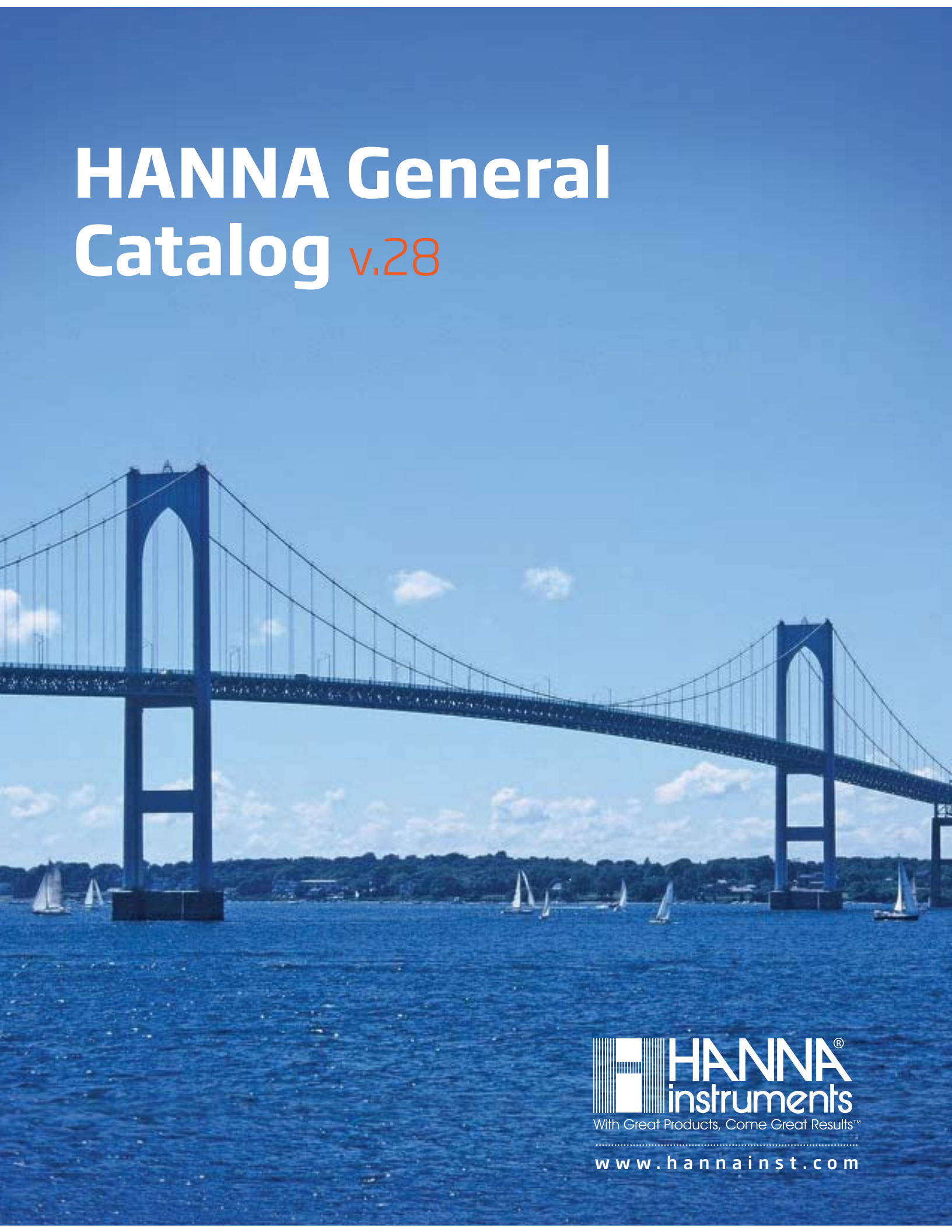
HANNA General Catalog v.28



HANNA® instruments
With Great Products, Come Great Results™

www.hannainst.com

President's Message

July 2011

Dear Valued Customer:

Hanna has long held the ideal that a company should be close to its customers to truly provide the highest level of personal service and technical support. We make every effort possible to open new offices to support this ideal. Our customers can always be assured that when they pick up a phone and dial one of our local sales, customer service, or technical support representatives they will be receiving the information they need. There are no centralized call centers; you are always speaking with a local Hanna employee.

We listen to all of our customer feedback and suggestions; not only to improve and introduce innovative products but to strengthen our relationship with you, our valued customer. We believe the only way to genuinely obtain the insight into the specific needs of our customers is to create an open dialogue about our products and your intended application.

As the largest family-owned manufacturer of analytical instrumentation in the world, we design, manufacture, supply and support all of our products to provide our customers with a level of value that our competitors struggle to compete with. Our products are manufactured in our European state-of-the-art ISO 9001:2000 production facility and are CE compliant to EN 61326-1 and EN 61010-1 standards.

Please use this catalog as a resource for finding the right product for your application. This catalog offers contact information so that you may get in touch with your local Hanna office and to learn a little more about our company and the value we offer.

Hanna dedicates itself to be a worldwide leader in quality, value, service and selection. We can assure you that these fundamentals will be unmistakable throughout your Hanna experience.

On behalf of Hanna worldwide, thank you for your continued loyal support.

Martino Nardo
President, HANNA Instruments

Table of Contents

About HANNA

History

HANNA Instruments was founded in Padova, Italy in 1978 by Anna and Oscar Nardo and is currently headquartered in Woonsocket, Rhode Island by their children, Pamela and Martino Nardo. With over 50 offices in 40 countries worldwide, HANNA continues to grow to meet the demand for its products in a variety of industries. Throughout its history, HANNA has been at the forefront of technology and innovation.

Philosophy

The philosophy of the Nardo family has always been to supply customers around the world with practical, cost-effective solutions for their testing needs.

When HANNA introduced the pHep® pH (pH Electronic Paper) tester in 1986 it literally revolutionized the world of testing. Millions of people from various industries were now capable of testing pH simply, accurately and affordably. This is the basis for the winning philosophy strongly embedded in HANNA. When we introduced the world's first single parameter series of automatic titrators dedicated to food analysis in 2005, we put thousands of users from around the world in the position to improve the quality of their product by performing their own in-house analytical tests.

The driving philosophy that has been a HANNA trademark for over three decades has enabled us to provide the right instrumentation to our customers with world class service and support.

Innovation

For over thirty years, HANNA has prided itself in being a world leader in innovation of analytical instrumentation. Headed by our team at the home office, HANNA's research & development department constantly challenge themselves to invent new testing techniques, and to advance existing technology. The minds at HANNA work to achieve the common goal of simplifying analytical testing through improving instrumentation, sensor development, reagents and chemicals.

In 1985, HANNA was first to introduce to a pH electrode with a built in temperature sensor. This electrode soon became commonly used throughout the worldwide market. In 1990, after listening to its customers, HANNA was one of the first companies to launch a line of waterproof, portable instruments built specifically for harsh environments. The concept of giving users the possibility to check the accuracy of their digital thermometer (CAL CHECK™) was introduced by HANNA in 1995 and is still unique today. With technology that was first introduced by HANNA in 2000, the HI 98129 and HI 98130 Combo testers allowed simultaneous testing for pH and EC in a single instrument. In 2004, HANNA introduced HI 98121, the worlds first combination pH and ORP tester.

Manufacturing

We believe in controlling the quality of our products from their inception to delivery. For this reason, we manufacture all of the products we bring to market. To ensure consistency and quality, each of our manufacturing facilities are specialized in a product family.

To stay at the forefront of quality and innovation, we continuously invest in new technologies and equipment as well as implementing new manufacturing techniques. As a vertically integrated manufacturer, HANNA does not subcontract any part of manufacturing. Processes such as plastic molding, glass blowing, chemical bottling and assembly are performed in one of our state of the art facilities. HANNA is an ISO 9001:2000 certified company.

A Rich History of Innovative Excellence

- **1978** HANNA opens in Italy
- **1980** World's first single-probe portable conductivity meter
- **1982** World's first pH controlled chemical dosing pump
- **1984** World's first microprocessor-based hand held pH meter
- **1985** World's first pH electrode with built-in temperature sensor
- **1986** World's first electronic pocket-sized pH tester

  Opened R&D/Sales & Technical Service Office in USA

  Opened Manufacturing Plant/Sales & Technical Service Office in Singapore
- **1987** Opened Sales & Technical Service Offices in Australia, Belgium and UK
- **1988** World's first pre-amplified pH electrode

  Opened Manufacturing Plant in Mauritius
  Opened Sales & Technical Service Offices in France, Germany, Japan and Malaysia
- **1989** Opened Sales & Technical Service Office in South Korea
- **1990** World's first waterproof portable pH meter

  Opened Sales & Technical Service Office in Taiwan
- **1991** World's first replaceable electrode pH pocket tester

  Opened Sales & Technical Service Offices in Spain and South Africa
- **1992** World's first portable pH meter with plain-paper printer

  Opened Sales & Technical Service Office in Canada
- **1994** Opened Sales & Technical Service Office in Argentina
- **1995** World's first pocket thermometer with CAL CHECK™
- **1996** Opened Sales & Technical Service Office in Indonesia
- **1997** World's first pH tester with double junction electrode

  Opened Sales & Technical Service Office in Chile
- **1999** World's first pH/temperature tester with dual-level LCD

  Opened Manufacturing Plant/Sales & Technical Service Office in Romania

  Opened Sales & Technical Service Offices in Holland, Mexico, Poland, Portugal and Thailand
- **2000** World's first multiparameter (pH/conductivity/ temperature) pocket tester

  Opened Manufacturing Plant/Sales & Technical Service Office in Hungary

  Opened Sales & Technical Service Office in China
- **2001** Opened Sales & Technical Service Office in Greece
- **2002** World's first colorimeter with CAL CHECK™ feature

  Opened Sales & Technical Service Office in Egypt
- **2003** World's first pH meter with Calibration Check™
- **2004** World's first process pH meter with integrated cellular communication

  World's first pH/ORP combo tester

  Opened Sales & Technical Service Office in Vietnam
- **2005** World's first single parameter line of auto titrators for wine testing

  Opened Sales & Technical Service Office in Brazil
- **2006** World's first single parameter automatic mini titrator

  Opened Sales & Technical Service Office in India
- **2007** World's first conductimetric known addition alcohol analyzer for beverages

  Opened Sales & Technical Service Office in Morocco
- **2010** World's first handheld colorimeters (Checker ®HC series) to offer ease of use and high accuracy in a palm sized design

  Opened Sales & Technical Service Offices in Bolivia, Cameroon Colombia, Costa Rica, Croatia, Czech Republic, Guatemala and Slovakia

360° Value

We Design, Manufacture, Supply and Support All of Our Products.

That's 360° Value.

When you buy a HANNA product, you're not only buying the best value for your money, but you're also receiving the benefit of HANNA's unsurpassed customer service and post-sale technical support.

Worldwide Leader

With 60 offices in over 40 countries, HANNA dedicates itself to be a worldwide leader in service and selection.

Offering research grade quality at competitive prices, every HANNA office strives to work with each customer to develop a solution tailored to their needs, on their budget.

Local Support

After you have made your investment, you should never feel uncertain about the support or technical service you will receive. HANNA develops relationships with its customers built on quality products with personal service and support.

24/7 Access

Visit www.hannainst.com. There you can search for products, look up local office contacts, download instruction manuals, MSDS and brochures. See 21.8 for more information.

Close to You

It is our policy to regularly participate in local tradeshows and advertise our latest innovations in market specific magazines.

Certification

All HANNA products are in compliance with CE directives and our production facilities are ISO 9001:2000 certified.

Quality

Our products are designed and manufactured under strict ISO 9001:2000 standards. Every instrument undergoes stringent quality control tests at different stages of manufacturing including 100% quality control checks just prior to shipment.

http://www.hannainst.com/

Production Facilities

Our main manufacturing facility is located on a 100 acre, state of the art industrial science park in Nusfalau, Europe, with a secondary site in Woonsocket, United States. All of our product lines are manufactured in-house.

In a short time, HANNA has reached it's target to produce all of it's instrumentation in-house. Since the introduction of it's industrial science park located in Romania, the facility is equipped to support all phases of production such as product research and design, plastic injection molding, electronic assembly, glass blowing for electrodes, standards production and final assembly of product. HANNA oversees all aspects of it's products from conception to the final quality check and packaging.

HANNA also produces the packaging for all product lines. Each package is carefully designed for safety and practicality.

The in-house control of all research, design and production steps provides continual quality control at all phases to assure the highest level of quality.

After continuous validation and testing, HANNA products undergo a final quality control before they are packaged and released to consumers.

In-house production affords HANNA the freedom to efficiently bring new and innovative products to market while continuously improving the quality and features of existing products to meet the needs of customers.

World Headquarters

Headquarters

HANNA's headquarters is located in Woonsocket, Rhode Island, USA. This facility also houses our primary research and development center, global marketing and sales coordination, technical training facility as well as the primary sales and technical service office for the USA.

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New Products

HI 903

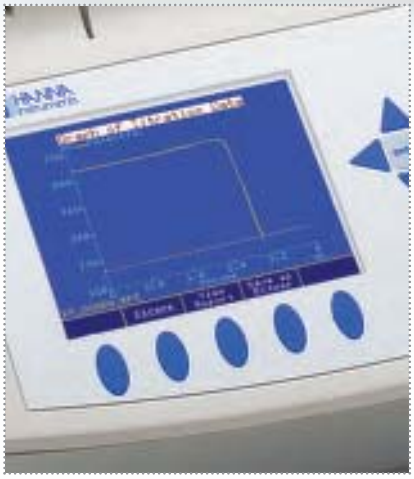
Karl Fischer Volumetric Titrator for Moisture Determination

5.8

The HI 903 Karl Fischer Volumetric Titrator for moisture analysis combines an ultra-high precision titrant delivery system with optically regulated magnetic stirring, endpoint determination, dynamic dosing and background drift correction algorithms.

The result is an extremely adaptable titrator capable of titrating with superior accuracy and precision even for samples with low moisture content. The HI 903 dispenses the titrant, detects the endpoint and performs all necessary calculations automatically.

- **Large 5.7" color LCD with backlight**
- **Stores standardization information for up to 20 titrants**
- **Supports up to 100 titration methods**
- **Dynamic dosing with optional pre-dispensing**
- **Display titration graph on-screen and save as a bitmap**
- **Multi language support**
- **Field-upgradeable software via USB flash drive input**
- **Incorporates into any GLP data management program**
- **Compatible with most major titrant and solvent brands**



USB Connectivity

Using a USB flash drive or connecting the titrator to the HI 900PC application, methods (standard and user) can be upgraded, stored or deleted.

Versatile and Intuitive Workflow

The HI 903's powerful software and intuitive menu system are easily navigated on the large, color LCD display making it simple to view results. Choose from included methods or develop a custom method for almost any application or sample type.

Clip-Lock™ Exchangeable Burette System

The Clip-Lock™ exchangeable burette system prevents cross contamination while reducing loss of time and reagents. Burettes simply slide out for quick exchanges, and detaching the aspiration and dispensing tubes from the titrant bottles is easy.

HI 9829 • HI 98290

8.4

GPS Multiparameter Meters

HANNA's HI 9829 and HI 98290 multiparameter meters are ideal for field measurements of lakes, rivers and seas.

These meters support turbidity, ISE's and Fast tracker™ logging along with the standard water quality parameters of pH, ORP, DO and EC.

The HI 98290 with GPS can embed location with measurement data to view on the display or PC using popular mapping software.

- **Fully customizable**
- **Display from 1 to 12 parameters**
- **Waterproof protection for meter (IP67) and probes (IP 68)**
- **Track measurement locations with GPS (HI 98290)**
- **Field replaceable sensors**
- **Logging on the probe or meter**

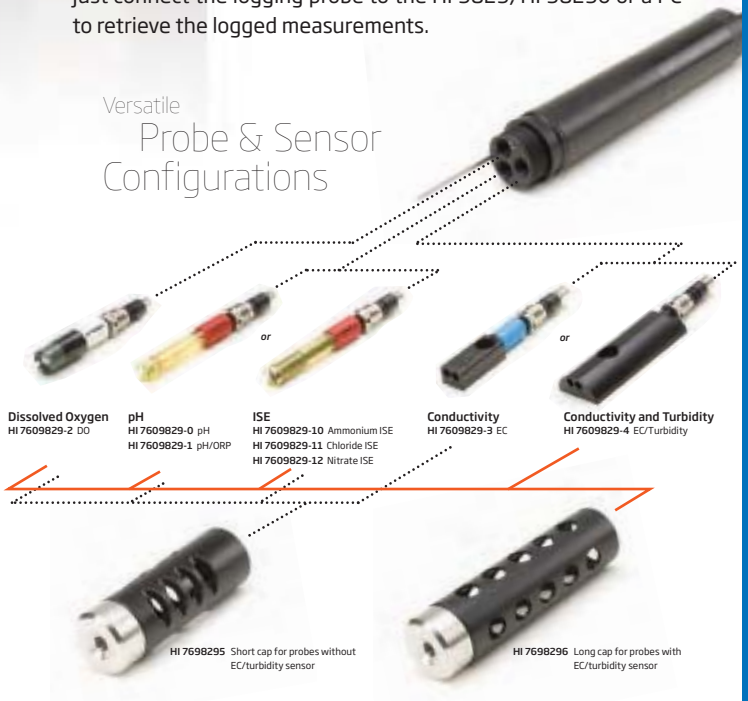
Autonomously Logging probes Available

After starting a log, the HI 7629829 and HI 7639829 logging probes can autonomously log parameters without further connection to the HI 9829 or HI 98290.

Just connect the logging probe to the HI 9829, HI 98290 or a PC to retrieve the logged measurements.

- **Dedicated HELP at the touch of a button**

Versatile Probe & Sensor Configurations



New Products

HI 902C

Automatic Titration System

5.12

The HI 902C is an automatic titrator dedicated to quick and accurate laboratory analysis. HI 902C can perform acid/base, potentiometric, ORP, complexometric, precipitation, back titrations and titre determinations. The HI 902C dispenses the titrant, detects the endpoint and performs all necessary calculations automatically.

- **Potentiometric titrator, pH meter, mV meter, and ISE meter**
- **Intuitive user interface**
- **Direct analytical laboratory balance connection**
- **Multi-language support**

- **USB connectivity**
  Allows for field upgrades and the transfer of methods and reports to a PC or another titrator via USB flash drive

- **Versatile support**
  Support for 2 electrodes, 2 burette dosing pumps and 2 stirrers

- **Method sequencing**
  Linked titration methods allow two methods to run in sequence

HI 3512

Two Channel pH Meter

The HI 3512 is a two channel professional benchtop meter with a graphic LCD, designed to provide accurate laboratory results. Channel one features pH/ORP/ISE and temperature measurement capability while channel two measures EC/TDS/NaCl/ Resistivity and temperature.

HI 2000 series

Benchtop Meters

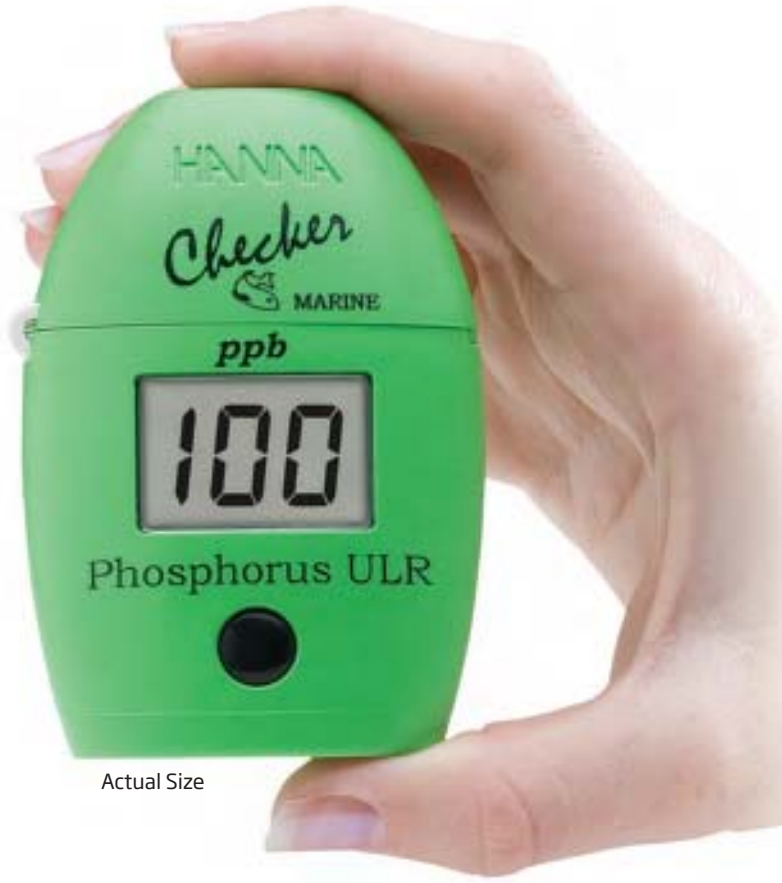
Our HI 2000 series of pH, conductivity and DO benchtop meters has been updated and expanded. Some highlights include the HI 2550 two channel meter that measures up to seven parameters, the HI 2221 and HI 2223 meters featuring Calibration Check™, HI 2216 pH/ISE meter and HI 2222 meter with CPS™ electrode specifically designed for wine analysis.

Foodcare Line

Mini Titrators

In addition to the Dairy and Wine Line mini titrators, HANNA introduces the Food Care Line of mini titrators for fruit juice, mayonnaise, mustard and vinegar. Formol Number for wine analysis has also been added to our Wine Line.

- **All in one**
- **Dedicated HELP button**
- **User friendly interface**



Actual Size

Checker®HC handheld colorimeter

Checker®HC Handheld Colorimeters

1.12

The HANNA Checker®HC bridges the gap between simple chemical test kits and professional instrumentation. Chemical test kits are not very accurate and only give five to ten points resolution while professional instrumentation can cost hundreds of dollars and can be time consuming to calibrate and maintain. The Checker®HC is both accurate and affordable.

The contoured style of the Checker®HC fits in your palm and pocket perfectly and the large LCD is easy to read. The auto shut-off feature assures the battery life will not be drained if you forget to turn it off.

The Checker®HC is extremely simple to use. First, zero the instrument with your water sample. Next, add the reagent. Last, place the vial into the Checker®HC, press the button and read the results. It's that easy.

- **Easier to use and more accurate than chemical test kits**
- **Large, easy to read digits**
- **Auto shut off**
- **Designed to work with HANNA's reagents**
- **Use for quick and accurate on the spot analysis**
- **Single button operation: zero and measure**
- **Operated by a single AAA battery**

Fast and Accurate measurements

The Checker®HC is very simple to use:

"Zero" the Checker®HC as required in specific procedure

Add reagent to your water sample

Place the vial into your Checker®HC

Press the button and read the results. It's that easy!

New Products

HANNA Portable Family

pH, ISE, Conductivity, DO and Temperature Portable Meters

Most pH, ISE, EC and DO portable instrumentation has been updated and redesigned. Features for most models include on-screen tutorials to guide users through operation and calibration, BEPS (Battery Error Prevention System) and waterproof casings.

pH, Conductivity, and DO

Upgraded and Expanded

pH, Conductivity and Multiparameter

Application Designed pH, Conductivity, and Multiparameter

Thermometers

HI 96 Series

Digital Refractometers

HANNA offers digital refractometers for analysis in wine, food, natural and artificial seawater analysis and ethylene and propylene glycol.

- **Dual level LCD**
- **IP65 waterproof protection**
- **Results in less than 1.5 seconds**

HI 96 Series

Portable Photometers

HANNA has extended the portable photometer line to include new single and multiparameter portable photometers.

- **CAL CHECK™ Calibration and Verification**
- **GLP** (Good Laboratory Practice)
- **BEPS** (Battery Error Prevention System)

HI 83 Series

Benchtop Photometers

HANNA has expanded it's benchtop photometer line including COD.

- **Log and recall readings**
- **On-screen tutorials**
- **Contextual help at the touch of a button**
- **PC compatible via USB**

HANNA instruments

With Great Products, Come Great Results™

CONTENTS

Checker®HC handheld colorimeter

HANNA Handheld Colorimeters

The HANNA Checker®HC bridges the gap between simple chemical test kits and professional instrumentation. Chemical test kits are not very accurate and only give 5 to 10 points resolution while professional instrumentation can cost hundreds of dollars and can be time consuming to calibrate and maintain. The Checker®HC is both accurate and affordable.

The contoured style of the Checker®HC fits in your palm and pocket perfectly and the large LCD is easy to read. The auto shut-off feature assures the battery life will not be drained if you forget to turn it off.

The Checker®HC is extremely simple to use. First, zero the instrument with your water sample. Next, add the reagent. Last, place the vial into the Checker®HC, press the button and read the results. It's that easy.

- **Easier to use and more accurate than chemical test kits**
  High accuracy
  Large, easy to read digits
  Auto shut off
- **Dedicated to a single parameter**
  Designed to work with HANNA's reagents
  Uses 10 mL glass cuvettes
- **Small size, big convenience**
  Weighing a mere 64 g (2.25 oz.), the Checker®HC easily fits in your palm or pocket
  Use for quick and accurate on the spot analysis
  Single button operation: zero and measure
  Operated by a single AAA battery

The Checker®HC is very simple to use:


"Zero" the Checker®HC as required in specific procedure


Add reagent to your water sample


Place the vial into your Checker®HC


Press the button and read the results. It's that easy!

PARAMETER	CODE	PAGE
Checker®HC Handheld Colorimeters		
Alkalinity	HI 755	1.12
Chlorine, Free	HI 701	1.13
Chlorine, Total	HI 711	1.13
Chromium VI, High Range	HI 723	1.14
Color of Water	HI 727	1.15
Fluoride, Low Range	HI 729	1.16
Fluoride, High Range	HI 739	1.16
Iodine	HI 718	1.17
Iron	HI 721	1.18
Nickel, High Range	HI 726	1.19
Nitrite, Ultra Low Range	HI 764	1.20
Phosphate, Low Range	HI 713	1.21
Phosphate, High Range	HI 717	1.21
Phosphorus, High Range	HI 706	1.22
Phosphorus, Ultra Low Range	HI 736	1.22
Silica, High Range	HI 770	1.23

HANNA Chemical Test Kits

HANNA test kits are a simple way to perform an accurate chemical analysis. The wide variety of single parameter test kits presented in this section includes colorimetric, checker disc, titration and turbidimetric methods.

Quick and easy to use, HANNA colorimetric chemical test kits are the ideal solution for water analysis of many chemical parameters. The kits are equipped with a transparent container which has the color scale right next to the sample being tested. This makes the color comparison process simple and error free. The reagents are either liquid or powder depending on the parameter to be measured.

HANNA Checker® Disc test kits use the technology of colorimetric kits to provide greater accuracy and resolution. The Checker® Disc is a color comparison wheel shaded from dark to light in proportion to the concentration of the chemical parameter being tested. The user just needs to put both the blank and the reacted cuvettes inside the Checker® Disc. By turning the wheel, the user can then visually find the concentration that best equals the reacted sample. This technique enhances resolution and accuracy.

These precise kits are easy to use without any loss of resolution and accuracy. To determine the concentration of the chemical parameter, these kits utilize a titration technique which consists of counting the number of drops of titrant necessary to cause a color change in the sample. The endpoint can be determined with enhanced accuracy and simplicity.

HANNA test kits are supplied ready to use, complete with all the necessary accessories. They are designed to help you to work better, faster and safer.

All HANNA chemical test kits use color coded dropper bottles which are easy to recognize during analysis. Dropper bottles make titration extremely quick and easy without compromising accuracy.

With some kits, a plastic beaker is provided featuring a ported cap to prevent spills and waste.

Every kit is manufactured according to the highest quality standards and a Safety Data Sheet (SDS) is available for each product, online.

Designed for Specific Applications

HANNA combination chemical test kits are tailor made for specific applications:

- **Olive Oil Acidity**
- **Acid Mining**
- **Agriculture**
- **Alkalinity - Acidity**
- **Aquaculture and Aquariums**
- **Boiler Feedwater**
- **Cooling Systems and Boilers**
- **Education**
- **Environmental Testing**
- **Swimming Pools**
- **Water Quality**

Tailor made for your application

HANNA multiparameter test kits include all the necessary reagents and accessories for their specific application.

Ideal for field measurements

These multiparameter test kits from HANNA are equipped with step-by-step, easy to understand instruction manuals. A hard carrying case helps to keep your equipment neat, organized and easy to carry around in the field. Our carrying cases are rugged, built to last, and easily refilled with replacement reagents as needed.

One more advantage: HANNA's exclusive pHep® for pH measurements

For those kits that offer pH measurements, HANNA has included the exclusive pHep® electronic tester so that your pH analysis will always be quick and reliable. Traditional pH test strips have limited accuracy and do not cover the entire pH range. Due to the pHep's long life, high accuracy and extended range, these problems are avoided.

Comprehensive Instructions

Every chemical test kit is supplied with a comprehensive, easy to understand instruction manual. The manuals guide you through the analysis step-by-step, making it easy for even non-technical personnel to perform tests.

HANNA Checker®HC Series

Product Spotlights

HI 701 • HI 711

Free and Total Chlorine Handheld Colorimeters

1.13

Chlorine is the most common water disinfectant. The monitoring of chlorine is crucial in applications such as swimming pools and spas, fruit and vegetable sanitation, disinfection and drinking water. By monitoring this crucial parameter, serious health and safety risks can be avoided.

These Checker®HC portable handheld colorimeters feature a resolution of 0.01 ppm (250 points for free chlorine, 350 for total chlorine) and ±0.03 ppm (mg/L) ±3% of reading accuracy. They also use an EPA approved DPD method.

The HI 711 and HI 701 Checker®HC's are extremely simple to use. First, zero the instrument with your water sample. Next, add the reagent. Last, place the vial into the Checker®HC, press the button and read the results. It's that easy.

HI 721

Iron Handheld Colorimeter

1.18

About 6.3% of the earths crust is made of iron, of which 43% is in soils. The analysis of iron is often performed to monitor ground water and irrigation waters as a gauge of corrosion from industrial settling, and as an indication of the effectiveness of treatment from mining leachate.

The new HI 721 Checker®HC portable handheld colorimeter features a resolution of 0.01 ppm (500 points) and ±0.04 ppm ±2% of reading accuracy. The HI 721 Checker®HC uses an adaptation of Standard Method 315 B.

The HI 721 Checker®HC is extremely simple to use. First, zero the instrument with your water sample. Next, add the reagent. Last, place the vial into the HI 721 Checker®HC, press the button and read the results. It's that easy.

HI 736

Phosphorus Ultra Low Range Handheld Colorimeter

1.22

All photosynthetic organisms and well as photosynthetic harborers require organic and inorganic phosphorus (as phosphate) in the aquarium system. Plants, algae and phytoplankton require this nutrient for nourishment and utilize phosphorous as a component of cell tissue.

The HI 736 Checker®HC portable handheld colorimeter features a resolution of 1 ppb and ±5 ppb ±5% of reading accuracy and uses an adaptation of Standard Method Ascorbic Acid for marine applications.

The HI 736 Checker®HC is extremely simple to use. First, zero the instrument with your water sample. Next, add the reagent. Last, place the vial into the HI 736 Checker®HC, press the button and read the results. It's that easy.

HI 3897

Olive Oil Acidity Test Kit

1.25

Acidity (expressed as percent oleic acid) is the most fundamental measurement of olive oil. It is the primary indicator of olive oil purity and freshness.

Normally, testing acidity is a complicated process requiring the use of various chemicals in a laboratory environment. HANNA has simplified this process in an easy to understand test kit that can be used by almost anyone to produce quick and accurate results.

With the HI 3897 test kit, it is possible to easily and accurately test the quality of olive oil at various stages of processing and storage to monitor and maintain the highest quality.

HI 3814

Environmental Monitoring Test Kit

1.58

HI 3814 is equipped with all the accessories and reagents to perform over 100 tests for each parameter.

The pHep®, our popular pH electronic tester, is included for your convenience. This small and easy to use pH meter will provide more accurate and reliable pH readings than conventional litmus paper. The pHep® also has the added benefit of introducing students to the use of a pH meter.

The kit is supplied complete with a step-by-step instruction manual and a hard carrying case which makes it easy to perform tests in the field.

HI 3899BP

Backpack Lab™ Marine Science Educational Test Kit

1.63

Backpack Lab™ is designed with all the necessary components in one place, reducing the chance of misplacing an item. Ideal for transporting, take this durable backpack to the field for on-site measurements.

This kit is designed to provide a complete unit for teachers to introduce students to important marine science topics. The teacher's guide provides detailed background information for marine science lessons/activities that can be adapted to various grade levels. Field tests are included to complement classroom lessons. All materials fit easily into the supplied backpack for easy transport.

Quick Reference Charts

SINGLE PARAMETER TEST KITS

PARAMETER	METHOD	RANGE	# OF TESTS	CODE	PAGE
Acidity (as $CaCO_3$)	titration	0-100 mg/L (ppm) 0-500 mg/L (ppm)	110 avg.	HI 3820	1.24
Acidity Total Exchangeable	titration	0.0-2.5 meq/100 g	100	HI 38084	1.24
Acidity (as Oleic acid %)	titration	0.00 - 1.00 % acidity	6	HI 3897	1.25
Alkalinity (as $CaCO_3$) Phenolphthalein and Total	titration	0-100 mg/L (ppm) 0-300 mg/L (ppm)	110 avg.	HI 3811	1.27
Alkalinity (as $CaCO_3$), Total	titration	0-500 gpg	100	HI 38014	1.27
Alkalinity (as $CaCO_3$), Phenolphthalein and Total	titration	0.0-10.0 gpg 0.0-20.0 gpg	200	HI 38013	1.27
Ammonia (as NH_3–N) (Fresh Water)	colorimetric	0.0-2.5 mg/L (ppm)	25 avg.	HI 3824	1.28
	checker disc	0.0-3.0 mg/L (ppm)	100	HI 38049	1.28
Ammonia (as NH_3–N) (Salt Water)	colorimetric	0.0-2.5 mg/L (ppm)	25 avg.	HI 3826	1.28
Ascorbic Acid	titration	10-200 mg/L (ppm)	100 avg.	HI 3850	1.29
Boron	titration	0.0-5.0 mg/L (ppm)	100	HI 38074	1.29
Bromine	colorimetric	0.0-3.0 mg/L (ppm)	60 avg.	HI 3830	1.30
Calcium (irrigation water)	turbidimetric	0-125 mg/L (ppm) 0-250 mg/L (ppm)	100	HI 38086	1.30
Ca & Mg (Irrigation Water)	titration	>0.0 meq/L	100 avg.	HI 38081	1.30
Ca & Mg (Soil)	titration	>0.0 meq/100 g	100 avg.	HI 38080	1.30
Carbon Dioxide	titration	0.0-10.0 mg/L (ppm) 0.0-50.0 mg/L (ppm) 0-100 mg/L (ppm)	110 avg.	HI 3818	1.31
Chloride (as Cl^-) for COD tesing	visual	1000 mg/L (ppm) (ISO) 2000 mg/L (ppm) (EPA)	100	HI 3898	1.31
Chloride (as Cl^-)	titration	0-100 mg/L (ppm) 0-1000 mg/L (ppm)	110 avg.	HI 3815	1.32
	titration	500-10000 mg/L (ppm) 5000-100000 mg/L (ppm)	100	HI 38015	1.32
Chlorine Free	colorimetric	0.0-2.0 mg/L (ppm)	50 avg.	HI 3829F	1.33
	colorimetric	0.0-2.5 mg/L (ppm)	50 avg.	HI 3831F, HI 3831F/S	1.33
	checker disc	0.0-3.5 mg/L (ppm)	100	HI 3875	1.33
	checker disc	0.00-0.70 mg/L (ppm) 0.0-3.5 mg/L (ppm)	200	HI 38018	1.33
Chlorine Free & pH	colorimetric	Cl_2: 0.0-2.5 mg/L (ppm) pH: 6.0-8.5 pH	50 avg. 100	HI 3887	1.33
Chlorine Free & Total	checker disc	0.00-0.70 mg/L (ppm) 0.0-3.5 mg/L (ppm)	200	HI 38017	1.33
	checker disc	0.00-0.70 mg/L (ppm) 0.0-3.5 mg/L (ppm) 0.0-10.0 mg/L (ppm)	200	HI 38020	1.33
Chlorine Total	colorimetric	0.0-2.5 mg/L (ppm)	50	HI 3831T, HI 3831T/S	1.34
	checker disc	0.0-3.5 mg/L (ppm)	100	HI 38016	1.34
	checker disc	0.00-0.70 mg/L (ppm) 0.0-3.5 mg/L (ppm)	200	HI 38019	1.34
	titration	0.0-4.0 mg/L (ppm) 0-20 mg/L (ppm)	100	HI 38022	1.34
	titration	10-200 mg/L (ppm)	100	HI 38023	1.34
Chlorine Total & pH	colorimetric	Cl_2: 0.0-2.5 mg/L (ppm) pH: 6.0-8.5 pH	50 100	HI 3888	1.34
Chromium (as Cr^{6+})	titration	0-100 mg/L (ppm) 100-1000 mg/L (ppm)	100 avg.	HI 3845	1.35
	colorimetric	0.0-1.0 mg/L (ppm)	100 avg.	HI 3846	1.35

SINGLE PARAMETER TEST KITS

PARAMETER	METHOD	RANGE	# OF TESTS	CODE	PAGE
Copper	colorimetric	0.0-2.5 mg/L (ppm)	100	HI 3847	1.36
	colorimetric	0.00-0.25 mg/L (ppm)	100	HI 3856	1.36
	colorimetric	0.00-0.25 mg/L (ppm) 0.0-6.0 mg/L (ppm)	100	HI 38075	1.36
Cyanide (as CN^-)	checker disc	0.00-0.30 mg/L (ppm)	100	HI 3855	1.37
Cyanuric Acid	turbidimetric	10-100 mg/L (ppm)	100	HI 3851	1.37
Detergents (as ABS/LAS*)	checker disc	0.00-1.30 mg/L (ppm)	35	HI 3857	1.38
Formaldehyde	titration	0.00-1.00% 0.0-10.0%	110 avg.	HI 3838	1.38
Glycol	visual	Present/Absent	25	HI 3859	1.38
Hardness (as $CaCO_3$) Total	titration	0.0-30.0 mg/L (ppm) 0-300 mg/L (ppm)	100 avg.	HI 3812	1.39
	titration	0-150 mg/L (ppm)	50 avg.	HI 3840	1.39
	titration	40-500 mg/L (ppm)	50 avg.	HI 3841	1.39
	titration	400-3000 mg/L (ppm)	50 avg.	HI 3842	1.39
	titration	0-30 gpg	100	HI 38033	1.39
	titration	0.0-20.0 gpg 0.0-20.0 mg/L (ppm)	100	HI 38034	1.39
Hardness (as $CaCO_3$) Total & Calcium	titration	Total: 0.0-20.0 gpg Ca: 0.0-20.0 gpg	100	HI 38035	1.39
Hydrazine	checker disc	0.00-1.00 mg/L (ppm)	100	HI 3849	1.40
Hydrogen Peroxide	titration	0.00-2.00 mg/L 0.0-10.0 mg/L	100 avg.	HI 3844	1.40
Hydroxide (as OH^-)	titration	0.00-1.00 g/L (ppt) 0.0-10.0 g/L (ppt)	110 avg.	HI 3839	1.40
Hypochlorite (as Cl_2)	titration	50-150 g/L (ppt)	100 avg.	HI 3843	1.41
Iodine	colorimetric	0.0-2.5 mg/L (ppm)	50 avg.	HI 3832	1.41
	colorimetric	0-5 mg/L (ppm)	100	HI 3879	1.41
Iron	colorimetric	0-5 mg/L (ppm)	50 avg.	HI 3834	1.42
	checker disc	0.00-1.00 mg/L (ppm)	100	HI 38039	1.42
	checker disc	0.0-5.0 mg/L (ppm)	100	HI 38040	1.42
	checker disc	0.0-10.0 mg/L (ppm)	100	HI 38041	1.42
Iron and Total Hardness	colorimetric titration	Fe: 0-5 mg/L (ppm) TH: 40-500 mg/L (ppm)	50 avg.	HI 3889	1.42
Magnesium (Irrigation Water)	titration	0.0-240.0 mg/L (ppm) 0.0-725.0 mg/L (ppm)	100 avg.	HI 38079	1.43
Manganese	checker disc	0.0-3.0 mg/L (ppm)	100	HI 38042	1.43
	checker disc	0.0-10.0 mg/L (ppm)	100	HI 38072	1.43
Nitrate (as NO_3^-–N)	colorimetric	0-50 mg/L (ppm)	100	HI 3874	1.44
Nitrate (as NO_3^-–N) (Irrigation Water and Soil)	checker disc	water: 0-50 mg/L (ppm) soil: 0-60 mg/L (ppm)	100 100	HI 38050	1.44

*ABS= Alkyl Benzene Sulfonate; LAS= Linear Alkyl Sulfonate

Quick Reference Charts

SINGLE PARAMETER TEST KITS					
PARAMETER	**METHOD**	**RANGE**	**# OF TESTS**	**CODE**	**PAGE**
Nitrite (as NO_2^-–N)	colorimetric	0.0-1.0 mg/L (ppm)	100	HI 3873	1.45
	checker disc	0.00-0.50 mg/L (ppm)	100	HI 38051	1.45
Oxygen, Dissolved	titration	0.0-10.0 mg/L (ppm)	110 avg.	HI 3810	1.45
Ozone	checker disc	0.0-2.3 mg/L (ppm)	100	HI 38054	1.45
pH	checker disc	3.0-5.0 pH	200	HI 3882	1.46
	colorimetric	4.0-6.5 pH	100	HI 3880, HI 3880/0*	1.46
	color card	4.0-8.0 pH	200	HI 3881-5	1.46
	colorimetric	6.0-8.5 pH	100	HI 3881, HI 3881/0*	1.46
	colorimetric	7.5-10.0 pH	100	HI 3886	1.46
	colorimetric	7.5-10.0 pH	100	HI 3886/0	1.46
	checker disc	4.0-10.0 pH	300	HI 38058	1.46
Phenols	checker disc	0.00-1.00 mg/L (ppm) 0.5-5.0 mg/L (ppm)	100	HI 3864	1.47
Phosphate (PO_4^{3-})	colorimetric	0-5 mg/L (ppm)	50	HI 3833	1.47
	checker disc	0.0-5.0 mg/L (ppm)	100	HI 38077	1.47
	checker disc	0.00-1.00 mg/L (ppm) 0.0-5.0 mg/L (ppm) 0-50 mg/L (ppm)	100	HI 38061	1.47
Phosphorus (Soil)	checker disc	0.0-130.0 mg/L (ppm)	100	HI 38073	1.48
Potassium (Soil)	turbidimetric	0-50 mg/L (ppm) 50-250 mg/L (ppm)	100	HI 38082	1.48
Salinity	titration	0.0-40.0 g/kg (ppt)	110 avg.	HI 3835	1.49
Sodium Adsorbtion Ratio (SAR)	DiST®4+ test kit	> 0.0 meq/L	100 avg.	HI 38078	1.49
Sodium Exchangeable (EES) and Gypsum Requirement (GR)	titration	EES: 0.00-56.40 meq/100 g soil GR: 0.0-213.0 metric ton/ha	100	HI 38083	1.49
Silica	checker disc	0.00-1.00 mg/L (ppm)	100	HI 38066	1.50
	checker disc	0-40 mg/L (ppm) 0-800 mg/L (ppm)	100	HI 38067	1.50
Sulfate (as SO_4^{2-})	turbidimetric	20-100 mg/L (ppm)	100	HI 38000	1.50
	titration	100-1000 mg/L (ppm) 1000-10000 mg/L (ppm)	200	HI 38001	1.50
Sulfite (as Na_2SO_3)	titration	0.0-20.0 mg/L (ppm) 0-200 mg/L (ppm)	110 avg.	HI 3822	1.51
Zinc	colorimetric	0.0-3.0 mg/L (ppm)	100	HI 3854	1.51
	checker disc	0.0-4.0 mg/L (ppm) 0.0-20.0 mg/L (ppm)	100	HI 38076	1.51

*contains dechlorinating reagent

MULTIPARAMETER TEST KITS

PARAMETER	METHOD	RANGE	# OF TESTS	PAGE
HI 3819 Acid Mining Test Kit				
Acidity (as $CaCO_3$)	titration	0-100 mg/L (ppm) 0-500 mg/L (ppm)	110 avg.	1.52
Alkalinity (as $CaCO_3$)	titration	0-100 mg/L (ppm) 0-300 mg/L (ppm)	110 avg.	
Iron	colorimetric	0-5 mg/L (ppm)	50	
pH	electronic pH tester	0.0-14.0 pH	life of the meter	
HI 3813 Alkalinity and Acidity Test Kit				
Acidity (as $CaCO_3$)	titration	0-100 mg/L (ppm) 0-500 mg/L (ppm)	110 avg.	1.52
Alkalinity (as $CaCO_3$)	titration	0-100 mg/L (ppm) 0-300 mg/L (ppm)	110 avg.	
HI 3895 Agriculture Test Kit, Basic				
Nitrogen	colorimetric	traces, low, medium, high	10	1.54
Phosphorus	colorimetric	traces, low, medium, high	10	
pH	colorimetric	4 to 9 pH (1 pH increments)	10	
Potassium	turbidimetric	traces, low, medium, high	10	
HI 3896 Agriculture Test Kit, Pro				
Nitrogen	colorimetric	traces, low, medium, high	25	1.54
Phosphorus	colorimetric	traces, low, medium, high	25	
pH	colorimetric	4 to 9 pH (1 pH increments)	25	
Potassium	turbidimetric	traces, low, medium, high	25	
HI 3823 Combination Test Kit for Aquaculture				
Alkalinity (as $CaCO_3$)	titration	0-100 mg/L (ppm) 0-300 mg/L (ppm)	110 avg.	1.55
Carbon Dioxide	titration	0.0-10.0 mg/L (ppm) 0.0-50.0 mg/L (ppm) 0-100 mg/L (ppm)	110 avg.	
Hardness (as $CaCO_3$)	titration	0.0-30.0 mg/L (ppm) 0-300 mg/L (ppm)	100 avg.	
Oxygen, Dissolved	titration	0.0-10.0 mg/L (ppm)	110 avg.	
pH	electronic pH tester	0.0-14.0 pH	life of the meter	
Salinity	titration	0.0-40.0 g/Kg (ppt)	110 avg.	
HI 3893 Aquarium Test Kit				
Ammonia (as NH_3–N)	colorimetric	0.0-2.5 mg/L (ppm)	50	1.55
Nitrate (as NO_3^-–N)	colorimetric	0-50 mg/L (ppm)	50	
Nitrite (as NO_2^-–N)	colorimetric	0.0-1.0 mg/L (ppm)	50	
pH	colorimetric	6.0-8.5 pH	50	
HI 3816 Boiler Test Kits				
Alkalinity (as $CaCO_3$)	titration	0-100 mg/L (ppm) 0-300 mg/L (ppm)	110 avg.	1.56
Chloride (as Cl^-)	titration	0-100 mg/L (ppm) 0-1000 mg/L (ppm)	110 avg.	
Hardness (as $CaCO_3$)	titration	0.0-30.0 mg/L (ppm) 0-300 mg/L (ppm)	100 avg.	

Quick Reference Charts

MULTIPARAMETER TEST KITS				
PARAMETER	**METHOD**	**RANGE**	**# OF TESTS**	**PAGE**
HI 3827 Boiler Test Kits				
Alkalinity (as $CaCO_3$)	titration	0-100 mg/L (ppm) 0-300 mg/L (ppm)	110 avg.	1.56
Chloride (as Cl^-)	titration	0-100 mg/L (ppm) 0-1000 mg/L (ppm)	110 avg.	
Hardness (as $CaCO_3$)	titration	0.0-30.0 mg/L (ppm) 0-300 mg/L (ppm)	100 avg.	
Phosphate	colorimetric	0-5 mg/L (ppm)	50	
pH	electronic pH tester	0.0-14.0 pH	life of the meter	
Sulfite (as Na_2SO_3)	titration	0.0-20.0 mg/L (ppm) 0-200 mg/L (ppm)	110 avg.	
HI 3828 Boiler Test Kits				
Alkalinity (as $CaCO_3$)	titration	0-100 mg/L (ppm) 0-300 mg/L (ppm)	110 avg.	1.56
Chloride (as Cl^-)	titration	0-100 mg/L (ppm) 0-1000 mg/L (ppm)	110 avg.	
Hardness (as $CaCO_3$)	titration	0.0-30.0 mg/L (ppm) 0-300 mg/L (ppm)	100 avg.	
Iron	colorimetric	0-5 mg/L (ppm)	50	
pH	electronic pH tester	0.0-14.0 pH	life of the meter	
HI 3837 Boiler Test Kits				
Phosphate	colorimetric	0-5 mg/L (ppm)	50	1.56
pH	electronic pH tester	0.0-14.0 pH	life of the meter	
Sulfite (as Na_2SO_3)	titration	0.0-20.0 mg/L (ppm) 0-200 mg/L (ppm)	110 avg.	
HI 3821 Cooling and Boiler Combination Test Kit				
Alkalinity (as $CaCO_3$)	titration	0-100 mg/L (ppm) 0-300 mg/L (ppm)	110 avg.	1.57
Chloride (as Cl^-)	titration	0-100 mg/L (ppm) 0-1000 mg/L (ppm)	110 avg.	
Hardness (as $CaCO_3$)	titration	0.0-30.0 mg/L (ppm) 0-300 mg/L (ppm)	100 avg.	
Phosphate	colorimetric	0-5 mg/L (ppm)	50 avg.	
Oxygen, Dissolved	titration	0.0-10.0 mg/L (ppm)	110 avg.	
Sulfite (as Na_2SO_3)	titration	0.0-20.0 mg/L (ppm) 0-200 mg/L (ppm)	110 avg.	
HI 3814 Environmental Monitoring Test Kit				
Acidity (as $CaCO_3$)	titration	0-100 mg/L (ppm) 0-500 mg/L (ppm)	110 avg.	1.58
Alkalinity (as $CaCO_3$)	titration	0-100 mg/L (ppm) 0-300 mg/L (ppm)	110 avg.	
Carbon Dioxide	titration	0.0-10.0 mg/L (ppm) 0.0-50.0 mg/L (ppm) 0-100 mg/L (ppm)	110 avg.	
Hardness (as $CaCO_3$)	titration	0.0-30.0 mg/L (ppm) 0-300 mg/L (ppm)	100 avg.	
Oxygen, Dissolved	titration	0.0-10.0 mg/L (ppm)	110 avg.	
pH	electronic pH tester	0.0-14.0 pH	life of the meter	
HI 3825 Combination Swimming Pool Test Kit				
Alkalinity (as $CaCO_3$)	titration	0-100 mg/L (ppm) 0-300 mg/L (ppm)	110 avg.	1.59
Bromine	colorimetric	0.0-3.0 mg/L (ppm)	60 avg.	
Chlorine, Free/Total	colorimetric	0.0-2.5 mg/L (ppm)	50 avg.	
pH	electronic pH tester	0.0-14.0 pH	life of the meter	

MULTIPARAMETER TEST KITS

PARAMETER	METHOD	RANGE	# OF TESTS	PAGE
HI 3887, HI 3888 Quick-check Swimming Pool Test Kits				
Free Chlorine	colorimetric	0-2.5 mg/L (ppm)	50 avg.	1.59
Total Chlorine	colorimetric	0-2.5 mg/L (ppm)	50 avg.	
pH	colorimetric	6.0-8.5 pH	100 avg.	
HI 3817 Water Quality Test Kit				
Alkalinity (as $CaCO_3$)	titration	0-100 mg/L (ppm) 0-300 mg/L (ppm)	110 avg.	1.60
Chloride (as Cl^-)	titration	0-100 mg/L (ppm) 0-1000 mg/L (ppm)	110 avg.	
Hardness (as $CaCO_3$)	titration	0.0-30.0 mg/L (ppm) 0-300 mg/L (ppm)	100 avg.	
Iron	colorimetric	0-5 mg/L (ppm)	50	
pH	electronic pH tester	0.0-14.0 pH	life of the meter	
Sulfite (as Na_2SO_3)	titration	0.0-20.0 mg/L (ppm) 0-200 mg/L (ppm)	110 avg.	
HI 3817BP Backpack Lab™ Water Quality Educational Test Kit				
Acidity ($CaCO_3$)	titration	0-100 mg/L (ppm) 0-500 mg/L (ppm)	110	1.61
Alkalinity ($CaCO_3$) Phenolphthalein & Total	titration	0-100 mg/L (ppm) 0-300 mg/L (ppm)	110	
Carbon Dioxide	titration	0.0-10.0 mg/L (ppm) 0.0-50.0 mg/L (ppm) 0-100 mg/L (ppm)	110	
Oxygen, Dissolved	titration	0.0-10.0 mg/L (ppm)	110	
Hardness ($CaCO_3$)	titration	0.0-30.0 mg/L (ppm) 0-300 mg/L (ppm)	100	
Nitrate (NO_3^-–N)	colorimetric	0-50 mg/L (ppm)	100	
Phosphate	colorimetric	0-5 mg/L (ppm)	50	
pH	electronic pH tester	0.0-14.0 pH	life of meter	
EC	electronic ED/TDS tester	0-3999 µS/cm	life of meter	
TDS	electronic ED/TDS tester	0-12.000 ppm	life of meter	
Temperature	electronic tester (included with pH & EC/TDS tester)	0.0-60.0°C	life of meter	
Turbidity	secchi disc	-	-	
HI 3896BP Backpack Lab™ Soil Quality Educational Test Kit				
Nitrogen	colorimetric	traces, low, medium, high	50	1.62
Phosphorus	colorimetric	traces, low, medium, high	50	
Potassium	turbidimetric	traces, low, medium, high	50	
pH	colorimetric	4 to 9 pH (1 pH increments)	50	
	electronic pH tester	0.0-14.0 pH	life of meter	
EC	electronic EC tester	0 to 3999 µS/cm	life of meter	
TDS	electronic TDS tester	0 to 2000 ppm	life of meter	
Temperature	electronic temperature tester	-50.0 to 220°C	life of meter	
HI 3899BP Backpack Lab™ Marine Science Educational Test Kit				
Acidity ($CaCO_3$)	titration	0-100 mg/L (ppm) 0-500 mg/L (ppm)	110	1.63
Alkalinity ($CaCO_3$) Phenolphthalein & Total	titration	0-100 mg/L (ppm) 0-300 mg/L (ppm)	110	
Ammonia (as NH_3–N) in salt water	colorimetric	0.0-2.5 mg/L (ppm)	25 avg.	
Carbon Dioxide (CO_2)	titration	0.0-10.0 mg/L (ppm) 0.0-50.0 mg/L (ppm) 0-100 mg/L (ppm)	110	
Oxygen, Dissolved	titration	0.0-10.0 mg/L (ppm)	110	
Nitrite	colorimetric	0.0-1.0 mg/L (ppm)	100	
Nitrate (NO_3^-–N)	colorimetric	0-50 mg/L (ppm)	100	
Phosphate (PO_4^{3-})	colorimetric	0-5 mg/L (ppm)	50	
Salinity	titration	0.0-40.0 g/kg	110	
Turbidity	secchi disc	-	-	

HI 755

Alkalinity Handheld Colorimeter

Alkalinity is one of the most important parameters to measure in salt water aquariums. It helps to maintain a stable pH, an important factor for most aquatic life. In seawater, bicarbonate is the largest contributor to alkalinity. Bicarbonate is a critical element needed for healthy corals. Corals need bicarbonate and carbonate available to form their skeletons. Without an adequate level, healthy coral growth is not possible. Since bicarbonate levels can be difficult to determine, total alkalinity is determined instead. The alkalinity of natural seawater is typically 125 ppm $CaCO_3$ (7dKH). In salt water aquariums typical alkalinity values can range from 125 to 200 ppm $CaCO_3$ (7-11.2 dKH).

The HANNA HI 755 Checker®HC bridges the gap between simple chemical test kits and professional instrumentation. Chemical test kits are not very accurate and have low resolution while professional instrumentation can cost hundreds of dollars and can be time consuming to calibrate and maintain. The HANNA HI 755 Checker®HC is accurate *and* affordable.

The Checker®HC features an accuracy of ±5 ppm (mg/L) ±5% of reading and uses the colorimetric method.

The contoured style of this Checker®HC fits in your palm and pocket perfectly and the large LCD is easy to read. The auto shut-off feature assures the battery life will not be drained if you forget to turn it off.

The HI 755 Checker®HC is extremely simple to use. After zeroing the instrument with your water sample, add the reagent to the cuvette and gently invert 5 times. Then insert the cuvette into the HI 755 Checker®HC and press the button to read the results. It's that easy.

Easier to use and more accurate than chemical test kits

- Colorimetric method
- Accuracy ±5 ppm ±5% of reading
- 1 ppm (mg/L) resolution
- Large, easy to read digits
- Auto shut off

Dedicated to a single parameter

- Designed to work with HANNA's liquid reagents
- Uses 10 mL glass cuvettes

Small size, big convenience

- Weighing a mere 64 g (2.25 oz.), the Checker®HC easily fits into the palm of your hand or pocket
- Use for quick and accurate on the spot analysis
- Single button operation: zero and measure
- Operated by a single AAA battery

Ideal for

- Saltwater aquariums

ORDERING INFORMATION

HI 755 Checker®HC is supplied with (2) sample cuvettes with caps, liquid reagents for alkalinity (25 tests approx.), syringe with tip, battery and instructions.

REAGENTS AND STANDARDS

HI 755-26	Reagents for 25 tests (alkalinity)
HI 755-11	Calibration checking set 0 and 100 ppm (alkalinity)

ACCESSORIES

HI 731318	Cuvette cleaning cloth (4)
HI 731321	Glass cuvettes (4)
HI 731225	Caps for cuvettes (4)
HI 93703-50	Cuvette cleaning solution, 230 mL

SPECIFICATIONS	HI 755 (Alkalinity)
Range	0 to 300 ppm (mg/L)
Resolution	1 ppm (mg/L)
Accuracy @ 25°C/77°F	±5 ppm (mg/L) ±5% of reading
Light Source	LED @ 610 nm
Light Detector	silicon photocell
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Battery Type	(1) 1.5V AAA
Auto-off	after ten minutes of non-use
Dimensions	81.5 x 61 x 37.5 mm (3.2 x 2.4 x 1.5")
Weight	64 g (2.25 oz.)
Method	colorimetric method

Free and Total Chlorine Handheld Colorimeters

Chlorine is the most common water disinfectant. The monitoring of chlorine is crucial in applications such as swimming pools and spas, fruit and vegetable sanitation, disinfection and drinking water. By monitoring this crucial parameter, serious health and safety risks can be avoided.

The HANNA HI 711 and HI 701 Checker® HC's bridge the gap between simple chemical test kits and professional instrumentation. Chemical test kits are not very accurate and only give 5 to 10 points resolution while professional instrumentation can cost hundreds of dollars and can be time consuming to calibrate and maintain. The HANNA HI 711 and HI 701 Checker®HC's are accurate and affordable.

These Checker®HC portable handheld colorimeters feature a resolution of 0.01 ppm (250 points for free chlorine, 350 for total chlorine) and ±0.03 ppm (mg/L) ±3% of reading accuracy. They also use an EPA approved DPD method.

The contoured style of these Checker®HC's fit in your palm and pocket perfectly and the large LCD is easy to read. The auto shut-off feature assures the battery life will not be drained if you forget to turn it off.

The HI 711 and HI 701 Checker®HC's are extremely simple to use. First, zero the instrument with your water sample. Next, add the reagent. Last, place the vial into the Checker®HC, press the button and read the results. It's that easy.

Easier to use and more accurate than chemical test kits

- EPA approved DPD method
- ±0.03 ppm ±3% of reading accuracy
- 0.01 ppm resolution (250 points for free chlorine, 350 for total chlorine)
- Large, easy to read digits
- Auto shut off

Dedicated to a single parameter

- Designed to work with HANNA's powder reagents
- Uses 10 mL glass cuvettes

Small size, big convenience

- The Checker®HC easily fits into the palm of your hand or pocket
- Use for quick and accurate on the spot analysis
- Single button operation: zero and measure
- Operated by a single AAA battery

Ideal for:

- Swimming pools and spas, fruit and vegetable sanitation, disinfection, drinking water and quality control checks

SPECIFICATIONS	HI 711 (Total Chlorine)	HI 701 (Free Chlorine)
Range	0.00 to 3.50 ppm (mg/L)	0.00 to 2.50 ppm (mg/L)
Resolution	0.01 ppm (mg/L)	
Accuracy @ 25°C/77°F	±0.03 ppm ±3% of reading	
Light Source	LED @ 525 nm	
Light Detector	silicon photocell	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Battery Type	(1) 1.5V AAA	
Auto-off	after two minutes of non-use and ten seconds after reading	
Dimensions	81.5 x 61 x 37.5 mm (3.2 x 2.4 x 1.5")	
Weight	64 g (2.25 oz.)	
Method	adaptation of USEPA method 330.5, DPD method	

ORDERING INFORMATION

HI 711 Checker®HC is supplied with sample cuvettes with caps (2), powder reagents for Total Chlorine (6), battery and instructions.
HI 701 Checker®HC is supplied with sample cuvettes with caps (2), powder reagents for Free Chlorine (6), battery and instructions.

REAGENTS AND STANDARDS

HI 711-25	Reagents for 25 tests (Total Cl_2)
HI 701-25	Reagents for 25 tests (Free Cl_2)
HI 711-11	Calibration checking set 0.00 and 1.00 ppm (Total Cl_2)
HI 701-11	Calibration checking set 0.00 and 1.00 ppm (Free Cl_2)

ACCESSORIES

HI 731318	Cuvette cleaning cloth (4)
HI 731321	Glass cuvettes (4)
HI 731225	Caps for cuvettes (4)
HI 93703-50	Cuvette cleaning solution, 230 mL

HI 723

Chromium VI High Range Handheld Colorimeter

There are two natural forms of ionic chromium, the hexavalent ion, Cr (VI) and the trivalent Cr (III). Cr (III) is much less toxic than Cr (VI) and seldom found in potable waters. Cr (VI), however, is toxic to humans and is found in water. Even though the toxic effects from Cr (VI) in drinking water are not well documented, it is a suspected carcinogen.

There are many industries that use chromic acid and other forms of Cr (VI) that could be a possible source of Cr (VI) pollution in either water or air or both. One industry that can introduce Cr (VI) to water sources is the chrome-plating industry (for the plating of car bumpers). Chromic acid is used in the electroplating process and can be present in industrial waste waters. Cr (VI) also can enter water supplies from industrial cooling towers where chromic acid is added to the water to inhibit metal corrosion.

The maximum permissible level or Cr (VI) allowed to be released into the waterways is 50 ppb. Its level in drinking water is normally much lower and a lever higher than 3 ppb is suggestive of industrial pollution.

By monitoring this parameter with the HANNA HI 723 Checker®HC, serious health and safety risks can be avoided.

The HI 723 Checker®HC is extremely simple to use. First, zero the instrument with your water sample. Next, add the reagent, shake vigurosly for 10 seconds. Last, place the vial into the Checker®HC, press the operational button for about 3 seconds and the display will show the countdown prior to the measurement or, alternatively, wait for 6 minutes and press operational button. When the timer ends the meter will perform the reading. The Checker®HC displays concentration in ppb of chromium VI. It's that easy.

Easier to use and more accurate than chemical test kits

- Diphenylcarbohydrazide method
- Accuracy ±5 ppb ±5% of reading
- 1 ppb (µg/L) resolution
- Large, easy to read digits
- Auto shut off

Dedicated to a single parameter

- Designed to work with HANNA's powder reagents
- Uses 10 mL glass cuvettes

Small size, big convenience

- Weighing a mere 64 g (2.25 oz.), the Checker®HC easily fits into the palm of your hand or pocket
- Use for quick and accurate on the spot analysis
- Single button operation: zero and measure
- Operated by a single AAA battery

Ideal for

- Water quality

SPECIFICATIONS	HI 723 (Chromium VI High Range)
Range	0 to 999 ppb
Resolution	1 ppb
Accuracy @ 25°C/77°F	±5% of reading ±5 ppb
Light Source	LED @ 525 nm
Light Detector	silicon photocell
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Battery Type	(1) 1.5V AAA
Auto-off	after ten minutes of non-use
Dimensions	81.5 x 61 x 37.5 mm (3.2 x 2.4 x 1.5")
Weight	64 g (2.25 oz.)
Method	adaptaion of the ATSM, Manual of Water and Enviornmental Technology, D 1687-92, Diphenylcarbohydrazide method

ORDERING INFORMATION

HI 723 Checker®HC is supplied with sample cuvettes with caps (2 ea.), powder reagents for chromium VI HR (6), battery and instructions.

REAGENTS AND STANDARDS

HI 723-25	Reagents for 25 tests
HI 723-11	Calibration checking set (0 and 300 ppb chromium VI)

ACCESSORIES

HI 731318	Cuvette cleaning cloth (4)
HI 731321	Glass cuvettes (4)
HI 731225	Caps for cuvettes (4)
HI 93703-50	Cuvette cleaning solution, 230 mL

Color of Water Handheld Colorimeter

Easier to use and more accurate than chemical test kits

- Diphenylcarbohydrazide method
- Accuracy ±10 PCU ±5 % of reading
- 5 PCU resolution
- Large, easy to read digits
- Auto shut off

Dedicated to a single parameter

- Uses 10 mL glass cuvettes

Small size, big convenience

- Weighing a mere 64 g (2.25 oz.), the Checker®HC easily fits into the palm of your hand or pocket
- Use for quick and accurate on the spot analysis
- Single button operation: zero and measure
- Operated by a single AAA battery

Ideal for

- Water quality

SPECIFICATIONS	HI 727 (Color of Water)
Range	0 to 500 PCU
Resolution	5 PCU
Accuracy @ 25°C/77°F	±5% of reading ±10 PCU
Light Source	LED @ 470 nm
Light Detector	silicon photocell
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Battery Type	(1) 1.5V AAA
Auto-off	after ten minutes of non-use
Dimensions	81.5 x 61 x 37.5 mm (3.2 x 2.4 x 1.5")
Weight	64 g (2.25 oz.)
Method	adaptation of the Standard Methods for the Examination of Water and Wastewater, 21th edition, Colorimetric Platinum Cobalt method

True color is caused by dissolved compounds in water. It can be natural or artificial. Dissolved and suspended solids (together) cause apparent color. Color is measured in Platinum-Cobalt units. The AWWA recommends ≤ 15 PCU.

The term "color" is used here to mean true color, that is, the color of water from which turbidity has been removed. The term "apparent color" includes not only color due to substances in solution, but also color that is due to suspended matter. Apparent color is determined on the original sample without filtration or centrifugation. In some highly colored industrial wastewaters, color is contributed principally by colloidal or suspended material. In such cases both true color and apparent color should be determined.

To determine color by currently accepted methods, turbidity must be removed before analysis. Methods for removing turbidity without removing color vary. Filtration yields results that are reproducible from day to day among laboratories, however, some filtration procedures may also remove some true color. Centrifugation avoids interaction of color with filter materials, but results vary with the sample nature and size and speed of the centrifuge. When sample dilution is necessary, whether it precedes or follows turbidity removal, it can alter the measured color. Acceptable pretreatment procedures are included with each method. State the pretreatment method when reporting results.

The HI 727 Checker®HC is extremely simple to use. First, zero the instrument with deionized water. Next, prepare the sample according to the Apparent/True color measurement. Place the second vial with prepared sample into the Checker®HC, press the operational button and the HI 727 Checker®HC displays the color of water in PCU.

ORDERING INFORMATION

HI 727 Checker®HC is supplied with sample cuvettes with caps (2 ea.), battery and instructions

REAGENTS AND STANDARDS

HI 740230	Deionized water, 230 ml
HI 727-11	Calibration checking set (0 and 150 PCU)

ACCESSORIES

HI 731318	Cuvette cleaning cloth (4)
HI 731321	Glass cuvettes (4)
HI 731225	Caps for cuvettes (4)
HI 93703-50	Cuvette cleaning solution, 230 mL

HI 729 • HI 739

Fluoride Low Range and High Range Handheld Colorimeters

Fluoride is one of the very few chemicals that have been shown to cause significant effects in people through drinking-water. Fluoride has beneficial effects on teeth at low concentrations in drinking-water, but excessive exposure to fluoride in drinking-water, or in combination with exposure to fluoride from other sources, can give rise to a number of adverse effects.

Water fluoridation is the controlled addition of fluoride to a public water supply to reduce tooth decay. Fluoridated water operates on tooth surfaces: in the mouth it creates low levels of fluoride in saliva, which reduces the rate at which tooth enamel demineralizes and increases the rate at which it remineralizes in the early stages of cavities.

A 1994 World Health Organization expert committee suggested a level of fluoride from 0.5 to 1.0 mg/L, depending on climate. Bottled water typically has unknown fluoride levels, and some domestic water filters remove some or all fluoride.

The HI 729 Checker®HC is simple to use. For this measurement you need 2 vials (#1 and #2); in both vials add 2 mL of reagent and until the mark: deionized water in vial #1 and sample in vial #2, and gently invert 5 times, and wait 2 minutes. Then insert the cuvette #1 into the HI 729 Checker®HC and press the button to zero; after that cuvette #2 to read the measurement results.

The HI 739 Checker®HC is simple to use. In one vial add 2 ml of Reagent A and 8 ml of Reagent B; gently invert 5 times, and wait 1 minute, then zero the instrument with the vial. After zeroing, remove the vial and add 1 ml of sample, gently invert 5 times, wait 1 minute, then insert the cuvette into the HI 739 Checker®HC and press the read button for results.

ORDERING INFORMATION

HI 729 Checker®HC is supplied with sample cuvettes with caps (2), reagents for 6 tests, syringe with tip, battery and instructions.
HI 739 Checker®HC is supplied with sample cuvettes with caps (2), reagents for 4 tests, syringe with tip, pipette, battery and instructions.

REAGENTS AND STANDARDS

HI 729-26	Reagents for 25 tests (Fluoride LR)
HI 739-26	Reagents for 25 tests (Fluoride HR)
HI 729-11	Calibration checking set (0 and 1.00 ppm Fluoride)
HI 739-11	Calibration checking set (0 and 10.0 ppm Fluoride)

ACCESSORIES

HI 731318	Cuvette cleaning cloth (4)
HI 731321	Glass cuvettes (4)
HI 731225	Caps for cuvettes (4)
HI 93703-50	Cuvette cleaning solution, 230 mL

Checker HC® handheld colorimeter

Easier to use and more accurate than chemical test kits

- SPADNS method
- HI 729: ±0.05 ppm ±5% of reading accuracy
- HI 739: ±0.5 ppm ± 5% of reading accuracy
- Large, easy to read digits
- Auto shut off

Dedicated to a single parameter

- Designed to work with HANNA's reagents
- Uses 10 mL glass cuvettes

Small size, big convenience

- Weighing a mere 64 g (2.25 oz.), the Checker®HC easily fits into the palm of your hand or pocket
- Use for quick and accurate on the spot analysis
- Single button operation: zero and measure
- Operated by a single AAA battery

Ideal for:

- Water quality

SPECIFICATIONS	HI 729 (Fluoride LR)	HI 739 (Fluoride HR)
Range	0.00 to 2.00 ppm	0.0 to 20.0 ppm
Resolution	0.01 ppm	0.1 ppm
***Accuracy @ 25°C/77°F**	±0.05 ppm ±5% of reading	±0.5 ppm ± 5% of reading
Light Source	LED @ 575 nm	
Light Detector	silicon photocell	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Battery Type	(1) 1.5V AAA	
Auto-off	after two minutes of non-use and ten seconds after reading	
Dimensions	81.5 x 61 x 37.5 mm (3.2 x 2.4 x 1.5")	
Weight	64 g (2.25 oz.)	
Method	adaptation of SPADNS method	

* Excluding sample volume error

Iodine Handheld Colorimeter

Iodine is sometimes used as a disinfectant for swimming pools, spas and potable water. It has also found use as a disinfectant in the poultry industry. The rapid determination of iodine is required for adequate control of this bactericide.

The HANNA Checker®HC's bridge the gap between simple chemical test kits and professional instrumentation. Chemical test kits are not very accurate and only give 5 to 10 points resolution while professional instrumentation can cost hundreds of dollars and can be time consuming to calibrate and maintain. The HANNA HI 718 and Checker®HC is accurate *and* affordable.

The HI 718 Checker®HC portable handheld colorimeter features a resolution of 0.1 ppm and accuracy of ±0.1 ppm ±5% of reading. This Checker® HC uses a modification of the DPD method used for residual chlorine.

The contoured style of this Checker®HC fits in your palm and pocket perfectly and the large LCD is easy to read. The auto shut-off feature assures the battery life will not be drained if you forget to turn it off.

The HI 718 is extremely simple to use. First, zero the instrument with your water sample. Next, add the reagent. Last, place the vial into the instrument, press the button and read the results. It's that easy.

Easier to use and more accurate than chemical test kits

- DPD method
- ±0.1 ppm ±5% of reading accuracy
- Large, easy to read digits
- Auto shut off

Dedicated to a single parameter

- Designed to work with HANNA's powder reagents
- Uses 10 mL glass cuvettes

Small size, big convenience

- Weighing a mere 64 g (2.25 oz.), the Checker®HC easily fits into the palm of your hand or pocket
- Use for quick and accurate on the spot analysis
- Single button operation: zero and measure
- Operated by a single AAA battery

Ideal for:

- Swimming pools and spas, industrial processes and disinfection

SPECIFICATIONS	HI 718 (Iodine)
Range	0.0 to 12.5 ppm (mg/L)
Resolution	0.1 ppm (mg/L)
Accuracy @ 25°C/77°F	±0.1 ppm ±5% of reading
Light Source	LED @ 525 nm
Light Detector	silicon photocell
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Battery Type	(1) 1.5V AAA
Auto-off	after two minutes of non-use and ten seconds after reading
Dimensions	81.5 x 61 x 37.5 mm (3.2 x 2.4 x 1.5")
Weight	64 g (2.25 oz.)
Method	adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th edition, DPD method.

ORDERING INFORMATION

HI 718 Checker®HC is supplied with sample cuvettes with caps (2), powder reagents for iodine (6), battery and instructions.

REAGENTS AND STANDARDS

HI 718-25	Reagents for 25 tests (iodine)
HI 718-11	Calibration checking set 0.0 and 1.0 ppm (iodine)

ACCESSORIES

HI 731318	Cuvette cleaning cloth (4)
HI 731321	Glass cuvettes (4)
HI 731225	Caps for cuvettes (4)
HI 93703-50	Cuvette cleaning solution, 230 mL

HI 721

Iron Handheld Colorimeter

About 6.3% of the earth's crust is made of iron, of which 43% is in soils. The analysis of iron is often performed to monitor ground water and irrigation waters as a gauge of corrosion from industrial settling, and as an indication of the effectiveness of treatment from mining leachate.

The HANNA HI 721 Checker®HC bridges the gap between simple chemical test kits and professional instrumentation. Chemical test kits are not very accurate and only give 5 to 10 points resolution while professional instrumentation can cost hundreds of dollars and can be time consuming to calibrate and maintain. The HANNA HI 721 Checker®HC is accurate *and* affordable with immediate results.

The new HI 721 Checker®HC portable handheld colorimeter features a resolution of 0.01 ppm (500 points) and ±0.04 ppm ±2% of reading accuracy. The HI 721 Checker®HC uses an adaptation of Standard Method 315 B.

The contoured style of this Checker®HC fits in your palm and pocket perfectly and the large LCD is easy to read. The auto shut-off feature assures the battery life will not be drained if you forget to turn it off.

The HI 721 Checker®HC is extremely simple to use. First, zero the instrument with your water sample. Next, add the reagent. Last, place the vial into the HI 721 Checker®HC, press the button and read the results. It's that easy.

Easier to use and more accurate than chemical test kits

- Phenanthroline method
- ±0.04 ppm ±2% of reading accuracy
- 0.01 ppm (mg/L) resolution (500 points)
- Large, easy to read digits
- Auto shut off

Dedicated to a single parameter

- Designed to work with HANNA's powder reagents
- Uses 10 mL glass cuvettes

Small size, big convenience

- Weighing a mere 64 g (2.25 oz.), the Checker®HC easily fits into the palm of your hand or pocket
- Use for quick and accurate on the spot analysis
- One button operation: zero and measure
- Operated by a single AAA battery

Ideal for:

- Industrial, ground and treated waters, mining leachate monitoring and agricultural irrigation water

SPECIFICATIONS	HI 721 (Iron)
Range	0.00 to 5.00 ppm (mg/L)
Resolution	0.01 ppm (mg/L)
Accuracy @ 25°C/77°F	±0.04 ppm ±2% of reading
Light Source	LED @ 525 nm
Light Detector	silicon photocell
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Battery Type	(1) 1.5V AAA
Auto-off	after three minutes of non-use and ten seconds after reading
Dimensions	81.5 x 61 x 37.5 mm (3.2 x 2.4 x 1.5")
Weight	64 g (2.25 oz.)
Method	adaptation of the EPA Phenantroline method 315 B, for natural and treated waters.

ORDERING INFORMATION

HI 721 Checker®HC is supplied with sample cuvettes with caps (2), powder reagents for iron (6), battery and instructions.

REAGENTS AND STANDARDS

HI 721-25	Reagents for 25 tests (iron)
HI 721-11	Calibration checking set 0.00 and 1.00 ppm (iron)

ACCESSORIES

HI 731318	Cuvette cleaning cloth (4)
HI 731321	Glass cuvettes (4)
HI 731225	Caps for cuvettes (4)
HI 93703-50	Cuvette cleaning solution, 230 mL

Nickel High Range Handheld Colorimeter

Easier to use and more accurate than chemical test kits

- Photometric method
- ±0.10 g/L ±5% of reading accuracy
- 0.01 g/L resolution (700 points)
- Large, easy to read digits
- Auto shut off

Dedicated to a single parameter

- Designed to work with HANNA's powder reagents
- Uses 10 mL glass cuvettes

Small size, big convenience

- Weighing a mere 64 g (2.25 oz.), the Checker®HC easily fits into the palm of your hand or pocket
- Use for quick and accurate on the spot analysis
- One button operation: zero and measure
- Operated by a single AAA battery

Ideal for:

- Steel manufacturing, electroplating and electronics production

SPECIFICATIONS	HI 726 (Nickel HR)
Range	0.00 to 7.00 g/L
Resolution	0.01 g/L
Accuracy @ 25°C/77°F	±0.10 g/L ±5% of reading
Light Source	LED @ 575 nm
Light Detector	silicon photocell
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Battery Type	(1) 1.5V AAA
Auto-off	after three minutes of non-use and ten seconds after reading
Dimensions	81.5 x 61 x 37.5 mm (3.2 x 2.4 x 1.5")
Weight	64 g (2.25 oz.)
Method	adaptation of the photometric method

Nickel is extensively used in electroplating, the manufacturing of steel, electronic devices, ceramics and colored glasses. It plays a vital role in many processes of applied sciences and fundamental sciences. It necessitates development of rapid methods for estimation of nickel.

Nickel is seldom found in natural waters, but often present in industrial wastewater as a direct by-product of metal plating baths, and as a corrosion by-product of stainless steel, nickel or cobalt alloys.

The most serious effects of nickel, such as lung cancer and nasal sinus have occurred in people who have breathed nickel dust while working in nickel refineries or in nickel processing plants. The levels of nickel in the workplace were much higher than background levels. The Department of Health and Human Services has determined that nickel and certain nickel compounds may be reasonably anticipated to be carcinogens. The International Agency for Research on Cancer (IARC) has determined that some nickel compounds are carcinogenic to humans and that metallic nickel may possibly be carcinogenic to humans. The EPA has determined that nickel refinery dust and nickel subsulfide are human carcinogens. Other lung effects including chronic bronchitis and reduced lung function have been observed in workers breathing nickel.

The HI 726 Checker®HC is extremely simple to use. First, zero the instrument with your water sample. Next, add the reagent, shake gently until complete dissolution. Last, place the vial into the Checker®HC, press the operational button for about 3 seconds. The display will show the countdown prior to the measurement or, alternatively, wait for 1 minute and press operational button. When the timer ends the meter will perform the reading and display concentration in g/L of nickel. It's that easy.

ORDERING INFORMATION

HI 726 Checker®HC is supplied with sample cuvettes with caps (2 ea.), powder reagents for Nickel HR (6), battery and instructions.

REAGENTS AND STANDARDS

HI 726-25	Reagents for 25 tests (Nickel HR)
HI 726-11	Calibration checking set (0 and 3.50 Nickel HR)

ACCESSORIES

HI 731318	Cuvette cleaning cloth (4)
HI 731321	Glass cuvettes (4)
HI 731225	Caps for cuvettes (4)
HI 93703-50	Cuvette cleaning solution, 230 mL

HI 764

Nitrite Ultra Low Range Handheld Colorimeter

Nitrification is the biological oxidation of ammonia (ammonium ion) into nitrite followed by the oxidation of the nitrites to nitrates. The first step of this 2 step process is carried out in an aquarium by nitrifying bacteria. During this quick process, the ammonium levels drop while the nitrite levels increase. Since nitrite is just as harmful as ammonia, nitrite levels should be maintained at immeasurable levels. A mature biological filter should be able to keep nitrite levels low.

Also, if tap water is to be used in an aquarium, it is recommended that it be tested for phosphate, as well as silicate, ammonia, nitrate, nitrite, pH, and alkalinity.

The HANNA HI 764 Checker®HC bridges the gap between simple chemical test kits and professional instrumentation. Chemical test kits are not very accurate while professional instrumentation can cost hundreds of dollars and can be time consuming to calibrate and maintain. The HANNA HI 764 Checker®HC is accurate *and* affordable.

The HI 764 Checker®HC portable handheld colorimeter features a resolution of 1 ppb and uses an adaptation of EPA Diazotization method 354.1.

The contoured style of this Checker®HC fits in your palm and pocket perfectly and the large LCD is easy to read. The auto shut-off feature assures the battery life will not be drained if you forget to turn it off.

The HI 764 Checker®HC is extremely simple to use. First, zero the instrument with your water sample. Next, add the reagent. Last, place the vial into the HI 764 Checker®HC, press the button and read the results. It's that easy.

Easier to use and more accurate than chemical test kits

- Adaptation of EPA Diazotization method
- ±10 ppb ±4% of reading accuracy
- 1 ppb resolution (200 points)
- Large, easy to read digits
- Auto shut off

Dedicated to a single parameter

- Designed to work with HANNA's powder reagents
- Uses 10 mL glass cuvettes

Small size, big convenience

- Weighing a mere 64 g (2.25 oz.), the Checker®HC easily fits into the palm of your hand or pocket
- Use for quick and accurate on the spot analysis
- Single button operation: zero and measure
- Operated by a single AAA battery

Ideal for:

- Aquaculture

SPECIFICATIONS	HI 764 (Nitrite ULR)
Range	0 to 200 ppb
Resolution	1 ppb
Accuracy @ 25°C/77°F	±10 ppb ±4% of reading
Light Source	LED @ 525 nm
Light Detector	silicon photocell
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Battery Type	(1) 1.5V AAA
Auto-off	after two minutes of non-use
Dimensions	81.5 x 61 x 37.5 mm (3.2 x 2.4 x 1.5")
Weight	64 g (2.25 oz.)
Method	adaptation of the EPA Diazotization method 354.1

ORDERING INFORMATION

HI 764 Checker®HC is supplied with sample cuvettes with caps (2), powder reagents for phosphorus (6), battery and instructions.

REAGENTS AND STANDARDS

HI 764-25	Reagents for 25 tests (nitrite)
HI 764-11	Calibration checking set (0 and 100 ppb nitrite)

ACCESSORIES

HI 731318	Cuvette cleaning cloth (4)
HI 731321	Glass cuvettes (4)
HI 731225	Caps for cuvettes (4)
HI 93703-50	Cuvette cleaning solution, 230 mL

Phosphate Handheld Colorimeters

Orthophosphates are found in natural and wastewaters. They are commonly added to drinking water as a corrosion inhibitor. The instantaneous analysis of orthophosphate by colorimetric determination provides rapid results using a standard analysis technique.

These HANNA HI 713 and HI 717 Checker® HC's bridge the gap between simple chemical test kits and professional instrumentation. Chemical test kits are not very accurate and only give only some points resolution while professional instrumentation can cost hundreds of dollars and can be time consuming to calibrate and maintain. The HANNA HI 713 and HI 717 Checker®HC's are accurate and affordable.

The HI 713 Checker®HC portable handheld colorimeter features a resolution of 0.01 ppm (250 points) and ±0.04 ppm (mg/L) ±4% of reading accuracy. The HI 713 Checker®HC uses an adaptation of Standard Method 4500-P E, Ascorbic Acid method.

The HI 717 Checker®HC portable handheld colorimeter features a resolution of 0.1 ppm (300 points) and ±1.0 ppm (mg/L) ±5% of reading accuracy. The HI 717 Checker®HC uses an adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th edition, Amino Acid method.

The HI 713 and HI 717 Checker®HC's are extremely simple to use. First, zero the instrument with your water sample. Next, add the reagents. Last, place the vial into the Checker®HC, press the button and read the results. It's that easy.

Easier to use and more accurate than chemical test kits

- Ascorbic acid method for HI 713, amino acid method for HI 717
- HI 713: ±0.04 ppm ±4% of reading accuracy
- HI 717: ±1.0 ppm ±5% of reading accuracy
- Large, easy to read digits
- Auto shut off

Dedicated to a single parameter

- Designed to work with HANNA's reagents
- Uses 10 mL glass cuvettes

Small size, big convenience

- Weighing a mere 64 g (2.25 oz.), the Checker®HC easily fits into the palm of your hand or pocket
- Use for quick and accurate on the spot analysis
- Single button operation: zero and measure
- Operated by a single AAA battery

Ideal for:

- Aquaculture, natural, waste, drinking waters and agriculture

SPECIFICATIONS	HI 713 (Phosphate LR)	HI 717 (Phosphate HR)
Range	0.00 to 2.50 ppm (mg/L)	0.0 to 30.0 ppm (mg/L)
Resolution	0.01 ppm (mg/L)	0.1 ppm (mg/L)
Accuracy @ 25°C/77°F	±0.04 ppm (mg/L) ±4% of reading	±1.0 ppm (mg/L) ±5% of reading
Light Source	LED @ 525 nm	
Light Detector	silicon photocell	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Battery Type	(1) 1.5V AAA	
Auto-off	after two minutes of non-use and ten seconds after reading	
Dimensions	81.5 x 61 x 37.5 mm (3.2 x 2.4 x 1.5")	
Weight	64 g (2.25 oz.)	
Method	adaptation of the Standard Methods for the Examination of Water and Wastewater, 20th edition, Ascorbic Acid method	adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th edition, Amino Acid method

ORDERING INFORMATION

HI 713 Checker®HC is supplied with sample cuvettes with caps (2), powder reagents for phosphate (6), battery and instructions.
HI 717 Checker®HC is supplied with sample cuvettes with caps (2), reagents for 20 tests, battery and instructions.

REAGENTS AND STANDARDS

HI 713-25	Reagents for 25 tests (Phosphate LR)
HI 717-25	Reagents for 40 tests (Phosphate HR)
HI 713-11	Calibration checking set (0.00 and 1.00 ppm phosphate)
HI 717-11	Calibration checking set (0.0 and 15.0 ppm phosphate)

ACCESSORIES

HI 731318	Cuvette cleaning cloth (4)
HI 731321	Glass cuvettes (4)
HI 731225	Caps for cuvettes (4)
HI 93703-50	Cuvette cleaning solution, 230 mL

HI 736 • HI 706

Phosphorus Handheld Colorimeters

Plants, algae and phytoplankton require phosphorus for nourishment and utilize phosphorous as a component of cell tissue. When organic matter such as plant tissue, dead fish, algae or uneaten food breaks down aerobically (with oxygen), phosphate is produced and results in rapid oxygen depletion of aquarium water, which in turn suffocates aquatic life and compounds the problem.

Phosphorus concentration in water is monitored because it causes corrosion when present in levels too high.

Both the HANNA HI 736 and HI 706 Checker®HC's bridge the gap between simple chemical test kits and professional instrumentation. The HANNA HI 736 (for marine applications) and HI 706 (for fresh water applications) are both accurate and affordable.

The HI 736 Checker®HC portable handheld colorimeter features a resolution of 1 ppb and ±5 ppb ±5% of reading accuracy and uses an adaptation of Standard Method Ascorbic Acid.

The HI 736 and HI 706 Checker®HC's are extremely simple to use. First, zero the instrument with your water sample. Next, add the reagents. Last, place the vial into the Checker®HC, press the button and read the results. It's that easy.

Easier to use and more accurate than chemical test kits

- Ascorbic acid method for HI 736, amino acid method for HI 706
- HI 736: ±5 ppb ±5% of reading accuracy
  HI 706: ±0.2 ppm ±5% of reading accuracy
- Large, easy to read digits
- Auto shut off

Dedicated to a single parameter

- Designed to work with HANNA's reagents
- Uses 10 mL glass cuvettes

Small size, big convenience

- Weighing a mere 64 g (2.25 oz.), the Checker®HC easily fits into the palm of your hand or pocket
- Use for quick and accurate on the spot analysis
- Single button operation: zero and measure
- Operated by a single AAA battery

Ideal for:

- Aquaculture

ORDERING INFORMATION

HI 736 Checker®HC is supplied with sample cuvettes with caps (2), powder reagents for phosphorus (6), battery and instructions.
HI 706 Checker®HC is supplied with sample cuvettes with caps (2), reagents for 20 tests, battery and instructions.

REAGENTS AND STANDARDS

HI 736-25	Reagents for 25 tests (Phosphorus ULR)
HI 706-25	Reagents for 40 tests (Phosphorus HR)
HI 736-11	Calibration checking set (0 and 100 ppb phosphorus)
HI 706-11	Calibration checking set (0.0 and 7.5 ppm phosphorus)

ACCESSORIES

HI 731318	Cuvette cleaning cloth (4)
HI 731321	Glass cuvettes (4)
HI 731225	Caps for cuvettes (4)
HI 93703-50	Cuvette cleaning solution, 230 mL

SPECIFICATIONS	HI 736 (Phosphorus ULR)	HI 706 (Phosphorus HR)
Range	0 to 200 ppb	0.0 to 15.0 ppm
Resolution	1 ppb	0.1 ppm
Accuracy @ 25°C/77°F	±5 ppb ±5% of reading	±0.2 ppm ±5% of reading
Light Source	LED @ 525 nm	
Light Detector	silicon photocell	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Battery Type	(1) 1.5V AAA	
Auto-off	after two minutes of non-use and ten seconds after reading	
Dimensions	81.5 x 61 x 37.5 mm (3.2 x 2.4 x 1.5")	
Weight	64 g (2.25 oz.)	
Method	adaptation of the Standard Methods for the Examination of Water and Wastewater, 20Th edition, Ascorbic Acid method.	adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th edition, Amino Acid method

Silica High Range Handheld Colorimeter

Easier to use and more accurate than chemical test kits

- Adaptation of EPA Diazotization method
- ±2 ppm ±5% of reading accuracy
- 1 ppm resolution (200 points)
- Large, easy to read digits
- Auto shut off

Dedicated to a single parameter

- Designed to work with HANNA's powder reagents
- Uses 10 mL glass cuvettes

Small size, big convenience

- Weighing a mere 64 g (2.25 oz.), the Checker®HC easily fits into the palm of your hand or pocket
- Use for quick and accurate on the spot analysis
- Single button operation: zero and measure
- Operated by a single AAA battery

Ideal for:

- Aquaculture

SPECIFICATIONS	HI 770 (Silica HR)
Range	0 to 200 ppm
Resolution	1 ppm
Accuracy @ 25°C/77°F	±2 ppm ±5% of reading
Light Source	LED @ 470 nm
Light Detector	silicon photocell
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Battery Type	(1) 1.5V AAA
Auto-off	after two minutes of non-use
Dimensions	81.5 x 61 x 37.5 mm (3.2 x 2.4 x 1.5")
Weight	64 g (2.25 oz.)
Method	adaptation of the USEPA METHOD 370.1 for drinking, surface and saline waters, domestic and industrial wastes and Standard Method 4500-SiO_2 C

Silica is the name given to silicon dioxide, SiO_2. Silicon, Si, is the most abundant element in the Earth's crust, 28% of it by weight. Silicon is never found free form in nature. In crystallized form it is only reactive under conditions of extremely high temperatures. Water and water vapor probably have little influence upon silicon solubility, because a protective surface layer of silicon dioxide is rapidly formed. Silicon binds with other elements to form various species of silica and silicate. The concentration of the soluble silica molecules are important to aquaculture because they influence (and limit) the growth of diatoms.

In most waters, the predominant form of dissolved silica is monosilicic acid, which incorporates 2 water molecules.

The HANNA HI 770 Checker®HC is accurate and affordable. This portable handheld colorimeter features a resolution of 1 ppm (200 points) and ±2 ppm ±5% of reading accuracy.

The contoured style of the HI 770 Checker®HC fit in your palm and pocket perfectly and the large LCD is easy to read. The auto shut off feature assures the battery life will not be drained if you forget to turn it off.

The HI 770 Checker®HC is simple to use. First, zero the instrument with your water sample. Next, add the reagents in order, respecting all the indications. Last, place the vial into the Checker®HC, press the operational button for about 3 seconds and the display will show the countdown prior to the measurement or, alternatively, wait for 2 minutes after last reagent adding and press operational button. The Checker®HC displays concentration in ppm of Silica as SiO_2.

ORDERING INFORMATION

HI 770 Checker®HC is supplied with sample cuvettes with caps (2 ea.), powder reagents for 6 tests, battery and instructions.

REAGENTS AND STANDARDS

HI 770-25	Reagents for 25 tests (Silica HR)
HI 770-11	Calibration checking set (0 and 100 ppm)

ACCESSORIES

HI 731318	Cuvette cleaning cloth (4)
HI 731321	Glass cuvettes (4)
HI 731225	Caps for cuvettes (4)
HI 93703-50	Cuvette cleaning solution, 230 mL

Chemical Test Kits

Acidity

HI 3820 Acidity Test Kit

With the use of diluted sodium hydroxide as the titrant and bromphenol blue or phenolphthalein indicators, the contribution of strong or organic acids can be determined. The measurement of the strong acid contribution to the sample acidity is known as methyl orange acidity. This is carried out by titrating with sodium hydroxide until the solution turns from yellow to green/blue (pH endpoint about 4.5). The total acidity caused by both mineral and organic acids is determined by titrating to an endpoint pH of 8.3, using phenolphthalein as an indicator. This is known as phenolphthalein inacidity.

HI 38084 Total Exchangeable Acidity Test Kit

The total exchangeable acidity (TEA) is a measure of the amount of acidic cations (hydrogen, aluminum, iron and manganese) present in soil. It is expressed in milliequivalent per 100 grams (meq/100 g) of soil. The more acidic it is a soil, the lower the soil pH value will be. Soils in humid regions normally accumulate increasing amounts of exchangeable acidity as they get older. Soil acidity may develop toxicity that can damage or kill plants.

The extraction method is the potassium chloride method. The acidic cations are firstly leached from the soil and then titrated with a standard alkali. The reaction endpoint is visually indicated by a color change (from colorless to pink) of the indicator reagent.

HI 3820 Acidity

Today, our water supplies are becoming more contaminated with corrosive chemicals from industrial dumping or acid rain. Therefore, acidity measurements are an essential monitoring device to define and control pollution in sewers, lakes and rivers. Acidity of water is equally important to monitor in soils and fish farming to maximize the growing environment. The HANNA acidity test kit is equipped with all you need to determine acidity of water. This makes it practical for field as well as laboratory use. The design makes the kit easy to handle and, except for acidity titrant, practically prevents accidental injury or damage due to spills.

The **acidity** of a water sample is its capacity to neutralize hydroxide ions. Acidity may be caused by mineral acids such as sulfuric acid or hydrochloric acid or by dissolved carbon dioxide. Most commonly in drinking water, Carbon dioxide is the principal cause of acidity in drinking water, but also it can be caused by mineral and organic acids. Acidity increases the corrosive behavior of water. Drinking water with a high acidity level is likely to be corrosive to copper water pipes and to the solder which joins those pipes. High levels of copper and lead in drinking water often occur when acidic water stands in pipes for extended periods of time (such as over night). In addition to creating a possible health hazard due to dissolved metal ions, acidity in water can cause copper plumbing to develop pin hole leaks after a few years.

ORDERING INFORMATION

HI 3820 test kit comes with 10 mL dechlorinating reagent, bromophenol blue indicator, phenolpthalein indicator, acidity titrant, 10 mL calibrated vessel, 50 mL calibrated vessel, and calibrated syringe.
HI 38084 test kit comes with 380 g potassium chloride, 20 mL phenolphthalein indicator, 120 mL titrant solution, 12 L demineralized water bottle with filter cap, 1 mm soil sieve, large funnel, 100 paper filter discs, 50 mL plastic test tube with screw cap, 50 mL calibrated plastic vessel, 2 g sample cups (2), 1 g sample cup, plastic pipette, brush and spoon

ACCESSORIES

HI 3820
HI 3820-100 Spare reagent for 100 tests
HI 38084
HI 38084-100 Spare reagent for 100 tests

METHOD	RANGE*	SMALLEST INCREMENT	CHEMICAL METHOD	# TESTS	WEIGHT
HI 3820 Acidity (as $CaCO_3$)					
titration	0-100 mg/L (ppm) 0-500 mg/L (ppm)	1 mg/L (ppm) 5 mg/L (ppm)	methyl-orange/ phenolphthalein	110 avg.	910 g
HI 38084 Acidity Total Exchangeable					
titration	0.0-2.5 meq/100 g	0.1 meq/100 g	extraction method: potassium chloride	100	1027 g

* 1 gpg = 17 ppm $CaCO_3$

HI 3897

Olive Oil Acidity Test Kit

Now there is an easy, affordable and accurate way to determine the quality, classification and freshness of your olive oil.

Acidity (expressed as percent oleic acid) is the most fundamental measurement of olive oil. It is the primary indicator of olive oil purity and freshness.

The quality of olive oil is directly related to the degree of breakdown of the fatty acids in the oil. As the bound fatty acids break down, free fatty acids are formed which increase the acidity of the % oil. Acidity, expressed as oleic acid, is a measure of the free fatty acid present in the oil, which is directly related to its purity.

The quality of olive oil can be adversely affected during maturation or by environmental conditions. Mishandling, processing and bruising during harvesting can also contribute to a breakdown of fatty acids and an increase in free acidity. Improper and/or long term storage can cause olive oil to breakdown and become rancid. Regular acidity testing is the best way to ensure and maintain quality and freshness.

Normally, testing acidity is a complicated process requiring the use of various chemicals in a laboratory environment. HANNA has simplified this process in an easy to understand test kit that can be used by almost anyone to produce quick and accurate results.

Studies have shown that the quality of olive oil has a direct impact on its health benefits. *Extra Virgin Olive Oil* contains higher levels of antioxidants, particularly phenols and vitamin E (because it is less processed). Antioxidants can help prevent oxidation damage to body tissue caused by free radicals. Studies have also shown that the oxidation of LDL (bad) cholesterol is associated with the hardening of arteries that can lead to heart disease.

With the HI 3897 test kit, it is possible to easily and accurately test the quality of olive oil at various stages of processing and storage to monitor and maintain the highest quality.

Acidity, defined as percent oleic acid, is a parameter that indicates olive oil freshness. A high acidity value indicates the oil quality has diminished and is at risk of becoming rancid.

Acidity is used to discriminate an extra virgin olive oil from all other olive oils. According to the CEE 2568/91 regulation, olive oil is considered extra virgin when its acidity level is below 1%. A low acidity value also indicates a natural extraction process occurred soon after olive harvesting.

The HI 3897 kit utilizes a titration method where the endpoint is visually determined when the color changes from yellow-green to pink.

CHEMICAL PARAMETERS

Olive Storage Period (between harvesting and extraction)	within 48 hours	2 to 4 days	over 4 days
Acidity (as oleic acid %)	0.3	0.4	0.5

The HI 180 is a compact and lightweight magnetic stirrer which incorporates electronic controls that allow the user to regulate the speed with precision. In addition to speed control, HANNA's Speedsafe™ system will assure that the maximum speed is never exceeded.

In accordance with the European Community (EC) reg. CEE2568/91 quality classification of olive oil based on acidity (expressed as percent oleic acid) is as follows:

Extra Virgin Olive Oil: Acidity ≤ 1%

"Perfect flavor and odor", with a maximum acidity, expressed as oleic acid, of 1 g/100 g

Virgin Olive Oil: Acidity 1 - 2%

"Perfect flavor and odor", with a maximum acidity, expressed as oleic acid, of 2 g/100 g

Ordinary Virgin Olive Oil: Acidity 2 - 3.3% (tolerance of 10%)

"Good flavor and odor", with a maximum acidity, expressed as oleic acid, of 3.3 g/100 g

Virgin Lampante Olive Oil: + 3.3%. Not fit for human consumption

"Off flavor and odor", with a maximum acidity, expressed as oleic acid, > 3.3 g/100 g

Sensory Quality of Olive Oil

The sensory analysis of virgin olive oil is based on a panel test, developed by the International Olive Oil Council. The rating is awarded on the basis of a scale of points running from 0, which indicates that the oil has extreme defects to 9, which indicates that the oil has no defects at all. See the following chart for sensory ratings of each grade of olive oil.

Extra Virgin Oil	**>6.5**
Virgin	**>5.5**
Ordinary Virgin	**>3.5**
Virgin Lampante	**<3.5**

ORDERING INFORMATION

HI 3897 is supplied with 6 ready-to-use bottles of organic solvent, HI 180MB magnetic stirrer, calibrated syringe for oil dosing, calibrated syringe for titrant dosing, titrant (30 mL bottle), rugged carrying case and instructions.

ACCESSORIES

HI 3897-010	Spare kit for 10 tests
HI 740226	5 mL calibrated syringe
HI 740142	1 mL calibrated syringe
HI 740143	1 mL calibrated syringe (6)
HI 740144	Tip for 1 mL calibrated syringe (6)
HI 740053	100 mL graduated glass bottle (10)
HI 731319	Magnetic stir bar for HI 180 (10)

Additional Technical Information:

Olive oil is a complex compound made of fatty acids, vitamins, volatile components, water soluble components and microscopic bits of olive. The 3 primary fatty acids (triglycerides) are oleic, linoleic, and linolenic.

Oleic Acid (18:1) = 55 ~ 85% olive oil composition
Linoleic Acid (18:2) = 3.5 ~ 21.00% olive oil composition
Linolenic Acid (18:3) = 0.0 ~ 1.5% olive oil composition

Oleic acid makes up 55-85% of olive oil. Oleic acid is the most abundant fatty acid found in nature.

Studies show that high concentrations of oleic acid can lower blood levels of total and LDL (bad) cholesterol, reducing the long term risk of heart disease.

Olive Oil Acid Composition

Palmitic Acid (16:0) = 7.5 - 20%
Palmitoleic Acid (16:1) = 0.3 - 3.5%
Stearic Acid (18:0) = 0.5 - 5.0%
Oleic Acid (18:1) = 55.0 - 83.0 %
Linoleic Acid (18:2) = 3.5 - 21.0%
Linolenic Acid (18:3) = 0.0 ~ 1.5%
Others = 1.5 - 3.2%

SPECIFICATIONS	HI 3897
Range	0.00 - 1.00 % acidity
Smallest Increment	0.01 mL = 0.01%
Method	titration
Sample Size	4.6 mL (4 g)
Number of Tests	6
Dimensions (kit)	112 x 390 x 318 mm (4.4 x 15.4 x 12.5")
Weight (kit)	3 kg (6.6 lb.)

SPECIFICATIONS	HI 180 Magnetic Stirrer (incl.)
Maximum Stirring Capacity	1 L (0.26 g)
Speed Range	100 rpm min.; 1000 rpm max
Installation Category	II
Cover Material	ABS plastic
Environment	0 to 50°C (32 to 122°F) 95% RH max
Dimensions	dia. 137 mm x 51 mm (h) (5.39 x 2")
Weight	640 g (1.4 lbs.)

HI 3811 Alkalinity Phenolphthalein and Total

Alkalinity is the quantitative capacity of a water sample to neutralize an acid to a set pH. This measurement is very important in determining the corrosive characteristics of water due primarily to hydroxide, carbonate and bicarbonate ions. Other sources of alkalinity can be from anions that can be hydrolyzed such as phosphates, silicates, borates, fluoride and salts of some organic acids. Alkalinity is critical in the treatment of drinking water, wastewater, boiler & cooling systems and soils.

Alkalinity Conversions

1 meq/L = 50 mg/L $CaCO_3$ = 2.8 dKH

1 mg/L $CaCO_3$ = 0.02 meq/L = 0.056 dKH

1 dKH = 0.36 meq/L = 17.86 mg/L $CaCO_3$

There are three methods of expressing alkalinity generally used:

mg/L $CaCO_3$ = milligrams of $CaCO_3$ per liter water

meq/L = milliequivalents per liter

dKH = degrees of carbonate hardness

METHOD	RANGE*	SMALLEST INCREMENT	CHEMICAL METHOD	# TESTS	WEIGHT
HI 3811 Alkalinity (as $CaCO_3$) Phenolphthalein and Total					
titration	0-100 mg/L (ppm) 0-300 mg/L (ppm)	1 mg/L (ppm) 3 mg/L (ppm)	phenolphthalein/ bromphenol blue	110 avg.	460 g
HI 38014 Alkalinity Total					
titration	0-500 gpg	5 gpg	bromphenol blue	100	363 g
HI 38013 Alkalinity, Phenolphthalein and Total					
titration	0.0-10.0 gpg 0.0-20.0 gpg	0.1 gpg 0.2 gpg	phenolphthalein/ bromphenol blue	200	865 g

* 1 gpg = 17 ppm $CaCO_3$

HI 3811 Alkalinity Test Kit

The HANNA alkalinity test kit makes monitoring easy, quick and safe. The compact size gives the user the versatility to use the kit anywhere. The design makes the kit easy to handle and, except for alkalinity titrant, practically prevents accidental injury or damage due to spills.

Alkalinity can be measured as phenolpthalein alkalinity and total alkalinity. The phenolpthalein alkalinity is determined by neutralizing the sample to a pH of 8.3 using a dilute hydrochloric acid solution, and a phenolpthalein indicator. Since bicarbonate ions can be converted to carbonic acid with additional hydrochloric acid, the phenolpthalein alkalinity measures total hydroxide ions, but only half of the bicarbonate contribution.

HI 38013 Phenolphthalein and Total Alkalinity Test Kit

In this case the phenolphthalein alkalinity is determined by neutralizing the sample to a pH of 8.3 using a dilute sulfuric acid solution and a phenolphthalein indicator. Since bicarbonate ions can be converted to carbonic acid with additional sulfuric acid, the phenolphthalein alkalinity measures total hydroxide ions, but only half of the carbonate contribution.

HI 38014 Total Alkalinity Test Kit

Total alkalinity is determined by neutralizing the sample to a pH of 4.5 using a dilute sulfuric acid solution and a bromophenol blue indicator.

ORDERING INFORMATION

HI 3811 test kit comes with 10 mL phenolpthalein indicator, 10 mL bromophenol blue indicator, 120 mL alkalinity titrant, 10 mL calibrated vessel, 50 mL calibrated vessel, and calibrated syringe with tip.
HI 38013 test kit comes with 10 mL phenolphthalein indicator, 10 mL bromophenol blue indicator, 105 mL alkalinity reagent (2), 20 mL calibrated plastic vessel with cap and 1 mL syringe with tip.
HI 38014 test kit comes with 10 mL bromophenol blue indicator, 110 mL total alkalinity reagent, 20 mL calibrated vessel with cap and 1 mL syringe with cap.

ACCESSORIES

HI 3811
HI 3811-100 Spare reagent for 100 tests
HI 38013
HI 38013-100 Spare reagent for 100 tests
HI 38014
HI 38014-100 Spare reagent for 100 tests

Chemical Test Kits

Ammonia

HI 3824 Ammonia Test Kit for Fresh Water

This HANNA ammonia portable test kit determines the ammonia concentration in water in several easy steps. The Nessler reagent reacts with ammonia, under strong alkaline conditions, to form a yellow colored complex.

HI 3826 Ammonia Test Kit for Sea Water

The HANNA ammonia portable test kit determines the ammonia concentration in water in several easy steps. The ammonia level in mg/L (or ppm), ammonia as nitrogen is determined by a colorimetric method. The Nessler reagent reacts with ammonia, under strong alkaline conditions, to form a yellow colored complex (see equation below). An addition of Reagent 1 for Sea Water inhibits precipitation of calcium and magnesium ions due to the presence of the alkaline Nessler reagent. The color intensity of the solution determines the ammonia concentration

$2K_2HgI_4 + 2NH_3 \rightarrow NH_2Hg_2I_3 + NH_4I + 4KI$

HI 38049 Ammonia Test Kit for Fresh Water

The HI 38049 test kit measures ammonia nitrogen concentration up to 3 ppm in fresh waters, employing the Nessler colorimetric method. Ammonia reacts with the reagent in basic solution to form a yellow compound. The absorbance of this colored product is proportional to the concentration of ammonia-nitrogen present in the aqueous sample.

HI 3826 Ammonia in salt water

Ammonia - nitrogen, in the form of NH_3 and NH_4^+, is often present in water as a component of the nitrogen cycle. In the metabolism of proteins and amino acids, many heterotrophic bacteria, actinomycetes, and fungi (occurring in both soil and water) excrete what for them is excess nitrogen: ammonia. Generally, in unpolluted waters, ammonia and ammonium compounds occur in relatively small quantities, on the order of 0.1 mg/L, while higher levels usually indicate organic pollution. Ammonia is also recognized to be toxic diatoms in the 7.4-8.5 pH range at a level of 1.1 mg/L, and to fish, in the same pH range, at a level of 2.5 mg/L.

In nature, the ammonia level in water can vary. Ground water normally contains ammonia due to bacterial decay of plants and animals. However, the presence of ammonia in surface water may be evidence of sanitary pollution due to waste discharges or natural causes.

Ammonia is commercially used as a fertilizer, either as such or in the form of compounds. Its presence in raw surface waters indicates animal or plant microbiological decay, and it is toxic to fish above certain critical levels.

ORDERING INFORMATION

HI 3826 test kit comes with 20 mL plastic beaker, color comparison cube, 20 mL ammonia reagent 1 (for sea water) and 20 mL Nessler reagent.
HI 3824 test kit comes with 20 mL plastic beaker, color comparison cube, 20 mL ammonia reagent 1 (for fresh water) and 20 mL Nessler reagent
HI 38049 test kit comes with 20 mL ammonia reagent (for fresh water), 20 mL Nessler reagent, checker disc, glass vials with caps (2) and 3 mL plastic pipette.

ACCESSORIES

HI 3826
HI 3826-025 Spare reagent for 25 tests
HI 3824
HI 3824-025 Spare reagent for 25 tests
HI 38049
HI 38049-100 Spare reagent for 100 tests

METHOD	RANGE	SMALLEST INCREMENT	CHEMICAL METHOD	# TESTS	WEIGHT
HI 3824 Ammonia (as NH_3-N) in fresh water					
colorimetric	0.0-2.5 mg/L (ppm)	0.5 mg/L (ppm)	Nessler	25 avg.	180 g
HI 3826 Ammonia (as NH_3-N) in salt water					
colorimetric	0.0-2.5 mg/L (ppm)	0.5 mg/L (ppm)	Nessler	25 avg.	180 g
HI 38049 Ammonia (as NH_3-N) in fresh water					
checker disc	0.0-3.0 mg/L (ppm)	0.1 mg/L (ppm)	Nessler	100	248 g

Ascorbic Acid, Boron

HI 3850 Ascorbic Acid Test Kit

Ascorbic acid and its sodium, potassium, and calcium salts are commonly used as antioxidant food additives.

Ascorbic acid (Vitamin C) is added as a flavoring and preservative agent to juice-based beverages. This kit is especially designed for the determination of the content in Vitamin C of beverages. It is based on drop-count titration and is practical also with intensively colored samples.

The National Academy of Sciences recommends the consumption of 60 mg of ascorbic acid per day. Vitamin C deficiency, which typically causes abnormalities in bones and teeth, was first characterized in sailors in the eighteenth century. These abnormalities were eliminated by compelling sailors to eat limes, a source of vitamin C. Many vegetables also contain large quantities of vitamin C, but ascorbic acid is commonly destroyed by many cooking processes, and hence citrus fruits are regarded as the most reliable source of vitamin C.

Boron is one of the micronutrients essential for plant growth, animal and humans, although the range between deficiency and excess is narrow. It may be present naturally in water or may find its way into a watercourse through industrial waste effluents. In aqueous environments boron is mainly present as boric acid, which is mostly undissociated. This is why a minimal boron concentration is required in the irrigation water for metabolic activities of the crops. However, excess boron is harmful to plant growth. Boron in excess of 2.0 mg/L in irrigation water is detrimental to many plants, but some plants may even be affected adversely by concentrations lower than 1.0 mg/L.

The US Department of Agriculture reports the following classification:

ppm of Boron	Effect on Crops
<0.5	good (except for very sensitive crops)
0.5-2.0	some risks (many crops must be excluded)
>2.0	dangerous (may only be used for very tolerant crops)

METHOD	RANGE*	SMALLEST INCREMENT	CHEMICAL METHOD	# TESTS	WEIGHT
HI 3850 Ascorbic Acid					
titration	10-200 mg/L (ppm)	10 mg/L (ppm)	iodometric	100 avg.	519 g
HI 38074 Boron					
titration	0.0-5.0 mg/L (ppm)	0.2 mg/L (ppm)	boric acid	100	780 g

* 1 gpg = 17 ppm $CaCO_3$

HI 3850 Ascorbic Acid Test Kit

Ascorbic acid ($C_6H_8O_6$) undergoes an oxidation reaction with potassium iodate in acidic condition.

The endpoint is indicated by the reaction of iodine with starch suspension, which produces a blue-black product. As long as ascorbic acid is present, the triiodide is quickly converted to iodide ion, and no blue-black iodine-starch product is observed. However, when all the ascorbic acid has been oxidized, the excess triiodide (in equilibrium with iodine) reacts with starch to form the expected blue-black color.

HI 38074 Boron Test Kit

Boric acid/borate react with chemical compounds containing multiple hydroxyls groups (polyols) such as mannitol, generating anionic complexes at the neutral pH of water.

The borate esters are formed and dissociated spontaneously in a variety of pH dependent equilibria. During to the release of acidic protons during complexation there is a concomitant decrease of pH which tends to reverse the reaction and thus, in order to maintain stable complexes there is a need to avoid pH decrease. The amount of acidification produced upon the addition of mannitol is proportional to the extent of borate ester formation.

The HI 38074 test kit can determine boron concentration in irrigation waters by direct titration of boric acid.

ORDERING INFORMATION

HI 3850 test kit comes with 100 mL ascorbic acid reagent A, 25 mL starch indicator, 100 mL ascorbic acid reagent C, 50 mL calibrated plastic vessels (2), 3 mL plastic pipette, 1 mL plastic pipette (2) and graduated plastic test tube with cap.
HI 38074 test kit comes with reagent for 100 tests, HI 98103 Checker pocket pH meter, pH 4.01 (1 sachet), pH 7.01 (1 sachet), screwdriver, 120 mL bottle with cap, 50 mL calibrated vessel, and 1 mL plastic pipettes (2).

ACCESSORIES

HI 3850

HI 3850-100	Spare reagent for 100 tests

HI 38074

HI 38074-100	Spare reagent for 100 tests
HI 70004P	pH 4.01 buffer (25 sachets, 20 mL ea.)
HI 7004M	pH 4.01 buffer, 230 mL
HI 70007P	pH 7.01 buffer (25 sachets, 20 mL ea.)
HI 7007M	pH 7.01 buffer, 230 mL

Chemical Test Kits

Bromine, Calcium

HI 3830 Bromine (as Br_2)*

The HANNA portable bromine test kit determines the bromine level in water with efficiency. The first step involves pH adjustment of the sample to pH 6.3 by adding pH buffer. The second step consists of adding the second reagent, an indicator solution which contains DPD (N, N-diethyl-p-phenylenediamine). DPD is immediately oxidized by bromine producing a reddish color. The color intensity of the solution determines the bromine concentration.

HI 38086 Calcium Test Kit for Irrigation Water

The HI 38086 test kit determines calcium in irrigation water via a turbidimetric method. HANNA reagents react selectively with calcium to form a white suspension. The developed turbidity is proportional to calcium concentration.

HI 38080 Calcium and Magnesium Test Kit for Soil & HI 38081 Calcium and Magnesium Test Kit for Irrigation Water

The HI 38081 test kit determines calcium and magnesium in irrigation water via a titrimetric method. The HI 38080 test kit extracts calcium and magnesium from soil in acidic medium and then determines them via a titrimetric method. The indicator chelates with the calcium and magnesium ions to form a red colored complex. As EDTA is added, calcium and magnesium complex with it, and the reaction endpoint is indicated by a change in color of the indicator from red to blue.

ORDERING INFORMATION

HI 3830 test kit comes with 30 mL reagent 1, 20 mL reagent 2, color comparison cube, and plastic vessel.
HI 38086 test kit comes with 30 mL buffer reagent, oxalate reagent (100 packets), 500 mL deionized water, 50 mL glass test tube, 50 mL calibrated vessel, 1 mL plastic pipette, plastic spoon, graduated card and line card.
HI 38081 test kit comes with 30 mL Ca & Mg reagent, 120 mL EDTA solution (2), 10 mL calmagite indicator, demineralizer bottle for 12 L, 50 mL calibrated vessel, 1 mL plastic pipette, 3 mL plastic pipette and 1 mL syringe with tip.
HI 38080 test kit comes with 100 mL buffer solution, 10 mL calmagite solution, 120 mL EDTA solution, 50 mL calibrated vessel, 3 mL plastic pipette, 1 mL plastic pipette and 1 mL syringe with tip.

ACCESSORIES

HI 3830
HI 3830-060 Spare reagent for 60 tests
HI 38086
HI 38086-100 Spare reagent for 100 tests
HI 38081
HI 38081-100 Spare reagent for 100 tests
HI 38080
HI 3841-100 Spare reagents for 100 tests

* No chlorine or iodine can be present in the water sample for this test to work properly.

HI 38081 Calcium and Magnesium Hardness

Bromine is less volatile and more stable than chlorine. This makes bromine a good choice as a disinfectant in pools as well as a sanitizing agent in drinking water systems. Like chlorine, excess amounts of bromine can be hazardous. Daily monitoring of bromine levels prevents adverse conditions and optimizes its proper function.

Calcium presence in water supplies results from passage over deposits of limestone, dolomite, gypsum and gypsiferous shale. Its concentration may extend from 0 to several hundred milligrams per liter, depending on its source and treatment. Calcium is necessary in plant and animal nutrition since it is an essential constituent of bones, shells and plant structures. Calcium in water as carbonate is one of the primary components of water hardness which can cause pipe or tube scaling.

Calcium and Magnesium are often present in soil as carbonates (e.g.: dolomite), sulfates (in arid regions) and silicates. They are necessary nutrients for plants since they have an important role in plant metabolism and growth. They can be removed from soil by leaching (for instance in acidic soil of humid regions) or by crop production; a deficiency of calcium and magnesium in soil will manifest itself in stunted growth and in yellow and deformed leaf tips. On the other hand, soil with an excess of calcium and magnesium will lock up other necessary micronutrients, making them unavailable to plant roots (e.g.: available phosphorus forms an insoluble salt with calcium at pH values above 7.5, thus decreasing the efficiency of applied phosphorus fertilizers).

METHOD	RANGE	SMALLEST INCREMENT	CHEMICAL METHOD	# TESTS	WEIGHT
HI 3830 Bromine (as Br_2)					
colorimetric	0.0-3.0 mg/L (ppm)	0.6 mg/L (ppm)	DPD	60 avg.	370 g
HI 38086 Calcium (Ca) of irrigation water					
turbidimetric	0-125 mg/L (ppm) 0-250 mg/L (ppm)	1 mg/L (ppm) 2 mg/L (ppm)	turbidimetric	100	950 g
HI 38081 Calcium (Ca) & Magnesium (Mg) Hardness of irrigation water					
titration	>0.0 meq/L	0.2 meq/L	EDTA	100 avg.	671 g
HI 38080 Calcium (Ca) & Magnesium (Mg) Hardness of soil					
titration	>0.0 meq/100 g	1.5 meq/100 g	EDTA	100 avg.	336 g

Carbon Dioxide, Chloride Test for COD

HI 3818 Carbon Dioxide

HI 3898 Chloride

Certain **carbon dioxide** levels are required in both man and nature's environment. Generally, lakes and rivers contain less than 10 mg/L carbon dioxide; however stagnant or polluted water can generate large amounts due to organic or mineral decomposition. These results can make the water corrosive and toxic to aquatic life-forms like fish. The monitoring of carbon dioxide levels is also critical in the man-made environment. A certain amount of carbon dioxide is reintroduced into potable water during the final stages of the water-softening process. In water systems, a delicate balance of carbon dioxide must be maintained to prevent either corrosion or encrustation of pipes and storage tanks.

$CO_2 + H_2O \rightleftharpoons H_2CO_3$

CO_2 is toxic in higher concentrations and levels of even 1% (10,000 ppm) will make some people feel drowsy.

Carbon dioxide is used by food, oil, and chemical industries. It is used in many consumer products that require pressurized gas because it is inexpensive and nonflammable, and because it undergoes a phase transition from gas to liquid at room temperature.

METHOD	RANGE	SMALLEST INCREMENT	CHEMICAL METHOD	# TESTS	WEIGHT
HI 3818 Carbon Dioxide (as CO_2)					
titration	0.0-10.0 mg/L (ppm) 0.0-50.0 mg/L (ppm) 0-100 mg/L (ppm)	0.1 mg/L (ppm) 0.5 mg/L (ppm) 1 mg/L (ppm)	phenolphthalein	110 avg.	460 g
HI 3898 Chloride (as Cl^-)*					
visual	1000 mg/L (ppm) (ISO) 2000 mg/L (ppm) (EPA)	-	silver nitrate	100	200 g

* If high chloride levels are detected, the sample for COD measurements needs to be diluted before digestion.

HI 3818 Carbon Dioxide (as CO_2) Test Kit

Carbon dioxide levels can be measured quickly and safely with the HANNA Carbon Dioxide Test Kit. This compact, portable kit allows the user the option of field or laboratory use. The design makes the kit easy to handle and, except for the Carbon Dioxide Reagent, practically prevents accidental injury or damage due to spills.

Carbon dioxide (as carbonic acid) in the water sample is neutralized with a dilute sodium-hydroxide solution to a pH of 8.3 using a phenolphthalein indicator. This process converts carbonic acid to sodium bicarbonate:

$CO_2+H_2O \rightarrow H_2CO_3+NaOH \rightarrow NaHCO_3+H_2O$

HI 3898 Chloride Rapid Screening Test for COD - ISO and EPA

This screening test is a quick test to detect high chloride levels in water and wastewater that might cause interference with official COD methods. The test is in accordance with the ISO 15705:2002 method, and indicates within seconds a YES/NO possibility of having chloride interference on COD measurements. The kit can be used for checking 1000 ppm chloride concentration for the ISO COD testing, or for a 2000 ppm chloride check for the USEPA, APHA, AWWA and WEF methods.

Upon adding the indictor to the sample, the solution turns yellow. Then the chloride titrant is added and a white precipitate is formed if chlorides are present. If the chloride concentration is lower than 1000 ppm for ISO, or 2000 ppm for EPA, a orange-brown complex is formed. If the solution remains yellow, high chloride concentrations are present.

ORDERING INFORMATION

HI 3818 test kit comes with 10 mL phenolphthalein indicator, 120 mL carbon dioxide reagent, 10 mL calibrated vessel, 50 mL calibrated vessel and calibrated syringe.
HI 3898 test kit comes with 25 mL chloride titrant bottles (4), 7 mL chloride indicator, glass cuvette with plastic stopper and1.0 mL calibrated syringes with tips (2).

ACCESSORIES

HI 3818-100 Spare reagent for 100 tests

Single Parameter Chemical Test Kits

Chloride

HI 3815 Chloride Test Kit

The HANNA chloride test kit is quick, easy to use and portable. The design makes the kit easy to handle and, except for mercuric nitrate solution, practically prevents accidental injury or damage due to spills. The pH is lowered to approximately 3 by addition of nitric acid. Mercuric ions react with chloride ions to form mercuric chloride; when excess mercuric ions is present, it complexes with diphenylcarbazone to form a purple solution. The color change from yellow to purple determines the end point of this titration.

HI 38015 Chloride, Extended Range Test Kit

The HANNA extended range chloride test kit is equipped with all you need to determine high chloride levels of water. The chloride level in mg/L (ppm) is determined by a silver nitrate titration, using potassium chromate as indicator. The color change from yellow to brick-red determines the end point of this titration.

HI 3815 Chloride

Chloride ions are one of the major inorganic anions in water and wastewater.

Effects on humans

A normal adult human body contains approximately 81.7 g chloride. On the basis of a total obligatory loss of chloride of approximately 530 mg/day, a dietary intake of 9 mg of chloride per kg of body weight for adults has been recommended (equivalent to slightly more than 1 g of table salt per person per day).

Chloride toxicity has not been observed in humans except in the special case of impaired sodium chloride metabolism, e.g. in congestive heart failure. Healthy individuals can tolerate the intake of large quantities of chloride provided that there is a accompanying intake of fresh water. Little is known about the effect of prolonged intake of large amounts of chloride in the diet. As shown with experimental animals, hypertension associated with sodium chloride intake appears to be related to the sodium rather than the chloride ion.

Other considerations

Chloride increases the electrical conductivity of water and thus increases its corrosivity. In metal pipes, chloride reacts with metal ions to form soluble salts, thus increasing levels of metals in drinking-water. In lead pipes, a protective oxide layer is built up, but chloride enhances galvanic corrosion. It can also increase the rate of pitting corrosion of metal pipes.

Chloride concentrations in excess of about 250 mg/L can be detected by taste in water, but the threshold depends upon the associated cations. Consumers can, however, become accustomed to concentrations in excess of 250 mg/L.

METHOD	RANGE	SMALLEST INCREMENT	CHEMICAL METHOD	# TESTS	WEIGHT
HI 3815 Chloride (as Cl^-)					
titration	0-100 mg/L (ppm) 0-1000 mg/L (ppm)	1 mg/L (ppm) 10 mg/L (ppm)	mercuric nitrate	110 avg.	460 g
HI 38015 Chloride (as Cl^-)					
titration	500-10000 mg/L (ppm) 5000-100000 mg/L (ppm)	100 mg/L (ppm) 1000 mg/L (ppm)	silver nitrate	100	664 g

ORDERING INFORMATION

HI 3815 test kit comes with 15 mL diphenylcarbazone indicator, 30 mL nitric acid solution, 120 mL mercuric nitrate solution, 50 mL calibrated vessel, 10 mL calibrated vessel, calibrated syringe with tip.
HI 38015 test kit comes with 100 mL chloride reagent A, 25 mL chloride reagent B (2), 100 mL chloride reagent C, demineralizer bottle with filter cap for 12 L, 50 mL calibrated plastic vessel with cap, 3 mL plastic pipette, 1 mL plastic pipette, 1 mL syringes with tips (2) and brush.

ACCESSORIES

HI 3815
HI 3815-100 Spare reagent for 100 tests
HI 38015
HI 3815-100 Spare reagent for 100 tests

HI 38017 Free & Total Chlorine

Free chlorine reacts with ammonium ions and organic compounds to form chlorine compounds resulting in diminished disinfecting capabilities compared with free chlorine. These chlorine compounds together with chloramines form combined chlorine. Combined chlorine and excess free chlorine together result in total chlorine. While free chlorine has a much higher disinfectant potential, combined chlorine has a much higher stability and has a lesser volatility. There should be sufficient levels of unreacted free chlorine for adequate disinfection, but not so much as to become harmful.

CODE	METHOD	RANGE	SMALLEST INCREMENT	CHEMICAL METHOD	# TESTS	WEIGHT
Chlorine (as Cl_2) Free						
HI 3829F	colorimetric	0.0-2.0 mg/L (ppm)	0.5 mg/L (ppm)	DPD	50 avg.	176 g
HI 3831F*	colorimetric	0.0-2.5 mg/L (ppm)	0.5 mg/L (ppm)	DPD	50 avg.	176 g
HI 3875	checker disc	0.0-3.5 mg/L (ppm)	0.1 mg/L (ppm)	DPD	100	984 g
HI 38018	checker disc	0.00-0.70 mg/L (ppm) 0.0-3.5 mg/L (ppm)	0.02 mg/L (ppm) 0.1 mg/L (ppm)	DPD	200	647 g
Chlorine (as Cl_2) Free & pH						
HI 3887	colorimetric	Cl_2: 0.0-2.5 mg/L (ppm) pH: 6.0-8.5 pH	Cl_2: 0.5 mg/L (ppm) pH: 0.5 pH	DPD pH indicator	50 avg. 100	280 g
Chlorine (as Cl_2) Free & Total						
HI 38017	checker disc	0.00-0.70 mg/L (ppm) 0.0-3.5 mg/L (ppm)	0.02 mg/L (ppm) 0.1 mg/L (ppm)	DPD	200	696 g
HI 38020	checker disc	0.00-0.70 mg/L (ppm) 0.0-3.5 mg/L (ppm) 0.0-10.0 mg/L (ppm)	0.02 mg/L (ppm) 0.1 mg/L (ppm) 0.5 mg/L (ppm)	DPD	200	688 g

*HI 3831F/S for Spain

HI 3829F Free Chlorine Test Kit
With color cube

HI 3831F Free Chlorine Test Kit

HI 3875 Free Chlorine Test Kit
Medium Range with Checker Disc

HI 38018 Free Chlorine Test Kit
Low and Medium Range with Checker Disc

HI 3887 Free Chlorine and pH Test Kit
With Checker Disc

HI 38017 Free & Total Chlorine Test Kit
Low and Medium Range with Checker Disc

HI 38020 Free & Total Chlorine Test Kit
Low, Medium and High Range with Checker Disc

ORDERING INFORMATION

HI 3829F test kit comes with color comparison cube, 20 mL reagent 1 and 15 mL reagent 2
HI 3831F and **HI 3831F/S** test kit comes with color comparison cube, 20 mL reagent 1 and 15 mL reagent 2.
HI 3831T/S test kit comes with
HI 3875 test kit comes with HI 93701-0 free Cl reagent (100 packets), 500 mL deionized water, checker disc, glass vials with caps (2) and 3 mL plastic pipette.
HI 38018 test kit comes with HI 93701-0 free chlorine reagent (200 packets), demineralizer bottle with cap for 12 L, checker disc, glass vials with caps (2) and 3 mL plastic pipettes.
HI 3887 test kit comes with color comparison cubes (2), 20 mL reagent 1, 15 mL reagent 2, 25 mL HI 3881-0 pH 6.0-8.5 reagent
HI 39017 and HI 38020 test kits come with HI 93701-0 free chlorine reagent (100 packets), HI 93711-0 total chlorine reagent (100 packets), demineralizer bottle with filter cap for 12 L, checker disc, glass vials with caps (2) and 3 mL plastic pipettes

ACCESSORIES

HI 3829F
HI 3829F-050 Spare reagent for 50 tests
HI 3831F and HI 3831F/S
HI 3831F-050 Spare reagent for 50 tests
HI 3875
HI 3875-100 Spare reagent for 100 tests
HI 38018
HI 38018-200 Spare reagent for 200 tests
HI 93701-01 Spare reagent for 100 tests
HI 90701-03 Spare reagent for 300 tests
HI 740231 20 mL glass cylinders with caps
DEMI-10 Demineralizer bottle
HI 3887
HI 3831F-050 Spare reagent for 50 tests (Free Cl)
HI 3881-100 Spare reagent for 100 tests (pH)
HI 3881-010 Spare reagent for 100 tests (pH) + Reagent
HI 38017
HI38017-200 Spare reagent for 200 tests (100 tests Free Cl, 100 tests Total Cl)
HI 93701-01 Spare reagent for 100 tests - Free Cl
HI 93701-03 Spare reagent for 300 tests - Free Cl
HI 93711-01 Spare reagent for 100 tests - Total Cl
HI 93711-03 Spare reagent for 300 tests - Total Cl
HI 740231 20 mL glass cylinders with caps
DEMI-10 Demineralizer Bottle
HI 38020
HI 38020-200 Spare reagent for 200 tests (100 tests Free Cl + 100 tests Total Cl)

Chemical Test Kits

Chlorine, Total

HI 3831T Total Chlorine Test Kit
(HI3831T/S - for Spain)

HI 38016 Total Chlorine Test Kit
Medium range with checker disc

HI 38019 Total Chlorine Test Kit
Low and medium range with checker disc

HI 38022 Total Chlorine Test Kit
High Range Test Kit

HI 38023 Total Chlorine Test Kit
Extended range

HI 3888 Total Chlorine & pH Test Kit
With color comparison cube

HI 3831F and 3831T Chlorine

HI 38022 Total Chlorine

ORDERING INFORMATION

HI 3831T and **HI 3831T/S** test kits comes with color comparison cube, 20 mL chlorine reagent 1, 15 mL chlorine reagent 2 and 15 mL chlorine reagent 3
HI 38016 test kit comes with HI 90711-0 total Cl reagent (100 packets), 500 mL deionized water, checker disc, glass vials with caps (2) and 3 mL plastic pipette.
HI 38019 test kit comes with HI 93711-0 total Cl reagent (100 packets), demineralizer bottle with filter cap for 12 L, checker disc, glass vials with caps (2) and 3 mL plastic pipette.
HI 38022 test kit comes with 30 mL potassium iodide solution, sulfamic reagent (100 packets), 25 mL starch indicator, 100 mL thiosulfate reagent, 50 mL calibrated vessel, 20 mL calibrated vessel, 3 mL plastic pipette, 1 mL plastic pipette and spoon.
HI 38023 test kit comes with 30 mL potassium iodide solution, sulfamic reagent (100 packets), 25 mL starch indicator, 100 mL thiosulfate reagent, 50 mL calibrated vessel, 1 mL syringe with tip, 1 mL plastic pipette and spoon.
HI 3888 test kit comes with color comparison cube, 20 mL Cl reagent 1, 15 mL Cl reagent 2, 15 mL Cl reagent 3 and 25 mL HI 3881-0 pH 6.0-8.5 reagent.

ACCESSORIES

HI 3831T and HI 3831T/S

HI 3881T-050	Spare reagent for 50 tests

HI 38016

HI 38016-100	Spare reagent for 100 tests

HI 38019

HI 38019-200	Spare reagent for 200 tests

HI 38022

HI 38022-100	Spare reagent for 100 tests

HI 38023

HI 38023-100	Spare reagent for 100 tests

HI 3888

HI 3831T-050	Spare reagent for 50 tests (total Cl)
HI 3881-100	Spare reagent for 100 tests (pH)
HI 3881-010	Spare reagent for 100 tests (pH) + dechlorinating reagent

The chlorination of water supplies and polluted waters is used mainly to destroy or deactivate disease-producing micro-organisms. It also serves to improve the quality of drinking waters, as chlorine reacts with ammonia, iron, manganese, sulfide and some organic substances.

Nevertheless, high amounts of **chlorine** will produce adverse effects, like formation of compounds which are potentially carcinogenic (e.g. chloroform) or harmful to aquatic life (e.g. chloramines). Thus it is essential to control that the proper amount of chlorine has been added in order to fulfill the primary purpose of disinfecting and to minimize any adverse effects.

CODE	METHOD	RANGE	SMALLEST INCREMENT	CHEMICAL METHOD	# TESTS	WEIGHT
Chlorine (as Cl_2) Total						
HI 3831T*	colorimetric	0.0-2.5 mg/L (ppm)	0.5 mg/L (ppm)	DPD	50	205 g
HI 38016	checker disc	0.0-3.5 mg/L (ppm)	0.1 mg/L (ppm)	DPD	100	977 g
HI 38019	checker disc	0.00-0.70 mg/L (ppm) 0.0-3.5 mg/L (ppm)	0.02 mg/L (ppm) 0.1 mg/L (ppm)	DPD	200	678 g
HI 38022	titration	0.0-4.0 mg/L (ppm) 0.0-20.0 mg/L (ppm)	0.2 mg/L (ppm) 1.0 mg/L (ppm)	iodometric	100	561 g
HI 38023	titration	10-200 mg/L (ppm)	10 mg/L (ppm)	iodometric	100	547 g
Chlorine (as Cl_2) Total & pH						
HI 3888	colorimetric	Cl_2: 0.0-2.5 mg/L (ppm) pH: 6.0-8.5 pH	Cl_2: 0.5 mg/L (ppm) pH: 0.5 pH	DPD pH indicator	50 100	310 g

*HI 3831T/S for Spain

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HI 3845 Chromium

Chromium is a metallic element in the periodic table. It is odorless and tasteless. Chromium is found naturally in rocks, plants, soil and volcanic dust, humans and animals. The most common forms of chromium in the environment are trivalent (chromium III), hexavalent (chromium VI) and the metal form, chromium 0. Chromium III occurs naturally in many vegetables, fruits, meats, grains and yeast. Chromium VI and 0 are generally produced by industrial processes. Major sources of chromium VI in drinking water are discharges from steel and pulp mills, and erosion of natural deposits of chromium III. At many locations, chromium compounds have been released to the environment via leakage, poor storage, or improper disposal practices. Chromium compounds are very persistent in water as sediments. The current maximum contaminant level for chromium in all forms in drinking water is 100 µg/L, which includes chromium VI.

Toxicologic Information

Hexavalent chromium is transported into cells via the sulfate transport mechanisms, taking advantage of the similarity of sulfate and chromate with respect to their structure and charge. Trivalent chromium, which is the more common variety of chromium compounds, is not transported into cells. Inside the cell, chromium VI is reduced first to metastable chromium V, then to trivalent chromium. Chromate-dyed textiles or chromate-tanned leather shoes can cause or exacerbate contact dermatitis. Vitamin C and other reducing agents combine with chromate to give chromium III products inside the cell. Hexavalent chromium compounds are genotoxic carcinogens. Chronic inhalation of hexavalent chromium compounds increases risk of lung cancer (lungs are especially vulnerable, followed by fine capillaries in kidneys and the intestine). According to some researchers, the damage is caused by hydroxyl radicals, produced during reoxidation of pentavalent chromium by hydrogen peroxide molecules present in the cell. In the U.S., the OSHA PEL for airborne exposures to hexavalent chromium is 5 µg/m^3 (0.005 mg/m^3).

Chromium salts are widely used in industrial processes, such as metal finishing and plating industries, as well as in the leather industry as a tanning agent, and in the manufacture of paints, dyes, explosives and ceramics. Chromium may enter a water supply through the discharge of waste from these industries and may also be discharged from chromate-treated cooling waters, where they are frequently added for corrosion control. The hexavalent state of chromium is toxic to humans, animals and aquatic life. It can also produce lung tumors when inhaled and readily induces skin sensitization.

METHOD	RANGE	SMALLEST INCREMENT	CHEMICAL METHOD	# TESTS	WEIGHT
HI 3845 Chromium (as Cr^{6+})					
titration	0-100 mg/L (ppm) 100-1000 mg/L (ppm)	5 mg/L (ppm) 50 mg/L (ppm)	iodometric	100 avg.	416 g
HI 3846 Chromium (as Cr^{6+})					
colorimetric	0.0-1.0 mg/L (ppm)	0.2 mg/L (ppm)	diphenylcarbohydrazide	100 avg.	160 g

HI 3845 Chromium Medium Range and High Range Test Kit

The HANNA chromium test kit is field portable and can also be used in the laboratory. HI 3845 is able to determine traces of chromium up to 1000 ppm.

Chromate is determined by a titrimetric method. Only the hexavalent chromium will react with iodide in acid solution. (Step 1:) The amount of iodine generated is equivalent to the chromium in the sample. (Step 2:) The liberated iodine is then titrated with standard sodium thiosulfate solution that reduces the iodine back to iodide ions.

Step 1:
$2(CrO_4)^{2-} + 16H^+ + 6I^- \rightarrow 3I_2 + 8H_2O + 2Cr^{3+}$

Step 2:
$I_2 + 2(S_2O_3)^{2-} \rightarrow 2I^- + (S_4O_6)^{2-}$

HI 3846 Chromium Test Kit

Chromium VI reacts with diphenylcarbohydrazide to form a purple product in an acidic buffered condition. The amount of color developed is proportional to the concentration of chromium present in the aqueous sample.

HI 3846 Chromium

ORDERING INFORMATION

HI 3845 test kit comes with chromium MR-HR reagent A (100 packets), 17 g chromium MR-HR reagent B, 60 mL chromium MR-HR reagent C, 25 mL starch indicator, 20 mL calibrated vessel, 1 mL plastic pipette, graduated plastic test tube with cap.
HI 3846 test kit comes with HI 3846-0 reagent (100 packets) and color comparison cube.

ACCESSORIES

HI 3845
HI 3845-100 Spare reagent for 100 tests
HI 3846
HI 3846-100 Spare reagent for 100 tests

Chemical Test Kits

Copper

HI 3847 Copper Test Kit

Copper is an essential trace element in human diet (the daily requirement is around 2.0 mg) and a factor in plant metabolism.

On the other hand, corrosion of copper alloys in pipe fittings may introduce considerable quantities of copper into water supplies.

Copper salts react with bicinchoninate reagent to form a purple product in a neutral buffered condition. The amount of color developed is directly proportional to the concentration of copper present in the aqueous sample.

HI 3856 Copper Test
Ultra low range, with color comparison cube.

HI 38075 Copper Test Kit
Low and high range, with long path and normal color comparison cubes.

HI 38075 Copper

ORDERING INFORMATION

HI 3847 test kit comes with HI 3847-0 reagent (100 packets) and color comparison cube.
HI 3856 test kit comes with HI 3856-0 reagent (100 packets) and color comparison cube.
HI 38075 test kit comes with HI 93702-0 reagent (50 packets), HI 3856-0 reagent (50 packets), 230 mL deionized water, long path color comparison cube, color comparison cube, 14 mL plastic test tube with screw cap, 3 mL plastic pipette.

ACCESSORIES

HI 3847
HI 3847-100 Spare reagent for 100 tests
HI 3856
HI 3856-100 Spare reagent for 100 tests
HI 38075
HI 38075-100 Spare reagent for 100 tests (50 LR and 50 HR)

HI 3856 Copper

Copper is a reddish metal that occurs naturally in rock, soil, water, sediment, and air. Its unique chemical and physical properties have made it one of the most commercially important metals. Since copper is easily shaped or molded, it is commonly used to make money, electrical wiring, and water pipes. Copper compounds are also used as an agricultural pesticide and to control algae in lakes and reservoirs.

Copper is found in surface water, groundwater, seawater and drinking water, in complexes or as particulate matter. Copper concentrations in drinking water vary widely as a result of variations in water characteristics, such as pH, hardness and copper availability in the distribution system.

Copper concentrations in drinking water often increase during distribution, especially in systems with an acid pH or high-carbonate waters with an alkaline pH (US EPA, 1995). In the USA, first-draw copper concentrations must be reported to the US EPA if they exceed 1.3 mg/L.

Elevated copper levels in drinking water may cause adverse health effects; a metallic taste in drinking water indicates that copper levels may have reached that level. Also, high concentrations of cooper are correlated with blue or blue-green stains around sinks and plumbing fixtures. The only way to be certain of the copper level in your drinking water supply is to have the water tested.

If you are being served by a public water system, the owner of the utility will have results of copper sampling which has been done in parts of the distribution system. If the EPA action level of 1300 µg/L for copper is exceeded in more than 10% of samples collected, the utility must conduct further testing to determine if the corrosiveness of the water is contributing to an increase in the copper levels.

They are also required to optimize corrosion control measures to reduce the corrosion of the water to acceptable levels. If you have questions regarding copper monitoring, contact your water utility.

METHOD	RANGE	SMALLEST INCREMENT	CHEMICAL METHOD	# TESTS	WEIGHT
HI 3847 Copper					
colorimetric	0.0-2.5 mg/L (ppm)	0.5 mg/L (ppm)	bicinchoninic acid	100	150 g
HI 3856 Copper					
colorimetric	0.00-0.25 mg/L (ppm)	0.05 mg/L (ppm)	bicinchoninic acid	100	180 g
HI 38075 Copper					
colorimetric	0.00-0.25 mg/L (ppm) 0.0-6.0 mg/L (ppm)	0.05 mg/L (ppm) 1.2 mg/L (ppm)	bicinchoninic acid	100	555 g

Cyanide, Cyanuric Acid

HI 3855 Cyanide

Cyanides can both occur naturally or be man-made and many are powerful and fast-acting poisons. Hydrogen cyanide (HCN), which is a gas, and the simple cyanide salts (sodium cyanide and potassium cyanide) are common examples of cyanide compounds. Certain bacteria, fungi, and algae can produce cyanide, and cyanide is found in a number of foods and plants. In certain plant foods, including almonds, millet sprouts, lima beans, soy, spinach, bamboo shoots, and cassava roots (which are a major source of food in tropical countries), cyanides occur naturally as part of sugars or other naturally-occurring compounds.

Many of the cyanides in soil and water come from industrial processes. The major sources of cyanides in water are discharges from some metal mining processes, organic chemical industries, iron and steel plants or manufacturers, and publicly owned wastewater treatment facilities. Other cyanide sources include vehicle exhaust, releases from certain chemical industries, burning of municipal waste, and use of cyanide-containing pesticides. Much smaller amounts of cyanide may enter water through storm water runoff where road salts are used that contains cyanide.

Cyanide in landfills can contaminate underground water. Hydrogen cyanide, sodium cyanide, and potassium cyanide are the forms of cyanide most likely to be in the environment as a result of industrial activities. Hydrogen cyanide is a colorless gas with a faint, bitter, almond-like odor.

Cyanuric acid is marketed as a chlorine stabilizer for swimming pools. It forms a weak bond with free chlorine in the pool water, protecting it from the sun's ultraviolet rays to reduce chlorine loss. Properly managed, cyanuric acid has been shown to reduce the amount of chlorine needed to maintain the minimum chlorine residual in an outdoor pool. In a small pool with a moderate bather load, cyanuric acid can significantly reduce the cost for chemical disinfection. The recommended range for cyanuric acid is 30-80 ppm.

HI 3855 Cyanide Test Kit

Cyanide refers to all of the CN groups in cyanide-compounds that can be determined as the cyanide ion CN^-. In most natural waters the molecular HCN form predominates. In solutions of metal cyanides, the CN group may also be present as a complex of varying stability. Cyanides are extensively used for extraction of silver/gold ores, metal-cleaning and electroplating baths, coke ovens and other chemical processes. There are mainly two chemical treatments to remove cyanides from waste-waters: one is chlorination and the other is the alkaline method.

Cyanides react with the pyridine-pyrazolone reagent to form a blue complex in neutral buffered solution. The absorbance of this colored product is proportional to the concentration of cyanide present in the aqueous sample.

HI 3851 Cyanuric Acid Test Kit

Cyanuric acid (CYA) is widely applied in swimming pools to slow down the decomposition of chlorine. In outside pool areas, this process is accelerated by the effect of ultraviolet rays. With a correct dose, it can save up to 80% of normal chlorine consumption in pools during peak sunny months.

Cyanuric acid is also used in chlorinated bleaches and selective herbicides.

The reaction between cyanuric acid and the reagent causes a white suspension in the sample. The turbidity is proportional to the concentration of cyanuric acid.

METHOD	RANGE	SMALLEST INCREMENT	CHEMICAL METHOD	# TESTS	WEIGHT
HI 3855 Cyanide (as CN^-)					
checker disc	0.00-0.30 mg/L (ppm)	0.01 mg/L (ppm)	pyridine-pyrazolone	100	580 g
HI 3851 Cyanuric Acid					
turbidimetric	10-100 mg/L (ppm)	5 mg/L (ppm)	turbidimetric	100	195 g

ORDERING INFORMATION

HI 3855 test kit comes with 17 g cyanide reagent A, 100 packets cyanide reagent B, 100 packets cyanide reagent C, checker disc, glass vials with caps, 3 mL plastic pipette and spoon.
HI 3851 test kit comes with 100 packets HI 93722-0 reagent, 25 mL glass test tube, 50 mL plastic vessel, 3 mL plastic pipette and spoon.

ACCESSORIES

HI 3855
HI 3855-100 Spare reagent for 100 tests
HI 3851
HI 3851-100 Spare reagent for 100 tests

Chemical Test Kits

Detergents, Formaldehyde, Glycol

HI 3857 Detergents Test Kit

The aqueous solution containing the detergents is treated with the colored indicator. The reaction product can be extracted in the chloroform layer, while the original dyestuff is insoluble in the organic medium. The intensity of the color developed is proportional to the concentration of the detergents present.

HI 3838 Formaldehyde Test Kit

The HANNA formaldehyde portable test kit makes monitoring easy, quick and safe. The design of the kit makes it practically impossible to spill the reagents, thereby reducing the possibility of injury or damage to property.

Formaldehyde concentration is determined by a simple acid titration. The formaldehyde, in the aqueous sample, reacts with sodium sulfite to form an alkaline product. This product is then titrated to a yellow alizarin R yellow endpoint, using a prestandardized hydrochloric acid solution.

HI 3859 Glycol Yes/No Test Kit

Use the HI 3859 glycol standard 0.025% included in the kit to easily recognize a positive result in the form of an intense purple color. Ethylene glycol and other glycols are determined by a two step reaction:

Step 1: glycol is oxidized to two carbonyl groups under acidic conditions;

Step 2: the carbonyl groups react with the indicator to give a colored solution.

ORDERING INFORMATION

HI 3857 test kit comes with 15 mL detergents reagent A, 15 mL detergent reagent B, 180 mL chloroform, demineralizer bottle with filter cap for 12 L, checker disc, 30 mL long glass vials with caps (2), long plastic pipette, 3 mL plastic pipette and 1 mL plastic pipette.
HI 3838 test kit comes with 15 mL Alizarin Yellow R indicator, 30 g sodium sulfite, 120 mL titrant solution, plastic spoon, plastic bottle, 10 mL calibrated vessel, filter cartridge, calibrated titration syringe and plungers
HI 3859 test kit comes with 125 mL glycol reagent A, 25 packets glycol reagent B, 25 packets glycol reagent C, 25 mL glycol standard 0.025%, 3 mL plastic pipette, 1 mL plastic pipettes (25), 10 mL glass vials with caps (2) and brush.

ACCESSORIES

HI 3857
HI 3857-035 Spare reagent for 35 tests
HI 3838
HI 3838-100 Spare reagent for 100 tests
HI 3859
HI 3859-025 Spare reagent for 25 tests

HI 3859 Glycol Yes/No Test Kit

Detergents can enter water and wastewater by discharge of domestic and industrial cleansing waters. The most widely used detergents are linear alkyl sulfonates (LAS) and alkyl benzene sulfonates (ABS): LAS are preferable to ABS because they are biodegradable, thus readily decomposed by microorganisms. The presence of anionic LAS/ABS detergents in natural waters should be below 0.1 mg/L and in raw domestic wastewater in the range from 1 to 20 mg/L.

Formaldehyde is used widely in industry. Its duties vary from holding dyes onto fabrics, to assisting in the electroplating of metals. Each application uses different levels of formaldehyde and requires monitoring to optimize its given purpose.

Ethylene **glycol** is widely used as a coolant and antifreeze. Its presence in motor oils is an indication of a perforated engine block or of a leakage in the cooling systems. The HANNA glycol test kit can be used for water as well as oil samples to determine traces of ethylene glycol and other 1,2 glycols above 30 ppm. For better results test samples from used motor oil since samples from new oils can give erroneous positive results. Never test oils from hot engines.

METHOD	RANGE	SMALLEST INCREMENT	CHEMICAL METHOD	# TESTS	WEIGHT
HI 3857 Detergents					
checker disc	0.00-1.30 mg/L (ppm)	0.02 mg/L (ppm)	methylene blue	35	1245 g
HI 3838 Formaldehyde (as CH_2O)					
titration	0.00-1.00% 0.0-10.0%	0.01% 0.1%	sodium sulfite/ hydrochloric acid	110 avg.	910 g
HI 3859 Glycol					
visual	Present/Absent	–	oxidation of glycolic group	25	380 g

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HI 3812 Total Hardness

Water **hardness** has traditionally been defined as the capacity of water to precipitate soap. The ionic species in the water causing the precipitation was later found to be primarily calcium and magnesium. In the present, therefore, water hardness is actually a quantitative measure of these ions in the water sample. It is also now known that certain other ion species, such as iron, zinc and manganese, contribute to the overall water hardness. The measure and subsequent control of water hardness is essential to prevent scaling and clogging in water pipes.

METHOD	RANGE*	SMALLEST INCREMENT	CHEMICAL METHOD	# TESTS	WEIGHT
HI 3812 Hardness (as $CaCO_3$) Total					
titration	0.0-30.0 mg/L (ppm) 0-300 mg/L (ppm)	0.3 mg/L (ppm) 3 mg/L (ppm)	EDTA	100	460 g
HI 3840 Hardness (as $CaCO_3$) Total					
titration	0-150 mg/L (ppm)	5 mg/L (ppm)	EDTA	50 avg.	120 g
HI 3841 Hardness (as $CaCO_3$) Total					
titration	40-500 mg/L (ppm)	20 mg/L (ppm)	EDTA	50 avg.	120 g
HI 3842 Hardness (as $CaCO_3$) Total					
titration	400-3000 mg/L (ppm)	100 mg/L (ppm)	EDTA	50 avg.	120 g
HI 38033 Hardness (as $CaCO_3$) Total					
titration	0-30 gpg	1 gpg	EDTA	100	457 g
HI 38034 Hardness (as $CaCO_3$) Total					
titration	0.0-20.0 gpg 0.0-20.0 mg/L (ppm)	0.2 gpg 0.2 mg/L (ppm)	EDTA EDTA	200	567 g
HI 38035 Hardness (as $CaCO_3$) Total & Calcium					
titration	Total: 0.0-20.0 gpg Ca: 0.0-20.0 gpg	0.2 gpg 0.2 gpg	EDTA EDTA	200	960 g

* 1 gpg = 17 ppm $CaCO_3$

HI 3812 Hardness Test Kit
The hardness level as mg/L (ppm) calcium carbonate is determined by an EDTA (ethylene-diamine-tetraacetic acid) titration.

HI 3840 Hardness Low Range Test Kit
The HANNA Test Kit determines total hardness in water via a titrimetric method.

HI 3841 Hardness Test Kit
Medium Range

HI 3842 Hardness Test Kit
High Range

HI 38033 Total Hardness Test Kit
0-30 gpg range

HI 38034 Total Hardness Test Kit
0-20 gpg range, 0-20 ppm range

HI 38035 Total Hardness & Calcium Test Kit
Calcium concentration is determined by an EDTA titration.

ORDERING INFORMATION

HI 3812 test kit comes with 30 mL hardness buffer, 10 mL calmagite indicator, 120 mL EDTA solution, 20 mL plastic beaker with cap, 50 mL plastic beaker with cap and 1 mL syringe with tip
HI 3840 test kit comes with 30 mL hardness LR reagent and 50 mL calibrated vessel.
HI 3841 test kit comes with 30 mL hardness MR reagent and 50 mL calibrated vessel.
HI 3842 test kit comes with 30 mL hardness HR reagent and 50 mL calibrated vessel.
HI 38033 test kit comes with 30 mL buffer solution, 10 mL calmagite indicator, 75 mL EDTA solution (2), 20 mL plastic beaker with cap and 1 mL plastic pipette.
HI 38034 test kit comes with 30 mL buffer solution (2), 10 mL calmagite indicator, 100 mL EDTA solution (0-20 gpg), 100 mL EDTA solution (0-20 ppm), 50 mL calibrated vessel with cap and 1 mL syringes (2).
HI 38035 test kit comes with 30 mL buffer solution, 10 mL calmagite indicator, 100 mL EDTA solution (0-20 gpg), 10 mL calcium reagent A, 10 mL calcium reagent B, 15 mL calcium solution B, 100 mL calcium solution D, 50 mL calibrated plastic vessel with cap and 1 mL syringe with two tips.

ACCESSORIES

HI 3812
HI 3812-100 Spare reagent for 100 tests
HI 740032P Cap for 20 mL plastic beaker (10)
HI 740034P Cap for 50 mL plastic beaker (10)
HI 740036P 50 mL plastic beaker (10)
HI 740037P 20 mL plastic beaker (10)
HI 740142P 1 mL graduated syringe (10)
HI 740144P Tips for 1 mL graduated syringe (10)
HI 38033
HI 38033-100 Spare reagent for 100 tests
HI 740032P Cap for 20 mL plastic beaker (10)
HI 740037P 20 mL plastic beaker (10)
HI 38034
HI 38034-200 Spare reagent for 200 tests
HI 38035
HI 38035-200 Spare reagent for 200 tests

Chemical Test Kits

Hydrazine, Hydrogen Peroxide, Hydroxide

HI 3849 Hydrazine Test Kit

Hydrazine reacts with the reagent in acidic solution to form a yellow complex. The absorbance of this colored product is proportional to the concentration of hydrazine present in the aqueous sample.

HI 3844 Hydrogen Peroxide Test Kit

The HANNA test kit can quickly and easy determine concentration in water up to 10 ppm of hydrogen peroxide. This is due to the fact that it is not affected by stabilizers, which are sometimes added to commercial hydrogen peroxide solutions. The kit is portable and can be used in the field as well as in the laboratory.

Hydrogen peroxide is determined by a titrimetric method. It reacts slowly with iodide in acid solution (**Step 1**); thus a 15 minute interval is required to allow the reaction to occur completely. The amount of iodine generated is equivalent to the hydrogen peroxide in the sample. The liberated iodine is then titrated with standard sodium thiosulfate solution that reduces the iodine back to iodide ions (**Step 2**).

HI 3839 Hydroxide Test Kit

The portable hydroxide test kit measures hydroxide levels using a fast and easy titrimetric method. The hydroxide ion concentration is determined by a titration. The hydroxide ions react with hydrochloric acid, until an endpoint is reached, where all the hydroxide ions have reacted. The addition of phenolphthalein determines this endpoint, by changing from pink to a colorless solution.

ORDERING INFORMATION

HI 3849 test kit comes with 50 mL hydrazine reagent (2), 500 mL deionized water, checker disc, glass vials with caps (2) and 3 mL plastic pipette.
HI 3844 test kit comes with 100 mL hydrogen peroxide reagent A, 17 g hydrogen peroxide reagent B, 30 mL hydrogen peroxide reagent C, 25 mL hydrogen peroxide reagent D, graduated plastic test tube with cap, 50 mL calibrated plastic vessel, 3 mL plastic pipette, 1 mL plastic pipette and plastic spoon.
HI 3839 test kit comes with 20 mL calibrated vessel, 50 mL calibrated vessel, 10 mL phenolphthalein indicator, 120 mL titrant solution and calibrated syringe with tip.

ACCESSORIES

HI 3849	
HI 3849-100	Spare reagent for 100 tests
HI 3844	
HI 3844-100	Spare reagent for 100 tests
HI 3839	
HI 3839-100	Spare reagent for 100 tests

HI 3849 Hydrazine

Hydrazine is an artificial chemical and it is not found in natural waters. It is extensively used as an oxygen scavenger to inhibit corrosion in high pressure boiler feedwater and reactor cooling water: this reducing chemical reacts with dissolved oxygen to yield nitrogen and water, so that hydrazine has the advantage over the sulfite treatment because it does not produce any dissolved solids in the boiler water.

Hydrogen peroxide is widely used as a disinfectant and as bleach for textiles, wood pulp, hair, fur etc. It is also used as a substitute for chlorine in water and sewage treatment. Most common commercial forms are aqueous solutions containing about 6, 12 and 30 per cent hydrogen peroxide and are referred to as "20-volume", "40-volume" and "100-volume" respectively, meaning the value of oxygen liberated when the solution is boiled.

Step 1: $H_2O_2 + 2H^+ + 2I^- \rightarrow I_2 + 2H_2O$

Step 2: $I_2 + 2(S_2O_3)^{2-} \rightarrow 2I^- + (S_4O_6)^{2-}$

In electrolytic copper plating, an alkaline solution is required in the bath. The process involves **hydroxide** ions reacting with formaldehyde to form hydride ions. These ions then reduce copper. The monitoring of hydroxide concentration in the bath is essential to optimize the performance of the bath.

METHOD	RANGE	SMALLEST INCREMENT	CHEMICAL METHOD	# TESTS	WEIGHT
HI 3849 Hydrazine (as N_2H_4)					
checker disc	0.00-1.00 mg/L (ppm)	0.02 mg/L (ppm)	p-dimethylamino-benzaldehyde	100	860 g
HI 3844 Hydrogen Peroxide (as H_2O_2)					
titration	0.00-2.00 mg/L 0.0-10.0 mg/L	0.25 mg/L (ppm) 1.0 mg/L (ppm)	iodometric	100 avg.	450 g
HI 3839 Hydroxide (as OH^-)					
titration	0.00-1.00 g/L (ppt) 0.0-10.0 g/L (ppt)	0.01 g/L (ppt) 0.1 g/L (ppt)	phenolphthalein	110 avg.	460 g

Hypochlorite, Iodine

HI 3832 Iodine

Hypochlorites are common bleaching agents to whiten textile or paper and to disinfect solutions. Sodium hypochlorite solution has been traditionally used for the treatment of pool water, since it is an inexpensive and readily available form of chlorine. The solution usually contains 10 to 15% available chlorine (equivalent to 100 to 150 g/L), but it rapidly loses its strength during storage. In addition, since it is greatly affected by heat, light, pH and heavy metals and needs to be monitored regularly.

Iodine may be used as a disinfectant in drinking and swimming pool waters. Unlike chlorinated pools, water treated with iodine decrease eye irritation among swimmers and provides a disinfectant more stable to adverse conditions. However, iodine levels in the water must be frequently checked to maximize its given purpose.

METHOD	RANGE	SMALLEST INCREMENT	CHEMICAL METHOD	# TESTS	WEIGHT
HI 3843 Hypochlorite (as Cl_2)					
titration	50-150 g/L (ppt)	5 g/L (ppt) (0.5%)	iodometric	100 avg.	485 g
HI 3832 Iodine (as I_2)					
colorimetric	0.0-2.5 mg/L (ppm)	0.5 mg/L (ppm)	DPD	50 avg.	180 g
HI 3879 Iodine (as I_2)					
colorimetric	0-5 mg/L (ppm)	1 mg/L (ppm)	DPD	100	143 g

HI 3843 Bleach Test Kit

The available chlorine refers to the chlorine liberated by the action of dilute acid on the hypochlorite:

$(OCl)^- + Cl^- + 2H^+ \rightarrow Cl_2 + H_2O$

An iodometric titration method is used in this test kit. The hypochlorite solution is treated with potassium iodide and strongly acidified with acid:

$(OCl)^- + 2H^+ + 2I^- \rightarrow Cl^- + I_2 + H_2O$

The amount of iodine generated is equivalent to the chlorine in the sample. The concentration of iodine is then calculated by titration of thiosulfate ions that reduce the iodine back to iodide ions:

$I_2 + 2(S_2O_3)^{2-} \rightarrow 2I^- + (S_4O_6)^{2-}$

HI 3832 Iodine Test Kit

The HI 3832 iodine test kit employs a color cube to determine the iodine content in water. The kit is compact and is practical for field use. No chlorine or bromine can be present in the water sample for this test to work properly. The iodine is measured by a colorimetric method. The sample is initially treated with a phosphate buffer to a pH of approximately 6.3. The addition of DPD (N, N-diethyl-p-phenylenediamine) is immediately oxidized by iodine producing a reddish color. The color intensity of the solution determines the iodine concentration.

HI 3879 Iodine Test Kit

The HI 3879 HANNA iodine test kit employs a color cube to determine the iodine content in water.

ORDERING INFORMATION

HI 3843 test kit comes with 30 mL potassium iodide solution, 100 packets bleach reagent B, 60 mL bleach reagent C (2), 125 mL glass Erlenmeyer flask and 1 mL plastic pipettes (25).
HI 3832 test kit comes with color comparison cube, 30 mL reagent 1 and 20 mL reagent 2
HI 3879 test kit comes with 100 packets iodine reagent, color comparison cube and 2 mL plastic pipette.

ACCESSORIES

HI 3843
HI 3843-100 Spare reagent for 100 tests
HI 3832
HI 3832-050 Spare reagent for 50 tests
HI 3879
HI 3879-100 Spare reagent for 100 tests

Chemical Test Kits

Iron

HI 3834 Iron Test Kit

The HANNA test kit determines the iron concentration in water by conversion of the ferrous (Fe^{2+}) state. The test is fast, easy and safe. The color cube makes it simple to obtain the iron level in water.

Iron can exist as ferrous (Fe^{2+}) or ferric (Fe^{3+}) ions. The HANNA test kit determines total iron levels in water via a colorimetric method. First all ferric ions are reduced by sodium sulfite to ferrous ions. Phenanthroline complexes with ferrous ion to form an orange colored solution. The color intensity of the solution determines the iron concentration.

HI 38039 Iron Test Kit
Low Range with Checker Disc

HI 38040 Iron Test Kit
Medium Range with Checker Disc

HI 38041 Iron Test Kit
High Range with Checker Disc

HI 3889 Iron & Total Hardness Test Kit
with Checker Disc

HI 38040 Iron

HI 3834 Iron

Iron is naturally present in water in low concentrations, but it reaches high concentrations in wastewater effluents. The iron concentration in water needs to be monitored because it becomes harmful above certain levels.

In domestic water, for instance, iron can unpleasantly alter the taste, stain laundry, damage kitchenware and favor the growth of certain bacteria. Iron is also an indicator of ongoing corrosion in industrial plants or in water cooling and heating systems. Moreover, iron is normally monitored in mining wastewater to avoid contamination.

Generally, ground and surface water contains no more than 1 mg/L (ppm) iron; but due to mining and industrial drainage, higher levels of iron have been observed. Iron in water appears to be more of a nuisance than a hazard.

ORDERING INFORMATION

HI 3834 test kit comes with 50 packets iron reagent, color comparison cube and 20 mL plastic vessel
HI 38039 and **HI 38040** test kits come with 100 packets iron reagent, checker disc, glass vials with caps (2) and 3 mL plastic pipette.
HI 38041 test kit comes with 100 packets iron reagent, 500 mL deionized water, checker disc, glass vials with caps (2), 3 mL plastic pipettes and long plastic pipette.
HI 3889 test kit comes with 50 packets iron reagent, color comparison cube, 20 mL plastic vessel, 30 mL hardness MR reagent and 50 mL calibrated plastic vessel.

ACCESSORIES

HI 3834
HI 3834-050 Spare reagent for 050 tests
HI 38039
HI 38039-100 Spare reagent for 100 tests
HI 38040
HI 38040-100 Spare reagent for 100 tests
HI 38041
HI 38041-100 Spare reagent for 100 tests
HI 3889
HI 3834-050 Spare reagent for 50 tests

METHOD	RANGE	SMALLEST INCREMENT	CHEMICAL METHOD	# TESTS	WEIGHT
HI 3834 Iron (Fe^{+2} & Fe^{+3})					
colorimetric	0-5 mg/L (ppm)	1 mg/L (ppm)	phenanthroline	50	142.5 g
HI 38039 Iron (Fe^{+2} & Fe^{+3})					
checker disc	0.00-1.00 mg/L (ppm)	0.02 mg/L (ppm)	phenanthroline	100	436 g
HI 38040 Iron (Fe^{+2} & Fe^{+3})					
checker disc	0.0-5.0 mg/L (ppm)	0.1 mg/L (ppm)	phenanthroline	100	427 g
HI 38041 Iron (Fe^{+2} & Fe^{+3})					
checker disc	0.0-10.0 mg/L (ppm)	0.2 mg/L (ppm)	phenanthroline	100	980 g
HI 3889 Iron and Total Hardness					
colorimetric titration	Fe: 0-5 mg/L (ppm) 40-500 mg/L (ppm)	Fe: 1 mg/L (ppm) 20 mg/L (ppm)	phenanthroline EDTA	50 avg.	260 g

HI 38042 Manganese

Magnesium is a common constituent of natural waters; its average abundance in streams is 4 mg/L and in groundwaters is >5 mg/L. In concentration greater than 125 mg/L it can cause a diuretic effect. The aqueous species is often Mg^{2+} and it does not normally result in precipitation (as dolomite) in natural waters. Magnesium is also an important contributor to the hardness of water: when heated, magnesium salts break down forming incrustation in boilers. Moreover magnesium is necessary to plant metabolism since it is an essential constituent of organic molecules such as chlorophyll.

Manganese is not present in natural waters but it is found in various salts and minerals frequently associated with iron compounds. Manganese salts are used as fertilizer additives, in ferroalloys (in steel manufacture), in nonferrous alloys as it improves their corrosion resistance and hardness.

Manganese is not considered to be toxic to man and aquatic life and it is ingested as a trace nutrient, both in food and water. Nonetheless manganese has been limited in drinking water since it causes tenacious stains to laundry and because it produces an objectionable taste in beverages.

Manganese is commonly found in domestic wastewater, industrial effluents and receiving streams.

METHOD	RANGE	SMALLEST INCREMENT	CHEMICAL METHOD	# TESTS	WEIGHT
HI 38079 Magnesium in irrigation water					
titration	0.0-24.0 mg/L (ppm) 0.0-725.0 mg/L (ppm)	2.4 mg/L (ppm) 7.3 mg/L (ppm)	EDTA	100 avg.	873 g
HI 38042 Manganese					
checker disc	0.0-3.0 mg/L (ppm)	0.2 mg/L (ppm)	sodium periodate	100	560 g
HI 38072 Manganese					
checker disc	0.0-10.0 mg/L (ppm)	0.5 mg/L (ppm)	sodium periodate	100	1100 g

HI 38079 Magnesium Test Kit for Irrigation Water

By using the HI 38079 HANNA test kit, it is possible to differentiate between calcium and magnesium, since the kit determines only the magnesium ions.

The HANNA test kit determines magnesium in irrigation water via a titrimetric method. Calcium, if present, is removed by prior filtration. Then the indicator chelates with magnesium to form a red colored complex; as EDTA is added, magnesium complexes with it: the reaction endpoint is indicated by a change in color of the indicator from red to blue.

HI 38042 Manganese Low Range Test Kit

The HANNA test kit determines manganese concentration via a checker disc. The reaction between manganese and reagents causes a violet tint in the sample which is proportional to the manganese concentration.

HI 38072 Manganese Test Kit
for Irrigation Water

ORDERING INFORMATION

HI 38079 test kit comes with 25 mL buffer reagent, 100 packets oxalate reagent, 120 mL ETDA solution, 100 mL buffer solution, 10 mL calmagite indicator, demineralizer bottle with filter cap for 12 L, 20 mL calibrated vessel, 50 mL calibrated vessel, large funnel and 100 paper filter discs.
HI 38042 test kit comes with 100 packets of buffer reagent A, 100 packets manganese reagent B, checker disc, glass vials with caps (2) and 3 mL plastic pipette.
HI 38072 test kit comes with 100 packets buffer reagent A, 100 packets manganese reagent B, 230 mL deionized water (2), checker disc, glass vials with caps (2) and 3 mL plastic pipette.

ACCESSORIES

HI 38079
HI 38079-100 Spare reagent for 100 tests
HI 38042
HI 38042-100 Spare reagent for 100 tests
HI 38072
HI 38072-100 Spare reagent for 100 tests

Chemical Test Kits

Nitrate

HI 38050 Nitrate Test Kit for Soil and Irrigation Water

The HANNA nitrate test kit for soil and irrigation water makes it possible to determine the need for nitrogen fertilization. It also obtains the best crop response and avoids over-fertilization.

Nitrate is reduced to nitrite in the presence of cadmium. The nitrite thus produced reacts with the reagent to yield an orange compound. The amount of color developed is proportional to the concentration of nitrate present in the aqueous sample.

The HANNA nitrate-nitrogen test can be performed the whole year round, but testing is particularly recommended during spring and late spring, when rainfall and temperature related bursts of microbiological activity often have great influence on the availability of nitrate-nitrogen.

HI 3874 Nitrate Test Kit

Nitrate ions are present in trace amounts in surface water and in higher levels in some groundwater. Nitrate is found only in small quantities in domestic wastewater but can reach higher concentration (up to 30 mg/L as nitrogen) in the outflow of nitrifying biological treatment plants. Excessive amounts can contribute to methaemoglobinemia: infant death and adult illness. In order to prevent this, a 10 mg/L limit (as nitrogen) has been imposed on drinking water.

ORDERING INFORMATION

HI 38050 test kit comes with 200 packets nitrogen reagent, checker disc, glass vials with caps (2), 10 g calcium sulfate, demineralizer bottle with filter cap for 12 L, soil sieve, 50 mL plastic test tube with screw cap, large funnel, 100 paper filter discs, brush, 50 mL calibrated vessels (2), 2 g sample cup, 3 mL plastic pipette and spoons (2)
HI 3874 test kit comes with 100 packets nitrate reagent, glass cuvette and color comparison cube.

ACCESSORIES

HI 38050
HI 38050-200 Spare reagent for 200 tests
HI 3874
HI 3874-100 Spare reagent for 100 tests
HI 3874-99 Spare color comparison cube

HI 38050
Nitrate Checker®
Disc Test Kit

Nitrogen (N) is an indispensable element for plant life. It is present in proteins, vitamins, chlorophyll, etc. Nitrogen allows the development of the vegetative activity of the plant, in particular, causes a lengthening of trunks and sprouts and increases the production of foliage and fruit. It directly increases the crop yield, though the crop quality depends on other elements.

Nitrogen, mostly absorbed by plants as nitrate (NO_3^-), derives from the mineralization of organic matter and the application of fertilizers. Nitrate-nitrogen is not durable in soil. The large amount required for crop production, makes it necessary to administer this element in moderate quantities during the crop growth season.

An excess of nitrogen weakens plants' structure creating an unbalanced relationship between the green and wooden parts. In addition, the plant becomes less resistant to diseases. Furthermore excessive nitrogen fertilization can contaminate groundwater and cause environmental problems.

Nitrogen is the most abundant element present on our planet and can be found in many different forms. Only a very small part of the total nitrogen is available for plant growth. The exchanges between available and unavailable nitrogen combine to form a complex system which is called the nitrogen cycle.

A very important source of nitrogen available for plants is the decomposition (mineralization and nitrification) of organic matter, the so called "turnover"; however only part of the organic matter decomposes during the crop growth season. The decomposition rate depends strongly on the local climate, the physical structure and microbiological activities in the soil, thus it varies from year to year. Other important sources of nitrogen are fertilization and irrigation when nitrogen compounds are present in the irrigation water. Even rain and snow can contribute, dissolving the **nitrate**, nitrite and ammonia normally present in the atmosphere and carrying them to the soil. Available nitrate-nitrogen can be lost from the soil in several ways. The most significant ones are leaching, which occurs during heavy rainfall or where excessive irrigation is used. Another is assimilation by crops. It is estimated that in natural soils (woods, forests) about 80% of the absorbed nitrogen is replenished when trees shed their leaves. In case of crops, the assimilated nitrogen is lost from soil during harvesting. Testing the soil during the crop cycle is a useful tool for next cultivation, in order to plan fertilization and to know the residues of fertilizers in relation to the crop, tillage and climate. An analysis can highlight shortages and help in understanding the causes of an abnormal growth.

METHOD	RANGE	SMALLEST INCREMENT	CHEMICAL METHOD	# TESTS	WEIGHT
HI 3874 Nitrate (as NO_3^-–N)					
colorimetric	0-50 mg/L (ppm)	10 mg/L (ppm)	cadmium reduction	100	156 g
HI 38050 Nitrate (as NO_3^-–N) in irrigation water and soil					
checker disc	water: 0-50 mg/L (ppm) soil: 0-60 mg/L (ppm)	water: 1 mg/L (ppm) soil: 2 mg/L	cadmium reduction cadmium reduction	100 100	1026 g

HANNA instruments

With Great Products, Come Great Results™

Nitrite, Dissolved Oxygen, Ozone

HI 3810 Dissolved Oxygen

Nitrites are intermediate oxidation state of nitrogen (in the oxidation of ammonia to nitrate or in the reduction of nitrate). Such oxidation/reduction may occur in wastewater of treatment plants and in natural waters during the biological decomposition of nitrogen-compounds. In small quantities it can cause methaemoglobinemia among infants.

Conversely, high levels are used to inhibit corrosion in cooling towers. Nitrosation reactions of nitrites can yield organic nitrosamines, which are known to be carcinogenic.

The concentration of **dissolved oxygen** in water is extremely important in nature as well in man's environment. In the oceans, lakes, rivers, and other surface water bodies, dissolved oxygen is essential to the growth and development of aquatic life. Without oxygen, the water can become toxic due to the anaerobic decaying of organic matter. In man's environment, water must contain at least 2 mg/L of oxygen to protect water pipes from corrosion. However, boiler system water, in many cases, cannot contain greater than 10 mg/L oxygen.

Ozone is an oxidizing agent and a germicide. It is used for oxidation of organic matter, which produces color or odor in drinking water.

METHOD	RANGE	SMALLEST INCREMENT	CHEMICAL METHOD	# TESTS	WEIGHT
HI 3873 Nitrite (as NO_2^-–N)					
colorimetric	0.0-1.0 mg/L (ppm)	0.2 mg/L (ppm)	chromotropic acid	100	169 g
HI 38051 Nitrite (as NO_2^-–N)					
checker disc	0.00-0.50 mg/L (ppm)	0.01 mg/L (ppm)	chromotropic acid	100	446 g
HI 3810 Oxygen, Dissolved					
titration	0.0-10.0 mg/L (ppm)	0.1 mg/L (ppm)	modified Winkler	110 avg.	910 g
HI 38054 Ozone					
checker disc	0.0-2.3 mg/L (ppm)	0.1 mg/L (ppm)	DPD	100	966 g

HI 3873 Nitrite Test Kit

The HI 3873 HANNA test kit determines the nitrite concentration in water via color comparison cube.

Nitrites react with chromotropic acid reagent to form a pink tint in the sample. The amount of color developed is proportional to the concentration of nitrite present in the aqueous sample.

HI 38051 Nitrite Test Kit

The HI 38051 HANNA test kit determines the nitrite concentration in water via checker disc.

HI 3810 Dissolved Oxygen Test Kit

The HANNA dissolved oxygen portable test kit can determine the oxygen concentration in water quickly and easily. A modified Winkler method is used. Manganous ions react with oxygen in the presence of potassium hydroxide to form a manganese oxide precipitate. An azide is present to prevent any nitrite ions from interfering with the test. On addition of acid, manganese oxide hydroxide oxidizes the iodide to iodine. Since the amount of iodine generated is equivalent to the oxygen in the sample, the concentration of iodine is calculated by titration of thiosulfate ions that reduce the iodine back to iodide ions.

HI 38054 Ozone Test Kit

The HANNA test kit for ozone determines the ozone concentration in water via checker disc. The reaction between ozone and the reagent causes a pink tint in the sample which is proportional to the ozone concentration.

ORDERING INFORMATION

HI 3873 test kit comes with 100 packets nitrite reagent, glass cuvette and color comparison cube.
HI 38051 test kit comes with 100 packets nitrite reagent, glass vials with caps (2) and 3 mL plastic pipette.
HI 3810 test kit comes with 30 mL manganous sulfate solution, 30 mL alkali-azide reagent, 60 mL sulfuric acid solution (2), 10 mL starch indicator, 120 mL titrant solution, glass bottle with stopper, 10 mL calibrated vessel and calibrated syringe with tip.
HI 38054 test kit comes with 100 packets ozone reagent, 500 mL deionized water, checker disc, glass vials with caps (2) and 3 mL plastic pipette.

ACCESSORIES

HI 3873
HI 3873-100 Spare reagent for 100 tests
HI 38051
HI 38051-100 Spare reagent for 100 tests
HI 3810
HI 3810-100 Spare reagent for 100 tests

Chemical Test Kits

pH

HI 3880 Test Kit
pH 4.0-6.5

HI 3880/0 Test Kit
pH 4.0-6.5

HI 3881 Test Kit
pH 6.0-8.5

HI 3881/0 Test Kit
pH 6.0-8.5

HI 3881-5 Test Kit
pH 4.0-8.0

HI 3882 Test Kit
pH 3.0-5.0

HI 3886 Test Kit
pH 7.5-10.0

HI 3886/0 Test Kit
pH 7.5-10.0

HI 38058 Test Kit
pH 4.0-10.0

HI 3880 pH

HI 3881 pH

pH represents acidity or alkalinity of an aqueous solution and is proportional to the hydrogen-ion concentration of the solution. Under neutral conditions water is dissociated into the $(OH)^-$ and H^+ ions in equal ratio and hence it has a pH of 7. When bases or acids are added to a water solution they ionize, increasing the concentration of $(OH)^-$ or H^+, respectively. Thus solutions with a pH of 1-3 contain strong acids, whereas those with a pH of 4-6 contain weak acids.

Weak bases result in solutions of pH 8-10 and strong bases in pH of 11-13.

Examples of pH value for some liquids

Liquid	pH Value
Sea water	7.8-8.2
Gastric juices	1.7
Milk	6.5-7
Soil	6-7 (optimum for crops)

ORDERING INFORMATION

HI 3880 test kit comes with 25 mL pH 4.0-6.5 reagent and color cube comparison.
HI 3880/0 test kit comes with 25 mL pH 4.0-6.5 reagent, 10 mL dechlorinating reagent and color comparison cube.
HI 3881 test kit comes with 25 mL pH 6.0-8.5 reagent and color comparison cube.
HI 3881/0 test kit comes with 25 mL pH 6.0-8.5 reagent, 10 mL dechlorinating reagent and color comparison cube.
HI 3881-5 test kit comes with 25 mL pH 4.0-8.0 reagent, test tube with cap and color chart.
HI 3882 test kit comes with 25 mL pH 3.0-5.0 reagent, checker disc, glass vials with caps (2) and 3 mL plastic pipette.
HI 3886 test kit comes with 25 mL pH 7.5-10.0 reagent and color comparison cube.
HI 3886/0 test kit comes with 25 mL pH 7.5-10.0 reagent, 10 mL dechlorinating reagent and color comparison cube.
HI 38058 test kit comes with 30 mL pH 4.0-10.0 reagent, checker disc, glass vials with caps (2) and 3 mL plastic pipette.

ACCESSORIES

HI 3880
HI 3880-100 Spare reagent for 100 tests
HI 3881
HI 3881-100 Spare reagent for 100 tests
HI 3881/0
HI 3881-010 Spare reagent for 100 tests + dechlorinating reagent
HI 3882
HI 3882-100 Spare reagent for 100 tests
HI 3886 and HI 3886/0
HI 3886-100 Spare reagent for 100 tests
HI 38058
HI 38058-100 Spare reagent for 300 tests

METHOD	RANGE	SMALLEST INCREMENT	CHEMICAL METHOD	# TESTS	WEIGHT
HI 3880 pH					
colorimetric	4.0-6.5 pH	0.5 pH	pH indicator	100	110 g
HI 3880/0 pH					
colorimetric	4.0-6.5 pH	0.5 pH	pH indicator	100	150 g
HI 3881 pH					
colorimetric	6.0-8.5 pH	0.5 pH	pH indicator	100	110 g
HI 3881/0 pH					
colorimetric	6.0-8.5 pH	0.5 pH	pH indicator	100	150 g
HI 3881-5 pH					
color card	4.0-8.0 pH	/	pH indicator	200	37 g
HI 3882 pH					
checker disc	3.0-5.0 pH	0.1 pH	pH indicator	200	215 g
HI 3886 pH					
colorimetric	7.5-10.0 pH	0.5 pH	pH indicator	100	110 g
HI 3886/0 pH					
colorimetric	7.5-10.0 pH	0.5 pH	pH indicator	100	150 g
HI 38058 pH					
checker disc	4.0-10.0 pH	0.5 pH	pH indicator	300	215 g

Phenols, Phosphate

HI 3864 Phenols

HI 3833 Phosphate

Phenols are widely used in pharmaceuticals, dyes and indicators and as general disinfectants. They may occur in household and industrial wastewaters and in natural waters; they can also enter potable water supplies and chlorination of such waters results in malodorous chlorophenol products that are detectable from 0.001 mg/L (1 ppb). The HANNA colorimetric method determines phenol and all ortho and para substituted phenols. Since substitution generally lowers the response, the readable value obtained by this method is the minimum concentration of phenolic compounds present. Natural water usually contains less than 0.001 mg/L of phenols, but sometimes values up to 0.02 mg/L (20 ppb) also occur. Since the concentration of phenols in wastewater is generally subjected to biological and chemical degradation, preserve samples in the refrigerator and analyze within four hours after collection.

Phosphates are widely introduced into the environment from such sources as agricultural fertilizers, cleaning and laundering products, boiler water conditioners, and drinking water treatment aids. At high levels, phosphates stimulate the growth of photosynthetic organisms which may contribute to eutrophication of lakes, rivers, and ponds. This makes it important to monitor and control phosphate discharges into the environment.

Phosphorus occurs in natural waters and in wastewaters almost entirely as phosphates (PO_4^{3-}). Large quantities of phosphate arise from laundering industries as it is used in many cleaning preparations, from soil runoff and sewage.

Phosphorus is essential to plants since it contributes to the formation of buds, roots and blooming as well as lignification. A lack of phosphorus results in stifled plants or a pale green color on leaves with reddish pigmentation on the edges.

However, an extensive discharge of phosphorus in water is the major cause of eutrophication, which is an abnormal and excessive growth of aquatic plants.

METHOD	RANGE	SMALLEST INCREMENT	CHEMICAL METHOD	# TESTS	WEIGHT
HI 3864 Phenols					
checker disc	0.00-1.00 mg/L (ppm) 0.5-5.0 mg/L (ppm)	0.02 mg/L (ppm) 0.1 mg/L (ppm)	aminoantipyrine	100	573 g
HI 3833 Phosphate (as PO_4^{3-})					
colorimetric	0-5 mg/L (ppm)	1 mg/L (ppm)	ascorbic acid	50	160 g
HI 38077 Phosphate (as PO_4^{3-})					
checker disc	0.0-5.0 mg/L (ppm)	0.1 mg/L (ppm)	ascorbic acid	100	429 g
HI 38061 Phosphate (as PO_4^{3-})					
checker disc	0.00-1.00 mg/L (ppm) 0.0-5.0 mg/L (ppm) 0-50 mg/L (ppm)	0.02 mg/L (ppm) 0.1 mg/L (ppm) 1 mg/L (ppm)	ascorbic acid	100	1010 g

HI 3864 Phenols Test Kit

The HANNA test kit for phenols determines the phenol concentration in water via checker disc. Phenolic compounds react to form a yellow to orange dye with 4-amino antipyrine in alkaline solution buffered at pH about 10. The absorbance of this colored product is proportional to the concentration of phenols present in the aqueous sample.

HI 3833 Phosphate Test Kit

The orthosphosphate level in mg/L (or ppm) is determined by a colorimetric method. Ammonium molybdate and potassium antimonyl tartrate react in acid medium with orthophosphate to form a phosphomolybdate complex, that is reduced to intensely colored molybdenum blue by ascorbic acid. The color intensity of the solution determines the phosphate concentration. Phosphates can be classified as ortho, condensed or organically bound. As with existing test kits on the market, the HANNA Phosphate Test Kit will only determine ortho phosphate levels.

HI 38061 Phosphate Test Kit with Checker Disc

The reaction between phosphate and the reagent causes a blue tint in the sample; adaptation of the ascorbic acid method.

HI 38077 Phosphate Test Kit for Irrigation Water

The HANNA Test Kit for phosphate determines the phosphate concentration in irrigation water via checker disc.

ORDERING INFORMATION

HI 3864 test kit comes with 100 packets reagent A, 100 packets reagent B, checker discs (2), glass vials with caps (2) and mirror

HI 3833 test kit comes with 20 mL plastic beaker, color comparison cube and 50 packets phosphate reagent.

HI 38077 test kit comes with 100 packets phosphate reagent, checker disc, glass vials with caps (2) and 3 mL plastic pipette.

HI 38061 test kit comes with 100 packets phosphate reagent, 500 mL deionized water, checker disc, glass vials with caps (2), 3 mL plastic pipette and long plastic pipette.

ACCESSORIES

HI 3864
HI 3864-100 Spare reagent for 100 tests
HI 3833
HI 3833-050 Spare reagent for 50 tests
HI 3833-99 Spare color comparison cube
HI 38077
HI 38077-100 Spare reagent for 100 tests
HI 38061
HI 38061-100 Spare reagent for 100 tests

Chemical Test Kits

Phosphorus, Potassium

HI 38073 Phosphorus Test Kit for Soil

The HANNA test kit for phosphorus determines the phosphorus concentration via checker disc.

The reaction between phosphate and the reagent causes a blue tint in the sample and uses an adaptation of the ascorbic acid method.

HI 38082 Potassium Test Kit for Soil

Potassium is present in tissues responsible for the growth of plants (primary and secondary meristems). It plays an important role in how much water is absorbed by the roots and in the regulation of cellular activity. In addition, potassium makes plants more resistant to diseases and yields a positive effect on the color and fragrance in flowers. Potassium deficiency is a frequent problem in calcareous soils.

The HANNA test kit determines potassium in soil via a turbidimetric method. Potassium is precipitated in a basic environment with sodium tetraphenylborate. The developed turbidity is proportional to potassium concentration.

HI 38073 Phosphorus

Phosphorus is a important element in the composition of DNA and RNA, the regulators of the energetic exchange (ATP, ADP) as well as the reserve substances in seeds and bulbs. Phosphate compounds within plants act as storage areas for energy derived from photosynthesis and carbohydrates. This stored energy can be used in future growth and reproductive processes of the plant.

Phosphorus contributes to the formation of buds, roots and blooming as well as lignification (process of depositing lignin in cell wall), which helps to bolster their strength and stiffness.

A lack of phosphorus can result in a stifling of the plant, slow growth, reduced production, smaller fruits, and a decreased expansion of roots. Since phosphorus does not move freely through soil, fertilizers containing phosphorus must be placed close to the root system of plants, preferably early in a plant's growth when the needs for phosphorus is greatest.

Phosphorus belongs to the primary macronutrient group. It is an essential element to plant growth and is needed in large amounts. Phosphorus exists in soil mainly as P. It is adsorbed at the surfaces of iron and aluminum oxides or in association with calcium. It also occurs in organic forms and may be released by microbial activity. It is absorbed by roots only in its maximum oxidation state as the orthophosphoric ion $(H_2PO_4)^-$ or $(HPO_4)^{2-}$, depending on the pH. Moreover, its absorption is mostly efficient for pH values between 5 and 7: this implies that acidic or calcareous soil needs to be corrected to neutral pH values for better tillage yield.

The importance of **potassium** to plant growth differs somewhat from nitrogen and phosphorus, in that potassium acts as more of a catalyst in plant carbohydrate metabolism. Over 60 plant enzymes need potassium to be activated. Activation occurs when potassium ions attach to the surface of enzyme molecules, resulting in a change to the shape of the molecule.

Other important functions of potassium are its ability to help with the regulation of water in plants, its contribution to the formation of ATP molecules, and as a necessary component for nitrogen uptake and protein synthesis. Plants without adequate potassium use water less efficiently, plants with increased supplies of potassium are able to more quickly assimilate carbon dioxide into sugars during photosynthesis, and plants low in potassium usually have lower nitrogen intake and protein synthesis activity.

METHOD	RANGE	SMALLEST INCREMENT	CHEMICAL METHOD	# TESTS	WEIGHT
HI 38073 Phosphorus (in soil)					
checker disc	0.0-130.0 mg/L (ppm)	3.3 mg/L (ppm)	ascorbic acid	100	435.5 g
HI 38082 Potassium (in soil)					
turbidimetric	0-50 mg/L (ppm) 50-250 mg/L (ppm)	5 mg/L (ppm) 25 mg/L (ppm)	turbidimetric	100	889 g

ORDERING INFORMATION

HI 38073 test kit comes with 100 packers phosphorus reagent, checker disc, glass vials with caps (2) and 1 mL syringe with tip.
HI 38082 test kit comes with 25 mL formaldehyde solution (4), 100 mL potassium reagent A (3), 100 packets potassium reagent B, 50 mL long glass test tube, 50 mL calibrated vessel, 1 mL plastic pipette, 3 mL plastic pipette, 1 mL syringe with tip, spoon, graduated card and point card.

ACCESSORIES

HI 38073
HI 38073-100 Spare reagent for 100 tests
HI 38082
HI 38082-100 Spare reagent for 100 tests

Salinity, SAR, Exchangeable Sodium (EES) and Gypsum Requirement (GR)

HI 3835 Salinity

Salinity is defined as the total solids in water after all carbonates have been converted to oxides, all bromide and iodide have been replaced by chloride and all organic matter has been oxidized. The value is in g/kg or ppt (parts per thousand). The monitoring of salinity is essential for industrial waste and seawater.

Sodium is one of the most studied elements because of its toxic effects to both soil texture and crops. High concentrations of sodium disperses soil colloidal particles, rendering the soil hard and resistant to water penetration. The build-up of osmotic pressure in soil due to high sodium concentration causes difficulty in water absorption by plant roots. Plants are sensitive to varying degrees of soil salinity and when this exceeds a certain limit their growth is impaired, thus lowering their productivity.

High amounts of sodium can be mitigated by presence of large quantities of calcium and magnesium in soil or with distribution of gypsum (calcium sulfate) directly on soil or as an additive to irrigation water.

Alkaline soils are characterized by a low electrical conductivity (EC), high **exchangeable sodium** percentage (ESP) and presence of carbonate and bicarbonate sodium salts. Hydrolysis of carbonate causes also an increase in pH, such that it is always greater than 8.5.

The "saline-sodic" soil group, which possesses the following peculiarities, also belongs to this alkaline group: EC > 4 mS/cm, ESP > 15, pH ≤ 8.5

High alkalinity causes impairment to plant growth since it gives rise to an incomplete solubilization of necessary nutrients such as iron, copper and manganese. Chlorosis, for instance, is a typical disease of leaves due to iron deficiency.

It is possible to correct soil alkalinity by adding a proper compound (generally gypsum) that removes sodium and decreases the pH.

METHOD	RANGE	SMALLEST INCREMENT	CHEMICAL METHOD	# TESTS	WEIGHT
HI 3835 Salinity					
titration	0.0-40.0 g/kg	0.4 g/kg	mercuric nitrate	110 avg.	460 g
HI 38078 SAR					
DiST®4 + test kit	> 0.0 meq/L	0.2 meq/L	titration	100 avg.	785 g
HI 38083 Gypsum Requirements & Exchangeable Sodium Test Kit					
titration	EES: 0.00-56.40 meq GR: 0.0-213.0 metric ton/ha	1.95 meq/100 g soil GR: 3.8 metric ton/ha	calcium sulfate	100	883 g

HI 3835 Salinity Test Kit

The HANNA test kit measures salinity using a fast and efficient titrimetric method. The test requires only a few simple and safe steps to obtain results. The salinity level in g/kg is determined by a mercuric nitrate titration method. The pH is lowered to approximately 3 by addition of nitric acid. Mercuric ions react with chloride ions to form mercuric chloride. When excessive mercuric ions are present, it complexes with diphenylcarbazone to form a purple solution. The color change from yellow to violet indicates the endpoint.

HI 38078 Sodium Adsorption Ratio (SAR) Test Kit

The HANNA test kit determines sodium hazard in irrigation water by calculation of SAR (Sodium Adsorption Ratio) in relation to calcium and magnesium concentration.

HI 38083 Gypsum Requirements & Exchangeable Sodium Test Kit

The exact quantity of gypsum needed for correction can be calculated with the HANNA gypsum requirement test kit. The extraction method is the saturated calcium sulfate method. The Test Kit determines gypsum requirement by titration of calcium. The indicator chelates with calcium ions to form a red colored complex. As EDTA is added, calcium complexes with it; the reaction endpoint is indicated by a change in color of the indicator from red to blue.

ORDERING INFORMATION

HI 3835 test kit comes with 15 mL diphenylcarbazone indicator, 30 mL nitric acid solution, 120 mL titrant solution, plastic vial and 1 mL calibrated syringe with tip.
HI 38078 test kit comes with DiST®4 EC meter (with instructions and screwdriver), 5000 µS/cm calibration standard sachets (2), 100 mL buffer solution, 10 mL calmagite indicator, 120 mL EDTA solution, demineralizer bottle with filter cap for 12 L, 50 mL calibrated vessel, 3 mL plastic pipette, 1 mL plastic pipette and 1 mL syringe.
HI 38083 test kit comes with 10 g calcium sulfate, 30 mL buffer solution, 100 mL EDTA solution (3), 10 mL calmagite indicator, demineralizer bottle with filter cap for 12 L, soil sieve, 14 mL plastic test tube with screw cap, 50 mL plastic test tube with screw cap, small funnel, 100 paper filter discs, brush, 50 mL calibrated vessel, 20 mL calibrated vessels with caps (2), 3 mL plastic pipette, 1 mL plastic pipette, 1 mL syringe with tip and spoons (2).

ACCESSORIES

HI 3835
HI 3835-100 Spare reagent for 100 tests
HI 38078
HI 38078-100 Spare reagent for 100 tests
HI 38083
HI 38083-100 Spare reagent for 100 tests

Chemical Test Kits

Silica, Sulfate

HI 38066 Silica Low Range Test Kit and HI 38067 Silica High Range Test Kit

Determination of silica concentration is an adaptation of the ASTM D859 method of the heteropoly blue method. The reaction between silica and reagents causes a blue tint in the sample which is proportional to the silica concentration.

HI 38000 Sulfate Test Kit

The procedure for determining sulfate is a modification of the barium sulfate turbidimetric method.

Sulfate is precipitated as barium sulfate by reaction with barium chloride in acidic medium. The turbidity is proportional to the concentration of sulfate:

$(SO_4)^{2-} + Ba^{2+} \rightarrow BaSO_4$

HI 38001 Sulfate Low and High Range Test Kit

The procedure for determining sulfate is a modification of the Determination of Sulfate by Sulfonazo III. Sulfate is determined via a titrimetric method. The reaction end point is indicated by the change in color of the solution from violet to blue.

ORDERING INFORMATION

HI 38066 test kit comes with 25 mL silica reagent A, 100 packets silica reagent B, 100 packets silica reagent C, checker disc, glass vials with caps (2) and 3 mL plastic pipette.
HI 38067 test kit comes with 25 mL silica reagent A, 100 packets silica reagent B, 100 packets silica reagent C, demineralizer bottle with filter cap for 12 L, checker disc, glass vials with caps (2), 3 mL plastic pipette and 1 mL syringe with tip.
HI 38000 test kit comes with 100 packets sulfate reagent A, 53 g sulfate reagent B, 10 mL complexing agent, 50 mL glass test tube, 50 mL plastic vessel, 3 mL plastic pipette and spoon.
HI 38001 test kit comes with 100 packets sulfate reagent A (2 sets), 100 mL LR sulfate reagent B, 100 mL HR sulfate reagent B, 10 mL sulfate reagent C, 20 mL complexing agent, 30 mL sulfate solution, 50 mL plastic vessels (2) and 1 mL syringes (2).

ACCESSORIES

HI 38066	
HI 38066-100	Spare reagent for 100 tests
HI 38067	
HI 38067-100	Spare reagent for 100 tests
HI 38000	
HI 38000-10	Spare reagent for 100 tests
HI 38001	
HI 38001-10	Spare reagent for 100 tests

HI 38000 Sulfate

Silicon is not free in nature, but rather as **silica** (SiO_2) in crystalline forms, combined with other oxides and metals in a variety of silicates. Silicon is usually reported as silica when rocks, sediments, soil and water are analyzed. Silica is only slightly soluble in water; solubility and form of silica in water depend on pH of water and on the minerals, containing silica, in contact with water. The silica content of natural water is in the 5 to 25 ppm range. It is important to estimate silica concentration in case of some industrial installation such as steam generation and cooling water systems.

Sulfate is largely present in natural waters in a wide range of concentrations. It is not toxic but has to be kept below a certain threshold to prevent it from creating an unpleasant taste in water. The concentrations are particularly higher close to mine run-off water. Sulfate is extensively used as a nutrient in agriculture.

METHOD	RANGE	SMALLEST INCREMENT	CHEMICAL METHOD	# TESTS	WEIGHT
HI 38066 Silica					
checker disc	0.00-1.00 mg/L (ppm)	0.02 mg/L (ppm)	colorimetric	100	580 g
HI 38067 Silica					
checker disc	0-40 mg/L (ppm) 0-800 mg/L (ppm)	1 mg/L (ppm) 40 mg/L (ppm)	colorimetric	100	712.5 g
HI 38000 Sulfate (as SO_4^{2-})					
turbidimetric	20-100 mg/L (ppm)	5 mg/L (ppm)	barium chloride	100	290 g
HI 38001 Sulfate (as SO_4^{2-})					
titration	100-1000 mg/L (ppm) 1000-10000 mg/L (ppm)	10 mg/L (ppm) 100 mg/L (ppm)	barium chloride	200	640 g

HI 3822 Sulfite

There are many reasons to monitor **sulfite** concentration in water. In industrial applications, a sulfite concentration of approximately 20 mg/L must be maintained to prevent pitting and oxidation of metal components as in boiler feed and effluent waters. A high level of sulfite results in a lowered pH, thus promoting corrosion. The monitoring of sulfite is important in environmental control. Sulfite ions are toxic to aquatic lifeforms and their ability to remove dissolved oxygen in water will destroy the delicate balance of ecology of lakes, rivers and ponds.

Zinc is widely used in alloys (brass, bronze, and dye-casting alloys), in galvanizing iron and other metals, and also as a fungicide. It is also an essential growth element in human diet. But with concentrations higher than 5 mg/L, it gives a bitter taste to water and opalescence to alkaline water.

Zinc can enter the domestic water supply from the deterioration of galvanized iron and dezincification of brass.

METHOD	RANGE	SMALLEST INCREMENT	CHEMICAL METHOD	# TESTS	WEIGHT
HI 3822 Sulfite (as Na_2SO_3)					
titration	0.0-20.0 mg/L (ppm) 0-200 mg/L (ppm)	0.2 mg/L (ppm) 2 mg/L (ppm)	iodometric	110 avg.	910 g
HI 3854 Zinc (as Zn^{+2})					
colorimetric	0.0-3.0 mg/L (ppm)	0.6 mg/L (ppm)	zincon	100	250 g
HI 38076 Zinc (as Zn^{+2})					
checker disc	0.0-4.0 mg/L (ppm) 0.0-20.0 mg/L (ppm)	0.1 mg/L (ppm) 0.4 mg/L (ppm)	zincon	100	647 g

HI 3822 Sulfite Test Kit

The HANNA sulfite test kit makes monitoring easy, quick and safe. The compact size gives the user the versatility to use the kit practically anywhere. The design of the kit makes it practically impossible to spill the reagents, thereby reducing the possibility of injury or damage to property.

The method used is an iodometric method. Iodide ions react with iodate ions in the presence of sulfuric acid to form iodine.

The sulfite present in the water sample then reduces the iodine back to iodide.

An excess of iodate ions will generate additional iodine, which will form a blue complex with starch. This color change determines the end point of this titration.

HI 3854 Zinc Test Kit

Zinc reacts with the zincon reagent to form a brownish-green to blue complex in a solution buffered at alkaline pH.

Since other metals can form colored complexes with zincon, cyanide is added to complex zinc and any other heavy metal present. Then, cyclohexanone is added to selectively free zinc from its cyanide complex so that it can react with zincon to form the final blue colored product. The amount of color developed is proportional to the concentration of zinc present in the aqueous sample.

HI 38076 Zinc Test Kit
with Checker Disc

ORDERING INFORMATION

HI 3822 test kit comes with 30 mL sulfamic acid solution, 30 mL EDTA reagent, 15 mL sulfuric acid solution, 10 mL starch indicator, 120 mL titrant solution, 20 mL calibrated vessel, 50 mL calibrated vessel and calibrated syringe with tip.
HI 3854 test kit comes with 100 packets zinc reagent A, 60 mL zinc reagent B (2), color comparison cube, 10 mL glass cuvette with HDPE stopper, 1 mL syringe, 20 mL calibrated vessel and plastic spoon.
HI 38076 test kit comes with 100 packets zinc reagent A, 100 mL zinc reagent B, demineralizer bottle with filter cap for 12 L, checker disc, glass vials with caps, long plastic pipette, 3 mL plastic pipette and 1 mL syringe with tip.

ACCESSORIES

HI 3822
HI 3822-100 Spare reagent for 100 tests
HI 3854
HI 3854-100 Spare reagent for 100 tests
HI 38076
HI 38076-100 Spare reagent for 100 tests

HI 3819 • HI 3813

Acid Mining Test Kit, Alkalinity and Acidity Test Kit

HI 3819 Acid Mining Test Kit

The HANNA combination test kit HI 3819 includes all the necessary tests for alkalinity, acidity, pH and iron. The reagent bottles are in easy-to-recognize ascending numbers to allow your tests to be more efficient.

The testing procedures are clearly shown in the step-by-step instruction manual so that anyone can carry out the analysis. For pH measurements, use our pHep electronic tester to get faster and more accurate results than conventional litmus paper.

HI 3813 Alkalinity and Acidity Combination Test Kit

This practical test kit is the ideal solution for combined testing of acidity and alkalinity. The reagent bottles are clearly coded to avoid confusion and can be purchased separately when they run out. Perform over 100 tests each of acidity and alkalinity with this kit.

This versatile test kit is supplied with a rugged and portable carrying case that is ideal for field use. It's convenient, saves time and keeps your test materials organized.

HI 3819 Acid Mining Test Kit

The acid mining industry produces discharge water which can be both acidic and alkaline, depending on the metal type. The discharge water can also contain metals such as iron. Since the run-off water will eventually find its way to lakes and rivers, it is important to test it to make sure it does not pollute the environment and water reservoirs.

HI 3813 Alkalinity and Acidity Test Kit

ORDERING INFORMATION

HI 3819 test kit includes 10 mL dechlorinating reagent, 10 mL bromophenol blue indicator (2), 10 mL phenolphthalein indicator, 120 mL acidity titrant, 10 mL calibrated vessel, 50 mL calibrated vessel, calibrated syringe, 120 mL alkalinity titrant, 100 packets iron reagent, color comparison cube and electronic pH tester.

HI 3813 test kit includes 10 mL dechlorinating reagent 10 mL bromophenol blue indicator, 10 mL phenolphthalein indicator, 120 mL acidity titrant, 10 mL calibrated vessel, 50 mL calibrated vessel, calibrated syringe and 120 mL alkalinity titrant.

ACCESSORIES

HI 3819

HI 3820-100	Reagent kit for 100 tests for acidity
HI 3811-100	Reagent kit for 100 tests for alkalinity
HI 3834-050	Replacement reagents set for 50 tests for Iron
HI 70004P	pH 4.01 buffer solution, for 25 calibrations in pH 4.01
HI 70007P	pH 7.01 buffer solution, for 25 calibrations in pH 7.01
HI 70010P	pH 10.01 buffer solution, for 25 calibrations in pH 10.01

HI 3813

HI 3820-100	Reagent kit for 100 tests for acidity
HI 3811-100	Reagent kit for 100 tests for alkalinity

PARAMETER	METHOD	RANGE	SMALLEST INCREMENT	CHEMICAL METHOD	# TESTS
HI 3819 Combination Test Kit for Acid Mining					
Acidity (as $CaCO_3$)	titration	0-100 mg/L (ppm) 0-500 mg/L (ppm)	1 mg/L (ppm) 5 mg/L (ppm)	methyl-orange/ phenolphthalein	110 avg.
Alkalinity (as $CaCO_3$)	titration	0-100 mg/L (ppm) 0-300 mg/L (ppm)	1 mg/L (ppm) 3 mg/L (ppm)	phenolphthalein/ bromphenol blue	110 avg.
Iron (as Fe^{2+} & Fe^{3+})	colorimetric	0-5 mg/L (ppm)	1 mg/L (ppm)	phenanthroline	50
pH	electronic pH tester	0.0-14.0 pH	0.1 pH	–	life of the meter
OTHER INFORMATION	**Dimensions/Weight** 370 x 270 x 80 mm (14.6 x 10.6 x 3.1")/1.6 kg (3.5 lb.)				
HI 3813 Acidity/Alkalinity Combination Test Kit					
Acidity (as $CaCO_3$)	titration	0-100 mg/L (ppm) 0-500 mg/L (ppm)	1 mg/L (ppm) 5 mg/L (ppm)	methyl-orange/ phenolphthalein	110 avg.
Alkalinity	titration	0-100 mg/L (ppm) 0-300 mg/L (ppm)	1 mg/L (ppm) 3 mg/L (ppm)	phenolphthalein/ bromphenol blue	110 avg.
OTHER INFORMATION	**Dimensions/Weight** 370 x 270 x 80 mm (14.6 x 10.6 x 3.1")/1.0 kg (2.2 lbs.)				

You can conveniently replace reagents separately as they run out (see Reagents section).
The number of pH tests has no limitations other than the life of the instrument itself.

HANNA instruments

With Great Products, Come Great Results™

The Importance of Soil Testing

Soil is not merely a support system for plants, but a complex world from which the roots obtain water and other required elements. In addition, soil is inhabited by small animals, insects, microorganisms (e.g. fungi and bacteria) which all influence the plant life in one way or another.

Soil evolution is a change in its characteristics based upon climate, presence of animals and plants as well as man's action. A natural soil, in which evolution is slow, is very different from a cultivated one.

Soil is composed of solids (minerals and organic matters), liquids (water and dissolved substances), gases (mostly oxygen and carbon dioxide) and living organisms contains. All these elements provide its physical and chemical properties.

Managing the soil properly is necessary in order to preserve its fertility, obtain better yield and respect the environment. Testing the soil however, is a must in order to manage it properly.

The physical structure of the soil depends on the dimension of the particles of its composition. In addition, the particles also differ based on their shape and volumic mass (mass per unit of volume).

Particles classification according to "International Society of Soil Science" (ISSS)

Diameter of Particles (mm)	Classification
>2	stony texture
2-0.2	coarse sand
0.2-0.02	fine sand
0.00-0.002	silt
<0.002	clay

Soil is divided into many classes of texture, according to the percentage of the basic particles (clay, sand and silt). If, for example, we have a soil with 37% clay, 38% sand and 25% silt, the soil is classified as "clay loam".

Among different types of soil, the loam soil is considered as being suitable for crop growth. However, other types of soil, with a rational management, can also provide positive results.

The soil texture is the cause of important aspects such as porosity, tenacity, adhesivity and plasticity. Porosity is important for the exchange of gases and liquids. Microporosity (porous < 2 - 10 µm) permits water to be retained while macro-porosity (porous > 10 µm) contributes to a fast circulation of air and water. Plants therefore are in need of a correct relationship between micro and macro porosity.

Clay soils have a greater micro-porosity than sandy soils and hence hold more water and remain wet for a longer period. Because of the greater tenacity and adhesivity of clay soils, they are called heavy, while sandy soils are referred to as light.

Organic matter, caused by animal and vegetable residues, is another important constituent of the solid part of the soil. Organic matter has a positive effect on the soil fertility by adding nutrients, stabilizing the pH reaction and permitting a good retainment of water.

Organic matter is also important for the activity of microorganisms and, in general, contributes towards prevention of soil erosion. The colloidal portion, composed of micro-particles (1-100 µm), is important for holding nutrients. Since most of these particles have a negative charge, the colloidal portion has a particularly large capacity to retain cations ($(NH_4)^+$, K^+, Na^+, Ca^{2+}, Mg^{2+}, etc.). The CEC (Cation Exchange Capacity) is higher in soils rich with clay and organic matter than in sandy soils.

Soil pH can be acid, neutral, or alkaline. Each plant has a range of pH in which it thrives and most plants prefer conditions near the neutral mark (pH 5.5-7.5). There are however plants that prefer acid or alkaline environments. The solubility of the nutrients, that is the ability of the plants to absorb them, depends largely on their pH value. The soil microbiological activity is also pH dependent. Most bacteria, specially those putting nutrients at the plants' disposition, prefer moderately acid or slightly alkaline conditions. The pH level hence influences the fertility of the soil.

FRUIT & VEGETABLE - Testing the nitrogen and phosphorus level in your soil is important, especially before seeding and replanting. While root vegetables need phosphorus, leafy plants require more Nitrogen.

Potassium however, helps increase the quality of the crop. With the HANNA Quick Soiltest, growers can keep these three important elements under control.

FLOWERS & SHRUBS - The right quantity of potassium is the key factor in ensuring beautiful and fragrant flowers. The other elements play an important role too in achieving quick and harmonious growth.

LAWNS - A lush lawn is the result of care and attention. In addition to tilling and irrigation, the pH and nitrogen levels need regular checks.

FRUIT & DECORATIVE TREES - Trees are the most appealing feature of our gardens. Nitrogen and phosphorus help in speeding up the growth of young plants, encouraging abundance of foliage and strengthening the trunk and the roots. Potassium, on the other hand keeps, the plants in tip top condition by protecting them from diseases.

BONSAI & HOUSEPLANTS - Every time a houseplant, but in particular a bonsai is potted, the choice of soil mixture is of prime importance. Having prepared the mixture, the HANNA Quick Soiltest will in a matter of minutes test the level of pH and other elements ensuring a livelier plant.

HI 3895 • HI 3896

Agriculture Test Kits

HI 3895 Quick Soil Test Kit

HANNA's quick Soiltest provides growers with an economical way to quickly test pH as well as the three basic elements needed for a healthier plant: nitrogen (N), phosphorus (P) and potassium (K).

HI 3896 HANNA Soil Test Kit

The chemical composition of soil includes pH and chemical elements. Soil analysis is necessary for better management of fertilization and to know the residues of fertilizers in relation to the crop, tillage and the most suitable plant choice for soil composition. An analysis can highlight shortages and help the understanding of the causes of an abnormal growth. By using the HANNA Soiltest, it is possible to measure pH and the most important elements for plant growth, that is, nitrogen (N), phosphorus (P) and potassium (K).

Testing the soil during each crop cycle and comparing the results with plant growth can be a useful experiment for subsequent cultivations.

HI 3896 Agricultural Test Kit

In agricultural applications, monitoring the quality of the soil is extremely important for the health and growth of crops. The pH level is an excellent guide as to which plants may thrive in a particular terrain, as well as indicating which conditioners and fertilizers to use. HANNA combination test kits allow you to test not only for pH, but for nitrogen, phosphorous and potassium which are all important for the quality of soil as well.

PARAMETER	METHOD	RANGE	CHEMICAL METHOD	# TESTS
HI 3895 Agriculture Test Kit, Basic				
Nitrogen	colorimetric	traces, low, medium, high	Ned	10
Phosphorus	colorimetric	traces, low, medium, high	ascorbic acid	10
pH	colorimetric	4 to 9 pH (1 pH increments)	pH indicator	10
Potassium	turbidimetric	traces, low, medium, high	tetraphenyl-borate	10
OTHER INFORMATION	**Dimensions/Weight** 113 x 113 x 62 mm (4.4 x 4.4 x 2.4")/105 g (3.7 oz.)			
HI 3896 Agriculture Test Kit, Pro				
Nitrogen	colorimetric	traces, low, medium, high	Ned	25
Phosphorus	colorimetric	traces, low, medium, high	ascorbic acid	25
pH	colorimetric	4 to 9 pH (1 pH increments)	pH indicator	25
Potassium	turbidimetric	traces, low, medium, high	tetraphenyl-borate	25
OTHER INFORMATION	**Dimensions/Weight** 235 x 176 x 117 mm (9.2 x 6.9 x 4.6")/710 g (1.6 lbs.)			

ORDERING INFORMATION

HI 3895 test kit includes 40 powder packets (10 each for pH, N, P & K), 1 mL plastic pipette, test tubes (4), color cards (4) and one graduated card.
HI 3896 test kit includes 120 mL extraction solution (2), 70 mL pH indicator, 75 powder packets (25 each for N,P & K), 1 mL pipettes (3), test tubes (5), test tube stand, spoon, brush, color cards (4), graduated card and handbook.

ACCESSORIES

HI 3895
HI3895-010 Replacement reagents set for 10 tests per each parameter

HI 3896
HI3896-025 Replacement reagents set for 25 tests /each parameter

Aquaculture and Aquarium Test Kits

HI 3823 Aquaculture Test Kit

HI 3823 provides users with the most important test parameters for aquaculture applications: alkalinity, carbon dioxide, dissolved oxygen, hardness, pH and salinity.

Each of these parameters plays a critical role in the delicate balance of the aquatic environment: alkalinity acts as a stabilizer for pH; carbon dioxide must be monitored because of its toxic effects on fish (every species can tolerate different levels of CO_2); oxygen levels affect fish respiration and incorrect concentrations can slow down their growth rate; hardness is monitored because it diminishes the toxicity level of ammonia; pH also is measured to determine the toxicity level of the water; salinity is important because of its relation to dissolved oxygen.

HI 3893 Aquarium Test Kit

HI 3893 combines in one package four different tests, namely, ammonia, nitrate, nitrite and pH. It is an ideal kit for crab and lobster aquariums and saltwater holding tanks at wholesalers as well as retail shops.

PARAMETER	METHOD	RANGE	SMALLEST INCREMENT	CHEMICAL METHOD	# TESTS
HI 3823 Combination Test Kit for Aquaculture					
Alkalinity (as $CaCO_3$)	titration	0-100 mg/L (ppm) 0-300 mg/L (ppm)	1 mg/L (ppm) 3 mg/L (ppm)	phenolphthalein/ bromphenol blue	110 avg.
Carbon Dioxide (as CO_2)	titration	0.0-10.0 mg/L (ppm) 0.0-50.0 mg/L (ppm) 0-100 mg/L (ppm)	0.1 mg/L (ppm) 0.5 mg/L (ppm) 1 mg/L (ppm)	phenolphthalein	110 avg.
Hardness (as $CaCO_3$)	titration	0.0-30.0 mg/L (ppm) 0-300 mg/L (ppm)	0.3 mg/L (ppm) 3 mg/L (ppm)	EDTA	100 avg.
Oxygen, Dissolved	titration	0.0-10.0 mg/L (ppm)	0.1 mg/L (ppm)	modified Winkler	110 avg.
pH	electronic pH tester	0.0-14.0 pH	0.1 pH	–	life of the meter
Salinity	titration	0-40 g/Kg	0.4 g/Kg	mercuric nitrate	110 avg.
OTHER INFORMATION	**Dimensions/Weight** 440 x 330 x 100 mm (17.3 x 13.0 x 3.9")/2.3 kg (5.1 lbs.)				
HI 3893 Aquarium Test Kit					
Ammonia (as NH_3–N)	colorimetric	0.0-2.5 mg/L (ppm)	0.5 mg/L (ppm)	Nessler	50
Nitrate (as NO_3^-–N)	colorimetric	0-50 mg/L (ppm)	10 mg/L (ppm)	cadmium reduction	50
Nitrite (as NO_2^-–N)	colorimetric	0.0-1.0 mg/L (ppm)	0.2 mg/L (ppm)	chromotropic acid	50
pH	colorimetric	6.0-8.5 pH	0.5 pH	pH indicator	50
OTHER INFORMATION	**Dimensions/Weight** 370 x 270 x 80 mm (14.6 x 10.6 x 3.1")/840 g (1.9 lbs.)				

ORDERING INFORMATION

HI 3823 test kit includes all reagents necessary to perform over 100 tests for each parameter, electronic pH tester, rigid carrying case, all needed accessories for tests and instruction manuals.
HI 3893 test kit includes all reagents necessary to perform over 100 tests for each parameter, rigid carrying case, all needed accessories for tests and instruction manuals.

ACCESSORIES

HI 3823

HI 3810-100	Replacement reagents set for 100 tests (Oxygen Dissolved)
HI 3811-100	Replacement reagents set for 100 tests (Alkalinity)
HI 3812-100	Replacement reagents set for 100 tests (Hardness)
HI 3818-100	Replacement reagents set for 100 tests (Carbon Dioxide)
HI 3835-100	Replacement reagents set for 100 tests (Salinity)
HI 70004P	pH 4.01 buffer solution, for 25 calibrations in pH 4.01
HI 70007P	pH 7.01 buffer solution, for 25 calibrations in pH 7.01
HI 70010P	pH 10.01 buffer solution, for 25 calibrations in pH 10.01

HI 3893

HI 3826-025	Replacement reagent set for 25 tests (Ammonia)
HI 3873-100	Replacement reagent set for 100 tests (Nitrite)
HI 3874-100	Replacement reagent set for 100 tests (Nitrate)
HI 3881-100	Replacement kit for 100 tests (pH)

HI 3816 • HI 3827 • HI 3828 • HI 3837

Boiler and Feedwater Test Kits

Four Kits to Choose From!

For boiler and feedwater industries, choose the kit that best fits your application among any of our four combinations.

All the tests are performed with a titration method except for the pH test. pH is obtained with HANNA's pHep®, pH electronic tester which guarantees greater accuracy and a longer life than traditional litmus paper.

Every kit is equipped with all the necessary reagents and equipment to perform over 100 tests (50 each for iron and phosphate). All reagents can be purchased individually as they run out (please see our reagents section). All tests are easy to perform with step-by-step instructions.

Every kit is supplied with a rugged portable carrying case for orderly transportation.

HI 3837: kit for pH, phosphate and sulfite

HI 3816: kit for alkalinity, chloride and hardness

HI 3827: kit for alkalinity, chloride, hardness, pH, phosphate and sulfite

HI 3828: kit for alkalinity, chloride, hardness, iron and pH

ORDERING INFORMATION

HI 3816, HI 3827, HI 3828 and **HI 3837** test kits include all of the necessary reagents and accessories to perform over 100 tests for every parameter, for the exception of iron and phosphate which include reagents for 50 tests each, hard carrying cases and instructions.

ACCESSORIES

HI 3811-100	Replacement reagents set for 100 tests (Alkalinity)
HI 3812-100	Replacement reagents set for 100 tests (Hardness)
HI 3815-100	Replacement reagents set for 100 tests (Chloride)
HI 3822-100	Replacement reagents set for 100 tests (Sulfite)
HI 3833-050	Replacement reagents set for 50 tests (Phosphate)
HI 3834-050	Replacement reagents set for 50 tests (Iron)
HI 70004P	pH 4.01 buffer solution, for 25 calibrations in pH 4.01
HI 70007P	pH 7.01 buffer solution, for 25 calibrations in pH 7.01
HI 70010P	pH 10.01 buffer solution, for 25 calibrations in pH 10.01

PARAMETER	METHOD	RANGE	SMALLEST INCREMENT	CHEMICAL METHOD	# TESTS
HI 3816, HI 3827, HI 3828, HI 3837 Boiler Test Kits					
Alkalinity (as $CaCO_3$)	titration	0-100 mg/L (ppm) 0-300 mg/L (ppm)	1 mg/L (ppm) 3 mg/L (ppm)	phenolphthalein/ bromphenol blue	110 avg.
Chloride (as Cl^-)	titration	0-100 mg/L (ppm) 0-1000 mg/L (ppm)	1 mg/L (ppm) 10 mg/L (ppm)	mercuric nitrate	110 avg.
Hardness (as $CaCO_3$)	titration	0.0-30.0 mg/L (ppm) 0-300 mg/L (ppm)	0.3 mg/L (ppm) 3 mg/L (ppm)	EDTA	100 avg.
Iron	colorimetric	0-5 mg/L (ppm)	1 mg/L (ppm)	phenanthroline	50
Phosphate (as PO_4^{3-})	colorimetric	0-5 mg/L (ppm)	1 mg/L (ppm)	ascorbic acid	50
pH	electronic pH tester	0.0-14.0 pH	0.1 pH	–	life of the meter
Sulfite (as Na_2SO_3)	titration	0.0-20.0 mg/L (ppm) 0-200 mg/L (ppm)	0.2 mg/L (ppm) 2 mg/L (ppm)	iodometric	110 avg.
OTHER INFORMATION	**Dimensions** HI 3816 and HI 3837: 370 x 270 x 80 mm; HI 3827 and HI 3828: 440 x 330 x 100 mm **Weight** HI 3816: 1.2 kg (2.6 lbs.); HI 3827: 2.2 kg (4.9 lbs.); HI 3828: 2 kg (4.4 lbs.); HI 3837: 1.5 kg (3.3 lbs.)				

Cooling and Boiler Test Kit

Boilers can be complicated systems to maintain. It seems easy enough that water heats to steam, and that steam provides power. For such a seemingly simplistic operation, care and maintenance can be anything but simple. Proper boiler treatment can prevent or correct a multitude of hazardous and costly situations.

Corrosion can occur in many key areas of a boiler. It can shorten the life of a boiler, or at the least, increase the costs associated with maintaining a boiler. Corrosion can form in feed water heaters, deaerators, superheater tubes and economizers, among other places. Corrosion is commonly caused by the presence of dissolved gases and low pH.

Corrosion can be debilitating to boiler operation, but it is preventable. In order to effectively prevent or control corrosion, a boiler treatment regimen should include the maintenance of pH levels as well as alkalinity. Together with proper operation, the right boiler treatment chemicals can ward off dangerous corrosion in the critical components of a boiler.

This guarantees the maximum efficiency of the system and prevents costly damage that can occur as a result of corrosion to metal parts

HANNA's HI 3821 combination test kit includes all the necessary reagents to test these parameters. The kit allows you to perform over 100 tests for each parameter (50 for phosphate). All reagent bottles are numerically labeled for ease of operation and will allow you to avoid mistakes.

PARAMETER	METHOD	RANGE	SMALLEST INCREMENT	CHEMICAL METHOD	# TESTS
HI 3821 Cooling and Boiler Combination Test Kit					
Alkalinity (as $CaCO_3$)	titration	0-100 mg/L (ppm) 0-300 mg/L (ppm)	1 mg/L (ppm) 3 mg/L (ppm)	phenolphthalein/ bromphenol blue	110 avg.
Chloride	titration	0-100 mg/L (ppm) 0-1000 mg/L (ppm)	1 mg/L (ppm) 10 mg/L (ppm)	mercuric nitrate	110 avg.
Hardness (as $CaCO_3$)	titration	0.0-30.0 mg/L (ppm) 0-300 mg/L (ppm)	0.3 mg/L (ppm) 3 mg/L (ppm)	EDTA	100 avg.
Phosphate	colorimetric	0-5 mg/L (ppm)	1 mg/L (ppm)	ascorbic acid	50 avg.
Oxygen, Dissolved	titration	0.0-10.0 mg/L (ppm)	0.1 mg/L (ppm)	modified Winkler	110 avg.
Sulfite (as Na_2SO_3)	titration	0.0-20.0 mg/L (ppm) 0-200 mg/L (ppm)	0.2 mg/L (ppm) 2 mg/L (ppm)	iodometric	110 avg.
OTHER INFORMATION	**Dimensions/ Weight** 440 x 330 x 100 mm (17.3 x 13.0 x 3.9")/2.5 kg (5.5 lb.)				

ORDERING INFORMATION

HI 3821 test kit includes all of the necessary reagents and accessories to perform over 100 tests for every parameter, for the exception of phosphate which includes reagents for 50 tests each, hard carrying case and instructions.

ACCESSORIES

HI 3810-100	Replacement reagents set for 100 tests (Oxygen Dissolved)
HI 3811-100	Replacement reagents set for 100 tests (Alkalinity)
HI 3812-100	Replacement reagents set for 100 tests (Hardness)
HI 3815-100	Replacement reagents set for 100 tests (Chloride)
HI 3822-100	Replacement reagents set for 100 tests (Sulfite)
HI 3833-050	Replacement reagents set for 50 tests (Phosphate)

HI 3814

Environmental Monitoring Test Kit

Ideal for Professionals and Students

The six most important parameters in environmental applications can be monitored with this combination chemical test kit. They include: acidity, alkalinity, carbon dioxide, dissolved oxygen, hardness and pH.

This kit is ideal not only for professionals, but also for students of Environmental Sciences since it offers great performance and ease of use.

HI 3814 is equipped with all the accessories and reagents to perform over 100 tests for each parameter.

The pHep®, our popular pH electronic tester, is included for your convenience. This small and easy to use pH meter will provide more accurate and reliable pH readings than conventional litmus paper. The pHep® also has the added benefit of introducing students to the use of a pH meter.

The kit is supplied complete with a step-by-step instruction manual and a hard carrying case to easily perform tests in the field.

Reagents can be replenished individually by parameter as they run out. (Please see our reagents section).

ORDERING INFORMATION

HI 3814 test kit includes all of the necessary reagents and accessories to perform over 100 tests for every parameter, electronic pH tester, hard carrying case and instructions.

ACCESSORIES

HI 3810-100	Replacement reagents set for 100 tests (Oxygen Dissolved)
HI 3811-100	Replacement reagents set for 100 tests (Alkalinity)
HI 3812-100	Replacement reagents set for 100 tests (Hardness)
HI 3818-100	Replacement reagents set for 100 tests (Carbon Dioxide)
HI 3820-100	Replacement reagents set for 100 tests (Acidity)
HI 70004P	pH 4.01 buffer solution, for 25 calibrations
HI 70007P	pH 7.01 buffer solution, for 25 calibrations
HI 70010P	pH 10.01 buffer solution, for 25 calibrations

PARAMETER	METHOD	RANGE	SMALLEST INCREMENT	CHEMICAL METHOD	# TESTS
HI 3814 Environmental Monitoring Test Kit					
Acidity (as $CaCO_3$)	titration	0-100 mg/L (ppm) 0-500 mg/L (ppm)	1 mg/L (ppm) 5 mg/L (ppm)	methyl-orange/ phenolphthalein	110 avg.
Alkalinity (as $CaCO_3$)	titration	0-100 mg/L (ppm) 0-300 mg/L (ppm)	1 mg/L (ppm) 3 mg/L (ppm)	phenolphthalein/ bromphenol blue	110 avg.
Carbon Dioxide	titration	0.0-10.0 mg/L (ppm) 0.0-50.0 mg/L (ppm) 0-100 mg/L (ppm)	0.1 mg/L (ppm) 0.5 mg/L (ppm) 1 mg/L (ppm)	phenolphthalein	110 avg.
Hardness (as $CaCO_3$)	titration	0.0-30.0 mg/L (ppm) 0-300 mg/L (ppm)	0.3 mg/L (ppm) 3 mg/L (ppm)	EDTA	100 avg.
Oxygen, Dissolved	titration	0.0-10.0 mg/L (ppm)	0.1 mg/L (ppm)	modified Winkler	110 avg.
pH	electronic pH tester	0.0-14.0 pH	0.1 pH	–	life of the meter
OTHER INFORMATION	**Dimensions/ Weight** 440 x 330 x 100 mm (17.3 x 13.0 x 3.9")/2.3 kg (5.1 lb.)				

HI 3825 Combination Swimming Pool Test Kit

Organized for Daily Tests

Swimming pool water requires daily tests for alkalinity, bromine, chlorine and pH.

Chlorine and bromine, which kill microorganisms, are commonly used in swimming pool water because of their disinfectant properties.

Alkalinity and pH should be monitored because their concentration in pool water affects the proper activity of the disinfecting agents.

Bromine and chlorine tests are colorimetric (color comparison), while alkalinity tests are a titration. pH tests are performed with HANNA's pHep® pH tester. The pHep® offers greater accuracy and a wider range than litmus paper.

HANNA's Quick-check test kits combine two basic parameters in swimming pool monitoring. These kits are ideal for performing routine pH and chlorine testing.

HI 3825: Kit for alkalinity, bromine, chlorine and pH

HI 3887: Quick-check test kit for free chlorine and pH

HI 3888: Quick-check test kit for total chlorine and pH

PARAMETER	METHOD	RANGE	SMALLEST INCREMENT	CHEMICAL METHOD	# TESTS
HI 3825 Combination Swimming Pool Test Kit					
Alkalinity (as $CaCO_3$)	titration	0-100 mg/L (ppm) 0-300 mg/L (ppm)	1 mg/L (ppm) 3 mg/L (ppm)	phenolphthalein/ bromphenol blue	110 avg.
Bromine	colorimetric	0.0-3.0 mg/L (ppm)	0.6 mg/L (ppm)	DPD	60 avg.
Chlorine	colorimetric	0.0-2.5 mg/L (ppm)	0.5 mg/L (ppm)	DPD	50 avg.
pH	electronic pH tester	0.0-14.0 pH	0.1 pH	–	life of the meter
OTHER INFORMATION	**Dimensions/Weight** 370 x 270 x 80 mm (14.6 x 10.6 x 3.1")/1.1 kg (2.4 lb.)				
HI 3887, HI 3888 Quick-check Swimming Pool Test Kits					
Free Chlorine	colorimetric	0-2.5 mg/L (ppm)	0.5 mg/L (ppm)	DPD	50 avg.
Total Chlorine	colorimetric	0-2.5 mg/L (ppm)	0.5 mg/L (ppm)	DPD	50 avg.
pH	colorimetric	6.0-8.5 pH	0.5 pH	pH indicator	100 avg.
OTHER INFORMATION	**WEIGHT** HI 3887: 170 g (6.0 oz.); HI 3888: 190 g (6.7 oz)				

ORDERING INFORMATION

HI 3825, HI 3887 and **HI 3888** test kits include all of the necessary reagents and accessories to perform tests for every parameter, hard carrying cases and instructions.

ACCESSORIES

HI 3811-100	Replacement reagents set for 100 tests (Alkalinity)
HI 3830-060	Replacement reagents set for 60 tests (Bromine)
HI 3831F-050	Replacement reagents set for 50 tests (Free Chlorine)
HI 3831T-050	Replacement reagents set for 50 tests (Total Chlorine)
HI 70004P	pH 4.01 buffer solution, for 25 calibrations
HI 70007P	pH 7.01 buffer solution, for 25 calibrations
HI 70010P	pH 10.01 buffer solution, for 25 calibrations

HI 3817

Water Quality Test Kit

Accurate and Reliable Water Quality Tests

Monitor the most important chemical parameters in water: alkalinity, chloride, hardness, iron, pH and sulfite with this combination test kit.

The kit has all the reagents needed to perform over 100 tests for each parameter (50 tests for iron). Reagents may also be purchased individually as they run out. (please see our reagent section for a complete listing).

pH measurements are performed with our electronic pHep® pH tester which guarantees more accurate and repeatable readings than litmus paper.

The chemical reagents to perform each test are provided in numerically labeled bottles and are easy to identify. All titration reagents are standardized, and do not require chemical handling to perform the analysis.

The kit is supplied with a convenient hard carrying case, designed with field applications in mind. It will also keep your test kit neat and organized.

The HANNA HI 3817 combination test kit offers all the necessary equipment for accurate and reliable water quality testing.

ORDERING INFORMATION

HI 3817 test kit includes all of the necessary reagents and accessories to perform over 100 tests for every parameter, for the exception of iron which include reagents for 50 tests, electronic pH tester, hard carrying case and instructions.

ACCESSORIES

HI 3811-100	Replacement reagents set for 100 tests (Alkalinity)
HI 3812-100	Replacement reagents set for 100 tests (Hardness)
HI 3815-100	Replacement reagents set for 100 tests (Chloride)
HI 3822-100	Replacement reagents set for 100 tests (Sulfite)
HI 3834-050	Replacement reagents set for 50 tests (Iron)
HI 70004P	pH 4.01 buffer solution, for 25 calibrations
HI 70007P	pH 7.01 buffer solution, for 25 calibrations
HI 70010P	pH 10.01 buffer solution, for 25 calibrations

PARAMETER	METHOD	RANGE	SMALLEST INCREMENT	CHEMICAL METHOD	# TESTS
HI 3817 Water Quality Test Kit					
Alkalinity (as $CaCO_3$)	titration	0-100 mg/L (ppm) 0-300 mg/L (ppm)	1 mg/L (ppm) 3 mg/L (ppm)	phenolphthalein/ bromphenol blue	110 avg.
Chloride	titration	0-100 mg/L (ppm) 0-1000 mg/L (ppm)	1 mg/L (ppm) 10 mg/L (ppm)	mercuric nitrate	110 avg.
Hardness (as $CaCO_3$)	titration	0.0-30.0 mg/L (ppm) 0-300 mg/L (ppm)	0.3 mg/L (ppm) 3 mg/L (ppm)	EDTA	100 avg.
Iron	colorimetric	0-5 mg/L (ppm)	1 mg/L (ppm)	phenanthroline	50
pH	electronic pH tester	0.0-14.0 pH	0.1 pH	–	life of the meter
Sulfite (as Na_2SO_3)	titration	0.0-20.0 mg/L (ppm) 0-200 mg/L (ppm)	0.2 mg/L (ppm) 2 mg/L (ppm)	iodometric	110 avg.
OTHER INFORMATION	**Dimensions/ Weight** 440 x 330 x 100 mm (17.3 x 13.0 x 3.9")/2.1 kg (4.6 lb.)				

Backpack Lab™ Water Quality Educational Test Kit

backpacklab.com

Test kits can be replaced individually

Learn about environmental water parameters right form the source!

HANNA offers a series of test kits specifically designed for educators and Environmental Science students. These portable kits contain well constructed lessons and activities, and will allow the teacher to get the most out of their classroom time.

Backpack Lab™ is designed with all the necessary components in one place, reducing the chance of misplacing an item. Ideal for transporting, take this durable backpack to the field for on-site measurements.

The lesson plan and components are tied together by a comprehensive teacher's manual that includes information about each parameter, classroom activities designed to introduce students to each parameter, and detailed field testing procedures. HANNA chemical test kits and pocket testers provide teachers with a valuable tool in helping students assess the water quality of streams, rivers and lakes.

Backpack Lab™ Water Quality Education Test Kit Includes:

- 110 tests each for acidity & alkalinity, 100 tests for carbon dioxide, dissolved oxygen, hardness, nitrate & phosphate
- HANNA's pHep®4 waterproof pH/temperature tester
- HANNA's DiST®5 waterproof conductivity/total dissolved solids (TDS) tester
- Secchi disk for turbidity
- Backpack carrying case which holds all components of the kit
- 72-page teachers manual with a curriculum that meets National Science Teachers Association Standards
- Parameter summary in pdf and powerpoint format (on included CD).
- Laminated, laboratory instruction cards with step-by-step field test procedures
- Reproducible lab activity worksheets with instructions, goals, hypothesis, and testing procedure results/ observations
- A glossary of key terms in pdf format (on included CD).

PARAMETER	REORDER CODE	METHOD	RANGE	CHEMICAL METHOD	# TESTS
HI 3817BP Backpack Lab™ Water Quality Educational Test Kit					
Acidity ($CaCO_3$)	HI 3820	titration	0-100 mg/L (ppm) 0-500 mg/L (ppm)	methyl-orange phenolphthalein	110
Alkalinity ($CaCO_3$) Phenolphthalein & Total	HI 3811	titration	0-100 mg/L (ppm) 0-300 mg/L (ppm)	phenolphthalein/ bromphenol blue	110
Carbon Dioxide	HI 3818	titration	0.0-10.0 mg/L (ppm) 0.0-50.0 mg/L (ppm) 0-100 mg/L (ppm)	phenolphthalein	110
Oxygen, Dissolved	HI 3810	titration	0.0-10.0 mg/L (ppm)	modified Winkler	110
Hardness ($CaCO_3$)	HI 3812	titration	0.0-30.0 mg/L (ppm) 0-300 mg/L (ppm)	EDTA	100
Nitrate (NO_3^-–N)	HI 3874	colorimetric	0-50 mg/L (ppm)	cadmium reduction	100
Phosphate	HI 3833	colorimetric	0-5 mg/L (ppm)	ascorbic acid	50

ORDERING INFORMATION

HI 3817BP Backpack Lab includes pHep®4 pocket pH tester, DiST®5 EC/TDS/temperature meter, set of 10 field test procedures, vocabulary terms blackline master, set of 10 parameter summary transparencies, set of 10 lab activity worksheets, acidity test kit, alkalinity test kit, carbon dioxide test kit, dissolved oxygen test kit, hardness test kit, nitrate test kit, phosphate test kit and backpack.

ACCESSORIES

HI 3810-100	Replacement reagents set for 100 tests (Oxygen Dissolved)
HI 3811-100	Replacement reagents set for 100 tests (Alkalinity)
HI 3812-100	Replacement reagents set for 100 tests (Hardness)
HI 3818-100	Replacement reagents set for 100 tests (Carbon Dioxide)
HI 3820-100	Replacement reagents set for 100 tests (Acidity)
HI 3833-050	Replacement reagents set for 50 tests (Phosphate)
HI 3874-100	Replacement reagent set for 100 tests (Nitrate)
HI 70004P	pH 4.01 buffer solution, for 25 calibrations
HI 70007P	pH 7.01 buffer solution, for 25 calibrations
HI 70010P	pH 10.01 buffer solution, for 25 calibrations
HI 70031P	1413 µS/cm EC calibration standard, for 25 calibrations
HI 70039P	5000 µS/cm EC calibration standard, for 25 calibrations

Backpack Lab™ contents subject to change

HI 3896BP

Backpack Lab™ Soil Quality Educational Test Kit

A complete, portable learning experience

HANNA introduces a kit specifically assembled for the educator and Environmental Science student. Using the popular HANNA Agricultural Combination Test Kit (HI 3895 and HI 3896) as its foundation, the Soil Quality Education Test Kit is designed to provide a complete lesson plan for teachers. Teachers are able to introduce students to important chemical tests for evaluating soil quality and fertility, and relate these measurements to the principles of plant metabolism. Tied together by an extensive teacher's guide, this kit includes in-depth background information about each parameter, classroom activities designed to introduce students to each parameter and detailed field-testing procedures.

The HANNA Agricultural Combination Test Kit addresses important issues related to soil quality and modern agriculture practices. Real-world examples help students understand the relevance of macronutrients and other parameters in everyday life. This kit introduces the student to all major soil quality topics, and is presented in an easy to use format that makes lessons accessible, understandable and memorable.

Test kits can be replaced individually

Backpack Lab™ By HANNA
backpacklab.com

Backpack Lab™ Soil Quality Education Test Kit Includes:

- Agriculture combination test kit for testing nitrogen, phosphorus, potassium (N,P,K) with enough materials for 50 tests of each parameter
- HANNA's pHep®4 waterproof pH/temperature tester
- HANNA's DiST®5 waterproof conductivity/total dissolved solids (TDS) tester
- HANNA's HI 145 digital thermometer
- Backpack carrying case which holds all components of the kit
- 48-page teachers manual with a curriculum that meets National Science Teachers Association Standards
- Parameter summary in pdf and powerpoint format (on included CD).
- Laminated, laboratory instruction cards with step-by-step field test procedures
- Reproducible lab activity worksheets with instructions, goals, hypothesis and testing procedure results/ observations
- A glossary of key terms in pdf format (on included CD).

ORDERING INFORMATION

HI 3817BP Backpack Lab test kit includes agriculture test kit pro (enough for 100 NPK tests), pHep®4 meter, DiST®5 meter, HI 145 digital thermometer, set of 6 parameter summary transparencies, set of 6 field test procedures, set of 6 lab activity worksheets, vocabulary terms blackline master and backpack

PARAMETER	REORDER CODE	METHOD	RANGE	CHEMICAL METHOD	# TESTS
HI 3896BP Backpack Lab™ Soil Quality Educational Test Kit					
Nitrogen	HI 3896	colorimetric	traces, low, medium, high	Ned	50
Phosphorus	HI 3896	colorimetric	traces, low, medium, high	ascorbic acid	50
Potassium	HI 3896	turbidimetric	traces, low, medium, high	tetraphenylborate	50
pH	HI 3896	colorimetric	4 to 9 pH (1 pH increments)	pH indicators	50

Backpack Lab™ contents subject to change

Backpack Lab™ Marine Science Educational Test Kit

backpacklab.com

Test kits can be replaced individually

Everything students need to know about marine science parameters all in one backpack!

Backpack Lab™ is designed with all the necessary components in one place, reducing the chance of misplacing an item. Ideal for transporting, take this durable backpack to the field for on-site measurements.

This kit is designed to provide a complete unit for teachers to introduce students to important marine science topics. The teacher's guide provides detailed background information for marine science lessons/activities that can be adapted to various grade levels. Field tests are included to complement classroom lessons. All materials fit easily into the supplied backpack for convenient transport.

Backpack Lab™ Includes:

- 110 tests each for Acidity and Alkalinity, 100 tests for ammonia, carbon dioxide, dissolved oxygen, hardness, nitrate, nitrogen, phosphate and salinity.
- HANNA's pHep®4 waterproof pH/temperature tester
- HANNA's DiST®5 waterproof conductivity/ Total Dissolved Solids (TDS) tester
- Hydrometer for salinity
- Secchi disk for turbidity
- Backpack-style carrying case which holds all components of the kit
- 118-page teachers manual with a curriculum that meets National Science Teachers Standards
- Parameter summary in pdf and powerpoint format (on included CD).
- Laminated, laboratory instruction cards with step-by-step field-test procedures
- Reproducible lab activity worksheets with instructions, goals, hypothesis, and testing procedure results/ observations
- A glossary of key terms in pdf format (on included CD).

PARAMETER	REORDER CODE	METHOD	RANGE	CHEMICAL METHOD	# TESTS
HI 3899BP Backpack Lab™ Water Quality Educational Test Kit					
Acidity ($CaCO_3$)	HI 3820	titration	0-100 mg/L (ppm) 0-500 mg/L (ppm)	Methyl-orange Phenolphthalein	110
Alkalinity ($CaCO_3$) Phenolphthalein & Total	HI 3811	titration	0-100 mg/L (ppm) 0-300 mg/L (ppm)	Phenolphthalein/ Bromphenol blue	110
Ammonia (as NH_3–N) in salt water	HI 3826	colorimetric	0.0-2.5 mg/L (ppm)	Nessler	25 avg.
Carbon Dioxide	HI 3818	titration	0.0-10.0 mg/L (ppm) 0.0-50.0 mg/L (ppm) 0-100 mg/L (ppm)	Phenolphthalein	110
Oxygen, Dissolved	HI 3810	titration	0.0-10.0 mg/L (ppm)	Modified Winkler	110
Nitrite	HI 3873	colorimetric	0.0-1.0 mg/L (ppm)	Chromotropic acid	100
Nitrate (NO_3^-–N)	HI 3873	colorimetric	0-50 mg/L (ppm)	Cadmium reduction	100
Phosphate	HI 3833	colorimetric	0-5 mg/L (ppm)	Ascorbic acid	50
Salinity	HI 3835	titration	0.0-40.0 g/kg	Mercuric nitrate	110

Backpack Lab™ contents subject to change

ORDERING INFORMATION

HI 3899BP Backpack Lab includes acidity test kit, alkalinity test kit, carbon dioxide test kit, ammonia test kit, dissolved oxygen test kit, nitrate test kit, nitrite test kit, phosphate test kit, salinity test kit, secchi disc, hydrometer, pHep®4 pocket pH tester, DiST®6 EC/TDS/temperature meter, set of 6 field test procedure, vocabulary terms blackline master, set of 6 parameter summary transparencies, set of 6 lab activity worksheets and backpack.

ACCESSORIES

HI 3810-100	Replacement reagents set for 100 tests (Oxygen Dissolved)
HI 3811-100	Replacement reagents set for 100 tests (Alkalinity)
HI 3818-100	Replacement reagents set for 100 tests (Carbon Dioxide)
HI 3820-100	Replacement reagents set for 100 tests (Acidity)
HI 3826-025	Replacement reagents set for 25 tests (Ammonia)
HI 3833-050	Replacement reagents set for 50 tests (Phosphate)
HI 3835-100	Replacement reagents set for 100 tests (Salinity)
HI 3873-100	Replacement reagents set for 100 tests (Nitrite)
HI 3874-100	Replacement reagent set for 100 tests (Nitrate)
HI 70004P	pH 4.01 buffer solution, for 25 calibrations
HI 70007P	pH 7.01 buffer solution, for 25 calibrations
HI 70010P	pH 10.01 buffer solution, for 25 calibrations
HI 70031P	1413 µS/cm EC calibration standard, for 25 calibrations
HI 70039P	5000 µS/cm EC calibration standard, for 25 calibrations

Checker®HC Reagents and Calibration Check Sets

CODE	PARAMETER	CHEMICAL METHOD	REAGENT CODE	CALIBRATION CHECKING SET	# OF TESTS
HI 701	Chlorine, Free	DPD	HI 701-25	HI 701-11	25
HI 706	Phosphorus HR	Amino Acid	HI 706-25	HI 706-11	40
HI 711	Chlorine, Total	DPD	HI 711-25	HI 711-11	25
HI 713	Phosphate LR	Ascorbic Acid	HI 713-25	HI 713-11	25
HI 717	Phosphate HR	Amino Acid	HI 717-25	HI 717-11	40
HI 718	Iodine	DPD	HI 718-25	HI 718-11	25
HI 721	Iron HR	Phenantroline	HI 721-25	HI 721-11	25
HI 723	Chromium VI, HR	Diphenylcarbohydrazide	HI 723-25	HI 723-11	25
HI 726	Nickel HR	EDTA	HI 726-25	HI 726-11	25
HI 727	Color of Water	Platinum Cobalt	–	HI 727-11	–
HI 729	Fluoride LR	SPADNS	HI 729-26	HI 729-11	25
HI 736	Phosphorus ULR	Ascorbic Acid	HI 736-25	HI 736-11	25
HI 739	Fluoride HR	SPADNS	HI 739-26	HI 739-11	25
HI 755	Alkalinity	Colorimetric	HI 755-26	HI 755-11	25
HI 764	Nitrite ULR	Diazotization	HI 764-25	HI 764-11	25
HI 770	Silica HR	Molybdate	HI 770-25	HI 770-11	25

Tips for an accurate measurement

- It is important that the sample does not contain any debris.
- Whenever the cuvette is placed into the measurement cell, it must be dry outside, and completely free of fingerprints, oil or dirt. Wipe it thoroughly with HI 731318 or a lint-free cloth prior to insertion.
- Shaking the cuvette can generate bubbles, causing higher readings. To obtain accurate measurements, remove such bubbles by swirling or by gently tapping the cuvette.
- Do not let the reacted sample stand for too long after reagent is added, or accuracy will be lost.
- After the reading it is important to discard the sample immediately , otherwise the glass might become permanently stained.

Chemical Test Kit Reagents

CODE	TEST KIT PARAMETER	CHEMICAL METHOD	REAGENT CODE	# TESTS
HI 38000	Sulfate	barium chloride	HI 38000-10	100
HI 38001	Sulfate LR/HR	barium chloride	HI 38001-10	200
HI 38013	Alkalinity, Phenolphthalein and total	phenolphthalein bromine phenol blue	HI 38013-100	200
HI 38014	Alkalinity ($CaCO_3$)	acid titration	HI 38014-100	100
HI 38015	Chloride, extended range	silver nitrate titration	HI 38015-100	100
HI 38016	Chlorine, total, MR	DPD colorimetric	HI 38016-100	100
HI 38017	Chlorine, free and total, LR/MR	DPD colorimetric	HI 38017-200	200
HI 38018	Chlorine, free, LR/MR	DPD colorimetric	HI 38018-200	200
HI 38019	Chlorine, total, LR/MR	DPD colorimetric	HI 38019-200	200
HI 38020	Chlorine, free and total, LR/MR/HR	DPD colorimetric	HI 38020-200	200
HI 38022	Chlorine, total, HR	iodometric	HI 38022-100	100
HI 38023	Chlorine, total, extended range	iodometric	HI 38023-100	100
HI 38033	Hardness, total ($CaCO_3$)	EDTA titration	HI 38033-100	100
HI 38034	Hardness, total ($CaCO_3$)	EDTA titration	HI 38034-200	200
HI 38035	Hardness, (total and calcium)	EDTA titration	HI 38035-200	200
HI 38039	Iron LR	phenanthroline colorimetric	HI 38039-100	100
HI 38040	Iron MR	phenanthroline colorimetric	HI 38040-100	100
HI 38041	Iron HR	phenanthroline colorimetric	HI 38041-100	100
HI 38042	Manganese LR	sodium periodate	HI 38042-100	100
HI 38049	Ammonia (fresh water) (NH_3–N)	nessler colorimetric	HI 38049-100	100
HI 38050	Nitrate (soil + irrigation) (NO_3^-–N)	cadmium reduction	HI 38050-200	200
HI 38051	Nitrite (NO_2^-–N)	chromotropic acid	HI 38051-100	100
HI 38054	Ozone	DPD	HI 38054-100	100
HI 38058	pH	pH indicator	HI 38058-100	300
HI 38061	Phosphate	ascorbic acid	HI 38061-100	100
HI 38067	Silica HR (SiO_2)	heteropoly blue	HI 38067-100	100
HI 38066	Silica LR (SiO_2)	heteropoly blue	HI 38066-100	100
HI 38072	Manganese (irrigation water)	sodium periodate	HI 38072-100	100
HI 38073	Phosphorus (soil)	colorimetric	HI 38073-100	100
HI 38074	Boron	boric acid	HI 38074-100	100
HI 38075	Copper	bicinchoninic bicinchoninate	HI 38075-100	100
HI 38076	Zinc, extended range	zincon	HI 38076-100	100
HI 38077	Phosphate (irrigation water)	ascorbic acid	HI 38077-100	100
HI 38078	SAR	EDTA titration	HI 38078-100	100
HI 38079	Magnesium (irrigation water)	EDTA	HI 38079-100	100
HI 38080	Calcium and Magnesium (soil)	EDTA	HI 38080-100	100
HI 38081	Calcium and Magnesium (irrigation water)	EDTA	HI 38081-100	100
HI 38082	Potassium (soil)	turbidimetric	HI 38082-100	100
HI 38083	Sodium, exchangeable (EES) & gypsum requirement (GR)	calcium sulfate	HI 38083-100	100
HI 38084	Acidity, total exchangeable meq/100 g	potassium chloride	HI 38084	100
HI 38086	Calcium (irrigation water)	turbidimetric	HI 38086-100	100

Multiparameter

Chemical Test Kit Reagents

CODE	TEST KIT PARAMETER	CHEMICAL METHOD	REAGENT CODE	# TESTS
HI 3810	Dissolved Oxygen	Winkler	HI 3810-100	110
HI 3811	Alkalinity ($CaCO_3$)	acid titration	HI 3811-100	110
HI 3812	Hardness, total ($CaCO_3$)	EDTA titration	HI 3812-100	100
HI 3813	Alkalinity (as $CaCO_3$)	phenolphthalein/bromphenol blue	HI 3811-100	110 avg.
	Acidity (as $CaCO_3$)	methyl orange	HI 3820-100	110
HI 3814	Dissolved Oxygen	Winkler	HI 3810-100	110
	Alkalinity (as $CaCO_3$)	phenolphthalein/bromphenol blue	HI 3811-100	110 avg.
	Hardness (as $CaCO_3$)	EDTA	HI 3812-100	100 avg.
	Carbon Dioxide	base titration	HI 3818-100	110
	Acidity (as $CaCO_3$)	methyl-orange/phenolphthalein	HI 3820-100	110
HI 3815	Chloride	mercury nitrate titration	HI 3815-100	110
HI 3816	Alkalinity (as $CaCO_3$)	phenolphthalein/bromphenol blue	HI 3811-100	110 avg.
	Chloride	mercury nitrate titration	HI 3815-100	110
	Hardness (as $CaCO_3$)	EDTA	HI 3812-100	100 avg.
HI 3817	Alkalinity (as $CaCO_3$)	phenolphthalein/bromphenol blue	HI 3811-100	110 avg.
	Hardness (as $CaCO_3$)	EDTA	HI 3812-100	100 avg.
	Chloride	mercury nitrate titration	HI 3815-100	110
	Sulfite (Na_2SO_3)	titration	HI 3822-100	110
	Iron	phenanthroline colorimetric	HI 3834-050	50
	Buffer solution	–	HI 70004P	25
	Buffer solution	–	HI 70007P	25
	Buffer solution	–	HI 70010P	25
HI 3817BP	Dissolved Oxygen	Winkler	HI 3810-100	110
	Alkalinity (as $CaCO_3$)	phenolphthalein/bromphenol blue	HI 3811-100	110 avg.
	Hardness, total ($CaCO_3$)	EDTA titration	HI 3812-100	100
	Carbon Dioxide	base titration	HI 3818-100	110
	Acidity (as $CaCO_3$)	methyl orange	HI 3820-100	110
	Phosphate	ascorbic acid	HI 3833-050	50
	Nitrate (NO_3^-–N)	cadmium reduction	HI 3874-100	100
	Buffer solution	–	HI 70004P	25
	Buffer solution	–	HI 70007P	25
	Buffer solution	–	HI 70010P	25
	EC Calibration Standard	–	HI 70031P	25
	EC Calibration Standard	–	HI 70033P	25
HI 3818	Carbon Dioxide	base titration	HI 3818-100	110
HI 3819	Alkalinity (as $CaCO_3$)	phenolphthalein/bromphenol blue	HI 3811-100	110 avg.
	Acidity (as $CaCO_3$)	methyl orange	HI 3820-100	110
	Iron	phenanthroline colorimetric	HI 3834-050	50
	Buffer solution	–	HI 70004P	25
	Buffer solution	–	HI 70007P	25
	Buffer solution	–	HI 70010P	25
HI 3820	Acidity (as $CaCO_3$)	methyl orange	HI 3820-100	110
HI 3821	Dissolved Oxygen	Winkler	HI 3810-100	110

Chemical Test Kit Reagents

CODE	TEST KIT PARAMETER	CHEMICAL METHOD	REAGENT CODE	# TESTS
HI 3821	Alkalinity (as $CaCO_3$)	phenolphthalein/bromphenol blue	HI 3811-100	110 avg.
	Hardness, total ($CaCO_3$)	EDTA titration	HI 3812-100	100
	Chloride	mercury nitrate titration	HI 3815-100	110
	Sulfite (Na_2SO_3)	titration	HI 3822-100	110
	Phosphate	ascorbic acid	HI 3833-050	50
HI 3822	Sulfite (Na_2SO_3)	titration	HI 3822-100	110
HI 3823	Dissolved Oxygen	Winkler	HI 3810-100	110
	Alkalinity (as $CaCO_3$)	phenolphthalein/bromphenol blue	HI 3811-100	110 avg.
	Hardness, total ($CaCO_3$)	EDTA titration	HI 3812-100	100
	Carbon Dioxide	base titration	HI 3818-100	110
	Salinity (g/Kg)	mercuric mitrate titration	HI 3835-100	110
	Buffer solution	–	HI 70004P	25
	Buffer solution	–	HI 70007P	25
	Buffer solution	–	HI 70010P	25
HI 3824	Ammonia (fresh water) (NH_3–N)	nessler colorimetric	HI 3824-025	25
HI 3825	Alkalinity (as $CaCO_3$)	phenolphthalein/bromphenol blue	HI 3811-100	110 avg.
	Bromine	DPD colorimetric	HI 3830-060	60
	Chlorine, free	DPD colorimetric	HI 3831F-050	50
	Chlorine, total	DPD colorimetric	HI 3831T-050	50
	Buffer solution	–	HI 70004P	25
	Buffer solution	–	HI 70007P	25
	Buffer solution	–	HI 70010P	25
HI 3826	Ammonia (sea water) (NH_3–N)	nessler colorimetric	HI 3826-025	25
HI 3827	Alkalinity ($CaCO_3$)	acid titration	HI 3811-100	110
	Hardness, total ($CaCO_3$)	EDTA titration	HI 3812-100	100
	Chloride	mercury nitrate titration	HI 3815-100	110
	Sulfite (Na_2SO_3)	titration	HI 3822-100	110
	Phosphate	ascorbic acid	HI 3834-050	50
	Buffer solution	–	HI 70004P	25
	Buffer solution	–	HI 70007P	25
HI 3828	Alkalinity ($CaCO_3$)	acid titration	HI 3811-100	110
	Hardness, total ($CaCO_3$)	EDTA titration	HI 3812-100	100
	Chloride	mercury nitrate titration	HI 3815-100	110
	Iron	phenanthroline colorimetric	HI 3834-050	50
	Buffer solution	–	HI 70004P	25
	Buffer solution	–	HI 70007P	25
	Buffer solution	–	HI 70010P	25
HI 3829F	Chlorine, free	DPD colorimetric	HI 3829F-050	50
HI 3830	Bromine	DPD colorimetric	HI 3830-060	60
HI 3831F/HI 3831F/S	Chlorine, free	DPD colorimetric	HI 3831F-050	50
HI 3831T/HI 3831T/S	Chlorine, total	DPD colorimetric	HI 3831T-050	50
HI 3832	Iodine	DPD colorimetric	HI 3832-050	50
HI 3833	Phosphate	ascorbic acid	HI 3833-050	50
HI 3835	Salinity (g/Kg)	mercuric mitrate titration	HI 3835-100	110

Multiparameter

Chemical Test Kit Reagents

CODE	TEST KIT PARAMETER	CHEMICAL METHOD	REAGENT CODE	# TESTS
HI 3837	Sulfite (Na_2SO_3)	titration	HI 3822-100	110
	Phosphate	ascorbic acid	HI 3833-050	50
	Buffer solution	–	HI 70004P	25
	Buffer solution	–	HI 70007P	25
	Buffer solution	–	HI 70010P	25
HI 3838	Formaldehyde	acid titration	HI 3838-100	110
HI 3839	Hydroxide	acid titration	HI 3839-100	110
HI 3840	Hardness LR (as $CaCO_3$)	EDTA titration	HI 3840-0.50	50
HI 3841	Hardness MR (as $CaCO_3$)	EDTA titration	HI 3841-050	50
HI 3842	Hardness HR (as $CaCO_3$)	EDTA titration	HI 3842-050	50
HI 3843	Hypochlorite (bleach)	iodometric	HI 3843-100	100
HI 3844	Hydrogen Peroxide	iodometric	HI 3844-100	100
HI 3845	Chromium VI MR/HR	iodometric	HI 3845-100	100
HI 3846	Chromium VI	diphenylcarbohydrazide	HI 3846-100	100
HI 3847	Copper	bicinchoninic	HI 3847-100	100
HI 3849	Hydrazine	p-dimethylaminobenzalgehyde	HI 3849-100	100
HI 3850	Ascorbic Acid	iodometric	HI 3850-100	100
HI 3851	Cyanuric Acid	turbidimetric	HI 3851-100	100
HI 3854	Zinc	colorimetric	HI 3854-100	100
HI 3855	Cyanide	pyridine-pyrazolone	HI 3855-100	100
HI 3856	Copper ULR (Cu LR)	bicinchoninate	HI 3856-100	100
HI 3857	Detergents (ABS/LAS)	metilene blue	HI 3857-035	35
HI 3859	Glycol (ppm)	oxidation	HI 3859-025	25
HI 3864	Phenols (ppm)	aminoantipyrine	HI 3864-100	100
HI 3873	Nitrite (NO_2^-–N)	chromotropic acid	HI 3873-100	100
HI 3874	Nitrate (NO_3^-–N)	cadmium reduction	HI 3874-100	100
HI 3875	Chlorine, free, MR	DPD colorimetric	HI 3875-100	100
HI 3879	Iodine	DPD colorimetric	HI 3879-100	100
HI 3880/HI 3880/0	pH	pH indicator	HI 3880-100	100
HI 3881	pH	pH indicator	HI 3881-100	100
HI 3881-5	pH	pH indicator	HI 3881-5	500
HI 3882	pH	pH indicator	HI 3882-200	200
HI 3886	pH	pH indicator	HI 3886-100	100

Chemical Test Kit Reagents

CODE	TEST KIT PARAMETER	CHEMICAL METHOD	REAGENT CODE	# TESTS
HI 3887	Chlorine, free	DPD colorimetric	HI 3831F-050	50
	pH + Dechlorinating Agent	pH indicator	HI 3881-010	100
	pH	pH indicator	HI 3881-100	100
HI 3888	Chlorine, total	DPD colorimetric	HI 3831T-050	50
	pH + Dechlorinating Agent	pH indicator	HI 3881-010	100
	pH	pH indicator	HI 3881-100	100
HI 3889	Iron	phenanthroline colorimetric	HI 3834-050	50
	Hardness MR (as $CaCO_3$)	titration	HI 3841	50
HI 3893	Ammonia (sea water) (NH_3–N)	nessler colorimetric	HI 3826-025	25
	Nitrite (NO_2^-–N)	chromotropic acid	HI 3873-100	100
	Nitrate (NO_3^-–N)	cadmium reduction	HI 3874-100	100
	pH	pH indicator	HI 3881-100	100
HI 3895	Nitrogen	Ned	HI 3895-010	10
	Phosphorus	ascorbic acid	HI 3895-010	10
	Potassium	tetraphenylborate	HI 3895-010	10
	pH	pH indicators	HI 3895-010	10
HI 3896	Nitrogen	Ned	HI 3896-025	25
	Phosphorus	ascorbic acid	HI 3896-025	25
	Potassium	tetraphenylborate	HI 3896-025	25
	pH	pH indicators	HI 3896-025	25
HI 3896BP	Nitrogen	Ned	HI 3896-025	25
	Phosphorus	ascorbic acid	HI 3896-025	25
	Potassium	tetraphenylborate	HI 3896-025	25
	pH	pH indicators	HI 3896-025	25
	Buffer solution	–	HI 70004P	25
	Buffer solution	–	HI 70007P	25
	Buffer solution	–	HI 70010P	25
	EC Calibration Standard	–	HI 70031P	25
	EC Calibration Standard	–	HI 70033P	25
HI 3897	Acidity, olive oil	titration with hydroxide	HI 3897-010	10
HI 3898	Chloride, absence/presence	silver nitrate titration	HI 3898	100
HI 3899BP	Dissolved Oxygen	Winkler	HI 3810-100	110
	Alkalinity (as $CaCO_3$)	phenolphthalein/bromphenol blue	HI 3811-100	110 avg.
	Carbon Dioxide	base titration	HI 3818-100	110
	Acidity (as $CaCO_3$)	methyl-orange/phenolphthalein	HI 3820-100	110
	Ammonia (sea water) (NH_3–N)	nessler colorimetric	HI 3826-025	25
	Phosphate	ascorbic acid	HI 3833-050	50
	Salinity (g/Kg)	mercuric mitrate titration	HI 3835-100	110
	Nitrite (NO_2^-–N)	chromotropic acid	HI 3873-100	100
	Nitrate (NO_3^-–N)	cadmium reduction	HI 3874-100	100
	Buffer solution	–	HI 70004P	25
	Buffer solution	–	HI 70007P	25
	Buffer solution	–	HI 70010P	25
	EC Calibration Standard	–	HI 70031P	25
	EC Calibration Standard	–	HI 70033P	25

Accessories

Checker®HC Accessories

HI 740142	1 mL graduates syringe
HI 740028	1.5 V AAA batteries (6)
HI 731318	Cloth for wiping cuvettes (4)
HI 731321	Glass cuvettes (4)
HI 731225	Cuvette cap for Checker®HC (5)
HI 93703-50	Cuvette cleaning solutions
HI 93703-54	Dried resin 100 g
HI 740230	230 mL demineralized water
HI 740227	Filter assembly
HI 740228	Filter discs (100)
HI 740226	5 mL graduated syringe
HI 740157	Plastic refilling pipette (20)
HI 740146	Pipette tip (6)
HI 740143	1 mL graduated syringe (6)
HI 740036	100 mL plastic beaker (6)
HI 740034	Cap for 100 mL beaker

Chemical Test Kit Accessories

HI 3824-99	Color cube for ammonia test kit
HI 3830-99	Color cube for bromine test kit
HI 3831-99	Color cube for chlorine test kit
HI 3832-99	Color cube for iodine test kit
HI 3833-99	Color cube for phosphate test kit
HI 3834-99	Color cube for iron test kit
HI 3874-99	Color cube for nitrate test kit
HI 740098	Carrying case for HI 3813
HI 740099	Carrying case for HI 3814
HI 740100	Carrying case for HI 3816
HI 740101	Carrying case for HI 3817
HI 740102	Carrying case for HI 3819
HI 740103	Carrying case for HI 3821
HI 740104	Carrying case for HI 3823
HI 740105	Carrying case for HI 3825
HI 740106	Carrying case for HI 3827
HI 740107	Carrying case for HI 3828
HI 740108	Carrying case for HI 3837
HI 740051P	Scissors (10)
HI 740115	Carrying case for HI 3835
HI 740132P	Spoon for dosing (10)
HI 740133	Spoon for dosing (6)

Other Recommendations

Before using these products, make sure that they are entirely suitable for your specific application and for the environment in where they are used.

Operation of these instruments may cause unacceptable interferences to other electronic equipment, thus requiring the operator to take all necessary steps to eliminate interferences.

Any variation introduced by the user to the supplied equipment may degrade the instrument's performance.

To avoid damage or burns, do not put the instrument in the microwave oven. For your safety do not use or store the instrument in hazardous environments.

Hanna Instruments reserves the right to modify the design, construction and appearance of its products without advance notice.

For additional information, contact your dealer or the nearest HANNA Customer Service Center.

To find the HANNA Office in your area, visit our web site, www.hannainst.com

HI 3833-99

HI 3834-99

CONTENTS

Testers and Monitors

Introduction

In the past, the measurement and monitoring of many important parameters was limited to the laboratory. Now, these parameters are being tested right in the field in various applications, including environmental study, agriculture, the food industry, horticulture, wastewater management, fish farming, water quality maintainence and anywhere quality and accuracy is important. HANNA has developed a large variety of testers and monitors designed to fulfill the requirements of virtually any application.

HANNA offers a vast selection of single and multiparameter testers which cover a multitude of the most important parameters: pH, ORP, conductivity, TDS, temperature, sodium, salt and relative humidity.

Testers can perform on the spot measurement quickly, accurately and inexpensively. They allow users with different backgrounds and technical training to make readings without the need of a laboratory, and without having to purchase much more expensive and complicated analytical equipment.

HANNA provides high accuracy in a single parameter tester for pH, TDS, conductivity, temperature and more. Multiparameter testers are also available, eliminating the hassle of carrying multiple testers.

These testers have easy to read LCD's and durable outer casings. They are able to measure in places with a high percentage of humidity, and low power demand allows a long battery life– no worrying about frequent battery replacement.

pH Testers

All HANNA pH testers come with a replaceable pH probe, a huge advantage over most pH testers on the market today. Clogged electrode junctions are a problem of the past with extendable cloth junctions. When the cloth is dirty from routine testing, readings become slow and instable. This is quickly fixed by simply pulling out 3 mm of cloth, and cutting off the dirty cloth.

Testers feature Automatic Temperature Compensation (ATC) and calibration at one or two points. Being pocket sized, with a narrow tip, they are ideal for measurements in small samples or test tubes.

Conductivity Testers

Conductivity testers are widely used for monitoring EC/TDS in water conditioning, reverse osmosis, cooling towers, drinking water, wastewater, laboratories, agriculture, aquaculture and aquariums, hydroponics and printing industry.

With EC/TDS selectable or fixed conversion factors, readings are made easy. HANNA conductivity testers feature an amperometric graphite conductivity probe that provides greater accuracy and repeatability in measurements because it cannot be contaminated by salt deposits in solutions. Calibration of conductivity testers is simple and it can be manually or automatically in a single point.

Measurements are automatically temperature compensated to ensure correct readings.

Salt and Water Purity Testers

The Salintest can help you monitor the concentration of sodium chloride in live fish storage tanks, tropical fish aquariums and oceanographic investigations. Measurements are performed conductivimetrically, with one point check in a standard salt solution.

Water purity testers enable users to check the purity of your distilled or demineralized water in environments such as printed circuit board washing, laundry, steam cleaning, and all areas where pure water is used. Measurement is conductivimetric.

RH Measuring Tester

Relative humidity testers from HANNA use the thin film polimer capacitance sensing method, assuring a quick and accurate reading. Readings are converted directly in RH units, meaning there is no need for estimating, charts, thermometers and no complicated calculations.

Thermometers

HANNA's thermometers are provided with a unique CAL CHECK™ function for accurate measurements every time. HANNA temperature tester sensors allow users to take measurements with extremely high accuracy in a very short amount of time. The sharp tip of the probes can easily penetrate semisolid products, making routine controls simple and quick. These testers are ideal meters for measuring temperature according to HACCP requirements.

HANNA Monitors

HANNA monitors and indicators are an ideal economical solution in applications where constant monitoring of a stationary sample is required. HANNA offers a large selection of wall-mountable monitors that cover a multitude of parameters allowing the user to choose the meter and probe that best fits their application. The multiparameter models allow the user to monitor up to three different parameters with one indicator.

Each monitor has been designed to meet specific application requirements such as in hydroponics, greenhouses, horticultural, water treatment, food preparation and processing.

At startup, indicators perform a self check to assure proper working condition. Stability indicators and HOLD functions let the user know when to take readings and freeze the readings on display for easy and accurate recording. Selected instruments in this line provide a visual alarm so the user can easily recognize if the monitored solution is out of specification for the application.

HANNA offers indicators with large backlit LCDs to give users instantaneous readings of both pH and temperature or EC and temperature with utmost clarity. Monitors are provided with automatic calibration, automatic buffer selection and automatic temperature compensation features.

HANNA's wall mounted indicators are very easy to install and work with a 12 V power supply. Many models feature interchangeable probes, so that if an application requires a particular probe it can be plugged in to the meter. All monitors have durable outer casings protecting them from high humidity environments and rain.

pH Monitors

Ideal for growers, pH monitors are supplied with advanced, non-clogging double junction pH electrodes that will withstand the most aggressive environments. Measurements are highly accurate and can be verified with manual or automatic calibration, which can be performed in one or two points.

Should the pH exceed a user selected limit, an incorporated LED will alert the user with a flashing light. This feature allows even inexperienced users to successfully monitor parameters. The LED alarm, and pH value can be set through trimmers on the instrument.

Conductivity Monitors

Conductivity indicators with different measurement ranges are available with a host of features suited for aggressive environments.

Calibration and temperature compensation can be automatic or manual, while the EC/TDS conversion factor and temperature coefficient factor (β) are user adjustable. If desired, the most common TDS constant conversion factor of 0.7 (4-4-2) can be used depending on application specific measurements. Temperature can be easily switched between Celsius and Fahrenheit. Both the direct two pin probes or graphite probes assure great accuracy and little maintenance.

ORP Monitors

HANNA has developed oxidation reduction monitors especially for swimming pool and spa facilities where specific monitoring is needed. Casings incorporate a large, bright led indicator that will flash if measurements fall below the user selected value, enhancing the control and maintenance of water.

Temperature Monitors

Few manufacturers have given any thought to providing users with a convenient way of monitoring temperature conditions in catering, refrigerators and other places that need quick monitoring. HANNA's precision thermometers can be mounted right over the samples to be measured or in refrigerators.

Temperature monitors come with HANNA's exclusive CAL CHECK™ feature. With CAL CHECK™, users can ensure the accuracy of the meter without the need for external equipment.

Food grade stainless steel probes and quick response times assure the safety and preservation of the goods monitored.

Product Spotlights

HI 98129 • HI 98130

pH/Conductivity/TDS Testers

2.8

HI 98129 and HI 98130 are waterproof testers that offer high accuracy pH, EC/TDS and temperature measurements in a single tester! No more switching between meters for your routine measurements. These floating, waterproof testers have a large easy to read, dual-level LCD and automatic shut-off. pH and EC/TDS readings are automatically temperature compensated.

Fast, efficient, accurate and portable, the Combo pH, EC/TDS and temperature tester brings you all the features you've asked for and more!

HI 98130 (Combo)

HI 98127 • HI 98128

pH/Temperature Testers

2.11

The pHep®4 and pHep®5 testers are the most advanced testers in the market today. These testers are for users that require the greatest accuracy without breaking the budget. The pHep®4 has a 0.1 pH resolution and pHep®5 reads up to 0.01 pH. Both models have BEPS as well as user selectable automatic shut-off, replacable pH electrode cartridge, stability indicator and automatic calibration.

HI 98128 (pHep 5)

HI 98120 • HI 98121

pH/ORP and ORP Testers

2.19

HI 98120 is a waterproof ORP and temperature meter while HI 98121 measures pH, ORP and temperature. The housing of these testers have been completely sealed against humidity and are designed to float.

The exposed stainless steel temperature sensor on these models facilitates faster and more accurate temperature measurement.

HI 991404 • HI 991405

pH/EC/TDS/Temperature Monitors

2.39

These microprocessor indicators continuously monitor the three most important nutrient parameters in hydroponics, greenhouses and horticultural applications.

At startup, these indicators perform a self-check to assure proper working condition. The stability indicator and HOLD function lets the user know when to take readings and freezes the reading on display for easy and accurate recording.

HI 981504

pH/TDS/Temperature Monitor

2.40

Simply install the HI 981504 above the sample to be tested, plug the monitor in and immerse the probes. pH, TDS and temperature measurements will be simultaneously displayed on three backlit LCDs.

Users can easily select the temperature unit (°C or °F) through a switch on the back panel.

The HI 1286 gel-filled pH electrode is provided with a waterproof sheath to protect the BNC connector. The unique design of the electrode provides longer life in aggressive solutions. The HI 7634 TDS probe is easy to clean and requires little maintenance. Measurements are accurate and the meter can be calibrated at one or two points for pH and at a single point for TDS. Temperature range is factory calibrated.

HI 147

Checkfridge™ Remote Sensor Thermometer

2.53

Few manufacturers have given any thought to providing the user a convenient means to monitor internal temperature conditions of a refrigerator or freezer from the outside. When contents of freezer and refrigeration units need to be monitored to ensure safety and preservation, the HI 147 is the accurate and reliable solution.

Comparison Guide

GUIDE	pH Range	EC Range	TDS Range	ORP Range	Relative Humidity Range	Salinity Range	Temperature Range(s)	0.01 pH Resolution	Automatic Calibration	Automatic EC Calibration	pH Calibration Points	EC/TDS Calibration Points	pH Buffer Sets	ATC	Waterproof	Replaceable Electrode	Cloth Extendable Junction	HOLD Function	BEPS	Auto Shut Off	Page
Multiparameter																					
HI 98129	•	•	•				°C/°F	•	•	•	2	1	2	•	•	•	•	•	•	•	2.8
HI 98130	•	•	•				°C/°F	•	•	•	2	1	2	•	•	•	•	•	•	•	2.8
HI 98204	•	•		•			°C				2	1									2.10
pH/ORP																					
HI 98127	•						°C/°F		•		2		2	•	•	•	•	•	•	•	2.11
HI 98128	•						°C/°F	•	•		2		2	•	•	•	•	•	•	•	2.11
HI 98111	•						°C	•			2			•							2.12
HI 98112	•						°C	•			2			•							2.12
HI 98113	•						°C	•			2			•							2.12
HI 981408	•										1										2.13
HI 98109	•							•			2										2.14
HI 98110	•							•			2										2.14
HI 98106	•										1						•				2.15
HI 98107	•										2						•				2.15
HI 98108	•										2			•			•				2.15
HI 98103	•							•			2										2.16
HI 99104	•							•			2					•					2.17
HI 96106	•										1										2.18
HI 96107	•										1										2.18
HI 96108	•										2			•							2.18
HI 98201				•																	2.18
HI 98120				•			°C/°F								•	•		•	•	•	2.19
HI 98121	•			•			°C/°F	•			2		2	•	•	•	•	•	•	•	2.19
EC/TDS																					
HI 98311		•	•				°C/°F			•		1		•	•			•	•	•	2.20
HI 98312		•	•				°C/°F			•		1		•	•			•	•	•	2.20
HI 98331		•					°C					1		•		•					2.21
HI 98323		•	•				°C/°F					1		•	•			•	•		2.22
HI 98324		•	•				°C/°F			•		1		•	•			•	•		2.22
HI 983311		•	•				°C							•				•		•	2.23
HI 983310			•				°C							•				•		•	2.23
HI 981409		•								•		1		•		•					2.24
HI 981410			•						•			1		•		•					2.24
HI 98300			•									1		•							2.25
HI 98301			•									1		•							2.25
HI 98302			•									1		•							2.25
HI 98303		•										1		•							2.25
HI 98304		•										1		•							2.25
HI 96301			•									1		•							2.26
HI 96302			•									1		•							2.26
HI 96303		•										1		•							2.26
HI 96304		•										1		•							2.26
Primo		•	•						•			1		•						•	2.27
Primo 2		•	•				°C		•			1		•						•	2.27
Primo 5		•	•						•			1		•						•	2.27
Primo 1			•						•			1		•						•	2.27
Primo 3			•				°C		•			1		•						•	2.27
Primo 4			•						•			1		•						•	2.27
HI 98203						•						1									2.28
TDS 1			•									1		•							2.28
HI 98202						•						1									2.29
HI 98308		•										1									2.30
HI 98309		•																			2.30
HI 98601					•																2.31

GUIDE	pH Range	EC Range	TDS Range	ORP Range	Temperature Range(s)	pH Calibration Points	pH Buffer Sets	Automatic Calibration	pH Temp. Compensation	EC Temp. Compensation	TDS Temp. Compensation	CAL CHECK®	Waterproof	HOLD Function	Backlit LCD	12 VDC Power Supply	Battery Power	Visual Alarm	Auto Shut Off	Page
Temperature																				
HI 98501					℃							•								2.32
HI 98503					℃							•								2.32
HI 98502					°F							•								2.32
HI 98504					°F							•								2.32
HI 98505					℃							•								2.32
HI 98507					℃							•								2.32
HI 98506					°F							•								2.32
HI 98508					°F							•								2.32
HI 98509					℃							•								2.33
HI 98510					°F							•								2.33
HI 151-00					℃							•							•	2.34
HI 151-01					°F							•							•	2.34
HI 98501-1					℃															2.35
HI 98509-1					℃															2.35
HI 98509-01					℃							•								2.35
HI 98509-03					℃							•								2.35
HI 98510-01					°F							•								2.35
HI 145-00					℃							•								2.36
HI 145-01					°F							•								2.36
HI 145-20					℃							•								2.36
HI 145-30					°F							•								2.36
HI 149-00					℃															2.37
HI 149-01					°F															2.37
HI 98517					℃															2.38
HI 98518					°F															2.38
Monitors																				
HI 991404	•	•	•		℃/°F	2	2	•	•	•	•		•	•	•	•				2.39
HI 991405	•	•	•		℃/°F	2	2	•	•	•	•		•	•	•	•				2.39
HI 981504/5	•		•		℃/°F	2					•				•	•				2.40
HI 981504/7	•		•		℃/°F	2					•				•	•				2.40
HI 991401	•				℃/°F	2	2	•	•				•	•	•	•				2.41
HI 981401N	•					2										•				2.42
HI 981402	•					2										•		•		2.43
HI 981400	•					2										•		•		2.44
HI 981406	•			•		2										•		•		2.45
HI 982401				•												•		•		2.46
HI 981404N	•		•			2					•					•				2.47
HI 981405N	•	•				2				•						•				2.47
HI 993301		•	•		℃/°F			•		•	•		•	•	•	•				2.48
HI 993302		•	•		℃/°F			•		•	•		•	•	•	•				2.48
HI 983301N			•								•					•				2.49
HI 983301N/5			•								•					•				2.49
HI 983302N		•								•						•				2.49
HI 983303		•								•						•		•		2.50
HI 983306			•								•					•		•		2.50
HI 983307		•								•						•		•		2.50
HI 983308			•								•					•		•		2.50
HI 983309			•								•					•		•		2.50
HI 983304		•								•						•		•		2.51
HI 983305		•								•						•		•		2.51
HI 146-00					℃												•			2.52
HI 146-01					°F												•			2.52
HI 146-99					℃												•			2.52
HI 147-00					℃												•			2.53
HI 147-01					°F												•			2.53

HI 98129 • HI 98130

pH/Conductivity/TDS Testers

- **Waterproof and designed to float**
- **Cloth, renewable junction**
- **Close proximity temperature probe**
- **Automatic Temperature Compensation**
- **Automatic 1 or 2 point pH calibration**
- **Tactile grip casings**
- **HOLD function**
- **BEPS** (Battery Error Prevention System)
- **Battery % displayed at startup**
- **Automatic shut-off**
- **Efficient two button operation**
- **Temperature in °C or °F**
  Easily switch between Celsius and Fahrenheit readouts.

HI 98129 and HI 98130 are waterproof testers that offer high accuracy pH, EC/TDS and temperature measurements in a single tester! No more switching between meters for your routine measurements. These floating, waterproof combination testers have an easy to read, LCD and an automatic shut-off. pH and EC/TDS readings are automatically temperature compensated.

These testers feature a replaceable pH electrode cartridge with an extendable cloth junction as well as an EC/TDS graphite electrode. The extendable cloth junction provides an extended electrode life and the replaceable pH cartridge means that this tester does not need to be thrown away when the pH sensor is exhausted.

The EC/TDS conversion factor is user selectable as well as the temperature compensation coefficient (β).

Fast, efficient, accurate and portable, the Combo pH, EC/TDS and temperature tester combines all the features users have requested and more!

Replaceable pH electrode cartridge

The Combo features an easy-to-replace pH electrode. The sturdy, snap-in connector means there are no pins to bend or break.

High accuracy EC/TDS graphite probe

The graphite conductivity probe provides greater accuracy because it cannot be contaminated by salt deposits in the solution. The exposed temperature sensor provides fast response times, and guarantees highly accurate temperature compensated readings.

Cloth extendable junction

When the cloth junction becomes dirty from routine testing, simply pull out 3 mm (1/8") to increase response time and stability.

HANNA instruments

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LCD Display Features

On-screen battery life

LCD indicates the percentage of battery power remaining upon startup.

HOLD function

The HOLD function "freezes" the LCD display temporarily.

Instability & ATC indicators

Ensures reliable EC and TDS measurements. ATC symbol is shown when active.

Calibrate right in our buffer solution sachets

An easy calibration can be performed right in our buffer solution sachets for the most accurate readings.

Standard or N.I.S.T buffer calibration

Automatic calibration is performed with 2 sets of memorized buffers for greater accuracy.

Adjustable temperature coefficient factor

Users can choose between different BETA (β) factors for precise temperature compensated measurements.

Adjustable TDS ratio

For measurement accuracy, users can choose between different conductivity to TDS conversion factors.

SPECIFICATIONS		HI 98129	HI 98130
Range	pH	0.00 to 14.00 pH	
	EC	0 to 3999 µS/cm	0.00 to 20.00 mS/cm
	TDS	0 to 2000 mg/L (ppm)	0.00 to 10.00 g/L (ppt)
	Temperature	0.0 to 60.0°C / 32.0 to 140.0°F	
Resolution	pH	0.01 pH	
	EC	1 µS/cm	0.01 mS/cm
	TDS	1 mg/L (ppm)	0.01 g/L (ppt)
	Temperature	0.1°C / 0.1°F	
Accuracy (@20°C)	pH	±0.05 pH	
	EC / TDS	±2% F.S.	
	Temperature	±0.5°C /±1°F	
Temperature Compensation		pH: automatic; EC/TDS: automatic with β adjustable from 0.0 to 2.4% / °C	
Calibration	pH	automatic, one or two points with two sets of standard buffers (pH 4.01 / 7.01 / 10.01 or 4.01 / 6.86 / 9.18)	
	EC / TDS	automatic, one point at 1413 µS/cm or1382 mg/L (ppm)	automatic, one point at 12.88 mS/cm or 6.44 g/L (ppt)
TDS Conversion Factor		0.45 to 1.00	
pH Electrode		HI 73127 (replaceable; included)	
Environment		0 to 50°C (32 to 122°F); RH max 100%	
Battery Type / Life		1.5V (4) / approximately 100 hours of continuous use, auto-off after 8 minutes of non-use	
Dimensions/Weight		163 x 40 x 26 mm (6.4 x 1.6 x 1.0")/100 g (3.5 oz.)	

ORDERING INFORMATION

HI 98129 (Combo) and **HI 98130** (Combo) are supplied with HI 73127 pH electrode and HI 73128 electrode removal tool, batteries and instructions.

ELECTRODES

HI 73127	Spare pH electrode for (Combo)

SOLUTIONS

HI 70004P	pH 4.01 buffer solution, 20 mL sachets (25)
HI 70006P	pH 6.86 buffer solution, 20 mL sachets (25)
HI 70007P	pH 7.01 buffer solution, 20 mL sachets (25)
HI 70009P	pH 9.18 buffer solution, 20 mL sachets (25)
HI 70010P	pH 10.01 buffer solution, 20 mL sachets (25)
HI 70030P	12.88 mS/cm buffer solution, 20 mL sachets (25)
HI 70031P	1413 µS/cm buffer solution, 20 mL sachets (25)
HI 70032P	1382 mg/L (ppm) buffer solution, 20 mL sachets (25)
HI 70038P	6.44 g/L (ppt) buffer solution, 20 mL sachets (25)
HI 70442P	1500 mg/L (ppm) buffer solution, 20 mL sachets (25)
HI 70300M	Electrode storage solution, 250 mL
HI 7061M	Electrode cleaning solution, 250 mL

ACCESSORIES

HI 73128	Electrode removal tool

For a complete list of Solutions, see the end of pH *Section 3* and Conductivity *Section 6*.

HI 98204

pH/ORP/EC/°C Field Meter

- **Four instruments in one**
- **Lightweight with handle**
- **Easy to take measurements**
- **Long battery life**

Water Test provides quick and reliable measurement of the four most important variables of water analysis: pH, ORP, conductivity and temperature.

The lightweight and compact body makes it perfect to use in the plant as well as in the field. Superior in design and construction, Water Test is made of rugged VALOX® material which offers excellent protection from typical environmental conditions.

Water Test is designed with such simplicity that even non-technical users can operate it: fill the base of Water Test with the sample to be measured, press "RANGE" to select the mode and then simply read your measurement!

The rugged construction and simple operation make Water Test ideal for water treatment analysis, wastewater tests, ecological studies, aquaculture and hydroponic applications.

ORDERING INFORMATION

HI 98204 (Water Test) is supplied with measuring compartment, batteries and instructions.

SOLUTIONS

HI 740088	Plastic vessel for sample
HI 7004M	pH 4.01 buffer solution, 250 mL
HI 7007M	pH 7.01 buffer solution, 250 mL
HI 7010M	pH 10.01 buffer solution, 250 mL
HI 7020M	200/275 mV test solution, 250 mL
HI 7031M	1413 µS/cm calibration solution, 250 mL
HI 70300M	Electrode storage solution, 250 mL
HI 7091M	Reducing solution, 250 mL
HI 7092M	Oxidizing solution, 250 mL

SPECIFICATIONS	pH	ORP	EC	°C
Range	0.0 to 14.0 pH	±1000 mV	0 to 1999 µS/cm	0.0 to 60.0°C
Resolution	0.1 pH	1 mV	1 µS/cm	0.1°C
Accuracy (@20°C/68°F)	±0.2 pH	±5 mV	±2% F.S.	±1°C
Calibration	manual, two points	factory calibrated	manual, one point	factory calibrated
Battery Type / Life	1.5V (3) / approximately 200 hours of continuous use			
Environment	0 to 50°C (32 to 122°F); RH max 95%			
Dimensions	190 x 85 x 85 mm (7.5 x 3.3 x 3.3")			
Weight	260 g (9.2 oz.)			

For a complete list of Solutions, see the end of pH *Section 3* and Conductivity *Section 6*.

pH/Temperature Testers

pHep®4 & pHep®5

Replaceable pH electrode

Electrode replacement with the stainless steel round connector means there are no pins to bend or break during replacement.

Cloth extendable junction

When the cloth junction becomes dirty from routine testing, simply pull out 3 mm (1/8") to increase response time and stability.

Exposed temperature sensor

The exposed temperature sensor provides fast response time, and its proximity to the pH electrode guarantees greater accuracy in temperature compensated readings.

- **Waterproof and designed to float**
- **Automatic Temperature Compensation**
- **Automatic calibration**
- **Tactile grip casings**
- **HOLD function**
- **Automatic shut-off**
- **Efficient two button operation**
- **Temperature in °C or °F**
- **BEPS** (Battery Error Prevention System)
- **Battery % displayed at startup**

The pHep®4 and pHep®5 testers are for users that require the greatest accuracy and features while staying economical. The pHep®4 has a 0.1 pH resolution and pHep®5 reads up to 0.01 pH.

Both models have BEPS as well as user selectable automatic shut-off, replacable pH electrode cartridge, stability indicator and automatic calibration.

Calibrate right in our buffer solution sachets

SPECIFICATIONS		HI 98127 (pHep®4)	HI 98128 (pHep®5)
Range	pH	-2.0 to 16.0 pH	-2.00 to 16.00 pH
	Temperature	-5.0 to 60.0°C / 23.0 to 140.0°F	
Resolution	pH	0.1 pH	0.01 pH
	Temperature	0.1°C / 0.1°F	
Accuracy (@20°C)	pH	±0.1 pH	±0.05 pH
	Temperature	±0.5°C /±1°F	
pH Calibration		automatic, at one or two points with two sets of standard buffers (pH 4.01 / 7.01 / 10.01 or pH 4.01 / 6.86 / 9.18)	
Temperature Compensation		automatic	
Battery Type / Life		1.5V (4) / approximately 300 hours of continuous use; auto-off after 8 minutes of non-use	
Environment		-5 to 50°C (23 to 122°F); RH max 100%	
Dimensions		163 x 40 x 26 mm (6.4 x 1.6 x 1.0")	
Weight		100 g (3.5 oz.)	

ORDERING INFORMATION

HI 98127 (pHep®4) and **HI 98128** (pHep®5) are supplied with HI 73127 pH electrode, HI 73128 electrode removal tool, batteries and instructions.

SOLUTIONS

HI 70004P	pH 4.01 buffer solution, 20 mL sachets (25)
HI 70006P	pH 6.86 buffer solution, 20 mL sachets (25)
HI 70007P	pH 7.01 buffer solution, 20 mL sachets (25)
HI 70009P	pH 9.18 buffer solution, 20 mL sachets (25)
HI 70010P	pH 10.01 buffer solution, 20 mL sachets (25)

ACCESSORIES

HI 73127	Spare electrode
HI 73128	Electrode removal tool

For a complete list of Solutions, see the end of pH *Section 3*.

HI 98111 PICCOLO® • HI 98112 PICCOLO®2 • HI 98113 PICCOLO® plus

Stick pH Tester

- **Pre-amplified electrode**
- **Narrow, replaceable probe**
- **Easy to hold and operate**

PICCOLO® is a revolutionary pH meter with a 4-in-1 amplified electrode.

Conventional pH meters are susceptible to the weak, high impedance signal which makes the electrode, connector, cable and meter vulnerable to noise, humidity and dirty environments. PICCOLO® has overcome these problems with a pre-amplified electrode delivering a strong signal to the meter. The interchangeable electrode is inexpensive, rugged and houses the pH sensor, reference system, temperature sensor and the amplifier module.

PICCOLO® with a 9 cm (3.5") electrode (HI 1280).

PICCOLO® 2 with a 16 cm (6.3") electrode (HI 1290).

PICCOLO® plus with a 16 cm (6.3") electrode (HI 1295) and temperature readout on LCD.

ORDERING INFORMATION

All PICCOLO® models are supplied complete with pH electrode, pH 4.01 and pH 7.01 buffer solution sachets, calibration screwdriver, batteries, rugged carrying case and instructions.
HI 98111 (PICCOLO®) is supplied with 90 mm (3.5") HI 1280 amplified pH electrode.
HI 98112 (PICCOLO®2) is supplied with 160 mm (6.3") HI 1290 amplified pH electrode.
HI 98113 (PICCOLO® plus) is supplied with HI 1295 amplified electrode with temperature sensor.

ELECTRODES

HI 1280	Spare pH electrode for Piccolo® polypropylene body, pre-amplified pH electrode with internal temperature sensor
HI 1290	Spare pH electrode for Piccolo®2 polypropylene body, pre-amplified pH electrode with internal temperature sensor
HI 1295	Spare pH electrode for Piccolo® plus polypropylene body, pre-amplified pH electrode with internal temperature sensor

SOLUTIONS

HI 70004P	pH 4.01 buffer solution, 20 mL sachets (25)
HI 70007P	pH 7.01 buffer solution, 20 mL sachets (25)
HI 70010P	pH 10.01 buffer solution, 20 mL sachets (25)
HI 70300M	Electrode storage solution, 250 mL
HI 7061M	Cleaning solution, 250 mL

SPECIFICATIONS	HI 98111 (PICCOLO®)	HI 98112 (PICCOLO®2)	HI 98113 (PICCOLO® plus)
Range	1.00 to 13.00 pH	1.00 to 13.00 pH	1.00 to 13.00 pH; 0.0 to 70.0°C
Resolution	0.01 pH	0.01 pH	0.01 pH; 0.1°C
Accuracy (@20°C/68°F)	±0.01 pH	±0.01 pH	±0.01 pH; ±1°C
Calibration	manual, two points		
Temperature Compensation	automatic, 0 to 70°C (32 to 150°F)		
Electrode	HI 1280	HI 1290	HI 1295
Battery Type / Life	1.5V (3) / approximately 100 hours of continuous use		
Environment	0 to 50°C (32 to 122°F); RH max 95%		
Dimensions (with electrode)	194 x 29 x 15 mm (7.6 x 1.1 x 0.6")	265 x 29 x 15 mm (10.4 x 1.1 x 0.6")	
Weight	70 g (2.5 oz.)		

For a complete list of Solutions, see the end of pH *Section 3*.

HANNA instruments

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HI 981408

Agriculture pH Stick Tester

GRO'CHEK

- **Shock-resistant casing**
- **Long probe is ideal for fertilizer solution in tanks and vats**
- **2000 hours of operation on 2 AA batteries**
- **Floating**
- **Replaceable probe**

HI 981408 has been specifically designed to address the needs of growers in hydroponics, greenhouses and nurseries.

The meter has all the features necessary to check the pH of the fertilizer solution during preparation. With a sturdy body, it also floats so that it can be quickly retrieved if accidentally dropped in the tank.

Frequent battery replacement is no longer an issue, the HI 981408 will run for 2000 hours continuously on common AA-type batteries. This translates into more than 2 years of continuous use up to 2 hours a day, seven days a week! Calibration has been simplified to one point through a dial on the front of the meter. The outer casing also incorporates a molded eye so you can hang the meter when not in use.

SPECIFICATIONS	HI 981408
Range	0.00 to 14.00 pH
Resolution	0.01 pH
Accuracy (@20°C/68°F)	±0.02 pH
Calibration	manual, one point
Electrode	HI 1219 polypropylene body pH electrode, 240 mm (9.4") long, with DIN connector (included)
Battery Type / Life	1.5V AA (2) / approximately 2000 hours of continuous use
Environment	0 to 50°C (32 to 122°F); RH max 100%
Dimensions (meter only)	86 x 94 x 33 mm (3.4 x 3.7 x 1.3")
Weight (meter only)	150 g (5.3 oz.)

ORDERING INFORMATION

HI 981408 is supplied with HI 1219 pH electrode, pH 7 buffer solution, batteries and instructions

ELECTRODES

HI 1219	Spare double junction pH electrode

SOLUTIONS

HI 70007P	pH 7.01 buffer solution, 20 mL sachets (25)
HI 70300M	Electrode storage solution, 250 mL
HI 7061M	Cleaning solution, 250 mL

For a complete list of Solutions, see the end of pH *Section 3*.

HI 98109 Skincheck™ • HI 98110 Skincheck™1

Skin pH Tester

- **Easy, non-intrusive pH measurement**
- **Fast accurate results**
- **Cable model is ideal for easy viewing and for self measurements**
- **Approximately 3000 hours of operation**
- **Replaceable probe**

The health and beauty industry has been searching for a professional product that can determine the pH value of the scalp, hair strands and skin, quickly, accurately and inexpensively.

HANNA offers Skincheck™, the first pH meter that makes it possible for you to easily measure pH in this application.

Skincheck™ measures pH in just a few seconds with a special flat-tip electrode specifically designed to measure pH on body surfaces. Skincheck™ has a measurement range that covers the full spectrum of hair and skin pH levels. Measurements are quickly displayed on the LCD with an accuracy of ±0.2 pH.

Skincheck is an absolute must for hair care specialists, beauty salons, cosmeticians, beauticians, dermatologists and the cosmetic industry.

The First Step to Healthy, Balanced Skin

ORDERING INFORMATION

HI 98109 (Skincheck™) is supplied with HI 1413S/50 pH electrode, calibration screwdriver, batteries and instructions.
HI 98110 (Skincheck™1) is supplied with HI 1413B/50 pH electrode, calibration screwdriver, batteries and instructions.

ELECTRODES

HI 1413S/50	Spare glass body pH electrode for Skincheck™ with flat tip and screw connector
HI 1413B/50	Spare glass body pH electrode for Skincheck™1 with flat tip, BNC connector and 1 m (3.3') cable
HI 740173	Protective cap for electrode

SOLUTIONS

HI 70004P	pH 4.01 buffer solution, 20 mL sachets (25)
HI 70007P	pH 7.01 buffer solution, 20 mL sachets (25)
HI 70010P	pH 10.01 buffer solution, 20 mL sachets (25)
HI 70300M	Electrode storage solution, 250 mL
HI 7061M	Cleaning solution, 250 mL

SPECIFICATIONS	HI 98109 (Skincheck™)	HI 98110 (Skincheck™)
Range	0.00 to 14.00 pH	
Resolution	0.01 pH	
Accuracy (@20°C/68°F)	±0.2 pH	
Calibration	manual, one or two points	
Electrode	HI 1413S/50 glass body pH electrode with flat tip and screw connector (included)	HI 1413B/50 glass body pH electrode with flat tip, BNC connector and 1 m (3.3') cable (included)
Battery Type / Life	1.5V (2) / approx. 3000 hours of continuous use	
Environment	0 to 50°C (32 to 122°C); RH max 95%	
Dimensions	66 x 50 x 25 mm (2.6 x 2.0 x 1.0")	
Weight (with electrode)	70 g (2.5 oz.)	90 g (3.2 oz.)

For a complete list of Solutions, see the end of pH *Section 3*.

pHep pH Tester

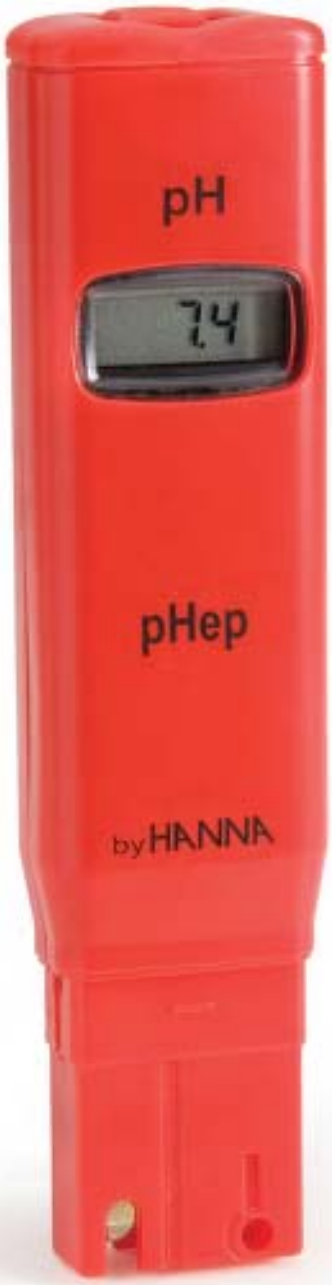
pHep®

Renewable junction

HI 98107 pHep® features an innovative, renewable cloth junction.

Guides

The max level guide lets you know how deep to submerse the probe.



- **Renewable junction**
- **Easy 1 or 2 point manual calibration**
- **700 hour battery life**
- **Simple to use**
- **Economical**

The pHep® revolutionized the pH industry by providing non-technical personnel with a simple, inexpensive solution to accurate pH measurement.

HI 98107 is used by millions of people around the world to monitor pH in laboratories and industrial applications as well as in agriculture, fish farming, food manufacturing and quality control, swimming pools and the printing industry.

With a renewable cloth junction, the pHep® has an extended life over typical pH testers. A normal junction clogs with use over time and a typical tester would normally have to be thrown away once the junction is too contaminated. HI 98107's junction is 2 cm long and when dirty, can be pulled out to expose a fresh section to effectively renew the pHep's life.

Calibration is performed manually at 1 or 2 points with a trimmer located on the side of the tester.

With a battery life of 700 hours of continuous use, the pHep® will provide years of testing before the batteries need to be replaced.

SPECIFICATIONS	HI 98106 (Champ®)	HI 98107 (pHep®)	HI 98108 (pHep®+)
Range	0.0 to 14.0 pH		
Resolution	0.1 pH		
Accuracy (@20°C/68°F)	±0.2 pH	±0.1 pH	±0.1 pH
Calibration	manual, one point	manual, two points	manual, two points
Temp. Compensation	–	–	automatic, 0 to 50°C
Battery Type / Life	1.5V (4) / approximately 800 hours of continuous use	1.5V (4) / approximately 700 hours of continuous use	1.5V (4) / approximately 200 hours of continuous use
Environment	0 to 50°C (32 to 122°F); RH max 95%		
Dimensions	175 x 41 x 23 mm (6.9 x 1.6 x 0.9")		
Weight	78 g (2.7 oz.)	95 g (3.4 oz.)	

ORDERING INFORMATION

HI 98106 (Champ®), **HI 98107** (pHep®), **HI 98108** (pHep®+) are supplied with protective cap, calibration screwdriver, batteries and instructions.

ELECTRODES

HI 73106*	Spare electrode
HI 98107-T*	Spare electrode for HI 98107

SOLUTIONS

HI 77400P	pH 4.01 and pH 7.01 buffer solution, 20 mL sachets (5 ea)
HI 70300M	Electrode storage solution, 250 mL
HI 7061M	Cleaning solution, 250 mL

* To be replaced by authorized technical personnel only.

For a complete list of Solutions, see the end of pH *Section 3*.

HI 98103

CHECKER® pH Tester

- **High accuracy with 0.01 pH resolution**
- **Two point fast and accurate calibration**
- **Usable with virtually any electrode that shares the same connector**
- **3000 hours of battery life**
- **HI 1270 small diameter probe fits easily into a test tube**

The pH Checker® series supplies users with fast and accurate readings from 0 to 14 pH with a resolution of 0.01 pH. This compact tester features an easy to read LCD and simple to perform two point calibration.

The pH electrode of the Checker® can be easily replaced. You only need to unscrew the electrode from the meter body and screw on a new one.

The Checker® is fast, accurate, lightweight and with 3000 hours of battery life, you don't have to worry about frequent battery replacement.

Testing pH has never been easier!

ORDERING INFORMATION

HI 98103 (Checker®) is supplied with HI 1270 pH electrode, batteries and instructions.

ELECTRODES

HI 1270	Plastic body, pH electrode with screw-type connector
HI 1207	Plastic body, pH electrode with screw-type connector

SOLUTIONS

HI 77400P	pH 4.01 and pH 7.01 buffer solution, 20 mL sachets (5 ea)
HI 70300M	Electrode storage solution, 250 mL
HI 7061M	Cleaning solution, 250 mL

SPECIFICATIONS	HI 98103 Checker®
Range	0.00 to 14.00 pH
Resolution	0.01 pH
Accuracy (@20°C/68°F)	±0.2 pH
Calibration	manual, two points
Electrode	HI 1270 (included)
Battery Type / Life	1.5V (2) / approximately 3000 hours of continuous use
Environment	0 to 50°C (32 to 122°F); RH max 95%
Dimensions	66 x 50 x 25 mm (2.6 x 2.0 x 1.0") - without probe
Weight	50 g (1.8 oz.) - without probe

For a complete list of Solutions, see the end of pH *Section 3*.

HANNA instruments

With Great Products, Come Great Results™

Education pH Tester

- **Accurate and economical measurements**
- **Simple calibration**
- **Long battery life**
- **Small diameter probe fits easily into a test tube**
- **Replaceable electrode**

HI 99104 is an ideal pocket tester for educational purposes.

Designed with a 0.01 pH resolution and two point manual calibration through easy to reach trimmers, it immediately displays pH variations to reflect the smallest change in the sample.

Unlike conventional testers, HI 99104 has a long and slim stem, ideal for measurements in small samples or test tubes.

HI 99104 is supplied with a rugged, plastic body electrode with a screw connector that allows for quick and easy electrode replacement.

Additionally, it's low power demand allows for 1000 hours of battery life with common 1.5V batteries.

SPECIFICATIONS	HI 99104
Range	0.00 to 14.00 pH
Resolution	0.01 pH
Accuracy (@20°C/68°F)	±0.2 pH
Calibration	manual,two points
pH Electrode	HI 1270 (included)
Battery Type / Life	1.5V (2) / approximately 1000 hours of continuous use
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	200 x 28 x 20 mm (7.9 x 1.1 x 0.8")
Weight	46 g (1.6 oz.)

ORDERING INFORMATION

HI 99104 is supplied with HI 1270 pH electrode, batteries and instructions.

ELECTRODES

HI 1270	Plastic body, pH electrode with screw-type connector

SOLUTIONS

HI 77400P	pH 4.01 and pH 7.01 buffer solution, 20 mL sachets (5 ea)
HI 70300M	Electrode storage solution, 250 mL
HI 7061M	Cleaning solution, 250 mL

For a complete list of Solutions, see the end of pH *Section 3*.

HI 96106 • HI 96107 • HI 96108

The Original pHep®

Simple, precise and rugged, the pHep® is the answer to the inaccuracy observed with litmus paper. This tester family includes 3 models:

The **HI 96106 (Champ)** is an economical pH pocket tester with manual 1 point calibration and ±0.2 pH accuracy.

The **HI 96107 (pHep)** is an economical pH pocket tester with manual 1 point calibration and ±0.1 pH accuracy.

The **HI 96108 (pHep®+)** features Automatic Temperature Compensation (ATC) and calibration at 2 points. ATC measures the temperature of the sample and compensates the pH reading relative to the temperature of the pH bulb. Precision is increased by this feature even in quick measurements.

SPECIFICATIONS	HI 96106 (Champ®)	HI 96107 (pHep®)	HI 96108 (pHep®+)
Range	0.0 to 14.0 pH	0.0 to 14.0 pH	0.0 to 14.0 pH
Resolution	0.1 pH	0.1 pH	0.1 pH
Accuracy (20°C/68°F)	±0.2 pH	±0.1 pH	±0.1 pH
Calibration	manual, one point	manual, one point	manual, two points
Temp. Compensation	–	–	automatic, 0 to 50°C
Battery Type / Life	1.5V (3) / approximately 150 hours		
Environment	0 to 50°C (32 to 122°F); RH max 95%		
Dimensions	150 x 30 x 21 mm (5.9 x 1.2 x 0.8")		
Weight	70 g (2.5 oz.)		

ORDERING INFORMATION

HI 96106 (Champ®), **HI 96107** (pHep®), **HI 96108** (pHep®+) are supplied with protective cap, calibration screwdriver, batteries and instructions.

SOLUTIONS

HI 77400P	pH 4.01 and pH 7.01 buffer solution, 20 mL sachets (5 ea)
HI 70300M	Electrode storage solution, 250 mL
HI 7061M	Cleaning solution, 250 mL

HI 98201

ORP Tester

Oxidation reduction is a process by which a molecule or ion loses or gains electrons. This occurs most readily in water treatment and in pool and spa maintenance where an oxidizer, such as chlorine, is added to the water to destroy contaminants. The higher the ORP value, the greater the sanitizing power of your water.

HI 98201 is ideal for swimming pools and spas and can provide a valuable indication of water quality. This tester utilizes a platinum electrode and HANNA unique renewable cloth junction, that can be pulled out when clogging occurs, reactivating the reference and restoring the electrode.

SPECIFICATIONS	HI 98201
Range	±999 mV
Resolution	1 mV
Accuracy (@20°C/68°F)	±5 mV
Battery Type / Life	1.5V (4) / approximately 700 hours of continuous use
Environment	0 to 50°C (32 to 122°F); RH max 95%
Dimensions (meter only)	175 x 41 x 23 mm (6.9 x 1.6 x 0.9")
Weight (meter only)	95 g (3.4 oz.)

ORDERING INFORMATION

HI 98201 (ORP) is supplied with protective cap, batteries and instructions

ELECTRODES

HI 73201	Spare ORP electrode*

SOLUTIONS

HI 7020M	ORP test solution, 200/275 mV, 250 mL
HI 7091M	Reducing solution, 250 mL
HI 7092M	Oxidizing solution, 250 mL

* To be replaced by authorized technical personnel only.

For a complete list of Solutions, see the end of pH *Section 3*.

pH/ORP and ORP Testers

HI 98120

HI 98121

- **Waterproof and it floats!**
- **HANNA's exclusive cartridge pH and ORP electrode**
- **Extendable cloth pH junction** (HI 98121)
- **Automatic Temperature Compensation** (HI 98121)
- **Automatic calibration** (HI 98121)
- **Battery % Level at startup and stability indicator**
- **HOLD function**

The HI 98120 is a waterproof ORP and temperature meter while HI 98121 measures pH, ORP and temperature. The housing of these testers have been completely sealed against humidity and are designed to float.

Electrode replacement with the stainless steel round connector means there are no pins to bend or break during replacement.

When the cloth junction becomes clogged and response time is sluggish, simply pull out 3 mm (1/8") to clear the clogging which will improve response time and stability.

The exposed stainless steel temperature sensor on these models facilitates faster and more accurate temperature measurement.

SPECIFICATIONS		HI 98120	HI 98121
Range	ORP	± 1000 mV	
	pH	–	-2.00 to 16.00 pH
	Temperature	-5.0 to 60.0°C / 23.0 to 140.0°F	
Resolution	ORP	1 mV	
	pH	–	0.01 pH
	Temperature	0.1°C / 0.1°F	
Accuracy (@20°C)	ORP	±2 mV	
	pH	–	±0.05 pH
	Temperature	±0.5°C / ±1°F	
Calibration	ORP	factory calibrated	
	pH	–	automatic, one or two points with two sets of memorized buffers (pH 4.01 / 7.01 / 10.01 or 4.01 / 6.86 / 9.18)
Temperature Compensation		–	automatic for pH readings
Electrodes		HI 73120 replaceable ORP electrode (included)	HI 73127 replaceable pH electrode (included); fixed ORP sensor
Battery Type / Life		1.5V (4) / approximately 250 hours of continuous use; auto-off after 8 minutes of non-use	
Environment		-5 to 50°C (23 to 122°F); RH max 100%	
Dimensions		163 x 40 x 26 mm (6.4 x 1.6 x 1.0")	
Weight		100 g (3.5 oz.)	

ORDERING INFORMATION

HI 98120 (ORP) is supplied with HI 73120 ORP electrode, HI 73128 electrode removal tool, batteries and instructions.
HI 98121 (ORP/pH) is supplied with HI 73127 pH electrode, HI 73128 electrode removal tool, batteries and instructions.

ELECTRODES

HI 73127	Spare pH electrode (HI 98121)
HI 73120	Spare ORP electrode (HI 98120)
HI 73128	Electrode removal tool

SOLUTIONS

HI 7004M	pH 4.01 buffer solution, 250 mL
HI 7007M	pH 7.01 buffer solution, 250 mL
HI 7010M	pH 10.01 buffer solution, 250 mL
HI 7021M	ORP test solution, 240 mV, 250 mL
HI 7022M	ORP test solution, 470 mV, 250 mL
HI 70300L	Storage solution, 460 mL

For a complete list of Solutions, see the end of pH *Section 3*.

HI 98311 • HI 98312

EC/TDS/ Temperature Testers

DiST®5 & DiST®6

- **Waterproof and it floats!**
- **High accuracy**
- **Automatic calibration and temperature compensation**
- **HOLD function**
- **BEPS** (Battery Error Prevention System)

When the original DiST® (Dissolved Solids Tester) was first introduced, conductivity and total dissolved solids measurements became easy and affordable. The DiST's ease of use, in combination with its affordability made it the standard in EC and TDS measurement. HANNA continues the standard in EC and TDS testing with the DiST®5 and DiST®6.

These testers include features such as: a replaceable graphite electrode, adjustable TDS ratio, °C or °F measurement, Automatic Temperature Compensation (ATC) with adjustable β, battery level indicator, stability indicator, automatic shut-off and automatic calibration.

The graphite conductivity electrode provides greater accuracy because it resists contamination by salt deposits in the sample.

All of these features are packed in a floating, waterproof casing. These 3-in-1 testers are unmatched in EC/TDS/ temperature measurements.

On-screen battery life

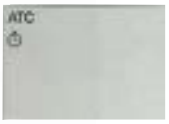
LCD indicates the percentage of battery power remaining upon startup.

Adjustable temperature coefficient

For more precise temperature compensated measurements users can choose between different BETA (β) factors.

Adjustable TDS ratio

For measurement accuracy, users can choose between different conductivity to TDS conversion factors.



Instability and ATC indicators

Ensures reliable EC and TDS measurements. ATC symbol is shown when active.

- **Replaceable graphite electrode**

An easy-to-replace graphite electrode with a sturdy, snap-in connector means there are no pins to bend or break.

SPECIFICATIONS		HI 98311 (DiST®5)	HI 98312 (DiST®6)
Range	EC	0 to 3999 µS/cm	0.00 to 20.00 mS/cm
	TDS	0 to 2000 mg/L (ppm)	0.00 to 10.00 g/L (ppt)
	Temperature	0.0 to 60.0°C / 32.0 to 140.0°F	
Resolution	EC	1 µS/cm	0.01 mS/cm
	TDS	1 mg/L (ppm)	0.01 g/L (ppt)
	Temperature	0.1°C / 0.1°F	
Accuracy (@20°C)	EC	±2% F.S.	
	TDS	±2% F.S.	
	Temperature	±0.5°C / ±1°F	
Calibration		automatic, one point at 1413 µS/cm or 1382 mg/L (ppm)	automatic, one point at 12.88 mS/cm or 6.44 g/L (ppt)
TDS Conversion Factor		adjustable from 0.45 to 1.00	
Temperature Compensation		automatic, with β adjustable from 0.0 to 2.4% / °C	
Probe		HI 73311 replaceable EC/TDS graphite electrode (included)	
Environment		0 to 50°C (32 to 122°F); RH max 100%	
Battery Type / Life		1.5V (4) / approximately 100 hours of continuous use, auto-off after 8 minutes of non-use	
Dimensions		163 x 40 x 26 mm (6.4 x 1.6 x 1.0")	
Weight		100 g (3.5 oz.)	

ORDERING INFORMATION

HI 98311 (DiST®5) and **HI 98312** (DiST®6) are supplied with HI 73311 EC/TDS probe, HI 73128 probe removal tool, batteries and instructions.

PROBES

HI 73311	Spare probe

SOLUTIONS

HI 70030P	12.88 mS/cm calibration solution, 20 mL sachets (25)
HI 70031P	1413 µS/cm calibration solution, 20 mL sachets (25)
HI 70032P	1382 mg/L (ppm) calibration solution, 20 mL sachets (25)
HI 70038P	6.44 g/L (ppt) calibration solution, 20 mL sachets (25)
HI 70442P	1500 mg/L (ppm) calibration solution, 20 mL sachets (25)

ACCESSORIES

HI 73128	Probe removal tool

For a complete list of Solutions, see the end of Conductivity *Section 6.*

HANNA instruments

With Great Products, Come Great Results™

Soil Test™ Direct Soil EC Tester

- **Replaceable 122 mm (4.5") penetration probe**
- **Automatic Temperature Compensation**
- **Lightweight and portable**

The HI 98331 Soil Test™ is a pocket tester specifically designed to directly measure soil conductivity and temperature. With a temperature sensor in the penetration probe, measurements are automatically temperature compensated.

The conductivity range can be calibrated at one point and is designed to be performed in a standardized solution.

SPECIFICATIONS		HI 98331 Soil Test™
Range	EC	0.00 to 4.00 mS/cm (dS/m)*
	Temperature	0.0 to 50.0°C
Resolution	EC	0.01 mS/cm
	Temperature	0.1°C
Accuracy (@20°C)	EC	±0.05 mS/cm (0.00 to 2.00 mS/cm), ±0.30 mS/cm (2.00 to 4.00 mS/cm)
	Temperature	±1°C
Calibration		manual, one point
Probe		HI 73331 122 mm (4.5") penetration (included)
Temperature Compensation		automatic, temperature coefficient (β) fixed 2% / °C
Environment		0 to 50°C (32 to 122°F); RH max 100%
Battery Type		1.5V (4)
Dimensions (without probe)		163 x 40 x 26 mm (6.4 x 1.6 x 1.0")
Weight		100 g (3.5 oz.)

* The meter gives indicative readings with lower accuracy be- tween 4 mS/cm and 10 mS/cm.

ORDERING INFORMATION

HI 98331 (Soil Test™) is supplied with HI 73331 penetration conductivity probe, calibration screwdriver, batteries and instructions.

PROBES

HI 73331	Direct soil conductivity probe

SOLUTIONS

HI 7031L	1413 µS/cm (1.4 mS/cm) calibration solution, 500 mL
HI 7031M	1413 µS/cm (1.4 mS/cm) calibration solution, 250 mL
HI 70031P	1413 µS/cm (1.4 mS/cm) calibration solution, 20 mL sachets (25)

ACCESSORIES

HI 731326	Calibration screwdrivers (20)

For a complete list of Solutions, see the end of Conductivity *Section 6*.

HI 98323 • HI 98324

Sample Cell EC/TDS Testers

- **Multiple ranges**
- **Automatic calibration**
- **Automatic Temperature Compensation**
- **HOLD function**
- **BEPS** (Battery Error Prevention System)
- **Battery % on Startup**

DiST® 7 & DiST® 8 handheld meters from HANNA are designed for quick and easy EC, TDS and temperature measurements with high accuracy. These waterproof instruments display EC or TDS and temperature in either °C or °F.

These meters have been developed in direct response to users' requests in water treatment, boilers, cooling towers, reverse osmosis and agricultural applications.

Rugged and easy to use, each feature an on-board sample cell with built-in funnel, digital readout, push button automatic calibration and Automatic Temperature Compensation. The EC/TDS conversion factor and temperature coefficient (β) are user adjustable for application specific measurements.

At startup DiST®7 and DiST®8 perform a self-check and then display the battery level to ensure proper working conditions. Each unit has a stability indicator and HOLD function to prompt the user when to freeze the display and take a reading for easy and accurate recording.

SPECIFICATIONS		HI 98323 (DiST®7)	HI 98324 (DiST®8)
Range	EC	0 to 3999 µS/cm	0.00 to 20.00 mS/cm
	TDS	0 to 2000 mg/L (ppm)	0.00 to 10.00 g/L (ppt)
	Temperature	0.0 to 60.0°C / 32.0 to 140.0°F	
Resolution	EC	1 µS/cm	0.01 mS/cm
	TDS	1 mg/L (ppm)	0.01 g/L (ppt)
	Temperature	0.5°C / 0.1°F	
Accuracy (@20°C)	EC	±2% F.S.	
	TDS	±2% F.S.	
	Temperature	±0.5°C / ±1°F	
Calibration		automatic, one point at 1413 µS/cm or 1382 mg/L (ppm)	automatic, one point at 12.88 mS/cm or 6.44 g/L (ppt)
TDS Conversion Factor		adjustable from 0.45 to 1.00	
Temperature Compensation		automatic, with β adjustable from 0.0 to 2.4% / °C	
Environment		0 to 50°C (32 to 122°F); RH max 100%	
Battery Type / Life		1.5V AA (4) / approximately 2000 hours of continuous use; auto-off after 8 minutes of non-use	
Dimensions		120 x 53 x 81 mm (4.7 x 2.1 x 3.2")	
Weight		205 g (7.2 oz.)	

ORDERING INFORMATION

HI 98323 (DiST®7) is supplied with calibration solution, batteries and instructions.
HI 98324 (DiST®8) is supplied with calibration solution, batteries and instructions.

SOLUTIONS

HI 70030P	12880 µS/cm calibration solution, 20 mL sachets (25)
HI 70031P	1413 µS/cm calibration solution, 20 mL sachets (25)
HI 70032P	1382 mg/L (ppm) calibration solution, 20 mL sachets (25)
HI 70038P	6.44 g/L (ppt) calibration solution, 20 mL sachets (25)
HI 70442P	1500 mg/L (ppm) calibration solution, 20 mL sachets (25)

For a complete list of Solutions, see the end of Conductivity *Section 6*.

EC/TDS and TDS Testers

- **Probe can be used as a fertilizer solution stirrer**
- **HOLD function**
- **Auto shut-off** (HI 983311)
- **No calibration needed**

HI 983311 Aqua Dip™ EC/TDS provides simple and fast EC/TDS/Temperature measurements in places with high relative humidity. Aqua Dip™ EC/TDS allows immediate and precise response with only two operation buttons. This rugged unit is tough and built to last. The probe is even durable enough to be used as a stirrer. The HOLD button will freeze the display reading for your documentation requirements. Aqua Dip™ EC/TDS is factory calibrated and offers total protection against humidity, which makes Aqua Dip™ EC/TDS ideal for field use.

To perform TDS measurements in places with a high percentages of humidity, HANNA offers the HI 983310 Aqua Dip™ TDS. This instrument indicates the TDS measurement in ppm and the temperature in °C. With 2-button operation the Aqua Dip™ TDS is simple to use. One button turns the meter on and the other switches from TDS to temperature measurements and activates the HOLD function.

SPECIFICATIONS		HI 983311 AQUA DIP™ EC/TDS	HI 983310 AQUA DIP™ TDS
Range	EC	0 to 3999 µS/cm	–
	TDS	0 to 2000 mg/L (ppm)	0 to 1999 mg/L (ppm)
	°C	0.0 to 60.0°C	0.0 to 60.0°C
Resolution	EC	1 µS/cm	–
	TDS	1 mg/L (ppm)	1 mg/L (ppm)
	°C	0.1°C	0.1°C
Accuracy (@20°C)	EC	±2% F.S.	–
	TDS	±2% F.S	±2% F.S
	°C	±0.5°C	±0.5°C
Calibration		factory calibrated	
TDS Factor		0.5 (HI 983311) or 0.7 (HI 983311/7)	0.5
Temperature Compensation		automatic, with β = 2.1% / °C	
Environment		0 to 50°C (32 to 122°F); RH max 100%	
Battery Type / Life		1.5V (2) AAA / approximately 180 hours of use	1.5V AAA (2) / approximately 1000 hours of use
Dimensions		94 x 38 x 440 mm (3.7 x 1.5 x 17.3")	
Weight		200 g (7.8 oz.)	

ORDERING INFORMATION

HI 983311 (Aqua Dip™ 0.5 TDS factor) is supplied with batteries and instructions.
HI 983311/7 (Aqua Dip™ 0.7 TDS factor) is supplied with batteries and instructions.
HI 983310 (Aqua Dip™TDS) is supplied with batteries and instructions.

For a complete list of Solutions, see the end of Conductivity *Section 6*.

HI 981409 • HI 981410

EC and TDS Testers for Fertigation Solutions

- **Lightweight and they float!**
- **Water resistant**
- **Ideal for mixing fertilizer**
- **Automatic calibration**
- **Automatic Temperature Compensation**

HI 981409 and HI 981410 TDS and EC testers have been specifically designed to address the needs of operators in hydroponics, greenhouses and nurseries.

Calibration is easy and completely automatic. Simply press and hold the on/off button for a few seconds and the meter will request the appropriate calibration solution. Place the probe in the solution and wait until it is calibrated. No extra buttons to push or dials to turn!

HI 1220 probe measures 24 cm (9.4") and can be used to mix the fertilizer solution. The meter switches off after five minutes of inactivity to save battery life. The outer casing also incorporates a molded eye so that the meter can be hung right where it is needed.

EC GRO'CHEK

TDS GRO'CHEK

ORDERING INFORMATION

HI 981409 is supplied with HI 1220 EC/TDS probe (L: 240 mm) with DIN connector and protective sheath, batteries (2) and 1500 mg/L ppm solution sachet.
HI 981410 is supplied with HI 1220 EC/TDS probe (L: 240 mm) with DIN connector and protective sheath, batteries and 5.00 mS/cm solution sachet.

ELECTRODES

HI 1220	Spare probe for HI 981409 and HI 981410

SOLUTIONS

HI 70442P	1500 mg/L (ppm calibration solution, 20 mL sachets (25)
HI 70039P	5.00 mS/cm calibration solution, 20 mL sachets (25)

SPECIFICATIONS	HI 981409	HI 981410
Range	0 to 1999 mg/L (mg/L (ppm)	0.00 to 10.00 mS/cm
Resolution	1 mg/L (mg/L (ppm))	0.01 mS/cm
Accuracy (@20°C/68°F)	±2% F.S.	
Calibration	automatic, at 1500 mg/L (ppm)	automatic, at 5.00 mS/cm
Temperature Compensation	automatic, 5 to 50°C (41 to 122°F) with β = 2%/°C	
Probe	HI 1220, replaceable EC/TDS probe, 240 mm (9.4") long, with DIN connector (included)	
Battery Type / Life	1.5V AA (2) / approximately 300 hours of continuous use; auto-off after 5 minutes of non-use	
Environment	0 to 50°C (32 to 122°F); RH max 95%	
Dimensions (meter only)	86 x 94 x 33 mm (3.4 x 3.7 x 1.3")	
Weight (meter only)	150 g (5.3 oz.)	

For a complete list of Solutions, see the end of Conductivity *Section 6.*

EC and TDS Testers

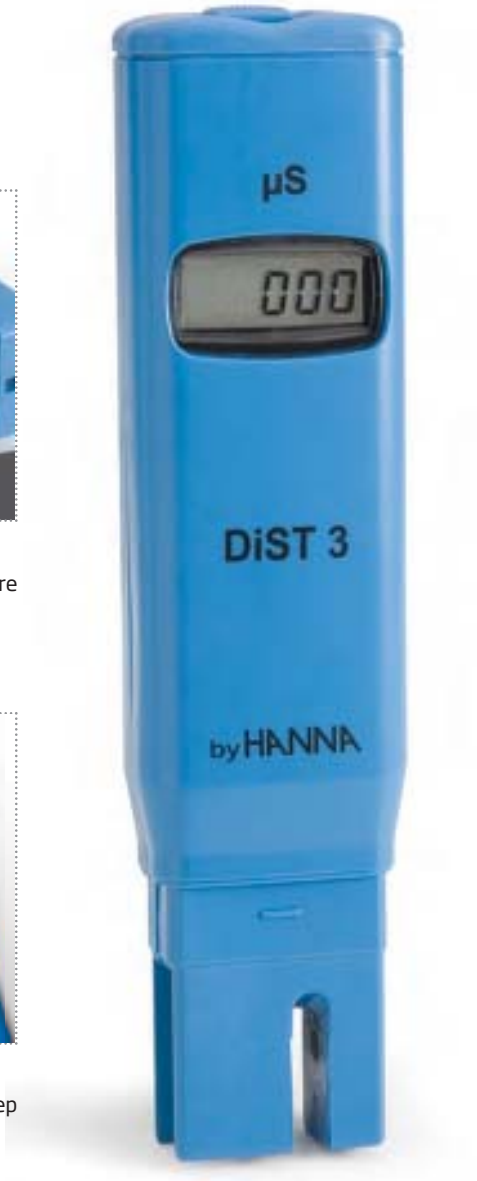
DiST®

Exposed temperature sensor

These testers feature exposed temperature sensors for faster response times.

Guides

The max level guide lets you know how deep to submerse the probe.



- **Graphite electrodes**
- **ATC**
- **Simple one point calibration**
- **Easy to use**
- **Economical**

DiST's are rugged and reliable pocket-sized testers that offer quick and accurate readings of conductivity or TDS.

The DiST® family of testers is widely used for monitoring EC/TDS in drinking water, water conditioning, reverse osmosis, cooling towers, wastewater, laboratories, agriculture, aquaculture and aquariums, hydroponics and the printing industry.

These testers feature an amperometric graphite electrode that provides better repeatability in measurements since they do not oxidize. An amperometric measurement of EC/TDS is based on Ohm's Law, I = V/R where R depends on the distance between two pins and their surface. Oxidation changes both the distance and surface which will affect accuracy. The DiST's non-oxidizing graphite pins are able to provide an optimal surface for accurate, dependable results.

When calibration is necessary, simply submerge the electrode tip into calibration solution and adjust the trimmer on the side of the tester.

SPECIFICATIONS	HI 98300 / HI 98301 (DIST® 1)	HI 98302 (DIST® 2)	HI 98303 (DIST® 3)	HI 98304 (DIST® 4)
Range	1999 mg/L (ppm)	10.00 g/L (ppt)	1999 µS/cm	19.99 mS/cm
Resolution	1 mg/L (ppm)	0.01 g/L (ppt)	1 µS/cm	0.01 mS/cm
Accuracy (@20°C/68°F)	±2% F.S.	±2% F.S.	±2% F.S.	±2% F.S.
TDS Factor	0.65 / 0.5	0.5	-	-
Calibration Solution	HI 70442 / HI 70032	HI 70038	HI 70031	HI 70039 or HI 70030
Calibration	manual, one point	manual, one point	manual, one point	manual, one point
Probe	HI 73301	HI 73302	HI 73303	HI 73304
Temperature Compensation	automatic, 0 to 50°C (32 to 122°F)			
Battery Type / Life	1.5V (4) / approx. 200 hours of continuous use			
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing			
Dimensions	175 x 41 x 23 mm (6.9 x 1.6 x 0.9")			
Weight	95 g (3.4 oz.)			

ORDERING INFORMATION

HI 98300 (DiST®1), **HI 98301** (DiST®1), **HI 98302** (DiST®2), **HI 98303** (DiST®3) and **HI 98304** (DiST®4) are supplied with protective cap, screwdriver, batteries and instructions.

ELECTRODES

HI 73301*	Spare probe for HI 98300 / HI 98301
HI 73302*	Spare probe for HI 98302
HI 73303*	Spare probe for HI 98303
HI 73304*	Spare probe for HI 98304

SOLUTIONS

HI 70030P	12.88 mS/cm calibration solution, 20 mL sachets (25)
HI 70031P	1413 µS/cm calibration solution, 20 mL sachets (25)
HI 70032P	1382 mg/L (ppm) calibration solution, 20 mL sachets (25)
HI 70442P	1500 mg/L (ppm) calibration solution, 20 mL sachets (25)
HI 70038P	6.44 g/L (ppt) calibration solution, 20 mL sachets (25)
HI 70039P	5.00 mS/cm calibration solution, 20 mL sachets (25)

* To be replaced by authorized technical personnel only.

For a complete list of Solutions, see the end of Conductivity *Section 6*.

DiST®: HI 96301 • HI 96302 • HI 96303 • HI 96304

The Original DiST®

- **Automatic Temperature Compensation**
- **Rugged casing**

For many applications, it is crucial to determine the quantity of dissolved salts in a body of water. High concentrations can cause corrosion, deposits in heating systems and can be detrimental to aquatic plant life and animals.

DiST® is an affordable pocket tester that ensures precise EC and TDS readings. Simply immerse the tester in the solution and the reading will be displayed.

HI 96301 (DiST®1) and HI 96302 (DiST®2) read in ppm, while HI 96303 (DiST®3) and HI 96304 (DiST®4) read in µS/cm.

Calibration is very simple to perform: immerse the tester in the calibration solution and adjust the trimmer on the rear of the meter until the correct value is displayed.

Automatic Temperature Compensation ensures correct readings. The digital display allows the operator to see the readings from every angle.

ORDERING INFORMATION

HI 96301 (DiST®1) is supplied with protective cap, calibration screwdriver, batteries and instructions.
HI 96302 (DiST®2) is supplied with protective cap, calibration screwdriver, batteries and instructions.
HI 96303 (DiST®3) is supplied with protective cap, calibration screwdriver, batteries and instructions.
HI 96304 (DiST®4) is supplied with protective cap, calibration screwdriver, batteries and instructions.

SOLUTIONS

HI 70031P	1413 µS/cm calibration solution, 20 mL sachets (25)
HI 70032P	1382 ppm calibration solution, 20 mL sachets (25)
HI 70038P	6.44 g/L (ppt) calibration solution, 20 mL sachets (25)
HI 70039P	5000 µS/cm calibration solution, 20 mL sachets (25)

SPECIFICATIONS	HI 96301 (DiST® 1)	HI 96302 (DiST® 2)	HI 96303 (DiST® 3)	HI 96304 (DiST® 4)
Range	1990 ppm	10000 ppm	1990 µS/cm	19900 µS/cm
Resolution	10 ppm	100 ppm	10 µS/cm	100 µS/cm
Accuracy (@20°C/68°F)	±2% F.S.			
Calibration	manual, one point, through trimmer			
Temperature Compensation	automatic, 5 to 50°C (41 to 122°F)			
Battery Type / Life	1.5V (4) / approximately 150 hours of continuous use			
Environment	0 to 50°C (32 to 122°F); RH max 95%			
Dimensions	150 x 30 x 21 mm (5.9 x 1.2 x 0.8")			
Weight	70 g (2.5 oz.)			

For a complete list of Solutions, see the end of Conductivity *Section 6*.

Conductivity and TDS Testers

- **Choose from TDS or EC**
- **Direct or cable probe connection**
- **Automatic calibration**
- **Automatic Temperature Compensation**

The Primo series of testers provide a fast and dependable way to measure the total dissolved solids or conductivity in your water samples. It is ideally suited for the rigorous demands of water quality professionals. Many professionals use the cabled version of the Primo when demonstrating the before and after results of conditioning and filtration systems.

Temperature is compensated automatically to ensure the readings are consistent to the standard or reference temperature.

Operating and routine maintenance has never been easier. Primo uses a single button at the top of the meter. Press it once and the meter is powered and ready for use. Press and hold the button for a few seconds and Primo automatically enters calibration mode. Simply open a sachet of calibration solution, dip the probe in, and within seconds the meter recognizes the calibration solution and calibrates itself!

SPECIFICATIONS	Primo	Primo 2	Primo 5	Primo 1	Primo 3	Primo 4
Range	0 to 1999 mg/L (ppm)	0 to 1999 mg/L (ppm); 0.0 to 60.0°C	0 to 1999 µS/cm	0 to 1999 mg/L (ppm)	0 to 1999 mg/L (ppm); 0.0 to 60.0°C	0.00 to 10.00 mS/cm
Resolution	1 mg/L (ppm)	1 mg/L (ppm); 0.1°C	1 µS/cm	1 mg/L (ppm)	1 mg/L (ppm); 0.1°C	0.01 mS/cm
Accuracy (@20°C/68°F)	±2% F.S.	±2% F.S.; ±0.5°C	±2% F.S.	±2% F.S.	±2% F.S.; ±0.5°C	±2% F.S.
Calibration	automatic, at 1382 mg/L (ppm)	automatic, at 1382 mg/L (ppm)	automatic, at 1413 µS/cm	automatic, at 1382 mg/L (ppm)	automatic, at 1382 mg/L (ppm)	automatic, at 5.00 mS/cm
Probe Connection	Direct	Direct	Direct	1 m (3.3') cable	1 m (3.3') cable	1 m (3.3') cable
Temperature Compensation	automatic, 0 to 60°C (32 to 140°F), β=2%/°C					
Battery Type / Life	1.5V (2) / approximately 200 hours or continuous use; auto-off after 5 minutes of non-use					
Environment	0 to 50°C (32 to 122°F); RH max 95%					
Dimensions	180 x 50 x 25 mm (7.1 x 2.0 x 1.0")			66 x 50 x 25 mm (2.6 x 2.0 x 1.0") meter only		
Weight	50 g (1.8 oz.)			115 g (4.1 oz.)		

ORDERING INFORMATION

Primo, **Primo 2** and **Primo 5** with direct probe connection are supplied with batteries and instructions.
Primo 1, **Primo 3** and **Primo 4** with 1 m (3.3') cable probe connection are supplied with batteries and instructions.

SOLUTIONS

HI 70031P	1413 µS/cm calibration solution, 20 mL sachets (25)
HI 70032P	1382 ppm calibration solution, 20 mL sachets (25)
HI 70039P	5.00 mS/cm calibration solution, 20 mL sachets (25)

For a complete list of Solutions, see the end of Conductivity *Section 6*.

TDS 1

TDS Tester

- Quick and accurate readings
- Automatic temperature compensation

Water contains a variety of minerals and salts such as carbonates, bicarbonates, chlorides and nitrate. TDS is the parameter that measures the total sum of all of these compounds.

TDS 1 is a simple and affordable tester for TDS measurements. Due to its internal sensor, TDS measurements are automatically compensated for temperature variations. Calibration can be performed in one point with a trimmer.

The tester is supplied with a cap that protects the probe when it is not in use. Batteries can be easily replaced.

Light and small, TDS 1 is an ideal pocket meter to perform quick TDS measurements.

SPECIFICATIONS	TDS 1
Range	0 to 999 mg/L (ppm)
Resolution	1 mg/L (ppm)
Accuracy (@20°C/68°F)	±2% F.S.
Calibration Solution	HI 70080P
Calibration	manual, 1 point, through trimmer
Temperature Compensation	automatic, 5 to 50°C (41 to 122°F)
Battery Type / Life	(4) 1.5V / approx. 150 hours
Environment	0 to 50°C (32 to 122°F); RH max 95%
Dimensions	150 x 30 x 21 mm (5.9 x 1.2 x 0.8")
Weight	70 g (2.5 oz.)

ORDERING INFORMATION

TDS 1 is supplied with protective cap, calibration screwdriver, batteries and instructions

SOLUTIONS

HI 70080P 800 ppm calibration solution, 20 mL sachets (25)

For a complete list of Solutions, see the end of Conductivity *Section 6*.

HI 98203 SALINTEST

Salt Content Meter

- Replaceable electrode
- Easy to handle
- Quick calibration

Worldwide, fish farming has made great strides in the past two decades, with aquaculture becoming the prime source for quality seafood. As the methods and products keep changing, one crucial factor remains the same: the necessity for salinity testing.

The main component of salt in seawater is sodium chloride. The SALINTEST can help you accurately monitor the concentration of sodium chloride in aquaculture systems. Besides applications in aquaculture, SALINTEST is also ideal for checking salt concentrations in live fish storage tanks, tropical fish aquariums, refrigerated storage and oceanographic investigations.

The SALINTEST is easy to maintain and to assure accuracy, it has one point calibration through a trimmer on the side.

SPECIFICATIONS	HI 98203 SALINTEST
Range	0.00 to 1.00 pNaCl (58.4 to 5.84 g/L (ppt) NaCl)
Resolution	0.01 pNaCl
Accuracy (@20°C/68°F)	±0.02 pNaCl
Calibration	manual, 1 point
Battery Type / Life	1.5V (4) / approximately 500 hours of continuous use
Environment	0 to 50°C (32 to 122°F); RH max 95%
Dimensions	175 x 41 x 23 mm (6.9 x 1.6 x 0.9")
Weight	95 g (3.4 oz.)

ORDERING INFORMATION

HI 98203 (SALINTEST) is supplied with protective cap, calibration screwdriver, batteries and instructions. SALINTEST is also supplied with a handy chart that converts readings into g/L of sodium chloride.

ELECTRODES

HI 73202 Spare electrode* for HI 98203

SOLUTIONS

HI 7081L 30 g/L NaCl solution, 500 mL
HI 7061M Cleaning solution, 250 mL

* to be replaced by authorized technical personnel only

For a complete list of Solutions, see ISE *Section 4*.

HANNA instruments

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pNa takes guess work out of resin regeneration!

The pNa is an easy to use and inexpensive instrument for determining water hardness or softness. The hardness of water is due to the presence of magnesium and calcium. These make washing difficult, wastes soap, and creates unpleasant scum and scale deposits. With a zeolite system, the calcium and magnesium ions are substituted on a one-to-one basis with sodium ions from a conditioning resin. Once all the sodium ions are exhausted, the resin has to be regenerated.

A common but inaccurate way to determine when to change resin is to estimate the volume of water that goes through the softener and guessing when to change the resin! Even though this may work in some cases, it fails in most since the sodium content of feed water is never constant. As a result, either the resin is regenerated too early and wastes resources, or too late, risking damage due to scaling.

With the pNa, you can measure the sodium content of feed and exit water in seconds. When the resin is exhausted of sodium, there will be no exchange and the pNa will read the same value at the two ends. Only then should the resin be changed.

SPECIFICATIONS	HI 98202 pNa
Range	0.0 to 3.0 pNa (23 to 0.023 g/L (ppt) Na^+)
Resolution	0.1 pNa
Accuracy (@20°C/68°F)	±0.2 pNa
Calibration	manual, one point
Battery Type / Life	1.5V (4) / approximately 800 hours of continuous use
Environment	0 to 50°C (32 to 122°F); RH max 95%
Dimensions	175 x 41 x 23 mm (6.9 x 1.6 x 0.9")
Weight	95 g (3.4 oz)

ORDERING INFORMATION

HI 98202 (pNa) is supplied with protective cap, calibration screwdriver, batteries and instructions.

ELECTRODES

HI 73202* Spare electrode for HI 98202

SOLUTIONS

HI 7080L 2.3 g/L Na+ solution, 500 mL
HI 7061M Cleaning solution, 250 mL

* to be replaced by authorized technical personnel only

For a complete list of Standard Solutions, see the end of ISE *Section 4*. For Cleaning and Maintenance, see the end of pH *Section 3*.

HI 98308 PWT • HI 98309 UPW

Water Purity Testers

- **Exposed temperature probe for fast response**
- **Graphite sensors for reduced polarization**
- **Replaceable probes**

Pure Water Test (PWT) enables users to check the purity of your distilled or demineralized water in laboratory or industrial environments. Ultra Pure Water (UPW) is an ideal tester for MΩ checks.

PWT is suited for fields such as printed circuit board washing, laundry, steam cleaning, checking car battery water and all areas where distilled, demineralized or pure water is used. UPW is the first pure water tester to measure in 1/1000ths of micro-Siemens (µS) and provides fast, on the spot checks for minute traces of contamination in your water.

These testers are housed in a durable case that provides excellent protection against harsh industrial environments.

RESISTANCE OF DISTILLED/UPW	EQUIVALENT DEIONIZED WATER READING
1 MΩ	1.000 µS/cm
2 MΩ	0.500 µS/cm
5 MΩ	0.200 µS/cm
10 MΩ	0.100 µS/cm
15 MΩ	0.067 µS/cm
20 MΩ	0.050 µS/cm

SOME TYPICAL CONVERSIONS OF MEASUREMENTS PERFORMED WITH PWT		
µS/CM READING	RESISTIVITY	mg/L NaCl
99.9	10 KΩ	48
10	100 KΩ	4.6
1	1 MΩ	0.4
0.1	10 MΩ	0.02

ORDERING INFORMATION

HI 98308 (PWT) and **HI 98309** (UPW) are supplied with protective cap, calibration screwdriver (HI 98308), batteries and instructions.

ELECTRODES

HI 73308 Spare probe* for HI 98308
HI 73309 Spare probe* for HI 98309

SOLUTIONS

HI 70033P 84 µS/cm calibration solution, 20 mL sachets (25)

* to be replaced by authorized technical personnel only

SPECIFICATIONS	HI 98308 PWT	HI 98309 UPW
Range	0.0 to 99.9 µS/cm	0.000 to 1.999 µS/cm
Resolution	0.1 µS/cm	0.001 µS/cm
Accuracy (@20°C/68°F)	±2% F.S.	
Calibration	manual, one point	factory calibrated
Temperature Compensation	automatic, 0 to 50°C (32 to 122°F) with β=2%/°C typical	–
Battery Type / Life	1.5V (4) / approximately 250 hours of continuous use	1.5V (4) / approximately 120 hours of continuous use
Environment	0 to 50°C (32 to 122°F); RH max 95%	
Dimensions	175 x 41 x 23 mm (6.9 x 1.6 x 0.9")	
Weight	95 g (3.4 oz.)	

For a complete list of Solutions, see the end of Conductivity *Section 6*.

HYGROCHECK® Relative Humidity Tester

Pocket-Sized for Easy Transport

The HANNA HYGROCHECK® uses the advanced TFPC* sensing method to measure humidity and an integrated electronic circuit to perform all relative conversions. This method of Relative Humidity measurement assures a quick and accurate readings. With a complete measurement range of 10% to 90% RH and an accuracy of 3% across the entire range, HYGROCHECK® is the most complete and versatile pocket-sized Hygrometer available!

Most hygrometers on the market are too large or heavy to be carried around with other instruments for on-the-spot testing. The pocket-sized HYGROCHECK® is only 180 x 30 x 15 mm (7.1 x 1.2 x 0.6") and weighs just 62 grams (2.2 oz.). This compact, rugged unit will slip right into your pocket to be carried anywhere!

The housing is constructed of durable ABS material and the LCD is protected behind a transparent plastic cover. The LCD displays the RH reading which can be read from any angle. Also, a vented cap protects the sensor while allowing maximum airflow for fast response.

No Conversions Necessary

Unlike traditional hygrometers, HANNA's HYGROCHECK® performs all relative conversions electronically. NO charts, NO estimating, NO broken thermometers, NO human error! This unit measures RH in seconds without the limitations associated with traditional hygrometers.

(*Thin Film Polymer Capacitance)

SPECIFICATIONS	HI 98601 HYGROCHECK®
Range	10.0 to 90.0% RH
Resolution	0.1% RH
Accuracy (@20°C/68°F)	±3% F.S.
Response Time	Up to 20 seconds for 95% accuracy
Battery Type / Life	1.5V (3)/ approximately 100 hours of continuous use
Environment	0 to 50°C (32 to 122°F); RH 95%
Dimensions	180 x 30 x 15 mm (7.1 x 1.2 x 0.6")
Weight	62 g (2.2 oz.)

ORDERING INFORMATION

HI 98601 (HYGROCHECK®) is supplied complete with batteries, soft carrying case and instruction manual.

ACCESSORIES

HI 740203	Soft carrying case

HI 98501 • HI 98502 • HI 98505 • HI 98506

Checktemp® Electronic Digital Thermometer

- **±0.3°C accuracy**
- **CAL CHECK®**
- **Ideal for spot checks**
- **Fast and accurate results**

If you ever wished that your temperature measurements could be made a little easier, the Checktemp® might just be what you're looking for! The Checktemp® offers high accuracy over a wider range without worrying about breakage or condensation.

The Checktemp® offers NO breakage, NO waste, NO injuries, NO difficulty in reading; not even a parallax error by taking a wrong measurement due to the angle of view!

Checktemp® is provided with HANNA's unique CAL CHECK™ function for accurate measurements every time: simply activate a switch and the instrument will simulate an ice bath of 0.0°C (32.0°F) signal that is displayed on the LCD within a range of ±0.3°C (±0.5°F).

The sharp-tip probe of the Checktemp® easily penetrates semisolid products, making routine controls simple and quick for both incoming and outgoing goods. Checktemp® is the ideal instrument for measuring temperature according to HACCP requirements.

Checktemp® L models feature a round tip probe for liquid measurements and safety.

Models with factory calibration certificate against NIST standards are also available.

ORDERING INFORMATION

HI 98501 (Checktemp®C) is supplied with penetration probe, protective cap, battery and instructions.
HI 98503 (Checktemp®C) is supplied with penetration probe, protective cap, battery, factory calibration certificate and instructions.
HI 98502 (Checktemp®F) is supplied with penetration probe, protective cap, battery and instructions.
HI 98504 (Checktemp®F) is supplied with penetration probe, protective cap, battery, factory calibration certificate and instructions.
HI 98505 (Checktemp®LC) is supplied with liquid probe, protective cap, battery and instructions.
HI 98507 (Checktemp®LC) is supplied with liquid probe, protective cap, battery, factory calibration certificate and instructions.
HI 98506 (Checktemp®LF) is supplied with liquid probe, protective cap, battery and instructions.
HI 98508 (Checktemp®LF) is supplied with liquid probe, protective cap, battery, factory calibration certificate and instructions.

SPECIFICATIONS	HI 98501/ HI 98503 (Checktemp®C)	HI 98502/ HI 98504 (Checktemp®F)	HI 98505/ HI 98507 (Checktemp®LC)	HI 98506/ HI 98508 (Checktemp® LF)
Range	-50.0 to 150.0°C	-58.0 to 302.0°F	-50.0 to 150.0°C	-58.0 to 302.0°F
Resolution	0.1°C	0.1°F (58.0 to 199.9°F); 1°F (200 to 302°F)	0.1°C	0.1°F (58.0 to 199.9°F); 1°F (200 to 302°F)
Accuracy	±0.3°C (-20 to 90°C) ±0.5°C (outside)	±0.5°F (-4 to 194°F) ±1°F (outside)	±0.3°C (-20 to 90°C) ±0.5°C (outside)	±0.5°F (-4 to 194°F) ±1°F (outside)
Probe	fixed, stainless steel probe; 105 x ø 3 mm (penetration)	fixed, stainless steel probe; 105 x ø 3 mm (penetration)	fixed, stainless steel probe; 105 x ø 3 mm (liquid)	fixed, stainless steel probe105 x ø 3 mm (liquid)
Battery Type / Life	1.5V / approximately 3000 hours of continuous use			
Environment	0 to 50°C (32 to 122°F); RH max 95%			
Dimensions	66 x 50 x 25 mm (2.6 x 2.0 x 1.0")			
Weight	50 g (1.8 oz.) - meter only			

HANNA instruments

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HI 740024
Base for Checktemp®1 optional

- **±0.3°C accuracy**
- **Stainless steel probe with sharp tip for semi-solids**
- **CAL CHECK®**
- **Ideal for HACCP requirements**

The Checktemp®1 is a high accuracy thermometer with a 1 m (3.3') flexible cable between the meter and the stainless steel probe. The sharp-tip penetration probe easily penetrates semisolid products such as fruits, vegetables, and cheeses. This probe can also handle liquid, air and measurements in frozen materials. These thermometers utilize a NTC thermistor sensor to measure the temperature. Thermistors make it possible to obtain extremely high accuracy in a very short period of time.

The HANNA CAL CHECK® feature has been incorporated into the Checktemp®1. Activate the "test" switch and this device will simulate an ice bath of 0.0°C (32.0°F) signal that is displayed on the LCD within a range of ±0.3°C (±0.5°F). This assures the user that the reading is reliable and accurate, every time.

Checktemp®1 makes routine controls fast and simple for both incoming and outgoing goods. Constructed of AISI 316 stainless steel material, this probe is in compliance with food regulations making it an ideal instrument for measuring temperature according to HACCP requirements.

The Checktemp®1 is ideal to check the temperature of meat

SPECIFICATIONS	HI 98509 Checktemp®1C	HI 98510 Checktemp®1F
Range	-50.0 to 150.0°C	-58.0 to 302.0°F
Resolution	0.1°C	0.1°F
Accuracy	±0.3°C (-20 to 90°C) / ±0.5°C (outside)	±0.5°F (-4 to 194°F) / ±1°F (outside)
Probe	stainless steel probe with 1 m (3.3') cable; 160 x dia 3 mm (6.3 x dia 0.1")	
Battery Type / Life	1.5V AAA / approximately 3 years of use	
Environment	0 to 50°C (32 to 122°F); RH max 95%	
Dimensions	106 x 58 x 19 mm (4.2 x 2.3 x 0.7")	
Weight	80 g (2.8 oz.) - meter only	

ORDERING INFORMATION

HI 98509 (Checktemp®1 C) is supplied with battery and instructions
HI 98511 (Checktemp®1 C) is supplied with battery, factory calibration certificate and instructions
HI 98510 (Checktemp®1 F) is supplied complete with battery and instructions
HI 98512 (Checktemp®1 F) is supplied complete with battery, factory calibration certificate and instructions.

ACCESSORIES

HI 740024P Base for Checktemp® 1

HI 151

Folding Pocket Thermometer

- **±0.3°C accuracy**
- **CAL CHECK®**
- **Stainless steel folding probe with penetration tip**
- **Enables angled measurement**
- **Ergonomic**
- **Auto shut-off**

The folding Checktemp®4 provides practical temperature measurement for the food service industry.

Special attention was given to the ergonomic form of Checktemp®4. This thermometer fits comfortably and securely in your hand. The LCD on the side of the handle is easy to see and read. The fast responding, fold-away probe is made of high quality, stainless steel and can penetrate semi-frozen and semi-solid foods like meats, ice cream and cheeses. When you are finished using your Checktemp®4, wipe the probe clean and fold it away. Checktemp®4 automatically turns OFF so you can safely carry it in your pocket.

CAL CHECK®

As you unfold the stainless steel probe, the Checktemp® 4 automatically turns ON and immediately performs a calibration test. This unique HANNA feature, CAL CHECK®, provides the security of knowing you have accurate measurements. CAL CHECK® also lets you know if your battery level is low or if your meter requires recalibration.

SPECIFICATIONS	HI 151-00 (Checktemp®4C)	HI 151-01 (Checktemp®4F)
Range	-50.0 to 220°C	-58.0 to 428°F
Resolution	0.1°C (-50.0 to 199.9°C); 1°C (200 to 220°C)	0.1°F (-58.0 to 199.9°F); 1°F (200 to 428°F)
Accuracy	±0.3°C ±1 digit (-20.0 to 90.0°C); ±1% F.S. ±1 digit (outside)	±0.5°F ±1 digit (-4.0 to 194.0°F); ±1% F.S. ±1 digit (outside)
Calibration Check	automatic, at start-up	
Probe	stainless steel probe with penetration tip; 117 x dia 3.5 mm (4.6 x dia 0.14")	
Battery Type / Life	1.5V AA / approximately 25,000 hours of continuos use; auto-off after 8 minutes of non-use	
Environment	0 to 50°C (32 to 122°F); RH max 95%	
Dimensions	165 x 50 x 20 mm (6.5 x 2.0 x 0.8")	
Weight	100 g (3.5 oz.)	

ORDERING INFORMATION

HI 151-00 (Checktemp®4 C) is supplied complete with battery and instructions
HI 151-01 (Checktemp®4 F) is supplied complete with battery and instructions
HI 151-001 (Checktemp®4 C) is supplied complete with calibration certificate, battery and instructions
HI 151-011 (Checktemp®4 F) is supplied complete with calibration certificate, battery and instructions
HI 151-02 (Checktemp®4 C) ±0.5°C accuracy, without CAL CHECK is supplied complete with battery and instructions

HI 98501-1 • HI 98509-1

±1°C Accuracy Pocket Thermometers

HI 98501-1 and HI 98509-1 are two models with the same technical characteristics, but designed for different applications.

HI 98501-1 is a compact meter with direct probe that is suitable for temperature measurements in semisolid samples and liquid testing.

HI 98509-1 is provided with a probe and a 1 m (3.3') cable, that allows easy measurements in hard-to-reach locations. In addition, the large LCD immediately displays the temperature value, making routine monitoring simple and fast.

These pocket thermometers are the closest digital alternative to traditional glass thermometers.

SPECIFICATIONS	HI 98501-1	HI 98509-1
Range	-50.0 to 150.0°C	
Resolution	0.1°C	
Accuracy	±1°C	
Probe	stainless steel probe; 105 mm x dia 3 mm (4.1 x dia 0.1")	stainless steel probe with 1 m (3.3') cable; 160 mm x dia 3 mm (6.3 x dia 0.12")
Battery Type / Life	1.5V / approximately 3000 hours of use	1.5V AAA / approximately 3 years of use
Environment	0 to 50°C (32 to 122°F); RH max 95%	
Dimensions	66 x 50 x 25 mm (2.6 x 2.0 x 1.0")	106 x 58 x 19 mm (4.2 x 2.3 x 0.7")
Weight	50 g (1.8 oz.) - meter only	80 g (2.8 oz.) - meter only

ORDERING INFORMATION

HI 98501-1 and **HI 98509-1** are supplied with battery and instructions

HI 98509-01 • HI 98509-03 • HI 98510-01

Weighted Probe Precision Thermometer

Checktemp® Dip is an accurate thermometer measuring from -20 to 100°C (-4 to 212°F). The stainless steel probe with a flexible 3 m (9.9') cable is weighted so that it can be dipped into any vat or tank to measure the temperature at different depths. Due to its hygienic stainless steel probe, it is ideal for food applications, especially to check the temperature inside wine casks and milk tanks.

Checktemp® Dip can also be used for applications such as fish farms, water reservoirs and pools where the operator can simply stand on the edge of the water and throw the probe over.

In addition, you can check to make sure that your thermometer is measuring the right temperature with HANNA exclusive CAL CHECK® technology. The battery life is a remarkable 3 years with a normal AAA battery.

SPECIFICATIONS	HI 98509-01	HI 98509-03	HI 98510-01
Range	-20.0 to 100.0°C		-4.0 to 212°F
Resolution	0.1°C		0.1°F (-4 to 199.9°F) / 1°F (200 to 212°F)
Accuracy	±0.5°C (-20 to 50°C) / ±0.9°C (outside)		±0.9°F (-4 to 122°F) / ±2°F (outside)
Probe	stainless steel weighted probe and 3 m (9.9') cable	flat probe	stainless steel weighted probe and 3 m (9.9') cable
Battery Type / Life	1.5V AAA / approximately 3 years of use		
Environment	0 to 50°C (32 to 122°F); RH 95% Max		
Dimensions	106 x 58 x 19 mm (4.1 x 5.2 x 0.7")		
Weight	80 g (2.8 oz.)		

ORDERING INFORMATION

HI 98509-01 (Checktemp®Dip C), °C, is supplied with weighted probe and 3 m (9.9') cable (fixed), battery and instructions.
HI 98509-03 (Checktemp®Dip C), °C, is supplied with flat probe and 3 m (9.9') cable (fixed), battery and instructions.
HI 98510-01 (Checktemp®Dip F), °F, is supplied with weighted probe and 3 m (9.9') cable (fixed), battery and instructions.

HI 145

T-Shaped Thermometer

- ±0.3°C accuracy
- T-shaped body for easy reading
- Two probe lengths available
- CAL CHECK®
- Ideal for semi-solids, deep fryers and soup preparation
- Exceptionally long battery life of over a year

HI 145 thermometers were developed for HACCP programs that need high standards of performance with simplicity of use. The durable T-shaped handle fits comfortably in hand and is ideal for applications where applied force is necessary for insertion, such as with incoming meat inspection and semi-frozen foods. The LCD positioned on top of the meter allows for easy reading in cooking applications.

HI 145-00 and **HI 145-01** are equipped with a 125 mm (5") long AISI 316 stainless steel probe. The sharp conical tip provides fast response and improved accuracy over the entire range.

HI 145-20 and **HI 145-30** are supplied with a 300 mm (12") long stainless steel probe; ideal for monitoring hot liquids, such as deep frying and soup preparation.

With an automatic CAL CHECK® feature, the HI 145 series performs a self check of its calibration status and displays it on the LCD. This feature ensures accuracy, repeatability and confidence in readings.

HI 145-20 (°C) – HI 145-30 (°F):
Stainless steel probe
300 x dia 5 mm

HI 145-00 (°C) – HI 145-01 (°F):
Stainless steel probe
125 x dia 5 mm

SPECIFICATIONS	HI 145-00	HI 145-01	HI 145-20	HI 145-30
Range	-50.0 to 220°C	-58.0 to 428.0°F	-50.0 to 220°C	-58.0 to 428.0°F
Resolution	0.1°C (-50.0 to 199.9°C); 1°C (200 to 220°C)	0.1°F (-58.0 to 199.9°F); 1°F (200 to 428°F)	0.1°C (-50.0 to 199.9°C); 1°C (200 to 220°C)	0.1°F (-58.0 to 199.9°F); 1°F (200 to 428°F)
Accuracy	±0.3°C (-20 to 90°C); ±0.4% F.S. (outside)	±0.6°F (-4 to 194°F); ±0.4% F.S. (outside)	±0.3°C (-20 to 90°C) ±0.4% F.S. (outside)	±0.6°F (-4 to 194°F); ±0.4% F.S. (outside)
Probe	stainless steel probe; 125 mm x dia 5 mm (4.9 x dia 0.2")		stainless steel probe; 300 mm x dia 5 mm (11.8 x dia 0.2")	
Battery Type / Life	1.5V AAA / approximately 10,000 hours of continuous use; auto-off after 8 minutes of non-use			
Environment	-10 to 50°C (14 to 122°F); RH max 95%			
Dimensions	92 x 165 x 38 mm (3.6 x 6.5 x 1.5")		92 x 340 x 38 mm (3.6 x 13.4 x 1.5")	
Weight	65 g (2.3 oz.)		80 g (2.8 oz.)	

ORDERING INFORMATION

All models of the HI 145 series are supplied complete with battery and instructions
HI 145-00 with 125 mm probe
HI 145-01 with 125 mm probe
HI 145-20 with 300 mm probe
HI 145-30 with 300 mm probe

HANNA instruments

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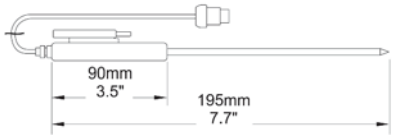
High Temperature Thermometer

- **Interchangeable probes**
- **Designed for the food industry**

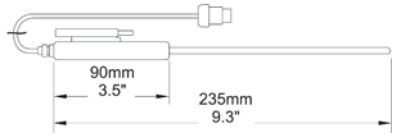
HI 149 is a pocket thermometer for routine checks in the food industry. It provides an extensive measurement range from -40°C to 300°C (-40 to 572°F). With a user replaceable probe, it can be employed in an equally wide range of applications. Users have a choice of four probes specifically manufactured to measure the temperature of liquids, air, surface, solids and semi-solids. This way, users can match the probe to the application as well as change probes without requiring calibration.

4 Probes available

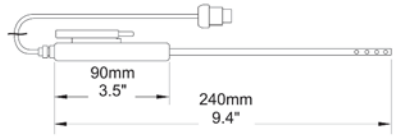
PROBE EPW
Penetration Probe



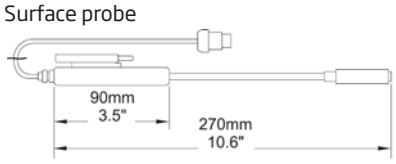
PROBE ELW
Probe for general use/liquids



PROBE ECW
Probe for air and gas



PROBE EMW
Surface probe



SPECIFICATIONS	HI 149-00	HI 149-01
Range	-40 to 300°C	-40 to 572°F
Resolution	1°C	1°F
Accuracy	±2°C	±4 °F
Probe	interchangeable, stainless steel probe with 1 m cable (not included)	
Battery Type / Life	1.5V (3) / approximately 700 hours of continuous use	
Environment	0 to 50°C (32 to 122°F); RH max 95%	
Dimensions	106 x 68 x 21 mm (4.2 x 2.7 x 0.8)	
Weight	80 g (2.8 oz.)	

ORDERING INFORMATION

HI 149-00, °C readings, is supplied with batteries and instructions
HI 149-01, °F readings, is supplied with batteries and instructions

PROBES (at least 1 required)

PROBE EPW Penetration probe
PROBE ELW General purpose/liquid probe
PROBE ECW Air/gas probe
PROBE EMW Surface probe

HI 98517 KEY® °C • HI 98518 KEY® °F

KEY® Pocket Thermometer

- **Ideal for spot measurements**
- **Five interchangeable stainless steel probes available**

The KEY® is a thermometer with an interchangeable probe for quick spot measurements. With a response time of less than 20 seconds in water, KEY® is ideal for quality control and industrial temperature monitoring.

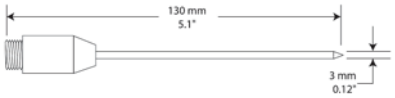
Five interchangeable temperature probes are available to meet specific requirements. Each probe is constructed out of rugged AISI 316 stainless steel, which resists the harmful effects of chemicals and humidity.

In the HVAC field, gas and air can be monitored with the HI 98517-11 probe. The HI 98517-13 probe is for penetration and is included with the meter. It also provides a fast response typical of a thermocouple probe. HI 98517-15 and HI 98517-30 probes are for general liquid monitoring. The HI 98517-12 being a surface probe is made for machine shops, molding facilities and welding surfaces.

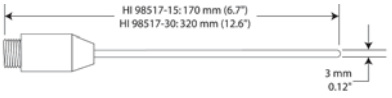
The KEY® is a K-Type Thermocouple

5 Probes available

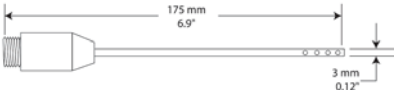
HI 98517-13
penetration/general purpose
K-type thermocouple probe supplied with KEY®. *Application: liquid, air/gas, penetration of semisolids.*



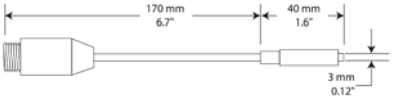
HI 98517-15 and HI 98517-30
liquid/general purpose
K-type thermocouple probe for KEY®. *Application: liquids, air/gas.*



HI 98517-11
air/gas
K-type thermocouple probe for KEY®. *Application: air/gas.*



HI 98517-12
surface
K-type thermocouple probe for KEY®. *Application: solids, plates, furnaces, molds.*



ORDERING INFORMATION

HI 98517 (KEY®C) and **HI 98518** (KEY®F) are supplied with HI 98517-13 probe, batteries and instructions.
HI 98517-00 (KEY®C) is supplied with batteries and instructions (without probe).

PROBES

HI 98517-11	K-thermocouple probe for air/ gas
HI 98517-12	K-thermocouple probe for surfaces
HI 98517-13	K-thermocouple probe for penetration
HI 98517-15	K-thermocouple probe for liquid/general purpose, length 170 mm (6.7")
HI 98517-30	K-thermocouple probe for liquid/general purpose, length 320 mm (12.6")

SPECIFICATIONS	HI 98517 (KEY®C)	HI 98518 (KEY®F)
Range	-40 to 550°C	-40 to 999°F
Resolution	1°C	1°F
Accuracy	±2°C	±4°F
Response Time	approximately 20 seconds in water with HI 98517-13 probe (included)	
Battery Type / Life	1.5V (4) / approximately 700 hours of continuous use	
Environment	0 to 50°C (32 to 122°F); RH max 95%	
Dimensions (meter only)	175 x 41 x 23 mm (6.2 x 1.4 x 0.8")	
Weight	78 g (3.0 oz.)	

pH/EC/TDS/Temperature Monitors

- **Waterproof**
- **Adjustable TDS ratio and adjustable β**
- **Stability indicator and HOLD**

These indicators continuously monitor the three most crucial nutrient parameters in hydroponic, greenhouse and horticultural applications.

At startup, these indicators perform a self-check to assure proper working condition. The stability indicator and HOLD function lets the user know when to take readings and freezes the reading on display for easy and accurate recording.

These instruments are supplied with a non-clogging double junction pH electrode as well as a rugged conductivity probe that will withstand even the most aggressive environments. The 12 VDC adapter makes these instruments ideal for all continuous monitoring applications.

SPECIFICATIONS		HI 991404	HI 991405
Range	pH	0.0 to 14.0 pH	0.0 to 14.0 pH
	EC	0 to 3999 µS/cm	0.00 to 20.00 mS/cm
	TDS	0 to 2000 mg/L (ppm)	0.00 to 10.00 g/L (ppt)
	Temperature	0.0 to 60.0°C / 32.0 to 122.0°F	0.0 to 60.0°C / 32.0 to 122.0°F
Resolution	pH	0.1 pH	0.1 pH
	EC	1 µS/cm	0.01 mS/cm
	TDS	1 mg/L (ppm)	0.01 g/L (ppt)
	Temperature	0.1°C (o 0.1°F)	0.1°C (0.1°F)
Accuracy (@20°C/68°F)	pH	±0.1 pH	
	EC/TDS	±2% F.S.	
	Temperature	±0.5°C (±1°F)	
Temperature Compensation		pH: automatic; EC/TDS: automatic with β adjustable from 0.0 to 2.4%/°C	
pH Calibration		pH: automatic, one or two points with auto-buffer recognition	
EC/TDS Calibration		automatic, one point at 1413 µS/cm or 1382 ppm	automatic, one point at 12.88 mS/cm or 6.44 g/L (ppt)
pH Electrode		HI 1293 PEI body, pre-amplified pH electrode with 1/2" NPT pipe thread, DIN connector and 2 m (6.6') cable (included);	
EC/TDS Probe		HI 7630 conductivity probe with 1/2" NPT pipe thread and 2 m (6.6') cable(fixed)	
TDS Conversion Factor		adjustable from 0.45 to 1.00	
Environment		0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Input Impedance		10^{12} Ohm	
Power Supply		12 VDC adapter (included)	
Dimensions / Weight (meter only)		160 x 105 x 31 mm (6.3 x 4.1 x 1.2) / 190 g (6.7 oz.)	

ORDERING INFORMATION

HI 991404-01 (115V) and **HI 991404-02** (230V) is supplied with HI 1293 pH electrode, HI 7630 EC probe (fixed), HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 70031 1413 µS/cm calibration solution sachet, 12 VDC adapter and instructions.

HI 991405-01 (115V) and **HI 991405-02** (230V) is supplied with HI 1293 pH electrode, HI 7630 EC probe (fixed), HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 70030 1288 mS/cm calibration solution sachet, 12 VDC adapter and instructions.

ELECTRODES

HI 7630	Conductivity probe with 1/2" NPT pipe thread and 2 m (6.6') cable*
HI 1293	PEI body, pre-amplified pH electrode with 1/2" NPT pipe thread, DIN connector and 2 m (6.6') cable

SOLUTIONS

HI 70004P	pH 4.01 buffer solution, 20 mL sachets (25)
HI 70007P	pH 7.01 buffer solution, 20 mL sachets (25)
HI 70010P	pH 10.01 buffer solution, 20 mL sachets (25)
HI 70030P	12.88 mS/cm calibration solution, 20 mL sachets (25)
HI 70031P	1413 µS/cm calibration solution, 20 mL sachets (25)
HI 70032P	1382 ppm calibration solution, 20 mL sachets (25)
HI 70038P	6.44 g/L (ppt) calibration solution, 20 mL sachets (25)
HI 70442P	1500 ppm calibration solution, 20 mL sachets (25)
HI 70300M	Electrode storage solution, 250 mL
HI 7061M	Probe cleaning solution, 250 mL

* to be replaced by authorized technical personnel only

For a complete list of Solutions, see the end of pH *Section 3* and Conductivity *Section 6*.

HI 981504

pH/TDS/Temperature Monitor

- **Simultaneous display of pH, TDS and temperature**
- **Continuous measurements**
- **Measure in °C or °F**
- **Three, backlit displays**

Set-up is simple. Install the HI 981504 near the sample to be tested, plug the indicator in and immerse the probes. pH, TDS and temperature measurements will be simultaneously displayed on three backlit LCDs.

Users can easily select the temperature unit (°C or °F) on the back panel.

The HI 1286 gel-filled pH electrode is provided with a waterproof sleeve to protect the BNC connector. The unique design of the electrode provides longer life in aggressive solutions. The HI 7634 TDS probe is easy to clean and requires little maintenance. Measurements are accurate and the meter can be calibrated at one or two points for pH and at a single point for TDS. Temperature is factory calibrated.

ORDERING INFORMATION

HI 981504/5-01 (115V) and **HI 981504/5-02** (230V) are supplied with HI 1286 pH electrode, HI 7634 TDS probe (fixed), temperature probe (fixed), HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 70032 1382 ppm calibration solution sachet, HI 700661 electrode cleaning solution sachet (2), screwdriver, 12 VDC adapter and instructions.

HI 981504/7-01 (115V) and **HI 981504/7-02** (230V) are supplied with HI 1286 pH electrode, HI 7634 TDS probe (fixed), temperature probe (fixed), HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 70442 1500 ppm calibration solution sachet, HI 700661 electrode cleaning solution sachet (2), screwdriver, 12 VDC adapter and instructions.

ELECTRODES

HI 1286	PEI body pH electrode with BNC connector and 2 m (6.6') cable

SOLUTIONS

HI 70004P	pH 4.01 calibration solution, 20 mL sachets (25)
HI 70007P	pH 7.01 calibration solution, 20 mL sachets (25)
HI 70032P	1382 ppm calibration solution, 20 mL sachets (25)
HI 70442P	1500 ppm calibration solution, 20 mL sachets (25)
HI 70300M	Electrode storage solution, 250 mL
HI 7061M	Probe cleaning solution, 250 mL

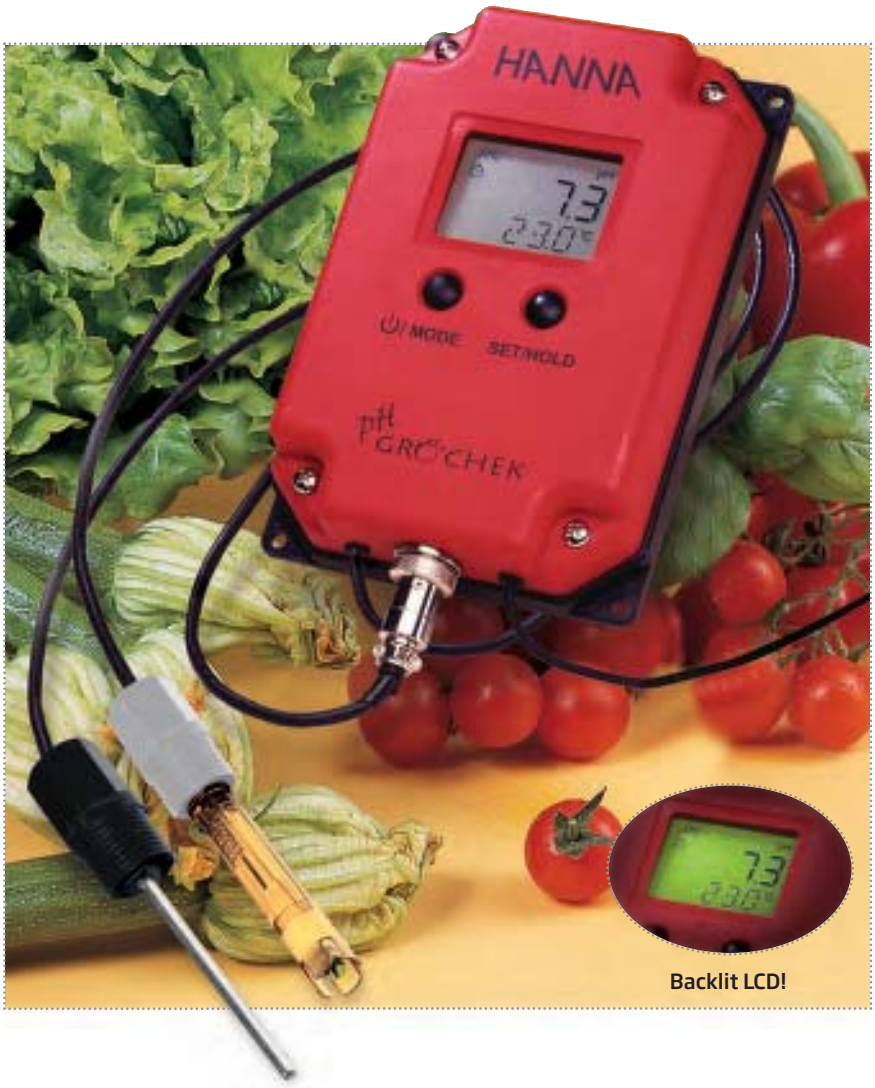
ACCESSORIES

HI 731326	Calibration screwdriver, (20)

SPECIFICATIONS	HI 981504/5	HI 981504/7
Range	pH: 0.0 to 14.0; TDS: 0 to 1990 ppm; temperature: -10.0 to 60.0°C or -14.0 to 140.0°F	
Resolution	pH: 0.1; TDS: 10 ppm; temperature: 0.1°C or 0.1°F	
Accuracy	pH: ±0.2; TDS: ±2% F.S.; temperature: ±0.3°C or ±0.5°F	
pH Calibration	manual two points through trimmers	
TDS Calibration	manual one point through trimmer	
TDS Factor	0.5	0.7
Probes	pH: HI 1286 PEI body pH electrode with 2 m (6.6') cable (included); TDS: HI 7634 TDS probe (fixed); temperature: stainless steel with 2 m cable (fixed)	
Temperature Compensation	automatic, 5 to 50°C (41 to 122°F), for TDS readings only	
Power Supply	12 VDC adapter (included)	
Environment	0 to 50°C (32 to 122°F); 95% RH	
Dimensions/Weight	160 x 110 x 35 mm (6.3 x 4.3 x 1.4")/560 g (1.2 lbs.)	

For a complete list of Solutions, see the end of pH *Section 3* and Conductivity *Section 6*.

pH and Temperature Monitor



- **Waterproof**
- **Measure in °C or °F**
- **Stability indicator**
- **HOLD function**
- **Backlit display**

This indicator from HANNA has a large backlit LCD to give users instantaneous readings of both pH and temperature that can be easily read in dim light. The HI 991401 provides automatic calibration, automatic buffer selection and automatic temperature compensation.

HI 991401's waterproof housing has been designed to meet the growers' need for an indictor that is well suited to withstand the aggressive environments found in agricultural and hydroponics applications. Measurements are highly accurate and can be verified with one or two point calibrations. With a 12 VDC power supply included with the meter, low battery failures are never an issue.

The pH electrode has been specially designed to address the needs of growers. It's design guarantees greater clogging resistance in fertilizer solutions with high concentrations of phosphate, nitrate, etc. to ensure longer electrode life.

SPECIFICATIONS		HI 991401
Range	pH	0.0 to 14.0 pH
	Temperature	0.0 to 60.0°C (32.0 to 140.0°F)
Resolution	pH	0.1 pH
	Temperature	0.1°C (0.1°F)
Accuracy (@20°C/68°F)	pH	±0.1 pH
	Temperature	±0.5°C (±1°F)
Probes		HI 1293 PEI body, pre-amplified pH electrode with 1/2" NPT pipe thread, DIN connector and 2 m (6.6') cable (included); HI 1294 temperature probe with 1.2" NPT pipe thread and 2 m (6.6') cable (fixed)
pH Calibration		automatic, one or two points with two sets of memorized buffers (pH 4.01/ 7.01/10.01 or pH 4.01/6.86/9.18)
Temperature Compensation		automatic
Input Impedance		10^{12} Ohm
Power Supply		12 VDC adapter (included)
Environment		0 to 50°C (32 to 122°F); RH max 95%
Dimensions		160 x 105 x 31 mm (6.3 x 4.1 x 1.2)
Weight		190 g (6.7 oz.) - meter only

ORDERING INFORMATION

HI 991401-01 (115V) and **HI 991401-02** (230V) are supplied with HI 1293 pH electrode, HI 1294 temperature probe (fixed), HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, 12 VDC power adapter and instructions.

ELECTRODES

HI 1293	PEI body, pre-amplified pH electrode with 1/2" NPT pipe thread, DIN connector and 2 m (6.6') cable
HI 1294	Temperature probe with 1/2" NPT pipe thread and 2 m (6.6') cable*

SOLUTIONS

HI 70004P	pH 4.01 buffer solution, 20 mL sachets (25)
HI 70007P	pH 7.01 buffer solution, 20 mL sachets (25)
HI 70010P	pH 10.01 buffer solution, 20 mL sachets (25)
HI 77400P	pH 4 and pH 7 solution, (10) 20 mL sachets, (5) each
HI 70300L	Electrode storage solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL

*Replaceable by technical personnel only.

For a complete list of Solutions, see the end of pH *Section 3*.

HI 981401N

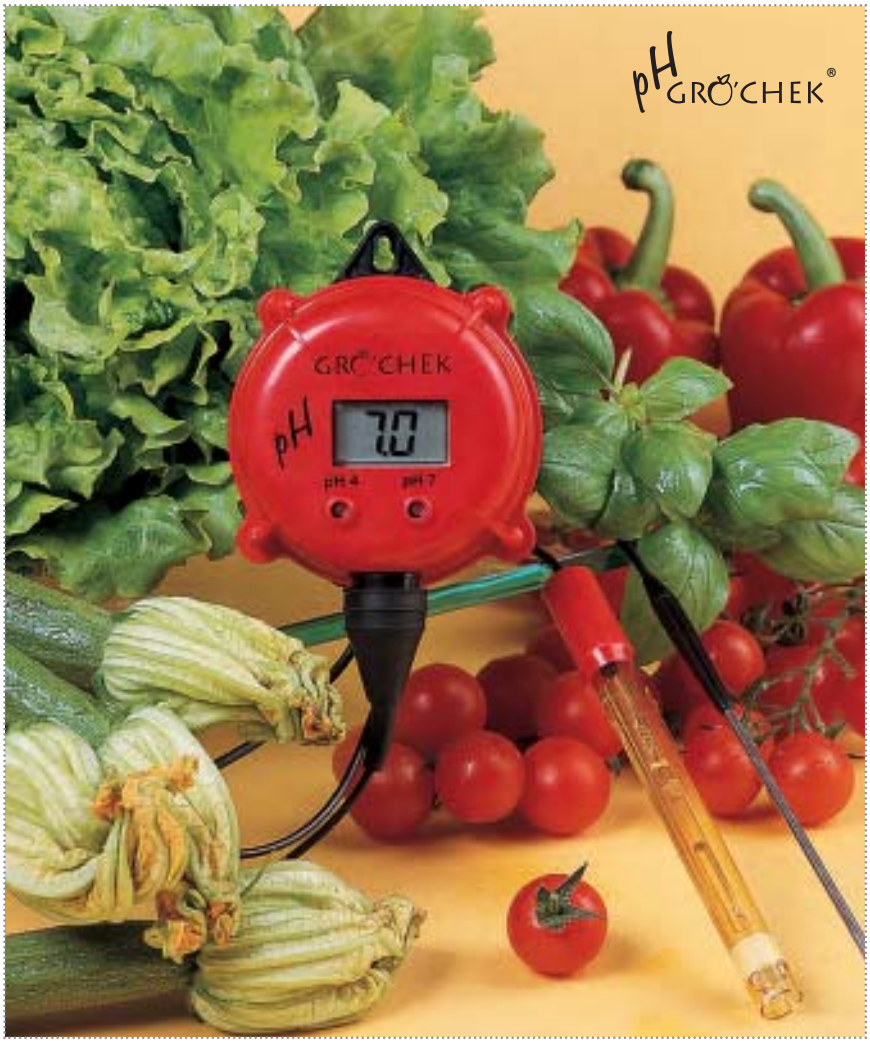
pH Indicator

- **Water resistant**
- **One or two point calibration**
- **Electrode clog resistance**

The pH indicator HI 981401N has been designed to meet the grower's need for equipment suited to the aggressive environments found in agricultural and hydroponics applications. The housing is water resistant and features a molded eye which allows installation right above the sample to be monitored.

Measurements are highly accurate and can be verified with two point calibration. With a 12 VDC power supply included with the meter, low battery failures are never an issue. The electrode is interchangeable and the connector is well protected behind a waterproof sleeve. The meter is supplied with a stainless steel probe, preventing potential grounding problems and ensuring extended electrode life.

The gel-filled pH electrode has been specially designed to address the needs of growers. Its design guarantees greater clogging resistance in fertilizer solutions with high concentrations of nutrients such as phosphate and nitrate.



ORDERING INFORMATION

HI 981401N-01 (115V) and **HI 981401N-02** (230V) are supplied with HI 1286 pH electrode, HI 1283 stainless steel grounding bar, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, calibration screwdriver, 12 VDC adapter and instructions.

ELECTRODES

HI 1286	PEI body pH electrode with BNC connector and 2 m (6.6') cable
HI 1283*	Stainless steel grounding bar with 2 m (6.6') cable

SOLUTIONS

HI 70004P	pH 4.01 buffer solution, 20 mL sachets (25)
HI 70007P	pH 7.01 buffer solution, 20 mL sachets (25)
HI 70010P	pH 10.01 buffer solution, 20 mL sachets (25)
HI 70300L	Electrode storage solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL

*Replaceable by technical personnel only.

Grounding pin prevents electrical noise (from light, motors, pumps, etc...) from interfering with readings.

SPECIFICATIONS	HI 981401N
Range	0.0 to 14.0 pH
Resolution	0.1 pH
Accuracy (@20°C/68°F)	±0.2 pH
Calibration	manual two point, at pH 4 and 7
pH Electrode	HI 1286 PEI body pH electrode with 2 m (6.6') cable (included); HI 1283 stainless steel grounding bar with 2 m (6.6') cable (included)
Input Impedance	10^{12} Ohm
Power Supply	12 VDC power adapter (included)
Environment	0 to 50°C; RH max 100%
Dimensions	86 x 110 x 43 mm (3.4 x 4.3 x 1.7 ")
Weight	150 g (5.3 oz.)

For a complete list of Solutions, see the end of pH *Section 3*.

pH Indicator

- **Water resistant**
- **LED alarm**
- **Clog-resistant electrode**

HI 981402 is a water resistant pH meter with a built-in digital LCD. The meter is supplied with the HI 1286 double junction, plastic-body, gel-filled combination pH electrode with a flexible 2 m (6.6') cable. The electrode also has a unique clog resistant PTFE junction that enhances both probe life and accuracy. The BNC connector is protected by a waterproof sleeve.

The alarm set point can be selected anywhere in the 3 to 11 pH range. A red LED warns the user in the event the reading is outside the set point by more than ±0.5 pH. Calibration can be manually performed at two points through two easily accessible trimmers on the front of the unit.

The HI 981402 is suited for outdoor installations and highly humid conditions. The molded eye allows the meter to be installed close to the sample and the 12 VDC power supply is ideal for continuous monitoring for extended periods of time.

SPECIFICATIONS	HI 981402
Range	0.0 to 14.0 pH
Resolution	0.1 pH
Accuracy (@20°C/68°F)	±0.2 pH
Calibration	manual, one or two points
Set Point	adjustable from 3.0 to 11.0 pH
Alarm	red LED (blinks when pH reading differs from the set point more than ±0.5 pH)
pH Electrode	HI 1286 PEI body pH electrode with 2 m (6.6') cable (included)
Input Impedance	10^{12} Ohm
Power Supply	12 VDC adapter (included)
Environment	0 to 50°C (32 to 122°F); RH max 100%
Dimensions	86 x 110 x 43 mm (3.4 x 4.3 x 1.7")
Weight	150 g (5.3 oz.)

ORDERING INFORMATION

HI 981402-01 (115V) and **HI 981402-02** (230V) is supplied with HI 1286 pH electrode, calibration screwdriver, 12 VDC power adapter and instructions.

ELECTRODES

HI 1286	PEI body pH electrode with BNC connector and 2 m (6.6') cable

SOLUTIONS

HI 70004P	pH 4.01 buffer solution, 20 mL sachets (25)
HI 70007P	pH 7.01 buffer solution, 20 mL sachets (25)
HI 70010P	pH 10.01 buffer solution, 20 mL sachets (25)
HI 70300L	Electrode storage solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL

For a complete list of Solutions, see the end of pH *Section 3*.

HI 981400

HACCP Compliant pH Meter and Indicator

- **HACCP compliant**
- **Water resistant**
- **LED alarm**
- **Clog resistant electrode**

pH is monitored at different stages of food preparation and processing to guarantee safety, improve production and enhance quality. The pH of raw ingredients such as milk and meat is measured to ensure that standards have been properly met. Along with temperature and water activity, pH also affects the shelf-life of foodstuffs. For example, by bringing the pH value below 4.5, pathogen growth is inhibited.

HI 981400 is a compact and affordable indicator designed to check the pH of food. It has a molded eye for convenient positioning above a QC bench, or at the goods-in area. An ideal pH value can be set between 4.0 and 7.5 pH through a trimmer on the back of the unit. Should the pH exceed this user selectable limit, an incorporated LED will alert the user with a flashing light. This important feature permits pH control to be delegated to inexperienced operators.

ORDERING INFORMATION

HI 981400-01 (115V) and **HI 981400-02** (230V) are supplied with HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, calibration screwdriver, 12 VDC adapter and instructions.

ELECTRODES

FC 200B	PVDF body pH electrode for food and HACCP, with BNC connector and 1 m (3.3') cable
FC 230B	PVDF body pH electrode for meat, with BNC connector and 1 m (3.3') cable
FC 098	Stainless steel blade for meat penetration, 20 mm (for use with FC 230B)
FC 099	Stainless steel blade for meat penetration, 35 mm (for use with FC 230B)

SOLUTIONS

HI 70004P	pH 4.01 buffer solution, 20 mL sachets (25)
HI 70007P	pH 7.01 buffer solution, 20 mL sachets (25)
HI 70010P	pH 10.01 buffer solution, 20 mL sachets (25)
HI 70300L	Electrode storage solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL

SPECIFICATIONS	HI 981400
Range	0.0 to 14.0 pH
Resolution	0.1 pH
Accuracy (@20°C/68°F)	±0.2 pH
Calibration	manual, one or two points at pH 4 and pH 7
Set Point	adjustable from 4.6 to 7.5 pH
Alarm	red LED (blinks when pH reading > set point)
Input Impedance	10^{12} Ohm
Power Supply	12 VDC adapter (included)
Environment	0 to 50°C (32 to 122°F); RH max 100%
Dimensions	86 x 110 x 43 mm (3.4 x 4.3 x 1.7")
Weight	150 g (5.3 oz.)

For a complete list of electrodes, see pH food specific electrode section, pages 3.81 to 3.86

For a complete list of Solutions, see the end of pH *Section 3*.

pH and ORP Indicator

Grounding pin prevents electrical noise (from light, motors, pumps, etc...) from interfering with readings.

- **LED alarm signals**
- **Continuous monitoring**
- **Displays pH and mV simultaneously**
- **Adjustable set points**

HI 981406 has been specially designed for water treatment and swimming pool applications where both pH and ORP need to be monitored. Instead of sourcing two meters, users can now continuously measure both pH and ORP with HI 981406.

There are two separate adjustable set points for pH and ORP. Once the pH set point is exceeded, the appropriate LED light will come on to alert the operator. Likewise, once the ORP level drops below the set point, the red ORP light will stay on.

HI 981406 is supplied with HI 1283 ground probe. The HI 1283 ground probe provides users with more reliable readouts by suppressing current effects, which are found in pools. The optional HI 2114P/2 pH electrode and HI 3214P/2 ORP electrode are designed specifically for swimming pools. Both probes are constructed with a specially designed fiber salt-bridge making each particularly resistant to clogging in pools.

SPECIFICATIONS		HI 981406
Range	pH	0.0 to 14.0 pH
	ORP	±999 mV
Resolution	pH	0.1 pH
	ORP	1 mV
Accuracy (@20°C/68°F)	pH	±0.2 pH
	ORP	±5 mV
pH Calibration		manual, one or two points
Set Points		pH: adjustable from 5.0 to 9.0 pH; ORP: adjustable from 350 to 850 mV
Alarms		2 red LEDs (1 for pH and 1 for ORP), light up for pH value > set point and/or ORP value < set point
Probes		HI 1283 stainless steel grounding bar with 2 m (6.6') cable (included) HI 2114P/2 PEI body pH electrode with BNC connector and 2 m (6.6') cable (not included); HI 3214P/2 PEI body ORP electrode with platinum sensor, BNC connector and 2 m (6.6') cable (not included);
Input Impedance		10^{12} Ohm
Power Supply		12 VDC adapter (included)
Environment		0 to 50°C (32 to 122°F); RH max 95%
Dimensions		165 x 110 x 35 mm (6.5 x 4.3 x 1.4")
Weight		300 g (10.6 oz.)

ORDERING INFORMATION

HI 981406-01 (115V) and **HI 981406-02** (230V) are supplied with HI 1283 grounding bar, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, calibration screwdriver, 12 VDC adapter and instructions.

ELECTRODES

HI 2114P/2	PEI body pH electrode with BNC connector and 2 m (6.6') cable
HI 3214P/2	PEI body ORP electrode with platinum sensor, BNC connector and 2 m (6.6') cable
HI 1283	Stainless steel grounding bar with 2 m (6.6') cable*

SOLUTIONS

HI 70004P	pH 4.01 buffer solution, 20 mL sachets (25)
HI 70007P	pH 7.01 buffer solution, 20 mL sachets (25)
HI 77400P	pH 4.01 and pH 7.01 buffer solution, 20mL sachets, (10, 5 ea)
HI 7020L	ORP test solution 200/275 mV, 500 mL
HI 7091L	Pretreatment reducing solution, 500 mL
HI 7092L	Pretreatment oxidizing solution, 500 mL
HI 70300L	Storage solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL
HI 70000P	Rinse solution 20 mL sachets (25)

*Replaceable by technical personnel only.

For a complete list of Solutions, see the end of pH *Section 3*.

HI 982401

ORP Indicator

- **Continuous ORP monitoring**
- **Visual LED alarm**
- **Platinum electrode available**
- **Water resistant**

HI 982401 is an easy to operate, continuous monitor for ORP (oxidation reduction potential) measurements. It has been produced for monitoring swimming pools, spas and research facilities where ORP specific monitoring is needed.

This monitor measures from -999 to +999 mV in the ORP range. Operators can also set the ORP level at which their application will produce the best results.

The HI 982401's front case incorporates a large, bright LED indicator. Should the measurements fall below the user set ORP values, the red LED flashes and alerts the operator to the undesired condition. Even from a distance, operators can check for status readings.

Thanks to its compact size of 9 cm (3.3") diameter, HI 982401 with its electrode HI 3214P/2, can be mounted in confined spaces and right next to the vat or barrel containing the sample. This casing also incorporates a molded eye so that it can be easily mounted with a single screw.

Pronto ORP

ORDERING INFORMATION

HI 982401-01 (115V) and **HI 982401-02** (230V) is supplied with screwdriver, 12 VDC power adapter and instructions.

ELECTRODES

HI 3214P/2	PEI body ORP electrode with platinum sensor, BNC connector and 2 m (6.6') cable

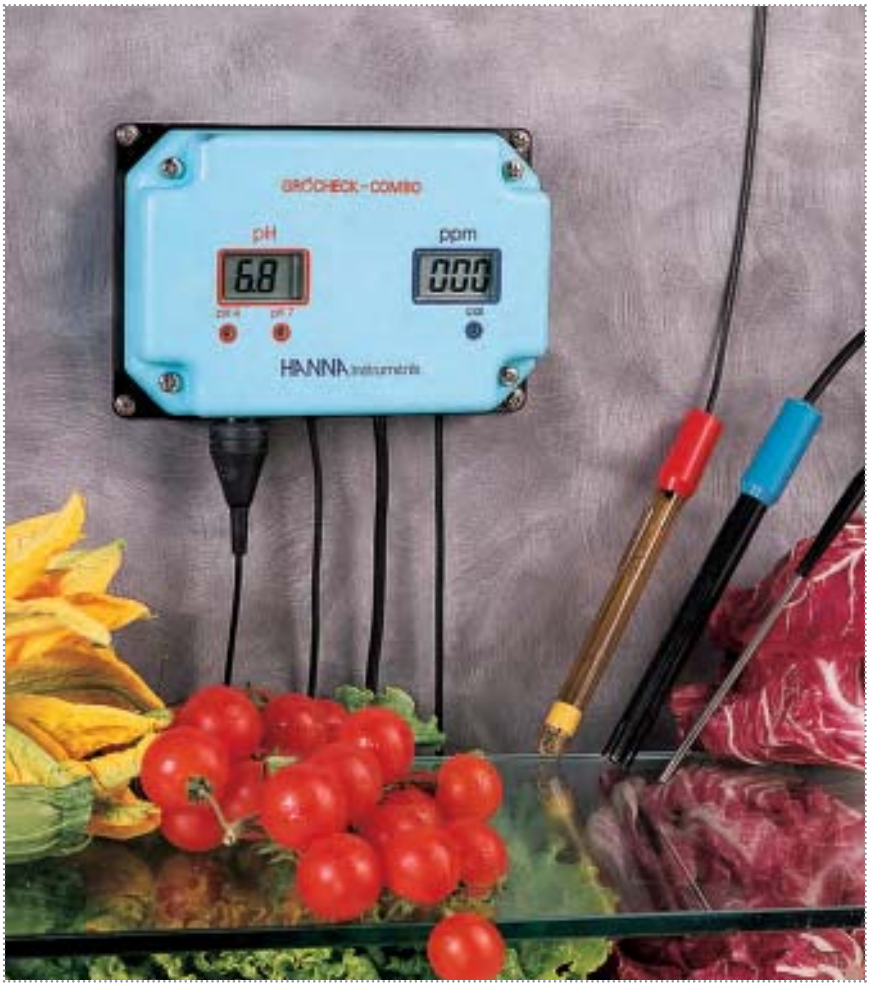
SOLUTIONS

HI 7020M	ORP test solution 200/275 mV, 230 mL
HI 7091L	Pretreatment reducing solution, 500 mL
HI 7092L	Pretreatment oxidizing solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL

SPECIFICATIONS	HI 982401
Range	±999 mV
Resolution	1 mV
Accuracy (@20°C/68°F)	±5 mV
Calibration	factory calibrated
Set Point	adjustable from 350 to 850 mV
Alarm	red LED; blinks for ORP value < set point
ORP electrode	HI 3214P/2 PEI body ORP electrode with platinum sensor, BNC connector and 2 m (6.6') cable (not included);
Input impedance	10^{12} Ohm
Power supply	12 VDC adapter (included)
Environment	0 to 50°C; RH. max 100%
Dimensions	86 x 110 x 43 mm (3.4 x 4.3 x 1.7")
Weight	150 g (5.3 oz.)

For a complete list of Solutions, see the end of pH *Section 3*.

pH & TDS or EC Continuous Indicators



- **Two parameters with a single instrument**
- **Advanced electrode technology**
- **Simple operation and maintenance**
- **Supplied complete and ready to use**

HI 981404N and HI 981405N are ideal for agricultural, horticultural and hydroponics applications where pH and TDS (HI 981404N) or pH and EC (HI 981405N) levels need to be continuously monitored for optimal plant growth. These instruments continuously monitor and display the values of a solution on an easy to read set of LCD's.

The HI 1286 gel filled pH electrode is replaceable and the BNC connector is protected behind a waterproof sleeve. The unique design of the electrode guarantees greater clogging resistance in fertilizer solutions with high concentrations of phosphate, nitrate, etc. TDS measurements are performed using the 4-4-2 conversion factor of 0.7 so you do not need to convert the readings.

Both models are equipped with a grounding bar to ensure highly accurate pH readings and longer electrode life.

The HI 981404N and HI 981405N are compact and easy to install and use making them ideal for all continuous monitoring applications.

GRÓ'CHEK®

SPECIFICATIONS	HI 981404N	HI 981405N
Range	0.0 to 14.0 pH; 0 to 1990 mg/L (ppm)	0.0 to 14.0 pH; 0.00 to 9.99 mS/cm
Resolution	0.1 pH; 10 mg/L (ppm)	0.1 pH; 0.01 mS/cm
Accuracy (@20°C/68°F)	±0.2 pH; ±2% F.S.	±0.2 pH; ±2% F.S.
Calibration	manual at one or two points (pH); manual at one point (TDS)	manual at one or two points (pH); manual at one point (EC)
Temperature Compensation	automatic from 5 to 50°C (41 to 122°F) (TDS only)	automatic from 5 to 50°C (41 to 122°F) (EC only)
TDS Conversion Factor	0.7 ppm = 1 µS/cm	-
Probes	HI 1286 interchangeable pH electrode (included), HI 7634 TDS probe (fixed), HI 1283 grounding bar with 2 m (6.6') cable (included)	HI 1286 interchangeable pH electrode (included), HI 7632 EC probe (fixed), HI 1283 grounding bar with 2 m (6.6') cable (included)
Power Supply	12 VDC adapter (included)	
Environment	0 to 50°C (32 to 122°F), RH 95%	
Dimensions	165 x 110 x 35 mm (6.5 x 4.3 x 1.3")	
Weight	300 g (10.6 oz.)	

ORDERING INFORMATION

HI 981404N-01 (115V) and **HI 981404N-02** (230V) are supplied complete with HI 1286 pH electrode, HI 7634 TDS probe, HI 1283 grounding bar, calibration solutions, screwdriver for calibration, 12 VDC adapter and instructions.

HI 981405N-01 (115V) and **HI 981405N-02** (230V) are supplied complete with HI 1286 pH electrode, HI 7632 EC probe, HI 1283 grounding bar, calibration solutions, screwdriver for calibration, 12 VDC adapter and instructions.

ACCESSORIES

HI 1286	pH electrode, plastic, BNC, 2 m (6.6') cable
HI 70000P	Rinse solution (25 x 20 mL)
HI 70004P	Cal. sol. pH 4 (25 x 20 mL)
HI 70007P	Cal. sol. pH 7 (25 x 20 mL)
HI 70300M	Storage solution, 230 mL
HI 70442P	Cal. sol. 1500 ppm (25 x 20 mL)
HI 77400P	Cal. kit (pH 4 &7, 20 mL, 5 pcs each)
HI 70039P	Cal. sol. 5000 µS/cm (25 x 20 mL)
HI 7061M	Electrode cleaning solution, 230 mL
HI 710005	12 VDC power supply

For a complete list of Solutions, see the end of pH *Section 3*.

HI 993301 • HI 993302

EC/TDS/Temperature Monitors

EC TDS GRO'CHEK®

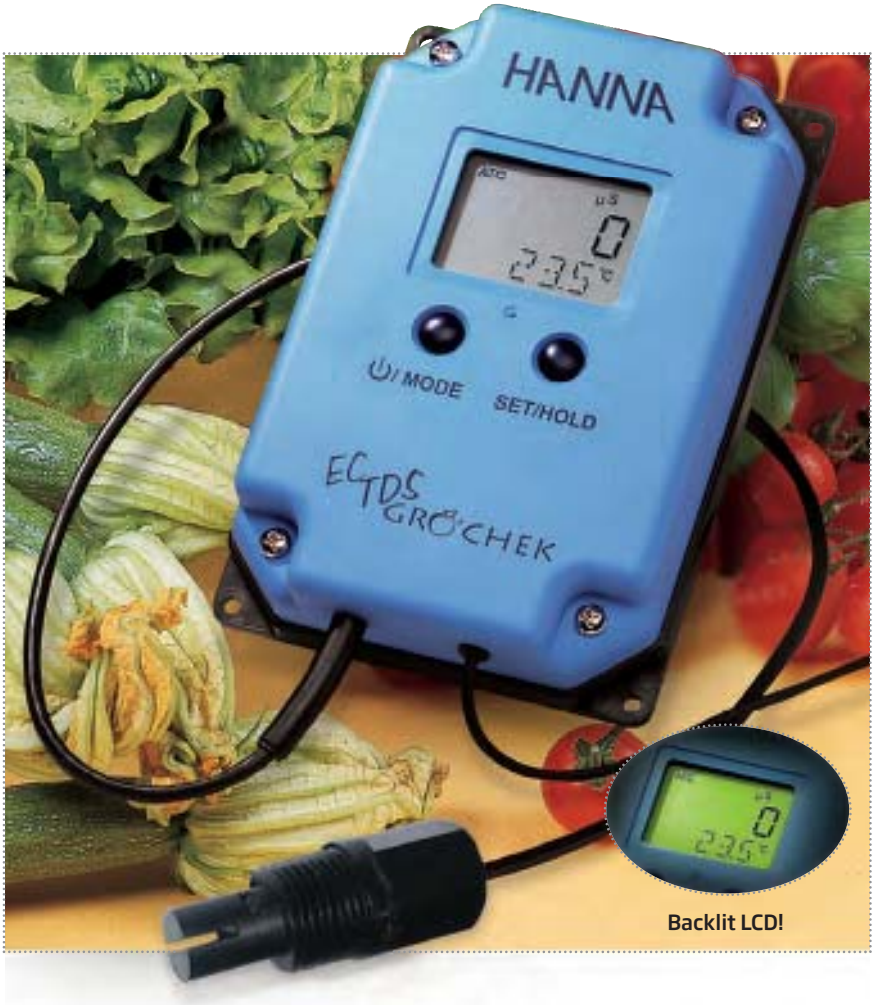
- **Waterproof**
- **Measure in °C or °F**
- **HOLD function**
- **Adjustable TDS ratio**
- **Adjustable β**
- **Stability indicator**
- **Backlit display**
- **12 VDC power supply**

Waterproof and chemically resistant, HI 993301 and HI 993302 have been designed to meet the grower's need for equipment suited to the aggressive environments found in agricultural and hydroponics applications. At startup, HI 993301 and HI 993302 perform a self-check to ensure proper working condition.

These indicators from HANNA have backlit LCDs and display instantaneous readings of both EC or TDS and temperature–even from a distance.

These instruments feature a stability indicator that prompts the user when to take the reading. For manual recording purposes, readings can be frozen on the LCD display by pressing the HOLD button.

Calibration and temperature compensation are automatic, while the EC/TDS conversion factor and temperature coefficient factor (β) are user adjustable for application specific measurements.



Backlit LCD!

ORDERING INFORMATION

HI 993301-01 (115V) and **HI 993301-02** (230V) is supplied with HI 7630 conductivity probe, HI 70031 1413 µS/cm calibration solution sachet, 12 VDC adapter and Instructions.
HI 993302-01 (115V) and **HI 993302-02** (230V) is supplied with HI 7630 conductivity probe, HI 70030 12.88 mS/cm calibration solution sachet, 12 VDC adapter and Instructions.

ELECTRODES

HI 7630	Conductivity probe with internal temperature sensor, 1/2" NPT pipe thread and 2 m (6.6') cable*

SOLUTIONS

HI 70030P	12.88 mS/cm calibration solution, 20 mL sachets (25)
HI 70031P	1413 µS/cm calibration solution, 20 mL sachets (25)
HI 70032P	1382 ppm calibration solution, 20 mL sachets (25)
HI 70038P	6.44 g/L (ppt) calibration solution, 20 mL sachets (25)

*Replaceable by technical personnel only.

SPECIFICATIONS		HI 993301	HI 993302
Range	EC	0 to 3999 µS/cm	0.00 to 20.00 mS/cm
	TDS	0 to 2000 mg/L (ppm)	0.00 to 10.00 g/L (ppt)
	Temperature	0.0 to 60.0°C / 32.0 to 140.0°F	0.0 to 60.0°C / 32.0 to 140.0°F
Resolution	EC	1 µS/cm	0.01 mS/cm
	TDS	1 mg/L (ppm)	0.01 g/L (ppt)
	Temperature	0.1 °C (0.1°F)	0.1 °C (0.1°F)
Accuracy (@20°C/68°F)	EC	±2% F.S.	±2% F.S.
	TDS	±2% F.S.	±2% F.S.
	Temperature	±0.5°C (±1°F)	±0.5°C (±1°F)
EC/TDS Calibration		automatic, one point at 1413 µS/cm or 1382 mg/L (ppm)	automatic, one point at 12.88 mS/cm or 6.44 g/L (ppt)
Probe		HI 7630 conductivity probe with internal temperature sensor, 1/2" NPT pipe thread and 2 m (6.6') cable (fixed, included)	
TDS Conversion Factor		adjustable from 0.45 to 1.00	
Temperature Compensation		automatic with β adjustable from 0.0 to 2.4%/°C	
Power Supply		12 VDC adapter (included)	
Environment		0 to 50°C (32 to 122°F); RH max 95%	
Dimensions		160 x 105 x 31 mm (6.3 x 4.1 x 1.2)	
Weight		190 g (6.7 oz.) - meter only	

For a complete list of Solutions, see the end of Conductivity *Section 6.*

HANNA instruments

With Great Products, Come Great Results™

- **Water resistant**
- **Low maintenance probes**
- **Hang right above the samples**
- **Probes designed for horticulture and hydroponics applications**

These meters have been engineered with a host of features suited for the aggressive environments commonly found in agricultural applications. Housings and cable connections have been sealed against vapor and humidity.

Select HI 983301N for TDS measurements with the common 0.7 TDS conversion factor (4-4-2) or HI 983301N/5 which uses a 0.5 conversion factor.

Both the TDS and EC meters come with a probe specifically made for horticulture and hydroponics applications. The probe compensates for temperature variations automatically, is easy to clean, is very stable and needs little maintenance.

The 12 VDC power supply included with the meter eliminates low battery failures.

SPECIFICATIONS	HI 983301N	HI 983301N/5	HI 983302N
Range	0 to 1990 mg/L (ppm)	0 to 1990 mg/L (ppm)	0.00 to 9.99 mS/cm
Resolution	10 mg/L (ppm)	10 mg/L (ppm)	0.01 mS/cm
Accuracy (@20°C/68°F)	2% F.S.		
Calibration	manual at one point, through trimmer		
Temperature compensation	automatic, 5 to 50°C (41 to 122°F)		
TDS conversion factor	0.7	0.5	–
Probe	HI 7634 TDS probe with 2 m (6.6') cable (included)		HI 7632 EC probe with 2 m (6.6') cable (included)
Power supply	12 VDC adapter (included)		
Environment	0 to 50°C (32 to 122°F); RH max 100%		
Dimensions	86 x 110 x 43 mm (3.4 x 4.3 x 1.7")		
Weight	215 g (7.6 oz.)		

ORDERING INFORMATION

HI 983301N-01 (115V) and **HI 983301N-02** (230V) is supplied with HI 7634 probe, 12 VDC adapter, 1500 ppm calibration solution (20 mL), calibration screwdriver and instructions.
HI 983301N/5-01 (115V) and **HI 983301N/5-02** (230V) is supplied with HI 7634 probe, 12 VDC adapter, 1382 ppm calibration solution (20 mL), calibration screwdriver and instructions.
HI 983302N-01 (115V) and **HI 983302N-02** (230V) is supplied with HI 7632 probe, 12 VDC adapter, 1413 mS/cm calibration solution (20 mL), calibration screwdriver and instructions.

ELECTRODES

HI 7632	EC probe with 2 m (6.6') cable*
HI 7632/2	EC probe with 2 m (6.6') cable and 1/2" thread for in-line installation*
HI 7632/3	EC probe with 2 m (6.6') cable and 3/4" thread for in-line installation*
HI 7634	TDS probe with 2 m (6.6') cable*
HI 7634/2	TDS probe with 2 m (6.6') cable and 1/2" thread for in-line installation*
HI 7634/3	TDS probe with 2 m (6.6') cable and 3/4" thread for in-line installation*

SOLUTIONS

HI 70032P	1382 ppm calibration solution, 20 mL sachets (25)
HI 70031P	1413 mS/cm calibration solution, 20 mL sachets (25)
HI 70442P	1500 ppm calibration solution, 20 mL sachets (25)

*Replaceable by technical personnel only.

For a complete list of Solutions, see the end of Conductivity *Section 6*.

HI 983303 • HI 983306 • HI 983307 • HI 983308 • HI 983309

EC/TDS Meters

- **Water resistant**
- **Continuous EC and TDS monitoring**
- **Visual LED alarms**

These water resistant conductivity/TDS meters are the result of customer requests for accurate, affordable process monitoring with low maintenance.

Five different models are available to cover all applications. Each meter is supplied with a direct 2-pin probe and 2 m (6.6') cable with a ½" thread for flow-thru mounting. The probe has a temperature sensor to automatically compensate against temperature changes from 5 to 50°C (41 to 122°F) with a β of 2% per degree.

In the measurement mode, a red LED will warn the user in the event the reading is outside of the alarm interval. A front trimmer allows manual calibration at 1 point. The electrical circuitry is tightly sealed inside the water resistant enclosure. EC and TDS can be installed anywhere quickly and easily with the casings molded eye. The casing has been specially designed to sit out of the way and will not roll off a table. The 12 VDC power supply allows continuous monitoring over extended periods of time.

SPECIFICATIONS	HI 983303	HI 983306	HI 983307	HI 983308	HI 983309
Range	0 to 1990 µS/cm	0 to 1990 mg/L (ppm)	0.00 to 9.99 mS/cm	0.00 to 9.99 g/L (ppt)	0 to 999 ppm (mg/L)
Resolution	10 µS/cm	10 mg/L (ppm)	0.01 mS/cm	0.01 g/L (ppt)	1 ppm (mg/L)
Accuracy (@20°C/68°F)	±2% F. S.				
Calibration	manual, one point, through trimmer				
Calibration Solution	HI 70031	HI 70032	HI 70039	HI 70038	HI 70080
Temperature Compensation	automatic, 5 to 50°C (41 to 122°F) with β=2%				
TDS Factor	–	0.5	–	0.5	0.5
Set point	200 to 1600 µS/cm	200 to 1600 ppm	0.70 to 3.50 mS/cm	0.70 to 3.50 g/L (ppt)	0 to 150 ppm (mg/L)
Alarm	red LED blinks when measured value differs from set point more than:				
	100 µS/cm	±100 mg/L (ppm)	±0.20 mS/cm	±0.20 g/L (ppt)	over setpoint
Probe (included)	HI 7634/2	HI 7634/2	HI 7632/2	HI 7632/2	HI 7634/2
	all probes are provided with 2 m (6.6') cable and ½" thread for in-line installation				
Power supply	12 VDC adapter (included)				
Environment	0 to 50°C (32 to 122°F); RH max 100%				
Dimensions	86 x 110 x 43 mm (3.4 x 4.3 x 1.7")				
Weight	215 g (7.6 oz.)				

ORDERING INFORMATION

HI 983303-01 (115V), **HI 983303-02** (230V), **HI 983306-01** (115V), **HI 983306-02** (230V), **HI 983309-01** (115V) and **HI 983309-02** (230V) are supplied with HI 7634/2 EC/TDS probe, calibration screwdriver, 12 VDC adapter and instructions.
HI 983307-01 (115V), **HI 983307-02** (230V), **HI 983308-01** (115V) and **HI 983308-02** (230V) are supplied with HI 7632/2 EC/TDS probe, calibration screwdriver, 12 VDC adapter and instructions.

SOLUTIONS

HI 70031P	1413 µS/cm calibration solution, 20 mL sachets (25)
HI 70032P	1382 mg/L (ppm) calibration solution, 20 mL sachets (25)
HI 70039P	5.00 mS/cm calibration solution, 20 mL sachets (25)
HI 70038P	6.44 g/L (ppt) calibration solution, 20 mL sachets (25)
HI 70080P	800 mg/L (ppm) calibration solution, 20 mL sachets (25)

For a complete list of Solutions, see the end of Conductivity *Section 6*.

Conductivity Meters for Demineralized Water

- **Specifically designed for demineralization and deionization applications**
- **Water resistant enclosure**
- **External 12 VDC power supply for continuous monitoring**
- **Selectable setpoint and LED alarm**
- **Automatic Temperature Compensation**
- **Molded hook for easy installation**

HI 983304 and HI 983305, are specifically designed for use in demineralized and deionized water.

When placed at the output of any demineralization system, the visual alarm will be activated once the demineralizing equipment is exhausted. This exclusive feature will ensure maximum system efficiency with minimum investment.

Both meters measure 0 to 19.99 µS/cm. HI 983304 has a built-in 3½-digit LCD, while HI 983305 is without LCD but comes with an alarm relay.

Each meter is supplied with an HI 7631/2 direct 2-pin probe with 2 m (6.6') cable and a ½" thread for flow-thru mounting. This probe is also equipped with a temperature sensor to automatically compensate measurements against temperature changes from 5 to 50°C (41 to 122°F).

When operating in the measurement mode, HI 983304's red LED will alert the user as soon as the reading is 1 µS/cm over the setpoint. The alarm relay of HI 983305 is activated in the same circumstances and can be connected to any external device.

SPECIFICATIONS	HI 983304	HI 983305
Range	0.00 to 19.99 µS/cm	
Resolution	0.01 µS/cm	
Accuracy (@20°C/68°F)	±2% F. S.	
Calibration	manual, one point, through trimmer	not required
Temperature Compensation	automatic, 5 to 50°C (41 to 122°F) with β=2.4%/°C	
Set point	1.00 to 5.00 µS/cm	
Alarm	red LED blinks when measured value differs from the set point more than 1.00 µS/cm	
Probe (included)	HI 7631/2 conductivity probe with 2 m (6.6') cable and 1/2" thread for flow-thru monitoring (included)	
Power supply	12 VDC adapter (included)	
Environment	0 to 50°C (32 to 122°F); RH max 100%	
Dimensions	86 x 110 x 43 mm (3.4 x 4.3 x 1.7")	
Weight	215 g (7.6 oz.)	

ORDERING INFORMATION

HI 983304-01 (115V), **HI 983304-02** (230V) and **HI 983305-01** (115V) and **HI 983305-01** (230V) are supplied with HI 7631/2 EC/TDS probe, calibration screwdriver, 12 VDC adapter and instructions.

SOLUTIONS

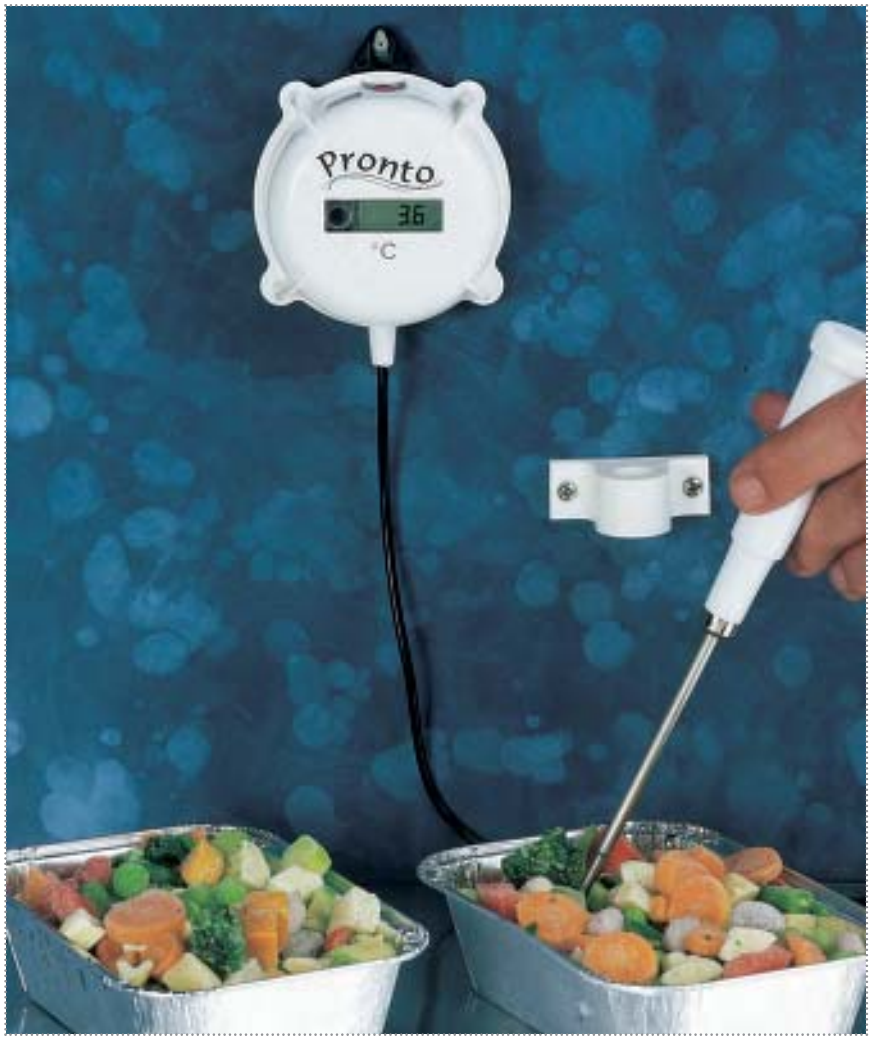
HI 70031P	1413 µS/cm calibration solution, 20 mL sachets (25)

For a complete list of Solutions, see the end of Conductivity *Section 6*.

HI 146-00 • HI 146-01 • HI 146-99

Wall-Mounting Precision Thermometer

- **HACCP compliant**
- **CAL CHECK®**
- **Hang above the samples or spot check**
- **Stainless steel temperature probe**
- **Water resistant** (HI 146-00/HI 146-01)
- **Waterproof** (HI 146-99)



HI 146-00, HI 146-01 and the waterproof HI 146-99 are high accuracy thermometers with a professional grade probe and a flexible 2 m (6.6') cable. The CAL CHECK® feature is incorporated into its function to allow you to confirm the accuracy of the meters any time.

You can monitor the exact temperature of any product continuously and easily observe it on the LCD display.

With their compact and simplified design featuring a fixed stainless steel probe and optional probe holder, these thermometers are ideal for monitoring the temperatures of liquids, semi-solids and refrigerated foods.

HI 146-00, HI 146-01 and HI 146-99 can be easily carried from station to station or installed in a fixed position using the molded eye and a wall mount probe holder.

In order to make sure that the meter is reporting the correct temperature, HI 146 has been designed with HANNA's exclusive CAL CHECK® switch. By simply setting the switch from "READ" to "TEST" and without requiring any external equipment, users can ensure the accuracy of the meter. In the "TEST" mode, HI 146 shows 0.0 °C (or 32.0°F) ±0.3°C (±0.5°F) which is the accuracy of the meter. With this HANNA innovation, the accuracy can be checked throughout the life of the thermometer without requiring any accessories or additional investments.

HI 750146 Wall-mounted probe holder

SPECIFICATIONS	HI 146-00	HI 146-01	HI 146-99
Range	-50.0 to 150.0°C	-58.0 to 302.0°F	-50.0 to 150.0°C
Resolution	0.1°C	0.1°F (-58.0 to 199.9 °F) 1°F (200 to 302 °F)	0.1°C
Accuracy	±0.3°C (-20 to 90°C) ±0.5°C (outside)	±0.5°F (4 to 194°C) ±1°F (outside)	±0.3°C (-20 to 90°C) ±0.5°C (outside)
Temperature Probe	stainless steel probe (fixed) with 2 m (6.6') cable; 160 x dia 3 mm (6.3 x dia 0.1")		
Battery type / life	1.5V AA / approximately 5 years		
Environment	0 to 50°C (32 to 122°F); RH max 95%		0 to 50°C; RH max 100%
Dimensions	86 x 110 x 43 mm (3.4 x 4.3 x 1.7")		
Weight	150 g (5.3 oz.)		

ORDERING INFORMATION

HI 146-00, **HI 146-01** and **HI 146-99** are supplied with stainless steel temperature probe, battery and instructions

ACCESSORIES

HI 750146 Wall-mounted probe holder

HANNA instruments

With Great Products, Come Great Results™

Checkfridge™ Remote Sensor Thermometer

- **Perfect for refrigerator and incubator monitoring**
- **Magnetic backing**
- **Food grade stainless steel thermistor probe on 1 m (3.3') cable**
- **Fast response**
- **±0.3°C accuracy**
- **CAL CHECK® verification at 0°C**
- **Low battery warning**

Few manufacturers have given any thought to providing the user a convenient means to monitor internal temperature conditions of a refrigerator or freezer from the outside.

Water testing laboratories require constant monitoring of refrigerators and incubators for compliance to standard operations. The HANNA HI 147 Checkfridge™ is the ideal thermometer for accurate, reliable internal temperature readings.

How do you know when the reading on the thermometer is correct? An ice point or slurry could be made. Even then there could be several degrees difference in the real vs theoretical temperatures. With the HI 147, there is no need to waste time preparing and ice bath for making these tests. It's unique CAL CHECK® feature can simulate it. Conveniently located on the face of the thermometer is a TEST switch. Engage the switch and the HI 147 performs an internal calibration check. In only a few seconds, you see the results on the large LCD. Return the switch to the READ position and the HI 147 returns to its normal measuring status.

SPECIFICATIONS	HI 147-00 Checkfridge™ C	HI 147-01 Checkfridge™ F
Range	-50.0 to 150.0°C	-58.0 to 302.0°F
Resolution	0.1°C	0.1°F (-58.0 to 199.9°F) 1°F (200 to 302°F)
Accuracy	±0.3°C (-20 to 90°C); ±0.5°C (outside)	±0.6°F (-4 to 194°F); ±1°F (outside)
Calibration Check	manual, through switch	
Temperature Probe	stainless steel, general purpose with 1 m (3.3') cable (fixed); 40 x dia 5 mm (1.6 x dia 0.2")	
Battery Type / Life	1.5V AAA / approximately 3 years of continuous use	
Environment	0 to 50°C (32 to 122°F); RH max 95%	
Dimensions (meter only)	93 x 39 x 31 mm (3.7 x 1.5 x 1.2")	
Weight	60 g (2.1 oz.)	

ORDERING INFORMATION

HI 147-00 (Checkfridge™ C) is supplied with battery and instructions
HI 147-01 (Checkfridge™ F) is supplied with battery and instructions
HI 147-001 (Checkfridge™ C) is supplied with calibration certificate, battery and instructions

Replacement pH Electrodes

CODE	HI 73127	HI 1280	HI 1290	HI 1295	HI 1219
Description	spare electrode	spare electrode	spare electrode	spare electrode	spare electrode
Reference	single Ag/AgCl	single, Ag/AgCl	single, Ag/AgCl	single, Ag/AgCl	single, Ag/AgCl
Junction / Flow Rate	cloth	ceramic, single	ceramic, single / 15-20 µL/H	ceramic, single / 15-20 µL/H	cloth
Electrolyte	gel	gel	gel	gel	gel
Max Pressure	3 bar	0.1 bar	0.2 bar	2 bar	3 bar
Range	pH: 0 to 14	pH: 0 to 13	pH: 0 to 13	pH: 0 to 13	pH: 0 to 13
Tip /Shape	spheric (dia: 5.0 mm)	spheric (dia: 5.0 mm)	spheric (dia: 5.0 mm)	spheric (dia: 5.0 mm)	spheric (dia: 5.0 mm)
Temperature Sensor	no	yes	yes	yes	no
Amplifier	no	yes	yes	yes	no
Body Material	polypropylene	polypropylene	polypropylene	polypropylene	polypropylene
Cable	no	no	no	no	no
Recommended Use	general purpose, field applications	general purpose, field applications	general purpose, field applications	general purpose, field applications	field applications, fertigation solutions

Electrodes are not to scale

CONNECTION	CONNECTION	CONNECTION	CONNECTION	CONNECTION
HI 73127 pin	**HI 1280** multi-pin	**HI 1290** multi-pin	**HI 1295** multi-pin	**HI 1219** screw cap
To be used with HI 98127, HI 98128, HI 98121, HI 98129 and HI 98130	To be used with HI 98111	To be used with HI 98112	To be used with HI 98113	To be used with HI 981408

Replacement pH and ORP Electrodes

CODE	HI 1413X/50	HI 1270	HI 1207	HI 73120	HI 3214P
Description	pH electrode	spare electrode	spare electrode	spare electrode	spare electrode
Reference	single, Ag/AgCl	single, Ag/AgCl	single, Ag/AgCl	single	double, Ag/AgCl
Junction / Flow Rate	open	cloth	cloth	cloth	cloth
Electrolyte	viscolene	gel	gel	gel	gel
Max Pressure	0.1 bar	0.1 bar	0.1 bar	0.1 bar	3 bar
Range	pH: 0 to 12	pH: 0 to 13	pH: 0 to 13	ORP: ±2000 mV	ORP: ±2000 mV
Tip /Shape	flat	spheric (dia: 3.0 mm)	spheric (7.5 mm)	platinum pin	platinum pin
Temperature Sensor	no	no	no	no	no
Amplifier	no	no	no	no	no
Body Material	glass	polypropylene	PEI	polypropylene	PEI
Cable	coaxial; 1 m (3.3')	no	no	no	coaxial; 2 m (6.6')
Recommended Use	skin, scalp	general purpose, field applications	general purpose, field applications	general purpose, field applications	general purpose, agriculture, disinfection

Electrodes are not to scale

CONNECTION	CONNECTION	CONNECTION	CONNECTION	CONNECTION
HI 1413B/50 BNC **HI 1413S/50** screw cap	**HI 1270** screw cap	**HI 1207** screw cap	**HI 73120** pin	**HI 3214P** BNC
To be used with Skincheck™ series	To be used with HI 98103 and HI 99104	To be used with HI 98104	To be used with HI 98120	To be used with HI 981406 and HI 982401

Replacement pH Electrodes

CODE	HI 1286	HI 2114P	HI 1293
Description	spare electrode	spare electrode	spare electrode
Reference	double, Ag/AgCl	double, Ag/AgCl	double, Ag/AgCl
Junction / Flow Rate	PTFE	cloth	PTFE
Electrolyte	polymer	gel	polymer
Max Pressure	3 bar	3 bar	3 bar
Range	pH: 0 to 13	pH: 0 to 13	pH: 0 to 13
Tip /Shape	spheric (dia: 7.5 mm)	spheric (dia: 7.5 mm)	spheric (dia: 7.5 mm)
Temperature Sensor	no	no	no
Amplifier	no	no	yes
Body Material	PEI	PEI	PEI
Cable	coaxial; 2 m (6.6')	coaxial; 2 m (6.6')*	5-pole; 2 m (6.6')
Recommended Use	general purpose, water treatment, agriculture	general purpose, agriculture	hydroponics, greenhouses

Electrodes are not to scale

CONNECTION

HI 1286 BNC

To be used with HI 981401N and HI 981402

CONNECTION

HI 2114P multi-pin
HI 2114P/5 multi-pin *(5 m cable)

To be used with HI 981406

CONNECTION

HI 1293 DIN

To be used with HI 991401, HI 991404 and HI 991405

CONTENTS

Introduction to pH Instrumentation

Single or Multiparameter Instrumentation

Depending on the requirements of the application, users may need to measure only one parameter such as pH or a group of parameters such as pH, ORP, EC, TDS, temperature and others. From benchtops to complete systems and from portables to testers, HANNA provides solutions in all categories of instrumentation.

The HANNA single parameter instrument offers the advantage of simplicity and focus in the requested parameter needs. The advantage of HANNA multiparameter instruments is that a user can choose a single meter packed with all the requirements they need to meet the demands of their application.

Multiparameter instruments offer different operating solutions that tailor to a user's real-world needs: multiparameter meters that can measure two or three parameters, but only one per time or multiparameter meters that offer two or three parameters measured simultaneously–useful on experimental and research applications where the influence between the parameters is important to be known. Multiple inputs provide the capability for simultaneous measurement.

pH Measurement Input

Different input solutions are available for HANNA instrumentation according with the type of the electrode selected by the user: a BNC connection for combined pH electrodes or a half cell electrode and reference probe using a separated reference input. A DIN connector is used to connect amplified and intelligent pH electrodes. Electrodes utilizing a DIN connection are usually combined and feature a built-in temperature sensor.

Temperature Input

Temperature is measured to compensate for temperature in pH readings. For HANNA meters featuring temperature compensation, a separate temperature probe is usually supplied with the instrument or the pH probe features a temperature sensor built-in. If a temperature input is not present, many instruments still offer the ability to manually adjust the temperature according with an external temperature reference.

pH Temperature Compensation

pH readings must be temperature compensated. The source of temperature measurement could be from a temperature sensor or from a trimmer that is manually adjusted. In any case, the instrument is correcting the pH reading with temperature.

mV Reading

HANNA meters with this feature can offer the ability to read two different parameters expressed in mV; the pH when the input probe is a pH electrode or ORP if an ORP probe is connected. The mV relative mode permits a calibration of the input expressed in mV.

pH Calibration

pH calibration should be performed daily or every time when a new lot of readings is started. Any kind of errors during the calibration will affect all the readings until a new calibration is performed. Errors during the calibration process can be eliminated if standard calibration procedures are follwed.

Some of the requirements of the standard calibration procedure::

1) To clean and activate the pH electrode before the calibration
2) To use only fresh pH buffers
3) To respect the measurement and rinsing steps during calibration to avoid any kind of buffer contamination.
4) To wait for full stability before a new calibration point is confirmed
5) To have a correct temperature compensation of pH reading and pH buffers.

Based on the conclusion that one of the most important step that have to be done to have good readings during the standard pH measurement is calibration. HANNA pH instruments are supplied with a starter package of solutions to assure this.

pH Calibration Check™

Many instruments feature HANNA's exclusive pH Calibration Check™ technology. Calibration Check™ is a diagnostics system that ensures accurate pH readings every time. By alerting users of potential problems during the calibration process, the Calibration Check™ system eliminates erroneous readings due to dirty or faulty pH electrodes or contaminated pH buffer solutions during calibration.

Throughout the calibration process, users are guided step-by-step by the on-screen tutorial. After calibration, the probe condition and response time is evaluated and an electrode condition and response time graph is displayed informing the user of the overall pH electrode status.

Calibration Errors

Instruments utilizing HANNA's Calibration Check™ technology can evaluate an electrode during calibration and store a history of parameters that describe the quality of electrode to be compared from one calibration to another. During calibration, a very small degradation of these parameters is normal and can be expected. A big change in the parameters signifies an error in the calibration procedure such as a dirty electrode before the calibration.

pH Buffer Contamination

pH buffers can be contaminated during the calibration procedure by numerous factors such as introducing a contaminated probe, using old buffers, or by reusing buffers. With these factors, the calibration of the instrument and subsequent measurements will be wrong.

Contaminated buffer issues can be detected during calibration by HANNA instrumentation with Calibration Check™. Warning messages can be generated to inform users about the identified issue.

Response Time of Electrodes

Another parameter that is evaluated during the calibration with Calibration Check™ technology is the response time of an electrode. This is evaluated based on the measurement of time necessary to reach stability when the electrode is immersed in a new buffer that has a difference in pH larger than than 3 pH units from the old one.

Offset and Slope of pH Electrode

The offset and slope are the most important parameters that can describe the quality of an electrode. It is important for a measurement process determination to be stable and accurate.

With HANNA's calibration Check™ technology, the offset of the electrode can be evaluated after one point calibration. Common sense is asking to be 7.00 pH buffer, but HANNA instruments using Calibration Check™ are able to determinate the offset based on any calibration point. The accepted range for offset is ±30 mV. A minimum 2 calibration points is necessary to determine the slope. Between any two calibration points the slope can be evaluated and normally has to be in a range of 80% to 110 %, where the 100% is 59.16 mV/pH @ 25°C.

Calibration Points and pH buffers

The calibration of pH electrodes is performed normally in 2 points: 7 pH, and 4 or 10 pH. This is based on the assumption that the pH electrode is linear from 3 pH up to 10 pH. For the most accurate reading, it is a good practice to calibrate to a point closest to the values received during normal measurement. For a variety of applications and measuring points, many HANNA meters offer the ability to calibrate in more than 2 points, such as 3 points up to 5 points being common. Many instruments can recognize up to 7 calibration pH buffers: 1.68, 3.00, 4.01, 6.86, 7.01, 9.18, 10.01 and 12.45 to cover the entire pH range. The recognized pH buffers are temperature compensated by the instrument which is necessary due to pH variation of buffers due to temperature. For example, a 7.01 pH buffer is 7.01 pH only @ 25°C. A table of temperature variation is printed on the label of each pH buffer .

Custom pH Buffers

HANNA has implemented the concept of custom pH buffers into many of its intruments. This concept is solves two different issues: to use non-standard pH buffers or to permit in-line calibration using a reference pH meter that measures the pH of similar sample. In both cases, temperature compensation cannot be performed because the temperature variation correlation is unknown.

Stability During the Calibration

A readings stability has to be reached in order to avoid a wrong calibration. Based on this, the confirmation of a new calibration point is done only after stability criteria is reached. Users are informed during all processes about the stability conditions before the user confirms a stable condition, and any instability will restart the stability evaluation. The stability criteria during the calibration is more rigorous than during the measurement. This mode used in HANNA instrumentation avoids errors by confirmation of calibration points during unstable readings. This principle is respected in any type of calibration: manual or automatic confirmation.

Out of Calibration Range

This is an important feature during measurement and is part of GLP (Good Laboratory Practice). Based on the calibration points where the instrument was calibrated, the measurement is considered accurate or not. If the measurement reading is in a range far from the calibration points, the "Out of calibration range" message is displayed. The measured value is shown and the user can use it, but with the warning from instrument related to possible inaccuracy.

Calibration Time-out

The Calibration Time Out, like Out of Calibration Range are warning messages from GLP (good laboratory practice). Proper, scheduled calibrations are crucial for accurate and repeatable measurements. In the event that readings are performed after an unacceptable time has passed since last calibration, a warning reminder will be displayed. The reading can still be perfromed and used, but under the condition imposed by the warnings.

Step by Step Calibration

In order to avoid errors during the calibration procedure, the meters display indicators that can be followed by the user for a successful calibration. If necessary, it is possible for the calibration steps to be performed in a different order by the user.

Additional Features

GLP (Good Laboratory Practice) and ISO standards are used to request the traceability of operations. HANNA's GLP solutions offer support for quality of calibration plus all the necessary information to identify the instrument, operator and the moment when the calibration was done.

Logging is a common feature for many instruments and can be used to memorize readings. Two working modes are available: log-on-demand and automatic or interval logging. With Log-on-demand, measurements that are considered important by the user will be saved by request upon pressing the log button. With automatic or interval logging, the instrument saves all the readings according with a specified interval. Another logging mode is AutoEnd logging or log on stability.

Analog output is a feature used to connect the instrument to a recorder to record the measurement in analog mode. The common ranges of analog output are 4 – 20 mA or 0 – 20 mA and 0 to 5V.

The graphic LCD that many HANNA meters include improve the user experience with features such as tutorials, contextual help, multi-language support and icons and messages to guide the user through operation and calibration.

Product Spotlights

Research Grade Calibration Check™ pH Meters

3.8-3.11

HI 4521 and HI 4522 are research grade, benchtop instruments that feature 8 measurement ranges: pH, ORP (Oxidation Reduction Potential), ISE (HI 4522 only), conductivity, resistivity, TDS, salinity and temperature. These instruments incorporate dual channels with a separate temperature input and support the external reference electrodes required by half cell pH and ISE sensors.

HI 4221 and HI 4222 are research grade pH, ORP and temperature benchtop meters. HI 4222 also incorporates ISE measurements and dual channels.

These instruments are fully user customizable and offer a large logging space to fulfill the demands and versatility needed by research laboratories.

HI 3000 series pH Benchtop Meters

3.12-3.15

The HI 3512 is a 2 channel professional benchtop meter with a graphic LCD, designed to provide accurate laboratory results. Channel 1 features pH/ORP/ISE and temperature measurement capability while channel 2 measures EC/TDS/NaCl/Resistivity and temperature.

HANNA's HI 3220, HI 3221 and HI 3222 benchtop instruments feature up to five point pH calibration with a choice of five custom buffers and seven standard buffers.

HI 2000 series pH Benchtop Meters

3.18-3.27

HI 2550 is a two channel instrument that measures up to 7 parameters. With this single laboratory bench meter you can measure pH, ORP, ISE, conductivity (EC), TDS, NaCl percentage and temperature.

The HI 2221 and HI 2223 are pH benchtop meters featuring our exclusive Calibration Check™ diagnostics for both pH electrodes and buffer solutions. These advanced instruments compare the characteristics of the pH electrode from one calibration to the next. In the case of large variances in the electrode condition, these meters alert the user that the electrode needs to be properly cleaned prior to calibration and measuring.

Other models such as the HI 2222 pH meter for wine analysis and HI 2216 pH/ORP/ISE meter with 0.001 pH resolution are available.

Product Spotlights

pH/ORP/ISE Waterproof Portable Meters

3.32

HI 98183, HI 98184 and HI 98185 are waterproof, portable meters designed for demanding applications. HI 98183 measures pH/ORP and temperatuare while HI 98184 and HI 98185 also include ISE measurement.

Choose from 7 standard pH buffers and 5 custom pH buffers to obtain up to five point calibration and achieve high precision readings with a pH accuracy of ±0.002 and up to ±0.001 pH resolution.

HANNA's Calibration Check® maintains a history of past calibrations and monitors the pH electrode and buffers during subsequent calibrations for any signs of wide calibration variances due to a dirty or broken electrode or contaminated pH buffers. In measurement mode, the electrode's percent condition is continuously displayed.

Waterproof Portable pH Meters

3.34-3.39

HI 98172 is a pH/ORP/ISE meter housed in a waterproof casing. Up to five point pH calibration is available with seven memorized pH buffers and five custom pH buffers to provide users with the flexibility necessary to adjust the calibration range to obtain the most accurate and precise readings.

HI 98140 and HI 98150 are portable Calibration Check™ pH meters that utilize HANNA's SMART electrode technology.

The HI 9126 includes HANNA's exclusive Calibration Check™ technology. Calibration Check™ monitors the pH bulb and reference junction of the electrode every time the instrument is calibrated. In the event of a dirty pH electrode, Calibration Check™ warns the user that maintenance may be needed.

Other models such as our HI 9126V pH meter for wine analysis are available .

Application Designed Portable pH Meters

3.40-3.48

These compact and waterproof instruments have been designed for specific applications. They feature application specific probes, on-screen tutorial messages for calibration and set-up, and BEPS (Battery Error Prevention System) to alert the user in the event that low battery power could adversely affect readings

HI 991001, HI 991002 and HI 991003 - Industrial
HI 99121 - Soil
HI 99141 - Boiler and cooling towers
HI 99131 - Plating baths
HI 99171 - Leather and paper
HI 99161 - Food and dairy
HI 99163 - Meat
HI 99181 - Skin and scalp

Comparison Guide

Benchtop Meters

GUIDE	Extended pH Range	0.001 pH Resolution	ISE Range	ORP Range/Relative mV	EC/TDS/Salinity Range	Resistivity Range	Temperature Range	pH Calibration: (A)utomatic or (M)anual	Calibration Points	Calibration Check™	pH Buffers: Standard/Custom	Temperature Compensation: (A)utomatic or (M)anual	GLP	(A)uto, (L)og on demand and Auto(E)nd Data Logging	(H)OLD, (M)emory Recall	(P)re-amplified/(S)mart, (B)NC Electrode	PC Connection	On-screen Help, Tutorial and Multi-language	(P)rinting, (A)nalog output and (S)tirring	Page
HI 4522	•	•	•	•	•	•	°C/°FK	A	5	•	8/5	A/M	•	A, L, E	H	B	USB/ RS232	•		3.8
HI 4521	•	•		•	•	•	°C/°FK	A	5	•	8/5	A/M	•	A, L, E	H	B	USB/ RS232	•		3.8
HI 4222	•	•	•	•			°C/°FK	A	5	•	8/5	A/M	•	A, L, E	H	B	USB/ RS232	•		3.10
HI 4221	•	•		•			°C/°FK	A	5	•	8/5	A/M	•	A, L, E	H	B	USB/ RS232	•		3.10
HI 3512	•	•	•	•	•	•	°C/°F	A	5	•	7/2	A/M	•	A, L		B	USB	•		3.12
HI 3222	•	•	•	•			°C/°F	A	5	•	7/5	A/M	•	A, L		B	USB	•		3.14
HI 3221	•	•	•	•			°C/°F	A	5	•	7/5	A/M	•	A, L		B	USB	•		3.14
HI 3220	•	•		•			°C/°F	A	5	•	7/5	A/M	•	A, L		B	USB	•		3.14
HI 123	•	•	•	•			°C/°F	A	5	•	7/2	A/M	•	A, L		B	RS232		P	3.16
HI 122	•	•		•			°C/°F	A	5	•	7/2	A/M	•	A, L		B	RS232		P	3.16
HI 2550	•	•	mV	•	•		°C/°F	A	5		7/2	A/M	•	A, L	H	B	USB			3.18
HI 2223	•	•		•			°C/°F	A	5	•	7/2	A/M	•	L		B	USB			3.20
HI 2221	•			•			°C/°F	A	5	•	7/2	A/M	•	L		B	USB			3.20
HI 2222	•			•			°C/°F	A	2	•	7/2	A/M	•	L		B	USB			3.22
HI 2216	•	•	•	•			°C/°F	A	5		7/2	A/M	•	A, L		B	USB			3.24
HI 2215	•	•		•			°C/°F	A	5		7/2	A/M	•	A, L		B	USB			3.25
HI 2214	•			•			°C/°F	A	5		7/2	A/M	•	A, L		B	USB			3.25
HI 2213	•			•			°C/°F	A	3		5/2	A/M	•		M	B				3.26
HI 2212	•						°C/°F	A	3		5/2	A/M	•		M	B				3.26
HI 2211	•			•			°C/°F	A	2		5/0	A/M			M	B				3.27
HI 2210	•						°C/°F	A	2		5/0	A/M			M	B				3.27
pH 209				•				M	2		3/0	M				B			A	3.28
pH 208	•						°C/°F	A	2		6/0	A			H	P			S	3.27
pH 207	•						°C/°F	A	2		6/0	A			H	P				3.27
pH 21				•			°C	A	2		3/0	M				B				3.30
pH 20							°C	A	2		3/0	M				B				3.30
HI 9815							°C	A	3		3/0	M		A		B	RS232			3.31

Portable Meters

GUIDE	Extended pH Range	0.001 pH Resolution	ISE Range	ORP Range/Relative mV	Temperature Range	pH Calibration: Automatic (A) or Manual (M)	Calibration Points	Calibration Check™	pH Buffers: Standard/Custom	Temperature Compensation: Automatic (A) or Manual (M)	GLP	(A)uto, (L)og on demand and Auto(E)nd Data Logging	(H)OLD, (M)emory Recall	(P)re-amplified/(S)mart, (B)NC Electrode	PC Connection	On-screen Help, Tutorial and Multi-language	(S)ensor Check™, (R)echargenbale battery	Battery Management / BEPS	Page
HI 98185	•	•	•	•	°C/°F	M	5	•	7/5	A, M	•	A, L, E	H	B	USB	•	R	•	3.32
HI 98184	•	•	•	•	°C/°F	M	5	•	7/5	A, M	•	A, L, E	H	B	USB	•	R	•	3.32
HI 98183	•	•		•	°C/°F	M	5	•	7/5	A, M	•	A, L, E	H	B	USB	•	R	•	3.32
HI 98172	•		•	•	°C/°F	M	5	•	6/5	A, M	•	A, L, E	H	B	USB			•	3.34
HI 98160	•			•	°C/°F	A	5	•	8/2	A, M	•	L	H	B	USB			•	3.35
HI 98150	•			•	°C/°F	A	5	•	7/2	A, M	•	L	H	S	USB			•	3.36
HI 98140	•				°C/°F	A	3	•	7/2	A, M	•	L	H	S	USB			•	3.36
HI 9126	•			•	°C/°F	A	2	•	7/2	A, M			M	B				•	3.37
HI 9126V	•			•	°C/°F	A	2	•	7/2	A, M			M	B				•	3.38
HI 9125	•			•	°C/°F	A	2		5/0	A, M			M	B				•	3.39
HI 9124	•				°C/°F	A	2		5/0	A, M			M	B				•	3.39
HI 991003	•			•	°C/°F	A	2	•	6/0	A			H	P			S	•	3.40
HI 991002	•			•	°C/°F	A	2	•	6/0	A			H	P				•	3.40
HI 991001	•				°C/°F	A	2	•	6/0	A			H	P				•	3.40
HI 99121	•				°C/°F	A	2	•	6/0	A			H	P				•	3.42
HI 99131	•				°C/°F	A	2	•	6/0	A			H	P				•	3.43
HI 99141	•				°C/°F	A	2	•	6/0	A			H	P				•	3.44
HI 99171	•				°C/°F	A	2	•	6/0	A			H	P				•	3.45
HI 99161	•				°C/°F	A	2	•	6/0	A			H	P				•	3.46
HI 99163	•				°C/°F	A	2	•	6/0	A			H	P				•	3.47
HI 99181	•				°C/°F	A	2	•	6/0	A			H	P				•	3.48
HI 8424	•			•	°C/°F	A	2		3/0	A			H	B				•	3.49
HI 83141				•	°C	M	2			A				P				•	3.50
HI 8314				•	°C	M	2			A				B				•	3.51
HI 8014				•		M	2			M				B				•	3.52
HI 8010						M	2			M				B				•	3.52

HI 4521 • HI 4522

Research Grade Meters with Calibration Check™ and USP

pH/ORP/ISE and EC/TDS/Resistivity/Salinity and Temperature

- **Up to eight measurement parameters**
- **Two input channels**
  pH/ORP/ISE and EC/TDS/Resistivity/Salinity
- **pH Calibration Check™**
- **Five point pH and ISE calibration with standard and custom buffers**
- **USP 645 method, ISE incremental methods and salinity scales**
- **Fully customizable**
- **Large log memory with different logging methods**

HI 4521 and HI 4522 are research grade, benchtop instruments that feature 8 measurement parameters: pH, ORP (Oxidation Reduction Potential), ISE (HI 4522 only), conductivity, resistivity, TDS, salinity and temperature. These instruments incorporate dual channels with a separate temperature input and support the external reference electrodes required by half cell pH and ISE sensors.

The user interface is customizable and capable of displaying two channels at the same time, showing the measurements in various modes: basic measurement with or without GLP information, graph or logging data.

These instruments offer multi-language support and contextual help is available through a dedicated Help key. Clear tutorial messages and directions are available on-screen to quickly and easily guide users through all measurement and calibration procedures to ensure measurements and calibrations are performed properly.

HANNA's pH Calibration Check™ diagnostics system ensures accurate readings every time by alerting users of potential problems during the calibration process. The Calibration Check™ system eliminates erroneous readings due to dirty or faulty pH electrodes or contaminated pH buffer solutions. After the guided calibration process, electrode condition is evaluated and an indicator is displayed informing the user of the overall pH electrode status.

Automatic, semiautomatic and manual pH calibration is available in up to five points, with eight standard (1.68, 3.00, 4.01, 6.86, 7.01, 9.18, 10.01 and 12.45) and up to five custom buffers. The Out of Calibration Range and Cal Due features alert the user in the event the measurement is far from the calibration point or when the meter is due for recalibration. Proper, scheduled calibrations are crucial for accurate and repeatable measurements.

HI 4522 features up to five point Manual Selection and Custom Standard ISE calibration with up to five standard solutions and up to five custom solutions with or without temperature compensation. From the on-screen list, users can select their ISE electrode parameter along with it's standard configuration profile or create their own.

Up to a four point automatic or custom standard conductivity calibration can be performed in up to four points as well as probe cell constant. One fixed point salinity calibration can be performed on the Percent Scale only. Three salinity ranges are available: practical scale, natural sea water scale and percentage scale.

Up to ten profiles can be saved and recalled eliminating the need to reconfigure each time when a different probe is used. User definable configurations can include: temperature compensation in accordance with each parameter, isopotential points for pH and ISE, measurement units of ISE concentrations and ISE electrode type, temperature units, EC temperature reference, EC temperature coefficient, EC probe type, and cell constant.

Three selectable logging modes are available: Automatic, Manual and AutoHold logging. Up to 100 logging lots with up to 10,000 recods each can be stored for automatic or manual modes along with up to 200 USP reports, and up to 100 ISE methods reports. Automatic logging features a selectable area and sampling period while GLP information includes complete data about user calibration of each parameter and identification information for the instrument, user, and company. Data can be transferred to a PC via the opto-isolated RS232 or USB ports and HI 92000 software (optional).

SPECIFICATIONS		HI 4521	HI 4522
pH	Range	-2.000 to 20.000 pH	
	Resolution	0.1 pH; 0.01 pH; 0.001 pH	
	Accuracy	±0.1 pH; ±0.01 pH; ±0.002 pH ±1 LSD	
mV	Range	±2000 mV	
	Resolution	0.1 mV	
	Accuracy	±0.2 mV ±1 LSD	
ISE	Range	–	1 x 10^{-6} to 9.99 x 10^{10} concentration
	Resolution	–	1; 0.1; 0.01; 0.001 concentration
	Accuracy	–	±0.5% (monovalent ions); ±1% (divalent ions)
Conductivity	Range	0.000 to 9.999 µS/cm; 10.00 to 99.99 µS/cm; 100.0 to 999.9 µS/cm; 1.000 to 9.999 mS/cm; 10.00 to 99.99 mS/cm; 100.0 to 999.9 mS/cm; 1000 mS/cm	
	Resolution	0.001 µS/cm; 0.01 µS/cm; 0.1 µS/cm; 0.001 mS/cm; 0.01 mS/cm; 0.1 mS/cm	
	Accuracy	±1% of reading (±0.01 µS/cm)	
	Cell Constant	0.0500 to 200.00	
	Cell Type	2, 4 rings	
	Calibration Type	auto standard recognition, user standard single point / multi point calibration	
	Calibration Reminder	yes	
	Temperature Coefficient	0.00 to 10.00 %/°C	
	Reference Temperature	15.0 °C to 30.0°C	
	Profiles	up to 10	
	USP Compliant	yes	
Resistivity	Range	1.0 to 99.9 Ohms x cm; 100 to 999 Ohms x cm; 1.00 to 9.99 kOhms x cm; 10.0 to 99.9 kOhms x cm; 100 to 999 kOhms x cm; 1.00 to 9.99 MOhms x cm; 10.0 to 100.0 MOhms x cm	
	Resolution	0.1 Ohms x cm; 1 Ohms x cm; 0.01 kOhms x cm; 0.1 kOhms x cm; 1 kOhms x cm; 0.01 MOhms x cm; 0.1 MOhms x cm	
	Accuracy	±2% of reading (±1 Ohm x cm)	
TDS	Range	0.000 to 9.999 ppm; 10.00 to 99.99 ppm; 100.0 to 999.9 ppm; 1.000 to 9.999 ppt; 10.00 to 99.99 ppt; 100.0 to 400.0 ppt actual TDS (with 1.00 factor)	
	Resolution	0.001 ppm; 0.01 ppm; 0.1 ppm; 0.001 ppt; 0.01 ppt; 0.1 ppt	
	Accuracy	±1% of reading (±0.01 ppm)	
Salinity	Range	practical scale: 0.00 to 42.00 psu; natural sea water scale: 0.00 to 80.00 ppt; percent scale: 0.0 to 400.0%	
	Resolution	0.01 for practical scale/natural sea water scale; 0.1% for percent scale	
	Accuracy	±1% of reading	
Temperature	Range	-20.0 to 120°C; -4.0 to 248.0°F; 253.15 to 393.15K	
	Resolution	0.1°C; 0.1°F; 0.1K	
	Accuracy	±0.2°C; ±0.4°F; ±0.2K (without probe)	
Calibration	pH	automatic, up to five point calibration, eight standard buffers available (1.68, 3.00, 4.01, 6.86, 7.01,9.18, 10.01, 12.45), and five custom buffers	
	ISE	–	automatic, up to five point calibration, 5 fixed standard solutions available for each measurement unit, and 5 user defined standards
	Conductivity	auto standard recognition, user standard single point/multi-point	
	Salinity	percent scale–1 point (with HI 7037 standard)	
pH Calibration Check™		yes	
Relative mV Offset Range		±2000 mV	
Input Channel(s)		1 pH/ORP + 1 EC	1 pH/ORP/ISE + 1 EC
GLP		cell constant, reference temperature/coefficient, calibration points, cal time stamp, probe offset for conductivity	
Temperature Compensation	pH	automatic or manual from -20.0 to 120.0°C/-4.0 to 248.0°/253 to 393K	
	EC	disabled, linear and non-linear (natural water)	
pH Electrode		HI 1131B glass body pH electrode with BNC connector and 1 m (3.3') cable (included)	
EC Probe		HI 76312 platinum, 4-ring conductivity/TDS probe with internal temperature sensor and 1 m (3.3') cable (included)	
Temperature Probe		HI 7662-T stainless steel temperature probe with 1 m (3.3') cable (included)	
Logging	Record	100 lots with 10,000 record/lot	
	Interval	settable between 1 and max log time	
	Type	automatic, log on demand, auto HOLD	
Replatinization		yes	
Display		color graphic LCD with on-screen help, graphing, language selection and custom configuration	
PC Connection		USB and RS232	
Power Supply		12 VDC adapter (included)	
Environment		0-50°C (32 to 122°F) (273 to 323K) RH max 95% non-condensing	
Dimensions / Weight		160 x 231 x 94 mm (6.3 x 9.1 x 3.7") / 1.2 Kg (2.64 lbs.)	

ORDERING INFORMATION

HI 4521-01 (115V), **HI 4521-02** (230V), **HI 4522-01** (115V) and **HI 4522-02** (230V) are supplied with HI 76312 conductivity/TDS probe, HI 1131B pH electrode, HI 7662-T temperature probe, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 700661 electrode cleaning solution sachet (2), HI 7071S electrolyte solution (30 mL), HI 76404N electrode holder, 12 VDC adapter and instructions.

SOLUTIONS

HI 6004	pH 4.010 buffer solution, 500 mL
HI 6007	pH 7.010 buffer solution, 500 mL
HI 6010	pH 10.010 buffer solution, 500 mL
HI 7030L	12880 µS/cm cal. solution, 500 mL
HI 7031L	1413 µS/cm calibration solution, 500 mL
HI 7033L	84 µS/cm calibration solution, 500 mL
HI 7034L	80000 µS/cm cal. solution, 500 mL
HI 7035L	111800 µS/cm cal. solution, 500 mL
HI 7039L	5000 µS/cm cal. solution, 500 mL
HI 7037L	Salinity standard solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL

ACCESSORIES

HI 92000	Windows® compatible software
HI 920013	USB cable for PC connection

For a complete list of Solutions and Electrodes, see the end of pH *Section 3*, ISE *Section 4* and Conductivity *Section 6*.

HI 4221 • HI 4222

Research Grade Meters with Calibration Check™

pH/ORP/ISE and Temperature

- **Two input channels (HI 4222)**
  pH/ORP/ISE and temperature
- **pH Calibration Check™**
- **Five point pH and ISE calibration with standard and custom buffers**
- **ISE incremental methods**
- **User customizable interface for one (HI 4221) or two (HI 4222) channels**
- **Fully customizable**
- **Large log memory with different logging methods**

HI 4221 and HI 4222 are research grade pH, ORP and temperature benchtop meters. HI 4222 also incorporates ISE measurements and dual channels with a separate temperature input and support the external reference electrodes required by half cell pH and ISE sensors.

The user interface of both instruments are customizable and the HI 4222 is capable of displaying two channels at the same time. These meters are capable of showing the measurements in various modes: basic measurement with or without GLP information, graph or logging data.

These instruments offer multi-language support and contextual help is available through a dedicated Help key. Clear tutorial messages and directions are available on-screen to quickly and easily guide users through all measurement and calibration procedures to ensure measurements and calibrations are performed properly.

HANNA's exclusive Calibration Check™ diagnostics system ensures accurate pH readings every time by alerting users of potential problems during the calibration process. The Calibration Check™ system eliminates erroneous readings due to dirty or faulty pH electrodes or contaminated pH buffer solutions during calibration. After the guided calibration process, the electrode condition is evaluated and an indicator is displayed informing the user of the overall pH electrode status.

Automatic, semiautomatic and manual pH calibration is available in up to five points, with 8 standard (1.68, 3.00, 4.01, 6.86, 7.01, 9.18, 10.01 and 12.45) and up to 5 custom buffers. The Out of Calibration Range and Cal Due features alert the user in the event the measurement is far from the calibration point or when the meter is due for recalibration. Proper, scheduled calibrations are crucial for accurate and repeatable measurements.

HI 4222 also features Manual Selection and Custom Standard ISE calibration up to five points, with standard solutions and up to 5 custom solutions, with or without temperature compensation.

From the on-screen list, users can select their ISE electrode parameter along with it's standard configuration profile or create their own.

Up to 10 profiles can be saved and recalled for both instruments, eliminating the need to reconfigure each time when a different electrode is used. User definable configurations can include: temperature compensation modes in accordance with each parameter, isopotential points for pH and ISE (HI 4222 only), measurement units of ISE concentrations, ISE electrode type (HI 4222 only), and temperature units.

Three selectable logging modes are available: Automatic, Manual and AutoHold logging. Up to 100 logging lots with 10,000 records each can be stored for automatic or manual mode, and up to 100 ISE methods reports (HI 4222 only). Automatic logging features a selectable area and sampling period while GLP information includes complete data about user calibration of each parameter and identification information for the instrument, user, and company. Data can be transferred to a PC via the opto-isolated RS232 or USB ports and HI 92000 software (optional).

SPECIFICATIONS		HI 4221	HI 4222
pH	Range	-2.000 to 20.000 pH	
	Resolution	0.1 pH; 0.01 pH; 0.001 pH	
	Accuracy	±0.1 pH; ±0.01 pH; ±0.002 pH ±1 LSD	
mV	Range	±2000 mV	
	Resolution	0.1 mV	
	Accuracy	±0.2 mV ±1 LSD	
ISE	Range	–	1×10^{-7} to 9.99×10^{10} concentration
	Resolution	–	1; 0.1; 0.01; 0.001 concentration
	Accuracy	–	±0.5% (monovalent ions); ±1% (divalent ions)
Temperature	Range	-20.0 to 120°C; -4.0 to 248.0°F; 253.15 to 393.15K	
	Resolution	0.1°C; 0.1°F; 0.1K	
	Accuracy	±0.2°C; ±0.4°F; ±0.2K (without probe)	
Calibration	pH	automatic, up to five point calibration, eight standard buffers available (1.68, 3.00, 4.01, 6.86, 7.01, 9.18, 10.01, 12.45), and 5 custom buffers	
	ISE	–	automatic, up to five point calibration, five fixed standard solutions available for each measurement unit, and five user defined standards
pH Calibration Check™		yes	
Relative mV Offset Range		±2000 mV	
Input Channel(s)		1 pH/ORP	2 pH/ORP/ISE
GLP		cell constant, reference temperature/coefficient, calibration points, cal time stamp, probe offset for conductivity	
Temperature Compensation	pH	automatic or manual from -20.0 to 120.0°C/-4.0 to 248.0°/253 to 393K	
pH Electrode		HI 1131B glass body pH electrode with BNC connector and 1 m (3.3') cable (included)	
Temperature Probe		HI 7662-T stainless steel temperature probe with 1 m (3.3') cable (included)	
Logging	Record	100 lots with 10,000 record/lot	
	Interval	settable between one and max log time	
	Type	automatic, log on demand, auto HOLD	
Replatinization		yes	
Display		color graphic LCD with on-screen help, graphing, language selection and custom configuration	
PC Connection		USB and RS232	
Power Supply		12 VDC adapter (included)	
Environment		0-50°C (32 to 122°F) (273 to 323K) RH max 95% non-condensing	
Dimensions		160 x 231 x 94 mm (6.3 x 9.1 x 3.7")	
Weight		1.2 Kg (2.64 lbs.)	

ORDERING INFORMATION

HI 4221-01 (115V), **HI 4221-02** (230V), **HI 4222-01** (115V) and **HI 4222-02** (230V) are supplied with HI 1131B pH electrode, HI 7662-T temperature probe, HI 76404N electrode holder, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 700661 electrode cleaning solution sachet (2), HI 7071S electrolyte solution (30 mL), 12 VDC adapter and instructions.

ELECTRODES

HI 1131B	Glass body pH electrode with BNC connector and 1 m (3.3') cable
HI 7662-T	Stainless steel temperature probe with 1 m (3.3') cable

SOLUTIONS

HI 6004	pH 4.010 buffer solution, 500 mL
HI 6007	pH 7.010 buffer solution, 500 mL
HI 6010	pH 10.010 buffer solution, 500 mL
HI 7004L	pH 4.01 buffer solution, 500 mL
HI 7007L	pH 7.01 buffer solution, 500 mL
HI 7010L	pH 10.01 buffer solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL

ACCESSORIES

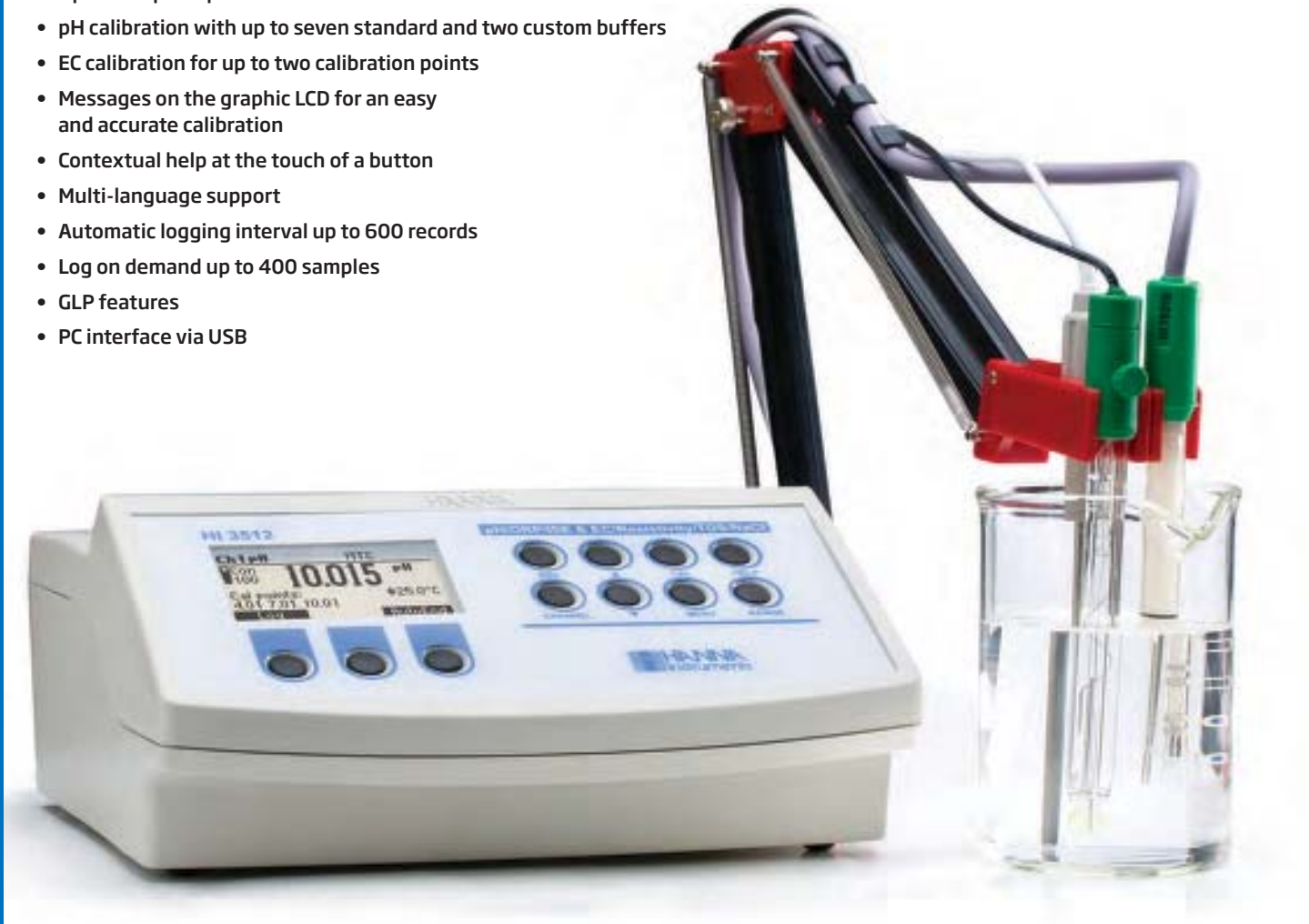
HI 76404N	Electrode holder
HI 92000	Windows® compatible software
HI 920013	USB cable for PC connection

For a complete list of Solutions and Electrodes, see the end of pH *Section 3* and ISE *Section 4*.

HI 3512

Two Channel, pH/ORP/ISE, EC/TDS/NaCl/Resistivity Benchtop Meter

- pH Calibration Check™ and electrode condition
- Up to five point pH calibration
- pH calibration with up to seven standard and two custom buffers
- EC calibration for up to two calibration points
- Messages on the graphic LCD for an easy and accurate calibration
- Contextual help at the touch of a button
- Multi-language support
- Automatic logging interval up to 600 records
- Log on demand up to 400 samples
- GLP features
- PC interface via USB



The HI 3512 is a 2 channel professional benchtop meter with a graphic LCD, designed to provide accurate laboratory results. Channel 1 features pH/ORP/ISE and temperature measurement capability while channel 2 measures EC/TDS/NaCl/Resistivity and temperature.

The pH channel offers up to five point pH calibration with seven standard buffers (pH 1.68, 4.01, 6.86, 7.01, 9.18, 10.01 and 12.45) and up to two custom buffers.

HANNA's exclusive Calibration Check™ diagnostics system ensures accurate pH readings every time by alerting users of potential problems during the calibration process. The Calibration Check™ system eliminates erroneous readings due to dirty or faulty pH electrodes or contaminated pH buffer solutions during calibration. After the guided calibration process, the probe condition is evaluated and an indicator is displayed informing the user of the overall pH electrode status.

This instrument can measure using ORP electrodes (pH channel input), thanks to their capability to measure mV with a resolution up to 0.1 mV and ISE electrodes on ppm scale (pH channel input). The electrode type and unit selection capability and the ISE calibration in up to five calibration standard solutions make this instrument very useful for a large range of concentration solution measurements.

The EC channel offers up to two calibration points with 7 memorized standards (0.00 µS/cm, 84.0 µS/cm, 1.413 mS/cm, 5.00 mS/cm, 12.88 mS/cm, 80.0 mS/cm and 111.8 mS/cm). The EC channel supports autoranging, manual ranging and lock of the user selected range, temperature compensation selection, temperature reference selection (15 °C, 20 °C or 25 °C) and temperature coefficient set.

TDS factor can be set between 0.40 and 1.00.

pH and EC channels also provide user selectable "out of calibration range" warnings and a "calibration timeout" to remind the user when a new calibration is necessary.

Messages on the graphic LCD offer directions for easy and accurate calibration for both channels as well as diagnostics to alert the user when calibration or measurement issues are detected.

Other features of the HI 3512 include log-on-demand of up to 400 samples, automatic logging interval with log on stability feature of up to 600 records, auto HOLD that freezes the first stable reading on the LCD display, GLP to view the last calibration data for pH, rel mV, ISE, EC or NaCl and PC interface via USB.

SPECIFICATIONS		HI 3512
pH	Range	-2.0 to 20.0; -2.00 to 20.00; -2.000 to 20.000 pH
	Resolution	0.1 pH; 0.01 pH; 0.001 pH
	Accuracy	±0.01 pH; ±0.002 pH
mV	Range	±2000.0 mV
	Resolution	0.1 mV
	Accuracy	±0.2 mV
ISE	Range	1.00 E-7 to 9.99 E10 conc.
	Resolution	3 digits 0.01, 0.1, 1, 10 conc.
	Accuracy	±0.5% of reading (monovalent ions); ±1% of reading (divalent ions)
Temperature Channel 1	Range	-20.0 to 120.0 °C (4.0 to 248.0 °F)
	Resolution	0.1 °C (0.1 °F)
	Accuracy	±0.2 °C (±0.4 °F) (excluding probe error)
Relative mV Offset Range		±2000 mV
pH Calibration		up to five point calibration, seven standard buffers available (1.68, 4.01, 6.86, 7.01, 9.18, 10.01, 12.45), and two custom buffers
Calibration Check™		yes
Slope Calibration		from 80 to 110%
pH Temperature Compensation		manual or automatic from -20.0 to 120.0 °C (-4.0 to 248.0 °F)
pH Electrode		HI 1131B glass body pH electrode with BNC connector and 1 m (3.3') cable (included)
Temperature probe		HI 7662-T temperature probe with 1 m (3.3') cable (included)
ISE Calibration		up to five-point calibration points 6 standard solutions available (0.1, 1, 10, 100, 1000, 10000 ppm)
EC	Range	0.001 µS/cm to 400 mS/cm (shows values up to 1000 mS/cm actual conductivity); 0.001 to 9.999 µS/cm; 10.00 to 99.99 µS/cm; 100.0 to 999.9 µS/cm; 1.000 to 9.999 mS/cm; 10.00 to 99.99 mS/cm; 100.0 to 999.9 mS/cm; 1000 mS/cm (autoranging)
	Resolution	0.001 µS/cm; 0.01 µS/cm; 0.1 µS/cm; 0.001 mS/cm; 0.01 mS/cm; 0.1 mS/cm; 1 mS/cm
	Accuracy	±1% of reading (±0.01 µS/cm or 1 digit whichever is greater) excluding probe error
Resistivity	Range	1.0 to 99.9 ohms; 100 to 999 ohms; 1.00 to 9.99 Kohms; 10.0 to 99.9 Kohms; 100 to 999 Kohms; 1.00 to 9.99 Mohms; 10.0 to 100.0 Mohms (autoranging)
	Resolution	0.1 ohm; 1 ohm; 0.01 Kohms; 0.1 Kohms; 1 Kohms; 0.01 Mohms; 0.1 Mohms
	Accuracy	±1% of reading (±10 ohms or 1 digit whichever greater) excluding probe error
TDS	Range	0.000 to 9.999 ppm; 10.00 to 99.99 ppm; 100.0 to 999.9 ppm; 1.000 to 9.999 g/L; 10.00 to 99.99 g/L; 100.0 to 400.0 g/L (autoranging)
	Resolution	0.001 ppm; 0.01 ppm; 0.1 ppm; 0.001 g/L; 0.01 g/L; 0.1 g/L
	Accuracy	±1% of reading (±0.05 ppm or 1 digit whichever greater) excluding probe error
	Factor	0.40 to 1.00
Salinity	Range	% NaCl: 0.0 to 400.0 %
	Resolution	0.1 %
	Accuracy	±1% of reading excluding probe error
Temperature Channel 2	Range	-20.0 to 120°C
	Resolution	0.1°C
	Accuracy	±0.2 °C (excluding probe error)
EC Calibration		automatic up to two points with seven memorized standards (0.00 µS/cm, 84.0 µS/cm, 1.413 mS/cm, 5.00 mS/cm, 12.88 mS/cm, 80.0 mS/cm, 111.8 mS/cm)
Constant Cell Setup		0.010 to 10.000
NaCl Calibration		max. one point only (with HI 7037 standard)
EC Probe		HI 76310 platinum four ring conductivity/TDS probe with 1 m (3.3') cable (included)
Temperature Source		automatic from sensor inside the probe; manual entry
EC Temperature Compensation		NoTC, MTC, ATC
Reference Temperature		15, 20, 25 °C
Temperature Coeficient		0.00 to 10.00 %/°C
Log On Demand		400 samples
Lot Logging / Interval		5, 10, 30 seconds; 1, 2, 5, 10, 15, 30, 60, 120, 180 minutes, AutoEnd (max 600 samples)
PC interface		opto-isolated USB
Input Impedance		10^{12} ohms
Power Supply		12 VDC adapter (included)
Environment		0 to 50 °C (32 - 122 °F) RH max 55% non-condensing
Dimensions / Weight		235 x 207 x 110 mm (9.2 x 8.14 x 4.33") / 1.8 Kg (4 lbs.)

ORDERING INFORMATION

HI 3512-01 (115V) and **HI 3512-02** (230V) is supplied with HI 76310 conductivity/TDS probe, HI 1131B pH electrode, HI 7662-T temperature probe, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 700661 electrode cleaning solution sachet (2), HI 7071S electrolyte solution (30 mL), HI 76404N electrode holder, 12 VDC adapter and instructions.

SOLUTIONS

HI 6016 pH 1.679 buffer solution, 500 mL
HI 6004 pH 4.010 buffer solution, 500 mL
HI 6007 pH 7.010 buffer solution, 500 mL
HI 6010 pH 10.010 buffer solution, 500 mL
HI 6124 pH 12.450 buffer solution, 500 mL
HI 7030L 12880 µS/cm calibration solution, 500 mL
HI 7031L 1413 µS/cm calibration solution, 500 mL
HI 7033L 84 µS/cm calibration solution, 500 mL
HI 7034L 80000 µS/cm calibration solution, 500 mL
HI 7035L 111800 µS/cm calibration solution, 500 mL
HI 7039L 5000 µS/cm calibration solution, 500 mL
HI 7037L Salinity standard solution, 500 mL
HI 7061L Electrode cleaning solution, 500 mL
HI 70300L Electrode storage solution, 500 mL

ACCESSORIES

HI 76404N Electrode holder
HI 92000 Windows® compatible software
HI 920013 USB cable for PC connection

For a complete list of Solutions and Electrodes, see the end of pH *Section 3*, ISE *Section 4* and Conductivity *Section 6*.

HI 3220 • HI 3221 • HI 3222

pH/ORP/ISE Graphic LCD pH Benchtop Meters

- One or two input channels
- pH Calibration Check™
- Five point pH calibration with seven standard and five custom buffers
- Stability, interval and log on demand logging
- Up to 400 log on demand records and 600 automatic logging records
- Messages on the graphic LCD for an easy and accurate calibration
- Multi-language support
- GLP features
- PC interface via USB

HANNA's HI 3220, HI 3221 and HI 3222 benchtop instruments feature up to five point pH calibration with a choice of five custom buffers and seven standard buffers.

HI 3222, HI 3221 and HI 3220 feature an interactive user support interface that assists you before, during and after measurement. On-screen tutorials guide users through set-up, calibration and measurement while context sensitive help of any screen is available at a push of a button. The help screen includes language specific assistance for menu parameters, calibration, logging, contact and accessory information for your instrument.

These instruments feature HANNA's exclusive Calibration Check™, a diagnostics system that ensures accurate pH readings every time. By alerting users of potential problems during the calibration process, the Calibration Check™ system eliminates erroneous readings due to dirty or faulty pH electrodes or contaminated pH buffer solutions during calibration. Throughout the calibration process, users are guided step-by-step by the on-screen tutorial. After calibration, the probe condition is evaluated and an indicator is displayed informing the user of the overall pH electrode status.

Both the HI 3220 and HI 3221 are equipped with one input channel. HI 3222 is equipped with two input channels for simultaneous measurements. Having these two channels eliminates the need for swapping probes and recalibrating.

These instruments can measure using ORP electrodes (pH channel input), thanks to their capability to measure mV with a resolution up to 0.1 mV. The HI 3221 and HI 3222 can use ISE electrodes in the ppm scale (pH channel input) and provides a choice of measurement units (ppb, ppm, molarity, weight/volume %). The electrode type and unit selection capability and the ISE calibration in up to five calibration standard solutions (HI 3222 only) make these instruments very useful for a large range of concentration solutions measurements.

SPECIFICATIONS		HI 3220	HI 3221	HI 3222
Range	pH	-2.0 to 20.0; -2.00 to 20.00; -2.000 to 20.000 pH		
	mV	±2000 mV		
	ISE	–	1.00 E-3 to 1.00 E5 concentration	1.00 E-7 to 9.99 E10 concentration (choice of units)
	Temperature	-20.0 to 120.0 °C (-4.0 to 248.0°F)		
Resolution	pH	0.1; 0.01; 0.001 pH		
	mV	0.1 mV		
	ISE	–	3 digits 0.01; 0.1; 1; 10 concentration	
	Temperature	0.1°C (0.1°F)		
Accuracy	pH	±0.01; ±0.002 pH		
	mV	±0.2 mV		
	ISE	–	±0.5% of reading (monovalent ions), ±1% of reading (divalent ions)	
	Temperature	±0.2°C (±0.4°F) (excluding probe error)		
Calibration	pH	up to five point calibration, seven standard buffers available (1.68, 4.01, 6.86, 7.01, 9.18, 10.01, 12.45) + five custom buffers		
	ISE	–	up to two point calibration, six standard solutions (0.1, 1, 10, 100, 1000, 10000 ppm)	up to five point calibration, six standard solutions (in units selected)
	Slope	from 80 to 110%		
pH Calibration Check™		yes		
Rel mV Offset Range		±2000 mV		
Temperature Compensation (pH)		manual or automatic from -20.0 to 120.0°C (-4.0 to 248.0°F)		
Input Channels		1	1	2
pH Electrode		HI 1131B pH electrode with glass body, BNC connector and 1 m (3.3') cable (included)		
Temperature Probe		HI 7662-T temperature probe, stainless steel with 1 m (3.3') cable (included)		
Logging		log on demand 200 samples	log on demand 300 samples	log on demand 400 samples
Lot Logging		5, 10, 30 seconds; 1, 2, 5, 10, 15, 30, 60, 120, 180 minutes (max 600 samples)		
PC Connectivity		opto-isolated USB (with optional HI 92000 software)		
Input Impedance		10^{12} Ohms		
Power Supply		12 VDC adapter (included)		
Environment		0-50°C (32 to 122°F) RH max 55% non-condensing		
Dimensions		235 x 207 x 110 mm (9.2 x 8.14 x 4.33")		
Weight		1.8 kg (4 lbs.)		

ORDERING INFORMATION

HI 3220-01 (115V), **HI 3220-02** (230V), **HI 3221-01** (115V), **HI 3221-02** (230V), **HI 3222-01** (115V) and **HI 3222-02** (230V) are supplied with HI 1131B pH electrode, HI 7662-T temperature probe, HI 76404N electrode holder, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 700661 electrode cleaning solution sachet (2), HI 7071S electrolyte solution (30 mL), 12 VDC adapter and instructions.

ELECTRODES

All electrodes part numbers ending in "B" are supplied with a BNC connector and 1 m (3.3') cable, as shown below:

HI 1043B Use: strong acid/alkalis; Glass-body, double junction, refillable, combination pH electrode

HI 1053B Use: emulsions; Glass-body, triple ceramic, refillable, combination pH electrode

HI 1083B Use: biotechnology; Glass-body, open junction, refillable, combination pH electrode

HI 1131B Use: general purpose; Glass-body, single junction, refillable, combination pH electrode

HI 3230B Use: general purpose; Plastic-body, gel-filled, combination platinum ORP electrode

HI 7662-T Stainless steel temperature probe with 1 m (3.3') cable

SOLUTIONS

HI 5004L pH 4.01 buffer solution, 500 mL
HI 5007L pH 7.01 buffer solution, 500 mL
HI 5010L pH 10.01 buffer solution, 500 mL
HI 7020L ORP test solution @200-275 mV, 500 mL
HI 7021L ORP test solution @240 mV, 500 mL
HI 7022L ORP test solution @470 mV, 500 mL
HI 7091L Reducing pretreatment ORP solution, 500 mL
HI 7092L Oxidizing pretreatment ORP solution, 500 mL
HI 7071 3.5M KCl + AgCl electrolyte solution, 30 mL (4), for single junction electrodes
HI 7082 3.5M KCl electrolyte solution, 30 mL (4), for double junction electrodes
HI 7061L Electrode cleaning solution, 500 mL
HI 70300L Electrode storage solution, 500 mL

ACCESSORIES

HI 740155 Plastic refilling pipette (20)
HI 76404N Electrode holder
HI 92000 Windows® compatible software
HI 920013 USB cable for PC connection

For a complete list of Solutions and Electrodes, see the end of pH *Section 3* and ISE *Section 4*.

HI 122 • HI 123

pH Benchtop Meters with Built-in Printer

- pH Calibration Check™
- Electrode response time
- Five pH calibration points
- Seven standard and two custom buffers
- Out of calibration range warning
- Large, custom LCD
- Built-in impact printer
- Separate pH and ISE channels (HI 123)
- Automatic data logging of 2000 records and log on demand
- GLP capabilities
- High and low audible alarms

HI 122 and HI 123 are benchtop instruments featuring a built-in printer, Calibration Check™, electrode response time and condition monitoring, and enhanced diagnostic messages during calibration. HI 123 also incorporates dual inputs to measure both pH and ISE simultaneously.

These meters use HANNA's "P" series of electrodes. For more accuracy, these meters also check if the measurement is outside the calibration range and warns the user in case measurements are too far outside the calibration points. Calibration can be performed in up to five points using the standard seven buffers that are automatically recognized, or by using two custom buffer values. The buffer(s) used during calibration are displayed on the LCD even when in measurement mode.

Users can log on demand up to 50 samples (50 samples per channel for dual channel model). These meters have automatic data logging of up to 1000 points (1000 points per channel for dual channel model) with flexible starting and stopping criteria.

This instrument provides GLP capabilities that allows for the storage and retrieval of all data regarding pH, rel mV, EC and NaCl calibration as well as data regarding the maintenance and status of the electrode.

Printing

The built-in impact printer incorporated into the HI 122 and HI 123 uses regular paper that does not fade with time. A complete set of information based on the measured, set or recorded data can be printed on demand (for current reading in measurement mode, GLP and SETUP modes) or automatically (for autolog and log on demand modes). These models also allow users to print detailed information in four languages for specific help screens and instrument set-up.

Exclusive pH Calibration Check™

HANNA's exclusive Calibration Check™, a diagnostics system that ensures accurate pH readings every time. By alerting users of potential problems during the calibration process, the Calibration Check™ system eliminates erroneous readings due to dirty or faulty pH electrodes or contaminated pH buffer solutions during calibration. Throughout the calibration process, users are guided step-by-step by the on-screen tutorial. After calibration, the probe condition and response time is evaluated and an electrode condition and response time graph is displayed informing the user of the overall pH electrode status. The Calibration Time Out and Out of Calibration Range warning complete the instruments' calibration features.

Out of Calibration Range warning:

Measuring samples outside the calibration range may result in loss of accuracy.

Contaminated Buffer warning:

A contaminated buffer solution causes erroneous calibration curve resulting in loss of accuracy during measurement.

Clean pH Electrode warning:

A dirty pH electrode causes erroneous calibration curve resulting in loss of accuracy during measurement.

Check pH Electrode warning:

This message is displayed in the event the junction of the pH electrode is clogged.

SPECIFICATIONS		HI 122	HI 123
Range	pH	-2.00 to 16.00 pH / -2.000 to 16.000 pH	
	mV	±999.9 and ±2000 mV	
	Selective Ions	–	0.001 to 19999 ppm
	Temperature	-20.0 to 120.0°C (-4.0 to 248.0°F)	
Resolution	pH	0.01 pH / 0.001 pH	
	mV	0.1 mV / 1 mV	
	Selective Ions	–	0.001 / 0.01 / 0.1 / 1 ppm
	Temperature	0.1°C (0.1°F)	
Accuracy (@20°C)	pH	±0.01 pH / ±0.002 pH	
	mV	±0.2 mV (±699.9 mV) / ±0.5 mV (±999.9 mV) / ±1 mV (±2000 mV)	
	Selective Ions	–	±0.5% f.s.
	Temperature	±0.4°C (±0.7°F) excluding probe error	
BNC Inputs		1 for pH electrode	2 for pH and/or ISE electrode
pH Calibration Check		status of electrode condition and response time, status of the buffer solutions during calibration	
Relative mV Offset Range		±2000 mV	
pH Calibration		automatic, up to five point calibration standard with seven buffers (1.68, 4.01, 6.86, 7.01, 9.18, 10.01, 12.45) + two custom buffers	
ISE Calibration		–	automatic, one or two point with five standard values (0.1, 1, 10,100, 1000 ppm)
Temperature Compensation		automatic or manual, -20.0 to 120°C (-4.0 to 248.0°F)	
pH Electrode		HI 1131P glass body pH electrode with BNC + pin connectors and 1 m (3.3') cable (included)	
Temperature Probe		HI 7662-T temperature probe, stainless steel with 1 m (3.3') cable (included)	
Input Impedance		10^{12} Ohm	
Log On Demand		50 samples	100 samples
Automatic Logging		1000 samples	2000 samples
PC Connection		RS232 serial port, opto-isolated	
Printer		built-in dot matrix printer, with 44 mm plain paper	
Power Supply		12 VDC adapter (included)	
Environment		0 to 50°C (32 to 122°F); RH max 95%	
Dimensions		280 x 203 x 84 mm (11.0 x 8.0 x 3.3")	
Weight		1.9 kg (4.2 lbs.)	

ORDERING INFORMATION

HI 122-01 (115V), **HI 122-02** (230V), **HI 123-01** (115V) and **HI 123-02** (230V) are supplied with HI 1131P pH electrode, HI 7662-T temperature probe, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 7071S electrolyte solution (30 mL), (5) paper rolls, 12 VDC adapter and instructions.

ELECTRODES

All electrode part numbers ending in "P" are supplied with a BNC and PIN connector and 1 m (3.3') cable:

HI 1043P	Use: strong acid/alkalis; glass-body, double junction, refillable, combination pH electrode
HI 1053P	Use: emulsions; glass-body, triple ceramic, refillable, combination pH electrode
HI 1083P	Use: biotechnology; glass-body, open junction, refillable, combination pH electrode
HI 1131P	Use: general purpose; glass-body, single junction, refillable, combination pH electrode
HI 7662-T	Stainless steel temperature probe with 1 m (3.3') cable

SOLUTIONS

HI 5004L	pH 4.01 buffer solution, 500 mL
HI 5007L	pH 7.01 buffer solution, 500 mL
HI 5010L	pH 10.01 buffer solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL
HI 7071	3.5M KCl+AgCl Electrolyte, 30 mL (4), for single junction electrodes
HI 7072	1M KNO_3 Electrolyte, 30 mL (4)
HI 7082	3.5M KCl Electrolyte, 30 mL (4), for double junction electrodes

ACCESSORIES

HI 710032	(10) Plain paper rolls
HI 710033	Replacement ink cartridge
HI 76405	Electrode holder
HI 92000	Windows® compatible software
HI 920010	RS232 cable for PC connection

For a complete list of Solutions and Electrodes, see the end of pH *Section 3* and ISE *Section 4*.

HI 2550

pH/ORP/ISE/EC/TDS/NaCl Benchtop Meter

- Up to seven measurement parameters
- Two input channels: pH/ORP/ISE and EC/TDS/Resistivity/NaCl
- Up to five point pH calibration with seven standard and two custom buffers
- EC/TDS autoranging, manual ranging and range lock
- HOLD button to freeze readings on the display
- Automatic Temperature Compensation (pH & EC)
- PC interface via USB

HI 2550 is a 2 channel instrument that measures up to 7 parameters. With this single laboratory bench meter you can measure pH, ORP, ISE, conductivity (EC), TDS, NaCl percentage and temperature.

Utilizing an external temperature probe, pH readings are automatically temperature compensated. To ensure a higher level of precision, pH calibrations are up to five calibration points, chosen from the seven available memorized buffers.

This instrument can measure using ORP electrodes (pH channel input), due to it's capability to measure mV with a resolution up to 0.1 mV and also use ISE electrodes on the mV scale (pH channel input).

EC measurements can be compensated relative to a selected reference temperature. The EC calibration mode allows you to chose from among six recognized conductivity standards and perform a single-point calibration. The most suitable EC and TDS range for your application is automatically selected. The HI 2550 also includes the ability to set and lock the range manually.

This instrument provides GLP capabilities that allows for the storage and retrieval of all data regarding pH, rel mV, EC and NaCl calibration and sample measurement as well as data regarding the maintenance and status of the electrode.

With a built-in logging function, measurements are stored in non volatile memory, and can be transferred to a PC through the USB port. Users can manually log up to 200 records and interval log up to 500 records.

SPECIFICATIONS		HI 2550
Range	pH	-2.0 to 16.0 pH; -2.00 to 16.00 pH; -2.000 to 16.000 pH
	ISE & ORP	±999.9 mV (ISE & ORP); ±2000 mV (ISE & ORP)
	EC	0.00 to 29.99 µS/cm; 30.0 to 299.9 µS/cm; 300 to 2999 µS/cm; 3.00 to 29.99 mS/cm; 30.0 to 200.0 mS/cm; up to 500.0 mS/cm actual* conductivity
	TDS	0.00 to 14.99 ppm; 15.0 to 149.9 ppm; 150 to 1499 ppm; 1.50 to 14.99 g/L; 15.0 to 100.0 g/L; up to 400.0 g/L actual* TDS (with 0.80 factor)
	NaCl	0.0 to 400.0% NaCl
	Temperature	-20.0 to 120.0 °C (pH, EC range)
Resolution	pH	0.1 pH; 0.01 pH; 0.001 pH
	ISE & ORP	0.1 mV (±999.9 mV); 1 mV (± 2000 mV)
	EC	0.01 µS/cm; 0.1 µS/cm; 1 µS/cm; 0.01 mS/cm; 0.1 mS/cm
	TDS	0.01 ppm; 0.1 ppm; 1 ppm; 0.01 g/L; 0.1 g/L
	NaCl	0.1% NaCl
	Temperature	0.1 °C
Accuracy @ 20°C/68°F	pH	± 0.01 pH; ± 0.002 pH
	ISE & ORP	± 0.2 mV (±999.9 mV); ± 1 mV (±2000 mV)
	EC	± 1 % reading (±0.05 µS/cm or 1 digit, whichever greater)
	TDS	±1% of reading (±0.03 ppm or 1 digit, whichever greater)
	NaCl	±1% of reading
	Temperature	± 0.4 °C (excluding probe error)
Relative mV Offset		±2000 mV
pH Calibration		up to five point calibration, seven standard buffers available (1.68, 4.01, 6.86, 7.01, 9.18, 10.01, 12.45), and two custom buffers
EC Calibration		two point calibration; one point slope calibration; six buffers available: 84.0, 1413 µS/cm; 5.00, 12.88, 80.0, 111.8 mS/cm; one point offset: 0.00 µS/cm
NaCl Calibration		one point with HI 7037L standard (optional)
Temperature Compensation		manual or automatic from: -20.0 to 120.0 °C (pH range) -20.0 to 120.0 °C (EC range) (can be disabled on conductivity range to measure actual conductivity)
Cond. Temp. Coefficient		0.00 to 6.00 %/°C (for EC and TDS only) default value is 1.90 %/°C
TDS Factor		0.40 to 0.80 (default value is 0.50)
pH Probe		HI 1131B glass body pH electrode with BNC connector and 1 m (3.3') cable (included)
Conductivity Probe		HI 76310 platinum four ring conductivity/TDS probe with built-in temperature sensor and 1 m (3.3') cable (included)
Temperature Probe		HI 7662 temperature probe with 1 m (3.3') cable (included)
Input Impedance		10^{12} ohms
PC Connectivity		opto-isolated USB
Log On Demand		200 records
Log Interval Feature		500 records; 5, 10, 30 sec and 1, 2, 5, 10, 15, 30, 60, 120, 180 min stability logging ("StAb")
Power Supply		12 VDC
Environment		0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions		235 x 218 x 108 mm (9.2 x 8.5 x 4.2")
Weight		1.3 Kg (2.9 lb); kit with holder 2.1 Kg (4.6 lb.)

(*) Uncompensated conductivity (or TDS) is the conductivity (or TDS) value without temperature compensation.

ORDERING INFORMATION

HI 2550-01 (115V) and **HI 2550-02** (230V) are supplied with HI 1131B pH electrode, HI 76310 conductivity/TDS probe, HI 7662 temperature probe, HI 76404N electrode holder, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 7071S electrolyte solution (30 mL), 12 VDC adapter and instruction manual.

ELECTRODES

HI 1131B	Glass body pH electrode with BNC connector and 1 m (3.3') cable
HI 76310	Platinum, 4-ring conductivity/TDS probe with built-in temperature sensor and 1 m (3.3') cable
HI 7662	Stainless steel temperature probe with 1 m (3.3') cable

SOLUTIONS

HI 5004L	pH 4.01 buffer solution, 500 mL
HI 5007L	pH 7.01 buffer solution, 500 mL
HI 5010L	pH 10.01 buffer solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL
HI 7030L	12880 µS/cm calibration solution, 500 mL
HI 7031L	1413 µS/cm calibration solution, 500 mL
HI 7033L	84 µS/cm calibration solution, 500 mL
HI 7034L	80000 µS/cm calibration solution, 500 mL
HI 7035L	111800 µS/cm calibration solution, 500 mL
HI 7037L	Salinity standard solution, 500 mL

ACCESSORIES

HI 76404N	Electrode holder
HI 92000	Windows® compatible software
HI 920013	USB cable for PC connection

For a complete list of Solutions and Electrodes, see the end of pH *Section 3*, ISE *Section 4* and Conductivity *Section 6*.

HI 2221 • HI 2223

Calibration Check™ pH Benchtop Meters

- **pH Calibration Check™**
- **On-screen electrode condition and response time**
- **Up to five point calibration with seven standard buffers**
- **Diagnostic alerts through icons**
- **Automatic Temperature Compensation**
- **Log up to 500 samples** (HI 2223)
- **GLP features**
- **PC interface via USB**

A properly manufactured and maintained pH electrode will retain its measuring integrity for a long time. As a result of many factors such as age, poor maintenance or improper handling, any electrode in time will lose its integrity.

The most common cause for pH measurement inaccuracies is an unclean or improperly cleaned electrode. This is very important to note, because during calibration, the instrument assumes that the electrode is clean and that the standardization curve created during the calibration process will remain a valid reference until the next calibration.

A dirty electrode or wrong calibration approach can contribute to buffer solution contamination. A contaminated buffer solution can present a major problem during calibration due to the fact that it is considered the only reference.

The HI 2221 and HI 2223 are pH benchtop meters featuring our exclusive Calibration Check™ diagnostics for both pH electrodes and buffer solutions during calibration. These instruments compare the characteristics of the pH electrode from one calibration to the next.

In the case of large variances in the electrode condition, these meters alert the user that the electrode needs to be properly cleaned prior to calibration and measuring.

The second feature is to detect if the calibration buffer solution is contaminated. After calibration, the probe condition is evaluated and an indicator is displayed informing the user of the overall pH electrode status.

These instruments can measure using ORP electrodes (pH channel input), due to it's capability to measure mV with a resolution up to 0.1 mV.

These instruments also feature five point calibration with seven standard buffers, Automatic Temperature Compensation and GLP capabilities that allow for the storage and retrieval of all data regarding pH. With a built-in logging function, measurements are stored in non volatile memory and can be transferred to a PC through the USB port. Users can manually log up to 200 records and interval log up to 500 records.

Calibration Messages

The calibration history is used to alert users during calibration in the case of an unclean electrode or contaminated buffer to reduce calibration errors and assist in ensuring the highest accuracy.

Electrode aging is a slow process, if a substantial change is seen from a previous calibration, it is likely due to a temporary problem with the electrode or buffers. Calibrating under these conditions will give measurement errors.

Error messages such as to clean or check the electrodes and/or buffers appear if the calibration parameters are out of accepted windows. Calibrations cannot be completed until the errors are corrected.

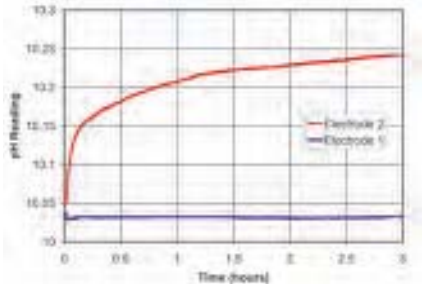
Diagnostic Messages

When using an appropriate HANNA P Type BNC electrode with pin, HI 2221 and HI 2223 will assess electrode condition and response time during each calibration and display the status for the rest of the day.

The digital gauge for electrode condition is a representation of the offset and slope performance of the electrode. The response time gauge is a function of the stabilization time evaluated between the first and second calibration buffers.

The condition and response are also visible when viewing GLP data.

Figure A



Electrode 1 has been properly cleaned before calibration. Electrode 2 has not been properly cleaned.

Figure A (above) shows that the pH measured by a dirty electrode changes over a short period of time. This results from the residue on the pH electrode bulb dissolving into the solution and the electrode gradually returning close to its true characteristics. The resulting pH measurements, based upon the calibration of a dirty electrode, will then be incorrect.

SPECIFICATIONS		HI 2221	HI 2223
Range	pH	- 2.00 to 16.00 pH	-2.00 to 16.00 pH; -2.000 to 16.000 pH
	mV	± 699.9 mV; ± 2000 mV	±999.9 mV; ±2000 mV
	Temperature	-20.0 to 120.0 °C	
Resolution	pH	0.01 pH	0.01 pH; 0.001 pH
	mV	0.1 mV (±699.9 mV); 1 mV (±2000 mV)	0.1mV(±999.9 mV); 1 mV(±2000 mV)
	Temperature	0.1 °C	
Accuracy	pH	± 0.01 pH	±0.01 pH; ±0.002 pH
	mV	± 0.2 mV (± 699.9 mV); ± 1 mV (± 2000 mV)	±0.2 mV (± 999.9 mV); ±1 mV (± 2000 mV)
	Temperature	± 0.2 °C excluding probe error	
pH Calibration		automatic, up to five point calibration with seven standard buffers available (1.68, 4.01, 6.86, 7.01, 9.18, 10.01, 12.45)	
pH Calibration Check™		yes	
Temperature Compensation		manual or automatic from -20.0 to 120.0 °C (-4.0 to 248.0°F)	
pH Electrode		HI 1131P glass body pH electrode with BNC + pin connectors and 1 m (3.3') cable (included)	
Temperature Probe		HI 7662 stainless steel temperature probe and 1 m (3.3') cable (included)	
PC Connection		opto-isolated USB	
Data Logging		100 points	500 points
Input Impedance		10^{12} ohm	
Power Supply		12 VDC adapter (included)	
Environment		0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions		235 x 222 x 109 mm (9.2 x 8.7 x 4.3")	
Weight		1.3 Kg (2.9 lb)	

ORDERING INFORMATION

HI 2221-01 (115V), **HI 2221-02** (230V) and **HI 2223-01** (115V) and **HI 2223-02** (230V) are supplied with HI 1131B pH electrode, HI 7662 temperature probe, HI 76404N electrode holder, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 700661 cleaning solution sachet, HI 7071S electrolyte solution (30 mL), 12 VDC adapter and instructions.

ELECTRODES

Combination pH electrodes. All part codes ending with P are provided with BNC & Pin connectors, and 1 m (3.3') cable:

HI 1043P	Use: strong acids and bases. glass-body, double junction, refillable
HI 1053P	Use: emulsions. glass-body, triple ceramic junction, refillable
HI 1083P	Use: biotechnology. glass-body, open junction, refillable
HI 1131P	Use: general purpose. glass-body, ceramic junction, refillable
HI 1332P	Use: general purpose. PEI body, double junction, refillable
HI 7662	Temperature probe

SOLUTIONS

HI 5004L	pH 4.01 buffer solution, 500 mL
HI 5007L	pH 7.01 buffer solution, 500 mL
HI 5010L	pH 10.01 buffer solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL

ACCESSORIES

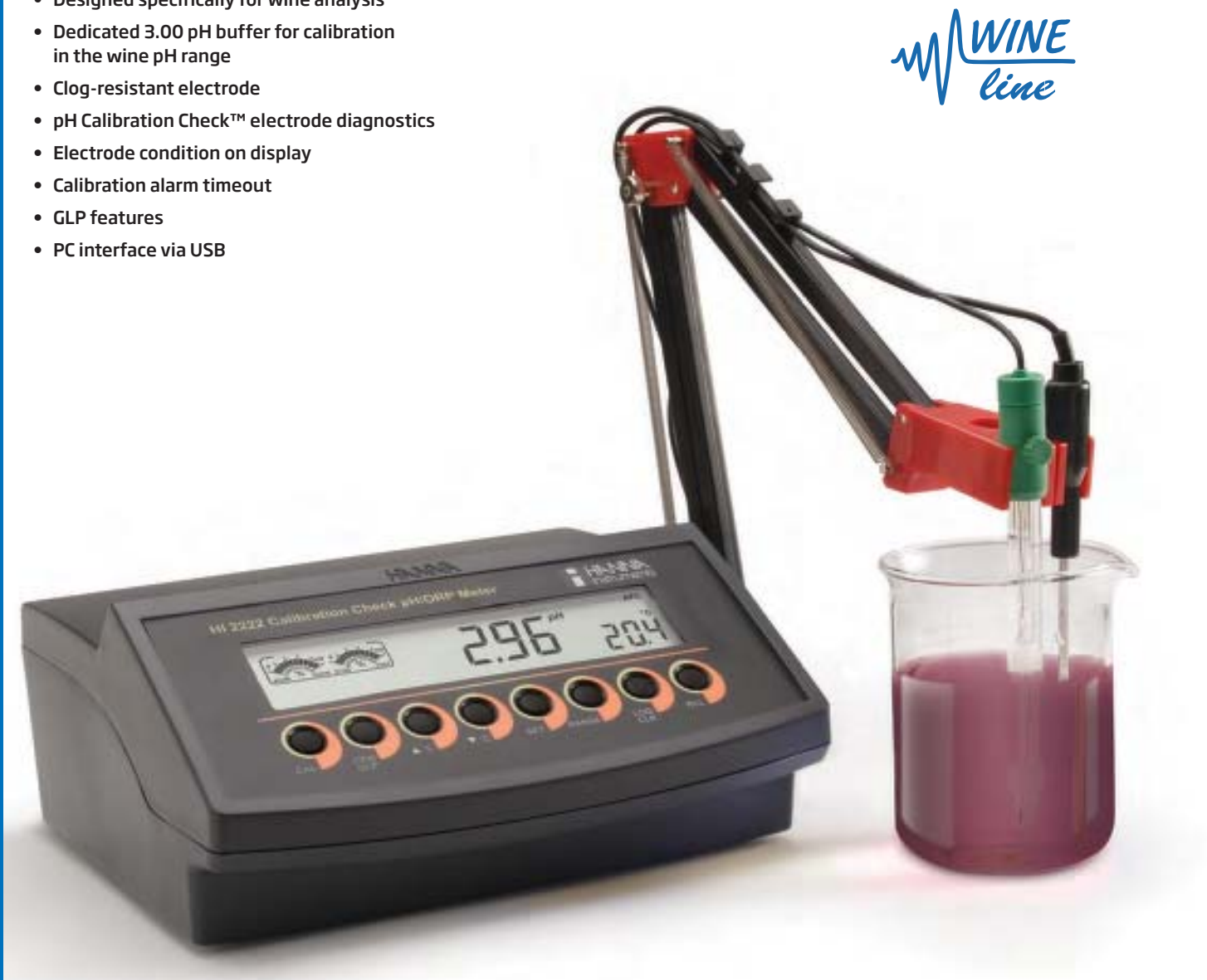
HI 92000	Windows® compatible software
HI 920013	USB cable for PC connection
HI 76404N	Electrode holder

For a complete list of Solutions and Electrodes, see the end of this section.

HI 2222

Wine Analysis pH Benchtop Meter

- Designed specifically for wine analysis
- Dedicated 3.00 pH buffer for calibration in the wine pH range
- Clog-resistant electrode
- pH Calibration Check™ electrode diagnostics
- Electrode condition on display
- Calibration alarm timeout
- GLP features
- PC interface via USB



HI 2222 is the only pH meter on the market today that allows for automatic pH calibration at pH 3 and pH 7. With the dedicated 3.00 pH buffer for wine calibration in the wine pH range, any error due to calibration will be minimized. The HI 2222's Calibration Check™ diagnostics along with the included HI 1048P clogging resistant pH electode further enhances measurement accuracy.

This wine analysis instrument also features logging of up to 100 samples, GLP (Good Laboratory Practice) capability, and a USB interface for the transfer of data to a PC.

In the process of wine making, most pH measurements are made in the must. A pH electrode gets dirty quickly when measuring the pH of must because sediments build up on both the pH measuring bulb and pH electrode junction. This becomes a big problem during the actual pH measurement if the electrode has not been properly cleaned. A dirty pH electrode can give results that are up to 0.5 pH inaccurate – even after a pH calibration has just been performed.

Conventional pH meters do not warn the user when the pH electrode is dirty. A common example of this occurs just after calibrating the instrument – the pH electrode is immersed into the pH 7 buffer and the reading is lower than expected (pH 6.8 or 6.9 instead of 7.0). HI 2222 uses HANNA 's unique technology to detect when the electrode is dirty and gives a warning during calibration.

It is important to properly clean the pH electrode prior to use. A proper cleaning of the electrode must be done with appropriate cleaning solutions in order to remove all the deposits on the sensitive bulb and junction. HI 70635 (wine deposits removal) and HI 70636 (wine stain removal) are tailored made cleaning solutions that remove deposits from your pH electrode to guarantee accurate calibrations for stable, repeatable measurements and long electrode life. HANNA is the only manufacturer to offer tailor made cleaning solutions for winemaking.

pH Calibration Check™ Indications

Optimal condition

Clogged junction

Clogged junction, dirty electrode

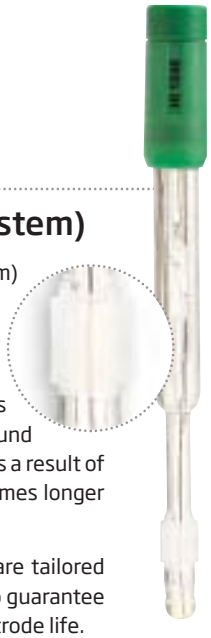
Aged/dirty electrode

Electrode failure

HI 1048P with CPS™ (Clogging Prevention System)

The HI 1048P pH wine electrode with CPS™ (Clogging Prevention System) is HANNA's latest innovation in pH electrode technology.

Conventional pH electrodes use ceramic junctions that clog quickly when used with wine. When the junction is clogged, the electrode does not function. CPS™ technology utilizes the porousness of ground glass coupled with a PTFE sleeve to prevent clogging of the junction. The ground glass allows proper flow of the liquid, while the PTFE sleeve repels dirt. As a result of HANNA's new CPS™ technology, pH electrodes stay fresh for up to 20 times longer than conventional electrodes.



HI 70635 (wine deposits removal) and HI 70636 (wine stain removal) are tailored made cleaning solutions that remove deposits from your pH electrode to guarantee accurate calibrations for stable, repeatable measurements and long electrode life.

SPECIFICATIONS		HI 2222
Range	pH	-2.00 to 16.00
	mV	±699.9 mV; ±2000 mV
	Temperature	-20.0 to 120.0 °C
Resolution	pH	0.01
	mV	0.1 mV (± 699.9 mV); 1 mV (± 2000 mV)
	Temperature	0.1°C
Accuracy	pH	±0.01
	mV	±0.2 (±699.9 mV); ±1 (±2000 mV)
	Temperature	± 0.2 °C excluding probe error
pH Calibration Check		yes
pH Calibration		automatic, one or two point calibration with seven memorized buffers available (1.68, 3.00, 6.86, 7.01, 9.18, 10.01, 12.45)
Temperature Compensation		manual or automatic, -20.0 to 120.0°C (-4 to 248°F)
Specialized pH Electrode for Wine		HI 1048P glass body pH electrode with CPS™, BNC connector + pin with 1 m (3.3') cable (included)
Temperature Probe		HI 7662 stainless steel temperature probe with 1 m (3.3') cable (included)
PC Connection		opto-isolated USB
Data Logging		100 points
Input Impedance		10^{12} Ohm
Power Supply		12 VDC adapter (included)
Environment		0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions		235 x 222 x 109 mm (9.2 x 8.7 x 4.3")
Weight		1.3 Kg (2.9 lb)

pH 3.00 Buffer: Calibration for Wine Analysis

Since most wine measurements are taken at a pH of less than 4, these meters have been pre-programmed at a calibration point of 3.00 pH.

Using the pH 3.00 buffer will minimize any measurement error due to calibration.

ORDERING INFORMATION

HI 2222-01 (115V) and **HI 2222-02** (230V) are supplied with HI 1048P pH electrode, HI 7662 temperature probe, HI 76404N electrode holder, HI 5003 pH 3.00 pH buffer solution, HI 70007 pH 7.01 buffer solution sachet, HI 700636 wine stain cleaning solution sachet, HI 700635 wine deposit cleaning solution sachet, HI 7082S electrolyte solution (30 mL), 5 mL graduated syringe, 12 VDC adapter and instructions.

ELECTRODES

HI 1048P	Glass body, food grade pH electrode with open, CPS™ junction, BNC + pin connector and 1 m (3.3') cable, recommended for wine and must applications.
HI 7662	Stainless steel temperature probe and 1 m (3.3') cable

SOLUTIONS

HI 5003	pH 3.00 buffer solution, 500 mL
HI 5007L	pH 7.01 buffer solution, 500 mL
HI 5010L	pH 10.01 buffer solution, 500 mL
HI 7001L	pH 1.68 buffer Solution in FDA approved bottle, 500 mL
HI 70635L	Cleaning solution for wine deposits, 500 mL
HI 700635P	Cleaning Solution for wine deposits, 20mL sachets (25)
HI 70636L	Cleaning solution for wine stains, 500 mL
HI 700636P	Cleaning Solution for wine stains, 20 mL sachets (25)
HI 70300L	Electrode storage solution, 500 mL
HI 7082	3.5M KCl Electrolyte, 30 mL (4), for double junction electrodes
HI 731312	Red wine decolorization kit (25 pcs)

ACCESSORIES

HI 92000	Windows® compatible software
HI 920013	USB cable for PC connection
HI 76404N	Electrode holder

For a complete list of Solutions and Electrodes, see the end of this section.

HI 2216

0.001 Resolution pH/ORP/ISE/°C Benchtop Meter

- **Up to five point pH calibration with seven standard buffers**
- **Up to two point ISE calibration with five standard solutions**
- **0.001 pH resolution**
- **Calibration expiration reminder**
- **GLP features**
- **Automatic Temperature Compensation**
- **Manually log up to 200 records and interval log up to 500 records**
- **PC interface via USB**

The HI 2216 is a pH, ORP, ISE meter with five point pH calibration and 0.001 pH resolution.

This instrument provides GLP capabilities to allow for the storage and retrieval of all data regarding pH, ORP, and ISE calibration.

HI 2216 can perform measurements using ORP electrodes in the mV scale and ISE electrodes in the ppm scale through the pH channel input. A relative mV feature is also provided.

ORDERING INFORMATION

HI 2216-01 (115V) and **HI 2216-02** (230V) is supplied with HI 1131B pH electrode, HI 7662 temperature probe, HI 76404N electrode holder, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 7071S electrolyte solution (30 mL), HI 700661 cleaning solution sachet, 12 VDC adapter and instructions.

ELECTRODES

Combination pH electrodes provided with BNC connector and 1 m (3.3') cable:

HI 1043B	Use: strong acids and bases. glass-body, double junction, refillable
HI 1053B	Use: emulsions. glass-body, triple ceramic junction, refillable
HI 1083B	Use: biotechnology. glass-body, open junction, refillable
HI 1131B	Use: general purpose. glass-body, ceramic junction, refillable
HI 1332B	Use: general purpose. PEI body, double junction, refillable
HI 7662	Stainless steel temperature probe and 1 m (3.3') cable

SOLUTIONS

HI 5004L	pH 4.01 buffer solution, 500 mL
HI 5007L	pH 7.01 buffer solution, 500 mL
HI 5010L	pH 10.01 buffer solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL

ACCESSORIES

HI 92000	Windows® compatible software
HI 920013	USB cable for PC connection
HI 76404N	Electrode holder

SPECIFICATIONS		HI 2216
Range	pH	-2.0 to 16.0 pH; -2.00 to 16.00 pH; -2.000 to 16.000 pH
	mV	±999.9 mV (ORP); ±2000 mV (ORP)
	ISE	0.001 to 19990 ppm
	Temperature	-20.0 to 120.0 °C (-4.0 to 248.0°F)
Resolution	pH	0.1 pH; 0.01 pH; 0.001 pH
	mV	0.1 mV (±999.9 mV); 1 mV (±2000 mV)
	ISE	0.001 (to 1.999 ppm); 0.01 (to 19.99 ppm); 0.1 (to 199.9 ppm); 1 (to 1999 ppm); 10 (to 19990 ppm)
	Temperature	0.1 °C
Accuracy	pH	±0.1 pH; ±0.01 pH; ±0.002 pH
	mV	±0.2 mV (±999.9 mV); ±1 mV (±2000 mV)
	ISE	±0.5% FS
	Temperature	±0.2°C (excluding probe error)
Relative mV Offset		±2000 mV
pH Calibration		automatic, up to five point calibration with seven standard buffers available (1.68, 4.01, 6.86, 7.01, 9.18, 10.01, 12.45), and two custom buffers
ISE Calibration		automatic, one or two points with five available buffers (0.1, 1, 10, 100, 1000 ppm)
Temperature Compensation		manual or automatic (with HI 7662 probe) from -20.0 to 120.0 °C (-4.0 to 248.0°F)
pH Electrode		HI 1131B glass body pH electrode with BNC connector and 1 m (3.3') cable (included)
Temperature Probe		HI 7662 stainless steel temperature probe with 1 m (3.3') cable (included)
Input Impedance		10^{12} ohm
PC Connectivity		opto-isolated USB
Data Logging		log on demand, 200 records; autologging, 500 records
Logging Interval		5, 10, 30 seconds and 1, 2, 5, 10, 15, 30, 60, 120, 180 minutes stability logging ("StAb")
Power Supply		12 VDC adapter (included)
Environment		0 to 50°C (32 to 122°F); RH max 95%
Dimensions		235 x 222 x 109 mm (9.2 x 8.7 x 4.3")
Weight		1.3 Kg (2.9 lb.)

For a complete list of Solutions and Electrodes, see the end of pH *Section 3* and ISE *Section 4*.

0.001 Resolution and Data Logging pH Benchtop Meters

- **Up to five point pH calibration with seven standard buffers**
- **Calibration expiration reminder**
- **Manually log up to 100 records**
- **Interval log up to 500 records** (HI 2215)
- **GLP features**
- **PC interface via USB**

HI 2214 and HI 2215 are pH and ORP benchtop meters offering five point calibration. A relative mV feature is also provided. HI 2215 adds 0.001 pH resolution and interval logging.

These instruments can take measurements using ORP electrodes (pH channel input) due to their capability to measure mV with a resolution up to 0.1 mV.

Both instruments provide GLP capabilities to allow the storage and retrieval of all data regarding pH and relative mV calibration.

SPECIFICATIONS		HI 2214	HI 2215
Range	pH	-2.0 to 16.0 pH; -2.00 to 16.00 pH	-2.0 to 16.0 pH; -2.00 to 16.00 pH; -2.000 to 16.000 pH
	mV	±699.9 mV; ±2000 mV	±999.9 mV; ±2000 mV
	Temperature	-20.0 to 120.0 °C (-4.0 to 248.0°F)	
Resolution	pH	0.1 pH; 0.01 pH	0.1 pH; 0.01 pH; 0.001 pH
	mV	0.1 mV (±699.9 mV); 1 mV (±2000 mV)	0.1 mV (±999.9 mV); 1 mV (±2000 mV)
	Temperature	0.1 °C	
Accuracy	pH	±0.01 pH	
	mV	±0.2 mV (±699.9 mV); ±1 mV (±2000 mV)	±0.2 mV (±999.9 mV); ±1 mV (±2000 mV)
	Temperature	±0.2 °C (excluding probe error)	
Relative mV Offset		±2000 mV	
pH Calibration		automatic, up to five point calibration with seven standard buffers available (1.68, 4.01, 6.86, 7.01, 9.18, 10.01, 12.45), and two custom buffers	
Temperature Compensation		manual or automatic from -20.0 to 120.0 °C (-4.0 to 248.0°F)	
pH Electrode		HI 1131B glass body pH electrode with BNC connector and 1 m (3.3') cable (included)	
Temperature Probe		HI 7662 stainless steel temperature probe with 1 m (3.3') cable (included)	
Input Impedance		10^{12} ohm	
PC Connectivity		opto-isolated USB	
Data Logging		log on demand, 100 records	
Logging Interval		–	5, 10, 30 seconds and 1, 2, 5, 10, 15, 30, 60, 120, 180 minutes stability logging ("StAb")
Power Supply		12 VDC adapter (included)	
Environment		0 to 50°C (32 to 122°F); RH max 95%	
Dimensions		235 x 222 x 109 mm (9.2 x 8.7 x 4.3")	
Weight		1.3 Kg (2.9 lb)	

ORDERING INFORMATION

HI 2214-01 (115V), **HI 2214-02** (230V) and **HI 2215-01** (115V) and **HI 2215-02** (230V) are supplied with HI 1131B pH electrode, HI 7662 temperature probe, HI 76404N electrode holder, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 7071S electrolyte solution (30 mL), HI 700661 cleaning solution sachet, 12 VDC adapter and instructions.

ELECTRODES

Combination pH electrodes with BNC connector and 1 m (3.3') cable:

HI 1043B	Use: strong acids and bases. glass body, double junction, refillable
HI 1053B	Use: emulsions. glass-body, triple ceramic junction, refillable
HI 1083B	Use: biotechnology. glass-body, open junction, refillable
HI 1131B	Use: general purpose. glass-body, ceramic junction, refillable
HI 1332B	Use: general purpose. PEI body, double junction, refillable
HI 7662	Stainless steel temperature probe and 1 m (3.3') cable

SOLUTIONS

HI 5004L	pH 4.01 buffer solution, 500 mL
HI 5007L	pH 7.01 buffer solution, 500 mL
HI 5010L	pH 10.01 buffer solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL

ACCESSORIES

HI 92000	Windows® compatible software
HI 920013	USB cable for PC connection
HI 76404N	Electrode holder

For a complete list of Solutions and Electrodes, see the end of this section.

HI 2212 • HI 2213

pH Benchtop Meters with Three Point Calibration

- **Up to three point pH calibration with five standard buffers or two custom**
- **ORP measurement** (HI 2213 only)
- **Relative mV readings** (HI 2213 only)
- **GLP features**
- **Calibration expiration reminder**
- **Automatic Temperature Compensation**

The HI 2212 and HI 2213 are pH and temperature benchtop meters. HI 2213 can measure oxidation reduction potential (ORP) in the mV range. A relative mV feature is also provided.

Calibration can be performed at up to three-points using five standard and two custom buffers.

These instruments feature manual or automatic temperature compensation with the HI 7662 temperature probe.

GLP (Good Laboratory Practice) feature provides data consistency. A calibration reminder can be set to alert the user, that too much time has elapsed since the last pH calibration and a new one should be performed.

ORDERING INFORMATION

HI 2212-01 (115V), **HI 2212-02** (230V) and **HI 2213-01** (115V) and **HI 2213-02** (230V) are supplied with HI 1131B pH electrode, HI 7662 temperature probe, HI 76404N electrode holder, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 7071S electrolyte solution (30 mL), HI 700661 cleaning solution sachet, 12 VDC adapter and instructions.

ELECTRODES

Combination pH electrodes with BNC connectors, and 1 m (3.3') cable:

HI 1043B	Use: strong acids and bases. glass body, double junction, refillable
HI 1053B	Use: emulsions. glass-body, triple ceramic junction, refillable
HI 1083B	Use: biotechnology. glass-body, open junction, refillable
HI 1131B	Use: general purpose. glass-body, ceramic junction, refillable
HI 1332B	Use: general purpose. PEI body, double junction, refillable
HI 7662	Stainless steel temperature probe and 1 m (3.3') cable

SOLUTIONS

HI 5004L	pH 4.01 buffer solution, 500 mL
HI 5007L	pH 7.01 buffer solution, 500 mL
HI 5010L	pH 10.01 buffer solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL

SPECIFICATIONS		HI 2212	HI 2213
Range	pH	-2.00 to 16.00 pH	
	mV	–	±699.9 mV; ±2000 mV
	Temperature	-20.0 to 120.0 °C (-4.0 to 248.0°F)	
Resolution	pH	0.01 pH	
	mV	–	0.1 mV; 1 mV
	Temperature	0.1 °C	
Accuracy	pH	±0.01 pH	
	mV	–	±0.2 mV; ±1 mV
	Temperature	±0.2°C (excluding probe error)	
Relative mV Offset Range		–	±2000 mV
pH Calibration		automatic, up to three points with five standard buffers available (4.01, 6.86, 7.01, 9.18, 10.01), and two custom buffers	
Temperature Compensation		manual or automatic from -20.0 to 120.0 °C (-4.0 to 248.0°F)	
pH Probe		HI 1131B glass body pH electrode with BNC connector and 1 m (3.3') cable (included)	
Temperature Probe		HI 7662 stainless steel temperature probe with 1 m (3.3') cable (included)	
Input Impedance		10^{12} ohm	
Power Supply		12 VDC adapter (included)	
Environment		0 to 50°C (32 to 122°F); RH max 95%	
Dimensions		235 x 222 x 109 mm (9.2 x 8.7 x 4.3")	
Weight		1.3 kg (2.9 lbs.)	

For a complete list of Solutions and Electrodes, see the end of this section.

Basic pH Benchtop Meters

- **Simple to operate**
- **Automatic Temperature Compensation**
- **Automatic calibration**
- **Calibration expiration reminder**
- **ORP range**

HI 2211 and HI 2210 are benchtop pH and °C meters. HI 2211 adds measurement for ion concentration (ISE) and Oxidation Reduction Potential (ORP) in the mV range.

These instruments also feature a reading stability indicator used during calibration and a measurement memory/memory recall function .

pH measurements for both instruments are compensated for the temperature effect manually or automatically with the HI 7662 temperature probe. These instruments are equipped with an easy-to-read LCD which shows both the primary reading and °C.

SPECIFICATIONS		HI 2210	HI 2211
Range	pH	-2.00 to 16.00 pH	
	mV	–	±399.9 mV ; ±2000 mV
	Temperature	-20 to 120.0°C	
Resolution	pH	0.01 pH	
	mV	–	0.1 mV; 1 mV
	Temperature	0.1°C	
Accuracy (@20°C)	pH	±0.01 pH	
	mV	–	±0.2 mV (±399.9 mV); ±1 mV (±2000 mV)
	Temperature	±0.4 °C (excluding probe error)	
pH Calibration		automatic, one or two points with five memorized buffer values (pH 4.01, 6.86, 7.01, 9.18, 10.01)	
Temperature Compensation		automatic (with HI 7662 probe) or manual from -20.0 to 120.0°C	
pH Electrode		HI 1131B glass body pH electrode with BNC connector and 1 m (3.3') cable (included)	
Temperature Probe		HI 7662 stainless steel temperature probe with 1 m (3.3') cable (included)	
Input Impedance		10^{12} Ohm	
Power Supply		12 VDC adapter (included)	
Environment		0 to 50°C (32 to 122°F); RH max 95%	
Dimensions		235 x 222 x 109 mm (9.2 x 8.7 x 4.3")	
Weight		1.3 kg (2.9 lbs.)	

ORDERING INFORMATION

HI 2210-01 (115V), **HI 2210-02** (230V), **HI 2210-03** (AUS plug), **HI 2211-01** (115V) and **HI 2211-02** (230V) are supplied with HI 1131B pH electrode, HI 7662 temperature probe, HI 76404N electrode holder, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 7071S electrolyte solution (30 mL), HI 700661 cleaning solution sachet, 12 VDC adapter and instructions.

ELECTRODES

HI 1043B	Use: strong acids and bases. glass body, double junction, refillable
HI 1053B	Use: emulsions. glass-body, triple ceramic junction, refillable
HI 1083B	Use: biotechnology. glass-body, open junction, refillable
HI 1131B	Use: general purpose. glass-body, ceramic junction, refillable
HI 1332B	Use: general purpose. PEI body, double junction, refillable
HI 7662	Stainless steel temperature probe with 1 m (3.3') cable

SOLUTIONS

HI 5004L	pH 4.01 buffer solution, 500 mL
HI 5007L	pH 7.01 buffer solution, 500 mL
HI 5010L	pH 10.01 buffer solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL

ACCESSORIES

HI 8427	pH/mV electrode simulator
HI 931001	pH/mV electrode simulator with display
HI 76404N	Electrode holder

For a complete list of Solutions and Electrodes, see the end of this section.

pH 209

Analog pH Benchtop Meter

- **Simple to operate**
- **Manual calibration**
- **Manual Temperature Compensation** (MTC)
- **Economical**

The pH 209 benchtop pH meter is designed for durability and simplicity of use. This instrument features a large, easy to read LCD and user friendly dials.

The pH calibration is manual at one or two points using dials on the front panel making them ideal for applications that require custom calibration points.

In many applications, a standard calibration curve such as pH 7 or pH 4 is too far from the value of the sample to achieve the highest accuracy. Manual calibration enables the user to select the instrument's calibration points closer to the desired range of measurement to achieve maximum accuracy.

The pH 209 can also measure ion concentration (ISE) or ORP (oxidation reduction potential) in the extended mV range with optional electrodes.

Durability, simplicity and comprehensive operating procedures make this meter one of the most popular student pH meters available today.

ORDERING INFORMATION

pH 209-01 (115V) and **pH 209-02** (230V) are supplied with HI 1332B pH electrode, 12 VDC adapter and instruction manual.

ELECTRODES

HI 1332B	Use: general purpose. PEI body, double junction, refillable
HI 3131B	Glass body ORP electrode with platinum sensor, BNC connector and 1 m (3.3') cable

SOLUTIONS

HI 5004L	pH 4.01 buffer solution, 500 mL
HI 5007L	pH 7.01 buffer solution, 500 mL
HI 5010L	pH 10.01 buffer solution, 500 mL
HI 7004L	pH 4.01 buffer solution, 500 mL
HI 7004M	pH 4.01 buffer solution, 230 mL
HI 7007L	pH 7.01 buffer solution, 500 mL
HI 7007M	pH 7.01 buffer solution, 230 mL
HI 7010L	pH 10.01 buffer solution, 500 mL
HI 7010M	pH 10.01 buffer solution, 230 mL
HI 7061L	Electrode cleaning solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL

SPECIFICATIONS		pH 209
Range	**pH**	0.00 to 14.00 pH
	mV	±1999 mV
Resolution	**pH**	0.01 pH
	mV	1 mV
Accuracy (@20°C)	**pH**	±0.01 pH
	mV	±1 mV
pH Calibration		manual, two point
Temperature Compensation		manual, 0 to 100°C (32 to 212°F)
pH Electrode		HI 1332B PEI body pH electrode with BNC connector and 1 m (3.3') cable (included)
Input Impedance		10^{12} Ohm
Power Supply		12 VDC adapter (included)
Environment		0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions		240 x 182 x 74 mm (9.4 x 7.2 x 2.9")
Weight		1.0 kg (2.2 lbs.)

For a complete list of Solutions and Electrodes, see the end of this section.

pH Meters for Education

- **Compact and lightweight**
- **Built-in beaker and beaker-top electrode holder**
- **pH and temperature in one probe**
- **Built-in magnetic stirrer** (HI 208)
- **Dual-level LCD**
- **Automatic calibration**
- **Operated by battery or 12 VDC**
- **°C and °F temperature scales**

With features such as a built-in beaker holder, beaker-top electrode holder and rugged, 2-in-1 pH and temperature sensor, the HI 207 and HI 208 are designed to meet busy classroom environments.

These instruments also feature an extended pH range, dual-level LCD with icons for stability and buffer recognition, built-in magnetic stirrer (HI 208 only), automatic pH calibration, and temperature display in either Celsius or Fahrenheit. In addition, all readings are automatically compensated for temperature variations.

In the classroom, these compact units reduce clutter and utilize a minimal amount of space on the desktop. Switch to battery power and the instrument can be taken outside the classroom for field studies. When lab time is over, the instruments are easily cleaned and can be placed out of the way–right away.

SPECIFICATIONS		HI 207	HI 208
Range	pH	-2.00 to 16.00 pH	
	Temperature*	-5.0 to 105.0°C / 23.0 to 221.0°F	
Resolution	pH	0.01 pH	
	Temperature	0.1°C / 0.1°F	
Accuracy (@20°C)	pH	±0.02 pH	
	Temperature	±0.5 (up to 60°C); ±1°C (outside) ±1°F (up to 140°F); ±2°F (outside)	
pH Calibration		automatic, one or two point with two sets of memorized buffer values (pH 4.01/7.01/10.01 or 4.01/6.86/9.18)	
Temperature Compensation		automatic	
Electrode		HI 1291D PEI body pH electrode with internal temperature sensor, DIN connector and 1 m (3.3') cable (included)	
Built-in Magnetic Stirrer		no	yes, built-in at 500 rpm
Battery Type / Life		9V / approximately 500 hours of continuous use (without stirrer)	
Power Supply		12 VDC adapter (included)	
Environment		0 to 50°C (32 to 122°F); RH max 95%	
Dimensions		192 x 104 x 134 mm (7.5 x 4.1 x 5.3")	
Weight		420 g (14.8 oz.)	

(*) The temperature range is limited to 80 °C (176 °F) if using the HI 1291D probe.

ORDERING INFORMATION

HI 207-01 (115V), **HI 207-02** (230V), **HI 208-01** (115V) and **HI 208-02** (230V) are supplied with HI 1291D pH electrode, HI 740035 pH electrode holder and plastic beaker, rubber O-ring, magnetic stir bar (HI 208 only), HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, 12 VDC adapter, battery and instructions.

ELECTRODES

HI 1291D	PEI body, preamplified pH electrode with internal temperature sensor, DIN connector and 1 m (3.3') cable

SOLUTIONS

HI 5004L	pH 4.01 buffer solution, 500 mL
HI 5007L	pH 7.01 buffer solution, 500 mL
HI 5010L	pH 10.01 buffer solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL

ACCESSORIES

HI 740036P	Plastic beakers, 50 mL (10)
HI 731316	Magnetic stir bars for HI 208 (5)
HI 740035	Electrode holder and 50 mL plastic beaker for HI 207 and HI 208

For a complete list of Solutions and Electrodes, see the end of this section.

pH 20 • pH 21

Basic pH Benchtop Meters

- **Easy to use meter for performing specific measurements**
- **Automatic pH calibration**
- **ORP readings** (pH 21 only)

pH 20 and pH 21 are basic pH meters designed for simplicity of use in all applications where fast and efficient daily controls are required. These meters are also suitable for the educational field, where students are often first introduced to measuring instruments.

Both models measure pH in the 0 to 14 range, with 0.01 resolution. In addition, the pH 21 can also measure ORP (mV) by using a proper ORP electrode (optional). The pH calibration procedure is automatic and can be performed at one or two points.

Readings can be manually (MTC) or automatically (ATC) compensated for temperature. The automatic temperature compensation is performed if using the optional HI 7662 temperature probe, while for manual compensation the user can set the temperature value through the arrow keys. The meters are also provided with the HOLD function, which allows to freeze reading on the LCD by simply pressing the HOLD button.

ORDERING INFORMATION

pH 20-01 (115V), **pH 20-02** (230V), **pH 21-01** (115V) and **pH 21-02** (230V) are supplied with HI 1110B pH electrode, 12 VDC adapter and instructions.

ELECTRODES AND PROBES

HI 1110B	Glass body pH electrode with BNC connector and 1 m (3.3') cable
HI 3131B	Glass body ORP electrode with platinum sensor, BNC connector and 1 m (3.3') cable
HI 7662	Stainless steel temperature probe with 1 m (3.3') cable

SOLUTIONS

HI 5004L	pH 4.01 buffer solution, 500 mL
HI 5007L	pH 7.01 buffer solution, 500 mL
HI 5010L	pH 10.01 buffer solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL

ACCESSORIES

HI 76405	Electrode holder

SPECIFICATIONS		pH 20	pH 21
Range	pH	0.00 to 14.00 pH	
	mV	–	-1999 to 1999 mV
	Temperature	0.0 to 100.0 °C	
Resolution	pH	0.01 pH	
	mV	–	1 mV
	Temperature	0.1°C	
Accuracy (@20°C/68°F)	pH	±0.02 pH	
	mV	–	±2 mV
	Temperature	±1°C	
Temperature Compensation		manual (adjustable with arrow keys) or automatic from 0 to 100°C (with temperature probe)	
pH Electrode		HI 1110B glass body pH electrode with BNC connector and 1 m (3.3') cable (included)	
Temperature Probe		HI 7662 temperature probe with 1 m (3.3') cable (optional)	
pH Calibration		automatic, one or two point	
Power Supply		12 VDC adapter (included)	
Environment		0 to 50°C (32 to 122°F); RH max 95%	
Dimensions		230 x 170 x 75 mm (9.1 x 6.7 x 3.0")	
Weight		500 g (1.1 lbs.)	

For a complete list of Solutions and Electrodes, see the end of this section.

pH Turtle™

PC (required), beaker and electrode holder not included.

- **Continuous real-time data logging directly on the PC**
- **Compatible with all Windows® versions**
- **Includes pH electrode, RS232 connection cable and software**
- **Inexpensive desktop solution**

The HANNA pH Turtle (HI 9815) is an easy to use transmitter that turns any PC into a pH meter. Simply plug it into your PC's serial port and go! Within moments you can view pH measurements on your PC.

The HI 981500 user-friendly software from HANNA allows continuous real time data logging right from the desktop. This software can be operated in eight different languages: Dutch, English, French, German, Italian, Norwegian, Portuguese and Spanish. The main menu window of this powerful software contains a virtual pH meter display and continuously updates the logging data table and real-time graph with zoom-in features.

The pH Turtle is also supplied with the HI 1333B double-junction, refillable pH electrode to ensure long life, even in varied and unclean samples. In addition, its rugged plastic body provides higher impact resistance.

SPECIFICATIONS	HI 9815
Range	0.0 to 14.0 pH
Resolution	0.1 pH
Accuracy (@20°C/68°F)	±0.2 pH
Calibration	automatic, up to three points directly from PC
Temperature Compensation	manual, 0 to 100°C (32 to 212°F)
pH Electrode	HI 1333B PEI body pH electrode with BNC connector and 1 m (3.3') cable (included)
Input Impedance	10^{12} Ohm
PC Connection	RS232
Environment	0 to 50°C (32 to 122°F); RH max 95%
Dimensions	Ø 88 x 40 mm (Ø 3.5 x 1.6")
Weight	250 g (8.8 oz.)

ORDERING INFORMATION

HI 9815 (pH Turtle) is supplied HI 1333B pH electrode, software and instructions.

ELECTRODES

HI 1333B	PEI body pH electrode with BNC connector and 1 m (3.3') cable

SOLUTIONS

HI 5004L	pH 4.01 buffer solution, 500 mL
HI 5007L	pH 7.01 buffer solution, 500 mL
HI 5010L	pH 10.01 buffer solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL

ACCESSORIES

HI 76405	Electrode Holder and steel base
HI 981500	Windows® compatible software

For a complete list of Solutions and Electrodes, see the end of this section.

HI 98183 • HI 98184 • HI 98185

pH/ORP/ISE Waterproof Portable Meters

Feature Highlights

- pH Calibration Check™
- Electrode condition on display
- Five point pH calibration with seven standard buffers and five custom buffers
- Automatic logging and log on demand
- Menu driven for ease of use
- Soft-key extended functionality
- Multiple language selection
- Contextual help at the touch of a button
- GLP features
- USB
- Backlit, graphic LCD and battery life on display
- Waterproof and rugged casing

Rechargeable batteries

These models have up to 200 hours of extended battery life to guarantee long operation in the field. When the batteries are low, you don't have to worry about carrying a spare set with you, the batteries can be recharged with HANNA's inductive recharger. Simply leave the meter on the recharger for a few hours and you're ready to go. The recharger can be plugged into a standard 115V or 230V socket using the appropriate HANNA adapter.

HI 98183, HI 98184 and HI 98185 are waterproof, portable meters designed for demanding applications. HI 98183 measures pH/ORP and temperatuare while HI 98184 and HI 98185 also include ISE measurement.

Choose from 7 standard pH buffers and 5 custom pH buffers to obtain up to five point calibration and achieve high precision readings with a pH accuracy of ±0.002 and up to ±0.001 pH resolution.

HANNA's Calibration Check® maintains a history of past calibrations and monitors the pH electrode and buffers during subsequent calibrations for any signs of wide calibration variances due to a dirty or broken electrode or contaminated pH buffers. In measurement mode, the electrode's percent condition is continuously displayed.

Exchange out the pH probe for an ORP probe to obtain mV readings in the ±2000 mV range. HI 98184 and HI 98185 adds direct ion concentration readings for ISE's and the results are displayed in ppm. The ion charge or nominal slope can be entered manually.

HI 98185 adds auto recognition of 15 different ISE sensors and can be calibrated in up to five points and 6 standard buffers (choice of units). This meter allows an extensive choice of measurement units (ppm, ppt, g/L, ppb, ug/L, mg/mL, M, mol/L, mmol/L, % w/v, user) and has an expanded measuring range of 1.00×10^{-7} to 9.99×10^{-10}.

Press Auto-Hold while measuring and once stabilized, the current reading will remain displayed for your convenience in documenting. Switching to log-on-demand mode allows users to record and save up to 200 samples (HI 98183) or 300 samples (HI 98184 and HI 98185). This data can later be transferred to a PC with the USB connection and HANNA's HI 92000 software. "Out Of Calibration Range Warning" can be engaged to keep the user informed of the current calibration and helps to avoid taking measurements that are out of range.

A backlit, graphic LCD provides easy to read resolution even in low-lit areas. A combination of dedicated and soft keys allows easy, intuitive operation in a choice of languages. Comprehensive GLP data are directly accessible by pressing the GLP key. Access the contextual Help Menu to obtain on-screen information and assistance about each feature at the touch of a button. Designed for field use, these instruments can be operated with one hand and are supplied in a rugged carrying case. With an extended battery life of up to 200 hours, users are assured long operation. The inductive charger can either be plugged into a standard 115V socket with the included adapter or a 12 VDC source, such as a car's 12 V accessory outlet.

These meters come equipped with the HI 72911B pH/ temperature electrode with rugged, titanium casing.

Calibration

pH calibration features detailed Calibration Check™ message.

Users are guided through the calibration procedure with step-by-step on-screen instructions.

Setup screen

Our extensive setup screen features a host of configurable options such as time, date, temperature units and language for help screens and guides.

Help

Users can consult the on-screen help from any mode simply by pressing the HELP key. The instrument will then explain the options currently available.

GLP

Comprehensive GLP functions are directly accessible by pressing the GLP key. Calibration data, date and ID info are stored for retrieval at a later time.

SPECIFICATIONS		HI 98183	HI 98184	HI 98185
Range	pH	-2.0 to 20.0; -2.00 to 20.00; -2.000 to 20.000 pH		
	mV	±2000 mV		
	ISE	–	from 1.00 E-3 to 1.00 E5 concentration	from 1.00 E-7 to 9.99 E10 concentration
	Temperature	-20.0 to 120.0 °C (-4.0 to 248.0°F)		
Resolution	pH	0.1; 0.01; 0.001 pH		
	mV	0.1 mV		
	ISE	–	3 digits 0.01; 0.1; 1; 10 concentration	
	Temperature	0.1°C (0.1°F)		
Accuracy	pH	±0.01; ±0.002 pH		
	mV	±0.2 mV		
	ISE	–	±0.5% of reading (monovalent ions), ±1% of reading (divalent ions)	
	Temperature	±0.4°C (±0.8°F) (excluding probe error)		
Calibration	pH	up to five point calibration, seven standard buffers available (1.68, 4.01, 6.86, 7.01, 9.18, 10.01, 12.45) + five custom buffers		
	ISE	–	up to two point calibration, six standard solutions (0.1, 1, 10, 100, 1000, 10000 ppm)	up to five point calibration, six standard solutions (0.1, 1, 10, 100, 1000, 10000 ppm)
	Slope	From 80 to 110%		
Temperature Compensation (pH)		manual or automatic from -20.0 to 120.0°C (-4.0 to 248.0°F)		
Probe		HI 72911B Titanium body, pH electrode with internal temperature sensor, BNC connector and 1 m (3.3' cable)		
Logging		log on demand 200 samples (100 ea. range)	log on demand 300 samples (100 each range)	
PC Connectivity		opto-isolated USB with optional HI 92000 software		
Input Impedance		10^{12} Ohms		
Battery Type / Life		1.2V AA rechargeable batteries (4) / approximately 200 hours of continuous use without backlight (50 hours with backlight)		
Auto-off		user selectable: 5, 10, 30, 60 min or can be disabled		
Environment		0 to 50°C (32 to 122°F); RH 100%		
Dimensions		226.5 x 95 x 52 mm (8.9 x 3.75 x 2")		
Weight		525 g (18.5 oz.)		

ORDERING INFORMATION

HI 98183-01 (115V), **HI 98183-02** (230V), **HI 98184-01** (115V), **HI 98184-02** (230V) and **HI 98185-01** (115V) and **HI 98185-02** (230V) are supplied with HI 72911B pH electrode, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, rechargeable batteries, HI 710042 inductive battery charger with power adapter, instructions and hard carrying case.

ELECTRODES AND PROBES

Combination pH electrodes with BNC connector and 1 m (3.3') cable:

HI 1043B Use: strong acids and bases. glass-body, double junction, refillable

HI 1230B Use: general purpose. PEI body, double junction, gel-filled

HI 72911B Use: general purpose. titanium body, double junction, gel-filled with internal temperature sensor

HI 3230B Use: For oxidizing reactions. platinum tipped ORP probe, PEI body, single junction, gel-filled

HI 4430B Use: Strong oxidizing solutions gold tipped ORP probe, PEI body, single junction, gel-filled

HI 7662 Temperature probe with 1 m (3.3') screened cable

SOLUTIONS

HI 5004L pH 4.01 buffer solution, 500 mL

HI 5007L pH 7.01 buffer solution, 500 mL

HI 5010L pH 10.01 buffer solution, 500 mL

HI 7061L Electrode cleaning solution, 500 mL

HI 70300L Electrode storage solution, 500 mL

HI 7091L ORP reducing pretreatment solution, 500 mL

HI 7092L ORP oxidizing pretreatment solution, 500 mL

HI 7020L ORP test solution @200-275 mV, 500 mL

HI 7021L ORP test solution @240 mV, 500 mL

HI 7022L ORP test solution @470 mV, 500 mL

ACCESSORIES

HI 920013 USB cable for PC connection

HI 92000 Windows® compatible software

For a complete list of Solutions and Electrodes, see the end of pH *Section 3* and ISE *Section 4*.

HI 98172

Portable pH/ORP/ISE Meter with Calibration Check™

- pH Calibration Check™
- Five point pH calibration with seven standard and five custom pH buffers
- Log on demand (500 samples)
- User-selectable "calibration time out"
- Tutorial messages on LCD
- PC interface via USB

HI 98172 is a pH/ORP/ISE meter housed in a waterproof casing. Up to five point pH calibration is available with seven memorized pH buffers and five custom pH buffers to provide users with the flexibility necessary to adjust the calibration range to obtain the most accurate and precise readings.

Exchange out the pH sensor for an ORP sensor to obtain mV readings. ISE sensors are calibrated up to five points and measurements are displayed in ppm.

Calibration Check® incorporates an electrode condition graph which alerts the user with regards to the electrode status. If readings are taken too far outside the calibration range, the unit will warn the user with a graphic signal. Users may set a reminder to notify when calibration is due.

HI 98172 features tutorial messages on the LCD and an auto-end mode to ensure readings are taken only when they are stable. Comprehensive GLP data are directly accessible by pressing the GLP key and log-on-demand holds up to 500 records. Data can be transferred to a PC via USB with optional HI 92000 software and HI 920014 USB connection cable.

ORDERING INFORMATION

HI 98172 is supplied with HI 1230B pH electrode, HI 7662 temperature probe, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, 100 mL plastic beaker, batteries, instructions and hard carrying case.

ELECTRODES

HI 1230B	PEI body pH electrode with BNC connector and 1 m (3.3') cable
HI 3131B	Glass body ORP electrode with platinum sensor, BNC connector and 1 m (3.3') cable
HI 7662	Stainless steel temperature probe with 1 m (3.3') cable

SOLUTIONS

HI 5004L	pH 4.01 buffer solution, 500 mL
HI 5007L	pH 7.01 buffer solution, 500 mL
HI 5010L	pH 10.01 buffer solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL

ACCESSORIES

HI 92000	Windows® compatible software
HI 920014	Mini USB connection cable

SPECIFICATIONS		HI 98172
Range	pH	-4.0 to 20.0 pH; -4.00 to 20.00 pH
	mV	±699.9; ±2000 mV
	ISE	0.001 to 19990 ppm
	Temperature	-20.0 to 120.0°C (-4.0 to 248.0°F)
Resolution	pH	0.1 pH; 0.01 pH
	mV	0.1 mV (±699.9 mV); 1 mV (±2000)
	ISE	0.001 ppm (0.001 to 1.999); 0.01 ppm (2.00 to 19.99); 0.1 ppm (20.0 to 199.9); 1 ppm (200 to 1999); 10 ppm (2000 to 19990)
	Temperature	0.1°C (0.1°F)
Accuracy (@20°C)	pH	±0.1 pH; ±0.01 pH
	mV	±0.2 mV (±699.9 mV); ±1 mV (±2000 mV)
	ISE	±0.5% f.s.
	Temperature	±0.2°C (±0.4°F) excluding probe error
pH Calibration		up to five point calibration with seven standard buffers available (1.68, 4.01, 6.86, 7.01, 9.18, 10.01, 12.45), and 5 custom buffers
ISE Calibration		up to five point calibration with six standard buffers available (0.1, 1, 10, 100, 1000, 10000 ppm)
Slope/Offset Calibration		±1 pH/from 80 to 110%
Relative mV Offset Range		±2000 mV
Temperature Compensation		manual or automatic from -20.0 to 120.0 °C (-4.0 to 248.0 °F)
pH Electrode		HI 1230B PEI body pH electrode with BNC connector and 1 m (3.3') cable (included)
Temperature Probe		HI 7662 stainless steel temperature probe with 1 m (3.3') cable (included)
Logging		log on demand, 500 samples
PC Connection		opto-isolated USB with optional HI 92000 software
Input Impedance		10^{12} Ohm
Power Supply		1.5V AAA (3) / approximately 200 hours of continuous use without backlight (50 hours with backlight). User selectable auto-off (5, 10, 20, 60 minutes or can be disabled)
Environment		0 to 50°C (32 to 122°F); RH max 100%
Dimensions / Weight		185 x 72 x 36 mm (7.3 x 2.8 x 1.4") / 300 g (10.6 oz.)

For a complete list of Solutions and Electrodes, see the end of pH *Section 3* and ISE *Section 4*.

HI 98160

Portable pH/ORP Meter with Calibration Check™

- **pH Calibration Check™**
- **Five point pH calibration with seven standard and five custom pH buffers**
- **Log on demand (500 samples)**
- **User-selectable "calibration time out"**
- **Tutorial messages on LCD**
- **PC interface via USB**

HI 98160 is a pH/ORP meter housed in a waterproof casing. Up to five point calibration is available with eight memorized pH buffers and two custom pH buffers to provide users with the flexibility necessary to adjust the calibration range to obtain the most accurate and precise readings.

Exchange out the pH sensor for an ORP sensor to obtain mV readings.

HANNA's Calibration Check® incorporates an electrode condition graph which alerts the user with regards to the electrode status. If readings are taken too far outside the calibration range, the unit will warn the user with a graphic signal. Users may set a reminder to notify when calibration is due.

HI 98160 features tutorial messages on the LCD and an auto-end mode to ensure readings are taken only when they are stable. Comprehensive GLP data are directly accessible by pressing the GLP key and log-on-demand holds up to 500 records. Data can be transferred to a PC via USB with optional HI 92000 software and HI 920014 USB connection cable.

SPECIFICATIONS		HI 98160
Range	pH	-4.0 to 20.0 pH; -4.00 to 20.00 pH
	mV	±699.9; ±2000 mV
	Temperature	-20.0 to 120.0°C (-4.0 to 248.0°F)
Resolution	pH	0.1 pH; 0.01 pH
	mV	0.1 mV (±699.9 mV); 1 mV (±2000)
	Temperature	0.1°C (0.1°F)
Accuracy (@20°C/68°F)	pH	±0.1 pH; ±0.01 pH
	mV	±0.2 mV (±699.9 mV); ±1 mV (±2000 mV)
	Temperature	±0.2°C (±0.4°F) excluding probe error
pH Calibration		up to five point calibration with eight standard buffers available (1.68, 3.00, 4.01, 6.86, 7.01, 9.18, 10.01, 12.45), and two custom buffers
mV Calibration		automatic, two point at 0, 350 mV or three point at 0, 350, 1900 mV
Offset Calibration		±1 pH
Slope Calibration		from 80 to 110%
Temperature Compensation		manual or automatic from -20.0 to 120.0 °C (-4.0 to 248.0 °F)
pH Electrode		HI 1230B PEI body pH electrode with BNC connector and 1 m (3.3') cable (included)
Temperature Probe		HI 7662 stainless steel temperature probe with 1 m (3.3') cable (included)
Log On Demand		500 samples
PC Connection		opto-isolated USB with optional HI 92000 software
Input Impedance		10^{12} Ohm
Power Supply		1.5V AAA (3) / approximately 200 hours of continuous use without backlight (50 hours with backlight). User selectable auto-off (5, 10, 20, 60 minutes or can be disabled)
Environment		0 to 50°C (32 to 122°F); RH max 100%
Dimensions		185 x 72 x 36 mm (7.3 x 2.8 x 1.4")
Weight		300 g (10.6 oz.)

ORDERING INFORMATION

HI 98160 is supplied with HI 1230B pH electrode, HI 7662 temperature probe, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, batteries, instructions and rugged carrying case.

ELECTRODES

HI 1230B	PEI body pH electrode with BNC connector and 1 m (3.3') cable
HI 3131B	Glass body ORP electrode with platinum sensor, BNC connector and 1 m (3.3') cable
HI 7662	Stainless steel temperature probe with 1 m (3.3') cable

SOLUTIONS

HI 5004L	pH 4.01 buffer solution, 500 mL
HI 5007L	pH 7.01 buffer solution, 500 mL
HI 5010L	pH 10.01 buffer solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL

ACCESSORIES

HI 92000	Windows® compatible software
HI 920014	Mini USB connection cable

For a complete list of Solutions and Electrodes, see the end of this section.

HI 98140 • HI 98150

Portable pH Meter with SMART Electrodes

- **pH Calibration Check™ Electrode Diagnostics**
- **Waterproof**
- **Up to five point pH calibration**
- **Up to seven automatically recognized pH buffers and up to two custom pH buffers (HI 98150 only)**
- **Log on demand (500 samples)**
- **GLP features**
- **Auto endpoint**
- **User-selectable "calibration time out"**
- **Backlit, multi-level LCD display**
- **Tutorial messages on LCD**
- **Opto-isolated USB**
- **BEPS and % battery life on display**
  Battery Error Prevention System alerts the user in the event that low battery power could adversely affect readings

HI 98140 and HI 98150 are portable Calibration Check™ pH meters that utilize HANNA's SMART electrode technology.

SMART electrodes incorporate a chip, which stores the calibration data performed with a specific instrument. When the "SMART" electrode is attached to the meter again, it is automatically recognized. This allows the operator to optimize time and efficiency with unsurpassed safety. It also avoids erroneous measurements taken in the event the pH electrode is substituted after calibration.

ORDERING INFORMATION

HI 98140 and **HI 98150** are supplied with HI 1618D pH electrode, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 70000 electrode cleaning solution sachet, HI 700661 electrode cleaning solution sachet, batteries, instructions and hard carrying case.

ELECTRODES

HI 3620D	PEI body, Pre-amplified ORP electrode with "SMART" technology, DIN connector and 1 m (3.3') cable

SOLUTIONS

HI 5004L	pH 4.01 buffer solution, 500 mL
HI 5007L	pH 7.01 buffer solution, 500 mL
HI 5010L	pH 10.01 buffer solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL

ACCESSORIES

HI 92000	Windows® compatible software
HI 920014	Mini USB connection cable

SPECIFICATIONS		HI 98140	HI 98150
Range	pH	-4.0 to 20.0 pH; -4.00 to 20.00 pH	
	mV	–	±699.9; ±2000 mV
	Temperature	-20.0 to 120.0°C (-4.0 to 248.0°F)	
Resolution	pH	0.1 pH; 0.01 pH	
	mV	–	0.1 mV (±699.9 mV); 1 mV (outside)
	Temperature	0.1°C (0.1°F)	
Accuracy (@20°C)	pH	±0.1 pH; ±0.01 pH	
	mV	–	±0.2 mV (±699.9 mV); ±1 mV (±2000 mV)
	Temperature	±0.2°C (±0.4°F) excluding probe error	
pH Calibration		up to three point calibration with seven standard buffers available (1.68, 4.01, 6.86, 7.01, 9.18, 10.01, 12.45), and two custom buffers	up to five point calibration with seven standard buffers available (1.68, 4.01, 6.86, 7.01, 9.18, 10.01, 12.45), and two custom buffers
Offset Calibration		±1 pH	
Slope Calibration		from 80 to 110%	
Temperature Compensation		manual or automatic from -20.0 to 120.0 °C (-4.0 to 248.0 °F)	
pH Electrode		HI 1618D PEI body, pre-amplified pH electrode with "SMART" technology, internal temperature sensor, DIN connector and 1 m (3.3') cable (included)	
Logging		log on demand, 500 samples	
PC Connection		opto-isolated USB with optional HI 92000 software	
Input Impedance		10^{12} Ohm	
Battery Type / Life		1.5V AAA (3) / approximately 200 hours of continuous use without backlight (50 hours with backlight). User selectable auto-off (5, 10, 20, 60 minutes or can be disabled)	
Environment		0 to 50°C (32 to 122°F); RH max 100%	
Dimensions		185 x 72 x 36 mm (7.3 x 2.8 x 1.4")	
Weight		300 g (10.6 oz.)	

For a complete list of Solutions and Electrodes, see the end of this section.

Calibration Check™ Portable pH Meter

- **pH Calibration Check™**
- **Electrode condition monitoring**
- **Measurement store and recall**
- **Backlit, multi-level LCD display**
- **Real time clock**
- **User-selectable calibration reminder**
- **Tutorial messages displayed on LCD**
- **BEPS**

  (Battery Error Prevention System) alerts the user in the event that low battery power could adversely affect readings.
- **Battery % displayed on startup.**

The HI 9126 includes HANNA's exclusive Calibration Check™ technology. Calibration Check™ monitors the pH bulb and reference junction of the electrode every time the instrument is calibrated. In the event of a dirty pH electrode, Calibration Check™ warns users that maintenance may be needed.

Calibrated buffers are continuously displayed in measurement mode to remind users of the instrument's calibration point. Users can easily determine if readings are taken too far outside the calibration range.

The HI 9126 can store and recall readings at the touch of a button.

HI 9126 utilizes the HI 1230B double junction pH electrode. The double junction helps to minimize junction contamination for consistently accurate results. The HI 9126 can also measure ORP using optional probes.

SPECIFICATIONS		HI 9126
Range	pH	-2.00 to 16.00 pH
	mV	±699.9 mV; ±1999 mV
	Temperature	-20.0 to 120.0°C / -4.0°F to 248.0°F
Resolution	pH	0.01 pH
	mV	0.1 mV; 1 mV
	Temperature	0.1°C / 0.1 °F
Accuracy (@20°C)	pH	±0.01 pH
	mV	±0.2 mV; ±1 mV
	Temperature	±0.4°C/±0.8°F (excluding probe error)
pH Calibration Check		yes, check of the electrode status during calibration
pH Calibration		automatic, one or two point with seven memorized buffer values (pH 1.68, 4.01, 6.86, 7.01, 9.18, 10.01, 12.45) + 2 custom buffers
Offset Calibration		±1 pH
Slope Calibration		from 80 to 108%
Temperature Compensation		automatic or manual, -20 to 120°C (-4 to 248°F) without temperature probe
pH Electrode		HI 1230B PEI body pH electrode with BNC connector and 1 m (3.3') cable (included)
Temperature Probe		HI 7662 stainless steel temperature probe with 1 m (3.3') cable (included)
Input Impedance		10^{12} Ohm
Battery Type / Life		1.5V (3) AAA / approximately 200 hours of continuous use without backlight (50 hours with backlight). auto-off after 20 minutes of non-use (can be disabled)
Environment		0 to 50°C (32 to 122°F); RH max 100%
Dimensions		185 x 72 x 36 mm (7.3 x 2.8 x 1.4")
Weight		300 g (10.6 oz.)

ORDERING INFORMATION

HI 9126 is supplied with HI 1230B pH electrode, HI 7662 temperature probe, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer sachet, HI 700661 electrode cleaning solution sachet, 100 mL plastic beaker, batteries, instructions and hard carrying case.

ELECTRODES

HI 1230B	PEI body pH electrode with BNC connector and 1 m (3.3') cable
HI 3230B	PEI body ORP electrode with platinum sensor, BNC connector and 1 m (3.3') cable
HI 7662	Stainless steel temperature probe with 1 m (3.3') cable

SOLUTIONS

HI 5004L	pH 4.01 buffer solution, 500 mL
HI 5007L	pH 7.01 buffer solution, 500 mL
HI 5010L	pH 10.01 buffer solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL

For a complete list of Solutions and Electrodes, see the end of this section.

HI 9126V

pH Meter for Wine Analysis

WINE line

- **Dedicated 3.00 pH buffer for calibration in the wine pH range**
- **Clog-resistant electrode**
- **Exclusive pH Calibration Check™**
- **Electrode condition monitoring**
- **Tutorial messages displayed on LCD**
- **Backlit, multi-level LCD display**
- **User-selectable calibration reminder**
- **BEPS**

  (Battery Error Prevention System) alerts the user in the event that low battery power could adversely affect readings.
- **Battery % displayed on startup.**

HANNA's HI 9126V advanced pH/ORP meter and HI 1048P pH electrode with CPS™ (Clogging Prevention System) are designed specifically for precise wine analysis. The backlit display provides clear readings in the darkest environments. In addition to the HI 9126V's seven memorized buffer values, user's can program two custom buffer values, in order to best fit the characteristics of the sample.

If you are going to measure wine and must, you can custom calibrate using HI 5003 pH 3.00 buffer and enter the value into the meter for calibration. When calibration is complete, the electrode condition is displayed so the user can be sure the electrode is working properly or that it needs to be cleaned or replaced.

The supplied HI 1048B electrode with CPS™ technology is ideal for pH measurements in wine and must. With an optional ORP electrode, the HI 9126V can also measure ORP with a resolution up to 0.1 mV.

ORDERING INFORMATION

HI 9126V is supplied with HI 1048B CPS™pH electrode, HI 7662 temperature probe, pH 3.00 buffer solution, HI 70007 pH 7.01 buffer solution sachet, HI 700636 wine stain electrode cleaning solution sachet, HI 700635 wine deposit electrode cleaning solution sachet, HI 7082 electrolyte solution (30 mL) with syringe, 100 mL plastic beaker, batteries, rugged carrying case and instructions.

SOLUTIONS

HI 5003	pH 3.00 custom buffer solution, 500 mL
HI 5007L	pH 7.01 buffer solution, 500 mL
HI 70300L	Storage solution, 500 mL
HI 70635L	Electrode cleaning solution for wine deposits, 500 mL
HI 70636L	Electrode cleaning solution for wine stains, 500 mL
HI 731312	Red wine decolorization kit (25 pcs)

SPECIFICATIONS		HI 9126V
Range	pH	-2.00 to 16.00 pH
	mV	±699.9 mV; ±1999 mV
	Temperature	-20.0 to 120.0°C / -4.0°F to 248.0°F
Resolution	pH	0.01 pH
	mV	0.1 mV; 1 mV
	Temperature	0.1°C / 0.1 °F
Accuracy (@20°C)	pH	±0.01 pH
	mV	±0.2 mV; ±1 mV
	Temperature	±0.4°C/±0.8°F (excluding probe error)
pH Calibration Check		yes, check of the electrode status during calibration
pH Calibration		automatic, one or two point with seven memorized buffer values (pH 1.68, 4.01, 6.86, 7.01, 9.18, 10.01, 12.45) + two custom buffers
Offset Calibration		±1 pH
Slope Calibration		from 80 to 108%
Temperature Compensation		automatic or manual, -20 to 120°C (-4 to 248°F) without temperature probe
pH Electrode		HI 1048B glass-body pH electrode with CPS™ technology, BNC connector and 1 m (3.3') cable (included)
Temperature Probe		HI 7662 stainless steel temperature probe with 1 m (3.3') cable (included)
Input Impedance		10^{12} Ohm
Battery Type / Life		1.5V (3) AAA / approximately 200 hours of continuous use without backlight (50 hours with backlight). auto-off after 20 minutes of non-use (can be disabled)
Environment		0 to 50°C (32 to 122°F); RH max 100%
Dimensions		185 x 72 x 36 mm (7.3 x 2.8 x 1.4")
Weight		300 g (10.6 oz.)

For a complete list of Solutions and Electrodes, see the end of this section.

HANNA instruments

With Great Products, Come Great Results™

Portable pH Meters

- **User-selectable "calibration time out"**
- **Automatic calibration**
- **Automatic Temperature Compensation**
- **Tutorial messages on LCD**
- **BEPS**

  (Battery Error Prevention System) alerts the user in the event that low battery power could adversely affect readings
- **Battery % displayed on startup.**

The HI 9124 and HI 9125 are waterproof pH meters. The HI 9125 can utilize ORP (oxidation reduction potential) electrodes.

A large dual-level LCD displays both the pH and temperature along with an operational guide. Graphic symbols are displayed to help the users during the calibration process.

The pH calibration procedure is automatic with five memorized pH buffer values and buffer recognition to simplify the calibration process.

These meters utilize the HI 1230B double junction pH electrode. The double junction helps to minimize junction contamination for accurate, consistent results.

SPECIFICATIONS		HI 9124	HI 9125
Range	pH	-2.00 to 16.00 pH	
	mV	–	±699.9 mV; ±1999 mV
	Temperature	-20.0 to 120.0°C/-4.0°F to 248.0°F	
Resolution	pH	0.01 pH	
	mV	–	0.1 mV; 1 mV
	Temperature	0.1°C/0.1°F	
Accuracy (@20°C/60°F)	pH	±0.01 pH	
	mV	–	±0.2 mV; ±1 mV
	Temperature	±0.4°C/±0.8°F (excluding probe error)	
pH Calibration		automatic, one or two point with five standard buffer values (pH 4.01, 6.86, 7.01, 9.18, 10.01)	
Offset Calibration		±1 pH	
Slope Calibration		from 80 to 108%	
Temperature Compensation		automatic or manual, -20.0 to 120.0°C/-4.0 to 248.0°F without temperature probe	
Electrode		HI 1230B PEI body pH electrode with BNC connector and 1 m (3.3') cable (included)	
Temperature Probe		HI 7662 stainless steel temperature probe with 1 m (3.3') cable (included)	
Input Impedance		10^{12} Ohm	
Battery Type / Life		1.5V AAA (3) / approximately 200 hours of continuous use. auto-off after 20 minutes of non-use (can be disabled)	
Environment		0 to 50°C (32 to 122°F); RH max 100%	
Dimensions		185 x 72 x 36 mm (7.3 x 2.8 x 1.4")	
Weight		300 g (10.6 oz.)	

ORDERING INFORMATION

HI 9124 and **HI 9125** are supplied with HI 1230B pH electrode, HI 7662 temperature probe, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, 100 mL plastic beaker, batteries, instructions and hard carrying case.

ELECTRODES

HI 1230B	PEI body pH electrode with BNC connector and 1 m (3.3') cable
HI 3131B	Glass body ORP electrode with platinum sensor, BNC connector and 1 m (3.3') cable
HI 7662	Stainless steel temperature probe with 1 m (3.3') cable

SOLUTIONS

HI 5004L	pH 4.01 buffer solution, 500 mL
HI 5007L	pH 7.01 buffer solution, 500 mL
HI 5010L	pH 10.01 buffer solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL

For a complete list of Solutions and Electrodes, see the end of this section.

HI 991001 • HI 991002 • HI 991003

pH/pH-mV/ORP and Temperature Meters

- **pH Sensor Check™**
  (HI 991003) Allows users to check electrode status at any time
- **Multi-level LCD display**
  Display the current measurement simultaneously with the current temperature.
- **On-screen tutorial messages**
- **Automatic Temperature Compensation**
- **Automatic one or two point calibration**
- **HI 1297 pH/ORP/Temperature and HI 1296 pH/Temperature probe in titanium enclosure**
- **BEPS**
  (Battery Error Prevention System) alerts the user in the event that low battery power could adversely affect readings
- **Battery % displayed on startup**.
- **Compact, heavy-duty, and waterproof**

HI 991001, HI 991002 and HI 991003 are ideal for plating baths, wastewater, swimming pool and spa water quality and environmental applications.

HI 991003 is a portable pH/pH-mV/ORP/temperature meter with our unique Sensor Check™ feature that allows the user to determine the electrode status at any time. HI 991002 measures pH/ORP/temperature while the HI 991001 measures pH/temperature.

The HI 1296D pH/temperature and HI 1297D pH/ORP/temperature probes feature an easy to clean recessed tip that prevents solids in solutions from collecting on the sensor. The AISI 316 stainless steel and titanium body of these probes function as a potential matching pin for increased stability of readings and extended sensor life.

These compact instruments fit in the palm of your hand and the bottom probe connection ensures the electrode cable doesn't get in your way.

HANNA instruments

With Great Products, Come Great Results™

Pre-amplified pH electrodes

The HI 1297D pH/ORP electrode (HI 991003 and HI 991002) and HI 1296D pH electrode (HI 991001) have an internal temperature sensor and also contains a pre-amplifier to render measurements impervious to noise and electrical interferences.

- **Protective Rubber Boot**

  The optional rubber boot helps protect your meter

SPECIFICATIONS		HI 991001	HI 991002	HI 991003
Range	pH		-2.00 to 16.00 pH	
	pH-mV	–	–	±825 mV (pH-mV)
	ORP	–	±1999 mV	±1999 mV
	Temperature		-5.0 to 105.0°C; 23.0 to 221.0°F	
Resolution	pH		0.01 pH	
	pH-mV	–	–	1 mV
	ORP	–	1 mV	1 mV
	Temperature		0.1°C/0.1°F	
Accuracy (@20°C)	pH		±0.02 pH	
	pH-mV	–	–	±1 mV
	ORP	–	±2 mV	±2 mV
	Temperature	±0.5°C up to 60°C; ±1.0°C outside; ±1.0°F up to 140°F; ±2.0°F (outside)		
pH Calibration		automatic one or two point calibration with two sets of memorized buffers (standard 4.01, 7.01, 10.01 or NIST 4.01, 6.86, 9.18)		
Temperature Compensation		automatic, -5.0 to 105.0°C (23.0 to 221.0°F)		
Electrode		HI 1296D pre-amplified pH probe with internal temperature sensor, DIN connector and 1 m (3.3') cable (included)	HI 1297D pre-amplified pH/ORP probe with internal temperature sensor, DIN connector and 1 m (3.3') cable (included)	
Battery Type / Life		1.5V (3) AAA / approximately 1200 hours of continuous use. auto-off after eight minutes of non-use		
Environment		0 to 50°C (32 to 122°F); RH max. 100%		
Dimensions		152 x 58 x 30 mm (6.0 x 2.3 x 1.2")		
Weight		205 g (7.2 oz.)		

ORDERING INFORMATION

HI 991001 is supplied with HI 1296D pH/ORP probe with internal temperature sensor, HI 70004 pH 4.01 buffer sachet, HI 70007 pH 7.01 buffer sachet, HI 700661 electrode cleaning solution sachet (2), batteries, instructions and rugged carrying case.

HI 991002 and **HI 991003** are supplied with HI 1297D pH/ORP probe with internal temperature sensor, HI 70004 pH 4.01 buffer sachet, HI 70007 pH 7.01 buffer sachet, HI 700661 electrode cleaning solution sachet (2), batteries, instructions and rugged carrying case.

ELECTRODES

HI 1296D	Stainless steel body, Pre-amplified pH electrode with internal temperature sensor, DIN connector and 1 m (3.3') cable (for HI 991001)
HI 1297D	Titanium body, Pre-amplified pH/ORP electrode with internal temperature sensor, DIN connector and 1 m (3.3') cable (for HI 991002 and HI 991003)

SOLUTIONS

HI 5004L	pH 4.01 buffer solution, 500 mL
HI 5007L	pH 7.01 buffer solution, 500 mL
HI 5010L	pH 10.01 buffer solution, 500 mL
HI 7020L	ORP test solution @200/275 mV, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL

ACCESSORIES

HI 710023	Orange protective rubber boot
HI 710024	Blue protective rubber boot

For a complete list of Solutions and Electrodes, see the end of this section.

HI 99121

Direct Soil pH Measurement Kit

- **Dedicated to soil pH measurement**
- **Specialized soil pH electrode**
- **Multi-level LCD display**
- **User friendly operation using only 2 buttons**
- **On-screen tutorial messages**
- **Automatic Temperature Compensation**
- **Automatic one or two point calibration**
- **BEPS**

  (Battery Error Prevention System) alerts the user in the event that low battery power could adversely affect readings
- **Battery % displayed on startup**
- **Compact, heavy-duty, and waterproof**

With the HI 99121 and HI 1292D direct soil pre-amplified pH and temperature probe, users can test both the pH of soil directly or after preparation of a diluted sample.

The HI 1292D features a conical, rugged tip that can be directly inserted in moist or soft soil. For harder soils, the kit includes a plastic auger to perforate the ground.

- **Soil Preparation Solution**

  For higher degrees of accuracy, or for stony ground where the electrode may be damaged, use the included HI 7051M soil preparation solution

ORDERING INFORMATION

HI 99121 is supplied with HI 1292D pH electrode, HI 721319 soil auger, HI 7051M soil preparation solution, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 700663 cleaning solution sachet for inorganic soil deposits, HI 700664 cleaning solution sachet for organic soil deposits, 100 mL plastic beaker, batteries, instructions and a hard carrying case.

ELECTRODES

HI 1292D	Glass body, pre-amplified pH electrode for soil measurement with internal temperature sensor, DIN connector and 1 m (3.3') cable

SOLUTIONS

HI 5004L	pH 4.01 buffer solution, 500 mL
HI 5007L	pH 7.01 buffer solution, 500 mL
HI 7051M	Soil preparation solution, 230 mL
HI 700661P	Electrode cleaning solution for agriculture, 20 mL sachets (25)
HI 700663P	Electrode cleaning solution for inorganic soil deposits, 20 mL sachets (25)
HI 700664P	Electrode cleaning solution for organic soil deposits, 20 mL sachets (25)
HI 70300L	Electrode storage solution, 500 mL

ACCESSORIES

HI 721319	Ground auger
HI 710023	Orange protective rubber boot
HI 710024	Blue protective rubber boot

SPECIFICATIONS		HI 99121
Range	**pH**	-2.00 to 16.00 pH
	Temperature	-5.0 to 105.0°C/23.0 to 221.0°F
Resolution	**pH**	0.01 pH
	Temperature	0.1°C/0.1°F
Accuracy (@20°C)	**pH**	±0.02 pH
	Temperature	±0.5°C (up to 60°C), ±1.0°C (outside) / ±1.0°F (up to 140°F); ±2.0°F (outside)
pH Calibration		automatic one or two point calibration with two sets of memorized buffers (Standard 4.01, 7.01, 10.01 or NIST 4.01, 6.86, 9.18)
Temperature Compensation		automatic, -5.0 to 105.0°C (23 to 221°F)
Electrode		HI 1292D glass body, pre-amplified pH electrode for soil measurement with internal temperature sensor, DIN connector and 1 m (3.3') cable (included)
Battery Type / Life		1.5V AAA (3) / approximately 1200 hours of continuous use. auto-off after 8 minutes of non-use
Environment		0 to 50°C (32 to 122°F); RH max. 100%
Dimensions		152 x 58 x 30 mm (6.0 x 2.3 x 1.2")
Weight		205 g (7.2 oz.)

For a complete list of Solutions and Electrodes, see the end of this section.

HI 99131

pH Meter for Plating Baths

- **Titanium probe body**
  The HI 62911D is encased in a titanium casing for maximum protection and shielding

- **Flat-tipped, pre-amplified pH probe with titanium body**
- **Multi-level LCD display**
- **On-screen tutorial messages for calibration and set-up**
- **Automatic Temperature Compensation**
- **Automatic one or two point calibration**
- **BEPS**
  (Battery Error Prevention System) alerts the user in the event that low battery power could adversely affect readings
- **Battery % displayed on startup**.
- **Compact, heavy-duty, and waterproof**
- **Easy to clean sensor**
  The flat tip sensor is easy to clean and keep clean by design

HI 99131 is a waterproof, portable pH and temperature meter supplied with a flat tip probe specifically designed for use in plating baths.

The HI 62911D pre-amplified, double junction pH probe features a recessed flat tip that is easy to clean and prevents solids in solutions from collecting on the sensor. The titanium body of the HI 62911D functions as a potential matching pin for increased stability of readings and extended sensor life.

SPECIFICATIONS		HI 99131
Range	pH	-2.00 to 16.00 pH
	Temperature	-5.0 to 105.0°C/23.0 to 221.0°F
Resolution	pH	0.01 pH
	Temperature	0.1°C/0.1°F
Accuracy (@20°C)	pH	±0.02 pH
	Temperature	±0.5°C (up to 60°C), ±1.0°C (outside) / ±1.0°F (up to 140°F); ±2.0°F (outside)
pH Calibration		automatic one or two point calibration with two sets of memorized buffers (Standard 4.01, 7.01, 10.01 or NIST 4.01, 6.86, 9.18)
Temperature Compensation		automatic, -5.0 to 105.0°C (23 to 221°F)
Electrode		HI 62911D titanium body, pre-amplified pH probe with internal temperature sensor, DIN connector and 1 m (3.3') cable (included)
Battery Type / Life		1.5V AAA (3) / approximately 1200 hours of continuous use. auto-off after 8 minutes of non-use
Environment		0 to 50°C (32 to 122°F); RH max. 100%
Dimensions		152 x 58 x 30 mm (6.0 x 2.3 x 1.2")
Weight		205 g (7.2 oz.)

ORDERING INFORMATION

HI 99131 is supplied with HI 62911D pH probe, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 700661 electrode cleaning solution sachets (2), batteries, instructions and hard carrying case.

ELECTRODES

HI 62911D	Titanium body, pre-amplified pH probe with internal temperature sensor, DIN connector and 1 m (3.3') cable

SOLUTIONS

HI 5004L	pH 4.01 buffer solution, 500 mL
HI 5007L	pH 7.01 buffer solution, 500 mL
HI 5010L	pH 10.01 buffer solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL

ACCESSORIES

HI 710023	Orange protective rubber boot
HI 710024	Blue protective rubber boot

For a complete list of Solutions and Electrodes, see the end of this section.

HI 99141

pH Meter for Boiler and Cooling Towers

- **Dedicated to boiler and cooling tower applications**
- **Flat-tipped, pre-amplified pH probe with titanium body**
- **Multi-level LCD display**
- **On-screen tutorial messages for calibration and set-up**
- **Automatic Temperature Compensation**
- **Automatic one or two point calibration**
- **BEPS**
  (Battery Error Prevention System) alerts the user in the event that low battery power could adversely affect readings
- **Battery % displayed on startup**.
- **Compact, heavy-duty, and waterproof**
- **Easy to clean flat-tip sensor**

HI 99141 is a waterproof, portable pH/temperature meter supplied with a flat tip probe specifically designed for boiler and cooling tower applications.

The HI 72911D pre-amplified double junction pH probe features a recessed flat tip that is easy to clean and prevents solids in solutions from collecting on the sensor. The titanium body of the HI 72911D functions as a potential matching pin for increased stability of readings and extended sensor life.

- **Titanium probe body**
  The HI 72911D is encased in a titanium casing for maximum protection and shielding.

ORDERING INFORMATION

HI 99141 is supplied with HI 72911D pH/temperature probe, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 700661 electrode cleaning solution sachets (2), batteries, instructions and hard carrying case.

ELECTRODES

HI 72911D	Titanium body, pre-amplified pH electrode with internal temperature sensor, DIN connector, 1 m (3.3' cable)

SOLUTIONS

HI 5004L	pH 4.01 buffer solution, 500 mL
HI 5007L	pH 7.01 buffer solution, 500 mL
HI 5010L	pH 10.01 buffer solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL
HI 700670P	Electrode cleaning solution for salt deposits, 20 mL sachets (25)
HI 700671P	Electrode cleaning and disinfection solution for algae, fungi and bacteria, 20 mL sachets (25)

ACCESSORIES

HI 710023	Orange protective rubber boot
HI 710024	Blue protective rubber boot

SPECIFICATIONS		HI 99141
Range	**pH**	-2.00 to 16.00 pH
	Temperature	-5.0 to 105.0°C/23.0 to 221.0°F
Resolution	**pH**	0.01 pH
	Temperature	0.1°C/0.1°F
Accuracy (@20°C)	**pH**	±0.02 pH
	Temperature	±0.5°C (up to 60°C), ±1.0°C (outside) / ±1.0°F (up to 140°F); ±2.0°F (outside)
pH Calibration		automatic one or two point calibration with two sets of memorized buffers (Standard 4.01, 7.01, 10.01 or NIST 4.01, 6.86, 9.18)
Temperature Compensation		automatic, -5.0 to 105.0°C (23 to 221°F)
Electrode		HI 72911D titanium body, pre-amplified pH electrode with internal temperature sensor, DIN connector and 1 m (3.3' cable) (included)
Battery Type / Life		1.5V AAA (3) / approximately 1200 hours of continuous use. Auto-off after eight minutes of non-use
Environment		0 to 50°C (32 to 122°F); RH max. 100%
Dimensions		152 x 58 x 30 mm (6.0 x 2.3 x 1.2")
Weight		205 g (7.2 oz.)

For a complete list of Solutions and Electrodes, see the end of this section.

pH Meter for Leather and Paper

- **Dedicated to leather and paper applications**
- **Flat-tipped glass probe**
- **Multi-level LCD display**
- **On-screen tutorial messages for calibration and set-up**
- **Stability indicator**
- **Automatic Temperature Compensation**
- **Automatic one or two point calibration**
- **BEPS**

  (Battery Error Prevention System) alerts the user in the event that low battery power could adversely affect readings
- **Battery % displayed on startup**
- **Compact, heavy-duty, and waterproof**
- **Easy to clean flat-tip sensor**

Direct pH measurement on paper and leather is fast and accurate with the HI 99171N pH meter. HI 99171N utilizes a flat tip probe designed to optimize surface contact with the sample.

pH measurement of papers and cartons is important, not only in the production phase, but also in the packaging phase. The food industry, for example, perform pH compatibility tests.

- **Flat-tipped glass probe**

  The HI 1414D maximizes surface contact with the sample to provide accurate, consistent results.

SPECIFICATIONS		HI 99171
Range	pH	-2.00 to 16.00 pH
	Temperature	-5.0 to 105.0°C/23.0 to 221.0°F
Resolution	pH	0.01 pH
	Temperature	0.1°C / 0.1°F
Accuracy (@20°C)	pH	±0.02 pH
	Temperature	±0.5°C (up to 60°C), ±1°C (outside) ±1.0°F (up to 140°F), ±2°F (outside)
pH Calibration		automatic one or two point calibration with two sets of memorized buffers (Standard 4.01, 7.01, 10.01 or NIST 4.01, 6.86, 9.18)
Temperature Compensation		automatic, -5.0 to 105.0°C (23 to 221°F)
Electrode		HI 1414D Glass body, pre-amplified pH electrode with flat tip, internal temperature sensor, DIN connector and 1 m (3.3') cable (included)
Battery Type / Life		1.5V AAA (3) / approximately 1200 hours of continuous use. Auto-off after eight minutes of non-use
Environment		0 to 50°C (32 to 122°F); RH max. 100%
Dimensions		152 x 58 x 30 mm (6.0 x 2.3 x 1.2")
Weight		205 g (7.2 oz.)

ORDERING INFORMATION

HI 99171 is supplied with HI 1414D flat tipped pH/temperature probe, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 700680 electrode cleaning solution for cellulose deposits sachets (2), HI 70960 conductive electrolyte solution for pH measurement (30 mL), batteries, instructions and hard carrying case..

ELECTRODES

HI 1414D	Glass body, pre-amplified pH electrode with flat tip, internal temperature sensor, DIN connector and 1 m (3.3') cable

SOLUTIONS

HI 5004L	pH 4.01 buffer solution, 500 mL
HI 5007L	pH 7.01 buffer solution, 500 mL
HI 5010L	pH 10.01 buffer solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL
HI 700680P	Electrode cleaning solution for cellulose deposits, 20 mL sachets (25)
HI 700681P	Electrode cleaning solution for ink stains, 20 mL sachets (25)

ACCESSORIES

HI 710023	Orange protective rubber boot
HI 710024	Blue protective rubber boot

For a complete list of Solutions and Electrodes, see the end of this section.

HI 99161

HACCP pH Meter for Food and Dairy

- **Easy to clean and keep clean**
- **Specialized dairy electrode**
- **Multi-level LCD display**
- **On-screen tutorial messages for calibration and set-up**
- **Automatic Temperature Compensation**
- **Automatic one or two point calibration**
- **BEPS**

  (Battery Error Prevention System) alerts the user in the event that low battery power could adversely affect readings
- **Battery % displayed on startup.**
- **Compact, heavy-duty, and waterproof**

Monitoring pH in dairy processes is critical to ensure the quality of products.

The HI 99161 is a portable, pH and temperature meter is specifically designed for dairy applications.

FC 202D pH electrode features a rugged, easy to clean, PVDF body with a conical tip ideal for measurements in semi-solids such as meats and cheeses. The FC 202D is also provided with a free diffusion sleeve type reference junction which prevents the typical problems of clogging in viscous liquids such as milk or condiments. The electrolyte used in the FC 202D electrode is free from poisonous silver chloride which, in turn, effectively eliminates food contamination by the electrode.

- **Protective rubber boot**

  The optional protective boot helps protect your meter

- **Specialized electrode**

  The FC 202D is the ideal electrode to measure the pH of milk, yogurt, meats, cheeses, fruit, sushi rice, jams, jellies, dough, ice cream, yogurt, beverages, and juice

ORDERING INFORMATION

HI 99161 is supplied with FC 202D pH/temperature probe, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 700642 electrode cleaning solution sachets (2), batteries, instructions and hard carrying case.

ELECTRODES

FC 202D	PVDF body, pre-amplified pH electrode with internal temperature sensor, DIN connector, 1 m (3.3') cable

SOLUTIONS

HI 5004L	pH 4.01 buffer solution, 500 mL
HI 5007L	pH 7.01 buffer solution, 500 mL
HI 5010L	pH 10.01 buffer solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL
HI 700641P	Electrode cleaning & disinfection solution for dairy products, 20 mL sachets (25)
HI 700642P	Electrode cleaning solution for cheese deposits, 20 mL sachets (25)
HI 700640P	Electrode cleaning solution for milk products, 20 mL sachets (25)

ACCESSORIES

HI 710023	Orange protective rubber boot
HI 710024	Blue protective rubber boot

SPECIFICATIONS		HI 99161
Range	**pH**	-2.00 to 16.00 pH
	Temperature	-5.0 to 105.0°C/23.0 to 221.0°F
Resolution	**pH**	0.01 pH
	Temperature	0.1°C/0.1°F
Accuracy (@20°C)	**pH**	±0.02 pH
	Temperature	±0.5°C (up to 60°C), ±1.0°C (outside) / ±1.0°F (up to 140°F); ±2.0°F (outside)
pH Calibration		automatic one or two point calibration with two sets of memorized buffers (Standard 4.01, 7.01, 10.01 or NIST 4.01, 6.86, 9.18)
Temperature Compensation		automatic, -5.0 to 105.0°C (23 to 221°F)
Electrode		FC 202D PVDF body, pre-amplified pH electrode with internal temperature sensor, DIN connector, 1 m (3.3') cable
Battery Type / Life		1.5V (3) AAA / approximately 1200 hours of continuous use. auto-off after 8 minutes of non-use
Environment		0 to 50°C (32 to 122°F); RH max. 100%
Dimensions		152 x 58 x 30 mm (6.0 x 2.3 x 1.2")
Weight		205 g (7.2 oz.)

For a complete list of Solutions and Electrodes, see the end of this section.

HACCP Compliant pH Meter for Meat

- **Specialized pre-amplified pH probe with stainless steel penetration blade**
- **Multi-level LCD display**
- **On-screen tutorial messages for calibration and set-up**
- **Automatic Temperature Compensation**
- **Automatic one or two point calibration**
- **BEPS**

  (Battery Error Prevention System) alerts the user in the event that low battery power could adversely affect readings
- **Battery % displayed on startup**
- **Compact, heavy-duty, and waterproof**
- **Easy to clean and keep clean**

HI 99163 is a portable pH/temperature meter designed for the meat processing industry to ensure a quality product.

The FC 232D pre-amplified pH electrode and removable stainless steel blade enables users to perform unintrusive measurements on meat products inside and out. The free diffusion junction helps to avoid a clogged reference and the external body material is non-toxic and food compatible.

- **Two blade lengths available**

  Use the optional FC 098 (20 mm) or the included FC 099 (35 mm) stainless steel meat penetration blades for meat processing applications

SPECIFICATIONS		HI 99163
Range	pH	-2.00 to 16.00 pH
	Temperature	-5.0 to 105.0°C/23.0 to 221.0°F
Resolution	pH	0.01 pH
	Temperature	0.1°C/0.1°F
Accuracy (@20°C/68°F)	pH	±0.02 pH
	Temperature	±0.5°C (up to 60°C), ±1.0°C (outside) / ±1.0°F (up to 140°F); ±2.0°F (outside)
pH Calibration		automatic one or two point calibration with two sets of memorized buffers (Standard 4.01, 7.01, 10.01 or NIST 4.01, 6.86, 9.18)
Temperature Compensation		automatic, -5.0 to 105.0°C (23 to 221°F)
Electrode (included)		FC 432D pre-amplified pH probe with internal temperature sensor, DIN connector and 1 m (3.3' cable)
Battery Type / Life		1.5V AAA (3) / approximately 1200 hours of continuous use. auto-off after eight minutes of non-use
Environment		0 to 50°C (32 to 122°F); RH max. 100%
Dimensions		152 x 58 x 30 mm (6.0 x 2.3 x 1.2")
Weight		205 g (7.2 oz.)

ORDERING INFORMATION

HI 99163 is supplied with FC 432D pH/ temperature probe with FC 099 stainless steel blade tip, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 700630 electrode acid cleaning solution sachets for meat, grease and fats (2), batteries, instructions and hard carrying case.

ELECTRODES

FC 432D	PVDF body, pre-amplified pH electrode with internal temperature sensor, DIN connector, 1 m (3.3') cable
FC 098	20 mm stainless steel blade
FC 099	35 mm stainless steel blade

SOLUTIONS

HI 5004L	pH 4.01 buffer solution, 500 mL
HI 5068L	pH 6.86 buffer solution, 500 mL
HI 5007L	pH 7.01 buffer solution, 500 mL
HI 5010L	pH 10.01 buffer solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL
HI 700630P	Acid cleaning solution for meat, grease and fats, 20 mL sachets (25)
HI 70631L	Alkaline cleaning solution for meat grease and fats, 500 mL
HI 70632L	Cleaning & disinfection solution for blood products, 500 mL

ACCESSORIES

HI 710023	Orange protective rubber boot
HI 710024	Blue protective rubber boot

For a complete list of Solutions and Electrodes, see the end of this section.

HI 99181

pH Meter for Skin

- **Pre-amplified flat-tip pH electrode with built-in temperature sensor allows for maximum surface contact**
- **Multi-level LCD display**
- **On-screen tutorial messages for calibration and set-up**
- **Automatic Temperature Compensation**
- **Automatic one or two point calibration**
- **BEPS**

  (Battery Error Prevention System) alerts the user in the event that low battery power could adversely affect readings
- **Battery % displayed on startup**
- **Compact, heavy-duty, and waterproof**
- **Easy to clean and keep clean**

HI 99181 is a pH meter specifically designed for skin analysis. Essential for labs researching the biological compatibility of cosmetics and pharmaceuticals. HI 99181 provides quick and simple measurements without compromising precision.

The amplified HI 1414D/50 probe has been specially designed with a flat tip for accurate skin pH measurement with maximum surface contact.

Shown with HI 710023 protective boot (optional)

ORDERING INFORMATION

HI 99181 is supplied with HI 1414D/50 flat tipped pH/temperature probe, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 700620 electrode cleaning and disinfection solution for skin residuals sachets (2), HI 700621 electrode cleaning solution for skin grease and sebum sachets (2), batteries, instructions and hard carrying case.

ELECTRODES

HI1414D/50	Glass body, pre-amplified pH electrode with flat tip, internal temperature sensor, DIN connector and 1 m (3.3') cable

SOLUTIONS

HI 5004L	pH 4.01 buffer solution, 500 mL
HI 5007L	pH 7.01 buffer solution, 500 mL
HI 700620P	Electrode cleaning & disinfection solution for skin residuals, 20 mL sachets (25)
HI 700621P	Electrode cleaning solution for skin grease and sebum, 20 mL sachets (25)
HI 70960	Electrolyte solution for sample preparation, 30 mL
HI 70300L	Electrode storage solution, 500 mL

ACCESSORIES

HI 710023	Orange protective rubber boot
HI 710024	Blue protective rubber boot

SPECIFICATIONS		HI 99181
Range	**pH**	-2.00 to 16.00 pH
	Temperature	-5.0 to 105.0°C/23.0 to 221.0°F
Resolution	**pH**	0.01 pH
	Temperature	0.1°C/0.1°F
Accuracy (@20°C)	**pH**	±0.02 pH
	Temperature	±0.5°C (up to 60°C), ±1.0°C (outside) / ±1.0°F (up to 140°F); ±2.0°F (outside)
pH Calibration		automatic one or two point calibration with two sets of memorized buffers (Standard 4.01, 7.01, 10.01 or NIST 4.01, 6.86, 9.18)
Temperature Compensation		automatic, -5.0 to 105.0°C (23 to 221°F)
Probe (included)		HI 1414D/50 glass body, pre-amplified pH electrode with flat tip, internal temperature sensor, DIN connector and 1 m (3.3') cable
Battery Type / Life		1.5V AAA (3) / approximately 1200 hours of continuous use. auto-off after eight minutes of non-use
Environment		0 to 50°C (32 to 122°F); RH max. 100%
Dimensions		152 x 58 x 30 mm (6.0 x 2.3 x 1.2")
Weight		205 g (7.2 oz.)

For a complete list of Solutions and Electrodes, see the end of this section.

HI 8424

pH/ORP Meter

- **Automatic calibration**
- **Automatic Temperature Compensation**
- **Automatic buffer recognition**
- **Three standard buffer values**
- **Calibration tags on LCD**
- **Low battery indicator**
- **Auto shut-off**
- **HOLD function**
- **°C and °F measurements**

HI 8424 is one of the most popular pH meters on the market. This instrument is able to perform pH, ORP and temperature measurements with a high degree of accuracy and fast response.

Calibration is automatic at one or two points with three memorized buffer values (pH 4.01, pH 7.01 and pH 10.01). Once the instrument has been calibrated, the buffer values used during calibration are displayed with tags on the LCD. This feature keeps users informed of the current calibration and helps to avoid taking measurements that are out of range.

Exchange the pH probe for an ORP probe to obtain ORP readings in the mV range.

SPECIFICATIONS		HI 8424
Range	pH	-2.00 to 16.00 pH
	mV	±699.9 mV; ±1999 mV
	Temperature	-20.0 to 120.0°C / -4.0 to 248.0°F
Resolution	pH	0.01
	mV	0.1 mV; 1 mV
	Temperature	0.1°C / 0.1°F
Accuracy (@20°C)	pH	±0.01
	mV	±0.2 mV; ±1 mV
	Temperature	±0.4°C / ±0.8°F
Calibration	pH	automatic, one or two point with three memorized buffer values (pH 4.01, 7.01, 10.01)
	Offset	±1 pH
	Slope	75 to 110%
Input Impedance		10^{12} Ohm
Temperature Compensation		automatic, -20 to 120°C (-4 to 248°F) or manual without temperature probe
pH Electrode		HI 1230B PEI body pH electrode with BNC connector and 1 m (3.3') cable (included)
Temperature Probe		HI 7662 stainless steel temperatures probe with 1 m cable (included)
Battery Type / Life		9V / approximately 150 hours of continuous use; auto-off after 20 minutes of non-use or disabled (user-selectable)
Environment		0 to 50°C (32 to 122°F); RH max 100%
Dimensions		164 x 76 x 45 mm (6.5 x 3.0 x 1.8")
Weight		180 g (6.3 oz.)

ORDERING INFORMATION

HI 8424 is supplied with HI 1230B pH electrode, HI 7662 temperature probe, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 700661 electrode cleaning solution sachets (2), battery, protective case and instructions.

ELECTRODES

HI 1230B	PEI body pH electrode with BNC connector and 1 m (3.3') cable
HI 3230B	PEI body ORP electrode with platinum sensor, BNC connector and 1 m (3.3') cable
HI 7662	Temperature probe

SOLUTIONS

HI 5004L	pH 4.01 buffer solution, 500 mL
HI 5007L	pH 7.01 buffer solution, 500 mL
HI 5010L	pH 10.01 buffer solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL

ACCESSORIES

HI 710015	Shockproof rubber boot, blue
HI 710016	Shockproof rubber boot, orange

For a complete list of Solutions and Electrodes, see the end of this section.

HI 83141

Analog pH/ORP Meter

- **Easy manual one or two point calibration**
- **Automatic Temperature Compensation**
- **Low battery indicator**

HI 83141 is a handheld pH/mV/°C meter designed to be reliable and easy-to-use.

HI 83141 uses the HI 1230B pH electrode and HI 7669AW temperature probe using separate connections (both included).

Manual calibration is performed at one or two points by adjusting the knobs on the front panel. This instrument is ideal for applications that require a custom calibration point. Manual calibration can be extremely useful in order to achieve better accuracy.

ORDERING INFORMATION

HI 83141 is supplied with HI 1230B pH electrode and HI 7669AW temperature probe, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 700661 electrode cleaning solution sachets (2), calibration screwdriver, battery, protective case and instructions.

ELECTRODES

HI 1230B	PEI body pH electrode with BNC connector and 1 m (3.3') cable
HI 3230B	PEI body ORP electrode with platinum sensor, BNC connector and 1 m (3.3') cable
HI 3131B	Glass body ORP electrode with platinum sensor, BNC connector and 1 m (3.3') cable
HI 7669AW	Stainless steel temperature probe with 1 m (3.3') cable

SOLUTIONS

HI 7004L	pH 4.01 buffer solution, 500 mL
HI 7007L	pH 7.01 buffer solution, 500 mL
HI 7010L	pH 10.01 buffer solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL

ACCESSORIES

HI 710007	Shockproof rubber boot, blue
HI 710008	Shockproof rubber boot, orange

SPECIFICATIONS		HI 83141
Range	pH	0.00 to 14.00 pH
	mV	±1999 mV
	Temperature	0.0 to 100.0°C
Resolution	pH	0.01 pH
	mV	1 mV
	Temperature	0.1°C
Accuracy (@20°C)	pH	±0.01 pH
	mV	±1 mV
	Temperature	±0.4°C (excluding probe error)
pH Calibration		manual, two point, through trimmers (offset ±1 pH; slope: 80 to 110%)
Temperature Compensation		automatic, 0 to 70°C (32 to 158 °F)
pH Electrode		HI 1230B PEI body pH electrode with BNC connector and 1 m (3.3') cable (included)
Temperature Probe		HI 7669AW stainless steel temperature probe, BNC connector (included)
Input Impedance		10^{12} Ohm
Battery Type / Life		9V / approximately 100 hours of continuous use
Environment		0 to 50°C (32 to 122°F); RH max 100%
Dimensions		145 x 80 x 36 mm (5.7 x 3.1 x 1.4")
Weight		230 g (8.1 oz.)

For a complete list of Solutions and Electrodes, see the end of this section.

Analog pH/ORP Meter

- **Pre-amplified pH electrode**
- **Easy manual one or two point calibration**
- **Automatic Temperature Compensation**
- **Low battery indicator**

HI 8314 is a handheld pH/mV/°C meter designed to be reliable and easy-to-use.

HI 8314 uses the HI 1217D pre-amplified pH electrode and internal temperature sensor.

Manual calibration is performed at one or two points by adjusting the trimmers on the front panel. This instrument is ideal for applications that require a custom calibration point. Manual calibration can be extremely useful in order to achieve better accuracy.

SPECIFICATIONS		HI 8314
Range	pH	0.00 to 14.00 pH
	mV	±1999 mV
	Temperature	0.0 to 100.0°C
Resolution	pH	0.01 pH
	mV	1 mV
	Temperature	0.1°C
Accuracy (@20°C)	pH	±0.01 pH
	mV	±1 mV
	Temperature	±0.4°C (excluding probe error)
pH Calibration		manual, two point, through trimmers (offset ±1 pH; slope: 80 to 110%)
Temperature Compensation		automatic, 0 to 70°C (32 to 158 °F)
pH Electrode		HI 1217D PEI body, pre-amplified pH electrode with internal temperature sensor, DIN connector and 1 m cable (included)
Input Impedance		10^{12} Ohm
Battery Type / Life		9V / approximately 100 hours of continuous use
Environment		0 to 50°C (32 to 122°F); RH max 100%
Dimensions		145 x 80 x 36 mm (5.7 x 3.1 x 1.4")
Weight		230 g (8.1 oz.)

ORDERING INFORMATION

HI 8314 is supplied with HI 1217D pH electrode, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 700661 electrode cleaning solution sachets (2), calibration screwdriver, battery, protective case and instructions.

ELECTRODES

HI 1217D	PEI body, preamplified pH electrode with internal temperature sensor, DIN connector and 1 m (3.3') cable
HI 3618D	Glass body, preamplified ORP electrode with platinum sensor, internal temperature sensor and BNC connector with 1 m (3.3') cable

SOLUTIONS

HI 7004L	pH 4.01 buffer solution, 500 mL
HI 7007L	pH 7.01 buffer solution, 500 mL
HI 7010L	pH 10.01 buffer solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL

ACCESSORIES

HI 710015	Shockproof rubber boot, blue
HI 710016	Shockproof rubber boot, orange

For a complete list of Solutions and Electrodes, see the end of this section.

HI 8010 • HI 8014

Educational pH Meters

- **Manual calibration**
- **Easy mode selection**
- **Rugged for heavy use**

HI 8010 and HI 8014 are rugged, handheld pH meters specifically designed with ease of use in mind. These affordable meters are ideal for education and field applications.

HI 8010 and HI 8014 perform pH measurements with Manual Temperature Compensation. HI 8014 also performs ORP measurements.

Two-point calibration can be performed with trimmers on the front panel. The set values are stored even when the meter is shut off.

These rugged, manual pH meters are perfect for teaching students the fundamentals of pH measurement.

ORDERING INFORMATION

HI 8010 and **HI 8014** are supplied with HI 1230B pH electrode, calibration screwdriver, battery and instructions.

ELECTRODES

HI 1230B	PEI body pH electrode with BNC connector and 1 m (3.3') cable
HI 3230B	PEI body ORP electrode with platinum sensor, BNC connector and 1 m (3.3') cable

SOLUTIONS

HI 5004L	pH 4.01 buffer solution, 500 mL
HI 5007L	pH 7.01 buffer solution, 500 mL
HI 5010L	pH 10.01 buffer solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL

ACCESSORIES

HI 710009	Shockproof rubber boot, blue
HI 710010	Shockproof rubber boot, orange
HI 710001	Soft carrying case
HI 721311	Rugged carrying case
HI 8427	pH/mV electrode simulator
HI 931001	pH/mV electrode simulator with display

SPECIFICATIONS		HI 8010	HI 8014
Range	**pH**	0.00 to 14.00 pH	
	mV	–	±1999 mV
Resolution	**pH**	0.01 pH	
	mV	–	1 mV
Accuracy (@20°C)	**pH**	±0.01pH	
	mV	–	±1 mV
pH Calibration		manual, two point, through trimmers (offset ±1 pH; slope: 85 to 105%)	
Temperature Compensation		manual, 0 to 100°C (32 to 212°F)	
pH Electrode		HI 1230B PEI body pH electrode with BNC connector and 1 m (3.3') cable (included)	
Input Impedance		10^{12} Ohm	
Battery Type / Life		9V / approximately 100 hours of continuous use	
Environment		0 to 50°C (32 to 122°F); RH max 95%	
Dimensions		185 x 82 x 53 mm (7.3 x 3.2 x 2.1")	
Weight		265 g (9.3 oz.)	

For a complete list of Solutions and Electrodes, see the end of this section.

HANNA instruments

With Great Products, Come Great Results™

pH and mV Precision Simulators

- **Simulate output to discover malfunctions**
- **Simulate temperature**
- **Provided with universal BNC connector**

HI 8427 is designed specifically to simulate pH and ORP electrodes to confirm proper functioning of your meter. Standard pH electrode ranges are selectable with a dial on the front panel.

Provided with a universal BNC connector, this unit is also a high impedance tester, for cable and connector inspection with a leakage sensitivity of 10^9 ohm. This unique tester is a "one of a kind" in the industry that eliminates the need for very expensive MΩ meters.

Sometimes it is difficult to recognize whether a particular malfunction is due to the meter or the electrode. By simply connecting **HI 931001** to your meter's input socket and turning the dials, pH readings can be simulated from 0 to 14 pH in 0.01 steps. The output signals all correspond to pH values at 25°C and your pH meter should be able to check the span of your pH meter.

For the mV range, HI 931001 can simulate output from -1000 to +1000 mV in 1 mV steps.

HI 710010
Shockproof Boot

SPECIFICATIONS		HI 8427	HI 931001
Range	pH	0, 2, 4, 7, 10, 12, 14	0.00 to 14.00
	mV	-1900, -350, 350, 1900	-1000 to 1000
Resolution	pH	–	0.01
	mV	–	1
Accuracy (@ 20°C)	pH	±0.1	±0.01
	mV	±5	±1
Impedance test		10^9 Ohm	–
Temperature Compensation		manual, 0 to 50°C (32 to 122°F)	all output values are simulated at 25°C
Battery Type / Life		9V / approximately 100 hours of use	9V / approximately 500 hours of use
Environment		0 to 50°C (32 to 122°F); RH max 95%	
Dimensions		185 x 82 x 53 mm (7.3 x 3.2 x 2.1")	
Weight		255 g (9.0 oz.)	320 g (11.3 oz.)

ORDERING INFORMATION

HI 8427 and **HI 931001** are supplied with HI 7858/1 BNC/BNC coaxial cable

ELECTRODES

HI 7863	DIN/BNC connection cable, 1 m (3.3')
HI 7858/1	BNC/BNC connection cable, 1 m (3.3')
HI 7858/3	BNC/BNC connection cable, 3 m (9.8')
HI 7858/5	BNC/BNC connection cable, 5 m (16.4')
HI 7858/10	BNC/BNC connection cable, 10 m (33')
HI 7858/15	BNC/BNC connection cable, 15 m (49')

ACCESSORIES

HI 710009	Shockproof rubber boot, blue
HI 710010	Shockproof rubber boot, orange
HI 710001	Soft carrying case
HI 721316	Rugged carrying case

Designed and Manufactured by HANNA

pH Electrodes

At The Forefront of Electrode Technology

HANNA is the largest family-owned manufacturer of scientific analytical instrumentation, and a major European producer of electrodes. HANNA has helped propel the field of sensor technology with it's innovative methodology. The HANNA line of pH electrodes are produced in state of the art manufacturing facilities, and are available with glass or thermal plastic bodies.

In 1981, HANNA developed it's own formulations for sensing glass with the help of the Experimental Institute for Glass in Murano Italy. From that point forward, the company has continued to offer these premium pH sensing glass electrodes that cannot be imitated. While other companies have reduced their offerings, HANNA has continued to expand their electrode line to support a multitude of specific applications to get the job done right. An extensive variety of cleaning and maintenance solutions are also available to keep electrodes at peak performance.

Different Shaped Membranes (Tips)

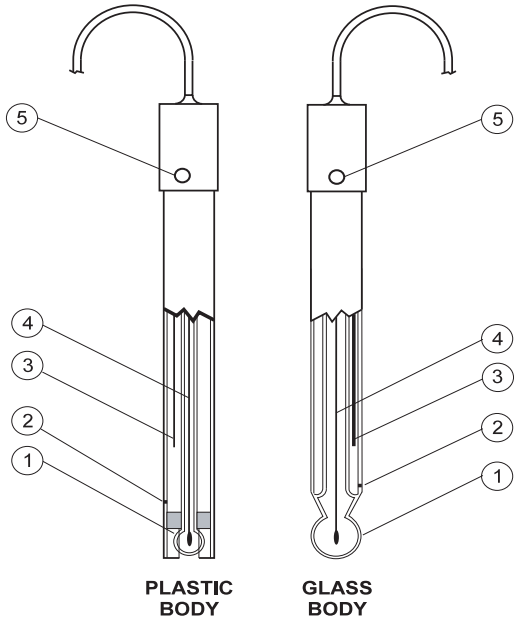
The pH membranes used as the sensor on pH electrodes can be fabricated with different shaped membranes; spherical, conical, and flat tips are used in HANNA's products. For analysis of small samples, microelectrodes are also available.

A spherical tip is recommended for general use in aqueous or liquid solutions and provides a wide surface of contact with the sample.

A conical tip is recommended for semi-solid products, emulsions, cheese, meat and food in general.

A flat tip is recommended for direct surface measurement on skin, leather, paper, etc.

Combination pH Electrode



Electrodes are housed in either plastic or in an all-glass body configuration. They can be either single cells or as shown in the diagram, combined into one body for ease-of-use. Regardless of the configuration, there are several features common to all electrodes.

1. Sensing Membrane Glass: Performs actual measurement.
2. Reference Junction: Acts as a liquid path electrical conductor.
3. Internal Reference: Supplies a constant equilibrium voltage.
4. pH Internal Element: Supplies a voltage based on the pH value of the sample.
5. Reference Fill Hole: Used to replace the reference electrolyte solution (not in GEL or SOLID-filled references).

Feature Guide: A Quick Glance

Calibration Check™ System

When used in tandem with a HANNA Calibration Check™ meter, our Calibration Check™ equipped electrodes allow users to be informed if they have performed a proper calibration. In the event of a dirty or broken electrode or contaminated buffer solution, the system alerts the user to either check the electrode, replace the buffer solution or both. The system also reminds users when the instrument should be recalibrated.

Smart Electrodes

With models that feature our SMART circuitry, an exclusive microchip embedded inside the electrode retains the calibration data and assigns an identity code to the host unit. As soon as the electrode is connected to a pH meter in the SMART series, it is recognized and its characteristics retrieved. The meter then uses the accessed calibration data as a reference for future measurements. Once each SMART electrode is calibrated, these electrodes can be used in succession without requiring new calibration. HANNA's intelligent electrodes help eliminate errors and will save time when working with more than one electrode.

Pre-amplified Electrodes

Integral pre-amplifiers are encapsulated in this series of HANNA's pH electrodes. The pre-amplifier converts the high impedance signal from the pH glass to a low impedence signal thus allowing the user to use long runs of sensor cable with ordinary connectors without noisy or voltage drops resulting in erroneous measurements.

Clogging Prevention System (CPS™)

Conventional pH electrodes use ceramic junctions that may clog quickly when used in biological samples such as wine. When the junction is blocked, the entire electrode will not function properly. Electrodes that feature CPS™ technology utilize a ground glass/ PTFE sleeve junction which controls a steady, predictable flow of fill solution thus keeping the junction open. The hydrophobic property of PTFE sleeve repels wetness and coatings.

Titanium Casings

Our electrodes that feature titanium bodies offer durability and shielding required in many industrial applications.

pH Measurement

The most common pH measurement system utilizes glass pH electrodes. The system consists of a pH sensor (whose voltage varies proportionately to the hydrogen ion activity of the solution), a reference electrode (which provides a stable and constant reference voltage), a conductive measurement solution and a special meter to display and measure the pH.

The pH sensor incorporates a thin membrane of hydrogen sensitive glass blown on the end of an inert glass tube. This tube is filled with a buffered electrolyte, and a Ag/AgCl wire. This is called a pH half cell.

A complimentary system produces a constant voltage; it also contains a Ag/AgCl wire and an electrolyte (often a KCl solution saturated with AgCl). A small "filter", often a porous ceramic piece, connects this tube to the external sample. This system is called a reference half cell.

The meter measures the voltage difference between the pH half cell and the reference half cell in DC millivolts. The reading is read by the meter and displayed in either mV or pH units.

The remarkable glass pH measurement system is capable of measuring over fourteen decades of hydrogen ion concentration! The system has a proven track record for reliability and predictability. Several companies have marketed ion selective field effect transistors (ISFET technology) as a response to the need for glass free measurements (such as the use of glass in food processing). An ISFET is a chemically coated transistor that responds to hydrogen ions as well as oxidation and reduction voltages. These electrodes also require a reference electrode. ISFETS are reported to suffer from drift and instability but may still have a niche market. The glass pH sensor is still the far better choice for the majority of applications.

Electrode Body

Until the seventies, it was a common practice to offer two half cells separately, a glass pH sensor and separate reference electrode. Today it is more common to use a single combined electrode that has both of the components. Reference electrodes still enjoy use in other electrochemical techniques and are often preferred with ion selective electrodes (ISE) half cells.

Combination pH electrodes are often made entirely of glass. The bodies of these electrodes are lead free glass, which is not pH sensitive. All glass electrodes are ideal for routine laboratory work because they respond quickly to temperature changes, are easily cleaned and are compatible with organic solvents. However, in the hands of some, glass can be very breakable.

The electrode body can be made less fragile by incorporating an outer body made from a thermoplastic. HANNA uses PEI resin, PVDF and PP as examples of materials utilized for outer body construction.

Some industrial sensors utilize additional materials such as PVC and titanium, the space age metal. A titanium body increases immunity to electrostatic and magnetic fields and features strong corrosion resistance (even in sea water). Our titanium bodied electrodes' outer casing also serves as a matching pin.

Matching Pin

A matching pin is a differential measurement technique used to eliminate ground loops and common mode perturbations for the measurement system. In a system without a matching pin, electrical currents in the sample can affect the reference half cell voltage that is connected via the liquid junction with the sample.

In this case, the reference electrode picks up the electromagnetic fields and the measurement of the pH is altered. The matching pin isolates these current/magnetic fields from the reference electrode.

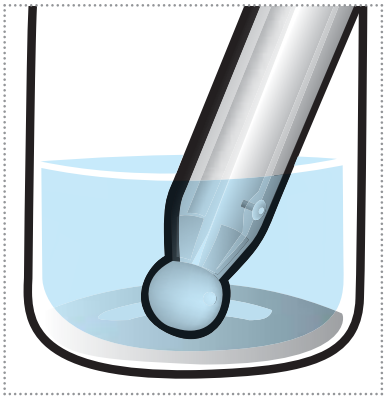
HANNA manufactures a number of models with the matching pin design for safe precise pH measurements.

Measurement Preparation Procedure

A coated measurement sensor or reference may yield slow responding and erroneous results. To ensure the best pH measurements possible, preventative maintenance and storage practices are strongly advised. A clean, conditioned HANNA pH electrode will provide the best measurements possible.

When using a new electrode, remove the protective bulb cap and inspect the electrode. As water may have evaporated during shipping or storage, salt crystals may be found in the cap or on the pH bulb. Rinse off with water.

During transport, air bubbles may have formed inside the glass bulb. Shake down the electrode as you would an old style mercury thermometer.



Condition the sensing tip; soak the pH bulb and junction in HI 70300 Storage Solution for at least one hour or longer. If possible, an overnight soak is best. This will hydrate a dehydrated glass sensor, thoroughly wetting a dried reference junction (wick, ceramic etc).

Water Conductivity and pH Measurement

pH measurement is the measurement of hydrogen ions. Ultrapure water is the perfect solvent, and readily dissolves many things. The pH glass surface can actually become dehydrated if stored or used in deionized or distilled water as ions are leached from the sensing surface. pH electrodes require ions in a solution, preferably with a conductivity of or exceeding 200 µS/cm to function properly.

In the case of low conductivity samples or when working below 200 µS/cm, we suggest the use of specific electrodes, such as our HI 1053B.

pH Measuring System

HANNA has put a lot of effort in the development of efficient pH measuring systems. Some of the changes made to our pH sensors are not immediately apparent to the user. These things include better pH glass, stem glass, liquid junctions, seals, internal buffers systems, cables and caps. Changes in our instrumentation are more obvious to the user. We strive for user friendly interfaces with state of the art electronics. The required components for a pH measurement system are as follows:

pH Electrode
Sensor half cell of an electrochemical cell that typically contains a special glass composition membrane that responses to hydrogen ion concentration.

Reference Electrode
Half cell of the electrochemical cell that supplies a stable voltage that is known, constant and completely insensitive to the measurement solution. Changes in voltages generated from the pH sensor are measured versus this electrode's voltage.

High Input Impedance Meter
It is the measurement device that processes the voltage from the electrochemical cell and converts it into a meaningful measurement unit (pH). The measurement is done with virtually zero current flow to prevent polarization of the electrodes. Modern pH meters also may provide sensor diagnostics, automatic buffer recognition, calibration reminders and user prompts.

Chemical pH Buffers
Stable well characterized standards for calibration. Two or more pH buffers that bracket the sample pH range are suggested for the most accurate results.

Thermometer or Temperature Probe
The temperature is required to calibrate the electrode properly, as buffers have different values at different temperatures. An auxiliary or built-in temperature probe and automatic buffer recognition ensures the calibration and measurement is automatically temperature compensated, thus eliminating error.

Magnetic Stirrer
Used in a laboratory setting, a magnetic stirrer together with magnetic stir bars continually agitate the buffer and/or samples to keep them homogenous without temperature or sample gradients.

pH Electrode Manufacturing

Other producers use the continuous fusion technique in crucibles with induction furnaces. In this case the glass is exposed to the fusion temperature for hours and it is difficult to retain the quality of the product due to the evaporation of some of its components.

HANNA uses glass blowing technology, typical of the Murano masters, with sensitive glass sticks fused in controlled batches. Only this technique, which exposes the sensitive glass to the high fusion temperature for a few seconds, can guarantee the consistency and quality of the pH half cell.

HANNA Offers 4 Different pH Sensitive Glass Formulations

Application driven design has influenced our offering of pH glass formulations. HANNA has selected the best glass compositions possible for each sensor to ensure the most accurate measurements in a given application. The characteristics of the sensitive glass used in the manufacture of pH electrodes is extremely important in determining how the electrode will respond. Characteristics of pH glass include workability (what shapes can be made with a certain glass composition), impedance of the glass (shape also influences this), pH range, alkaline error, acid error, hydrofluoric acid resistance and abrasion resistance.

HANNA utilizes 4 different types of pH sensitive glass to cover the vast number of applications HANNA electrodes service. Our manufacturing processes are specific for each design of pH electrode. For instance, some electrodes with low impedance glass are particularly suited at performing measurements in solutions with low conductivity or cold solutions. For industrial grade electrodes, HANNA produces a specific range of sensitive glass that guarantees a linear response over a wide pH range as well as being resistant to harsh environments.

To optimize a pH measurement for a particular application, the pH glass characteristics are considered as well as materials of construction including reference junctions, wetted materials and internal seals. HANNA provides the best material and performance for a particular application to ensure reliability of measurement. For example, when measuring at temperature extremes, glass impedance is an important factor to consider. As a general rule, the pH glass impedance doubles for every 10°C (50°F) drop in temperature. Very high impedance results in a very noisy, erratic signal that is prone to errors in measurement. HANNA offers LT a low impedance glass for these applications. At elevated temperatures, glass can dissolve readily, shortening the life and performance of the sensor. HANNA offers HT glass for these applications.

GLASS MEMBRANE	APPLICATION
GP	General Purpose
HT	High Temperature
LT	Low Temperature
HF	Samples with Fluoride

GP Glass

HANNA's GP (general purpose) hydrogen sensitive glass provides the best response over the entire pH range and can be used for a wide range of applications. Great results are obtained with a sphere geometry with diameter of 9.5 mm (0.37"). This achieves a system with 100 MΩ, impedance. The GP glass is also used on smaller diameter spheres.

As the diameter of the sphere is reduced, the system impedance increases, the response time can increase from the usual 2 seconds for the 9.5 mm (0.37") sphere to about 6 seconds with a 3 mm (0.12") sphere. The glass is green.

LT Glass

LT glass is used on our flat and conical shaped membranes as well as sensors used at cold temperatures because the glass has lower impedance. If an electrode has very high impedance, the measurement response will be sluggish, and a voltage drop causing error can occur. At temperatures below -8°C (17°F) the internal buffer may freeze and expand and cause the mechanical destruction of the sensor. This glass has a more limited pH range. This glass is dark green.

HT Glass

Designed for extended use at elevated temperature. The glass impedance has a temperature coefficient of about 14.3% per degree Celsius.

HT sensitive glass has an impedance of 400 MΩ at approximately 25°C (77°F). At extremely high temperatures the impedance drops significantly. This glass makes it possible to obtain accurate, high temperature pH measurements for extended periods of time 90°C (194°F) and for a few weeks at 100°C (212°F). At room temperature the response time may increase so additional time for equilibration in buffers should be allowed. This glass is clear.

HF Glass

Hydrofluoric acid can dissolve glass rapidly. HANNA uses HF resistant glass for aggressive applications that have fluoride ions. Electrodes manufactured with this glass live ten times longer than electrodes made with standard pH glass formulations (from 10 days to 100 days). The alkaline error is very high for this glass so it is not suited for pH measurements above pH 10. The recommended pH range with this glass is 2-10 pH.

How Temperature Effects pH Measurements

Samples change pH as a function of temperature due to changes in ion dissociation and increased ion activity with increases in temperature. An example of this is pH buffers whose well-characterized values are published on the buffer bottles. With very pure water, a change in ~1.3 pH is observed between 0 and 100°C. This example shows that even a neutral solution can have a large temperature coefficient. All samples have a temperature coefficient that is variable for actual samples. Changes in pH due to the sample temperature coefficient are not compensated for.

There is an exception to this; because buffers are well characterized, on intelligent pH meters, during calibration, the buffers are compensated for. They will display a 25°C value during calibration but will change after the calibration to read their actual pH at the temperature of measurement.

pH Compensation

A well-made pH electrode together with modern pH instrumentation can compensate for changes in temperature related pH measurements due to thermodynamic changes demonstrated by the Nernst equation. The electrode itself is made with an isothermal point close to pH 7 and a slope that closely follows the Nernst equation.

The majority of pH meters HANNA manufactures incorporate either automatic or manual temperature compensation.

When temperature compensation is made with a pH meter. The slope (or gain) of the meter is changed to compensate for the Nernst slope change exhibited by the electrodes. On models with manual compensation the user can change the temperature with a dial or software entry to correspond to the sample temperature.

Nernst Equation

$E_{obs} = E_c + \mathbf{ln(10)RT / nF} \log(a_{H+})$

E_{obs} = Observed potential (sum of reference and liquid junction potentials)
E_c = Reference potential including other stable and fixed potentials
a_{H+} = The hydrogen ion activity
T = Temperature in Kelvin (C° + 273.15)
n = Valency of the ion measured (1)
F = Faraday's constant (9.6485×10^4)
R = Gas constant (8.31432J / KMol)

From this equation one can see if the temperature T changes the term ln(10)RT / nF, which is known as the slope factor, will change also. The table below illustrates the change in slope factor for changes in temperature.

TEMPERATURE (°C)	SLOPE FACTOR (mV/pH)
05	55.18
10	56.18
15	57.18
20	58.17
25	59.16
30	60.15
35	61.14

pH meter with separate pH and temperature probes

pH meter with pH electrode incorporating an internal temperature sensor

Automatic Temperature Compensation

The ability to compensate for changes in the Nernst slope factor in the least possible time requires the measurement of temperature automatically. HANNA supplies many pH meters with either a separate temperature sensor or one integrated with the pH sensor. This elegant design, which has the advantage of space conservation and convenience, is used with all process sensors and many of our handheld devices. In 1988, HANNA incorporated pre-amplifiers in some of their pH electrodes used with portable instrumentation. This popular design has permitted HANNA to use slimmer cables and has the advantage of the integral sensor incorporated with the pH. The pre-amplifier converts the high impedance signal to a low impedance signal and the bulky insulated cables are not needed.

Other intelligent enhancements to pH measurement

Other functions can also be added to the electronic circuit's memory. Electrode production data and the recognition of the model code of the electrode are two examples of intelligence that has been added to some models of sensors. The instrument can use this data to compare previous data with the present calibration thus avoiding calibration errors.

When the user has to use a different electrode for a different application, the instrument will recognize the new electrode and can tell if it has been previously calibrated and proceed correctly.

This technology has spread from industrial to portable and laboratory measurements.

Alkaline Error

Alkaline error exists in high pH solutions when the hydrogen ions in the gel layer are partially or completely substituted with alkali ions, and the resulting pH is lower than it actually should be. The difference between the theoretical and experimental pH is called the alkaline error. Sodium ions are typically the ions that are responsible but potassium and lithium ions can also contribute to this error. In earlier glass compositions, the alkaline error was seen to start at pH 9. Newer glass formulations and ones especially formulated to minimize this error now exhibit an error starting at pH 12 or 13 pH.

To solve the problem of alkaline error, HANNA's HT glass minimizes alkali error in highly alkaline solutions. The tables below show the sodium error that exists with HANNA glass types at ambient temperatures:

ALKALI ERROR WITH 0.1 M SODIUM				
pH	**GP**	**HT**	**LT**	**HF**
10.5				0.06
11.0				0.15
11.5			0.05	0.22
12.0	0.01		0.18	0.30
12.5	0.11	0.05	0.28	
13.0	0.23	0.11	0.35	
13.5	0.35	0.16	0.45	
14.0	0.48	0.20	0.54	

ALKALI ERROR WITH 1.0 M SODIUM				
pH	**GP**	**HT**	**LT**	**HF**
10.0			0.01	0.25
10.5			0.14	0.25
11.0	0.02		0.30	0.48
11.5	0.11	0.01	0.46	0.71
12.0	0.21	0.06	0.62	
12.5	0.32	0.11	0.79	
13.0	0.43	0.15		
13.5	0.45	0.21		
14.0	0.65	0.27		

Half Cell/Reference Electrodes

All potentiometric measurements are taken with two electrodes, one is a sensor with a potential that varies as a function of the concentration of the species to be measured and the second is a reference electrode which keeps its potential constant. The mV reading is the difference of the two values.

Reference Half Cell Junction

The reference half cell must be constructed so as to allow contact between the fill solution inside the half cell and the sample being measured. The fill solution must meet some requirements:

- The reference fill solution should not interfere with the measurement.
- The reference fill solution should not react with the solution measured (no precipitates or complexes).
- The reference solution should be miscible with the solution measured.
- The solution measured must not react chemically with the reference half cell.
- The mobility of the ions in the fill solution should be matched (equitransferent)
- Should be non-toxic

The junction (the part in contact between the two liquids) is typically made with inert materials that will not increase a junction potential or be chemically attacked by the measured solutions. The materials most commonly used are:

Porous Ceramic
Normally used in electrodes with glass bodies, because ceramic with the correct expansion coefficient is is easily welded to glass. Ceramic is available with different porosities and diameters. Also sometimes called a diaphragm.

Porous PTFE (PolyTetraFluoro-Ethylene)
Porous PTFE is a hydrophobic material that is available with different porosities. Because of its chemical advantages, PTFE is widely used in industrial applications.

Fiber wick
This type junction is often used on plastic bodied electrodes with gelled electrolytes. The advantage of this type junction is it is renewable; as the cloth like material is pulled out from its position, the junction is renewed with an uncontaminated fresh surface.

Cone Style
This junction is also renewable. As the sleeve or collar is moved fresh fill solution cleans out the junction with fresh electrolyte. This has a higher flow rate than a ceramic type and is often specified for ISE measurements.

Open junction
This type junction is found in reference half-cell is filled with a special gel which comes into direct contact with the solution to be measured An advantage of an open junction is low conta resistance and it is virtually impossible to clog.

Other types of junctions include:

Capillary junction
Can be made with smooth or frosted glass. The advantage of a capillary junction is a fast flow rate and a very open channel. Typically used with thickened electrolytes.

Open Platinum
This style junction is made by partially sealing fine Pt wires through the stem glass which creates a leakage path. These have high flow rates.

Fiberglass
This style junction is very similar to a fiber wick. The junction is typically renewable and may have a high flow rate depending on strand number in the bundle.

Calomel Electrode

There are concerns regarding the use and disposal of mercury in the environment. Because of this, the calomel electrode has fallen out of favor. It however has an extremely stable voltage at ambient temperature. The calomel electrode has a cartridge containing mercury in contact with a with mercuric chloride paste. It is used with a potassium chloride fill solution which is in contact with the sample to be measured through a porous ceramic junction.

The concentration of potassium chloride varies from saturated down to 0.1 M. The calomel electrode responds very slowly to temperature changes; it could even take hours to come to thermal equilibrium and it cannot be used for temperatures higher than 70°C (158°F). It is not reversible.

Silver/Silver Chloride Half Cell

The silver/silver chloride electrode is made of a pure silver wire electroplated with a layer of silver chloride and often dipped in molten AgCl. The wire is equilibrated in a solution of potassium chloride solution in contact with the sample to be measured, often through a porous ceramic junction. AgCl is soluble in concentrated potassium chloride, so the electrolyte is saturated with silver chloride to prevent the plating from dissolving off the wire.

The Ag/AgCl half cell responds to the temperature changes much faster than the calomel electrode and may be used at temperatures higher than 70°C (158°F) for a long period of time.

Both the fast reversible temperature response and wide range of operating temperatures have contributed to the popularity of this type electrode. It is also safer to handle and dispose of.

The table below tabulates the half cell voltage of the Ag/AgCl with different KCl concentrations versus a standard hydrogen electrode (SHE) at various temperatures.

°C	1.0 M	3.0 M	3.5 M	SATURATED
10	231.4	260.2	215.2	213.8
15	228.6	258.5	211.7	208.9
20	225.6	256.9	208.2	204.0
25	222.3	254.9	204.5	198.9
30	219.0	253.0	200.9	193.9
35	215.6	250.8	197.1	188.7
40	212.1	248.7	193.3	183.5

Non-Polluting Reference System

The HANNA double-junction electrodes with reference systems that contain no silver chloride (AgCl) are designed to prevent sample contamination and reduce clogging of the diaphragm.

Multiple or Open Junctions

The single ceramic junction (diaphragm) allows a low rate of electrolyte leakage and is suitable for general use in aqueous solutions. The triple ceramic junction allows a higher leakage rate and makes the reference system less sensitive to electrode "poisoning" which is suitable for emulsion and protein enriched solutions.

The free diffusion layer allows the greatest degree of contact. Recommended for the dairy and food industry.

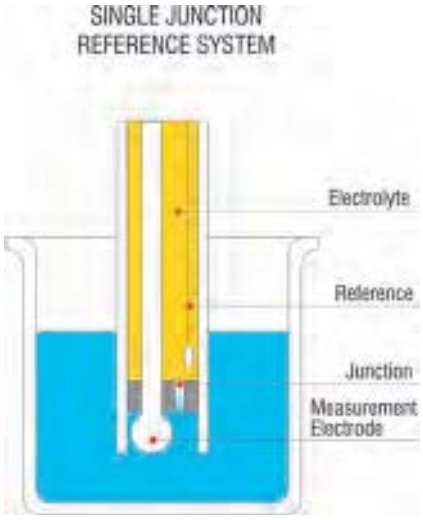
Single Junction Reference

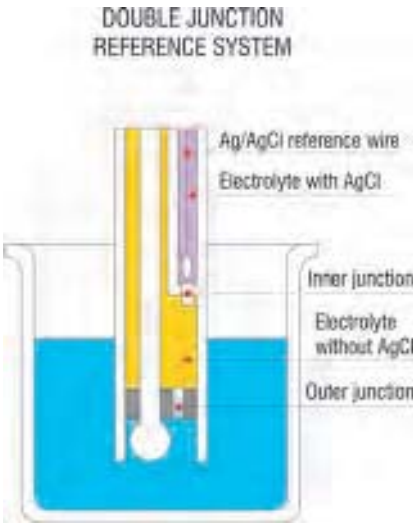
This is the most common model, where a Ag/AgCl wire is dipped into a 3.5 molar KCl + Ag Cl solution. As explained in the section on reference electrodes, the electrolyte must be saturated with AgCl to avoid dissolution in the KCl electrolyte. It allows the possibility that traces of AgCl will come into contact with the sample solution forming silver precipitates which may block the junction.

Double Junction Reference

This silver/silver chloride based half cell has two chambers for electrolyte. The internal chamber houses the silver/silver chloride wire and electrolyte containing chloride and AgCl. It contacts the outer chamber through a porous ceramic junction. The outer chamber serves as a silver free buffer zone. The electrolyte may be 3.5 M KCl or 1 M KNO_3 for example. A second junction contacts the sample from this chamber. Since silver reacts with tris buffer and heavy metals to form a precipitate, the absence of silver in the electrolyte gives the double junction reference a big advantage. Keeping the silver within the inner chamber and KCl in the outer chamber prevents the precipitation and results in a cleaner junction, free from silver precipitates.

The disadvantage is, such an electrode has a greater heat capacity, which may be a problem when measuring laboratory samples at different temperatures. The double junction reference is widely used with process electrode designs, especially when taking measurements inside pipes with operating pressures up to 8 bar.





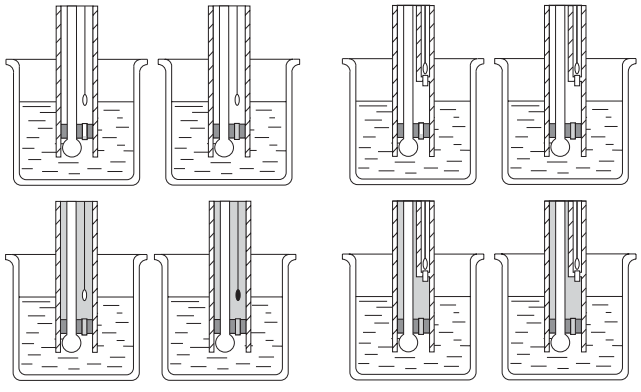
Improved Performance Through Innovation

HANNA has continually been at the forefront of sensor research and development since the 1980's. The increasing demand for reliable, durable and high quality electrodes for the laboratory, water treatment and process industries has motivated us to persist in our commitment to the creation of new technologies, and improvement of existing methods and designs. The most common sensing problems related to pH electrodes are the contamination and clogging of the reference junction, resulting in slow, drifty and noisy measurements. HANNA's vast experience in the manufacturing of electrodes has enabled us to introduce innovative ideas, developing dedicated answers to specific problems in the measurement of pH.

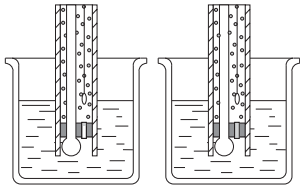
a) Minimizing Contamination

Conventional electrodes are normally single junction. As depicted by the figures below, these electrodes have only a single junction which serves to put the reference electrode system in contact with the sample. Under adverse conditions e.g., high pressure, high temperature, highly acidic or alkaline solutions etc., the positive flow of the electrolyte through the junction is often reversed resulting in the ingress of sample solution into the reference compartment. If this is left unchecked, the reference electrode ultimately is contaminated, leading to complete electrode failure.

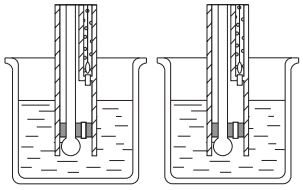
HANNA's double junction system, as the name implies, has two junctions, only one of which is in contact with the sample. As illustrated in the figures below, under adverse conditions, the same tendency of sample ingress is evident. However, as the reference electrode system is separated physically from the intermediate electrolyte area, the contamination of the electrode is minimized. This leads to long electrode life. The chances of recovery are also higher if proper maintenance procedures are taken.



b) Reduction in Clogging of Junctions



A common cause of clogged junctions in conventional electrodes is due to the common ion effect. AgCl is less soluble in the sample than the reference electrolyte solution. Therefore, when the electrolyte solution makes contact with the sample, some AgCl will precipitate on the external face of the junction. Even though regular maintenance procedures and backflushing eliminates clogging, often the severity of this problem is not comprehended. The result is drifty readings obtained from the sensor.



In HANNA's double junction electrodes, the secondary compartment electrolyte which contacts the sample through the junction does not contain any silver chloride ions. As such, this problem is nonexistent. Though the primary compartment contains heavy ions, the contact across the primary junction is purely by ionic diffusion and as such in contrast to the high flow junctions in contact with the sample, the clogging effect is negligible.

c) Reference Electrolyte Compatibility

At times, the incompatibility of the electrolyte and sample leads to a chemical reaction at the junction creating clogging and measurements that drift. In conventional electrodes, the types of reference electrolytes that can be used are extremely limited to the inherent characteristics of the electrode system.

With double junction electrodes, one can easily substitute a compatible reference electrolyte in the secondary chamber to ensure accurate measurements of difficult samples without damaging the electrode reference system, thus eliminating the problems of conventional electrodes.

pH Electrodes and Signal Strength

A pH electrode is made of a half cell of pH sensitive glass and a reference electrode. From the tip of each electrode a connecting wire comes out. A pH electrode needs therefore 2 conductors.

A special insulated cable is required to carry the high impedance mV signal from the pH sensor without experiencing a voltage drop and error in pH value. pH glass impedance is found to vary from a few MΩ up to 800 MΩ depending on glass type and temperature. To ensure a precise measurement (0.001 pH), the connecting cable requirement is extremely important and must have an impedance 14,000 times greater than that of the glass electrode (800 MΩ x 14,000 = 11.2 x 10^{12}Ω).

Any insulation of less than 10^{12}Ω will result in wrong readings. In case of leakage a drained current from the electrode occurs. A pH measurement must be made with no current flow.

Leakage currents higher than 2 pA (picoamps) will damage the electrode and cause it to polarize. An electrode that has supplied a few picoamps just for a few seconds, will take hours to regain its capacity to take measurements.

At the end of the cable there is a two-conductor connector. The most common version, capable of holding the high value of the required insulation, is the BNC connector with PTFE insulation.

Cable Limitations and Solutions

Because of the limitations that have been mentioned, cables longer than 5 meters (16') should be avoided with standard electrodes.

In industrial installations, a signal from the sensor often has to travel much greater distances than 5 meters (16'). Often a device known as a 2 wire transmitter is used to convert the voltage from the sensor to a current for transmission. The current can travel long distances to a recording device, controller or other devices that can use the 4-20 mA signal. The HI 8614 and HI 8614L are two wire transmitters that have water-tight cases and galvanically isolated power requirements. (HI 8614: 18 to 30 VDC, HI 8614L: 20 to 36 VDC). These transmitters carry the 4-20 mA signal over the same two wires as power. The local indication of pH near the sensor makes installation of the pH electrode quick and easy. The downside of this technology is the receiving device must accept and utilize the current input.

Another approach for carrying a pH signal a long distance without loss of signal or noise is realized with the HANNA AmpHel® sensor. This preamplified pH sensor contains its own high impedance pH amplifier with required batteries. The typical high impedance signal from a pH bulb is reduced to a low impedance signal. The low impedance signal can be carried long distances (100 m; 328') without degradation in signal. The preamplifier has a life of approximately 3 years from the date of production. This long life exceeds the typical life of a pH glass bulb.

Electrode Connectors

Most HANNA meters accept pH or ORP probes with one of the connectors on the left.

The **BNC connector** is the most versatile since it can be used with any meter that utilizes BNC regardless of brand.

BNC + PIN connectors are used specifically with meters that utilize HANNA's exclusive Calibration Check™ system.

DIN, **Screw** and **T-type** connections are for the most part proprietary to the meters they are supplied with.

Screw and **T-Type** connectors attach directly to the meter.

Electrodes with BNC, BNC + PIN or DIN connectors feature cable lengths that can be ordered in a variety of lengths.

Even though both screw and T-type connectors attach directly to the meter, they can also be made interchangeable with other meters by using a HANNA BNC extension cables.

B BNC

P BNC + PIN

D DIN

S SCREW

T T-TYPE

Take Time for Routine Electrode Maintenance

Calibration

There are many different industries that rely upon the use of a pH meter to make decisions about a process. Calibration is an important function that must be done routinely to standardize the electrode the face of its ever-changing characteristic. That is, when the meter is calibrated, it is done to compensate for the changes that have taken place to the electrode since the previous calibration. There are many influences including aging, temperature, coatings, and chemicals used that will affect the characteristic. So the question becomes 'what is a typical probe characteristic and how do you check it?'

A pH meter is a very sensitive voltmeter, in that when a pH probe is placed into a solution a mV potential is generated in response to the hydrogen ion concentration [H^+]. The theoretical voltage generated can be determined by the Nernst equation. Theoretically at 25 °C, a pH 7.0 solution will generate 0 mV and there will be a 59.16 mV change for each pH unit. So at pH 4.0, which is characterized by a higher concentration of H^+, a +177.48 mV will be generated while at pH 10.0, with a lower H^+ concentration relative to pH 7.0, a -177.48 mV will be generated. Again, this is theoretical and does not represent the real world behavior. In fact, a new pH electrode will generate between +/- 10 mV in pH 7.0 and will have a slope percentage between 95 and 105%. The slope percentage is determined by dividing the actual voltage generated by the theoretical and then multiplied by 100.

The following are two examples of different electrodes having different characteristics. The voltage generated is determined by using a pH meter that has a mV option.

Example 1: An electrode in pH 7.0 buffer generates +15 mV. When placed in pH 4.0 buffer it generates +175 mV. The net difference between the two buffers is +160 mV which is then divided by +177.48 mV. The result, 0.901, is then multiplied by 100 to give a slope percentage of 90.1%.

Example 2: An electrode in pH 7.0 buffer generated -45 mV while in pH 4.0 it generated +115 mV. The net difference is 160 mV and as seen from example 1 equates to a 90.1% slope.

Example 2 is a prime example of how a probe can be calibrated but not be operating with an acceptable probe characteristic. That is, generally speaking, a slope of 90% is acceptable but the offset of -45 mV is not. An offset shift can be the result of a build up on the probe. This will not only affect the response time but also if the coating then comes off with use, then the characteristic will change and the calibration will no longer be valid. Typically the offset voltage should fall within +/-25 mV and the slope between 85 and 105%. The greater the accuracy needed, the closer the readings should be to the theoretical.

Exclusive Calibration Check™

Proper calibration of both the pH meter and pH electrode system is critical in order to achieve accurate, reliable results. HANNA's exclusive Calibration Check™ diagnostics system includes several features to help reach that goal.

By alerting users of potential problems during the calibration process, Calibration Check™ diagnostics system eliminates erroneous readings due to dirty or faulty pH electrodes or contaminated buffer solutions. Users are guided step-by-step through the calibration process by an on-screen tutorial. After calibration, a probe condition indicator is displayed on the LCD informing the user of the overall electrode status and any associated messages.

Typical Calibration Check Displays

General guidelines for pH electrode use:

All HANNA electrodes are shipped with a cap that protects the bulb and junction from damage. The cap must be REMOVED and set aside.

Remove any salt deposits that may have formed on the surface of the electrode during storage and shipping by thoroughly rinsing with water. The presence of salt deposits is normal and generally indicates that the reference junction is open and free-flowing.

Verify that the electrode is connected properly to meter and the meter is powered.

During measurement, always operate the electrode with the fill hole open. This does not apply to gel and solid filled electrodes which do not have reference fill hole.

During normal use, fill solution will slowly drain out of the junction located on the side of the electrode; excessive loss (> 2 cm drop within 24 hours) is not normal.

Add fill solution daily to maintain a good head pressure. For optimum reference response, this level should be maintained and not be allowed to drop more than 2 cm below fill hole.

The electrode glass should always be kept wet. If dry, the tip should be soaked in electrode storage solution (HI 70300) or in absence, pH 4.01(7.01) buffer, or water for 2 hours to hydrate the pH glass membrane before use or calibration.

Calibration buffers and sample solution should be at the same temperature.

Periodically re-check calibration (if possible every 1-2 hours) to ensure maximum performance.

Rinse electrode with deionized or distilled water between samples and dab dry with lab wipe or soft disposable absorbent towel.

Calibration standards and sample solutions should be stirred at the same rate using identical sized stir bars.

Clean pH Electrodes

A clean pH electrode provides the most accurate measurements. HANNA has studied the effects of a soiled pH surface on electrode efficiency and has solved the problem of how to clean a pH glass surface properly.

As mentioned previously, a pH measurement requires two half cell potentials. The pH sensor is sensitive to changes in hydrogen ion concentration and is normally made from a special gas membrane bulb. Inside the glass bulb, a buffered (close to pH 7) chloride containing solution is permanently sealed with a silver wire coated with silver chloride. This forms a stable internal pH sensor voltage. If the external bulb surface was placed into this same buffered solution, the voltage difference would be zero or very small. As the hydrogen concentration was changed on the outside of the bulb (sample side), the glass bulb produces an electrical potential equal to 58.17 mV for each unit of pH (at 20°/68°F). The actual value that is generated depends on the exact pH glass composition used in producing the pH sensor. Each manufacturer uses slightly different compositions of components but most pH glass contains these components in these proportions: 21.6% Na_2O, 6.4% CaO and 72% SiO_2.

A Dirty Bulb

When the surface of a pH bulb is not perfectly clean, for example, if it is 10% coated, there is a 10% reduction in sample contact with the external bulb. Let us assume the pH sensor is in a sample of pH 4 but has a greasy deposit (value pH 7) on 10% of it. The voltage (EMF) the sensor will generate can be calculated.

90% of the sphere: pH 7 inside and pH 4 outside
= 0.9 x 3 x 59.16 mV = 159.732 mV

10% of the sphere: pH 7 inside and pH 7 outside
= 0.1 x 0 x 59.16 mV = 0 mV (portion of the dirty sphere)

The available EMF will then be 157.059 mV. In the case of a clean electrode, the EMF would have been:

100% of the sphere: pH 7 inside and pH 4 outside
= 1 x 3 x 59.16 mV = 177.48 mV

Therefore a dirty electrode supplies less EMF than a clean one.

Dirt Could Come From Anywhere

Eyeglasses are commonly used and it is well known how easily they become dirty. Each small spot represents a percentage error when it comes to measuring the pH.

HANNA offers instruments that are capable of detecting calibration errors due to spots. In addition, HANNA has developed a wide range of cleaning solutions for pH electrodes that makes this operation easy for users.

pH Electrode Conditioning and Conservation

The glass electrode should not be used when it is dry. The bulb must always be hydrated or the active layer degenerates and it will then take hours to restore equilibrium.

The electrode should be kept in a HI 70300 pH storage solution or in a buffer solution at pH 4 or pH 7. We do not advise storage of the electrode in alkaline buffer solutions with values higher than pH 9.18 or deionized water.

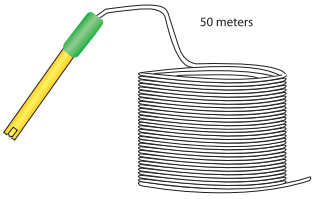
Reference electrodes also benefit from being kept wet with HI 70300 solution. If the reference is stored dry, evaporation of electrolyte results in salt crystals forming around the ceramic junction. These crystals are easily washed off but there is also danger of the porous junction developing air pockets. Instability results until the ceramic is thoroughly wetted.

With ceramic diaphragms, this equilibrium can be achieved by immersion in HI 70300 solution for a few hours. When PTFE is used, an immersion of 24 hours may be necessary. Avoid the use of deionized water to store glass and reference electrodes. Deionized water promotes osmosis with the salty solution inside the reference electrode and a higher rate of diffusion.

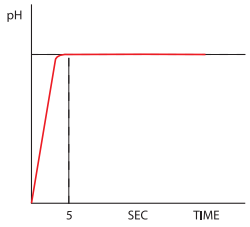
Reference electrodes have both gels and liquid filling solutions (typical for laboratory electrodes). When liquid fill solutions are used, the fill hole on the electrode body must be kept open during measurements to ensure positive head pressure and promote flow of electrolyte through the junction from inside the electrolyte reservoir to the outside of it. This promotes the formation of a good stable liquid junction. Unscrew the fill hole cap during measurements and close it afterward for storage.

The liquid filling solution level should be restored to just below the fill hole level by using the appropriate electrolyte and a syringe. The level should not drop below 50% of the electrode length and should always be above the level of the immersed sensor.

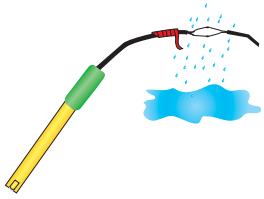
AmpHel®: an Extraordinary Advantage



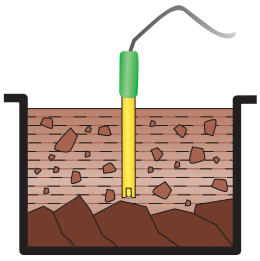
Long Unshielded Cable



Fast and Stable Reponse



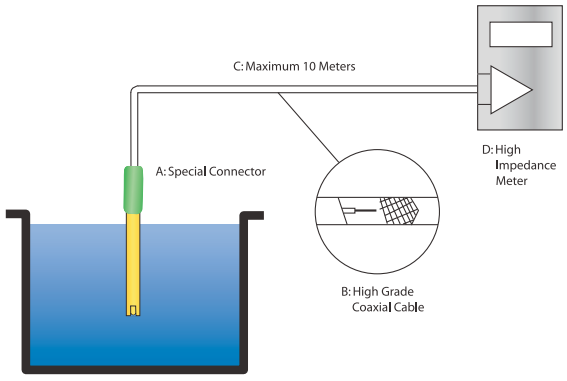
Simple Connection, Immune to Humidity and noise



Minimal Contamination

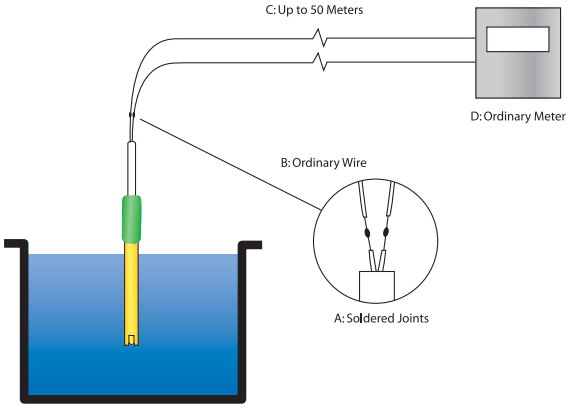
Characteristics and Advantages

- **Combination Ag/AgCl sensor & reference system.**
- **Rugged design with epoxy body housing and sensor protection.**
- **Battery life of 2 years.**
- **Very low output impedance (typically 10 Kohms) for:**
  1) instantaneous response
  2) unsurpassed stability
  3) connections with long unshielded cables (up to 50 meters)
  4) high mechanical and electrical noise immunity
  5) compatibility with existing pH meters in the market
  6) on-line process control applications
- **Double junction reference system for minimization of contamination due to clogged pores or ingress of sample.**
- **Refillable external reference system for versatility and durability.**
- **High flow rate fiber junction for optimum ionic conduction.**
- **Complete pH range from 0 to 14 and from 0 to 80°C.**



Conventional pH Technology

Due to the high resistance of the glass membrane of a pH electrode, conventional pH measuring systems utilize high impedance signal transmission. Bad insulation of the electrode connectors (A) and cables (B) results in high susceptibility to leakage, stray noise and humidity which tends to give erroneous pH readings. As a result, particular care has to be taken in connecting the electrode to the metering system. For this conventional system, the cable length (C) is restricted to typically less than 10 meters because of the low signal transmission. For measurements to be accurate the use of a high impedance meter is required and it is necessary to provide for high insulation in the meter connections. For these reasons, the conventional pH measuring system is delicate.



The Amphel™ Breakthrough

With an amplifier built into the electrode, the problems associated with high impedance is now isolated to one location (see figure on the left). The high impedance circuitry is now located at the top of the electrode which is completely encapsulated. As a result you now have low output impedance signals from the electrode to the metering system. This means you can use ordinary connectors (A) with long unshielded cables (B, C) and an ordinary meter (D). This breakthrough in pH technology provides you with a rugged system for all industrial pH measurements and monitoring.

ORP Electrodes

Similar to the manner in which acidic or alkaline solutions are quantified by pH measurements, solutions can also be graded as oxidizing or reducing ability based on measurements of ORP (sometimes called "REDOX").

When an oxidizing and/or reducing agent is dissolved into an aqueous sample, they may react with materials present and produce a voltage (EMF) that is related to the ratio of oxidized to reduce species in the sample. An electron exchange can develop between this solution and an inert metal sensor immersed in the solution, and the voltage can be measured (when compared to a reference electrode) with a pH/mV meter. This type of measurement is known as redox or ORP. The units of measurement are the mV. At a glance, an ORP electrode may look very similar to a pH electrode. Like a combined pH electrode, both the "sensor" and the reference are housed in a common body. A common use for this type of sensor is as an indicator in an ORP type titration.

The scale of measurement may be positive (indicating oxidizing) or negative (indicating reducing). It should be noted that when zero mV is observed, it is really an oxidizing situation because the reference voltage (~200 mV for an Ag/AgCl with KCl electrolyte) is included in the observed mV value. In some cases the user may wish to offset the reading to remove the reference contribution. The mV is then said to be approaching the absolute mV scale that references a SHE (standard hydrogen electrode). This type of calibration is called relative mV calibration.

An ORP sensor must be chemically inert; it cannot be oxidized or reduced itself. It must also have the proper surface characteristics to promote rapid electron exchange, a property known as high exchange current density. Two noble metals have proven to work well for this purpose. Pure platinum and pure gold are both used in the construction of ORP sensors.

The platinum sensor is often preferred because it is mechanically simpler and safer to produce. Platinum can be welded to glass and has the same thermal coefficient.

Platinum Ring

Platinum Pin

Sensors made of gold cannot be welded to the glass and are often placed in plastic supports applied to the glass or plastic tube by means of tiny elastomeric bungs. The gold or platinum sensor signal is carried through the electrode body, and together with the reference signal is conducted to the measurement meter via a coaxial cable with BNC connector.

An ORP system does not have a high impedance source (like a pH bulb), but is a potentiometric device that produces a voltage (like pH). It also uses similar cables, connectors and calibration solutions. For this reason a high impedance electronic meter (pH) with many user friendly features are a benefit for this measurement also.

Because of the close relationship between pH and ORP, there is a scale that takes into account the ratio (mV) ORP/pH, the rH scale. The rH range varies from 0 to 42, where the extreme values represent the reducing effect of an atmosphere of pure hydrogen (rH=0) and to the oxidizing effect of an atmosphere of pure oxygen (rH=42), respectively.

This is the formula for obtaining the rH value:

$$\mathbf{rH} = \frac{mV}{0.0992\,(273.14 + T)} + 2\,pH$$

where T is the temperature (°C) of the sample, mV is the ORP (mV) reading, and pH is the pH value of the sample.

The rH scale is not used in the instruments available on the market and the direct mV reading from the electrode is preferred, within the ±2000 mV range, without compensation/correlation with the pH/temperature value.

ORP Applications

ORP measurements are based on the potential difference measured between the platinum or gold electrode and a reference electrode. The identical reference system utilized for the pH electrode (Ag/AgCl) is also used for redox measurements.

Redox electrodes are used to monitor many chemical processes particularly those involving reversible reactions. Common applications include the following:

Industrial Waste Water Treatment

The redox systems used in water treatment are the reduction of chromates and oxidation of cyanides. Waste hexavalent chromium is reduced to trivalent chromium by the addition of sodium bisulfite or sulphur dioxide. In the case of cyanide, chlorine or sodium hypochlorite is used to oxidize the cyanide, followed by the hydrolysis of cyanogen chloride to form cyanate.

Water Sanitation

ORP measurements are being increasingly used as an effective measure of the sanitizing activity in pool, spa and potable water. The kill time of E.Coli bacteria in water depends on the ORP value. ORP is a reliable indicator of bacteriological water quality. Water having an ORP value equal to or higher than 650 mV are well within accepted bacterial parameter for pool and spa waters.

pH Electrode Application Guide

* Spheric (S) Conic (C) Flat(F)
** Glass (G) Plastic (P) Metal (M)

APPLICATION	RECOMMENDED ELECTRODES	Tip Shape*	Body Material**	Single Reference	Double Reference	Cloth Junction	Ceramic Junction	Open Junction	Viscolene Electrolyte	Gel Electrolyte	KCL 3.5M Electrolyte	KCL 3.5M + AgCl Electrolyte	Refillable	"Intelligent"	Temperature Sensor	Amplifier	Pressure (Bar)	PAGE
Acids, Strong	HI 1043B/P, HI 1040S	S	G		•		•				•		•				0.1	3.72
Alkaline, Strong	HI 2111B + HI 5311	S	G		•		•				•						0.1	3.90+3.92
Aquariums	HI 1332B/P, HI 1312S	S	P		•		•				•		•				0.1	3.80
Base, Strong	HI 1043B/P, HI 1040S	S	G		•		•				•		•				0.1	3.72
Beauty Cream	FC 212D	C	G	•				•	•					•	•	•	0.1	3.85
Beer	HI 1131B/P, HI 1111S	S	G	•			•					•	•				0.1	3.73
Biotechnology (< 100 µl)	HI 1083B/P	S	G	•				•	•								0.1	3.72
Boilers and Cooling Towers	HI 72911D	F	M		•		PTFE				Polymer				•	•	3	3.88
Cheese	FC 100B	S	P		•		•				•		•				0.1	3.81
	FC 240B	C	M	•				•	•								0.1	3.83
	FC 250B	C	G	•				•	•								0.1	3.83
Chemicals	HI 1332B/P, HI 1312S	S	P		•		•				•		•				0.1	3.80
Conductivity, Low	HI 1053B/P, HI 1050S	C	G	•			•					•	•				0.1	3.72
	HI 1617D	C	G	•			•					•	•	•	•	•	0.1	3.76
Conductivity, High	HI 1043B/P, HI 1040S	S	G		•		•				•		•				0.1	3.72
Creams	FC 211D, FC 213D	C	G	•				•	•						•	•	0.1	3.82
	FC 210B	C	G		•			•	•								0.1	3.82
	FC 220B	S	G	•			•					•	•				0.1	3.82
	FC 212D	C	G	•				•	•					•	•	•	0.1	3.85
	FC 911B	S	P		•		•				•					•	0.1	3.84
Dairy Products	HI 2031B, HI 2020S	C	G	•			•					•	•				0.1	3.75
	FC 211D	C	G	•				•	•						•	•	0.1	3.82
	FC 200B/S	C	P	•				•	•								0.1	3.81
	FC 240B	C	M	•				•	•								0.1	3.83
	FC 250B	C	G	•				•	•								0.1	3.83
	FC 201D, FC 202D	C	P	•				•	•					•	•	•	0.1	3.85
Emulsions	HI 1053B/P, HI 1050S	C	G	•			•					•	•				0.1	3.72
	HI 1617D	C	G	•			•					•	•	•	•	•	0.1	3.76
	HI 1612D	C	G	•			•					•	•		•	•	0.1	3.79
	HI 1413B, HI 1410S	F	G	•				•	•								0.1	3.87
	HI 1414D	F	G	•				•	•						•	•	0.1	3.87
Environmental	HI 1217-6D	S	P	•			•			•					•	•	2	3.79
Fats and Creams	HI 1053B/P, HI 1050S	C	G	•			•					•	•				0.1	3.72
	HI 1617D	C	G	•			•					•	•	•	•	•	0.1	3.76
Flasks	HI 1331B, HI 1311S	S	G	•			•					•	•				0.1	3.74
Fluoride, Samples with	HI 1143B	S	G		•		•				•		•				0.1	3.73
Food Industry (General Use)	FC 100B	S	P		•		•				•		•				0.1	3.81
	FC 911B	S	P		•		•				•		•			•	0.1	3.84
Food, Semi Solid	FC 201D, FC 202D	C	P	•				•	•					•	•	•	0.1	3.85
	FC 200B/S	C	P	•				•	•								0.1	3.81

*Unsure about which electrode to choose? Give your local HANNA office a call for assistance.

pH Electrode Application Guide

* Spheric (S) Conic (C) Flat(F)
** Glass (G) Plastic (P)

APPLICATION	RECOMMENDED ELECTRODES	Tip Shape*	Body Material**	Single Reference	Double Reference	Cloth Junction	Ceramic Junction	Open Junction	Viscolene Electrolyte	Gel Electrolyte	KCL 3.5M Electrolyte	KCL 3.5M + AgCl Electrolyte	Refillable	"Intelligent"	Temperature Sensor	Amplifier	Pressure (Bar)	PAGE
Fruit	FC 200B/S	C	P	•				•	•								0.1	3.81
	FC 230B	C	P	•				•	•								0.1	3.83
	FC 202D	C	P	•				•	•						•	•	0.1	3.85
Fruit Juices, Organic	FC 220B	S	G	•			•					•	•				0.1	3.82
	FC 911B	S	P		•		•				•		•			•	0.1	3.84
Frozen, Semi	FC 230B	C	P	•				•	•								0.1	3.83
Ham and Sausages	FC 200B/S	C	P	•				•	•								0.1	3.81
	FC 202D	C	P	•				•	•						•	•	0.1	3.85
	FC 230B	C	P	•				•	•								0.1	3.83
Horticulture and Nurseries	HI 1053B/P, HI 1050S	C	G	•			•					•	•				0.1	3.72
	HI 1292D	C	G	•			•					•	•		•	•	0.1	3.87
Humidity, High	FC 911B	S	P		•		•				•		•			•	0.1	3.84
Hydrocarbon	HI 1043B/P, HI 1040S	S	G		•		•				•		•				0.1	3.72
Laboratory (General Use)	HI 1131B/P, HI 1111S	S	G	•			•					•	•				0.1	3.73
	HI 1230B, HI 1210S	S	P		•		•			•							2	3.74
	HI 1615D	S	G	•			•					•	•	•	•	•	0.1	3.76
	HI 1618D	S	P	•		•				•				•	•	•	3	3.76
	HI 1217D/S, HI 1217-6D	S	P	•			•			•					•	•	2	3.79
	HI 12170	S	P	•			•			•					•		2	3.89
	HI 1610D	S	G	•			•					•	•		•	•	0.1	3.79
	HI 1332B/P, HI 1312S	S	P		•		•				•		•				0.1	3.80
	HI 1333B	S	P		•		•				•		•				0.1	3.89
	HI 2112 + HI 5311	S	G		•		•				•		•				0.1	3.90+3.92
	HI 1010S	S	G	•			•					•	•				0.1	3.73
	HI 1110B	S	G	•			•			•							2	3.89
	HI 1211S	S	P	•			•					•	•				0.5	3.74
Leather	HI 1413B, HI 1410S	F	G	•				•	•								0.1	3.87
	HI 1414D	F	G	•				•	•						•	•	0.1	3.87
Meat	FC 230B	C	P	•				•	•								0.1	3.83
	FC 400B, FC 204B	C	P	•				•	•								0.1	3.84
	FC 231D, FC 232D	C	P	•				•	•					•	•	•	0.1	3.85
	FC 431D	C	P		•			•	•					•	•	•	0.1	3.86
	FC 201D, FC 202D	C	P	•				•	•					•	•	•	0.1	3.85
Milk and Yogurt	FC 211D, FC 213D	C	G	•				•	•						•	•	0.1	3.82
	FC 200B/S	C	P	•				•	•								0.1	3.81
	FC 210B	C	G		•			•	•								0.1	3.82
	FC 201D, FC 202D	C	P	•				•	•					•	•	•	0.1	3.85
	FC 212D	C	G	•				•	•					•	•	•	0.1	3.85
Monitoring, Continuous	HI 1135B	S	G		•		•				•		•				3	3.73
	HI 1616D	S	G	•			•			•				•	•	•	2	3.76
	HI 1611D	S	G	•			•			•					•	•	2	3.79
NMR Tubes	HI 1093B	S	G	•			•		•								0.1	3.72
Paint	HI 1043B/P, HI 1040S	S	G		•		•				•		•				0.1	3.72

pH Electrode Application Guide

* Spheric (S) Conic (C) Flat(F)
** Glass (G) Plastic (P) Metal (M)

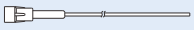
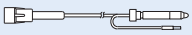
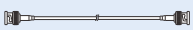
APPLICATION	RECOMMENDED ELECTRODES	Tip Shape*	Body Material**	Single Reference	Double Reference	Cloth Junction	Ceramic Junction	Open Junction	Viscolene Electrolyte	Gel Electrolyte	KCL 3.5M Electrolyte	KCL 3.5M + AgCl Electrolyte	Refillable	"Intelligent"	Temperature Sensor	Amplifier	Pressure (Bar)	PAGE
Paper	HI 1413B, HI 1410S	F	G	•				•	•								0.1	3.72
	HI 1414D	F	G	•				•	•						•	•	0.1	3.87
Photographic Chemicals	HI 1230B, HI 1210S	S	P		•		•			•								3.74
Plating Baths	HI 62911D	F	M		•		PTFE				Polymer				•	•	3	3.88
Quality Control	HI 1332B/P, HI 1312S	S	P		•		•				•		•				0.1	3.80
Sauces	FC 220B	S	G	•			•					•	•				0.1	3.82
	FC 911B	S	P		•		•				•		•			•	0.1	3.84
Seawater	HI 1043B/P, HI 1040S	S	G		•		•				•		•				0.1	3.72
Semi-solid Products	HI 1053B/P, HI 1050S	C	G	•			•					•	•				0.1	3.72
	HI 1617D	C	G	•			•					•	•	•	•	•	0.1	3.76
	HI 1612D	C	G	•			•					•	•		•	•	0.1	3.79
	FC 200B/S	C	P	•				•	•								0.1	3.81
	FC 201D, FC 202D	C	P	•				•	•					•	•	•	0.1	3.85
	HI 2031B, HI 2020S	C	G	•			•					•	•				0.1	3.75
Skin, Scalp	HI 1413B, HI 1410S	F	G	•				•	•								0.1	3.87
	HI 1413B/50, HI 1413S/50	F	G	•				•	•								0.1	3.87
	HI 1414D/50	F	G	•				•	•						•	•	0.1	3.87
Soil, Direct	HI 1292D	C	G	•			•					•	•		•	•	0.1	3.87
Soil Samples	HI 1053B/P, HI 1050S	C	G	•			•					•	•				0.1	3.72
	HI 1230B, HI 1210S	S	P		•		•			•							2	3.74
	HI 1617D	C	G	•			•					•	•	•	•	•	0.1	3.76
	HI 1292D	C	G	•			•					•	•		•	•	0.1	3.87
Solvents	HI 1043B/P, HI 1040S	S	G		•		•				•		•				0.1	3.72
Surface Measurements	HI 1413B, HI 1410S	F	G	•				•	•								0.1	3.87
	HI 1414D	F	G	•				•	•						•	•	0.1	3.87
Swimming Pools	HI 1297D	C	M	•		•				•					•	•	3	3.87
	HI 1134B/3, HI 1134B/5, HI 1114S	S	P		•	•				•							3	3.75
Titration	HI 2110B + HI 5311	S	G		•		•				•		•				0.1	3.90+3.92
Tris Buffer	HI 1043B/P, HI 1040S	S	G		•		•				•		•				0.1	3.72
	HI 1144B	S	G	•			•				•		•				0.1	3.74
	HI 1343B	S	P	•			•				•						0.1	3.75
Vials and Test tubes	HI 1330B/P, HI 1310S	S	G	•			•				•		•				0.1	3.75
Wastewater	HI 1296D	S	M	•		•				•					•	•	3	3.88
	HI 1297D	C	M	•		•				•					•	•	3	3.88
Water, High Purity	HI 1053B/P, HI 1050S	C	G	•			•					•	•				0.1	3.72
Water, Mineral	HI 1153B	S	G		•		•				•		•				0.1	3.84
Water, Municipal	HI 1297D	S	M	•		•				•					•	•	3	3.88
Water, Potable	HI 1053B/P, HI 1050S	C	G	•			•					•	•				0.1	3.72
Water Treatment	HI 1297D	C	M	•		•				•					•	•	3	3.88
Wine and Must	HI 1048B/P	S	G		•			•			•		•				0.1	3.84

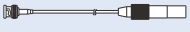
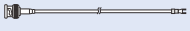
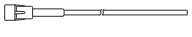
ORP Electrode Application Guide

* Platinum (Pt) Gold (Gl)
** Glass (G) Plastic (P) Metal (M)

APPLICATION	RECOMMENDED ELECTRODES	Pin Material*	Body Material**	Single Reference	Double Reference	Cloth Junction	Ceramic Junction	Open Junction	Gel Electrolyte	KCL 3.5M Electrolyte	KCL 3.5M + AgCl Electrolyte	Refillable	"Intelligent"	Temperature Sensor	Amplifier	Pressure (Bar)	PAGE
Disinfection	HI 3619D	Pt	G	•			•				•	•	•		•	0.1	3.77
Disinfection, with Ozone	HI 4619D	Gl	G	•			•		•					•	•	2	3.78
Laboratory (General Use)	HI 3131B/P, HI 3111S	Pt	G	•			•				•	•				0.1	3.78
	HI 3619D	Pt	G	•			•				•	•	•		•	0.1	3.77
	HI 3618D	Pt	G	•			•				•	•		•	•	0.1	3.78
	HI 3620D	Pt	P	•			•		•				•		•	2	3.77
	HI 3133B (half cell)	Pt	G														3.91
Oxidants	HI 4430B, HI 4410S	Gl	P	•			•		•							2	3.80
Oxidants, Strong	HI 4619D	Gl	G	•			•		•					•	•	2	3.78
Ozone	HI 4430B, HI 4410S	Gl	P	•			•		•							2	3.80
Plating Baths	HI 4110S	Gl	G	•			•		•							2	3.78
	HI 3410S	Pt	M		•	•			•							3	3.88
Quality Control	HI 3230B, HI 3210S	Pt	P	•			•		•							2	3.80
Swimming Pools	HI 3620D	Pt	P	•			•		•				•		•	2	3.77
Titrations, Argentometric	HI 5110B (half cell)	Gl	G														3.91
Titrations, ORP	HI 3131B/P, HI 3111S	Pt	G	•			•				•	•				0.1	3.78
Titrations, Potentiometric	HI 3133B (half cell)	Pt	G														3.91
Water, Municipal	HI 3230B, HI 3210S	Pt	P	•			•		•							2	3.80
Wine	HI 3148B	Pt	G		•			•		•		•				0.1	3.86

Electrode Extension Cables

PART #	CABLE LENGTH	CABLES / CONNECTORS	DESCRIPTION
HI 7854/1 HI 7854/3 HI 7854/5 HI 7854/10 HI 7854/15	1 m (3.3') 3 m (9.9') 5 m (16.5') 10 m (33') 15 m (49.5')		3.0 mm (0.12") cable with screw type connectors
HI 7855/1 HI 7855/3 HI 7855/5 HI 7855/10 HI 7855/15	1 m (3.3') 3 m (9.9') 5 m (16.5') 10 m (33') 15 m (49.5')		3.0 mm (0.12") cable with screw type and BNC connectors
HI 7856/1 HI 7856/3 HI 7856/5 HI 7856/10 HI 7856/15	1 m (3.3') 3 m (9.9') 5 m (16.5') 10 m (33') 15 m (49.5')		3.0 mm (0.12") cable with screw type and US Standard connectors
HI 7857/1 HI 7857/3 HI 7857/5 HI 7857/10 HI 7857/15	1 m (3.3') 3 m (9.9') 5 m (16.5') 10 m (33') 15 m (49.5')		3.0 mm (0.12") cable with screw type and DIN connectors
HI 7858/1 HI 7858/3 HI 7858/5 HI 7858/10 HI 7858/15	1 m (3.3') 3 m (9.9') 5 m (16.5') 10 m (33') 15 m (49.5')		3.0 mm (0.12") cable with BNC connectors

PART #	CABLE LENGTH	CABLES / CONNECTORS	DESCRIPTION
HI 7859/1 HI 7859/3 HI 7859/5 HI 7859/10 HI 7859/15	1 m (3.3') 3 m (9.9') 5 m (16.5) 10 m (33') 15 m (49.5')		3.0 mm (0.12") cable with BNC and DIN connectors
HI 7860/1 HI 7860/3 HI 7860/5 HI 7860/10 HI 7860/15	1 m (3.3') 3 m (9.9') 5 m (16.5') 10 m (33') 15 m (49.5')		3.0 mm (0.12") cable with BNC and US Standard connectors
HI 7861/1 HI 7861/3 HI 7861/5 HI 7861/10 HI 7861/15	1 m (3.3') 3 m (9.9') 5 m (16.5') 10 m (33') 15 m (49.5')		3.0 mm (0.12") cable with BNC and spade lug connectors
HI 778P/1 HI 778P/3 HI 778P/5 HI 778P/10 HI 778P/15 HI 778P/50	1 m (3.3') 3 m (9.9') 5 m (16.5') 10 m (33') 15 m (49.5') 50 m (164')		5.0 mm (0.2") cable with screw type connectors
HI 778P/1B HI 778P/3B HI 778P/5B HI 778P/10B HI 778P/15B	1 m (3.3') 3 m (9.9') 5 m (16.5') 10 m (33') 15 m (49.5')		5.0 mm (0.2") cable with BNC type connectors

Combination pH and ORP Electrodes

CODE	HI 104XX	HI 105XY	HI 1083X	HI 1093B
Description	refillable, combination pH electrode w/ double junction	refillable, combination pH electrode w/ conical tip	combination pH electrode w/ micro bulb for small samples	combination pH electrode w/ extended length and micro bulb
Reference	double, Ag/AgCl	single, Ag/AgCl	single, Ag/AgCl	single, Ag/AgCl
Junction / Flow Rate	ceramic, single / 15-20 µL/h	ceramic, triple / 40-50 µL/h	open	open
Electrolyte	KCl 3.5M	KCl 3.5M + AgCl	viscolene	viscolene
Max Pressure	0.1 bar	0.1 bar	0.1 bar	0.1 bar
Range	pH: 0 to 14	pH: 0 to 12	pH: 0 to 13	pH: 0 to 13
Recommended Operating Temp.	30 to 85°C (86 to 185°F)	-5 to 30°C (23 to 86°F)	20 to 40°C (68 to 104°F)	20 to 40°C (68 to 104°F)
Tip /Shape	spheric (dia: 9.5 mm)	conic (12 x 12 mm)	spheric (dia: 3 mm)	spheric (dia: 3 mm)
Temperature Sensor	no	no	no	no
Amplifier	no	no	no	no
Body Material	glass	glass	glass	glass
Cable**	coaxial; 1 m (3.3')	coaxial; 1 m (3.3')	coaxial; 1 m (3.3')	coaxial; 1 m (3.3')
Recommended Use	hydrocarbon, paints, solvents, sea water, strong acid and base, high conductivity samples, Tris buffer	fats and creams, soil samples, potable water, semi solid products, low conductivity solutions, emulsions	biotechnology, samples < 100 µl	NMR tubes

* For pH meters with CAL CHECK™ system
** Not for screw cap models.

CONNECTION	
HI 1043B	BNC
HI 1043D	DIN
HI 1043U	US standard
HI 1040S	screw cap
HI 1043P	BNC + pin*

CONNECTION	
HI 1053B	BNC
HI 1053P	BNC + pin*
HI 1050S	screw cap
HI 1053D	DIN
HI 1053U	US standard

CONNECTION	
HI 1083B	BNC
HI 1083P	BNC + pin*
HI 1083D	DIN
HI 1083U	US standard

CONNECTION	
HI 1093B	BNC

Combination pH and ORP Electrodes

CODE	HI 1010S • HI 1111S	HI 1131X	HI 1135B	HI 1143X
Description	refillable, combination pH electrode	refillable, combination pH electrode	refillable, combination pH electrode side arm construction & fast flow rate	refillable, combination pH electrode for fluoride applications
Reference	single, Ag/AgCl	single, Ag/AgCl	double, Ag/AgCl	double, Ag/AgCl
Junction / Flow Rate	ceramic, double / 30-40 µL/h	ceramic, single / 15-20 µL/h	ceramic, double / 30-40 µL/h	ceramic, single / 15-20 µL/h
Electrolyte	KCl 3.5M + AgCl	KCl 3.5M + AgCl	KCl 3.5M	KCl 3.5M
Max Pressure	0.1 bar	0.1 bar	3 bar with back pressure	0.1 bar
Range	pH: 0 to 13	pH: 0 to 13	pH: 0 to 14	pH: 0 to 10
Recommended Operating Temp.	20 to 40°C (68 to 104°F)	20 to 40°C (68 to 104°F)	30 to 85°C (104 to 185°F)	-5 to 30°C (23 to 86°F)
Tip /Shape	spheric (dia: 9.5 mm)	spheric (dia: 9.5 mm)	spheric (dia: 9.5 mm)	spheric (dia: 9.5 mm)
Temperature Sensor	no	no	no	no
Amplifier	no	no	no	no
Body Material	glass	glass	glass	glass
Cable**	–	coaxial; 1 m (3.3')	coaxial; 1 m (3.3')	coaxial; 1 m (3.3')
Recommended Use	laboratory general purpose	laboratory general purpose, beer	continuous monitoring with remote filling	samples with fluoride (max 2 g/L @ pH 2 and temperature < 60°C)

* For pH meters with CAL CHECK™ system
** Not for screw cap models.

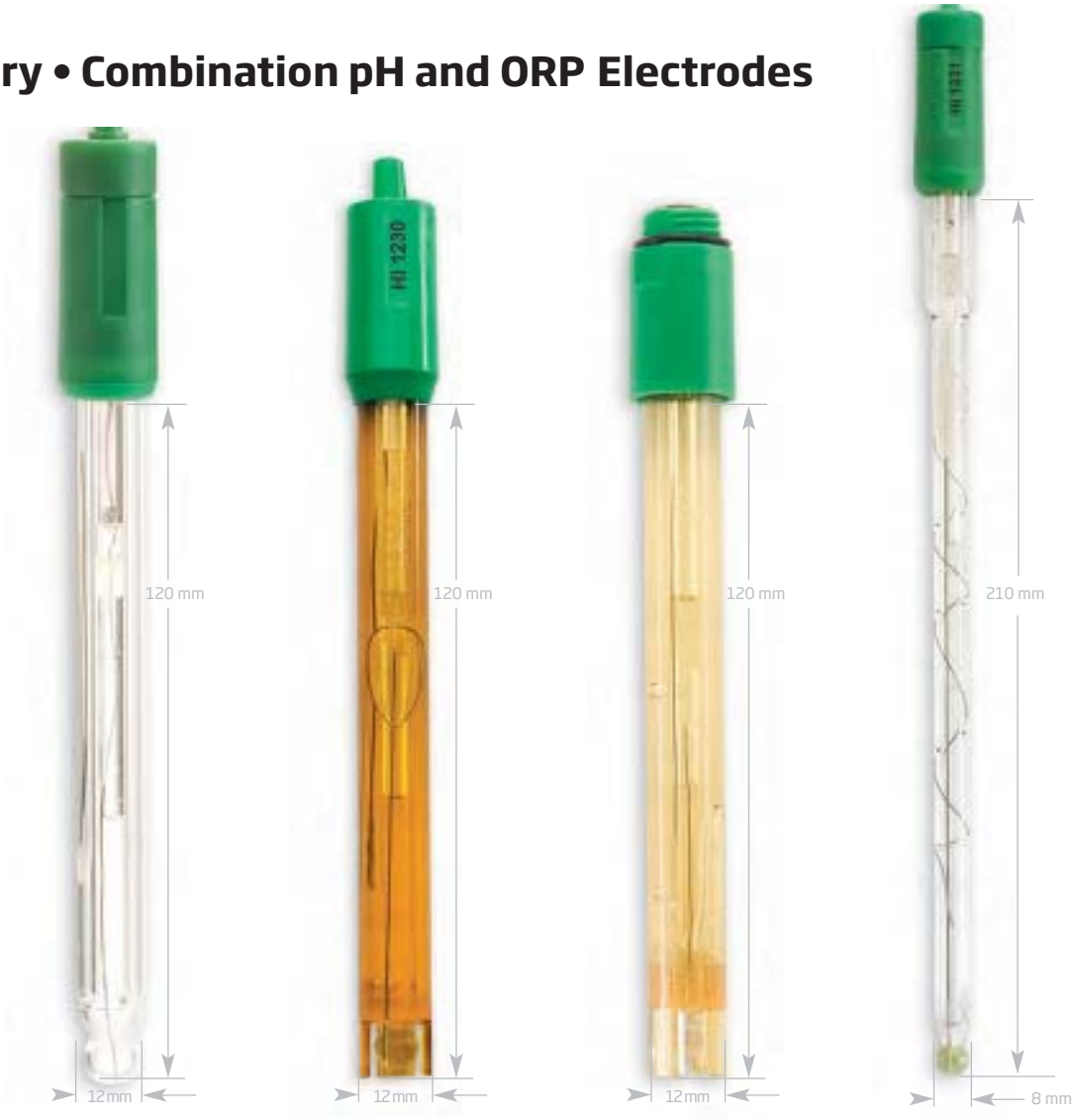
CONNECTION	
HI 1010S	screw cap
HI 1111S	screw cap

CONNECTION	
HI 1131B	BNC
HI 1131P	BNC + pin*
HI 1131D	DIN
HI 1131U	US standard

CONNECTION	
HI 1135B	BNC

CONNECTION	
HI 1143B	BNC
HI 1143D	DIN

Laboratory • Combination pH and ORP Electrodes



CODE	HI 1144X	HI 12X0Y	HI 1211S	HI 13X1Y
Description	refillable, combination pH electrode with calomel references	combination pH electrode	pH electrode	combination pH electrode
Reference	single, Hg/Hg_2Cl_2	double, Ag/AgCl	single, Ag/AgCl	single, Ag/AgCl
Junction / Flow Rate	ceramic / 15-20 µL/h	ceramic, single / 15-20 µL/h	ceramic, single / 15-20 µL/h	ceramic, single / 15-20 µL/h
Electrolyte	KCl 3.5M	gel	KCl 3.5M + AgCl	KCl 3.5M + AgCl
Max Pressure	0.1 bar	2 bar	0.1 bar	0.1 bar
Range	pH: 0 to 14	pH: 0 to 13	pH: 0 to 13	pH: 0 to 13
Recommended Operating Temp.	20 to 40°C (68 to 104°F)	20 to 40°C (68 to 104°F)	20 to 40°C (68 to 104°F)	20 to 40°C (68 to 104°F)
Tip /Shape	spheric (dia: 9.5 mm)	spheric (dia: 7.5 mm)	spheric (dia: 7.5 mm)	spheric (dia: 7.5 mm)
Temperature Sensor	no	no	no	no
Amplifier	no	no	no	no
Body Material	glass	PEI	PEI	glass
Cable**	coaxial; 1 m (3.3')	coaxial; 1 m (3.3')	–	coaxial; 1 m (3.3')
Recommended Use	tris buffer	field applications	general purpose	specific for flasks

** Not for screw cap models.

CONNECTION	
HI 1144B	BNC
HI 1144D	DIN

CONNECTION	
HI 1230B	BNC
HI 1210S	screw cap
HI 1230D	DIN
HI 1230U	US standard

CONNECTION	
HI 1211S	screw cap

CONNECTION	
HI 1331B	BNC
HI 1311S	screw cap
HI 1331D	DIN
HI 1331U	US standard

Laboratory • Combination pH and ORP Electrodes

CODE	HI 13X0Y	HI 1343X	HI 11X4Y(/Z)	HI 20XYZ
Description	combination pH electrode	combination pH electrode	combination pH electrode	refillable, conical tip combination pH electrode
Reference	single, Ag/AgCl	single, Hg/Hg_2Cl_2	double, Ag/AgCl	single, Ag/AgCl
Junction / Flow Rate	ceramic, single / 15-20 µL/h	ceramic, single / 15-20 µL/h	cloth	ceramic, single / 15-20 µL/h
Electrolyte	KCl 3.5M + AgCl	KCl 3.5M	gel	KCl 3.5M + AgCl
Max Pressure	0.1 bar	0.1 bar	3.0 bar	0.1 bar
Range	pH: 0 to 12	pH: 0 to 14	pH: 0 to 13	pH: 0 to 12
Recommended Operating Temp.	20 to 40°C (68 to 104°F)	20 to 40°C (68 to 104°F)	20 to 40°C (68 to 104°F)	-5 to 30°C (23 to 86°F)
Tip /Shape	spheric (dia: 5 mm)	spheric (dia: 7.5 mm)	spheric (dia: 7.5 mm)	conic (6 x 10 mm)
Temperature Sensor	no	no	no	no
Amplifier	no	no	no	no
Body Material	glass	PEI	PEI	glass
Cable**	coaxial; 1 m (3.3')	coaxial; 1 m (3.3')	coaxial; 3 m (9.8'); /5: 5 m (16')	coaxial; 1 m (3.3')
Recommended Use	specific for vials and test tubes	specific for Tris buffer	swimming pools	dairy and semi-solid products

* For pH meters with CAL CHECK™ system
** Not for screw cap models.

CONNECTION	
HI 1330B	BNC
HI 1330P	BNC + pin*
HI 1310S	screw cap
HI 1330D	DIN
HI 1330U	US standard

CONNECTION	
HI 1343B	BNC
HI 1343D	DIN

CONNECTION	
HI 1134B/3	BNC
HI 1134B/5	BNC
HI 1114S	screw cap

CONNECTION	
HI 2031B	BNC
HI 2020S	screw cap
HI 2031D	DIN
HI 2031U	US standard

Laboratory • pH and ORP SMART Electrodes

CODE	HI 1615D	HI 1616D	HI 1617D	HI 1618D
Description	pH electrode	pH electrode	pH electrode	pH electrode
Reference	single, Ag/AgCl	single, Ag/AgCl	single, Ag/AgCl	single, Ag/AgCl
Junction / Flow Rate	ceramic, single / 15-20 µL/h	ceramic, single	ceramic, triple / 40-50 µL/h	cloth
Electrolyte	KCl 3.5M + AgCl	gel	KCl 3.5M + AgCl	gel
Max Pressure	0.1 bar	up to 2 bar	0.1 bar	2 bar
Range	pH: 0 to 13	pH: 0 to 14	pH: 0 to 12	pH: 0 to 13
Recommended Operating Temp.	20 to 40°C (68 to 104°F)	20 to 40°C (68 to 104°F)	-5 to 30°C (23 to 86°F)	20 to 40°C (68 to 104°F)
Tip /Shape	spheric (dia: 9.5 mm)	spheric (dia: 9.5 mm)	conic (12 x 12 mm)	spheric (dia: 5 mm)
Temperature Sensor	yes	yes	yes	yes
Amplifier	yes	yes	yes	yes
Body Material	glass	glass	glass	PEI
Cable**	7-pole; 1 m (3.3')	7-pole; 1 m (3.3')	7-pole; 1 m (3.3')	7-pole; 1 m (3.3')
Recommended Use	laboratory general use	continuous monitoring	fats and creams, soil samples, semi solid products, low conductivity solutions, emulsions	field applications

* Recommended for use with HI 98140, HI 98150, HI 98230 and HI 98240 pH meters.

CONNECTION		CONNECTION		CONNECTION		CONNECTION	
HI 1615D	7-pin DIN*	**HI 1616D**	7-pin DIN*	**HI 1617D**	7-pin DIN*	**HI 1618D**	7-pin DIN*

Smart Electrodes

HANNA's SMART electrodes incorporate microchips that memorize calibration data.

The SMART electrode is recognized the moment it is connected to the meter. Once calibrated, several electrodes can be used in series without requiring new calibration. The meter can provide timely prompts about electrode status and even decide when to replace it. These SMART pH electrodes also incorporate a temperature sensor for Automatic Temperature Compensation.

Installing and checking ORP electrodes

ORP electrodes can be used on any HANNA pH/ORP meter.

1) After removing the protective cap from the electrode and opening the fill hole cover, soak the tip in warm tap water. This will enhance the flow of the reference junction.

2) To check the function of the electrode, immerse the tip in HI 7020 ORP test solution. The value should be between 200 and 275 mV. Oxidizing or reduction treatment with HI 7092 or HI 7091 will prepare the electrode's surface and speed initial response time.

ORP for sanitation

ORP measurements are used as an effective measure of the sanitation of pool, spa and potable water. E. Coli bacteria presence in water depends on the ORP value. ORP is a reliable indicator of bacteriological water quality.

CODE	HI 3619D	HI 3620D
Description	ORP electrode	ORP electrode
Reference	single, Ag/AgCl	single, Ag/AgCl
Junction / Flow Rate	ceramic, single / 15-20 µL/h	ceramic, single
Electrolyte	KCl 3.5M + AgCl	gel
Max Pressure	0.1 bar	2 bar
Range	ORP: ±2000 mV	ORP: ±2000 mV
Recommended Operating Temp.	20 to 40°C (68 to 104°F)	20 to 40°C (68 to 104°F)
Tip /Shape	platinum pin	platinum pin
Temperature Sensor	no	no
Amplifier	yes	yes
Body Material	glass	PEI
Cable**	7-pole; 1 m (3.3')	7-pole; 1 m (3.3')
Recommended Use	laboratory general use, disinfection	field applications, swimming pools

* Recommended for use with HI 98140, HI 98150, HI 98230 and HI 98240 pH meters.

CONNECTION	
HI 3619D	DIN*

CONNECTION	
HI 3620D	DIN*

Laboratory • Special ORP Electrodes

CODE	HI 3618D	HI 31X1Y	HI 4619D	HI 4110S
Description	ORP combination electrode	refillable combination ORP electrode	ORP combination electrode	ORP combination electrode
Reference	single, Ag/AgCl	single, Ag/AgCl	single, Ag/AgCl	single, Ag/AgCl
Junction / Flow Rate	ceramic, single / 15-20 µL/h	ceramic, single / 15-20 µL/h	ceramic, single	ceramic, single
Electrolyte	KCl 3.5M + AgCl	KCl 3.5M + AgCl	gel	gel
Max Pressure	0.1 bar	0.1 bar	2 bar	1.5 bar
Range	ORP: ±2000 mV	ORP: ±2000 mV	ORP: ±2000 mV	ORP: ±2000 mV
Recommended Operating Temp.	20 to 40°C (68 to 104°F)	20 to 40°C (68 to 104°F)	20 to 40°C (68 to 104°F)	20 to 40°C (68 to 104°F)
Tip /Shape	platinum pin	platinum pin	gold pin	gold pin
Temperature Sensor	yes	no	yes	no
Amplifier	yes	no	yes	no
Body Material	glass	glass	glass	glass
Cable**	5-pole; 1 m (3.3')	coaxial; 1 m (3.3')	5-pole; 1 m (3.3')	–
Recommended Use	laboratory	laboratory general use, ORP titrations	strong oxidants, disinfection with ozone	plating baths

* For pH meters with CAL CHECK™ system
** Not for screw cap models.

CONNECTION

HI 3618D DIN

Recommended for use with HI 8314 pH meter.

CONNECTION

HI 3131B BNC
HI 3131P BNC + pin*
HI 3111S screw cap
HI 3131D DIN
HI 3131U US standard

CONNECTION

HI 4619D DIN

Recommended for use with HI 8314 pH meter.

CONNECTION

HI 4110S screw cap

HANNA instruments

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Laboratory • Electrodes with Temperature Sensor

CODE	HI 1217X	HI 1610D	HI 1611D	HI 1612D
Description	pH electrode	pH electrode	pH electrode	pH electrode
Reference	single, Ag/AgCl	single, Ag/AgCl	single, Ag/AgCl	single, Ag/AgCl
Junction / Flow Rate	ceramic, single	ceramic, single / 15-20 µL/h	ceramic, single	ceramic, triple / 40-50 µL/h
Electrolyte	gel	KCl 3.5M + AgCl	gel	KCl 3.5M + AgCl
Max Pressure	2 bar	0.1 bar	2 bar	0.1 bar
Range	pH: 0 to 13	pH: 0 to 13	pH: 0 to 14	pH: 0 to 12
Recommended Operating Temp.	20 to 40°C (68 to 104°F)	20 to 40°C (86 to 104°F)	30 to 85°C (104 to 185°F)	-5 to 30°C (23 to 86°F)
Tip /Shape	spheric (dia: 5.0 mm)	spheric (dia: 9.5 mm)	spheric (dia: 9.5 mm)	conic (12 x 12 mm)
Temperature Sensor	yes	yes	yes	yes
Amplifier	yes	yes	yes	yes
Body Material	PEI	glass	glass	glass
Cable**	5-pole; 1 m (3.3')	5-pole; 1 m (3.3')	5-pole; 1 m (3.3')	5-pole; 1 m (3.3')
Recommended Use	general purpose	laboratory general use	continuous monitoring	emulsions, semi solid samples

CONNECTION		CONNECTION	CONNECTION	CONNECTION
HI 1217D	DIN ***	HI 1610D DIN	HI 1611D DIN	HI 1612D DIN
HI 1217S	screw cap ‡			

*** To be used with HI 8314 pH meter.
‡ To be used with HI 9214

Recommended for use with HI 8314 pH meter.

Recommended for use with HI 8314 pH meter.

Recommended for use with HI 8314 pH meter.

Rugged pH and ORP Electrodes

CODE	HI 13X2Y	HI 32X0Y	HI 44X0Y
Description	pH electrode	ORP electrode	gel filled, combination ORP electrode with gold contact
Reference	double, Ag/AgCl	single, Ag/AgCl	single, Ag/AgCl
Junction / Flow Rate	ceramic, single / 15-20 µL/h	ceramic, single	ceramic, single
Electrolyte	KCl 3.5M	gel	gel
Max Pressure	0.1 bar	2 bar	2 bar
Range	pH: 0 to 13	ORP: ±2000 mV	ORP: ±2000 mV
Recommended Operating Temp.	20 to 40°C (68 to 104°F)	20 to 40°C (68 to 104°F)	20 to 40°C (68 to 104°F)
Tip /Shape	spheric (dia: 7.5 mm)	platinum pin	gold pin
Temperature Sensor	no	no	no
Amplifier	no	no	no
Body Material	PEI	PEI	PEI
Cable**	coaxial; 1 m (3.3')	coaxial; 1 m (3.3')	coaxial; 1 m (3.3')
Recommended Use	chemicals, field applications, quality control	municipal water, quality control	oxidants, ozone

* For pH meters with CAL CHECK™ system
** Not for screw cap models.

CONNECTION	
HI 1332B	BNC
HI 1332P	BNC + pin*
HI 1312S	screw cap
HI 1332D	DIN
HI 1332U	US standard

CONNECTION	
HI 3230B	BNC
HI 3210S	screw cap
HI 3230D	DIN
HI 3230U	US standard

CONNECTION	
HI 4430B	BNC
HI 4410S	screw cap
HI 4430D	DIN
HI 4430U	US standard

Food Industry • Electrodes for Specific Use

FC 098 and FC 099 stainless steel blades for meat penetration (optional)

CODE	FC 100X	FC 200X	FC 430B
Description	pH electrode	pH electrode	combination pH electrode with PVDF outer body
Reference	double, Ag/AgCl	single, Ag/AgCl	double, Ag/AgCl
Junction / Flow Rate	ceramic, single / 15-20 µL/h	open	open
Electrolyte	KCl 3.5M	viscolene	viscolene
Max Pressure	0.1 bar	0.1 bar	0.1 bar
Range	pH: 0 to 13	pH: 0 to 12	pH: 0 to 12
Recommended Operating Temp.	20 to 40°C (68 to 104°F)	20 to 40°C (68 to 104°F)	-5 to 30°C (23 to 86°F)
Tip /Shape	spheric (dia: 7.5 mm)	conic (6 x 10 mm)	conic (6 x 10 mm)
Temperature Sensor	no	no	no
Amplifier	no	no	no
Body Material	PVDF	PVDF	PVDF
Cable**	coaxial; 1 m (3.3')	coaxial; 1 m (3.3')*	coaxial; 1 m (3.3')
Recommended Use	cheese	milk, yogurt, dairy products, semi solid foods	meat, semi frozen products

** Not for screw cap models.

CONNECTION	
FC 100B	BNC
FC 100D	DIN
FC 100U	US standard

CONNECTION	
FC 200B	BNC
FC 200S	screw cap
FC 200D	DIN
FC 200G	DIN, green cap
FC 200U	US standard

CONNECTION	
FC 430B	BNC

Food Industry • Electrodes for Specific Use

CODE	FC 210X	FC 211D	FC 213D	FC 220X
Description	pH electrode	pH electrode	pH electrode	pH electrode
Reference	double, Ag/AgCl	single, Ag/AgCl	single, Ag/AgCl	single, Ag/AgCl
Junction / Flow Rate	open	open	open	ceramic, triple / 40-50 µL/h
Electrolyte	viscolene	viscolene	viscolene	KCl 3.5M + AgCl
Max Pressure	0.1 bar	0.1 bar	0.1 bar	0.1 bar
Range	pH: 0 to 12	pH: 0 to 12	pH: 0 to 12	pH: 0 to 12
Recommended Operating Temp.	20 to 40°C (68 to 104°F)	-5 to 30°C (23 to 86°F)	-5 to 30°C (23 to 86°F)	-5 to 30°C (23 to 86°F)
Tip /Shape	conic (12 x 12 mm)	conic (12 x 12 mm)	conic (12 x 12 mm)	spheric (dia: 9.5 mm)
Temperature Sensor	no	yes	yes	no
Amplifier	no	yes	yes	no
Body Material	glass	glass	glass	glass
Cable	coaxial; 1 m (3.3')	5-pole; 1 m (3.3')	7-pole; 1 m (3.3')	coaxial; 1 m (3.3')
Recommended Use	milk, yogurt, creams	milk, yogurt, cream	milk, yogurt, cream	creams, fruit juices, sauces

CONNECTION	
FC 210B	BNC
FC 210D	DIN
FC 210U	US standard

CONNECTION	
FC 211D	DIN

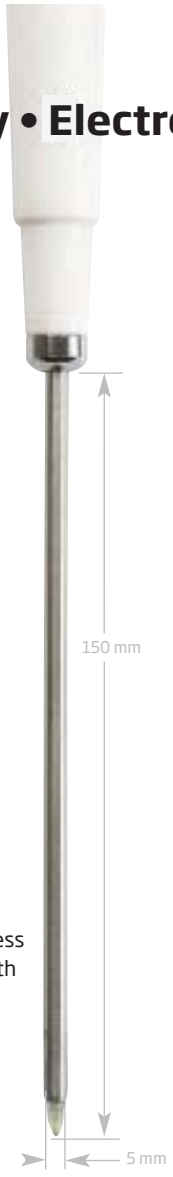
Recommended for use with HI 9210N and HI 8314 pH meters.

CONNECTION	
FC 213D	DIN

Recommended for use with HI 99161N pH meter.

CONNECTION	
FC 220B	BNC
FC 220D	DIN
FC 220U	US standard

Food Industry • Electrodes for Specific Use



CODE	FC 230X	FC 240B	FC 250B
Description	combination pH electrode with PVDF outer body	combination pH electrode with stainless steel sheath	combination pH electrode with long, thin body
Reference	single, Ag/AgCl	single, Ag/AgCl	single, Ag/AgCl
Junction / Flow Rate	open	open	open
Electrolyte	viscolene	viscolene	viscolene
Max Pressure	0.1 bar	0.1 bar	0.1 bar
Range	pH: 0 to 12	pH: 0 to 13	pH: 0 to 13
Recommended Operating Temp.	20 to 40°C (68 to 104°F)	20 to 40°C (68 to 104°F)	20 to 40°C (68 to 104°F)
Tip /Shape	conic (6 x 10 mm)	conic (3 x 5 mm)	conic (3 x 5 mm)
Temperature Sensor	no	no	no
Amplifier	no	no	no
Body Material	PVDF	AISI 316	glass
Cable	coaxial; 1 m (3.3')	coaxial; 1 m (3.3')	coaxial; 1 m (3.3')
Recommended Use	meat, semi frozen products	dairy products, cheese quality control	dairy products, semi mature cheese

CONNECTION	
FC 230B	BNC
FC 230D	DIN
FC 230U	US standard

CONNECTION	
FC 240B	BNC

CONNECTION	
FC 250B	BNC

Food Industry • Electrodes for Specific Use

CODE	FC 400X	HI 1048X	HI 1153X	FC 911X
Description	pH electrode	pH electrode with CPS™ (Clogging Prevention System)	pH electrode	pH electrode with amplifier
Reference	double, Ag/AgCl	double, Ag/AgCl	double, Ag/AgCl	double, Ag/AgCl
Junction / Flow Rate	open	open, CPS™	ceramic, triple / 40-50 µL/h	ceramic, single / 15-20 µL/H
Electrolyte	viscolene	KCl 3.5M	KCl 3.5M	KCl 3.5M
Max Pressure	0.1 bar	0.1 bar	0.1 bar	0.1 bar
Range	pH: 0 to 12	pH: 0 to 13	pH: 0 to 13	pH: 0 to 13
Recommended Operating Temp.	-5 to 30°C (23 to 86°F)	20 to 40°C (68 to 104°F)	20 to 40°C (68 to 104°F)	20 to 40°C (68 to 104°F)
Tip /Shape	conic (6 x 10 mm)	spheric (dia: 8 mm)	spheric (dia: 9.5 mm)	spheric (dia: 7.5 mm)
Temperature Sensor	no	no	no	no
Amplifier	no	no	no	yes
Body Material	PVDF	glass	glass	PVDF
Cable**	coaxial; 1 m (3.3')	coaxial; 1 m (3.3')	coaxial; 1 m (3.3')	coaxial; 1 m (3.3')
Recommended Use	meat	wine, must	mineral water	creams, fruit juices, sauces

* For pH meters with CAL CHECK™ system
** Not for screw cap models.

CONNECTION	
FC 400B	BNC
FC 400D	DIN
FC 204B	BNC

CONNECTION	
HI 1048B	BNC
HI 1048B/50	BNC
HI 1048P	BNC + PIN*
HI 1048S	scew cap
HI 1048D	DIN

CONNECTION	
HI 1153B	BNC
HI 1153D	DIN

CONNECTION	
FC 911B	BNC
FC 911D	DIN
FC 911U	US standard

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Food Industry • SMART Electrodes

CODE	FC 20XD	FC 40XD	FC 212D	FC 23XY
Description	pH SMART electrode	pH SMART electrode	pH SMART electrode	pH SMART electrode
Reference	single, Ag/AgCl	double, Ag/AgCl	single, Ag/AgCl	single, Ag/AgCl
Junction / Flow Rate	open	open	open	open
Electrolyte	viscolene	viscolene	viscolene	viscolene
Max Pressure	0.1 bar	0.1 bar	0.1 bar	0.1 bar
Range	pH: 0 to 12	pH: 0 to 12	pH: 0 to 12	pH: 0 to 12
Recommended Operating Temp.	20 to 40°C (68 to 104°F)	-5 to 30°C (23 to 86°F)	-5 to 30°C (23 to 86°F)	-5 to 30°C (23 to 86°F)
Tip /Shape	conic (6 x 10 mm)	conic (6 x 10 mm)	conic (12 x 12 mm)	conic (6 x 10 mm)
Temperature Sensor	yes	yes	yes	yes
Amplifier	yes	yes	yes	yes
Body Material	PVDF	PVDF	glass	PVDF
Cable	7-pole; 1 m (3.3')	7-pole; 1 m (3.3')	7-pole; 1 m (3.3')	7-pole; 1 m (3.3')
Recommended Use	milk, yogurt, dairy products, meat, semi solid foods	milk, yogurt, dairy products, meat, semi solid foods	milk, yogurt, creams	meat

CONNECTION

FC 201D DIN †
FC 202D DIN ‡
FC 203D 7-pin DIN

† Recommended for use with HI 98140, HI 98150, HI 98230 and HI 98240 pH meters.
‡ Recommended for use with HI 99161 pH meter.

CONNECTION

FC 401D DIN †
FC 402D DIN ‡

† Recommended for use with HI 98140, HI 98150, HI 98230 and HI 98240 pH meters.
‡ Recommended for use with HI 99161 pH meter.

CONNECTION

FC 212D DIN

Recommended for use with HI 98140, HI 98150, HI 98230 and HI 98240 pH meters.

CONNECTION

FC 231D DIN †
FC 232D DIN ‡

† Recommended for use with the HI 98140, HI 98150, HI 98230 and HI 98240 pH meters.
‡ Recommended for use with HI 99163 pH meter.

Food Industry • SMART Electrodes

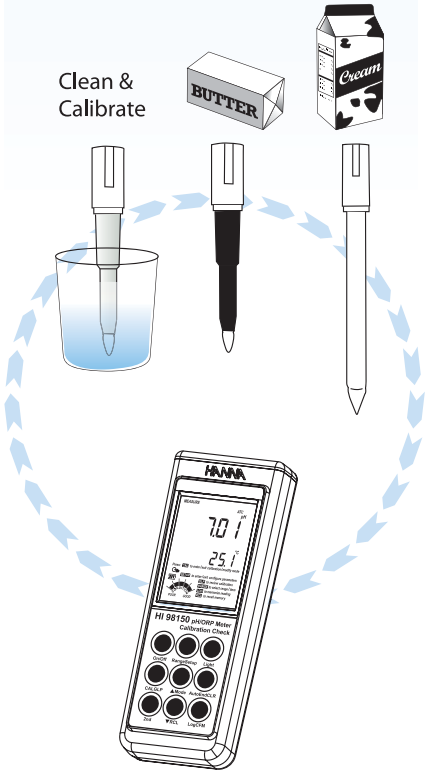
CPS™ (Clogging Prevention System)

SMART Electrodes and the Food Industry

Smart electrodes are useful for users who have to measure several samples a day and do not have time for cleaning and recalibration; for example in the milk and dairy industry, where cross contamination has to be avoided and dirty bulbs may occur frequently.

By simply changing from one electrode to another for each batch, you can avoid cross contamination and measure samples accurately and efficiently.

SMART electrodes contain an embedded microchip inside to retain calibration data and assign an identity code to the host unit. As soon as a SMART electrode is connected to the host pH meter, they are recognized. Each time a SMART electrode is exchanged for another SMART electrode, the new SMART electrode characteristics are retrieved, and the host meter uses the accessed calibration data as a point of reference for future measurements.



CODE	FC 43XD	HI 3148B
Description	pH SMART electrode	ORP SMART electrode
Reference	single, Ag/AgCl	double, Ag/AgCl
Junction	open	open / CPS™
Electrolyte	viscolene	KCl 3.5M + AgCl
Max Pressure	0.1 bar	0.1 bar
Range	pH: 0 to 12	ORP: ±2000 mV
Recommended Operating Temp.	-5 to 30°C (23 to 86°F)	20 to 40°C (68 to 104°F)
Tip /Shape	conic (6 x 10 mm)	platinum ring
Temperature Sensor	yes	no
Amplifier	yes	no
Body Material	PVDF	glass
Cable	7-pole; 1 m (3.3')	coaxial; 1 m (3.3')
Recommended Use	meat	wine

CONNECTION	
FC 431D	DIN †
FC 432D	DIN ‡

CONNECTION	
HI 3148B	BNC
HI 3148B/50	BNC

† Recommended for use with the HI 98140, HI 98150, HI 98230 and HI 98240 pH meters.
‡ Recommended for use with HI 99163 pH meter.

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Special Applications • Specific Analysis

CODE	HI 1292D	HI 1413X	HI 1414D	HI 1413X/50	HI 1414D/50
Description	pH electrode	pH electrode	pH electrode	pH electrode	pH electrode
Reference	single, Ag/AgCl	single, Ag/AgCl	single, Ag/AgCl	single, Ag/AgCl	single, Ag/AgCl
Junction	ceramic, triple / 40-50 µL/h	open	open	open	open
Electrolyte	KCl 3.5M + AgCl	viscolene	viscolene	viscolene	viscolene
Max Pressure	0.1 bar	0.1 bar	0.1 bar	0.1 bar	0.1 bar
Range	pH: 0 to 12	pH: 0 to 12	pH: 0 to 12	pH: 0 to 12	pH: 0 to 12
Recommended Operating Temp.	-5 to 30°C (23 to 86°F)	20 to 40°C (68 to 104°F)	20 to 40°C (68 to 104°F)	20 to 40°C (68 to 104°F)	20 to 40°C (68 to 104°F)
Tip /Shape	conic (12 x 12 mm)	flat	flat	flat	flat
Temperature Sensor	yes	no	yes	no	yes
Amplifier	yes	no	yes	no	yes
Body Material	glass	glass	glass	glass	
Cable**	7-pole; 1 m (3.3')	coaxial; 1 m (3.3')	7-pole; 1 m (3.3')	coaxial; 1 m (3.3')*	7-pole; 1 m (3.3')
Recommended Use	direct soil pH measurement, soil solution	surfaces, skin, leather, paper, emulsions	surface, leather, paper, emulsions	skin, scalp	skin, scalp

** Not for screw cap models.

CONNECTION	CONNECTION	CONNECTION	CONNECTION	CONNECTION
HI 1292D 7-pin DIN	**HI 1413B** BNC **HI 1410S** screw type	**HI 1414D** 7-pin DIN	**HI 1413B/50** BNC **HI 1413S/50** screw cap	**HI 1414D/50** DIN
Recommended for use with HI 99121 pH mete		Recommended for use with HI 99171 pH meter.	Recommended for use with Skincheck™ series	Recommended for use with HI 99181 pH meter

Special Applications • Specific Analysis

CODE	HI 3410S	HI 1296D	HI 1297D	HI 62911D	HI 72911X
Description	ORP electrode	pH electrode	pH/ORP electrode	pH electrode	pH electrode
Reference	double, Ag/AgCl	single, Ag/AgCl	single, Ag/AgCl	double, Ag/AgCl	double, Ag/AgCl
Junction	cloth	cloth	cloth	PTFE	PTFE
Electrolyte	gel	gel	gel	polymer	polymer
Max Pressure	3 bar	3 bar	3 bar	3 bar	3 bar
Range	ORP: ±2000 mV	pH: 0 to 13	pH: 0 to 13; ORP	pH: 0 to 13	pH: 0 to 13
Recommended Operating Temp.	20 to 40°C (68 to 104°F)	20 to 40°C (68 to 104°F)	20 to 40°C (68 to 104°F)	20 to 40°C (68 to 104°F)	20 to 40°C (68 to 104°F)
Tip /Shape	platinum pin	spheric (dia: 5 mm)	pH: conic (3 mm); ORP: platinum sensor	flat	flat
Temperature Sensor	no	yes	yes	yes	yes
Amplifier	no	yes	yes	yes	yes
Body Material	PEI	AISI 316 stainless steel	titanium	titanium body working as matching pin	
Cable	–	5-pole; 1 m (3.3')	7-pole; 1 m (3.3')	7-pole; 1 m (3.3')	7-pole; 1 m (3.3')
Recommended Use	process	wastewater	wastewater, municipal water, water treatment, swimming pools	plating baths	cooling towers, boilers

CONNECTION	CONNECTION	CONNECTION	CONNECTION	CONNECTION
HI 3410S screw type	**HI 1296D** DIN*	**HI 1297D** DIN*	**HI 62911D** DIN*	**HI 72911D** DIN* **HI 72911B** BNC + phono**

Recommended for use with HI 991001 pH meter.

Recommended for use with HI 991002 and HI 991003 pH meters.

Recommended for use with HI 99131 pH meter.

* Recommended for use with HI 99141 pH meter.
** Recommended for use with HI 9818x family of meters

HANNA instruments

With Great Products, Come Great Results™

Electrodes for Specific Instruments

CODE	HI 12170	HI 1333B	HI 1110X
Description	spare electrode	spare electrode	pH electrode
Reference	single, Ag/AgCl	double, Ag/AgCl	single, Ag/AgCl
Junction / Flow Rate	ceramic, single	ceramic, single / 15-20 µL/H	ceramic, single
Electrolyte	gel	KCl 3.5M	gel
Max Pressure	2 bar	0.1 bar	2 bar
Range	pH: 0 to 13	pH: 0 to 13	pH: 0 to 13
Recommended Operating Temp.	20 to 40°C (68 to 104°F)	20 to 40°C (68 to 104°F)	20to 40°C (86 to 104°F)
Tip /Shape	spheric (dia: 5.0 mm)	spheric (dia: 7.5 mm)	spheric (dia: 9.5 mm)
Temperature Sensor	yes	no	no
Amplifier	no	no	no
Body Material	PEI	PEI	glass
Cable**	no	coaxial; 1 m (3.3')	coaxial; 1 m (3.3')
Recommended Use	general purpose	field applications	laboratory general use

** Not for screw cap models.

CONNECTION

HI 12170 3-pole; screw cap

Recommended for use with HI 9214N pH meter.

CONNECTION

HI 1333B BNC

Recommended for use with HI 9815 pH Turtle™

CONNECTION

HI 1110B BNC*
HI 1110S screw cap
HI 1110T PG 13.5 thread L=110 mm

*Recommended for use with pH 20 and pH 21 pH meters.

pH Half Cells

CODE	HI 2110B	HI 2111B	HI 2112B	FC 260B
Description	pH half-cell	pH half-cell	pH half-cell	pH half-cell
pH Half Cell	–	–	–	–
Range	pH: 0 to 12	pH: 0 to 14	pH: 0 to 13	pH: 0 to 12
Recommended Operating Temp.	-5 to 30°C (23 to 86°F)	30 to 85°C (86 to 185°F)	20 to 40°C (68 to 104°F)	-5 to 30°C (23 to 86°F)
Tip /Shape	spheric (dia: 9.5 mm)	spheric (dia: 9.5 mm)	spheric (dia: 7.5 mm)	spheric (dia: 9.5 mm)
Body Material	glass	glass	PEI	glass
Cable	coaxial	coaxial	coaxial	coaxial; 1 m (3.3')
Recommended Use	titration	general purpose, strong alkaline solutions	general purpose	milk
CONNECTION	**HI 2110B** BNC	**HI 2111B** BNC	**HI 2112B** BNC	**FC 260B** BNC

To be used in conjunction with HI 5315 ISE reference electrode. Recommended for use with the HI 84429 dairy minititrator.

ORP Half Cells

Pt Electrodes

Platinum is a silvery-white metal when pure, and is malleable and ductile. It has a coefficient of expansion almost equal to that of soda-lime-silica glass, and is therefore used to make sealed electrodes in glass systems. The metal does not oxidize in air at any temperature, but is corroded by halogens, cyanides, sulfur, and caustic alkalis.

It is insoluble in hydrochloric and nitric acid, but dissolves when they are mixed as aqua regia, forming chloroplatinic acid.

Platinum electrodes consist of a small piece of platinum wire that is soldered or fused to wire made another metal. Platinum conducts electrons from the sample to the wire to which it is attached.

Platinum is used because it is assumed to be an inert metal; this means it does not give up its own electrons (does not oxidize) to the wire or sample. Iron containing materials such as steel will oxidize them selves and send their own electrons to the voltmeter. As a result the voltage we measure will not result solely from electrons being transferred to or from the sample. Metals such as copper and aluminum will oxidize and also cannot be used for ORP measurements. Stainless steel also may oxidize, but to a small extent, and should not be used.

CODE	HI 3133B	HI 5110B
Description	ORP half-cell	ORP half-cell
ORP Half Cell	platinum	Ag
Range	mV	mV
Recommended Operating Temp.	20 to 40°C (68 to 104°F)	20 to 40°C (68 to 104°F)
Tip /Shape	platinum pin	cylindric (dia: 3 mm)
Body Material	glass	glass
Cable	coaxial	coaxial
Recommended Use	general purpose, potentiometric titration	argentometric titration

CONNECTION	
HI 3133B	BNC

CONNECTION	
HI 5110B	BNC

Reference Electrodes

High pressure or high concentration of contaminants.

Because of the special electrode recharge system of the HI 5314 and HI 5414, it is possible to connect an outside container to increase the amount of electrolyte of the reference half cell and thus the pressure inside the electrode. By so doing, the junction will be able to work in high-pressure environments without the danger of implosion.

CODE	HI 5412	HI 5311	HI 5314	HI 5414
Description	reference electrode	reference electrode	reference electrode	reference electrode
Reference	single, Hg/Hg_2Cl_2	double, Ag/AgCl	double, Ag/AgCl	single, Hg/Hg_2Cl_2
Junction / Flow Rate	ceramic, single / 15-20 µL/h	ceramic, single / 15-20 µL/h	ceramic, double	ceramic, double
Electrolyte	KCl 3.5M	KCl 3.5M	KCl 3.5M	KCl 3.5M
Max Pressure	0.1 bar	0.1 bar	3 bar with back pressure	3 bar with back pressure
Recommended Operating Temp.	-5 to 30°C (23 to 86°F)	30 to 85°C (86 to 185°F)	30 to 85°C (86 to 185°F)	-5 to 30°C (23 to 86°F)
Body Material	glass	glass	glass	glass
Cable	1 m (3.3')	1 m (3.3')	1 m (3.3')	1 m (3.3')
Recommended Use	general purpose, ISE, titrations	general purpose (wide temperature range), titrations	measurements with remote filling	measurements with remote filling

CONNECTION		CONNECTION		CONNECTION		CONNECTION	
HI 5412	4 mm banana	**HI 5311**	4 mm banana	**HI 5314**	4 mm banana	**HI 5414**	4 mm banana

Reference Electrodes

CODE	HI 5413	HI 5312	HI 5313
Description	reference electrode	reference electrode	reference electrode
Reference	single, Hg/Hg_2Cl_2	double, Ag/AgCl	single, Ag/AgCl
Junction / Flow Rate	PTFE sleeve	PTFE sleeve	ceramic
Electrolyte	KCl 3.5M	KCl 3.5M	gel (KCl 1M + AgCl)
Max Pressure	0.1 bar	0.1 bar	0.1 bar
Recommended Operating Temp.	-5 to 30°C (23 to 86°F)	-5 to 30°C (23 to 86°F)	-5 to 30°C (23 to 86°F)
Body Material	glass	glass	PEI
Cable	1 m (3.3')	1 m (3.3')	1 m (3.3')
Recommended Use	samples with suspended solids, ISE	titrations, samples with suspended solids	used with FC 301B

CONNECTION	
HI 5413	4 mm banana

CONNECTION	
HI 5312	4 mm banana

CONNECTION	
HI 5313	4 mm banana

A Solution for Every Need

pH and ORP Solutions

Ready to Use Solutions

Buffer solutions that can be prepared in small batches from capsules, tablets or powders, are called "fresh" because they are prepared at the time of use. They are considered to be, but are not, very precise. The quality of buffer solutions depends on many factors that intervene during production: the quantity and quality of the chemicals and also distilled water that has been used in preparing the batches as well as the temperature and the instruments used to prepare them.

HANNA buffer solutions are prepared using chemicals that have been checked carefully, within an aseptic environment and with the highest precision reference instruments.

The main standard buffer solutions produced by HANNA are available in bottles or in sealed sachets, complete with or without a certificate of analysis.

HANNA solutions are more convenient than the so-called "fresh" solutions. The following pages show all the series of calibration solutions in the various types of packages that will satisfy every application need while always guaranteeing precise readings.

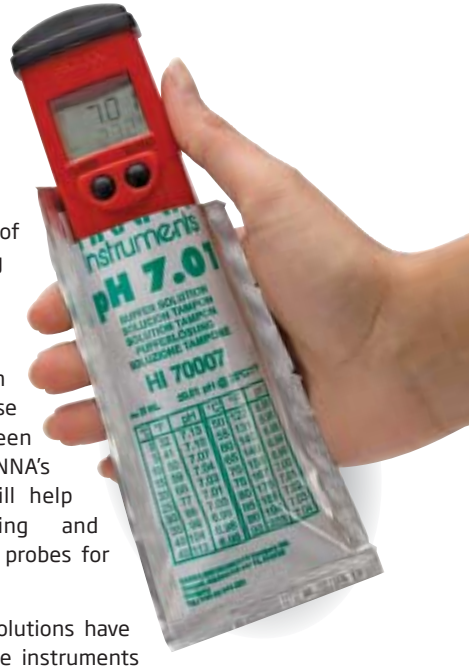
A Complete Range

The entire range of HANNA's solutions includes:

- **pH buffer solutions**
- **Standard solutions for conductivity, TDS, turbidity, salinity and ISE calibration**
- **ORP test and pretreatment solutions**
- **Reference fill solutions for refillable electrodes**
- **General and specific cleaning solutions for electrodes**
- **Solutions for electrode maintenance**
- **Solutions for sample preparation**

Solutions are available in many sizes from 20 mL sachets all the way to 3.78 L (1 Gallon) containers for the large quantities used in laboratories.

For safety and traceability, all HANNA solutions are provided with a label showing the batch number and expiration date.



Calibration and Cleaning Solutions

The fundamental use of calibration and cleaning solutions is to correctly maintain electrode operation to produce accurate and reproducible readings. Often readings are not correct because the sensors have not been properly handled. Using HANNA's wide range of solutions will help guarantee correct cleaning and calibration of electrodes and probes for maximum performance.

Our application engineered solutions have been produced with reference instruments calibrated with the highest precision NIST standards. Our range of buffer and cleaning solutions have been extended with 3 new lines: the HI 50xx series of technical buffer solutions which allow for calibration of pH meters from 1.00 to 13.00 pH; HI 60xx series of solutions with millesimal resolutions available for pH measurements with an accuracy of ±0.002 pH and application specific cleaning solutions available in bottles of 250 and 500 mL as well as in small sachets of 20 mL each.

A Wide Variety of Single Dose Sachets

Get the best out of your instruments using single-dose HANNA calibration and maintenance solutions. A wide range of solutions for pH, conductivity, TDS and cleaning is available in the form of practical 20 mL sachets.

Sachets are Practical, Safe and Ready to Use

Single-dose sachets are quick and easy to use. Each sealed, light-tight sachet holds just the right amount of solution.

Every time your instrument is calibrated using these HANNA sachets, it is like using a newly-opened bottle of solution.

Certified Solutions Sachets

Solutions in sachets are also available with a certificate of analysis. Just like in our bottled solutions, the certificate shows the date of production, batch number and expiration date.

Combination Kits in Bottles and Sachets

HANNA solutions are also available in combined kits for practicality. These kits are useful for multiparameter instruments or for two-point calibration.

°C	°F	pH
0	32	7.13
5	41	7.10
10	50	7.07
15	59	7.04
20	68	7.03
25	**77**	**7.01**
30	86	7.00
35	95	6.99
40	104	6.98
45	113	6.98
50	122	6.98
55	131	6.98
60	140	6.98
65	149	6.99
70	158	6.99
75	167	7.00
80	176	7.01
85	185	7.02
90	194	7.03
95	203	7.04

Table of Reference Temperatures

All calibration solutions are provided with a label presenting a reference table of the relationship between pH or conductivity values and temperature.

Bottles that Meet FDA Standards

For accuracy over an extended period of time, ask for HANNA solutions in FDA (US Food & Drug Administration) type light-tight bottles.

Certified Solutions

For those operators who request it, we provide standard solutions complete with certificate of analysis. These certificates are prepared against NIST standards to avoid any possible error in determining the actual pH value.

HI 50xx, HI 60xx and HI 80xx series solutions are provided with a certificate of analysis. HI 70xx series certified solutions are identified by the letter "C" at the end of the part number.

Safety Data Sheets

Download Safety Data Sheets (SDS) from our website at: www.hannainst.com.

HANNA Solution Series

To meet the requirements of various applications, the following categories of solutions are also available:

HI 50xx series, technical solutions: they allow for calibration at all units of pH from pH 1.00 to pH 13.00.

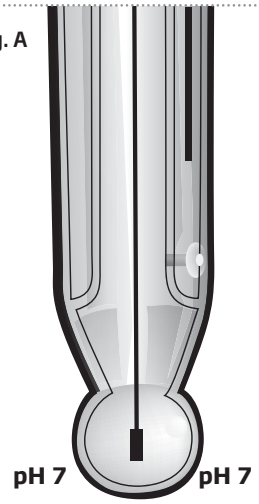
HI 60xx series, millesimal solutions: they allow for the correct calibration of pH meters with millesimal readings.

Cleaning Solution Series, cleaning solutions: an indispensable tool when electrodes are used continuously. Produced with the purpose of ensuring correct readings in widely varied areas of application, they guarantee precise measurement and long electrode life.

Electrode Cleaning, Calibrating and Maintenance

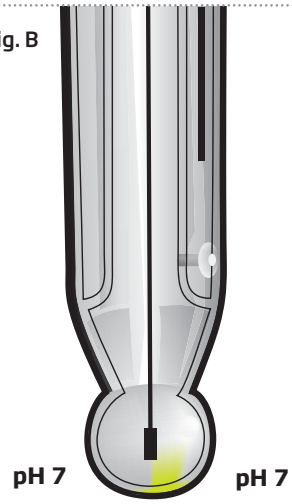
Step 1: Cleaning

Fig. A



Average: **pH 7**

Fig. B



Average: **pH 6.5**

Fig. C

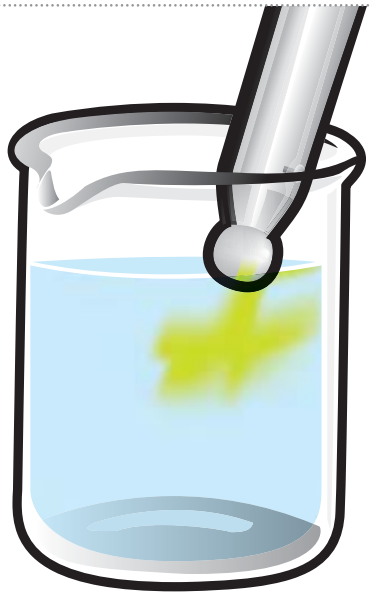


Fig A. pH reading from a properly cleaned electrode in pH 7 solution.

Fig B. pH reading from a dirty electrode in pH 7 solution.

A contaminated electrode could adversely effect not only the buffer solution, but the calibration of clean electrodes as well.

Just because you can't see contamination doesn't mean it isn't there.

An electrode generates a voltage of the average hydrogen ion concentration from the surface area outside the pH bulb tip. **Fig. A** above shows that the clean electrode is submersed in pH 7 from all areas of the bulb surface. When an electrode becomes dirty from use or neglect, the contaminated surface contributes to a voltage offset based on the surface area exposed to buffer as seen in **Fig. B**. Now the pH meter is mistakenly reading pH 6.5 instead of the actual pH 7.

Always clean your electrode before calibration. If a dirty electrode is used for calibration, all subsequent measurements will be in error.

A Dirty Electrode Can Contaminate Solutions

Always use fresh solutions with each calibration. Buffer solutions can be contaminated by dirty electrodes **Fig. C**, which can contaminate clean electrodes and so forth. Always clean your electrode before each use, each calibration, and always use fresh solutions.

Contamination can take time to work its way around the beaker. If your noticing fluctuations in your readings, it may be time to calibrate with fresh solutions.

Fresh Every Time

HANNA single-use sachets are a great way to ensure a fresh solution is used every time you calibrate. **Fig. D** shows just how easy it is to tear open the packet and insert the electrode. These light-tight sachets are also ideal for testers–they fit right in!

Fig. D

pH Cleaning Procedure

HANNA manufactures a full complement of cleaning solutions formulated to address general and specific cleaning needs.

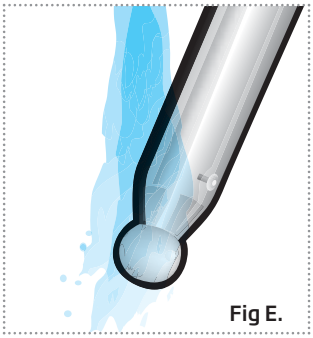


Fig E.

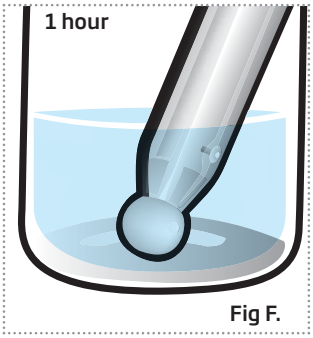


Fig F.

IMPORTANT: After performing any of the cleaning procedures, rinse the electrode thoroughly with distilled water, **Fig. E**, and soak the electrode in HI 70300 or HI 80300 Storage Solution for at least 1 hour before taking measurements, **Fig. F**.

General Cleaning

Soak in HANNA HI 7061 or HI 8061 General Cleaning Solution for approximately 30 minutes to dissolve mineral deposits and other general coatings.

Protein Coating

Soak in HANNA HI 7073 or HI 8073 Protein Cleaning Solution for 15 minutes to enzymatically dissolve deposits from protein sources.

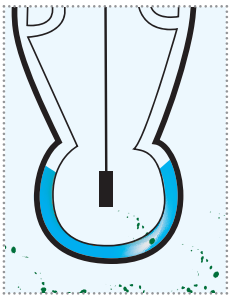
Inorganic Soak

Soak in HANNA HI 7074 Inorganic Cleaning Solution for 15 minutes. This cleaner is especially effective at removal of precipitates caused by reaction with the silver in the filling solution that may form in a ceramic junction.

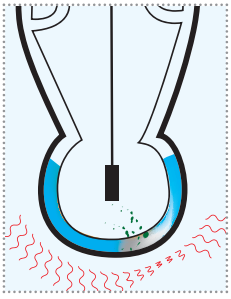
Oil/grease Rinse

Oil and grease removal require the correct chemicals to solubilize the coating but mild enough to leave the electrode unaffected. Use HANNA HI 7077 or HI 8077 Oil and Fat Cleaning Solution.

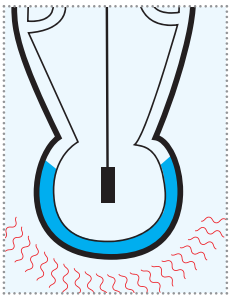
Step 2: Calibration



In time, particles during routine measurement can contaminate the sensor tip. Mishandled and aged solutions can also be affected.



If the electrodes sensor tip is not properly cleaned before calibration, your meter can be calibrated to an incorrect pH.



A proper cleaning and fresh solution ensures the whole surface of the sensor tip is reading correctly, ensuring an accurate calibration.

A pH electrode that is properly manufactured and kept clean will retain its measuring integrity for a long time. As a result of many factors such as age, use, poor maintenance or improper handling, any electrode will lose its integrity in time.

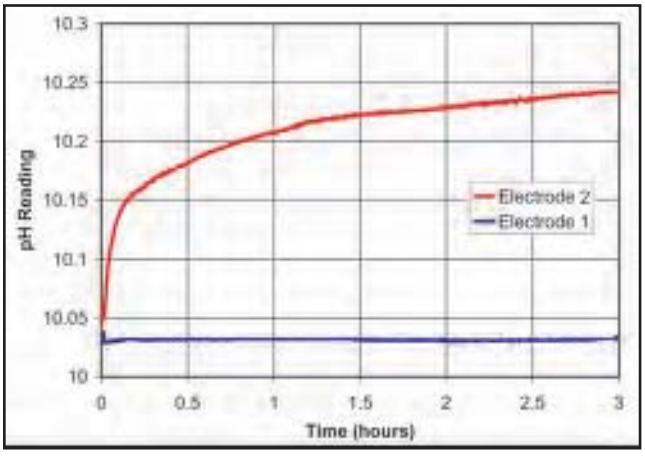
A proper calibration restores an electrodes ability to take professionally accurate measurements.

The most common cause for pH measurement inaccuracies is an unclean or improperly cleaned electrode. This is very important to note, because during calibration, the instrument assumes that the electrode is clean and that the standardization curve created during the calibration process will remain a valid reference until the next calibration. pH meters on the market today will allow an offset of approximately ±60 mV. The deviation from 0 mV is not unusual, in fact it represents the true characteristics of a normal pH electrode.

An offset can be compensated for by calibrating a pH meter with a properly cleaned electrode. Calibrating a meter with a dirty electrode will only compound the problem. An mV offset that continues to deviate on a properly cleaned electrode is a good indication that the electrode may need to be replaced.

Electrode Readings with Different Cleanings

Fig G.



Electrode 1 has been properly cleaned before calibration.
Electrode 2 has not been properly cleaned.

Fig. G (above) shows that the pH measured by a dirty electrode changes over a short period of time. This results from the residue on the pH electrode bulb dissolving into the solution and the electrode gradually returning close to its true characteristics. The resulting pH measurements, based upon the calibration of a coated electrode, will then be incorrect.

Conventional pH meters do not warn the user when a pH electrode is dirty or when a solution may be contaminated. A common example of this occurs just *after* calibrating the instrument–the pH electrode is immersed into the pH 7 buffer and the reading is lower than expected (pH 6.8 or 6.9 instead of pH 7). HANNA meters that feature our exclusive Calibration Check™ electrode diagnostics automatically alerts the user of any potential electrode or solution problems *during* calibration.

Precision Solutions

HANNA's wide range of solutions will help guarantee correct cleaning and calibration of electrodes and probes for maximum performance. Our solutions have been manufactured with your application in mind.

Step 3: Maintenance

Measurement

Always calibrate the electrode and pH meter together before making measurements.

Rinse the pH electrode sensor tip with deionized or distilled water. For a faster response and to avoid cross-contamination of the samples, rinse the electrode tip with a few drops of the solution to be tested, before taking measurements submerse the pH sensor tip and reference junction (~3 cm /1¼") in the stirred sample.

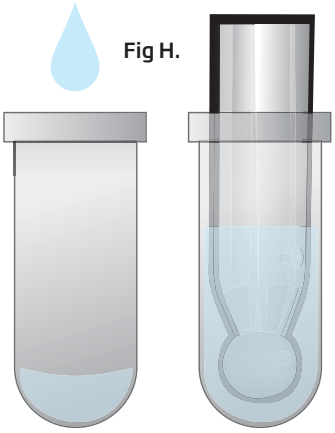
Storage

To ensure an optimum response time, the glass sensor tip and the reference junction of the pH electrode should be kept moist and not be allowed to dry out.

Replace the solution in the protective cap with a few drops of HI 70300 or HI 80300 Storage Solution or, in its absence, with pH 4 or pH 7 buffer, **Fig H**.

NOTE: *Never store the electrode in distilled or deionized water.*

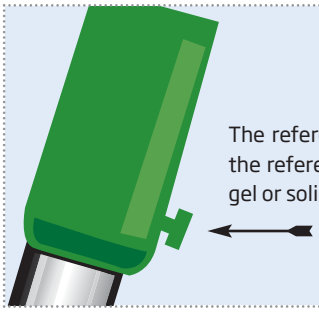
Fig H.



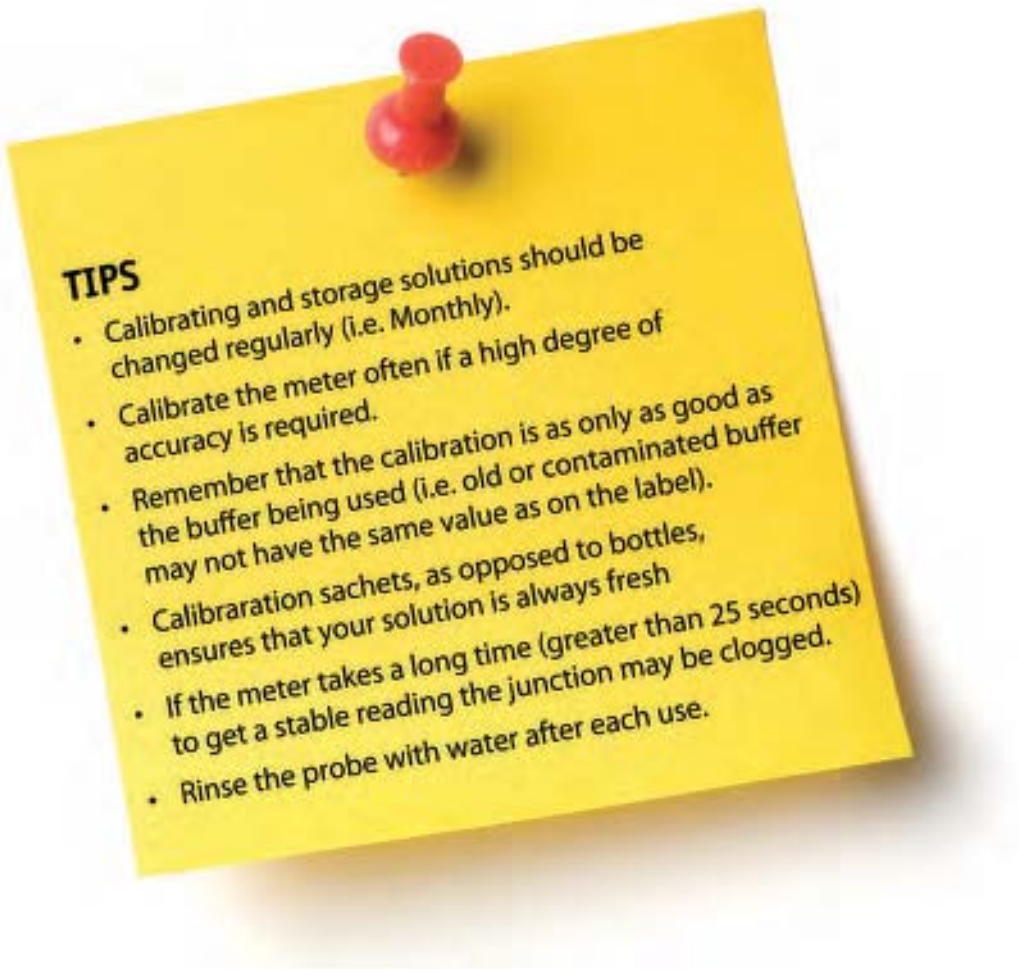
Inspect

Inspect and clean the electrode regularly to ensure the electrode will be ready when you need it. Coatings and reactions from samples result in decreased efficiency and longer response times.

Routine maintenance will ensure accurate readings while extending the life of your electrode.



The reference fill hole is used to replace the reference electrolyte solution (not in gel or solid-filled references).



Don't Let Your Electrode Dry Out

Ideally, pH electrodes should be stored in a storage solution when not in use. Placing the electrode in a small glass filled with storage solution is suitable. An option for pocket meters is to place a small piece of sponge into the meter's cap and pouring storage solution into the cap to wet the sponge. Pouring any excess solution beforehand, the cap can then be placed on the meter.

If a storage solution is not available the next best option is to use pH 4.01 buffer (pH 7.01 is also suitable to a lesser extent).

Clean Your Electrodes Before Use

Clean the liquid junction of your electrodes once a day or at least once a week to prevent junction clogging and to maintain accuracy. Immerse the electrode in the proper cleaning solution for at least 15-20 minutes. HANNA offers a wide range of cleaning solutions, for general purpose and specific applications.

Replace Your Electrode Once a Year

If your electrode takes too long to stabilize a reading, or readings fluctuate wildly, it is probably time to replace the electrode. 6 months to 1.5 years is the typical life span of any pH electrode.

Cleaning, Storage and Refilling Solutions

General Cleaning

Clean the liquid junction of your electrodes once a day or at least once a week to prevent junction clogging and to maintain accuracy. Immerse the electrode in the proper cleaning solution for at least 15-20 minutes.

HANNA offers a wide range of cleaning solutions, for general purpose and specific applications to dissolve many deposits from the electrode, and thus ensure correct measurements.

Electrode Storage Solutions

To minimize junction clogging and ensure fast response time, always keep the glass bulb and the junction of your pH electrode moist. Store the electrode with a few drops of HI 70300 storage or pH 4 or pH 7 buffer solution in the protective cap.

Electrode Fill Solutions

The electrolyte level in refillable electrodes should be checked before performing any measurement. If the level is low, refill with the proper electrolyte solution to ensure the correct electrode performance.

This simple maintenance helps guarantee adequate head pressure to promote efficiency and precision of your refillable electrodes.

Some electrolyte solutions are also available in FDA compliant bottles.

Electrode Cleaning Solutions for General Use

BOTTLES AND SACHETS

CODE	APPLICATION	PACKAGE
HI 70000P	rinsing	20 mL sachet (25)
HI 70000P/5	rinsing	20 mL sachet (500)
HI 7061L	general purpose	500 mL bottle
HI 7061M	general purpose	230 mL bottle
HI 7073L	proteins	500 mL bottle
HI 7073M	proteins	230 mL bottle
HI 7074L	inorganic substances	500 mL bottle
HI 7074M	inorganic substances	230 mL bottle
HI 7077L	oil and fats	500 mL bottle
HI 7077M	oil and fats	230 mL bottle
HI 8061L	general purpose	500 mL FDA bottle
HI 8061M	general purpose	230 mL FDA bottle
HI 8073L	proteins	500 mL FDA bottle
HI 8073M	proteins	230 mL FDA bottle
HI 8077L	oil and fats	500 mL FDA bottle
HI 8077M	oil and fats	230 mL FDA bottle

Electrode Storage Solutions

BOTTLES

CODE	DESCRIPTION	PACKAGE
HI 70300L	electrode storage solution	500 mL bottle
HI 70300M	electrode storage solution	230 mL bottle
HI 80300L	electrode storage solution	500 mL FDA bottle
HI 80300M	electrode storage solution	230 mL FDA bottle

Electrode Refilling Solutions

BOTTLES

CODE	DESCRIPTION	PACKAGE
HI 7071	electrolyte solution, 3.5M KCl + AgCl	30 mL bottle (4)
HI 7071M	electrolyte solution, 3.5M KCl + AgCl	230 mL bottle
HI 7071L	electrolyte solution, 3.5M KCl + AgCl	500 mL bottle
HI 7072	electrolyte solution, 1M KNO_3	30 mL bottle (4)
HI 7072L	electrolyte solution, 1M KNO_3	500 mL bottle
HI 7075	electrolyte solution, 1.7M KNO_3, 0.7M KCl	30 mL bottle (4)
HI 7076	electrolyte solution, 1.0M NaCl	30 mL bottle (4)
HI 7078	electrolyte solution, 0.5M $(NH_4)_2 SO_4$	30 mL bottle (4)
HI 7082	electrolyte solution, 3.5M KCl	30 mL bottle (4)
HI 7082M	electrolyte solution, 3.5M KCl	230 mL bottle
HI 7082L	electrolyte solution, 3.5M KCl	460 mL bottle
HI 7093	electrolyte solution, 1M NaCl	30 mL bottle (4)
HI 70960M	conductivity electrolyte solution for pH for viscous fluids	230 mL bottle
HI 70960L	conductivity electrolyte solution for pH for viscous fluids	500 mL bottle
HI 8071	electrolyte solution, 3.5M KCl + AgCl	30 mL FDA bottle (4)
HI 8072	electrolyte solution, 1M KNO_3	30 mL FDA bottle (4)
HI 8082	electrolyte solution, 3.5M KCl	30 mL FDA bottle (4)
HI 8093	electrolyte solution, 1M KCl + AgCl	30 mL FDA bottle (4)

BOTTLES

CODE	DESCRIPTION	SIZE
HI 70620L	cleaning and disinfection solution for skin residuals (cosmetic industry)	500 mL
HI 70620M	cleaning and disinfection solution for skin residuals (cosmetic industry)	230 mL
HI 70621L	cleaning solution for skin grease and sebum (cosmetic industry)	500 mL
HI 70621M	cleaning solution for skin grease and sebum (cosmetic industry)	230 mL
HI 70630L	acid cleaning solution for meat grease and fats (food industry)	500 mL
HI 70630M	acid cleaning solution for meat grease and fats (food industry)	230 mL
HI 70631L	alkaline cleaning solution for meat grease and fats (food industry)	500 mL
HI 70631M	alkaline cleaning solution for meat grease and fats (food industry)	230 mL
HI 70632L	cleaning and disinfection solution for blood products	500 mL
HI 70632M	cleaning and disinfection solution for blood products	230 mL
HI 70635L	cleaning solution for wine deposits (winemaking)	500 mL
HI 70635M	cleaning solution for wine deposits (winemaking)	230 mL
HI 70636L	cleaning solution for wine stains (winemaking)	500 mL
HI 70636M	cleaning solution for wine stains (winemaking)	230 mL
HI 70640L	cleaning solution for milk deposits (food industry)	500 mL
HI 70640M	cleaning solution for milk deposits (food industry)	230 mL
HI 70641L	cleaning and disinfection solution for dairy products (food industry)	500 mL
HI 70641M	cleaning and disinfection solution for dairy products (food industry)	230 mL
HI 70642L	cleaning solution for cheese deposits (food industry)	500 mL
HI 70642M	cleaning solution for cheese deposits (food industry)	230 mL
HI 70661L	cleaning solution for general purpose (agriculture)	500 mL
HI 70661M	cleaning solution for general purpose (agriculture)	230 mL
HI 70663L	cleaning solution for soil deposits (agriculture)	500 mL
HI 70663M	cleaning solution for soil deposits (agriculture)	230 mL
HI 70664L	cleaning solution for humus deposits (agriculture)	500 mL
HI 70664M	cleaning solution for humus deposits (agriculture)	230 mL
HI 70670L	cleaning solution for salt deposits (industrial processes)	500 mL
HI 70670M	cleaning solution for salt deposits (industrial processes)	230 mL
HI 70671L	cleaning and disinfection solution for algae, fungi and bacteria (industrial processes)	500 mL
HI 70671M	cleaning and disinfection solution for algae, fungi and bacteria (industrial processes)	230 mL
HI 70680L	cleaning solution for cellulose deposits	500 mL
HI 70680M	cleaning solution for cellulose deposits	230 mL
HI 70681L	cleaning solution for ink stains	500 mL
HI 70681M	cleaning solution for ink stains	230 mL

SACHETS

CODE	DESCRIPTION	QTY/SIZE
HI 700620P	cleaning and disinfection solution for skin residuals (cosmetic industry)	20 mL (25)
HI 700621P	cleaning solution for skin grease and sebum (cosmetic industry)	20 mL (25)
HI 700630P	acid cleaning solution for meat grease and fats (food industry)	20 mL (25)
HI 700635P	cleaning solution for wine deposits (winemaking)	20 mL (25)
HI 700636P	cleaning solution for wine stains (winemaking)	20 mL (25)
HI 700640P	cleaning solution for milk deposits (food industry)	20 mL (25)
HI 700641P	cleaning and disinfection solution for dairy products (food industry)	20 mL (25)
HI 700642P	cleaning Solution for cheese deposits (food industry)	20 mL (25)
HI 700661P	general purpose cleaning solution for agriculture	20 mL (25)
HI 700663P	cleaning solution for soil deposits (agriculture)	20 mL (25)
HI 700664P	cleaning solution for humus deposits (agriculture)	20 mL (25)
HI 700670P	cleaning solution for salt deposits (industrial processes)	20 mL (25)
HI 700671P	cleaning and disinfection solution for algae, fungi and bacteria (industrial processes)	20 mL (25)
HI 700680P	cleaning solution for cellulose deposits	20 mL (25)

Cleaning Solution Series

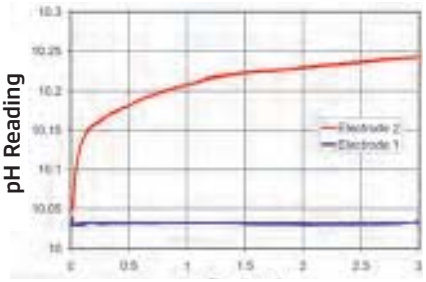
Focused Cleaning for A Top Performing Sensor

In many applications, electrodes become dirty from use and produce negative results on their efficiency. Since this dirt cannot be removed during normal use, special cleaning solutions are needed.

HANNA has prepared a complete line of cleaning and disinfection solutions that eliminate impurities and residues left on electrode surfaces when immersed in special samples. Such samples include wines, musts, oils, soil, industrial solutions, grease, algae, and dairy products.

The Cleaning Solution Series ensures the maximum efficiency and accuracy of your sensors when used for it's designated application.

Readings of electrodes cleaned with different procedures



Electrode 1 has been properly cleaned before calibration. Electrode 2 has not been properly cleaned.

The easy to open and always fresh sachet package is a practical and ideal solution for field measurements.

HI 5000 Series

pH Technical Calibration Solutions

Precise Measurements

To obtain precise and valid pH measurements, the pH meter and pH electrode must be calibrated at a minimum of 2 different points, close to the value of the sample to be tested.

HANNA offers a complete range of pH buffer solutions, that will satisfy all your calibration needs and which have been extended with two additional lines: the HI 50xx series of technical buffer solutions (shown on these pages,) and the solutions with millesimal resolution, HI 60xx.

Technical Solutions (±0.01 pH) for Each Point of the pH Scale

This complete scale of buffer solutions offers a higher degree of accuracy for pH measurements in specific areas of application, such as in monitoring the pH of must and wine. This line includes 13 solutions starting from a value of pH 1.00 up to pH 13.00 with an accuracy of ±0.01 pH, thus covering every point of the pH scale.

These solutions are dedicated to those applications that require extremely accurate pH monitoring, and are also available with certificate of analysis prepared by comparison against NIST standards.

Also available are solution bottles, that are colored according to a given standard calibration value: HI 5004-R (Red), HI 5007-G (Green) and HI 5010-V (Violet).

BOTTLES		
pH VALUE @25°C	CODE	PACKAGE
1.00	HI 5001	500 mL
1.68	HI 5016	500 mL
2.00	HI 5002	500 mL
2.00	HI 5002-01	1 L
2.00	HI 5002-36	500 mL (36)
3.00	HI 5003	500 mL
3.00	HI 5003-36	500 mL (36)
3.79	HI 5037	500 mL
4.01	HI 5004	500 mL
4.01	HI 5004-01	1 L
4.01	HI 5004-12	500 mL (12)
4.01	HI 5004-36	500 mL (36)
4.01	HI 5004-R	500 mL
4.01	HI 5004-R08	1 G (3.78 L) (2)
4.01	HI 5004-R36	500 mL (36)
4.63	HI 5046	500 mL
4.63	HI 5046-01	1 L
5.00	HI 5005	500 mL
5.00	HI 5005-01	1 L
6.00	HI 5006	500 mL
6.00	HI 5006-01	1 L
6.00	HI 5006-36	500 mL (36)
6.86	HI 5068	500 mL
7.01	HI 5007	500 mL
7.01	HI 5007-01	1 L
7.01	HI 5007-12	500 mL (12)
7.01	HI 5007-36	500 mL (36)
7.01	HI 5007-G	500 mL
7.01	HI 5007-G08	1 G (3.78 L) (2)
7.01	HI 5007-G36	500 mL (36)
7.41	HI 5074	500 mL
7.41	HI 5074-01	1 L
8.00	HI 5008	500 mL
8.00	HI 5008-01	1 L
8.00	HI 5008-36	500 mL (36)
9.00	HI 5009	500 mL
9.00	HI 5009-01	1 L
9.00	HI 5009-36	500 mL (36)
9.18	HI 5091	500 mL
10.01	HI 5010	500 mL
10.01	HI 5010-01	1 L
10.01	HI 5010-12	500 mL (12)
10.01	HI 5010-36	500 mL (36)
10.01	HI 5010-V	500 mL
10.01	HI 5010-V08	1 G (3.78 L) (2)
10.01	HI 5010-V36	500 mL (36)
11.00	HI 5011	500 mL
12.00	HI 5012	500 mL
12.45	HI 5124	500 mL
13.00	HI 5013	500 mL

SACHETS		
pH VALUE @25°C	**CODE**	**PACKAGE**
1.00	HI 50001-01	20 mL (10)
1.00	HI 50001-02	20 mL (25)
1.68	HI 50016-01	20 mL (10)
1.68	HI 50016-02	20 mL (25)
2.00	HI 50002-01	20 mL (10)
2.00	HI 50002-02	20 mL (25)
3.00	HI 50003-01	20 mL (10)
3.00	HI 50003-02	20 mL (25)
3.00	HI 50003P	20 mL (25)
3.79	HI 50037-01	20 mL (10)
3.79	HI 50037-02	20 mL (25)
4.01	HI 50004-01	20 mL (10)
4.01	HI 50004-02	20 mL (25)
4.63	HI 50046-01	20 mL (10)
4.63	HI 50046-02	20 mL (25)
5.00	HI 50005-01	20 mL (10)
5.00	HI 50005-02	20 mL (25)
6.00	HI 50006-01	20 mL (10)
6.00	HI 50006-02	20 mL (25)
6.86	HI 50068-01	20 mL (10)
6.86	HI 50068-02	20 mL (25)
7.01	HI 50007-01	20 mL (10)
7.01	HI 50007-02	20 mL (25)
7.01	HI 50021P	20 mL (25)
7.41	HI 50074-01	20 mL (10)
7.41	HI 50074-02	20 mL (25)
8.00	HI 50008-01	20 mL (10)
8.00	HI 50008-02	20 mL (25)
9.00	HI 50009-01	20 mL (10)
9.00	HI 50009-02	20 mL (25)
9.18	HI 50091-01	20 mL (10)
9.18	HI 50091-02	20 mL (25)
10.01	HI 50010-01	20 mL (10)
10.01	HI 50010-02	20 mL (25)
11.00	HI 50011-01	20 mL (10)
11.00	HI 50011-02	20 mL (25)
12.00	HI 50012-01	20 mL (10)
12.00	HI 50012-02	20 mL (25)
12.45	HI 50124-01	20 mL (10)
12.45	HI 50124-02	20 mL (25)
13.00	HI 50013-01	20 mL (10)
13.00	HI 50013-02	20 mL (25)

Easy to Use Single Dose Sachets

For the highest level of reliability of field instrumentation, technical solutions are also provided in convenient single-dose sachets.

Calibration solution sachets are sold in boxes containing 10 or 25 pieces to satisfy requirements for daily use.

HANNA Combo Kits

Use our combination kits for easy ordering and reordering.

SOLUTION COMBINATION KITS - BOTTLE		
CODE	**SOLUTIONS (pH VALUE @25°C)**	**BOTTLE**
HI 54710	pH 4.01, pH 7.01, pH 10.01	500 mL (3)
HI 54710-10	pH 4.01, pH 7.01, pH 10.01, HI 70300L	500 mL (4)
HI 54710-11	pH 4.01, pH 7.01, pH 10.01, HI 70300L, HI 7061L	500 mL (5)
HI 54710-12	pH 4.01, pH 7.01, pH 10.01, HI 70300L, HI 7061L, HI 7071L	500 mL (6)
HI 54710-13	pH 4.01, pH 7.01, pH 10.01, HI 70300L, HI 7061L, HI 7072L	500 mL (6)

HI 6000 Series

±0.002 pH Millesimal Calibration Solutions

Millesimal Calibration Solutions

This line of buffers with millesimal accuracy (±0.002 pH), HI 60xx, has been prepared to meet the increasing need for assured accuracy in pH measurements. Each bottle of the series HI 60xx is provided with a certificate of analysis, prepared by comparison with NIST standards.

Easy Range Identification

The colors on the HI 60xx series packaging correspond to a given standard pH value. They make it easy and safe to identify the buffers to be used.

Millesimal Calibration Solution Sachets

This series is also available in handy sachets to perform accurate calibrations on-site or in the field. Single dose sachet solutions are safe, easy to carry and always fresh.

MILLESIMAL BUFFER SOLUTIONS (±0.002 pH) - BOTTLE

pH VALUE @25°C	CODE	PACKAGE	pH VALUE @25°C	CODE	PACKAGE
1.000	HI 6001	500 mL	**7.010**	HI 6007	500 mL
1.000	HI 6001-01	1 L	**7.010**	HI 6007-01	1 L
1.679	HI 6016	500 mL	**7.413**	HI 6074	500 mL
1.679	HI 6016-01	1 L	**7.413**	HI 6074-01	1 L
2.000	HI 6002	500 mL	**8.000**	HI 6008	500 mL
2.000	HI 6002-01	1 L	**8.000**	HI 6008-01	1 L
3.000	HI 6003	500 mL	**9.000**	HI 6009	500 mL
3.000	HI 6003-01	1 L	**9.000**	HI 6009-01	1 L
3.788	HI 6037	500 mL	**9.177**	HI 6091	500 mL
3.788	HI 6037-01	1 L	**9.177**	HI 6091-01	1 L
4.010	HI 6004	500 mL	**10.010**	HI 6010	500 mL
4.010	HI 6004-01	1 L	**10.010**	HI 6010-01	1 L
4.630	HI 6046	500 mL	**11.000**	HI 6011	500 mL
4.630	HI 6046-01	1 L	**11.000**	HI 6011-01	1 L
5.000	HI 6005	500 mL	**12.000**	HI 6012	500 mL
5.000	HI 6005-01	1 L	**12.000**	HI 6012-01	1 L
6.000	HI 6006	500 mL	**12.450**	HI 6124	500 mL
6.000	HI 6006-01	1 L	**12.450**	HI 6124-01	1 L
6.862	HI 6068	500 mL	**13.000**	HI 6013	500 mL
6.862	HI 6068-01	1 L	**13.000**	HI 6013-01	1 L

MILLESIMAL BUFFER SOLUTIONS (±0.002 pH) - SACHET

pH VALUE @25°C	CODE	PACKAGE	pH VALUE @25°C	CODE	PACKAGE
1.000	HI 60001-01	20 mL (10)	**7.010**	HI 60007-01	20 mL (10)
1.000	HI 60001-02	20 mL (25)	**7.010**	HI 60007-02	20 mL (25)
1.679	HI 60016-01	20 mL (10)	**7.413**	HI 60074-01	20 mL (10)
1.679	HI 60016-02	20 mL (25)	**7.413**	HI 60074-02	20 mL (25)
2.000	HI 60002-01	20 mL (10)	**8.000**	HI 60008-01	20 mL (10)
2.000	HI 60002-02	20 mL (25)	**8.000**	HI 60008-02	20 mL (25)
3.000	HI 60003-01	20 mL (10)	**9.000**	HI 60009-01	20 mL (10)
3.000	HI 60003-02	20 mL (25)	**9.000**	HI 60009-02	20 mL (25)
3.788	HI 60037-01	20 mL (10)	**9.177**	HI 60091-01	20 mL (10)
3.788	HI 60037-02	20 mL (25)	**9.177**	HI 60091-02	20 mL (25)
4.010	HI 60004-01	20 mL (10)	**10.010**	HI 60010-01	20 mL (10)
4.010	HI 60004-02	20 mL (25)	**10.010**	HI 60010-02	20 mL (25)
4.630	HI 60046-01	20 mL (10)	**11.000**	HI 60011-01	20 mL (10)
4.630	HI 60046-02	20 mL (25)	**11.000**	HI 60011-02	20 mL (25)
5.000	HI 60005-01	20 mL (10)	**12.000**	HI 60012-01	20 mL (10)
5.000	HI 60005-02	20 mL (25)	**12.000**	HI 60012-02	20 mL (25)
6.000	HI 60006-01	20 mL (10)	**12.450**	HI 60124-01	20 mL (10)
6.000	HI 60006-02	20 mL (25)	**12.450**	HI 60124-02	20 mL (25)
6.862	HI 60068-01	20 mL (10)	**13.000**	HI 60013-01	20 mL (10)
6.862	HI 60068-02	20 mL (25)	**13.000**	HI 60013-02	20 mL (25)

pH Standard Calibration Solutions

1.68 Buffer Solution

Plating bath samples, food samples and waste samples are often acidic in nature. To increase accuracy of your measurment at lower pH, it is important to calibrate your electrode and meter at that pH also. HANNA pH 1.68 buffer is available to fufill this requirement. pH 1.68 buffer solution allows you to calibrate your measurement system in the acid pH range and bracket your acidic samples by using a second value at 4.01 pH or near 7.01 pH.

Our millesimal series offers ±0.002 certified accuracy and our HI 5016 technical grade solution offers ±0.01 pH certified accuracy. Standard NIST traceable (no certification included) 1.68 pH buffer with ±0.01 pH accuracy is available in two sizes.

BOTTLES

CODE	pH VALUE @25°C	SIZE	PACKAGE	FDA BOTTLE	CERTIFICATE OF ANALYSIS
HI 7001L	1.68	500 mL	bottle		on request
HI 7001M	1.68	230 mL	bottle		on request

4.01 Buffer Solution

HANNA buffer solutions are prepared according to precise formulas and are standardized with a pH electrode and meter calibrated with NIST standards. This buffer value is widely used in water purification plants, in the food industry and where ever the pH is expected to be slightly acidic.

All pH 4.01 solutions show batch number, expiration date and the correlation table between pH and temperature.

BOTTLES

CODE	pH VALUE @25°C	SIZE	PACKAGE	FDA BOTTLE	CERTIFICATE OF ANALYSIS
HI 7004/1G	4.01	1 gallon (3.78 L)	bottle		on request
HI 7004/1L	4.01	1 L	bottle		on request
HI 7004L	4.01	500 mL	bottle		on request
HI 7004L/C	4.01	500 mL	bottle		•
HI 7004M	4.01	230 mL	bottle		on request
HI 8004/1L	4.01	1 L	bottle	•	•
HI 8004L	4.01	500 mL	bottle	•	•
HI 8004L/C	4.01	500 mL	bottle	•	•

SACHETS

CODE	pH VALUE @25°C	SIZE	PACKAGE	CERTIFICATE OF ANALYSIS
HI 70004C	4.01	20 mL	sachets (25)	•
HI 70004P	4.01	20 mL	sachets (25)	
HI 7004P/5	4.01	20 mL	sachets (500)	
HI 77400C	4.01 & 7.01	20 mL	sachets (10, 5 ea)	•
HI 77400P	4.01 & 7.01	20 mL	sachets (10, 5 ea)	

Traceability with NIST Standard Reference

HANNA pH 4.01 buffers are carefully prepared using the highest quality ingredients available and are standardized with NIST references.

pH Standard Calibration Solutions

6.86 Buffer Solution

Many of our portable and benchtop instruments, may now be calibrated with both pH 6.86 or pH 7.01 buffers.

The HANNA range of pH 6.86 buffer solutions has been expanded and stability has been improved to match the stability of pH 7.01.

BOTTLES					
CODE	pH VALUE @25°C	SIZE	PACKAGE	FDA BOTTLE	CERTIFICATE OF ANALYSIS
HI 7006/1G	6.86	1 gallon (3.78 L)	bottle		on request
HI 7006/1L	6.86	1 L	bottle		on request
HI 7006L	6.86	500 mL	bottle		on request
HI 7006L/C	6.86	500 mL	bottle		•
HI 7006M	6.86	230 mL	bottle		on request
HI 8006/1L	6.86	1 L	bottle	•	•
HI 8006L	6.86	500 mL	bottle	•	•
HI 8006L/C	6.86	500 mL	bottle	•	•

SACHETS				
CODE	pH VALUE @25°C	SIZE	PACKAGE	CERTIFICATE OF ANALYSIS
HI 70006C	6.86	20 mL	sachets (25)	•
HI 70006P	6.86	20 mL	sachets (25)	

Traceability with Reference to NIST Standards

The buffer solution at pH 6.86 is standardized with a pH electrode and meter calibrated with NIST buffer solutions. The buffer is certified against to NIST standards.

7.01 Buffer Solution

pH 7.01 is the most widely used among all buffer solutions. For this reason we have prepared it in a wider variety of sizes to meet application demand.

HANNA pH buffer solutions are standardized against NIST reference solutions.

BOTTLES					
CODE	pH VALUE @25°C	SIZE	PACKAGE	FDA BOTTLE	CERTIFICATE OF ANALYSIS
HI 7007/1G	7.01	1 gallon (3.78 L)	bottle		on request
HI 7007/1L	7.01	1 L	bottle		on request
HI 7007L	7.01	500 mL	bottle		on request
HI 7007L/C	7.01	500 mL	bottle		•
HI 7007M	7.01	230 mL	bottle		on request
HI 8007/1L	7.01	1 L	bottle	•	•
HI 8007L	7.01	500 mL	bottle	•	•
HI 8007L/C	7.01	500 mL	bottle	•	•

SACHETS				
CODE	pH VALUE @25°C	SIZE	PACKAGE	CERTIFICATE OF ANALYSIS
HI 70007C	7.01	20 mL	sachets (25)	•
HI 70007P	7.01	20 mL	sachets (25)	
HI 7007P/5	7.01	20 mL	sachets (500)	
HI 770710C	10.01 & 7.01	20 mL	sachets (10, 5 ea)	•
HI 770710P	10.01 & 7.01	20 mL	sachets (10, 5 ea)	
HI 77100C	1413 µS/cm & pH 7.01	20 mL	sachets (20, 10 ea)	•
HI 77100P	1413 µS/cm & pH 7.01	20 mL	sachets (20, 10 ea)	
HI 77200C*	1500 mg/L (ppm) & pH 7.01	20 mL	sachets (20, 10 ea)	•
HI 77200P*	1500 mg/L (ppm) & pH 7.01	20 mL	sachets (20, 10 ea)	
HI 77300C	1382 mg/L (ppm) & pH 7.01	20 mL	sachets (20, 10 ea)	•
HI 77300P	1382 mg/L (ppm) & pH 7.01	20 mL	sachets (20, 10 ea)	
HI 77400C	4.01 & 7.01	20 mL	sachets (10, 5 ea)	•
HI 77400P	4.01 & 7.01	20 mL	sachets (10, 5 ea)	
HI 77700C	7.01	20 mL	sachets (10, 5 ea)	•
HI 77700P	7.01	20 mL	sachets (10, 5 ea)	

FDA approved bottle

For maximum reliability choose our solutions in bottles that meet the FDA standards (US Food & Drug Administration) that protect the solutions from extended exposure to light.

* TDS Conversion Factor 4-4-2: 0.65 ppm = 1 µS/cm (approximately).

pH Standard Calibration Solutions

BOTTLES					
CODE	pH VALUE @25°C	SIZE	PACKAGE	FDA BOTTLE	CERTIFICATE OF ANALYSIS
HI 70082M	8.20	230 mL	bottle		
HI 70083M	8.30	230 mL	bottle		

8.20 and 8.30 Buffer Solution

To increase accuracy of your measurement, HANNA 8.20 pH and 8.30 pH buffer solution. The label indicates the batch code, expiration data and pH/temperature correlation table.

BOTTLES					
CODE	pH VALUE @25°C	SIZE	PACKAGE	FDA BOTTLE	CERTIFICATE OF ANALYSIS
HI 7009/1G	9.18	1 gallon (3.78 L)	bottle		on request
HI 7009/1L	9.18	1 L	bottle		on request
HI 7009L	9.18	500 mL	bottle		on request
HI 7009L/C	9.18	500 mL	bottle		•
HI 7009M	9.18	230 mL	bottle		on request
HI 8009/L	9.18	500 mL	bottle	•	•
HI 8009/1L	9.18	1 L	bottle	•	•
HI 8009L/C	9.18	500 mL	bottle	•	•

SACHETS				
CODE	pH VALUE @25°C	SIZE	PACKAGE	CERTIFICATE OF ANALYSIS
HI 70009C	9.18	20 mL	sachets (25)	•
HI 70009P	9.18	20 mL	sachets (25)	

9.18 Buffer Solution

To increase accuracy of your measurement in an alkaline environment, it is important to calibrate your electrode and meter in that pH range and to preferably bracket your sample values. HANNA offers both pH 9.18 buffer and 10.01 buffer to fufill this requirement.

BOTTLES					
CODE	pH VALUE @25°C	SIZE	PACKAGE	FDA BOTTLE	CERTIFICATE OF ANALYSIS
HI 7010/1G	10.01	1 gallon (3.78 L)	bottle		on request
HI 7010/1L	10.01	1 L	bottle		on request
HI 7010L	10.01	500 mL	bottle		on request
HI 7010L/C	10.01	500 mL	bottle		•
HI 7010M	10.01	230 mL	bottle		on request
HI 8010/1L	10.01	1 L	bottle	•	•
HI 8010L	10.01	500 mL	bottle	•	•
HI 8010L/C	10.01	500 mL	bottle	•	•

SACHETS				
CODE	pH VALUE @25°C	SIZE	PACKAGE	CERTIFICATE OF ANALYSIS
HI 70010C	10.01	20 mL	sachets (25)	•
HI 70010P	10.01	20 mL	sachets (25)	
HI 70010P/5	10.01	20 mL	sachets (500)	
HI 770710C	10.01 & 7.01	20 mL	sachets (10, 5 ea)	•
HI 770710P	10.01 & 7.01	20 mL	sachets (10, 5 ea)	

10.01 Buffer Solution

pH 10.01 solution is commonly used to calibrate equipment used for analyzing basic samples. pH 10.01 buffer solution is available in various forms: choose the one that best fits your needs

ORP and Sample Preparation Solutions

ORP standard solutions allows users to test the precision of ORP electrodes. For example, by immersing the electrode in HI 7020 solution, readings should fall within the 200 to 275 mV range (@20°C/68°F).

If the reading is outside the indicated interval, clean and condition your ORP electrode in HANNA pretreatment solution.

Use HI 7092 for oxidizing or HI 7091 for reducing pretreatment.

ORP Test and Pretreatment Solutions

BOTTLES			
CODE	DESCRIPTION	SIZE	CERTIFICATE OF ANALYSIS
HI 7020L	ORP test solution @200 to 275 mV (@25°C)	500 mL	on request
HI 7020M	ORP test solution @200 to 275 mV (@25°C)	230 mL	on request
HI 7021L	ORP test solution @240 mV (@25°C)	500 mL	on request
HI 7021M	ORP test solution @240 mV (@25°C)	230 mL	on request
HI 7022L	ORP test solution @470 mV (@25°C)	500 mL	on request
HI 7022M	ORP test solution @470 mV (@25°C)	230 mL	on request
HI 7091L	reducing pretreatment solution	500 mL	
HI 7091M	reducing pretreatment solution	230 mL	
HI 7092L	oxidizing pretreatment solution	500 mL	
HI 7092M	oxidizing pretreatment solution	230 mL	

Sample Preparation Solutions

BOTTLES			
CODE	DESCRIPTION	SIZE	CERTIFICATE OF ANALYSIS
HI 7051M	soil sample preparation solution	230 mL	
HI 7051L	soil sample preparation solution	500 mL	
HI 70960	preparation solution for solid or semi-solid samples	30 mL	

CONTENTS

Introduction to ISE

Three Methods of Analysis

Potentiometric ion analyses with ISEs are performed by use of one of three methods, each entailing its own advantages: Direct Potentiometry, Incremental Methods, and Potentiometric Titration. HANNA offers a solution for each of these methods.

Direct Potentiometry

Direct Potentiometry is a widely used method of performing ion analysis with ISEs. This method is highly effective when the user must quickly measure large batches of samples at many concentrations. Our direct reading meters such as the HI 98184 and HI 98185 display concentration of the unknown sample by a direct reading after calibrating the instrument with 2 or more standards. Ionic strength adjustments are made to both samples and standards. In some applications quick and reliable measurements can be made on-site without taking samples back to the laboratory.

Incremental Methods

Incremental Methods are useful techniques used to determine ion concentration quickly in samples whose constituents are variable or concentrated. Incremental Methods have some inherent advantages over direct potentiometry. The techniques can reduce errors from variables such as temperature, viscosity, pH or ionic strength. The electrodes remain immersed throughout the process thus reducing sample carry over and possible liquid junction changes in the reference and analysis steps are reduced. Known addition, known subtraction, analyte addition, and analyte subtraction methods are four of these incremental techniques. All techniques involve adding a standard to the sample, or sample to the standard and the meter calculates the sample's ion concentration directly.

Potentiometric Titration

A Potentiometric Titration can increase the precision of ISE measurements and also the number of ionic species that can be determined. ISEs are commonly used as indicators for the titrant or sample species to follow the progress of a precipitation or complexometric titration. A small change in reactant addition corresponds to a large change in electrode potential at the stoichiometric endpoint. An example of a precipitation titration is the determination of chloride using silver nitrate. A silver ISE can be used to follow this titration. A complexometric titration is used for the determination of calcium. A calcium solution is titrated with the complexing reagent EDTA. During the titration there is a gradual decrease in the free Ca^{2+} ion concentration as more EDTA is added. The end point corresponds to the point when all the Ca^{2+} is complexed. The progress of this titration can be monitored using a calcium ISE.

HANNA offers a solution for each of these methods,

Ion Selective Electrode Types

HANNA's ion selective electrodes can be grouped into three general categories based upon construction.

Solid state electrodes are available as both single half cells or as combination electrodes complete with reference electrode. These electrodes incorporate a solid sensing surface made of compressed silver halides, or solid crystalline material. HANNA's offering includes sensors for the determination of bromide, cadmium, chloride, cupric, cyanide, fluoride, iodide, lead and silver ions. Rugged, solid body construction ensures a long life.

Theory: A solid state electrode develops a voltage due to ion-exchange occurring between the sample and the inorganic membrane. An equilibrium mechanism occurs due to the very limited solubility of the membrane material in the sample.

Liquid membrane electrodes are available as single half cells or as combination electrodes complete with reference electrode. The sensing surfaces of these electrodes are comprised of a homogeneous polymer matrix containing organic ion exchangers selective for the determined ion. These sensors incorporate easily replaceable membrane modules and are available for measurements of nitrate, potassium and calcium.

Theory: The potassium electrode was one of the earliest liquid membrane sensors developed of this type. The membrane is usually in the form of a thin disc of PVC impregnated with the antibiotic valinomycin. The exchanger, also known an ionophore, is a ring structure that fits potassium ions inside like a lock and key. This type of membrane is not as rugged as the solid state type so they are designed for easy replacement of the sensing module.

Reference and Combination Electrodes

HANNA's reference electrode is used with our half cell ISE sensors to provide accurate and repeatable measurements. HANNA's combination electrodes incorporate the measuring electrode with the reference making them ideal for field measurements.

Reference electrodes are used to provide a stable voltage and electrolytic contact to permit a voltage gradient to be measured across a measurement membrane such as an ISE. HANNA has designed an easy to use, unbreakable plastic, double junction, quick fill, sleeve style reference electrode with a cone style junction to work with the ion selective electrode family of sensors. The design forms the liquid junction with the test solution at the tip of the junction cone and not further up the cone surface. The design produces a highly stable reference electrode with reasonable, low flow rates. The model HI 5315 is a silver/silver chloride electrode half cell with a permanent gel filled internal cell. The outer fill solution is easily replaceable and serves as a buffer zone between the internal chloride ion containing gel and the sample solution. HANNA offers a complete line of silver-free fill solutions to optimize your ion measurement. A fast responding liquid junction, excellent reproducibility, and ease of use will mark this reference as your "best" in the lab.

Gas sensors are combination electrodes that detect dissolved gases in a solution. No external reference is required for these electrodes. The sensing element is separated from the sample solution by a gas permeable membrane. HANNA's offering includes the HI 4101 Ammonia electrode and the HI 4105 Carbon Dioxide electrode.

Theory: A gas sensor works due to the partial pressure of the measured gas in solution. The dissolved gas in the sample diffuses into the membrane and changes the pH in a thin film of unbuffered electrolyte on the surface of the internal pH sensor. Diffusion continues until the partial pressure of the sample and the thin film is the same. The pH change is proportional to the dissolved gas in the sample.

Combination electrodes include a sensor and reference electrode in a single electrode body. Our combination ion selective electrodes provide the same selectivity and response as our ISE half cells, but include our superior double junction reference into the same electrode body. Combination solid state electrodes have a built in solid state sensor and quick refillable reference electrode. Our liquid membrane and fluoride combination electrodes have replaceable module construction and the HANNA double junction reference stability.

Product Spotlights

HI 4222 • HI 4522

Research Grade ISE Meters

4.8

HI 4522 is a research grade, benchtop instrument that features 8 measurement ranges: pH, ORP (Oxidation Reduction Potential), ISE, conductivity, resistivity, TDS, salinity and temperature. HI 4222 is a research grade pH, ORP, ISE and temperature benchtop meter. These instruments incorporate dual channels with a separate temperature input and support the external reference electrodes required by half cell pH and ISE sensors. Both models provide direct ISE measurement of incremental methods.

The customizable user interface can display two channels at the same time, showing the measurements in various modes: basic measurement with or without GLP information, graph or log history.

These instruments offer multi-language support and contextual help is available through a dedicated Help key. Clear tutorial messages and directions are available on-screen to quickly and easily guide users through all measurement and calibration procedures to ensure measurements and procedures are performed properly.

HI 3512

Two Channel Benchtop Meter

4.10

The HI 3512 is a 2 channel professional benchtop meter with a graphic LCD, designed to provide accurate laboratory results. Channel 1 features pH/ORP/ISE and temperature measurement capability while channel 2 measures EC/TDS/NaCl/Resistivity and temperature.

This instrument can measure using ORP electrodes (pH channel input), thanks to its capability to measure mV with a resolution up to 0.1 mV and ISE electrodes on ppm scale (pH channel input). The electrode type and unit selection capability and the ISE calibration in up to five calibration standard solutions make this instrument very useful for a large range of concentration solution measurements.

HANNA's exclusive Calibration Check™ diagnostics system ensures accurate pH readings every time by alerting users of potential problems during the calibration process. The pH channel offers up to five point pH calibration with seven standard buffers (pH 1.68, 4.01, 6.86, 7.01, 9.18, 10.01 and 12.45) and up to two custom buffers.

Messages on the graphic LCD offer directions for easy and accurate calibration for both channels as well as diagnostics to alert the user when calibration or measurement issues are detected.

HI 2216

0.001 Resolution pH/mV/ISE/°C Meter

4.15

The HI 2216 is a pH, ORP, ISE meter with five point pH calibration, 0.001 pH resolution and two point ISE calibration.

HI 2216 can perform measurements through the pH channel input using ORP electrodes in the mV scale and ISE electrodes in the ppm scale. A relative mV feature is also provided.

This instrument provides GLP capabilities that allows the storage and retrieval of all data regarding pH, ORP, and ISE calibration.

HANNA instruments

With Great Products, Come Great Results™

HI 98184 • HI 98185

Graphic Display pH Meters

4.16

HI 98184 and HI 98185 are waterproof, portable meters designed for demanding applications. HI 98184 and HI 98185 measure pH/ORP/ISE and temperatuare.

HI 98185 supports 15 different ISE sensors by default and can be calibrated in up to five points and 6 standard buffers (choice of units). This unit allows an extensive choice of measurement units (ppm, ppt, g/L, ppb, µg/L, mg/mL, M, mol/L, mmol/L, % w/v, user) and has an expanded measuring range of 1.00 x 10^{-7} to 9.99 x 10^{-10}.

HANNA's Calibration Check™ maintains a history of past calibrations and monitors the pH electrode and buffers during subsequent calibrations for any signs of wide calibration variances due to a dirty or broken electrode or contaminated pH buffers. In measurement mode, the electrode's percent condition is continuously displayed.

HI 84184

ISE Fluoride Meter for Wine Analysis

4.20

The HI 84184 is a low cost, easy to use, fluoride ISE meter that performs automatic wine analysis by measuring the fluoride content in wine using an ion selective electrode. The method used is double standard addition, a simple and rapid method of analysis.

The instrument utilizes a powerful and effective built-in algorithm to analyze the shape of the ISE electrode response and to determine the reaction completion.

Results are immediately displayed in F^- mg/L (ppm), after which the HI 84184 is ready for another measurement.

HI 931100 • HI 931101 • HI 931102

Salinity and Sodium Content Meters

4.23

HI 931100 is a dedicated ion-selective meter that uses a sodium electrode to read the salt (NaCl) content of a solution. This powerful instrument has four ranges, capable of measuring concentrations from 0.150 g/L to 300 g/L. HI 931100 auto ranges from sample to sample over an extremely broad range without needing to recalibrate.

HI 931101 uses the FC 300B combination sodium electrode (not included) to give you sodium readings from 15.0 mg/L to 60 g/L. The calibration process is automatic at 2 points, the first is at 2.3 g/L while the second can be either at 0.23 g/L (low range) or at 23.0 g/L (high range).

HI 931102 HANNA® has designed this waterproof salinity meter for use in the food industry. This powerful instrument has four ranges, capable of measuring concentrations from 0.150 g/L to 300 g/L. This meter is able to auto range from sample to sample over an extremely broad range without needing to recalibrate.

Comparison Guide

Benchtop Meters

GUIDE	pH Range	ISE Range	ORP Range/Relative mV	EC/TDS/Salinity Range	Resistivity Range	Temperature Range	(D)irect /(I)ncremental Measurement	ISE Calibration Points	ISE Buffers: Standard/Custom	pH Calibration Check™	Temperature Compensation: (A)utomatic or (M)anual	GLP	(A)uto, (L)og on demand and Auto(E)nd Data Logging	HOLD	Predefined ISE electrode	PC Connection	On-screen Help, Tutorial and Multi-language	Application Designed	Page
HI 4522	•	•	•	•	•	°C/°F	D, I	5	8/5	•	A/M	•	A, L, E	•	•	USB/ RS232	•	research	4.8
HI 4222	•	•	•			°C/°F	D, I	5	8/5	•	A/M	•	A, L, E	•	•	USB/ RS232	•	research	4.8
HI 3512	•	•	•	•	•	°C/°F	D	5	7/2	•	A/M	•	A, L		•	USB	•	general	4.10
HI 3222	•	•	•			°C/°F	D	5	7/5	•	A/M	•	A, L		•	USB	•	general	4.12
HI 3221	•	•	•			°C/°F	D	2	7/5	•	A/M	•	A, L			USB	•	general	4.12
HI 123	•	•	•			°C/°F	D	2	7/2	•	A/M	•	A, L			RS232		general	4.14
HI 2216	•	•	•			°C/°F	D	2	7/2	•	A/M	•	A, L			USB		general	4.15
HI 84185		•				°C	I				A		L		•		•	wine	4.19
HI 84184		•				°C	I				A		L		•		•	wine	4.20
HI 84181		•				°C	I				A		L		•		•	wine	4.21

Portable Meters

GUIDE	pH Range	ISE Range	ORP Range/Relative mV	EC/TDS/Salinity Range	Resistivity Range	Temperature Range	(D)irect /(I)ncremental Measurement	ISE Calibration Points	ISE Buffers: Standard/Custom	pH Calibration Check™	Temperature Compensation: (A)utomatic or (M)anual	GLP	(A)uto, (L)og on demand and Auto(E)nd Data Logging	HOLD	Predefined ISE electrode	PC Connection	On-screen Help, Tutorial and Multi-language	Application Designed	Page
HI 98185	•	•	•			°C/°F	D	5	7/5	•	A/M	•	A, L, E	•		USB	•	general	4.16
HI 98184	•	•	•			°C/°F	D	2	7/5	•	A/M	•	A, L, E	•		USB	•	general	4.16
HI 98172	•	•	•			°C/°F	D	5	6/5	•	A/M	•	A, L	•		USB		general	4.18
HI 98402		•				°C	D		5/0	2	A/M				•			fluoride	4.22
HI 931100		•				°C	D		3/0	2	A/M				•			salinity	4.23
HI 931101		•				°C	D		3/0	2	A/M				•			salinity	4.23
HI 931102		•				°C	D		3/0	2	A/M				•			food salinity	4.24

Ion Selective Sensors and Accessories Reference Chart

SENSORS AND ACCESSORIES REFERENCE CHART

ELECTRODE	TYPE	HALF-CELL	COMBI-NATION	ISA	FILLING SOLUTION	STD 1	STD 2	STD 3	OTHER
Ammonia	gas	–	HI 4101	HI 4001-00	HI 4001-40	HI 4001-01 0.1 M	HI 4001-02 100 mg/L (ppm)	HI 4001-03 1000 mg/L (ppm)	HI 4000-52 replacement cap HI 4001-51 membrane kit HI 4000-51 replacement pH internal and cap for ammonia HI 4001-45 conditioning solution HI 4000-47 4 and 7 pH with salt
Bromide	solid	HI 4002	HI 4102	HI 4000-00	HI 7072	HI 4002-01 0.1 M			HI 4000-70 polishing strip
Cadmium	solid	HI 4003	HI 4103	HI 4000-00	HI 7072	HI 4003-01 0.1 M			HI 4000-70 polishing strip
Calcium	polymer membrane	HI 4004	HI 4104	HI 4004-00	HI 7082	HI 4004-01 0.1 M			HI 4004-51 module HI 4104-51 module for combination HI 4004-45 conditioning solution
Carbon Dioxide	gas	–	HI 4105	HI 4005-00	HI 4005-40	HI 4005-01 0.1 M		HI 4005-03 1000 mg/L (ppm)	HI 4000-54 replacement pH internal and cap for CO_2 HI 4005-53 CO_2 membrane kit (3 pack) HI 4000-47 4 and 7 pH with salt HI 4005-45 conditioning solution
Chloride	solid	HI 4007	HI 4107	HI 4000-00	HI 7072	HI 4007-01 0.1 M	HI 4007-02 100 mg/L (ppm)	HI 4007-03 1000 mg/L (ppm)	HI 4000-70 polishing strip
Cupric	solid	HI 4008	HI 4108	HI 4000-00	HI 7072	HI 4008-01 0.1 M			HI 4000-70 polishing strip
Cyanide	solid	HI 4009	HI 4109	HI 4001-00	HI 7072				HI 4000-70 polishing strip
Fluoride	solid	HI 4010	HI 4110	HI 4010-00 HI 4010-05 HI 4010-06 HI 4010-30	HI 7075	HI 4010-01 0.1M	HI 4010-02 100 mg/L (ppm)	HI 4010-03 1000 mg/L (ppm)	HI 4010-11 1 ppm with TISAB II HI 4010-12 2 ppm with TISAB II HI 4010-10 10 ppm with TISAB II HI 4110-51 module for combination HI 4010-30 Fluoride measurement kit
Iodide	solid	HI 4011	HI 4111	HI 4000-00	HI 7072	HI 4011-01 0.1 M			HI 4000-70 polishing strip
Lead/ Sulfate	solid	HI 4012	HI 4112	HI 4012-00	HI 7072	HI 4012-01 lead HI 4012-21 sulfate 0.1 M			HI 4000-70 polishing strip
Nitrate	polymer membrane	HI 4013	HI 4113	HI 4013-00	HI 7078	HI 4013-01 0.1 M	HI 4013-02 100 mg/L (ppm)	HI 4013-03 1000 mg/L (ppm)	HI 4013-53 module (3 pack) HI 4113-53 module for combination (3 pack) HI 4013-06 Interferent suppressant ISA
Potassium	polymer membrane	HI 4014	HI 4114	HI 4014-00	HI 7076	HI 4014-01 0.1 M			HI 4014-51 module HI 4114-51 module for combination
Silver/ Sulfide	solid	HI 4015	HI 4115	HI 4000-00 (Ag^+) HI 4015-00 (S^{2-})	HI 7072	HI 4015-01 0.1 M silver			HI 4000-70 polishing strip
Reference	–	HI 5315			HI 7072 HI 7075 HI 7076 HI 7082 HI 7078				

HI 4222 • HI 4522

Research Grade Meters with Calibration Check™

pH/ORP/ISE and EC/TDS/Resistivity/Salinity and Temperature

- **Up to eight measurement parameters (HI 4522)**
- **Two input channels**
  pH/ORP/ISE and EC/TDS/Resistivity/Salinity for HI 4522
  pH/ORP/ISE for HI 4222
- **pH Calibration Check™**
- **Five point pH and ISE calibration with standard and custom buffers**
- **USP 645 method, ISE incremental methods and salinity scales (HI 4522)**
- **Fully customizable**
- **GLP features**
- **Large log memory with different logging methods**

HI 4522 is a research grade, benchtop instrument that features eight measurement ranges: pH, ORP (Oxidation Reduction Potential), ISE, conductivity, resistivity, TDS, salinity and temperature. HI 4222 is a research grade pH, ORP and temperature benchtop meter. These instruments incorporate dual channels with a separate temperature input and support the external reference electrodes required by some pH and ISE sensors.

The customizable user interface can display two channels at the same time, showing the measurements in various modes: basic measurement with or without GLP information, graph or log history.

These instruments offer multi-language support and contextual help is available through a dedicated Help key. Clear tutorial messages and directions are available on-screen to quickly and easily guide users through all measurement and calibration procedures to ensure measurements and procedures are performed properly.

HANNA's pH Calibration Check™ diagnostics system ensures accurate readings every time by alerting users of potential problems during the calibration process. The Calibration Check™ system eliminates erroneous readings due to dirty or faulty pH electrodes or contaminated pH buffer solutions. After the guided calibration process, an electrode condition indicator is displayed on the LCD informing the user of the overall pH electrode status.

Automatic, semiautomatic and manual pH calibration is available in up to five points, with eight standard (1.68, 3.00, 4.01, 6.86, 7.01, 9.18, 10.01 and 12.45) and up to 5 custom buffers. The Out of Calibration Range and Cal Due features alert the user in the event the measurement is far from the calibration point or when the meter is due for recalibration. Proper, scheduled calibrations are crucial for accurate and repeatable measurements.

These instruments also feature up to five point Manual Selection and Custom Standard ISE calibration with up to five standard solutions and up to five custom solutions with or without temperature compensation (HI 4522 only). From the on-screen list, users can select their ISE electrode parameter along with it's standard configuration profile or create their own.

Up to a four point automatic or custom standard conductivity calibration can be performed in up to four points as well as probe cell constant. One fixed point salinity calibration can be performed (Percent Scale only), with a user selectable salinity range: practical scale, natural sea water scale, percentage scale (HI 4522 only).

Up to 10 profiles can be saved and recalled eliminating the need to reconfigure each time when a different electrode is used. User definable configurations can include: temperature compensation in accordance with each parameter, ISO-potential points for pH and ISE, measurement units of ISE concentrations and ISE electrode type, temperature units, and for HI 4522, EC temperature reference, EC temperature coefficient, EC probe type, and cell constant as well.

Three selectable logging modes are available: Automatic, Manual and AutoHold logging. Up to 100 logging lots can be stored for automatic or manual modes along with up to 200 USP reports, and up to 100 ISE methods reports. Automatic logging features a selectable area and sampling period while GLP information includes complete data about user calibration of each parameter and identification information for the instrument, user, and company. Data can be transferred to a PC via the opto-isolated PC interface via the RS232 or USB ports and HI 92000 software (optional).

SPECIFICATIONS		HI 4222	HI 4522
pH	Range	-2.000 to 20.000 pH	
	Resolution	0.1 pH; 0.01 pH; 0.001 pH	
	Accuracy	±0.1 pH; ±0.01 pH; ±0.002 pH ±1 LSD	
mV	Range	±2000 mV	
	Resolution	0.1 mV	
	Accuracy	±0.2 mV ±1 LSD	
ISE	Range	1 x 10^{-6} to 9.99 x 10^{10} concentration	
	Resolution	1; 0.1; 0.01; 0.001 concentration	
	Accuracy	±0.5% (monovalent ions); ±1% (divalent ions)	
Conductivity	Range	–	0.000 to 9.999 µS/cm; 10.00 to 99.99 µS/cm; 100.0 to 999.9 µS/cm; 1.000 to 9.999 mS/cm; 10.00 to 99.99 mS/cm; 100.0 to 999.9 mS/cm; 1000.0 mS/cm
	Resolution	–	0.001 µS/cm; 0.01 µS/cm; 0.1 µS/cm; 0.001 mS/cm; 0.01 mS/cm; 0.1 mS/cm
	Accuracy	–	±1% of reading (±0.01 µS/cm)
	Cell Constant	–	0.0500 to 200.00
	Cell Type	–	2, 4 rings
	Calibration Type	–	auto standard recognition, user standard single point / multi point calibration
	Calibration Reminder	–	yes
	Temperature Coefficient	–	0.00 to 10.00 %/°C
	Reference Temperature	–	15.0 °C to 30.0°C
	Profiles	–	up to 10
	USP Compliant	–	yes
Resistivity	Range	–	1.0 to 99.9 Ohms x cm; 100 to 999 Ohms x cm; 1.00 to 9.99 kOhms x cm; 10.0 to 99.9 kOhms x cm; 100 to 999 kOhms x cm; 1.00 to 9.99 MOhms x cm; 10.0 to 100.0 MOhms x cm
	Resolution	–	0.1 Ohms x cm; 1 Ohms x cm; 0.01 kOhms x cm; 0.1 kOhms x cm; 1 kOhms x cm; 0.01 MOhms x cm; 0.1 MOhms x cm
	Accuracy	–	±2% of reading (±1 Ohm x cm)
TDS	Range	–	0.000 to 9.999 ppm; 10.00 to 99.99 ppm; 100.0 to 999.9 ppm; 1.000 to 9.999 ppt; 10.00 to 99.99 ppt; 100.0 to 400.0 ppt actual TDS (with 1.00 factor)
	Resolution	–	0.001 ppm; 0.01 ppm; 0.1 ppm; 0.001 ppt; 0.01 ppt; 0.1 ppt
	Accuracy	–	±1% of reading (±0.01 ppm)
Salinity	Range	–	practical scale: 0.00 to 42.00 psu; natural sea water scale: 0.00 to 80.00 ppt; percent scale: 0.0 to 400.0%
	Resolution	–	0.01 for practical scale/natural sea water scale; 0.1% for percent scale
	Accuracy	–	±1% of reading
Temperature	Range	-20.0 to 120°C; -4.0 to 248.0°F; 253.15 to 393.15K	
	Resolution	0.1°C; 0.1°F; 0.1K	
	Accuracy	±0.2°C; ±0.4°F; ±0.2K (without probe)	
Calibration	pH	automatic, up to five point calibration, eight standard buffers available (1.68, 3.00, 4.01, 6.86, 7.01,9.18, 10.01, 12.45), and five custom buffers	
	ISE	automatic, up to five point calibration, 5 fixed standard solutions available for each measurement unit, and 5 user defined standards	
	Conductivity	–	auto standard recognition, user standard single point/multi-point
	Salinity	–	percent scale–1 point (with HI 7037 standard)
pH Calibration Check™		yes	
Relative mV Offset Range		±2000 mV	
Input Channel(s)		2 pH/ORP/ISE	1 pH/ORP/ISE + 1 EC
GLP		cell constant, reference temperature/coefficient, calibration points, cal time stamp	
Temperature Compensation	pH	automatic or manual from -20.0 to 120.0°C/-4.0 to 248.0°/253 to 393K	
	EC	–	disabled, linear and non-linear (natural water)
pH Electrode		HI 1131B glass body pH electrode with BNC connector and 1 m (3.3') cable (included)	
EC Probe		–	HI 76312 platinum, 4-ring conductivity/TDS probe with internal temperature sensor and 1 m (3.3') cable (included)
Temperature Probe		HI 7662-T stainless steel temperature probe with 1 m (3.3') cable (included)	
Logging	Record	100 lots with 10,000 record/lot	
	Interval	settable between 1 and max log time	
	Type	automatic, log on demand, auto HOLD	
Replatinization		–	yes
Display		240 x 320 dot-matrix color LCD with on-screen help, graphing, language selection and custom configuration	
PC Connection / Power Supply		USB and RS232 / 12 VDC adapter (included)	
Environment / Dimensions / Weight		0-50°C (32 to 122°F) (273 to 323K) RH max 95% non-condensing / 160 x 231 x 94 mm (6.3 x 9.1 x 3.7") / 1.2 Kg (1.8 lbs.)	

ORDERING INFORMATION

HI 4522-01 (115V), **HI 4522-02** (230V), **HI 4222-01** (115V) and **HI 4222-02** (230V) are supplied with HI 76312 conductivity/TDS probe (HI4522 only), HI 1131B pH electrode, HI 7662-T temperature probe, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 700661 electrode cleaning solution sachet (2), HI 7071S electrolyte solution (30 mL), HI 76404N electrode holder, 12 VDC adapter and instructions.

SOLUTIONS

HI 6004	pH 4.010 buffer solution, 500 mL
HI 6007	pH 7.010 buffer solution, 500 mL
HI 6010	pH 10.010 buffer solution, 500 mL
HI 7030L	12880 µS/cm cal. solution, 500 mL
HI 7031L	1413 µS/cm calibration solution, 500 mL
HI 7033L	84 µS/cm calibration solution, 500 mL
HI 7034L	80000 µS/cm cal. solution, 500 mL
HI 7035L	111800 µS/cm cal. solution, 500 mL
HI 7039L	5000 µS/cm cal. solution, 500 mL
HI 7037L	Salinity standard solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL

ACCESSORIES

HI 92000	Windows® compatible software
HI 920013	USB cable for PC connection

For a complete list of Solutions and Electrodes, see the end of pH *Section 3*, ISE *Section 4* and Conductivity *Section 6*.

HI 3512

Two Channel, pH/ORP/ISE, EC/TDS/NaCl/Resistivity Benchtop Meter

- pH Calibration Check™ and electrode condition
- Up to five point pH and ISE calibration
- Seven standard pH buffers for calibration
- pH calibration with up to two custom buffers
- EC calibration for up to two calibration points
- Seven memorized EC standards for calibration
- Messages on the graphic LCD for an easy and accurate calibration
- Contextual help at the touch of a button
- Multi-language support
- Automatic logging interval up to 600 records
- Log on demand up to 400 samples
- GLP features
- PC interface via USB

The HI 3512 is a 2 channel professional benchtop meter with a graphic LCD, designed to provide accurate laboratory results. Channel 1 features pH/ORP/ISE and temperature measurement capability while channel 2 measures EC/TDS/NaCl/Resistivity and temperature.

The pH channel offers up to five point pH calibration with seven standard buffers (pH 1.68, 4.01, 6.86, 7.01, 9.18, 10.01 and 12.45) and up to two custom buffers.

HANNA's exclusive Calibration Check™ diagnostics system ensures accurate pH readings every time by alerting users of potential problems during the calibration process. The Calibration Check™ system eliminates erroneous readings due to dirty or faulty pH electrodes or contaminated pH buffer solutions. After the guided calibration process, a probe condition indicator is displayed on the LCD informing the user of the overall pH electrode status.

This instrument can measure using ORP electrodes (pH channel input), thanks to its capability to measure mV with a resolution up to 0.1 mV and ISE electrodes on ppm scale (pH channel input). The electrode type and unit selection capability and the ISE calibration in up to five calibration standard solutions make this instrument very useful for a large range of concentration solution measurements.

The EC channel offers up to two calibration points with 7 memorized standards (0.00 µS/cm, 84.0 µS/cm, 1.413 mS/cm, 5.00 mS/cm, 12.88 mS/cm, 80.0 mS/cm and 111.8 mS/cm). The EC channel supports autoranging, manual ranging and lock of the user selected range, temperature compensation selection, temperature reference selection (15 °C, 20 °C or 25 °C) and temperature coefficient set.

pH and EC channels also provide user selectable "out of calibration range" warnings and a "calibration timeout" to remind the user when a new calibration is necessary.

Messages on the graphic LCD offer directions for easy and accurate calibration for both channels as well as diagnostics to alert the user when calibration or measurement issues are detected.

Other features of the HI 3512 include log-on-demand of up to 400 samples, automatic logging interval with log on stability feature of up to 600 records, auto HOLD that freezes the first stable reading on the LCD display, GLP to view the last calibration data for pH, rel mV, ISE, EC or NaCl and PC interface via USB.

SPECIFICATIONS		HI 3512
pH	Range	-2.0 to 20.0; -2.00 to 20.00; -2.000 to 20.000 pH
	Resolution	0.1 pH; 0.01 pH; 0.001 pH
	Accuracy	±0.01 pH; ±0.002 pH
mV	Range	±2000.0 mV
	Resolution	0.1 mV
	Accuracy	±0.2 mV
ISE	Range	1.00 E-7 to 9.99 E10 conc.
	Resolution	3 digits 0.01, 0.1, 1, 10 conc.
	Accuracy	±0.5% of reading (monovalent ions); ±1% of reading (divalent ions)
Temperature Channel 1	Range	-20.0 to 120.0 °C (4.0 to 248.0 °F)
	Resolution	0.1 °C (0.1 °F)
	Accuracy	±0.2 °C (±0.4 °F) (excluding probe error)
Relative mV Offset Range		±2000 mV
pH Calibration		up to five point calibration, seven standard buffers available (1.68, 4.01, 6.86, 7.01, 9.18, 10.01, 12.45), and two custom buffers
pH Calibration Check™		yes
Slope Calibration		from 80 to 110%
pH Temperature Compensation		manual or automatic from -20.0 to 120.0 °C (-4.0 to 248.0 °F)
pH Electrode		HI 1131B glass body pH electrode with BNC connector and 1 m (3.3') cable (included)
Temperature probe		HI 7662-T temperature probe with 1 m (3.3') cable (included)
ISE Calibration		up to five-point calibration points 6 standard solutions available (0.1, 1, 10, 100, 1000, 10000 ppm)
EC	Range	0.000 to 400 mS/cm (shows values up to 1000 mS/cm) actual conductivity 1000 mS/cm; 0.001 to 9.999 µS/cm; 10.00 to 99.99 µS/cm; 100.0 to 999.9 µS/cm; 1.000 to 9.999 mS/cm; 10.00 to 99.99 mS/cm; 100.0 to 999.9 mS/cm; 1000 mS/cm (autoranging)
	Resolution	0.001 µS/cm; 0.01 µS/cm; 0.1 µS/cm; 0.001 mS/cm; 0.01 mS/cm; 0.1 mS/cm; 1 mS/cm
	Accuracy	±1% of reading (±0.01 µS/cm or 1 digit whichever is greater) excluding probe error
Resistivity	Range	01.0 to 199.9 ohms; 100 to 1.999 ohms; 1.00 to 19.99 Kohms; 10.0 to 199.9 Kohms; 100 to 1.999 Kohms; 1.00 to 19.99 Mohms; 10.0 to 100.0 Mohms (autoranging)
	Resolution	0.1 ohm; 1 ohm; 0.01 Kohms; 0.1 Kohms; 1 Kohms; 0.01 Mohms; 0.1 Mohms
	Accuracy	±1% of reading (±10 ohms or 1 digit whichever greater) excluding probe error
TDS	Range	0.000 to 9.999 ppm; 10.00 to 99.99 ppm; 100.0 to 999.9 ppm; 1.000 to 9.999 g/L; 10.00 to 99.99 g/L; 100.0 to 400.0 g/L (autoranging)
	Resolution	0.001 ppm; 0.01 ppm; 0.1 ppm; 0.001 g/L; 0.01 g/L; 0.1 g/L
	Accuracy	±1% of reading (±0.05 ppm or 1 digit whichever greater) excluding probe error
	Factor	0.40 to 1.00
Salinity	Range	% NaCl: 0.0 to 400.0 %
	Resolution	0.1 %
	Accuracy	±1% of reading excluding probe error
Temperature Channel 2	Range	-20.0 to 120°C
	Resolution	0.1°C
	Accuracy	±0.2 °C (excluding probe error)
EC Calibration		automatic up to two points with seven memorized standards (0.00 µS/cm, 84.0 µS/cm, 1.413 mS/cm, 5.00 mS/cm, 12.88 mS/cm, 80.0 mS/cm, 111.8 mS/cm)
Constant Cell Setup		0.010 to 10.000
NaCl Calibration		max. one point only (with HI 7037 standard)
EC Probe		HI 76310 platinum four ring conductivity/TDS probe with 1 m (3.3') cable (included)
Temperature Source		automatic from sensor inside the probe; manual entry
EC Temperature Compensation		NoTC, MTC, ATC
Reference Temperature		15, 20, 25 °C
Temperature Coeficient		0.00 to 10.00 %/°C
Log On Demand		400 samples
Lot Logging		5, 10, 30 seconds; 1, 2, 5, 10, 15, 30, 60, 120, 180 minutes (max 600 samples)
PC interface		opto-isolated USB
Input Impedance		10^{12} ohms
Power Supply		12 VDC adapter (included)
Environment / Dimensions / Weight		0 to 50 °C (32 - 122 °F) RH max 55% non-condensing / 235 x 207 x 110 mm (9.2 x 8.14 x 4.33") / 1.8 Kg (4.1 lbs.)

ORDERING INFORMATION

HI 3512-01 (115V) and **HI 3512-02** (230V) is supplied with HI 76310 conductivity/TDS probe, HI 1131B pH electrode, HI 7662-T temperature probe, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 700661 electrode cleaning solution sachet (2), HI 7071S electrolyte solution (30 mL), HI 76404N electrode holder, 12 VDC adapter and instructions.

SOLUTIONS

HI 6016 pH 1.679 buffer solution, 500 mL
HI 6004 pH 4.010 buffer solution, 500 mL
HI 6007 pH 7.010 buffer solution, 500 mL
HI 6010 pH 10.010 buffer solution, 500 mL
HI 6124 pH 12.450 buffer solution, 500 mL
HI 7030L 12880 µS/cm calibration solution, 500 mL
HI 7031L 1413 µS/cm calibration solution, 500 mL
HI 7033L 84 µS/cm calibration solution, 500 mL
HI 7034L 80000 µS/cm calibration solution, 500 mL
HI 7035L 111800 µS/cm calibration solution, 500 mL
HI 7039L 5000 µS/cm calibration solution, 500 mL
HI 7037L Salinity standard solution, 500 mL
HI 7061L Electrode cleaning solution, 500 mL
HI 70300L Electrode storage solution, 500 mL

ACCESSORIES

HI 76404N Electrode holder
HI 92000 Windows® compatible software
HI 920013 USB cable for PC connection

For a complete list of Solutions and Electrodes, see the end of pH *Section 3*, ISE *Section 4* and Conductivity *Section 6*.

HI 3221 • HI 3222

pH/ORP/ISE Graphic LCD pH Benchtop Meters

- One or two input channels
- pH Calibration Check™
- Five point pH calibration with seven standard and five custom buffers
- Stability, interval and log on demand logging
- Up to 400 log on demand records and 600 automatic logging records
- Messages on the graphic LCD for an easy and accurate calibration
- Multi-language support
- GLP features
- PC interface via USB

HANNA's HI 3221 and HI 3222 benchtop instruments feature up to five point pH calibration with a choice of five custom buffers and seven standard buffers.

The HI 3221 and HI 3222 can use ISE electrodes in the ppm scale (pH channel input) and provides a choice of measurement units (ppb, ppm, molarity, weight/volume %). The electrode type and unit selection capability and the ISE calibration in up to five calibration standard solutions (HI 3222 only) make these instruments very useful for a large range of concentration solutions measurements.

HI 3221 and HI 3222 feature a powerful interactive user support interface that assists you before, during and after measurement. On-screen tutorials guide users through set-up, calibration and measurement while context sensitive help of any screen is available at a push of a button. The help screen includes language specific assistance for menu parameters, calibration, logging, contact information and accessories for your instrument.

These instruments feature HANNA's exclusive Calibration Check™, a diagnostics system that ensures accurate pH readings every time. By alerting users of potential problems during the calibration process, the Calibration Check™ system eliminates erroneous readings due to dirty or faulty pH electrodes or contaminated pH buffer solutions. Throughout the calibration process, users are guided step-by-step by the on-screen tutorial. After calibration, a probe condition indicator is displayed on the LCD informing the user of the overall pH electrode status.

HI 3221 is equipped with one input channel while the HI 3222 is equipped with two input channels for simultaneous measurements. Having these two channels eliminates the need for swapping probes and recalibrating.

These instruments can measure using ORP electrodes (pH channel input), thanks to their capability to measure mV with a resolution up to 0.1 mV.

SPECIFICATIONS		HI 3221	HI 3222
Range	pH	-2.0 to 20.0; -2.00 to 20.00; -2.000 to 20.000 pH	
	mV	±2000 mV	
	ISE	1.00 E-3 to 1.00 E5 concentration	1.00 E-7 to 9.99 E10 concentration (choice of units)
	Temperature	-20.0 to 120.0 °C (-4.0 to 248.0°F)	
Resolution	pH	0.1; 0.01; 0.001 pH	
	mV	0.1 mV	
	ISE	3 digits 0.01; 0.1; 1; 10 concentration	
	Temperature	0.1°C (0.1°F)	
Accuracy (@ 20°C/68°F)	pH	±0.01; ±0.002 pH	
	mV	±0.2 mV	
	ISE	±0.5% of reading (monovalent ions), ±1% of reading (divalent ions)	
	Temperature	±0.2°C (±0.4°F) (excluding probe error)	
Calibration	pH	up to five point calibration, seven standard buffers available (1.68, 4.01, 6.86, 7.01, 9.18, 10.01, 12.45) + five custom buffers	
	ISE	up to two point calibration, six standard solutions (0.1, 1, 10, 100, 1000, 10000 ppm)	up to five point calibration, six standard solutions (in units selected)
	Slope	from 80 to 110%	
pH Calibration Check™		yes	
Rel mV Offset Range		±2000 mV	
Temperature Compensation (pH)		manual or automatic from -20.0 to 120.0°C (-4.0 to 248.0°F)	
Input Channels		1	2
pH Electrode		HI 1131B pH electrode with glass body, BNC connector and 1 m (3.3') cable (included)	
Temperature Probe		HI 7662-T temperature probe, stainless steel with 1 m (3.3') cable (included)	
Logging		log on demand 300 samples	log on demand 400 samples
Lot Logging		5, 10, 30 seconds; 1, 2, 5, 10, 15, 30, 60, 120, 180 minutes (max 600 samples)	
PC Connectivity		opto-isolated USB (with optional HI 92000 software)	
Input Impedance		10^{12} Ohms	
Power Supply		12 VDC adapter (included)	
Environment		0-50°C (32 to 122°F) RH max 55% non-condensing	
Dimensions		235 x 207 x 110 mm (9.2 x 8.14 x 4.33")	
Weight		1.8 kg (4.1 lbs.)	

ORDERING INFORMATION

HI 3221-01 (115V), **HI 3221-02** (230V), **HI 3222-01** (115V) and **HI 3222-02** (230V) are supplied with HI 1131B pH electrode, HI 7662-T temperature probe, HI 76404N electrode holder, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 700661 electrode cleaning solution sachet (2), HI 7071S electrolyte solution (30 mL), 12 VDC adapter and instructions.

ELECTRODES

All electrodes part numbers ending in "B" are supplied with a BNC connector and 1 m (3.3') cable, as shown below:

HI 1043B	Use: strong acid/alkalis; Glass-body, double junction, refillable, combination pH electrode
HI 1053B	Use: emulsions; Glass-body, triple ceramic, refillable, combination pH electrode
HI 1083B	Use: biotechnology; Glass-body, open junction, refillable, combination pH electrode
HI 1131B	Use: general purpose; Glass-body, single junction, refillable, combination pH electrode
HI 3230B	Use: general purpose; Plastic-body, gel-filled, combination platinum ORP electrode
HI 7662-T	Stainless steel temperature probe with 1 m (3.3') cable

SOLUTIONS

HI 5004L	pH 4.01 buffer solution, 500 mL
HI 5007L	pH 7.01 buffer solution, 500 mL
HI 5010L	pH 10.01 buffer solution, 500 mL
HI 7020L	ORP test solution @200-275 mV, 500 mL
HI 7021L	ORP test solution @240 mV, 500 mL
HI 7022L	ORP test solution @470 mV, 500 mL
HI 7091L	Reducing pretreatment ORP solution, 500 mL
HI 7092L	Oxidizing pretreatment ORP solution, 500 mL
HI 7071	3.5M KCl + AgCl electrolyte solution, 30 mL (4), for single junction electrodes
HI 7082	3.5M KCl electrolyte solution, 30 mL (4), for double junction electrodes
HI 7061L	Electrode cleaning solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL

ACCESSORIES

HI 740157	Plastic refilling pipette (20)
HI 76404N	Electrode holder
HI 92000	Windows® compatible software
HI 920013	USB cable for PC connection

For a complete list of Solutions and Electrodes, see the end of pH *Section 3* and ISE *Section 4*.

HI 123

pH Benchtop Meter with Built-in Printer

- pH Calibration Check™
- Electrode response time
- Five pH calibration points
- Seven standard and two custom buffers
- Out of calibration range warning
- Large, custom LCD
- Built-in impact printer
- Separate pH and ISE channels (HI 123)
- Automatic data logging of 2000 records and log on demand
- GLP capabilities

HI 123 is benchtop instrument featuring a built-in printer, Calibration Check™, electrode response and condition monitoring and enhanced diagnostic messages during calibration. HI 123 also features dual inputs to measure both pH and ISE simultaneously.

ORDERING INFORMATION

HI 123-01 (115V) and **HI 123-02** (230V) are supplied with HI 1131P pH electrode, HI 7662-T temperature probe, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 7071 electrolyte solution (30 mL), (5) paper rolls, 12 VDC adapter and instructions.

ELECTRODES

All electrode part numbers ending in "P" are supplied with a BNC and PIN connector and 1 m (3.3') cable:

HI 1043P	Use: strong acid/alkalis; glass-body, double junction, refillable, combination pH electrode
HI 1053P	Use: emulsions; glass-body, triple ceramic, refillable, combination pH electrode
HI 1083P	Use: biotechnology; glass-body, open junction, refillable, combination pH electrode

SOLUTIONS

HI 5004L	pH 4.01 buffer solution, 500 mL
HI 5007L	pH 7.01 buffer solution, 500 mL
HI 5010L	pH 10.01 buffer solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL
HI 7071	3.5M KCl+AgCl Electrolyte, 30 mL (4), for single junction electrodes
HI 7072	1M KNO_3 Electrolyte, 30 mL (4)
HI 7082	3.5M KCl Electrolyte, 30 mL (4), for double junction electrodes

ACCESSORIES

HI 710032	(10) Plain paper rolls
HI 710033	Replacement ink cartridge
HI 76405	Electrode holder
HI 92000	Windows® compatible software
HI 920010	RS232 cable for PC connection

SPECIFICATIONS		HI 123
Range	**pH**	-2.00 to 16.00 pH / -2.000 to 16.000 pH
	mV	±999.9 and ±2000 mV
	Selective Ions	0.001 to 19999 ppm
	Temperature	-20.0 to 120.0°C (-4.0 to 248.0°F)
Resolution	**pH**	0.01 pH / 0.001 pH
	mV	0.1 mV / 1 mV
	Selective Ions	0.001 / 0.01 / 0.1 / 1 ppm
	Temperature	0.1°C (0.1°F)
Accuracy (@20°C/68°F)	**pH**	±0.01 pH / ±0.002 pH
	mV	±0.2 mV (±699.9 mV) / ±0.5 mV (±999.9 mV) / ±1 mV (±2000 mV)
	Selective Ions	±0.5% f.s.
	Temperature	±0.4°C (±0.7°F) excluding probe error
BNC Inputs		1 for pH electrode
pH Calibration Check™		status of electrode condition and response time, status of the buffer solutions during calibration
Relative mV Offset Range		±2000 mV
pH Calibration		automatic, up to five point calibration standard with seven buffers (1.68, 4.01, 6.86, 7.01, 9.18, 10.01, 12.45) + two custom buffers
ISE Calibration		automatic, one or two point with five standard values (0.1, 1, 10,100, 1000 ppm)
Temperature Compensation		automatic or manual, -20.0 to 120°C (-4.0 to 248.0°F)
pH Electrode		HI 1131P glass body pH electrode with BNC + pin connectors and 1 m (3.3') cable (included)
Temperature Probe		HI 7662-T temperature probe, stainless steel with 1 m (3.3') cable (included)
Input Impedance		10^{12} Ohm
Log On Demand		100 samples
Automatic Logging		2000 samples
PC Connection		RS232 serial port, opto-isolated
Printer		built-in dot matrix printer, with 44 mm plain paper
Power Supply		12 VDC adapter (included)
Environment		0 to 50°C (32 to 122°F); RH max 95%
Dimensions		280 x 203 x 84 mm (11.0 x 8.0 x 3.3")
Weight		1.9 kg (4.2 lbs.)

For a complete list of Solutions and Electrodes, see the end of pH *Section 3* and ISE *Section 4*.

0.001 Resolution pH/ORP/ISE/°C Benchtop Meter

- **Up to five point pH calibration with seven standard buffers**
- **Up to two point ISE calibration with five standard solutions**
- **0.001 pH resolution**
- **Calibration expiration reminder**
- **GLP features**
- **Automatic Temperature Compensation**
- **Manually log up to 200 records and interval log up to 500 records**
- **PC interface via USB**

The HI 2216 is a pH, ORP, ISE meter with five point pH calibration and 0.001 pH resolution.

This instrument provides GLP capabilities that allows for the storage and retrieval of all data regarding pH, ORP, and ISE calibration.

HI 2216 can perform measurements through the pH channel input using ORP electrodes in the mV scale and ISE electrodes in the ppm scale. A relative mV feature is also provided.

SPECIFICATIONS		HI 2216
Range	pH	-2.0 to 16.0 pH; -2.00 to 16.00 pH; -2.000 to 16.000 pH
	mV	±999.9 mV (ORP); ±2000 mV (ORP)
	ISE	0.001 to 19990 ppm
	Temperature	-20.0 to 120.0 °C (-4.0 to 248.0°F)
Resolution	pH	0.1 pH; 0.01 pH; 0.001 pH
	mV	0.1 mV (±999.9 mV); 1 mV (±2000 mV)
	ISE	0.001 (to 1.999 ppm); 0.01 (to 19.99 ppm); 0.1 (to 199.9 ppm); 1 (to 1999 ppm); 10 (to 19990 ppm)
	Temperature	0.1 °C
Accuracy (@20°C/68°F)	pH	±0.1 pH; ±0.01 pH; ±0.002 pH
	mV	±0.2 mV (±999.9 mV); ±1 mV (±2000 mV)
	ISE	±0.5% FS
	Temperature	±0.2°C (excluding probe error)
Relative mV Offset		±2000 mV
pH Calibration		automatic, up to five point calibration with seven standard buffers available (1.68, 4.01, 6.86, 7.01, 9.18, 10.01, 12.45), and two custom buffers
ISE Calibration		automatic, one or two points with five available buffers (0.1, 1, 10, 100, 1000 ppm)
Temperature Compensation		manual or automatic (with HI 7662 probe) from -20.0 to 120.0 °C (-4.0 to 248.0°F)
pH Electrode		HI 1131B glass body pH electrode with BNC connector and 1 m (3.3') cable (included)
Temperature Probe		HI 7662 stainless steel temperature probe with 1 m (3.3') cable (included)
Input Impedance		10^{12} ohm
PC Connectivity		opto-isolated USB
Data Logging		log on demand, 200 records; autologging, 500 records
Logging Interval		stability logging ("StAb") 5, 10, 30 seconds; 1, 2, 5, 10, 15, 30, 60, 120, 180 minutes
Power Supply		12 VDC adapter (included)
Environment		0 to 50°C (32 to 122°F); RH max 95%
Dimensions		235 x 222 x 109 mm (9.2 x 8.7 x 4.3")
Weight		1.3 Kg (2.9 lb.)

ORDERING INFORMATION

HI 2216-01 (115V) and **HI 2216-02** (230V) is supplied with HI 1131B pH electrode, HI 7662 temperature probe, HI 76404N electrode holder, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 7071S electrolyte solution (30 mL), HI 700661 cleaning solution sachet, 12 VDC adapter and instructions.

ELECTRODES

Combination pH electrodes provided with BNC + Pin connectors and 1 m (3.3') cable:

HI 1043P	Use: strong acids and bases. glass-body, double junction, refillable
HI 1053P	Use: emulsions. glass-body, triple ceramic junction, refillable
HI 1083P	Use: biotechnology. glass-body, open junction, refillable
HI 1131P	Use: general purpose. glass-body, ceramic junction, refillable
HI 1332P	Use: general purpose. PEI body, double junction, refillable

SOLUTIONS

HI 5004L	pH 4.01 buffer solution, 500 mL
HI 5007L	pH 7.01 buffer solution, 500 mL
HI 5010L	pH 10.01 buffer solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL

ACCESSORIES

HI 92000	Windows® compatible software
HI 920013	USB cable for PC connection

For a complete list of Solutions and Electrodes, see the end of pH *Section 3* and ISE *Section 4*.

HI 98184 • HI 98185

pH/ORP/ISE Waterproof Portable Meters

Feature Highlights

- **pH Calibration Check™**
- **Electrode condition on display**
- **Five point pH calibration with seven standard buffers and five custom buffers**
- **Automatic logging and log on demand**
- **Menu driven for ease of use**
- **Soft-key extended functionality**
- **Multiple language selection**
- **Contextual help at the touch of a button**
- **GLP features**
- **USB**
- **Backlit, graphic LCD and battery life on display**
- **Waterproof and rugged casing**

Rechargeable batteries

These models have up to 200 hours of extended battery life to guarantee long operation in the field. When the batteries are low, you don't have to worry about carrying a spare set with you, the batteries can be recharged with HANNA's inductive recharger. Simply leave the meter on the recharger for a few hours and you're ready to go. The recharger can be plugged into a standard 115V or 230V socket using the appropriate HANNA adapter.

HI 98184 and HI 98185 are waterproof, portable meters designed for demanding applications. HI 98184 and HI 98185 measures pH/ORP/ISE and temperatuare.

Choose from 7 standard pH buffers and 5 custom pH buffers to obtain up to five point calibration and achieve high precision readings with a pH accuracy of ±0.002 and up to ±0.001 pH resolution.

HANNA's Calibration Check™ maintains a history of past calibrations and monitors the pH electrode and buffers during subsequent calibrations for any signs of wide calibration variances due to a dirty or broken electrode or contaminated pH buffers. In measurement mode, the electrode's percent condition is continuously displayed.

Exchange the pH probe for an ORP probe to obtain mV readings in the ±2000 mV range. HI 98184 and HI 98185 adds direct ion concentration readings for ISE's and the results are displayed in ppm. The ion charge or nominal slope can be entered manually.

HI 98185 supports 15 different ISE sensors by default and can be calibrated with up to five points and 6 standard buffers (choice of units). This unit allows an extensive choice of measurement units (ppm, ppt, g/L, ppb, ug/L, mg/mL, M, mol/L, mmol/L, % w/v, user) and has an expanded measuring range of 1.00×10^{-7} to 9.99×10^{-10}.

Press Auto-Hold while measuring and once stabilized, the current reading will remain displayed for your convenience in documenting. Switching to log-on-demand mode allows users to record and save up to 300 samples. This data can later be transferred to a PC with the USB connection and HANNA's HI 92000 software. "Out Of Calibration Range Warning" can be engaged to keep the user informed of the current calibration and helps to avoid taking measurements that are out of range.

A backlit, graphic LCD provides easy to read resolution even in low-lit conditions. A combination of dedicated and soft keys allows easy, intuitive operation in a choice of languages. Comprehensive GLP data are directly accessible by pressing the GLP key. Access the contextual Help Menu to obtain on-screen information and assistance about each feature at the touch of a button. Designed for field use, these instruments can be operated with one hand and are supplied in a rugged carrying case. With an extended battery life of up to 200 hours users are assured long operation. The inductive charger can either be plugged into a standard 115V socket with the included adapter or a 12 VDC source, such as a car's 12 V accessory outlet.

These meters come equipped with the HI 72911B pH/ temperature electrode with rugged, titanium casing.

Calibration

ISE calibration features detailed messages.

Users are guided through the calibration procedure with step-by-step on-screen instructions.

Setup screen

Our extensive setup screen features a host of configurable options such as time, date, temperature units and language for help screens and guides.

Help

Users can consult the on-screen help from any mode simply by pressing the HELP key. The instrument will then explain the options currently available.

GLP

Comprehensive GLP functions are directly accessible by pressing the GLP key. Calibration data, date and ID info are stored for retrieval at a later time.

SPECIFICATIONS		HI 98184	HI 98185
Range	pH	-2.0 to 20.0; -2.00 to 20.00; -2.000 to 20.000 pH	
	mV	±2000 mV	
	ISE	from 1.00 E-3 to 1.00 E5 concentration	from 1.00 E-7 to 9.99 E10 concentration
	Temperature	-20.0 to 120.0 °C (-4.0 to 248.0°F)	
Resolution	pH	0.1; 0.01; 0.001 pH	
	mV	0.1 mV	
	ISE	3 digits 0.01; 0.1; 1; 10 concentration	
	Temperature	0.1°C (0.1°F)	
Accuracy (@20°C/68°F)	pH	±0.01; ±0.002 pH	
	mV	±0.2 mV	
	ISE	±0.5% of reading (monovalent ions), ±1% of reading (divalent ions)	
	Temperature	±0.4°C (±0.8°F) (excluding probe error)	
Calibration	pH	up to five point calibration, seven standard buffers available (1.68, 4.01, 6.86, 7.01, 9.18, 10.01, 12.45) + five custom buffers	
	ISE	up to two point calibration, six standard solutions (0.1, 1, 10, 100, 1000, 10000 ppm)	up to five point calibration, six standard solutions (0.1, 1, 10, 100, 1000, 10000 ppm)
	Slope	From 80 to 110%	
Temperature Compensation (pH)		manual or automatic from -20.0 to 120.0°C (-4.0 to 248.0°F)	
Probe		HI 72911B Titanium body, pre-amplified pH electrode with internal temperature sensor, BNC connector and 1 m (3.3' cable)	
Logging		log on demand 300 samples (100 each range)	
PC Connectivity		opto-isolated USB with optional HI 92000 software	
Input Impedance		10^{12} Ohms	
Battery Type / Life		1.2V AA rechargeable batteries (4) / approximately 200 hours of continuous use with backlight (50 hours with backlight)	
Auto-off		user selectable: 5, 10, 30, 60 min or can be disabled	
Environment		0 to 50°C (32 to 122°F); RH 100%	
Dimensions		226.5 x 95 x 52 mm (8.9 x 3.75 x 2")	
Weight		525 g (18.5 oz.)	

ORDERING INFORMATION

HI 98184-01 (115V), **HI 98184-02** (230V) and **HI 98185-01** (115V) and **HI 98185-02** (230V) are supplied with HI 72911B pH electrode, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, rechargeable batteries, HI 710042 inductive battery charger with power adapter, instructions and hard carrying case.

ELECTRODES AND PROBES

Combination pH electrodes. All part codes ending with P are provided with BNC and Pin connectors, and 1 m (3.3') cable:

HI 1043B Use: strong acids and bases. glass-body, double junction, refillable

HI 1230B Use: general purpose. PEI body, double junction, gel-filled

HI 72911B Use: general purpose. titanium body, double junction, gel-filled with internal temperature sensor

HI 3230B Use: For oxidizing reactions. platinum tipped ORP probe, PEI body, single junction, gel-filled

HI 4430B Use: Strong oxidizing solutions gold tipped ORP probe, PEI body, single junction, gel-filled

HI 7662 Temperature probe with 1 m (3.3') screened cable

SOLUTIONS

HI 5004L pH 4.01 buffer solution, 500 mL
HI 5007L pH 7.01 buffer solution, 500 mL
HI 5010L pH 10.01 buffer solution, 500 mL
HI 7061L Electrode cleaning solution, 500 mL
HI 70300L Electrode storage solution, 500 mL
HI 7091L ORP reducing pretreatment solution, 500 mL
HI 7092L ORP oxidizing pretreatment solution, 500 mL
HI 7020L ORP test solution @200-275 mV, 500 mL
HI 7021L ORP test solution @240 mV, 500 mL
HI 7020L ORP test solution @470 mV, 500 mL

ACCESSORIES

HI 920013 USB cable for PC connection
HI 92000 Windows® compatible software

For a complete list of Solutions and Electrodes, see the end of pH *Section 3* and ISE *Section 4*.

HI 98172

Portable pH/ORP/ISE Meter with Calibration Check™

- **pH Calibration Check™**
- **Five point pH calibration with seven standard and five custom pH buffers**
- **Log on demand (500 samples)**
- **User-selectable "calibration time out"**
- **Tutorial messages on LCD**
- **PC interface via USB**

HI 98172 is a pH/ORP/ISE meter housed in a waterproof casing. Up to five point pH calibration is available with seven memorized pH buffers and five custom pH buffers to provide users with the flexibility necessary to adjust the calibration range to obtain the most accurate and precise readings.

Exchange out the pH sensor for an ORP sensor to obtain mV readings. ISE sensors are calibrated up to five points and measurements are displayed in ppm.

Calibration Check™ incorporates an electrode condition graph which alerts the user with regards to the electrode status. If readings are taken too far outside the calibration range, the unit will warn the user with a graphic signal. Users may set a reminder to notify when calibration is due.

HI 98172 features tutorial messages on the LCD and an auto-end mode to ensure readings are taken only when they are stable. Comprehensive GLP data are directly accessible by pressing the GLP key and log-on-demand holds up to 500 records. Data can be transferred to a PC via USB with optional HI 92000 software and HI 920014 USB connection cable.

ORDERING INFORMATION

HI 98172 is supplied with HI 1230B pH electrode, HI 7662 temperature probe, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, 100 mL plastic beaker, batteries, instructions and hard carrying case.

ELECTRODES

HI 1230B	PEI body pH electrode with BNC connector and 1 m (3.3') cable
HI 3131B	Glass body ORP electrode with platinum sensor, BNC connector and 1 m (3.3') cable
HI 7662	Stainless steel temperature probe with 1 m (3.3') cable

SOLUTIONS

HI 5004L	pH 4.01 buffer solution, 500 mL
HI 5007L	pH 7.01 buffer solution, 500 mL
HI 5010L	pH 10.01 buffer solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL

ACCESSORIES

HI 92000	Windows® compatible software
HI 920014	Mini USB connection cable

SPECIFICATIONS		HI 98172
Range	**pH**	-4.0 to 20.0 pH; -4.00 to 20.00 pH
	mV	±699.9; ±2000 mV
	ISE	0.001 to 19990 ppm
	Temperature	-20.0 to 120.0°C (-4.0 to 248.0°F)
Resolution	**pH**	0.1 pH; 0.01 pH
	mV	0.1 mV (±699.9 mV); 1 mV (±2000)
	ISE	0.001 ppm (0.001 to 1.999); 0.01 ppm (2.00 to 19.99); 0.1 ppm (20.0 to 199.9); 1 ppm (200 to 1999); 10 ppm (2000 to 19990)
	Temperature	0.1°C (0.1°F)
Accuracy (@20°C/68°F)	**pH**	±0.1 pH; ±0.01 pH
	mV	±0.2 mV (±699.9 mV); ±1 mV (±2000 mV)
	ISE	±0.5% f.s.
	Temperature	±0.2°C (±0.4°F) excluding probe error
pH Calibration		up to five point calibration with seven standard buffers available (1.68, 4.01, 6.86, 7.01, 9.18, 10.01, 12.45), and 5 custom buffers
ISE Calibration		up to five point calibration with six standard buffers available (0.1, 1, 10, 100, 1000, 10000 ppm)
Slope/Offset Calibration		±1 pH/from 80 to 110%
Relative mV Offset Range		±2000 mV
Temperature Compensation		manual or automatic from -20.0 to 120.0 °C (-4.0 to 248.0 °F)
pH Electrode		HI 1230B PEI body pH electrode with BNC connector and 1 m (3.3') cable (included)
Temperature Probe		HI 7662 stainless steel temperature probe with 1 m (3.3') cable (included)
Logging		log on demand, 500 samples
PC Connection		opto-isolated USB with optional HI 92000 software
Input Impedance		10^{12} Ohm
Power Supply		1.5V AAA (3) / approximately 200 hours of continuous use without backlight (50 hours with backlight). User selectable auto-off (5, 10, 20, 60 minutes or can be disabled)
Environment		0 to 50°C (32 to 122°F); RH max 100%
Dimensions / Weight		185 x 72 x 36 mm (7.3 x 2.8 x 1.4") / 300 g (10.6 oz.)

For a complete list of Solutions and Electrodes, see the end of pH *Section 3* and ISE *Section 4*.

HANNA instruments

With Great Products, Come Great Results™

ISE Ammonia Nitrogen Meter for Wine Analysis

- **Designed for wine analysis**
- **Log up to 50 samples**
- **Twist-on electrode holder and built-in 500 rpm stirrer**

The HI 84185 is a low cost, easy to use, ammonia nitrogen ($N\text{-}NH_3$) ISE meter that performs automatic analysis by measuring the ammonia nitrogen ($N\text{-}NH_3$) content in wine using an ion selective electrode. The method used is double standard addition, a simple and quick method of analysis.

The instrument utilizes a powerful and effective built-in algorithm to analyze the shape of the ISE electrode response and to determine the reaction completion.

Results are immediately displayed in ammonia nitrogen ($N\text{-}NH_3$) mg/L (ppm), after which the HI 84185 is ready for another measurement.

Significance of Use

The nitrogenous compounds of must and wine are deriving from grapes and play important role in fermentation, clarification, and potential microbial instability of wines. They are profoundly modified during the alcoholic fermentation by the physiologic activity of yeast. Thus, yeast assimilates 60-70% of the must nitrogen, with ammonium ion completely disappearing during the fermentation and the total nitrogen being slightly reduced.

Ammonia is present in grapes as ammonium ions. Just a few milligrams serve as the primary form of available nitrogen for yeast metabolism. So, the content of ammonium ions can drastically decrease during the alcoholic fermentation, then increase again, especially in red wines, at the end of the malolactic fermentation because the lactic bacteria release ammonia nitrogen in wine.

The amount of ammonium ions in must influences the rapidity of fermentation start and evolution. The ammonia concentration ranges are from 24 to 209 mg/L (ppm) in grapes and from a few mg/L (ppm) to about 50 mg/L (ppm) in wine.

SPECIFICATIONS	HI 84185
Range	0 to 50 mg/L (ppm) $N\text{-}NH_3$
Resolution	1 mg/L (ppm) $N\text{-}NH_3$
Accuracy (@20°C/68°F)	±5% of reading
Sample Volume	50 mL
Temperature Compensation	automatic from 0 to 80 °C
Electrode	HI 61101 ammonia electrode with BNC connector and 1 m (3.3') cable
Temperature Probe	HI 7662-T stainless steel temperature probe with 1 m (3.3') cable (included)
Logging Feature	50 samples
Stirring Speed	500 rpm
Power	115V/230 Vac; 50-60Hz; 10VA
Environment	0 to 50 °C (32 to 122 °F); max 95% RH non-condensing
Dimensions	208 x 214 x 163 mm (8.2 x 8.4 x 6.4") (with beaker)
Weight	2200 g (77.6 oz.)

ORDERING INFORMATION

HI 84185-01 (115V) and **HI 84185-02** (230V) are supplied with a reagent set for 20 tests, HI 731341 1000 µL automatic pipette, plastic tips for 1000 µL automatic pipette (6), 50 mL beakers (2), HI 61101 ammonia electrode, HI 7662-T temperature probe, Stir bars (2), HI 4001-40 refilling solution, 30 mL (4), HI 4001-51 replacement membranes (10), HI 4000-47-4 pH 4.01 powder packet, HI 4000-47-7 pH 7.01 powder packet, 1 mL syringe, 1 mL pipette, tweezers, power cable and instruction manual.

ELECTRODES

HI 61101	Ammonia electrode with BNC connector and 1 m (3.3') cable
HI 7662-T	Stainless steel temperature probe with 1 m (3.3') cable

SOLUTIONS and REQUIRED REAGENTS

HI 4001-40	Ammonia filling solution (4)
HI 4001-45	Ammonia conditioning and storage solution, 500 mL
HI 4000-47	Buffer replacement kit
HI 84185-20	Ammonia reagent set (20 tests)
HI 84185-0	ISA for Ammonia electrode, 500 mL
HI 84185-1	Standard No. 1 for ammonia electrode, 500 mL
HI 85185-2	Standard No. 2 for ammonia electrode, 500 mL

ACCESSORIES

HI 61001-51	Membrane (20)
HI 731316	Stir bar (5)
HI 731341	Automatic pipette, 1000 µL
HI 731351	Tips for 1000 µL automatic pipette (25)
HI 740036P	Plastic beaker 50 mL (10)
HI 740143	Syringe 1 mL (6)
HI 740144	Syringe tip (6)

For a complete list of Solutions and Electrodes, see the end of this Section.

HI 84184

ISE Fluoride Meter for Wine Analysis

- **Designed for wine analysis**
- **Log up to 50 samples**
- **Twist-on electrode holder and built-in 500 rpm stirrer**

The HI 84184 is a low cost, easy to use, fluoride ISE meter that performs automatic wine analysis by measuring the fluoride content in wine using an ion selective electrode. The method used is double standard addition, a simple and quick method of analysis.

The instrument utilizes a powerful and effective built-in algorithm to analyze the shape of the ISE electrode response and to determine the reaction completion.

Results are immediately displayed in F^- mg/L (ppm), after which the HI 84184 is ready for another measurement.

ORDERING INFORMATION

HI 84184-01 (115V) and **HI 84184-02** (230V) are supplied with a reagent set for 20 tests, HI 731341 1000 µL automatic pipette, plastic tips for 1000 µL automatic pipette (4), 50 mL beakers (2), 20 mL beakers (2), HI 61010 fluoride half cell, HI 5315 reference half cell, HI 7662-T temperature probe, Stir bars (2), HI 7075 refilling solution, 30 mL (4), 1 mL syringe, 1 mL pipette, instruction sheet, power cable and instruction manual.

ELECTRODES

HI 61010	Fluoride half cell with BNC connector and 1 m (3.3') cable
HI 5315	Reference half cell with BNC connector and 1 m (3.3') cable
HI 7662-T	Stainless steel temperature probe with 1 m (3.3') cable

SOLUTIONS and REQUIRED REAGENTS

HI 7075	Electrode filling solution, 30 mL (4)
HI 84184-20	Fluoride reagent set (20 tests)
HI 84184-0	TISAB solution for fluoride electrode, 100 mL (5)
HI 84184-1	Standard No. 1 for fluoride electrode, 500 mL
HI 84184-2	Standard No. 2 for fluoride electrode, 500 mL

ACCESSORIES

HI 731316	Stir bar (5 pcs.)
HI 731341	Automatic pipette, 1000 µL
HI 731351	1000 µL automatic pipette tips (25)
HI 740036P	100 mL plastic beakers (10)
HI 740037P	20 mL plastic beakers (10)
HI 740143	Syringe, 1mL (6)
HI 740144	Syringe tip (6)
HI 740155	Capillary pipette (20)

Significance of Use

Fluoride ions (F^-) come from grapes used for wine and its usual concentration value varies between 0.1 and 2 mg/L (ppm). Higher levels of fluoride content in wine can derive from cryolite used by farmers as an insecticide in the vine.

SPECIFICATIONS	HI 84184
Range	0.0 to 5.0 mg/L (ppm) F^-
Resolution	0.1 mg/L (ppm) F^-
Accuracy (@20°C/68°F)	±5% of reading*
Sample Volume	50 mL
Temperature Compensation	automatic from 0 to 80 °C
Electrodes	HI 61010 fluoride half cell with BNC connector and 1 m (3.3') cable; HI 5315 reference half cell with BNC connector and 1 m (3.3') cable
Temperature Probe	HI 7662-T stainless steel temperature probe with 1 m (3.3') cable (included)
Logging Feature	50 samples
Stirring Speed	500 rpm
Power	115V/230 Vac; 50-60Hz; 10VA
Environment	0 to 50 °C (32 to 122 °F); max 95% RH non-condensing
Dimensions	208 x 214 x 163 mm (8.2 x 8.4 x 6.4") (with beaker)
Weight	2200 g (77.6 oz.)

* Above 3 mg/L the instrument provides information about the approximate fluoride content.

For a complete list of Solutions and Electrodes, see the end of this Section.

ISE Potassium Meter for Wine Analysis

- **Designed for wine analysis**
- **Log up to 50 samples**
- **Twist-on electrode holder and built-in 500 rpm stirrer**

The HI 84181 is a low cost, easy to use, potassium ISE meter that performs automatic analysis using an ISE electrode.

The instrument comes with a powerful built-in algorithm to analyze the shape of the ISE electrode response and to determine the reaction completion. The method used is the double standard addition which is a simple and rapid method of analysis.

By simply pressing the start key, the instrument guides the user and performs an automatic analysis with all the necessary calculations and verifications. The result is immediately displayed in g/L K^+ (ppt), after which the HI 84181 is ready for another measurement.

Significance of Use

Potassium ions (K^+) are absorbed by the vine from soil. Unlike other essential nutrients potassium remains in ionic form and passes to the grapes. Potassium ions are by far the most important ions that can be found in wine with concentrations between 0.7-2 g/L (ppt) and is mostly deriving from grapes. Potassium ions greatly influence the taste of wine. With its absence wine will have a sour taste.

The alcohol content and low temperatures can cause potassium to precipitate as potassium bitartrate. Red wines have an increased content of potassium compared to white wines because the phenols found in red wine inhibit the precipitation of potassium bitartrate.

SPECIFICATIONS	HI 84181
Range	0.0 to 5.0 g/L (ppt) K^+
Resolution	0.1 g/L (ppt) K^+
Accuracy (@20°C/68°F)	±5% of reading*
Sample Volume	50 mL
Temperature Compensation	automatic from 0 to 80 °C
Electrodes	HI 61014 potassium half cell with BNC connector and 1 m (3.3') cable; HI 5315 reference half cell with BNC connector and 1 m (3.3') cable
Temperature Probe	HI 7662-T stainless steel temperature probe with 1 m (3.3') cable (included)
Logging Feature	50 samples
Stirring Speed	500 rpm
Power	115V/230 Vac; 50-60Hz; 10VA
Environment	0 to 50 °C (32 to 122 °F); max 95% RH non-condensing
Dimensions	208 x 214 x 163 mm (8.2 x 8.4 x 6.4") (with beaker)
Weight	2200 g (77.6 oz.)

* Above 2.5 g/L the instrument provides information about the approximate potassium content.

ORDERING INFORMATION

HI 84181-01 (115V) and **HI 84181-02** (230V) are supplied with a reagent set for 20 tests, 2000 µL automatic pipette, plastic tips for 2000 µL automatic pipette (6), 50 mL beakers (2), HI 61014 Potassium half cell, HI 5315 Reference half cell, HI 7662-T temperature probe, Stir bars (2), HI 7076 refilling solution, 30 mL (4), 1 mL syringe, 1 mL pipette, instruction sheet, power cable and instruction manual.

ELECTRODES

HI 61014	Potassium half cell with BNC connector and 1 m (3.3') cable
HI 5315	Reference half cell with BNC connector and 1 m (3.3') cable
HI 7662-T	Stainless steel temperature probe with 1 m (3.3') cable

SOLUTIONS and REQUIRED REAGENTS

HI 7076	Electrode filling solution (4)
HI 84181-20	Reagent set (20 tests)
HI 84181-0	ISA for potassium electrode (500 mL)
HI 84181-1	Standard No. 1 for potassium electrode (500 mL)
HI 84181-2	Standard No. 2 for potassium electrode (500 mL)

ACCESSORIES

HI 731342	Automatic pipette 2000 µL
HI 731352	Tips for 2000 µL automatic pipette (25)
HI 740036P	Beakers, 100 mL (10)
HI 740143	Syringe, 1mL (6)
HI 740144	Syringe tips (6 pcs.)
HI 740155	Capillary pipette (20)

For a complete list of Solutions and Electrodes, see the end of this Section.

HI 98402

Fluoride Meter

- **Tutorial messages on LCD display**
- **Direct measurements in mg/L or g/L**
- **Waterproof, rugged housing for indoor/outdoor applications**
- **Extensive fluoride scale**
- **Automatic Temperature Compensation**

HI 98402 measures fluoride from 0.05 mg/L to 1.9 g/L in 5 distinct scales. The HI 98402 utilizes an auto-ranging feature which automatically selects the range that provides the best resolution.

HI 98402 automatically compensates for temperature from -5 to 55°C using the optional HI 7662 stainless steel temperature probe. Both the temperature measured together with fluoride concentrations are displayed on the large LCD.

Calibration is automatic at 1 or two points. The calibration points can be chosen among 1 mg/L, 2 mg/L, 10 mg/L, 100 mg/L and 1000 mg/L.

HI 98402 is supplied in a rugged carrying case complete with batteries that provide up to 200 hours of continuous operation.

ORDERING INFORMATION

HI 98402 is supplied with batteries, rugged carrying case and instructions.

ELECTRODES

HI 4010	Fluoride electrode with BNC connector and 1 m (3.3') cable
HI 5313	Reference electrode with BNC connector and 1 m (3.3') cable
HI 7662	Stainless steel temperature probe with 1 m (3.3') cable

SOLUTIONS

HI 4010-01	0.1 M fluoride solution, 500 mL
HI 4010-02	100 ppm fluoride solution, 500 mL
HI 4010-03	1000 ppm fluoride solution, 500 mL
HI 4010-30	Fluoride solution kit including HI 4010-00, HI 4010-10 and HI 4010-11, 500 mL (4 each)
HI 4010-11	1 mg/L (ppm) mixed with TISAB II fluoride solution, 500 mL
HI 4010-12	2 mg/L (ppm) mixed with TISAB II fluoride solution, 500 mL
HI 4010-10	10 mg/L (ppm) mixed with TISAB II fluoride solution, 500 mL
HI 4010-00	TISAB II fluoride solution, 500 mL
HI 4010-05	TISAB II fluoride solution, 1 gallon

SPECIFICATIONS		HI 98402
Range	**Fluoride**	0.050 to 0.500 mg/L (ppm); 0.50 to 5.00 mg/L; 5.0 to 50.0 mg/L; 50 to 500 mg/L; 0.50 to 1.90 g/L
	Temperature	-20.0 to 120.0°C (-4.0 to 248.0°F)
Resolution	**Fluoride**	0.001 mg/L (ppm); 0.01 mg/L; 0.1 mg/L; 1 mg/L; 0.01 g/L
	Temperature	0.1°C (0.1°F)
Accuracy	**Fluoride**	±5% of reading or ±0.02 mg/L (ppm) fluoride (with ±3°C from calibration temperature)
	Temperature	±0.2°C (±0.4°F) excluding probe error
Calibration		automatic, one or two point at 1 mg/L, 2 mg/L, 10 mg/L, 100 mg/L and 1000 mg/L
Temperature Compensation		automatic, -5 to 55°C (with temperature probe)
Electrodes		HI 4010 fluoride electrode with BNC connector and 1 m (3.3') cable (not included) HI 5313 reference electrode with 1 m (3.3') cable (not included)
Temperature Probe		HI 7662 stainless steel temperature probe with 1 m (3.3') cable (not included)
Input Impedance		10^{12} Ohm
Battery Type / Life		1.5V AAA (3) / approximately 200 hours of continuous use
Environment		0 to 50°C (32 to 122°F); RH max 100%
Dimensions		185 x 72 x 36 mm (7.3 x 2.8 x 1.4")
Weight		300 g (10.6 oz.)

For a complete list of Solutions and Electrodes, see the end of this Section.

Salinity and Sodium Content Meters

- **HI 931100 measures four salinity ranges**
- **Tutorial messages on LCD display**
- **Calibration reminder**
- **Displays parameter and temperature readings simultaneously**
- **Automatic calibration**
- **Dual-level LCD**

HI 931100 is an ion-selective meter that uses a sodium electrode to read the salt (NaCl) content of a solution. This powerful instrument has four ranges, capable of measuring concentrations from 0.150 g/L to 300 g/L.

HI 931100 auto ranges from sample to sample over an extremely broad range without the need for recalibration.

HI 931101 uses the FC 300B combination sodium electrode (not included) to give you sodium readings from 15.0 mg/L to 60 g/L. The calibration process is automatic at 2 points, the first is at 2.3 g/L while the second can be either at 0.23 g/L (low range) or at 23.0 g/L (high range).

A separate temperature probe, HI 7662, provides temperature readings from -20 to 120°C.

SPECIFICATIONS		HI 931100	HI 931101
Range	NaCl	0.150 to 1.500 g/L NaCl; 1.50 to 15.00 g/L NaCl; 15.0 to 150.0 g/L NaCl; 150 to 300 g/L NaCl	0.00 to 3.00 pNa; 15.0 to 150.0 mg/L (ppm) Na; 0.150 to 1.500 g/L Na; 1.50 to 15.00 g/L Na; 15.0 to 60.0 g/L Na
	°C	-20.0 to 120.0°C (-4.0 to 248.0°F)	
Resolution	NaCl	0.001 g/L NaCl; 0.01 g/L NaCl; 0.1 g/L NaCl; 1 g/L NaCl	0.01 pNa; 0.1 mg/L Na; 0.001 g/L Na; 0.01 g/L Na; 0.1 g/L Na
	°C	0.1°C (0.1°F)	
Accuracy (@20°C)	NaCl	±5% of reading (NaCl)	±0.05 pNa; ±5% of reading (Na)
	°C	±0.2°C (±0.4°F) (excluding probe error)	
Calibration		automatic, one or two point at 0.30 g/L (HI 7085) 3.00 g/L (HI 7083) 30.0 g/L (HI 7081)	automatic, one or two point at 0.23 g/L (HI 7087/HI 8087) 2.3 g/L (HI 7080/HI 8080) 23.0 g/L (HI 7086/HI 8086)
Temperature Compensation		fixed at 25°C (77°F)	
Electrode		FC 300B glass body sodium ion electrode with BNC connector and 1 m (3.3') cable (not included)	
Temperature Probe		HI 7662 stainless steel temperature probe with 1 m (3.3') cable (not included)	
Input Impedance		10^{12} Ohm	
Battery Type / Life		1.5V AAA (3) / approx. 200 hours of continuous use	
Environment		0 to 50°C (32 to 122°F); RH max 100%	
Dimensions		185 x 72 x 36 mm (7.3 x 2.8 x 1.4")	
Weight		300 g (10.6 oz.)	

ORDERING INFORMATION

HI 931100 and **HI 931101** and are supplied with batteries, instructions and hard carrying case.

ELECTRODES

FC 300B	Glass body sodium ion electrode with BNC connector and 1 m (3.3') cable
HI 7662	Stainless steel temperature probe with 1 m (3.3') cable

SOLUTIONS

HI 7080L	2.3 g/L Na solution, 500 mL
HI 7081L	30 g/L NaCl solution, 500 mL
HI 7083L	3 g/L NaCl solution, 500 mL
HI 7085L	0.3 g/L NaCl solution, 500 mL
HI 7086L	23.0 g/L Na solution, 500 mL
HI 7087L	0.23 g/L Na solution, 500 mL
HI 7090L	ISA solution, 500 mL

ACCESSORIES

HI 76405	Electrode holder
HI 721317	Rugged carrying case

For a complete list of Solutions and Electrodes, see the end of this Section.

HI 931102

HACCP Compliant Salinity Foodcare Meter

- **Tutorial messages on LCD display**
- **Calibration reminder**
- **Displays parameter and temperature readings simultaneously**
- **Automatic calibration**
- **Dual-level LCD**

HANNA has designed this waterproof salinity meter for use in food production.

HI 931102 is an ion-selective meter that uses a sodium electrode to read the salt (NaCl) content of a solution. This powerful instrument has four ranges, capable of measuring concentrations from 0.150 g/L to 300 g/L. This meter is able to auto range from sample to sample over an extremely broad range without the need for recalibration.

HI 931102 uses the FC 300B combination sodium electrode (not included) to give you sodium readings from 15.0 mg/L to 60 g/L. The calibration process is automatic at 2 points, the first is at 3.00 g/L while the second can be either at 0.30 g/L (low range) or at 30.0 g/L (high range).

A separate temperature probe, HI 7662, provides temperature readings from -20 to 120°C.

SPECIFICATIONS		HI 931102
Range	NaCl	0.150 to 1.500 g/L NaCl; 1.50 to 15.00 g/L NaCl; 15.0 to 150.0 g/L NaCl; 150 to 300 g/L NaCl; 0.0 to 30.0 % NaCl
	°C	-20.0 to 120.0°C (-4.0 to 248.0°F)
Resolution	NaCl	0.001 g/L NaCl; 0.01 g/L NaCl; 0.1 g/L NaCl; 1 g/L NaCl; 0.1 % NaCl
	°C	0.1°C (0.1°F)
Accuracy (@20°C)	NaCl	±5% of reading
	°C	±0.2°C (±0.4°F) (excluding probe error)
Calibration		automatic, one or two point at 0.30 g/L (HI 7085) 3.00 g/L (HI 7083) 30.0 g/L (HI 7081)
Temperature Compensation		fixed at 25°C (77°F)
Electrode		FC 300B glass body sodium ion electrode with BNC connector and 1 m (3.3') cable (not included)
Temperature Probe		HI 7662 stainless steel temperature probe with 1 m (3.3') cable (not included)
Input Impedance		10^{12} Ohm
Battery Type / Life		1.5V AAA (3) / approx. 200 hours of continuous use
Environment		0 to 50°C (32 to 122°F); RH max 100%
Dimensions		185 x 72 x 36 mm (7.3 x 2.8 x 1.4")
Weight		300 g (10.6 oz.)

ORDERING INFORMATION

HI 931102 is supplied with batteries, instructions and hard carrying case.

ELECTRODES

FC 300B	Glass body sodium ion electrode with BNC connector and 1 m (3.3') cable
HI 7662	Stainless steel temperature probe with 1 m (3.3') cable

SOLUTIONS

HI 7080L	2.3 g/L Na solution, 500 mL
HI 7081L	30 g/L NaCl solution, 500 mL
HI 7083L	3 g/L NaCl solution, 500 mL
HI 7085L	0.3 g/L NaCl solution, 500 mL
HI 7086L	23.0 g/L Na solution, 500 mL
HI 7087L	0.23 g/L Na solution, 500 mL
HI 7090L	ISA solution, 500 mL

ACCESSORIES

HI 76405	Electrode holder
HI 721317	Rugged carrying case

For a complete list of Solutions and Electrodes, see the end of this Section.

Ammonia • Bromide • Cadmium Ion Selective Electrodes

PARAMETER	AMMONIA	BROMIDE		CADMIUM	
CODE	**HI 4101**	**HI 4002**	**HI 4102**	**HI 4003**	**HI 4103**
Type	gas-sensing; combination	solid-state; half cell	solid-state; combination	solid-state; half cell	solid-state; combination
Measurement Range	1M to 1X 10^{-6}M 17000 to 0.02 mg/L (ppm) 14000 to 0.016 mg/L as N	1M to 1X 10^{-6}M 79910 to 0.08 mg/L (ppm)	1M to 1X 10^{-6}M 79910 to 0.08 mg/L (ppm)	1M to 1X 10^{-7}M 11200 to 0.01 mg/L (ppm)	1M to 1X 10^{-7}M 11200 to 0.01 mg/L (ppm)
Optimum pH Range	>11	2 to 12.5	2 to 12.5	2 to 12.5	2 to 12.5
Temperature Range	0 to 40°C	0 to 80°C	0 to 80°C	0 to 80°C	0 to 80°C
Approximate Slope	-56	-56	-56	+28	+28
Body O.D.	12 mm	12 mm	12 mm	12 mm	12 mm
Insertion Length	120 mm	120 mm	120 mm	120 mm	120 mm
Body Material	Delrin	epoxy	PEI	epoxy	PEI
Cable	1 m coaxial	1 m coaxial	1 m coaxial	1 m coaxial	1 m coaxial
Possible Applications	determination of ammonium, ammonia in wine, beer, water, waste water and soil	determination of free bromide ions in emulsified food products, beverages, plants, soils and as an indicator for titration		used as an indicator for titrations using chelates	

CONNECTION		CONNECTION		CONNECTION		CONNECTION		CONNECTION	
HI 4101	BNC	**HI 4002**	BNC	**HI 4102**	BNC	**HI 4003**	BNC	**HI 4103**	BNC

HI 4004 • HI 4104 • HI 4105 • HI 4007 • HI 4107

Calcium • Carbon Dioxide • Chloride Ion Selective Electrodes

PARAMETER	CALCIUM		CARBON DIOXIDE	CHLORIDE	
CODE	**HI 4004**	**HI 4104**	**HI 4105**	**HI 4007**	**HI 4107**
Type	polymer membrane; half cell	polymer membrane; combination	gas sensing; combination	solid-state; half cell	solid-state; combination
Measurement Range	1M to 3X 10^{-6}M 40080 to 0.12 mg/L (ppm)	1M to 3X 10^{-6}M 40080 to 0.12 mg/L (ppm)	1X 10^{-2}M to 1X 10^{-4}M 440 to 4.4 mg/L (ppm)	1M to 5X 10^{-5}M 35000 to 1.8 mg/L (ppm)	1M to 5X 10^{-5}M 35000 to 1.8 mg/L (ppm)
Optimum pH Range	4 to 10	4 to 10	4.2 to 5.2	2 to 11	2 to 11
Temperature Range	0 to 40°C	0 to 40°C	0 to 40°C	0 to 80°C	0 to 80°C
Approximate Slope	+28	+28	+54	-57	-57
Body O.D.	12 mm	12 mm	12 mm	12 mm	12 mm
Insertion Length	120 mm	120 mm	120 mm	120 mm	120 mm
Body Material	PVC	PEI/PVC	Delrin	epoxy	PEI
Cable	1 m coaxial	1 m coaxial	1 m coaxial	1 m coaxial	1 m coaxial
Possible Applications	determination of free calcium in beverages, water, and seawater		determination of carbonates as CO_2 in water, soft drinks and wine samples	determination of free chloride ions in emulsified food products, beverages, plants, soils and as an indicator for titration	

CONNECTION	CONNECTION	CONNECTION	CONNECTION	CONNECTION
HI 4004 BNC	**HI 4104** BNC	**HI 4105** BNC	**HI 4007** BNC	**HI 4107** BNC

Cupric • Cyanide • Fluoride Ion Selective Electrodes

PARAMETER	CUPRIC		CYANIDE		FLUORIDE		
CODE	**HI 4008**	**HI 4108**	**HI 4009**	**HI 4109**	**HI 4010**	**HI 4110**	**FC 301B**
Type	solid-state; half cell	solid-state; combination	solid-state; half cell	solid-state; combination	solid-state; half cell	solid-state; combination	solid-state; half cell
Measurement Range	0.1M to 1X 10^{-6}M 6354 to 0.06 mg/L (ppm)		10^{-2}M to 1X 10^{-6}M 260 to 0.02 mg/L (ppm)		1M to 1X 10^{-6}M Sat. to 0.02 mg/L (ppm)		
Optimum pH Range	2 to 12.5	2 to 12.5	>11	>11	5 to 8	5 to 8	5 to 8
Temperature Range	0 to 80°C	0 to 80°C	0 to 80°C	0 to 80°C	0 to 80°C	0 to 80°C	0 to 80°C
Approximate Slope	26	26	-57	-57	-56	-56	-56
Body O.D.	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm
Insertion Length	120 mm	120 mm	120 mm	120 mm	120 mm	120 mm	120 mm
Body Material	epoxy	PEI	epoxy	PEI	epoxy	PEI/epoxy	PEI/epoxy
Cable	1 m coaxial	1 m coaxial	1 m coaxial	1 m coaxial	1 m coaxial	1 m coaxial	1 m coaxial
Possible Applications	used as an indicator for titrations using chelates		determination of free cyanide ions in plating baths, waste water and in plant and soil samples		determination of free fluoride in potable water, soft drinks, wine, plants, emulsified food products, plating and pickling acids		

CONNECTION		CONNECTION		CONNECTION		CONNECTION		CONNECTION		CONNECTION		CONNECTION	
HI 4008	BNC	**HI 4108**	BNC	**HI 4009**	BNC	**HI 4109**	BNC	**HI 4010**	BNC	**HI 4110**	BNC	**FC 301B**	BNC

HI 4011 • HI 4111 • HI 4012 • HI 4112 • HI 4013 • HI 4113

Iodide • Lead/Sulfate • Nitrate Ion Selective Electrodes

PARAMETER	IODIDE		LEAD/SULFATE		NITRATE	
CODE	**HI 4011**	**HI 4111**	**HI 4012**	**HI 4112**	**HI 4013**	**HI 4113**
Type	solid-state; half cell	solid-state; combination	solid-state; half cell	solid-state; combination	polymer membrane; half cell	polymer membrane; combination
Measurement Range	1M to 1X 10^{-7}M 127000 to 0.01 mg/L (ppm)		0.1M to 1X 10^{-6}M 20700 to 0.21 mg/L (ppm)		1.0M to 1X 10^{-5}M 6200 to 0.62 mg/L (ppm) 1400 to 0.4 mg/L (ppm) as N	
Optimum pH Range	2 to 13	2 to 13	4 to 7	4 to 7	3.0 to 8	3.0 to 8
Temperature Range	0 to 80°C	0 to 80°C	0 to 80°C	0 to 80°C	0 to 40°C	0 to 40°C
Approximate Slope	-56	-56	+25	+25	-56	-56
Body O.D.	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm
Insertion Length	120 mm	120 mm	120 mm	120 mm	120 mm	120 mm
Body Material	epoxy	PEI	epoxy	PEI	PVC	PEI/PVC
Cable	1 m coaxial	1 m coaxial	1 m coaxial	1 m coaxial	1 m coaxial	1 m coaxial
Possible Applications	determination of free iodide ions in emulsified food samples (iodized table salt), plants and for titration		determination of lead ions in plating baths and as an indicator for titrations		determination of free nitrate in natural waters (fresh and sea), and in emulsified food and plant samples	

CONNECTION		CONNECTION		CONNECTION		CONNECTION		CONNECTION		CONNECTION	
HI 4011	BNC	**HI 4111**	BNC	**HI 4012**	BNC	**HI 4112**	BNC	**HI 4013**	BNC	**HI 4113**	BNC

Potassium • Silver/Sulfide • Reference Ion Selective Electrodes

PARAMETER	POTASSIUM		SILVER/SULFIDE		SODIUM	REFERENCE
CODE	HI 4014	HI 4114	HI 4015	HI 4115	FC 300	HI 5315
Type	polymer membrane; half cell	polymer membrane; combination	solid-state; half cell	solid-state; combination	N/A	N/A
Measurement Range	1M to 1X 10^{-6}M 39100 to 0.039 mg/L (ppm)		Ag^+ 1.0M to 1X 10^{-6}M 107900 to 0.11ppm S^{2-} 1.0M to 1X 10^{-7}M 32100 to 0.003 ppm	Ag^+ 1.0M to 1X 10^{-6}M 107900 to 0.11ppm S^{2-} 1.0M to 1X 10^{-7}M 32100 to 0.003 ppm	1.0M to 1X 10^{-5}M 39100 to 0.039 ppm	N/A
Optimum pH Range	1.5 to 12.0	1.5 to 12.0	Ag^+ 2 to 8 $S^=$ 12 to 14	Ag^+ 2 to 8 $S^=$ 12 to 14	9.75 to 14 pH	N/A
Temperature Range	0 to 40°C	0 to 40°C	0 to 80°C	0 to 80°C	0 to 80°C	0 to 80°C
Approximate Slope	+56	+56	+56 Ag^+ / -28 S^{2-}	+56 Ag^+ / -28 S^{2-}	+57	N/A
Body O.D.	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm
Insertion Length	120 mm	120 mm	120 mm	120 mm	120 mm	120 mm
Body Material	PVC	PEI/PVC	epoxy	PEI	glass	PEI
Cable	1 m coaxial	1 m coaxial	1 m coaxial	1 m coaxial	1 m coaxial	1 m coaxial
Possible Applications	determination of potassium ions in wine, waters, soils and biological samples.		as an indicator for titrations using silver nitrate. For the determination of sulfide ions in waters, paper liquors, natural waters and soils.		water, food products, soup, dairy, brines, laboratory	to complete electrical circuit and to provide stable reference voltage for ISE half cells
CONNECTION	HI 4014 BNC	HI 4114 BNC	HI 4015 BNC	HI 4115 BNC	FC 300B BNC FC 300D DIN FC 300U US standard	HI 5315 banana

ISE Solutions

ISE Standards

Our wide selection of HANNA ISE Standards are made and bottled in our own state of the art solutions facility. ISE Standards are required for direct and incremental measurement techniques and are available with certificate of analysis.

CODE	DESCRIPTION	SIZE
HI 4001-01	0.1 M ammonia std.	500 mL
HI 4001-02	100 mg/L (ppm) ammonia std. (as N)	500 mL
HI 4001-03	1000 mg/L (ppm) ammonia std. (as N)	500 mL
HI 4002-01	0.1 M bromide std.	500 mL
HI 4003-01	0.1 M cadmium std.	500 mL
HI 4004-01	0.1 M calcium std.	500 mL
HI 4005-01	0.1 M carbon dioxide std.	500 mL
HI 4005-03	1000 mg/L (ppm) carbon dioxide std. (as CaCO3)	500 mL
HI 4007-01	0.1 M chloride std.	500 mL
HI 4007-02	100 mg/L (ppm) chloride std.	500 mL
HI 4007-03	1000 mg/L (ppm) chloride std.	500 mL
HI 4008-01	0.1 M cupric std.	500 mL
HI 4010-01	0.1 M fluoride std.	500 mL
HI 4010-02	100 mg/L (ppm) fluoride std.	500 mL
HI 4010-03	1000 mg/L (ppm) fluoride std.	500 mL
HI 4010-10	10 mg/L (ppm) fluoride std. premixed with TISAB II	500 mL
HI 4010-11	1 mg/L (ppm) fluoride std. premixed with TISAB II	500 mL
HI 4010-12	2 mg/L (ppm) fluoride std. premixed with TISAB II	500 mL
HI 4010-30	Kit containing 4 bottles each of : HI 4010-10, HI 4010-11 and HI 4010-00	500 mL (3 x 4)
HI 4011-01	0.1 M iodide std.	500 mL
HI 4012-01	0.1 M lead std.	500 mL
HI 4012-21	0.1 M sulfate std.	500 mL
HI 4013-01	0.1 M nitrate std.	500 mL
HI 4013-02	100 mg/L (ppm) nitrate std. (as N)	500 mL
HI 4013-03	1000 mg/L (ppm) nitrate std. (as N)	500 mL
HI 4014-01	0.1 M potassium std.	500 mL
HI 4015-01	0.1 M silver std.	500 mL
HI 4016-01	0.1 M sodium standard	500 mL
HI 4016-02	100 ppm sodium standard	500 mL
HI 4016-03	1000 ppm sodium standard	500 mL
HI 4016-10	10 ppm sodium standard	500 mL

Gas Sensor Fill Solutions

CODE	DESCRIPTION	SIZE
HI 4001-40	ammonia filling solution	30 mL bottles (4)
HI 4005-40	carbon dioxide filling solution	30 mL bottles (4)

Specific "Solutions" for ISE Sensors

CODE	DESCRIPTION	SIZE
HI 4000-47	pH 4 and pH 7 buffers with chloride background. Used to check glass internal of gas sensors.	10 packages ea. and 2 beakers
HI 4001-45	conditioning and storage solution for HI 4101 ammonia ISE	500 mL
HI 4004-45	conditioning and storage solution for HI 4004 and HI 4104 calcium ISE's	500 mL
HI 4005-45	conditioning and storage solution for HI 4105 carbon dioxide ISE	500 mL
HI 4016-45	storage solution for sodium ISE	500 mL
HI 4016-46	conditioning solution for sodium ISE	500 mL

Ionic Strength Adjusters (ISA)

HANNA Ionic Strength Adjusters (ISA) are formulated to provide a constant ionic strength in sample and standards alike, thus permitting concentration rather than activity measurements to be made. In some cases ISA's adjust pH and eliminate matrix effects.

CODE	DESCRIPTION	SIZE
HI 4000-00	ISA for halide ISE's	500 mL
HI 4001-00	alkaline ISA for ammonia and cyanide ISE's	500 mL
HI 4004-00	ISA for calcium ISE's	500 mL
HI 4005-00	ISA for carbon dioxide ISE's	500 mL
HI 4010-00	TISAB II for Fluoride ISE's	500 mL
HI 4010-05	TISAB II for Fluoride ISE's	1 gallon
HI 4010-06	TISAB III concentrate for Fluoride ISE's	500 mL
HI 4012-00	ISA for lead/sulfate ISE's	500 mL
HI 4013-00	ISA for nitrate ISE's	500 mL
HI 4013-06	nitrate interferent suppressant ISA	500 mL
HI 4014-00	ISA for potassium ISE's	500 mL
HI 4015-00	SAOB (sulfide antioxidant buffer)	500 mL + 18 g (2 components)
HI 4016-00	ISA for sodium ISE's	500 mL

Accessories

HANNA replacement parts and accessories keep your measurements fast and accurate.

CODE	DESCRIPTION
HI 4000-50	liquid membrane sensor handle
HI 4000-51	gas sensor replacement pH for ammonia sensor
HI 4000-52	gas sensor membrane cap for ammonia
HI 4000-54	gas sensor replacement pH for carbon dioxide ISE
HI 4000-70	halide polishing strips (24)
HI 4001-51	ammonia membrane kit (20 loose)
HI 4004-51	calcium module for HI 4004 half cell ISE
HI 4104-51	calcium module for HI 4104 combination ISE
HI 4005-53	carbon dioxide membrane kit (3 caps)
HI 4110-51	fluoride module for HI 4110 combination ISE
HI 4013-53	nitrate module for HI 4013 half cell ISE (3 pack)
HI 4113-53	nitrate module for HI 4113 combination ISE (3 pack)
HI 4014-51	potassium module for HI 4014 half cell ISE
HI 4114-51	potassium module for combination ISE
HI 740155P	capillary pipettes (20 pcs)
HI 740159	plastic tweezers

Silver-free Reference Fill Solutions

Recommended for our combination ISE electrodes and the HANNA HI 5315 reference electrode. Reference electrodes should be topped off daily with the correct filling solution for optimum measurement performance. These solutions are silver free to eliminate silver precipitates found with standard electrolytes.

CODE	DESCRIPTION	SIZE
HI 7072	electrolyte solution, 1 M KNO_3	30 mL bottles (4)
HI 7075	electrolyte solution with KNO_3 and KCl	30 mL bottles (4)
HI 7076	electrolyte solution, 1 M NaCl	30 mL bottles (4)
HI 7078	electrolyte solution, $(NH_4)_2SO_4$	30 mL bottles (4)
HI 7082	electrolyte solution, 3.5 M KCl	30 mL bottles (4)

Reference Fill Solutions containing AgCl

CODE	DESCRIPTION	SIZE
HI 7079	Electrolyte for sodium ISE's (contains AgCl)	30 mL bottles (4)

Salinity and Fluoride Standard Solutions

Sodium (Na^+) ISE Standard Solutions

CODE	DESCRIPTION	PACKAGE
HI 7080L	standard solution at 2.3 g/L Na^+	500 mL bottle
HI 7080M	standard solution at 2.3 g/L Na^+	230 mL bottle
HI 7086L	standard solution at 23 g/L Na^+	500 mL bottle
HI 7086M	standard solution at 23 g/L Na^+	230 mL bottle
HI 7087L	standard solution at 0.23 g/L Na^+	500 mL bottle
HI 7087M	standard solution at 0.23 g/L Na^+	230 mL bottle
HI 8080L	standard solution at 2.3 g/L Na^+	500 mL FDA bottle
HI 8080M	standard solution at 2.3 g/L Na^+	230 mL FDA bottle
HI 8086L	standard solution at 23 g/L Na^+	500 mL FDA bottle
HI 8086M	standard solution at 23 g/L Na^+	230 mL FDA bottle
HI 8087L	standard solution at 0.23 g/L Na^+	500 mL FDA bottle
HI 8087M	standard solution at 0.23 g/L Na^+	230 mL FDA bottle

The **sodium** and **sodium chloride standard solutions** are used for the calibration of pocket sized, portable, bench salinity meters and sodium ISE.

These solutions are available in 230 or 500 mL bottles, and also in opaque bottles that meet the FDA (Food & Drug Administration) specifications.

Fluoride standard solutions are used to calibrate all instruments that measure fluoride using a fluoride ISE.

The most common applications include drinking water, the analysis of water from springs close to volcanic rocks or products such as toothpaste.

Solutions are available with a Certificate of Analysis on request.

Sodium Chloride (NaCl) Standard Solutions

CODE	DESCRIPTION	PACKAGE
HI 7037L	calibration solution for % Readings (100% NaCl)	500 mL bottle
HI 7037M	calibration solution for % Readings (100% NaCl)	230 mL bottle
HI 7081L	standard solution at 30 g/L NaCl	500 mL bottle
HI 7081M	standard solution at 30 g/L NaCl	230 mL bottle
HI 7083L	standard solution at 3.0 g/L NaCl	500 mL bottle
HI 7083M	standard solution at 3.0 g/L NaCl	230 mL bottle
HI 7084L	standard solution at 58.4 g/L NaCl	500 mL bottle
HI 7084M	standard solution at 58.4 g/L NaCl	230 mL bottle
HI 7085L	standard solution at 0.3 g/L NaCl	500 mL bottle
HI 7085M	standard solution at 0.3 g/L NaCl	230 mL bottle
HI 7088L	standard solution at 5.84 g/L NaCl	500 mL bottle
HI 7088M	standard solution at 5.84 g/L NaCl	230 mL bottle
HI 7089L	standard solution at 125 g/L NaCl	500 mL bottle
HI 7089M	standard solution at 125 g/L NaCl	230 mL bottle
HI 7090L	ISA solution for sodium ISE	500 mL bottle
HI 7090M	ISA solution for sodium ISE	230 mL bottle
HI 8084L	standard solution at 58.4 g/L NaCl	500 mL FDA bottle
HI 8084M	standard solution at 58.4 g/L NaCl	230 mL FDA bottle
HI 8088L	standard solution at 5.84 g/L NaCl	500 mL FDA bottle
HI 8088M	standard solution at 5.84 g/L NaCl	230 mL FDA bottle
HI 8089L	standard solution at 125 g/L NaCl	500 mL FDA bottle
HI 8089M	standard solution at 125 g/L NaCl	230 mL FDA bottle
HI 8095L	standard solution at 146 g/L NaCl	500 mL FDA bottle
HI 8095M	standard solution at 146 g/L NaCl	230 mL FDA bottle

Fluoride Standard Solutions

CODE	DESCRIPTION	BOTTLE
HI 7023/1L	TISAB Solution	1 L
HI 7023L	TISAB Solution	500 mL
HI 7023M	TISAB Solution	230 mL
HI 70701/1L	standard solution at 1 g/L F^-	1 L
HI 70701L	standard solution at 1 g/L F^-	500 mL
HI 70701M	standard solution at 1 g/L F^-	230 mL
HI 70702/1L	standard solution at 10 mg/L F^-	1 L
HI 70702L	standard solution at 10 mg/L F^-	500 mL
HI 70702M	standard solution at 10 mg/L F^-	230 mL
HI 70703/1L	standard solution at 100 mg/L F^-	1 L
HI 70703L	standard solution at 100 mg/L F^-	500 mL
HI 70703M	standard solution at 100 mg/L F^-	230 mL

HANNA instruments

With Great Products, Come Great Results™

CONTENTS

Titration

Introduction

General procedure used in manual titration

Before starting, make sure that all glassware, especially the burette, is clean and dry.

Accurately measure a volume of the reactant into to a beaker or Erlenmeyer flask.

Add a suitable indicator to the flask.

Pour the titrant into the burette, read the start-point of the liquid on the burette.

Turn the tap of the burette to allow the titrant to slowly fall into the reactant. Swirl the flask with the other hand or with a magnetic stirrer.

The indicator should change colour as the titrant is added, but then quickly return to its original color.

As the end-point is approached, the indicator takes longer to turn back to its starting color. Add the titrant more slowly at this point (one drop at a time).

When the indicator remains at its end colour, the reaction has reached the end point.

Measure the amount of titrant liquid used, as shown on the scale of the burette.

Repeat as many trials as needed, and then average the volumes.

Once the number of moles of reactant that have been neutralised has been determined then calculate the concentration in moles per litre or other unit.

Titration is a quantitative measurement of an analyte in solution by it's complete reaction without a reagent. Titration is used in analytical chemistry to determine the amount or concentration of a substance. In a titration, one reagent (the titrant) is slowly added to a solution containing the species being measured (the analyte). As it is added, a chemical reaction occurs between the titrant and analyte. The point where all analyte is consumed, and an equal quantity of titrant and analyte are present, it is called the equivalence-point. This is determined by one type of indicator that it is also present in the solution, or by a measurable physical change in the solution, like pH, electrode potential, conductivity, or light absorption (color). In practice, an abrupt change of this physical property signals the end of titration, called the endpoint.

The purpose of titration (also called volumetric analysis) is to determine the analyte quantity or concentration, the titrant concentration being known beforehand. Titrations are based on chemical reactions, and these reactions must fulfill four requirements:

- **The reaction must be fast, so that after the titrant's addition, the reaction occurs within approximately one second**
- **The reaction must go to completion**
- **The reaction must have well-known stoichiometry (reaction ratios)**
- **A convenient method of endpoint detection must be available**

In any titration, there must be a quick, quantitave reaction taking place as the titrant is added.

Manual titration is done with a burette and a long graduated tube that holds the titrant. The amount of titrant used in the titration is determined by reading the difference between the volume of titrant in the burette before the titration and when the endpoint is reacted. The most important factor for making accurate titrations is to read the burette volumes repeatedly. Generally, chemists use the bottom of the meniscus (rounded liquid level) to read the reagent volume in the burette. Additional required instrumentation would be: a burette, a beaker, a pipette - to measure the sample volume, an indicator solution and the (standardized) titrant.

Automatic Titration

Automatic titration is done with automatic titrators. These titrators deliver the titrant, stop at the endpoint and calculate the concentration of the analyte automatically. They are the best for repeatitive titrations. A certain type of electrochemical measurement usually detects the endpoint.

Some complex analysis performed by automatic titrators are...

- **Acid-base, specific ion redox determination by pH/mV measurement with potentiometric detection.**
- **Determination of water with Karl Fischer reagent using coulumetric detection.**
- **Determination of chlorine in aqueous solution with phenylarsene oxide using amperometric detection.**

The required equipment would be the automatic titrator, the (standardized) titrant, a titrant reservoir, a pipette (to measure the sample volume), a beaker, and possibly a magnetic stir-bar for stirring.

The automatic titrator must have an accurate liquid dispensing system. In high accuracy systems, this is typically a stepper motor driven piston burette, a valve system to switch between titrant inlet and outlet, and a titration tip to dispense the titrant into the sample solution. These three main subsystems must be as accurate as possible, with very low gear backlash in the burette drive mechanism, low piston seal flexing, accurate burette glass cylinder diamter, low dead volume in the valve, evaporation/permeation and chemically resistant tubing and an anti-diffusion titrant dispensing tip.

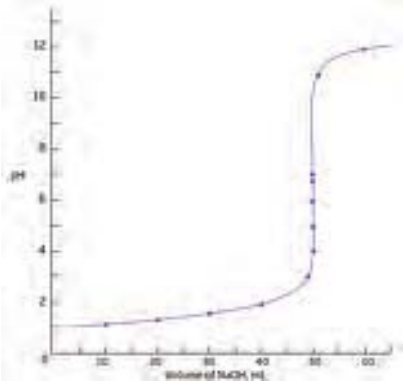
Standards and Standardization

One of the substances involved in a titration must be used as a standard for which the amount of substance is present is accurately known. The standard can be present either in the form of a pure substance or as a standard solution, a solution whose composition is accurately known. The titrant solution can be standardized in two ways; using a primary standard, or more commonly, titrating it against a previously standardized solution.

Type of Titrations

Acid-base titrations This is the most common type of titration - an acid-base reaction (simply exchange of protons). On the following table and graph you can see the variation of pH during the titration of a solution of 0.1 M HCl with one solution of NaOH 0.1 M

Volume of NaOH, mL	pH
0.00	1.00
10.00	1.18
20.00	1.37
30.00	1.60
40.00	1.95
49.00	3.00
49.90	4.00
49.99	5.00
50.00	7.00
50.01	9.00
50.10	10.00
51.00	11.00
60.00	11.96



In 1855, the German chemist, Friedrich Mohrn, defined titration as the "weighing without scale" method, because this process allows determination of the concentration of a sample without using complex instrumentation.

A manual titration requires high accuracy and precision, both in the preparation of the material, and the use of precisely dosed reagents. The operation must be repeated at least 3 times to obtain a reliable measured value. This procedure makes the manual analytical technique very long and fastidious; however, the infinite applications that titration presents, can't be neglected for both organic and inorganic parameters. In some applications, for example, in the food industry, the determination of the content of sulphur dioxide in must and wine and the level of acidity in cheese are still determined manually using the Soxhlet method.

The growing need for faster results has lead HANNA to develop the HI 901 and HI 902C titrators, two instruments that permit the automation of the titration procedures, while providing quick and reliable data.

Titration

Introduction

Potentiometric titrations are those where the potential from an electrode system is used as the analytical signal for the change occuring during the titration. Examples include pH electrodes used for acid-base titrations, ORP electrodes (platinum) used in a redox titration, ion selective electrodes used in a specific ion titration, and silver electrodes used to follow the silver ion concentration in argentometric titrations.

Precipitation titrations

Complexometric titrations In a complexometric titration metal ions are titrated using a titrant that binds strongly to the metal ions.

Amperometric titrations

Spectrophotometric titrations

Back-titrations In this type of titration, a large excess of a reagent is added to the sample solution, helping a slow reaction to go to completion; the unreacted excess reagent is then titrated.

Multiple endpoints titrations

Instrumental End-point Determination

Karl Fischer titrations (KFT) (HI 903) KFT use the Karl Fischer reaction between water, iodine and sulfur dioxide. There are 2 types of Karl fischer titrations: coulometric and volumetric. In the volumetric KFT, methanol solvent is pretitrated to the dryness end-point, sample is added, and the water in the sample solution that is titrated. The titrant contains iodine and SO_2. The CH_3OH solvent and SO_2 react to form (CH_3SO_3)- that reacts in the Karl Fischer reaction with water:

$CH_3OH + SO_2 + RN \rightarrow [RNH]CH_3SO_3$

$H_2O + I_2 + [RNH]CH_3SO_3 + 2RN \rightarrow [RNH]CH_3SO_4 + 2\,[RNH]I$

Were RN = base

In the coulometric KFT, the sample is added to a special reagent solution that contains CH_3OH solvent, SO_2 and iodide. During the titration, iodine (the active titrant) is generated electrochemically in-situ from iodide, by passing electricity across two platinum electrodes immersed in the reagents solution. A separate dual-platinum indicator electrode monitors the end-point, just as in the volumetric KFT. The quantity of passed electricity is measured and it is used to calculate the quantity of water that was present in sample.

The fundamental calculation for all titrations is based on:

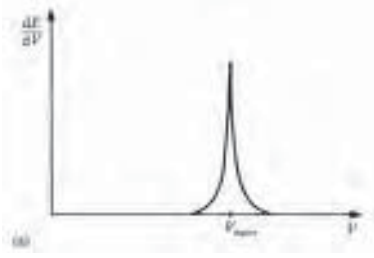
$C_1V_1 = C_2V_2$ or $N_1V_1 = N_2V_2$ or $C_1V_1E_1 = C_2V_2E_2$

Where C is the concentration in moles/liter, V is volume in liters or mL, N is the concentration in normality in equivalents. Liter, and E is the equivalents/mole factor for the analyte and titrant.

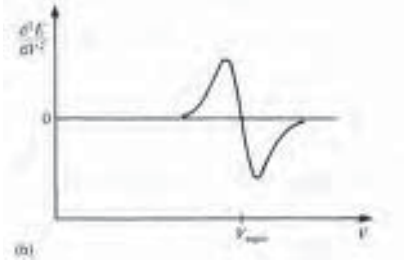
$C_{sample} = C_{titrant}\, V_{titrant} / V_{sample}$

This equation is the most basic form used for calculating the result of a titration. As will be shown in following illustrations, there are modifications to this basic equation necessary for obtaining results in other certain situations.

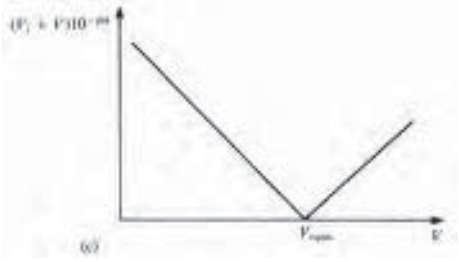
Methods for determining the equivalence point of a potentiometric titration curve (including acid-base titrations):



The first derivative (a); the equivalence point corresponds to the top of the peak.



The second derivative (b); the equivalence point is where the curve crosses the V-axis.



The Gran plot (c); this method consists of the mathematical transformation of the titration curve into straight lines via rearranged Nernst equations (titration of a strong acid with a strong base; V_i is the initial volume of acid and V the volume of base added)

Product Spotlights

HI 903

Karl Fischer Volumetric Titrator for Moisture Determination

5.8

The HI 903 Karl Fischer Volumetric Titrator is an extension of HANNA's highly successful potentiometric titrator platform. The HI 903 combines an ultra-high precision titrant delivery system with optically regulated magnetic stirring, and sophisticated endpoint determination, dynamic dosing and background drift correction algorithms.

The HI 903 comes equipped with a solvent handling system to reduce cell conditioning time and can be connected directly to your laboratory balance.

The result is an extremely adaptable titrator capable of titrating with superior accuracy and precision even for samples with low moisture content.

HI 902C

Automatic Titration Systems

5.12

The HI 902C is an automatic titrator that complements our wide range of products dedicated to quick and accurate laboratory analysis. HI 902C can perform acid/base, potentiometric, ORP, complexometric, precipitation, back titrations and titre determinations.

This versatile titrator supports up to 100 methods, standard or user defined. When powered on, the instrument initiates an internal diagnostics check and then readies itself for the first titration of the day. A large color LCD screen clearly shows the chosen method and related information. A real-time titration curve can be shown on the display; this feature is useful when new methods are tested or when a procedure needs to be optimized. At the end of the titration, all data, including the graph, are automatically stored in memory and can be copied via the built-in USB drive or through direct connection with a PC.

HI 84433

Formol Number Mini Titrator and pH Meter for Wines and Fruit Juices

5.34

The HI 84433 is an easy to use microprocessor-based automatic mini titrator and pH meter designed for the quick and accurate determination of formol number in wines or fruit juices. By eliminating subjective factors including color indicators, errors in mathematical calculations or erratic titrant additions from the measurement, the HI 84433 makes formol number determination precisely.

A clear and intuitive user interface allows users to navigate the HI 84433's menus and functions quickly. A HELP key located on the keypad aids in set-up, calibration status and troubleshooting.

WINE line

Product Spotlights

HI 84432

Titratable Acidity Mini Titrator and pH Meter for Fruit Juice

5.26

The HI 84432 digital automatic mini titrator and pH meter is designed for quick and accurate analysis of total titratable acidity in fruit juices. By eliminating subjective factors including color indicators, errors in mathematical calculations or erratic titrant additions from the measurement, the HI 84432 provides quick and accurate, repeatable results without guesswork.

A clear and intuitive user interface allows users to navigate the HI 84432's menus and functions quickly. A HELP key located on the keypad aids in set-up, calibration status and troubleshooting.

HI 84437

Titratable Acidity Mini Titrator and pH Meter for Mayonnaise

5.28

The HI 84437 is an easy to use microprocessor-based automatic mini titrator and pH meter designed for the quick and accurate analysis of titratable acidity in mayonnaise. By eliminating subjective factors including color indicators, errors in mathematical calculations or erratic titrant additions from the measurement, the HI 84437 makes titratable acidity analysis precisely. This instrument will quickly become a valuable tool for mayonnaise analysis.

A clear and intuitive user interface allows users to navigate the HI 84437's menus and functions quickly. A HELP key located on the keypad aids in set-up, calibration status and troubleshooting.

HI 83540

Alcohol in Wine Mini Titrator

5.38

With this instrument, alcohol determination is made using a new, state of the art method. The wine sample is measured before and after the HANNA reagent is added. The difference between measurements is used to calculate the alcohol content.

HANNA's new HI 83540 alcohol determination analyzer uses a patent pending conductimetric known addition procedure that allows wine makers to accurately determine alcohol concentration in minutes. The basis for this invention is that the change of electric conductivity (EC) of a wine after the addition depends on the amount of alcohol. The complex software of the instrument performs all the necessary calculations and adjustments, providing the user with a direct readout of alcohol in % volume on the graphic LCD.

HANNA instruments

With Great Products, Come Great Results™

Comparison Guide

GUIDE	Low Range Acidity	High Range Acidity	Ultra Low Range Alkalinity	High Range Alkalinity	pH Range	ORP Range	ISE Range	Temperature Range(s)	Citric Acid Range	Malic Acid Range	Tartaric Acid Range	Acetic Acid Range	Formol Number	Sulfur Dioxide Range	Alcohol Range	pH Calibration Points	Automatic Temperature Compensation	Clip Lock™	GLP	Logging	Backlit Display	PC Connectivity	Page
Karl Fischer Titrator																							
HI 903																		•	•	•	•	•	5.8
Bench Titrators																							
HI 902C					•	•	•	°C/°F K								5	•	•	•	•	•	•	5.12
HI 901					•	•	•	°C/°F K								5	•	•	•	•	•	•	5.16
HI 84430	•	•			•			°C								3			•	•	•		5.20
HI 84431			•	•	•			°C								3			•	•	•		5.22
HI 84442			•		•			°C								3			•	•	•		5.22
Acidity Mini Titrators																							
HI 84429	•	•			•			°C								3	•				•		5.24
HI 84432					•			°C	•	•	•					3	•		•	•	•		5.26
HI 84437					•			°C				•				3	•		•	•	•		5.28
HI 84435					•			°C				•				3	•		•	•	•		5.30
HI 84434					•			°C				•				3	•		•	•	•		5.32
HI 84433					•			°C					•			3	•		•	•	•		5.34
Wine Analysis Mini Titrators																							
HI 84100														•			•				•		5.36
HI 84102											•						•				•		5.37
HI 83540															•		•		•	•	•	•	5.38

HI 903

Karl Fischer Volumetric Titrator for Moisture Determination

Measures 100 ppm to 100% water content

- **Precision titrant delivery system**
  - 40,000 step, piston dosing pump
  - Accurate to 0.1%
  - Delivers as little as 0.125 µL of titrant
  - Precision ground, 5 mL glass burette with PTFE plunger, PTFE burette tubing, and polyurethane tube jacketing (thermally insulating, light blocking)
  - Glass anti-diffusion dispensing tip
  - Clip-Lock™ exchangeable burette system enables users to exchange reagent burettes in a matter of seconds
- **Sealed solvent system**
  - Change to fresh solvent in a matter of seconds without opening the titration vessel
  - Minimizes exposure to ambient humidity, reducing titrant consumption and saving time
  - PTFE solvent tubing is resistant to harsh KF solvents and titrants
- **Beaker top**
  - Chemically-resistant reaction vessel cap and fittings
  - Quick-remove sample port plug with replaceable silicone rubber septum
- **Anti-diffusion burette tip**
  - Delivers titrant in high turbulence zone, ensuring rapid reaction
  - Prevents unwanted diffusion of titrant
- **Built-in stirrer**
  - Automatic, integrated magnetic stirrer adjustable from 200-2000 RPM
  - Optical feedback for automatic speed control
  - Optional external stirrer available
- **Rechargeable indicating desiccant**
  - Prevents the ingress of ambient humidity into the sealed solvent system while maintaining full titrator functionality
  - Minimizes changes to titrant titre
  - Indicates when adsorption capacity is depleted
  - Regenerates at 150°C
- **PTFE bottle cap**
  - Caps fit any GL45-threaded bottle
  - Chemically resistant caps and fittings
  - Removable desiccant cartridges

Adaptable, High Accuracy Moisture Determination

The HI 903 Karl Fischer Volumetric Titrator for moisture analysis is an extension of HANNA's highly successful potentiometric titrator platform. The HI 903 combines an ultra-high precision titrant delivery system with optically regulated magnetic stirring, sophisticated endpoint determination, dynamic dosing and background drift correction algorithms.

The result is an extremely adaptable titrator capable of titrating with superior accuracy and precision even for samples with low moisture content. The HI 903 dispenses the titrant, detects the endpoint and performs all necessary calculations automatically.

The HI 903 comes equipped with a solvent handling system to reduce cell conditioning time and can be connected directly to your laboratory balance via serial interface.

The HI 903's powerful software and intuitive menus are easily navigated on the large, color LCD display making it simple to view results. Choose from included methods or develop a custom method for almost any application or sample type. Using a USB flash drive or connecting the titrator to the HI 900PC application, methods (standard and user) can be upgraded, stored or deleted.

Clip-Lock™ Exchangeable Burette System

With Clip-Lock™, it only takes a couple of seconds to exchange the reagent burettes to perform a different titration.

The Clip-Lock™ exchangeable burette system prevents cross contamination while reducing loss of time and reagents. Burettes simply slide out for quick exchanges, and detaching the aspiration and dispensing tubes from the titrant bottles is easy.

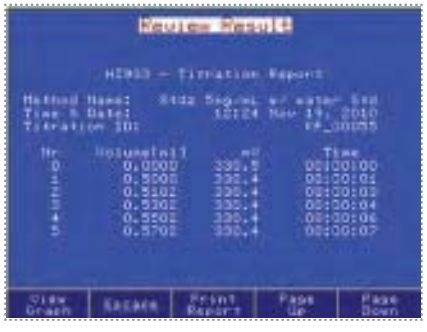
Interrupting an important cycle of analysis due to a malfunctioning burette is a thing of the past. With the HANNA Clip-Lock™ system you can simply substitute the burette and complete all your tests with the same titrant! Having several prepared burettes on hand will make the HANNA HI 903 one of the fastest and most versatile titration systems available.

Versatile Data Management

- **HI 900 Series titration systems can be easily incorporated into any existing GLP data management program:**
  Easily record all necessary GLP information with every sample such as sample identification, company and operator name, date, time, electrode ID codes and calibration information
- **Data can be transferred to a PC using the HANNA HI 900PC software application**
- **The USB port allows for the easy transfer of methods, reports and software upgrades via a USB flash drive**
- **Users can print reports of analyses directly from the titrator using a standard parallel printer**
- **An external monitor and keyboard can be attached for added versatility**

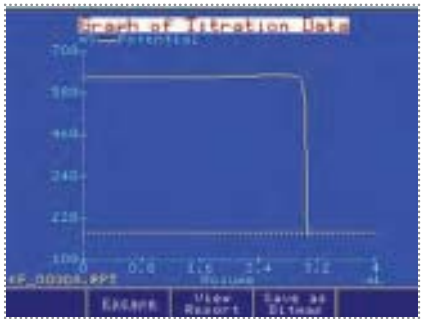
Customizable reports

Titration reports are fully customizable



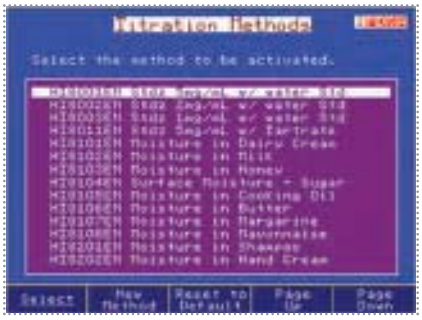
Versatile results

Titration or pH/mV/ISE reports can be viewed on-screen or transferred to a USB storage device



Titration graphs

Titration graphs can be viewed on screen or saved as a bitmap and transferred to a PC via USB



Methods

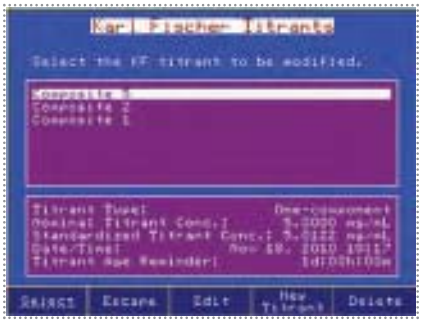
The HI 903 comes with a standard method pack

Standby

The HI 903 keeps the solvent dry between samples and monitors the drift rate

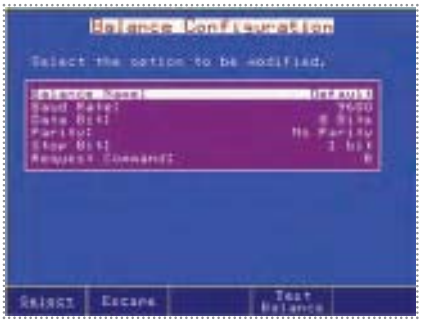
Results

Titration results are displayed with links to average results or a user-customized report



Titrant database

The HI 903 stores standardization information for up to 20 titrants and displays a reminder when standardization is due



Fully configurable balance interface

Enter sample size automatically from any laboratory balance with serial output

Fully customizable titration methods

Customize methods for any application

- **Titrant database**
  - Stores standardization information for up to 20 titrants
  - Standardization reminders
- **Supports up to 100 titration methods (standard and user defined)**
- **Dynamic dosing with optional pre-dispensing**
- **Results displayed directly in the selected units**
- **Titration graph can be displayed on-screen and saved as a bitmap**
- **Multi language support**
- **USB flash drive input**
  - Transfer methods, reports and graphs to either a PC or other titration system
  - Field-upgradeable software
- **Incorporates into any GLP data management program:**
  - Easily record all necessary GLP information with every sample including company and operator name, date, time, electrode ID codes and calibration information
- **Compatible with most major titrant and solvent brands**
- **Proper mixing of titrant and analyte**
  - Digital, magnetic stirring system with optical feedback
  - Conical titration cell to facilitate mixing over a wide volume range
  - Upward dispensing of titrant to ensure rapid reaction
- **Flexible, accurate detection of the titration endpoint**
  - Dual platinum pin polarization electrode for bivoltametric indication
  - Signal averaging reduces noise
  - Selectable endpoint criteria: fixed mV persistence, relative drift stop or absolute drift stop
- **Balance interface**
  - Automatically acquire sample mass or volume via serial RS-232 interface
- **Easy to operate**
  - User friendly interface
  - Context-sensitive help screens
  - Self diagnostic features for external components including dosing pump, burette and stirrer
- **Ideal for**
  - Food and beverage, pharmaceuticals, cosmetics, chemical and petrochemical manufacturing and solvents

HI 903 Connectivity

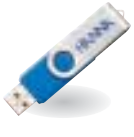
PC with HANNA software

VGA Display

Parallel Printer

PC Keyboard

Balance



USB Flash Drive

SPECIFICATIONS		HI 903
Range		100 ppm to 100%
Resolution		1 ppm (0.0001%)
Result Units		%, ppm, mg/g, µg/g, mg, µg, mg/mL, µg/mL, mg/pc, µg/pc
Sample Type		liquid or solid
Determination	Pre-Titration Conditioning	automatic
	Background Drift Correction	automatic or user selectable value
	Endpoint Criteria	fixed mV persistence, relative drift stop or absolute drift stop
	Dosing	dynamic with optional pre-dispensing rate
	Result Statistic	mean, standard deviation
Clip Lock™ Exchangeable Burette System	Dosing Pump Resolution	1/40000 of the burette volume (0.125 µL per dose)
	Dosing Pump Accuracy	±0.1% of full burette volume
	Syringe	5 mL precision ground glass with PTFE plunger
	Valve	motor driven 3-way, PTFE liquid contact material
	Tubing	PTFE with light block and thermal jacketing
	Dispensing Tip	glass, fixed position, anti-diffusing
	Titration Vessel	conical with operation volume between 50-150 mL
	Solvent Handling System	sealed system, integrated diaphragm air pump
Electrode	Type	dual platinum pin, polarization electrode
	Connection	BNC
	Polarization Current	1, 2, 5, 10, 15, 20, 30 or 40 µA
	Voltage Range	2 mV to 1000 mV
	Voltage Resolution	0.1 mV
	Accuracy (@25°C/77°F)	±0.1 mV
External Stirrer	Type	magnetic, optically regulated, digital stirrer
	Speed	200-2000 rpm
	Resolution	100 rpm
Peripheral Devices	PC	easily view, transfer, print or delete methods and reports via HI900PC application
	USB Flash Drive	easily upgrade software or transfer methods and reports between devices using a USB drive
	Laboratory Analytical Balance	RS232 to connect any laboratory balance
	Printer	print directly from the HI 903 to a printer via parallel port
	Monitor	instrument status and titrations can be viewed on a larger screen using any VGA compatible external monitor
	Keyboard	alphanumeric text can be entered using an optional PS/2 keyboard
Graphic Display		5.7" (320 x 240 pixel) color LCD
Titration Methods		up to 100 (standard and user) methods
Data Storage		up to 100 complete titration reports and drift rate reports can be stored
GLP Conformity		Good Laboratory Practice and instrument data storage and printing
Languages		English, Portuguese and Spanish
Enclosure Material		ABS plastic and steel
Keypad		polycarbonate
Power Supply		"-01" model: 115VAC, 50/60 Hz; "-02" model: 230VAC, 50/60 Hz;
Operating Environment		10 to 40°C, up to 95% RH
Storage Environment		-20 to 70°C, up to 95% RH
Dimensions		390 x 350 x 380 mm (15.3 x 13.8 x 14.9")
Weight		approximately 10 kg (22 lbs.)

ORDERING INFORMATION

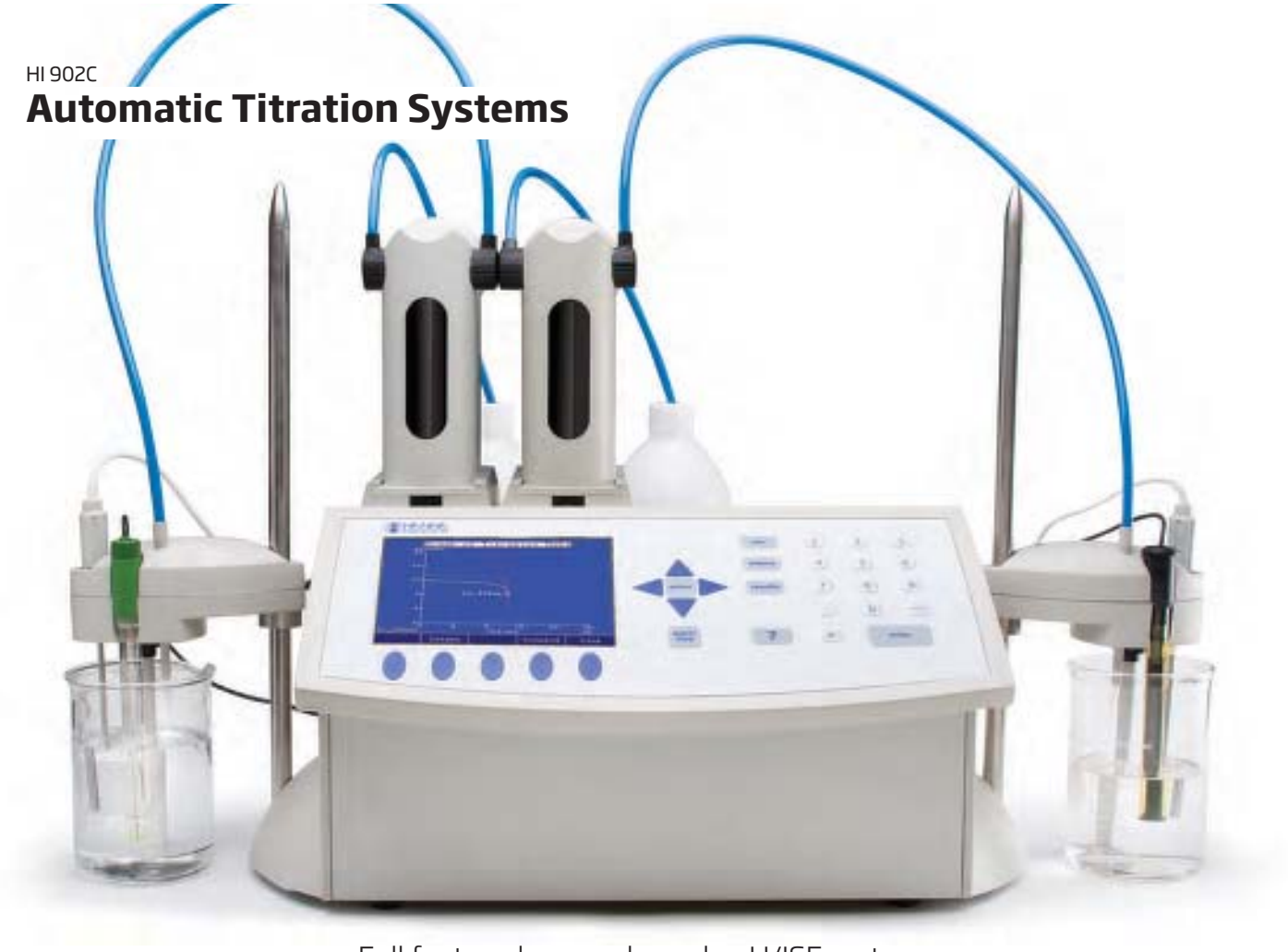
HI 903-01 (115V) and **HI 903-02** (230V) are supplied with dual platinum pin electrode, dosing pump, 5 mL burette assembly with tubing, air pump assembly with tubing, beaker and bottle top assemblies and all fittings, desiccant cartridges (4) with indicating desiccant, stir bar, waste bottle, calibration key, USB cable, power cable, HI 900PC application, USB flash drive, quality certificate, ISO 8655 burette compliance report and instruction manual binder.

ACCESSORIES

HI 76320D	KF electrode
HI 900100	Titrant dosing pump
HI 900520	Beaker assembly
HI 900505	5 mL burette assembly (includes syringe and aspiration and dispensing tubes)
HI 900205	5 mL burette syringe
HI 900260	3-way valve (includes 3 gaskets and 2 screws)
HI 900522	KF beaker
HI 900523	Dispensing tip (2)
HI 900527	Septum (5)
HI 900528	Solvent port plugs (2)
HI 900530	Titrant bottle top assembly
HI 900534	Waste bottle
HI 900531	Solvent/waste bottle top assembly
HI 900532	Desiccant cartridge for beaker or titrant
HI 900533	Desiccant cartridge for use with solvent or waste bottle top assemblies
HI 900180	Solvent-handling pump
HI 900535	Tubing for solvent/waste handling
HI 900536	Tubing for solvent-handling pump
HI 900540	O-ring set
HI 900570	Aspiration tubing (PTFE titrant tubing, blue protection tubing and tube lock)
HI 900580	Dispensing tubing and fitting (PTFE titrant tubings, blue protection tubing, fitting and tube lock)
HI 900930	RS232 cable for PC connection

HI 902C

Automatic Titration Systems



Full featured research grade pH/ISE meter

- **Intuitive user interface**
- **USB port allows for the transfer of methods and reports to a PC or another titrator via USB flash drive**
- **Field upgradeable software**
- **RS232 port allows direct connection to an analytical laboratory balance**
- **Multi language support**
- **Four working modes; potentiometric titrator, pH meter, mV meter, and ISE meter**
- **Potentiometric titrator**
  - Linked titration methods allow two methods to run in sequence
  - Acid/base, non-aqueous, ORP, complexation, back, precipitation titrations and titre determination can be performed
  - Supports up to 100 titration methods (standard and user defined)
  - Supplied standard methods pack or create your own
  - Titration graph can be displayed on-screen and saved as a bitmap
  - Choice of endpoint detection: equivalence point (1st or 2nd derivative) or fixed pH/mV value
  - Reminders for titrant age and standardization expiration
  - Multiple end-point titrations with multiple molecular weights and reaction ratios
  - Two sensor inputs with the addition of a second analog board
  - Supports two burette dosing pumps with the ability to perform back titrations
  - Clip-Lock exchangeable burette system enables users to exchange burettes in a matter of seconds
  - 25 mL precision ground glass syringe with PTFE plunger
  - 40,000 step screw drive, piston dosing pump
  - 3-way motor driven valve
  - PTFE burette tubing with polyurethane tube jacketing
- **pH meter**
  - Full featured research grade pH meter
  - Automatic Temperature Compensation (ATC)
  - Up to five calibration points with automatic recognition of standard buffers
  - Up to five custom buffers can be used for calibration
- **mV (ORP) meter**
  - Relative mV calibration
- **ISE meter**
  - Numerous concentration units including: mol/L, mmol/L, mg/L, mg/mL, ug/L, %, ppt, ppm, g/L, and user defined
  - Up to 5 calibration points with 5 custom standards

Support for 2 electrodes, 2 burette dosing pumps and 2 stirrers

Clip-Lock™ Exchangeable Burette System

With Clip-Lock™, it only takes a few seconds to exchange the reagent burettes to perform a different titration

Easy upgrades

Field upgradeable software via USB

Method sequencing

Linked titration methods allow two methods to run in sequence

Powerful Customization, Accurate Analysis

The HI 902C is an automatic titrator that complements our wide range of products dedicated to quick and accurate laboratory analysis. HI 902C can perform acid/base, potentiometric, ORP, complexometric, precipitation, back titrations and titre determinations.

The HI 902C dispenses the titrant, detects the endpoint and performs all necessary calculations automatically.

This versatile titrator supports up to 100 methods, standard or user defined. When powered on, the instrument initiates an internal diagnostics check and then readies itself for the first titration of the day. A large color LCD screen clearly shows the chosen method and related information. A real-time titration curve can be shown on the display; this feature is useful when new methods are tested or when a procedure needs to be optimized. At the end of the titration, all data, including the graph, are automatically stored in memory and can be copied via the built-in USB drive or through direct connection with a PC.

This titrator is supplied with a pack of standard methods or you can create your own. Methods (standard and user) can be upgraded, stored or deleted by connecting the titrator to a PC with HANNA software or USB flash drive. Software updates can also be performed using a USB flash drive.

Users can connect pH, ORP or ISE electrodes to the HI 902C, as well as create a complete workstation with a PC, monitor, keyboard and printer.

The HI 902C complies with GLP specifications. All GLP information from each sample can be stored, including ID number, date and time of analysis, electrode ID code, and last calibration date.

Clip-Lock™ Exchangeable Burette System

With Clip-Lock™, it only takes a few seconds to exchange the reagent burettes to perform a different titration.

The Clip-Lock™ exchangeable burette system prevents cross contamination while reducing loss of time and reagents. Burettes simply slide out for quick exchanges and detaching the aspiration and dispensing tubes from the titrant bottles is easy.

Interrupting an important cycle of analysis due to a malfunctioning burette is a thing of the past. With the HANNA Clip-Lock™ system you can simply substitute the burette and complete all your tests with the same titrant!

Having several prepared burettes on hand will make the HANNA HI 902C one of the fastest and most versatile titration systems on the market.

Fully customizable titration methods

Linked methods allow two methods to run in sequence

Fully configurable balance interface

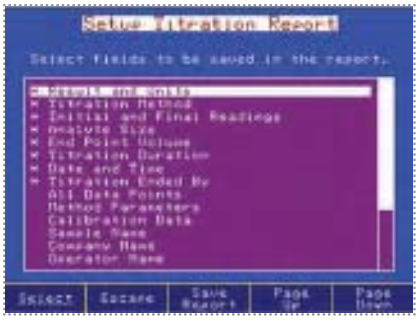
Up to 5 pH calibration points, with automatic buffer recognition

Relative mV calibration allows for a mV offset

Select your ISE type from the available list

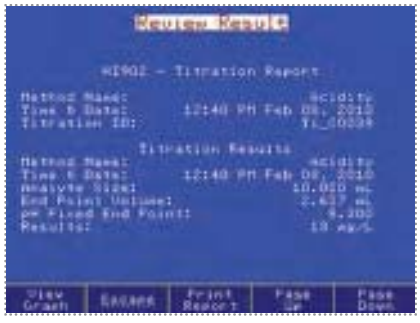
Versatile Data Management

- **HI 902C Series titration systems can be easily incorporated into any existing GLP data management program:**
  Easily record all necessary GLP information with every sample such as sample identification, company and operator name, date, time, electrode ID codes and calibration information
- **Data can be transferred to a PC using the HANNA HI 900PC application**
- **The USB port allows for the easy transfer of methods, reports and software upgrades via USB flash drive**
- **Users can print reports of analyses directly from the titrator using a standard parallel printer**
- **An external monitor and keyboard can be attached for added versatility**



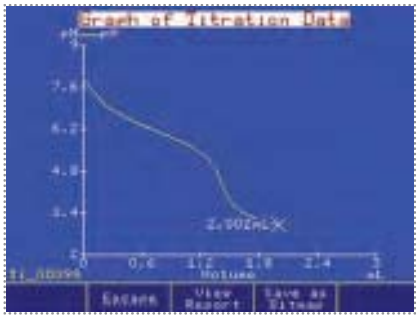
Customizable reports

Titration reports are fully customizable



Versatile results

Titration or pH/mV/ISE reports can be viewed on-screen or transferred to a USB storage device



Titration graphs

Titration graphs can be viewed on screen or saved as bitmaps and transferred to a PC via USB

HI 902C Connectivity

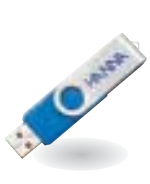
PC with HANNA software

VGA Display

Parallel Printer

PC Keyboard

Balance



USB Flash Drive

HANNA instruments

With Great Products, Come Great Results™

SPECIFICATIONS	mV	pH	ISE	Temperature
Range	-2000.0 to 2000.0 mV	-2.000 to 20.000 pH	1 x 10^{-6} to 9.99 x 10^{10}	-5.0 to 105.0°C/23 to 221°F/ 268.2 to 378.2 K
Resolution	0.1 mV	0.1/0.01/0.001 pH	1, 0.1, 0.01	0.1°C/0.1°F/0.1K
Accuracy (@25°C/77°F)	±0.1 mV	±0.001 pH	±0.5% monovalent; ±1% divalent	±0.1°C/±0.2°F/±0.1K (excluding probe error)
Burette Sizes	5, 10, and 25 mL			
Burette Resolution	1/40000			
Display Resolution	0.001 mL			
Dosing Accuracy	±0.1% of full burette volume			
Display	5.7" (320 x 240 pixel) backlit color LCD			
Languages	English, Portuguese, Spanish			
Methods	load up to 100 methods (standard and user-defined)			
Burette Auto-Detection	burette size is automatically recognized when inserted into the unit			
Programmable Stirrer	propeller type, 100-2500 RPM, automatically held within 10% of the set value, resolution 100 rpm			
Flow Rate	user-selectable from 0.1 mL/min to 2 x burette volumes/min			
Temperature Compensation	manual or automatic (ATC)			
End-point Determination	equivalence point (1st or 2nd derivative) or fixed pH/mV value			
pH Calibration	up to five point calibration, eight standard buffers and five custom buffers			
mV Calibration	single point offset			
ISE Calibration	up to five point calibration, seven standard solutions and five user defined standards			
Potentiometric Titrations	acid-base (pH or mV-mode), redox, precipitation, complexometric, non-aqueous, ion-selective, argentometric, back titrations and titre determination			
Measurement Units	user specified expression of concentration units to suit specific calculation requirements			
Real Time & Stored Graphs	mV-volume or pH-volume titration curve, 1st derivative curve or 2nd derivative curve, in pH-mode, mV-mode or ISE mode; pH/mV/concentration values versus time-datalogging results			
Data Storage	up to 100 titration and pH/mV/ISE reports			
USB Host (Side)	flash drive compatibility for transfers of methods and reports			
Peripherals (Rear)	connections for VGA display, PC-keyboard, parallel printer, USB device input, RS232, interface for future expansion			
GLP Conformity	instrumentation data storage and printing capabilities			
Operating Environment	10 to 40°C (50 to 104°F), up to 95% RH			
Storage Environment	-20 to 70°C (-4 to 158°F), up to 95% RH			
Power	"-01" models: 115VAC; "-02" models: 230VAC; 50/60 Hz			
Dimensions	390 x 350 x 380 mm (15.3 x 13.8 x 14.9 in)			
Weight	approximately 10 kg (22 lbs.) with one pump and stirrer assembly			

HI 900301 stirrer

Ensures effective mixing with a selectable speed from 100 to 2500 rpm.

Quick change

Having several prepared burettes on hand will make this one of the fastest and most versatile titration systems available.

ORDERING INFORMATION

HI 902C1-01 (115V) titrator with one analog board
HI 902C1-02 (230V) titrator with one analog board
HI 902C2-01 (115V) titrator with two analog boards
HI 902C2-02 (230V) titrator with two analog boards

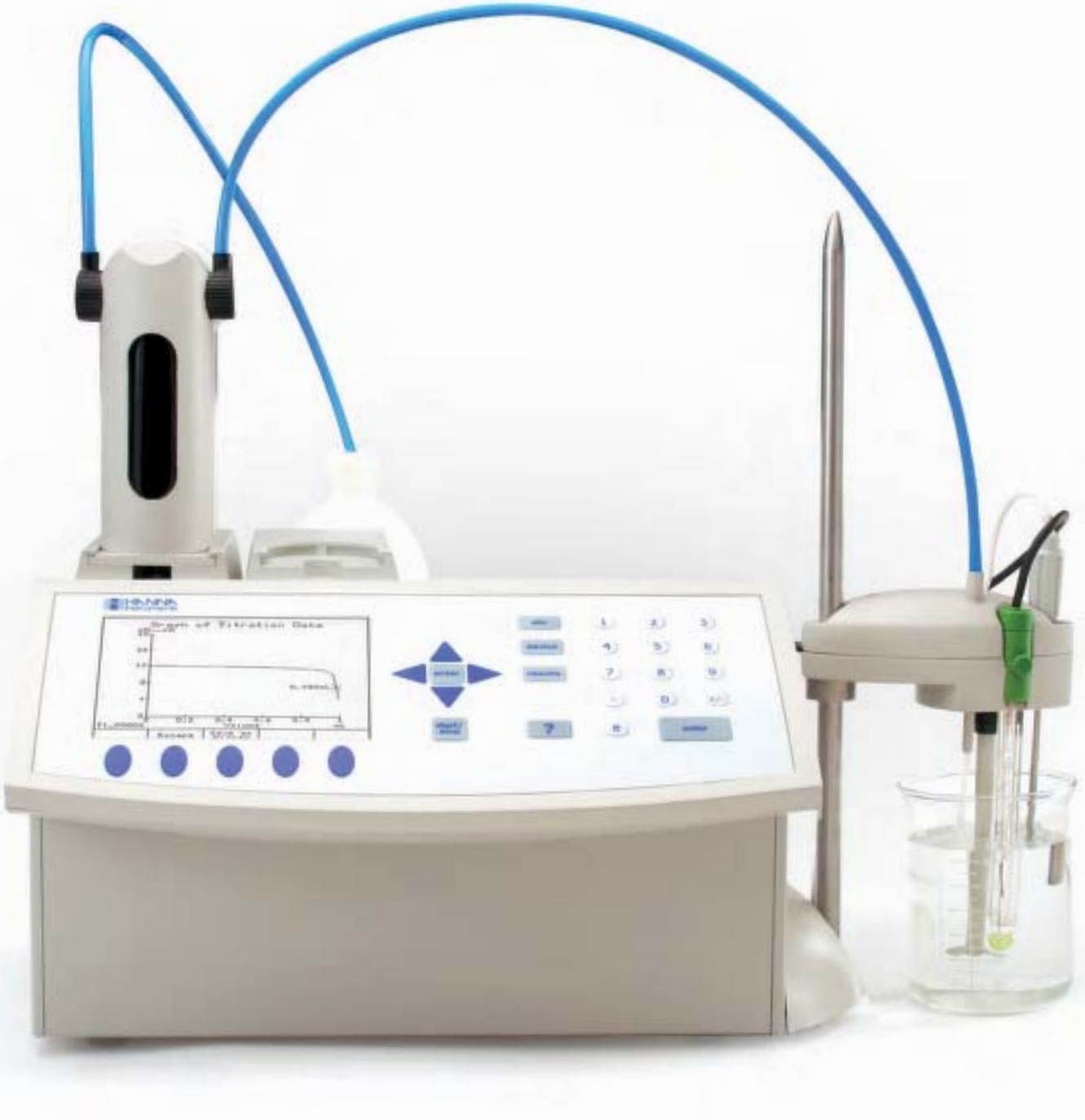
All models include stirrer with stand, 25 mL glass burette, dosing pump drive, temperature sensor, USB cable, 256 Mb USB flash drive and PC software.

ACCESSORIES

HI 900100	Dosing pump
HI 900150	50 mL burette assembly (includes syringe and aspiration and dispensing tubes)
HI 900125	25 mL burette assembly (includes syringe and aspiration and dispensing tubes)
HI 900110	10 mL burette assembly (includes syringe and aspiration and dispensing tubes)
HI 900105	5 mL burette assembly (includes syringe and aspiration and dispensing tubes)
HI 900225	25 mL burette syringe
HI 900210	10 mL burette syringe
HI 900205	5 mL burette syringe
HI 900260	3-way valve (includes 3 gaskets and 2 screws)
HI 900270	Aspiration tube with fitting (includes blue protection tube, gasket, and tube lock)
HI 900280	Dispensing tube with fitting (includes standard dispensing tip, blue protection tube, gasket, and tube lock)
HI 900301	Overhead stirrer assembly (includes overhead stirrer and 3 propellers)
HI 900302	Propeller (includes 3 propellers)
HI 900310	Overhead electrode holder (includes overhead stirrer without electronics and stir bar)
HI 900320	Stirrer stand
HI 900920	Temperature probe
HI 900930	RS232 cable for PC connection
HI 900942	Burette cap removal tool
HI 900941	Shorting connector

HI 901

Automatic Titration System



- Precise dosing system (accuracy under 0.1% of burette volume)
- Supports up to 10,000 titration methods (standard and user defined)
- Clip Lock™ – change burettes quickly with auto burette recognition
- Dynamic/Linear dosing feature
- Fixed end point potential or pH
- Equivalence point detection (first derivative and second derivative)
- The results are displayed directly in the selected units
- Titration graph can be displayed on-screen and saved
- User customized reports can be printed, saved on floppy disk or transferred to PC via RS232 interface
- Reminders for titrant age and standardization expiration
- Self diagnostic features for peripheral devices including pump, valve, burette and stirrer

Keep an accurate record of analyses!

HANNA's 900 Series titration systems are easily incorporated into any existing GLP data management program:

- Users can easily record all necessary Good Laboratory Practice information with every sample including sample identification, company and operator name, date, time, electrode ID codes and calibration information.
- Data can also be transferred using the integral floppy disk drive for communication with a PC or even other titration systems. Special memory cards are not required.
- All test results can be transferred directly to a PC.
- Users can print reports of analyses directly from the titrator using a standard parallel printer.
- An external monitor and keyboard can be attached for added versatility.
- RS485 port for future expansion.

Custom methods

Record up to 100 reports

Incorporate HANNA 900 series titrators into any GLP data management program

Powerful Customization, Accurate Analysis

The HI 901 is an automatic titrator that compliments our wide range of products dedicated to quick and accurate laboratory analysis.

This titration system is provided with a host of numerous features suitable for routine sample analysis and performs acid/base, potentiometric and amperometric titrations. The HI 901 can also drive two pumps separately.

This versatile titrator supports up to 10,000 methods: standard or user defined. When powered on, the instrument initiates an internal diagnostics check and then readies itself for the first titration of the day. A large LCD screen clearly shows the chosen method, correlated information and also indicates which parameters may be adjusted. A real-time titration curve is shown on the display; this feature is useful when new methods are tested or when a procedure needs to be optimized. At the end of the titration, all data, including the graph, are automatically stored in memory and can be copied to disk via the built-in floppy drive or through direct connection with the serial cable supplied with the titrator. The titrators are equipped with an RS485 serial port.

Burette maintenance is simple and completely automated. The user can decide to purge it or wash it and can select how many washings to perform. With our exclusive Clip Lock™ system for burette replacement, changing from one titrant to another is done in a flash! Often, preliminary titration operations are very long and arduous. A burette often needs to be adjusted for correct dosing, which extends waiting time for new sample analysis. HANNA has engineered a way to solve this problem.

The innovative Clip Lock™ system allows users to change burettes in two simple steps, passing from one titrant to the next without any problem. Additionally, HI 901 automatically recognizes the volume of the new burette.

Users can connect pH or ORP electrodes to this unit, as well as create a complete workstation with a PC, monitor, keyboard and printer. This unit complies with GLP specifications, providing validation support for analysis. All GLP information from each sample can be stored, including ID number, date and time of analysis, electrode ID code and last calibration date.

Up to 100 reports of analysis, complete with titration curve graphing is possible. A calibration "time-out" can be set and the user can be advised when the pH electrode needs to be calibrated. The instrument's status can be viewed clearly on the large LCD screen. Contained in the set-up menu, features like language, display brightness, resolution, pH electrode calibration, date and hour can be adjusted. During analysis, the titration is displayed in real-time together with the stored data. Date, hour, temperature (when probe is connected) and warning messages, such as a pH electrode calibration message, can all be displayed for your convenience.

Automatic Burette Volume Recognition

This feature makes exchanging titrants convenient, safe and fast.

Quick Change

Keep several burettes on hand for a quick change.

Stirrer

The optional stirrer ensures an effective mixing with a selectable speed from 100 to 2500 rpm.

A. Aspiration Tube (Titrant Inlet)
B. Dispensing Tube (Titrant Outlet)
C. Burette Assembly
D. Light Shield (in closed state)
E. Burette Support
F. Support Bar
G. Sliding Positioning Collar
H. Dispensing Tip
I. Temperature Sensor
J. pH Electrode
K. Stirrer Propeller
L. Stirrer Stand
M. Numeric Keys
N. Function Keys
O. Help Key
P. Arrow Keys
Q. Option Keys
R. 320 x 240 Pixel Graphic LCD

A Complete Analysis

These instruments perform a complete analysis comprising of sample preparation, dispensing of titrant solution, stirring, measuring and waiting times, recognition of the end point and storing the results. All the parameters that a titration requires are grouped into a method.

The titrators are already supplied with a set of standard methods or you can create your own. Using a floppy disk or connecting the titrator to the HI 900 PC application, methods (standard and user) can be upgraded, stored or deleted.

Clip-Lock™ Exchangeable Burette System

With Clip-Lock™, it only takes a couple of seconds to exchange the reagent burettes to perform a different titration.

With conventional titrators, there is the risk of cross contamination of titrants when exchanging reagents. Reconfiguring the titrator for different sample methods consumes time and reagents. Each method may need different reagents and care must be used when purging and cleaning the burette. To avoid these problems, HANNA introduces the Clip-Lock™ exchangeable burette system to prevent cross

contamination while reducing loss of time and reagents. Burettes simply slide out for quick exchanges and detaching the aspiration and dispensing tubes from the titrant bottles is easy.

Having several prepared burettes on hand will make the HANNA 900 series the fastest and most versatile titration systems available. Interrupting an important cycle of analysis due to a malfunctioning burette is a thing of the past. With the HANNA Clip-Lock™ system you can simply substitute the burette and complete all your tests with the same titrant!

HANNA's burettes feature a threaded screw connection to prevent leakage problems. Burettes are available in 5 mL, 10 mL & 25 mL sizes and are made of chemically resistant material to ensure many years of trouble-free operation.

HI 901 Connectivity

PC with HANNA software

VGA Display

Parallel Printer

PC Keyboard

SPECIFICATIONS	mV	pH	Temperature
Range	-2000.0 to 2000.0 mV	-2.000 to 20.000 pH	-5.0 to 105.0°C/23 to 221°F/ 268.2 to 378.2 K
Resolution	0.1 mV	0.1/0.01/0.001 pH	0.1°C/0.1°F/0.1K
Accuracy (@25°C/77°F)	±0.1 mV	±0.001 pH	±0.1°C/±0.2°F/±0.1K (excluding probe error)
Burette Sizes	5, 10, and 25 mL		
Burette Resolution	1/40000		
Display Resolution	0.001 mL		
Dosing Accuracy	±0.1% of full burette volume		
Display	graphic LCD, 320 x 240 pixel LCD		
Languages	English, Italian, Portuguese, Spanish		
Methods	up to 10,000 methods (standard and user-defined)		
Burette Auto-Detection	burette size is automatically recognized when inserted into the unit		
Programmable Stirrer	propeller type, 100-2500 RPM, automatically held within 10% of the set value, resolution 100 rpm		
Flow Rate	user-selectable from 0.1 mL/min to 2 x burette volumes/min		
pH/mV Measurement	titrators can also perform direct pH and mV measurements		
Temperature Compensation	manual or automatic (ATC)		
pH Calibration	manual or automatic at one to five points with four buffer sets or custom buffers		
Potentiometric Titrations	acid-base (pH or mV-Mode), redox, precipitation, complexometric, non-aqueous,ion-selective, argentometric (in mV-mode only)		
HI 901 Titration Methods	fixed mV or pH end-point detection & first equivalency point detection (with the 1st or 2nd derivatives)		
Measurement Units	user specified expression of concentration units to suit specific calculation requirements		
Real Time & Stored Graphs	mV-volume or pH-volume titration curve, 1st derivative curve or 2nd derivative curve, in pH-mode or mV-mode; pH/mV values versus time-datalogging results		
Data Storage:	up to 100 complete titration and pH/mV logging complete reports		
Disk Drive:	built-in 3.5" floppy disk drive allows storage and transfer of configurations, preprogrammed methods, custom methods, titration reports and bitmap graph files		
Peripherals	connections for VGA display, PC-keyboard, parallel printer, RS 232 input, interface for future expansion		
GLP Conformity	instrumentation data storage and printing capabilities		
Operating Environment	10 to 40°C (50 to 104°F), up to 95% RH		
Storage Environment	-20 to 70°C (-4 to 158°F), up to 95% RH		
Power	110V/220 Vac; 50-60Hz		
Dimensions	390 x 350 x 380 mm (15.3 x 13.8 x 14.9 in)		
Weight	approx. 10 kg (22 lbs.) with one pump and stirrer assembly		

ORDERING INFORMATION

HI 901-01 (115V) and **HI 901-02** (230V) is supplied with (1) 25 mL glass burette, (1) burette driver assembly, power adapter and instructions.

HI 84430

Total Titratable Acidity Titrator

- User-friendly interface
- Dedicated HELP key
- Simple to operate
- Log on demand
- GLP features

Titrator, pH meter, pH electrode and magnetic stirrer in one compact unit!

Total Titratable Acidity

The HI 84430 is an automatic titrator designed for easy, fast and accurate analysis of total titratable acidity in water. Potentiometric endpoint determination, peristaltic titrant delivery and integrated magnetic stirring systems eliminate the error and technique dependent results associated with manual titrations.

The accuracy of the instrument is ensured by performing a peristaltic pump calibration using the provided HANNA standard. The HI 84430 endpoint determination algorithm analyzes the pH vs. volume curve to determine the exact pH endpoint and performs the necessary calculations. The results are displayed in mg/L $CaCO_3$ or meq/L $CaCO_3$ units on the graphic display. Titrations are conducted using the low range reagent (15 to 500 mg/L as $CaCO_3$) or the high range reagent (400 to 4000 mg/L as $CaCO_3$).

An intuitive interface makes the instrument simple to use. A dedicated HELP key guides the user through set-up and calibration sequences, reports instrument status and aids in troubleshooting.

HI 84430 features include: log on demand for up to 100 samples (50 pH measurements, 50 titration results), GLP compliance.

Water acidity is an important parameter to monitor, it can affect the corrosive capacity of water, chemical reaction rates and biological processes. Acidity can also be used to monitor pollution in wastewater and drinking water.

Total titratable acidity is a measure of all of the hydrogen ions present in a sample. Many factors can contribute to the acidity of a water sample including strong acids (hydrochloric, sulfuric, nitric, etc.), weak acids (organic acids) and other acidic components (aluminum, iron, etc.).

Easy and clear measurement

The HI 84430 is a single parameter titrator designed to measure total acidity in a few easy steps. The HI 84430 displays the results directly on the screen in user selectable units.

pH meter with electrode condition on display

The HI 84430 features a pH meter. The HI 84430 also displays the electrode condition on the LCD using HANNA's exclusive electrode diagnostics.

Peristaltic pump

The HI 84430 features a precision peristaltic based titrant delivery system.

The titrant only makes direct contact with the titrant tubing and not the pump interior to virtually eliminate titrant contamination ensuring a long pump operating life.

SPECIFICATIONS		HI 84430
Range	Titratable Acidity (LR)	**mg/L (ppm):** 15.0 - 500.0 mg/L (ppm) as $CaCO_3$ **meq/L:** 0.3 - 10.0 meq/L as $CaCO_3$
	Titratable Acidity (HR)	**mg/L (ppm):** 400 - 4000 mg/L (ppm) as $CaCO_3$ **meq/L:** 8 - 80 meq/L as $CaCO_3$
	pH	-2.0 to 16.0 pH / -2.00 to 16.00 pH
	Temperature	-20.0 to 120.0 °C (-4.0 to 248.0 °F)
Resolution	Titratable Acidity (LR)	0.1 mg/L (ppm); 0.1 meq/L
	Titratable Acidity (HR)	1 mg/L (ppm); 1 meq/L
	pH	0.1 pH / 0.01 pH
	Temperature	0.1 °C
Accuracy (@25°C/77°F)	Titratable Acidity (LR)	5% of reading
	Titratable Acidity (HR)	5% of reading
	pH	± 0.01 pH
	Temperature	±0.4 °C without probe error
Titration Method		acid-base titration (total acidity / strong acidity)
Titration Principle		endpoint titration : 8.30 pH / 3.7 pH
Pump Volume		0.5 mL/min
Stirring Speed		600 rpm
pH Temperature Compensation		manual or automatic from -20 to 120 °C (-4 to 248 °F)
Logging	Titration	up to 50 samples
	pH	up to 50 samples
pH Calibration		one, two or three point calibration; three available buffers (1.68, 4.01; 8.30)
pH Electrode		HI 1131B glass body pH electrode with BNC connector and 1 m (3.3') cable
Temperature Probe		HI 7662-M stainless steel temperature probe with 1 m (3.3') cable(included)
Environment		0 to 50 °C (32 to 122 °F); max 95% RH non-condensing
Power Supply		12 VDC adapter
Dimensions		208 × 214 × 163 mm (8.2 × 8.4 × 6.4") (with beaker)
Weight		2200 g (77 oz.)

ORDERING INFORMATION

HI 84430-01 (115V) and **HI 84430-02** (230V) are supplied with HI 1131B pH electrode, HI 7071 filling solution (30 mL), HI 7662-M temperature probe, HI 84430-50 titrant low range (100 mL), HI 84430-51 titrant high range (100 mL), HI 84430-55 pump calibration solution (230 mL), HI 84430 additional reagent (30 mL), HI 7061 cleaning solution, HI 7001M pH 1.68 buffer solution (230 mL), HI 7004M pH 4.01 buffer solution (230 mL), HI 70083M pH 8.30 buffer solution (230 mL), 100 mL beakers (2), tube set with dispensing tip, medium stir bars (2), 12 VDC adapter, instruction manual and quick reference guide.

ACCESSORIES

HI 84430-50 Titrant solution for Low Range, 100 mL
HI 84430-51 Titrant solution for High Range, 100 mL
HI 84430-55M Pump calibration solution, 230 mL
HI 84430-58 Additional reagent, 30 mL
HI 84430-70 Reagents kit for low and high range (about 150 titrations)
HI 84430-71 Reagents kit for low range (about 150 titrations)
HI 84430-72 Reagents kit for high range (about 150 titrations)
HI 70483T Tube set with cap for titrant bottle and tip
HI 731319 Stir bar, 25 x 7 mm (10)
HI 731342 Pipette for automatic dosage, 2000 µL
HI 731352 Tip for 2000 µL graduated pipette (4)
HI 731341 Pipette for automatic dosage, 1000 µL
HI 731351 Tip for 1000 µL graduated pipette (25)

HI 84431 • HI 84442

Total Titratable Alkalinity Titrators

- **User-friendly interface**
- **Dedicated HELP key**
- **Simple to operate**
- **Log on demand up to 100 samples** (50 for pH; 50 for titration)
- **GLP features**
- **One, two or three point calibration**
- **pH temperature compensation**

Titrator, pH meter, pH electrode and magnetic stirrer in one compact unit!

Total Titratable Very Low Alkalinity

The HI 84442 is a dedicated mini titrator and pH meter designed for very low levels of alkalinity displayed as 5.0 to 20.00 mg/L as $CaCO_3$ or 0.1 to 0.4 meq/L as $CaCO_3$. It utilizes an electrometric titration with a pH electrode to determine the total titratable alkalinity in water. As titrant is slowly added to the sample solution the pH and temperature are carefully monitored. The software analyzes the resulting pH curve and determines the volume of titrant required to reach the endpoint of 4.5 pH. (known as bromcresol green alkalinity).

The dispensed titrant volume is used to automatically calculate the water alkalinity, which can be displayed in mg/L $CaCO_3$ or meq/L. Titrations are conducted using the reagent HI 84442-50.

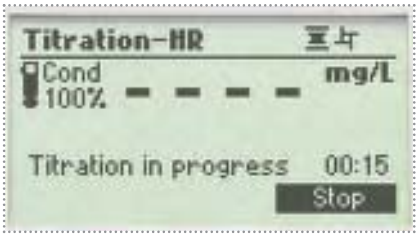
Total Titratable Low to High Alkalinity

The HI 84431 is a dedicated mini titrator and pH meter designed for low to high levels of alkalinity. It utilizes an electrometric titration with a pH electrode to determine the total titratable alkalinity in water. Titrant is slowly added to the sample solution the pH and temperature are carefully monitored. The software analyzes the resulting pH curve and determines the volume of titrant required to reach the endpoint. The user can choose either 8.3 pH (known as phenolphthalein alkalinity) or 4.5 pH (known as bromcresol green alkalinity as endpoints).

The dispensed titrant volume is used to automatically calculate the water alkalinity, which can be displayed in mg/L $CaCO_3$ or meq/L. Titrations are conducted using the low range reagent HI 84431-50 (10 to 500 mg/L as $CaCO_3$) or the high range reagent HI84431-51 (400 to 4000 mg/L as $CaCO_3$).

Total titratable alkalinity is a measure of primarily three types of alkalinities present in a water sample: hydroxide, carbonate and bicarbonate. Alkalinity in water can be the result of contributions from common chemicals including carbonate, bicarbonate, hydroxide, phosphates, borate and organic acid salts.

The alkalinity of a water sample indicates the ability to resist pH change, mostly due to the bicarbonate/ carbonate buffer. A low alkalinity level indicates that the water is susceptible to pH changes. While a high alkalinity level indicates that the water will be able to resist pH changes. Alkalinity can also be used to determine the corrosive capacity of water and water hardness.



Electrode condition on display

These titrators feature a pH meter which also displays the electrode condition on the LCD.

Easy and clear measurement

These titrators are designed to measure in a few easy steps. The results are displayed directly on the screen.

Peristaltic pump

Titrant only makes direct contact with the titrant tubing and not the pump interior virtually eliminating titrant contamination and ensuring a long pump operating life.

SPECIFICATIONS		HI 84431 Total Titratable Very Low Level Alkalinity	HI 84442 Total Titratable Ultra Low Level Alkalinity
Range	Total Titratable Alkalinity (Very Low/Ultra Low Range)	**mg/L (ppm) :** 10.0 - 500.0 mg/L (ppm) as $CaCO_3$ **meq/L :** 0.3 - 10.0 meq/L	**mg/L (ppm) :** 3.00-10.00 mg/L (ppm) as $CaCO_3$ **meq/L :** 0.06-0.20 meq/L
	Total Titratable Alkalinity (HR)	**mg/L (ppm) :** 400 - 4000 mg/L (ppm) as $CaCO_3$ **meq/L :** 8 - 80 meq/L	–
	pH	-2.0 to 16.0 pH / -2.00 to 16.00 pH	
	Temperature	-20.0 to 120.0 °C (-4.0 to 248.0 °F)	
Resolution	Total Titratable Alkalinity (VL/UL)	0.1 mg/L (ppm); 0.1 meq/L	0.01 mg/L; 0.01 meq/L
	Total Titratable Alkalinity (HR)	1 mg/L (ppm); 1 meq/L	–
	pH	0.1 pH / 0.01 pH	
	Temperature	0.1 °C	
Accuracy (@25°C/77°F)	Titratable Alkalinity (VL/UL)	5% of reading	
	Titratable Alkalinity (HR)	5% of reading	–
	pH	± 0.01 pH	
	Temperature	±0.4 °C without probe error	
Titration Method		acid-base titration (total alkalinity)	
Titration Principle		endpoint titration: 4.5 pH / 8.3 pH	endpoint titration: 4.5 pH
Pump Volume		0.5 mL/min	
Stirring Speed		600 rpm	700 rpm
pH Temperature Compensation		manual or automatic from: -20 to 120 °C (-4 to 248 °F)	
Logging	Titration	up to 50 samples	
	pH	up to 50 samples	
pH Calibration		one, two or three point calibration; three available buffers (4.01; 8.30; 10.01)	
pH Electrode		HI 1131B glass body pH electrode with BNC connector and 1 m (3.3') cable	
Temperature Probe		HI 7662-M stainless steel temperature probe with 1 m (3.3') cable(included)	
Environment		0 to 50 °C (32 to 122 °F); max 95% RH non-condensing	
Power Supply		12 VDC power adapter	
Dimensions		208 × 214 × 163 mm (8.2 × 8.4 × 6.4") (with beaker)	
Weight		2200 g (77 oz.)	

ORDERING INFORMATION

HI 84431-01 (115V) and **HI 84431-02** (230V) are supplied with HI 84431-50 titrant solution low range (100 mL), HI 84431-51 titrant high range (100 mL) and HI 84431-55M pump calibration solution (230 mL).
HI 84442-01 (115V) and **HI 84442-02** (230V) are supplied with HI 84442-50 titrant solution (100 mL), and HI 84442-55 pump calibration solution (230 mL).

Both meters are supplied with:
HI 1131B pH electrode, HI 7071 filling solution (30 mL), HI 7662-M temperature probe, HI 7061 cleaning solution, HI 7004M pH 4.01 buffer solution (230 mL), HI 70083M pH 8.30 buffer solution (230 mL), HI 7010M pH 10.01 buffer solution (230 mL), 100 mL beakers (2), tube set with dispensing tip, medium stir bars (2), 12 VDC adapter, Instructions and quick reference guide.

HI 84431 ACCESSORIES

HI 84431-50	Titrant solution for low range, 100 mL
HI 84431-51	Titrant solution for high range, 100 mL
HI 84431-55M	Pump calibration solution, 230 mL
HI 84431-70	Reagents kit for low and high range (about 150 titrations)
HI 84431-71	Reagents kit for low range (about 150 titrations)
HI 84431-72	Reagents kit for high range (about 150 titrations)

HI 84442 ACCESSORIES

HI 84442-50	Titrant solution (100 mL)
HI 84442-55	Pump calibration solution (230 mL)

ACCESSORIES

HI 70483T	Tube set with cap for titrant bottle and tip
HI 731319	Stir bar, 25 x 7 mm (10)
HI 731342	Pipette for automatic dosage 2000 µL
HI 731352	Tips for 2000 µL graduated pipette (4)
HI 731341	Pipette for automatic dosage 1000 µL
HI 731351	Tip for 1000 µL graduated pipette (25)

HI 84429

Titratable Acids Mini Titrator and pH Meter for the Dairy Industry

Perform a Complete Analysis with One Compact Meter!

HI 84429 is a low cost, easy to use, automatic titrator and pH meter that reflects HANNA's years of experience as a manufacturer of analytical instruments. HI 84429 performs automatic analysis with all the necessary calculations through a clear and simple interface.

This advanced automatic titrator and pH meter has a powerful and effective built-in algorithm to analyze the shape of the pH electrode response and determines the reaction completion. By pressing the START key, the instrument automatically conducts an endpoint titration the and result is immediately displayed. The HI 84429 has a simple and reliable peristaltic pump to ensure accuracy in dosing and repeatability in measurement.

The HI 84429 comes with a pre-programmed analysis method designed for total titratable acidity measurements on milk. The determination of total acids in dairy products is made according to a neutralization reaction; that is the reaction between the acids found in dairy products and a base. This type of reaction forms the basis of titration methods of analyzing acids. Titratable acidity is measured on a degassed sample at the endpoint of 8.30 pH. The results are expressed in °SH, °Thm °D or % l.a.

Acidity Measurement and Its Significance in the Dairy Industry

There are two fundamentally different conventions for expressing acidity in dairy products: titratable acidity and pH. The pH is a measurement of hydrogen ion concentration while titratable acidity is the neutralizing capacity by a base.

Acidity affects taste, thus this parameter is tested to determine the quality of the milk product. As milk acidity increases over time, measuring this parameter is also a means of monitoring storage conditions. Acidity is determined by an endpoint titration using sodium hydroxide (a base) and is defined as the consumption of base necessary to shift the pH value from 6.6 (corresponding to fresh milk) to a pre-determined basic pH value. While pH 7.0 is the actual point of neutralization, phenolphthalein is commonly employed as a color indicator to determine the endpoint of reaction and with it, color change occurs at pH 8.3. Titratable acidity is expressed as one of a variety of units, the use of which reflects the titration method and strength of base employed during titration.

°SH – Soxlet Henkel degrees: obtained by titrating 100 mL of milk with 0.25N NaOH, using phenolphthalein as the indicator. This method is common in Central Europe.

°Th – Thorner degrees: obtained by titrating 100 mL of milk thinned with 2 parts distilled water, with 0.1 N NaOH, using phenolphthalein as an indicator. Method is used mostly in Sweden and the CIS.

°D – Dornic degrees: obtained by titrating 100 mL of milk thinned with two parts distilled water, with 0.9N NaOH, using phenolphthalein as an indicator. Used mostly in the Netherlands and France.

% l.a. – percent lactic acid: obtained as °D divided by 100. Frequently used in the UK, USA, Canada, Australia and New Zealand.

Note: Taking into account the concentration of sodium hydroxide, the results expressed in one value can be easily converted into any other unit value by consulting the chart at right.

The HI 84429 Mini Titrator eliminates the subjective endpoint color change detection determined by the human eye, and instead employs the sensitivity and accuracy of a pH sensor. The titration method is a potentiometric endpoint determination using a pre-determined pH value.

Acidity of dairy products can be expressed in any of the units described earlier by simply selecting the desired unit. After performing a pump calibration with the supplied standard, you can then make titrations, expressed in the desired unit, using the same titrant. This eliminates the inconvenience of changing tubes, purging the titrant for tube cleaning and being sure that you have the right titrant concentration - saving time and titrant. The quantity of sample needed is much smaller in comparison to a traditional method, where 100 mL of product is used.

	°SH	°Th	°D	% l.a.
NaOH Concentration (N)	0.25	0.1	0.111	0.111
	1	2.5	2.25	0.0225
	0.4	1	0.9	0.009
	4/9	10/9	1	0.01

SPECIFICATIONS		HI 84429
Titrator	Titratable Acidity Low Range	0.0 to 15.0 °SH; 0 to 40 °Th; 0 to 35 °D; 0.00 to 0.35 % l.a.
	Titratable Acidity LR Resolution	0.1 °SH; 1 °Th; 1 °D; 0.01% l.a.
	Titratable Acidity High Range	10 to 75 °SH; 20 to 200 °Th; 20 to 175 °D; 0.0 to 2.0 % l.a.
	Titratable Acidity HR Resolution	0.5 °SH; 1 °Th; 1 °D; 0.1% l.a.
	Accuracy (@25°C/77°F)	5% of reading
	Titration Method	acid-base titration
	Principle	endpoint titration, 8.30 pH
	Pump Debit	0.5 mL/min
	Stirring Speed	800 rpm
	Logging Data	up to 50 samples
pH Meter	Range	-2.0 to 16.0 pH / -2.00 to 16.00 pH
	Resolution	0.1 pH / 0.01 pH
	Accuracy (@25°C/77°F)	±0.01 pH
	Calibration	one, two or three point calibration (pH 4.01, 6.00, 8.30)
	Temperature Compensation	manual or automatic from -20 to 120°C (-4 to 248°F)
	Logging Data	up to 50 samples
Temperature	Range	-20.0 to 120.0°C (-4.0 to 248.0°F)
	Resolution	0.1°C
	Accuracy (@25°C/77°F)	±0.4°C without probe error
Electrodes		FC 260B pH electrode with 1 m (3.3') cable (included), HI 5315 reference probe with 1 m (3.3') cable (included)
Temperature Probe		HI 7662-M stainless steel temperature probe with 1 m (3.3') cable (included)
Environment		0 to 50°C (32 to 122°F); RH max 95% non-condensing
Power Supply		12 VDC adapter (included)
Dimensions		208 x 214 x 163 mm (8.2 x 8.4 x 6.4") (with beaker)
Weight		2200 g (77 oz.)

ORDERING INFORMATION

HI 84429-01 (115V) and **HI 84429-02** (230V) are supplied with FC 260B pH electrode, HI 5315 Reference electrode, HI 7072 Filling solution (30 mL), HI 7662-M temperature probe, HI 84429-50 titrant (100 mL), HI 84429-55 Standard (500 mL), HI 700640 cleaning solution for milk deposits (20 mL, 2), pH 4.01 buffer solution (230 mL), pH 6.00 buffer solution (230 mL), pH 8.30 buffer solution (230 mL, 50 mL beakers (2), 20 mL beakers (2), tube set with cap, stir bars (2 small, 2 large), power cord, 1 mL syringe, capillary dropper pipette and Instruction manual.

SOLUTIONS

HI 84429-50	Titrant solution, 100 mL
HI 84429-55	Pump calibration standard, 500 mL
HI 84429-65	pH 4.01 buffer solution, 230 mL (6)
HI 84429-70	pH 6.00 buffer solution, 230 mL (6)
HI 84429-60	pH 8.30 buffer solution, 230 mL (6)
HI 84429-20	Reagent set starter kit (20 tests)
HI 70640L	Cleaning solution for remaining milk deposits, 500 mL
HI 70641L	Cleaning and disinfecting for dairy products, 500 mL
HI 70642L	Cleaning solution for remaining cheese deposits, 500 mL
HI 7072	Reference electrode filling solution (4)

ACCESSORIES

HI 70483T	Tube set with cap for titrant bottle and tip
HI 731316	Stir bar 12 x 5 mm (5)
HI 731319	Stir bar 25 x 7 mm (10)
HI 740036P	50 mL plastic beaker (10)
HI 740037P	20 mL plastic beaker (10)
HI 740143	Syringe 1 mL (6)
HI 740144	Pipette tip 1 mL (6)

HI 84432

Titratable Acidity Mini Titrator and pH Meter for Fruit Juice

- **Internationally accepted methodology**
  Based on the AOAC International accepted method for acidity determination
- **Data logging**
  Log on demand up to 100 total samples
- **GLP features**
- **Eliminates subjective factors**
- **Three point calibration**
- **Automatic pH temperature compensation**
- **Automatic "anytime" help**
- **Intuitive user interface**

All-in-One Fruit Juice Titrator, pH Meter, pH Electrode and Magnetic Stirrer

FOODCARE line

The HI 84432 digital automatic mini titrator and pH meter is designed for quick and accurate analysis of total titratable acidity in fruit juices. By eliminating subjective factors including color indicators, errors in mathematical calculations or erratic titrant additions from the measurement, the HI 84432 provides quick and accurate, repeatable results without guesswork.

A clear and intuitive user interface allows users to navigate the HI 84432's menus and functions quickly. A HELP key located on the keypad aids in set-up, calibration status and troubleshooting.

By simply pressing the START key, the HI 84432 automatically starts pump operation and titrates the sample to the endpoint. This instrument employs a powerful and effective algorithm to analyze the pH response to determine the exact pH endpoint, then uses this algorithm to make the necessary calculations.

The titratable acidity determination is instantaneously displayed in selected measurement units on the large dot matrix display. The instrument is immediately ready for the next analysis.

The HI 84432 has a simple and accurate peristaltic pump to ensure the best accuracy and repeatability. To ensure instrument accuracy, perform a pump calibration with the provided HANNA standard.

Why This Instrument is So Important...

The measurement of titratable acidity in fruit juices measures the concentration of titratable hydrogen ions contained in the fruit juice samples by neutralization with strong base solution to a fixed pH. This value includes all the substances of an acidic nature in the fruit juice: free hydrogen ions, organic acids, acid salts and cathions.

Because the organic acid is the most acidic component of the fruit juices that react with strong base solutions, the titratable acidity is usually expressed as a percentage (mass/volume) of the predominant acid:

- **Citric acid is present in many fruit species.**
- **Tartaric acid is essentially found in grapes.**
- **Malic acid is present in many fruit species, sometimes together with citric acid or tartaric acid in unripe grapes.**

The HI 84432 Mini Titrator uses a method based on the Official Methods of Analysis of AOAC International. The fruit juice is titrated with a sodium hydroxide solution until the end point at 8.2 pH is reached (determined by potentiometric method). Additionally the HI 84432 has a built-in pH meter for pH measurement (electrode and meter must be calibrated).

Features

Clear, accurate measurements

Measurement results as well as electrode condition are clearly displayed on the LCD.

Set up configuration menu

Accessed from pH or Titration screens, this menu allows parameters such as date formats, measurement units and language selection to be configured quickly and easily.

Log and recall data

Measurements along with time and date can be stored and recalled at a later date.

Calibration reminder

When calibration is required or due, users are reminded on screen.

The HI 84432 can also display when pump and electrode calibration was last performed.

Calibration warnings

For the most accurate performance, The HI 84432 warns users if there are errors in the calibration process. HI 84432 pinpoints the problem and displays the appropriate error message taking the guesswork out diagnosing errors such as dirty or broken electrodes or contaminated buffers.

Other calibration warnings include: wrong buffer temperature, wrong slope (high and low) and wrong buffer.

SPECIFICATIONS		HI 84432
Titrator	Titratable Acidity Range 15 mL sample	g/100 mL as citric acid : 0.20 – 1.20% CA g/100 mL as tartaric acid : 0.23 – 1.41% TA g/100 mL as malic acid : 0.21 – 1.26% MA
	Titratable Acidity Range 2 mL sample	g/100 mL as citric acid : 0.80 - 8.00% CA g/100 mL as tartaric acid : 0.94 - 9.30% TA g/100 mL as malic acid : 0.84 - 8.30% MA
	Titratable Acidity Resolution	0.01%
	Accuracy (@25°C/77°F)	5% of reading ±0.02
	Titration Method	acid-base titration
	Principle	endpoint titration: 8.20 pH
	Pump Debit	0.5 mL/min
	Stirring Speed	600 rpm
	Logging Data	up to 50 samples
pH Meter	Range	-2.0 to 16.0 pH / -2.00 to 16.00 pH
	Resolution	0.1 pH / 0.01 pH
	Accuracy (@25°C/77°F)	±0.01 pH
	Calibration	one, two or three calibration points; three available buffers (4.01; 7.01; 8.20)
	Temperature Compensation	manual or automatic from -20 to 120°C (-4 to 248°F)
	Logging Data	up to 50 samples
Temperature	Range	-20.0 to 120.0°C (-4.0 to 248.0°F)
	Resolution	0.1°C
	Accuracy (@25°C/77°F)	±0.4°C without probe error
Electrode		HI 1131B glass body pH electrode with BNC connector and 1 m (3.3') cable
Temperature Probe		HI 7662-M stainless steel temperature probe with 1 m (3.3') cable(included)
Environment		0 to 50°C (32 to 122°F); RH max 95% non-condensing
Power Supply		12 VDC adapter (included)
Dimensions		208 x 214 x 163 mm (8.2 x 8.4 x 6.4") (with beaker)
Weight		2200 g (77 oz.)

Titratable acidity of fruit is an important parameter to determine fruit maturity.

ORDERING INFORMATION

HI 84432-01 (115V) and **HI 84432-02** (230V) are supplied with HI 1131B pH electrode, HI 7662-M temperature probe, HI 84432-50 titrant (100 mL), HI 84432-55 pump calibration solution (100 mL), HI 70004 pH 4.01 buffer solution sachets (2), HI 70007 pH 7.01 buffer solution sachets (2), HI 700082 pH 8.20 buffer solution sachets (2), 100 mL beakers (2), tube set with dispensing tip, medium magnetic stir bars (2), 12 VDC adapter and instruction manual.

REAGENTS

HI 84432-50	Titrant solution (1 mL/analysis), 100 mL
HI 84432-55	Pump calibration solution (2.00 mL/calibration), 100 mL
HI 84432-70	Reagents kit (about 150 titrations)

SOLUTIONS

HI 7004M	pH 4.01 buffer solution, 230 mL
HI 7007M	pH 7.01 buffer solution, 230 mL
HI 70082M	pH 8.20 buffer solution, 230 mL
HI 70300M	Storage solution, 230 mL

HI 84437

Titratable Acidity Mini Titrator and pH Meter for Mayonnaise

- **No filtering, just mix and titrate**
- **Data logging**
  Log on demand up to 100 total samples
- **GLP features**
- **Eliminates subjective factors**
- **Can measure in % or g/L acetic acid**
- **Three point calibration**
- **Automatic pH temperature compensation**
- **Automatic "anytime" help**
- **Intuitive user interface**

All-in-One Mayonnaise Titrator, pH Meter, pH Electrode and Magnetic Stirrer

The HI 84437 is an easy to use automatic mini titrator and pH meter designed for the rapid and accurate analysis of titratable acidity in mayonnaise. By eliminating subjective factors including color indicators, errors in mathematical calculations or erratic titrant additions from the measurement, the HI 84437 makes titratable acidity analysis precise. This instrument will quickly become a valuable tool for mayonnaise analysis.

A clear and intuitive user interface allows users to navigate the HI 84437's menus and functions quickly. A HELP key located on the keypad aids in set-up, calibration status and troubleshooting.

Simply weigh the sample, dilute with water and press start. The HI 84437 automatically stirs the sample, starts pumps operation and titrates the sample to the endpoint.

The instrument employs a powerful and effective built-in algorithm to analyze the pH response to determine the exact pH endpoint, then uses this to make the necessary calculations.

Titratable acidity determination is instantaneously displayed in the selected measurement unit on the display. The instrument is then immediately ready for the next analysis .

The HI 84437 employs a simple peristaltic pump to ensure the best accuracy and repeatability in measurements. To ensure the most consistent results, pump calibrations can be performed with the provided HANNA standard.

Clear, accurate measurements

Measurement results as well as electrode condition are clearly displayed on the LCD.

Set up configuration menu

Accessed from pH or Titration screens, this menu allows parameters such as date formats, measurement units and language selection to be configured quickly and easily.

Log and recall data

Measurements along with time and date can be stored and recalled at a later date.

Calibration reminder

When calibration is required or due, users are reminded on screen.

The HI 84437 can also display when pump and electrode calibration was last performed.

Calibration warnings

For the most accurate performance, The HI 84437 warns users if there are errors in the calibration process. HI 84437 pinpoints the problem and displays the appropriate error message taking the guesswork out diagnosing errors such as dirty or broken electrodes or contaminated buffers.

Other calibration warnings include: wrong buffer temperature, wrong slope (high and low) and wrong buffer.

SPECIFICATIONS		HI 84437
Titrator	Titratable Acidity Range	g/100 g as acetic acid : 0.16 - 1.60% AA g/L (ppt) as acetic acid : 1.6 - 16.0 g/L (ppt) AA
	Resolution	0.01% AA 0.1 g/L (ppt) AA
	Accuracy (@25°C/77°F)	5% of reading
	Titration Method	acid-base titration
	Pump Debit	0.5 mL/min
	Stirring Speed	700 rpm
	Logging Data	up to 50 samples
pH Meter	Range	-2.0 to 16.0 pH / -2.00 to 16.00 pH
	Resolution	0.1 pH / 0.01 pH
	Accuracy (@25°C/77°F)	±0.01 pH
	Calibration	one, two or three calibration points; 3 available buffers (4.01; 7.01; 8.20)
	Temperature Compensation	manual or automatic from -20 to 120°C (-4 to 248°F)
	Logging Data	up to 50 samples
Temperature	Range	-20.0 to 120.0°C (-4.0 to 248.0°F)
	Resolution	0.1°C
	Accuracy (@25°C/77°F)	±0.4°C without probe error
Electrode		HI 1131B glass body pH electrode with BNC connector and 1 m (3.3') cable
Temperature Probe		HI 7662-M stainless steel temperature probe with 1 m (3.3') cable(included)
Environment		0 to 50°C (32 to 122°F); max 95% RH non-condensing
Power Supply		12 VDC adapter (included)
Dimensions		208 x 214 x 163 mm (8.2 x 8.4 x 6.4") (with beaker)
Weight		2200 g (77 oz.)

ORDERING INFORMATION

HI 84437-01 (115V) and **HI 84437-02** (230V) are supplied with HI 1131B pH electrode, HI 7662-M temperature probe, HI 84437-50 titrant solution (100 mL), HI 84437-55 pump calibration solution (100 mL), HI 7004M pH 4.01 buffer solution (230 mL), HI 7007M pH 7.01 buffer solution (230 mL), HI 70082M pH 8.20 buffer solution (230 mL), 100 mL beakers (2), tube set with dispensing tip, medium magnetic stir bars (2), 12 VDC adapter and instruction manual.

REAGENTS

HI 84437-50	Titrant solution, 100 mL
HI 84437-55	Pump calibration solution, 100 mL
HI 84437-70	Reagents kit (about 150 titrations)

SOLUTIONS

HI 7004M	pH 4.01 buffer solution, 230 mL
HI 7007M	pH 7.01 buffer solution, 230 mL
HI 70082M	pH 8.20 buffer solution, 230 mL
HI 70300M	Electrode storage solution, 230 mL
HI 7061M	Electrode cleaning solution, 230 mL
HI 7077M	Cleaning solution for oil and fats, 230 mL
HI 7071	Filling solution for HI 1131B, 30 mL (4)

OTHER ACCESSORIES

HI 70483T	Tube set with cap and tip for titrant bottle
HI 731319	Stir bar 25 x 7 mm (10)
HI 731342	2000 µL fixed volume pipette for automatic dosage
HI 731352	Tip for 2000 µL fixed volume pipette (4)

HI 84435

Titratable Acidity Mini Titrator and pH Meter for Mustard

- **No filtering, just mix and titrate**
- **Data logging**
  Log on demand up to 100 total samples
- **GLP features**
- **Eliminates subjective factors**
- **Can measure in % or g/L acetic acid**
- **Three point calibration**
- **Automatic pH temperature compensation**
- **Automatic "anytime" help**
- **Intuitive user interface**

All-in-One Mustard Titrator, pH Meter, pH Electrode and Magnetic Stirrer

The HI 84435 is an easy to use microprocessor-based automatic mini titrator and pH meter designed for quick and accurate analysis of titratable acidity in mustard. By eliminating subjective factors including color indicators, errors in mathematical calculations or erratic titrant additions from the measurement, the HI 84435 makes titratable acidity analysis precise. This instrument will quickly become a valuable tool for mustard analysis.

A clear and intuitive user interface allows users to navigate the HI 84435's menus and functions quickly. A HELP key located on the keypad aids in set-up, calibration status and troubleshooting.

Simply weigh the sample, dilute with water and press start. The HI 84435 automatically stirs the sample, starts pumps operation and titrates the sample to the endpoint.

The instrument employs a powerful and effective built-in algorithm to analyze the pH response to determine the exact pH endpoint, then uses this to make the necessary calculations.

Titratable acidity determination is instantaneously displayed in the selected measurement unit on the display. The instrument is then immediately ready for the next analysis .

The HI 84435 employs a simple peristaltic pump to ensure the best accuracy and repeatability in measurements. To ensure the most consistent results, pump calibrations can be performed with the provided HANNA standard.

Clear, accurate measurements

Measurement results as well as electrode condition are clearly displayed on the LCD.

Set up configuration menu

Accessed from pH or Titration screens, this menu allows parameters such as date formats, measurement units and language selection to be configured quickly and easily.

Log and recall data

Measurements along with time and date can be stored and recalled at a later date.

Calibration reminder

When calibration is required or due, users are reminded on screen.

The HI 84435 can also display when pump and electrode calibration was last performed.

Calibration warnings

For the most accurate performance, The HI 84435 warns users if there are errors in the calibration process. HI 84435 pinpoints the problem and displays the appropriate error message taking the guesswork out diagnosing errors such as dirty or broken electrodes or contaminated buffers.

Other calibration warnings include: wrong buffer temperature, wrong slope (high and low) and wrong buffer.

SPECIFICATIONS		HI 84435
Titrator	Titratable Acidity Range	g/100 g as acetic acid : 0.25 - 6.00% AA g/L (ppt) as acetic acid : 2.5 - 60.0 g/L (ppt) AA
	Resolution	0.01% AA 0.1 g/L (ppt) AA
	Accuracy (@25°C/77°F)	5% of reading
	Titration Method	acid-base titration
	Principle	endpoint titration, 7.50 pH
	Pump Debit	0.5 mL/min
	Stirring Speed	700 rpm
	Logging Data	up to 50 samples
pH Meter	Range	-2.0 to 16.0 pH / -2.00 to 16.00 pH
	Resolution	0.1 pH / 0.01 pH
	Accuracy (@25°C/77°F)	±0.01 pH
	Calibration	one, two or three calibration points; three available buffers (4.01; 7.01; 8.20)
	Temperature Compensation	manual or automatic from -20 to 120°C (-4 to 248°F)
	Logging Data	up to 50 samples
Temperature	Range	-20.0 to 120.0°C (-4.0 to 248.0°F)
	Resolution	0.1°C
	Accuracy (@25°C/77°F)	±0.4°C without probe error
Electrode		HI 1131B glass body pH electrode with BNC connector and 1 m (3.3') cable
Temperature Probe		HI 7662-M stainless steel temperature probe with 1 m (3.3') cable(included)
Environment		0 to 50°C (32 to 122°F); max 95% RH non-condensing
Power Supply		12 VDC adapter (included)
Dimensions		208 x 214 x 163 mm (8.2 x 8.4 x 6.4") (with beaker)
Weight		2200 g (77 oz.)

ORDERING INFORMATION

HI 84435-01 (115V) and **HI 84435-02** (230V) is supplied with HI 1131B pH electrode, HI 7662-M temperature probe, HI 84435-50 titrant solution (100 mL), HI 84435-55 pump calibration solution (100 mL), HI 7004M pH 4.01 buffer solution (230 mL), HI 7007M pH 7.01 buffer solution (230 mL), HI 70082M pH 8.20 buffer solution (230 mL), 100 mL beakers (2), tube set with dispensing tip, medium magnetic stir bars (2), 12 VDC adapter and instruction manual.

REAGENTS

HI 84435-50	Titrant solution (100 mL)
HI 84435-55	Pump calibration solution (100 mL)
HI 84435-70	Reagents kit (about 150 titrations)

SOLUTIONS

HI 7004M	pH 4.01 buffer solution, 230 mL
HI 7007M	pH 7.01 buffer solution, 230 mL
HI 70082M	pH 8.20 buffer solution, 230 mL
HI 70300M	Electrode storage solution, 230 mL
HI 7061M	Electrode cleaning solution, 230 mL
HI 7071	Filling solution for HI 1131B, 30 mL (4)

OTHER ACCESSORIES

HI 70483T	Tube set with cap and tip for titrant bottle
HI 731319	Stir bar 25 x 7 mm (10)
HI 731342	2000 µL fixed volume pipette for automatic dosage
HI 731352	Tip for 2000 µL fixed volume pipette (4)

HI 84434

Titratable Acidity Mini Titrator and pH Meter for Vinegar

- **Data logging**
  Log on demand up to 100 total samples
- **GLP features**
- **Eliminates subjective factors**
- **Can measure in % or g/L acetic acid**
- **Three point calibration**
- **Automatic pH temperature compensation**
- **Automatic "anytime" help**
- **Intuitive user interface**

All-in-One Vinegar Titrator, pH Meter, pH Electrode and Magnetic Stirrer

The HI 84434 is an easy to use automatic mini titrator and pH meter designed for the quick and accurate analysis of total titratable acidity in vinegar. By eliminating subjective factors including color indicators, errors in mathematical calculations or erratic titrant additions from the measurement, the HI 84434 makes total titratable acidity analysis precise. This will quickly become a valuable analysis tool of vinegar.

A clear and intuitive user interface allows users to navigate the HI 84434's menus and functions quickly. A HELP key located on the keypad aids in set-up, calibration status and troubleshooting.

By simply pressing the START key, the HI 84434 automatically starts pump operation and titrates the sample to the endpoint.

The instrument employs a powerful and effective built-in algorithm to analyze the pH response to determine the exact pH endpoint, then uses this to make the necessary calculations.

The titratable acidity determination is instantaneously displayed in the selected measurement unit on the large display. The instrument is then immediately ready for the next analysis .

The HI 84434 employs a simple peristaltic pump to ensure the best accuracy and repeatability in measurements. To ensure the most consistent results, pump calibrations can be performed with the provided HANNA standard.

The HI 84434 has two operating options:

1) pH measurement using the meter in pH mode.
2) Titratable acidity determination by titration of the vinegar samples with sodium hydroxide solution to 8.2 pH (determined by potentiometric method).

With Great Products, Come Great Results™

Clear, accurate measurements

Measurement results as well as electrode condition are clearly displayed on the LCD.

Set Up configuration menu

Accessed from pH or Titration screens, this menu allows parameters such as date formats, measurement units and language selection to be configured quickly and easily.

Log and recall data

Measurements along with time and date can be stored and recalled at a later date.

Calibration reminder

When calibration is required or due, users are reminded on screen.

The HI 84434 can also display when pump and electrode calibration was last performed.

Calibration warnings

For the most accurate performance, The HI 84434 warns users if there are errors in the calibration process. HI 84434 pinpoints the problem and displays the appropriate error message taking the guesswork out diagnosing errors such as dirty or broken electrodes or contaminated buffers.

Other calibration warnings include: wrong buffer temperature, wrong slope (high and low) and wrong buffer.

SPECIFICATIONS		HI 84434
Titrator	Titratable Acidity Range	g/100 mL as acetic acid: 1.5 – 15% AA g/L (ppt) as acetic acid: 15 – 150 g/L (ppt) AA
	Resolution	0.1% AA 1 g/L (ppt) AA
	Accuracy (@25°C/77°F)	5% of reading
	Titration Method	acid-base titration (total acidity / strong acidity)
	Principle	endpoint titration: 8.20 pH
	Pump Debit	0.5 mL/min
	Stirring Speed	600 rpm
	Logging Data	up to 50 samples
pH Meter	Range	-2.0 to 16.0 pH / -2.00 to 16.00 pH
	Resolution	0.1 pH / 0.01 pH
	Accuracy (@25°C/77°F)	±0.01 pH
	Calibration	one, two or three calibration points; three available buffers (4.01; 7.01; 8.20)
	Temperature Compensation	manual or automatic from -20 to 120°C (-4 to 248°F)
	Logging Data	up to 50 samples
Temperature	Range	-20.0 to 120.0°C (-4.0 to 248.0°F)
	Resolution	0.1°C
	Accuracy (@25°C/77°F)	±0.4°C without probe error
Electrode		HI 1131B glass body pH electrode with BNC connector and 1 m (3.3') cable
Temperature Probe		HI 7662-M stainless steel temperature probe with 1 m (3.3') cable(included)
Environment		0 to 50°C (32 to 122°F); max 95% RH non-condensing
Power Supply		12 VDC adapter (included)
Dimensions		208 x 214 x 163 mm (8.2 x 8.4 x 6.4") (with beaker)
Weight		2200 g (77 oz.)

ORDERING INFORMATION

HI 84434-01 (115V) and **HI 84434-02** (230V) is supplied with HI 1131B pH electrode, HI 7662-M temperature probe, HI 84434-50 titrant solution (100 mL), HI 84434-55 pump calibration solution (100 mL), HI 7004M pH 4.01 buffer solution (230 mL), HI 7007M pH 7.01 buffer solution (230 mL), HI 70082M pH 8.20 buffer solution (230 mL), 100 mL beakers (2), tube set with dispensing tip, medium magnetic stir bars (2), 12 VDC adapter and instruction manual.

REAGENTS

HI 84434-50	Titrant solution, 100 mL
HI 84434-55	Pump calibration solution, 100 mL
HI 84434-70	Reagents kit (about 150 titrations)

SOLUTIONS

HI 7004M	pH 4.01 buffer solution, 230 mL
HI 7007M	pH 7.01 buffer solution, 230 mL
HI 70082M	pH 8.20 buffer solution, 230 mL
HI 70300M	Electrode storage solution, 230 mL
HI 7061M	Electrode cleaning solution, 230 mL
HI 7071	Filling solution for HI 1131B, 30 mL (4)

OTHER ACCESSORIES

HI 70483T	Tube set with cap and tip for titrant bottle
HI 731319	Stir bar 25 x 7 mm (10)
HI 731342	2000 µL fixed volume pipette for automatic dosage
HI 731352	Tip for 2000 µL fixed volume pipette (4)
HI 731341	1000 µL fixed volume pipette for automatic dosage
HI 731351	Tip for 1000 µL fixed volume pipette (25)

HI 84433

Formol Number Mini Titrator and pH Meter for Wines and Fruit Juices

- **Data logging**
  Log on demand up to 100 total samples
- **GLP features**
- **Eliminates subjective factors**
- **Can measure in units of meq/L, meq% or mg/L**
- **Three point calibration**
- **Automatic pH temperature compensation**
- **Automatic "anytime" help**
- **Intuitive user interface**

All-in-One
Formal Number Titrator,
pH Meter, pH Electrode
and Magnetic Stirrer

WINE line

The HI 84433 is an easy to use automatic mini titrator and pH meter designed for the rapid and accurate determination of formol number in wines or fruit juices. By eliminating subjective factors including color indicators, errors in mathematical calculations or erratic titrant additions from the measurement, the HI 84433 makes formol number determination precise.

A clear and intuitive user interface allows users to navigate the HI 84433's menus and functions quickly. A HELP key located on the keypad aids in set-up, calibration status and troubleshooting.

After an initial sample prep, the HI 84433 starts pump operation and titrates the sample to the endpoint. This instrument employs a powerful and effective algorithm to analyze the pH response to determine the exact pH endpoint, then uses this algorithm to make the necessary calculations.

The formol number determination is instantaneously displayed in selected measurement units on the large dot matrix display. The instrument is ready for the next analysis immediately.

The HI 84433 employs a simple peristaltic pump to ensure the best accuracy and repeatability in measurements. To ensure the most consistent results, pump calibrations can be performed with the provided HANNA standard.

The HI 84433 has two operating options:

1) pH measurement using the meter in pH mode.
2) Formol number determination by titration of wines and fruit juice samples with sodium hydroxide solution to an 8.2 pH endpoint. (Note: sample step prep required)

Clear, accurate measurements

Measurement results as well as electrode condition are clearly displayed on the LCD.

Setup configuration menu

Accessed from pH or Titration screens, this menu allows parameters such as date formats, measurement units and language selection to be configured quickly and easily.

Log and recall data

Measurements along with time and date can be stored and recalled at a later date.

Calibration reminder

When calibration is required or due, users are reminded on screen.

The HI 84433 can also display when pump and electrode calibration was last performed.

Calibration warnings

For the most accurate performance, The HI 84433 warns users if there are errors in the calibration process. HI 84433 pinpoints the problem and displays the appropriate error message. This takes the guesswork out of diagnosing errors such as dirty or broken electrodes or contaminated buffers.

Other calibration warnings include: wrong buffer temperature, wrong slope (high and low) and wrong buffer.

SPECIFICATIONS		HI 84433
Titrator	Range	meq/L as N: 2.5 – 50.0 meq/L meq% as N: 0.25 – 5.00 meq% mg/L (ppm) as N: 70 – 1400 mg/L (ppm)
	Resolution	0.1 meq/L 0.01 meq% 1 mg/L (ppm)
	Accuracy (@25°C/77°F)	5% of reading
	Titration Method	acid-base titration
	Principle	endpoint titration: 8.20 pH
	Pump Debit	0.5 mL/min
	Stirring Speed	600 rpm
	Logging Data	up to 50 samples
pH Meter	Range	-2.0 to 16.0 pH / -2.00 to 16.00 pH
	Resolution	0.1 pH / 0.01 pH
	Accuracy (@25°C/77°F)	±0.01 pH
	Calibration	one, two or three calibration points; three available buffers (4.01; 7.01; 8.20)
	Temperature Compensation	manual or automatic from -20 to 120°C (-4 to 248°F)
	Logging Data	up to 50 samples
Temperature	Range	-20.0 to 120.0°C (-4.0 to 248.0°F)
	Resolution	0.1°C
	Accuracy (@25°C/77°F)	±0.4°C without probe error
Electrode		HI 1131B glass body pH electrode with BNC connector and 1 m (3.3') cable
Temperature Probe		HI 7662-M stainless steel temperature probe with 1 m (3.3') cable(included)
Environment		0 to 50°C (32 to 122°F); RH max 95% non-condensing
Power Supply		12 VDC adapter (included)
Dimensions		208 x 214 x 163 mm (8.2 x 8.4 x 6.4") (with beaker)
Weight		2200 g (77 oz.)

ORDERING INFORMATION

HI 84433-01 (115V) and **HI 84433-02** (230V) are supplied with HI 1131B pH electrode, HI 7662-M temperature probe, HI 84433-50 low concentration titrant solution (100 mL), HI 84433-51 pH adjustment solution (100 mL), HI 84433-55 pump calibration solution (100 mL), HI 84433-60 Formol base reagent (100 mL), HI 70004 pH 4.01 buffer solution sachets (2), HI 70007 pH 7.01 buffer solution sachets (2), HI 700082 pH 8.20 buffer solution sachets (2), 100 mL beakers (2), tube set with dispensing tip (2), magnetic stir bars, medium (2), 12 VDC adapter and instruction manual.

REAGENTS

HI 84433-50	Titrant solution, low concentration, 100 mL
HI 84433-51	pH adjustment solution, 100 mL
HI 84433-55	Pump calibration solution, 100 mL
HI 84433-58	Additional reagent, 30 mL
HI 84433-60	Formol base reagent, 230 mL
HI 84433-70	Reagents kit

SOLUTIONS

HI 7004M	pH 4.01 buffer solution, 230 mL
HI 7007M	pH 7.01 buffer solution, 230 mL
HI 70082M	pH 8.20 buffer solution, 230 mL
HI 70300M	Electrode storage solution, 230 mL
HI 7061M	Electrode cleaning solution, 230 mL
HI 731312	Red wine decolorization kit (25 pcs)

OTHER ACCESSORIES

HI 70483T	Tube set, cap and tip for titrant bottle
HI 731319	Stir bar 25 x 7 mm (10)
HI 731342	2000 µL fixed volume pipette for automatic dosage
HI 731341	1000 µL fixed volume pipette for automatic dosage

HI 84100

Sulfur Dioxide Mini Titrator for Wine Analysis

- **Compact unit**
- **Results in minutes**
- **Simple to operate**

The HI 84100 is a low-cost, easy to use, microprocessor-based automatic titrator that incorporates a simple and reliable peristaltic pump which ensures high dosing repeatability. Pump calibrations, performed with the provided HANNA standards, assure the accuracy of the instrument.

The instrument includes a pre-programmed analysis method designed for free and total sulfur dioxide measurements for wine analysis. The HI 84100 uses a powerful algorithm which analyzes the shape of the electrode response in order to determine when the titration reaction has reached completion.

The HI 84100 offers the possibility to test free or total SO_2 in all the wines including the red ones, that are difficult to test with manual methods because the color changes are hardly seen.

ORDERING INFORMATION

HI 84100-01 (115V) and **HI 84100-02** (230V) are supplied with HI 3148B/50 ORP probe, reagent set for 20 titrations, 50 mL beakers (2), 20 mL beakers (2), scissors, tube set with cap, stir bar, power cable, electrode refill solution (30 mL), 1 mL syringe, wine deposits cleaning solution sachets (2), wine stain cleaning solution sachets (2), power cable and instructions.

PROBES

HI 3148B/50	Glass body ORP Probe with BNC connector and 50 cm (1.6') cable

SOLUTIONS

HI 70300L	Electrode storage solution, (500 mL)
HI 70635	Cleaning solution for wine deposits, 500 mL
HI 70636	Cleaning solution for wine stains, 500 mL
HI 731312	Red wine decolorization kit (25 pcs)

REAGENTS

HI 84100-50	Titrant solution, 100 mL
HI 84100-51	Alkaline reagent, 500 mL
HI 84100-52	Acid reagent for total SO_2 determination, 500 mL
HI 84100-53	Acid reagent for free SO_2 determination, 500 mL
HI 84100-54	SO_2 stabilizer reagent, 25 pieces
HI 84100-55	SO_2 calibration standard, 500 mL

ACCESSORIES

HI 70483T	Complete tubing kit with cap for titrant bottle and tip
HI 731319	Stir bar (5)
HI 740036P	50 mL beaker (10)
HI 740037P	20 mL beaker (10)

SPECIFICATIONS	HI 84100
Range	0 to 400 ppm of SO_2
Resolution	1 ppm
Accuracy (@25°C/77°F)	5% of reading or ±1 ppm
Method	Ripper titrimetric method
Principle	equivalence point redox titration
Sample Volume	50 mL
ORP Electrode	HI 3148B/50 glass body ORP probe with BNC connector 50 cm (1.6') cable (included)
Pump Dosing	0.5 mL/min
Environment	0 to 50°C (32 to 122°F); max 95% RH non-condensing
Power Supply	115V/230 VAC; 50-60Hz; 10VA
Dimensions	208 x 214 x 163 mm (8.2 x 8.4 x 6.4") (with beaker)
Weight	2200 g (77.6 oz.)

Titratable Total Acidity Mini Titrator for Wine Analysis

- **Compact unit**
- **Results in minutes**
- **Simple to operate**

The HI 84102 is a low cost, easy to use, microprocessor-based automatic titrator that features a simple and yet accurate peristaltic pump to ensure the best accuracy and repeatability. By performing pump calibration with the provided HANNA standards, instrument accuracy is assured. The HI 84102 includes a preprogrammed analysis method designed for Total Titratable Acidity measurements on wine.

The instrument has a powerful and effective built-in algorithm to analyze the shape of the pH electrode response and to determine the reaction completion. The HI 84102 performs automatic analysis by performing all the necessary calculations. By simply pressing the START/STOP button, the instrument will automatically make the titration up to the end point. The result is immediately displayed in convenient units, then the instrument is ready for another titration.

SPECIFICATIONS	HI 84102
Range	0.0 to 25.0 g/L (ppt) of tartaric acid
Resolution	0.1 g/L (ppt)
Accuracy (@25°C/77°F)	5% of reading
Method	acid-base titration method
Principle	endpoint titration
pH Calibration	one point in selected endpoint: 7.00 pH or 8.20 pH
Sample Volume	2 mL
Temperature Compensation	automatic from 0.0 to 100.0°C
pH Electrode	HI 1048B glass body pH electrode with CPS™ technology, BNC connector and 1 m (3.3') cable (included)
Temperature Probe	HI 7662-T stainless steel temperature probe with 1 m (3.3') cable (included)
Pump Dosing	0.5 mL/min
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Power Supply	115V/230 VAC; 50-60Hz; 10VA
Dimensions	208 x 214 x 163 mm (8.2 x 8.4 x 6.4") (with beaker)
Weight	2200 g (77.6 oz.)

ORDERING INFORMATION

HI 84102-01 (115V) and **HI 84102-02** (230V) are supplied with HI 1048B pH electrode, HI 7662-T temperature probe, reagent set for 20 titrations, 2000 µL automatic pipette, plastic tips for 2000 µL automatic pipette (2), 50 mL beakers (2), tube set with cap, stir bar, refill solution (30 mL), 1 mL syringe, wine deposits cleaning solution sachets (2), wine stain cleaning solution sachets (2), power cable and instruction manual.

ELECTRODES

HI 1048B	Glass body pH Electrode with CPS™ technology, BNC connector and 1 m (3.3') cable
HI 7662-T	Temperature Probe

SOLUTIONS

HI 70300L	Electrode storage solution, 500 mL
HI 70635	Cleaning solution for wine deposits, 500 mL
HI 70636	Cleaning solution for wine stains, 500 mL
HI 731312	Red wine decolorization kit (25 pcs)
HI 84102-50	Titrant solution, 100 mL
HI 84102-55	Calibration standard, 100 mL
HI 84102-60	Buffer solution 1, pH 7.00, 500 mL
HI 84102-61	Buffer solution 2, pH 8.20, 500 mL

ACCESSORIES

HI 70483T	Complete tubing kit with cap for titrant bottle and tip
HI 731316	Stir bar (5)
HI 731342	Automatic pipette 2000 µL
HI 731352	2000 µL automatic pipette tips (4)
HI 740036P	Beaker 50 mL (10)

HI 83540

Alcohol in Wine Mini Titrator

About the instrument

- Backlit LCD with user-friendly interface
- Log and recall data
- USB connection - PC compatible
- GLP features
- Calibration data reminders
- Built-in magnetic stirrer
- Twist-on electrode holder
- Automatic (ATC), manual (MTC) or no temperature compensation (NoTC)

About the Measurement

- Exclusive HANNA patent pending conductimetric known addition procedure
- Fast results: tests in less than 5 minutes
- No sample preparation required
- Low cost
- Better than 1.0% accuracy
- Not dangerous, no need for toxic reagents
- Automatic sugar compensation: fixed, by wine type, and by sugar concentration
- No barometric pressure dependency

Method for alcohol determination

With this instrument, alcohol determination is made using a new, state of the art method. The wine sample is measured before and after the HANNA reagent is added. The difference between measurements is used to calculate the alcohol content.

Until now, the determination of alcohol in wine required wine makers to invest in expensive gas chromatography or HPLC equipment, or to use alternate methods such as ebulliometry or hydrometry which are time consuming. HANNA's new HI 83540 alcohol determination analyzer uses a patent pending conductimetric known addition procedure that allows wine makers to accurately determine alcohol concentration in minutes. The basis for this invention is that the change of electric conductivity (EC) of a wine after the addition depends on the amount of alcohol. The complex software of the instrument performs all the necessary calculations and adjustments, providing the user with a direct readout of alcohol in % volume on the graphic LCD.

In addition to the HI 83540's logging, storage and recall features, readings can be transferred to a PC for further analysis and storage via USB.

Significance of use

Alcohol content is a critical parameter in the analysis of wine, representing the first and most important criteria for classifying the wine into quality classes.

From a qualitative point of view, alcohol concentration has an important role in the conservation of a wine over time.

From a sensory point of view, alcohol content influences the power, warmth and sweetness of a wine. Lower alcoholic concentrations tend to taste sweeter.

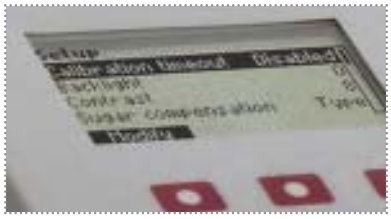
The HI 83540 meter measures the alcohol content in wine simply and accurately, displaying the results directly in % v/v units.

Sugar content:

Sugar has a direct effect on the concentration of alcohol in wine. For this reason, HI 83540 features a built-in algorithm for sugar content compensation. There are three types of sugar content compensation: fixed sugar compensation (the same compensation for all wine types); specific wine type sugar compensation and sugar content compensation (compensation made when the sugar content of a wine is known).

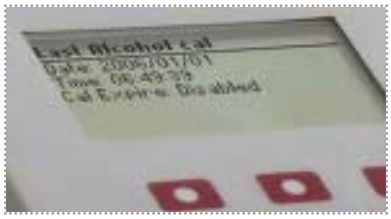
LCD Display Examples

Fast, easy measurements

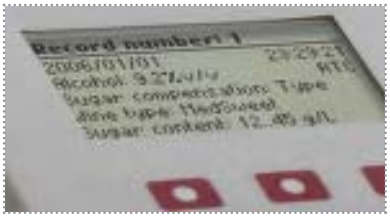


Setup

Sample preparation



GLP



Recall

Alcohol calibration

Easy Measurements

Step 1

Fill the beaker with the wine sample

Step 2

Add HI 83540-50 standard solution

Step 3

Read the results

SPECIFICATIONS		HI 83540
Range		0.0 to 25.0 %v/v
Resolution		0.1 %v/v
Accuracy (@25°C/77°F)	Fixed Sugar Compensation	0.7 %v/v for dry and medium-dry wines (less than 12 g/L (ppt) sugar)
	Type Sugar Compensation	dry range: 0.4 %v/v (less than 4 g/L (ppt) sugar) medium-dry range: 0.4 %v/v (4 g/L (ppt)..12 g/L sugar) medium-sweet range: 0.8 %v/v (12 g/L (ppt)..45 g/L sugar) sweet range: 0.8 %v/v (45 g/L (ppt)..180 g/L sugar)
	Sugar Content Compensation	dry range: 0.2 %v/v (less than 4 g/L (ppt) sugar) medium-dry range: 0.2 %v/v (4 g/L (ppt)..12 g/L sugar) medium-sweet range: 0.4 %v/v (12 g/L (ppt)..45 g/L sugar) sweet range: 0.4 %v/v (45 g/L (ppt)..180 g/L sugar)
Sample volume		60 mL
Temperature Compensation		5-35 °C (41 to 95 °F)
Electrode		HI 76315 alcohol probe
Stirring Speed		900 rpm
Environment		0 to 50 °C (32 to 122 °F); max 95% RH non-condensing
Power Supply		12 VDC adapter (included)
Dimensions		208 x 214 x 163 mm (8.2 x 8.4 x 6.4") (with beaker)
Weight		2200 g (77.6 oz.)

ORDERING INFORMATION

HI 83540-01 (115V) and **HI 83540-02** (230V) are supplied with HI 76315 alcohol probe, reagents set for 50 tests, 60 mL plastic syringe, 30 mL plastic syringe, 100 mL beaker, stir bar, 12 VDC adapter and Instruction manual.

PROBE

HI 76315	Alcohol probe

REQUIRED REAGENTS AND ACCESSORIES

HI 83540-50	Standard solution, 500 mL (3)
HI 731312	Red wine decolorization kit (25 pcs)
HI 83540-51	Electrode cleaning solution, 230 mL
HI 83540-55	Calibration solution, 230 mL
HI 731319	Stir bar (10)
HI 740035	Electrode holder and beaker
HI 740225	60 mL syringe
HI 740235	30 mL syringe bar
HI 92000	Windows compatible software

Titration Electrode

CODE	HI 76320D
Description	dual platinum electrode for amperometric titration
Reference	–
Amperometric Cell	platinum-platinum
Junction / Flow Rate	–
Electrolyte	–
Max Pressure	–
Range	T: 20 to 40°C (86 to 104°F)
Tip /Shape	2-pin platinum
Temperature Sensor	–
Amplifier	–
Body Material	glass
Cable	bipolar
Recommended Use	Chlorine titration ASTM D 1253-86

** Not for models with screw cap.

PLUG	
HI 76320D	BNC

Recommended Operating Temperature
20 to 40°C (86 to 104°F)

Reagents

HI 70401	Potassium hydrogen phthalate, 20 g
HI 70402	Tartaric acid, 20 g
HI 70403	Sodium thiosulfate penta hydrate, 20 g
HI 70404	KI powder packets, 100 packets
HI 70405	Glucose fructose standard, 20 g
HI 70406	Sodium chloride, 20 g
HI 70407	Potassium iodate, 20 g
HI 70408	Oxalic acid, 20 g
HI 70409	Potassium permanganate, 20 g
HI 70423	NaOH solution, 0.11N (N/9), 1 L
HI 70424	Amino-propanol buffer, 25 mL
HI 70425	Sulfuric acid (16%), 500 mL
HI 70426	Glyoxal, solution 40%, 100 mL
HI 70427	HNO_3 solution (1.5 M), 500 mL
HI 70428	NaOH solution (0.25 N), 1 L
HI 70429	$AgNO_3$ solution (0.05 M), 1L
HI 70432	Hydrogen Peroxide solution 3%, 25 mL
HI 70433	Stabilized iodine, 0.01N, 1L
HI 70434	Phosphoric acid (85%), 500 mL
HI 70435	NaOH solution (5 M), 500 mL
HI 70436	Deionized water, 3.78 L
HI 70437	Potassium Iodide concentrated (30%) solution, 500 mL
HI 70438	Tris buffer, 1L+3.5 mL
HI 70439	Sodium thiosulfate, 0.1 M, 1 L
HI 70440	Iodine stabilized, 0.02 N, 1 L
HI 70441	Iodine stabilized, 0.04 N, 1 L
HI 70443	Sulfuric acid 10%, 500 mL
HI 70444	Sulfuric acid 25%, 500 mL
HI 70445	Nitric acid solution, 1 M, 500 mL
HI 70446	Fehling solution A, 500 mL
HI 70447	Fehling solution B, 500 mL
HI 70448	$AgNO_3$ solution, 0.02 M, 1 L
HI 70449	EDTA solution, 0.02 M, 1 L
HI 70453	HCL solution, 0.02 N, 1 L
HI 70454	NaOH solution, 0.02 N, 1 L
HI 70455	NaOH solution (0.01 M), 1 L
HI 70456	NaOH solution (0.1 M), 1 L
HI 70457	NaOH solution (1 M), 1 L
HI 70458	H_2SO_4 solution (0.01 M), 1 L
HI 70459	H_2SO_4 solution (0.05 M), 1 L
HI 70462	HCL solution (0.01 M), 1 L
HI 70463	HCL solution (0.1 N), 1 L
HI 70464	HCL solution (1 N), 1 M
HI 70465	Reagent for hydrogen peroxide titration, 25 mL
HI 70466	Phenylarsine oxide standard solution, 500 mL
HI 70467	Acetate buffer pH 4, 230 mL
HI 70468	Potassium iodide powder for 100 tests
HI 70469	0.00188N iodine standard solution, 230 mL (4)
HI 70470	0.00564N phenylarsine oxide (PAO) standard solution, 500 mL
HI 70471	Calibration solution 0,00564N PAO, 500 mL
HI 70472	Phosphate buffer pH 7, 230 mL

CONTENTS

Conductivity/TDS Meters Introduction

Definition of Conductivity

Electrical Conductivity is the ability of a solution to conduct an electrical current. Current flow in liquids carried by ions is different from metals, where is carried by free electrons. Ions are formed when a solid such as salt is dissolved in a liquid to form electrical components having opposite electrical charges. The sodium chloride separates to form Na^+ and Cl^- ions. All ions present in the solutions contribute to the current flowing through the sensor and therefore, contribute to the conductivity measurement. Conductivity can be used as a measure of the concentration of ions present in the sample.

Conductivity Units

Electrical conductivity is the reciprocal of electrical resistivity. Electrical resistivity uses the unit of ohm meter or Ω x m. Rather than use the units Ω−1 x m−1, in 1971 the unit "siemens" (symbolized by the capital letter S) was adopted by the General Conference on Weights and Measures as an SI derived unit.

The unit for electrical conductivity becomes siemens per meter. The siemens unit is named after Werner von Siemens, the 19th century German inventor and entrepreneur in the area of electrical engineering. Previously to the siemens per meter unit, mho/cm was used to measure conductivity, where the unit "mho" is a reciprocal ohm. The "mho" is the "ohm" spelled backwards. Because of the history of conductivity, micromho/cm and millimho/cm is commonly translated to microsiemens/cm and millisiemens/cm because they correspond one-to-one.

The unit of measurement commonly used is one millionth of a Siemens per centimeter (micro-Siemens per centimeter or µS/cm). When measuring more concentrated solutions, the units are expressed as milli-Siemens/cm (mS/cm). For ease of expression, 1000 µS/cm are equal to 1 mS/cm. Often times conductivity is expressed simply as either micro or milli Siemens.

Table of Aqueous Conductivity/TDS/Resistivity

Solution	µS/cm	mS/cm	ppm	MΩ x cm
Pure water	0.055			18.18
Typical DI water	0.1			10
Distilled water	0.5			2
Rain water	50-100		25-50	0.02 - 0.01
Drinking water	500-800	0.5-0.8	250-400	2.0-1.25 [KΩ x cm]
Potable water (max)	1 055	1.055	528	0.95 [KΩ x cm]
Sea water	56 000	56	28 000	
1 mol/L NaCl	85 000	85	42.5 [ppt]	
1 mol/L HCl	332 000	332	166 [ppt]	

TDS

Total dissolved solids (TDS) is a gravimetric measurement, but because the solides in a solution are predominately present in ionic form, they can be approximated with conductivity. The TDS scale uses 2 µS/cm = 1 ppm (part per million as $CaCO_3$), expressed as 1 mg/L TDS. The method of measurement is the same, the conductivity meters make the conversion and express the results of a measurement in TDS units.

Resistivity

For low and very low ionic concentration, the measured conductivity becomes difficult and not accurate. Therefore, the resistivity scale is used to express the results as opposed to fractions. The numbers are exactly the inverse of each other. The reciprocal of 0.10 µS/cm or 1/(0.10 x 10^{-6} S/cm)] is then 10 x 10^6 ohms x cm (10 MΩ x cm). This is also commonly referred to as "mega-ohms". Either unit of measurement can be used to state exactly the same value.

Salinity

Salinity is a measurement without the unit corresponding to the weight of dissolved salts in seawater. The salinity is calculated from an empirical relationship between the conductivity and the salinity of a seawater sample. Oceanographic Tables and Standards endorsed by UNESCO/SCOR/ICES/IAPSO are used for the calculation.

Salinity measurements are performed with no direct temperature correction. The salinity range is calibrated using a standard sea water solution.

Temperature effect

Conductivity is temperature sensitive as ionic activity increases with increasing temperature. Commonly, conductivity is referred to 25°C such as in the reference temperature of some standards. The coefficient used to correct for changes in temperature, β is expressed as a percentage of reading per degree Celsius. In order to establish the true value of beta, the solution is measured at high temperature (without temperature compensation = actual conductivity), then the solution is cooled and re-measured. β can then be calculated for that solution. HANNA conductivity meters allow for custom reference temperatures and adjustable β temperature correction factor. The β temperature correction factor can be in the following ranges according with the solution class: Acids: (1.0 ÷ 1.6%)/°C; Bases: (1.8 ÷ 2.2%)/°C; Salts: (2.2 ÷ 3.0%)/ °C; Drinking water: 2.0%/°C; Ultrapure water: 5.2%/°C.

In the case of natural water, the temperature correction is no longer linear, in this case, a non linear characteristic has to be used. Many HANNA meters offer the ability to apply this temperature correction curve.

Amperometric

The first solution to measure conductivity was originally an amperometric probe based on two electrodes at a distance of 1 cm. The amperometric method applies a known potential (voltage, V) to

the pair of electrodes and measures the current (I) that is established in the solution. Current is proportional with the conductivity. Construction for these types of probes can use either graphite or stainless steel pin electrodes. HANNA offers probes and instruments using either constructed solutions. The resistance can be precisely calculated but is not constant, the major perturbation is generated by the deposits and polarization effect that appear on the electrodes based on the electrolysis effect which appears in the solution during the measurements. For low to medium levels of conductivity (< 2 mS/cm) the effect is not significant and this may be acceptable if the voltage that is applied is alternated. For higher values the accuracy of reading will be affected, and in this case, the potentiometric method is recommended.

Potentiometric

The potentiometric method employs four rings: two outer rings apply an alternating voltage and induce a current loop in the solution, while the remaining inner rings measure the voltage drop induced by the current loop. The voltage drop measured is directly dependent to solution conductivity. All of the probes utilize a sleeve during the measurement to control the influence of the external elements over the inducted field. The range in which these kinds of probes can be used is higher than the limits imposed to the amperometric methods by the electrolysis effect. Stainless steel or platinum rings can be used in the construction of this type of probe. HANNA offers both solutions for these types of probes. The selection has to be chosen based on criteria in which the resistance to corrosion and cleaning are important factors.

Inductive or Toroidal

For industrial process control systems, another method of conductivity measurement is available using an inductive or toroidal sensor. The advantage of this technology is measurement without any electrical contact between the electrode and the process fluid. The probe uses two toroidal transformers which are inductively coupled side by side and encased in a plastic sheath.

The controller supplies a high frequency reference voltage to the first toroid or drive coil which generates a strong magnetic field. The liquid containing conductive ions close the magnetic field that induces in the second toroidal current. A clear relation between the measured current and the conductivity of solution in which the probe is immersed can be established. The magnetic field is not disturbed if a minimum distance from the wall or pipe is respected.

Calibration

The calibration of conductivity meters is performed using a conductivity standard, by example 1413 µS/cm. The scope of the calibration is to determine the precise value of cell constant of the probe. The meters allow the user to select from a range of pre-selected standard values according with the range where solution will be measured and expected to be. Many HANNA meters allow up to five point calibration for improved accuracy over a wider range of measured values. It is recommended to calibrate the probes a minimum of one time per week.

US Pharmacopoeia

USP <645> with Stage 1, 2 and 3 compliance is required for purified water and WFI (water for injection). HANNA offers instruments that are able to perform all three stages required by this standard. Some of these requirements are: Resolution of 0.1µS/cm or better, accuracy at 1.3µS/cm of 0.1µS/cm, to be able to read with or without automatic temperature compensation, the cell constant be known with an uncertainty better than ±2%.

Conductivity partly depends on other factors such as the pH, the temperature, and the amount of atmospheric carbon dioxide which has been dissolved in the water to form ions (intrinsic conductivity). Conductivity also depends on the chloride, sodium and ammonium ions considered as water impurities (extraneous conductivity). The conductivity (intrinsic and extraneous) of the water is measured and compared to values listed in a table to evaluate if the studied water is suitable or not for use in pharmaceutical applications. If the sample fails Stage 1, additional tests have to be performed (Stages 2 and 3) in order to determine if the excessive conductivity value is due to intrinsic factors or extraneous ions.

6.8

HI 4321

Research Grade Conductivity/TDS/ Resistivity/Salinity/Temperature Meter with USP <645>

HI 4321 is a research-grade EC/Resistivity/TDS/Salinity benchtop meter with a large, color, graphic LCD with backlight capable of millesimal measuring resolution of conductivity with an extended range from 0.001 µS/cm to 1 S/cm.

HI 4321 can be used to perform all 3 stages of USP <645> method required for conductivity measurement of pure and ultra pure water. The instrument provides clear directions on how to perform each testing stage and automatically monitors the temperature, conductivity and stability during testing and determines whether a sample is within USP limits.

Product Spotlights

HI 2300

Autoranging EC/TDS/ NaCl/Temperature Meter

6.14

HI 2300 measures EC, TDS, NaCl and temperature. In extended conductivity and TDS ranges (up to 500 mS/cm and 400 g/L respectively) the instrument automatically chooses the best scale to maintain the highest accuracy.

This instrument utilizes a four ring potentiometric probe with platinum sensors that offers greater versatility over typical amperometric designs. By utilizing the four ring method, it is possible to measure very low or high conductivity levels without changing probes.

Calibration is automatic at one point with six memorized buffers. The meter has three options for temperature compensation: ATC between 0 to 60.0°C , MTC and NoTC. Other features include a read lock function, stability indicator, GLP and PC compatibility via optional HI 92000 software.

HI 98188

Graphic Display EC/Resistivity/ TDS/NaCl Meter

6.18

HI 98188 is a waterproof, portable conductivity meter that has an expanded conductivity range from 0.001 µS/cm to 400 mS/cm, as well as resistivity and three salinity scales. This meter automatically recognizes the probe type (two or four ring) and allows the user to adjust the nominal cell constant.

Choose from seven memorized standards and obtain up to a five point calibration. For salinity (% range), HI 7037 standard allows you to make a one point calibration. Both linear and natural water temperature compensation are available and the reference temperature is user adjustable. Ten sets of measurement parameters (such as reference temperature, temperature compensation mode, TDS factor, calibration etc.) can be stored as a customized user profile and recalled for later use. HI 98188 is also USP <645> compliant with stages 1, 2 and 3.

HI 99300 • HI 99301

EC/TDS/Temperature Meters

6.22

H 99300 and HI 99301 are portable, microprocessor-based EC/TDS and temperature meters. HI 99300N measures conductivity in µS/cm and TDS in ppm while the HI 99301N measures conductivity in mS/cm and TDS in ppt.

These instruments are ideal in applications such as water conditioning, fish farming, agriculture and water treatment. They easily fit in the palm of your hand and the bottom probe connection ensures the electrode cable doesn't get in your way. The large, multi-level LCD displays the primary reading, temperature and calibration guides simultaneously.

Benchtop Meters

GUIDE	EC Range	pH Range	Resistivity Range	ORP Range	TDS Range	Salinity Range	Temperature Range(s)	EC Calibration Points	EC Calibration Solutions	ATC (Automatic Temperature Compensation)	BEPS	Logging	GLP	HOLD Feature	PC Connectivity	Autoranging	Waterproof	Page
HI 4522	•	•	•	•	•	•	°C/°F K	4	*	•		•	•	•	•	•		6.6
HI 4521	•	•	•	•	•	•	°C/°F K	4	*	•		•	•	•	•	•		6.6
HI 4321	•		•		•	•	°C/°F K	4	*	•		•	•	•	•	•		6.8
HI 3512	•	•	•	•	•		°C/°F	2	*	•		•	•	•	•	•		6.10
HI 2550	•	•		•	•	•	°C	1	6	•		•	•	•	•	•		6.12
HI 2300	•				•		°C	1	6	•			•		•	•		6.14
HI 216	•		•					1		•								6.16
EC 214	•							1										6.17
EC 215	•							1		•								6.17
EC 215R	•							1		•								6.17

Portable Meters

GUIDE	EC Range	pH Range	Resistivity Range	ORP Range	TDS Range	Salinity Range	Temperature Range(s)	EC Calibration Points	EC Calibration Solutions	ATC (Automatic Temperature Compensation)	BEPS	Logging	GLP	HOLD Feature	PC Connectivity	Autoranging	Waterproof	Page
HI 98188	•		•		•	•	°C	5	7			•	•		•	•	•	6.18
HI 9835	•				•	•	°C	1	6	•	•		•			•	•	6.20
HI 98360	•				•	•	°C	1	6	•	•	•	•		•	•	•	6.20
HI 99300	•				•		°C/°F	1		•	•			•			•	6.22
HI 99301	•				•		°C/°F	1		•	•			•			•	6.22
HI 993310	•							1		•	•							6.24
HI 9033	•				•			1		•	•						•	6.25
HI 9034	•				•			1		•	•						•	6.25
HI 8633	•							1		•							•	6.26
HI 8733	•							1		•							•	6.26
HI 87314	•		•					1		•								6.27
HI 8730	•				•		°C	1		•								6.28
HI 8731	•				•		°C	1		•								6.28
HI 8732	•				•		°C	1		•								6.28
HI 86301	•				•			1		•								6.29
HI 86302	•				•			1		•								6.29
HI 86303	•				•			1		•								6.29
HI 86304	•				•			1		•								6.29
HI 8734					•												•	6.30
HI 8033	•				•			1										6.31

* auto standard recognition, custom calibration solution

HI 4521 • HI 4522

Research Grade Meter with Calibration Check™ and USP <645>

pH/ORP/ISE and EC/TDS/Resistivity/Salinity and Temperature

- Up to eight measurement parameters, two input channels
- Extended range from 0.001 µS/cm to 1000 mS/cm
- Performs all three stages of USP <645> method required for conductivity measurement of pure and ultra pure water
- Practical salinity, natural sea water, and percent scales
- Linear and natural water temperature compensation, no compensation for actual conductivity
- Five point pH and ISE calibration with standard and custom buffers
- Large log memory with different logging methods
- pH Calibration Check™
- Fully customizable

HI 4521 and HI 4522 are research grade, benchtop instruments that feature 8 measurement ranges: pH, ORP (Oxidation Reduction Potential), ISE (HI 4522 only), conductivity, resistivity, TDS, salinity and temperature. These instruments incorporate dual channels with a separate temperature input and support the external reference electrodes required by some pH and ISE sensors.

The user interface is customizable and capable of displaying two channels at the same time, showing the measurements in various modes: basic measurement with or without GLP information, graph or log history.

Conductivity is fully customizable and include: temperature compensation coefficient, temperature reference, selectable compensation method (linear, natural water and no compensation), adjustable cell constant and TDS factor.

All ranges of conductivity, resistivity and TDS feature autorange or users can select the unit of measure manually. Three salinity scales are available: natural sea water, practical salinity and %.

These instruments can be used to perform all 3 stages of USP <645> method required for conductivity measurement of pure and ultra pure water. The instrument provides clear directions on how to perform each testing stage and automatically monitors the temperature, conductivity and stability during testing and determines whether a sample is within USP limits.

These instruments are equipped with auto standard recognition and can support custom calibration solutions. Up to a four point calibration can be obtained for enhanced accuracy over an extended measuring range.

The enhanced warning system is in place to alert users when measuring outside the calibration range. This system will also remind the user when a new calibration is due.

HANNA's pH Calibration Check™ diagnostics system ensures accurate readings every time by alerting users of potential problems during the calibration process.

Automatic, semiautomatic and manual pH calibration is available in up to five points, with 8 standard (1.68, 3.00, 4.01, 6.86, 7.01, 9.18, 10.01 and 12.45) and up to 5 custom buffers. These instruments also feature up to five point Manual Selection and Custom Standard ISE calibration with up to five standard solutions and up to 5 custom solutions with or without temperature compensation (HI 4522 only).

Up to 10 profiles can be saved and recalled eliminating the need to reconfigure each time when a different electrode is used.

Three selectable logging modes are available: Automatic, Manual and AutoHold. Up to 100 logging lots with 10,000 records per lot can be stored for automatic or manual modes along with up to 200 USP reports, and up to 100 ISE method reports. Automatic logging features a selectable area and sampling period while GLP information includes complete data about user calibration of each parameter and identification information for the instrument, user, and company. Data can be transferred to a PC via the opto-isolated PC interface via the RS232 or USB ports and HI 92000 software (optional).

These instruments offer multi-language support and contextual help is available through a dedicated Help key. Clear tutorial messages and directions are available on-screen to quickly and easily guide users through all measurement and calibration procedures to ensure measurements and procedures are performed properly.

SPECIFICATIONS		HI 4521	HI 4522
pH	Range	-2.000 to 20.000 pH	
	Resolution	0.1 pH; 0.01 pH; 0.001 pH	
	Accuracy	±0.1 pH; ±0.01 pH; ±0.002 pH ±1 LSD	
mV	Range	±2000 mV	
	Resolution	0.1 mV	
	Accuracy	±0.2 mV ±1 LSD	
ISE	Range	–	1 x 10^{-6} to 9.99 x 10^{10} concentration
	Resolution	–	1; 0.1; 0.01; 0.001 concentration
	Accuracy	–	±0.5% (monovalent ions); ±1% (divalent ions)
Conductivity	Range	0.000 to 9.999 µS/cm; 10.00 to 99.99 µS/cm; 100.0 to 999.9 µS/cm; 1.000 to 9.999 mS/cm; 10.00 to 99.99 mS/cm; 100.0 to 999.9 mS/cm; 1000 mS/cm (actual EC)	
	Resolution	0.001 µS/cm; 0.01 µS/cm; 0.1 µS/cm; 0.001 mS/cm; 0.01 mS/cm; 0.1 mS/cm; 1 mS/cm	
	Accuracy	±1% of reading (±0.01 µS/cm)	
	Cell Constant	0.0500 to 200.00	
	Cell Type	2, 4 rings	
	Calibration Type	auto standard recognition, user standard single point / multi point calibration	
	Calibration Reminder	yes	
	Temperature Coefficient	0.00 to 10.00 %/°C	
	Reference Temperature	15.0 °C to 30.0°C	
	Profiles	up to 10	
	USP Compliant	yes	
Resistivity	Range	1.0 to 99.9 Ohms x cm; 100 to 999 Ohms x cm; 1.00 to 9.99 kOhms x cm; 10.0 to 99.9 kOhms x cm; 100 to 999 kOhms x cm; 1.00 to 9.99 MOhms x cm; 10.0 to 100.0 MOhms x cm	
	Resolution	0.1 Ohms x cm; 1 Ohms x cm; 0.01 kOhms x cm; 0.1 kOhms x cm; 1 kOhms x cm; 0.01 MOhms x cm; 0.1 MOhms x cm	
	Accuracy	±2% of reading (±1 Ohm x cm)	
TDS	Range	0.000 to 9.999 ppm; 10.00 to 99.99 ppm; 100.0 to 999.9 ppm; 1.000 to 9.999 ppt; 10.00 to 99.99 ppt; 100.0 to 400.0 ppt (actual TDS) (with 1.00 factor)	
	Resolution	0.001 ppm; 0.01 ppm; 0.1 ppm; 0.001 ppt; 0.01 ppt; 0.1 ppt	
	Accuracy	±1% of reading (±0.01 ppm)	
Salinity	Range	practical scale: 0.00 to 42.00 psu; natural sea water scale: 0.00 to 80.00 ppt; percent scale: 0.0 to 400.0%	
	Resolution	0.01 for practical scale/natural sea water scale; 0.1% for percent scale	
	Accuracy	±1% of reading	
Temperature	Range	-20.0 to 120°C; -4.0 to 248.0°F; 253.15 to 393.15K	
	Resolution	0.1°C; 0.1°F; 0.1K	
	Accuracy	±0.2°C; ±0.4°F; ±0.2K (excluding probe error)	
Calibration	pH	automatic, up to five point calibration, eight standard buffers available (1.68, 3.00, 4.01, 6.86, 7.01,9.18, 10.01, 12.45), and five custom buffers	
	ISE	–	automatic, up to five point calibration, 5 fixed standard solutions available for each measurement unit, and 5 user defined standards
	Conductivity	auto standard recognition, user standard single point/multi-point	
	Salinity	percent scale–1 point (with HI 7037 standard)	
pH Calibration Check™		yes	
Relative mV Offset Range		±2000 mV	
Input Channel(s)		1 pH/ORP + 1 EC	1 pH/ORP/ISE + 1 EC
GLP		cell constant, reference temperature/coefficient, calibration points, cal time stamp	
Temperature Compensation	pH	automatic or manual from -20.0 to 120.0°C/-4.0 to 248.0°/253 to 393K	
	EC	disabled, linear and non-linear (natural water)	
pH Electrode		HI 1131B glass body pH electrode with BNC connector and 1 m (3.3') cable (included)	
EC Probe		HI 76312 platinum, 4-ring conductivity/TDS probe with internal temperature sensor and 1 m (3.3') cable (included)	
Temperature Probe		HI 7662-T stainless steel temperature probe with 1 m (3.3') cable (included)	
Logging	Record	100 lots with 10,000 record/lot	
	Interval	settable between 1 and max log time	
	Type	automatic, log on demand, AutoHold	
Replatinization		yes	
Display		240 x 320 dot-matrix color LCD with on-screen help, graphing, language selection and custom configuration	
PC Connection		USB and RS232	
Power Supply		12 VDC adapter (included)	
Environment		0-50°C (32 to 122°F) (273 to 323K) RH max 95% non-condensing	
Dimensions / Weight		160 x 231 x 94 mm (6.3 x 9.1 x 3.7") / 1.2 Kg (2.6 lbs.)	

ORDERING INFORMATION

HI 4521-01 (115V), **HI 4521-02** (230V), **HI 4522-01** (115V) and **HI 4522-02** (230V) are supplied with HI 76312 conductivity/TDS probe, HI 1131B pH electrode, HI 7662-T temperature probe, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 700661 electrode cleaning solution sachet (2), HI 7071S electrolyte solution (30 mL), HI 76404N electrode holder, 12 VDC adapter and instructions.

SOLUTIONS

HI 6004	pH 4.010 buffer solution, 500 mL
HI 6007	pH 7.010 buffer solution, 500 mL
HI 6010	pH 10.010 buffer solution, 500 mL
HI 7030L	12880 µS/cm cal. solution, 500 mL
HI 7031L	1413 µS/cm calibration solution, 500 mL
HI 7033L	84 µS/cm calibration solution, 500 mL
HI 7034L	80000 µS/cm cal. solution, 500 mL
HI 7035L	111800 µS/cm cal. solution, 500 mL
HI 7039L	5000 µS/cm cal. solution, 500 mL
HI 7037L	Salinity standard solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL

ACCESSORIES

HI 92000	Windows® compatible software
HI 920013	USB cable for PC connection
HI 76404N	Electrode holder

For a complete list of Solutions and Electrodes, see the end of pH *Section 3*, ISE *Section 4* and Conductivity *Section 6*.

HI 4321

Research Grade Conductivity/ TDS Meter with USP <645>

EC/TDS/Resistivity/Salinity and Temperature

- EC, resistivity, TDS and salinity ranges
- Extended range from 0.001 µS/cm to 1000 mS/cm
- Ready to perform all three stages of USP <645> method required for conductivity measurement of pure and ultra pure water
- Three salinity scales: practical salinity, natural sea water, percent
- Linear and natural water temperature compensation, no compensation for actual conductivity
- Fully customizable
- Large log memory with different logging methods

HI 4321 is a research-grade EC/Resistivity/TDS/Salinity benchtop meter with a large, color, graphic LCD with backlight, capable of millesimal measuring resolution of conductivity with an extended range from 0.001 µS/cm to 1 S/cm.

Conductivity is fully customizable and include: temperature compensation coefficient, temperature reference, selectable compensation method (linear, natural water and no compensation), adjustable cell constant and TDS factor.

All ranges of conductivity, resistivity and TDS feature autorange or users can select the unit to measure manually. Three salinity scales are available: natural sea water, practical salinity and %.

HI 4321 can be used to perform all 3 stages of USP <645> method required for conductivity measurement of pure and ultra pure water. The instrument provides clear directions on how to perform each testing stage and automatically monitors the temperature, conductivity and stability during testing and determines whether a sample is within USP limits.

This instrument is equipped with auto standard recognition and can support custom calibration solutions. Up to a four point calibration can be obtained for enhanced accuracy over an extended measuring range.

The enhanced warning system is in place to alert users when measuring outside the calibration range. This system will also remind the user when a new calibration is due.

Features also include real-time graphic displays and on-screen GLP data. Fully customizable instrument and parameters via setup screens. On-board contextual help can be accessed from any mode simply by pressing the HELP button.

Up to 10 profiles can be saved and recalled eliminating the need to reconfigure each time when a different electrode is used.

Three selectable logging modes are available: Automatic, Manual and AutoHold. Up to 100 logging lots with 10,000 records per lot can be stored for automatic or manual modes along with up to 200 USP reports.

All features are available in English, Italian, Portuguese and Spanish. Connect to a PC via the USB or RS232 ports, with the use of HI 92000 Windows® compatible software.

EC USP Mode

HI 4321 is capable of performing all 3 stages of United States Pharmacopeia testing requirements for water quality (USP <645>).

This instrument provides clear instructions on performing each stage and automatically checks the respects of USP limits.

Comprehensive results are shown for all stages on a single screen at the end of the test. Up to 200 reports can be saved for future recall.

SPECIFICATIONS		HI 4321
Conductivity	Range	0.000 to 9.999 µS/cm; 10.00 to 99.99 µS/cm; 100.0 to 999.9 µS/cm; 1.000 to 9.999 mS/cm; 10.00 to 99.99 mS/cm; 100.0 to 1000 mS/cm (actual EC)
	Resolution	0.001 µS/cm; 0.01 µS/cm; 0.1 µS/cm; 0.001 mS/cm; 0.01 mS/cm; 0.1 mS/cm
	Accuracy	±1% of reading (±0.01 µS/cm)
Resistivity	Range	1.0 to 99.9 Ohms x cm; 100 to 999 Ohms x cm; 1.00 to 9.99 kOhms x cm; 10.0 to 99.9 kOhms x cm; 100 to 999 kOhms x cm; 1.00 to 9.99 MOhms x cm; 10.0 to 100.0 MOhms x cm
	Resolution	0.1 Ohms x cm; 1 Ohms x cm; 0.01 kOhms x cm; 0.1 kOhms x cm; 1 kOhms x cm; 0.01 MOhms x cm; 0.1 MOhms x cm
	Accuracy	±2% of reading (±1 Ohm x cm)
TDS	Range	0.000 to 9.999 ppm; 10.00 to 99.99 ppm; 100.0 to 999.9 ppm; 1.000 to 9.999 ppt; 10.00 to 99.99 ppt; 100.0 to 400.0 ppt actual TDS (with 1.00 factor)
	Resolution	0.001 ppm; 0.01 ppm; 0.1 ppm; 0.001 ppt; 0.01 ppt; 0.1 ppt
	Accuracy	±1% of reading (±0.01 ppm)
	Factor	0.40 to 1.00
Salinity	Range	practical scale: 0.00 to 42.00 psu; natural sea water scale: 0.00 to 80.00 ppt; percent scale: 0.0 to 400.0%
	Resolution	0.01 for practical scale/natural sea water scale; 0.1% for percent scale
	Accuracy	±1% of reading
Temperature	Range	-20.0 to 120°C; -4.0 to 248.0°F; 253.15 to 393.15K
	Resolution	0.1°C; 0.1°F; 0.1K
	Accuracy	±0.2°C; ±0.4°F; ±0.2K (excluding probe error)
Calibration	Conductivity	auto standard recognition, custom calibration solution/four point calibration
	Salinity	percent scale–one point (with HI 7037 standard)
	Temperature	three points
Temperature Compensation		linear and non-linear (natural water)
EC Probe		HI 76312 platinum, four ring conductivity/TDS probe with internal temperature sensor and 1 m (3.3') cable (included)
Temperature Probe		HI 7662-T stainless steel temperature probe with 1 m (3.3') cable (included)
Logging	Record	100 lots with 10,000 record/lot
	Interval	settable between one and max log time
	Type	automatic, log on demand, AutoHold
Replatinization		yes
Display		240 x 320 dot-matrix color LCD with on-screen help, graphing, language selection and custom configuration
PC Connection		RS232, USB
Power Supply		12 VDC adapter (included)
Environment		0-50°C (32 to 122°F) (273 to 323K) RH max 95% non-condensing
Dimensions		160 x 231 x 94 mm (6.3 x 9.1 x 3.7")
Weight		1.2 Kg (2.6 lbs.)

ORDERING INFORMATION

HI 4321-01 (115V) and **HI 4321-02** (230V) are supplied with HI 76312 conductivity probe, HI 76404N electrode holder, 12 VDC power adapter and instructions.

PROBES

HI 76312	Platinum, four ring conductivity/TDS probe with internal temperature sensor and 1 m (3.3') cable
HI 7662-T	Stainless steel temperature probe with 1 m (3.3') cable

SOLUTIONS

HI 7030L	12880 µS/cm calibration solution, 500 mL
HI 7031L	1413 µS/cm calibration solution, 500 mL
HI 7033L	84 µS/cm calibration solution, 500 mL
HI 7034L	80000 µS/cm calibration solution, 500 mL
HI 7035L	111800 µS/cm calibration solution, 500 mL
HI 7039L	5000 µS/cm calibration solution, 500 mL
HI 7037L	Salinity solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL

ACCESSORIES

HI 76404N	Electrode holder
HI 92000	Windows® compatible software
HI 920013	USB cable for PC connection
HI 920010	RS232 cable for PC connection

For a complete list of Solutions and Electrodes, see the end of this section.

HI 3512

Two Channel, pH/ORP/ISE, EC/TDS/NaCl/Resistivity Benchtop Meter

- EC calibration for up to two calibration points
- Seven memorized EC standards for calibration
- Extended EC range
- pH calibration with up to two custom buffers
- pH Calibration Check™ and electrode condition
- Up to five point pH calibration
- Seven standard pH buffers for calibration
- Messages on the graphic LCD for an easy and accurate calibration
- Contextual help at the touch of a button
- Multi-language support
- Automatic logging interval up to 600 records
- Log on demand up to 400 samples
- GLP features
- PC interface via USB

The HI 3512 is a multiparameter, 2 channel professional benchtop meter with a graphic LCD, designed to provide accurate laboratory results. Channel 1 features pH/ORP/ISE and temperature measurement capability while channel 2 measures EC/TDS/NaCl/Resistivity and temperature.

The EC channel measures an extended range from 0.001 µS to 1000 mS (actual EC) and offers up to two calibration points with 7 memorized standards (0.00 µS/cm, 84.0 µS/cm, 1.413 mS/cm, 5.00 mS/cm, 12.88 mS/cm, 80.0 mS/cm and 111.8 mS/cm). The EC channel supports autoranging, manual ranging and lock of the user selected range, temperature compensation selection, temperature reference selection (15 °C, 20 °C or 25 °C) and temperature coefficient set. Cell constant can be set from 0.010 to 10.000 and TDS factor from 0.40 to 1.00.

The pH channel offers up to five point pH calibration with seven standard buffers (pH 1.68, 4.01, 6.86, 7.01, 9.18, 10.01 and 12.45) and up to two custom buffers.

HANNA's exclusive Calibration Check™ diagnostics system ensures accurate pH readings every time by alerting users of potential problems during the calibration process. The Calibration Check™ system eliminates erroneous readings due to dirty or faulty pH electrodes or contaminated pH buffer solutions. After the guided calibration process, a probe condition indicator is displayed on the LCD informing the user of the overall pH electrode status.

This instrument can measure using ORP electrodes (pH channel input), thanks to their capability to measure mV with a resolution up to 0.1 mV and ISE electrodes on ppm scale (pH channel input). The electrode type and unit selection capability and the ISE calibration in up to five calibration standard solutions make this instrument very useful for a large range of concentration solution measurements.

pH and EC channels also provide user selectable "out of calibration range" warnings and a "calibration timeout" to remind the user when a new calibration is necessary.

Messages on the graphic LCD offer directions for easy and accurate calibration for both channels as well as diagnostics to alert the user when calibration or measurement issues are detected.

Other features of the HI 3512 include log-on-demand of up to 400 samples, automatic logging interval with log on stability feature of up to 600 records, auto HOLD that freezes the first stable reading on the LCD display, GLP to view the last calibration data for pH, rel mV, ISE, EC or NaCl and PC interface via USB.

SPECIFICATIONS		HI 3512
pH	Range	-2.0 to 20.0; -2.00 to 20.00; -2.000 to 20.000 pH
	Resolution	0.1 pH; 0.01 pH; 0.001 pH
	Accuracy	±0.01 pH; ±0.002 pH
mV	Range	±2000.0 mV
	Resolution	0.1 mV
	Accuracy	±0.2 mV
ISE	Range	1.00 E-7 to 9.99 E10 conc.
	Resolution	3 digits 0.01, 0.1, 1, 10 conc.
	Accuracy	±0.5% of reading (monovalent ions); ±1% of reading (divalent ions)
Temperature Channel 1	Range	-20.0 to 120.0 °C (4.0 to 248.0 °F)
	Resolution	0.1 °C (0.1 °F)
	Accuracy	±0.2 °C (±0.4 °F) (excluding probe error)
Relative mV Offset Range		±2000 mV
pH Calibration		up to five point calibration, seven standard buffers available (1.68, 4.01, 6.86, 7.01, 9.18, 10.01, 12.45), and two custom buffers
pH Calibration Check™		yes
Slope Calibration		from 80 to 110%
pH Temperature Compensation		manual or automatic from -20.0 to 120.0 °C (-4.0 to 248.0 °F)
pH Electrode		HI 1131B glass body pH electrode with BNC connector and 1 m (3.3') cable (included)
Temperature probe		HI 7662-T temperature probe with 1 m (3.3') cable (included)
ISE Calibration		up to five-point calibration points 6 standard solutions available (0.1, 1, 10, 100, 1000, 10000 ppm)
EC	Range	0.001 µS/cm to 400 mS/cm (shows values up to 1000 mS/cm) actual conductivity 1000 mS/cm; 0.001 to 9.999 µS/cm; 10.00 to 99.99 µS/cm; 100.0 to 999.9 µS/cm; 1.000 to 9.999 mS/cm; 10.00 to 99.99 mS/cm; 100.0 to 999.9 mS/cm; 1000 mS/cm (autoranging)
	Resolution	0.001 µS/cm; 0.01 µS/cm; 0.1 µS/cm; 0.001 mS/cm; 0.01 mS/cm; 0.1 mS/cm; 1 mS/cm
	Accuracy	±1% of reading (±0.01 µS/cm or 1 digit whichever is greater) excluding probe error
Resistivity	Range	1.0 to 99.9 ohms; 100 to 999 ohms; 1.00 to 19.99 Kohms; 10.0 to 99.9 Kohms; 100 to 999 Kohms; 1.00 to 9.99 Mohms; 10.0 to 100.0 Mohms (autoranging)
	Resolution	0.1 ohm; 1 ohm; 0.01 Kohms; 0.1 Kohms; 1 Kohms; 0.01 Mohms; 0.1 Mohms
	Accuracy	±1% of reading (±10 ohms or 1 digit whichever greater) excluding probe error
TDS	Range	0.000 to 9.999 ppm; 10.00 to 99.99 ppm; 100.0 to 999.9 ppm; 1.000 to 9.999 g/L; 10.00 to 99.99 g/L; 100.0 to 400.0 g/L (autoranging)
	Resolution	0.001 ppm; 0.01 ppm; 0.1 ppm; 0.001 g/L; 0.01 g/L; 0.1 g/L
	Accuracy	±1% of reading (±0.05 ppm or 1 digit whichever greater) excluding probe error
	Factor	0.40 to 1.00
Salinity	Range	% NaCl: 0.0 to 400.0 %
	Resolution	0.1 %
	Accuracy	±1% of reading excluding probe error
Temperature Channel 2	Range	-20.0 to 120°C
	Resolution	0.1°C
	Accuracy	±0.2 °C (excluding probe error)
EC Calibration		automatic up to two points with seven memorized standards (0.00 µS/cm, 84.0 µS/cm, 1.413 mS/cm, 5.00 mS/cm, 12.88 mS/cm, 80.0 mS/cm, 111.8 mS/cm)
Constant Cell Setup		0.010 to 10.000
NaCl Calibration		max. one point only (with HI 7037 standard)
EC Probe		HI 76310 platinum four ring conductivity/TDS probe with 1 m (3.3') cable (included)
Temperature Source		automatic from sensor inside the probe; manual entry
EC Temperature Compensation		NoTC, MTC, ATC
Reference Temperature		15, 20, 25 °C
Temperature Coeficient		0.00 to 10.00 %/°C
Log On Demand		400 samples
Lot Logging		600 samples
PC interface		opto-isolated USB
Input Impedance		10^{12} ohms
Power Supply		12 VDC adapter (included)
Environment		0 to 50 °C (32 - 122 °F) RH max 55% non-condensing
Dimensions / Weight		235 x 207 x 110 mm (9.2 x 8.14 x 4.33") / 1.8 Kg (4.1 lbs.)

ORDERING INFORMATION

HI 3512-01 (115V) and **HI 3512-02** (230V) is supplied with HI 76310 conductivity/TDS probe, HI 1131B pH electrode, HI 7662-T temperature probe, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 700661 electrode cleaning solution sachet (2), HI 7071S electrolyte solution (30 mL), HI 76404N electrode holder, 12 VDC adapter and instructions.

SOLUTIONS

HI 6016	pH 1.679 buffer solution, 500 mL
HI 6004	pH 4.010 buffer solution, 500 mL
HI 6007	pH 7.010 buffer solution, 500 mL
HI 6010	pH 10.010 buffer solution, 500 mL
HI 6124	pH 12.450 buffer solution, 500 mL
HI 7030L	12880 µS/cm calibration solution, 500 mL
HI 7031L	1413 µS/cm calibration solution, 500 mL
HI 7033L	84 µS/cm calibration solution, 500 mL
HI 7034L	80000 µS/cm calibration solution, 500 mL
HI 7035L	111800 µS/cm calibration solution, 500 mL
HI 7039L	5000 µS/cm calibration solution, 500 mL
HI 7037L	Salinity standard solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL

ACCESSORIES

HI 76404N	Electrode holder
HI 92000	Windows® compatible software
HI 920013	USB cable for PC connection

For a complete list of Solutions and Electrodes, see the end of pH *Section 3*, ISE *Section 4* and Conductivity *Section 6*.

HI 2550

pH/ORP/ISE, EC/TDS/NaCl Benchtop Meter

- Up to seven measurement parameters
- Two input channels: pH/ORP/ISE and EC/TDS/Resistivity/NaCl
- Up to five point pH calibration with seven standard and two custom buffers
- EC/TDS autoranging, manual ranging and range lock
- Automatic Temperature Compensation (pH & EC)
- PC interface via USB
- GLP features

HI 2550 is a multiparameter 2 channel instrument that measures up to 7 parameters. With this single laboratory bench meter you can measure pH, ORP, ISE, conductivity (EC), TDS, NaCl percentage and temperature.

EC measurements can be compensated relative to a selected reference temperature of 20°C or 25°C and the temperature coefficient can be set between 0.0 and 6.0%/°C. Also selectable is the cell constant between 0.500 and 1.700 and TDS factor from 0.40 to 0.80. The EC calibration mode allows you to chose from among six recognized conductivity standards and perform a single-point calibration. The most suitable EC and TDS range for your application is automatically selected. The HI 2550 also includes the ability to set and lock the range manually.

To ensure a higher level of precision, pH calibrations are up to five calibration points, chosen from the seven available memorized buffers. By utilizing an external temperature probe, pH readings are automatically temperature compensated.

This instrument can measure using ORP electrodes (pH channel input), due to it's capability to measure mV with a resolution up to 0.1 mV and also use ISE electrodes on the mV scale (pH channel input).

This instrument provides GLP capabilities that allows the storage and retrieval of all data regarding pH, rel mV, EC and NaCl calibration and sample measurement as well as data regarding the maintenance and status of the electrode.

With a built-in logging function, measurements are stored in non volatile memory, and can be transferred to a PC through the USB port. Users can manually log up to 200 records and interval log up to 500 records.

SPECIFICATIONS		HI 2550
Range	pH	-2.0 to 16.0 pH; -2.00 to 16.00 pH; -2.000 to 16.000 pH
	ISE & ORP	±999.9 mV (ISE & ORP); ±2000 mV (ISE & ORP)
	EC	0.00 to 29.99 µS/cm; 30.0 to 299.9 µS/cm; 300 to 2999 µS/cm; 3.00 to 29.99 mS/cm; 30.0 to 200.0 mS/cm; up to 500.0 mS/cm actual* conductivity
	TDS	0.00 to 14.99 ppm; 15.0 to 149.9 ppm; 150 to 1499 ppm; 1.50 to 14.99 g/L; 15.0 to 100.0 g/L; up to 400.0 g/L actual* TDS (with 0.80 factor)
	NaCl	0.0 to 400.0% NaCl
	Temperature	-20.0 to 120.0 °C (pH, EC range)
Resolution	pH	0.1 pH; 0.01 pH; 0.001 pH
	ISE & ORP	0.1 mV (±999.9 mV); 1 mV (± 2000 mV)
	EC	0.01 µS/cm; 0.1 µS/cm; 1 µS/cm; 0.01 mS/cm; 0.1 mS/cm
	TDS	0.01 ppm; 0.1 ppm; 1 ppm; 0.01 g/l; 0.1 g/L
	NaCl	0.1% NaCl
	Temperature	0.1 °C
Accuracy @ 20°C/68°F	pH	± 0.01 pH; ± 0.002 pH
	ISE & ORP	± 0.2 mV (±999.9 mV); ± 1 mV (±2000 mV)
	EC	± 1 % reading (±0.05 µS/cm or 1 digit, whichever greater)
	TDS	±1% of reading (±0.03 ppm or 1 digit, whichever greater)
	NaCl	±1% of reading
	Temperature	± 0.4 °C (excluding probe error)
Relative mV Offset		±2000 mV
pH Calibration		up to five point calibration, seven standard buffers available (1.68, 4.01, 6.86, 7.01, 9.18, 10.01, 12.45), and two custom buffers
EC Calibration		one point slope calibration; six buffers available: 84.0, 1413 µS/cm; 5.00, 12.88, 80.0, 111.8 mS/cm; one point offset: 0.00 µS/cm
NaCl Calibration		one point with HI 7037L standard (optional)
Temperature Compensation		manual or automatic from: -20.0 to 120.0 °C (pH range) -20.0 to 120.0 °C (EC range) (can be disabled on conductivity or TDS range to measure actual conductivity) or actual TDS
Cond. Temp. Coefficient		0.00 to 6.00 %/°C (for EC and TDS only) default value is 1.90 %/°C
TDS Factor		0.40 to 0.80 (default value is 0.50)
pH Probe		HI 1131B glass body pH electrode with BNC connector and 1 m (3.3') cable (included)
Conductivity Probe		HI 76310 platinum four ring conductivity/TDS probe with built-in temperature sensor and 1 m (3.3') cable (included)
Temperature Probe		HI 7662 temperature probe with 1 m (3.3') cable (included)
Input Impedance		10^{12} ohms
PC Connectivity		opto-isolated USB
Log On Demand		200 records
Log Interval Feature		500 records; stability logging ("StAb") , 5, 10, 30 sec and 1, 2, 5, 10, 15, 30, 60, 120, 180 min
Power Supply		12 VDC
Environment		0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions		235 x 218 x 108 mm (9.2 x 8.5 x 4.2")
Weight		1.3 Kg (2.9 lb); kit with holder 2.1 Kg (4.6 lb.)

*with temperature compensation disabled

ORDERING INFORMATION

HI 2550-01 (115V) and **HI 2550-02** (230V) are supplied with HI 1131B pH electrode, HI 76310 conductivity/TDS probe, HI 7662 temperature probe, HI 76404N electrode holder, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 7071S electrolyte solution (30 mL), 12 VDC adapter and instruction manual.

PROBES

HI 1131B	Glass body pH electrode with BNC connector and 1 m (3.3') cable
HI 76310	Platinum, 4-ring conductivity/TDS probe with built-in temperature sensor and 1 m (3.3') cable
HI 7662	Stainless steel temperature probe with 1 m (3.3') cable

SOLUTIONS

HI 5004L	pH 4.01 buffer solution, 500 mL
HI 5007L	pH 7.01 buffer solution, 500 mL
HI 5010L	pH 10.01 buffer solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL
HI 7030L	12880 µS/cm calibration solution, 500 mL
HI 7031L	1413 µS/cm calibration solution, 500 mL
HI 7033L	84 µS/cm calibration solution, 500 mL
HI 7034L	80000 µS/cm calibration solution, 500 mL
HI 7035L	111800 µS/cm calibration solution, 500 mL
HI 7037L	Salinity standard solution, 500 mL

ACCESSORIES

HI 76404N	Electrode holder
HI 92000	Windows® compatible software
HI 920013	USB cable for PC connection

For a complete list of Solutions and Electrodes, see the end of pH *Section 3*, ISE *Section 4* and Conductivity *Section 6*.

HI 2300

Autoranging EC, TDS, NaCl, Temperature Meter

- **Autoranging**
  The EC and TDS scales are autoranging. The meter automatically sets the scale with the highest possible resolution.
- **Manual range selection and range lock**
- **Four ring potentiometric conductivity probe with internal temperature sensor**
- **Automatic (ATC), manual (MTC) or no temperature compensation (NoTC)**
- **GLP features**
- **Log-on-demand up to 500 records**
- **PC compatible via USB**

HI 2300 measures EC, TDS, NaCl and temperature. In conductivity and TDS ranges (up to 500 mS/cm and 400 g/L respectively) the instrument automatically chooses the best scale to maintain the highest accuracy.

EC calibration is a one-point procedure. Selectable calibration points are 0.00 µS, 84.0 µS, 1413 µS, 5.00 mS, 12.88 mS, 80.0 mS, and 111.8 mS selected according with the expected measurement range. NaCl calibration is a one-point procedure at 100.0% NaCl. Use HI 7037L calibration solution as a 100% NaCl standard solution.

This instrument utilizes a four ring potentiometric probe with platinum sensors to offer versatility over typical amperometric designs. By utilizing the four ring method, it is possible to measure very low or high conductivity levels without changing probes.

Three options of compensating for temperature are available for this instrument:

Automatic (ATC): The EC probe has a built-in temperature sensor which is used to automatically compensate the EC/TDS reading (from -9.9°C to 120.0°C), using the selected reference temperature (20 or 25°C) and temperature compensation coefficient from (0.0 to 6.0%)/°C

Manual (MTC): The temperature value, shown on the secondary LCD, can be manually set with the ARROW keys. The compensation is referenced at the selected temperature. All the other parameters of temperature compensation are settable similar to ATC.

No Compensation (NoTC): For actual conductivity or TDS measurement, the temperature value shown on the secondary LCD is not taken into account.

Cell constant is selectable between 0.5 and 1.700. TDS factor is selectable between 0.40 and 0.80.

The HI 2300 also provides users with GLP capabilities. Good Laboratory Practice (GLP) is a set of functions that allows storage and retrieval of data regarding the status of the system. After a successful calibration, the meter automatically stores the date and time of calibration, the calibration solution used and the resulting cell constant value. All this information can be later recalled by the user. Other features include a lock range function and stability indicator.

For PC communication, use the optional HI 92000 software and HI 920013 USB cable. The software is provided with an exclusive online guide of all the commands available and allows data printing, plotting and exporting.

Last calibration date

Last calibration year

Last calibration time

Cell constant value (K)

Offset value

SPECIFICATIONS		HI 2300
Range	EC	0.00 to 29.99 µS/cm; 30.0 to 299.9 µS/cm; 300 to 2999 µS/cm; 3.00 to 29.99 mS/cm; 30.0 to 200.0 mS/cm; up to 500.0 mS/cm (actual EC)*
	TDS	0.00 to 14.99 mg/L (ppm); 15.0 to 149.9 mg/L (ppm); 150 to 1499 mg/L (ppm); 1.50 to 14.99 g/L (ppt); 15.0 to 100.0 g/L (ppt); up to 400.0 g/L (actual TDS)*, with 0.80 conversion factor
	NaCl	0.0 to 400.0%
	Temperature	-20.0 to 120.0°C
Resolution	EC	0.01 µS/cm; 0.1 µS/cm; 1 µS/cm; 0.01 mS/cm; 0.1 mS/cm
	TDS	0.01 mg/L; 0.1 mg/L; 1 mg/L; 0.01 g/L; 0.1 g/L
	NaCl	0.1%
	Temperature	0.1°C
Accuracy	EC	±1% of reading ± (0.05 µS/cm or 1 digit)
	TDS	±1% of reading ± (0.03 mg/L or 1 digit)
	NaCl	±1% of reading
	Temperature	±0.4°C
Calibration	EC	automatic, one point with six memorized values (84, 1413, 5000, 12880, 80000, 111800 µS/cm)
	NaCl	one point, with HI 7037 calibration solution
	Temperature	two point, at 0 and 50°C
Temperature Compensation		automatic or manual from -20.0 to 120.0°C
Temperature Coefficient		selectable from 0.00 to 6.00%/°C (EC and TDS only)
TDS Conversion Factor		selectable from 0.40 to 0.80 (default value: 0.50)
Probe		HI 76310 platinum, four ring conductivity/TDS probe with internal temperature sensor and 1 m (3.3') cable (included)
PC Connectivity		opto-isolated USB
Logging		log on demand, 500 samples
Auto-off		after five minutes of non-use (can be disabled)
Power Supply		12 VDC adapter (included)
Environment		0 to 50°C (32 to 122°F); RH max 95%
Dimensions		235 x 218 x 108 mm (9.2 x 8.5 x 4.2")
Weight		1.3 kg (2.9 lbs.)

* with temperature compensation function disabled

ORDERING INFORMATION

HI 2300-01 (115V) and **HI 2300-02** (230V) is supplied with HI 76310 conductivity probe, 12 VDC adapter and instructions.

PROBES

HI 76310	Platinum, four ring conductivity/ TDS probe with internal temperature sensor and 1 m (3.3') cable

SOLUTIONS

HI 7030L	12880 µS/cm calibration solution, 500 mL
HI 7031L	1413 µS/cm calibration solution, 500 mL
HI 7033L	84 µS/cm calibration solution, 500 mL
HI 7034L	80000 µS/cm calibration solution, 500 mL
HI 7035L	111800 µS/cm calibration solution, 500 mL
HI 7039L	5000 µS/cm calibration solution, 500 mL
HI 7037L	Salinity solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL

ACCESSORIES

HI 92000	Windows® compatible software
HI 920013	USB cable for PC connection
HI 76404N	Electrode holder

For a complete list of Solutions, see the end of this section.

HI 216

EC and Resistivity Meter

- **Four user selectable conductivity measurement ranges**
- **Automatic probe recognition**
- **EC and resistivity temperature compensation**
- **Four platinum ring EC probe and resistivity probe included**

HI 216 is a combination bench meter that can read conductivity in four different ranges and resistivity.

For conductivity measurements, the calibration is a simple one point procedure using the easy to operate front panel knob and the supplied EC probe does not require recalibration when switching from one range to another. The four platinum ring probe has a built-in temperature sensor that automatically compensates for temperature. The temperature coefficient can be adjusted from 0 to 2.5% by also using a knob on the front panel.

For resistivity measurements, the meter is factory calibrated and if necessary, calibration can be adjusted. The HI 3316D resistivity probe is easy to clean and requires little maintenance. It also features a built-in temperature sensor for automatic temperature compensation and the temperature coefficient is user selectable from 2 to 7%.

Both the EC and resistivity probes use the same DIN connector on the rear panel and the meter automatically recognizes which probe is connected.

ORDERING INFORMATION

HI 216-01 (115V) and **HI 216-02** (230V) are supplied with HI 76303 conductivity probe, HI 3316D resistivity probe, 12 VDC adapter and instruction manual.

PROBES

HI 76303 Platinum four ring conductivity probe with interal temperature sensor, DIN connector and 1 m (3.3') cable.
HI 3316D Resistivity probe with internal temperature sensor, DIN connector and 1 m (3.3') cable.

SOLUTIONS

HI 7030L 12880 µS/cm calibration solution, 500 mL
HI 7031L 1413 µS/cm calibration solution, 500 mL
HI 7033L 84 µS/cm calibration solution, 500 mL
HI 7034L 80000 µS/cm calibration solution, 500 mL
HI 7035L 111800 µS/cm calibration solution, 500 mL
HI 7039L 5000 µS/cm calibration solution, 500 mL
HI 7061L Electrode cleaning solution, 500 mL

ACCESSORIES

HI 76405 Probe holder

SPECIFICATIONS		HI 216
Range	EC	0.0 to 199.9 µS/cm; 0 to 1999 µS/cm; 0.00 to 19.99 mS/cm; 0.0 to 199.9 mS/cm
	Resistivity	0 to 19.90 MΩ•cm
Resolution	EC	0.1 µS/cm; 1 µS/cm; 0.01 mS/cm; 0.1 mS/cm
	Resistivity	0.10 MΩ•cm
Accuracy (@20°C)	EC	±1% FS
	Resistivity	±2% FS
Calibration		manual, one point, for both EC and resistivity
Temperature Compensation		automatic from 0 to 50°C with β selectable from 0 to 2.5%/°C for EC and from 2 to 7%/°C for resistivity
Probes		HI 76303 platinum four ring conductivity probe with internal temperature sensor, DIN connector and 1 m (3.3') cable (included); HI 3316D resistivity probe with internal temperature sensor, DIN connector and 1 m (3.3') cable (included)
Power Supply		12 VDC (power adapter included)
Environment		0 to 50°C (32 to 122°F); RH max 95%
Dimensions / Weight		240 x 182 x 74 mm (9.4 x 7.1 x 2.9") / 1.0 kg (2.3 lbs.)

For a complete list of Solutions, see the end of this section.

EC 214 • EC 215 • EC 215R

Conductivity Meters

- **Four measurement ranges**
- **Manual calibration**
- **Automatic Temperature Compensation**
- **Analog output (EC 215R)**

These instruments utilize a four ring potentiometric probe with platinum sensor that offers greater versatility over typical amperometric designs. A potentiometric probe works on the principal of induction which eliminates the effects of polarization (a common problem of amperometric systems). Two outer rings apply an alternating voltage and induce a current loop in the solution while two inner rings measure the voltage drop induced by the current loop (which is dependent on the conductivity of the solution). By utilizing the 4-ring method, it is possible to measure very low or high conductivity levels (up to 200 mS/cm) without changing probes.

The temperature coefficient correction is settable between 0 and 2.5%/°C for EC 215.

In addition, the EC 215R model offers analog output of 0 to 5V that represents the full conductivity scale across all four ranges.

SPECIFICATIONS	EC 214	EC 215	EC 215R
Range	0.0 to 199.9 µS/cm; 0 to 1999 µS/cm; 0.00 to 19.99 mS/cm; 0.0 to 199.9 mS/cm		
Resolution	0.1 µS/cm; 1 µS/cm; 0.01 mS/cm; 0.1 mS/cm		
Accuracy (@20°C/68°F)	±1% F.S. (excluding probe error)		
Calibration	manual, one point		
Temperature Compensation	manual, 0 to 50°C (32 to 122°F) with β = 2%/°C	automatic, 0 to 50°C (32 to 122°F) with β adjustable from 0 to 2.5%/°C	
Probe	HI 76300, platinum four ring conductivity probe with DIN connector and 1 m (3.3') cable (included)	HI 76303, platinum four ring conductivity probe with internal temperature sensor, DIN connector and 1 m (3.3') cable (included)	
Analog Output	–	–	0 to 5 Vcc non isolated output; accuracy ±0.1% of reading; resolution ±2.5 mV
Power Supply	12 VDC adapter (included)		
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing		
Dimensions	240 x 182 x 74 mm (9.4 x 7.2 x 2.9")		
Weight	1.0 kg (2.2 lbs.)		

ORDERING INFORMATION

EC 214-01 (115V) and **EC 214-02** (230V) are supplied with HI 76300 conductivity probe, 12 VDC adapter and instruction manual.
EC 215-01 (115V), **EC 215-02** (230V), **EC 215-03** (AUS plug), **EC 215R-01** (115V) and **EC 215R-02** (230V) are supplied with HI 76303 conductivity probe, 12 VDC adapter and instruction manual.

ELECTRODES

HI 76300 Platinum four ring conductivity probe with DIN connector and 1 m (3.3') cable for EC 214
HI 76303 Platinum four ring conductivity probe with interal temperature sensor, DIN connector and 1 m (3.3') cable for EC 215 and EC 215R

SOLUTIONS

HI 7030L 12880 µS/cm calibration solution, 500 mL
HI 7031L 1413 µS/cm calibration solution, 500 mL
HI 7033L 84 µS/cm calibration solution, 500 mL
HI 7034L 80000 µS/cm calibration solution, 500 mL
HI 7035L 111800 µS/cm calibration solution, 500 mL
HI 70300L Electrode storage solution, 500 mL
HI 7061L Electrode cleaning solution, 500 mL

ACCESSORIES

HI 76404 Probe holder

For a complete list of Solutions, see the end of this section.

HI 98188

Graphic Display EC/Resistivity/TDS/NaCl Meter with USP <645>

- **Autorange from 0.001 µS/cm to 1,000 mS/cm (actual EC)**
- **Ready to perform all three stages of USP <645> method required for EC measurement of pure and ultra pure water**
- **Linear, natural water, or no temperature compensation**
- **Memorize up to ten user profiles**
- **Log on demand and autolog**
  All logged data can be transferred to PC through USB port.
- **GLP features**
- **Backlit, graphic display**

Rechargeable batteries

These models have up to 100 hours of extended battery life to guarantee long operation in the field. When the batteries are low, you don't have to worry about carrying a spare set with you–the batteries can be recharged with HANNA's inductive recharger. Simply leave the meter on the recharger for a few hours and you're ready to go. The recharger can be plugged into a standard 115V or 230V socket using the appropriate HANNA adapter.

HI 98188 is a waterproof, portable conductivity meter that has an expanded conductivity range from 0.001 µS/cm to 400 mS/cm, as well as TDS, resistivity and three salinity scales. This meter automatically recognizes the probe type (two or four ring) and allows the user to adjust the nominal cell constant. HI 98188 is also ready to perform all three stages of USP <645> method required for EC measurement of pure and ultrapure water.

Choose from seven memorized standards and obtain up to a five point conductivity calibration. For salinity (% range), HI 7037 standard allows users to make a one point calibration.

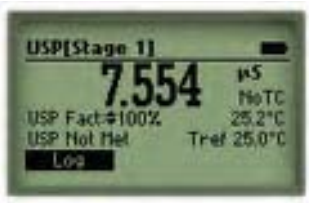
EC and TDS measurements are fully customizable and include: cell contant selection between 0.0 and 10.000, selection of linear or natural water (non-linear) or no (for actual conductivity reading) temperature compensation, configurable temperature compensation coefficient range from 0.00 to 10.00%/°C, choice of reference temperatures of of 15°C, 20°C and 25°C and a selectable TDS factor between 0.40 and 1.00.

Ten sets of customized measurement parameters can be stored as a user profile and recalled for later use.

Data may be captured by either the log on demand option (400 samples) or by interval logging (from 5 sec to 1 minute). Data can be transferred to a PC using HI 92000 software and HI 920013 USB cable.

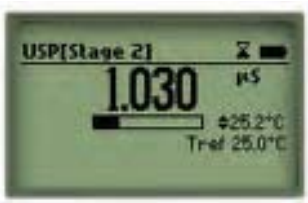
A combination of dedicated and soft keys allows quick, intuitive operation in a choice of languages. Comprehensive GLP data is directly accessible by pressing the GLP key. At the touch of a button users can access the contextual help menu to obtain on-screen information and assistance about each feature.

Designed for field use, this instrument can be easily operated with one hand and includes a rugged carrying case. With an extended battery life of up to 100 hours, users are assured long operation. The inductive charger can either be plugged into a standard 115V socket with the adapter included or a 12 Vdc source, such as a car's 12 volt accessory outlet.



3 Stage conformity

This meter can perform all 3 stages of USP <645> water quality testing requirements.



Progress bar

Meter displays progress towards meeting stage 2 stability requirements.

On-screen guide

Users are provided with on-screen instructions for each USP stage.

User profiles

10 sets of measurement parameters can be stored in user profiles for later retrieval.

Measurement

Large backlit graphic display shows multiple messages along with the current measurement readings.

Help

Users can consult the on-screen help from any mode by pressing the HELP key. The instrument will then explain the function and options currently available.

SPECIFICATIONS		HI 98188
EC	Range	0.001 µS/cm to 400 mS/cm (actual conductivity 1000 mS/cm) 0.001 to 9.999 µS/cm*; 10.00 to 99.99 µS/cm; 100.0 to 999.9 µS/cm; 1.000 to 9.999 mS/cm; 10.00 to 99.99 mS/cm; 100.0 to 1000.0 mS/cm (actual EC) (autoranging)
	Resolution	0.001 µS/cm*; 0.01 µS/cm; 0.1 µS/cm; 0.001 mS/cm; 0.01 mS/cm; 0.1 mS/cm
	Accuracy	±1% of reading (±0.01 µS/cm or 1 digit, whichever is greater)
Resistivity	Range	1.0 to 99.9 Ohms; 100 to 999 Ohms; 1.00 to 9.99 KOhms; 10.0 to 99.9 KOhms; 100 to 999 KOhms; 1.00 to 9.99 MOhms; 10.0 to 100.0 MOhms (autoranging)
	Resolution	0.1 Ohm; 1 Ohm; 0.01 KOhms; 0.1 KOhms; 1 KOhms; 0.01 MOhms; 0.1 MOhms
	Accuracy	±1% of reading (±10 Ohms or 1 digit, whichever is greater)
TDS	Range	0.00 to 99.99 mg/L (ppm); 100.0 to 999.9 mg/L (ppm); 1.000 to 9.999 g/L (ppt); 10.00 to 99.99 g/L (ppt); 100.0 to 400.0 g/L (ppt) (autoranging)
	Resolution	0.01 mg/L (ppm); 0.1 mg/L (ppm); 0.001 g/L (ppt); 0.01 g/L (ppt); 0.1 g/L (ppt)
	Accuracy	±1% of reading (±0.05 mg/L (ppm) or 1 digit, whichever is greater)
NaCl	Range	%: 0.0 to 400.0%; **seawater scale:** 0.00 to 80.00 (ppt); **practical salinity:** 0.01 to 42.00 (PSU)
	Resolution	0.1%; 0.01
	Accuracy	±1% of reading
Temperature	Range	-20.0 to 120.0°C
	Resolution	0.1°C
	Accuracy	±0.2°C (excluding probe error)
Calibration	EC	automatic up to five points with seven memorized standards (0.00 µS/cm, 84.0 µS/cm, 1.413 mS/cm, 5.00 mS/cm, 12.88 mS/cm, 80.0 mS/cm, 111.8 mS/cm)
	NaCl	one point only in % range (with HI 7037 standard); use conductivity calibration for all other ranges
	Temperature	one or two points
Temperature Compensation		-20.0 to 120.0°C
Reference Temperature		15°C, 20°C and 25°C
Temperature Coefficient		0.00 to 10.00 %/°C
TDS Factor		0.40 to 1.00
Probe		HI 76313 platinum, four ring conductivity/TDS probe with internal temperature sensor, DIN connector and 4 m (13.1') cable (included)
Logging	Log On Demand	400 samples
	Lot Logging	5, 10, 30 sec, 1, 2, 5, 10, 15, 30, 60, 120, 180 min (max 1000 samples)
Memorized Profiles		up to 10
Measurement Modes		autorange, autoend, LOCK and fixed range
PC Connectivity		opto-isolated USB (with HI 92000 software)
Battery Type / Life		1.2V AA rechargeable batteries (4) / approximately 100 hours of continuous use (without backlight); user selectable auto-off: 5, 10, 30, 60 minutes or disabled
Environment		IP67
Dimensions		226.5 x 95 x 52 mm (8.9 x 3.75 x 2")
Weight		525 g

* The 0.001 µS/cm EC range and 0.1 MOhms Resistivity range are not available with the 4m cable probe.

ORDERING INFORMATION

HI 98188-01 (115V) and **HI 98188-02** (230V) are supplied with HI 76313 conductivity probe, 100 mL plastic beaker, HI 7031M 1413 mS/cm calibration solution (230 mL), HI 7035 111.8 mS/cm calibration solution, rechargeable batteries, 12 VDC adapter/charger, instructions and rugged carrying case.
HI 98188/10M (230V) is supplied with everything above but includes a HI 76313 probe with 10 m (32.8') cable in place of the standard cable length.

PROBES

HI 76313	Platinum, four ring conductivity/TDS probe with internal temperature sensor, DIN connector and 4 m (13.1') cable

SOLUTIONS

HI 7030L	12880 µS/cm calibration solution, 500 mL
HI 7031L	1413 µS/cm calibration solution, 500 mL
HI 7033L	84 µS/cm calibration solution, 500 mL
HI 7034L	80000 µS/cm calibration solution, 500 mL
HI 7035L	111800 µS/cm calibration solution, 500 mL
HI 7039L	5000 µS/cm calibration solution, 500 mL
HI 7035L	111800 µS/cm calibration solution, 500 mL
HI 70442L	1500 mg/L (ppm) calibration solution, 500 mL
HI 7036L	12.41 g/L (ppt) calibration solution, 500 mL
HI 7037L	Salinity solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL

ACCESSORIES

HI 92000	Windows® compatible software
HI 920013	USB cable for PC connection

For a complete list of Solutions, see the end of this section.

HI 9835 • HI 98360

EC/TDS/NaCl/°C Meters

- **Autoranging, manual ranging and range lock**
- **Four ring probe design**
- **Automatic, manual and no Temperature Compensation**
- **Auto endpoint**
  Automatically freezes stable readings on the LCD display
- **GLP features**
- **BEPS**
  (Battery Error Prevention System) alerts the user in the event that low battery power could adversely affect readings
- **On-screen user guides**
- **Backlit display**
- **Logging of up to 500 records**
  (HI 98360)
- **% Battery displayed on startup**
- **USB port for PC compatibility**
  (HI 98360)

HI 9835 and HI 98360 are handheld conductivity/TDS/salinity/temperature meters. Users are provided with a series of diagnostic features and messages on the LCD which guide the user through calibration, operation and troubleshooting.

Conductivity and TDS measurement parameters are selectable such as: cell constant range from 0.500 to 1.700, temperature coefficient from 0.00 to 6.00%/°C, temperature reference from 20 to 25°C and a selectable TDS factor of 0.40 to 0.80.

Both instruments utilize the four ring HI 76309/1.5 conductivity probe with internal temperature sensor. The four ring design offers accurate readings over all the conductivity range with immunity to polarization and falling that occurs on long term use of amperometric probes.

The autoranging feature of the EC and TDS modes automatically sets the meter to the scale with the highest possible resolution. The auto endpoint feature automatically freezes the display once a stable reading is reached.

The HI 98360 includes all of the features of the HI 9835 while adding data logging (up to 500 records) and a USB port for data transfer to a computer.

HI 76309/1.5 Conductivity Probe

The HI 76309/1.5 conductivity and temperature probe features a PVC body with a stainless steel four ring design. This design offers accurate readings over all the conductivity range.

- **Four ring design**
  Immune to polarization and fouling for longer periods of time
- **Extended cable**
  This probe features a 1.5 m (4.9') cable

SPECIFICATIONS		HI 9835	HI 98360
Range	EC	0.00 to 29.99 µS/cm; 30.0 to 299.9 µS/cm; 300 to 2999 µS/cm; 3.00 to 29.99 mS/cm; 30.0 to 200.0 mS/cm; up to 500.0 mS/cm (actual EC)*	
	TDS	0.00 to 14.99 mg/L (ppm); 15.0 to 149.9 mg/L (ppm); 150 to 1499 mg/L (ppm); 1.50 to 14.99 g/L (ppt); 15.0 to 100.0 g/L (ppt); up to 400.0 g/L (ppt) (actual TDS)* with 0.80 conversion factor	
	NaCl	0.0 to 400.0%	
	Temperature	-20.0 to 120.0 °C (-4.0 to 248.0°F)**	
Resolution	EC	0.01 µS/cm; 0.1 µS/cm; 1 µS/cm; 0.01 mS/cm; 0.1 mS/cm	
	TDS	0.01 mg/L (ppm); 0.1 mg/L (ppm); 1 mg/L (ppm); 0.01 g/L (ppt); 0.1 g/L (ppt)	
	NaCl	0.1%	
	Temperature	0.1°C	
Accuracy	EC	±1 % of reading (±0.05 µS/cm or 1 digit)	±0.5% of reading
	TDS	±1 % of reading (±0.03 mg/L (ppm) or 1 digit, whichever greater)	±0.5% of reading
	NaCl	±1% of reading	±0.5% of reading
	Temperature	±0.2°C (excluding probe error)	
Calibration	EC	automatic, one point with six memorized values (84, 1413, 5000, 12880, 80000, 111800 µS/cm)	
	NaCl	one point with HI 7037 calibration solution	
	Temperature	two point, at 0 and 50°C (32 and 122°F)	
Temperature Compensation		automatic or manual from -20.0 to 120.0 °C (-4.0 to 248.0°F) (can be disabled for measuring conductivity)	
Temperature Coefficient		selectable from 0.00 to 6.00%/°C (EC and TDS only); default value is 1.90%/°C	
Reference Temperature		20°C or 25°C	
TDS Conversion Factor		selectable from 0.40 to 0.80 (default value is 0.50)	
Data Logging		–	log on demand, up to 500 samples
PC Interface		–	opto-isolated USB
Probe (included)		HI 76309 four ring conductivity probe with internal temperature sensor, DIN connector and 1 m (3.3') cable	HI 76309/1.5 four ring conductivity probe with internal temperature sensor, DIN connector and 1.5 m (4.9') cable
Battery Type / Life		1.5V AAA batteries (3) /approximately 200 hours of continuous use without backlight (50 hours with backlight on); auto-off after 5, 10, 20 and 60 minutes (can be disabled)	
Environment		0 to 50°C (32 to 122°F); RH max 95%	
Dimensions		185 x 72 x 36 mm (7.3 x 2.8 x 1.4")	
Weight		300 g (10.6 oz)	

* with temperature compensation function disabled ** using the proper probe

ORDERING INFORMATION

HI 9835 is supplied with HI 76309 conductivity probe, batteries, instructions and rugged carrying case.
HI 98360 is supplied with HI 76309/1.5 conductivity probe, batteries, instructions and rugged carrying case.

PROBES

HI 76309	Four ring conductivity probe with internal temperature sensor, DIN connector and 1 m (3.3') cable
HI 76309/1.5	Four ring conductivity probe with internal temperature sensor, DIN connector and 1.5 m (4.9') cable
HI 76309/10	Four ring conductivity probe with internal temperature sensor, DIN connector and 10 m (32.8') cable
HI 76309/20	Four ring conductivity probe with internal temperature sensor, DIN connector and 20 m (65.6') cable
HI 76309/50	Four ring conductivity probe with internal temperature sensor, DIN connector and 50 m (164') cable.

SOLUTIONS

HI 7030L	12880 µS/cm calibration solution, 500 mL
HI 7031L	1413 µS/cm calibration solution, 500 mL
HI 7033L	84 µS/cm calibration solution, 500 mL
HI 7034L	80000 µS/cm calibration solution, 500 mL
HI 7035L	111800 µS/cm calibration solution, 500 mL
HI 7039L	5000 µS/cm calibration solution, 500 mL
HI 7037L	100% NaCl seawater standard solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL

ACCESSORIES

HI 92000	Windows® compatible software
HI 920014	Mini USB connection cable

For a complete list of Solutions, see the end of this section.

HI 99300 • HI 99301

EC/TDS/Temperature Meters

- **Amperometric probe technology**
- **Automatic Temperature Compensation**
- **Automatic single calibration with calibration indicator**
- **On-screen tutorial messages for calibration and set-up**
- **HOLD**
- **BEPS**
  (Battery Error Prevention System) alerts the user in the event that low battery power could adversely affect readings
- **Battery % displayed on startup**.
- **Compact, heavy-duty and waterproof**

HI 99300 and HI 99301 are portable, EC/TDS/temperature meters. HI 99300 measures low range conductivity in µS/cm and TDS in ppm while the HI 99301 measures high range conductivity in mS/cm and TDS in ppt. Both instruments are housed in a case rated for IP67 conditions.

These instruments offer single point, automatic calibration with automatically temperature compensated measurements. The compensation coefficient and EC/TDS conversion factor are user-selectable from 0.45 to 1.00 and temperature coefficient is selectable from 0.0 to 2.4%/°C.

These instruments easily fit in the palm of your hand and the bottom probe connection ensures the electrode cable doesn't get in your way. The large, multi-level LCD displays the primary reading, temperature and calibration guides simultaneously. Symbols and messages on the LCD indicate meter status and guides users through operations.

At start-up, the meter shows the remaining battery percentage and when a low battery condition is detected, a battery symbol appears on the LCD to advise the user that only a few hours of working time is left.

The HI 76306 EC/TDS/temperature probe resists clogging and is easy to clean.

HANNA instruments

With Great Products, Come Great Results™

Shown with HI 710023 protective boot (optional)

- **Protective rubber boot**
  The optional rubber boot helps protect your meter

HI 76306 EC/TDS Probe

The slim yet rugged EC/TDS probe features a built-in temperature sensor for simultaneous EC and temperature readings. The multi-level LCD of the HI 99300 and HI 99301 displays both of these readings at the same time.

SPECIFICATIONS		HI 99300	HI 99301
Range	EC	0 to 3999 µS/cm	0.00 to 20.00 mS/cm
	TDS	0 to 2000 ppm (mg/L)	0.00 to 10.00 ppt (g/L)
	Temperature	0.0 to 60.0°C/32.0 to 140.0°F	
Resolution	EC	1 µS/cm	0.01 mS/cm
	TDS	1 ppm (mg/L)	0.01 ppt (g/L)
	Temperature	0.1°C/0.1°F	
Accuracy (@20°C)	EC/TDS	±2% F.S.	
	Temperature	±0.5°C/±1°F	
Calibration		automatic, one point at 1413 µS/cm, 1382 ppm (CONV 0.5) or 1500 ppm (CONV 0.7)	automatic, one point at 12.88 mS/cm, 6.44 ppt (CONV 0.5) or 9.02 ppt (CONV 0.7)
Temperature Compensation	EC/TDS	automatic, 0 to 60°C (32 to 140°F) with β adjustable from 0.0 to 2.4%/°C with 0.1% step	
EC/TDS Factor		adjustable from 0.45 to 1.00 with 0.01 step (default 0.50)	
Probe		HI 76306 EC/TDS probe with internal temperature sensor, DIN connector and 1 m (3.3') cable (included)	
Battery Type / Life		1.5V AAA (3) / approximately 500 hours of continuous use. auto-off after eight minutes of non-use	
Environment		0 to 50°C (32 to 122°F); RH max. 100%	
Dimensions		152 x 58 x 30 mm (6.0 x 2.3 x 1.2")	
Weight		205g (7.2 oz.)	

ORDERING INFORMATION

HI 99300 and **HI 99301** are supplied with HI 76306 EC/TDS probe, batteries, instructions and rugged carrying case.

PROBES

HI 76306	EC/TDS probe with internal temperature sensor, DIN connector and 1 m (3.3') cable

SOLUTIONS

HI 7030M	12.88 mS/cm solution, 230 mL
HI 7031M	1413 µS/cm solution, 230 mL
HI 7032M	1382 ppm solution, 230 mL
HI 70442M	1500 ppm solution, 230 mL
HI 70038P	6.44 ppt solution, 20 mL (25)

ACCESSORIES

HI 710023	Orange protective rubber boot
HI 710024	Blue protective rubber boot

For a complete list of Solutions, see the end of this section.

HI 993310

Direct Soil Activity and Solution Conductivity Measurement Kit

- **Supplied with two probes**
- **Automatic Temperature Compensation**
- **BEPS**

  (Battery Error Prevention System) alerts the user in the event that low battery power could adversely affect readings

HI 993310 is an instrument that has been designed to address the need for fast and accurate conductivity measurements in soil and liquids. It is supplied with two probes: HI 76305 with stainless steel, conical tip for direct soil measurement and HI 76304 for fertilizer enriched solutions.

HI 993310 measures the soil conductivity in EC (mS/cm) as well as salt activity (g/L). The different scales can be selected through two keys on the front panel and two separate LEDs indicate which parameter is being tested. In addition, HI 993310 is equipped with an alarm LED that illuminates if the soil is too dry or nutritive substances such as potassium or nitrogen are lacking. Demineralized water can be added to the soil prior to proceeding with further tests.

Direct soil measurement is facilitated by the stainless steel HI 76305 probe. Once inserted into the ground, the user simply waits until the meter displays the value read by the auger-like probe.

ORDERING INFORMATION

HI 993310 is supplied with HI 76304 conductivity probe, HI 76305 direct soil conductivity probe, battery, instructions and rugged carrying case.

PROBES

HI 76305	Stainless steel conductivity probe with internal temperature sensor, DIN connector and 1 m (3.3') cable for direct soil measurement
HI 76304	Conductivity probe with internal temperature sensor, DIN connector and 1 m (3.3') cable for measurement in soil slurry sample

SOLUTIONS

HI 7030L	12880 µS/cm calibration solution, 500 mL
HI 7031L	1413 µS/cm calibration solution, 500 mL
HI 7051M	Soil preparation solution, 230 mL

ACCESSORIES

HI 721319	Ground auger
HI 710009	Shockproof rubber boot, blue
HI 710010	Shockproof rubber boot, orange
HI 721313	Rugged carrying case

Why this meter is so important...

Conductivity is an important factor in greenhouses and hydroponics and is measured in soil as well as in fertilizer solutions since it is an excellent indication for the presence of nutritive salts. Soil conductivity is checked before and after fertilization to establish its effectiveness as well as ensuring that the soil is not too saline or damaging to the plant roots.

Conductivity of the irrigation water and fertilizer mixes is checked to make sure values are within an acceptable range and a correct fertilizer concentration strength is being applied.

SPECIFICATIONS		HI 993310
Range	**EC**	0.00 to 19.99 mS/cm
	Salt Activity	0.00 to 1.00 g/L
Resolution	**EC**	0.01 mS/cm
	Salt Activity	0.01 g/L
Accuracy (@20°C/68°F)		±2% F.S. (0 to 15.00 mS/cm; excluding probe error)
Calibration		manual, one point
Temperature Compensation		automatic, 0 to 50°C (32 to 122°F), β=2%/°C
Probes		HI 76305 stainless steel conductivity probe with internal temperature sensor, DIN connector and 1 m (3.3') cable for direct soil measurement (included); HI 76304 conductivity probe with internal temperature sensor, DIN connector and 1 m (3.3') cable for measurement in soil slurry sample (included)
Battery Type / Life		9V / approximately 100 hours of continuous use
Environment		0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions		185 x 82 x 52 mm (7.3 x 3.2 x 2.0")
Weight		275 g (9.7 oz.)

For a complete list of Solutions, see the end of this section.

Multi-range EC and TDS Meters

- **Multiple conductivity ranges**
- **Automatic Temperature Compensation**
- **BEPS** (Battery Error Prevention System)

The HI 9033 is a rugged meter designed to hold up under extended use in wet, humid, dusty and muddy conditions. This meter has the advantage of measuring samples from deionized water to brine without having to switch or recalibrate the probe.

HI 9034 measures total dissolved solids (TDS) in three ranges and offers the highest accuracy when performing measurements in applications as diverse as HVAC, wastewater treatment and reverse osmosis. All three ranges can be activated at the touch of a button without having to change the conductivity probe.

Both instruments perform measurements with Automatic Temperature Compensation which adjusts for the effects of temperature on the probe. These instruments also feature HANNA's BEPS (Battery Error Prevention System) technology that alerts the user when low batteries could affect the readings.

SPECIFICATIONS	HI 9033	HI 9034
Range	0.0 to 199.9 µS/cm; 0 to 1999 µS/cm; 0.00 to 19.99 mS/cm; 0.0 to 199.9 mS/cm	0.0 to 199.9 mg/L; 0 to 1999 mg/L; 0.00 to 19.99 g/L
Resolution	0.1 µS/cm; 1 µS/cm; 0.01 mS/cm; 0.1 mS/cm	0.1 mg/L; 1 mg/L; 0.01 g/L
Accuracy (@20°C/68°F)	±1% F.S. (excluding probe error)	
Calibration	manual, one point	
TDS Factor	–	0.5
Temperature Compensation	automatic, 10 to 50°C (50 to 122°F) with β = 2%/°C	
Probe	HI 76302W conductivity probe with internal temperature sensor, DIN connector and 1 m (3.3') cable (included)	
Battery Type / Life	9V / approximately 100 hours of continuous use	
Environment	0 to 50°C (32 to 122°F); RH max 100%	
Dimensions	185 x 72 x 36 mm (7.3 x 2.8 x 1.4")	
Weight	425 g (0.9 lbs.)	

ORDERING INFORMATION

HI 9033 and **HI 9034** are supplied with HI 76302W conductivity probe, battery, instructions and rugged carrying case.

PROBES

HI 76302W Four ring conductivity probe with internal temperature sensor, DIN connector and 1 m (3.3') cable

HI 76302W/5 Four ring conductivity probe with internal temperature sensor, DIN connector and 5 m (16.4') cable

SOLUTIONS

HI 7030L 12880 µS/cm calibration solution, 500 mL
HI 7031L 1413 µS/cm calibration solution, 500 mL
HI 7033L 84 µS/cm calibration solution, 500 mL
HI 7034L 80000 µS/cm calibration solution, 500 mL
HI 7035L 111800 µS/cm calibration solution, 500 mL
HI 7032L 1382 mg/L (ppm) calibration solution, 500 mL
HI 7036L 12.41 g/L (ppt) calibration solution, 500 mL
HI 7061L Electrode cleaning solution, 500 mL

ACCESSORIES

HI 721317 Rugged carrying case

For a complete list of Solutions, see the end of this section.

HI 8633 • HI 8733

Multi-range EC Meters

- **Four ring potentiometric probe**
- **On-screen operation guide**
- **Multiple scales cover a wide range**
- **Automatic Temperature Compensation** (HI 8733)

HI 8633 and HI 8733 conductivity meters have been designed for use in areas of production and quality control.

These meters utilize four ring potentiometric probes that offer greater versatility over typical amperometric designs. These rugged probes are made of PVC–ideal for indoor, as well as outdoor measurements.

HI 8733's conductivity measurements can be automatically temperature compensated by using the HI 76302W probe with built-in temperature sensor.

Temperature compensation for HI 8633 is performed by manual adjustment.

ORDERING INFORMATION

HI 8633 is supplied with HI 76301D conductivity probe, 12880 µS/cm HI 70030 calibration solution sachets (5), calibration screwdriver, battery, instructions and rugged carrying case.
HI 8733 is supplied with HI 76302W conductivity probe, 12880 µS/cm HI 70030 calibration solution sachets (5), battery, instructions and rugged carrying case.

PROBES

HI 76301D	Four ring conductivity probe with DIN connector and 1 m (3.3') cable for HI 8633
HI 76302W	Four ring conductivity probe with internal temperature sensor, DIN connector and 1 m (3.3') cable for HI 8733
HI 76302W/5	Four ring conductivity probe with internal temperature sensor, DIN connector and 5 m (16.4') cable for HI 8733

SOLUTIONS

HI 7030L	12880 µS/cm calibration solution, 500 mL
HI 7031L	1413 µS/cm calibration solution, 500 mL
HI 7033L	84 µS/cm calibration solution, 500 mL
HI 7034L	80000 µS/cm calibration solution, 500 mL
HI 7035L	111800 µS/cm calibration solution, 500 mL

ACCESSORIES

HI 710007	Shockproof rubber boot, blue
HI 710008	Shockproof rubber boot, orange
HI 721313	Rugged carrying case

SPECIFICATIONS	HI 8633	HI 8733
Range	0.0 to 199.9 µS/cm; 0 to 1999 µS/cm 0.00 to 19.99 mS/cm; 0.0 to 199.9 mS/cm	
Resolution	0.1 µS/cm; 1 µS/cm 0.01 mS/cm; 0.1 mS/cm	
Accuracy (@20°C/68°F)	±1% f.s. (excluding probe error)	
Calibration	manual, one point through EC knob	
Temperature Compensation	manual, 0 to 50°C (32 to 122°F) with β = 2%/°C	automatic, 0 to 50°C (32 to 122°F) with β adjustable from 0 to 2.5%/°C
Probe	HI 76301D four ring conductivity probe with DIN connector and 1 m (3.3') cable (included)	HI 76302W four ring conductivity probe with internal temperature sensor, DIN connector and 1 m (3.3') cable (included)
Battery Type / Life	9V / approximately 100 hours of continuous use	
Environment	0 to 50°C (32 to 122°F); RH max 100%	
Dimensions	145 x 80 x 36 mm (5.7 x 3.1 x 1.4")	
Weight	230 g (8.1 oz.)	

For a complete list of Solutions, see the end of this section.

HI 87314

EC and Resistivity Meter

- **Supplied with two probes**
- **Automatic probe recognition**
- **On-screen operation guide**
- **Automatic Temperature Compensation**

HI 87314 is a combination, portable meter that can read conductivity in four different ranges and resistivity.

For conductivity measurements, a one-point calibration is performed via a trimmer located in the battery compartment. The supplied probe does not require recalibration when switching from one range to another. The four-ring (stainless steel) probe has a built-in temperature sensor that automatically compensates for temperature changes. The temperature coefficient can be adjusted from 0 to 2.5% using a knob on the front panel.

For resistivity measurements, the meter is factory calibrated and, if necessary, calibration can be adjusted. The HI 3316D resistivity probe is easy to clean and requires little maintenance. It also features a built-in temperature sensor to automatically compensate for temperature variations. The temperature coefficient is user-selectable from 2 to 7%.

SPECIFICATIONS		HI 87314
Range	EC	199.9 µS/cm; 1999 µS/cm; 19.99 mS/cm; 199.9 mS/cm
	Resistivity	0 to 19.90 MΩ•cm
Resolution	EC	0.1 µS/cm; 1 µS/cm; 0.01 mS/cm; 0.1 mS/cm
	Resistivity	0.10 MΩ•cm
Accuracy (@20°C)	EC	±1% FS
	Resistivity	±2% FS
Calibration		manual, one point, for both EC and resistivity
Temperature Compensation		automatic from 0 to 50°C with β selectable from 0 to 2.5%/°C for EC and from 2 to 7%/°C for resistivity
Probes		HI 76302W conductivity probe with internal temperature sensor, DIN connector and 1 m (3.3') cable; HI 3316D resistivity probe with internal temperature sensor, DIN connector and 1 m (3.3') cable
Battery Type / Life		9V / approximately 100 hours of use
Environment		0 to 50°C (32 to 122°F); RH max 100%
Dimensions		145 x 80 x 36 mm (5.7 x 3.1 x 1.4")
Weight		230 g (8.1 oz.)

ORDERING INFORMATION

HI 87314 is supplied with HI 76302W conductivity probe, HI 3316D resistivity probe, HI 70030 calibration solution sachet, calibration screwdriver, battery, instructions and hard carrying case.

PROBES

HI 76302W	Four ring conductivity probe with internal temperature sensor, DIN connector and 1 m (3.3') cable
HI 76302W/5	Four ring conductivity probe with internal temperature sensor, DIN connector and 5 m (16.4') cable
HI 3316D	Resistivity probe with internal temperature sensor, DIN connector and 1 m (3.3') cable

SOLUTIONS

HI 7030L	12880 µS/cm calibration solution, 500 mL
HI 7031L	1413 µS/cm calibration solution, 500 mL
HI 7033L	84 µS/cm calibration solution, 500 mL
HI 7034L	80000 µS/cm calibration solution, 500 mL
HI 7035L	111800 µS/cm calibration solution, 500 mL
HI 7039L	5000 µS/cm calibration solution, 500 mL
HI 7061L	Cleaning solution, 500 mL

ACCESSORIES

HI 76405	Electrode holder

For a complete list of Solutions, see the end of this section.

HI 8730 • HI 8731 • HI 8732

EC, TDS and Temperature Meters

- **Watertight**
- **On-screen operation guide**
- **Automatic Temperature Compensation**

These EC/TDS meters are lightweight, water-tight and easy to maintain. Each desired measurement mode features its own key for quick selection.

HI 8730 measures EC in the 0 to 1990 µS/cm range and TDS from 0 to 1990 ppm.

HI 8731 measures EC and TDS with extended ranges (from 0 to 6000 µS/cm and from 0 to 3000 ppm, respectively).

HI 8732 measures EC in the 0 to 4 mS/cm range, TDS from 0 to 1999 ppm with adjustable TDS factor

The HI 761285 probe features a built-in temperature sensor and has been designed to require little maintenance.

ORDERING INFORMATION

HI 8730 is supplied with HI 761285 conductivity probe, HI 70031 1413 µS/cm calibration solution sachet, HI 70032 1382 mg/L (ppm) calibration solution sachet, battery, instructions and rugged carrying case.
HI 8731 is supplied with HI 761285 conductivity probe, HI 70032 1382 mg/L (ppm) calibration solution sachet, HI 70039 5000 µS/cm calibration solution sachet, battery, instructions and rugged carrying case.
HI 8732 is supplied with HI 761285 conductivity probe, HI 70031 1413 µS/cm calibration solution sachet, HI 70442 1500 mg/L (ppm) calibration solution sachet, battery, instructions and rugged carrying case.

PROBES

HI 761285 Conductivity probe with internal temperature sensor, DIN connector and 1 m (3.3') cable

SOLUTIONS

HI 70031P 1413 µS/cm calibration solution, 20 mL sachet (25)
HI 7031M 1413 µS/cm cal. solution, 230 mL
HI 7031L 1413 µS/cm cal. solution, 500 mL
HI 70032P 1382 mg/L (ppm) calibration solution, 20 mL sachet (25)
HI 7032M 1382 mg/L (ppm) cal. solution, 230 mL
HI 7032L 1382 mg/L (ppm) cal. solution, 500 mL
HI 70039P 5000 µS/cm calibration solution, 20 mL sachet (25)
HI 7039M 5000 µS/cm cal. solution, 230 mL
HI 7039L 5000 µS/cm cal. solution, 500 mL
HI 70442P 1500 mg/L (ppm) calibration solution, 20 mL sachet (25)
HI 70442M 1500 mg/L (ppm) cal. solution, 230 mL
HI 70442L 1500 mg/L (ppm) solution, 500 mL

SPECIFICATIONS		HI 8730	HI 8731	HI 8732
Range	EC	0 to 1990 µS/cm	0 to 6000 µS/cm	0.00 to 4.00 mS/cm
	TDS	0 to 1990 mg/L (ppm)	0 to 3000 mg/L (ppm)	0 to 1999 mg/L (ppm)
	Temperature	0 to 70°C	0.0 to 70.0°C	
Resolution	EC	10 µS/cm		0.01 mS/cm
	TDS	10 mg/L (ppm)		1 mg/L (ppm)
	Temperature	1°C	0.1°C	
Accuracy (@20°C)	EC/TDS	±2% F.S.		
	Temperature	±1 °C	±0.5 °C	
Calibration		EC/TDS: manual one point through knob; temperature: factory calibrated		
TDS Factor		0.5		variable, 0.56 to 0.72 (according to TDS 442 curve)
Probe		HI 761285 conductivity probe with internal temperature sensor, DIN connector and 1 m (3.3') cable (included)		
Temperature Compensation		automatic, 0 to 50°C (32 to 122 °F) with β=2%/°C		
Environment		0 to 50°C (32 to 122°F); RH max 100%		
Battery Type / Life		1.9V / approximately 200 hours of continuous use		
Dimensions		145 x 80 x 36 mm (5.7 x 3.1 x 1.4")		
Weight		230 g (8.1 oz.)		

For a complete list of Solutions, see the end of this section.

HI 86301 • HI 86302 • HI 86303 • HI 86304

TDS and EC Meters

- **On-screen tutorial messages for EC/TDS calibration**
- **Automatic Temperature Compensation**
- **BEPS**
  Battery Error Prevention System turns the meter off in the event that low battery power could adversely affect readings

These meters have been designed for simplicity of use while still retaining measurement accuracy. Readings are automatically compensated for temperature variations and calibration is manually performed at one point through a knob.

The housings of these instruments have been completely sealed against humidity for use in harsh environments. The probe is easy to clean and requires little maintenance.

SPECIFICATIONS	HI 86301	HI 86302	HI 86303	HI 86304
Range	0 to 1999 mg/L (ppm)	0.00 to 10.00 g/L (ppt)	0 to 1999 µS/cm	0.00 to 19.99 mS/cm
Resolution	1 mg/L (ppm)	0.01 g/L (ppt)	1 µS/cm	0.01 mS/cm
Accuracy (@20°C/68°F)	±2% f. s.			±2% f. s. (up to 15.00 mS/cm calibrated in 12.88 mS solution), ±6% f. s. over
Calibration	manual, one point, through knob			
Calibration Solution	HI 70032	HI 70032	HI 70031	HI 70039
Temperature Compensation	automatic, 5 to 50°C (41 to 122°F) with β=2%/°C			
Probe	HI 7634D/1	HI 7632D/1	HI 7634D/1	HI 7632D/1
Battery Type / Life	9V alkaline / approx. 200 hours	9V alkaline / approx. 150 hours	9V alkaline / approx. 200 hours	9V alkaline / approx. 150 hours
Environment	0 to 50°C (32 to 122°F); RH max 100%			
Dimensions	145 x 80 x 36 mm (5.7 x 3.1 x 1.4")			
Weight	230 g (8.1 oz.)			

ORDERING INFORMATION

HI 86301 is supplied with HI 7634D/1 conductivity probe, HI 70032 1382 mg/L (ppm) calibration solution sachet, battery, instructions and rugged carrying case.
HI 86302 is supplied with HI 7632D/1 conductivity probe, HI 70032 1382 mg/L (ppm) calibration solution sachet, battery, instructions and rugged carrying case.
HI 86303 is supplied with HI 7634D/1 conductivity probe, HI 70031 1413 µS/cm calibration solution sachet, battery, instructions and hard carrying case.
HI 86304 is supplied with HI 7632D/1 conductivity probe, HI 70039 5000 µS/cm calibration solution sachet, battery, instructions and rugged carrying case.

PROBES

HI 7632D/1	Conductivity probe, HR, with internal temperature sensor, DIN connector and 1 m (3.3') cable
HI 7634D/1	Conductivity probe, LR, with internal temperature sensor, DIN connector and 1 m (3.3') cable

SOLUTIONS

HI 70031P	1413 µS/cm calibration solution, 20 mL sachet (25)
HI 7031M	1413 µS/cm calibration solution, 230 mL
HI 70032P	1382 mg/L (ppm) calibration solution, 20 mL sachet (25)
HI 7032M	1382 mg/L (ppm) calibration solution, 230 mL
HI 7032L	1382 mg/L (ppm) calibration solution, 500 mL
HI 70039P	5000 µS/cm calibration solution, 20 mL sachet (25)
HI 7039M	5000 µS/cm calibration solution, 230 mL
HI 7039L	5000 µS/cm calibration solution, 500 mL

For a complete list of Solutions, see the end of this section.

HI 8734

TDS Meter

- **Three measurement ranges**
- **Rugged probe for field use**
- **Waterproof**

HI 8734 has not only been specifically designed for the water conditioning industry, but particularly in the softening, demineralization, reverse osmosis and drinking water applications.

Three ranges of measurement ensure the highest accuracy possible. All three ranges can be executed at the touch of a button, without having to change the conductivity probe. This makes it very easy to switch applications without having to worry about recalibration.

To enhance accuracy and efficiency, MTC (Manual Temperature Compensation) is available using a knob on the front panel.

For the best protection in the field, the four ring potentiometric probe is made of rugged PVC. To access difficult areas, the probe is supplied with a 1 m (3.3') cable.

The ratio between conductivity and TDS is factory set at 0.5.

ORDERING INFORMATION

HI 8734 is supplied with HI 76301D conductivity probe, HI 70032 1382 mg/L (ppm) calibration solution sachet, battery, instructions and rugged carrying case.

PROBES

HI 76301D	Four ring conductivity probe with DIN connector and 1 m (3.3') cable

SOLUTIONS

HI 7032L	1382 mg/L (ppm) calibration solution, 500 mL
HI 7036L	12.41 g/L (ppt) calibration solution, 500 mL

ACCESSORIES

HI 710007	Shockproof rubber boot, blue
HI 710008	Shockproof rubber boot, orange
HI 710022	Spare protective case

SPECIFICATIONS	HI 8734
Range	0.0 to 199.9 mg/L (ppm); 0 to 1999 mg/L (ppm); 0.00 to 19.99 g/L (ppt)
Resolution	0.1 mg/L (ppm); 1 mg/L (ppm); 0.01 g/L (ppt)
Accuracy (@20°C/68°F)	±1% F.S. (excluding probe error)
Calibration	manual, one point through TDS knob
Temperature Compensation	manual, 0 to 50°C (32 to 122°F) with β = 2%/°C
TDS Factor	0.5
Probe	HI 76301D four ring conductivity probe with DIN connector and 1 m (3.3') cable (included)
Battery Type / Life	9V / approximately 100 hours of continuous use
Environment	0 to 50°C (32 to 122°F); RH max 100%
Dimensions	145 x 80 x 36 mm (5.7 x 3.1 x 1.4")
Weight	230 g (8.1 oz.)

For a complete list of Solutions, see the end of this section.

µS/mS/TDS Meter

- **Potentiometric technology**
- **Three conductivity ranges and one TDS**
- **Accurate and reliable**
- **Easy to clean probe**

HI 8033 is a handheld conductivity meter with the ability to take measurements in three different ranges.

The included HI 76301W probe utilizes the four-ring potentiometric method which measures conductivity with the utmost accuracy and reliability.

The four stainless steel rings are embedded in the resin shaft of the probe to create a smooth surface for fast and easy cleaning.

To improve accuracy in measurements, temperature compensation can be achieved with a knob on the front panel of the meter.

The dial on the front of the HI 8033 easily indicates which range you are working in.

HI 710010
Shockproof Boot

HI 710001 Soft Carrying Case

ORDERING INFORMATION

HI 8033 is supplied with HI 76301W conductivity probe, calibration screwdriver, battery and instructions.

PROBES

HI 76301W	Four ring conductivity probe with 1 m (3.3') cable

SOLUTIONS

HI 7030L	12880 µS/cm calibration solution, 500 mL
HI 7031L	1413 µS/cm calibration solution, 500 mL
HI 7032L	1382 mg/L (ppm) calibration solution, 500 mL
HI 7033L	84 µS/cm calibration solution, 500 mL
HI 7039L	5000 µS/cm calibration solution, 500 mL

ACCESSORIES

HI 710009	Shockproof rubber boot
HI 710010	Shockproof rubber boot
HI 710001	Soft carrying case
HI 721313	Rugged carrying case

SPECIFICATIONS		HI 8033
Range	**EC**	0.0 to 199.9 µS/cm; 0 to 1999 µS/cm; 0.00 to 19.99 mS/cm
	TDS	0 to 19990 mg/L (ppm)
Resolution	**EC**	0.1 µS/cm; 1 µS/cm; 0.01 mS/cm
	TDS	10 mg/L (ppm)
Accuracy (@20°C/68°F)		±1% F.S. (excluding probe error)
Calibration		manual, one point
Temperature Compensation		manual, 0 to 50°C (32 to 122°F) with β=2%/°C
Probe		HI 76301W conductivity probe with 1 m (3.3') cable (included)
Battery Type / Life		9V / approximately 100 hours of continuous use
Environment		0 to 50°C (32 to 122°F); RH max 95%
Dimensions		185 x 82 x 47 mm (7.3 x 3.2 x 1.9")
Weight		270 g (9.5 oz.)

For a complete list of Solutions, see the end of this section.

Quality Solutions for Laboratory Applications

Conductivity Calibration Solutions

BOTTLES					
CODE	EC VALUE @25°C	SIZE	PACKAGE	FDA BOTTLE	CERTIFICATE OF ANALYSIS
HI 6031	1413 µS/cm	500 mL	1 bottle		•
HI 6033	84 µS/cm	500 mL	1 bottle		•
HI 7030L	12880 µS/cm	500 mL	1 bottle		on request
HI 7030M	12880 µS/cm	230 mL	1 bottle		on request
HI 7030/1G	12880 µS/cm	1 gallon (3.78 L)	1 bottle		on request
HI 7031L	1413 µS/cm	500 mL	1 bottle		on request
HI 7031L/C	1413 µS/cm	500 mL	1 bottle		•
HI 7031M	1413 µS/cm	230 mL	1 bottle		on request
HI 7031/1G	1413 µS/cm	1 gallon (3.78 L)	1 bottle		on request
HI 7033L	84 µS/cm	500 mL	1 bottle		on request
HI 7033M	84 µS/cm	230 mL	1 bottle		on request
HI 7034L	80000 µS/cm	500 mL	1 bottle		on request
HI 7034M	80000 µS/cm	230 mL	1 bottle		on request
HI 7035L	111800 µS/cm	500 mL	1 bottle		on request
HI 7035M	111800 µS/cm	230 mL	1 bottle		on request
HI 7039L	5000 µS/cm	500 mL	1 bottle		on request
HI 7039M	5000 µS/cm	230 mL	1 bottle		on request
HI 8030L	12880 µS/cm	500 mL	1 bottle	•	•
HI 8031L	1413 µS/cm	500 mL	1 bottle	•	•
HI 8033L	84 µS/cm	500 mL	1 bottle	•	•
HI 8034L	80000 µS/cm	500 mL	1 bottle	•	•
HI 8035L	111800 µS/cm	500 mL	1 bottle	•	•
HI 8039L	5000 µS/cm	500 mL	1 bottle	•	•

SACHETS				
CODE	EC VALUE @25°C	SIZE	PACKAGE	CERTIFICATE OF ANALYSIS
HI 70030C	12880 µS/cm	20 mL	25 sachets	•
HI 70030P	12880 µS/cm	20 mL	25 sachets	
HI 70031C	1413 µS/cm	20 mL	25 sachets	•
HI 70031P	1413 µS/cm	20 mL	25 sachets	
HI 70031P/5	1413 µS/cm	20 mL	500 sachets	
HI 70033C	84 µS/cm	20 mL	25 sachets	•
HI 70033P	84 µS/cm	20 mL	25 sachets	
HI 70039C	5000 µS/cm	20 mL	25 sachets	•
HI 70039P	5000 µS/cm	20 mL	25 sachets	
HI 77100C	1413 µS/cm and pH 7.01	20 mL	20 sachets (10 ea)	•
HI 77100P	1413 µS/cm and pH 7.01	20 mL	20 sachets (10 ea)	

Solutions for All Your Needs

Proper calibration of the instrument/sensor measuring system will ensure your results are accurate and repeatable.

The use of standard calibration solutions is fundamental for correctly calibrating the measuring system.

The HANNA range of conductivity calibration solutions has been produced to ensure the maximum accuracy for conductivity meters and probes.

Guaranteed Quality

HANNA conductivity meters can be calibrated in a few minutes right in the laboratory or field.

HANNA offers a range of six conductivity solutions in different forms and values.

Each label shows the production batch number, expiration date and conductivity /temperature correlation table.

Certified Solutions

For those users that require documented accuracy, conductivity (EC) solutions are available in bottles or sachets with certificates of analysis.

FDA Compliant Bottles

HANNA solutions are offered in opaque, light-tight bottles that meet FDA requirements.

High Accuracy Solutions

HI 60xx high accuracy solutions are also available and are supplied with a certificate of analysis.

Conductivity Calibration Solutions

84 µS/cm Calibration Solution

This 84 µS/cm conductivity solution makes it possible to calibrate instruments with a conductivity scale of up to 200 µS/cm, for example, in the measurement of pure or distilled water.

By using our single-dose 20 mL sachets, solution freshness is guaranteed for every calibration.

BOTTLES

CODE	EC VALUE @25°C	SIZE	PACKAGE	FDA BOTTLE	CERTIFICATE OF ANALYSIS
HI 6033	84 µS/cm	500 mL	1 bottle		•
HI 7033L	84 µS/cm	500 mL	1 bottle		on request
HI 7033M	84 µS/cm	230 mL	1 bottle		on request
HI 8033L	84 µS/cm	500 mL	1 bottle	•	•

SACHETS

CODE	EC VALUE @25°C	SIZE	PACKAGE	CERTIFICATE OF ANALYSIS
HI 70033C	84 µS/cm	20 mL	25 sachets	•
HI 70033P	84 µS/cm	20 mL	25 sachets	

1413 µS/cm Calibration Solution

The 1413 µS/cm calibration solution is best suited for general use. This solution is also available in combined kits with HANNA pH 7 buffer for easy calibration of multiparameter instruments.

This solution is also available in different sized bottles and in single dose, ready to use sachets.

The HI 8031L solution is provided in an opaque bottle according to FDA (Food & Drug Administration) regulations, which prevents the reagent from damage due to extended exposure to light.

Our wide range of calibration solutions also includes solutions provided with a certificate of analysis, to satisfy the requirements of any application from the farm to the factory.

BOTTLES

CODE	EC VALUE @25°C	SIZE	PACKAGE	FDA BOTTLE	CERTIFICATE OF ANALYSIS
HI 6031	1413 µS/cm	500 mL	1 bottle		•
HI 7031/1G	1413 µS/cm	1 gallon (3.78 L)	1 bottle		on request
HI 7031L	1413 µS/cm	500 mL	1 bottle		on request
HI 7031L/C	1413 µS/cm	500 mL	1 bottle		•
HI 7031M	1413 µS/cm	250 mL	1 bottle		on request
HI 8031L	1413 µS/cm	500 mL	1 bottle	•	•

SACHETS

CODE	EC VALUE @25°C	SIZE	PACKAGE	CERTIFICATE OF ANALYSIS
HI 70031C	1413 µS/cm	20 mL	25 sachets	•
HI 70031P	1413 µS/cm	20 mL	25 sachets	
HI 77100C	1413 µS/cm & pH 7.01	20 mL	20 sachets (10 ea)	•
HI 77100P	1413 µS/cm & pH 7.01	20 mL	20 sachets (10 ea)	

Quality Solutions for Laboratory Applications

Conductivity Calibration Solutions

5000 µS/cm Calibration Solution

This calibration solution is ideal for those applications that need to achieve higher reading accuracies in a conductivity scale between 2000 µS/cm and 10000 µS/cm.

HANNA has produced a 5000 µS/cm calibration solution that is available in a wide range of sizes and packages to suit every application.

This solution is widely used in agriculture for monitoring and preparing nutrient solutions for proper crop production.

BOTTLES

CODE	EC VALUE @25°C	SIZE	PACKAGE	FDA BOTTLE	CERTIFICATE OF ANALYSIS
HI 7039L	5000 µS/cm	500 mL	1 bottle		on request
HI 7039M	5000 µS/cm	230 mL	1 bottle		on request
HI 8039L	5000 µS/cm	500 mL	1 bottle	•	•

SACHETS

CODE	EC VALUE @25°C	SIZE	PACKAGE	CERTIFICATE OF ANALYSIS
HI 70039C	5000 µS/cm	20 mL	25 sachets	•
HI 70039P	5000 µS/cm	20 mL	25 sachets	

12880 µS/cm Calibration Solution

12880 µS/cm (12.88 mS/cm) calibration solution is widely used to assure the proper performance of conductivity meters with a scale higher than 10 mS/cm.

This solution is used mainly for industrial applications and is available in various sizes to better meet user requirements.

BOTTLES

CODE	EC VALUE @25°C	SIZE	PACKAGE	FDA BOTTLE	CERTIFICATE OF ANALYSIS
HI 7030/1G	12880 µS/cm	1 gallon (3.78 L)	1 bottle		on request
HI 7030L	12880 µS/cm	500 mL	1 bottle		on request
HI 7030M	12880 µS/cm	230 mL	1 bottle		on request
HI 8030L	12880 µS/cm	500 mL	1 bottle	•	•

SACHETS

CODE	EC VALUE @25°C	SIZE	PACKAGE	CERTIFICATE OF ANALYSIS
HI 70030C	12880 µS/cm	20 mL	25 sachets	•
HI 70030P	12880 µS/cm	20 mL	25 sachets	

Conductivity Calibration Solutions

80000 µS/cm Calibration Solution

HANNA 8000 µS/cm calibration solution is needed for the proper calibration of instrumentation used to measure high conductivity samples, such as very dirty wastewater, solutions with suspended materials and plating baths.

It is available in 2 different sizes and also in an FDA approved light shielded bottle.

This calibration solution is also ideal for use in the agroalimentary sector.

BOTTLES

CODE	EC VALUE @25°C	SIZE	PACKAGE	FDA BOTTLE	CERTIFICATE OF ANALYSIS
HI 7034L	80000 µS/cm (µmho/cm)	500 mL	1 bottle		on request
HI 7034M	80000 µS/cm (µmho/cm)	230 mL	1 bottle		on request
HI 8034L	80000 µS/cm (µmho/cm)	500 mL	1 bottle	•	•

111800 µS/cm Calibration Solution

This calibration solution is useful to calibrate instrumentation used to measure samples with conductivity higher than 100 mS/cm (100,000 µS/cm).

In fact, this solution makes it possible to calibrate instruments that perform under conditions of high salt concentrations.

This calibration solution is ideal for use in systems where phase limits have to be detected (e.g. separation of a substance from water), monitoring of bottle washing plants, beverage controls, check of acids or bases in electrodeposition processes and some plating baths.

BOTTLES

CODE	EC VALUE @25°C	SIZE	PACKAGE	FDA BOTTLE	CERTIFICATE OF ANALYSIS
HI 7035L	111800 µS/cm (µmho/cm)	500 mL	1 bottle		on request
HI 7035M	111800 µS/cm (µmho/cm)	230 mL	1 bottle		on request
HI 8035L	111800 µS/cm (µmho/cm)	500 mL	1 bottle	•	•

Quality Solutions for Laboratory Applications

TDS Calibration Solutions

BOTTLES				
CODE	TDS VALUE @25°C	SIZE	PACKAGE	CERTIFICATE OF ANALYSIS
HI 6032	1382 mg/L (ppm)	500 mL	1 bottle	•
HI 7032L	1382 mg/L (ppm)	500 mL	1 bottle	on request
HI 7032M	1382 mg/L (ppm)	230 mL	1 bottle	on request
HI 7036L	12.41 g/L (ppt)	500 mL	1 bottle	on request
HI 7036M	12.41 g/L (ppt)	230 mL	1 bottle	on request
HI 70442L*	1500 mg/L (ppm)	500 mL	1 bottle	on request
HI 70442M*	1500 mg/L (ppm)	230 mL	1 bottle	on request

SACHETS				
CODE	TDS VALUE @25°C	SIZE	PACKAGE	CERTIFICATE OF ANALYSIS
HI 70032C	1382 mg/L (ppm)	20 mL	25 sachets	•
HI 70032P	1382 mg/L (ppm)	20 mL	25 sachets	
HI 70032P/5	1382 mg/L (ppm)	20 mL	500 sachets	
HI 70038C	6.44 g/L (ppt)	20 mL	25 sachets	•
HI 70038P	6.44 g/L (ppt)	20 mL	25 sachets	
HI 70080C	800 mg/L (ppm)	20 mL	25 sachets	•
HI 70080P	800 mg/L (ppm)	20 mL	25 sachets	
HI 70442C*	1500 mg/L (ppm)	20 mL	25 sachets	•
HI 70442P*	1500 mg/L (ppm)	20 mL	25 sachets	
HI 77200C*	1500 mg/L (ppm) & pH 7.01	20 mL	20 sachets (10 ea)	•
HI 77200P*	1500 mg/L (ppm) & pH 7.01	20 mL	20 sachets (10 ea)	
HI 77300C	1382 mg/L (ppm) & pH 7.01	20 mL	20 sachets (10 ea)	•
HI 77300P	1382 mg/L (ppm) & pH 7.01	20 mL	20 sachets (10 ea)	

* TDS Conversion Factor 4-4-2: 0.65 ppm = 1 µS/cm (approximately).

TDS Solutions

HANNA is one of the few producers to offer calibration solutions in packages from 20 to 500 mL for lab and field applications. Our packaging has been designed to keep air and light from damaging the solution.

Safety Data Sheets

The safety data sheets for all HANNA solutions in this catalog are available at www.hannainst.com or upon request.

Expiration Date

The production batch number and the expiration date are reported on all of HANNA calibration solutions.

NIST Traceability

TDS solutions are produced with high-quality potassium chloride in various concentrations. They are standardized using a conductivity meter calibrated with NIST potassium chloride.

HI 6032 Standard Solution

- **High precision standard solution at 1382 ppm**
- **Certificate of analysis**

HANNA instruments

With Great Products, Come Great Results™

CONTENTS

Professional Instruments for a Variety of D.O. Applications

Dissolved Oxygen Meters

Dissolved Oxygen

Dissolved oxygen meters are instruments that measure the quantity of oxygen dissolved in water.

In normal condition at normal temperature and pressure in an aqueous solution that is allowed to equilibrate with room air, oxygen constitutes about 20.9% of the total dissolved gas with nitrogen being about 78% (some carbon dioxide is present as well). These proportions are similar in air and in solution equilibrated with room air. The atmospheric pressure on the water surface along with temperature are factors that modify the concentrations of DO and therefore have to be compensated for a correct reading.

Since dissolved oxygen determination is based on measurement of a current that is established between the anode and cathode, the salt content of water is another factor that can influence readings and must also be compensated.

Applications

Dissolved oxygen is an important indicator of the degree of usefulness of a sample of water for a specific application. Dissolved oxygen can exist in water in different concentrations and is important for the respiration of a wide variety of animals and aerobic bacteria in the aquatic environment.

Other applications include: water treatment plants, sewage treatment works, effluent activated sludge process, river monitoring, fish farming, and generally any other field where water quality is important.

Biotechnological processes, are another area of applications where dissolved oxygen measurements are essential to maintain quality of the finished product.

In water quality applications, such as aquaculture and fish farming, the level of DO must be kept high. If the DO level falls too low the fish will suffocate. For waste water treatment, in sewage treatment, bacteria decompose the solids, if the DO level is too low, the bacteria will die and decomposition stops; if the DO level is high, there is no need to spend energy in the aeration of the water.

For industrial applications like boilers or cooling towers, low DO levels prevent corrosion and scale build-up which inhibits heat transfer.

Polarographic and Galvanic Probes

HANNA dissolved oxygen meters utilize one of the two common types of dissolved oxygen sensing probes: polarographic sensors and galvanic sensors.

Polarographic sensor technology is based on the Ross and Clark polarographic measurement method. An oxygen probe is composed of a platinum electrode and a solid silver electrode. A concentrated potassium chloride solution is held in place over the surfaces of the electrodes by a PTFE membrane. An external voltage creates a difference in potential between the cathode and anode (less than 0.5 volts).

The external voltage applied to the platinum electrode cathode, silver electrode anode, KCl solution and gas-permeable membrane material establishes a current that is proportional with the concentration of oxygen.

In contrast, a galvanic probe requires no external voltage. The difference in potential between the cathode and anode is greater than 0.5 volts. Galvanic DO sensors consist of two electrodes, a zinc or lead anode and silver cathode, both of which are immersed in electrolyte. An oxygen permeable membrane separates the anode and cathode from the water being measured. Oxygen diffuses across the membrane and interacts with the probe internals to produce an electrical current.

Comparison Guide

GUIDE	Dissolved Oxygen Range	Barometric Pressure	% Saturation O_2	Salinity Compensation	Altitude Compensation	Temperature Range(s)	DO Calibration Points	Barometric Pressure Calibration Points	ATC	HOLD Feature	BEPS	PC Connectivity	Logging	Alarm	GLP	Page
Bench Meters																
HI 4421	•	•		•		°C/°F/K	2	1		•		•	•	•	•	7.4
HI 2400	•		•		•	°C	2		•			•	•		•	7.6
Portable Meters																
HI 98186	•	•	•	•		°C/°F	2	1	•	•	•	•	•		•	7.8
HI 9146	•		•	•	•	°C	2		•		•				•	7.10
HI 9147	•		•	•		°C/°F			•		•					7.11
HI 9142	•					°C/°F	2		•		•					7.12

Product Spotlights

HI 4421

Research Grade Dissolved Oxygen and BOD Meter

7.4

HANNA's research grade bench meter line expands to include HI 4421. The fully customizable HI 4421 features DO, BOD, OUR and SOUR measurement modes in a compact versatile instrument. The color graphic LCD is capable of displaying graphs, soft key menus, help screens and calibration reminders. HI 4421 also incorporates an intuitive menu system to help streamline your workflow process and provide accurate measurements quickly and efficiently. The large log memory offers 100 lots with 10,000 records per lot. Measurements can be transferred to a PC via USB or RS 232 with HANNA software.

HI 2400

Dissolved Oxygen Meter

7.6

HI 2400 is a dissolved oxygen benchtop meter with automatic calibration and an extended range to measure up to 300% or 45 ppm. This instrument allows for temperature and salinity compensation as well as altitude compensation up to 4000 m.

Dissolved oxygen measurements are displayed in parts per million (ppm=mg/L) or in % saturation.

The polarographic probe uses screw-on membranes for simple replacement. The automatic logging interval can be set to perform analysis and store data in non-volatile memory. All logged data can be transferred to your PC through the USB port. Memory can store up to 8000 samples.

HI 9147

Dissolved Oxygen Meter for Aquaculture

7.12

HI 9147 are specially designed for aquaculture applications. This unit is unique among our family of DO meters, it is supplied with a galvanic probe.

Unlike polarographic probes, galvanic DO probes require no conditioning time. When you need to measure multiple samples in a given period of time, pick it up and measure on demand.

HI 9147 is a must have for DO sensitive organisms or high bio-load environments.

HI 4421

Research Grade Dissolved Oxygen and BOD Meter

- **Extended DO range up to 90 ppm (mg/L) and 600%**
- **Measures DO, atmospheric pressure and temperature**
- **DO direct, DO direct/autohold**
  BOD: Biological Oxygen Demand
  OUR: Oxygen Uptake Rate
  SOUR: Specific Oxygen Uptake Rate
- **Temperature and atmospheric pressure automatic compensation**
- **Manual salinity compensation**
- **Fully customizable**
- **Large log memory using different logging methods**
- **Polarographic probe with built-in temperature sensor**

HI 4421 is a research grade dissolved oxygen bench meter with extensive capabilities in measuring DO as BOD (Biological Oxygen Demand), OUR (Oxygen Uptake Rate), SOUR (Specific Oxygen Uptake Rate), atmospheric pressure and temperature.

DO measurements can be performed in ppm (mg/L) range or in % and feature automatic or manual temperature and atmospheric pressure compensation and manual salinity compensation.

Automatic and manual calibration of DO can be performed in one or two points using standard or user defined standards. Users can set the reading stability criteria; three modes are available: Fast, Medium and Accurate. Direct/autohold auomatically holds the reading on display when measurement stability is reached. In direct reading mode, the user interface can be set to basic with or without GLP, graphic or logging information.

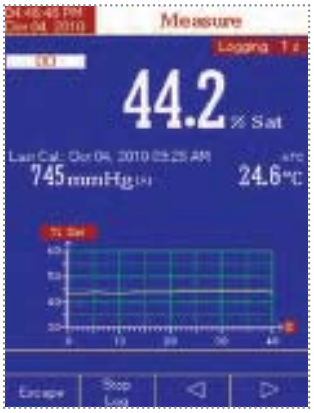
These instruments offer multi-language support and contextual help is available through a dedicated Help key. Clear tutorial messages and directions are available on-screen to quickly and easily guide users through all measurement and calibration procedures to ensure measurements and procedures are performed properly.

The BOD, OUR and SOUR methods are supported with a dedicated tutorial and step by step indication in order to assure a full and correct reading of DO using this specific measuring method.

The DO probe is using the polarographic principal of measurement and has a built-in temperature sensor.

Up to 10 profiles can be saved and recalled eliminating the need to reconfigure each time when a different electrode is used. User definable configurations can include reading mode: direct or BOD, OUR, and SOUR, measurement units, temperature units, stability criteria, and temperature, atmospheric pressure and salinity compensation.

Three selectable logging modes are available: Automatic, Manual and AutoHold logging. Up to 100 logging lots can be stored for automatic or manual modes. Automatic logging features a selectable area and sampling period while GLP information includes complete data about user calibration of each parameter and identification information for the instrument, user, and company. Data can be transferred to a PC via the opto-isolated PC interface via the RS232 or USB ports and HI 92000 software (optional).



Direct measurement

BOD (Biological Oxygen Demand)

OUR (Oxygen Uptake Rate)

SOUR (Specific Oxygen Uptake Rate)

SPECIFICATIONS		HI 4421
Range	Dissolved Oxygen	0.00 to 90.00 ppm; 0.0 to 600.0 % saturation
	Barometric Pressure	450 to 850 mmHg; 560 to 1133 mBar
	Temperature	-20.0 to 120.0°C; -4.0 to 248°F; 253.1 to 393.1 K
Resolution	Dissolved Oxygen	0.01 ppm; 0.1% saturation
	Barometric Pressure	1 mm Hg
	Temperature	0.1°C/°F/K
Accuracy	Dissolved Oxygen	±1.5% of reading ±1 digit
	Barometric Pressure	±3 mm Hg + 1 least significant digit
	Temperature	±0.2°C/K/°F (excluding probe error)
Measurement Modes		direct DO; BOD (biochemical oxygen demand); OUR (oxygen uptake rate); SOUR (specific oxygen uptake rate)
Calibration	Dissolved Oxygen	automatic/user standard, one or two points
	Barometric Pressure	single point
Temperature Compensation		0.0 to 50.0°C; 32.0 to 122.0°F; 237.1 to 323.1 K
Salinity Compensation		0 to 45 g/L (ppt)
Probe		thin body, polarographic dissolved oxygen probe with internal temperature sensor and 1 m (3.3') cable (included)
Logging	Record Samples	up to 100 lots; 10,000 samples/lot for automatic logging; 5000 samples/lot for manual logging
	Logging Interval	from one second and up
	Type	manual, automatic
GLP Features		yes (last calibration data, calibration info)
Alarm (DO, BOD, OUR, SOUR)		inside and outside limits
PC Connection		opto-isolated USB and RS232
Display		graphic color LCD with on-screen help, graphing, language selection and custom configuration
Power Supply		12 VDC adapter (included)
Dimensions		160 x 231 x 94 mm (6.3 x 9.1 x 3.7")
Weight		1.2 Kg (2.6 lbs.)

ORDERING INFORMATION

HI 4421-01 (115V) and **HI 4421-02** (230V) is supplied with HI 76408 DO probe, HI 76404N electrode holder, HI 7041S electrolyte solution (30 mL), HI 76407A membrane caps (2), 12 VDC adapter and instruction manual.

PROBES

HI 76408	Thin body, polarographic DO probe with internal temperature sensor, DIN connector and 1 m (3.3') cable
HI 76407/2	Polarographic DO probe with internal temperature sensor, DIN connector and 2 m (6.6') cable
HI 76407/4	Polarographic DO probe with internal temperature sensor, DIN connector and 4 m (13') cable
HI 76407/10	Polarographic DO probe with internal temperature sensor, DIN connector and 10 m (33') cable
HI 76407/20	Polarographic DO probe with internal temperature sensor, DIN connector and 20 m (67') cable

SOLUTIONS

HI 7040M	Zero oxygen solution, 230 mL
HI 7040L	Zero oxygen solution, 500 mL
HI 7041S	Electrolyte solution, 30 mL
HI 7041M	Refilling electrolyte solution (230 mL)
HI 7041L	Refilling electrolyte solution (500 mL)

ACCESSORIES

HI 76407A/P	Replacement membrane (5)
HI 76404N	Electrode holder
HI 92000	Windows® compatible software
HI 920013	USB cable for PC connection
HI 920010	Serial cable for PC connection

For a complete list of Solutions, Probes and Accessories, see the end of this section.

HI 2400

Dissolved Oxygen Meter

- DO range up to 300%
- Altitude compensation up to 4000 m
- Salinity compensation up to 40 g/L
- Automatic temperature compensation
- Automatic calibration in air
- PC compatible via USB
- Datalogging and storage up to 8000 samples
- GLP Features

HI 2400 is a dissolved oxygen benchtop meter with automatic calibration and % or mg/L (ppm) measurement range. The measurement is automatically compensated for altitude and salinity compensation based on the user settings for altitude up to 4000 m and 40 g/L for salinity.

Calibration is performed at one or two points at 0% using HANNA's HI 7040 solution or 100% in air.

Measurements are automatically temperature compensated by using the polarographic DO probe with built-in temperature sensor. This probe features screw cap membranes for easy replacement.

With a built-in logging function, measurements are stored in non volatile memory, and can be transferred to a PC through the USB port using the optional HI 92000 software and HI 920013 USB cable. The software is provided with an exclusive online guide of all the commands available and allows data printing, plotting and exporting.

The 8000 record logging interval allows the possibility of process and experimental monitoring of DO. The logging interval is automatic with user selectable intervals from 5 seconds to 180 minutes according with the speed of DO variation inside the process.

The HI 2400 also provides users with GLP (Good Laboratory Practice) capabilities. GLP is a set of functions that allow the storage and retrieval of data regarding calibration. The GLP feature provides data consistency and a calibration reminder which can be set to alert the user that too much time has elapsed since the last calibration and a new one should be performed.

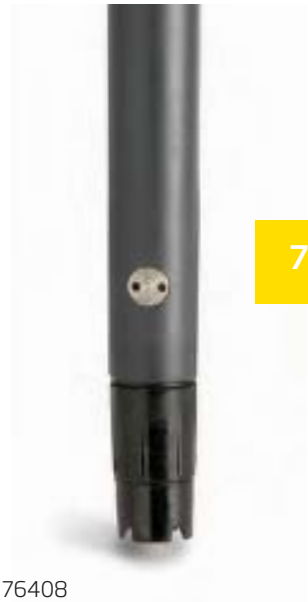
7.13

HI 76407

Standard DO Probe

HI 76407 dissolved oxygen probe is extremely rugged making it ideal for both laboratory and field applications. Calibration is fast, simple and all DO measurements are temperature compensated. The pre-tensioned, ready-made PTFE membrane can be changed in a few seconds without the need to stretch and cut replacements.

Several cable lengths are available.



7.15

HI 76408

Thinner, Lighter DO Probe for Laboratories

The HANNA HI 76408 DO probe is rugged and perfect for both laboratory and field applications. Calibration is fast and simple, and measurements are temperature compensated. The sensitive PTFE membrane can be changed in a few seconds.

Polarographic DO Probe

The HI 2400 utilizes Polarographic sensor technology based on the Ross and Clark polarographic measurement type solution. An oxygen probe is composed of a platinum electrode and a solid silver electrode. A concentrated potassium chloride solution is held in place over the surfaces of the electrodes by a PTFE membrane. An external voltage creates a difference in potential between the cathode and anode (less than 0.5 volts). The external voltage applied to the platinum electrode cathode, silver electrode anode, KCl solution and gas-permeable membrane material establishes a current that is proportional with the concentration of oxygen.

SPECIFICATIONS		HI 2400
Range	DO	0.00 to 45.00 mg/L (ppm)
	% Saturation O_2	0.0 to 300.0 %
	Temperature	0.0 to 50.0°C
Resolution	DO	0.01 mg/L (ppm)
	% Saturation O_2	0.1%
	Temperature	0.1°C
Accuracy (@20°C/68°F)	DO	±1.5% F.S.
	% Saturation O_2	±1.5% F.S.
	Temperature	±0.2°C (excluding probe error)
Dissolved Oxygen Calibration		one or two points at 0% (HI 7040 solution) and 100% (in air)
Altitude Compensation		0 to 4000 m (with 100 m resolution)
Salinity Compensation		0 to 40 g/L (ppt) (with 1 g/L resolution)
Temperature Compensation		automatic, 0.0 to 50.0°C (32.0 to 122°F)
Probe		HI 76407/2 polarographic DO probe with internal temperature sensor, DIN connector and 2 m (6.6') cable (included)
Logging Interval		5, 10, 30 seconds or 1, 2, 5, 10, 15, 30, 60, 120, 180 minutes
PC Connection		opto-isolated USB
Power Supply		12 VDC adapter
Environment		0 to 50°C; RH max 95%
Dimensions		235 x 222 x 109 mm (9.2 x 8.7 x 4.3")
Weight		1.3 kg (2.9 lbs.)

ORDERING INFORMATION

HI 2400-01 (115V) and **HI 2400-02** (230V) are supplied with HI 76407/2 dissolved oxygen probe, HI 76407A membrane caps (2), HI 7041S electrolyte solution (30 mL), 12 VDC adapter and instructions.

PROBES

HI 76407/2	Polarographic DO probe with internal temperature sensor, DIN connector and 2 m (6.6') cable
HI 76407/4	Polarographic DO probe with internal temperature sensor, DIN connector and 4 m (13') cable
HI 76407/10	Polarographic DO probe with internal temperature sensor, DIN connector and 10 m (33') cable
HI 76407/20	Polarographic DO probe with internal temperature sensor, DIN connector and 20 m (67') cable
HI 76408	Thin body, polarographic DO probe with internal temperature sensor, DIN connector and 1 m (3.3') cable

SOLUTIONS

HI 7040M	Zero oxygen solution, 230 mL
HI 7040L	Zero oxygen solution, 500 mL
HI 7041S	Electrolyte solution, 30 mL
HI 7041M	Refilling electrolyte solution (230 mL)
HI 7041L	Refilling electrolyte solution (500 mL)

ACCESSORIES

HI 76407A/P	Replacement membranes (5)
HI 92000	Windows® compatible software
HI 920013	USB cable for PC connection

For a complete list of Solutions, Probes and Accessories, see the end of this section.

HI 98186

Dissolved Oxygen and BOD Meter

- **Extended DO range up to 50 ppm and 600% saturation**
- **Built-in barometer**
- **Salinity, pressure and temperature compensation**
- **Backlit, graphic LCD display**
- **Calibration reminder**
- **Log on demand** (400 samples)
- **Auto HOLD**
- **GLP features**
- **PC connectivity via USB**

BOD gives an indication of the biodegradable organic material present in a sample of water. The dissolved oxygen concentration is measured before and after an incubation period of 5 days and the BOD is calculated in mg per liter from the difference.

OUR and SOUR are used to determine the oxygen consumption or respiration rate. OUR is measured in mg of oxygen consumed per liter per hour, and SOUR is measured in mg of oxygen consumed per gram of volatile suspended solids per hour.

HI 98186 portable Dissolved Oxygen Meter has extended ranges of up to 50 ppm or 600% saturation. This instrument includes barometric pressure measurement and calibration with a user selectable unit (mmHg, atm, mbar, psi, kPa) as well as a 1 or 2 point temperature calibration. Salinity, pressure and temperature compensations enhance the precision of your readings.

With its internal barometer, the instrument is able to automatically compensate for changes in barometric pressure so there is no need for charts, altitude information or external barometric pressure information. Salinity compensation in water allows direct determination of dissolved oxygen in saline waters.

Other features include measurement and methods for BOD (biochemical oxygen demand), OUR (oxygen uptake rate), and SOUR (specific oxygen uptake rate).

The HI 98186's log on-demand features allows users to store up to 400 samples that can be later transferred to a PC with the HI 920013 USB cable and HI 92000 software.

An "Out Of Calibration Range Warning" can be activated to alert the user in the event that a reading is taken too far from the calibration's periphery. A combination of dedicated and soft keys allows easy, intuitive operation in a choice of languages. Comprehensive GLP data is directly accessible by pressing the GLP key and a contextual Help menu can be access to obtain on-screen information and assistance about each feature at the touch of a button.

Designed for field use, this instrument can be easily operated with one hand and is housed in a rugged carrying case. The inductive charger can either be plugged into a standard 115V socket with the adapter included or a 12 VDC source, such as a car's 12 V accessory outlet.

BOD results

BOD is calculated in mg per liter from the difference between the initial and final dissolved oxygen concentration readings.

OUR results

Measured in mg of oxygen consumed per L per hour.

SOUR results

Measured in mg of oxygen consumed per g of volatile suspended solids per hour.

BOD parameters and records

All necessary parameters for BOD testing can be set and displayed at once.

A list of all saved BOD data can be easily retrieved and shown on the LCD display.

SPECIFICATIONS		HI 98186
Range	Dissolved Oxygen	0.00 to 50.00 mg/L (ppm); 0.0 to 600.0 % saturation
	Barometric Pressure	450 to 850 mmHg
	Temperature	-20.0 to 120.0°C (-4.0 to 248.0°F)
Resolution	Dissolved Oxygen	0.01 mg/L (ppm); 0.1% saturation
	Barometric Pressure	1 mm Hg
	Temperature	0.1°C/°F
Accuracy (@20°C/68°F)	Dissolved Oxygen	±1.5% of reading ±1 digit
	Barometric Pressure	± 3 mmHg within ±15% from the calibration point
	Temperature	±0.2°C/±0.4°F (excluding probe error)
Measurement Modes		direct DO; BOD (biochemical oxygen demand); OUR (oxygen uptake rate); SOUR (specific oxygen uptake rate)
Calibration	Dissolved Oxygen	automatic one or two point at 100 % (8.26 mg/L) and 0 % (0 mg/L).; manual one point using a value entered by the user in % saturation or mg/L
	Barometric Pressure	one point at any in range pressure value
	Temperature	one or two point at any in range temperature value
Compensation	Barometric	automatic from 450 to 850 mmHg
	Salinity	automatic from 0 to 70 g/L
	Temperature	automatic from 0.0 to 50.0 °C (32.0 to 122.0 °F)
Probe		HI 76407/4F polarographic DO probe with protective sleeve, internal temperature sensor, DIN connector and 4m (13') cable (included)
Logging		log on demand, 400 samples
PC Connectivity		opto-isolated USB (with HI 92000 software)
Battery Type / Life		1.2V (4) AA rechargeable batteries/approximately 200 hours of continuous use without backlight
Auto-off		user selectable: 5, 10, 30, 60 min or can be disabled
Environment		0 - 50 °C (32 - 122 °F) RH max 100%
Dimensions		226.5 x 95 x 52 mm (8.9 x 3.75 x 2")
Weight		525 g (1.1 lbs.)

HI 76407A/P

Easy, Screw Cap DO Membranes

Carry Extras for Assurance

When the PTFE (PolyTetraFluoro-Ethylene) membrane of the protective cap wears, it is always good to have a back-up.

HI 76407A/P Contains 5 ready-to-use, replacement membranes.

ORDERING INFORMATION

HI 98186-01 (115V) and **HI 98186-02** (230V) are supplied with HI 76407/4F DO probe, spare membranes (2), HI 7041S electrolyte solution (30 mL), rechargeable batteries, HI 710042 inductive battery charger with power adapter, 12 VDC adapter, instructions and rugged carrying case.

PROBES

HI 76407/4F Polarographic DO probe with protective sleeve, internal temperature sensor, DIN connector and 4 m (13') cable

HI 76407/10F Polarographic DO probe with protective sleeve, internal temperature sensor, DIN connector and 10 m (33') cable

HI 76407A/P Replacement membranes (5)

SOLUTIONS

HI 7040M Zero oxygen solution, 230 mL

HI 7040L Zero oxygen solution, 500 mL

HI 7041S Electrolyte solution, 30 mL

HI 7041M Refilling electrolyte solution (230 mL)

HI 7041L Refilling electrolyte solution (500 mL)

For a complete list of Solutions, Probes and Accessories, see the end of this section.

HI 9146

Dissolved Oxygen Meter

- On-screen tutorial messages
- Two point calibration
- Auto endpoint
- DO range up to 300%, temperature compensated
- Altitude compensation up to 4000 m
- Salinity compensation up to 80 g/L
- Automatic calibration in air
- GLP features
- Low battery indicator

HI 9146 is a water-resistant, dissolved oxygen meter that measures up to 300% saturation or 45 ppm (mg/L) with temperature compensation and automatic calibration. It has been developed for DO and temperature measurement in water, wastewater, and applications such as fish farming.

This instrument also allows altitude compensation up to 4000 m and the ppm and % saturation are both compensated for changes in solubility of oxygen in water and for permeability of the membrane as well as the temperature effect.

The included polarographic probe features built-in temperature compensation and removable protective membrane cover.

ORDERING INFORMATION

HI 9146-04 is supplied complete with HI 76407/4F probe with 4 m (13.1') cable, HI 76407A membranes (2), HI 7041S electrolyte solution (30 mL), batteries, instructions and rugged carrying case.
HI 9146-10 is supplied complete with HI 76407/10F probe with 10 m (32.8') cable, HI 76407A membranes (2), HI 7041S electrolyte solution (30 mL), batteries, instructions and rugged carrying case.

PROBES

HI 76407/4F	Polarographic DO probe with protective sleeve, internal temperature sensor, DIN connector and 4 m (13') cable
HI 76407/10F	Polarographic DO probe with protective sleeve, internal temperature sensor, DIN connector and 10 m (33') cable

SOLUTIONS

HI 7040M	Zero oxygen solution, 230 mL
HI 7040L	Zero oxygen solution, 500 mL
HI 7041S	Electrolyte solution, 30 mL
HI 7041M	Refilling electrolyte solution (230 mL)
HI 7041L	Refilling electrolyte solution (500 mL)

ACCESSORIES

HI 76407A/P	Replacement membranes (5)

SPECIFICATIONS		HI 9146
Range	O_2	0.00 to 45.00 mg/L (ppm)
	% Saturation O_2	0.0 to 300.0%
	Temperature	0.0 to 50.0°C
Resolution	O_2	0.01 mg/L (ppm)
	% Saturation O_2	0.1%
	Temperature	0.1°C
Accuracy (@ 20°C/68°F)	O_2	±1.5% F.S.
	% Saturation O_2	±1.5% F.S.
	Temperature	±0.2°C (excluding probe error)
Dissolved Oxygen Calibration		one or two points at 0% (HI 7040 solution) and 100% (in air)
Temperature Compensation		automatic, 0 to 50°C (32 to 122°F)
Altitude Compensation		0 to 4000 m (resolution 100 m)
Salinity Compensation		0 to 80 g/L (ppt) (resolution 1 g/L)
Probe		HI 76407/4F polarographic DO probe, internal temperature sensor, DIN connector and 2 m (6.6') cable (included)
Battery Type / Life		1.5V AAA (3) /approximately 200 hours of continuous use without backlight (50 hours with backlight on)
Environment		0 to 50°C (32 to 122°F); RH max 95%
Dimensions		185 x 72 x 36 mm (7.3 x 2.8 x 1.4")
Weight		300 g (10.6 oz.)

For a complete list of Solutions, Probes and Accessories, see the end of this section.

HI 9147

Dissolved Oxygen Meter for Aquaculture

Galvanic Probe for Fish Farming

- **Designed specifically for aquaculture**
- **Galvanic DO probe**
- **Backlit LCD**
- **Automatic Temperature Compensation**
- **Manual salinity and altitude compensation**
- **Water-resistant**

HI 9147 is designed for aquaculture applications. This unit is unique among our family of DO meters as it is supplied with a galvanic probe.

Unlike polarographic probes, galvanic DO probes require no conditioning time. When you need to measure multiple samples in a given period of time, pick it up and measure on demand.

HI 9147 is a must have for DO sensitive organisms or high bio-load environments.

DO Levels at 100% Saturation

	Salinity (ppt)				
Temperature	0	10	20	30	40
10°C / 50°F	13.0	12.2	11.4	10.6	9.8
15°C / 59°F	10.3	9.7	9.2	8.6	8.1
20°C / 68°F	9.4	8.8	8.4	7.9	7.4
25°C / 77°F	8.5	8.0	7.6	7.2	6.7
30°C / 86°F	7.8	7.4	7.0	6.6	6.2

SPECIFICATIONS		HI 9147
Range	O_2	0.0 to 50.0 mg/L (ppm)
	% Saturation O_2	0 to 600 %
	Temperature	-5.0 to 50.0°C (32.0 to 122.0°F)
Resolution	O_2	0.1 mg/L (ppm) or 1%
	Temperature	0.1°C (1°F)
Accuracy (@ 20°C/68°F)	O_2	±1% of reading
	Temperature	±0.2°C (1°F) (excluding probe error)
Calibration		manual, in saturated air
Temperature Compensation		automatic, -5 to 50°C (23°F to 122°F)
Altitude Compensation		0 to 4000 m (resolution 100 m)
Salinity Compensation		0 to 51 g/L (ppt) (1 g/L resolution)
Probe		HI 76409/4 galvanic DO probe (fixed) with internal temperature sensor, DIN connector and 4 m (13') cable (HI 9147-04), 10 m (33') cable (HI 9147-10), 15 m (49') cable (HI 9147-15) or 20 m (66') cable (HI 9147-20) (included)
Battery Type / Life		1.5V AAA (3) / approx. 1,000 hours of continuous use without backlight
Environment		0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions		185 x 72 x 36 mm (7.3 x 2.8 x 1.4")
Weight		450 g (15.9 oz.)

ORDERING INFORMATION

HI 9147-04 is supplied with HI 76409/4 probe with 4 m (13') cable and spare membranes (2), electrolyte solution (30 mL), batteries, screwdriver and instructions.
HI 9147-10 is supplied with HI 76409/10 probe with 10 m (32.8') cable and spare membranes (5), electrolyte solution (30 mL), batteries, screwdriver and instructions.
HI 9147-15 is supplied with HI 76409/15 probe with 15 m (49.2') cable and spare membranes (5), electrolyte solution (30 mL), batteries, screwdriver and instructions.
HI 9147-20 is supplied with HI 76409/20 probe with 20 m (65.6') cable and spare membranes (5), electrolyte solution (30 mL), batteries, screwdriver and instructions.

SOLUTIONS

HI 7042S	Electrolyte solution for galvanic probes, 30 mL
HI 7040M	Zero oxygen solution, 230 mL
HI 7040L	Zero oxygen solution, 500 mL

ACCESSORIES

HI 76409-0	Protective sleeve for HI 76409 probes
HI 76409A/P	Membranes for HI 76409 probes (5)

For a complete list of Solutions, Probes and Accessories, see the end of this section.

HI 9142

Manual Calibration Dissolved Oxygen Meter

- **Automatic Temperature Compensation**
- **Affordable and efficient**
- **DO probe and carrying case included**

The ever increasing demand for instant on-site analysis results has created a need for innovative and rugged portable, waterproof meters.

Field work can subject instrumentation to the inclemency of weather. Cold, rain, snow, dust and humidity can cause condensation to breech the housing. Once the housing has been compromised, the meter is susceptible to diminishing performance and life. The rugged, waterproof housing of the HI 9142 solves many of the problems of field use.

Calibration is performed with HI 7040 zero oxygen solution, while 100% calibration is done in air.

The polarographic probe (HI 76407/4) is accurate to 0.3 ppm and is supplied with a 4 m (13') cable that allows measurements to be taken even in hard to reach places.

ORDERING INFORMATION

HI 9142 is supplied with HI 76407/4 probe with 4 m (13') cable, 2 spare membranes, HI 7041S electrolyte solution (30 mL), calibration screwdriver, batteries, instructions and rugged carrying case.
HI 9142/10 is supplied with HI 76407/10 probe with 10 m (32.8') cable, 2 spare membranes, HI 7041S electrolyte solution (30 mL), calibration screwdriver, batteries, instructions and rugged carrying case.
HI 9142/20 is supplied with HI 76407/20 probe with 20 m (65.6') cable, 2 spare membranes, HI 7041S electrolyte solution (30 mL), calibration screwdriver, batteries, instructions and rugged carrying case.

PROBES

HI 76407/4	Polarographic DO probe with protective sleeve, internal temperature sensor, DIN connector and 4 m (13') cable
HI 76407/10	Polarographic DO probe with internal temperature sensor, DIN connector and 10 m (32.8') cable
HI 76407/20	Polarographic DO probe with internal temperature sensor, DIN connector and 20 m (65.6') cable

SOLUTIONS

HI 7040M	Zero oxygen solution, 230 mL
HI 7040L	Zero oxygen solution, 500 mL
HI 7041S	Refilling electrolyte solution (30 mL)
HI 7041M	Refilling electrolyte solution (230 mL)
HI 7041L	Refilling electrolyte solution (500 mL)

ACCESSORIES

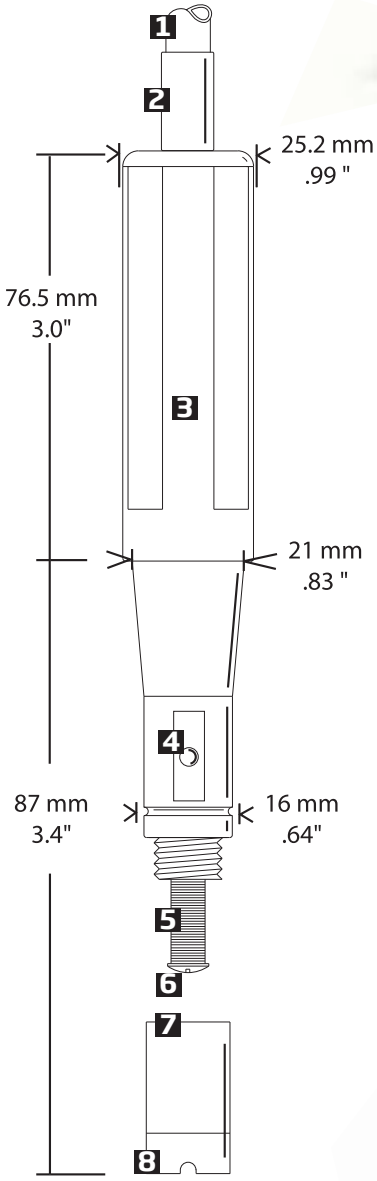
HI 76407A/P	Replacement membranes (5)
HI 721317	Rugged carrying case

SPECIFICATIONS		HI 9142
Range	O_2	0.0 to 19.9 mg/L (ppm)
	Temperature	-5.0 to 50.0°C (32.0 to 122.0°F)
Resolution	O_2	0.1 mg/L (ppm)
	Temperature	0.1°C (1°F)
Accuracy (@ 20°C/68°F)	O_2	±1.5% F.S.
	Temperature	±0.2°C (±1°F) (excluding probe error)
Calibration		manual, at one or two points (zero and slope)
Temperature Compensation		automatic, 0 to 50°C (32 to 122°F)
Probe		HI 76407/4 polarographic DO probe with internal temperature sensor, DIN connector and 4 m (13') cable
Battery Type / Life		1.5V AAA (3) / approximately 1,000 hours of continuous use
Environment		0 to 50°C (32 to 122°F); RH max 95%
Dimensions		185 x 72 x 36 mm (7.3 x 2.8 x 1.4")
Weight		300 g (10.6 oz.)

For a complete list of Solutions, Probes and Accessories, see the end of this section.

HI 76407

Standard DO Probe



HI 76407

The HI 76407 dissolved oxygen probe is extremely rugged, making it perfect for both laboratory and field applications. Calibration is fast, simple and all DO readings are temperature compensated.

The pre-tensioned, ready-made PTFE membrane can be changed in a few seconds without the need to stretch and cut replacements.

The HI 76407 is offered with several cable lengths to meet your specific needs.

HI 76407

1. Shielded, waterproof cable
2. Protective sleeve
3. PEI probe for best field protection
4. Linearized and accurate thermistor temperature sensor protected behind a stainless steel cover
5. Silver wire anode element
6. Glass encapsulated platinum cathode
7. Potassium chloride electrolyte solution (HI 7041S)
8. Thin permeable PTFE membrane isolates the sensor elements from the testing solution, but allows oxygen to enter (HI 76407A/P)

PROBE	CABLE LENGTH	METER
HI 76407/2	2 m (6.6')	HI 4421 HI 2400
HI 76407/4	4 m (13')	
HI 76407/10	10 m (33')	
HI 76407/20	20 m (67')	
HI 76407/30	30 m (98.4')	
HI 76407/50	50 m (164')	
HI 76407/60	60 m (196.8')	

HI 76407A/P

Easy, Screw Cap DO Membranes

When the PTFE (PolyTetraFluoro-Ethylene) membrane of the protective cap wears, it is always good to have a back-up.

HI 76407A/P Contains 5 ready-to-use, replacement membranes.

HI 7041

Electrolyte Solution

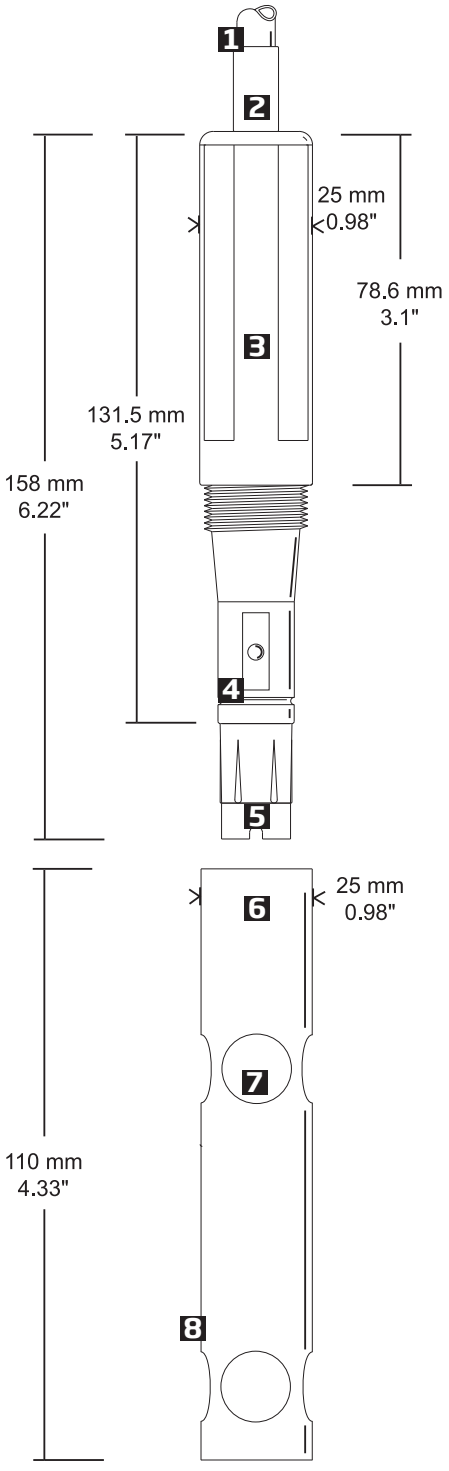
It is crucial to the performance of your DO probe, to keep the sensor active with regular maintenance. For this purpose, HANNA has developed HI 7041 electrolyte solution to refill the membrane cap.

HI 7041S	Refilling electrolyte solution (30 mL)
HI 7041M	Refilling electrolyte solution (230 mL)
HI 7041L	Refilling electrolyte solution (500 mL)

HI 76407F Series

DO Probe with Protective Sleeve

Perfect for laboratory and field applications, HANNA HI 76407 F Series DO probes are extremely rugged with a screw on protective sleeve. Calibration is fast and simple, and measurements are temperature compensated. The sensitive PTFE membrane can be changed in a few seconds.



1. Shielded, waterproof cable
2. Protective sleeve
3. PEI probe for best field protection
4. Linearized and accurate thermistor temperature sensor protected behind a stainless steel cover
5. Permeable membrane
6. Glass encapsulated platinum cathode
7. Hole for solution cycling
8. Protective sleeve for field applications

PROBE	CABLE LENGTH	METER
HI 76407/4F	4 m (13')	HI 98186 HI 9146 HI 9142
HI 76407/10F	10 m (33')	
HI 76407/20F	20 m (65.6')	
HI 76407/30F	30 m (98.4')	
HI 76407/50F	50 m (164')	

HI 7040 • HI 7041

DO Solutions

It is crucial to the performance of your DO probe, to keep the sensor active with regular maintenance.

HI 7040M	Zero oxygen solution, 230 mL
HI 7040L	Zero oxygen solution, 500 mL
HI 7041S	Refilling electrolyte solution (30 mL)
HI 7041M	Refilling electrolyte solution (230 mL)
HI 7041L	Refilling electrolyte solution (500 mL)

HI 76407A/P

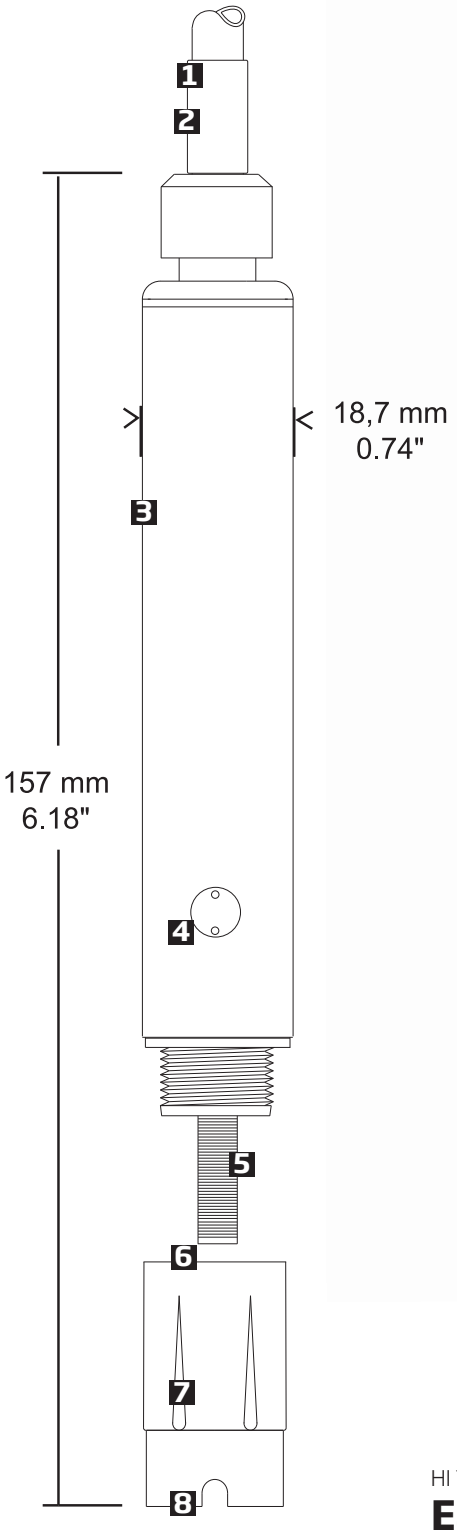
Easy, Screw Cap DO Membranes

When the PTFE (PolyTetraFluoro-Ethylene) membrane of the protective cap wears, it is always good to have a back-up.

HI 76407A/P Contains 5 ready-to-use, replacement membranes.

HI 76408

Thinner, Lighter DO Probe for Laboratories



Thin and Light

The HANNA HI 76408 DO probe is rugged and perfect for both laboratory and field applications. Calibration is fast and simple, and measurements are temperature compensated. The sensitive PTFE membrane can be changed in a few seconds.

1. Shielded, waterproof cable
2. Protective sleeve
3. PEI probe for best field protection
4. Linearized and accurate thermistor temperature sensor protected behind a stainless steel cover
5. Silver wire anode element
6. Glass encapsulated platinum cathode
7. Potassium chloride electrolyte solution (HI 7041S)
8. Thin permeable PTFE membrane isolates the sensor elements from the testing solution, but allows oxygen to enter (HI 76407A/P)

PROBE	CABLE LENGTH	METER
HI 76408	1 m (3.3')	HI 4421 HI 2400

HI 76407A/P

Easy, Screw Cap DO Membranes

When the PTFE (PolyTetraFluoro-Ethylene) membrane of the protective cap wears, it is always good to have a back-up.

HI 76407A/P Contains 5 ready-to-use, replacement membranes.

HI 7040 • HI 7041

DO Solutions

It is crucial to the performance of your DO probe, to keep the sensor active with regular maintenance.

HI 7040M	Zero oxygen solution, 230 mL
HI 7041S	Refilling electrolyte solution (30 mL)
HI 7041M	Refilling electrolyte solution (230 mL)
HI 7041L	Refilling electrolyte solution (500 mL)

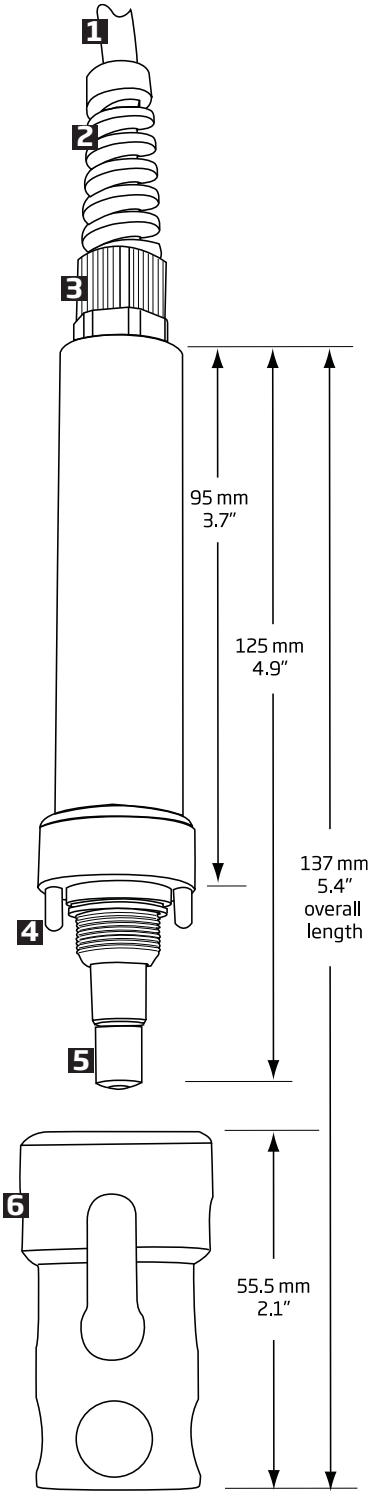
HI 76409

Galvanic DO Probe with Protective Cap

Unlike polarographic probes, galvanic DO probes require no conditioning time. When you need to measure multiple samples in a given period of time, pick it up and measure on demand.

1. Shielded, waterproof cable
2. Flex protect
3. Strain relief for cable
4. Temperature sensors
5. Cathode (3.5 mm), pure silver
6. Protective cap

PROBE	CABLE LENGTH	METER
HI 76409/4	4 m (13')	HI 9147 (meter specific, fixed probe)
HI 76409/10	10 m (33')	
HI 76409/15	15 m (49')	
HI 76409/20	20 m (65.6')	



HI 7040 • HI 7042

DO Solutions

It is crucial to the performance of your DO probe, to keep the sensor active with regular maintenance.

HI 7040M	Zero oxygen solution, 230 mL
HI 7040L	Zero oxygen solution, 500 mL
HI 7042S	Electrolyte solution for galvanic probes, 30 mL

HI 76409A/P

Easy, Screw Cap DO Membranes

When the PTFE (PolyTetraFluoro-Ethylene) membrane of the protective cap wears, it is always good to have a back-up.

HI 76409A/P	Contains 5 ready-to-use, replacement membranes.

CONTENTS

Multiparameter Meters

Product Spotlights

HI 9829 • HI 98290

GPS Multiparameter Meter with Autonomously Logging Probes

8.4

- Field replaceable ISO 7027 compliant turbidity sensor
- Ammonium, chloride and nitrate ISE's
- Logging from probe or meter
- Display from 1 to 12 parameters with font dimension adjustment
- Track measurement locations with GPS (HI 98290)
- Field replaceable sensors
- Auto-recognition of all sensors
- pH/ORP or pH, four electrode EC or EC/Turbidity and galvanic DO sensors
- Graphic LCD with backlight
- Waterproof protection for meter (IP 67) and probes (IP 68)
- Fast Tracker™–Tag I.D. System simplifies test logging

Rugged, waterproof and easy to use, the HI 9829 and HI 98290 are the ideal meters for field measurements of lakes, rivers and seas. Both meters display 1 to 12 parameters simultaneously from up to 15 user selectable parameters. Combined with one of the HI 76x9829 series probes, the HI 9829 and HI 98290 can measure water quality parameters such as pH, ORP, conductivity, turbidity, temperature, ions ammonium, nitrate, chloride (as NH_4^+–N, NO_3^-–N or Cl^-), dissolved oxygen (as % saturation or concentration), resistivity, TDS, salinity, and seawater σ. Atmospheric pressure is measured for DO concentration compensation.

The HI 98290 with the GPS option incorporates a built-in GPS receiver and antenna that guarantees position accuracy.

Parameter Guide

Portable Meters

GUIDE	pH	ORP	EC	TDS	Resistivity	Salinity	Temperature	Ammonium	Chloride	Nitrate	Seawater σ	Seawater Specific Gravity	Turbidity	Dissolved Oxygen	Atm. Pressure	GPS	Fast Tracker™	Logging	Page
HI 9829	•	•	•	•	•	•	•	•	•	•	•		•	•	•		•	•	8.4
HI 98290	•	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•	8.4
HI 9828	•	•	•	•	•	•	•					•		•	•	•	•	•	8.12
HI 991300	•		•	•			•												8.18
HI 991301	•		•	•			•												8.18
HI 9813-5	•		•	•			•												8.20
HI 9813-6	•		•	•			•												8.20
HI 9811-5	•		•	•			•												8.22
HI 9812-5	•		•	•			•												8.22

Multiparameter Meters

Product Spotlights

HI 9813-5 • HI 9813-6

Portable Multiparameter Meters for Agriculture

8.20

HI 9813-5 and HI 9813-6 are versatile, water-resistant portable meters specifically designed for agricultural applications such as hydroponics, greenhouses, farming and nurseries.

This series of instruments feature an extra large LCD that clearly displays the parameter being measured as well as calibration instructions. Calibration is fast and easy with knobs located on the front panel of the instrument.

HI 9811-5 • HI 9812-5

Portable Multiparameter Meters for Agriculture and Ground Water

8.22

HI 9811-5 and HI 9812-5 are pH/EC/TDS water-resistant portable meters designed for simplicity in taking pH, µS/cm, ppm (mg/L) and temperature measurements. Both the HI 9811-5 and HI 9812-5 are ideal for hydroponics, greenhouses, farming and ground water applications .

Conductivity measurements are automatically compensated for temperature changes with a built-in temperature sensor. The temperature coefficient is fixed at 2%/°C.

HI 991300 • HI 991301

Slimline Multiparameter Meters

8.18

HI 991300 and HI 991301 have been designed to offer you pH, conductivity, total dissolved solids and temperature measurements all in a slim, lightweight, portable unit. For greater precision in your application, both models are available, each with different conductivity ranges. From purified to brine waters, just choose the model for your range of measurement.

The HI 1288 pre-amplified multiparameter probe features an easy to clean flat tip sensor and a cloth junction that can be pulled longer to increase the life of the probe. To ensure against interference from transient electrical noise, a solid-state amplifier is integrated into the HI 1288.

HI 9829 • HI 98290

GPS Multiparameter Meters

pH/ORP/ISE, EC/TDS/Resistivity/Salinity/Seawater σ, Turbidity, DO, Temperature and Atmospheric Pressure

- Field replaceable ISO 7027 compliant turbidity sensor
- Ammonium, chloride and nitrate ISE's
- Logging from probe or meter
- Fully customizable instrument, probe, sensors and measurement specifications
- Display from 1 to 12 parameters with font dimension adjustment
- Field replaceable sensors
- pH/ORP or pH, four electrode EC or EC/Turbidity and galvanic DO sensors
- Auto-recognition of all sensors
- Rugged probe with stainless steel tip has a diameter under 2" for wells and pipes
- Track measurement locations with GPS (HI 98290)
- Fast Tracker™–Tag I.D. System simplifies periodic monitoring
- Features a built-in barometer for DO concentration compensation
- Quick or independent sensor calibration feature
- Measurement check eliminates erroneous readings
- Logged data can be displayed as graphs
- Graphic LCD with backlight
- USB for PC connectivity
- Good Laboratory Practice feature with last five parameter calibrations recorded
- Meter accepts both alkaline and rechargeable batteries
- Waterproof protection for meter (IP67) and probes (IP 68)

Rugged, waterproof and easy to use, the HI 9829 and HI 98290 are the ideal meters for field measurements of lakes, rivers and seas. Both meters display 1 to 12 parameters simultaneously from up to 15 user selectable parameters.

Combined with one of the HI 76x9829 series probes, the HI 9829 and HI 98290 can measure water quality parameters such as pH, ORP, conductivity, turbidity, temperature, ions ammonium, nitrate, chloride (as NH_4^+–N, NO_3^-–N or Cl^-), dissolved oxygen (as % saturation or concentration), resistivity, TDS, salinity, and seawater σ. Atmospheric pressure is measured for DO concentration compensation.

The HI 98290 with the GPS option incorporates a built-in GPS receiver and antenna that guarantees position accuracy. Measurements from specific locations are tracked with detailed coordinate information that can be viewed immediately on the display.

Both meters feature a graphic, backlit LCD that scales digits to fit up to 12 parameters and allows full configuration of each parameter measured along with an on-screen graphing capability.

HELP key displays context sensitive help. The alpha-numeric keypad offers a user friendly way to complete the input fields.

The Perfect Monitoring Tool

Water scientists and managers alike utilize data-collection programs as part of environmental monitoring. These programs are designed to reveal changes in water and the environment around it over time. Reliable, dependable measurements are required to monitor these changes and understand the contributions from seasonal fluctuations, weathering, as well as manmade pollution.

HI 7609829
for pH/ORP, Dissolved Oxygen, EC

HI 76198298
for pH/ORP, Dissolved Oxygen, EC/Turbidity

HI 7629829
for pH/ORP, Dissolved Oxygen, EC, Logging

HI 7639829
for pH/ORP, Dissolved Oxygen, EC/Turbidity, Logging

Four probes to choose from. These **Digital** probes provide stable, noise-free sensor signal management without the need for pre-amplified pH sensors.

Autonomously Logging probes Available

After starting a log, the HI 7629829 and HI 7639829 logging probes can autonomously log parameters without further connection to the HI 9829 or HI 98290.

Just connect the logging probe to the HI 9829, HI 98290 or a PC to retrieve the logged measurements.

SPECIFICATIONS		HI 7609829	HI 7619829	HI 7629829	HI 7639829
Supported Configuration	**Connector 1**	pH, pH/ORP, ammonium ISE, chloride ISE, nitrate ISE			
	Connector 2	dissolved oxygen			
	Connector 3	EC	EC/Turbidity	EC	EC/Turbidity
Upgradeable		to HI 7619829, adding EC/turbidity sensor and long protective shield	–	to HI 7639829, adding EC/turbidity sensor and long protective shield	–
Temperature sensor		built-in			
Autonomous Logging		–	–	yes	yes
Logging Interval		–	–	1 second to 3 hours	
Computer Inteface		–	–	USB (HI 76982910)	
Memory		–	–	140,000 measurements (single parameter logged); 35,000 measurements (all parameters logged)	
Operating Temperature		-5 to 55°C*			
Maximum Depth		20 m (66')*			
Cable Specification		Multistrand-multiconductor shielded cable with internal strength member rated for 68 kg (150 lb.) intermittent use			
Wetted Materials		Body: ABS; Threads: nylon; Shield: ABS/316 SS; Temperature Probe: 316 SS; O-rings: EPDM			
Logging Probe Internal Battery Type		–	–	1.5V (4) AA alkaline	
Logging Probe Battery Life Note: Log space must be available for continuous logging		–	–	Interval: 1-5 seconds / 1 minute / 10 minutes	All channels logging (no averaging): 72 hours / 22 days / 70 days	All channels logging (10 sample averaging): 72 hours / 11 days / 65 days
Sample Environment		fresh, brackish, seawater			
Waterproof Protection		IP68			
Dimensions (without cable)		342 mm (13.5"), dia=46 mm (1.8")	382 mm (15.1"), dia 46 mm (1.8")	442 mm (17.4"), dia 46 mm (1.8")	482 mm (19.0"), dia 46 mm (1.8")
Weight (with batteries and sensors)		570 g (20.1 oz.)	650 g (22.9 oz.)	775 g (27.3 oz.)	819 g (28.9 oz)

* Reduced for ISE sensors

Field Ready

For field calibration, our quick calibration solution allows users to standardize pH and conductivity with one calibration solution.

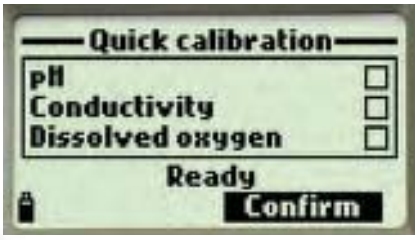
Sensors

Hanna offers a selection of 7 sensors to be used on the intelligent probes. Sensor replacement is quick and easy with screw type connectors and color coded sensors. The HI 9829 and HI 98290 automatically recognizes sensor presence.

The new HI 7609829-4 EC/turbidity sensor is field replaceable and offers readings from both parameters at the same time.

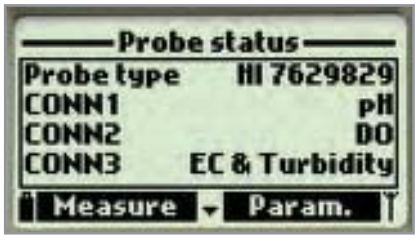
All potentiometric sensors feature a double junction design and are gel filled to increase resistance to contamination. An ISE sensor can be used in place of the pH sensor and is automatically recognized. pH in mV readings are also displayed –ideal for troubleshooting.

HI 9828-25 "Quick Calibration" solution



Quick Calibration

Simply screw the calibration beaker filled with HI 9828-25 solution onto the probe, select "Quick calibration" from the menu and press OK. Individual calibration may also be performed using multiple calibration points.



Auto-sensor recognition

In this example, the HI 9829 is identifying a pH, dissolved oxygen and turbidity/ EC sensor

A Great Combination

The use of HANNA's microprocessor based multiparameter intelligent probes with HI 9829 and HI 98290 meters will provide reliable data collection that can lead to an improved scientific understanding of the interconnections between natural, chemical and geological processes and man made pollution to effectively evaluate applications for waste-discharge permits, remediate contaminated sites and to protect or restore biological resources.

The HI 76x9829 probes utilize field replaceable sensors with auto-recognition. The sensors are housed with the probe electronics in a rugged housing with a water-tight cable connection. The HI 76909829 probe allows conductivity, pH/ORP (or an ISE), and dissolved oxygen measurement. Other probe models allow turbidity and logging.

The probes are available with a choice of cable lengths such as 4 m and 10 m and 20 m (13, 33') that utilize a DIN connection to interface with the meters. Logging probes can be connected directly to a PC with the HI 76982910 USB adapter cable, and HI 929829 PC application software to download log files directly from the probes.

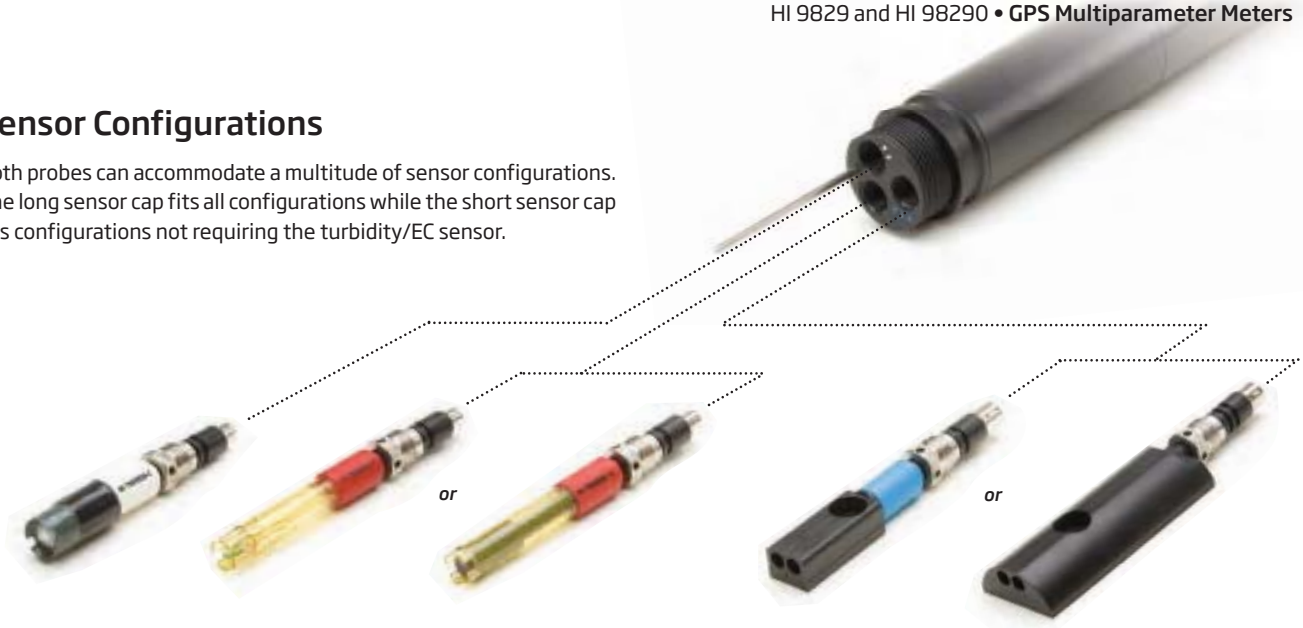
Reliable temperature measurements are a critical parameter of aquatic system monitoring. Temperature and temperature changes due to water releases can affect the ability of water to hold oxygen as well as the ability of organisms to resist certain pollutants. The intelligent probes incorporate an accurate thermistor that changes predictably with temperature changes. Accurate temperature reading in degrees Celsius, Kelvin or Fahrenheit are displayed and utilized by other detectors for temperature correction.

The HI 7609829-0 and -1 features a double junction design and are gel filled to increase resistance to contamination. These pH or pH/ORP sensors incorporate the technology that has made HANNA so successful as a pH manufacturer. Reliable pH measurements are one of the most important indicators of water chemistry indicating the relative amount of free hydrogen and hydroxyl ions in the water. HANNA's pH sensors utilize a resilient PEI body to protect them from solid particulates found water samples. Consistency and quality are the hallmarks of these sensors. Our differential measurement system further enhances the measurement reliability providing temperature corrected pH.

A choice of 3 ion selective electrodes is available for constant reporting of common surface water contaminants. Nitrate,

Sensor Configurations

Both probes can accommodate a multitude of sensor configurations. The long sensor cap fits all configurations while the short sensor cap fits configurations not requiring the turbidity/EC sensor.



Dissolved Oxygen
HI 7609829-2 DO

pH
HI 7609829-0 pH
HI 7609829-1 pH/ORP

ISE
HI 7609829-10 Ammonium ISE
HI 7609829-11 Chloride ISE
HI 7609829-12 Nitrate ISE

Conductivity
HI 7609829-3 EC

Conductivity and Turbidity
HI 7609829-4 EC/Turbidity

HI 7698295 Short cap for probes without EC/turbidity sensor

HI 7698296 Long cap for probes with EC/turbidity sensor

ammonium and chloride ISE's are available. Each ISE is a combination electrode incorporating an extremely constant reference spiral; all potentionmetric probes feature a double junction and solid gelled reference design. By utilizing conductivity, the HI 9829 and HI 98290 can convert ion activity measurements to concentration units. The HI 9829(0) displays these measurements as ppm ammonium-nitrogen, ppm chloride and ppm nitrate-nitrogen.

The HI 7609829-3 4-electrode conductivity sensor using the polarographic measurement principal ensures stable conductivity readings. Electrolytic conductivity measures of the ability of water to conduct an electrical current. It is highly dependent on the amount of dissolved solids (such as salt) in the water. Absolute conductivity, temperature corrected conductivity, salinity, Seawater σ and water hardness (TDS) determinations are possible with measurements from this sensor.

The oxygen dissolved in lakes, rivers, and oceans is crucial for the organisms and creatures living in it. If dissolved oxygen concentrations drop below normal levels in water bodies, the water quality degrades and the organisms begin to die off. The HI 7609829-2 galvanic DO sensor does not require long polarization times so is ready for measurement at a moment's notice. This sensor also utilizes a replaceable cap design for ease of maintenance and a safe non-toxic electrolyte. DO readings are compensated for the effects of temperature (using the probes built-in temperature sensor) and atmospheric pressure (using the HI 9829 and HI 98290's internal atmospheric pressure sensor). The DO measurement complies with standard methods 4500-O G. and EPA article 360.1.

The HI 7609829-4 combined EC/turbidity sensor is a replaceable design for instantaneous conductivity and turbidity measurements that conform to ISO 7027 standards. It provides measurements from 0.0 to 1000 FNU. Turbidity is the amount of particulate matter that is suspended in water. Turbidity measures the scattering effect that suspended solids have on light: the higher the intensity of scattered light, the higher the turbidity. Material that causes water to be turbid include: clay, silt, finely divided organic and inorganic matter, soluble colored organic compounds, plankton and microscopic organisms. Conductivity measurement is the same as in the HI 7609829-3.

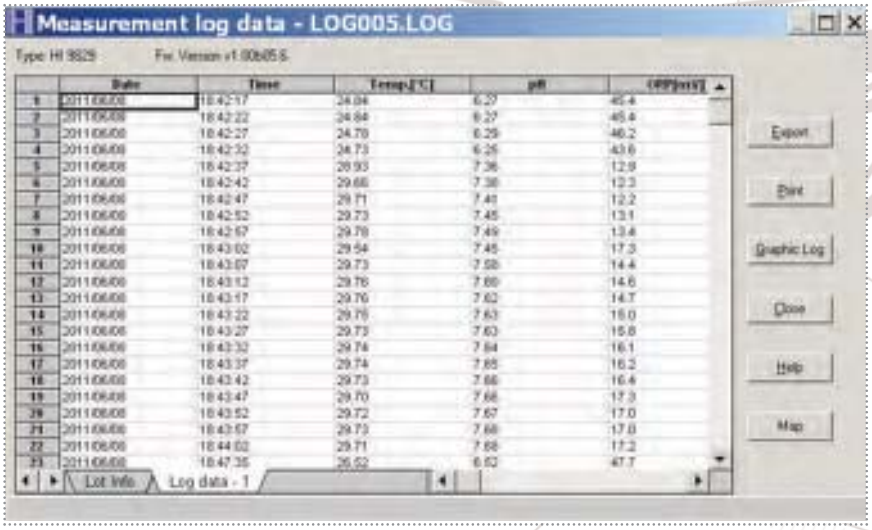
Probes with the logging function have a logging memory that allows storage of up to 140,000 individual samples or 35,000 complete sample data sets with date and time stamp thus permitting up to a 70 day deployment with all channels logging at 10 minute intervals. The probe incorporates a temperature sensor for temperature compensation of all parameters.

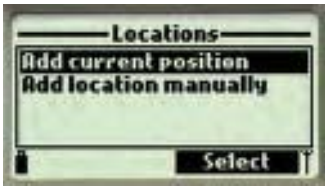
Monitoring and Tracking

The HI 98290 with GPS module can track measurement locations with detailed coordinate information. All models of the HI 9829 are equipped with the Fast Tracker™ TAG ID system which is an invaluable tool for associating measurements with their locations. HI 9829(0) meters also incorporate a real-time clock which stamps all logged data with a time and date in addition to location information.

GPS (Global Positioning System)

The new HI 98290 features an internal 12 channel GPS receiver and antenna that calculates its position to track locations along with measurement data. The GPS tracks your location using satellites to within 30 ft (10 m) so you can be sure that you return to the same location for repeated measurements. The GPS coordinates can be shown on the LCD together with up to 10 measurement parameters and are recorded with logged data. Users can connect to GPS tracking software such as Google™ Maps* to view locations where samples have been taken. Measurement information is shown right on the map.

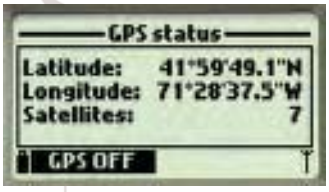




GPS data can be customized to meet specific requirements.

Displays distances between current and predefined locations.

Display current readings along with GPS coordinates



Shows current position and number of satellites.

Basic GPS Features

- GPS coordinates shown on the LCD with up to 10 measurement parameters
- GPS signal strength shown on LCD
- Logged data is embedded with GPS coordinates
- GPS status screen

Advanced GPS Features

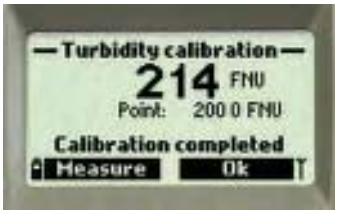
- Users can associate GPS coordinates with alphanumeric locations
- Distances between current location and predefined locations are displayed arranged by distance
- Memorizes last location and time should signal be lost

HI 929829 PC Application Software

- Manages logged data from the HI 9829
- Displays GPS coordinates with logged data
- Automatically maps samples on your PC (internet connection required)
- Shows location points on map with measurement data

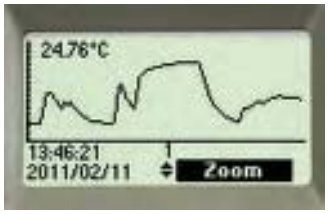
*Google™ is a registered trademark of Google™, inc. HANNA Instruments® has no affiliation with Google™.

Intuitive Configuration, Measurement and Help



Calibration

Calibration with the HI 9829(0) is easy and intuitive.



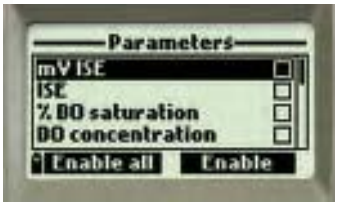
Graphing

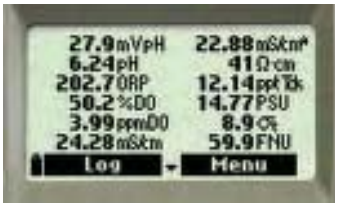
Trend graphing may be viewed on the display or transferred to a PC. The sample date and time stamp will also be displayed.

Help

The context sensitive help screen is always accessible.

Fully Configurable Measurement Screen





Fast Tracker™–Tag Identification System

HANNA's Fact Tracker™–Tag Identification System simplifies test logging. iButton®s with a unique ID can be installed at various sampling sites. When the matching connector on the meter contacts the location button, measurements are logged and labeled with the alphanumeric user-entered location ID. Location, date, time and measurements are logged into the meter which can be transferred to a PC. The Fast Tracker™ system complements the GPS for ultimate tracking.

FastTracker™
A new revolution in organized data management

iButton® Tags are Easy to Install

Install the optional TAGs near your sampling points for quick and easy iButton® readings. Each TAG contains a computer chip with a unique identification code encased in stainless steel. You can install a practically unlimited amount of TAGs. Additional TAGs can be ordered for all of your traceability requirements.

SPECIFICATIONS	HI 9829	HI 98290 with GPS
Temperature Compensation	automatic from -5 to 55°C (23 to 131°F)	
GPS	–	12 channel receiver
Logging Memory from Meter	44,000 records	
Logging Interval	1 second to 3 hours	
Computer Interface	USB (with HI 929829 software)	
FastTracker™ TAG ID	Yes	
Waterproof Protection	IP67	
Environment	0 to 50°C (32 to 122°F); RH 100%	
Power Supply	1.5V alkaline C cells (4) / 1.2V NiMH rechargeable C cells (4), USB, 12V power adapter	
Dimensions	221 x 115 x 55 mm (8.7 x 4.5 x 2.2")	
Weight	750g (26.5 oz.)	

SPECIFICATIONS	HI 9829 and HI 98290 PARAMETERS					
	pH / mV of pH input		**ORP mV**	**Ammonium-Nitrogen**	**Chloride**	**Nitrate-Nitrogen**
Range	0.00 to 14.00 pH / ±600.0 mV		±2000.0 mV	0.02 to 200 ppm (as N)	0.6 to 200 ppm	0.62 to 200 ppm (as N)
Resolution	0.01 pH / 0.1 mV		0.1 mV	0.01 ppm to 1 ppm; 0.1 ppm to 200 ppm		
Accuracy	±0.02 pH / ±0.5 mV		±1.0 mV	±5% of reading or 2 ppm, whichever is greater		
	Conductivity	**TDS**	**Resistivity**	**Salinity**	**Seawater σ**	
Range	0 to 200 mS/cm (absolute EC up to 400 mS/cm)	0 to 400000 mg/L or ppm (the maximum value depends on the TDS factor)	0 to 999999 Ω•cm; 0 to 1000.0 kΩ•cm; 0 to 1.0000 MΩ•cm	0.00 to 70.00 PSU	0 to 50.0 $\sigma_t, \sigma_0, \sigma_{15}$	
Resolution	**manual:** 1 µS/cm; 0.001 mS/cm; 0.01 mS/cm; 0.1 mS/cm; 1 mS/cm; **automatic:** 1 µS/cm from 0 to 9999 µS/cm; 0.01 mS/cm from 10.00 to 99.99 mS/cm; 0.1 mS/cm from 100.0 to 400.0 mS/cm; **automatic mS/cm:** 0.001 mS/cm from 0.000 to 9.999 mS/cm; 0.01 mS/cm from 10.00 to 99.99 mS/cm; 0.1 mS/cm from 100.0 to 400.0 mS/cm	**manual:** 1 mg/L (ppm); 0.001 g/L (ppt); 0.01g/L (ppt); 0.1 g/L (ppt); 1 g/L (ppt); **autorange scales:** 1 mg/L (ppm) from 0 to 9999 mg/L (ppm); 0.01 g/L (ppt) from 10.00 to 99.99 g/L (ppt); 0.1 g/L (ppt) from 100.0 to 400.0 g/L (ppt); **autorange g/L (ppt) scales:** 0.001 g/L (ppt) from 0.000 to 9.999 g/L (ppt); 0.01 g/L (ppt) from 10.00 to 99.99 g/L (ppt); 0.1 g/L (ppt) from 100.0 to 400.0 g/L (ppt)	dependent on resistivity reading	0.01 PSU	0.1 $\sigma_t, \sigma_0, \sigma_{15}$	
Accuracy	±1% of reading or ±1 µS/cm, whichever is greater	±1% of reading or ±1 mg/L, whichever is greater		±2% of reading or ±0.01 PSU, whichever is greater	±1 $\sigma_t, \sigma_0, \sigma_{15}$	
	Turbidity	**Dissolved Oxygen**	**Atm. Pressure**	**Temperature**		
Range	0.0 to 99.9 FNU; 100 to 1000 FNU	0.0 to 500.0%; 0.00 to 50.00 ppm	450 to 850 mm Hg; 17.72 to 33.46 in Hg; 600.0 to 1133.2 mbar; 8.702 to 16.436 psi; 0.5921 to 1.1184 atm; 60.00 to 113.32 kPa	-5.00 to 55.00°C; 23.00 to 131.00°F; 268.15 to 328.15K		
Resolution	0.1 FNU from 0.0 to 99.9 FNU; 1 FNU from 100 to 1000 FNU	0.1%; 0.01 ppm	0.1 mm Hg; 0.01 in Hg; 0.1 mbar; 0.001 psi; 0.0001 atm; 0.01 kPa	0.01°C; 0.01°F; 0.01K		
Accuracy	±0.3 FNU or ±2% of reading, whichever is greater	0.0 to 300.0%: ±1.5% of reading or ±1.0% whichever is greater; 300.0 to 500.0%: ±3% of reading; 0.00 to 30.00 ppm: ±1.5% of reading or 0.10 ppm, whichever is greater; 30.00 ppm to 50.00 ppm: ±3% of reading	±3 mm Hg within ±15°C from the temperature during calibration	±0.15°C; ±0.27°F; ±0.15K		

ORDERING INFORMATION

Sensors for all meter and probe configurations are sold separately. Choose your configuration below:

METER ONLY, CARTON BOX PACKAGING

HI 9829-01 Meter only, charging adapter and instruction manual, 115VAC
HI 9829-02 Same as HI 9829-01, for 230VAC
HI 98290-01 Meter only with GPS, charging adapter and instruction manual, 115VAC
HI 98290-02 Same as HI 98290-01, for 230VAC

METER AND PROBE ONLY, NO SENSORS, CARRYING CASE PACKAGING

HI 98291-01 HI 9829 and HI 7629829/4 logging probe for pH/pH+ORP/ISE, DO, EC, temperature, with 4 m (13.1') cable, probe maintenance kit, charging adapter, instruction manual and hard carrying case, 115VAC
HI 98291-02 Same as HI 98291-01, for 230VAC
HI 98292-01 HI 9829 and HI 7639829/4 logging probe for pH/pH+ORP/ISE, DO, EC+turbidity, temperature, with 4 m (13.1') cable, probe maintenance kit, charging adapter, instruction manual and hard carrying case, 115VAC
HI 98292-02 Same as HI 98292-01, for 230VAC
HI 98293-01 HI 9829 and HI 7629829/10 logging probe for pH/pH+ORP/ISE, DO, EC, temperature, with 10 m (33') cable, probe maintenance kit, charging adapter, instruction manual and hard carrying case, 115VAC
HI 98293-02 Same as HI 98293-01, for 230VAC
HI 98294-01 HI 9829 and HI 7639829/10 logging probe for pH/pH+ORP/ISE, DO, EC+turbidity, temperature, with 10 m (33') cable, probe maintenance kit, charging adapter, instruction manual and hard carrying case, 115VAC
HI 98294-02 Same as HI 98294-01, for 230VAC
HI 98295-01 HI 98290 with GPS and HI 7629829/4 logging probe for pH/pH+ORP/ISE, DO, EC, temperature, with 4 m (13.1') cable, probe maintenance kit, charging adapter, instruction manual and hard carrying case, 115VAC
HI 98295-02 Same as HI 98295-01, for 230VAC
HI 98296-01 HI 98290 with GPS and HI 7639829/4 logging probe for pH/pH+ORP/ISE, DO, EC+turbidity, temperature, with 4 m (13.1') cable, probe maintenance kit, charging adapter, instruction manual and hard carrying case, 115VAC
HI 98296-02 Same as HI 98296-01, for 230VAC
HI 98297-01 HI 98290 with GPS and HI 7629829/10 logging probe for pH/pH+ORP/ISE, DO, EC, temperature, with 10 m (33') cable, probe maintenance kit, charging adapter, instruction manual and hard carrying case, 115VAC
HI 98297-02 Same as HI 98297-01, for 230VAC
HI 98298-01 HI 98290 with GPS and HI 7639829/10 logging probe for pH/pH+ORP/ISE, DO, EC+turbidity, temperature, with 10 m (33') cable, probe maintenance kit, charging adapter, instruction manual and hard carrying case, 115VAC
HI 98298-02 Same as HI 98298-01, for 230VAC

PROBE ONLY, NO SENSORS, CARTON BOX PACKAGING

HI 7609829/4 Probe for pH/pH+ORP/ISE, DO, EC, temperature with HI 7698295 short protective shield and 4 m (13.1') cable
HI 7609829/10 Probe for pH/pH+ORP/ISE, DO, EC, temperature with HI 7698295 short protective shield and 10 m (33') cable
HI 7619829/4 Probe for pH/pH+ORP/ISE, DO, EC+turbidity, temperature, with HI 7698296 long protective shield and 4 m (13.1') cable
HI 7619829/10 Probe for pH/pH+ORP/ISE, DO, EC+turbidity, temperature, with HI 7698296 long protective shield and 10 m (33') cable
HI 7629829/4 Logging probe for pH/pH+ORP/ISE, DO, EC, temperature with HI 7698295 short protective shield and 4 m (13.1') cable
HI 7629829/10 Logging probe for pH/pH+ORP/ISE, DO, EC, temperature with HI 7698295 short protective shield and 10 m (33') cable
HI 7639829/4 Logging probe for pH/pH+ORP/ISE, DO, EC+turbidity, temperature, with HI 7698296 long protective shield, and 4 m (13.1') cable
HI 7639829/10 Logging probe for pH/pH+ORP/ISE, DO, EC+turbidity, temperature, with HI 7698296 long protective shield, and 10 m (33') cable

SENSORS WITH O-RING

HI 7609829-0 pH
HI 7609829-1 pH/ORP
HI 7609829-2 Dissolved oxygen
HI 7609829-3 EC
HI 7609829-4 EC/Turbidity
HI 7609829-10 Ammonium ISE
HI 7609829-11 Chloride ISE
HI 7609829-12 Nitrate ISE

QUICK CALIBRATION SOLUTIONS

HI 9828-25 Quick calibration solution, 500 mL
HI 9828-27 Quick calibration solution, 1 gal.

pH CALIBRATION SOLUTIONS

HI 7004L pH 4.01 buffer solution, 500 mL
HI 7007L pH 7.01 buffer solution, 500 mL
HI 7010L pH 10.01 buffer solution, 500 mL

ORP CALIBRATION SOLUTIONS

HI 7021L ORP test solution @240 mV, 500 mL
HI 7022L ORP test solution @470 mV, 500 mL

CONDUCTIVITY CALIBRATION SOLUTIONS

HI 7030L 12880 µS/cm cal. sol., 500 mL
HI 7031L 1413 µS/cm cal. sol., 500 mL
HI 7033L 84 µS/cm cal. sol., 500 mL
HI 7034L 80000 µS/cm cal. sol., 500 mL
HI 7035L 111800 µS/cm cal. sol., 500 mL
HI 7039L 5000 µS/cm cal. sol., 500 mL

DISSOLVED OXYGEN SOLUTIONS

HI 7040L Zero oxygen solution, 500 mL
HI 7042S Electrolyte solution, 30 mL

TURBIDITY CALIBRATION SOLUTIONS

HI 9829-16 0 FNU calibration solution, 230 mL
HI 9829-17 20 FNU calibration solution, 230 mL
HI 9829-18 200 FNU calibration solution, 230 mL

ISE STANDARDS

HI 9829-10/11 Kit containing 10 sachets each of 10 ppm and 100 ppm standard for HI 7609829-10 ammonium ISE
HI 9829-10 10 ppm standard sachet for HI 7609829-10 ammonium ISE, 25 mL (25)
HI 9829-11 100 ppm standard sachet for HI 7609829-10 ammonium ISE, 25 mL (25)
HI 9829-12/13 Kit containing 10 sachets each of 10 ppm and 100 ppm standard for HI 7609829-11 chloride ISE
HI 9829-12 10 ppm standard sachet for HI 7609829-11 chloride ISE, 25 mL (25)
HI 9829-13 100 ppm standard sachet for HI 7609829-11 chloride ISE, 25 mL (25)
HI 9829-14/15 Kit containing 10 sachets each of 10 ppm and 100 ppm standard for HI 7609829-12 nitrate ISE
HI 9829-14 10 ppm standard sachet for HI 7609829-12 nitrate ISE, 25 mL (25)
HI 9829-15 100 ppm standard sachet for HI 7609829-12 nitrate ISE, 25 mL (25)

PROBE MAINTENANCE KIT

HI 7698292 Probe maintenance kit consisting of HI 7042S (electrolyte solution for DO sensor), O-rings for DO sensor (5), small brush, O-rings for probe (5), and syringe with grease to lubricate the O-rings.

pH/ORP CLEANING AND STORAGE SOLUTIONS

HI 70300L pH/ORP electrode storage sol., 500 mL
HI 7061L pH/ORP electrode cleaning sol., 500 mL

ACCESSORIES

HI 929829 PC application software
HI 7698291 USB cable, PC to meter
HI 76982910 USB cable, PC to probe
HI 710046 Cigarette lighter cable
HI 7698290 Short calibration beaker
HI 7698293 Long calibration beaker
HI 7698294 Short flow cell
HI 7698297 Long, quick release flow cell
HI 7698295 Short protective shield
HI 7698296 Long protective shield
HI 920005 iButton® with holder (5 pcs)
HI 710140 Hard carrying case
HI 710045 Power supply cable

For a complete list of Solutions, see the end of pH *Section 3*, ISE *Section 4*, Conductivity *Section 6*, Dissolved Oxygen *Section 7* and Turbidity *Section 12*.

HI 9828

GPS Multiparameter Meter

- **Display up to 12 parameters**
- **Track measurement locations with GPS**
- **Waterproof protection for meter** (IP67) **and probe** (IP68)
- **Fast Tracker™–Tag I.D. System simplifies test logging**
- **Graphic LCD with backlight**
- **Built-in barometer for DO compensation**
- **Quick calibration feature**
- **Measurement check eliminates erroneous readings**
- **Auto recognition of pH and pH/ORP probe**
- **Logger function records the data of all connected sensors**
- **Log on demand and automatic logging** (up to 60,000 samples)
- **Logged data can be displayed as graphs**
- **USB for PC connectivity**
- **Autorange of EC and TDS readings**
- **Good Laboratory Practice feature with last 5 calibrations recorded**
- **Field replaceable sensors**
- **Meter accepts both alkaline and rechargeable batteries**
- **Rugged probe with stainless steel tip has a diameter under 2" for wells and pipes**

Measure pH, pH/mV, ORP, % saturation DO, mg/L DO, EC, absolute EC, resistivity, TDS, salinity, seawater specific gravity, atmospheric pressure and temperature

The HI 9828 multiparameter meter with GPS receiver monitors up to 13 different water quality parameters (6 measured, 7 calculated). Measurements include pH, pH/mV, ORP, % saturation DO, mg/L DO, EC, absolute EC, resistivity, TDS, salinity, seawater specific gravity, atmospheric pressure and temperature.

Measurements from specific locations are tracked with detailed coordinate information that can be viewed immediately on the display. GPS information can be transferred to a PC using HANNA's HI 929828 software. GPS information can also be viewed by GPS mapping software such as Google™ maps*. Clicking on visited locations using mapping software such as Google™ Maps displays measurement information. The built-in 12 channel GPS receiver and antenna guarantees a position accuracy of 30 ft (10 m).

For measuring points within a 30 ft range or where GPS signals are not available, HI 9828's Fast Tracker™ is invaluable for associating measurements with their locations.

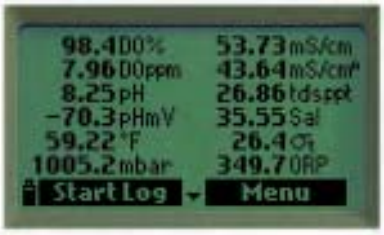
HANNA's exclusive Fast Tracker™–Tag I.D. System monitors and records data using iButton®s that can be installed at any number of sampling sites.

The HI 9828 has a graphic, backlit LCD that automatically sizes the digits to fit the screen and allows full configuration of each parameter measured along with on-screen graphing capability. The meter incorporates comprehensive GLP features and the downloading of data via USB connection.

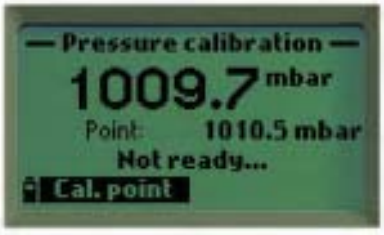
Each parameter is supported by on-screen context sensitive help, both in the calibration mode and during measurement.

Designed for outdoor environments, the meter is impact resistant and waterproof meeting IP67 standards (30 minutes immersion under 1 m of water). The multi-sensor probe can be left underwater in accordance with IP68 standards.

Fully Configurable Measurement Screen



Intuitive Configuration, Measurement and Help



Pressure

Atmospheric pressure calibration and measurement can be made in a choice of units.

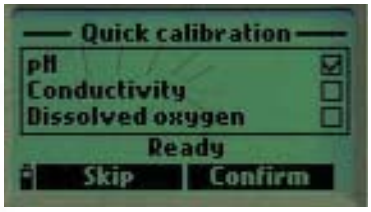
Graphing

Trend graphing may be viewed on the display or transferred to a PC. The sample date and time stamp will also be displayed.

Help

The context sensitive help screen is always accessible.

Quick Calibration



Quick calibration

In the field, the Quick Calibration feature verifies probe functionality and calibration with a single calibration solution (HI 9828-25). Simply screw the calibration beaker filled with solution onto the probe, select "Quick calibration" from the menu and press OK. Individual calibration may also be performed using multiple calibration points.

Field ready

For field calibration, our quick calibration solution allows users to standardize pH and conductivity with one solution.

HI 769828 Multiparameter, Intelligent Probe

HANNA's HI 769828 multiparameter probe incorporates a built-in microprocessor and amplifier that convert the high impedance signals from the sensors of the probe to eliminate common problems such as cable length limitations and noise associated with high impedance signals. This allows the probe to have a reliable communication with the meter and also immediately warns the user of problems such as a broken cable. The standard cable lengths of the probe are 4, 10 and 20 meters (13, 32 and 64 feet) and custom lengths are also available.

The probe also features HANNA's Quick Calibration which allows the user to calibrate pH and conductivity with one solution in a single, simple step. Dissolved oxygen is also calibrated in one step in saturated air. The probe houses 5 of the 6 measured parameters: pH, ORP, EC, dissolved oxygen and temperature. The sensors are all independently replaceable and are easy to maintain and keep clean. The sensors are protected by an outer PVC/stainless steel sleeve and cap which is suitable for use in 2" wells. The probe housing complies with IP68 standard.

Sensor replacement is quick and easy with screw type connectors and color coded sensors.

The Galvanic DO sensor does not require polarization time so it's ready at a moment's notice.

The 4-ring conductivity system ensures stable conductivity readings that are immune to surface coating. Absolute conductivity, temperature corrected conductivity, salinity, specific gravity and TDS determinations are possible with measurements from this sensor.

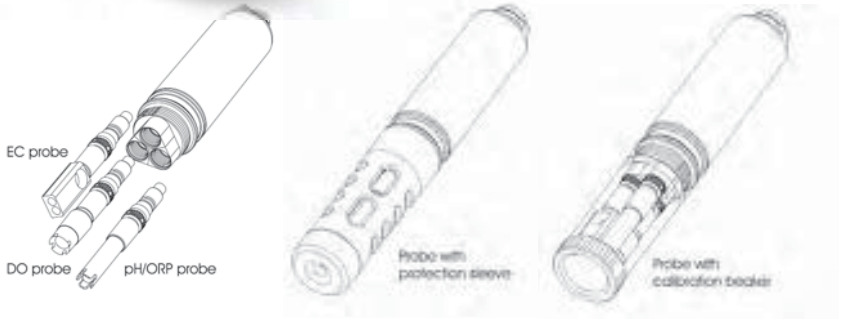
The HI 9828 automatically recognizes the presence of either the pH or pH/ORP sensor.

Both sensors have a cloth junction which allows greater sensitivity, and are gel filled for improved resistance to contamination.

The meter also displays pH in mV readings–ideal for troubleshooting.

HI 9828 is supplied complete with a probe maintenance kit.

This kit includes HI 7042S (electrolyte solution for DO sensor), (5) O-rings for DO sensor, a small brush, (5) O-rings for multiparameter probe and a syringe with grease to lubricate the O-rings.



PROBE REORDER INFORMATION

HI 769828 pH/ORP, EC, DO, temperature multisensor probe with cable.

Configure your HI 769828:

HI 769828/4	DO/EC/°C probe with 4 m cable
HI 769828/10	DO/EC/°C1 probe with 10 m cable
HI 769828/20	DO/EC/°C probe with 20 m cable
HI 769828/30	DO/EC/°C probe with 30 m cable
HI 769828/40	DO/EC/°C probe with 40 m cable
HI 769828/50	DO/EC/°C probe with 50 m cable
HI 769828/60	DO/EC/°C probe with 60 m cable
HI 769828/70	DO/EC/°C probe with 70 m cable
HI 769828/80	DO/EC/°C probe with 80 m cable
HI 769828/90	DO/EC/°C probe with 90 m cable
HI 769828/100	DO/EC/°C probe with 100 m cable

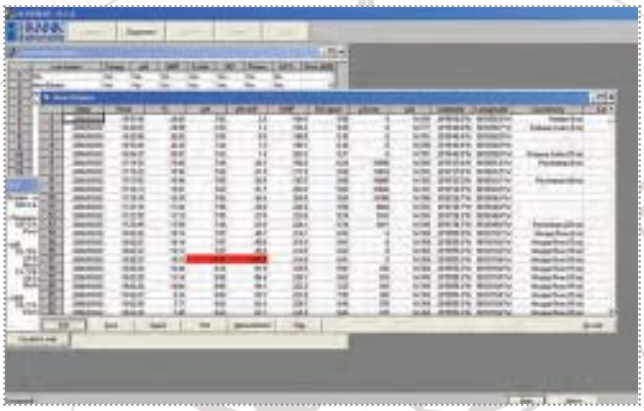
GPS (Global Positioning System) Enabled

The new HI 9828 features an internal 12 channel GPS receiver and antenna that calculates its position to track locations along with measurement data. The GPS tracks your location using satellites to within 30 ft (10 m).

GPS coordinates are shown on the LCD with up to 10 measurement parameters. The LCD also displays the GPS signal strength, number of satellites and logged data embedded with GPS coordinates.

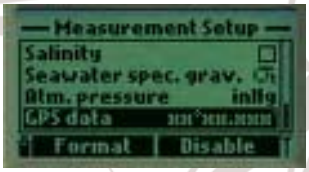
Users can associate GPS coordinates with alphanumeric locations and distances between current location and predefined locations are displayed arranged by distance. In the case of GPS signal loss, the HI 9828 memorizes the last location and time.

HI 929828 PC Software manages logged data from the HI 9828 and displays GPS coordinates along with logged data.



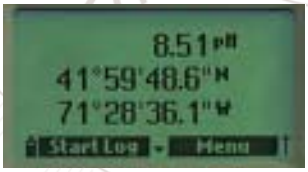
Track Measurement Locations

Users can connect to GPS tracking software such as Google™ Maps* to view locations where samples have been taken. Measurement information is shown right on the map.

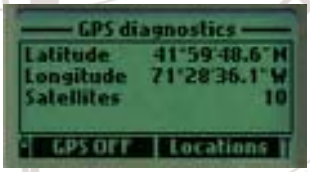


GPS data can be customized to meet specific requirements.

Displays distances between current location and predefined locations.



Display current readings along with GPS coordinates



Shows current position and number of satellites.

FastTracker™
A new revolution in organized data management

Fast Tracker™–Tag Identification System

HANNA's Fast Tracker™–Tag Identification System simplifies test logging. iButton®s with a unique ID can be installed at various sampling sites. When the matching connector on the meter contacts the location button, measurements are logged and labeled with the alphanumeric user entered location ID. Location, date, time and measurements are logged into the meter which can be transferred to a PC. The Fast Tracker™ system complements the GPS for ultimate tracking.

*Google™ is a registered trademark of Google™, inc. HANNA Instruments® has no affiliation with Google™.

SPECIFICATIONS		HI 9828
pH	**Range**	0.00 to 14.00 pH
	Resolution	0.01 pH
	Accuracy	±0.02 pH
mV of pH Input	**Range**	±600.0 mV
	Resolution	0.1 mV
	Accuracy	±0.5 mV
ORP	**Range**	±2000.0 mV
	Resolution	0.1 mV
	Accuracy	±1.0 mV
Dissolved Oxygen	**Range**	0.0 to 500.0% / 0.00 to 50.00 mg/L
	Resolution	0.1% / 0.01 mg/L
	Accuracy	0.0 to 300.0%: ±1.5% of reading or ±1.0% whichever is greater; 300.0 to 500.0%: ±3% of reading; 0.00 to 30.00 mg/L: ±1.5% of reading or 0.10 mg/L whichever is greater; 30.00 mg/L to 50.00 mg/L: ±3% of reading
Conductivity	**Range**	0.000 to 200.000 mS/cm (absolute EC up to 400 mS/cm)
	Resolution	**manual:** 1 µS/cm; 0.001 mS/cm; 0.01 mS/cm; 0.1 mS/cm; 1 mS/cm; **automatic:** 1 µS/cm from 0 to 9999 µS/cm; 0.01 mS/cm from 10.00 to 99.99 mS/cm ; 0.1 mS/cm from 100.0 to 400.0 mS/cm; **automatic mS/cm:** 0.001 mS/cm from 0.000 to 9.999 mS/cm; 0.01 mS/cm from 10.00 to 99.99 mS/cm; 0.1 mS/cm from 100.0 to 400.0 mS/cm
	Accuracy	±1% of reading or ±1 µS/cm whichever is greater
Resistivity	**Range**	0 to 999999 Ω•cm; 0 to 1000.0 kΩ•cm; 0 to 1.0000 MΩ•cm
	Resolution	dependent on resistivity reading
TDS	**Range**	0 to 400000 mg/L or ppm (the maximum value depends on the TDS factor)
	Resolution	**manual:** 1 mg/L (ppm); 0.001 g/L (ppt); 0.01g/L (ppt); 0.1 g/L (ppt); 1 g/L (ppt); **autorange scales:** 1 mg/L (ppm) from 0 to 9999 mg/L (ppm); 0.01 g/L (ppt) from 10.00 to 99.99 g/L (ppt); 0.1 g/L (ppt) from 100.0 to 400.0 g/L (ppt); **autorange g/L (ppt) scales:** 0.001 g/L (ppt) from 0.000 to 9.999 g/L (ppt); 0.01 g/L (ppt) from 10.00 to 99.99 g/L (ppt); 0.1 g/L (ppt) from 100.0 to 400.0 g/L (ppt)
	Accuracy	±1% of reading or ±1 mg/L (ppm) whichever is greater
Salinity	**Range**	0.00 to 70.00 PSU (Extended Practical Salinity Scale)
	Resolution	0.01 PSU
	Accuracy	±2% of reading or 0.01 PSU whichever is greater
Seawater Specific Gravity	**Range**	0.0 to 50.0 σ_t, σ_0, σ_{15}
	Resolution	0.1 σ_t, σ_0, σ_{15}
	Accuracy	±1 σ_t, σ_0, σ_{15}
Atm. Pressure	**Range**	450 to 850 mmHg; 17.72 to 33.46 inHg; 600.0 to 1133.2 mbar; 8.702 to 16.436 psi; 0.5921 to 1.1184 atm; 60.00 to 113.32 kPa
	Resolution	0.1 mmHg; 0.01 inHg; 0.1 mbar; 0.001 psi; 0.0001 atm; 0.01 kPa
	Accuracy	±3 mmHg within ±15°C from the calibration temperature
Temperature	**Range**	-5.00 to 55.00°C; 23.00 to 131.00°F; 268.15 to 328.15K
	Resolution	0.01°C; 0.01°F; 0.01K
	Accuracy	±0.15°C; ±0.27°F; ±0.15K
Calibration	**pH**	automatic one, two, or three points with five memorized standard buffers (pH 4.01, 6.86, 7.01, 9.18, 10.01) or one custom buffer
	ORP	automatic at one custom point
	Conductivity	automatic one point with six memorized standards (84 µS/cm, 1413 µS/cm, 5.00 mS/cm, 12.88 mS/cm, 80.0 mS/cm, 111.8 mS/cm) or custom point
	DO	automatic one or two points at 0, 100% or one custom point
	Resistivity, TDS, σ	based on conductivity or salinity calibration
	Salinity	one custom point
	Atm. Pressure, Temp.	automatic at one custom point
Temperature Compensation		automatic from -5 to 55°C (23 to 131°F)
Logging Memory		up to 60,000 samples with 13 measurements each; Up to 45,000 samples with 15 measurements each (GPS)
Logging Interval		1 second to 3 hours
Computer Interface		USB (with HI 929829 software)
Waterproof Protection		meter IP67, probe IP68
Environment		0 to 50°C (32 to 122°F); RH 100%
Power Supply		1.5V alkaline C cells (approximately 150 hours of continuous use without backlight) (4) / 1.2V rechargeable C cells (approximately 70 hours of continuous use without backlight) (4)
Dimensions Meter / Probe		221 x 115 x 55 mm (8.7 x 4.5 x 2.2") / 270 x 46 mm DIA (10.6 x 1.8" DIA)
Weight		**meter:** 750g (26.5 oz.); **probe:** 750g (26.5 oz.)

ORDERING INFORMATION

HI 9828 configurations are supplied with HI 769828 multisensor probe (pH/ORP, EC, DO, temperature), HI 9828-25 quick calibration standard solution (500 mL), probe maintenance kit, rechargeable C size Ni-MH batteries (4), power adapter & cable, car 12V accessory outlet adapter, HI 7698281 USB interface cable, HI 92828 Windows® compatible software and instruction manual in a rugged carrying case.

Choose your configuration below:

HI 982804-01	HI 9828 with GPS and 4 m (13.1') probe cable, 115VAC
HI 982804-02	HI 9828 with GPS and 4 m (13.1') probe cable, 230VAC
HI 9828010-01	HI 9828 with GPS and 10 m (33') probe cable, 115VAC
HI 9828010-02	HI 9828 with GPS and 10 m (33') probe cable, 230VAC
HI 9828020-01	HI 9828 with GPS and 20 m (66') probe cable, 115VAC
HI 9828020-02	HI 9828 with GPS and 20 m (66') probe cable, 230VAC
HI 9828030-01	HI 9828 with GPS and 30 m (98') probe cable, 115VAC
HI 9828030-02	HI 9828 with GPS and 30 m (98') probe cable, 230VAC
HI 9828040-01	HI 9828 with GPS and 40 m (131') probe cable, 115VAC
HI 9828040-02	HI 9828 with GPS and 40 m (131') probe cable, 230VAC
HI 9828050-01	HI 9828 with GPS and 50 m (164') probe cable, 115VAC
HI 9828050-02	HI 9828 with GPS and 50 m (164') probe cable, 230VAC
HI 9828060-01	HI 9828 with GPS and 60 m (200') probe cable, 115VAC
HI 9828060-02	HI 9828 with GPS and 60 m (200') probe cable, 230VAC
HI 9828070-01	HI 9828 with GPS and 70 m (230') probe cable, 115VAC
HI 9828070-02	HI 9828 with GPS and 70 m (230') probe cable, 230VAC
HI 9828080-01	HI 9828 with GPS and 80 m (262') probe cable, 115VAC
HI 9828080-02	HI 9828 with GPS and 80 m (262') probe cable, 230VAC
HI 9828090-01	HI 9828 with GPS and 90 m (295') probe cable, 115VAC
HI 9828090-02	HI 9828 with GPS and 90 m (295') probe cable, 230VAC
HI 98280100-01	HI 9828 with GPS and 100 m (328') probe cable, 115VAC
HI 98280100-02	HI 9828 with GPS and 100 m (328') probe cable, 230VAC
HI 9828/4-01	HI 9828 and 4 m (13.1') probe cable, no GPS, 115VAC
HI 9828/4-02	HI 9828 and 4 m (13.1') probe cable, no GPS 230VAC
HI 9828/10-01	HI 9828 and 10 m (33') probe cable, no GPS, 115VAC
HI 9828/10-02	HI 9828 and 10 m (33') probe cable, no GPS, 230VAC
HI 9828/20-01	HI 9828 and 20 m (66') probe cable, no GPS, 115VAC
HI 9828/20-02	HI 9828 and 20 m (66') probe cable, no GPS, 230VAC
HI 9828/30-01	HI 9828 with GPS and 30 m (98') probe cable, no GPS, 115VAC
HI 9828/30-02	HI 9828 and 30 m (98') probe cable, no GPS, 230VAC
HI 9828/40-01	HI 9828 and 40 m (131') probe cable, no GPS, 115VAC
HI 9828/40-02	HI 9828 and 40 m (131') probe cable, no GPS, 230VAC
HI 9828/50-01	HI 9828 and 50 m (164') probe cable, no GPS, 115VAC
HI 9828/50-02	HI 9828 and 50 m (164') probe cable, no GPS, 230VAC
HI 9828/60-01	HI 9828 and 60 m (200') probe cable, no GPS, 115VAC
HI 9828/60-02	HI 9828 and 60 m (200') probe cable, no GPS, 230VAC
HI 9828/70-01	HI 9828 and 70 m (230') probe cable, no GPS, 115VAC
HI 9828/70-02	HI 9828 and 70 m (230') probe cable, no GPS, 230VAC
HI 9828/80-01	HI 9828 and 80 m (262') probe cable, no GPS, 115VAC
HI 9828/80-02	HI 9828 and 80 m (262') probe cable, no GPS, 230VAC
HI 9828/90-01	HI 9828 and 90 m (295') probe cable, no GPS, 115VAC
HI 9828/90-02	HI 9828 and 90 m (295') probe cable, no GPS, 230VAC
HI 9828/100-01	HI 9828 and 100 m (328') probe cable, no GPS, 115VAC
HI 9828/100-02	HI 9828 and 100 m (328') probe cable, no GPS, 230VAC

Longer probe cable lengths are available

QUICK CALIBRATION SOLUTIONS

HI 9828-25	Quick calibration solution, 500 mL
HI 9828-27	Quick calibration solution, 1 G

CLEANING AND MAINTENANCE SOL.

HI 70300L	Electrode storage solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL

pH CALIBRATION SOLUTIONS

HI 7004L	pH 4.01 buffer solution, 500 mL
HI 7007L	pH 7.01 buffer solution, 500 mL
HI 7010L	pH 10.01 buffer solution, 500 mL

ORP CALIBRATION SOLUTIONS

HI 7021L	ORP test solution @240 mV, 500 mL
HI 7022L	ORP test solution @470 mV, 500 mL

DISSOLVED OXYGEN SOLUTIONS

HI 7040L	Zero oxygen solution, 500 mL
HI 7042S	Electrolyte solution, 30 mL

CONDUCTIVITY CALIBRATION SOL.

HI 7030L	12880 µS/cm solution, 500 mL
HI 7031L	1413 µS/cm solution, 500 mL
HI 7033L	84 µS/cm solution, 500 mL
HI 7034L	80000 µS/cm solution, 500 mL
HI 7035L	111800 µS/cm solution, 500 mL
HI 7039L	5000 µS/cm solution, 500 mL

SENSORS

HI 769828-0	pH sensor, single junction, non-refillable
HI 769828-1	pH/ORP sensor
HI 769828-2	DO sensor
HI 769828-3	EC sensor

OTHER ACCESSORIES

HI 7698281	USB interface cable
HI 7698282	Probe maintenance kit
HI 7698283	Calibration beaker
HI 7698284	Flow cell
HI 710045	Power supply cable
HI 710046	Lighter cigarette cable
HI 929828	Software application
HI 920005	iButton® with holder (5 pcs)

For a complete list of Solutions, see the end of pH *Section 3*, Conductivity *Section 6*, and Dissolved Oxygen *Section 7*.

HI 991300 • HI 991301

pH/EC/TDS/Temperature Meters

- **Automatic one or two point calibration**
- **Multi-level LCD display**

  The meters display the current measurement simultaneously with the current temperature.
- **On-screen tutorial messages for calibration and setup**
- **HOLD**

  The HOLD button freezes readings on the display for manual recording
- **Automatic Temperature Compensation**
- **BEPS**

  (Battery Error Prevention System) alerts the user in the event that low battery power could adversely affect readings
- **Measure pH, EC/TDS and temperature with one probe**
- **Battery % displayed on startup**
- **Easy to clean and keep clean**

HI 991300 and HI 991301 have been designed to offer you pH, conductivity, total dissolved solids and temperature measurements all in a slim, lightweight, portable unit. From purified to brine water measurement, you can select the meter which will work best with your range of conductivity for greater precision.

There are only 2 buttons, yet you can select from a range of calibration buffers and even the temperature scale (°C or °F) most familiar to you. The housing is waterproof and rated for IP 67 conditions.

The HI 1288 pre-amplified multiparameter probe features an easy to clean sensor and a cloth junction that can be pulled longer to increase the life of the probe. To ensure against interference from transient electrical noise, a solid-state amplifier is integrated into the HI 1288.

User selectable features include different TDS factors from 0.45 to 1.00 and a range of temperature coefficients (β) from 0.0 to 2.4% for greater consistency and reproducibility. Standardized buffer recognition values are also selectable.

These instruments easily fit in the palm of your hand and the bottom probe connection ensures the electrode cable doesn't get in your way. The large, multi-level LCD displays the primary reading, temperature and calibration guides simultaneously.

HANNA instruments

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Shown with HI 710020 protective boot (optional)

HI 1288 Multiparameter Probe and Protective Boot

The HI 1288 multiparameter probe includes pH, EC/TDS and temperature measurement in one convenient, rugged handle. A solid-state pre-amplifier is integrated into the probe to ensure against interference from transient electrical noise.

- **Amperometric conductivity probe**
- **Built-in temperature sensor**
- **Easy to clean**

  The sensor is easy to clean and keep clean by design
- **pH sensor with extendable cloth junction**

  The HI 1288 multiparameter probe features a cloth junction that can be pulled longer, effectively increasing the life of the probe

ORDERING INFORMATION

HI 991300 is supplied with HI 1288 multiparameter probe, HI 70004 pH 4.01 buffet solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 70031 1413 µS/cm calibration solution sachet, HI 70032 1382 mg/L (ppm) calibration solution sachet, HI 700661 electrode cleaning solution sachet, batteries, instructions and rugged carrying case.

HI 991301 is supplied with HI 1288 multiparameter probe, HI 70004 pH 4.01 buffet sachet, HI 70007 pH 7.01 buffer sachet, HI 70030 12880 µS/cm calibration solution sachet, HI 70038 6.44 g/L (ppt) calibration solution sachet, HI 700661 electrode cleaning solution sachet, batteries, instructions and rugged carrying case.

ELECTRODES

HI 1288	PVC body, pre-amplified multiparameter probe with internal temperature sensor, DIN connector and 1.2 m (3.93') cable

SOLUTIONS

HI 7004L	pH 4.01 buffer solution, 500 mL
HI 7007L	pH 7.01 buffer solution, 500 mL
HI 7010L	pH 10.01 buffer solution, 500 mL
HI 7030L	12880 µS/cm (µmho/cm) calibration solution, 500 mL
HI 7031L	1413 µS/cm (µmho/cm) calibration solution, 500 mL
HI 7032L	1382 ppm (mg/L) calibration solution, 500 mL
HI 7038L	6.44 ppt (g/L) calibration solution, 500 mL
HI 70442L	1500 ppm calibration solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL

ACCESSORIES

HI 710023	Orange protective rubber boot
HI 710024	Blue protective rubber boot

SPECIFICATIONS		HI 991300	HI 991301
Range	**pH**	0 to 14.00 pH	
	EC	0 to 3999 µS/cm	0.00 to 20.00 mS/cm
	TDS	0 to 2000 ppm (mg/L)	0.00 to 10.00 ppt (g/L)
	Temperature	0.0 to 60.0°C/32.0 to 140.0°F	
Resolution	**pH**	0.01 pH	
	EC	1 µS/cm	0.01 mS/cm
	TDS	1 ppm (mg/L)	0.01 ppt (g/L)
	Temperature	0.01°C/0.1°F	
Accuracy (@20°C/68°F)	**pH**	±0.01 pH	
	EC/TDS	±2% F.S.	
	Temperature	±0.5°C/±1°F	
pH Calibration		automatic, one or two point calibration with two sets of memorized buffers (Standard 4.01, 7.01, 10.01 or NIST 4.01, 6.86, 9.18)	
EC/TDS Calibration		automatic one point at: 1382 ppm (CONV=0.5) or 1500 ppm(CONV=0.7 or 1413 µS/cm	automatic one point at: 6.44 ppt (CONV=0.5) or 9.02 ppt (CONV=0.7) or 12880 µS/cm
Temperature Compensation	**pH**	automatic	
	EC/TDS	automatic with β selectable from 2.4%/°C with 0.1 increments	
TDS Conversion Factor		selectable from 0.45 to 1.00 with 0.01 increments (default 0.50)	
Probe (included)		HI 1288 PVC body, pre-amplified multiparameter probe with internal temperature sensor, DIN connector and 1.2 m (3.93') cable	
Battery Type/Life		1.5V AAA (3) /approximately 500 hours of continuous use. auto-off after 8 minutes of inactivity	
Environment		0 to 50°C (32 to 122°F); RH max. 100%	
Dimensions		152 x 58 x 30 mm (6.0 x 2.3 x 1.2")	
Weight		205g (7.2 oz.)	

For a complete list of Solutions, see the end of pH *Section 3* *and* Conductivity *Section 6*.

HI 9813-5 • HI 9813-6

pH/EC/TDS/Temperature Portable Meter

- **Water resistant**
- **On-screen tutorial messages for calibration**
- **Exclusive CAL CHECK™ feature**
  Alerts users of calibration status (HI 9813-6 only)
- **BEPS**
  (Battery Error Prevention System) alerts the user in the event that low battery power could adversely affect readings
- **Switch parameters at the touch of a button**
- **Automatic Temperature Compensation**
  For pH and conductivity
- **Simple calibration**
  Dials located on the front panel makes calibration quick and simple, even for non-technical users
- **Battery % displayed on startup**
- **Fast response multiparameter probe**

HI 9813-5 and HI 9813-6 are versatile, water resistant, multiparameter portable instruments specifically designed for agricultural applications such as hydroponics, greenhouses, farming and nurseries.

This series of instruments feature an large LCD that clearly displays the parameter being measured as well as calibration instructions. Calibration is fast and easy with knobs located on the front panel of the instrument.

HI 9813-5 is a pH/EC/TDS meter designed for simplicity of use in taking pH, mS/cm, ppm and temperature in the °C scale measurements.

HI 9813-6 includes all the features of the HI 9813-5 while incorporating our exclusive CAL CHECK™ feature. CAL CHECK™ allows the user to easily check the pH probe calibration status at any time.

Both instruments utilize the HI 1285 series pH/EC/TDS/temperature probe. This probe features a fiber junction and gel electrolyte making it ideal for fertilizer solutions.

HI 9813-6 Exclusive CAL CHECK™ Feature

When used in conjunction with the HI 1285-6 pH/EC/TDS/temperature probe and HI 50021 check solution, the HI 9813-6's CAL CHECK™ feature allows the user to check the meter calibration status at any time with a simple procedure:

1) **Rinse the probe with water and immerse the probe in HI 50021 check solution.**
3) **Press the check key.**
4) **If the meter is calibrated "probe is OK" message is displayed.**
5) **If cleaning is needed "clean probe and calibrate" message is displayed**

If cleaning is needed just immerse the probe in HI 700661 cleaning solution for 5 minutes, rinse the probe and check again. Calibration is needed if "clean probe and calibrate" message is displayed a second time.

Shown with HI 710008 protective boot (optional)

- **Protective rubber boot**
  The optional rubber boot helps protect your meter

HI 1285 Series Probe

The specially engineered HI 1285-5 and HI 1285-6 pH/EC/TDS/temperature probes utilize a fiber junction and gel electrolyte which provide fast response and reduced contamination. This combination makes these probes particularly suitable to be used in fertilizer solutions.

These probes can be used with instruments that use the same connector.

- **Built-in pH, amperometric EC and temperature sensor**
- **Specialized rugged probe**
  Designed for harsh environments such as fertilizer solutions.

SPECIFICATIONS		HI 9813-5	HI 9813-6
Range	pH	0.0 to 14.0 pH	
	EC	0.00 to 4.00 mS/cm	
	TDS	0 to 1999 ppm (mg/L)	
	Temperature	0.0 to 60.0°C	
Resolution	pH	0.1 pH	
	EC	0.01 mS/cm	
	TDS	1 ppm (mg/L)	
	Temperature	0.1°C	
Accuracy (@20°C/68°F)	pH	±0.1 pH	
	EC	±2% F.S.	
	TDS	±2% F.S.	
	Temperature	±0.5°C	
TDS Conversion Factor		0.56 to 0.78 ppm = 1 µS/cm (according to TDS 442 curve)	
pH Calibration		manual, one point (all parameters except temperature)	
Temperature Compensation		automatic 0 to 50°C (32 to 122°F) with β=2%/°C (EC/TDS only)	
Probe		HI 1285-5 polypropylene body, pre-amplified multiparameter probe with internal temperature sensor, 8-pin DIN connector and 1 m (3.3') cable (included)	HI 1285-6 polypropylene body, pre-amplified multiparameter probe with CAL CHECK™ compatibilty, internal temperature sensor, 8-pin DIN connector and 1 m (3.3') cable (included)
Battery Type / Life		9V / approximately 150 hours of continuous use	
Environment		0 to 50°C (32 to 122°F); RH max 100%	
Dimensions		145 x 80 x 36 mm (5.7 x 3.1 x 1.4")	
Weight		230 g (8.1 oz.)	

ORDERING INFORMATION

HI 9813-5 is supplied with HI 1285-5 multiparameter probe, HI 70007 pH 7.01 calibration solution sachet, HI 70442 1500 ppm (mg/L) calibration solution sachet, HI 70031 1413 µS/cm calibration solution sachet, HI 700661 electrode cleaning solution sachets (2), battery, instructions and rugged carrying case.
HI 9813-6 is supplied with HI 1285-6 multiparameter probe, HI 70007 pH 7.01 calibration solution sachet, HI 70442 1500 ppm (mg/L) calibration solution sachet, HI 70031 1413 µS/cm calibration solution sachet, 700521 electrode cleaning solution sachets (2), battery, instructions and rugged carrying case.

PROBES

HI 1285-5	Polypropylene body, pre-amplified multiparameter probe with internal temperature sensor, 8-pin DIN connector and 1 m (3.3') cable.
HI 1285-6	Polypropylene body, pre-amplified multiparameter probe with CAL CHECK™ compatibilty, internal temperature sensor, 8-pin DIN connector and 1 m (3.3') cable

CALIBRATION SOLUTIONS

HI 7031L	1413 µS/cm calibration solution, 500 mL
HI 70442L	1500 ppm (mg/L) calibration solution, 500 mL

pH BUFFER SOLUTIONS

HI 7004L	pH 4.01 buffer solution, 500 mL
HI 7006L	pH 6.86 buffer solution, 500 mL
HI 7007L	pH 7.01 buffer solution, 500 mL
HI 7009L	pH 9.18 buffer solution, 500 mL
HI 7010L	pH 10.01 buffer solution, 500 mL

OTHER SOLUTIONS

HI 700661P	Cleaning solution, 20 mL sachets (25)
HI 50021P	Check solution, 20 mL sachets (25)
HI 70300L	Electrode storage solution, 500 mL

OTHER ACCESSORIES

HI 710007	Shockproof rubber boot, blue
HI 710008	Shockproof rubber boot, orange

For a complete list of Solutions, see the end of pH *Section 3* *and* Conductivity *Section 6*.

HI 9811-5 • HI 9812-5

pH/EC/TDS/Temperature Portable Meters

- **Water resistant**
- **On-screen tutorial messages for calibration**
- **Switch parameters at the touch of a button**
- **Automatic Temperature Compensation**
  For pH and conductivity
- **Simple calibration**
  Dials located on the front panel makes calibration quick and simple, even for non-technical users
- **BEPS**
  (Battery Error Prevention System) alerts the user in the event that low battery power could adversely affect readings
- **Battery % displayed on startup**
- **Fast response probe included**

HI 9811-5 and HI 9812-5 are pH/EC/TDS waterproof meters designed for simplicity in taking pH, µS/cm, ppm (mg/L) and temperature measurements. both the HI 9811-5 and HI 9812-5 are ideal for hydroponics, greenhouses, farming and ground water applications .

Due to the built-in temperature sensor, conductivity readings are automatically compensated for temperature changes. The temperature coefficient is fixed at 2%/°C.

No probe changes are required when switching your measured parameter between pH, conductivity and TDS. These multiparameter meters reduce the number of instruments required for daily water quality analysis.

- **Protective rubber boot**
  The optional rubber boot helps protect your meter

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SPECIFICATIONS		HI 9811-5	HI 9812-5
Range	pH	0.0 to 14.0 pH	
	EC	0 to 6000 µS/cm	0 to 1990 µS/cm
	TDS	0 to 3000 ppm (mg/L)	0 to 1990 ppm (mg/L)
	Temperature	0 to 60°C	
Resolution	pH	0.1 pH	
	EC	10 µS/cm	
	TDS	10 ppm (mg/L)	
	Temperature	0°C	
Accuracy (@20°C/68°F)	pH	±0.1 pH	
	EC	±2% F.S.	
	TDS	±2% F.S.	
	Temperature	±0.5°C	
TDS Conversion Factor		0.5 ppm (mg/L) = 1 µS/cm	
Calibration		manual, one point (all parameters except temperature)	
Temperature Compensation		automatic from 0 to 50°C (32 to 122°F) with β = 2% /°C (EC/TDS only)	
Probe		HI 1285-5 polypropylene body, pre-amplified multiparameter probe with internal temperature sensor, 8-pin DIN connector and 1 m (3.3') cable (included)	
Battery Type / Life		9V / approximately 150 hours of continuous use	
Environment		0 to 50°C (32 to 122°F); RH max 100%	
Dimensions		145 x 80 x 36 mm (5.7 x 3.1 x 1.4")	
Weight		230 g (8.1 oz.)	

HI 1285-5 Probe

The specially engineered HI 1285-5 pH/EC/TDS and temperature probe utilizes a fiber junction and gel electrolyte which provide a fast response and reduced contamination. This combination makes the HI 1285-5 particularly designed to withstand harsh environments such as fertilizer solutions.

ORDERING INFORMATION

HI 9811-5 and **HI 9812-5** are supplied with HI 1285-5 multiparameter probe, HI 70007 pH 7.01 calibration solution sachet, HI 70032 1382 ppm (mg/L) calibration solution sachet, HI 70031 1413 µS/cm calibration solution sachet, HI 700661 electrode cleaning solution sachets (2), battery, instructions and rugged carrying case.

ELECTRODES

HI 1285-5	Polypropylene body, pre-amplified multiparameter probe with internal temperature sensor, 8-pin DIN connector and 1 m (3.3') cable.

CONDUCTIVITY & TDS CALIBRATION SOLUTIONS

HI 7031L	1413 µS/cm calibration solution, 500 mL
HI 7032L	1382 ppm (mg/L) calibration solution, 500 mL

pH BUFFER SOLUTIONS

HI 7004L	pH 4.01 buffer solution, 500 mL
HI 7006L	pH 6.86 buffer solution, 500 mL
HI 7007L	pH 7.01 buffer solution, 500 mL
HI 7009L	pH 9.18 buffer solution, 500 mL
HI 7010L	pH 10.01 buffer solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL

OTHER ACCESSORIES

HI 710007	Shockproof rubber boot, blue
HI 710008	Shockproof rubber boot, orange

For a complete list of Solutions, see the end of pH *Section 3* *and* Conductivity *Section 6*.

Replacement Electrodes

CODE	HI1285-6	HI 1285-5	HI 1288
Description	preamplified pH and EC probe	preamplified pH and EC probe	preamplified pH and EC probe
Reference	single, Ag/AgCl	single, Ag/AgCl	single, Ag/AgCl
Junction / Flow Rate	cloth	cloth	cloth
Electrolyte	gel	gel	gel
Max Pressure	0.1 bar	0.1 bar	1 bar
Range	**pH:** 0 to 13 / EC **T:** 20 to 40°C (68 to 104°F)	**pH:** 0 to 13 / EC **T:** 20 to 40°C (68 to 104°F)	**pH:** 0 to 13 / EC **T:** 20 to 40°C (68 to 104°F)
Tip /Shape	spheric (dia: 8.0 mm)	spheric (dia: 8.0 mm)	spheric (dia: 8.5 mm)
Temperature Sensor	yes	yes (HI 1285-5 only)	yes
Amplifier	yes	yes	yes
Body Material	polypropylene	polypropylene	PVC
Cable	7-pole; 2 m (3.3')	7-pole; 2 m (6.6')	7-pole; 1.2m (3.93')
Recommended Use	greenhouses, hydroponics, environmental monitoring, water treatment, boilers, cooling towers	greenhouses, hydroponics, environmental monitoring, water treatment, boilers, cooling towers	general purpose, water treatment, agriculture, boilers, cooling towers

PLUG		PLUG		PLUG	
HI 1285-6	DIN* with CAL-CHECK™ for HI 9813 series	**HI 1285-5**	DIN*	**HI 1288**	DIN†

* To be used with HI 9811, HI 9812 and HI 9813 series

† To be used with HI 991300 and HI 991301

CONTENTS

Speedsafe™

Magnetic Stirrers

Compact and Lightweight Stirrers

The HI 190M, HI 190MB and HI 200M are compact and lightweight, so that lack of laboratory bench space is no longer a concern.

HI 190M and HI 190MB come supplied with an ABS cover that resists the harmful effects of chemicals that are accidentally spilled.

HI 200M is supplied with an AISI 316 stainless steel cover. This model is ideal for applications that create exothermic reactions.

Compact round edge mini-stirrers are ideal where space is a concern.

Common stirrers are manufactured with steel and aluminum components. These units are often too large and heavy to fit in the limited space of a laboratory. The HI 180 series is compact, lightweight, inexpensive and designed in a special round shape without any sharp corners.

Speedsafe™

Comparison Chart

GUIDE	Maximum Stirring Capacity (Liters)	Low Speed (rpm)	High Speed (rpm)	Auto-Feedback	Auto-Reverse	Tachometer	Timer	ABS Plastic Cover	AISI 316 S.S. Cover	110/115 or 220/240 VAC	12 VCD	Page
Magnetic Stirrers												
HI 180	1	100	1000					•		•	•*	9.4
HI 190M	1	100	1000					•		•		9.5
HI 190M-0	1	100	1000					•			•	9.5
HI 200M	1	100	1000						•	•		9.5
HI 300N	2.5	100	800-1000						•	•		9.6
HI 310N	5	100	800-1000	•					•	•		9.6
HI 301N	2.5	100-500	800-1000						•	•		9.6
HI 311N	5	100-500	800-1000	•					•	•		9.6
HI 302N	2.5	100	800-1000		•				•	•		9.7
HI 312N	5	100	800-1000	•	•				•	•		9.7
HI 303N	2.5	100-500	1000			•			•	•		9.7
HI 304N	2.5	100	800-1000		•	•			•	•		9.8
HI 322N	5	100	800-1000	•			•		•	•		9.8
HI 324N	5	100	800-1000	•		•	•		•	•		9.8

* HI 180I/MB only

Speedsafe™ from HANNA

There are two types of magnetic stirrers; mechanical and electronic. Most manufacturers of magnetic stirrers use the mechanical approach. They use steel and aluminum for the structural material and outdated methods of speed control. These units are not only very heavy, but also very inaccurate. The use of these materials and methods appear to make the units rugged and strong, but they are instead cumbersome and obsolete.

Something as simple as completely dissolving salts in a medium, is in reality, a science. Often this cannot be achieved with simple mechanical processes. The only choice that the user has with mechanical products is to increase the stirring time or the temperature. With electronics, you can do more... the HANNA approach is electronic.

Speed sensor and limiter: Each HANNA stirrer is equipped with a speed sensing device (opto-sensor) coupled with an FVC (frequency voltage converter), which monitors the speed. As the speed reaches a preset maximum level, the speed limiter shuts down the VCO to slow down the motor speed. This ensures that when the load is suddenly removed from the stirrer, the motor will not accelerate to such a high speed that will be hazardous to both the user and the stirrer; a feature not commonly found in conventional stirrers.

Accuracy: Adjusting the stirring speed with a mechanical stirrer is inaccurate. Similar to the "ZOOM" function of a microscope, you can have access to two separate ranges of speed by using electronics. This assures maximum repeatability in experiments and processing.

A proper stirring speed plays an important role to minimize air contamination when mixing solutions. Too high a speed can create a deep vortex which may contaminate mixtures.

Auto-feedback: In addition, with the HANNA auto-feedback stirrer, any change in viscosity or volume of the solution is automatically compensated for, to keep the speed constant.

Sophisticated Engineering

Parts are engineered and manufactured to strict specifications to ensure absolute reliability. All components are mounted into a molded casing covered with a stainless steel plate, which are splash proof and chemically resistant. Minimal vibration and a well balanced rotating arm provide years of trouble free operation.

Safety

An ON/OFF switch on the face of the instruments and a fuse located at the rear panel allows users to easily disconnect power. The circuitry is grounded to the case for additional protection.

HI 180

Compact Magnetic Mini-Stirrers

Speedsafe™

- **Round edge**
- **Dynamic design**

  Easy to handle, these lightweight and compact stirrers need little room and are quickly recognizable on busy benches
- **Built to last**

  Glass-free chemical resistant housing resists damage by accidental falls

Common stirrers are manufactured with steel and aluminum components. These units are often too large and heavy to fit in the limited space of a laboratory. HANNA HI 180 series is compact, lightweight, inexpensive and designed in a special round shape without any sharp corners.

Often, in the lab, a sample is removed from a typical stirrer before reducing the speed. Normally, this would cause the motor to accelerate until it is destroyed. Not so with HANNA stirrers. HANNA stirrers incorporate electronic controls that allow the user to regulate the speed with greater precision. In addition to speed control, a Speedsafe™ mechanism will assure that the maximum speed will never be exceeded.

HI 180 mini-stirrers are available in nine colors. Several HI 180 stirrers can be placed on a laboratory bench with their colors helping to identify the different samples.

9 colors to choose from


HI 180G - Red


HI 180H - Grey


HI 180I - Ivory


HI 180F - Blue


HI 180E - Green


HI 180D - Yellow


HI 180C - Light Blue


HI 180B - Light Sea Green


HI 180A - Light Yellow

ORDERING INFORMATION

All models are supplied with micro stir bar and instructions

HI 180A-1	Light yellow mini-stirrer (115V)
HI 180A-2	Light yellow mini-stirrer (230V)
HI 180B-1	Light sea-green mini-stirrer (115V)
HI 180B-2	Light sea-green mini-stirrer (230V)
HI 180B-3	Light sea-green mini-stirrer (AUS plug)
HI 180C-1	Light blue mini-stirrer (115V)
HI 180C-2	Light blue mini-stirrer (230V)
HI 180C-3	Light blue mini-stirrer (AUS plug)
HI 180D-1	Yellow mini-stirrer (115V)
HI 180D-2	Yellow mini-stirrer (230V)
HI 180E-1	Green mini-stirrer (115V)
HI 180E-2	Green mini-stirrer (230V)
HI 180F-1	Blue mini-stirrer (115V)
HI 180F-2	Blue mini-stirrer (230V)
HI 180F-3	Blue mini-stirrer (AUS plug)
HI 180G-1	Red mini-stirrer (115V)
HI 180G-2	Red mini-stirrer (230V)
HI 180H-1	Grey mini-stirrer (115V)
HI 180H-2	Grey mini-stirrer (230V)
HI 180H-3	Grey mini-stirrer (AUS plug)
HI 180I-1	Ivory mini-stirrer(115V)
HI 180I-2	Ivory mini-stirrer (230V)
HI 180I-3	Ivory mini-stirrer (AUS plug)
HI 180I/MB	Ivory mini-stirrer (12 VDC)

ACCESSORIES

HI 731319	Magnetic stir bar (10)

SPECIFICATIONS		HI 180
Maximum Stirring Capacity		1 liter (0.26 gallons)
Speed Range	**Min.**	100 rpm
	Max.	1000 rpm
Power Supply		110/115 VAC or 220/240 VAC, 50/60 Hz
Installation Category		II
Cover Material		ABS plastic
Environment		0 to 50°C (32 to 122°F) ; RH max 95%
Dimensions		137 mm (dia) x 51 mm (h)
Weight		640 g (1.4 lbs.)

Our Most Popular Magnetic Mini-Stirrers

Speedsafe™

AISI 316 Stainless Steel

ABS Plastic

- **Compact size**

  The compact size of these stirrers allow users to maximize bench space for efficiency and safety.

- **Safety**

  Speedsafe™ limits the maximum speed to 1000 rpm even if a load is suddenly removed.

- **Built to last**

  The ABS housing of HI 190M and HI 190 M-0 resists most harmful chemicals in the lab.

The HI 190M, HI 190M-0 and HI 200M are compact and lightweight, so that lack of laboratory bench space is no longer a concern.

These stirrers incorporate electronic controls that allow the user to regulate the speed with greater precision. Often, in the lab, a sample is removed from the stirrer before reducing the speed. This would cause the motor of conventional equipment to accelerate until it is destroyed. This does not pose a problem with HANNA mini-stirrers. In fact, the internal Speedsafe™ mechanism will ensure that the maximum speed is never exceeded.

HI 190M and HI 190M-0 come supplied with an ABS cover that will resist the harmful effects of chemicals that are accidentally spilled. The ABS-covered mini-stirrer is available in two versions: HI 190M operating at 110 or 220 VAC and HI 190M-0 at 12 VDC. This provides you with the flexibility to choose between field and lab models, as well as being able to use the HI 190M-0 for applications where a low input voltage is a must.

HI 200M has an AISI 316 stainless steel cover. This model is ideal for applications that create exothermic reactions.

SPECIFICATIONS		HI 190M	HI 190M-0	HI 200M
Maximum Stirring Capacity			1 liter (0.26 gallons)	
Speed Range	Min.		100 rpm	
	Max.		1000 rpm	
Power Supply		110/115 VAC or 220/240 VAC, 50/60Hz	12 VDC	110/115 VAC or 230/240 VAC, 50/60Hz
Installation Category			II	
Cover Material		ABS plastic	ABS plastic	AISI 316 stainless steel
Environment			0 to 50°C (32 to 122°F); RH max 95%	
Dimensions			120 x 120 x 45 mm (4.8 x 4.8 x 1.8")	
Weight		640 g (1.4 lbs.)	610 g (1.3 lbs.)	710 g (1.6 lbs.)

ORDERING INFORMATION

HI 190M, **HI 190M-0** and **HI 200M** mini-stirrers are supplied with micro stir bar and instructions.

HI 190M-1	ABS cover (115V)
HI 190M-2	ABS cover (230V)
HI 190M-0	ABS cover (12 VDC)
HI 200M-1	Stainless steel cover (115V)
HI 200M-2	Stainless steel cover (230V)
HI 200M-3	Stainless steel cover (AUS plug)

ACCESSORIES

HI 731319	Magnetic stir bar (10)

HI 300N • HI 310N

Heavy-duty Magnetic Stirrers

Speedsafe™

HI 300N and HI 310N are heavy-duty stirrers. HI 300N can stir up to 2.5 liters (0.66 gallons) of liquid and the HI 310N can stir up to 5.0 liters (1.3 gallons). This makes them perfect for laboratory use as well as use in production. Electronic controls are incorporated into these stirrers that allow the user to regulate the speed with greater precision. With HANNA 's Speedsafe™, a limiter will assure that the maximum speed will never be exceeded.

HI 310N also has an automatic feedback feature. The motor is electronically controlled to maintain the chosen speed as the load changes. If the viscosity or the level (fluid weight) increases or decreases, the circuitry will adjust the output power to keep the speed constant.

SPECIFICATIONS		HI 300N	HI 310N
Maximum Stirring Capacity		2.5 liters (0.66 gallons)	5 liters (1.3 gallons)
Speed Range	Min.	100 rpm	
	Max.	800 to 1000 rpm	
Auto-Feedback		-	standard
Power Supply		110/115 VAC or 230/240 VAC, 50/60 Hz	
Installation Category		II	
Cover Material		AISI 316 stainless steel	
Environment		0 to 50°C (32 to 122°F); RH max 95%	
Dimensions		180 x 180 x 70 mm (7.1 x 7.1 x 2.8")	
Weight		1.4 kg (3.1 lbs.)	

ORDERING INFORMATION

HI 300N-1 (115V), **HI 300N-2** (230V), **HI 310N-1** (115V), **HI 310N-2** (230V), and **HI 310N-3** (AUS plug) are supplied with micro stir bar and instructions.

ACCESSORIES

HI 731320 Magnetic stir bar (10)

HI 301N • HI 311N

2-speed Magnetic Stirrers

Speedsafe™

HI 301N and HI 311N are heavy-duty stirrers that offer dual range precision. HI 301N can stir up to 2.5 liters (0.66 gallons) of liquid and HI 311N can stir up to 5.0 liters (1.3 gallons).

Similar to the "ZOOM" function of a microscope, these stirrers allow access to two separate stirring ranges. In each range, the speed can be fine tuned for exacting accuracy. This assures maximum repeatability in experiments and processing for laboratory, as well as production use.

In addition to speed control, a limiter will assure that the maximum speed will never be exceeded (Speedsafe™). HANNA stirrers incorporate a VCO device that will stop the motor from accelerating as soon as the load is removed.

HI 311N also has an automatic feedback feature. The motor is electronically controlled to maintain the chosen speed as the load changes. If the viscosity or the level (fluid weight) increases or decreases, the circuitry will adjust the output power.

SPECIFICATIONS		HI 301N	HI 311N
Maximum Stirring Capacity		2.5 liters (0.66 gallons)	5 liters (1.3 gallons)
Speed Range	Low	100 to 500 rpm	
	High	100 to 800/1000 rpm	
Auto-Feedback		-	standard
Power Supply		110/115 VAC or 230/240 VAC, 50/60 Hz	
Installation Category		II	
Cover Material		AISI 316 stainless steel	
Environment		0 to 50°C (32 to 122°F); RH max 95%	
Dimensions		180 x 180 x 70 mm (7.1 x 7.1 x 2.8")	
Weight		1.4 kg (3.1 lbs.)	

ORDERING INFORMATION

HI 301N-1 (115V), **HI 301N-2** (230V), **HI 311N-1** (115V), and **HI 311N-2** (230V) are supplied with magnetic stir bar and instructions

ACCESSORIES

HI 731320 Magnetic stir bar (10)

HI 302N • HI 312N

Auto-reverse Magnetic Stirrers

Speedsafe™

HI 312N is a powerful stirrer that stirs up to 5.0 liters (1.3 gallons). The HI 302N model can stir up to 2.5 liters (0.66 gallons). It is often desirable to stir your samples in two directions. This will achieve maximum homogeneity and solubility. An advanced circuit allows HI 302N and HI 312N to reverse the direction of the stirring at a user selected interval. The interval can be adjusted from 30 seconds up to 3 minutes. In addition to precision speed control, a limiter will also assure that the maximum speed will never be exceeded.

HANNA stirrers incorporate a VCO device that stops the motor from accelerating as soon a load is removed (Speedsafe™). In addition to this feature, HI 312N also has an automatic feedback feature. The motor is electronically controlled to maintain the chosen speed as the load changes. If the viscosity or the level (fluid weight) increases or decreases, the circuitry will adjust the output power.

SPECIFICATIONS		HI 302N	HI 312N
Maximum Stirring Capacity		2.5 liters (0.66 gallons)	5 liters (1.3 gallons)
Speed Range	Low	100 rpm	
	High	800 to 1000 rpm	
Auto-Feedback		-	standard
Reverse Interval		from 30 seconds to 3 minutes	
Power Supply		110/115 VAC or 220/240V, 50/60 Hz	
Installation Category		II	
Cover Material		AISI 316 stainless steel	
Environment		0 to 50°C (32 to 122°F); RH max 95%	
Dimensions		180 x 180 x 70 mm (7.1 x 7.1 x 2.8")	
Weight		1.4 kg (3.1 lb.)	

ORDERING INFORMATION

HI 302N-1 (115V), **HI 302N-2** (230V), **HI 312N-1** (115V), and **HI 312N-2** (230V) are supplied with magnetic stir bar and instructions.

ACCESSORIES

HI 731320 Magnetic stir bar (10)

HI 303N

2-speed Magnetic Stirrers with Tachometer

Speedsafe™

QC stations and labs must be able to repeat tests and processes. In order to do this, the specifications must be clear at all times. When stirring a solution, the RPMs are a very crucial factor. Without a tachometer, there is no way of knowing the exact RPMs and therefore no way of repeating the process. The HI 303N solves this problem by incorporating an LCD tachometer. These stirrers also allow precise stirring repeatability by using two separate ranges. In each range, the speed can be fine tuned for exacting accuracy. This assures maximum repeatability in experiments and processing for laboratory as well as production use.

In addition to speed control, a limiter will assure that the maximum speed will never be exceeded (Speedsafe™). HANNA stirrers incorporate VCO device that will stop the motor from accelerating as soon as the load is removed.

SPECIFICATIONS		HI 303N
Maximum Stirring Capacity		2.5 liters (0.66 gallons)
Speed Range	Low	100 to 500 rpm
	High	100 to 1000 rpm
Tachometer		4-digit LCD
Power Supply		110/115 VAC or 220/240 VAC, 50/60 Hz
Installation Category		II
Cover Material		AISI 316 stainless steel
Environment		0 to 50°C (32 to 122°F); RH max 95%
Dimensions		180 x 180 x 70 mm (7.1 x 7.1 x 2.8")
Weight		1.4 kg (3.1 lbs.)

ORDERING INFORMATION

HI 303N-1 (115V) and **HI 303N-2** (230V) are supplied with magnetic stir bar and instructions.

ACCESSORIES

HI 731320 Magnetic sir bar (10)

HI 304N

Auto-reverse Magnetic Stirrers with Tachometer

When stirring a solution, to work with a constant speed is an important factor in ensuring that the best repeatability in tests and processes is achieved. Without a tachometer, there is no way of knowing the RPMs.

HI 304N is a heavy-duty stirrer with a built-in tachometer. It is often desirable to stir in two directions in order to achieve maximum homogeneity. An advanced circuit allows HI 304N to reverse the direction of the stir at a user selected interval. The interval can be adjusted from 30 seconds up to 3 minutes. In addition to precision speed control, a limiter will also assure that the maximum speed will never be exceeded (Speedsafe™). Often, a sample is removed from the stirrer before the uses reduces the speed with ordinary stirrers. This can cause the motor to accelerate until it is destroyed. HANNA stirrers incorporate a VCO device that will stop the motor from accelerating as soon as the load is removed.

SPECIFICATIONS		HI 304N
Maximum Stirring Capacity		2.5 liters (0.66 gallons)
Speed Range	Low	100 rpm
	High	800 to 1000 rpm
Tachometer		four-digit LCD
Reverse Interval		from 30 seconds to 3 minutes
Power Supply		110/115 VAC or 220/240 VAC, 50/60 Hz
Installation Category		II
Cover Material		AISI 316 stainless steel
Environment		0 to 50°C (32 to 122°F); RH max 95%
Dimensions / Weight		180 x 180 x 70 mm (7.1 x 7.1 x 2.8") / 1.4 kg (3.1 lbs.)

ORDERING INFORMATION

HI 304N-1 (115V) and **HI 304N-2** (230V) is supplied with magnetic stir bar and instructions

ACCESSORIES

HI 731320 Magnetic stir bar (10)

HI 322N • HI 324N

Timer Controlled Magnetic Stirrers

HI 322N and HI 324N are heavey duty stirrers that incorporate a timer control that will turn the motor off after a selected amount of time. The time is adjustable from 5 minutes to 2 hours. This feature allows the user to carry out other tasks without worrying about over or under stirring. HI 322N and HI 324N can stir up to 5.0 liters (1.3 gallons), making them ideal for laboratory and production use.

These stirrers allow regulated speed control. A limiter will assure the maximum speed is never exceeded (*Speedsafe*™), and a VCO device stops motor acceleration as soon as a load is removed.

HI 322N and HI 324N have an automatic feedback feature with the HI 324N also incorporating an LCD tachometer. The motor is electronically controlled to maintain the chosen speed as the load changes. If the viscosity or the level increases or decreases, the circuitry will adjust the output power. The HI 324N's RPM display guarantees repeatability in QC tests and research by constantly displaying the RPMs.

SPECIFICATIONS		HI 322N	HI 324N
Maximum Stirring Capacity		5 liters (1.3 gallons)	
Speed Range	Low	100 rpm	
	High	800 to 1000 rpm	
Auto-Feedback		standard	
Timer Range		from 5 minutes to 2 hours	
Tachometer		-	four-digit LCD
Power Supply		110/115 VAC or 220/240 VAC, 50/60 Hz	
Installation Category		II	
Cover Material		AISI 316 stainless steel	
Environment		0 to 50°C (32 to 122°F); RH max 95%	
Dimensions		1.4 kg (3.1 lb.)	
Weight		180 x 180 x 70 mm (7.1 x 7.1 x 2.8")	

ORDERING INFORMATION

HI 322N-1 (115V), **HI 322N-2** (230V), **HI 324N-1** (115V) and **HI 324N-2** (230V) are supplied with magnetic stir bar and instructions

ACCESSORIES

HI 731320 Magnetic stir bar (10)

CONTENTS

Photometers

Introduction

Light and Color

Before entering into colorimetry, we need to understand the relationship between light and color.

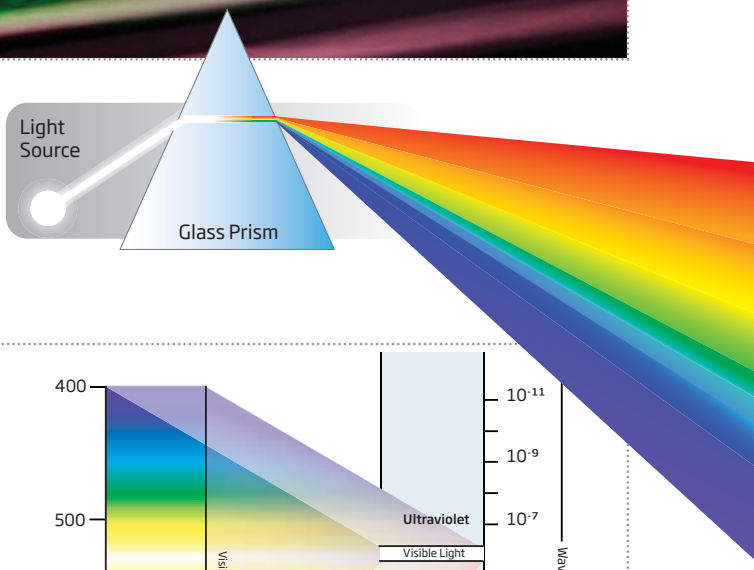
The simple answer is that colors are dependent on light. We do not actually see colors, what we see as color is the effect of light shining on an object. When white light shines on an object, it may be reflected, absorbed or transmitted. Glass transmits most of the light that comes into contact with it, thus it appears colorless. Snow reflects all of the light and appears white. A black cloth absorbs all light, and so appears black. A red piece of paper reflects red light better than it reflects other colors. Most objects appear colored because their chemical structure absorbs certain wavelengths of light and reflects others.

When we talk about light, we usually mean white light. A thin line of light is called a ray; a beam is made up of many rays of light. When white light passes through a prism (a triangular transparent object) the colors that make up white light disperse into seven bands of color. These bands of color are called a spectrum. Seven colors constitute white light: red, orange, yellow, green, blue, indigo, and violet. In any spectrum, the bands of color are always organized in this order from left to right.

The variation of the color of a system with change in concentration of some component is the basis of colorimetric analysis.

Suppose we shine a beam of white light at a substance that absorbs blue light. Since the blue component of the white light gets absorbed by the substance, the light that is transmitted is mostly yellow, the complementary color of blue. This yellow light reaches our eyes, and we "see" the substance as a yellow colored substance.

Wavelength (nm)	Color Absorbed	Color observed
400	Violet	Yellow-green
435	Blue	Yellow
495	Green	Purple
560	Yellow	Blue
650	Orange	Greenish blue
800	Red	Bluish green



Colorimetry

Colorimetry is simply the measurement of color. Colorimetry is concerned with the determination of the concentration of a substance by measurement of the relative absorption of light with respect to a known concentration of the substance. In visual colorimetry, natural or artificial white light is generally used as a light source, and determinations are usually made with a simple instrument termed a colorimeter, or color comparator. When the eye is replaced by a photoelectric cell the instruments is termed photoelectric colorimeter.

A colorimetric analysis is based on the principle that many substances react with each other and form a color which can indicate the concentration of the substance to be measured. When a substance is exposed to a beam of light of intensity $\mathbf{I_0}$ a portion of the radiation is absorbed by the substance's molecules and a radiation of intensity **I** lower than $\mathbf{I_0}$ is emitted.

Photometers

Introduction

The quantity of radiation absorbed is given by the Beer-Lambert Law: $A = \log \frac{I_o}{I}$

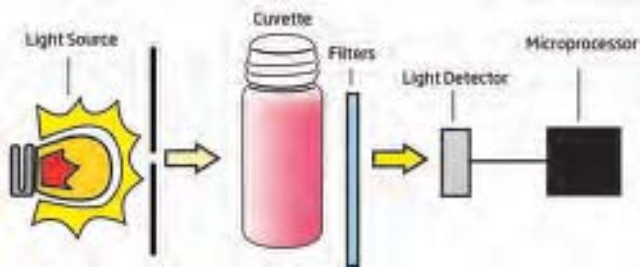
Absorbance is also given by: $A = \varepsilon_\lambda \bullet C \bullet l$

where:

A	**is a dimensionless number**
ε_λ	**the proportionality constant, is called the molar extinction coefficient or molar absorptivity; it is a constant for a given substance, provided the temperature and wavelength are constant (liter/mol · cm)**
C	**concentration of the substance (mol/liter)**
l	**optical distance light travels through sample (cm)**

Therefore, the concentration (**C**) can be calculated from the absorbance of the substance determined by the emitted radiation (**I**), as the other factors are known.

A typical block diagram of a photometer is shown below:



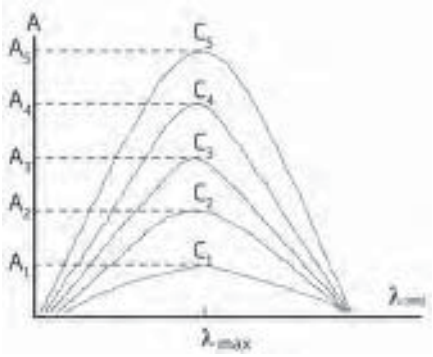
Sources of light used by HANNA colorimeters:

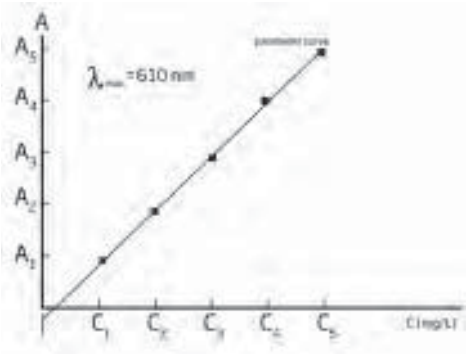
Tungsten lamp	an incandescent lamp having tungsten filaments
LED	light emitting diode

The optical distance is measured by the dimension of the cuvette containing the sample. The photoelectric cell collects the radiation (**I**) emitted by the sample and converts it into an electric current, producing a potential in the mV range. The microprocessor uses this potential to convert the incoming value into the desired measuring unit and to display it on the LCD.

In fact, the preparation of the solution to be measured occurs under known conditions, which are programmed into the meter's microprocessor in the form of a calibration curve. This curve is used as a reference for each measurement. It is then possible to determine unknown concentrations of a sample by inducing a colorimetric reaction, and thus obtain the mV related to the emitted intensity (**I**) (the color of the sample). By employing the calibration curve, one can determine the concentration of the sample that corresponds to the mV value.

Supposing that for one chemical substance we have one maximum absorbance at 610 nm. On the following you have one example of how the colorimeters are working:





One example of an early colorimetric analysis is Nessler's method for ammonia, which was first proposed in 1856. Nessler found that adding an alkaline solution of HgI_2 and KI to a dilute solution of ammonia produced a yellow to reddish brown colloid with the color determined by the concentration of ammonia. A comparison of the sample's color for a series of standards was used to determine the concentration of ammonia. Equal volumes of the sample and standards were transferred to a set of tubes with flat bottoms. The tubes were placed in a rack equipped at the bottom with a reflecting surface, allowing light to pass through the solution. The colors of the samples and standards were compared by looking down through the solutions. Until recently, a modified form of this method was listed as a standard method for the analysis of ammonia in water and wastewater.

Product Spotlights

HI 83200

Multiparameter Photometer for Laboratories

10.10

HI 83200 is one of the most versatile photometers on the market. Just one meter measures up to 44 of the most important water quality parameters.

HI 83200 has a powerful interactive user support that assists the user during the analysis process. A full tutorial is available in the Setup Menu, and the Help Menu provides assistance for every step in the measurement process. This meter can be connected to a PC via a USB cable, where the data can be managed with optional HI 92000 Windows® compatible software.

HI 83203

Multiparameter Photometer for Aquaculture

10.11

With the ever increasing depletion of fish stocks in the open seas, aquaculture has gained prominence and can prove essential to our future dietary needs. Monitoring and controlling parameters such as the oxygen level as well as pH and nitrate content in water is vital in ensuring profitable fish production.

Accurate control can prevent disease, increase production and even reduce the premiums on crop insurance. Research personnel, fish farm operators and wildlife specialists now have one compact and easy to use meter to keep a close tab on the most important parameters in aquaculture.

HI 83203 is a multiparameter bench meter that measures thirteen methods essential for aquaculture analysis. It has four channels allowing for a wide range of tests.

HI 83226

Multiparameter Photometer for Pools and Spas

10.22

In order to achieve ideal water conditions, swimming pool water requires testing on a daily and sometimes hourly basis for disinfection of residuals and maintaining pH levels. Equally important, calcium hardness and alkalinity levels should be monitored weekly to ensure the pool water is well balanced, thus to avoid corrosion and scale formation.

HI 83226 is a multiparameter bench meter that measures nine parameters essential for advanced pool and spa water analysis.

HI 96771

Chlorine, Free Ultra High Range Portable Photometer

10.38

HI 96771 has been developed to check chlorine dosing in disinfection processes with ultra high concentrations of chlorine. Thanks to the extended range from 0 to 500 mg/L (ppm), it is ideal for the food industry, such as in fruit and vegetable washing.

The HI 96771 meter measures the free chlorine (Cl_2) content in water samples and chlorine ultra high range. The methods are an adaptation of Standard Methods for the Examination of Water and Wastewater, 20th edition, 4500-Cl.

HI 96713

Phosphate LR Portable Photometers

10.59

Phosphates are particularly important for the growth and development of plant roots, and hence are one of the most common fertilizers used in agriculture.

Phosphates are also utilized in detergents and are needed, in small quantities, for heating systems. However, high concentrations of phosphates can cause environmental pollution: they are for example a primary cause of eutrophication.

For these reasons, it is necessary to closely monitor the phosphate levels present in both municipal and industrial waste water.

The HI 96713 meter measures phosphate (PO_4^{3-}) content in water, wastewater and seawater in the 0.00 to 2.50 mg/L (ppm) range.

HI 96725

Chlorine, Cyanuric Acid and pH Photometer

10.70

Legionella species is the agent that causes human Legionnaires' disease as well as the lesser form, Pontiac Fever. Transmission is facilitated by the inhalation of mist droplets containing the Legionella bacteria.

The HI 96725 measures four parameters that are crucial in monitoring for preventive maintenance or disinfection.

Comparison Guide

Multiparameter Benchtop Photometers

Guide	HI 83200	HI 83203	HI 83205	HI 83211	HI 83209	HI 83218	HI 83206	HI 83225	HI 83215	HI 83226	HI 83216	HI 83212	HI 83210	HI 83207	HI 83213	HI 83208
Aluminum	•		•	•									•	•	•	
Alkalinity	•									•	•					
Ammonia	•	•	•	•	•	•	•	•	•			•			•	•
Bromine	•		•							•					•	
Calcium	•							•								
Chlorine Dioxide	•		•										•			
Chlorine	•	•	•		•		•			•	•	•	•	•	•	•
Chromium VI	•		•	•	•	•	•								•	
Color of Water	•				•		•						•	•	•	
Copper	•	•	•	•	•		•			•		•		•	•	•
Cyanuric Acid	•			•			•			•	•			•		
Fluoride	•															•
Hardness	•									•	•					
Honey																
Hydrazine	•		•									•				
Iodine	•			•											•	
Iron	•		•	•						•						•
Magnesium	•							•								
Manganese	•													•		•
Maple Syrup																
Molybdenum	•		•	•			•					•		•		•
Nickel	•			•			•							•	•	•
Nitrate	•	•	•		•	•	•	•	•					•	•	•
Nitrite	•	•	•		•	•	•								•	
Nitrogen																
Oxygen, Dissolved	•	•	•		•		•						•	•	•	•
Ozone	•									•						
pH	•	•	•	•	•		•			•	•		•	•	•	•
Phosphate	•	•	•	•	•		•					•	•	•	•	•
Phosphorus	•			•	•	•	•	•	•			•		•	•	•
Potassium	•							•	•							
Silica	•		•	•	•		•					•	•		•	•
Silver	•			•	•		•					•	•	•	•	•
Sulfate	•							•								
Zinc	•		•	•	•		•						•	•		•
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Multiparameter Portable Photometers

Guide	HI 96101	HI 96104	HI 96710	HI 96724	HI 96725	HI 96734	HI 96736	HI 96741	HI 96742	HI 96743	HI 96744	HI 96745	HI 96752
Bromine	•												
Calcium HR													•
Chlorine, Free	•	•	•	•	•							•	
Chlorine, Free HR						•							
Chlorine, Total	•	•	•	•	•							•	
Chlorine, Total HR						•							
Cyanuric Acid	•	•			•								
Hardness, Ca							•				•	•	
Hardness, Mg							•				•	•	
Hardness, Total							•	•			•	•	
Iodine	•												
Iron LR	•							•	•	•	•	•	
Magnesium HR													•
Manganese LR									•				
pH	•	•	•		•		•			•	•	•	
Potassium LR													
Potassium MR													
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Single Parameter Portable Photometers

PARAMETER	METER	PAGE
Aluminum	HI 96712	10.31
Ammonia LR	HI 96700	10.32
Ammonia MR	HI 96715	10.32
Ammonia HR	HI 96733	10.32
Anionic Surfactants	HI 96769	10.33
Bromine	HI 96716	10.34
Chloride	HI 96753	10.35
Chlorine Dioxide	HI 96738	10.36
Chlorine, Free	HI 96701	10.37
Chlorine, Free LR	HI 96762	10.37
Chlorine, Free and UHR	HI 96771	10.38
Chlorine, Free and Total	HI 96711	10.39
Chlorine, Total LR	HI 96761	10.39
Chromium VI LR	HI 96749	10.40
Chromium VI HR	HI 96723	10.40
Color of Water	HI 96727	10.41
Copper LR	HI 96747	10.42
Copper HR	HI 96702	10.42
Cyanide	HI 96714	10.43
Cyanuric Acid	HI 96722	10.44
Fluoride LR	HI 96729	10.45
Fluoride HR	HI 96739	10.45
Hardness, Ca	HI 96720	10.46
Hardness, Mg	HI 96719	10.46
Hardness, EPA	HI 96735	10.47
Honey Color	HI 96785	10.48
Hydrazine	HI 96704	10.49
Iodine	HI 96718	10.50
Iron LR	HI 96746	10.51
Iron HR	HI 96721	10.51

PARAMETER	METER	PAGE
Manganese LR	HI 96748	10.52
Manganese HR	HI 96709	10.52
Maple Syrup	HI 96759, HI 96760	10.53
Molybdenum	HI 96730	10.54
Nickel LR	HI 96740	10.55
Nickel HR	HI 96726	10.55
Nitrate, as Nitrogen	HI 96728	10.56
Nitrate	HI 96786	10.56
Nitrite LR	HI 96707	10.57
Nitrite HR	HI 96708	10.57
Oxygen, Dissolved	HI 96732	10.58
Phosphate LR	HI 96713	10.59
Phosphate HR	HI 96717	10.59
Phosphorus	HI 96706	10.60
Potassium	HI 96750	10.61
Silica	HI 96705	10.62
Silica HR	HI 96770	10.62
Silver	HI 96737	10.63
Sulfate	HI 96751	10.64
Zinc	HI 96731	10.65
Blood Plasma	HI 95765	10.79

Wine and Olive Oil Measurement Photometers		
Copper in Wine	HI 83740	10.82
Iron in Wine	HI 83741	10.83
Color and Total Phenols in Wine	HI 83742	10.84
Concentration of Reducing Sugars	HI 83746	10.86
Tartaric Acid in Wine	HI 83748	10.87
Peroxide in Olive Oils	HI 83730	10.88

Multiparameter Bench Photometers

Introduction

- **Up to 45 measurement methods**
- **Light blocking cuvette holder**
- **Backlit LCD**
- **BEPS**

  (Battery Error Prevention System) Alerts users in the event a low battery could effect readings
- **PC compatible via USB**
- **Powered by rechargeable batteries or 12 VDC**
- **Save and recall logged data at the touch of a button**.
- **On-screen tutorial**

  With the tutorial function enabled, short guides relating to current operation are displayed.
- **HELP button**

  Screen specific help can viewed at the touch of a button.
- **Method selection**

  Users can easily select parameters via the Method button.
- **Setup button**

  Instrument preferences such as backlight intensity and screen contrast can be changed via the setup button.

The new series of HI 83xxx benchtop photometers from HANNA offers all the features from our previous popular series plus many upgrades and improvements that make these instruments much more versatile and easy to use.

These instruments have been redesigned to accommodate more sophisticated optical systems, resulting in greater reproducibility. These new casings feature a cuvette compartment door that will eliminate external light disturbances.

These photometers also feature a graphic, backlit LCD which clearly displays the method selection. Each method's measuring procedure is shown on the LCD taking the user step by step through the process. At any stage in the measurement process or during setup, context sensitive help can be displayed by pressing the help button. Additionally, the help screen also lists the required reagent sets, accessories and customer support contact information. All these features are available in a user selectable language.

Each HANNA photometer eliminates confusion by automatically converting readings to other chemical forms. Common conversions are available at the touch of a button

GENERAL ACCESSORIES

HI 731318	Cloth for wiping cuvettes (4 pcs)
HI 731321	Glass cuvettes (4 pcs)
HI 731325W	New cap for cuvette (4 pcs)
HI 740034P	Cap for 100 mL beaker (10 pcs)
HI 740036P	100 mL plastic beaker (10 pcs)
HI 740038	60 mL glass bottle and stopper
HI 740142	1 mL graduated syringe
HI 740143	1 mL graduated syringe (6 pcs)
HI 740144	Pipette tip (6 pcs)
HI 740155	Plastic pipette (20 pcs)
HI 740220	25 mL glass cylinder with caps (2 pcs)
HI 740223	170 mL plastic beaker
HI 740224	170 mL plastic beaker (12 pcs)
HI 740225	60 mL graduated syringe
HI 740226	5 mL graduated syringe
HI 740227	Filter assembly
HI 740228	Filter disc (25 pcs)
HI 740229	100 mL graduated cylinder
HI 740230	230 mL Demineralized water
HI 92000	Windows® Compatible Software
HI 920013	USB cable for PC connection
HI 93703-50	Cuvette cleaning solution, 230 mL
HI 93703-54	Dried resin (100 g)
HI 93703-55	Activated Carbon (50 pcs)

GENERAL SPECIFICATIONS FOR ALL MODELS

Light Source	up to 5 tungsten lamps with different narrow band interference filters. (see above for operating wavelengths according to methods.)
Light Detector	silicon photocell
Environment	0 to 50°C (32 to 122°F); max 90% RH non-condensing
Power Supply	external 12 VDC power adapter or built-in rechargeable battery
Dimensions	235 x 200 x 110 mm (9.2 x 7.87 x 4.33")
Weight	0.9 Kg (2 lbs.)

Multiparameter Bench Photometers

Introduction

ADP
Application Designed Photometers

Since 1978, HANNA has introduced instruments tailored to the needs of a specific application or industry.

From this philosophy we have created **Application Designed Photometers** to satisfy the needs of your specific application or industry.

Aquaculture	HI 83203
Boilers & Cooling Towers	HI 83205
Chemical Manufacturers	HI 83211
Education	HI 83209
Environmental Apps	HI 83218
Environmental Testing	HI 83206
Honey Color Analysis	HI 83221
Laboratories	HI 83200
Laboratories, with COD	HI 83099
Nutrient Analyses	HI 83215
Pool and Spa Applications	HI 83216
Pool and Spa Applications	HI 83226
Power Plant Utilities	HI 83212
Pulp & Paper Mills	HI 83210
Wastewater Analysis	HI 83214
Wastewater Analysis	HI 83224
Wastewater, Industrial	HI 83207
Wastewater, Municipal	HI 83213
Water Conditioning	HI 83208

Narrow band Interference filter wavelengths

Aluminum	525 nm	Fluoride	575 nm	Nitrite LR	525 nm
Alkalinity	575 nm	Calcium Hardness	525 nm	Oxygen, Dissolved	420 nm
Ammonia MR	420 nm	Mg Hardness	525 nm	Ozone	525 nm
Ammonia LR	420 nm	Hydrazine	420 nm	pH	525 nm
Bromine	525 nm	Iodine	525 nm	Phosphate HR	525 nm
Calcium	466 nm	Iron HR	525 nm	Phosphate LR	610 nm
Chlorine, Free	525 nm	Iron LR	575 nm	Phosphorus	525 nm
Chlorine, Total	525 nm	Magnesium	466 nm	Potassium HR	610 nm
Chlorine Dioxide	575 nm	Manganese HR	525 nm	Potassium MR	610 nm
Chromium VI HR	525 nm	Manganese LR	575 nm	Potassium LR	610 nm
Chromium VI LR	525 nm	Molybdenum	420 nm	Silica	610 nm
Color of Water	420 nm	Nickel HR	575 nm	Silver	575 nm
Copper HR	575 nm	Nickel LR	575 nm	Sulfate	466 nm
Copper LR	575 nm	Nitrate	525 nm	Zinc	575 nm
Cyanuric Acid	525 nm	Nitrite HR	575 nm		

Cuvette holder with door

The cuvette cover aids in stopping stray light from effecting measurements.

HI 83200

Multiparameter Photometer for Laboratories

HI 83200 is one of the most versatile photometers on the market. Just one meter measures up to 44 methods critical to analyzing water quality.

The optical system of HI 83200 is based on special subminiature tungsten lamps and narrow-band interference filters to guarantee both high performance and reliable results.

HI 83200 has a powerful interactive user support that assists the user during the analysis process. A full tutorial is available in the Setup Menu, and the Help Menu provides assistance for every step in the measurement process. This meter can be connected to a PC via a USB cable, where the data can be managed with optional HI 92000 Windows® compatible software.

ADP
Application Designed Photometers

ORDERING INFORMATION

HI 83200-01 (115V), **HI 83200-02** (230V) and **HI 83200-03** (AUS plug) is supplied with sample cuvettes and caps (4 ea.), sample preparation kit, cloth for wiping cuvettes, 60 mL glass bottle for dissolved oxygen analysis, scissors, AC/DC power adapter, instruction manual.

HI 83200-100 sample preparation kit contains 10 mL cuvettes (4) with caps, 100 mL plastic beaker, 170 mL plastic beaker, 100 mL graduated cylinder, 60 mL syringe with screw rim, 5 mL syringe, funnel, filter discs (25), spoon, pipettes (2), carbon powder packets (50), demineralizer bottle with filter cap for approximately 12 liters of deionized water (dependant on hardness of water to be tested).

TEST	RANGE	METHOD	REAGENT CODE†
Alkalinity	0 to 500 mg/L (ppm) as $CaCO_3$	EDTA Colorimetric	HI 93755-01
Aluminum	0.00 to 1.00 mg/L (ppm)	Aluminon	HI 93712-01
Ammonia MR	0.00 to 10.00 mg/L (ppm)	Nessler	HI 93715-01
Ammonia LR	0.00 to 3.00 mg/L (ppm)	Nessler	HI 93700-01
Bromine	0.00 to 8.00 mg/L (ppm)	DPD	HI 93716-01
Calcium	0 to 400 mg/L (ppm)	Oxalate	HI 937521-01**
Chlorine Dioxide	0.00 to 2.00 mg/L (ppm)	Chlorophenol Red	HI 93738-01
Chlorine*, Free	0.00 to 2.50 mg/L (ppm)	DPD	HI 93701-01
Chlorine*, Total	0.00 to 3.50 mg/L (ppm)	DPD	HI 93711-01
Chromium VI HR	0 to 1000 µg/L	Diphenylcarbohydrazide	HI 93723-01
Chromium VI LR	0 to 300 µg/L	Diphenylcarbohydrazide	HI 93749-01
Color of Water	0 to 500 PCU	Colorimetric Platinum Cobalt	–
Copper HR	0.00 to 5.00 mg/L (ppm)	Bicinchoninate	HI 93702-01
Copper LR	0 to 1000 µg/L	Bicinchoninate	HI 95747-01
Cyanuric Acid	0 to 80 mg/L (ppm)	Turbidimetric	HI 93722-01
Fluoride	0.00 to 2.00 mg/L (ppm)	SPADNS	HI 93729-01
Hardness, Calcium	0.00 to 2.70 mg/L (ppm) (as $CaCO_3$)	Calmagite	HI 93720-01
Hardness, Magnesium	0.00 to 2.00 mg/L (ppm) (as $CaCO_3$)	EDTA Colorimetric	HI 93719-01
Hydrazine	0 to 400 µg/L	p-Dimethylaminobenzaldehyde	HI 93704-01
Iodine	0.0 to 12.5 mg/L (ppm)	DPD	HI 93718-01
Iron HR	0.00 to 5.00 mg/L (ppm)	Phenantroline	HI 93721-01
Iron LR	0 to 400 µg/L	TPTZ	HI 93746-01**
Magnesium	0 to 150 mg/L (ppm)	Calmagite	HI 937520-01**
Manganese HR	0.0 to 20.0 mg/L (ppm)	Periodate	HI 93709-01
Manganese LR	0 to 300 µg/L	PAN	HI 93748-01**
Molybdenum	0.0 to 40.0 mg/L (ppm)	Mercaptoacetic Acid	HI 93730-01
Nickel HR	0.00 to 7.00 g/L	Photometric	HI 93726-01
Nickel LR	0.000 mg/L to 1.000 mg/L (ppm)	PAN	HI 93740-01**
Nitrate	0.0 to 30.0 mg/L (ppm)	Cadmium Reduction	HI 93728-01
Nitrite HR	0 to 150 mg/L (ppm)	Ferrous Sulfate	HI 93708-01
Nitrite LR	0 to 1.15 mg/L (ppm)	Diazotization	HI 93707-01
Oxygen, Dissolved (DO)	0.0 to 10.0 mg/L (ppm)	Winkler	HI 93732-01
Ozone	0.00 to 2.00 mg/L (ppm)	DPD	HI 93757-01
pH	6.5 to 8.5 pH	Phenol Red	HI 93710-01
Phosphate HR	0.0 to 30.0 mg/L (ppm)	Amino Acid	HI 93717-01
Phosphate LR	0.00 to 2.50 mg/L (ppm)	Ascorbic Acid	HI 93713-01
Phosphorus	0.0 to 15.0 mg/L (ppm)	Amino Acid	HI 93706-01
Potassium HR	20 to 200 mg/L (ppm)	Turbidimetric Tetraphenylborate	HI 93750-01
Potassium MR	10 to 100 mg/L (ppm)	Turbidimetric Tetraphenylborate	HI 93750-01
Potassium LR	0.0 to 20.0 mg/L (ppm)	Turbidimetric Tetraphenylborate	HI 93750-01
Silica	0.00 to 2.00 mg/L (ppm)	Heteropoly blue	HI 93705-01
Silver	0.000 to 1.000 mg/L (ppm)	PAN	HI 93737-01**
Sulfate	0 to 100 mg/L (ppm)	Turbidimetric	HI 93751-01
Zinc	0.00 to 3.00 mg/L (ppm)	Zincon	HI 93731-01

Reagents are available in liquid or powder form, and the amount of each reagent is precisely dosed to ensure maximum repeatability.
† Unless noted otherwise, all reagent codes ending with -01 are for 100 tests. Replace the -01 with -03 for 300 tests.
* For Chlorine, liquid reagents are available. ** Reagents for 50 tests, replace -01 for -03 for 150 tests

For a complete list of Reagents, see Reagents *Section 18*.

Multiparameter Photometer for Aquaculture

With the ever increasing depletion of fish stocks in the open seas, aquaculture has gained prominence and can prove essential to our future dietary needs. Monitoring and controlling parameters such as the oxygen level as well as pH and nitrate content in water is vital in ensuring profitable fish production.

Accurate control can prevent disease, increase production and even reduce the premiums on crop insurance. Research personnel, fish farm operators and wildlife specialists now have one compact and easy to use meter to keep a close tab on the most important parameters in aquaculture.

HI 83203 is a multiparameter bench meter that measures thirteen methods essential for aquaculture analysis. It has four channels allowing for a wide range of tests.

The optical system of HI 83203 is based on special subminiature tungsten lamps and narrow-band interference filters to guarantee both high performance and reliable results.

HI 83203 has a powerful interactive user support that assists the user during the analysis process. A full tutorial is available in the Setup Menu, and the Help Menu provides assistance for every step in the measurement process.This meter can be connected to a PC via a USB cable, where the data can be managed with optional HI 92000 Windows® compatible software.

ADP Application Designed Photometers

13 methods

TEST	RANGE	METHOD	REAGENTS†
Ammonia LR	0.00 to 3.00 mg/L (ppm)	Nessler	HI 93700-01
Ammonia MR	0.00 to 10.00 mg/L (ppm)	Nessler	HI 93715-01
Chlorine free*	0.00 to 2.50 mg/L (ppm)	DPD	HI 93701-01
Chlorine total*	0.00 to 3.50 mg/L (ppm)	DPD	HI 93711-01
Copper HR	0.00 to 5.00 mg/L (ppm)	Bicinchoninate	HI 93702-01
Copper LR	0 to 1000 µg/L	Bicinchoninate	HI 95747-01
Nitrate	0.0 to 30.0 mg/L (ppm)	Cadmium Reduction	HI 93728-01
Nitrite HR	0 to 150 mg/L (ppm)	Ferrous Sulfate	HI 93708-01
Nitrite LR	0.00 to 1.15 mg/L (ppm)	Diazotization	HI 93707-01
Oxygen, Dissolved (DO)	0.0 to 10.0 mg/L (ppm)	Winkler	HI 93732-01
pH	6.5 to 8.5 pH	Phenol Red	HI 93710-01
Phosphate HR	0.0 to 30.0 mg/L (ppm)	Amino Acid	HI 93717-01
Phosphate LR	0.00 to 2.50 mg/L (ppm)	Ascorbic Acid	HI 93713-01

Reagents are available in liquid or powder form, and the amount of each reagent is precisely dosed to ensure maximum repeatability.
† Unless noted otherwise, all reagent codes ending with -01 are for 100 tests. Replace the -01 with -03 for 300 tests.
* For Chlorine measurements, liquid reagents are available

ORDERING INFORMATION

HI 83203-01 (115V) and **HI 83203-02** (230V) are supplied with sample cuvettes and caps (2 ea.), cloth for wiping cuvettes, 60 mL glass bottle for dissolved oxygen analysis, scissors, AC/DC power adapter, and instruction manual.

For a complete list of Reagents, see Reagents *Section 18*.

HI 83205

Multiparameter Photometer for Boilers and Cooling Towers

HI 83205 is a multiparameter bench meter that measures twenty-four methods essential for monitoring boiling and cooling towers. It has four channels allowing for a wide range of tests.

With just one unit, technicians can keep an eye on 24 methods needed for proper and efficient functioning of their systems. The parameters that HI 83205 monitors include: iron, whose presence can be an important indication of corrosion; chlorine to circumvent microbiological fouling; dissolved oxygen, whose presence causes corrosion; silica can point to a contamination of the feed water while phosphate is important to reduce scaling.

The optical system of HI 83205 is based on special subminiature tungsten lamps and narrow-band interference filters to guarantee both high performance and reliable results.

HI 83205 has a powerful interactive user support that assists the user during the analysis process. A full tutorial is available in the Setup Menu, and the Help Menu provides assistance for every step in the measurement process. This meter can be connected to a PC via a USB cable, where the data can be managed with optional HI 92000 Windows® compatible software.

ADP
Application Designed Photometers

24 methods

ORDERING INFORMATION

HI 83205-01 (115V) and **HI 83205-02** (230V) are supplied sample cuvettes and caps (2 ea.), cloth for wiping cuvettes, 60 mL glass bottle for dissolved oxygen analysis, scissors, AC/DC power adapter, and instruction manual.

TEST	RANGE	METHOD	REAGENT CODE†
Aluminum	0.00 to 1.00 mg/L (ppm)	Aluminon	HI 93712-01
Ammonia MR	0.00 to 10.00 mg/L (ppm)	Nessler	HI 93715-01
Ammonia LR	0.00 to 3.00 mg/L (ppm)	Nessler	HI 93700-01
Bromine	0.00 to 8.00 mg/L (ppm)	DPD	HI 93716-01
Chlorine Dioxide	0.00 to 2.00 mg/L (ppm)	Chlorophenol Red	HI 93738-01
Chlorine*, Free	0.00 to 2.50 mg/L (ppm)	DPD	HI 93701-01
Chlorine*, Total	0.00 to 3.50 mg/L (ppm)	DPD	HI 93711-01
Chromium VI HR	0 to 1000 µg/L	Diphenylcarbohydrazide	HI 93723-01
Chromium VI LR	0 to 300 µg/L	Diphenylcarbohydrazide	HI 93749-01
Copper HR	0.00 to 5.00 mg/L (ppm)	Bicinchoninate	HI 93702-01
Copper LR	0 to 1000 µg/L	Bicinchoninate	HI 95747-01
Hydrazine	0 to 400 µg/L	p-Dimethylaminobenzaldehyde	HI 93704-01
Iron HR	0.00 to 5.00 mg/L (ppm)	Phenantroline	HI 93721-01
Iron LR	0 to 400 µg/L	TPTZ	HI 93746-01**
Molybdenum	0.0 to 40.0 mg/L (ppm)	Mercaptoacetic Acid	HI 93730-01
Nitrate	0.0 to 30.0 mg/L (ppm)	Cadmium Reduction	HI 93728-01
Nitrite HR	0 to 150 mg/L (ppm)	Ferrous Sulfate	HI 93708-01
Nitrite LR	0.00 to 0.35 mg/L (ppm)	Diazotization	HI 93707-01
Oxygen, Dissolved (DO)	0.0 to 10.0 mg/L (ppm)	Winkler	HI 93732-01
pH	6.5 to 8.5 pH	Phenol red	HI 93710-01
Phosphate HR	0.0 to 30.0 mg/L (ppm)	Amino Acid	HI 93717-01
Phosphate LR	0.00 to 2.50 mg/L (ppm)	Ascorbic Acid	HI 93713-01
Silica	0.00 to 2.00 mg/L (ppm)	Heteropoly blue	HI 93705-01
Zinc	0.00 to 3.00 mg/L (ppm)	Zincon	HI 93731-01

Reagents are available in liquid or powder form, and the amount of each reagent is precisely dosed to ensure maximum repeatability.
† Unless noted otherwise, all reagent codes ending with -01 are for 100 tests. Replace the -01 with -03 for 300 tests.
* For Chlorine, liquid reagents are available. ** Reagents for 50 tests

For a complete list of Reagents, see Reagents *Section 18*.

Multiparameter Photometer for Chemical Manufacturers

TEST	RANGE	METHOD	REAGENT CODE†
Aluminum	0.00 to 1.00 mg/L (ppm)	Aluminon	HI 93712-01
Ammonia LR	0.00 to 3.00 mg/L (ppm)	Nessler	HI 93700-01
Ammonia MR	0.00 to 10.00 mg/L (ppm)	Nessler	HI 93715-01
Chromium VI HR	0 to 1000 µg/L	Diphenylcarbohydrazide	HI 93723-01
Chromium VI LR	0 to 300 µg/L	Diphenylcarbohydrazide	HI 93749-01
Copper HR	0.00 to 5.00 mg/L (ppm)	Bicinchoninate	HI 93702-01
Copper LR	0 to 1000 µg/L	Bicinchoninate	HI 95747-01
Cyanuric Acid	0 to 80 mg/L (ppm)	Turbidimetric	HI 93722-01
Iodine	0.0 to 12.5 mg/L (ppm)	DPD	HI 93718-01
Iron HR	0.00 to 5.00 mg/L (ppm)	Phenantroline	HI 93721-01
Iron LR	0 to 400 µg/L	TPTZ	HI 93746-01**
Molybdenum	0.0 to 40.0 mg/L (ppm)	Mercaptoacetic Acid	HI 93730-01
Nickel HR	0.00 to 7.00 g/L	Photometric	HI 93726-01
Nickel LR	0.000 to 1.000 mg/L (ppm)	PAN	HI 93740-01**
pH	6.5 to 8.5 pH	Phenol Red	HI 93710-01
Phosphate HR	0.0 to 30.0 mg/L (ppm)	Amino Acid	HI 93717-01
Phosphate LR	0.00 to 2.50 mg/L (ppm)	Ascorbic Acid	HI 93713-01
Phosphorus	0.0 to 15.0 mg/L (ppm)	Amino Acid	HI 93706-01
Silica	0.00 to 2.00 mg/L (ppm)	Heteropoly blue	HI 93705-01
Silver	0.000 to 1.000 mg/L (ppm)	PAN	HI 93737-01**
Zinc	0.00 to 3.00 mg/L (ppm)	Zincon	HI 93731-01

Reagents are available in liquid or powder form, and the amount of each reagent is precisely dosed to ensure maximum repeatability.
† Unless noted otherwise, all reagent codes ending with -01 are fo 100 tests. Replace the -01 with -03 for 300 tests.
** Reagents for 50 tests

The chemical manufacturing industry creates a multitude of environmental impacts; it is one of the largest users of natural resources. In order to respect government regulation requirements, all manufacturers must monitor and control their emissions.

Chemical manufacturers use a variety of water quantities, depending on the product manufactured and production processess.

The primary uses of water are for non-contact cooling, steam applications, and product processing. The production of various chemicals requires different amounts of water. For example, producing silicon-based chemicals requires large quantities of water, yet the top manufactured chemicals by volume (including nitrogen, ammonia, phosphoric acid) require far less water during production. Throughout the industry, more than 80% of the water used for cooling and steam is recycled. Processes of water recycling varies widely, and need to be strictly monitored and controlled in order to meet regulations.

HI 83211 is a multiparameter bench meter that measures twenty-one methods essential for chemical manufacturing analysis. It has five channels allowing for a wide range of tests.

The optical system of HI 83211 is based on special subminiature tungsten lamps and narrow-band interference filters to guarantee both high performance and reliable results.

HI 83211 has a powerful interactive user support that assists the user during the analysis process. A full tutorial is available in the Setup Menu, and the Help Menu provides assistance for every step in the measurement process. This meter can be connected to a PC via a USB cable, where the data can be managed with optional HI 92000 Windows® compatible software.

ADP
Application Designed Photometers

21 **methods**

ORDERING INFORMATION

HI 83211-01 (115V) and **HI 83211-02** (230V) is supplied with sample cuvettes and caps (2 ea.), cloth for wiping cuvettes, scissors, AC/DC power adapter, and instruction manual.

For a complete list of Reagents, see Reagents *Section 18*.

HI 83209

Multiparameter Photometer for Education

HI 83209 is a multiparameter bench meter dedicated to educational use. It measures twenty methods, and has four channels allowing for a wide range of tests.

HI 83209 has been designed to be used both indoors and out. In fact, with its splashproof keyboard, rechargeable battery and 12 VDC adapter, HI 83209 is as equally at home in a busy school lab as out near a pond.

The optical system of HI 83209 is based on special subminiature tungsten lamps and narrow-band interference filters to guarantee both high performance and reliable results.

HI 83209 has a powerful interactive user support that assists the user during the analysis process. A full tutorial is available in the Setup Menu, and the Help Menu provides assistance for every step in the measurement process. This meter can be connected to a PC via a USB cable, where the data can be managed with optional HI 92000 Windows® compatible software.

ADP *Application Designed Photometers*

20 methods

ORDERING INFORMATION

HI 83209-01 (115V) and **HI 83209-02** (230V) is supplied with sample cuvettes (3), cloth for wiping cuvettes, 60 mL glass bottle for dissolved oxygen, scissors, AD/DC power adapter, and instruction manual.

TEST	RANGE	METHOD	REAGENT CODE†
Ammonia MR	0.00 to 10.00 mg/L (ppm)	Nessler	HI 93715-01
Ammonia LR	0.00 to 3.00 mg/L (ppm)	Nessler	HI 93700-01
Chlorine*, Free	0.00 to 2.50 mg/L (ppm)	DPD	HI 93701-01
Chlorine*, Total	0.00 to 3.50 mg/L (ppm)	DPD	HI 93711-01
Chromium VI HR	0 to 1000 µg/L	Diphenylcarbohydrazide	HI 93749-01
Chromium VI LR	0 to 300 µg/L	Diphenylcarbohydrazide	HI 93723-01
Color of Water	0 to 500 PCU	Colorimetric platinum cobalt	–
Copper HR	0.00 to 5.00 mg/L (ppm)	Bicinchoninate	HI 93702-01
Copper LR	0 to 1000 µg/L	Bicinchoninate	HI 95747-01
Nitrate	0.0 to 30.0 mg/L (ppm)	Cadmium Reduction	HI 93728-01
Nitrite HR	0 to 150 mg/L (ppm)	Ferrous Sulfate	HI 93708-01
Nitrite LR	0.00 to 1.15 mg/L (ppm)	Diazotization	HI 93707-01
Oxygen, Dissolved (DO)	0.0 to 10.0 mg/L (ppm)	Winkler	HI 93732-01
pH	6.5 to 8.5 pH	Phenol Red	HI 93710-01
Phosphate HR	0.0 to 30.0 mg/L (ppm)	Amino Acid	HI 93717-01
Phosphate LR	0.00 to 2.50 mg/L (ppm)	Ascorbic Acid	HI 93713-01
Phosphorus	0.0 to 15.0 mg/L (ppm)	Amino Acid	HI 93706-01
Silica	0.00 to 2.00 mg/L (ppm)	Heteropoly blue	HI 93705-01
Silver	0.000 to 1.000 mg/L (ppm)	PAN	HI 93737-01**
Zinc	0.00 to 3.00 mg/L (ppm)	Zincon	HI 93731-01

Reagents are available in liquid or powder form, and the amount of each reagent is precisely dosed to ensure maximum repeatability.
† Unless noted otherwise, all reagent codes ending with -01 are for 100 tests. Replace the -01 with -03 for 300 tests.
* For Chlorine, liquid reagents are available. ** Reagents for 50 tests

For a complete list of Reagents, see Reagents *Section 18*.

Multiparameter Photometer for Environmental Analysis

HI 83218 is a multiparameter bench meter that measures five parameters essential for environmental analysis. It has three channels allowing for a wide range of tests.

The HI 83218 is designed to be simple to use and offer high accuracy measurements at a low cost per test. In order to improve resolution and cover a wider range, there are dual scales for ammonia, chromium and nitrite.

The optical system of HI 83218 is based on special subminiature tungsten lamps and narrow-band interference filters to guarantee both high performance and reliable results.

HI 83218 has a powerful interactive user support that assists the user during the analysis process. A full tutorial is available in the Setup Menu, and the Help Menu provides assistance for every step in the measurement process. This meter can be connected to a PC via a USB cable, where the data can be managed with optional HI 92000 Windows® compatible software.

ADP
Application Designed Photometers

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methods

TEST	RANGE	METHOD	REAGENTS†
Ammonia HR	0.0 to 50.0 mg/L (ppm)	Nessler	HI 93733-01
Ammonia MR	0.00 to 10.00 mg/L (ppm)	Nessler	HI 93715-01
Chromium VI HR	0 to 1000 µg/L	Diphenylcarbohydrazide	HI 93723-01
Chromium VI LR	0 to 300 µg/L	Diphenylcarbohydrazide	HI 93749-01
Nitrate	0.0 to 30.0 mg/L (ppm)	Cadmium Reduction	HI 93728-01
Nitrite HR	0 to 150 mg/L (ppm)	Ferrous Sulfate	HI 93708-01
Nitrite LR	0.00 to 1.15 mg/L (ppm)	Diazotization	HI 93707-01
Phosphorus	0.0 to 15.0 mg/L (ppm)	Amino Acid	HI 93706-01

Reagents are available in liquid or powder form, and the amount of each reagent is precisely dosed to ensure maximum repeatability.
† Unless noted otherwise, all reagent codes ending with -01 are for 100 tests. Replace the -01 with -03 for 300 tests.

ORDERING INFORMATION

HI 83218-01 (115V) and **HI 83218-02** (230V) is supplied with sample cuvettes and caps (2 ea.), cloth for wiping cuvettes (1), scissors, AC/DC power adapter, and instruction manual.

For a complete list of Reagents, see Reagents *Section 18*.

HI 83206

Multiparameter Photometer for Environmental Testing

HI 83206 is a multiparameter bench photometer dedicated to environmental testing. Critical environmental parameters such as pH, dissolved oxygen, nitrite, ammonia, chlorine and phosphorus or pollutants like chromium VI, nickel, silver and zinc can be monitored with this meter. This instrument measures 24 different methods, and has four measuring channels for a wide range of tests.

The optical system of HI 83206 is based on special subminiature tungsten lamps and narrow-band interference filters to guarantee both high performance and reliable results.

HI 83206 has a powerful interactive user support that assists the user during the analysis process. A full tutorial is available in the Setup Menu, and the Help Menu provides assistance for every step in the measurement process. This meter can be connected to a PC via a USB cable, where the data can be managed with optional HI 92000 Windows® compatible software.

ADP
Application Designed Photometers

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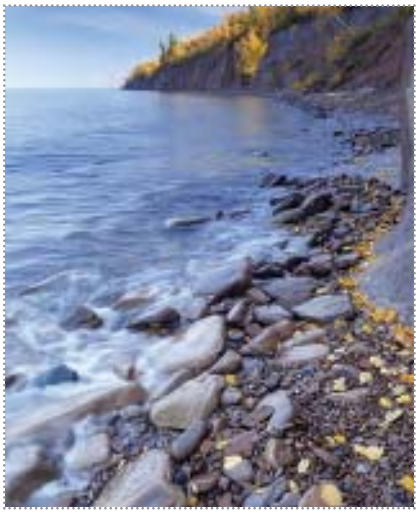

ORDERING INFORMATION

HI 83206-01 (115V) and **HI 83206-02** (230V) are supplied with sample cuvettes and caps (3 ea), cloth for wiping cuvettes (1), 60 mL glass bottle for dissolved oxygen (1), scissors, AC/DC power adapter and instruction manual.

TEST	RANGE	METHOD	REAGENT CODE†
Ammonia MR	0.00 to 10.00 mg/L (ppm)	Nessler	HI 93715-01
Ammonia LR	0.00 to 3.00 mg/L (ppm)	Nessler	HI 93700-01
Chlorine*, Free	0.00 to 2.50 mg/L (ppm)	DPD	HI 93701-01
Chlorine*, Total	0.00 to 3.50 mg/L (ppm)	DPD	HI 93711-01
Chromium VI HR	0 to 1000 µg/L	Diphenylcarbohydrazide	HI 93723-01
Chromium VI LR	0 to 300 µg/L	Diphenylcarbohydrazide	HI 93749-01
Color of Water	0 to 500 PCU	Colorimetric platinum cobalt	–
Copper HR	0.00 to 5.00 mg/L (ppm)	Bicinchoninate	HI 93702-01
Copper LR	0 to 1000 µg/L	Bicinchoninate	HI 95747-01
Cyanuric Acid	0 to 80 mg/L (ppm)	Turbidimetric	HI 93722-01
Molybdenum	0.0 to 40.0 mg/L (ppm)	Mercaptoacetic Acid	HI 93730-01
Nickel HR	0.00 to 7.00 g/L	Photometric	HI 93726-01
Nickel LR	0.000 to 1.000 mg/L (ppm)	PAN	HI 93740-01**
Nitrate	0.0 to 30.0 mg/L (ppm)	Cadmium Reduction	HI 93728-01
Nitrite HR	0 to 150 mg/L (ppm)	Ferrous Sulfate	HI 93708-01
Nitrite LR	0.00 to 1.15 mg/L (ppm)	Diazotization	HI 93707-01
Oxygen, Dissolved (DO)	0.0 to 10.0 mg/L (ppm)	Winkler	HI 93732-01
pH	6.5 to 8.5 pH	Phenol Red	HI 93710-01
Phosphate HR	0.0 to 30.0 mg/L (ppm)	Amino Acid	HI 93717-01
Phosphate LR	0.00 to 2.50 mg/L (ppm)	Ascorbic Acid	HI 93713-01
Phosphorus	0.0 to 15.0 mg/L (ppm)	Amino Acid	HI 93706-01
Silica	0.00 to 2.00 mg/L (ppm)	Heteropoly blue	HI 93705-01
Silver	0.000 to 1.000 mg/L (ppm)	PAN	HI 93737-01**
Zinc	0.00 to 3.00 mg/L (ppm)	Zincon	HI 93731-01

Reagents are available in liquid or powder form, and the amount of each reagent is precisely dosed to ensure maximum repeatability.
† Unless noted otherwise, all reagent codes ending with -01 are for 100 tests. Replace the -01 with -03 for 300 tests.
* For chlorine, liquid reagents are available. ** Reagents for 50 tests

For a complete list of Reagents, see Reagents *Section 18*.

HANNA instruments

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Nutrient Analysis Photometer for Greenhouses and Hydroponics

Nitrogen, phosphorus, and potassium (NPK) are often the first three factors considered when making recommendations to growers. Compared to the HI 83215, the HI 83225 provides control over three additional important growing factors: sulfur (most common as sulfates), calcium and magnesium.

HI 83225 is designed for the hydroponics and greenhouse industries to measure seven nutrients commonly present in fertilizer enriched solutions. It can measure fifteen different methods using specific liquid or powder reagents, and has four measuring channels for a wide range of tests.

The optical system of HI 83225 is based on special subminiature tungsten lamps and narrow-band interference filters to guarantee both high performance and reliable results.

HI 83225 has a powerful interactive user support that assists the user during the analysis process. A full tutorial is available in the Setup Menu, and the Help Menu provides assistance for every step in the measurement process. This meter can be connected to a PC via a USB cable, where the data can be managed with optional HI 92000 Windows® compatible software.

TEST	RANGE	METHOD	REAGENTS
Ammonia HR	0 to 100 mg/L (ppm)	Nessler	HI 93715-01
Ammonia MR	0.0 to 50.0 mg/L (ppm)	Nessler	HI 93715-01
Ammonia LR	0.0 to 10.0 mg/L (ppm)	Nessler	HI 93715-01
Nitrate HR	0 to 300 mg/L (ppm)	Cadmium Reduction	HI 93728-01
Nitrate MR	0 to 150 mg/L (ppm)	Cadmium Reduction	HI 93728-01
Nitrate LR	0.0 to 30.0 mg/L (ppm)	Cadmium Reduction	HI 93728-01
Phosphorus HR	0 to 100 mg/L (ppm)	Amino Acid	HI 93706-01
Phosphorus MR	0.0 to 50.0 mg/L (ppm)	Amino Acid	HI 93706-01
Phosphorus LR	0.0 to 10.0 mg/L (ppm)	Amino Acid	HI 93706-01
Potassium HR	20 to 200 mg/L (ppm)	Turbidimetric	HI 93750-01
Potassium MR	10 to 100 mg/L (ppm)	Turbidimetric	HI 93750-01
Potassium LR	0.0 to 20.0 mg/L (ppm)	Turbidimetric	HI 93750-01
Calcium	0 to 400 mg/L (ppm)	Oxalate	HI 937521-01**
Magnesium	0 to 150 mg/L (ppm)	Calmagite	HI 937520-01**
Sulfate	0 to 100 mg/L (ppm)	Turbidimetric	HI 93751-01

Reagents are available in liquid or powder form, and the amount of each reagent is precisely dosed to ensure maximum repeatability.
† Unless noted otherwise, all reagent codes ending with -01 are for 100 tests. Replace the -01 with -03 for 300 tests.
* For chlorine, liquid reagents are available. ** Reagents for 50 tests (-01) and 150 tests (-03)

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ORDERING INFORMATION

HI 83225-01 (115V) and **HI 83225-02** (230V) are supplied with sample cuvettes and caps (4 ea.), sample preparation kit, cloth for wiping cuvettes (1), scissors, AC/DC power adapter and instruction manual

HI 83225-100 kit includes 10 mL cuvettes and caps (4 ea.), 100 mL plastic beaker, 170 mL plastic beaker, 100 mL graduated cylinder, 60 mL syringe with screw rim, 5 mL syringe, funnel, filter discs (25), spoon, pipettes (2), carbon powder packets (50) and demineralizer bottle with filter cap for approximately 12 liters of deionized water.

For a complete list of Reagents, see Reagents *Section 18*.

HI 83215

Nutrient Analysis Photometer for Greenhouses and Hydroponics

Deciding which fertilizer to use can be overwhelming, but with a bit of knowledge you can be sure your garden will get the right amount of nutrients it needs. The first question you'll need to answer is, "What analysis do I need?" The analysis is actually three numbers you see usually at the middle or bottom of fertilizer packages (for example 10-20-10). These numbers represent percentages of the three major nutrients plants need: nitrogen, phosphorus and potassium (NPK for short).

HI 83215 is a multiparameter bench meter that measures twelve methods in low, medium and high ranges essential for monitoring greenhouse and hydroponics operations. It's three channels allow for a wide range of tests.

The optical system of HI 83215 is based on special subminiature tungsten lamps and narrow-band interference filters to guarantee both high performance and reliable results.

HI 83215 has powerful interactive user support that assists the user during the analysis process. A full tutorial is available in the Setup Menu, and the Help Menu provides assistance for every step in the measurement process. This meter can be connected to a PC via a USB cable, where the data can be managed with optional HI 92000 Windows® compatible software.

NPK

Nitrogen, represented by the first number from fertilizer packages, provides plants with lush green foliage growth. The second number represents phosphorus, which aids in root development, flowering ability and size. Many companies will market high phosphorus fertilizers as "bloom boosters". Potassium is represented by the third number in the N-P-K sequence. This helps guard a plant from disease and insects, as well as temperature extremes and drought.

ADP Application Designed Photometers

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TEST	RANGE	METHOD	REAGENTS†
Ammonia HR	0 to 100 mg/L (ppm)	Nessler	HI 93715-01
Ammonia MR	0.0 to 50.0 mg/L (ppm)	Nessler	HI 93715-01
Ammonia LR	0.0 to 10.0 mg/L (ppm)	Nessler	HI 93715-01
Nitrate HR	0 to 300 mg/L (ppm)	Cadmium Reduction	HI 93728-01
Nitrate MR	0 to 150 mg/L (ppm)	Cadmium Reduction	HI 93728-01
Nitrate LR	0.0 to 30.0 mg/L (ppm)	Cadmium Reduction	HI 93728-01
Phosphorus HR	0 to 100 mg/L (ppm)	Amino Acid	HI 93706-01
Phosphorus MR	0.0 to 50.0 mg/L (ppm)	Amino Acid	HI 93706-01
Phosphorus LR	0.0 to 10.0 mg/L (ppm)	Amino Acid	HI 93706-01
Potassium HR	20 to 200 mg/L (ppm)	Turbidimetric	HI 93750-01
Potassium MR	10 to 100 mg/L (ppm)	Turbidimetric	HI 93750-01
Potassium LR	0.0 to 20.0 mg/L (ppm)	Turbidimetric	HI 93750-01

Reagents are available in liquid or powder form, and the amount of each reagent is precisely dosed to ensure maximum repeatability.
† Unless noted otherwise, all reagent codes ending with -01 are for 100 tests. Replace the -01 with -03 for 300 tests.

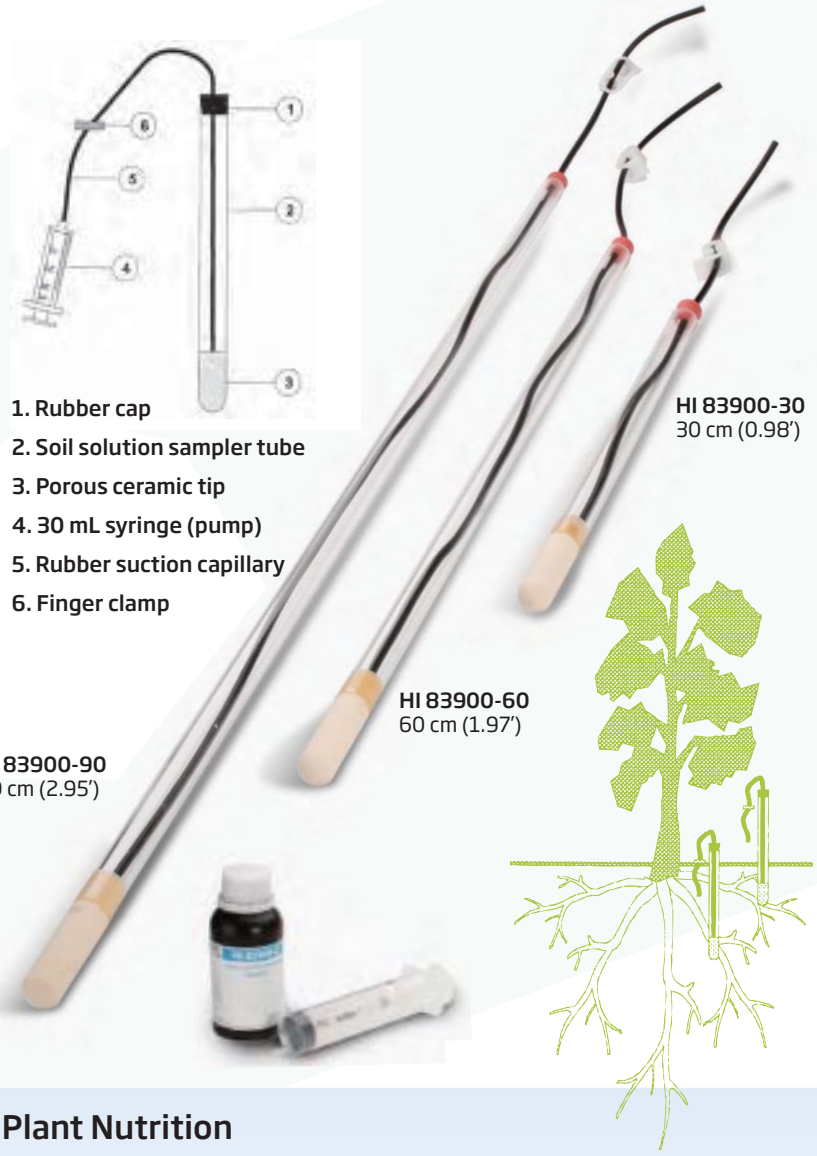
ORDERING INFORMATION

HI 83215-01 (115V) and **HI 83215-02** (230V) is supplied with sample cuvettes and caps (4 ea.), sample preparation kit, cloth for wiping cuvettes (1), scissors, AC/DC power adapter and instruction manual

HI 83215C-100 kit includes 10 mL cuvettes with caps (4 ea.), 100 mL plastic beaker, 170 mL plastic beaker, 100 mL graduated cylinder, 60 mL syringe with screw rim, 5 mL syringe, funnel, filter discs (25), spoon, pipettes (2), carbon powder packets (50), and demineralizer bottle with filter cap for approximately 12 liters of deionized water.

For a complete list of Reagents, see Reagents *Section 18*.

Suction Lysimeter for Root Level Soil Monitoring



- **The perfect companion to the HI 83225 and HI 83215**
- **Monitor soil composition at the roots**
- **Easy to use**

The HI 83900 suction lysimeter is built with a porous ceramic cap connected to a transparent tube for soil solution extraction. A rubber capillary is inserted in the tube passing through a rubber cap and reaching the ceramic tip.

The HI 83900 series lysimeter is an ideal tool for collecting soil solution samples and then perform quantitative chemical analysis. In this way the operator can easily monitor the level of nutrients, such as ammonia, nitrate, phosphorous and potassium, sulfate, calcium, magnesium.

The ceramic tip of the lysimeter can be used in all types of soil, and it is made of a sinterized material that does not react with nutrient elements. The soil solution, therefore, is not affected by the chemical composition of the ceramic cap resulting in precise and reliable tests.

The HI 83900 allows the extraction of a solution from the soil by creating a vacuum (negative pressure or suction) inside the sampler tube, that exceeds the soil water tension. This will establish an hydraulic gradient for the solution to flow through the porous ceramic cap and into the lysimeter tube. Typically, a vacuum of about -60 cb (centibar) should be drawn.

For better monitoring of soil solution composition throughout an entire growth period of crops, at least two lysimeters should be installed in the root zone of a representative plant, one at the upper and one in the lower part of the root zone.

For better measurement accuracy and repeatability, it is recommended to replicate installations in at least two more locations.

Plant Nutrition

The three elements that are most needed by plants are nitrogen (N), phosphorous (P) and potassium (K).

Nitrogen is indispensable for the plant's life and is a key factor in fertilization. Nitrogen allows the development of the vegetative activity of the plant, in particular, causes lengthening of trunks and sprouts and increases the production of foliage and fruits. An excess of nitrogen weakens the plants structure creating an unbalanced relationship between the leaves and the stalks. In addition, the plant becomes less resistant to diseases.

Phosphorous is an important element in the composition of DNA and RNA, the regulators of the energetic exchange (ATP and ADP), as well as the reserve substances in seeds and bulbs. It contributes to the formation of buds, roots, blooming, and lignification. A lack of phosphorous results in: stifling of plants, slow growth, a reduction of production, smaller fruits and a lower expansion of the roots.

Even if potassium is not a constituent of important compounds, it plays a remarkable role in many physiological activities like the control of cellular turgor and the accumulation of carbohydrates. It increases the size of fruits, their flavor, as well as yielding a positive effect on the color and fragrance of flowers. Potassium also makes plants more resistant to disease.

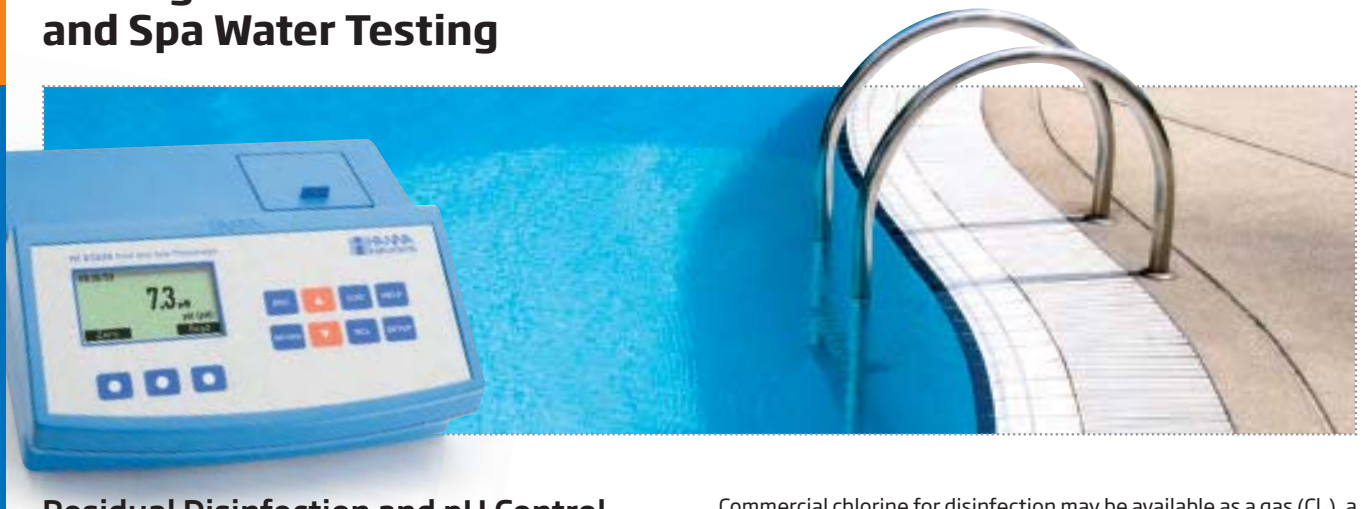
ORDERING INFORMATION

HI 83900-30 is comprised of 30 cm (0.98') sampler tube ending with porous ceramic tip.
HI 83900-60 is comprised of 60 cm (1.97') sampler tube ending with porous ceramic tip.
HI 83900-90 is comprised of 90 cm (2.95') sampler tube ending with porous ceramic tip.
All include capillary rubber tube with rubber cap and finger clamp, cleaning solution stater kit (120 mL), 30 mL syringe and instructions

ACCESSORIES

HI 83900-25 Cleaning solution kit, 500 mL
HI 83900-00 Cleaning solution starter kit, 120 mL

The Significance of Pool and Spa Water Testing



Residual Disinfection and pH Control

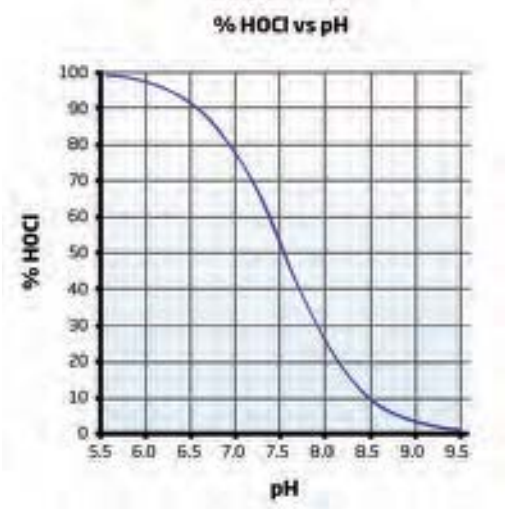
In terms of swimming pool treatment, disinfection or sanitizing basically means to rid the pool of bather pollution, destroy bacteria, and control nuisance organisms like algae, which may occur in the pool, filtration equipment, and piping.

There are a number of techniques used, namely, chlorine, bromine and ozone dosing systems, of which chlorine is the most common.

Chlorine

Chlorine is a strong oxidizing agent that destroys organic pollutants and bacteria. Chlorine combines with compounds containing nitrogen to form chloramines, during which only part of the chlorine will be used while the rest remains active, continuing it's disinfecting action.

Combined chlorine is the quantity of chlorine that has already combined with nitrogen containing compounds. It is much less effective as a disinfectant than free chlorine, which has yet to make the transition. The addition of combined chlorine, and free chlorine gives total chlorine. A pool manager needs to aim for the perfect balance where free and total chlorine are proportionally equal, and thus to keep the combined chlorine levels near zero. The presence of chloramines is undesirable because of the distinctive 'swimming pool smell' as well as irritation to the eyes and mucous membranes caused by combined chlorines like dichloramines.



Commercial chlorine for disinfection may be available as a gas (Cl_2), a liquid like sodium hypochlorite or bleach (NaOCl) or in a solid state like calcium hypochlorite, chlorohydantoins or chlorocyanuric acid compounds. These compounds, once dissolved in water, establish equilibrium between the hypochlorous acid (HOCl) and the hypochlorite ions (OCl^-). Although both forms are considered free chlorine, it is the hypochlorous acid that provides the strongest disinfecting and oxidizing characteristic of chlorine solutions. The amount of hypochlorous acid in chlorinated water depends upon the pH value of the solution. Changes in pH value will effect the HOCl equilibrium in relation to the hydrogen and hypochlorite ions.

As depicted by the graph, HOCl decreases and OCl^- increases as pH increases. At a low pH, almost all the free chlorine is in the molecular form HOCl, and at a pH of around 7.5, the ratio between HOCl and OCl^- is 50:50. Since the ionic form OCl^- is a slow acting sanitizer while the molecular HOCl is a fast acting, it is important to measure pH regularly. As a general rule a pH of about 7.2 is recommended to maintain fast acting disinfection conditions.

Bromine

In many countries bromine sanitizing has been introduced as an alternative for chlorine, although it is not as strong. The advantage of bromine lies in its stability at higher temperatures (advantageous for heated pools and hot tubs), and its maintained disinfection power at a higher pH. Furthermore, there is very little reaction between bromine and nitrogen compounds, reducing the unpleasant odor, and eye irritation problems. The main disadvantage of bromine is the slower acting disinfecting power, making it less suitable for larger pools.

Ozone

Ozone is a very strong oxidizing agent that destroys organic compounds that are especially difficult to oxidize. It allows the pool manager to very efficiently remove combined chlorine without frequently refreshing large amounts of pool water. By the time the water passes through the filter units, ozone has already completed sanitizing, and it is not effected by the pH level.

Mainly because of its strong oxidizing power, the return water may contain trace concentrations of ozone. It imperative to know that ozone is very unstable, so to ensure thorough sanitization of the water, low-level chlorination remains necessary.

The Water Balance and Langelier Index

Pool water characteristics need to be maintained in a balanced state to avoid numerous issues. Measuring certain variables is extremely important to predict if the water is corrosive, scaling or balanced.

A saturation index developed by Dr. Wilfred Langelier is widely used to predict the balance of swimming pool waters. It represents the estimation of a solutions ability to dissolve or precipitate calcium carbonate deposits. A certain level of this precipitation (filming) is desired to insulate pipes and boilers from contact with water. When no protective filming is formed, water is considered to be corrosive. On the other hand, too much filming can develop into scaling and incrustation of the pipes.

In the treatment and monitoring of pool water, the pool manager must ensure that related parameters such as alkalinity, hardness and pH are dutily taken into consideration.

Calcium

The presence of calcium in the system is desired to ensure filming on those places where the temperature is relatively high, like in boilers and pipes transporting warm water. Scaling must be avoided because it reduces heat transfer and pump capacity, and causes cloudiness in the water.

It is recommended to maintain the calcium hardness value within the range from 200 to 400 ppm as calcium carbonate ($CaCO_3$).

Alkalinity

Alkalinity is the measure of the total concentration of alkaline substances, mostly bicarbonates, dissolved in the water. The higher the alkalinity, the more resistant the water is to pH change. At the same time, high alkaline water is a major contributor to scaling problems like incrustation in filtration equipment, pumps, and piping.

pH

It is recommended to maintain the alkalinity value within the range from 80 to 125 ppm as calcium carbonate ($CaCO_3$).

The pH of the water is an important factor since at lower pH levels the corrosion rate increases. If the alkalinity values are sufficiently high, it will not be difficult to control the pH. Most pool managers prefer to keep the pH between 7.2 and 7.4 to best maintain low corrosion rates and a sufficient activity of chlorine.

The Langelier Index is a powerful tool to calculate the water balance, and to predict corrosion or scaling problems. Theoretically, a LI of zero indicates perfect water condition for swimming pools. If LI>0, scaling and staining of the water is present, and if LI<0 the water is corrosive and highly irritating. A tolerance of ±0.4 is normally acceptable.

The Langelier formula is expressed as:

LI = pH + TF + HF + AF - 12.5

Where:

LI = Langelier Index (also called Saturation Index)
pH = pH of the water
TF = temperature factor
HF = hardness factor, log (Ca hardness, ppm as CaCO3)
AF = alkalinity factor, log (alkalinity, ppm as CaCO3)

To calculate the exact Langelier Index of your water please use the WATER INDEX reference tables.

For most pools, water is balanced if:

- **The pH value is maintained within the recommended ranges of pH 7.2 - 7.6**
- **Ideally the Alkalinity should be maintained within a range of 80 - 125 ppm**
- **The Calcium Hardness should be maintained within a range of 200 - 400 ppm.**

To calculate your water balance, three parameters must be measured; calcium hardness, alkalinity and pH. Find the hardness and alkalinity factor in the WATER INDEX reference tables below.

The water temperature is, in general, maintained between 24°C (76°F) and 34°C (94°F). Assuming the temperature is kept within those ranges, an average value or 0.7 may be used.

Water balance = pH+TF+HF+AF

Water Balance	Condition	Recommendation
11.0-12.0	Corrosive	Increase pH and/or alkalinity
12.1-12.3	Acceptable Balance	Retest water frequently
12.4-12.6	Ideal Balance	Maintain
12.7-12.9	Acceptable Balance	Retest water frequently
13.0-14.0	Scale Forming	Reduce pH and/or alkalinity

Water Index Reference Table

Temperature			Calcium Hardness		Alkalinity	
°C	°F	TF	mg/L (as $CaCO_3$)	HF	mg/L (as $CaCO_3$)	AF
0	32	0	5	0.7	5	0.7
4	39	0.1	25	1.4	25	1.4
8	46	0.2	50	1.7	50	1.7
12	54	0.3	75	1.9	75	1.9
16	60	0.4	100	2.0	100	2.0
20	68	0.5	150	2.2	150	2.2
24	75	0.6	200	2.3	200	2.3
28	82	0.7	250	2.4	250	2.4
32	90	0.7	300	2.5	300	2.5
36	97	0.8	400	2.6	400	2.6
40	104	0.9	500	2.7	500	2.7
50	122	1.0	1000	3.0	1000	3.0

HI 83226

Multiparameter Photometer for Pools and Spas

Around the world, swimming pool and spa facilities welcome dozens, even hundreds of people on a daily basis. A basic necessity of pool water treatment is to maintain the water in a safe and pleasant condition for the bathers.

In order to achieve ideal water conditions, swimming pool water requires testing on a daily and sometimes hourly basis for disinfection of residuals and maintaining pH levels. Equally important, calcium hardness and alkalinity levels should be monitored weekly to ensure the pool water is well balanced, thus to avoid corrosion and scale formation.

HI 83226 is a multiparameter bench meter that measures nine parameters essential for advanced pool and spa water analysis.

The optical system of HI 83226 is based on special subminiature tungsten lamps and narrow-band interference filters to guarantee both high performance and reliable results.

HI 83226 has a powerful interactive user support that assists the user during the analysis process. A full tutorial is available in the Setup Menu, and the Help Menu provides assistance for every step in the measurement process. This meter can be connected to a PC via a USB cable, where the data can be managed with optional HI 92000 Windows® compatible software.

ADP
Application Designed Photometers

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methods

ORDERING INFORMATION

HI 83226-01 (115V), **HI 83226-02** (230V), are supplied with sample cuvettes with caps (4 ea.), cloth for wiping cuvettes, scissors, AC/DC power adapter and instruction manual

HI 83226 TEST	RANGE	METHOD	REAGENT CODE†
Alkalinity	0 to 500 mg/L (ppm) as $CaCO_3$	Bromocresol green	HI 93755-01
Bromine	0.00 to 10.00 mg/L (ppm)	DPD	HI 93716-01
Chlorine, Free	0.00 to 5.00 mg/L (ppm)	DPD	HI 93701-01
Chlorine, Total	0.00 to 5.00 mg/L (ppm)	DPD	HI 93711-01
Copper, Free	0.00 to 5.00 mg/L (ppm)	Bicinchoninate	HI 93702-01
Copper, Total	0.00 to 5.00 mg/L (ppm)	Bicinchoninate	HI 93702T-01
Cyanuric Acid	0 to 200 mg/L (ppm)	Turbidimetric	HI 93722-01
Hardness, Calcium	0 to 500 mg/L (ppm) as $CaCO_3$	Calmagite	HI 93720-01
Iron HR	0.00 to 5.00 mg/L (ppm)	Phenantroline	HI 93721-01
Ozone	0.00 to 2.00 mg/L (ppm)	DPD	HI 93757-01
pH	6.5 to 8.5 pH	Phenol Red	HI 93710-01

Reagents are available in liquid or powder form, and the amount of each reagent is precisely dosed to ensure maximum repeatability.
† Unless noted otherwise, all reagent codes ending with -01 are for 100 tests. Replace the -01 with -03 for 300 tests.

For a complete list of Reagents, see Reagents *Section 18*.

HANNA instruments

With Great Products, Come Great Results™

Multiparameter Photometer for Pools and Spas

When you need to only measure a few parameters daily, the HI 83216 can do the job quickly, accurately and at a comparable cost of chemical test kits.

Around the world, swimming pool and spa facilities welcome dozens, even hundreds of people on a daily basis. A basic necessity of pool water treatment is to maintain the water in a safe and pleasant condition for the bathers.

In order to achieve ideal water conditions, swimming pool water requires testing on a daily and sometimes hourly basis for disinfection residuals and maintaining pH levels. Equally important, calcium hardness and alkalinity levels should be monitored weekly to ensure the pool water is well balanced, thus to avoid corrosion and scale formation.

HI 83216 is a multiparameter bench meter that measures six different methods essential for pool and spa water analysis. It has two channels allowing for a wide range of tests.

The optical system of HI 83216 is based on special subminiature tungsten lamps and narrow-band interference filters to guarantee both high performance and reliable results.

HI 83216 has a powerful interactive user support that assists the user during the analysis process. A full tutorial is available in the Setup Menu, and the Help Menu provides assistance for every step in the measurement process. This meter can be connected to a PC via a USB cable, where the data can be managed with optional HI 92000 Windows® compatible software.

HI 83216 TEST	RANGE	METHOD	REAGENT CODE†
Alkalinity	0 to 500 mg/L (ppm) as $CaCO_3$	Bromocresol green	HI 93755-01
Chlorine, Free	0.00 to 5.00 mg/L (ppm)	DPD	HI 93701-01
Chlorine, Total	0.00 to 5.00 mg/L (ppm)	DPD	HI 93711-01
Cyanuric Acid	0 to 200 mg/L (ppm)	Turbidimetric	HI 93722-01
Hardness, Calcium	0 to 500 mg/L (ppm) as $CaCO_3$	Calmagite	HI 93720-01
pH	6.5 to 8.5 pH	Phenol Red	HI 93710-01

Reagents are available in liquid or powder form, and the amount of each reagent is precisely dosed to ensure maximum repeatability.
† Unless noted otherwise, all reagent codes ending with -01 are for 100 tests. Replace the -01 with -03 for 300 tests.

ADP
Application Designed Photometers

6
methods

ORDERING INFORMATION

HI 83216-01 (115V), **HI 83216-02** (230V), are supplied with sample cuvettes with caps (4 ea.), cloth for wiping cuvettes, scissors, AC/DC power adapter and instruction manual

For a complete list of Reagents, see Reagents *Section 18*.

HI 83212

Multiparameter Photometer for Power Plant Utilities

Ammonia levels are often tested in boiler feedwater and industrial waste.

Chlorine is used to sanitize cooling towers and industrial equipment.

Copper is often added to water to hinder growth of plankton and algae.

Hydrazine has bactericidal properties and scavenges oxygen.

Molybdenum is used as a corrosion inhibitor in cooling towers while phosphate can enter water streams due to boiler blow-downs and is added to reduce scaling.

Silica, on the other hand, can be a major source of scaling while Silver is a toxic pollutant and needs to be monitored in effluents.

HI 83212 is a multiparameter bench meter that measures thirteen methods essential for power plant utilities. It has four channels allowing for a wide range of tests.

The optical system of HI 83212 is based on special subminiature tungsten lamps and narrow-band interference filters to guarantee both high performance and reliable results.

HI 83212 has a powerful interactive user support that assists the user during the analysis process. A full tutorial is available in the Setup Menu, and the Help Menu provides assistance for every step in the measurement process. This meter can be connected to a PC via a USB cable, where the data can be managed with optional HI 92000 Windows® compatible software.

ADP
Application Designed Photometers

13 methods

ORDERING INFORMATION

HI 83212-01 (115V) and **HI 83212-02** (230V), are supplied with sample cuvettes with caps (4 ea.), cloth for wiping cuvettes, scissors, AC/DC power adapter and instruction manual

TEST	RANGE	METHOD	REAGENT CODE†
Ammonia MR	0.00 to 10.00 mg/L (ppm)	Nessler	HI 93715-01
Ammonia LR	0.00 to 3.00 mg/L (ppm)	Nessler	HI 93700-01
Chlorine*, Free	0.00 to 2.50 mg/L (ppm)	DPD	HI 93701-01
Chlorine*, Total	0.00 to 3.50 mg/L (ppm)	DPD	HI 93711-01
Copper HR	0.00 to 5.00 mg/L (ppm)	Bicinchoninate	HI 93702-01
Copper LR	0 to 1000 µg/L	Bicinchoninate	HI 95747-01
Hydrazine	0 to 400 µg/L	p-Dimethylamino - benzaldehyde	HI 93704-01
Molybdenum	0.0 to 40.0 mg/L (ppm)	Mercaptoacetic Acid	HI 93730-01
Phosphate HR	0.0 to 30.0 mg/L (ppm)	Amino Acid	HI 93717-01
Phosphate LR	0.00 to 2.50 mg/L (ppm)	Ascorbic Acid	HI 93713-01
Phosphorus	0.0 to 15.0 mg/L (ppm)	Amino Acid	HI 93706-01
Silica	0.00 to 2.00 mg/L (ppm)	Heteropoly blue	HI 95705-01
Silver	0.000 to 1.000 mg/L (ppm)	PAN	HI 93737-01**

Reagents are available in liquid or powder form, and the amount of each reagent is precisely dosed to ensure maximum repeatability.
† Unless noted otherwise, all reagent codes ending with -01 are for 100 tests. Replace the -01 with -03 for 300 tests.
* For Chlorine, liquid reagents are available. ** Reagents for 50 tests

For a complete list of Reagents, see Reagents *Section 18*.

Pulp and paper are manufactured from raw materials containing cellulose fibers generally from wood, recycled paper, and agricultural residues.

There are numerous steps in the paper manufacturing process; raw material preparation, such as wood debarking and chip making, pulp manufacturing, pulp bleaching and fiber recycling. Pulp mills and paper mills may exist separately or as integrated operations.

Pulp

Processed pulp is used as a source of cellulose for fiber manufacture and for conversion into paper or cardboard. Cellulosic pulp is manufactured from the raw materials, using chemical and mechanical means.

The manufacture of pulp for paper and cardboard employs mechanical (including thermomechanical), chemimechanical, and chemical methods. Mechanical pulping separates fibers by such methods as disk abrasion and billeting.

Chemimechanical processes involve mechanical abrasion and the use of chemicals.

Chemical pulps are made by cooking (digesting) the raw materials, using the kraft (sulfate) and sulfite processes.

In the case of chemical pulps (kraft and sulfite), the objective of bleaching is to remove the small fraction of the lignin remaining after cooking. Oxygen, hydrogen peroxide, ozone, peracetic acid, sodium hypochlorite, chlorine dioxide, chlorine, and other chemicals are used to transform lignin into an alkali-soluble form. An alkali, such as sodium hydroxide, is necessary in the bleaching process to extract the alkali-soluble form of lignin.

Pulp is washed with water in the bleaching process.

In modern mills, oxygen is normally used in the first stage of bleaching. The trend is to avoid the use of any kind of chlorine chemicals and employ "total chlorine-free" (TCF) bleaching.

TCF processes allow the bleaching effluents to be fed to the recovery boiler for steam generation; the steam is then used to generate electricity, thereby reducing the amount of pollutants discharged. Elemental chlorine-free (ECF) processes, which use chlorine dioxide, are required for bleaching certain grades of pulp.

Pulp and Paper Mill Wastewater

The significant environmental impacts of the manufacture of pulp and paper result from the pulping and bleaching processes. In some processes, sulfur compounds and nitrogen oxides are emitted into the air, and chlorinated and organic compounds, nutrients, and metals are discharged into the wastewater.

Wastewaters are discharged at a rate of 20–250 cubic meters per metric ton (m3/t) of air-dried pulp.

Wastewater from chemical pulping contains 12–20 kg of BOD/t of air-dried pulp, with values of up to 350 kg/t. The corresponding values for mechanical pulping wastewater are 15–25 kg BOD/t of air-dried pulp.

Phosphorus and nitrogen are also released into wastewaters.

The main source of nutrients, nitrogen, and phosphorus compounds is raw material such as wood. The use of peroxide, ozone, and other chemicals in bleaching makes it necessary to use a complexing agent for heavy metals.

HI 83210

Multiparameter Photometer for Pulp and Paper Mills

Water is an indispensable medium for all stages of paper production. It is used for suspending and swelling, transport, the dissolution and the rebuilding of fiber bondings and more.

Due to shrinking water resources, and subsequently, rising costs of available water supplies, more stringent environmental legislation has been put in place, strictly regulating industrial water consumption. Amongst the many industries effected, pulp and paper mills have imposed a trend towards less water consumption. This requires precise monitoring of chemicals and water supplies.

HI 83210 is a multiparameter bench meter that measures twelve methods essential for paper production. It has four channels allowing for a wide range of tests.

The optical system of HI 83210 is based on special subminiature tungsten lamps and narrow-band interference filters to guarantee both high performance and reliable results.

HI 83210 has a powerful interactive user support that assists the user during the analysis process. A full tutorial is available in the Setup Menu, and the Help Menu provides assistance for every step in the measurement process. This meter can be connected to a PC via a USB cable, where the data can be managed with optional HI 92000 Windows® compatible software.

ADP
Application Designed Photometers

12 **methods**

ORDERING INFORMATION

HI 83210-01 (115V) and **HI 83210-02** (230V), are supplied with sample cuvettes with caps (4 ea.), cloth for wiping cuvettes, 60 mL glass bottle for dissolved oxygen analysis, scissors, AC/DC power adapter and instruction manual

TEST	RANGE	METHOD	REAGENT CODE†
Aluminum	0.00 to 1.00 mg/L (ppm)	Aluminon	HI 93712-01
Chlorine Dioxide	0.00 to 2.00 mg/L (ppm)	Chlorophenol Red	HI 93738-01
Chlorine*, Free	0.00 to 2.50 mg/L (ppm)	DPD	HI 93701-01
Chlorine*, Total	0.00 to 3.50 mg/L (ppm)	DPD	HI 93711-01
Color of Water	0 to 500 PCU	Platinum Cobalt	–
Oxygen, Dissolved (DO)	0.0 to 10.0 mg/L (ppm)	Winkler	HI 93732-01
pH	6.5 to 8.5 pH	Phenol Red	HI 93710-01
Phosphate HR	0.0 to 30.0 mg/L (ppm)	Amino Acid	HI 93717-01
Phosphate LR	0.00 to 2.50 mg/L (ppm)	Ascorbic Acid	HI 93713-01
Silica	0.00 to 2.00 mg/L (ppm)	Heteropoly blue	HI 93705-01
Silver	0.000 to 1.000 mg/L (ppm)	PAN	HI 93737-01**
Zinc	0.00 to 3.00 mg/L (ppm)	Zincon	HI 93731-01

Reagents are available in liquid or powder form, and the amount of each reagent is precisely dosed to ensure maximum repeatability.
† Unless noted otherwise, all reagent codes ending with -01 are for 100 tests. Replace the -01 with -03 for 300 tests.
* For Chlorine, liquid reagents are available. ** Reagents for 50 tests

For a complete list of Reagents, see Reagents *Section 18*.

Multiparameter Photometer for Industrial Wastewater

Pollution and excessive use seriously compromise the availability of fresh water around the world. In order to reduce the impact of industrial operators, there are numerous processes that can be used to clean up the wastewaters depending on the type and extent of contamination. Most wastewater is treated at an industrial scale at wastewater treatment plants, which may include physical, chemical and biological treatment processes.

The quality of wastewater which can be discharged by industrial users is strictly limited by regulations.

HI 83207 is a multiparameter bench meter that measures twenty methods essential for industrial wastewater analysis. It has four channels to allow a wide range of tests.

The optical system of HI 83207 is based on special subminiature tungsten lamps and narrow-band interference filters to guarantee both high performance and reliable results.

HI 83207 has a powerful interactive user support that assists the user during the analysis process. A full tutorial is available in the Setup Menu, and the Help Menu provides assistance for every step in the measurement process. This meter can be connected to a PC via a USB cable, where the data can be managed with optional HI 92000 Windows® compatible software.

TEST	RANGE	METHOD	REAGENT CODE†
Aluminum	0.00 to 1.00 mg/L (ppm)	Aluminon	HI 93712-01
Chlorine*, Free	0.00 to 2.50 mg/L (ppm)	DPD	HI 93701-01
Chlorine*, Total	0.00 to 3.50 mg/L (ppm)	DPD	HI 93711-01
Color of Water	0 to 500 PCU	Platinum Cobalt	–
Copper HR	0.00 to 5.00 mg/L (ppm)	Bicinchoninate	HI 93702-01
Copper LR	0 to 1000 µg/L	Bicinchoninate	HI 95747-01
Fluoride	0.00 to 2.00 mg/L (ppm)	SPADNS	HI 93729-01
Manganese HR	0.0 to 20.0 mg/L (ppm)	Periodate	HI 93709-01
Manganese LR	0 to 300 µg/L	PAN	HI 93748-01**
Molybdenum	0.0 to 40.0 mg/L (ppm)	Mercaptoacetic Acid	HI 93730-01
Nickel HR	0.00 to 7.00 g/L	Photometric	HI 93726-01
Nickel LR	0.000 to 1.000 mg/L (ppm)	PAN	HI 93740-01**
Nitrate	0.0 to 30.0 mg/L (ppm)	Cadmium Reduction	HI 93728-01
Oxygen, Dissolved (DO)	0.0 to 10.0 mg/L (ppm)	Winkler	HI 93732-01
pH	6.5 to 8.5 pH	Phenol Red	HI 93710-01
Phosphate HR	0.0 to 30.0 mg/L (ppm)	Amino Acid	HI 93717-01
Phosphate LR	0.00 to 2.50 mg/L (ppm)	Ascorbic Acid	HI 93713-01
Phosphorus	0.0 to 15.0 mg/L (ppm)	Amino Acid	HI 93706-01
Silver	0.000 to 1.000 mg/L (ppm)	PAN	HI 93737-01**
Zinc	0.00 to 3.00 mg/L (ppm)	Zincon	HI 93731-01

Reagents are available in liquid or powder form, and the amount of each reagent is precisely dosed to ensure maximum repeatability.
† Unless noted otherwise, all reagent codes ending with -01 are for 100 tests. Replace the -01 with -03 for 300 tests.
* For Chlorine, liquid reagents are available. ** Reagents for 50 tests

ADP Application Designed Photometers

20 methods

ORDERING INFORMATION

HI 83207-01 (115V) and **HI 83207-02** (230V) are supplied with sample cuvettes with caps (4 ea.), cloth for wiping cuvettes, 60 mL glass bottle for dissolved oxygen analysis, scissors, AC/DC power adapter and instruction manual

For a complete list of Reagents, see Reagents *Section 18*.

HI 83213

Multiparameter Photometer for Municipal Wastewater

With the beginning of the new millennium, water is becoming a strategic resource. Water has been and will continue to be a major factor for our survival, and the continuation of our way of life. Because of the limited resources of fresh water, careful use of it, as well as frequent reuse (after appropriate treatment) are requirements for sustainable development.

HI 83213 is a multiparameter bench meter that measures twenty-four methods essential for municipal wastewater analysis. It has four channels allowing for a wide range of tests.

The optical system of HI 83213 is based on special subminiature tungsten lamps and narrow-band interference filters to guarantee both high performance and reliable results.

HI 83213 has a powerful interactive user support that assists the user during the analysis process. A full tutorial is available in the Setup Menu, and the Help Menu provides assistance for every step in the measurement process. This meter can be connected to a PC via a USB cable, where the data can be managed with optional HI 92000 Windows® compatible software.

ADP
Application Designed Photometers

24 methods

ORDERING INFORMATION

HI 83213-01 (115V) and **HI 83213-02** (230V) are supplied with sample cuvettes with caps (4 ea.), cloth for wiping cuvettes, 60 mL glass bottle for dissolved oxygen analysis, scissors, AC/DC power adapter and instruction manual

TEST	RANGE	METHOD	REAGENT CODE†
Aluminum	0.00 to 1.00 mg/L (ppm)	Aluminon	HI 93712-01
Ammonia MR	0.00 to 10.00 mg/L (ppm)	Nessler	HI 93715-01
Ammonia LR	0.00 to 3.00 mg/L (ppm)	Nessler	HI 93700-01
Bromine	0.00 to 8.00 mg/L (ppm)	DPD	HI 93716-01
Chlorine*, Free	0.00 to 2.50 mg/L (ppm)	DPD	HI 93701-01
Chlorine*, Total	0.00 to 3.50 mg/L (ppm)	DPD	HI 93711-01
Chromium VI HR	0 to 1000 µg/L	Diphenylcarbohydrazide	HI 93723-01
Chromium VI LR	0 to 300 µg/L	Diphenylcarbohydrazide	HI 93749-01
Color of Water	0 to 500 PCU	Platinum Cobalt	–
Copper HR	0.00 to 5.00 mg/L (ppm)	Bicinchoninate	HI 93702-01
Copper LR	0 to 1000 µg/L	Bicinchoninate	HI 95747-01
Iodine	0.0 to 12.5 mg/L (ppm)	DPD	HI 93718-01
Nickel HR	0.00 to 7.00 g/L	Photometric	HI 93726-01
Nickel LR	0.000 to 1.000 mg/L (ppm)	PAN	HI 93740-01**
Nitrate	0.0 to 30.0 mg/L (ppm)	Cadmium Reduction	HI 93728-01
Nitrite HR	0 to 150 mg/L (ppm)	Ferrous Sulfate	HI 93708-01
Nitrite LR	0.00 to 1.15 mg/L (ppm)	Diazotization	HI 93707-01
Oxygen, Dissolved (DO)	0.0 to 10.0 mg/L (ppm)	Winkler	HI 93732-01
pH	6.5 to 8.5 pH	Phenol Red	HI 93710-01
Phosphate HR	0.0 to 30.0 mg/L (ppm)	Amino Acid	HI 93717-01
Phosphate LR	0.00 to 2.50 mg/L (ppm)	Ascorbic Acid	HI 93713-01
Phosphorus	0.0 to 15.0 mg/L (ppm)	Amino Acid	HI 93706-01
Silver	0.000 to 1.000 mg/L (ppm)	PAN	HI 93737-01**
Zinc	0.00 to 3.00 mg/L (ppm)	Zincon	HI 93731-01

Reagents are available in liquid or powder form, and the amount of each reagent is precisely dosed to ensure maximum repeatability.
† Unless noted otherwise, all reagent codes ending with -01 are for 100 tests. Replace the -01 with -03 for 300 tests.
* For Chlorine, liquid reagents are available. ** Reagents for 50 tests

For a complete list of Reagents, see Reagents *Section 18*.

Multiparameter Photometer for Water Conditioning

TEST	RANGE	METHOD	REAGENT CODE†
Ammonia MR	0.00 to 10.00 mg/L (ppm)	Nessler	HI 93715-01
Ammonia LR	0.00 to 3.00 mg/L (ppm)	Nessler	HI 93700-01
Chlorine*, Free	0.00 to 2.50 mg/L (ppm)	DPD	HI 93701-01
Chlorine*, Total	0.00 to 3.50 mg/L (ppm)	DPD	HI 93711-01
Copper HR	0.00 to 5.00 mg/L (ppm)	Bicinchoninate	HI 93702-01
Copper LR	0 to 1000 µg/L	Bicinchoninate	HI 95747-01
Fluoride	0.00 to 2.00 mg/L (ppm)	SPADNS	HI 93729-01
Iron HR	0.00 to 5.00 mg/L (ppm)	Phenantroline	HI 93721-01
Iron LR	0 to 400 µg/L	TPTZ	HI 93746-01**
Manganese HR	0.0 to 20.0 mg/L (ppm)	Periodate	HI 93709-01
Manganese LR	0 to 300 µg/L	PAN	HI 93748-01**
Molybdenum	0.0 to 40.0 mg/L (ppm)	Mercaptoacetic Acid	HI 93730-01
Nickel HR	0.00 to 7.00 g/L	Photometric	HI 93726-01
Nickel LR	0.000 to 1.000 mg/L (ppm)	PAN	HI 93740-01**
Nitrate	0.0 to 30.0 mg/L (ppm)	Cadmium Reduction	HI 93728-01
Oxygen, Dissolved (DO)	0.0 to 10.0 mg/L (ppm)	Winkler	HI 93732-01
pH	6.5 to 8.5 pH	Phenol Red	HI 93710-01
Phosphate HR	0.0 to 30.0 mg/L (ppm)	Amino Acid	HI 93717-01
Phosphate LR	0.00 to 2.50 mg/L (ppm)	Ascorbic Acid	HI 93713-01
Phosphorus	0.0 to 15.0 mg/L (ppm)	Amino Acid	HI 93706-01
Silica	0.00 to 2.00 mg/L (ppm)	Heteropoly blue	HI 93705-01
Silver	0.000 to 1.000 mg/L (ppm)	PAN	HI 93737-01**
Zinc	0.00 to 3.00 mg/L (ppm)	Zincon	HI 93731-01

Reagents are available in liquid or powder form, and the amount of each reagent is precisely dosed to ensure maximum repeatability.
† Unless noted otherwise, all reagent codes ending with -01 are for 100 tests. Replace the -01 with -03 for 300 tests.
* For Chlorine, liquid reagents are available. ** Reagents for 50 tests

The global distribution of freshwater resources varies greatly from region to region, and only 3% of global water resources are defined as freshwater.

The definition of freshwater is water containing less than 1000 mg/L of dissolved solids, most often salt.

The HI 83208 was developed to measure the most common parameters in water quality monitoring:

Ammonia detection in water treatment systems is particularly important for aquarium owners and fish farm operators. Ammonia is highly soluble in water and extremely toxic to fish.

Chlorine and chlorine-release compounds are used extensively as water purifiers or surface disinfectants.

Phosphates are present in natural waters, and at normal concentrations do not pose any specific health threats to humans. Phosphate contamination that comes from agricultural fertilizer run off can promote excessive algae.

HI 83208 is a multiparameter bench meter that measures twenty-three methods essential for water conditioning.

The optical system of HI 83208 is based on special subminiature tungsten lamps and narrow-band interference filters to guarantee both high performance and reliable results.

HI 83208 has a powerful interactive user support that assists the user during the analysis process. A full tutorial is available in the Setup Menu, and the Help Menu provides assistance for every step in the measurement process. This meter can be connected to a PC via a USB cable, where the data can be managed with optional HI 92000 Windows® compatible software.

ADP
Application Designed Photometers

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methods

ORDERING INFORMATION

HI 83208-01 (115V), **HI 83208-02** (230V) and **HI 83208-03** (AUS plug) are supplied with sample cuvettes with caps (2 ea.), cloth for wiping cuvettes, 60 mL glass bottle for dissolved oxygen analysis, scissors, AC/DC power adapter and instruction manual

For a complete list of Reagents, see Reagents *Section 18*.

HI 96 Series

Portable Photometers

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**
- **Ideal for field applications**

HANNA's line of portable photometers includes instruments to measure ammonia, chlorine at several ranges, copper, anionic detergents, fluoride, iron, nitrite, phosphate, phosphorus, and more. This series features an advanced optical system and HANNA's exclusive CAL CHECK™ validation function. The advanced optical system is based on a special tungsten lamp/LED–Light Emitting Diode and a narrow band interference filter assuring accurate readings every time.

With the exclusive CAL CHECK™ validation function, users are able to verify the performance of the instrument at any time. Taking just a few short steps, the validation procedure is extremely user friendly and ensures that the meter is properly calibrated. Just use the exclusive HANNA ready-made, NIST traceable standards to verify the performance of the instrument and recalibrate as necessary. All instruments are factory calibrated and the electronic and optical design minimizes the need for frequent calibration.

The cuvette is made from special optical glass to obtain best results and an exclusive positive-locking system ensures that the cuvette is in the same position every time it is placed into the measurement cell. The cell is designed to fit a wide mouth cuvette making it easier to add both samples and reagents.

The reagents are in powder or liquid form and the amount of reagent is precisely dosed to ensure maximum repeatability.

SOLUTIONS

HI 93703-50 Cuvette cleaning solution, 230 mL

ACCESSORIES

HI 731318 Cuvette cleaning cloth (4)
HI 731331 Measuring cuvettes (4)
HI 731335 Cuvette caps (4)
HI 740318 Carrying case for HI 96 series

CAL CHECK™ Validation*

2-step validation procedure for proper calibration.

Zero the meter prior to validation...

Place the CAL CHECK™ Standard A into the cuvette holder and press ZERO/CFM. The lamp, cuvette and detector icons will appear on the display followed by "-0.0-". The meter is now zeroed and ready for validation.

... and compare accuracy against a known standard.

Place the CAL CHECK™ standard B into the cuvette holder and press CAL CHECK™. The lamp, cuvette and detector icons together with "CAL CHECK" will appear on the display. At the end of the measurement the display will show the validation standard value.

CAL CHECK™ Calibration*

Calibrate your instrument quickly and easily.

Zero the meter prior to calibration...

Press and hold CAL CHECK™ for three seconds to enter calibration mode. Place the CAL CHECK™ Standard A into the cuvette holder and press ZERO/CFM. The lamp, cuvette and detector icons will appear on the display followed by "-0.0-". The meter is now zeroed and ready for calibration.

... and calibrate to a known standard.

Place the CAL CHECK™ Standard B into the cuvette holder. Press READ/▶ and the lamp, cuvette and detector icons will appear on the display. After measurement the instrument will show the CAL CHECK™ Standard value.

GENERAL SPECIFICATIONS	
Power Supply	9V battery
Auto-off	after 10 minutes of non-use in measurement mode; after 1 hour of non-use in calibration mode; with last reading reminder.
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)

Each CAL CHECK™ cuvette is clearly labeled with its respective measurement. Please read the full instruction manual before validation/calibration.

HANNA instruments

With Great Products, Come Great Results™

Aluminum Portable Photometer

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

Many food-packaging materials and shiny plastic novelties are made of paper or plastic with an evaporated coating of bright aluminum.

In fact, cooking even weakly acidic foods such as tomatoes in an aluminum pot can dissolve enough aluminum to give the dish a "metallic" taste. Aluminum also dissolves in strong bases such as sodium hydroxide, commonly known as lye. Most oven cleaners, which are designed to work on steel and porcelain, contain sodium or potassium hydroxide, in which case, it is in the user's best interest to refrain from handling the aluminum parts of the cookware. Some commercial drain cleaners contain lye mixed with shavings of aluminum metal.

Aluminum is the most abundant metal and the third most abundant element in the Earth's crust, behind only oxygen and silicon. It is a lightweight, silvery metal, familiar to every household in the form of pots and pans, beverage cans, and aluminum foil. It is nontoxic, corrosion resistant, non-magnetic, and easy to form or cast into a variety of shapes. It is one of the most useful metals we have.

In spite of the fact that aluminum is very active chemically, it does not corrode in moist air the way iron does. Instead, it quickly forms a thin, hard coating of aluminum oxide.

Aluminum is used in water purification because when it reacts with lime (or any base), it forms a sticky precipitate of aluminum hydroxide that sweeps out tiny particles of impurities.

HI 96712 measures the aluminum content in water and wastewater in the 0.00 to 1.00 mg/L range.

The meter uses an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

SPECIFICATIONS	HI 96712 Aluminum
Range	0.00 to 1.00 mg/L (ppm)
Resolution	0.01 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.02 mg/L ±4% of reading
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 525 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	adaptation of the aluminon method

The reagents are in powder form and are supplied in packets. The amount of reagent is precisely dosed to ensure maximum repeatability.

ORDERING INFORMATION

HI 96712 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96712-11 CAL CHECK™ standard cuvettes
HI 93712-01 Reagents for 100 tests
HI 93712-03 Reagents for 300 tests

For a complete list of Reagents, see Reagents *Section 18*.

HI 96700 • HI 96715 • HI 96733

Ammonia Portable Photometers

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

The HI 96700 and HI 96715 meters measure the ammonia-nitrogen (NH_3-N) content in water samples. The HI 96733 measures the ammonium ion (NH_4^+) content in water, wastewater and seawater.

These meters use an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

Ammonia is often an excellent indication of the presence of animal or plant microbiological decay. It is tested in fish farms (fresh and salt water tanks) due to the damaging effects of its toxic nature. Its presence in rivers and reservoirs normally points to agricultural and/or civil pollutants. Ammonia is tested in lakes, rivers, portable water, boiler feed water, sewage, industrial and waste water.

Ammonia - nitrogen, in the form of NH_3 and NH_4^+, is often present in water as a component of nitrogen cycle. In the metabolism of proteins and amino acids, many heterotrophic bacteria, actinomycetes, and fungi (occurring in both soil and water) excrete what for them is excess nitrogen: ammonia. Generally, in unpolluted waters, ammonia and ammonium compounds occur in relatively small quantities, on the order of 0.1 mg/L, while higher levels usually indicate organic pollution. Ammonia is also recognized to be toxic to diatoms in the 7.4-8.5 pH range at a level of 1.1 mg/L, and to fish, in the same pH range, at a level of 2.5 mg/L.

ORDERING INFORMATION

HI 96700, **HI 96715** and **HI 96733** are supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96700C, **HI 96715C** and **HI 96733C** includes photometer, sample cuvettes (2) with caps, 9V battery, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

For HI 96700

HI 96700-11 CAL CHECK™ standard cuvettes
HI 93700-01 Reagents for 100 tests (N-NH_3 LR)
HI 93700-03 Reagents for 300 tests (N-NH_3 LR)

For HI 96715

HI 96715-11 CAL CHECK™ standard cuvettes
HI 93715-01 Reagents for 100 tests (N-NH_3 MR)
HI 93715-03 Reagents for 300 tests (N-NH_3 MR)

For HI 96733

HI 96733-11 CAL CHECK™ standard cuvettes
HI 93733-01 Reagents for 100 tests (NH_4^+ HR)
HI 93733-03 Reagents for 300 tests (NH_4^+ HR)

SPECIFICATIONS	HI 96700 Ammonia LR	HI 96715 Ammonia MR	HI 96733 Ammonia HR
Range	0.00 to 3.00 mg/L (ppm) (as NH_3-N)	0.00 to 9.99 mg/L (ppm) (as NH_3-N)	0.0 to 50.0 mg/L (ppm) (as NH_4^+)
Resolution	0.01 mg/L (ppm)	0.01 mg/L (ppm)	0.1 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.04 mg/L ±4% of reading	±0.05 mg/L ±5% of reading	±0.5 mg/L ±5% of reading
Light Source	tungsten lamp	light emitting diode	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 420 nm	silicon photocell with narrow band interference filter @ 466	silicon photocell with narrow band interference filter @ 420 nm
Power Supply	9V battery		
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder		
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing		
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")		
Weight	360 g (12.7 oz.)		
Method	adaptation of the ASTM Manual of Water and Environmental Technology, D1426-92, Nessler method		

The reagents are in liquid form and are supplied in bottles. The amount of reagents is precisely dosed to ensure maximum repeatability.

For a complete list of Reagents, see Reagents *Section 18*.

Anionic Surfactants Portable Photometer

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

Detergents are among the most common water pollutants, discharged as a consequence of laundering or cleaning processes, either from households or industrial origin. Detergents are mainly preparations or mixtures of linear alkyl sulfonates and other additives that help to remove grease and dirt.

These compounds and their foams are inconvenient in water dischargers because they interfere with transfer of the air to the water. In addition, they may deflocculate colloids, promote the flotation of the solids, emulsify oil and grease, lower the level of dissolved oxygen trough biodegradation, and have a negative aesthetic impact. They can also destroy the natural water-repellent protective coating of aquatic animals and birds. In large concentrations, detergents may cause the death of aquatic plants and animals.

Surfactants are produced in large quantities and are widely used in many applications. Due to their common use, surfactants are introduced into the water supply through domestic and industrial drains.

Surfactants are harmful to water treatment plants, due to the scum that is created by emulsifying oil and grease. So, by law, surfactant concentrations must be monitored in wastewaters.

The HI 96769 measures anionic surfactants in drinking, surface and waste waters. The meter uses an exclusive positive-locking system to ensure that the cuvette is in the same position every time it is placed into the measurement cell. It is designed to fit a cuvette with a larger neck making it easier to add both sample and reagents. The cuvette is made from special optical glass to obtain best results.

SPECIFICATIONS	HI 96769 Anionic Surfactants
Range	0.00 to 3.50 mg/L (ppm) as SDBS
Resolution	0.01 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.04 mg/L ±3% of reading
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 610 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	adaptation of the USEPA method 425.1 and Standard Methods for the Examination of Water and Wastewater, 20th edition, 5540C, Anionic Surfactants as MBAS

The reagent is in liquid form and is supplied in bottles. The amount of reagent is precisely dosed by use of the supplied pipettes to ensure the maximum repeatability.

ORDERING INFORMATION

HI 96769 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96769C includes HI 96769 photometer, sample cuvettes (2) with caps, 25 mL glass vial with cap, plastic pipettes (3), 9V battery, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96769-11 CAL CHECK™ standard cuvettes
HI 93769-01 Reagent for 40 anionic surfactants tests

For a complete list of Reagents, see Reagents *Section 18*.

HI 96716

Bromine Portable Photometer

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

In many countries, bromine sanitizing has been introduced as an alternative for chlorine. Although it is not as strong as chlorine, bromine remains stable at higher temperatures (advantageous for heated pools and hot tubs), and higher pH levels. Furthermore, it has little reaction to nitrogen compounds, thus reducing the unpleasant odor and eye irritation problems associated with pool water sanitation. The main disadvantage of bromine is the slower acting disinfecting power, making it less suitable for larger pools.

The HI 96716 meter measures the bromine content in water samples in the 0.00 to 10.00 mg/L (ppm) range. The HI 96 series portable photometers use an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

The Alternative to Chlorine

Bromine is often used instead of chlorine as a disinfectant because of its less volatile nature. Its action has more effective results when the pH value is above 7.4, and the main application is pools, spas and hot tubs. Like all chemicals used for this purpose, the concentration must be within acceptable limits, which can vary according to the application.

SPECIFICATIONS	HI 96716 Bromine
Range	0.00 to 10.00 mg/L (ppm)
Resolution	0.01 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.08 mg/L ± 3% of reading
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 525 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	adaptation of the Standard Methods for the Examination of Water and Wastewater, 20th edition, DPD method

The reagent is in powder form and is supplied in packets. The amount of reagent is precisely dosed to ensure maximum repeatability.

ORDERING INFORMATION

HI 96716 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96716C includes HI 96716 photometer, sample cuvettes (2) and caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96716-11 CAL CHECK™ standard cuvettes
HI 93716-01 Reagents for 100 tests
HI 93716-03 Reagents for 300 tests

For a complete list of Reagents, see Reagents *Section 18*.

Chloride Portable Photometer

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

Chloride is a major constituent of sea water and is extremely corrosive in acidic environments. It requires close monitoring in applications such as marine boiler systems that are prone to seawater contamination.

Chlorides are used by the water treatment professional to determine cycles of concentration in low pressure boilers and cooling systems. Merchant and ocean going passenger vessels need to ensure that chloride contamination of engine cooling systems and boilers does not occur.

Due to the range limit, HI 96753 can be also used in sea water applications if the sample is diluted accordingly.

Chloride ions are one of the major inorganic anions in water and wastewater. Although high concentrations of chloride in water are not known to be toxic to humans, its regulation is mainly due to adverse effects on taste. It is essential to monitor chloride concentrations in boiler systems to prevent metal parts from being damaged. In high levels, chloride can corrode stainless steel. The level of chloride concentrations in boiler and cooling towers varies from small quantities to very high levels. Furthermore high levels of chloride can be toxic to plant life.

Chlorides are the salts of hydrochloric acid with a metal. Some common examples are sodium chloride (NaCl), ammonium chloride (NH_4Cl), calcium chloride ($CaCl_2$), and magnesium chloride ($MgCl_2$). When dissolved in water, these salts produce chloride ions, Cl^-.

The HI 96753 meter measures the chloride content in water and wastewater samples. This meter uses an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

SPECIFICATIONS	HI 96753 Chloride
Range	0.0 to 20.0 mg/L (ppm)
Resolution	0.1 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.5 mg/L ±6% of reading
Light Source	light emitting diode
Light Detector	silicon photocell with narrow band interference filter @ 466 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	adaptation of the mercury (II) thiocyanate method

ORDERING INFORMATION

HI 96753 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96753C includes HI 96753 photometer, sample cuvettes (2) with caps, 9V battery, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96753-11 CAL CHECK™ standard cuvettes
HI 93753-01 Reagents for 100 tests
HI 93753-03 Reagents for 300 tests

For a complete list of Reagents, see Reagents *Section 18*.

HI 96738

Chlorine Dioxide Portable Photometer

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

Chlorine dioxide is used primarily as a disinfectant in drinking water and also in various industrial processes. In drinking water applications, it is gaining popularity over chlorine, considering that it does not generate trihalomethanes when reacting with organic compounds. In industrial applications, it is used as a bleaching agent in such applications as pulp and paper.

The HI 96738 meter measures the chlorine dioxide content in water samples in the 0.00 to 2.00 mg/L range. This meter uses an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

Chlorine Dioxide is a highly effective, eco-friendly microbiocide that carries a number of important regulatory approvals from several international organisations including the US EPA, FDA and UK Government for many of its uses.

Chlorine and bromine react rapidly with microbiological species and chemicals in water. This reactivity is both their strength and weakness. Since chemical reactions are usually the first to take place, only the small residual of the product remaining after the chemical reaction is completed is available for microbiological control.

Chlorine dioxide is a very safe and potent biocide. It is effective over a wide pH range in both hard and soft water and does not react with most other water treatment chemicals.

Chlorine dioxide, ClO_2, is a stable oxide and can be prepared by reducing chlorates or in reaction with moist oxalic acid. Chlorine dioxide is a strong oxidizing agent toward both organic and inorganic materials.

Chlorine dioxide is an extremely effective oxidizing biocide used in the disinfection of tanked potable water and for high shock dose chemical cleaning.

The local authorities has set guidelines for the concentration of total oxidants present in potable water, with particular reference to the use of chlorine dioxide, produced at high concentration via generators, then blended with the distributed water supply.

ORDERING INFORMATION

HI 96738 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96738C is supplied with HI 96738 photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96738-11 CAL CHECK™ standard cuvettes
HI 93738-01 Reagents for 100 tests
HI 93738-03 Reagents for 300 tests

SPECIFICATIONS	HI 96738 Chlorine Dioxide
Range	0.00 to 2.00 mg/L (ppm)
Resolution	0.01 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.10 mg/L ±5% of reading
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 575 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	Chlorophenol Red method

The reagents are liquid / powder form and are supplied in bottles / packets. The amount of reagent is precisely dosed to ensure the maximum repeatability.

For a complete list of Reagents, see Reagents *Section 18*.

Chlorine, Free Portable Photometers

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

The HI 96701 meter measures the free chlorine (Cl_2) content in water samples in the 0.00 to 5.00 mg/L (ppm) range.

HI 96762 was specially developed to measure low concentrations of free chlorine in drinking water.

These meters use an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

Chlorine is widely used in making many everyday products, but most notably, it is used for producing safe drinking water the world over. Even the smallest water supplies are now usually chlorinated. It is also extensively used in the production of paper products, dyestuffs, textiles, petroleum products, medicines, antiseptics, insecticides, food, solvents, paints, plastics, and many other consumer products. Most of the chlorine produced is used in the manufacture of chlorinated compounds for sanitation, pulp bleaching, disinfectants, and textile processing.

Organic chemistry demands much from chlorine, both as an oxidizing agent and in substitution, since it often brings many desired properties in an organic compound when substituted for hydrogen, as in one form of synthetic rubber.

SPECIFICATIONS	HI 96701 Chlorine, Free	HI 96762 Chlorine, Free Low Range
Range	0.00 to 5.00 mg/L (ppm)	0.000 to 0.500 mg/L (ppm)
Resolution	0.01 mg/L from 0.00 to 3.50 mg/L (ppm); 0.10 mg/L above 3.50 mg/L (ppm)	0.001 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.03 mg/L ±3% of reading	±0.020 mg/L ±3% of reading
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 525 nm	
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of the USEPA method 330.5 and Standard Method 4500-Cl G	

The reagents are in powder form and are supplied in packets. The amount of reagent is precisely dosed to ensure the maximum repeatability.

ORDERING INFORMATION

HI 96701 and **HI 96762** are supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96701C and **HI 96762C** include photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96701

HI 96701-11 CAL CHECK™ Standard Cuvettes
HI 93701-01 Reagents for 100 tests
HI 93701-03 Reagents for 300 tests

HI 96762

HI 96762-11 CAL CHECK™ Standard Cuvettes
HI 95762-01 Reagents for 100 tests
HI 95762-03 Reagents for 300 tests

For a complete list of Reagents, see Reagents *Section 18.*

HI 96771

Chlorine, Free Ultra High Range Portable Photometer

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

HI 96771 has been developed to check chlorine dosing in disinfection processes with ultra high concentrations of chlorine. Thanks to the extended range from 0 to 500 mg/L (ppm), it is ideal for the food industry, such as in fruit and vegetable washing.

The HI 96771 meter measures the free chlorine (Cl_2) content in water samples and chlorine ultra high range. The methods are an adaptation of Standard Methods for the Examination of Water and Wastewater, 20th edition, 4500-Cl.

The meter uses an exclusive positive-locking system to ensure that the cuvette is in the same position every time it is placed into the measurement cell. It is designed to fit a cuvette with a larger neck making it easier to add both sample and reagents. The cuvette is made from special optical glass to obtain best results.

Exposure to chlorine, hypochlorous acid, and hypochlorite ions through ingestion of household bleach occurs most commonly with children. Intake of a small quantity of bleach generally results in irritation of the oesophagus, a burning sensation in the mouth and throat, and spontaneous vomiting. In these cases, it is not clear whether it is the sodium hypochlorite or the extremely caustic nature of the bleach that causes the tissue injury.

The effects of heavily chlorinated water on human populations exposed for varying periods were summarized in a report that was essentially anecdotal in character and did not describe in detail the health effects observed. It has been reported that asthma can be triggered by exposure to chlorinated water. Episodes of dermatitis have also been associated with exposure to chlorine and hypochlorite.

SPECIFICATIONS	HI 96771 Chlorine, Free and Ultra High Range	
	Chlorine, Free (P1)	Chlorine, UHR (P2)
Range	0.00 to 5.00 mg/L (ppm)	0 to 500 mg/L (ppm)
Resolution	0.01 mg/L from 0.00 to 3.50 mg/L (ppm); 0.10 mg/L above 3.50 mg/L (ppm)	1 mg/L from 0 to 200 mg/L (ppm); 10 mg/L above 200 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.03 mg/L ±3% of reading	±3 mg/L ±3% of reading
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 466 nm	
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of Standard Methods for the Examination of Water and Wastewater, 20th edition, 4500-Cl	

The reagents are in powder form and are supplied in packets. The amount of reagent is precisely dosed to ensure the maximum repeatability.

ORDERING INFORMATION

HI 96771 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96771C includes HI 96771 photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 95771-11 CAL CHECK™ Standard Cuvettes
HI 93701-01 Reagents for 100 tests
HI 93701-03 Reagents for 300 tests
HI 95771-01 Reagents for 100 tests
HI 95771-03 Reagents for 300 tests

For a complete list of Reagents, see Reagents *Section 18*.

Chlorine, Total Portable Photometers

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

The HI 96711 meter measures the free and total chlorine (Cl_2) content in water and wastewater. The HI 96761 meter measures the traces of total chlorine (Cl_2) content in drinking water samples.

This meter uses an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

Chlorine is integrated into water supplies in it's molecular form for the purpose of destroying unwanted microorganisms. Once introduced to the water, chlorine will form into three different forms; free chlorine, hypochlorous acid, and hypochlorous ions. Free chlorine will combine itself with ammonia and nitrogen compounds, creating combined chlorine. When chlorine and ammonia combine, it creates chloramines (monochloramine, dichloramine, and nitrogen trichloride. Proper testing should be administered when chlorinating any water supply, as potentially harmful compounds such as chloroform may be formed. N, N-diethyl-p-phenylenediamine (DPD) as well as other methods are available for measuring total residual chlorine.

SPECIFICATIONS	HI 96711 Chlorine, Free and Total	HI 96761 Chlorine, Total Low Range
Range	0.00 to 5.00 mg/L (ppm)	0.000 to 0.500 mg/L (ppm)
Resolution	0.01 mg/L from 0.00 to 3.50 mg/L (ppm); 0.10 mg/L above 3.50 mg/L (ppm)	0.001 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.03 mg/L ±3% of reading	±0.020 mg/L ±3% of reading
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 525 nm	
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of the USEPA method 330.5 and Standard Method 4500-Cl G	

ORDERING INFORMATION

HI 96711 and **HI 96761** are supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96711C and HI 96761C include photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96711

HI 95701-11 CAL CHECK™ standard cuvettes
HI 93701-01 Reagents for 100 tests
HI 93701-03 Reagents for 300 tests
HI 96711-11 CAL CHECK™ standard cuvettes
HI 93711-01 Reagents for 100 tests
HI 93711-03 Reagents for 300 tests

HI 96761

HI 96761-11 CAL CHECK™ Standard cuvettes
HI 95761-01 Reagents for 100 tests
HI 95761-03 Reagents for 300 tests

For a complete list of Reagents, see Reagents *Section 18*.

HI 96723 • HI 96749

Chromium VI HR and LR Portable Photometers

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

At normal temperatures chromium is corrosion-resistant. For this reason, it plays an important role in the plating industry as well as cooling towers. In addition, it has certain qualities that make it useful in the production processes of the textile industry.

The HI 96723 and HI 96749 meters measure the hexavalent chromium (Cr VI) content in water and waste waters samples.

The meters use an exclusive positive-locking system to ensure that the cuvette is in the same position every time it is placed into the measurement cell.

All compounds of chromium are colored; the most important are the chromates of sodium and potassium and the dichromates and the potassium and ammonium chrome alums. The dichromates are used as oxidizing agents in quantitative analysis, also in tanning leather.

Another compound of industrial value is lead chromate which is chrome yellow, a valuable pigment.

Chromium compounds are used in the textile industry as mordants, and by the aircraft and other industries for anodizing aluminum.

ORDERING INFORMATION

HI 96723 and **HI 96749** are supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96723-11 CAL CHECK™ standard cuvettes
HI 96749-11 CAL CHECK™ standard cuvettes
HI 93723-01 Reagents for 100 tests
HI 93723-03 Reagents for 300 tests
HI 93749-01 Reagents for 100 tests
HI 93749-03 Reagents for 300 tests

SPECIFICATIONS	HI 96723 Chromium VI High Range	HI 96749 Chromium VI Low Range
Range	0 to 1000 µg/L (ppb)	0 to 300 µg/L (ppb)
Resolution	1 µg/L (ppb)	1 µg/L (ppb)
Accuracy @ 25°C (77°F)	±5 mg/L ±4% of reading	±1 mg/L ±4% of reading
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 525 nm	
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of the ASTM Manual of Water and Environmental Technology, D1687-92, diphenylcarbohyzide method. The reaction between Cr VI and reagents causes a purple tint in the sample	

The reagents are in powder form and are supplied in packets. The amount of reagent is precisely dosed to ensure the maximum repeatability.

For a complete list of Reagents, see Reagents *Section 18*.

Color of Water Portable Photometer

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

Color together with odor, taste and turbidity form an integral part of our sensory system.

Testing for color can be a quick and easy test which often reflects the amount of organic material in the water, although certain inorganic components like iron or manganese can also impart color.

The HI 96727 measures the true and apparent color in water and wastewater in the 0 to 500 PCU (Platinum Cobalt Units) range.

The HI 96727 uses an exclusive positive-locking system to ensure that the cuvette is in the same position every time it is placed into the measurement cell. It is designed to fit a cuvette with a larger neck making it easier to add both sample and reagents. The cuvette is made from special optical glass to obtain best results.

Apparent color is the color of the whole water sample, and consists of color from both dissolved and suspended components. **True color** is measured after filtering the water sample to remove all suspended material.

The presence of color in water does not necessarily indicate that the water is not potable. Color-causing substances such as tannins may be harmless.

Color is not removed by typical water filters; however, slow sand filters can remove color, and the use of coagulants may also succeed in trapping the color-causing compounds within the resulting precipitate.

SPECIFICATIONS	HI 96727 Color of Water
Range	0 to 500 PCU (Platinum Cobalt Units)
Resolution	10 PCU
Accuracy @ 25°C (77°F)	±10 PCU ±5% of reading
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 420 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	Colorimetric Platinum Cobalt method

ORDERING INFORMATION

HI 96727 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96727-11 CAL CHECK™ standard cuvettes 0.45 nm membrane for true color measurement

For a complete list of Reagents, see Reagents *Section 18*.

HI 96747 • HI 96702

Copper Portable Photometers

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

HI 96747 is a auto-diagnostic photometer engineered to measure a wide range of copper concentrations. Due to the specially formulated powder reagent with long-term stability, copper analysis is possible even where iron and calcium is present, such as in sea water.

The HI 96702 meter measures the copper content in water and wastewater.

Both meters use an exclusive positive-locking system to ensure that the cuvette is in the same position every time it is placed into the measurement cell. It is designed to fit a cuvette with a larger neck making it easier to add both sample and reagents. The cuvette is made from special optical glass to obtain best results.

Copper is one of the most abundant metals in the earth's crust. Because of it's malleability, thermal and electrical conductivity, corrosion resistance, and other useful qualities, it is used in a large variety of industrial and technological applications.

Copper is found in effluents and natural water both as suspended solids and salt. A high concentration is toxic for plants and animals, which accounts for its rigorous monitoring by the authorities and industry. Lower concentrations are often employed to contain the growth of plankton and algae.

ORDERING INFORMATION

HI 96747 and **HI 96702** are supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96747C and **HI 96702C** include photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96747

HI 96747-11 CAL CHECK™ standard cuvettes
HI 95747-01 Reagents for 100 tests
HI 95747-03 Reagents for 300 tests

HI 96702

HI 96702-11 CAL CHECK™ standard cuvettes
HI 93702-01 Reagents for 100 tests
HI 93702-03 Reagents for 300 tests

SPECIFICATIONS	HI 96747 Copper, Low Range	HI 96702 Copper, High Range
Range	0.000 to 1.500 mg/L (ppm)	0.00 to 5.00 mg/L (ppm)
Resolution	0.001 mg/L (ppm)	0.01 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.010 mg/L ±5% of reading	±0.02 mg/L ± 4% of reading
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 560 nm	silicon photocell with narrow band interference filter @ 575 nm
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of the USEPA approved bicinchoninate method	

The reagents are in powder form and are supplied in packets. The amount of reagent is precisely dosed to ensure the maximum repeatability.

For a complete list of Reagents, see Reagents *Section 18*.

Cyanide Portable Photometer

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

The HI 96714 meter measures the cyanide concentration in waters. The meter uses an exclusive positive-locking system to ensure that the cuvette is in the same position every time it is placed into the measurement cell. It is designed to fit cuvettes with a larger neck making it easier to add both sample and reagents. The cuvettes are made from special optical glass to obtain best results.

Cyanide is a pollutant that originates mostly from metalurgical and galvanic industrial plants. Cyanide is poisonous to human nervous system, and it is therefore imperative to monitor and control its level in potable water. Continuous monitoring in waste effluents is required, and cyanide is removed using alkaline chlorination procedure. Due to this, European norm limit the concentration of cyanide in drinking water to 0.05 mg/L, while the EPA has established that the maximum level is not to exceed 0.2 mg/L.

Measures to Minimize Cyanide Discharge

To meet the public's need for safety, environmental protection, and clean water and air, the ongoing regulatory cycle involves ever-tightening restrictions on hazardous materials and their discharge.

For cyanide users, this is exemplified by more stringent discharge restrictions, stricter storage requirements and mandatory use of cyanide gas sensing/detection systems in some jurisdictions.

SPECIFICATIONS	HI 96714 Cyanide
Range	0.000 to 0.200 mg/L (ppm)
Resolution	0.001 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.005 mg/L ±3% of reading
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 610 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th edition, Pyridine-Pyrazolone method

The reagents are in powder form and are supplied in bottle/packets. The amount of reagent is precisely dosed to ensure the maximum repeatability.

ORDERING INFORMATION

HI 96714 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96714-11 CAL CHECK™ standard cuvettes
HI 93714-01 Reagents for 100 tests
HI 93714-03 Reagents for 300 tests

For a complete list of Reagents, see Reagents *Section 18*.

HI 96722

Cyanuric Acid Portable Photometer

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

Monitor This Critical Parameter Easily

The HI 96722 meter measures the cyanuric acid content in water samples in the 0 to 80 mg/L (ppm) range.

This meter uses an exclusive positive-locking system to ensure that the cuvette is in the same position every time it is placed into the measurement cell. It is designed to fit cuvettes with a larger neck making it easier to add both sample and reagents. The cuvettes are made from special optical glass to obtain best results.

Cyanuric acid (CYA) is best known as a stabilizing reagent for chlorine. It is widely applied in swimming pool and spa treatment programs to slow down the decomposition of hypochlorous acid. In outside pool areas, this process is accelerated by the effects of UV rays. When applied properly it can save up to 80% of normal chlorine consumption in pools during peak months.

Cyanuric acid is also used in chlorinated beaches, selective herbicides and whitening agents.

SPECIFICATIONS	HI 96722 Cyanuric Acid
Range	0 to 80 mg/L (ppm)
Resolution	1 mg/L (ppm)
Accuracy @ 25°C (77°F)	±1 mg/L ±15% of reading
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 525 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	adaptation of the turbidimetric method

The reagent is in powder form and is supplied in packets. The amount of reagent is precisely dosed to ensure the maximum repeatability.

ORDERING INFORMATION

HI 96722 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96722-11 CAL CHECK™ standard cuvettes
HI 93722-01 Reagents for 100 tests
HI 93722-03 Reagents for 300 tests

For a complete list of Reagents, see Reagents *Section 18*.

HANNA instruments

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Fluoride Portable Photometers

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

The HI 96729 meter measures the fluoride (F^-) content in the 0.00 to 2.00 mg/L (ppm) range, in drinking, surface and waste waters. The amount of reagent is precisely dosed by use of the supplied automatic pipette for maximum repeatability.

The HI 96739 meter measures the fluoride (F^-) content in water, wastewater and seawater in the 0 to 20 mg/L (ppm) range.

Both meters use an exclusive positive-locking system to ensure that the cuvette is in the same position every time it is placed into the measurement cell. It is designed to fit cuvettes with a larger neck making it easier to add both sample and reagents. The cuvettes are made from special optical glass to obtain best results.

Fluoride is best known for preventing tooth decay. Water authorities often add fluoride to drinking water to maintain approximately a 1.0 mg/L (ppm) concentration. Fluoride can be found naturally in ground water, particularly if a reservoir is in the proximity of draws of sea water. While fluoride does help prevent tooth decay, too little can be ineffective and too much can cause staining.

SPECIFICATIONS	HI 96729 Fluoride LR	HI 96739 Fluoride HR
Range	0.00 to 2.00 mg/L (ppm)	0.0 to 20.0 mg/L (ppm)
Resolution	0.01 mg/L (ppm)	0.1 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.03 mg/L ±3% of reading	±0.5 mg/L ±3% of reading
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 575 nm	
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of the EPA method 340.1 and Standard Methods for the Examination of Water and Wastewater, 20th edition, SPADNS method	adaptation of the SPADNS method

The reagents are in liquid form and are supplied in bottles. The amount of reagent is precisely dosed by use of the supplied automatic pipette to ensure the maximum repeatability.

ORDERING INFORMATION

HI 96729 and **HI 96739** is supplied sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96729C and **HI 96739C** include photometer, sample cuvettes (2) with caps, 2000 µL automatic pipette with instruction sheet, 9V battery, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 93703-53 Reagent for reducing chlorine concentration

For HI 96729

HI 96729-11 CAL CHECK™ standard cuvettes

HI 93729-01 Reagents for 100 tests

HI 93729-03 Reagents for 300 tests

For HI 96739

HI 96739-11 CAL CHECK™ standard cuvettes

HI 93739-01 Reagents for 100 tests

HI 93739-03 Reagents for 300 tests

For a complete list of Reagents, see Reagents *Section 18*.

HI 96720 • HI 96719

Hardness Standard Method Portable Photometers

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**.

The HI 96720 measures the calcium hardness content, as $CaCO_3$, in water and wastewater in the 0.00 to 2.70 mg/L (ppm) range.

The HI 96719 measures the magnesium hardness content, as $CaCO_3$, in water and wastewater in the 0.00 to 2.00 mg/L (ppm) range.

Both meters use an exclusive positive-locking system to ensure that the cuvette is in the same position every time it is placed into the measurement cell. It is designed to fit cuvettes with a larger neck making it easier to add both sample and reagents. The cuvettes are made from special optical glass to obtain best results.

Water, with exception to distilled water, contains dissolved salts (**magnesium** and **calcium carbonates**). The concentration of these salts determines the water hardness, which can be expressed in calcium carbonate or magnesium carbonate. The sum of these two represents the total hardness level.

In addition, this parameter is also related to the phenomenon of pipe rusting in water heating and cooling systems, reverse osmosis and demineralization plants.

ORDERING INFORMATION

HI 96720 and **HI 96719** are supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96720C and **HI 96719C** include photometer, sample cuvettes (2) with caps, 9V battery, 1 mL syringe with tip, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

For HI 96720

HI 96720-11 CAL CHECK™ standard cuvettes
HI 93720-01 Reagents for 100 tests
HI 93720-03 Reagents for 300 tests

For HI 96719

HI 96719-11 CAL CHECK™ standard cuvettes
HI 93719-01 Reagents for 100 tests
HI 93719-03 Reagents for 300 tests

SPECIFICATIONS	HI 96720 Ca Hardness	HI 96719 Mg Hardness
Range	0.00 to 2.70 mg/L (ppm)	0.00 to 2.00 mg/L (ppm)
Resolution	0.01 mg/L (ppm)	0.01 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.11 mg/L ±5% of reading	
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 525nm	
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th ed. Calmagite method	adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th ed. EDTA colorimetric method

The reagents are in liquid form and are supplied in bottles. The amount of reagent is precisely dosed by use of the supplied automatic pipette to ensure the maximum repeatability.

For a complete list of Reagents, see Reagents *Section 18*.

HANNA instruments

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Hardness, EPA Portable Photometer

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

Total hardness, that is the presence of magnesium and calcium, is due mainly to the runoff water dissolving these salts as it flows or filters through different strata. Hardness can also cause scaling of pipes in cooling and heating systems.

The HI 93735 measures the total hardness in drinking, surface and wastewater.

This meter uses an exclusive positive-locking system to ensure that the cuvette is in the same position every time it is placed into the measurement cell. It is designed to fit cuvettes with a larger neck making it easier to add both sample and reagents. The cuvettes are made from special optical glass to obtain best results.

Hardness in water is caused by dissolved minerals, primarily divalent cations, including calcium (Ca^{2+}), iron (Fe^{2+}), strontium (Sr^{2+}), zinc (Zn^{2+}), and manganese (Mn^{2+}). Calcium and magnesium ions are usually the only ions present in significant concentrations, therefore, hardness is generally considered to be a measure of the calcium and magnesium content of water. Considerations should be given when other cations contributing to hardness are present in significant amounts.

SPECIFICATIONS	HI 96735 Hardness, Total		
	Hardness LR (P1)	Hardness MR (P2)	Hardness HR (P3)
Range	0 to 250 mg/L (ppm)	200 to 500 mg/L (ppm)	400 to 750 mg/L (ppm)
Resolution	1 mg/L from 0 to 100 mg/L, 5 mg/L from 100 to 750 mg/L	5 mg/L	5 mg/L
Accuracy @ 25°C (77°F)	±5 mg/L ±4% of reading	±7 mg/L ±3% of reading	±10 mg/L ±2% of reading
Light Source	light emitting diode		
Light Detector	silicon photocell with narrow band interference filter @ 466		
Power Supply	9V battery		
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder		
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing		
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")		
Weight	360 g (12.7 oz.)		
Method	adaptation of the EPA recommended method 130.1		

The reagents are in liquid and powder form and are supplied in bottles and in packets. The amount of reagent is precisely dosed to ensure maximum repeatability.

ORDERING INFORMATION

HI 96735 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96735-11	CAL CHECK™ standard cuvettes
HI 93735-00	Reagents for 100 tests (0-250 mg/L)
HI 93735-01	Reagents for 100 tests (200-500 mg/L)
HI 93735-02	Reagents for 100 tests (400-750 mg/L)
HI 93735-0	Reagents for 100 tests (0-750 mg/L)

For a complete list of Reagents, see Reagents *Section 18*.

HI 96785

Honey Color Portable Analyzer

No More Judging By Eye!

- **Immediate results**
- **Digital readout**
- **No more judging by eye**

The HI 96785 portable microprocessor analyzer measures the percent light transmittance of honey compared to analytical reagent grade glycerol. The transmittance value allows identification of the honey Pfund grade. The instrument directly displays the measurement result expressed in mm Pfund.

Measurements are made using matched square optical cuvettes having a 10 mm light path.

Why this instrument is so important

The natural color of honey presents many tonalities: from straw yellow to amber, from dark amber to almost black with a hint of red. The color of untreated honey originates from the botanical varieties used by the bees: for this reason, its coloration allows one to commercially identify the original floral type.

In addition, the color of honey tends to darken with age or change according to the method of conservation or production used by beekeepers, (for example: the use of old beehives, contact with metals, the temperature of conservation, exposure to light, etc.). The classes of color are expressed in millimeters (mm) on the Pfund scale, compared to an analytical standard scale of reference on the graduation of glycerin.

Application Designed Photometers

USDA Color Standards Designations	Color Range Pfund Scales (mm)
Water White	≤ 8 or less
Extra White	> 8 - ≤ 17
White	> 17 - ≤ 34
Extra Light Amber	> 34 - ≤ 50
Light Amber	> 50 - ≤ 85
Amber	> 85 - ≤ 114
Dark Amber	> 114

SPECIFICATIONS	HI 96785
Range	0 to 150 mm Pfund
Resolution	1 mm Pfund
Accuracy @ 25°C (77°F)	±2 mm Pfund @ 80mm Pfund
Light Source	tungsten lamps
Light Detector	silicon photocells with narrow band interference filter @ 420 nm and 525 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	direct measure

ORDERING INFORMATION

HI 96785 is supplied with sample cuvettes (5), 9V battery, light shield cap, 30 mL bottle of glycerol, instruction manual.

ACCESSORIES

HI 93703-56 Consists of 82 matched square cuvettes, 30 mL of glycerol and (2) 5 mL syringes (75 tests average)

HI 70662 Cleaning solution for honey meter (30 mL)

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Hydrazine Portable Photometer

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

Hydrazine is an inorganic chemical compound represented by the formula N_2H_4. It is a colorless, flammable liquid with an ammonia-like odor and is derived from the same industrial chemistry processes that manufacture ammonia. However, hydrazine has physical properties that are closer to those of water.

Hydrazine is highly toxic and dangerously unstable, and is usually handled while in solution for safety reasons.

Hydrazine is a liquid chemical substance normally used in high pressure heating plants because of its properties as an oxygen inhibitor. It is added to avoid scaling and corrosion in the plant itself. Hydrazine reacts with dissolved oxygen to yield nitrogen and water, so that hydrazine has the advantage over the sulfite treatment because it does not produce any dissolved solids in the boiled water. Hydrazine is also used in tanks because it controls the growth of bacteria. Other hydrazine uses include:

- oxygen scavenger for water boiler feed and heating systems to prevent corrosion damage
- energy source in fuel elements
- reducing agent for the recovery of metals (copper, nickel and others)
- intermediate in insecticides, herbicides, explosives, plant growth regulators, pharmaceuticals, dyes, flame-retardants, polymerization catalysts and other chemical products
- component of photo development

The HI 96704 meter measures the hydrazine content in water samples. The method is an adaptation of the ASTM Manual of Water and Environmental Technology, method D1385-88 for natural and treated water.

SPECIFICATIONS	HI 96704 Hydrazine
Range	0 to 400 µg/L (ppb)
Resolution	1 µg/L (ppb)
Accuracy @ 25°C (77°F)	±3% of full scale
Light Source	light emitting diode
Light Detector	silicon photocell with narrow band interference filter @ 466 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	adaptation of the ASTM Manual of Water and Environmental Technology, method D1385-88 for natural and treated water

The reagent is in liquid form and is supplied in dropper bottles. The amount of reagent is precisely dosed to ensure the maximum repeatability.

ORDERING INFORMATION

HI 96704 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96704C includes HI 96704 photometer, sample cuvettes (2) with caps, 9V battery, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96704-11 CAL CHECK™ standard cuvettes
HI 93704-01 Reagents for 100 tests
HI 93704-03 Reagents for 300 tests

For a complete list of Reagents, see Reagents *Section 18*.

HI 96718
Iodine Photometer

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

The disinfectant properties of Iodine have led to its use as an alternative to chlorine and bromine. Unlike chlorinated pools, water treated with iodine decreases eye irritation among swimmers, and provides a level of disinfection more stable to adverse conditions.

However, its toxic and corrosive properties and the difficulties of dissolving it in water has limited it's widespread acceptance. One of its most common applications is in poultry industry process water.

HI 96718 uses an exclusive positive-locking system to ensure that the cuvette is in the same position every time it is placed into the measurement cell. It is designed to fit a cuvette with a larger neck making it easier to add both sample and reagents. The cuvette is made from special optical glass to obtain best results.

The HI 96718 measures the Iodine content in water samples in the 0.0 to 12.5 mg/L (ppm) range. The method is an adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th edition, DPD method.

SPECIFICATIONS	HI 96718 Iodine
Range	0.0 to 12.5 mg/L (ppm)
Resolution	0.1 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.1 mg/L ±5% of reading
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 525 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th edition, DPD method

The reagent is in powder form and is supplied in packets. The amount of reagent is precisely dosed to ensure the maximum repeatability.

ORDERING INFORMATION

HI 96718 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96718C includes HI 96718 photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96718-11 CAL CHECK™ standard cuvettes
HI 93718-01 Reagents for 100 tests
HI 93718-03 Reagents for 300 tests

For a complete list of Reagents, see Reagents *Section 18*.

Iron Photometers

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

The HI 96746 meter measures the iron content in water, wastewater and seawater in the 0.00 to 1.60 mg/L (ppm) range.

The HI 96721 meter measures total iron (Fe) content in water samples in the 0.00 to 5.00 mg/L (ppm) range. The reagent contains both a reducing and a complexing agent: the first converts all but very most resistant forms of iron present in the sample to the ferrous (Fe^{2+}) or soluble state; the second reacts with the ferrous iron to form the characteristic orange-colored complex.

Both meters use an exclusive positive-locking system to ensure that the cuvette is in the same position every time it is placed into the measurement cell. It is designed to fit a cuvette with a larger neck making it easier to add both sample and reagents. The cuvette is made from special optical glass to obtain best results.

Iron is naturally present in water in low concentrations, but it reaches high concentrations in wastewater effluents. The iron concentration in water needs to be monitored because it becomes harmful above certain levels.

In domestic water, for instance, iron can unpleasantly alter the taste, stain laundry, damage kitchenware and favor the growth of certain bacteria. Iron is also an indicator of ongoing corrosion in industrial plants or in water cooling and heating systems. Moreover, iron is normally monitored in mining wastewater to avoid contamination.

SPECIFICATIONS	HI 96746 Iron LR	HI 96721 Iron HR
Range	0.00 to 1.60 mg/L (ppm)	0.00 to 5.00 mg/L (ppm)
Resolution	0.01 mg/L (ppm)	0.01 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.01 mg/L ±8% of reading	±0.04 mg/L ±2% of reading
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 525 nm	
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of the TPTZ method	adaptation of the USEPA method 315B and Standard Method 3500-Fe B

The reagents are in powder form and are supplied in packets. The amount of reagent is precisely dosed to ensure the maximum repeatability.

ORDERING INFORMATION

HI 96746 and **HI 96721** are supplied with sample cuvettes (2) with caps, 9V battery and instructions.

CAL CHECK™ standards and testing reagents sold separately

HI 96746C and **HI 96721C** includes photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

For HI 96746

HI 96746-11 CAL CHECK™ standard cuvettes
HI 93746-01 Powder reagents for 100 tests
HI 93746-03 Powder reagents for 300 tests

For HI 96721

HI 96721-11 CAL CHECK™ standard cuvettes
HI 93721-01 Reagents for 100 tests
HI 93721-03 Reagents for 300 tests

For a complete list of Reagents, see Reagents *Section 18*.

HI 96748 • HI 96709

Manganese Photometer

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

Manganese is one of the most common metals present in nature and is used in many industrial applications, for example, the production of fertilizers and in the pharmaceutical industry.

Manganese salts are also used in iron alloys (steel manufacturing) and non-iron alloys as it improves their corrosion resistance and hardness.

The HI 96748 measures the low range manganese content in water and wastewater in the 0 to 300 µg/L (ppb) range.

The HI 96709 measures the high range manganese content in water and wastewater in the 0.0 to 20.0 mg/L (ppm) range.

Both meters use an exclusive positive-locking system to ensure that the cuvette is in the same position every time it is placed into the measurement cell. It is designed to fit a cuvette with a larger neck making it easier to add both sample and reagents. The cuvette is made from special optical glass to obtain best results.

Manganese is not considered to be dangerous, but high concentrations of this metal in water will alter the taste and smell. In industry, manganese can produce corrosion and incrustation to pipes when found in high concentrations.

ORDERING INFORMATION

HI 96748 and **HI 96709** is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96709C includes HI 96709 photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

For HI 96748

HI 96748-11 CAL CHECK™ standard cuvettes
HI 93748-01 Reagents for 50 tests
HI 93748-03 Reagents for 150 tests

For HI 96709

HI 96709-11 CAL CHECK™ standard cuvettes
HI 93709-01 Reagents for 100 tests
HI 93709-03 Reagents for 300 tests

SPECIFICATIONS	HI 96748 Manganese, Low Range	HI 96709 Manganese, High Range
Range	0 to 300 µg/L	0.0 to 20.0 mg/L
Resolution	1 µg/L	0.1 mg/L
Accuracy @ 25°C (77°F)	±10 µg/L ±3% of reading	±0.2 mg/L ±3% of reading
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 525 nm	
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of the 1-(2-pyridylazo)-2-naphtol PAN method	adaptation of Standard Methods for the Examination of Water and Wastewater, 18th edition, Periodate method

The reagents are in powder form and are supplied in packets. The amount of reagent is precisely dosed to ensure the maximum repeatability.

For a complete list of Reagents, see Reagents *Section 18*.

HANNA instruments

With Great Products, Come Great Results™

Application Designed Photometers

HI 96759 • HI 96760

Maple Syrup Photometers

The H 96759 and HI 96760 handheld maple syrup transmittance analyzers are high precision, USDA (HI 96759) or Canada Federal and Quebec (HI 96760) compliant photometers that bring judging "by eye" to an end.

These meters benefit from HANNA's years of experience as a manufacturer of analytical instruments. They have the advanced optical system based on special tungsten lamps and a narrow band interference filter that allow most accurate and repeatable readings.

HANNA maple syrup transmittance analyzers measure the percent light transmittance of maple syrup as compared to analytical reagent glycerol. The transmittance value allows identification of syrup quality class.

Measurements are performed by using matched square optical cuvettes having a 10 mm light path.

A very light syrup color has a very high level of quality and can be compared to minimum standards of light transmittance while a very dark syrup color signifies a low level of classification.

MAPLE SYRUP GRADE DESIGNATIONS

RANGE (% TRANSMITTANCE)	United States, USDA	Canada, Federal & Quebec
75.0 to 100.0	grade A light amber	No. 1 Extra Light
60.5 to 74.9	grade A medium amber	No. 1 Light Grade A
44.0 to 60.4	grade A dark amber	No. 1 Medium Grade A
27.0 to 43.9	grade B for reprocessing	No. 2 Amber
less than 27.0	substandard	No. 3 Dark

SPECIFICATIONS	HI 96759 (USA) • HI 96760 (CAN)
Range	0.0 to 100.0% transmittance
Resolution	0.1% transmittance
Accuracy @ 25°C (77°F)	±3% @ 75.0% transmittance
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter 560 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	direct measurement

ORDERING INFORMATION

HI 96759 and **HI 96760** are supplied with square sample cuvettes (6), light shield cap, 5 mL syringes (2), 30 mL bottle of glycerol, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

SOLUTIONS

HI 93703-50 Cuvette cleaning solution, 230 mL

ACCESSORIES

HI 93703-56 Consists of 82 matched square cuvettes, glycerol (30 mL) and 5 mL syringes (2) (75 tests average)

HI 96730

Molybdenum Photometer

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

The HI 96730 measures the molybdenum content in water and wastewater. The meter uses an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

The cuvette has a very important role because it is an optical element and thus requires particular attention. It is important that both, the measurement and the calibration (zeroing) cuvettes, are optically identical to provide the same measurement conditions. Whenever possible use the same cuvette for both. It is necessary that the surface of the cuvette is clean and not scratched to avoid interference due to unwanted reflection and absorption of light. It is recommended not to touch the cuvette walls with hands.

Furthermore, in order to maintain the same conditions during the zeroing and the measuring phases, it is necessary to close the cuvette to prevent any contamination.

Molybdenum or molybdate are salts often used in industrial cooling towers. They are non-toxic and continue to become more popular over chromates as a corrosion inhibitor. Molybdenum has a wide variety of applications as an alloying agent in steel and cast iron, a pigment for inks and paints and also as a multipurpose solid lubricant.

SPECIFICATIONS	HI 96730 Molybdenum
Range	0.0 to 40.0 mg/L (ppm)
Resolution	0.1 mg/L
Accuracy @ 25°C (77°F)	±0.3 mg/L ±5% of reading
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 420 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	adaptation of the mercaptacetic acid method

The reagents are in powder form and are supplied in packets. The amount of reagent is precisely dosed to ensure maximum repeatability.

ORDERING INFORMATION

HI 96730 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96730-11 CAL CHECK™ standard cuvettes
HI 93730-01 Reagents for 100 tests
HI 93730-03 Reagents for 300 tests

For a complete list of Reagents, see Reagents *Section 18*.

Nickel Photometers

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

Nickel is commonly utilized by the electroplating industry in processes utilizing stainless steel, cobalt or nickel alloys.

Nickel is also used in batteries, fuel cells and hydrogenation of vegetable oils in the food industry.

The HI 96726 and HI 96740 meters measure the Nickel content in water and wastewater. Both meters use an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

The cuvette has a very important role because it is an optical element and thus requires particular attention. It is important that both, the measurement and the calibration (zeroing) cuvettes, are optically identical to provide the same measurement conditions.

Even though **nickel** is regarded as non-toxic to humans, concentrations found in wastewater exceeding 0.5 mg/L (ppm) can cause damage to certain plants and aquatic life.

SPECIFICATIONS	HI 96740 Nickel LR	HI 96726 Nickel HR
Range	0.000 to 1.000 mg/L (ppm)	0.00 to 7.00 g/L
Resolution	0.001 mg/L (ppm)	0.01 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.010 mg/L ±7% of reading	±0.07 mg/L ±4% of reading
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 575 nm	
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of the PAN method	adaptation of the photometric method

The reagent is in powder form and is supplied in packets. The amount of reagent is precisely dosed to ensure maximum repeatability.

ORDERING INFORMATION

HI 96726 and **HI 96740** is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96726C and **HI 96740C** include photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96726-11 CAL CHECK™ standard cuvettes
HI 96740-11 CAL CHECK™ standard cuvettes
HI 93726-01 Reagents for 100 tests
HI 93726-03 Reagents for 300 tests
HI 93740-01 Reagents for 100 tests
HI 93740-03 Reagents for 300 tests

For a complete list of Reagents, see Reagents *Section 18*.

HI 96728 • HI 96786

Nitrate Portable Photometers

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

Nitrates are present in nature as a result of decomposition of organic microorganisms or due to their use as fertilizers. Nitrates reduce to nitrites, which in turn easily combine to form substances dangerous to man.

A maximum level of 45 mg/L (ppm) is established as a worldwide guideline for nitrate concentration in water. In Europe, the maximum consented level of nitrates in potable water is 50.0 mg/L (ppm), while in the USA the EPA has established a guideline for the maximum level of nitrate–nitrogen of 10 mg/L (NO_3^--N), which corresponds to 45.0 mg/L of nitrates.

The HI 96728 and HI 96786 meter measures the nitrate content in water and wastewater.

Both meters use an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

Nitrogen is abundant in Earth's atmosphere, and is present in water in the form of nitrate, nitrite and ammonia. Plants use nitrogen as a nutrient to build proteins by tacking it in through their root system. Nitrate is formed in water mainly through rainfall, decomposition of organic matter, and runoff from man made pollutants such as sewage waste and fertilizers.

Almost all the surface waters have some measurable level of nitrate, and a moderate amount is considerate beneficial. Large amounts of nitrate can lead the eutrophication that may result in decreased levels of dissolved oxygen in the water.

ORDERING INFORMATION

HI 96728 and **HI 96786** are supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96728C and **HI 76786C** include photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96728-11 CAL CHECK™ standard cuvettes
HI 96786-11 CAL CHECK™ standard cuvettes
HI 93728-01 Reagents for 100 tests
HI 93728-03 Reagents for 300 tests

SPECIFICATIONS	HI 96728 Nitrate (as nitrogen)	HI 96786 Nitrate
Range	0.0 to 30.0 mg/L (ppm)	0.0 to 100 mg/L
Resolution	0.1 mg/L (ppm)	1 mg/L
Accuracy @ 25°C (77°F)	±0.5 mg/L ±10% of reading	±5 mg/L ±5% of reading
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 525 nm	
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of cadmium reaction method	

The reagents are in powder form and are supplied in packets. The amount of reagent is precisely dosed to ensure maximum repeatability.

For a complete list of Reagents, see Reagents *Section 18*.

Nitrite Portable Photometers

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

Nitrites are an intermediate product in the nitrogen cycle and are produced by ammonia oxidation with water, or even originate in industrial waste directly. They must not be present in drinking water.

The HI 96707 measures the Nitrogen-Nitrite content in the 0.000 to 0.600 mg/L (ppm) range, in drinking, surface and saline water samples and in domestic and industrial wastes.

The HI 96708 meter measures the nitrite content in water and wastewater in the 0 to 150 mg/L (ppm) range.

Both meters use an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

Nitrites can be harmful to aquatic organisms even in low concentrations and for this reason, they are closely monitored in aquaculture facilities. In cooling towers, however, an adequate amount of nitrites is necessary to prevent corrosion.

In high concentrations, they can be harmful to the environment and to humans. They are, therefore, normally monitored to verify the quality of water for domestic use, as well as lakes and ponds.

SPECIFICATIONS	HI 96707 Nitrite, Low Range	HI 96708 Nitrite, High Range
Range	0.000 to 0.600 mg/L (ppm)	0 to 150 mg/L (ppm)
Resolution	0.001 mg/L (ppm)	1 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.020 mg/L ±4% of reading	±4 mg/L ±4% of reading
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 525 nm	silicon photocell with narrow band interference filter @ 575 nm
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of an EPA approved method	adaptation of the Ferrous Sulfate method

The reagents are in powder form and are supplied in packets. The amount of reagent is precisely dosed to ensure maximum repeatability.

ORDERING INFORMATION

HI 96707 and **HI 96708** are supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96707C and **HI 96708C** include photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

For HI 96707

HI 96707-11	CAL CHECK™ standard cuvettes
HI 93707-01	Powder reagents for 100 tests
HI 93707-03	Powder reagents for 300 tests

For HI 96708

HI 96708-11	CAL CHECK™ standard cuvettes
HI 93708-01	Reagents for 100 tests
HI 93708-03	Reagents for 300 tests

For a complete list of Reagents, see Reagents *Section 18*.

HI 96732

Dissolved Oxygen Portable Photometer

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

In aquaculture, dissolved oxygen is arguably the most important parameter of water quality. Most species require a minimum of 3 mg/L (ppm) DO, 8-10 mg/L (ppm) is preferable. Unlike other gases such as nitrogen, oxygen supersaturation doesn't usually result in gas bubble disease ("pop-eye"), so high levels generally aren't an issue.

The HI 96732 measures the content of dissolved oxygen (O_2) in surface, feed, natural and waste waters in the 0.0 to 10.0 mg/L (ppm) range.

HI 96732 uses an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

Dissolved oxygen analysis measures the amount of gaseous oxygen (O_2) dissolved in an aqueous solution. Dissolved oxygen is one of the most important parameters in aquatic systems. This gas is an absolute requirement for the metabolism of aerobic organisms and also influences inorganic chemical reactions. Therefore, knowledge of the solubility and dynamics of oxygen distribution is essential to interpreting both biological and chemical processes within water bodies. Oxygen gets into water by diffusion from the surrounding air, by aeration (rapid movement) and as a waste product of photosynthesis. The amount of oxygen (or any gas) that can dissolve in pure water (saturation point) is inversely proportional to the temperature of water; the warmer the water, the less dissolved oxygen.

SPECIFICATIONS	HI 96732 Oxygen, Dissolved
Range	0.0 to 10.0 mg/L (ppm)
Resolution	0.1 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.2 mg/L ±3% of reading
Light Source	light emitting diode
Light Detector	silicon photocell with narrow band interference filter @ 466 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	modified Winkler method

The reagents are in liquid form and are supplied in bottles. The amount of reagent is precisely dosed to ensure maximum repeatability.

ORDERING INFORMATION

HI 96732 is supplied with sample cuvettes (2) with caps, 60 mL glass bottle with stopper, 9V battery and instruction manual

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96732-11 CAL CHECK™ standard cuvettes
HI 93732-01 Reagents for 100 tests
HI 93732-03 Reagents for 300 tests

For a complete list of Reagents, see Reagents *Section 18*.

Phosphate Portable Photometers

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

Phosphates are present in a number of products that are used by humans everyday. Some examples of the effects of phosphate are enhancing the flavor and tartness of cola drinks, as a buffering agent in controlling pH in antifreeze and delaying darkening of cut potatoes used for french fries.

Phosphates are also extensively used in detergents and cleaning fluids because of their ability to soften water and remove soil deposits.

The largest use of phosphates is in the conversion of the mineral apatite, which is a mixture of calcium phosphate and other calcium compounds that are used in fertilizers. Local laws govern the use of phosphates and the discharge levels into streams.

Phosphates are particularly important for the growth and development of plant roots, and hence are one of the most common fertilizers used in agriculture.

Phosphates are also utilized in detergents and are needed, in small quantities, for heating systems. However, high concentrations of phosphates can cause environmental pollution as they are a primary cause of eutrophication.

For these reasons, it is necessary to closely monitor the phosphate levels present in both municipal and industrial waste water.

The HI 96713 measures phosphate (PO_4^{3-}) content in water, wastewater and seawater in the 0.00 to 2.50 mg/L (ppm) range.

The HI 96717 measures the phosphate (PO_4^{3-}) content in water samples in the 0.0 to 30.0 mg/L (ppm) range.

SPECIFICATIONS	HI 96713 Phosphate LR	HI 96717 Phosphate HR
Range	0.00 to 2.50 mg/L (ppm)	0.0 to 30.0 mg/L (ppm)
Resolution	0.01 mg/L (ppm)	0.1 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.04 mg/L ±4% of reading	±1.0 mg/L ±4% of reading
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 610 nm	silicon photocell with narrow band interference filter @ 525 nm
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of the ascorbic acid method	Amino Acid Method, adapted from Standard Method for the Examination of Water and Wastewater

The reagents are in powder and liquid form and are supplied in packets and bottles. The amount of reagent is precisely dosed to ensure the maximum repeatability.

ORDERING INFORMATION

HI 96713 and **HI 96717** are supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96713C and **HI 96717C** include photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

For HI 96713

HI 96713-11 CAL CHECK™ standard cuvettes
HI 93713-01 Reagents for 100 tests
HI 93713-03 Reagents for 300 tests

For HI 96717

HI 96717-11 CAL CHECK™ standard cuvettes
HI 93717-01 Reagents for 100 tests
HI 93717-03 Reagents for 300 tests

For a complete list of Reagents, see Reagents *Section 18*.

HI 96706

Phosphorus Portable Photometer

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

Phosphorus is found in nature as phosphates. Its concentration in water is monitored because it causes corrosion when present in high levels. It is also an essential parameter for the growth of microorganisms and algae, which are often unwanted in tanks and reserves of water.

Phosphorus is also an essential element for plant growth and for this reason, is needed in large amounts.

The HI 96706 measures the phosphorus (P) content in water samples in the 0.0 to 15.0 mg/L (ppm) range.

HI 96706 uses an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

Worldwide demand for fertilizers has contributed to record phosphate production. Phosphates are used in the production of special glasses, such as those used for sodium lamps. Bone-ash, calcium phosphate, is used to create fine china and to produce mono-calcium phosphate, used in baking powder.

Phosphorus is also important in the production of steels, phosphor bronze, and many other products. Trisodium phosphate is important as a cleaning agent, as a water softener, and for preventing boiler scale and corrosion of pipes and boiler tubes.

Phosphorus is also an essential ingredient of all cell protoplasm, nervous tissue, and bones.

SPECIFICATIONS	HI 96706 Phosphorus
Range	0.0 to 15.0 mg/L (ppm)
Resolution	0.1 mg/L (ppm)
Accuracy @ 25°C (77°F)	± 0.3 mg/L ±4% of reading
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 525 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	Amino Acid Method, adapted from Standard Method for the Examination of Water and Wastewater

The reagents are in powder and liquid form and are supplied in packets and bottles. The amount of reagent is precisely dosed to ensure the maximum repeatability.

ORDERING INFORMATION

HI 96706 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual

CAL CHECK™ standards and testing reagents sold separately

HI 96706C includes photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96706-11 CAL CHECK™ standard cuvettes
HI 93706-01 Reagents for 100 tests
HI 93706-03 Reagents for 300 tests

For a complete list of Reagents, see Reagents *Section 18*.

Potassium Portable Photometer

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

Potassium as a chemical element is commonly found in nature. It is present in soil and drinking water and is also an essential element for the growth of plants and animals.

Potassium concentration is important in determining the quality of soil in many greenhouse, agriculture and horticulture applications. Potassium salts are also a common component of fertilizers.

The HI 96750 measures the potassium (K) content in water samples in the 0.0 to 10.0 mg/L (ppm) for low range and 10 to 100 mg/L (ppm) for medium range. The HI 96750 uses the Tetraphenylborate Method. The reaction between potassium and reagents causes turbidity in the sample.

HI 96750 uses an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

The importance of potassium to plant growth differs somewhat from nitrogen and phosphorus, in that potassium acts as more of a catalyst in plant carbohydrate metabolism. Over 60 plant enzymes need potassium to be activated.

Other important functions of potassium are its ability to help with the regulation of water in plants, its contribution to the formation of ATP molecules, and as a necessary component for nitrogen uptake and protein synthesis.

Plants without adequate potassium use water less efficiently and usually have a lower nitrogen intake and protein synthesis activity. Plants with increased supplies of potassium are able to more quickly assimilate carbon dioxide into sugars during photosynthesis.

SPECIFICATIONS	HI 96750 Potassium	
	Potassium LR (P1)	Potassium MR (P2)
Range	0.0 to 10.0 mg/L (ppm)	10 to 100 mg/L (ppm)
Resolution	0.1 mg/L (ppm)	1 mg/L (ppm)
Accuracy @ 25°C (77°F)	±1.5 mg/L ±7% of reading	±15 mg/L ±7% of reading
Light Source	light emitting diode	
Light Detector	silicon photocell with narrow band interference filter @ 466 nm	
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	Tetraphenylborate method	

The reagents are in powder and liquid form and are supplied in packets and bottles respectively. The amount of reagent is precisely dosed to ensure the maximum repeatability.

ORDERING INFORMATION

HI 96750 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96750C includes photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96750-11 CAL CHECK™ standard cuvettes
HI 93750-01 Reagents for 100 tests
HI 93750-03 Reagents for 300 tests

For a complete list of Reagents, see Reagents *Section 18*.

HI 96705 • HI 96770

Silica Portable Photometers

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

Silica is found in all natural waters in the dissolved mineral form. Silica is only slightly soluble in water; solubility and therefore the form of silica in water depends on the pH level of the water and on the minerals containing silica in contact with water.

Silica's presence in industrial applications is undesirable since it causes scale. In particular, high pressure turbines are highly effected by this factor.

Heating systems and reverse osmosis plants also require monitoring of silica.

The HI 96705 meter measures the silica (SiO_2) content in water and wastewater in the 0.00 to 2.00 mg/L (ppm) range. HI 96770 measures silica (SiO_2) content from 0 to 200 mg/L.

ORDERING INFORMATION

HI 96705 and **HI 96770** are supplied with sample cuvettes (2) with caps, 9V battery and instructions.

CAL CHECK™ standards and testing reagents sold separately

HI 96705C and **HI 96770C** include photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

For HI 96705

HI 96705-11 CAL CHECK™ standard cuvettes
HI 93705-01 Reagents for 100 tests
HI 93705-03 Reagents for 300 tests

For HI 96770

HI 96770-11 CAL CHECK™ standard cuvettes
HI 96770-01 Reagents for 100 tests
HI 96770-03 Reagents for 300 tests

SPECIFICATIONS	HI 96705 Silica	HI 96770 Silica HR
Range	0.00 to 2.00 mg/L (ppm)	0 to 200 mg/L (as SiO_2)
Resolution	0.01 mg/L (ppm)	1 mg/L
Accuracy @ 25°C (77°F)	±0.03 mg/L ±3% of reading	±1 mg/L ±5% of reading
Light Source	tungsten lamp	light emitting diode
Light Detector	silicon photocell with narrow band interference filter @ 610 nm	silicon photocell with narrow band interference filter @ 466 nm
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of the ASTM D859 method of heteropoly blue method	adaptation of the USEPA METHOD 370.1 for drinking, surface and saline waters, domestic and industrial wastes and Standard Method 4500-SiO_2 C

The reagents are in powder and liquid form and are supplied in packets and bottles respectively. The amount of reagent is precisely dosed to ensure the maximum repeatability.

For a complete list of Reagents, see Reagents *Section 18*.

Silver Portable Photometer

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

Small quantities of silver are bacteriostatic or bactericidal. As a result, it is at times used in disinfection of pools and spas, as well as in water filters.

The presence of silver in water is generally indicative of pollution from mainly film manufacturers, film processors and surface finishers. In fact, silver levels are closely monitored in these sectors since its presence can cause discoloration of the skin, eyes and mucous membranes.

The HI 96737 measures the silver content in water and wastewater in the 0.000 to 1.000 mg/L (ppm) range.

This instrument uses an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

The cuvette has a very important role because it is an optical element and thus requires particular attention. It is important that both, the measurement and the calibration (zeroing) cuvettes, are optically identical to provide the same measurement conditions.

Seawater contains approximately 2-100 ppt of silver, and the surface concentration may be even lower. River water generally contains approximately 0.3-1 ppb of silver. The phytoplankton concentration is 0.1-1 ppm (dry mass), leading to a 104-105 bio concentration factor in seawater. In oyster tissue, concentrations of approximately 890 ppm (dry mass) were found.

Silver does not react with pure water. Is is stable in both water and air. Moreover, it is acid and base resistant, but it corrodes when it comes in contact with sulphur compounds. Dissolved in water silver mainly occurs as Ag^+ (aq), and in seawater as $AgCl_2$- (aq).

SPECIFICATIONS	HI 96737 Silver
Range	0.000 to 1.000 mg/L (ppm)
Resolution	0.001 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.005 mg/L ±10% of reading
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 575 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	adaptation of the PAN method

The reagents are in liquid form and are supplied in bottles. The amount of reagent is precisely dosed to ensure maximum repeatability.

ORDERING INFORMATION

HI 96737 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96737-11 CAL CHECK™ standard cuvettes
HI 93737-01 Reagents for 50 tests
HI 93737-03 Reagents for 150 tests

For a complete list of Reagents, see Reagents *Section 18*.

HI 96751

Sulfate Portable Photometer

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

Sulfate is widely present within natural waters in different concentrations. Sulfate concentration is to be kept within a strict range for drinking water, especially since this value can be high near mine drainage points.

Sulfate is also rigorously tested in the production of beverages such as beer, due to its significant effect upon odor and taste.

The HI 96751 measures the sulfate content in water samples in the 0 to 150 mg/L (ppm) range. Sulfate is precipitated with barium chloride crystals.

The instrument uses an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

The cuvette has an important role because it is an optical element and thus requires particular attention. It is important that both, the measurement and the calibration (zeroing) cuvettes, are optically identical to provide the same measuring conditions.

Sulfate is added to certain types of boilers to help precipitate calcium and magnesium and to inhibit encrustation. Too much sulfate can be corrosive in high pressure boilers, electric turbines and their heat exchangers. In fact, in these applications, it is important to keep the level below a specific limit. Similar checks of sulfate presence are carried out in water used for different production cycles, including those of semiconductors.

SPECIFICATIONS	HI 96751 Sulfate
Range	0 to 150 mg/L (ppm)
Resolution	1 mg/L (ppm)
Accuracy @ 25°C (77°F)	±1 mg/L ±5% of reading
Light Source	light emitting diode
Light Detector	silicon photocell with narrow band interference filter @ 466 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	adaptation of the turbidimetric method

The reagent is in powder form and is supplied in packets. The amount of reagent is precisely dosed to ensure maximum repeatability.

ORDERING INFORMATION

HI 96751 is supplied with sample cuvettes with caps (2), 9V battery and instructions.

CAL CHECK™ standards and testing reagents sold separately

HI 96751C includes photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96751-11 CAL CHECK™ standard cuvettes
HI 93751-01 Reagents for 100 tests
HI 93751-03 Reagents for 300 tests

For a complete list of Reagents, see Reagents *Section 18*.

Zinc Portable Photometer

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

Even though zinc is non-toxic to human beings, concentrations above 5 mg/L (ppm) can cause a bitter, astringent taste. This level of zinc can result in a milky, iridescent color in alkaline waters and irritate the human digestive system.

Zinc in low quantities, however, is a beneficial and essential element necessary for body growth. In fact, US drinking water contains an average of 1.33 mg/L (ppm) of zinc.

Zinc is normally introduced into drinking water through industrial effluents, especially due to dezincification of brass and deterioration of galvanized iron.

In addition to drinking water, zinc is measured in surface finishing, boilers and cooling towers, water conditioning, effluent waters and many others.

The HI 96731 measures the zinc content in water and wastewater in the 0.00 to 3.00 mg/L (ppm) range.

The meter uses an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

The cuvette has a very important role because it is an optical element and thus requires particular attention. It is important that both, the measurement and the calibration (zeroing) cuvettes, are optically identical to provide the same measurement conditions.

SPECIFICATIONS	HI 96731 Zinc
Range	0.00 to 3.00 mg/L (ppm)
Resolution	0.01 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.03 mg/L ±3% of reading
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 575 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	adaptation of the Standard Methods for the Examination of Water and Wastewater, 20th edition, Zincon method

The reagents are in liquid and powder form and are supplied in bottles and in packets. The amount of reagent is precisely dosed to ensure maximum repeatability.

ORDERING INFORMATION

HI 96731 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96731-11 CAL CHECK™ standard cuvettes
HI 93731-01 Reagents for 100 tests
HI 93731-03 Reagents for 300 tests

For a complete list of Reagents, see Reagents *Section 18*.

HI 96101

Bromine, Chlorine, Cyanuric Acid, Iron Iodine and pH Portable Photometer

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

The HI 96101 measures Bromine, Free and Total Chlorine, Cyanuric Acid, Iron, Iodine and pH content in water and wastewater samples. The reagents are in powder and liquid form depending on the parameter and they are supplied in dropper bottles and packets.

The meter uses an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

The cuvette has a very important role because it is an optical element and thus requires particular attention. It is important that both the measurement and calibration (zeroing) cuvettes are optically identical to provide the same measuring conditions.

This multiparameter photometer can save time and money. If you need a simple, but professional meter measuring the most important constituents of water, especially in pools and spas, then HI 96101 has been designed for you.

ORDERING INFORMATION

HI 96101 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96101C includes HI 96101 photometer, sample cuvettes (2) with caps, scissors, cuvette cleaning cloth, 9V battery, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96701-11 CAL CHECK™ standard cuvettes
HI 93701-01 Reagents for 100* tests
HI 96710-11 CAL CHECK™ standard cuvettes
HI 93710-01 Reagents for 100* tests
HI 96711-11 CAL CHECK™ standard cuvettes
HI 93711-01 Reagents for 100* tests
HI 96716-11 CAL CHECK™ standard cuvettes
HI 93716-01 Reagents for 100* tests
HI 96718-11 CAL CHECK™ standard cuvettes
HI 93718-01 Reagents for 100* tests
HI 96722-11 CAL CHECK™ standard cuvettes
HI 93722-01 Reagents for 100*tests
HI 96746-11 CAL CHECK™ standard cuvettes
HI 93746-01 Reagents for 50 tests
*Reagents for 300 tests also available

SPECIFICATIONS	HI 96101 Bromine, Chlorine, Cyanuric Acid, Iodine, Iron LR and pH
Range	**Bromine:** 0.00 to 10.00 mg/L (ppm); **Free Chlorine:** 0.00 to 5.00 mg/L (ppm) **Total Chlorine:** 0.00 to 5.00 mg/L (ppm); **Cyanuric Acid:** 0 to 80 mg/L (ppm) **Iodine:** 0.0 to 12.5 mg/L (ppm); **Iron LR:** 0.00 to 1.60 mg/L; **pH:** 6.5 to 8.5 pH
Resolution	**Bromine:** 0.01 mg/L (ppm); **Chlorine:** 0.01 mg/L under 3.50 mg/L; 0.10 mg/L above 3.50 mg/L **Cyanuric Acid:** 1 mg/L (ppm); **Iodine:** 0.1 mg/L (ppm) **Iron LR:** 0.01 mg/L; **pH:** 0.1 pH
Accuracy @ 25°C (77°F)	**Bromine:** ±0.08 mg/L ±3% of reading; **Chlorine:** ±0.03 mg/L ±3% of reading; **Cyanuric Acid:** ±1 mg/L ±15% of reading; **Iodine:** ±0.1 mg/L ±5% of reading; **Iron LR:** ±0.01 mg/L ±8% of reading; **pH:** ±0.1 pH
Light Source	tungsten lamp
Light Detector	Silicon photocell with narrow band interference filter @ 525 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	**Bromine:** adaptation of the EPA, DPD method; **Chlorine:** Adaptation of the USEPA method and Standard Method 4500-Cl G; **Cyanuric Acid:** adaptation of the turbidimetric method; **Iodine:** adaptation of the EPA, DPD method; **Iron LR:** adaptation of the TPTZ method; **pH:** Phenol Red method

The amount of reagent is precisely dosed to ensure the maximum repeatability.

For a complete list of Reagents, see Reagents *Section 18*.

HANNA instruments

With Great Products, Come Great Results™

pH, Free and Total Chlorine & Cyanuric Acid Portable Photometer

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

Chlorine is the most common water disinfectant used in many swimming pools and spas.

In swimming pools, spas and similar applications, Cyanuric Acid helps to stabilize the breakdown of chlorine, especially in sunlight. Frequent testing of both cyanuric acid and pH will help to minimize chlorine consumption.

Specifically designed for swimming pool and spa applications, the HI 96104 measures pH, Free and Total Chlorine and Cyanuric Acid content.

The HI 96104 meter measures pH, Free and Total Chlorine and Cyanuric Acid content in water and wastewater. The reagents are in powder and liquid form depending on the parameter and they are supplied in dropper bottles and packets.

SPECIFICATIONS	HI 96104 Chlorine, Cyanuric Acid and pH			
	pH (P1)	Cl, Free (P2)	Cl, Total (P3)	Cyanuric Acid (P4)
Range	6.5 to 8.5 pH	0.00 to 5.00 mg/L (ppm)	0.00 to 5.00 mg/L (ppm)	0 to 80 mg/L (ppm)
Resolution	0.1 pH	0.01 mg/L (ppm)	0.01 mg/L (ppm)	1 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.1 pH	±0.03 mg/L (ppm) ±3% of reading	±0.03 mg/L (ppm) ±3% of reading	±1 mg/L (ppm) ±15% of reading
Light Source	tungsten lamp			
Light Detector	silicon photocell with narrow band interference filter @ 525 nm			
Power Supply	9V battery			
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder			
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing			
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")			
Weight	360 g (12.7 oz.)			
Method	phenol red method	adaptation of the EPA recommended DPD method 330.5		adaptation of the Turbidimetric method

The reagents are in powder and liquid form and supplied in packets or bottles. The amount of reagent is precisely dosed to ensure the maximum repeatability.

ORDERING INFORMATION

HI 96104 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96104C includes HI 96104 photometer, sample cuvettes (2) with caps, scissors, cuvette cleaning cloth, 9V battery, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96701-11	CAL CHECK™ standard cuvettes
HI 93701-01	Reagents for 100 tests
HI 93701-03	Reagents for 300 tests
HI 96710-11	CAL CHECK™ standard cuvettes
HI 93710-01	Reagents for 100 tests
HI 93710-03	Reagents for 300 tests
HI 96711-11	CAL CHECK™ standard cuvettes
HI 93711-01	Reagents for 100 tests
HI 93711-03	Reagents for 300 tests
HI 96722-11	CAL CHECK™ standard cuvettes
HI 93722-01	Reagents for 100 tests
HI 93722-03	Reagents for 300 tests

For a complete list of Reagents, see Reagents *Section 18*.

HI 96710

Free and Total Chlorine and pH Portable Photometer

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

HANNA has developed the HI 96710 to measure pH, free chlorine and total chlorine – three critical parameters to ensure good water quality.

pH	Molecular Chlorine	Hypochlorous Acid	Hypochlorite Ion
effect of pH on the hypochlorous acid present in water			
4	0.5	99.5	0
5	0	99.5	0.5
6	0	96.5	3.5
7	0	72.5	27.5
8	0	21.5	78.5
9	0	1.0	99.0
10	0	0.1	99.9

ORDERING INFORMATION

HI 96710 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96710C includes HI 96710 photometer, sample cuvettes (2) with caps, scissors, cuvette cleaning cloth, 9V battery, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96701-11 CAL CHECK™ standard cuvettes
HI 93701-01 Powder reagents for 100 tests
HI 93701-03 Powder reagents for 300 tests
HI 96710-11 CAL CHECK™ standard cuvettes
HI 93710-01 Reagents for 100 tests
HI 93710-03 Reagents for 300 tests
HI 96711-11 CAL CHECK™ standard cuvettes
HI 93711-01 Reagents for 100 tests
HI 93711-03 Reagents for 300 tests

SPECIFICATIONS	HI 96710 Free and Total Chlorine and pH		
	pH (P1)	Cl, Free (P2)	Cl, Total (P3)
Range	6.5 to 8.5 pH	0.00 to 5.00 mg/L (ppm)	0.00 to 5.00 mg/L (ppm)
Resolution	0.1 pH	0.01 mg/L (ppm)	0.01 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.1 pH	±0.03 mg/L (ppm) ±3% of reading	±0.03 mg/L (ppm) ±3% of reading
Light Source	tungsten lamp		
Light Detector	silicon photocell with narrow band interference filter @ 525 nm		
Power Supply	9V battery		
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder		
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing		
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")		
Weight	360 g (12.7 oz.)		
Method	phenol red	adaptation of the EPA recommended DPD method 330.5	

The reagent is in powder and liquid form and is supplied in packets and bottles respectively. The amount of reagent is precisely dosed to ensure the maximum repeatability.

For a complete list of Reagents, see Reagents *Section 18*.

Free and Total Chlorine Portable Photometer

This photometer has been designed to be used with liquid reagents. Free and total chlorine parameters can be switched between depending on procedure and reagents.

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

The HI 96724 measures the free and total chlorine content in water samples in the 0.00 to 5.00 mg/L (ppm) range. The method is an adaptation of the USEPA Method 330.5 for wastewater, and Standard Method 4500-CL G for drinking water.

The HI 96724 incorporates an advanced optical system based on a special tungsten lamp and a narrow band interference filter that allows the most accurate and repeatable readings. The instrument is factory calibrated and the electronic and optical design minimizes the need of frequent calibration.

The meter uses an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

The cuvette has a very important role because it is an optical element and thus requires particular attention. It is important that both the measurement and calibration (zeroing) cuvettes, are optically identical to provide the same measuring conditions.

SPECIFICATIONS	HI 96724 Free and Total Chlorine
Range	0.00 to 5.00 mg/L (ppm)
Resolution	0.01 mg/L from 0.00 to 3.50 mg/L (ppm); 0.10 mg/L above 3.50 mg/L
Accuracy @ 25°C (77°F)	±0.03 mg/L ±3% of reading
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 525 nm
Power Supply	9V battery
Auto-off	after 10 minutes of non-use in measurement mode; after 1 hour of non-use in calibration mode; with last reading reminder.
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	adaptation of the USEPA method 330.5 and Standard Method 4500-Cl G

The reagents are in liquid form and are supplied in bottles. The amount of reagent is precisely dosed to ensure maximum repeatability.

ORDERING INFORMATION

HI 96724 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96724C includes HI 96724 photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 93701-F	Reagents for 300 tests
HI 93701-T	Reagents for 300 tests; free and 100 tests total chlorine
HI 93711-D3	DPD3 reagent for 200 tests
HI 96724-11	CAL CHECK™ Standard Cuvettes

For a complete list of Reagents, see Reagents *Section 18*.

HI 96725

Chlorine, Cyanuric Acid and pH Portable Photometer for Legionella Protection

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

Legionella species is the agent that causes human Legionnaires' disease as well as the lesser form, Pontiac Fever. Transmission is facilitated by the inhalation of mist droplets containing the Legionella bacteria.

Common sources of Legionella include cooling towers used in industrial cooling water systems as well as in large central air conditioning systems, domestic hot water systems, fountains, and similar disseminators that draw from a public water supply. Natural sources include freshwater ponds and creeks.

Since Legionella is especially harmful to people with weakened immune systems, it should be actively checked for in the water systems of hospitals and nursing homes.

The HI 96725 measures 4 parameters that are crucial in monitoring for preventive maintenance or disinfection.

The microbial and chemical quality of the water used for filling pools and hot tubs will affect the efficacy of disinfection. Ideally, a detectable residual biocide level should be maintained at all times, to prevent colonization of the system by microorganisms living in biofilms. In unusual situations where there is a maintenance fault, the pH could drop to levels at which oxidizing biocides will be disassociated, leading to increased levels of chlorine, which can cause eye and skin irritation. At high pH levels, the chlorine will remain bound and be less effective.

Various additives may also be used to help maintain the water balance; for example, cyanuric acid helps to stabilize chlorine, particularly in outdoor pools, by preventing its breakdown by UV light and sunlight. Bicarbonates or carbonates may be added to act as a buffer against rapid changes in pH caused by high bather loads, pollutants and chemicals.

ORDERING INFORMATION

HI 96725 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96725C includes HI 96725 photometer, sample cuvettes (2) with caps, scissors, cuvette cleaning cloth, 9V battery, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96701-11	CAL CHECK™ standard cuvettes
HI 93701-01	Reagents for 100 tests
HI 93701-03	Reagents for 300 tests
HI 96710-11	CAL CHECK™ standard cuvettes
HI 93710-01	Reagents for 100 tests
HI 93710-03	Reagents for 300 tests
HI 96711-11	CAL CHECK™ standard cuvettes
HI 93711-01	Reagents for 100 tests
HI 93711-03	Reagents for 300 tests
HI 96722-11	CAL CHECK™ standard cuvettes
HI 93722-01	Reagents for 100 tests
HI 93722-03	Reagents for 300 tests

SPECIFICATIONS	HI 96725 Chlorine, Cyanuric Acid and pH			
	Cl, Free (P1)	Cl, Total (P2)	Cyanuric Acid (P3)	pH (P4)
Range	0.00 to 5.00 mg/L	0.00 to 5.00 mg/L (ppm)	0 to 80 mg/L (ppm)	6.5 to 8.5 pH
Resolution	0.01 mg/L (ppm)	0.01 mg/L (ppm)	1 mg/L (ppm)	0.1 pH
Accuracy @ 25°C (77°F)	±0.03 mg/L (ppm) ±3% of reading	±0.03 mg/L (ppm) ±3% of reading	±1 mg/L (ppm) ±15% of reading	±0.1 pH
Light Source	tungsten lamp			
Light Detector	silicon photocell with narrow band interference filter @ 525 nm			
Power Supply	9V battery			
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder			
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing			
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")			
Weight	360 g (12.7 oz.)			
Method	adaptation of the EPA recommended DPD method 330.5		adaptation of the Turbidimetric method	Phenol Red method

The reagents are in powder and liquid form and supplied in packets or bottles. The amount of reagent is precisely dosed to ensure the maximum repeatability.

For a complete list of Reagents, see Reagents *Section 18*.

Free and Total Chlorine, High Range Portable Photometer

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

HI 96734 permits free and total chlorine analysis to monitor overchlorination through chloramine destruction.

The HI 96734 photometer uses an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

The cuvette has a very important role because it is an optical element and thus requires particular attention. It is important that both the measurement and calibration (zeroing) cuvettes, are optically identical to provide the same measuring conditions.

Bleach/chlorine is the most cost effective disinfectant and is used extensively in dialysis clinics. Its use varies from light duty application in surface sanitation to heavy duty disinfection of medical devices or removal of microorganism infections in piping systems. The advantage of chlorine over peroxide type disinfectants is that chlorine not only is a strong oxidant, it also is capable of breaking tough chemical bounds found in cell walls or biofilms. Correct and effective use of bleach/chlorine requires understanding of the chemical nature of the disinfectant.

SPECIFICATIONS	HI 96734 Free and Total Chlorine, High Range	
	Chlorine, Free HR (P1)	Chlorine, Total HR (P2)
Range	0.00 to 10.00 mg/L	0.00 to 10.00 mg/L
Resolution	0.01 mg/L from 0.00 to 3.50 mg/L; 0.10 mg/L above mg/L	
Accuracy @ 25°C (77°F)	±0.03 mg/L ±3% of reading (excluding dilution error)	
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 525 nm	
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of the USEPA method 330.5 and Standard method 4500-CL G	

The reagents are in powder and liquid form and are supplied in packets and bottles. The amount of reagent is precisely dosed to ensure the maximum repeatability

ORDERING INFORMATION

HI 96734 is supplied with sample cuvettes (2) with caps, 9V battery and instructions.

CAL CHECK™ standards and testing reagents sold separately

HI 96734C includes HI 96734 photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 93734-01 Reagents for 100 Tests
HI 93734-03 Reagents for 300 Tests
HI 96734-11 CAL CHECK™ standard cuvettes

For a complete list of Reagents, see Reagents *Section 18*.

HI 96736

Total Hardness and pH Portable Photometer

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

HI 96736 is a multiparameter portable photometer that measures total hardness and pH.

The HI 96736 meter uses an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

The cuvette has a very important role because it is an optical element and thus requires particular attention. It is important that both the measurement and calibration (zeroing) cuvettes, are optically identical to provide the same measuring conditions.

SPECIFICATIONS	HI 96736 Total Hardness and pH	
	Total Hardness (P1)	pH (P2)
Range	0.00 to 4.70 mg/L (ppm)	6.5 to 8.5 pH
Resolution	0.01 mg/L (ppm)	0.1 pH
Accuracy @ 25°C (77°F)	±0.11 mg/L ±5% of reading	±0.1 pH
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 525 nm	
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th Edition, colorimetric method	phenol red method

ORDERING INFORMATION

HI 96736 is supplied with sample cuvettes with caps (2), 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96710-11 CAL CHECK™ standard cuvettes
HI 93710-01 Reagents for 100 tests
HI 93710-03 Reagents for 300 tests
HI 96719-11 CAL CHECK™ standard cuvettes
HI 93719-01 Reagents for 100 tests
HI 93719-03 Reagents for 300 tests

For a complete list of Reagents, see Reagents *Section 18*.

Total Hardness and Iron, Low Range Portable Photometer

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

In domestic water, **iron** can alter the taste and make it unpleasant to drink. It can also stain laundry, damage kitchenwares and favor the growth of certain bacteria. However, low levels of iron are critical in beverage production.

Hardness is a consequence of the type of rock layers which the water passes through and of its permanence in the water bearing stratum.

Hardness can cause pipe rusting in water heating and cooling systems, reverse osmosis systems and demineralization plants. It can also increase the consumption of soaps and detergents in industrial washing machines or laundries.

In domestic water, iron can alter the taste and make it unpleasant to drink. It can also stain laundry, damage kitchenwares and favor the growth of certain bacteria. However, low levels of iron are critical in beverage production.

Hardness is a consequence of the type of rock layers which the water passes through and of its permanence in the water bearing stratum.

Hardness can cause pipe rusting in water heating and cooling systems, reverse osmosis and demineralization plants. It can also increase the consumption of soaps and detergents in industrial washing machines or laundries.

HI 96741 can provide critical measurements of low range iron and total hardness (magnesium and calcium).

The iron concentration in water needs to be monitored since it can become harmful above certain levels.

Hardness, on the other hand, is indicative of the presence of calcium and magnesium in water. By passing through various layers of soil and rocks, rain water dissolves some of the mineral substances.

With the portable HI 96741 you can monitor both iron and hardness levels.

SPECIFICATIONS	HI 96741 Total Hardness and Iron, Low Range	
	Total Hardness (P1)	Iron, Low Range (P2)
Range	0.00 to 4.70 mg/L (ppm)	0 to 1.60 mg/L (ppm)
Resolution	0.01 mg/L (ppm)	0.01 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.11 mg/L ±5% of reading	±0.01 mg/L ±8% of reading
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 525 nm	
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th ed.	adaptation of TPTZ method

ORDERING INFORMATION

HI 96741 is supplied with sample cuvettes with caps (2), 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96719-11 CAL CHECK™ standard cuvettes
HI 93719-01 Reagents for 100 tests
HI 93719-03 Reagents for 300 tests
HI 96746-11 CAL CHECK™ standard cuvettes
HI 93746-01 Reagents for 50 tests
HI 93746-03 Reagents for 150 tests

For a complete list of Reagents, see Reagents *Section 18*.

HI 96742

Iron, Low Range and Manganese Low Range Portable Photometer

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

Neither iron nor manganese are considered dangerous, but high concentrations of these metals in water can create a bittersweet or astringent taste.

The presence of iron in supplied water is undesirable due to the staining effect on laundry and porcelain.

Manganese, in high concentrations, can produce corrosion and scaling in pipes, which is a serious industrial concern.

The solution for these applications is the HANNA HI 96742, a handheld photometer to measure low range iron and manganese.

SPECIFICATIONS	HI 96742 Iron, Low Range and Manganese	
	Iron, Low Range (P1)	**Manganese, Low Range (P2)**
Range	0 to 1.60 mg/L (ppm)	0 to 300 µg/L
Resolution	0.01 mg/L (ppm)	1 µg/L
Accuracy @ 25°C (77°F)	±0.01 mg/L ±8% of reading	±2 µg/L ±3% of reading
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 525 nm	
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder.	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of TPTZ method	adaptation of the 1-(2-pyridylazo)-2-naphthol PAN method

ORDERING INFORMATION

HI 96742 are supplied with sample cuvettes with caps (2), 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 93746-01 Reagents for 100 Tests
HI 93746-03 Reagents for 300 Tests
HI 93748-01 Reagents for 100 Tests
HI 93748-03 Reagents for 300 Tests
HI 96746-11 CAL CHECK™ standard cuvettes
HI 96748-11 CAL CHECK™ standard cuvettes

For a complete list of Reagents, see Reagents *Section 18*.

Iron LR and pH Portable Photometer

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

pH is normally measured using litmus paper or a pH meter with an electrode. Litmus paper provides poor results and also poses a serious problem to those who find it difficult to distinguish certain colors. Conventional pH meters, however, provide very accurate results but require electrode maintenance and do not measure iron, a prime cause of unpleasant taste in drinking water and kitchenware and laundry damage.

The best choice for pH and Iron measurement is the HI 96743. Measurements with the HI 96743 can be performed in a few short steps and are impervious to temperature variations, a common source of error with conventional pH meters.

The HI 96743 offers unparalleled accuracy at a cost-per-test that is comparable with chemical test kits and litmus paper.

SPECIFICATIONS	HI 96743 Iron, Low Range and pH	
	Iron, Low Range (P1)	**pH (P2)**
Range	0 to 1.60 mg/L (ppm)	6.5 to 8.5 pH
Resolution	0.01 mg/L (ppm)	0.1 pH
Accuracy @ 25°C (77°F)	±0.01 mg/L ±8% of reading	±0.1 pH
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 525 nm	
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of TPTZ method	phenol red method

ORDERING INFORMATION

HI 96743 is supplied with sample cuvettes with caps (2), 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96710-11	CAL CHECK™ standard cuvettes
HI 93710-01	Reagents for 100 tests
HI 93710-03	Reagents for 300 tests
HI 96746-11	CAL CHECK™ standard cuvettes
HI 93746-01	Reagents for 50 tests
HI 93746-03	Reagents for 150 tests

For a complete list of Reagents, see Reagents *Section 18*.

HI 96744

Total Hardness, Iron LR and pH Portable Photometer

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

Three important parameters measured with just one meter! The easy-to-use HI 96744 can replace several meters or test kits to practically perform the same tests with better accuracy.

At the touch of a button, users can zero the sample. This means that prior to each measurement and literally in a few seconds, the meter is calibrated, ensuring an accurate end result. The unit is powered by a common and inexpensive 9V battery that can provide up to 40 hours of battery life. A built-in automatic shut-off will turn the meter off after 10 minutes.

The meter housing is made of rugged ABS plastic and the keyboard is splash proof. The unit weighs less than 300 grams so that it can easily be carried to the remotest sites.

SPECIFICATIONS	HI 96744 Total Hardness, Iron LR and pH		
	pH (P1)	Total Hardness (P2)	Iron, Low Range (P3)
Range	6.5 to 8.5 pH	0.00 to 4.70 mg/L (ppm)	0 to 1.60 mg/L (ppm)
Resolution	0.1 pH	0.01 mg/L (ppm)	0.01 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.1 pH	±0.11 mg/L ±5% of reading	±0.01 mg/L ±8% of reading
Light Source	tungsten lamp		
Light Detector	silicon photocell with narrow band interference filter @ 525 nm		
Power Supply	9V battery		
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder		
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing		
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")		
Weight	360 g (12.7 oz.)		
Method	phenol red method	adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th Edition, colorimetric method	adaptation of TPTZ method

ORDERING INFORMATION

HI 96744 are supplied with sample cuvettes with caps (2), 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96710-11 CAL CHECK™ standard cuvettes
HI 93710-01 Reagents for 100 tests
HI 93710-03 Reagents for 300 tests
HI 96719-11 CAL CHECK™ standard cuvettes
HI 93719-01 Reagents for 100 tests
HI 93719-03 Reagents for 300 tests
HI 96746-11 CAL CHECK™ standard cuvettes
HI 93746-01 Reagents for 50 tests
HI 93746-03 Reagents for 150 tests

For a complete list of Reagents, see Reagents *Section 18*.

HANNA instruments

With Great Products, Come Great Results™

Chlorine, Total Hardness, Iron LR and pH Portable Photometer

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

Chlorine and pH are two of the most closely monitored parameters in water quality tests. Hardness is also an important parameter, attentively regulated to reduce waste or ensure proper functioning of equipment. Iron can cause an unpleasant taste or stain kitchenware or laundry.

The HI 96745 is a powerful instrument to keep all these parameters under control. The reagents are in liquid or powder form and are supplied in bottles or in packets.

The cuvette has a very important role because it is an optical element and thus requires particular attention. It is important that both the measurement and calibration (zeroing) cuvettes, are optically identical to provide the same measuring conditions.

SPECIFICATIONS	HI 96745 Chlorine, Total Hardness, Iron Low Range and pH			
	pH (P1)	Cl, Free (P2) Cl, Total (P3)	Total Hardness (P4)	Iron, Low Range (P5)
Range	6.5 to 8.5 pH	0.00 to 5.00 mg/L	0.00 to 4.70 mg/L	0 to 1.60 mg/L (ppm)
Resolution	0.1 pH	0.01 mg/L under 3.50 mg/L; 0.10 mg/L above 3.50 mg/L	0.01 mg/L	0.01 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.1 pH	±0.03 mg/L ±3% of reading	±0.11 mg/L ±5% of reading	±0.01 mg/L ±8% of reading
Light Source	tungsten lamp			
Light Detector	silicon photocell with narrow band interference filter @ 525 nm			
Power Supply	9V battery			
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder.			
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing			
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")			
Weight	360 g (12.7 oz.)			
Method	Phenol Red	Adaptation of the USEPA method and Standard Method 4500-Cl G	adaptation of the Standard Methods for the examination of Water and Wastewater, 18th ed., colorimetric method	adaptation of the TPTZ method

The amount of reagent is precisely dosed to ensure maximum repeatability.

ORDERING INFORMATION

HI 96745 is supplied with sample cuvettes (2) with caps, battery and instructions.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96701-11	CAL CHECK™ standard cuvettes
HI 93701-01	Reagents for 100 tests
HI 93701-03	Reagents for 300 tests
HI 96710-11	CAL CHECK™ standard cuvettes
HI 93710-01	Reagents for 100 tests
HI 93710-03	Reagents for 300 tests
HI 96711-11	CAL CHECK™ standard cuvettes
HI 93711-01	Reagents for 100 tests
HI 93711-03	Reagents for 300 tests
HI 93719-01	Reagents for 100 tests
HI 93719-03	Reagents for 300 tests
HI 96746-11	CAL CHECK™ standard cuvettes
HI 93746-01	Reagents for 50 tests
HI 93746-03	Reagents for 150 tests

For a complete list of Reagents, see Reagents *Section 18*.

HI 96752

Calcium and Magnesium Portable Photometer

- **CAL CHECK™**
- **User calibration**
- **Certified calibration and verification standards**
- **BEPS** (Battery Error Prevention System)
- **TIMER function**
- **Auto shut-off**
- **GLP Features**

The HI 96752 measures two important parameters in agricultural and hydroponic applications.

HI 96752 measures calcium concentrations from 0 to 400 mg/L and magnesium from 0 to 150 mg/L and the values are displayed directly on the large LCD to eliminate the need for conversion tables.

This handy and portable meter with a low cost-per-test is an ideal hi-tech alternative to chemical test kits.

Accurate and cost-saving, this two in one portable photometer is factory calibrated to measure only calcium and magnesium, to provide an instrument that is easy to use in the lab or on the field.

SPECIFICATIONS	HI 96752 Calcium and Magnesium	
	Calcium (P1)	Magnesium (P2)
Range	0 to 400 mg/L (ppm)	0 to 150 mg/L (ppm)
Resolution	1 mg/L (ppm)	1 mg/L (ppm)
Accuracy @ 25°C (77°F)	±10 mg/L ±5% of reading	±3 mg/L ±3% of reading
Light Source	light emitting diode	
Light Detector	silicon photocell with narrow band interference filter @ 466 nm	
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of Oxalate method	adaptation of the Calmagite method

ORDERING INFORMATION

HI 96752 is supplied with sample cuvettes with caps (2), 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 93752-01 Reagents for 100 Tests
HI 93752-03 Reagents for 300 Tests
HI 96752-11 CAL CHECK™ standard cuvettes
HI 96754-11 CAL CHECK™ standard cuvettes

For a complete list of Reagents, see Reagents *Section 18*.

HANNA instruments

With Great Products, Come Great Results™

Blood Plasma Analyzer

HI 95765 performs analysis of centrifuged animal blood plasma coming from abattoirs for quality evaluation.

Quality is valued with sample absorbance and checked by measuring its color, expressed in Quality Units.

When blood cells are damaged, hemoglobin is present in plasma and results in a high reading.

Therefore, the lower the reading in Quality Units (low color), the higher the blood plasma quality. This special instrument reads blood plasma quality from 0 to 10 units.

Designed to be practical, HI 95765 is equipped with a microprocessor system that checks the readings before displaying the correct value.

ADP
Application Designed Photometers

SPECIFICATIONS	HI 95765 BLOOD PLASMA
Range	0.0 to 10.0 units
Resolution	0.1 unit
Precision	±0.2 to 5.0 unit
Light Source	light emitting diode
Light Detector	silicon photocell with narrow band interference filter @ 555 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	180 x 83 x 46 mm (7.1x 3.3 x 1.8")
Weight	290 g (10 oz.)
Method	colorimetric

ORDERING INFORMATION

HI 95765 is supplied with a hard carrying case, protective cap, battery and instructions.

Standard Reagents

TEST	REAGENT KIT	NO. OF TESTS
Alkalinity	HI 93755-01 HI 93755-03	100 300
Aluminum	HI 93712-01 HI 93712-03	100 300
Ammonia HR	HI 93733-01 HI 93733-03	100 300
Ammonia MR	HI 93715-0 HI 93715-03	100 300
Ammonia LR	HI 93700-01 HI 93700-03	100 300
Bromine	HI 93716-01 HI 93716-03	100 300
Calcium	HI 937521-01 HI 937521-03	100 300
Calcium and Magnesium	HI 93752-01 HI 93752-03	100 300
Chloride	HI 93753-01 HI 93753-03	100 300
Chlorine Dioxide	HI 93738-01 HI 93738-03	100 300
Chlorine UHR	HI 95771-01 HI 95771-03	100 300
Chlorine, Free	HI 93701-01 HI 93701-03 HI 93701-F (liquid)	100 300 300
Chlorine, Free and Total HR	HI 93734-01 HI 93734-03	100 300
Chlorine, Free ULR	HI 95762-01 HI 95762-03	100 300
Chlorine, Total	HI 93711-01 HI 93711-03 HI 93701-T (liquid)	100 300 300
Chlorine, Total ULR	HI 95761-01 HI 95761-03	100 300
Chromium VI HR	HI 93723-01 HI 93723-03	100 300
Chromium VI LR	HI 93749-01 HI 93749-03	100 300
Copper HR	HI 93702-01 HI 93702-03 total HI 93702T-01 total HI 93702T-03	100 300 100 300
Copper LR	HI 95747-01 HI 95747-03	100 300
Cyanide	HI 93714-01 HI 93714-03	100 300
Cyanuric Acid	HI 93722-01 HI 93722-03	100 300
Detergents, Anionic	HI 95769-01	40
Fluoride HR	HI 93739-01 HI 93739-03	100 300
Fluoride LR	HI 93729-01 HI 93729-03	100 300
Glycine Powder	HI 93703-52-2	100
Hardness (Calcium)	HI 93720-01 HI 93720-03	100 300

TEST	REAGENT KIT	NO. OF TESTS
Hardness (Magnesium) and Total Hardness	HI 93719-01 HI 93719-03	100 300
Hardness, Total LR Hardness, Total MR Hardness, Total HR Hardness, Total LR+MR+HR	HI 93735-00 HI 93735-01 HI 93735-02 HI 93735-0	100 100 100 100
Hydrazine	HI 93704-01 HI 93704-03	100 300
Iodine	HI 93718-01 HI 93718-03	100 300
Iron HR	HI 93721-01 HI 93721-03	100 300
Iron LR	HI 93746-01 HI 93746-03	50 150
Manganese HR	HI 93709-01 HI 93709-03	100 300
Manganese LR	HI 93748-01 HI 93748-03	50 150
Magnesium	HI 937520-01 HI 937520-03	100 300
Molybdenum	HI 93730-01 HI 93730-03	100 300
Nickel HR	HI 93726-01 HI 93726-03	100 300
Nickel LR	HI 93740-01 HI 93740-03	50 150
Nitrate	HI 93728-01 HI 93728-03	100 300
Nitrite HR	HI 93708-01 HI 93708-03	100 300
Nitrite LR	HI 93707-01 HI 93707-03	100 300
Oxygen, Dissolved (D.O.)	HI 93732-01 HI 93732-03	100 300
Ozone	HI 93757-01 HI 93757-03	100 300
pH	HI 93710-01 HI 93710-03	100 300
Phosphate HR	HI 93717-01 HI 93717-03	100 300
Phosphate LR	HI 93713-01 HI 93713-03	100 300
Phosphorus	HI 93706-01 HI 93706-03	100 300
Potassium	HI 93750-01 HI 93750-03	100 300
Silica LR	HI 93705-01 HI 93705-03	100 300
Silica HR	HI 96770-01 HI 96701-03	100 300
Silver	HI 93737-01 HI 93737-03	50 150
Sulfate	HI 93751-01 HI 93751-03	100 300
Zinc	HI 93731-01 HI 93731-03	100 300

CAL CHECK™ Standard Reagents

Single Parameter

INSTRUMENT	CAL CHECK™ STANDARDS SET	PARAMETER
HI 96700	HI 96700-11	Ammonia
HI 96701	HI 96701-11	Free Chlorine
HI 96702	HI 96702-11	Copper
HI 96704	HI 96704-11	Hydrazine
HI 96705	HI 96705-11	Silica
HI 96706	HI 96706-11	Phosphorus
HI 96707	HI 96707-11	Nitrite
HI 96708	HI 96708-11	Nitrite
HI 96709	HI 96709-11	Manganese
HI 96712	HI 96712-11	Aluminum
HI 96713	HI 96713-11	Phosphate
HI 96714	HI 96714-11	Cyanide
HI 96715	HI 96715-11	Ammonia
HI 96716	HI 96716-11	Bromine
HI 96717	HI 96717-11	Phosphate
HI 96718	HI 96718-11	Iodine
HI 96719	HI 96719-11	Hardness, Magnesium
HI 96720	HI 96720-11	Hardness, Calcium
HI 96721	HI 96721-11	Iron
HI 96722	HI 96722-11	Cyanuric Acid
HI 96723	HI 96723-11	Chromium VI
HI 96724	HI 96724-11	Free/Total Chlorine
HI 96726	HI 96726-11	Nickel
HI 96727	HI 96727-11	Color of Water
HI 96728	HI 96728-11	Nitrate
HI 96729	HI 96729-11	Fluoride
HI 96730	HI 96730-11	Molybdenum
HI 96731	HI 96731-11	Zinc
HI 96732	HI 96732-11	Dissolved Oxygen
HI 96733	HI 96733-11	Ammonia
HI 96737	HI 96737-11	Silver
HI 96738	HI 96738-11	Chlorine Dioxide
HI 96739	HI 96739-11	Fluoride
HI 96740	HI 96740-11	Nickel
HI 96746	HI 96746-11	Iron
HI 96747	HI 96747-11	Copper
HI 98748	HI 96748-11	Manganese
HI 96749	HI 96749-11	Chromium VI
HI 96750	HI 96750-11	Potassium
HI 96751	HI 96751-11	Sulfate
HI 96753	HI 96753-11	Chloride
HI 96761	HI 96761-11	Total Chlorine
HI 96762	HI 96762-11	Trace Free Chlorine
HI 96769	HI 96769-11	Anionic Detergents
HI 96770	HI 96770-11	Silica
HI 96771	HI 96771-11	Ultra High Range Free Chlorine
HI 96786	HI 96786-11	Nitrate

Multiparameter

INSTRUMENT	CAL CHECK™ STANDARDS SET	PARAMETER
HI 96101	HI 96716-11 HI 96701-11 HI 96711-11 HI 96722-11 HI 96718-11 HI 96746-11 HI 96710-11	Bromine Free Chlorine Total Chlorine Cyanuric Acid Iodine Iron pH
HI 96104	HI 96710-11 HI 96701-11 HI 96711-11 HI 96722-11	pH Free Chlorine Total Chlorine Cyanuric Acid
HI 96710	HI 96701-11 HI 96711-11 HI 96710-11	Free Chlorine Total Chlorine pH
HI 96711	HI 96701-11 HI 96711-11	Free Chlorine Total Chlorine
HI 96725	HI 96701-11 HI 96711-11 HI 96722-11 HI 96710-11	Free Chlorine Total Chlorine Cyanuric Acid pH
HI 96734	HI 96734-11	Free Chlorine Total Chlorine
HI 96735	HI 96735-11	Hardness
HI 96736	HI 96719-11 HI 96710-11	Total Hardness pH
HI 96741	HI 96719-11 HI 96746-11	Total Hardness Iron
HI 96742	HI 96746-11 HI 96748-11	Iron Manganese
HI 96743	HI 96746-11 HI 96710-11	Iron pH
HI 96744	HI 96710-11 HI 96719-11 HI 96746-11	pH Ca Hardness Mg Hardness Iron
HI 96745	HI 96701-11 HI 96711-11 HI 96719-11 HI 96746-11 HI 96710-11	Free Chlorine Total Chlorine Mg, Hardness Iron pH
HI 96752	HI 96752-11 HI 96754-11	Calcium Magnesium

HI 83740

Photometer for the Determination of Copper in Wine

Why Monitoring Copper is Important

Instability, which is initially manifested as a white haze (white wines) and later as a reddish-brow precipitate, could result from storage of bottled wine containing levels of copper above 0.5 mg/L. The precipitated casse (see table 1) develops only in the strong reducing conditions found in bottled wine. Instability can damage the quality of wine irreparably. Excessive levels of copper are toxic and may be removed or reduced in wine by treatment of potassium ferrocyanide (blue fining, see table 2).

Significance of Use

Grapes normally accumulate only a small amount of copper by natural translocation from roots. Unless exposed to significant airborne pollution or vineyard sprays, increased concentrations in wine result from contamination during post fermentation processing, like contact with non stainless steel equipment and as impurities in fining agents and filter media.

The copper concentration in wine is normally low, less that 0.10 to 0.30 mg/L (ppm), because excess copper is precipitated during fermentation due to adsorption onto the yeast cells. This adsorption and precipitation can reduce the initial copper concentration with 40 to 89%. At higher concentration copper plays an important role in catalyzing oxidation reactions of wine phenols.

It is important to check the copper content both in must and in wine, because at levels about 9 mg/L (ppm) copper becomes a metabolic toxin that inhibits or delays alcoholic fermentation, and concentrations exceeding 1 mg/L (ppm) may be sensorially detected and should be avoided.

Other copper related problems can be manifested as formation of white haze (in white wines) and later as a reddish brown amorphous precipitate. This precipitated "casse" develops only under the strongly reducing conditions found in bottled wines. It has been found that this casse is a mixture of copper compounds and proteins.

HANNA's HI 83740 is an invaluable instrument to monitor this crucial parameter in the winemaking process.

TABLE 1: FACTORS FAVORING COPPER CASSE

CONDITIONS FOR COPPER CASSE FORMATION	PREVENTIVE MEASURES
Strong reducing conditions	maintain copper levels at less then 0.3 mg/L
Low ion concentrations	limit SO_2 addition
High protein levels	cold-stabilize and bentonite fine to reduce proteins in white wine
Light and heat	-

TABLE 2: COPPER ELIMINATION WITH POTASSIUM FERROCYANIDE TREATMENT

WINE BEFORE TREATMENT		WINE AFTER $Fe(CN)_6K_4$ TREATMENT (BLUE FINING)
IRON (mg/L)	COPPER (mg/L)	COPPER (mg/L)
20	5	0.2
10	5	0.5
5	5	1.0
2.5	5	1.5
1	5	2.0
Small traces	5	3.0

SPECIFICATIONS	HI 83740
Range	0.00 to 1.50 mg/L
Resolution	0.05 mg/L
Accuracy @ 25°C/77°F	±0.05 mg/L ±5% of reading
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 560 nm
Method	extraction method 2.2 bichinoline
Environment	0 to 50°C; RH max 95% non-condensing
Power Supply	1.5V AA batteries (4) / 12 VDC adapter
Auto Shut-off	after 15 minutes of non-use
Dimensions	225 x 85 x 80 mm (8.7 x 3.3 x 3.1")
Weight	500 g (17.6 oz.)

ORDERING INFORMATION

HI 83740-01 (115V) and **HI 83740-02** (230V) are supplied with sample cuvettes and caps (2), reagents for 5 tests (HI 83740A-0, HI 83740B-0, HI 83740C-0, HI 83740D-0), 20 mL glass vials with caps (2), 1 mL plastic pipette (2), 3 mL plastic pipette (2), spoons (2), cuvette cleaning cloth, 12 VDC adapter, batteries, instructions, instrument quality certificate and rugged carrying case.

REAGENT SETS

HI 83740-20 Copper reagent set for wine (20 tests)
HI 83742-25 Color Reagent Set for wine (Wine Solvent-1)

ACCESSORIES

HI 731312 Red wine decolorization kit (25 pcs)
HI 731318 Cuvette cleaning cloth (4)
HI 731321 Glass cuvettes (4)
HI 731325W Caps for cuvettes (4)
HI 93703-50 Cuvette cleaning solution (230 mL)
HI 740027P 1.5V AA batteries (12)

HI 83741

Photometer for the Determination of Iron in Wine

Iron Concentration and Casse

HANNA HI 83741 measures the iron concentrations of both white and red wines. HI 83741 makes it possible to quickly and easily determine the state of your wine, and to act on it in case it may be necessary.

Significance of Use

Trace iron concentrations in wine are beneficial for enzyme activity, as a stabilizer, and as a functional component for proteins.

At higher concentrations it alters the redox potential, in favoring oxidation, affecting sensory characteristics and participating in the formation of complexes with tannin and phosphates resulting in instabilities (casse). The most common iron case is "white casse" (iron phosphate), it is initially seen as milky white cloud and later as a precipitate. The "blue casse" (ferric tannate) that occurs less often can be observed in white wines, for example, after tannic acid additions.

Most of the iron present in wine is present in the ferrous Fe (II) state. The ratio of the Fe (II)/Fe (III) depends on the oxidation state of wine. If Fe (III) is formed, it can bind with phosphates that are normally present in wine.

Since iron strongly binds with several organic acids, some wine makers add citric acid to the wine to complex free iron if the concentration exceeds 5 mg/L. If no contamination, occurs the normal concentrations must be in range from 1 to 5 ppm. The most important source of iron in wine is contact with iron containing alloys during processing. During fermentation a part of the iron is absorbed by yeast and thus removed from the wine during filtration.

Iron Concentration & Casse

Wine containing less than 8 mg/L of iron: there is no risk of casse.

Wine containing more than 8 mg/L of iron: it is necessary to check the stability since there may be the possibility for casse to occur.

Wine containing 8 to 15 mg/L of iron: wine is subject to casse and needs treatment with SO_2, citric acid or ascorbic acid.

Wine containing over 15 mg/L of iron: wine is highly subject to casse and needs treatment with potassium ferricyanide.

HANNA's HI 83741 is an invaluable instrument for monitoring this crucial parameter in the process of wine making. With a few simple steps wine makers can quickly and accurately measure iron content in wine directly in mg/L.

SPECIFICATIONS	HI 83741
Range	0.0 to 15.0 mg/L
Resolution	0.1 mg/L
Accuracy @ 25°C/77°F	±0.2 mg/L ±5% of reading
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 560 nm
Method	the reaction between iron and the reagents causes a purple tint in the sample
Environment	0 to 50°C; RH max 95% non-condensing
Power supply	1.5V AA batteries (4) / 12 VDC adapter
Auto Shut-off	after 15 minutes of non-use
Dimensions	225 x 85 x 80 mm (8.7 x 3.3 x 3.1")
Weight	500 g (17.6 oz.)

ORDERING INFORMATION

HI 83741-01 (115V) and **HI 83741-02** (230V) is supplied with sample cuvettes and caps (2), reagents for 5 tests (HI 83741A-0, HI 83741B-0, HI 83742-0), scissors, 1000 µL automatic pipette with instruction sheet, plastic tips for 1000 µL automatic pipette (2), 1 mL plastic pipette, cuvette cleaning cloth, 12 VDC adapter, batteries, instructions, instrument quality certificate and rugged carrying case.

REAGENT SETS

HI 83741-20 Iron reagents set for wine (20 tests)

OTHER ACCESSORIES

HI 731312 Red wine decolorization kit (25 pcs)
HI 740027P 1.5V AA batteries (12)
HI 731318 Cuvette cleaning cloth (4)
HI 731321 Glass cuvettes (4)
HI 731325W Caps for cuvettes (4)
HI 93703-50 Cuvette cleaning solution (230 mL)
HI 731341 1000 µL automatic pipette
HI 731351 Plastic tips for 1000 µL automatic pipette (25)

CASSE FORMATION AND INHIBITION

WHITE CASSE FORMATION	WHITE CASSE INHIBITION
iron concentration >7	iron concentration <5
high redox potential (Fe3 + present)	clarification with bentonite
pH 2.9-3.6	citric acid addition 12-24 g/hL

HI 83742

Photometer for the Determination of Color and Total Phenols in Wine

Color Determination

Analytical techniques have become a valuable tool of modern wine makers. The definition and the processing techniques to obtain the desired wine color are of key importance. The right decisions taken during maturation of the grapes, processing, aging and blending, all strongly influence the final resulting wine color.

The color of wine is always read after removal of suspended matter. There are mainly two color components present, yellow and red but also a blue or green hue may appear. The color hue is the ratio between the yellow color concentrations over the red one, and is an indication about the degree of evolution.

ORDERING INFORMATION

HI 83742-01 (115V) and **HI 83742-02** (230V) are supplied with sample cuvettes and caps (2), reagents for 5 tests (HI 83742-0, HI 83742A-0, HI 83742B-0, HI 83742C-0), 200 µL automatic pipette with (2) tips and instruction sheet, 2000 µL automatic pipette with (2) tips, 5 mL syringe with tip, 1 mL plastic pipette, 3 mL plastic pipette, cuvette cleaning cloth, 12 VDC adapter, batteries (4), instructions and rugged carrying case.

REAGENT SETS

HI 83742-20	Phenols reagent set (20 tests)
HI 83742B-0	Total phenols in wine reagent B, 10 mL (20 tests)
HI 83742-25	HI 83742-0 Wine Solvent 1 color reagent set for wine (20 tests)
HI 83742-27	HI 83742-3 Wine Solvent 3 color reagent set for wine (20 tests)

ACCESSORIES

HI 731312	Red wine decolorization kit (25 pcs)
DEMI-10	Bottle to prepare 10 liters of demineralized water
HI 740027P	1.5V AA batteries (12 pcs)
HI 731318	Cloth for wiping cuvettes (4 pcs)
HI 731321	Glass cuvettes (4 pcs)
HI 731325W	Caps for cuvettes (4 pcs)
HI 93703-50	Cuvettes cleaning solution (230 mL)
HI 740226	5 mL graduated syringe
HI 731340	200 µL automatic pipette
HI 731350	Plastic tips for 200 µL automatic pipette (25 pcs)
HI 731342	2000 µL automatic pipette
HI 731352	Plastic tips for 2000 µL automatic pipette (25 pcs)
HI 740157P	Plastic refilling pipette (20 pcs)

SPECIFICATIONS		HI 83742	
		WHITE WINE	RED WINE
Range	Color Density (I.C.)	0.000 to 1.000	0.00 to 15.00
	Tint (O.D.420/O.D.525)	0.00 to 9.99	0.00 to 9.99
	Total Phenols (g/L)	0.000 to 0.750	0.00 to 5.00
Resolution	Color Density (I.C.)	0.001	0.01
	Tint (O.D.420/O.D.525)	0.01	0.01
	Total Phenols (g/L)	0.001	0.01
Accuracy @ 25°C/77°F	Color Density (I.C.)	±0.005 ±5% of reading	±0.03 ±4% of reading
	Tint (O.D.420/O.D.525)	±0.01 ±4% of reading	±0.01 ±4% of reading
	Total Phenols (g/L)	±0.015 ±5% of reading	±0.10 g/L ±5% of reading
Light Source		tungsten lamp	
Light Detector		silicon photocell with narrow band interference filter @ 420 nm, 520 nm and 610 nm	
Method		colorimetric	
Environment		0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Power Supply		1.5V AA batteries (4) /12 VDC adapter	
Auto Shut-off		after 15 minutes of non-use	
Dimensions		225 x 85 x 80 mm (8.7 x 3.3 x 3.1")	
Weight		500 g (17.6 oz.)	

Red and Yellow Color in Wine

The yellow color in wine comes from the presence of tannins (polymers of flavonoid-procyanidins type, and non-flavonoid phenols) and can be read without dilution. The increase of the yellow-brown color in older wines is due to aging or oxidation.

The red colors of wines are caused by free anthocyanins, copigments of anthocyanins, and polymerized phenolic compounds. The color of these pigments is pH dependent and can be intensely dark. It is therefore necessary to dilute the wine sample taking care not to change the original wine pH. HANNA recommends using it's special wine solvent to minimize possible errors due to dilution.

Phenol Determination

Phenolic compounds are important for several reasons since they (I) affect the color of the wine, (II) have an astringent taste, (III) may cause pungent odor, (IV) are a source of oxygen reduction, and (V) are sources of browning substances.

Wine can contain a large variety of phenolic compounds, and with traditional analytical techniques it is difficult to distinguish between total phenols and specific phenols. Although some progress has been made with HPLC, the most common analyses for total phenols remain the reaction of phenolic substances with the Folin-Ciocalteu reagent. Other methods like the direct spectrophotometric determinations are less accurate, because of differences in specific molar absorptivity, and color present of non phenolic substances.

Tint	State	Value (O.D420./O.D.525)
Purple-Red	young wine	less than 0.44
Red	mature wine	0.44 to 1
Red-Yellow	very mature wine	greater than 1

	Color Density (I.C.)	Total Phenols (g/L)
White Wines	0.05 to 0.15	0.4 to 1.2
Red Wines	4 to 6	2 to 5

Wine Making

The initial step in the making of wine is growing grapes. Specific varieties of grapes are used in making premium wines, but any grape with sugar content can be fermented. Successful wine grape farming is dependent upon proper soil and climatic conditions. These particular geographic regions (appellations) can be conducive to the quality of a particular variety or to wine grapes in general.

When wine grapes are harvested, they must be taken to a certified weigh station. Many wineries will have a weigh station at their facility. The winery is required to keep certain information about their grape supply (whether they grow their own grapes or buy them from others).

The process of making wine is a manufacturing process. The winery takes one product (grapes) and transforms it into another (wine). Wine production can take several years and many of the people or other costs involved in the process cross cost center boundaries. This combination of factors can make cost accounting difficult.

Wineries can make several different products. Bulk wine is made in large quantities, usually of lesser quality grapes and using lesser quality techniques. Bulk wine is sometimes used for related products such as brandy, wine coolers or vinegar, but usually is sold as jug or generic wine. Premium varieties are the high quality, high priced wines that use the highest quality grapes. Sparkling wines, commonly known as champagne, need another step in processing to give them the effervescence. Brandy is made by distilling wine and aging it an additional 3 years.

The first step in the wine making process is the delivery of the grapes from the fields.

The grapes go into a stemmer/crusher which both separates the individual grapes (berries) from the stems and leaves, and breaks open the skins to allow the juice to run free. This juice is then called the "free run." The grapes are then placed in a press and depending on the type of wine to be made, various degrees of pressure can be exerted on the grape skins/pulp to extract more juice. Generally, white wines are made from juice without the skins, while red wines are fermented with skins and seeds included.

The grape juice is then transferred to a container in which it will be fermented. White wine is often fermented in temperature controlled, stainless steel tanks. Some premium white varieties are fermented in the 55 gallon oak barrels in which they will be aged. Red wines are similarly fermented in stainless steel tanks as the normal practice, but are occasionally fermented in large open topped wood tanks.

Wines may remain in the tanks in which they were fermented for the balance of their aging prior to bottling. In this case, the tanks see duty as both fermentation and aging tanks. In other cases, the wines, after spending time in the fermentation tank, will be transferred to smaller oak barrels for further aging. In either case, the wine in the fermentation tank will be transferred prior to the next year's harvest, so that the fermentation tank will be available again.

HI 83746

Photometer for the Determination of Concentration of Reducing Sugars

A critical parameter in the winemaking process

The determination of concentration of reducing sugars (RS) is one of the most important parameters that need to be measured during the wine making process. Following the increase of RS during maturation of grapes can help decide when to start harvest. Having the highest possible sugar content is important because this is the main parameter that defines the commercial value of grapes. During the alcoholic fermentation instead, the decrease of sugars can be followed to decide when fermentation is completed, or allows the taking of corrective actions if the content of RS is too low to obtain the desired alcohol degree or sweetness.

The predominant RS in grape products are glucose and fructose (hexoses). After reaction with excess alkaline cupric tartrate (Fehling reagents), the RS content can be determined colorimetrically. The Fehling method is not an exact determination but an index of the reducing sugar concentration, because the reaction depends upon the amount and kind of RS present. When the reducing sugar content is known at the beginning of fermentation, the potential alcohol degree can be estimated multiplying the sugar concentration (in g/L) by 0.06. Phenols interfere in the Fehling reaction and therefore red wine must be colorized prior to analysis. Wine also contains non-fermentable reducing sugars like pentose which will also be analyzed by this method.

TYPICAL CONTENT OF REDUCING SUGARS IN MUST AND WINE		
Must		
Sweet must	20-25 %	200-250 g/L
Normal	10-20 %	100-200 g/L
In fermentation	4-12.5 %	40-125 g/L
Wine		
Sweet	2.5-12.5 %	25-125 g/L
Semi Sweet	0.8-2.5 %	8-25 g/L
Almost Dry	0.2-0.8 %	2-8 g/L
Dry	0-0.2 %	0-2 g/L

SPECIFICATIONS	HI 83746
Range	0.00 to 50.00 g/L
Resolution	0.25 g/L
Accuracy @ 25°C/77°F	± 0.50 g/L ±5% of reading
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 610 nm
Method	Fehling
Environment	0 to 50°C; RH max 95% non-condensing
Battery Type	1.5V AA batteries (4)/ 12 VDC adapter
Auto Shut-off	after 15 minutes of non-use
Dimensions	224 x 87 x 77 mm (8.7 x 3.3 x 3.1")
Weight	512 g (17.6 oz.)

ORDERING INFORMATION

HI 83746-01 (115V) and **HI 83746-02** (230V) is supplied with glass cuvettes and caps (4), reagents for about 20 tests (HI 83746A-0 and HI 83746B-0), HI 93703-59 Charcoal, 200 µL automatic Pipette with two plastic tips, 1000 µL automatic pipette with plastic tips (2), instruction sheet for automatic pipette, spoon, funnel, filter paper (25), cuvette cleaning cloth, 12 VDC adapter, batteries, instructions and rugged carrying case.

OPTIONAL REAGENTS

HI 83746-20 RS reagent set (20 tests)
HI 93703-59 Charcoal for decoloration of red wine (about 100 tests)

ACCESSORIES

HI 731318 Cuvette cleaning cloth (4)
HI 731321 Large 10 mL cuvette (4)
HI 731340 200 µL pipette
HI 731350 200 µL pipette tips (25)
HI 731341 1000 µL pipette
HI 731351 1000 µL pipette tips (25)
HI 740142P 1 mL graduated syringe
HI 740144P 2 mL graduated syringe tips (10)
HI 740216 Tube rack for glass vials
HI 740217 Safety shield
HI 740232 Filter paper type 1 (100)
HI 839800 Thermoreactor
HI 740027P 1.5V AA batteries (12)

HI 83748

Photometer for the Determination of Tartaric Acid in Wine

Tartaric Acid: Wine Acidity

Tartaric acid and tartrate play an important role in the stability of wines. They can be present in wine and juice in various forms, like tartaric acid (H_2T), potassium bi-tartrate (KHT) or calcium tartrate (CaT). The ratio of these depends mainly on the pH of the wine. The percent of tartrate present as bitartrate (HT^-) is maximum at pH 3.7.

The formation of crystalline deposits (tartrate casse) is a phenomenon of wine aging that does not meet customer acceptance. It is therefore important to test for, and to reduce the potential of bottle precipitation. For example, by adjusting the pH of the wine, winemakers can significantly influence the potential of casse formation.

Potassium concentrations in wine can range from 600 to 2500 mg/L (ppm) in certain red wines. Although the potassium bi-tartrate is soluble in water, alcohol and low temperatures decrease its solubility. Especially during the alcoholic fermentation potassium bi-tartrate becomes increasingly insoluble resulting in super-saturation and precipitation. The KHT stability can be restored by chilling (with or without seeding). Wines with initial pH values below 3.65 can show a reduction in pH during cold stabilization because of generation of one free proton for each KHT precipitated. The pH may drop as much as 0.2 pH unites. For wines at higher pH than 3.7, the pH shifts to a higher pH.

Calcium concentrations can range from 6 to 165 mg/L (ppm) and may complex with tartrate or oxalate to form crystalline precipitates. Calcium tartrate instabilities occur normally from 4 to 7 months after fermentation and are temperature independent.

Sulphates, proteins, gum and polyphenols can form stable complexes with tartrate thus inhibiting casse formation. The complexes are mainly between polyphenols and tartaric acid in red, and proteins in white wine. This explains why, as pigment polymerization occurs, the holding capacity of tartaric acid diminishes, resulting in delayed casse. The sulfate instead does not complex with potassium from 50% in white wines up to 100% in red ones.

Tartaric acid concentrations in wine range normally from 1.5 to 4.0 g/L. This acid concentration may not be confused with total or titratable acidity of wines that are often expressed in tartaric acid content too. Although it is the tartaric acid that is the predominantly present acid (up to 60% of the total acidity), others like malic, citric and several volatile acids do give a significant contribution total acidity.

SPECIFICATIONS	HI 83748
Range	0.0 to 5.0 g/L
Resolution	0.1 g/L
Accuracy @ 25°C/77°F	±0.1 g/L ±5% of reading
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 525 nm
Method	the reaction between tartaric acid and the reagents causes a yellow/orange red tint in the sample.
Environment	0 to 50°C; RH max 95% non-condensing
Battery Type	1.5V AA batteries (4) / 12 VDC adapter
Auto Shut-off	after 15 minutes of non-use
Dimensions	225 x 85 x 80 mm (8.7 x 3.3 x 3.1")
Weight	500 g (17.6 oz.)

ORDERING INFORMATION

HI 83748-01 (115V) and **HI 83748-02** (230V) are supplied with sample cuvettes and caps (2), reagents for 5 tests (HI 83748A-0, HI 83748B-0), 200 µL automatic pipette with Instruction Sheet, plastic tips for 200 µL automatic pipette (2), 5 mL syringe with tip, cuvette cleaning cloth, 12 VDC adapter, batteries, instructions, instrument quality certificate and rugged carrying case.

REAGENT SETS

HI 83748-20 Tartaric Acid reagents set for wine (20 tests)

OTHER ACCESSORIES

HI 740027P	1.5V AA batteries (12)
HI 731318	Cuvette cleaning cloth (4)
HI 731321	Glass cuvettes (4)
HI 731325W	Caps for cuvettes (4)
HI 93703-50	Cuvette cleaning solution (230 mL)
HI 740226	5 mL graduated syringe
HI 731340	200 µL automatic pipette
HI 731350	Plastic tips for 200 µL automatic pipette (25)

HI 83730

Photometer for the Determination of Peroxide Value in Olive Oils

The HI 83730 is an instrument that benefits from HANNA's years of experience as a manufacturer of analytical instruments. It has an advanced optical system based on a special tungsten lamp and a narrow band interference filter that allows the most accurate and repeatable readings. All instruments are factory calibrated.

The auto-diagnostic feature of this meter ensures optimal measurement conditions for highly precise readings. The light level is automatically adjusted each time a zero-measurement is made, and the lamp is temperature controlled to avoid overheating.

Significance and Use

Peroxides are the primary products of oil oxidation. Their identification gives useful information about oil conservation and rancidity. HI 83730 allows a fast and simple analysis of peroxides in oil in accordance with the EC 2568/91 method.

Oil Peroxides Content	
<10 meq O_2/kg	excellent conservation
10-15 meq O_2/kg	good conservation
<10 meqO_2/kg	refined oil
>20 meqO_2/kg	rancid oil

ORDERING INFORMATION

HI 83730-01 (115V) and **HI 83730-02** (230V) are supplied with reagents for 10 tests, 1 mL syringes (4), scissors, vial cleaning cloth, batteries, AC adapter, instructions and a rigid carrying case.

REAGENT SETS

HI 83730-20 Peroxide in olive oil reagents kit (21 tests)

ACCESSORIES

HI 93703-50 Cleaning solution, 230 mL
HI 740216 Test tube cooling rack
HI 740142P 1 mL graduated syringe, 10 pcs.
HI 731318 Cloth for wiping cuvettes, 4 pcs.
HI 710005 Voltage adapter from 115V to 12 VDC
HI 710006 Voltage adapter from 230V to 12 VDC

SPECIFICATIONS	HI 83730
Range	0.0 to 25.0 meq O_2/kg
Resolution	0.5 meq O_2/kg
Accuracy @ 25°C/77°F	±0.5 meq O_2/kg
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 466 nm
Method	adaptation of EC 2568/91 method and following amendments
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Power Supply	1.5V AA batteries (4) / 12 VDC adapter
Auto Shut-off	after 15 minutes of non-use
Dimensions	224 x 87 x 77 mm (8.8 x 3.4 x 3")
Weight	512 g (18 oz.)

CONTENTS

Chemical Oxygen Demand

Introduction

Wastewater needs to be monitored closely to prevent environmental pollution and human illness.

Oxygen Demand and COD

Chemical Oxygen Demand (COD) is a measure of the oxygen equivalent of the organic matter in the sample that is susceptible to oxidation by a strong oxidizing agent.

The HANNA COD method is based on the well established closed dichromate-reflux colorimetric method. The colorimetric measurement of COD is faster and easier to perform than the titrimetric analysis; additional reagents are not required. The sample is digested in a vial under closed reflux conditions. Potassium hydrogen phthalate is used as reference standard for COD analysis. The theoretical COD for 1 mg of potassium hydrogen phthalate is 1.175 mg.

Moreover, the US Environmental Protection Agency (EPA) specifies that the **dichromate reflux method is the only method acceptable for reporting purposes**. The advantage in using this method includes certifiable results as well as high accuracy.

COD Testing Applications

COD is used as a measurement of pollutants. It is normally measured in both municipal and industrial wastewater treatment plants and gives an indication of the efficiency of the treatment process. COD is measured on both influent and effluent water. The efficiency of the treatment process is normally expressed as COD removal, measured as a percentage of the organic matter purified during the cycle. COD has further applications in power plant operations, chemical manufacturing, commercial laundries, pulp and paper mills, agriculture and animal waste runoff, environmental studies and general education. HANNA equipment can be used in the laboratory or for on-site testing. The measurement procedure has been designed for ease of use by personnel at any skill level.

Monitoring examples:

Test #	COD INFLUENT	COD EFFLUENT	COD REMOVAL
1	1214	451	62%
2	948	328	63%
3	1341	307	77%

Beyond COD: Nitrogen and Phosphorus

The goal in wastewater treatment is not only COD reduction, but also to control nitrogen and phosphorus, which are responsible for eutrophication phenomena in natural environments. COD, nitrogen, and phosphorus control are performed not only to obey environmental protection laws, but also to optimize plant costs.

Effective monitoring and control of parameters such as ammonia, nitrate, total nitrogen and total reactive phosphorus allow plant managers to profile and improve the health of aquatic ecosystems. By accurately monitoring levels of each specific pollutant, operational parameters can be adjusted to maintain high efficiency of biodegradation treatments while also minimizing costs.

Nitrogen

When a treatment plant uses processes like nitrification and denitrification, it is important to monitor and maintain the equilibrium between ammonia nitrogen, nitrate and total nitrogen during the bio-treatment. The nitrogen level is important because it relates to the quantity of oxygen provided in the nitrification area. Ammonia is also controlled because it can become very toxic for the bacteria responsible for denitrification.

Nitrification

$NH_4^+ + 3/2\ O_2 \xrightarrow{\text{nitrosomonas}} NO_2^- + 2\ H^+ + H_2O$

$NO_2^- + 1/2\ O_2 \xrightarrow{\text{nitrobacteria}} NO_3^-$

$NH_4^+ + 2\ O_2 \xrightarrow{\text{nitrobacteria}} NO_3^- + 2\ H^+ + H_2O$

Denitrification

$2NO_3^- + \text{carbon} \xrightarrow{\text{denitrobacteria}} N_2 + 3CO_2$

Phosphorus

Phosphorus is measured during both biological and chemical dephosphorization. An excessive amount of phosphate discharged in superficial waters or in bio-treatment tanks causes an increase of algae and system eutrophication

HI 83224

COD Meter and Multiparameter Photometer

11.4

The HI 83224* is a multiparameter bench photometer that includes 15 methods for the measurement of ammonia, COD, chlorine, nitrate, nitrogen and phosphorus.

The HI 83224 features a powerful interactive user support system that assists you before, during and after analysis. On-screen tutorials guide users through set-up, calibration and measurement procedures while context sensitive help screens are available at a push of a button.

**NOT FOR SALE IN THE UNITED STATES & GERMANY*

HI 83099

COD Laboratory Photometer

11.6

HI 83099 is one of the most versatile photometers on the market. In addition to COD, this meter measures up to 47 of the most important water quality parameters. The HI 83099 operates in three different ranges to cover virtually every COD application.

HI 839800

COD Test Tube Heater with 25 Vial Capacity

11.10

The HI 839800 COD reactor is an easy to use test tube heater with intuitive operation and durable construction. The reactor's aluminum block features a 25-vial capacity and a well for a reference temperature probe.

HI 83224

COD Meter and Multiparameter Photometer with Bar Code Recognition of Sample Vials

Application Designed Photometers

- Measures ammonia, chlorine, COD, nitrate, nitrogen and phosphorus
- Three operation modes: automatic, semi-automatic and manual
- Bar coded pre-dosed reagent vials
- On screen step-by-step tutorial
- Logs up to 200 samples
- Context sensitive help screen at a touch of a button
- USB connection

The HI 83224* is a multiparameter bench photometer that features 15 methods for measurement of ammonia, COD, chlorine, nitrate, nitrogen and phosphorus.

Automatic recognition of bar coded samples is an exciting feature of the HI 83224. This advanced meter scans each vial inserted into the vial holder and automatically identifies the sample method and range. This feature eliminates errors and simplifies the testing process.

The HI 83224 also features a powerful interactive user support system that assists users before, during and after analysis. On-screen tutorials guide users through set-up, calibration and measurement procedures while context sensitive help screens are available at a push of a button.

HI 83224 uses a new series of pre-dosed reagent vials for the 15 methods. Each reagent vial is bar coded with specific reagent information at our factory (with the exception of chlorine). This information is automatically scanned by the HI 83224 to assure that the vial and method are the same.

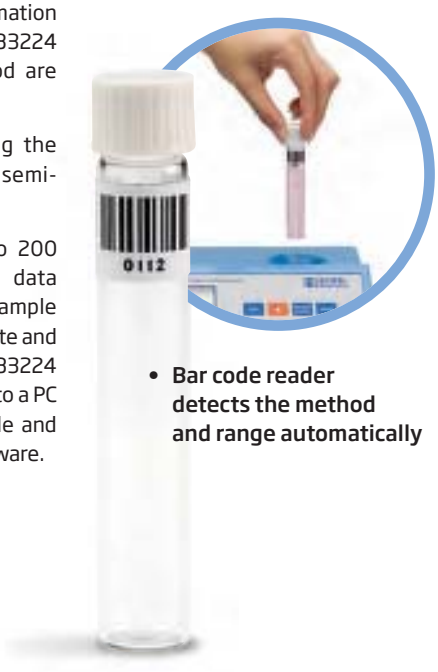
Users have the choice of operating the HI 83224 in automatic mode, semi-automatic mode and manual mode.

HI 83224 can log and recall up to 200 different measurements. Stored data includes parameter, test results, sample number, lot number, instrument id, date and time. For data management, the HI 83224 bench photometer can be connected to a PC via the optional HI 920013 USB cable and HI 92000 Windows® compatible software.

Avoid vial confusion and wrong samples with bar code identification

Sample vials inserted into the HI 83224 are identified using bar codes. The bar codes for different methods are shown in the table below. For parameters that don't use a bar coded reagents, the vials supplied with the instrument should be used. The bar code has 4 digits. The first 2 digits are for parameter identification and the second 2 digits are for reagent lot ID.

HI 83224 has a powerful interactive help system that assists the user during the analysis process. At a touch of a button, users can get detailed help tailored to the current information on the LCD. A tutorial mode is also available and can be accessed via the setup menu.



- Bar code reader detects the method and range automatically

PART CODE	METHOD	VIAL BAR CODE
HI 94764A-25	Ammonia, LR	01xx
HI 94764B-25	Ammonia HR	02xx
HI 93701-01	Chlorine, Free	N/A
HI 93711-01	Chlorine, Total	N/A
HI 94766-50	Nitrate	05xx
HI 94767A-50	Nitrogen, Total LR	16xx; 06xx
HI 94767B-50	Nitrogen, Total HR	17xx; 07xx
HI 94754A-25	Oxygen Demand, Chemical (COD) LR	12xx
HI 94754B-25	Oxygen Demand, Chemical (COD) MR	13xx
HI 94754C-25	Oxygen Demand, Chemical (COD) HR	24xx
HI 94758A-50	Phosphorus, Reactive	30xx
HI 94758B-50	Phosphorus, Acid Hydrolyzable	31xx
HI 94758C-50	Phosphorus, Total	32xx
HI 94763A-50	Phosphorus, Reactive HR	33xx
HI 94763B-50	Phosphorus, Total HR	34xx

Note: xx represents the reagent lot code.

*NOT FOR SALE IN THE UNITED STATES & GERMANY

SPECIFICATIONS	HI 83224
Light Source	tungsten lamps
Light Detector	silicon photocells with narrow-band interference filters
Data Logging	up to 200 samples
Power Supply	230 VAC or 115 VAC power adapter
Dimensions	235 x 212 x 143 mm (9.2 x 8.34 x 5.62")
Weight	2.3 kg (5.1 lb)

Some analytical methods require digestion of the sample. For digestion of the vials, use the HANNA HI 839800 reactor only.

For safety, the optional HI 740217 safety shield and HI 740216 test tube cooling rack for the HI 839800 are strongly recommended.

TEST	RANGE	RESOLUTION	ACCURACY	METHOD	REAGENT CODE
Ammonia LR	0.00 to 3.00 mg/L (as NH_3-N)	0.01 mg/L	±0.10 mg/L or ±5% of reading***	Nessler	HI 94764A-25 (25 tests)
Ammonia HR	0 to 100 mg/L (as NH_3-N)	1 mg/L	±1 mg/L or ±5% of reading***	Nessler	HI 94764B-25 (25 tests)
Chlorine, Free**	0.00 to 5.00 mg/L	0.01 mg/L from 0.00 to 0.99 mg/L; 0.1 mg/L above 0.99 mg/L	±0.03 mg/L or ±4% of reading	DPD	HI 93701-01 (100 tests) HI 93701-03 (300 tests)
Chlorine, Total**	0.00 to 5.00 mg/L	0.01 mg/L from 0.00 to 0.99 mg/L; 0.1 mg/L above 0.99 mg/L	±0.03 mg/L or ± 4% of reading	DPD	HI 93711-01 (100 tests) HI 93711-03 (300 tests)
Chemical Oxygen Demand LR	0 to 150 mg/L (as COD)	1 mg/L	±5 mg/L or ±5% of reading***	dichromate, mercuric sulfate, EPA*	HI 94754A-25 (25 tests)
Chemical Oxygen Demand MR	0 to 1500 mg/L (as COD)	1 mg/L	±15 mg/L or ±4% of reading***	dichromate, mercuric sulfate, EPA*	HI 94754B-25 (25 tests)
Chemical Oxygen Demand HR	0 to 15000 mg/L (as COD)	10 mg/L	±150 mg/L or ±3% of reading***	dichromate, mercuric sulfate, EPA*	HI 94754C-25 (25 tests)
Chemical Oxygen Demand LR	0 to 150 mg/L (ppm)	1 mg/L	±5 mg/L or ±5% of reading***	dichromate, mercury free◇	HI 94754D-25 (25 tests)
Chemical Oxygen Demand MR	0 to 1500 mg/L (ppm)	1 mg/L	±15 mg/L or ±4% of reading***	dichromate, mercury free◇	HI 94754E-25 (25 tests)
Chemical Oxygen Demand LR	0 to 150 mg/L (ppm)	1 mg/L	±5 mg/L or ±5% of reading***	dichromate, follows official method ISO 15705	HI 94754F-25 (25 tests)
Chemical Oxygen Demand MR	0 to 1000 mg/L (ppm)	1 mg/L	±15 mg/L or ±4% of reading***	dichromate, follows official method ISO 15705	HI 94754G-25 (25 tests)
Nitrate	0.0 to 30.0 mg/L (as NO_3-N)	0.1 mg/L	±1.0 mg/L or ±5% of reading***	chromotropic acid	HI 94766-50 (50 tests)
Nitrogen, Total LR	0.0 to 25.0 mg/L (as N)	0.1 mg/L	±1.0 mg/L or ±5% of reading***	chromotropic acid	HI 94767A-50 (50 tests)
Nitrogen, Total HR	10 to 150 mg/L (as N)	1 mg/L	±3 mg/L or ±4% of reading***	chromotropic acid	HI 94767B-50 (50 tests)
Phosphorus, Acid Hydrolyzable	0.00 to 1.60 mg/L (as P)	0.01 mg/L	±0.05 mg/L or ±5% of reading***	ascorbic acid	HI 94758B-50 (50 tests)
Phosphorus, Reactive	0.00 to 1.60 mg/L (as P)	0.01 mg/L	±0.05 mg/L or ±5% of reading***	ascorbic acid	HI 94758A-50 (50 tests)
Phosphorus, Reactive HR	0.0 to 32.6 mg/L (as P)	0.1 mg/L	±0.5 mg/L or ±5% of reading***	vanadomolybdophosphoric acid	HI 94763A-50 (50 tests)
Phosphorus, Total	0.00 to 1.15 mg/L (as P)	0.01 mg/L	±0.05 mg/L or ±6% of reading***	ascorbic acid	HI 94758C-50 (50 tests)
Phosphorus, Total HR	0.0 to 32.6 mg/L (as P)	0.1 mg/L	±0.5 mg/L or ±5% of reading***	vanadomolybdophosphoric acid	HI 94763B-50 (50 tests)

ORDERING INFORMATION

HI 83224-01 (115V) and **HI 83224-02** (230V) are supplied with sample vials (10), vial cleaning cloths (4), scissors and instruction manual.

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ACCESSORIES

HI 839800-01 HANNA reactor (115 VAC)
HI 839800-02 HANNA reactor (230 VAC)

HI 93703-50 Vial cleaning solution, 230 mL
HI 731318 Cloth for wiping vials (4)
HI 731340 200 µL automatic pipette
HI 731341 1000 µL automatic pipette
HI 731342 2000 µL automatic pipette
HI 731350 Tips for HI 731340 (25)
HI 731351 Tips for HI 731341 (25)
HI 731352 Tips for HI 731342 (4)
HI 740142P 1 mL graduated syringe (10 pcs)
HI 740143 1 mL graduated syringe (6 pcs)

HI 740144 Pipette tip (6 pcs)
HI 740157P Plastic refilling pipette (20 pcs)
HI 740216 Test tube cooling rack (25 holes)
HI 740217 Laboratory bench safety shield
HI 92000 Windows® compatible software
HI 920013 USB cable for PC connection

HI 731340 200 µL Automatic Pipette

Notes:
* Method with chromium-sulfuric acid is officially recognized by EPA for wastewater analysis.
◇ This method is recommended for general purpose analysis with no chloride interference.
** @ 25°C (77°F)
*** Whichever is greater

HI 83099

COD Meter and Multiparameter Photometer

Application Designed Photometers

- Easy COD measurement
- Outstanding measurement quality
- Save space in your laboratory
- PC compatible
- 47 methods

ORDERING INFORMATION

HI 83099-01 (115V) and **HI 83099-02** (230V) is supplied with glass cuvettes (3), cell protective cap, batteries, 12 VDC adapter and instructions.

SOLUTIONS

HI 93703-50	Cuvette cleaning solution, 230 mL

ACCESSORIES

HI 83099-100	Sample prep kit
HI 3898	Test kit for chloride concentration
HI 839800-01	HANNA reactor (115 VAC)
HI 839800-02	HANNA Reactor (230 VAC)
HI 151-00	Thermometer with stainless steel probe
HI 731318	Cuvette cleaning cloth (4)
HI 731321	Measurement cuvette (4)
HI 731325N	Cuvette cap (4)
HI 740216	Test tube cooling rack (25 tube capacity)
HI 740217	Laboratory bench safety shield
HI 92000	Windows® compatible application software
HI 920013	USB cable for PC connection

HI 83099 is one of the most versatile photometers on the market. In addition to COD, this meter measures up to 47 of the most important water quality parameters using liquid or powder reagents. The amount of reagent is precisely dosed to ensure maximum reproducibility.

HI 83099 bench photometer can be connected to a PC via a USB cable. The optional HI 92000 Windows® Compatible Software helps users manage their data.

HI 83099 features a powerful interactive user support that assists the user during each step of the analysis process. A tutorial mode is also available in the Setup Menu.

SPECIFICATIONS	HI 83099
Light Source	tungsten lamps with narrow-band interference filters
Light Detector	silicon photocell
Environment	0 to 50°C (32 to 122°F); RH max 90% non-condensing
Power Supply	external 12 VDC power adapter or built-in rechargeable battery
Auto-off	after 10 min. of non-use in measuring mode. after 1 hour of non-use in calibration mode with last reading reminder
Dimensions	235 x 200 x 110 mm (9.2 x 7.87 x 4.33")
Weight	0.9 Kg (2 lbs.)

HANNA instruments

With Great Products, Come Great Results™

COD TEST	RANGE	METHOD	REAGENT CODE
COD LR	0 to 150 mg/L (ppm)	dichromate EPA‡ dichromate mercury-free◇◇ dichromate ISO◇	HI 93754A-25 HI 93754D-25 HI 93754F-25
COD MR	0 to 1500 mg/L (ppm) 0 to 1000 mg/L (ppm)	dichromate EPA‡ dichromate mercury-free◇◇ dichromate ISO◇	HI 93754B-25 HI 93754E-25 HI 93754G-25
COD HR	0 to 15000 mg/L (ppm)	dichromate	HI 93754C-25

WATER QUALITY TEST	RANGE	METHOD	REAGENT CODE†
Alkalinity	0 to 500 mg/L (ppm) as $CaCO_3$	bromocresol green	HI 93755-01
Aluminum	0.00 to 1.00 mg/L (ppm)	aluminon	HI 93712-01
Ammonia MR	0.00 to 10.00 mg/L (ppm)	Nessler	HI 93715-01
Ammonia LR	0.00 to 3.00 mg/L (ppm)	Nessler	HI 93700-01
Bromine	0.00 to 8.00 mg/L (ppm)	DPD	HI 93716-01
Calcium	0 to 400 mg/L (ppm)	oxalate	HI 937521-01**
Chlorine Dioxide	0.00 to 2.00 mg/L (ppm)	chlorophenol Red	HI 93738-01
Chlorine*, Free	0.00 to 2.50 mg/L (ppm)	DPD	HI 93701-01
Chlorine*, Total	0.00 to 3.50 mg/L (ppm)	DPD	HI 93711-01
Chromium VI HR	0 to 1000 µg/L	diphenylcarbohydrazide	HI 93723-01
Chromium VI LR	0 to 300 µg/L	diphenylcarbohydrazide	HI 93749-01
Color of Water	0 to 500 PCU	colorimetric platinum cobalt	–
Copper HR	0.00 to 5.00 mg/L (ppm)	bicinchoninate	HI 93702-01
Copper LR	0 to 1000 µg/L	bicinchoninate	HI 95747-01
Cyanuric Acid	0 to 80 mg/L (ppm)	turbidimetric	HI 93722-01
Fluoride	0.00 to 2.00 mg/L (ppm)	SPADNS	HI 93729-01
Hardness, Calcium	0.00 to 2.70 mg/L (ppm)	calmagite	HI 93720-01
Hardness, Magnesium	0.00 to 2.00 mg/L (ppm)	EDTA	HI 93719-01
Hydrazine	0 to 400 µg/L	p-dimethylaminobenzaldehyde	HI 93704-01
Iodine	0.0 to 12.5 mg/L (ppm)	DPD	HI 93718-01
Iron HR	0.00 to 5.00 mg/L (ppm)	phenantroline	HI 93721-01
Iron LR	0 to 400 µg/L	TPTZ	HI 93746-01**
Magnesium	0 to 150 mg/L (ppm)	calmagite	HI 937520-01**
Manganese HR	0.0 to 20.0 mg/L (ppm)	periodate	HI 93709-01
Manganese LR	0 to 300 µg/L	PAN	HI 93748-01**
Molybdenum	0.0 to 40.0 mg/L (ppm)	mercaptoacetic acid	HI 93730-01
Nickel HR	0.00 to 7.00 g/L	photometric	HI 93726-01
Nickel LR	0.000 mg/L to 1.000 mg/L (ppm)	PAN	HI 93740-01**
Nitrate	0.0 to 30.0 mg/L (ppm)	cadmium reduction	HI 93728-01
Nitrite HR	0 to 150 mg/L (ppm)	ferrous sulfate	HI 93708-01
Nitrite LR	0.00 to 0.35 mg/L (ppm)	diazotization	HI 93707-01
Oxygen, Dissolved (DO)	0.0 to 10.0 mg/L (ppm)	Winkler	HI 93732-01
Ozone	0.00 to 2.00 mg/L (ppm)	DPD	HI 93757-01
pH	6.5 to 8.5 pH	phenol red	HI 93710-01
Phosphate HR	0.0 to 30.0 mg/L (ppm)	amino acid	HI 93717-01
Phosphate LR	0.00 to 2.50 mg/L (ppm)	ascorbic acid	HI 93713-01
Phosphorus	0.0 to 15.0 mg/L (ppm)	amino acid	HI 93706-01
Potassium HR	20 to 200 mg/L (ppm)	turbidimetric tetraphenylborate	HI 93750-01
Potassium MR	10 to 100 mg/L (ppm)	turbidimetric tetraphenylborate	HI 93750-01
Potassium LR	0.0 to 20.0 mg/L (ppm)	turbidimetric tetraphenylborate	HI 93750-01
Silica	0.00 to 2.00 mg/L (ppm)	heteropoly blue	HI 93705-01
Silver	0.000 to 1.000 mg/L (ppm)	PAN	HI 93737-01**
Sulfate	0 to 150 mg/L (ppm)	turbidimetric	HI 93751-01
Zinc	0.00 to 3.00 mg/L (ppm)	zincon	HI 93731-01

HI 3898

Chloride Test Kit

Quick Chloride Tests

The HI 3898 is a chloride concentration test kit developed according to the ISO 15705:2002 method.

This very important test is recommended by ISO, since an excessive presence of chloride can interfere with the COD analysis.

This test gives a fast YES/NO reply to the question if chloride will interfere with the COD analysis. If chloride concentration is greater than the official maximum level, the solution turns yellow and the sample needs to be diluted before performing the COD test, otherwise if the solution is orange-brown, the sample doesn't need to be diluted.

The maximum level allowed is 1000 ppm of Cl^- following ISO methods, or 2000 ppm of Cl^- for US EPA, APHA, AWWA and WEF methods.

SPECIFICATIONS	HI 3898
Range	1000 ppm Cl^- (ISO) 2000 ppm Cl^- (EPA)
Analysis Method	visual evaluation
Sample Volume	2 mL
Number of Tests	100
Dimensions	120 x 110 x 90 mm (4.7 x 4.3 x 3.5")
Weight	200 g (7.0 oz.)

ORDERING INFORMATION

HI 3898 is supplied with 25 mL chloride titrant (4), chloride Indicator 7 mL (1), glass cuvette with plastic stopper (1) and calibrated syringes of 1.0 mL with tip (2).

SOLUTIONS

HI 93703-50 Cuvette cleaning solution, 230 mL

Notes:
‡ Method with chromium-sulfuric acid is officially recognized by EPA for wastewater analysis.
◇ The HI 93754F-25 and HI 93754G-25 method follows the official method ISO 15705.
◇◇ This method is recommended for general purpose analysis with no chloride interference.
† Unless noted otherwise, all reagent codes ending with -01 are for 100 tests. Replace the -01 with -03 for 300 tests.
* For Chlorine, liquid reagents are available.
** Reagents for 50 tests, replace -01 for -03 for 150 tests

HI 83214

COD Meter and Multiparameter Photometer for Wastewater Analysis

Application Designed Photometers

- **Easy COD measurement**

  HI 83214 multiparameter photometer is pre-calibrated to measure COD levels at three ranges at the touch of a key pad.
- **Outstanding measurement quality**

  An advanced optical system assures high accuracy measurements throughout the entire range.
- **Save space in your laboratory.**

  The compact size of the HI 83214 allows users to eliminate the clutter of bulky and costly spectrophotometers.

The HI 83214 multiparameter photometer is a compact instrument featuring different ranges and methods, suitable for a wide range of applications.

HI 83214 is designed and built to perform COD analysis in accordance with EPA 410.4 and ISO 15705:2002 standards. Ensuring accurate and repeatable results, it is the ideal tool for documenting waste treatment processes.

Besides the fundamental parameter of COD, H 83214 also measures total ammonia, free and total chlorine, nitrate, nitrogen and total reactive phosphorus.

HI 83214 allows for a complete wastewater analysis in a single, powerful instrument.

SPECIFICATIONS	HI 83214
Light Source	tungsten lamps with narrow-band interference filters
Light Detector	silicon photocell
Environment	0 to 50°C (32 to 122°F); RH max 90% non-condensing
Power Supply	external 12 VDC power adapter or built-in rechargeable battery
Auto-off	after 10 min. of non-use in measuring mode. after 1 hour of non-use in calibration mode with last reading reminder
Dimensions	235 x 200 x 110 mm (9.2 x 7.87 x 4.33")
Weight	0.9 Kg (2 lbs.)

ORDERING INFORMATION

HI 83214-01 (115V) and **HI 83214-02** (230V) is supplied with glass cuvettes (5), batteries, 12 VDC adapter and instructions

SOLUTIONS

HI 93703-50 Cuvette cleaning solution, 230 mL

ACCESSORIES

HI 3898 Chloride concentration test kit
HI 839800-01 HANNA reactor (115 VAC)
HI 839800-02 HANNA reactor (230 VAC)
HI 151-00 Thermometer with stainless steel probe
HI 731311 Cuvettes with caps for HI 83214 (15)
HI 731318 Cuvette cleaning cloth (4)
HI 731340 200 µL automatic pipette
HI 731341 1000 µL automatic pipette
HI 731342 2000 µL automatic pipette
HI 731350 Tips for 200 µL automatic pipette (25)
HI 731351 Tip for 1000 µL automatic pipette (25)
HI 731352 Tip for 2000 µL automatic pipette (4)
HI 740216 Test tube cooling rack (25 capacity)
HI 740217 Laboratory bench safety shield
HI 740219 COD test tube adapter for HI 83099
HI 92000 Windows® compatible application software
HI 920013 USB cable for PC connection

PARAMETER	RANGE	METHOD	REAGENT CODE
Ammonia, LR	0.00 to 3.00 mg/L	Nessler	HI 93764A-25
Ammonia, HR	0 to 100 mg/L	Nessler	HI 93764B-25
Chlorine, Free	0.00 to 5.00 mg/L	DPD	HI 93701-01, HI 93701-03
Chlorine, Total	0.00 to 5.00 mg/L	DPD	HI 93711-01, HI 93711-03
Nitrate	0.0 to 30.0 mg/L	Chromotropic acid	HI 93766-50
Nitrogen, Total	0.0 to 25.0 mg/L	Chromotropic acid	HI 93767A-50
Nitrogen, Total HR	10 to 150 mg/L	Chromotropic acid	HI 93767B-50
COD LR, EPA*	0 to 150 mg/L	Dichromate	HI 93754A-25
COD MR, EPA*	0 to 1500 mg/L	Dichromate	HI 93754B-25
COD HR	0 to 15000 mg/L	Dichromate	HI 93754C-25
COD LR, Mercury-free†	0 to 150 mg/L	Dichromate, mercury-free	HI 93754D-25
COD MR, Mercury-free†	0 to 1500 mg/L	Dichromate, mercury-free	HI 93754E-25
COD LR, ISO**	0 to 150 mg/L	Dichromate	HI 93754F-25
COD MR, ISO**	0 to 1000 mg/L	Dichromate	HI 93754G-25
Phosphorus, Reactive	0.00 to 5.00 mg/L	Ascorbic acid	HI 93758A-50
Phosphorus, Acid Hydrolyzable	0.00 to 5.00 mg/L	Ascorbic acid	HI 93758B-50
Phosphorus, Total	0.00 to 3.50 mg/L	Ascorbic acid	HI 93758C-50
Phosphorus, Reactive HR	0.0 to 100.0 mg/L	Vanadomolybdophosphoric acid	HI 93763A-50
Phosphorus, Total HR	0.0 to 100.0 mg/L	Vanadomolybdophosphoric acid	HI 93763B-50

Notes:
* Method with chromium-sulfuric acid is officially recognized by EPA for wastewater analysis.
** The HI 93754F-25 and HI 93754G-25 method follows the official method ISO 15705.
† This method is recommended for general purpose analysis with no chloride interference

HANNA instruments

With Great Products, Come Great Results™

Certified COD Reagents

HANNA COD reagents are available in the following formats:

CODE	DESCRIPTION	METHOD	RANGE
HI 93754A-25	low range	EPA*	0 to 150 mg/L (ppm)
HI 93754B-25	medium range	EPA*	0 to 1500 mg/L (ppm)
HI 93754C-25	high range	EPA*	0 to 15000 mg/L (ppm)
HI 93754D-25	low range	Mercury-free***	0 to 150 mg/L (ppm)
HI 93754E-25	medium range	Mercury-free***	0 to 1500 mg/L (ppm)
HI 93754F-25	low range	ISO 15705**	0 to 150 mg/L (ppm)
HI 93754G-25	medium range	ISO 15705**	0 to 1000 mg/L (ppm)
HI 93754H-25	low range	–	0 to 150 mg/L (ppm)

Each box of 25 vials is supplied with a HANNA certificate of quality.

The reagents are traceable to NIST SRM® 930.

HANNA also produces mercury-free reagents to be used for analyzing samples without chloride.

- **Three measurement ranges to satisfy each need**

  As COD levels vary depending on the application and process measuring points, HANNA offers reagents to cover three separate ranges. Simply choose the best range for the application:

  low range: 0 to 150 mg/L O_2
  medium range: 0 to 1500 mg/L or 0 to 1000 mg/L O_2
  high range: 0 to 15000 mg/L O_2

- **Accurate and repeatable measurements**

  HANNA COD reagents have been developed in accordance with Standard Methods 5220D, USEPA 410.4 and ISO 15705:2002 methods.

- **Pre-dosed vials**

  HANNA vials contain approx. 3 mL of pre-dosed reagent. The operator just needs to add a small quantity of the sample - 2 mL for LR and MR, and 0.2 mL for HR analysis.

- **Quick and accurate measurements**

  With pre-dosed vials, test preparation time is dramatically reduced. There is no time-consuming reagent preparation procedure or glassware cleaning.

- **Safe reagents**

  HANNA COD reagents are safe for operators and the environment. Vials and caps have been designed to avoid accidental reagent spills. Due to the pre-dosed reagents, the amount of chemicals is minimized.

HI 740216 Test Tube Cooling Rack

Notes:
* Method with chromium-sulfuric acid is officially recognized by EPA for wastewater analysis.
** The HI 93754F-25 and HI 93754G-25 method follows the official method ISO 15705.
*** This method is recommended for general purpose analysis with no chloride interference.

HI 839800

COD Test Tube Heater with 25 Vial Capacity

- **Low temperature alert**
  Appears when the block is warming up. It alerts the user that the temperature is below the set value.
- **High temperature alert**
  Appears when the block is warming up. It alerts the user that the temperature is above the set value.
- **Countdown timer**
  Shows time remaining until the heating element shuts off.

The HI 839800 COD reactor is constructed of durable materials. The aluminum block incorporates a 25-vial capacity and a well for a reference temperature probe.

The HI 839800 COD reactor is an easy to use test tube heater. Its well-marked user interface provides intuitive operation. The reactor is equipped with two predefined temperature settings: 150° and 105°C. COD and total phosphorus digestions are conducted at 150°C, and total nitrogen digestions are at the 105°C.

In addition, the HI 839800 has 3 LED's for visual indication. A green LED indicates power, a blinking red LED warns the user of a hot heater block (above 50°C), and a yellow LED indicates heating.

A three hour countdown timer is also incorporated to control timed digestions. When the countdown timer expires, a beep will sound and the heating element will turn off.

The reactor contains a thermal fuse that prevents overheating by turning off the heating element.

Block tempertaure is continuously displayed on the LCD even when there is no active temperature program running.

Outer casing stays cool to the touch!

HI 740217
Lab Safety Shield

HI 740216
Test Tube Cooling Rack

SPECIFICATIONS	HI 839800
Temperature of Reaction	105°C or 150°C (221°F or 302°F)
Temperature Stability	±0.5°C (±0.9°F)
Temperature Range	-10°C to 160°C (14°F to 320°F)
Accuracy	±2°C (±3.6°F)
Capacity	25 vials (dia 16 x 100 mm), one receptacle for a stainless steel reference thermometer
Warm-up Time	10-15 minutes, depending on selected temperature
Operating Mode	timed (0 to 180 minutes) or infinity mode
Block	aluminum
Environment	5 to 50°C (41 to 122°F)
Power Supply (fuse protected)	HI 839800-01: 115 VAC; 60 Hz; 250 W HI 839800-02: 230 VAC; 50 Hz; 250 W
Dimensions	190 x 300 x 95 mm (7.5 x 11.8 x 3.7")
Weight	approximately 4.8 kg (10.6 lb.)

ORDERING INFORMATION

HI 839800-01 (115V) and **HI 839800-02** (230V) is supplied with power cable and instructions.

ACCESSORIES

HI 740216	Test tube cooling rack (25 tube capacity)
HI 740217	Laboratory bench safety shield
HI 151-00	Electronic thermometer for reactor (°C)
HI 151-01	Electronic thermometer for reactor (°F)

CONTENTS

Turbidity

Introduction

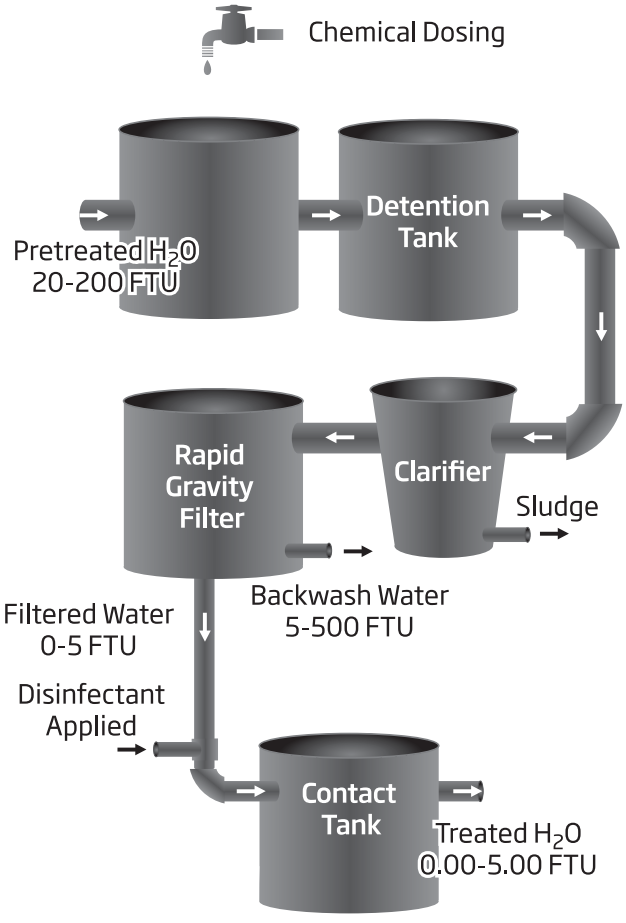
Introduction to Turbidity

Turbidity of water is an optical property that causes light to be scattered and absorbed, rather than transmitted. The scattering of the light that passes through a liquid is primarily caused by the suspended solids. The higher the turbidity, the greater the amount of scattered light. Because even the molecules in a very pure fluid scatter light to a certain degree, no solution will have zero turbidity.

The unit of measure adopted by the ISO Standard is the FNU (Formazine Nephelometric Unit) and by EPA is NTU (Nephelometric Turbidity Unit). The other two methods used to test for turbidity and their measurement units are the JTU (Jackson Turbidity Unit) and the Silica unit (mg/L SiO_2). See the conversion table below for reference.

	JTU	FTU (NTU/FNU)	SiO_2 (mg/L)
JTU	1	19	2.5
FTU (NTU/FNU)	0.053	1	0.13
SiO_2 (mg/L)	0.4	7.5	1

Treatment Process of Drinking Water



Purification of Drinking Water

Turbidity is one of the most important parameters used to determine the quality of drinking water. Public water suppliers are required to treat their water to remove turbidity. In the United States, for systems that use conventional or direct filtration methods, turbidity cannot be higher than 1.0 nephelometric turbidity units (NTU) at the plant outlet and all samples for turbidity must be less than or equal to 0.3 NTU for at least 95 percent of the samples in any month. Adequately treated surface water does not usually present a turbidity problem. The World Health Organization indicates 5 FTU as the reference turbidity value of water for trade. This value has been established based on the aesthetic characteristics of water. From a hygienic point of view, 1 FTU is the recommended value. Many drinking water utilities strive to achieve levels as low as 0.1 NTU.

Turbidity is an indicator and will not give results for a specific pollutant. It will, however, provide information on the degree of overall contamination. The flow chart for the water treatment process of drinking water shows the turbidity reference values for each phase.

Monitoring for Natural Water Supplies

In natural water, turbidity measurements are taken to gauge general water quality and its compatibility in applications where there are aquatic organisms. It has been found that there is a strong correlation between the turbidity level and the BOD value. Moreover, by definition, turbidity obstructs light, thus reducing the growth of marine plants, eggs and larvae, which are usually found in the lower levels of an aquatic ecosystem.

Wastewater Treatment and Turbidity

Historically, turbidity is one of the main parameters monitored in wastewater. In fact, the monitoring and treatment process was once solely based on the control of turbidity. Currently, the measurement of turbidity at the end of the wastewater treatment process is necessary to verify that the values are within regulatory standards. Generally speaking, the turbidity value has to be between 0 and 50 FTU, with an accuracy of ±3 FTU, depending on the phase of the wastewater treatment process. By monitoring the turbidity level, it can be determined if the different stages of the process, particularly in the filtration and purification stages, have been completed correctly.

Turbidity

Introduction

The HANNA Solution

There are three analytical test methods for turbidity: ISO 7027 "Water Quality: Determination of Turbidity", US EPA Method No. 180.1, "Turbidity", and "Standard Methods" No. 2130B

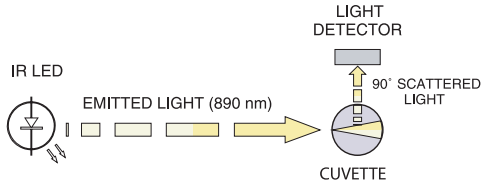
The USEPA and Standard Methods recommend a particular wavelength in the visible range of the spectrum and the European system requiring an infrared light source (ISO 7027). In order to satisfy these different requirements, HANNA has developed products that meet both standards.

The Infrared Method (ISO 7027)

HI 88713 and HI 98713 operate by passing a beam of infrared light through a vial containing the sample to be tested. The light source is a High Emission Infrared LED. A sensor, positioned at 90° with respect to the direction of the light, detects the amount of light scattered by the undissolved particles present in the sample. A microprocessor converts these readings into FTU (FNU) values.

The USEPA (Environmental Protection Agency) Approved Method

Instruments featuring EPA approved methods are designed to meet or exceed the criteria specified by the USEPA Method 180.1 and Standard Method 2130 B.



Turbidity Bench Meters Principal of Operation

The USEPA Method 180.1 specify the key parameters for the optical system to measure turbidity for drinking, saline and surface water, in a 0 to 40 NTU range, using the nephelometric method.

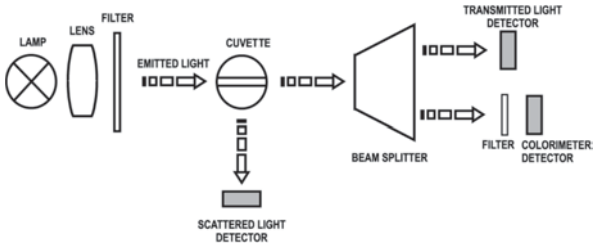
HI 83414 and HI 88703 are designed to meet or exceed the criteria specified by the USEPA Method 180.1 and Standard Method 2130 B. The light beam that passes through the sample is scattered in all directions. The intensity and pattern of the scattered light is affected by many variables, such as wavelength of the incident light, particle size and shape, refractive index and color. The optical system includes a tungsten filament lamp, a scattered light detector (90°) and a transmitted light detector (180°).

In the ratio turbidimeter range, the microprocessor of the instrument calculates the NTU value from the signals that reach the two detectors by using an effective algorithm. This algorithm corrects and compensates for interferences of color, making the HI 83414 and HI 88703 color-compensated. The optical system and measuring technique also compensate for the lamp intensity fluctuations–minimizing the need of frequent calibration.

In the non-ratio turbidimeter range, the NTU value is calculated from the signal on the scattered light detector (90°). This method offers a high linearity on the low range but is more sensitive to lamp intensity fluctuations.

The lower detection limit of a turbidimeter is determined by stray light. Stray light is the light detected by the sensors that is not caused by light scattering from suspended particles. The optical system of HI 83414 and HI 88703 is designed to have very low stray light, providing accurate results for low turbidity samples.

Portable Turbidity Meters



Principal of Operation

The USEPA Method 180.1 specifies the key parameters for the optical system to measure turbidity for drinking, saline and surface water in a 0 to 40 NTU range, using the nephelometric method. The HI 93414 and HI 98703 Portable Turbidimeter are designed to meet or exceed the criteria specified by the USEPA Method 180.1 and Standard Method 2130 B.

The ISO 7027 standard specifies the key parameters for the optical system to measure turbidity for drinking and surface water, using the formazin based metric method. The HI 98713 portable turbidimeter is designed to meet or exceed the criteria specified by the ISO 7027 standard.

The light beam that passes through the sample is scattered in all directions. The intensity and pattern of the scattered light is affected by many variables like wavelength of the incident light, particle size, shape, refractive index and color.

HI 93414 and HI 98703's optical system includes a tungsten filament lamp, a scattered light detector (90°) and a transmitted light detector (180°). For the colorimeter range the optical system is based on the turbidimeter tungsten lamp and a separate detector with a narrow band interference filter @ 525 nm to guarantee both high performance and reliable results for colorimetric measurements.

HI 98713's optical system includes an infrared LED, a scattered light detector (90°) and a transmitted light detector (180°). By using an effective algorithm, the instrument's microprocessor calculates the FTU value from the signals that reach the two detectors. This algorithm corrects and compensates for interferences of color, making the HI 98713 turbidimeter color-compensated.

The optical system and measuring technique allow the compensation of lamp intensity (HI 98703, HI 93414) or LED intensity (HI 98713) fluctuations, minimizing the need of frequent calibration.

The lower detection limit of a turbidimeter is determined by the so called "stray light". Stray light is the light detected by the sensors that is not caused by light scattering from suspended particles. The optical system of HI 98713 turbidimeter is designed to have very low stray light, providing accurate results for low turbidity samples when special care is taken.

Product Spotlights

HI 83414

Turbidity and Free/Total Chlorine Benchtop Meter,EPA Compliant

12.6

HI 83414 is a highly accurate dual parameter instrument that reflects HANNA's years of experience. The HI 83414 successfully combines turbidity and colorimetric measurements to test the most important parameters of drinking water: turbidity and free/total chlorine. The meter is especially designed for water quality measurements, providing reliable and accurate readings on low turbidity and chlorine values. The HI 83414 meets and exceeds the requirements of USEPA and Standard Methods both for turbidity and colorimetric measurements.

HI 88713

Turbidity Benchtop Meter, ISO

12.13

HI 88713 is based on an optical system which guarantees accurate results, long term stability and minimizes stray light and color interferences. It also compensates for variations in intensity of the LED, limiting the need for frequent calibration.

Depending on the measured sample and needed accuracy, normal, continuous or signal averaging measurement can be selected.

A two, three, four or five-point calibration can be performed using the supplied standards. Calibration points can be modified when user prepared standards are used.

HI 93414

Turbidity and Free/Total Chlorine Portable Meter with CAL CHECK™ Technology, EPA Compliant

12.10

The HI 93414 measures the most important parameters of drinking water: turbidity and free/total chlorine. Designed for water quality measurements, HI 93414 provides reliable and accurate readings on low turbidity and chlorine values. The HI 93414 meets and exceeds the requirements of USEPA and Standard Methods both for turbidity and colorimetric measurements.

This instrument incorporates an optical system which guarantees accurate results. The optical system, consisting of a tungsten filament lamp, three detectors (scattered, transmitted for turbidimeter range and one for colorimeter range), and a narrow band interference filter @ 525 nm assures long term stability and minimizes stray light and color interferences. It also compensates for variations in intensity of the lamp, making no need for frequent calibration. The 25 mm round cuvettes made from special optical glass guarantee repeatability and consistency of measurements.

GUIDE	Turbidity	pH	Free Chlorine	Total Chlorine	Bromine (Br)	Iodine (I)	Cyanuric Acid (CYS)	Iron, Low Range (Fe, LR)	Ratio Mode	Non-Ratio Mode	FNU Mode	FAU Mode	NTU Ratio Mode	NTU Non-Ratio Mode	Max. Calibration Points	CAL CHECK™	Logging	EPA Compliant	GLP	PC Connectivity	Fast Tracker™	ISO	Backlit LCD	Auto-off	Page
EPA Compliant Meters																									
HI 83414	•		•	•					•	•					5	•	•	•	•	•			•	•	12.6
HI 88703	•								•	•					5		•	•	•	•			•	•	12.9
HI 93414	•		•	•											4	•	•	•	•	•	•		•	•	12.10
HI 98703	•														4		•	•	•	•	•		•	•	12.12
ISO Meters																									
HI 88713	•										•	•	•	•	5		•		•	•		•	•		12.13
HI 98713	•														4		•		•	•	•	•	•	•	12.14
HI 93703	•														3				•			•			12.15
HI 93703-11	•														3		•		•			•			12.15
Specific Application Meters																									
HI 93102	•	•	•	•	•	•	•	•							2			•							12.16
HI 83749	•														4		•	•	•	•	•		•	•	12.17
HI 847491	•														4		•		•	•	•		•	•	12.18
HI 847492	•														4		•		•	•	•		•	•	12.18
HI 847493	•														4		•		•	•	•		•	•	12.18

HI 83414

Turbidity and Free/Total Chlorine Benchtop Meter, EPA Compliant

- **HI 83414 features four measuring ranges:**
  - Ratio, non ratio, free chlorine, total chlorine
- **Meets USEPA requirements**
- **Exclusive chlorine CAL CHECK™ calibration validation**
- **GLP Features**
- **Two, three, four or five point turbidity calibration**
- **USB PC connectivity**
- **Backlit LCD**
- **Log and recall up to 200 measurements**
- **Auto-off**
- **On-screen tutorial and help modes**

HI 83414 is a highly accurate dual parameter instrument that reflects HANNA's years of experience. The HI 83414 successfully combines turbidity and colorimetric measurements to test the most important parameters of drinking water: turbidity and free/total chlorine. The meter is specially designed for water quality measurements, providing reliable and accurate readings on low turbidity and chlorine values. The HI 83414 meets and exceeds the requirements of USEPA and Standard Methods both for turbidity and colorimetric measurements.

With the powerful CAL CHECK™ function, reliable performance can be validated at any moment by using the exclusive HANNA ready-made, NIST traceable standards. A one-point calibration can be performed using the same CAL CHECK™ standard.

This instrument features an optical system to guarantee accurate results, assure long term stability and minimize stray light and color interferences. They also compensate for variations in intensity of the lamp for less frequent calibration.

The 525 nm interference filter of the colorimeter assures accurate and repeatable results. Repeatability of the measurements are ensured with 25 mm round cuvettes made from special optical glass.

Turbidity measurements can be made in the 0.00 to 4000 NTU (Nephelometric Turbidity Units) range when ratiometric measurements are used and in the 0.00 to 40.0 NTU range when non ratio method is used. The HI 83414 has an EPA compliance reading mode which rounds the reading to meet EPA reporting requirements. Alternative EBC and Nephelos measuring units are available. Depending on the measured sample and needed accuracy, normal measurement, continuous measurement or signal averaging measurement can be selected.

A two, three, four or five-point calibration can be performed by using the supplied (<0.1, 15, 100, 750 and 2000 NTU) standards. If user prepared standards are used, the calibration points can be modified. Free or total chlorine measurements can be made in the 0.00 to 5.00 mg/L (ppm) range.

HI 83414 features complete GLP (Good Laboratory Practice) functions that allow traceability of the calibration conditions. The last calibration points, time and date can be checked.

This meter also incorporates a user-friendly interface with an easy to understand, graphic LCD. All messages are in plain text making them easy to read. Comprehensive contextual help is available at the press of a button. All messages and help screens are available in several languages. Confirmation and error acoustic signals help the user during instrument operation. Furthermore, a tutorial mode of operation guides the user step by step through the analysis process.

The logging function offers complete measurement information. Up to 200 measurements can be stored in the internal memory and consulted at any time. For further storage or analysis options, data can be downloaded to a PC using the USB port.

Turbidity Standards

The nephelometric turbidity meter is designed to be routinely standardized with a known light scattering standard. As with all analytical standards or reference materials, a turbidity standard should be able to perform the following: provide traceability, demonstrate the accuracy of results, calibrate the equipment and methodology, monitor the user performance, validate tests and facilitate comparability to ensure that when the correct procedures have been followed the same analysis of the same materials will produce results that agree with each other whenever they are performed.

Standards and reference materials should be produced and characterized in a technically competent manner, should be homogenous, stable, certified and have available a known uncertainty of measurement. Presently, there are at least two standards recognized and approved by the USEPA, Standard Methods, ASTM and other regulatory agencies, these are formazin and AMCO AEPA-1.

Formazin

Formazin is an aqueous suspension of an insoluble polymer formed by the condensation reaction between hydrazine sulphate and hexamethylenetetramine. Although formazin was suggested as a turbidity standard as early as 1926 it has many limitations such as it's high toxicity, low shelf life, quick rate of settling and easy agglomeration. Also, the diluent for formazin standards must be turbidity free water. This is often difficult to obtain, particularly in a field situation.

AMCO AEPA-1 Standard

Fortunately, since 1982, there is a standard available which overcomes the shortcomings of formazin. This has been developed by the American company, Advanced Polymer Systems, and is a suspended mixture of styrene divinylbenzene polymer spheres.

These standards have the following characteristics:

Stability. AMCO APEA-1 turbidity standards are a stabilized suspension of cross linked styrene divinylbenzene copolymer microbeads in ultrapure water. These beads are chemically inert and keep their chemical balance in a water medium regardless of concentration.

The size scatter of the beads only ranges from 0.06 to 0.2 microns. This small size accounts for random Brownian movement of these beads in suspension, keeping them in constant motion and totally dispersed within the ultra pure water matrix.

Physical properties. Particle size, uniform shape and refractive index make these spheres ideal to characterize light absorption and scatter for 90° behavior in the UV-VIS range. In addition the bead's spherical shape and size impedes the agglomeration or precipitation of the standard. For these reasons the AMCO AEPA-1 standards are very stable.

Reliability. These standards are prepared and bottled in a clean room facility. They are tested for accuracy and stability, fully validated before bottling, and free from any toxic or carcinogenic chemicals or compounds.

HANNA turbidity calibration standards are prepared from NIST traceable primary standard reference materials. All prepared standards are compared to formazin turbidity standard solutions. The values reported on HANNA Certificate of Analysis are the results obtained at the date of analysis. The evaluation of these data is based on Standard Methods.

HI 83414 • Turbidity and Free/Total Chlorine Benchtop Meter, EPA Compliant

HI 731331

HI 731318

HI 92000

ORDERING INFORMATION

HI 83414-01 (115V) and **HI 83414-02** (230V) are supplied with sample cuvettes and caps (5), calibration cuvettes for turbidimeter and colorimeter (HI 83414-11), silicone oil (HI 93703-58), tissue for wiping cuvettes, scissors, power cord and instruction manual.

REAGENTS AND STANDARDS

HI 93414-11	CAL CHECK™ Calibration set for free & total chlorine
HI 93701-01	Reagents for 100 free chlorine tests
HI 93701-03	Reagents for 300 free chlorine tests
HI 93711-01	Reagents for 100 total chlorine tests
HI 93711-03	Reagents for 300 total chlorine tests
HI 88703-11	Turbidity calibration standards (<0.1, 15, 100, 750 and 2000 NTU)

ACCESSORIES

HI 93703-50	Cuvette cleaning solution, 230 mL
HI 93703-58	Silicone oil (15 mL)
HI 731318	Tissue for wiping cuvettes (4)
HI 731331	Glass cuvettes (4)
HI 731335N	Caps for cuvettes (4)
HI 740234	Replacement lamp for EPA turbidimeter
HI 92000	Windows® compatible software
HI 920013	USB cable for PC connection

HI 83414 TURBIDITY SPECIFICATIONS	
Range– Non Ratio Mode	0.00 to 9.99; 10.0 to 40.0 NTU; 0.0 to 99.9; 100 to 268 Nephelos 0.00 to 9.80 EBC
Resolution– Non Ratio Mode	0.01; 0.1 NTU; 0.1; 1 Nephelos; 0.01 EBC
Range–Ratio Mode	0.00 to 9.99; 10.0 to 99.9; 100 to 4000 NTU 0.0 to 99.9; 100 to 26800 Nephelos 0.00 to 9.99; 10.0 to 99.9; 100 to 980 EBC
Resolution–Ratio Mode	0.01; 0.1; 1 NTU; 0.1; 1 Nephelos; 0.01; 0.1, 1 EBC
Range Selection	automatic
Accuracy @25°C/77°F	±2% of reading plus 0.02 NTU (0.15 Nephelos; 0.01 EBC) ±5% of reading above 1000 NTU (6700 Nephelos; 245 EBC)
Repeatability	±1% of reading or 0.02 NTU (0.15 Nephelos; 0.01 EBC) whichever is greater
Stray Light	< 0.02 NTU (0.15 Nephelos; 0.01 EBC)
Light Detector	silicon photocell
Method	Nephelometric method (90°) or Ratio Nephelometric Method (90° & 180°), Adaptation of the USEPA Method 108.1 and Standard Method 2130 B
Measuring Mode	normal, average, continuous
Turbidity Standards	<0.1, 15, 100, 750 and 2000 NTU
Calibration	two, three, four or five-point calibration

HI 83414 FREE AND TOTAL CHLORINE SPECIFICATIONS	
Range	**Free Cl_2:** 0.00 to 5.00 mg/L (ppm) **Total Cl_2:** 0.00 to 5.00 mg/L (ppm)
Resolution	0.01 mg/L (ppm) from 0.00 to 3.50 mg/L (ppm) 0.10 above 3.50 mg/L (ppm)
Accuracy @25°C/77°F	±0.03 mg/L or ±3% of reading (whichever is greater)
Detector	silicon photocell with 525 nm narrow band interference filters
Method	adaptation of the USEPA Method 330.5 and Standard Method 4500-Cl G.
Standards	1.00 mg/L free/total chlorine
Calibration	one-point calibration

HI 83414 GENERAL SPECIFICATIONS	
Light Source/ Life	tungsten filament lamp / greater than 100,000 readings
Display	40 x 70 mm graphic LCD (64 x 28 pixels) with backlight
Log Memory	200 records
PC Interface	USB
Environment	0°C (32°F) to 50°C (122°F); max 95% RH non-condensing
Power Supply	230 V/50 Hz or 115 V/60 Hz 20 W auto-off after 15 minutes of non-use
Dimensions	230 x 200 x 145 mm (9 x 7.9 x 5.7")
Weight	2.5 Kg (88 oz.)

HANNA instruments

With Great Products, Come Great Results™

HI 88703

Precision Turbidity Benchtop Meter, EPA Compliant

- **Two measuring ranges:**
  Ratio turbidity, non-ratio turbidity
- **Meets USEPA requirements**
- **GLP features**
- **Two, three, four or five point turbidity calibration**
- **USB PC connectivity**
- **Log up to 200 measurements**
- **Contextual help and tutorial mode**

The HI 88703 turbidity benchtop meter is specially designed for water quality measurements, providing reliable and accurate readings on low turbidity ranges.

This instrument has an EPA compliance reading mode which rounds the reading to meet EPA reporting requirements. Alternative EBC and Nephelos measuring units are available. Depending on the measured sample and needed accuracy, normal, continuous or signal averaging measurement can be selected.

A two, three, four or five-point calibration could be performed by using the supplied standards. When user prepared standards are used, calibration points can be modified.

H 88703 features complete GLP (Good Laboratory Practice) functions that allows traceability of the calibration conditions. The last calibration points, time and date can be checked.

Up to 200 measurements can be stored in internal memory. Data can be transferred to a PC via optional HI 920013 USB cable and HI 92000 Windows® compatible software.

SPECIFICATIONS	HI 88703
Range–Non Ratio Mode	0.00 to 9.99; 10.0 to 40.0 NTU; 0.0 to 99.9; 100 to 268 Nephelos 0.00 to 9.80 EBC
Resolution–Non Ratio Mode	0.01; 0.1 NTU 0.1; 1 Nephelos 0.01 EBC
Range–Ratio Mode	0.00 to 9.99; 10.0 to 99.9; 100 to 4000 NTU 0.0 to 99.9; 100 to 26800 Nephelos 0.00 to 9.99; 10.0 to 99.9; 100 to 980 EBC
Resolution–Ratio Mode	0.01; 0.1; 1 NTU 0.1; 1 Nephelos 0.01; 0.1, 1 EBC
Range Selection	automatic
Accuracy @25°C/77°F	±2% of reading plus 0.02 NTU (0.15 Nephelos; 0.01 EBC) ±5% of reading above 1000 NTU (6700 Nephelos; 245 EBC)
Repeatability	±1% of reading or 0.02 NTU (0.15 Nephelos; 0.01 EBC) whichever is greater
Stray Light	< 0.02 NTU (0.15 Nephelos; 0.01 EBC)
Light Detector	silicon photocell
Light Source/ Life	tungsten filament lamp / greater than 100,000 readings
Display	40 x 70 mm graphic LCD (64 x 28 pixels) with backlight
Method	Nephelometric method (90°) or Ratio Nephelometric Method (90° & 180°), Adaptation of the USEPA Method 108.1 and Standard Method 2130 B
Measuring Mode	normal, average, continuous
Turbidity Standards	<0.1, 15, 100, 750 and 2000 NTU
Calibration	two, three, four or five-point calibration
Log Memory	200 records
PC Interface	USB
Environment	0°C (32°F) to 50°C (122°F); max 95% RH non-condensing
Power Supply	230 V/50 Hz or 115 V/60 Hz 20 W; auto-off after 15 minutes of non-use
Dimensions	230 x 200 x 145 mm (9 x 7.9 x 5.7")
Weight	2.5 Kg (88 oz.)

ORDERING INFORMATION

HI 88703-01 (115V) and **HI 88703-02** (230V) is supplied with sample cuvettes and caps (5), calibration cuvettes, silicone oil (HI 93703-58), tissue for wiping cuvettes, power cord and instruction manual.

STANDARDS

HI 88703-11 Turbidity calibration standards (<0.1, 15, 100, 750 and 2000 NTU)

ACCESSORIES

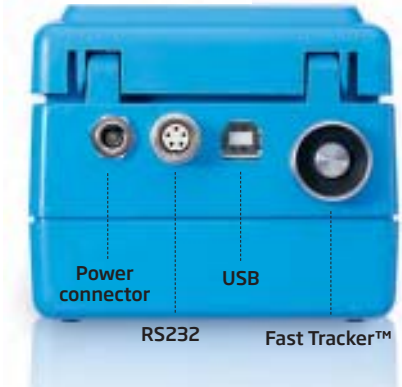
HI 93703-50 Cuvette cleaning solution, 230 mL
HI 93703-58 Silicone oil (15 mL)
HI 731318 Tissue for wiping cuvettes (4)
HI 731331 Glass cuvettes (4)
HI 731335N Caps for cuvettes (4)
HI 740234 Replacement lamp for EPA turbidimeter
HI 92000 Windows® compatible software
HI 920013 USB cable for PC connection

HI 93414

Turbidity and Free/Total Chlorine Portable Meter with CAL CHECK™ and Fast Tracker™ Technology, EPA Compliant

- High accuracy at low ranges
- Exclusive chlorine CAL CHECK™ calibration validation
- Exclusive Fast Tracker™ system
- User replaceable light source
- Two, three or four point turbidity calibration
- USB and RS232 PC connectivity
- GLP features
- Logging for up to 200 readings
- User friendly, backlit display with guidance codes
- Auto-off
- Battery % on startup
- Continuous current time on display

FastTracker™
A new revolution in organized data management



The HI 93414 measures the most important parameters of drinking water: turbidity and free/total chlorine. Designed for water quality measurements, HI 93414 provides reliable and accurate readings on low turbidity and chlorine values. The HI 93414 meets and exceeds the requirements of USEPA and Standard Methods both for turbidity and colorimetric measurements.

This instrument incorporates an optical system which guarantees accurate results. The optical system, consisting of a tungsten filament lamp, three detectors (scattered, transmitted for turbidimeter range and one for colorimeter range), and a narrow band interference filter @ 525 nm assures long term stability and minimizes stray light and color interferences. It also compensates for variations in intensity of the lamp, making no need for frequent calibration. The 25 mm round cuvettes made from special optical glass guarantee repeatability and consistency of measurements.

Turbidity measurements can be made in the 0.00 to 1000 NTU (Nephelometric Turbidity Units) range. The instrument has an EPA compliance reading mode which rounds readings to meet EPA reporting requirements. Depending on the measured sample and needed accuracy, normal measurement, continuous measurement or signal averaging measurement can be selected. Free or total chlorine measurements can be made in the 0.00 to 5.00 mg/L (ppm) range.

At startup, the meter displays the percentage of remaining battery life and, if too low, a 'low battery' warning message is displayed.

With the powerful CAL CHECK™ function, performance of the instrument can be validated at any time by using the exclusive HANNA ready-made NIST traceable standards. Calibration can be performed at any time for turbidity and colorimetric range. For turbidity, a two, three or four-point calibration is available using supplied (<0.1, 15, 100 and 750 NTU adjustable calibration points) or user prepared standards. For colorimeter measurements, a one-point calibration can be performed.

HI 93414 has complete GLP (Good Laboratory Practice) functions that allow traceability of the calibration conditions. The last calibration points, time and date can be checked at the touch of a button. HI 93414 has a user-friendly interface with an easy to read, large (LCD). Displayed codes guide the user step by step with routine operation and through calibration. Confirmation and error acoustic signals aid the user during instrument operation.

For advanced field applications, the HI 93414 is equipped with Fast Tracker™–Tag Identification System (T.I.S.) that makes data collecting and management simpler than ever. Fast Tracker™ allows users to record the time and location of a specific measurement or series of measurements.

With it's logging function, up to 200 measurements along with it's tagged locations can be stored in internal memory and consulted at any time. Data can be later transferred to a PC via RS232 or USB interface and HANNA HI 92000 software (optional).

Peace of mind.

CAL CHECK™ Calibration Validation

With HANNA's exclusive CAL CHECK™ validation function users are able to verify the performance of the instrument at any time. Using HANNA's exclusive ready-made, NIST traceable standards, validation is user friendly and ensures that the meter is properly calibrated.

iButton® Tags are Easy to Install

Install tags near your sampling points for quick and easy iButton® readings. Each tag contains a computer chip with a unique identification code encased in stainless steel. You can install a practically unlimited amount of tags.

HI 93414 TURBIDITY	
Range	0.00 to 9.99; 10.0 to 99.9 and 100 to 1000 NTU
Range Selection	automatic
Resolution	0.01 NTU from 0.00 to 9.99 NTU; 0.1 NTU from 10.0 to 99.9 NTU; 1 NTU from 100 to 1000 NTU
Accuracy @25°C/77°F	±2% of reading plus 0.02 NTU
Repeatability	±1% of reading or 0.02 NTU, whichever is greater
Stray Light	< 0.02 NTU
Light Detector	silicon photocell
Method	Ratio Nephelometric Method (90°), ratio of scattered and transmitted light; adaptation of the USEPA Method 180.1 and Standard Method 2130 B
Measuring mode	normal, average, continuous
Turbidity Standards	<0.1, 15, 100 and 750 NTU
Calibration	two, three or four-point calibration

HI 93414 FREE AND TOTAL CHLORINE	
Range	**free Cl_2:** 0.00 to 5.00 mg/L; **total Cl_2:** 0.00 to 5.00 mg/L
Resolution	0.01 mg/L from 0.00 to 3.50 mg/L; 0.10 above 3.50 mg/L
Accuracy @25°C/77°F	±0.03 mg/L ±3% of reading (whichever is greater)
Detector	silicon photocell with 525 nm narrow band interference filter
Method	adaptation of the USEPA Method 330.5 and Standard Method 4500-Cl G. the reaction between chlorine and DPD reagent causes a pink tint in the sample.
Standards	1 mg/L free chlorine, 1 mg/L total chlorine
Calibration	one-point calibration

HI 93414 GENERAL SPECIFICATIONS	
Light Source	tungsten filament lamp
Lamp Life	greater than 100,000 readings
Log Memory	200 records
Serial Interface	USB or RS 232
Environment	up to 50°C (122°F); RH max 95% non-condensing
Power Supply	1.5V AA alkaline batteries (4) or AC adapter; auto-off after 15 minutes of non-use
Dimensions / Weight	224 x 87 x 77 mm (8.8 x 3.4 x 3.0") / 512 g (18 oz.)

ORDERING INFORMATION

HI 93414-01 (115V) and **HI 93414-02** (230V) is supplied with sample cuvettes and caps (5), calibration cuvettes for turbidimeter, calibration cuvettes for colorimeter, silicone oil, cuvette wiping tissue, scissors, batteries, AC adapter, instructions and rugged carrying case.

REAGENTS AND STANDARDS

HI 93414-11	CAL CHECK™ Calibration set for Free & Total Chlorine
HI 93701-01	Reagents for 100 Free Chlorine tests
HI 93701-03	Reagents for 300 Free Chlorine tests
HI 93711-01	Reagents for 100 Total Chlorine tests
HI 93711-03	Reagents for 300 Total Chlorine tests
HI 98703-11	Turbidity calibration standards

ACCESSORIES

HI 93703-50	Cuvette cleaning solution, 230 mL
HI 920005	Tag holders with tags (5)
HI 98703-58	Silicone oil, 15 mL
HI 93703-60	Caps for cuvettes (4)
HI 731318	Cuvette cleaning cloth (4)
HI 731331	Glass cuvettes (4)

HI 92000	Windows® compatible software
HI 920011	5 to 9 pin RS232 connection cable
HI 920013	USB cable for PC connection

HI 98703

Turbidity Meter with Fast Tracker™ Technology, EPA Compliant

- **High accuracy at low ranges (below 0.05 NTU)**
- **Two, three or four point calibration**
- **USB and RS232 PC connectivity**
- **Log up to 200 records**
- **GLP Features**
- **User friendly, backlit display with guidance codes**
- **Battery % on startup**
- **Continuous current time on display**

The HI 98703 meets and exceeds the requirements of the USEPA Method 180.1 for wastewater and Standard Method 2130 B for drinking water. The instrument has an EPA compliance reading mode which rounds readings to meet EPA reporting requirements. Users will appreciate the accuracy and sensitivity of this instrument, particularly at very low turbidity levels.

This instrument incorporates complete GLP (Good Laboratory Practice) functions that allow traceability of the calibration conditions. The last calibration points, time and date can be checked at the touch of a button.

With it's logging function, up to 200 measurements along with it's tagged locations can be stored in internal memory and consulted at any time. Data can be later transferred to a PC via RS232 or USB interface and HANNA HI 92000 software (optional).

FastTracker™
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Exclusive Fast Tracker™
For advanced field applications, the HI 98703 is equipped with Fast Tracker™– Tag Identification System (T.I.S.) that makes data collecting and management simpler than ever. Fast Tracker™ allows users to record the time and location of a specific measurement or series of measurements.

ORDERING INFORMATION

HI 98703-01 (115V), **HI 98703-02** (230V) and **HI 98703-03** (AUS plug) are supplied with sample cuvettes and caps (5), HI 98703-11 calibration cuvettes, HI 93703-58 silicone oil, cuvette cleaning cloth, batteries, AC adapter, instruction manual and rugged carrying case.

STANDARDS

HI 98703-11 Turbidity calibration standards

ACCESSORIES

HI 93703-50 Cuvette cleaning solution, 230 mL
HI 920005 Tag holders with tags (5)
HI 98703-58 Silicone oil, 15 mL
HI 93703-60 Caps for cuvettes (4)
HI 731318 Cuvette cleaning cloth (4)
HI 731331 Glass cuvettes (4)
HI 92000 Windows® compatible software
HI 920011 5 to 9 pin RS232 connection cable
HI 920013 USB cable for PC connection

SPECIFICATIONS	HI 98703
Range	0.00 to 9.99; 10.0 to 99.9 and 100 to 1000 NTU
Range Selection	automatic
Resolution	0.01 NTU from 0.00 to 9.99 NTU; 0.1 NTU from 10.0 to 99.9 NTU; 1 NTU from 100 to 1000 NTU
Accuracy @25°C/77°F	±2% of reading plus 0.02 NTU
Repeatability	±1% of reading or 0.02 NTU, whichever is greater
Stray Light	< 0.02 NTU
Light Detector	silicon photocell
Light Source	tungsten filament lamp
Lamp Life	greater than 100,000 readings
Method	Ratio Nephelometric Method (90°), ratio of scattered and transmitted light; Adaptation of the USEPA Method 180.1 and Standard Method 2130 B
Measuring mode	normal, average, continuous
Turbidity Standards	<0.1, 15, 100 and 750 NTU
Calibration	two, three or four-point calibration
LOG Memory	200 records
Serial Interface	USB or RS232
Environment	up to 50°C (122°F); RH max 95% non-condensing
Power Supply	1.5V AA alkaline batteries (4) or AC adapter; auto-off after 15 minutes of non-use
Dimensions / Weight	224 x 87 x 77 mm (8.8 x 3.4 x 3.0") / 512 g (18 oz.)

Turbidity Benchtop Meter, ISO

- **Graphic display, backlit LCD**
- **Two, three, four or five point calibration**
- **GLP features**
- **Log up to 200 records**
- **Contextual help and tutorial mode**
- **USB PC connectivity**

The HI 88713 turbidity bench meter meets and exceeds the requirements of the ISO 7027 standard.

HI 88713 is based on an optical system which guarantees accurate results, long term stability and minimizes stray light and color interferences. It also compensates for variations in intensity of the LED, limiting the need for frequent calibration.

Depending on the measured sample and needed accuracy, normal, continuous or signal averaging measurement can be selected.

A two, three, four or five-point calibration can be performed using the supplied standards. Calibration points can be modified when user prepared standards are used.

The HI 88713 turbidity bench meter has complete GLP (Good Laboratory Practice) functions that allow traceability of the calibration conditions.

The HI 88713 turbidity bench meter has a user-friendly interface with an easy to understand, graphic LCD. Comprehensive contextual help is available at a simple key press. Furthermore, a tutorial mode of operation guides the user step by step through the analysis process.

Up to 200 measurements can be stored in internal memory. Data can be transferred to a PC via optional HI 920013 USB cable and HI 92000 Windows® compatible software.

SPECIFICATIONS		HI 88713
Range	FNU Mode	0.00 to 9.99; 10.0 to 99.9; 100 to 1000 FNU
	FAU Mode	10.0 to 99.9; 100 to 4000 FAU
	NTU Ratio Mode	0.00 to 9.99; 10.0 to 99.9; 100 to 4000 NTU 0.00 to 9.99; 10.0 to 99.9; 100 to 980 EBC
	NTU Non-Ratio Mode	0.00 to 9.99; 10.0 to 99.9; 100 to 1000 NTU 0.00 to 9.99; 10.0 to 99.9; 100 to 245 EBC
Range Selection		automatic
Resolution	FNU Mode	0.01; 0.1; 1 FNU
	FAU Mode	0.1; 1 FAU
	NTU Ratio Mode	0.01; 0.1; 1 NTU / 0.01; 0.1; 1 EBC
	NTU Non-Ration Mode	0.01; 0.1; 1 NTU / 0.01; 0.1; 1 EBC
Accuracy @25°C/77°F	FNU Mode	±2% of reading plus stray light
	FAU Mode	±10% of reading
	NTU Ratio Mode	±2% of reading plus stray light / ±5% of reading above 1000 NTU
	NTU Non-Ratio Mode	±2% of reading plus stray light
Repeatability		±1% of reading or stray light, whichever is greater
Stray Light		< 0.1 NTU (0.05 EBC)
Light Detector		silicon photocell
Light Source		IR LED
Method		ISO 7027 Method
Measuring Mode		normal, average, continuous.
Turbidity Standards		<0.1, 15, 100, 750 FNU and 2000 NTU
Calibration		two, three, four or five-point calibration
Log Memory		200 records
Serial Interface		USB
Environment		0°C (32°F) to 50°C (122°F); max 95% RH non-condensing
Power Supply		12 Vdc power input
Dimensions / Weight		230 x 200 x 145 mm (9 x 7.9 x 5.7") / 2.5 Kg (88 oz.)

ORDERING INFORMATION

HI 88713-01 (115V) and **HI 88713-02** (230V) are supplied with sample cuvettes and caps (6), calibration cuvettes, silicone oil, tissue for wiping cuvettes, power adapter and instruction manual.

STANDARDS

HI 88713-11 Turbidity calibration standards (<0.1, 15, 100, 750 FNU and 2000 NTU)

ACCESSORIES

HI 93703-50 Cuvette cleaning solution, 230 mL
HI 98703-58 Silicone oil (15 mL)
HI 731318 Tissue for wiping cuvettes (4)
HI 731331 Glass cuvettes (4)
HI 731335N Caps for cuvettes (4)
HI 92000 Windows® compatible software
HI 920013 USB cable for PC connection

HI 98713

Portable Turbidity Meter with Fast Tracker™ Technology, ISO

- **Two, three or four point calibration**
- **USB and RS 232 PC connectivity**
- **Log up to 200 records**
- **GLP Features**
- **User friendly, backlit LCD display with guidance codes**
- **Battery % on startup**
- **Continuous current time on display**

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For advanced field applications, the HI 98713 is equipped with Fast Tracker™–Tag Identification System (T.I.S.) that makes data collecting and management simpler than ever. Fast Tracker™ allows users to record the time and location of a specific measurement or series of measurements.

The HI 98713 meets and exceeds the requirements of the ISO 7027 for water quality and provides a reliable and accurate readings on low turbidity values. An effective algorithm calculates and converts the detectors output in FNU. Depending on the needed accuracy, normal, continuous, or signal averaging can be selected.

The optical system–The Infrared Method (ISO 7027), consists of a infrared LED and two detectors (scattered and transmitted light), that assures long term stability and minimizes stray light and color interferences. HI 98713 also compensates for variations in intensity of the LED, minimizing the need for frequent calibration.

This instrument incorporates complete GLP (Good Laboratory Practice) functions that allow traceability of the calibration conditions. The last calibration points, time and date can be checked at the touch of a button.

With it's logging function, up to 200 measurements along with it's tagged locations can be stored in internal memory and consulted at any time. Data can be later transferred to a PC via RS232 or USB interface and HANNA HI 92000 software (optional).

ORDERING INFORMATION

HI 98713-01 (115V) and **HI 98713-02** (230V) is supplied with sample cuvettes and caps (5), HI 98713-11 calibration cuvettes, HI 93703-58 silicone oil, cuvette cleaning cloth, batteries, AC adapter, instructions and rugged carrying case.

SOLUTIONS

HI 98713-11	Turbidity calibration standards
HI 93703-50	Cuvette cleaning solution, 230 mL

ACCESSORIES

HI 920005	Tag holders with tags (5)
HI 98703-58	Silicone oil (15 mL)
HI 93703-60	Caps for cuvettes (4)
HI 731318	Cuvette cleaning cloth (4)
HI 731331	Glass cuvettes (4)
HI 92000	Windows® compatible software
HI 920011	5 to 9 pin RS232 connection cable
HI 920013	USB cable for PC connection

SPECIFICATIONS	HI 98713
Range	0.00 to 9.99; 10.0 to 99.9 and 100 to 1000 FNU
Range Selection	automatic
Resolution	0.01 FNU from 0.00 to 9.99 FNU; 0.1 FNU from 10.0 to 99.9 FNU; 1 FNU from 100 to 1000 FNU
Accuracy @25°C/77°F	±2% of reading plus 0.1 FNU
Repeatability	±1% of reading or 0.1 FNU, whichever is greater
Stray Light	< 0.1 FNU
IR Detector	silicon photocell
Light Source	860 nm infrared LED
Lamp Life	greater than 100,000 readings
Method	adaptation of ISO 7027, ratio method with 90° and 180° detector
Turbidity Standards	<0.1, 15, 100 and 750 FNU
Calibration	two, three or four-point calibration
Log Memory	200 records
Serial Interface	USB or RS232
Environment	up to 50°C (122°F); RH max 95% non-condensing
Power Supply	1.5V AA alkaline batteries (4) or AC adapter; auto-off after 15 minutes of non-use
Dimensions / Weight	224 x 87 x 77 mm (8.8 x 3.4 x 3.0") / 512 g (18 oz.)

HANNA instruments

With Great Products, Come Great Results™

Logging Turbidity Meters, ISO

HI 93703 series are microprocessor based turbidity meters that provide laboratory accuracy for field turbidity measurements.

The HI 93703 is easy to calibrate (with 3 point calibration) using AMCO-EPA standards and is ISO 7027 compliant.

HANNA instruments has chosen 10 FTU* as the calibration point because it is the value that best fits the water turbidity measurements in different applications, from drinking water to wastewater treatment. HANNA instruments uses the primary standard AMCO-AEPA-1 to avoid all formazine-related problems. Formazine is a very toxic, unstable substance which requires particular care: its standards have to be prepared only a few minutes before performing the calibration, and cannot be reused because of their short life. HANNA AMCO-AEPA-1 standards are extremely stable, can be reused, and last up to six months if free from contamination. HI 93703 can be used with both standards.

The HI 93703-11 enhanced version features a real-time clock, logging for up to 199 measurements and PC compatibility via the RS232 interface and Windows® compatible HI 92000 software.

Both versions meet the requirements of GLP (Good Laboratory Practice) protocols for last calibration data storage.

SPECIFICATIONS	HI 93703
Range	0.00 to 50.00 FTU* 50 to 1000 FTU*
Resolution	0.01 FTU* (0.00 to 50.00 FTU) 1 FTU (50 to 1000 FTU)
Accuracy @25°C/77°F	±0.5 FTU or ±5% of reading (whichever is greater)
Calibration	three points (0 FTU, 10 FTU and 500 FTU)
Light Source	infrared LED
Light Detector	silicon photocell
Battery Type / Life	1.5V AA (4) /approximately 60 hours of continuous use or 900 measurements; auto-off after 5 minutes of non-use
Environment	0 to 50°C (32 to 122°F); RH max 95% (non condensing)
Dimensions	220 x 82 x 66 mm (8.7 x 3.2 x 2.6")
Weight	510 g (1.1 lb.)

	HI 93703-11 Same as HI 93703 with additional features:
Data Logging	199 measurements, on-demand
PC Connection	through serial port and HI 92000 Windows® compatible software (not included)
Real Time Clock	yes

*HI 93703 has been designed according to the ISO 7027 International Standard, consequently the turbidity unit is the FTU (Formazine Turbidity Unit). FTU is equivalent to the other internationally recognized unit: NTU (Nephelometric Turbidity Unit).

ORDERING INFORMATION

HI 93703 is supplied complete with glass cuvette, batteries and instructions.
HI 93703-11 is supplied complete with glass cuvette, batteries and instructions.
HI 93703C, kit including HI 93703 and HI 731313 maintenance kit.

SOLUTIONS

HI 93703-0	AMCO-AEPA-1@ 0 FTU calibration solution, 30 mL
HI 93703-05	AMCO-AEPA-1 @ 500 FTU calibration solution, 30 mL
HI 93703-10	AMCO-AEPA-1 @ 10 FTU calibration solution, 30 mL

ACCESSORIES

HI 731313	Maintenance kit: rugged carrying case including HI 93102-0 and HI 93102-20 calibration solutions, HI 93703-50 cuvette cleaning solution, cuvettes (2) and cuvette cleaning cloth
HI 731318	Cuvette cleaning cloth (4)
HI 731321	Spare glass cuvettes (4)
HI 92000	Windows®compatible software
HI 920011	Serial cable (5 to 9 pin) for PC connection

HI 93102

Complete Tool for Water Analysis: Turbidity, Cl_2, pH, Br, Fe, I and CYS

- **USEPA Compliance**

  In the turbidimetric mode, the HI 93102 uses the nephelometric principle according to USEPA's 180.1 method and the Standard Method 2130B.

- **Custom Calibration Points**

  Advanced electronics allow operators to calibrate the meter at a selectable point in from 0.00 to 50.00 NTU.

- **Logging Capability**

  The HI 93102 makes it possible to log and retrieve up to 25 different samples.

The most important parameters needed for water analysis, especially in drinking water, can be measured with HANNA's HI 93102 portable meter. This instrument not only measures turbidity, but also pH, total and free chlorine, bromine, iodine, iron, and cyanuric acid (CYS). Achieve laboratory results in the field quickly and easily.

Measurements are made quickly and repeatedly through a sophisticated, yet easy-to-use microprocessor. In colorimetric mode, users can select between factory preprogrammed calibration or calibrating the meter on their own, and measure either concentration or relative absorbance of the sample. Up to 25 measured samples can be stored in memory together with time and date. Miniaturization of the electronics has made it possible to offer unsurpassed accuracy and quality in a portable unit weighing just one pound!

SPECIFICATIONS		HI 93102
Range	Turbidity	0.00 to 9.99 NTU† / 0.00 to 50.0 NTU†
	Br	0.00 to 8.00 mg/L (ppm)
	Free Chlorine	0.00 to 2.50 mg/L (ppm)
	Total Chlorine	0.00 to 3.50 mg/L (ppm)
	CYS	0 to 80 mg/L (ppm)
	I	0.0 to 12.5 mg/L (ppm)
	Fe LR	0.00 to 1.00 mg/L (ppm)
	pH	6.5 to 8.5 pH
Resolution	Turbidity	0.01 and 0.1 NTU†
	Br	0.01 mg/L (ppm)
	Chlorine	0.01 mg/L (ppm)
	CYS	1 mg/L (ppm)
	I	0.1 mg/L (ppm)
	Fe LR	0.01 mg/L (ppm)
	pH	0.1 pH
Accuracy @25°C/77°F	Turbidity	±0.5 NTU or ±5% of reading (whichever is greater)
	Br	±0.08 mg/L (ppm) ±3% of reading
	Chlorine	±0.03 mg/L (ppm) ±3% of reading
	CYS	±1 mg/L (ppm) ±15% of reading
	I	±0.1 mg/L (ppm) ±5% of reading
	Fe LR	±0.02 mg/L (ppm) ±8% of reading
	pH	±0.1 pH
Calibration		two points; selectable between 0.00 - 50.0 FTU (0.00 and 20.0 FTU recommended)
Light Source		pure green LED
Light Detector		silicon photocell
Battery Type / Life		1.5V AA (4) / approximately 60 hours of continuous use or 1000 measurements; automatic shut-off selectable after 10, 20, 30, 40, 50 or 60 minutes
Environment		0 to 50°C (32 to 122°F); RH max 95% (non condensing)
Dimensions		220 x 82 x 66 mm (8.7 x 3.2 x 2.6")
Weight		510 g (1.1 lb.)

† 1 NTU (Nephelometric Turbidity Unit) = FTU (Formazine Turbidity Unit)

ORDERING INFORMATION

HI 93102 is supplied with measurement cuvette cap, batteries and instruction manual.

ACCESSORIES

HI 731318	Cuvette cleaning cloth (4 pcs)
HI 731321	Spare measurement cuvettes (4 pcs)
HI 93701-01*	Reagent kit for 100 tests (Free Cl_2)
HI 731327	Rugged carrying case with calibration solutions HI 93102-0 and HI 93102-20, HI 93703-50 cleaning solution, HI 731318 cuvette cleaning cloth and 2 measurement cuvettes
HI 93710-01*	Reagent kit for 100 tests (pH)
HI 93711-01*	Reagent kit for 100 tests (T. Cl_2)
HI 93716-01*	Reagent kit for 100 tests (Br)
HI 93718-01*	Reagent kit for 100 tests (I)
HI 93722-01*	Reagent kit for 100 tests (CYS)
HI 93746-01**	Reagent kit, 100 pkt for 50 tests (Fe LR)
HI 93102-0	AMCO-EPA-1 cal. sol. @ 0 NTU (30 mL)
HI 93102-20	AMCO-EPA-1 cal. sol. @ 20 NTU (30 mL)

* set of 300 tests available, -03
** set of 150 tests available, -03

HANNA instruments

With Great Products, Come Great Results™

Portable Turbidity Meter and Bentonite Monitoring

- **GLP Features**
- **Fast Tracker™ with iButton™ tags**
- **Continuous measurement mode**
  Verifies the settling rate of suspended matter.
- **Signal Average (AVG) mode**
  Accumulates multiple readings giving a final average value.
- **Backlit LCD**
- **USB**

Wines with low phenol contents, such as rosé, light reds and whites should be checked for protein stability before bottling. HANNA is offers a quick test to verify the risk of future protein haze formation. If protein instability is detected, a subsequent test can help define the right amount of bentonite to be added for improving protein stability. It is important not to overdose bentonite to avoid stripping wine flavor, body, and significant loss of color, especially in young red wines. Moreover, adding only the necessary amount of bentonite to obtain the desired protein stability also saves costs.

The HI 83749 measures turbidity of samples from 0.00 to 1200 NTU (Nephelometric Turbidity Units) and is USEPA compliant. In the USEPA measurement mode the instrument rounds the readings to meet USEPA reporting requirements.

SPECIFICATIONS	HI 83749
Range	0.00 to 9.99 NTU*; 10.0 to 99.9 NTU; 100 to 1200 NTU automatic range selection
Resolution	0.01 NTU from 0.00 to 9.99 NTU; 0.1 NTU from 10.0 to 99.9 NTU; 1 NTU from 100 to 1200 NTU
Accuracy @25°C/77°F	±2% of reading plus 0.05 NTU
Repeatability	±1% of reading plus 0.05 NTU
Stray Light	< 0.05 NTU
Light Source	tungsten filament lamp
Light Detector	silicon photocell
Method	Ratio Nephelometric
Display	60 x 90 mm backlit LCD
Calibration	two, three or four points
LOG Memory	200 records
Serial Interface	RS 232 or USB 1.1
Environment	0 to 50°C; max 95% RH non-condensing
Battery Type	1.5V AA batteries (4) / 12 VDC adapter
Auto Shut-off	after 15 minutes of non-use
Dimensions	224 x 87 x 77 mm (8.7 x 3.3 x 3.1")
Weight	512 g (17.6 oz.)

* NTU (Nephelometric Turbidity Units)

ORDERING INFORMATION

HI 83749-01 (115V), **HI 83749-02** (230V) and **HI 83749-03** (AUS plug) are supplied with sample cuvettes and caps (6), calibration cuvettes (HI 83749-11) (4), bentocheck reagent (HI 83749-0) and silicone oil (HI 93703-58), 1000 µL automatic pipette with two tips and instructions sheet, 25 mL glass vials with caps (4), 1 mL syringe with two tips, funnel, filter paper (25), cuvette cleaning cloth, 12 VDC adapter, batteries, instructions and rugged carrying case.

OPTIONAL REAGENTS

HI 83749-11	Turbidity calibration standards
HI 83749-20	Bentocheck solution, 100 mL

ACCESSORIES

HI 731312	Red wine decolorization kit (25 pcs)
HI 93703-58	Silicone oil (15 mL)
HI 731331	Glass cuvettes (4)
HI 731335N	Caps for cuvettes (4)
HI 93703-50	Cuvette cleaning solution, 230 mL
HI 731318	Cuvette cleaning cloth (4)
HI 740220	25 mL glass vial with cap (2)
HI 731341	Automatic pipette 1000 µL
HI 731351	Tips fo automatic pipette 1000 µL (25)
HI 740233	Filter paper type II (100)
HI 740142P	1 mL graduated syringe (10)
HI 740144P	Tips for 1 mL syringe (10)
HI 740234	Replacement lamp for EPA turbidimeter
HI 92000	Windows® compatible software
HI 920011	RS232 connection cable
HI 920005	iButton tag holders with tags (5)

HI 847491 • HI 847492 • HI 847493

Haze Meters for Beer Quality Analysis

- **Utilizes Fast Tracker–Tag ID System**
- **LED optical system**
- **PC compatible via USB**
- **GLP Features**
- **Log on demand**
- **Large, backlit LCD**

FastTracker™
A new revolution in organized data management

The HI 847491, HI 847492, and HI 847493 are auto diagnostic haze in beer meters. Each instrument features a different measuring unit or light source to comply with different standard requirements.

HI 847491 is designed according to the ISO standard for haze in beer measurements.

HI 847492 is designed, according to the ASBC (American Society of Brewing Chemists) standard for haze in beer measurements.

HI 847493 is designed, according with the MEBAK (Central European Brewing Commission) standard requirements, for haze in beer measurements.

These instruments compensate a beer color to guarantee accurate readings during the brewering process. The optical system consists of an LED and multiple detectors. A two, three or four point calibration can be easily performed at any time using the supplied or user prepared standards.

These meters have all the necessary GLP (Good Laboratory Practice) features to allow maximum traceability of data. Features include a real time clock, log on demand (up to 200 measurements), and Fast Tracker™ – Tag Identification System.

These meters also incorporate a continuous measurement mode to measure the settling rate of suspended matter, and a signal average (AVG) mode to accumulate multiple readings giving a final average value. The average mode is particularly useful to measure samples with suspended particles with different dimensions.

All three meters feature a user-friendly interface, with a large backlit LCD. Acoustic signals and display codes to guide the user step-by-step through routine operations.

Why this instrument is so important...

Beer haze may be defined as an insoluble or semisoluble particulate matter which is small enough to form a colloidal suspension in beer. These particles scatter transmitted light and are observed as a degradation in the transparency of the beer.

The beer clarity is a parameter constantly controlled in brewery, and to assure a consistent product quality, the brewmaster needs more than visual inspection.

Several substances can cause haze in beer, but the most frequently encountered problem is due to a cross-linking of polyphenol and protein.

A range of stabilization treatments are available for avoiding haze problems. The products have to be controlled on several steps during brewing process, in particular after filtration and before the beer enters the single tanks.

BEER HAZE TABLE

GRADE	EBC	ASBC
Brilliant	0.0 to 0.5	0.0 to 34.5
Almost Brilliant	0.5 to 1.0	34.5 to 69
Very Slightly Hazy	1.0 to 2.0	69 to 138
Slightly Hazy	2.0 to 4.0	138 to 276
Hazy	4.0 to 8.0	276 to 552
Very Hazy	> 8.0	> 552

Methods

Many methods were used to measure turbidity over the years. The Jackson Candle Turbidimeter was used to measure turbidity as Jackson turbidity units (JTU). The method is visual and are not considered very accurate. To obtain more accurate readings a nephelometer should be used as a turbidity reading instrument.

The HI 847491 reports the measurements in FNU (Formazin Nephelometric Units), HI 847492 reports the measurements in FTU (Formazin Turbidity Units). FTU units are equal to NTU units (Nephelometric Turbidity Units). The HI 847493 reports the measurements in EBC (European Brewery Convention). The conversion table between these measurement units is shown below:

	NTU/FNU/FTU	EBC	ASBC	HELM
1 NTU/1 FNU/1 FTU	1	0.25	17.5	0.1
1 EBC	4	1	69	40
1 ASBC	0.057	0.014	1	0.579
1 HELM	10	0.025	1.725	1

SPECIFICATIONS	HI 847491	HI 847492	HI 847493
Range	0.00 to 9.99 FNU 10.0 to 99.9 FNU 100 to 1000 FNU	0.00 to 9.99 FTU 10.0 to 99.9 FTU 100 to 1000 FTU	0.00 to 9.99 EBC 10.0 to 99.9 EBC 100 to 250 EBC
Range Selection	automatic		
Resolution	0.01 FNU from 0.00 to 9.99 FNU; 0.1 FNU from 10.0 to 99.9 FNU; 1 FNU from 100 to 1000 FNU	0.01 FTU from 0.00 to 9.99 FTU; 0.1 FTU from 10.0 to 99.9 FTU; 1 FTU from 100 to 1000 FTU	0.01 EBC from 0.00 to 9.99 EBC; 0.1 EBC from 10.0 to 99.9 EBC; 1 EBC from 100 to 250 EBC
Accuracy @25°C/77°F	±2% of reading plus 0.05 FNU	±2% of reading plus 0.05 FTU	±2% of reading plus 0.02 EBC
Repeatability	±1% of reading or 0.02 FNU, whichever is greater	±1% of reading or 0.02 FTU, whichever is greater	±1% of reading 0.01 EBC, whichever is greater
Stray Light	< 0.1 FNU	< 0.1 FTU	< 0.03 EBC
Light Source	IR LED @ 860 nm	LED @ 580 nm	LED @ 650 nm
Light Detector	silicon photocell		
Method	Ratio Nephelometric method.		
Display	60 x 90 mm backlit LCD		
Calibration	two, three or four point calibration		
Log Memory	200 records		
Serial Interface	RS232 or USB		
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing		
Power Supply	1.5V AA alkaline batteries (4) or AC adapter		
Auto-off	after 15 minutes of non-use		
Dimensions	224 x 87 x 77 mm (8.8 x 3.4 x 3.0")		
Weight	512 g (18 oz.)		

HI 731318 Cuvette Cleaning Cloth

HI 920005 Tag holders with tags

ORDERING INFORMATION

HI 847491-01 (115V) and **HI 847491-02** (230V) are supplied with HI 98501-1 Checktemp® thermometer, Checktemp® instruction manual, sample cuvettes and caps (6), calibration cuvettes (HI 847491-11) (4), 25 mL glass vials with caps (4), cuvette cleaning cloth, batteries, AC adapter, instrument quality certificate, instructions and rugged carrying case.

HI 847492-01 (115V) and **HI 847492-02** (230V) is supplied with HI 98501-1 Checktemp® thermometer, Checktemp® instruction manual, sample cuvettes and caps (6), calibration cuvettes (HI 847492-11) (4), 25 mL glass vials with caps (4), cuvette cleaning cloth, batteries, AC adapter, instrument quality certificate, instructions and rugged carrying case.

HI 847493-01 (115V), **HI 847493-02** (230V) and **HI 847493-03** (AUS plug) is supplied with sample cuvettes and caps (6), calibration cuvettes (HI 847493-11) (4), 25 mL glass vials with caps (4), cuvette cleaning cloth, batteries, AC adapter, instrument quality certificate, instructions and rugged carrying case.

ACCESSORIES

HI 93703-58	Silicone oil, 15 mL
HI 847491-11	Turbidity calibration standards (HI 847491)
HI 847492-11	Turbidity calibration standards (HI 847492)
HI 847493-11	Turbidity calibration standards (HI 847493)
HI 731331	Glass cuvettes (4)
HI 731335N	Caps for cuvettes (4)
HI 93703-50	Cuvette cleaning solution, 230 mL
HI 731318	Cuvette cleaning cloth (4)
HI 740220	25 mL glass vial with cap (2)
HI 92000	Windows® compatible software
HI 920011	RS232 connection cable
HI 920005	5 tag holders with tags
HI 740027P	1.5V AA battery (12)

Accessories

HI 731313	Maintenance kit: rugged carrying case including HI 93102-0 and HI 93102-20 calibration solutions, HI 93703-50 cuvette cleaning solution, cuvettes (2) and cuvette cleaning cloth
HI 731318	Cuvette cleaning cloth (4)
HI 731321	Spare glass cuvettes (4)
HI 731331	Glass cuvettes (4)
HI 731335N	Caps for cuvettes (4)
HI 740220	25 mL glass vial with cap (2)
HI 740027P	1.5V AA battery (12)
HI 740234	Replacement lamp for EPA turbidimeter
HI 847491-11	Calibration standard cuvette (HI 847491)
HI 847492-11	Calibration standard cuvette (HI 847492)
HI 847493-11	Calibration standard cuvette (HI 847493)
HI 92000	Windows® compatible software
HI 920005	Tag holders with tags (5)
HI 920011	5 to 9 pin RS232 connection cable
HI 920013	USB cable for PC connection
HI 93703-50	Cuvette cleaning solution, 230 mL
HI 98703-51	Dispersing agent, 20 mL
HI 93703-57	Glycerol, 30 mL (4)
HI 98703-58	Silicone oil, 15 mL
HI 93703-59	Activated charcoal (10 g)
HI 93703-60	Caps for cuvettes (4)

Turbidity Standard Solutions

The HANNA **turbidity calibration solutions** are referenced to the AMCO AEPA-1 standards, at 0, 10, 20 and 500 FTU.

They are preferred to the formazine based standards, as they are non-toxic, stable, reusable and long lasting.

CODE	DESCRIPTION	PACKAGE
HI 93102-0	AMCO-AEPA-1 calibration solution at 0 NTU	30 mL bottle
HI 93102-20	AMCO-AEPA-1 calibration solution at 20 NTU	30 mL bottle
HI 93124-0	standard solution at 0 EBC	30 mL bottle
HI 93124-1	standard solution at 2.5 EBC	30 mL bottle
HI 93124-2	standard solution at 125 EBC	30 mL bottle
HI 93703-0	AMCO-AEPA-1 calibration solution at 0 FTU	30 mL bottle
HI 93703-05	AMCO-AEPA-1 calibration solution at 500 FTU	30 mL bottle
HI 93703-10	AMCO-AEPA-1 calibration solution at 10 FTU	30 mL bottle

Typical sources of turbidity in drinking water include the following:

- **Waste discharge**
- **Runoff from watersheds, especially those that are disturbed or eroding**
- **Algae or aquatic weeds and products of their breakdown in water reservoirs, rivers, or lakes**
- **Humic acids and other organic compounds resulting from decay of plants, leaves, etc. in water sources**
- **High iron concentrations which give water a rust-red coloration (mainly in ground water and ground water under the direct influence of surface water).**
- **Air bubbles and particles from the treatment process**

Simply stated, turbidity is the measure of relative clarity of a liquid. Clarity is important when producing drinking water for human consumption, and in many manufacturing uses.

Once considered as a mostly aesthetic characteristic of drinking water, significant evidence exists that controlling turbidity is a competent safeguard against pathogens in drinking water.

Turbidity measurement is a quick and inexpensive test that can help operators diagnose and treat water problems. Proper calibration technique and the use of high quality turbidity standards, such as the AMCO AEPA standards, ensure that measurements can be fully validated, are in compliance with regulatory requirements, are traceable to Primary Reference Materials and, most importantly, are comparable. The user can be certain that their measurements irrespective of instrument are all traceable in an unbroken chain to the same NIST Primary Standard.

CONTENTS

HANNA Digital Refractometers

Introduction

Refractometry

Refractometry is the method of measuring a substances refractive index (one of their fundamental physical properties) in order to assess their composition or purity.

The refractive index of a substance is strongly influenced by temperature and the wavelength of light used to measure it, therefore, care must be taken to control or compensate for temperature differences and wavelength. The refractive index measurements are usually reported at a reference temperature of 20 degrees Celsius, which is equal to 68 degrees Fahrenheit, and considered to be room temperature.

A digital refractometer is an instrument used to measure the refractive index and to convert/compensate this information in specific units (depending by model).

Refractive Index

Determinations are made by measuring the refractive index of a solution. Refractive Index is an optical characteristic of a substance and the number of dissolved particles in it.

Refractive Index is defined as the ratio of the speed of light in empty space to the speed of light in the substance. A result of this property is that light will "bend", or change direction, when it travels through a substance of different refractive index. This is called refraction.

When passing from a material with a higher to lower refractive index, there is a critical angle at which an incoming beam of light can no longer refract, but will instead be reflected off the interface.

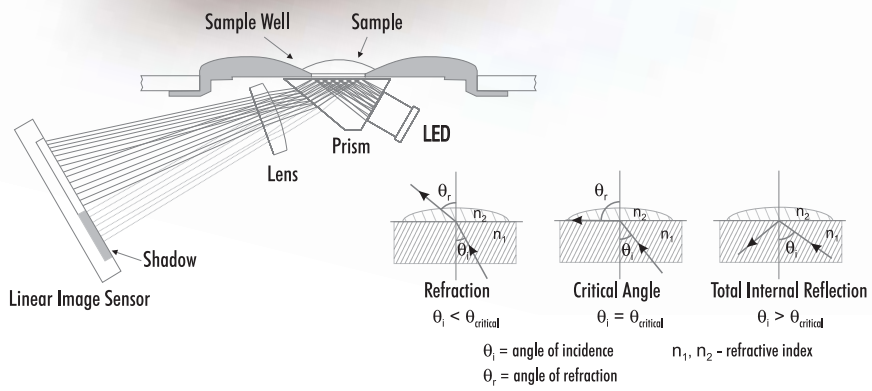
The critical angle can be used to easily calculate the refractive index according to the equation:

$\sin(\theta_{critical}) = n_2 / n_1$

Where n_2 is the refractive index of the lower-density medium; n_1 is the refractive index of the higher-density medium.

Light from an LED passes through a prism in contact with the sample.

An image sensor determines the critical angle at which the light is no longer refracted through the sample. Specialized algorithms then apply temperature compensation to the measurement and convert the refractive index to the specified parameter.



- **Automatic Temperature Compensation**
  For exceptionally accurate measurements
- **Easy measurement**
  Place a few drops of the sample in the well and press the READ key
- **BEPS**
  (Battery Error Prevention System) alerts the user in the event that low battery power could adversely affect readings.
- **IP65 water protection**
  Built to perform under harsh laboratory and field conditions.
- **Single point calibration**
  Calibrate with distilled or deionized water
- **Small sample size**
  Sample size can be as small as 2 metric drops.
- **Stainless steel sample well**
  Easy to clean and corrosion resistant
- **ABS thermoplastic casing**
- **Start-up**
  When powered on the meter displays battery life and the set measurement units.
- **Unit selection**
  Pressing the RANGE key quickly cycles through the units of measurement (if applicable).
- **Calibration**
  Perform a quick and easy calibration after start-up with distilled or deionized water.

Battery life on display


Easy to clean stainless steel sample well

Easy measurement

HANNA instruments

With Great Products, Come Great Results™

HI 96801

Digital Refractometer for Analysis of Sugar in Food, Sucrose Measurement

13.6

HANNA offers four sugar refractometers to meet the requirements of the food industry. The HI 96801 refractometer measures the refractive index to determine the % Brix of sugar in aqueous solutions. The refractive index of the sample is converted to % Brix concentration units. Temperature (in °C or °F) is displayed simultaneously with the measurement on the large dual level display along with icons for low power and other helpful messages

HI 96811

Digital Refractometer for Measurement of Sugar in Wine

13.4

HANNA offers five wine refractometers to meet the requirements of cultural differences found throughout the wine industry. HI 96811, converts the refractive index of the sample to sucrose concentration in units of percent by weight, %Brix (also referred to as °Brix). The conversion used is based on the ICUMSA Methods Book (International Commission for Uniform Methods of Sugar Analysis). Since the majority of sugar in grape juice is fructose and glucose and not sucrose, the reading is sometimes referred to as "Apparent Brix".

HI 96822

Digital Refractometer for Natural or Artificial Seawater Analysis

13.10

HANNA's HI 96822 Digital Refractometer is a rugged, portable, water resistant device that utilizes the measurement of the refractive index to determine the salinity of natural and artificial seawater, ocean water or brackish intermediates. The HI 96822 reflects HANNA's years of experience as a manufacturer of analytical instruments. This digital refractometer eliminates the uncertainty associated with mechanical refractometers and is durable and compact enough to be used at home, in the lab and out in the field.

HI 96811 • HI 96812 • HI 96813 • HI 96814 • HI 96816

Digital Refractometers for Measurement of Sugar in Wine

- **Dual-level LCD**
  The dual-level LCD displays measurement and temperature readings simultaneously
- **Automatic Temperature Compensation**
  For accurate measurements
- **Easy measurement**
  Place a few drops of the sample in the well and press the READ key
- **BEPS**
  (Battery Error Prevention System) alerts the user in the event that low battery power could adversely affect readings.
- **IP65 water protection**
  Built to perform under harsh laboratory and field conditions.
- **Quick, accurate results**
  Readings are displayed in approximately 1.5 seconds.
- **Single point calibration**
  Calibrate with distilled or deionized water
- **Small sample size**
  Sample size can be as small as 2 metric drops.
- **Automatic shut-off**
  After three minutes of non-use
- **Stainless steel sample well**
  Easy to clean and corrosion resistant
- **ABS thermoplastic casing**

HANNA offers five wine refractometers to meet the requirements of cultural differences found throughout the wine industry. The HI 96811, HI 96812, HI 96813, HI 96814 and HI 96816 Digital Wine Refractometers are rugged, lightweight and waterproof for measurements in the lab or field. Each instrument offers a different but valid way to measure the density of grape must and other sugar based liquids.

These optical instruments employ the measurement of the refractive index to determine parameters pertinent to the wine industry.

The actual measurement of the refractive index is simple and quick and provides the vintner a standard accepted method for sugar content analysis. Samples are measured after a simple user calibration with deionized or distilled water. Within seconds, the instrument measures the refractive index of the grape must. These digital refractometers eliminate the uncertainty associated with mechanical refractometers and are ideal for fast, reliable measurements in the field.

HI 96811, **HI 96813** and **HI 96814** convert the refractive index of the sample to sucrose concentration in units of percent by weight, %Brix (also referred to as °Brix). The conversion used is based on the ICUMSA Methods Book (International Commission for Uniform Methods of Sugar Analysis). Since the majority of sugar in grape juice is fructose and glucose and not sucrose, the reading is sometimes referred to as "Apparent Brix".

HI 96812 has units of °Baumé. The °Baumé scale is based on density and was originally designed to measure the mass of sodium chloride in water. °Baumé is used in wine making to measure the sugar in must. The HI 96812 converts the %Brix reading to °Baumé based on the table found in the Official Methods of Analysis of AOAC International, 18th Edition. 1 °Baumé is approximately equal to 1.8 %Brix, and 1 °Baumé is roughly equivalent to 1 % alcohol when the wine is fully fermented.

In addition to %Brix, HI 96814 includes two other scales used in the wine industry: °Oechsle and °KMW.

°Oechsle (°Oe) is mainly used in the German, Swiss and Luxenburgish winemaking industry to measure the sugar content of must. The °Oe scale is based on specific gravity at 20°C (SG20/20) and is the first 3 digits following the decimal point. 1 °Oe is roughly equal to 0.2 %Brix.

°Oe = [(SG20/20) - 1] x 1000

°Klosterneuburger Mostwaage (°KMW) is used in Austria to measure the sugar content of must.

°KMW is related to °Oe by the following equation: °Oe = °KMW x [(0.022 x °KMW) + 4.54]

1 °KMW is roughly equivalent to 1 %Brix or 5 °Oe. °KMW is also known as °Babo.

"Potential" or "probable" alcohol is an estimation of the alcohol content (% vol/vol) in finished wine based on the conversion between sugar and alcohol. This conversion depends on many factors such as the type of grapes, the grape maturity, the growing region and yeast fermentation efficiency and temperature.

The **HI 96813** allows the user to tailor the instrument to their specific needs based on their experience, since no fixed conversion factor is universally applicable. The first conversion is based on the %Brix value and an adjustable conversion factor between 0.50 and 0.70 (0.55 is a common value).

Potential alcohol (% v/v) = (0.50 to 0.70) x % Brix

One drawback of the above equation is that it does not take into account the nonfermentable sugars and extract.

A second equation was also added that takes these factors into account and can give a more accurate estimate of the alcohol content in the finished wine. This conversion is named "C1" on the meter, and uses the following equation:

Potential Alcohol (%v/v) = 0.059 x [(2.66 x °Oe) - 30] (C1)

The **HI 96816** potential alcohol curve is based on the tables found in the European Economic Community Commission Regulation No 2676/90 of September 17, 1990, Determining Community Methods for the Analysis of Wine and International Organization of Vine and Wine (OIV). The potential alcohol curve is based on the following equation:

Potential alcohol (%v/v) = g/L of Sugar / 16.83

SPECIFICATIONS		HI 96811	HI 96812	HI 96813	HI 96814	HI 96816
Range	**Sugar Content**	0 to 50 % Brix	0 to 27 °Baumé	0 to 50 % Brix; 0.0-25.0 % V/V Potential Alcohol	0 to 50 % Brix; 0-230° Oechsle; 0-42° KMW	4.9 to 56.8 %v/v Potential Alcohol (10 to 75 %Brix)
	Temperature			0 to 80°C (32 to 176°F)		
Resolution	**Sugar Content**	0.1 % Brix	0.1 °Baumé	0.1 % Brix; 0.1 % V/V Potential Alcohol	0.1 % Brix; 1° Oechsle 0.1° KMW	0.1 %v/v
	Temperature			±0.1°C (0.1°F)		
Accuracy (@20°C/68°F)	**Sugar Content**	±0.2 % Brix	±0.1 °Baumé	±0.1 °Baumé; ±0.2 V/V Potential Alcohol	±0.2 % Brix; ±1° Oechsle ±0.1° KMW	±0.2 %v/v
	Temperature			±0.3°C (0.5°F)		
Temperature Compensation		automatic between 10 and 40°C (50 to 104°F)				
Measurement Time		approximately 1.5 seconds				
Minimum Sample Volume		100 µL (to cover prism totally)				
Light Source		yellow LED				
Sample Cell		stainless steel ring and flint glass prism				
Auto-off		after three minutes of non-use				
Enclosure Rating		IP65				
Battery Type / Battery Life		9V / approximately 5000 readings				
Dimensions / Weight		192 x 104 x 69 mm (7.6 x 4.1 x 2.7") / 420 g (14.8 oz.)				

ORDERING INFORMATION

HI 96811, **HI 96812**, **HI 96813**, **HI 96814** and **HI 96816** are supplied with battery and instruction manual.

HI 96801 • HI 96802 • HI 96803 • HI 96804

Digital Refractometers for Sugar Analysis Throughout the Food Industry

- **Ideal for the analysis of:**
  fruits, energy drinks, puddings, soy milk juices, jam, marmalade, honey, soups, jelly, tofu and condiments
- **Dual-level LCD**
  The dual-level LCD displays measurement and temperature readings simultaneously
- **Automatic Temperature Compensation**
  For accurate measurements
- **Easy measurement**
  Place a few drops of the sample in the well and press the READ key
- **BEPS**
  (Battery Error Prevention System) alerts the user in the event that low battery power could adversely affect readings.
- **IP65 water protection**
  Built to perform under harsh laboratory and field conditions.
- **Quick, accurate results**
  Readings are displayed in approximately 1.5 seconds.
- **Single point calibration**
  Calibrate with distilled or deionized water
- **Small sample size**
  Sample size can be as small as 2 metric drops.
- **Automatic shut-off**
  After three minutes of non-use
- **Stainless steel sample well**
  Easy to clean and corrosion resistant
- **ABS thermoplastic casing**

HANNA offers four sugar refractometers to meet the requirements of the food industry. The HI 96801 Sucrose, HI 96802 Fructose, HI 96803 Glucose and HI 96804 Invert Sugar digital refractometers are rugged, portable and water resistant for measurements in the lab or field. Each instrument offers a specific analysis to determine accurate sugar concentration.

These optical instruments employ the measurement of the refractive index to determine parameters pertinent for sugar concentration analysis.

The actual measurement of refractive index is simple and quick and provides the operator a standard accepted method for sugar content analysis. Samples are measured after a simple user calibration with deionized or distilled water. Within seconds these instruments measure the refractive index of the sample and convert it to percent by weight concentration units (or %Brix for HI 96801). These digital refractometers eliminate the uncertainty associated with mechanical refractometers and are easily portable for measurements in the field.

These four instruments utilize internationally recognized references for unit conversion and temperature compensation and employ methodology recommended in the ICUMSA Methods Book (internationally recognized body for sugar analysis).

Temperature (in °C or °F) is displayed simultaneously with the measurement on the large dual level display along with icons for low power and other helpful messages.

HI 96801

Measures the refractive index to determine the % Brix of sugar in aqueous solutions. The refractive index of the sample is converted to % Brix concentration units.

HI 96802

Measures the refractive index to determine the % fructose in aqueous solutions. The refractive index of the sample is converted to % by weight concentration units.

HI 96803

Measures the refractive index to determine the % glucose in aqueous solutions. The refractive index of the sample is converted to % by weight concentration units.

HI 96804

Measures the refractive index to determine the % invert sugar in aqueous solutions. The refractive index of the sample is converted to % by weight concentration units.

Making a standard % Brix solution

To make a Brix Solution, follow the procedure below:

- Place container (such as a glass vial or dropper bottle that has a cover) on an analytical balance.
- Tare the balance.
- To make an X BRIX solution weigh out X grams of high purity sucrose (CAS #: 57-50-1) directly into the container.
- Add distilled or deionized water to the container so the total weight of the solution is 100 g.

Note: Solutions above 60 %Brix need to be vigorously stirred or shaken and heated in a water bath. Remove solution from bath when sucrose has dissolved. The total quantity can be scaled proportionally for smaller containers but accuracy may be sacrificed.

Example with 25 %Brix:

% Brix	25
g Sucrose	25.000
g Water	75.000
g Total	100.000

SPECIFICATIONS		HI 96801	HI 96802	HI 96803	HI 96804
Range	**Sugar Content**	0 to 85% Brix (% Brix)	0 to 85% (by weight) (% fructose)	0 to 85% (by weight) (% glucose)	0 to 85% (by weight) (% invert sugar)
	Temperature	0 to 80°C (32 to 176°F)			
Resolution	**Sugar Content**	0.1 % Brix	0.1	0.1	0.1
	Temperature	0.1°C (0.1°F)			
Accuracy (@20°C/68°F)	**Sugar Content**	±0.2% Brix	±0.2%	±0.2%	±0.2%
	Temperature	0.3°C (0.5°F)			
Temperature Compensation		automatic between 10 and 40°C (50 to 104°F)			
Measurement Time		approximately 1.5 seconds			
Minimum Sample Volume		100 µL (to cover prism totally)			
Light Source		yellow LED			
Sample Cell		stainless steel ring and flint glass prism			
Auto-off		after three minutes of non-use			
Enclosure Rating		IP65			
Battery Type / Battery Life		9V / approximately 5000 readings			
Dimensions / Weight		192 x 104 x 69 mm (7.6 x 4.1 x 2.7") / 420 g (14.8 oz.)			

ORDERING INFORMATION

HI 96801, **HI 96802**, **HI 96803** and **HI 96804** are supplied with battery and instruction manual.

HI 96821

Digital Refractometer for Sodium Chloride Measurement for the Food Industry

- **Ideal for the analysis of:**
  Salad Dressings, Cheeses, Condiments, Pickles, Canned Foods, Jarred Foods, Milk, Juices, Energy Drinks, Soups, Brines and Whey
- **Dual-level LCD**
  The dual-level LCD displays measurement and temperature readings simultaneously
- **Automatic Temperature Compensation**
  For accurate measurements
- **Easy measurement**
  Place a few drops of the sample in the well and press the READ key
- **BEPS**
  (Battery Error Prevention System) alerts the user in the event that low battery power could adversely affect readings.
- **IP65 water protection**
  Built to perform under harsh laboratory and field conditions.
- **Quick, accurate results**
  Readings are displayed in approximately 1.5 seconds.
- **Single point calibration**
  Calibrate with distilled or deionized water
- **Small sample size**
  Sample size can be as small as 2 metric drops.
- **Automatic shut-off**
  After three minutes of non-use
- **Stainless steel sample well**
  Easy to clean and corrosion resistant
- **ABS thermoplastic casing**

HANNA offers the HI 96821 digital sodium chloride refractometer to meet the requirements of the food industry. This optical instrument employs the measurement of the refractive index to determine sodium chloride concentration in aqueous solutions used in food preparation. It is not intended for sea water salinity measurements.

The measurement of refractive index is simple and quick and provides the user an accepted method for NaCl analysis. Samples are measured after a simple user calibration with deionized or distilled water. Within seconds the instrument measures the refractive index of the solution. The digital refractometer eliminates the uncertainty associated with mechanical refractometers and is portable for measurements where you need them.

The instrument utilizes internationally recognized references for unit conversion and temperature compensation. It can display the measurement of NaCl concentration 4 different ways: g/100 g, g/100 mL, specific gravity, and °Baumé.

Temperature (in °C or °F) is displayed simultaneously with the measurement (on 3 of the ranges) on the large dual level display along with icons for Low Power and other helpful message codes.

Easy Operation

Start-up screens

When the HI 96821 is turned on, test screens then the percentage of battery life remaining is shown on the LCD followed by the ready status.

Unit selection

Just press the RANGE key to cycle through the HI 96821's units of measurement. g/100 g, g/100 mL, Specific Gravity and °Baumé.

Temperature selection can also be easily changed.

Calibration

Perform a quick and easy calibration after start-up:

1. Using a plastic pipette, completely cover the prism in the sample well with distilled or deionized water.
2. Press the ZERO key

Measurement

Achieve fast, professional results:

1. Using a plastic pipette, drip sample onto the prism surface until the well is full.
2. Press the READ key and the results are display in the selected units.

SPECIFICATIONS		HI 96821
Range	g/100 g	0 to 28
	g/100 mL	0 to 34
	Specific Gravity	1.000 to 1.216
	°Baumé	0 to 26
	Temperature	0 to 80°C (32 to 176°F)
Resolution	g/100 g	0.1
	g/100 mL	0.1
	Specific Gravity	0.001
	°Baumé	0.1
	Temperature	0.1°C (0.1°F)
Accuracy (@20°C/68°F)	g/100 g	±0.2
	g/100 mL	±0.2
	Specific Gravity	±0.002
	°Baumé	±0.2
	Temperature	±0.3°C (0.5°F)
Temperature Compensation		automatic between 10 and 40°C (50 to 104°F)
Measurement Time		approximately 1.5 seconds
Minimum Sample Volume		100 µL (to cover prism totally)
Light Source		yellow LED
Sample Cell		stainless steel ring and flint glass prism
Auto-off		after three minutes of non-use
Enclosure Rating		IP65
Battery Type / Battery Life		9V / approximately 5000 readings
Dimensions / Weight		192 x 104 x 69 mm (7.6 x 4.1 x 2.7") / 420 g (14.8 oz.)

Making a Standard Sodium Chloride Solution

To make a standard NaCl solution (g/100 g), follow the procedure below:

- Place a container (such as a glass vial or dropper bottle that has a cover) on an analytical balance.
- Tare the balance.
- To make an X NaCl solution weigh out X grams of high purity dried Sodium Chloride (CAS #: 7647-14-5: MW 58.44) directly into the container.
- Add distilled or deionized water to the container so the total weight of the solution is 100 g.

Example with g/100 g NaCl:

g/100 g NaCl	10
g NaCl	10.000
g Water	90.000
g Total	100.000

ORDERING INFORMATION

HI 96821 is supplied with battery and instruction manual.

HI 96822

Digital Refractometer for Natural or Artificial Seawater Analysis

- **Dual-level LCD**
  The dual-level LCD displays measurement and temperature readings simultaneously
- **Automatic Temperature Compensation**
  For accurate measurements
- **Easy measurement**
  Place a few drops of the sample in the well and press the READ key
- **BEPS**
  (Battery Error Prevention System) alerts the user in the event that low battery power could adversely affect readings.
- **IP65 water protection**
  The HI 96822 is built to perform under the harsh field conditions associated with environments containing seawater.
- **Quick, accurate results**
  Readings are displayed in approximately 1.5 seconds.
- **Single point calibration**
  Calibrate with distilled or deionized water
- **Small sample size**
  Sample size can be as small as 2 metric drops.
- **Automatic shut-off**
  After three minutes of non-use
- **Stainless steel sample well**
  Easy to clean and corrosion resistant
- **ABS thermoplastic casing**

HANNA's HI 96822 Digital Refractometer is a rugged, portable, water resistant device that utilizes the measurement of the refractive index to determine the salinity of natural and artificial seawater, ocean water or brackish intermediates. The HI 96822 reflects HANNA's years of experience as a manufacturer of analytical instruments. This digital refractometer eliminates the uncertainty associated with mechanical refractometers and is durable and compact enough to be used at home, in the lab and out in the field.

The HI 96822 is an optical device that is quick and easy to use. After a simple user calibration with distilled or deionized water, a seawater sample can be introduced into the sample well.

Within seconds, the refractive index and temperature are measured and converted into one of 3 popular measurement units: Practical Salinity Units (PSU), salinity in parts per thousand (ppt), or specific gravity (S.G. (20/20)). All conversion algorithms are based upon respected scientific publications using the physical properties of seawater (not sodium chloride).

The Importance of Salinity Measurement Throughout a Variety of Applications

Salinity is a critical measurement in many applications, such as aquaculture, environmental monitoring, aquariums, desalination plants, well water, and many more. Until now, the available technology to measure salinity has relied on mechanical instruments, such as hydrometers and ocular refractometers, or on high-tech conductivity meters. While easy to use, ocular refractometers can be difficult to get a accurate reading from and are highly susceptible to changes in temperature. Hydrometers, though inexpensive, are clumsy and inaccurate. Conductivity meters that convert to salinity can be cost-prohibitive.

The HANNA HI 96822 is the solution to all these issues. It is lightweight, easy to use, cost-efficient, and is extremely accurate. With the ability to read in all the three of the most widely used salinity units (PSU, ppt, and specific gravity), it is the ideal instrument for any application.

Easy Operation

Start-up screens

When the HI 96821 is turned on, test screens then the percentage of battery life remaining is shown on the LCD followed by the ready status.

Unit selection

Just press the RANGE key to cycle through the HI 96822's units of measurement. PSU, ppt, specific gravity (20/20).

Temperature selection can also be easily changed.

Calibration

Perform a quick and easy calibration after start-up:

1. Using a plastic pipette, completely cover the prism in the sample well with distilled or deionized water.
2. Press the ZERO key

Measurement

Achieve fast, professional results:

1. Using a plastic pipette, drip sample onto the prism surface until the well is full.
2. Press the READ key and the results are display in the selected units.

Making a standard sodium chloride solution

Sodium Chloride solutions can be used to check the accuracy of the meter. The table below lists several Sodium Chloride solutions and there expected ppt Seawater value.

To make a Standard NaCl Solution (g/100 g), follow the procedure for the HI 96821.

	g of NaCl	g of Water	Total Weight	Expected ppt Seawater Value
5% NaCl	5.00	95.00	100.00	48
10% NaCl	10.00	90.00	100.00	96
15% NaCl	15.00	85.00	100.00	145

SPECIFICATIONS		HI 96822
Range	**PSU**	0 to 50
	ppt	0 to 150
	Specific Gravity (20/20)	1.000 to 1.114
	Temperature	0 to 80°C (32 to 176°F)
Resolution	**PSU**	1
	ppt	1
	Specific Gravity (20/20)	0.001
	Temperature	0.1°C (0.1°F)
Accuracy (@20°C/68°F)	**PSU**	±2
	ppt	±2
	Specific Gravity (20/20)	±0.002
	Temperature	±0.3°C (0.5°F)
Temperature Compensation		automatic between 10 and 40°C (50 to 104°F)
Measurement Time		approximately 1.5 seconds
Minimum Sample Volume		100 µL (to cover prism totally)
Light Source		yellow LED
Sample Cell		stainless steel ring and flint glass prism
Auto-off		after three minutes of non-use
Enclosure Rating		IP65
Battery Type / Life		9V / approximately 5000 readings
Dimensions		192 x 104 x 69 mm (7.6 x 4.1 x 2.7") / 420 g (14.8 oz.)
Weight		420 g

Some specific examples of the importance of salinity:

Aquaculture: Young salmon start their lives in fresh water. As they mature, they reach a stage ("smoltification") when the transition to salt water. When farming salmon, it is critically important to maintain proper salinity levels at each life stage to prevent unnecessary stress that could negatively affect growth and development.

Salinity is a vital parameter to monitor accurately when raising eggs and larval fish, optimizing juvenile and adult growth, and culturing live food such as rotifers and artemia.

Aquariums: Whether it is the world renowned, eight million gallon Georgia Aquarium, or a 20 gallon reef tank at home, salinity is a crucial parameter to measure. In closed systems such as these, salinity is easily affected. As water evaporates, it leaves the salt behind, raising the salinity. When evaporated water is replaced with fresh water, the salinity is lowered. The potential for disaster is inherent in both situations. Use HANNA's digital refractometer to accurately measure salinity will help prevent any mishaps.

Environment: Salinity is almost always a required measurement when doing any kind of environmental monitoring or pollution studies. Salinity has the ability to affect many processes, such as respiration, reproduction, and growth development. If monitoring for the effect of pollution, it is important to make sure a salinity variation is not having an additional influence.

Well Water: In coastal areas, the freshwater aquifer (or water table) is adjacent to salt water. This aquifer often supplies the drinking water for the local population. If too many wells are sunk, or too much water is drawn from the aquifer, the water table may sink so low that salt water incursion occurs and the water table has become contaminated.

ORDERING INFORMATION

HI 96822 is supplied with battery and instruction manual.

HI 96831 • HI 96832

Digital Refractometer for Ethylene and Propylene Glycol Analysis

- **Dual-level LCD**
  The dual-level LCD displays measurement and temperature readings simultaneously
  Automatic Temperature Compensation
  For accurate measurements
- **Easy measurement**
  Place a few drops of the sample in the well and press the READ key
- **BEPS**
  (Battery Error Prevention System) alerts the user in the event that low battery power could adversely affect readings.
- **IP65 water protection**
  Built to perform under harsh laboratory and field conditions.
- **Quick, accurate results**
  Readings are displayed in approximately 1.5 seconds.
- **Single point calibration**
  Calibrate with distilled or deionized water
- **Small sample size**
  Sample size can be as small as 2 metric drops.
- **Automatic shut-off**
  After three minutes of non-use
- **Stainless steel sample well**
  Resists corrosion from salt water.
- **ABS thermoplastic casing**

The HI 96831 Ethylene Glycol and HI 96832 Propylene Glycol Digital Refractometers are rugged, portable, water resistant devices that utilize the measurement of refractive index to determine the percent volume and freezing point of ethylene or propylene glycol based solutions.

These digital refractometers eliminate the uncertainty associated with mechanical refractometers. HI 96831 and HI 96832 samples are measured after a simple user calibration with distilled or deionized water. Within seconds, the refractive index and temperature are measured and converted into one of two measurement units; % volume or freezing point. These meters use internationally recognized references for unit conversion and temperature compensation for glycol solutions (e.g. CRC Handbook of Chemistry and Physics, 87th Edition).

ORDERING INFORMATION

HI 96831 and **HI 96832** are supplied with battery and instruction manual.

SPECIFICATIONS		HI 96831 Ethylene Glycol	HI 96832 Propylene Glycol
Range	% Volume	0 to 100 %	
	Freezing Point	0 to -50 °C (32 to -58 °F)	0 to -51 °C (32 to -59.8 °F)
	Temperature	0 to 80 °C (32 to 176 °F)	
Resolution	% Volume	0.1 %	
	Freezing Point	0.1 °C (0.1 °F)	
	Temperature	0.1 °C (0.1 °F)	
Accuracy (@20°C/68°F)	% Volume	±0.2 %	
	Freezing Point	±0.5 °C (±1.0 °F)	
	Temperature	±0.3 °C (±0.5 °F)	
Temperature Compensation		automatic between 0 and 40°C (32 to 104°F)	
Measurement Time		approximately 1.5 seconds	
Minimum Sample Volume		100 µL (to cover prism totally)	
Light Source		yellow LED	
Sample Cell		stainless steel ring and flint glass prism	
Auto-off		after three minutes of non-use	
Enclosure Rating		IP65	
Battery Type / Battery Life		9V / approximately 5000 readings	
Dimensions / Weight		192 x 104 x 69 mm (7.6 x 4.1 x 2.7") / 420 g (14.8 oz.)	

HANNA instruments

With Great Products, Come Great Results™

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Thermometers

Introduction

About Thermometers

Precise process control is one of the most important factors in maintaining high quality in production, just as precision and accuracy are the key to research. Temperature is one of the most important variables today in research, as well as in production. Up to a few decades ago, thermometers had remained virtually unchanged. They were mainly either glass or dial/metal type.

Glass and metal thermometers use thermal expansion to measure temperature. This method uses a physical law which gives a false sense of reliability since one assumes the measurement is "true" because he or she can see how it works. This system is no longer suitable for many reasons and their accuracy and range are very limited. Glass construction is fragile and can be dangerous to a persons health, as well as to the environment. For these reasons, an alternative way of measuring temperature has become necessary.

Electronic thermometers have provided the versatility, speed and accuracy requested by operators in all areas of temperature measurement. Speed is important when the reactions being monitored are changing rapidly. Small, compact sensors are preferable for tightly arranged areas, such as electronics and other miniature applications. Electronic thermometers allow users to monitor maximum, minimum and even average temperatures. Mechanical stress is no longer a worry with an electronic thermometer. Rain, cold, dust and other natural obstacles common to field measurements are overcome with our rugged instruments.

Dedicated research teams, precision process control, integrated production facilities and an overall team effort is required to meet the demanding applications of our users. HANNA's extensive professional thermometer line constitutes the true dedication HANNA commits to thermometer design and production.

Measurement Unit

Temperature is one of the most common physical properties in our everyday life. It is defined as the property of a body that determines the transfer of heat to or from other bodies. Physically, temperature affects variations in the macroscopic parameters of a body such as volume and pressure, among others.

The fundamental temperature scale is the absolute, thermodynamic or Kelvin scale. The Kelvin (K), unit of thermodynamic temperature, is the fraction 1/273.16 of thermodynamic temperature of the triple point of water. The triple point of water is a standard fixed point at which ice, liquid water, and water vapor are in equilibrium.

Two empirical temperature scales are in common use: the Celsius and Fahrenheit scales. These scales are based on two fixed points.

The Celsius (formally Centigrade) temperature scale uses the Celsius (°C) units, defined as 1/100th of the difference between the temperature of boiling (100°C) and freezing points (0°C) of water. The relationship between the Kelvin and Celsius scales is given by:

$$K = °C + 273.15$$

The Fahrenheit scale uses Fahrenheit (°F) units, where the temperature of boiling water is taken of 212°F, and the temperature of the freezing point at 32°F. The scale originally used the temperature of a mixture of ice and common salt as 0°F, and the inventor's body temperature as 96°F. The relationship between the Fahrenheit and Celsius scales is calculated by:

$$°F = °C \times 9/5 + 32$$

Achieving Thermometer Accuracy

Even though it is easy to show resolutions of 0.1°C with digital thermometers, there is no relationship between resolution and accuracy of measurements.

Here is a list of the main causes that can have an effect on accuracy in temperature measurements:

- **Instrument**

  The instrument may have an extended scale and 19,000 points of measurement may be obtained. Within these 19,000 points the instrument may perform differently because of internal linearity.
- **Electronic components**

  The internal electronics have a drift that depends on the ambient temperature. For this reason the accuracy of the instrument is stated at a specific temperature of 20 or 25°C, and the drift has to be specified for each degree of variations with respect to the reference temperature.
- **LCD**

  Liquid crystals have an operating limitation which is a function of temperature. Their normal range is between 0 and 50°C, but there are components capable of performing between -20°C and 70°C.
- **Batteries**

  Instrument battery power supply also has limitations of use.
- **Temperature sensor**

  This is a separate accuracy, which is to be added to the instrument's error.

Also, if the probe supplied is connected to the meter during factory calibration, the probe error is eliminated but will reappear if the probe is replaced.

With all the possible forces influencing accuracy, calibration verification is essential. HANNA's CAL CHECK™ can verify an accurate calibration quickly and easily.

Importance of Accuracy

Up to a few years ago, accuracy was not a very critical aspect and tolerances of a few °C did not jeopardize a process. From the time that HACCP programs became a necessity, measurement accuracy has become a discriminating factor. Due to health risk factors, now an error of a few tenths of a degree can decide whether food can still be kept or must be discarded. In 1990, HANNA began to produce thermometers for our customers' HACCP programs to comply with new government regulations. Soon after, HANNA became the market leader in Europe as a result of the technological solutions offered to our users.

User Calibration

To calibrate typical thermometers you need:

- **for thermocouple thermometers:** a simulator of the emf (electromotive force) generated by the thermocouple
- **for thermometers with NTC/PTC sensor:** at least two thermostatic baths
- **for Pt100 thermometers:** a resistance simulator
- **for infrared thermometers:** a heat source (panel) at controlled temperature

Few users can afford this investment in time and materials for checking their thermometers' accuracy. HANNA's exclusive CAL CHECK™ is a quick and cost effective way to verify accuracy.

CAL CHECK™ Feature

As previously described, the electronic components of an instrument shift with time. HANNA has made it possible for users, with the simple touch of a button, to verify whether the response of the instrument is within the tolerance limit of ±0.02°C.

The CAL CHECK™ system acts by substituting the sensor with an internal resistor, which corresponds to 0°C, and thus simulating the response that the temperature probe would have at 0°C.

Standardization

HANNA has designed a series of pre-calibrated temperature probes with a maximum error of 2°C for trouble free replacement.

Thermocouple Thermometer Calibration

Although quite fast, thermocouple thermometers read with a response time much slower than other sensors and technologies. Unfortunately, the measurement of the thermocouple emf (electromotive force) loses accuracy because of the measuring system itself, based on the emf generated by the temperature difference between cold and hot junctions. The same emf may be generated under different conditions:

- **Hot junction at 100°C; cold junction at 20°C; difference: 80°C or:**
- **Hot junction at 90°C; cold junction at 10°C; difference: 80°C**

A temperature difference of 80°C is obtained with two different temperatures of the sample. It is, therefore, very important to determine the cold junction temperature very precisely. The ability to do this has a large effect on the accuracy of the measuring system. A thermocouple thermometer is made of two thermometers, one that measures the cold junction, and one for measuring the emf generated by the thermocouple. The cold junction is usually measured with an NTC type sensor, which has response times different from those of the thermocouple. Another crucial point is measuring the actual value of the cold junction, without any environmental influence and dispersions.

To partially solve this problem, HANNA has devised the calibration of the instrument-thermocouple system, by dipping the probe in melting ice, and thus allowing the user to calibrate the measuring system at 0°C.

Thanks to this solution, it is now possible to use thermocouple thermometers for HACCP controls with an accuracy of ±0.3°C, which is the same performance of our Pt100 or NTC thermometers, but with a higher response time.

Calibration Test Keys

To check the calibration status of the instrument, calibrated keys have been prepared in the range from -18°C to 70°C. These keys reproduce the value of the sensor at different temperatures. Simply disconnect the measuring probe, replace it with the key and make sure that the instrument reads the simulated value.

Thermometers

Introduction

HANNA calibrates all thermometers with a standard probe. All NTC temperature probes are inspected and calibrated with standard instruments. During quality inspection our technicians make sure that the reading errors are within the stated accuracies.

In addition, HANNA provides users with the necessary tools to verify that your thermometers read accurate values.

Our complete line of electronic thermometers provides fast and precise measurements down to a tenth of a degree Celsius.

HANNA thermometers may be divided into four main categories: thermistor thermometers, thermocouple thermometers, Pt100 thermometers and infrared thermometers.

Thermistor Thermometers

The thermistor is a semi-conductor device whose resistivity (r) varies as a function of temperature (T)

$$r = ro\ (1 + aT)$$

where

ro = characteristic resistivity of material

a = temperature resistance coefficient of material

The temperature resistance coefficient is the parameter that determines if the resistivity variation is positive (as with the Positive Temperature Coefficient sensors) or negative (as with the Negative Temperature Coefficient thermistors). It is possible to determine the temperature by applying a potential difference and measuring the resistance.

Thermistor sensors are suitable for a temperature range of -50 to 150°C (-58 to 302°F). Higher temperatures may damage the semi-conductor sensor. Accurate temperature measurements are possible (tenths of degree) due to the high sensitivity of the sensor.

Thermocouple Thermometers

The thermocouple consists of the junction of two wires of different metals. At a given temperature, a potential difference results at the opposite extremes of the two wires (Seebeck effect), with the respective variations linearly related within small intervals. It is therefore possible to determine the temperature given the potential difference and characteristics of the two metals. The measurement end of the thermocouple probe is called the hot junction, while the connection of the thermocouple to the meter is the cold junction. An error is introduced as the cold junction is exposed to the ambient temperature. This error can be eliminated by physically putting the cold junction into an ice bath and forcing a reference temperature of 0°C, or by electronically compensating for the cold junction temperature effect. There are various types of thermocouples, identified by an ANSI code using a letter of the alphabet. The K type is the most commonly used.

Pt100 Thermometers

The operating principle of resistance thermometers is based on the increase of electric resistance of metal conductors (RDT: Resistance Temperature Detectors) with temperature.

This physical phenomenon was discovered by Sir Humphry Davy in 1821. In 1871, Sir William Siemens described the application of this property using platinum, thereby introducing an innovation in the manufacturing of temperature sensors. Platinum resistance thermometers have been used as an international standard for measuring temperatures between hydrogen triple point at 13.81 K and the freezing point of antimony at 630.75°C (1167.26°F).

Among the various metals to be used in the construction of resistance thermometers, platinum, a noble metal, is the one that can measure temperatures throughout a wide range; from -251 (-419.8°F) to 899°C (1650.2°F), with a linear behavior.

Platinum RTD thermometers were common in the seventies but now they have been replaced with thermistor sensors because of their smaller dimensions and faster response to temperature changes. The most common RTD sensor, using platinum, is the Pt100, which means a resistance of 100Ω at 0°C with a temperature coefficient of 0.00385Ω per degree Celsius. For a higher price one can buy platinum sensors with 250, 500 or 1000Ω (Pt1000).

The main disadvantage of RTD probes is the resistance of the connection cable.

This resistance prevents the use of standard two-wire cables for lengths over a few meters, since it affects the accuracy of the reading. For this reason, to obtain high levels of accuracy in industrial and laboratory applications, the use of a three or four-wire system is recommended.

For all its Pt100 thermometers and probes, HANNA has chosen the multiple-wire technology for higher accuracy.

Infrared Thermometers

All objects emit a radiant energy in the infrared (IR) spectrum that falls between visible light and radio waves.

The origins of IR measurements can be traced back to Sir Isaac Newton's prism and the separation of sunlight into colors and electromagnetic energy. In 1800, the relative energy of each color was measured but it was not until early 20th century that IR energy was quantified. It was then discovered that this energy is proportional to the 4th power of the object's temperature.

IR instrumentation using this formula has been around for over 50 years. They almost exclusively use an optic device that detects the heat energy generated by the object that the sensor is aimed at. This is then amplified, linearized and converted into an electronic signal which in turn shows the surface temperature in Celsius or Fahrenheit degrees.

Infrared measurements are particularly suitable for areas where it is difficult or undesirable to take surface measurements using conventional contact sensors. Applications for IR meters include non-destructive testing of foodstuffs, moving machinery, high temperature surfaces and hazardous areas, such as high voltage wires.

An ideal surface for IR measurements is a black body or radiator with an emissivity of 1.0. Emissivity is the ratio of the energy radiated by an object at a certain temperature to that emitted by a perfect radiator at the same temperature.

The shinier or more polished the surface, the less accurate the measurements. For example, the emissivity of most organic material and rough or painted surfaces is in the 0.95 region and hence, suitable for IR measurements.

On the other hand, surfaces of highly polished or shiny material, such as mirrors or aluminum, may not be appropriate for this application without using some form of filtration. This is due to other factors, namely, reflectivity and transmissivity. The former is a measure of an object's ability to reflect infrared energy while the latter is its ability to transmit it. Another important and practical concern is the field of view. Infrared meters measure the average temperature of all objects in their field of view. To obtain an accurate result, it is important that the object completely fills the instrument's field of view and there are no obstacles between the meter and the object. The distance-to-target ratio, or the optic coefficient, is therefore an important consideration.

Reference Temperatures

In 1990, NIST established 17 fixed points of the International Temperature Scale (ITS-90) related to reproducible physical phenomena in nature. The ITS-90 Fixed Points are shown in the chart below:

Equilibrium state	K	°C
Vapor pressure point of helium	3 to 5	-270.15 to -268.19
Triple point of hydrogen	13.8033*	-259.346*
Boiling point of hydrogen at a pressure of 33.330.6 Pa	17.042*	-256.108*
Boiling point of equilibrium hydrogen	20.28*	-252.87*
Triple point of neon	27.102	-246.048
Triple point of oxygen	54.361	-218.789
Triple point of argon	83.8058	-189.3442
Triple point of mercury	234.3156	-38.8344
Triple point of water	273.16	0.01
Triple point of gallium	302.9146	29.7646
Melting point of indium	429.7485	156.5985
Melting point of tin	505.078	231.928
Melting point of zinc	692.677	419.527
Melting point of aluminum	933.473	660.323
Melting point of silver	1234.93	961.78
Melting point of gold	1337.33	1064.18
Melting point of copper	1357.77	1084.62

* Given for e-H2 , which is hydrogen at the equilibrium concentration of the ort and para molecular forms.

Product Spotlights

HI 935007N • HI 935007NS

K-Type Thermocouple Thermometer with Direct Measurement Probe

14.26

HI 935007N and HI 935007NS extends the range of portable HANNA thermometers by measuring temperatures as high as 900°C. Their attractive price point makes it possible for every operator to carry his or her own professional instrument.

The fixed HI 766C penetration probe with 1 m (3.3') flexible cable is also supplied with the instrument. Advanced battery management features include a display of remaining battery power at startup, low battery warning and BEPS battery error prevention system.

HI 93510 • HI 93510N

Thermistor Thermometer

14.30

HI 93510 is a high performance, waterproof thermometer tailor made for lab and field use. The LCD displays the highest and lowest readings in the cycle along with the current temperature. To freeze the reading for easy recording, simply press the HOLD button. Celsius or Fahrenheit range can be selected at the touch of a button. Battery level is shown at startup and a low battery warning with BEPS assures long periods of trouble free use.

The HI 93510N offers all the features of the HI 93510 plus a CAL button to allow the operator to calibrate the meter and probe in an ice bath at 0°C. This will assure the removal of the combined meter and probe interchange error. In addition to calibration capabilities, HI 93510N has a user-activated backlit display.

HI 93501N • HI 93501NS

Thermistor Thermometer for the Food Industry

14.28

HI 93501N is a waterproof thermometer designed to be used daily in food applications such as industrial kitchens and catering. The "S" version also adds a stability indicator bargraph and HOLD button to freeze readings on the LCD.

The HI 762PWL penetration probe is included. The probe can be replaced with a vast assortment of HI 762 probes at your disposal for specific applications.

The display indicates the remaining battery power at startup then continuously checks the battery level and warns the user with ample time to change the battery. When low battery power may affect your results, the meter will shut down and ensure that accuracy is not compromised.

GUIDE	K-type	K,J,T - type	Range	CAL Button	Calibration Check™	PC Compatibility	BEPS	HOLD Feature	Waterproof	Autoranging	Logging	Alarm	Interchangeable Probe	Multiple Channels	Backlit LCD	Stability Bargraph	Page
Thermocouple Thermometers																	
HI 935005	•		°C/°F				•	•	•				•				14.8
HI 935005N	•		°C/°F	•			•	•	•				•		•		14.8
HI 935002	•		°C/°F				•		•				•	•			14.9
HI 935009	•		°C/°F	•			•		•				•	•	•		14.9
HI 93531	•		°C/°F				•	•	•				•				14.10
HI 93531N	•		°C/°F	•			•	•	•				•		•		14.10
HI 93531R	•		°C/°F	•		•	•	•	•				•		•		14.10
HI 93532	•		°C/°F				•	•	•				•	•			14.11
HI 93532N	•		°C/°F	•			•	•	•				•	•	•		14.11
HI 93532R	•		°C/°F	•		•	•	•	•				•	•	•		14.11
HI 93530	•		°C/°F				•	•					•				14.12
HI 93530N	•		°C/°F	•			•	•					•		•		14.12
HI 9063	•		°C/°F					•		•			•				14.13
HI 9063C	•		°C/°F					•		•			•				14.13
HI 93551		•	°C/°F				•	•	•				•				14.14
HI 93551N		•	°C/°F	•			•	•	•				•		•		14.14
HI 93551R		•	°C/°F	•		•	•	•	•				•		•		14.14
HI 93542		•	°C/°F				•	•	•				•	•			14.15
HI 93552		•	°C/°F	•			•	•	•				•	•	•		14.15
HI 93552R		•	°C/°F	•		•	•	•	•				•	•	•		14.15
HI 935007N	•		°C		•		•		•								14.26
HI 935007NS	•		°C		•		•	•	•							•	14.26
Thermistor Thermometers																	
HI 9241			°C		•		•		•				•				14.27
HI 93501N			°C		•		•		•				•				14.28
HI 93501NS			°C		•		•	•	•				•			•	14.28
HI 93503			°C		•		•	•	•				•			•	14.29
HI 93510			°C/°F				•	•	•				•				14.30
HI 93510N			°C/°F	•			•	•	•				•		•		14.30
HI 93512			°C/°F				•	•	•				•	•			14.31
HI 93522			°C/°F	•			•	•	•				•	•	•		14.31
Pt100 Thermometers																	
HI 955501			°C										•				14.38
HI 955502			°C														14.38
Infrared Thermometers																	
HI 99551			°C/°F					•									14.40
HI 99556			°C/°F					•									14.40
HI 99550-00			°C					•									14.41
HI 99550-01			°F					•									14.41
Temperature Dataloggers																	
HI 141			°C/°F			•			•		•	•		•			14.42
HI 140			°C/°F			•	•		•		•	•					14.44
HI 142 / HI 504903			°C/°F			•	•		•		•						14.45
HI 143			°C/°F			•			•		•	•					14.46

HI 935005 • HI 935005N

K-Type Thermocouple Thermometers

- **High accuracy ±0.2%**
- **Waterproof casing**
- **High/Low function**
- **Instantly °C to °F shifting**
- **HOLD function**
- **BEPS and low battery warning**
- **Battery life indicator at start-up**
- **Up to 1600 battery life**
- **Backlit display (N version)**
- **One point temperature calibration (N version)**

HI 935005 series are waterproof, K-type thermometers offering accurate temperature measurements in a wide range as well as a 1600 hours of battery life.

These units display current temperature along with the minimum and maximum values achieved during the measuring session on the LCD.

The HOLD button freezes the display to allow the user time to record readings. The °C/°F button switches between the Celsius and Fahrenheit temperature scale. The CLEAR button restarts the evaluation of high and low values.

HI 935005N features a user-activated backlight for low or no light conditions. A CAL button to allow the operator a simple one point calibration in an ice bath at 0°C when probe interchange occurs.

The instruments are equipped with BEPS (Battery Error Prevention System) which alerts the user in the event that low battery power could adversely affect readings.

A wide variety of interchangeable probes are available to meet your specific needs. Optional rubber boots are available.

ORDERING INFORMATION

HI 935005 and **HI 935005N** are supplied with batteries, protective case and instructions

PROBES

HI 766C	Penetration, stainless steel K-type thermocouple temperature probe with 1 m cable
HI 766D	Air/gas, stainless steel K-type thermocouple temperature probe with 1 m (3.3') cable
HI 766E1	General purpose/penetration, stainless steel K-type thermocouple temperature probe with 1 m (3.3') cable

ACCESSORIES

HI 710007	Shockproof rubber boot, blue
HI 710008	Shockproof rubber boot, orange

SPECIFICATIONS	HI 935005	HI 935005N
Range	-50.0 to 199.9°C and 200 to 1350°C; -58.0 to 399.9°F and 400 to 2462°F	
Resolution	0.1°C (-50.0 to 199.9°C) and 1°C (outside); 0.1°F (-58.0 to 399.9°F) and 1°F (outside)	
Accuracy	±0.2% f.s. (for 1 year, excluding probe error)	
Probe	HI 766 series K-type thermocouple (not included)	
CAL Button	N/A	yes
Backlit LCD	N/A	yes
Battery Type / Life	1.5V AA (3) / approximately 1600 hours of continuous use (with backlight off); HI 935005 only: auto-off selectable after 8 or 60 minutes of non-use (can be disabled)	
Environment	-10 to 50°C (14 to 122°F); RH max 100%	
Dimensions	150 x 80 x 36 mm (5.9 x 3.1 x 1.4")	
Weight	235 g (8.3 oz.)	

A wide variety of probes are available, see the end of this Thermocouple Thermometer Section.

2-channel, K-Type Thermocouple Thermometers

- **Dual input channels**
- **One point calibration (HI 935009)**
- **High accuracy ±0.2%**
- **Waterproof casing**
- **High/Low function**
- **°C to °F shifting**
- **HOLD function**
- **BEPS and low battery warning**
- **Battery life indicator at start-up**
- **Backlit display (HI 935009)**
- **Up to 1600 battery life**
- **Reading storage**

HI 935002 and HI 935009 are 2-channel, waterproof, K-type thermometers that offer accurate temperature measurements in a wide range as well as a 1600 hours of battery life.

These units display current temperature along with the minimum and maximum for each channel achieved during the measuring session. The difference between each channel can be shown, or a relative value can be set on each channel and variances around that value can be monitored.

The HOLD button freezes the display to allow the user time to record readings.

HI 935009 features a user-activated backlight for low or no light conditions. The CAL button allows the operator a simple one point calibration in an ice bath at 0°C when probe interchange occurs.

The instruments are equipped with BEPS (Battery Error Prevention System) which alerts the user in the event that low battery power could adversely affect readings.

SPECIFICATIONS	HI 935002	HI 935009
Range	-50.0 to 199.9°C and 200 to 1350°C; -58.0 to 399.9°F and 400 to 2462°F	
Resolution	0.1°C (-50.0 to 199.9°C) and 1°C (outside); 0.1°F (-58.0 to 399.9°F) and 1°F (outside)	
Accuracy	±0.2% f.s. (for 1 year, excluding probe error)	
Probe	HI 766 series K-type thermocouple (not included)	
CAL Button	N/A	yes
Backlit LCD	N/A	yes
Battery Type / Life	1.5V AA (3) / approx. 1600 hours of continuous use (with backlight off); HI 935009 only: auto-off selectable after 8 or 60 minutes of non-use (can be disabled)	
Environment	-10 to 50°C (14 to 122°F); RH max 100%	
Dimensions	150 x 80 x 36 mm (5.9 x 3.1 x 1.4")	
Weight	235 g (8.3 oz.)	

K-type thermocouple probes should be ordered separately to meet your specific application.

ORDERING INFORMATION

HI 935002 and **HI 935009** are supplied with batteries and instructions.

PROBES

HI 766C	Penetration, stainless steel K-type thermocouple temperature probe with 1 m cable
HI 766D	Air/gas, stainless steel K-type thermocouple temperature probe with 1 m (3.3') cable
HI 766E1	General purpose/penetration, stainless steel K-type thermocouple temperature probe with 1 m (3.3') cable

ACCESSORIES

HI 710007	Shockproof rubber boot, blue
HI 710008	Shockproof rubber boot, orange

A wide variety of probes are available, see the end of this Thermocouple Thermometer Section.

HI 93531 • HI 93531N • HI 93531R

0.1° Resolution K-Type Thermocouple Thermometers

- **High accuracy ±0.2%**
- **One point calibration (N and R versions)**
- **Waterproof casing**
- **High/Low function**
- **°C to °F shifting**
- **HOLD function**
- **BEPS and low battery warning**
- **Battery life indicator at start-up**
- **Auto-off capability**
- **Backlit display (N and R versions)**
- **Reading storage**
- **PC and printer compatible (R version)**

These waterproof thermometers feature 0.1° resolution in the -149.9 to 999.9°C (-24.9 to 999.9°F) range, making them ideal for precise temperature measurements. These instruments display the current temperature along with the minimum and maximum extremes achieved.

The HOLD button freezes the display to allow the user time to record readings. The °C/°F button switches between the Celsius and Fahrenheit temperature scale. The CLEAR button restarts the evaluation of high and low values.

HI 93531N and HI 93531R feature a user-activated backlight for low or no light conditions. The CAL button allows a simple one point calibration in an ice bath at 0°C when probe interchange occurs. HI 93531R adds RS232 output that allows for data transfer to a PC or printer.

The instruments are equipped with BEPS (Battery Error Prevention System) which alerts the user in the event that low battery power could adversely affect readings.

ORDERING INFORMATION

HI 93531, **HI 93531N** and, **HI 93531R** are supplied with batteries and instructions.

PROBES

HI 766C	Penetration, stainless steel K-type thermocouple temperature probe with 1 m cable
HI 766D	Air/gas, stainless steel K-type thermocouple temperature probe with 1 m (3.3') cable
HI 766E1	General purpose/penetration, stainless steel K-type thermocouple temperature probe with 1 m (3.3') cable

ACCESSORIES

HI 710007	Shockproof rubber boot, blue
HI 710008	Shockproof rubber boot, orange
HI 92000	Windows® compatible software
HI 920011	Serial cable for PC connection

SPECIFICATIONS	HI 93531	HI 93531N	HI 93531R
Range	-200.0 to 999.9°C; 1000 to 1371°C -328.0 to 999.9°F; 1000 to 2500°F		
Resolution	0.1°C (-149.9 to 999.9°C); 0.2°C (-200.0 to -150.0°C); 1°C (outside) 0.1°F (-24.9 to 999.9°F); 0.2°F (-249.9 to -25.0°F); 0.3°F (-328.0 to -250.0°F); 1°F (outside)		
Accuracy	±0.5°C (-100.0 to 999.9°C); ±1°C (outside); ±1°F (-148.0 to 999.9°F); ±1.5°F (outside) (for 1 year, excluding probe error)		
Probe	HI 766 series K-type thermocouple (not included)		
CAL Button	N/A	yes	yes
Backlit LCD	N/A	yes	yes
RS232	N/A	N/A	yes
Battery Type / Life	1.5V AA (3) / approximately 500 hours of continuous use (with backlight off); auto-off after 60 minutes of non-use (can be disabled)		
Environment	-10 to 50°C (14 to 122°F); RH max 100%		
Dimensions	150 x 80 x 36 mm (5.9 x 3.1 x 1.4")		
Weight	235 g (8.3 oz.)		

K-type thermocouple probes should be ordered separately to meet your specific application.

A wide variety of probes are available, see the end of this Thermocouple Thermometer Section.

HANNA® instruments

With Great Products, Come Great Results™

Dual-input, K-Type Thermocouple Thermometers

- **Dual input**
- **High accuracy ±0.2%**
- **Waterproof casing**
- **High/Low function**
- **°C to °F shifting**
- **HOLD function**
- **BEPS and low battery warning**
- **Battery life indicator at start-up**
- **Auto-off capability**
- **Backlit display (N and R versions)**
- **One point calibration (N and R versions)**
- **PC and printer compatible (R version)**

Conditions often require the measurement of two samples at the same time. The HI 93532 series feature two built in channels for two K-type probe connectors.

These thermometers display current temperature along with the high and low values in either channel. You can also see the difference between the two channels simultaneously with the high and low of the difference.

The HOLD button freezes the display to allow the user time to record readings.

The HI 93532N, HI 93532R feature a user-activated backlight for low or no light conditions. The CAL button allows the operator to perform a simple one point calibration in an ice bath at 0°C when probe interchange occurs.

HI 93532R adds RS232 output that allows for data transfer to a PC or printer.

The instruments are equipped with BEPS (Battery Error Prevention System) which alerts the user in the event that low battery power could adversely affect readings.

SPECIFICATIONS	HI 93532	HI 93532N	HI 93532R
Range	-200.0 to 999.9°C; 1000 to 1371°C; -328.0 to 999.9°F; 1000 to 2500°F		
Resolution	0.1°C (-149.9 to 999.9°C); 0.2°C (-200.0 to -150.0°C); 1°C (outside) 0.1°F (-24.9 to 999.9°F); 0.2°F (-249.9 to -25.0°F); 0.3°F (-328.0 to -250.0°F); 1°F (outside)		
Accuracy	±0.5°C (-100.0 to 999.9°C); ±1°C (outside); ±1°F (-148.0 to 999.9°F); ±1.5°F (outside) (for 1 year, excluding probe error)		
Probe	HI 766 series K-type thermocouple (not included)		
CAL Button	N/A	yes	yes
Backlit LCD	N/A	yes	yes
RS232	N/A	N/A	yes
Battery Type / Life	1.5V AA (3) / approximately 500 hours of continuous use (with backlight off); auto-off after 60 minutes of non-use (can be disabled)		
Environment	-10 to 50°C (14 to 122°F); RH max 100%		
Dimensions	150 x 80 x 36 mm (5.9 x 3.1 x 1.4")		
Weight	235 g (8.3 oz.)		

K-type thermocouple probes should be ordered separately to meet your specific application.

ORDERING INFORMATION

HI 93532, **HI 93532N** and **HI 93532R** are supplied with batteries and instructions.

PROBES

HI 766C	Penetration, stainless steel K-type thermocouple temperature probe with 1 m cable
HI 766D	Air/gas, stainless steel K-type thermocouple temperature probe with 1 m (3.3') cable
HI 766E1	General purpose/penetration, stainless steel K-type thermocouple temperature probe with 1 m (3.3') cable

ACCESSORIES

HI 710007	Shockproof rubber boot, blue
HI 710008	Shockproof rubber boot, orange
HI 92000	Windows® compatible software
HI 920011	Serial cable for PC connection

A wide variety of probes are available, see the end of this Thermocouple Thermometer Section.

HI 93530 • HI 93530N

0.1° Resolution K-Type Thermocouple Thermometers

- **Immediate °C to °F shifting**
- **High resolution**
- **Waterproof casing**
- **HOLD function**
- **BEPS and low battery warning**
- **Battery life indicator at start-up**
- **One point calibration (N version)**
- **Backlit display (N version)**

HI 93530 and HI 93530N are waterproof thermometers that can read with a resolution of 0.1 in the -149.9 to 999.9°C (-24.9 to 999.9°F) range.

The HOLD button freezes the display to allow the user time to record readings. The °C/°F button switches between the Celsius and Fahrenheit temperature scale.

For high accuracy, HI 93530N features a CAL button to allow the operator a simple one point calibration in an ice bath at 0°C when probe interchange occurs.

HI 93530N also incorporates a user-activated backlight for low or no light conditions.

Remaining battery power is displayed at start-up and these Instruments are equipped with BEPS (Battery Error Prevention System) which alerts the user in the event that low battery power could adversely affect readings.

Several interchangeable probes are available to meet your specific needs. Optional rubber boots are also available.

ORDERING INFORMATION

HI 93530 and **HI 93530N** are supplied with batteries and instructions.

PROBES

HI 766C	Penetration, stainless steel K-type thermocouple temperature probe with 1 m cable
HI 766D	Air/gas, stainless steel K-type thermocouple temperature probe with 1 m (3.3') cable
HI 766E1	General purpose/penetration, stainless steel K-type thermocouple temperature probe with 1 m (3.3') cable

ACCESSORIES

HI 710007	Shockproof rubber boot, blue
HI 710008	Shockproof rubber boot, orange
HI 710018	Spare protective case

SPECIFICATIONS	HI 93530	HI 93530N
Range	-200.0 to 999.9°C; 1000 to 1371°C; -328.0 to 999.9°F; 1000 to 2500°F	
Resolution	0.1°C (-149.9 to 999.9°C); 0.2°C (-200.0 to -150.0°C); 1°C (outside) 0.1°F (-24.9 to 999.9°F); 0.2°F (-249.9 to -25.0°F); 0.3°F (-328.0 to -250.0°F); 1°F (outside)	
Accuracy	±0.5°C (-100.0 to 999.9°C); ±1°C (outside); ±1°F (-148.0 to 999.9°F); ±1.5°F (outside) (for 1 year, excluding probe error)	
Probe	HI 766 K-type thermocouple (not included)	
CAL Button	N/A	yes
Backlit LCD	N/A	yes
Battery Type / Life	1.5V AA (3) / approximately 500 hours of continuous use (with backlight off); auto-off after 60 minutes of non-use (can be disabled)	
Environment	-10 to 50°C (14 to 122°F); RH max 100%	
Dimensions	150 x 80 x 36 mm (5.9 x 3.1 x 1.4")	
Weight	235 g (8.3 oz.)	

A wide variety of probes are available, see the end of this Thermocouple Thermometer Section.

Heavy-duty K-Type Thermocouple Thermometer

- **Auto ranging**
- **Enhanced accuracy**
- **Waterproof casing**
- **High/Low function**
- **°C to °F shifting**
- **HOLD function**
- **BEPS and low battery warning**
- **Battery life indicator at start-up**

HI 9063 K-type thermocouple thermometer features auto ranging, enhanced accuracy, and display current temperature along with the high and low extremes achieved during the measuring session on the LCD.

The HOLD button freezes the display to allow the user time to record readings. The °C/°F button switches between the Celsius and Fahrenheit temperature scale. The CLEAR button assigns the reading to high and low temperature values.

HI 9063 is equipped with BEPS (Battery Error Prevention System) which alerts the user in the event that low battery power could adversely affect readings.

SPECIFICATIONS	HI 9063
Range	-50.0 to 1350°C -58.0 to 2462°F
Resolution	0.1°C (up to 199.9°C); 1°C (outside) 0.1°F (up to 399.9°F); 1°F (outside)
Accuracy	±0.2% F.S. (for 1 year, excluding probe error)
Probe	HI 766 series K-type thermocouple
Battery Type / Life	1.5V AA (4) / approximately 2000 hours of continuous use
Environment	-10 to 50°C (14 to 122°F); RH max 100%
Dimensions	196 x 80 x 60 mm (7.7 x 3.1 x 2.4")
Weight	500 g (1.1 lbs.)

ORDERING INFORMATION

HI 9063 is supplied with batteries and instructions.
HI 9063C is supplied with HI 9063, HI 766HD probe handle, HI 766PE1, HI 766PB, HI 766PD probes, batteries, rugged carrying case and instructions.

PROBES

HI 766C Penetration, stainless steel K-type thermocouple temperature probe with 1 m cable
HI 766D Air/gas, stainless steel K-type thermocouple temperature probe with 1 m (3.3') cable
HI 766E1 General purpose/penetration, stainless steel K-type thermocouple temperature probe with 1 m (3.3') cable

ACCESSORIES

HI 710021 Spare protective case
HI 710141 Rugged carrying case

A wide variety of probes are available, see the end of this Thermocouple Thermometer Section.

HI 93551 • HI 93551N • HI 93551R

K, J, T-Type Thermocouple Thermometers

- Accepts K, J, T - thermocouples
- Waterproof casing
- High/Low function
- °C to °F shifting
- HOLD function
- BEPS and low battery warning
- Battery life indicator at start-up
- Auto-off capability
- One point calibration (N and R versions)
- Backlit display (R version)
- PC and printer compatible (R version)

These instruments offer the ability to take temperature measurements with different types of thermocouples and are equipped with a single button that switches between K-type, J-type or T-type thermocouples.

The HOLD button freezes the display to allow the user time to record readings. The CLEAR button restarts the evaluation of high and low values.

These thermometers display the current temperature along with the high and low extremes achieved during measurement.

For high accuracy, HI 93551N and HI 93551R feature a CAL button to allow the operator a simple one point calibration in an ice bath at 0°C when probe interchange occurs.

The instruments are equipped with BEPS (Battery Error Prevention System) which alerts the user in the event that low battery power could adversely affect readings.

HI 93551R adds RS232 output that allows for data transfer to a PC or printer.

ORDERING INFORMATION

HI 93551, **HI 93551N** and **HI 93551R** are supplied with batteries, instructions and protective case.

PROBES

HI 766C	Penetration, stainless steel K-type thermocouple temperature probe with 1 m cable
HI 766D	Air/gas, stainless steel K-type thermocouple temperature probe with 1 m (3.3') cable
HI 766E1	General purpose/penetration, stainless steel K-type thermocouple temperature probe with 1 m (3.3') cable

ACCESSORIES

HI 710007	Shockproof rubber boot, blue
HI 710008	Shockproof rubber boot, orange
HI 92000	Windows® compatible software
HI 920011	Serial cable for PC connection

SPECIFICATIONS		HI 93551	HI 93551N	HI 93551R
Range	K	-200.0 to 999.9°C and 1000 to 1371°C; -328.0 to 999.9°F and 1000 to 2500°F		
	J	-200.0 to 999.9°C; -328.0 to 999.9°F and 1000 to 1832°F		
	T	-200.0 to 400.0°C; -328.0 to 752.0°F		
Resolution	K	0.1°C (-149.9 to 999.9°C); 0.2°C (-200.0 to -150.0°C); 1°C (1000 to 1371°C); 0.1°F (-24.9 to 999.9°F); 0.2°F (-249.9 to -25.0°F); 0.3°F (-328.0 to -250.0°F); 1°F (1000 to 2500°F)		
	J	0.1°C (-200.0 to 999.9°C); 0.1°F (-149.9 to 999.9°F); 0.2°F (-328.0 to -150.0°F); 1°F (1000 to 1832°F)		
	T	0.1°C (-149.9 to 400.0°C); 0.2°C (-200.0 to -150.0°C); 0.1°F (0.0 to 752.0°F); 0.2°F(-270.0 to -0.1°F); 0.3°F (-328.0 to -270.1°F)		
Accuracy		±0.5°C (-100.0 to 999.9°C); ±1°C (outside); ±1°F (-148.0 to 999.9°F); ±1.5°F (outside) (for 1 year, excluding probe error)		
Probe		HI 766 series K-type thermocouple (not included)		
CAL Button		N/A	yes	yes
Backlit LCD		N/A	N/A	yes
RS232		N/A	N/A	yes
Battery Type / Life		1.5V AA (3) / approximately 500 hours of continuous use (with backlight off); auto-off after 60 minutes of non-use (can be disabled)		
Environment		-10 to 50°C (14 to 122°F); RH max 100%		
Dimensions / Weight		150 x 80 x 36 mm (5.9 x 3.1 x 1.4") / 235 g (8.3 oz.)		

A wide variety of probes are available, see the end of this Thermocouple Thermometer Section.

Dual-channel, K, J, T-Type Thermocouple Thermometers

- **Accepts K, J, T - thermocouples**
- **Waterproof casing**
- **High/Low function**
- **°C to °F shifting**
- **HOLD function**
- **BEPS and low battery warning**
- **Battery life indicator at start-up**
- **Auto-off capability**
- **One point calibration (HI 93552 and HI 93552R)**
- **Backlight display (HI 93552R)**
- **PC and printer compatible (HI 93552R)**

HI 93542 and HI 93552 are dual-channel waterproof K, J, and T-type thermocouple thermometers that can switch between thermocouple types at a touch of a button.

At any time, users can switch views to see all information on either channel, display current temperature or average along with the high and low values. Users can also see the difference between the two channels simultaneously along with the high and low of the difference.

The HOLD button freezes the display to allow the user time to record readings. The °C/°F button switches between the Celsius and Fahrenheit temperature scale. The CLEAR button restarts the evaluation of high and low values.

For high accuracy, HI 93552 and HI 93552R feature a CAL button to allow the operator a simple one point calibration in an ice bath at 0°C when probe interchange occurs.

HI 93552R adds RS232 output that allows for data transfer to a PC or printer.

The instruments are equipped with BEPS (Battery Error Prevention System) which alerts the user in the event that low battery power could adversely affect readings.

SPECIFICATIONS		HI 93542	HI 93552	HI 93552R
Range	K	-200.0 to 999.9°C and 1000 to 1371°C; -328.0 to 999.9°F and 1000 to 2500°F		
	J	-200.0 to 999.9°C; -328.0 to 999.9°F and 1000 to 1832°F		
	T	-200.0 to 400.0°C; -328.0 to 752.0°F		
Resolution	K	0.1°C (-149.9 to 999.9°C); 0.2°C (-200.0 to -150.0°C); 1°C (1000 to 1371°C); 0.1°F (-24.9 to 999.9°F); 0.2°F (-249.9 to -25.0°F); 0.3°F (-328.0 to -250.0°F); 1°F (1000 to 2500°F)		
	J	0.1°C (-200.0 to 999.9°C); 0.1°F (-149.9 to 999.9°F); 0.2°F (-328.0 to -150.0°F); 1°F (1000 to 1832°F)		
	T	0.1°C (-149.9 to 400.0°C); 0.2°C (-200.0 to -150.0°C); 0.1°F (0.0 to 752.0°F); 0.2°F(-270.0 to -0.1°F); 0.3°F (-328.0 to -270.1°F)		
Accuracy		±0.5°C (-100.0 to 999.9°C); ±1°C (outside); ±1°F (-148.0 to 999.9°F); ±1.5°F (outside) (for 1 year, excluding probe error)		
Probe		HI 766 series K-type thermocouple (not included)		
CAL Button		N/A	yes	yes
Backlit LCD		N/A	yes	yes
RS232		N/A	N/A	yes
Battery Type / Life		1.5V AA (3) / approximately 500 hours of continuous use (with backlight off); auto-off: after 60 minutes of non-use (HI 93542); selectable after 8 or 60 minutes of non-use (HI 93552) (can be disabled for all models)		
Environment		-10 to 50°C (14 to 122°F); RH max 100%		
Dimensions		150 x 80 x 36 mm (5.9 x 3.1 x 1.4")		
Weight		235 g (8.3 oz.)		

ORDERING INFORMATION

HI 93542, **HI 93552** and **HI 93552R** are supplied with batteries, instructions and protective case.

PROBES

HI 766C	Penetration, stainless steel K-type thermocouple temperature probe with 1 m cable
HI 766E1	General purpose/penetration, stainless steel K-type thermocouple temperature probe with 1 m (3.3') cable

ACCESSORIES

HI 710007	Shockproof rubber boot, blue
HI 710008	Shockproof rubber boot, orange
HI 92000	Windows® compatible software
HI 920011	Serial cable for PC connection

A wide variety of probes are available, see the end of this Thermocouple Thermometer Section.

HI 766

HI 766 K-Type Thermocouple Probes

HI 766Px Series, Probes with Detachable Handle

The HI 766Px series are K-type thermocouple temperature probes to be used with thermocouple thermometers. These probes are ideal for measuring samples at very high temperatures, such as in industrial applications.

All probes are made with stainless steel for long life and easy cleaning. The HI 766Px series includes a wide range of probes for measurement of liquids, air, gas, penetration in semisolids, as well as curved, planed or hard to reach surfaces. In addition, models are available with interchangeable or fixed handles for maximum versatility.

HI 766HD, Probe Interchangeable Handle

A rugged, PVC handle with a 1 meter (3.3') cable. It is provided with a female connector, which allows the connection of any HI 766Px probe.

HI 766EX, Extension Cable

Coiled cable which extends by 1 m (3.3') the probe cable, with two connectors at the two ends (1 male and 1 female).

HI 766PA, Roller Surface Probe

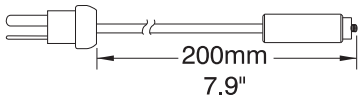
This probe is designed to measure the temperature of convex surfaces.

SPECIFICATIONS

CODE	APPLICATION	MAX TEMPERATURE	RESPONSE TIME (90% OF FINAL VALUE)	PROBE LENGTH	PROBE
HI 766PA	convex surfaces, moving rollers	320°C (600°F)	7 seconds	280 mm (11')	stainless steel

HI 766PB, Surface Probe

Temperature probe for measurements on surfaces.

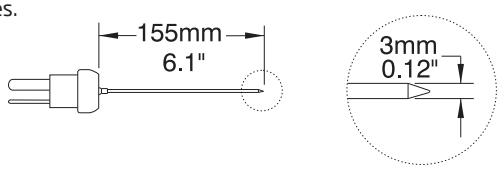


SPECIFICATIONS

CODE	APPLICATION	MAX TEMPERATURE	RESPONSE TIME (90% OF FINAL VALUE)	PROBE DIMENSIONS	PROBE
HI 766PB	hot solids, furnaces, molds	650°C (1200°F)	8 seconds	L 200 mm x dia 16 mm (7.9 x 0.6")	stainless steel

HI 766PC, Penetration Probe

K-type thermocouple probe with sharp tip for penetration of semi-solid samples.

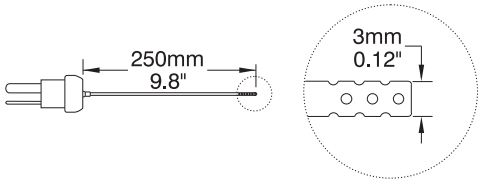


SPECIFICATIONS

CODE	APPLICATION	MAX TEMPERATURE	RESPONSE TIME (90% OF FINAL VALUE)	PROBE DIMENSIONS	PROBE
HI 766PC	semi-solids, meat, rubber	900°C (1650°F)	15 seconds	L 155 mm x dia 3 mm (6.1 x 0.12")	stainless steel

HI 766PD, Probe for Air and Gas

K-type thermocouple probe for measuring the temperature of air and gases.

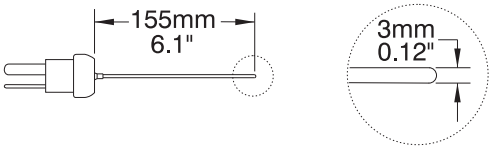


SPECIFICATIONS

CODE	APPLICATION	MAX TEMPERATURE	RESPONSE TIME (90% OF FINAL VALUE)	PROBE DIMENSIONS	PROBE
HI 766PD	air, gases	300°C (570°F)	20 seconds	L 250 mm x dia 3 mm (9.8 x 0.12")	stainless steel

HI 766PE1, General Purpose Probe

General purpose, penetration probe.

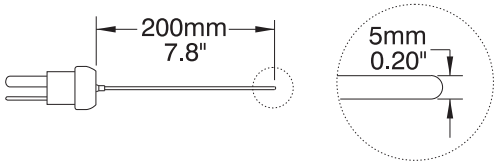


SPECIFICATIONS

CODE	APPLICATION	MAX TEMPERATURE	RESPONSE TIME (90% OF FINAL VALUE)	PROBE DIMENSIONS	PROBE
HI 766PE1	liquids, air, gases	900°C (1650°F)	6 seconds	L 155 mm x dia 3 mm (6.1 x 0.12")	stainless steel

HI 766PE2, General Purpose Probe

General purpose, penetration probe.



SPECIFICATIONS

CODE	APPLICATION	MAX TEMPERATURE	RESPONSE TIME (90% OF FINAL VALUE)	PROBE DIMENSIONS	PROBE
HI 766PE2	liquids, air, gases	900°C (1650°F)	6 seconds	L 200 mm x dia 5 mm (7.8 x 0.2")	stainless steel

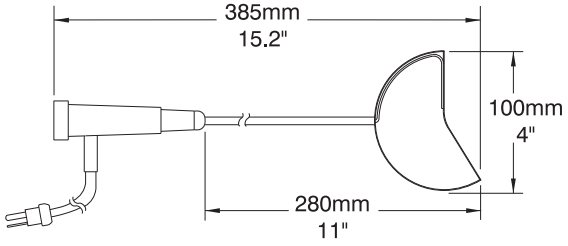
HI 766

HI 766 K-Type Thermocouple Probes with Handle

HI 766A, Roller Surface Probe

This probe is designed to measure the temperature of convex surfaces.

1 m (3.3') Cable
Mini Connector



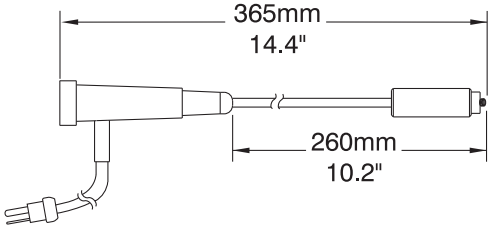
SPECIFICATIONS

CODE	APPLICATION	MAX TEMPERATURE	RESPONSE TIME (90% OF FINAL VALUE)	PROBE DIMENSIONS	PROBE
HI 766A	convex surfaces, moving rollers	320°C (600°F)	7 seconds	280 mm (11') (probe length)	stainless steel

HI 766B, Surface Probe

Temperature probe for measurements on surfaces.

1 m (3.3') Cable
Mini Connector



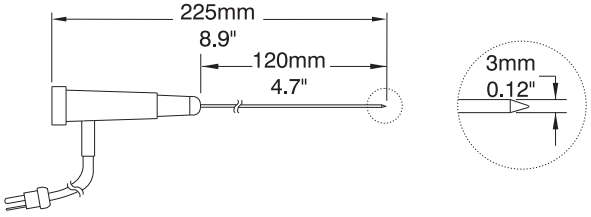
SPECIFICATIONS

CODE	APPLICATION	MAX TEMPERATURE	RESPONSE TIME (90% OF FINAL VALUE)	PROBE DIMENSIONS	PROBE
HI 766B	hot solids, furnaces, molds	650°C (1200°F)	8 seconds	L 200 mm x dia 16 mm (7.9 x 0.6")	stainless steel

HI 766C, Penetration Probe

K-type thermocouple probe with sharp tip for penetration of semi-solid samples.

1 m (3.3') Cable
Mini Connector

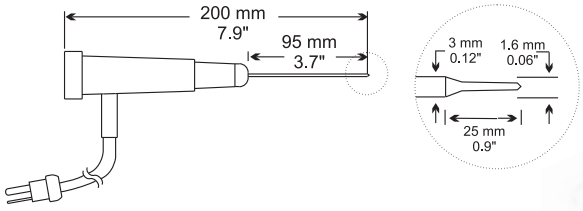


SPECIFICATIONS

CODE	APPLICATION	MAX TEMPERATURE	RESPONSE TIME (90% OF FINAL VALUE)	PROBE DIMENSIONS	PROBE	CABLE COLOR
HI 766C	semi-solids, meat, rubber	900°C (1650°F)	15 seconds	L 155 mm x dia 3 mm (6.1 x 0.12")	stainless steel	green
HI 766CL	semi-solids, meat, rubber	900°C (1650°F)	15 seconds	L 310 mm x dia 5 mm (12.2 x 0.19")	stainless steel	green
HI 766CA	semi-solids, meat, rubber	900°C (1650°F)	15 seconds	L 155 mm x dia 3 mm (6.1 x 0.12")	stainless steel	green, no connector

HI 766C1, Ultra-Fast Penetration Probe

Penetration probe with fast response time



1 m (3.3') Cable
Mini Connector

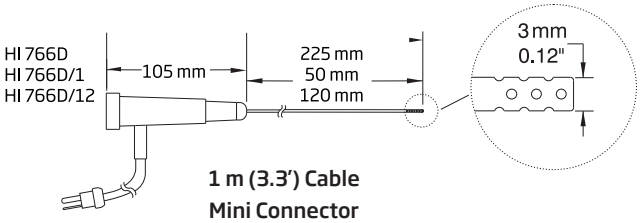
HI 766CAR

SPECIFICATIONS

CODE	APPLICATION	MAX TEMPERATURE	RESPONSE TIME (90% OF FINAL VALUE)	PROBE DIMENSIONS	PROBE	CABLE COLOR
HI 766C1	semi-solids, food	300°C (570°F)	4 seconds	L 95 mm x dia 1.6 mm (3.7 x 0.06")	stainless steel	green
HI 766C1/G	semi-solids, food	300°C (570°F)	4 seconds	L 95 mm x dia 1.6 mm (3.7 x 0.06")	stainless steel	yellow
HI 766CAR	rubber, car tires	300°C (570°F)	4 seconds	L 10 mm x dia 1.6 mm (.39 x 0.06")	stainless steel	black

HI 766D and HI 766D/12, Probes for Air and Gas

K-type thermocouple probe for measuring the temperature of air and gases.



1 m (3.3') Cable
Mini Connector

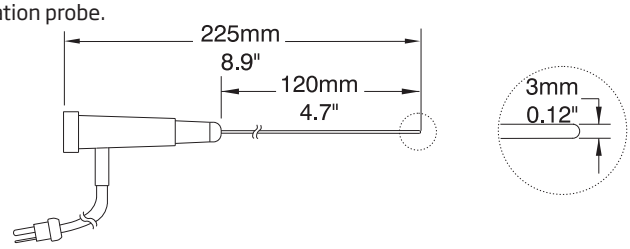
SPECIFICATIONS

CODE	APPLICATION	MAX TEMPERATURE	RESPONSE TIME (90% OF FINAL VALUE)	PROBE DIMENSIONS	PROBE	CABLE COLOR
HI 766D	air, gases	300°C (570°F)	20 seconds	L 245 mm x dia 3 mm (9.6 x 0.12")	stainless steel	green
HI 766D/1	air, gases	300°C (570°F)	20 seconds	L 50 mm x dia 3 mm (9.6 x 0.12")	stainless steel	green
HI 766D/12	air, gases	300°C (570°F)	20 seconds	L 120 mm x dia 3 mm (4.7 x 0.12")	stainless steel	green

HI 766E1, General Purpose Probe

General purpose, penetration probe.

1 m (3.3') Cable
Mini Connector



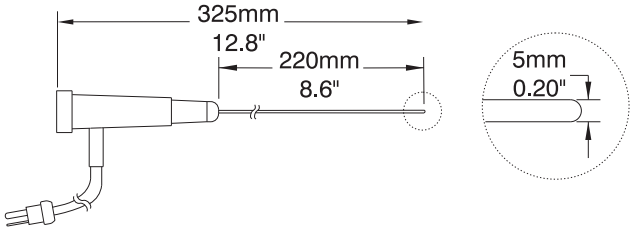
SPECIFICATIONS

CODE	APPLICATION	MAX TEMPERATURE	RESPONSE TIME (90% OF FINAL VALUE)	PROBE DIMENSIONS	PROBE	CABLE LENGTH
HI 766E1	liquids, air, gases	900°C (1650°F)	6 seconds	L 120 mm x dia 3 mm (4.7 x 0.12")	stainless steel	1 m (3.3')

HI 766E2, General Purpose Probe

General purpose, penetration probe

1 m (3.3') Cable
Mini Connector

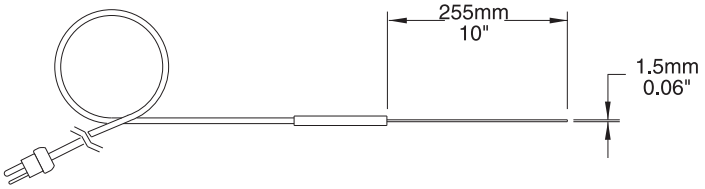


SPECIFICATIONS

CODE	APPLICATION	MAX TEMPERATURE	RESPONSE TIME (90% OF FINAL VALUE)	PROBE DIMENSIONS	PROBE	CABLE LENGTH
HI 766E2	liquids, air, gases	900°C (1650°F)	6 seconds	L 220 mm x dia 5 mm (8.5 x 0.2")	stainless steel	1 m (3.3')
HI 766E2/20	liquids, air, gases	900°C (1650°F)	6 seconds	L 220 mm x dia 5 mm (8.5 x 0.2")	stainless steel	20 m (66')
HI 766E2A	liquids, air, gases	900°C (1650°F)	6 seconds	L 220 mm x dia 5 mm (8.5 x 0.2")	stainless steel	1 m (3.3'), no connector

HI 766F, High Temperature Probe

Probe with flexible sheath without handle, designed to measure high temperatures.



SPECIFICATIONS

CODE	APPLICATION	MAX TEMPERATURE	RESPONSE TIME (90% OF FINAL VALUE)	PROBE DIMENSIONS	PROBE	CABLE LENGTH
HI 766F	high temperature	1100°C (2000°F)	4 seconds	L 255 mm x dia 1.5 mm (10 x 0.06")	AISI 316 stainless steel	1 m (3.3')
HI 766F/3	high temperature	1100°C (2000°F)	4 seconds	L 255 mm x dia 1.5 mm (10 x 0.06")	AISI 316 stainless steel	3 m (9.9')

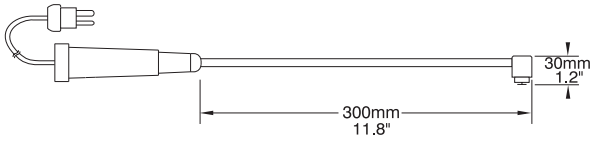
HI 766 K-Type Thermocouple Probes for Specific Applications

The following probes are designed to ensure optimal contact with surfaces of different shapes and dimensions.

When using these probes, the handle temperature must never exceed 150°C (302°F), to avoid possible damage to the probe.

HI 766B1, 90° Angle Surface Probe

Probe for measuring the temperature of 90° angle surfaces.

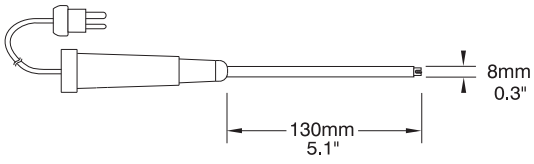


SPECIFICATIONS

CODE	APPLICATION	MAX TEMPERATURE	RESPONSE TIME (90% OF FINAL VALUE)	PROBE DIMENSIONS	PROBE	SENSOR
HI 766B1	hard to reach surfaces	450°C (840°F)	8 seconds	L 300 mm x dia 30 mm (11.8 x 1.2")	stainless steel	spring-loaded

HI 766B2, Surface Probe

Probe for measuring the temperature of round surfaces.

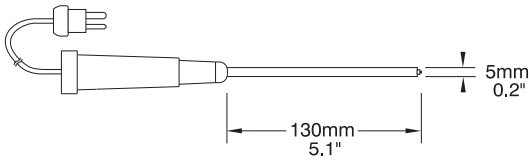


SPECIFICATIONS

CODE	APPLICATION	MAX TEMPERATURE	RESPONSE TIME (90% OF FINAL VALUE)	PROBE DIMENSIONS	PROBE	SENSOR
HI 766B2	solids, furnaces, molds	900°C (1650°F)	3 seconds	L 130 mm x dia 8 mm (5.1 x 0.3")	stainless steel	spring-loaded

HI 766B3, Small Surface Probe

Probe for measuring the temperature of small surfaces.

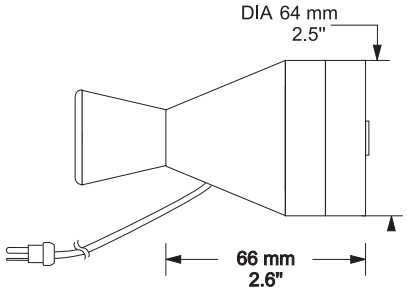


SPECIFICATIONS

CODE	APPLICATION	MAX TEMPERATURE	RESPONSE TIME (90% OF FINAL VALUE)	PROBE DIMENSIONS	PROBE	SENSOR
HI 766B3	small surfaces	200°C (390°F)	6 seconds	L 130 mm x dia 5 mm (5.1 x 0.2")	stainless steel, insulated tube	spring-loaded

HI 766B4, Grill Surface Probe with Jacketed Cable

Probe for measuring the temperature of hot grill surfaces.

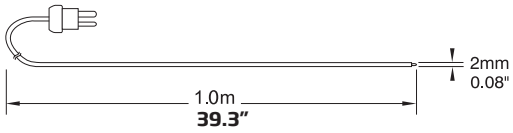


SPECIFICATIONS

CODE	APPLICATION	MAX TEMPERATURE	RESPONSE TIME (63.2% F.S.)	PROBE DIMENSIONS	SENSOR	WIRE LENGTH
HI 766B4	hot grills for food cooking	250°C (482°F)	6 seconds	L 66 mm x dia 64 mm (2.6 x 2.5")	PTFE contact surface with replaceable stainless steel sensor (HI 7664B4S)	70 cm (27.6") length, protected with stainless steel jacket

HI 766F1, Wire Temperature Probe

Wire probe, designed to access hard to reach places. Probe does not incorporate a handle.

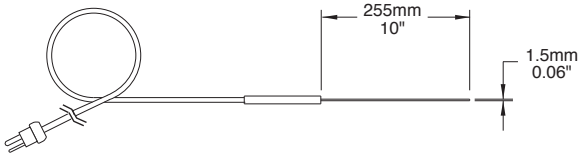


SPECIFICATIONS

CODE	APPLICATION	MAX TEMPERATURE	RESPONSE TIME (63.2% F.S.)	PROBE DIMENSIONS	SENSOR	WIRE LENGTH
HI 766F1	hard to reach areas	480°C (900°F)	1 second	dia 2 mm (0.08")	exposed wires	1 m (3.3')
HI 766F1/3	hard to reach areas	480°C (900°F)	1 second	dia 2 mm (0.08")	exposed wires	3 m (9.9')
HI 766F1/5	hard to reach areas	480°C (900°F)	1 second	dia 2 mm (0.08")	exposed wires	5 m (16.4')
HI 766F1/50	hard to reach areas	480°C (900°F)	1 second	dia 2 mm (0.08")	exposed wires	50 m (164')

HI 766Z, Wire Temperature Probe

Wire probe, designed to measure temperature inside ovens.

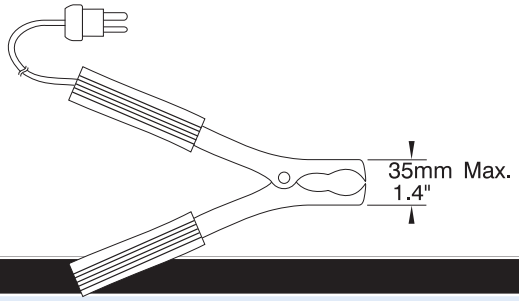


SPECIFICATIONS

CODE	APPLICATION	MAX TEMPERATURE	RESPONSE TIME (90% OF FINAL VALUE)	PROBE DIMENSIONS	SENSOR	CABLE LENGTH
HI 766Z	ovens	1100°C (2000°F)	4 seconds	L 255 mm x dia 1.5 mm (10 x 0.06")	stainless steel	1.7 m (5.6')
HI 766Z/3	ovens	1100°C (2000°F)	4 seconds	L 255 mm x dia 1.5 mm (10 x 0.06")	stainless steel	3 m (9.9')
HI 766Z/5	ovens	1100°C (2000°F)	4 seconds	L 255 mm x dia 1.5 mm (10 x 0.06")	stainless steel	5 m (16.4')
HI 766Z/7	ovens	1100°C (2000°F)	4 seconds	L 255 mm x dia 1.5 mm (10 x 0.06")	stainless steel	7 m (22.9')

HI 766TV1, Pipe Clamp Probe

Probe for measuring the temperature of pipes and tubes.

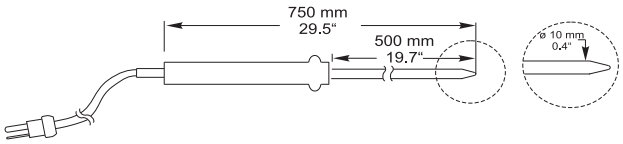


SPECIFICATIONS

CODE	APPLICATION	MAX TEMPERATURE	RESPONSE TIME (90% OF FINAL VALUE)	CLAMP OPENING DIAMETER	SENSOR
HI 766TV1	pipes, tubes	200°C (390°F)	8 seconds	max 35 mm (1.4")	housed inside the clamp

HI 766TR1, Penetration Probe

K-type thermocouple probe with sharp tip for penetration of semi-solid samples.

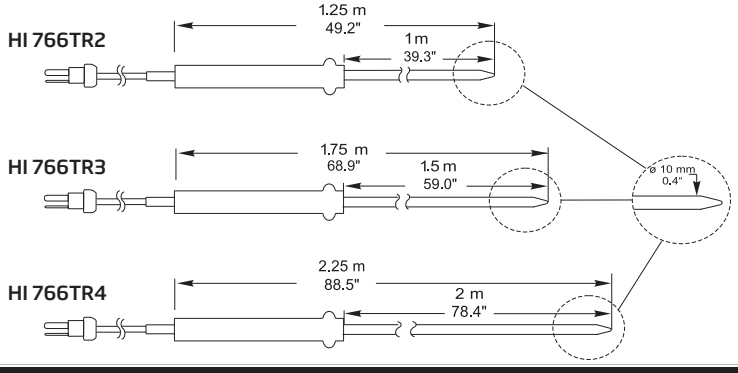


SPECIFICATIONS

CODE	APPLICATION	MAX TEMPERATURE	RESPONSE TIME (90% OF FINAL VALUE)	PROBE DIMENSIONS	SENSOR
HI 766TR1	semi-solids, liquids	250°C (482°F)	10 seconds	L 500 mm x dia 10 mm (19.7 x 0.4")	stainless steel

HI 766TR2, HI 766TR3, HI 766TR4, Penetration Probes

K-type thermocouple probes with sharp tip for penetration of semi-solid samples.



SPECIFICATIONS

CODE	APPLICATION	MAX TEMPERATURE	RESPONSE TIME (90% OF FINAL VALUE)	PROBE LENGTH	SENSOR
HI 766TR2	semi-solids, liquids	250°C (482°F)	10 seconds	1 m (3.3')	stainless steel
HI 766TR3	semi-solids, liquids	250°C (482°F)	10 seconds	1.5 m (5')	stainless steel
HI 766TR4	semi-solids, liquids	250°C (482°F)	10 seconds	2 m (6.6')	stainless steel

HACCP & Food Quality Testing

HANNA Thermometers for the Food Sector

Operators in the food sector need an extensive range of products in order to guarantee the quality and safety of food supplied to the public while maintaining compliance with local and federal laws. In order to satisfy the need for quality, safety and compliance, HANNA has manufactured a vast range of products with the necessary accuracy and reliability to check the quality of food in all phases of preparation and distribution.

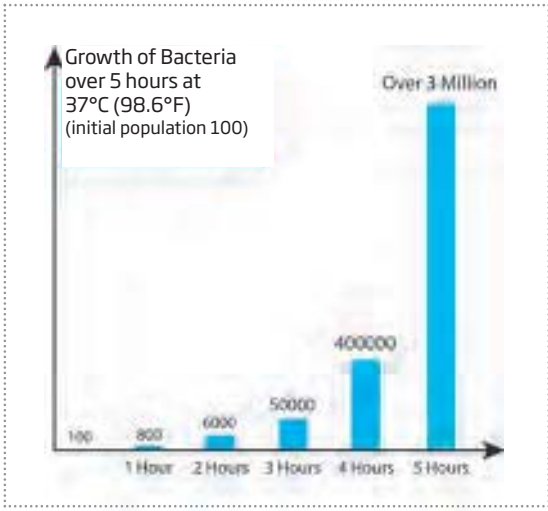
Much of HANNA's portable and pocket thermometer lines have become synonymous with temperature control in restaurants and catering facilities.

For the adverse measurement conditions found in food production areas, typically with high humidity and condensation problems, HANNA has manufactured a substantial array of waterproof meters.

To satisfy the requirements of HACCP, HANNA supplies a complete range of thermometers and pH meters to check goods from production to transport and from catering to storage. Documentation is a must in certain production cycles and important for HACCP programs, you can choose from a range of logging meters. These are stand-alone meters that can measure and log the parameters without any supervision. Shock-resistant protective boots are available for many of our instruments.

Temperature

Temperature of food is constantly monitored to keep growth of pathogens and microorganisms under control. Temperature is important in production to ensure that the food is not spoiled and the quality is not compromised, therefore enhancing it's value. Food needs to be kept at the correct temperature while stored, displayed, and on the move. If temperature is not properly controlled, bacteria can grow to dangerous levels in just a few hours.



The table below lists recommended temperatures for different products. It is vital to monitor and document the temperature to which food has been exposed.

Product	Temp.	Product	Temp.
Chunks of Meat	≤ 7°C	Smoked Fish	≤ 7°C
Minced Meat	≤ 4°C	Frozen Food	≤ -18°C
Innards	≤ 3°C	Milk	≤ 7°C
Frozen Chicken	≤ -12°C	Fruit and Vegetables	≤ 10°C
Deep-freeze Chicken	≤ -18°C	Eggs	≤ 8°C
Fresh Fish	≤ 2°C	Dried Fruit	≤ 25°C

Products and their recommended storage temperatures

Temperature plays an important role in the processing and preparation of edible products containing meat

Meat

The temperature of meat at slaughterhouses is a vital quality control test and needs to be checked at various points of production. Fresh meat should be stored at about 2°C (35.6°F).

For deep freeze meat in storage, it should have an internal temperature around -22°C (-7.6°F) with the surface temperature reaching -35°C (-31°F). In order to thaw the meat properly, the surrounding temperature should be 7°C (44.6°F).

Ham and Sausages

The temperature of salted meat stored for several months is around 2°C (35.6°F). Afterwards, the product is rinsed and dried at around 25°C (77°F) prior to maturing at a preset temperature for a particular product. For sausages, the mixed ingredients are cooked at a certain temperature and then cooled at around 5 to 15°C (41 to 59°F).

Beverages

The temperature of spring or deep well waters that are extracted for beverage production must be continuously monitored to ensure purity. During the production of soft drinks, syrup is pasteurized before being added, to prevent bacteriological problems. In order to prepare fruit juices, fruit pulp is heated to just below boiling point for a few seconds to reduce the presence of microorganisms. During both of these processes, accurate temperature monitoring is crucial.

Temperature control also plays a crucial role in beer production. For example, malt has to be heated to 75°C (167°F) during the mash process. Once the mash is cooled, the vessel is heated above boiling

point to prepare the mash for a strainer and later the mash is heated to up to 120°C (248°F) for a few seconds to pasteurize it. The type of yeast then used for the fermentation process is also temperature dependent. By controlling the fermentation temperature, operators can determine the time needed for the product to fully develop. Temperature is controlled during filtration which is needed in order to remove particles and improve the taste and longevity of beer. In order to remove protein, beer is cooled down to almost 0°C (32°F). As with many other products in the market, beer is pasteurized at around 60°C (140°F) after it has been bottled to eliminate the presence of microorganisms.

Controlling temperature is important in beer, wine and soft drink production.

Milk and Dairy Products

Milk is checked for impurities and infections upon collection. During storage, the temperature of stored milk is normally kept below 5°C (41°F). In order to slow down cream formation, milk is homogenized at about 60°C (140°F).

The pasteurization of milk results in the reduction of microorganisms by a 95% and it is attained by raising the temperature to over 72°C (161.6°F). For UHT (ultra heat treated), milk is heated to 135/150°C (275/302°F) in a pressurized vessel for a few seconds. If the process is repeated for several minutes, all microorganisms, including spores, are destroyed and the sterilized milk will have a 12 month shelf life. For cheese, temperature needs to be adjusted before and during various processes, for example, when rennet is added.

Temperature in the maturation chamber also determines the period of maturation needed. Likewise, temperature is important in the production of butter. For example, skimmed milk is separated from cream at around 55°C (131°F) and the cream is then cooled to about 8°C (46.4°F). The temperature of incoming milk is raised to 45°C (113°F) before the addition of a culture for yogurt manufacturing. In order to denature the whey proteins, milk is raised to very high temperatures. The incubation temperature is maintained for a few hours prior to its cooling to about 10°C (50°F).

Bread and Pasta

The temperature of stored grain in silos is controlled to ensure that premature fermentation does not occur. During pasta production, water at about 25°C (77°F) is added to wheat flour and during fermentation of dough for bread making the temperature is kept at around 30°C (86°F). The oven temperature for baking should be around 260°C (500°F) and once baked, bread is cooled to room temperature. For semi-finished products that can be flash-baked, the dough has to be stored at very low temperatures.

Chocolate

Fermentation of cocoa beans is started by increasing the temperature to about 50°C (122°F). At different stages of chocolate manufacturing such as crystallization, accurate temperature measurement is a must. Once the chocolate is ready, the storage temperature should be monitored to ensure that it stays in the 15°C (59°F) range.

Coffee

In order to invoke an aroma, coffee beans are heated up to 200°C (392°F). During roasting, the temperature is closely monitored. In order to provide a long shelf life, the finished product is frozen at -40°C (-40°F) prior to drying. To produce a good coffee, it is important to ensure that the temperature of coffee machines do not exceed 80°C (176°F).

Sanitization of Machinery

The temperature of cleansing agents, together with their concentration, have a significant bearing on how effectively the machinery is sanitized. The temperature for fermentation vessels can range from room temperature to 40°C (104°F). For milk and yogurt, tanks may reach 70°C (158°F) and as high as 150°C (302°F) for steam sterilizers. In addition, regulatory bodies recommend a certain minimum temperature for cleaning agents to be effective that varies from 24°C (75.2°F) for iodine and ammonia to 49°C (120.2°F) for chlorine.

HI 935007N • HI 935007NS

K-Type Thermocouple Thermometer with Penetration Probe

- **Autoranging**
- **High accuracy ±0.2°C**
- **Waterproof**
- **Calibration Check™ at startup**
- **Damaged probe indicator**
- **Stability indicator (HI 935007NS)**
- **HOLD (HI 935007NS)**
- **BEPS and low battery warning**
- **Battery level indicator at startup**
- **Compact, heavy-duty, and waterproof**
- **Easy to clean and keep clean**

HI 935007 series are portable thermometers that measure temperatures as high as 1350°C. The resolution remains 0.1 up to 199.9°C and automatically changes to 1.0 above.

The fixed HI 766C penetration probe with 1 m (3.3') flexible cable is also supplied with the instrument.

With the optional protective rubber boot, HI 935007N can be used anywhere with maximum impact protection. These features along with a wide measurement range make HI 935007N extremely popular in catering, food preparation and restaurants.

The HI 935007NS adds a HOLD button to freeze the display to allow the user time to record readings and a stability indicator.

HI 935007's attractive price makes it possible for every operator to carry his or her own professional instrument.

Advanced battery management features include a display of remaining battery power at startup, low battery warning and BEPS (Battery Error Prevention System) which alerts the user in the event that low battery power could adversely affect readings.

SPECIFICATIONS	HI 935007N • HI 935007NS
Range	-50.0 to 199.9°C; 200 to 1350°C
Resolution	0.1°C (up to 199.9°C); 1°C (outside)
Accuracy	±0.2% full scale (excluding probe error)
Probe	HI 766C penetration, stainless steel K-type thermocouple temperature probe with 1 m (3.3) cable(fixed)
Battery Type	1.5V AAA (3) / approximately 1000 hours of continuous use; auto-off after 8 minutes of non-use
Environment	-10 to 50°C (14 to 122°F); RH max 100%
Dimensions	152 x 58 x 30 mm (6.0 x 2.3 x 1.2")
Weight	205 g (7.2 oz.)

ORDERING INFORMATION

HI 935007N and **HI 935007NS** are supplied with HI 766C fixed temperature probe, batteries, instructions and hard carrying case.

ACCESSORIES

HI 710023	Orange protective rubber boot
HI 710024	Blue protective rubber boot

HANNA instruments

With Great Products, Come Great Results™

Thermistor Thermometer with Pre-calibrated Probe

- **High accuracy ±0.4°C**
- **Calibration Check™ at startup**
- **Missing/damaged probe indicators**
- **Compact, heavy-duty, and waterproof**
- **BEPS and low battery warning**
- **Battery level indicator at startup**
- **Easy to clean and keep clean**

HI 9241 features a new streamlined design with bottom probe connection. This instrument measures a wide range from -50.0°C to 150.0°C with exceptional accuracy. This meter is simple to operate and is supplied complete with the user-replaceable HI 765PW general purpose, penetration probe.

Users may exchange the probe with any in the HI 765 series without requiring recalibration. A diverse assortment of HI 762 probes and cable lengths are available. Probes can be ordered with different handle colors to prevent cross-contamination.

Advanced battery management features include a display of remaining battery power at startup, low battery warning and BEPS (Battery Error Prevention System) which alerts the user in the event that low battery power could adversely affect readings.

Users can check the meter's accuracy at any time with HANNA calibration keys. Simply plug the key into the meters probe input and if the display value does not match those of the key, the meter is due for recalibration.

SPECIFICATIONS	HI 9241
Range	-50.0 to 150.0°C
Resolution	0.1°C
Accuracy (@20°C/68°F)	±0.4°C, excluding probe error
Probe	HI 765PW general purpose/penetration, stainless steel thermistor temperature probe with white handle and 1 m (3.3') cable (included)
Battery Type/Life	1.5V AAA (3) /approximately 2000 hours of continuous use; auto-off after 8 minutes of inactivity
Environment	-10 to 50°C (14 to 122°F); RH max 100% non-condensing
Dimensions	152 x 58 x 30 mm (6.0 x 2.3 x 1.2")
Weight	205 g (7.2 oz.)

ORDERING INFORMATION

HI 9241 is supplied with HI 765PW temperature probe, batteries, instructions and rugged carrying case.

PROBES

HI 765PW	General purpose/penetration, stainless steel thermistor temperature probe with white handle and 1 m (3.3') cable
HI 765A	Air/gas, stainless steel thermistor temperature probe with white handle and 1 m (3.3') cable
HI 765L	Air/liquid, stainless steel thermistor temperature probe with white handle and 1 m (3.3') cable
HI 765W	Thermistor wire, stainless steel temperature probe with 1 m cable

ACCESSORIES

HI 710023	Shockproof rubber boot, blue
HI 710024	Shockproof rubber boot, orange
HI 765-18C	Test key at -18.0°C
HI 765000C	Test key at 0.0°C
HI 765070C	Test key at +70.0°C

A wide variety of probes are available, see the end of this Thermistor Thermometer Section.

HI 93501N • HI 93501NS

Thermistor Thermometers

- **High accuracy ±0.4°C**
- **Compact, heavy-duty, and waterproof**
- **Calibration Check™ at startup**
- **Missing/damaged probe indicators**
- **Stability indicator (HI 93501NS)**
- **HOLD button (HI 93501NS)**
- **BEPS and low battery warning**
- **Battery level indicator at startup**
- **Easy to clean and keep clean**

HI 93501N is a waterproof thermometer designed for daily use in food applications such as industrial kitchens and catering. The "S" version also adds a stability indicator bargraph and HOLD button to freeze readings on the LCD.

The HI 762PWL penetration probe is included. A diverse assortment of HI 762 probes and cable lengths are available. Probes can be ordered with different handle colors to prevent cross-contamination.

The display indicates the remaining battery power at startup then continuously checks the battery level and warns the user with ample time to change the battery.

The instruments are equipped with BEPS (Battery Error Prevention System) which alerts the user in the event that low battery power could adversely affect readings.

Users can check the meter's accuracy at any time with HANNA calibration keys. Simply plug the key into the meters probe input and if the display value does not match those of the key, the meter is due for recalibration.

ORDERING INFORMATION

HI 93501N and **HI 93501NS** are supplied with HI 762PWL temperature probe, batteries, instructions and rugged carrying case.

PROBES

HI 762DIP	Weighted, stainless steel thermistor temperature probe with 1 m (3.3') cable for measurement in tanks
HI 762A	Air/gas, stainless steel thermistor temperature probe with white handle and 1 m (3.3') cable
HI 762L	Air/liquid, stainless steel thermistor temperature probe with white handle and 1 m (3.3') cable
HI 762W	Thermistor, stainless steel wire temperature probe with 1 m cable

ACCESSORIES

HI 710023	Shockproof rubber boot, blue
HI 710024	Shockproof rubber boot, orange
HI 762-18C	Test key at -18.0°C
HI 762000C	Test key at 0.0°C
HI 762070C	Test key at +70.0°C

SPECIFICATIONS	HI 93501N • HI 93501NS
Range	-50.0 to 150.0°C
Resolution	0.1°C
Accuracy	±0.4°C for 1 year, excluding probe error
Probe	HI 762PWL penetration, stainless steel thermistor temperature probe with white handle and 1 m (3.3') cable (included)
Battery Type / Life	1.5V AAA (3) / approximately 2000 hours of continuous use; auto-off after 8 minutes of non-use
Environment	-10 to 50°C (14 to 122°F); RH max 100%
Dimensions	152 x 58 x 30 mm (6.0 x 2.3 x 1.2")
Weight	205 g (7.2 oz.)

A wide variety of probes are available, see the end of this Thermistor Thermometer Section.

HI 93503

Waterproof Thermometer with Pre-Calibrated Interchangeable Probe

- **High accuracy ±0.4°C**
- **Compact, heavy-duty, and waterproof**
- **Calibration Check™ at startup**
- **Stability indicator**
- **HOLD button**
- **BEPS and low battery warning**
- **Battery level indicator at startup**

HI 93503 features a new streamlined design with bottom probe connection. This instrument measures a wide range of from -50.0°C to 150.0°C with exceptional accuracy. This meter is simple to operate and supplied with the user replaceable HI 765PWL penetration probe.

The HI 93503 also features a HOLD button to freeze the display to allow the user time to record readings and a stability indicator.

Exchange the probe with any other model in the HI 765 series without requiring recalibration. A diverse assortment of HI 765 probes and cable lengths are available. Probes can be ordered with different handle colors to prevent cross-contamination.

The instrument is also equipped with BEPS (Battery Error Prevention System) which alerts the user in the event that low battery power could adversely affect readings.

Users can check the meter's accuracy at any time with HANNA calibration keys. Simply plug the key into the meters probe input and if the display value does not match those of the key, the meter is due for recalibration.

SPECIFICATIONS	HI 93503
Range	-50.0 to 150.0°C
Resolution	0.1°C
Accuracy	±0.4°C, excluding probe error
Probe	HI 765PWL penetration, stainless steel thermistor temperature probe with white handle and 1 m (3.3') cable (included)
Battery Type / Life	1.5V AAA (3) /approximately 2000 hours of continuous use. auto-off after 8 minutes of inactivity
Environment	-10 to 50°C (14 to 122°F); RH max 100%
Dimensions	152 x 58 x 30 mm (6.0 x 2.3 x 1.2")
Weight	205 g (7.2 oz.)

ORDERING INFORMATION

HI 93503 is supplied with HI 765PWL temperature probe, batteries, instructions and hard carrying case.

PROBES

HI 765PW	General purpose/penetration, stainless steel thermistor temperature probe with white handle and 1 m (3.3') cable
HI 765A	Air/gas, stainless steel thermistor temperature probe with white handle and 1 m (3.3') cable
HI 765L	Air/liquid, stainless steel thermistor temperature probe with white handle and 1 m (3.3') cable
HI 765W	Thermistor wire, stainless steel temperature probe with 1 m cable

ACCESSORIES

HI 710023	Shockproof rubber boot, blue
HI 710024	Shockproof rubber boot, orange
HI 765-18C	Test key at -18.0°C
HI 765000C	Test key at 0.0°C
HI 765070C	Test key at +70.0°C

A wide variety of probes are available, see the end of this Thermistor Thermometer Section.

HI 93510 • HI 93510N

Thermistor Thermometers

- **Waterproof casing**
- **High accuracy ±0.4°C/±0.8°F**
- **Switch between °C and °F at the touch of a button**
- **HOLD button**
- **BEPS and low battery warning**
- **Battery level indicator at startup**
- **2000 hour battery life**
- **Backlit display (N version)**
- **Calibration feature (N version)**

HI 93510 is a waterproof thermometer tailored for the lab and field. The LCD displays the highest and lowest readings in the cycle along with the current temperature. To freeze the reading for easy recording, simply press the HOLD button. Celsius or Fahrenheit range can be selected at the touch of a button.

The HI 93510N offers all the features of the HI 93510 plus a CAL button to allow the operator to calibrate the meter and probe in an ice bath at 0°C. This will assure the removal of the combined meter and probe interchange error. In addition to calibration capabilities, HI 93510N has a user-activated backlit display.

A diverse assortment of HI 762 probes and cable lengths are available. Probes can be ordered with different handle colors to prevent cross-contamination.

Advanced battery management features include a display of remaining battery power at startup, low battery warning and BEPS (Battery Error Prevention System) which alerts the user in the event that low battery power could adversely affect readings.

HI 762 Test Keys

ORDERING INFORMATION

HI 93510 and **HI 93510N** are supplied with HI 762BL temperature probe, batteries and instructions.

PROBES

HI 762L	Air/liquid, stainless steel thermistor temperature probe with white handle and 1 m (3.3') cable
HI 762A	Air/gas, stainless steel thermistor temperature probe with white handle and 1 m (3.3') cable

ACCESSORIES

HI 710007	Shockproof rubber boot, blue
HI 710008	Shockproof rubber boot, orange
HI 762-18C	Test key at -18.0°C
HI 762000C	Test key at 0.0°C
HI 762070C	Test key at 70.0°C

SPECIFICATIONS	HI 93510	HI 93510N
Range	-50.0 to 150.0°C; -58.0 to 302.0°F	
Resolution	0.1°C; 0.1°F (-58.0 to 230.0°F) and 0.2°F (outside)	
Accuracy	±0.4°C; ±0.8°F (for 1 year, excluding probe error)	
Probe	HI 762BL air/liquid, stainless steel thermistor temperature probe with black handle and 1 m (3.3') cable (included)	
CAL Button	N/A	yes
Backlit LCD	N/A	yes
Battery Type / Life	1.5V AA (3) / approximately 2000 hours of continuous use (with backlight off); HI 93510 only: auto-off selectable after 8 or 60 minutes of non-use (can be disabled)	
Environment	-10 to 50°C (14 to 122°F); RH max 100%	
Dimensions	150 x 80 x 36 mm (5.9 x 3.1 x 1.4")	
Weight	235 g (8.3 oz.)	

A wide variety of probes are available, see the end of this Thermistor Thermometer Section.

2-channel Thermistor Thermometers

HI 762 Test Keys

- **Two input channels**
- **Waterproof casing**
- **High accuracy ± 0.4°C/± 0.8°F**
- **HOLD button**
- **BEPS and low battery warning**
- **2000 hour battery life**
- **Backlit display (HI 93522)**
- **Calibration feature (HI 93522)**
- **Reading store and recall**

HI 93512 is a waterproof two-channel thermometer, ideal for monitoring two samples at once. This easy to use thermometer displays the temperature together with high and low readings.

HI 93512 allows the user to view the differences between each channel (along with the high and low values or current temperature at each probe), as well as the variance from a reference temperature.

For even greater accuracy, the HI 93522 incorporates a CAL button that allows the operator to remove the combined meter and probe interchange error in an ice bath at 0°C. HI 93522 can also store and recall a reading as well as allowing the user to set the auto-off time period and activate the backlight for low light conditions.

The HOLD button freezes the display to allow the user time to record readings.

A diverse assortment of HI 762 probes and cable lengths are available. Probes can be ordered with different handle colors to prevent cross-contamination.

Advanced battery management features include a display of remaining battery power at startup, low battery warning and BEPS (Battery Error Prevention System) which alerts the user in the event that low battery power could adversely affect readings.

SPECIFICATIONS	HI 93512	HI 93522
Range	-50.0 to 150.0°C; -58.0 to 302.0°F	
Resolution	0.1°C; 0.1°F (-58.0 to 230.0°F) and 0.2°F (outside)	
Accuracy	±0.4°C; ±0.8°F (for 1 year, excluding probe error)	
Probe	HI 762BL air/liquid, stainless steel thermistor temperature probe with black handle and 1 m (3.3') cable (included)	
CAL Button	N/A	yes
Backlit LCD	N/A	yes
Battery Type / Life	1.5V AA (3) / approximately 2000 hours of continuous use (with backlight off); HI 93522 only: auto-off selectable after 8 or 60 minutes of non-use (can be disabled)	
Environment	-10 to 50°C (14 to 122°F); RH max 100%	
Dimensions	150 x 80 x 36 mm (5.9 x 3.1 x 1.4")	
Weight	235 g (8.3 oz.)	

ORDERING INFORMATION

HI 93512 and **HI 93522** are supplied with HI 762BL temperature probe, batteries and instructions.

PROBES

HI 762L	Air/liquid, stainless steel thermistor temperature probe with white handle and 1 m (3.3') cable

ACCESSORIES

HI 762-18C	Test key at -18.0°C
HI 762000C	Test key at 0.0°C
HI 762070C	Test key at 70.0°C
HI 710007	Shockproof rubber boot, blue
HI 710008	Shockproof rubber boot, orange

A wide variety of probes are available, see the end of this Thermistor Thermometer Section.

HI 762

HI 762 Thermistor Probes

The HI 762 temperature probes can be identified by the grey cap on the top of the handle and have the following specifications:

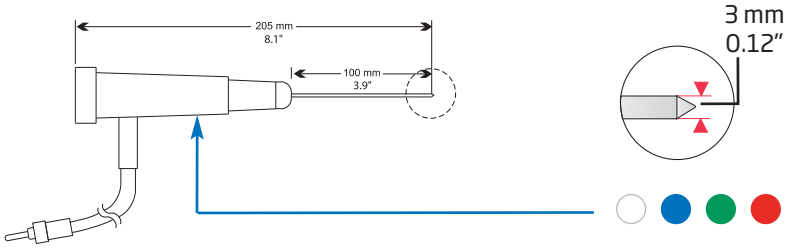
Range	-50 to 150°C (-58 to 302°F)
Sensor	NTC thermistor
Accuracy	±0.2°C (±0.4°F)
Probe Handle	ABS
Interchange Error	±0.2°C (±0.4°F)
Probe	AISI 316 stainless steel
Response Time (90% of final value)	6 seconds

The HI 762 series with NTC thermistor sensor offers a wide range of probes for measuring liquids, air and gases, and for penetration in semisolids.

Models are available with a 1, 2 or 10 meter cable, and colored handles to be identified more easily when measuring different samples.

HI 762P

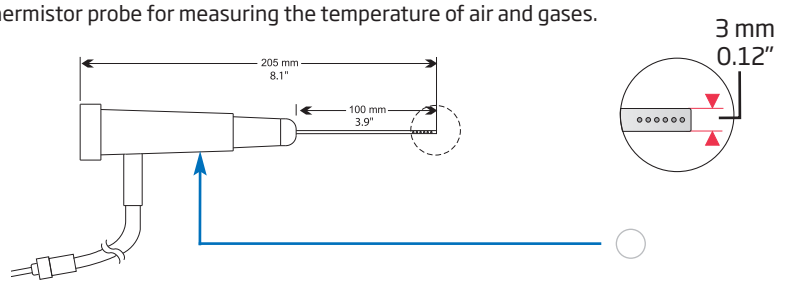
General purpose, penetration probe with colored handle.



SPECIFICATIONS			
1 m (3.3') Cable	**2 m (6.6') Cable**	**10 m (32.8') Cable**	**Handle Color**
HI 762PW	–	HI 762PW/10	white
HI 762PBL	–	HI 762PBL/10	blue
HI 762PG	–	HI 762PG/10	green
HI 762PR	–	HI 762PR/10	red

HI 762A

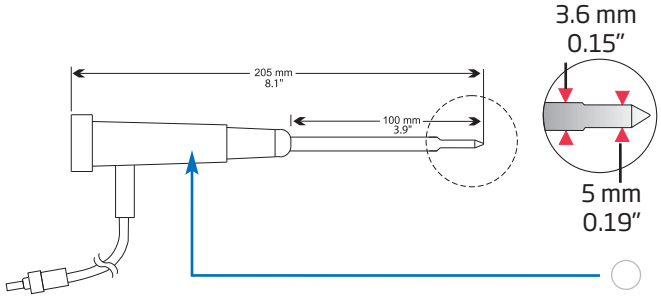
Thermistor probe for measuring the temperature of air and gases.



SPECIFICATIONS			
1 m (3.3') Cable	**2 m (6.6') Cable**	**10 m (32.8') Cable**	**Handle Color**
HI 762A	–	HI 762A/10	white

HI 762PWL

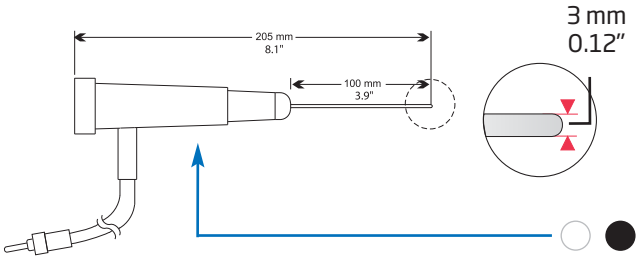
Thermistor probe with sharp tip for penetration of semi-solid samples.



SPECIFICATIONS			
1 m (3.3') Cable	2 m (6.6') Cable	10 m (32.8') Cable	Handle Color
HI 762PWL	–	–	white

HI 762L

Air, liquid probe.

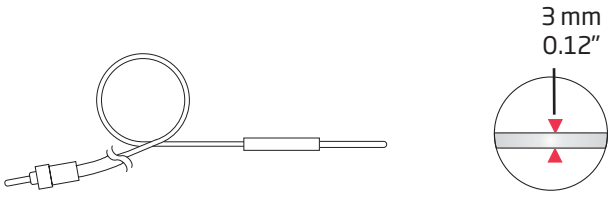


SPECIFICATIONS			
1 m (3.3') Cable	2 m (6.6') Cable	10 m (32.8') Cable	Handle Color
HI 762L	HI 762L/2	HI 762L/10	white
HI 762BL	–	–	black

HI 762W

Wire probe, designed to access hard to reach places.

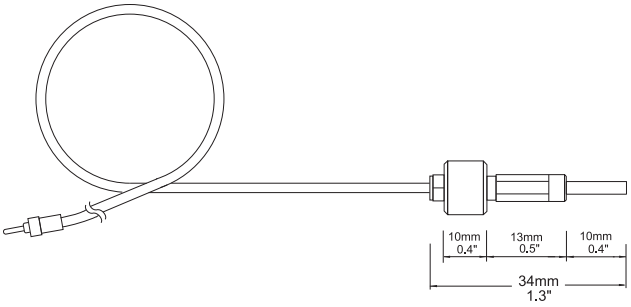
Probe does not incorporate a handle.



SPECIFICATIONS			
1 m (3.3') Cable	2 m (6.6') Cable	10 m (32.8') Cable	Handle Color
HI 762W	–	HI 762W/10	–

HI 762DIP

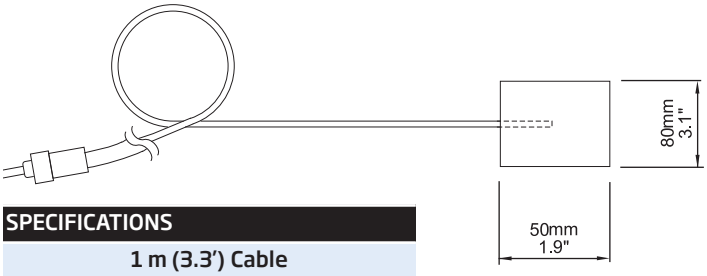
Weighted probe without handle, designed to measure the temperature in tanks.



SPECIFICATIONS			
1 m (3.3') Cable	**2 m (6.6') Cable**	**10 m (32.8') Cable**	**Handle Color**
HI 762DIP	HI 762DIP/5	HI 762DIP/50	white

HI 762BP

Thermistor probe without handle, designed to measure the temperature of stacked goods.



SPECIFICATIONS
1 m (3.3') Cable
HI 762BP

Calibration Test Keys for Thermistor Thermometers

For measurements that are always reliable, thermometers must be calibrated periodically.

HANNA test keys offer a fast and simple way of checking the accuracy of your instruments.

Connect the key to the probe input. If the reading on the display differs more than 0.4°C (0.8°F) from the key rated value, your thermometer should be recalibrated at our technical service center.

Test Keys for Thermometers Using HI 762 Probes

HI 762-18C	Test key at -18°C	**HI 762-004F**	Test key at -0.4°F
HI 762000C	Test key at 0°C	**HI 762032F**	Test key at 32°F
HI 762070C	Test key at 70°C	**HI 762158F**	Test key at 158°F

For periodic verification of your thermometer's calibration, it is recommended to check at least two points. Choose the test keys with the nominal values closest to the temperature usually measured.

HI 765 Thermistor Probes

The HI 765 temperature probes are provided with a PTC thermistor sensor, and have the following specifications:

Range	-50 to 150°C (-58 to 302°F)
Accuracy	±0.2°C (±0.4°F)
Sensor	PTC thermistor
Probe Handle	ABS
Interchange Error	±0.2°C (±0.4°F)
Probe	AISI 316 stainless steel
Response Time (90% of final value)	8 seconds

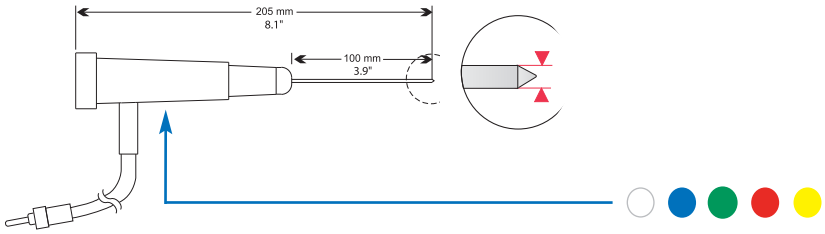
All probes are pre-calibrated with a maximum error of ±0.2°C (±0.4°F).

The HI 765 series can be identified by the white cap on the top of the handle. This series offers a wide range of probes for measuring liquids, air and gases, and for penetration in semi-solids.

Models are available with a cable length of 1 to 10 meters and colored handles for easy identification during measurements of different samples.

HI 765P

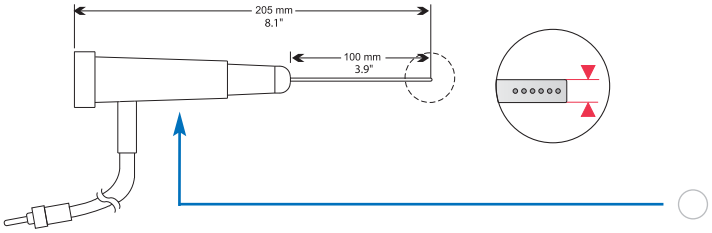
General purpose, penetration probe with colored handle.



SPECIFICATIONS		
1 m (3.3') Cable	**10 m (32.8') Cable**	**Handle Color**
HI 765PW	HI 765PW/10	white
HI 765PWD (DIN connector)	–	white
HI 765PWST (braided cable)	–	white
HI 765RP	–	white
HI 765PBL	HI 765PBL/10	blue
HI 765PG	HI 765PG/10	green
HI 765PR	HI 765PR/10	red
HI 765PY	–	yellow

HI 765A

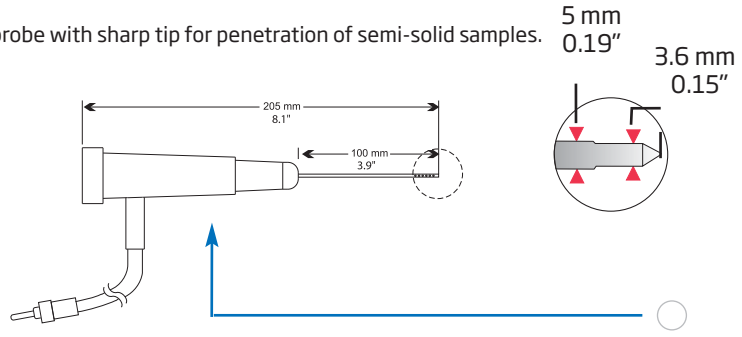
Thermistor probe for measuring the temperature of air and gases.



SPECIFICATIONS		
1 m (3.3') Cable	**10 m (32.8') Cable**	**Handle Color**
HI 765A	HI 765A/10	white

HI 765PWL

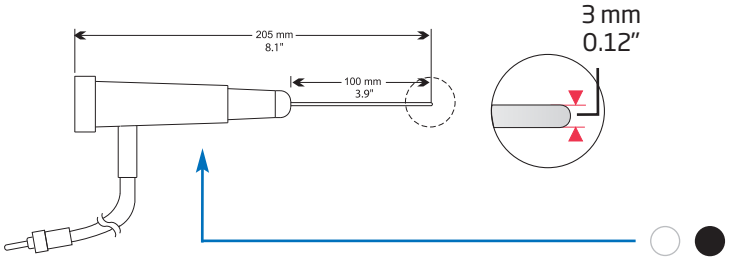
Thermistor probe with sharp tip for penetration of semi-solid samples.



SPECIFICATIONS		
1 m (3.3') Cable	**2 m (6.6') Cable**	**Handle Color**
HI 765PWL	HI 765PWL/2	white

HI 765L

Air, liquid probe.

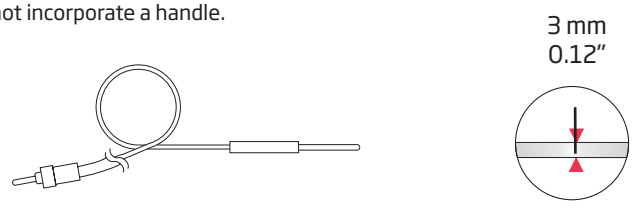


SPECIFICATIONS		
1 m (3.3') Cable	**10 m (32.8') Cable**	**Handle Color**
HI 765L	HI 765L/10	white
HI 765BL	–	black

HI 765W

Wire probe, designed to access hard to reach places.

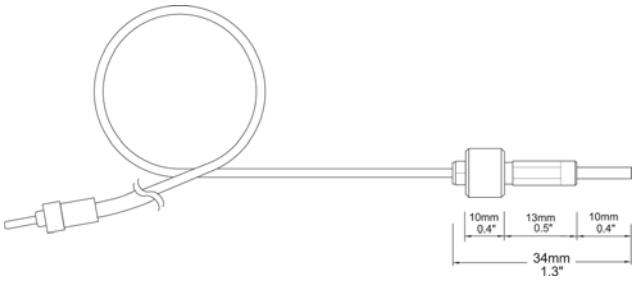
Probe does not incorporate a handle.



SPECIFICATIONS	
1 m (3.3') Cable	**10 m (32.8') Cable**
HI 765W1	HI 765W/10

HI 765DIP

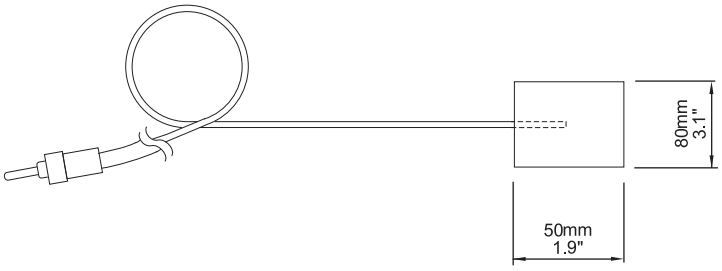
Weighted probe without handle, designed to measure the temperature in tanks.



SPECIFICATIONS			
1 m (3.3') Cable	**3 m (9.9') Cable**	**5 m (16.4') Cable**	**10 m (32.8) Cable**
HI 765DIP	HI 765DIP/3	HI 765DIP/5	HI 765DIP/10

HI 765BP

Thermistor probe without handle, designed to measure the temperature of stacked goods.



SPECIFICATIONS	
1 m (3.3') Cable	**2 m (6.6') Cable**
HI 765BP1	HI 765BP2

HI 765S

Surface probe for FoodCare thermometers.

SPECIFICATIONS
1 m (3.3') Cable
HI 765S

Calibration Test Keys for Thermistor Thermometers

For measurements that are always reliable, thermometers must be calibrated periodically.

HANNA test keys offer a fast and simple way of checking the accuracy of your instruments.

Connect the key to the probe input. If the reading on the display differs more than 0.4°C (0.8°F) from the key rated value, your thermometer should be recalibrated at our technical service center.

Test Keys for Thermometers Using HI 765 Probes

HI 765-18C	Test key at -18°C	**HI 765-004F**	Test key at -0.4°F
HI 765000C	Test key at 0°C	**HI 765032F**	Test key at 32°F
HI 765070C	Test key at 70°C	**HI 765158F**	Test key at 158°F

For periodic verification of your thermometer's calibration, it is recommended to check at least two points. Choose the test keys with the nominal values closest to the temperature usually measured.

HI 955501 • HI 955502

4-wire Pt100 Thermometers

- **Autoranging**
- **Available with interchangeable or fixed probe**
- **Economical**
- **Missing probe indictor (HI 955501)**
- **Optional protective boot**

Pt100 models are widely recognized as the most accurate with the best stability, repeatability and linearity among thermometers. Add to this the 4-wire system that is practically impervious to lead-wire length error and you have a powerful tool to measure temperature accurately.

HI 955501 works with HI 768 series of Pt100 temperature probes, while the HI 955502 model is supplied with fixed general-purpose probe.

HI 955501 also features a missing probe indicator to alert the user if no temperture probe is detected.

Both the HI 955501 and HI 955502 measure temperatures with 0.1°C resolution in the -199.9 to 199.9°C range and then automatically switch to 1°C from 200 to 850°C. Press RANGE and the resolution switches to 1°C at any time.

A compact, ergonomic design and a wrist-strap make it easy to carry them anywhere in the lab or plant. To protect the meter during field measurements, a HANNA shockproof boot is recommended.

Shown with optional HI 710007 protective rubber boot

ORDERING INFORMATION

HI 955501 is supplied with battery and instructions.
HI 955502 is supplied with HI 768P fixed temperature probe, battery and instructions.

PROBES

HI 768A	Air/gas, stainless steel Pt100 temperature probe (fixed) with 1 m (3.3') cable
HI 768L	Air/liquid, stainless steel Pt100 temperature probe (fixed) with 1 m (3.3') cable
HI 768P	General purpose/penetration, Pt100 stainless steel temperature probe with 1 m (3.3') cable

ACCESSORIES

HI 710007	Shockproof rubber boot, blue
HI 710008	Shockproof rubber boot, orange
HI 710004	Soft carrying case

SPECIFICATIONS	HI 955501	HI 955502
Range	-199.9 to 199.9°C; 200 to 850°C	
Resolution	0.1°C (-199.9 to +199.9°C); 1°C (-200 to 850°C)	
Accuracy	±0.2°C and ±1 digit (-120.0 to 199.9°C); ±1°C and ±1 digit (-170 to 450°C); ±1% f.s. and ±1 digit (outside) (for 1 year, excluding probe error)	
Probe	HI 768 series stainless steel Pt100 temperature probe with 1 m (3.3') cable (not included)	HI 768P general purpose/penetration, stainless steel Pt100 temperature probe (fixed) with 1 m (3.3') cable (included)
Battery Type / Life	9V / approximately 150 hours of continuous use	
Environment	0 to 50°C (32 to 122°F); RH max 95%	
Dimensions	143 x 80 x 38 mm (5.6 x 3.2 x 1.5")	
Weight	320 g (11.3 oz.)	

A variety of probes are available with different cable lengths, see the next page.

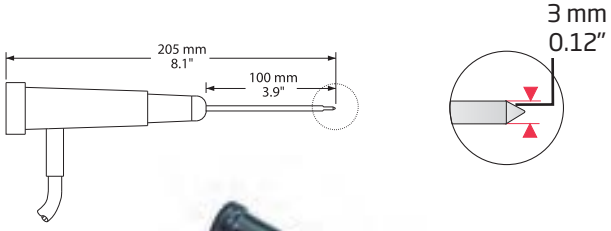
HI 768 Series: Pt100 Probes

The HI 768 series of temperature probes is provided with a Pt100 sensor and features the following specifications:

Range	-30 to 350°C (-22 to 622°F)
Sensor	Pt100
Accuracy	±0.25°C (±0.5°F) ±3% of reading
Probe Handle	Carilon®
Interchange Error	±0.2°C (±0.4°F)
Probe	AISI 316 stainless steel
Response Time	30 seconds

HI 768P, General Purpose/Penetration Probe

Pt100 probe for applications, such as air measurement and penetration of semi-solids.

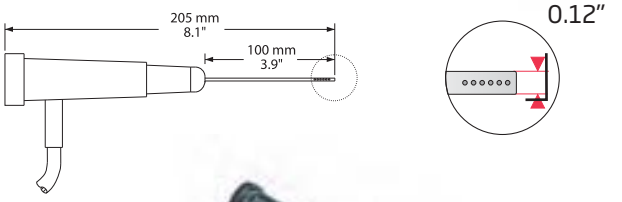


SPECIFICATIONS

CODE	APPLICATION	PROBE DIMENSIONS	HANDLE COLOR	CABLE LENGTH
HI 768P	general purpose/penetration	L 205 mm x dia 3 mm (0.12")	green	1 m (3.3')
HI 768PBL/10	general purpose/penetration	L 205 mm x dia 3 mm (0.12")	blue	10 m (32.8')

HI 768A

Pt100 probe for measuring the temperature of air and gases.

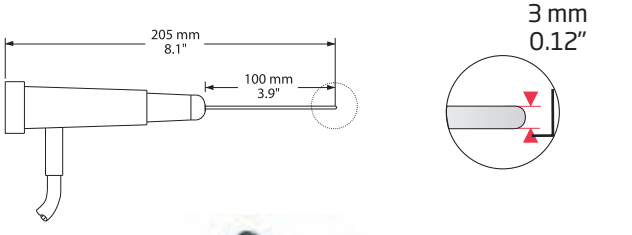


SPECIFICATIONS

CODE	APPLICATION	PROBE DIMENSIONS	CABLE LENGTH
HI 768A	air, gases	L 205 mm x dia 3 mm (0.12")	1 m (3.3')
HI 768A/3	air, gases	L 205 mm x dia 3 mm (0.12")	3 m (9.9')
HI 768A/5	air, gases	L 205 mm x dia 3 mm (0.12")	5 m (16.4')

HI 768L

Pt100 probe for applications, such as liquid and air.



SPECIFICATIONS

CODE	APPLICATION	PROBE DIMENSIONS	CABLE LENGTH
HI 768L	liquid, air	L 205 mm x dia 3 mm (0.12")	1 m (3.3')
HI 768L/3	liquid, air	L 205 mm x dia 3 mm (0.12")	3 m (9.9')
HI 768L/5	liquid, air	L 205 mm x dia 3 mm (0.12")	5 m (16.4')

HI 99551 • HI 99556

Infrared Thermometers for the Food Industry

- **Non-invasive measurement**
- **HOLD function**
- **Battery life indicator on startup**
- **Optional external probe can also be used (HI 99556)**

The HI 99551 and HI 99556 thermometers employ infrared technology to measure surface temperatures. Infrared readings are extremely fast with a response time typically around 1 second.

One big advantage of these meters is the non-intrusive nature of measurements. This feature is particularly attractive for food distribution, retailing and markets since it translates practicality into savings by leaving products intact, especially those sealed or pre-wrapped.

In order to measure the temperature, simply turn on the meter and point to the product or target. Readings are displayed on the LCD. This type of non-intrusive measurement is also useful when the surface temperature is too high to approach, for difficult to reach places or for hygiene requirements.

If you must check the core temperature in addition to surface measurement, the HI 99556 is the ideal solution for you. Simply attach an optional external probe to the meter and you have a 2-in-1 infrared-thermistor thermometer.

A HOLD function freezes the display to allow the user time to record readings.

Measure temperature through sealed items

ORDERING INFORMATION

Choose your configuration:

x = **1** meter with IR sensor
6 meter with IR sensor and HI 765PW probe (40 to 150°C range)

y = **00** IR range from -10 to 300°C
01 IR range from 14 to 572°F
10 IR range from -20 to 199.9°C

HI 9955 [x] – [ ][y]

PROBES

HI 765PW General purpose/penetration, stainless steel thermistor temperature probe with white handle and 1 m (3.3') cable

ACCESSORIES

HI 731318 Sensor cleaning cloth (4)
HI 710007 Shockproof rubber boot, blue
HI 710008 Shockproof rubber boot, orange
HI 710004 Soft carrying case
HI 721316 Rugged carrying case

SPECIFICATIONS		HI 99551-00/ HI 99556-00	HI 99551-01/ HI 99556-01	HI 99551-10/ HI 99556-10
Range	IR	-10 to 300°C	14 to 572°F	-20.0 to 199.9°C
	Probe (HI 99556 only)	-40 to 150°C	-40 to 302°F	-40 to 150.0°C
Resolution	IR	1°C	1°F	0.1°C
	Probe (HI 99556 only)	1°C	1°F	0.1°C
Accuracy	IR	±2% of reading or ±2°C	±2% of reading or ±3°F	±2% of reading or ±2°C
	Probe (HI 99556 only)	±0.5°C (-20 to 120°C); ±0.5°C +1% reading (outside)	±1°F (0 to 250°F); ±1°F +1% reading (outside)	±0.5°C (-20 to 120°C); ±0.5°C +1% reading (outside)
IR Sensor Response Time		1 second		
IR Sensor Optic Coefficient		3:1 (ratio of distance to target diameter)		
Minimum Distance		30 mm (1.2")		
Probe (HI 99556 only)		HI 765PW general purpose/penetration, stainless steel thermistor temperature probe with white handle and 1 m (3.3') cable (included)		
Battery Type / Life		9V / approximately 150 hours of continuous use		
Environment		0 to 50°C (32 to 122°F); RH max 95%		
Dimensions		143 x 80 x 38 mm (5.6 x 3.2 x 1.5")		
Weight		320 g (11.3 oz.)		

HANNA instruments

With Great Products, Come Great Results™

Infrared Thermometers

- **Measure temperature in difficult to reach places**
- **HOLD function**
- **Battery life indicator on startup**
- **Ideal for industrial facilities**

Infrared radiation emitted from an object depends on its temperature. The HANNA HI 99550 infrared thermometer employs this technology to measure surface temperature. Infrared thermometers provide non-invasive measurements with instantaneous response times. This can translate into substantial savings particularly in industries where products are sealed or pre-wrapped.

In order to measure the temperature, simply point to the product or the target spot and hold down the measurement key. The measured value will be immediately displayed on the LCD.

This type of non-intrusive measurement is also useful when the surface temperature is high, for difficult to reach places or due to hygiene requirements.

HANNA HI 99550 is designed with a wrist-strap and ergonomic shape for greater ease of use.

The fast response time along with the HOLD function, which freezes the display to allow the user time to record readings, make the HI 99550 infrared thermometer particularly attractive for repetitive tests in the factory or on the production line.

SPECIFICATIONS	HI 99550-00	HI 99550-01
Range	-10 to 300°C	14 to 572°F
Resolution	1°C	1°F
Accuracy	±2% of reading or ±2°C	±2% of reading or ±3°F
Emissivity	0.95	
Typical Response Time	1 second	
Optic Coefficient	3:1 (ratio of distance to target diameter); minimum distance 30 mm (1.2")	
Battery Type / Life	9V / approximately 150 hours of continuous use	
Environment	0 to 50°C (32 to 122°F); RH max 95%	
Dimensions	143 x 80 x 38 mm (5.6 x 3.2 x 1.5")	
Weight	320 g (11.3 oz.)	

ORDERING INFORMATION

HI 99550-00 and **HI 99550-01** are supplied with battery and instructions.

ACCESSORIES

HI 731318	Sensor cleaning cloth (4)
HI 710007	Shockproof rubber boot, blue
HI 710008	Shockproof rubber boot, orange
HI 710004	Soft carrying case
HI 721316	Rugged carrying case

HI 141

Temperature Dataloggers

- 1 or 2 channels with internal or external sensor
- With or without LCD
- 16,000 samples/channel (1-channel models) or 8,000 samples/channel (2-channel models)
- Logging interval from 1 second to 24 hours
- Logging delay start up to 199 hours and magnetic start
- Programmable high and low alarms
- Non-volatile storage of logging
- Waterproof casing
- BEPS (Battery Error Protection System)

The HI 141 series is a family of temperature dataloggers with either one or two channels, internal or external temperature sensors, and an optional LCD. External temperature sensor models feature one or two stainless steel sensors on a 1 m (3.3') cable for direct insertion. HI 141 can store up to 16,000 temperature samples in a protected, non-volatile EEPROM memory. The logging interval can be set from once per second to once per 24 hour period, and logging delay can be set anywhere up to 199 hours. The MIN or MAX temperature between logging intervals can also be stored. All of your collected data is tamper-proof and stored into serial numbered lots.

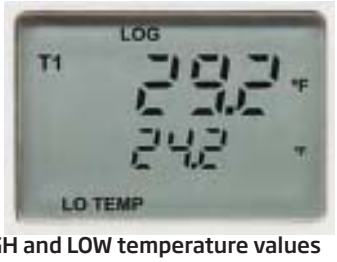
The HI 141000 Windows® compatible software supports communication between the logger and the PC through the HI 141001 infrared transmitter.

The waterproof housing can include a convenient hanging hook (simply add an "H" to the end of the code). For a typical 1 minute logging interval, the battery will last about 4 years.

Users can assess the current temperature, channel and status of the logging sequence according to your programmed instructions:

HIGH and LOW alarm settings

Number of samples taken



HIGH and LOW temperature values

Countdown until the start of logging

Number of samples which have exceeded the HIGH/LOW alarms

HANNA® instruments

With Great Products, Come Great Results™

SPECIFICATIONS Model	Display	Molded Eye for Hanging	Sensor(s)	Cable Length (if applicable)	Range
HI 141A			1 internal	–	-40.0 to 80.0°C / -40.0 to 176.0°F
HI 141AH		•	1 internal	–	-40.0 to 80.0°C / -40.0 to 176.0°F
HI 141B			1 external	1 m (3.3')	-40.0 to 125.0°C / -40.0 to 257.0°F
HI 141BH		•	1 external	1 m (3.3')	-40.0 to 125.0°C / -40.0 to 257.0°F
HI 141BH/3		•	1 external	3 m (9.8')	-40.0 to 125.0°C / -40.0 to 257.0°F
HI 141BH/10		•	1 external	10 m (32.8')	-40.0 to 125.0°C / -40.0 to 257.0°F
HI 141BH/15		•	1 external	15 m (49.2')	-40.0 to 125.0°C / -40.0 to 257.0°F
HI 141BH/20		•	1 external	20 m (65.6')	-40.0 to 125.0°C / -40.0 to 257.0°F
HI 141BH/25		•	1 external	25 m (82')	-40.0 to 125.0°C / -40.0 to 257.0°F
HI 141C	•		1 internal	–	-20.0 to 70.0°C / -40.0 to 158.0°F
HI 141CH	•	•	1 internal	–	-20.0 to 70.0°C / -40.0 to 158.0°F
HI 141D	•		1 external	1 m (3.3')	-40.0 to 125.0°C / -40.0 to 257.0°F
HI 141DH	•	•	1 external	1 m (3.3')	-40.0 to 125.0°C / -40.0 to 257.0°F
HI 141DH/2	•	•	1 external	2 m (6.6')	-40.0 to 125.0°C / -40.0 to 257.0°F
HI 141DH/5	•	•	1 external	5 m (16.4)	-40.0 to 125.0°C / -40.0 to 257.0°F
HI 141DHS/5	•	•	1 external, 12 cm penetration	5 m (16.4)	-40.0 to 125.0°C / -40.0 to 257.0°F
HI 141DH/10	•	•	1 external	20 m (65.6')	-40.0 to 125.0°C / -40.0 to 257.0°F
HI 141DH/20	•	•	1 external	20 m (65.6')	-40.0 to 125.0°C / -40.0 to 257.0°F
HI 141E			1 internal 1 external	1 m (3.3')	-40.0 to 80.0°C / -40.0 to 176.0°F -40.0 to 125.0°C / -40.0 to 257.0°F
HI 141EH		•	1 internal 1 external	1 m (3.3')	-40.0 to 80.0°C / -40.0 to 176.0°F -40.0 to 125.0°C / -40.0 to 257.0°F
HI 141EH/2		•	1 internal 1 external	2 m (6.6')	-40.0 to 80.0°C / -40.0 to 176.0°F -40.0 to 125.0°C / -40.0 to 257.0°F
HI 141F			2 external	1 m (3.3')	-40.0 to 125.0°C / -40.0 to 257.0°F
HI 141FH		•	2 external	1 m (3.3')	-40.0 to 125.0°C / -40.0 to 257.0°F
HI 141G	•		1 internal 1 external	1 m (3.3')	-20.0 to 70.0°C / -40.0 to 158.0°F -40.0 to 125.0°C / -40.0 to 257.0°F
HI 141GH	•	•	1 internal 1 external	1 m (3.3')	-20.0 to 70.0°C / -40.0 to 158.0°F -40.0 to 125.0°C / -40.0 to 257.0°F
HI 141GHS/120	•	•	1 internal 1 external, 12 cm penetration	1 m (3.3')	-20.0 to 70.0°C / -40.0 to 158.0°F -40.0 to 125.0°C / -40.0 to 257.0°F
HI 141GH/2	•	•	1 internal 1 external	2 m (6.6')	-20.0 to 70.0°C / -40.0 to 158.0°F -40.0 to 125.0°C / -40.0 to 257.0°F
HI 141GH/5	•	•	1 internal 1 external	5 m (16.4)	-20.0 to 70.0°C / -40.0 to 158.0°F -40.0 to 125.0°C / -40.0 to 257.0°F
HI 141GH/20	•	•	1 internal 1 external	20 m (65.6')	-20.0 to 70.0°C / -40.0 to 158.0°F -40.0 to 125.0°C / -40.0 to 257.0°F
HI 141J	•		2 external	1 m (3.3')	-40.0 to 125.0°C / -40.0 to 257.0°F
HI 141JH	•	•	2 external	1 m (3.3')	-40.0 to 125.0°C / -40.0 to 257.0°F
HI 141JHS/120	•	•	2 external, 12 cm penetration	1 m (3.3')	-40.0 to 125.0°C / -40.0 to 257.0°F
HI 141JH/2	•	•	2 external	2 m (6.6')	-40.0 to 125.0°C / -40.0 to 257.0°F
HI 141JHS/2	•	•	2 external, 12 cm penetration	2 m (6.6')	-40.0 to 125.0°C / -40.0 to 257.0°F
HI 141JH/5	•	•	2 external	5 m (16.4)	-40.0 to 125.0°C / -40.0 to 257.0°F
HI 141JH/15	•	•	2 external	15 m (49.2')	-40.0 to 125.0°C / -40.0 to 257.0°F

Specification for all models

Resolution	0.1°C (-40.0 to 100.0°C); 0.2°C (> 100.0°C) 0.1°F (-40.0 to 190.0°F); 0.3°F (> 190.0°F)
Accuracy	±0.5°C (-40.0 to 0.0 and 70.0 to 100.0°C); ±0.4°C (0.0 to 70.0°C); ±1.0°C (> 100.0°C) ±1.0°F (-40.0 to 32.0 and 158.0 to 212.0°F); ±0.8°F (32.0 to 158.0°F); ±2.0°F (> 212.0°F)
Environment	RH 100%
Diameter	86.5 mm (3.4")
Height	35 mm (1.4")
Weight	150 g (5.5 oz.)

* For models with molded hook, use the "H" at the end of the part code. Ex. HI 141AH
** Models with different cable lengths are available upon request. Contact your nearest HANNA dealer.

ORDERING INFORMATION

All **HI 141** models are supplied with 3.6V Lithium AA battery, magnetic key and instructions.

ACCESSORIES

HI 141000	Windows® application software (Required)
HI 141001	Infrared transmitter (Required)
HI 740033	3.6 V AA lithium battery
HI 740221	Key for HI 141 magnetic start

HI 140

Temperature Dataloggers

- **LED indicators**
- **Store up to 7600 temperatures**
- **Remotely controlled form the PC**
- **BEPS** (Battery Error Protection System)

HI 140 loggers are not much larger than a PC mouse. They are housed in a smooth, yet tough ABS casing that is sealed against ingress of dust and water.

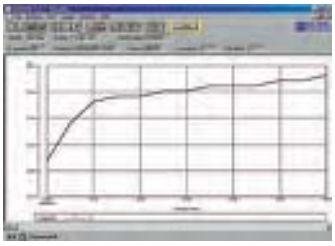
These dataloggers represent the most economical and secure way of monitoring temperature continuously over long periods of time. They can be placed with goods on the move, on supermarket shelves and in warehouses. They record the temperature at a given interval to make sure that perishable goods are not left unattended such as on a loading dock on the other side of the world! For instance, users can check if fresh fish remained at unacceptable temperatures and for how long! They can provide that extra guarantee that goods never ventured out of limits of public safety.

HI 140 models feature different temperature ranges to make them more accurate for your specific needs. A green LED on the front of the meter notifies users of the logging status, while a red LED serves as an alarm indication when undesired temperatures have been encountered.

HI 140 can store up to 7600 measurements at selectable intervals from 1 minute to 24 hours. All parameters can be set through our Windows® compatible software. An infrared cradle eliminates the need to put a connector on the meter - an undesirable dirt-trap in the food market and source of problems due to wear and tear over time.

Logged data can be transferred to a PC by simply placing the instrument on the HI 90140 interface and running the HI 92140 software. Users need just one interface connected to the PC to handle all HANNA dataloggers, each identified by a unique ID code.

The instruments are equipped with BEPS (Battery Error Prevention System) which alerts the user in the event that low battery power could adversely affect readings.



- **The HI 140 logger is an excellent way to conform with HACCP requirements and guarantee safety throughout the food chain**
- **Through HI 92140 application software (optional), all models can be programmed to read °C or °F**
- **Completely user friendly - set the parameters to best fit your application**

ORDERING INFORMATION

All **HI 140** models are supplied with batteries and instructions.

ACCESSORIES

HI 90140	Infrared interface for PC connection
HI 92140	Windows® compatible software

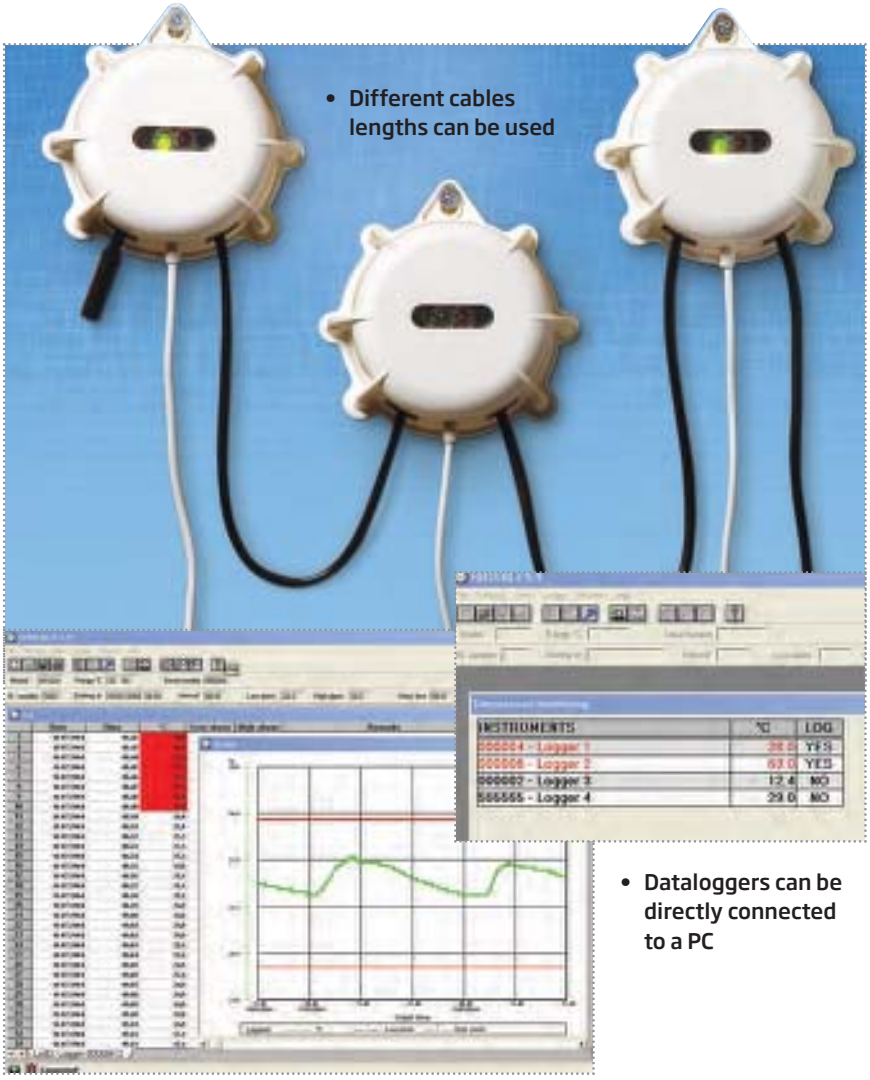
SPECIFICATIONS

Model	Range	Resolution	Accuracy
HI 140A(H)*	-30.0 to 70.0°C / -22.0 to 158.0°F	0.5°C / 0.5°F	±1.5°C / ±3°F
HI 140B(H)	-10.0 to 30.0°C / 14 to 86°F	0.2°C / 0.4°F	±0.5°C / ±1°F
HI 140C(H)	-30.0 to 10.0°C / -22 to 50°F	0.2°C / 0.4°F	±0.5°C / ±1°F
HI 140D(H)	20.0 to 60.0°C / 68 to 140°F	0.2°C / 0.4°F	±0.5°C / ±1°F
HI 140E(H)	-30.0 to -10.0°C / -22 to 14°F	0.1°C / 0.2°F	±0.3°C / ±0.6°F
HI 140F(H)	20.0 to 40.0°C / 68 to 104°F	0.1°C / 0.2°F	±0.3°C / ±0.6°F
HI 140G(H)	-5.0 to 15.0°C / 23 to 59°F	0.1°C / 0.2°F	±0.3°C / ±0.6°F
HI 140H(H)	10 to 120°C / 50 to 248°F	1°C /.2°F	±2°C / ±4°F

All loggers have the following features: programmable high and low alarm thresholds; programmable logging interval from 1 min. to 23 hours and 59 min; logging delay start selectable from 0 min. to 23 hours and 59 min; programmable ID number; infrared communication with PC interface; programmable real time clock; 3 x 1.5V AA batteries (included) with approx. life of 4 years at 25°C; dimensions: dia 86.5 mm x h 35 mm; / weight: 150 g

* For models with molded hook, use the "H" at the end of the part code. Ex. HI 140AH

Temperature Monitoring System



• **Dataloggers can be directly connected to a PC**

- **Monitor temperature from a PC**
- **Create a network of up to 31 loggers**

Required temperature monitoring and control is becoming more prevalent in the food industry, catering and supermarkets.

Many instruments have been produced for continuous temperature monitoring, but they usually have to be removed from their location for data transfer.

Now, with our HI 142, this is no longer a problem. HI 142 is available in 8 models with different temperature ranges and can log up to 7600 samples.

Users can interact with the loggers directly from a PC and check the status of the instruments. From the PC software, users can also can perform set-up as well as download data when logging is complete. It is possible to build a network with up to 31 loggers.

HI 92140 Windows® compatible software can be also used to set High and Low alarm thresholds, logging interval, logging delay start, alarm mask time, and lot ID.

SPECIFICATIONS Model	Range	Resolution	Accuracy
HI 142A(H)*	-30.0 to 70.0°C	0.5°C	±1.5°C
HI 142B(H)(/5)**	-10.0 to 30.0°C	0.2°C	±0.5°C
HI 142C(H)	-30.0 to 10.0°C	0.2°C	±0.5°C
HI 142D(H)	20.0 to 60.0°C	0.2°C	±0.5°C
HI 142E(H)	-30.0 to -10.0°C	0.1°C	±0.3°C
HI 142F(H)	20.0 to 40.0°C	0.1°C	±0.3°C
HI 142G(H)	-5.0 to 15.0°C	0.1°C	±0.3°C
HI 142H(H)(/5)	10 to 120°C	1°C	±2°C

Specifications for all models	
Data Logging	up to 7600 samples
Environment	0 to 50°C (32 to 122°F); RH max 95%
Power Supply	10-20 VDC
Probe	fixed, with 1.5 m cable of non-toxic material
Dimensions / Weight	dia 86.5 x h 35 mm (dia 3.4 x h 1.4") / 150 g (5.5 oz.)

* For models with molded hook, use the "H" at the end of the part code. Ex. HI 142AH
** For models with a 5 m (16.4') cable, use the "/5" at the end of the part code. Ex. HI 142HH/5

ORDERING INFORMATION

HI 142 is supplied with instructions.

ACCESSORIES

HI 92140	Windows® compatible software

HI 143

T-Logger with Locking Wall Cradle

- **Logging start through PC** by pressing a button or at a set time
- **Selectable sampling interval** from 1 minute to 24 hours
- **Up to 4,000 logged samples**
- **Selectable measurement unit, °C or °F**
- **Min/Max measured values are stored and displayed**
- **Programmable high and low alarms**
- **Non-volatile storage of logging parameters and data**
- **Battery level indicator on display**
- **Security password**
- **Waterproof protection**

HI 143 is a temperature data logger with internal NTC sensor. The HI 143 is controlled via USB or RS232 on a PC with HANNA's Windows® compatible application software. Communication is made between the logger and the PC through the HI 143001 transmitter with RS232 or HI 143002 with USB connector. The supplied wall cradle makes it easy to lock the meter in place to prevent tampering and the application software supports security passwords.

ORDERING INFORMATION

HI 143 is supplied with CR2032 lithium battery, wall cradle, lock and instructions.
HI 143-00 is supplied with HI 143001 RS232 communication cradle, Windows® compatible application software, CR2032 lithium battery, wall cradle, lock and instructions.
HI 143-10 is supplied with HI 143002 USB communication cradle, Windows® compatible application software, CR2032 lithium battery, wall cradle, lock and instructions.

ACCESSORIES

HI 143002	USB communication cradle
HI 143001	RS232 communication cradle
HI 92143	HI 143 software

SPECIFICATIONS	HI 143
Range	-30. to 70.0°C/-22.0 to 158.0°F
Resolution	0.1°C/0.1°F
Accuracy	±0.4°C (-20 to 60°C); ±0.6°C (outside) ±0.7°F (-4 to 140°C); ±1.1°F (outside)
Calibration	factory calibrated
Data Logging	up to 4,000 samples
Logging Interval	user selectable, from 1 minute to 24 hours
Battery Type / Life	CR2032 3V lithium ion / approximately 2 years
Protection	IP65 (water-resistant)
Dimensions	60 x 37 x 17 mm (2.4 x 1.5 x 0.7")

CONTENTS

Hygrometers: Relative Humidity Measurement

Introduction

The hygrometer is an instrument used to measure relative humidity (RH), that is, the quantity of water vapor present in the air. Hygrometers are often available in versions that also measure temperature–these are normally called thermohygrometers.

Relative humidity is expressed as the ratio of the quantity of water vapor present in the air to the quantity at which the air would reach saturation (100%) at a given temperature.

Accurate and Efficient RH Measurement

HANNA offers a wide range of relative humidity (RH) meters. Calibration is performed at the factory using humidity chambers and tuned at 3 different points (14%, 50%, 80%). Each model has been designed around certain field applications and environments.

Principle of Operation

The measurement system is made up of a meter connected to a probe. The probe measures capacitance, a capacitor with a polymer or plastic dielectric material with a fixed dielectrical constant from 2 to 15. Increased humidity causes the dielectric to dilate, hence distancing the plates with consequent variation of the capacitor's geometry and reduction of its capacitance. These capacitance variations in turn cause a frequency change in the instrument's electronics, resulting in a frequency modulation which is a function of relative humidity. The frequency is then converted into voltage, which is converted into a relative humidity value displayed on the LCD.

The hygrometers precision essentially depends on how insusceptible it is to the following three factors: the first is the "linearity error" caused by the typical non-linearity of RH sensors. HANNA hygrometers compensate for the effects of this error. It is advisable, however, to calibrate the meter periodically to reduce the probability of this error reoccurring.

The second factor is the "temperature error" caused by the variation of the hygroscopic properties of the sensor's dielectric material as a function of temperature. In fact, the ratio between the quantity of water vapor present in the dielectric and the relative humidity is not directly proportional, but varies with temperature.

The third factor is the "calibration error" caused by an incorrect calibration procedure.

Calibration

The RH probe is first immersed in the low RH chamber and allowed to stabilize. The meter is then calibrated at the RH value of the chamber being used. The procedure is repeated with the high RH chamber. Since RH is dramatically affected by temperature changes, kits do not provide accurate calibration due to the practical difficulties in performing the calibration at a constant temperature. Climatic chambers that simulate different humidity levels are the ideal solution to calibrate hygrometers accurately. Hygrometers are also calibrated using two different levels of relative humidity in this calibration procedure, and then the accuracy is checked by simulating other RH values in the chamber.

HANNA service centers are equipped with calibration chambers to provide for the highest accuracy.

Dew Point

The dew point is defined as the temperature to which air must be cooled in order for condensation (saturation) to occur. The dew point is dependent on the concentration of water vapor present, and therefore, the relative humidity. HI 9565 not only measures relative humidity, but automatically measures and displays the dew point as well.

HI 7101 Calibration Chamber

Comparison Guide

GUIDE	RH Range	Temperature Range	Dew Point Range	BEPS	HOLD	Backlit LCD	Page
Portable Meters							
HI 9565	•	°C/°F	•	•	•	•	15.3
HI 9564	•	°C/°F		•	•		15.3
HI 93640	•	°C/°F		•			15.4
HI 8666	•	°C					15.5

HI 9564 • HI 9565

Thermohygrometers with Dew Point and Calibration Data-Logging Probe

- **Backlit LCD**
- **Auto shut-off**
- **HOLD button**
- **BEPS and low battery warning**

HI 9564 and HI 9565 are two portable thermohygrometers designed to provide peak performance in harsh environments. For poorly lit areas the HI 9565 features a backlit LCD.

In addition to RH and temperature, HI 9565 will display the dew point with the press of a button. The dew point indicates the presence of water vapor in the air at a given temperature. With this feature HI 9565 permits quick and effective environmental monitoring where a controlled microclimate is necessary, like greenhouses, museums, clean rooms and laboratories.

These instruments also feature a HOLD button to freeze readings on the display for manual recording and BEPS (Battery Error Prevention System) which alerts the user in the event that low battery power could adversely affect readings.

HI 70602 RH probe features a built-in microchip that can store calibration data. When the probe is connected to another hygrometer, the microchip transfers the stored calibration data and eliminates the need to recalibrate the instrument.

Both instruments feature auto-off after 20 minutes of inactivity, temperature readings in Celsius and Fahrenheit, and online help to indicate anomalies and direct procedures.

SPECIFICATIONS		HI 9564	HI 9565
Range	RH	20.0 to 95.0%	
	Temperature	0.0 to 60.0°C / 32 to 140.0°F*	
	Dew Point	–	-20.0 to 60.0°C / -4.0 to 140.0°F
Resolution	RH	0.1% RH	
	Temperature	0.1°C / 0.1°F	
	Dew Point	–	0.1°C / 0.1°F
Accuracy	RH	±3 % RH (50 to 85 % RH and 15 to 40°C); ±5% RH (outside)	
	Temperature	±0.5°C / ±1°F	
	Dew Point	–	±2°C /±4°F (50 to 85 % RH and 15 to 40°C); ±4.5°C /±9°F (outside)
Probe		HI 70602 RH probe with thin, ABS body, perforated cap, internal temperature sensor with DIN connector and 1 m (3.3') cable (included)	
Battery Type / Life		9V / approximately 250 hours of continuous use; auto-off after 20 minutes of non-use (can be disabled)	
Environment		0 to 60°C (32 to 140°F); RH max 98% non-condensing	
Dimensions		164 x 76 x 45 mm (6.5 x 3 x 1.8 ")	
Weight		340 g (12 oz.)	

* Note: The meter measures temperature from -30 to 80°C, but the RH measurement can only be taken within the range 0 to 60 °C.

ORDERING INFORMATION

HI 9564 and **HI 9565** are supplied with HI 70602 relative humidity probe, battery and instructions.

ELECTRODES

HI 70602	RH probe with thin, ABS body, perforated cap, internal temperature sensor, DIN connector and 1 m (3.3') cable
HI 70602/5	RH probe with thin, ABS body, perforated cap, internal temperature sensor, DIN connector and 5 m (16.5') cable

ACCESSORIES

HI 710015	Blue protective boot
HI 710016	Orange protective boot

HI 93640

Compact Thermo-Hygrometer with Built-in Sensor

- **Portability and simplicity**
- **Low battery indicator**
- **Dual temperature range**
- **BEPS and low battery warning**

H 93640 is a compact, portable and versatile thermo-hygrometer that monitors relative humidity, anywhere. This simple to use meter is ideal for the HVAC field.

The built-in thin-film capacitance sensor assures accurate humidity measurements from 10 to 95% RH with a resolution of 0.1%.

Designed to be operated with just one hand, the compact housing fits easily in your palm. The design of the rubber keys resists the ingress of dust and protects the instrument from accidental splashes.

A sintered cap can be placed on the sensor shaft for protection in dusty environments. If faster response is desired, the cap can be removed.

The HI 93640 is equipped with BEPS (Battery Error Prevention System) which alerts the user in the event that low battery power could adversely affect readings.

ORDERING INFORMATION

HI 93640 is supplied with built in RH sensor, protective sintered cap for RH sensor, battery and instructions.

ACCESSORIES

HI 710011	RH probe protective sintered cap
HI 7102	Calibration chamber for probes with sintered cap
HI 7111/P	LiCl RH calibration salts for low humidity calibration, 15 g (6)
HI 7121/P	NaCl RH calibration salts for high humidity calibration, 33 g (6)
HI 710007	Blue Shockproof rubber boot
HI 710008	Orange Shockproof rubber boot
HI 710031	Rugged carrying case

SPECIFICATIONS		HI 93640
Range	**RH**	10.0 to 95.0% RH
	Temperature	0.0 to 60.0°C / 32.0 to 140.0°C
Resolution	**RH**	0.1%
	Temperature	0.1°C / 0.1°F
Accuracy	**RH**	±3% RH (50 to 85 % RH); ±4% RH (outside)
	Temperature	±0.5°C / ±1°F
Battery Type / Life		1.5 AA (3) / approximately 1,000 hours of continuous use
Environment		0 to 60°C (32 to 140°F); RH max 98% non-condensing
Dimensions		190 x 80 x 36 mm (7.5 x 3.1 x 1.4")
Weight		250 g (8.8 oz.)

Relative Humidity and Temperature Transmitter

- **Dual-range transmitter**
- **Removable sintered metal cap**
- **Can be quickly removed for maintenance with minimal downtime**
- **Wall mounted**

This solid-state transmitter plugs into its wall-mounted receptacle for on-site, continuous monitoring of relative humidity and temperature in critical or controlled environments.

The HI 8666 has an excellent accuracy of ±2% RH and ±1% °C. Each 4-20 mA analog signal can be sent to remote panel meters, controllers or data acquisition systems. The signals are to be powered by separate external voltage sources.

Equipped with a removable sintered cap, the HI 8666 sensor is well protected for the long run against the ingress of dust or unclean environments.

With the sintered cap removed, the sensor's response time is faster but it is no longer protected from dust or debris.

With the sintered cap installed, the life of the sensor and the instrument is prolonged and less maintenance is needed. This is ideal in some applications, such as food and industrial applictions where reliability rather than response time is the primary objective.

SPECIFICATIONS		HI 8666
Range	RH	0% (4 mA) to 100% (20 mA)
	Temperature	-20°C (4 mA) to 60°C (20 mA)
Accuracy	RH	±2% (5% to 95% RH)
	Temperature	±1% f.s.
Response Time		six seconds without sintered cap; sixty seconds with sintered cap
Power Supply		10-30 Vdc
Output Signal		4 to 20 mA
Environment		0 to 60°C (32 to 140°F)
Panel Cutout		73 x 42 mm (2.9 x 1.6")
Dimensions		79 x 49 x 150 mm (3.1 x 1.9 x 5.9")
Weight		150 g (5.3 oz.)

ORDERING INFORMATION

HI 8666 is supplied with built-in RH sensor, protective sintered cap for RH sensor, mounting brackets and instructions.

ACCESSORIES

HI 710011 RH probe protective sintered cap
HI 7102 Calibration chamber for probes with sintered cap
HI 7111/P LiCl RH calibration salts for low humidity calibration, 15 g (6)
HI 7121/P NaCl RH calibration salts for high humidity calibration, 33 g (6)

Relative Humidity Probe

HANNA humidity probes utilize a high-tech Thin-Film Polymer Capacitance (TFPC) humidity sensor. This sensor enables rapid response and high accuracy.

For rapid response, HANNA recommends a probe with a perforated cap. For industrial environments with dust and powders, HANNA recommends a probe with a protective sintered cap.

PROBE	CABLE LENGTH	PROBE LENGTH	CONNECTOR	SENSORS	USED WITH
HI 70602	1 m (3.3')	170 mm (6.5")	DIN	RH (resistive) & °C	HI 9564, HI 9565 (included)
HI 70602/5	5 m (16.5')	170 mm (6.5")	DIN	RH (resistive) & °C	HI 9564, HI 9565 (optional)

HI 7102 Calibration chamber for probes with sintered cap

HI 7111/P LiCl RH calibration salts for low humidity calibration, 15 g (6)
HI 7121/P NaCl RH calibration salts for high humidity calibration, 33 g (6)

HI 710007 Blue Shockproof rubber boot
HI 710008 Orange Shockproof rubber boot

HI 710011 RH probe protective sintered cap

HI 97500

Portable Lux Meter

- **Three measurement ranges**
- **Light sensor attached to 1.5 meter coaxial cable**
- **Rugged, waterproof case**
- **Low-battery indicator**

HI 97500 is a portable lux meter designed to perform light measurements simply and accurately. The instrument is supplied with a light sensor connected by a fixed 1.5 m coaxial cable to allow measurements to be taken from a distance without any interference from the operator.

By simply pressing the RANGE key, users can switch among three ranges to choose the best resolution according to the environment being tested. The HI 97500 lux meter has a rugged and water-resistant body for frequent outdoor use.

HI 97500 features a low battery indicator and automatic shut-off feature that turns the meter of after 7 minutes of non-use. Powered by a single 9V battery, this instrument guarantees about 200 hours of continuous operation.

The Quality of Light

Quality of light is very important in the workplace, schools, greenhouses and public buildings. Too little light (or luminous intensity) affects the quantity and quality of performance of both people and crops. HANNA's light meter uses special optic filters to match the spectral sensitivity of the human eye.

Luminous intensity is measured and reported in foot-candle or lux (lx). Light meters are commonly referred to as lux meters. One lux is equal to one lumen per square meter and one foot-candle is equal to one lumen per square foot. To convert measurements, use the following formula:

foot-candle = 10.764 lux

lux = 0.0929 foot-candle

SPECIFICATIONS	HI 97500
Range	0.001 to 1.999 Klux 0.01 to 19.99 Klux 0.1 to 199.9 Klux
Resolution	0.001 Klux 0.01 Klux 0.1 Klux
Accuracy	±6% of reading ±2 digits
Sensor	human-eye-response silicon photodiode with 1.5 m coaxial cable (fixed)
Battery Type / Life	9V / approximately 200 hours of continuous use; auto-off after 7 minutes of non-use
Environment	0 to 50°C (32 to 122°F); RH 100%
Dimensions	164 x 76 x 45 mm (6.5 x 3.0 x 1.8")
Weight	180 g (6.3 oz.)

ORDERING INFORMATION

HI 97500 is supplied with battery, protective case and instructions.

CONTENTS

HANNA BL Series Mini Controllers

Accurate and Simple to Install

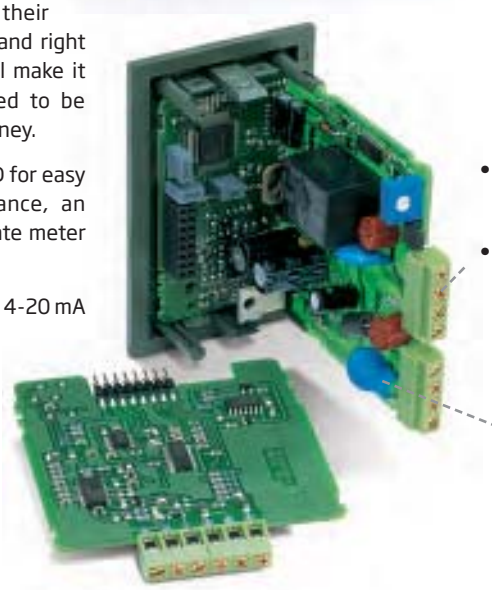
Traditionally, process monitoring has required considerable investment in system design, equipment, maintenance and training. With our mini controllers, we are able to offer a solution for industries that have to monitor a process economically. HANNA mini controllers are easy to use and allow accurate continuous monitoring and control of pH, ORP, TDS, EC, resistivity and level. These compact, in-line instruments are designed to consistently perform in most environments and conditions.

Our line of easy operation controllers have been specially designed for hydroponics, swimming pools or applications where space or cost are a major concern. Thanks to their compact size, they can be mounted in confined spaces and right next to tanks or vats. The low cost of these meters will make it possible for processes that were manually maintained to be controlled automatically, saving considerable time and money.

Our redesigned mini controller series features a larger LCD for easy reading, manual output control for simple maintenance, an overtime control system and a multicolored LED to indicate meter condition (measurement, dosing or alarm mode).

The BL 931700 and BL 932700 models are provided with a 4-20 mA analog output and input for remote control disabling.

- **Fire retardant casing**
- **Large LCD**
- **Selectable overdose protection system**
- **External disable feature**
- **Selectable control override**
- **Matching pin connection**
- **4-20 mA analog output** (specific models)



- **Removable modules for easy maintenance**
- **Quick-connect terminal blocks**
- **2 amp built-in fuse**

Comparison Guide

Mini Controllers

GUIDE	pH	ORP	EC	TDS	Resistivity	Level	ATC	0.1 Resolution	0.01 Resolution	Page
BL 981411	•							•		16.5
BL 931700	•								•	16.6
BL 982411		•								16.7
BL 932700		•								16.8
BL 983313			•				•			16.9
BL 983320			•				•	•		16.9
BL 983322			•				•		•	16.9
BL 983317			•				•		•	16.10
BL 983327			•				•		•	16.10
BL 983315				•			•	•		16.11
BL 983319				•			•			16.11
BL 983321				•			•		•	16.11
BL 983329				•			•			16.11
BL 983318				•			•		•	16.12
BL 983324				•			•	•		16.13
BL 983314					•		•	•		16.14
HI 7871						•				16.15
HI 7873						•				16.15

Any System Can be Cost Effectively Monitored 24/7

BlackStone mini controllers are the perfect solution for water analysis and control

pH Mini Controllers

Monitoring and controlling pH in water conditioning and industrial applications is essential for water quality and maintaining infrastructure (piping and equipment). In the case of industrial effluent, neutralization of acidic waste is vital for environmental safety and public health. In industrial applications such as boiler feed water conditioning, a higher pH of 8.5 is necessary to prevent scaling and corrosion of critical components. Maintaining a pH of 7.4 is fundamental for proper and efficient sanitization in swimming pools and spas. The effectiveness of sanitizers such as chlorine is dependent on a controlled pH value.

ORP Mini Controllers

ORP (Oxidation Reduction Potential) is the most dependable and consistent indicator of the sanitizing effectiveness of your pool, spa, or water treatment. As oxidizers such as chlorine, peroxide, and ozone are added to water for the purpose of sanitization, the ORP value increases, providing a clear indication of the cleansing power of the water. Typically, an ORP value of 650 to 700 mV at a pH of 7.2 indicates that your water is properly treated and all harmful bacteria are killed in less than 1 second. ORP is also essential in chemical processing where reducing agents are used and a negative ORP value is an indicator of proper neutralization.

Conductivity Mini Controllers

In water, an increase in conductivity indicates an increase in water hardness and a decrease in purity. Conductivity monitoring and control is essential in reducing water hardness and maintaining water quality. For instance, water with a conductivity value in the range of 0-140 µS is considered "very soft", where water with a range of 640-840 µS is considered "hard" water. An increase in conductivity indicates an increase in the amount of damaging dissolved solids (salts) present in water. Conductivity monitoring and control is essential in industrial applications such as feed water control, blow down activation in cooling towers and water management. In these applications, high conductivity will cause scaling and corrosion of piping and damage to critical components.

TDS Mini Controllers

TDS measurement is an important indicator of water quality. An increase in the TDS reading indicates an increase in the amount of dissolved solids (salts) present in the water. TDS monitoring and control is imperative in industrial applications such as feed water control, blow down activation in cooling towers and water management, in these applications high TDS will cause scaling and corrosion of piping and damage to critical components.

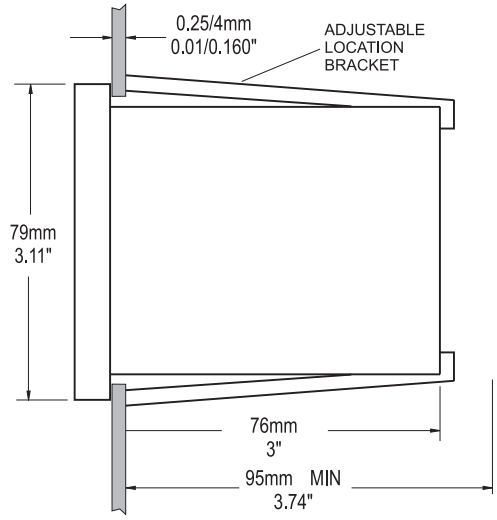
TDS measurement is also an important indicator of the effectiveness of water conditioning since an increase in TDS indicates an increase in water hardness and a decrease in purity. This will affect the quality of drinking water, feed water and rinse water. TDS monitoring and control is crucial in reducing water hardness and maintaining water quality and usability.

Resistivity Mini Controller

Resistivity, measured in MΩ (Ohm's), is the optimal way to measure the quality of water produced by high purity systems such as reverse osmosis systems and water conditioning equipment. As filter systems become less effective, the resistivity value will decrease indicating a need for maintenance and/or replacement of filters and critical components. Properly functioning RO and water conditioning systems will consistently produce water with resistivity readings in the range of 16 to 18 MΩ.

HANNA Mini Controllers

BL Series Mechanical Dimensions

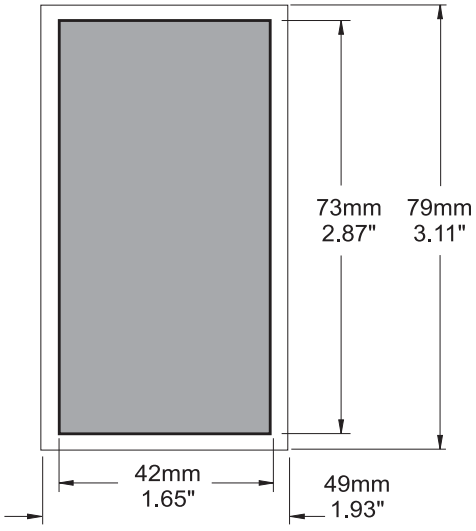


Side View

Side view of panel-mounted controllers.

Adjustable location brackets allow the controller to slide into the cutout and will hold the unit securely in place.

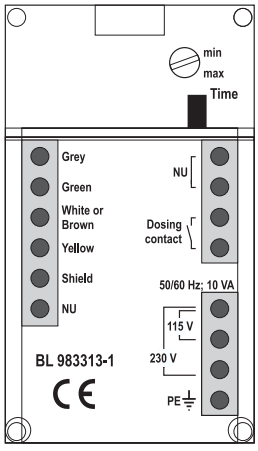
130 or 87 mm (depending on model) is the minimum amount of room required to install the meter with all wiring.



Front View

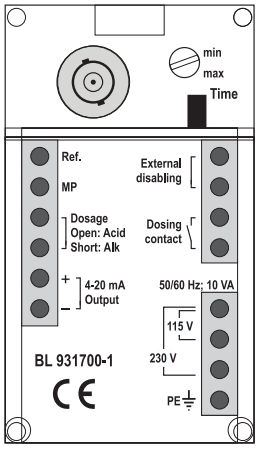
Front view of the panel-mounted units.

Dimensions show the cutout size for installation and also the outside dimensions of the panel.



Rear View

Rear view of the BL 983313-1 with electrical connections.



Rear View

Rear view of the BL 931700-1 with electrical connections.

pH Mini Controller

- **Easy to handle**
- **Fire retardant casing**
- **Selectable overdose protection system**
- **Splash resistant cover**

BL 981411 pH controller has been designed for easy, affordable installation in tight spaces, ideal for simple and effective process control. The unit is provided with high impedance pH input and can be used with any pH electrode with standard BNC connector. Measurements are clearly displayed on the LCD, while the status LED indicates operating mode.

BL 981411 is also provided with a dosing relay. Selecting acid dosing, will cause the relay to activate when the measurement is higher than the set point. If the basic dosing is selected, the relay is activated when the reading falls below the set point.

Set point adjustment (from 0 to 14 pH) and calibration procedures are easily performed with trimmers on the front panel. Users can choose from automatic or manual dosing modes with a switch on the front panel. Manual control is particularly useful during maintenance operations, because it permits operators to enable or disable the dosing relay according to need. An overtime control system advises users when the relay is active too long, to help prevent overdosing.

SPECIFICATIONS	BL 981411-0	BL 981411-1
Range	0.0 to 14.0 pH	
Resolution	0.1 pH	
Accuracy (@20°C/68°F)	±0.2 pH	
Calibration	manual, through CAL (Offset) trimmer	
Dosing Relay	maximum 2A (fuse protected), 250 Vac, 30 VDC	
Dosing Selection	acid or alkaline contact open=acid dosage=relay ON if measurement > set point contact close=alkaline dosage=relay ON if measurement < set point	
Set point	adjustable from 0.0 to 14.0 pH	
Overtime	adjustable, typically from 5 to approximately 30 minutes	
Input Impedance	10^{12} Ohm	
Power Supply	12 VDC adapter (included)	115/230 VAC ±10%; 50/60Hz
Dimensions	79 x 49 x 95 mm (3.1 x 1.9 x 3.7")	
Weight	200 g (7.1 oz.)	300 g (10.6 oz.)

ORDERING INFORMATION

BL 981411-0 (12 VDC) and **BL 981411-1** (115/230V) are supplied with mounting brackets, transparent cover and instruction manual.

PROBES

HI 1001	PVDF body pH electrode with 1/2" NPT thread, BNC connector and 3 m (9.8') cable for continuous flow-thru monitoring

SOLUTIONS

HI 7004L	pH 4.01 buffer solution, 500 mL
HI 7007L	pH 7.01 buffer solution, 500 mL
HI 7010L	pH 10.01 buffer solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL

ACCESSORIES

HI 710005	115 VAC/12 VDC power adapter
HI 710006	230 VAC/12 VDC power adapter
HI 740146	Mounting brackets

For a complete list of Solutions, see the end of pH *Section 3*.

BL 931700

pH Mini Controller with 4-20 mA Recorder Output

- **Easy to handle**
- **Fire retardant casing**
- **Selectable overdose protection system**
- **Splash resistant cover**

BL 931700 mini pH controller has been designed for easy, affordable installation in tight spaces to perform simple yet effective process control. Thanks to its compact size, BL 931700 can be installed right next to tanks or vats.

This versatile controller is ideal for a wide variety of applications, such as textiles, papers, photographic solutions, plating baths, chemicals and water treatment.

BL 931700 is provided with a selectable set point for acid or basic dosage.

Measurements are directly taken from a pH electrode in the range from 0 to 14 with a 0.01 pH resolution. Accuracy is ensured by two point calibration, performed manually through trimmers on the front panel.

Users can choose automatic or manual dosing mode with a switch on the front panel. Manual control is particularly useful during maintenance operations, because it permits operators to enable or disable the dosing relay according to need. The overtime control system advises users when the relay is active for too long, helping to prevent overdosing.

In addition, this model features a 4-20 mA analog output for recorder connection.

ORDERING INFORMATION

BL 931700-0 (12 VDC) and **BL 931700-1** (115/230V) are supplied with mounting brackets, transparent cover and instruction manual.

PROBES

HI 1001	PVDF body pH electrode with 1/2" NPT thread, BNC connector and 3 m (9.8') cable for continuous flow-thru monitoring

SOLUTIONS

HI 7004L	pH 4.01 buffer solution, 500 mL
HI 7007L	pH 7.01 buffer solution, 500 mL
HI 7010L	pH 10.01 buffer solution,500 mL
HI 70300L	Electrode storage solution,500 mL
HI 7061L	Electrode cleaning solution, 500 mL

ACCESSORIES

HI 710005	115 VAC/12 VDC adapter
HI 710006	230 VAC/12 VDC adapter
HI 740146	Mounting brackets

SPECIFICATIONS	BL 931700-0	BL 931700-1
Range	0.00 to 14.00 pH	
Resolution	0.01 pH	
Accuracy (@20°C/68°F)	±0.02 pH	
Calibration	manual, through offset and slope trimmers	
Dosing Relay	maximum 2A (fuse protected), 250 Vac, 30 VDC	
Dosing Selection	acid or alkaline contact open=acid dosage=relay ON if measurement > set point contact close=alkaline dosage=relay ON if measurement < set point	
Set point	adjustable from 0.00 to 14.00 pH	
Overtime	adjustable, typically from 5 to approximately 30 minutes	
Recorder Output	4 to 20 mA, accuracy ±0.20 mA, 500 Ω maximum load	
Input Impedance	10^{12} Ohm	
Power Supply	12 VDC adapter (included)	115/230 VAC ±10%; 50/60Hz
Dimensions	79 x 49 x 95 mm (3.1 x 1.9 x 3.7")	
Weight	200 g (7.1 oz.)	300 g (10.6 oz.)

For a complete list of Solutions, see the end of pH *Section 3*.

ORP Mini Controller

- **Easy to handle**
- **Fire retardant casing**
- **Selectable overdose protection system**
- **Splash resistant cover**

BL 982411 is an ORP mini controller for panel mounting, specially designed for swimming pools and spas. Thanks to its compact size, BL 982411 can be installed in small spaces. BL 982411 is the ideal solution for those who have always checked ORP manually. With it's automatic dosing, this mini controller will significantly reduce maintenance time.

BL 982411 can be used with any ORP electrode with standard BNC connector. The instrument measures ORP in the 0 to 1000 mV range and shows the readings on the display. The status LED continuously indicates if the controller is in measurement, dosing or alarm mode.

BL 982411 is also provided with a relay for selecting the dosing direction, oxidizing or reducing.

Users can choose automatic or manual dosing mode with a switch on the front panel. Manual control is particularly useful during maintenance operations, because it permits operators to enable or disable the dosing relay according to need. The overtime control system advises users when the relay is active for too long, helping to prevent over-dosage.

SPECIFICATIONS	BL 982411-0	BL 982411-1
Range	0 to 1000 mV	
Resolution	1 mV	
Accuracy (@20°C/68°F)	±5 mV	
Calibration	manual, with CAL trimmer	
Dosing Relay	maximum 2A (fuse protected), 250 Vac, 30 VDC	
Dosing Selection	reducing or oxidizing, selectable on the back panel contact open=reductant dosage=relay ON if measure > set point contact close=oxidant dosage=relay ON if measure < set point	
Set point	adjustable, from 0 to 1000 mV	
Overtime	adjustable, typically from 5 to approximately 30 minutes	
Input Impedance	10^{12} Ohm	
Power Supply	12 VDC adapter (included)	115/230 VAC ±10%; 50/60Hz
Dimensions	79 x 49 x 95 mm (3.1 x 1.9 x 3.7")	
Weight	200 g (7.1 oz.)	300 g (10.6 oz.)

ORDERING INFORMATION

BL 982411-0 (12 VDC) and **BL 982411-1** (115/230V) are supplied with mounting brackets, transparent cover and instruction manual.

PROBES

HI 2001	PVDF body ORP electrode with 1/2" NPT thread, BNC connector and 3 m (9.8') cable for continuous flow-thru monitoring

SOLUTIONS

HI 7020L	ORP test solution @200-275 mV, 500 mL
HI 7022L	ORP test solution @470 mV, 500 mL
HI 7091L	Reducing pretreatment ORP solution, 500 mL
HI 7092L	Oxidizing pretreatment ORP solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL

ACCESSORIES

HI 710005	115 VAC/12 VDC power adapter
HI 710006	230 VAC/12 VDC power adapter
HI 740146	Mounting brackets

For a complete list of Solutions, see the end of pH *Section 3*.

BL 932700

ORP Mini Controller with 4-20 mA Recorder Output

- **Easy to handle**
- **Fire retardant casing**
- **Selectable overdose protection system**
- **Splash resistant cover**

BL 932700 is an ORP mini controller that has been designed for easy, affordable installation in tight spaces, ideal for simple yet effective process control. As a result of its compact size, BL 932700 can be installed right next to tanks or vats.

This versatile controller is ideal for many applications, such as ORP monitoring bleaching processes, waste water treatment and swimming pools. BL 932700 permits automatic control of installations previously checked manually.

The instrument can be set for reducing or oxidizing dosage. It measures in the ±1000 mV range, with 1 mV resolution. Set point adjustment and calibration are simply performed through trimmers on the front panel. Users can choose automatic or manual dosing mode with a switch on the front panel. Manual control is particularly useful during maintenance operations, because it permits operators to enable or disable the dosing relay according to need.

The overtime control system advises users when the relay is active too long, helping to prevent over dosage. In addition, this model features a 4-20 mA analog output for recorder connection.

ORDERING INFORMATION

BL 932700-0 (12 VDC) and **BL 932700-1** (115/230V) are supplied with mounting brackets, transparent cover and instruction manual.

PROBES

HI 2001	PVDF body ORP electrode with 1/2" NPT thread, BNC connector and 3 m (9.8') cable for continuous flow-thru monitoring

SOLUTIONS

HI 7020L	ORP test solution @200-275 mV, 500 mL
HI 7022L	ORP test solution @470 mV, 500 mL
HI 7091L	Reducing pretreatment ORP solution, 500 mL
HI 7092L	Oxidizing pretreatment ORP solution, 500 mL
HI 70300L	Electrode storage solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL

ACCESSORIES

HI 710005	115 VAC/12 VDC power adapter
HI 710006	230 VAC/12 VDC power adapter
HI 740146	Mounting brackets

SPECIFICATIONS	BL 932700-0	BL 932700-1
Range	±1000 mV	
Resolution	1 mV	
Accuracy (@20°C/68°F)	±5 mV	
Calibration	manual, with CAL trimmer	
Dosing Relay	maximum 2A (fuse protected), 250 Vac, 30 VDC	
Dosing Selection	reducing or oxidizing, selectable on the back panel contact open=reductant dosage=relay ON if measure > set point contact close=oxidant dosage=relay ON if measure < set point	
Set point	adjustable from -1000 to 1000 mV	
Overtime	adjustable, typically from 5 to approximately 30 minutes	
Recorder Output	4 to 20 mA, accuracy ±0.20 mA, 500 Ω maximum load	
Input Impedance	10^{12} Ohm	
Power Supply	12 VDC adapter (included)	115/230 VAC ±10%; 50/60Hz
Dimensions	79 x 49 x 95 mm (3.1 x 1.9 x 3.7")	
Weight	200 g (7.1 oz.)	300 g (10.6 oz.)

For a complete list of Solutions, see the end of pH *Section 3*.

Conductivity Mini Controllers Measuring in µS/cm

- **Easy to handle**
- **Fire retardant casing**
- **Selectable overdose protection system**
- **Splash resistant cover**

These HANNA mini controllers have been specially designed for water conditioning and growing applications. Compact in size, they can be mounted in confined spaces or even right next to the vat or barrel containing the chemicals. These meters permit automatic control of installations previously checked manually.

EC measurements are shown on the display and the multicolored LED continuously indicates if the mini controller is in measurement, dosing or alarm mode. BL 983313 measures in the 0 to 1999 µS/cm range, BL 983320 measures from 0.0 to 199.9 µS/cm and BL 983322 from 0.00 to 19.99 µS/cm.

Users can choose automatic or manual dosing mode with a switch on the front panel. Manual control is particularly useful during maintenance operations, because it permits operators to enable or disable the dosing relay according to need. The overtime control system advices users when the relay is active for too long, helping to prevent over dosage.

SPECIFICATIONS	BL 983313	BL 983320	BL 983322
Range	0 to 1999 µS/cm	0.0 to 199.9 µS/cm	0.00 to 19.99 µS/cm
Resolution	1 µS/cm	0.1 µS/cm	0.01 µS/cm
Accuracy (@20°C/68°F)	±2% f.s.		
Probe	HI 7634-00 EC/TDS probe with internal temperature sensor and 2 m (6.6') cable (not included)		
Temperature Compensation	automatic, 5 to 50°C (41 to 122°F) with β=2%/°C		
Calibration	manual, with CAL trimmer		
Dosing Relay	maximum 2A (fuse protected), 250 Vac, 30 VDC contact close when measure > set point		
Set point	adjustable from 0 to 1999 µS/cm	adjustable from 0 to 199.9 µS/cm	adjustable from 0 to 19.99 µS/cm
Overtime	adjustable, typically from 5 to approximately 30 minutes		
Power Supply	models "-0": 12 VDC adapter (included) models "-1": 115/230 VAC ±10%; 50/60Hz		
Dimensions	79 x 49 x 95 mm (3.1 x 1.9 x 3.7")		
Weight	models "-0": 200 g (7.1 oz.) / models "-1": 300 g (10.6 oz.)		

ORDERING INFORMATION

BL 983313-0 (12 VDC), **BL 983313-1** (115/230V), **BL 983320-0** (12 VDC), **BL 983320-1** (115/230V), **BL 983322-0** (12 VDC) and **BL 983322-1** (115/230V) are supplied with mounting brackets, transparent cover and instruction manual.

ELECTRODES

HI 7634-00	EC/TDS probe with internal temperature sensor and 2 m (6.6') cable
HI 7634-00/4	EC/TDS probe with internal temperature sensor and 4 m (13.1') cable
HI 7634-00/5	EC/TDS probe with internal temperature sensor and 5 m (16.4') cable

SOLUTIONS

HI 7031L	1413 µS/cm calibration solution, 500 mL
HI 7033L	84 µS/cm calibration solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL

ACCESSORIES

HI 710005	115 VAC/12 VDC power adapter
HI 710006	230 VAC/12 VDC power adapter
HI 740146	Mounting brackets

For a complete list of Solutions, see the end of Conductivity *Section 6*.

BL 983317 • BL 983327

Conductivity Mini Controllers Measuring in mS/cm

- **Easy to handle**
- **Fire retardant casing**
- **Selectable overdose protection system**
- **Splash resistant cover**

BL 983317 and BL 983327 are panel mounted mini controllers with an output relay that have been designed for easy, affordable installation in tight spaces–ideal for simple yet effective process control.

Both instruments are provided with automatic compensation for variations in temperature. The probe (not included) is easy to clean and requires very little maintenance. The calibration is performed at one point, through a trimmer.

All wiring and connections to external devices are done through the terminals on the rear panel. The multicolor LED continuously indicates if the controller is in measurement, dosing or alarm mode.

Users can choose automatic or manual dosing mode by a switch on the front panel. Manual control is particularly useful during maintenance operations because it permits operators to enable or disable the dosing relay according to need. To help prevent overdosing, the overtime control system advises users when the relay is active too long.

ORDERING INFORMATION

BL 983317-0 (12 VDC), **BL 983317-1** (115/230V), **BL 983327-0** (12 VDC) and **BL 983327-1** (115/230V) are supplied with mounting brackets, transparent cover and instruction manual.

PROBES

HI 7632-00	EC/TDS probe with internal temperature sensor and 2 m (6.6') cable
HI 7632-00/5	EC/TDS probe with internal temperature sensor and 5 m (16.4') cable
HI 7632-00/6	EC/TDS probe with internal temperature sensor and 6 m (19.7') cable

SOLUTIONS

HI 7031L	1.41 mS/cm calibration solution, 500 mL
HI 7039L	5.00 mS/cm calibration solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL

ACCESSORIES

HI 710005	115 VAC/12 VDC power adapter
HI 710006	230 VAC/12 VDC power adapter
HI 740146	Mounting brackets

SPECIFICATIONS	BL 983317	BL 983327
Range	0.00 to 10.00 mS/cm	
Resolution	0.01 mS/cm	
Accuracy (@20°C/68°F)	±2% f.s.	
Probe	HI 7632-00 EC/TDS probe with internal temperature sensor and 2 m (6.6') cable (not included)	
Temperature Compensation	automatic, 5 to 50°C (41 to 122°F) with β=2%/°C	
Calibration	manual, with CAL trimmer	
Dosing Relay	maximum 2A (fuse protected), 250 Vac, 30 VDC	
	contact close when measure < set point	contact close when measure > set point
Set point	adjustable from 0 to 10 mS/cm	
Overtime	adjustable, typically from 5 to approximately 30 minutes	
Power Supply	models "-0": 12 VDC adapter (included) models "-1": 115/230 VAC ±10%; 50/60Hz	
Dimensions	79 x 49 x 95 mm (3.1 x 1.9 x 3.7")	
Weight	models "-0": 200 g (7.1 oz.) / models "-1": 300 g (10.6 oz.)	

For a complete list of Solutions, see the end of Conductivity *Section 6*.

TDS Mini Controllers

- **Easy to handle**
- **Fire retardant casing**
- **Selectable overdose protection system**
- **Splash resistant cover**

These instruments have been designed for TDS control in hydroponics, horticulture and water conditioning. Compact in size, they can be mounted in confined spaces or even right next to the vat or barrel containing the chemicals. These meters permit automatic control of installations previously checked manually.

Readings are shown on the display and the multicolored LED continuously indicates if the mini controller is in measurement, dosing or alarm mode.

Users can choose automatic or manual dosing mode with a switch on the front panel. Manual control is particularly useful during maintenance operations, because it permits operators to enable or disable the dosing relay according to your need.

The overtime control system advises users when the relay is active too long, helping to prevent over dosage.

SPECIFICATIONS	BL 983315	BL 983319	BL 983321	BL 983329
Range	0.0 to 199.9 mg/L (ppm)	0 to 1999 mg/L (ppm)	0.00 to 19.99 mg/L (ppm)	0 to 999 mg/L (ppm)
Resolution	0.1 mg/L (ppm)	1 mg/L (ppm)	0.01 mg/L (ppm)	1 mg/L (ppm)
Accuracy (@20°C/68°F)	±2% f.s.			
TDS Conversion Factor	0.5	0.65	0.5	0.5
Probe	HI 7634-00 EC/TDS probe with internal temperature sensor and 2 m (6.6') cable (not included)			
Temperature Compensation	automatic, 5 to 50°C (41 to 122°F) with β=2%/°C			
Calibration	manual, with CAL trimmer			
Dosing Relay	maximum 2A (fuse protected), 250 Vac, 30 VDC Contact close when measure:			
	> set point	< set point	> set point	> set point
Set point	adjustable from 0 to 199.9 mg/L (ppm)	adjustable from 0 to 1999 mg/L (ppm)	adjustable from 0 to 19.99 mg/L (ppm)	adjustable from 0 to 999 mg/L (ppm)
Overtime	adjustable, typically from 5 to approximately 30 minutes			
Power Supply	models "-0": 12 VDC adapter (included) models "-1": 115/230 VAC ±10%; 50/60Hz			
Dimensions	79 x 49 x 95 mm (3.1 x 1.9 x 3.7")			
Weight	models "-0": 200 g (7.1 oz.) / models "-1": 300 g (10.6 oz.)			

ORDERING INFORMATION

BL 983315-0 (12 VDC), **BL 983315-1** (115/230V), **BL 983319-0** (12 VDC), **BL 983319-1** (115/230V), **BL 983321-0** (12 VDC), **BL 983321-1** (115/230V), **BL 983329-0** (12 VDC) and **BL 983329-1** (115/230V) are supplied with mounting brackets, transparent cover and instruction manual.

PROBES

HI 7634-00	EC/TDS probe with internal temperature sensor and 2 m (6.6') cable
HI 7634-00/4	EC/TDS probe with internal temperature sensor and 4 m (13.1') cable
HI 7634-00/5	EC/TDS probe with internal temperature sensor and 5 m (16.4') cable
HI 7642/2	TDS probe for HI 983319, 2 m (6.6') cable, 10 BAR

SOLUTIONS

HI 7033L	84 µS/cm (42ppm) calibration solution, 500 mL
HI 7032L	1382 mg/L (ppm) calibration solution, 500 mL
HI 70442L	1500 mg/L (ppm) calibration solution, 500 mL
HI 7061L	Electrode cleaning solution, 500 mL

ACCESSORIES

HI 710005	115 VAC/12 VDC power adapter
HI 710006	230 VAC/12 VDC power adapter
HI 740146	Mounting brackets

For a complete list of Solutions, see the end of Conductivity *Section 6*.

BL 983318

0 to 10,000 ppm TDS Mini Controllers

- **Easy to handle**
- **Fire retardant casing**
- **Selectable overdose protection system**
- **Splash resistant cover**

BL 983318 is a mini controller that has been designed for easy, affordable installation in tight spaces, ideal for simple yet effective process control.

BL 983318 features ATC (Automatic Temperature Compensation) and simple one point calibration performed through the trimmer.

The multicolored LED continuously indicates if the controller is in measurement, dosing or alarm mode.

Wiring and external device connections are extremely simple to perform through the terminals on the rear of the instrument.

Users can choose automatic or manual dosing mode with a switch on the front panel. Manual control is particularly useful during maintenance operations because it permits operators to enable or disable the dosing relay according to need.

The overtime control system advises users when the relay is active too long, helping to prevent over-dosage.

ORDERING INFORMATION

BL 983318-0 (12 VDC) and **BL 983318-1** (115/230V) are supplied with mounting brackets, transparent cover and instruction manual.

PROBES

HI 7632-00	EC/TDS probe with internal temperature sensor and 2 m (6.6') cable
HI 7632-00/5	EC/TDS probe with internal temperature sensor and 5 m (16.4') cable
HI 7632-00/6	EC/TDS probe with internal temperature sensor and 6 m (19.7') cable

SOLUTIONS

HI 70038P	6.44 ppt (g/L) calibration solution, 20 mL sachet (25)
HI 70038C	6.44 ppt (g/L) certified calibration solution, 20 mL sachet (25)
HI 7061L	Electrode cleaning solution, 500 mL

ACCESSORIES

HI 710005	115 VAC/12 VDC power adapter
HI 710006	230 VAC/12 VDC power adapter
HI 740146	Mounting brackets

SPECIFICATIONS	BL 983318-0	BL 983318-1
Range	0.00 to 10.00 ppt	
Resolution	0.01 ppt	
Accuracy (@20°C/68°F)	±2% f.s.	
TDS Conversion Factor	0.5	
Probe	HI 7632-00 EC/TDS probe with internal temperature sensor and 2 m (6.6') cable (not included)	
Temperature Compensation	automatic, 5 to 50°C (41 to 122°F) with β=2%/°C	
Calibration	manual, with CAL trimmer	
Dosing Relay	maximum 2A (fuse protected), 250 Vac, 30 VDC contact close when measure > set point	
Set point	adjustable from 0 to 10 ppt (g/L)	
Overtime	adjustable, typically from 5 to approximately 30 minutes	
Power Supply	12 VDC adapter (included)	115/230 VAC ±10%; 50/60Hz
Dimensions	79 x 49 x 95 mm (3.1 x 1.9 x 3.7")	
Weight	200 g (7.1 oz.)	300 g (10.6 oz.)

For a complete list of Solutions, see the end of Conductivity *Section 6*.

TDS Mini Controllers

- **Easy to handle**
- **Fire retardant casing**
- **Selectable overdose protection system**
- **Splash resistant cover**

BL 983324 is a panel mounted TDS controller, designed for easy installation, configuration and maintenance.

The meter is provided with a dosing relay, activated when the TDS reading exceeds the set point value.

Measurements are compensated for temperature variations and shown on the display automatically.

A multicolored LED on the front panel continuously indicates if the mini controller is in measurement, dosing or alarm mode.

Wiring and external device connections are extremely simple to perform through the terminals on the rear of the instrument.

Users can choose automatic or manual dosing mode with a switch on the front panel. Manual control is particularly useful during maintenance operations, because it permits operators to enable or disable the dosing relay according to need.

The overtime control system advises operators when the relay is active too long, helping to prevent over dosage.

SPECIFICATIONS	BL 983324-0	BL 983324-1
Range	0.0 to 49.9 mg/L (ppm)	
Resolution	0.1 mg/L (ppm)	
Accuracy (@20°C/68°F)	±2% f.s.	
TDS Conversion Factor	0.5	
Probe (not included)	HI 7634-00 EC/TDS probe with internal temperature sensor and 2 m (6.6') cable(not included)	
Temperature Compensation	automatic, 5 to 50°C (41 to 122°F) with β=2%/°C	
Calibration	manual, with CAL trimmer	
Dosing Relay	maximum 2A (fuse protected), 250 Vac, 30 VDC contact close when measure > set point	
Set point	adjustable from 0 to 49.9 mg/L (ppm)	
Overtime	adjustable, typically from 5 to approximately 30 minutes	
Power Supply	12 VDC adapter (included)	115/230 VAC ±10%; 50/60Hz
Dimensions	79 x 49 x 95 mm (3.1 x 1.9 x 3.7")	
Weight	200 g (7.1 oz.)	300 g (10.6 oz.)

ORDERING INFORMATION

BL 983324-0 (12 VDC) and **BL 983324-1** (115/230V) are supplied with mounting brackets, transparent cover and instruction manual.

PROBES

HI 7634-00 EC/TDS probe with internal temperature sensor and 2 m (6.6') cable

HI 7634-00/4 EC/TDS probe with internal temperature sensor and 4 m (13.1') cable

HI 7634-00/5 EC/TDS probe with internal temperature sensor and 5 m (16.4') cable

SOLUTIONS

HI 7033L 84 µS/cm (42mg/L (ppm) calibration solution, 500 mL

HI 7061L Electrode cleaning solution, 500 mL

ACCESSORIES

HI 710005 115 VAC/12 VDC power adapter

HI 710006 230 VAC/12 VDC power adapter

HI 740146 Mounting brackets

For a complete list of Solutions, see the end of Conductivity *Section 6*.

BL 983314

Resistivity Mini Controllers

- **Easy to handle**
- **Fire retardant casing**
- **Selectable overdose protection system**
- **Splash resistant cover**

BL 983314 is a simple to operate resistivity controller designed for ultra pure water, reverse osmosis, and water conditioning applications. The BL 983314 resistivity controller is also ideal for continuous monitoring of process solutions. Set point and calibration are manually adjusted with a trimmer and the alarm relay allows for simple control.

Readings are automatically temperature compensated, with three different coefficients (β=2.4, 3.5 or 4.5 %/°C). The alarm contact can be used for connection to an alarm, pump, solenoid or dosing system.

The relay contact is open when readings are higher than the set point, while for measurements lower than set point, the relay contact is closed. The Hysteresis is typically 0.20 MΩ/cm from the set point.

Measurements are displayed on the LCD and the multicolored LED continuously indicates if the controller is in measurement, dosing or alarm mode. Users can choose automatic or manual dosing mode with a switch on the front panel. Manual control is particularly useful during maintenance operations, because it permits operators to enable or disable the dosing relay according to need.

The overtime control system advises users when the relay is active for too long, helping to prevent over-dosage.

SPECIFICATIONS	BL 983314-0	BL 983314-1
Range	0.00 to 19.90 MΩ/cm	
Resolution	0.10 MΩ/cm	
Accuracy (@20°C/68°F)	±2% f.s.	
Probe	HI 3314 resistivity probe with 2 m (6.6') cable (included)	
Temperature Compensation	automatic and linear, 5 to 50°C (41 to 122°F)	
Temperature Coefficient	β=2.4 ; 3.5 ; 4.5 %/°C selectable through jumper on the rear panel	
Calibration	factory calibrated	
Dosing Relay	maximum 2A (fuse protected), 250 Vac, 30 Vdc contact close when measure < set point	
Set point	adjustable from 0 to 19.90 MΩ/cm	
Overtime	adjustable, typically from 5 to approximately 30 minutes	
Power Supply	12 VDC adapter (included)	115/230 VAC ±10%; 50/60Hz
Dimensions	79 x 49 x 95 mm (3.1 x 1.9 x 3.7")	
Weight	200 g (7.1 oz.)	300 g (10.6 oz.)

ORDERING INFORMATION

BL 983314-0 (12 VDC) and **BL 983314-1** (115/230V) are supplied with mounting brackets, transparent cover and instruction manual.

PROBES

HI 3314	Resistivity probe with 2 m (6.6') cable

ACCESSORIES

HI 710005	115 VAC/12 VDC power adapter
HI 710006	230 VAC/12 VDC power adapter
HI 740146	Mounting brackets

Mini Level Controllers

HI 7871 and HI 7873 mini level controllers are ideal for liquid level control over distances of up to 100 m (330'). These instruments are highly compact and will fit in tight spaces.

These easy to use controllers are suited for nearly any liquid level application such as industrial and municipal water treatment, nutrient tank control in farming, hydroponics, aquaculture applications and plating rinse baths.

HI 7871 features high and low level control, while HI 7873 includes an overflow alarm. Both instruments are connected to a 2-wire transmitter (HI 7874), which is ideal for level monitoring in remote applications.

A complete liquid level measuring system requires:

- *A controller (HI 7871 or HI 7873)*
- *A bar holder with amplifier circuitry (HI 7874)*
- *A package of measuring bars (HI 731324)*
- *An undecal connector (HI 7164)*

HI 7874
Level Transmitter with HI 731324 Stainless Steel Measuring Bars

SPECIFICATIONS	HI 7871	HI 7873
Transmission	max 100 m (330')	
Electrical Connection	HI 7164 undecal connector (not included)	
Level Adjustment	high and low	high, low and overflow
Level Indication	high and low	high, low and overflow
Sensor Bars	three (not included)	four (not included)
	(HI 731324 pack of five)	
Transmitter	HI 7874 (not included)	
Output Contact	1 relay (2A/250 VAC, 30 VDC)	2 relays (2A/250V, 30 VDC)
Power Supply	models "/115": 110/115 VAC ±10%; 50/60Hz models "/220": 220/240 VAC ±10%; 50/60Hz	
Environment	0 to 50°C (32 to 122°F); RH max 85% non condensing	
Dimensions	79 x 49 x 95 mm (3.1 x 1.9 x 3.7")	
Weight	250 g (8.8 oz	

HI 7871 requires 3 bars, one each for low and high levels and the third as a consent sensor.
HI 7873 requires 4 bars with the additional bar used for overflow measurement.

ORDERING INFORMATION

HI 7871/115 (115V) is supplied with mounting brackets and instructions.
HI 7871/220 (220V) is supplied with mounting brackets and instructions.
HI 7873/115 (115V) is supplied with mounting brackets and instructions.
HI 7873/220 (220V) is supplied with mounting brackets and instructions.

ACCESSORIES

HI 7874	Level transmitter with internal amplifier
HI 7164	Undecal connector
HI 731324	Stainless steel threaded measuring bars (5)

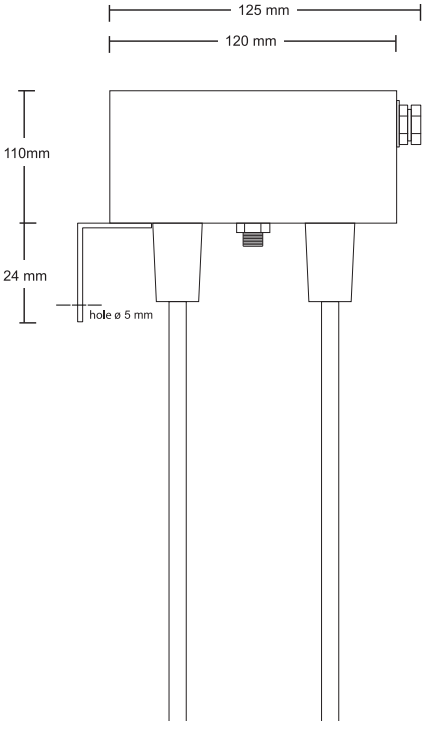
HI 7874

Level Transmitter

Accurate level control is critical to many industrial applications, especially for process adjustments using aggressive chemicals. Our sensor bars are built with stainless steel for long life even in harsh conditions. They are easy to install and ideal for monitoring tanks and water conditioning plants.

The HI 7874 transmitter has been designed to be combined with the HI 7871 and HI 7873 level controllers. The transmitter is housed in a durable and waterproof ABS body, and allows the user to easily adjust the length of the sensor bars according to the specific need.

HI 7874 is supplied with a sturdy mounting bracket for quick and easy installation.



HI 7874 Level Transmitter with HI 731324 Stainless Steel Measuring Bars

ORDERING INFORMATION

HI 7874 is supplied with mounting bracket and instructions.

ACCESSORIES

HI 731324	Stainless steel threaded measuring bars (5)

SPECIFICATIONS	HI 7874
Transmission	max 100 m (330')
Electrical Connection	two-wire terminal
Level Adjustment	high, low and overflow
Sensor Bars	3 or 4 (not included) (HI 731324 pack of 5)
Power Supply	from level controller
Environment	0 to 50°C (32 to 122°F); RH max 100%
Weight	550 g (1.2 lbs.)

CONTENTS

Comparison Guides

Fertigation Control Systems

Pages 17.6-17.9

	Time/volume Irrig control programs	Irrigated sectors	Fertilization control by EC	Fertilization control by volume	pH correction	EC probes	pH probes	Agitators control	Filter control, differential presostate	Solar radiation sensor	Temperature sensor	Control/mixing of water sources	Wind speed sensor	Volum. counters	Tank level sensors	External back-up power control	On/off dosing valves	Motorized dosing valves	Pumps
HI 8001/ HI 8002	10	32	4		acid or alk.	3	2	•	2 and 2	•				1 irrig.	4 fertilizer, 1 acid/alk., 1 mixing, 5 external		•		1 irrigation
HI 8011	10	16	no	4	acid or alk., by volume	No	No	•	2 and 2	•	2		1	1 irrig, 4 fert., 1 acid	1 mixing, 5 external	•	•		1 irrigation
HI 8021/ HI 8022	10	16	EC monitor	4	acid or alk.	3	2	•	2 and 2	•				1 irrig, 4 fert., 1 acid	1 mixing, 5 external		•		1 irrigation
HI 8051/ HI 8052	10	24	4		acid or alk.	2	1	•	2 and 2		1	•		1 irrig, 4 fert.	1 external, pH correction, 4 fertilizer, 3 incoming water		•	1 pH correction, 4 fertilizer	3 Irrigation, 1 fertilizer

PCA Series Analyzers

Pages 17.10-17.13

	Total and Free Chlorine	Bromine	Iodine	pH	ORP	Temperature	Logging	Alarm	PC connection	Analog output	Password protection
PCA 310	•						•	•	•	•	•
PCA 320	•			•		•	•	•	•	•	•
PCA 330	•			•	•	•	•	•	•	•	•
PCA 311		•					•	•	•	•	•
PCA 321		•		•		•	•	•	•	•	•
PCA 331		•		•	•	•	•	•	•	•	•
PCA 312			•				•	•	•	•	•
PCA 322			•	•		•	•	•	•	•	•
PCA 332			•	•	•	•	•	•	•	•	•

*applies to "L" models with LCD

Digital Panel Mount Controllers

Pages 17.14-17.28

	pH	ORP	Conductivity	TDS	Temperature	Logging	Alarm	(S)ingle or (D)ual setpoint	ON/OFF control	Proportional control	PID control	SSR relay	Digital output	(S)ingle or (D)ual Analog output	Password protection	Sensor Check™	Automatic cleaning
HI 504	•	•			•	•	•	S or D	•		•			S or D	•	•	•
HI 720			•		•	•	•	S or D	•		•		RS485	S or D	•	•	•
pH 502	•				•		•	S or D	•		•	•	RS485	S	•		
pH 500	•				•		•	S or D	•	•			RS232	S	•		
mV 602		•			•		•	S or D	•		•		RS485	S	•		
mV 600		•			•		•	S	•	•			RS232	S	•		
HI 700			•		•		•	D	•		•		RS485	S	•		
HI 710			•	•	•		•	D	•		•		RS485	S	•		

Analog Process Controllers

Pages 17.31-17.38

	pH	ORP	Conductivity	Dissolved Oxygen	Recorder output	Backlight	(S)ingle or (D)ual setpoint	Dosing outputs	Alarm	Self diagnostics	Selectable dosing control	Adjustable overdosing control
HI 8510	•				•	•		1		•		
HI 8710	•				•	•	S	1	•	•	•	•
HI 8711	•				•	•	D	2	•	•	•	•
HI 8512		•			•	•		1	•	•		
HI 8720		•			•	•	S	1	•	•	•	•
HI 8931			•		•	•	S	1	•	•	•	•
HI 943500			•		•	•	S	1	•	•		
HI 8410				•	•	•	S	1	•	•	•	•

Controller and Pump Systems

Pages 17.40-17.41

	pH	ORP	Proportional dosing	Dosning contacts	Alarm contact	Recorder output
BL 7916	•		•	1	1	•
BL 7917		•	•	1	1	•

Comparison Guides

Wall Mount Controllers

Pages 17.44-17.57

	pH	ORP	Conductivity	TDS	Temperature	Digital	Alarm	(S)ingle or (D)ual setpoint	ON/OFF control	Proportionall control	PID control	Digital output	Password protection	Boiler and colling tower applications	Agriculture applications
HI 21	•				•	•	•	S or D	•	•		RS485	•		
HI 22		•			•	•	•	S	•	•		RS485	•		
HI 23			•		•	•	•	D	•		•	RS485	•		
HI 24			•	•	•	•	•	D	•		•	RS485	•		
HI 9912	•	•					•	D		•			•		
HI 9913	•		•				•	S		•			•		•
HI 9923	•		•				•	S					•	•	
HI 9935	•			•			•	S		•			•		•
HI 9914	•		•				•	S					•		•
HI 9910	•						•	S		•			•		
HI 9911	•						•	D		•			•		
HI 9920		•					•	S		•			•		
HI 9931			•				•	S		•			•		•
HI 9934				•			•	S		•			•		•

Digital and Analog Transmitters

Pages 17.59-17.62

	pH	ORP	Conductivity	Output	Recorder output	ATC	LCD	Casing	Designed for HI 8000 series
HI 98143-01	•		•	0-1 V		•		IP54	
HI 98143-04	•		•	0-4 V		•		IP54	
HI 98143-20	•		•	4-20 mA		•		IP54	
HI 98143-22	•		•	4-20 mA		•		IP54	•
HI 8614N	•			4-20 mA	•	•		IP65	
HI 8614LN	•			4-20 mA	•	•	•	IP65	
HI 8615N		•		4-20 mA	•			IP65	
HI 8615LN		•		4-20 mA	•		•	IP65	
HI 8936 "N" series			•	4-20 mA	•	•		IP65	
HI 8936 "LN" series			•	4-20 mA	•	•	•	IP65	

HI 8000 Series

Fertigation Control Systems

17.6

A wide variety of models are available to cover the requirements of specific fertigation applications.

HI 8000 series models can be selected based on the irrigation and fertilization type of control along with the additional features that are proper for the specific application.

Up to 10 irrigation programs can be set by the user with different irrigation parameters: irrigation periods, type of irrigation control, irrigated sectors and volume or irrigation time specified for each sector, conditions to start irrigation such as time, accumulated solar radiation, low level in tanks (hydroponic crops), temperature variations, linked to another program, priority of program, number of repetitions. For irrigation water, each program has a defined pH set point, EC set point (if the quantity of fertilizer is dosed according with conductivity), and receipt of fertilizers. Control of agitators is specified by programs according with the irrigation periods.

PCA 300 Series

Chlorine,Bromine, Iodine, pH, ORP and Temperature Analyzers

17.10

The HANNA PCA 300 series models are chlorine, bromine or iodine and pH, ORP and temperature process analyzers which continuously monitor a sample stream and control the dosing to adjust the chlorine, bromine or iodine content and pH.

From drinking and wastewater treatment to the pool and spa sanitation, the monitoring of chlorine, bromine or iodine levels has an important bearing on public health as well as ROI and efficiency for heating system and industrial applications.

HI 504

pH/ORP Digital Controller with Sensor Check™

17.18

Digital controllers are designed for complex process systems and offer a full package of features for the control of the process with high levels of configuration for control and measurement parameters. HANNA solutions are designed for both accuracy of the reading and safety of the control process. The matching pin, sensor check, cleaning programs, auto-diagnostics, hold mode, alarm and warning system are all solutions to the same problem: measurement and control of processes has to be performed in safety from the process control point of view.

HI 8000 Series

Fertigation Control Systems

- Fertigation (fertilizer and irrigation) controllers
- Time or volume control with up to 10 irrigation programs for up to 32 sectors
- 4 fertilizer dosing control based on EC, volume or ratiometric
- Agitators controlled
- Filter cleaning detection and control
- Up to 2 pH and up to 3 EC probes connected through analog transmitters
- pH and EC reading temperature compensated on transmitter level
- Solar radiation, wind, temperature sensors
- Power engine back-up management (HI 801X only)
- Mixing input water control (HI 804X, HI 805X)
- Alarms for controlled parameters, water presence, pH or EC out of range and self system diagnostics
- Logging organized on three levels, user selectable
- RS232 connection to PC

Wall Mount

Variety and customization of models

A wide variety of models are available to cover the requirements of specific fertigation applications. The HI 8000 series are fully customizable and upgradable on the hardware and program level.

HI 8000 series models can be selected based on the irrigation and fertilization type of control along with the additional features that are proper for the specific application.

Some of the most important criteria in selection of controller type are: number of irrigated sectors: 8, 16, 24, 32; type of irrigation control: in volume or in time; type of fertilizer control: by EC, by Volume, ratiometric; type of pH correction: acid or alkaline; control of incoming water: one, two or three sources of water; control of dosing with venturi or motorized electrovalves; redundancy of the conductivity or pH probes; mounting solution: panel or wall mounted.

Panel Mount

Irrigation control

Irrigation control differs based on the type of control: by irrigation water volume or by irrigation time; the number of sectors that have to be irrigated, the available sources of water for irrigation – one or more with or without reusing the irrigation drain water.

Irrigation control is started by opening the irrigation valves and starting the main irrigation pump. The control of all these elements is performed by the controller based on concepts of irrigation programs.

Irrigation programs

Up to 10 irrigation programs can be set by the user with different irrigation parameters: irrigation periods, type of irrigation control, irrigated sectors and volume or irrigation time specified for each sector, conditions to start irrigation such as time, accumulated solar radiation, low level in tanks (hydroponic crops), temperature variations, linked to another program, priority of program, number of repetitions. For irrigation water, each program has a defined pH set point, EC set point (if the quantity of fertilizer is dosed according with conductivity), and receipt of fertilizers. Control of agitators is specified by programs according with the irrigation periods.

Irrigation water

The quality of irrigation water is assured by proper control of pH and the quantity of nutrients (fertilizers) present in irrigation water.

Fertilization control

Fertilizer can be dosed during irrigation using the Venturi tubes principal or with motorized valves. The control of the quantity of dosed fertilizer can be performed using the volume counters. The system supports dosing from up to 4 fertilizer tanks with specific receipts.

The concentration of the fertilizer in irrigation water can be controlled based on the conductivity reading, proportional with irrigation water based on the receipt or ratiometric, in which case the certain quantity of fertilizers are added with the amount of programmed water.

pH control

The pH control is performed in order to adjust the pH of water to the irrigation program set point.

The pH correction can be performed with alkaline or acid solution based on the characteristic of the incoming water.

The control of pH and EC is performed with PID, PI or proportional control. The tuning of the PID control can be accomplished by the user manually, or automatically by the PID auto-tuning feature.

Agitators and filter cleaning

The automatic control of agitators used in fertilizers tanks and filter cleaning system complete the needs of a standard fertigation system.

In order to keep the fertilizer concentration constant before and during the irrigation program, the fertilizers are mixed in their tanks based on the agitators program. The system can manage up to two filters mounted to protect the probes and in-line dosing elements.

With differential presostates, the filters are monitored and when necessary, the irrigation programs are automatically suspended and washer filter cleaning is started. This process removes any deposits and sediments that may appear on filters to increase the systems life.

Redundancy of EC and pH probes

For safety reasons, the systems can be equipped with 2 conductivity probes and two pH electrodes in redundancy so that the system can generate an alarm in the case of reading differences between them. A third conductivity probe can be mounted to verify and compensate the incoming water conductivity.

Logging system

The logging of the controller can be selected on three levels: input reading variations, statistics of reading (average of pH and EC) or events (start of programs, opening valves, ...).

Alarm system

The alarms of these systems are related to measured water quality parameters like conductivity and pH: out of range, differential reading between redundant probes; over dosing of conductivity or acid or alkaline correction solution, tanks at low level or no dosing detected by counter movement. Similar alarms can be generated after the units self-diagnostic tests are run.

Sensor connections

All the sensors: EC, pH, temperature are connected to the controller via transmitters.

pH and EC are temperature compensated on the transmitter level. The output of analog transmitters can be calibrated at two points for pH and conductivity. Also, the controller offers a calibration in two points for pH and one point for conductivity.

User interface and digital connection

The user interface is based on an 4 x 20 character line LCD, organized for settings and consultancy. The UI has multi-language support.

The RS232 connection permits the connection to a PC (dedicated PC software HI 800104).

Internal back-up system

The systems internal back-up power system offers a special feature; in the case of losing external power, the controller will stop the irrigations and memorize the irrigation programs that were not performed. The controller will start from the uncompleted programs after power has been restored. The programs will be executed based on their priority level with full respect of the quantity of irrigation water, pH level, and concentration of fertilizers.

Additional features that can be found are control of the external power supply and control of mixing of different water sources (clean water, drain irrigation water).

HI 8001 and HI 8002 models

The HI 8001 and HI 8002 fertigation controllers provide up to 10 programs to irrigate up to 32 sectors using time or volume irrigation control. Each irrigation program has one pH and one EC setpoint. The start condition of the program, the irrigation sectors and the time or volume for each sector are user defined. The irrigation water is pH corrected based on the pH control, with acid or alkaline solution and can contain nutrients for crops based on up to 4 fertilizer receipts. Correction of time or volume of irrigated water can be based on accumulated solar radiation or can be manually requested by user. Agitator control and filter cleaning control are performed automatically. The instruments read up to 3 EC probes, one to verify the incoming water EC, and the other two are in-line redundant for safety to measure the current irrigation water EC. The two pH electrodes are mounted in-line redundant for safety to read the irrigation water pH. The instruments provide an alarm system and logging organized on user selectable three levels.

HI 8011 model

The HI 8011 fertigation controller provides up to 10 irrigation programs to irrigate up to 16 sectors using volume control. The start condition of the program, the irrigation sectors and the volume for each sector are user defined. The irrigation water is pH corrected based on the pH control, with acid or alkaline solution and can contain nutrients for crops based on up to 4 fertilizer receipts. Fertilizer dosing is performed based on the volumetric control (quantity of fertilizer is dosed in ratio with volume of irrigated water). Another important feature is related to the ability to manage an external back-up power supply. The start of irrigation programs based on the temperature variations (like antifreeze reaction) is also a unique feature offered by this model. Agitator control and filter cleaning control are performed automatically. This instrument provides an alarm system and logging organized on three levels that are user selectable.

HI 8021 and HI 8022 models

The HI 8021 and HI 8022 fertigation controllers provide up to 10 irrigation programs to irrigate up to 16 sectors using time or volume control. Each irrigation program has one pH and one EC setpoint. The start condition of the program, the irrigation sectors and the time or volume for each sector are user defined. The irrigation water is pH corrected based on the pH control, with acid or alkaline solution and can contain nutrients for crops based on up to 4 fertilizer receipts. Fertilizer dosing is performed based on the volumetric control. Additionally, an EC level monitoring/alarm is implemented to stop irrigation should the conductivity exceed the maximum set level in order to avoid damages to irrigated crops. Agitator control and filter cleaning control is performed automatically. The instruments read up to two EC probes redundant in-line for safety to measure the current irrigation water EC. The two pH electrodes are mounted in-line redundant for safety to read the irrigation water pH. The instruments provide an alarm system and logging organized on three user selectable levels.

HI 8051 model

The HI 8051 fertigation controller provides up to 10 irrigation programs to irrigate up to 24 sectors using time or volume control. Each irrigation program has one pH and one EC setpoint. The start condition of the program, the irrigation sectors and the time or volume for each sector are user defined. The irrigation water is pH corrected based on the pH control with acid or alkaline solution and can contain nutrients for crops based on up to 4 fertilizer receipts. Fertilizer dosing is permormed based on the EC, volumetric or ratiometric control. Another important feature is the correction of irrigated water volume or time based on accumulated solar radiation or manually requested by user. Agitator control and filter cleaning control is performed automatically. The instrument reads up to 3 EC probes, one to verify the water incoming EC, and the other two redundant in-line for safety, to measure the current irrigation water EC. The two pH inputs are mounted in-line redundant for safety to read the irrigation water pH. This instrument provides an alarm system and logging organized on three user selectable levels. An important added feature is this models ability to mix 3 sources of incoming water. Fresh water, reused water and all dosing are performed based on the motorized valves that are activated by motors that allow different flows of the fertilizers, acid and alkaline solutions used for pH correction.

HI 98143 pH/EC Transmitter

FAMILY	800X	8011	802X	8051
Irrigation control	Time/volume control, 10 programs/5 priority levels with up to 99 repetition			
Irrigation start condition	By Time, by solar radiation, by 5 external tank low level			
Fertilization control	By EC	By volume	By volume, the EC monitored	By EC, By volume, Ratiometric
Fertilizers	Up to 4 valves			Up to 4 motorized valves
pH control/correction	Acid or alkaline	Acid or alkaline, by vol.	Acid or alkaline	Acid or alkaline, motorized pump
Agitators control	Yes	yes	Yes	Yes
Filter control/cleaning	2 differential presostate/2 filter cleaning relays			
Fertilizer tank levels/counters control	Level	No	Counters	Level and counters
Irrigation counter	Yes			
Acid/Alkaline tank level/counter control	Level	No	Counter	Level and counter
EC inputs	Up to 3, 0.0 to 10 mS/cm	No	Up to 2, 0.0 to 10 mS/cm	Up to 2, 0.0 to 10 mS/cm
pH inputs	Up to 2, 0.0 to 14.0 pH	No	Up to 2, 0.0 to 14.0 pH	1, 0.0 to 14.0 pH
Temperature Compensation	EC, pH		EC, pH	EC, pH
Solar radiation input	1; 0 to 2000 W/m2	1; 0 to 2000 W/m2	1; 0 to 2000 W/m2	No
Temperature	No	2	No	1
Wind speed	No	Yes	No	No
Engine power back-up	No	Yes	No	No
Irrigated sectors	Up to 32	Up to 16	Up to 16	Up to 24
Mixing source of water	No	No	No	Yes, 3 sources
PC connectivity	RS 232			
Alarms	Yes, user selectable levels			
Logging	Yes, three level			
Power Supply	115V/220V ±10% 50Hz/60Hz			
Environment	wall mounted: NEMA 4X specifications			
Dimensions	wallmounted: 280 x 330 x 165 mm (11.2 x 13.2 x 6.6"); panel mounted: 178 x 260 x 116 mm (7.1 x 10.4 x 4.6")			
Weight	wall mounted: 4.95 Kg (11 lb.); panel mounted: 3.4 Kg (7.5 lb.)			

ORDERING INFORMATION

Each **HI 8000 Series** model is supplied instructions.

Choose your configuration:

HI 8001-0100U Fertigation controller with priority for pH and EC, panel mount, 8 sectors, English, 115V.

HI 8001-0100D Fertigation controller with priority for pH and EC, panel mount, 8 sectors, English, 230V.

HI 8001-0200U Fertigation controller with priority for pH and EC, panel mount, 16 sectors, English, 115V.

HI 8001-0200D Fertigation controller with priority for pH and EC, panel mount, 16 sectors, English, 230V.

HI 8001-0300U Fertigation controller with priority for pH and EC, panel mount, 16 sectors, English, 115V.

HI 8001-0300D Fertigation controller with priority for pH and EC, panel mount, 16 sectors, English, 230V.

HI 8001-0400U Fertigation controller with priority for pH and EC, panel mount, 32 sectors, English, 115V.

HI 8001-0400D Fertigation controller with priority for pH and EC, panel mount, 32 sectors, English, 230V.

HI 8002-0100U Fertigation controller with priority for pH and EC, wall mount, 8 sectors, English, 115V.

HI 8002-0100D Fertigation controller with priority for pH and EC, wall mount, 8 sectors, English, 230V.

HI 8002-0200U Fertigation controller with priority for pH and EC, wall mount, 16 sectors, English, 115V.

HI 8002-0200D Fertigation controller with priority for pH and EC, wall mount, 16 sectors, English, 230V.

HI 8002-0400U Fertigation controller with priority for pH and EC, wall mount, 32 sectors, English, 115V.

HI 8002-0400D Fertigation controller with priority for pH and EC, wall mount, 32 sectors, English, 230V.

HI 8011-0200U Fertigation controller with flow control (irrigation counter), panel mount, 16 sectors, English, 115V.

HI 8011-0200D Fertigation controller with flow control (irrigation counter), panel mount, 16 sectors, English, 230V.

HI 8021-0200U Fertigation controller with flow control (irrigation counter), pH dosage and EC monitor, panel mount, 16 sectors, English, 115V.

HI 8021-0200D Fertigation controller with flow control (irrigation counter), pH dosage and EC monitor, panel mount, 16 sectors, English, 230V.

HI 8022-0200U Fertigation controller with flow control (irrigation counter), pH dosage and EC monitor, wall mount, 16 sectors, English, 115V.

HI 8022-0200D Fertigation controller with flow control (irrigation counter), pH dosage and EC monitor, wall mount, 16 sectors, English, 230V.

HI 8051-0300U Acid based fertigation controller with dual pH control, differential EC control, actuator control, multiple dosing and irrigation pump control, panel mount, 24 sectors, English, 115V.

HI 8051-0300D Acid based fertigation controller with dual pH control, differential EC control, actuator control, multiple dosing and irrigation pump control, panel mount, 24 sectors, English, 230V.

REQUIRED ACCESSORIES

HI 98143-22 pH/EC isolated transmitter, 4-20 mA sourcing current output

1 transmitter is needed in configuration with 1 EC probe and 1 pH probe (no probe redundancy feature)

2 transmitters are needed in configuration with 2 EC probes and 2 pH probes (for probe redundancy feature)

3 transmitters are needed in configuration with 3 EC probes and 2 pH probes (for probe redundancy feature and EC water incoming compensation)

ACCESSORIES

HI 1001 "flow-thru", double junction pH electrode with BNC connector and 3 m (10') cable

1 or 2 electrodes are needed (2 electrodes for probe redundancy feature)

HI 3001 "flow-thru", 4 platinum ring EC probe with built-in temperature sensor & 3 m (10') cable

1, 2 or 3 probes are needed (2 for probe redundancy feature), (3 for probe redundancy feature and EC water incoming compensation)

HI 60542 Electrode Holder for Direct Pipe

Order according with the total amount of ordered probes

HI 800104 Windows compatible PC application

HI 7004L pH 4.01 buffer solution, 500 mL

HI 7007L pH 7.01 buffer solution, 500 mL

HI 7039L 5.00 mS/cm calibration solution, 500 mL

HI 70300L Electrode storage solution, 500 mL

HI 7061L Electrode cleaning solution, 500 mL

HI 710005 115 VAC to 12VDC power adapter

HI 710006 230 VAC to 12VDC power adapter

For a complete list of Solutions, see the end of pH *Section 3* and Conductivity *Section 6*.

PCA 300 Family

Chlorine, Bromine, Iodine, pH, ORP and Temperature Analyzers

- Implements the DPD colorimetric method to determine free or total chlorine, bromine or iodine concentration
- One point calibration of photometric cell
- Up to two point pH calibration and in-line pH electrode calibration support
- ORP monitoring
- Control time cycles adjustable between 3 to 90 minutes
- Proportional control of Chlorine, bromine or iodine concentration
- Proportional control of pH and ORP monitoring
- Out of range measurement and self-diagnostic system alarms
- Parameter control through analog output or dedicated relays
- Logging space of up to of 3500 measurements and alarm status
- Multi-language support
- RS485 connectivity

In regards to swimming pool treatment, disinfection or sanitizing basically means to rid the pool of bather contamination, destroy bacteria, and control nuisance organisms like algae, which may occur in the pool, filtration equipment, and piping. Of the many techniques used (chlorine, bromine and iodine dosing systems), chlorine is the most common.

Chlorine

Chlorine is a strong oxidizing agent that destroys mostly organic pollutants and bacteria and can combine with nitrogen containing compounds, forming chloramines. When dosing chlorine for disinfection, only a portion of the dosed chlorine remains active to actually continue the disinfection process.

When free chlorine combines with a nitrogen containing compound it becomes a less efficient disinfectant called chloramines. The addition of these two parts gives total chlorine. The target is to keep free and total chlorine equal, and thus to maintain the combined chlorine concentration chloramines) near zero. The presence of chloramines is not desired because of the distinctive 'swimming pool' smell caused by combined chlorines like di-chloramines. Beside this unpleasant odor, chloramines can irritate the eyes and the mucous membranes.

Commercial chlorine for disinfection may be available as a gas (Cl_2), a liquid like sodium hypochlorite or bleach (NaOCl) or in a solid state like calcium hypochlorite, chloro-hydantoins or chloro-cyanuric acid compounds. These compounds, once dissolved in water do establish equilibrium between the hypochlorous acid (HOCl) and the hypochlorite ions (OCl^-). Although both forms are considered free chlorine, it is the hypochlorous acid that provides the strongest disinfecting and oxidising characteristic of chlorine solutions; the amount of hypochlorous acid in chlorinated water dependends upon the pH value of the solution. Changes in pH value will affect the HOCl equilibrium in relation to the hydrogen and hypochlorite ion; HOCl decreases and OCl^- increases as pH increases. At a low pH, almost all the free chlorine is in the molecular form HOCl and at a pH of around 7.5, the ratio between HOCl and OCl^- is 50:50. Since the ionic form OCl^- is a slow acting sanitizer while the molecular HOCl is a fast acting, it is important to regularly measure the pH. As a general rule a pH of about 7.2 is recommended to maintain fast acting disinfection conditions.

Bromine

In many countries, bromine sanitizing has been introduced as an alternative for chlorine, although it is a less effective sanitizer. The advantage of bromine is its stability at higher temperatures (advantageous for hot well pools), and its ability to maintain disinfection power at higher pH. Furthermore, it hardly reacts with nitrogen compounds, reducing the unpleasant odor and eye irritation problems. The main disadvantage of bromine is the slower acting disinfecting power, making it less suitable for larger pools.

Iodine

The disinfectant properties of Iodine have led to its use as an alternative to chlorine and bromine. Unlike chlorinated pools, water treated with iodine decreases eye irritation among swimmers, and provides a level of disinfection more stable to adverse conditions.

However, its toxic and corrosive properties and the difficulties of dissolving it in water have limited its widespread acceptance. One of its most common applications is in poultry industry process water.

Models

The HANNA PCA 300 series models are chlorine, bromine or iodine and pH, ORP and temperature process analyzers which continuously monitor a sample stream and control the dosing to adjust the chlorine, bromine or iodine content and pH.

From drinking and wastewater treatment to the pool and spa sanitation, the monitoring of chlorine, bromine or iodine levels has an important bearing on public health as well as ROI and efficiency for heating system and industrial applications.

The PCA 3X0 series monitors the free chlorine or total chlorine in the 0 to 5.0 mg/L range;

The PCA 3X1 series monitors the bromine in the 0 to 10.0 mg/L range;

The PCA 3X2 series monitors the iodine in the 0 to 12.5 mg/L range;

In the DPD Colorimetric method, N, N-Diethyl-p-phenylene-Diamine indicator and a buffer are mixed with the sample. Free available chlorine oxidizes the DPD indicator reagent at a pH between 6.3 and 6.6 to form a magenta colored compound. The intensity of the resulting color is proportional to the concentration of chlorine in the sample. The purpose of the buffer solution is to maintain the proper pH.

In total chlorine measurement (free available chlorine plus combined chloramines), potassium iodide is added. The chloramines in the sample cause the iodide ions to become iodine which reacts with free chlorine to oxidize the DPD indicator. A pH of 5.1 is required for this reaction. Thus total chlorine measurements require a different buffer solution containing potassium iodide. Once the chemical reaction is completed, the optical signal at 555 nm is compared to the signal measured through the sample before the reagents were added. From these measurements chlorine concentration is calculated and shown on the display.

Indicator and buffer reagent bottles are placed directly into the instrument case. With a sampling period of 5 minutes, reagents need only to be replenished about once a month.

Since chlorine, bromine and iodine effectiveness is closely tied with pH levels, HANNA has designed our new analyzers PCA 32X and PCA 33X with pH control and temperature and pH control, ORP monitoring and temperature respectively.

PCA 32X and PCA 33X use the HI 1005 pH probe to continuously measure the pH of the sample stream in the range of 0 to 14 pH. The sample temperature is measured in the 5 to 75°C range. pH and temperature are displayed on the front panel, and the pH value is temperature compensated.

PCA 33X uses the HI 2008 platinum ORP electrode to continuously measure the sample ORP value. The pH/temperature combined sensor and the ORP sensor are placed inside the case, directly in the sample stream.

Measurement and Control Cycle

The PCA has a control time cycle that can be set by the user according with the dimensions of the controlled system. The control process, dosing commands and alarms can be performed according to this time cycle. The range of cycle timing is from 3 to 90 minutes.

Chlorine/Bromine/Iodine Control

Four chlorine/bromine/iodine level set points can be adjusted by the operator: a proportional dosing set point, two alarm set points and a minimum level for dosing. The proportional dosing factor (1/Δ) is user selectable with a delta between 0.1 and 2 pH. Chlorine/bromine/iodine dosing system controls a SPST relay. Each alarm can be enabled or disabled.

pH Control

Three pH level set points can be adjusted by the operator: a control set point and two alarm set points. The pH control mode is user selectable; on/off or proportional dosing. The proportional dosing factor (1/Δ) is user selectable with a delta between 0.1 and 2 pH. The on/off dosing hysteresis is user selectable between 0.05 and 2.00 pH. The pH dosing system controls a SPST relay.

Each pH, ORP and temperature alarm can be enabled or disabled, and two alarm levels can be set by the user also for temperature and ORP. Alarm condition controls a SPDT relay. The system error feature activates a relay to signal the need for operator intervention. System error condition controls a SPST relay.

Analog Output

Two current outputs of 4-20 mA or 0-20 mA are available to drive external devices such as chart recorders. The analyzer can drive two dosing pumps through the 4-20 mA outputs for chloride and acid/alkali dosing. The analog output is fully programmable and can be proportional with chlorine concentration, pH, ORP or temperature value. The limits of the analog output is selectable for each parameter.

Logging

The analyzers can store up to 3500 readings (at least 7 days at 3 minutes sampling interval), that can be available for consulting or downloading. Logged records contain the time stamp, full information about the parameter values and the alarm status at the time.

Alarm and Warning System

Through the system, users have the ability to enable or disable the low and high level of alarms for all parameters. The system also offers overdosing protection that generates an alarm if something within the system is not working properly. The system will stop processes until the error is corrected by the user. Time is displayed on the main panel and time related reminders are available for "old calibration", "reagent expired", and "SIM expired". All these warnings are generated based on user settings.

Mounting

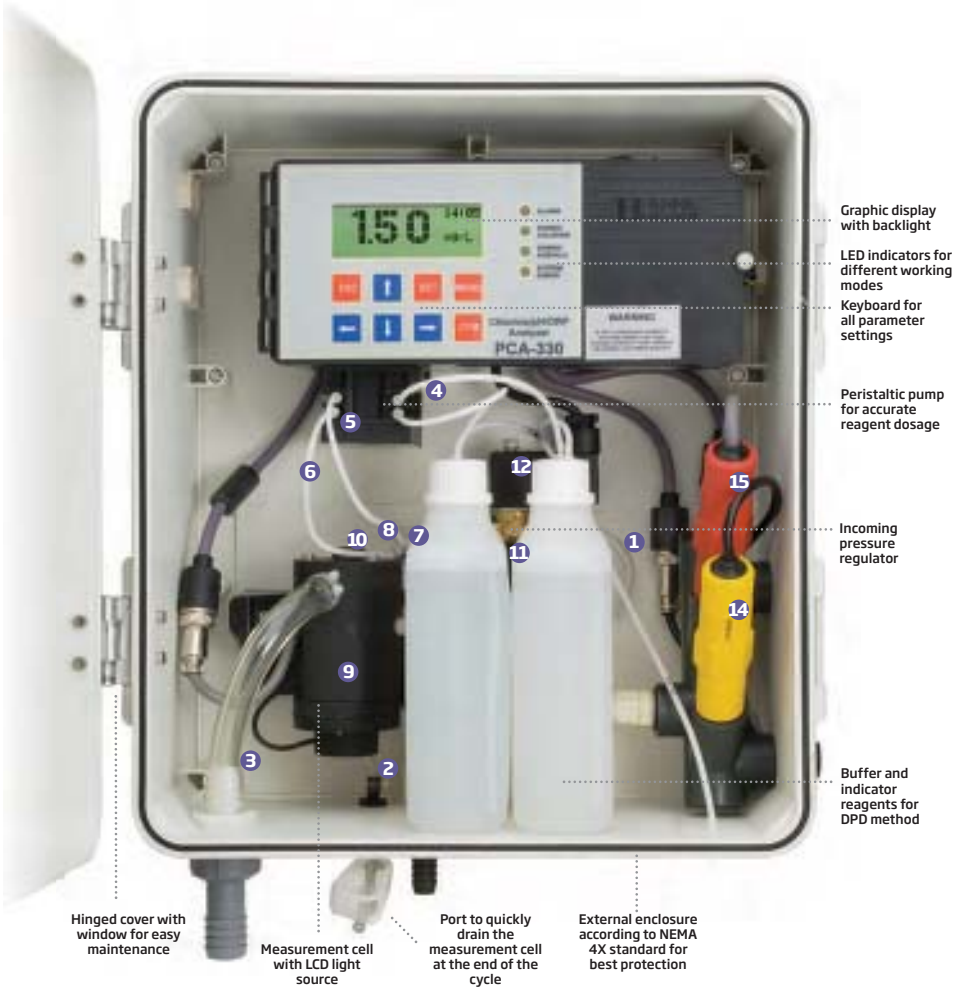
These controllers are offered in an easy to access, wall mounted casing that offers outstanding chemical, mechanical and temperature resistance.

SPECIFICATIONS		PCA 310	PCA 320	PCA 330	PCA 311	PCA 321	PCA 331	PCA 312	PCA 322	PCA 332
Range	Free & Total Chlorine	0.00 to 5.00 mg/L (ppm)			–	–	–	–	–	–
	Bromine	–	–	–	0.0 to 10.0 mg/L			–	–	–
	Iodine	–	–	–	–	–	–	0.0 to 12.5 mg/L		
	pH	–	0.00 to 14.00 pH		–	0.00 to 14.00 pH		–	0.00 to 14.00 pH	
	ORP	–	–	0 to 2000 mV	–	–	0 to 2000 mV	–	–	0 to 2000 mV
	Temperature	–	5.0 to 75.0 °C (41 to 167 °F)		–	5.0 to 75.0 °C (41 to 167 °F)		–	5.0 to 75.0 °C (41 to 167 °F)	
Resolution	Free & Total Chlorine	0.01 mg/L (ppm)			–	–	–	–	–	–
	Bromine	–	–	–	0.1 mg/L (ppm)			–	–	–
	Iodine	–	–	–	–	–	–	0.1 mg/L (ppm)		
	pH	–	0.01 pH		–	0.01 pH		–	0.01 pH	
	ORP	–	–	1 mV	–	–	1 mV	–		1 mV
	Temperature	–	0.1 °C		–	0.1 °C		–	0.1 °C	
Accuracy	Free & Total Chlorine	± 8% or ±0.05 mg/L whichever is greater			–	–	–	–	–	–
	Bromine	–	–	–	±8% or ±0.1 mg/L whichever is greater			–	–	–
	Iodine	–	–	–	–	–	–	± 8% or ±0.1 mg/L whichever is greater		
	pH	–	±0.05 pH		–	±0.05 pH		–	±0.05 pH	
	ORP	–	–	±1 mV	–	–	±1 mV	–	–	±1 mV
	Temperature	–	±0.5°C		–	±0.5°C		–	±0.5°C	
Min. Detectable Level	F & T Chlorine, Bromine, Iodine	0.05 mg/L (ppm)			0.1 mg/L (ppm)			0.1 mg/L (ppm)		
Input Impedance		10^{12} Ohm								
Calibration	F & T Chlorine, Bromine, Iodine	one point								
	pH	one or two point or in line calibration								
Sampling Rate	F & T Chlorine, Bromine, Iodine	adjustable from 3 to 90 minutes								
	pH	adjustable from 3 to 120 seconds								
Dosage	F & T Chlorine, Bromine, Iodine	proportional								
	pH	ON/OFF or proportional, relay or 4-20mA output								
Delta	F & T Chlorine, Bromine, Iodine	selectable from 0.1 to 5 mg/L (ppm)								
	pH	selectable from 0.1 to 2 pH (hysteresis adjustable from 0.05 to 2 pH)								
Recorder Output		4-20mA, 0-20mA								
PC Connectivity		RS485 port, galvanically isolated								
Baud Rate		1200, 2400, 4800, 9600 bps								
Data Logging		up to 3500 data points								
Alarm Relay		SPDT contact with 5A, 230V resistive load								
Dosing Relay		SPDT contact with 5A, 230V resistive load								
System Error		SPDT contact with 5A, 230V resistive load								
Inlet Pressure		0.07 to 4 bar with no external pressure regulator (for pressure exceeding four bar an external pressure regulator is required)								
Sample Flow		100 to 300 mL/min								
Sample Temperature		5 to 40°C (41 to 104°F)								
Sample Inlet/Outlet Connection		12mm (1/2") male NPT fitting								
Drain Connection		10mm (3/8") barb								
Power Supply		115 VAC ±10% or 230 VAC ±10%; 50/60 Hz; 20 VA								
Enclosure		NEMA-4X standard, molded fiberglass polyester with transparent Lexan window								
Dimensions / Weight		318 x 267 x 159 mm (12.5 x 10.5 x 6.25") / 5 kg (11 lb.) without reagents								

ORDERING INFORMATION

Each **PCA 300 series** model is supplied with reagent bottles (2), reagent caps (2), 1 DPD compound powder, tubing and instructions.

PCA 310-1 Free & total chlorine analyzer/control (115V)
PCA 310-2 Free & total chlorine analyzer/control (230V)
PCA 320-1 Free & total chlorine analyzer/control, pH control, temperature (115V)
PCA 320-2 Free & total chlorine analyzer/control, pH control, temperature (230V)
PCA 330-1 Free & total chlorine analyzer/control, pH control, ORP monitoring, temperature (115V)
PCA 330-2 Free & total chlorine analyzer/control, pH control, ORP monitoring, temperature (230V)
PCA 311-1 Bromine analyzer/control (115V)
PCA 311-2 Bromine analyzer/control (230V)
PCA 321-1 Bromine analyzer/control, pH control, temperature (115V)
PCA 321-2 Bromine analyzer/control, pH control, temperature (230V)
PCA 331-1 Bromine analyzer/control, pH control, ORP monitoring, temperature (115V)
PCA 331-2 Bromine analyzer/control, pH control, ORP monitoring, temperature (230V)
PCA 312-1 Iodine analyzer/control (115V)
PCA 312-2 Iodine analyzer/control (230V)
PCA 322-1 Iodine analyzer/control, pH control, temperature (115V)
PCA 322-2 Iodine analyzer/control, pH control, temperature (230V)
PCA 332-1 Iodine analyzer/control, pH control, ORP monitoring, temperature (115V)
PCA 332-2 Iodine analyzer/control, pH control, ORP monitoring, temperature (230V)



PARTS

HI 70473	PCA tubing kit, pressure regulator to drain (2). Each kit includes: transparent Tygon tubes 86L x 3.2ID mm (3.4 x 0.1") (Length x Internal Diameter) **(1, 2)** and 105 x 9.5 mm (4.1 x 0.4") **(3)**
HI 70474	PCA peristaltic pump tubing kit (6). Each kit includes: non-transparent C-flex tubes 55L x 0.8ID mm (2.1 x 0.03") **(5)**
HI 70475	PCA peristaltic pump tubing kit (2). Each kit includes: non-transparent C-flex tubes 55L x 0.8ID mm (2.1 x 0.03") **(5)**
HI 70476	PCA reagent bottle tubing kit (6). Each kit includes: non-transparent C-flex tubes 155L x 0.8ID mm (6.1 x 0.03") **(11)**
HI 70477	PCA tubing set for measuring cell (2). Each set includes: non-transparent C-flex tube 50L x 0.8ID mm (2.0 x 0.03") **(8)** and Y strainer **(7)**
HI 70478	PCA tubing kit, bottle to pump (6). Each kit includes: non-transparent C-flex tube 150L x 0.8ID mm (5.9 x 0.03") **(4)**
HI 70479	PCA tubing kit, pump to Y strainer (6 pcs). Each kit includes: non-transparent C-flex tube 150L x 0.8ID mm (5.9 x 0.03") **(6)**
HI 70482	PCA filters. The kit includes 0.5 µm and 50 µm filters **(13)**
HI 70496	Replacement filter, 0.5 µm **(15)**
HI 70497	Replacement filter, 50 µm **(16)**
HI 70483	PCA complete tubing kit. The kit includes: non-transparent C-flex tubes **(4, 6)** 150L x 0.8ID (5.9 x 0.03") (4 pcs), non-transparent C-flex tubes **(5)** 55L x 0.8ID (2.1 x 0.03") (2 pcs), non-transparent C-flex tubes **(8)** 50L x 0.8ID (2.0 x 0.03") and Y strainer **(7)**
HI 70484	PCA complete tubing kit (3). Each kit includes: non-transparent C-flex tubes **(4, 6)** 150L x 0.8ID (5.9 x 0.03") (4 pcs), non-transparent C-flex tubes **(5)** 55L x 0.8ID (2.1 x 0.03") (2 pcs), non-transparent C-flex tubes **(8)** 50L x 0.8ID (2.0 x 0.03"), Y strainer **(7)**
HI 70485	PCA stirrer motor
HI 70486	PCA stirring bar **(2)**
HI 70487/N	Measuring cell **(9)**
HI 70487/A	Adapter set for measuring cell
HI 70488	Electrovalve, 24VAC/60Hz **(12)**
HI 70489	Electrovalve, 24VAC/50Hz **(12)**
HI 70494	PCA calibration port cap **(10)**
HI 70492	Electrode holder (PCA 330)
HI 70493	Closing cap for electrode holder

ELECTRODES

HI 1005	Amplified pH electrode with Matching Pin and Pt100 **(14)** (PCA 320/330 only)
HI 2008	Amplified ORP electrode with Matching Pin **(15)** (PCA 330 only)

REAGENTS

HI70431	Total Chlorine reagent set for PCA (buffer citrate), 500 mL (2)
HI 70481	Total chlorine reagent set for PCA, 500 mL (2) + 6 g powder
HI 70491	Total chlorine reagent set for PCA, 500 mL (2) + 5 sachets (DPD)
HI 70430	Free chlorine reagents set for PCA (the most stable), recommended for long term measurements, 500 mL (2) + 6 g powder
HI 70480	Free chlorine reagents set for PCA, recommended for short term measurements, 500 mL (2) + 5 sachets (DPD)
HI 70490	Free chlorine reagents set for PCA, 500 mL (2) + 5 sachets (DPD)
HI 70452	DPD reagent,5 sachets
HI 70498	Bromine replacement reagent set for process bromine analyzer, 500 mL (2) + 5 sachets (DPD)
HI 70499	Iodine replacement reagent set for process iodine analyzer, 500 mL (2) + 5 sachets (DPD

SOLUTIONS

HI 70460	Total chlorine indicator solution for PCA, 500 mL
HI 70461	Total chlorine buffer solution for PCA, 500 mL
HI 70450	Free chlorine indicator solution for PCA, 500 mL
HI 70451	Free chlorine buffer solution for PCA, 500 mL
HI 7004L	pH 4.01 buffer solution, 500 mL
HI 7006L	pH 6.86 buffer solution, 500 mL
HI 7007L	pH 7.01 buffer solution, 500 mL
HI 7009L	pH 9.18 buffer solution, 500 mL
HI 7010L	pH 10.01 buffer solution, 500 mL
HI 7020L	200-275 mV buffer solution, 500 mL
HI 7091L	Pretreatment reducing solution, 500 mL
HI 7092L	Pretreatment oxidizing sol., 500 mL
HI 70300L	Storage solution, 500 mL
HI 7082	3.5M KCL electrolyte, 50 mL **(4)**
HI 7061L	Electrode cleaning solution, 500 mL

SOFTWARE

HI 92500	Windows® compatible software

For a complete list of pH and ORP Solutions, see the end of pH *Section 3*.

Process Instrumentation

The HANNA line of process instrumentation offers different solutions to control processes in which parameters like pH, ORP, Conductivity, TDS are important. The versatile solutions provided by HANNA can cover any application. Digital controllers are offered for complex process systems and offer a full package of features for the control of the process with high levels of configuration for control and measurement parameters. HANNA solutions are designed for both accuracy of the reading and safety of the control process. The matching pin, sensor check, cleaning programs, auto-diagnostics, hold mode, alarm and warning system are all solutions to the same problem: measurement and control of processes has to be performed in safety from the process control point of view.

Typical feedback systems are based on a control loop, including sensors, controllers with control algorithms and actuators. The purpose of this system is to try to regulate a variable parameter at a set point or reference value. Different types of feedback control algorithms are available: on/off, linear, proportional or PID controllers. Open-loop control systems do not make use of feedback, and run only in preset ways.

Closed-loop control systems typically operate at a fixed frequency. The frequency of changes to the drive signal is usually the same as the sampling rate. After reading each new sample from the sensor, the controller reacts to the controlled system changed state by recalculating and adjusting the actuators drive signal. The controlled system responds to this change, another sample is taken, and the cycle repeats. Eventually, the controlled system should reach the desired state and the controller will cease making changes. The above frequency is fixed based on a setting of the time cycle according with the time necessary to the controlled system to react to the actuator adjustment .

An on-off controller is a feedback controller that switches the actuators drive signal between two states. They are often used to control an actuator that accepts a binary input, for example an on/off valve. A common issue in most applications of on-off feedback control is the wear of actuators such as relays and control valves when the measurement is closed to the set point and the system is starting a continuous on/off switching on each cycle (similar with a continuous oscillation around the set point).

Therefore, practical on-off control systems are designed to include hysteresis, usually in the form of a dead-band, a region around the set point value in which no control action occurs. The width of dead-band may be adjustable or programmable.

Linear control

Linear control is the first solution to on/off control issues. Linear control systems use linear negative feedback to produce a control signal mathematically based on other variables, with a view to maintaining the controlled process within an acceptable operating range. The output from a linear control system into the controlled process may be in the form of a directly variable signal, such as a motorized valve that may be 0 or 100% open or anywhere in between. Sometimes this is not feasible and so, after calculating the current required corrective signal, a linear control system may repeatedly switch an actuator, such as a pump, motor or heater, fully on and then fully off again, regulating the duty cycle inside the time cycle using pulse-width modulation.

Proportional control

Proportional negative-feedback systems are based on the difference between the required set point and measured value. This difference is called the error. Correction is applied in direct proportion to the current calculated error, in the correct sense so as to tend to reduce the error. The amount of corrective action that is applied for a given error is set by the gain or sensitivity of the control system. At low gains, only a small corrective action is applied when errors are detected: the system may be safe and stable, but may be low in response on large changing conditions; errors will remain uncorrected for relatively long periods of time. If the proportional gain is increased, such systems become more responsive and errors are dealt with more quickly. There is an optimal value for the gain setting when the overall system is said to be critically damped. Increases in loop gain beyond this point will lead to oscillations in the process. To resolve the two problems of low response time on one side or system oscillation on the other side, many feedback control schemes include mathematical extensions to improve performance. The most common extensions lead to proportional-integral-derivative control, or PID control. The PID control is formed from three controllers that treat the error in different way: proportional, derivative and integrative.

Derivative action

The biggest problem with proportional control is to reach new desired outputs quickly and to avoid overshoot and minimize ripple once you get there. Responding quickly imposes a high proportional gain, but minimizing overshoot and oscillation requires a small proportional gain. Achieving both at the same time may not be possible in all systems.

The derivative part is concerned with the rate-of-change of the error with time: If the measured variable approaches the set point rapidly, then the actuator is backed off early to allow it to coast to the required level; if the measured value begins to move rapidly away from the set point, extra effort is applied–in proportion to that rapidity–to try to maintain it. If derivative action is over-applied, it can lead to oscillations as well.

Integral action

The integral term magnifies the effect of long-term steady-state errors, applying ever-increasing effort until they reduce to zero. If the actuator action being applied does not bring the controlled parameter up to set point, for whatever reason, integral action increasingly moves the proportional band relative to the set point until the error is reduced to zero and the set point is achieved.

PID Tuning

PID control is a very powerful and high quality solution for many control processes. The biggest problem of PID controllers is the tuning of the controller in accordance with the controlled system/parameter. Tuning control is not an easy operation and the controller and controlled system have to permit this. High level instruments offer the auto-tuning of controllers that is oriented to the automation of the controller reaction and do not request common PID tuning.

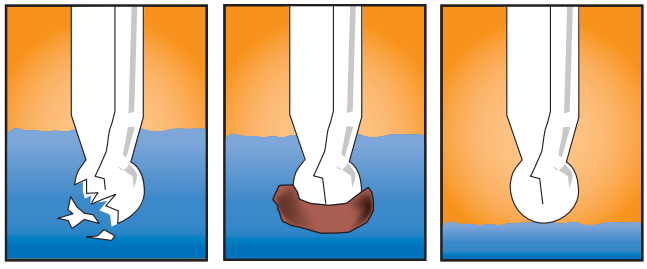
Input of the controllers

Controllers are in contact with the process based on the sensors and actuators. The sensors are the inputs of the controller, the actuators are the outputs of the controller. In HANNA controllers, the common inputs are the pH, ORP, conductivity, TDS along with temperature for temperature compensation. The probes are connected directly to the controller, or in case of extreme distances between controller and probe, through the transmitters (analog/digital).

Sensor Check™

A pH control system consists of a pH electrode in contact with a test solution, a connection cable, and a meter for measurements and adjustments. The instrument is typically set to control acid or alkaline dosage for the purpose of maintaining a desired pH value. Many efforts have been devoted to such functions as dosage in pipes or tanks, on/off or proportional control, Automatic Temperature Compensation, the use of amplifiers for distances exceeding 15 meters, panel or wall-mounted models, etc. However, little effort has been applied to determining when and what occurs when an electrode fails.

Problems Detected by the Sensor Check™ System



Broken electrode | **Dirty electrode** | **Electrode not immersed**

For example, let's assume a process electrode is installed in a tank of wastewater containing hexavalent chromium. The set point pH value is 3.0 and, every time this value rises, pumps or solenoid valves are activated to dose sulfuric acid to maintain the set point. Let's also assume that the process electrode becomes damaged and the pH bulb is broken. Under normal conditions, the electrode will produce a potential equal to the difference between the buffer inside the glass bulb (pH 7.0) and the liquid being tested (pH 3.0), i.e. pH (7.0-3.0) x approx. 59.16 mV = 236.64 mV (value not compensated for temperature variations).

Once the glass bulb is broken, a short circuit occurs between the reference wire of the glass electrode (bulb) and the reference electrode; as a result the complete electrode potential is 0 mV. When the instrument receives a 0 mV signal, it will read approximately pH 7.0 and will immediately start to dose sulfuric acid in order to lower the pH level of the tank. If the controller does not possess a timed override function to shut down automatically, the system will keep dosing in an attempt to reach the 3.0 pH set point. This will continue until the acid container becomes empty by which time the process stream will be dangerously contaminated. Even if a timed override is programmed into the controller, this will only limit the contamination. If the electrode fails near to the set point, the controller could dose for several minutes before the override shuts down the system.

This is just one of many possible examples of overdosing and contamination as a result of an undetectable electrode failure.

In any given application, costly damage can be avoided by automatically and continually monitoring the condition of the process sensors. HANNA has devised such a system. **The Sensor Check™ system automatically checks the condition of the process electrode every 5 seconds to ensure proper function.**

A pH glass electrode is a high impedance device (tens of MΩ at high temperatures, and up to 1,000 MΩ for temperatures close to zero). The Sensor Check™ system repeatedly checks the impedance of the cable and electrode to ensure it does not fall below the average value of the system (at least 10 MΩ). If a lower value is detected, indicating electrode failure, the instrument stops all dosage and activates an alarm that alerts the operator. By doing so, the Sensor Check™ system makes over dosage and contamination as a result of electrode failure a thing of the past.

Additionally, the Sensor Check™ system monitors the condition of the reference electrode. The pH measuring half cell may be intact and work normally, but problems may occur related specifically to the reference portion of the electrode. The purpose of the reference half cell portion of the electrode is to supply a consistent and stable potential that is independent of the liquid being tested. This stable potential is the reference value by which the measuring portion of the electrode is compared. As a result the potential difference between the measuring half cell and the reference is the value used by the instrument to produce the pH reading. The reference electrode must make contact with the test solution to complete an electrochemical connection. Unlike the measuring cell which is hermetically separated by means of a glass bulb, the reference cell contains a permeable membrane (reference junction) which allows electrolyte to diffuse into the solution. This creates an ionic

connection between the internal silver reference and test solution, completing the circuit.

As with any electrochemical connection, the possibility of contamination is always a concern. When contamination occurs, the potential of the reference electrode changes and the pH reading is no longer reliable. In addition, exposure to dirt and particles in the process stream may clog the porous reference junction, isolating the reference from the test liquid. If this occurs the electrochemical connection is broken and the electrode is essentially "unplugged" from the test solution making a correct pH reading impossible. This is why regular cleaning of the electrode system is a necessity. As with the pH bulb, the reference junction produces a measurable resistance value which under normal conditions is approximately 1,000Ω.

The HANNA Sensor Check™ system monitors the reference junction every 5 seconds to ensure that the proper resistance is maintained. Usres can program a maximum value for the resistance similar to setting the pH set point. When the resistance of the clogged junction exceeds the set value, the instrument can stop dosage, trigger an alarm or automatic cleaning cycle. These features are present in the HI 504 series of process pH/ORP controllers.

Ground loop current effect on process pH/ORP electrodes

An electrochemical (combination) cell, such as a pH or ORP electrode, is comprised of 2 half cells; the measuring cell and the reference.

Both are essential for the cell to function and each has a specific purpose. The entire cell is considered galvanic in that no external power is supplied to the solution. In many respects, the electrochemical cell is very much like a "wet cell" battery. In order for the measuring half cell to produce a readable measurement of a test solution, it must be compared to a stable reference potential. It is absolutely crucial that the potential produced by the reference half cell is consistent and stable (approx. 210 mV) regardless of the properties of the test solution and the working conditions. The only changing potential, as a result of the solution under test, is produced by the glass bulb of the measuring cell. The reference electrode must also make contact with the test solution to complete an electrochemical connection. Unlike the measuring cell which is hermetically separated by means of a glass bulb, the reference cell contains a permeable membrane (reference junction) which allows electrolyte to leach out into the solution. This creates an ionic connection between the internal silver reference and test solution completing the circuit. Hence the reference is now electrochemically connected to the solution which makes it vulnerable to transient electrical currents that may be present in the process.

Unlike with a portable battery powered pH meter and electrode, the process system is not isolated from potential difference and the resulting current flow. It is possible, given that unwanted potentials exist in the process, that the silver/silver chloride wire of the reference is exposed to current flow thousands of times higher than normal. In theory, this should not happen since most process instruments are powered at low voltage and the transformer inside the instrument will galvanically isolate the two potentials between the "process" and ground of the electrical system. This depends, therefore, on the quality of the instrument's input transformer. Even with the best isolation, capacitance may be generated between the instrument and the process stream. In this case, the reference electrode influenced by the resulting EMF can no longer function properly and as a result, the pH reading is lost.

By introducing the matching pin, which acts as a ground connection, the EMF is rerouted through the pin and galvanically isolated from the internal mass of the instrument. The instrument must be equipped electrically to perform this function. Hence, the matching pin can only be used with controllers provided with a differential input and circuit.

Few electrode and instrumentation manufacturers have paid the necessary attention to the matching pin and as a result it has been up to the user to devise makeshift ground connections that may or may not work correctly.

HANNA has responded to this problem by designing a complete series of process electrodes, each equipped with an integrated potential matching pin.

Matching Pin: The Solution to the Ground Loop Effect

In process applications utilizing controllers and electrodes installed in-line or in tank, the potential matching pin is considered the "earth ground" connection and is used to prevent ground loop effects from causing erratic readings and damage to the system. In fact, it is a grounding device with a pin made of a material (usually stainless steel or titanium) inert to chemical attack. The matching pin essentially redirects the current from the reference cell of the process electrode (i.e. pH or ORP sensor). Potentials and transient current flow can be caused by "leakage" of improperly insulated electrical equipment (pumps and stirrers), electrostatic charges introduced by the motion of mixer blades, or the existence of electric fields (electrolysis) present in plating baths.

Calibration of a Typical Process Meter

In industrial applications, the calibration of a meter often poses difficulties due to the distance between the electrode and the instrument. In addition, accessing the electrode for calibration may prove to be a challenge if it is installed in a pressurized line or large tank in a continuous process. Stopping a process frequently for the purposes of regular calibration may prove inconvenient and costly.

In laboratory applications, the task of calibration is significantly different because the electrode and the instrument are close together and easily manageable. To provide the same level of manageability in a process application, HANNA has developed a remote calibration method which allows the maintenance technician or operator the capability to calibrate the process controller without having direct access to it or without removing the electrode from the installation.

Analog or digital transmitters

In order to increase the distance between the sensor and the controller, different solutions were implemented: to amplify the sensor signal, to transform the signal into another type of signal in current or voltage using the analog transmitters, or to convert the signal from analog to digital and to transfer the reading in digital format. Based on this consideration HANNA supports all of these solutions on the sensor level and input of the controllers.

Controller Output

As mentioned earlier, actuators are the outputs of the controllers. The output to actuators on the controller side can be performed using a relay or analog output. Each of them is driven by the controller in accordance with the control method used. For example, an on/off control is common to be performed with a relay, a linear control with an analog output, and a duty cycle command using a solid state relay. HANNA controllers feature all of these options.

Alarms and warning

Controllers are designed to keep the controlled system/parameter within a certain area of values. In the event that parameters have gone out of range, the controller signals an alarm on the user interface and on an output such as an on/off relay according with the alarm status. The status of the controller and the process can be monitored using the analog output connected to a recorder or on the controller LCD.

Due to the complexity and importance of the controlled systems, the controllers incorporate a self-diagnostic feature. With this feature, the controller has the ability to check the most important functions, and in the event of failures, to take the actions that are necessary to minimize the effects of the problems. HANNA controllers have implemented both levels of protection: self-diagnostic and control of output in the event of failures.

Hold feature

The Hold feature is suspends the measurement and control of functions of the instrument. The control and control relays are also disabled. If the meter is in idle or control mode and displaying measurements, then the last measured value (both for temperature and pH, ORP or conductivity/concentration) is frozen on the display. The LCD displays the "Hold" message.

The instrument enters Hold mode during the calibration, setup, in progress cleaning or every time when this function is started by: calibration, setup, cleaning in place, the hold digital insulated input (there are two digital insulated inputs: one for hold mode and one for the advanced cleaning) when it is on; normally the signal level is polled at least every 4 seconds, the proper key combination (CFM and up arrow keys together) for service; the same key combination is used both to start and stop the hold mode (the key combination acts in the same way as the hold digital input, the daily programmable control timing, an error event, the hold start/stop RS485 command.

The display will show dashes if the meter is put into the Hold mode before any readings have taken place.

After the Hold mode expires, the meter exits the hold mode, but control and alarms remain disabled for a user-selectable delay (0 to 99 seconds). In this situation, measurements are normally acquired, displayed and recorded through the analog or RS485 output.

Analog output

HANNA controllers feature settable analog outputs. The analog output can be linked to the measured input or to the output of the PID controller. In the first case the analog output will be connected to a recorder and in the second case it will be used to drive external devices such as actuators in a control system. A feature of the recorder output configuration is the ability to zoom a specific measurement range, to offer a higher resolution on the recorder output. Additionally, values that are out of the defined analog output range can be used to signal the alarm condition that appears.

The analog output is communally working in current and the standard ranges are 0 to 20 mA or 4 to 20 mA. The measured range is divided proportional with the analog output range. In some conditions the analog output can be set in voltage with commune ranges between 0 to 5V or 0 to 2V. The voltage is not commonly to be used for long distances due to the drop in voltage on the connection and wires.

Password protection

The controllers can be mounted to monitor and control important processes where unqualified personnel intervention is not accepted. HANNA digital controllers feature a password protection solution that offesr restricted access to important features like calibration, setup and consultancy of logged data. The password can be set and enabled/disabled during the normal operations.

Panel Mount or Wall Mount Instruments

Most process instruments for measuring and controlling pH, ORP and conductivity are designed for installation in panel enclosures. Panel configurations are necessary when installing a variety of control devices in a confined space.

Quite often users need to design a simple and remote solution close to the measurement point. To solve this problem, HANNA has designed a series of wall mounted instruments which do not require enclosures and housing for a multitude of connections and wiring.

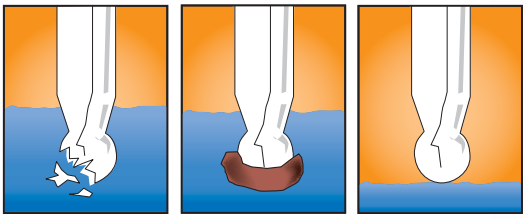
Almost the entire range of HANNA panel mount instrumentation is available in stand alone wall mountable versions for quick and easy "plug and play" installation.

HI 504

pH/ORP Digital Controller with Sensor Check™

- PID, PI, proportional or ON/OFF control of pH or ORP for one or two set points
- Sensor Check™ for a real-time pH/ORP electrode status monitoring
- Digital transmitter or direct connection of the probe
- Matching PIN to eliminate the ground loop effect
- Automatic temperature compensation for pH
- Logging of up to 100 system events and up to 6000 readings (pH, ORP, T)
- Control performed with up to 4 relays or analog output in 0-20 or 4-20 mA
- Automatic probe cleaning from alarm or user request

Problems Detected by the Sensor Check™ System



Broken electrode | Dirty electrode | Electrode not immersed

HI 504 is a PID, PI, proportional or on/off pH/ORP controller with one or two set points. The measurement configuration settings and control of pH and ORP are saved separately and permits users to switch between pH and ORP without losing settings. The pH channel can be calibrated in 2 calibration points. The instrument has a full auto diagnostic procedure. Sensor Check™ is also available for pH and ORP probes.

The temperature is continuously monitored using a temperature sensor (Pt100 or Pt1000 type) with automatic temperature compensation of pH.

One or two analog controller outputs (0-20 or 4-20 mA) can be configured for pH/ORP recording or controlling (only for models with PID), and relays can be used to control the process or be connected with alarm status.

Controller status is visable with LED's on the front panel and on LCD.

The controllers logging feature can save up to 6000 samples pH/°C or ORP and last 100 error, configuration, calibration and cleaning events. This information can accessible from a PC through RS485 and HI 92500 software. The powerful HI 92500 software has graphing capabilities and can print graphs directly or can be saved as a bitmap. Data can be exported in common spreadsheet formats.

Sensor Check™ pH/ORP

Sensor Check™ performs self-diagnostic and troubleshooting functions by continuously verifying the electrode status based on impedance movement of the glass and reference measurement. The internal circuit of the instrument executes two independent tests, one for the probe and one for the reference chamber, measuring the respective impedance values every 5 seconds. These tests last for a very short period to avoid electrolysis and polarization, which can be caused by a prolonged exposure to an electric current. The types of problems identified by Sensor Check™ are: pH electrode broken, reference electrode dirty, reference electrode or matching pin not immersed, clogged or dirty electrode junction, short-circuit between cables of pH and reference electrodes, signal problems from the cable or connector due to humid or dirty environments. The test is not limited to a simple signal that indicates an error in progress, but it reports the nature of the problem with a specific error code.

Analog Output: Data Logging or PID Dosage Control

Models are available with one or two analog outputs. These outputs can be connected to a recorder for the catalogging of process data (pH/mV and temperature), or can be used for controlling dosing systems (pumps or electrovalves) using PID control.

Logging of the Last 100 Events

With the HI 504 series, it is possible to recall the sequence of the last 100 occurred events at any time: errors, calibrations performed, set parameter changes and cleaning cycles. Every code shown on the display corresponds to a certain type of event, error, or operation.

Programmable Cleaning Cycles

Heavy-duty applications often require almost continuous probe maintenance. Elements such as suspended solids, fat, oils, pigments and microorganisms can quickly deposit and soil the glass bulb of a pH probe, the sensor of an ORP probe or the reference junction. To solve these problems, the HI 504 series has been equipped with an automatic cleaning system (simple or advanced, depending on model) with programmable cycles. The cleaning cycle is a simple wash with either water or detergent, programmed by setting the rinse time and the pause length. The advanced cleaning uses both water and detergent, and allows the user to program three stages, with the possibility to vary the sequence, the time, and the number of cycles. The advanced mode can also be triggered at any time from a remote control or through the isolated digital input on the rear panel, which can be connected to an external switch.

The controllers can also automatically activate both cleaning modes whenever Sensor Check™ reveals a soiled probe. A delay time can be set before restarting the reading after a cleaning cycle has taken place; this allows the probe to adjust to new operating conditions.

Programmable Hold System

The hold function allows the user to stop the regulating action of the controller for programmable time periods. It is possible to activate the hold periods in correspondence to programmed operations, such as plant maintenance and cleaning procedures.

Fail Safe Alarm System

HANNA's exclusive Fail Safe Alarm System protects against problems caused by power supply failure or signal interruption, which are typical risks in industrial environments. The system acts both on a hardware and a software level. The alarm relay functions in a normally closed condition, and is tripped when there is a power failure if, for example, the power cable is accidentally cut. This function is very important in industrial plants where alarms are usually not activated if there is a power supply interruption, which can cause serious damage due to a loss of control of the process plant. At the software level, the Fail Safe function activates an alarm in case of abnormal circumstances, for example if the dosing contacts remain closed for an excessive period. The alarm condition is also indicated by a red LED, located directly on the front panel of the controller.

SPECIFICATIONS	HI 504
Range	-2.00 to 16.00 pH; -2000 to 2000 mV; -30 to 130.0°C
Resolution	0.01 pH; 1 mV; 0.1°C (above -10 °C); 1°C (below -10°C)
Accuracy (@20°C/68°F)	±0.02 pH; ±2 mV; ±0.5°C (-9.9 to 130.0°C); ±1°C (-30 to -10°C)
Input Impedance	10^{12} Ohm
Digital Input for the pH/ORP/°C Transmitter	RS485
Other Digital Insulated Inputs	two digital insulated inputs: one for hold and one for the advanced cleaning; ON state: 5 to 24 VDC
Digital Insulated Output	a digital insulated contact closed upon hold mode
Temperature Compensation	automatic or manual, -30 to 130°C
Temperature Probe	with three-wire or two-wire Pt100/Pt1000 sensor (with automatic recognition and damage test)
Power Supply (depending on model)	24 VDC/AC, 115 VAC ±10%, 230 VAC ±10% or 100 VAC ±10%; 50/60 Hz
Power Consumption	10 VA
Over Current Protection	400 mA 250V quick blow fuse
Max. Oscillation Frequency	8 MHz
Relays 1, 2, 3, 4	electromechanical relay SPDT contact outputs, 5A-250 VAC, 5A - 30 VDC (resistive load); fuse protected: 5A, 250V quick blow fuse
Alarm Relay	electromechanical relay SPDT contact output, 5A - 250 VAC, 5A - 30 VDC (resistive load) fuse protected: 5A, 250V quick blow fuse
Analog Output	two independent outputs, 0 - 22 mA (configuring as 0-20 mA or 4-20 mA)
Analog Output Resolution	0.1% f.s.
Analog Output Accuracy	± 2% f.s.
Data logging	6000 pH/°C or ORP samples
Environment	0 to 50°C (32 to 122°F); RH max 85% non-condensing
Casing	IP20 (housing); IP54 (front panel)
Weight	1.6 kg (3.5 lb.)

ORDERING INFORMATION

Each **HI 504** model is supplied complete with mounting brackets and instructions.

Choose your configuration:

HI 504112-0 single setpoint, on/off control, single analog output, 24VDC/AC
HI 504112-1 single setpoint, on/off control, single analog output, 115V
HI 504112-2 single setpoint, on/off control, single analog output, 230V
HI 504122-0 single setpoint, on/off and PID control, single analog output, 24VDC/AC
HI 504122-1 single setpoint, on/off and PID control, single analog output, 115V
HI 504122-2 single setpoint, on/off and PID control, single analog output, 230V
HI 504124-0 single setpoint, on/off and PID control, dual analog output, 24VDC/AC
HI 504124-1 single setpoint, on/off and PID control, dual analog output, 115V
HI 504124-2 single setpoint, on/off and PID control, dual analog output, 230V
HI 504212-0 dual setpoint, on/off control, single analog output, 24VDC/AC
HI 504212-1 dual setpoint, on/off control, single analog output, 115V
HI 504212-2 dual setpoint, on/off control, single analog output, 230V
HI 504214-0 dual setpoint, on/off control, dual analog output, 24VDC/AC
HI 504214-1 dual setpoint, on/off control, dual analog output, 115V
HI 504214-2 dual setpoint, on/off control, dual analog output, 230V
HI 504222-0 dual setpoint, on/off and PID control, single analog output, 24VDC/AC
HI 504222-1 dual setpoint, on/off and PID control, single analog output, 115V
HI 504222-2 dual setpoint, on/off and PID control, single analog output, 230V
HI 504224-0 dual setpoint, on/off and PID control, dual analog output, 24VDC/AC
HI 504224-1 dual setpoint, on/off and PID control, dual analog output, 115V
HI 504224-2 dual setpoint, on/off and PID control, dual analog output, 230V
HI 504922-0 dual setpoint, advanced cleaning, on/off and PID control, single analog output, 24VDC/AC
HI 504922-1 dual setpoint, advanced cleaning, on/off and PID control, single analog output, 115V
HI 504922-2 dual setpoint, advanced cleaning, on/off and PID control, single analog output, 230V
HI 504924-0 dual setpoint, advanced cleaning, on/off and PID control, dual analog output, 24VDC/AC
HI 504924-1 dual setpoint, advanced cleaning, on/off and PID control, dual analog output, 115V
HI 504924-2 dual setpoint, advanced cleaning, on/off and PID control, dual analog output, 230V

PROBES

HI 62920D pH electrode with titanium body
HI 7610 Stainless steel Pt100 probe with front and back 1/2" NPT thread and 5 m (16.4') cable
HI 7611 Glass Pt100 probe with front and back 1/2" NPT thread and 5 m (16.4') cable

ACCESSORIES

HI 92500 Windows® compatible software

For a complete list of Solutions, see the end of pH *Section 3*.

Conductivity Process Digital Controller with Inductive Probe

The HI 720 is equipped with a graphic display that is understandable and straightforward. Simple messages guide the user through all operations and parameter settings.

- **Autoranging EC or TDS and temperature for EC/TDS**
- **Automatic temperature compensation for EC/TDS**
- **Fully customizable:**
  automatic/manual/no temperature compensation
  Selectable reference temperature between 02 and 25 C;
  Selectable temperature coefficient between 0.00 to 20.00%/C,
  Selectable temperature compensation curve between linear, salinity or user definable, Selectable TDS factor between 0.01 to 1.00
- **Temperature compensation curve selectable between linear, salinity or user defined**
- **TDS factor selectable between 0.01 to 1.00**
- **Supports inductive EC probe with built-in or external Pt100/1000 sensor temperature**
- **PID, PI, Proportional or On/off control for one or two set points**
- **Sensor Check™ for real time detection of soiled EC/TDS probes**
- **Damage test for temperature probe**
- **Mount probes directly or use a digital transmitter for large distances**
- **Logging of up to 100 system events**
- **Control with up to 4 relays or analog output in 0-20 mA or 4-20 mA**
- **Probe cleaning program performed automatically, by alarm or upon user request**
- **Large variety of models to fit the user system requirements**

HI 720 is a PID, PI, proportional or on/off EC/TDS controller with one or two set points and includes an inductive conductivity probe.

The measurement configuration settings and EC and TDS control are saved separately and permits users to switch between EC and TDS without losing settings. TDS or a specific user defined curve can be used for concentration.

Temperature is continuously monitored using a temperature sensor (Pt100 or Pt1000 type) with ATC of conductivity. Conductivity temperature compensation parameters are fully customizable: linear or non-linear temperature compensation, reference temperature and temperature coefficient. Users can define the specific curve of temperature compensation.

The working conductivity range is user selectable and the conductivity calibration in one point is performed in a value that corresponds to the measurement range.

One or two analog controller outputs (0-20 or 4-20 mA) can be configured for recording of pH/ORP or controlling (only for models with PID), and up to 4 relays can be used to control the process or be connected with alarm status. Controller status is visable with LED's on the front panel and on LCD.

The controller logging feature can save the last 100 error, configuration, calibration and cleaning events. This information can be accessible from a PC through RS485 and HI 92500 software.

The controller also has a full auto diagnostic procedure. A cleaning procedure of the EC inductive probe is also available.

In-Line Cleaning

The cleaning feature allows an automatic cleaning action of the probe. To perform cleaning, the controller activates an external device (pump). Cleaning actions never take place if no relay is configured for cleaning. Cleaning can be of two types:

1. **Simple cleaning:** with water only, it can be triggered only by a timer (periodical cleaning) or by an error for which a cleaning action can be configured.
2. **Advanced cleaning** (optional): with water and detergent, it can be triggered by the following events:

   Timer; Digital input or RS485 command (external trigger);
   Timer and digital input or RS485 command (external trigger);
   Timer masked by the digital input (i.e. disabled when the digital input is on);
   Error for which a cleaning action can be configured

EC Inductive Probe Theory of Operation

This instrument allows conductivity measurements without any electrical contact between electrodes and process fluid. The measurement is based on inductive coupling of two toroidal transformers by the liquid.

The instrument supplies a high frequency, reference voltage to the "Drive Coil", and a strong magnetic field is generated in the toroid.

The liquid passes through the hole in the toroid and can be considered as one turn secondary winding. The magnetic field induces a voltage in this liquid winding, the current induced in the flow is proportional to this voltage, and the conductance of the liquid one-turn winding is in accordance to Ohm's law.

The conductance is proportional to the specific conductivity and a constant factor determined by the sensor geometry and installation.

The liquid also passes through the second toroid and therefore the liquid turn can be considered as a primary winding of the second toroidal transformer. The current in the liquid will create a magnetic field in the second toroid, and the induced current can be measured as an output.

The output current of this "receive coil" is therefore proportional to the specific conductivity of process liquid.

For an inductive cell, the cell constant is defined as the measured conductivity, obtained by making a loop through the sensor with a resistor R, multiplied by that R value.

The cell constant depends only on the sensor geometry. However, when the probe is immersed in a liquid, the induced current in the solution is affected by the piping or any other container where the probe is inserted. This effect is negligible when there is an area of at least 3 cm of liquid around the cell.

Otherwise, it is necessary to multiply measurements by the installation factor: Conductivity = (cell constant)(installation factor)/(measured resistance). The installation factor is < 1 for conductive piping/containers, and > 1 for nonconductive piping/containers.

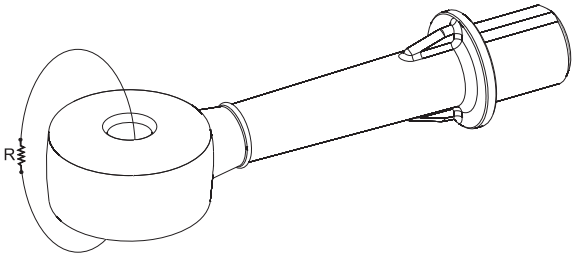
Since this type of sensor has no electrodes, common problems such as polarization and contamination are eliminated and will not affect the performance of the electrodeless sensor.

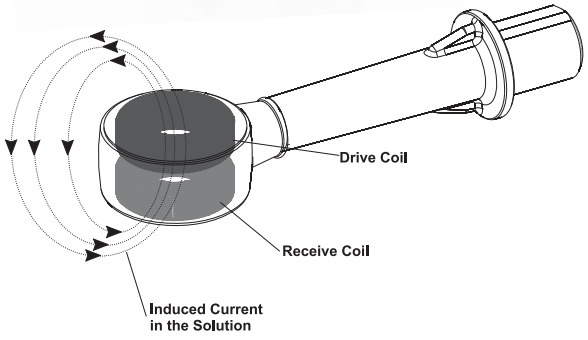
SPECIFICATIONS	HI 7650 Inductive Conductivity Probe
Measuring Range	0 to 2000 mS/cm
Accuracy	±2% f.s.
Cell Constant	approx. 2.4 cm^{-1}
Protection Class	IP67
Temperature Sensor	Pt100 to Pt1000 (depending on model)
Temperature Response	90% of the final value, approximately 10 minutes
Required Pipe Diameter	>80 mm (consider installation factor for pipe with diameter < 125 mm)
Dimensions (probe only)	40 x 190 x 55 mm (1.57 x 7.48 x 2.16") ; head: 32 x OD 55 mm (1.25" x OD 2.16"n)
Weight (probe only)	approximately 330 g (11.64 oz.)

ORDERING INFORMATION for HI 7650

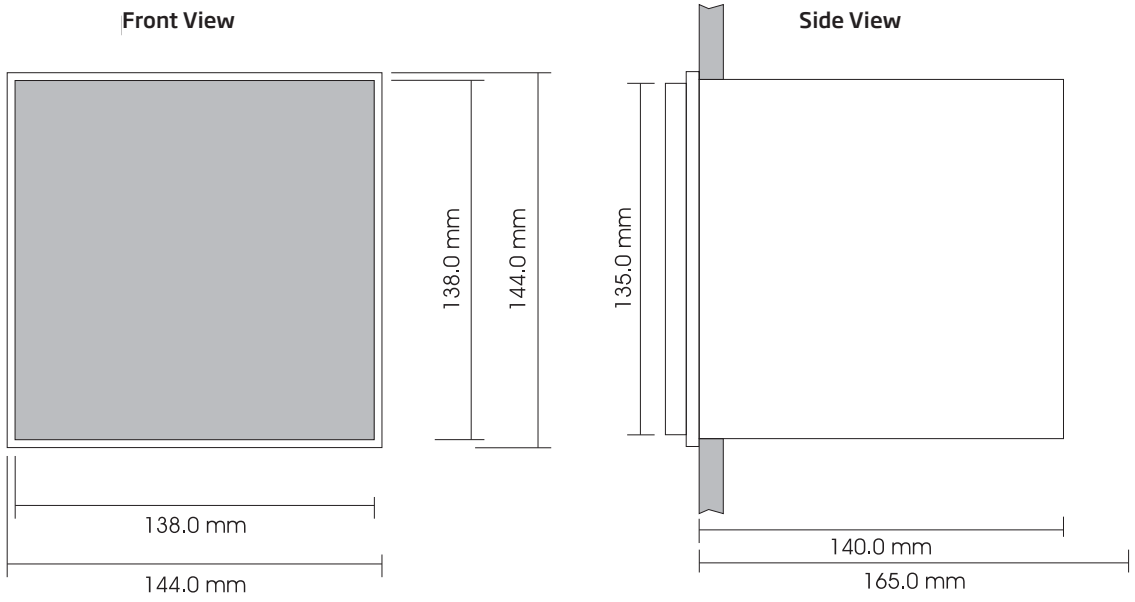
Choose your configuration:

HI 7650-1105 PVC body, Pt100, 5 m cable
HI 7650-1110 PVC body, Pt100, 10 m cable
HI 7650-1115 PVC body, Pt100, 15 m cable





Mechanical Dimensions



SPECIFICATIONS	HI 720
Range	0 to 2000 mS/cm (autoranging); -30 to 130°C / -22 to 266°F
Resolution	1 µS/cm (0 to 1999 µS/cm); 0.01 mS/cm (2.00 to 19.99 mS/cm); 0.1 mS/cm (20.0 to 199.9 mS/cm); 1 mS/cm (200 to 2000 mS/cm); 0.1°C / 0.2°F
Accuracy (@20°C/68°F)	±2% f.s. (conductivity) / ±0.5°C / ±1°F
Temperature Compensation	automatic or manual, -30 to 130°C
Temperature Probe	three-wire or two-wire Pt100 or Pt1000 sensor with automatic recognition and damage test
Digital Input	digital transmitter, hold and advanced cleaning inputs
Digital Output	one digital insulated contact closed upon hold mode
Analog Output	one or two independent outputs; 0-22 mA (configuring as 0-20 mA or 4-20 mA)
Digital Serial Output	RS485
Dosing Relay	1, 2, 3 or 4 electromechanical relays SPDT; 5A-250 VAC, 5A-30 VDC (resistive load); fuse protected: 5A, 250 V fuse
Alarm Relay	1 electromechanical relay SPDT; 5A-250 VAC, 5A-30 VDC (resistive load); fuse protected: 5A, 250 V fuse
Installation Category	II
Power supply (depending on model)	24 VDC/ac, or 115 VAC or 230 VAC or 100 VAC ±10%, 50/60 Hz; fuse protected: 400 mA, 250 V fast fuse
Power Consumption	10 VA
Max Oscillation Frequency	8 MHz
Environment	0 to 50°C (32 to 122°F); RH max 85% non-condensing
Enclosure	single case 1/2 DIN
Weight	approximately 1.6 kg (3.5 lb.)

ORDERING INFORMATION for HI 720

Each **HI 720** model is supplied complete with mounting brackets and instructions.

Choose your configuration:

HI 720122-1	single setpoint, on/off and PID control, single analog output, 115V
HI 720122-2	single setpoint, on/off and PID control, single analog output, 230V
HI 720224-1	dual setpoint, on/off and PID control, dual analog output, 115V
HI 720224-2	dual setpoint, on/off and PID control, dual analog output, 230V

PROBES

HI 7610	Stainless steel Pt100 probe with front and back 1/2" NPT thread and 5 m (16.4') cable
HI 7611	Glass Pt100 probe with front and back 1/2" NPT thread and 5 m (16.4') cable
HI 7620	Stainless steel Pt1000 probe with PG 13.5 thread and 5 m (16.4') cable
HI 7621	Glass Pt1000 probe with PG 13.5

ACCESSORIES

BL Pumps	Dosing pumps with flow rate from 1.5 to 18.3 LPH
HI 92500	Windows® compatible software
HI 98501	ChecktempC temperature tester (-50 to 150°C range)
HI 98502	ChecktempF temperature tester (-58 to 302°F range)

For a complete list of Solutions, see the end of Conductivity *Section 6*.

pH 502

pH Digital Controllers with Matching Pin and PID Control

- Single or dual set point
- SSR relay available
- Control through analog output
- PID control
- Fully programmable
- mA and VDC recorder output or RS485
- Differential input for ground loop protection
- Automatic three point calibration
- Last calibration data
- Automatic Temperature Compensation
- Simple wiring with removable terminal modules

The pH 502 series of controllers offer many features to increase the level of control available in your plant. These instruments can be configured to utilize P, PI, PID controlling. With this feature, the pH 502 takes the place of three instruments that only allow one configuration each. The pH 502 line includes models that incorporate control through analog output to drive any compatible device, such as an electrovalve or pump. Models equipped with a solid state relay are also available to ensure maximum life of the switching device. Each model has a differential input for a grounding bar to extend electrode life. Several models come with an RS485 port, as well as analog recorder output.

Fail Safe Alarm System protects against power interruption or line failure. 1, 2 or 3 point automatic calibration and manual or Automatic Temperature Compensation complete the features of this controller.

ORDERING INFORMATION

Each **pH 502** model is supplied complete with mounting brackets and instructions.

Choose your configuration:

pH 502113-1 single setpoint, on/off control, analog and RS485 output, 115V
pH 502113-2 single setpoint, on/off control, analog and RS485 output, 230V
pH 502123-1 single setpoint, on/off and PID controls, analog and RS485 output, 115V
pH 502123-2 single setpoint, on/off and PID controls, analog and RS485 output, 230V
pH 502213-1 dual setpoint, on/off control, analog and RS485 output, 115V
pH 502213-2 dual setpoint, on/off control, analog and RS485 output, 230V
pH 502223-1 dual setpoint, on/off and PID controls, analog and RS485 output, 115V
pH 502223-2 dual setpoint, on/off and PID controls, analog and RS485 output, 230V
pH 502321-1 single setpoint with SSR relay, on/off and PID controls, analog output, 115V
pH 502321-2 single setpoint with SSR relay, on/off and PID controls, analog output, 230V
pH 502421-1 dual setpoint with SSR relay, on/off and PID controls, analog output, 115V
pH 502421-2 dual setpoint with SSR relay, on/off and PID controls, analog output, 230V and PID controls, RS485 output, 230V
pH 502423-1 dual setpoint with SSR relay, on/off and PID controls, analog and RS485 output, 115V
pH 502423-2 dual setpoint with SSR relay, on/off and PID controls, analog and RS485 output, 230V
pH 502523-1 control through analog output, on/off and PID controls, analog and RS485 output, 115V
pH 502523-2 control through analog output, on/off and PID controls, analog and RS485 output, 230V

SPECIFICATIONS	pH 502
Range	0.00 to 14.00 pH; -9.9 to 120°C
Resolution	0.01 pH; 0.1°C
Accuracy (@20°C/68°F)	±0.02 pH; ±0.5°C
Input Impedance	10^{12} Ohm
pH Calibration	automatic, one, two or three point, at pH 4.01, 7.01, 10.01
Temperature Compensation	automatic (with Pt100 probe) or manual from -9.9 to 120°C
Outputs	digital: RS485 bi-directional opto-isolated; or analog, galvanically isolated: 0-1 mA, 0-20 mA and 4-20 mA, 0-5 VDC, 1-5 VDC and 0-10 VDC
Set Point Relay	1 or 2 contact outputs SPDT 5A-250 VAC, 5A-30 VDC (resistive load) or 1 or 2 Solid State Relay (SSR), 1A, 250 VAC (resistive and inductive load), fuse protected (2A, 250V fast fuse)
Alarm Relay	one contact output SPDT, 5A-250 VAC, 5A-30 VDC (resistive load), fuse protected (5A, 250V fuse)
Power Supply	115 VAC ±10% or 230 VAC ±10%; 50/60 Hz
Power Consumption	15 VA
Over Current Protection	400 mA 250V fast fuse
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	panel cutout:140 x 140 mm, instrument: 144 x 144 x 170 mm
Weight	1.6 kg (3.5 lb.)

For a complete list of Solutions, see the end of pH *Section 3*.

pH Digital Controllers with Matching Pin

- Single or dual set point
- Fully programmable
- mA and VDC recorder output or RS232
- Differential input for ground loop protection
- Automatic three point calibration
- Last calibration data
- Automatic Temperature Compensation
- Simple wiring with removable terminal modules

pH 500 series of controllers are simple to operate, microprocessor-based process meters packed with features. For more flexibility and better resolution for chart recorders, any two points between 0 and 14 pH can be chosen to correspond to the analog output spans. Several pH 500 models are equipped with a bi-directional RS232 port. Push button password programming prevents tampering.

The Fail Safe Alarm System protects the pH 500 against the pitfalls of process control, like power interruption or line failure. With pH 500 quick one, two or three point calibration at pH 4.01, 7.01 and 10.01 comes standard. The temperature can be manually or automatically compensated for. Models with RS232 output allow computer compatibility, a necessity for process control instrumentation. You can also choose from ON/OFF or proportional dosage to save on chemicals.

SPECIFICATIONS	pH 500
Range	0.00 to 14.00 pH; -9.9 to 120°C
Resolution	0.01 pH; 0.1°C
Accuracy (@20°C/68°F)	±0.02 pH; ±0.5°C
Input Impedance	10^{12} Ohm
pH Calibration	automatic, one, two or three point, at pH 4.01, 7.01, 10.01
Temperature Compensation	automatic (with Pt100 probe) or manual from -9.9 to 120°C
Outputs	digital: RS232 bi-directional optoisolated; or analog, galvanically isolated: 0-1 mA, 0-20 mA and 4-20 mA, 0-5 VDC, 1-5 VDC and 0-10 VDC
Set Point Relay	1 or 2 contact outputs SPDT 5A-250 VAC, 5A-30 VDC (resistive load), fuse protected (2A, 250V fast fuse)
Alarm Relay	1 contact output SPDT, 5A-250 VAC, 5A-30 VDC (resistive load), fuse protected (2A, 250V fast fuse)
Power Supply	115 VAC ±10% or 230 VAC ±10%; 50/60 Hz
Power Consumption	15 VA
Over Current Protection	400 mA 250V fast fuse
Max. Oscillation Frequency	4 MHz
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	panel cutout: 140 x 140 mm, instrument: 144 x 144 x 170 mm
Weight	1.6 kg (3.5 lb.)

ORDERING INFORMATION

Each **pH 500** model is supplied complete with mounting brackets and instructions.

Choose your configuration:

pH 500111-1 single setpoint, on/off control, analog output, 115V
pH 500111-2 single setpoint, on/off control, analog output, 230V
pH 500112-1 single setpoint, on/off control, RS232 output, 115V
pH 500112-2 single setpoint, on/off control, RS232 output, 230V
pH 500121-1 single setpoint, proportional control, analog output, 115V
pH 500121-2 single setpoint, proportional control, analog output, 230V
pH 500211-1 dual setpoint, on/off control, analog output, 115V
pH 500211-2 dual setpoint, on/off control, analog output, 230V
pH 500212-1 dual setpoint, on/off control, RS232 output, 115V
pH 500212-2 dual setpoint, on/off control, RS232 output, 230V
pH 500221-1 dual setpoint, proportional control, analog output, 115V
pH 500221-2 dual setpoint, proportional control, analog output, 230V
pH 500222-1 dual setpoint, proportional control, RS232 output, 115V
pH 500222-2 dual setpoint, proportional control, RS232 output, 230V

ACCESSORIES

HI 8427 pH/ORP electrode simulator
HI 931001 pH/ORP electrode simulator with display

For a complete list of Solutions, see the end of pH *Section 3*.

mV 602

ORP Digital Controller with Matching Pin and PID Control

- Control through analog output (single set point)
- Fully programmable microprocessor memory
- RS485 interface
- Differential input for ground loop protection
- Automatic two point calibration
- Last calibration data
- Automatic Temperature Compensation
- Simple wiring with removable terminal modules

The mV 602 line of microprocessor controllers have been engineered to incorporate ease of use with a powerful set of features. These robust instruments can be configured to utilize P, PI or PID controlling. This means you don't need to choose from three separate instruments that only allow one configuration.

The mV 602 line includes models that incorporate control through analog output to drive compatible devices such as electrovalves or pumps. Several models feature bi-directional RS485 to allow remote operation with a PC as well as analog recorder output.

The Fail Safe Alarm System protects against power interruption or line failure. Use of solid state relay has been included to meet the needs of extreme industrial applications.

All models incorporate a differential input so a grounding bar may be attached, extending the life of the electrodes by eliminating ground loop current problems.

ORDERING INFORMATION

Each **mV 602** model is supplied with mounting brackets and instructions.

Choose your configuration:

mV 602113-1 single setpoint, on/off control, analog and RS485 outputs, 115 V
mV 602113-2 single setpoint, on/off control, analog and RS485 output, 230 V
mV 602123-1 single setpoint, on/off and PID controls, analog and RS485 output, 115 V
mV 602123-2 single setpoint, on/off and PID controls, analog and RS485 output, 230 V
mV 602321-1 dual setpoint, on/off and PID controls, analog output, 115 V
mV 602321-2 dual setpoint, on/off and PID controls, analog output, 230 V
mV 602323-1 dual setpoint, on/off and PID controls, analog and RS485 outputs, 115 V
mV 602323-2 dual setpoint, on/off and PID controls, analog and RS485 outputs, 230 V

ACCESSORIES

HI 8427 pH/ORP electrode simulator
HI 931001 pH/ORP electrode simulator with display

SPECIFICATIONS	mV 602
Range	-2000 to 2000 mV; -9.9 to 120°C
Resolution	1 mV; 0.1°C
Accuracy (@20°C/68°F)	±2 mV; ±0.5°C
Input Impedance	10^{12} Ohm
ORP Calibration	automatic, two point, at 0 and 350 or 1900 mV
Outputs	digital: RS485 bi-directional opto-isolated; or analog, galvanically isolated: 0-1 mA, 0-20 mA and 4-20 mA, 0-5 VDC, 1-5 VDC and 0-10 VDC
Set Point Relay	1 or 2 contact outputs SPDT 5A-250 VAC, 5A-30 VDC (resistive load) or 1 or 2 Solid State Relay (SSR), 1A, 250 VAC (resistive and inductive load), fuse protected (2A, 250V fast fuse)
Alarm Relay	1 contact output SPDT, 5A-250 VAC, 5A-30 VDC (resistive load), fuse protected (5A, 250V fuse)
Power Supply	115 VAC ±10% or 230 VAC ±10%; 50/60 Hz
Power Consumption	15 VA
Over Current Protection	400 mA 250V fast fuse
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	panel cutout: 140 x 140 mm, instrument: 144 x 144 x 170 mm
Weight	1.6 kg (3.5 lb.)

For a complete list of Solutions, see the end of pH *Section 3*.

ORP Digital Controller with Matching Pin

- **Fully programmable**
- **mA and VDC recorder output or RS232**
- **Differential input for ground loop protection**
- **Automatic two point calibration**
- **Last calibration data**
- **Automatic Temperature Compensation**
- **Simple wiring with removable terminal modules**

The mV 600 controllers have been engineered with the same outstanding features as the pH 500 meters. The Fail Safe Alarm System protects these meters against the pitfalls of process control. User selectable timing capability safeguards against overdosing.

These instruments have a differential input, extending electrode life by eliminating ground loop current through the reference. Users can choose between ON/OFF and proportional control as well as selectable current and voltage output. For more flexibility and better resolution for chart recorders, choose any two points between 0 and 2000 mV to correspond to the analog output spans.

RS232 capability makes two mV 600 models PC compatible. Wiring the controllers is simple with extractable terminal modules. A host of self-testing features and user friendly functions make mV 600 a great value.

SPECIFICATIONS	mV 600
Range	±2000 mV; -9.9 to 120°C
Resolution	1 mV; 0.1°C
Accuracy (@20°C/68°F)	±2 mV; ±0.5°C
Input Impedance	10^{12} Ohm
ORP Calibration	automatic, two point, at 0 and 350 or 1900 mV
Outputs	digital: RS232 bi-directional optoisolated; or analog, galvanically isolated: 0-1 mA, 0-20 mA and 4-20 mA, 0-5 VDC, 1-5 VDC and 0-10 VDC
Set Point Relay	1 or 2 contact outputs SPDT 5A-250 VAC, 5A-30 VDC (resistive load), fuse protected (2A, 250V fast fuse)
Alarm Relay	1 contact output SPDT, 5A-250 VAC, 5A-30 VDC (resistive load), fuse protected (2A, 250V fast fuse)
Power Supply	115 VAC ±10% or 230 VAC ±10%; 50/60 Hz
Power Consumption	15 VA
Over Current Protection	400 mA 250V fast fuse
Max. Oscillation Frequency	4 MHz
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	panel cutout: 140 x 140 mm, instrument: 144 x 144 x 170 mm
Weight	1.6 kg (3.5 lb.)

ORDERING INFORMATION

Each **mV 600** model is supplied complete with mounting brackets and instructions.

Choose your configuration:

mV 600111-1 single setpoint, on/off control, analog output, 115V
mV 600111-2 single setpoint, on/off control, analog output, 230V
mV 600112-1 single setpoint, on/off control, RS232 output, 115V
mV 600112-2 single setpoint, on/off control, RS232 output, 230V
mV 600121-1 single setpoint, proportional control, analog output, 115V
mV 600121-2 single setpoint, proportional control, analog output, 230V
mV 600122-1 single setpoint, proportional control, RS232 output, 115V
mV 600122-2 single setpoint, proportional control, RS232 output, 230V

ACCESSORIES

HI 8427 pH/ORP electrode simulator
HI 931001 pH/ORP electrode simulator with display

For a complete list of Solutions, see the end of pH *Section 3*.

HI 700 • HI 710

Conductivity and TDS Digital Controllers with Four-ring Potentiometric Probe

- **Fully programmable microprocessor memory**
- **Dual set points**
- **mA & VDC recorder output**
- **Differential input for ground loop protection**
- **Automatic one or two point calibration**
- **Last calibration data**
- **Manual or Automatic Temperature Compensation**
- **Extensive range for both conductivity and TDS**

The HI 700 series of regulators offer state of the art specifications for your process control. They can be configured for ON/OFF, proportional, PI or PID control. Thanks to our exclusive technology, they can be customized to best fit your application. Bright LED's show the current status even from a distance. A menu-driven display aids the user throughout the operations with running messages and clear prompts. All relevant parameters can be simply adjusted and will remain memorized until overwritten.

With self-diagnostic features and extractable terminals, installation and maintenance are fast and simple. Password protection guarantees that the calibration and predetermined parameters cannot be altered unnecessarily. The controllers can operate with four-ring probe or 4-20 mA signal. They accept probes with or without a built-in Pt100 temperature sensor. HI 710 includes all of the features of the HI 700 and adds TDS measurement.

ORDERING INFORMATION

Each **HI 700** and **HI 710** model is provided with dual set point, ON/OFF and PID controls and is supplied with mounting brackets and instructions.

Choose your configuration:

HI 700221-1	dual setpoint, on/off and PID controls, analog output, 115V
HI 700221-2	dual setpoint, on/off and PID controls, analog output, 230V
HI 700222-1	dual setpoint, on/off and PID controls, RS485 output, 115V
HI 700222-2	dual setpoint, on/off and PID controls, RS485 output, 230V
HI 710221-1	dual setpoint, on/off and PID controls, analog output, 115V
HI 710221-2	dual setpoint, on/off and PID controls, analog output, 230V
HI 710222-1	dual setpoint, on/off and PID controls, RS485 output, 115V
HI 710222-2	dual setpoint, on/off and PID controls, RS485 output, 230V

SOLUTIONS

HI 7030L	12880 µS/cm calibration solution, 500 mL
HI 7031L	1413 µS/cm calibration solution, 500 mL
HI 7033L	84 µS/cm calibration solution, 500 mL
HI 7034L	80000 µS/cm calibration solution, 500 mL

SPECIFICATIONS		HI 700	HI 710
Range	EC	0.0 to 199.9 µS/cm; 0 to 1999 µS/cm 0.00 to 19.99 mS/cm; 0.0 to 199.9 mS/cm	
	TDS	–	0.0 to 100.0 mg/L (ppm); 0 to 1000 mg/L (ppm) 0.00 to 10.00 g/L (ppt); 0.0 to 100.0 g/L (ppt)
	Temperature	-10.0 to 100.0°C	
Resolution		0.1 µS; 1 µS; 0.01 mS; 0.1 mS; 0.1 °C	
		–	0.1 ppm; 1 ppm; 0.01 g/L (ppt); 0.1 g/L (ppt)
Accuracy (@20°C/68°F)		±0.5% f.s. (EC / TDS); ±0.5°C (0 to 70°C); ±1°C (outside)	
EC Calibration		automatic or manual at 1 point	
Temperature Compensation		automatic or manual, -10 to 100°C with adjustable temperature coefficient from 0.00 to 10.00%/°C	
TDS Conversion Factor		–	adjustable from 0.00 to 1.00
Outputs		analog: isolated 0-1 mA, 0-20 mA and 4-20 mA; 0-5 VDC, 1-5 VDC and 0-10 VDC or digital: RS485 bi-directional opto-isolated	
Analog Input		4-20 mA	
Set Point Relay		two contact outputs SPDT 5A-250 VAC, 5A-30 VDC (resistive load), fuse protected (2A, 250V fast fuse)	
Alarm Relay		contact output SPDT 5A-250 VAC, 5A-30 VDC (resistive load), fuse protected (2A, 250V fast fuse	
Power Supply		115 VAC ±10% or 230 VAC ±10%; 50/60 Hz	
Power Consumption		15 VA	
Over Current Protection		400 mA 250V fast fuse	
Environment		0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions		panel cutout: 140 x 140 mm, instrument: 144 x 144 x 170 mm	
Weight		1.6 kg (3.5 lb.)	

For a complete list of Solutions, see the end of Conductivity *Section 6*.

Panel Mounted Controllers

HANNA panel mounted pH, ORP and conductivity controllers are designed to meet your most demanding process control requirements. Our controllers come equipped with a relay operating at a maximum of 2 A (240V). Where a direct electrode input is not suitable, the controller is available with a 4-20 mA input from a transmitter. This feature greatly improves the safety of your instrumentation and plant. Accurate measurements are displayed on a large LCD, enabling the operator to check the controller readings easily. These units have sophisticated, built-in, self-diagnostic functions that allow the operator to check whether a malfunction has originated in the instrument itself, or in the outside connection (electrode, transmitter or cables). This saves valuable time and money, particularly in the monitoring of critical processes. In the event of a malfunction, the operator can determine the origin and rectify the situation before any costly errors occur. This Self-Diagnostic Error Prevention System makes these process instruments superior to conventional controllers.

Alarm Feature

HANNA controllers incorporate an alarm warning system. When the measured value of the meter is out of the user-specified range, the alarm is activated. When activated, the alarm contacts close, triggering the mechanism of your choice, whether a buzzer, light or any other electrical connection. The alarm feature is a necessity when the installation is in a remote location and corrective action must be taken immediately in the event of an out of range condition.

Recorder Output

The ability to record data from the process you are monitoring greatly enhances process troubleshooting. By simply connecting a recorder to the controller's output terminals (choose between 0 to 20 mA or 4 to 20 mA according to your needs), users are able to acquire a hard copy for demonstrative or analytical purposes.

Low or High Impedance Input and Analog Inputs

HANNA pH and ORP controllers come in two different models to meet user requirements. These models, have a high impedance 10^{12} Ohm direct input from an electrode, ideal for connections with a distance of up to 10 m (33'). However, if the distance is greater than 10 m (33') then a 4 to 20 mA transmitter should be used. The greater the distance between the controller and the sample, the greater the chance you have of line noise causing erroneous readings. Using a transmitter greatly enhances the input signal, thus allowing high accuracy at distances of up to 300 m (1000').

Consent Feature

The consent contact allows you to be sure that the ORP dosing occurs only when the pH value is correct. This assures that the pH is within a specified range before any dosing of oxidizing or reducing agents occurs. This will prevent any overdosing of chemicals, a very important cost-effective feature in many applications, especially in pools, spas and hot tubs.

Quality Construction

The controllers are housed in sturdy aluminum casings with ABS plastic front panels. The mounting brackets that are supplied with the meter, can be installed securely and quickly. When in operation, and with the transparent protective cover installed, the units comply with IP42 standards (see chart in section 20 for IP codes). The use of this design protects the unit from the conditions associated with industrial environments, ensuring a long and trouble-free operation.

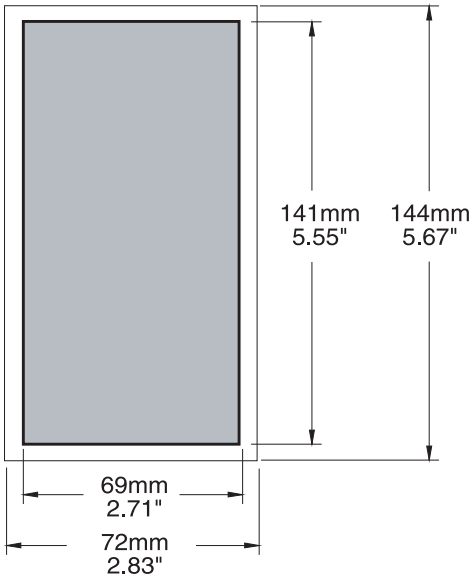
LED Indicators

The LEDs on the front panel light up to indicate the current operational mode. The LEDs also blink at different rates to indicate multiple modes occurring simultaneously. This feature allows the user to evaluate the controller from a distance and clearly read which mode it is in.

Mechanical Dimensions for Panel Mounting

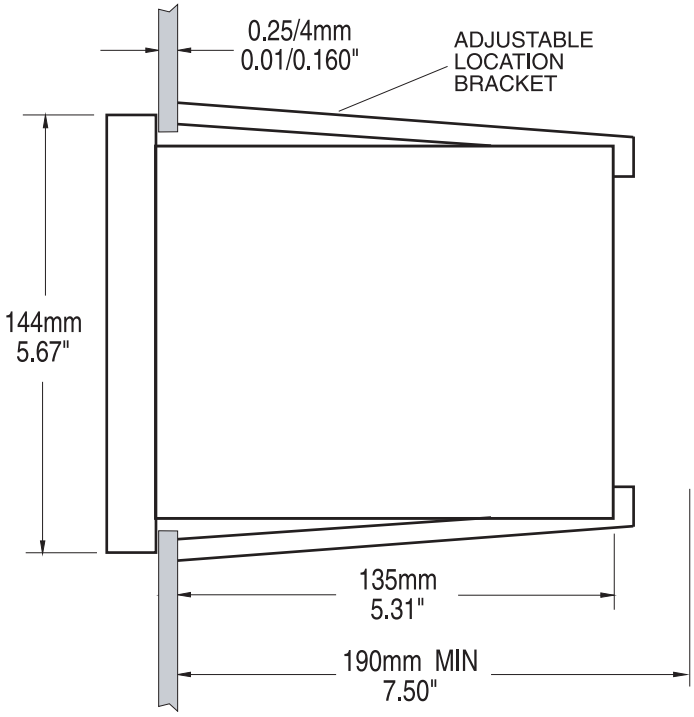
Analog Indicators and Controllers

HI 8510 / HI 8512 / HI 8710 / HI 8711 / HI 8720 /
HI 8931A / HI 8931B / HI 8931C / HI 8931D / HI 943500



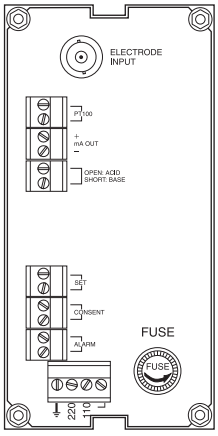
Front View

Dimensions show the cutout size for installation and also the outside dimensions of the instrument panel.



Side View

Adjustable location brackets allow the instrument to slide into the cutout and will hold the unit securely in place. 190 mm (7.50") is the minimum amount of room required to install the indicator with the cables connected.



Rear View

Rear view of the HI 8710 shows the typical electrical connections.

pH Analog Indicator with Self Diagnostic Test

- **Inputs: BNC connector, Direct wire connection with amplified probe** (supports HI 1006 series probes) **and 4-20 mA from a transmitter**
- **Extended temperature compensation range: -20 to 100°C**
- **Supports potential matching pin connection**
- **Both 4-20 and 0-20 mA analog output**
- **±5V outputs for amplified electrodes**
- **Backlit LCD**
- **Auto-diagnostic tests for pH electrode and instrument status**
- **Operational mode LED indicators**
- **Designed for easy panel mount installation**
- **Transparent splash-proof cover included**

HI 8510 is ideal for monitoring pH in process control. It can provide highly accurate pH measurements and display values on the easy to read LCD. BNC input, amplified probe input and input from transmitter are supported.

Designed for easy and fast installation, the HI 8510 is provided with membrane keypads on the front panel, large display, and auto-diagnostic functions to check pH electrode and instrument status. These instruments also provide ±5V power output and input terminals for amplified electrodes.

The front panel is protected behind a transparent splash-proof cover.

SPECIFICATIONS	HI 8510
Range	0.00 to 14.00 pH
Resolution	0.01 pH
Accuracy (@20°C/68°F)	±0.02 pH (0 to 100 °C) ±0.05 pH (-20 to 0 °C) ±0.5% (input transmitter)
Input	high impedance 10^{12} Ohm; reference and matching pin inputs are available; 4-20 mA
Power Output	±5 Vcc; 150 mA max load for amplified electrodes
Calibration	offset: ±2 pH with OFFSET trimmer; slope: 80 to 110% with SLOPE trimmer
Temperature Compensation	fixed or automatic with Pt100, from -20 to 100°C (-4 to 212°F)
Recorder Output	0-20 mA or 4-20 mA (isolated)
Backlight	continuous on
Power Supply	115 VAC ±10% or 230 VAC ±10%; 50/60 Hz
Enclosure	flame retardant ABS body and front panel; transparent splash-proof front cover
Environment	-10 to 50°C (14 to 122°F); RH max 95% non-condensing
Panel Cutout	141 x 69 mm (5.6 x 2.7")
Weight	1 kg (2.2 lb.)

ORDERING INFORMATION

The **HI 8510** is supplied complete with mounting brackets and instructions.

SOLUTIONS

HI 7004/1L	pH 4.01 buffer solution, 1 L
HI 7007/1L	pH 7.01 buffer solution, 1 L
HI 7010/1L	pH 10.01 buffer solution, 1 L

ACCESSORIES

HI 8427	pH / ORP electrode simulator
HI 931001	pH / ORP electrode simulator with display
HI 8614N	pH transmitter
HI 8614LN	pH transmitter with display

For a complete list of Solutions, see the end of pH *Section 3*.

HI 8710

pH Analog Controller with Self-Diagnostic Test

- **Inputs: BNC connector, Direct wire connection with amplified probe** (supports HI 1006 series probes) **and 4-20 mA from a transmitter**
- **Extended temperature compensation range: -20 to 100°C**
- **Supports potential matching pin connection**
- **Both 4-20 and 0-20 mA output**
- **±5V outputs for amplified electrodes**
- **Backlit LCD**
- **Auto-diagnostic tests for pH electrode and instrument status**
- **Operational mode LED indicators**
- **Fail Safe Function-the alarm relay is activated at power down**
- **Transparent splash-proof cover**

HI 8710 is a panel mounted pH controller with self-diagnostic test capabilities. Users can set: the setpoint for acid or alkaline dosage, the tolerance of the setpoint before an alarm is activated, the dosage mode: automatic, continuous on or OFF and the over dosage control by setting the overtime dosage knob.

When used in conjunction with the HI 8720 ORP controller, the ODCD* function will ensure that the ORP dosage will start only when the pH level is correct.

"Overtime dosage" function with selection knob and jumper for disable on the rear panel. If the dosing relay remains continuously activated for more than selected dosing time the alarm relay is activated, the alarm LED is blinking and the dosing relay is deactivated.

* ORP dosing consent device

ORDERING INFORMATION

The **HI 8710** is supplied complete with mounting brackets and instructions.

SOLUTIONS

HI 7004/1L	pH 4.01 buffer solution, 1 L
HI 7007/1L	pH 7.01 buffer solution, 1 L
HI 7010/1L	pH 10.01 buffer solution, 1 L

ACCESSORIES

HI 8427	pH / ORP electrode simulator
HI 931001	pH / ORP electrode simulator with display
HI 8614N	pH transmitter
HI 8614LN	pH transmitter with display

SPECIFICATIONS	HI 8710
Range	0.00 to 14.00 pH
Resolution	0.01 pH
Accuracy (@20°C/68°F)	±0.02 pH (0 to 100 °C) ±0.05 pH (-20 to 0 °C) ±0.5% (input from transmitter)
Input	high impedance 10^{12} Ohm; reference and matching pin inputs are available 4-20 mA
Power Output	±5 Vcc; 150 mA max load for amplified electrodes
Calibration	offset: ±2 pH with OFFSET trimmer; slope: 80 to 110% with SLOPE trimmer
Temperature Compensation	fixed or automatic with Pt100, from -20 to 100°C (-4 to 212°F)
Recorder Output	0-20 mA or 4-20 mA (isolated)
Set Point Relay	1, isolated, 2 A, max 240 V, resistive load, 1000000 strokes (not fuse protected)
Set Point Range	0.00 to 14.00 pH
Alarm Relay	1, isolated, 2 A, max 240 V, resistive load, 1000000 strokes (not fuse protected)
Alarm Range	0.2 to 3.00 pH
Consent Relay	1, isolated, 2 A, max 240 V, resistive load, 1000000 strokes (not fuse protected)
Dosing Control	OFF/AUTO/ON with selection switch
Over Dosing Control	adjustable, from 5 min to 60 min with knob or disable by wire strap - on rear panel
Backlight	continuous on
Power Supply	115 VAC ±10% or 230 VAC ±10%; 50/60 Hz
Enclosure	flame retardant ABS body and front panel; transparent splash-proof front cover
Environment	-10 to 50°C (14 to 122°F); RH max 95% non-condensing
Panel Cutout	141 x 69 mm (5.6 x 2.7")
Weight	1 kg (2.2 lb.)

For a complete list of Solutions, see the end of pH *Section 3*.

pH Analog Controller with Dual Output and Self-Diagnostic Test

- **Inputs: BNC connector, Direct wire connection with amplified probe** (supports HI 1006 series probes) **and 4-20 mA from a transmitter**
- **Auto-diagnostics to verify offset and slope calibration and electrode contamination/deterioration**
- **Selectable manual ON, OFF and automatic dosing control for alkaline, acid and REDOX dosing with indicator**
- **Dual set point with two independent dosing outputs**
- **Extended temperature compensation range: -20 to 100°C**
- **Supports potential matching pin connection**
- **Both 4-20 and 0-20 mA output**
- **±5V outputs for amplified electrodes**
- **Fail Safe Function-the alarm relay is activated at power down**
- **Operational mode LED indicators**
- **Backlit LCD**
- **Transparent splash-proof cover**

HI 8711 allows the selection of two set points with two independent outputs for acid and alkaline dosages.

Each model accepts either a direct input from a pH or ORP electrode or from a transmitter through 4-20 mA input. The instrument also provides ±5V power output and input terminals for amplified electrodes. In addition, you can choose the output configuration for connecting a recorder or a PLC, between 0-20 or 4-20 mA.

The HI 8711 incorporates adjustable overtime dosing protection from 5 to 60 minutes. If dosing exceeds selected time, the alarm will be triggered and the dosing contact will deactivate. This feature can be activated or deactivated.

SPECIFICATIONS	HI 8711
Range	0.00 to 14.00 pH
Resolution	0.01 pH
Accuracy (@20°C/68°F)	±0.02 pH (0 to 100 °C) ±0.05 pH (-20 to 0 °C) ±0.5% (input from transmitter)
Input	high impedance 10^{12} Ohm; reference and matching pin inputs are available; 4-20 mA
Power Output	±5 Vcc; 150 mA max load for amplified electrodes
Calibration	offset: ±2 pH with OFFSET trimmer; slope: 80 to 110% with SLOPE trimmer
Temperature Compensation	fixed or automatic with Pt100, from -20 to 100°C (-4 to 212°F)
Recorder Output	0-20 mA or 4-20 mA (isolated)
Set Point Relay	2, isolated, 2 A, max 240 V, resistive load, 1000000 strokes (not fuse protected)
Set Point Range	alk. set: from 0.00 to 14.00 pH; acid set: from 0.00 to 14.00 pH
Alarm Relay	1, isolated, 2 A, max 240 V, resistive load, 1000000 strokes (not fuse protected)
Alarm Range	0.2 to 3.00 pH
Dosing Control	OFF/AUTO/ON with selection switch
Over Dosing Control	adjustable, from 5 min to 60 min with knob or disable by wire strap - on rear panel
Backlight	continuous on
Power Supply	115 VAC ±10% or 230 VAC ±10%; 50/60 Hz
Enclosure	flame retardant ABS body and front panel; transparent splash-proof front cover
Environment	-10 to 50°C (14 to 122°F); RH max 95% non-condensing
Panel Cutout	141 x 69 mm (5.6 x 2.7")
Weight	1 kg (2.2 lb.)

ORDERING INFORMATION

The **HI 8711** is supplied complete with mounting brackets and instructions.

SOLUTIONS

HI 7004/1L	pH 4.01 buffer solution, 1 L
HI 7007/1L	pH 7.01 buffer solution, 1 L
HI 7010/1L	pH 10.01 buffer solution, 1 L

ACCESSORIES

HI 8427	pH / ORP electrode simulator
HI 931001	pH / ORP electrode simulator with display
HI 8614N	pH transmitter
HI 8614LN	pH transmitter with display

For a complete list of Solutions, see the end of pH *Section 3*.

HI 8512

ORP Analog Indicator with Self-Diagnostic Test

- **Inputs: BNC connector, Direct wire connection with amplified probe** (supports HI 1006 series probes) **and 4-20 mA from a transmitter**
- **ORP range extension: ± 1999 mV**
- **BNC, amplified input and input from transmitter all in one instrument**
- **Supports potential matching pin connection**
- **Recorder output 0-20mA or 4-20mA user selectable**
- **±5V outputs for amplified electrodes**
- **Backlit LCD**
- **Auto-diagnostic tests for electrode and instrument status**
- **Operational mode LED indicators**
- **Designed for easy installation**
- **Transparent splash-proof cover included**

HI 8512 ORP panel mounted controllers are ideal for process control monitoring in a wide range of industrial applications.

These instruments have been designed for easy and fast installation, and are provided with membrane keypads on the front panel, large display, and autodiagnostic functions.

Each model accepts either a direct input from an ORP electrode or from a transmitter through 4-20 mA input. The instrument also provides ±5V power output and input terminals for amplified electrodes.

Moreover, you can choose the output configuration for connecting a recorder or a PLC, between 0-20 or 4-20 mA.

ORDERING INFORMATION

The **HI 8512** is supplied complete with mounting brackets and instructions.

SOLUTIONS

HI 7020L	ORP test solution @200/275 mV, 500 mL
HI 7091L	Pretreatment reducing solution, 500 mL
HI 7092L	Pretreatment oxidizing solution, 500 mL

ACCESSORIES

HI 8427	pH / ORP electrode simulator
HI 931001	pH / ORP electrode simulator with display
HI 8615N	ORP transmitter
HI 8615LN	ORP transmitter with display

SPECIFICATIONS	HI 8512
Range	±1999 mV
Resolution	1 mV
Accuracy (@20°C/68°F)	±5 mV ±0.5% (input form transmitter)
Input	high impedance 10^{12} Ohm; reference and matching pin inputs are available; 4-20 mA
Power Output	±5 Vcc; 150 mA max load for amplified electrodes
Calibration	offset: ±200 mV with CAL trimmer
Recorder Output	0-20 mA or 4-20 mA (isolated)
Backlight	continuous on
Power Supply	115 VAC ±10% or 230 VAC ±10%; 50/60 Hz
Enclosure	flame retardant ABS body and front panel; transparent splash-proof front cover
Environment	-10 to 50°C (14 to 122°F); RH max 95% non-condensing
Panel Cutout	141 x 69 mm (5.6 x 2.7")
Weight	1 kg (2.2 lb.)

For a complete list of Solutions, see the end of pH *Section 3*.

ORP Analog Controller with Self-Diagnostic Test

- **Inputs: BNC connector, Direct wire connection with amplified probe** (supports HI 1006 series probes) **and 4-20 mA from a transmitter**
- **Selectable manual ON, OFF and automatic dosing control for alkaline, acid and REDOX dosing with indicator**
- **Auto-diagnostic test for instrument status troubleshooting**
- **Operational mode LED indicators**
- **Supports potential matching pin connection**
- **Both 4-20 and 0-20 mA output**
- **±5V outputs for amplified electrodes**
- **Backlit LCD**
- **Transparent splash-proof cover**

This instrument allows the selection of a set point for oxidizing or reducing dosage.

When used in conjunction with the HI 8710 pH controller, the ODCD (ORP dosing consent device) function (featured by the HI 8710) will ensure that the ORP dosage will start only when the pH level is correct.

These instruments have been designed for easy and fast installation and are provided with membrane keypads on the front panel, large display, and autodiagnostic functions.

Each model accepts either a direct input from an ORP electrode or from a transmitter through 4-20 mA input. The instrument also provides ±5V power output and input terminals for amplified electrodes.

Moreover, you can choose the output configuration for connecting a recorder or a PLC, between 0-20 or 4-20 mA.

SPECIFICATIONS	HI 8720
Range	±1999 mV
Resolution	1 mV
Accuracy (@20°C/68°F)	±5 mV ±0.5% (input from transmitter)
Input	high impedance 10^{12} Ohm; reference and matching pin inputs are available; 4-20 mA
Power Output	±5 Vcc; 150 mA max load for amplified electrodes
Calibration	offset: ±200 mV with CAL trimmer;
Recorder Output	0-20 mA or 4-20 mA (isolated)
Set Point Relay	1, isolated, 2 A, max 240 V, resistive load, 1000000 strokes (not fuse protected)
Set Point Range	±1999 mV
Alarm Relay	1, isolated, 2 A, max 240 V, resistive load, 1000000 strokes (not fuse protected)
Alarm Range	10 to 300 mV
Dosing Control	OFF/AUTO/ON with selection switch
Over Dosing Control	adjustable, from 5 min to 60 min with knob or disable by wire strap - on rear panel
Backlight	continuous on
Power Supply	115 VAC ±10% or 230 VAC ±10%; 50/60 Hz
Enclosure	flame retardant ABS body and front panel; transparent splash-proof front cover
Environment	-10 to 50°C (14 to 122°F); RH max 95% non-condensing
Panel Cutout	141 x 69 mm (5.6 x 2.7")
Weight	1 kg (2.2 lb.)

ORDERING INFORMATION

The **HI 8720** is supplied complete with mounting brackets and instructions.

SOLUTIONS

HI 7020L	ORP test solution @200/275 mV, 500 mL
HI 7091L	pretreatment reducing solution, 500 mL
HI 7092L	pretreatment oxidizing solution, 500 mL

ACCESSORIES

HI 8427	pH / ORP electrode simulator
HI 8615N	ORP transmitter
HI 8615LN	ORP transmitter with display

For a complete list of Solutions, see the end of pH *Section 3*.

HI 8931AN • HI 8931BN • HI 8931CN • HI 8931DN

Conductivity Analog Controller with Input from Probe or Transmitter

- **Both electrode and transmitter compatible inputs accepted**
- **Selectable manual ON, OFF and automatic dosing control with indicator**
- **Built-in auto-diagnostic function for offset and slope**
- **Both 4-20 and 0-20 mA output user selectable, all in one instrument**
- **Backlit LCD**
- **Transparent splash-proof cover included**
- **Operational mode LED indicators**

HI 8931 is a panel mounted conductivity controller designed for simplicity of use. For in-line applications, use the HI 7635 probe, while for tanks the HI 7638 with external threads is recommended. These probes are provided with a built-in NTC sensor for temperature compensated conductivity measurements.

HI 8931 also features a direct connection up to 20 m (67'), without needing to amplify the signal to the conductivity probe.

Using the HI 8931 in conjunction with a 4-20 mA output transmitter (HI 8936 or HI 8936L series) will assure a strong, interference free signal at distances up to 300 meters (1000').

ORDERING INFORMATION

The **HI 8931** series is supplied with mounting brackets and instructions.

SOLUTIONS

HI 7033L	84 µS/cm calibration solution, 500 mL
HI 7031L	1413 µS/cm calibration solution, 500 mL
HI 7030L	12880 µS/cm calibration solution, 500 mL
HI 7034L	80000 µS/cm calibration solution, 500 mL
HI 7035L	111800 µS/cm calibration solution, 500 mL
HI 7039L	5000 µS/cm calibration solution, 500 mL

PROBES

HI 3001D	PEI/PVDF body, 20 mm conductivity probe with internal temperature sensor, 1/2" NPT front thread (flow-thru) and 3/4" NPT back thread (submersion/pipe) mounting, DIN connector and 3 m (9.9') cable Other probes available upon request

ACCESSORIES

HI 779/15	6-wire cable (15 m/49.2' roll)

SPECIFICATIONS	HI 8931AN	HI 8931BN	HI 8931CN	HI 8931DN
Range	0.0 to 199.9 mS/cm	0.00 to 19.99 mS/cm	0 to 1999 µS/cm	0.0 to 199.9 µS/cm
Resolution	0.1 mS/cm	0.01 mS/cm	1 µS/cm	0.1 µS/cm
Accuracy (@20°C/68°F)	±2% F.S. (excluding probe error)			
Input from Transmitter	HI 8936A / AL	HI 8936B / BL	HI 8936C / CL	HI 8936D / DL
Temperature Compensation	automatic, 0 to 60°C with β=2%/°C; see also transmitter HI 8936			
Inputs	DIN (probe) or 4-20 mA (transmitter)			
Conductivity Probe	HI 7635 for in-line applications or HI 3001D for flow-thru (not included)			
Calibration	manual, two point, through offset and slope trimmers			
Recorder Output	0 to 20 mA or 4 to 20 mA (isolated)			
Set Point and Alarm Relay	1, Isolated, 2A, max. 240V, resistive load, 1,000,000 strokes			
Set Point Range	0.0 to 199.9 mS/cm	0.00 to 19.99 mS/cm	0 to 1999 µS/cm	0.0 to 199.9 µS/cm
Alarm Range	0.0 mS and 100.0 mS	0.00 mS and 10.00 mS	0 µS and 1000 µS	0.0 µS and 100.0 µS
Dosing Control	OFF/AUTO/ON with selection switch			
Over Dosing Control	adjustable, from 5 min to 60 min with knob or disable by wire strap - on rear panel			
Backlight	continuous on			
Power Supply	115 VAC ±10% or 230 VAC ±10%; 50/60 Hz			
Enclosure	flame retardant ABS body and front panel; transparent splash-proof front cover			
Environment	-10 to 50°C (14 to 122°F); RH max 95% non-condensing			
Panel Cutout	141 x 69 mm (5.6 x 2.7")			
Weight	1 kg (2.2 lbs.)			

For a complete list of Solutions, see the end of Conductivity *Section 6*.

HI 943500

Conductivity Analog Controller with Direct Input from Potentiometric Probe

- **Direct connection of up to 20 m (66') without needing to amplify the signal to the HI 7638 probe**
- **Automatic diagnostic controls**
- **Available in four models, each with a different measurement range**
- **Operational mode LED indicators**
- **Automatic Temperature Compensation with HI 7638 potentiometric conductivity probe with built-in temperature sensor**
- **Transparent splash-proof cover included**

These controllers allow direct connection of a potentiometric conductivity probe (HI 7638) with a cable up to 20 m long, without needing a transmitter to amplify the signal.

The output configuration for connecting a recorder or a PLC can be chosen between 0-20 or 4-20 mA.

The LED on the front panel indicates the operating status of the controller.

The Automatic Temperature Compensation (ATC) is performed directly by the HI 7638 probe with built-in temperature sensor.

The front panel is protected behind a transparent splash-proof cover.

SPECIFICATIONS	HI 943500A	HI 943500B	HI 943500C	HI 943500D
Range	0.0 to 199.9 mS/cm	0.00 to 19.99 mS/cm	0 to 1999 µS/cm	0.0 to 199.9 µS/cm
Resolution	0.1 mS/cm	0.01 mS/cm	1 µS/cm	0.1 µS/cm
Accuracy (@20°C/68°F)	±2% F.S.			
Calibration	manual, two point, through offset and slope trimmers			
Temperature Compensation	automatic, 0 to 60°C (32 to 140°F), with β=2%/°C			
Recorder Output	4-20 mA (isolated)			
Set Point Relay	1, isolated, 2A, max. 240 V, resistive load, 1,000,000 strokes			
Alarm Relay	1, isolated, 2A, max. 240 V, resistive load, 1,000,000 strokes			
Power Supply	115 or 230 VAC ±10% (user selectable); 50/60 Hz			
Enclosure	black anodized aluminum body; front panel with flame retardant ABS; transparent splash-proof front cover			
Environment	-10 to 50°C (14 to 122°F); RH max 95%			
Panel Cutout	141 x 69 mm (5.6 x 2.7")			
Weight	1 kg (2.2 lb.)			

ORDERING INFORMATION

The **HI 943500** series is supplied complete with mounting brackets and instructions.

PROBES

HI 7638	PEI/glass body, 75 mm conductivity probe with internal temperature sensor and 3/8" NPT thread (immersion)
HI 3001	PEI/PVDF body, 20 mm conductivity probe with internal temperature sensor, 1/2" NPT front thread (flow-thru) and 3/4" NPT back thread (submersion/pipe) mounting and 3 m (9.9') cable
HI 3002	PEI/PVDF body, 60 mm conductivity probe with internal temperature sensor, 1/2" NPT front thread (flow-thru) and 3/4" NPT back thread (submersion/pipe) mounting and 3 m (9.9') cable

SOLUTIONS

HI 7033L	84 µS/cm calibration solution, 500 mL
HI 7031L	1413 µS/cm calibration solution, 500 mL
HI 7030L	12880 µS/cm calibratoin solution, 500 mL
HI 7034L	80000 µS/cm solution, 500 mL

For a complete list of Solutions, see the end of Conductivity *Section 6*.

HI 8410

Dissolved Oxygen Controller with Extended Range and Analog Output

- **Extended range to 50 mg/L (ppm)**
- **Manual single point calibration**
- **Selectable 0-20 or 4-20 mA output**
- **Low maintenance Galvanic DO probe**
- **Backlit LCD**
- **Operational mode LED indicators**
- **Transparent splash-proof cover included**

The HI 8410 is a panel mounted dissolved oxygen controller that is used to maintain and monitor the concentration of DO in a wide range of industrial process applications. The HI 8410 uses a Galvanic probe that typically requires less maintenance than a Polarographic style making it ideal for long term monitoring.

The set point for controlling the activation of a relay is adjusted manually by the user. An alarm relay is also manually adjustable and is based upon a tolerance from the programmed set point. Calibration is single set point and can be done in zero oxygen solution.

The dosage mode: automatic, continuous ON or OFF and over dosage control by setting the overtime dosage trimmer. If the dosing relay remains continuously activated for more than the selected dosing time, the alarm relay is activated, the alarm LED will start blinking and the dosing relay will be deactivated. A jumper found on the rear panel can disable the "over time dosage" function.

"Automatic/Off/manual" dosing selection switch and LED on the front panel. In Automatic mode all the relays are controlled based on the measurement set point and alarm values. In OFF mode the dosing and alarm relays are always deactivated. The dosing LED is OFF (as relay status) and the ALARM LED is in accordance with the instrument set point, input reading, and ALARM. In ON (Manual) mode the dosing relay is always on. The alarm relay is still enabled. If an alarm occurs the dosing relay remains activated. If the over dose time exceeds the setting during manual mode, the alarm relay remains activated.

The D.O. probe is provided with a membrane covering the galvanic sensor and a built-in thermistor for temperature measurement and compensation.

Other features include: recorder output in 0-20 mA or 4-20 mA configuration, LED indicators which identify whether the controller is in operation mode or setup selection mode, overtime control function and hysteresis setting.

ORDERING INFORMATION

The **HI 8410** is supplied complete with mounting brackets and instructions.

PROBES

HI 76410/4	Galvanic DO probe (fixed) with internal temperature sensor, DIN connector and 4 m (13.1') cable
HI 76410/10	Galvanic DO probe (fixed) with internal temperature sensor, DINconnector and 10 m (32.8') cable

SOLUTIONS

HI 76410A	Spare membranes for HI 76410 DO probe

SPECIFICATIONS	HI 8410
Range	0.0 to 50.0 mg/L (ppm) O_2 0 to 600 % O_2 -5.0 to 50.0 °C
Resolution	0.1 mg/L (ppm) or 1% (O_2) / 0.1 °C
Accuracy (@20°C/68°F)	±1% of reading (O_2) / ±0.2 °C
Calibration	manual, one point, in saturated air
Temperature Compensation	automatic, from -5 to 50°C (23 to 122 °F)
Salinity Compensation	0 to 51 g/L (resolution 1 g/L)
Probe (not included)	HI 76410/4 with 4 m (13.1') cable or HI 76410/10 with 10 m (32.8') cable
Recorder Output	0 to 20 mA or 4 to 20 mA (isolated)
Set point and Alarm Relay	1, isolated, 2A, max. 240V, resistive load, 1,000,000 strokes
Set point Range	1 to 600 % O_2; 0.1to 50.0 mg/L (mg/L (ppm) O_2
Alarm Range	1.0 to 5.0 mg/L (ppm) O_2
Hysteresis Range	0.5 to 2.4 mg/L (ppm) O_2
Dosing Control	OFF/AUTO/ON with selection switch
Over Dosing Control	adjustable, from 5 min to 60 min with knob or disable by wire strap - on rear panel
Backlight	continuous on
Power Supply	115 VAC ±10% or 230 VAC ±10%; 50/60 Hz
Enclosure	flame retardant ABS body and front panel; transparent splash-proof front cover
Environment	-10 to 50°C (14 to 122°F); RH max 95% non-conndensing
Panel Cutout	141 x 69 mm (5.6 x 2.7")
Weight	1 kg (2.2 lb.)

For a complete list of Solutions, see the end of Dissolved Oxygen *Section 7*.

MEADOS pH and ORP Measuring and Dosing System

Two Advanced Instruments in One

MEADOS pumps combine the powerful Blackstone dosing pumps with HANNA pH/ORP controllers. These unique products were developed by our Blackstone division for measuring and controlling pH or ORP. This latest innovation eliminates the need for multiple units by combining a pH controller and chemical feed pump into one. No more complicated installations, wiring and compatibility problems. This compact unit features accurate regulation, proportional dosing, alarm and recorder signals and much more, all in one meter.

Easy Installation

Designed with mounting holes built into a rugged base, Blackstone pump/controllers are simple to install. They use a standard pH probe with a BNC connector to eliminate the need for any additional hardware. All of the controls and pump assemblies are conveniently located on the front of the unit. If the operator must access the pump head or control panel for any reason, there is no need to uninstall the unit.

Rugged Construction

Blackstone pump/controllers are housed in rugged, fiber-reinforced polypropylene casings that are IP55 rated to prevent the ingress of liquids. The material used for the housing resists corrosion caused by most chemicals, protecting the unit from hazardous spills and splashes.

Superior Materials

Blackstone pumps use PVDF, FPM/FKM and PTFE materials for all components in contact with the chemicals being dosed. These materials have properties which enable them to resist even the most corrosive chemicals in the industry. Blackstone's choice of material makes the pump more versatile, allowing it to handle a wider variety of reagents. The chemical resistance chart on page 18.76 shows how well PVDF, FPM/FKM and PTFE resist the harmful effects of different products.

Simple Pump Action

A positive displacement solenoid with few moving parts makes Blackstone pumps more reliable than motor driven pumps. With no rotating parts, gears or cams, part wear and oiling associated with motor driven pumps is eliminated; drastically reducing any chance of mechanical failure.

Proportional Dosing

The Blackstone controller/pump strokes at full capacity when the measured value deviates by more than 1.5 pH or 150 mV from the set value. A proportional control slows down the stroke rate as the measured value approaches the user selectable set points, avoiding overdosage of chemicals. This feature makes the pump's dosing more accurate, saves chemicals and eliminates unnecessary and costly corrections to your process, especially with slow reacting chemicals.

Isolated Recorder Output

To enhance troubleshooting and provide the user with the ability to record data while monitoring, the Blackstone controller/pumps provide a recorder output. By simply attaching a recording device to the instrument's 4 to 20 mA output contacts, conveniently located on the front panel, you can obtain a hard copy of the results on demand.

Alarm Output

When monitoring and controlling pH and ORP levels in a process, it is very important that any potential problem does not go unattended. The HANNA MEADOS units incorporate an alarm system that will alert the user if the reaction is not within certain guidelines. The alarm of the BL 7916 will be activated if the measured pH value is 2 pH units lower than the set point (if dosing acid, this indicates overdosage, a common symptom of siphoning). The alarm will also activate if the value is 2 pH higher than the set point (if dosing acid, this is an indication of insufficient dosage, a common symptom of the lack of chemicals). The BL 7917's alarm will activate if the mV value is 200 mV lower than the set point (if dosing reducing chemicals, this indicates overdosage). The alarm will also activate if the value is 200 mV higher than the set point (if dosing reducing chemicals, this is an indication of lack of chemicals).

Auxiliary Dosing Contacts

The auxiliary dosing contacts of the MEADOS units are closed whenever the pump is dosing. This solution offers considerable advantages, especially for small plants, where these pumps need to be the only equipment left running. This will spare other equipment such as mixers, priming pumps etc. With this feature activated, a mixer can be automatically started, when the pump is dosing.

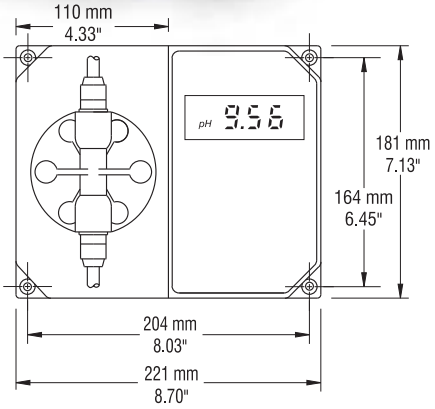
BL 7916

pH Controller and Pump

- **pH controller and dosing pump** in one compact unit.
- **±0.01 pH accuracy** with unbeatable performance.
- **Isolated 4 to 20 mA recorder output.**
- **Proportional dosing** slows the pump down when the measured pH level approaches the set valve, which ensures precise dosage and avoids costly waste of chemicals due to overdosage.
- **Alarm contact** is activated whenever the pH value varies more than 2 pH units from the set point.
- **Auxiliary contacts** allow the user to attach a mixer or priming pump that is activated only when the pump is dosing.
- **PVDF, FPM/FKM and PTFE materials** are used for all parts that come into contact with liquid.

Front View

This series of instruments will mount easily in your plant using a minimum of wall space. The controls and pump head are located in the front to allow easy access.



BL 7916 PRESSURE/FLOW	
BAR (PSI)	LPH (GPH)
0.5 (7.4)	13.3 (3.46)
1.0 (14.7)	11.7 (3.04)
2.0 (29.4)	10.1 (2.63)
3.0 (44.1)	9.0 (2.33)
4.0 (58.8)	7.8 (2.03)

ORDERING INFORMATION

BL 7916-1 is supplied with discharge and suction valves, polyethylene tubing, 115V power cable and instructions

BL 7916-2 is supplied with discharge and suction valves, polyethylene tubing, 230V power cable and instructions

SOLUTIONS

HI 7004L	pH 4.01 buffer solution, 500 mL
HI 7007L	pH 7.01 buffer solution, 500 mL
HI 7010L	pH 10.01 buffer solution, 500 mL

ACCESSORIES

HI 721101	Pumphead, O-ring, screws and washer
HI 721102	Discharge valve assembly
HI 721103	Suction valve assembly
HI 721004	Injection valve assembly (required)
HI 721005	Foot valve assembly (required)
HI 721008	Ceramic weight (4)
HI 8427	pH/ORP electrode simulator
HI 931001	pH/ORP electrode simulator with display

SPECIFICATIONS	BL 7916-1	BL 7916-2
Range	0.00 to 14.00 pH	
Resolution	0.01 pH	
Accuracy (@20°C/68°F)	±0.01 pH	
Flow Rate	see table	
Input Impedance	10^{12} Ohm	
Dosage	proportional, acid or base, user selectable	
Dosing Contact	1 isolated, 2A, max. 240V, resistive load, 1,000,000 strokes	
Alarm Contact	1 isolated, 2A, max. 240V, resistive load, 1,000,000 strokes	
Calibration	offset: ±1 pH with trimmer; slope: 85 to 115% with trimmer	
Recorder Output	4-20 mA (isolated)	
Power Supply	115V ±15%; 50/60Hz (40W)	230V ±15%; 50/60Hz (40W)
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	221 x 142 x 181 mm (8.7 x 5.6 x 7.1")	
Weight	5 kg (11 lb.)	

For a complete list of Solutions, see the end of pH *Section 3*.

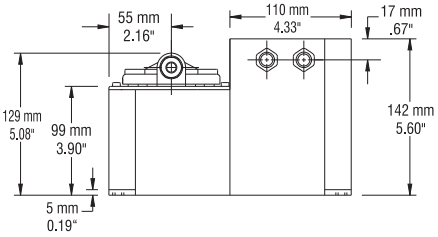
ORP Controller and Pump

Black Stone

- **ORP controller and dosing pumps** in one compact unit.
- **±5 mV accuracy** with unbeatable performance.
- **Isolated 4 to 20 mA recorder output.**
- **Proportional dosing** slows the pump down when the measured ORP level approaches the set value, to avoid over dosage of oxidizing or reducing agents.
- **Alarm contact** is activated whenever the ORP reading varies more than 200 mV from the set point.
- **Auxiliary contacts** allow users to attach a mixer or priming pump that is activated only when the pump is dosing
- **PVDF, FPM/FKM and PTFE materials** are used for all parts that come into contact with liquid.

Bottom View

The controller/pump series of instruments are enclosed in a modular housing for maximum protection. These illustrations show the layout of the controller/pumps and how they utilize the one-piece polypropylene, injection-molded housing. Since there are no joints or screws holding different sections of the housing together, the case is extremely rugged and sturdy.



BL 7917 PRESSURE/FLOW	
BAR (PSI)	LPH (GPH)
0.5 (7.4)	13.3 (3.46)
1.0 (14.7)	11.7 (3.04)
2.0 (29.4)	10.1 (2.63)
3.0 (44.1)	9.0 (2.33)
4.0 (58.8)	7.8 (2.03)

SPECIFICATIONS	BL 7917-1	BL 7917-2
Range	-999 mV to +999 mV	
Resolution	1 mV	
Accuracy (@20°C/68°F)	±5 mV	
Flow Rate	see table	
Input Impedance	10^{12} Ohm	
Dosage	proportional, oxidizing or reducing, user selectable	
Dosing Contact	1 isolated, 2A, max. 240V, resistive load, 1,000,000 strokes	
Alarm Contact	1 isolated, 2A, max. 240V, resistive load, 1,000,000 strokes	
Recorder Output	4-20 mA (isolated)	
Power Supply	115V ±15%; 50/60Hz (40W)	230V ±15%; 50/60Hz (40W)
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	221 x 142 x 181 mm (8.7 x 5.6 x 7.1")	
Weight	5 kg (11 lb.)	

ORDERING INFORMATION

BL 7917-1 is supplied with discharge and suction valves, polyethylene tubing, 115V power cable and instructions.

BL 7917-2 is supplied with discharge and suction valves, polyethylene tubing, 230V power cable and instructions.

SOLUTIONS

HI 7020L	ORP test solution @200/275 mV, 500 mL
HI 7091L	Pretreatment reducing solution, 500 mL
HI 7092L	Pretreatment oxidizing solution, 500 mL

ACCESSORIES

HI 721101	Pumphead, O-ring, screws and washer
HI 721102	Discharge valve assembly
HI 721103	Suction valve assembly
HI 721004	Injection valve assembly (required)
HI 721005	Foot valve assembly (required)
HI 721008	Ceramic weight (4)
HI 8427	pH/ORP electrode simulator
HI 931001	pH/ORP electrode simulator with display

For a complete list of Solutions, see the end of pH *Section 3*.

Wall-Mounted Process Controllers

Reliable, High Performance Wall Mounted Controllers

HANNA wall mounted pH, ORP, and conductivity controllers are specifically designed to meet your process control requirements. The controllers come equipped with power relays operating at a maximum of 2A (240V). Electrodes can be installed quickly and easily. Simply plug the universal BNC or DIN connector over the socket and twist it into a secured position. This feature greatly improves the reliability of your instrumentation by assuring a positive connection. Accurate measurements are displayed on a large LCD, enabling the operator to check the controller readings easily.

Alarm Feature

The HANNA wall mounted series of controllers incorporate a triple contact alarm system that allows the user to select whether the alarm contacts will be in a normally open or normally closed position. When the measured value of the meter is out of range, the alarm is activated. The alarm will also be activated if the unit loses power. When activated, the alarm contacts will open or close, triggering the mechanism of your choice, whether a buzzer, light or any other electrical device. The alarm is a necessity when the installation is in a remote location and corrective action must be taken immediately in the event of an out of range condition.

Isolated Recorder Output

The ability to record the data from the process you are monitoring greatly enhances process troubleshooting. By simply connecting a recorder to the controller's output terminals you are able to acquire a hard copy of the readings for demonstrative or analytical purposes. The recorder output terminals are isolated from the controller circuitry to avoid any interference and are user switchable between 0 to 20 mA or 4 to 20 mA.

High Impedance Input

The pH and ORP controllers come with high impedance $10^{12}\,\Omega$ direct input from the electrode, ideal for applications with distances of up to 10 m (33'). The greater the distance between the controller and the sample, the greater the chance that line noise will occur, causing faulty readings. Use an AmpHel® pH electrode (available also with external battery) to greatly enhance the input signal allowing high accuracy at distances of up to 50 m (165'). For distances greater than 50 m, an analog transmitter must be used to amplify the signal in a 4-20 mA current. When using the HI 504 or HI 25, HANNA's digital HI 504910 transmitter can be used at distances up to 1.2 km (.74 miles) and can store up to 6000 samples along with last calibration data. HI 504910 is also compatible with HANNA's Sensor Check™ feature for continuous pH and ORP probe inspection.

Quality Construction

These controllers are housed in a rugged, modular, fiber-reinforced polypropylene housing. Polypropylene has properties that will resist the harmful effects of most chemicals. When in operation, and with the transparent protective cover installed, the units comply with the IP55 standards. The modular design isolates the controller circuitry from all contacts, assuring that there is no noise interference. The use of this rugged design protects the unit from the tough conditions associated with industrial environments, ensuring long periods of trouble-free operation.

HI 2X Advanced Controllers

This line of industrial microprocessor controllers offers a wide range of features and functions such as single and dual set points, ON/OFF, proportional and PID control, relay outputs, bi-directional isolated RS485, isolated recorder outputs in mAmps and volts, differential input, control through analog output and Fail Safe features.

Simple to Use

The large, dual-level LCD shows both primary measurement and temperature and guides operators through calibration and programming with step-by-step prompts. The choice of ON/OFF, proportional and PID control provides extra versatility and makes it possible to pick the process controller that best fits your application. Keeping track of multiple controllers in different plants is made easy. These advanced controllers can be identified with both a factory and process ID.

Save Money with Custom Programs

HI 2X help to prevent overdosing or costly system failures. You can set your high and low set point hysteresis bands independently to fine tune dosing processes with the ON/OFF controllers. Similarly, the proportional band and time period are user-programmable to save on slow reacting chemicals which are commonly overdosed.

All models offer an adjustable overdosing timer from 10 minutes to 7 days as the maximum time that the relay contacts may remain closed. An important feature in case of sudden chemical depletion, truncated intake or discharge tubing and other calamities.

Fail Safe Protection

The Fail Safe Alarms protect processes against critical errors arising from power interruptions, surges and human errors. The sophisticated yet easy to use system resolves these problems on two fronts: hardware and software. To eliminate blackout and line failure problems, the alarm function operates in a "normally closed" state and goes off if the wires are accidentally tripped, or when the power is down. This is an important feature since with most meters the alarm terminals close in abnormal situations, but no alarm is sounded with a line interruption, causing extensive damage. With our controllers, software is employed to set off the alarm in abnormal circumstances, for example, if the dosing terminals are closed too long a red LED will provide a visual warning signal.

Differential Input (Matching Pin)

All HANNA controllers in this family come with a differential input to prevent problems due to ground loop current. With this new feature, the life of the electrodes will be greatly extended.

Password Protection

The HANNA password protection feature keeps these controllers safe from tampering. Only users with the proper password can change the settings of these controllers.

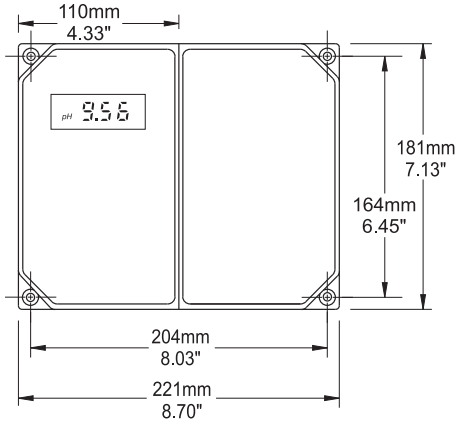
Simple Installation

These wall mounted controllers have mounting holes molded into the housing to assure simple, quick and secure installation without the need for additional hardware. Once all electrical connections are made, the protective cover can be installed over the front panel, making it possible to perform all adjustments without disassembling any part of the unit. Temperature probes can also be installed. Pumps to be used in conjunction with the controller simply plug into the controller's input and will be powered up through the unit's internal power supply.

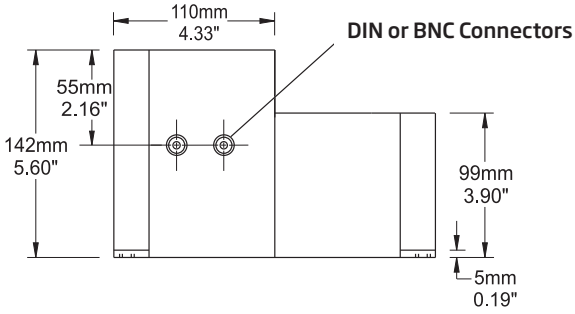
Mechanical Dimensions

The modular design isolates electrical connections in a closed compartment, while the control settings are accessible and can be made through the adjacent compartment.

Front View



Bottom View



HI 21

Industrial Grade pH Digital Controllers Wall Mounted with Matching Pin

- Control through analog output (single set point) or relay
- Fully customizable
- RS485 interface
- Differential input for ground loop protection
- Automatic three point pH calibration
- Last calibration data
- Automatic Temperature Compensation
- Password protection
- Fail Safe Alarm System
- Overdosing safeguard

The HI 21 controllers are simple to operate, microprocessor-based pH process controllers packed with features. With HI 21 quick one, two or three point calibration at pH 4.01, 7.01 and 10.01 comes standard and you can choose from ON/OFF, proportional and PID control to save on chemicals. These instruments have a differential input, extending electrode life by eliminating ground loop current through the reference.

Password protection prevents unauthorized modifications in settings or calibration. The Fail Safe Alarm System protects the HI 21 against the pitfalls of process control, like power interruption or line failure.

Wiring the controllers is simple with extractable terminal modules. A host of self-testing features and user-friendly functions make HI 21 a great value.

For more flexibility and better resolution for chart recorders, any two points between 0 and 14 pH can be chosen to correspond to the analog output spans. Some HI 21 models are equipped with a bi-directional RS485 port, which allows remote control of the instrument from a PC.

ORDERING INFORMATION

Each **HI 21** model is supplied with instructions.

Choose your configuration:

HI 21111-1	single setpoint, on/off control, analog output, 115V
HI 21111-2	single setpoint, on/off control, analog output, 230V
HI 21211-1	dual setpoint, on/off control, analog output, 115V
HI 21211-2	dual setpoint, on/off control, analog output, 230V
HI 21221-1	dual setpoint, on/off and proportional control, analog output, 115V
HI 21221-2	dual setpoint, on/off and proportional control, analog output, 230V
HI 21222-1	dual setpoint, on/off and proportional control, RS485 output, 115V
HI 21222-2	dual setpoint, on/off and proportional control, RS485 output, 230V
HI 21523-1	control through analog output, on/off and proportional control, analog output and RS485, 115V
HI 21523-2	control through analog output, on/off and proportional control, analog output and RS485, 230V

SOLUTIONS

HI 7004L	pH 4.01 buffer solution, 500 mL
HI 7007L	pH 7.01 buffer solution, 500 mL
HI 7010L	pH 10.01 buffer solution, 500 mL

ACCESSORIES

HI 8427	pH / ORP electrode simulator
HI 931001	pH / ORP electrode simulator with display

SPECIFICATIONS	HI 21
Range	0.00 to 14.00 pH; -9.9 to 120°C
Resolution	0.01 pH; 0.1°C
Accuracy (@20°C/68°F)	±0.02 pH; ±0.5°C
Input Impedance	10^{12} Ohm
pH Calibration	automatic, one, two or three point, at pH 4.01, 7.01, 10.01
Temperature Compensation	automatic (with Pt100 probe) or manual from -9.9 to 120°C
Analog Output	0 to 1 mA, 0 to 20 mA, 4 to 20 mA; 0 to 5 VDC, 1 to 5 VDC, 0 to 10 VDC
Digital Output	RS485
Relays 1 and 2	electromechanical relay SPDT contact outputs, 5A-250 VAC, 5A - 30 VDC (resistive load) (HI 211YZ and HI 212YZ), fuse protected: 5A, 250V fast fuse
Alarm Relay	electromechanical relay SPDT contact output, 5A - 250 VAC, 5A - 30 VDC (resistive load) fuse protected: 5A, 250V, 250V fast fuse
Power Supply Input	±5V (for amplified electrodes)
Power Supply	115 VAC ±10% or 230 VAC ±10%; 50/60 Hz
Power Consumption	15 VA
Over Current Protection	400 mA, 250V, fast fuse
Environment	0 to 50°C (32 to 122°F); RH max. 85% non-condensing
Protection	IP 54
Dimensions	221 x 181 x 86 mm (8.7 x 7.1 x 3.4")
Weight	1.4 kg (3.1 lb.)

For a complete list of Solutions, see the end of pH *Section 3*.

Industrial Grade ORP Digital Controllers Wall Mounted with Matching Pin

- **Fully customizable**
- **RS485 interface**
- **Differential input for ground loop protection**
- **Automatic two point ORP calibration**
- **Last calibration data**
- **Password protection**
- **Fail Safe Alarm System**
- **Overdosing safeguard**

The HI 22 controllers have been engineered with the same outstanding quality and features as the HI 21 meters.

The Fail Safe Alarm System protects these meters against the pitfall of process control, like power interruption or line failure. User selectable timing capability safeguards against overdosing and saves money while protecting the environment. RS485 capability makes this model PC compatible. The microprocessor memory is fully programmable and has a 3-month backup power supply.

These instruments have a differential input, extending electrode life by eliminating ground loop current through the reference. Users can choose between ON/OFF and proportional control as well as selectable current and voltage outputs. For more flexibility and better resolution for chart recorders, choose any two points between 0 and ±2000 mV to correspond to the analog output spans.

Wiring the controllers is simple with extractable terminal modules. A host of self-testing features and user-friendly functions make HI 22 a great value.

SPECIFICATIONS	HI 22
Range	±2000 mV; -9.9 to 120°C
Resolution	1 mV; 0.1°C
Accuracy (@20°C/68°F)	±2 mV; ±0.5°C
Input Impedance	10^{12} Ohm
ORP Calibration	automatic, at 0 and 350 or 1900 mV
AnalogOutput	0 to 1 mA, 0 to 20 mA, 4 to 20 mA; 0 to 5 VDC, 1 to 5 VDC, 0 to 10 VDC
Digital Output	RS485
Relays 1 and 2	electromechanical relay SPDT contact outputs, 5A-250 VAC, 5A - 30 VDC (resistive load) (HI 221YZ), fuse protected: 5A, 250V fast fuse
Alarm Relay	electromechanical relay SPDT contact output, 5A - 250 VAC, 5A - 30 VDC (resistive load) Fuse protected: 5A, 250V, 250V fast fuse
Power Supply Input	±5V (for amplified electrodes)
Power Supply	115 VAC ±10% or 230 VAC ±10%; 50/60 Hz
Power Consumption	15 VA
Over Current Protection	400 mA, 250V, fast fuse
Environment	0 to 50°C (32 to 122°F); RH max. 85% non-condensing
Protection	IP 54
Dimensions	221 x 181 x 86 mm (8.7 x 7.1 x 3.4")
Weight	1.4 kg (3.1 lb.)

ORDERING INFORMATION

Each **HI 22** model is supplied complete with instructions.

Choose your configuration:

HI 22111-1	single setpoint, on/off controls, analog output, 115V
HI 22111-2	single setpoint, on/off controls, analog output, 230V
HI 22122-1	single setpoint, on/off and proportional controls, RS485 output, 115V
HI 22122-2	single setpoint, on/off and proportional controls, RS485 output, 230V

SOLUTIONS

HI 7020L	ORP test solution @200-275 mV, 500 mL
HI 7091L	ORP reducing pretreatment solution, 500 mL
HI 7092L	ORP oxidizing pretreatment solution, 500 mL

ACCESSORIES

HI 8427	pH/ORP electrode simulator
HI 931001	pH/ORP electrode simulator with display

For a complete list of Solutions, see the end of pH *Section 3*.

HI 23

Industrial Grade EC Digital Controllers Wall Mounted with Four-ring Potentiometric Probe

- **Works with four-ring potentiometric probe**
- **Automatic EC calibration**
- **Automatic Temperature Compensation**

HI 23 is a wall mounted, microprocessor conductivity controller that provides very accurate measurements due to the four-ring EC probe and Automatic Temperature Compensation (ATC) feature.

Users can choose among models featuring ON/OFF or PID control, analog input and output, double set point. The relay contacts can drive external devices such as pumps or electrovalves.

The input signal can come from a probe or a 4-20 mA transmitter. Models with the RS485 output option are also available. This option allows the user to insert the controller into a 2-wire RS485 network.

ORDERING INFORMATION

Each **HI 23** model is provided with dual set point and is supplied complete with instructions.

Choose your configuration:

HI 23211-1	dual setpoint, on/off control, analog output, 115V
HI 23211-2	dual setpoint, on/off control, analog output, 230V
HI 23222-1	dual setpoint, on/off and PID controls, RS485 port, 115V
HI 23222-2	dual setpoint, on/off and PID controls, RS485 port, 230V

PROBES

HI 7639D	Conductivity probe with DIN connector and 4 m (13.1') cable for high temp in-line applications
HI 7639D/5	Conductivity probe with DIN connector and 5 m (16.4') cable for high temp in-line applications

SOLUTIONS

HI 7030L	12880 µS/cm calibration solution, 500 mL
HI 7031L	1413 µS/cm calibration solution, 500 mL
HI 7033L	84 µS/cm calibration solution, 500 mL
HI 7034L	80000 µS/cm calibration solution, 500 mL

SPECIFICATIONS		HI 23
Range	**EC**	0.0 to 199.9 µS/cm; 0 to 1999 µS/cm; 0.00 to 19.99 mS/cm; 0.0 to 199.9 mS/cm
	Temperature	-10.0 to 100.0°C
Resolution	**EC**	0.1 µS/cm, 1 µS/cm; 0.01 mS/cm, 0.1 mS/cm
	Temperature	0.1 °C
Accuracy (@20°C/68°F)		0.5% f.s. (EC); ±0.5 °C (0 to 70°C); ±1 °C (outside)
Calibration		automatic, 1 point
Temperature Compensation		automatic or manual from -10 to 100°C with Pt100 probe; β adjustable from 0.00 to 10.00%/°C
Probe		four-ring conductivity probe with built-in 3-wire Pt100 temperature sensor or conductivity probe + external Pt100 (not included)
Analog Input		4-20mA
Analog Output		0-10 VDC, 0-5 VDC or 1-5 VDC; 0-1mA, 0-20 mA or 4-20mA
RS485 baud rate		1200, 2400, 4800 and 9600
Relays 1 and 2		electromechanical relay SPDT contact outputs, 5A-250 VAC, 5A - 30 VDC (resistive load) (HI 211YZ and HI 212YZ), fuse protected: 5A, 250V fast fuse
Alarm Relay		electromechanical relay SPDT contact output, 5A - 250 VAC, 5A - 30 VDC (resistive load) fuse protected: 5A, 250V, 250V fast fuse
Power Supply		115 VAC ±10% or 230 VAC ±10%; 50/60 Hz
Power Consumption		15 VA
Over Current Protection		400 mA, 250V, fast fuse
Environment		0 to 50°C (32 to 122°F); RH max. 85% non-condensing
Case Material		fiber-reinforced, self-extinguishing ABS
Protection		IP54
Dimensions		221 x 181 x 86 mm (8.7 x 7.1 x 3.4")
Weight		1.6 kg (3.5 lb.)

For a complete list of Solutions, see the end of Conductivity *Section 6*.

Industrial Grade EC/TDS Digital Controllers Wall Mounted with Four-ring Potentiometric Probe

- **Works with four-ring potentiometric probe**
- **Automatic EC calibration**
- **Automatic Temperature Compensation**

HI 24 is a wall mounted, microprocessor-based EC and TDS controller which utilizes a four-ring probe (optional) and Automatic Temperature Compensation to provide very accurate EC and TDS measurements.

Users can choose among models featuring ON/OFF or PID control, analog input and output and double set point. The relay contacts can drive external devices such as pumps or electrovalves. The input signal can come from a probe or a 4-20 mA transmitter.

Models with RS485 output are also available. This option allows the user to insert the controller into a 2-wire RS485 network.

SPECIFICATIONS		HI 24
Range	EC	0.0 to 199.9 µS/cm, 0 to 1999 µS/cm; 00 to 19.99 mS/cm, 0.0 to 199.9 mS/cm
	TDS	0.0 to 100.0 mg/L (ppm), 0 to 1000 mg/L (ppm); 0.00 to 10.00 g/L (ppt), 0.0 to 100.0 g/L (ppt)
	Temperature	-10.0 to 100.0°C
Resolution	EC	0.1 µS/cm, 1 µS/cm; 0.01 mS/cm, 0.1 mS/cm
	TDS	0.1 mg/L (ppm), 1 mg/L (ppm); 0.01 g/L (ppt), 0.1 g/L (ppt)
	Temperature	0.1 °C
Accuracy (@20°C/68°F)		0.5% F.S. (EC / TDS); ±0.5°C (0 to 70°C), ±1°C (outside)
EC Calibration		automatic, 1 point
Temperature Compensation		automatic or manual from -10 to 100°C with Pt100 probe; β adjustable from 0.00 to 10.00%/°C
Probe		four-ring conductivity probe with built-in 3-wire Pt100 temperature sensor or conductivity probe + external Pt100 (not included)
Analog Input		4-20mA
Analog Output		0-10 VDC, 0-5 VDC or 1-5 VDC; 0-1mA, 0-20 mA or 4-20mA
RS485 baud rate		1200, 2400, 4800 and 9600
Relays 1 and 2		electromechanical relay SPDT contact outputs, 5A-250 VAC, 5A - 30 VDC (resistive load) (HI 211YZ and HI 212YZ), fuse protected: 5A, 250V fast fuse
Alarm Relay		electromechanical relay SPDT contact output, 5A - 250 VAC, 5A - 30 VDC (resistive load) fuse protected: 5A, 250V, 250V fast fuse
Power Supply		115 VAC ±10% or 230 VAC ±10%; 50/60 Hz
Power Consumption		15 VA
Over Current Protection		400 mA, 250V, fast fuse
Environment		0 to 50°C (32 to 122°F); RH max. 85% non-condensing
Material		fiber-reinforced, self-extinguishing ABS
Protection		IP54
Dimensions		221 x 181 x 86 mm (8.7 x 7.1 x 3.4")
Weight		1.6 kg (3.5 lb.)

ORDERING INFORMATION

Each **HI 24** model is provided with dual set point and is supplied complete with instructions.

Choose your configuration:

HI 24211-1	dual setpoint, on/off control, analog output, 115V
HI 24211-2	dual setpoint, on/off control, analog output, 230V
HI 24222-1	dual setpoint, on/off and PID controls, RS485 port, 115V
HI 24222-2	dual setpoint, on/off and PID controls, RS485 port, 230V

PROBES

HI 7639	Conductivity probe for high temperature in-line applications

SOLUTIONS

HI 7030L	12880 µS/cm calibration solution, 500 mL
HI 7031L	1413 µS/cm calibration solution, 500 mL
HI 7033L	84 µS/cm calibration solution, 500 mL
HI 7034L	80000 µS/cm calibration solution, 500 mL

For a complete list of Solutions, see the end of Conductivity *Section 6*.

HI 9912

Industrial Grade pH & ORP Controller

HI 9912 is a pH and ORP controller specially designed for pool sanitization.

Two separate set points can be adjusted by the user from 6 to 8 pH and 500 to 900 mV. The relays are activated when the pH exceeds or the mV falls below the relevant set point. HI 9912 accepts any pH and ORP electrode ending in a universal BNC connector. Two independent terminals provide for pH and ORP matching pin/ground probes to extend electrode life and eliminate interference.

HANNA's proportional control allows considerable savings by minimizing the use of chemicals. The settings are made through independent time cycles adjustable from 0 to 90 seconds and two proportional bands from 0 to 200 mV and 0 to 2 pH. Two pumps or electrovalves can be wired directly to the controller and be powered through the terminal.

The HI 9912's alarm is activated when measurements exceed the operator-adjustable thresholds of 50 to 250 mV or 0.5 to 2.5 pH. Should the two max dosing periods of 1 to 10 minutes be exceeded an alarm is activated to signal the abnormality. The alarm is alterable in a normally-closed or a normally-open state and can be turned off during maintenance. A pools status can be ascertained from a distance through dosage and alarm LED's.

HI 9912 comes with extractable terminal modules for quicker and safer wiring. The wiring compartment is protected behind a fire-retardant ABS removable panel.

SPECIFICATIONS	HI 9912
Range	0.00 to 14.00 pH; 0 to 1000 mV
Resolution	0.01 pH; 1 mV
Accuracy (@20°C/68°F)	±0.02 pH; ±5 mV
Input Impedance	10^{12} Ohm
Calibration	manual, two points for pH and 1 point for ORP, through trimmers on the front panel
Set point	two, selectable from 6.00 to 8.00 pH and from 500 to 900 mV
Proportional Control	two independent controls: pH from 0.0 to 2.0 and ORP from 0 to 200 mV with two separate time cycle from 0 to 90 seconds
Alarm Contact	relay can be configured as normally open or normally closed (isolated output max. 2A, max. 240V, resistive load, 1,000,000 strokes). The alarm is activated if pH varies by more than the user selectable interval (0 to 2 pH), and/or ORP varies by more than the user selectable interval (0 to 200 mV) from the set points or due to overdosage
Dosing Terminals	two sets of independent terminals (115 to 240V, max.2A, 1,000,000 strokes) are activated whenever pH exceeds the pH set point or when ORP falls below the mV set point
Power Supply	±10% 115 VAC or 230 VAC; 50/60 Hz
Environment	-10 to 50°C (14 to 122°F); RH max 95% non-condensing
Case Material	fiber-reinforced, self-extinguishing ABS
Dimensions	221 x 181 x 86 mm (8.7 x 7.1 x 3.4")
Weight	1.6 kg (3.5 lb.)

ORDERING INFORMATION

HI 9912 is supplied complete with instructions.

Choose your configuration:

HI 9912-1	115V
HI 9912-2	230V

SOLUTIONS

HI 7004/1L	pH 4.01 buffer solution, 1 L
HI 7007/1L	pH 7.01 buffer solution, 1 L
HI 7010/1L	pH 10.01 buffer solution, 1 L
HI 7020L	ORP test solution @200-275 mV, 500 mL
HI 7021L	ORP test solution @240 mV, 500 mL
HI 7022L	ORP test solution @470 mV, 500 mL

For a complete list of Solutions, see the end of pH *Section 3*.

Industrial Grade pH & Conductivity Controller with Proportional Control of Fertilization

HI 9913 is a 2-in-1 pH and conductivity controller engineered for dosage of fertilizer solutions in hydroponics and agriculture.

HI 9913 measures pH from 0 to 14 and EC from 0 to 10 mS/cm. Two separate set points can be user adjusted from 4 to 7 pH and 0 to 6 mS/cm. The relays are activated when pH exceeds the set point or conductivity falls below the desired value. Two pumps or electrovalves can be wired directly to the controller and be powered through the terminal. The operator can adjust two independent proportional settings for pH and conductivity. The time cycle is adjustable from 0 to 90 seconds, while the proportional band is 0 to 2 for both pH and EC. A matching pin/ground probe can be connected to the appropriate terminals to eliminate interference and prolong the pH electrode's life.

HI 9913 provides for an alarm relay which is activated in several circumstances. These include when the pH is below the set point by the operator-adjustable threshold of 0.5 to 2.5 pH, or EC exceeds the set point by a value in the 0.5 to 2.5 mS/cm range. The alarm goes off if the pH and/or conductivity are not corrected within the operator-determined time frame of 1 to 10 minutes. The alarm can be turned off during maintenance.

Fertilization status can be ascertained from a distance through dosage and alarm LED's.

HI 9913 accepts pH electrodes with BNC and conductivity probes with DIN connectors.

SPECIFICATIONS	HI 9913
Range	0.00 to 14.00 pH; 0.00 to 10.00 mS/cm
Resolution	0.01 pH; 0.01 mS/cm
Accuracy (@20°C/68°F)	±0.02 pH; ±2% f.s. EC
Input Impedance	10^{12} Ohm
Calibration	through "OFFSET" and "SLOPE" trimmers for pH, and "ZERO CAL" and "SLOPE CAL" for Conductivity (EC)
Set point	from 4.0 to 7.0 pH and 1.0 to 4.0 mS/cm (EC)
Temperature Compensation (EC)	automatic, 0 to 50°C (32 to 122°F) with β=2%/°C
Proportional Control	two independent controls: pH from 0.0 to 2.0 and conductivity (EC) from 0.0 to 2.0 mS/cm with two separate time cycles from 0 to 90 seconds
Alarm Contact	terminals can be configured as normally open or normally closed (isolated output max. 2A, max. 240V, resistive load, 1,000,000 strokes). The alarm is activated if pH falls below the set point by the user selectable interval (0.0 to 2.0 pH), or conductivity exceeds the set point by more than the user selectable interval (0 to 2.0 mS/cm) or due to overdosage
Dosing Terminals	two sets of independent terminals (115 to 240V, Max.2A, 1,000,000 strokes) are activated whenever pH exceeds the pH set point and/or conductivity falls below the EC set point
Probe	any combination pH electrode with a universal BNC connector and HANNA conductivity four-ring potentiometric probe with built-in temperature sensor and DIN connector (not included)
Power Supply	±10% 115 VAC or 230 VAC ; 50/60 Hz
Environment	-10 to 50°C (14 to 122°F); RH max 95% non-condensing
Case Material	fiber-reinforced, self-extinguishing ABS
Dimensions	221 x 181 x 86 mm (8.7 x 7.1 x 3.4")
Weight	1.6 kg (3.5 lb.)

ORDERING INFORMATION

HI 9913 is supplied complete with instructions.

Choose your configuration:

HI 9913-1	115V
HI 9913-2	230V

PROBES

HI 3001D	PEI/PVDF body, 20 mm conductivity probe with internal temperature sensor, 1/2" NPT front thread (flow-thru) and 3/4" NPT back thread (submersion/pipe) mounting, DIN connector and 3 m (9.9') cable

SOLUTIONS

HI 7004/1L	pH 4.01 buffer solution, 1 L
HI 7007/1L	pH 7.01 buffer solution, 1 L
HI 7010/1L	pH 10.01 buffer solution, 1 L
HI 7031L	1413 µS/cm calibration solution, 500 mL
HI 7039L	5000 µS/cm calibration solution, 500 mL

For a complete list of Solutions, see the end of pH *Section 3* and Conductivity *Section 6*.

HI 9923

Industrial Grade pH & Conductivity Controller for Boilers and Cooling Towers

HI 9923 is a 2-in-1 pH and conductivity controller engineered for the monitoring of industrial boilers and cooling towers. Two separate set points can be adjusted from 5 to 10 pH and 1 to 6 mS/cm to activate independent relays. Two pumps or electrovalves can be wired directly to the controller and be powered through the terminals. For optimum control, the operator can set the deadband (hysteresis) from 0 to 0.5 mS/cm. Trimmers for the pH and conductivity are positioned on the front panel make for easy calibration. A matching pin/ground probe can be connected to the appropriate terminals to prolong the pH electrode's life.

HI 9923 provides for an alarm relay which is activated when the pH falls below the set point by the operator adjustable threshold of 0.5 to 2.5 pH, or conductivity exceeds the set point by a value in the 0.5 to 2.5 mS/cm range. The alarm is also activated if the pH and/or conductivity are not corrected within the operator determined time frame of 1 to 90 minutes.

This 2-in-1 controller accepts pH electrodes with a BNC connector and a conductivity probe with a DIN connector incorporating a temperature sensor.

SPECIFICATIONS	HI 9923
Range	0.00 to 14.00 pH and 0.00 to 10.00 mS/cm (mmho/cm)
Resolution	0.01 pH and 0.01 mS/cm (mmho/cm)
Accuracy (@20°C/68°F)	±0.02 pH; ±2% f.s. EC
Input Impedance	10^{12} Ohm
Calibration	through "OFFSET" and "SLOPE" trimmers for pH, and "ZERO CAL" and "SLOPE CAL" for conductivity
Hysteresis (EC)	adjustable from 0.0 to 0.5 mS/cm (mmho/cm)
Set point	from 5.0 to 10.0 pH & 1.00 to 6.00 mS/cm (mmho/cm)
Temperature Compensation (EC)	automatic, 0 to 50°C (32 to 1226F) with β=2%/°C
Alarm Contact	terminals can be configured as normally open or normally closed (isolated output max. 2A, max. 240V, resistive load, 1,000,000 strokes). The alarm is activated if pH exceeds the set point by the user selectable interval (0 to 2 pH), or conductivity falls below the set point by more than the user selectable interval (0 to 2.0 mS/ cm) or due to overdosage
Dosing Terminals	two sets of independent terminals (115 to 240V, max. 2A, 1,000,000 strokes) are activated whenever pH falls below the pH set point or the conductivity exceeds the "BLEED" set point
Probe	any combination pH electrode with a universal BNC connector and HANNA conductivity four-ring potentiometric probe with built-in temperature sensor and DIN connector (optional)
Power Supply	±10% 115 VAC or 230 VAC; 50/60 Hz
Environment	-10 to 50°C (14 to 122°F); RH max 95% non-condensing
Case Material	fiber-reinforced, self-extinguishing ABS
Dimensions	221 x 181 x 86 mm (8.7 x 7.1 x 3.4")
Weight	1.6 kg (3.5 lb.)

ORDERING INFORMATION

HI 9923 is supplied complete with instructions.

Choose your configuration:

HI 9923-1	115V
HI 9923-2	230V

PROBES

HI 3001D	PEI/PVDF body, 20 mm conductivity probe with internal temperature sensor, 1/2" NPT front thread (flow-thru) and 3/4" NPT back thread (submersion/pipe) mounting, DIN connector and 3 m (9.9') cable

SOLUTIONS

HI 7004/1L	pH 4.01 buffer solution, 1 L
HI 7007/1L	pH 7.01 buffer solution, 1 L
HI 7031L	1413 µS/cm calibration solution, 500 mL
HI 7039L	5000 µS/cm calibration solution, 500 mL

For a complete list of Solutions, see the end of pH *Section 3* and Conductivity *Section 6*.

HANNA instruments

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Industrial Grade pH & TDS Controller with Proportional Control of Fertilization

HI 9935 is a pH and TDS controller for fertilizer solution dosage in hydroponics.

HI 9935 measures pH from 0 to 14 and TDS from 0 to 1999 mg/L (ppm). Two separate set points can be adjusted from 4 to 7 pH and 900 to 1800 ppm (mg/L). The relays are activated when the pH exceeds the set point or TDS falls below the desired value. Two pumps or electrovalves can be wired directly to the controller and be powered through the terminals. Independent proportional settings for pH and TDS can be adjusted from 0 to 90 seconds, 0 to 2.0 for pH and 0 to 400 mg/L (ppm) for TDS. A matching pin/ground probe can be connected to the appropriate terminals to extend electrode life and eliminate interference.

HI 9935 provides for an alarm relay which is activated in several circumstances. These include when the pH is below the set points in the operator adjustable threshold of 0.5 to 2.5 pH, or similarly, TDS exceeding the set point by a value in the 50 to 450 mg/L (ppm) range. The alarm also goes off if the pH and/or TDS are not corrected within the operator determined time frame of 1 to 10 minutes. Moreover, the alarm configuration is switchable from a normally-closed to a normally-open state or turned off during maintenance. The fertilization status can be ascertained from a distance through dosage and alarm LED's.

HI 9935 accepts pH electrodes with a BNC connector and TDS probes with a DIN connector.

SPECIFICATIONS	HI 9935
Range	0.00 to 14.00 pH; 0 to 1999 ppm (mg/L)
Resolution	0.01 pH; 1 ppm (mg/L)
Accuracy (@20°C/68°F)	±0.02 pH; ±2% f.s. TDS
Input Impedance	10^{12} Ohm
Calibration	through "OFFSET" and "SLOPE" trimmers for pH, and "ZERO CAL" and "SLOPE CAL" for TDS
Set point	from 4.0 to 7.0 pH and 900 to 1800 ppm (mg/L)
TDS Conversion Factor	0.65 mg/L (ppm) = 1 µS/cm
Temperature Compensation (TDS)	automatic, 0 to 50°C (32 to 122°F) with β = 2%/°C
Proportional Control	two independent controls: pH from 0.0 to 2.0 and TDS from 0.0 to 400 ppm (mg/L) with two separate time cycles from 0 to 90 seconds
Alarm Contact	terminals can be configured as normally open or normally closed (isolated output max. 2A, max. 240V, resistive load, 1,000,000 strokes). The alarm is activated if pH falls below the set point by the user selectable interval (0 to 2 pH),or TDS exceeds the set point by more than the user selectable interval (0 to 400 ppm) or due to overdosage
Dosing Terminals	two sets of independent terminals (115 to 240V, max. 2A, 1,000,000 strokes) are activated whenever pH exceeds the pH set point and for the TDS falls below the TDS set point
Probe	any combination pH electrode with a universal BNC connector and HANNA TDS four-ring potentiometric probe with built-in temperature sensor and DIN connector (not included)
Power Supply	±10% 115 VAC or 230 VAC; 50/60 Hz
Environment	-10 to 50°C (14 to 122°F); RH max 95% non-condensing
Case Material	fiber-reinforced, self-extinguishing ABS
Dimensions	221 x 181 x 86 mm (8.7 x 7.1 x 3.4")
Weight	1.6 kg (3.5 lb.)

ORDERING INFORMATION

HI 9935 is supplied complete with instructions.

Choose your configuration:

HI 9935-1	115V
HI 9935-2	230V

PROBES

HI 3001D	PEI/PVDF body, 20 mm conductivity probe with internal temperature sensor, 1/2" NPT front thread (flow-thru) and 3/4" NPT back thread (submersion/pipe) mounting, DIN connector and 3 m (9.9') cable

SOLUTIONS

HI 7004/1L	pH 4.01 buffer solution, 1 L
HI 7007/1L	pH 7.01 buffer solution, 1 L
HI 70442L	1500 mg/L (ppm) calibration solution, 500 mL

For a complete list of Solutions, see the end of pH *Section 3* and Conductivity *Section 6*.

HI 9914

Industrial Grade Fertigation Controller for Process Control Requirements

HI 9914 is a wall mounted fertigation controller, designed to meet specific process control requirements in agricultural, horticultural and hydroponics applications. The controller is provided with two measuring channels, one for pH and one for conductivity. The readings are displayed simultaneously on two backlit, independent LCDs.

The conductivity probe is designed with a built-in temperature sensor which allows the controller to automatically compensate for the temperature effect. The differential input and the use of a matching pin prevent grounding problems and thus ensure longer life to the pH electrode.

The controller includes two regulators for pH and conductivity, that can be adjusted from the front panel by setting two independent thresholds. The conductivity and pH controls are time separated and have a timed operation mode to avoid overdosing of fertilizer or acid. The controller status is indicated by LEDs on the front panel. Moreover, the equipment is provided with a three-level sensor, to control the water level in mixing tanks, the alarm condition and irrigation sequences.

The instrument also features an alarm system, which is activated when an unusual working condition occurs. A humidity detector can be used to stop the controller if any leakage is detected. Water nozzle, circulation pump, feeding pump and alarm are equipped with relays.

ORDERING INFORMATION

HI 9914 is supplied complete with instructions.

Choose your configuration:

HI 9914-1 115V
HI 9914-2 230V

PROBES

HI 3001D PEI/PVDF body, 20 mm conductivity probe with internal temperature sensor, 1/2" NPT front thread (flow-thru) and 3/4" NPT back thread (submersion/pipe) mounting, DIN connector and 3 m (9.9') cable

SOLUTIONS

HI 7004L pH 4.01 buffer solution, 500 mL
HI 7007L pH 7.01 buffer solution, 500 mL
HI 7010L pH 10.01 buffer solution, 500 mL
HI 7031L 1.41 mS/cm calibration solution, 500 mL
HI 7039L 5.00 mS/cm calibration solution, 500 mL

SPECIFICATIONS	HI 9914
Range	0.00 to 10.00 mS/cm; 0.00 to 14.00 pH
Resolution	0.01 mS/cm; 0.01 pH
Accuracy (@20°C/68°F)	±5% f.s. EC; ±0.02 pH
Calibration	**EC:** manual, 1 point with slope trimmer (80 to 120%) on the front panel; **pH:** manual, 2 point, with offset (±2 pH) and slope (80 to 120%) trimmers
Set point	**EC:** adjustable, from 0.50 to 10.00 mS/cm; **pH:** adjustable, from 0.5 to 14.0 pH
Temperature Compensation	**EC:** automatic from 0 to 50°C
Analog Output	0-5V±5% (0.5V/mS); 0-7 V±5% (0.5 V/pH)
Controller Output	**EC:** 2A, 220V relay; **pH:** 2A, 220V relay
Timer	adjustable, from 1 to 10 minutes within a 15-minutes-time frame
Feed OK Output	12V, 15 mA current source
Humidity Sensor	activated if resistivity is below 220Ω
Water Nozzle Output	2A, 220V relay
Circulation Pump Output	2A, 220V relay
Feeding Pump Output	2A, 220V relay
Alarm Output	2A, 220V relay
Water Level Inputs	contact type water level sensors
User Input	contact type switch
External FILL Button	contact type push-button
Power Supply	±10% 115 VAC or 230 VAC; 50/60 Hz
Environment	-10 to 50°C (14 to 122°F); RH max 95% non-condensing
Case Material	fiber-reinforced, self-extinguishing ABS
Dimensions	221 x 181 x 90 mm (8.7 x 7.1 x 3.5")
Weight	1.75 kg (3.9 lb.)

For a complete list of Solutions, see the end of pH *Section 3* and Conductivity *Section 6*.

Industrial Grade pH Controller with Single Set point and Proportional Dosage

HI 9910 is a pH controller with a single set point for proportional dosage of acid or alkaline solutions. Any pH electrode ending in a BNC connector can be directly attached to the controller. The proportional control can be fine tuned through two dials on the front panel. The time cycle is adjustable from 0 to 90 seconds and the proportional band from 0.0 to 2.0 pH. Coarse and fine as well as offset and slope trimmers make accurate setting and calibration easy and convenient. A pump or electrovalve can be wired directly to the controller and be powered through the terminals.

The HI 9910 also provides for an alarm relay. The alarm is activated when the measurements stray away from the set point by a predetermined value in the 0.5 to 2.5 pH range. A maximum dosing time from 1 to 10 minutes can also be set, after which the alarm is activated to warn of an abnormality. The alarm can be configured in either normally-closed or normally-opened state. HI 9910 also provides an isolated output signal which is user selectable between 0-20 or 4-20 mA. A dial on the front panel renders manual temperature compensation fast and easy.

For automatic temperature compensation, hook up a three wire Pt100 to the controller. To speed up wiring, the HI 9910 comes with extractable terminal modules. Once wired up, the compartment containing the connections is protected behind a fire-retardant ABS panel. Several LED's show whether the set point or alarm relays are activated from a distance.

SPECIFICATIONS	HI 9910
Range	0.00 to 14.00 pH
Resolution	0.01 pH
Accuracy (@20°C/68°F)	±0.02 pH
Calibration	through "OFFSET" and "SLOPE" trimmers (max. ±1.5 pH for offset and 80% to 110% for slope)
Temperature Compensation	automatic from 0 to 50°C with Pt100 probe or manual from -10 to 80°C
Set point	from 0.00 to 14.00 pH with "COARSE" and "FINE" trimmers with "ACID" or "ALK" (alkaline) selection
mA Output	user selectable 0 to 20 mA or 4 to 20 mA over the 0-14 pH range with isolated output
Proportional Control	pH is user adjustable from 0.0 to 2.0 and time cycle from 0 to 90 seconds
Alarm Contact	terminals can be configured as normally open or normally closed (isolated output max. 2A, max. 240V, resistive load, 1,000,000 strokes). The alarm is activated if pH varies by more than user selectable interval (0 to 2 pH) from set point or due to overdosage
Dosing Terminals	relay terminals (115 to 240V, max.2A,1,000,000 strokes) are activated when pH exceeds the set point with "ACID" dosage or falls below the set point with "ALK" selection (alkaline dosage)
Power Supply	±10% 115 VAC or 230 VAC; 50/60 Hz
Environment	-10 to 50°C (14 to 122°F); RH max 95% non-condensing
Case Material	fiber-reinforced, self-extinguishing ABS
Dimensions	221 x 181 x 86 mm (8.7 x 7.1 x 3.4")
Weight	1.6 kg (3.5 lb.)

ORDERING INFORMATION

HI 9910 is supplied complete with instructions.

Choose your configuration:

HI 9910-1	115V
HI 9910-2	230V

SOLUTIONS

HI 7004L	pH 4.01 buffer solution, 500 mL
HI 7007L	pH 7.01 buffer solution, 500 mL
HI 7010L	pH 10.01 buffer solution, 500 mL

ACCESSORIES

HI 8427	pH / ORP electrode simulator
HI 931001	pH / ORP electrode simulator with display

For a complete list of Solutions, see the end of pH *Section 3* and Conductivity *Section 6*.

HI 9911

Industrial Grade pH Controller with Dual Set point and Proportional Dosage

HI 9911 is a pH controller with two set points for proportional dosage of acidic and alkaline solutions. Through two sets of coarse and fine trimmers, the set points can be accurately fine tuned to any value in the 0.00 to 14.00 range. Likewise, two trimmers on the front panel allow for easy calibration. HI 9911 accepts any pH electrode ending in a BNC connector. The proportional control can be adjusted to match your application through the time cycle from 0 to 90 seconds and the proportional band of 0 to 2 pH. Two pumps or valves can be wired directly to the controller and be powered through the terminals.

HI 9911 provides for two types of alarms. The alarm relay is activated when the measurements are away from the set points by more than a predetermined value in the 0.5 to 2.5 pH range or when one of the two independently adjustable maximum dosing times is exceeded. The alarm can be configured in either normally-open or normally-closed state and turned off during maintenance. HI 9911 also provides for a user selectable 0-20 or 4-20 mA isolated recorder output.

You can choose from manual or automatic temperature compensation with an optional three-wire Pt100 probe. HI 9911 comes with extractable terminal modules. Once wired, the compartment containing the connections is closed behind a fire-retardant ABS removable panel. As with HI 9910, a matching pin/ground probe can be hooked up to the controller to eliminate interference.

ORDERING INFORMATION

HI 9911 is supplied complete with instructions.

Choose your configuration:

HI 9911-1	115V
HI 9911-2	230V

SOLUTIONS

HI 7004L	pH 4.01 buffer solution, 500 mL
HI 7007L	pH 7.01 buffer solution, 500 mL
HI 7010L	pH 10.01 buffer solution, 500 mL

ACCESSORIES

HI 8427	pH / ORP electrode simulator
HI 931001	pH / ORP electrode simulator with display

SPECIFICATIONS	HI 9911
Range	0.00 to 14.00 pH
Resolution	0.01 pH
Accuracy (@20°C/68°F)	±0.02 pH
Calibration	through "OFFSET" and "SLOPE" trimmers (max. ±1.5 pH for offset and 80% to 110% for slope)
Temperature Compensation	manual from -10 to 80 °C (14 to 176 °F) or automatic with three-wire Pt100 probe from 0 to 50 °C (32 to 122 °F)
Set point	from 0.00 to 14.00 pH with 2 trimmers: "COARSE" for approx. regulation, "FINE" for fine tuning
mA Output	user selectable 0 to 20 mA or 4 to 20 mA over the 0-14 pH range with isolated output
Proportional Control	pH is user adjustable from 0.0 to 2.0 and time cycle from 0 to 90 seconds
Alarm Contact	terminals can be configured as normally open or normally closed (isolated output max. 2A, max. 240V, resistive load, 1,000,000 strokes). The alarm is activated if pH varies by more than user selectable interval (0 to 2 pH) from set point or due to overdosage
Dosing Terminals	two sets of independent relay terminals (115 to 240V, max.2A, 1,000,000 strokes) are activated whenever pH exceeds the "ACID" set point or falls below the "ALK" set point (alkaline dosage)
Power Supply	±10% 115 VAC or 230 VAC; 50/60 Hz
Environment	-10 to 50°C (14 to 122°F); RH max 95% non-condensing
Case Materials	fiber-reinforced, self-extinguishing ABS
Dimensions	221 x 181 x 86 mm (8.7 x 7.1 x 3.4")
Weight	1.6 kg (3.5 lb.)

For a complete list of Solutions, see the end of pH *Section 3*.

Industrial Grade ORP Controller with Proportional Dosage

HI 9920 is an ORP controller with a single set point for user selectable dosage of reducing or oxidizing solutions. Any ORP electrode ending in a BNC connector can be directly attached to the controller. With proportional control, you can fine tune your treatment plant and minimize the use of chemicals. The proportional setting can be adjusted through the time cycle from 0 to 90 seconds and the band from 0 to 200 mV. The set point can be accurately adjusted through coarse and fine trimmers. A pump or electrovalve can be wired directly to the controller and be powered through the terminal.

In addition to the set point relay, HI 9920 also provides for an alarm relay. The alarm is activated when the measurements exceed the operator adjustable threshold of 50 to 250 mV from set point. For extra security, a maximum dosing time from 1 to 10 minutes can also be set, after which the alarm is activated to signal an abnormality. The alarm configuration is alterable in a normally-closed or normally-open state to accommodate Fail Safe installations.

Any recorder accepting a 0-20 or 4-20 mA output can also be hooked up to the controller. Users can see the controller's status, even from a distance, by observing the dosage or alarm LED's. To speed up wiring, HI 9920 comes with extractable terminal modules. Once wired up, the compartment containing the connections is protected behind a fire-retardant ABS removable panel.

HI 9920 also provides for a matching pin/ground probe to eliminate interference and prolong the electrode's life.

SPECIFICATIONS	HI 9920
Range	-500 to 1500 mV
Resolution	1 mV
Accuracy (@20°C/68°F)	±5 mV
Calibration	through "CAL" trimmer
Set point	from -500 to 1500 mV with "COARSE" and "FINE" 2 trimmers with "OXID" or "RED" selection for oxidizing or reducing dosage
mA Output	user-selectable 0 to 20 mA or 4 to 20 mA over the -500 to 1500 mV range with isolated output
Proportional Control	ORP setting is adjustable from 0 to 200 mV and time cycle from 0 to 90 seconds
Alarm Contact	normally open or normally closed isolated outputs (max. 2A, max. 240V, resistive load, 1,000,000 strokes). Terminals are activated when the ORP value varies by more than the user selectable interval (0 to 200mV) from set point, or due to overdosage
Dosing Terminals	relay terminals (115 to 240V, max.2A,1,000,000 strokes) are activated when mV exceeds the set point with "RED" dosage or when mV falls below the set point with "OXID" selection
Power Supply	110/115 VAC or 220/240 VAC; 50/60 Hz
Environment	-10 to 50°C (14 to 122°F); RH max 95% non-condensing
Case Material	fiber-reinforced, self-extinguishing ABS
Dimensions	221 x 181 x 86 mm (8.7 x 7.1 x 3.4")
Weight	1.6 kg (3.5 lb.)

ORDERING INFORMATION

HI 9920 is supplied complete with instructions.

Choose your configuration:

HI 9920-1	115V
HI 9920-2	230V

SOLUTIONS

HI 7020L	ORP test solution @200-275 mV, 500 mL
HI 7021L	ORP test solution @240 mV, 500 mL
HI 7022L	ORP test solution @475 mV, 500 mL
HI 7091L	ORP reducing pretreatment solution, 500 mL
HI 7092L	ORP oxidizing pretreatment solution, 500 mL

ACCESSORIES

HI 8427	pH/ORP electrode simulator
HI 931001	pH/ORP electrode simulator with display

For a complete list of Solutions, see the end of pH *Section 3*.

HI 9931

Industrial Grade EC Controller with Proportional Fertilizer Dosing for Hydroponics Applications

HI 9931 is a wall mounted meter that measures and controls conductivity in the 0 to 10 mS/cm range. A single set point allows for proportional dosage of fertilizer solutions. The proportional settings can be fine tuned through two conveniently positioned dials on the front panel. The time cycle is adjustable from 0 to 90 seconds and the proportional band from 0 to 1.6 mS/cm. Calibration and set points have a coarse and fine tuning trimmers. A pump or electrovalve can be wired directly to the controller and be powered through the terminals.

HI 9931 also provides for an alarm relay which is activated when the measurements exceed the set point by a user selectable margin from 0.5 to 2.5 mS/cm. The alarm also triggers if, due to a malfunction, the continuous dosing time exceeds the operator adjustable period of 1 to 10 minutes. The alarm can be configured in either normally closed or open position and turned off during maintenance. HI 9931 also provides an isolated output signal which is user selectable between 0-20 or 4-20 mA.

HANNA four-ring conductivity probes ending in a DIN connector can be quickly attached to the HI 9931. Readings are automatically compensated for the effects of temperature in the 0 to 50°C (32 to 122°F) range. For quick and easy wiring, HI 9931 comes with extractable terminal modules. Several LED's show whether the set point or alarm relays have been activated.

ORDERING INFORMATION

HI 9931 is supplied complete with instructions.

Choose your configuration:

HI 9931-1	115V
HI 9931-2	230V

PROBES

HI 3001D PEI/PVDF body, 20 mm conductivity probe with internal temperature sensor, 1/2" NPT front thread (flow-thru) and 3/4" NPT back thread (submersion/pipe) mounting, DIN connector and 3 m (9.9') cable

SOLUTIONS

HI 7031L	1413 µS/cm calibration solution, 500 mL
HI 7039L	5000 µS/cm calibration solution, 500 mL

SPECIFICATIONS	HI 9931
Range	0.00 to 10.00 mS/cm
Resolution	0.01 mS/cm
Accuracy (@20°C/68°F)	±2% f.s.
Calibration	through "ZERO CAL" and "SLOPE CAL" trimmers
Set point	from 0 to 10.00 mS/cm
Temperature Compensation	automatic, 0 to 50°C (32 to 122°F) with β = 2%/°C
Recorder Output	selectable at 0-20 mA or 4-20 mA (isolated)
Proportional Control	conductivity from 0.0 to 1.6 mS/cm and time cycle from 0 to 90 seconds
Alarm Contact	terminal can be configured as normally open or normally closed (isolated output max. 2A, max. 240V, resistive load, 1,000,000 strokes). The alarm is activated if conductivity exceeds by more than the user selectable interval (0 to 2.0 mS/cm) from the set point or due to overdosage
Dosing Terminals	relay (115 to 240V, max.2A, 1,000,000 strokes) is activated whenever conductivity falls below the set point
Probe	four-ring potentiometric with built-in temperature sensor and DIN connector (not included)
Power Supply	±10% 115 VAC or 230 VAC; 50/60 Hz
Environment	-10 to 50°C (14 to 122°F); RH max 95% non-condensing
Case Materials	fiber-reinforced, self-extinguishing ABS
Dimensions	221 x 181 x 86 mm (8.7 x 7.1 x 3.4")
Weight	1.6 kg (3.5 lb.)

For a complete list of Solutions, see the end of pH *Section 3*.

Industrial Grade TDS Controller with Proportional Fertilizer Dosing for Hydroponics Applications

HI 9934 is a wall mounted meter that controls TDS in the 0 to 1999 ppm (mg/L) range through a single set point for dosage of fertilizers. The proportional control can be fine tuned through the time cycle between 0 to 90 seconds and the proportional band from 0 to 400 ppm. Coarse and fine as well as a slope trimmer make for an accurate setting and calibration. A pump or electrovalve can be powered through the terminal. In addition to the set point relay, HI 9934 also provides for an alarm relay. The alarm is activated when the measurements exceed the set point by a user selectable margin in the 50 to 450 mg/L (ppm) range. The alarm also triggers if, due to a malfunction, the continuous dosing time exceeds the operator adjustable period of 1 to 10 minutes. The alarm can be configured in either normally-closed or normally-open position and turned off during maintenance.

HI 9934 also provides an isolated output signal which is user selectable between 0-20 or 4-20 mA.

HANNA instruments four-ring TDS probes with incorporated temperature sensor and DIN connector can be quickly attached to the controller. Readings are automatically compensated for temperature variations in the 0 to 50°C (32 to 122°F) range.

The extractable terminal wiring is through the side of the meter with washers and grommets. The compartment containing the connections is enclosed behind a fire-retardant ABS panel.

SPECIFICATIONS	HI 9934
Range	0 to 1999 ppm (mg/L)
Resolution	1 ppm (mg/L)
Accuracy (@20°C/68°F)	±2% f.s.
Calibration	through "ZERO CAL" and "SLOPE CAL" trimmers
Set point	from 0 to 1999 ppm (mg/L)
TDS Conversion factor	0.65 mg/L (ppm) = 1 µS/cm
Temperature Compensation	automatic, 0 to 50°C (32 to 122°F) with β = 2%/°C
Recorder Output	selectable at 0-20 mA or 4-20 mA (isolated)
Proportional Control	TDS from 0 to 400 ppm and time cycle from 0 to 90 seconds
Alarm Contact	terminals can be configured as normally open or normally closed (isolated output max. 2A, max. 240V, resistive load, 1,000,000 strokes). The alarm is activated if TDS exceeds by more than the user- selectable interval (0 to 400 ppm) from the set point or due to overdosage
Dosing Terminals	relay (115 to 240V, max.2A, 1,000,000 strokes) are activated whenever TDS falls below the set point
Probe	four-ring potentiometric with built-in temperature sensor (not included)
Power Supply	±10% 115 VAC or 230 VAC; 50/60 Hz
Environment	-10 to 50°C (14 to 122°F); RH max 95% non-condensing
Case Material	fiber-reinforced, self-extinguishing ABS
Dimensions	221 x 181 x 86 mm (8.7 x 7.1 x 3.4")
Weight	1.6 kg (3.5 lb.)

ORDERING INFORMATION

HI 9934 is supplied complete with instructions.

Choose your configuration:

HI 9934-1 115V
HI 9934-2 230V

PROBES

HI 3001D PEI/PVDF body, 20 mm TDS probe with internal temperature sensor, 1/2" NPT front thread (flow-thru) and 3/4" NPT back thread (submersion/pipe) mounting, DIN connector and 3 m (9.9') cable

SOLUTIONS

HI 70442L 1500 mg/L (ppm) calibration solution, 500 mL

For a complete list of Solutions, see the end of Conductivity *Section 6*.

Digital and Analog Transmitters for pH, ORP and Conductivity

Two-Wire pH & ORP Transmitters

Two-wire transmitters are widely used for process control in industry. These instruments are particularly useful in industrial conditions where electrical interference is an important factor. By galvanically isolating the signals, any interference created is prevented from reaching the transmitter. One usually associates industrial environments with corrosive conditions, therefore any instrumentation used must be resistant to liquids and corrosion. HANNA transmitters meet all of these criteria and they only use two wires which reduces costs and eliminates the need for an expensive coaxial cable. Two-wire transmitters are ideal when used in remote applications that do not have AC power available.

As technology advances it is becoming more important to monitor certain processes closely, particularly from remote locations. Computers are commonly used to receive signals from transducers that have travelled a great distance (up to 300 meters, 1000'). When transmitting signals over such a distance, it is likely that a substantial portion of the signal will be absorbed by the resistance of the lines. Considerable differences in ground potentials and between the signal source and load, are inherent to long lines.

Powering the system with an AC supply is beneficial in eliminating this problem. One of the two wires is power ground return, while the other is the power supply. The power supply line acts in a dual manner, as a power supply, and as a signal carrier. This allows the transmitter to operate with 2 wires.

The signal current from the process controller is normally 4 to 20 mA. When the load is connected with the power supply return line, the signal current will be proportional in the range of 4 to 20 mA.

The ability to use a thinner gauge of wire greatly reduces the costs associated with the wiring of remote transmitters. Typically, a heavy gauge of shielded cable is required in order to minimize the ambient electrical noise from AC power sources, interference from electrical equipment, or various other sources of noise.

Thin wire will also provide better operation when the transmitter current output is a 4 to 20 mA signal. All of these features and many more, give HANNA transmitters the versatility to be used over long distances in almost any process control application.

Conductivity, Four-Ring Technology

HANNA conductivity transmitters use four-ring Potentiometric probes. As opposed to the more widely used 2-electrode Amperometric method, the four-ring Potentiometric method provides the highest accuracy and repeatability attainable. When measuring liquids that have a high conductivity, the 2-electrode system is susceptible to polarization. This condition makes it exceptionally difficult to obtain measurements with any accuracy. The polarization is directly related to the electrode's current load, and will cause a considerable, nonlinear drop in the voltage. As a result, the solution around the electrode simulates a low conductivity condition.

Four-ring electrodes eliminate the polarization effect by splitting the four rings into 2 current and 2 voltage electrodes. When placed in a conductive liquid, the 2 current electrodes take the alternating voltage and create a current. This alternating current produces a buffer field from which polarization is absent. The voltage is then measured in this field assuring no altered readings.

pH and EC Transmitter with Galvanic Isolated Output

- **Accepts pH electrode and EC probe signals simultaneously**
- **Direct probe connection**

  Assures a positive electrical connection eliminating signal loss
- **Automatic Temperature Compensation** (EC only)

The HI 98143 series is designed to accept signals directly from a pH electrode and a conductivity probe at the same time.

Direct connection of the probes to the transmitter assure a positive electrical connection with no signal loss. This transmitter is ideal for remote process control applications.

Four models are available, transmitting a 0-1 V, 0-4 V or 4-20 mA signal. The output signals are proportional to the input signals but independent of changes in load or cable capacitance. Compensation for the effects of temperature for EC measurements are performed by the transmitters' Automatic Temperature Compenstion circuitry.

The transmitter can be connected to any pH or conductivity controller, recorder, PC or any data monitoring device that accepts 0 to 1 V, 0 to 4 V or 4 to 20 mA input. HI 98143 is an ideal tool for applications that require the monitoring of both pH and conductivity at the same time.

specifically designed to be used with HI 8000 series fertigation controllers

SPECIFICATIONS	HI 98143-01	HI 98143-04	HI 98143-20	HI 98143-22
Range	0 to 14 pH; 0 to 10 mS/cm			
Accuracy (@20°C/68°F)	±0.5% f.s. pH; ±2% f.s. EC			
Calibration	manual, 2 point, through trimmers: **pH:** offset and slope trimmers; **EC:** 0 and 5 mS/cm trimmers			
Temperature Compensation (EC)	automatic, 0 to 60°C (32 to 132°F) with β=2%/°C			
Output (isolated)	0-1 V	0-4 V	4-20 mA	4-20 mA
pH Electrode	HI 1001 pH electrode (suggested, not included), HI 1283 matching pin (not included)			
EC Probe	HI 3001 (not included) with cell constant 2.1			
Casing	IP54			
Power Supply	12-24 VDC			
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing			
Dimensions	160 x 105 x 31 mm (6.3 x 4.1 x 1.2")			
Weight	280 g (9.9 oz.)			

ORDERING INFORMATION

All **HI 98143** models are supplied with instructions.

Choose your configuration:

HI 98143-01	pH/EC transmitter with 0-1 V isolated output
HI 98143-04	pH/EC transmitter with 0-4 V isolated output
HI 98143-20	pH/EC transmitter with 4-20 mA isolated output
HI 98143-22	pH/EC transmitter with 4-20 mA isolated output (specific for HI 8000 controllers)

PROBES

HI 3001	Conductivity probe for in-line or submersion applications

ACCESSORIES

HI 7004/1L	pH 4.01 buffer solution, 1 L
HI 7007/1L	pH 7.01 buffer solution, 1 L bottle
HI 7010/1L	pH 10.01 buffer solution, 1 L bottle
HI 7039L	5000 µS/cm calibration solution, 500 mL
HI 7855/1	1 m (3.3') connection cable with BNC and screw connectors

For a complete list of Solutions, see the end of pH *Section 3* and Conductivity *Section 6*.

HI 8614N • HI 8614LN

pH Transmitters with 4-20 mA Galvanically Isolated Output

- **Water resistant**
- **Loop powered**
- **Automatic Temperature Compensation**
- **Available with or without LCD**

The HI 8614N is a water-resistant pH transmitter is designed to be used with a standard high impedance pH probe with BNC connector. The signal is then processed by a special high-impedance amplifier, which transmits an output current directly proportional to the input signal but independent of changes in load or cable capacitance.

Calibration is performed by the adjustment of two independent trimmers – slope and offset.

Temperature compensation is performed by the transmitter's ATC (Automatic Temperature Compensation) circuitry when measurements are taken with a temperature probe attached; if ATC is not required, it is also possible to substitute a fixed resistor for the temperature probe. The transmitter can be connected to HANNA controller HI 8510, HI 8710 or HI 8711, recorders, computers or any data monitoring device that accepts 4 to 20 mA input.

HI 8614"L" versions allow easy verification and monitoring of measured values and is easier to calibrate and maintain.

HI 8614LN with LCD

HI 8614N without LCD

ORDERING INFORMATION

HI 8614N and **HI 8614LN** (with display) is supplied with instructions.

ELECTRODES

HI 76608	Temperature probe with 3 m (9.9') cable

SOLUTIONS

HI 7004L	pH 4.01 buffer solution, 500 mL
HI 7007L	pH 7.01 buffer solution, 500 mL
HI 7010L	pH 10.01 buffer solution, 500 mL

ACCESSORIES

HI 6054B	In-line electrode holder
HI 931002	4-20 mA simulator
HI 931001	pH / ORP electrode simulator with display

SPECIFICATIONS	HI 8614N	HI 8614LN
Range	0.00 to 14.00 pH; 4-20 mA	
Resolution (for "L" models)	0.01 pH; 0.01 mA	
Accuracy (@20°C/68°F)	±0.02 pH; ±0.02 mA	
Calibration	offset: ±2 pH; ±2.2 mA; slope: 86 to 116%; ±0.5 mA	
Temperature Compensation	fixed or automatic from 0 to 100°C (32 to 212°F) with HI 76608 probe	
Input Impedance	10^{12} Ohm	
Recorder Output	4-20 mA (isolated)	
Protection	IP65	
Power Supply	18-30 VDC	20-36 VDC
LCD display	-	yes
Load	max 500 Ohm	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	165 x 110 x 71 mm (6.5 x 4.3 x 2.8")	
Weight	1 kg (2.2 lb.)	

For a complete list of Solutions, see the end of pH *Section 3*.

ORP Transmitters with 4-20 mA Galvanically Isolated Output

HI 8615LN with LCD

HI 8615N without LCD

- **Universal BNC connector for quick connections**
- **Rugged ABS casing**
- **Loop powered**
- **Available with or without LCD**

The HI 8615 has been designed for transmitting ORP measurements from remote locations.

This improved transmitter features two controls (one for 4 mA and one for 20 mA) to compensate for electronic drift and ambient temperature.

The HI 8615 uses a universal BNC socket for quick and secure connection of any ORP electrode with a BNC connector.

An IP65 rating and a rugged ABS casing provide optimum protection even in harsh environments making this instrument ideal for chromium hexavalent reductions and water sanitation. The transmitter can be connected to HANNA meters HI 8512, HI 8720 or any recorders, PC's or data monitors that accept 4 to 20 mA input.

HI 8615"L" versions allow easy verification and monitoring of measured values and is easier to calibrate and maintain.

SPECIFICATIONS	HI 8615N	HI 8615LN
Range	±1999 mV; 4-20 mA	
Resolution	1 mV; 0.01 mA	
Accuracy (@20°C/68°F)	±5 mV; ±0.02 mA	
Calibration	offset: ±100 mV; ±0.8 mA slope: 90 to 110%; ±0.8 mA	
Input Impedance	10^{12} Ohm	
Recorder Output	4-20 mA (isolated)	
Protection	IP65	
Power Supply	18-30 VDC	20-36 VDC
LCD display	-	yes
Load	max 500 Ohm	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	165 x 110 x 71 mm (6.5 x 4.3 x 2.8")	
Weight	1 kg (2.2 lb.)	

ORDERING INFORMATION

HI 8615N and **HI 8615LN** (with display) is supplied with instructions.

SOLUTIONS

HI 7020L	ORP test solution @200-275 mV,
HI 7091L	Reducing pretreatment ORP solution, 500 mL
HI 7092L	Oxidizing pretreatment ORP solution, 500 mL

ACCESSORIES

HI 6054B	In-line electrode holder
HI 8427	pH / ORP electrode simulator
HI 931001	pH / ORP electrode simulator with display

For a complete list of Solutions, see the end of pH *Section 3*.

HI 8936 Series

Conductivity Transmitters to use with Four-ring Probe

- **Utilizes HANNA's potentiometric four-ring conductivity probe**
- **Automatic Temperature Compensation**
- **Direct probe connection eliminates signal loss**
- **Available with or without LCD**
- **Use in conjunction with HI 7638 or HI 3001 platinum conductivity probes**

HI 8936 is our redesigned conductivity transmitter that utilizes a four-ring potentiometric probe. This probe is virtually immune to contamination by unclean solutions. This allows the transmitter to operate at peak performance at all times.

Temperature effects are compensated for by utilizing both the built-in temperature sensor on the probe and the transmitter's ATC circuitry with a β of 2%/°C.

Direct connection of the probe to the transmitter assures a positive electrical connection with no signal loss over long distances.

HI 8936"L" versions allow easy verification and monitoring of measured values and is easier to calibrate and maintain.

The HI 8936 series requires external power to the 4-20 mA current loop.

ALN, BLN, CLN, and DLN with LCD

AN, BN, CN, and DN
without LCD

The HI 8936 series should be used in conjunction with the HI 7635 in-line probe or HI 7638 platinum probe (see Process Electrodes and Probes).

ORDERING INFORMATION

All **HI 8936** models are supplied complete with instructions.

SOLUTIONS

HI 7030L	12880 µS/cm calibration solution, 500 mL
HI 7031L	1413 µS/cm calibration solution, 500 mL
HI 7033L	84 µS/cm calibration solution, 500 mL
HI 7034L	80000 µS/cm calibration solution, 500 mL
HI 7035L	111800 µS/cm calibration solution, 500 mL
HI 7039L	5000 µS/cm calibration solution, 500 mL

ACCESSORIES

HI 731326	Calibration screwdrivers (20)
HI 779/15	6-wire cable (15 m/49.2' roll)
HI 8733	Portable conductivity meter with ATC

SPECIFICATIONS	HI 8936AN HI 8936ALN	HI 8936BN HI 8936BLN	HI 8936CN HI 8936CLN	HI 8936DN HI 8936DLN
Range	0.0 to 199.9 mS/cm	0.00 to 19.99 mS/cm	0 to 1999 µS/cm	0.0 to 199.9 µS/cm
Resolution	0.1 mS/cm	0.01 mS/cm	1 µS/cm	0.1 µS/cm
Accuracy (@20°C/68°F)	±2% f.s. (excluding probe error)			
Calibration	manual, two point, with offset and slope trimmers			
Temperature Compensation	fixed or automatic from 0 to 50°C (32 to 122°F) with β=2%/°C			
Conductivity Probe	HI 7635 for in-line applications (not included)			
Recorder Output	4-20 mA, not isolated, max 500 Ohm			
Protection	IP65			
Power Supply	without LCD: 12-30 VDC; with LCD: 17-36 VDC			
LCD Display	HI 8936AN: no HI 8936ALN: yes	HI 8936BN: no HI 8936BLN: yes	HI 8936CN: no HI 8936CLN: yes	HI 8936DN: no HI 8936DLN: yes
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing			
Dimensions	165 x 110 x 71 mm (6.5 x 4.3 x 2.8")			
Weight	1 kg (2.2 lb.)			

For a complete list of Solutions, see the end of Conductivity *Section 6*.

4-20 mA Amperometer, Simulator and Calibrator

HI 931002 is a portable instrument designed by the Plant Repair and Maintenance Operator for the MRO! This portable simulator can monitor and regulate 4-20 mA from practically any process meter with or without a voltage generator. The communication bus from process instrumentation can be simulated in any of the following modes:

Passive drive/Calibrator mode:

HI 931002 can set the 4-20 mA current values and the user can then adjust the process meter accordingly.

Active drive/Simulator mode:

HI 931002 simulates the correct current values as above in addition to providing power to the bus communication. Power is provided through an external adapter (included) which is connected to the simulator. This mode is ideal to calibrate chart recorders, pressure transducer or current indicators.

Passive measurement/Tester mode:

HI 931002 practically becomes an Amperometer. It measures and displays the mA (or pH) values transmitted by the process meter.

Active measurement/Tester mode:

Same as above in addition to providing voltage to the 4-20 mA bus.

HI 931002 can measure incoming current, provide power, and simulate 4-20 mA output to calibrate your process meter. A large LCD shows values on the display. You can select between drive and measurement modes through a switch on the front panel and two dials allow for quick adjustment of the current.

SPECIFICATIONS		HI 931002
Range	Active Drive	2.00 to 19.99 mA; -1.50 to 14.00 pH
	Passive Drive	2.00 to 19.99 mA; -1.50 to 14.00 pH
	Active Measure	0.00 to 19.99 mA; -3.50 to 14.00 pH
	Passive Measure	0.00 to 19.99 mA; -3.50 to 14.00 pH
Resolution		0.01 mA; 0.01 pH
Accuracy (@20°C/68°F)		±0.01 mA; ±0.01 pH
Input Resistance		20Ω
Fuse		5 x 20 mm, 200 mA, 250V
Power Supply		9V; approximately 1600 hours of continuous use; or 12 VDC adapter (included)
Environment		0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions		180 x 83 x 40 mm (7.1 x 3.3 x 1.6")
Weight		320 g (11.3 oz.)

ORDERING INFORMATION

HI 931002 is supplied with 1 m (3.3') connection cable, battery, 12 VDC adapter and instructions.

ACCESSORIES

HI 7862/1 1 m (3.3') connection cable

BlackStone Chemical Dosing Pumps

Versatility

BlackStone pumps have been designed to meet the ever changing needs of industry. With their broad, flat base and mounting holes for tank, shelf or floor mounting (horizontal), the pumps can be easily mounted anywhere in your plant. The rear of the pump housing also provides mounting holes to facilitate vertical mounting: wall, tank or machine. Since the pump valve assembly and controls for the unit are located on the front of the pump, there is never a problem with installation or flow adjustments.

Simple Operation

BlackStone pumps are equipped with a single control for pump output. The external flow rate control (potentiometer) on the face of the pump allows you to adjust the percentage of flow from 0 to 100% of the pump's rated capacity. This feature eliminates the need to worry about stroke lengths and power settings. An LED indicator lights up each time a stroke begins, allowing the user to assess the stroke rate from a distance.

High Quality Materials

BlackStone pumps have been manufactured with the highest level of mechanical precision from materials chosen for their inherent ability to resist the effects of aggressive chemicals. When you select a Blackstone pump, you are eliminating the time consuming effort involved in picking the right material for your application. Blackstone pumps are supplied with the highest quality material as standard equipment–not optional. The diaphragm utilizes one-piece construction of PTFE, which unlike conventional laminated diaphragms, will stand up to the test of time and wear. Ball valves are constructed in glass.

The pumphead and O-rings are made of PVDF, PTFE and FPM/FKM which offer unsurpassed resistance. The chemical resistance chart (right) shows how well PVDF and PTFE stand up to some of the most aggressive chemicals.

Chemical Resistance Guide*

Chemical Resistance Guide*	PVC	PP	Hypalon	FPM/FKM	PVDF	PTFE
Acetic Acid, 80%	D	B	A	E	A	A
Bleach	A	B	A	A	A	B
Citric Acid	A	A	A	A	A	A
Copper Cyanide	A	A	X	B	A	A
Copper Sulfate	A	A	B	B	A	A
Ferric Chloride	A	A	B	B	A	A
Ferric Sulfate	A	A	B	B	A	A
Hydrazine	X	X	B	B	A	A
Hydrochloric Acid (concentrated)	A	A	B	B	A	A
Hydrochloric Acid (diluted)	A	A	B	B	A	A
Hydrofluoric Acid (diluted)	D	B	D	A	A	A
Hydrogen Sulfide	C	A	B	B	A	A
Magnesium Nitrate	A	A	A	A	A	A
Magnesium Sulfate	A	A	A	A	A	A
Nitric Acid, 50%	A	C	E	A	A	A
Phosphoric Acid	B	B	A	B	A	A
Plating Baths	A	A	C	A	A	A
Potassium Cyanide	A	A	B	B	A	A
Potassium Nitrate	A	A	B	B	A	A
Propyl Alcohol	C	X	B	B	A	A
Soaps	A	A	B	B	A	A
Sodium Bicarbonate	A	A	A	A	A	A
Sodium Bisulfite	A	A	A	A	A	A
Sodium Hydroxide, 50%	A	A	B	E	A	A
Sodium Hypochlorite, 18%	A	A	A	D	A	A
Sulfuric Acid (concentrated)	A	A	B	A	A	A
Tanning Reagents	A	A	A	X	A	A
Trichloretane	E	C	E	A	A	A

* PARTIAL LISTING

Symbol Key

A - Excellent B - Good C - Fair D - Acceptable (limited use) E - Not recommended X - Unknown

BL Series Dosing Pumps

BlackStone's positive displacement solenoid driven pumps use a minimum number of moving parts, therefore reducing the chance of mechanical failure. Part wear and oiling associated with motor driven pumps (ball-bearings, gear drives and cams) are not a concern with these pumps. Blackstone pumps are more accurate than standard pumps due to the positive displacement design ensuring each stroke is identical to the strokes before and after it, thus keeping the flow rate consistent.

A wide range of BlackStone pumps with different dosing capacities are available for your specific dosing needs. Each pump is supplied with discharge and suction valves.

Part Number	Max Output	Rated Pressure	Dosing Frequency strokes/min
With Large Diaphragm			
BL 20	18.3 lph (4.8 gph)	0.5 bar (7.4 psi)	120
BL 15	15.2 lph (4.0 gph)	1 bar (14.5 psi)	120
BL 10	10.8 lph (2.9 gph)	3 bar (43.5 psi)	120
BL 7	7.6 lph (2.0 gph)	3 bar (43.5 psi)	120
With Small Diaphragm			
BL 5	5.0 lph (1.3 gph)	7 bar (101.5 psi)	120
BL 3	2.9 lph (0.8 gph)	8 bar (116 psi)	120
BL 1.5	1.5 lph (0.4 gph)	13 bar (188.5 psi)	120

SPECIFICATIONS	BL Series
Max Output	see table above
Pump Casing	fiber-reinforced polypropylene
Materials	pumphead in PVDF, diaphragm in PTFE, glass ball valves and O-rings in FPM/FKM, polyethylene 5 x 8 mm tubing
Self-priming	max height: 1.5 m (5 feet)
Power Supply	110/115 VAC or 220/240 VAC, 50/60Hz
Max Power Consumption	approximately 200 W
Protection	IP65
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	194 x 165 x 121 mm (7.6 x 6.5 x 4.8")
Weight	approx. 3 kg (6.6 lb.)

ORDERING INFORMATION*

BL 1.5-1	1.5 LPH flow rate
BL 1.5-2	1.5 LPH flow rate
BL 3-1	2.9 LPH flow rate
BL 3-2	2.9 LPH flow rate
BL 5-1	5.0 LPH flow rate
BL 5-2	5.0 LPH flow rate
BL 7-1	7.6 LPH flow rate
BL 7-2	7.6 LPH flow rate
BL 10-1	10.8 LPH flow rate
BL 10-2	10.8 LPH flow rate
BL 15-1	15.2 LPH flow rate
BL 15-2	15.2 LPH flow rate
BL 20-1	18.3 LPH flow rate
BL 20-2	18.3 LPH flow rate

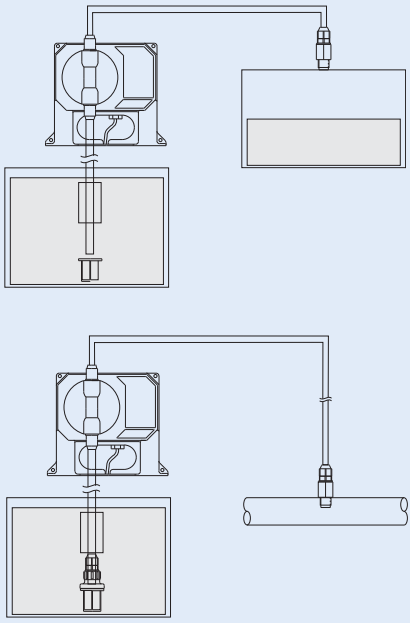
ACCESSORIES

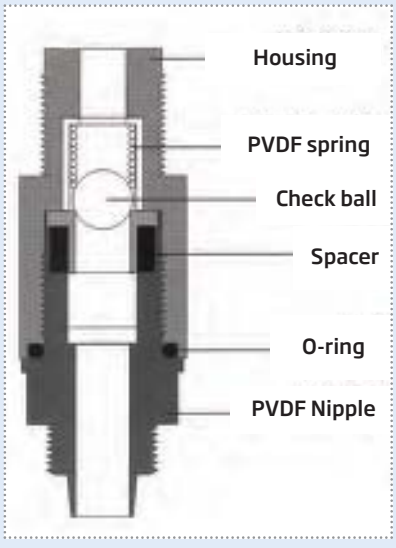
HI 721004**	Injection valve assembly
HI 721005**	Foot valve assembly
HI 721101	Pumphead, O-ring, screws and washer
HI 721102	Discharge valve assembly
HI 721103	Suction valve assembly
HI 721008	Ceramic weight (4)
HI 720011D	Magnet and coil for BL pumps (230VAC)
HI 720011U	Magnet and coil for BL pumps (115VAC)
HI 720025	Pump body
HI 720034	Magnet pump head assembly for BL pumps
HI 721001	Complete pumphead with valves
HI 72001	Tube nut. 5 x 8 mm dia. (100 pcs)
HI 721009	Diaphragm
HI 721010	PTFE coated O-ring for pump head
HI 721011	Aluminum piston, insulation disk, washer and springs replacement kit for BL pump
HI 721013	Piston set for BL pump
HI 721014	Bottom housing and housing seal
HI 721104	Small diaphragm for BL pumps
HI 721105	BlackStone spare pump head
HI 721106	BlackStone pump head assembly

Rugged Design

Blackstone pumps are completely sealed during assembly and offer IP65 protection against splashes and spills providing excellent protection even in hostile environments. The fiber-reinforced polypropylene housing stands up to aggressive chemicals while offering superior strength under tough industrial conditions.

Typical Installations



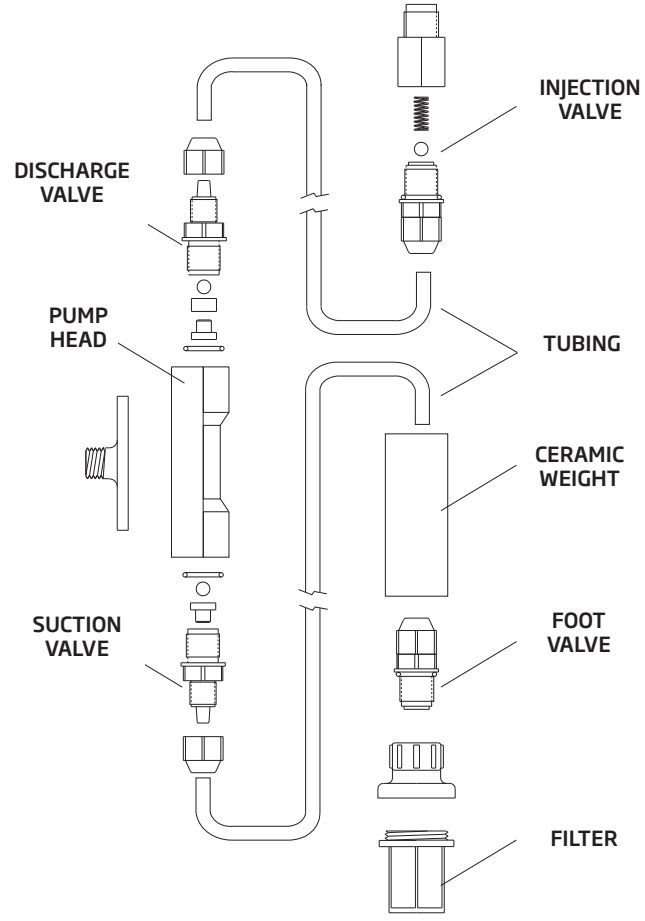


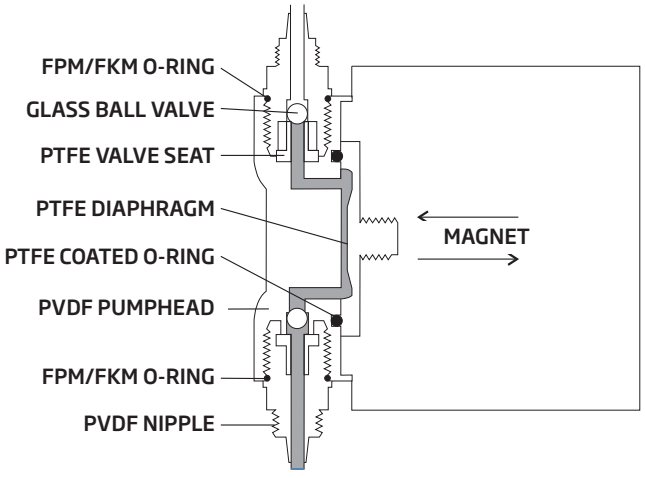
* -1 = 110/115 VAC power supply
-2 = 220/2400 VAC power supply

** Required for operation

Replacement Parts for BlackStone Chemical Dosing Pumps

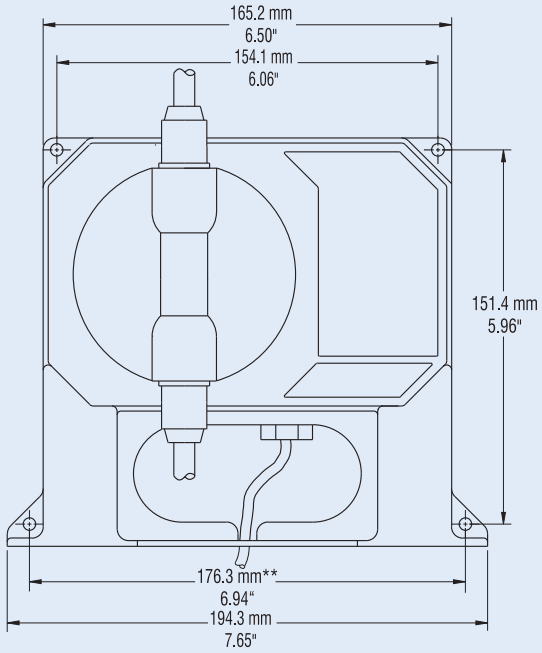
Assembly Diagram





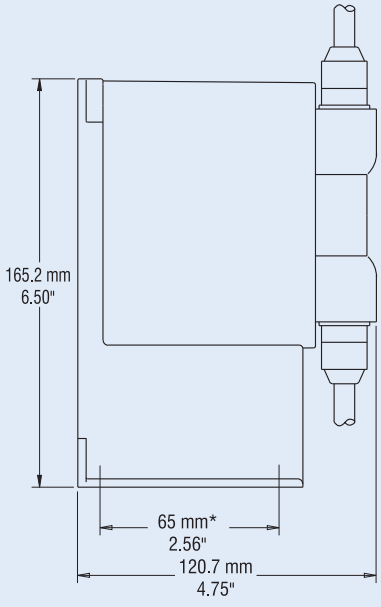
Mechanical Dimensions for BlackStone Chemical Dosing Pumps

Front View



** Dimensions for floor and wall mounting

Side View



* Dimensions for floor mounting

ORDERING INFORMATION

HI 721101
This kit contains the PVDF pumphead, PTFE coated O-ring, 6 screws and washers.

HI 721102
This kit contains all the necessary replacement parts for your discharge valve assembly. Complete with a FPM/FKM O-ring, glass valve ball, the valve spacer and seat, head nipple and the tube nut to secure the assembled parts.

HI 721103
Suction valve assembly, complete with a FPM/FKM O-ring, glass valve ball, the valve spacer and seat, head nipple and the tube nut to secure the assembled parts.

HI 721004
Complete with an injection nipple, PTFE coated spring, glass valve ball and a valve assembly.

HI 721005
This kit contains a filter with a filter holder and a valve assembly.

HI 721003
This kit contains 10 glass balls and 10 valve O-rings.

HI 721006
This kit contains 4 PVDF springs.

HI 720029
LDPE hose, 3 m (9.9').
Inside diameter 4.71 mm
Outside diameter 7.87 mm

HI 720030
LDPE hose, 10 m (33').
Inside diameter 4.71 mm
Outside diameter 7.87 mm

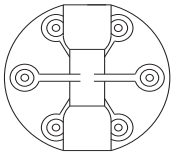
HI 720031
LDPE hose, 50 m (165').
Inside diameter 4.71 mm
Outside diameter 7.87 mm

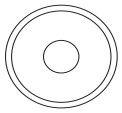
HI 720032
LPDE hose, 100 m (333').
Inside diameter 4.71 mm
Outside diameter 7.87 mm

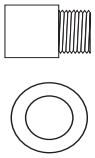
HI 721008
This kit contains 4 ceramic weights.

HI 740156
This kit contains 3 valve seats.

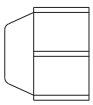
HI 721101

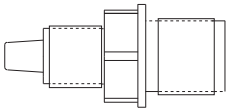

pumphead


PTFE coated o-ring


6 screws and washers

HI 721102

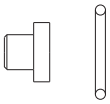

tube nut


head nipple


valve

spacer

o-ring

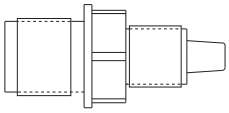

valve seat

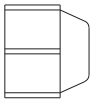
HI 721103

o-ring

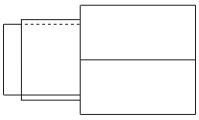
valve


valve seat


head nipple

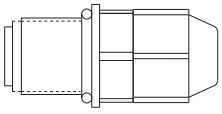

tube nut

HI 721004

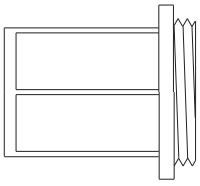

injection nipple

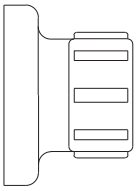
valve

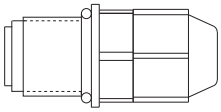

PVDF spring


valve assembly

HI 721005


filter


filter holder


valve assembly

HI 721003

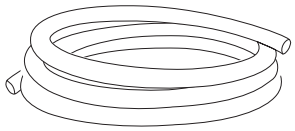

o-ring


valve

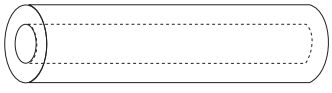
HI 721006


PVDF spring

HI 720032


LDPE hose

HI 721008


ceramic weight

Electrodes Designed and Manufactured by HANNA

Process Electrodes

A Worldwide Leader in Electrode Manufacturing

Since the beginning of the 1990's HANNA has been a leader in the research & development of pH and ORP electrodes. Today, HANNA is proud to present the latest family of industrial electrodes, the Flat Tip Series, which completes the wide range of HANNA probes for any process application. All HANNA industrial pH and ORP electrodes are combination type, i.e. the reference half cell and the measurement half cell are assembled in the same body.

Industrial Electrodes and Probes

HI 1000/HI 2000 Series

Standard

AmpHel®

Flat Tip

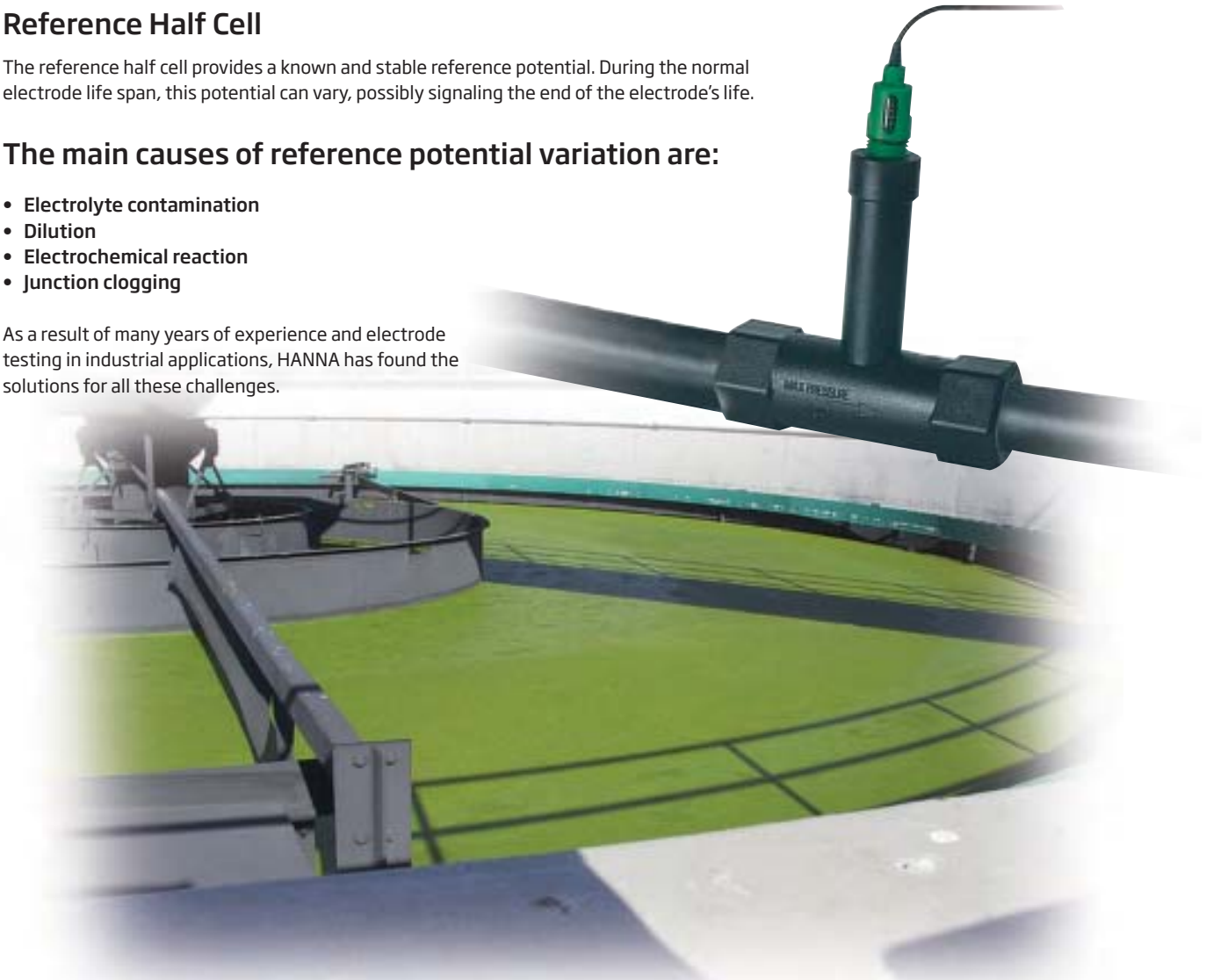
Reference Half Cell

The reference half cell provides a known and stable reference potential. During the normal electrode life span, this potential can vary, possibly signaling the end of the electrode's life.

The main causes of reference potential variation are:

- **Electrolyte contamination**
- **Dilution**
- **Electrochemical reaction**
- **Junction clogging**

As a result of many years of experience and electrode testing in industrial applications, HANNA has found the solutions for all these challenges.



Electrolyte Contamination

The contamination of the reference half cell is linked to the diffusion of external substances into the reference chamber (strong oxidants, reductants, complexing agents).

The combination of HANNA double junction technology. with a polymer reference electrolyte, reduces the diffusion process rate and keeps the reference potential stable for long periods of time.

Dilution

When a reference cell, containing a very concentrated solution, comes in contact with a water solution sample much less concentrated, a diffusion phenomenon will take place on the electrolyte/sample junction, i.e. the diffusion of the electrolyte (KCl) into the sample solution. This process causes a progressive dilution of the reference electrolyte with a consequent variation of the reference potential.

HANNA double junction technology and the use of a large electrolyte volume (up to three times greater than traditional electrodes) makes the dilution effect negligible.

Electrochemical Reaction

In many industrial applications, it is possible to get a potential difference between the measuring point and the instrument. This inconvenience originates from electrical currents that destroy the Ag/AgCl element of the reference half-cell and also creates non-stable, interfering potentials.

The simple and effective HANNA solution to this challenge is the matching pin built-in to each industrial electrode, a unique characteristic in the market. The matching pin is a stainless steel or titanium element that is connected to the instrument to prevent grounding problems, and thus prolong electrode life.

Junction Clogging

Typical industrial applications require continuous monitoring of pH and ORP. Periodic cleaning and maintenance of the electrode junction ensure a stable and repeatable contact between sample and junction. The frequency of these cleaning procedures depends on the junction shape and material.

HANNA industrial electrodes are provided with different types of junctions. In particular, we want to highlight the porous PTFE junction used for our Flat Tip electrodes, which, thanks to its shape, can provide optimum performance for months without requiring any maintenance.

Measurement Half Cell

All HANNA industrial pH electrodes include a measurement cell with glass sensor.

Even though it can be difficult to handle, the glass sensor is still the only answer for most industrial requirements. Below is a list of the main causes of shortened glass sensor life, for which HANNA has developed different types of specialized glass:

- **High temperature**
- **Low temperature**
- **Acid samples containing fluoride**

Built for Everyday, Demanding Use

HANNA provides glass sensors that are able to withstand the previously listed industrial environmental challenges.

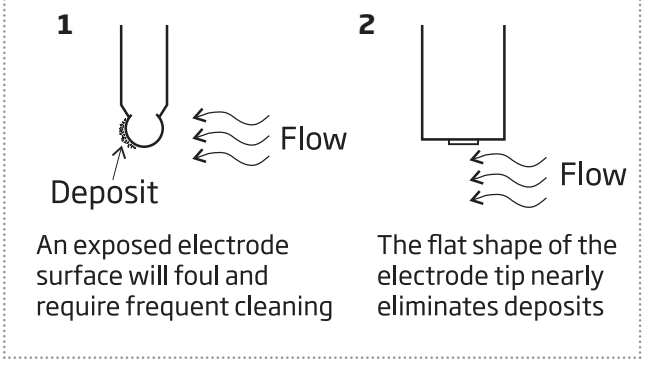
GLASS TYPE	APPLICATION	pH RANGE	TEMPERATURE RANGE
LT	low temperature	0 to 12	-10 to 80°C
HT	high temperature	0 to 14	0 to 100°C
HF	acid samples with fluoride	0 to 10	-5 to 60°C

Mechanical Stress

In a continuous in-line installation, the glass sensor of the pH electrode can be physically damaged by solution streams containing suspended solids.

Our Flat Tip electrodes are the best answer to this problem. The flat tip virtually eliminates deposits that can foul the electrode, significantly reducing necessary maintenance.

Flat Tip Advantages



An exposed electrode surface will foul and require frequent cleaning

The flat shape of the electrode tip nearly eliminates deposits

Electrode Body Material: Glass, PVDF or PEI

Glass

The glass body electrode can withstand high pressure and high temperature applications. The glass body also offers high resistance to aggressive chemicals (only fluoridic acid and strong alkaline solutions can damage glass).

PVDF

The PVDF body used for the Flat Tip Series withstands high pressure and high temperature applications, and guarantees a high chemical and mechanical resistance. These characteristics makes the PVDF material the most recommended for many industrial applications. PVDF is also non-toxic and compatible with food applications.

PEI

PEI is a special plastic material used first to produce electrodes by HANNA. PEI electrodes proved to be ideally suited to field applications, as well as industrial environments. An electrode with an PEI body represents a very good combination of chemical, mechanical, and thermic resistance, and can be used in non-critical applications (e.g. swimming pools), or with portable meters for routine field monitoring and control, such as wells, lakes and rivers, and discharges of tanks and reservoirs.

AmpHel®: Why and Where to Use It

pH electrode glass sensors have a high impedance of typically 100 Mohm, but can reach 800 Mohm depending on the temperature. This is a very weak signal available for accurate measurements. Impedance this high is difficult to handle especially between the electrode and the instrument. Normally this distance is covered by special cables with very high shielding and electrical insulation. Even with these cables, distances cannot be longer than 5 meters.

In industrial installations it is not easy to limit the distance between the electrode and the measuring instrument to 5 meters . Quite often, the recording instruments are located in separate areas from where the pH is measured. To avoid this limitation, a pH amplifier can be used.

Amplifiers are usually available with water-tight casings and can be used under extremely harsh conditions. The pH amplifier needs a power supply and usually must also provide for galvanic insulation between the power supply and the amplification circuit. At times it is difficult to have a power supply close to the measuring electrode. In such a case, 2-wire amplifiers and a 4-20 mA output can solve the problem (see HI 8614 and HI 8614L produced by HANNA).

Such amplifiers need instruments with 4-20 mA input in place of, or in parallel with, the BNC connector (some instruments are not provided with this option).

To overcome the instrument limitation, in 1988, HANNA produced the AmpHel® electrode (Amplified pH electrode). The AmpHel® electrodes feature an internal, high impedance pH amplifier with the required batteries.

An AmpHel® electrode has a life of approximately 3 years from the day it was produced. Taking into consideration that an average life for a pH electrode is one year, three years from the date of production should not be considered a limitation.

The output is still with 2 wires, as in the case of the typical coaxial cable, but it has a low impedance, and allows connections up to 75 meters long without delays in the measurements.

Cable Leakage

A high impedance coaxial cable, when installed more than 5 meters away from the electrode, could also be subject to current leakage. Quite often the installers place it in underground ducts as done with any other electric cable. During the installation of the cable, the insulation may become scratched by rubbing against the pipes or sharp corners. Underneath the insulation there is a screen connected to the reference electrode.

If the cable is in an underwater duct, it could happen that, sometime during the year, the reference electrode (the screen) could come into contact with the humid environment and, thus, with the grounding circuit of the electrical installations. Under these conditions, the pH electrode cannot take reliable measurements and can give erroneous readings. Without any reference to the measurement, the actual reading can be many pH units off. This is another solid reason for avoiding cables longer than 5 meters.

Electrode-Cable Connection

Some German manufacturers have produced pH electrodes with a coaxial connector mounted directly at one end of the electrode, i.e. without cable. The intention was to replace the electrode, without having to replace the connecting cable which remains attached. But as time passed, such an intention has proven to be harmful.

In fact, in many cases, the electrode is placed inside an electrode holder, which protects it from test liquid (tank measurement). Moisture forms inside the holder because of temperature changes from day to night. This moisture reduces the connector insulation, and the signal to the electrode drops.

When an electrode leaks, the generated emf drops and the reading drifts toward the pH 7 value. Therefore, for example, instead of pH 3, the measurement can be pH 3.5 or 4. This reading may result in a dosage that is harmful to the system.

Potential Matching Pin

In many industrial applications, especially in plating baths, grounding loop current is a very common problem.

When a traditional electrode/controller system is used, with the electrode reference connected both to the electrode and to the instrument, a current flow occurs through the reference half cell, causing fluctuations in reading and serious damage to the Ag/AgCl element. The potential matching pin shields the reference

from external electrical fields. Shown above, the matching pin allows the measurement to stabilize and ensures effective process regulation. In order to function properly, the matching pin has to be continuously immersed in the measured solution and for this reason is placed near the electrode junction.

Temperature Effect

The sample temperature is a very important parameter for solutions with a pH different from 7.0. In fact at pH 7.0, temperature compensation is not required.

Due to a built-in temperature sensor, there is only one electrode to install. Also due to its proximity to the pH sensor, the built-in temperature sensor ensures fast, accurately compensated readings even during sudden temperature fluctuations.

A Specific Electrode for Each Application

The table to the right lists the most common industrial applications with the corresponding, recommended HANNA electrodes.

For each application, several models are available, with different options for the following characteristics:

- **electrode dimensions**
- **connection type**
- **installation requirement**
- **optional configurations (matching pin, Pt100 or Pt1000 sensor)**

HANNA produces a wide range of industrial electrodes, for any specific application need.

Common Industrial Applications

APPLICATION	pH ELECTRODE SERIES	CODE
Domestic Wastewater Sewage, Septic Tank Treatment	flat tip	HI 1026-2005
	easy	HI 1090B/5
Industrial Wastewater	flat tip	HI 1006-2005
	AmpHel®	HI 5291005
	HI 1000	HI 1003/5
	easy	HI 1210B/5
Food Industry (Beer, Jam, Diary Products)	flat tip	HI 1006-2005
	AmpHel®	HI 5291005
	easy	HI 1090B/5
Chemical Neutralization	flat tip	HI 1006-2005
	AmpHel®	HI 5291005
	easy	HI 1210B/5
Potable Water (>400µS/cm)	flat tip	HI 1006-2005
	AmpHel®	HI 5291005
	HI 1000	HI 1001
	easy	HI 1210B/5
Cooling Towers	flat tip	HI 1006-1005
	AmpHel®	HI 6291005
	HI 1000	HI 1002/5
	easy	HI 1210B/5
Water Softening	flat tip	HI 1006-2005
	AmpHel®	HI 6291005
	HI 1000	HI 1001/5, HI 1002/5
	easy	HI 1210B/5
Demineralization	flat tip	HI 1006-2005
	AmpHel®	HI 5291005
	easy	HI 1090B/5
Low Conductivity Solutions	flat tip	HI 1006-2005
	AmpHel®	HI 5291005
Swimming Pools	flast tip	HI 1006-2005
	AmpHel®	HI 5291005
Sea Water	flat tip	HI 1026-2005
	AmpHel®	HI 5291005
	easy	HI 1090B/5
Galvanic Baths	flat tip	HI 1006-3005
	AmpHel®	HI 8299505
	HI 1000	HI 1003/5
	easy	HI 1210B/5
Sugar Industry, Paper Industry	flat tip	HI 1006-2005
	AmpHel®	HI 5291005
	easy	HI 1090B/5
Textile Industry, Tanneries	flat tip	HI 1006-3005
	AmpHel®	HI 8299505
Acid Samples with Fluoride Ions	flat tip	HI 1006-4005
	AmpHel®	HI 7291005, HI 7299505

APPLICATION	ORP ELECTRODE SERIES	CODE
Oxidation of Cyanide and Nitrite	flat tip	HI 2004-2005
Ozonization & Oxidant Products	AmpHel®	HI 6493005
	HI 2000	HI 2013/5
Reductant Products (Chromate Reduction)	flat tip	HI 2004-1005
	AmpHel®	HI 6293005
	HI 2000	HI 2003/5
	easy	HI 3210B/5
Swimming Pools	HI 2000	HI 2001, HI 2003/5
	easy	HI 3210B/5

Flat Tip Industrial Electrodes

Select the flat tip electrode that best fits your process requirements by choosing from the following technical characteristics:

1. Junction

Three junction types are available:

- **Annular non-clogging PTFE junction, for testing solutions with high content of suspended solids or for high pressure installation**
- **Open junction, ideal for wastewater analysis**
- **Ceramic junction**

2a. pH Electrodes

HANNA has developed four types of specialized glass. First is a durable sensor glass for general purpose, industrial use. This glass can withstand the stress of daily use. The remaining types of electrode glass allow continuous monitoring in highly acidic solutions containing fluoride ions, as well as high or low temperature process streams significantly increasing the electrode life.

2b. ORP Electrodes

ORP electrodes are provided with a platinum sensor for most applications, while a gold sensor is required for measurement of cyanide or highly oxidative environments.

3. Temperature Sensor

The pH electrodes with built-in 3-wire Pt100 or Pt1000 temperature sensor allow for the temperature compensation of pH readings as well as temperature measurements.

4. Connection Type

Electrodes are be provided with wire for direct connection to a transmitter or process controller, or with the standard BNC connector.

5. Built-in Amplifier

Models with a built-in amplifier are necessary for long distance measurements, where it is not possible to install a transmitter.

The internal amplifier can be powered directly from select HANNA process controllers or a power source that supplies the appropriate voltage.

6. Cable Length

Non-amplified electrodes are provided with a 5, 10 or 15 m cable (16', 33' or 49'), while the amplified models are provided with a 15, 25, 50 or 75 m cable (49, 82, 164 or 246').

(*) F- max 2 g/L, temperature max 60°C, pH >2

- **Self-cleaning flat tip sensor**
- **Significantly reduced maintenance requirement**
- **Models especially designed for plating baths**
- **PVDF body**
- **Three junction types: ceramic, PTFE and open**
- **Built-in potential matching pin**
- **Three different glass type pH sensors**
- **ORP electrodes with platinum or gold sensor**
- **Models with built-in Pt100 or Pt1000 temp. sensor**
- **Internal amplifier models powered by the process controller**
- **3/4" NPT external thread on both ends for easy installation**

HANNA presents a series of combination pH and ORP electrodes, including more than 300 models, incorporating over 20 years of electrode manufacturing experience.

The most advanced feature of this series is the electrode shape with flat tip, virtually eliminating deposits that can foul the electrode, significantly reducing necessary maintenance. This characteristic makes flat tip electrodes ideal for continuous in-line monitoring and for solutions containing aggressive chemicals.

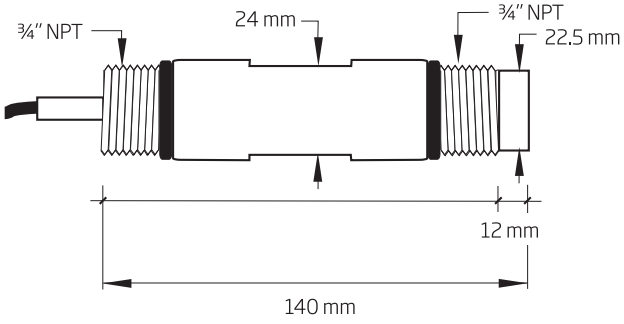
The PVDF body offers a higher level of mechanical and temperature resistance. Moreover, the PVDF material is non-toxic and compatible with food applications.

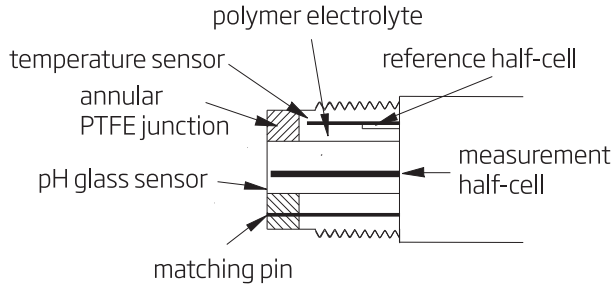
Each pH and ORP electrode is provided with an internal matching pin that can avoid typical problems caused by grounding loop current, such as:

- **progressive damage of the electrode**
- **fluctuating measurements**
- **poor process regulation**

Glass Type	Application	pH Range	Temperature Range
LT	low temperature	0 to 12	-10 to 80°C
HT	high temperature	0 to 14	0 to 100°C
HF	acid samples with F- (*)	0 to 10	-5 to 60°C

Flat Tip Industrial pH Electrodes





Flat Tip pH Electrodes: Ordering Information

Choose your configuration:

w =	**06**	PTFE junction
	16	ceramic junction
	26	open junction*
x =	**1**	LT (Low Temperature) glass sensor
	2	GP (General Purpose) glass sensor
	3	HT (High Temperature) glass sensor; titanium matching pin
	4	HF (Fluoride resistant) glass sensor
y =	**0**	BNC connector
	1	direct wire connection
	2	BNC connector + Pt100
	3	direct wire connection + Pt100
	4	BNC connector + Pt1000
	5	direct wire connection + Pt1000
	6	amplified electrode with BNC connector
	7	amplified electrode with BNC connector + Pt100
z =	**05, 10, 15**	Cable length (meters); for non-amplified electrodes
	15, 25, 50, 75	Cable length (meters); for amplified electrodes

HI 10 [w] – [x] [y] [z]

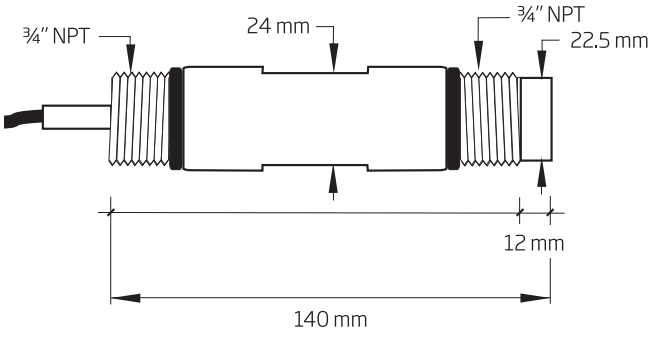
* Open junction is available only with GP glass sensor.
Note: The internal amplifier can be powered directly from select HANNA process controllers or a power source that supplies the appropriate voltage.

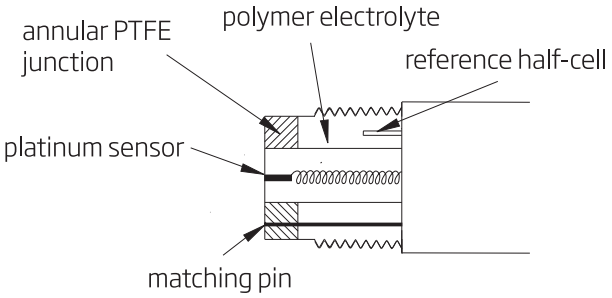
HI 1006/5 Flat-tip pH electrode , 5 m cable

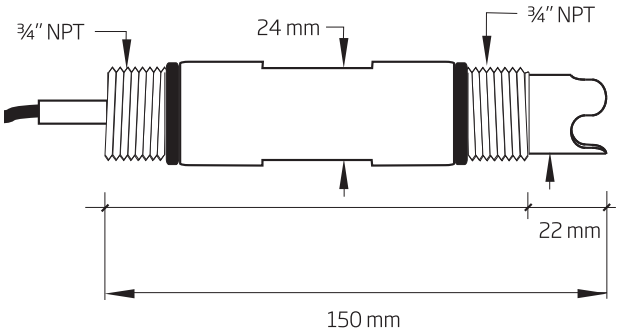
HANNA instruments

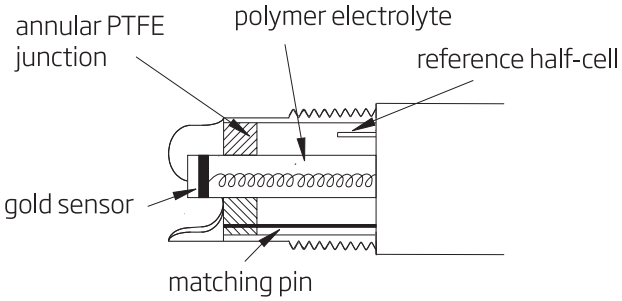
With Great Products, Come Great Results™

Flat Tip Industrial ORP Electrodes









Flat Tip ORP Electrodes: Ordering Information

Choose your configuration:

w =	**04**	PTFE junction
	14	ceramic junction
	24	open junction
x =	**1**	platinum sensor
	2	gold sensor
y =	**0**	BNC connector
	1	direct wire connection
	6	amplified electrode with BNC connector
z =	**05, 10, 15**	Cable length (meters); for non-amplified electrodes
	15, 25, 50, 75	Cable length (meters); for amplified electrodes

HI 20 [w] – [x] [y] [z]

Note: The internal amplifier can be powered directly from select HANNA process controllers or a power source that supplies the appropriate voltage.

AmpHel® Flat Tip Industrial Electrodes

- AmpHel® amplified
- Matching pin
- Flat tip
- PVDF body

AMPHEL® FLAT-TIP pH ELECTRODES

GENERAL PURPOSE pH ELECTRODES

CODE	RANGE	BODY	JUNCTION	ELECTROLYTE	GLASS TYPE	TEMPERATURE	ATC	MAX PRESSURE	CONNECTOR	CABLE
HI 6100405	0-13	PVDF	double, PTFE	polymer	GP	-5 to 80 °C	–	6 bar (87 psi)	BNC	5 m
HI 6101405	0-13	PVDF	double, PTFE	polymer	GP	-5 to 80 °C	Pt100	6 bar (87 psi)	BNC + lead	5 m
HI 6101415	0-13	PVDF	double, PTFE	polymer	GP	-5 to 80 °C	Pt100	6 bar (87 psi)	BNC + lead	15 m

LOW TEMPERATURE pH ELECTRODES

CODE	RANGE	BODY	JUNCTION	ELECTROLYTE	GLASS TYPE	TEMPERATURE	ATC	MAX PRESSURE	CONNECTOR	CABLE
HI 6100605	0-12	PVDF	double, PTFE	polymer	LT	-10 to 80 °C	–	6 bar (87 psi)	BNC	5 m
HI 6101605	0-12	PVDF	double, PTFE	polymer	LT	-10 to 80 °C	Pt100	6 bar (87 psi)	BNC + lead	5 m

HIGH TEMPERATURE pH ELECTRODES

CODE	RANGE	BODY	JUNCTION	ELECTROLYTE	GLASS TYPE	TEMPERATURE	ATC	MAX PRESSURE	CONNECTOR	CABLE
HI 6100805	0-14	PVDF	double, PTFE	polymer	HT	0 to 100 °C	–	6 bar (87 psi)	BNC	5 m
HI 6101805	0-14	PVDF	double, PTFE	polymer	HT	0 to 100 °C	Pt100	6 bar (87 psi)	BNC + lead	5 m

pH ELECTRODES FOR ACID SAMPLES WITH FLUORIDE IONS (F- MAX 2 G/L, TEMPERATURE MAX 60 °C, pH >2)

CODE	RANGE	BODY	JUNCTION	ELECTROLYTE	GLASS TYPE	TEMPERATURE	ATC	MAX PRESSURE	CONNECTOR	CABLE
HI 6100205	0-10	PVDF	double, PTFE	polymer	HF	-5 to 60 °C	–	6 bar (87 psi)	BNC	5 m
HI 6101205	0-10	PVDF	double, PTFE	polymer	HF	-5 to 60 °C	Pt100	6 bar (87 psi)	BNC + lead	5 m

AMPHEL® FLAT-TIP ORP ELECTRODES

PLATINUM TYPE ORP SENSORS

CODE	RANGE	BODY	JUNCTION	ELECTROLYTE	TEMPERATURE	ATC	MAX PRESSURE	CONNECTOR	CABLE
HI 6200405	±2000 mV	PVDF	double, PTFE	polymer	-5 to 100 °C	–	6 bar (87 psi)	BNC	5 m

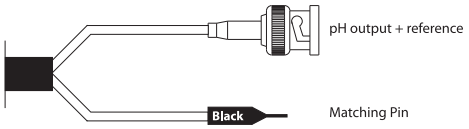
GOLD TYPE ORP SENSORS

CODE	RANGE	BODY	JUNCTION	ELECTROLYTE	TEMPERATURE	ATC	MAX PRESSURE	CONNECTOR	CABLE
HI 6200505	±2000 mV	PVDF	double, PTFE	polymer	-5 to 100 °C	–	6 bar (87 psi)	BNC	5 m

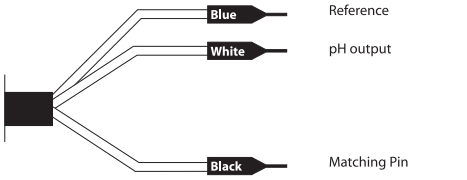
Flat Tip Industrial Electrodes Electrical Connections and Installation

Electrical Connections

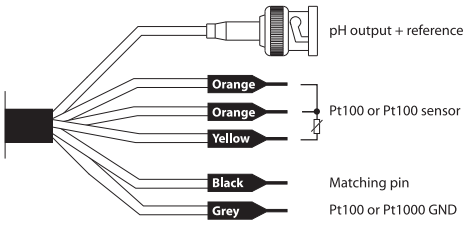
pH & ORP electrodes with BNC connector



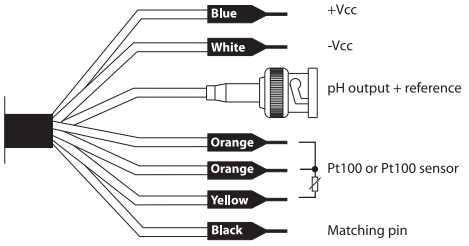
pH & ORP electrodes with direct wire connection



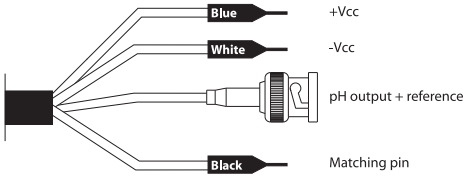
pH electrodes with BNC connector & Pt100 or Pt1000 temperature sensor



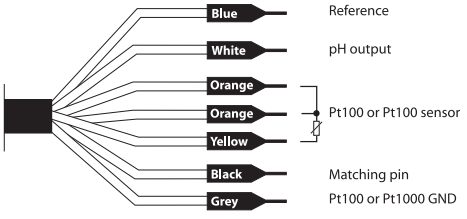
pH electrodes with BNC connector & Pt 100 temperature sensor, amplified



pH & ORP electrodes with BNC connector, amplified



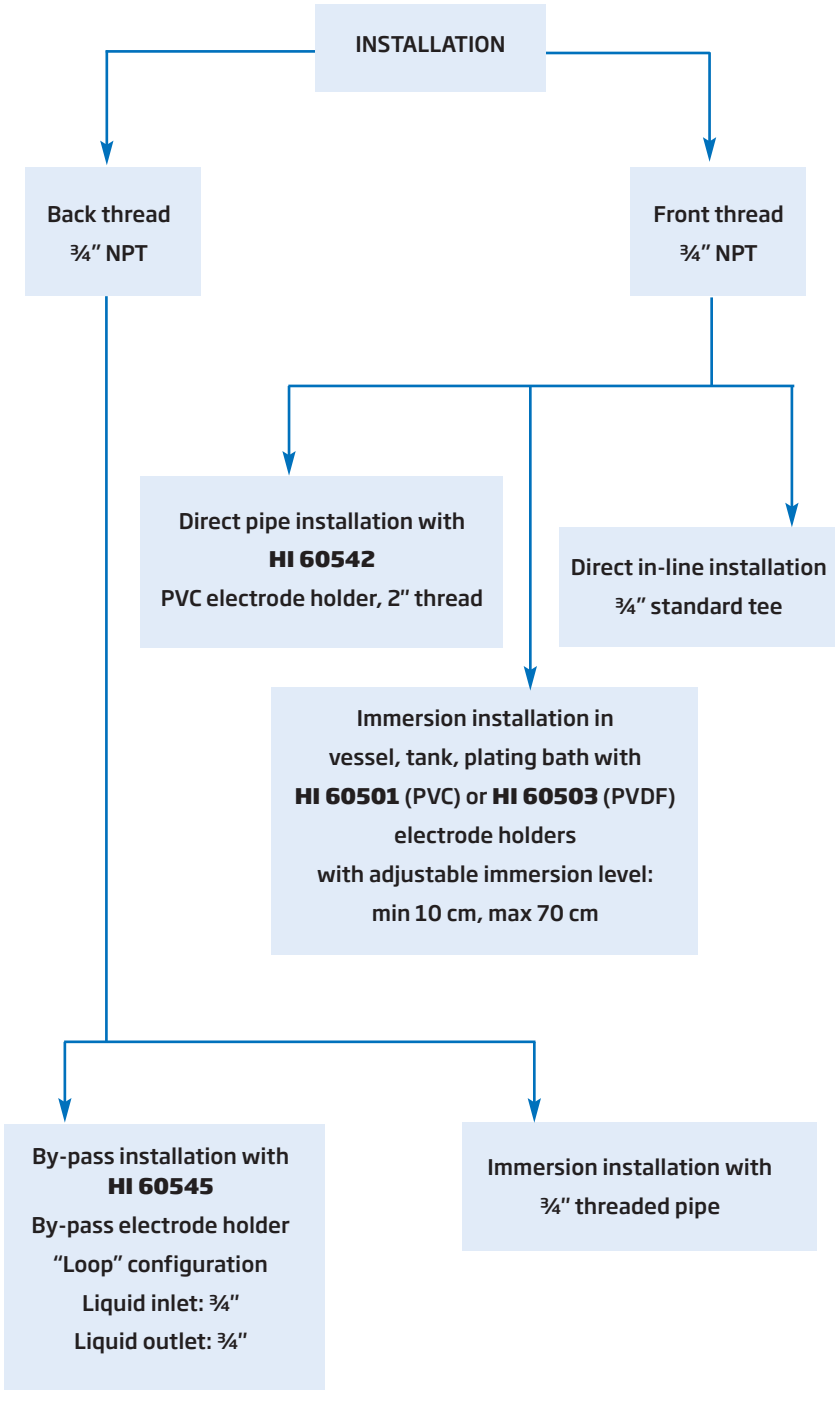
pH electrodes with direct wire connection & Pt100 or Pt1000 temperature sensor



Installation

These electrodes have been designed with ¾" external thread on both ends for easy installation.

HANNA also provides a series of probe holders for in-line, tank or by-pass installations for these electrodes, as shown below.



Amplified pH and ORP AmpHel® Electrodes

- **Strong signal up to 75 meters (246')**
- **Low noise coaxial cables are no longer required**
- **Measurements in unclean samples and high humidity conditions**
- **Models with external replaceable battery, for longer electrode life**
- **Glass sensor for specific applications**

Due to the high resistance of the glass membrane, conventional electrodes require a high impedance measurement system. Inadequate insulation of the connectors and cables result in erroneous readings due to leakage or noise. For conventional electrodes, the lead is therefore limited to typically less than 15-20 meters. HANNA AmpHel® electrodes incorporate a miniaturized amplifier which resolves most of the problems associated with high impedance signals. The amplifier circuitry is located right on top of the electrode and is completely sealed. As a result, a strong, low impedance signal is emitted and ordinary connectors with long unshielded cables can be used. This breakthrough technology provides a stable signal for industrial monitoring as well as a major saving in low noise coaxial cable costs. In some cases, the need for a transmitter is also eliminated, resulting in further cost reductions.

For those applications that have been proven particularly hostile to electrodes, HANNA has developed four types of specialized glass. First is an extremely durable sensor glass for general purpose and industrial use. This glass can withstand the stress of daily use. The remaining types of electrode glass allow continuous monitoring in highly acidic solutions containing fluoride ions, as well as high or low temperature process streams, without significantly reducing the useful life of the electrode.

Electrode body material is glass or PEI, while the junction is cloth or PTFE.

Extend Electrode Life

With the AmpHel® replaceable battery model, it is no longer necessary to throw away an electrode when the battery is exhausted.

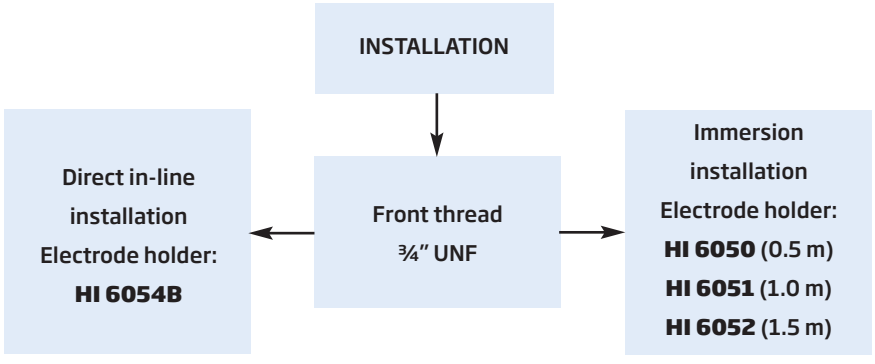
HI 2931 HI 2911

HANNA GLASS SENSORS FOR PROCESS ELECTRODES	
GLASS MEMBRANE	**APPLICATION**
GP	General Purpose
HT	High Temperature
LT	Low Temperature
HF	Samples with Fluoride

Easy Installation

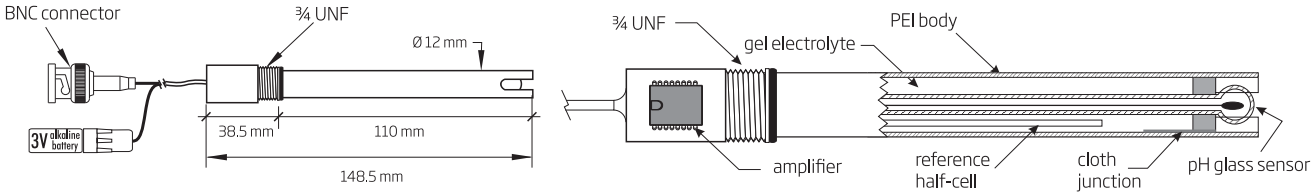
Models with glass body and PTFE junctions are recommended for in-line installations.

Models with an PEI body and cloth junction are suitable for tank monitoring or for use with portable meters, where the electrode can be easily accessed for maintenance.



ACCESSORIES

HI 740031 Spare replaceable battery for AmpHel® electrodes



AMPHEL® pH ELECTRODES WITH REPLACEABLE BATTERY

GENERAL PURPOSE pH ELECTRODES								
CODE	BODY	JUNCTION	ELECTROLYTE	GLASS TYPE	TEMPERATURE	MAX PRESSURE	CONNECTOR	CABLE
HI 6291005	PEI	cloth	gel	GP	-5 to 80 °C	3 bar	BNC	5 m
HI 6291010	PEI	cloth	gel	GP	-5 to 80 °C	3 bar	BNC	10 m
HI 6291050	PEI	cloth	gel	GP	-5 to 80 °C	3 bar	BNC	15 m
HI 6294005	glass	cloth	gel	GP	0 to 60 °C	3 bar	BNC	5 m
HI 6294010	glass	cloth	gel	GP	0 to 60 °C	3 bar	BNC	10 m
LOW TEMPERATURE pH ELECTRODES								
CODE	BODY	JUNCTION	ELECTROLYTE	GLASS TYPE	TEMPERATURE	MAX PRESSURE	CONNECTOR	CABLE
HI 5291005	PEI	cloth	gel	LT	-10 to 80 °C	3 bar	BNC	5 m
HIGH TEMPERATURE pH ELECTRODES								
CODE	BODY	JUNCTION	ELECTROLYTE	GLASS TYPE	TEMPERATURE	MAX PRESSURE	CONNECTOR	CABLE
HI 8299505	glass	PTFE	polymer	HT	0 to 100 °C	3 bar	BNC	5 m
pH ELECTRODES FOR ACID SAMPLES WITH FLUORIDE IONS (F- MAX 2 G/L, TEMPERATURE MAX 60 °C, pH >2)								
CODE	BODY	JUNCTION	ELECTROLYTE	GLASS TYPE	TEMPERATURE	MAX PRESSURE	CONNECTOR	CABLE
HI 7291005	PEI	cloth	gel	HF	-5 to 60 °C	3 bar	BNC	5 m
HI 7299505	glass	PTFE	polymer	HF	-5 to 60 °C	3 bar	BNC	5 m

AmpHel® pH ELECTRODES WITH INTERNAL BATTERY

CODE	BODY	JUNCTION	ELECTROLYTE	GLASS TYPE	TEMPERATURE	MAX PRESSURE	CONNECTOR	CABLE
HI 2910B	PEI	cloth	gel	GP	-5 to 80 °C	3 bar (43.5 psi)	BNC	1 m
HI 2910B/5	PEI	cloth	gel	GP	-5 to 80 °C	3 bar (43.5 psi)	BNC	5 m
HI 2910D	PEI	cloth	gel	GP	0 to 80 °C	3 bar (43.5 psi)	DIN	5 m
HI 2911B/5	PEI	PTFE	polymer	GP	-5 to 80 °C	3 bar (43.5 psi)	BNC	5 m
HI 2911B/15	PEI	PTFE	polymer	GP	-5 to 80 °C	3 bar (43.5 psi)	BNC	15 m

AmpHel® ORP ELECTRODES WITH REPLACEABLE BATTERY

CODE	BODY	JUNCTION	ELECTROLYTE	PIN TYPE	TEMPERATURE	MAX PRESSURE	CONNECTOR	CABLE
HI 6293005	PEI	cloth	gel	platinum	-5 to 80 °C	3 bar (43.5 psi)	BNC	5 m
HI 6293010	PEI	cloth	gel	platinum	-5 to 80 °C	3 bar (43.5 psi)	BNC	10 m
HI 6493005	PEI	cloth	gel	gold	-5 to 80 °C	3 bar (43.5 psi)	BNC	5 m

AmpHel® ORP ELECTRODES WITH INTERNAL BATTERY

CODE	BODY	JUNCTION	ELECTROLYTE	PIN TYPE	TEMPERATURE	MAX PRESSURE	CONNECTOR	CABLE
HI 2930B/5	PEI	cloth	gel	platinum	-5 to 80 °C	3 bar (43.5 psi)	BNC	5 m
HI 2930B/10	PEI	cloth	gel	platinum	-5 to 80 °C	3 bar (43.5 psi)	BNC	10 m
HI 2930B/15	PEI	cloth	gel	platinum	-5 to 80 °C	3 bar (43.5 psi)	BNC	15 m
HI 2931B/5	PEI	PTFE	gel	platinum	-5 to 80 °C	3 bar (43.5 psi)	BNC	5 m
HI 2931B/10	PEI	PTFE	gel	platinum	-5 to 80 °C	3 bar (43.5 psi)	BNC	10 m
HI 2931B/15	PEI	PTFE	gel	platinum	-5 to 80 °C	3 bar (43.5 psi)	BNC	15 m
HI 2931B/20	PEI	PTFE	gel	platinum	-5 to 80 °C	3 bar (43.5 psi)	BNC	20 m
HI 2931B/35	PEI	PTFE	gel	platinum	-5 to 80 °C	3 bar (43.5 psi)	BNC	35 m
HI 3930B	PEI	ceramic	gel	platinum	0 to 80 °C	1.5 bar (21.7 psi)	BNC	1 m

HI 1000 and HI 2000 Series

pH and ORP Electrodes for Continuous Flow-thru Monitoring

Specifically Built for Industrial Applications

- **½" NPT external thread for in-line installation**
- **pH electrode with exclusive PTFE non-clogging membrane**
- **Double-junction technology**
- **PVDF body**
- **Models with built-in matching pin and amplifier**

In order to reduce normal contamination coming from industrial use, these electrodes combine a polymer reference and double-junction technology. With this technology, no refilling is required and the electrode can be used in samples such as organic compounds, proteins and heavy metals. In addition, the pH electrodes use a unique annular PTFE junction that minimizes clogging.

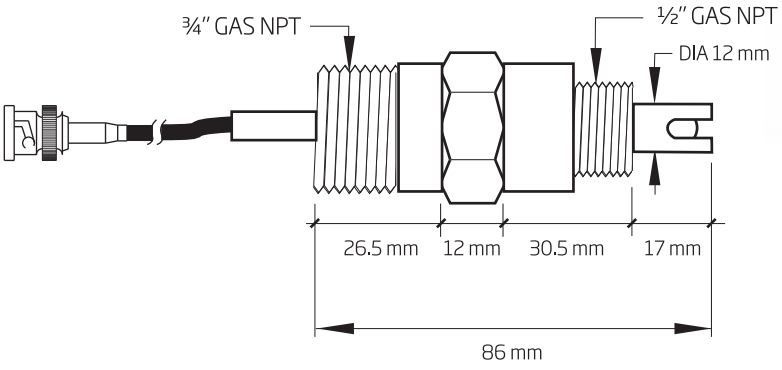
These industrial probes have a glass body electrode for use in aggressive chemicals and are easy to clean. A PEI protective sleeve gives the electrodes resistance against mechanical stress. Operating limits are -5 to 80°C (23 to 176°F) and pressure up to 6 bar (87 psi).

Both pH and ORP models are available, many of which include a built-in matching pin. Some models also feature a built-in amplifier, which allows for measurements to be taken far from the location of the instrument without requiring a transmitter.

HI 1000 and HI 2000 series incorporate a BNC connector that enables connection to any pH/ORP meter quick and easy; models with 3 or 5 meters (9.8 or 16 feet) cable are available.

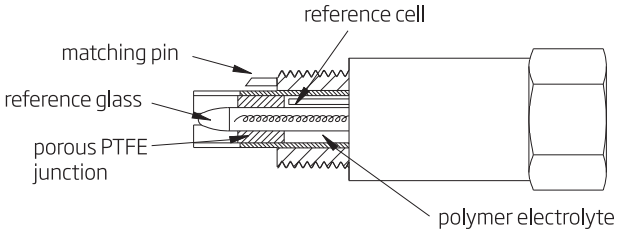
Matching pin with differential input for grounding

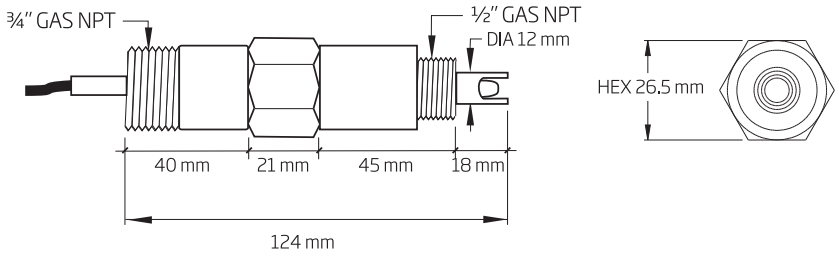
HI 1000 and 2000 series



HI 1001 AND HI 1005 (pH ELECTRODES) AND HI 2001 (ORP ELECTRODE WITH PT SENSOR)

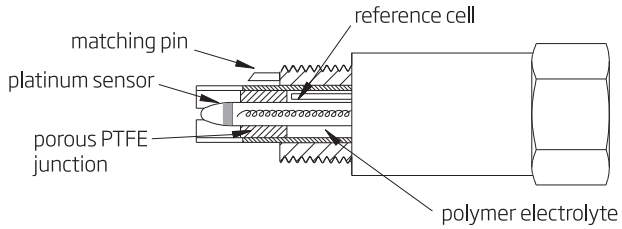
CODE	JUNCTION	ELECTROLYTE	TEMPERATURE	MAX PRESSURE	CONNECTOR	CABLE
HI 1001	double, PTFE	polymer	-5 to 80°C	6 bar (87 psi)	BNC	3 m
HI 1005	double, PTFE	polymer	-5 to 80°C	6 bar (87 psi)	DIN	0.5 m
HI 2001	double, PTFE	polymer	-5 to 80°C	6 bar (87 psi)	BNC	3 m

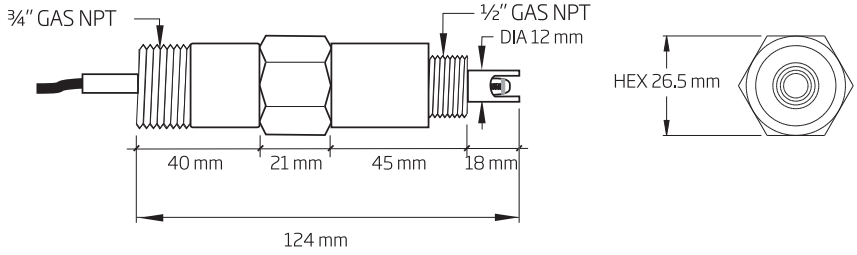




HI 1000 SERIES: pH ELECTRODES

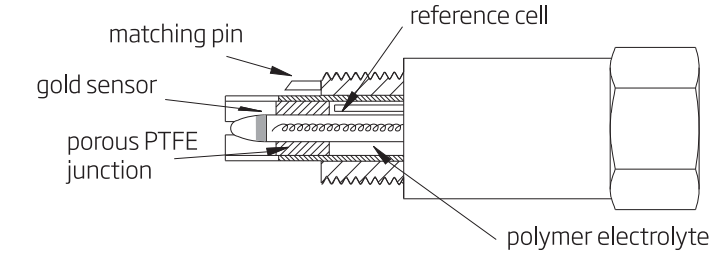
CODE	JUNCTION	ELECTROLYTE	MATCHING PIN	AMPLIFIER	TEMPERATURE	MAX PRESSURE	CONNECTOR	CABLE
HI 1002/3	double, PTFE	polymer	–	–	-5 to 80°C	6 bar (87 psi)	BNC	3 m
HI 1002/5	double, PTFE	polymer	–	–	-5 to 80°C	6 bar (87 psi)	BNC	5 m
HI 1002/10	double, PTFE	polymer	–	–	-5 to 80°C	6 bar (87 psi)	BNC	10 m
HI 1003/3	double, PTFE	polymer	yes	–	-5 to 80°C	6 bar (87 psi)	BNC	3 m
HI 1003/5	double, PTFE	polymer	yes	–	-5 to 80°C	6 bar (87 psi)	BNC	5 m
HI 1004/5	double, PTFE	polymer	yes	yes	-5 to 80°C	6 bar (87 psi)	spade lug	5 m
HI 1004/15	double, PTFE	polymer	yes	yes	-5 to 80°C	6 bar (87 psi)	spade lug	15 m

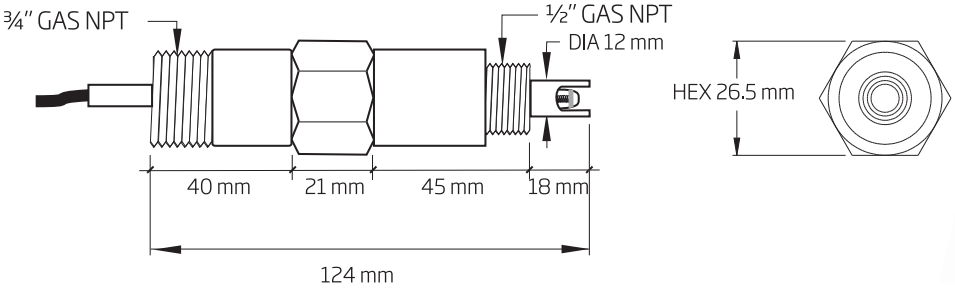




HI 2000 SERIES: ORP ELECTRODES WITH PLATINUM SENSOR

CODE	JUNCTION	ELECTROLYTE	MATCHING PIN	AMPLIFIER	TEMPERATURE	MAX PRESSURE	CONNECTOR	CABLE
HI 2002/3	double, PTFE	polymer	–	–	-5 to 80°C	6 bar (87 psi)	BNC	3 m
HI 2002/5	double, PTFE	polymer	–	–	-5 to 80°C	6 bar (87 psi)	BNC	5 m
HI 2003/3	double, PTFE	polymer	yes	–	-5 to 80°C	6 bar (87 psi)	BNC	3 m
HI 2003/5	double, PTFE	polymer	yes	–	-5 to 80°C	6 bar (87 psi)	BNC	5 m
HI 2004/5	double, PTFE	polymer	yes	yes	-5 to 80°C	6 bar (87 psi)	spade lug	5 m
HI 2006/5	double, PTFE	polymer	yes	yes	-5 to 80°C	6 bar (87 psi)	BNC	5 m



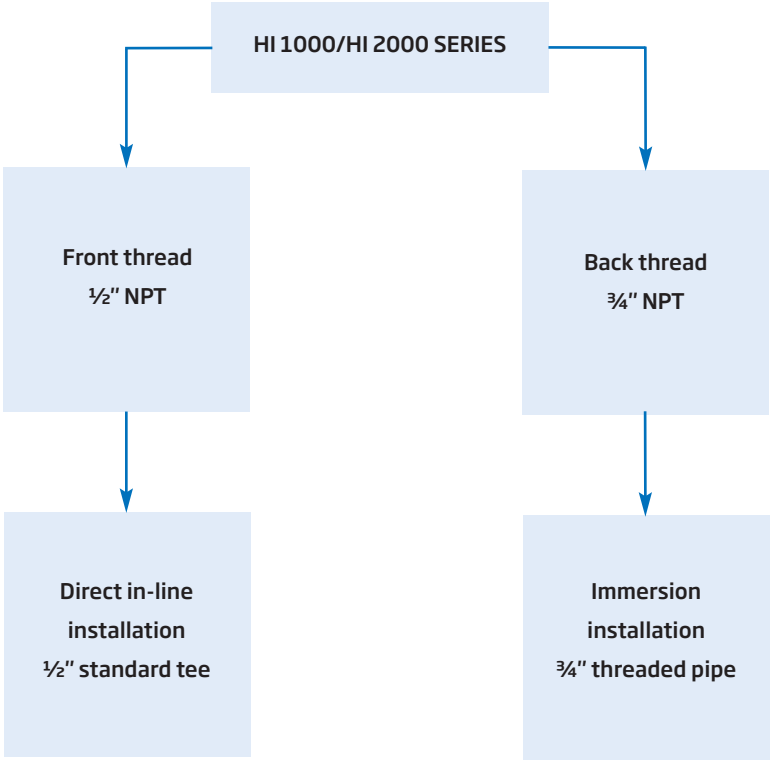


HI 2000 SERIES: ORP ELECTRODES WITH GOLD SENSOR

CODE	JUNCTION	ELECTROLYTE	MATCHING PIN	AMPLIFIER	TEMPERATURE	MAX PRESSURE	CONNECTOR	CABLE
HI 2012/3	double, PTFE	polymer	-	-	-5 to 80°C	6 bar (87 psi)	BNC	3 m
HI 2012/5	double, PTFE	polymer	-	-	-5 to 80°C	6 bar (87 psi)	BNC	5 m
HI 2013/3	double, PTFE	polymer	yes	-	-5 to 80°C	6 bar (87 psi)	BNC	3 m
HI 2013/5	double, PTFE	polymer	yes	-	-5 to 80°C	6 bar (87 psi)	BNC	5 m
HI 2005/5	double, PTFE	polymer	yes	yes	-5 to 80°C	6 bar (87 psi)	spade lug	5 m
HI 2008	double, PTFE	polymer	yes	yes	-5 to 80°C	6 bar (87 psi)	DIN	0.5 m

Installation

These sensors have a hex-shaped body for easy installation, requiring no special tools. Continuous in-line mounting is possible due to the ½" external thread. No special holders are required: HI 1000 and HI 2000 series can be used with any standard ½" pipe tee available on the market. On the opposite end, these probes are provided with a ¾" thread so that they can be attached to a pipe for dip applications.



Easy pH and ORP Electrodes with Quick and Easy BNC Connection

- **BNC connector**
- **Submersion and in-line installation capability**
- **PEI and glass body**

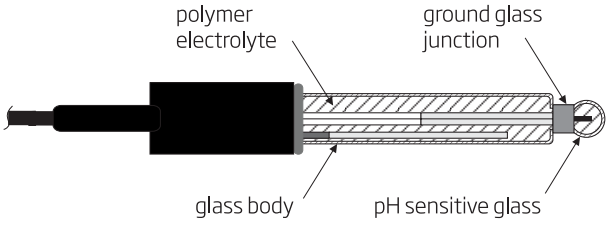
HANNA offers a wide range of combination pH and ORP electrodes specifically designed for needs of industrial users.

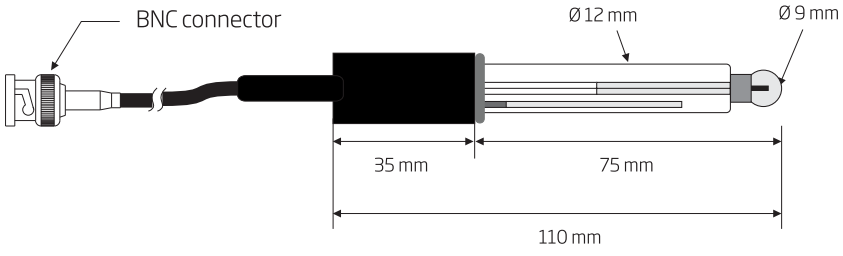
In order to reduce contamination problems, all electrodes are gel or polymer filled and feature double-junction technology.

The BNC connector allows quick and easy connection to any pH/ORP meter or transmitter. In addition to the BNC connection, select models offer a ¾" UNF thread for secure in-line installation.

PEI and glass body electrodes are available. PEI bodied electrodes are rugged and suitable for applications in which the capability to resist stress is needed. Glass bodied electrodes are easier to clean and recommended for use in aggressive chemicals.

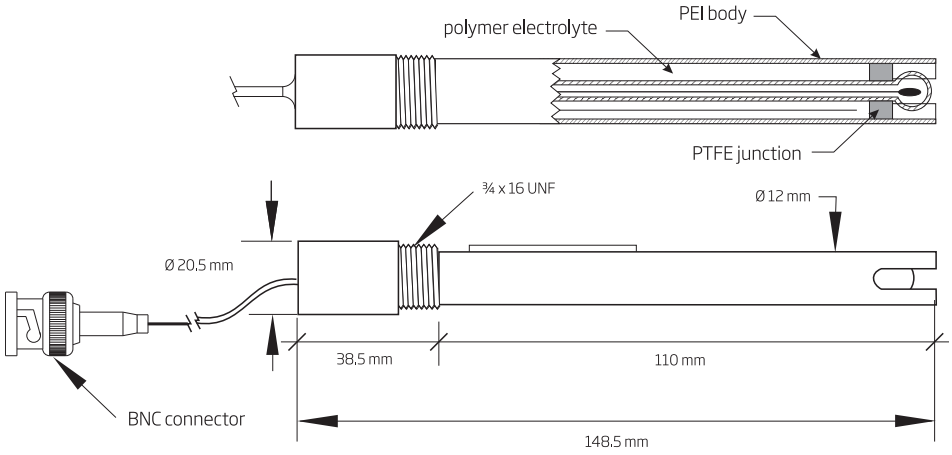
All pH and ORP electrodes can be mounted with the HANNA in-line and submersion assemblies.



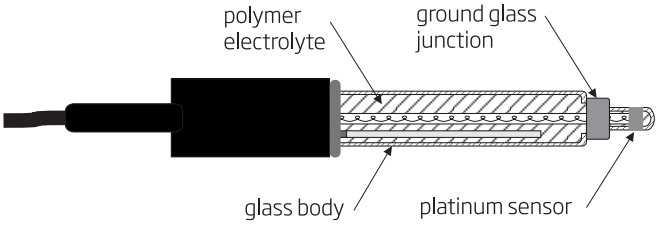


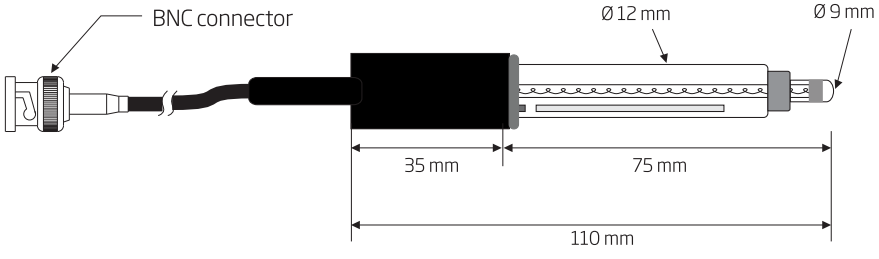
COMBINATION GLASS-BODY pH ELECTRODE						
CODE	JUNCTION	ELECTROLYTE	TEMPERATURE	MAX PRESSURE	CONNECTOR	CABLE
HI 1090B/5	double, ground glass	polymer	-5 to 95°C (23-203°F)	3 bar (43.5 psi)	BNC	5 m

Easy pH and ORP Electrodes with Quick and Easy BNC Connection

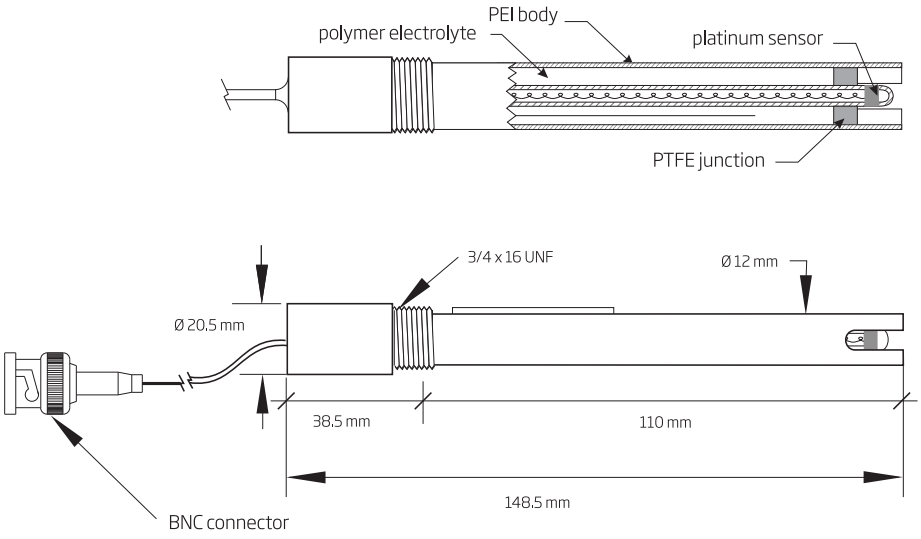


COMBINATION PEI-BODY pH ELECTRODE						
CODE	JUNCTION	ELECTROLYTE	TEMPERATURE	MAX PRESSURE	CONNECTOR	CABLE
HI 1210B/5	double, PTFE	polymer	-5 to 80°C	3 bar (43.5 psi)	BNC	5 m





COMBINATION GLASS-BODY ORP ELECTRODE WITH PLATINUM SENSOR						
CODE	JUNCTION	ELECTROLYTE	TEMPERATURE	MAX PRESSURE	CONNECTOR	CABLE
HI 3090B/5	double, ground glass	polymer	-5 to 95°C	3 bar (43.5 psi)	BNC	5 m



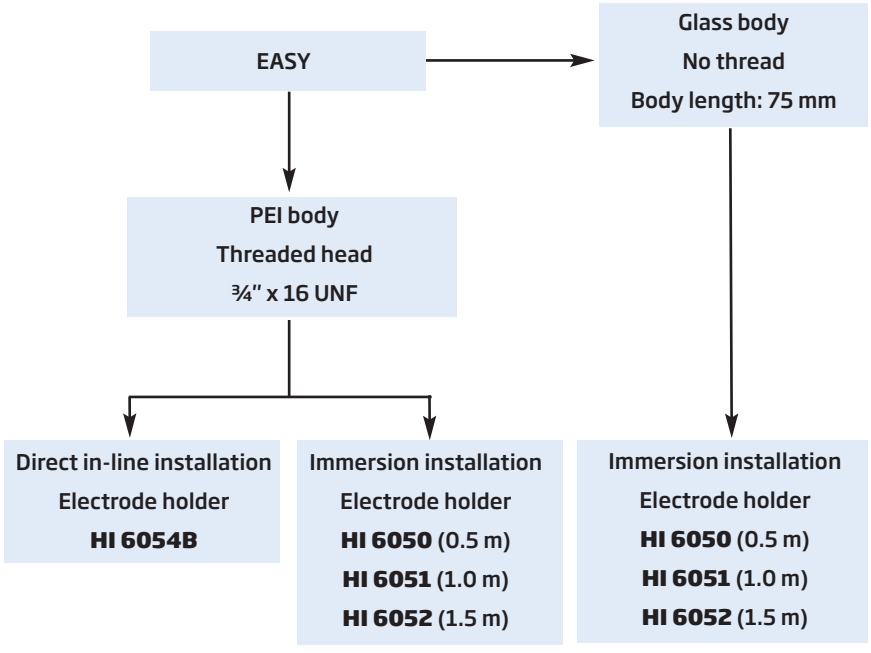
COMBINATION PEI-BODY ORP ELECTRODE WITH PLATINUM SENSOR						
CODE	**JUNCTION**	**ELECTROLYTE**	**TEMPERATURE**	**MAX PRESSURE**	**CONNECTOR**	**CABLE**
HI 3210B/5	double, PTFE	polymer	-5 to 80°C	3 bar (43.5 psi)	BNC	5 m
HI 3130B	single, ceramic	gel	0 to 80°C	3 bar (43.5 psi)	BNC	1 m

Installation

The installation of these electrodes is very flexible, because you can choose different mounting configurations.

Models with glass body and no external thread can be installed on tanks using the HI 6050 electrode holder with sealing O-ring.

Models with a PEI body and ¾" UNF thread or glass body and no thread can be easily installed directly in-line, using a T shape electrode holder, such as HI 6054B.



pH and ORP Electrodes with T-type Connection

- **Screw cap connector and PG 13.5 thread**
- **Easy operation**
- **Double-junction technology**
- **Pressure up to 3 bar (43.5 PSI)**

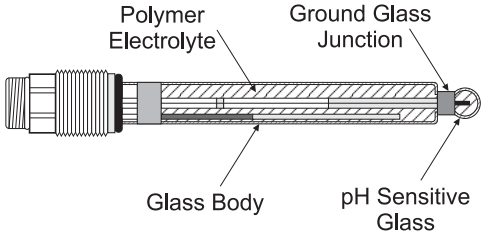
Electrodes featuring a T-connector have been designed by HANNA to gain the advantages of both PG 13.5 thread and screw cap. The PG 13.5 thread ensures proper in-line installation, furthermore, the user can quickly and easily perform all servicing and maintenance procedures. The screw cap allows for maximum versatility making it possible to connect a cable of different lengths. Easily detacheable cables make electrode replacement simple.

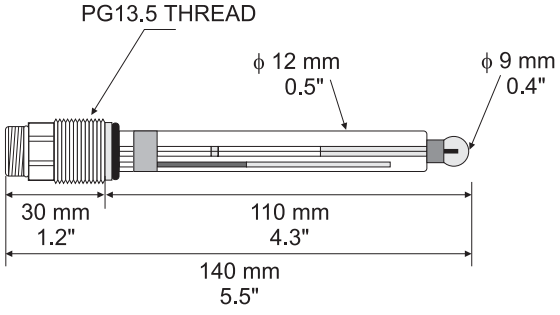
Many models are available to choose from, all of which feature a double junction of gel polymer filling to ensure long electrode life and reliability in harsh environments. In addition, users can select from ground-glass or cloth junction technology to meet the needs of their specific application.

Electrodes featuring a PEI body are ideal for use in moderately aggressive liquids, such as in wastewater, while electrodes featuring glass bodies are recommended with more aggressive chemicals, such as in galvanic applications.

These sensors are also suitable to be operated with moderate pressure up to 3 bar (43.5 psi) and operating temperature limits of -5 up to 95°C (23 to 203°F).

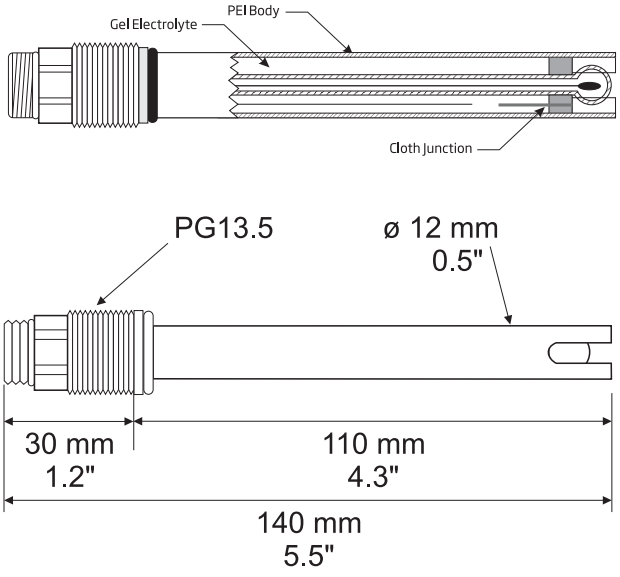
HANNA electrode holders and assemblies are featured at the end of this section for in-line and submersion applications. These optional accessories can be dismantled and reassembled easily without requiring any special tools.





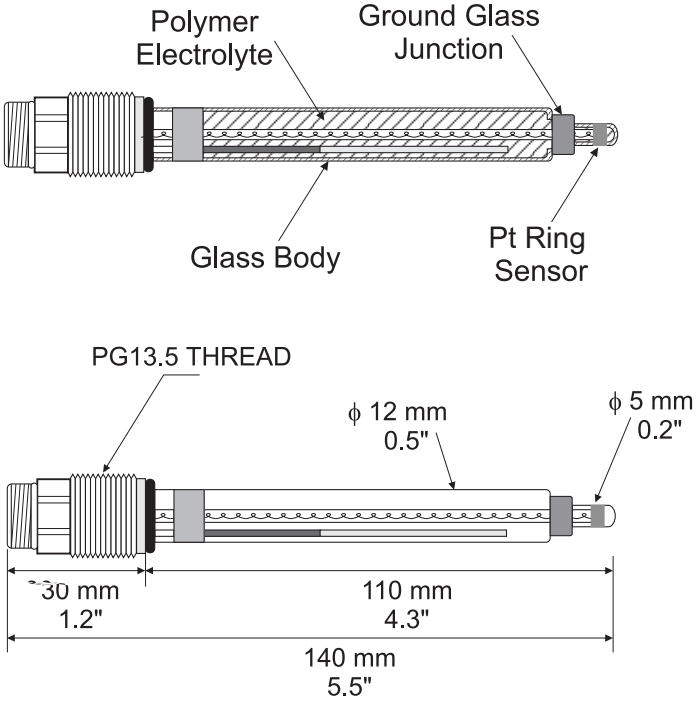
COMBINATION GLASS-BODY pH ELECTRODE

CODE	JUNCTION	ELECTROLYTE	TEMPERATURE	MAX PRESSURE	CONNECTOR
HI 1090T	double, ground glass	polymer	-5 to 95°C (23 to 203°F)	3 bar (43.5 psi)	T-type
HI 1190T	double, PTFE	polymer	-15 to 80°C (5 to 176°F)	6 bar (87 psi)	T-type
HI 1191T	double, PTFE	polymer	-15 to 80°C (5 to 176°F)	8 bar (116 psi)	T-type
HI 1192T	double, PTFE	polymer	-15 to 80°C (5 to 176°F)	8 bar (116 psi)	T-type



COMBINATION PEI-BODY pH ELECTRODE

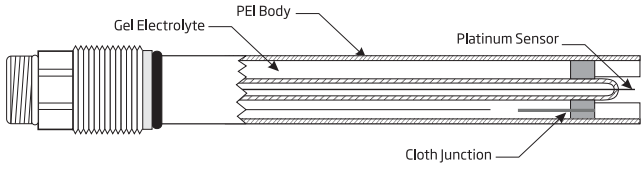
CODE	JUNCTION	ELECTROLYTE	TEMPERATURE	MAX PRESSURE	CONNECTOR
HI 1210T	double, cloth	gel	-5 to 80°C (23 to 176°F)	3 bar (43.5 psi)	T-type
HI 1211T	double, PTFE	polymer	-5 to 80°C (23 to 176°F)	3 bar (43.5 psi)	T-type

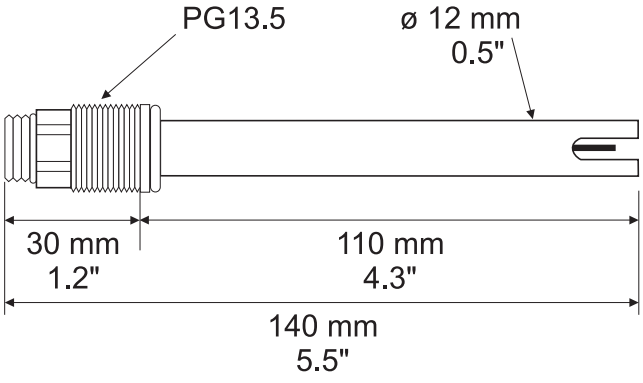


COMBINATION GLASS-BODY ORP ELECTRODE WITH PLATINUM SENSOR

CODE	JUNCTION	ELECTROLYTE	TEMPERATURE	MAX PRESSURE	CONNECTOR
HI 3090T	double, ground glass	polymer	-5 to 95°C (23 to 203°F)	3 bar (43.5 psi)	T-type
HI 3190T	double, PTFE	polymer	-15 to 100°C (5 to 212°F)	6 bar (87 psi)	T-type
HI 3211T	double, cloth	gel	-5 to 80°C (23 to 176°F)	3 bar (43.5 psi)	T-type

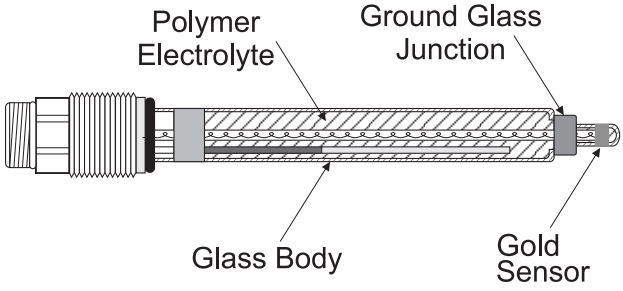
pH and ORP Electrodes with T-type Connection

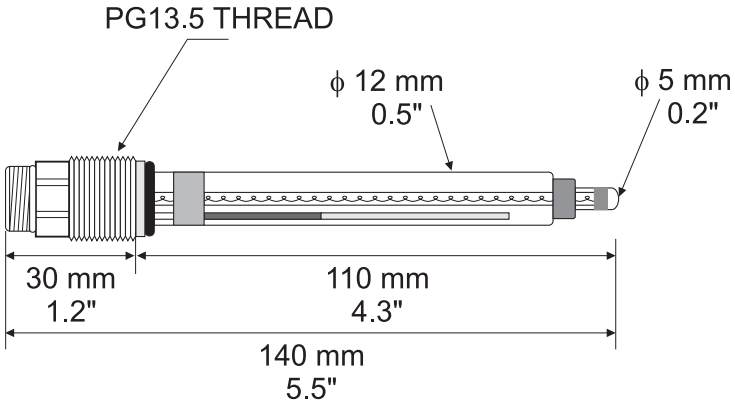




COMBINATION PEI-BODY ORP ELECTRODE WITH PLATINUM SENSOR

CODE	JUNCTION	ELECTROLYTE	TEMPERATURE	MAX PRESSURE	CONNECTOR	CABLE
HI 3210T	double, cloth	gel	-5 to 80°C (23-176°F)	3 bar (43.5 psi)	T-type	–





COMBINATION GLASS-BODY ORP ELECTRODE WITH GOLD SENSOR

CODE	JUNCTION	ELECTROLYTE	TEMPERATURE	MAX PRESSURE	CONNECTOR	CABLE
HI 4190T	double, PTFE	polymer	-5 to 80°C (23 to 176°F)	3 bar (43.5 psi)	T-type	–
HI 4290T	single, ground glass	polymer	-5 to 80°C (23 to 176°F)	3 bar (43.5 psi)	T-type	–

pH and ORP Immersion and In-Line Electrodes

CODE	HI 101	HI 102	HI 201
Description	submersible pH electrode	in-line pH electrode	submersible ORP electrode
Reference	double, Ag/AgCl	double, Ag/AgCl	double, Ag/AgCl
Junction / Flow Rate	PTFE	PTFE	PTFE
Electrolyte	polymer	polymer	polymer
Max Pressure	6 bar (25°C)	6 bar (25°C)	6 bar (25°C)
Range	pH: 0 to 13	pH: 0 to 13	pH: 0 to 13
Recommended Operating Temp.	20 to 40°C (68 to 104°F)	20 to 40°C (68 to 104°F)	20 to 40°C (86 to 104°F)
Tip /Shape	flat	flat	flat, platinum
Temperature Sensor	no	no	no
Amplifier	no	no	no
Body Material	PVC	PVC	PVC
Connector	BNC female	BNC female	BNC female
Connection Cable	HI 101/3 adapter with 3 m (9.9') cable	HI 101/3 adapter with 3 m (9.9') cable	HI 101/3 adapter with 3 m (9.9') cable
Recommended Use	Immersion	In-line	Immersion

HI 7635 • HI 7636

In-line Conductivity Probes

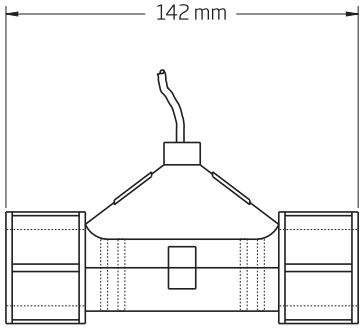
Flow-thru Conductivity Probes

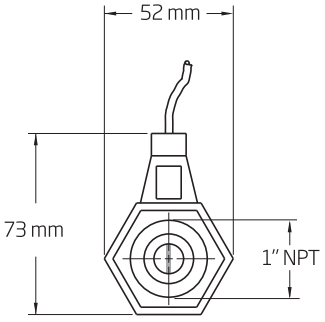
The wide range of HANNA conductivity probes includes flow-thru and dip models for industrial applications.

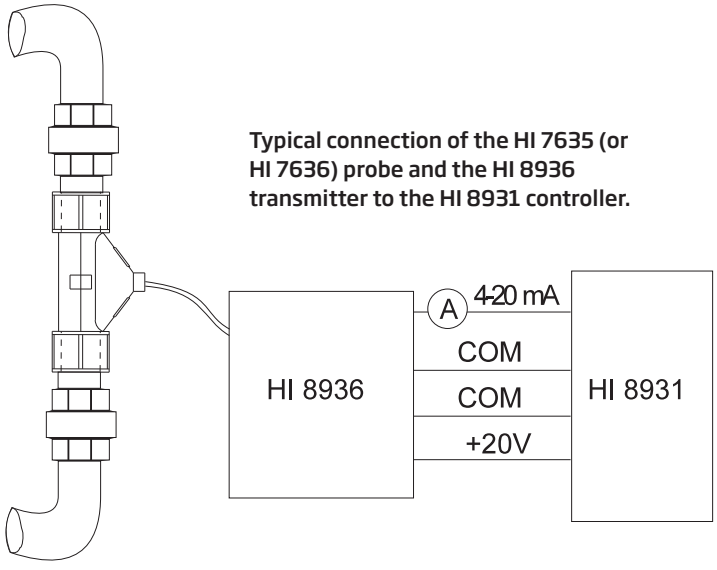
These conductivity probes combine the proven four-ring potentiometric method of measuring conductivity with platinum sensors. The universally acclaimed four-ring method provides an exceptionally stable measurement over a wider range. These probes do not suffer polarization, nor do they need frequent calibration or cell changes.

The built-in temperature sensor (select models) allows automatically temperature compensated measurements and features easy operation and maintenance.

The majority of probes are provided with a 4 m cable incorporating color coded wires for easy connection to HI 8936 transmitters while others provide a DIN connection.







Typical connection of the HI 7635 (or HI 7636) probe and the HI 8936 transmitter to the HI 8931 controller.

SPECIFICATIONS

CODE	TEMPERATURE COMPENSATION	BODY	OPERATING TEMPERATURE	MAX PRESSURE (@25°C/77°F)	CABLE/ CONNECTION
HI 7635	automatic, 0 to 50°C with NTC sensor	polypropylene	0 to 80°C (32 to 176°F)	5 bar	4 m (13.1')/Color coded wires
HI 7635D	automatic, 0 to 50°C with NTC sensor	polypropylene	0 to 80°C (32 to 176°F)	5 bar	4 m (13.1')/DIN
HI 7636	–	polypropylene	0 to 80°C (32 to 176°F)	5 bar	4 m (13.1')/Color coded wires

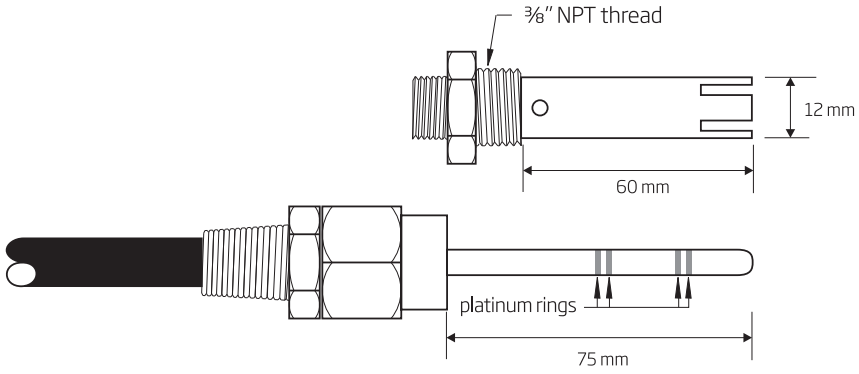
In-line Conductivity Probes with Platinum Ring

HI 7638

These conductivity probes combine the proven four-ring potentiometric method of measuring conductivity with platinum sensors. The universally acclaimed four-ring method provides an exceptionally stable measurement over a wider range. These probes do not suffer polarization, nor do they need frequent calibration or cell changes.

The built-in temperature sensor for the HI 7638 and HI 7639 allows automatically temperature compensated measurements and features easy operation and maintenance.

HI 7638 and HI 7639 are provided with a 4 m cable incorporating color coded wires for easy connection to HI 8936 transmitters while HI 7640 provides a DIN connection.



SPECIFICATIONS

CODE	TEMPERATURE COMPENSATION	BODY	OPERATING TEMPERATURE	MAX PRESSURE (@25°C/77°F)	CABLE/ CONNECTION
HI 7638	automatic, 0 to 50°C with NTC sensor	PEI and glass	0 to 120°C (32 to 248°F)	5 bar (72.5 psi)	3 m (9.9')/Color coded wires
HI 7638/5	automatic, 0 to 50°C with NTC sensor	PEI and glass	0 to 120°C (32 to 248°F)	5 bar (72.5 psi)	5 m (16.4')/Color coded wires
HI 7638/10	automatic, 0 to 50°C with NTC sensor	PEI and glass	0 to 120°C (32 to 248°F)	5 bar (72.5 psi)	10 m (32.8')/Color coded wires
HI 7638/20	automatic, 0 to 50°C with NTC sensor	PEI and glass	0 to 120°C (32 to 248°F)	5 bar (72.5 psi)	20 m (65.6')/Color coded wires
HI 7639	automatic, 0 to 50°C with Pt100 sensor	PEI and glass	0 to 120°C (32 to 248°F)	5 bar (72.5 psi)	3 m (9.9')/Color coded wires
HI 7639/5	automatic, 0 to 50°C with Pt100 sensor	PEI and glass	0 to 120°C (32 to 248°F)	5 bar (72.5 psi)	5 m (16.4')/Color coded wires
HI 7639/10	automatic, 0 to 50°C with Pt100 sensor	PEI and glass	0 to 120°C (32 to 248°F)	5 bar (72.5 psi)	10 m (32.8')/Color coded wires
HI 7639/15	automatic, 0 to 50°C with Pt100 sensor	PEI and glass	0 to 120°C (32 to 248°F)	5 bar (72.5 psi)	15 m (49.2')/Color coded wires
HI 7639/20	automatic, 0 to 50°C with Pt100 sensor	PEI and glass	0 to 120°C (32 to 248°F)	5 bar (72.5 psi)	20 m (65.6')/Color coded wires
HI 7639/30	automatic, 0 to 50°C with Pt100 sensor	PEI and glass	0 to 120°C (32 to 248°F)	5 bar (72.5 psi)	30 m (98.4')/Color coded wires
HI 7639D	automatic, 0 to 50°C with Pt100 sensor	PEI and glass	0 to 120°C (32 to 248°F)	5 bar (72.5 psi)	3 m (9.9')/DIN
HI 7639D/5	automatic, 0 to 50°C with Pt100 sensor	PEI and glass	0 to 120°C (32 to 248°F)	5 bar (72.5 psi)	5 m (16.4')/DIN
HI 7640	–	PEI and glass	0 to 120°C	5 bar (72.5 psi)	3 m (9.9)/Color coded wires

HI 3001 • HI 3001D • HI 3011

Flow-thru Conductivity Probes

Four-ring and Platinum Sensors

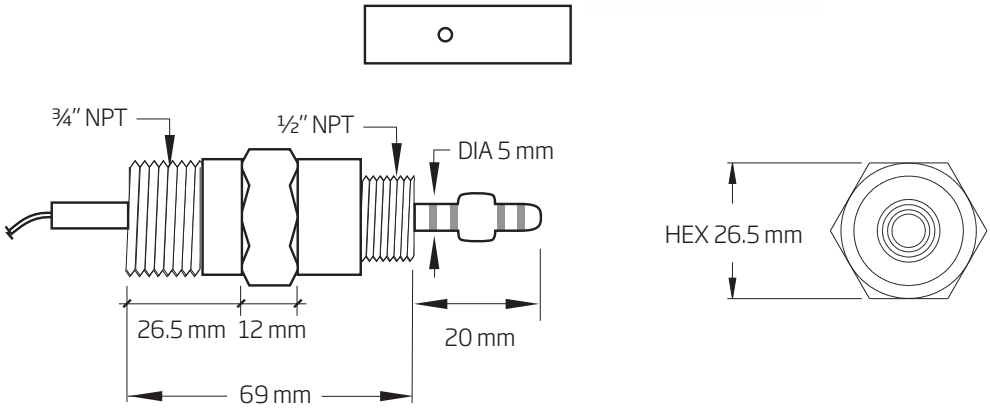
These four-ring probes measure conductivity with platinum sensors. They come with standard ½" external thread on the front for flow-thru mounting and ¾" threads on the back for submersion or pipe mounting.

These probes feature 3 m (9.9') of cable and the protective cover is made of PEI and can be removed for quick maintenance. These probes can withstand temperatures up to 80°C (176°F) and 6 bars (87 psi) of pressure.

In addition, HI 3001 houses an NTC sensor for Automatic Temperature Compensation.

Model HI 3001D with DIN connector is to be used with the HI 99xx series of wall-mounted controllers.

HI 3001



SPECIFICATIONS

CODE	TEMPERATURE COMPENSATION	BODY	OPERATING TEMPERATURE	MAX PRESSURE (@25°C/77°F)	CONNECTOR	CABLE
HI 3001	automatic, 0 to 60°C with NTC sensor	PEI and PVDF	0 to 80°C (32 to 176°F)	6 bar (87 psi)	–	3 m (9.9')
HI 3001/5	automatic, 0 to 60°C with NTC sensor	PEI and PVDF	0 to 80°C (32 to 176°F)	6 bar (87 psi)	–	5 m (16.4')
HI 3001/10	automatic, 0 to 60°C with NTC sensor	PEI and PVDF	0 to 80°C (32 to 176°F)	6 bar (87 psi)	–	10 m (32.8')
HI 3001D	automatic, 0 to 60°C with NTC sensor	PEI and PVDF	0 to 80°C (32 to 176°F)	6 bar (87 psi)	DIN	3 m (9.9')
HI 3001D/5	automatic, 0 to 60°C with NTC sensor	PEI and PVDF	0 to 80°C (32 to 176°F)	6 bar (87 psi)	DIN	5 m (16.4')
HI 3001D/10	automatic, 0 to 60°C with NTC sensor	PEI and PVDF	0 to 80°C (32 to 176°F)	6 bar (87 psi)	DIN	10 m (32.8')
HI 3001D/15	automatic, 0 to 60°C with NTC sensor	PEI and PVDF	0 to 80°C (32 to 176°F)	6 bar (87 psi)	DIN	15 m (49.2')
HI 3003/D*	automatic, 0 to 60°C with NTC sensor	PEI and PVDF	0 to 80°C (32 to 176°F)	6 bar (87 psi)	DIN	3 m (9.9')
HI 3011	–	PEI and PVDF	0 to 80°C (32 to 176°F)	6 bar (87 psi)	–	3 m (9.9')

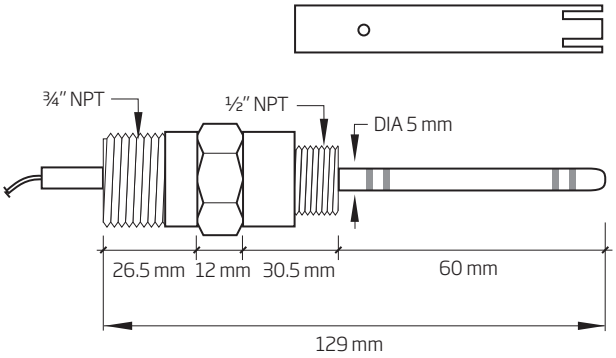
*for HI 9914 only

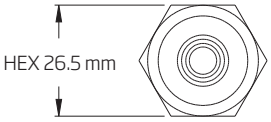
HI 3002

Four-ring and Platinum Sensors

The HI 3002 and HI 3012 four-ring probes measure conductivity with platinum sensors. They come with standard ½" external thread on the front for flow-thru mounting and ¾" threads on the back for submersion or pipe mounting. Probes incorporate 3 m (9.9') of cable.

The protective probe cover is made of PEI and can be removed for quick maintenance. These probes can withstand temperatures up to 80°C (176°F) and 6 bars (87 psi) of pressure. HI 3002 also houses an NTC temperature sensor for automatically temperature compensated measurements.





SPECIFICATIONS

CODE	TEMPERATURE COMPENSATION	BODY	OPERATING TEMPERATURE	MAX PRESSURE (@25°C/77°F)	CONNECTOR	CABLE
HI 3002	automatic, 0 to 60°C with NTC sensor	PEI and PVDF	0 to 80°C (32 to 176°F)	6 bar (87 psi)	–	3 m (9.9')
HI 3002/10	automatic, 0 to 60°C with NTC sensor	PEI and PVDF	0 to 80°C (32 to 176°F)	6 bar (87 psi)	–	10 m (32.8')
HI 3002D/5	automatic, 0 to 60°C with NTC sensor	PEI and PVDF	0 to 80°C (32 to 176°F)	6 bar (87 psi)	DIN	5 m (16.4')
HI 3002D/10	automatic, 0 to 60°C with NTC sensor	PEI and PVDF	0 to 80°C (32 to 176°F)	6 bar (87 psi)	DIN	10 m (32.8')
HI 3002D/15	automatic, 0 to 60°C with NTC sensor	PEI and PVDF	0 to 80°C (32 to 176°F)	6 bar (87 psi)	DIN	15 m (49.2')
HI 3012	–	PEI and PVDF	0 to 80°C (32 to 176°F)	6 bar (87 psi)	–	3 m (9.9')

HI 7610 • HI 7611

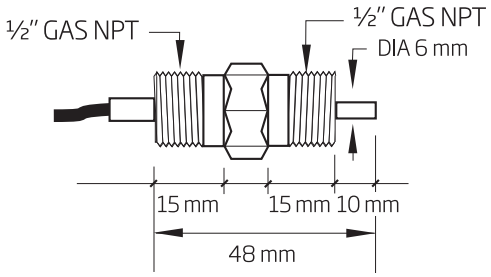
Stainless Steel Temperature Probes

- **Flow-thru and immersion mounting**
- **High accuracy**
- **Stainless steel model with ½" GAS NPT external thread**
- **Glass version with high chemical resistance and PG 13.5 external thread**

HI 7610, HI 7611

HI 7610 and HI 7611 are temperature probes with 3-wire Pt100 or Pt1000 sensors. These probes provide accurate and effective temperature compensation. They can be used with a vast array of industrial pH, ORP and conductivity controllers on the market, as well as our pH 500, mV 600, HI 700 & HI 504 series.

HI 7610 and HI 7611 are constructed of stainless steel for additional ruggedness. They incorporate ½" external threads on both ends to facilitate inline and immersion installations.



HI 7610 AND HI 7611 INDUSTRIAL TEMPERATURE PROBES

CODE	TEMPERATURE SENSOR	BODY	MAX PRESSURE	CABLE LENGTH
HI 7610	Pt100	stainless steel	8 bar	5 m (16.4')
HI 7611	Pt1000	stainless steel	8 bar	5 m (16.4')

HI 7620 • HI 7621

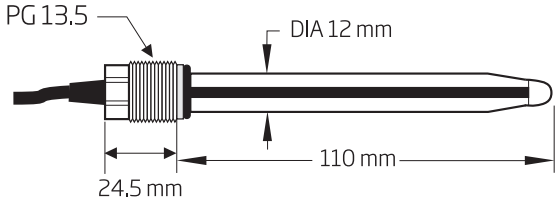
Glass Body Probes

- **Flow-thru and immersion mounting**
- **High accuracy**
- **Glass body with high chemical resistance and PG 13.5 external thread**

HI 7621

HI 7620 and HI 7621 are temperature probes with 3-wire Pt100 or Pt1000 sensors. These probes provide accurate and effective temperature compensation. They can be used with a vast array of industrial pH, ORP and conductivity controllers on the market, as well as our pH 500, mV 600, HI 700 & HI 504 series.

HI 7620 and HI 7621 are made with a glass body in order to provide greater resistance against aggressive chemicals. They also come with a standard PG 13.5 external thread so that they may be used with our HI 6054T holder as well as other common probe holders.

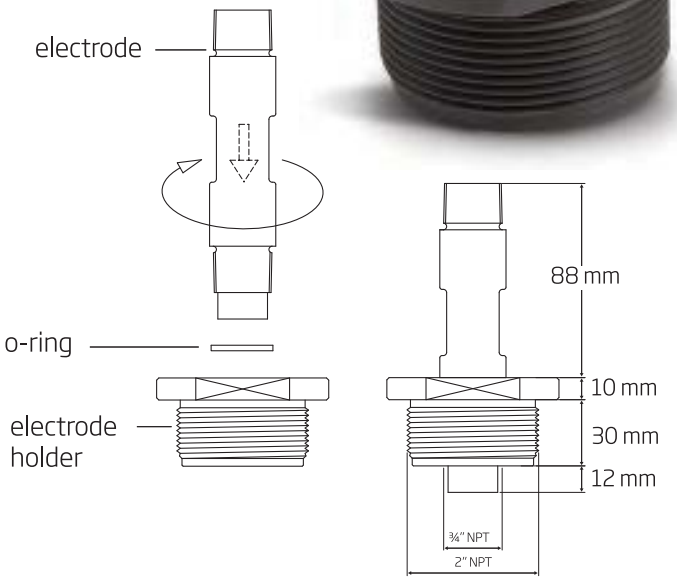


HI 7620 AND HI 7621 INDUSTRIAL TEMPERATURE PROBES

CODE	TEMPERATURE SENSOR	BODY	MAX PRESSURE	CABLE LENGTH
HI 7620	Pt100	glass	3 bar	5 m (16.4')
HI 7621	Pt1000	glass	3 bar	5 m (16.4')

HI 60542

In-line Electrode Holder for Direct Pipe Installation



HI 60542 is a two inch NPT in-line PVC electrode holder ideal for direct pipe installation.

HI 60542 has been designed specifically to be used with HANNA ¾" NPT process electrodes with built-in temperature sensor and matching pin.

SPECIFICATIONS	HI 60542
Electrode Holder Material	PVC
O-ring Material	NBR (Buna N)
Minimum Temperature	-10 °C
Maximum Temperature	+60 °C
Maximum Pressure	8 bar @25°C or 3 bar @50°C

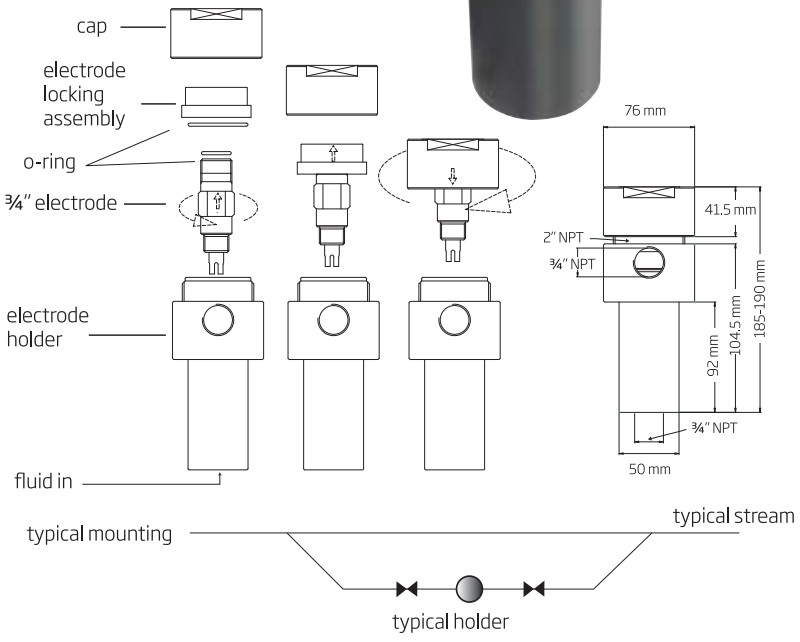
ACCESSORIES

HI 60542-0 1 set of O-rings

HI 60545

By-pass Loop Electrode Holder

No Downtime



HI 60545 is an electrode holder designed for use in a bypass loop configuration.

HI 60545 allows easy maintenance and calibration without shutting down the process. The design of HI 60545 assures that the glass sensor remains wet even when system is not under pressure.

HI 60545 is only for use with HANNA 1006 series probes that have a ¾" NPT fitting.

SPECIFICATIONS	HI 60545
Electrode Holder Material	PVC
O-ring Material	NBR (Buna N)
Minimum Temperature	-10 °C
Maximum Temperature	+60 °C
Maximum Pressure	8 bar @25°C or 3 bar @50°C

ACCESSORIES

HI 60545-0 1 set of O-rings

HI 6050

Submersible Electrode Holder

These electrode mounting systems are constructed in rugged PVC and will resist most of the chemicals associated with wastewater treatment.

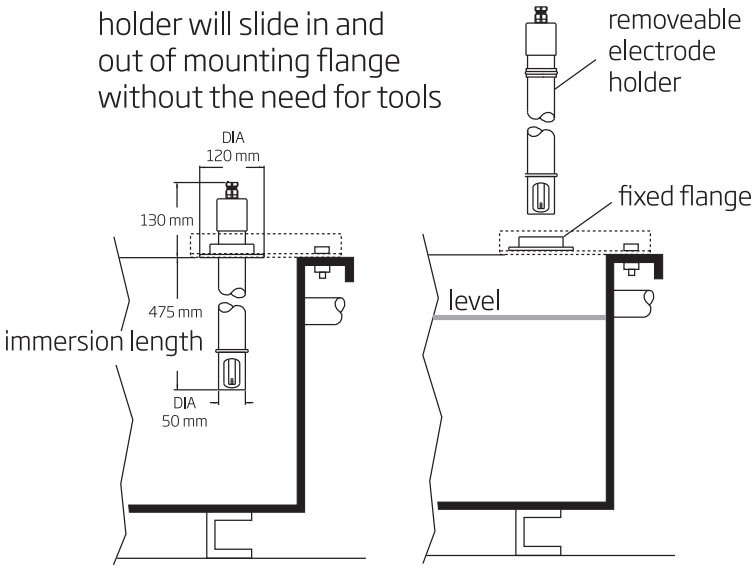
They are easy to install and require no tools for maintenance, making weekly electrode inspection and meter calibration a quick and easy task.

The mounting flange is a rugged PVC piece that mounts directly to the stainless steel brackets on your tank.

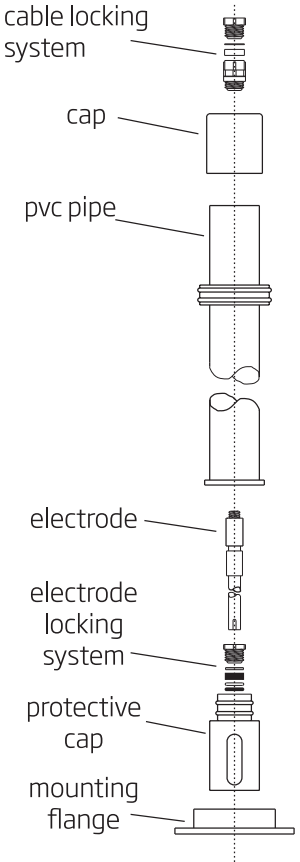
The figure illustrates the suggested bracket dimensions used for mounting. Once mounted to your tank, the electrode holder is a sturdy, protective housing that will extend the life of your electrodes.

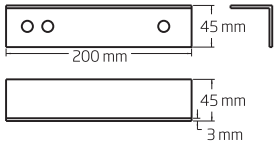
The electrode slides into the holder and is hand tightened into place. The cable from the electrode will lead up through the holder and out through the cap on top. The cable is also shielded inside the holder to prevent any damage to the insulation. The protective cap is removable to allow for quick and simple electrode maintenance and replacement.

removable electrode holder will slide in and out of mounting flange without the need for tools

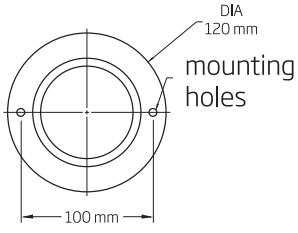


PVC construction requires no tools for maintenance





suggested dimensions of stainless steel mounting brackets to mount the flange onto the tank



SPECIFICATIONS	TOTAL LENGTH	WEIGHT	SUBMERSION LENGTH
HI 6050	605 mm (23.8")	0.8 kg (26 oz.)	475 mm (18.7")
HI 6051	1105 mm (43.5")	1.2 kg (44 oz.)	975 mm (38.4")
HI 6052	1605 mm (63.2")	2.0 kg (71 oz.)	1500 mm (59.1")

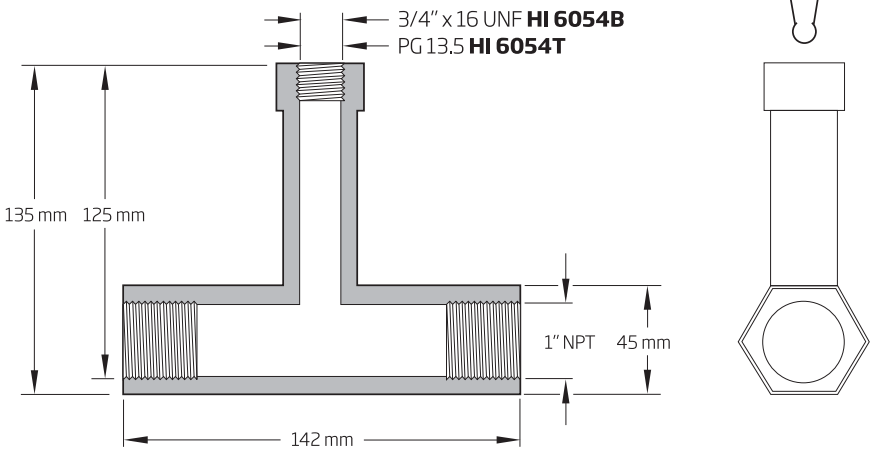
Electrode Holders for In-line Applications

The HI 6054 is a rugged, fiber-reinforced polypropylene in-line electrode holder.

Simply install the holder in the line so that liquid will always be present inside the holder.

Once installed, the electrode will remain in contact with the fluid at all times, allowing the most accurate readings possible.

The HI 6054B and HI 6054T are designed specifically to work with HANNA electrodes with external thread of ¾" x 16 UNF and PG 13.5 respectively.

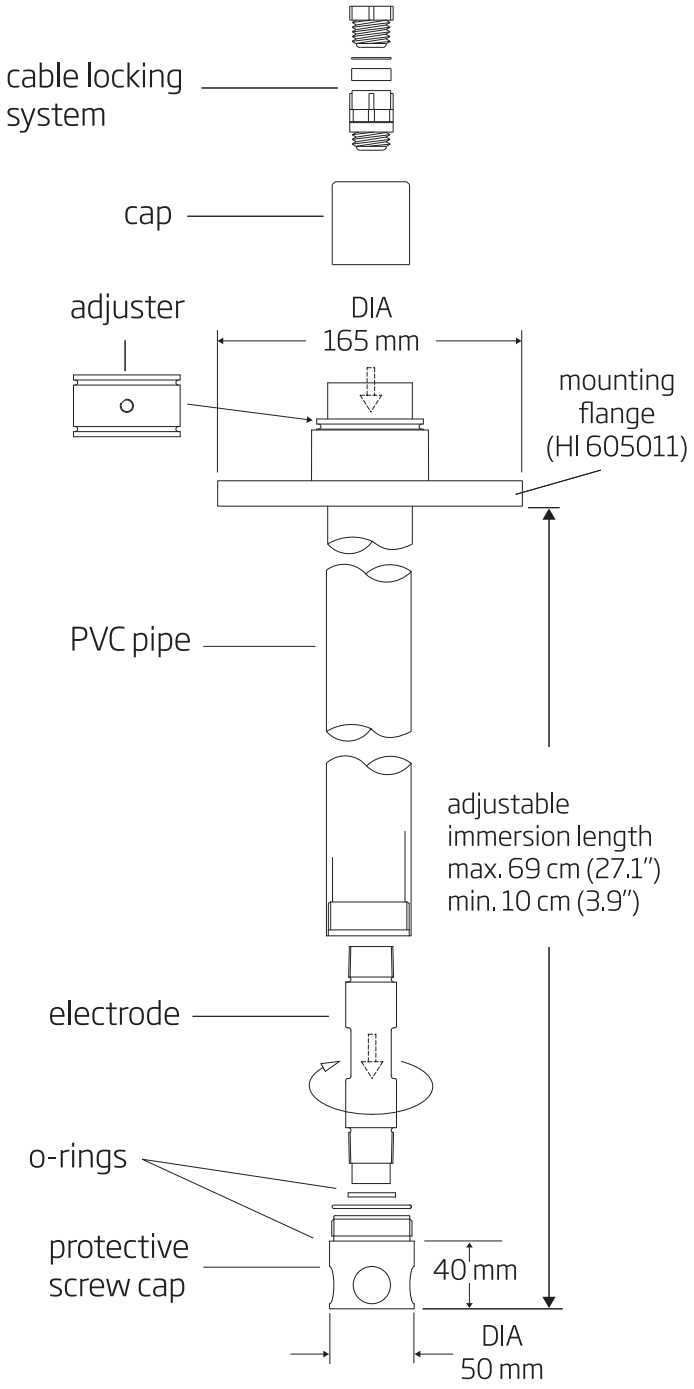


HI 60501 • HI 60503

Immersion Electrode Holders for Tanks, Vessels, Baths and Open Channels

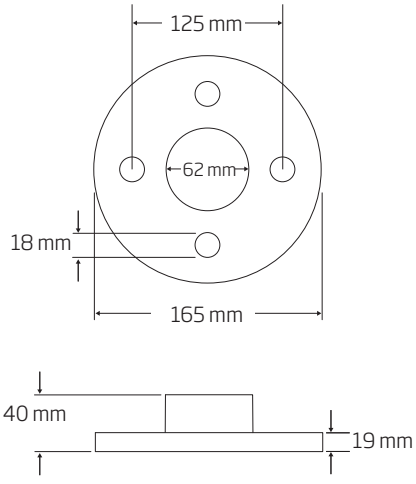
These electrode holders are adjustable length and have been designed for immersion applications. Simply set the flange adjuster and the flange (HI 605011) to your required length and install.

These holders have been designed specifically to be used with HANNA 1006 series probes that have a ¾" NPT fitting.



HI 60503

HI 605011
mounting flange



SPECIFICATIONS	HI 60501	HI 60503
Electrode Holder Material	PVC	PVDF
O-ring Material	NBR (Buna N)	NBR (Buna N)
Minimum Immersion Level	10 cm (3.9")	10 cm (3.9")
Maximum Immersion Level	69 cm (27.1")	69 cm (27.1")
Minimum Temperature	-10°C (14°F)	-15°C (5°F)
Maximum Temperature	+60°C (140°F)	+100°C (212°F)

ACCESSORIES

HI 605011	PVC mounting flange
HI 60501-0	1 set of O-rings

CONTENTS

Reagents

Checker®HC
Reagents

Code	Test Kit Reagent	# Tests
HI 701	Chlorine, Free HI 701-25	25 tests
HI 706	Phosphorus HR HI 706-25	40 tests
HI 711	Chlorine, Total HI 711-25	25 tests
HI 713	Phosphate LR HI 713-25	25 tests
HI 717	Phosphate HR HI 717-25	40 tests
HI 718	Iodine HI 718-25	25 tests
HI 721	Iron HR HI 721-25	25 tests
HI 723	Chromium VI, HR HI 723-25	25 tests
HI 726	Nickel HR HI 726-25	25 tests
HI 727	Color of Water N/A	N/A
HI 729	Fluoride LR HI 729-26	25 tests
HI 736	Phosphorus LR HI 736-25	25 tests
HI 739	Fluoride HR HI 739-26	25 tests
HI 755	Alkalinity HI 755-26	25 tests
HI 764	Nitrite ULR HI 764-25	25 tests
HI 770	Silica HR HI 770-25	25 tests

Chemical Test Kit
Reagents

Code	Test Kit Reagent	# Tests
HI 38000	Sulfate HI 38000-10	100 tests
HI 38001	Sulfate LR/HR HI 38001-10	200 tests
HI 38013	Alkalinity, Phenolphthalein & Total HI 38013-100	200 tests
HI 38014	Alkalinity ($CaCO_3$) HI 38014-100	100 tests
HI 38015	Chloride, extended range HI 38015-100	100 tests
HI 38016	Chlorine, Total, MR HI 38016-100	100 tests
HI 38017	Chlorine, Free & Total, LR/MR HI 38017-200	200 tests
HI 38018	Chlorine, Free, LR/MR HI 38018-200	200 tests
HI 38019	Chlorine, Total, LR/MR HI 38019-200	200 tests
HI 38020	Chlorine, Free & Total, LR/MR/HR HI 38020-200	200 tests
HI 38022	Chlorine, Total, HR HI 38022-100	100 tests
HI 38023	Chlorine, Total, extended range HI 38023-100	100 tests
HI 38033	Hardness, Total ($CaCO_3$) HI 38033-100	100 tests
HI 38034	Hardness, Total ($CaCO_3$) HI 38034-200	200 tests
HI 38035	Hardness (Total & Calcium) HI 38035-200	200 tests
HI 38039	Iron LR HI 38039-100	100 tests
HI 38040	Iron MR HI 38040-100	100 tests
HI 38041	Iron HR HI 38041-100	100 tests
HI 38042	Manganese LR HI 38042-100	100 tests
HI 38049 (NH_3–N)	Ammonia (fresh water) HI 38049-100	100 tests

Code	Test Kit Reagent	# Tests
HI 38050	Nitrate (soil / irrigation) (NO_3^-–N) HI 38050-200	200 tests
HI 38051	Nitrite (NO_2^-–N) HI 38051-100	100 tests
HI 38054	Ozone HI 38054-100	100 tests
HI 38058	pH HI 38058-100	300 tests
HI 38061	Phosphate HI 38061-100	100 tests
HI 38067	Silica HR (SiO_2) HI 38067-100	100 tests
HI 38066	Silica LR (SiO_2) HI 38066-100	100 tests
HI 38072	Manganese (irrigation water) HI 38072-100	100 tests
HI 38073	Phosphorus (soil) HI 38073-100	100 tests
HI 38074	Boron HI 38074-100	100 tests
HI 38075	Copper HI 38075-100	100 tests
HI 38076	Zinc HI 38076-100	100 tests
HI 38077	Phosphate (irrigation water) HI 38077-100	100 tests
HI 38078	SAR HI 38078-100	100 tests
HI 38079	Magnesium (irrigation water) HI 38079-100	100 tests
HI 38081	Calcium & Magnesium (irrigation water) HI 38081-100	100 tests
HI 38080	Calcium & Magnesium (soil) HI 38080-100	100 tests
HI 38082	Potassium (soil) HI 38082-100	100 tests
HI 38083	Sodium, exchangeable (EES) & gypsum requirement (GR) HI 38083-100	100 tests

Code	Test Kit / Reagent	# Tests
HI 38084	**Acidity, total exchangeable meq/100 g**	
	HI 38084	100 tests
HI 38086	**Calcium (irrigation water)**	
	HI 38086-100	100 tests
HI 3810	**Dissolved Oxygen**	
	HI 3810-100	110 tests
HI 3811	**Alkalinity ($CaCO_3$)**	
	HI 3811-100	110 tests
HI 3812	**Hardness, Total ($CaCO_3$)**	
	HI 3812-100	100 tests
HI 3813	**Alkalinity & Acidity**	
	Alkalinity (as $CaCO_3$)	
	HI 3811-100	110 avg. tests
	Acidity (as $CaCO_3$)	
	HI 3820-100	110 tests
HI 3814	**Environmental Monitoring**	
	Dissolved Oxygen	
	HI 3810-100	110 tests
	Alkalinity (as $CaCO_3$)	
	HI 3811-100	110 avg. tests
	Hardness (as $CaCO_3$)	
	HI 3812-100	100 avg. tests
	Carbon Dioxide	
	HI 3818-100	110 tests
	Acidity (as $CaCO_3$)	
	HI 3820-100	110 tests
HI 3815	**Chloride**	
	HI 3815-100	110 tests
HI 3816	**Boiler & Feedwater**	
	Alkalinity (as $CaCO_3$)	
	HI 3811-100	110 avg. tests
	Chloride	
	HI 3815-100	110 tests
	Hardness (as $CaCO_3$)	
	HI 3812-100	100 avg. tests
HI 3817	**Water Quality**	
	Alkalinity (as $CaCO_3$)	
	HI 3811-100	110 avg. tests
	Hardness (as $CaCO_3$)	
	HI 3812-100	100 avg. tests
	Chloride	
	HI 3815-100	110 tests
	Sulfite (Na_2SO_3)	
	HI 3822-100	110 tests
	Iron	
	HI 3834-050	50 tests
HI 3817BP	**Water Quality Backpack Lab™**	
	Dissolved Oxygen	
	HI 3810-100	110 tests
	Alkalinity (as $CaCO_3$)	
	HI 3811-100	110 avg. tests
	Hardness, total ($CaCO_3$)	
	HI 3812-100	100 tests
	Carbon Dioxide	
	HI 3818-100	110 tests
	Acidity (as $CaCO_3$)	
	HI 3820-100	110 tests
	Phosphate	
	HI 3833-050	50 tests
	Nitrate (NO_3^-–N)	
	HI 3874-100	100 tests
HI 3818	**Carbon Dioxide**	
	HI 3818-100	110 tests
HI 3819	**Acid Mining**	
	Alkalinity (as $CaCO_3$)	
	HI 3811-100	110 avg. tests
	Acidity (as $CaCO_3$)	
	HI 3820-100	110 tests
	Iron	
	HI 3834-050	50 tests
HI 3820	**Acidity (as $CaCO_3$)**	
	HI 3820-100	110 tests
HI 3821	**Dissolved Oxygen**	
	HI 3810-100	110 tests
HI 3821	**Cooling & Boilers**	
	Alkalinity (as $CaCO_3$)	
	HI 3811-100	110 avg. tests
	Hardness, Total ($CaCO_3$)	
	HI 3812-100	100 tests
	Chloride	
	HI 3815-100	110 tests
	Sulfite (Na_2SO_3)	
	HI 3822-100	110 tests
	Phosphate	
	HI 3833-050	50 tests
HI 3822	**Sulfite (Na_2SO_3)**	
	HI 3822-100	110 tests
HI 3823	**Aquaculture**	
	Dissolved Oxygen	
	HI 3810-100	110 tests
	Alkalinity (as $CaCO_3$)	
	HI 3811-100	110 avg. tests
	Hardness, Total ($CaCO_3$)	
	HI 3812-100	100 tests
	Carbon Dioxide	
	HI 3818-100	110 tests
	Salinity (g/Kg)	
	HI 3835-100	110 tests
HI 3824	**Ammonia (fresh water) (NH_3–N)**	
	HI 3824-025	25
HI 3825	**Swimming Pool**	
	Alkalinity (as $CaCO_3$)	
	HI 3811-100	110 avg.
	Bromine	
	HI 3830-060	60 tests
	Chlorine, Free	
	HI 3831F-050	50 tests
	Chlorine, Total	
	HI 3831T-050	50 tests
HI 3826	**Ammonia (sea water) (NH_3–N)**	
	HI 3826-025	25
HI 3827	**Boiler & Feedwater**	
	Alkalinity ($CaCO_3$)	
	HI 3811-100	110 avg.
	Hardness, Total ($CaCO_3$)	
	HI 3812-100	100 tests
	Chloride	
	HI 3815-100	110 tests
	Sulfite (Na_2SO_3)	
	HI 3822-100	110 tests
	Phosphate	
	HI 3833-050	50 tests
HI 3828	**Boiler & Feedwater**	
	Alkalinity ($CaCO_3$)	
	HI 3811-100	110 avg.
	Hardness, Total ($CaCO_3$)	
	HI 3812-100	100 tests
	Chloride	
	HI 3815-100	110 tests
	Iron	
	HI 3834-050	50 tests
HI 3829F	**Chlorine, Free**	
	HI 3829F-050	50 tests
HI 3830	**Bromine**	
	HI 3830-060	60 tests
HI 3831F*	**Chlorine, Free**	
	HI 3831F-050	50 tests
HI 3831T*	**Chlorine, Total**	
	HI 3831T-050	50 tests
HI 3832	**Iodine**	
	HI 3832-050	50 tests
HI 3833	**Phosphate**	
	HI 3833-050	50 tests
HI 3835	**Salinity (g/Kg)**	
	HI 3835-100	110 tests

*add /S to code for Spain

Code	Test Kit / Reagent	# Tests
HI 3837	**Boiler & Feedwater**	
	Sulfite (Na_2SO_3)	
	HI 3822-100	110 tests
	Phosphate	
	HI 3833-050	50 tests
HI 3838	**Formaldehyde**	
	HI 3838-100	110 tests
HI 3839	**Hydroxide**	
	HI 3839-100	110 tests
HI 3840	**Hardness LR (as $CaCO_3$)**	
	HI 3840-050	50 tests
HI 3841	**Hardness MR (as $CaCO_3$)**	
	HI 3841-050	50 tests
HI 3842	**Hardness HR (as $CaCO_3$)**	
	HI 3842-050	50 tests
HI 3843	**Hypochlorite (bleach)**	
	HI 3843-100	100 tests
HI 3844	**Hydrogen Peroxide**	
	HI 3844-100	100 tests
HI 3845	**Chromium VI MR/HR**	
	HI 3845-100	100 tests
HI 3846	**Chromium VI**	
	HI 3846-100	100 tests
HI 3847	**Copper**	
	HI 3847-100	100 tests
HI 3849	**Hydrazine**	
	HI 3849-100	100 tests
HI 3850	**Ascorbic Acid**	
	HI 3850-100	100 tests
HI 3851	**Cyanuric Acid**	
	HI 3851-100	100 tests
HI 3854	**Zinc**	
	HI 3854-100	100 tests
HI 3855	**Cyanide**	
	HI 3855-100	100 tests
HI 3856	**Copper ULR**	
	HI 3856-100	100 tests
HI 3857	**Detergents (ABS/LAS)**	
	HI 3857-035	35 tests
HI 3859	**Glycol (ppm)**	
	HI 3859-025	25 tests
HI 3864	**Phenols (ppm)**	
	HI 3864-100	100 tests
HI 3873	**Nitrite (NO_2^-–N)**	
	HI 3873-100	100 tests
HI 3874	**Nitrate (NO_3^-–N)**	
	HI 3874-100	100 tests
HI 3875	**Chlorine, Free, MR**	
	HI 3875-100	100 tests
HI 3879	**Iodine**	
	HI 3879-100	100 tests
HI 3880 (HI 3880/0)	**pH**	
	HI 3880-100	100 tests
HI 3881	**pH**	
	HI 3881-100	100 tests
HI 3881-5	**pH**	
	HI 3881-5	500 tests
HI 3882	**pH**	
	HI 3882-200	200 tests
HI 3886	**pH**	
	HI 3886-100	100 tests
HI 3887	**Swimming Pool (Cl, Free)**	
	Chlorine, Free	
	HI 3831F-050	50 tests
	pH + Dechlorinating Agent	
	HI 3881-010	100 tests
	pH	
	HI 3881-100	100 tests
HI 3888	**Swimming Pool (Cl, Total)**	
	Chlorine, Total	
	HI 3831T-050	50 tests
	pH + Dechlorinating Agent	
	HI 3881-010	100 tests
	pH	
	HI 3881-100	100 tests
HI 3889	**Iron & Total Hardness**	
	Iron	
	HI 3834-050	50 tests
	Hardness MR (as $CaCO_3$)	
	HI 3841	50 tests
HI 3893	**Aquarium**	
	Ammonia (sea water) (NH_3–N)	
	HI 3826-025	25 tests
	Nitrite (NO_2^-–N)	
	HI 3873-100	100 tests
	Nitrate (NO_3^-–N)	
	HI 3874-100	100 tests
	pH	
	HI 3881-100	100 tests
HI 3895	**Agriculture, Basic**	
	Nitrogen	
	HI 3895-010	10 tests
	Phosphorus	
	HI 3895-010	10 tests
	Potassium	
	HI 3895-010	10 tests
	pH	
	HI 3895-010	10 tests
HI 3896	**Agriculture, Pro**	
	Nitrogen	
	HI 3896-025	25 tests
	Phosphorus	
	HI 3896-025	25 tests
	Potassium	
	HI 3896-025	25 tests
	pH	
	HI 3896-025	25 tests
HI 3896BP	**Agriculture Backpack Lab™**	
	Nitrogen	
	HI 3896-025	25 tests
	Phosphorus	
	HI 3896-025	25 tests
	Potassium	
	HI 3896-025	25 tests
	pH	
	HI 3896-025	25 tests
HI 3897	**Acidity, olive oil**	
	HI 3897-010	10 tests
HI 3898	**Chloride, absence/presence**	
	HI 3898	100 tests
HI 3899BP	**Marine Science Backpack Lab™**	
	Dissolved Oxygen	
	HI 3810-100	110 tests
	Alkalinity (as $CaCO_3$)	
	HI 3811-100	110 avg. tests
	Carbon Dioxide	
	HI 3818-100	110 tests
	Acidity (as $CaCO_3$)	
	HI 3820-100	110 tests
	Ammonia (sea water) (NH_3–N)	
	HI 3826-025	25 tests
	Phosphate	
	HI 3833-050	50 tests
	Salinity (g/Kg)	
	HI 3835-100	110 tests
	Nitrite (NO_2^-–N)	
	HI 3873-100	100 tests
	Nitrate (NO_3^-–N)	
	HI 3874-100	100 tests

COD Reagents

Parameter	Reagent	# Tests
Ammonia, LR	HI 93764A- 25	25 tests
Ammonia, HR	HI 93764B- 25	25 tests
Chlorine, Free	HI 93701- 01	100 tests
	HI 93701- 03	300 tests
Chlorine, Total	HI 93711- 01	100 tests
	HI 93711- 03	300 tests
Nitrate	HI 93766-50	50 tests
Nitrogen, Total	HI 93767A-50	50 tests
Nitrogen, Total HR	HI 93767B-50	50 tests
COD LR, EPA	HI 93754A-25	25 tests
COD MR, EPA	HI 93754B-25	25 tests
COD HR	HI 93754C-25	25 tests
COD LR, Mercury-free	HI 93754D-25	25 tests
COD MR, Mercury-free	HI 93754E-25	25 tests
COD LR, ISO	HI 93754F-25	25 tests
COD MR, ISO	HI 93754G-25	25 tests
Phosphorus, Reactive	HI 93758A-50	50 tests
Phosphorus, Acid Hydrolyzable	HI 93758B-50	50 tests
Phosphorus, Total	HI 93758C-50	50 tests
Phosphorus, Reactive HR	HI 93763A-50	50 tests
Phosphorus, Total HR	HI 93763B-50	50 tests

ISE Reagents

Reagent	Code	Volume
Ammonia standard, 0.1M	HI 4001-01	500 mL
Ammonia standard (as N), 100 mg/L	HI 4001-02	500 mL
Ammonia standard (as N), 1000 mg/L	HI 4001-03	500 mL
Bromide standard, 0.1M	HI 4002-01	500 mL
Cadmium standard, 0.1M	HI 4003-01	500 mL
Calcium standard, 0.1M	HI 4004-01	500 mL
Carbon Dioxide standard, 0.1M	HI 4005-01	500 mL
Carbon Dioxide standard, 1000 mg/L as $CaCO_3$	HI 4005-03	500 mL
Chloride standard, 0.1M	HI 4007-01	500 mL
Chloride standard, 100 mg/L	HI 4007-02	500 mL
Chloride standard, 1000 mg/L	HI 4007-03	500 mL
Cupric standard, 0.1M	HI 4008-01	500 mL
Fluoride standard, 0.1M	HI 4010-01	500 mL
Fluoride standard, 100 mg/L	HI 4010-02	500 mL
Fluoride standard, 1000 mg/L	HI 4010-03	500 mL
Fluoride standard, 10 mg/L (premixed with TISAB II)	HI 4010-10	500 mL
Fluoride standard, 1 mg/L (premixed with TISAB II)	HI 4010-11	500 mL
Fluoride standard, 2 mg/L (premixed with TISAB II)	HI 4010-12	500 mL
Fluoride KIT (4 x HI 4010-00, 4 x HI4010-10, 4 x HI 4010-11)	HI 4010-30	12 x 500 mL

Reagent	Code	Volume
Fluoride standard, 1 g/L	HI 70701/1L	1 L
	HI 70701L	500 mL
	HI 70701M	230 mL
Fluoride standard, 10 mg/L	HI 70702/1L	1 L
	HI 70702L	500 mL
	HI 70702M	230 mL
Fluoride standard, 100 mg/L	HI 70703/1L	1 L
	HI 70703L	500 mL
	HI 70703M	230 mL
Iodide standard, 0.1M	HI 4011-01	500 mL
Lead standard, 0.1M	HI 4012-01	500 mL
Nitrate standard, 0.1M	HI 4013-01	500 mL
Nitrate standard, 100 mg/L as N	HI 4013-02	500 mL
Nitrate standard, 1000 mg/L as N	HI 4013-03	500 mL
Potassium standard, 0.1M	HI 4014-01	500 mL
Silver standard, 0.1M	HI 4015-01	500 mL
Sodium standard, 0.1M	HI 4016-01	500 mL
Sodium standard, 100 mg/L	HI 4016-02	500 mL
Sodium standard, 1000 mg/L	HI 4016-03	500 mL
Sodium standard, 10 mg/L	HI 4016-10	500 mL
Sodium standard, 2.3 g/L as Na^+	HI 7080L	500 mL
	HI 7080M	230 mL
	HI 8080L*	500 mL
	HI 8080M*	230 mL
Sodium standard, 23 g/L as Na^+	HI 7086L	500 mL
	HI 7086M	230 mL
	HI 8086L*	500 mL
	HI 8086M*	230 mL

*FDA Bottle

ISE
Reagents

Reagent	Code	Volume
Sodium standard, 0.23 g/L as Na^+		
	HI 7087L	500 mL
	HI 7087M	230 mL
	HI 8087L*	500 mL
	HI 8087M*	230 mL
Sodium Chloride standard, 100% NaCl		
	HI 7037L	500 mL
	HI 7037M	230 mL
Sodium Chloride standard, 30 g/L		
	HI 7081L	500 mL
	HI 7081M	230 mL
Sodium Chloride standard, 3.0 g/L		
	HI 7083L	500 mL
	HI 7083M	230 mL
Sodium Chloride standard, 58.4 g/L		
	HI 7084L	500 mL
	HI 7084M	230 mL
	HI 8084L*	500 mL
	HI 8084M*	230 mL
Sodium Chloride standard, 0.3 g/L		
	HI 7085L	500 mL
	HI 7085M	230 mL
Sodium Chloride standard, 5.84 g/L		
	HI 7088L	500 mL
	HI 7088M	230 mL
	HI 8088L*	500 mL
	HI 8088M*	230 mL
Sodium Chloride standard, 125 g/L		
	HI 7089L	500 mL
	HI 7089M	230 mL
	HI 8089L*	500 mL
	HI 8089M*	230 mL
Sodium Chloride standard, 146 g/L		
	HI 8095L*	500 mL
	HI 8095M*	230 mL
Sulfate standard, 0.1M		
	HI 4012-21	500 mL

PCA & DO
Reagents

Reagent	Code	Volume
Bromine		
	HI 70498	500 mL (2)+ sachets (5)
Chlorine, Free		
	HI 70430	500 mL (2) + 6 g
	HI 70450	500 mL
	HI 70451	500 mL
	HI 70452	sachets (5)
	HI 70480	500 mL (2) + sachets (5)
	HI 70490	500 mL (2) + sachets (5)
Chlorine, Total		
	HI 70431	500 mL (2)
	HI 70460	500 mL
	HI 70461	500 mL
	HI 70452	sachets (5)
	HI 70481	500 mL (2) + sachets (5)
	HI 70491	500 mL (2) + sachets (5)
Iodine		
	HI 70499	500 mL (2) + sachets (5)
Zero Oxygen Standard		
	HI 7040M	230 mL
	HI 7040L	500 mL

Food Photometer
Reagents

Meter	Reagent	# Tests
HI 83730		
	HI 83730-20	21 tests
HI 83740		
	HI 83740-20	20 tests
	HI 83742-25	20 tests
HI 83741		
	HI 83741-20	20 tests
HI 83742		
	HI 83742-20	20 tests
	HI 83742B-0	20 tests
	HI 83742-25	20 tests
	HI 83742-27	20 tests
HI 83746		
	HI 83746-20	20 tests
	HI 93703-59	100 tests
HI 83748		
	HI 83748-20	20 tests

*FDA Bottle

HANNA instruments

With Great Products, Come Great Results™

HI 83 Series Photometer Reagents

Parameter	Reagent	# Tests
Alkalinity	HI 93755-01	100 tests
	HI 93755-03	300 tests
Aluminum	HI 93712-01	100 tests
	HI 93712-03	300 tests
Ammonia, Low Range	HI 93700-01	100 tests
	HI 93700-03	300 tests
Ammonia, Middle Range	HI 93715-0	100 tests
	HI 93715-03	300 tests
Ammonia, High Range	HI 93733-01	100 tests
	HI 93733-03	300 tests
Bromine	HI 93716-01	100 tests
	HI 93716-03	300 tests
Calcium	HI 937521-01	100 tests
	HI 937521-03	300 tests
Calcium & Magnesium	HI 93752-01	100 tests
	HI 93752-03	300 tests
Chloride	HI 93753-01	100 tests
	HI 93753-03	300 tests
Chlorine Dioxide	HI 93738-01	100 tests
	HI 93738-03	300 tests
Chlorine, Free	HI 93701-01	100 tests
	HI 93701-03	300 tests
	HI 93701-F (liq.)	300 tests
Chlorine, Total	HI 93711-01	100 tests
	HI 93711-03	300 tests
	HI 93701-T (liq.)	300 Tests
	HI 93711-D3	
Chromium VI, High Range	HI 93723-01	100 tests
	HI 93723-03	300 tests
Chromium VI, Low Range	HI 93749-01	100 tests
	HI 93749-03	300 tests
Copper, High Range, Free & Total	HI 93702-01	100 tests
	HI 93702-03	300 tests
	HI 93702T-01	100 tests
	HI 93702T-03	300 tests
Copper, Low Range	HI 95747-01	100 tests
	HI 95747-03	300 tests
Cyanuric Acid	HI 93722-01	100 tests
	HI 93722-03	300 tests
Fluoride, Low Range	HI 93729-01	100 tests
	HI 93729-03	300 tests
Hardness, Calcium	HI 93720-01	100 tests
	HI 93720-03	300 tests
Hardness, Magnesium	HI 93719-01	100 tests
	HI 93719-03	300 tests
Hydrazine	HI 93704-01	100 tests
	HI 93704-03	300 tests
Iodine	HI 93718-01	100 tests
	HI 93718-03	300 tests
Iron, High Range	HI 93721-01	100 tests
	HI 93721-03	300 tests
Iron, Low Range	HI 93746-01	50 tests
	HI 93746-03	150 tests
Manganese, High Range	HI 93709-01	100 tests
	HI 93709-03	300 tests
Manganese, Low Range	HI 93748-01	50 tests
	HI 93748-03	150 tests
Magnesium	HI 937520-01	100 tests
	HI 937520-03	300 tests
Molybdenum	HI 93730-01	100 tests
	HI 93730-03	300 tests
Nickel, High Range	HI 93726-01	100 tests
	HI 93726-03	300 tests
Nickel, Low Range	HI 93740-01	50 tests
	HI 93740-03	300 tests
Nitrate	HI 93728-01	100 tests
	HI 93728-03	300 tests
Nitrite, High Range	HI 93708-01	100 tests
	HI 93708-03	300 tests
Nitrite, Low Range	HI 93707-01	100 tests
	HI 93707-03	300 tests
Oxygen, Dissolved	HI 93732-01	100 tests
	HI 93732-03	300 tests
Ozone	HI 93757-01	100 tests
	HI 93757-03	300 tests
	HI 93703-52-2	100 tests
pH	HI 93710-01	100 tests
	HI 93710-03	300 tests
Phosphate, High Range	HI 93717-01	100 tests
	HI 93717-03	300 tests
Phosphate, Low Range	HI 93713-01	100 tests
	HI 93713-03	300 tests
Phosphorus	HI 93706-01	100 tests
	HI 93706-03	300 tests
Potassium	HI 93750-01	100 tests
	HI 93750-03	300 tests
Silica, Low Range	HI 93705-01	100 tests
	HI 93705-03	300 tests
Silver	HI 93737-01	100 tests
	HI 93737-03	300 tests
Sulfate	HI 93751-01	100 tests
	HI 93751-03	300 tests
Zinc	HI 93731-01	100 tests
	HI 93731-03	300 tests

HI 96 Series Photometer

Reagents

Meter Parameter	Reagent	# Tests
HI 96101		
Bromine	HI 93716-01	100 tests
	HI 93716-03	300 tests
Cl, Free	HI 93701-01	100 tests
	HI 93701-03	300 tests
Cl, Total	HI 93711-01	100 tests
	HI 93711-03	300 tests
Cyanuruc acid	HI 93722-01	100 tests
	HI 93722-03	300 tests
Iodine	HI 93718-01	100 tests
	HI 93718-03	300 tests
Iron	HI 93746-01	50 tests
	HI 93746-03	150 tests
pH	HI 93710-01	100 tests
	HI 93710-03	300 tests
HI 96104		
Cl, Free	HI 93701-01	100 tests
	HI 93701-03	300 tests
Cl, Total	HI 93711-01	100 tests
	HI 93711-03	300 tests
Cyanuric Acid	HI 93722-01	100 tests
	HI 93722-03	300 tests
pH	HI 93710-01	100 tests
	HI 93710-03	300 tests
HI 96700		
Ammonia, LR	HI 93700-01	100 tests
	HI 93700-03	300 tests
HI 96701		
Cl, Free	HI 93701-01	100 tests
	HI 93701-03	300 tests
HI 96702		
Copper, HR	HI 93702-01	100 tests
	HI 93702-03	300 tests
HI 96704		
Hydrazine	HI 93704-01	100 tests
	HI 93704-03	300 tests
HI 96705		
Silica, LR	HI 93705-01	100 tests
	HI 93705-03	300 tests
HI 96706		
Phosphorus	HI 93706-01	100 tests
	HI 93706-03	300 tests
HI 93707		
Nitrite, LR	HI 93707-01	100 tests
	HI 93707-03	300 tests
HI 96708		
Nitrite, HR	HI 93708-01	100 tests
	HI 93708-03	300 tests
HI 96709	**Manganese, High Range**	
	HI 93709-01	100 tests
	HI 93709-03	300 tests

Meter Parameter	Reagent	# Tests
HI 96710		
Cl, Free	HI 93701-01	100 tests
	HI 93701-03	300 tests
Cl, Total	HI 93711-01	100 tests
	HI 93711-03	300 tests
pH	HI 93710-01	100 tests
	HI 93710-03	300 tests
HI 96711		
Cl, Free	HI 93701-01	100 tests
	HI 93701-03	300 tests
Cl, Total	HI 93711-01	100 tests
	HI 93711-03	300 tests
HI 96712		
Aluminum	HI 93712-01	100 tests
	HI 93712-03	300 tests
HI 96713		
Phosphate, LR	HI 93713-01	100 tests
	HI 93713-03	300 tests
HI 96714		
Cyanide	HI 93714-01	100 tests
	HI 93714-03	300 tests
HI 96715		
Ammonia, MR	HI 93715-0	100 tests
	HI 93715-03	300 tests
HI 96716		
Bromine	HI 93716-01	100 tests
	HI 93716-03	300 tests
HI 96717		
Phosphate, HR	HI 93717-01	100 tests
	HI 93717-03	300 tests
HI 96718		
Iodine	HI 93718-01	100 tests
	HI 93718-03	300 tests
HI 96719		
Hardness, Mg	HI 93719-01	100 tests
	HI 93719-03	300 tests
HI 96720		
Hardness, Ca	HI 93720-01	100 tests
	HI 93720-03	300 tests
HI 96721		
Iron, HR	HI 93721-01	100 tests
	HI 93721-03	300 tests
HI 96722		
Cyanuric Acid	HI 93722-01	100 tests
	HI 93722-03	300 tests
HI 96723		
Chromium VI, HR	HI 93723-01	100 tests
	HI 93723-03	300 tests

Meter Parameter	Reagent	# Tests
HI 96724		
Cl, Free	HI 93701-F	300 Tests
Cl, Total	HI 93701-T	300 Tests
	HI 93711-D3	
HI 96725		
Cl, Free	HI 93701-01	100 tests
	HI 93701-03	300 tests
Cl, Total	HI 93711-01	100 tests
	HI 93711-03	300 tests
Cyanuric Acid	HI 93722-01	100 tests
	HI 93722-03	300 tests
pH	HI 93710-01	100 tests
	HI 93710-03	300 tests
HI 96726		
Nickel, HR	HI 93726-01	100 tests
	HI 93726-03	300 tests
HI 96728		
Nitrate (as Nitrogen)	HI 93728-01	100 tests
	HI 93728-03	300 tests
HI 96729		
Fluoride, LR	HI 93729-01	100 tests
	HI 93729-03	300 tests
HI 96730		
Molybdenum	HI 93730-01	100 tests
	HI 93730-03	300 tests
HI 96731		
Zinc	HI 93731-01	100 tests
	HI 93731-03	300 tests
HI 96732		
Dissolved Oxygen	HI 93732-01	100 tests
	HI 93732-03	300 tests
HI 96733		
Ammonia, HR	HI 93733-01	100 tests
	HI 93733-03	300 tests
HI 96734		
Cl, Free & Total, HR	HI 93734-01	100 tests
	HI 93734-03	300 tests
HI 96735		
Hardness, HR	HI 93735-02	100 tests
Hardness, LR	HI 93735-00	100 tests
Hardness, MR	HI 93735-01	100 tests
Hardness, LR + MR + HR	HI 93735-0	100 tests each
HI 96736		
Hardness, Mg	HI 93719-01	100 tests
	HI 93719-03	300 tests
pH	HI 93710-01	100 tests
	HI 93710-03	300 tests
HI 96737		
Silver	HI 93737-01	100 tests
	HI 93737-03	300 tests

Meter Parameter	Reagent	# Tests
HI 96738		
Chlorine Dioxide	**HI 93738-01**	100 tests
	HI 93738-03	300 tests
HI 96739		
Fluoride, HR	**HI 93739-01**	100 tests
	HI 93739-03	300 tests
HI 96740		
Nickel, LR	**HI 93740-01**	50 tests
	HI 93740-03	150 tests
HI 96741		
Hardness, Mg	**HI 93719-01**	100 tests
	HI 93719-03	300 tests
Iron, LR	**HI 93746-01**	50 tests
	HI 93746-03	150 tests
HI 96742		
Iron, LR	**HI 93746-01**	50 tests
	HI 93746-03	150 tests
Manganese, LR	**HI 93748-01**	50 tests
	HI 93748-03	150 tests
HI 96743		
Iron, LR	**HI 93746-01**	50 tests
	HI 93746-03	150 tests
pH	**HI 93710-01**	100 tests
	HI 93710-03	300 tests
HI 96744		
Hardness, Mg	**HI 93719-01**	100 tests
	HI 93719-03	300 tests
Iron, LR	**HI 93746-01**	50 tests
	HI 93746-03	150 tests
pH	**HI 93710-01**	100 tests
	HI 93710-03	300 tests
HI 96745		
Cl, Free	**HI 93701-01**	100 tests
	HI 93701-03	300 tests
Cl, Total	**HI 93711-01**	100 tests
	HI 93711-03	300 tests
Hardness, Mg	**HI 93719-01**	100 tests
	HI 93719-03	300 tests
Iron, LR	**HI 93746-01**	50 tests
	HI 93746-03	150 tests
pH	**HI 93710-01**	100 tests
	HI 93710-03	300 tests
HI 96746		
Iron, LR	**HI 93746-01**	50 tests
	HI 93746-03	150 tests
HI 96747		
Copper, LR	**HI 95747-01**	100 tests
	HI 95747-03	300 tests
HI 96748		
Manganese, LR	**HI 93748-01**	50 tests
	HI 93748-03	150 tests

Meter Parameter	Reagent	# Tests
HI 96749		
Chromium VI, LR	**HI 93749-01**	100 tests
	HI 93749-03	300 tests
HI 96750		
Potassium	**HI 93750-01**	100 tests
	HI 93750-03	300 tests
HI 96751		
Sulfate	**HI 93751-01**	100 tests
	HI 93751-03	300 tests
HI 96752 Calcium & Magnesium		
Calcium & Magnesium	**HI 93752-01**	100 tests
	HI 93752-03	300 tests
HI 96753		
Chloride	**HI 93753-01**	100 tests
	HI 93753-03	300 tests
HI 96761		
Chlorine, Total, ULR	**HI 95761-01**	100 tests
	HI 95761-03	300 tests
HI 96762 Chlorine, Free, ULR		
	HI 95762-01	100 tests
	HI 95762-03	300 tests
HI 96769 Detergents, Anionic		
	HI 95769-01	40 tests
HI 96770 Silica, High Range		
	HI 96770-01	100 tests
	HI 96770-03	300 tests
HI 96771		
Cl, Free	**HI 93701-01**	100 tests
	HI 93701-03	300 tests
Cl, UHR	**HI 95771-01**	100 tests
	HI 95771-03	300 tests
HI 96786		
Nitrate	**HI 93728-01**	100 tests
	HI 93728-03	300 tests

CAL CHECK™ Sets
for HI 96 Series Photometers

Meter	Parameter	CAL CHECK™ set
HI 96101	Bromine	HI 96716-11
	Free Chlorine	HI 96701-11
	Total Chlorine	HI 96711-11
	Cyanuric Acid	HI 96722-11
	Iodine	HI 96718-11
	Iron	HI 96746-11
	pH	HI 96710-11
HI 96104	pH	HI 96710-11
	Free Chlorine	HI 96701-11
	Total Chlorine	HI 96711-11
	Cyanuric Acid	HI 96722-11
HI 96700	Ammonia LR	HI 96700-11
HI 96701	Free Chlorine	HI 96701-11
HI 96702	Copper HR	HI 96702-11
HI 96704	Hydrazine	HI 96704-11
HI 96705	Silica LR	HI 96705-11
HI 96706	Phosphorus	HI 96706-11
HI 96707	Nitrite LR	HI 96707-11
HI 96708	Nitrite HR	HI 96708-11
HI 96709	Manganese HR	HI 96709-11
HI 96710	Chlorine, Free	HI 96701-11
	Chlorine, Total	HI 96711-11
	pH	HI 96710-11
HI 96711	Chlorine, Free	HI 96701-11
	Chlorine, Total	HI 96711-11
HI 96712	Aluminum	HI 96712-11
HI 96713	Phosphate LR	HI 96713-11
HI 96714	Cyanide	HI 96714-11
HI 96715	Ammonia MR	HI 96715-11
HI 96716	Bromine	HI 96716-11
HI 96717	Phosphate HR	HI 96717-11
HI 96718	Iodine	HI 96718-11
HI 96719	Hardness, Mg	HI 96719-11
HI 96720	Hardness, Ca	HI 96720-11
HI 96721	Iron HR	HI 96721-11
HI 96722	Cyanuric Acid	HI 96722-11
HI 96723	Chromium VI HR	HI 96723-22

Meter	Parameter	CAL CHECK™ set
HI 96724	Chlorine, Free & Total	HI 96724-11
HI 96725	Chlorine, Free	HI 96701-11
	Chlorine, Total	HI 96711-11
	Cyanuric Acid	HI 96722-11
	pH	HI 96710-11
HI 96726	Nickel HR	HI 96726-11
HI 79727	Color of Water	HI 96727-11
HI 96728	Nitrate	HI 96728-11
HI 96729	Fluoride LR	HI 96729-11
HI 96730	Molybdenum	HI 96730-11
HI 96731	Zinc	HI 96731-11
HI 96732	Oxygen, Dissolved	HI 96732-11
HI 96733	Ammonia HR	HI 96733-11
HI 96734	Chlorine, Free & Total HR	HI 96734-11
HI 96735	Hardness LR/MR/HR	HI 96735-11
HI 96736	Total Hardness	HI 96719-11
	pH	HI 96710-11
HI 96737	Silver	HI 96737-11
HI 96738	Chlorine Dioxide	HI 96738-11
HI 96739	Fluoride HR	HI 96739-11
HI 96740	Nickel LR	HI 96740-11
HI 96741	Total Hardness	HI 96719-11
	Iron LR	HI 96746-11
HI 96742	Iron LR	HI 96746-11
	Manganese LR	HI 96748-11
HI 96743	IronLR	HI 96746-11
	pH	HI 96710-11
HI 96744	pH	HI 96710-11
	Total Hardness	HI 96719-11
	Iron LR	HI 96746-11
HI 96745	Chlorine, Free	HI 96701-11
	Chlorine, Total	HI 96711-11
	Total Hardness	HI 96719-11
	Iron LR	HI 96746-11
	pH	HI 96710-11
HI 96746	Iron LR	HI 96746-11

Meter	Parameter	CAL CHECK™ set
HI 96747	Copper LR	HI 96747-11
HI 96748	Manganese LR	HI 96748-11
HI 96749	Chromium VI LR	HI 96749-11
HI 96750	Potassium LR & MR	HI 96750-11
HI 96751	Sulfate	HI 96751-11
HI 96752	Calcium HR	HI 96752-11
	Magnesium HR	HI 96754-11
HI 96753	Chloride	HI 96753-11
HI 96761	Chlorine, Total ULR	HI 96761-11
HI 96762	Chlorine, Free ULR	HI 96762-11
HI 96769	Anionic Detergents	HI 96796-11
HI 96770	Silica HR	HI 96770-11
HI 96771	UHR & Free Chlorine	HI 96771-11
HI 96786	Nitrate HR	HI 96786-11

HANNA instruments

With Great Products, Come Great Results™

Titration
Solutions & Reagents

Mini Titrator Reagents & Solutions

HI 83540
Meter Reagent	Description
HI 83540-50	Standard solution, 500 mL (3)
HI 83540-51	Electrode cleaning solution, 230 mL
HI 83540-55	Calibration standard, 230 mL

HI 84100
Meter Reagent	Description
HI 84100-50	Titrant solution, 100 mL
HI 84100-51	Alkaline reagent, 500 mL
HI 84100-52	Acid reagent for total SO_2, 500 mL
HI 84100-53	Acid reagent for free SO_2, 500 mL
HI 84100-54	SO_2 stabilizer reagent, 25 pcs.
HI 84100-55	SO_2 calibration standard, 500 mL

HI 84102
Meter Reagent	Description
HI 84102-50	Titrant solution, 100 mL
HI 84102-55	Calibration standard, 100 mL

HI 84429
Meter Reagent	Description
HI 84429-50	Titrant solution, 100 mL
HI 84429-55	Calibration standard, 100 mL

HI 84430
Meter Reagent	Description
HI 84430-50	Titrant solution for low range, 100 mL
HI 84430-51	Titrant solution for high range, 100 mL
HI 84430-55M	Pump calibration solution, 230 mL
HI 84430-58	Additional reagent, 30 mL
HI 84430-70	Reagents kit for low & high range, set
HI 84430-71	Reagents kit for low range, set
HI 84430-72	Reagents kit for high range, set

HI 84431
Meter Reagent	Description
HI 84431-50	Titrant solution for low range, 100 mL
HI 84431-51	Titrant solution for high range, 100 mL
HI 84431-55M	Pump calibration solution, 230 mL
HI 84431-70	Reagents for low & high range, set
HI 84431-71	Reagents for low range, set
HI 84431-72	Reagents for high range, set

HI 84432
Meter Reagent	Description
HI 84432-50	Titrant solution, 100 mL
HI 84432-55	Pump calibration solution, 100 mL
HI 84432-70	Reagent kit, set

HI 84433
Meter Reagent	Description
HI 84433-50	Titrant solution low concentration, 100 mL
HI 84433-51	pH adjustment solution, 100 mL
HI 84433-55M	Pump calibration solution, 100 mL
HI 84433-58	Additional reagent, 30 mL
HI 84433-60	Formol base reagent, 230 mL
HI 84433-70	Reagents kit, set

HI 84434
Meter Reagent	Description
HI 84434-50	Titrant solution, 100 mL
HI 84434-55	Pump calibration solution, 100 mL
HI 84434-70	Reagent kit, set

HI 84435
Meter Reagent	Description
HI 84435-50	Titrant solution, 100 mL
HI 84435-55	Pump calibration solution, 100 mL
HI 84435-70	Reagent kit, set

HI 84437
Meter Reagent	Description
HI 84437-50	Titrant solution, 100 mL
HI 84437-55	Pump calibration solution, 100 mL
HI 84437-70	Reagent kit, set

HI 84442
Meter Reagent	Description
HI 84442-50	Titrant solution, 100 mL
HI 84442-55	Pump calibration solution, 230 mL

Titration Standard Reagents & Solutions
Meter Reagent	Description
HI 70424	Ammino-propanol Buffer, 25 mL
HI 70467	Buffer Solution Acetate, pH 4, 230 mL
HI 70472	Buffer Solution Phosphate, pH 7, 230 mL
HI 70462	Chlorhydric Acid Solution, 0.01 M, 1 L
HI 70453	Chlorhydric Acid Solution, 0.02 N, 1 L
HI 70463	Chlorhydric Acid Solution, 0.1 N, 1 L
HI 70464	Chlorhydric Acid Solution, 1 N, 1 L
HI 70436	Deionized Water, 3.78 L
HI 70449	EDTA Solution, 0.02 M, 1 L
HI 70446	Fehling Solution A, 500 mL
HI 70447	Fehling Solution B, 500 mL
HI 70405	Glucose - Fructose Standard, 20 g
HI 70426	Glyoxal Solution Solution, 40%, 100 mL
HI 70432	Hydrogen Peroxide Solution, 3%, 25 mL
HI 70465	Hydrogen Peroxide Titration Reagent, 25 mL
HI 70469	Iodine Standard Solution, 0.00188N, 230 mL (4)
HI 70433	Iodine Stabilized Solution, 0.01N, 1 L
HI 70440	Iodine Stabilized Solution, 0.02 N, 1 L
HI 70441	Iodine Stabilized Solution, 0.04 N, 1 L
HI 70445	Nitric Acid Solution, 1 M, 500 mL
HI 70427	Nitric Acid Solution, 1.5 M, 500 mL
HI 70408	Oxalic Acid, 20 g
HI 70471	PAO Calibration Colution, 0.00564N, 500 mL
HI 70470	Phenylarsine Oxide (PAO) Standard Solution, 0.00564N, 500 mL
HI 70466	Phenylarsine Oxide Standard Solution, 500 mL
HI 70434	Phosphoric Acid, 85%, 500 mL
HI 70401	Potassium Hydrogen Phthalate, 20 g
HI 70407	Potassium Iodate, 20 g
HI 70404	Potassium Iodide (powder packets), 100 pcs.
HI 70468	Potassium Iodide , 35 g
HI 70437	Potassium Iodide Solution, 30%, 500 mL
HI 70409	Potassium Permanganate, 20 g
HI 70448	Silver Nitrate Solution, 0.02 M, 1 L
HI 70429	Silver Nitrate Solution, 0.05 M, 1 L
HI 70406	Sodium Chloride, 20 g
HI 70455	Sodium Hydroxide Solution, 0.01 M, 1 L
HI 70454	Sodium Hydroxide Solution, 0.02 N, 1 L
HI 70456	Sodium Hydroxide Solution, 0.1 M, 1 L
HI 70423	Sodium Hydroxide Solution, 0.11N, 1 L
HI 70428	Sodium Hydroxide Solution, 0.25 N, 1 L
HI 70457	Sodium Hydroxide Solution, 1 M, 1 L
HI 70435	Sodium Hydroxide Solution, 5 M, 500 mL
HI 70439	Sodium Thiosulfate Solution, 0.1 M, 1 L
HI 70403	Sodium Thiosulfate Pentahydrate, 20 g
HI 70458	Sulphuric Acid Solution, 0.01 M, 1 L
HI 70459	Sulphuric Acid Solution, 0.05 M, 1 L
HI 70443	Sulfuric Acid Solution, 10%, 500 mL
HI 70425	Sulfuric Acid Solution, 16%, 500 mL
HI 70444	Sulfuric Acid Solution, 25%, 500 mL
HI 70402	Tartaric Acid, 20 g
HI 70438	Tris Buffer Solution, 1 L + 3.5 mL

Turbidity
Reagents & Calibration Standards

Meter Parameter	Reagent	# Tests
HI 83414		
Free chlorine	**HI 93701-01**	100 tests
	HI 93701-03	300 tests
Total chlorine	**HI 93711-01**	100 tests
	HI 93711-03	300 tests
HI 83749		
Bentocheck	**HI 83749-20**	100 tests
HI 93114		
Free chlorine	**HI 93701-01**	100 tests
	HI 93701-03	300 tests
Total chlorine	**HI 93711-01**	100 tests
	HI 93711-03	300 tests
HI 93414		
Free chlorine	**HI 93701-01**	100 tests
	HI 93701-03	300 tests
Total chlorine	**HI 93711-01**	100 tests
	HI 93711-03	300 tests
HI 93102		
Free chlorine	**HI 93701-01**	100 tests
	HI 93701-03	300 tests
pH	**HI 93710-01**	100 tests
	HI 93710-03	300 tests
Total chlorine	**HI 93711-01**	100 tests
	HI 93711-03	300 tests
Bromine	**HI 93716-01**	100 tests
	HI 93716-03	300 tests
Iodine	**HI 93718-01**	100 tests
	HI 93718-03	300 tests
Cyanuric acid	**HI 93722-01**	100 tests
	HI 93722-03	300 tests
Iron LR	**HI 93746-01**	50 tests
	HI 93746-03	150 tests

Meter Standard Set	Description
HI 83414	
HI 93414-11	Free & total chlorine
HI 88703-11	Turbidity (5 standards)
HI 83749	
HI 83749-11	4 standards
HI 847491	
HI 847491-11	4 standards
HI 847492	
HI 847492-11	4 standards
HI 847493	
HI 847493-11	4 standards
HI 88703	
HI 88703-11	5 standards
HI 88713	
HI 88713-11	5 standards
HI 93102	
HI 93102-0	AMCO-AEPA-1 @ 0 NTU
HI 93102-20	AMCO-AEPA-1 @ 20 NTU
HI 93124	
HI 93124-0	Calibration solution, 0 EBC
HI 93124-1	Calibration solution, 2.5 EBC
HI 93124-2	Calibration solution, 125 EBC
HI 93124-03	EBC haze calibration set
HI 93414	
HI 93414-11	Free & total chlorine
HI 98703-11	Turbidity (4 standards)
HI 93703 / HI 93703-11	
HI 93703-0	AMCO-AEPA-1 @ 0 FTU
HI 93703-05	AMCO-AEPA-1 @ 500 FTU
HI 93703-10	AMCO-AEPA-1 @ 10 FTU
HI 98703	
HI 98703-11	4 standards
HI 98713	
HI 98713-11	4 standards

HANNA instruments

With Great Products, Come Great Results™

CONTENTS

A-B

Accessories

Adapter

Adapter for Industrial Electrodes

This adapter allows installation of any electrode in in-line holders. The nipple comes with an O-ring for more secure installation.

HI 6057 3/4" nipple for electrodes

Adapter, PC Connection

HI 92150 RS232 to USB

Auger for Ground Penetration

The auger is supplied with HI 99121 and HI 993310 for direct soil measurement.

HI 721319 Ground auger


HI 721319

Bar

Bar, Grounding

This stainless steel AISI 316 grounding bar can be connected to the differential input of all pH and ORP meters provided with this feature, and prevents the electrode from problems due to ground loop current. The life of the electrode will be much longer.

HI 1283 Grounding bar with 2 m (6.6') cable

Bar, Measuring for Level Controllers

Stainless steel measuring bars for detection of liquid level in tanks, designed to be used with HANNA level controllers and transmitters. Available singly or in packs of 5 pcs. Can be joined for custom lengths. Each bar is 0.5 m (1.7') long.

HI 731324 0.5 m (1.7') measuring bar (5 pcs)
HI 731328 0.5 m (1.7') measuring bar


HI 731324

Bar, Stir Bars for Magnetic Stirring

Stir bars specifically designed for HANNA stirrers. The PTFE (polytetrafluoroethylene) coating ensures high chemical resistance even with aggressive substances.

HI 731319 Stir bars (L 25 mm x dia 7 mm/ 1 x 0.3"), specially designed for use with HI 180, and HI 190M, HI 190MB and HI 200M stirrers. (10 pcs.)
HI 731320 Stir bars (L 50 mm x dia 7 mm/ 2 x 0.3"), designed for use with the HI 300 stirrer series (10 pcs.)
HI 731316 Stir bars (L 12 mm x dia 5 mm/ 2 x 0.3") for mini Titrators and HI 208 (5 pcs.)
HI 70486 Stir bars for PCA series, (2 pcs.)


HI 731319

Base

Base for Checktemp® 1

Handy plastic stand for Checktemp®1

HI 740024P Stand for Checktemp®1 (10 pcs)
HI 740025 Stand for Checktemp®1 (6 pcs)


HI 740024

Base for HI 76405 *–see Electrode Holder*

Battery


HI 740026P

Battery, 1.5 V

Replacement batteries used in most HANNA testers.

HI 740026 1.5 V battery (4 pcs)
HI 740026P 1.5 V battery (12 pcs)
HI 721301 1.5 V battery (100 pcs)


HI 740033

Battery, 1.5 V AA

Replacement batteries for all HANNA waterproof and printing/logging portable meters.

HI 740027P 1.5 V AA battery (12 pcs)

Battery, 1.5 V AAA

Replacement batteries.

HI 740028 1.5 V AAA battery (4 pcs)
HI 740028P 1.5 V AAA battery (12 pcs)


HI 721310

Battery, 3.6 V AA Lithium

Replacement battery for HI 141 series.

HI 740033 3.6 V AA Lithium battery

Battery, 9 V

Replacement battery for all HANNA portable meters with non-waterproof housing.

HI 740029P 9 V battery (10 pcs)


HI 740031

Battery, for AmpHel® Electrodes

Spare battery for amplified pH and ORP industrial electrodes, AmpHel® series.

HI 740031 Spare battery for AmpHel® electrodes

Battery Cover *–see Cover for Battery Compartment*

Beaker

Rugged plastic beakers available in several different sizes. For use during testing with HANNA chemical test kits and photometers. Anti-spill ported caps are available separately.

HI 740036P 100 mL plastic beaker (10 pcs.)
HI 740037P 20 mL plastic beaker (10 pcs.)
HI 740223 170 mL plastic beaker
HI 740224 170 mL plastic beaker (6 pcs.)
HI 740032P Cap for 20 mL plastic beaker (10 pcs.)
HI 740034P Cap for 100 mL plastic beaker (10 pcs.)


HI 740223 HI 740037P

Blades, for Meat pH Electrodes

These stainless steel blades, in conjunction with FC 230, FC 231 and FC 232 pH electrodes, allow easy meat penetration. Two models are available for different depths.

FC 098 Stainless steel blade for meat pH electrode, 20 mm (0.8")
FC 099 Stainless steel blade for meat pH electrode, 35 mm (1.4")


FC 099 FC 098

B
Accessories

Boot, Shockproof Rubber

These special boots have been designed to protect your instruments and prevent damage due to accidental impact. They can withstand high temperature (up to 200°C / 392°F), ozone and environmental phenomena, and are available in 2 colors.


HI 710024


HI 710023

"Streamlined" style casing

HI 710024 Shockproof rubber boot, blue
HI 710023 Shockproof rubber boot, orange

"ERGO" style casing

HI 710007 Shockproof rubber boot, blue
HI 710008 Shockproof rubber boot, orange


HI 710007


HI 710008

HI 8010 style casing.

HI 710009 Shockproof rubber boot, blue
HI 710010 Shockproof rubber boot, orange

HI 8424 style casing.

HI 710015 Shockproof silicone boot, blue
HI 710016 Shockproof silicone boot, orange

Bottle


HI 710009


HI 710010

Bottle for D.O. Analysis

Glass bottle, supplied with the HANNA chemical test kits and photometer for DO analysis. The bottle is provided with a glass stopper to ensure an air tight seal.

HI 740038 60 mL glass bottle and stopper

Bottle, for Olive Oil Acidity

HI 740053 100 mL graduated glass bottle with cap (10 pcs)

Bottle, Polyethylene

High density polyethylene bottles, suitable for sampling, mixing and storage. Available in packs of 6 and 10 pcs, and in several capacities, from 30 mL to 1 Gallon (approx. 3.78 L). Polypropylene caps can be ordered separately.


HI 710015


HI 710016

HI 740056P 30 mL bottle (10 pcs)
HI 740058P 30 mL bottle (10 pcs)
HI 740059P Cap for 30 mL bottle (10 pcs)
HI 740048P 120 mL bottle (10 pcs)
HI 740050 120 mL bottle (6 pcs)
HI 740049P Cap for 120 mL bottle (10 pcs)
HI 740052P 230 mL bottle (10 pcs)
HI 740054 230 mL bottle (6 pcs)
HI 740055 Cap for 230 mL bottle (6 pcs)
HI 740070P 500 mL bottle (10 pcs)
HI 740072 500 mL bottle (6 pcs)
HI 740073P Cap for 500 mL bottle (10 pcs)
HI 740046P 1 L bottle (10 pcs)
HI 740047P Cap for 1 liter bottle (10 pcs)
HI 740044P 1 Gallon bottle (5 pcs)
HI 740045P Cap for 1 Gallon bottle (10 pcs)


HI 740038


HI 710056P

Bottle, Polyethylene, Dropper

Provided with HANNA test kits where one-by-one drop dosing is required.

HI 740060P 30 mL dropping bottle (10 pcs)
HI 740063 30 mL dropping bottle (6 pcs)
HI 740061P Plug for 30 mL dropping bottle (10 pcs)
HI 740064 Plug for 30 mL dropping bottle (6 pcs)
HI 740065P Cap for 30 mL dropping bottle (10 pcs)


HI 710084P

Bottle, Polyethylene, FDA Compliant

These black bottles protect liquids even under direct light. They are available in several capacities, from 30 mL to 1 liter.

HI 740068P 30 mL FDA bottle (10 pcs)
HI 740069P Cap for 30 mL FDA bottle (10 pcs)
HI 740084P 500 mL FDA bottle (10 pcs)
HI 740086 500 mL FDA bottle (6 pcs)
HI 740087P Cap for 500 mL FDA bottle (10 pcs)
HI 740082P 1 L FDA bottle (10 pcs)
HI 740083P Cap for 1 L FDA bottle (10 pcs)

Bottle, Polyethylene, Rectangular

These bottles complete the range of HANNA bottles. They are typically provided as containers for the reagents of the PCA analyzers.

HI 740074P 460 mL rectangular bottle (10 pcs)
HI 740076P 460 mL rectangular bottle (10 pcs)
HI 740077P Cap for 460 mL rectangular bottle (10 pcs)


HI 740146

Bracket for Installation of Process Meters

To be used for installation of panel mounted process meters, such as BL 931700, HI 8710 and pH 500.

HI 740145 Mounting bracket for HI 8710 housing (2 pcs)
HI 740146 Mounting bracket for BL 931700 housing (2 pcs)
HI 740147 Mounting bracket for pH 500 housing (2 pcs)


HI 740145

Burette

Glass burette for liquid dosing, ideal tool for educational and laboratory applications. The reagent can be accurately dosed with a resolution of 0.1 mL. The burette is supplied with a reagent glass container to perform up to 100 tests before requiring refilling.

HI 740195 10 mL glass burette with 500 mL reagent container and pressure bulb
HI 740212 25 mL glass burette with 1 L reagent container and pressure bulb

Cable

Cable, 6-wire

6-wire cable for 4-ring conductivity probes. Several lengths are available.

HI 779/1 6-wire cable, 1 m (3.3')
HI 779/3 6-wire cable, 3 m (9.9')
HI 779/5 6-wire cable, 5 m (16.5')
HI 779/10 6-wire cable, 10 m (33')
HI 779/15 6-wire cable, 15 m (49.5')


HI 779/5

C
Accessories

Cable Connection for Electrodes

Wide range of connection cables for pH and ORP electrodes, available with several options for connectors and cable lengths. Connection cable without connectors, dia 3 mm (0.12")

HI 7853/1 Cable for electrodes, 1 m (3.3')
HI 7853/3 Cable for electrodes, 3 m (9.9')
HI 7853/5 Cable for electrodes, 5 m (16.5')
HI 7853/10 Cable for electrodes, 10 m (33')
HI 7853/15 Cable for electrodes, 15 m (49.5')

Cable Connection for HI 931002

To connect pH and ORP process controllers to the HI 931002 simulator and perform all calibration procedures.

HI 7862/1 HI 931002 connection cable, 1 m (3.3')
HI 7863 Cable for electrodes DIN/BNC for HI 931001 and HI 8427, 1 m (3.3')


HI 7862/1

Cable Connection with one screw-cap connector at one end, dia 5 mm (0.2")

HI 778P/1 Cable for electrodes with screw-cap connector, 1 m (3.3')
HI 778P/3 Cable for electrodes with screw-cap connector, 3 m (9.9')
HI 778P/5 Cable for electrodes with screw-cap connector , 5 m (16.5')
HI 778P/10 Cable for electrodes with screw-cap connector , 10 m (33')
HI 778P/15 Cable for electrodes with screw-cap connector , 15 m (49.5')
HI 778P Cable for electrodes with screw-cap connector, 100 m (333')

Cable Connection, 3 mm (0.12') dia. with a screw-cap connector at one end. The other end can be free or provided with a BNC, DIN or US standard connector.

HI 7854/1 Connection cable with screw-cap connector, 1 m (3.3')
HI 7854/3 Connection cable with screw-cap connector, 3 m (9.9')
HI 7854/5 Connection cable with screw-cap connector, 5 m (16.5')
HI 7854/10 Connection cable with screw-cap connector, 10 m (33')
HI 7854/15 Connection cable with screw-cap connector, 15 m (49.5')
HI 7855/1 Connection cable with screw and BNC connectors, 1 m (3.3')
HI 7855/3 Connection cable with screw and BNC connectors, 3 m (9.9')
HI 7855/5 Connection cable with screw and BNC connectors, 5 m (16.5')
HI 7855/10 Connection cable with screw and BNC connectors, 10 m (33')
HI 7855/15 Connection cable with screw and BNC connectors, 15 m (49.5')
HI 7856/1 Connection cable with screw and US connectors, 1 m (3.3')
HI 7856/3 Connection cable with screw and US connectors, 3 m (9.9')
HI 7856/5 Connection cable with screw and US connectors, 5 m (16.5')
HI 7856/10 Connection cable with screw and US connectors, 10 m (33')
HI 7856/15 Connection cable with screw and US connectors, 15 m (49.5')
HI 7857/1 Connection cable with screw and DIN connectors, 1 m (3.3')
HI 7857/3 Connection cable with screw and DIN connectors, 3 m (9.9')
HI 7857/5 Connection cable with screw and DIN connectors, 5 m (16.5')
HI 7857/10 Connection cable with screw and DIN connectors, 10 m (33')
HI 7857/15 Connection cable with screw and DIN connectors, 15 m (49.5')


HI 7856/1

Cable Connection, 3 mm (0.12') dia. with a BNC connector at one end. The other end can be provided with a BNC, DIN, US standard connector or spade lug.

HI 7858/1 Connection cable with BNC and BNC connectors, 1 m 3.3')
HI 7858/3 Connection cable with BNC and BNC connectors, 3 m (9.9')
HI 7858/5 Connection cable with BNC and BNC connectors, 5 m (16.5')
HI 7858/10 Connection cable with BNC and BNC connectors, 10 m (33')
HI 7858/15 Connection cable with BNC and BNC connectors, 15 m (49.5')
HI 7859/1 Connection cable with BNC and DIN connectors, 1 m (3.3')
HI 7859/3 Connection cable with BNC and DIN connectors, 3 m (9.9')
HI 7859/5 Connection cable with BNC and DIN connectors, 5 m (16.5')
HI 7859/10 Connection cable with BNC and DIN connectors, 10 m (33')
HI 7859/15 Connection cable with BNC and DIN connectors, 15 m (49.5')
HI 7860/1 Connection cable with BNC and US connectors, 1 m (3.3')
HI 7860/3 Connection cable with BNC and US connectors, 3 m (9.9')
HI 7860/5 Connection cable with BNC and US connectors, 5 m (16.5')
HI 7860/10 Connection cable with BNC and US connectors, 10 m (33')


HI 7858-15


HI 7861/1

HI 7860/15 Connection cable with BNC and US connectors, 15 m (49.5')
HI 7861/1 Connection cable with BNC conn. and spade lug, 1 m (3.3')
HI 7861/3 Connection cable with BNC conn. and spade lug, 3 m (9.9')
HI 7861/5 Connection cable with BNC conn. and spade lug, 5 m (16.5')
HI 7861/10 Connection cable with BNC conn. and spade lug, 10 m (33')
HI 7861/15 Connection cable with BNC conn. and spade lug, 15 m (49.5')

Cable, Extension, for K-Type Thermocouple Probes

This coiled cable can be used to extend the cable of all K-type thermocouple probes. It comes with male and female connectors at the two ends, respectively.

HI 766EX Extension cable for K-type thermocouple probes, 1 m (3.3')


HI 920010

Cable, PC Connection, for Bench Meters.

HI 920010 Serial cable for PC connection (9 to 9-pin)

Cable, PC Connection, for Portable Meters.

HI 920011 Serial cable for PC connection (5 to 9-pin)


HI 920011

Cable, USB PC Connection

HI 7698281 USB PC connection cable for HI 9828
HI 920013 USB cable for PC connection (excluding HI 9828, use HI 7698281 instead)
HI 920014 Mini USB cable for PC connection

Calibration, Tool

To perform manual calibration of the HI 99104 pH tester.

HI 740091P Calibration tool for HI 99104 (20 pcs)

Cap

Cap, Beaker –*see Beaker*

Cap, Bottle –*see Bottle*

Cap, Cuvette

To be used with cuvettes for photometers, turbidity and Checker HC™ meters.

HI 731325 Cap for cuvette for turbidity meters (4)
HI 731325N Cap for cuvette for HI 832xx series (4)
HI 731335N Cap for cuvette for HI 96 series (4)
HI 731225 Caps for Checker HC™ cuvettes (4)
HI 731325W Caps for HI 837 series of photometers (4)


HI 740178

Cap, Protective

Prevents tester and probe damage due to accidental impacts.

HI 740162P Protective cap for Checktemp® (5 pcs)
HI 740164 Protective cap for HI 1083
HI 740165 Protective cap for HI 1330
HI 740166 Protective cap for HI 1331
HI 740167 Protective cap for HI 2031
HI 740169 Protective cap for Hygrocheck®
HI 740170 Protective cap with O-ring for top compartment in HI 9033 housing
HI 740172 Protective cap for Piccolo
HI 740173 Protective cap for SkincheckTM electrode
HI 740178 Protective cap for RH probes
HI 740194 Protective cap for pH and ORP electrodes
HI 740208P Protective cap for FC 200 (2 pcs)
HI 740208 Protective cap for FC 200
HI 740210P Protective cap for wateproof testers (2 pcs)
HI 740211 Transparent protective cap for DO probes


HI 740194

C

Accessories

Cap for Refillable Electrodes

Plastic cap for refilling hole of all pH and ORP electrodes using liquid electrolyte.

HI 740093P Cap for refillable electrodes (20 pcs)

Cap, Sintered, for RH Probes

Sintered cap for protecting the sensors of HANNA RH probes in harsh environments.

HI 710011 Sintered cap

Cap, Transportation, for DO Probes

Protects the membrane of HANNA DO probes during transportation, against accidental impacts.

HI 740094P Transportation cap for DO probes (10 pcs)

Carrying Case

Rugged

Rugged carrying case for photometers and turbidity meters with thermoformed tray to fit instrument, reagents and apparatus. 381 x 311 x 108 mm (15 x 12.2 x 4.2").

HI 740318 Carrying case for portable 96 series photometers

Rugged carrying case for general use. 340 x 230 x 90 mm (13.4 x 9.1 x 3.5")

HI 710031 General rugged carrying case

Rugged carrying case with thermoformed tray for HANNA portable meters. 312 x 248 x 45 mm (12.3 x 9.8 x 1.8")

HI 710132 General rugged carrying case for HI 8314 style casing
HI 710133 General rugged carrying case for HI 991300 style casing
HI 710134 General rugged carrying case for HI 98703 style casing
HI 710136 General rugged carrying case for HI 9125 style casing
HI 710137 General rugged carrying case for HI 993310 style casing
HI 710139 General rugged carrying case for HI 93703 style casing
HI 710141 General rugged carrying case for HI 9063 style casing

Rugged carrying case for HI 93703 turbidity meter with thermoformed tray complete with calibration and cleaning solutions, cleaning cloths and cuvettes. 312 x 248 x 45 mm (12.3 x 9.8 x 1.8").

HI 710138 General rugged carrying case for HI 93703

Rugged carrying case with thermoformed tray and sample preparation kit for HI 83099. 381 x 311 x 108 mm (15 x 12.2 x 4.2")

HI 83099-100 Sample preparation kit in rugged carrying case for HI 83099

Rugged carrying case with thermoformed tray and sample preparation kit for HI 83200. 381 x 311 x 108 mm (15 x 12.2 x 4.2")

HI 83200-100 Sample preparation kit in rugged carrying case for HI 83200

Rugged carrying case with thermoformed tray for chemical test kits. The tray allows orderly placement of the reagents in each test kit.

HI 740098 Carrying case for HI 3813
HI 740099 Carrying case for HI 3814
HI 740100 Carrying case for HI 3816
HI 740101 Carrying case for HI 3817
HI 740102 Carrying case for HI 3819
HI 740103 Carrying case for HI 3821
HI 740104 Carrying case for HI 3823
HI 740105 Carrying case for HI 3825
HI 740106 Carrying case for HI 3827
HI 740107 Carrying case for HI 3828
HI 740108 Carrying case for HI 3837
HI 740115 Carrying case for HI 3835
HI 740197 Carrying case for HI 3810
HI 740201 Carrying case for HI 3822


HI 740318


HI 710133


HI 710134


HI 710136


HI 710138


HI 710139

HI 710141

Carrying Case, for Testers

In addition, several rugged carrying cases are available for other HANNA products, such as pocket meters.

HI 740109 Carrying case for Piccolo
HI 740110 Carrying case for HI 96107 housing
HI 740112 Carrying case for Conmet

Carrying Case, Soft

Soft carrying case for HI 8014 and portable photometer housing. 230 x 130 x 50 mm (9.1 x 5.1 x 2").

HI 710001 Soft carrying case for HI 8014 housing

Soft carrying case for portble thermistor thermometers. 280 x 120 x 50 mm (11 x 4.7 x 2").

HI 710002 Soft carrying case for portable thermistor thermometers

Soft carrying case for HI 93510 and HI 955501 housings. 150 x 90 x 30 mm (5.9 x 3.5 x 1.2").

HI 710004 Soft carrying case for HI 93510 housing

Soft carrying case for HYGROCHECK®.

HI 740203 Soft carrying case for HYGROCHECK®

Case, Protective

Protective case for portable meters.

HI 710118 Protective case with tray for HI 93530N housing
HI 710119 Protective case tray for HI 93510N housing with probe
HI 710120 Protective case tray for HI 9040 housing with probe
HI 710122 Protective case tray for HI 8424 housing
HI 710123 Protective case tray for HI 991300 housing

Cell

Cell, Colorimetric, for PCA Series –*see PCA Spare Parts*

Cell, Measurement, for Photometers and Turbidity Meters –*see Cuvette*

HI 740219

COD Test Tube Adapter

HI 740219 COD test tube adapter
HI 740235 COD adapter for HI 83099

Connector

Connectors to repair or customize the probe connection cables.

HI 740116 BNC connector (2 pcs)
HI 740117 DIN connector (2 pcs)
HI 740118 US standard connector (2 pcs)
HI 731323 Phono style plug with 1 m (3.3') cable and wire end for HI 762 and HI 765 series of temperature probes (4 pcs)
HI 76P2-10 Phono style plug with 10 m (33') cable and wire end for HI 762 and HI 765 series of temperature probes (4 pcs)

HI 7164

Connector, Undecal

11-pin connector for all electrical connections of HI 7871, HI 7873 and HI 8666.

HI 7164 Undecal connector

C
Accessories

Cover


HI 740022P

Cover for Battery Compartment

Spare battery covers for portable and pocket meters.

HI 740002P Battery cover for Checker® (10 pcs)
HI 740003P Battery cover for Checktemp® (10 pcs)
HI 740004P Battery cover for Checktemp® 1 (10 pcs)
HI 740005P Battery cover for Checktemp® 2 (10 pcs)
HI 740006 Battery cover for Conmet
HI 740007P Battery cover for HI 9040 casing (10pcs)
HI 740010P Battery cover for HI 9041 casing (10 pcs)
HI 740011P Battery cover for Piccolo + (10 pcs)
HI 740013P Battery cover for HI 9214 casing (10 pcs)
HI 740015P Battery cover for infrared thermometer casing (10 pcs)
HI 740017P Battery cover for Hygrocheck® (10 pcs)
HI 740019P Battery cover for HI 83221 (10 pcs)
HI 740020P Battery cover for HI 99104 (10 pcs)
HI 740021P Battery cover for Piccolo (10 pcs)
HI 740022P Battery cover with O-ring for waterproof testers (10 pcs)
HI 740023 Battery cover for Watercheck
HI 740207P Battery cover for HI 93703 (10 pcs)


HI 3834-99 HI 3833-99


HI 143002

Cover for Fuse Holder

Spare cover for fuse holder of process instrumentation.

HI 740119P Cover for fuse holder (10 pcs)

Cover for Housing

Used for housing protection and internal electronics. Transparent covers for front panels of process meters and built-in printers.

HI 740120 Left keyboard cover for HI 120 series
HI 740121 Right plastic cover for wall mounted instruments
HI 740122P Plastic cover for terminals of BL 7916 and BL 7917 (2 pcs)
HI 740124P Rear cover for HI 140 series (2 pcs)
HI 740125P Rear cover for HI 981401 (2 pcs)
HI 740126 Rear cover for HI 8614 housing
HI 740129 Transparent front cover for BL 7916 and BL 7917
HI 740130 Transparent front cover for HI 8710 housing
HI 740131 Transparent front cover for BL minicontrollers


HI 731331 HI 731318


HI 76404

Cube, Color for CTK

Spare comparison cubes for colorimetric chemical test kits.

HI 3824-99 Color cube for ammonia test kit
HI 3830-99 Color cube for bromine test kit
HI 3831-99 Color cube for chlorine test kit
HI 3832-99 Color cube for iodine test kit
HI 3833-99 Color cube for phosphate test kit
HI 3834-99 Color cube for iron test kit
HI 3874-99 Color cube for nitrate test kit


HI 76404N

Cradle, Docking

Docking cradle for quick and easy placement of your instrument for PC connection.

HI 143001 RS232 communication cradle complete with Windows® compatible software for HI 143 T-logger.
HI 143002 USB communication cradle complete with Windows® compatible software for HI 143 T-logger.


HI 76405


HI 740035

Cuvette

The glass cuvette is the most sensitive part for taking accurate measurements with photometers and turbidity meters. It is important that the cuvette is always clean and without scratches.

HI 731321 Glass cuvette for HI 832xx series (4)
HI 731332P Spare cuvettes for bench photometers (100)
HI 731331 Glass cuvette for HI 96 series (4)
HI 731311 Glass vial with cap for HI 83214 (5)
HI 731331N Spare cuvette for HI 98703 turbidity meter (4)


HI 60501
HI 60545

Cuvette Cleaning Cloth

These non-abrasive cloths are ideal to wipe measurement cuvettes of photometers and turbidity meters, without damaging the cuvette surface.

HI 731318 Cuvette cleaning cloth (4 pcs)

Demineralized Water

Demi-02 Bottle to prepare 2 liters of demineralized water
Demi-05 Bottle to prepare 5 liters of demineralized water
Demi-10 Bottle to prepare 10 liters of demineralized water


HI 6054T

Electrode Holder

Cantilever stand with a large steel base provides greater stability and flexibility, and holds up to three electrodes in any position.

HI 76404 Electrode holder for pH 209 type bench meters
HI 76404N Electrode holder for HI 42xx type bench meters
HI 76405 Electrode holder with steel base
HI 76405A Cantilever arm
HI 76405C Steel base for HI 76405
HI 740035 Electrode holder and plastic beaker for HI 207 and HI 208

Industrial by-pass loop electrode holder.

HI 60545 Electrode holder for by-pass loop configurations


HI 6050
HI 60503
HI 60542

Industrial electrode holder for immersion installation. Made of rugged PVC, this item can withstand most chemicals.

HI 6050 Electrode holder for immersion installation, 0.6 m (23.8")
HI 6051 Electrode holder for immersion installation, 1 m (3.3')
HI 6052 Electrode holder for immersion installation, 1.6 m (5.25')
HI 60501 Electrode holder for immersion installation for tanks, vessels, baths and open channels
HI 60503 Electrode holder for immersion installation for tanks, vessels, baths and open channels
HI 605011 PVC mounting flange

Industrial electrode holder for in-line installation. Two models are available, depending on the electrode thread. Made of fiber-glass reinforced polypropylene, these holders perfectly fit the relevant HANNA pH and ORP electrodes.

HI 6054B Electrode holder for in-line installation, 3/4x16UNF thread
HI 6054T Electrode holder for in-line installation, PG 13.5 thread
HI 60542 Electrode holder for in-line direct pipe installation, PG 13.5 thread

Electrodes for Testers, Spare Parts

HI 73106 Spare electrode for HI 98106 and HI 98107
HI 73108 Spare electrode for HI 9810
HI 73120 Spare electrode for HI 98120
HI 73127 Spare electrode for HI 98121, HI 98127, HI 98128, HI 98129 and HI 98130
HI 73201 Spare electrode for HI 98201
HI 73202 Spare electrode for HI 98202 and HI 98203

E-I

Accessories

Electrode Removal Tool

To remove the probe cartridge of HI 98120, HI 98121, HI 98127, HI 98128, HI 98129, HI 98130, HI 98311 and HI 98312 testers.

HI 73128 Probe removal tool (10 pcs)

HI 73128

Filter for Chemical Test Kits

Replacement filter cartridge for HI 3838 formaldehyde test kit.

HI 740135 Filter for HI 3838

Filter for PCA *–see PCA Spare Parts*

Filter Paper

Replacement filter papers

HI 740232 Filter paper type 1 (100 pcs)
HI 740233 Filter paper type 2 (100 pcs)

Fuse

HI 70490P 400 mA, 5 x 20 mm fuse (10 pcs)
HI 740140P 200 mA, 5 x 20 mm fuse (10 pcs)
HI 740136P 1 A, 5 x 20 mm fuse (10 pcs)
HI 740137 1 A, 5 x 20 mm fuse (6 pcs)
HI 740138P 2 A, 5 x 20 mm fuse (10 pcs)
HI 740139 2 A, 5 x 20 mm fuse (6 pcs)
HI 740214 4 A, 5 x 20 mm fuse (1 pcs)
HI 740215 4 A, 5 x 20 mm fuse (6 pcs)

Holder

Holder for Electrodes *–see Electrode Holder*

HI 750146

Holder for HI 146 Probe

HI 750146 Wall mounting probe holder for HI 146

Holder for Level Controller Bars

The HANNA level controllers require measuring bars and this bar holder, which incorporates the amplifier circuitry to operate the controllers.

HI 7874 Bar holder and level transmitter

HI 7874

Hose

LDPE hose to be used with BL dosing pumps. Different lengths are available.

HI 720029 LDPE hose, 3 m (9.9')
HI 720030 LDPE hose, 10 m (33')
HI 720031 LDPE hose, 50 m (165')
HI 720032 LDPE hose, 100 m (333')

iButton®

i-Button® tags to be used with Fast Tracker™ compatible meters.

HI 920005 5 tag holders with tags

HI 920005


HI 740221

Key

Key for HI 141 Magnetic Start

HI 740221 Key for HI 141 magnetic start


HI 762

Key for Testing Thermometer Calculation

Allows a quick calibration check of the thermistor thermometers. Simply connect the key to the meter and verify that reading is within the key value ±0.4°C (or ±0.8°F). If not, contact the nearest HANNA instructments® Customer Service Center for recalibration.

Test keys for thermometers using an HI 762 series probe.

HI 762-18C Test key at -18°C
HI 762000C Test key at 0°C
HI 762070C Test key at 70°C
HI 762-004F Test key at -0.4°F
HI 762032F Test key at 32°F
HI 762158F Test key at 158°F


HI 765

Test keys for thermometers using an HI 765 series probe.

HI 765-18C Test key at -18°C
HI 765000C Test key at a 0°C
HI 765070C Test key at 70°C
HI 765-004F Test key at -0.4°F
HI 765032F Test key at 32°F
HI 765158F Test key at 158°F


HI 710046

Kit


HI 7698281

Kit, HI 83215 and HI 83225 Accessories

Complete accessory kit for preparation of samples to be analyzed (nutrients for agriculture) with the HI 83215 photometer.

HI 740223 Plastic beaker (170 mL)
HI 740224 Plastic beaker (170 mL, 12 pcs)
HI 740225 Syringe (60 mL)
HI 740226 Pipette (5 mL)
HI 740227 Filter
HI 740228 Filter (25 pcs)
HI 740229 Polypropylene cylinder (100 mL)
HI 740230 Demineralized bottle (230 mL)
HI 93703-54 Dried resin (100 g)
HI 93703-55 Activated carbon (for 50 tests)
HI 83215-100 Sample preparation kit in rugged carrying case for HI 83215
HI 83225-100 Sample preparation kit in rugged carrying case for HI 83225


HI 7698282


HI 7698284


HI 7698283

Kit, HI 9828 and HI 9829 Accessories

Accessories designed for HI 9828 and HI 9829 multiparameter portable meter and HI 76X9828 probe series. For a full list, refer to them in our Multiparameter section.

HI 920005 i-Button® with holder (5 pcs)
HI 7698282 Maintenance probe kit
HI 710045 Power supply cable
HI 710046 Lighter cigarette cable
HI 721320 Complete carrying case


HI 710045


HI 740234

Lamp, Turbidimeter

HI 740234 Replacement lamp for EPA turbidimeter

L-P

Accessories

Lysimeter, Suction

Designed to be used with the HANNA HI 83215 and HI 83225, this lysimeter is available in three sizes and is comprised of: sampler tube ending in a porous tip, capillary rubber tube with rubber cap and finger clamp, cleaning solution starter kit, 30 mL syringe and instructions.

HI 83900-30 Suction lysimeter, 30 cm (0.98') tube
HI 83900-60 Suction lysimeter, 60 cm (1.97') tube
HI 83900-90 Suction lysimeter, 90 cm (2.95') tube
HI 83900-25 Cleaning solution replacement kit, 500 mL

HI 70475

Mounting Bracket *–see Bracket for Installation of Process Meters*

Mounting Kit for Process Instruments

For installation of panel-mounted process instruments with the relevant mounting brackets (supplied with the meter).

HI 740148P Nut, screw and washer to install HI 8710 housing (10 pcs)
HI 740150P Nut, screw and washer to install pH 500 housing (10 pcs)

HI 70477

Nut

Plastic nuts to tightly seal electrical connections for transmitters to an HI 8614 housing, ensuring IP65 protection rate.

HI 740151P Black plastic nut for HI 8614 housing (10 pcs)
HI 740152 Grey plastic nut for HI 8614 housing

HI 70478 HI 70479

O-ring

Spare O-rings.

HI 740153P O-ring to secure the HI 1083 protective cap (10 pcs)
HI 740154 O-ring to secure the HI 1083 protective cap (6 pcs)
HI 60501-0 O-rings for HI 60501
HI 60542-0 O-rings for HI 60542
HI 60545-0 O-rings for HI 60545

HI 70482

PCA Spare Parts

Complete list of accessories and spare parts to be used with the PCA series of process analyzers, for measurement and maintenance purposes.

HI 70473 PCA tubing kit, pressure regulator to drain (2 pcs)
HI 70474 PCA peristaltic pump tubing kit (6 pcs)
HI 70475 PCA peristaltic pump tubing kit (2 pcs)
HI 70476 Reagent bottle tubing kit (6 pcs)
HI 70477 PCA Y strainer and tubing to measuring cell (2 pcs)
HI 70478 PCA tubing kit, bottle to pump (6 pcs)
HI 70479 PCA tubing kit, pump to Y strainer (8 pcs)
HI 70482 5 µm and 50 µm input filters for PCA series
HI 70483 PCA complete tubing kit
HI 70484 PCA complete tubing kit (3 pcs)
HI 70485 Magnetic stirrer motor for PCA series
HI 70486 Magnetic bar for PCA series (2 pcs)
HI 70487/N PCA measuring cell
HI 70487/A Adapter set for measuring cell
HI 70488 PCA electrovalve, 60 Hz
HI 70489 PCA electrovalve, 50 Hz
HI 70490 Free chlorine reagent kit

HI 70483

HI 70487/N

HI 70488


HI 70496


HI 70497

HI 70491 Total chlorine reagent kit
HI 70492 PCA drain tubing kit
HI 70493 PCA drain pressure regulator
HI 70494 PCA calibration port cap
HI 70495 PCA incoming pressure regulator
HI 70496 0.45 µm filter for PCA series
HI 70497 50 µm filter for PCA series
HI 70498 Reagent set for PCA 311, PCA 321 and PCA 331
HI 70499 Reagent set for PCA 312, PCA 322 and PCA 332

Pipette

Pipette for Automatic Dosage


HI 731340

HI 731340 200 µL graduated pipette
HI 731341 1000 µL graduated pipette
HI 731342 2000 µL graduated pipette
HI 731350 Tip for 200 µL graduated pipette (25 pcs)
HI 731351 Tip for 1000 µL graduated pipette (25 pcs)
HI 731352 Tip for 2000 µL graduated pipette (4 pcs)

Pipette, Capillary

HI 740155 Capillary pipette (20)

Pipette (Tip) for Dosing Syringes


HI 731342

This tool allows the user to precisely dose the reagent, avoiding any contamination of the titration syringe during measurements with the chemical test kits. Use one tip for each reagent to prevent cross contamination.

HI 740144 Pipette tip for syringe (6 pcs)
HI 740144P Pipette tip for syringe (10 pcs)

Pipette for Electrode Refilling

HI 731351

HI 731352

Typically used with refillable pH and ORP electrodes for precise dosage of the electrolyte solution. They are also useful for precision liquid transfer in any field or lab application.

HI 740157P Electrode refilling pipette (20 pcs)

Power

Power Adapter

These converters enable HANNA meters to operate at 12 Vdc from a 115 Vac or 230 Vac power outlet and are available with several plugs.

HI 710005 115 Vac to 12 VDC, US plug
HI 710006 230 Vac to 12 VDC, European plug
HI 710012 230 Vac to 12 VDC, UK plug
HI 710013 230 Vac to 12 VDC, South African plug
HI 710014 230 Vac to 12 VDC, Australian plug
HI 710017 115 Vac to 12 VDC, Japanese plug
HI 710005/8 115V to 12VDC adapter for HI 42xx family
HI 710006/8 230V to 12VDC adapter for HI 42xx family
HI 71005/8 115 Vac to 12 VDC, 800 mA
HI 71006/8 230 Vac to 12 VDC, 800 mA

Power Cord


HI 740199

These cords power all HANNA meters requiring direct 115 Vac or 230 Vac supply.

HI 740198 Power cord with European plug
HI 740199 Power cord with US plug

P-S

Accessories

Power Plug

To be used with old wall mounted controllers and external devices (such as pumps or electrovalves) driven by the controllers, and with BL 7916 and BL 7917.

HI 767/P Input plug (5 pcs)
HI 7671/P Output plug (5 pcs)


HI 721003

Pump Spare Parts

List of necessary spare parts for operation and maintenance of dosing pumps.

HI 721003 Glass ball with O-ring (10 pcs each)
HI 721004 Injection valve assembly
HI 721005 Foot valve assembly
HI 721006 Spring (4 pcs)
HI 721008 Ceramic weight (4 pcs)
HI 720029 LDPE hose, 3 m (9.9')
HI 720030 LDPE hose, 10 m (33')
HI 720031 LDPE hose, 50 m (165')
HI 720032 LDPE hose, 100 m (333')
HI 721101 Pumphead, O-ring, screws (6 pcs) and washers (6 pcs)
HI 721102 Discharge valve assembly
HI 721103 Suction valve assembly
HI 721108 PVDF nut (25 pcs)
HI 740156 Valve seat (3 pcs)


HI 721004 HI 721005


HI 721006 HI 721108


HI 721101

Rack, Test Tube Cooling

HI 740216 Test tube cooling rack (25 holes)

RH Calibration Chamber

These portable chambers allow you to easily calibrate your hygrometers. They measure 190 x 115 x 110 mm (7.5 x 4.5 x 4.3"), and are supplied complete with O-ring and precalibrated, ready-to-use saturated salts.

The HI 7101 model is designed for use with HI 9064 and HI 9065, while the HI 7102 is for use with the HI 93640 and HI 8666 hygrometers.

HI 7101 Calibration chamber for RH probes with sintered cap
HI 7102 Calibration chamber for RH probes without sintered cap


HI 721103 HI 740156

RH Calibration Salt

LiCl calibration salt for HI 7101 and HI 7102 calibration chambers (low RH).

HI 7111/P LiCl calibration salt, 15 g bottle (6 pcs)
HI 7111 LiCl calibration salt, 15 g bottle


HI 770216

NaCl calibration salt for HI 7101 and HI 7102 calibration chambers (high RH).

HI 7121/P NaCl calibration salt, 33 g bottle (6 pcs)
HI 7121 NaCl calibration salt, 33 g bottle

Scissors

Standard HANNA small scissors.

HI 740051P Blue scissors (10)

Screwdriver for Calibration

Calibration screwdriver, length 90 mm (3.5"), to perform manual calibration with trimmers.

HI 731326 Calibration screwdriver (20 pcs)


HI 7102


HI 7121/P

Shield, Safety

Safety shield that connects to the top of the HI 839800 test tube heater.

HI 740217 Laboratory bench safety shield for HI 839800

Sleeve


HI 731326

Sleeve, Protective, for Conductivity Probes

These sleeves are needed to correctly perform EC and TDS measurements with HANNA probes. In addition, they protect sensors against accidental impact.

HI 740179 Protective PVC sleeve for Conmet
HI 740180 Protective PVC sleeve for HI 76302W
HI 740181 Protective PVC sleeve for HI 1285
HI 740182 Protective PVC sleeve for HI 76303

Sleeve, Protective, for DO Probes

Protective sleeve designed HI 76409 series of dissolved oxygen probes.

HI 76409-0 Protective sleeve for HI 76409 series

Software


HI 740217

Use the following Windows® compatible softwares to handle PC connection of the relevant HANNA meters.

HI 92000 Windows® compatible software for logging instruments, photometers and turbidity meters
HI 92140 Windows® compatible software for HI 140 and HI 142 series
HI 141000 Windows® compatible software for HI 141 series
HI 92143 Windows® compatible software for HI 143 series
HI 92500 Windows® compatible software for microprocessor-based process controllers
HI 800104 Windows® compatible software for HI 8000 controllers
HI 981500 Windows® compatible software for pH Turtle (HI 9815)

Spoon, Dosing

HI 740181

HI 740133 Dosing spoon (6)
HI 740132P Dosing spoon (10)

Stir Bars for Magnetic Stirrers *–see Bars, Stir Bars for Magnetic Stirrers*

Syringe


HI 740225


HI 740226


HI 740143

Graduated syringe for accurately reagent dosing for CTK and photometers.

HI 740225 60 mL graduated syringe
HI 740226 60 mL graduated syringe
HI 740142P 1 mL graduated syringe (10 pcs)
HI 740143 1 mL graduated syringe (6 pcs)

Syringe, Tip

HI 740144 Syringe tip for HI 740143 (6 pcs)

T-W

Accessories

Terminals, Extractable, for Process Instruments

These extractable modules have been designed for quick and easy wiring of HANNA process meters. They are available for 2, 3 and 4 inputs.

HI 740191P Extractable terminal, 2 inputs (10 pcs)
HI 740192P Extractable terminal, 3 inputs (10 pcs)
HI 740193P Extractable terminal, 4 inputs (10 pcs)
HI 740204P Large extractable terminal, 2 inputs (10 pcs)
HI 740205P Large extractable terminal, 3 inputs (10 pcs)


HI 740191P HI 740193P

Test Tube

HI 740220 Glass test tube with caps, 25 mL (2 pcs)


HI 740220

Transformer *–see Power Adapter*

Transmitter, Infrared, for PC Connection

Simply place the unit on the cradle and the data will be transmitted to the PC through the RS232 serial port.

Infrared interfaces to be used with temperature dataloggers.
HI 90140 Infrared transmitter for HI 140 series
HI 141001 Infrared transmitter for HI 141 series

Tubing Set

HI 70483T Tube set with cap for titrant and bottle tip

Vessel for Water Test

Plastic vessel to collect sample being measured with Water Test.

HI 740088 Vessel for Water Test


HI 90140

Vial *–see also Cuvette*

To be used with HI 3835 salinity test kit, to perform the reaction during titration.

HI 740196P Plastic vial for HI 3835 (20 pcs)

Weight, Ceramic, for Pumps *–see Pump Spare Parts*

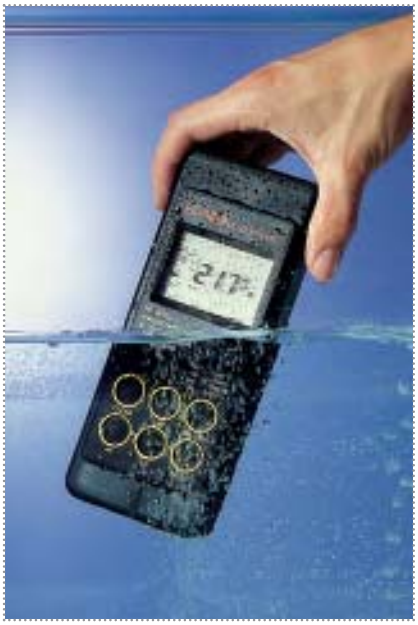
Wrist-strap

HI 740123 Spare wrist-strap for ergonomic portable meters (in HI 93510, HI 8633 and HI 151 housing)


HI 141001


HI 740088

IP 67–Heavy-Duty Construction

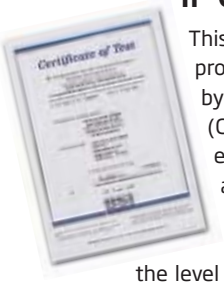


IP 67: The Waterproof Edge

HANNA waterproof meters comply with the IP 67 standards that classify them dust-tight and protected against the effect of temporary immersion in water.

This enables the units to operate in the harshest of environments, protected against spills, dust, high humidity and severe weather conditions. This makes them ideal for outdoor measurements and the most severe industrial applications such as mines, food processing, plating, industry, foundries, etc. HANNA waterproof meters are built to last.

IP Codes



This standard describes a system for classifying the degree of protection provided by the enclosure of electrical/electronic equipment. Developed by the European Committee for Electro-Technical Standardization (CENELEC), these standards are designed to numerically rate an electrical product on the level of protection its enclosure provides. By assigning different number codes, the degree of protection of the product can be quickly and easily identified. In the IP 67 code, for example, IP signifies International Protection, the first digit 6 indicates the level of protection from solid objects, and the second digit 7 denotes the level of protection from liquids. See the tables below for the details.

DEGREE OF PROTECTION (FIRST NUMBER IN THE CODE)

FIRST #	BRIEF DESCRIPTION	DEFINITION
0	Not protected	–
1	Protected against solid foreign objects of 50 mm diameter and greater	An object probe, sphere of 50 mm diam. shall not fully penetrate*
2	Protected against solid foreign objects of 12.5 mm diameter and greater	An object probe, sphere of 12.5 mm diam. shall not fully penetrate*
3	Protected against solid foreign objects of 2.5 mm diameter and greater	An object probe of 2.5 mm diam. shall not penetrate at all
4	Protected against solid foreign objects of 1.0 mm diameter and greater	An object probe of 1.0 mm diam. shall not penetrate at all
5	Dust-Protected	Ingress of dust is not totally prevented, but dust shall not penetrate in a quantity to interfere with satisfactory operation of the apparatus or to impair safety.
6	Dust-tight	No ingress of dust.

DEGREE OF PROTECTION FROM LIQUIDS (SECOND NUMBER IN THE CODE)

SECOND #	BRIEF DESCRIPTION	DEFINITION
0	Not protected	–
1	Protected against vertically falling water drops	Vertically falling water drops shall have no harmful effects.
2	Protected against vertically falling water drops tilted at any angle up to 15°	Vertically falling water drops have no harmful effects when the enclosure is when enclosures is tilted up to 15° on either side of the vertical.
3	Protected against spraying water	Water sprayed at an angle up to 60° on either side of the vertical shall have no harmful effects.
4	Protected against splashing water	Water splashed against the enclosure from any direction shall have no harmful effects.
5	Protected against water jets	Water projected in jets against the enclosure from any direction shall have no harmful effects.
6	Protected against powerful water jets	Water projected in powerful jets against the enclosure from any direction shall have no harmful effects.
7	Protected against the effects of temporary immersion in water	Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is temporarily immersed 1 meter in water under standardized conditions of pressure and time.
8	Protected against the effects of continuous immersion in water	Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is continuously immersed in water under conditions which shall be agreed between manufacturer and the user, but are more severe than for number 7.

* The full diameter of the object probe shall not pass through an opening of the enclosure.

CE Mark Definition and Compliance

All industries make use of electronic instrumentation for their daily operations. The increased use of electronic equipment in many industries means that more instruments are used together and in conjunction with each other, often in a very restricted area.

Proximity of equipment has increased the likelihood of interferences between various instruments, as well as the instruments and the environment surrounding them. Improper operation of the equipment may result from these undesired Electromagnetic Interferences (EMI).

Electromagnetic Interferences (EMI)

Electromagnetic Interferences are generated by currents which flow into the electronic circuitry of instrumentation. Some electromagnetic interferences originate in nature through atomospheric phenomena, such as lightning and static electricity.

Electromagnetic Compatibility (EMC) Directives define two categories (illustrated below).

Directives which sets standards for the amount of EMI a device can withstand and still operate normally and without incurring any damage.

Restrict the amplitude of the signals emerging from a device.

Each category is further sub-divided into:

- **Conducted EMI propagated by wires (such as power or connection cables)**
- **Radiated EMI spread through the air**

The effects of these electromagnetic interferences are the main cause for:

- **Incorrect equipment operation and therefore, inaccurate measurements**
- **Damage to the equipment, itself**

International Governing bodies have defined the EMI tolerance limits for electronic instruments. The aim is to limit EMI effects and to reach an Electromagnetic Compatibility (EMC) that permits all electronic devices to operate normally, and in proximity with each other, without having an adverse effect on their operation.

Electromagnetic Compatibility

Electromagnetic Compatibility of an instrument means that electromagnetic interferences will not compromise its functionality, and at the same time, the meter itself will not generate interferences which may affect other equipment. In Europe, the CE mark on a product means compliance with the EMC Directives. The products must meet the directives before they can be legally sold. The CE Directive referring the the "Conducted and Radiated Emissions" is designated as EN 50081-1, while EN 50082-1 defines the prerequisites for "Susceptibility to the Conducted and Radiated EMI".

The "Mission Statement" of HANNA's Research and Development is "a complete dedication in designing electroanalytical instruments to monitor and safeguard the environment, in compliance with the CE Directives". The following provides a short list of the significance of CE Norms and how we comply with them.

Radiated Susceptibility

Our instruments are not susceptible to radiation generated by other equipment that in turn can cause improper operation, such as, automatic switching off and/or inaccurate measurements.

Radited Emissions

The HANNA meters do not emit radiation that might cause improper functioning of other equipment in their proximity (such as switching off and/or inaccurate measurements).

Susceptibility to Conducted Interferences

This is caused mainly by power leads or signal/control cables connecting different devices, which could result in malfunctioning or permanent damage. HANNA products come with this protection

Electrostatic Discharges

HANNA equipment is not susceptible to static electricity from users or objects, whether due to direct contact or proximity. This kind of discharge can cause severe damage to other equipment.

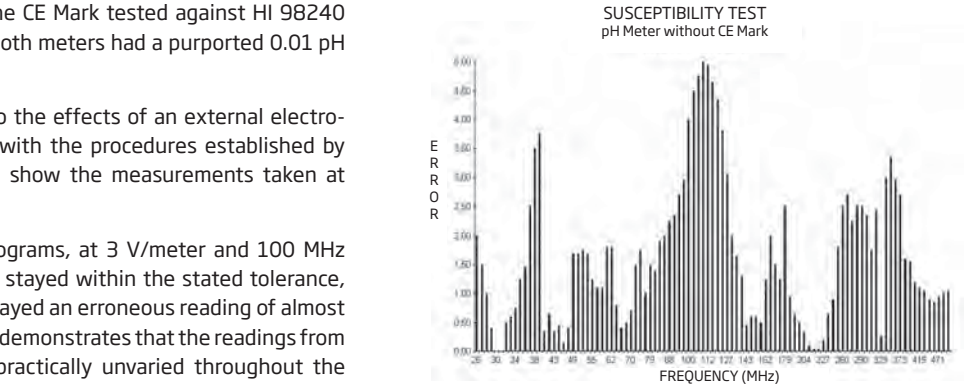
Compliance with the CE Directives, ensures reliability and accuracy for products manufactured by HANNA.

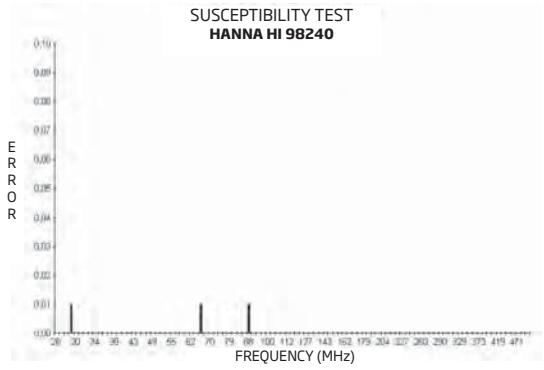
HANNA Meter Vs. Meter without CE

To show how susceptible instruments are to outside interference, we had a pH meter without the CE Mark tested against HI 98240 from HANNA (shown below). Both meters had a purported 0.01 pH margin of error.

Both meters were subjected to the effects of an external electro-magnetic field, in accordance with the procedures established by the CE Directives. The graphs show the measurements taken at different frequencies.

As you can see from the histograms, at 3 V/meter and 100 MHz frequency, the HANNA meters stayed within the stated tolerance, wheras the non-CE model displayed an erroneous reading of almost 5 pH! The rest of the graph also demonstrates that the readings from the HANNA meter remained practically unvaried throughout the test.





Our commitment to provide quality products for our customers has resulted in instruments manufactured by HANNA, complying with the European Directives

EN 61000-6-1,

EN 61000-6-3 and

EN 61010-1.

ISO 9001:2000 and HANNA Compliance

With HANNA, you receive products manufactured to the most stringent quality standards.

HANNA is an ISO 9001:2000 certified company. Our production system is certified to guarantee our customers a quality product every time.

ISO Standards

ISO 9000 standards were adopted in 1978 by the International Organization of Standards in Geneva, Switzerland, as a uniform standard of excellence for use in the European Economic Community. The standards were an immediate success and have since been adopted in more than 90 countries around the world, including the USA.

In order to obtain an ISO 9001:2000 Certification, each and every one of the following department need to comply with the rigorous ISO standards:

1) Design/Development: HANNA products are designed, developed and engineered under ISO 9001 standards.
2) Production: Every instrument undergoes stringent Quality Control tests at different stages of manufacturing.
3) Quality Assurance: All meters undergo 100% quality control checks prior to shipment.
4) Installation and Servicing: HANNA provides unsurpassed level of customer service, technical support and after sales assistance.

Glossary

ABS cover
Acrylonitrile butadiene styrene is a common thermoplastic.

ABS/LAS
Alkyl benzene sulfonate / Linear alkyl sulfonate (detergents)

Absorbance
Absorption of light is a typical phenomenon of interaction between electromagnetic radiation and matter. When a light beam crosses a substance, some of the radiation may be absorbed by atoms, molecules or crystal lattices.

Accuracy
The accuracy of an analytical procedure expresses the closeness of agreement between the value which is accepted either as a conventional true value or an accepted reference value and the value found.

AICI
The American Iron and Steel Institute AICI 316 (grade).

Alkalinity
The quantitative capacity of a water sample to neutralize an acid to a set pH.

Analytical Procedure
The analytical procedure refers to the way of performing the analysis. This may include but is not limited to: the sample, the reference standard and the reagents preparations, use of the apparatus, generation of the calibration curve, use of the formulae for the calculation, etc.

Amphel™ Breakthrough
HANNA AmpHel® electrodes incorporate a miniaturized amplifier which resolves most of the problems associated with high impedance signals. The amplifier circuitry is located right on top of the electrode and is completely sealed. As a result, a strong, low impedance signal is emitted and ordinary connectors with long unshielded cables can be used. This breakthrough technology provides a stable signal for industrial monitoring as well as a major saving in low noise coaxial cable costs. In some cases, the need for a transmitter is also eliminated, resulting in further cost reductions.

AOAC
Association of Official Analytical Chemists

Aqua Dip™
Aqua Dip™ EC/TDS provides simple and fast EC/TDS/Temperature measurements in places with high relative humidity.

ASBC
American Society of Brewing Chemists turbidity units.

ASTM
American Society for Testing and Materials.

ATC
Automatically Temperature Compensation.

Auto-feedback
With a HANNA magnetic stirrer incorporating auto-feedback, any change in viscosity or volume of the solution is automatically compensated for to keep the speed constant.

Backlight
A form of illumination used in LCD's; backlights illuminate the LCD from the side or back of the display panel.

Backpack Lab™
Backpack Lab™ from HANNA are portable student laboratories that include a collection of well constructed lessons and activities, testing instruments, and kits for use by educators and students of environmental science.

Bé
Degree Baumé. The Baumé scale is used to measure density of various liquids. Notated variously as degrees Baume, degrees Baumé, B°, Be°, Bé, Baume.

BEPS
Battery Error Prevention System. Alerts the user in the event that low battery power could adversely affect readings

BNC Connector
Bayonet Neill-Concelman connector is a common type of radio-frequency connector used for the coaxial cable which connects various devices; usually is applied for frequencies below 3 GHz.

BOD
Biochemical Oxygen Demand. BOD gives an indication of the biodegradable organic material present in a sample of water. The dissolved oxygen concentration is measured before and after an incubation period of 5 days and the BOD is calculated in mg per liter from the difference.

%Brix
Degrees Brix is a unit representative of the sugar content of an aqueous solution. One degree Brix corresponds to 1 gram of sucrose in 100 grams of solution (% w/w).

°C

Celsius temperature degree; °C = (°F-32) / 1.8

Cal Check™

With the HANNA exclusive CAL CHECK™ validation function, users are able to verify the performance of the instrument at any time. Taking just a few short steps, the validation procedure is extremely user friendly and ensures that the meter is properly calibrated.

Calibration

Calibration is the validation of specific measurement techniques and equipment.

The bias is the difference between the mean of the measurements and the reference value. The procedure that establishes and corrects the bias is the calibration.

At the simplest level, calibration is a comparison between measurements–one of known magnitude or correctness made or set with one device and another measurement made in as similar a way as possible with a second device.

Calibration is often regarded as including the process of adjusting the output or indication on a measurement instrument to agree with the value of the applied standard, within a specified accuracy. (Automatic, Manual, Semiautomatic)

Calibration Check™ System

When used in tandem with a HANNA Calibration Check™ meter, Calibration Check™ equipped electrodes permit users to be informed if they have performed a proper calibration. In the event of a dirty or broken electrode or contaminated buffer solution, the system alerts the user to either check the electrode, replace the buffer solution or both. The system also reminds users when the instrument should be recalibrated.

Calibration Curve

In analytical chemistry, a calibration curve is a general method for determining the concentration of a substance in an unknown sample by comparing the unknown to a set of standard samples of known concentration. A calibration curve is one approach to the problem of instrument calibration; other approaches may mix the standard into the unknown, giving an internal standard.

The calibration curve is a plot of how the instrumental response, the so called analytical signal, changes with the concentration of the analyte (the substance to be measured). The operator prepares a series of standards across a range of concentrations near the expected concentration of analyte in the unknown. The concentrations of the standards must lie within the working range of the technique (instrumentation) they are using. Analyzing each of these standards using the chosen technique will produce a series of measurements. For most analyses, a plot of instrument response vs. Analyte concentration will show a linear relationship. The operator can measure the response of the unknown, and using the calibration curve, they can interpolate to find the concentration of analyte.

Candela

The candela is the luminous intensity, in a given direction, of a source that emits monochromatic radiation of frequency 540 × 1012 hertz and that has a radiant intensity in that direction of 1/683 watt per steradian.

CaT

Calcium tartrate

Checker®

HANNA pocket-sized electronic meter.

Checkfridge™

HANNA temperature monitor with magnetic backing and remote thermistor sensor on a 1 meter cable.

Checktemp®

HANNA Electronic Digital Thermometer with sharp-tip probe

CIS

Commonwealth of Independent States

Cleaning Solution

The solution used for cleaning the glass bulb of the electrode /probe once a day or at least once a week to maintain accuracy and to prevent junction clogging.

Clip-Lock™

Interrupting an important cycle of analysis due to a malfunctioning burette is a thing of the past. With the HANNA Clip-Lock™ system you can simply substitute the burette and complete all your tests with the same titrant!

The Clip-Lock™ exchangeable burette system prevents cross contamination while reducing loss of time and reagents. Burettes simply slide out for quick exchanges, and detaching the aspiration and dispensing tubes from the titrant bottles is easy.

COD

Chemical Oxygen Demand is a measure of the oxygen equivalent of the organic matter in the sample that is susceptible to oxidation by a strong oxidizing agent.

Colorimeter

(see Photometer)

Glossary

Colorimetry

Colorimetry is concerned with the determination of the concentration of a substance by measurement of the relative absorption of light with respect to a known concentration of the substance. In visual colorimetry, natural or artificial white light is generally used as a light source, and determinations are usually made with a simple instrument termed a photometer, or color comparator. When the eye is replaced by a photoelectric cell (thus largely eliminating the errors due to the personal characteristics of each observer) the instrument is termed a photoelectric colorimeter, or photometer.

Conditioning Solution

A specialized solution in which the electrode must be immersed in to activate the glass selective membrane.

CPS™

Clogging Prevention System. Conventional pH electrodes use ceramic junctions that may clog quickly when used in biological samples such as wine. When the junction is blocked, the entire electrode will not function properly. Electrodes that feature CPS™ technology utilize a ground glass/PTFE sleeve junction which controls a steady, predictable flow of fill solution thus keeping the junction open. The hydrophobic property of PTFE sleeve repels wetness and coatings.

CYS

Cyanuric Acid

°D

Dornic degrees. Obtained by titrating 100 mL of milk thinned with two parts distilled water, with 0.9N NaOH, using phenolphthalein as an indicator. Used mostly in the Netherlands and France.

Delrin

A plastic made from Acetal Homopolymer; a crystalline plastic that offers an excellent balance of properties that bridge the gap between metals and plastics.

Detection Limit

In analytical chemistry, the detection limit LOD of an individual analytical procedure is the lowest amount of analyte in a sample which can be detected but not necessarily quantitated as an exact value; or the lowest quantity of a substance that can be distinguished from the absence of that substance (a blank value) within a stated confidence limit (generally 1%).

The detection limit is estimated from the mean of the blank, the standard deviation of the blank and some confidence factor. Another consideration that affects the detection limit is the accuracy of the model used to predict concentration from the raw analytical signal.

There are a number of different "detection limits" that are commonly used. These include: the instrument detection limit (IDL), the method detection limit (MDL) and the limit of quantitation (LOQ).

Even when the same terminology is used, there can be differences in the LOD, according to nuances of what definition is used and what type of noise contributes to the measurement and calibration.

Most analytical instruments produce a signal even when a blank (matrix without analyte) is analyzed. This signal is referred to as the noise level.

The IDL is the analyte concentration that is required to produce a signal greater than three times the standard deviation of the noise level.

Many times there is more to the analytical method than just doing a reaction or submitting it to direct analysis. For example it might be necessary to heat a sample that is to be analyzed for a particular metal with the addition of acid first (this is called digestion). The sample may also be diluted or concentrated prior to analysis on an instrument.

Additional steps in an analysis add additional opportunities for error.

Since detection limits are defined in terms of error, this will naturally increase the measured detection limit. This detection limit (with all steps of the analysis included) is called the MDL.

Dew Point

The dew point is defined as the temperature to which air must be cooled in order for condensation (saturation) to occur. The dew point is dependent on the concentration of water vapor present, and therefore, the relative humidity.

DIN Connector

A circular connector for consumer electronics, originally standardized by the Deutches Institut für Normung (DIN) for analog audio signals.

Direct Potentiometry

Direct Potentiometry is a widely used method of performing ion analysis with ISEs. This method is highly effective when the user must quickly measure large batches of samples at many concentrations. HANNA direct reading meters such as the HI 98184 and HI 98185 display concentration of the unknown sample by a direct reading after calibrating the instrument with two or more standards. Ionic strength adjustments are made to both samples and standards. In some applications quick and reliable measurements can be made on-site, without taking samples back to the laboratory.

DiST®

HANNA Dissolved Solids Testers are widely used for monitoring EC/TDS in water conditioning, reverse osmosis, cooling towers, drinking water, wastewater, laboratories, agriculture, aquaculture and aquariums, hydroponics and the printing industry.

dKH

Degrees of carbonate hardness.
In case of alkalinity: 1 dKH = 0.36 meq/L = 17.86 mg/L $CaCO_3$

DO

Dissolved Oxygen. A relative measure of the amount of oxygen that is dissolved or carried in a given medium.

DPD

N,N-diethyl-p-phenylenediamine

EBC

European Brewery Convention turbidity units

EC

Electrical conductivity is a measure of how well a material accommodates the transport of electric charge. Its SI derived unit is the Siemens per meter, (A2s3m-3kg-1) (named after Werner von Siemens). It is the ratio of the current density to the electric field strength. This applies also to the electrolytic conductivity of a fluid.

EDTA

Edetic acid; etylenediaminetetraacetic acid

EES

Sodium exchangeable (in meq/100 g soil)

Electromagnetic Compatibility

Electromagnetic compatibility of an instrument means that electromagnetic interferences will not compromise its functionality, also the meter itself will not generate interferences which may affect other equipment. In Europe, the CE mark on a product means compliance with the EMC Directives. The products must meet the directives before they can be legally sold. The CE Directive referring the "Conducted and Radiated Emissions" is designated as EN 50081-1, while EN 50082-1 defines the prerequisites for "Susceptibility to the Conducted and Radiated EMI".

The "Mission Statement" of HANNA's Research and Development is "a complete dedication in designing electroanalytical instruments to monitor and safeguard the environment, in compliance with the CE Directives". The following provides a short list of the significance of CE Norms and how we comply with them.

Electromagnetic Interferences (EMI)

Electromagnetic interferences are generated by currents which flow into the electronic circuitry of instrumentation. Some electromagnetic interferences originate in nature through atmospheric phenomena, such as lightning and static electricity.

Electromagnetic

Compatibility (EMC) Directives define two categories...

Each category is further sub-divided into:

- Conducted EMI propagated by wires (such as power or connection cables)
- Radiated EMI spread through the air

The effects of these electromagnetic interferences are the main cause for:

- Incorrect equipment operation and therefore, inaccurate measurements
- Damage to the equipment, itself

International governing bodies have defined the EMI tolerance limits for electronic instruments. The aim is to limit EMI effects and to reach an electromagnetic compatibility (EMC) that permits all electronic devices to operate normally, and in proximity with each other, without having an adverse effect on their operation.

EPA (U.S. EPA)

United States Environmental Protection Agency

°F

Fahrenheit temperature degree; °F = (1.8 x °C) + 32

FAO

Food and Agriculture Organization

Fast Tracker™–Tag Identification System

HANNA's Fact Tracker™–Tag Identification System simplifies test logging. iButton®s with a unique ID can be installed at various sampling sites. When the matching connector on the meter contacts the location button, measurements are logged and labeled with the alphanumeric user-entered location ID. Location, date, time and measurements are logged into the meter which can be transferred to a PC.

FDA

US Food & Drug Administration.

FDA bottle = bottles that meet FDA Standards.

Filling Solution

Solution containing the anion to which the reference electrode of the operational pH cell is reversible, eg. Chloride for Ag-AgCl electrodes.

FNU

Formazine Nephelometric Unit.

FTU

Formazine Turbidity Unit.

F.S. (or f.s.)

Full scale.

Glossary

Glass Membrane

HANNA utilizes four different types of pH sensitive glass to cover a vast number of applications. Our manufacturing processes are specific for each pH electrode design. For instance, some electrodes with low impedance glass are particularly suited at performing measurements in solutions with low conductivity or cold solutions. For industrial grade electrodes, HANNA produces a specific range of sensitive glass that guarantees a linear response over a wide pH range as well as being resistant to harsh environments.

To optimize a pH measurement for a particular application, the pH glass characteristics are considered, as well as materials of construction including reference junctions, wetted materials and internal seals. HANNA provides the best materials and performance for a particular application to ensure reliable measurements.

GP General Purpose
HT High Temperature
LT Low Temperature
HF Samples with Fluoride

GLP

Good Laboratory Practice. The phrase good laboratory practice especially refers to a Quality System concerned with the organizational process and the conditions under which non-clinical health and environmental safety studies are planned, performed, monitored, recorded, archived and reported.

GP Glass

HANNA's GP (general purpose) hydrogen sensitive glass provides the best response over the entire pH range and can be used for a wide range of applications. Great results are obtained with sphere geometry with diameter of 9.5 mm (0.37"). This achieves a system with 100 MΩ, impedance. The GP glass is also used on smaller diameter spheres.

GPS

Global Positioning System

GR

Gypsum Requirement (metric ton/ha or ton/acre).

H_2T

Tartaric Acid.

HACCP

Hazard Analysis and Critical Control Points.

HC

Handheld Colorimeter.

HF Glass

Hydrofluoric acid can dissolve glass rapidly. HANNA uses HF resistant glass for aggressive applications that have fluoride ions. Electrodes manufactured with this glass live ten times longer than electrodes made with standard pH glass formulations (from 10 days to 100 days). The alkaline error is very high for this glass so it is not suited for pH measurements above pH 10. The recommended pH range with this glass is 2-10 pH.

High Input Impedance Meter

It is the measurement device that processes the voltage from the electrochemical cell and converts it into a meaningful measurement unit (pH). The measurement is done with virtually zero current flow to prevent polarization of the electrodes. Modern pH meters also may provide sensor diagnostics, automatic buffer recognition, calibration reminders and user prompts.

HOLD Function

Function that lets the user know when to take readings and freezes the readings on display for easy and accurate recording.

HPLC

High Performance Liquid Chromatography.

HR

High Range.

HT Glass

Designed for extended use at elevated temperature. The glass impedance has a temperature coefficient of about 14.3% per degree Celsius. HT sensitive glass has an impedance of 400 MΩ at approximately 25°C (77°F). At extremely high temperatures, the impedance drops significantly. This glass makes it possible to obtain accurate, high temperature pH measurements for extended periods of time 90°C (194°F) and for a few weeks at 100°C (212°F). At room temperature, the response time may increase so additional time for equilibration in buffers should be allowed. This glass is clear.

HVAC

Heating, Ventilating, and Air Conditioning - refers to technology of indoor or automotive environmental comfort.

HYGROCHECK®

The most complete and versatile pocket-sized HANNA Hygrometer

Hygrometer

The hygrometer is an instrument used to measure relative humidity (RH), that is, the quantity of water vapor present in the air. Hygrometers are often available in versions that also measure temperature–these are normally called thermo-hygrometers.

IARC

International Agency for Research on Cancer

iButton® Tags

Install the optional TAGs near your sampling points for quick and easy iButton® readings. Each TAG contains a computer chip with a unique identification code encased in stainless steel. Users can order and install a virtually unlimited amount of TAGs to meet any need of traceability requirements.

ICUMSA

International Commission for Uniform Methods of Sugar Analysis

Incremental Method

Incremental Methods are useful techniques used to determine ion concentration quickly in samples whose constituents are variable or concentrated. Incremental Methods have some inherent advantages over direct potentiometry. The techniques can reduce errors from variables such as temperature, viscosity, pH or ionic strength. The electrodes remain immersed throughout the process thus reducing sample carry over and possible liquid junction changes in the reference and analysis steps are reduced. Known addition, known subtraction, analyte addition, and analyte subtraction methods are four of these incremental techniques. All techniques involve adding a standard to the sample, or sample to the standard and the meter calculates the sample's ion concentration directly.

IR

Infrared. Electromagnetic radiation with a wavelength longer than VIS (according to CIE the IR band is 700 nm to 1mm).

ISA

Ionic Strength Adjusters (ISA) are formulated to provide a constant ionic strength in sample and standards alike, thus permitting concentration rather than activity measurements to be made. In some cases ISA's adjust pH and eliminate matrix effects.

ISE

Ion Selective Electrode, also known as a specific ion electrode. ISE's are sensors that convert the activity of a specific ion dissolved in a solution into an electrical potential, which can be measured by a pH meter or a voltmeter.

ISO Standards

ISO 9000 standards were adopted in 1978 by the International Organization of Standards in Geneva, Switzerland, as a uniform standard of excellence for use in the European Economic Community. The standards were an immediate success and have since been adopted in more than 90 countries around the world, including the USA.

HANNA is an ISO 9001:2000 certified company. This means the production system is certified to guarantee our customers a quality-oriented product every time. In order to obtain an ISO 9001:2000 Certification, each and every one of the following departments need to comply with the rigorous ISO standards:

1) Design/Development: HANNA products are designed, developed and engineered under ISO 9001 standards.
2) Production: Every instrument undergoes stringent Quality Control tests at different stages of manufacturing.
3) Quality Assurance: All meters undergo 100% quality control checks prior to shipment.
4) Installation and Servicing: HANNA provides unsurpassed level of customer service, technical support and after sales assistance.

ISOPOTENTIAL pH

Is the pH at which the cell voltage does not change when the temperature changes.

ISSS

International Society of Soil Science.

ITS

International Temperature Scale.

Junction

The junction (the part in contact between the two liquids) is typically made with inert materials that will not increase a junction potential or be chemically attacked by the measured solutions.

JTU

Jackson Turbidity Unit.

KEY®

The KEY® is a thermometer with an interchangeable probe for quick spot measurements. With a response time of less than 20 seconds in water, KEY is ideal for QC and industrial temperature monitoring.

KHT

Potassium Bi-Tartrate.

°KMW

°Klosterneuburger Mostwaage is used in Austria to measure the sugar content of must.

°KMW is related to °Oe by the following equation:
°Oe = °KMW x [(0.022 x °KMW) + 4.54]

1 °KMW is roughly equivalent to 1 %Brix or 5 °Oe. °KMW is also known as °Babo.

% l.a.

Percent lactic acid: obtained as °D divided by 100. Frequently used in the UK, USA, Canada, Australia and New Zealand.

Glossary

LCD

Liquid Crystal Display.

LDL Cholesterol

Low-density lipoprotein cholesterol.

LED

Light-emitting diode; a semiconductor light source.

LI

Langelier Index is a saturation index developed by Dr. Wilfred Langelier and is widely used to predict the balance of swimming pool waters. It is an estimation of the solutions ability to dissolve or precipitate calcium carbonate deposits.

Linearity

The linearity of an analytical procedure is its ability (within a given range) to obtain test results which are directly proportional to the concentration of analyte in the sample.

LOAEL

Lowest-observed-adverse-effect level.

LR

Low Range.

LSD

Low Significant Digit.

LT Glass

This glass is used on our flat and conical shaped membranes as well as sensors used at cold temperatures, because the glass has lower impedance. If an electrode has very high impedance, the measurement response will be sluggish, and a voltage drop causing error can occur. At temperatures below -8°C (17°F) the internal buffer may freeze and expand and cause the mechanical destruction of the sensor. This glass has a more limited pH range and is dark green.

Lux (lx)

The SI unit of illuminance and luminous emittance measuring luminous power per area.

Matching Pin

A matching pin is a differential measurement technique used to eliminate ground loops and common mode perturbations for the measurement system. In a system without a matching pin, electrical currents in the sample can affect the reference half cell voltage that is connected via the liquid junction with the sample.

In this case, the reference electrode picks up the electromagnetic fields and the measurement of the pH is altered. The matching pin isolates these current/magnetic fields from the reference electrode. HANNA manufactures a number of models with the matching pin design for safe precise pH measurements.

MEADOS

Measuring and Dosing System.

MEBAK

Central European Brewing Commission.

meq/L

Milliequivalents per liter.

In case of alkalinity: 1 meq/L = 50 mg/L $CaCO_3$ = 2.8 dKH.

Mho/cm

see S/cm.

Millesimal pH Buffer

This line of buffers with millesimal accuracy (±0.002 pH), has been prepared to meet the increasing need for assured accuracy in pH measurements. Each bottle is provided with a certificate of analysis, prepared by comparison with NIST standards.

MR

Medium Range.

MTC

Manual Temperature Compensation.

The temperature value, shown on the LCD, can be manually set. The compensation is referenced at the selected temperature.

mV

1/1000 of a volt, a measure of electrical potential (voltage).

NIST

National Institute of Standards and Technology.

nm

Nanometer. Unit of measurement for length in the metric system, equal to one billionth of a meter.

NoTC

No Temperature Compensation. For actual conductivity or TDS measurement, the temperature value shown on the LCD is not taken into account.

NPK

Nitrogen, phosphorus, and potassium.

NPT

National Pipe Thread. A U.S. standard for tapered threads used on threaded pipes amd fittings.

NTU

Nephelometric Turbidity Unit.

°Oe

°Oechsle is mainly used in the German, Swiss and Luxenburgish winemaking industry to measure the sugar content of must. The °Oe scale, one degree Oechsle corresponds to one ram of difference between the mass of one liter of must at 20°C and 1 kg (the mass of 1 liter of water at same temperature).

Open Junction

This type junction, found in reference half-cells, is filled with a special gel which comes into direct contact with the solution to be measured. An advantage of an open junction is low contact resistance and it is virtually impossible to clog.

Opto-isolator

In electronics, an opto-isolator is an electronic device designed to transfer electrical signals by utilizing light waves to provide coupling with electrical isolation between its input and output.

ORP

Oxidation Reduction Potential. Solutions can be graded as oxidizing or reducing based on measurement of ORP values.

OSHA

The Occupational Safety and Health Administration.

OUR

Oxygen Uptake Rate. Used to determine the oxygen consumption or respiration rate; is measured in mg of oxygen consumed per liter per hour.

PAN

1-(2-pyridylazo)-2-naphtol (indicator)

PCU

Platinum Cobalt Unit–measuring unit for true and apparent color of water.

PD Controller

Proportional Derivative controller.

PEI

Polyether Imide.

PELs

Standards for the length and intensity of exposure to certain elements.

Pfund Scale

The Pfund scale is a color grader used to provide readings of the range of honey colors. There are seven color classifications for processed honey; water white, extra white, white, extra light amber, light amber, amber and dark amber. Traditionally, the Pfund color grader works by visually comparing a wedge-shaped glass container of honey with an amber glass wedge.

pH [NIST]

The negative logarithm of the hydrogen ion activity has been given the symbol pH. The original definition was in terms of hydrogen ion concentration. The present definition of pH is associated with the "effective" concentration of hydrogen ion.

pH Glass Electrode [IUPAC]

Hydrogen ion responsive electrode usually consists of a bulb, or other suitable form of special glass attached to a stem of high-resistance glass complete with internal reference electrode and internal filling solution system. Other geometrical forms may be appropriate for special applications.

Photometer

An instrument used for measuring of photometric quantities by means of a photoreceptor.

PID Controller

Proportional-Integral-Derivative controller.

PLC

Programmable Logic Controller.

Potentiometric Titration

A Potentiometric Titration can increase the precision of ISE measurements and also the number of ionic species that can be determined. ISEs are commonly used as indicators for the titrant or sample species to follow the progress of a precipitation or complexometric titration. A small change in reactant addition corresponds to a large change in electrode potential at its stoichiometric endpoint. An example of a precipitation titration is the determination of chloride using silver nitrate. A silver ISE can be used to follow this titration. A complexometric titration is used for the determination of calcium. A calcium solution is titrated with the complexing reagent EDTA. During the titration, there is a gradual decrease in the free Ca^{2+} ion concentrations as more EDTA is added. The endpoint corresponds to the point when all the Ca^{2+} is complexed. The progress of this titration can be monitored using a calcium ISE.

Glossary

Pre-amplified Electrode

HANNA electrode containing an internal pre-amplifier. The pre-amplifier converts the high impedance signal from the pH glass to a low impedance signal thus allowing the user to use long runs of sensor cable with ordinary connectors without noisy or voltage drops resulting in erroneous measurements.

Precision

The precision of an analytical procedure expresses the closeness of agreement (degree of scatter) between a series of measurements obtained from multiple sampling of the same homogeneous sample under the prescribed conditions. Precision may be considered at three levels: repeatability, intermediate precision and reproducibility.

Precision should be investigated using homogeneous, authentic samples. However, if it is not possible to obtain a homogeneous sample it may be investigated using artificially prepared samples or a sample solution.

The precision of an analytical procedure is usually expressed as the variance, standard deviation or coefficient of variation of a series of measurements.

Intermediate precision expresses within-laboratories variations: different days, different analysts, different equipment, etc.

ppb

parts per billion; as concentration: 1 ppb = 1 µg substance /L solution.

ppm

parts per million; as concentration:
1 ppm = 1 mg substance /L solution; 1% = 10000 ppm.

ppt

parts per thousand; as concentration: 1 ppt = 1 g substance /L solution.

Pt100

Platinum sensors with means a resistance of 100Ω 0°C with a temperature coefficient of 0.00385Ω per degree Celsius. Similar for Pt1000.

PTFE

PolyTetraFluoro-Ethylene. Porous PTFE is a hydrophobic material that is available with different porosities. Because of its chemical advantages, PTFE is widely used in industrial applications.

PVC

Polyvinyl chloride.

PVDF

Polyvinylidene Fluoride–a highly non-reactive and pure thermoplastic fluoropolymere.

PWT

Pure Water Test.

QC

Quality Control.

Range

The range of an analytical procedure is the interval between the upper and lower concentrations of analyte in the sample (including these concentrations) for which it has been demonstrated that the analytical procedure has a suitable level of precision, accuracy and linearity.

RDT

Resistance Temperature Detectors.

Reference Electrode

Half cell of the electrochemical cell that supplies a stable voltage that is known, constant and completely insensitive to the measurement solution. Changes in voltages generated from the pH sensor are measured versus this electrode's voltage.

Refractive Index

Refractive Index is defined as the ratio of the speed of light in empty space to the speed of light in the substance.

Repeatability

Repeatability expresses the precision under the same operating conditions over a short interval of time. Repeatability is also termed intra-assay precision.

Reproducibility

Reproducibility expresses the precision between laboratories collaborative studies, (usually applied to standardization of methodology).

Resistivity

Electrical resistivity (also known as specific electrical resistance) is a measure indicating how strongly a material opposes the flow of electric current. A low resistivity indicates a material that readily allows the movement of electrons. The SI unit for electrical resistivity is the ohm meter.

RH

Relative humidity is expressed as the ratio of the quantity of water vapor present in the air to the quantity at which the air would reach saturation (100%) at a given temperature.

Robustness

The robustness of an analytical procedure is a measure of its capacity to remain unaffected by small, but deliberate variations in method parameters and provides an indication of its reliability during normal usage.

rpm

Revolutions per minute.

RS

Reducing Sugars.

RS232

In telecommunications, RS-232 (Recommended Standard 232) is traditional name for a series of standards for serial binary single-ended data and control signals.

RS485

In telecomunications, RS-485 (Recommended Standard 485) is a standard defining the electrical characteristics of drivers and receivers for use in balanced digital multipoint systems. RS-485 can be used effectively over long distances and in electrically noisy environments.

S/cm

The siemens (S) unit is named after Werner von Siemens, the 19th century German inventor and entrepreneur in the area of electrical engineering. Previously to the siemens per meter unit, mho/cm was used to measure conductivity, where the unit "mho" is a reciprocal ohm. The "mho" is "ohm" spelled backwards. Because of the history of conductivity, µmho/cm and mmho/cm is commonly translated to µS/cm and mS/cm because they correspond one-to-one.

The unit of measurement commonly used is one millionth of a Siemens per centimeter (micro-Siemens per centimeter or µS/cm).

When measuring more concentrated solutions, the units are expressed as milli-Siemens/cm or mS/cm (thousandths of a Siemens). For ease of expression, 1000 µS/cm are equal to 1 mS/cm.

Salinity

Salinity is a measurement without the unit corresponding to the weight of dissolved salts in seawater. Salinity is calculated from an empirical relationship between the conductivity and the salinity of a seawater sample. Oceanographic Tables and Standards endorsed by UNESCO/SCOR/ICES/IAPSO are used for the calculation.

Salinity measurements are performed with no direct temperature correction. The salinity range is calibrated using a standard sea water solution.

SAR

Sodium Absorbtion Ratio (meq/L).

Sensor Check™

Allows users to check electrode status at any time.

°SH

Soxlet Henkel degrees: obtained by titrating 100 mL of milk with 0.25N NaOH, using phenolphthalein as the indicator. This method is common in Central Europe.

SHE

Standard Hydrogen Electrode.

SMART electrode

With models that feature our SMART circuitry, an exclusive microchip embedded inside the electrode retains the calibration data and assigns an identity code to the host unit. As soon as the electrode is connected to a pH meter in the SMART series, it is recognized and its characteristics retrieved. The meter then uses the accessed calibration data as a reference for future measurements. Once each SMART electrode is calibrated, these electrodes can be used in succession without requiring new calibration. HANNA's intelligent electrodes help eliminate errors and will save time when working with more than one electrode.

SOP

Standard Operating Procedures means documented procedures which describe how to perform tests or activities normally not specified in detail in study plans or tests guidelines.

SOUR

Specific Oxygen Uptake Rate. This is used to determine the oxygen consumption or respiration rate; SOUR is measured in mg of oxygen consumed per gram of volatile suspended solids per hour.

SPDT relay

Single Pole Double Throw relay.

Specificity

Specificity is the ability to assess unequivocally the analyte in the presence of components which may be expected to be present.Typically these might include impurities, degradants, matrix, etc.

Speedsafe™

Each HANNA stirrer is equipped with a speed sensing device (opto-sensor) coupled with an FVC (frequency voltage converter), which monitors the speed. As the speed reaches a preset maximum level, the speed limiter shuts down the VCO to slow down the motor speed. This ensures that when the load is suddenly removed from the stirrer, the motor will not accelerate to such a high speed that will be hazardous to both the user and the stirrer; a feature not commonly found in conventional stirrers.

Glossary

SPST Relay

Single Pole Single Throw relay.

SRM

Standard Reference Material (CRM of National Institute of Standards and Technology).

Storage Solution

Solution used to keep the electrode moist when not in use.

TDS

Total Dissolved Solids (often abbreviated TDS) is a measure of the combined content of all inorganic and organic substances contained in a liquid in: molecular, ionized or micro-granular (colloidal sol) suspended form.

TDS Factor

When a solution does not have a similar ionic content to natural water or salt water, then a TDS conversion factor is needed to automatically adjust the readings. TDS = CF x conductivity (CF is TDS Conversion factor).

TFPC

Thin Film Polymer Capacitance.

TEA

Total Exchangeable Acidity - A measure of the amount of acidic cations (hydrogen, aluminum, iron and manganese) present in soil. It is expressed in Milliequivalents per 100 grams (meq/100 g) of soil.

°Th

Thorner degrees: obtained by titrating 100 mL of milk thinned with 2 parts distilled water, with 0.1 N NaOH, using phenolphthalein as an indicator. Method is used mostly in Sweden and the CIS.

Timer Function

Counts down to appropriate time interval before a reading is displayed. This feature ensures consistency in measurements.

TPTZ

2,4,6-tri-(2-pyridyl)-1,3,5-triazine (iron indicator)

Traceability [IUPAC]

Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties. The concept is often expressed by the adjective traceable. The unbroken chain of comparisons is called a traceability chain.

Turbidity

Turbidity of water is an optical property that causes light to be scattered and absorbed, rather than transmitted. The scattering of the light that passes through a liquid is primarily caused by the suspended solids. The higher the turbidity, the greater the amount of scattered light. Because even the molecules in a very pure fluid scatter light to a certain degree, no solution will have zero turbidity.

UPW

Ultra Pure Water.

USB

Universal Serial Bus is a application to establish communication between various devices and a host controller (usually a PC).

USDA

United States Department of Agriculture.

USP

US Pharmacopoeia. USP <645> with Stage 1, 2 and 3 compliance is required for purified water and WFI (water for injection). HANNA offers instruments that are able to perform all three stages required by this standard. Some of these requirements are: Resolution of 0.1 µS/cm or better, accuracy at 1.3µS/cm of 0.1µS/cm, to be able to read with or without automatic temperature compensation, the cell constant be known with an uncertainty better than ±2%.

UV

Ultraviolet–electromagnetic radiation with a wavelength shorter than that of VIS, but longer than X-rays (10-400 nm).

VCO

Voltage Controlled Oscillator.

VIS

The visible spectrum - is the portion of the electromagnetic spectrum that is visible (can be detected by) to the human eye (390 - 750 nm for typical human eye).

WHO

World Health Organization.

Equilibrium Relative Humidity

RELATIVE HUMIDITY IN AIR AS A FUNCTION OF TEMPERATURE OF SOME SATURATED SALT SOLUTIONS					
TEMPERATURE °C	LITHIUM CHLORIDE	POTASSIUM ACETATE	MAGNESIUM CHLORIDE	POTASSIUM CARBONATE	MAGNESIUM NITRATE
0	11.23 ± 0.54		33.66 ± 0.33	43.13 ± 0.66	60.35 ± 0.55
5	11.26 ± 0.47		33.60 ± 0.28	43.13 ± 0.50	58.86 ± 0.43
10	11.29 ± 0.41	23.28 ± 0.53	33.47 ± 0.24	43.14 ± 0.39	57.36 ± 0.33
15	11.30 ± 0.35	23.40 ± 0.32	33.30 ± 0.21	43.15 ± 0.33	55.87 ± 0.27
20	11.31 ± 0.31	23.11 ± 0.25	33.07 ± 0.18	43.16 ± 0.33	54.38 ± 0.23
25	11.30 ± 0.27	22.51 ± 0.32	32.78 ± 0.16	43.16 ± 0.39	52.89 ± 0.22
30	11.28 ± 0.24	21.61 ± 0.53	32.44 ± 0.14	43.17 ± 0.50	51.40 ± 0.24
35	11.25 ± 0.22		32.05 ± 0.13		49.91 ± 0.29
40	11.21 ± 0.21		31.60 ± 0.13		48.42 ± 0.37
45	11.16 ± 0.21		31.10 ± 0.13		46.93 ± 0.47
50	11.10 ± 0.22		30.54 ± 0.13		45.44 ± 0.60
55	11.03 ± 0.23		29.93 ± 0.16		
60	10.95 ± 0.26		29.26 ± 0.18		
65	10.86 ± 0.29		28.54 ± 0.21		
70	10.75 ± 0.33		27.77 ± 0.25		
75	10.64 ± 0.38		26.94 ± 0.29		
80	10.51 ± 0.44		26.05 ± 0.34		
85	10.38 ± 0.51		25.11 ± 0.39		
90	10.23 ± 0.59		24.12 ± 0.46		
95	10.07 ± 0.67		23.07 ± 0.52		
100	9.90 ± 0.77		21.97 ± 0.60		

RELATIVE HUMIDITY IN AIR AS A FUNCTION OF TEMPERATURE OF SOME SATURATED SALT SOLUTIONS				
TEMPERATURE °C	SODIUM CHLORIDE	POTASSIUM CHLORIDE	POTASSIUM NITRATE	POTASSIUM SULFATE
0	75.51 ± 0.34	88.61 ± 0.53	96.33 ± 2.90	98.77 ± 1.10
5	76.65 ± 0.27	87.67 ± 0.45	96.27 ± 2.10	98.48 ± 0.91
10	75.67 ± 0.22	86.77 ± 0.39	95.96 ± 1.40	98.18 ± 0.76
15	75.61 ± 0.18	85.92 ± 0.33	95.41 ± 0.96	97.89 ± 0.63
20	75.47 ± 0.14	85.11 ± 0.29	94.62 ± 0.66	97.59 ± 0.53
25	75.29 ± 0.12	84.34 ± 0.26	93.58 ± 0.55	97.30 ± 0.45
30	75.09 ± 0.11	83.62 ± 0.25	93.21 ± 0.60	97.00 ± 0.40
35	74.87 ±0.12	82.95 ± 0.25	90.79 ± 0.83	96.71 ± 0.38
40	74.68 ± 0.13	82.32 ± 0.25	89.03 ± 1.20	96.41 ± 0.38
45	74.52 ± 0.16	81.74 ± 0.28	87.03 ± 1.80	96.12 ± 0.40
50	74.43 ± 0.19	81.20 ± 0.31	84.78 ± 2.50	95.82 ± 0.45
55	74.41 ± 0.24	80.70 ± 0.35		
60	74.50 ± 0.30	80.25 ± 0.41		
65	74.71 ± 0.37	79.85 ± 0.48		
70	75.06 ± 0.45	79.49 ± 0.57		
75	75.58 ± 0.55	79.17 ± 0.66		
80	76.29 ± 0.65	78.90 ± 0.77		
85		78.68 ± 0.89		
90		78.50 ± 1.00		
95				
100				

Thermoelectric Voltage in milliVolts

Thermocouple Reference Tables

Reference Tables

N.I.S.T Rev. ITS-90

K-TYPE THERMOCOUPLE - TEMPERATURE IN DEGREES "C" WITH REFERENCE JUNCTION AT 0°C

°C	0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	°C
-270	-6.458											-270
-260	-6.441	-6.444	-6.446	-6.448	-6.450	-6.452	-6.453	-6.455	-6.456	-6.457	-6.458	-260
-250	-6.404	-6.408	-6.413	-6.417	-6.421	-6.425	-6.429	-6.432	-6.435	-6.438	-6.441	-250
-240	-6.344	-6.351	-6.358	-6.364	-6.370	-6.377	-6.382	-6.388	-6.393	-6.399	-6.404	-240
-230	-6.262	-6.271	-6.280	-6.289	-6.297	-6.306	-6.314	-6.322	-6.329	-6.337	-6.344	-230
-220	-6.158	-6.170	-6.181	-6.192	-6.202	-6.213	-6.223	-6.233	-6.243	-6.252	-6.262	-220
-210	-6.035	-6.048	-6.061	-6.074	-6.087	-6.099	-6.111	-6.123	-6.135	-6.147	-6.158	-210
-200	-5.891	-5.907	-5.922	-5.936	-5.951	-5.965	-5.980	-5.994	-6.007	-6.021	-6.035	-200
-190	-5.730	-5.747	-5.763	-5.780	-5.797	-5.813	-5.829	-5.845	-5.861	-5.876	-5.891	-190
-180	-5.550	-5.569	-5.588	-5.606	-5.624	-5.642	-5.660	-5.678	-5.695	-5.713	-5.730	-180
-170	-5.354	-5.374	-5.395	-5.415	-5.435	-5.454	-5.474	-5.493	-5.512	-5.531	-5.550	-170
-160	-5.141	-5.163	-5.185	-5.207	-5.228	-5.250	-5.271	-5.292	-5.313	-5.333	-5.354	-160
-150	-4.913	-4.936	-4.960	-4.983	-5.006	-5.029	-5.052	-5.074	-5.097	-5.119	-5.141	-150
-140	-4.669	-4.694	-4.719	-4.744	-4.768	-4.793	-4.817	-4.841	-4.865	-4.889	-4.913	-140
-130	-4.411	-4.437	-4.463	-4.490	-4.516	-4.542	-4.567	-4.593	-4.618	-4.644	-4.669	-130
-120	-4.138	-4.166	-4.194	-4.221	-4.249	-4.276	-4.303	-4.330	-4.357	-4.384	-4.411	-120
-110	-3.852	-3.882	-3.911	-3.939	-3.968	-3.997	-4.025	-4.054	-4.082	-4.110	-4.138	-110
-100	-3.554	-3.584	-3.614	-3.645	-3.675	-3.705	-3.734	-3.764	-3.794	-3.823	-3.852	-100
-90	-3.243	-3.274	-3.306	-3.337	-3.368	-3.400	-3.431	-3.462	-3.492	-3.523	-3.554	-90
-80	-2.920	-2.953	-2.986	-3.018	-3.050	-3.083	-3.115	-3.147	-3.179	-3.211	-3.243	-80
-70	-2.587	-2.620	-2.654	-2.688	-2.721	-2.755	-2.788	-2.821	-2.854	-2.887	-2.920	-70
-60	-2.243	-2.278	-2.312	-2.347	-2.382	-2.416	-2.450	-2.485	-2.519	-2.553	-2.587	-60
-50	-1.889	-1.925	-1.961	-1.996	-2.032	-2.067	-2.103	-2.138	-2.173	-2.208	-2.243	-50
-40	-1.527	-1.564	-1.600	-1.637	-1.673	-1.709	-1.745	-1.782	-1.818	-1.854	-1.889	-40
-30	-1.156	-1.194	-1.231	-1.268	-1.305	-1.343	-1.380	-1.417	-1.453	-1.490	-1.527	-30
-20	-0.778	-0.816	-0.854	-0.892	-0.930	-0.968	-1.006	-1.043	-1.081	-1.119	-1.156	-20
-10	-0.392	-0.431	-0.470	-0.508	-0.547	-0.586	-0.624	-0.663	-0.701	-0.739	-0.778	-10
0	0.000	-0.039	-0.079	-0.118	-0.157	-0.197	-0.236	-0.275	-0.314	-0.353	-0.392	0
°C	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**°C**
0	0.000	0.039	0.079	0.119	0.158	0.198	0.238	0.277	0.317	0.357	0.397	0
10	0.397	0.437	0.477	0.517	0.557	0.597	0.637	0.677	0.718	0.758	0.798	10
20	0.798	0.838	0.879	0.919	0.960	1.000	1.041	1.081	1.122	1.163	1.203	20
30	1.203	1.244	1.285	1.326	1.366	1.407	1.448	1.489	1.530	1.571	1.612	30
40	1.612	1.653	1.694	1.735	1.776	1.817	1.858	1.899	1.941	1.982	2.023	40
50	2.023	2.064	2.106	2.147	2.188	2.230	2.271	2.312	2.354	2.395	2.436	50
60	2.436	2.478	2.519	2.561	2.602	2.644	2.685	2.727	2.768	2.810	2.851	60
70	2.851	2.893	2.934	2.976	3.017	3.059	3.100	3.142	3.184	3.225	3.267	70
80	3.267	3.308	3.350	3.391	3.433	3.474	3.516	3.557	3.599	3.640	3.682	80
90	3.682	3.723	3.765	3.806	3.848	3.889	3.931	3.972	4.013	4.055	4.096	90
100	4.096	4.138	4.179	4.220	4.262	4.303	4.344	4.385	4.427	4.468	4.509	100
110	4.509	4.550	4.591	4.633	4.674	4.715	4.756	4.797	4.838	4.879	4.920	110
120	4.920	4.961	5.002	5.043	5.084	5.124	5.165	5.206	5.247	5.288	5.328	120
130	5.328	5.369	5.410	5.450	5.491	5.532	5.572	5.613	5.653	5.694	5.735	130
140	5.735	5.775	5.815	5.856	5.896	5.937	5.977	6.017	6.058	6.098	6.138	140
150	6.138	6.179	6.219	6.259	6.299	6.339	6.380	6.420	6.460	6.500	6.540	150
160	6.540	6.580	6.620	6.660	6.701	6.741	6.781	6.821	6.861	6.901	6.941	160
170	6.941	6.981	7.021	7.060	7.100	7.140	7.180	7.220	7.260	7.300	7.340	170
180	7.340	7.380	7.420	7.460	7.500	7.540	7.579	7.619	7.659	7.699	7.739	180
190	7.739	7.779	7.819	7.859	7.899	7.939	7.979	8.019	8.059	8.099	8.138	190
200	8.138	8.178	8.218	8.258	8.298	8.338	8.378	8.418	8.458	8.499	8.539	200
210	8.539	8.579	8.619	8.659	8.699	8.739	8.779	8.819	8.860	8.900	8.940	210
220	8.940	8.980	9.020	9.061	9.101	9.141	9.181	9.222	9.262	9.302	9.343	220
230	9.343	9.383	9.423	9.464	9.504	9.545	9.585	9.626	9.666	9.707	9.747	230
240	9.747	9.788	9.828	9.869	9.909	9.950	9.991	10.031	10.072	10.113	10.153	240
250	10.153	10.194	10.235	10.276	10.316	10.357	10.398	10.439	10.480	10.520	0.561	250
260	10.561	10.602	10.643	10.684	10.725	10.766	10.807	10.848	10.889	10.930	10.971	260
270	10.971	11.012	11.053	11.094	11.135	11.176	11.217	11.259	11.300	11.341	11.382	270
280	11.382	11.423	11.465	11.506	11.547	11.588	11.630	11.671	11.712	11.753	11.795	280
290	11.795	11.836	11.877	11.919	11.960	12.001	12.043	12.084	12.126	12.167	12.209	290
300	12.209	12.250	12.291	12.333	12.374	12.416	12.457	12.499	12.540	12.582	12.624	300
310	12.624	12.665	12.707	12.748	12.790	12.831	12.873	12.915	12.956	12.998	13.040	310
320	13.040	13.081	13.123	13.165	13.206	13.248	13.290	13.331	13.373	13.415	13.457	320
330	13.457	13.498	13.540	13.582	13.624	13.665	13.707	13.749	13.791	13.833	13.874	330
340	13.874	13.916	13.958	14.000	14.042	14.084	14.126	14.167	14.209	14.251	14.293	340
350	14.293	14.335	14.377	14.419	14.461	14.503	14.545	14.587	14.629	14.671	14.713	350
360	14.713	14.755	14.797	14.839	14.881	14.923	14.965	15.007	15.049	15.091	15.133	360
370	15.133	15.175	15.217	15.259	15.301	15.343	15.385	15.427	15.469	15.511	15.554	370
380	15.554	15.596	15.638	15.680	15.722	15.764	15.806	15.849	15.891	15.933	15.975	380
390	15.975	16.017	16.059	16.102	16.144	16.186	16.228	16.270	16.313	16.355	16.397	390
400	16.397	16.439	16.482	16.524	16.566	16.608	16.651	16.693	16.735	16.778	16.820	400
410	16.820	16.862	16.904	16.947	16.989	17.031	17.074	17.116	17.158	17.201	17.243	410
420	17.243	17.285	17.328	17.370	17.413	17.455	17.497	17.540	17.582	17.624	17.667	420
430	17.667	17.709	17.752	17.794	17.837	17.879	17.921	17.964	18.006	18.049	18.091	430
440	18.091	18.134	18.176	18.218	18.261	18.303	18.346	18.388	18.431	18.473	18.516	440
450	18.516	18.558	18.601	18.643	18.686	18.728	18.771	18.813	18.856	18.898	18.941	450
460	18.941	18.983	19.026	19.068	19.111	19.154	19.196	19.239	19.281	19.324	19.366	460
470	19.366	19.409	19.451	19.494	19.537	19.579	19.622	19.664	19.707	19.750	19.792	470
480	19.792	19.835	19.877	19.920	19.962	20.005	20.048	20.090	20.133	20.175	20.218	480
490	20.218	20.261	20.303	20.346	20.389	20.431	20.474	20.516	20.559	20.602	20.644	490
500	20.644	20.687	20.730	20.772	20.815	20.857	20.900	20.943	20.985	21.028	21.071	500
510	21.071	21.113	21.156	21.199	21.241	21.284	21.326	21.369	21.412	21.454	21.497	510
520	21.497	21.540	21.582	21.625	21.668	21.710	21.753	21.796	21.838	21.881	21.924	520
530	21.924	21.966	22.009	22.052	22.094	22.137	22.179	22.222	22.265	22.307	22.350	530
540	22.350	22.393	22.435	22.478	22.521	22.563	22.606	22.649	22.691	22.734	22.776	540

K-TYPE THERMOCOUPLE - TEMPERATURE IN DEGREES "C" WITH REFERENCE JUNCTION AT 0°C

°C	0	1	2	3	4	5	6	7	8	9	10	°C
550	22.776	22.819	22.862	22.904	22.947	22.990	23.032	23.075	23.117	23.160	23.203	550
560	23.203	23.245	23.288	23.331	23.373	23.416	23.458	23.501	23.544	23.586	23.629	560
570	23.629	23.671	23.714	23.757	23.799	23.842	23.884	23.927	23.970	24.012	24.055	570
580	24.055	24.097	24.140	24.182	24.225	24.267	24.310	24.353	24.395	24.438	24.480	580
590	24.480	24.523	24.565	24.608	24.650	24.693	24.735	24.778	24.820	24.863	24.905	590
600	24.905	24.948	24.990	25.033	25.075	25.118	25.160	25.203	25.245	25.288	25.330	600
610	25.330	25.373	25.415	25.458	25.500	25.543	25.585	25.627	25.670	25.712	25.755	610
620	25.755	25.797	25.840	25.882	25.924	25.967	26.009	26.052	26.094	26.136	26.179	620
630	26.179	26.221	26.263	26.306	26.348	26.390	26.433	26.475	26.517	26.560	26.602	630
640	26.602	26.644	26.687	26.729	26.771	26.814	26.856	26.898	26.940	26.983	27.025	640
650	27.025	27.067	27.109	27.152	27.194	27.236	27.278	27.320	27.363	27.405	27.447	650
660	27.447	27.489	27.531	27.574	27.616	27.658	27.700	27.742	27.784	27.826	27.869	660
670	27.869	27.911	27.953	27.995	28.037	28.079	28.121	28.163	28.205	28.247	28.289	670
680	28.289	28.332	28.374	28.416	28.458	28.500	28.542	28.584	28.626	28.668	28.710	680
690	28.710	28.752	28.794	28.835	28.877	28.919	28.961	29.003	29.045	29.087	29.129	690
700	29.129	29.171	29.213	29.255	29.297	29.338	29.380	29.422	29.464	29.506	29.548	700
710	29.548	29.589	29.631	29.673	29.715	29.757	29.798	29.840	29.882	29.924	29.965	710
720	29.965	30.007	30.049	30.090	30.132	30.174	30.216	30.257	30.299	30.341	30.382	720
730	30.382	30.424	30.466	30.507	30.549	30.590	30.632	30.674	30.715	30.757	30.798	730
740	30.798	30.840	30.881	30.923	30.964	31.006	31.047	31.089	31.130	31.172	31.213	740
750	31.213	31.255	31.296	31.338	31.379	31.421	31.462	31.504	31.545	31.586	31.628	750
760	31.628	31.669	31.710	31.752	31.793	31.834	31.876	31.917	31.958	32.000	32.041	760
770	32.041	32.082	32.124	32.165	32.206	32.247	32.289	32.330	32.371	32.412	32.453	770
780	32.453	32.495	32.536	32.577	32.618	32.659	32.700	32.742	32.783	32.824	32.865	780
790	32.865	32.906	32.947	32.988	33.029	33.070	33.111	33.152	33.193	33.234	33.275	790
800	33.275	33.316	33.357	33.398	33.439	33.480	33.521	33.562	33.603	33.644	33.685	800
810	33.685	33.726	33.767	33.808	33.848	33.889	33.930	33.971	34.012	34.053	34.093	810
820	34.093	34.134	34.175	34.216	34.257	34.297	34.338	34.379	34.420	34.460	34.501	820
830	34.501	34.542	34.582	34.623	34.664	34.704	34.745	34.786	34.826	34.867	34.908	830
840	34.908	34.948	34.989	35.029	35.070	35.110	35.151	35.192	35.232	35.273	35.313	840
850	35.313	35.354	35.394	35.435	35.475	35.516	35.556	35.596	35.637	35.677	35.718	850
860	35.718	35.758	35.798	35.839	35.879	35.920	35.960	36.000	36.041	36.081	36.121	860
870	36.121	36.162	36.202	36.242	36.282	36.323	36.363	36.403	36.443	36.484	36.524	870
880	36.524	36.564	36.604	36.644	36.685	36.725	36.765	36.805	36.845	36.885	36.925	880
890	36.925	36.965	37.006	37.046	37.086	37.126	37.166	37.206	37.246	37.286	37.326	890
900	37.326	37.366	37.406	37.446	37.486	37.526	37.566	37.606	37.646	37.686	37.725	900
910	37.725	37.765	37.805	37.845	37.885	37.925	37.965	38.005	38.044	38.084	38.124	910
920	38.124	38.164	38.204	38.243	38.283	38.323	38.363	38.402	38.442	38.482	38.522	920
930	38.522	38.561	38.601	38.641	38.680	38.720	38.760	38.799	38.839	38.878	38.918	930
940	38.918	38.958	38.997	39.037	39.076	39.116	39.155	39.195	39.235	39.274	39.314	940
950	39.314	39.353	39.393	39.432	39.471	39.511	39.550	39.590	39.629	39.669	39.708	950
960	39.708	39.747	39.787	39.826	39.866	39.905	39.944	39.984	40.023	40.062	40.101	960
970	40.101	40.141	40.180	40.219	40.259	40.298	40.337	40.376	40.415	40.455	40.494	970
980	40.494	40.533	40.572	40.611	40.651	40.690	40.729	40.768	40.807	40.846	40.885	980
990	40.885	40.924	40.963	41.002	41.042	41.081	41.120	41.159	41.198	41.237	41.276	990
1000	41.276	41.315	41.354	41.393	41.431	41.470	41.509	41.548	41.587	41.626	41.665	1000
1010	41.665	41.704	41.743	41.781	41.820	41.859	41.898	41.937	41.976	42.014	42.053	1010
1020	42.053	42.092	42.131	42.169	42.208	42.247	42.286	42.324	42.363	42.402	42.440	1020
1030	42.440	42.479	42.518	42.556	42.595	42.633	42.672	42.711	42.749	42.788	42.826	1030
1040	42.826	42.865	42.903	42.942	42.980	43.019	43.057	43.096	43.134	43.173	43.211	1040
1050	43.211	43.250	43.288	43.327	43.365	43.403	43.442	43.480	43.518	43.557	43.595	1050
1060	43.595	43.633	43.672	43.710	43.748	43.787	43.825	43.863	43.901	43.940	43.978	1060
1070	43.978	44.016	44.054	44.092	44.130	44.169	44.207	44.245	44.283	44.321	44.359	1070
1080	44.359	44.397	44.435	44.473	44.512	44.550	44.588	44.626	44.664	44.702	44.740	1080
1090	44.740	44.778	44.816	44.853	44.891	44.929	44.967	45.005	45.043	45.081	45.119	1090
1100	45.119	45.157	45.194	45.232	45.270	45.308	45.346	45.383	45.421	45.459	45.497	1100
1110	45.497	45.534	45.572	45.610	45.647	45.685	45.723	45.760	45.798	45.836	45.873	1110
1120	45.873	45.911	45.948	45.986	46.024	46.061	46.099	46.136	46.174	46.211	46.249	1120
1130	46.249	46.286	46.324	46.361	46.398	46.436	46.473	46.511	46.548	46.585	46.623	1130
1140	46.623	46.660	46.697	46.735	46.772	46.809	46.847	46.884	46.921	46.958	46.995	1140
1150	46.995	47.033	47.070	47.107	47.144	47.181	47.218	47.256	47.293	47.330	47.367	1150
1160	47.367	47.404	47.441	47.478	47.515	47.552	47.589	47.626	47.663	47.700	47.737	1160
1170	47.737	47.774	47.811	47.848	47.884	47.921	47.958	47.995	48.032	48.069	48.105	1170
1180	48.105	48.142	48.179	48.216	48.252	48.289	48.326	48.363	48.399	48.436	48.473	1180
1190	48.473	48.509	48.546	48.582	48.619	48.656	48.692	48.729	48.765	48.802	48.838	1190
1200	48.838	48.875	48.911	48.948	48.984	49.021	49.057	49.093	49.130	49.166	49.202	1200
1210	49.202	49.239	49.275	49.311	49.348	49.384	49.420	49.456	49.493	49.529	49.565	1210
1220	49.565	49.601	49.637	49.674	49.710	49.746	49.782	49.818	49.854	49.890	49.926	1220
1230	49.926	49.962	49.998	50.034	50.070	50.106	50.142	50.178	50.214	50.250	50.286	1230
1240	50.286	50.322	50.358	50.393	50.429	50.465	50.501	50.537	50.572	50.608	50.644	1240
1250	50.644	50.680	50.715	50.751	50.787	50.822	50.858	50.894	50.929	50.965	51.000	1250
1260	51.000	51.036	51.071	51.107	51.142	51.178	51.213	51.249	51.284	51.320	51.355	1260
1270	51.355	51.391	51.426	51.461	51.497	51.532	51.567	51.603	51.638	51.673	51.708	1270
1280	51.708	51.744	51.779	51.814	51.849	51.885	51.920	51.955	51.990	52.025	52.060	1280
1290	52.060	52.095	52.130	52.165	52.200	52.235	52.270	52.305	52.340	52.375	52.410	1290
1300	52.410	52.445	52.480	52.515	52.550	52.585	52.620	52.654	52.689	52.724	52.759	1300
1310	52.759	52.794	52.828	52.863	52.898	52.932	52.967	53.002	53.037	53.071	53.106	1310
1320	53.106	53.140	53.175	53.210	53.244	53.279	53.313	53.348	53.382	53.417	53.451	1320
1330	53.451	53.486	53.520	53.555	53.589	53.623	53.658	53.692	53.727	53.761	53.795	1330
1340	53.795	53.830	53.864	53.898	53.932	53.967	54.001	54.035	54.069	54.104	54.138	1340
1350	54.138	54.172	54.206	54.240	54.274	54.308	54.343	54.377	54.411	54.445	54.479	1350
1360	54.479	54.513	54.547	54.581	54.615	54.649	54.683	54.717	54.751	54.785	54.819	1360
1370	54.819	54.852	54.886									1370

Thermoelectric Voltage in milliVolts

Thermocouple Reference Tables

K-TYPE THERMOCOUPLE - TEMPERATURE IN DEGREES "F" WITH REFERENCE JUNCTION AT 32°F

°F	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	°F
-450							-6.458	-6.457	-6.457	-6.456	-6.456	-450
-440	-6.456	-6.455	-6.454	-6.454	-6.453	-6.452	-6.451	-6.450	-6.449	-6.448	-6.446	-440
-430	-6.446	-6.445	-6.444	-6.443	-6.441	-6.440	-6.438	-6.436	-6.435	-6.433	-6.431	-430
-420	-6.431	-6.429	-6.427	-6.425	-6.423	-6.421	-6.419	-6.416	-6.414	-6.411	-6.409	-420
-410	-6.409	-6.406	-6.404	-6.401	-6.398	-6.395	-6.392	-6.389	-6.386	-6.383	-6.380	-410
-400	-6.380	-6.377	-6.373	-6.370	-6.366	-6.363	-6.359	-6.355	-6.352	-6.348	-6.344	-400
-390	-6.344	-6.340	-6.336	-6.332	-6.328	-6.323	-6.319	-6.315	-6.310	-6.306	-6.301	-390
-380	-6.301	-6.296	-6.292	-6.287	-6.282	-6.277	-6.272	-6.267	-6.262	-6.257	-6.251	-380
-370	-6.251	-6.246	-6.241	-6.235	-6.230	-6.224	-6.218	-6.213	-6.207	-6.201	-6.195	-370
-360	-6.195	-6.189	-6.183	-6.177	-6.171	-6.165	-6.158	-6.152	-6.146	-6.139	-6.133	-360
-350	-6.133	-6.126	-6.119	-6.113	-6.106	-6.099	-6.092	-6.085	-6.078	-6.071	-6.064	-350
-340	-6.064	-6.057	-6.049	-6.042	-6.035	-6.027	-6.020	-6.012	-6.004	-5.997	-5.989	-340
-330	-5.989	-5.981	-5.973	-5.965	-5.957	-5.949	-5.941	-5.933	-5.925	-5.917	-5.908	-330
-320	-5.908	-5.900	-5.891	-5.883	-5.874	-5.866	-5.857	-5.848	-5.840	-5.831	-5.822	-320
-310	-5.822	-5.813	-5.804	-5.795	-5.786	-5.776	-5.767	-5.758	-5.749	-5.739	-5.730	-310
-300	-5.730	-5.720	-5.711	-5.701	-5.691	-5.682	-5.672	-5.662	-5.652	-5.642	-5.632	-300
-290	-5.632	-5.622	-5.612	-5.602	-5.592	-5.581	-5.571	-5.561	-5.550	-5.540	-5.529	-290
-280	-5.529	-5.519	-5.508	-5.497	-5.487	-5.476	-5.465	-5.454	-5.443	-5.432	-5.421	-280
-270	-5.421	-5.410	-5.399	-5.388	-5.377	-5.365	-5.354	-5.343	-5.331	-5.320	-5.308	-270
-260	-5.308	-5.296	-5.285	-5.273	-5.261	-5.250	-5.238	-5.226	-5.214	-5.202	-5.190	-260
-250	-5.190	-5.178	-5.166	-5.153	-5.141	-5.129	-5.117	-5.104	-5.092	-5.079	-5.067	-250
-240	-5.067	-5.054	-5.042	-5.029	-5.016	-5.003	-4.991	-4.978	-4.965	-4.952	-4.939	-240
-230	-4.939	-4.926	-4.913	-4.900	-4.886	-4.873	-4.860	-4.847	-4.833	-4.820	-4.806	-230
-220	-4.806	-4.793	-4.779	-4.766	-4.752	-4.738	-4.724	-4.711	-4.697	-4.683	-4.669	-220
-210	-4.669	-4.655	-4.641	-4.627	-4.613	-4.599	-4.584	-4.570	-4.556	-4.542	-4.527	-210
-200	-4.527	-4.513	-4.498	-4.484	-4.469	-4.455	-4.440	-4.425	-4.411	-4.396	-4.381	-200
-190	-4.381	-4.366	-4.351	-4.336	-4.321	-4.306	-4.291	-4.276	-4.261	-4.246	-4.231	-190
-180	-4.231	-4.215	-4.200	-4.185	-4.169	-4.154	-4.138	-4.123	-4.107	-4.091	-4.076	-180
-170	-4.076	-4.060	-4.044	-4.029	-4.013	-3.997	-3.981	-3.965	-3.949	-3.933	-3.917	-170
-160	-3.917	-3.901	-3.885	-3.869	-3.852	-3.836	-3.820	-3.803	-3.787	-3.771	-3.754	-160
-150	-3.754	-3.738	-3.721	-3.705	-3.688	-3.671	-3.655	-3.638	-3.621	-3.604	-3.587	-150
-140	-3.587	-3.571	-3.554	-3.537	-3.520	-3.503	-3.486	-3.468	-3.451	-3.434	-3.417	-140
-130	-3.417	-3.400	-3.382	-3.365	-3.348	-3.330	-3.313	-3.295	-3.278	-3.260	-3.243	-130
-120	-3.243	-3.225	-3.207	-3.190	-3.172	-3.154	-3.136	-3.119	-3.101	-3.083	-3.065	-120
-110	-3.065	-3.047	-3.029	-3.011	-2.993	-2.975	-2.957	-2.938	-2.920	-2.902	-2.884	-110
-100	-2.884	-2.865	-2.847	-2.829	-2.810	-2.792	-2.773	-2.755	-2.736	-2.718	-2.699	-100
-90	-2.699	-2.680	-2.662	-2.643	-2.624	-2.605	-2.587	-2.568	-2.549	-2.530	-2.511	-90
-80	-2.511	-2.492	-2.473	-2.454	-2.435	-2.416	-2.397	-2.378	-2.359	-2.339	-2.320	-80
-70	-2.320	-2.301	-2.282	-2.262	-2.243	-2.223	-2.204	-2.185	-2.165	-2.146	-2.126	-70
-60	-2.126	-2.106	-2.087	-2.067	-2.048	-2.028	-2.008	-1.988	-1.969	-1.949	-1.929	-60
-50	-1.929	-1.909	-1.889	-1.869	-1.850	-1.830	-1.810	-1.790	-1.770	-1.749	-1.729	-50
-40	-1.729	-1.709	-1.689	-1.669	-1.649	-1.628	-1.608	-1.588	-1.568	-1.547	-1.527	-40
-30	-1.527	-1.507	-1.486	-1.466	-1.445	-1.425	-1.404	-1.384	-1.363	-1.343	-1.322	-30
-20	-1.322	-1.301	-1.281	-1.260	-1.239	-1.218	-1.198	-1.177	-1.156	-1.135	-1.114	-20
-10	-1.114	-1.094	-1.073	-1.052	-1.031	-1.010	-0.989	-0.968	-0.947	-0.926	-0.905	-10
0	-0.905	-0.883	-0.862	-0.841	-0.820	-0.799	-0.778	-0.756	-0.735	-0.714	-0.692	0

°F	0	1	2	3	4	5	6	7	8	9	10	°F
0	-0.692	-0.671	-0.650	-0.628	-0.607	-0.586	-0.564	-0.543	-0.521	-0.500	-0.478	0
10	-0.478	-0.457	-0.435	-0.413	-0.392	-0.370	-0.349	-0.327	-0.305	-0.284	-0.262	10
20	-0.262	-0.240	-0.218	-0.197	-0.175	-0.153	-0.131	-0.109	-0.088	-0.066	-0.044	20
30	-0.044	-0.022	0.000	0.022	0.044	0.066	0.088	0.110	0.132	0.154	0.176	30
40	0.176	0.198	0.220	0.242	0.264	0.286	0.308	0.330	0.353	0.375	0.397	40
50	0.397	0.419	0.441	0.463	0.486	0.508	0.530	0.552	0.575	0.597	0.619	50
60	0.619	0.642	0.664	0.686	0.709	0.731	0.753	0.776	0.798	0.821	0.843	60
70	0.843	0.865	0.888	0.910	0.933	0.955	0.978	1.000	1.023	1.045	1.068	70
80	1.068	1.090	1.113	1.136	1.158	1.181	1.203	1.226	1.249	1.271	1.294	80
90	1.294	1.316	1.339	1.362	1.384	1.407	1.430	1.453	1.475	1.498	1.521	90
100	1.521	1.543	1.566	1.589	1.612	1.635	1.657	1.680	1.703	1.726	1.749	100
110	1.749	1.771	1.794	1.817	1.840	1.863	1.886	1.909	1.931	1.954	1.977	110
120	1.977	2.000	2.023	2.046	2.069	2.092	2.115	2.138	2.161	2.184	2.207	120
130	2.207	2.230	2.253	2.276	2.298	2.321	2.344	2.367	2.390	2.413	2.436	130
140	2.436	2.459	2.483	2.506	2.529	2.552	2.575	2.598	2.621	2.644	2.667	140
150	2.667	2.690	2.713	.736	2.759	2.782	2.805	2.828	2.851	2.874	2.897	150
160	2.897	2.920	2.944	2.967	2.990	3.013	3.036	3.059	3.082	3.105	3.128	160
170	3.128	3.151	3.174	3.197	3.220	3.244	3.267	3.290	3.313	3.336	3.359	170
180	3.359	3.382	3.405	3.428	3.451	3.474	3.497	3.520	3.544	3.567	3.590	180
190	3.590	3.613	3.636	3.659	3.682	3.705	3.728	3.751	3.774	3.797	3.820	190
200	3.820	3.843	3.866	3.889	3.912	3.935	3.958	3.981	4.004	4.027	4.050	200
210	4.050	4.073	4.096	4.119	4.142	4.165	4.188	4.211	4.234	4.257	4.280	210
220	4.280	4.303	4.326	4.349	4.372	4.395	4.417	4.440	4.463	4.486	4.509	220
230	4.509	4.532	4.555	4.578	4.601	4.623	4.646	4.669	4.692	4.715	4.738	230
240	4.738	4.760	4.783	4.806	4.829	4.852	4.874	4.897	4.920	4.943	4.965	240
250	4.965	4.988	5.011	5.034	5.056	5.079	5.102	5.124	5.147	5.170	5.192	250
260	5.192	5.215	5.238	5.260	5.283	5.306	5.328	5.351	5.374	5.396	5.419	260
270	5.419	5.441	5.464	5.487	5.509	5.532	5.554	5.577	5.599	5.622	5.644	270
280	5.644	5.667	5.690	5.712	5.735	5.757	5.779	5.802	5.824	5.847	5.869	280
290	5.869	5.892	5.914	5.937	5.959	5.982	6.004	6.026	6.049	6.071	6.094	290
300	6.094	6.116	6.138	6.161	6.183	6.205	6.228	6.250	6.272	6.295	6.317	300
310	6.317	6.339	6.362	6.384	6.406	6.429	6.451	6.473	6.496	6.518	6.540	310
320	6.540	6.562	6.585	6.607	6.629	6.652	6.674	6.696	6.718	6.741	6.763	320
330	6.763	6.785	6.807	6.829	6.852	6.874	6.896	6.918	6.941	6.963	6.985	330
340	6.985	7.007	7.029	7.052	7.074	7.096	7.118	7.140	7.163	7.185	7.207	340

K-TYPE THERMOCOUPLE - TEMPERATURE IN DEGREES "F" WITH REFERENCE JUNCTION AT 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
350	7.207	7.229	7.251	7.273	7.296	7.318	7.340	7.362	7.384	7.407	7.429	350
360	7.429	7.451	7.473	7.495	7.517	7.540	7.562	7.584	7.606	7.628	7.650	360
370	7.650	7.673	7.695	7.717	7.739	7.761	7.783	7.806	7.828	7.850	7.872	370
380	7.872	7.894	7.917	7.939	7.961	7.983	8.005	8.027	8.050	8.072	8.094	380
390	8.094	8.116	8.138	8.161	8.183	8.205	8.227	8.250	8.272	8.294	8.316	390
400	8.316	8.338	8.361	8.383	8.405	8.427	8.450	8.472	8.494	8.516	8.539	400
410	8.539	8.561	8.583	8.605	8.628	8.650	8.672	8.694	8.717	8.739	8.761	410
420	8.761	8.784	8.806	8.828	8.851	8.873	8.895	8.918	8.940	8.962	8.985	420
430	8.985	9.007	9.029	9.052	9.074	9.096	9.119	9.141	9.163	9.186	9.208	430
440	9.208	9.231	9.253	9.275	9.298	9.320	9.343	9.365	9.388	9.410	9.432	440
450	9.432	9.455	9.477	9.500	9.522	9.545	9.567	9.590	9.612	9.635	9.657	450
460	9.657	9.680	9.702	9.725	9.747	9.770	9.792	9.815	9.837	9.860	9.882	460
470	9.882	9.905	9.927	9.950	9.973	9.995	10.018	10.040	10.063	10.086	10.108	470
480	10.108	10.131	10.153	10.176	10.199	10.221	10.244	10.267	10.289	10.312	10.334	480
490	10.334	10.357	10.380	10.402	10.425	10.448	10.471	10.493	10.516	10.539	10.561	490
500	10.561	10.584	10.607	10.629	10.652	10.675	10.698	10.720	10.743	10.766	10.789	500
510	10.789	10.811	10.834	10.857	10.880	10.903	10.925	10.948	10.971	10.994	11.017	510
520	11.017	11.039	11.062	11.085	11.108	11.131	11.154	11.176	11.199	11.222	11.245	520
530	11.245	11.268	11.291	11.313	11.336	11.359	11.382	11.405	11.428	11.451	11.474	530
540	11.474	11.497	11.519	11.542	11.565	11.588	11.611	11.634	11.657	11.680	11.703	540
550	11.703	11.726	11.749	11.772	11.795	11.818	11.841	11.864	11.887	11.910	11.933	550
560	11.933	11.956	11.978	12.001	12.024	12.047	12.070	12.093	12.116	12.140	12.163	560
570	12.163	12.186	12.209	12.232	12.255	12.278	12.301	12.324	12.347	12.370	12.393	570
580	12.393	12.416	12.439	12.462	12.485	12.508	12.531	12.554	12.577	12.600	12.624	580
590	12.624	12.647	12.670	12.693	12.716	12.739	12.762	12.785	12.808	12.831	12.855	590
600	12.855	12.878	12.901	12.924	12.947	12.970	12.993	13.016	13.040	13.063	13.086	600
610	13.086	13.109	13.132	13.155	13.179	13.202	13.225	13.248	13.271	13.294	13.318	610
620	13.318	13.341	13.364	13.387	13.410	13.433	13.457	13.480	13.503	13.526	13.549	620
630	13.549	13.573	13.596	13.619	13.642	13.665	13.689	13.712	13.735	13.758	13.782	630
640	13.782	13.805	13.828	13.851	13.874	13.898	13.921	13.944	13.967	13.991	14.014	640
650	14.014	14.037	14.060	14.084	14.107	14.130	14.154	14.177	14.200	14.223	14.247	650
660	14.247	14.270	14.293	14.316	14.340	14.363	14.386	14.410	14.433	14.456	14.479	660
670	14.479	14.503	14.526	14.549	14.573	14.596	14.619	14.643	14.666	14.689	14.713	670
680	14.713	14.736	14.759	14.783	14.806	14.829	14.853	14.876	14.899	14.923	14.946	680
690	14.946	14.969	14.993	15.016	15.039	15.063	15.086	15.109	15.133	15.156	15.179	690
700	15.179	15.203	15.226	15.250	15.273	15.296	15.320	15.343	15.366	15.390	15.413	700
710	15.413	15.437	15.460	15.483	15.507	15.530	15.554	15.577	15.600	15.624	15.647	710
720	15.647	15.671	15.694	15.717	15.741	15.764	15.788	15.811	15.834	15.858	15.881	720
730	15.881	15.905	15.928	15.952	15.975	15.998	16.022	16.045	16.069	16.092	16.116	730
740	16.116	16.139	16.163	16.186	16.209	16.233	16.256	16.280	16.303	16.327	16.350	740
750	16.350	16.374	16.397	16.421	16.444	16.468	16.491	16.514	16.538	16.561	16.585	750
760	16.585	16.608	16.632	16.655	16.679	16.702	16.726	16.749	16.773	16.796	16.820	760
770	16.820	16.843	16.867	16.890	16.914	16.937	16.961	16.984	17.008	17.031	17.055	770
780	17.055	17.078	17.102	17.125	17.149	17.173	17.196	17.220	17.243	17.267	17.290	780
790	17.290	17.314	17.337	17.361	17.384	17.408	17.431	17.455	17.478	17.502	17.526	790
800	17.526	17.549	17.573	17.596	17.620	17.643	17.667	17.690	17.714	17.738	17.761	800
810	17.761	17.785	17.808	17.832	17.855	17.879	17.902	17.926	17.950	17.973	17.997	810
820	17.997	18.020	18.044	18.068	18.091	18.115	18.138	18.162	18.185	18.209	18.233	820
830	18.233	18.256	18.280	18.303	18.327	18.351	18.374	18.398	18.421	18.445	18.469	830
840	18.469	18.492	18.516	18.539	18.563	18.587	18.610	18.634	18.657	18.681	18.705	840
850	18.705	18.728	18.752	18.776	18.799	18.823	18.846	18.870	18.894	18.917	18.941	850
860	18.941	18.965	18.988	19.012	19.035	19.059	19.083	19.106	19.130	19.154	19.177	860
870	19.177	19.201	19.224	19.248	19.272	19.295	19.319	19.343	19.366	19.390	19.414	870
880	19.414	19.437	19.461	19.485	19.508	19.532	19.556	19.579	19.603	19.626	19.650	880
890	19.650	19.674	19.697	19.721	19.745	19.768	19.792	19.816	19.839	19.863	19.887	890
900	19.887	19.910	19.934	19.958	19.981	20.005	20.029	20.052	20.076	20.100	20.123	900
910	20.123	20.147	20.171	20.194	20.218	20.242	20.265	20.289	20.313	20.336	20.360	910
920	20.360	20.384	20.407	20.431	20.455	20.479	20.502	20.526	20.550	20.573	20.597	920
930	20.597	20.621	20.644	20.668	20.692	20.715	20.739	20.763	20.786	20.810	20.834	930
940	20.834	20.857	20.881	20.905	20.929	20.952	20.976	21.000	21.023	21.047	21.071	940
950	21.071	21.094	21.118	21.142	21.165	21.189	21.213	21.236	21.260	21.284	21.308	950
960	21.308	21.331	21.355	21.379	21.402	21.426	21.450	21.473	21.497	21.521	21.544	960
970	21.544	21.568	21.592	21.616	21.639	21.663	21.687	21.710	21.734	21.758	21.781	970
980	21.781	21.805	21.829	21.852	21.876	21.900	21.924	21.947	21.971	21.995	22.018	980
990	22.018	22.042	22.066	22.089	22.113	22.137	22.160	22.184	22.208	22.232	22.255	990
1000	22.255	22.279	22.303	22.326	22.350	22.374	22.397	22.421	22.445	22.468	22.492	1000
1010	22.492	22.516	22.540	22.563	22.587	22.611	22.634	22.658	22.682	22.705	22.729	1010
1020	22.729	22.753	22.776	22.800	22.824	22.847	22.871	22.895	22.919	22.942	22.966	1020
1030	22.966	22.990	23.013	23.037	23.061	23.084	23.108	23.132	23.155	23.179	23.203	1030
1040	23.203	23.226	23.250	23.274	23.297	23.321	23.345	23.368	23.392	23.416	23.439	1040
1050	23.439	23.463	23.487	23.510	23.534	23.558	23.581	23.605	23.629	23.652	23.676	1050
1060	23.676	23.700	23.723	23.747	23.771	23.794	23.818	23.842	23.865	23.889	23.913	1060
1070	23.913	23.936	23.960	23.984	24.007	24.031	24.055	24.078	24.102	24.126	24.149	1070
1080	24.149	24.173	24.197	24.220	24.244	24.267	24.291	24.315	24.338	24.362	24.386	1080
1090	24.386	24.409	24.433	24.457	24.480	24.504	24.527	24.551	24.575	24.598	24.622	1090
1100	24.622	24.646	24.669	24.693	24.717	24.740	24.764	24.787	24.811	24.835	24.858	1100
1110	24.858	24.882	24.905	24.929	24.953	24.976	25.000	25.024	25.047	25.071	25.094	1110
1120	25.094	25.118	25.142	25.165	25.189	25.212	25.236	25.260	25.283	25.307	25.330	1120
1130	25.330	25.354	25.377	25.401	25.425	25.448	25.472	25.495	25.519	25.543	25.566	1130
1140	25.566	25.590	25.613	25.637	25.660	25.684	25.708	25.731	25.755	25.778	25.802	1140
1150	25.802	25.825	25.849	25.873	25.896	25.920	25.943	25.967	25.990	26.014	26.037	1150
1160	26.037	26.061	26.084	26.108	26.132	26.155	26.179	26.202	26.226	26.249	26.273	1160
1170	26.273	26.296	26.320	26.343	26.367	26.390	26.414	26.437	26.461	26.484	26.508	1170
1180	26.508	26.532	26.555	26.579	26.602	26.626	26.649	26.673	26.696	26.720	26.743	1180
1190	26.743	26.767	26.790	26.814	26.837	26.861	26.884	26.907	26.931	26.954	26.978	1190

Thermoelectric Voltage in milliVolts

Thermocouple Reference Tables

K-TYPE THERMOCOUPLE - TEMPERATURE IN DEGREES "F" WITH REFERENCE JUNCTION AT 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
1200	26.978	27.001	27.025	27.048	27.072	27.095	27.119	27.142	27.166	27.189	27.213	1200
1210	27.213	27.236	27.259	27.283	27.306	27.330	27.353	27.377	27.400	27.424	27.447	1210
1220	27.447	27.471	27.494	27.517	27.541	27.564	27.588	27.611	27.635	27.658	27.681	1220
1230	27.681	27.705	27.728	27.752	27.775	27.798	27.822	27.845	27.869	27.892	27.915	1230
1240	27.915	27.939	27.962	27.986	28.009	28.032	28.056	28.079	28.103	28.126	28.149	1240
1250	28.149	28.173	28.196	28.219	28.243	28.266	28.289	28.313	28.336	28.360	28.383	1250
1260	28.383	28.406	28.430	28.453	28.476	28.500	28.523	28.546	28.570	28.593	28.616	1260
1270	28.616	28.640	28.663	28.686	28.710	28.733	28.756	28.780	28.803	28.826	28.849	1270
1280	28.849	28.873	28.896	28.919	28.943	28.966	28.989	29.013	29.036	29.059	29.082	1280
1290	29.082	29.106	29.129	29.152	29.176	29.199	29.222	29.245	29.269	29.292	29.315	1290
1300	29.315	29.338	29.362	29.385	29.408	29.431	29.455	29.478	29.501	29.524	29.548	1300
1310	29.548	29.571	29.594	29.617	29.640	29.664	29.687	29.710	29.733	29.757	29.780	1310
1320	29.780	29.803	29.826	29.849	29.873	29.896	29.919	29.942	29.965	29.989	30.012	1320
1330	30.012	30.035	30.058	30.081	30.104	30.128	30.151	30.174	30.197	30.220	30.243	1330
1340	30.243	30.267	30.290	30.313	30.336	30.359	30.382	30.405	30.429	30.452	30.475	1340
1350	30.475	30.498	30.521	30.544	30.567	30.590	30.613	30.637	30.660	30.683	30.706	1350
1360	30.706	30.729	30.752	30.775	30.798	30.821	30.844	30.868	30.891	30.914	30.937	1360
1370	30.937	30.960	30.983	31.006	31.029	31.052	31.075	31.098	31.121	31.144	31.167	1370
1380	31.167	31.190	31.213	31.236	31.260	31.283	31.306	31.329	31.352	31.375	31.398	1380
1390	31.398	31.421	31.444	31.467	31.490	31.513	31.536	31.559	31.582	31.605	31.628	1390
1400	31.628	31.651	31.674	31.697	31.720	31.743	31.766	31.789	31.812	31.834	31.857	1400
1410	31.857	31.880	31.903	31.926	31.949	31.972	31.995	32.018	32.041	32.064	32.087	1410
1420	32.087	32.110	32.133	32.156	32.179	32.202	32.224	32.247	32.270	32.293	32.316	1420
1430	32.316	32.339	32.362	32.385	32.408	32.431	32.453	32.476	32.499	32.522	32.545	1430
1440	32.545	32.568	32.591	32.614	32.636	32.659	32.682	32.705	32.728	32.751	32.774	1440
1450	32.774	32.796	32.819	32.842	32.865	32.888	32.911	32.933	32.956	32.979	33.002	1450
1460	33.002	33.025	33.047	33.070	33.093	33.116	33.139	33.161	33.184	33.207	33.230	1460
1470	33.230	33.253	33.275	33.298	33.321	33.344	33.366	33.389	33.412	33.435	33.458	1470
1480	33.458	33.480	33.503	33.526	33.548	33.571	33.594	33.617	33.639	33.662	33.685	1480
1490	33.685	33.708	33.730	33.753	33.776	33.798	33.821	33.844	33.867	33.889	33.912	1490
1500	33.912	33.935	33.957	33.980	34.003	34.025	34.048	34.071	34.093	34.116	34.139	1500
1510	34.139	34.161	34.184	34.207	34.229	34.252	34.275	34.297	34.320	34.343	34.365	1510
1520	34.365	34.388	34.410	34.433	34.456	34.478	34.501	34.524	34.546	34.569	34.591	1520
1530	34.591	34.614	34.637	34.659	34.682	34.704	34.727	34.750	34.772	34.795	34.817	1530
1540	34.817	34.840	34.862	34.885	34.908	34.930	34.953	34.975	34.998	35.020	35.043	1540
1550	35.043	35.065	35.088	35.110	35.133	35.156	35.178	35.201	35.223	35.246	35.268	1550
1560	35.268	35.291	35.313	35.336	35.358	35.381	35.403	35.426	35.448	35.471	35.493	1560
1570	35.493	35.516	35.538	35.560	35.583	35.605	35.628	35.650	35.673	35.695	35.718	1570
1580	35.718	35.740	35.763	35.785	35.807	35.830	35.852	35.875	35.897	35.920	35.942	1580
1590	35.942	35.964	35.987	36.009	36.032	36.054	36.076	36.099	36.121	36.144	36.166	1590
1600	36.166	36.188	36.211	36.233	36.256	36.278	36.300	36.323	36.345	36.367	36.390	1600
1610	36.390	36.412	36.434	36.457	36.479	36.501	36.524	36.546	36.568	36.591	36.613	1610
1620	36.613	36.635	36.658	36.680	36.702	36.725	36.747	36.769	36.792	36.814	36.836	1620
1630	36.836	36.859	36.881	36.903	36.925	36.948	36.970	36.992	37.014	37.037	37.059	1630
1640	37.059	37.081	37.104	37.126	37.148	37.170	37.193	37.215	37.237	37.259	37.281	1640
1650	37.281	37.304	37.326	37.348	37.370	37.393	37.415	37.437	37.459	37.481	37.504	1650
1660	37.504	37.526	37.548	37.570	37.592	37.615	37.637	37.659	37.681	37.703	37.725	1660
1670	37.725	37.748	37.770	37.792	37.814	37.836	37.858	37.881	37.903	37.925	37.947	1670
1680	37.947	37.969	37.991	38.013	38.036	38.058	38.080	38.102	38.124	38.146	38.168	1680
1690	38.168	38.190	38.212	38.235	38.257	38.279	38.301	38.323	38.345	38.367	38.389	1690
1700	38.389	38.411	38.433	38.455	38.477	38.499	38.522	38.544	38.566	38.588	38.610	1700
1710	38.610	38.632	38.654	38.676	38.698	38.720	38.742	38.764	38.786	38.808	38.830	1710
1720	38.830	38.852	38.874	38.896	38.918	38.940	38.962	38.984	39.006	39.028	39.050	1720
1730	39.050	39.072	39.094	39.116	39.138	39.160	39.182	39.204	39.226	39.248	39.270	1730
1740	39.270	39.292	39.314	39.335	39.357	39.379	39.401	39.423	39.445	39.467	39.489	1740
1750	39.489	39.511	39.533	39.555	39.577	39.599	39.620	39.642	39.664	39.686	39.708	1750
1760	39.708	39.730	39.752	39.774	39.796	39.817	39.839	39.861	39.883	39.905	39.927	1760
1770	39.927	39.949	39.970	39.992	40.014	40.036	40.058	40.080	40.101	40.123	40.145	1770
1780	40.145	40.167	40.189	40.211	40.232	40.254	40.276	40.298	40.320	40.341	40.363	1780
1790	40.363	40.385	40.407	40.429	40.450	40.472	40.494	40.516	40.537	40.559	40.581	1790
1800	40.581	40.603	40.624	40.646	40.668	40.690	40.711	40.733	40.755	40.777	40.798	1800
1810	40.798	40.820	40.842	40.864	40.885	40.907	40.929	40.950	40.972	40.994	41.015	1810
1820	41.015	41.037	41.059	41.081	41.102	41.124	41.146	41.167	41.189	41.211	41.232	1820
1830	41.232	41.254	41.276	41.297	41.319	41.341	41.362	41.384	41.405	41.427	41.449	1830
1840	41.449	41.470	41.492	41.514	41.535	41.557	41.578	41.600	41.622	41.643	41.665	1840
1850	41.665	41.686	41.708	41.730	41.751	41.773	41.794	41.816	41.838	41.859	41.881	1850
1860	41.881	41.902	41.924	41.945	41.967	41.988	42.010	42.032	42.053	42.075	42.096	1860
1870	42.096	42.118	42.139	42.161	42.182	42.204	42.225	42.247	42.268	42.290	42.311	1870
1880	42.311	42.333	42.354	42.376	42.397	42.419	42.440	42.462	42.483	42.505	42.526	1880
1890	42.526	42.548	42.569	42.591	42.612	42.633	42.655	42.676	42.698	42.719	42.741	1890
1900	42.741	42.762	42.783	42.805	42.826	42.848	42.869	42.891	42.912	42.933	42.955	1900
1910	42.955	42.976	42.998	43.019	43.040	43.062	43.083	43.104	43.126	43.147	43.169	1910
1920	43.169	43.190	43.211	43.233	43.254	43.275	43.297	43.318	43.339	43.361	43.382	1920
1930	43.382	43.403	43.425	43.446	43.467	43.489	43.510	43.531	43.552	43.574	43.595	1930
1940	43.595	43.616	43.638	43.659	43.680	43.701	43.723	43.744	43.765	43.787	43.808	1940
1950	43.808	43.829	43.850	43.872	43.893	43.914	43.935	43.957	43.978	43.999	44.020	1950
1960	44.020	44.041	44.063	44.084	44.105	44.126	44.147	44.169	44.190	44.211	44.232	1960
1970	44.232	44.253	44.275	44.296	44.317	44.338	44.359	44.380	44.402	44.423	44.444	1970
1980	44.444	44.465	44.486	44.507	44.528	44.550	44.571	44.592	44.613	44.634	44.655	1980
1990	44.655	44.676	44.697	44.719	44.740	44.761	44.782	44.803	44.824	44.845	44.866	1990
2000	44.866	44.887	44.908	44.929	44.950	44.971	44.992	45.014	45.035	45.056	45.077	2000
2010	45.077	45.098	45.119	45.140	45.161	45.182	45.203	45.224	45.245	45.266	45.287	2010
2020	45.287	45.308	45.329	45.350	45.371	45.392	45.413	45.434	45.455	45.476	45.497	2020
2030	45.497	45.518	45.539	45.560	45.580	45.601	45.622	45.643	45.664	45.685	45.706	2030
2040	45.706	45.727	45.748	45.769	45.790	45.811	45.832	45.852	45.873	45.894	45.915	2040

K-TYPE THERMOCOUPLE - TEMPERATURE IN DEGREES "F" WITH REFERENCE JUNCTION AT 32°F

°F	0	1	2	3	4	5	6	7	8	9	10	°F
2050	45.915	45.936	45.957	45.978	45.999	46.019	46.040	46.061	46.082	46.103	46.124	2050
2060	46.124	46.145	46.165	46.186	46.207	46.228	46.249	46.269	46.290	46.311	46.332	2060
2070	46.332	46.353	46.373	46.394	46.415	46.436	46.457	46.477	46.498	46.519	46.540	2070
2080	46.540	46.560	46.581	46.602	46.623	46.643	46.664	46.685	46.706	46.726	46.747	2080
2090	46.747	46.768	46.789	46.809	46.830	46.851	46.871	46.892	46.913	46.933	46.954	2090
2100	46.954	46.975	46.995	47.016	47.037	47.057	47.078	47.099	47.119	47.140	47.161	2100
2110	47.161	47.181	47.202	47.223	47.243	47.264	47.284	47.305	47.326	47.346	47.367	2110
2120	47.367	47.387	47.408	47.429	47.449	47.470	47.490	47.511	47.531	47.552	47.573	2120
2130	47.573	47.593	47.614	47.634	47.655	47.675	47.696	47.716	47.737	47.757	47.778	2130
2140	47.778	47.798	47.819	47.839	47.860	47.880	47.901	47.921	47.942	47.962	47.983	2140
2150	47.983	48.003	48.024	48.044	48.065	48.085	48.105	48.126	48.146	48.167	48.187	2150
2160	48.187	48.208	48.228	48.248	48.269	48.289	48.310	48.330	48.350	48.371	48.391	2160
2170	48.391	48.411	48.432	48.452	48.473	48.493	48.513	48.534	48.554	48.574	48.595	2170
2180	48.595	48.615	48.635	48.656	48.676	48.696	48.717	48.737	48.757	48.777	48.798	2180
2190	48.798	48.818	48.838	48.859	48.879	48.899	48.919	48.940	48.960	48.980	49.000	2190
2200	49.000	49.021	49.041	49.061	49.081	49.101	49.122	49.142	49.162	49.182	49.202	2200
2210	49.202	49.223	49.243	49.263	49.283	49.303	49.323	49.344	49.364	49.384	49.404	2210
2220	49.404	49.424	49.444	49.465	49.485	49.505	49.525	49.545	49.565	49.585	49.605	2220
2230	49.605	49.625	49.645	49.666	49.686	49.706	49.726	49.746	49.766	49.786	49.806	2230
2240	49.806	49.826	49.846	49.866	49.886	49.906	49.926	49.946	49.966	49.986	50.006	2240
2250	50.006	50.026	50.046	50.066	50.086	50.106	50.126	50.146	50.166	50.186	50.206	2250
2260	50.206	50.226	50.246	50.266	50.286	50.306	50.326	50.346	50.366	50.385	50.405	2260
2270	50.405	50.425	50.445	50.465	50.485	50.505	50.525	50.545	50.564	50.584	50.604	2270
2280	50.604	50.624	50.644	50.664	50.684	50.703	50.723	50.743	50.763	50.783	50.802	2280
2290	50.802	50.822	50.842	50.862	50.882	50.901	50.921	50.941	50.961	50.981	51.000	2290
2300	51.000	51.020	51.040	51.060	51.079	51.099	51.119	51.139	51.158	51.178	51.198	2300
2310	51.198	51.217	51.237	51.257	51.276	51.296	51.316	51.336	51.355	51.375	51.395	2310
2320	51.395	51.414	51.434	51.453	51.473	51.493	51.512	51.532	51.552	51.571	51.591	2320
2330	51.591	51.611	51.630	51.650	51.669	51.689	51.708	51.728	51.748	51.767	51.787	2330
2340	51.787	51.806	51.826	51.845	51.865	51.885	51.904	51.924	51.943	51.963	51.982	2340
2350	51.982	52.002	52.021	52.041	52.060	52.080	52.099	52.119	52.138	52.158	52.177	2350
2360	52.177	52.197	52.216	52.235	52.255	52.274	52.294	52.313	52.333	52.352	52.371	2360
2370	52.371	52.391	52.410	52.430	52.449	52.468	52.488	52.507	52.527	52.546	52.565	2370
2380	52.565	52.585	52.604	52.623	52.643	52.662	52.681	52.701	52.720	52.739	52.759	2380
2390	52.759	52.778	52.797	52.817	52.836	52.855	52.875	52.894	52.913	52.932	52.952	2390
2400	52.952	52.971	52.990	53.010	53.029	53.048	53.067	53.087	53.106	53.125	53.144	2400
2410	53.144	53.163	53.183	53.202	53.221	53.240	53.260	53.279	53.298	53.317	53.336	2410
2420	53.336	53.355	53.375	53.394	53.413	53.432	53.451	53.470	53.490	53.509	53.528	2420
2430	53.528	53.547	53.566	53.585	53.604	53.623	53.643	53.662	53.681	53.700	53.719	2430
2440	53.719	53.738	53.757	53.776	53.795	53.814	53.833	53.852	53.871	53.890	53.910	2440
2450	53.910	53.929	53.948	53.967	53.986	54.005	54.024	54.043	54.062	54.081	54.100	2450
2460	54.100	54.119	54.138	54.157	54.176	54.195	54.214	54.233	54.252	54.271	54.289	2460
2470	54.289	54.308	54.327	54.346	54.365	54.384	54.403	54.422	54.441	54.460	54.479	2470
2480	54.479	54.498	54.517	54.536	54.554	54.573	54.592	54.611	54.630	54.649	54.668	2480
2490	54.668	54.687	54.705	54.724	54.743	54.762	54.781	54.800	54.819	54.837	54.856	2490
2500	54.856	54.875	54.894									

Resistance Values of HANNA Thermistor Sensors

HI 765 Series

The following table shows various ambient temperatures and the corresponding resistance values of our HI 765 sensor series in the -50.0 to +170.0°C range

AMBIENT TEMPERATURE (°C)	RESISTANCE (OHM)	AMBIENT TEMPERATURE (°C)	RESISTANCE (OHM)
-50.0	537.2	60.0	1275.3
-40.0	588.2	70.0	1361.9
-30.0	641.9	80.0	1450.2
-20.0	699.5	90.0	1542.0
-10.0	760.9	100.0	1637.2
0.0	825.0	110.0	1734.9
10.0	891.9	120.0	1835.9
20.0	962.4	130.0	1939.4
25.0	999.1	140.0	2045.2
30.0	1036.7	150.0	2154.3
40.0	1112.6	160.0	2267.5
50.0	1193.1	170.0	2380.2

HI 762 Series

The following table shows various ambient temperatures and the corresponding resistance values of our HI 762 sensor series in the -50.0 to +140.0°C range

AMBIENT TEMPERATURE (°C)	RESISTANCE (OHM)	AMBIENT TEMPERATURE (°C)	RESISTANCE (OHM)
-50.0	670100	50.0	3603
-40.0	336500	60.0	2488
-30.0	177000	70.0	1752
-20.0	97070	80.0	1258
-10.0	55330	90.0	917.7
0.0	32650	100.0	680.0
10.0	19900	110.0	511.2
20.0	12490	120.0	389.3
25.0	10000	130.0	300.9
30.0	8057	140.0	234.8
40.0	5327		

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Limited Warranty, Return and Exchange

Limited Warranty

HANNA products are manufactured in our ISO 9001:2000 facilities, meeting the highest quality standards in the industry. HANNA's high standards also apply should a product be returned due to defects in material or workmanship. Our extensive warranty extends up to five years on some products.

Limitations: Warranted products may be returned for repair or replacement only at the discretion of HANNA. In some circumstances, remedy may constitute refund for the price paid for the product.

The warranty period commences from the original date of sale to the user or a maximum of 18 months from factory ship date. Warranty is valid only when the product is used under normal conditions and in accordance with operating limitations and prescribed maintenance procedures. The express warranty stated previously is the only express warranty given by HANNA to the end-user buyer. HANNA expressly disclaims any warranties implied by law, including but not limited to warranty of merchantability of fitness for a particular purpose. HANNA shall not be liable for any individual or consequential damages of any kind for breach of any warranty, negligence, on the basis of strict liability or otherwise. HANNA's warranty periods differ across our range of instrumentation, please visit us on the web at: www.hannainst.com or contact your local HANNA representative for specific warranty information.

Instrument Service:

Warranty and non-warranty service, replacement, recalibration and repairs are performed by factory trained service technicians at one of HANNA's Technical Service Centers worldwide. All items must have a Return Goods Authorization (RGA) number that can be obtained by contacting the HANNA Technical Service Department. The RGA number should be clearly marked on the outside of the box and the unit shipped prepaid and insured. Any product not bearing an RGA number will be refused. All products returned for warranty repair or replacement MUST be preceded or accompanied with proof of purchase, such as the original invoice or packing slip. Under special circumstances it may be deemed necessary by HANNA to issue a Return In Advance (RIA). In such cases, the defective materials must be returned to HANNA within 30 days. Materials not returned within 30 days become chargeable. Materials must be packed properly to avoid damage during transport, which would render the warranty null and void. The sender is responsible for expediting any damage claims placed against the carrier.

In most cases, a flat minimum service charge applies to non-warranty repairs or recalibration. Please contact your local HANNA Technical Service Department for current rates. Any materials returned for repair which are considered non-warranty may be serviced at hourly cost (excluding parts) following subsequent notification and approval of such.

Product Return and Exchange

Returning Merchandise:

Should an instance occur when a product may need to be returned for exchange or credit, or should a discrepancy occur in a packing slip, HANNA must be contacted to obtain a Return Goods Authorization Number (RGA). Please follow these steps:

1. Within 30 days of receipt of merchandise call HANNA's Technical Service Department to obtain a Return Goods Authorization Number.
2. HANNA will issue a Return Goods Authorization Number.
3. The number must be clearly marked on the outside of the package being returned. Shipments not bearing a Return Goods Authorization Number will be refused.
4. Credit returns may be subject to a 25% restocking fee.

Terms and Conditions

Return shipments must meet the following requirements to be accepted for credit:

1. Products must be returned in the original packaging with labeling not defaced. All items returned will be inspected for credit worthiness. Credit will only be issued for product returned in like-new condition. No credit will be issued for product, which is not received in like-new condition.
2. All freight charges are the responsibility of the customer.
3. All chemicals and reagents being returned must be packaged in accordance with the laws and regulations of the governing country. Only unopened chemicals and reagents may be returned.

HANNA instruments® reserves the right to change or modify the design of its products at any time without advance notice.

WE DESIGN, MANUFACTURE, SUPPLY AND SUPPORT ALL OF OUR PRODUCTS.

THAT'S 360° VALUE

HANNA is the largest family-owned manufacturer of analytical instrumentation in the world. For over 30 years, HANNA has never failed to design fresh and innovative products. Each of our products are manufactured in our European state-of-the-art ISO 9001:2000 production facility.

When you buy a HANNA product, you're not only buying the best value for your money, but you're also receiving the benefit of HANNA's unsurpassed customer service and post-sale technical support.

HANNA® instruments

With Great Products, Come Great Results™

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