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.

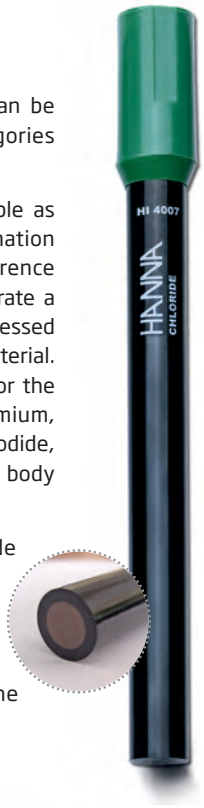
HANNA offers a solution for each of these methods,

Ion Selective Electrode Types

HANNA's ion selective electrodes can be grouped into three general categories based upon construction.

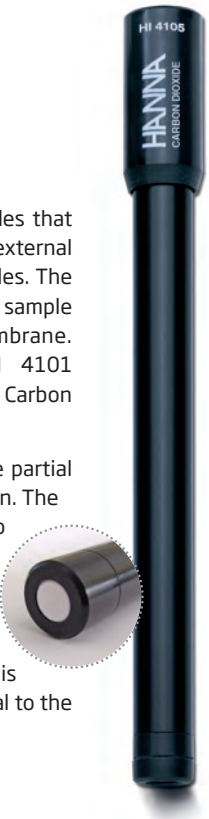
Solid state electrodes are available as both single half cells or as combination electrodes complete with reference electrode. These electrodes incorporate a solid sensing surface made of compressed silver halides, or solid crystalline material. HANNA's offering includes sensors for the determination 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.



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.

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.

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.

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 1.00×10^{-7} to 9.99×10^{-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	1×10^{-6} to 9.99×10^{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.

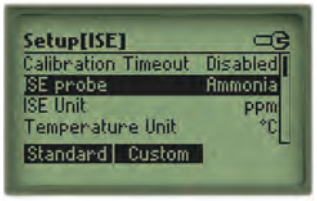
A backlit, graphic LCD provides easy to read resolution even in low-lit conditions. A combination of dedicated and soft keys allows easy, intuitive operation in a choice of languages. Comprehensive GLP data are directly accessible by pressing the GLP key. Access the contextual Help Menu to obtain on-screen 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

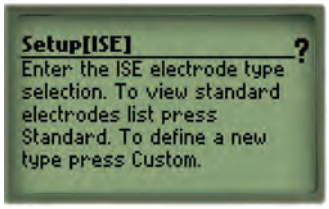
ISE calibration features detailed messages.

Users are guided through the calibration procedure with step-by-step on-screen instructions.



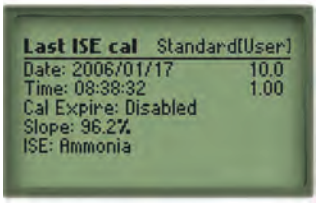
Setup screen

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*.

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-NH_3) ISE meter that performs automatic analysis by measuring the ammonia nitrogen (N-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-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-NH_3
Resolution	1 mg/L (ppm) N-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.o 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		CONNECTION		CONNECTION		CONNECTION		CONNECTION		CONNECTION	
HI 4014	BNC	**HI 4114**	BNC	**HI 4015**	BNC	**HI 4115**	BNC	**FC 300B** **FC 300D** **FC 300U**	BNC DIN 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 $CaCO_3$)	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