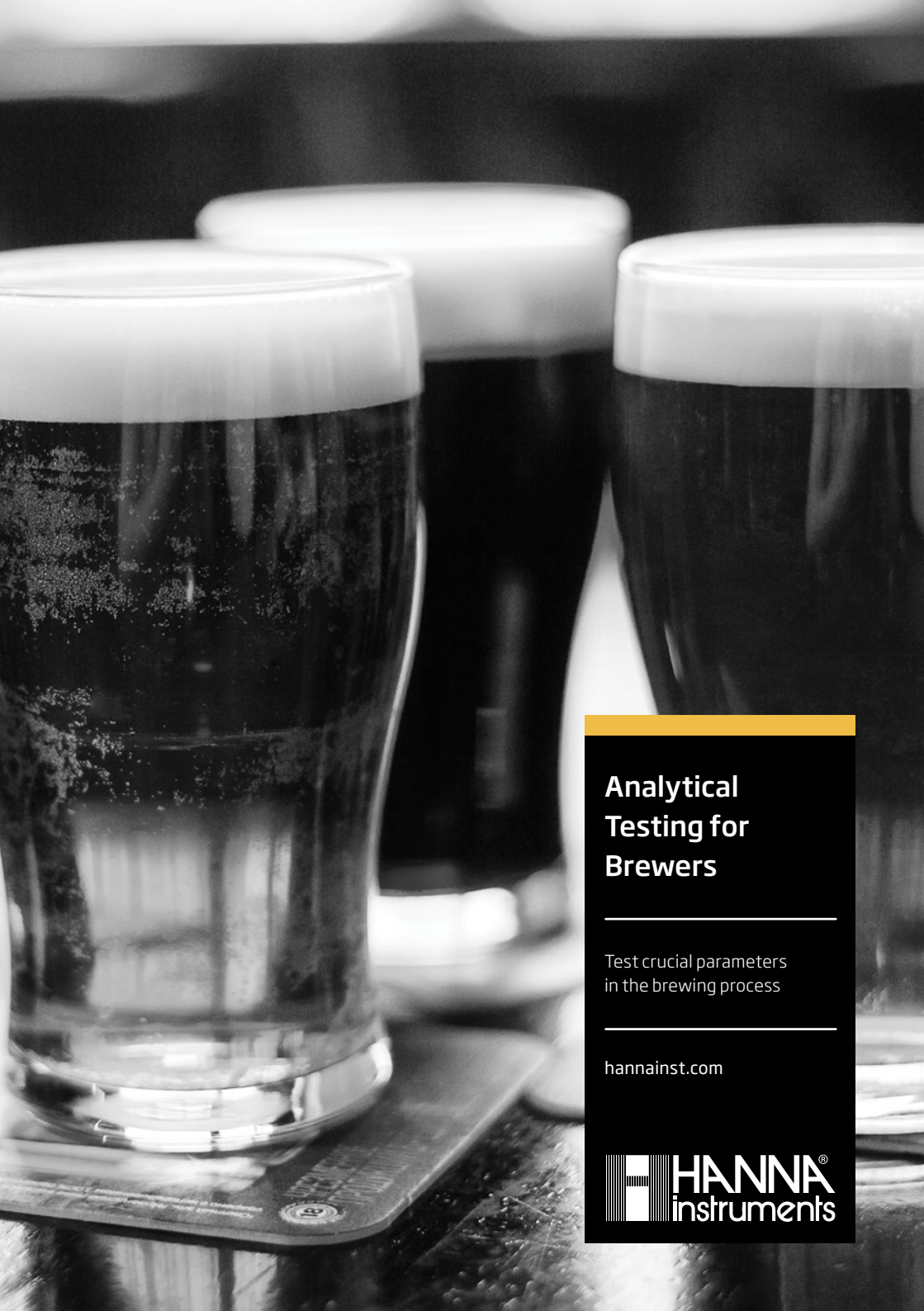

Analytical Testing for Brewers

Test crucial parameters in the brewing process

hannainst.com

HANNA® instruments

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Spectrophotometer

iris portable spectrophotometer is unlike any of the products we have created in the past. It is different from our photometers as it allows for measurement in the spectrum of all wavelengths of visible light and not just pre-specified wavelengths. Spectrophotometers work by isolating light at specific wavelengths from white light. This compact meter incorporates a number of features that facilitate both fantastic performance and exceptional usability.

iris

- Advanced split beam optical system
- Rechargeable Li-ion battery
- User customizable methods
- Step-by-step method creation
- Capacitive touchpad
- Advanced split-beam optical system
- Intuitive menu design
- Universal cuvette holder

Step-by-step method creation

The HI801 guides you step-by-step through the process of creating your own custom method. The user interface will guide you through naming your method, setting the measurement wavelengths, creating reaction timers, and calibrating the method.

Favorite methods feature

Always have your most frequently used methods readily available.

Pre-programmed methods

85 commonly used methods for chemical analysis are pre-programmed.

User methods

Program up to 100 personal methods that can include up to 10 calibration points, 5 different wavelengths (which can be used simultaneously), and 5 reaction timers.

Data logging and transfer

Store up to 14,000 measurements. Data can be transferred as a CSV or PDF file.

Spectral range

The meter features a spectral range of 340nm to 900nm allowing for a wide selection of analytical methods.

Battery operated

The HI801's rechargeable lithium ion battery lasts for approximately 3,000 measurements.


HANNA
0.61
IRON LR
iris

Beer Analysis

Alcohol, Low Level in Beer	Dissolved Oxygen	Total Sulfur Dioxide in Beer
Total Carbohydrate	FAN of Beer	Total Polyphenols
Copper in Beer	Free Amino Nitrogen (FAN) of Wort	Yeast Flocculation
Color of Beer	Iron in Beer	
Color of Wort	Lactic Acid	
Diacetyl	Sulfur Dioxide of Malts	

In addition to these critical parameters for beer, iris is pre-programmed with 85 different tests.

Specifications	HI801 iris
Operating Mode	transmittance (%), absorbance and concentration
Wavelength Resolution	1 nm
Stray Light	<0.1 % T at 340 nm with $NaNO_2$
Light Source	tungsten halogen lamp
Wavelength Calibration	internal, automatic at power-on, visual feedback
Wavelength Selection	automatic: based on selected program; manual: in all modes except stored programs (factory methods)
Connections	1 x USB type A; 1 x USB type B (PC)
Sample Cell	1-cm square ; 1x5-cm rectangular; 16-mm round small; 22-mm round large; 13-mm round (vial)
Photometric Range	0.000-3.000 Abs
Wavelength Range	340 to 900 nm
Photometric Accuracy	5 mAbs at 0.0-0.5 Abs; 1 % at 0.50-3.0 Abs
Wavelength Accuracy	±1.5 nm
Ordering Information	**HI801-01** (115V) and **HI801-02** (230V) is supplied with sample cuvettes and caps, cuvette adapters (3), cloth for wiping cuvettes,USB cable, Li-ion rechargeable batterypower adapter and instruction manual.

pH in beer

In the brewing process, the enzymes required to convert the starch into sugar are pH-sensitive with an optimal pH range between 5.2 pH and 5.6 pH. Different compounds are used to adjust the pH including phosphoric acid, lactic acid, and gypsum.

Wort clarity and break formation are also affected by pH. Protein coagulation occurs during wort boiling, where the optimum pH is around 4.9, even though a common boil pH is 5.2. A pH that is too high will not only inhibit coagulation but also promote browning due to the interaction of amino acids and reducing sugars.

Hop utilization during the wort boil is also affected by pH. As pH increases, the solubility of hop resins increases. Unfortunately for hop lovers, a high pH also increases the release of tannins resulting in a harsher taste. Higher pH also favors elevated microbial activity.

As a living catalyst, yeast maintains a pH around 6.5 within its cells; however, the preference is to inhabit a more acidic environment. During the fermentation stage, the pH should be lower to accommodate the yeast and also to ensure microbial stability and consistent flavoring of the beer; an optimal pH range during fermentation is between pH 4.1 and 4.3.

Hanna Lab App
Available on iOS and Android

Take pH and temperature measurements using your smart phone or tablet.

Hanna HALO Bluetooth® pH meter is designed to help anyone get high quality pH and temperature results quickly and consistently.

All of your results, all of the time.
- Your Hanna pH lab app collects all of your pH and temperature data.

Highlight your most important results.
- Push button logging highlights your data of interest and can be noted for future reference and comparison.

Sort and share your data.
- Group your data by time or notation. Email it for storage or share it with friends or colleagues.

One press connect
- At the press of a button connect to the Hanna Lab App via Bluetooth® wireless technology (10 m range (33')).

FC2142 HALO

The FC2142 HALO wireless pH meter for beer is ideal for measuring the pH of mash or wort during the beer making process. All readings are transmitted directly to the Hanna Lab App for compatible smart phones and tablets.

High temperature glass formulation

– Measuring pH at very high temperatures is detrimental to the sensitive glass bulb and will shorten the life of your probe. As your beer HALO is used at elevated temperatures, such as in the wort or mash, the resistance decreases. Making it suitable for samples from 0 to 80°C (32 to 176°F).

Titanium body

– The titanium body offers increased durability that is ideal for rough environments.

Cloth junction

– Every pH electrode has a junction. They can be made from a variety of material including ceramic, PTFE, and a fiber wick. The fiber wick (also known as a cloth junction) is often used on electrodes with gelled electrolytes. The advantage of the cloth junction is that it can be extracted from the probe exposing a fresh surface. This is very important since one of the major contributors to unstable measurements is a clogged junction. This is likely to occur when measuring the pH of mash that has a high solids content. Having the ability to pull out a small portion (⅛") of the junction will clear any clogging resulting in an increased life of the pH electrode.

WIRELESS

FC2142 HALO features a titanium body, high temperature glass, and an extendable cloth junction. To be used in conjunction with the Hanna Lab App for compatible smart devices or egde®blu.

Specifications	FC2142 HALO
Measurement Range	0.00 to 13.00 pH
Reference Cell Type	double, Ag/AgCl
Junction Type	cloth
Electrolyte	gel
Body Material	titanium
Temperature Sensor	integrated
Battery Type/Life	CR2032 3V lithium ion / approximately 500 hours
Ordering Information	**FC2142** (HALO) is supplied with storage solution, cleaning solution, pH 7.01 buffer solution, pH 4.01 buffer solution, battery, quality certificate and instruction sheet.

Hanna Lab App

Available on iOS and Android

pH	mV	T (°C)	Date
5.52	83.4	23.6	1/16/17, 3:10:01 PM
5.52	83.3	23.6	1/16/17, 3:10:02 PM
5.52	83.4	23.6	1/16/17, 3:10:03 PM
5.52	83.4	23.6	1/16/17, 3:10:04 PM
5.52	83.5	23.6	1/16/17, 3:10:05 PM
5.52	83.5	23.6	1/16/17, 3:10:06 PM
5.52	83.5	23.6	1/16/17, 3:10:07 PM
5.52	83.5	23.6	1/16/17, 3:10:08 PM
5.52	83.5	23.6	1/16/17, 3:10:09 PM
5.52	83.5	23.6	1/16/17, 3:10:10 PM
5.52	83.5	23.6	1/16/17, 3:10:11 PM
5.52	83.5	23.6	1/16/17, 3:10:12 PM
5.52	83.5	23.6	1/16/17, 3:10:13 PM
5.52	83.5	23.6	1/16/17, 3:10:14 PM
5.52	83.5	23.6	1/16/17, 3:10:15 PM
5.52	83.5	23.6	1/16/17, 3:10:16 PM
5.52	83.5	23.6	1/16/17, 3:10:17 PM

Measure like a pro

- Your smart device is now a professional grade pH meter wherever and whenever you need it.

Real-time data

- Displays updated pH and temperature every second

The first app that turns a smart phone or tablet into a full-featured pH meter.

The Hanna Lab App turns a compatible smart phone or tablet into a full-featured pH meter when used with HALO®. Functions include calibration, measurement, data logging, graphing, GLP, and data sharing. Measurement and logging of pH and temperature at one second intervals start as soon as the probe is connected. Measurements can be displayed alone, with tabulated data or as a graph. The graph can be panned and zoomed with pinch-to-zoom technology.

Views

Just the essentials

- Basic view provides measurement information in a clean, straightforward manner.

All Information on display

- Table view is able to display measurement, time and date, annotations, and alarm status in a continuously updated table.

Fluid, dynamic graphing

- Graph view provides measurement information linearly. Graph axes may be expanded using pinch-to-zoom technology for enhanced viewing

Hanna Lab App Specifications*	
Range**	-2.000 to 16.000 pH; ±800 mV; -20.0 to 120.0°C (-4.0 to 248.0°F)
Resolution	0.1; 0.01; 0.001 pH; 1; 0.1 mV; 0.1°C (0.1°F)
Accuracy (@25°C/77°F)	±0.005 pH; ±0.3 mV; ±0.5°C (±1.0°F)
Calibration Points	up to five-point calibration with seven standard buffers (1.68, 3.00 (HI10482 only) or 4.01, 6.86, 7.01, 9.18, 10.01, 12.45 pH)
Temperature Compensation**	automatic from -5.0 to 100.0 °C – 23.0 to 212.0 °F
Compatibility/System Requirements	see www.hannainst.com for latest compatibility requirements
Download Information	Download on the App Store · ANDROID APP ON Google Play

*HALO™ required for measurement use.
** limits will be reduced to actual probe/sensor limits.

edge®

edge® Multiparameter pH Meter

edge's groundbreaking design is the culmination of Hanna's vision, design capabilities, integrated production and world class R&D. edge is only 0.5" thick yet rich in features to accommodate the needs of a vast amount of customers. For those that prefer very simplistic operation there is a basic mode operation with a simplified menu and options. For those who require advanced features there is the full featured standard operating mode. The edge HI2020 pH kit can be upgraded at any time with additional probes to measure Conductivity or Dissolved Oxygen.

Hybrid meters that can be used in portable, wall-mount and benchtop configurations

Portable field unit

Wall-mount cradle

Electrode holder with built-in cradle

Capacitive touch keypad

– edge® features sensitive capacitive touch buttons that cannot get clogged with sample residue.

Rechargeable battery

– edge's built-in rechargeable battery can be charged through the micro USB port, benchtop cradle, or wall-mount cradle.

Two USB ports

– edge includes one standard USB for data export and one micro USB port for data export to your computer as well as for charging when the cradle is not available.

HI2020 includes 11310 pH electrode. All edge compatible pH, ORP, EC and dissolved oxygen digital probes are interchangeable with edge.

Data logging

– edge allows you to store up to 1000 log records of data. Data sets include readings, GLP data, date and time.

GLP

– Data of the last calibration you perform is stored in the sensor including the date, time, and buffers used.

CAL Check™

– CAL Check analyzes the pH electrode response in the pH buffers during the calibration process to alert the user of potential problems such as a contaminated buffer or dirty electrode.

Digital electrodes

– edge measures pH, conductivity and dissolved oxygen through its unique digital electrodes. These digital electrodes are auto-recognized, providing sensor type, calibration data and a serial number when connected to edge by an easy to plug-in 3.5mm connector.

Specifications		HI2020
pH*	Range	-2.00 to 16.00 pH; -2.000 to 16.000 pH†
	Resolution	0.01 pH; 0.001 pH†
	Accuracy (@25°C/77°F)	±0.01 pH; ±0.002 pH†
	Calibration	automatic, up to five points (Standard mode) 1.68, 4.01 (3.00†), 6.86, 7.01, 9.18, 10.01, 12.45, and two custom buffers; up to three points (Basic mode) 4.01; 6.86; 7.01; 9.18; 10.01
mV pH	Range	±1000 mV
	Resolution	0.1 mV
	Accuracy (@25°C/77°F)	±0.2 mV
Temperature*	Range	-20.0 to 120.0°C; -4.0 to 248.0°F
	Resolution	0.1°C; 0.1°F
	Accuracy	±0.5°C; ±0.9°F
Ordering Information	**HI2020-01** (115V) and **HI2020-02** (230V) pH kit includes: HI11310 glass body, refillable pH electrode with temperature sensor, pH 4 buffer solution sachets (4), pH 7 buffer solution sachets (2), pH 10 buffer solution sachets (2), and electrode cleaning solution sachets (2), benchtop docking station with electrode holder, wall-mount cradle, USB cable, 5 VDC power adapter, quality certificates and instruction manual.	

* limits will be reduced to actual sensor limits
† standard mode only

Laboratory Research Grade Two-Channel Benchtop pH/mV/ISE Meter

The HI5222 is an advanced research grade dual channel benchtop pH/ISE/mV meter that is completely customizable with a large color LCD, capacitive touch keys, and USB port for computer connectivity. The HI5222 is rich in features including 5 point calibration, selectable resolution, data logging, alarm limits, comprehensive GLP, automatic temperature compenstion, and much more. It retains simplicity with both dedicated key for routine operation and virtual keys that guide the user through setup options.

Highly customizable user interface

- The user interface can display measurements in various modes: basic measurement with or without GLP information, real-time graphing, and logging data.

Capacitive touch

- Sensitive capacitive touch buttons ensures the buttons cannot be clogged with sample residue.

Color graphic LCD

- The display allows for real-time graphing and the use of virtual keys provide for an intuitive user interface.

Two galvanically isolated pH/ORP/ISE channels

- Each input channel has connectors for BNC probes, reference probes and a temperature sensor.

Choice of calibration

– Automatic buffer recognition, semi-automatic, and direct manual entry pH calibration options are available.

GLP data

– View calibration data and calibration expiration information.

CAL Check™

– CAL Check™ alerts users to potential problems during the calibration of the pH electrode.

ISE measurement with choice of concentration units

– Allows for calibration and readings in choice of concentration units which include ppt, g/L, mg/mL, ppm, mg/L, µg/mL, ppb, µg/L, mg/mL, M, mol/L, mmol/L, %w/v and a user-defined unit.

ISE measurement with incremental methods

– The known addition, known subtraction, analyte addition, and analyte subtraction incremental methods are pre-programmed.

Data logging

– automatic, manual, and AutoHold logging are available. Automatic and manual logs up to 100 lots with 50,000 records max/lot with up to 100,000 total data points per channel.

HI5221 includes HI1131B pH electrode and is also compatible with pH electrodes that use BNC and BNC+PIN connectors and ISE electrodes that use BNC connectors.

Specifications		HI5222
pH*	Range	-2.0 to 20.0 pH; -2.00 to 20.00; -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
	Calibration	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
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)
	Calibration	automatic, up to five-point calibration, seven fixed standard solutions available for each measurement unit, and five user defined standards
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
Ordering Information		**HI5222-01** (115V) and **HI5222-02** (230V) are supplied with HI1131B pH electrode, HI7662-T temperature probe, pH 4.01 buffer solution sachet (2), pH 7.01 buffer solution sachet (2), HI700601 electrode cleaning solution sachet (2), HI7082 3.5M KCl electrolyte solution (30 mL), HI76404W electrode holder, 12 VDC adapter, capillary dropper pipette, quality certificate, quick start guide and instruction manual.

* limits will be reduced to actual sensor limits

D
DIN

HI99151 includes FC214D pH electrode for beer analysis with extractable cloth junction to clear any clogs caused by samples with a high solids content.

Portable pH Meter for Beer Analysis

The Hanna HI99151 is a durable, waterproof, and portable pH and temperature meter designed specifically for beer analysis. Automatic calibration is performed at one or two points with two sets of buffers. All calibration and measurement readings are automatically compensated for temperature variations. The split-level LCD displays both pH and temperature readings, along with indicators for reading stability, battery percentage, and calibration instructions.

The HI99151 uses the FC214D titanium body, amplified pH electrode that offers numerous features such as high temperature glass and an extractable cloth junction to improve pH testing for beer analysis.

Waterproof
- The HI99151 is a waterproof meter rated IP67 for immersion in up to one meter of water for 30 minutes.

Multi-level LCD display
- The split-level LCD displays both pH and temperature readings, along with indicators for reading stability, battery percentage, and calibration instructions.

On-screen tutorial
- Clear tutorial messages and directions are available on-screen to quickly and easily guide users through setup and calibration.

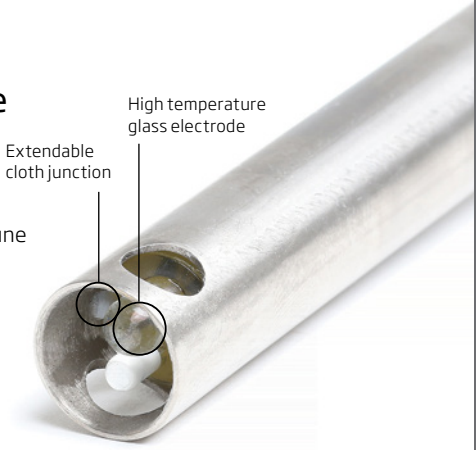
Automatic calibration
- One or two-point calibration is automatic to two selectable buffer sets.

Automatic Temperature Compensation
- An integrated temperature sensor allows for automatic temperature compensation of pH measurements.

Battery error prevention system
- The meter will automatically shut off if there isn't enough power to obtain an accurate measurement.

Battery life indicator
- The battery percent level is

FC214D Amplified pH Electrode for Beer Analysis



Amplified electrode
- Provides a fast, stable response that is immune to electrical noise due to static discharge

Maintenance free gel filled electrode
- No fill solution required

Highly durable titanium body

Extendable cloth junction to prevent clogging

Specifications		HI99151
pH*	Range	-2.00 to 16.00 pH
	Resolution	0.01 pH
	Accuracy	±0.02 pH
Temperature*	Range	-5.0 to 105.0°C; 23.0 to 221.0°F
	Resolution	0.1°C; 0.1°F
	Accuracy	±0.5°C (up to 60°C), ±1.0°C (outside); ±1.0°F (up to 140°F), ±2.0°F (outside)
Ordering Information		**HI99151** is supplied with FC214D pH and temperature probe, HI70004 pH 4.01 buffer solution sachet, HI70007 pH 7.01 buffer solution sachet, HI700661 electrode cleaning solution sachets (2), batteries, instructions and hard carrying case.

* limits will be reduced to actual sensor limits

pHep+ Waterproof Pocket pH Tester with 0.01 pH Resolution

Large multi-level LCD
- Displays both the pH and temperature simultaneously.

Two-button operation

Extractable cloth junction to extend pH electrode life

Integrated temperature sensor
- Allows for Temperature Compensated measurements.

Automatic calibration
- Automatic calibration to one or two points using standard buffers (pH 4.01, 7.01 and 10.01).

Stability indicator
- A clock tag stability indicator will disappear to alert the user when the reading is stable.

User selectable automatic shut-off
- Options are 8 min, 60 min or disabled.

Low battery indicator

Battery % level at startup

Specifications		HI98108 (pHep®+)
pH	Range	0.00 to 14.00 pH
	Resolution	0.01 pH
	Accuracy (@25°C/77°F)	±0.10 pH
	Calibration	automatic, one or two-points (pH 4.01, 7.01, 10.01)
Temperature	Range	0.0 to 50.0 °C (32.0 to 122.0 °F)
	Resolution	0.1°C / 0.1°F
	Accuracy (@25°C/77°F)	±0.5°C /±1.0°F
Ordering Information	**HI98108** (pHep+) is supplied with CR2032 Li-ion battery, electrode cleaning solution sachet, pH 4.01 buffer solution sachet, pH 7.01 buffer solution sachet (2), storage/ protection sleeve, instruction manual and quality certificate.	

Checker®Plus pH Tester

Replaceable pH electrode
- The supplied HI1271 pH electrode is 103 mm long and tapers to an 8 mm diameter at the sensing end to easily fit into test tubes, vials, and other containers with small a opening.

High accuracy
- The HI98100 Checker Plus features ±0.2 pH accuracy with 0.01 resolution.

Large LCD
- Enhanced LCD that displays reading, stability indicator, low battery indicator, and calibration tags.

Automatic calibration
- These meters are calibrated automatically to one or two points.

Stability indicator
- An hourglass indicator is displayed on the LCD until a stable reading is obtained.

Automatic shut-off
- These meters can be set to automatically turn off after 8 or 60 minutes.

Long battery life
- These Checkers have a long battery life of approximately 1000 hours. When the battery power is running low a battery indicator is displayed.

Specifications		HI98100 Checker Plus
pH	Range	0.00 to 14.00 pH
	Resolution	0.01 pH
	Accuracy (@25°C/77°F)	±0.2 pH
	Calibration	automatic, one or two-point
Ordering Information	**HI98100** (Checker Plus) is supplied with HI1271 pH electrode, pH 4.01 buffer solution sachet (2), pH 7.01 buffer solution sachet (2), electrode cleaning solution sachet (2), battery, quality certificate, and instruction manual in a carrying case.	

pH Buffer Solutions

(±0.01 pH)

These solutions are dedicated to applications that require extremely accurate pH monitoring, and come with a certificate of analysis prepared by comparison against NIST standards.

Two-point calibration

– To obtain precise and valid pH measurements, the pH meter and electrode must be calibrated at a minimum of two different points.

Bottles

pH Value @25°C	Code	Package
4.01	**HI5004-012**	120 mL
	HI5004-025	250 mL
	HI5004-050	500 mL
	HI5004-100	1 L
	HI5004-R	500 mL (color coded solution)
	HI5004-R08	1 G (3.78 L), color coded solution (2)
7.01	**HI5007-012**	120 mL
	HI5007-025	250 mL
	HI5007-050	500 mL
	HI5007-100	1 L
	HI5007-G	500 mL, color coded solution
	HI5007-G08	1 G (3.78 L), color coded solution (2)

Single-use sachets

pH Value @25°C	Code	Package
4.01	**HI50004-01**	20 mL (10)
4.01	**HI50004-02**	20 mL (25)
7.01	**HI50007-01**	20 mL (10)
7.01	**HI50007-02**	20 mL (25)
10.01	**HI50010-01**	20 mL (10)
10.01	**HI50010-02**	20 mL (25)

Electrode Cleaning, Storage and Filling Solutions

Electrode cleaning solutions

Code	Description
HI7073L	cleaning solution for proteins, 500 mL
HI7073M	cleaning solution for proteins, 230 mL

Electrode storage solutions

Code	Description
HI70300L	electrode storage solution, 500 mL
HI70300M	electrode storage solution, 230 mL

Electrode filling solutions

Code	Description
HI7082	electrolyte solution, 3.5M KCl, 30 mL bottle (4)
HI7082M	electrolyte solution, 3.5M KCl, 230 mL
HI7082L	electrolyte solution, 3.5M KCl, 460 mL

Electrode filling accessories

Code	Description
HI740157P	Electrode filling pipettes (20)

Clean sensors weekly

Clean the sensing portion of your electrodes weekly to prevent fouling and to maintain accuracy. Immerse the electrode in the proper cleaning solution for at least 15 to 20 minutes, rehydrate in storage solution and calibrate before use.

Keep bulb and junctions moist

To minimize junction clogging and ensure fast response time, always keep the glass bulb and the junction of your pH electrode moist. Store the electrode with a few drops of HI70300 storage solution in the protective cap.

Top-off electrolyte levels if needed

The electrolyte level in refillable electrodes should be checked before performing any measurement. If the level is low, refill with the proper electrolyte solution to ensure correct electrode performance. This simple maintenance helps guarantee adequate head pressure to keep the liquid junction flowing.

EC/TDS in brewing

Total dissolved solids, or TDS, is a measurement of the total concentration of dissolved substances in water. This can include minerals, salts, other organics, and even some chemical residues. Ground and surface waters contain high minerals and sometimes organic materials and are subject to pollution by human activity. One the other hand, municipal plants are often regulated by law to disinfect or pre-treat water with chemicals, removing contaminants that would adversely affect taste or health. These additives that serve to make drinking water safe can be an issue for brewers as disinfectants can result in off-flavors in the brew. The upside is that TDS can provide you with an indication of the gross mineralization of your water. The downside is that TDS is not ion specific.

Monitoring your TDS is a good way to be alerted to any unusual changes in your water supply. Additionally, a high TDS value can indicate water that is more corrosive to equipment and prone to scaling. Water to be used for brewing should have less than 500 ppm TDS.

Some brewers may wish to use selective water treatment options, such as reverse osmosis systems, to remove the minerals from incoming water in order to redesign the water profile. This can be achieved by adding brewing salts and bicarbonates. The ability to define the water profile allows for a diverse array of beer styles.

DiST Waterproof Pocket TDS Tester

Large multi-level LCD
- Displays both TDS and temperature simultaneously.

Graphite sensor
- Reduces polarization effects and does not oxidize resulting in a reliable and accurate reading.

Integrated temperature sensor
- Allows for Temperature Compensated measurements.

Automatic calibration
- Automatic calibration at 1382 ppm (mg/L) with a single push of a button.

Stability indicator
- A clock tag stability indicator will disappear to alert the user when the reading is stable.

User selectable automatic shut-off
- Options are 8 min, 60 min or disabled.

Low battery indicator

Battery % level at startup

Specifications		HI98301 (DiST®1)
TDS	Range	0 to 2000 mg/L (ppm)
	Resolution	1 mg/L (ppm)
	Accuracy (@25°C/77°F)	±2% F.S.
	Calibration	automatic, one-point
	TDS Factor	0.5
Temperature	Range	0.0 to 50.0°C/32.0 to 122.0°F
	Resolution	0.1°C / 0.1°F
	Accuracy (@25°C/77°F)	±0.5°C / ±1.0°F
Ordering Information	**HI98301** (DiST 1) is supplied with CR2032 3V Li-ion battery, 1382 ppm calibration solution sachet (4), storage/protection sleeve, instruction manual and quality certificate.	
Accessories	**HI70032** 1382 mg/L (ppm) TDS solution sachets, 20 mL (25)	

TDS Mini Controller

Adjustable dry contact dosing relay

Programmable overdose protection

Relay control override

Fuse protected dosing contacts

Automatic temperature compensation

Multicolor LED Indicator

Fire-retardant casing

Splash-resistant cover

The BL983329 is a compact, panel mounted, process controller for measuring total dissolved solids (TDS) in a process stream.

Specifications	BL983329
Range	0 to 999 mg/L (ppm)
Resolution	1 mg/L (ppm)
Accuracy (@25°C/77°F)	±2% F.S.
TDS Conversion Factor*	0.5
Ordering Information	**BL983329-0** (12 VDC) and **BL983329-1** (115/230V) is supplied with mounting brackets, transparent cover and instruction manual.
Recommended Probe	**HI7634-00** EC/TDS probe with internal temperature sensor and 2 m (6.6') cable

*The BL983329 uses a 0.5 conversion factor in which 100 µS/cm = 50 ppm.

EC Mini Controller

Adjustable dry contact dosing relay

Programmable overdose protection

Relay control override

Fuse protected dosing contacts

Automatic temperature compensation

Multicolor LED Indicator

Fire-retardant casing

Splash-resistant cover

The BL983320 is a compact, panel mounted, process controller for measuring electrolytic conductivity (EC) of a process stream. The BL983320 can be used to monitor the quality of water produced from ion exchange, reverse osmosis (RO) or distillation.

Specifications	BL983320
Range	0.0 to 199.9 µS/cm
Resolution	0.1 µS/cm
Accuracy (@25°C/77°F)	±2% F.S.
Ordering Information	**BL983320-0** (12 VDC), and **BL983320-1** (115/230V) is supplied with mounting brackets, transparent cover and instruction manual.
Recommended Probe	**HI7634-00** EC/TDS probe with internal temperature sensor and 2 m (6.6') cable

Turbidity in brewing

Beer clarity is a parameter constantly controlled in the brewery. Clarity can be affected by haze, or insoluble or semi-soluble particulate matter which is small enough to form a colloidal suspension in beer, typically less than 2 mm. These particles scatter transmitted light and are observed as a degradation in the brilliance of the beer. To assure consistent product quality, the brewmaster needs more than visual inspection.

Several substances can cause haze in beer, but the most frequently encountered problem is due to a cross-linking of polyphenols and proteins. These materials exist in equilibrium in beer and manifest themselves as a haze when they combine to form insoluble colloids. A range of stabilization treatments is available for avoiding haze problems, and the product has to be controlled in several steps during the brewing process, particularly after filtration and before the beer enters the bright tanks.

Haze Turbidity Meter for Beer

The HI847492 Haze Meter is specially designed for measurement of haze in beer quality analysis. The instrument is based on a state-of-the-art optical system which guarantees accurate results, assures long term stability, and minimizes stray light and color interferences. It also compensates for variations in intensity of the lamp, although proper calibration ensures measurements are fully validated, comparable, and in compliance with regulatory requirements. The 25 mm round cuvettes composed of special optical glass guarantee the repeatability of turbidity measurements.

FastTracker™
location traceability

Fast Tracker - Tag Identification System (T.I.S.) allows brewers to record the time and location of a specific measurement or series of measurements using iButton® tags on specific tanks for quick and easy readings. Each iButton® tag contains a computer chip with a unique identification code encased in stainless steel.

ASBC compliant measurement

The HI847492 meets and exceeds the requirements of the ASBC method for haze measurements. Measurements are taken from beer samples that have been chilled and degassed, and results are reported in Formazin Turbidity Units (FTU).

AMCO AEPA-1 primary turbidity standard

The AMCO AEPA-1 supplied standards are recognized as a primary standard by the USEPA. These non-toxic standards are made of styrene divinylbenzene polymer spheres that are uniform in size and density. The standards are reusable and stable with a long shelf life.

Calibration

A two, three, or four-point turbidity calibration can be performed by using the supplied (<0.1, 15, 100, and 800 FTU) standards. Calibration points can be modified if user-prepared standards are used.

GLP data

The HI847492 features complete GLP (Good Laboratory Practice) functions that allow traceability of the calibration conditions. Data includes calibration points, date, and time.

Data logging

Up to 200 measurements can be stored in the internal memory and recalled at any time. Logged data can be downloaded to a Windows compatible PC using the RS232 or USB port and the HI92000 software.

Backlit display

A backlit LCD display provides an easy to understand, user-friendly interface. Displayed codes guide the user step-by-step through routine operation and calibration.

Specifications	HI847492
Range	0.00 to 1000 FTU
Range Selection	automatic
Resolution	0.01 (0.00 to 9.99 FTU); 0.1 (10.0 to 99.9 FTU); 1 (100 to 1000 FTU)
Accuracy	±2% of reading plus 0.05 FTU
Repeatability	±1% of reading or 0.02 FTU, whichever is greater
Method	ratio nephelometric method.
Calibration	two, three or four-point calibration
Ordering Information	**HI847492-01** (115V) and **HI847492-02** (230V) is supplied with sample cuvettes and caps (6), calibration cuvettes (4), 25 mL glass vials with caps (4), cuvette cleaning cloth, batteries, AC adapter, instrument quality certificate, instructions and rugged carrying case.
Accessories	**HI847492-11** Calibration standard cuvette

Turbidity Benchtop Meter for Beer

The HI88713 Precision ISO Turbidity Benchtop Meter is specially designed for water quality measurements, providing reliable and accurate readings, even within low turbidity ranges. The instrument is based on a state-of-the-art optical system which guarantees accurate results, assures long term stability, and minimizes stray light and color interferences. Periodic calibration with the supplied standards compensates for any variations in intensity of the tungsten lamp. The 25 mm round cuvettes composed of special optical glass guarantee the repeatability of turbidity measurements.

Four measurement modes

- There are four options for turbidity measurement: FNU (Formazin Nephelometric Units), FAU (Formazin Attenuation Units), and NTU (Nephelometric Turbidity Units) ratio and non-ratio mode.

Multiple turbidity units of measure

- Turbidity can be read as Formazin Nephelometric Units (FNU), Formazin Attenuation Units (FAU), European Brewing Convention units (EBC), and Nephelometric Turbidity Units (NTU).

AMCO AEPA-1 primary turbidity standard

- These non-toxic standards are made of styrene divinylbenzene polymer spheres that are uniform in size and density. The standards are reusable and stable with a long shelf life.

ISO compliant

- HI88713 meets and exceeds the requirements of ISO 7027 method for turbidity measurements by use of an infrared LED light source.

Calibration

– A two, three, four, or five-point turbidity calibration can be performed by using the supplied (<0.10, 15, 100, 750 FNU, and 2000 NTU) standards. Calibration points can be modified if user-prepared standards are used.

GLP data

– The HI88713 features complete GLP (Good Laboratory Practice) functions that allow traceability of the calibration conditions. Data includes calibration points, date, and time.

Data logging

– Up to 200 measurements can be stored in the internal memory and recalled at any time.

Backlit display

– A backlit LCD display provides an easy to understand, user-friendly interface.

Specifications		HI88713
FNU Mode	Range	0.00 to 1000 FNU
	Resolution	0.01 (0.00 to 9.99 FNU); 0.1 (10.0 to 99.9 FNU); 1 (100 to 1000 FNU)
	Accuracy	±2% of reading plus stray light
FAU Mode	Range	10.0 to 4000 FAU
	Resolution	0.1 (10.0 to 99.9 FAU); 1 (100 to 4000 FAU)
	Accuracy @25°C/77°F	± 10% of reading
NTU Ratio Mode	Range	0.00 to 4000 NTU; 0.00 to 980 EBC
	Resolution	0.01 (0.00 to 9.99 NTU); 0.1 (10.0 to 99.9 NTU); 1 (100 to 4000 NTU) / 0.01 (0.00 to 9.99 EBC); 0.1 (10.0 to 99.9 EBC); 1 (100 to 980 EBC)
	Accuracy	±2% of reading plus stray light; ±5% of reading above 1000 NTU
NTU Non-ratio Mode	Range	0.00 to 1000 NTU; 0.00 to 245 EBC
	Resolution	0.01 (0.00 to 9.99 NTU); 0.1 (10.0 to 99.9 NTU); 1 (100 to 1000 NTU) / 0.01 (0.00 to 9.99 EBC); 0.1 (10.0 to 99.9 EBC); 1 (100 to 245 EBC)
	Accuracy @25°C/77°F	±2% of reading plus stray light
Additional Specifications	Repeatability	±1% of reading or stray light, whichever is greater
	Method	ISO 7027 method
	Calibration	two, three, four or five-point calibration
Ordering Information	**HI88713-01** (115V) and **HI88713-02** (230V) are supplied with sample cuvettes and caps (6), calibration cuvettes (HI88713-11), silicone oil (HI98703-58), cuvette wiping cloth, power adapter and instruction manual.	
Accessories	**HI88713-11** turbidity calibration standards (<0.1, 15, 100, 750 FNU and 2000 NTU)	

Dissolved oxygen

Understanding and managing oxygen uptake during beer production is important for creating a stable product. In wort, a small amount of dissolved oxygen can ensure proper yeast fermentation, ultimately affecting important characteristics of the beer including color and taste. Typically, for a traditional ale or lager wort, 5 to 10 ppm of dissolved oxygen will provide a suitable environment for yeast. However, oxygen needs can vary based on yeast strains and specific gravity levels.

Spot checking can be helpful to ensure the connections to pumps, transfer lines, and tanks are secure during beer movement and fining so as to minimize exposure to air. Measuring dissolved oxygen before and after these transfer points may provide insight to faulty equipment or connections or may indicate if transfer practices could be improved.

For many beers, the final step is aging and secondary fermentation. During this process, the beer matures, developing natural carbonation and promoting unique flavors. Additional carbonation can be added through the infusion of carbon dioxide. Once carbonated, the beer is ready for packaging and is put into bottles or kegged for distribution. Too much oxygen in the finished product can result in off flavors or colors, resulting sometimes in a "skunky" aroma and a decreased shelf life.

While dissolved oxygen values can vary widely between breweries,a general rule of thumb is to obtain values less than 0.05 ppm throughout the post-fermentation process.

Waterproof Portable Dissolved Oxygen and BOD Meter

The HI98193 is a rugged, portable dissolved oxygen (DO) meter designed for demanding applications. This professional, waterproof meter complies with IP67 standards and measures DO, barometric pressure, BOD and temperature. The HI98193 is supplied complete with all accessories to perform a DO measurement packaged into a durable carrying case.

Backlit graphic LCD display

- The HI98193 features a backlit graphic LCD with on-screen help. The graphic display allows for the use of virtual keys to provide for an intuitive user interface.

Waterproof protection

- The meter is enclosed in an IP67 rated waterproof casing and can withstand immersion in water at a depth of 1 m for up to 30 minutes. The probe features an IP68 rating for continuous immersion in water.

Data logging

- The HI98193's log on-demand feature allows users to store up to 400 readings. This data can then be transferred to a PC with the HI920015 USB cable and HI92000 software.

Quick connect probe

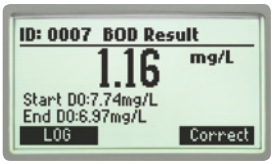
- Quick connect DIN connector makes attaching and removing the probe simple and easy.

Measurement

- The HI98193 has extended ranges of up to 50 ppm and 600% saturation. When measuring dissolved oxygen, compensations for salinity, temperature and pressure are essential to improve the accuracy and precision of readings.

AutoHold

- Pressing AutoHold during measurement will automatically hold the first stable reading on the display.



BOD results

– BOD is calculated in mg per liter from the difference between the initial and final dissolved oxygen

BOD parameters and records

– All necessary parameters for BOD testing can be set and displayed at once. A list of all saved BOD data can be easily retrieved and shown on the LCD display.

OUR results

– Measured in mg of oxygen consumed per L per hour.

SOUR results

– Measured in mg of oxygen consumed per g of volatile suspended solids per hour.

Built-in barometer

– With the internal barometer, the HI98193 is able to compensate for changes in barometric pressure so there is no need for charts, altitude information or external barometric pressure information.

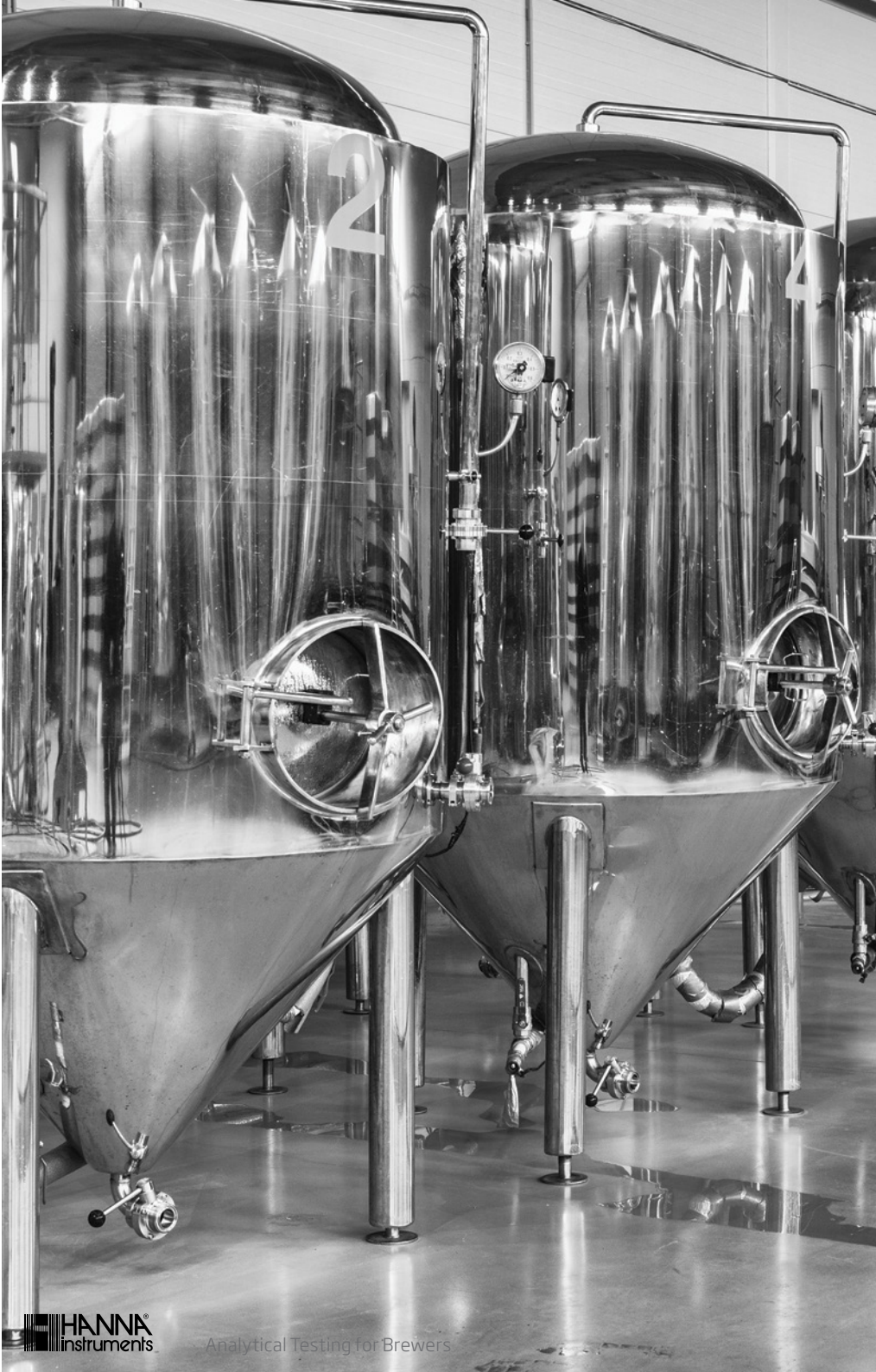
GLP

– Comprehensive GLP functions are directly accessible by pressing the GLP key. Calibration data, including date, time and calibration values are stored for retrieval at a later time.

QUICK DIN

HI98193 includes HI764073 polarographic DO probe and protective sleeve with a quick connect DIN connector to make attaching and removing the probe simple and easy.

Specifications		HI98193
DO	Range	0.00 to 50.00 mg/L (ppm); 0.0 to 600.0% saturation
	Resolution	0.01 mg/L (ppm); 0.1% saturation
	Accuracy (@25°C/77°F)	±1.5% of reading ±1 digit
	Calibration	automatic one or two point at 100 % (8.26 mg/L) and 0 % (0 mg/L).; manual one point using a value entered by the user in % saturation or mg/L
Atmospheric Pressure	Range	450 to 850 mmHg
	Resolution	1 mmHg
	Accuracy (@25°C/77°F)	± 3 mmHg within ±15% from the calibration point
	Calibration	one point at any in range pressure value
Temperature	Range	-20.0 to 120.0°C; -4.0 to 248.0°F
	Resolution	0.1°C; 0.1°F
	Accuracy (@25°C/77°F)	±0.2°C; ±0.4°F (excluding probe error)
	Calibration	one or two point at any in range temperature value
Ordering Information	**HI98193** is supplied with HI764073 polarographic DO probe with protective sleeve, HI7040 bi-component zero oxygen solution (230 mL + 30 mL), HI7041S electrolyte solution (30 mL), preformed PTFE membrane caps (2), DO protective cap, O-rings (2), 100 mL plastic beaker (2), HI92000 PC software, HI920015 micro USB cable, 1.5V AA batteries (4), quick start guide, quality certificate and instruction manual in an HI720193 rugged carrying case with custom insert.	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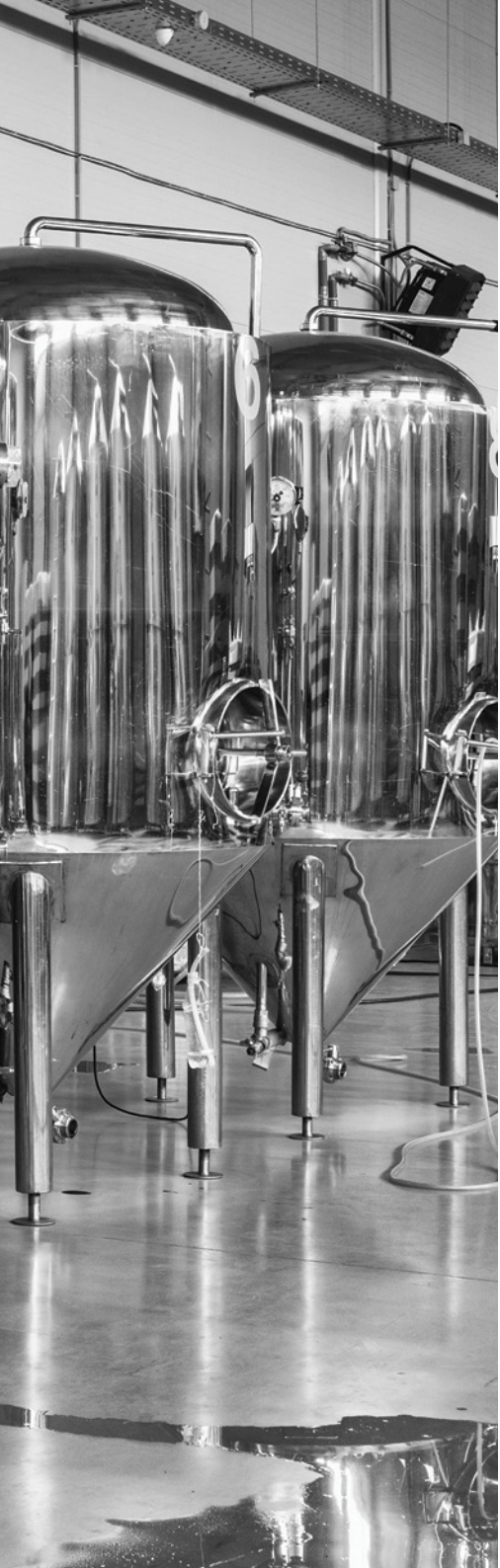


Temperature in brewing

At it's core, all beer is made from the same 4 ingredients: water, yeast, hops and grain. Some brewers will choose to modify this basic recipe to include spices or fruits, as seen in many Belgian beers. Regardless of additives, all beers can be classified as either an ale or a lager based on which yeast is used: ale yeast or lager yeast. Temperature plays an important role in yeast fermentation and can be a deciding factor as to which style is chosen.

To begin, milled grains, such as barley and oats, are added to a large vessel called the mash tun. Hot water is added, activating malt enzymes from the grains which then convert the starches into fermentable sugars. The next step, called lautering, separates the sugary liquid known as wort from the spent grains. In order to end enzymatic activity, the temperature is brought to over 170° Fahrenheit, a process known as mashing out. The wort and some water is sent through the mash, removing any final sugars. Brewers can use temperature and time to manipulate which enzymes are active to bring out the desired sugars and influence taste. In general, lower mash temps increase fermentability while higher temps decrease it.

The wort goes through a series of boils while hops and other additives are added, and once cooled down, the yeast is pitched and thus begins the process of fermentation. Over the course of the next 7 to 10 days, the yeast will convert the simple sugars in the hopped wort into alcohol and carbon dioxide.

During fermentation, sugar from the grains are converted to ethanol and carbon dioxide via yeast. Ale yeast ferments best at higher temperatures, typically 65-70°F (18-21°C). At these warmer temperatures, fermentation speeds up, taking less time and also producing esters and phenols that add to the flavor. Lager yeasts ferment best at lower temperatures around 50-55°F (10-13°C). These yeasts tend to ferment slower, producing fewer phenols and creating a flavor more influenced by the hops and grains.

Thermistor Thermometer

FC762PW thermistor probes series

Calibration Check feature

Remaining battery life indication / low battery detection

Auto-off capability

Waterproof casing

Temperature plays a very important role in the food industry, and it also has to be checked in the warehouses, loading docks and in transportation vehicles.

HI93501 is a professional, rugged, and waterproof thermometer designed to be used on a daily basis in industrial kitchens and catering as well as warehouses, loading docks and transportation vehicles. HI93501 offers a wide temperature range with a resolution of 0.1 °C (0.1 °F). This thermometer provides excellent accuracy and can operate with a wide range of interchangeable probes without requiring recalibration.

Standard features include CAL Check for checking the meter calibration status any time, low battery detection, auto-off capability and long battery life.

Specifications	HI93501
Range	-50.0 to 150.0°C; -58.0 to 302.0°F
Resolution	0.1°C; 0.1°F
Accuracy@ 23.0°C ±5°C	±0.4 °C (-10.0 to 80.0 °C) ±0.7 °F (-14 to 176 °F) – Only with FC762 family of thermistor interchangeable probes. ±0.8 °C / ±1.44 °F (outside)
Probe	FC762PW stainless steel, general purpose, penetration thermistor temperature probe with white handle and 1 m (3.3') cable (included)
Ordering Information	**HI93501** and are supplied with FC762PW temperature probe, 1.5V AAA batteries (3), instructions and rugged carrying case.

K-Type Thermocouple Thermometer

FC766PW K-thermocouple probe

Remaining battery life indication/ low battery detection

Auto-off capability

Waterproof casing

Temperature plays a very important role in the food industry, and it also has to be checked in the warehouses, loading docks and in transportation vehicles.

HI935001 is a professional, rugged, and waterproof thermometer designed to be used on a daily basis in industrial kitchens and catering as well as warehouses, loading docks and transportation vehicles. HI935007 K-type thermocouple thermometer is designed to cover an extended temperature range with automatic change of resolution from 0.1 °C (0.1 °F) to 1 °C (1 °F).

Standard features include CAL Check for checking the meter calibration status any time, low battery detection, auto-off capability and long battery life.

Specifications	HI935001
Range	-50.0 to 199.9 °C / -58.0 to 399.9 °F; 200 to 1350 °C / 400 to 2462 °F
Resolution	0.1 °C (up to 199.9 °C) / 1 °C (outside); 0.1 °F (up to 399.9 °F) / 1 °F (outside)
Accuracy@ 23.0°C ±5°C	±2 °C (-50.0 to 1350 °C); ±3.6°F (-58.0 to 2462 °F) Only with FC766 familyof thermocouple interchangeable probes
Probe	FC766PW stainless steel, general purpose, penetration thermistor temperature probe with white handle and 1 m (3.3') cable (included)
Ordering Information	**HI935001** and are supplied with FC766PW temperature probe, 1.5V AAA batteries (3), instructions and rugged carrying case.

Checktemp® Digital Thermometer

The HI 98501 Checktemp® is a digital thermometer with stainless steel penetration probe. It delivers high accuracy temperature measurements over a wide temperature range without worrying about breakage or condensation.

±0.2°C (±0.5°F) accuracy

CAL Check™
- Automatically verifies calibration at startup

°C/°F Status - user selectable

Large display with wide environmental temperature range and viewing angle.

IP 65 water resistant protection

HACCP Compatible - Use as a tool for control in HACCP analysis

AISI 316 stainless steel penetration probe

2000 hours of battery life (Continuous use)

Auto-Off (select from 8 min., 60 min., or turn the feature off)

Specifications	°C	°F
Range	-50.0 to 150.0°C	-58.0 to 302°F
Resolution	0.1°C (-50.0 to 150.0°C)	0.1°F (-58.0 to 199.9°F); 1°F (above 200°F)
Accuracy	±0.2°C (-30 to 120°C) ±0.3°C (outside: -50.0 to -30.0°C and 120.0 to 150.0°C)	±0.5°F (-22 to 199.9°F) ±1°F (outside: -58.0 to -22.0°F and 200 to 302°F)
Ordering Information	**HI98501** (Checktemp®) is supplied with penetration probe, protective cap, CR2032 Li-ion battery and instructions.	

Checktemp® Dip Digital Thermometer

The Checktemp Dip Digital Thermometer - HI98539 is a high-accuracy thermometer connected to a weighted, stainless steel probe by a 3 m (9.9') flexible, silicone cable. The probe incorporates an NTC thermistor sensor, providing an extremely accurate temperature measurement that can satisfy your HACCP requirements.

±0.3°C (±0.5°F) Accuracy

CAL Check™
- Automatically verifies calibration at startup

3 m (9.9') silicone cable

°C/°F readout - User selectable

Clear LCD display that is easy to read

IP 65 water resistant protection

HACCP Compatible - Use as a tool for control in HACCP analysis

AISI 316 stainless steel weighted probe

User-selectable auto-off (select from 8 min., 60 min., or disable)

Specifications	°C	°F
Range	-20.0 to 80.0°C	-4.0 to 176.0°F
Resolution	0.1°C	0.1°F
Accuracy	±0.3°C	±0.5°F
Ordering Information	**HI98539** (Checktemp®Dip) is supplied with stainless steel weighted probe, stand, 1.5V AAA batteries (3) and instructions.	

°Plato scale in brewing

The °Plato scale is a way to quantify the concentration of sugars and dissolved solids in wort. It is used as an indicator of the potential alcoholic strength of a brewing and expresses the fermentability. The HI96841 converts the refractive index reading to °Plato based on the tables maintained by the International Commission for Uniform Methods of Sugar Analysis (ICUMSA) and the American Society of Brewing Chemists (ASBC).

Digital Refractometer for Beer

The HI96841 Digital Refractometer combines form and function into one compact unit. Featuring a 1.5 second response time, the HI96841 measures the refractive index of wort and converts it to °Plato with temperature compensation. The improved easy-to-read LCD screen displays temperature units (°C or °F) and measurements simultaneously. The HI96841's IP65 water-resistant casing and sealed sample well is built to perform under harsh conditions, making it suitable for use in any brewery.

- Designed for wort sugar analysis
- Dual-level LCD
- Easy measurement
- IP65 protection
- Automatic temperature compensation
- Readings are displayed in approximately 1.5 seconds
- Sample size can be as small as 2 metric drops
- Automatic shut-off
- Stainless steel sample well

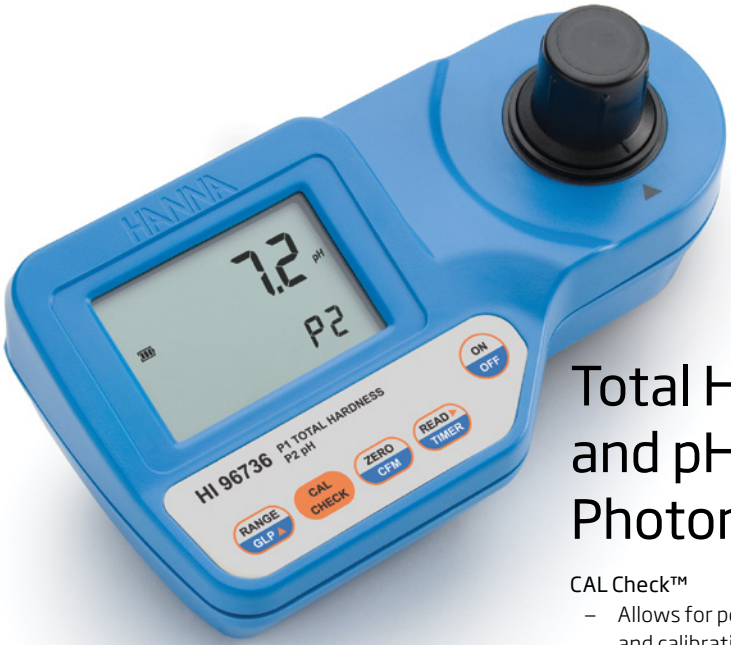
Specifications		HI96841 °Plato
°Plato	Range	0 to 30 °Plato
	Resolution	0.1 °Plato
	Accuracy (@25°C/77°F)	± 0.2 °Plato
Temperature	Range	0 to 80°C (32 to 176°F)
	Resolution	0.1°C (0.1°F)
	Accuracy (@25°C/77°F)	±0.3°C (±0.5°F)
Ordering Information	**HI96841** is supplied with 9V battery and instruction manual.	

Hardness in brewing

Defined as the sum of calcium and magnesium ions, Total Hardness is often expressed as CaCO3. Other divalent metals ions such as zinc or iron can also contribute to this number, but are seldom included. Hardness can fall into one of two categories. The first is temporary hardness and is made up of calcium and/or magnesium hydrogencarbonates. Temporary hardness can be removed by boiling or lime softening in which the calcium ions combine with the bicarbonate to precipitate out calcium carbonate ($CaCO_3$). Permanent hardness is that portion remaining after the water has been boiled resulting from calcium and magnesium sulfate salts remaining in the water. Brewers should aim to have a total hardness value of 150-500 ppm as $CaCO_3$.

Calcium is the principal ion that determines water hardness. While it doesn't contribute to flavor, it is essential to successful yeast, enzyme and protein reactions in both the mash and boil stages. In the wort, calcium ions react with phosphates derived from the malt, precipitating calcium phosphate and releasing hydrogen ions into the wort. This reduces the mash pH and improves enzymatic activity, reduces chances for bacterial infection, and promotes clarity and color. Calcium should be within the range of 50-150 ppm. If the value is too low, it is possible to add calcium. If the value is too high, it can impair the yeast's ability to take up magnesium, reducing fermentation.

Another important ion that contributes to water hardness is magnesium. This ion is required by yeast to produce certain enzymes required for fermentation and should be closely monitored for several reasons. The first being it can interfere with calcium-based reactions as its' phosphates are more soluble. Additionally, high levels of magnesium can produce a sour taste in beer as well as have a laxative effect on the beer drinker. Magnesium levels should be relatively low, within 0 - 40 ppm.



Total Hardness and pH Portable Photometer

CAL Check™

- Allows for performance verification and calibration of the meter using NIST traceable standards

Specifications		HI96736 Total Hardness and pH	
Parameter Specifications		**Total Hardness (P1)**	**pH (P2)**
	Range	0.00 to 4.70 mg/L (ppm) as $CaCO_3$	6.5 to 8.5 pH
	Resolution	0.01 mg/L	0.1 pH
	Accuracy @ 25°C (77°F)	±0.11 mg/L ±5% of reading	±0.1 pH
Additional Specifications	Light Source	tungsten lamp	
	Light Detector	silicon photocell with narrow band interference filter @ 525 nm	
	Method	**Total Hardness:** adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th Edition, colorimetric method; **pH:** phenol red method	
Ordering Information	**HI96736** is supplied with sample cuvettes with caps (2), 9V battery, instrument quality certificate and instruction manual. CAL Check™ standards and testing reagents sold separately		
Reagents and Standards	**HI96710-11**	CAL Check™ standard cuvettes (pH)	
	HI93710-01	reagents for 100 tests (pH)	
	HI93710-03	reagents for 300 tests (pH)	
	HI96719-11	CAL Check™ standard cuvettes (hardness)	
	HI93719-01	reagents for 100 tests (hardness)	
	HI93719-03	reagents for 300 tests (hardness)	

Hardness, EPA Portable Photometer

CAL Check™

– Allows for performance verification and calibration of the meter using NIST traceable standards.

Specifications	HI96735 Hardness, Total		
	Hardness LR (P1)	Hardness MR (P2)	Hardness HR (P3)
Range	0 to 250 mg/L (ppm)	200 to 500 mg/L (ppm)	400 to 750 mg/L (ppm)
Resolution	1 mg/L from 0 to 100 mg/L 5 mg/L from 100 to 250 mg/L	1 mg/L from 0-100 mg/L 5 mg/L from 100-500 mg/L	5 mg/L from 400-750 mg/L
Accuracy @ 25°C (77°F)	±5 mg/L ±4% of reading	±7 mg/L ±3% of reading	±10 mg/L ±2% of reading
Light Source	light emitting diode		
Light Detector	silicon photocell with narrow band interference filter @ 466		
Method	adaptation of the EPA recommended method 130.1		
Ordering Information	**HI96735** is supplied with sample cuvettes (2) with caps, 9V battery, instrument quality certificate and instruction manual. CAL Check™ standards and testing reagents sold separately		
Reagents and Standards	**HI96735-11**	CAL Check™ standard cuvettes	
	HI93735-00	reagents for 100 tests (0-250 mg/L)	
	HI93735-01	reagents for 100 tests (200-500 mg/L)	
	HI93735-02	reagents for 100 tests (400-750 mg/L)	
	HI93735-0	reagents for 100 tests (0-750 mg/L)	

*The reagents are in liquid and powder form and are supplied in bottles and in packets. The amount of reagent is precisely dosed to ensure maximum repeatability.

Calcium Combination Ion Selective Electrode

Specifications	HI4104
Type	polymer membrane; half-cell
Measurement Range	1M to $3 \cdot 10^{-6}$M 40080 to 0.12 mg/L (ppm)
Optimum pH Range	4 to 10
Temperature Range	0 to 40°C
Approximate Slope	+28
Body O.D.	12 mm
Insertion Length	120 mm
Body Material	epoxy/PVC
Ordering Information	**HI4104** combination ISE with 1 m coaxial cable and BNC connector

Total Hardness Chemical Test Kit

The HI3812 chemical test kit measures total hardness as $CaCO_3$ by titration with EDTA. The HI3812 is supplied complete with all of the reagents and equipment necessary to perform approximately 100 tests.

Pre-made reagents for ease of use

All reagents marked with expiration date and lot number for traceability

Manual titration performed with calmagite indicator

Specifications	HI3812 Total Hardness
Type	titration
Range	0.0 to 30.0 mg/L $CaCO_3$; 0 to 300 mg/L $CaCO_3$
Smallest Increment	0.3 mg/L (0.0 to 30.0 mg/L); 3 mg/L (0 to 300 mg/L)
Method	EDTA
Number of Tests	100 avg.
Ordering Information	**HI3812** test kit comes with 30 mL hardness buffer, 10 mL calmagite indicator, 120 mL EDTA solution, 20 mL plastic beaker with cap, 50 mL plastic beaker with cap and 1 mL syringe with tip.
Reagent	**HI3812-100** total hardness (as $CaCO_3$), 100 tests avg.

Titratable acidity in brewing

The acidity in beer is critical to the quality of sour beers. Sour beers, which are fermented with 'wild' yeasts and/or bacteria, obtain their characteristic flavor and aroma by the conversion of some of the fermentable sugars into acids and other products by lactic acid fermentation. This process presents an additional challenge to brewers, who need to balance the acidity with other flavors to achieve a quality beer that's consistent with their vision and recipe. Too much acid development can cause a harsh vinegary flavor while too little may not provide enough tartness to balance the hops and malt.

Understanding the titratable acidity, as well as the pH, is critical during the brewing process to ensure a quality product. This relationship is complex since pH is the measurement of hydrogen ion activity and acidity is the concentration or buffering capacity of a particular acid. For example, additional acid may not appreciably affect the pH because of compounds such as phenols may act in a buffering capacity to prevent changes in the pH.

Ultimately, the acidity, rather than the pH, provides an indicator to how tart a finished beer will taste.

Automatic Titration System

The HI901C automatic titrator complements our wide range of products dedicated to efficient and accurate laboratory analysis. The HI901C potentiometric titrator can perform acid/base, redox (ORP), complexometric, precipitation, non-aqueous, argentometric, and ion selective titrations. This powerful titrator dispenses the titrant, detects the endpoint, and performs all necessary calculations and graphs automatically. In addition to titration mode, the HI901C also operates as a fully functional pH, mV/ORP, and ion selective electrode (ISE) meter.

This titrator is supplied with a pack of standard methods or you can create your own. Methods (standard or user) can be easily transferred between titrators via USB flash drive or PC application.

Titrator capabilities

Dynamic titrant dosing

- Dynamic dosing allows for timely and accurate titration results by relating the titrant volume dosed to the mV response from the titration reaction. This provides for larger doses near the beginning of a titration and smaller, more precise doses near the titration endpoint.

Equivalence endpoint detection

- Equivalence endpoint detection is critical in applications where fixed endpoints are not specified in standard methods. This endpoint indicates where the mV response from the titration is greatest with respect to the volume of titrant dosed.

Multiple titration types
- Paired with the right electrode from our sensor line, our potentiometric titrator can perform acid/base, redox (ORP), complexometric, precipitation, non-aqueous, argentometric, and titrations with an ion selective electrode.

Signal stability timing
- The signal stability feature monitors when the mV response of the titration reaction stabilizes before providing the next titrant dose. This ensures reliable measurement values throughout the length of a titration.

Methods of analysis

Customizable methods
- The HI901C can store up to 100 user-defined or standard titration methods. Each method may be customized and optimized for performance based on application and user requirements.

Titration method support
- Onsite installation, training, and customization is available from one of our Applications or Service experts. Hanna offers continued support via phone or webinar for any questions you might have along the way.

Adaptable standard methods
- Our technical experts can program and customize standard methods developed by such affiliations as ISO, ASTM, AOAC, AOCS, EPA, and more directly onto your titrator. Ask our Sales Consultants which standard methods are possible with our HI901C system.

Burettes and dosing system

Exchangeable Burette System
- With Hanna's Clip-Lock burette, it only takes a few seconds to exchange titrants and reagents, preventing cross-contamination and saving time.

Multiple burette sizes
- The HI901C comes standard with a 25 mL burette but may be equipped with a 5 mL, 10 mL, or 50 mL burette.

Precision dosing pump
- Our unmatched 40,000 step piston driven pump is capable of dosing extremely small and precise volumes of titrant or reagent.

Data and storage

Customizable titration reports
- Each titration report is fully customizable so users can ensure they are storing and filing the appropriate data required for their application and procedures.

Flexible GLP management
- All necessary GLP (Good Laboratory Practice) information can be recorded with each sample.

Effortless data transfer
- Data can easily be transferred to a USB flash drive or PC with the Hanna HI900PC application software.

Connectivity and functionality

Multifunctional with four working modes
- The HI901C functions as a titrator, pH meter, mV/ORP meter, and ISE meter.

Multiple connections (HI901C2 only)
- The titrator offers device support for two analog boards, which allows two electrodes and two stirrers to be simultaneously connected to one unit.

Multiple peripherals
- Users can print reports directly from the titrator using a standard parallel printer. An external monitor and keyboard may be attached for added versatility, as well as an analytical balance for automatic sample mass entry for titrations.

Specifications		HI901C1	HI901C2
pH	Range	-2.0 to 20.0 pH; -2.00 to 20.00 pH; -2.000 to 20.000 pH	
	Resolution	0.1; 0.01; 0.001 pH	
	Accuracy (@25°C/77°F)	±0.001 pH	
	pH Calibration	up to five-point calibration, eight standard buffers and five custom buffers	
mV	Range	-2000.0 to 2000.0 mV	
	Resolution	0.1 mV	
	Accuracy (@25°C/77°F)	±0.1 mV	
	mV Calibration	single point offset	
ISE	Range	$1 \cdot 10^{-6}$ to $9.99 \cdot 10^{10}$	
	Resolution	1; 0.1; 0.01	
	Accuracy (@25°C/77°F)	±0.5% monovalent; ±1% divalent	
	ISE Calibration	up to five-point calibration, seven standard solutions and five user-defined standards	
Temperature	Range	-5.0 to 105.0°C; 23.0 to 221.0°F; 268.2 to 378.2 K	
	Resolution	0.1°C; 0.1°F; 0.1K	
	Accuracy (@25°C/77°F)	±0.1°C; ±0.2°F; ±0.1K, excluding probe error	
Additional Specifications	Analog Board(s) Each Analog Board Provides: (1) BNC (pH/mV/ISE) Input, (1) Reference Input, (1)Temperature Input, (1) Stirrer Input	1	2
	Analog Board(s) Capability	1	2
	Dosing Pump Capability	2	2
	Burette Included	1 (25 mL)	1 (25 mL)
	Burette Size Capability	5, 10, 25 and 50 mL	
	Burette Resolution	1/40000	
	Display Resolution	0.001 mL	
	Dosing Accuracy	±0.1% of full burette volume	
	GLP Conformity	instrumentation data storage and printing capabilities	
Ordering Information	**HI901C1-01** and **HI901C1-02** includes titrator with one analog board, overhead propeller stirrer with stand, 25 mL glass burette, dosing pump, temperature sensor, USB cable, USB flash drive and PC software. **HI901C2-01** and **HI901C2-02** includes titrator with two analog boards, overhead propeller stirrer with stand, 25 mL glass burette, dosing pump, temperature sensor, USB cable, USB flash drive and PC software.		
Reagent	**HI70456**	sodium hydroxide solution (0.1 N), 1 L	

Alkalinity in brewing

An essential parameter to measure in brewing water is total alkalinity. This is a measurement of the carbonate (CO_3), bicarbonate (HCO_3-), and hydroxyl (OH-) ions present in the water and influences the mash's ability to resist pH changes. While the recommended level of alkalinity varies a bit based on style, it is recommended to keep alkalinity at a value less than 100 ppm. For lighter beers will have a lower alkalinity, while darker beers will have a higher alkalinity.

Alkalinity Test Kit

The HI3811 is a chemical test kit that measures alkalinity by titration with hydrochloric acid. The HI3811 is supplied complete with all of the reagents and equipment necessary to perform approximately 110 tests.

Pre-made reagents for ease of use

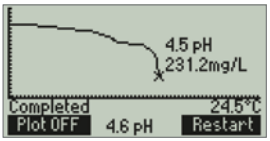
All reagents marked with expiration date and lot number for traceability

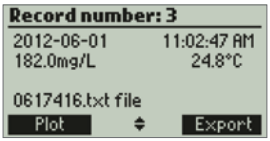
Manual titration performed with color indicator

Specifications	HI3811
Type	titration
Range	0 to 100 mg/L (ppm) $CaCO_3$; 0 to 300 mg/L (ppm) $CaCO_3$
Smallest Increment	1 mg/L (0 to 100 mg/L); 3 mg/L (0 to 300 mg/L)
Method	acid titration using phenolphthalein and bromophenol blue
Number of Tests	110 avg.
Ordering Information	**HI3811** test kit comes with 10 mL phenolpthalein indicator, 10 mL bromophenol blue indicator, 120 mL alkalinity titrant, 10 mL calibrated vessel, 50 mL calibrated vessel, and calibrated syringe with tip.
Reagent	**HI3811-100** Alkalinity (as $CaCO_3$), 110 tests avg

Titratable Alkalinity Titrator and pH Meter

The HI84531 is an easy to use, fast and affordable automatic mini titrator designed for testing titratable alkalinity levels in water. Based on an acid base titration method, this mini titrator uses an optimized pre-programmed method of analysis with a powerful algorithm that determines the completion of the titration reaction by the use of a glass body pH electrode.





Graphic mode

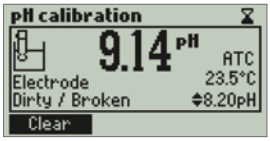
- Displays in-depth data during titration, including a real-time graph of the titration curve.

GLP features

- Date, time, offset, slope and buffers used

Log-on-demand

- Data logging of up to 400 samples: 200 titration results and 200 pH/mV readings. Data can be stored and exported to a USB drive or a PC using the USB connection.



CAL Check™

– Based on electrode response in the buffer, indicators are displayed on screen to alert the user of potential problems during calibration.

B
BNC

HI84531 includes HI1131B glass bodied pH electrode with BNC connector.

Specifications		HI84531
Titrator	Range (as $CaCO_3$)	Low Range: 30.0 to 400.0 mg/L; 0.6 to 8.0 meq/L High Range: 300 to 4000 mg/L; 6.0 to 80.0 meq/L
	Resolution	Low Range: 0.1 mg/L (ppm); 0.1 meq/L High Range: 1 mg/L (ppm); 1 meq/L
	Accuracy (@25°C/77°F)	Low Range: ±1 mg/L or 3% of reading, whichever is greater High Range: ±10 mg/L or 3% of reading, whichever is greater
	Method	acid-base titration (strong alkalinity /total alkalinity)
	Principle	endpoint titration : 8.30 pH (phenolphthalein) / 4.50 pH (bromcresol green-methyl red)
	Pump Volume	10 mL/min
	Stirring Speed	600 rpm
pH Meter	Range	-2.0 to 16.0 pH / -2.00 to 16.00 pH
	Resolution	0.1 pH / 0.01 pH
	Accuracy (@25°C/77°F)	± 0.01 pH
	Calibration	one, two or three-point calibration; four available buffers (4.01, 7.01, 8.30, 10.01)
mV Meter	Range	-2000.0 to 2000.0 mV
	Resolution	0.1 mV
	Accuracy (@25°C/77°F)	± 1.0 mV
Temperature	Range	-20.0 to 120.0°C; -4.0 to 248.0°F; 253.2 to 393.2 K
	Resolution	0.1°C; 0.1°F; 0.1 K
	Accuracy	±0.4°C; ±0.8°F; ±0.4 K
Ordering Information	**HI84531-01** (115V) and **HI84531-02** (230V) are supplied with HI1131B pH electrode, HI7662-T temperature probe, HI84531-70 reagent kit for water analysis, 100 mL beakers (2), dosing pump valve, 5 mL syringe, 1 mL plastic pipette, tube set (aspiration tube with titrant bottle cap and dispensing tube with tip), stir bar, power adapter, instruction manual and quality certificate.	
Reagents	**HI84531-50**	titrant solution for low range, 120 mL
	HI84531-51	titrant solution for high range, 120 mL
	HI84531-55	pump calibration standard, 230 mL

Sulfate in brewing

Some ions play a bigger role in the flavor and smells of beer, such as sulfate. Often used to highlight hop bitterness, sulfates produce a crisp, drier beer flavor. Sulfate is weakly alkaline and does not contribute much to the overall alkalinity. It should be noted, however, that while easy to add, sulfates are difficult to remove. In general, brewers can aim for a range of below 150 ppm for mild beers and upwards of 150 to 350 ppm for very bitter beers. When used in conjunction with chloride, it can make all the difference between a stout or an ale. For this reason, the ratio between sulfate and chloride makes a bigger impact than the measured amount.

Sulfate Portable Photometer

CAL Check™

- Allows for performance verification and calibration of the meter using NIST traceable standards

GLP

- Review of the last calibration date

Error messages

- Messages on display alerting to problems including no cap, high zero, and standard too low

Auto-shut off

- Automatic shut off after 10 minutes of non-use when the meter is in measurement mode

Battery status indicator

Specifications	HI96751 Sulfate	
Range	0 to 150 mg/L (ppm)	
Resolution	1 mg/L	
Accuracy @ 25°C (77°F)	±1 mg/L ±5% of reading	
Light Source	light emitting diode	
Light Detector	silicon photocell with narrow band interference filter @ 466 nm	
Method	adaptation of the turbidimetric method; sulfate is precipitated with barium chloride crystals and light absorbance of the suspension is measured	
Ordering Information	**HI96751** is supplied with sample cuvettes with caps (2), 9V battery, instrument quality certificate and instructions. CAL Check™ standards and testing reagents sold separately **HI96751C** includes photometer, CAL Check™ standards, sample cuvettes (2) with caps, 9V battery, scissors, cuvette wiping cloth, instrument quality certificate, instruction manual and rigid carrying case. Reagents sold separately	
Reagents and Standards	**HI96751-11**	CAL Check™ standard cuvettes
	HI93751-01	reagents for 100 tests
	HI93751-03	reagents for 300 tests

Sulfate Test Kits

The HI38000 is a chemical test kit that uses a turbidimetric method to measure sulfate. The HI38000 is supplied complete with all of the reagents and equipment necessary to perform approximately 100 tests.

Pre-made reagents for ease of use

All reagents marked with expiration date and lot number for traceability

Visual indicator for simple determination

Specifications	HI38000 Sulfate
Type	turbidimetric
Range	20 to 30 mg/L (ppm) SO_4^{2-}; 30 to 100 mg/L (ppm) SO_4^{2-}
Smallest Increment	5 mg/L (20 to 30 mg/L); 10 mg/L (30 to 100 mg/L)
Method	barium chloride
Number of Tests	100 avg.
Ordering Information	**HI38000** test kit comes with 100 packets sulfate reagent A, 53 g sulfate reagent B, 10 mL complexing agent, 50 mL glass test tube, 50 mL plastic vessel, 3 mL plastic pipette and spoon.
Reagent	**HI38000-10** sulfate, 100 tests avg.

Sulfate Test Kits

Low and High Range

The HI38001 is a chemical test kit that uses a titrimetric method to measure sulfate. The HI38001 is supplied complete with all of the reagents and equipment necessary to perform approximately 200 tests.

Pre-made reagents for ease of use

All reagents marked with expiration date and lot number for traceability

Manual titration performed with color indicator

Specifications	HI38001 Sulfate
Type	titration
Range	100 to 1000 mg/L (ppm) SO_4^{2-}; 1000 to 10000 mg/L (ppm) SO_4^{2-}
Smallest Increment	10 mg/L (100 to 1000 mg/L); 100 mg/L (1000 to 10000 mg/L)
Method	barium chloride
Number of Tests	200 avg.
Ordering Information	**HI38001** test kit comes with 100 packets sulfate reagent A (2 sets), 100 mL LR sulfate reagent B, 100 mL HR sulfate reagent B, 10 mL sulfate reagent C, 20 mL complexing agent, 30 mL sulfate solution, 50 mL plastic vessels (2) and 1 mL syringes (2).
Reagent	**HI38001-10** sulfate LR/HR, 100 tests avg.

Chlorine in brewing

Chlorine is an effective disinfectant that works by oxidizing the cellular membranes of microorganisms. As a result, chlorine is added to municipal water sources as a way to remove any organisms that could adversely affect your health. While chlorine is good for drinking water, it is not good for brewing as chlorine can cause off flavors and byproducts in beer. Additionally, chlorine can have a negative effect on reverse osmosis membranes used for filtration due to oxidation. A brewer should test the chlorine levels of their source water, aiming for a goal of zero ppm. A carbon filter can be installed to help remove any residual chlorine.

It should be noted that chlorine can be measured as free or total chlorine. Free chlorine refers only to unbound chlorine whereas total chlorine is the measurement of both bound and unbound forms. If chloramines are used in a water supply, often seen in municipal water sources, then a 'total chlorine' test is required.

Free Chlorine Handheld Colorimeter

Our handheld colorimeter is portable and easily carried anywhere you need

One-button operation makes getting your free chlorine results simple

Easy operation and direct results make measurement quick

Specifications	HI701
Range	0.00 to 2.50 ppm
Resolution	0.01 ppm
Accuracy @ 25°C/77°F	±0.03 ppm ±3% of reading
Light Source	LED @ 525 nm
Light Detector	silicon photocell
Method	adaptation of USEPA method 330.5, DPD method
Ordering Information	**HI701** Checker HC is supplied with sample cuvettes with caps (2), free chlorine reagent starter kit (reagents for 6 tests), battery, instructions and quick start guide.
Reagent Set	**HI701-25** (25 tests)
Calibration Set	**HI701-11**

Total Chlorine Handheld Colorimeter

Our handheld colorimeter is portable and easily carried anywhere you need

One-button operation makes getting your total chlorine results simple

Easy operation and direct results make measurement quick

Specifications	HI711
Range	0.00 to 3.50 ppm
Resolution	0.01 ppm
Accuracy @ 25°C/77°F	±0.03 ppm ±3% of reading
Light Source	LED @ 525 nm
Light Detector	silicon photocell
Method	adaptation of USEPA method 330.5, DPD method
Ordering Information	**HI711** Checker HC is supplied with sample cuvettes with caps (2), total chlorine reagent starter kit (reagents for 6 tests), battery, instructions and quick start guide.
Reagent Set	**HI711-25** (25 tests)
Calibration Set	**HI711-11**

Free and Total Chlorine Portable Photometer

CAL Check™
- Allows for performance verification and calibration of the meter using NIST traceable standards

GLP
- Review of the last calibration date

Error messages
- Messages on display alerting to problems including no cap, high zero, and standard too low

Auto-shut off

Battery status indicator

Specifications	HI96711 Free and Total Chlorine	
Range	**Chlorine, Free (P1)**	**Chlorine, Total (P2)**
	0.00 to 5.00 mg/L (ppm)	
Resolution	0.01 mg/L from 0.00 to 3.50 mg/L (ppm); 0.10 mg/L above 3.50 mg/L (ppm)	
Accuracy @ 25°C (77°F)	±0.03 mg/L ±3% of reading	
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 525 nm	
Method	adaptation of the USEPA method 330.5 and Standard Method 4500-Cl G	
Ordering Information	**HI96711** is supplied with sample cuvettes (2) with caps, 9V battery, instrument quality certificate and instruction manual. CAL Check™ standards and testing reagents sold separately **HI96711C** includes photometer, CAL Check™ standards, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case. Reagents sold separately	
Reagents and Standards	**HI96701-11**	CAL Check™ standard cuvettes (free Cl)
	HI93701-01	reagents for 100 tests (free Cl)
	HI93701-03	reagents for 300 tests (free Cl)
	HI96711-11	CAL Check™ standard cuvettes (total Cl)
	HI93711-01	reagents for 100 tests (total Cl)
	HI93711-03	reagents for 300 tests (total Cl)

Free and Total Chlorine and pH Portable Photometer

CAL Check™
- Allows for performance verification and calibration of the meter using NIST traceable standards

GLP
- Review of the last calibration date

Error messages
- Messages on display alerting to problems including no cap, high zero, and standard too low

Auto-shut off

Battery status indicator

Specifications		HI96710 Free and Total Chlorine and pH		
Parameter Specifications		**pH (P1)**	**Chlorine, Free (P2)**	**Chlorine, Total (P3)**
	Range	6.5 to 8.5 pH	0.00 to 5.00 mg/L (ppm)	
	Resolution	0.1 pH	0.01 mg/L under 3.50 mg/L; 0.10 mg/L above 3.50 mg/L	
	Accuracy @ 25°C (77°F)	±0.1 pH	±0.03 mg/L ±3% of reading	
Additional Specifications	Light Source	tungsten lamp		
	Light Detector	silicon photocell with narrow band interference filter @ 525 nm		
	Method	**pH:** phenol red method; **Chlorine:** adaptation of the EPA recommended DPD method		
Ordering Information	**HI96710** is supplied with sample cuvettes (2) with caps, 9V battery, instrument quality certificate and instruction manual. CAL Check™ standards and testing reagents sold separately **HI96710C** includes photometer, CAL Check™ standards, sample cuvettes (2) with caps, scissors, cuvette wiping cloth, 9V battery, instruction manual and rigid carrying case. Reagents sold separately			
Reagents and Standards	**HI96710-11**	CAL Check™ standard cuvettes (pH)		
	HI93710-01	reagents for 100 tests (pH)		
	HI93710-03	Reagents for 300 tests (pH)		
	HI96701-11	CAL Check™ standard cuvettes (free Cl)		
	HI93701-01	powder reagents for 100 tests (free Cl)		
	HI93701-03	powder reagents for 300 tests (free Cl)		
	HI96711-11	CAL Check™ standard cuvettes (total Cl)		
	HI93711-01	Reagents for 100 tests (total Cl)		
	HI93711-03	Reagents for 300 tests (total Cl)		

Free Chlorine Test Kit

Low and Medium Range with Checker® Disc

The HI38018 is supplied complete with all of the reagents and equipment necessary to perform the analysis, including the Checker disc for accurate determination than a color comparator cube. The test kit contains enough reagents to perform 200 tests.

Pre-made reagents for ease of use

All reagents marked with expiration date and lot number for traceability

Checker disc for more accurate determination

Specifications	HI38018 Free Chlorine
Type	checker disc
Range	0.00 to 0.70 mg/L (ppm); 0.0 to 3.5 mg/L (ppm)
Smallest Increment	0.02 mg/L (0.00 to 0.70 mg/L), 0.1 mg/L (0.0 to 3.5 mg/L)
Method	DPD
Number of Tests	200 avg.
Ordering Information	**HI38018** test kit comes with HI93701-0 free chlorine reagent (200 packets), demineralizer bottle with cap for 12 L, checker disc, glass vials with caps (2) and 3 mL plastic pipettes.
Reagent	**HI38018-200** free chlorine, 200 tests avg.

Free Chlorine Test Kit

The HI3831F is a chemical test kit that uses the DPD method to measure free chlorine. The HI3831F is supplied complete with all of the reagents and equipment necessary to perform approximately 50 tests.

Pre-made reagents for ease of use

All reagents marked with expiration date and lot number for traceability

Color comparison cube for simple determination

Specifications	HI3831F Free Chlorine
Type	colorimetric
Range	0.0 to 2.5 mg/L (ppm)
Smallest Increment	0.5 mg/L (ppm)
Method	DPD
Number of Tests	50 avg.
Ordering Information	**HI3831F** test kit comes with color comparison cube, 20 mL reagent 1 and 15 mL reagent 2.
Reagent	**HI3831F-050** free chlorine, 50 tests avg.

Total Chlorine Test Kit

The HI3831T is a chemical test kit that uses the DPD method to measure total chlorine. The HI3831T is supplied complete with all of the reagents and equipment necessary to perform approximately 50 tests.

Pre-made reagents for ease of use

All reagents marked with expiration date and lot number for traceability

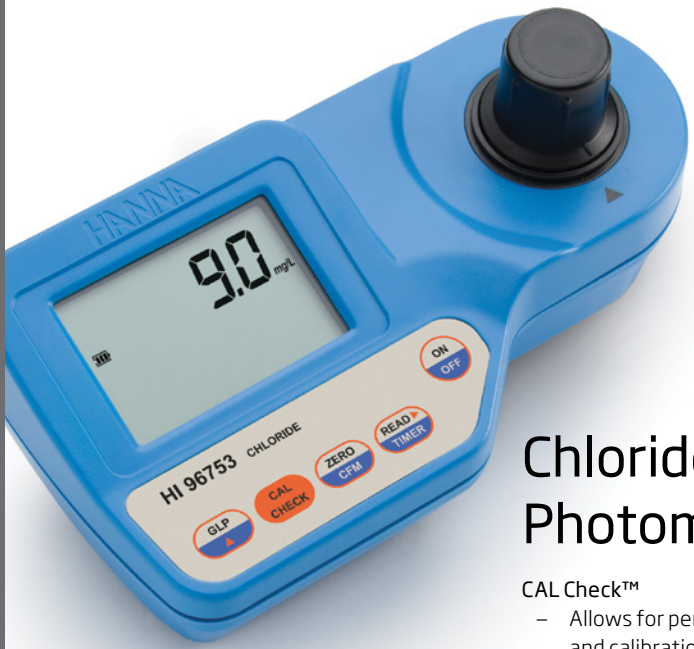
Color comparison cube for simple determination

Specifications	HI3831T Total Chlorine
Type	colorimetric
Range	0.0-2.5 mg/L (ppm)
Smallest Increment	0.5 mg/L (ppm)
Method	DPD
Number of Tests	50 avg.
Ordering Information	**HI3831T** test kits comes with color comparison cube, 20 mL chlorine reagent 1, 15 mL chlorine reagent 2 and 15 mL chlorine reagent 3
Reagent	**HI3831T-050** total chlorine, 50 tests avg.

Chloride in brewing

Opposite of sulfate, chloride helps accentuate the sweetness and imparts the feeling of a full body beer with better head retention and enhanced mouthfeel. Typical brewing ranges fall between 0 and 100 ppm. More than 250 ppm, the beer will have a salty taste and more than 300 ppm can affect yeast health and metabolism. It should be noted that chloride is not related to residual chlorine from disinfection techniques.


0,5l



Chloride Portable Photometer

CAL Check™

– Allows for performance verification and calibration of the meter using NIST traceable standards.

Specifications	HI96753 Chloride	
Range	0.0 to 20.0 mg/L (ppm)	
Resolution	0.1 mg/L	
Accuracy @ 25°C (77°F)	±0.5 mg/L ±6% of reading	
Light Source	light emitting diode	
Light Detector	silicon photocell with narrow band interference filter @ 466 nm	
Method	adaptation of the mercury (II) thiocyanate method	
Ordering Information	**HI96753** is supplied with sample cuvettes (2) with caps, 9V battery, instrument quality certificate and instruction manual. CAL Check™ standards and testing reagents sold separately **HI96753C** includes photometer, CAL Check™ standards, sample cuvettes (2) with caps, 9V battery, cuvette wiping cloth, instrument quality certificate, instruction manual and rigid carrying case. Reagents sold separately	
Reagents and Standards	**HI96753-11**	CAL Check™ standard cuvettes
	HI93753-01	reagents for 100 tests
	HI93753-03	reagents for 300 tests

Chloride Test Kit

The HI3815 is a chemical test kit that measures chloride by titration with mercuric nitrate. The HI3815 is supplied complete with all of the reagents and equipment necessary to perform approximately 110 tests.

Pre-made reagents for ease of use

All reagents marked with expiration date and lot number for traceability

Manual titration performed with diphenylcarbazone indicator

Specifications	HI3815 Chloride (as Cl^-)
Type	titration
Range	0-100 mg/L (ppm) 0-1000 mg/L (ppm)
Smallest Increment	1 mg/L (ppm) 10 mg/L (ppm)
Method	mercuric nitrate
Number of Tests	110 avg.
Ordering Information	**HI3815** test kit comes with 15 mL diphenylcarbazone indicator, 30 mL nitric acid solution, 120 mL mercuric nitrate solution, 50 mL calibrated vessel, 10 mL calibrated vessel, calibrated syringe with tip.
Reagent	**HI3815-100** Chloride, 110 tests avg

Chloride Hand-held Colorimeter

Our handheld colorimeter is portable and easily carried anywhere you need

One-button operation makes getting your total chlorine results simple

Easy operation and direct results make measurement quick

Specifications	HI753
Range	0.0 to 20.0 ppm
Resolution	0.1 ppm
Accuracy @ 25°C/77°F	± 0.5 ppm ± 6% of reading
Light Source	LED @ 470 nm
Light Detector	silicon photocell
Method	adaptation of the mercury(II) thiocyanate method
Ordering Information	**HI753** Checker®HC is supplied with sample cuvettes with caps (2), chloride reagent starter kit (reagents for 25 tests), syringes with tips (2), battery, instructions and quick start guide.
Reagent Set	**HI753-25** (25 tests)
Calibration Set	**HI753-11**

Glycol in brewing

While not a part of the beer making process, proper refrigeration, both storage and serving temperature, is vital to a good finished product. The proper temperature for storing and serving beer is 38°F, be it domestic or import, pasteurized or not. Beer that is too warm will cause excessive foaming, while beer kept too cold doesn't release enough carbonation and remains flat. Either way, improper temperature results in poor quality and loss of profits.

Beer cooling systems implement a separate chiller that uses the power of glycol to move beer further distances. Glycol is mixed with water to create a chilled mixture that is pumped from the glycol power pack or power packing system through the cooling lines that run parallel to the beer system lines. Both lines are kept cold by the internal moisture barrier in the trunk line and foil wrap nearby each glycol line. For a successful system, you need a 35% glycol, 65% water solution to prevent the pipes from freezing/busting or not cooling efficiently enough.

There are 2 main types of glycol used in refrigeration. Solutions composed of both ethylene glycol and propylene glycol will effectively lower the freezing point of water and for most applications can be used interchangeably or even as a mixture of the two. While they share similar chemical forms, propylene glycol is significantly less toxic and is favored over ethylene glycol in applications where human exposure can occur.

Glycol Digital Refractometers

0 to -50 °C Freezing Point Range with ±0.5 °C Accuracy

Dual-level LCD
- Displays measurement and temperature readings simultaneously

Easy measurement
- Place a few drops of the sample in the well and press the READ key

Quick, accurate results
- Readings are displayed in approximately 1.5 seconds

IP65 protection
- Built to perform under harsh conditions.

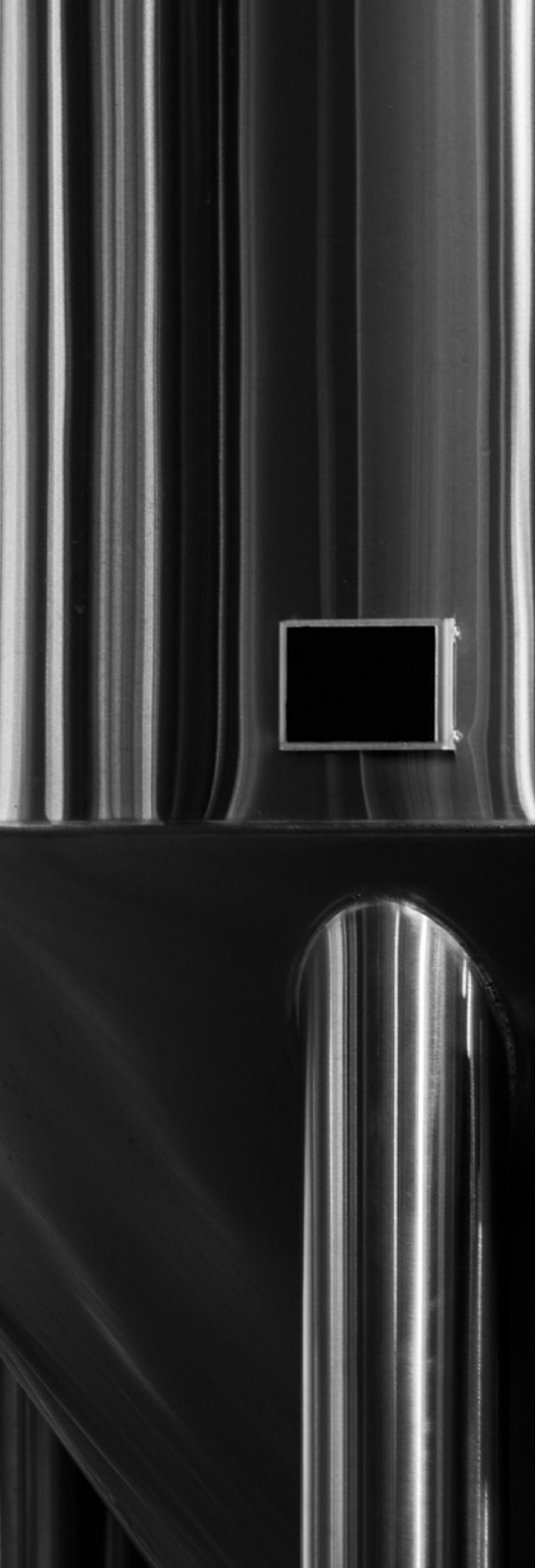
Single-point calibration
- Calibrate with distilled or deionized water

Small sample size
- Sample size can be as small as 2 metric drops

Automatic shut-off

Stainless steel sample well

Specifications		HI96831 Ethylene Glycol	HI96832 Propylene Glycol
% Volume (% v/v)	Range	0 to 100%	0 to 100%
	Resolution	0.1 %	0.1 %
	Accuracy (@25°C/77°F)	±0.2 %	±0.3 %
Freezing Point (FP)	Range	0 to -50°C (32 to -58°F)	0 to -51°C (32 to -59.8°F)
	Resolution	0.1°C (0.1 °F)	0.1°C (0.1 °F)
	Accuracy (@25°C/77°F)	±0.5°C (±1.0°F)	±0.5°C (±1.0°F)
Temperature	Range	0 to 80°C (32 to 176°F)	0 to 80°C (32 to 176°F)
	Resolution	0.1°C (0.1°F)	0.1°C (0.1°F)
	Accuracy (@25°C/77°F)	±0.3°C (±0.5°F)	±0.3°C (±0.5°F)
Ordering Information	**HI96831** is supplied with 9V battery and instruction manual. **HI96832** is supplied with 9V battery and instruction manual.		



Chemical Oxygen Demand (COD) in brewing

Testing the wastewater at any production site is paramount in ensuring water released into the waste stream meets the required standards. If the quality of the discharged wastewater, or effluent, does not meet predetermined standards, hefty fines can be issued by local, state, or federal regulatory agencies. In brewing, large amounts of organic waste are produced. Inorganic waste is also released during the necessary cleaning operations for safe and hygienic production facilities. Large influxes of organic and inorganic matter in wastewater treatment plants can overwhelm the plant and result in ineffective waste treatment or diversion of pollutants. To mitigate an overload into the municipal wastewater treatment plant from large levels of organic matter and other potential interferences, monitoring and pretreatment is sometimes required prior to discharge into the wastewater collection system. Biochemical oxygen demand (BOD) and chemical oxygen demand (COD) are both useful measurements in quantifying organic matter in water, but due to its faster turnaround time, COD is becoming more commonly measured during wastewater treatment.

Cuvette Adapter

– The HI83399 is supplied with a 16 mm cuvette adapter that accepts digestion vials.

Multiparameter Photometers with COD

with Digital pH Electrode Input

HI83399 and HI83314 are compact, multiparameter photometers with COD for measuring key water and wastewater quality parameters. With their digital pH/temperature electrode input, these meters double as a professional pH meter. Now one meter can be used for both photometric and pH measurements.

Advanced optical system

– Innovative optical design that utilizes a reference detector and focusing lens to eliminate errors from changes in the light source and from imperfections in the glass cuvette

Built-in reaction timer for photometric measurements

– The measurement is taken after the countdown timer expires. This ensures that all readings are taken at the appropriate reaction intervals regardless of user for better consistency in measurements

Result conversion

– Automatically convert readings to other chemical forms with the touch of a button

Absorbance mode

- Hanna's exclusive CAL Check cuvettes for validation of light source and detector.
- Allows for the user to plot concentration versus absorbance for a specific wavelength for use with user supplied chemistry or for teaching principles of photometry

Digital pH electrode input

- Measure pH and temperature with a single probe
- Good Laboratory Practice (GLP) to track calibration information including date, time, buffers used, offset and slope for traceability
- pH CAL Check alerts user to potential problems during the calibration process

Data logging

- Log and recall up to 1000 photometric and pH readings via dedicated LOG and RECALL buttons.
- Sample ID and User ID information can be added to a logged reading

Connectivity

- Logged readings can be transferred to a flash drive via USB or to a computer via micro-USB
- Data is exported as a .CSV file for use

Rechargeable battery

- Li-polymer rechargeable battery lasts for 500 measurements or 50 hours of pH measurement

Battery status indicator

Backlit 128 x 64 pixel graphic LCD display

General Specifications

Parameters	See table on page 78 and 79	
Measurement Channels	5 x optical channels; 1 x digital electrode channel (pH measurement)	
Absorbance	Range	0.000 to 4.000 Abs
	Resolution	0.001 Abs
	Accuracy	±0.003 Abs (at 1.000 Abs)
	Light Source	light-emitting diode
	Bandpass Filter Bandwidth	8 nm
	Bandpass Filter Wavelength Accuracy	± 1.0 nm
pH (from pH digital electrode)	Range	-2.00 to 16.00 pH (±1000 mV)*
	Resolution	0.01 pH (0.1 mV)
	Temperature Compensation	Automatic (-5.0 to 100.0°C; 23.0 to 212.0°F)*
Temperature	Range	-20 to 120°C (-4.0 to 248.0 °F)
	Resolution	0.1 °C (0.1 °F)
Ordering Information	**HI83399-01** (115V) and **HI83399-02** (230V) is supplied with sample cuvettes and caps (4 ea.), cloth for wiping cuvettes, USB to micro USB cable connector, power adapter and instruction manual. Reagents sold separately.	
	HI83314-01 (115V) and **HI83314-02** (230V) is supplied with sample cuvettes and caps (4 ea.), cloth for wiping cuvettes, USB to micro USB cable connector, power adapter and instruction manual. Reagents sold separately.	
Standards	**HI83399-11** CAL Check Cuvette Kit for HI83399	
	HI83314-11 CAL Check Cuvette Kit for HI83314	

Parameters

	HI83399	HI83314
Alkalinity	•	
Alkalinity, Marine	•	
Aluminum	•	
Ammonia Low Range	•	•
Ammonia Low Range (16 mm vial)	•	•
Ammonia Medium Range	•	•
Ammonia High Range	•	•
Ammonia High Range (16 mm vial)	•	•
Bromine	•	
Calcium	•	
Calcium, Marine	•	
Chloride	•	
Chlorine Dioxide	•	
Chlorine, Free	•	•
Chlorine, Free Ultra Low Range	•	
Chlorine, Total	•	•
Chlorine, Total Ultra Low Range	•	
Chlorine, Total Ultra High Range	•	
Chromium(VI) Low Range	•	
Chromium(VI) High Range	•	
COD Low Range (16 mm vial)	•	•
COD Medium Range (16 mm vial)	•	•
COD HR (16 mm vial)	•	•
Color of Water	•	
Copper Low Range	•	
Copper High Range	•	
Cyanuric Acid	•	
Fluoride Low Range	•	
Fluoride High Range	•	
Hardness, Calcium	•	
Hardness, Magnesium	•	
Hardness, Total Low Range	•	
Hardness, Total Medium Range	•	

	HI83399	HI83314
Hardness, Total High Range	•	
Hydrazine	•	
Iodine	•	
Iron Low Range	•	
Iron High Range	•	
Magnesium	•	
Manganese Low Range	•	
Manganese High Range	•	
Molybdenum	•	
Nickel Low Range	•	
Nickel High Range	•	
Nitrate	•	
Nitrate (16 mm vial)	•	•
Nitrite Ultra Low Range, Marine	•	
Nitrite Low Range	•	•
Nitrite High Range	•	•
Nitrogen, Total Low Range (16 mm vial)	•	•
Nitrogen, Total High Range (16 mm vial)	•	•
Oxygen, Dissolved	•	
Oxygen Scavengers (Carbohydrazide)	•	
Oxygen Scavengers (DEHA)	•	
Oxygen Scavengers (Hydroquinone)	•	
Oxygen Scavengers (Iso-ascorbic acid)	•	
Ozone	•	
pH (from method)	•	
Phosphate Ultra Low Range, Marine	•	
Phosphate Low Range	•	
Phosphate High Range	•	
Phosphorus Reactive Low Range (16 mm vial)	•	•
Phosphorus Reactive High Range (16 mm vial)	•	•

	HI83399	HI83314
Phosphorus Acid Hydrolyzable (16 mm vial)	•	•
Phosphorus, Total Low Range (16 mm vial)	•	•
Phosphorus, Total High Range (16 mm vial)	•	•
Potassium	•	

	HI83399	HI83314
Silica Low Range	•	
Silica High range	•	
Silver	•	
Sulfate	•	
Surfactants, Anionic	•	
Zinc	•	

COD Reactor for Digestion Vials

A COD reactor is used to heat the digestion vials. The digestion vials must be heated to a specific temperature for a period time making the HI839800 an important accessory required to have a complete wastewater treatment monitoring system.

COD Certified Standards and Reagents

Pre-dosed reagents for ease of use

Supplied with certificate of quality

Marked with expiration date and lot number for traceability

Each box of 25 vials is supplied with a Hanna certificate of quality.

Ordering Information	**HI93754B-25**	COD MR, 0 to 1500 mg/L dichromate EPA‡
	HI93754E-25	COD MR, 0 to 1500 mg/L, dichromate mercury-free°°
	HI93754C-25	COD HR, 0 to 15000 mg/L, dichromate
	HI93754-11	500 ppm COD standard, 500 mL bottle
	HI93754-12	14000 ppm COD standard, 500 mL bottle

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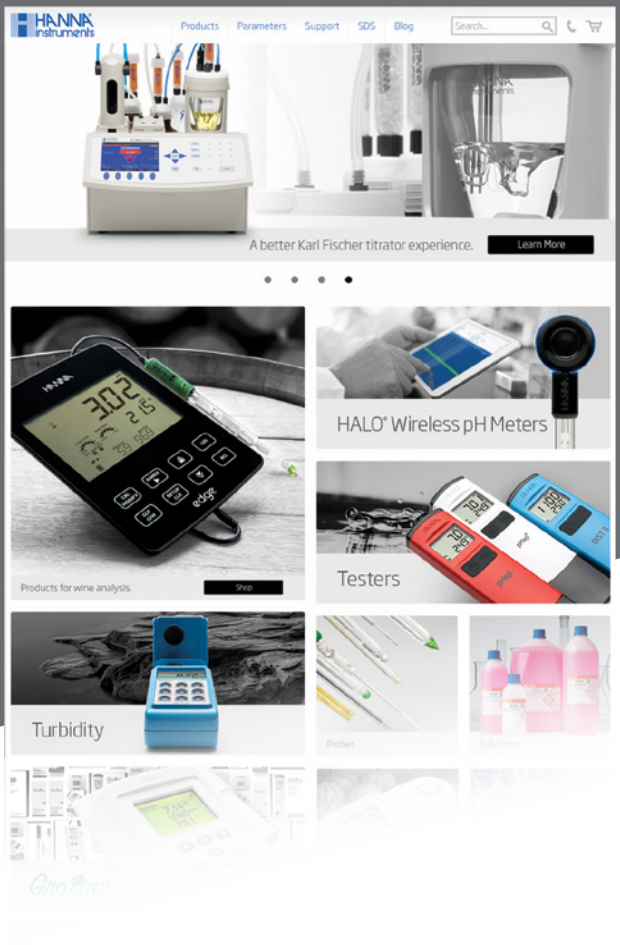

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