

Introduction10.2

Product Spotlights10.4

Comparison Guide10.6

Benchtop.....10.8

Laboratory10.10

Aquaculture10.11

Boiler and Cooling Tower10.12

Chemical Manufacturing10.13

Education10.14

Environmental10.15, 10.16

Greenhouses10.17, 10.18

Suction Lysimeter10.19

Pool and Spa10.20-10.23

Power Plant10.24

Pulp and Paper Mill10.25, 10.26

Wastewater10.27, 10.28

Water Conditioning10.29

Portable10.30

Single Parameter10.30

Multiparameter10.66

Reagents.....10.79

Standard Reagents.....10.79

CAL CHECK™ Reagents10.80

Wine Photometers10.81**Accessories10.88**



Light and Color

Before entering into colorimetry, we need to understand the relationship between light and color.

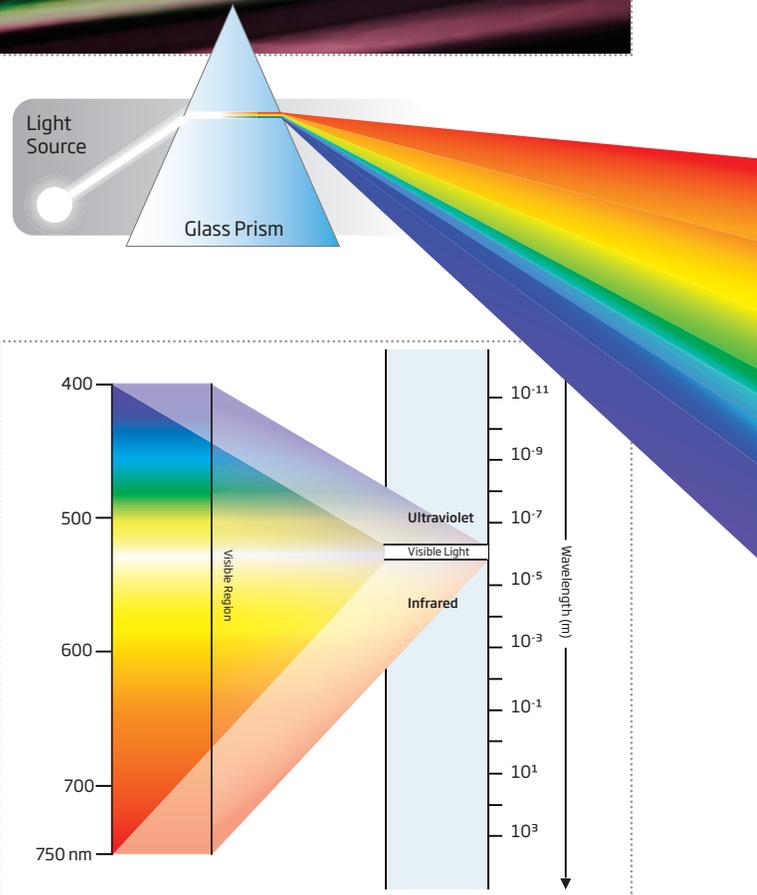
The simple answer is that colors are dependent on light. We do not actually see colors, what we see as color is the effect of light shining on an object. When white light shines on an object, it may be reflected, absorbed or transmitted. Glass transmits most of the light that comes into contact with it, thus it appears colorless. Snow reflects all of the light and appears white. A black cloth absorbs all light, and so appears black. A red piece of paper reflects red light better than it reflects other colors. Most objects appear colored because their chemical structure absorbs certain wavelengths of light and reflects others.

When we talk about light, we usually mean white light. A thin line of light is called a ray; a beam is made up of many rays of light. When white light passes through a prism (a triangular transparent object) the colors that make up white light disperse into seven bands of color. These bands of color are called a spectrum. Seven colors constitute white light: red, orange, yellow, green, blue, indigo, and violet. In any spectrum, the bands of color are always organized in this order from left to right.

The variation of the color of a system with change in concentration of some component is the basis of colorimetric analysis.

Suppose we shine a beam of white light at a substance that absorbs blue light. Since the blue component of the white light gets absorbed by the substance, the light that is transmitted is mostly yellow, the complementary color of blue. This yellow light reaches our eyes, and we "see" the substance as a yellow colored substance.

Wavelength (nm)	Color Absorbed	Color observed
400	Violet	Yellow-green
435	Blue	Yellow
495	Green	Purple
560	Yellow	Blue
650	Orange	Greenish blue
800	Red	Bluish green



Colorimetry

Colorimetry is simply the measurement of color. Colorimetry is concerned with the determination of the concentration of a substance by measurement of the relative absorption of light with respect to a known concentration of the substance. In visual colorimetry, natural or artificial white light is generally used as a light source, and determinations are usually made with a simple instrument termed a colorimeter, or color comparator. When the eye is replaced by a photoelectric cell the instrument is termed photoelectric colorimeter.

A colorimetric analysis is based on the principle that many substances react with each other and form a color which can indicate the concentration of the substance to be measured. When a substance is exposed to a beam of light of intensity I_0 , a portion of the radiation is absorbed by the substance's molecules and a radiation of intensity I lower than I_0 is emitted.

The quantity of radiation absorbed is given by the Beer-Lambert Law: $A = \log \frac{I_0}{I}$

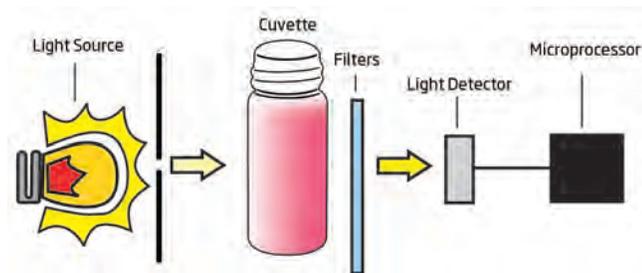
Absorbance is also given by: $A = \epsilon_\lambda \cdot C \cdot l$

where:

- A** is a dimensionless number
- ϵ_λ the proportionality constant, is called the molar extinction coefficient or molar absorptivity; it is a constant for a given substance, provided the temperature and wavelength are constant (liter/mol · cm)
- C** concentration of the substance (mol/liter)
- l** optical distance light travels through sample (cm)

Therefore, the concentration (C) can be calculated from the absorbance of the substance determined by the emitted radiation (I), as the other factors are known.

A typical block diagram of a photometer is shown below:



Sources of light used by HANNA colorimeters:

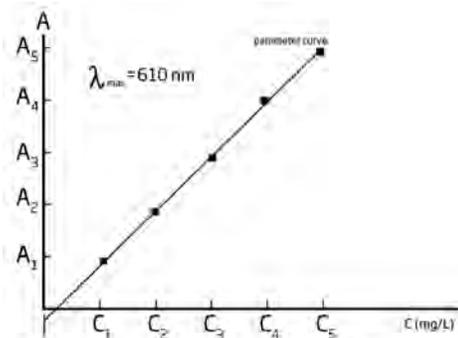
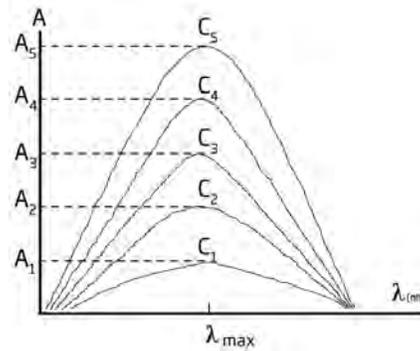
- Tungsten lamp** an incandescent lamp having tungsten filaments
- LED** light emitting diode

The optical distance is measured by the dimension of the cuvette containing the sample. The photoelectric cell collects the radiation (I) emitted by the sample and converts it into an electric current, producing a potential in the mV range. The microprocessor uses this potential to convert the incoming value into the desired measuring unit and to display it on the LCD.

In fact, the preparation of the solution to be measured occurs under known conditions, which are programmed into the meter's microprocessor in the form of a calibration curve. This curve is used as a reference for each measurement. It is then possible to determine unknown concentrations of a sample by inducing a colorimetric reaction, and thus obtain the mV related to the emitted

intensity (I) (the color of the sample). By employing the calibration curve, one can determine the concentration of the sample that corresponds to the mV value.

Supposing that for one chemical substance we have one maximum absorbance at 610 nm. On the following you have one example of how the colorimeters are working:



One example of an early colorimetric analysis is Nessler's method for ammonia, which was first proposed in 1856. Nessler found that adding an alkaline solution of HgI₂ and KI to a dilute solution of ammonia produced a yellow to reddish brown colloid with the color determined by the concentration of ammonia. A comparison of the sample's color for a series of standards was used to determine the concentration of ammonia. Equal volumes of the sample and standards were transferred to a set of tubes with flat bottoms. The tubes were placed in a rack equipped at the bottom with a reflecting surface, allowing light to pass through the solution. The colors of the samples and standards were compared by looking down through the solutions. Until recently, a modified form of this method was listed as a standard method for the analysis of ammonia in water and wastewater.



HI 83200

Multiparameter Photometer for Laboratories

10.10

HI 83200 is one of the most versatile photometers on the market. Just one meter measures up to 44 of the most important water quality parameters.

HI 83200 has a powerful interactive user support that assists the user during the analysis process. A full tutorial is available in the Setup Menu, and the Help Menu provides assistance for every step in the measurement process. This meter can be connected to a PC via a USB cable, where the data can be managed with optional HI 92000 Windows® compatible software.

ADP
Application Designed Photometers



HI 83203

Multiparameter Photometer for Aquaculture

10.11

With the ever increasing depletion of fish stocks in the open seas, aquaculture has gained prominence and can prove essential to our future dietary needs. Monitoring and controlling parameters such as the oxygen level as well as pH and nitrate content in water is vital in ensuring profitable fish production.

Accurate control can prevent disease, increase production and even reduce the premiums on crop insurance. Research personnel, fish farm operators and wildlife specialists now have one compact and easy to use meter to keep a close tab on the most important parameters in aquaculture.

HI 83203 is a multiparameter bench meter that measures thirteen methods essential for aquaculture analysis. It has four channels allowing for a wide range of tests.

ADP
Application Designed Photometers



HI 83226

Multiparameter Photometer for Pools and Spas

10.22

In order to achieve ideal water conditions, swimming pool water requires testing on a daily and sometimes hourly basis for disinfection of residuals and maintaining pH levels. Equally important, calcium hardness and alkalinity levels should be monitored weekly to ensure the pool water is well balanced, thus to avoid corrosion and scale formation.

HI 83226 is a multiparameter bench meter that measures nine parameters essential for advanced pool and spa water analysis.

ADP
Application Designed Photometers





HI 96771

Chlorine, Free Ultra High Range Portable Photometer

10.38

HI 96771 has been developed to check chlorine dosing in disinfection processes with ultra high concentrations of chlorine. Thanks to the extended range from 0 to 500 mg/L (ppm), it is ideal for the food industry, such as in fruit and vegetable washing.

The HI 96771 meter measures the free chlorine (Cl_2) content in water samples and chlorine ultra high range. The methods are an adaptation of Standard Methods for the Examination of Water and Wastewater, 20th edition, 4500-Cl.



HI 96713

Phosphate LR Portable Photometers

10.59

Phosphates are particularly important for the growth and development of plant roots, and hence are one of the most common fertilizers used in agriculture.

Phosphates are also utilized in detergents and are needed, in small quantities, for heating systems. However, high concentrations of phosphates can cause environmental pollution: they are for example a primary cause of eutrophication.

For these reasons, it is necessary to closely monitor the phosphate levels present in both municipal and industrial waste water.

The HI 96713 meter measures phosphate (PO_4^{3-}) content in water, wastewater and seawater in the 0.00 to 2.50 mg/L (ppm) range.



HI 96725

Chlorine, Cyanuric Acid and pH Photometer

10.70

Legionella species is the agent that causes human Legionnaires' disease as well as the lesser form, Pontiac Fever. Transmission is facilitated by the inhalation of mist droplets containing the Legionella bacteria.

The HI 96725 measures four parameters that are crucial in monitoring for preventive maintenance or disinfection.

Multiparameter Benchtop Photometers

Guide	HI 83200	HI 83203	HI 83205	HI 83211	HI 83209	HI 83218	HI 83206	HI 83225	HI 83215	HI 83226	HI 83216	HI 83212	HI 83210	HI 83207	HI 83213	HI 83208
Aluminum	•		•	•									•	•	•	
Alkalinity	•									•	•					
Ammonia	•	•	•	•	•	•	•	•	•			•			•	•
Bromine	•		•							•					•	
Calcium	•							•								
Chlorine Dioxide	•		•										•			
Chlorine	•	•	•		•		•			•	•	•	•	•	•	•
Chromium VI	•		•	•	•	•	•								•	•
Color of Water	•				•		•						•	•	•	•
Copper	•	•	•	•	•		•			•		•		•	•	•
Cyanuric Acid	•			•			•			•	•			•		
Fluoride	•															•
Hardness	•									•	•					
Honey																
Hydrazine	•		•									•				
Iodine	•			•											•	
Iron	•		•	•						•						•
Magnesium	•							•								
Manganese	•													•		•
Maple Syrup																
Molybdenum	•		•	•			•					•		•	•	•
Nickel	•			•			•							•	•	•
Nitrate	•	•	•		•	•	•	•	•					•	•	•
Nitrite	•	•	•		•	•	•								•	
Nitrogen																
Oxygen, Dissolved	•	•	•		•		•						•	•	•	•
Ozone	•									•						
pH	•	•	•	•	•		•			•	•	•	•	•	•	•
Phosphate	•	•	•	•	•		•					•	•	•	•	•
Phosphorus	•			•	•	•	•	•	•			•		•	•	•
Potassium	•							•	•							
Silica	•		•	•	•		•					•	•		•	•
Silver	•			•	•		•					•	•	•	•	•
Sulfate	•							•								
Zinc	•		•	•	•		•						•	•		•
Page	10.10	10.11	10.12	10.13	10.14	10.15	10.16	10.17	10.18	10.22	10.23	10.24	10.26	10.27	10.28	10.29

Multiparameter Portable Photometers

Guide	HI 96101	HI 96104	HI 96710	HI 96724	HI 96725	HI 96734	HI 96736	HI 96741	HI 96742	HI 96743	HI 96744	HI 96745	HI 96752
Bromine	•												
Calcium HR													•
Chlorine, Free	•	•	•	•	•							•	
Chlorine, Free HR						•							
Chlorine, Total	•	•	•	•	•							•	
Chlorine, Total HR						•							
Cyanuric Acid	•	•			•								
Hardness, Ca							•				•	•	
Hardness, Mg							•				•	•	
Hardness, Total							•	•			•	•	
Iodine	•												
Iron LR	•							•	•	•	•	•	
Magnesium HR													•
Manganese LR									•				
pH	•	•	•		•		•			•	•	•	
Potassium LR													
Potassium MR													
Page	10.66	10.67	10.68	10.69	10.70	10.71	10.72	10.73	10.74	10.75	10.76	10.77	10.78

Single Parameter Portable Photometers

PARAMETER	METER	PAGE
Aluminum	HI 96712	10.31
Ammonia LR	HI 96700	10.32
Ammonia MR	HI 96715	10.32
Ammonia HR	HI 96733	10.32
Anionic Surfactants	HI 96769	10.33
Bromine	HI 96716	10.34
Chloride	HI 96753	10.35
Chlorine Dioxide	HI 96738	10.36
Chlorine, Free	HI 96701	10.37
Chlorine, Free LR	HI 96762	10.37
Chlorine, Free and UHR	HI 96771	10.38
Chlorine, Free and Total	HI 96711	10.39
Chlorine, Total LR	HI 96761	10.39
Chromium VI LR	HI 96749	10.40
Chromium VI HR	HI 96723	10.40
Color of Water	HI 96727	10.41
Copper LR	HI 96747	10.42
Copper HR	HI 96702	10.42
Cyanide	HI 96714	10.43
Cyanuric Acid	HI 96722	10.44
Fluoride LR	HI 96729	10.45
Fluoride HR	HI 96739	10.45
Hardness, Ca	HI 96720	10.46
Hardness, Mg	HI 96719	10.46
Hardness, EPA	HI 96735	10.47
Honey Color	HI 96785	10.48
Hydrazine	HI 96704	10.49
Iodine	HI 96718	10.50
Iron LR	HI 96746	10.51
Iron HR	HI 96721	10.51

PARAMETER	METER	PAGE
Manganese LR	HI 96748	10.52
Manganese HR	HI 96709	10.52
Maple Syrup	HI 96759, HI 96760	10.53
Molybdenum	HI 96730	10.54
Nickel LR	HI 96740	10.55
Nickel HR	HI 96726	10.55
Nitrate, as Nitrogen	HI 96728	10.56
Nitrate	HI 96786	10.56
Nitrite LR	HI 96707	10.57
Nitrite HR	HI 96708	10.57
Oxygen, Dissolved	HI 96732	10.58
Phosphate LR	HI 96713	10.59
Phosphate HR	HI 96717	10.59
Phosphorus	HI 96706	10.60
Potassium	HI 96750	10.61
Silica	HI 96705	10.62
Silica HR	HI 96770	10.62
Silver	HI 96737	10.63
Sulfate	HI 96751	10.64
Zinc	HI 96731	10.65
Blood Plasma	HI 95765	10.79

Wine and Olive Oil Measurement Photometers

Copper in Wine	HI 83740	10.82
Iron in Wine	HI 83741	10.83
Color and Total Phenols in Wine	HI 83742	10.84
Concentration of Reducing Sugars	HI 83746	10.86
Tartaric Acid in Wine	HI 83748	10.87
Peroxide in Olive Oils	HI 83730	10.88

Multiparameter Bench Photometers

Introduction

- Up to 45 measurement methods
- Light blocking cuvette holder
- Backlit LCD
- BEPS
(Battery Error Prevention System) Alerts users in the event a low battery could effect readings
- PC compatible via USB
- Powered by rechargeable batteries or 12 VDC
- Save and recall logged data at the touch of a button.
- On-screen tutorial
With the tutorial function enabled, short guides relating to current operation are displayed.
- HELP button
Screen specific help can viewed at the touch of a button.
- Method selection
Users can easily select parameters via the Method button.
- Setup button
Instrument preferences such as backlight intensity and screen contrast can be changed via the setup button.



The new series of HI 83xxx benchtop photometers from HANNA offers all the features from our previous popular series plus many upgrades and improvements that make these instruments much more versatile and easy to use.

These instruments have been redesigned to accommodate more sophisticated optical systems, resulting in greater reproducibility. These new casings feature a cuvette compartment door that will eliminate external light disturbances.

These photometers also feature a graphic, backlit LCD which clearly displays the method selection. Each method's measuring procedure is shown on the LCD taking the user step by step through the process. At any stage in the measurement process or during setup, context sensitive help can be displayed by pressing the help button. Additionally, the help screen also lists the required reagent sets, accessories and customer support contact information. All these features are available in a user selectable language.

Each HANNA photometer eliminates confusion by automatically converting readings to other chemical forms. Common conversions are available at the touch of a button



GENERAL ACCESSORIES

HI 731318	Cloth for wiping cuvettes (4 pcs)
HI 731321	Glass cuvettes (4 pcs)
HI 731325W	New cap for cuvette (4 pcs)
HI 740034P	Cap for 100 mL beaker (10 pcs)
HI 740036P	100 mL plastic beaker (10 pcs)
HI 740038	60 mL glass bottle and stopper
HI 740142	1 mL graduated syringe
HI 740143	1 mL graduated syringe (6 pcs)
HI 740144	Pipette tip (6 pcs)
HI 740155	Plastic pipette (20 pcs)
HI 740220	25 mL glass cylinder with caps (2 pcs)
HI 740223	170 mL plastic beaker
HI 740224	170 mL plastic beaker (12 pcs)
HI 740225	60 mL graduated syringe
HI 740226	5 mL graduated syringe
HI 740227	Filter assembly
HI 740228	Filter disc (25 pcs)
HI 740229	100 mL graduated cylinder
HI 740230	230 mL Demineralized water
HI 92000	Windows® Compatible Software
HI 920013	USB cable for PC connection
HI 93703-50	Cuvette cleaning solution, 230 mL
HI 93703-54	Dried resin (100 g)
HI 93703-55	Activated Carbon (50 pcs)

GENERAL SPECIFICATIONS FOR ALL MODELS

Light Source	up to 5 tungsten lamps with different narrow band interference filters. (see above for operating wavelengths according to methods.)
Light Detector	silicon photocell
Environment	0 to 50°C (32 to 122°F); max 90% RH non-condensing
Power Supply	external 12 VDC power adapter or built-in rechargeable battery
Dimensions	235 x 200 x 110 mm (9.2 x 7.87 x 4.33")
Weight	0.9 Kg (2 lbs.)



Application Designed Photometers

Since 1978, HANNA has introduced instruments tailored to the needs of a specific application or industry.

From this philosophy we have created **Application Designed Photometers** to satisfy the needs of your specific application or industry.

Aquaculture	HI 83203
Boilers & Cooling Towers	HI 83205
Chemical Manufacturers	HI 83211
Education	HI 83209
Environmental Apps	HI 83218
Environmental Testing	HI 83206
Honey Color Analysis	HI 83221
Laboratories	HI 83200
Laboratories, with COD	HI 83099
Nutrient Analyses	HI 83215
Pool and Spa Applications	HI 83216
Pool and Spa Applications	HI 83226
Power Plant Utilities	HI 83212
Pulp & Paper Mills	HI 83210
Wastewater Analysis	HI 83214
Wastewater Analysis	HI 83224
Wastewater, Industrial	HI 83207
Wastewater, Municipal	HI 83213
Water Conditioning	HI 83208

Narrow band Interference filter wavelengths

Aluminum	525 nm	Fluoride	575 nm	Nitrite LR	525 nm
Alkalinity	575 nm	Calcium Hardness	525 nm	Oxygen, Dissolved	420 nm
Ammonia MR	420 nm	Mg Hardness	525 nm	Ozone	525 nm
Ammonia LR	420 nm	Hydrazine	420 nm	pH	525 nm
Bromine	525 nm	Iodine	525 nm	Phosphate HR	525 nm
Calcium	466 nm	Iron HR	525 nm	Phosphate LR	610 nm
Chlorine, Free	525 nm	Iron LR	575 nm	Phosphorus	525 nm
Chlorine, Total	525 nm	Magnesium	466 nm	Potassium HR	610 nm
Chlorine Dioxide	575 nm	Manganese HR	525 nm	Potassium MR	610 nm
Chromium VI HR	525 nm	Manganese LR	575 nm	Potassium LR	610 nm
Chromium VI LR	525 nm	Molybdenum	420 nm	Silica	610 nm
Color of Water	420 nm	Nickel HR	575 nm	Silver	575 nm
Copper HR	575 nm	Nickel LR	575 nm	Sulfate	466 nm
Copper LR	575 nm	Nitrate	525 nm	Zinc	575 nm
Cyanuric Acid	525 nm	Nitrite HR	575 nm		



Cuvette holder with door

The cuvette cover aids in stopping stray light from effecting measurements.

HI 83200

Multiparameter Photometer for Laboratories

HI 83200 is one of the most versatile photometers on the market. Just one meter measures up to 44 methods critical to analyzing water quality.

The optical system of HI 83200 is based on special subminiature tungsten lamps and narrow-band interference filters to guarantee both high performance and reliable results.

HI 83200 has a powerful interactive user support that assists the user during the analysis process. A full tutorial is available in the Setup Menu, and the Help Menu provides assistance for every step in the measurement process. This meter can be connected to a PC via a USB cable, where the data can be managed with optional HI 92000 Windows® compatible software.



ORDERING INFORMATION

HI 83200-01 (115V), HI 83200-02 (230V) and HI 83200-03 (AUS plug) is supplied with sample cuvettes and caps (4 ea.), sample preparation kit, cloth for wiping cuvettes, 60 mL glass bottle for dissolved oxygen analysis, scissors, AC/DC power adapter, instruction manual.

HI 83200-100 sample preparation kit contains 10 mL cuvettes (4) with caps, 100 mL plastic beaker, 170 mL plastic beaker, 100 mL graduated cylinder, 60 mL syringe with screw rim, 5 mL syringe, funnel, filter discs (25), spoon, pipettes (2), carbon powder packets (50), demineralizer bottle with filter cap for approximately 12 liters of deionized water (dependant on hardness of water to be tested).

TEST	RANGE	METHOD	REAGENT CODE†
Alkalinity	0 to 500 mg/L (ppm) as CaCO ₃	EDTA Colorimetric	HI 93755-01
Aluminum	0.00 to 1.00 mg/L (ppm)	Aluminon	HI 93712-01
Ammonia MR	0.00 to 10.00 mg/L (ppm)	Nessler	HI 93715-01
Ammonia LR	0.00 to 3.00 mg/L (ppm)	Nessler	HI 93700-01
Bromine	0.00 to 8.00 mg/L (ppm)	DPD	HI 93716-01
Calcium	0 to 400 mg/L (ppm)	Oxalate	HI 937521-01**
Chlorine Dioxide	0.00 to 2.00 mg/L (ppm)	Chlorophenol Red	HI 93738-01
Chlorine*, Free	0.00 to 2.50 mg/L (ppm)	DPD	HI 93701-01
Chlorine*, Total	0.00 to 3.50 mg/L (ppm)	DPD	HI 93711-01
Chromium VI HR	0 to 1000 µg/L	Diphenylcarbohydrazide	HI 93723-01
Chromium VI LR	0 to 300 µg/L	Diphenylcarbohydrazide	HI 93749-01
Color of Water	0 to 500 PCU	Colorimetric Platinum Cobalt	-
Copper HR	0.00 to 5.00 mg/L (ppm)	Bicinchoninate	HI 93702-01
Copper LR	0 to 1000 µg/L	Bicinchoninate	HI 95747-01
Cyanuric Acid	0 to 80 mg/L (ppm)	Turbidimetric	HI 93722-01
Fluoride	0.00 to 2.00 mg/L (ppm)	SPADNS	HI 93729-01
Hardness, Calcium	0.00 to 2.70 mg/L (ppm) (as CaCO ₃)	Calmagite	HI 93720-01
Hardness, Magnesium	0.00 to 2.00 mg/L (ppm) (as CaCO ₃)	EDTA Colorimetric	HI 93719-01
Hydrazine	0 to 400 µg/L	p-Dimethylaminobenzaldehyde	HI 93704-01
Iodine	0.0 to 12.5 mg/L (ppm)	DPD	HI 93718-01
Iron HR	0.00 to 5.00 mg/L (ppm)	Phenantroline	HI 93721-01
Iron LR	0 to 400 µg/L	TPTZ	HI 93746-01**
Magnesium	0 to 150 mg/L (ppm)	Calmagite	HI 937520-01**
Manganese HR	0.0 to 20.0 mg/L (ppm)	Periodate	HI 93709-01
Manganese LR	0 to 300 µg/L	PAN	HI 93748-01**
Molybdenum	0.0 to 40.0 mg/L (ppm)	Mercaptoacetic Acid	HI 93730-01
Nickel HR	0.00 to 7.00 g/L	Photometric	HI 93726-01
Nickel LR	0.000 mg/L to 1.000 mg/L (ppm)	PAN	HI 93740-01**
Nitrate	0.0 to 30.0 mg/L (ppm)	Cadmium Reduction	HI 93728-01
Nitrite HR	0 to 150 mg/L (ppm)	Ferrous Sulfate	HI 93708-01
Nitrite LR	0 to 1.15 mg/L (ppm)	Diazotization	HI 93707-01
Oxygen, Dissolved (DO)	0.0 to 10.0 mg/L (ppm)	Winkler	HI 93732-01
Ozone	0.00 to 2.00 mg/L (ppm)	DPD	HI 93757-01
pH	6.5 to 8.5 pH	Phenol Red	HI 93710-01
Phosphate HR	0.0 to 30.0 mg/L (ppm)	Amino Acid	HI 93717-01
Phosphate LR	0.00 to 2.50 mg/L (ppm)	Ascorbic Acid	HI 93713-01
Phosphorus	0.0 to 15.0 mg/L (ppm)	Amino Acid	HI 93706-01
Potassium HR	20 to 200 mg/L (ppm)	Turbidimetric Tetraphenylborate	HI 93750-01
Potassium MR	10 to 100 mg/L (ppm)	Turbidimetric Tetraphenylborate	HI 93750-01
Potassium LR	0.0 to 20.0 mg/L (ppm)	Turbidimetric Tetraphenylborate	HI 93750-01
Silica	0.00 to 2.00 mg/L (ppm)	Heteropoly blue	HI 93705-01
Silver	0.000 to 1.000 mg/L (ppm)	PAN	HI 93737-01**
Sulfate	0 to 100 mg/L (ppm)	Turbidimetric	HI 93751-01
Zinc	0.00 to 3.00 mg/L (ppm)	Zincon	HI 93731-01

Reagents are available in liquid or powder form, and the amount of each reagent is precisely dosed to ensure maximum repeatability.
 † Unless noted otherwise, all reagent codes ending with -01 are for 100 tests. Replace the -01 with -03 for 300 tests.
 * For Chlorine, liquid reagents are available. ** Reagents for 50 tests, replace -01 for -03 for 150 tests

For a complete list of Reagents, see Reagents Section 18.

Multiparameter Photometer for Aquaculture



With the ever increasing depletion of fish stocks in the open seas, aquaculture has gained prominence and can prove essential to our future dietary needs. Monitoring and controlling parameters such as the oxygen level as well as pH and nitrate content in water is vital in ensuring profitable fish production.

Accurate control can prevent disease, increase production and even reduce the premiums on crop insurance. Research personnel, fish farm operators and wildlife specialists now have one compact and easy to use meter to keep a close tab on the most important parameters in aquaculture.

HI 83203 is a multiparameter bench meter that measures thirteen methods essential for aquaculture analysis. It has four channels allowing for a wide range of tests.

The optical system of HI 83203 is based on special subminiature tungsten lamps and narrow-band interference filters to guarantee both high performance and reliable results.

HI 83203 has a powerful interactive user support that assists the user during the analysis process. A full tutorial is available in the Setup Menu, and the Help Menu provides assistance for every step in the measurement process. This meter can be connected to a PC via a USB cable, where the data can be managed with optional HI 92000 Windows® compatible software.

TEST	RANGE	METHOD	REAGENTS [†]
Ammonia LR	0.00 to 3.00 mg/L (ppm)	Nessler	HI 93700-01
Ammonia MR	0.00 to 10.00 mg/L (ppm)	Nessler	HI 93715-01
Chlorine free*	0.00 to 2.50 mg/L (ppm)	DPD	HI 93701-01
Chlorine total*	0.00 to 3.50 mg/L (ppm)	DPD	HI 93711-01
Copper HR	0.00 to 5.00 mg/L (ppm)	Bicinchoninate	HI 93702-01
Copper LR	0 to 1000 µg/L	Bicinchoninate	HI 95747-01
Nitrate	0.0 to 30.0 mg/L (ppm)	Cadmium Reduction	HI 93728-01
Nitrite HR	0 to 150 mg/L (ppm)	Ferrous Sulfate	HI 93708-01
Nitrite LR	0.00 to 1.15 mg/L (ppm)	Diazotization	HI 93707-01
Oxygen, Dissolved (DO)	0.0 to 10.0 mg/L (ppm)	Winkler	HI 93732-01
pH	6.5 to 8.5 pH	Phenol Red	HI 93710-01
Phosphate HR	0.0 to 30.0 mg/L (ppm)	Amino Acid	HI 93717-01
Phosphate LR	0.00 to 2.50 mg/L (ppm)	Ascorbic Acid	HI 93713-01

Reagents are available in liquid or powder form, and the amount of each reagent is precisely dosed to ensure maximum repeatability.

[†] Unless noted otherwise, all reagent codes ending with -01 are for 100 tests. Replace the -01 with -03 for 300 tests.

* For Chlorine measurements, liquid reagents are available

For a complete list of Reagents, see Reagents Section 18.

ADP 13
Application Designed Photometers methods



ORDERING INFORMATION

HI 83203-01 (115V) and HI 83203-02 (230V) are supplied with sample cuvettes and caps (2 ea.), cloth for wiping cuvettes, 60 mL glass bottle for dissolved oxygen analysis, scissors, AC/DC power adapter, and instruction manual.

HI 83205

Multiparameter Photometer for Boilers and Cooling Towers

HI 83205 is a multiparameter bench meter that measures twenty-four methods essential for monitoring boiling and cooling towers. It has four channels allowing for a wide range of tests.

With just one unit, technicians can keep an eye on 24 methods needed for proper and efficient functioning of their systems. The parameters that HI 83205 monitors include: iron, whose presence can be an important indication of corrosion; chlorine to circumvent microbiological fouling; dissolved oxygen, whose presence causes corrosion; silica can point to a contamination of the feed water while phosphate is important to reduce scaling.

The optical system of HI 83205 is based on special subminiature tungsten lamps and narrow-band interference filters to guarantee both high performance and reliable results.

HI 83205 has a powerful interactive user support that assists the user during the analysis process. A full tutorial is available in the Setup Menu, and the Help Menu provides assistance for every step in the measurement process. This meter can be connected to a PC via a USB cable, where the data can be managed with optional HI 92000 Windows® compatible software.



24
methods



ORDERING INFORMATION

HI 83205-01 (115V) and HI 83205-02 (230V) are supplied sample cuvettes and caps (2 ea.), cloth for wiping cuvettes, 60 mL glass bottle for dissolved oxygen analysis, scissors, AC/DC power adapter, and instruction manual.

TEST	RANGE	METHOD	REAGENT CODE [†]
Aluminum	0.00 to 1.00 mg/L (ppm)	Aluminon	HI 93712-01
Ammonia MR	0.00 to 10.00 mg/L (ppm)	Nessler	HI 93715-01
Ammonia LR	0.00 to 3.00 mg/L (ppm)	Nessler	HI 93700-01
Bromine	0.00 to 8.00 mg/L (ppm)	DPD	HI 93716-01
Chlorine Dioxide	0.00 to 2.00 mg/L (ppm)	Chlorophenol Red	HI 93738-01
Chlorine*, Free	0.00 to 2.50 mg/L (ppm)	DPD	HI 93701-01
Chlorine*, Total	0.00 to 3.50 mg/L (ppm)	DPD	HI 93711-01
Chromium VI HR	0 to 1000 µg/L	Diphenylcarbohydrazide	HI 93723-01
Chromium VI LR	0 to 300 µg/L	Diphenylcarbohydrazide	HI 93749-01
Copper HR	0.00 to 5.00 mg/L (ppm)	Bicinchoninate	HI 93702-01
Copper LR	0 to 1000 µg/L	Bicinchoninate	HI 95747-01
Hydrazine	0 to 400 µg/L	p-Dimethylaminobenzaldehyde	HI 93704-01
Iron HR	0.00 to 5.00 mg/L (ppm)	Phenantroline	HI 93721-01
Iron LR	0 to 400 µg/L	TPTZ	HI 93746-01**
Molybdenum	0.0 to 40.0 mg/L (ppm)	Mercaptoacetic Acid	HI 93730-01
Nitrate	0.0 to 30.0 mg/L (ppm)	Cadmium Reduction	HI 93728-01
Nitrite HR	0 to 150 mg/L (ppm)	Ferrous Sulfate	HI 93708-01
Nitrite LR	0.00 to 0.35 mg/L (ppm)	Diazotization	HI 93707-01
Oxygen, Dissolved (DO)	0.0 to 10.0 mg/L (ppm)	Winkler	HI 93732-01
pH	6.5 to 8.5 pH	Phenol red	HI 93710-01
Phosphate HR	0.0 to 30.0 mg/L (ppm)	Amino Acid	HI 93717-01
Phosphate LR	0.00 to 2.50 mg/L (ppm)	Ascorbic Acid	HI 93713-01
Silica	0.00 to 2.00 mg/L (ppm)	Heteropoly blue	HI 93705-01
Zinc	0.00 to 3.00 mg/L (ppm)	Zincon	HI 93731-01

Reagents are available in liquid or powder form, and the amount of each reagent is precisely dosed to ensure maximum repeatability.
[†] Unless noted otherwise, all reagent codes ending with -01 are for 100 tests. Replace the -01 with -03 for 300 tests.
^{*} For Chlorine, liquid reagents are available. ^{**} Reagents for 50 tests

For a complete list of Reagents, see Reagents Section 18.

Multiparameter Photometer for Chemical Manufacturers



The chemical manufacturing industry creates a multitude of environmental impacts; it is one of the largest users of natural resources. In order to respect government regulation requirements, all manufacturers must monitor and control their emissions.

Chemical manufacturers use a variety of water quantities, depending on the product manufactured and production processes.

The primary uses of water are for non-contact cooling, steam applications, and product processing. The production of various chemicals requires different amounts of water. For example, producing silicon-based chemicals requires large quantities of water, yet the top manufactured chemicals by volume (including nitrogen, ammonia, phosphoric acid) require far less water during production. Throughout the industry, more than 80% of the water used for cooling and steam is recycled. Processes of water recycling varies widely, and need to be strictly monitored and controlled in order to meet regulations.

HI 83211 is a multiparameter bench meter that measures twenty-one methods essential for chemical manufacturing analysis. It has five channels allowing for a wide range of tests.

The optical system of HI 83211 is based on special subminiature tungsten lamps and narrow-band interference filters to guarantee both high performance and reliable results.

HI 83211 has a powerful interactive user support that assists the user during the analysis process. A full tutorial is available in the Setup Menu, and the Help Menu provides assistance for every step in the measurement process. This meter can be connected to a PC via a USB cable, where the data can be managed with optional HI 92000 Windows® compatible software.

TEST	RANGE	METHOD	REAGENT CODE [†]
Aluminum	0.00 to 1.00 mg/L (ppm)	Aluminon	HI 93712-01
Ammonia LR	0.00 to 3.00 mg/L (ppm)	Nessler	HI 93700-01
Ammonia MR	0.00 to 10.00 mg/L (ppm)	Nessler	HI 93715-01
Chromium VI HR	0 to 1000 µg/L	Diphenylcarbohydrazide	HI 93723-01
Chromium VI LR	0 to 300 µg/L	Diphenylcarbohydrazide	HI 93749-01
Copper HR	0.00 to 5.00 mg/L (ppm)	Bicinchoninate	HI 93702-01
Copper LR	0 to 1000 µg/L	Bicinchoninate	HI 95747-01
Cyanuric Acid	0 to 80 mg/L (ppm)	Turbidimetric	HI 93722-01
Iodine	0.0 to 12.5 mg/L (ppm)	DPD	HI 93718-01
Iron HR	0.00 to 5.00 mg/L (ppm)	Phenantroline	HI 93721-01
Iron LR	0 to 400 µg/L	TPTZ	HI 93746-01**
Molybdenum	0.0 to 40.0 mg/L (ppm)	Mercaptoacetic Acid	HI 93730-01
Nickel HR	0.00 to 7.00 g/L	Photometric	HI 93726-01
Nickel LR	0.000 to 1.000 mg/L (ppm)	PAN	HI 93740-01**
pH	6.5 to 8.5 pH	Phenol Red	HI 93710-01
Phosphate HR	0.0 to 30.0 mg/L (ppm)	Amino Acid	HI 93717-01
Phosphate LR	0.00 to 2.50 mg/L (ppm)	Ascorbic Acid	HI 93713-01
Phosphorus	0.0 to 15.0 mg/L (ppm)	Amino Acid	HI 93706-01
Silica	0.00 to 2.00 mg/L (ppm)	Heteropoly blue	HI 93705-01
Silver	0.000 to 1.000 mg/L (ppm)	PAN	HI 93737-01**
Zinc	0.00 to 3.00 mg/L (ppm)	Zincon	HI 93731-01

Reagents are available in liquid or powder form, and the amount of each reagent is precisely dosed to ensure maximum repeatability.

[†] Unless noted otherwise, all reagent codes ending with -01 are for 100 tests. Replace the -01 with -03 for 300 tests.

** Reagents for 50 tests

ADP
Application Designed Photometers

21
methods

ORDERING INFORMATION

HI 83211-01 (115V) and HI 83211-02 (230V) is supplied with sample cuvettes and caps (2 ea.), cloth for wiping cuvettes, scissors, AC/DC power adapter, and instruction manual.

For a complete list of Reagents, see Reagents Section 18.

HI 83209

Multiparameter Photometer for Education

HI 83209 is a multiparameter bench meter dedicated to educational use. It measures twenty methods, and has four channels allowing for a wide range of tests.

HI 83209 has been designed to be used both indoors and out. In fact, with its splashproof keyboard, rechargeable battery and 12 VDC adapter, HI 83209 is as equally at home in a busy school lab as out near a pond.

The optical system of HI 83209 is based on special subminiature tungsten lamps and narrow-band interference filters to guarantee both high performance and reliable results.

HI 83209 has a powerful interactive user support that assists the user during the analysis process. A full tutorial is available in the Setup Menu, and the Help Menu provides assistance for every step in the measurement process. This meter can be connected to a PC via a USB cable, where the data can be managed with optional HI 92000 Windows® compatible software.



ADP 20
Application Designed Photometers methods



ORDERING INFORMATION

HI 83209-01 (115V) and **HI 83209-02** (230V) is supplied with sample cuvettes (3), cloth for wiping cuvettes, 60 mL glass bottle for dissolved oxygen, scissors, AD/DC power adapter, and instruction manual.

TEST	RANGE	METHOD	REAGENT CODE†
Ammonia MR	0.00 to 10.00 mg/L (ppm)	Nessler	HI 93715-01
Ammonia LR	0.00 to 3.00 mg/L (ppm)	Nessler	HI 93700-01
Chlorine*, Free	0.00 to 2.50 mg/L (ppm)	DPD	HI 93701-01
Chlorine*, Total	0.00 to 3.50 mg/L (ppm)	DPD	HI 93711-01
Chromium VI HR	0 to 1000 µg/L	Diphenylcarbohydrazide	HI 93749-01
Chromium VI LR	0 to 300 µg/L	Diphenylcarbohydrazide	HI 93723-01
Color of Water	0 to 500 PCU	Colorimetric platinum cobalt	-
Copper HR	0.00 to 5.00 mg/L (ppm)	Bicinchoninate	HI 93702-01
Copper LR	0 to 1000 µg/L	Bicinchoninate	HI 95747-01
Nitrate	0.0 to 30.0 mg/L (ppm)	Cadmium Reduction	HI 93728-01
Nitrite HR	0 to 150 mg/L (ppm)	Ferrous Sulfate	HI 93708-01
Nitrite LR	0.00 to 1.15 mg/L (ppm)	Diazotization	HI 93707-01
Oxygen, Dissolved (DO)	0.0 to 10.0 mg/L (ppm)	Winkler	HI 93732-01
pH	6.5 to 8.5 pH	Phenol Red	HI 93710-01
Phosphate HR	0.0 to 30.0 mg/L (ppm)	Amino Acid	HI 93717-01
Phosphate LR	0.00 to 2.50 mg/L (ppm)	Ascorbic Acid	HI 93713-01
Phosphorus	0.0 to 15.0 mg/L (ppm)	Amino Acid	HI 93706-01
Silica	0.00 to 2.00 mg/L (ppm)	Heteropoly blue	HI 93705-01
Silver	0.000 to 1.000 mg/L (ppm)	PAN	HI 93737-01**
Zinc	0.00 to 3.00 mg/L (ppm)	Zincon	HI 93731-01

Reagents are available in liquid or powder form, and the amount of each reagent is precisely dosed to ensure maximum repeatability.
† Unless noted otherwise, all reagent codes ending with -01 are for 100 tests. Replace the -01 with -03 for 300 tests.
* For Chlorine, liquid reagents are available. ** Reagents for 50 tests

For a complete list of Reagents, see Reagents Section 18.

Multiparameter Photometer for Environmental Analysis



HI 83218 is a multiparameter bench meter that measures five parameters essential for environmental analysis. It has three channels allowing for a wide range of tests.

The HI 83218 is designed to be simple to use and offer high accuracy measurements at a low cost per test. In order to improve resolution and cover a wider range, there are dual scales for ammonia, chromium and nitrite.

The optical system of HI 83218 is based on special subminiature tungsten lamps and narrow-band interference filters to guarantee both high performance and reliable results.

HI 83218 has a powerful interactive user support that assists the user during the analysis process. A full tutorial is available in the Setup Menu, and the Help Menu provides assistance for every step in the measurement process. This meter can be connected to a PC via a USB cable, where the data can be managed with optional HI 92000 Windows® compatible software.



Application Designed Photometers



methods

TEST	RANGE	METHOD	REAGENTS ¹
Ammonia HR	0.0 to 50.0 mg/L (ppm)	Nessler	HI 93733-01
Ammonia MR	0.00 to 10.00 mg/L (ppm)	Nessler	HI 93715-01
Chromium VI HR	0 to 1000 µg/L	Diphenylcarbohydrazide	HI 93723-01
Chromium VI LR	0 to 300 µg/L	Diphenylcarbohydrazide	HI 93749-01
Nitrate	0.0 to 30.0 mg/L (ppm)	Cadmium Reduction	HI 93728-01
Nitrite HR	0 to 150 mg/L (ppm)	Ferrous Sulfate	HI 93708-01
Nitrite LR	0.00 to 1.15 mg/L (ppm)	Diazotization	HI 93707-01
Phosphorus	0.0 to 15.0 mg/L (ppm)	Amino Acid	HI 93706-01

Reagents are available in liquid or powder form, and the amount of each reagent is precisely dosed to ensure maximum repeatability.
¹ Unless noted otherwise, all reagent codes ending with -01 are for 100 tests. Replace the -01 with -03 for 300 tests.

For a complete list of Reagents, see Reagents Section 18.



ORDERING INFORMATION

HI 83218-01 (115V) and **HI 83218-02** (230V) is supplied with sample cuvettes and caps (2 ea.), cloth for wiping cuvettes (1), scissors, AC/DC power adapter, and instruction manual.

HI 83206

Multiparameter Photometer for Environmental Testing

HI 83206 is a multiparameter bench photometer dedicated to environmental testing. Critical environmental parameters such as pH, dissolved oxygen, nitrite, ammonia, chlorine and phosphorus or pollutants like chromium VI, nickel, silver and zinc can be monitored with this meter. This instrument measures 24 different methods, and has four measuring channels for a wide range of tests.

The optical system of HI 83206 is based on special subminiature tungsten lamps and narrow-band interference filters to guarantee both high performance and reliable results.

HI 83206 has a powerful interactive user support that assists the user during the analysis process. A full tutorial is available in the Setup Menu, and the Help Menu provides assistance for every step in the measurement process. This meter can be connected to a PC via a USB cable, where the data can be managed with optional HI 92000 Windows® compatible software.



ADP
Application Designed Photometers

24
methods



ORDERING INFORMATION

HI 83206-01 (115V) and HI 83206-02 (230V) are supplied with sample cuvettes and caps (3 ea), cloth for wiping cuvettes (1), 60 mL glass bottle for dissolved oxygen (1), scissors, AC/DC power adapter and instruction manual.

TEST	RANGE	METHOD	REAGENT CODE [†]
Ammonia MR	0.00 to 10.00 mg/L (ppm)	Nessler	HI 93715-01
Ammonia LR	0.00 to 3.00 mg/L (ppm)	Nessler	HI 93700-01
Chlorine*, Free	0.00 to 2.50 mg/L (ppm)	DPD	HI 93701-01
Chlorine*, Total	0.00 to 3.50 mg/L (ppm)	DPD	HI 93711-01
Chromium VI HR	0 to 1000 µg/L	Diphenylcarbohydrazide	HI 93723-01
Chromium VI LR	0 to 300 µg/L	Diphenylcarbohydrazide	HI 93749-01
Color of Water	0 to 500 PCU	Colorimetric platinum cobalt	-
Copper HR	0.00 to 5.00 mg/L (ppm)	Bicinchoninate	HI 93702-01
Copper LR	0 to 1000 µg/L	Bicinchoninate	HI 95747-01
Cyanuric Acid	0 to 80 mg/L (ppm)	Turbidimetric	HI 93722-01
Molybdenum	0.0 to 10.0 mg/L (ppm)	Mercaptoacetic Acid	HI 93730-01
Nickel HR	0.00 to 7.00 g/L	Photometric	HI 93726-01
Nickel LR	0.000 to 1.000 mg/L (ppm)	PAN	HI 93740-01**
Nitrate	0.0 to 30.0 mg/L (ppm)	Cadmium Reduction	HI 93728-01
Nitrite HR	0 to 150 mg/L (ppm)	Ferrous Sulfate	HI 93708-01
Nitrite LR	0.00 to 1.15 mg/L (ppm)	Diazotization	HI 93707-01
Oxygen, Dissolved (DO)	0.0 to 10.0 mg/L (ppm)	Winkler	HI 93732-01
pH	6.5 to 8.5 pH	Phenol Red	HI 93710-01
Phosphate HR	0.0 to 30.0 mg/L (ppm)	Amino Acid	HI 93717-01
Phosphate LR	0.00 to 2.50 mg/L (ppm)	Ascorbic Acid	HI 93713-01
Phosphorus	0.0 to 15.0 mg/L (ppm)	Amino Acid	HI 93706-01
Silica	0.00 to 2.00 mg/L (ppm)	Heteropoly blue	HI 93705-01
Silver	0.000 to 1.000 mg/L (ppm)	PAN	HI 93737-01**
Zinc	0.00 to 3.00 mg/L (ppm)	Zincon	HI 93731-01

Reagents are available in liquid or powder form, and the amount of each reagent is precisely dosed to ensure maximum repeatability.

[†] Unless noted otherwise, all reagent codes ending with -01 are for 100 tests. Replace the -01 with -03 for 300 tests.

* For chlorine, liquid reagents are available. ** Reagents for 50 tests

For a complete list of Reagents, see Reagents Section 18.

Nutrient Analysis Photometer for Greenhouses and Hydroponics



Nitrogen, phosphorus, and potassium (NPK) are often the first three factors considered when making recommendations to growers. Compared to the HI 83215, the HI 83225 provides control over three additional important growing factors: sulfur (most common as sulfates), calcium and magnesium.

HI 83225 is designed for the hydroponics and greenhouse industries to measure seven nutrients commonly present in fertilizer enriched solutions. It can measure fifteen different methods using specific liquid or powder reagents, and has four measuring channels for a wide range of tests.

The optical system of HI 83225 is based on special subminiature tungsten lamps and narrow-band interference filters to guarantee both high performance and reliable results.

HI 83225 has a powerful interactive user support that assists the user during the analysis process. A full tutorial is available in the Setup Menu, and the Help Menu provides assistance for every step in the measurement process. This meter can be connected to a PC via a USB cable, where the data can be managed with optional HI 92000 Windows® compatible software.

TEST	RANGE	METHOD	REAGENTS
Ammonia HR	0 to 100 mg/L (ppm)	Nessler	HI 93715-01
Ammonia MR	0.0 to 50.0 mg/L (ppm)	Nessler	HI 93715-01
Ammonia LR	0.0 to 10.0 mg/L (ppm)	Nessler	HI 93715-01
Nitrate HR	0 to 300 mg/L (ppm)	Cadmium Reduction	HI 93728-01
Nitrate MR	0 to 150 mg/L (ppm)	Cadmium Reduction	HI 93728-01
Nitrate LR	0.0 to 30.0 mg/L (ppm)	Cadmium Reduction	HI 93728-01
Phosphorus HR	0 to 100 mg/L (ppm)	Amino Acid	HI 93706-01
Phosphorus MR	0.0 to 50.0 mg/L (ppm)	Amino Acid	HI 93706-01
Phosphorus LR	0.0 to 10.0 mg/L (ppm)	Amino Acid	HI 93706-01
Potassium HR	20 to 200 mg/L (ppm)	Turbidimetric	HI 93750-01
Potassium MR	10 to 100 mg/L (ppm)	Turbidimetric	HI 93750-01
Potassium LR	0.0 to 20.0 mg/L (ppm)	Turbidimetric	HI 93750-01
Calcium	0 to 400 mg/L (ppm)	Oxalate	HI 937521-01**
Magnesium	0 to 150 mg/L (ppm)	Calmagite	HI 937520-01**
Sulfate	0 to 100 mg/L (ppm)	Turbidimetric	HI 93751-01

Reagents are available in liquid or powder form, and the amount of each reagent is precisely dosed to ensure maximum repeatability.
 † Unless noted otherwise, all reagent codes ending with -01 are for 100 tests. Replace the -01 with -03 for 300 tests.
 * For chlorine, liquid reagents are available. ** Reagents for 50 tests (-01) and 150 tests (-03)

For a complete list of Reagents, see Reagents Section 18.

ADP 15
 Application Designed Photometers methods

ORDERING INFORMATION

HI 83225-01 (115V) and HI 83225-02 (230V) are supplied with sample cuvettes and caps (4 ea.), sample preparation kit, cloth for wiping cuvettes (1), scissors, AC/DC power adapter and instruction manual

HI 83225-100 kit includes 10 mL cuvettes and caps (4 ea.), 100 mL plastic beaker, 170 mL plastic beaker, 100 mL graduated cylinder, 60 mL syringe with screw rim, 5 mL syringe, funnel, filter discs (25), spoon, pipettes (2), carbon powder packets (50) and demineralizer bottle with filter cap for approximately 12 liters of deionized water.

HI 83215

Nutrient Analysis Photometer for Greenhouses and Hydroponics

Deciding which fertilizer to use can be overwhelming, but with a bit of knowledge you can be sure your garden will get the right amount of nutrients it needs. The first question you'll need to answer is, "What analysis do I need?" The analysis is actually three numbers you see usually at the middle or bottom of fertilizer packages (for example 10-20-10). These numbers represent percentages of the three major nutrients plants need: nitrogen, phosphorus and potassium (NPK for short).

HI 83215 is a multiparameter bench meter that measures twelve methods in low, medium and high ranges essential for monitoring greenhouse and hydroponics operations. Its three channels allow for a wide range of tests.

The optical system of HI 83215 is based on special subminiature tungsten lamps and narrow-band interference filters to guarantee both high performance and reliable results.

HI 83215 has powerful interactive user support that assists the user during the analysis process. A full tutorial is available in the Setup Menu, and the Help Menu provides assistance for every step in the measurement process. This meter can be connected to a PC via a USB cable, where the data can be managed with optional HI 92000 Windows® compatible software.



12
methods

ORDERING INFORMATION

HI 83215-01 (115V) and **HI 83215-02** (230V) is supplied with sample cuvettes and caps (4 ea.), sample preparation kit, cloth for wiping cuvettes (1), scissors, AC/DC power adapter and instruction manual

HI 83215C-100 kit includes 10 mL cuvettes with caps (4 ea.), 100 mL plastic beaker, 170 mL plastic beaker, 100 mL graduated cylinder, 60 mL syringe with screw rim, 5 mL syringe, funnel, filter discs (25), spoon, pipettes (2), carbon powder packets (50), and demineralizer bottle with filter cap for approximately 12 liters of deionized water.

NPK

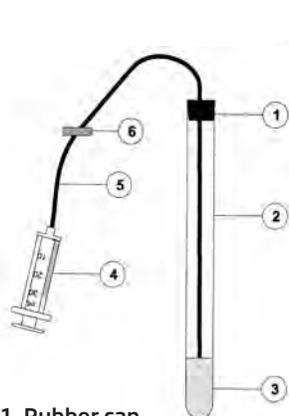
Nitrogen, represented by the first number from fertilizer packages, provides plants with lush green foliage growth. The second number represents phosphorus, which aids in root development, flowering ability and size. Many companies will market high phosphorus fertilizers as "bloom boosters". Potassium is represented by the third number in the N-P-K sequence. This helps guard a plant from disease and insects, as well as temperature extremes and drought.

TEST	RANGE	METHOD	REAGENTS [†]
Ammonia HR	0 to 100 mg/L (ppm)	Nessler	HI 93715-01
Ammonia MR	0.0 to 50.0 mg/L (ppm)	Nessler	HI 93715-01
Ammonia LR	0.0 to 10.0 mg/L (ppm)	Nessler	HI 93715-01
Nitrate HR	0 to 300 mg/L (ppm)	Cadmium Reduction	HI 93728-01
Nitrate MR	0 to 150 mg/L (ppm)	Cadmium Reduction	HI 93728-01
Nitrate LR	0.0 to 30.0 mg/L (ppm)	Cadmium Reduction	HI 93728-01
Phosphorus HR	0 to 100 mg/L (ppm)	Amino Acid	HI 93706-01
Phosphorus MR	0.0 to 50.0 mg/L (ppm)	Amino Acid	HI 93706-01
Phosphorus LR	0.0 to 10.0 mg/L (ppm)	Amino Acid	HI 93706-01
Potassium HR	20 to 200 mg/L (ppm)	Turbidimetric	HI 93750-01
Potassium MR	10 to 100 mg/L (ppm)	Turbidimetric	HI 93750-01
Potassium LR	0.0 to 20.0 mg/L (ppm)	Turbidimetric	HI 93750-01

Reagents are available in liquid or powder form, and the amount of each reagent is precisely dosed to ensure maximum repeatability.
† Unless noted otherwise, all reagent codes ending with -01 are for 100 tests. Replace the -01 with -03 for 300 tests.

For a complete list of Reagents, see Reagents Section 18.

Suction Lysimeter for Root Level Soil Monitoring



1. Rubber cap
2. Soil solution sampler tube
3. Porous ceramic tip
4. 30 mL syringe (pump)
5. Rubber suction capillary
6. Finger clamp

HI 83900-90
90 cm (2.95')

HI 83900-60
60 cm (1.97')

HI 83900-30
30 cm (0.98')



- The perfect companion to the HI 83225 and HI 83215
- Monitor soil composition at the roots
- Easy to use

The HI 83900 suction lysimeter is built with a porous ceramic cap connected to a transparent tube for soil solution extraction. A rubber capillary is inserted in the tube passing through a rubber cap and reaching the ceramic tip.

The HI 83900 series lysimeter is an ideal tool for collecting soil solution samples and then perform quantitative chemical analysis. In this way the operator can easily monitor the level of nutrients, such as ammonia, nitrate, phosphorous and potassium, sulfate, calcium, magnesium.

The ceramic tip of the lysimeter can be used in all types of soil, and it is made of a sinterized material that does not react with nutrient elements. The soil solution, therefore, is not affected by the chemical composition of the ceramic cap resulting in precise and reliable tests.

The HI 83900 allows the extraction of a solution from the soil by creating a vacuum (negative pressure or suction) inside the sampler tube, that exceeds the soil water tension. This will establish an hydraulic gradient for the solution to flow through the porous ceramic cap and into the lysimeter tube. Typically, a vacuum of about -60 cb (centibar) should be drawn.

For better monitoring of soil solution composition throughout an entire growth period of crops, at least two lysimeters should be installed in the root zone of a representative plant, one at the upper and one in the lower part of the root zone.

For better measurement accuracy and repeatability, it is recommended to replicate installations in at least two more locations.

ORDERING INFORMATION

HI 83900-30 is comprised of 30 cm (0.98') sampler tube ending with porous ceramic tip.

HI 83900-60 is comprised of 60 cm (1.97') sampler tube ending with porous ceramic tip.

HI 83900-90 is comprised of 90 cm (2.95') sampler tube ending with porous ceramic tip.

All include capillary rubber tube with rubber cap and finger clamp, cleaning solution stater kit (120 mL), 30 mL syringe and instructions

ACCESSORIES

HI 83900-25 Cleaning solution kit, 500 mL

HI 83900-00 Cleaning solution starter kit, 120 mL

Plant Nutrition

The three elements that are most needed by plants are nitrogen (N), phosphorous (P) and potassium (K).

Nitrogen is indispensable for the plant's life and is a key factor in fertilization. Nitrogen allows the development of the vegetative activity of the plant, in particular, causes lengthening of trunks and sprouts and increases the production of foliage and fruits. An excess of nitrogen weakens the plants structure creating an unbalanced relationship between the leaves and the stalks. In addition, the plant becomes less resistant to diseases.

Phosphorous is an important element in the composition of DNA and RNA, the regulators of the energetic exchange (ATP and ADP), as well as the reserve substances in seeds and bulbs. It contributes to the formation of buds, roots, blooming, and lignification. A lack of phosphorous results in: stifling of plants, slow growth, a reduction of production, smaller fruits and a lower expansion of the roots.

Even if potassium is not a constituent of important compounds, it plays a remarkable role in many physiological activities like the control of cellular turgor and the accumulation of carbohydrates. It increases the size of fruits, their flavor, as well as yielding a positive effect on the color and fragrance of flowers. Potassium also makes plants more resistant to disease.

The Significance of Pool and Spa Water Testing



Residual Disinfection and pH Control

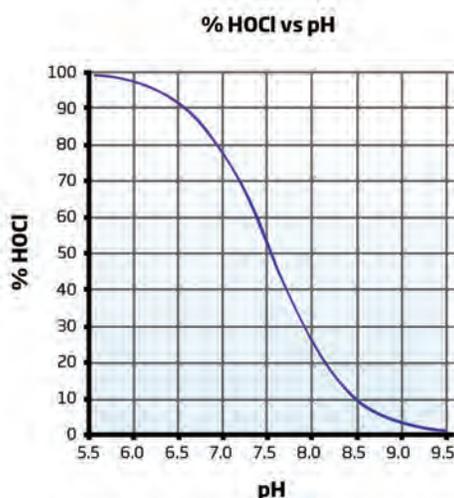
In terms of swimming pool treatment, disinfection or sanitizing basically means to rid the pool of bather pollution, destroy bacteria, and control nuisance organisms like algae, which may occur in the pool, filtration equipment, and piping.

There are a number of techniques used, namely, chlorine, bromine and ozone dosing systems, of which chlorine is the most common.

Chlorine

Chlorine is a strong oxidizing agent that destroys organic pollutants and bacteria. Chlorine combines with compounds containing nitrogen to form chloramines, during which only part of the chlorine will be used while the rest remains active, continuing its disinfecting action.

Combined chlorine is the quantity of chlorine that has already combined with nitrogen containing compounds. It is much less effective as a disinfectant than free chlorine, which has yet to make the transition. The addition of combined chlorine, and free chlorine gives total chlorine. A pool manager needs to aim for the perfect balance where free and total chlorine are proportionally equal, and thus to keep the combined chlorine levels near zero. The presence of chloramines is undesirable because of the distinctive 'swimming pool smell' as well as irritation to the eyes and mucous membranes caused by combined chlorines like dichloramines.



Commercial chlorine for disinfection may be available as a gas (Cl_2), a liquid like sodium hypochlorite or bleach (NaOCl) or in a solid state like calcium hypochlorite, chlorohydrantoin or chlorocyanuric acid compounds. These compounds, once dissolved in water, establish equilibrium between the hypochlorous acid (HOCl) and the hypochlorite ions (OCl^-). Although both forms are considered free chlorine, it is the hypochlorous acid that provides the strongest disinfecting and oxidizing characteristic of chlorine solutions. The amount of hypochlorous acid in chlorinated water depends upon the pH value of the solution. Changes in pH value will effect the HOCl equilibrium in relation to the hydrogen and hypochlorite ions.

As depicted by the graph, HOCl decreases and OCl^- increases as pH increases. At a low pH, almost all the free chlorine is in the molecular form HOCl , and at a pH of around 7.5, the ratio between HOCl and OCl^- is 50:50. Since the ionic form OCl^- is a slow acting sanitizer while the molecular HOCl is a fast acting, it is important to measure pH regularly. As a general rule a pH of about 7.2 is recommended to maintain fast acting disinfection conditions.

Bromine

In many countries bromine sanitizing has been introduced as an alternative for chlorine, although it is not as strong. The advantage of bromine lies in its stability at higher temperatures (advantageous for heated pools and hot tubs), and its maintained disinfection power at a higher pH. Furthermore, there is very little reaction between bromine and nitrogen compounds, reducing the unpleasant odor, and eye irritation problems. The main disadvantage of bromine is the slower acting disinfecting power, making it less suitable for larger pools.

Ozone

Ozone is a very strong oxidizing agent that destroys organic compounds that are especially difficult to oxidize. It allows the pool manager to very efficiently remove combined chlorine without frequently refreshing large amounts of pool water. By the time the water passes through the filter units, ozone has already completed sanitizing, and it is not effected by the pH level.

Mainly because of its strong oxidizing power, the return water may contain trace concentrations of ozone. It imperative to know that ozone is very unstable, so to ensure thorough sanitization of the water, low-level chlorination remains necessary.

The Water Balance and Langelier Index

Pool water characteristics need to be maintained in a balanced state to avoid numerous issues. Measuring certain variables is extremely important to predict if the water is corrosive, scaling or balanced.

A saturation index developed by Dr. Wilfred Langelier is widely used to predict the balance of swimming pool waters. It represents the estimation of a solution's ability to dissolve or precipitate calcium carbonate deposits. A certain level of this precipitation (filming) is desired to insulate pipes and boilers from contact with water. When no protective filming is formed, water is considered to be corrosive. On the other hand, too much filming can develop into scaling and incrustation of the pipes.

In the treatment and monitoring of pool water, the pool manager must ensure that related parameters such as alkalinity, hardness and pH are dutifully taken into consideration.

Calcium

The presence of calcium in the system is desired to ensure filming on those places where the temperature is relatively high, like in boilers and pipes transporting warm water. Scaling must be avoided

The Langelier Index is a powerful tool to calculate the water balance, and to predict corrosion or scaling problems. Theoretically, a LI of zero indicates perfect water condition for swimming pools. If $LI > 0$, scaling and staining of the water is present, and if $LI < 0$ the water is corrosive and highly irritating. A tolerance of ± 0.4 is normally acceptable.

The Langelier formula is expressed as:

$$LI = pH + TF + HF + AF - 12.5$$

Where:

LI = Langelier Index (also called Saturation Index)

pH = pH of the water

TF = temperature factor

HF = hardness factor, log (Ca hardness, ppm as $CaCO_3$)

AF = alkalinity factor, log (alkalinity, ppm as $CaCO_3$)

To calculate the exact Langelier Index of your water please use the WATER INDEX reference tables.

For most pools, water is balanced if:

- The pH value is maintained within the recommended ranges of pH 7.2 - 7.6
- Ideally the Alkalinity should be maintained within a range of 80 - 125 ppm
- The Calcium Hardness should be maintained within a range of 200 - 400 ppm.

To calculate your water balance, three parameters must be measured; calcium hardness, alkalinity and pH. Find the hardness and alkalinity factor in the WATER INDEX reference tables below.

because it reduces heat transfer and pump capacity, and causes cloudiness in the water.

It is recommended to maintain the calcium hardness value within the range from 200 to 400 ppm as calcium carbonate ($CaCO_3$).

Alkalinity

Alkalinity is the measure of the total concentration of alkaline substances, mostly bicarbonates, dissolved in the water. The higher the alkalinity, the more resistant the water is to pH change. At the same time, high alkaline water is a major contributor to scaling problems like incrustation in filtration equipment, pumps, and piping.

pH

It is recommended to maintain the alkalinity value within the range from 80 to 125 ppm as calcium carbonate ($CaCO_3$).

The pH of the water is an important factor since at lower pH levels the corrosion rate increases. If the alkalinity values are sufficiently high, it will not be difficult to control the pH. Most pool managers prefer to keep the pH between 7.2 and 7.4 to best maintain low corrosion rates and a sufficient activity of chlorine.

The water temperature is, in general, maintained between 24°C (76°F) and 34°C (94°F). Assuming the temperature is kept within those ranges, an average value of 0.7 may be used.

$$\text{Water balance} = pH + TF + HF + AF$$

Water Balance	Condition	Recommendation
11.0-12.0	Corrosive	Increase pH and/or alkalinity
12.1-12.3	Acceptable Balance	Retest water frequently
12.4-12.6	Ideal Balance	Maintain
12.7-12.9	Acceptable Balance	Retest water frequently
13.0-14.0	Scale Forming	Reduce pH and/or alkalinity

Water Index Reference Table

Temperature			Calcium Hardness		Alkalinity	
°C	°F	TF	mg/L (as $CaCO_3$)	HF	mg/L (as $CaCO_3$)	AF
0	32	0	5	0.7	5	0.7
4	39	0.1	25	1.4	25	1.4
8	46	0.2	50	1.7	50	1.7
12	54	0.3	75	1.9	75	1.9
16	60	0.4	100	2.0	100	2.0
20	68	0.5	150	2.2	150	2.2
24	75	0.6	200	2.3	200	2.3
28	82	0.7	250	2.4	250	2.4
32	90	0.7	300	2.5	300	2.5
36	97	0.8	400	2.6	400	2.6
40	104	0.9	500	2.7	500	2.7
50	122	1.0	1000	3.0	1000	3.0

HI 83226

Multiparameter Photometer for Pools and Spas

Around the world, swimming pool and spa facilities welcome dozens, even hundreds of people on a daily basis. A basic necessity of pool water treatment is to maintain the water in a safe and pleasant condition for the bathers.

In order to achieve ideal water conditions, swimming pool water requires testing on a daily and sometimes hourly basis for disinfection of residuals and maintaining pH levels. Equally important, calcium hardness and alkalinity levels should be monitored weekly to ensure the pool water is well balanced, thus to avoid corrosion and scale formation.

HI 83226 is a multiparameter bench meter that measures nine parameters essential for advanced pool and spa water analysis.

The optical system of HI 83226 is based on special subminiature tungsten lamps and narrow-band interference filters to guarantee both high performance and reliable results.

HI 83226 has a powerful interactive user support that assists the user during the analysis process. A full tutorial is available in the Setup Menu, and the Help Menu provides assistance for every step in the measurement process. This meter can be connected to a PC via a USB cable, where the data can be managed with optional HI 92000 Windows® compatible software.



11

methods



ORDERING INFORMATION

HI 83226-01 (115V), HI 83226-02 (230V), are supplied with sample cuvettes with caps (4 ea.), cloth for wiping cuvettes, scissors, AC/DC power adapter and instruction manual

HI 83226 TEST	RANGE	METHOD	REAGENT CODE ¹
Alkalinity	0 to 500 mg/L (ppm) as CaCO ₃	Bromocresol green	HI 93755-01
Bromine	0.00 to 10.00 mg/L (ppm)	DPD	HI 93716-01
Chlorine, Free	0.00 to 5.00 mg/L (ppm)	DPD	HI 93701-01
Chlorine, Total	0.00 to 5.00 mg/L (ppm)	DPD	HI 93711-01
Copper, Free	0.00 to 5.00 mg/L (ppm)	Bicinchoninate	HI 93702-01
Copper, Total	0.00 to 5.00 mg/L (ppm)	Bicinchoninate	HI 93702T-01
Cyanuric Acid	0 to 200 mg/L (ppm)	Turbidimetric	HI 93722-01
Hardness, Calcium	0 to 500 mg/L (ppm) as CaCO ₃	Calmagite	HI 93720-01
Iron HR	0.00 to 5.00 mg/L (ppm)	Phenantroline	HI 93721-01
Ozone	0.00 to 2.00 mg/L (ppm)	DPD	HI 93757-01
pH	6.5 to 8.5 pH	Phenol Red	HI 93710-01

Reagents are available in liquid or powder form, and the amount of each reagent is precisely dosed to ensure maximum repeatability.
¹ Unless noted otherwise, all reagent codes ending with -01 are for 100 tests. Replace the -01 with -03 for 300 tests.

For a complete list of Reagents, see Reagents Section 18.

Multiparameter Photometer for Pools and Spas

Around the world, swimming pool and spa facilities welcome dozens, even hundreds of people on a daily basis. A basic necessity of pool water treatment is to maintain the water in a safe and pleasant condition for the bathers.

In order to achieve ideal water conditions, swimming pool water requires testing on a daily and sometimes hourly basis for disinfection residuals and maintaining pH levels. Equally important, calcium hardness and alkalinity levels should be monitored weekly to ensure the pool water is well balanced, thus to avoid corrosion and scale formation.

HI 83216 is a multiparameter bench meter that measures six different methods essential for pool and spa water analysis. It has two channels allowing for a wide range of tests.

The optical system of HI 83216 is based on special subminiature tungsten lamps and narrow-band interference filters to guarantee both high performance and reliable results.

HI 83216 has a powerful interactive user support that assists the user during the analysis process. A full tutorial is available in the Setup Menu, and the Help Menu provides assistance for every step in the measurement process. This meter can be connected to a PC via a USB cable, where the data can be managed with optional HI 92000 Windows® compatible software.



When you need to only measure a few parameters daily, the HI 83216 can do the job quickly, accurately and at a comparable cost of chemical test kits.

HI 83216 TEST	RANGE	METHOD	REAGENT CODE ¹
Alkalinity	0 to 500 mg/L (ppm) as CaCO ₃	Bromocresol green	HI 93755-01
Chlorine, Free	0.00 to 5.00 mg/L (ppm)	DPD	HI 93701-01
Chlorine, Total	0.00 to 5.00 mg/L (ppm)	DPD	HI 93711-01
Cyanuric Acid	0 to 200 mg/L (ppm)	Turbidimetric	HI 93722-01
Hardness, Calcium	0 to 500 mg/L (ppm) as CaCO ₃	Calmagite	HI 93720-01
pH	6.5 to 8.5 pH	Phenol Red	HI 93710-01

Reagents are available in liquid or powder form, and the amount of each reagent is precisely dosed to ensure maximum repeatability.
¹ Unless noted otherwise, all reagent codes ending with -01 are for 100 tests. Replace the -01 with -03 for 300 tests.



ORDERING INFORMATION

HI 83216-01 (115V), HI 83216-02 (230V), are supplied with sample cuvettes with caps (4 ea.), cloth for wiping cuvettes, scissors, AC/DC power adapter and instruction manual

For a complete list of Reagents, see Reagents Section 18.

HI 83212

Multiparameter Photometer for Power Plant Utilities

Ammonia levels are often tested in boiler feedwater and industrial waste.

Chlorine is used to sanitize cooling towers and industrial equipment.

Copper is often added to water to hinder growth of plankton and algae.

Hydrazine has bactericidal properties and scavenges oxygen.

Molybdenum is used as a corrosion inhibitor in cooling towers while phosphate can enter water streams due to boiler blow-downs and is added to reduce scaling.

Silica, on the other hand, can be a major source of scaling while Silver is a toxic pollutant and needs to be monitored in effluents.

HI 83212 is a multiparameter bench meter that measures thirteen methods essential for power plant utilities. It has four channels allowing for a wide range of tests.

The optical system of HI 83212 is based on special subminiature tungsten lamps and narrow-band interference filters to guarantee both high performance and reliable results.

HI 83212 has a powerful interactive user support that assists the user during the analysis process. A full tutorial is available in the Setup Menu, and the Help Menu provides assistance for every step in the measurement process. This meter can be connected to a PC via a USB cable, where the data can be managed with optional HI 92000 Windows® compatible software.



13
methods



ORDERING INFORMATION

HI 83212-01 (115V) and HI 83212-02 (230V), are supplied with sample cuvettes with caps (4 ea.), cloth for wiping cuvettes, scissors, AC/DC power adapter and instruction manual

TEST	RANGE	METHOD	REAGENT CODE†
Ammonia MR	0.00 to 10.00 mg/L (ppm)	Nessler	HI 93715-01
Ammonia LR	0.00 to 3.00 mg/L (ppm)	Nessler	HI 93700-01
Chlorine*, Free	0.00 to 2.50 mg/L (ppm)	DPD	HI 93701-01
Chlorine*, Total	0.00 to 3.50 mg/L (ppm)	DPD	HI 93711-01
Copper HR	0.00 to 5.00 mg/L (ppm)	Bicinchoninate	HI 93702-01
Copper LR	0 to 1000 µg/L	Bicinchoninate	HI 95747-01
Hydrazine	0 to 400 µg/L	p-Dimethylamino - benzaldehyde	HI 93704-01
Molybdenum	0.0 to 40.0 mg/L (ppm)	Mercaptoacetic Acid	HI 93730-01
Phosphate HR	0.0 to 30.0 mg/L (ppm)	Amino Acid	HI 93717-01
Phosphate LR	0.00 to 2.50 mg/L (ppm)	Ascorbic Acid	HI 93713-01
Phosphorus	0.0 to 15.0 mg/L (ppm)	Amino Acid	HI 93706-01
Silica	0.00 to 2.00 mg/L (ppm)	Heteropoly blue	HI 95705-01
Silver	0.000 to 1.000 mg/L (ppm)	PAN	HI 93737-01**

Reagents are available in liquid or powder form, and the amount of each reagent is precisely dosed to ensure maximum repeatability.

† Unless noted otherwise, all reagent codes ending with -01 are for 100 tests. Replace the -01 with -03 for 300 tests.

* For Chlorine, liquid reagents are available. ** Reagents for 50 tests

For a complete list of Reagents, see Reagents Section 18.



Pulp and paper are manufactured from raw materials containing cellulose fibers generally from wood, recycled paper, and agricultural residues.

There are numerous steps in the paper manufacturing process; raw material preparation, such as wood debarking and chip making, pulp manufacturing, pulp bleaching and fiber recycling. Pulp mills and paper mills may exist separately or as integrated operations.

Pulp

Processed pulp is used as a source of cellulose for fiber manufacture and for conversion into paper or cardboard. Cellulosic pulp is manufactured from the raw materials, using chemical and mechanical means.

The manufacture of pulp for paper and cardboard employs mechanical (including thermomechanical), chemimechanical, and chemical methods. Mechanical pulping separates fibers by such methods as disk abrasion and billeting.

Chemimechanical processes involve mechanical abrasion and the use of chemicals.

Chemical pulps are made by cooking (digesting) the raw materials, using the kraft (sulfate) and sulfite processes.

In the case of chemical pulps (kraft and sulfite), the objective of bleaching is to remove the small fraction of the lignin remaining after cooking. Oxygen, hydrogen peroxide, ozone, peracetic acid, sodium hypochlorite, chlorine dioxide, chlorine, and other chemicals are used to transform lignin into an alkali-soluble form. An alkali, such as sodium hydroxide, is necessary in the bleaching process to extract the alkali-soluble form of lignin.

Pulp is washed with water in the bleaching process.

In modern mills, oxygen is normally used in the first stage of bleaching. The trend is to avoid the use of any kind of chlorine chemicals and employ "total chlorine-free" (TCF) bleaching.

TCF processes allow the bleaching effluents to be fed to the recovery boiler for steam generation; the steam is then used to generate electricity, thereby reducing the amount of pollutants discharged. Elemental chlorine-free (ECF) processes, which use chlorine dioxide, are required for bleaching certain grades of pulp.

Pulp and Paper Mill Wastewater

The significant environmental impacts of the manufacture of pulp and paper result from the pulping and bleaching processes. In some processes, sulfur compounds and nitrogen oxides are emitted into the air, and chlorinated and organic compounds, nutrients, and metals are discharged into the wastewater.

Wastewaters are discharged at a rate of 20-250 cubic meters per metric ton (m³/t) of air-dried pulp.

Wastewater from chemical pulping contains 12-20 kg of BOD/t of air-dried pulp, with values of up to 350 kg/t. The corresponding values for mechanical pulping wastewater are 15-25 kg BOD/t of air-dried pulp.

Phosphorus and nitrogen are also released into wastewaters.

The main source of nutrients, nitrogen, and phosphorus compounds is raw material such as wood. The use of peroxide, ozone, and other chemicals in bleaching makes it necessary to use a complexing agent for heavy metals.



HI 83210

Multiparameter Photometer for Pulp and Paper Mills

Water is an indispensable medium for all stages of paper production. It is used for suspending and swelling, transport, the dissolution and the rebuilding of fiber bondings and more.

Due to shrinking water resources, and subsequently, rising costs of available water supplies, more stringent environmental legislation has been put in place, strictly regulating industrial water consumption. Amongst the many industries effected, pulp and paper mills have imposed a trend towards less water consumption. This requires precise monitoring of chemicals and water supplies.

HI 83210 is a multiparameter bench meter that measures twelve methods essential for paper production. It has four channels allowing for a wide range of tests.

The optical system of HI 83210 is based on special subminiature tungsten lamps and narrow-band interference filters to guarantee both high performance and reliable results.

HI 83210 has a powerful interactive user support that assists the user during the analysis process. A full tutorial is available in the Setup Menu, and the Help Menu provides assistance for every step in the measurement process. This meter can be connected to a PC via a USB cable, where the data can be managed with optional HI 92000 Windows® compatible software.



12
methods



ORDERING INFORMATION

HI 83210-01 (115V) and HI 83210-02 (230V), are supplied with sample cuvettes with caps (4 ea.), cloth for wiping cuvettes, 60 mL glass bottle for dissolved oxygen analysis, scissors, AC/DC power adapter and instruction manual

TEST	RANGE	METHOD	REAGENT CODE [†]
Aluminum	0.00 to 1.00 mg/L (ppm)	Aluminon	HI 93712-01
Chlorine Dioxide	0.00 to 2.00 mg/L (ppm)	Chlorophenol Red	HI 93738-01
Chlorine*, Free	0.00 to 2.50 mg/L (ppm)	DPD	HI 93701-01
Chlorine*, Total	0.00 to 3.50 mg/L (ppm)	DPD	HI 93711-01
Color of Water	0 to 500 PCU	Platinum Cobalt	-
Oxygen, Dissolved (DO)	0.0 to 10.0 mg/L (ppm)	Winkler	HI 93732-01
pH	6.5 to 8.5 pH	Phenol Red	HI 93710-01
Phosphate HR	0.0 to 30.0 mg/L (ppm)	Amino Acid	HI 93717-01
Phosphate LR	0.00 to 2.50 mg/L (ppm)	Ascorbic Acid	HI 93713-01
Silica	0.00 to 2.00 mg/L (ppm)	Heteropoly blue	HI 93705-01
Silver	0.000 to 1.000 mg/L (ppm)	PAN	HI 93737-01**
Zinc	0.00 to 3.00 mg/L (ppm)	Zincon	HI 93731-01

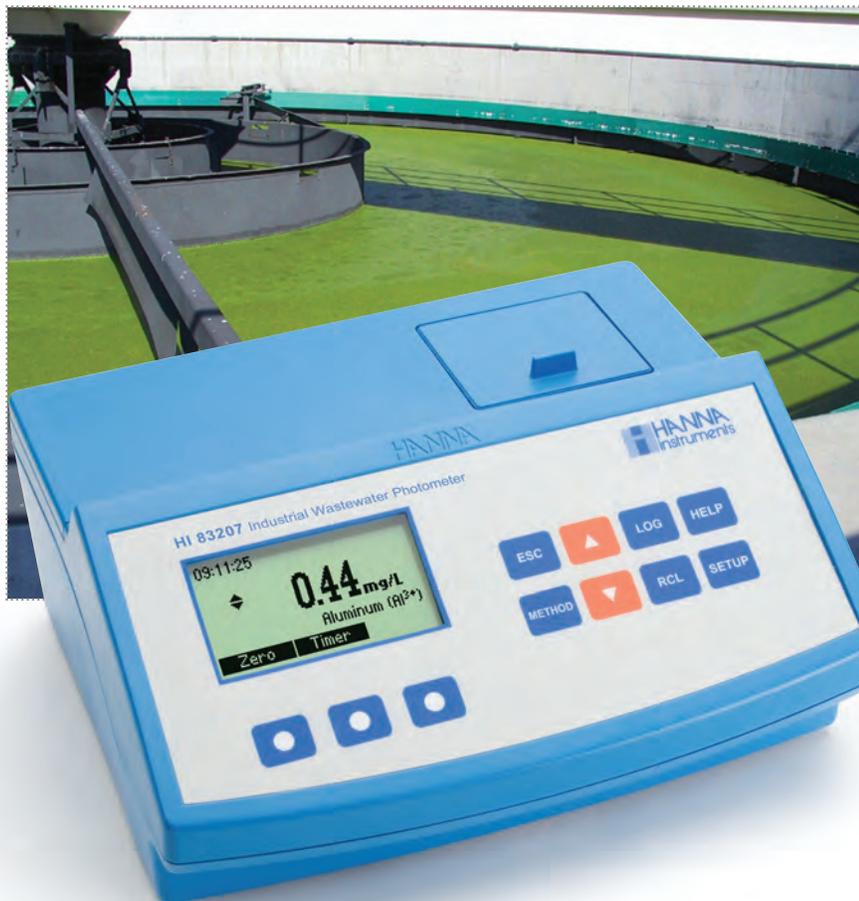
Reagents are available in liquid or powder form, and the amount of each reagent is precisely dosed to ensure maximum repeatability.

[†] Unless noted otherwise, all reagent codes ending with -01 are for 100 tests. Replace the -01 with -03 for 300 tests.

* For Chlorine, liquid reagents are available. ** Reagents for 50 tests

For a complete list of Reagents, see Reagents Section 18.

Multiparameter Photometer for Industrial Wastewater



Pollution and excessive use seriously compromise the availability of fresh water around the world. In order to reduce the impact of industrial operators, there are numerous processes that can be used to clean up the wastewaters depending on the type and extent of contamination. Most wastewater is treated at an industrial scale at wastewater treatment plants, which may include physical, chemical and biological treatment processes.

The quality of wastewater which can be discharged by industrial users is strictly limited by regulations.

HI 83207 is a multiparameter bench meter that measures twenty methods essential for industrial wastewater analysis. It has four channels to allow a wide range of tests.

The optical system of HI 83207 is based on special subminiature tungsten lamps and narrow-band interference filters to guarantee both high performance and reliable results.

HI 83207 has a powerful interactive user support that assists the user during the analysis process. A full tutorial is available in the Setup Menu, and the Help Menu provides assistance for every step in the measurement process. This meter can be connected to a PC via a USB cable, where the data can be managed with optional HI 92000 Windows® compatible software.

TEST	RANGE	METHOD	REAGENT CODE [†]
Aluminum	0.00 to 1.00 mg/L (ppm)	Aluminon	HI 93712-01
Chlorine*, Free	0.00 to 2.50 mg/L (ppm)	DPD	HI 93701-01
Chlorine*, Total	0.00 to 3.50 mg/L (ppm)	DPD	HI 93711-01
Color of Water	0 to 500 PCU	Platinum Cobalt	-
Copper HR	0.00 to 5.00 mg/L (ppm)	Bicinchoninate	HI 93702-01
Copper LR	0 to 1000 µg/L	Bicinchoninate	HI 95747-01
Fluoride	0.00 to 2.00 mg/L (ppm)	SPADNS	HI 93729-01
Manganese HR	0.0 to 20.0 mg/L (ppm)	Periodate	HI 93709-01
Manganese LR	0 to 300 µg/L	PAN	HI 93748-01**
Molybdenum	0.0 to 40.0 mg/L (ppm)	Mercaptoacetic Acid	HI 93730-01
Nickel HR	0.00 to 7.00 g/L	Photometric	HI 93726-01
Nickel LR	0.000 to 1.000 mg/L (ppm)	PAN	HI 93740-01**
Nitrate	0.0 to 30.0 mg/L (ppm)	Cadmium Reduction	HI 93728-01
Oxygen, Dissolved (DO)	0.0 to 10.0 mg/L (ppm)	Winkler	HI 93732-01
pH	6.5 to 8.5 pH	Phenol Red	HI 93710-01
Phosphate HR	0.0 to 30.0 mg/L (ppm)	Amino Acid	HI 93717-01
Phosphate LR	0.00 to 2.50 mg/L (ppm)	Ascorbic Acid	HI 93713-01
Phosphorus	0.0 to 15.0 mg/L (ppm)	Amino Acid	HI 93706-01
Silver	0.000 to 1.000 mg/L (ppm)	PAN	HI 93737-01**
Zinc	0.00 to 3.00 mg/L (ppm)	Zincon	HI 93731-01

Reagents are available in liquid or powder form, and the amount of each reagent is precisely dosed to ensure maximum repeatability.

[†] Unless noted otherwise, all reagent codes ending with -01 are for 100 tests. Replace the -01 with -03 for 300 tests.

* For Chlorine, liquid reagents are available. ** Reagents for 50 tests

For a complete list of Reagents, see Reagents Section 18.

ADP 20
Application Designed Photometers methods



ORDERING INFORMATION

HI 83207-01 (115V) and HI 83207-02 (230V) are supplied with sample cuvettes with caps (4 ea.), cloth for wiping cuvettes, 60 mL glass bottle for dissolved oxygen analysis, scissors, AC/DC power adapter and instruction manual

HI 83213

Multiparameter Photometer for Municipal Wastewater

With the beginning of the new millennium, water is becoming a strategic resource. Water has been and will continue to be a major factor for our survival, and the continuation of our way of life. Because of the limited resources of fresh water, careful use of it, as well as frequent reuse (after appropriate treatment) are requirements for sustainable development.

HI 83213 is a multiparameter bench meter that measures twenty-four methods essential for municipal wastewater analysis. It has four channels allowing for a wide range of tests.

The optical system of HI 83213 is based on special subminiature tungsten lamps and narrow-band interference filters to guarantee both high performance and reliable results.

HI 83213 has a powerful interactive user support that assists the user during the analysis process. A full tutorial is available in the Setup Menu, and the Help Menu provides assistance for every step in the measurement process. This meter can be connected to a PC via a USB cable, where the data can be managed with optional HI 92000 Windows® compatible software.



ADP
Application Designed Photometers

24
methods



ORDERING INFORMATION

HI 83213-01 (115V) and HI 83213-02 (230V) are supplied with sample cuvettes with caps (4 ea.), cloth for wiping cuvettes, 60 mL glass bottle for dissolved oxygen analysis, scissors, AC/DC power adapter and instruction manual

TEST	RANGE	METHOD	REAGENT CODE [†]
Aluminum	0.00 to 1.00 mg/L (ppm)	Aluminon	HI 93712-01
Ammonia MR	0.00 to 10.00 mg/L (ppm)	Nessler	HI 93715-01
Ammonia LR	0.00 to 3.00 mg/L (ppm)	Nessler	HI 93700-01
Bromine	0.00 to 8.00 mg/L (ppm)	DPD	HI 93716-01
Chlorine*, Free	0.00 to 2.50 mg/L (ppm)	DPD	HI 93701-01
Chlorine*, Total	0.00 to 3.50 mg/L (ppm)	DPD	HI 93711-01
Chromium VI HR	0 to 1000 µg/L	Diphenylcarbohydrazide	HI 93723-01
Chromium VI LR	0 to 300 µg/L	Diphenylcarbohydrazide	HI 93749-01
Color of Water	0 to 500 PCU	Platinum Cobalt	-
Copper HR	0.00 to 5.00 mg/L (ppm)	Bicinchoninate	HI 93702-01
Copper LR	0 to 1000 µg/L	Bicinchoninate	HI 95747-01
Iodine	0.0 to 12.5 mg/L (ppm)	DPD	HI 93718-01
Nickel HR	0.00 to 7.00 g/L	Photometric	HI 93726-01
Nickel LR	0.000 to 1.000 mg/L (ppm)	PAN	HI 93740-01**
Nitrate	0.0 to 30.0 mg/L (ppm)	Cadmium Reduction	HI 93728-01
Nitrite HR	0 to 150 mg/L (ppm)	Ferrous Sulfate	HI 93708-01
Nitrite LR	0.00 to 1.15 mg/L (ppm)	Diazotization	HI 93707-01
Oxygen, Dissolved (DO)	0.0 to 10.0 mg/L (ppm)	Winkler	HI 93732-01
pH	6.5 to 8.5 pH	Phenol Red	HI 93710-01
Phosphate HR	0.0 to 30.0 mg/L (ppm)	Amino Acid	HI 93717-01
Phosphate LR	0.00 to 2.50 mg/L (ppm)	Ascorbic Acid	HI 93713-01
Phosphorus	0.0 to 15.0 mg/L (ppm)	Amino Acid	HI 93706-01
Silver	0.000 to 1.000 mg/L (ppm)	PAN	HI 93737-01**
Zinc	0.00 to 3.00 mg/L (ppm)	Zincon	HI 93731-01

Reagents are available in liquid or powder form, and the amount of each reagent is precisely dosed to ensure maximum repeatability.

[†] Unless noted otherwise, all reagent codes ending with -01 are for 100 tests. Replace the -01 with -03 for 300 tests.

* For Chlorine, liquid reagents are available. ** Reagents for 50 tests

For a complete list of Reagents, see Reagents Section 18.

Multiparameter Photometer for Water Conditioning



The global distribution of freshwater resources varies greatly from region to region, and only 3% of global water resources are defined as freshwater.

The definition of freshwater is water containing less than 1000 mg/L of dissolved solids, most often salt.

The HI 83208 was developed to measure the most common parameters in water quality monitoring:

Ammonia detection in water treatment systems is particularly important for aquarium owners and fish farm operators. Ammonia is highly soluble in water and extremely toxic to fish.

Chlorine and chlorine-release compounds are used extensively as water purifiers or surface disinfectants.

Phosphates are present in natural waters, and at normal concentrations do not pose any specific health threats to humans. Phosphate contamination that comes from agricultural fertilizer run off can promote excessive algae.

HI 83208 is a multiparameter bench meter that measures twenty-three methods essential for water conditioning.

The optical system of HI 83208 is based on special subminiature tungsten lamps and narrow-band interference filters to guarantee both high performance and reliable results.

HI 83208 has a powerful interactive user support that assists the user during the analysis process. A full tutorial is available in the Setup Menu, and the Help Menu provides assistance for every step in the measurement process. This meter can be connected to a PC via a USB cable, where the data can be managed with optional HI 92000 Windows® compatible software.



ORDERING INFORMATION

HI 83208-01 (115V), HI 83208-02 (230V) and HI 83208-03 (AUS plug) are supplied with sample cuvettes with caps (2 ea.), cloth for wiping cuvettes, 60 mL glass bottle for dissolved oxygen analysis, scissors, AC/DC power adapter and instruction manual

TEST	RANGE	METHOD	REAGENT CODE [†]
Ammonia MR	0.00 to 10.00 mg/L (ppm)	Nessler	HI 93715-01
Ammonia LR	0.00 to 3.00 mg/L (ppm)	Nessler	HI 93700-01
Chlorine*, Free	0.00 to 2.50 mg/L (ppm)	DPD	HI 93701-01
Chlorine*, Total	0.00 to 3.50 mg/L (ppm)	DPD	HI 93711-01
Copper HR	0.00 to 5.00 mg/L (ppm)	Bicinchoninate	HI 93702-01
Copper LR	0 to 1000 µg/L	Bicinchoninate	HI 95747-01
Fluoride	0.00 to 2.00 mg/L (ppm)	SPADNS	HI 93729-01
Iron HR	0.00 to 5.00 mg/L (ppm)	Phenantroline	HI 93721-01
Iron LR	0 to 400 µg/L	TPTZ	HI 93746-01**
Manganese HR	0.0 to 20.0 mg/L (ppm)	Periodate	HI 93709-01
Manganese LR	0 to 300 µg/L	PAN	HI 93748-01**
Molybdenum	0.0 to 40.0 mg/L (ppm)	Mercaptoacetic Acid	HI 93730-01
Nickel HR	0.00 to 7.00 g/L	Photometric	HI 93726-01
Nickel LR	0.000 to 1.000 mg/L (ppm)	PAN	HI 93740-01**
Nitrate	0.0 to 30.0 mg/L (ppm)	Cadmium Reduction	HI 93728-01
Oxygen, Dissolved (DO)	0.0 to 10.0 mg/L (ppm)	Winkler	HI 93732-01
pH	6.5 to 8.5 pH	Phenol Red	HI 93710-01
Phosphate HR	0.0 to 30.0 mg/L (ppm)	Amino Acid	HI 93717-01
Phosphate LR	0.00 to 2.50 mg/L (ppm)	Ascorbic Acid	HI 93713-01
Phosphorus	0.0 to 15.0 mg/L (ppm)	Amino Acid	HI 93706-01
Silica	0.00 to 2.00 mg/L (ppm)	Heteropoly blue	HI 93705-01
Silver	0.000 to 1.000 mg/L (ppm)	PAN	HI 93737-01**
Zinc	0.00 to 3.00 mg/L (ppm)	Zincon	HI 93731-01

Reagents are available in liquid or powder form, and the amount of each reagent is precisely dosed to ensure maximum repeatability.

[†] Unless noted otherwise, all reagent codes ending with -01 are for 100 tests. Replace the -01 with -03 for 300 tests.

* For Chlorine, liquid reagents are available. ** Reagents for 50 tests

For a complete list of Reagents, see Reagents Section 18.

HI 96 Series

Portable Photometers

- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features
- Ideal for field applications

HANNA's line of portable photometers includes instruments to measure ammonia, chlorine at several ranges, copper, anionic detergents, fluoride, iron, nitrite, phosphate, phosphorus, and more. This series features an advanced optical system and HANNA's exclusive CAL CHECK™ validation function. The advanced optical system is based on a special tungsten lamp/LED–Light Emitting Diode and a narrow band interference filter assuring accurate readings every time.

With the exclusive CAL CHECK™ validation function, users are able to verify the performance of the instrument at any time. Taking just a few short steps, the validation procedure is extremely user friendly and ensures that the meter is properly calibrated. Just use the exclusive HANNA ready-made, NIST traceable standards to verify the performance of the instrument and recalibrate as necessary. All instruments are factory calibrated and the electronic and optical design minimizes the need for frequent calibration.

The cuvette is made from special optical glass to obtain best results and an exclusive positive-locking system ensures that the cuvette is in the same position every time it is placed into the measurement cell. The cell is designed to fit a wide mouth cuvette making it easier to add both samples and reagents.

The reagents are in powder or liquid form and the amount of reagent is precisely dosed to ensure maximum repeatability.

SOLUTIONS

HI 93703-50 Cuvette cleaning solution, 230 mL

ACCESSORIES

- HI 731318** Cuvette cleaning cloth (4)
- HI 731331** Measuring cuvettes (4)
- HI 731335** Cuvette caps (4)
- HI 740318** Carrying case for HI 96 series



CAL CHECK™ Validation*

2-step validation procedure for proper calibration.

Zero the meter prior to validation...

Place the CAL CHECK™ Standard A into the cuvette holder and press ZERO/CFM. The lamp, cuvette and detector icons will appear on the display followed by "-0.0-". The meter is now zeroed and ready for validation.

... and compare accuracy against a known standard.

Place the CAL CHECK™ standard B into the cuvette holder and press CAL CHECK™. The lamp, cuvette and detector icons together with "CAL CHECK" will appear on the display. At the end of the measurement the display will show the validation standard value.

CAL CHECK™ Calibration*

Calibrate your instrument quickly and easily.

Zero the meter prior to calibration...

Press and hold CAL CHECK™ for three seconds to enter calibration mode. Place the CAL CHECK™ Standard A into the cuvette holder and press ZERO/CFM. The lamp, cuvette and detector icons will appear on the display followed by "-0.0-". The meter is now zeroed and ready for calibration.

... and calibrate to a known standard.

Place the CAL CHECK™ Standard B into the cuvette holder. Press READ/▶ and the lamp, cuvette and detector icons will appear on the display. After measurement the instrument will show the CAL CHECK™ Standard value.

GENERAL SPECIFICATIONS

Power Supply	9V battery
Auto-off	after 10 minutes of non-use in measurement mode; after 1 hour of non-use in calibration mode; with last reading reminder.
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)

Each CAL CHECK™ cuvette is clearly labeled with its respective measurement. Please read the full instruction manual before validation/calibration.

Aluminum Portable Photometer



- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

Aluminum is the most abundant metal and the third most abundant element in the Earth's crust, behind only oxygen and silicon. It is a lightweight, silvery metal, familiar to every household in the form of pots and pans, beverage cans, and aluminum foil. It is nontoxic, corrosion resistant, non-magnetic, and easy to form or cast into a variety of shapes. It is one of the most useful metals we have.

In spite of the fact that aluminum is very active chemically, it does not corrode in moist air the way iron does. Instead, it quickly forms a thin, hard coating of aluminum oxide.

Aluminum is used in water purification because when it reacts with lime (or any base), it forms a sticky precipitate of aluminum hydroxide that sweeps out tiny particles of impurities.

HI 96712 measures the aluminum content in water and wastewater in the 0.00 to 1.00 mg/L range.

The meter uses an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

Many food-packaging materials and shiny plastic novelties are made of paper or plastic with an evaporated coating of bright aluminum.

In fact, cooking even weakly acidic foods such as tomatoes in an aluminum pot can dissolve enough aluminum to give the dish a "metallic" taste. Aluminum also dissolves in strong bases such as sodium hydroxide, commonly known as lye. Most oven cleaners, which are designed to work on steel and porcelain, contain sodium or potassium hydroxide, in which case, it is in the user's best interest to refrain from handling the aluminum parts of the cookware. Some commercial drain cleaners contain lye mixed with shavings of aluminum metal.

SPECIFICATIONS	HI 96712 Aluminum
Range	0.00 to 1.00 mg/L (ppm)
Resolution	0.01 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.02 mg/L ±4% of reading
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 525 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	adaptation of the aluminon method

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

For a complete list of Reagents, see Reagents Section 18.

ORDERING INFORMATION

HI 96712 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

- HI 96712-11 CAL CHECK™ standard cuvettes
- HI 93712-01 Reagents for 100 tests
- HI 93712-03 Reagents for 300 tests

HI 96700 • HI 96715 • HI 96733

Ammonia Portable Photometers

- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

The HI 96700 and HI 96715 meters measure the ammonia-nitrogen ($\text{NH}_3\text{-N}$) content in water samples. The HI 96733 measures the ammonium ion (NH_4^+) content in water, wastewater and seawater.

These meters use an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

Ammonia is often an excellent indication of the presence of animal or plant microbiological decay. It is tested in fish farms (fresh and salt water tanks) due to the damaging effects of its toxic nature. Its presence in rivers and reservoirs normally points to agricultural and/or civil pollutants. Ammonia is tested in lakes, rivers, portable water, boiler feed water, sewage, industrial and waste water.

ORDERING INFORMATION

HI 96700, HI 96715 and HI 96733 are supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96700C, HI 96715C and HI 96733C includes photometer, sample cuvettes (2) with caps, 9V battery, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

For HI 96700

- HI 96700-11 CAL CHECK™ standard cuvettes
- HI 93700-01 Reagents for 100 tests (N- NH_3 LR)
- HI 93700-03 Reagents for 300 tests (N- NH_3 LR)

For HI 96715

- HI 96715-11 CAL CHECK™ standard cuvettes
- HI 93715-01 Reagents for 100 tests (N- NH_3 MR)
- HI 93715-03 Reagents for 300 tests (N- NH_3 MR)

For HI 96733

- HI 96733-11 CAL CHECK™ standard cuvettes
- HI 93733-01 Reagents for 100 tests (NH_4^+ HR)
- HI 93733-03 Reagents for 300 tests (NH_4^+ HR)



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

SPECIFICATIONS	HI 96700 Ammonia LR	HI 96715 Ammonia MR	HI 96733 Ammonia HR
Range	0.00 to 3.00 mg/L (ppm) (as $\text{NH}_3\text{-N}$)	0.00 to 9.99 mg/L (ppm) (as $\text{NH}_3\text{-N}$)	0.0 to 50.0 mg/L (ppm) (as NH_4^+)
Resolution	0.01 mg/L (ppm)	0.01 mg/L (ppm)	0.1 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.04 mg/L ±4% of reading	±0.05 mg/L ±5% of reading	±0.5 mg/L ±5% of reading
Light Source	tungsten lamp	light emitting diode	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 420 nm	silicon photocell with narrow band interference filter @ 466	silicon photocell with narrow band interference filter @ 420 nm
Power Supply	9V battery		
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder		
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing		
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")		
Weight	360 g (12.7 oz.)		
Method	adaptation of the ASTM Manual of Water and Environmental Technology, D1426-92, Nessler method		

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

For a complete list of Reagents, see Reagents Section 18.

Anionic Surfactants Portable Photometer



- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

Surfactants are produced in large quantities and are widely used in many applications. Due to their common use, surfactants are introduced into the water supply through domestic and industrial drains.

Surfactants are harmful to water treatment plants, due to the scum that is created by emulsifying oil and grease. So, by law, surfactant concentrations must be monitored in wastewaters.

The HI 96769 measures anionic surfactants in drinking, surface and waste waters. The meter uses an exclusive positive-locking system to ensure that the cuvette is in the same position every time it is placed into the measurement cell. It is designed to fit a cuvette with a larger neck making it easier to add both sample and reagents. The cuvette is made from special optical glass to obtain best results.

Detergents are among the most common water pollutants, discharged as a consequence of laundering or cleaning processes, either from households or industrial origin. Detergents are mainly preparations or mixtures of linear alkyl sulfonates and other additives that help to remove grease and dirt.

These compounds and their foams are inconvenient in water dischargers because they interfere with transfer of the air to the water. In addition, they may deflocculate colloids, promote the flotation of the solids, emulsify oil and grease, lower the level of dissolved oxygen through biodegradation, and have a negative aesthetic impact. They can also destroy the natural water-repellent protective coating of aquatic animals and birds. In large concentrations, detergents may cause the death of aquatic plants and animals.

SPECIFICATIONS	HI 96769 Anionic Surfactants
Range	0.00 to 3.50 mg/L (ppm) as SDBS
Resolution	0.01 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.04 mg/L ±3% of reading
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 610 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	adaptation of the USEPA method 425.1 and Standard Methods for the Examination of Water and Wastewater, 20th edition, 5540C, Anionic Surfactants as MBAS

The reagent is in liquid form and is supplied in bottles. The amount of reagent is precisely dosed by use of the supplied pipettes to ensure the maximum repeatability.

For a complete list of Reagents, see Reagents Section 18.

ORDERING INFORMATION

HI 96769 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96769C includes HI 96769 photometer, sample cuvettes (2) with caps, 25 mL glass vial with cap, plastic pipettes (3), 9V battery, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

- HI 96769-11 CAL CHECK™ standard cuvettes
- HI 93769-01 Reagent for 40 anionic surfactants tests

HI 96716

Bromine Portable Photometer

- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

In many countries, bromine sanitizing has been introduced as an alternative for chlorine. Although it is not as strong as chlorine, bromine remains stable at higher temperatures (advantageous for heated pools and hot tubs), and higher pH levels. Furthermore, it has little reaction to nitrogen compounds, thus reducing the unpleasant odor and eye irritation problems associated with pool water sanitation. The main disadvantage of bromine is the slower acting disinfecting power, making it less suitable for larger pools.

The HI 96716 meter measures the bromine content in water samples in the 0.00 to 10.00 mg/L (ppm) range. The HI 96 series portable photometers use an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.



The Alternative to Chlorine

Bromine is often used instead of chlorine as a disinfectant because of its less volatile nature. Its action has more effective results when the pH value is above 7.4, and the main application is pools, spas and hot tubs. Like all chemicals used for this purpose, the concentration must be within acceptable limits, which can vary according to the application.

ORDERING INFORMATION

HI 96716 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96716C includes HI 96716 photometer, sample cuvettes (2) and caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96716-11 CAL CHECK™ standard cuvettes

HI 93716-01 Reagents for 100 tests

HI 93716-03 Reagents for 300 tests

SPECIFICATIONS	HI 96716 Bromine
Range	0.00 to 10.00 mg/L (ppm)
Resolution	0.01 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.08 mg/L ± 3% of reading
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 525 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	adaptation of the Standard Methods for the Examination of Water and Wastewater, 20th edition, DPD method

The reagent is in powder form and is supplied in packets. The amount of reagent is precisely dosed to ensure maximum repeatability.

For a complete list of Reagents, see Reagents Section 18.



- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

Chloride ions are one of the major inorganic anions in water and wastewater. Although high concentrations of chloride in water are not known to be toxic to humans, its regulation is mainly due to adverse effects on taste. It is essential to monitor chloride concentrations in boiler systems to prevent metal parts from being damaged. In high levels, chloride can corrode stainless steel. The level of chloride concentrations in boiler and cooling towers varies from small quantities to very high levels. Furthermore high levels of chloride can be toxic to plant life.

Chlorides are the salts of hydrochloric acid with a metal. Some common examples are sodium chloride (NaCl), ammonium chloride (NH₄Cl), calcium chloride (CaCl₂), and magnesium chloride (MgCl₂). When dissolved in water, these salts produce chloride ions, Cl⁻.

The HI 96753 meter measures the chloride content in water and wastewater samples. This meter uses an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

Chloride is a major constituent of sea water and is extremely corrosive in acidic environments. It requires close monitoring in applications such as marine boiler systems that are prone to seawater contamination.

Chlorides are used by the water treatment professional to determine cycles of concentration in low pressure boilers and cooling systems. Merchant and ocean going passenger vessels need to ensure that chloride contamination of engine cooling systems and boilers does not occur.

Due to the range limit, HI 96753 can be also used in sea water applications if the sample is diluted accordingly.

SPECIFICATIONS	HI 96753 Chloride
Range	0.0 to 20.0 mg/L (ppm)
Resolution	0.1 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.5 mg/L ±6% of reading
Light Source	light emitting diode
Light Detector	silicon photocell with narrow band interference filter @ 466 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	adaptation of the mercury (II) thiocyanate method

ORDERING INFORMATION

HI 96753 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96753C includes HI 96753 photometer, sample cuvettes (2) with caps, 9V battery, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

- HI 96753-11 CAL CHECK™ standard cuvettes
- HI 93753-01 Reagents for 100 tests
- HI 93753-03 Reagents for 300 tests

For a complete list of Reagents, see Reagents Section 18.

HI 96738

Chlorine Dioxide Portable Photometer

- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

Chlorine dioxide is used primarily as a disinfectant in drinking water and also in various industrial processes. In drinking water applications, it is gaining popularity over chlorine, considering that it does not generate trihalomethanes when reacting with organic compounds. In industrial applications, it is used as a bleaching agent in such applications as pulp and paper.

The HI 96738 meter measures the chlorine dioxide content in water samples in the 0.00 to 2.00 mg/L range. This meter uses an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

Chlorine Dioxide is a highly effective, eco-friendly microbicide that carries a number of important regulatory approvals from several international organisations including the US EPA, FDA and UK Government for many of its uses.

Chlorine and bromine react rapidly with microbiological species and chemicals in water. This reactivity is both their strength and weakness. Since chemical reactions are usually the first to take place, only the small residual of the product remaining after the chemical reaction is completed is available for microbiological control.

Chlorine dioxide is a very safe and potent biocide. It is effective over a wide pH range in both hard and soft water and does not react with most other water treatment chemicals.

ORDERING INFORMATION

HI 96738 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96738C is supplied with HI 96738 photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96738-11 CAL CHECK™ standard cuvettes

HI 93738-01 Reagents for 100 tests

HI 93738-03 Reagents for 300 tests



Chlorine dioxide, ClO₂, is a stable oxide and can be prepared by reducing chlorates or in reaction with moist oxalic acid. Chlorine dioxide is a strong oxidizing agent toward both organic and inorganic materials.

Chlorine dioxide is an extremely effective oxidizing biocide used in the disinfection of tanked potable water and for high shock dose chemical cleaning.

The local authorities has set guidelines for the concentration of total oxidants present in potable water, with particular reference to the use of chlorine dioxide, produced at high concentration via generators, then blended with the distributed water supply.

SPECIFICATIONS	HI 96738 Chlorine Dioxide
Range	0.00 to 2.00 mg/L (ppm)
Resolution	0.01 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.10 mg/L ±5% of reading
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 575 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	Chlorophenol Red method

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

For a complete list of Reagents, see Reagents Section 18.

Chlorine, Free Portable Photometers



- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

The HI 96701 meter measures the free chlorine (Cl_2) content in water samples in the 0.00 to 5.00 mg/L (ppm) range.

HI 96762 was specially developed to measure low concentrations of free chlorine in drinking water.

These meters use an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

Chlorine is widely used in making many everyday products, but most notably, it is used for producing safe drinking water the world over. Even the smallest water supplies are now usually chlorinated. It is also extensively used in the production of paper products, dyestuffs, textiles, petroleum products, medicines, antiseptics, insecticides, food, solvents, paints, plastics, and many other consumer products. Most of the chlorine produced is used in the manufacture of chlorinated compounds for sanitation, pulp bleaching, disinfectants, and textile processing.

Organic chemistry demands much from chlorine, both as an oxidizing agent and in substitution, since it often brings many desired properties in an organic compound when substituted for hydrogen, as in one form of synthetic rubber.

SPECIFICATIONS	HI 96701 Chlorine, Free	HI 96762 Chlorine, Free Low Range
Range	0.00 to 5.00 mg/L (ppm)	0.000 to 0.500 mg/L (ppm)
Resolution	0.01 mg/L from 0.00 to 3.50 mg/L (ppm); 0.10 mg/L above 3.50 mg/L (ppm)	0.001 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.03 mg/L ±3% of reading	±0.020 mg/L ±3% of reading
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 525 nm	
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of the USEPA method 330.5 and Standard Method 4500-Cl G	

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

ORDERING INFORMATION

HI 96701 and HI 96762 are supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96701C and HI 96762C include photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96701

HI 96701-11 CAL CHECK™ Standard Cuvettes

HI 93701-01 Reagents for 100 tests

HI 93701-03 Reagents for 300 tests

HI 96762

HI 96762-11 CAL CHECK™ Standard Cuvettes

HI 95762-01 Reagents for 100 tests

HI 95762-03 Reagents for 300 tests

For a complete list of Reagents, see Reagents Section 18.

HI 96771

Chlorine, Free Ultra High Range Portable Photometer

- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

HI 96771 has been developed to check chlorine dosing in disinfection processes with ultra high concentrations of chlorine. Thanks to the extended range from 0 to 500 mg/L (ppm), it is ideal for the food industry, such as in fruit and vegetable washing.

The HI 96771 meter measures the free chlorine (Cl₂) content in water samples and chlorine ultra high range. The methods are an adaptation of Standard Methods for the Examination of Water and Wastewater, 20th edition, 4500-Cl.

The meter uses an exclusive positive-locking system to ensure that the cuvette is in the same position every time it is placed into the measurement cell. It is designed to fit a cuvette with a larger neck making it easier to add both sample and reagents. The cuvette is made from special optical glass to obtain best results.



Exposure to chlorine, hypochlorous acid, and hypochlorite ions through ingestion of household bleach occurs most commonly with children. Intake of a small quantity of bleach generally results in irritation of the oesophagus, a burning sensation in the mouth and throat, and spontaneous vomiting. In these cases, it is not clear whether it is the sodium hypochlorite or the extremely caustic nature of the bleach that causes the tissue injury.

The effects of heavily chlorinated water on human populations exposed for varying periods were summarized in a report that was essentially anecdotal in character and did not describe in detail the health effects observed. It has been reported that asthma can be triggered by exposure to chlorinated water. Episodes of dermatitis have also been associated with exposure to chlorine and hypochlorite.

ORDERING INFORMATION

HI 96771 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96771C includes HI 96771 photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

- HI 95771-11 CAL CHECK™ Standard Cuvettes
- HI 93701-01 Reagents for 100 tests
- HI 93701-03 Reagents for 300 tests
- HI 95771-01 Reagents for 100 tests
- HI 95771-03 Reagents for 300 tests

SPECIFICATIONS	HI 96771 Chlorine, Free and Ultra High Range	
	Chlorine, Free (P1)	Chlorine, UHR (P2)
Range	0.00 to 5.00 mg/L (ppm)	0 to 500 mg/L (ppm)
Resolution	0.01 mg/L from 0.00 to 3.50 mg/L (ppm); 0.10 mg/L above 3.50 mg/L (ppm)	1 mg/L from 0 to 200 mg/L (ppm); 10 mg/L above 200 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.03 mg/L ±3% of reading	±3 mg/L ±3% of reading
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 466 nm	
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of Standard Methods for the Examination of Water and Wastewater, 20th edition, 4500-Cl	

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

For a complete list of Reagents, see Reagents Section 18.

Chlorine, Total Portable Photometers



- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

The HI 96711 meter measures the free and total chlorine (Cl_2) content in water and wastewater. The HI 96761 meter measures the traces of total chlorine (Cl_2) content in drinking water samples.

This meter uses an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

Chlorine is integrated into water supplies in its molecular form for the purpose of destroying unwanted microorganisms. Once introduced to the water, chlorine will form into three different forms; free chlorine, hypochlorous acid, and hypochlorous ions. Free chlorine will combine itself with ammonia and nitrogen compounds, creating combined chlorine. When chlorine and ammonia combine, it creates chloramines (monochloramine, dichloramine, and nitrogen trichloride). Proper testing should be administered when chlorinating any water supply, as potentially harmful compounds such as chloroform may be formed. N, N-diethyl-p-phenylenediamine (DPD) as well as other methods are available for measuring total residual chlorine.

SPECIFICATIONS	HI 96711 Chlorine, Free and Total	HI 96761 Chlorine, Total Low Range
Range	0.00 to 5.00 mg/L (ppm)	0.000 to 0.500 mg/L (ppm)
Resolution	0.01 mg/L from 0.00 to 3.50 mg/L (ppm); 0.10 mg/L above 3.50 mg/L (ppm)	0.001 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.03 mg/L ±3% of reading	±0.020 mg/L ±3% of reading
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 525 nm	
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of the USEPA method 330.5 and Standard Method 4500-Cl G	

ORDERING INFORMATION

HI 96711 and HI 96761 are supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96711C and HI 96761C include photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96711

HI 95701-11 CAL CHECK™ standard cuvettes

HI 93701-01 Reagents for 100 tests

HI 93701-03 Reagents for 300 tests

HI 96711-11 CAL CHECK™ standard cuvettes

HI 93711-01 Reagents for 100 tests

HI 93711-03 Reagents for 300 tests

HI 96761

HI 96761-11 CAL CHECK™ Standard cuvettes

HI 95761-01 Reagents for 100 tests

HI 95761-03 Reagents for 300 tests

For a complete list of Reagents, see Reagents Section 18.

HI 96723 • HI 96749

Chromium VI HR and LR Portable Photometers

- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

At normal temperatures chromium is corrosion-resistant. For this reason, it plays an important role in the plating industry as well as cooling towers. In addition, it has certain qualities that make it useful in the production processes of the textile industry.

The HI 96723 and HI 96749 meters measure the hexavalent chromium (Cr VI) content in water and waste waters samples.

The meters use an exclusive positive-locking system to ensure that the cuvette is in the same position every time it is placed into the measurement cell.



All compounds of chromium are colored; the most important are the chromates of sodium and potassium and the dichromates and the potassium and ammonium chrome alums. The dichromates are used as oxidizing agents in quantitative analysis, also in tanning leather.

Another compound of industrial value is lead chromate which is chrome yellow, a valuable pigment.

Chromium compounds are used in the textile industry as mordants, and by the aircraft and other industries for anodizing aluminum.

ORDERING INFORMATION

HI 96723 and HI 96749 are supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

- HI 96723-11 CAL CHECK™ standard cuvettes
- HI 96749-11 CAL CHECK™ standard cuvettes
- HI 93723-01 Reagents for 100 tests
- HI 93723-03 Reagents for 300 tests
- HI 93749-01 Reagents for 100 tests
- HI 93749-03 Reagents for 300 tests

SPECIFICATIONS	HI 96723 Chromium VI High Range	HI 96749 Chromium VI Low Range
Range	0 to 1000 µg/L (ppb)	0 to 300 µg/L (ppb)
Resolution	1 µg/L (ppb)	1 µg/L (ppb)
Accuracy @ 25°C (77°F)	±5 mg/L ±4% of reading	±1 mg/L ±4% of reading
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 525 nm	
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of the ASTM Manual of Water and Environmental Technology, D1687-92, diphenylcarbohydride method. The reaction between Cr VI and reagents causes a purple tint in the sample	

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

For a complete list of Reagents, see Reagents Section 18.

Color of Water Portable Photometer



- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

Color together with odor, taste and turbidity form an integral part of our sensory system.

Testing for color can be a quick and easy test which often reflects the amount of organic material in the water, although certain inorganic components like iron or manganese can also impart color.

The HI 96727 measures the true and apparent color in water and wastewater in the 0 to 500 PCU (Platinum Cobalt Units) range.

The HI 96727 uses an exclusive positive-locking system to ensure that the cuvette is in the same position every time it is placed into the measurement cell. It is designed to fit a cuvette with a larger neck making it easier to add both sample and reagents. The cuvette is made from special optical glass to obtain best results.

Apparent color is the color of the whole water sample, and consists of color from both dissolved and suspended components. **True color** is measured after filtering the water sample to remove all suspended material.

The presence of color in water does not necessarily indicate that the water is not potable. Color-causing substances such as tannins may be harmless.

Color is not removed by typical water filters; however, slow sand filters can remove color, and the use of coagulants may also succeed in trapping the color-causing compounds within the resulting precipitate.

SPECIFICATIONS	HI 96727 Color of Water
Range	0 to 500 PCU (Platinum Cobalt Units)
Resolution	10 PCU
Accuracy @ 25°C (77°F)	±10 PCU ±5% of reading
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 420 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	Colorimetric Platinum Cobalt method

ORDERING INFORMATION

HI 96727 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96727-11 CAL CHECK™ standard cuvettes
0.45 nm membrane for true color measurement

For a complete list of Reagents, see Reagents Section 18.

HI 96747 • HI 96702

Copper Portable Photometers

- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

HI 96747 is a auto-diagnostic photometer engineered to measure a wide range of copper concentrations. Due to the specially formulated powder reagent with long-term stability, copper analysis is possible even where iron and calcium is present, such as in sea water.

The HI 96702 meter measures the copper content in water and wastewater.

Both meters use an exclusive positive-locking system to ensure that the cuvette is in the same position every time it is placed into the measurement cell. It is designed to fit a cuvette with a larger neck making it easier to add both sample and reagents. The cuvette is made from special optical glass to obtain best results.



Copper is one of the most abundant metals in the earth's crust. Because of its malleability, thermal and electrical conductivity, corrosion resistance, and other useful qualities, it is used in a large variety of industrial and technological applications.

Copper is found in effluents and natural water both as suspended solids and salt. A high concentration is toxic for plants and animals, which accounts for its rigorous monitoring by the authorities and industry. Lower concentrations are often employed to contain the growth of plankton and algae.

ORDERING INFORMATION

HI 96747 and HI 96702 are supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96747C and HI 96702C include photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96747

HI 96747-11 CAL CHECK™ standard cuvettes

HI 95747-01 Reagents for 100 tests

HI 95747-03 Reagents for 300 tests

HI 96702

HI 96702-11 CAL CHECK™ standard cuvettes

HI 93702-01 Reagents for 100 tests

HI 93702-03 Reagents for 300 tests

SPECIFICATIONS	HI 96747 Copper, Low Range	HI 96702 Copper, High Range
Range	0.000 to 1.500 mg/L (ppm)	0.00 to 5.00 mg/L (ppm)
Resolution	0.001 mg/L (ppm)	0.01 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.010 mg/L ±5% of reading	±0.02 mg/L ± 4% of reading
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 560 nm	silicon photocell with narrow band interference filter @ 575 nm
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of the USEPA approved bicinchoninate method	

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

For a complete list of Reagents, see Reagents Section 18.



- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

The HI 96714 meter measures the cyanide concentration in waters. The meter uses an exclusive positive-locking system to ensure that the cuvette is in the same position every time it is placed into the measurement cell. It is designed to fit cuvettes with a larger neck making it easier to add both sample and reagents. The cuvettes are made from special optical glass to obtain best results.

Cyanide is a pollutant that originates mostly from metallurgical and galvanic industrial plants. Cyanide is poisonous to human nervous system, and it is therefore imperative to monitor and control its level in potable water. Continuous monitoring in waste effluents is required, and cyanide is removed using alkaline chlorination procedure. Due to this, European norm limit the concentration of cyanide in drinking water to 0.05 mg/L, while the EPA has established that the maximum level is not to exceed 0.2 mg/L.

Measures to Minimize Cyanide Discharge

To meet the public's need for safety, environmental protection, and clean water and air, the ongoing regulatory cycle involves ever-tightening restrictions on hazardous materials and their discharge.

For cyanide users, this is exemplified by more stringent discharge restrictions, stricter storage requirements and mandatory use of cyanide gas sensing/detection systems in some jurisdictions.

SPECIFICATIONS	HI 96714 Cyanide
Range	0.000 to 0.200 mg/L (ppm)
Resolution	0.001 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.005 mg/L ±3% of reading
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 610 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th edition, Pyridine-Pyrazolone method

The reagents are in powder form and are supplied in bottle/packets. The amount of reagent is precisely dosed to ensure the maximum repeatability.

For a complete list of Reagents, see Reagents Section 18.

ORDERING INFORMATION

HI 96714 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

- HI 96714-11 CAL CHECK™ standard cuvettes
- HI 93714-01 Reagents for 100 tests
- HI 93714-03 Reagents for 300 tests

HI 96722

Cyanuric Acid Portable Photometer

- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

The HI 96722 meter measures the cyanuric acid content in water samples in the 0 to 80 mg/L (ppm) range.

This meter uses an exclusive positive-locking system to ensure that the cuvette is in the same position every time it is placed into the measurement cell. It is designed to fit cuvettes with a larger neck making it easier to add both sample and reagents. The cuvettes are made from special optical glass to obtain best results.

Cyanuric acid (CYA) is best known as a stabilizing reagent for chlorine. It is widely applied in swimming pool and spa treatment programs to slow down the decomposition of hypochlorous acid. In outside pool areas, this process is accelerated by the effects of UV rays. When applied properly it can save up to 80% of normal chlorine consumption in pools during peak months.

Cyanuric acid is also used in chlorinated beaches, selective herbicides and whitening agents.



Monitor This Critical Parameter Easily

ORDERING INFORMATION

HI 96722 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

- HI 96722-11 CAL CHECK™ standard cuvettes
- HI 93722-01 Reagents for 100 tests
- HI 93722-03 Reagents for 300 tests

SPECIFICATIONS	HI 96722 Cyanuric Acid
Range	0 to 80 mg/L (ppm)
Resolution	1 mg/L (ppm)
Accuracy @ 25°C (77°F)	±1 mg/L ±15% of reading
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 525 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	adaptation of the turbidimetric method

The reagent is in powder form and is supplied in packets. The amount of reagent is precisely dosed to ensure the maximum repeatability.

For a complete list of Reagents, see Reagents Section 18.

Fluoride Portable Photometers



- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

The HI 96729 meter measures the fluoride (F⁻) content in the 0.00 to 2.00 mg/L (ppm) range, in drinking, surface and waste waters. The amount of reagent is precisely dosed by use of the supplied automatic pipette for maximum repeatability.

The HI 96739 meter measures the fluoride (F⁻) content in water, wastewater and seawater in the 0 to 20 mg/L (ppm) range.

Both meters use an exclusive positive-locking system to ensure that the cuvette is in the same position every time it is placed into the measurement cell. It is designed to fit cuvettes with a larger neck making it easier to add both sample and reagents. The cuvettes are made from special optical glass to obtain best results.

Fluoride is best known for preventing tooth decay. Water authorities often add fluoride to drinking water to maintain approximately a 1.0 mg/L (ppm) concentration. Fluoride can be found naturally in ground water, particularly if a reservoir is in the proximity of draws of sea water. While fluoride does help prevent tooth decay, too little can be ineffective and too much can cause staining.

SPECIFICATIONS	HI 96729 Fluoride LR	HI 96739 Fluoride HR
Range	0.00 to 2.00 mg/L (ppm)	0.0 to 20.0 mg/L (ppm)
Resolution	0.01 mg/L (ppm)	0.1 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.03 mg/L ±3% of reading	±0.5 mg/L ±3% of reading
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 575 nm	
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of the EPA method 340.1 and Standard Methods for the Examination of Water and Wastewater, 20th edition, SPADNS method	adaptation of the SPADNS method

The reagents are in liquid form and are supplied in bottles. The amount of reagent is precisely dosed by use of the supplied automatic pipette to ensure the maximum repeatability.

For a complete list of Reagents, see Reagents Section 18.

ORDERING INFORMATION

HI 96729 and HI 96739 is supplied sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96729C and HI 96739C include photometer, sample cuvettes (2) with caps, 2000 µL automatic pipette with instruction sheet, 9V battery, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 93703-53 Reagent for reducing chlorine concentration

For HI 96729

HI 96729-11 CAL CHECK™ standard cuvettes

HI 93729-01 Reagents for 100 tests

HI 93729-03 Reagents for 300 tests

For HI 96739

HI 96739-11 CAL CHECK™ standard cuvettes

HI 93739-01 Reagents for 100 tests

HI 93739-03 Reagents for 300 tests

HI 96720 • HI 96719

Hardness Standard Method Portable Photometers

- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features.

The HI 96720 measures the calcium hardness content, as CaCO_3 , in water and wastewater in the 0.00 to 2.70 mg/L (ppm) range.

The HI 96719 measures the magnesium hardness content, as CaCO_3 , in water and wastewater in the 0.00 to 2.00 mg/L (ppm) range.

Both meters use an exclusive positive-locking system to ensure that the cuvette is in the same position every time it is placed into the measurement cell. It is designed to fit cuvettes with a larger neck making it easier to add both sample and reagents. The cuvettes are made from special optical glass to obtain best results.



Water, with exception to distilled water, contains dissolved salts (**magnesium and calcium carbonates**). The concentration of these salts determines the water hardness, which can be expressed in calcium carbonate or magnesium carbonate. The sum of these two represents the total hardness level.

In addition, this parameter is also related to the phenomenon of pipe rusting in water heating and cooling systems, reverse osmosis and demineralization plants.

ORDERING INFORMATION

HI 96720 and HI 96719 are supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96720C and HI 96719C include photometer, sample cuvettes (2) with caps, 9V battery, 1 mL syringe with tip, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

For HI 96720

HI 96720-11 CAL CHECK™ standard cuvettes

HI 93720-01 Reagents for 100 tests

HI 93720-03 Reagents for 300 tests

For HI 96719

HI 96719-11 CAL CHECK™ standard cuvettes

HI 93719-01 Reagents for 100 tests

HI 93719-03 Reagents for 300 tests

SPECIFICATIONS	HI 96720 Ca Hardness	HI 96719 Mg Hardness
Range	0.00 to 2.70 mg/L (ppm)	0.00 to 2.00 mg/L (ppm)
Resolution	0.01 mg/L (ppm)	0.01 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.11 mg/L ±5% of reading	
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 525nm	
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th ed. Calmagite method	adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th ed. EDTA colorimetric method

The reagents are in liquid form and are supplied in bottles. The amount of reagent is precisely dosed by use of the supplied automatic pipette to ensure the maximum repeatability.

For a complete list of Reagents, see Reagents Section 18.

Hardness, EPA Portable Photometer



- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

Total hardness, that is the presence of magnesium and calcium, is due mainly to the runoff water dissolving these salts as it flows or filters through different strata. Hardness can also cause scaling of pipes in cooling and heating systems.

The HI 93735 measures the total hardness in drinking, surface and wastewater.

This meter uses an exclusive positive-locking system to ensure that the cuvette is in the same position every time it is placed into the measurement cell. It is designed to fit cuvettes with a larger neck making it easier to add both sample and reagents. The cuvettes are made from special optical glass to obtain best results.

Hardness in water is caused by dissolved minerals, primarily divalent cations, including calcium (Ca^{2+}), iron (Fe^{2+}), strontium (Sr^{2+}), zinc (Zn^{2+}), and manganese (Mn^{2+}). Calcium and magnesium ions are usually the only ions present in significant concentrations, therefore, hardness is generally considered to be a measure of the calcium and magnesium content of water. Considerations should be given when other cations contributing to hardness are present in significant amounts.

SPECIFICATIONS	HI 96735 Hardness, Total		
	Hardness LR (P1)	Hardness MR (P2)	Hardness HR (P3)
Range	0 to 250 mg/L (ppm)	200 to 500 mg/L (ppm)	400 to 750 mg/L (ppm)
Resolution	1 mg/L from 0 to 100 mg/L, 5 mg/L from 100 to 750 mg/L	5 mg/L	5 mg/L
Accuracy @ 25°C (77°F)	±5 mg/L ±4% of reading	±7 mg/L ±3% of reading	±10 mg/L ±2% of reading
Light Source	light emitting diode		
Light Detector	silicon photocell with narrow band interference filter @ 466		
Power Supply	9V battery		
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder		
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing		
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")		
Weight	360 g (12.7 oz.)		
Method	adaptation of the EPA recommended method 130.1		

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

For a complete list of Reagents, see Reagents Section 18.

ORDERING INFORMATION

HI 96735 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96735-11	CAL CHECK™ standard cuvettes
HI 93735-00	Reagents for 100 tests (0-250 mg/L)
HI 93735-01	Reagents for 100 tests (200-500 mg/L)
HI 93735-02	Reagents for 100 tests (400-750 mg/L)
HI 93735-0	Reagents for 100 tests (0-750 mg/L)

HI 96785

Honey Color Portable Analyzer

No More Judging By Eye!

- Immediate results
- Digital readout
- No more judging by eye

The HI 96785 portable microprocessor analyzer measures the percent light transmittance of honey compared to analytical reagent grade glycerol. The transmittance value allows identification of the honey Pfund grade. The instrument directly displays the measurement result expressed in mm Pfund.

Measurements are made using matched square optical cuvettes having a 10 mm light path.

Why this instrument is so important

The natural color of honey presents many tonalities: from straw yellow to amber, from dark amber to almost black with a hint of red. The color of untreated honey originates from the botanical varieties used by the bees: for this reason, its coloration allows one to commercially identify the original floral type.

In addition, the color of honey tends to darken with age or change according to the method of conservation or production used by beekeepers, (for example: the use of old beehives, contact with metals, the temperature of conservation, exposure to light, etc.). The classes of color are expressed in millimeters (mm) on the Pfund scale, compared to an analytical standard scale of reference on the graduation of glycerin.



Application Designed Photometers

USDA Color Standards Designations	Color Range Pfund Scales (mm)
Water White	≤ 8 or less
Extra White	> 8 - ≤ 17
White	> 17 - ≤ 34
Extra Light Amber	> 34 - ≤ 50
Light Amber	> 50 - ≤ 85
Amber	> 85 - ≤ 114
Dark Amber	> 114

SPECIFICATIONS	HI 96785
Range	0 to 150 mm Pfund
Resolution	1 mm Pfund
Accuracy @ 25°C (77°F)	±2 mm Pfund @ 80mm Pfund
Light Source	tungsten lamps
Light Detector	silicon photocells with narrow band interference filter @ 420 nm and 525 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	direct measure

ORDERING INFORMATION

HI 96785 is supplied with sample cuvettes (5), 9V battery, light shield cap, 30 mL bottle of glycerol, instruction manual.

ACCESSORIES

HI 93703-56 Consists of 82 matched square cuvettes, 30 mL of glycerol and (2) 5 mL syringes (75 tests average)

HI 70662 Cleaning solution for honey meter (30 mL)

Hydrazine Portable Photometer



- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

Hydrazine is a liquid chemical substance normally used in high pressure heating plants because of its properties as an oxygen inhibitor. It is added to avoid scaling and corrosion in the plant itself. Hydrazine reacts with dissolved oxygen to yield nitrogen and water, so that hydrazine has the advantage over the sulfite treatment because it does not produce any dissolved solids in the boiled water. Hydrazine is also used in tanks because it controls the growth of bacteria. Other hydrazine uses include:

- oxygen scavenger for water boiler feed and heating systems to prevent corrosion damage
- energy source in fuel elements
- reducing agent for the recovery of metals (copper, nickel and others)
- intermediate in insecticides, herbicides, explosives, plant growth regulators, pharmaceuticals, dyes, flame-retardants, polymerization catalysts and other chemical products
- component of photo development

The HI 96704 meter measures the hydrazine content in water samples. The method is an adaptation of the ASTM Manual of Water and Environmental Technology, method D1385-88 for natural and treated water.

Hydrazine is an inorganic chemical compound represented by the formula N_2H_4 . It is a colorless, flammable liquid with an ammonia-like odor and is derived from the same industrial chemistry processes that manufacture ammonia. However, hydrazine has physical properties that are closer to those of water.

Hydrazine is highly toxic and dangerously unstable, and is usually handled while in solution for safety reasons.

SPECIFICATIONS	HI 96704 Hydrazine
Range	0 to 400 µg/L (ppb)
Resolution	1 µg/L (ppb)
Accuracy @ 25°C (77°F)	±3% of full scale
Light Source	light emitting diode
Light Detector	silicon photocell with narrow band interference filter @ 466 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	adaptation of the ASTM Manual of Water and Environmental Technology, method D1385-88 for natural and treated water

The reagent is in liquid form and is supplied in dropper bottles. The amount of reagent is precisely dosed to ensure the maximum repeatability.

ORDERING INFORMATION

HI 96704 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96704C includes HI 96704 photometer, sample cuvettes (2) with caps, 9V battery, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

- HI 96704-11 CAL CHECK™ standard cuvettes
- HI 93704-01 Reagents for 100 tests
- HI 93704-03 Reagents for 300 tests

For a complete list of Reagents, see Reagents Section 18.

HI 96718

Iodine Photometer

- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

The disinfectant properties of Iodine have led to its use as an alternative to chlorine and bromine. Unlike chlorinated pools, water treated with iodine decreases eye irritation among swimmers, and provides a level of disinfection more stable to adverse conditions.

However, its toxic and corrosive properties and the difficulties of dissolving it in water has limited its widespread acceptance. One of its most common applications is in poultry industry process water.

HI 96718 uses an exclusive positive-locking system to ensure that the cuvette is in the same position every time it is placed into the measurement cell. It is designed to fit a cuvette with a larger neck making it easier to add both sample and reagents. The cuvette is made from special optical glass to obtain best results.

The HI 96718 measures the Iodine content in water samples in the 0.0 to 12.5 mg/L (ppm) range. The method is an adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th edition, DPD method.



ORDERING INFORMATION

HI 96718 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96718C includes HI 96718 photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96718-11 CAL CHECK™ standard cuvettes

HI 93718-01 Reagents for 100 tests

HI 93718-03 Reagents for 300 tests

SPECIFICATIONS	HI 96718 Iodine
Range	0.0 to 12.5 mg/L (ppm)
Resolution	0.1 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.1 mg/L ±5% of reading
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 525 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th edition, DPD method

The reagent is in powder form and is supplied in packets. The amount of reagent is precisely dosed to ensure the maximum repeatability.

For a complete list of Reagents, see Reagents Section 18.



- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

The HI 96746 meter measures the iron content in water, wastewater and seawater in the 0.00 to 1.60 mg/L (ppm) range.

The HI 96721 meter measures total iron (Fe) content in water samples in the 0.00 to 5.00 mg/L (ppm) range. The reagent contains both a reducing and a complexing agent: the first converts all but very most resistant forms of iron present in the sample to the ferrous (Fe²⁺) or soluble state; the second reacts with the ferrous iron to form the characteristic orange-colored complex.

Both meters use an exclusive positive-locking system to ensure that the cuvette is in the same position every time it is placed into the measurement cell. It is designed to fit a cuvette with a larger neck making it easier to add both sample and reagents. The cuvette is made from special optical glass to obtain best results.

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

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

SPECIFICATIONS	HI 96746 Iron LR	HI 96721 Iron HR
Range	0.00 to 1.60 mg/L (ppm)	0.00 to 5.00 mg/L (ppm)
Resolution	0.01 mg/L (ppm)	0.01 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.01 mg/L ±8% of reading	±0.04 mg/L ±2% of reading
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 525 nm	
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of the TPTZ method	adaptation of the USEPA method 315B and Standard Method 3500-Fe B

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

ORDERING INFORMATION

HI 96746 and HI 96721 are supplied with sample cuvettes (2) with caps, 9V battery and instructions.

CAL CHECK™ standards and testing reagents sold separately

HI 96746C and HI 96721C includes photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

For HI 96746

HI 96746-11 CAL CHECK™ standard cuvettes

HI 93746-01 Powder reagents for 100 tests

HI 93746-03 Powder reagents for 300 tests

For HI 96721

HI 96721-11 CAL CHECK™ standard cuvettes

HI 93721-01 Reagents for 100 tests

HI 93721-03 Reagents for 300 tests

For a complete list of Reagents, see Reagents Section 18.

HI 96748 • HI 96709

Manganese Photometer

- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

Manganese is one of the most common metals present in nature and is used in many industrial applications, for example, the production of fertilizers and in the pharmaceutical industry.

Manganese salts are also used in iron alloys (steel manufacturing) and non-iron alloys as it improves their corrosion resistance and hardness.

The HI 96748 measures the low range manganese content in water and wastewater in the 0 to 300 µg/L (ppb) range.

The HI 96709 measures the high range manganese content in water and wastewater in the 0.0 to 20.0 mg/L (ppm) range.

Both meters use an exclusive positive-locking system to ensure that the cuvette is in the same position every time it is placed into the measurement cell. It is designed to fit a cuvette with a larger neck making it easier to add both sample and reagents. The cuvette is made from special optical glass to obtain best results.



Manganese is not considered to be dangerous, but high concentrations of this metal in water will alter the taste and smell. In industry, manganese can produce corrosion and incrustation to pipes when found in high concentrations.

ORDERING INFORMATION

HI 96748 and HI 96709 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96709C includes HI 96709 photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

For HI 96748

HI 96748-11 CAL CHECK™ standard cuvettes

HI 93748-01 Reagents for 50 tests

HI 93748-03 Reagents for 150 tests

For HI 96709

HI 96709-11 CAL CHECK™ standard cuvettes

HI 93709-01 Reagents for 100 tests

HI 93709-03 Reagents for 300 tests

SPECIFICATIONS	HI 96748 Manganese, Low Range	HI 96709 Manganese, High Range
Range	0 to 300 µg/L	0.0 to 20.0 mg/L
Resolution	1 µg/L	0.1 mg/L
Accuracy @ 25°C (77°F)	±10 µg/L ±3% of reading	±0.2 mg/L ±3% of reading
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 525 nm	
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of the 1-(2-pyridylazo)-2-naphthol PAN method	adaptation of Standard Methods for the Examination of Water and Wastewater, 18th edition, Periodate method

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

For a complete list of Reagents, see Reagents Section 18.

HI 96759 • HI 96760

Maple Syrup Photometers



ADP
Application Designed Photometers

MAPLE SYRUP GRADE DESIGNATIONS

RANGE (% TRANSMITTANCE)	United States, USDA	Canada, Federal & Quebec
75.0 to 100.0	grade A light amber	No. 1 Extra Light
60.5 to 74.9	grade A medium amber	No. 1 Light Grade A
44.0 to 60.4	grade A dark amber	No. 1 Medium Grade A
27.0 to 43.9	grade B for reprocessing	No. 2 Amber
less than 27.0	substandard	No. 3 Dark

SPECIFICATIONS

HI 96759 (USA) • HI 96760 (CAN)

Range	0.0 to 100.0% transmittance
Resolution	0.1% transmittance
Accuracy @ 25°C (77°F)	±3% @ 75.0% transmittance
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter 560 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	direct measurement

The H 96759 and HI 96760 handheld maple syrup transmittance analyzers are high precision, USDA (HI 96759) or Canada Federal and Quebec (HI 96760) compliant photometers that bring judging "by eye" to an end.

These meters benefit from HANNA's years of experience as a manufacturer of analytical instruments. They have the advanced optical system based on special tungsten lamps and a narrow band interference filter that allow most accurate and repeatable readings.

HANNA maple syrup transmittance analyzers measure the percent light transmittance of maple syrup as compared to analytical reagent glycerol. The transmittance value allows identification of syrup quality class.

Measurements are performed by using matched square optical cuvettes having a 10 mm light path.

A very light syrup color has a very high level of quality and can be compared to minimum standards of light transmittance while a very dark syrup color signifies a low level of classification.

ORDERING INFORMATION

HI 96759 and **HI 96760** are supplied with square sample cuvettes (6), light shield cap, 5 mL syringes (2), 30 mL bottle of glycerol, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

SOLUTIONS

HI 93703-50 Cuvette cleaning solution, 230 mL

ACCESSORIES

HI 93703-56 Consists of 82 matched square cuvettes, glycerol (30 mL) and 5 mL syringes (2) (75 tests average)

HI 96730

Molybdenum Photometer

- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

The HI 96730 measures the molybdenum content in water and wastewater. The meter uses an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

The cuvette has a very important role because it is an optical element and thus requires particular attention. It is important that both, the measurement and the calibration (zeroing) cuvettes, are optically identical to provide the same measurement conditions. Whenever possible use the same cuvette for both. It is necessary that the surface of the cuvette is clean and not scratched to avoid interference due to unwanted reflection and absorption of light. It is recommended not to touch the cuvette walls with hands.

Furthermore, in order to maintain the same conditions during the zeroing and the measuring phases, it is necessary to close the cuvette to prevent any contamination.



Molybdenum or molybdate are salts often used in industrial cooling towers. They are non-toxic and continue to become more popular over chromates as a corrosion inhibitor. Molybdenum has a wide variety of applications as an alloying agent in steel and cast iron, a pigment for inks and paints and also as a multipurpose solid lubricant.

ORDERING INFORMATION

HI 96730 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

- HI 96730-11 CAL CHECK™ standard cuvettes
- HI 93730-01 Reagents for 100 tests
- HI 93730-03 Reagents for 300 tests

SPECIFICATIONS	HI 96730 Molybdenum
Range	0.0 to 40.0 mg/L (ppm)
Resolution	0.1 mg/L
Accuracy @ 25°C (77°F)	±0.3 mg/L ±5% of reading
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 420 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	adaptation of the mercaptacetic acid method

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

For a complete list of Reagents, see Reagents Section 18.

Nickel Photometers



- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

Nickel is commonly utilized by the electroplating industry in processes utilizing stainless steel, cobalt or nickel alloys.

Nickel is also used in batteries, fuel cells and hydrogenation of vegetable oils in the food industry.

The HI 96726 and HI 96740 meters measure the Nickel content in water and wastewater. Both meters use an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

The cuvette has a very important role because it is an optical element and thus requires particular attention. It is important that both, the measurement and the calibration (zeroing) cuvettes, are optically identical to provide the same measurement conditions.

Even though **nickel** is regarded as non-toxic to humans, concentrations found in wastewater exceeding 0.5 mg/L (ppm) can cause damage to certain plants and aquatic life.

SPECIFICATIONS	HI 96740 Nickel LR	HI 96726 Nickel HR
Range	0.000 to 1.000 mg/L (ppm)	0.00 to 7.00 g/L
Resolution	0.001 mg/L (ppm)	0.01 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.010 mg/L ±7% of reading	±0.07 mg/L ±4% of reading
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 575 nm	
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of the PAN method	adaptation of the photometric method

The reagent is in powder form and is supplied in packets. The amount of reagent is precisely dosed to ensure maximum repeatability.

For a complete list of Reagents, see Reagents Section 18.

ORDERING INFORMATION

HI 96726 and HI 96740 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96726C and HI 96740C include photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

- HI 96726-11 CAL CHECK™ standard cuvettes
- HI 96740-11 CAL CHECK™ standard cuvettes
- HI 93726-01 Reagents for 100 tests
- HI 93726-03 Reagents for 300 tests
- HI 93740-01 Reagents for 100 tests
- HI 93740-03 Reagents for 300 tests

HI 96728 • HI 96786

Nitrate Portable Photometers

- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

Nitrates are present in nature as a result of decomposition of organic microorganisms or due to their use as fertilizers. Nitrates reduce to nitrites, which in turn easily combine to form substances dangerous to man.

A maximum level of 45 mg/L (ppm) is established as a worldwide guideline for nitrate concentration in water. In Europe, the maximum consented level of nitrates in potable water is 50.0 mg/L (ppm), while in the USA the EPA has established a guideline for the maximum level of nitrate-nitrogen of 10 mg/L (NO_3^- -N), which corresponds to 45.0 mg/L of nitrates.

The HI 96728 and HI 96786 meter measures the nitrate content in water and wastewater.

Both meters use an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.



Nitrogen is abundant in Earth's atmosphere, and is present in water in the form of nitrate, nitrite and ammonia. Plants use nitrogen as a nutrient to build proteins by taking it in through their root system. Nitrate is formed in water mainly through rainfall, decomposition of organic matter, and runoff from man made pollutants such as sewage waste and fertilizers.

Almost all the surface waters have some measurable level of nitrate, and a moderate amount is considerate beneficial. Large amounts of nitrate can lead the eutrophication that may result in decreased levels of dissolved oxygen in the water.

ORDERING INFORMATION

HI 96728 and HI 96786 are supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96728C and HI 76786C include photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96728-11 CAL CHECK™ standard cuvettes

HI 96786-11 CAL CHECK™ standard cuvettes

HI 93728-01 Reagents for 100 tests

HI 93728-03 Reagents for 300 tests

SPECIFICATIONS	HI 96728 Nitrate (as nitrogen)	HI 96786 Nitrate
Range	0.0 to 30.0 mg/L (ppm)	0.0 to 100 mg/L
Resolution	0.1 mg/L (ppm)	1 mg/L
Accuracy @ 25°C (77°F)	±0.5 mg/L ±10% of reading	±5 mg/L ±5% of reading
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 525 nm	
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of cadmium reaction method	

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

For a complete list of Reagents, see Reagents Section 18.

Nitrite Portable Photometers



- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

Nitrites are an intermediate product in the nitrogen cycle and are produced by ammonia oxidation with water, or even originate in industrial waste directly. They must not be present in drinking water.

The HI 96707 measures the Nitrogen-Nitrite content in the 0.000 to 0.600 mg/L (ppm) range, in drinking, surface and saline water samples and in domestic and industrial wastes.

The HI 96708 meter measures the nitrite content in water and wastewater in the 0 to 150 mg/L (ppm) range.

Both meters use an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

Nitrites can be harmful to aquatic organisms even in low concentrations and for this reason, they are closely monitored in aquaculture facilities. In cooling towers, however, an adequate amount of nitrites is necessary to prevent corrosion.

In high concentrations, they can be harmful to the environment and to humans. They are, therefore, normally monitored to verify the quality of water for domestic use, as well as lakes and ponds.

SPECIFICATIONS	HI 96707 Nitrite, Low Range	HI 96708 Nitrite, High Range
Range	0.000 to 0.600 mg/L (ppm)	0 to 150 mg/L (ppm)
Resolution	0.001 mg/L (ppm)	1 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.020 mg/L ±4% of reading	±4 mg/L ±4% of reading
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 525 nm	silicon photocell with narrow band interference filter @ 575 nm
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of an EPA approved method	adaptation of the Ferrous Sulfate method

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

For a complete list of Reagents, see Reagents Section 18.

ORDERING INFORMATION

HI 96707 and HI 96708 are supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96707C and HI 96708C include photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

For HI 96707

HI 96707-11 CAL CHECK™ standard cuvettes

HI 93707-01 Powder reagents for 100 tests

HI 93707-03 Powder reagents for 300 tests

For HI 96708

HI 96708-11 CAL CHECK™ standard cuvettes

HI 93708-01 Reagents for 100 tests

HI 93708-03 Reagents for 300 tests

HI 96732

Dissolved Oxygen Portable Photometer

- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

In aquaculture, dissolved oxygen is arguably the most important parameter of water quality. Most species require a minimum of 3 mg/L (ppm) DO, 8-10 mg/L (ppm) is preferable. Unlike other gases such as nitrogen, oxygen supersaturation doesn't usually result in gas bubble disease ("pop-eye"), so high levels generally aren't an issue.

The HI 96732 measures the content of dissolved oxygen (O₂) in surface, feed, natural and waste waters in the 0.0 to 10.0 mg/L (ppm) range.

HI 96732 uses an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.



Dissolved oxygen analysis measures the amount of gaseous oxygen (O₂) dissolved in an aqueous solution. Dissolved oxygen is one of the most important parameters in aquatic systems. This gas is an absolute requirement for the metabolism of aerobic organisms and also influences inorganic chemical reactions. Therefore, knowledge of the solubility and dynamics of oxygen distribution is essential to interpreting both biological and chemical processes within water bodies. Oxygen gets into water by diffusion from the surrounding air, by aeration (rapid movement) and as a waste product of photosynthesis. The amount of oxygen (or any gas) that can dissolve in pure water (saturation point) is inversely proportional to the temperature of water; the warmer the water, the less dissolved oxygen.

ORDERING INFORMATION

HI 96732 is supplied with sample cuvettes (2) with caps, 60 mL glass bottle with stopper, 9V battery and instruction manual

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

- HI 96732-11 CAL CHECK™ standard cuvettes
- HI 93732-01 Reagents for 100 tests
- HI 93732-03 Reagents for 300 tests

SPECIFICATIONS	HI 96732 Oxygen, Dissolved
Range	0.0 to 10.0 mg/L (ppm)
Resolution	0.1 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.2 mg/L ±3% of reading
Light Source	light emitting diode
Light Detector	silicon photocell with narrow band interference filter @ 466 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	modified Winkler method

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

For a complete list of Reagents, see Reagents Section 18.

Phosphate Portable Photometers



- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

Phosphates are particularly important for the growth and development of plant roots, and hence are one of the most common fertilizers used in agriculture.

Phosphates are also utilized in detergents and are needed, in small quantities, for heating systems. However, high concentrations of phosphates can cause environmental pollution as they are a primary cause of eutrophication.

For these reasons, it is necessary to closely monitor the phosphate levels present in both municipal and industrial waste water.

The HI 96713 measures phosphate (PO_4^{3-}) content in water, wastewater and seawater in the 0.00 to 2.50 mg/L (ppm) range.

The HI 96717 measures the phosphate (PO_4^{3-}) content in water samples in the 0.0 to 30.0 mg/L (ppm) range.

Phosphates are present in a number of products that are used by humans everyday. Some examples of the effects of phosphate are enhancing the flavor and tartness of cola drinks, as a buffering agent in controlling pH in antifreeze and delaying darkening of cut potatoes used for french fries.

Phosphates are also extensively used in detergents and cleaning fluids because of their ability to soften water and remove soil deposits.

The largest use of phosphates is in the conversion of the mineral apatite, which is a mixture of calcium phosphate and other calcium compounds that are used in fertilizers. Local laws govern the use of phosphates and the discharge levels into streams.

SPECIFICATIONS	HI 96713 Phosphate LR	HI 96717 Phosphate HR
Range	0.00 to 2.50 mg/L (ppm)	0.0 to 30.0 mg/L (ppm)
Resolution	0.01 mg/L (ppm)	0.1 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.04 mg/L ±4% of reading	±1.0 mg/L ±4% of reading
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 610 nm	silicon photocell with narrow band interference filter @ 525 nm
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of the ascorbic acid method	Amino Acid Method, adapted from Standard Method for the Examination of Water and Wastewater

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

For a complete list of Reagents, see Reagents Section 18.

ORDERING INFORMATION

HI 96713 and HI 96717 are supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96713C and HI 96717C include photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

For HI 96713

HI 96713-11 CAL CHECK™ standard cuvettes

HI 93713-01 Reagents for 100 tests

HI 93713-03 Reagents for 300 tests

For HI 96717

HI 96717-11 CAL CHECK™ standard cuvettes

HI 93717-01 Reagents for 100 tests

HI 93717-03 Reagents for 300 tests

HI 96706

Phosphorus Portable Photometer

- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

Phosphorus is found in nature as phosphates. Its concentration in water is monitored because it causes corrosion when present in high levels. It is also an essential parameter for the growth of microorganisms and algae, which are often unwanted in tanks and reserves of water.

Phosphorus is also an essential element for plant growth and for this reason, is needed in large amounts.

The HI 96706 measures the phosphorus (P) content in water samples in the 0.0 to 15.0 mg/L (ppm) range.

HI 96706 uses an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.



Worldwide demand for fertilizers has contributed to record phosphate production. Phosphates are used in the production of special glasses, such as those used for sodium lamps. Bone-ash, calcium phosphate, is used to create fine china and to produce mono-calcium phosphate, used in baking powder.

Phosphorus is also important in the production of steels, phosphor bronze, and many other products. Trisodium phosphate is important as a cleaning agent, as a water softener, and for preventing boiler scale and corrosion of pipes and boiler tubes.

Phosphorus is also an essential ingredient of all cell protoplasm, nervous tissue, and bones.

ORDERING INFORMATION

HI 96706 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual

CAL CHECK™ standards and testing reagents sold separately

HI 96706C includes photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96706-11 CAL CHECK™ standard cuvettes

HI 93706-01 Reagents for 100 tests

HI 93706-03 Reagents for 300 tests

SPECIFICATIONS	HI 96706 Phosphorus
Range	0.0 to 15.0 mg/L (ppm)
Resolution	0.1 mg/L (ppm)
Accuracy @ 25°C (77°F)	± 0.3 mg/L ±4% of reading
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 525 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	Amino Acid Method, adapted from Standard Method for the Examination of Water and Wastewater

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

For a complete list of Reagents, see Reagents Section 18.



- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

Potassium as a chemical element is commonly found in nature. It is present in soil and drinking water and is also an essential element for the growth of plants and animals.

Potassium concentration is important in determining the quality of soil in many greenhouse, agriculture and horticulture applications. Potassium salts are also a common component of fertilizers.

The HI 96750 measures the potassium (K) content in water samples in the 0.0 to 10.0 mg/L (ppm) for low range and 10 to 100 mg/L (ppm) for medium range. The HI 96750 uses the Tetraphenylborate Method. The reaction between potassium and reagents causes turbidity in the sample.

HI 96750 uses an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

The importance of potassium to plant growth differs somewhat from nitrogen and phosphorus, in that potassium acts as more of a catalyst in plant carbohydrate metabolism. Over 60 plant enzymes need potassium to be activated.

Other important functions of potassium are its ability to help with the regulation of water in plants, its contribution to the formation of ATP molecules, and as a necessary component for nitrogen uptake and protein synthesis.

Plants without adequate potassium use water less efficiently and usually have a lower nitrogen intake and protein synthesis activity. Plants with increased supplies of potassium are able to more quickly assimilate carbon dioxide into sugars during photosynthesis.

SPECIFICATIONS	HI 96750 Potassium	
	Potassium LR (P1)	Potassium MR (P2)
Range	0.0 to 10.0 mg/L (ppm)	10 to 100 mg/L (ppm)
Resolution	0.1 mg/L (ppm)	1 mg/L (ppm)
Accuracy @ 25°C (77°F)	±1.5 mg/L ±7% of reading	±15 mg/L ±7% of reading
Light Source	light emitting diode	
Light Detector	silicon photocell with narrow band interference filter @ 466 nm	
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	Tetraphenylborate method	

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

For a complete list of Reagents, see Reagents Section 18.

ORDERING INFORMATION

HI 96750 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96750C includes photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 96750-11 CAL CHECK™ standard cuvettes

HI 93750-01 Reagents for 100 tests

HI 93750-03 Reagents for 300 tests

HI 96705 • HI 96770

Silica Portable Photometers

- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

Silica is found in all natural waters in the dissolved mineral form. Silica is only slightly soluble in water; solubility and therefore the form of silica in water depends on the pH level of the water and on the minerals containing silica in contact with water.

Silica's presence in industrial applications is undesirable since it causes scale. In particular, high pressure turbines are highly effected by this factor.

Heating systems and reverse osmosis plants also require monitoring of silica.

The HI 96705 meter measures the silica (SiO₂) content in water and wastewater in the 0.00 to 2.00 mg/L (ppm) range. HI 96770 measures silica (SiO₂) content from 0 to 200 mg/L.



ORDERING INFORMATION

HI 96705 and HI 96770 are supplied with sample cuvettes (2) with caps, 9V battery and instructions.

CAL CHECK™ standards and testing reagents sold separately

HI 96705C and HI 96770C include photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

For HI 96705

HI 96705-11 CAL CHECK™ standard cuvettes

HI 93705-01 Reagents for 100 tests

HI 93705-03 Reagents for 300 tests

For HI 96770

HI 96770-11 CAL CHECK™ standard cuvettes

HI 96770-01 Reagents for 100 tests

HI 96770-03 Reagents for 300 tests

SPECIFICATIONS	HI 96705 Silica	HI 96770 Silica HR
Range	0.00 to 2.00 mg/L (ppm)	0 to 200 mg/L (as SiO ₂)
Resolution	0.01 mg/L (ppm)	1 mg/L
Accuracy @ 25°C (77°F)	±0.03 mg/L ±3% of reading	±1 mg/L ±5% of reading
Light Source	tungsten lamp	light emitting diode
Light Detector	silicon photocell with narrow band interference filter @ 610 nm	silicon photocell with narrow band interference filter @ 466 nm
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of the ASTM D859 method of heteropoly blue method	adaptation of the USEPA METHOD 370.1 for drinking, surface and saline waters, domestic and industrial wastes and Standard Method 4500-SiO ₂ C

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

For a complete list of Reagents, see Reagents Section 18.



- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

Small quantities of silver are bacteriostatic or bactericidal. As a result, it is at times used in disinfection of pools and spas, as well as in water filters.

The presence of silver in water is generally indicative of pollution from mainly film manufacturers, film processors and surface finishers. In fact, silver levels are closely monitored in these sectors since its presence can cause discoloration of the skin, eyes and mucous membranes.

The HI 96737 measures the silver content in water and wastewater in the 0.000 to 1.000 mg/L (ppm) range.

This instrument uses an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

The cuvette has a very important role because it is an optical element and thus requires particular attention. It is important that both, the measurement and the calibration (zeroing) cuvettes, are optically identical to provide the same measurement conditions.

Seawater contains approximately 2-100 ppt of silver, and the surface concentration may be even lower. River water generally contains approximately 0.3-1 ppb of silver. The phytoplankton concentration is 0.1-1 ppm (dry mass), leading to a 104-105 bio concentration factor in seawater. In oyster tissue, concentrations of approximately 890 ppm (dry mass) were found.

Silver does not react with pure water. It is stable in both water and air. Moreover, it is acid and base resistant, but it corrodes when it comes in contact with sulphur compounds. Dissolved in water silver mainly occurs as Ag^+ (aq), and in seawater as $AgCl_2^-$ (aq).

SPECIFICATIONS	HI 96737 Silver
Range	0.000 to 1.000 mg/L (ppm)
Resolution	0.001 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.005 mg/L ±10% of reading
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 575 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	adaptation of the PAN method

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

For a complete list of Reagents, see Reagents Section 18.

ORDERING INFORMATION

HI 96737 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

- HI 96737-11 CAL CHECK™ standard cuvettes
- HI 93737-01 Reagents for 50 tests
- HI 93737-03 Reagents for 150 tests

HI 96751

Sulfate Portable Photometer

- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

Sulfate is widely present within natural waters in different concentrations. Sulfate concentration is to be kept within a strict range for drinking water, especially since this value can be high near mine drainage points.

Sulfate is also rigorously tested in the production of beverages such as beer, due to its significant effect upon odor and taste.

The HI 96751 measures the sulfate content in water samples in the 0 to 150 mg/L (ppm) range. Sulfate is precipitated with barium chloride crystals.

The instrument uses an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

The cuvette has an important role because it is an optical element and thus requires particular attention. It is important that both, the measurement and the calibration (zeroing) cuvettes, are optically identical to provide the same measuring conditions.



Sulfate is added to certain types of boilers to help precipitate calcium and magnesium and to inhibit encrustation. Too much sulfate can be corrosive in high pressure boilers, electric turbines and their heat exchangers. In fact, in these applications, it is important to keep the level below a specific limit. Similar checks of sulfate presence are carried out in water used for different production cycles, including those of semiconductors.

ORDERING INFORMATION

HI 96751 is supplied with sample cuvettes with caps (2), 9V battery and instructions.

CAL CHECK™ standards and testing reagents sold separately

HI 96751C includes photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

- HI 96751-11 CAL CHECK™ standard cuvettes
- HI 93751-01 Reagents for 100 tests
- HI 93751-03 Reagents for 300 tests

SPECIFICATIONS	HI 96751 Sulfate
Range	0 to 150 mg/L (ppm)
Resolution	1 mg/L (ppm)
Accuracy @ 25°C (77°F)	±1 mg/L ±5% of reading
Light Source	light emitting diode
Light Detector	silicon photocell with narrow band interference filter @ 466 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	adaptation of the turbidimetric method

The reagent is in powder form and is supplied in packets. The amount of reagent is precisely dosed to ensure maximum repeatability.

For a complete list of Reagents, see Reagents Section 18.



- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

Zinc is normally introduced into drinking water through industrial effluents, especially due to dezincification of brass and deterioration of galvanized iron.

In addition to drinking water, zinc is measured in surface finishing, boilers and cooling towers, water conditioning, effluent waters and many others.

The HI 96731 measures the zinc content in water and wastewater in the 0.00 to 3.00 mg/L (ppm) range.

The meter uses an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

The cuvette has a very important role because it is an optical element and thus requires particular attention. It is important that both, the measurement and the calibration (zeroing) cuvettes, are optically identical to provide the same measurement conditions.

Even though zinc is non-toxic to human beings, concentrations above 5 mg/L (ppm) can cause a bitter, astringent taste. This level of zinc can result in a milky, iridescent color in alkaline waters and irritate the human digestive system.

Zinc in low quantities, however, is a beneficial and essential element necessary for body growth. In fact, US drinking water contains an average of 1.33 mg/L (ppm) of zinc.

SPECIFICATIONS	HI 96731 Zinc
Range	0.00 to 3.00 mg/L (ppm)
Resolution	0.01 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.03 mg/L ±3% of reading
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 575 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	adaptation of the Standard Methods for the Examination of Water and Wastewater, 20th edition, Zincon method

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

For a complete list of Reagents, see Reagents Section 18.

ORDERING INFORMATION

HI 96731 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

- HI 96731-11 CAL CHECK™ standard cuvettes
- HI 93731-01 Reagents for 100 tests
- HI 93731-03 Reagents for 300 tests

HI 96101

Bromine, Chlorine, Cyanuric Acid, Iron Iodine and pH Portable Photometer

- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

The HI 96101 measures Bromine, Free and Total Chlorine, Cyanuric Acid, Iron, Iodine and pH content in water and wastewater samples. The reagents are in powder and liquid form depending on the parameter and they are supplied in dropper bottles and packets.

The meter uses an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

The cuvette has a very important role because it is an optical element and thus requires particular attention. It is important that both the measurement and calibration (zeroing) cuvettes are optically identical to provide the same measuring conditions.



This multiparameter photometer can save time and money. If you need a simple, but professional meter measuring the most important constituents of water, especially in pools and spas, then HI 96101 has been designed for you.

ORDERING INFORMATION

HI 96101 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96101C includes HI 96101 photometer, sample cuvettes (2) with caps, scissors, cuvette cleaning cloth, 9V battery, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

- HI 96701-11 CAL CHECK™ standard cuvettes
 - HI 93701-01 Reagents for 100* tests
 - HI 96710-11 CAL CHECK™ standard cuvettes
 - HI 93710-01 Reagents for 100* tests
 - HI 96711-11 CAL CHECK™ standard cuvettes
 - HI 93711-01 Reagents for 100* tests
 - HI 96716-11 CAL CHECK™ standard cuvettes
 - HI 93716-01 Reagents for 100* tests
 - HI 96718-11 CAL CHECK™ standard cuvettes
 - HI 93718-01 Reagents for 100* tests
 - HI 96722-11 CAL CHECK™ standard cuvettes
 - HI 93722-01 Reagents for 100* tests
 - HI 96746-11 CAL CHECK™ standard cuvettes
 - HI 93746-01 Reagents for 50 tests
- *Reagents for 300 tests also available

SPECIFICATIONS		HI 96101 Bromine, Chlorine, Cyanuric Acid, Iodine, Iron LR and pH
Range		Bromine: 0.00 to 10.00 mg/L (ppm); Free Chlorine: 0.00 to 5.00 mg/L (ppm) Total Chlorine: 0.00 to 5.00 mg/L (ppm); Cyanuric Acid: 0 to 80 mg/L (ppm) Iodine: 0.0 to 12.5 mg/L (ppm); Iron LR: 0.00 to 1.60 mg/L; pH: 6.5 to 8.5 pH
Resolution		Bromine: 0.01 mg/L (ppm); Chlorine: 0.01 mg/L under 3.50 mg/L; 0.10 mg/L above 3.50 mg/L Cyanuric Acid: 1 mg/L (ppm); Iodine: 0.1 mg/L (ppm) Iron LR: 0.01 mg/L; pH: 0.1 pH
Accuracy @ 25°C (77°F)		Bromine: ±0.08 mg/L ±3% of reading; Chlorine: ±0.03 mg/L ±3% of reading; Cyanuric Acid: ±1 mg/L ±15% of reading; Iodine: ±0.1 mg/L ±5% of reading; Iron LR: ±0.01 mg/L ±8% of reading; pH: ±0.1 pH
Light Source		tungsten lamp
Light Detector		Silicon photocell with narrow band interference filter @ 525 nm
Power Supply		9V battery
Auto-off		after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder
Environment		0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions		192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight		360 g (12.7 oz.)
Method		Bromine: adaptation of the EPA, DPD method; Chlorine: Adaptation of the USEPA method and Standard Method 4500-Cl G; Cyanuric Acid: adaptation of the turbidimetric method; Iodine: adaptation of the EPA, DPD method; Iron LR: adaptation of the TPTZ method; pH: Phenol Red method

The amount of reagent is precisely dosed to ensure the maximum repeatability.

For a complete list of Reagents, see Reagents Section 18.

pH, Free and Total Chlorine & Cyanuric Acid Portable Photometer



- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

Chlorine is the most common water disinfectant used in many swimming pools and spas.

In swimming pools, spas and similar applications, Cyanuric Acid helps to stabilize the breakdown of chlorine, especially in sunlight. Frequent testing of both cyanuric acid and pH will help to minimize chlorine consumption.

Specifically designed for swimming pool and spa applications, the HI 96104 measures pH, Free and Total Chlorine and Cyanuric Acid content.

The HI 96104 meter measures pH, Free and Total Chlorine and Cyanuric Acid content in water and wastewater. The reagents are in powder and liquid form depending on the parameter and they are supplied in dropper bottles and packets.

SPECIFICATIONS	HI 96104 Chlorine, Cyanuric Acid and pH			
	pH (P1)	Cl, Free (P2)	Cl, Total (P3)	Cyanuric Acid (P4)
Range	6.5 to 8.5 pH	0.00 to 5.00 mg/L (ppm)	0.00 to 5.00 mg/L (ppm)	0 to 80 mg/L (ppm)
Resolution	0.1 pH	0.01 mg/L (ppm)	0.01 mg/L (ppm)	1 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.1 pH	±0.03 mg/L (ppm) ±3% of reading	±0.03 mg/L (ppm) ±3% of reading	±1 mg/L (ppm) ±15% of reading
Light Source	tungsten lamp			
Light Detector	silicon photocell with narrow band interference filter @ 525 nm			
Power Supply	9V battery			
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder			
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing			
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")			
Weight	360 g (12.7 oz.)			
Method	phenol red method	adaptation of the EPA recommended DPD method 330.5		adaptation of the Turbidimetric method

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

For a complete list of Reagents, see Reagents Section 18.

ORDERING INFORMATION

HI 96104 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96104C includes HI 96104 photometer, sample cuvettes (2) with caps, scissors, cuvette cleaning cloth, 9V battery, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

- HI 96701-11 CAL CHECK™ standard cuvettes
- HI 93701-01 Reagents for 100 tests
- HI 93701-03 Reagents for 300 tests
- HI 96710-11 CAL CHECK™ standard cuvettes
- HI 93710-01 Reagents for 100 tests
- HI 93710-03 Reagents for 300 tests
- HI 96711-11 CAL CHECK™ standard cuvettes
- HI 93711-01 Reagents for 100 tests
- HI 93711-03 Reagents for 300 tests
- HI 96722-11 CAL CHECK™ standard cuvettes
- HI 93722-01 Reagents for 100 tests
- HI 93722-03 Reagents for 300 tests

HI 96710

Free and Total Chlorine and pH Portable Photometer

- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

HANNA has developed the HI 96710 to measure pH, free chlorine and total chlorine – three critical parameters to ensure good water quality.



pH	Molecular Chlorine	Hypochlorous Acid	Hypochlorite Ion
effect of pH on the hypochlorous acid present in water			
4	0.5	99.5	0
5	0	99.5	0.5
6	0	96.5	3.5
7	0	72.5	27.5
8	0	21.5	78.5
9	0	1.0	99.0
10	0	0.1	99.9

ORDERING INFORMATION

HI 96710 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96710C includes HI 96710 photometer, sample cuvettes (2) with caps, scissors, cuvette cleaning cloth, 9V battery, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

- HI 96701-11 CAL CHECK™ standard cuvettes
- HI 93701-01 Powder reagents for 100 tests
- HI 93701-03 Powder reagents for 300 tests
- HI 96710-11 CAL CHECK™ standard cuvettes
- HI 93710-01 Reagents for 100 tests
- HI 93710-03 Reagents for 300 tests
- HI 96711-11 CAL CHECK™ standard cuvettes
- HI 93711-01 Reagents for 100 tests
- HI 93711-03 Reagents for 300 tests

SPECIFICATIONS	HI 96710 Free and Total Chlorine and pH		
	pH (P1)	Cl, Free (P2)	Cl, Total (P3)
Range	6.5 to 8.5 pH	0.00 to 5.00 mg/L (ppm)	0.00 to 5.00 mg/L (ppm)
Resolution	0.1 pH	0.01 mg/L (ppm)	0.01 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.1 pH	±0.03 mg/L (ppm) ±3% of reading	±0.03 mg/L (ppm) ±3% of reading
Light Source	tungsten lamp		
Light Detector	silicon photocell with narrow band interference filter @ 525 nm		
Power Supply	9V battery		
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder		
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing		
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")		
Weight	360 g (12.7 oz.)		
Method	phenol red	adaptation of the EPA recommended DPD method 330.5	

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

For a complete list of Reagents, see Reagents Section 18.

Free and Total Chlorine Portable Photometer



This photometer has been designed to be used with liquid reagents. Free and total chlorine parameters can be switched between depending on procedure and reagents.

- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

The HI 96724 measures the free and total chlorine content in water samples in the 0.00 to 5.00 mg/L (ppm) range. The method is an adaptation of the USEPA Method 330.5 for wastewater, and Standard Method 4500-CL G for drinking water.

The HI 96724 incorporates an advanced optical system based on a special tungsten lamp and a narrow band interference filter that allows the most accurate and repeatable readings. The instrument is factory calibrated and the electronic and optical design minimizes the need of frequent calibration.

The meter uses an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

The cuvette has a very important role because it is an optical element and thus requires particular attention. It is important that both the measurement and calibration (zeroing) cuvettes, are optically identical to provide the same measuring conditions.

SPECIFICATIONS	HI 96724 Free and Total Chlorine
Range	0.00 to 5.00 mg/L (ppm)
Resolution	0.01 mg/L from 0.00 to 3.50 mg/L (ppm); 0.10 mg/L above 3.50 mg/L
Accuracy @ 25°C (77°F)	±0.03 mg/L ±3% of reading
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 525 nm
Power Supply	9V battery
Auto-off	after 10 minutes of non-use in measurement mode; after 1 hour of non-use in calibration mode; with last reading reminder.
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")
Weight	360 g (12.7 oz.)
Method	adaptation of the USEPA method 330.5 and Standard Method 4500-CL G

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

ORDERING INFORMATION

HI 96724 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96724C includes HI 96724 photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

- HI 93701-F Reagents for 300 tests
- HI 93701-T Reagents for 300 tests; free and 100 tests total chlorine
- HI 93711-D3 DPD3 reagent for 200 tests
- HI 96724-11 CAL CHECK™ Standard Cuvettes

For a complete list of Reagents, see Reagents Section 18.

HI 96725

Chlorine, Cyanuric Acid and pH Portable Photometer for Legionella Protection

- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

Legionella species is the agent that causes human Legionnaires' disease as well as the lesser form, Pontiac Fever. Transmission is facilitated by the inhalation of mist droplets containing the Legionella bacteria.

Common sources of Legionella include cooling towers used in industrial cooling water systems as well as in large central air conditioning systems, domestic hot water systems, fountains, and similar disseminators that draw from a public water supply. Natural sources include freshwater ponds and creeks.

Since Legionella is especially harmful to people with weakened immune systems, it should be actively checked for in the water systems of hospitals and nursing homes.

The HI 96725 measures 4 parameters that are crucial in monitoring for preventive maintenance or disinfection.



The microbial and chemical quality of the water used for filling pools and hot tubs will affect the efficacy of disinfection. Ideally, a detectable residual biocide level should be maintained at all times, to prevent colonization of the system by microorganisms living in biofilms. In unusual situations where there is a maintenance fault, the pH could drop to levels at which oxidizing biocides will be disassociated, leading to increased levels of chlorine, which can cause eye and skin irritation. At high pH levels, the chlorine will remain bound and be less effective.

Various additives may also be used to help maintain the water balance; for example, cyanuric acid helps to stabilize chlorine, particularly in outdoor pools, by preventing its breakdown by UV light and sunlight. Bicarbonates or carbonates may be added to act as a buffer against rapid changes in pH caused by high bather loads, pollutants and chemicals.

ORDERING INFORMATION

HI 96725 is supplied with sample cuvettes (2) with caps, 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

HI 96725C includes HI 96725 photometer, sample cuvettes (2) with caps, scissors, cuvette cleaning cloth, 9V battery, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

- HI 96701-11 CAL CHECK™ standard cuvettes
- HI 93701-01 Reagents for 100 tests
- HI 93701-03 Reagents for 300 tests
- HI 96710-11 CAL CHECK™ standard cuvettes
- HI 93710-01 Reagents for 100 tests
- HI 93710-03 Reagents for 300 tests
- HI 96711-11 CAL CHECK™ standard cuvettes
- HI 93711-01 Reagents for 100 tests
- HI 93711-03 Reagents for 300 tests
- HI 96722-11 CAL CHECK™ standard cuvettes
- HI 93722-01 Reagents for 100 tests
- HI 93722-03 Reagents for 300 tests

SPECIFICATIONS	HI 96725 Chlorine, Cyanuric Acid and pH			
	Cl, Free (P1)	Cl, Total (P2)	Cyanuric Acid (P3)	pH (P4)
Range	0.00 to 5.00 mg/L	0.00 to 5.00 mg/L (ppm)	0 to 80 mg/L (ppm)	6.5 to 8.5 pH
Resolution	0.01 mg/L (ppm)	0.01 mg/L (ppm)	1 mg/L (ppm)	0.1 pH
Accuracy @ 25°C (77°F)	±0.03 mg/L (ppm) ±3% of reading	±0.03 mg/L (ppm) ±3% of reading	±1 mg/L (ppm) ±15% of reading	±0.1 pH
Light Source	tungsten lamp			
Light Detector	silicon photocell with narrow band interference filter @ 525 nm			
Power Supply	9V battery			
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder			
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing			
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")			
Weight	360 g (12.7 oz.)			
Method	adaptation of the EPA recommended DPD method 330.5		adaptation of the Turbidimetric method	Phenol Red method

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

For a complete list of Reagents, see Reagents Section 18.

Free and Total Chlorine, High Range Portable Photometer



- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

HI 96734 permits free and total chlorine analysis to monitor overchlorination through chloramine destruction.

The HI 96734 photometer uses an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

The cuvette has a very important role because it is an optical element and thus requires particular attention. It is important that both the measurement and calibration (zeroing) cuvettes, are optically identical to provide the same measuring conditions.

Bleach/chlorine is the most cost effective disinfectant and is used extensively in dialysis clinics. Its use varies from light duty application in surface sanitation to heavy duty disinfection of medical devices or removal of microorganism infections in piping systems. The advantage of chlorine over peroxide type disinfectants is that chlorine not only is a strong oxidant, it also is capable of breaking tough chemical bounds found in cell walls or biofilms. Correct and effective use of bleach/chlorine requires understanding of the chemical nature of the disinfectant.

SPECIFICATIONS	HI 96734 Free and Total Chlorine, High Range	
	Chlorine, Free HR (P1)	Chlorine, Total HR (P2)
Range	0.00 to 10.00 mg/L	0.00 to 10.00 mg/L
Resolution	0.01 mg/L from 0.00 to 3.50 mg/L; 0.10 mg/L above mg/L	
Accuracy @ 25°C (77°F)	±0.03 mg/L ±3% of reading (excluding dilution error)	
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 525 nm	
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of the USEPA method 330.5 and Standard method 4500-CL G	

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

For a complete list of Reagents, see Reagents Section 18.

ORDERING INFORMATION

HI 96734 is supplied with sample cuvettes (2) with caps, 9V battery and instructions.

CAL CHECK™ standards and testing reagents sold separately

HI 96734C includes HI 96734 photometer, sample cuvettes (2) with caps, 9V battery, scissors, cuvette cleaning cloth, instrument quality certificate, instruction manual and rigid carrying case.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 93734-01 Reagents for 100 Tests

HI 93734-03 Reagents for 300 Tests

HI 96734-11 CAL CHECK™ standard cuvettes

HI 96736

Total Hardness and pH Portable Photometer

- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

HI 96736 is a multiparameter portable photometer that measures total hardness and pH.

The HI 96736 meter uses an exclusive positive-locking system to ensure that the cuvette is in the same place every time it is placed into the measurement cell.

The cuvette has a very important role because it is an optical element and thus requires particular attention. It is important that both the measurement and calibration (zeroing) cuvettes, are optically identical to provide the same measuring conditions.



ORDERING INFORMATION

HI 96736 is supplied with sample cuvettes with caps (2), 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

- HI 96710-11 CAL CHECK™ standard cuvettes
- HI 93710-01 Reagents for 100 tests
- HI 93710-03 Reagents for 300 tests
- HI 96719-11 CAL CHECK™ standard cuvettes
- HI 93719-01 Reagents for 100 tests
- HI 93719-03 Reagents for 300 tests

SPECIFICATIONS	HI 96736 Total Hardness and pH	
	Total Hardness (P1)	pH (P2)
Range	0.00 to 4.70 mg/L (ppm)	6.5 to 8.5 pH
Resolution	0.01 mg/L (ppm)	0.1 pH
Accuracy @ 25°C (77°F)	±0.11 mg/L ±5% of reading	±0.1 pH
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 525 nm	
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th Edition, colorimetric method	phenol red method

For a complete list of Reagents, see Reagents Section 18.

Total Hardness and Iron, Low Range Portable Photometer



- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

In domestic water, iron can alter the taste and make it unpleasant to drink. It can also stain laundry, damage kitchenwares and favor the growth of certain bacteria. However, low levels of iron are critical in beverage production.

Hardness is a consequence of the type of rock layers which the water passes through and of its permanence in the water bearing stratum.

Hardness can cause pipe rusting in water heating and cooling systems, reverse osmosis and demineralization plants. It can also increase the consumption of soaps and detergents in industrial washing machines or laundries.

HI 96741 can provide critical measurements of low range iron and total hardness (magnesium and calcium).

The iron concentration in water needs to be monitored since it can become harmful above certain levels.

Hardness, on the other hand, is indicative of the presence of calcium and magnesium in water. By passing through various layers of soil and rocks, rain water dissolves some of the mineral substances.

With the portable HI 96741 you can monitor both iron and hardness levels.

In domestic water, **iron** can alter the taste and make it unpleasant to drink. It can also stain laundry, damage kitchenwares and favor the growth of certain bacteria. However, low levels of iron are critical in beverage production.

Hardness is a consequence of the type of rock layers which the water passes through and of its permanence in the water bearing stratum.

Hardness can cause pipe rusting in water heating and cooling systems, reverse osmosis systems and demineralization plants. It can also increase the consumption of soaps and detergents in industrial washing machines or laundries.

SPECIFICATIONS	HI 96741 Total Hardness and Iron, Low Range	
	Total Hardness (P1)	Iron, Low Range (P2)
Range	0.00 to 4.70 mg/L (ppm)	0 to 1.60 mg/L (ppm)
Resolution	0.01 mg/L (ppm)	0.01 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.11 mg/L ±5% of reading	±0.01 mg/L ±8% of reading
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 525 nm	
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th ed.	adaptation of TPTZ method

ORDERING INFORMATION

HI 96741 is supplied with sample cuvettes with caps (2), 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

- HI 96719-11 CAL CHECK™ standard cuvettes
- HI 93719-01 Reagents for 100 tests
- HI 93719-03 Reagents for 300 tests
- HI 96746-11 CAL CHECK™ standard cuvettes
- HI 93746-01 Reagents for 50 tests
- HI 93746-03 Reagents for 150 tests

For a complete list of Reagents, see Reagents Section 18.

HI 96742

Iron, Low Range and Manganese Low Range Portable Photometer

- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

Neither iron nor manganese are considered dangerous, but high concentrations of these metals in water can create a bittersweet or astringent taste.

The presence of iron in supplied water is undesirable due to the staining effect on laundry and porcelain.

Manganese, in high concentrations, can produce corrosion and scaling in pipes, which is a serious industrial concern.

The solution for these applications is the HANNA HI 96742, a handheld photometer to measure low range iron and manganese.



ORDERING INFORMATION

HI 96742 are supplied with sample cuvettes with caps (2), 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 93746-01 Reagents for 100 Tests
 HI 93746-03 Reagents for 300 Tests
 HI 93748-01 Reagents for 100 Tests
 HI 93748-03 Reagents for 300 Tests
 HI 96746-11 CAL CHECK™ standard cuvettes
 HI 96748-11 CAL CHECK™ standard cuvettes

SPECIFICATIONS	HI 96742 Iron, Low Range and Manganese	
	Iron, Low Range (P1)	Manganese, Low Range (P2)
Range	0 to 1.60 mg/L (ppm)	0 to 300 µg/L
Resolution	0.01 mg/L (ppm)	1 µg/L
Accuracy @ 25°C (77°F)	±0.01 mg/L ±8% of reading	±2 µg/L ±3% of reading
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 525 nm	
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder.	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of TPTZ method	adaptation of the 1-(2-pyridylazo)-2-naphthol PAN method

For a complete list of Reagents, see Reagents Section 18.

Iron LR and pH Portable Photometer



- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

pH is normally measured using litmus paper or a pH meter with an electrode. Litmus paper provides poor results and also poses a serious problem to those who find it difficult to distinguish certain colors. Conventional pH meters, however, provide very accurate results but require electrode maintenance and do not measure iron, a prime cause of unpleasant taste in drinking water and kitchenware and laundry damage.

The best choice for pH and Iron measurement is the HI 96743. Measurements with the HI 96743 can be performed in a few short steps and are impervious to temperature variations, a common source of error with conventional pH meters.

The HI 96743 offers unparalleled accuracy at a cost-per-test that is comparable with chemical test kits and litmus paper.

SPECIFICATIONS	HI 96743 Iron, Low Range and pH	
	Iron, Low Range (P1)	pH (P2)
Range	0 to 1.60 mg/L (ppm)	6.5 to 8.5 pH
Resolution	0.01 mg/L (ppm)	0.1 pH
Accuracy @ 25°C (77°F)	±0.01 mg/L ±8% of reading	±0.1 pH
Light Source	tungsten lamp	
Light Detector	silicon photocell with narrow band interference filter @ 525 nm	
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of TPTZ method	phenol red method

ORDERING INFORMATION

HI 96743 is supplied with sample cuvettes with caps (2), 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

- HI 96710-11 CAL CHECK™ standard cuvettes
- HI 93710-01 Reagents for 100 tests
- HI 93710-03 Reagents for 300 tests
- HI 96746-11 CAL CHECK™ standard cuvettes
- HI 93746-01 Reagents for 50 tests
- HI 93746-03 Reagents for 150 tests

For a complete list of Reagents, see Reagents Section 18.

HI 96744

Total Hardness, Iron LR and pH Portable Photometer

- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

Three important parameters measured with just one meter! The easy-to-use HI 96744 can replace several meters or test kits to practically perform the same tests with better accuracy.

At the touch of a button, users can zero the sample. This means that prior to each measurement and literally in a few seconds, the meter is calibrated, ensuring an accurate end result. The unit is powered by a common and inexpensive 9V battery that can provide up to 40 hours of battery life. A built-in automatic shut-off will turn the meter off after 10 minutes.

The meter housing is made of rugged ABS plastic and the keyboard is splash proof. The unit weighs less than 300 grams so that it can easily be carried to the remotest sites.



ORDERING INFORMATION

HI 96744 are supplied with sample cuvettes with caps (2), 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

- HI 96710-11 CAL CHECK™ standard cuvettes
- HI 93710-01 Reagents for 100 tests
- HI 93710-03 Reagents for 300 tests
- HI 96719-11 CAL CHECK™ standard cuvettes
- HI 93719-01 Reagents for 100 tests
- HI 93719-03 Reagents for 300 tests
- HI 96746-11 CAL CHECK™ standard cuvettes
- HI 93746-01 Reagents for 50 tests
- HI 93746-03 Reagents for 150 tests

SPECIFICATIONS	HI 96744 Total Hardness, Iron LR and pH		
	pH (P1)	Total Hardness (P2)	Iron, Low Range (P3)
Range	6.5 to 8.5 pH	0.00 to 4.70 mg/L (ppm)	0 to 1.60 mg/L (ppm)
Resolution	0.1 pH	0.01 mg/L (ppm)	0.01 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.1 pH	±0.11 mg/L ±5% of reading	±0.01 mg/L ±8% of reading
Light Source	tungsten lamp		
Light Detector	silicon photocell with narrow band interference filter @ 525 nm		
Power Supply	9V battery		
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder		
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing		
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")		
Weight	360 g (12.7 oz.)		
Method	phenol red method	adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th Edition, colorimetric method	adaptation of TPTZ method

For a complete list of Reagents, see Reagents Section 18.

Chlorine, Total Hardness, Iron LR and pH Portable Photometer



- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

Chlorine and pH are two of the most closely monitored parameters in water quality tests. Hardness is also an important parameter, attentively regulated to reduce waste or ensure proper functioning of equipment. Iron can cause an unpleasant taste or stain kitchenware or laundry.

The HI 96745 is a powerful instrument to keep all these parameters under control. The reagents are in liquid or powder form and are supplied in bottles or in packets.

The cuvette has a very important role because it is an optical element and thus requires particular attention. It is important that both the measurement and calibration (zeroing) cuvettes, are optically identical to provide the same measuring conditions.

SPECIFICATIONS	HI 96745 Chlorine, Total Hardness, Iron Low Range and pH			
	pH (P1)	Cl, Free (P2) Cl, Total (P3)	Total Hardness (P4)	Iron, Low Range (P5)
Range	6.5 to 8.5 pH	0.00 to 5.00 mg/L	0.00 to 4.70 mg/L	0 to 1.60 mg/L (ppm)
Resolution	0.1 pH	0.01 mg/L under 3.50 mg/L; 0.10 mg/L above 3.50 mg/L	0.01 mg/L	0.01 mg/L (ppm)
Accuracy @ 25°C (77°F)	±0.1 pH	±0.03 mg/L ±3% of reading	±0.11 mg/L ±5% of reading	±0.01 mg/L ±8% of reading
Light Source	tungsten lamp			
Light Detector	silicon photocell with narrow band interference filter @ 525 nm			
Power Supply	9V battery			
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder.			
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing			
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")			
Weight	360 g (12.7 oz.)			
Method	Phenol Red	Adaptation of the USEPA method and Standard Method 4500-Cl G	adaptation of the Standard Methods for the examination of Water and Wastewater, 18th ed., colorimetric method	adaptation of the TPTZ method

The amount of reagent is precisely dosed to ensure maximum repeatability.

For a complete list of Reagents, see Reagents Section 18.

ORDERING INFORMATION

HI 96745 is supplied with sample cuvettes (2) with caps, battery and instructions.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

- HI 96701-11 CAL CHECK™ standard cuvettes
- HI 93701-01 Reagents for 100 tests
- HI 93701-03 Reagents for 300 tests
- HI 96710-11 CAL CHECK™ standard cuvettes
- HI 93710-01 Reagents for 100 tests
- HI 93710-03 Reagents for 300 tests
- HI 96711-11 CAL CHECK™ standard cuvettes
- HI 93711-01 Reagents for 100 tests
- HI 93711-03 Reagents for 300 tests
- HI 93719-01 Reagents for 100 tests
- HI 93719-03 Reagents for 300 tests
- HI 96746-11 CAL CHECK™ standard cuvettes
- HI 93746-01 Reagents for 50 tests
- HI 93746-03 Reagents for 150 tests

HI 96752

Calcium and Magnesium Portable Photometer

- CAL CHECK™
- User calibration
- Certified calibration and verification standards
- BEPS (Battery Error Prevention System)
- TIMER function
- Auto shut-off
- GLP Features

The HI 96752 measures two important parameters in agricultural and hydroponic applications.

HI 96752 measures calcium concentrations from 0 to 400 mg/L and magnesium from 0 to 150 mg/L and the values are displayed directly on the large LCD to eliminate the need for conversion tables.

This handy and portable meter with a low cost-per-test is an ideal hi-tech alternative to chemical test kits.

Accurate and cost-saving, this two in one portable photometer is factory calibrated to measure only calcium and magnesium, to provide an instrument that is easy to use in the lab or on the field.



ORDERING INFORMATION

HI 96752 is supplied with sample cuvettes with caps (2), 9V battery and instruction manual.

CAL CHECK™ standards and testing reagents sold separately

REAGENTS AND STANDARDS

HI 93752-01 Reagents for 100 Tests

HI 93752-03 Reagents for 300 Tests

HI 96752-11 CAL CHECK™ standard cuvettes

HI 96754-11 CAL CHECK™ standard cuvettes

SPECIFICATIONS	HI 96752 Calcium and Magnesium	
	Calcium (P1)	Magnesium (P2)
Range	0 to 400 mg/L (ppm)	0 to 150 mg/L (ppm)
Resolution	1 mg/L (ppm)	1 mg/L (ppm)
Accuracy @ 25°C (77°F)	±10 mg/L ±5% of reading	±3 mg/L ±3% of reading
Light Source	light emitting diode	
Light Detector	silicon photocell with narrow band interference filter @ 466 nm	
Power Supply	9V battery	
Auto-off	after ten minutes of non-use in measurement mode; after one hour of non-use in calibration mode; with last reading reminder	
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	360 g (12.7 oz.)	
Method	adaptation of Oxalate method	adaptation of the Calmagite method

For a complete list of Reagents, see Reagents Section 18.



SPECIFICATIONS	HI 95765 BLOOD PLASMA
Range	0.0 to 10.0 units
Resolution	0.1 unit
Precision	±0.2 to 5.0 unit
Light Source	light emitting diode
Light Detector	silicon photocell with narrow band interference filter @ 555 nm
Power Supply	9V battery
Auto-off	after ten minutes of non-use in measurement mode
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Dimensions	180 x 83 x 46 mm (7.1x 3.3 x 1.8")
Weight	290 g (10 oz.)
Method	colorimetric

HI 95765 performs analysis of centrifuged animal blood plasma coming from abattoirs for quality evaluation.

Quality is valued with sample absorbance and checked by measuring its color, expressed in Quality Units.

When blood cells are damaged, hemoglobin is present in plasma and results in a high reading.

Therefore, the lower the reading in Quality Units (low color), the higher the blood plasma quality. This special instrument reads blood plasma quality from 0 to 10 units.

Designed to be practical, HI 95765 is equipped with a microprocessor system that checks the readings before displaying the correct value.

ORDERING INFORMATION

HI 95765 is supplied with a hard carrying case, protective cap, battery and instructions.

TEST	REAGENT KIT	NO. OF TESTS
Alkalinity	HI 93755-01	100
	HI 93755-03	300
Aluminum	HI 93712-01	100
	HI 93712-03	300
Ammonia HR	HI 93733-01	100
	HI 93733-03	300
Ammonia MR	HI 93715-0	100
	HI 93715-03	300
Ammonia LR	HI 93700-01	100
	HI 93700-03	300
Bromine	HI 93716-01	100
	HI 93716-03	300
Calcium	HI 937521-01	100
	HI 937521-03	300
Calcium and Magnesium	HI 93752-01	100
	HI 93752-03	300
Chloride	HI 93753-01	100
	HI 93753-03	300
Chlorine Dioxide	HI 93738-01	100
	HI 93738-03	300
Chlorine UHR	HI 95771-01	100
	HI 95771-03	300
Chlorine, Free	HI 93701-01	100
	HI 93701-03	300
	HI 93701-F (liquid)	300
Chlorine, Free and Total HR	HI 93734-01	100
	HI 93734-03	300
Chlorine, Free ULR	HI 95762-01	100
	HI 95762-03	300
Chlorine, Total	HI 93711-01	100
	HI 93711-03	300
	HI 93701-T (liquid)	300
Chlorine, Total ULR	HI 95761-01	100
	HI 95761-03	300
Chromium VI HR	HI 93723-01	100
	HI 93723-03	300
Chromium VI LR	HI 93749-01	100
	HI 93749-03	300
Copper HR	HI 93702-01	100
	HI 93702-03	300
	total HI 93702T-01	100
	total HI 93702T-03	300
Copper LR	HI 95747-01	100
	HI 95747-03	300
Cyanide	HI 93714-01	100
	HI 93714-03	300
Cyanuric Acid	HI 93722-01	100
	HI 93722-03	300
Detergents, Anionic	HI 95769-01	40
Fluoride HR	HI 93739-01	100
	HI 93739-03	300
Fluoride LR	HI 93729-01	100
	HI 93729-03	300
Glycine Powder	HI 93703-52-2	100
Hardness (Calcium)	HI 93720-01	100
	HI 93720-03	300

TEST	REAGENT KIT	NO. OF TESTS
Hardness (Magnesium) and Total Hardness	HI 93719-01	100
	HI 93719-03	300
Hardness, Total LR	HI 93735-00	100
Hardness, Total MR	HI 93735-01	100
Hardness, Total HR	HI 93735-02	100
Hardness, Total LR+MR+HR	HI 93735-0	100
Hydrazine	HI 93704-01	100
	HI 93704-03	300
Iodine	HI 93718-01	100
	HI 93718-03	300
Iron HR	HI 93721-01	100
	HI 93721-03	300
Iron LR	HI 93746-01	50
	HI 93746-03	150
Manganese HR	HI 93709-01	100
	HI 93709-03	300
Manganese LR	HI 93748-01	50
	HI 93748-03	150
Magnesium	HI 937520-01	100
	HI 937520-03	300
Molybdenum	HI 93730-01	100
	HI 93730-03	300
Nickel HR	HI 93726-01	100
	HI 93726-03	300
Nickel LR	HI 93740-01	50
	HI 93740-03	150
Nitrate	HI 93728-01	100
	HI 93728-03	300
Nitrite HR	HI 93708-01	100
	HI 93708-03	300
Nitrite LR	HI 93707-01	100
	HI 93707-03	300
Oxygen, Dissolved (D.O.)	HI 93732-01	100
	HI 93732-03	300
Ozone	HI 93757-01	100
	HI 93757-03	300
pH	HI 93710-01	100
	HI 93710-03	300
Phosphate HR	HI 93717-01	100
	HI 93717-03	300
Phosphate LR	HI 93713-01	100
	HI 93713-03	300
Phosphorus	HI 93706-01	100
	HI 93706-03	300
Potassium	HI 93750-01	100
	HI 93750-03	300
Silica LR	HI 93705-01	100
	HI 93705-03	300
Silica HR	HI 96770-01	100
	HI 96701-03	300
Silver	HI 93737-01	50
	HI 93737-03	150
Sulfate	HI 93751-01	100
	HI 93751-03	300
Zinc	HI 93731-01	100
	HI 93731-03	300

CAL CHECK™ Standard Reagents

Single Parameter

INSTRUMENT	CAL CHECK™ STANDARDS SET	PARAMETER
HI 96700	HI 96700-11	Ammonia
HI 96701	HI 96701-11	Free Chlorine
HI 96702	HI 96702-11	Copper
HI 96704	HI 96704-11	Hydrazine
HI 96705	HI 96705-11	Silica
HI 96706	HI 96706-11	Phosphorus
HI 96707	HI 96707-11	Nitrite
HI 96708	HI 96708-11	Nitrite
HI 96709	HI 96709-11	Manganese
HI 96712	HI 96712-11	Aluminum
HI 96713	HI 96713-11	Phosphate
HI 96714	HI 96714-11	Cyanide
HI 96715	HI 96715-11	Ammonia
HI 96716	HI 96716-11	Bromine
HI 96717	HI 96717-11	Phosphate
HI 96718	HI 96718-11	Iodine
HI 96719	HI 96719-11	Hardness, Magnesium
HI 96720	HI 96720-11	Hardness, Calcium
HI 96721	HI 96721-11	Iron
HI 96722	HI 96722-11	Cyanuric Acid
HI 96723	HI 96723-11	Chromium VI
HI 96724	HI 96724-11	Free/Total Chlorine
HI 96726	HI 96726-11	Nickel
HI 96727	HI 96727-11	Color of Water
HI 96728	HI 96728-11	Nitrate
HI 96729	HI 96729-11	Fluoride
HI 96730	HI 96730-11	Molybdenum
HI 96731	HI 96731-11	Zinc
HI 96732	HI 96732-11	Dissolved Oxygen
HI 96733	HI 96733-11	Ammonia
HI 96737	HI 96737-11	Silver
HI 96738	HI 96738-11	Chlorine Dioxide
HI 96739	HI 96739-11	Fluoride
HI 96740	HI 96740-11	Nickel
HI 96746	HI 96746-11	Iron
HI 96747	HI 96747-11	Copper
HI 98748	HI 96748-11	Manganese
HI 96749	HI 96749-11	Chromium VI
HI 96750	HI 96750-11	Potassium
HI 96751	HI 96751-11	Sulfate
HI 96753	HI 96753-11	Chloride
HI 96761	HI 96761-11	Total Chlorine
HI 96762	HI 96762-11	Trace Free Chlorine
HI 96769	HI 96769-11	Anionic Detergents
HI 96770	HI 96770-11	Silica
HI 96771	HI 96771-11	Ultra High Range Free Chlorine
HI 96786	HI 96786-11	Nitrate

Multiparameter

INSTRUMENT	CAL CHECK™ STANDARDS SET	PARAMETER
HI 96101	HI 96716-11	Bromine
	HI 96701-11	Free Chlorine
	HI 96711-11	Total Chlorine
	HI 96722-11	Cyanuric Acid
	HI 96718-11	Iodine
	HI 96746-11	Iron
HI 96104	HI 96710-11	pH
	HI 96701-11	Free Chlorine
	HI 96711-11	Total Chlorine
	HI 96722-11	Cyanuric Acid
HI 96710	HI 96701-11	Free Chlorine
	HI 96711-11	Total Chlorine
	HI 96710-11	pH
HI 96711	HI 96701-11	Free Chlorine
	HI 96711-11	Total Chlorine
HI 96725	HI 96701-11	Free Chlorine
	HI 96711-11	Total Chlorine
	HI 96722-11	Cyanuric Acid
	HI 96710-11	pH
HI 96734	HI 96734-11	Free Chlorine
		Total Chlorine
HI 96735	HI 96735-11	Hardness
HI 96736	HI 96719-11	Total Hardness
	HI 96710-11	pH
HI 96741	HI 96719-11	Total Hardness
	HI 96746-11	Iron
HI 96742	HI 96746-11	Iron
	HI 96748-11	Manganese
HI 96743	HI 96746-11	Iron
	HI 96710-11	pH
HI 96744	HI 96710-11	pH
	HI 96719-11	Ca Hardness
	HI 96746-11	Mg Hardness Iron
HI 96745	HI 96701-11	Free Chlorine
	HI 96711-11	Total Chlorine
	HI 96719-11	Mg, Hardness
	HI 96746-11	Iron
	HI 96710-11	pH
HI 96752	HI 96752-11	Calcium
	HI 96754-11	Magnesium

HI 83740

Photometer for the Determination of Copper in Wine

Why Monitoring Copper is Important

Instability, which is initially manifested as a white haze (white wines) and later as a reddish-brown precipitate, could result from storage of bottled wine containing levels of copper above 0.5 mg/L. The precipitated casse (see table 1) develops only in the strong reducing conditions found in bottled wine. Instability can damage the quality of wine irreparably. Excessive levels of copper are toxic and may be removed or reduced in wine by treatment of potassium ferrocyanide (blue fining, see table 2).

Significance of Use

Grapes normally accumulate only a small amount of copper by natural translocation from roots. Unless exposed to significant airborne pollution or vineyard sprays, increased concentrations in wine result from contamination during post fermentation processing, like contact with non stainless steel equipment and as impurities in fining agents and filter media.

The copper concentration in wine is normally low, less than 0.10 to 0.30 mg/L (ppm), because excess copper is precipitated during fermentation due to adsorption onto the yeast cells. This adsorption and precipitation can reduce the initial copper concentration with 40 to 89%. At higher concentration copper plays an important role in catalyzing oxidation reactions of wine phenols.

It is important to check the copper content both in must and in wine, because at levels about 9 mg/L (ppm) copper becomes a metabolic toxin that inhibits or delays alcoholic fermentation, and concentrations exceeding 1 mg/L (ppm) may be sensorially detected and should be avoided.

Other copper related problems can be manifested as formation of white haze (in white wines) and later as a reddish brown amorphous precipitate. This precipitated "casse" develops only under the strongly reducing conditions found in bottled wines. It has been found that this casse is a mixture of copper compounds and proteins.

HANNA's HI 83740 is an invaluable instrument to monitor this crucial parameter in the winemaking process.

ORDERING INFORMATION

HI 83740-01 (115V) and HI 83740-02 (230V) are supplied with sample cuvettes and caps (2), reagents for 5 tests (HI 83740A-O, HI 83740B-O, HI 83740C-O, HI 83740D-O), 20 mL glass vials with caps (2), 1 mL plastic pipette (2), 3 mL plastic pipette (2), spoons (2), cuvette cleaning cloth, 12 VDC adapter, batteries, instructions, instrument quality certificate and rugged carrying case.

REAGENT SETS

HI 83740-20 Copper reagent set for wine (20 tests)
HI 83742-25 Color Reagent Set for wine (Wine Solvent-1)

ACCESSORIES

HI 731312 Red wine decolorization kit (25 pcs)
HI 731318 Cuvette cleaning cloth (4)
HI 731321 Glass cuvettes (4)
HI 731325W Caps for cuvettes (4)
HI 93703-50 Cuvette cleaning solution (230 mL)
HI 740027P 1.5V AA batteries (12)



WINE
line

TABLE 1: FACTORS FAVORING COPPER CASSE

CONDITIONS FOR COPPER CASSE FORMATION	PREVENTIVE MEASURES
Strong reducing conditions	maintain copper levels at less than 0.3 mg/L
Low ion concentrations	limit SO ₂ addition
High protein levels	cold-stabilize and bentonite fine to reduce proteins in white wine
Light and heat	-

TABLE 2: COPPER ELIMINATION WITH POTASSIUM FERROCYANIDE TREATMENT

WINE BEFORE TREATMENT		WINE AFTER Fe(CN) ₆ K ₄ TREATMENT (BLUE FINING)
IRON (mg/L)	COPPER (mg/L)	COPPER (mg/L)
20	5	0.2
10	5	0.5
5	5	1.0
2.5	5	1.5
1	5	2.0
Small traces	5	3.0

SPECIFICATIONS

HI 83740	
Range	0.00 to 1.50 mg/L
Resolution	0.05 mg/L
Accuracy @ 25°C/77°F	±0.05 mg/L ±5% of reading
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 560 nm
Method	extraction method 2.2 bichinoline
Environment	0 to 50°C; RH max 95% non-condensing
Power Supply	1.5V AA batteries (4) / 12 VDC adapter
Auto Shut-off	after 15 minutes of non-use
Dimensions	225 x 85 x 80 mm (8.7 x 3.3 x 3.1")
Weight	500 g (17.6 oz.)



SPECIFICATIONS	HI 83741
Range	0.0 to 15.0 mg/L
Resolution	0.1 mg/L
Accuracy @ 25°C/77°F	±0.2 mg/L ±5% of reading
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 560 nm
Method	the reaction between iron and the reagents causes a purple tint in the sample
Environment	0 to 50°C; RH max 95% non-condensing
Power supply	1.5V AA batteries (4) / 12 VDC adapter
Auto Shut-off	after 15 minutes of non-use
Dimensions	225 x 85 x 80 mm (8.7 x 3.3 x 3.1")
Weight	500 g (17.6 oz.)

ORDERING INFORMATION

HI 83741-01 (115V) and HI 83741-02 (230V) is supplied with sample cuvettes and caps (2), reagents for 5 tests (HI 83741A-0, HI 83741B-0, HI 83742-0), scissors, 1000 µL automatic pipette with instruction sheet, plastic tips for 1000 µL automatic pipette (2), 1 mL plastic pipette, cuvette cleaning cloth, 12 VDC adapter, batteries, instructions, instrument quality certificate and rugged carrying case.

REAGENT SETS

HI 83741-20 Iron reagents set for wine (20 tests)

OTHER ACCESSORIES

HI 731312	Red wine decolorization kit (25 pcs)
HI 740027P	1.5V AA batteries (12)
HI 731318	Cuvette cleaning cloth (4)
HI 731321	Glass cuvettes (4)
HI 731325W	Caps for cuvettes (4)
HI 93703-50	Cuvette cleaning solution (230 mL)
HI 731341	1000 µL automatic pipette
HI 731351	Plastic tips for 1000 µL automatic pipette (25)

HI 83741

Photometer for the Determination of Iron in Wine

Iron Concentration and Casse

HANNA HI 83741 measures the iron concentrations of both white and red wines. HI 83741 makes it possible to quickly and easily determine the state of your wine, and to act on it in case it may be necessary.

Significance of Use

Trace iron concentrations in wine are beneficial for enzyme activity, as a stabilizer, and as a functional component for proteins.

At higher concentrations it alters the redox potential, in favoring oxidation, affecting sensory characteristics and participating in the formation of complexes with tannin and phosphates resulting in instabilities (casse). The most common iron case is "white casse" (iron phosphate), it is initially seen as milky white cloud and later as a precipitate. The "blue casse" (ferric tannate) that occurs less often can be observed in white wines, for example, after tannic acid additions.

Most of the iron present in wine is present in the ferrous Fe (II) state. The ratio of the Fe (II)/Fe (III) depends on the oxidation state of wine. If Fe (III) is formed, it can bind with phosphates that are normally present in wine.

Since iron strongly binds with several organic acids, some wine makers add citric acid to the wine to complex free iron if the concentration exceeds 5 mg/L. If no contamination, occurs the normal concentrations must be in range from 1 to 5 ppm. The most important source of iron in wine is contact with iron containing alloys during processing. During fermentation a part of the iron is absorbed by yeast and thus removed from the wine during filtration.

Iron Concentration & Casse

Wine containing less than 8 mg/L of iron: there is no risk of casse.

Wine containing more than 8 mg/L of iron: it is necessary to check the stability since there may be the possibility for casse to occur.

Wine containing 8 to 15 mg/L of iron: wine is subject to casse and needs treatment with SO₂, citric acid or ascorbic acid.

Wine containing over 15 mg/L of iron: wine is highly subject to casse and needs treatment with potassium ferricyanide.

HANNA's HI 83741 is an invaluable instrument for monitoring this crucial parameter in the process of wine making. With a few simple steps wine makers can quickly and accurately measure iron content in wine directly in mg/L.

CASSE FORMATION AND INHIBITION

WHITE CASSE FORMATION	WHITE CASSE INHIBITION
iron concentration >7	iron concentration <5
high redox potential (Fe ³⁺ + present)	clarification with bentonite
pH 2.9-3.6	citric acid addition 12-24 g/hL

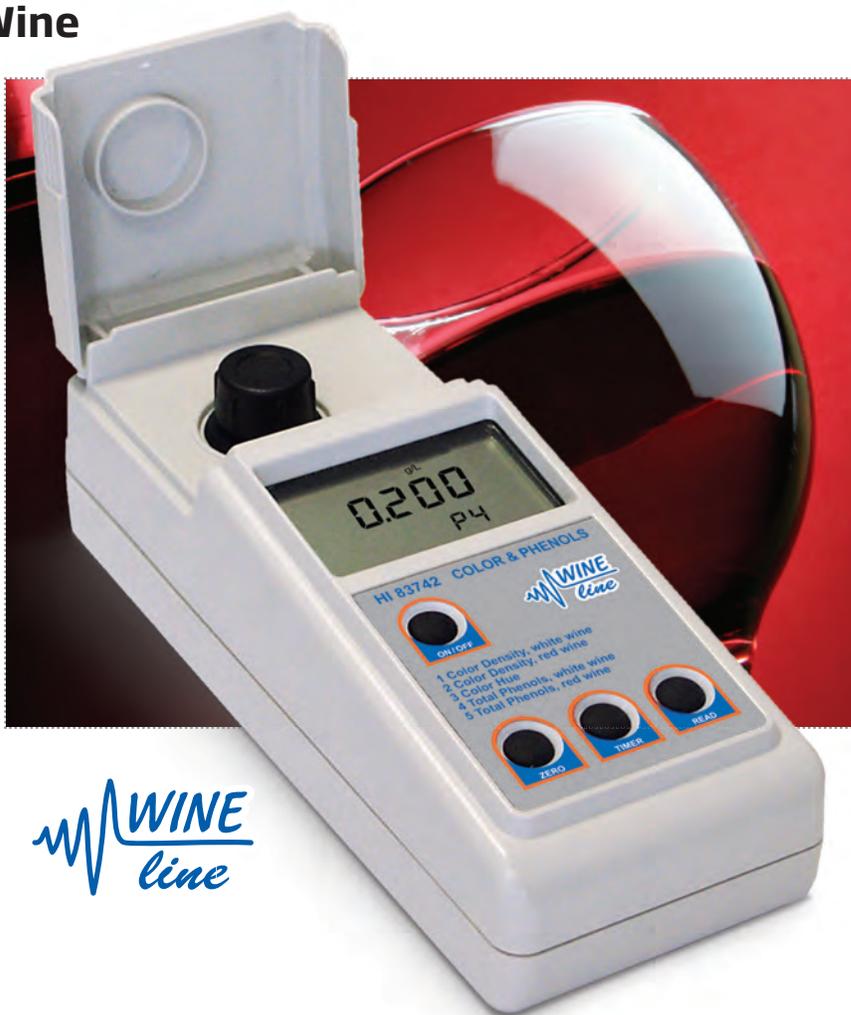
HI 83742

Photometer for the Determination of Color and Total Phenols in Wine

Color Determination

Analytical techniques have become a valuable tool of modern wine makers. The definition and the processing techniques to obtain the desired wine color are of key importance. The right decisions taken during maturation of the grapes, processing, aging and blending, all strongly influence the final resulting wine color.

The color of wine is always read after removal of suspended matter. There are mainly two color components present, yellow and red but also a blue or green hue may appear. The color hue is the ratio between the yellow color concentrations over the red one, and is an indication about the degree of evolution.



ORDERING INFORMATION

HI 83742-01 (115V) and HI 83742-02 (230V) are supplied with sample cuvettes and caps (2), reagents for 5 tests (HI 83742-0, HI 83742A-0, HI 83742B-0, HI 83742C-0), 200 μ L automatic pipette with (2) tips and instruction sheet, 2000 μ L automatic pipette with (2) tips, 5 mL syringe with tip, 1 mL plastic pipette, 3 mL plastic pipette, cuvette cleaning cloth, 12 VDC adapter, batteries (4), instructions and rugged carrying case.

REAGENT SETS

- HI 83742-20 Phenols reagent set (20 tests)
 HI 83742B-0 Total phenols in wine reagent B, 10 mL (20 tests)
 HI 83742-25 HI 83742-0 Wine Solvent 1 color reagent set for wine (20 tests)
 HI 83742-27 HI 83742-3 Wine Solvent 3 color reagent set for wine (20 tests)

ACCESSORIES

- HI 731312 Red wine decolorization kit (25 pcs)
 DEMI-10 Bottle to prepare 10 liters of demineralized water
 HI 740027P 1.5V AA batteries (12 pcs)
 HI 731318 Cloth for wiping cuvettes (4 pcs)
 HI 731321 Glass cuvettes (4 pcs)
 HI 731325W Caps for cuvettes (4 pcs)
 HI 93703-50 Cuvettes cleaning solution (230 mL)
 HI 740226 5 mL graduated syringe
 HI 731340 200 μ L automatic pipette
 HI 731350 Plastic tips for 200 μ L automatic pipette (25 pcs)
 HI 731342 2000 μ L automatic pipette
 HI 731352 Plastic tips for 2000 μ L automatic pipette (25 pcs)
 HI 740157P Plastic refilling pipette (20 pcs)

SPECIFICATIONS		HI 83742	
		WHITE WINE	RED WINE
Range	Color Density (I.C.)	0.000 to 1.000	0.00 to 15.00
	Tint (O.D.420/O.D.525)	0.00 to 9.99	0.00 to 9.99
	Total Phenols (g/L)	0.000 to 0.750	0.00 to 5.00
Resolution	Color Density (I.C.)	0.001	0.01
	Tint (O.D.420/O.D.525)	0.01	0.01
	Total Phenols (g/L)	0.001	0.01
Accuracy @ 25°C/77°F	Color Density (I.C.)	$\pm 0.005 \pm 5\%$ of reading	$\pm 0.03 \pm 4\%$ of reading
	Tint (O.D.420/O.D.525)	$\pm 0.01 \pm 4\%$ of reading	$\pm 0.01 \pm 4\%$ of reading
	Total Phenols (g/L)	$\pm 0.015 \pm 5\%$ of reading	$\pm 0.10 \text{ g/L} \pm 5\%$ of reading
Light Source	tungsten lamp		
Light Detector	silicon photocell with narrow band interference filter @ 420 nm, 520 nm and 610 nm		
Method	colorimetric		
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing		
Power Supply	1.5V AA batteries (4) /12 VDC adapter		
Auto Shut-off	after 15 minutes of non-use		
Dimensions	225 x 85 x 80 mm (8.7 x 3.3 x 3.1")		
Weight	500 g (17.6 oz.)		

Red and Yellow Color in Wine

The yellow color in wine comes from the presence of tannins (polymers of flavonoid-procyanidins type, and non-flavonoid phenols) and can be read without dilution. The increase of the yellow-brown color in older wines is due to aging or oxidation.

The red colors of wines are caused by free anthocyanins, copigments of anthocyanins, and polymerized phenolic compounds. The color of these pigments is pH dependent and can be intensely dark. It is therefore necessary to dilute the wine sample taking care not to change the original wine pH. HANNA recommends using it's special wine solvent to minimize possible errors due to dilution.



Phenol Determination

Phenolic compounds are important for several reasons since they (I) affect the color of the wine, (II) have an astringent taste, (III) may cause pungent odor, (IV) are a source of oxygen reduction, and (V) are sources of browning substances.

Wine can contain a large variety of phenolic compounds, and with traditional analytical techniques it is difficult to distinguish between total phenols and specific phenols. Although some progress has been made with HPLC, the most common analyses for total phenols remain the reaction of phenolic substances with the Folin-Ciocalteu reagent. Other methods like the direct spectrophotometric determinations are less accurate, because of differences in specific molar absorptivity, and color present of non phenolic substances.

Tint	State	Value (O.D.420./O.D.525)
Purple-Red	young wine	less than 0.44
Red	mature wine	0.44 to 1
Red-Yellow	very mature wine	greater than 1

	Color Density (I.C.)	Total Phenols (g/L)
White Wines	0.05 to 0.15	0.4 to 1.2
Red Wines	4 to 6	2 to 5

Wine Making

The initial step in the making of wine is growing grapes. Specific varieties of grapes are used in making premium wines, but any grape with sugar content can be fermented. Successful wine grape farming is dependent upon proper soil and climatic conditions. These particular geographic regions (appellations) can be conducive to the quality of a particular variety or to wine grapes in general.

When wine grapes are harvested, they must be taken to a certified weigh station. Many wineries will have a weigh station at their facility. The winery is required to keep certain information about their grape supply (whether they grow their own grapes or buy them from others).

The process of making wine is a manufacturing process. The winery takes one product (grapes) and transforms it into another (wine). Wine production can take several years and many of the people or other costs involved in the process cross cost center boundaries. This combination of factors can make cost accounting difficult.

Wineries can make several different products. Bulk wine is made in large quantities, usually of lesser quality grapes and using lesser quality techniques. Bulk wine is sometimes used for related products such as brandy, wine coolers or vinegar, but usually is sold as jug or generic wine. Premium varieties are the high quality, high priced wines that use the highest quality grapes. Sparkling wines, commonly known as champagne, need another step in processing to give them the effervescence. Brandy is made by distilling wine and aging it an additional 3 years.

The first step in the wine making process is the delivery of the grapes from the fields.

The grapes go into a stemmer/crusher which both separates the individual grapes (berries) from the stems and leaves, and breaks open the skins to allow the juice to run free. This juice is then called the "free run." The grapes are then placed in a press and depending on the type of wine to be made, various degrees of pressure can be exerted on the grape skins/pulp to extract more juice. Generally, white wines are made from juice without the skins, while red wines are fermented with skins and seeds included.

The grape juice is then transferred to a container in which it will be fermented. White wine is often fermented in temperature controlled, stainless steel tanks. Some premium white varieties are fermented in the 55 gallon oak barrels in which they will be aged. Red wines are similarly fermented in stainless steel tanks as the normal practice, but are occasionally fermented in large open topped wood tanks.

Wines may remain in the tanks in which they were fermented for the balance of their aging prior to bottling. In this case, the tanks see duty as both fermentation and aging tanks. In other cases, the wines, after spending time in the fermentation tank, will be transferred to smaller oak barrels for further aging. In either case, the wine in the fermentation tank will be transferred prior to the next year's harvest, so that the fermentation tank will be available again.

HI 83746

Photometer for the Determination of Concentration of Reducing Sugars

A critical parameter in the winemaking process

The determination of concentration of reducing sugars (RS) is one of the most important parameters that need to be measured during the wine making process. Following the increase of RS during maturation of grapes can help decide when to start harvest. Having the highest possible sugar content is important because this is the main parameter that defines the commercial value of grapes. During the alcoholic fermentation instead, the decrease of sugars can be followed to decide when fermentation is completed, or allows the taking of corrective actions if the content of RS is too low to obtain the desired alcohol degree or sweetness.

The predominant RS in grape products are glucose and fructose (hexoses). After reaction with excess alkaline cupric tartrate (Fehling reagents), the RS content can be determined colorimetrically. The Fehling method is not an exact determination but an index of the reducing sugar concentration, because the reaction depends upon the amount and kind of RS present. When the reducing sugar content is known at the beginning of fermentation, the potential alcohol degree can be estimated multiplying the sugar concentration (in g/L) by 0.06. Phenols interfere in the Fehling reaction and therefore red wine must be colorized prior to analysis. Wine also contains non-fermentable reducing sugars like pentose which will also be analyzed by this method.

TYPICAL CONTENT OF REDUCING SUGARS IN MUST AND WINE

Must		
Sweet must	20-25 %	200-250 g/L
Normal	10-20 %	100-200 g/L
In fermentation	4-12.5 %	40-125 g/L
Wine		
Sweet	2.5-12.5 %	25-125 g/L
Semi Sweet	0.8-2.5 %	8-25 g/L
Almost Dry	0.2-0.8 %	2-8 g/L
Dry	0-0.2 %	0-2 g/L



SPECIFICATIONS	HI 83746
Range	0.00 to 50.00 g/L
Resolution	0.25 g/L
Accuracy @ 25°C/77°F	± 0.50 g/L ±5% of reading
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 610 nm
Method	Fehling
Environment	0 to 50°C; RH max 95% non-condensing
Battery Type	1.5V AA batteries (4)/ 12 VDC adapter
Auto Shut-off	after 15 minutes of non-use
Dimensions	224 x 87 x 77 mm (8.7 x 3.3 x 3.1")
Weight	512 g (17.6 oz.)

ORDERING INFORMATION

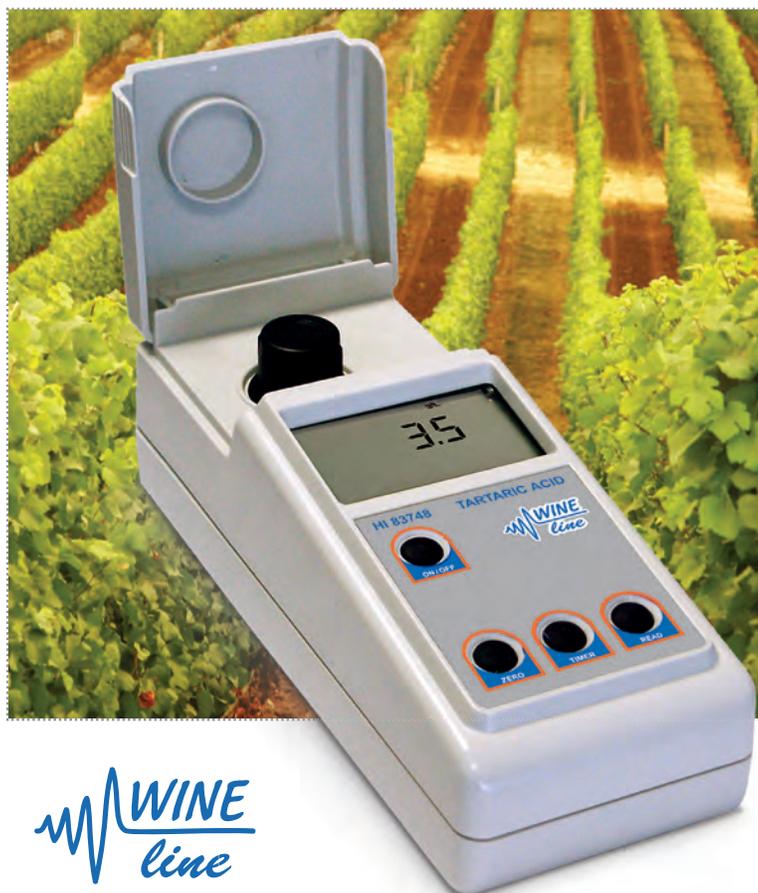
HI 83746-01 (115V) and HI 83746-02 (230V) is supplied with glass cuvettes and caps (4), reagents for about 20 tests (HI 83746A-0 and HI 83746B-0), HI 93703-59 Charcoal, 200 µL automatic Pipette with two plastic tips, 1000 µL automatic pipette with plastic tips (2), instruction sheet for automatic pipette, spoon, funnel, filter paper (25), cuvette cleaning cloth, 12 VDC adapter, batteries, instructions and rugged carrying case.

OPTIONAL REAGENTS

HI 83746-20 RS reagent set (20 tests)
 HI 93703-59 Charcoal for decoloration of red wine (about 100 tests)

ACCESSORIES

HI 731318 Cuvette cleaning cloth (4)
 HI 731321 Large 10 mL cuvette (4)
 HI 731340 200 µL pipette
 HI 731350 200 µL pipette tips (25)
 HI 731341 1000 µL pipette
 HI 731351 1000 µL pipette tips (25)
 HI 740142P 1 mL graduated syringe
 HI 740144P 2 mL graduated syringe tips (10)
 HI 740216 Tube rack for glass vials
 HI 740217 Safety shield
 HI 740232 Filter paper type 1 (100)
 HI 839800 Thermoreactor
 HI 740027P 1.5V AA batteries (12)



SPECIFICATIONS	HI 83748
Range	0.0 to 5.0 g/L
Resolution	0.1 g/L
Accuracy @ 25°C/77°F	±0.1 g/L ±5% of reading
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 525 nm
Method	the reaction between tartaric acid and the reagents causes a yellow/orange red tint in the sample.
Environment	0 to 50°C; RH max 95% non-condensing
Battery Type	1.5V AA batteries (4) / 12 VDC adapter
Auto Shut-off	after 15 minutes of non-use
Dimensions	225 x 85 x 80 mm (8.7 x 3.3 x 3.1")
Weight	500 g (17.6 oz.)

ORDERING INFORMATION

HI 83748-01 (115V) and HI 83748-02 (230V) are supplied with sample cuvettes and caps (2), reagents for 5 tests (HI 83748A-O, HI 83748B-O), 200 µL automatic pipette with Instruction Sheet, plastic tips for 200 µL automatic pipette (2), 5 mL syringe with tip, cuvette cleaning cloth, 12 VDC adapter, batteries, instructions, instrument quality certificate and rugged carrying case.

REAGENT SETS

HI 83748-20 Tartaric Acid reagents set for wine (20 tests)

OTHER ACCESSORIES

HI 740027P 1.5V AA batteries (12)
 HI 731318 Cuvette cleaning cloth (4)
 HI 731321 Glass cuvettes (4)
 HI 731325W Caps for cuvettes (4)
 HI 93703-50 Cuvette cleaning solution (230 mL)
 HI 740226 5 mL graduated syringe
 HI 731340 200 µL automatic pipette
 HI 731350 Plastic tips for 200 µL automatic pipette (25)

HI 83748

Photometer for the Determination of Tartaric Acid in Wine

Tartaric Acid: Wine Acidity

Tartaric acid and tartrate play an important role in the stability of wines. They can be present in wine and juice in various forms, like tartaric acid (H_2T), potassium bi-tartrate (KHT) or calcium tartrate (CaT). The ratio of these depends mainly on the pH of the wine. The percent of tartrate present as bitartrate (HT^-) is maximum at pH 3.7.

The formation of crystalline deposits (tartrate casse) is a phenomenon of wine aging that does not meet customer acceptance. It is therefore important to test for, and to reduce the potential of bottle precipitation. For example, by adjusting the pH of the wine, winemakers can significantly influence the potential of casse formation.

Potassium concentrations in wine can range from 600 to 2500 mg/L (ppm) in certain red wines. Although the potassium bi-tartrate is soluble in water, alcohol and low temperatures decrease its solubility. Especially during the alcoholic fermentation potassium bi-tartrate becomes increasingly insoluble resulting in super-saturation and precipitation. The KHT stability can be restored by chilling (with or without seeding). Wines with initial pH values below 3.65 can show a reduction in pH during cold stabilization because of generation of one free proton for each KHT precipitated. The pH may drop as much as 0.2 pH units. For wines at higher pH than 3.7, the pH shifts to a higher pH.

Calcium concentrations can range from 6 to 165 mg/L (ppm) and may complex with tartrate or oxalate to form crystalline precipitates. Calcium tartrate instabilities occur normally from 4 to 7 months after fermentation and are temperature independent.

Sulphates, proteins, gum and polyphenols can form stable complexes with tartrate thus inhibiting casse formation. The complexes are mainly between polyphenols and tartaric acid in red, and proteins in white wine. This explains why, as pigment polymerization occurs, the holding capacity of tartaric acid diminishes, resulting in delayed casse. The sulfate instead does not complex with potassium from 50% in white wines up to 100% in red ones.

Tartaric acid concentrations in wine range normally from 1.5 to 4.0 g/L. This acid concentration may not be confused with total or titratable acidity of wines that are often expressed in tartaric acid content too. Although it is the tartaric acid that is the predominantly present acid (up to 60% of the total acidity), others like malic, citric and several volatile acids do give a significant contribution total acidity.

HI 83730

Photometer for the Determination of Peroxide Value in Olive Oils

The HI 83730 is an instrument that benefits from HANNA's years of experience as a manufacturer of analytical instruments. It has an advanced optical system based on a special tungsten lamp and a narrow band interference filter that allows the most accurate and repeatable readings. All instruments are factory calibrated.

The auto-diagnostic feature of this meter ensures optimal measurement conditions for highly precise readings. The light level is automatically adjusted each time a zero-measurement is made, and the lamp is temperature controlled to avoid overheating.

Significance and Use

Peroxides are the primary products of oil oxidation. Their identification gives useful information about oil conservation and rancidity. HI 83730 allows a fast and simple analysis of peroxides in oil in accordance with the EC 2568/91 method.

Oil Peroxides Content

<10 meq O ₂ /kg	excellent conservation
10-15 meq O ₂ /kg	good conservation
<10 meq O ₂ /kg	refined oil
>20 meq O ₂ /kg	rancid oil

ORDERING INFORMATION

HI 83730-01 (115V) and HI 83730-02 (230V) are supplied with reagents for 10 tests, 1 mL syringes (4), scissors, vial cleaning cloth, batteries, AC adapter, instructions and a rigid carrying case.

REAGENT SETS

HI 83730-20 Peroxide in olive oil reagents kit (21 tests)

ACCESSORIES

HI 93703-50 Cleaning solution, 230 mL
 HI 740216 Test tube cooling rack
 HI 740142P 1 mL graduated syringe, 10 pcs.
 HI 731318 Cloth for wiping cuvettes, 4 pcs.
 HI 710005 Voltage adapter from 115V to 12 VDC
 HI 710006 Voltage adapter from 230V to 12 VDC



SPECIFICATIONS

	HI 83730
Range	0.0 to 25.0 meq O ₂ /kg
Resolution	0.5 meq O ₂ /kg
Accuracy @ 25°C/77°F	±0.5 meq O ₂ /kg
Light Source	tungsten lamp
Light Detector	silicon photocell with narrow band interference filter @ 466 nm
Method	adaptation of EC 2568/91 method and following amendments
Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
Power Supply	1.5V AA batteries (4) / 12 VDC adapter
Auto Shut-off	after 15 minutes of non-use
Dimensions	224 x 87 x 77 mm (8.8 x 3.4 x 3")
Weight	512 g (18 oz.)