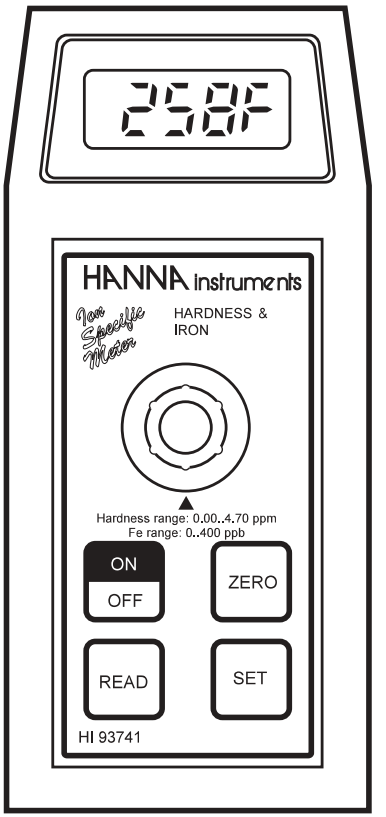
HANNA LITERATURE

Hanna publishes a wide range of catalogs and handbooks for an equally wide range of applications. The reference literature currently covers areas such as:

- Water Treatment
- Process
- Swimming Pools
- Agriculture
- Food
- Laboratory
- Thermometry

and many others. New reference material is constantly being added to the library.

For these and other catalogs, handbooks and leaflets contact your dealer or the Hanna Customer Service Center nearest to you. To find the Hanna Office in your vicinity, check our home page at www.hannainst.com.



PEWA
Messtechnik GmbH

Weidenweg 21
58239 Schwerte

Tel.: 02304-96109-0
Fax: 02304-96109-88
E-Mail: info@pewa.de
Homepage : www.pewa .de

CE

These Instruments are in Compliance with the CE Directives

Dear Customer,

Thank you for choosing a Hanna product. Please read this instruction manual carefully before using the meter. This manual will provide you with the necessary information for the correct use of the instrument. If you need additional technical information, do not hesitate to e-mail us at tech@hannainst.com. These instruments are in compliance with CE directives.

TABLE OF CONTENTS

Potassium	HI 93750	0.0 to 50.0 mg/L	Tetraphenylborate
Sulfate	HI 93751	0 to 150 mg/L	Turbidimetric
Silica	HI 93705	0.00 to 2.00 mg/L	Heteropoly Blue
Silver	HI 93737	0.000 to 1.000 mg/L	PAN
Zinc	HI 93731	0.00 to 3.00 mg/L	Zincon

CE DECLARATION OF CONFORMITY

HANNA instruments

CE

DECLARATION OF CONFORMITY

We

Hanna Instruments Italia Srl
Viale Delle Industrie, 12/A
35010 Villafranca Padovana- PD
ITALY

herewith certify that the meter:

HI 93741 HI 93742 HI 93743 HI 93744 HI 93745
HI 93710 HI 93724 HI 93725 C101 C104

Has been tested and found to be in compliance with EMC Directive 89/336/EEC and Low Voltage Directive 73/23/EEC according to the following applicable normatives:

EN 50082-1: Electromagnetic Compatibility - Generic Immunity Standard
IEC 61000-4-2 Electrostatic Discharge
IEC 61000-4-3 RF Radiated

EN 50081-1: Electromagnetic Compatibility - Generic Emission Standard
EN 55022 Radiated, Class B

EN61010-1: Safety requirements for electrical equipment for measurement, control and laboratory us

Date of Issue: 30/05/1997

D. Volpato - Engineering Manager
On behalf of
Hanna Instruments Italia S.r.l.

Recommendations for Users

Before using these products, make sure that they are entirely suitable for the environment in which they are used.

Operation of these instruments in residential area could cause unacceptable interferences to radio and TV equipments, requiring the operator to take all necessary steps to correct interferences.

Any variation introduced by the user to the supplied equipment may degrade the instruments' EMC performance.

To avoid damages or burns, do not perform any measurement in microwave ovens.

OTHER ISM FROM HANNA

Single-parameter Colorimeters

Description	Code	Range	Method
Aluminum	HI 93712	0.00 to 1.00 mg/L	Aluminon
Ammonia LR	HI 93700	0.00 to 3.00 mg/L	Nessler
Ammonia MR	HI 93715	0.00 to 9.99 mg/L	Nessler
Ammonia HR	HI 93733	0.0 to 50.0 mg/L	Nessler
Bromine	HI 93716	0.00 to 8.00 mg/L	DPD
Calcium HR		0 to 400 mg/L	Oxalate
& Magnesium HR	HI 93752	0 to 150	Calmagite
Chlorine, Free	HI 93701	0.00 to 2.50 mg/L	DPD
Chlorine, Total	HI 93711	0.00 to 3.50 mg/L	DPD
Chlorine, Free HR		0.00 to 9.99 mg/L	DPD
& Total HR	HI 93734	0.00 to 9.99 mg/L	DPD
Chlorine Dioxide	HI 93738	0.00 to 2.00 mg/L	Chlorophenol Red
Chloride	HI 93753	0.0 to 20.0 mg/L	Mercury (II) Thiocyanate
Chromium VI, LR	HI 93749	0 to 300 µg/L	Diphenylcarbohydrazide
Chromium VI, HR	HI 93723	0 to 1000 µg/L	Diphenylcarbohydrazide
Color of Water	HI 93727	0 to 500 PCU	Colorimetric Platinum Cobalt
Copper, LR	HI 93747	0 to 990 µg/L	Porphyrin
Copper, HR	HI 93702	0.00 to 5.00 mg/L	Bicinchoninate
Cyanide	HI 93714	0.000 to 0.200 mg/L	Pyridine-Pyrazalone
Cyanuric Acid	HI 93722	0 to 80 mg/L	Turbidimetric
Fluoride	HI 93729	0.00 to 2.00 mg/L	SPADNS
Fluoride, HR	HI 93739	0.0 to 20.0 mg/L	SPADNS
Hardness, Ca	HI 93720	0.00 to 2.70 mg/L	Calmagite/colorimetric
Hardness, Mg	HI 93719	0.00 to 2.00 mg/L	EDTA/colorimetric
Hardness, Total	HI 93735	0 to 750 mg/L	Calmagite
Hydrazine	HI 93704	0 to 400 µg/L	p-Dimethylaminobenzaldehyde
Iodine	HI 93718	0.0 to 12.5 mg/L	DPD
Iron, LR	HI 93746	0 to 400 µg/L	TPTZ
Iron, HR	HI 93721	0.00 to 5.00 mg/L	Phenantroline
Manganese, LR	HI 93748	0 to 300 µg/L	PAN
Manganese, HR	HI 93709	0.0 to 20.0 mg/L	Periodate Oxidation
Molybdenum	HI 93730	0.0 to 40.0 mg/L	Mercaptoacetic Acid
Nickel LR	HI 93740	0.000 to 1.000 mg/L	PAN
Nickel HR	HI 93726	0.00 to 7.00 g/L	Photometric
Nitrate	HI 93728	0.0 to 30.0 mg/L	Cadmium Reduction
Nitrite, LR	HI 93707	0.00 to 0.35 mg/L	Diazotization
Nitrite, HR	HI 93708	0 to 150 mg/L	Ferrous Sulfate
pH	HI 93710	5.9 to 8.5 pH	Phenol Red
Phosphate, LR	HI 93713	0.00 to 2.50 mg/L	Ascorbic Acid
Phosphate, HR	HI 93717	0.0 to 30.0 mg/L	Amino Acid
Phosphorus	HI 93706	0.0 to 15.0 mg/L	Amino Acid

PRELIMINARY EXAMINATION

Remove the instrument from the packing material and examine it carefully to make sure that no damage has occurred during shipment. If there is any damage, notify your Dealer.

Each Ion Specific Meter is supplied complete with:

- 9V Battery
- Two Sample Cuvets and Caps*
- One Transport Cap

Note: Save all packing material until you are sure that the instrument functions correctly. Any defective item must be returned in its original packing with the supplied accessories.

* HI 93725 is supplied with 3 cuvets and caps

GENERAL DESCRIPTION

The Hanna Instruments Ion Specific Meters are portable, microprocessor-based colorimeters that measure the ion content in water and waste waters.

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

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

Display codes aid the user in routine operations.

The meters have an auto-shut off feature that will turn the meter off after 10 minutes of non-use.

PRINCIPLE OF OPERATION

The color of every object we see is determined by a process of absorption and emission of the electromagnetic radiation (light) of its molecules.

Colorimetric analysis is based on the principle that specific compounds react with others and form a color, the intensity of which is proportional to the concentration of the substance to be measured.

When a substance is exposed to a beam of light of intensity I_o, a portion of the radiation is absorbed by the substance's molecules and a radiation of intensity I, lower than I_o, is emitted.

The quantity of radiation absorbed is given by the Lambert-Beer Law:

$$\log I_o/I = \varepsilon_\lambda \, c \, d$$

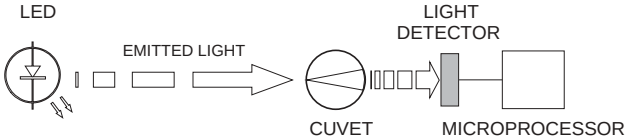
Where $\log I_o/I$ = Absorbance (A)

ε_λ = molar extinction coefficient of the substance at wavelength λ

c = molar concentration of the substance

d = optical distance light travels through sample

Therefore, the concentration "c" can be calculated from the color intensity of the substance determined by the emitted radiation I, as the other factors are known.



BLOCK DIAGRAM OF A COLORIMETER

A monochromatic LED (Light Emitting Diode) emits radiation at a single wavelength, supplying the system with the intensity I_o.

Since a substance absorbs the color complimentary to the one it emits (for example, a substance appears yellow because it absorbs blue light), Hanna colorimeters use LEDs that emit the appropriate wavelength to measure the sample.

The optical distance (d) is measured by the diameter of the cuvet containing the sample.

The photoelectric cell collects the radiation I that is not absorbed 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.

The measurement process is done in two phases: setting the meter to zero and the actual measurement.

The cuvet 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) cuvets are optically identical to provide the same measurement conditions. Whenever possible use the same cuvet for both.

It is also necessary that the cuvet's surface is clean and not scratched, in order to avoid measurement interference due to unwanted reflection and absorption of light.

WARRANTY

All Hanna Instruments meters are warranted for two years against defects in workmanship and materials when used for their intended purpose and maintained according to instructions.

This warranty is limited to repair or replacement free of charge.

Damages due to accidents, misuse, tampering or lack of prescribed maintenance are not covered.

If service is required, contact the dealer from whom you purchased the instrument. If under warranty, report the model number, date of purchase, serial number and the nature of the failure. If the repair is not covered by the warranty, you will be notified of the charges incurred.

If the instrument is to be returned to Hanna Instruments, first obtain a Returned Goods Authorization Number from the Customer Service department and then send it with shipment costs prepaid. When shipping any instrument, make sure it is properly packaged for complete protection.

To validate your warranty, fill out and return the enclosed warranty card within 14 days from the date of purchase.

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

ACCESSORIES

REAGENT SETS

HI 93701-01 100 free chlorine tests
HI 93701-03 300 free chlorine tests
HI 93701-F 300 free chlorine tests (liquid version)
HI 93701-T 300 total chlorine tests (liquid version)
HI 93710-01 100 pH tests
HI 93710-03 300 pH tests
HI 93711-01 100 total chlorine tests
HI 93711-03 300 total chlorine tests
HI 93716-01 100 bromine tests
HI 93716-03 300 bromine tests
HI 93718-01 100 iodine tests
HI 93718-03 300 iodine tests
HI 93719-01 100 Mg hardness tests
HI 93719-03 300 Mg hardness tests
HI 93722-01 100 cyanuric acid tests
HI 93722-03 300 cyanuric acid tests
HI 93746-01 50 iron LR tests
HI 93746-03 150 iron LR tests
HI 93748-01 50 manganese LR tests
HI 93748-03 150 manganese LR tests

OTHER ACCESSORIES

HI 710009 Blue rubber boot
HI 710010 Orange rubber boot
HI 721310 9V battery (10 pcs)
HI 731318 Tissue for wiping cuvets (4 pcs)
HI 731321 Glass cuvets (4 pcs)
HI 731325 Cap for cuvet (4 pcs)
HI 93703-50 Cuvets cleaning solution (230 mL)
MANISMMPR3 Instruction manual

It is recommended not to touch the cuvet walls with hands.

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

DISPLAY CODE GUIDE

This indicates that the meter is in a ready state and zeroing can be performed.

Sampling in Progress. This prompt appears each time the meter is performing a measurement.

This indicates that the meter is in a zeroed state and measurement can be performed.

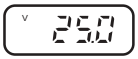
A zero reading was not taken. Insert a sample before adding reagent and press ZERO.

Under range. A blinking "0.00" indicates that the sample absorbs less light than the zero reference. Check the procedure and make sure you use the same cuvet for reference (zero) and measurement.

Over range. A flashing value higher than the maximum concentration readable (see specifications) indicates that the sample absorbs too much light, meaning that the concentration is too high. Dilute the sample.

Light over range. The cuvet is not inserted correctly and an excess ambient light is reaching the detector. If the cover is properly installed, then contact your dealer or the nearest Hanna Customer Service Center.

Light under range. The zero sample is too dark for proper zeroing. If this is not the case, contact your dealer or the nearest Hanna Customer Service Center.



The "V" indicates that the battery voltage is getting low and the battery needs to be replaced.

This indicates that the battery is dead and must be replaced.

Note: once this indication is displayed, the meter will lockup. Change the battery to restart.

TIPS FOR AN ACCURATE MEASUREMENT

The instruction listed below should be carefully followed during testing to ensure best accuracy.

- Do not let the test sample stand too long after reagent is added or accuracy will be lost.
- Whenever the cuvet is placed into the measurement cell, it must be completely free of fingerprints, oil or dirt. Wipe it thoroughly with HI 731318 or a lint-free cloth prior to insertion.
- It is important that the sample does not contain any debris. This would corrupt the readings.
- Each time the cuvet is used, the cap must be tightened to the same degree.
- It is possible to take multiple readings in a row, but it is recommended that a zero reading be taken for each sample and that the same cuvet is used for zeroing and measurement.
- It is important to discard the sample immediately after the reading is taken because the glass might become permanently stained.
- Shaking the cuvet can generate bubbles in the sample, causing higher readings. To obtain accurate measurements, remove such bubbles by swirling or by gently tapping the vial.
- All the reaction times reported in this manual are referred to 20°C (68°F). As a general rule of thumb, they should be doubled at 10°C (50°F) and halved at 30°C (86°F).

COMMON SPECIFICATIONS

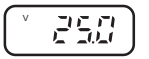
All the ion specific meters in this manual have the following common features:

Light Life	Life of the instrument
Light Detector	Silicon Photocell
Environment	0 to 50°C (32 to 122°F); max 95% RH non-condensing
Battery Type/Life	1 x 9 volt/40 hours
Auto-Shut off	After 10' of non-use
Dimensions	180 x 83 x 46 mm (7.1 x 3.3 x 1.8")
Weight	290 g (10 oz.)

BATTERY REPLACEMENT

To prolong battery life, switch your meter off after use. However, the meter has an auto-shut off feature that will turn itself off after 10 minutes of non-use.

A "V" on the LCD indicates low voltage and the battery should be replaced.

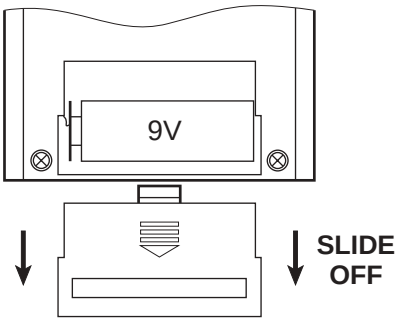


If the battery is not replaced immediately, in order to prevent erroneous readings due to low voltage "-BA-" is displayed soon afterwards.

At this point, the meter will completely lockup and will not allow any commands and the display will go blank.

Battery replacement must only take place in a non-hazardous area using a 9V alkaline battery.

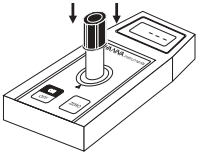
Simply slide off the battery cover on the back of the meter. Detach the battery from the terminals and attach a fresh 9V battery while paying attention to the correct polarity. Replace the battery and the cover.



The meter will turn on automatically when a new battery is connected. You can turn it off by pressing ON/OFF.

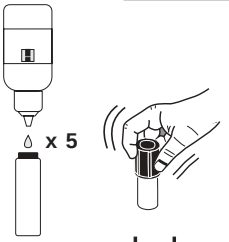
pH MEASUREMENT

- Fill the cuvet up to the mark with 10 mL of unreacted sample and replace the cap.

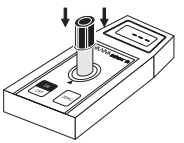


- Place the cuvet into the holder and ensure that the notch on the cap is positioned securely into the groove.
- Press ZERO and "SIP" will appear on the display.

- Wait for a few seconds and the display will show "-0.0-". Now the meter is zeroed and ready for measurement.



- Remove the cuvet and add 5 drops of the HI 93710 Phenol Red Indicator. Replace the cap and swirl the solution.



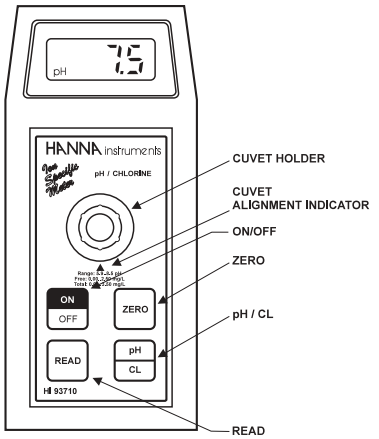
- Reinsert the cuvet into the instrument.
- Press the READ key and "SIP" will appear on the display during measurement.

- The instrument directly displays the pH measured value on the Liquid Crystal Display.

HI 93710 - pH & Chlorine

The HI 93710 meter measures both pH and chlorine (Cl_2, free and total) content in water and wastewater in the following ranges:

pH	5.9 to 8.5 pH units
Free Chlorine	0.00 to 2.50 mg/L (ppm)
Total Chlorine	0.00 to 3.50 mg/L (ppm).



SPECIFICATIONS

Range	pH	5.9 to 8.5
	Free Cl_2	0.00 to 2.50 mg/L
	Total Cl_2	0.00 to 3.50 mg/L
Resolution		0.1 pH/0.01 mg/L Cl_2
Accuracy		±0.1 pH ±0.03 mg/L ±3% of Cl_2 reading
Typical EMC Deviation		±0.2 pH ±0.02 mg/L Cl_2
Light Source		Light Emitting Diode @ 555 nm
Method		Adaptation of the EPA recommended DPD method 330.5 for chlorine analysis. The reaction with reagents causes a pink tint in the sample. For pH, Phenol red method. The reaction with reagents causes a red tint in the sample.

REQUIRED REAGENTS

Code	Unit	Description	Quantity
HI 93710-0	pH	Phenol red	5 drops
HI 93701-0	Free Cl_2	DPD	1 packet

HI 93711-0 Total Cl_2 DPD 1 packet

Liquid version (chlorine):

Code	Unit	Description	Quantity
HI 93701A-F	Free Cl_2	DPD1 indicator	3 drops
HI 93701B-F	Free Cl_2	DPD1 buffer	3 drops
HI 93701A-T	Total Cl_2	DPD1 indicator	3 drops
HI 93701B-T	Total Cl_2	DPD1 buffer	3 drops
HI 93701C-T	Total Cl_2	DPD3 solution	1 drop

REAGENT SETS

HI 93701-01 Reagents for 100 free chlorine tests

HI 93701-03 Reagents for 300 free chlorine tests

HI 93710-01 Reagents for 100 pH tests

HI 93710-03 Reagents for 300 pH tests

HI 93711-01 Reagents for 100 total chlorine tests

HI 93711-03 Reagents for 300 total chlorine tests

HI 93701-F Reagents for 300 free chlorine tests (liquid version)

HI 93701-T Reagents for 300 total chlorine tests (liquid version)

For other accessories see page 48.

MEASUREMENT PROCEDURE

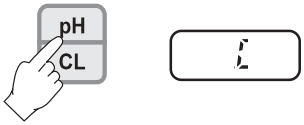
- Turn the meter on by pressing ON/OFF.
- The meter will automatically default to pH measurement mode.
- When the LCD displays "- - -", it is ready.

pH MEASUREMENTS

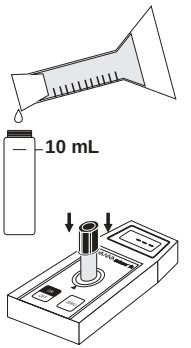
In order to perform pH measurements, follow the procedure on page 46.

CHLORINE MEASUREMENTS

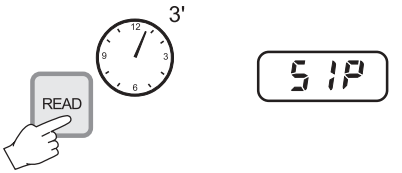
- Press the pH/CL range key to select the chlorine scale. "C" will appear on the LCD.
- Follow the procedures on page 34 and 36.



Note: Free and total chlorine have to be measured separately following the indicated procedure with fresh unreacted samples if both values are requested.



- Fill a cuvet with 10 mL of the reacted sample up to the mark and replace the cap. This is the sample.
- Insert the sample into the instrument.
- Wait for 3 minutes and then press READ. "SIP" will appear during measurement.



- The instrument directly displays concentration in µg/L of iron on the Liquid Crystal Display.

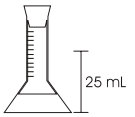
Note: For better accuracy wash glassware with HCl 6N.

INTERFERENCES

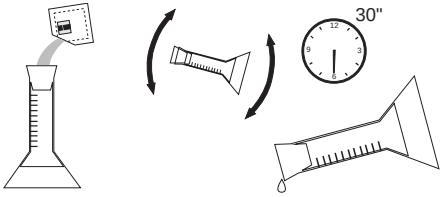
Interference may be caused by:
Cadmium above 4.0 mg/L
Chromium^{3+} above 0.25 mg/L
Chromium^{6+} above 1.2 mg/L
Cobalt above 0.05 mg/L
Copper above 0.6 mg/L
Cyanide above 2.8 mg/L
Manganese above 50.0 mg/L
Mercury above 0.4 mg/L
Molybdenum above 4.0 mg/L
Nickel above 1.0 mg/L
Nitrite ion above 0.8 mg/L
Sample pH should be between 3 and 4 to avoid developed color to fade or turbidity.

IRON LOW RANGE MEASUREMENT

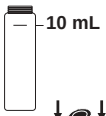
- Fill one graduated mixing cylinder up to the 25 mL mark with deionized water.



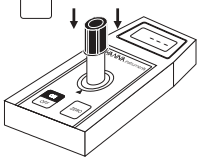
- Add the content of one packet of HI 93746 TPTZ reagent, close the cylinder and agitate for 30 seconds. This is the blank.



- Fill a cuvet with 10 mL of the blank up to the mark and let it sit for 3 minutes.



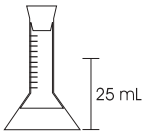
- Replace the cap, insert the blank into the holder and make sure that the notch on the cap is positioned securely into the groove.



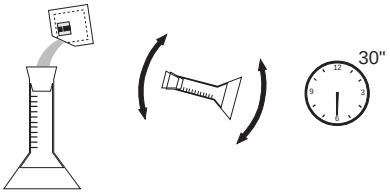
- Press ZERO and "SIP" will appear on the display.

- Wait for a few seconds and the display will show "-0.0-". Now the meter is zeroed and ready for measurement.

- Fill one graduated mixing cylinder up to the 25 mL mark with the sample.

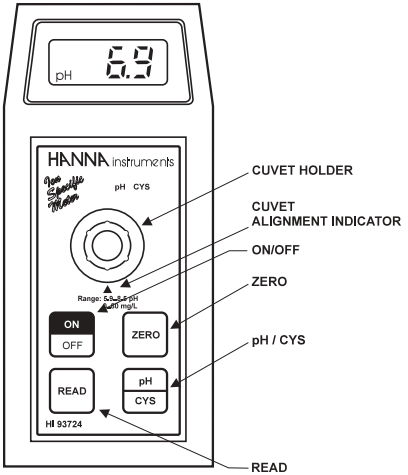


- Add the content of one packet of HI 93746 TPTZ reagent, close the cylinder and agitate for 30 seconds.



HI 93724 - Cyanuric Acid & pH

The HI 93724 meter measures cyanuric acid and pH content in water and wastewater in the following ranges: 0 to 80 mg/L for Cyanuric Acid (CYS) and 5.9 to 8.5 for pH.



SPECIFICATIONS

Range	CYS	0 to 80 mg/L
	pH	5.9 to 8.5
Resolution	CYS	1 mg/L
	pH	0.1
Accuracy	CYS	±1 mg/L ±15% of reading
	pH	±0.1
Typical EMC Deviation	CYS	±1 mg/L
	pH	±0.1
Light Source		Light Emitting Diode @ 555 nm
Method		For pH, Phenol Red method. The reaction with reagent causes a red tint in the sample. For cyanuric acid, adaptation of the turbidimetric method. The reaction between cyanuric acid and the reagent causes a white suspension in the sample.

REQUIRED REAGENTS

Code	Unit	Description	Quantity
HI 93710-0	pH	Phenol red	5 drops
HI 93722-0	CYS	Powder Reagent	1 packet

REAGENT SETS

HI 93710-01 Reagents for 100 pH tests
HI 93710-03 Reagents for 300 pH tests
HI 93722-01 Reagents for 100 CYS tests
HI 93722-03 Reagents for 300 CYS tests
For other accessories see page 48.

MEASUREMENT PROCEDURE

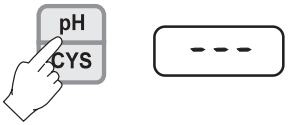
- Turn the meter on by pressing ON/OFF.
- The meter will automatically default to pH measurement mode.
- When the LCD displays "- - -", it is ready.

pH MEASUREMENTS

In order to perform pH measurements, follow the procedure on page 46.

CYANURIC ACID MEASUREMENTS

- Press the pH/CYS key to select the cyanuric acid scale. "pH" will disappear from the LCD.



- Follow the procedure on page 38.

INTERFERENCES

Interference may be caused by:

Bromine

Chlorine

Ozone

Oxidized forms of chromium and manganese

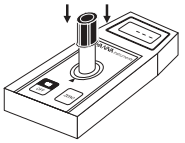
Alkalinity above 300 mg/L and acidity above 150 mg/L as $CaCO_3$ require neutralization since the color could instantly fade. To resolve this, neutralize the sample with diluted HCl or NaOH.

In case of water with hardness greater than 500 mg/L $CaCO_3$, shake the sample for approximately 1 minute after adding the reagent.

IODINE MEASUREMENT

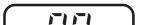
- Fill the cuvet up to the mark with 10 mL of unreacted sample and replace the cap.

- Place the cuvet into the holder and ensure that the notch on the cap is positioned securely into the groove.

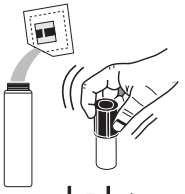


- Press ZERO and "SIP" will appear on the display.

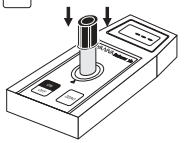
- Wait for a few seconds and the display will show "-0.0-". Now the meter is zeroed and ready for measurement.



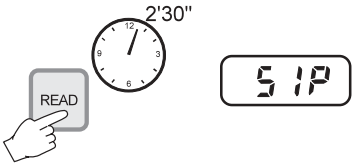
- Remove the cap and add the content of one packet of HI 93718 reagent. Replace the cap and shake gently.



- Reinsert the cuvet into the instrument.



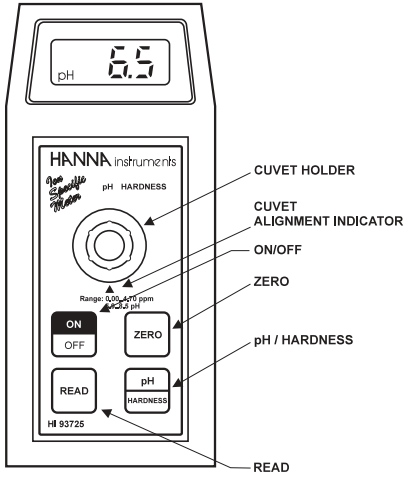
- Wait for 2 minutes and 30 seconds and press READ. "SIP" will appear during measurement.



- The instrument directly displays concentration in mg/L of iodine on the Liquid Crystal Display.

HI 93725 - pH & Total Hardness

The HI 93725 meter measures pH and Magnesium/Calcium and Total Hardness content in water and wastewater.



SPECIFICATIONS

Range	pH	5.9 to 8.5
	Mg Hardness	0.00 to 2.00 mg/L
	Ca Hardness	0.00 to 2.70 mg/L
	Total Hardness	0.00 to 4.70 mg/L
Resolution	pH	0.1
	Hardness	0.01 mg/L
Accuracy	pH	±0.1
	Hardness	±0.11 mg/L ±5% of reading)
Typical EMC Deviation	pH	±0.1
	Hardness	±0.02 mg/L
Light Source		Light Emitting Diode @ 555 nm
Method		For pH, Phenol red method. The reaction with reagent causes a red tint in the sample.
		For total hardness, adaptation of the *Standard Methods for the Examination of Water and Wastewater, 18th edition,* Calmagite/colorimetric method. The reaction between hardness and reagents causes a maroon tint in the sample.

REQUIRED REAGENTS

Code	Description	Quantity
HI 93710-0	pH Phenol red	5 drops
HI 93719A-0	Ca & Mg indicator	0.5 mL
HI 93719B-0	Alkali solution	0.5 mL
HI 93719C-0	EDTA solution	1 drop
HI 93719D-0	EGTA solution	1 drop

REAGENT SETS

HI 93710-01 Reagents for 100 pH tests

HI 93710-03 Reagents for 300 pH tests

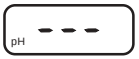
HI 93719-01 Reagents for 100 hardness tests

HI 93719-03 Reagents for 300 hardness tests

For other accessories see page 48.

MEASUREMENT PROCEDURE

- Turn the meter on by pressing ON/OFF.
- The meter will automatically default to pH measurement mode.
- When the LCD displays "- - -", it is ready.



pH MEASUREMENTS

In order to perform pH measurements, follow the procedure on page 46.

HARDNESS MEASUREMENTS

- Press pH/HARDNESS to select the Hardness range (the LCD displays "ZER1").

- Follow the procedure on page 39.

- Pressing READ will result in the meter scrolling through the hardness concentration in mg/L (ppm) by first displaying the Magnesium (n), then the Calcium (C) and then the Total (t).

- By pressing ZERO the meter will be reset and be ready for another test of Hardness.

SAMPLE DILUTION

This meter is designed to determine low levels of hardness, typically found in water purification systems.

When testing some other sources of water, it is not uncommon to come across levels of hardness that are greater than the range of this meter.

This problem can be overcome through dilution. Dilutions must be performed with hardness-free water or the readings will be erroneous.

A dilution to reduce the level of hardness by a factor of one hundred is performed as follows:

- Fill a 1 mL syringe with the sample.
- Place the syringe in a 50 mL beaker, making sure that the beaker is clean and empty, and inject 0.5 mL into the beaker.
- Fill the beaker up to the 50 mL mark with hardness-free water.

Now, follow normal measurement procedure. The true value of the sample is the reading obtained multiplied by a factor of one hundred (the dilution factor).

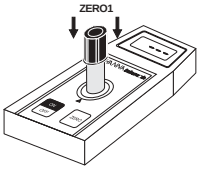
For your reference, factors to convert readings in mg/L to French degrees (FD), German degrees (DD) and English degrees (ED) of hardness are as follows:

$$1 \text{ mg/L} = 0.1 \text{ FD} = 0.056 \text{ DD} = 0.07 \text{ ED}.$$

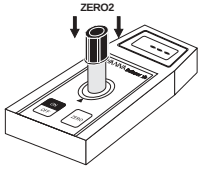
INTERFERENCES

Interference may be caused by excessive amounts of heavy metals.

- Nothing is added to the third cuvet.

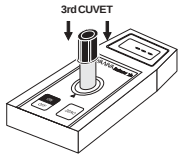


- Place the ZERO1 sample into the holder and ensure that the notch on the cap is positioned securely into the groove.
- Press ZERO; "SIP" will appear during measurement, then the instrument will display "ZER2".



- Remove the ZERO1 sample and insert the ZERO2 sample into the instrument.
- Press ZERO again; "SIP" will appear during measurement, then the instrument will display the level of Magnesium hardness in ppm $CaCO_3$ (together with "n").

- Remove the ZERO2 sample and insert the third cuvet into the instrument.

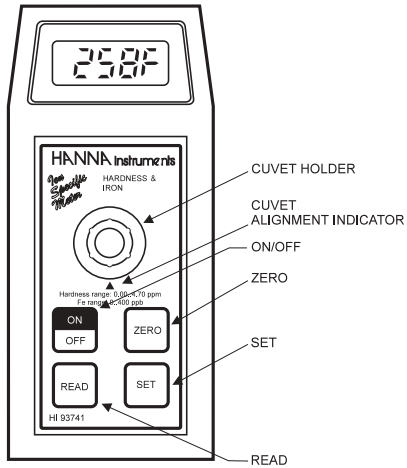


- Press READ; "SIP" will appear during measurement, then the instrument will display the concentration of Calcium in ppm $CaCO_3$ (together with "C").

- Press READ again; "SIP" will appear during measurement and the instrument will display the total hardness concentration in ppm $CaCO_3$ (together with "t").

HI 93741
Total Hardness & Iron Low Range

The HI 93741 meter measures the Iron (Fe) content and the Magnesium (Mg), Calcium (Ca) and Total Hardness in water and wastewater.



SPECIFICATIONS

Range	Fe	0 to 400 µg/L
	Mg Hardness	0.00 to 2.00 mg/L
	Ca Hardness	0.00 to 2.70 mg/L
	Total Hardness	0.00 to 4.70 mg/L
Resolution	Fe	1 µg/L
	Hardness	0.01 mg/L
Accuracy	Fe	±10 µg/L ±8% of reading
	Hardness	±0.11 mg/L ±5% of reading
Typical EMC Deviation	Fe	±1 µg/L
	Hardness	±0.02 mg/L
Light Source		Light Emitting Diode @ 555 nm
Method		For Iron, Adaptation of the TPTZ Method. The reaction between iron and the reagent causes a blue tint in the sample. For Hardness, adaptation of the *Standard Methods for the Examination of Water and Wastewater, 18th edition,* Calmagite/colorimetric method. The reaction between hardness and reagents causes a maroon tint in the sample.

REQUIRED REAGENTS

Code	Unit	Description	Quantity
HI 93746-0	Iron LR	TPTZ Reagent	2 packets
HI 93719A-0	Hardness	Ca & Mg indicator	0.5 mL
HI 93719B-0	Hardness	Alkali solution	0.5 mL
HI 93719C-0	Hardness	EDTA solution	1 drop
HI 93719D-0	Hardness	EGTA solution	1 drop

REAGENT SETS

HI 93746-01 Reagents for iron LR (100 packets)

HI 93746-03 Reagents for iron LR (300 packets)

HI 93719-01 Reagents for 100 hardness tests

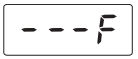
HI 93719-03 Reagents for 300 hardness tests

For other accessories see page 48.

MEASUREMENT PROCEDURE

- Turn the meter on by pressing ON/OFF. The meter will automatically default to the iron measurement mode and F will appear on the right to warn the user.

- When the LCD displays "- - -", it is ready.



- Refer to the manual pages below to measure the appropriate parameter and for the required reagents:

IRON LR MEASUREMENT

- See page 44.

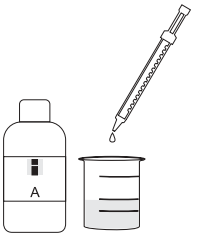
HARDNESS MEASUREMENT

- Press SET to select the hardness scale. "ZER1" will appear on the LCD; then see page 39.

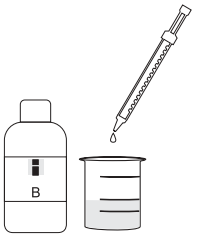
HARDNESS MEASUREMENT

- Fill a graduated beaker up to the 50 mL mark with the sample.

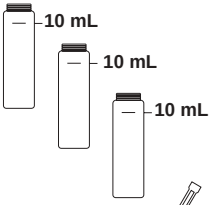
- Add 0.5 mL of HI 93719A Calcium and Magnesium indicator solution and mix.



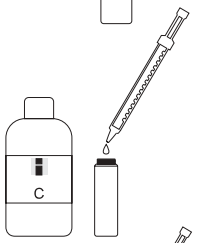
- Add 0.5 mL of HI 93719B Alkali solution for Calcium and Magnesium and mix.



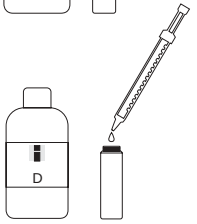
- Fill three cuvets up to the mark with 10 mL of sample each.



- Add 1 drop of HI 93719C EDTA solution to one cuvet, replace the cap and swirl the solution. This is the ZERO1 sample.



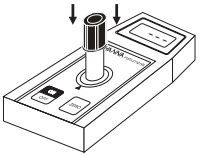
- Add 1 drop of HI 93719D EGTA solution to the second cuvet, replace the cap and swirl the solution. This is the ZERO2 sample.



CYANURIC ACID MEASUREMENT

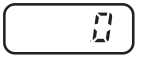
- Fill the cuvet up to the mark with 10 mL of sample and replace the cap.

- Place the cuvet into the holder and ensure that the notch on the cap is positioned securely into the groove.

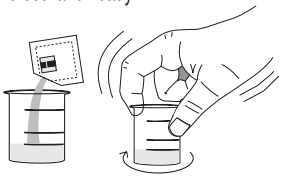


- Press ZERO and "SIP" will appear on the display.

- Wait for a few seconds and the display will show "0". Now the meter is zeroed and ready for measurement.

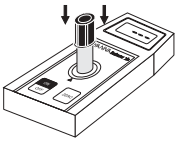


- Fill a beaker up to the 25 mL mark with the sample, add the content of one packet of HI 93722 reagent and stir gently to mix.

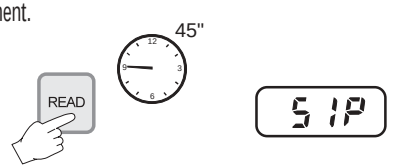


- Fill a second cuvet with 10 mL of the reacted sample up to the mark. Replace the cap.

- Reinsert the cuvet into the instrument.



- Wait for 45 seconds and press READ. "SIP" will appear during measurement.



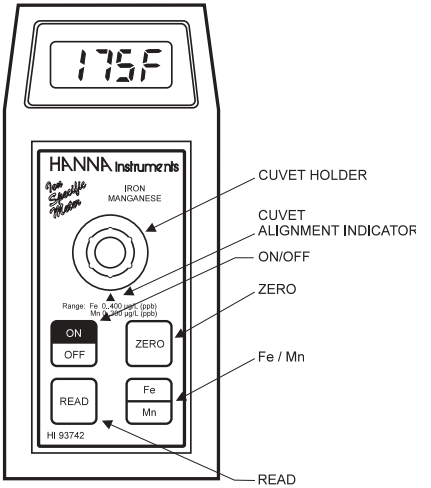
- The instrument directly displays concentration in mg/L of cyanuric acid on the Liquid Crystal Display.

HI 93742 - Iron Low Range and Manganese Low Range

The HI 93742 meter measures the iron and manganese content in water, wastewater and seawater (iron only) in the following ranges:

Iron 0 to 400 µg/L (ppb)

Manganese 0 to 300 µg/L (ppb).



SPECIFICATIONS

Range	Fe	0 to 400 µg/L
	Mn	0 to 300 µg/L
Resolution		1 µg/L
Accuracy	Fe	±10 µg/L ±8% of reading
	Mn	±2 µg/L ±3% of reading
Typical EMC Deviation		±1 µg/L
Light Source		Light Emitting Diode @ 555 nm
Method		Adaptation of the TPTZ method for iron and PAN method for manganese. The reaction between iron or manganese and the reagents respectively causes a blue or an orange tint in the sample.

REQUIRED REAGENT

Code	Description	Quantity
Iron		
HI 93746-0	TPTZ reagent	2 packets

Manganese

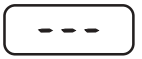
HI 93748A-0	Ascorbic acid	2 packets
HI 93748B-0	Alkaline-cyanide solution	0.40 mL
HI 93748C-0	0.1% PAN indicator	2 mL
HI 93703-51	Dispersing Agent	4-6 drops (only when necessary, see note)

REAGENT SETS

HI 93746-01 Reagents for 50 iron LR tests
HI 93746-03 Reagents for 150 iron LR tests
HI 93748-01 Reagents for 50 manganese LR tests
HI 93748-03 Reagents for 150 manganese LR tests
For other accessories see page 48.

MEASUREMENT PROCEDURE

- Turn the meter on by pressing ON/OFF.
- When the LCD displays "- - -", it is ready.

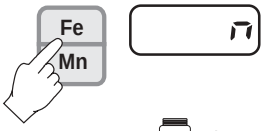


IRON MEASUREMENTS

- Select the iron parameter by pressing the Fe/Mn key until "F" appears on the display.
- Follow the procedure on page 44.

MANGANESE MEASUREMENTS

- Select the manganese parameter by pressing the Fe/Mn key until "n" appears on the display.

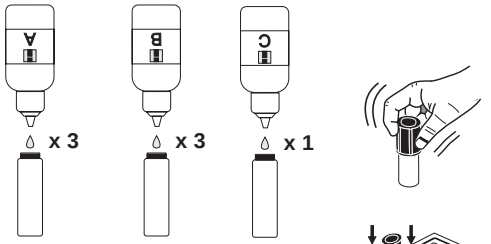


- Fill one cuvet up to the mark with 10 mL of deionized water.

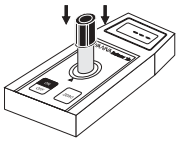
- Fill a second cuvet up to the mark with 10 mL of sample.

Liquid reagent procedure

- Add 3 drops of HI 93701A-T DPD1 indicator, 3 drops of HI 93701B-T DPD1 buffer and 1 drop of HI 93701-C to another cuvet. Shake gently before adding 10 mL of unreacted sample. Replace the cap and shake gently again.



- Reinsert the cuvet into the instrument.



- Wait for approximately 30 seconds and then press READ. The display will show "SIP" during measurement.

- The instrument directly displays concentration in mg/L of free or total chlorine on the Liquid Crystal Display.

Note: Free and total chlorine have to be measured separately with fresh unreacted samples following the above procedure if both values are requested.

INTERFERENCES

Interference may be caused by:

Bromine, Iodine, Fluorine, Ozone, Oxidized manganese and Chromium.

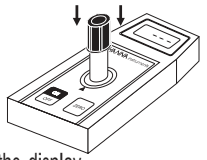
In case of water with hardness greater than 500 mg/L $CaCO_3$, shake the sample for approximately 1 minute after adding the reagent.

Alkalinity above 250 mg/L or acidity above 150 mg/L will not reliably develop the full amount of color or it may rapidly fade. To resolve this, neutralize the sample with diluted HCl or NaOH.

TOTAL CHLORINE MEASUREMENT

- Fill the cuvet up to the mark with 10 mL of unreacted sample and replace the cap.

- Place the cuvet into the holder and ensure that the notch on the cap is positioned securely into the groove.



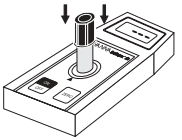
- Press ZERO and "SIP" will appear on the display.

- Wait for a few seconds and the display will show "-0.0-". Now the meter is zeroed and ready for measurement.

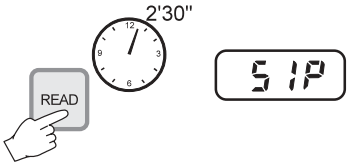
Powder reagents procedure

- Remove the cuvet and add one packet of DPD Total Chlorine reagent. Replace the cap and shake gently.

- Reinsert the cuvet into the instrument.

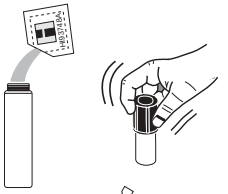


- Wait for 2 minutes and 30 seconds and then press READ. The display will show "SIP" during measurement.

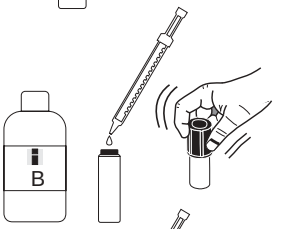


- The instrument directly displays concentration in mg/L of total chlorine on the Liquid Crystal Display.

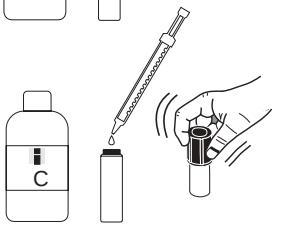
- Add the content of one packet of HI 93748A ascorbic acid to each cuvet, replace the caps and shake gently.



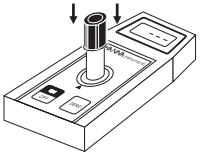
- Add 0.2 mL of the HI 93748B alkaline-cyanide reagent solution to each cuvet, replace the caps and shake gently.



- Add 1 mL of the HI 93748C 0.1% PAN indicator solution to each cuvet, replace the caps and shake gently.



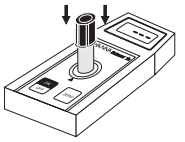
- Place the cuvet with the reacted deionized water (blank) into the holder and ensure that the notch on the cap is positioned securely into the groove.



- Wait for 2 minutes and press ZERO. "SIP" will appear during zeroing.

- Wait for a few seconds and the display will show "-0.0-". Now the meter is zeroed and ready for measurement.

- Insert the second cuvet with the reacted sample into the instrument.



- Press READ. "SIP" will appear during measurement.

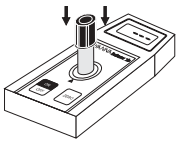
- The instrument directly displays concentration in µg/L of manganese on the display.

Note: a temperature above 30°C may cause turbidity. In this case, before zeroing and taking readings, add 2-3 drops of Dispersing Agent (HI 93703-51) to each cuvet and swirl until complete dissolution of the turbidity.

INTERFERENCES

Manganese

Interference may be caused by:
Aluminum above 20 mg/L
Cadmium above 10 mg/L
Calcium above 200 mg/L as $CaCO_3$
Cobalt above 20 mg/L
Copper above 50 mg/L
Iron above 10 mg/L
Lead above 0.5 mg/L
Magnesium above 100 mg/L as $CaCO_3$
Nickel above 40 mg/L
Zinc above 15 mg/L.



- Reinsert the cuvet into the instrument.
- Wait for approximately 30 seconds and then press READ. The display will show "SIP" during measurement.

- The instrument directly displays concentration in mg/L of free chlorine on the Liquid Crystal Display.

Note: Free and total chlorine have to be measured separately with fresh unreacted samples following the above procedure if both values are requested.

INTERFERENCES

Interference may be caused by:

Bromine

Iodine

Fluorine

Ozone

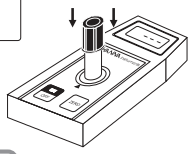
Oxidized manganese and Chromium

In case of water with hardness greater than 500 mg/L $CaCO_3$, shake the sample for approximately 1 minute after adding the reagent.

In case of water with alkalinity greater than 250 mg/L $CaCO_3$ or acidity greater than 150 mg/L $CaCO_3$, the color of the sample could disappear or develop only partially. To resolve this, neutralize the sample with diluted HCl or NaOH.

FREE CHLORINE MEASUREMENT

- Fill the cuvet up to the mark with 10 mL of unreacted sample and replace the cap.
- Place the cuvet into the holder and ensure that the notch on the cap is positioned securely into the groove.

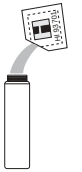


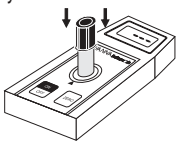
- Press ZERO and "SIP" will appear on the display.
- Wait for a few seconds and the display will show "-0.0-". Now the meter is zeroed and ready for measurement.

- Remove the cuvet.

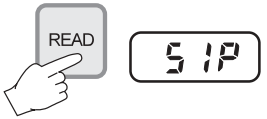
Powder reagents procedure

- Add the content of one packet of HI 93701 DPD reagent. Replace the cap and shake gently.





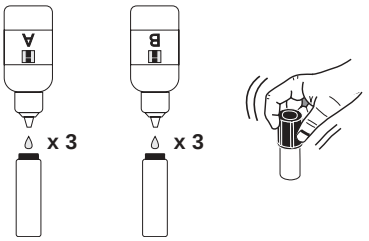
- Reinsert the cuvet into the instrument.



- Press READ and the display will show "SIP" during measurement.
- The instrument directly displays concentration in mg/L of free chlorine on the Liquid Crystal Display.

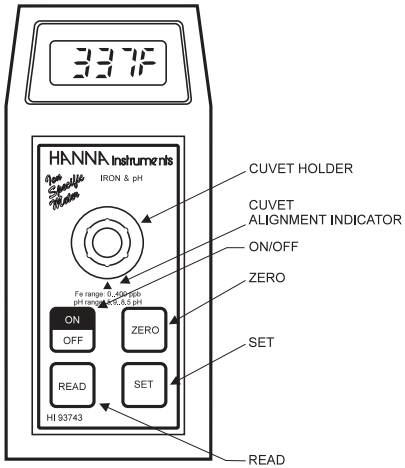
Liquid reagents procedure

- Add 3 drops of HI 93701A-F DPD1 indicator and 3 drops of HI 93701B-F DPD1 buffer to another cuvet. Shake gently before adding 10 mL of unreacted sample. Replace the cap and shake gently again.



HI 93743
Iron Low Range & pH

The HI 93743 meter measures the pH and the Iron (Fe) content in water and wastewater.



SPECIFICATIONS

Range	Fe	0 to 400 µg/L
	pH	5.9 to 8.5
Resolution	Fe	1 µg/L
	pH	0.1
Accuracy	Fe	±10 µg/L ±8% of reading
	pH	±0.1
Typical EMC Deviation	Fe	±1 µg/L
	pH	±0.1
Light Source		Light Emitting Diode @ 555 nm
Method		For Iron, Adaptation of the TPTZ Method. The reaction between iron and the reagent causes a blue tint in the sample. For pH, Phenol red method. The reaction between pH and the reagent causes a red tint in the sample.

REQUIRED REAGENTS

Code	Unit	Description	Quantity
HI 93746-0	Iron LR	TPTZ Reagent	2 packets
HI 93710-0	pH	Phenol red	5 drops

REAGENT SETS

HI 93746-01 Reagents for iron LR (100 packets)

HI 93746-03 Reagents for iron LR (300 packets)

HI 93710-01 Reagents for 100 pH tests

HI 93710-03 Reagents for 300 pH tests

For other accessories see page 48.

MEASUREMENT PROCEDURE

- Turn the meter on by pressing ON/OFF. The meter will automatically default to the pH measurement mode and pH will appear on the left to warn the user.

- When the LCD displays "- - -", it is ready.
- Refer to the manual pages below to measure the appropriate parameter and for the required reagents:

pH MEASUREMENT

- See page 46.

IRON LR MEASUREMENT

- Press SET to select the iron scale. "F" will appear on the LCD; then see page 44.

INTERFERENCES

Interference may be caused by:

Chlorine

Iodine

Ozone

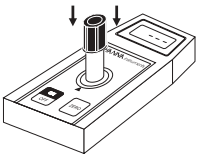
Oxidized forms of chromium and manganese

Alkalinity above 300 mg/L and acidity above 150 mg/L as $CaCO_3$ require neutralization since the color could instantly fade. To resolve this, neutralize the sample with diluted HCl or NaOH.

In case of water with hardness greater than 500 mg/L $CaCO_3$, shake the sample for approximately 1 minute after adding the reagent.

BROMINE MEASUREMENT

- Fill the cuvet up to the mark with 10 mL of unreacted sample and replace the cap.

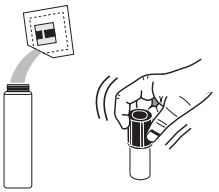


- Place the cuvet into the holder and ensure that the notch on the cap is positioned securely into the groove.

- Press ZERO and "SIP" will appear on the display.

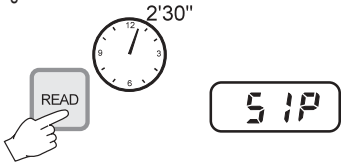
- Wait for a few seconds and the display will show "-0.0-". Now the meter is zeroed and ready for measurement.

- Remove the cuvet and add the content of one packet of HI 93716 reagent. Replace the cap and shake gently.



- Reinsert the cuvet into the instrument.

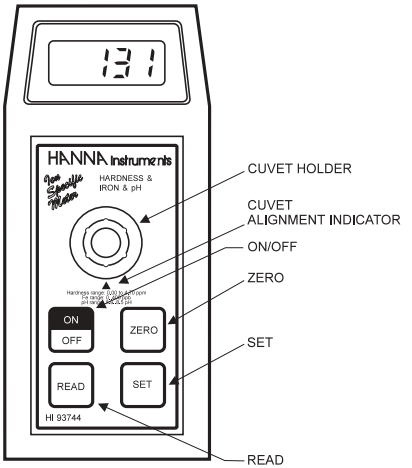
- Wait for 2 minutes and 30 seconds and press READ. "SIP" will appear during measurement.



- The instrument directly displays concentration in mg/L of bromine on the Liquid Crystal Display.

HI 93744
pH/Total Hardness/Iron Low Range

The HI 93744 meter measures the pH, the Magnesium (Mg), Calcium (Ca) and Total Hardness and the Iron (Fe) content in water and wastewater.



SPECIFICATIONS

Range	pH	5.9 to 8.5
	Fe	0 to 400 µg/L
	Mg Hardness	0.00 to 2.00 mg/L
	Ca Hardness	0.00 to 2.70 mg/L
	Total Hardness	0.00 to 4.70 mg/L
Resolution	pH	0.1
	Fe	1 µg/L
	Hardness	0.01 mg/L
Accuracy	pH	±0.1
	Fe	±10 µg/L ±8% of reading
	Hardness	±0.11 mg/L ±5% of reading
Typical EMC Deviation	pH	±0.2
	Fe	±1 µg/L
	Hardness	±0.02 mg/L
Light Source		Light Emitting Diode @ 555 nm
Method		For pH, Phenol red method. The reaction between pH and the reagent causes a red tint in the sample. For Iron, Adaptation of the TPTZ Method. The reaction between iron and the reagent causes a blue tint in the sample. For Hardness, adaptation of the *Standard Meth-*

ods for the Examination of Water and Wastewater, 18th edition, Calmagite/colorimetric method. The reaction between hardness and reagents causes a maroon tint in the sample.

REQUIRED REAGENTS

Code	Unit	Description	Quantity
HI 93710-0	pH	Phenol red	5 drops
HI 93746-0	Iron LR	TPTZ Reagent	2 packets
HI 93719A-0	Hardness	Ca & Mg indicator	0.5 mL
HI 93719B-0	Hardness	Alkali solution	0.5 mL
HI 93719C-0	Hardness	EDTA solution	1 drop
HI 93719D-0	Hardness	EGTA solution	1 drop

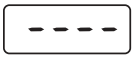
REAGENT SETS

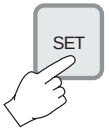
HI 93710-01 Reagents for 100 pH tests
HI 93710-03 Reagents for 300 pH tests
HI 93746-01 Reagents for iron LR (100 packets)
HI 93746-03 Reagents for iron LR (300 packets)
HI 93719-01 Reagents for 100 hardness tests
HI 93719-03 Reagents for 300 hardness tests

For other accessories see page 48.

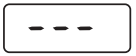
MEASUREMENT PROCEDURES

- Turn the meter on by pressing ON/OFF.
- When the LCD displays "- - - -" keep SET pressed until the desired parameter is displayed.





- Release the key and when the LCD displays "- - -", it is ready.



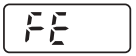
- Refer to the manual pages below to measure the appropriate parameter and for the required reagents:

pH MEASUREMENT

- "PH" will appear on the LCD; then see page 46.

LOW RANGE IRON MEASUREMENT

- "FE" will appear on the LCD; then see page 44.



HARDNESS MEASUREMENT

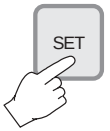
- "Hrd" will appear on the LCD; then see page 39.

- At this point, follow the chlorine procedure on page 36.

Note: Free and total chlorine have to be measured separately with fresh unreacted samples following the above procedure if both values are requested.

CYANURIC ACID MEASUREMENTS

- Press SET to select the cyanuric acid scale. "A" will appear on the LCD.



- At this point, follow the procedure on page 38.

HI 93711-0	Total Cl_2	DPD	1 packet
HI 93722-0	Cyanuric Acid	Powder Reagent	1 packet

Liquid version (chlorine):

HI 93701A-F	Free Chlorine	DPD1 indicator	3 drops
HI 93701B-F	Free Chlorine	DPD1 buffer	3 drops
HI 93701A-T	Total Chlorine	DPD1 indicator	3 drops
HI 93701B-T	Total Chlorine	DPD1 buffer	3 drops
HI 93701C-T	Total Chlorine	DPD3 solution	1 drop

REAGENT SETS

HI 93701-01 Reagents for 100 free chlorine tests

HI 93701-03 Reagents for 300 free chlorine tests

HI 93701-F Reagents for 300 free chlorine tests (liquid version)

HI 93701-T Reagents for 300 total chlorine tests (liquid version)

HI 93710-01 Reagents for 100 pH tests

HI 93710-03 Reagents for 300 pH tests

HI 93711-01 Reagents for 100 total chlorine tests

HI 93711-03 Reagents for 300 total chlorine tests

HI 93722-01 Reagents for 100 cyanuric acid tests

HI 93722-03 Reagents for 300 cyanuric acid tests

For other accessories see page 48.

MEASUREMENT PROCEDURE

- Turn the meter on by pressing ON/OFF.

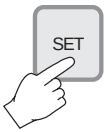
- The meter will automatically default to pH measurement mode.
- When the LCD displays "- - -", it is ready.

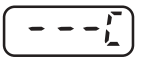
pH MEASUREMENTS

In order to perform pH measurements, follow the procedure on page 46.

CHLORINE MEASUREMENTS

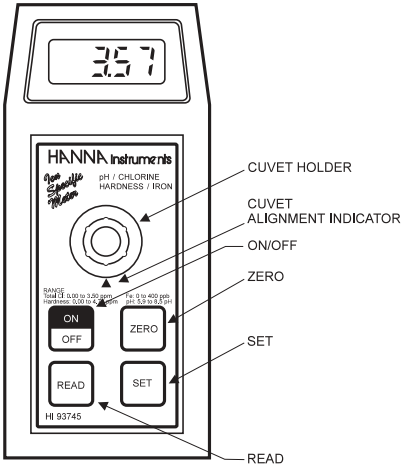
- Press SET once to select the chlorine scale. "C" will appear on the LCD.





HI 93745
pH/Free & Total Chlorine Total Hardness/Iron Low Range

The HI 93745 meter measures the pH, the Magnesium (Mg), Calcium (Ca) and Total Hardness, the Free and Total Chlorine (Cl_2) and Iron (Fe) contents in water and wastewater.



SPECIFICATIONS

Range	pH	5.9 to 8.5
	Free Cl_2	0.00 to 2.50 mg/L
	Total Cl_2	0.00 to 3.50 mg/L
	Fe	0 to 400 µg/L
	Mg Hardness	0.00 to 2.00 mg/L
	Ca Hardness	0.00 to 2.70 mg/L
	Total Hardness	0.00 to 4.70 mg/L
Resolution	pH	0.1
	Cl_2	0.01 mg/L
	Fe	1 µg/L
	Hardness	0.01 mg/L
Accuracy	pH	±0.1
	Cl_2	±0.03 mg/L ±3% of reading
	Fe	±10 µg/L ±8% of reading
	Hardness	±0.11 mg/L ±5% of reading
Typical EMC Deviation	pH	±0.1
	Cl_2	±0.01 mg/L
	Fe	±1 µg/L
	Hardness	±0.02 mg/L

Light Source	Light Emitting Diode @ 555 nm
Method	For pH, Phenol red method. The reaction between pH and the reagent causes a red tint in the sample. For Chlorine, adaptation of the EPA recommended DPD method 330.5. The reaction between chlorine and the reagent causes a pink tint in the sample. For Iron, Adaptation of the TPTZ Method. The reaction between iron and the reagent causes a blue tint in the sample. For Hardness, adaptation of the *Standard Methods for the Examination of Water and Wastewater, 18th edition,* Calmagite/colorimetric method. The reaction between hardness and reagents causes a maroon tint in the sample.

REQUIRED REAGENTS

Code	Unit	Description	Quantity
HI 93710-0	pH	Phenol red	5 drops
HI 93701-0	Free Cl_2	DPD	1 packet
HI 93711-0	Total Cl_2	DPD	1 packet
HI 93746-0	Iron LR	TPTZ Reagent	2 packets
HI 93719A-0	Hardness	Ca & Mg indicator	0.5 mL
HI 93719B-0	Hardness	Alkali solution	0.5 mL
HI 93719C-0	Hardness	EDTA solution	1 drop
HI 93719D-0	Hardness	EGTA solution	1 drop

Liquid version (chlorine):

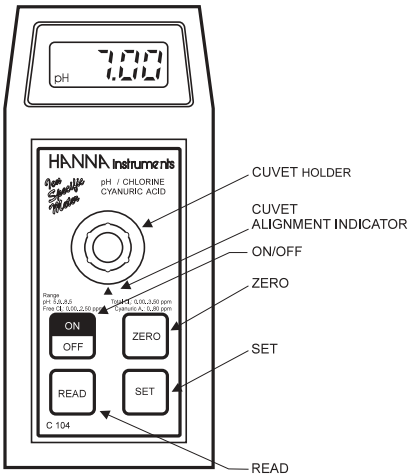
HI 93701A-F	Free Cl_2	DPD1 indicator	3 drops
HI 93701B-F	Free Cl_2	DPD1 buffer	3 drops
HI 93701A-T	Total Cl_2	DPD1 indicator	3 drops
HI 93701B-T	Total Cl_2	DPD1 buffer	3 drops
HI 93701C-T	Total Cl_2	DPD3 solution	1 drop

REAGENT SETS

HI 93710-01 Reagents for 100 pH tests
HI 93710-03 Reagents for 300 pH tests
HI 93701-01 Reagents for 100 free chlorine tests
HI 93701-03 Reagents for 300 free chlorine tests
HI 93711-01 Reagents for 100 total chlorine tests
HI 93711-03 Reagents for 300 total chlorine tests
HI 93701-F Reagents for 300 free chlorine tests (liquid version)

C 104 - PH, CL_2 AND CYANURIC ACID

The C 104 meter measures pH, chlorine (Cl_2, free and total) and cyanuric acid content in water and wastewater.



SPECIFICATIONS

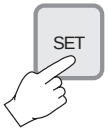
Range	pH	5.9 to 8.5
	Free Cl_2	0.00 to 2.50 mg/L
	Total Cl_2	0.00 to 3.50 mg/L
	Cyanuric Acid	0 to 80 mg/L
Resolution	pH	0.1
	Cl_2	0.01 mg/L
	Cyanuric Acid	1 mg/L
Accuracy	pH	±0.1
	Cl_2	±0.03 mg/L ±3% of reading
	Cyanuric Acid	±1 mg/L ±15% of reading
Typical EMC Deviation	pH	±0.1
	Cl_2	±0.01 mg/L
	Cyanuric Acid	±1 mg/L
Light Source		Light Emitting Diode @ 555 nm
Method		For chlorine, adaptation of the EPA recommended DPD method 330.5. For pH, Phenol red method. For cyanuric acid, adaptation of the turbidimetric method.

REQUIRED REAGENTS

Code	Unit	Description	Quantity
HI 93710-0	pH	Phenol red	5 drops
HI 93701-0	Free Cl_2	DPD	1 packet

MEASUREMENT PROCEDURES

- Turn the meter on by pressing ON/OFF.
- When the LCD displays "C101" keep SET pressed until the desired parameter is displayed.



- Release the key and when the LCD displays "- - -", it is ready.

- Refer to the manual pages below to measure the appropriate parameter and for the required reagents:

FREE CHLORINE MEASUREMENT

- "Cl F" will appear on the LCD; then see page 34.

TOTAL CHLORINE MEASUREMENT

- "Cl t" will appear on the LCD; then see page 36.

pH MEASUREMENT

- "PH" will appear on the LCD; then see page 46.

IODINE MEASUREMENT

- "Id" will appear on the LCD; then see page 42.

BROMINE MEASUREMENT

- "br" will appear on the LCD; then see page 32.

CYANURIC ACID MEASUREMENT

- "CYS" will appear on the LCD; then see page 38.

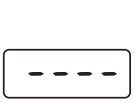
LOW RANGE IRON MEASUREMENT

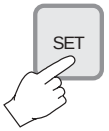
- "FE" will appear on the LCD; then see page 44.

HI 93701-T Reagents for 300 total chlorine tests (liquid version)
HI 93719-01 Reagents for 100 hardness tests
HI 93719-03 Reagents for 300 hardness tests
HI 93746-01 Reagents for iron LR (100 packets)
HI 93746-03 Reagents for iron LR (300 packets)
For other accessories see page 48.

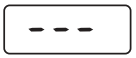
MEASUREMENT PROCEDURES

- Turn the meter on by pressing ON/OFF.
- When the LCD displays "- - - -" keep SET pressed until the desired parameter is displayed.
- Release the key and when the LCD displays "- - -", it is ready.





- Refer to the manual pages below to measure the appropriate parameter and for the required reagents:



FREE CHLORINE MEASUREMENT

- "Cl F" will appear on the LCD; then see page 34.

TOTAL CHLORINE MEASUREMENT

- "Cl t" will appear on the LCD; then see page 36.

pH MEASUREMENT

- "PH" will appear on the LCD; then see page 46.

LOW RANGE IRON MEASUREMENT

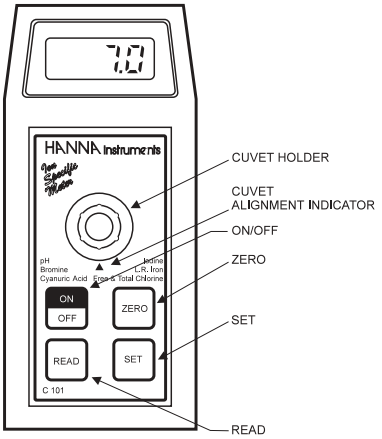
- "FE" will appear on the LCD; then see page 44.

HARDNESS MEASUREMENT

- "Hrd" will appear on the LCD; then see page 39.

C 101 - PH, CL_2, CYS, I, BR, FE

The C 101 meter measures free & total chlorine, cyanuric acid, pH, iodine, bromine and low range iron in water and wastewater.



SPECIFICATIONS

Range	pH	5.9 to 8.5
	Free Cl_2	0.00 to 2.50 mg/L
	Total Cl_2	0.00 to 3.50 mg/L
	Cyanuric Acid	0 to 80 mg/L
	Iodine	0.0 to 12.5 mg/L
	Bromine	0.00 to 8.00 mg/L
	Low Range Iron	0 to 400 µg/L (ppb)
Resolution	pH	0.1
	Free Cl_2	0.01 mg/L
	Total Cl_2	0.01 mg/L
	Cyanuric Acid	1 mg/L
	Iodine	0.1 mg/L
	Bromine	0.01 mg/L
	Low Range Iron	1 µg/L
Accuracy	pH	±0.1
	Free Cl_2	±0.03 mg/L ±3% of reading
	Total Cl_2	±0.03 mg/L ±3% of reading
	Cyanuric Acid	±1 mg/L ±15% of reading
	Iodine	±0.1 mg/L ±5% of reading
	Bromine	±0.08 mg/L ±3% of reading
	Low Range Iron	±10 µg/L ±8% of reading
Typical EMC	pH	±0.1
Deviation	Free Cl_2	±0.01 mg/L
	Total Cl_2	±0.01 mg/L
	Cyanuric Acid	±1 mg/L
	Iodine	±0.1 mg/L
	Bromine	±0.01 mg/L
	Low Range Iron	±1 µg/L
Light Source		Light Emitting Diode @ 555 nm
Method		For Chlorine, Iodine and Bromine, adaptation of the EPA recommended DPD method 330.5. For pH, Phenol red method. For Cyanuric Acid, adaptation of the turbidimetric method. For Iron, adaptation of the TPTZ method.

REQUIRED REAGENTS

Code	Unit	Description	Quantity
HI 93710-0	pH	Phenol red	5 drops
HI 93701-0	Free Cl_2	DPD Reagent	1 packet
HI 93716-0	Bromine	DPD Reagent	1 packet
HI 93718-0	Iodine	DPD Reagent	1 packet
HI 93722-0	Cyanuric Acid	Powder Reagent	1 packet
HI 93746-0	Iron LR	TPTZ Reagent	2 packets
Liquid version (Chlorine):			
HI 93701A-F	Free Cl_2	DPD1 indicator	3 drops
HI 93701B-F	Free Cl_2	DPD1 buffer	3 drops
HI 93701A-T	Total Cl_2	DPD1 indicator	3 drops
HI 93701B-T	Total Cl_2	DPD1 buffer	3 drops
HI 93701C-T	Total Cl_2	DPD3 solution	1 drop

REAGENT SET

HI 93701-01 Reagents for 100 free chlorine tests
HI 93701-03 Reagents for 300 free chlorine tests
HI 93701-F Reagents for 300 free Cl_2 tests (liquid version)
HI 93701-T Reagents for 300 total Cl_2 tests (liquid version)
HI 93710-01 Reagents for 100 pH tests
HI 93710-03 Reagents for 300 pH tests
HI 93711-01 Reagents for 100 total chlorine tests
HI 93711-03 Reagents for 300 total chlorine tests
HI 93716-01 Reagent for 100 bromine tests
HI 93716-03 Reagent for 300 bromine tests
HI 93718-01 Reagent for 100 iodine tests
HI 93718-03 Reagent for 300 iodine tests
HI 93722-01 Reagents for 100 cyanuric acid tests
HI 93722-03 Reagents for 300 cyanuric acid tests
HI 93746-01 Reagents for Iron LR (100 packets)
HI 93746-03 Reagents for Iron LR (300 packets)

For other accessories see page 48.