INSTRUCTION MANUAL

HI802

iris Visible Spectrophotometer

with Barcode Identification

Hanna Instruments Inc., 584 Park East Drive, Woonsocket, RI 02895 USA
www.hannainst.com

Dear Customer,

Thank you for choosing a Hanna Instruments® product.

Please read this instruction manual carefully before using this instrument as it provides the necessary information for correct use of this instrument and a precise idea of its versatility.

If you need additional technical information, do not hesitate to e-mail us at tech@hannainst.com.
Visit www.hannainst.com for more information about Hanna Instruments and our products.

INTRODUCTION

The HI802 iris® visible spectrophotometer is a compact and versatile instrument with a split beam optical system. It features a visible wavelength range from 340 to 900 nm.
The meter features an internal reference system that reduces errors caused by lamp intensity and temperature fluctuations.
The optical system has been designed to minimize stray light, improving linearity and accuracy.

The spectrophotometer is supplied with 103 factory methods. These methods are pre-programmed with all of the information necessary to complete an analysis, including the wavelength, vial type, calibration curve and timers. Up to 100 user methods can be created.
Both factory and user methods are easily accessible from the main screen using the favorite methods option.

Users can select up to 5 wavelengths and timers, cuvette type and enter their own calibration curves (concentration only). Calibration curves can contain up to 10 points, with a linear regression curve fit to the data. The slope, offset and R-squared (R^2) are visible for the calibration curve.

- Supplied with 103 factory methods
- Create up to 100 user methods
- Automatic method identification of vial samples
- Vial barcode reader
- Shared single-zero measurement across multiple vial methods
- 5 cuvette types (16 mm round, 22 mm round, 13 mm vial, 10 mm square, 50 mm rectangular) with automatic detection
- Data storage for 9999 measurements with ability to auto log results
- Simplified data transfer to a PC or Mac
- Field upgradeable firmware
- Rechargeable battery

This manual provides information regarding installation and functionality of the spectrophotometer and refined operation suggestions. Before using the spectrophotometer, it is recommended users become familiar with its various features and functionality.

PART I. INSTRUCTION MANUAL

Provides a comprehensive description of the operating principles, user interface, and general options.

PART II. FACTORY METHODS

Contains complete instructions for commonly-used analyses.
Additional methods and method packs are available, contact your local Hanna Instruments office for more details.

TABLE OF CONTENTS

PART I. INSTRUCTION MANUAL

PART II. FACTORY METHODS

PART I. INSTRUCTION MANUAL

1. PRELIMINARY EXAMINATION

Remove the instrument and accessories from the packaging and examine it carefully. For further assistance, please contact your local Hanna Instruments® office or email us at tech@hannainst.com.
Each HI802 iris® spectrophotometer is supplied with:

- Sample cuvette and cap, 22 mm (4 pcs.)
- Cuvette adapter (2 pcs.)
- Vial adapter with barcode reading feature
- Cloth for wiping cuvettes
- Scissors
- USB cable
- 15 VDC power adapter
- USB flash drive
- Instrument quality certificate
- Instruction manual

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

2. SAFETY MEASURES

- The chemicals contained in the reagent kits may be hazardous if improperly handled.
- Read the Safety Data Sheet before performing tests.

Safety equipment

Wear suitable eye protection and clothing when required and follow instructions carefully.

Reagent spills

If a reagent spill occurs, wipe up immediately and rinse with plenty of water. If reagent contacts skin, rinse the affected area thoroughly with water. Avoid breathing released vapors.

Waste disposal

For proper disposal of reagent kits and reacted samples, contact a licensed waste disposal provider.

To prevent injury, death or damage to the instrument:

- Use only the power supply, battery and accessories specified in the manual.
- Do not open, disassemble or modify the battery pack or instrument.
- Do not expose the battery or instrument to excess heat.
- Before storing the instrument for an extended period of time, remove the battery pack and disconnect the power plug.
- Do not use or store the battery or instrument in dusty or humid places.
- Do not shake, drop or subject the instrument to physical shock.
- Do not leave the instrument near objects with strong magnetic fields.

To prevent fire or electrical shock:

- Ensure the power adapter is completely plugged in.
- Never handle the power adapter or battery with wet hands.
- Do not leave the battery or meter near a heat source.
- Do not insert any foreign objects in the power adapter connector or battery compartment.
- Do not recharge battery outside ambient temperature conditions (0 to 45 °C).

***Note**: If the meter experiences a sudden temperature change, allow it to equilibrate before turning on. Condensation may have formed on the instrument and on the internal parts.*

3. SPECIFICATIONS

Wavelength range	340 to 900 nm
Wavelength resolution	1 nm
Wavelength accuracy	±1.5 nm
Photometric range	0.000 to 3.000 Abs
Photometric accuracy	5 mAbs at 0.000 to 0.500 Abs 1 % at 0.500 to 3.000 Abs
Measurement mode	Transmittance (%) Absorbance Concentration
Sample cell	10 mm square 50 mm rectangular 16 mm round 22 mm round 13 mm round (vial) with barcode
Wavelength selection	Automatic, based on the selected method (editable for user methods only)
Light source	Tungsten halogen lamp
Optical system	Split beam
Wavelength calibration	Internal, automatic at power-on (with visual feedback)
Stray light	<0.1 % T at 340 nm with $NaNO_2$
Spectral bandwidth	5 nm
Number of methods	up to 150 factory (103 pre-loaded) up to 100 user
Data points stored	9999 measured values
Export capability	csv file format pdf file format
Connectivity	1x USB A (mass storage host) 1x USB B (mass storage device)
Battery life	3000 measurements or 8 hours*
Power supply	15 VDC power adapter 10.8 VDC Li-Ion rechargeable battery
Environment	0 to 50 °C (32 to 122 °F) 0 to 95% RH non-condensing
Dimensions	155 x 205 x 322 mm (6.1 x 8.0 x 12.6")
Weight	3.4 kg (7.5 lbs.)

*excluding vial rotation

4. ABBREVIATIONS

Abs	Absorbance
ADMI	American Dye Manufacturer's Institute
ASTM	American Society for Testing Materials
COD	Chemical Oxygen Demand
DPD	N,N-diethyl-p-phenylenediamine
dkH	degrees of carbonate hardness
°dH	German degree (Hardness)
°e	English degree (Hardness)
°f	French degree (Hardness)
%T	Percent Transmittance
g/L	grams per liter (ppt)
meq/kg	milliequivalents per kilogram
meq/L	milliequivalents per liter
µg/L	micrograms per liter (ppb)
mg/L	milligrams per liter (ppm)
mL	milliliter
EDTA	Ethylene Diamine Triacetic Acid
EPA	US Environmental Protection Agency
HDPE	High-Density Polyethylene
ISO	International Organization for Standardization
TBPE	Tetrabromophenolphthalein Ethyl Ester
PCU	Platinum Cobalt Unit
pH	Negative log of the hydrogen ion activity
ppb	parts per billion (µg/L)
ppm	parts per million (mg/L)
ppt	parts per thousand (g/L)
ULR	Ultra Low Range
LR	Low Range
MR	Medium Range
HR	High Range
UHR	Ultra High Range

5. DESCRIPTION

5.1. PRINCIPLE OF OPERATION

Absorption of light is a typical phenomenon of interaction between electromagnetic radiation and matter.
A spectrophotometer separates electromagnetic radiation (white light) into its component wavelengths and selectively measures the intensity of the radiation after it passes through a sample.
The white light is passed through a prism to disperse the light into bands of color. These bands of color make up the visible light spectrum and correlate to the wavelength.

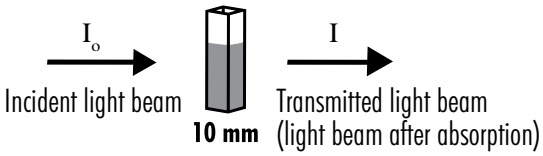
Wavelength (nm)	Absorbed color	Transmitted color
400	violet	yellow-green
435	blue	yellow
495	green	purple
560	yellow	blue
650	orange	greenish blue
800	red	bluish green

When a light beam crosses a substance, some of the radiation may be absorbed by atoms, molecules or crystal lattices.

If pure absorption occurs, the fraction of light absorbed depends both on the optical path length through the matter and on the physical-chemical characteristics of the substance according to the Beer-Lambert Law:

$$T = I/I_o$$
$$-\log I/I_o = \varepsilon_\lambda \, c \, d$$
or
$$A = \varepsilon_\lambda \, c \, d$$

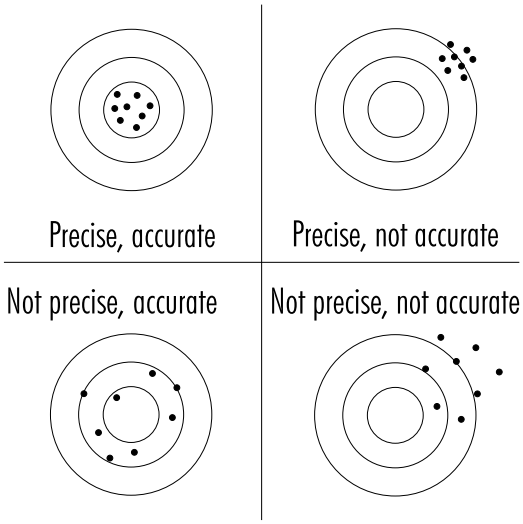
T = transmittance
A = absorbance
I_o = intensity of incident light beam
I = intensity of light beam after absorption
ε_λ = molar extinction coefficient at wavelength λ
c = molar concentration of the substance
d = optical path through the substance



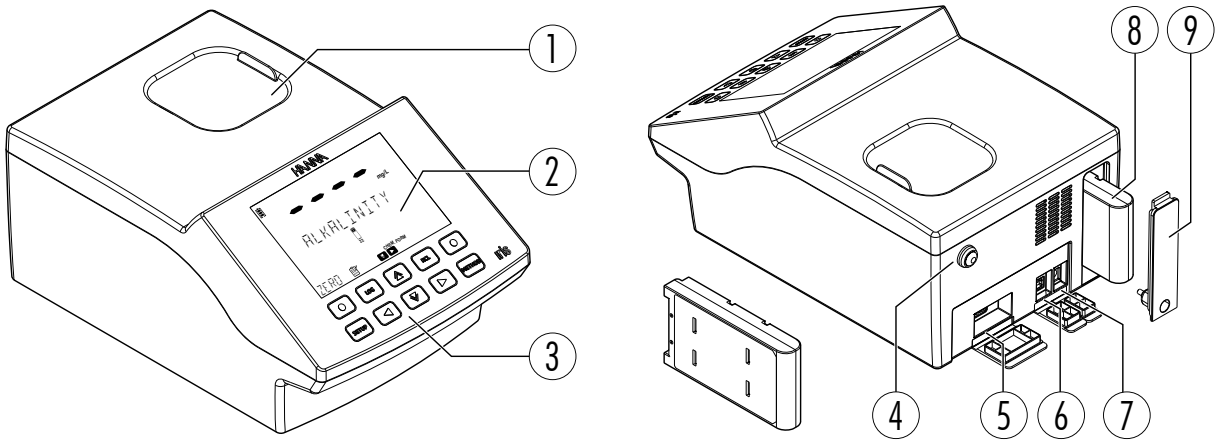
The concentration "c" can be calculated from the absorbance of the substance as the other factors are constant.
Photometric chemical analysis is based on specific chemical reactions between a sample and reagent to produce a light-absorbing compound.

5.2. PRECISION & ACCURACY

Precision is how closely repeated measurements are to one another. Precision is usually expressed as standard deviation. Accuracy is defined as the closeness of a test result to the true value. Although good precision suggests good accuracy, precise results can be inaccurate.
For each method, the accuracy is expressed in the related measurement section. The figure explains these definitions.

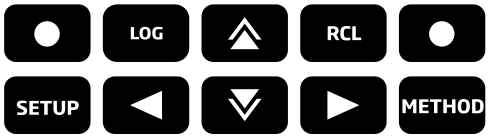


5.3. FUNCTIONAL DESCRIPTION & LCD DISPLAY



1 Sample compartment
2 Liquid Cristal Display (LCD)
3 Keypad
4 ON/OFF button
5 USB socket (flash drive)
6 USB socket (PC)
7 Power socket
8 Battery
9 Battery cover

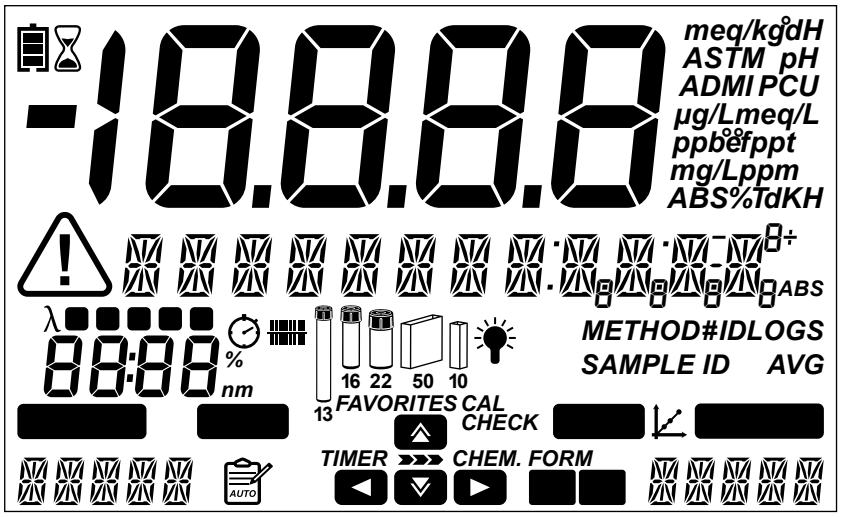
5.3.1. KEYPAD DESCRIPTION



The keypad contains 8 direct keys and 2 functional keys with the following functions:

- Press the functional key to perform the function displayed above it on the LCD
- METHOD — Press to access the METHOD menu
- Press to move up in a menu, to increment a value or to access the FAVORITE METHODS from the MAIN SCREEN
- Press to go back to a previous menu level, to scroll through letter places in the method creation process or to access the TIMER MENU on the MAIN SCREEN
- Press to move down in a menu or to decrement a set value
- Press to advance in the menu, to scroll through letter places in the method creation setup or to access the CHEMICAL FORMULAS for factory methods on the MAIN SCREEN
- SETUP — Press to access the SETUP menu
- LOG — Press to save the current measurement
- RCL — Press to recall logged measurements

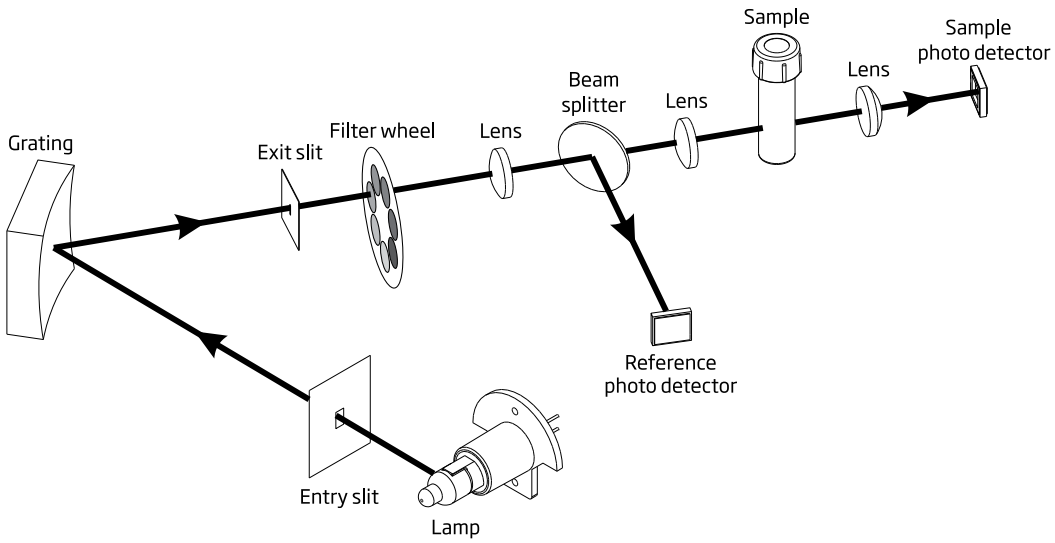
5.3.2. LCD DESCRIPTION



Tag	Description
	Battery status indicator
	Stability indicator
	Warning indicator
	Timer indicator
	Barcode indicator
λ	Wavelength indicator
1 2 3 4 5	Wavelength or timer tags
13 16 22 50 10	Vial type indicator for the selected method*
	Lamp status
SETUP LOG RCL METHOD	Indicates the active menu
➤➤➤	Navigation level in menus
	Indicates arrow key is active
	Calibration indicator
AUTO	Auto log enabled
USB PC USB HOST	PC / Flash drive connection established

**Note*: *For factory methods the indicated vial must be used to obtain valid measurements.*

5.4. OPTICAL SYSTEM



Optical System Block Diagram

A tungsten halogen lamp is used as the light source for the entire working range of the meter (340 nm to 900 nm). The tungsten halogen lamp produces a white light that is passed through a diffraction grating.

The diffraction grating splits the polychromatic white light into the visible color spectrum, allowing for specific wavelengths to be selected.

The light is then passed through an optical filter to reduce stray light and improve measurement accuracy.

The internal reference system uses a reference photo detector to compensate for drifts due to lamp intensity, ambient temperature and environmental changes, providing a stable source of light.

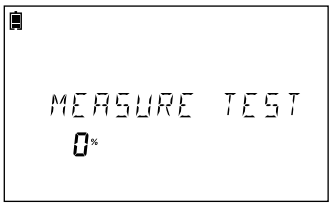
Focusing lenses are used throughout the optical system to ensure all of the light is being collected. This allows a brighter, stronger signal to be received.

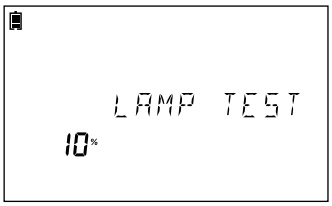
After the light exits the cuvette, a final focusing lens is used. This reduces error from cuvette imperfection and scratches, eliminating the need to index the cuvette.

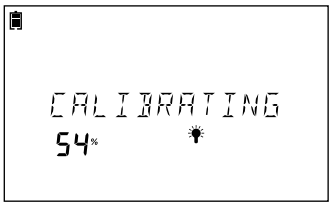
6. OPERATING MODE

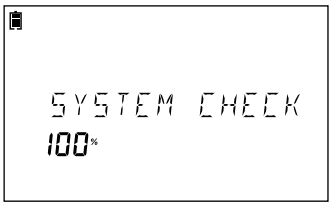
6.1. START UP

When the instrument is powered on, all the LCD tags will be visible for several seconds before the auto-diagnostic tests run.
This process will take several seconds, during this time the progress will be displayed on the screen. Once these tests are completed the main screen will be displayed.
These tests ensure that the meter is working properly. If any errors occur a warning message will be displayed.

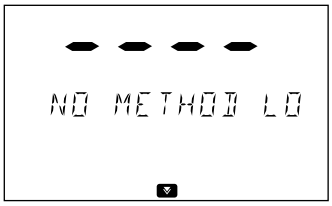








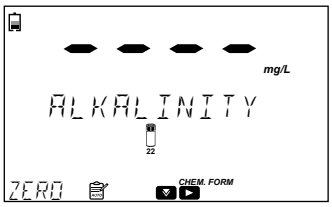
If there are no methods installed, “No Method Loaded” message is displayed.



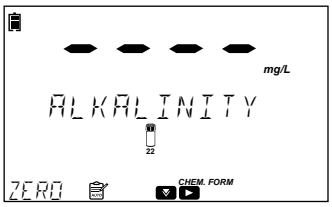
6.2. POWER CONNECTION & BATTERY MANAGEMENT

The meter can be powered from an AC/DC power adapter or from the rechargeable battery.
To conserve power, the auto off option can be enabled in the setup menu, see Setup section for more information. If this option is enabled, the instrument will automatically turn off after a defined period of time if no interaction has occurred.
The battery icon located on the top left corner indicates battery and charging status.

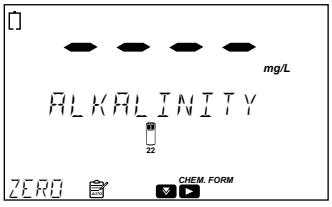
- Battery is charging from external adapter



- Battery fully charged (connected to power adapter)



- Battery near 0% (no external power adapter)

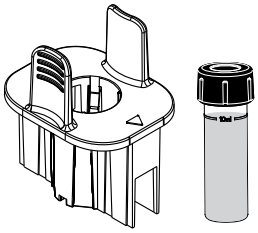


6.3. CUVETTE & VIAL ADAPTERS

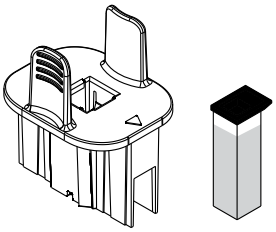
The meter is supplied with two cuvette adapters and one vial adapter:

***Note**: HI802 accepts supplied 13 mm vial adapter only.*

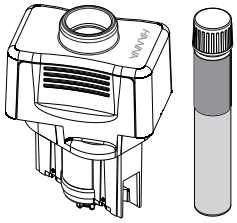
***Warning**: Do not attempt to insert HI801 vial adapter as it risks damaging the meter holder.*



for 16 mm cuvette



for 10 mm square cuvette

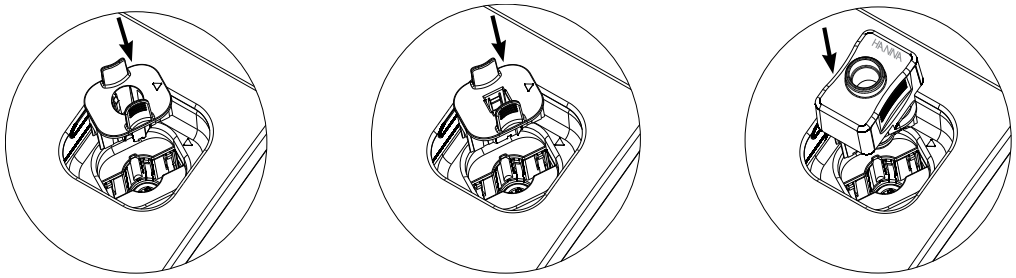


for 13 mm barcoded vials

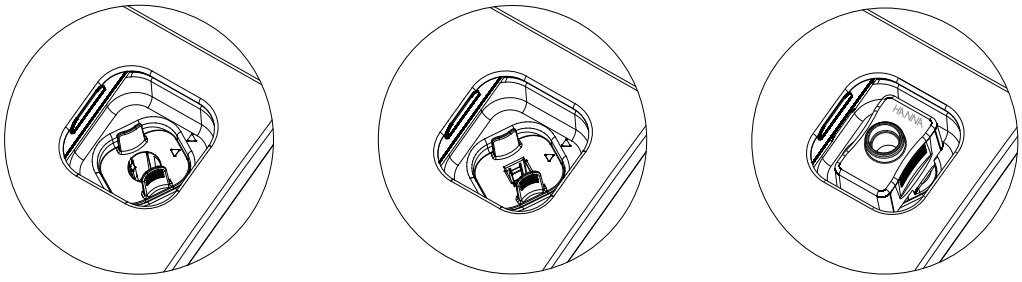
***Note**: The 22 mm round and 50 mm rectangular cuvettes do not require adapters. The cuvettes can be directly inserted into the meter.*

To insert the adapter:

1. Open the meter's lid.
2. Select the adapter according to the cuvette type required for the selected method.
3. Orient the adapter so that the indexing mark (*HANNA* logo, when using 13 mm barcoded vial) is aligned with the indexing mark located inside the meter.



4. Using light pressure, push the adapter down until it reaches the bottom of the meter's holder.



The meter is ready for use.

Always utilize the selected adapter for both "Zero" and "Read" measurements as specified in the method instructions.

***Note**: The meter's lid can't be closed while using the 13 mm vial adapter. This is normal, the vial adapter itself will block out all external light.*

***Warning**: Improper use of the vial adapters could cause irreversible damage to the meter. Always use the following precautions:*

- *Never use excessive force to insert the adapter.*
- *If the vial is not reaching the bottom, if there is large resistance or if a "light low" error message is displayed during the "Zero" operation, re-check that the indexing marks (HANNA logo) are aligned on the adapter and meter.*
- *Never insert hot vials or samples into the vial adapter. Samples should be near room temperature before inserting into the meter or adapter.*

6.4. METHODS

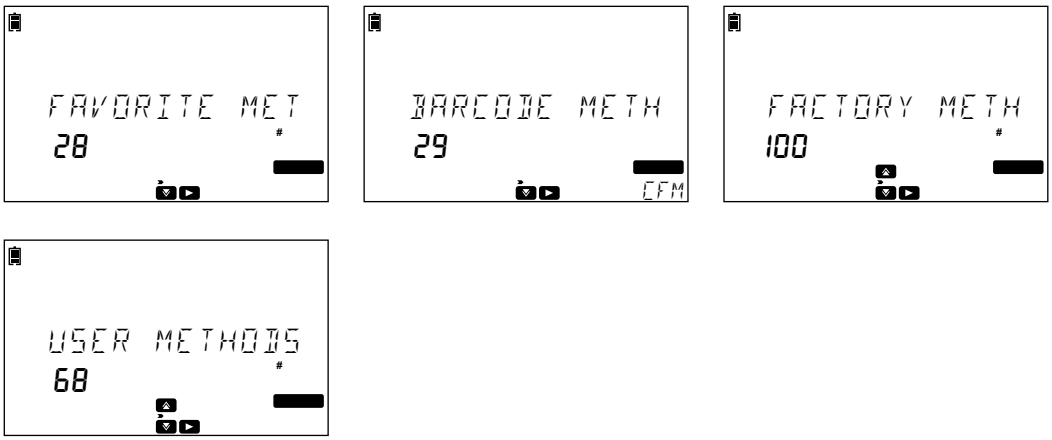
Option: Favorite methods (if enabled), Barcode methods, Factory methods, User methods, Create new

In order to run an analysis, a method needs to be loaded.

Press the ▲ or ▼ key to scroll through the available options.

The number of methods will be displayed on the lower left side of the screen.

Press the **METHOD** key to return to the main screen.



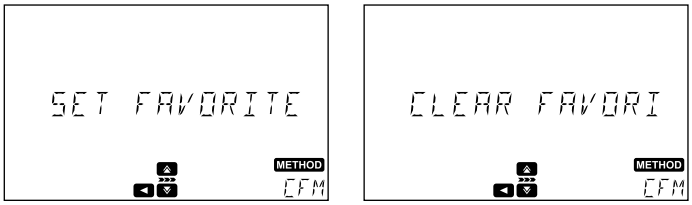
6.4.1. FAVORITE METHODS

This option is only available when at least 1 favorite method has been defined.

Frequently used methods can be tagged as favorite methods. Favorite methods can be both factory and user methods.

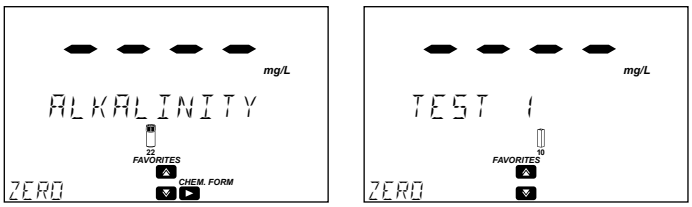
Up to 30 methods can be tagged as favorites.

To add a method to the favorites list press **CFM** when "Set Favorite" is displayed. If the method is already tagged as a favorite, "Clear Favorite" is displayed.



Once a method has been tagged as a favorite it will appear in the Favorite Method list for easy access when the **METHOD** key is pressed.

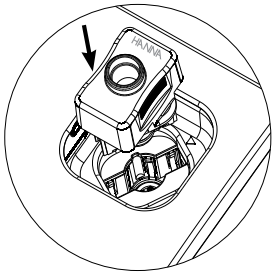
Favorite Methods can also be easily accessed from the main screen by pressing the ▲ key.



6.4.2. BARCODE METHODS

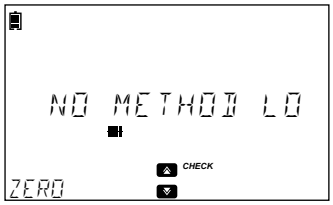
iris® spectrophotometer supports Barcode Methods option that permits quick access to 13 mm vial methods. The vials for different methods can be distinguished by a barcode printed on the vial (and cap color). The barcode has four digits: the first two digits for parameter identification and the second two digits for reagent lot ID. Reagent barcode is read quickly and accurately, and correct test method and parameter range are automatically identified reducing the risk of errors and aiding measurement procedure.

- Using light pressure, push supplied barcode reader vial adapter down until it reaches the bottom of the meter's holder.

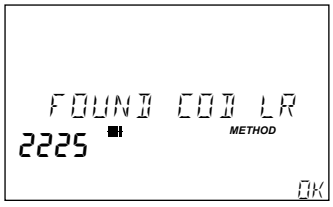


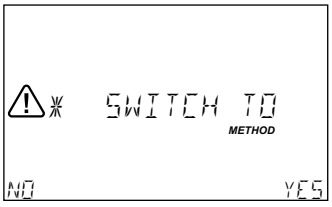
- Press the ▶ key to enter Barcode Methods submenu.

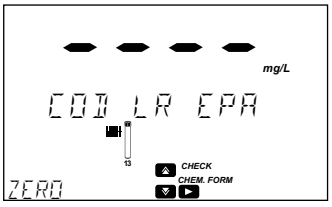
- Press **CFM** to enter Barcode Methods mode.
  If no barcode method is selected, NO METHOD LOADED message is displayed.



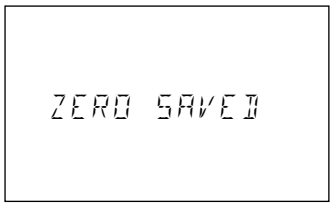
- Insert the barcoded reagent vial into the adpater.
- Press ⏏ **CHECK** to scan the barcoded reagent vial.
  The meter will switch to the correct method once scanned.

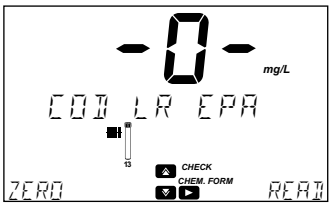




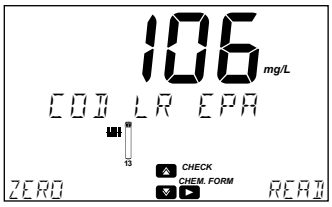


- Press **ZERO** if barcoded reagent vial has not been previously zeroed.
  The display will show "-0-" when the meter is zeroed and ready for measurement.





- If the meter already has a stored zero for the barcoded reagent vial, press **READ** to measure the reagent vial.



When reading multiple barcoded reagent vials with different methods, insert the vial into the adapter and press either **ZERO**, ⏶ **CHECK**, or **READ** to automatically switch to the method under test.
Alternatively, select barcoded methods manually by using the the ⏶ or ⏷ key and scrolling through the list of methods.
Press **CFM** on the desired methods.
Methods can be viewed by Method ID or Method Name.

Barcode methods

Method Name	Method ID	Reagent Code	Vial Barcode ID*	Wavelength	Shared Zero	Stored Zero
Ammonia Low Range	005	HI93764A-25	01xx	425 nm	☑	☑
Ammonia High Range	008	HI93764B-25	02xx	430 nm	☑	☑
Ammonia Low Range (ISO)	101	HI96791-25	09xx	690 nm	☑	☑
Chromium (VI)/Total	087	HI96781-25	43xx	525 nm	☑	☑
Chemical Oxygen Demand Low Range (EPA)	025	HI93754A-25	22xx	420 nm	–	☑
Chemical Oxygen Demand Medium Range (EPA)	028	HI93754B-25	23xx	610 nm	–	☑
Chemical Oxygen Demand High Range (EPA)	031	HI93754C-25	24xx	610 nm	–	☑
Chemical Oxygen Demand Low Range (Hg Free)	026	HI93754D-25	25xx	420 nm	–	☑
Chemical Oxygen Demand Medium Range (Hg Free)	029	HI93754E-25	26xx	610 nm	–	☑
Chemical Oxygen Demand Low Range (ISO)	027	HI93754F-25	27xx	420 nm	–	☑
Chemical Oxygen Demand Medium Range (ISO)	030	HI93754G-25	28xx	610 nm	–	☑
Chemical Oxygen Demand Ultra High Range	088	HI93754J-25	21xx	610 nm	–	☑
Iron	096	HI96786-25	41xx	525 nm	☑	☑
Iron Total	090	HI96778-25	42xx	525 nm	☑	☑
Nitrate Chromotropic Acid	056	HI93766-50	05xx	410 nm	☑	☑
Nitrite Low Range	091	HI96783-25	03xx	525 nm	☑	☑
Nitrite Medium Range	092	HI96784-25	04xx	525 nm	☑	☑
Nitrite, Seawater	098	HI96789-25	08xx	525 nm	☑	☑
Phenols	097	HI96788-25	54xx	510 nm	☑	☑
Nitrogen, Total Low Range	060	HI93767A-50	06xx	420 nm	–	☑
Nitrogen, Total High Range	061	HI93767B-50	07xx	420 nm	–	☑
Phosphorus, Reactive Low Range	073	HI93758A-50	30xx	610 nm	☑	☑
Phosphorus, Acid Hydrolyzable	072	HI93758B-50	31xx	610 nm	☑	☑
Phosphorus, Total Low Range	075	HI93758C-50	32xx	610 nm	☑	☑
Phosphorus, Reactive High Range	074	HI93763A-50	33xx	420 nm	–	☑
Phosphorus, Total High Range	076	HI93763B-50	34xx	420 nm	–	☑
Surfactants, Anionic	093	HI96782-25	52xx	610 nm	☑	☑
Surfactants, Cationic	095	HI96785-25	53xx	420 nm	☑	☑
Surfactants, Nonionic	094	HI96780-25	51xx	610 nm	–	☑

*xx = reagent lot code

When scanning the barcode the meter automatically identifies the method and correct wavelength. Vial methods with the same wavelength support use of a single -"Zero" measurement.

Wavelength	Method Name	Method ID
410 nm	Nitrate Chromotropic Acid	056
420 nm	Surfactants, Cationic	095
425 nm	Ammonia Low Range	005
430 nm	Ammonia High Range	008
510 nm	Phenols	097
525 nm	Iron, Total	090
	Chromium (VI)/Total	087
	Nitrite Low Range	091
	Nitrite Medium Range	092
	Iron	096
	Nitrite, Seawater	098
610 nm	Phosphorus, Reactive Low Range	073
	Phosphorus, Acid Hydrolyzable	072
	Phosphorus, Total Low Range	075
	Surfactants, Anionic	093
690 nm	Ammonia Low Range ISO	101

6.4.3. FACTORY METHODS

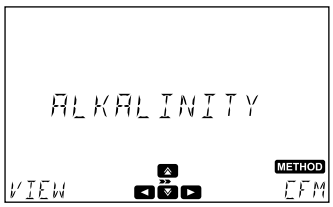
Factory methods were developed by Hanna Instruments® and are pre-programmed with all of the information needed to run an analysis. These methods are calibrated for the selected wavelength, vial type, and reagent set.

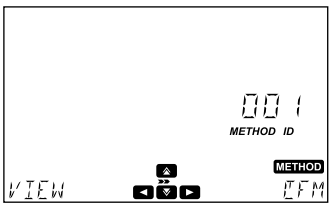
Up to 150 factory methods can be stored on the instrument.

Press the ⏫ or ⏬ key to scroll through the methods.

Press **VIEW** to view the methods by ID.

Press **CFM** to load the selected method.

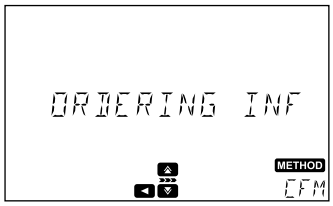


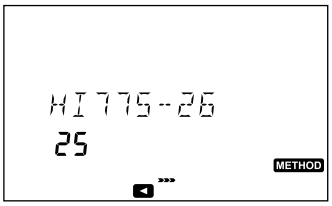


Press the ▶ key to view the ordering information, method version or to mark the method as a favorite (if enabled) .

Press the ⏫ or ⏬ key to view the available options.

To view the ordering information press **CFM** when "Ordering Info" is displayed.





Press the ◀ key to return to the method list.

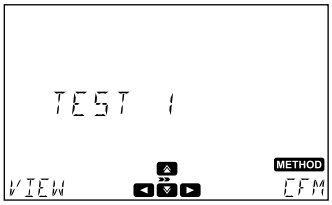
6.4.4. USER METHODS

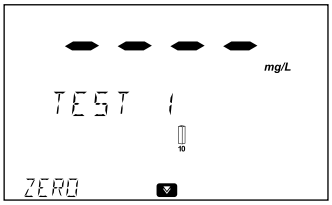
User methods are developed by the user. These methods can be customized based on the analysis. Options include multiple wavelengths, vial type, reaction timers and calibration curves. Up to 100 user methods can be stored on the instrument.

Press the ▲▲ or ▼▼ key to scroll through the methods.

Press **VIEW** to view the methods by ID

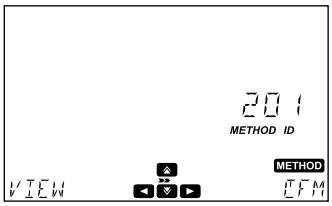
Press **CFM** to load the selected method.





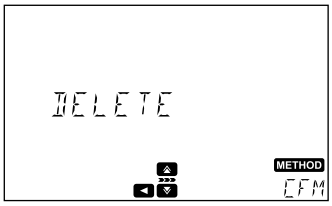
Press the ▶ key to view additional information.

Press the ▲▲ or ▼▼ key to view the available options.

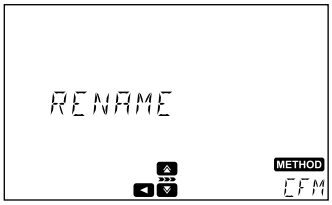


To add a method to the favorites list, press **CFM** when "Set Favorite" is displayed. If the method is already tagged as a favorite, "Clear Favorite" is displayed.

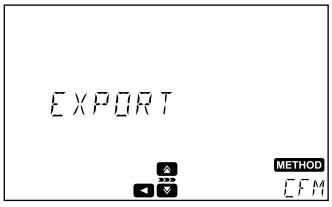
To delete the selected method, press **CFM** when "Delete" is displayed.



To rename the selected method, press **CFM** when "Rename" is displayed. See Method Name section for additional information.



To export the selected method, press **CFM** when "Export" is displayed. See USB section for additional information.

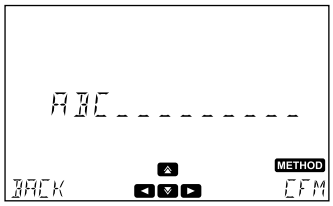


6.4.5. CREATE NEW

See User Methods for additional information on creating a new user method.
Press the ◀ key to return to the previous setting.

Method Name

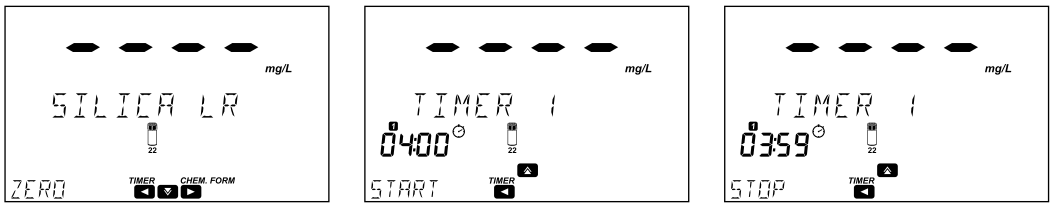
Option: Up to 12 alphanumeric characters
Press the ▲ or ▼ key to select the desired character. Press the ◀ or ▶ key to move across characters.
Press **CFM** to save and continue or **BACK** to return to the methods menu.



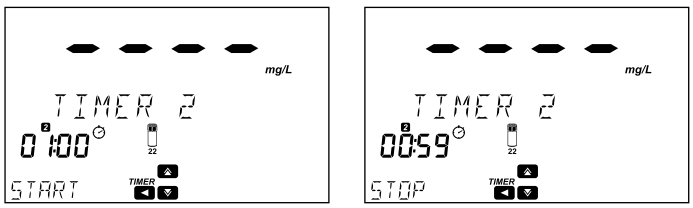
For more information on the settings and options that are available during method creation, see Method Settings (User Methods Only) section.
After all settings have been entered, press **CFM** to create the method. The meter will show "Method Created" before returning to the main screen.
All of these settings can be modified in method settings, see Method Settings (User Methods Only) section for additional information.
In order to use the newly created method that reports in a concentration unit a calibration must be done.
A calibration is not required for methods reporting in absorbance, % transmittance or multiwavelength.

6.5. TIMERS

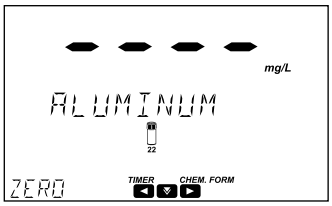
Each method requires a different measurement procedure.
If a timer is used during the measurement procedure, the ◀ key will be visible on the main screen with the TIMER tag above it. Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown. To stop and reset the timer, press **STOP**.

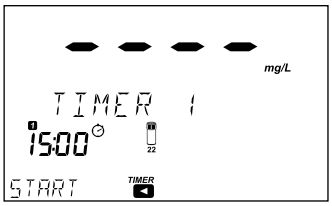


If the method requires more than one timer, press the ◀ key to access the timer menu. Press the ▲ key to select Timer 2 through Timer 5.



When the timer has expired press **ZERO** or **READ** to continue.

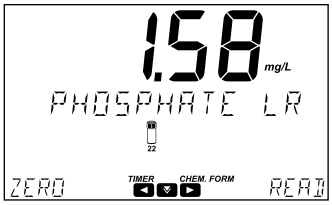


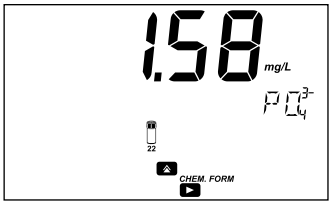


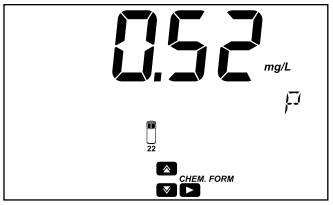
***Note**: A zero measurement must be done before a read measurement. Follow the instructions in the method procedure for preparation of the zero cuvette.*

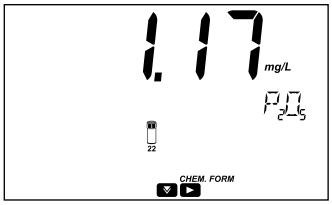
6.6. CHEMICAL FORMULA / UNIT CONVERSION

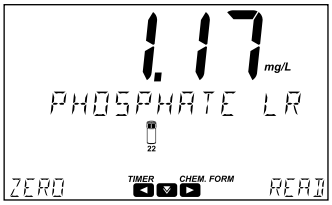
Chemical formulas and conversion factors are preprogrammed into the instrument and are method specific (factory methods only).
On the main screen the ▶ key will be visible with the CHEM. FORM tag above it.
Press the ▶ key to view the default chemical formula.
If additional chemical formulas are available, use the ▲ or ▼ key to select a new formula. The results will be converted to the new formula automatically.
Press the ▶ key to return to the measurement screen with the updated chemical formula.











6.7. DATA MANAGEMENT

The meter can hold up to 9999 measurements. Data can be reviewed on the screen or transferred to a PC.

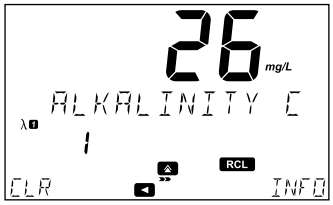
6.7.1. LOG DATA

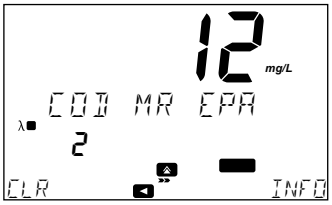
If Automatic Log is enabled, the meter automatically saves the reading. The AUTO is shown on the display when this feature is enabled. See Automatic Log section for detailed information.
Measurements can also be saved by pressing the **LOG** key.
If Sample ID is enabled (see Sample ID section for additional information), saved measurements can be labeled with an alphanumerical ID of maximum 10 characters.
The previously entered ID will be displayed automatically.
Press **CFM** to confirm the Sample ID or **CLR** to return to the previous screen.

6.7.2. LOG RECALL

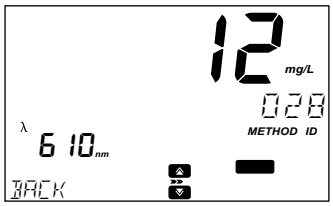
Data saved on the instrument can be viewed by pressing the **RCL** key.
Logs are displayed in order by date and time, the newest log is shown first.

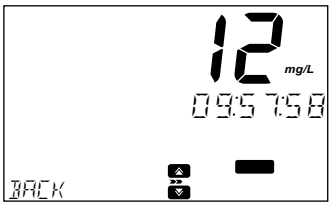
- Press the ▲ key to scroll through the available logs.

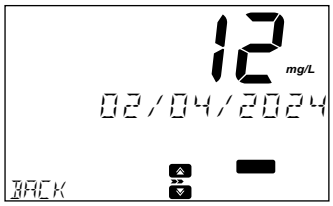


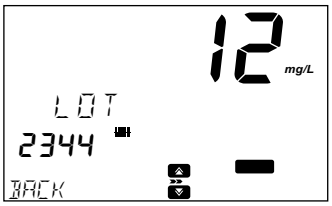


- Press **INFO** to access additional information for the selected log.
- Use the ▲ or ▼ key to scroll through the information saved for each measurement: method name, chemical formula (factory methods only), date and time of the measurement, sample ID, method ID, wavelength and absorbance (user methods only) and lot number (barcoded methods only).

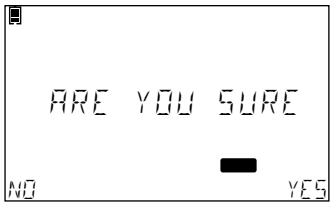








- Alternatively, press **CLR** to delete individual logs. The instruments prompts for confirmation: "Are you sure you want to delete this log".

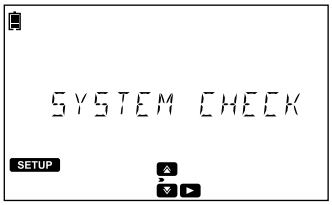


6.7.3. DATA TRANSFER

All data stored on the meter can be saved to a PC / Mac or exported to a USB flash drive. For detailed information please see Setup section.

7. SETUP

Option: Method settings (user methods only), Meter setup, System check, USB



To return to the main screen press the **SETUP** key.

7.1. METER SETUP

Press the ▲ or ▼ key to select METER SETUP, press the ▶ key to enter the menu.
METER SETUP allows users to modify the meter's general functionality, these settings do not affect the measurement.

7.1.1. FAVORITE METHODS

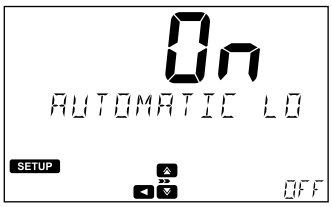
Option: On or Off

When this option is On, methods can be marked as favorites. Favorite methods are easily accessible on the main screen by pressing the ▲ key. See User Methods section for more information. Up to 30 methods can be marked as favorites.

7.1.2. AUTOMATIC LOG

Option: On or Off

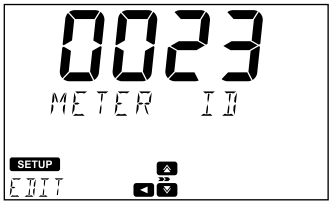
When this option is On, measurements are automatically saved in the log. When enabled, the AUTO tag is displayed on the main screen. When this option is Off, measurements can be added to the log by pressing the **LOG** key.



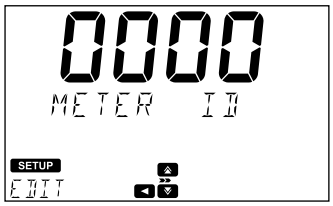
7.1.3. METER ID

Option: 0000 to 9999

Press **EDIT** to set a meter ID.



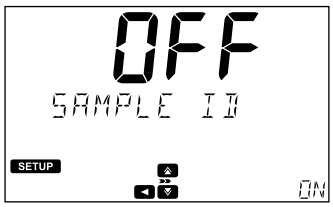
Press the ◀ or ▶ key to highlight the digit to be modified. Press the ▲ or ▼ key to set the desired value. Press **CFM** to confirm the meter ID or **CLR** to return to the setup menu without saving.



7.1.4. SAMPLE ID

Option: On or Off

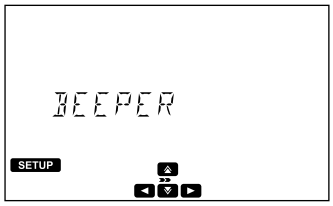
If this option is On, the user will be prompted to enter a sample ID when a measurement is saved.



7.1.5. BEEPER

Option: Key Press, Errors, Timers

Press the ▶ key to access the beeper submenu.



Key press

Option: On or Off

If this option is On, a short beep is heard every time an active key is touched, a long beep is heard every time an inactive key is touched.

Errors

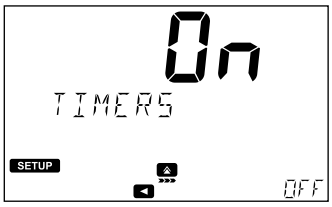
Option: On or Off

If this option is On, a long beep is heard every time an error occurs.

Timers

Option: On or Off

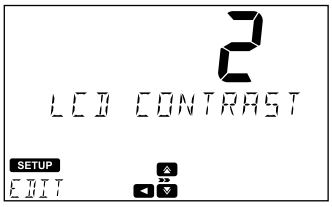
If this option is On, a long beep is heard when a timer reaches "00:00".

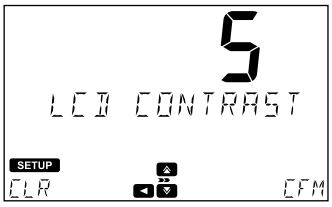


7.1.6. LCD CONTRAST

Option: 0 to 7

Press **EDIT** to change the display's contrast.
Press the ▲ or ▼ key to increase or decrease the value.
Press **CFM** to save the value or **CLR** to return to the setup menu without saving.

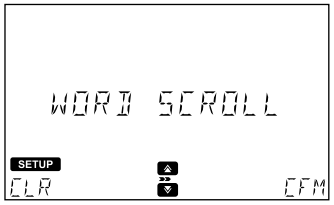




7.1.7. SCROLL

Option: Letter scroll or Word scroll

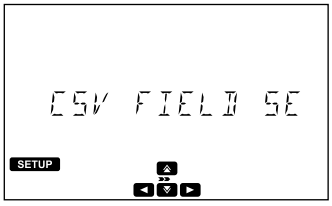
Press **EDIT** to change the scrolling text. Press the ▲ or ▼ key to select the desired type.
Press **CFM** to save the type or **CLR** to return to the setup menu without saving.



7.1.8. CSV FIELD SEPARATOR

Option: Comma (,) or Semicolon (;)

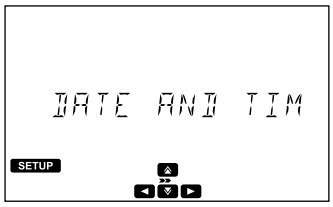
Press the ► key to access the submenu.
Press **EDIT** to change the type. Press the ▲ or ▼ key to select the field separator.
Press **CFM** to confirm the field separator or **CLR** to return to the setup menu without saving.



7.1.9. DATE & TIME SETTING

Option: Time format, Date format, Set date, Set time

Press the ▶ key to access the date and time submenu.



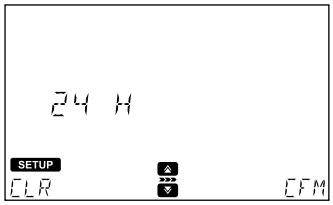
Time Format

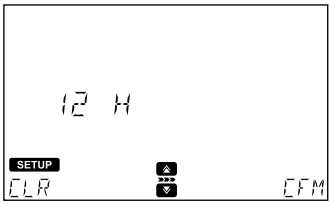
Option: 24 h or 12 h

Press **EDIT** to change the time format.

Press the ▲ or ▼ key to select the desired time format.

Press **CFM** to confirm the time format or **CLR** to return to the previous screen without saving.





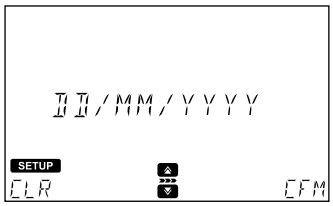
Date Format

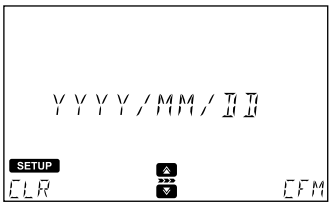
Option: DD/MM/YYYY, MM/DD/YYYY, YYYY/MM/DD

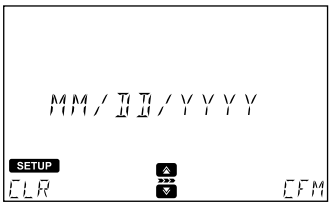
Press **EDIT** to change the date format.

Press the ▲ or ▼ key to select the desired date format.

Press **CFM** to confirm the date or **CLR** to return to the previous screen without saving.





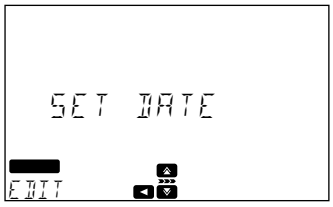


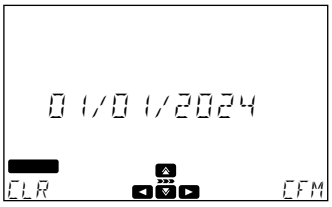
Set Date

Press **EDIT** to modify the date.

Press the ◀ or ▶ key to highlight the digit to be modified. Press the ▲ or ▼ key to set the desired value.

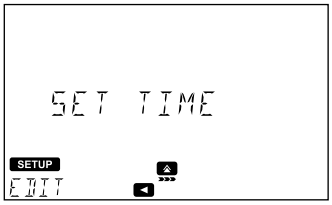
Press **CFM** to save the date or **CLR** to return to the previous screen without saving.

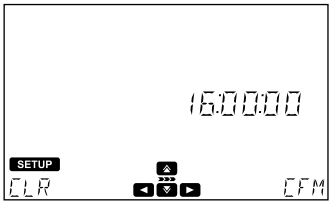




Set Time

Press **EDIT** to modify the time.
Press the ◀ or ▶ key to highlight the digit to be modified. Press the ⏫ or ⏬ key to set the desired value.
Press **CFM** to save the time or **CLR** to return to the previous screen without saving.





7.1.10. CUVETTE DETECTION

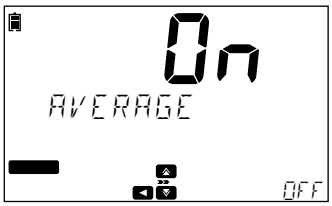
Option: On or Off

If this option is On, automatic cuvette detection is enabled.
If the wrong cuvette is used, an error message will be displayed.
If this option is Off, the indicated cuvette must be used with the factory methods to get a valid measurement.

7.1.11. AVERAGE

Option: On or Off

If option On is selected, rotational averaging of signals during measurement (lamp on) allows for a number of absorbance readings that the instrument then converts to concentration units, and the result is shown on the LCD display.
A built-in algorithm rejects any readings that are outliers and gives accurate average readings.
The meter displays a consistent average value, despite any flaws in the glassware, or any smudges or fingerprints.

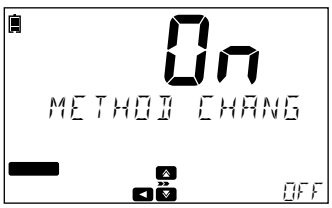


7.1.12. METHOD CHANGE MESSAGE

Option: On or Off

13 mm vial methods only

If option On is selected, the meter reads the barcode, identifies correct method, and prompts users to confirm the measurement method.
If option Off is selected, the meter automatically switches to operating with the identified measurement method.



7.1.13. COD PREFERENCE

Option: EPA, ISO, Hg Free

This option allows automatic selection of the preferred method type for Chemical Oxygen Demand.

This is necessary if using previous-generation barcode reagents in the HI94754x-25 family. All HI93754x-25 reagents for Chemical Oxygen Demand will select the correct method without additional user input.

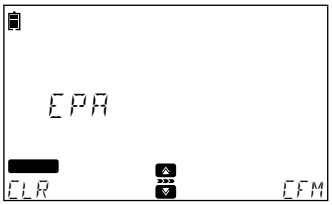
Press the ▶ key to enter menu.

Press **EDIT** to configure preferred COD method.

Press the ⏫ or ⏬ key to set the desired value.

Press **CFM** to save the date or **CLR** to return to the previous screen without saving.

Allows readings with HI977



7.1.14. AUTO OFF

Option: Off, 5, 10, 30, 60 minutes

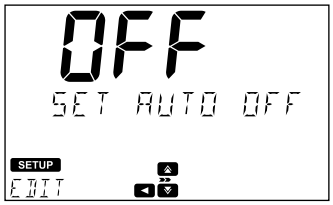
If there is no interaction between the user and the instrument for the set amount of time, the instrument will automatically turn off to preserve the battery.

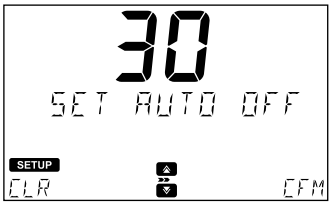
If the auto off is set to Off and the power adapter is removed, the meter will auto off after 60 minutes unless the power adapter is reconnected.

Press **EDIT** to modify value.

Press the ⏫ or ⏬ key to select the desired value.

Press **CFM** to confirm the auto off or **CLR** to return to the setup menu without saving.





7.1.15. FACTORY RESET

Press **CFM** to reset the instrument to factory settings.

Press **YES** to continue or **NO** to return to the meter setup menu.

***Note**: Back up all data before you continue to prevent accidental data loss. Once this process has been started, it cannot be interrupted or reversed.*

The meter will restart when the factory restart is complete.

7.1.16. RESET CONFIGURATION

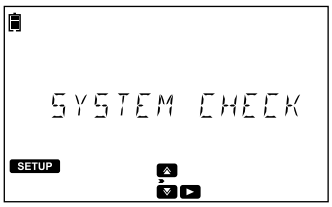
Press **CFM** to reset all modifications made to the meter's configuration.
Press **YES** to continue or **NO** to return to the meter setup menu.

RESET DEFAULT OPTIONS

Setup Item	Deafult Option
Favorite methods	Off
Automatic log	Off
Meter ID	0000
Sample ID	Off
Beeper	On (all)
LCD contrast	2
Scroll	Letter scroll messages
CSV field separator	comma
Date and time setting	24 H (hours) DD/ MM / YYYY
Cuvette detection	On
Average	On
Method change message	Off
COD preference	EPA
Auto Off	Off

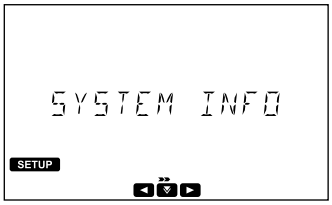
7.2. SYSTEM CHECK

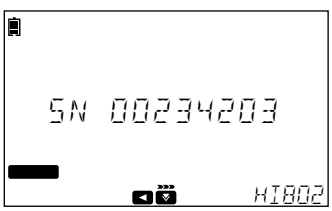
Press the ▲ or ▼ key to select system check, press the ▶ key to enter the menu.
System check allows users to view information about the instrument and perform self diagnostic tests.

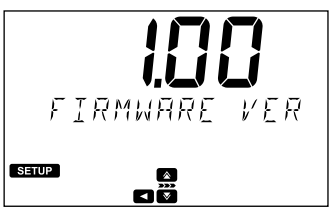


7.2.1. SYSTEM INFO

Press the ▶ key to access the system info menu.
Press the ▲ or ▼ key to scroll instrument's serial number, firmware version and baseboard version.
Press the ◀ key to return to the system check menu.



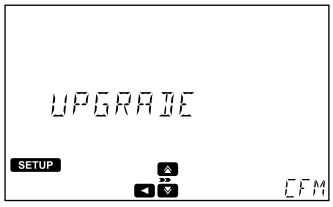




7.2.2. UPGRADE

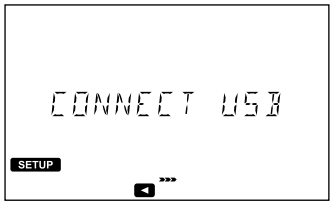
Firmware Upgrade Steps

1. Press the **SETUP** key.
2. Press the ⮟ key to go to SYSTEM CHECK.
3. Press the ▶ key to enter configurable meter Setup.
4. Press the ⮟ or key to navigate to UPGRADE.



5. Press **CFM** to update the firmware.
   "PLEASE BACK UP DATA BEFORE UPGRADING" is scrolled on the LCD.

6. Press the ▶ key to continue with the upgrade.
   To return to the menu, press the ◀ key.
7. Plug the USB drive into the port at the rear of the meter.



Upgrade file type

- mandatory file: APP.bin
- default location: USB drive root directory

8. Wait for file transfer from the USB flash drive to the device to complete.
   ***Note**: Back up all data before upgrade. All data will be lost upon upgrade completion.*

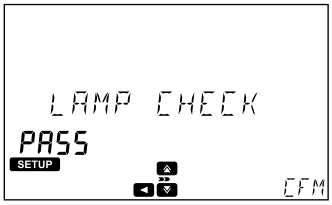
- After a few seconds the meter restarts and all LCD tags are displayed.
- This indicates that the meter is ready for analysis.

To verify upgrade is complete:

1. Press the **SETUP** key.
2. Press the ⮟ key to go to SYSTEM CHECK.
3. Press the ▶ key to go to SYSTEM INFO.
4. Press the ⮝ or ⮟ key to verify firmware version.

7.2.3. LAMP CHECK

To perform a diagnostic check on the lamp, press **CFM**. If the lamp passes, the "PASS" message is displayed on the lower left side of the display.
Press the ◀ key to return to the system check menu.

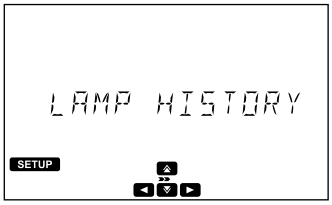


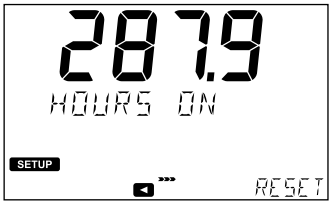
7.2.4. LAMP HISTORY

Press the ▶ key to view the number of hours the lamp has been running.
Press **RESET** to restart the counter and clear all stored zero measurements. This should be performed after replacing the lamp.

***Note**: Lamp replacement causes a significant system change. Performing the RESET function eliminates the possibility of error due to a lamp change.*

Press the ◀ key to return to the system check menu.





7.2.5. WAVELENGTH CHECK

Press **CFM** to start the analysis.
Insert the zero cuvette and press **ZERO**.
Insert the HI801-11 holmium oxide glass filter and press **READ**.
Once the measurement is complete use the ◀ or ▶ key to view the results. The wavelengths corresponding to the found peaks will be displayed on the lower left side of the screen.
Press **EXIT** to return to the menu.

7.3. USB

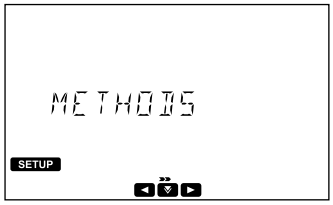
Press the ⏫ or ⏬ key to select USB. Press the ▶ key to enter the menu.
Use this menu to import factory methods, import or export user methods and export logs.

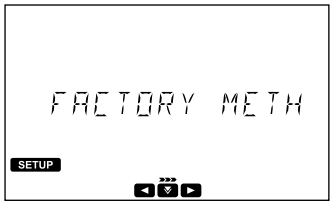
7.3.1. METHODS

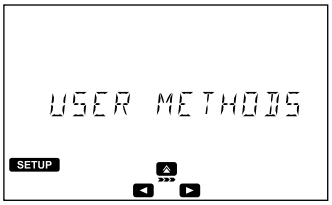
Option: Factory methods, User methods

Press the ▶ key to access the methods submenu.

Press the ⏫ or ⏬ key to scroll through the options.





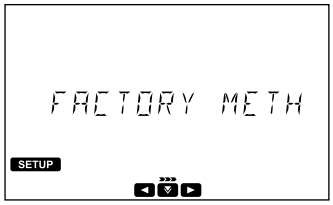


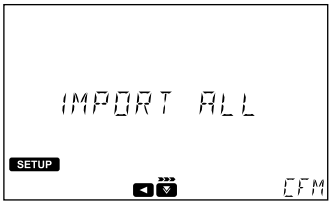
Factory Methods

Option: Import all

Press the ▶ key, "IMPORT ALL" will be displayed. Insert a USB flash drive containing the factory methods and press **CFM**. The process will start automatically, the display will show the progress. To avoid data corruption, do not remove the USB flash drive until the file transfer is complete.

Press the ◀ key to return to the Factory Methods submenu.





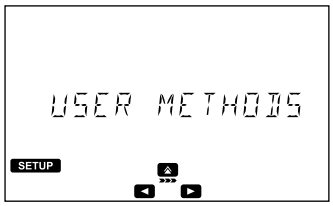
User Methods

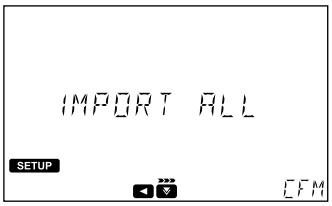
Option: Import all or Export all

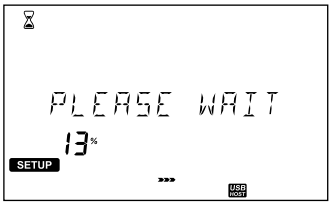
Press the ⏫ key. "IMPORT ALL" will be displayed. Press the ⏫ or ⏬ key to select the desired option. Insert a USB flash drive and press **CFM**. The process will start automatically, the display will show the progress. To avoid data corruption, do not remove the USB flash drive until the file transfer is complete.

Exported methods can be transferred to other meters.

Press the ◀ key to return to the METHODS menu.



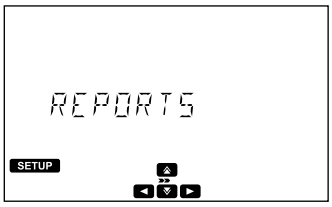


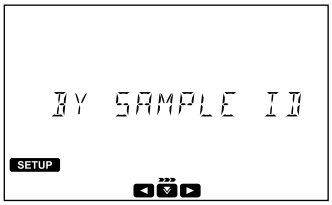


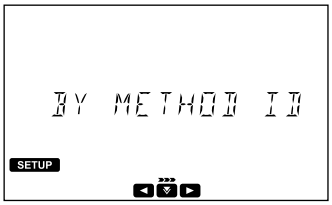
7.3.2. REPORTS

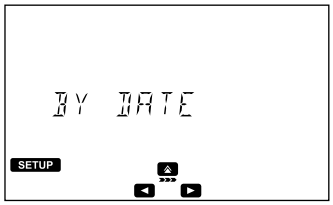
Option: By sample ID (if enabled), By method ID, By date

Press the ▶ key to access the reports submenu.









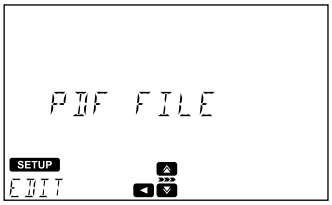
By Sample ID (if enabled)

Press the ▶ key. The select Sample ID screen is shown.

Press **EDIT** to edit the sample ID. Press the ◀ or ▶ key to highlight the digit to be modified. Press the ⏫ or ⏬ key to set the desired value.

Press **CFM** to confirm the Sample ID or **CLR** to return to the previous screen without saving.

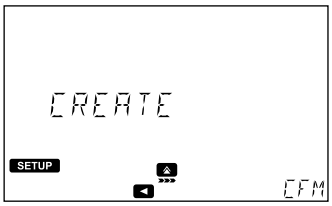
Press the ⏬ key to select the file type. The selected file type will be displayed on the screen.



Press **EDIT** to change the file type. Press the ⏫ or ⏬ key to select the file type. Press **CFM** to confirm the file type or **CLR** to return to the previous screen without saving.

Press the ⏬ key to continue. The "CREATE" message will be displayed.

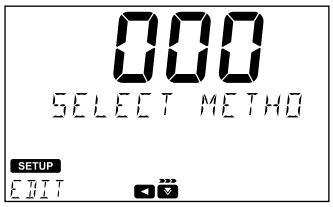
Press **CFM** to export the file. To avoid data corruption, do not remove the USB flash drive until the file transfer is complete.



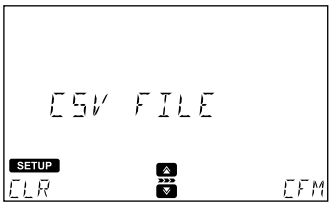
***Note**: If no USB flash drive is connected, users will be prompted to connect the flash drive.*

By Method ID

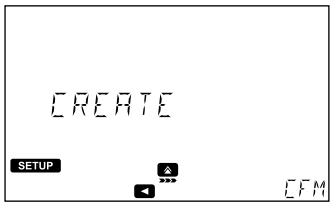
Press the ▶ key. The select Method ID screen is shown.
Press **EDIT** to edit the method ID. Press the ◀ or ▶ key to highlight the digit to be modified.
Press the ⏫ or ⏬ key to set the desired value.
Press **CFM** to confirm the Method ID or **CLR** to return to the previous screen without saving.



Press the ⏬ key to select the file type. The selected file type will be displayed on the screen.
Press **EDIT** to change the file type. Press the ⏫ or ⏬ key to select the file type. Press **CFM** to confirm the file type or **CLR** to return to the previous screen without saving.



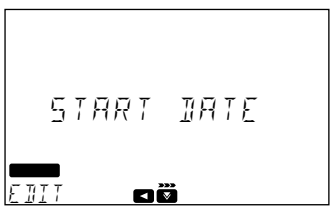
Press the ⏬ key to continue. The "CREATE" message will be displayed. Press **CFM** to export the file.
To avoid data corruption, do not remove the USB flash drive until the file transfer is complete.

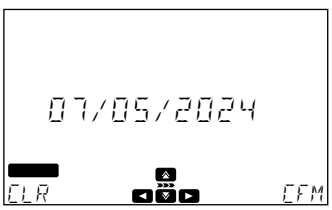


***Note**: If no USB flash drive is connected, users will be prompted to connect the flash drive.*

By Date

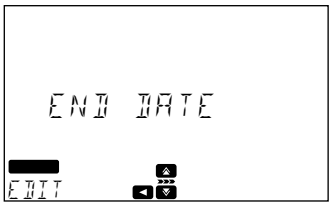
Press the ▶ key. The Start Date screen is shown.
Press **EDIT** to edit the start date. Press the ◀ or ▶ key to highlight the digit to be modified.
Press the ⏫ or ⏬ key to set the desired value.
Press **CFM** to confirm the start date value or **CLR** to return to the previous screen without saving.

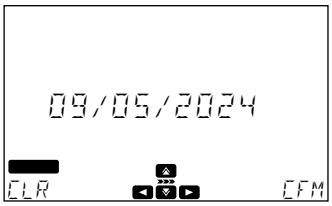




Press the ⏬ key to select the end date.
Press **EDIT** to edit the end date. Press the ◀ or ▶ key to highlight the digit to be modified.
Press the ⏫ or ⏬ key to set the desired value.

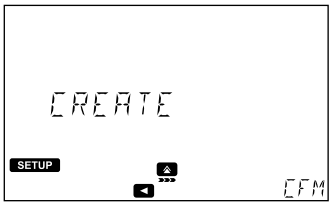
Press **CFM** to confirm the value end date or **CLR** to return to the previous screen without saving.





Press the ▼ key to select the file type. The selected file type will be displayed on the screen.
Press **EDIT** to change the file type. Press the ▲ or ▼ key to select the file type. Press **CFM** to confirm the file type or **CLR** to return to the previous screen without saving.

Press the ▼ key to continue. The "CREATE" message will be displayed.
Press **CFM** to export the file. To avoid data corruption, do not remove the USB flash drive until the file transfer is complete.

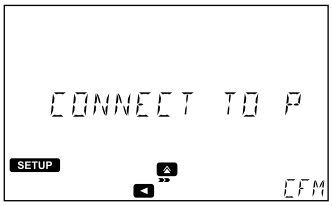


***Note**: If no USB flash drive is connected, users will be prompted to connect the flash drive.*

7.3.3. CONNECT TO PC

Once the instrument is connected, reports and user methods can be imported or exported directly from the unit.

1. Press **CFM** to enable the connection. The USB PC tag and the message "CONNECTED TO PC" will be displayed.
2. Use a file manager (such as Windows Explorer or Mac Finder) to move the files to/from the meter/PC. The meter will appear as a removable disk. To avoid data corruption, do not remove the USB cable until the file transfer is complete.
3. Press **STOP** to disconnect the instrument.



7.4. METHOD SETTINGS (USER METHODS ONLY)

This option is only available if there is at least 1 user method defined.
Method Settings allows users to modify the settings and calibration curve for to the selected user method. These settings affect the measurement.

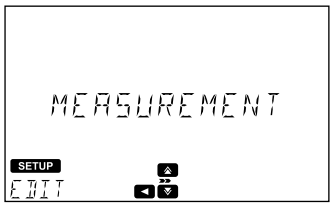
7.4.1. MEASUREMENT UNIT

Option: None, %T, ABS, ppm, mg/L, ppt, °f, °e, ppb, meq/L, µg/L, PCU, ADMI, pH, ASTM, dKH, °dH, meq/kg

Press **EDIT** to select the measurement unit.

Press the ▲ or ▼ key to select the unit.

Press **CFM** to confirm the unit or **CLR** to return to the method settings menu without saving.



7.4.2. NUMBER OF WAVELENGTHS (except for ABS or %T methods)

Option: 1 to 5

Press **EDIT** to change the number of wavelengths.

Press the ▲ or ▼ key to select the number of wavelengths.

Press **CFM** to confirm the number of wavelengths or **CLR** to return to the method settings menu without saving.

7.4.3. WAVELENGTH SETTINGS

Option: 340 to 900 nm

Press **EDIT** to modify the wavelength.

Press the ◀ or ▶ key to highlight the digit to be modified. Press the ▲ or ▼ key to set the desired value.

Press **CFM** to confirm the set wavelength or **CLR** to return to the method settings menu without saving.

***Note**: Press the ▼ key to view additional wavelengths (if enabled).*

7.4.4. DECIMALS

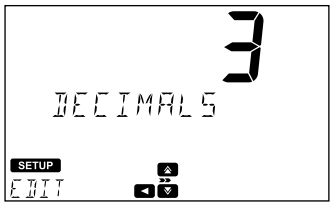
Option: 0 to 3

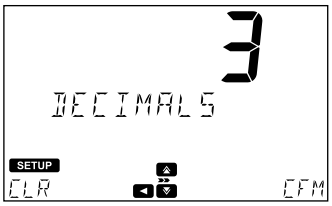
Resolution for absorbance (Abs) and transmittance (%T) are fixed and cannot be modified.

Press **EDIT** to select the number of decimals (xxxx, xxx.x, xx.xx or x.xxx).

Press the ▲ or ▼ key to select the number of decimals.

Press **CFM** to confirm the number of decimals or **CLR** to return to the method settings menu without saving.





7.4.5. DILUTION FACTOR

Option: 001 to 100

This allows samples with high concentrations that are outside the measurement range to be measured. If the sample is not diluted enter a factor of 001.

Press **EDIT** to modify the dilution factor.

Press the ◀ or ▶ key to highlight the digit to be modified. Press the ▲ or ▼ key to set the desired value.

Press **CFM** to confirm the dilution factor or **CLR** to return to the method settings menu without saving.

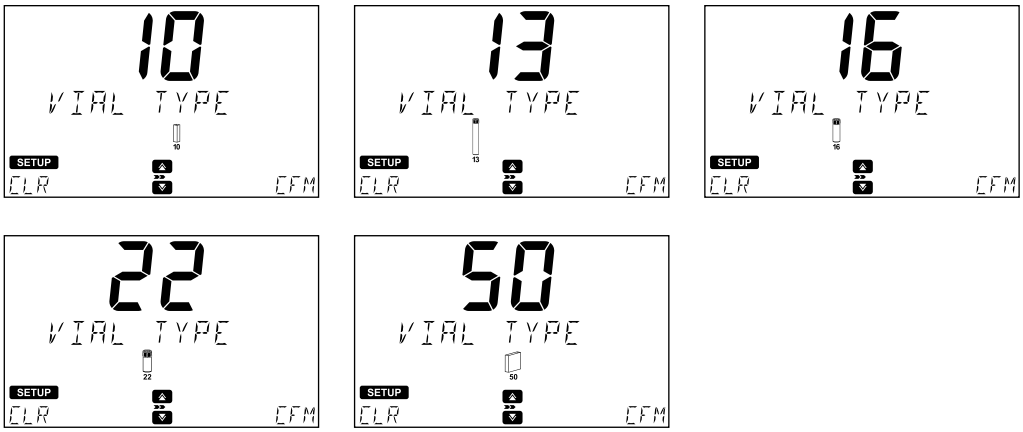
7.4.6. VIAL TYPE

Option: 10 mm, 13 mm, 16 mm, 22 mm, 50 mm

Press **EDIT** to select the vial type.

Press the ▲ or ▼ key to select the vial.

Press **CFM** to confirm the vial type or **CLR** to return to the method settings menu without saving.

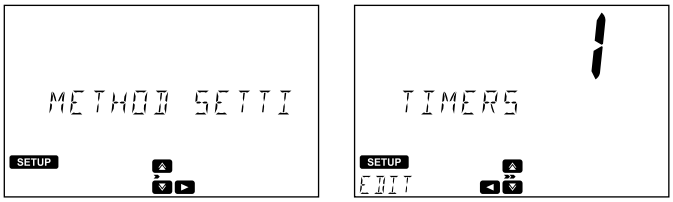


7.4.7. NUMBER OF TIMERS

Option: 0 to 5

Press **EDIT** to select the number of timers. Press the ▲ or ▼ key to select the number of timers.

Press **CFM** to confirm the number of timers or **CLR** to return to the method settings menu without saving.



7.4.8. TIMER SETTING

Option: 00:00 to 59:59

Press **EDIT** to modify the time.

Press the ◀ or ▶ key to highlight the digit to be modified. Press the ▲ or ▼ key to set the desired value.

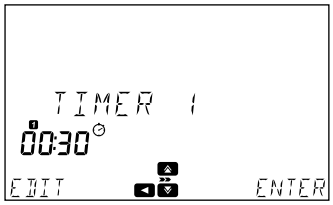
Press **CFM** to confirm the time or **CLR** to return to the method settings menu without saving.

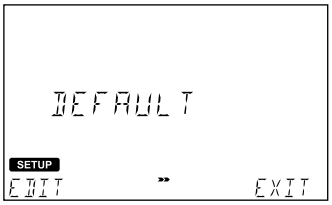
Press **ENTER** to modify the timer name. Press **EDIT** to modify the name.

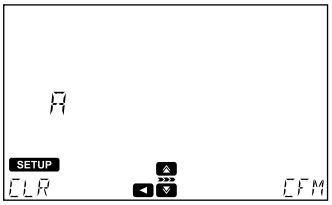
Press the ◀ or ▶ key to highlight the character to be modified. Press the ▲ or ▼ key to set the desired character.

Press **CFM** to confirm the timer name or **CLR** to return to the method settings menu without saving.
Press **EXIT** to return to the timer screen.

***Note**: Press the ⏬ key to view additional timers (if enabled).*

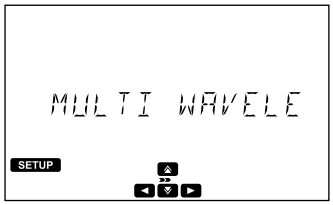






7.4.9. MULTI WAVELENGTH FORMULA

This option is only available if the selected method uses more than 1 wavelength.
The final result can be calculated using equations with editable coefficients.



Equations:

The following equations can be used to calculate the final result.

Formula sum $P_1 A_1 + P_2 A_2 + P_3 A_3 + P_4 A_4 + P_5 A_5$

Formula fraction $C = \dfrac{P_1 A_1 + P_2 A_2 + P_3 A_3 + P_4 A_4 + P_5 A_5}{Q_1 A_1 + Q_2 A_2 + Q_3 A_3 + Q_4 A_4 + Q_5 A_5 + Q_6}$

Formula A1 $C = P_1 A_1$

Formula A2 $C = P_2 A_2$

Formula A3 $C = P_3 A_3$

Formula A4 $C = P_4 A_4$

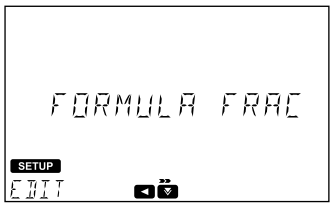
Formula A5 $C = P_5 A_5$

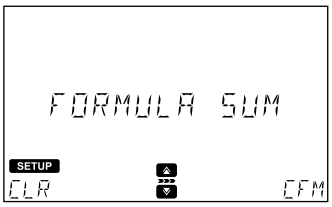
C = Concentration

A_1 to A_5 = Absorbance at specified wavelength

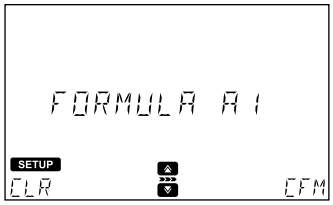
P_1 to P_5 and Q_1 to Q_6 = Factors

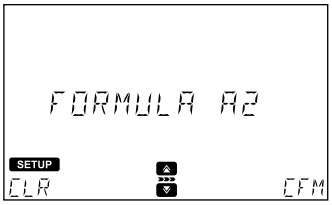
Press **EDIT** to select the equation. Press the ⏫ or ⏬ key to select the equation.
Press **CFM** to save the selection or **CLR** to return to the method settings.

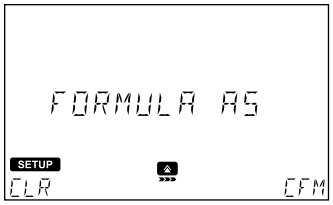




***Note**: The multiwavelength formula is not available for ABS and %T unit selected.*

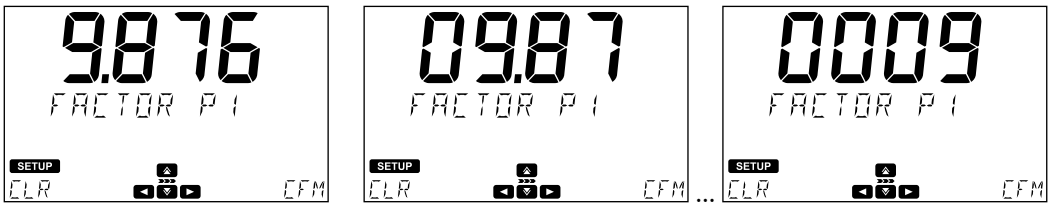




... 

Factors

The meter will only display and use the factor needed for the selected equation.
Press the ▲ or ▼ key to select the factor.
Press **EDIT** to modify the value.
Press the ◄ or ► key to highlight the digit to be modified. Press the ▲ or ▼ key to set the desired value.
To shift the number (along with the decimal point) to the right use the ◄ key to highlight the digit furthest to the left and press the ◄ key (i.e. 9.876 will become 09.87, then 009.8 and 0009).



To make the number negative, use the ◄ key to highlight the digit furthest to the left and press the ▼ key, to decrement the value.
To shift the number (along with the decimal point) to the left, use the ► key to highlight the digit furthest to the right and press the ► key (i.e. -0009 will become -009.8, then -09.87 and -9.876). This can be done as long as there are leading zeros available.

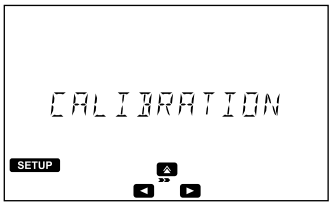
The digit furthest to the left takes values from -9 to 9 by pressing the ▲ or ▼ key, while the other digits are cyclic and take values from 0 to 9.

7.4.10. CALIBRATION

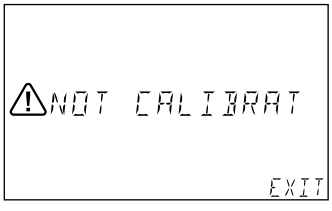
Option: Measure standards, Manual Abs entry

Calibrations can contain up to 10 points.

***Note**: This option is only available if a concentration unit is selected (i.e. mg/L, meq/kg, etc.). A calibration cannot be entered for methods using absorbance or % transmittance or multiwavelength methods. This option is only available for user methods. Factory methods have pre-programmed calibration curves based on the wavelength, cuvette type, and reagent set.*



A calibration is required to run a new user method.
Press the ► key to enter the menu. Press the ▲ or ▼ key to select the desired option.
Press the ◄ key to return to the calibration menu.
Once a method has been calibrated, the 📈 will be displayed on the main screen when the method is selected. If a user method has not been calibrated the error message "NOT CALIBRATED" will be displayed.

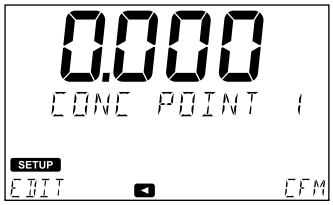


Measure Standards

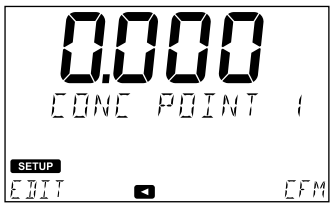
This allows users to measure the absorbance of standards with a known concentration. Up to 10 points can be used to calibrate the method.

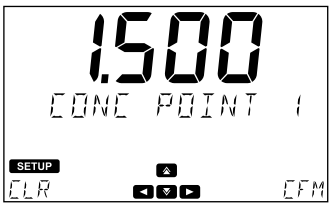
Press **CFM** to start the calibration.
Press **EDIT** to modify the concentration for the first standard.
Press the ◀ or ▶ key to highlight the digit to be modified. Press the ▲ or ▼ key to set the desired value.
Press **CFM** to confirm the value or **CLR** to delete set value.
Press the ◀ key or the **SETUP** key to abort the calibration.

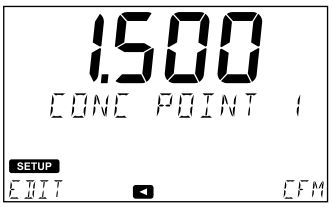
Press **NO** to return to the last calibration point screen or press **YES** to exit calibration.



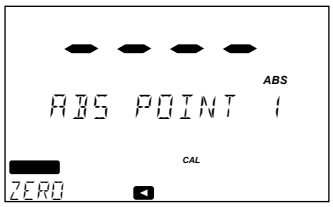
Press **CFM** to continue.

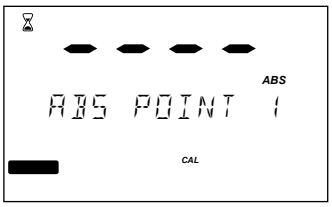


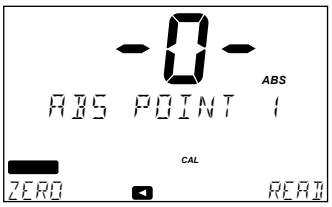


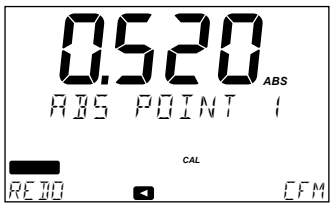


Insert the zero cuvette and press **ZERO**.
Insert the first standard and press **READ**.
Press **CFM** to save the value and continue or **REDO** to repeat the measurement.

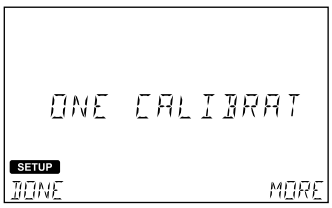




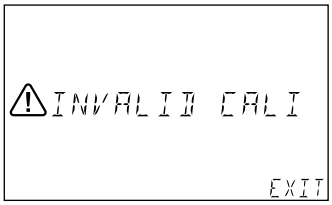




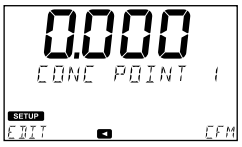
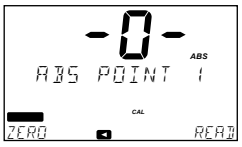
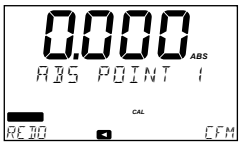
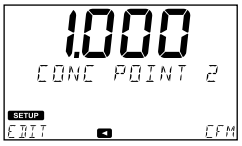
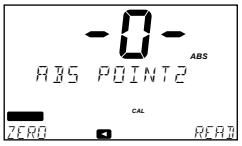
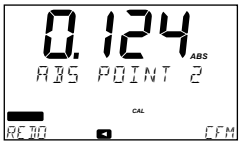
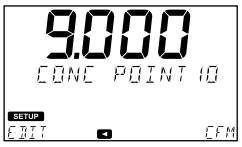
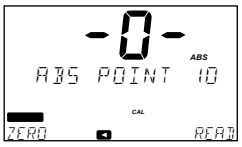
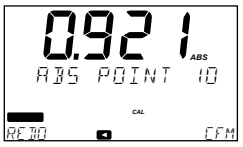
Press the ◀ key or the **SETUP** key to abort the calibration.
Press **DONE** to save and exit the calibration or **MORE** to add additional points.



When wrong slope or offset occurred the meter will display an error message:

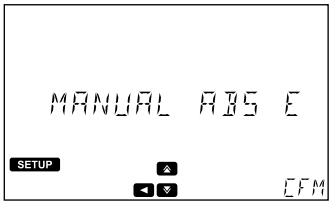


This procedure can be repeated until 10 calibration points have been added.

Edit concentration point		Measure ABS point	
			
			
...		...	
			

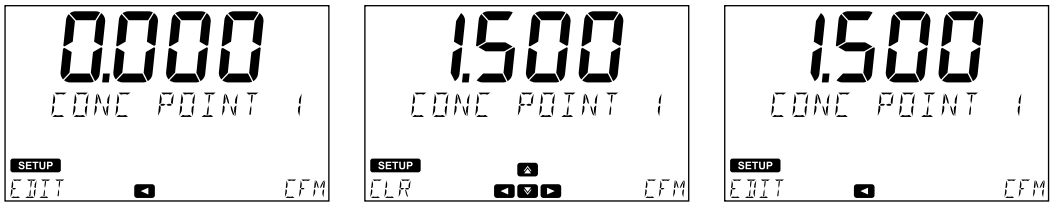
Manual Abs Entry

This allows users to enter the absorbance of standards with a known concentration. Up to 10 points can be used to calibrate the method.

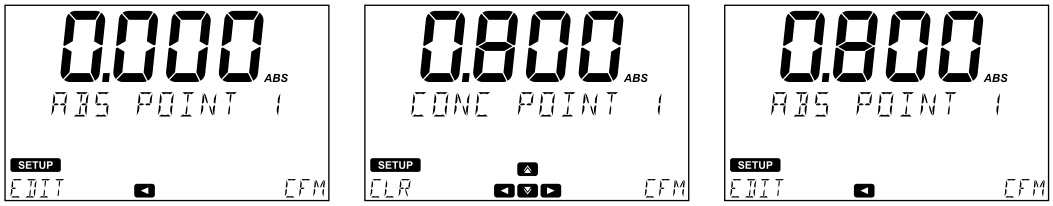


Press **CFM** to start the calibration.
Press **EDIT** to modify the concentration for the first standard.
Press the ◀ or ▶ key to highlight the digit to be modified. Press the ▲ or ▼ key to set the desired value.
Press **CFM** to confirm the value or **CLR** to delete set value. Press the ◀ key or the **SETUP** key to abort calibration.

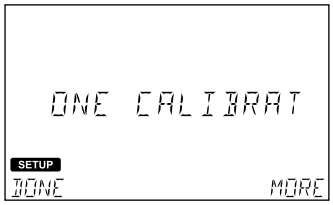
Press **CFM** to continue.

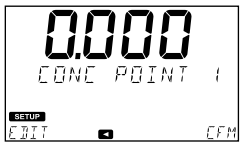
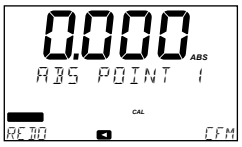
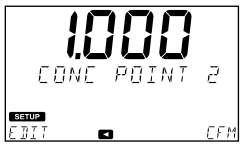
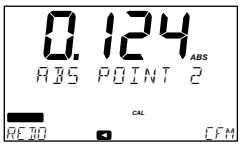
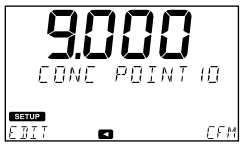
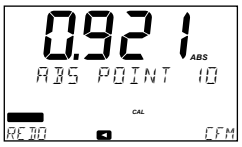


Press **EDIT** to modify the absorbance for the first standard.
Press the ◀ or ▶ key to highlight the digit to be modified. Press the ▲ or ▼ key to set the desired value.
Press **CFM** to confirm the value or **CLR** to return to the method settings menu without saving.
To set a negative abs value, highlight the first digit and use the ▲ or ▼ key to select designed value.
Press **CFM** to save the value.



Press **DONE** to save and exit the calibration or **MORE** to add additional points.
This procedure can be repeated until 10 calibration points have been added.



Edit concentration point	Edit ABS point	
		
		
...	...	
		

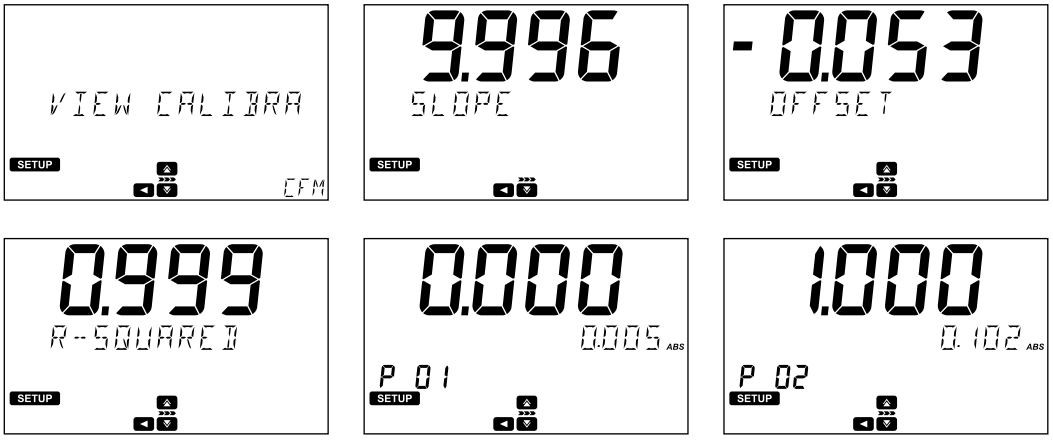
View Calibration

Option: Slope, Offset, R-squared value

After a calibration has been completed, the calibration data can be viewed using View Calibration. A linear regression is done by the instrument for the saved calibration points, the meter will apply the best straight-line fit to the calibration points.

Press **CFM** to view the calibration information.

Press the ▲ or ▼ key to scroll through the options.

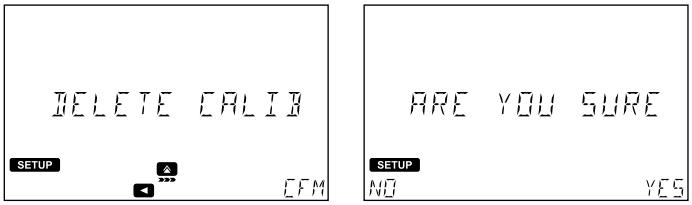


Press the ◀ key to return to the previous screen.

Delete Calibration

To delete a previous saved calibration use the ▲ or ▼ key to select Delete Calibration.

Press **CFM** and **YES** to continue or **NO** to return to the Calibration menu.

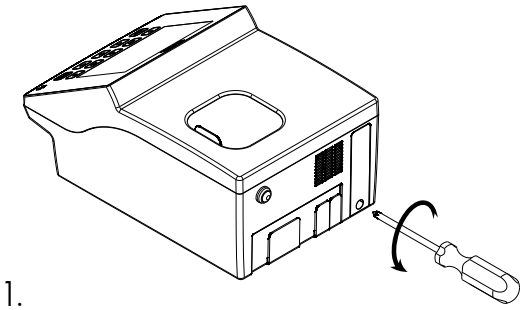


A new calibration is required before the method can be run.

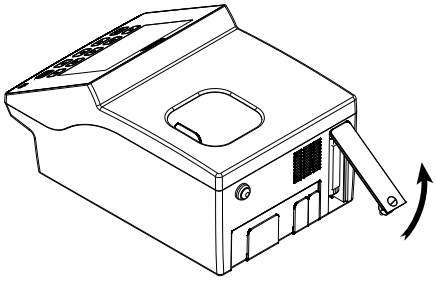
8. SPARE PARTS

8.1. BATTERY REPLACEMENT

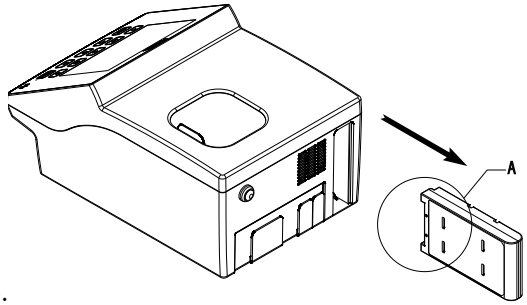
1. Loosen the battery cover screw using a Phillips head screwdriver.
2. Remove the cover.
3. Pull the battery out.
4. Insert the new battery with the (+) sign up.



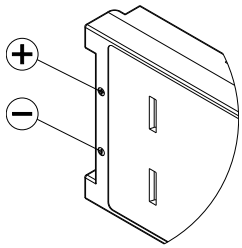
1.



2.



3.



4.

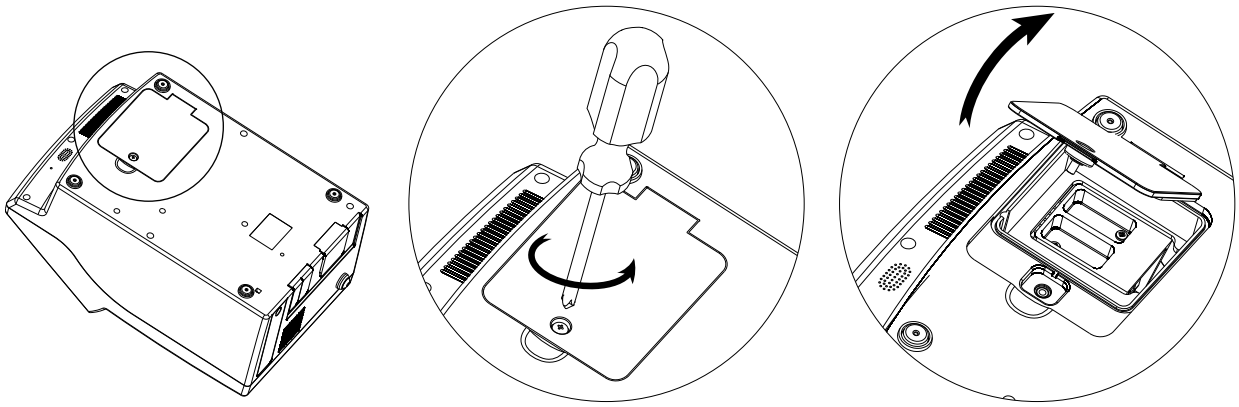
8.2. LAMP REPLACEMENT

***Warning**: Do not touch the pins or the quartz glass! Only hold the tungsten halogen lamp by the metal holder.*

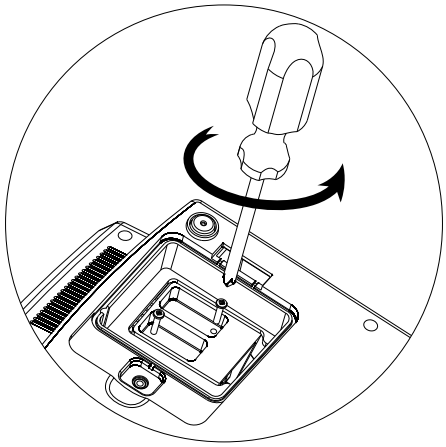
Ensure the instrument is off before continuing.

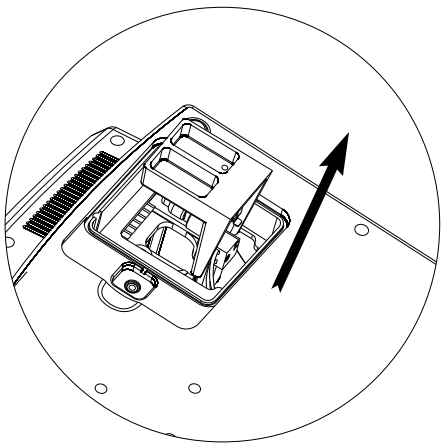
To remove the tungsten halogen lamp follow the steps below.

1. Remove the screw on the lamp cover using a Phillips head screwdriver. Remove the cover.

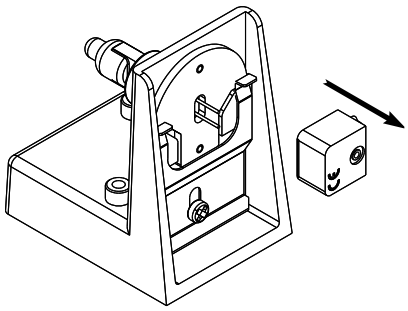


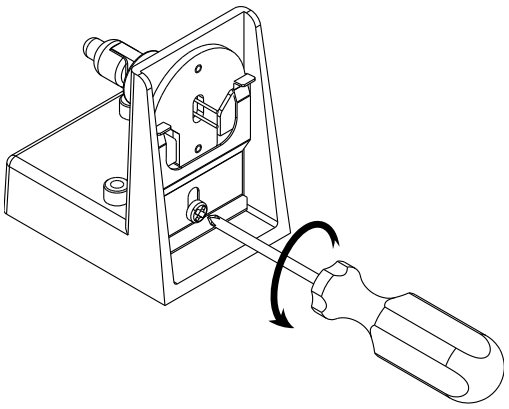
2. Remove the two bottom screws of the lamp holder.
3. Slowly pull out the lamp cover.



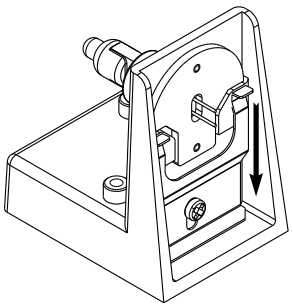


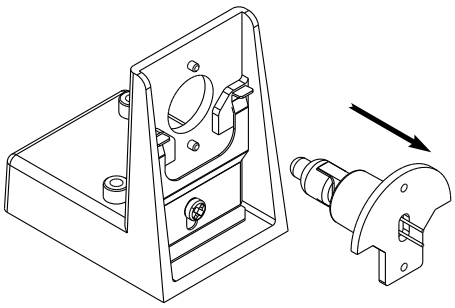
4. Disconnect the lamp cable. Loosen the screw.





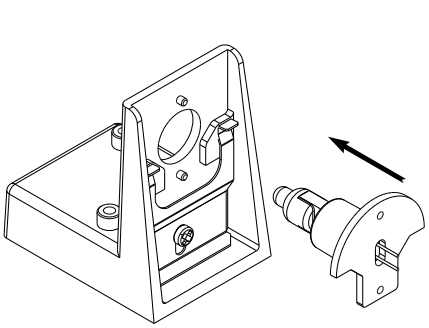
5. Slide down the metal support. Remove the lamp.

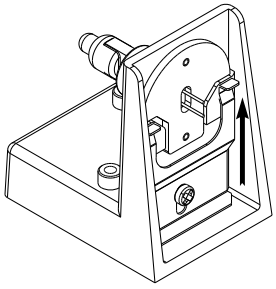


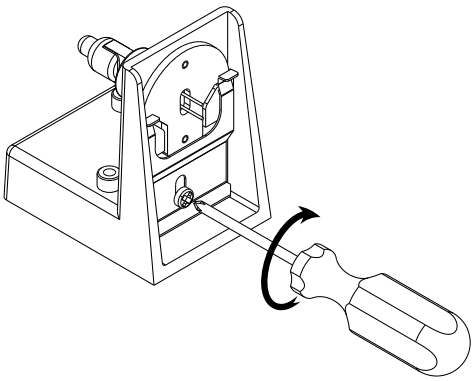


To replace the tungsten halogen lamp follow the steps below:

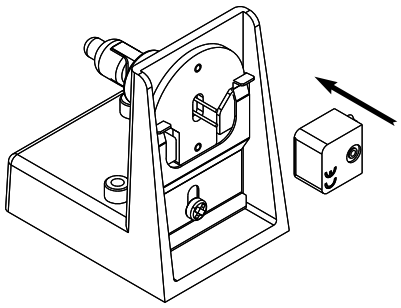
1. Insert the new lamp into the holder.
2. Slide up the metal support and tighten the screw.



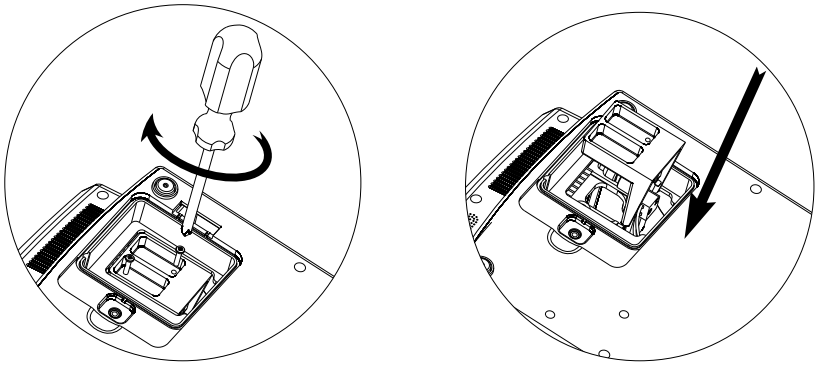




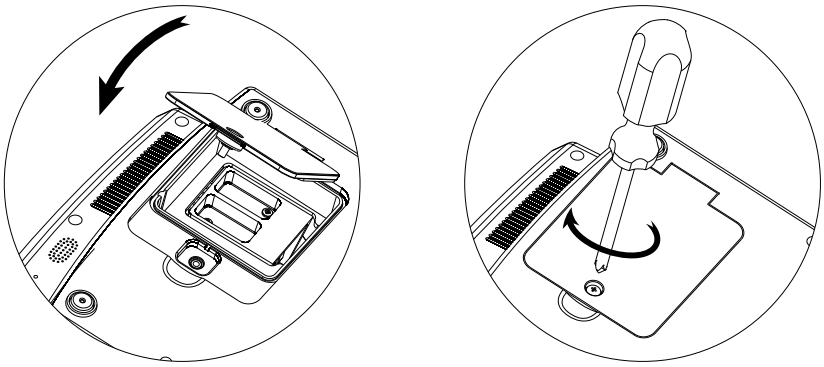
3. Connect the lamp cable.



4. Align the lamp with the screw holes into the optical system, making sure the cable is not pinned between the optical system and holder.
5. Tighten the two screws in the base of the lamp holder and push the power cable back into the instrument.



6. Place the cover and secure the screw.



7. Power on the instrument.
8. Reset the lamp hours counter. See Section 7.2.4. Lamp History.

***Note**: Lamp replacement causes a significant system change. Performing the RESET function eliminates the possibility of error due to a lamp change.*

9. WARNING & ERROR MESSAGES

9.1. WARNING MESSAGES

FACTORY METHODS FULL	The maximum number of factory methods has been reached.
USER METHODS FULL	The maximum number of user methods has been reached. At least 1 user method needs to be deleted before a new one can be created.
FAVORITE METHODS FULL	The maximum number of favorite methods has been reached.
METHOD MISSING OR CORRUPT	Corrupt method file.
FILE MISSING OR CORRUPT	Corrupt log file.
DISK FULL FACTORY	Factory partition full.
DISK FULL	The maximum number of logs have been saved. At least 1 log needs to be deleted before a new one can be created.
FLASH NOT SUPPORTED USB	Flash drive not supported.
FLASH REMOVED	The USB flash drive is missing or cannot be read.
LOG CORRUPTED	Corrupt log file.
NO LIGHT	The light source is not functioning properly. Replace the lamp or check the wiring.
LOW LIGHT	The instrument cannot adjust the light level. Please check that the sample does not contain any debris.
LIGHT HIGH	There is too much light to perform a measurement. Please check the preparation of the zero cuvette.
REFERENCE ERROR	There is a problem with the reference channel.
CLOSE THE LID	The lid is not properly closed.
INVERTED CUVETTES	The sample and the zero cuvettes are were measured in the wrong order or there is a problem with the cuvette preparation.
WRONG OR MISSING CUVETTE	Wrong cuvette inserted. The cuvette does not match the one specified in the method.
NOT CALIBRATED	A calibration is required before a user method can be used.
INVALID CALIBRATION	The calculated slope for the calibration curve is outside of allowed range. Please repeat the calibration.
HIGH TEMPERATURE	The internal temperature is higher then 55 °C.
LOW TEMPERATURE	The internal temperature is lower then 0 °C.
TEMPERATURE CHANGED	If temperature when "Zero" was done is different then "Read" temperature with more then 5 °C.
LAMP OLD - REPLACE SOON	The lamp life has exceeded recommended lifespan. Consider lamp replacement.
DIFFERENT REAGENT LOT	The "Zero" and "Read" are done with different reagents lots (barcode methods only).
Battery symbol displayed blinking	Charging stopped. Battery temperature is out of working temperature.
UNREADABLE BARCODE	Method identification was unsuccessful. The instrument cannot identify the vial's barcode or the vial has no code.
UNKNOWN BARCODE	The vial's barcode is not the expected one.

9.2. ERROR MESSAGES

These types of events are continuously monitored and if one or more occurred it will put the instrument in ERROR mode to avoid unpredictable behavior.

The "Err" is displayed on LCD, followed by the internal code of the error. This screen will block the access to the other screens. If a system error occurs, contact Hanna® Technical Support and provide the displayed code.

PART II. FACTORY METHODS

1. COLLECTING & MEASURING SAMPLES AND REAGENTS

1.1. PROPER USE OF AUTOMATIC FIXED-VOLUME PIPETTES

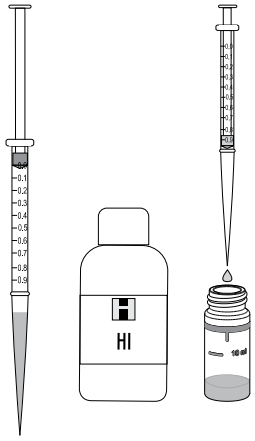
For adding the exact amount of sample or liquid reagent to the cuvette or vial it is recommended to use automatic or a class A volumetric pipette. Hanna Instruments® offers a variety of fixed volume pipettes (see Accessories section for more information).

Proper use of automatic fixed-volume pipette:

1. Attach the pipette tip. Press the button down to the first stop.
2. Immerse the pipette tip in the liquid approximately 2-3 mm.
3. Slowly let the button move back to the original position, wait 2 seconds.
4. Remove the pipette tip from the liquid.
5. To dispense the liquid, place the pipette tip on the inside wall of the container.
6. Slowly press the button down to the first stop.
7. Wait until all of the liquid has been dispensed.
8. Press the button down to the second stop, this will allow any remaining liquid to be dispensed.

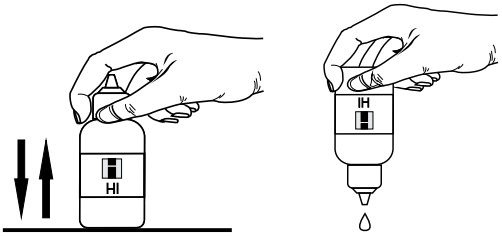
1.2. PROPER USE OF SYRINGE

1. Push the plunger completely into the syringe and insert the tip into the solution.
2. Pull the plunger up until the lower edge of the seal is exactly on the mark for the desired volume.
3. Take out the syringe and clean the outside of the tip, ensuring that no drops are hanging from the tip.
4. Keeping the syringe in a vertical position, push the plunger down. The desired volume has been delivered.



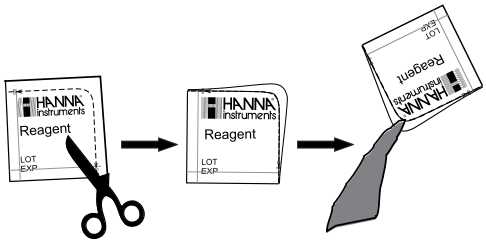
1.3. PROPER USE OF DROPPER BOTTLE

1. Tap the dropper on the table several times.
2. Remove the cap and wipe the outside of the tip with a cloth.
3. Keep the dropper bottle in a vertical position while dosing the reagent.



1.4. PROPER USE OF POWDER PACKET

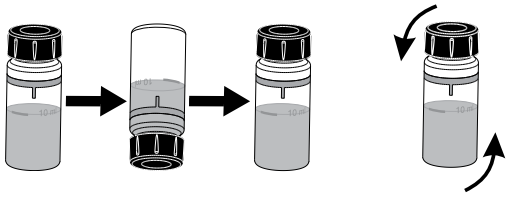
1. Use scissors to open the powder packet.
2. Push the edges of the packet to form a spout.
3. Pour out the content of the packet.



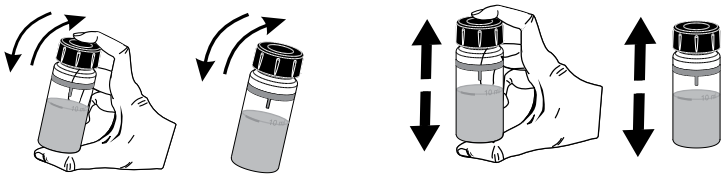
2. CUVETTE PREPARATION

Proper mixing is very important for reproducibility of the measurements. The proper mixing technique for each method is listed in the method procedure.

(a) Invert the cuvette a couple of times or for a specified time: hold the cuvette in the vertical position. Turn the cuvette upside-down and wait for all of the solution to flow to the cap end, then return the cuvette to the upright vertical position and wait for all of the solution to flow to the bottom. This is one inversion. The correct speed for this mixing technique is 10 to 15 complete inversions in 30 seconds. This mixing technique is indicated with "invert to mix" and one of the following icons:



(b) Shaking the cuvette, moving the cuvette up and down. The movement may be gentle or vigorous. This mixing technique is indicated with "shake gently" or "shake vigorously" and one of the following icons:

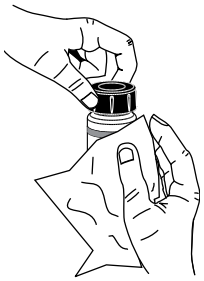


shake gently shake vigorously

(c) Swirl the cuvette gently to mix the solution. This mixing technique is indicated with one of the following icons:

In order to avoid reagent leaking and to obtain more accurate measurements, close the cuvette first with the supplied High-Density Polyethylene (HDPE) plastic stopper and then the black cap.

Whenever the cuvette is placed into the measurement holder, it must be dry outside and free of fingerprints, oil, and dirt. Wipe it thoroughly with HI731318 microfiber cleaning cloth or a lint-free wipe prior to insertion.



Shaking the cuvette can generate bubbles in the sample, causing higher readings. To obtain accurate measurements, remove such bubbles by swirling or by gently tapping the cuvette.

Do not let the reacted sample stand too long after reagent is added. For best accuracy, respect the timings described in each specific method.

It is possible to take multiple readings in a row, but it is recommended to take a new zero reading for each sample and to use the same cuvette for zeroing and measurement when possible.

Discard the sample immediately after the reading is taken or the glass might become permanently stained.

All the reaction times reported in this manual are at 25 °C (77 °F). In general, the reaction time should be increased for temperatures lower than 20 °C (68 °F) and decreased for temperatures higher than 25 °C (77 °F).

3. BLANK MEASUREMENTS

Blank measurements are important steps required for accurate analytical measurements of samples.
These measurements adjust the calculated analytical value to correct for contamination or non-analyte sources of signal.
The HI802 contains Factory Methods with pre-defined working procedures. The pre-defined procedures can be categorized into two types:

- Methods containing a reagent blank correction.
- Methods containing a sample blank correction.

3.1. REAGENT BLANK CORRECTION

A reagent blank correction is used in methods where the background color caused by the reagents produces significant signal that is expected to vary between lots. Such methods correct this error by zeroing the HI802 with a vial containing reagents and deionized water. This "blank preparation" is used as the ZERO measurement, or baseline measurement.
These method procedures cannot correct for sample color or turbidity. Colored or turbid samples should be pre-treated to remove interference due to color or turbidity.

3.2. SAMPLE BLANK CORRECTION

A sample blank correction is the most common method procedure. Such methods correct for sample color or turbidity by zeroing the HI802 with a vial containing sample. The vial may also contain components that do not produce an analytical signal. This "sample blank" is used as the ZERO measurement, or baseline measurement.
These method procedures can correct for sample color or turbidity.
If the sample contains background color or turbidity, a new ZERO cuvette should be prepared for every such sample.

***Note**: Do NOT use SHARED or STORED ZERO measurements between different samples with various background signals; doing so will negatively affect results.*

4. METHOD LIST BY ID

ID	Method Name
001	Alkalinity
002	Alkalinity, Marine
003	Aluminum
004	Ammonia Low Range
005	Ammonia Low Range (13 mm Vial)
006	Ammonia Medium Range
007	Ammonia High Range
008	Ammonia High Range (13 mm Vial)
009	Bromine
010	Calcium
011	Calcium, Marine
012	Chloride
013	Chlorine Dioxide
014	Chlorine, Free Ultra Low Range
015	Chlorine, Free Low Range (Powder Reagent)
016	Chlorine, Free Low Range (Liquid Reagent)
017	Chlorine, Free High Range
018	Chlorine, Total Ultra Low Range
019	Chlorine, Total Low Range (Powder Reagent)
020	Chlorine, Total Low Range (Liquid Reagent)
021	Chlorine, Total High Range
022	Chlorine, Total Ultra High Range
023	Chromium (VI) Low Range
024	Chromium (VI) High Range
025	Chemical Oxygen Demand Low Range EPA (13 mm Vial)
026	Chemical Oxygen Demand Low Range Mercury Free (13 mm Vial)
027	Chemical Oxygen Demand Low Range ISO (13 mm Vial)
028	Chemical Oxygen Demand Medium Range EPA (13 mm Vial)
029	Chemical Oxygen Demand Medium Range Mercury Free (13 mm Vial)
030	Chemical Oxygen Demand Medium Range ISO (13 mm Vial)
031	Chemical Oxygen Demand High Range EPA (13 mm Vial)
032	Color of Water
033	Copper Low Range
034	Copper High Range
035	Cyanide
036	Cyanuric Acid
037	Fluoride Low Range
038	Fluoride High Range
039	Hardness, Calcium
040	Hardness, Magnesium
041	Hardness, Total Low Range
042	Hardness, Total Medium Range
043	Hardness, Total High Range
044	Hydrazine
045	Iodine
046	Iron Low Range
047	Iron High Range
048	Magnesium
049	Manganese Low Range
050	Manganese High Range
051	Maple Syrup

ID	Method Name
052	Molybdenum
053	Nickel Low Range
054	Nickel High Range
055	Nitrate
056	Nitrate Chromotropic Acid (13 mm Vial)
057	Nitrite, Marine Ultra Low Range
058	Nitrite Low Range
059	Nitrite High Range
060	Nitrogen, Total Low Range (13 mm Vial)
061	Nitrogen, Total High Range (13 mm Vial)
062	Oxygen, Dissolved
063	Oxygen Scavengers (Carbohydrazide)
064	Oxygen Scavengers (Diethylhydroxylamine) (DEHA)
065	Oxygen Scavengers (Hydroquinone)
066	Oxygen Scavengers (Isoascorbic Acid)
067	Ozone
068	pH
069	Phosphorus, Marine Ultra Low Range
070	Phosphate Low Range
071	Phosphate High Range
072	Phosphorus, Acid Hydrolyzable (13 mm Vial)
073	Phosphorus, Reactive Low Range (13 mm Vial)
074	Phosphorus, Reactive High Range (13 mm Vial)
075	Phosphorus, Total Low Range (13 mm Vial)
076	Phosphorus, Total High Range (13 mm Vial)
077	Potassium Low Range
078	Potassium Medium Range
079	Potassium High Range
080	Silica Low Range
081	Silica High Range
082	Silver
083	Sulfate
084	Surfactants, Anionic
085	Zinc
086	Chlorine Dioxide (Rapid)
087	Chromium (VI)/Total (13 mm Vial)
088	Chemical Oxygen Demand Ultra High Range (13 mm Vial)
089	Iron (II) (Ferrous)
090	Iron Total (13 mm Vial)
091	Nitrite Low Range (13 mm Vial)
092	Nitrite Medium Range (13 mm Vial)
093	Surfactants, Anionic (13 mm Vial)
094	Surfactants, Nonionic (13 mm Vial)
095	Surfactants, Cationic (13 mm Vial)
096	Iron (13 mm Vial)
097	Phenols (13 mm Vial)
098	Nitrite, Seawater (13 mm Vial)
099	Color ADMI Low Range
100	Color ADMI High Range
101	Ammonia Low Range ISO (13 mm Vial)
102	Nitrate, Marine High Range
103	Magnesium, Marine

5. METHOD PROCEDURES

Alkalinity

SPECIFICATIONS

Range	0 to 500 mg/L (as $CaCO_3$)
Resolution	1 mg/L
Accuracy	±5 mg/L ±5% of reading at 25 °C
Wavelength	610 nm
Cuvette type	22 mm diameter
Method	Bromocresol Green
Method ID	#001

REQUIRED REAGENTS

Code	Description	Quantity
HI775S	Alkalinity Reagent	1 mL
HI93755-53	Chlorine Removal Reagent	1 drop

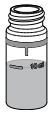
REAGENT SETS

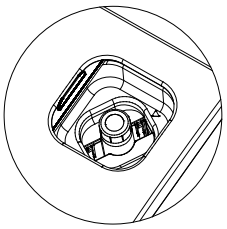
HI775-26	Reagents for 25 tests

For other accessories see Accessories section.

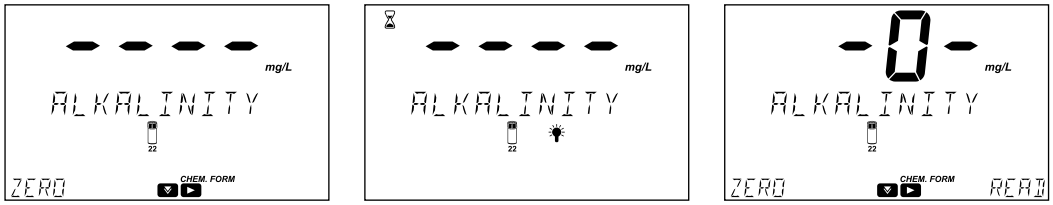
MEASUREMENT PROCEDURE

- Select the Alkalinity method using the procedure described in the Factory Methods section.
- Fill the cuvette with 10 mL of unreacted sample (up to the mark). Replace the plastic stopper and the cap.

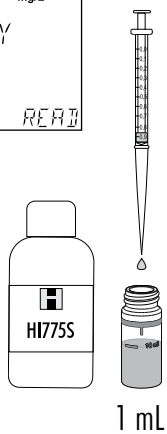




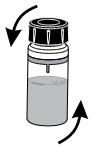
- Insert the cuvette into the holder and close the lid.
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



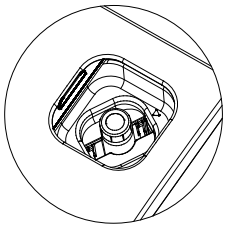
- Remove the cuvette.
- Add 1 mL of HI775S Alkalinity Reagent to the sample using a 1 mL syringe.



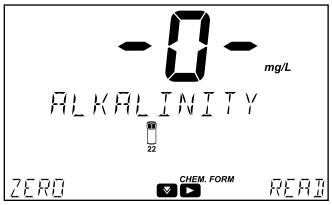
- Replace the plastic stopper and the cap. Invert 5 times.

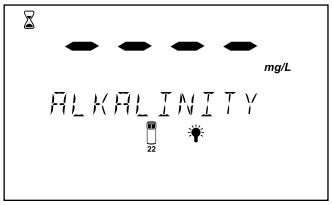


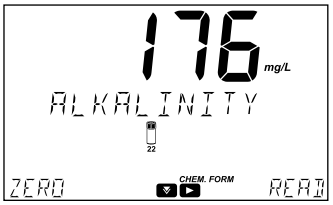
- Insert the cuvette into the holder and close the lid.



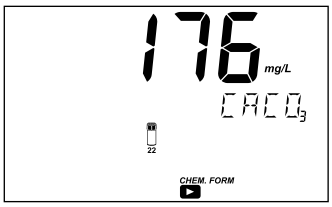
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **calcium carbonate ($CaCO_3$)**.







- Press the ⩔ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Chlorine must be absent.
  To remove the interference, add one drop of HI93755-53 Chlorine Removal Reagent to the unreacted sample.

Alkalinity, Marine

SPECIFICATIONS

Range	0 to 300 mg/L (as $CaCO_3$)
Resolution	1 mg/L
Accuracy	±5 mg/L ±5% of reading at 25 °C
Wavelength	610 nm
Cuvette type	22 mm diameter
Method	Bromocresol Green
Method ID	#002

REQUIRED REAGENTS

Code	Description	Quantity
HI755S	Alkalinity Reagent	1 mL

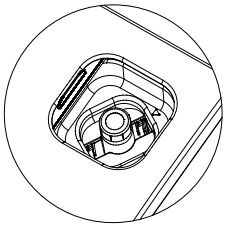
REAGENT SETS

HI755-26	Reagents for 25 tests

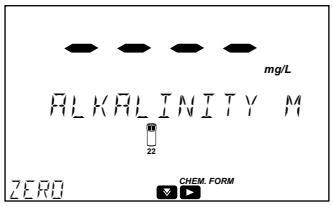
For other accessories see Accessories section.

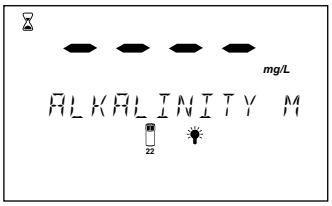
MEASUREMENT PROCEDURE

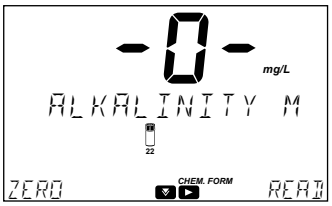
- Select the Alkalinity Marine method using the procedure described in the Factory Methods section.
- Fill the cuvette with 10 mL of unreacted sample (up to the mark). Replace the plastic stopper and the cap.



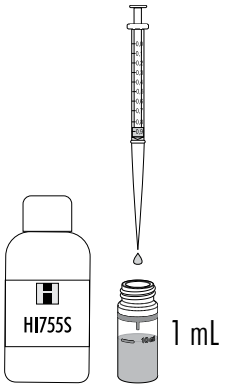
- Insert the cuvette into the holder and close the lid.
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



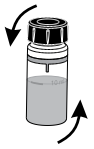




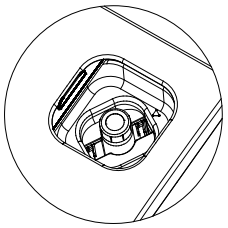
- Remove the cuvette.
- Add 1 mL of HI755S Alkalinity Reagent to the sample using a 1 mL syringe.



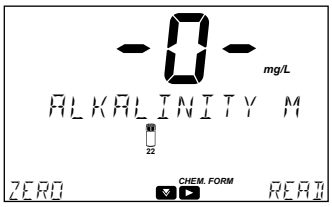
- Replace the plastic stopper and the cap. Invert 5 times.

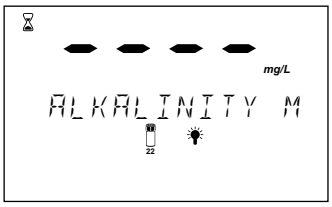


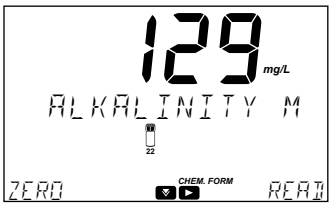
- Insert the cuvette into the holder and close the lid.



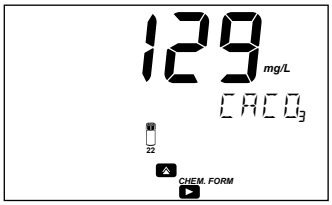
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **calcium carbonate ($CaCO_3$)**.

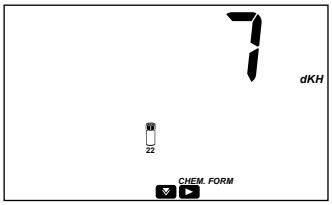






- Press the ⩔ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ⩓ key to convert the results to **degree carbonate hardness (dKH)**.





- Press the ▶ key to return to the measurement screen.

Aluminum

SPECIFICATIONS

Range	0.00 to 1.00 mg/L (as Al^{3+})
Resolution	0.01 mg/L
Accuracy	±0.04 mg/L ±4% of reading at 25 °C
Wavelength	530 nm
Cuvette type	22 mm diameter
Method	Adaptation of the Aluminon Method
Method ID	#003

REQUIRED REAGENTS

Code	Description	Quantity
HI93712A-0	Aluminum Reagent A	1 packet
HI93712B-0	Aluminum Reagent B	1 packet
HI93712C-0	Aluminum Reagent C	1 packet

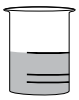
REAGENT SETS

HI93712-01	Reagents for 100 tests
HI93712-03	Reagents for 300 tests

For other accessories see Accessories section.

MEASUREMENT PROCEDURE

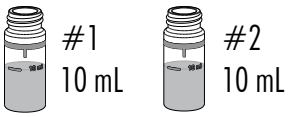
- Select the Aluminum method using the procedure described in the Factory Methods section.
- Fill a graduated beaker with 50 mL of sample.



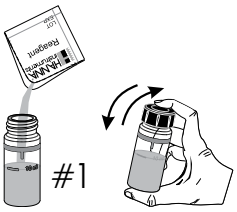
- Add one packet of HI93712A-0 Aluminum Reagent A. Mix until completely dissolved.

- Add one packet of HI93712B-0 Aluminum Reagent B. Mix until completely dissolved.

- Fill two cuvettes with 10 mL of sample (up to the mark).

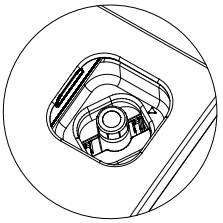


- Add one packet of HI93712C-0 Aluminum Reagent C to one cuvette (#1). Replace the plastic stopper and the cap. Shake gently until completely dissolved. This is the blank.

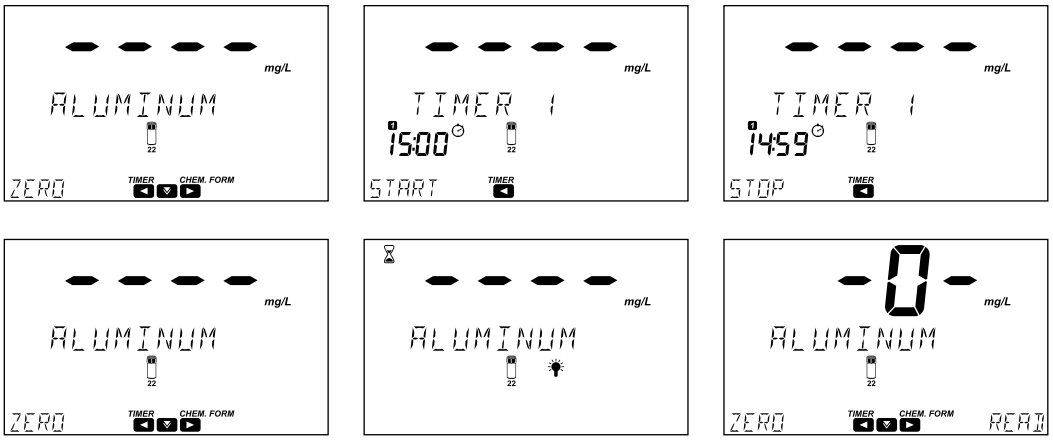


- Insert the first cuvette (#1) into the holder and close the lid.

#1

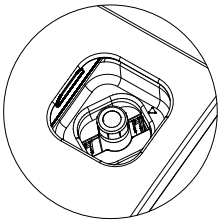


- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to the zero or wait 15 minutes.
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.

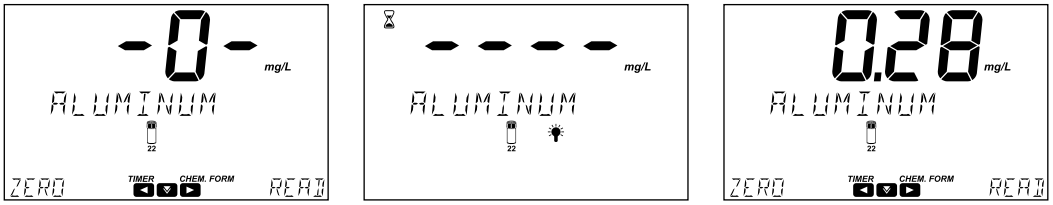


- Remove the blank and insert the second cuvette (#2) into the holder and close the lid.

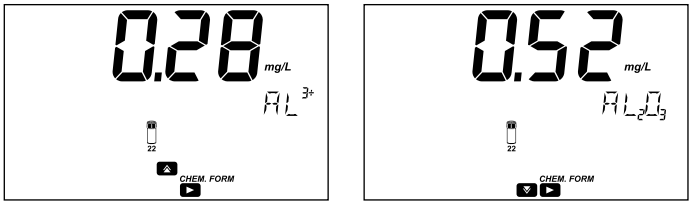
#2



- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **aluminum (Al^{3+})**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ▼ key to convert the results to **mg/L** of **aluminum oxide (Al_2O_3)**.

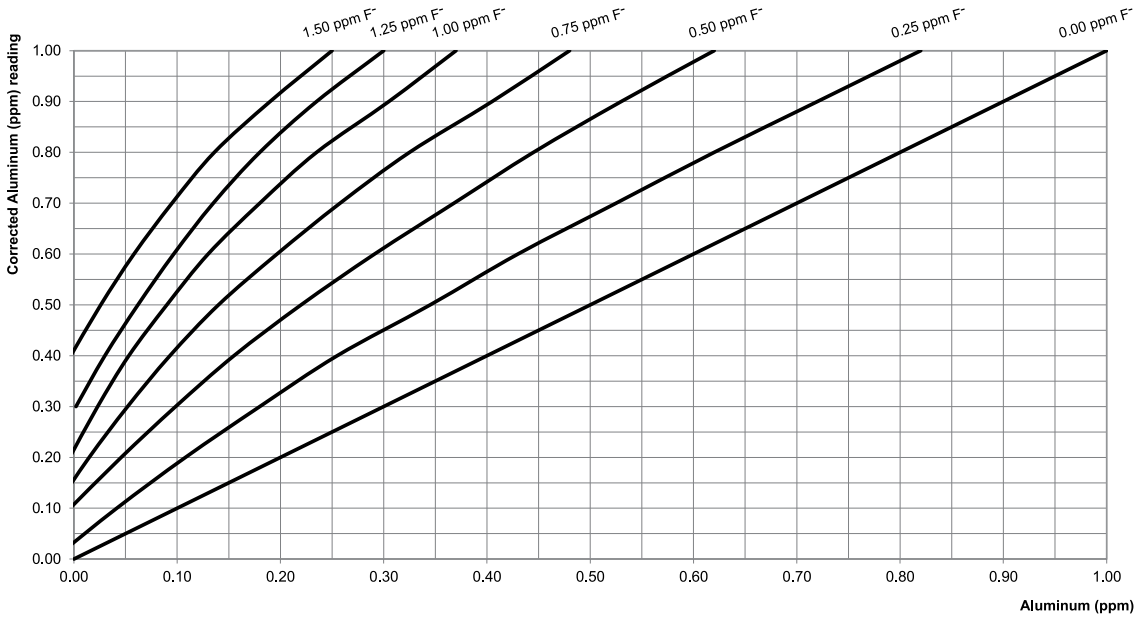


- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Alkalinity above 1000 mg/L
- Phosphate above 50 mg/L
- Iron above 20 mg/L
- Fluoride must be absent.
  If the fluoride concentration is known, the aluminum concentration can be determined using the graph below:



To determine the corrected aluminum concentration:

1. Follow the measurement procedure to obtain the aluminum concentration.
2. Locate the aluminum reading on x-axis.
3. Follow the line up, until it intersects the fluoride curve corresponding to the fluoride concentration in the sample.
4. From the intersection of the fluoride and aluminum line, follow the line to the left until it intersects the y-axis. This point corresponds to the corrected aluminum concentration in the sample.

Example: Aluminum reading on meter 0.40 ppm and fluoride content in sample 0.50 ppm, corrected aluminum concentration in sample is 0.75 ppm.

Ammonia Low Range

SPECIFICATIONS

Range	0.00 to 3.00 mg/L (as NH_3-N)
Resolution	0.01 mg/L
Accuracy	±0.04 mg/L ±4% of reading at 25 °C
Wavelength	425 nm
Cuvette type	16 mm diameter
Method	Adaptation of the ASTM Manual of Water and Environmental Technology, D1426 Nessler Method
Method ID	#004

REQUIRED REAGENTS

Code	Description	Quantity
HI93700A-0	Ammonia Low Range Reagent A	4 drops
HI93700B-0	Ammonia Low Range Reagent B	4 drops

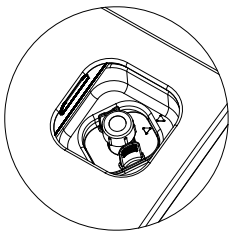
REAGENT SETS

HI93700-01	Reagents for 100 tests
HI93700-03	Reagents for 300 tests

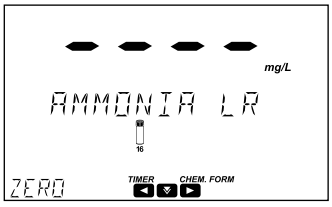
For other accessories see Accessories section.

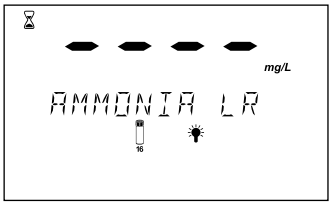
MEASUREMENT PROCEDURE

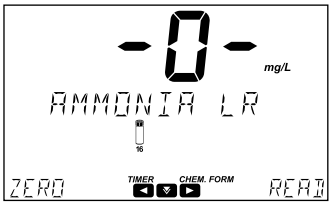
- Select the Ammonia LR method using the procedure described in the Factory Methods section.
- Fill the cuvette with 10 mL of unreacted sample (up to the mark). Replace the plastic stopper and the cap.



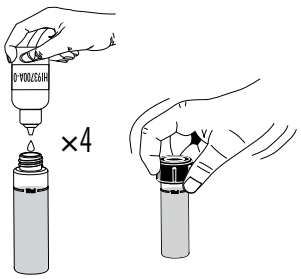
- Insert the 16 mm cuvette adapter using the procedure described in the Cuvette & Vial Adapters section.
- Insert the cuvette into the adapter and close the lid.
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.

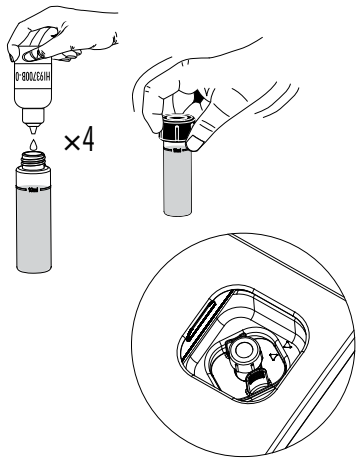




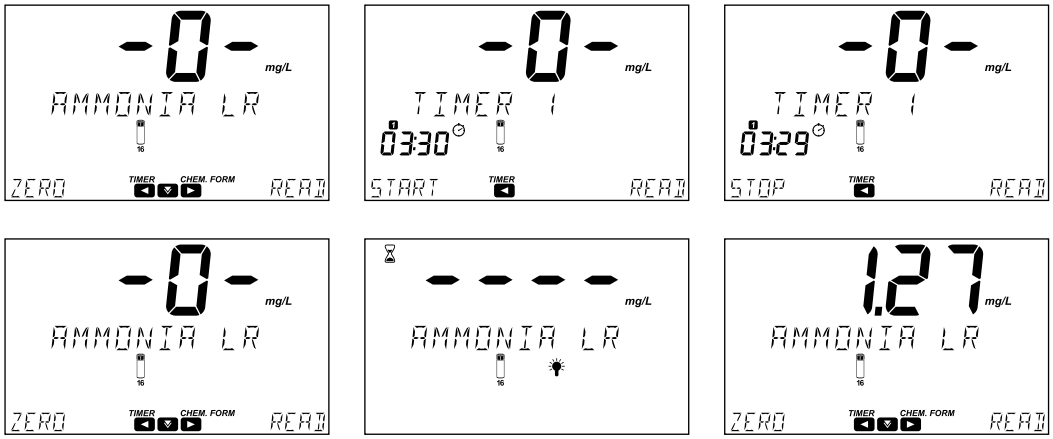


- Remove the cuvette.
- Add 4 drops of HI93700A-0 Ammonia Low Range Reagent A. Replace the plastic stopper and the cap. Swirl to mix the solution.

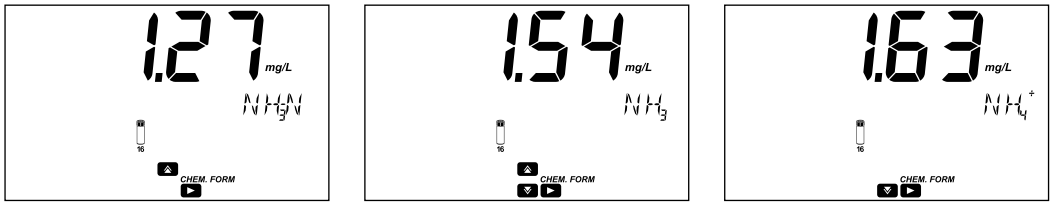




- Add 4 drops of HI93700B-0 Ammonia Low Range Reagent B. Replace the plastic stopper and the cap. Swirl to mix the solution.
- Insert the cuvette into the holder and close the lid.
- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 3 minutes and 30 seconds.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **ammonia nitrogen (NH_3-N)**.



- Press the ⏬ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ⏫ key to convert the results to **mg/L** of **ammonia (NH_3)** or **ammonium (NH_4^+)**.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Hardness above 1 g/L
- Iron
- Sulfide may cause turbidity
- Organic compounds like acetone above 0.1%, alcohols, aldehydes, aliphatic and aromatic amines, chloramines, glycine, or urea above 10 mg/L
  Distillation is required to remove the interference.

Ammonia Low Range (13 mm Vial)

SPECIFICATIONS

Range	0.00 to 3.00 mg/L (as NH_3-N)
Resolution	0.01 mg/L
Accuracy	± 0.10 mg/L or ± 5% of reading at 25 °C, whichever is greater
Wavelength	425 nm
Cuvette type	13 mm diameter
Method	Adaptation of the ASTM Manual of Water and Environmental Technology, D1426 Nessler Method
Method ID	#005

REQUIRED REAGENTS

Code	Description	Quantity
HI93764A-0*	Ammonia Low Range Reagent Vial	1 vial
HI93764-0	Nessler Reagent	4 drops

*Reagent vial identification: white label

REAGENT SETS

HI93764A-25	Reagents for 25 tests

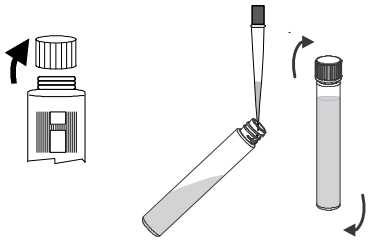
For other accessories see Accessories section.

***Note**: Store the unused vials in their packaging in a cool and dark place.*

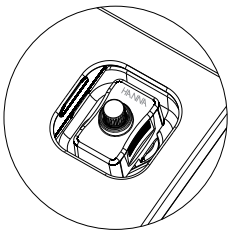
MEASUREMENT PROCEDURE

***Note**: Method selection is done automatically using a barcoded HI93764A-0 Ammonia Low Range Reagent Vial following the procedure described in the Barcode Methods section.*
Alternatively, select the Ammonia LR (13 mm) method using the procedure described in the Factory Methods section.

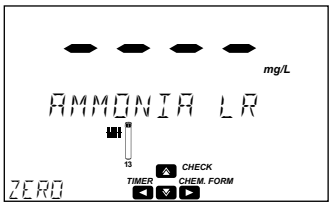
- Insert the supplied 13 mm vial adapter using the procedure described in the Cuvette & Vial Adapters section.
- Remove the cap from HI93764A-0 Ammonia Low Range Reagent Vial.

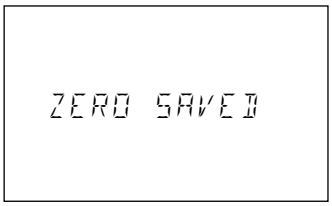


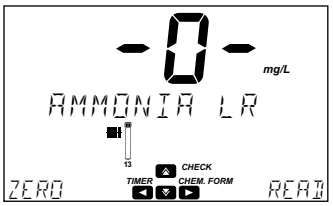
- Add 5 mL of sample to the vial, while keeping the vial at a 45-degree angle.
- Replace the cap. Invert several times to mix.
- Insert the vial into the adapter.
  Press steadily down until the vial clicks in place.



- Press **ZERO**.
  The meter scans the barcode and switches to the correct method automatically.
- The display will show "-0-"when the meter is zeroed and raedy for measurement.

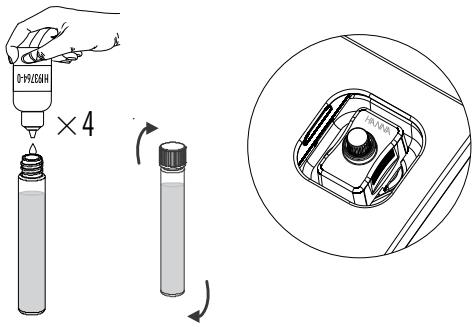




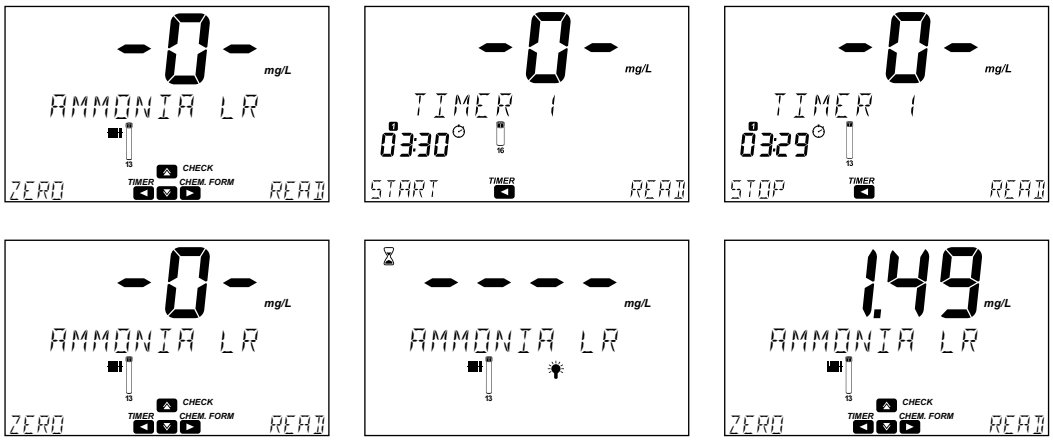


- Remove the vial.

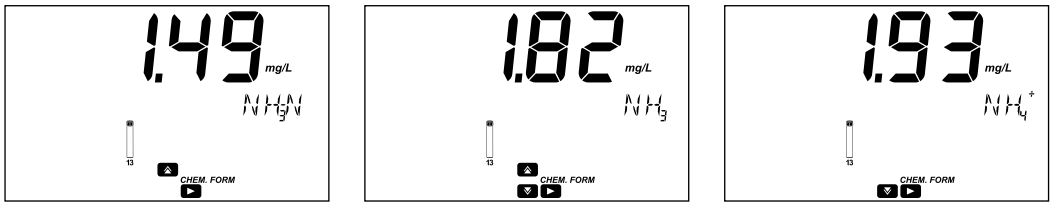
- Remove the cap and add 4 drops of HI93764-0 Nessler Reagent.
- Replace the cap. Invert the vial several times to mix.
- Insert the vial into the adapter.
  Press steadily down, until the vial clicks in place.



- Press the ◀ key to access the timer menu.
  Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 3 minutes and 30 seconds.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **ammonia nitrogen (NH_3-N)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ▲ key to convert the results to **mg/L ammonia (NH_3)** or **ammonium (NH_4^+)**.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Hardness above 1 g/L
- Iron
- Sulfide may cause turbidity
- Organic compounds like acetone above 0.1%, alcohols, aldehydes, aliphatic and aromatic amines, chloramines, glycine, or urea above 10 mg/L
  Distillation is required to remove the interference.

Ammonia Low Range ISO (13 mm Vial)

SPECIFICATIONS

Range	0.000 to 2.500 mg/L (NH_4^+)
Resolution	0.001 mg/L
Accuracy	±0.015 mg/L ± 3% of reading at 25 °C
Wavelength	690 nm
Cuvette type	13 mm diameter
Method	ISO 23695
Method ID	#101

REQUIRED REAGENTS

Code	Description	Quantity
HI96791-0	Ammonia ISO Reagent	1 sachet
HI96791V-0*	Ammonia ISO Low Range Reagent Vial	1 vial

*Reagent vial identification: red label

REAGENT SETS

HI96791-25	Reagents for 25 tests

For other accessories see Accessories section.

***Note**: Store the unused vials in their packaging in a cool and dark place.*
Storage between 2 and 8 °C can extend the reagent life up to 6 months beyond the expiration date.

PRINCIPLE

Ammonium (NH_4^+) ions react with hypochlorite and salicylate ions in strongly alkaline solutions to form monochloramine. The monochloramine reacts with a substituted phenol to form a blue indophenol derivative that is determined photometrically. The presence of sodium nitroprusside as catalyst promotes color development. Due to the intrinsic yellow coloration of the blank reagent, the measurement solution is yellow-green to green in color.

APPLICATION

Ammonium ions and dissolved ammonia in groundwater and surface water, drinking water, wastewater, swimming water

SIGNIFICANCE & USE

Ammonia and ammonium are naturally occurring organic compounds that are formed during decomposition of proteins, manure and urine wastes, and from other nitrogen-containing compounds. Ammonia and ammonium compounds are excellent sources of plant nitrogen, present in most fertilizers, whether natural or synthetic.
Ammonia solutions are effective for cleaning hard surfaces and as such, household cleaners such as glass, floor and counter cleaners are often ammonia-based.

RECOMMENDATIONS

***Note**: results must be checked for plausibility e.g. samples diluted and/or spiked.*

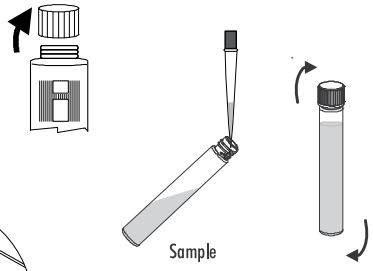
- Adjust sample pH with sodium hydroxide solution or sulphuric acid to maintain pH level between pH 4 and pH 9
- Keep both sample temperature and sample cuvette at 25 °C to avoid erroneous results
- Analise sample immediately after collection
- Filter turbid samples following ISO 23695 procedure
- Where appropriate, use dilution to eliminate interferences so that interfering ions fall below maximum tolerable concentration and NH_4^+ level is kept within measurement range
- Turbidity, color, and high salinity levels can affect both measurement and speed of color development

MEASUREMENT PROCEDURE

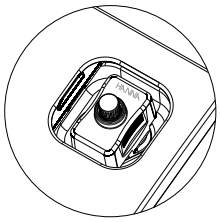
Before using the reagent kit carefully read all the instructions and the Safety Data Sheets (SDS).
Pay particular attention to all warnings, cautions and notes. Failure to do so may result in serious injury of the operator.
White crystals may be present in the reaction cells. They do not have an impact on the accuracy.

***Note**: Method selection is done automatically using a barcoded HI96791V-0 Ammonia ISO Low Range Reagent Vial following the procedure described in the Barcode Methods section.*
Alternatively, select the Ammonia LR ISO (13 mm) method using the procedure described in the Factory Methods section.

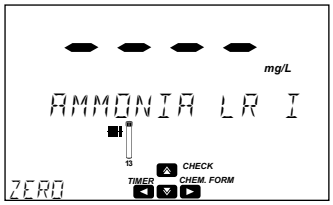
- Insert the supplied 13 mm vial adapter using the procedure described in the Cuvette & Vial Adapters section.
- Remove the cap from HI96791V-0 Ammonia ISO Low Range Vial.

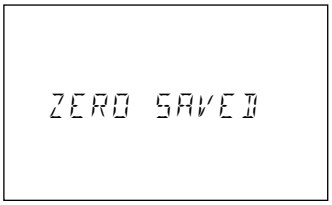


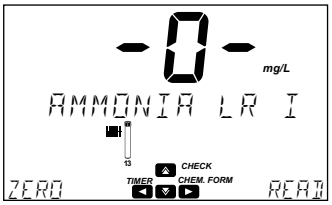
- Add 6 mL of sample to the vial, while keeping the vial at a 45-degree angle.
- Replace the cap. Invert several times to mix.



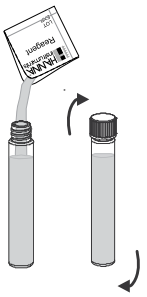
- Insert the vial into the adapter.
  Press steadily down until the vial clicks in place.
- Press **ZERO**.
  The meter scans the barcode and switches to the correct method automatically.
- The display will show "-0-" when the meter is zeroed and ready for measurement.



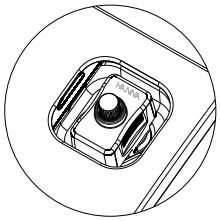




- Remove the vial.

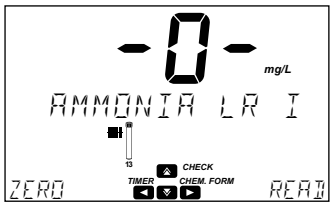


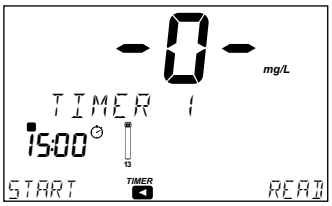
- Remove the cap and add one packet of HI96791-0 Ammonia ISO powder reagent.
- Replace the cap. Invert gently for 60 seconds.

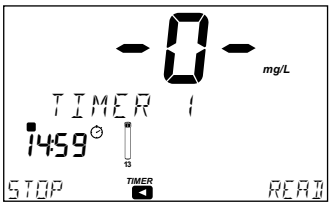


- Insert the vial into the adapter.
  Press steadily down until the vial clicks in place.
- Press the ◀ key to access the timer menu.

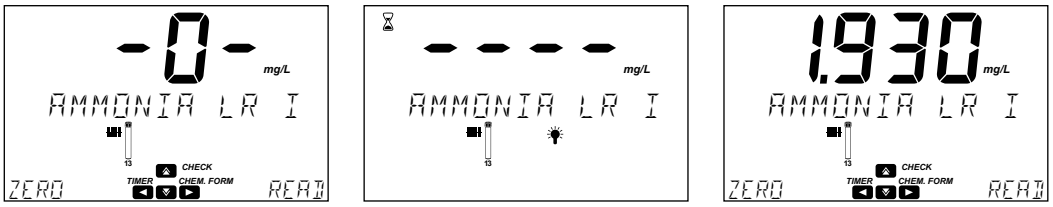
  Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 15 minutes.



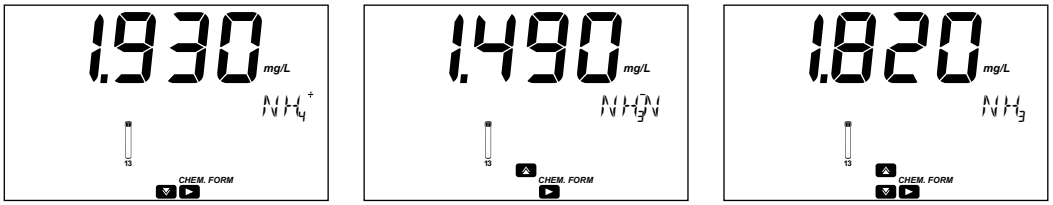




- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **ammonium (NH_4^+)**.



- Press the ⏬ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ⏫ key to convert the results to **mg/L** of **ammonia nitrogen (NH_3-N)** or **ammonia (NH_3)**.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Chloride (Cl^-) above 1500 mg/L
- Sodium (Na), Sulfate (SO_4^{2-}) above 1000 mg/L
- Bicarbonate (HCO_3-), Calcium (Ca^{2+}), Potassium (K) above 500 mg/L
- Nitrate (NO_3^-) above 250 mg/L
- Carbonate (CO_3^{2-}) above 200 mg/L
- Phosphate (PO_4^{3-}) above 100 mg/L
- Cr (III), Cu (II), Nitrite (NO_2^-) above 50 mg/L
- Magnesium (Mg^{2+}) above 30 mg/L
- Fe (II) above 25 mg/L
- Mn (II) above 5 mg/L
- Na_2SO_4 above 5%

Turbidity, color, and high salinity levels can affect both measurement and speed of color development.
Interferences checked individually in solution containing 1 mg/L of NH_4^+.
The cumulative effects have not been determined but cannot be excluded.
The determination is not yet interfered with up to the concentrations of foreign substances given above.

Ammonia Medium Range

SPECIFICATIONS

Range	0.00 to 10.00 mg/L (as NH_3-N)
Resolution	0.01 mg/L
Accuracy	± 0.05 mg/L ± 5% of reading at 25 °C, whichever is greater
Wavelength	425 nm
Cuvette type	16 mm diameter
Method	Adaptation of the ASTM Manual of Water and Environmental Technology, D1426, Nessler Method
Method ID	#006

REQUIRED REAGENTS

Code	Description	Quantity
HI93715A-0	Ammonia Medium Range Reagent A	4 drops
HI93715B-0	Ammonia Medium Range Reagent B	4 drops

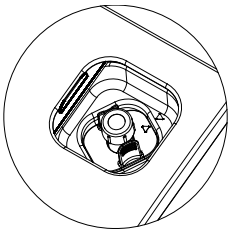
REAGENT SETS

HI93715-01	Reagents for 100 tests
HI93715-03	Reagents for 300 tests

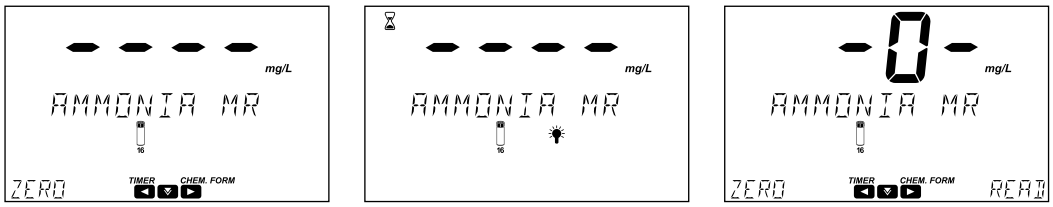
For other accessories see Accessories section.

MEASUREMENT PROCEDURE

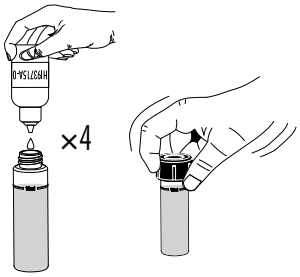
- Select the Ammonia MR method using the procedure described in the Factory Methods section.
- Fill the cuvette with 10 mL of unreacted sample (up to the mark). Replace the plastic stopper and the cap.

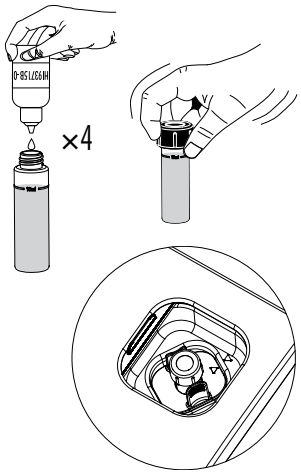


- Insert the 16 mm cuvette adapter using the procedure described in the Cuvette & Vial Adapters section.
- Insert the cuvette into the adapter and close the lid.
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.

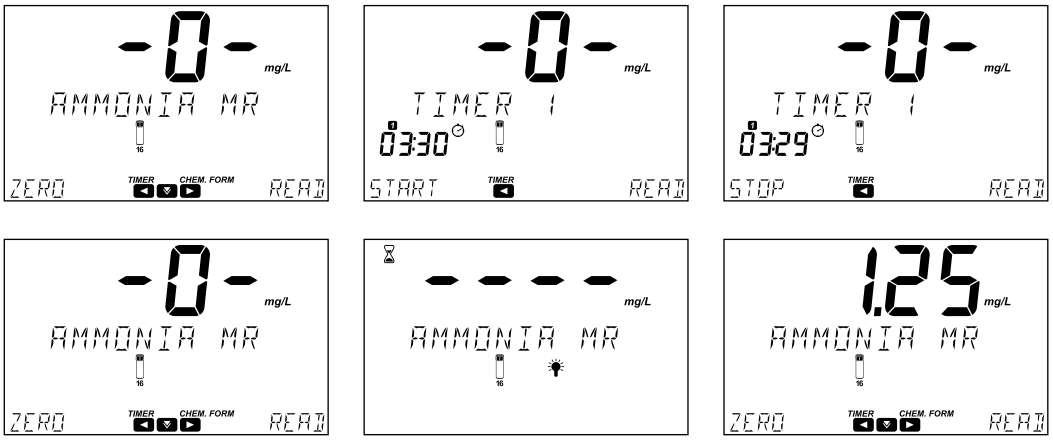


- Remove the cuvette.
- Add 4 drops of HI93715A-0 Ammonia Medium Range Reagent A. Replace the plastic stopper and the cap. Swirl to mix the solution.

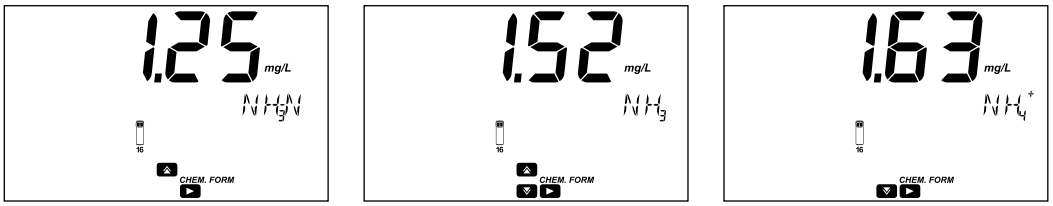




- Add 4 drops of HI93715B-0 Ammonia Medium Range Reagent B. Replace the plastic stopper and the cap. Swirl to mix the solution.
- Insert the cuvette into the adapter and close the lid.
- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 3 minutes and 30 seconds.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **ammonia nitrogen (NH_3-N)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ▲ key to convert the results to **mg/L** of **ammonia (NH_3)** or **ammonium (NH_4^+)**.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Hardness above 1 g/L
- Iron
- Sulfide may cause turbidity
- Organic compounds like acetone above 0.1%, alcohols, aldehydes, aliphatic and aromatic amines, chloramines, glycine, or urea above 10 mg/L
  Distillation is required to remove the interference.

Ammonia High Range

SPECIFICATIONS

Range	0.0 to 100.0 mg/L (as NH_4^+)
Resolution	0.1 mg/L
Accuracy	±0.5 mg/L ± 5% of reading at 25 °C
Wavelength	425 nm
Cuvette type	16 mm diameter
Method	Adaptation of the ASTM Manual of Water and Environmental Technology, D1426, Nessler Method
Method ID	#007

REQUIRED REAGENTS

Code	Description	Quantity
HI93733A-0	Ammonia High Range Reagent A	4 drops
HI93733B-0	Ammonia High Range Reagent B	9 mL

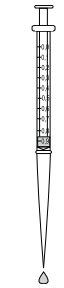
REAGENT SETS

HI93733-01	Reagents for 100 tests
HI93733-03	Reagents for 300 tests

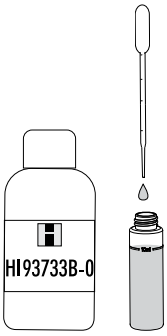
For other accessories see Accessories section.

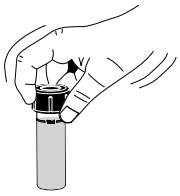
MEASUREMENT PROCEDURE

- Select the Ammonia HR method using the procedure described in the Factory Methods section.
- Insert the 16 mm cuvette adapter using the procedure described in the Cuvette & Vial Adapters section.
- Add 1 mL of unreacted sample to the cuvette using 1 mL syringe.

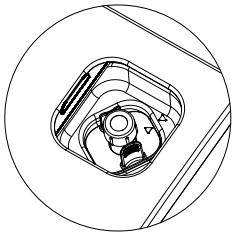


- Use the pipette to fill the cuvette up to the 10 mL mark with HI93733B-0 Ammonia High Range Reagent B. Replace the plastic stopper and the cap. Swirl to mix the solution.

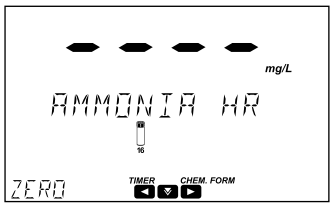


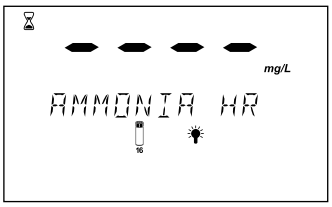


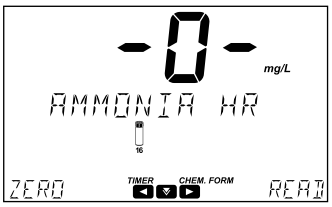
- Insert the cuvette into the holder and close the lid.



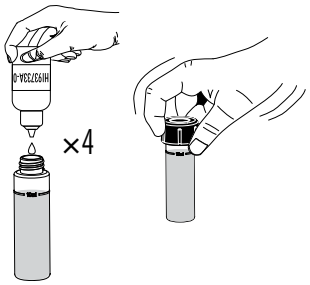
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



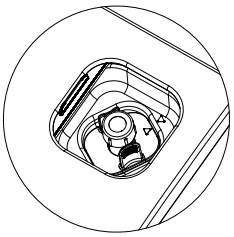




- Remove the cuvette

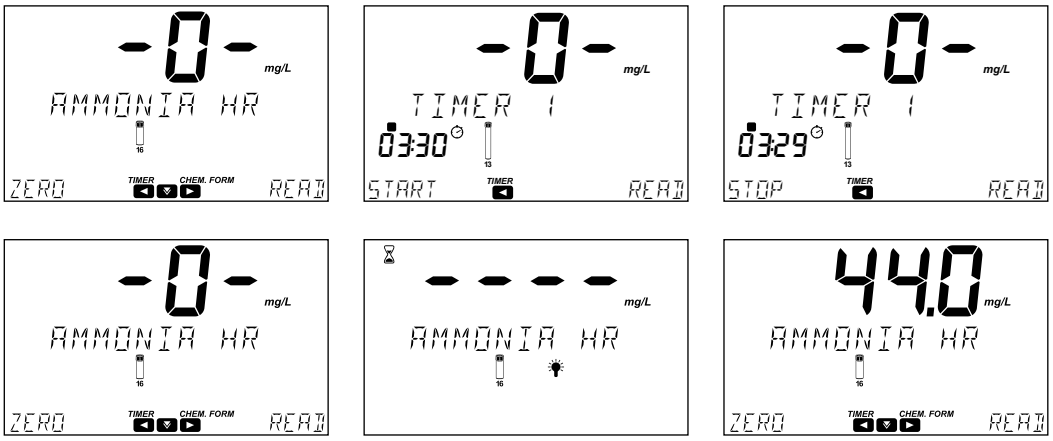


- Add 4 drops of HI93733A-0 Ammonia High Range Reagent A. Replace the plastic stopper and the cap. Swirl to mix the solution.



- Insert the cuvette into the adapter and close the lid.

- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown or wait 3 minutes and 30 seconds.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **ammonium (NH_4^+)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ▲ key to convert the results to **mg/L** of **ammonia nitrogen (NH_3-N)** or **ammonia (NH_3)**.

- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Hardness above 1 g/L
- Iron
- Sulfide may cause turbidity
- Organic compounds like acetone above 0.1%, alcohols, aldehydes, aliphatic and aromatic amines, chloramines, glycine, or urea above 10 mg/L
  Distillation is required to remove the interference.

Ammonia High Range (13 mm Vial)

SPECIFICATIONS

Range	0.0 to 100.0 mg/L (as NH_3-N)
Resolution	0.1 mg/L
Accuracy	± 1.0 mg/L or ± 5% of reading at 25 °C, whichever is greater
Wavelength	430 nm
Cuvette type	13 mm diameter
Method	Adaptation of the ASTM Manual of Water and Environmental Technology, D1426 Nessler Method
Method ID	#008

REQUIRED REAGENTS

Code	Description	Quantity
HI93764B-0*	Ammonia High Range Reagent Vial	1 vial
HI93764-0	Nessler Reagent	4 drops

*Reagent vial identification: green label

REAGENT SETS

HI93764B-25	Reagents for 25 tests

For other accessories see Accessories section.

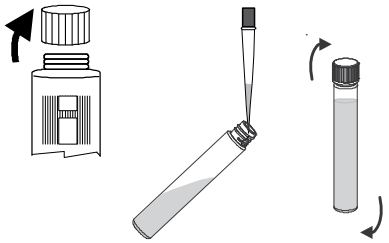
***Note**: Store the unused vials in their packaging in a cool and dark place.*

MEASUREMENT PROCEDURE

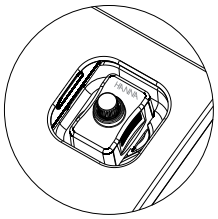
***Note**: Method selection is done automatically using a barcoded HI93764B-0 Ammonia High Range Reagent Vial following the procedure described in the Barcode Methods section.*

Alternatively, select the Ammonia HR (13 mm) method using the procedure described in the Factory Methods section.

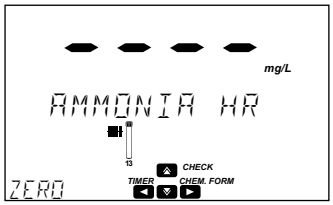
- Insert the supplied 13 mm vial adapter using the procedure described in the Cuvette & Vial Adapters section.
- Remove the cap from HI93764B-0 Ammonia High Range Reagent Vial.

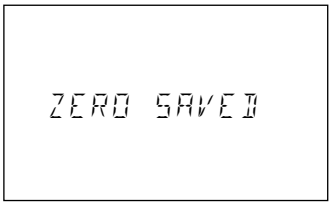


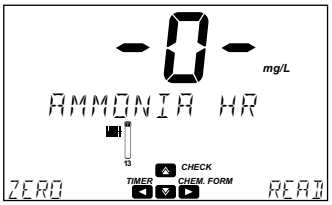
- Add 1 mL of sample to the vial, while keeping the vial at a 45-degree angle.
- Replace the cap. Invert several times to mix.
- Insert the vial into the adapter.
  Press steadily down until the vial clicks in place.



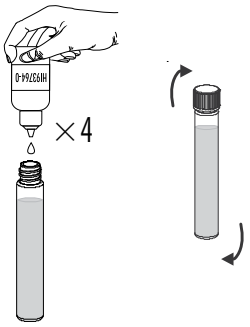
- Press **ZERO**.
  The meter scans the barcode and switches to the correct method automatically..
- The display will show "-0-" when the meter is zeroed and ready for measurement.



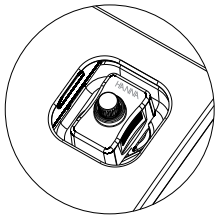




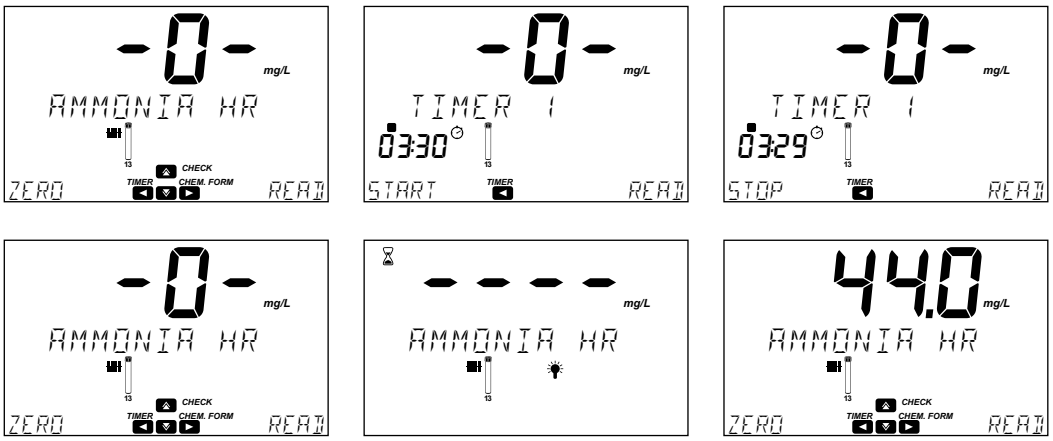
- Remove the vial.



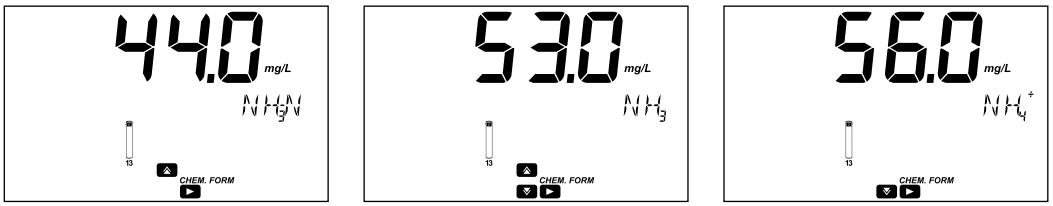
- Remove the cap and add 4 drops of HI93764-0 Nessler Reagent.
- Replace the cap. Invert the vial several times to mix.
- Insert the vial into the adapter.
  Press steadily down, until the vial clicks in place.



- Press the ◀ key to access the timer menu.
  Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 3 minutes and 30 seconds.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **ammonia nitrogen (NH_3-N)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ▲ key to convert the results to **mg/L ammonia (NH_3)** or **ammonium (NH_4^+)**.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Hardness above 1 g/L
- Iron
- Sulfide may cause turbidity
- Organic compounds like acetone above 0.1%, alcohols, aldehydes, aliphatic and aromatic amines, chloramines, glycine, or urea above 10 mg/L
  Distillation is required to remove the interference.

Bromine

SPECIFICATIONS

Range	0.00 to 10.00 mg/L (as Br_2)
Resolution	0.01 mg/L
Accuracy	±0.08 mg/L ±3% of reading at 25 °C
Wavelength	525 nm
Cuvette type	22 mm diameter
Method	Adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th Edition, DPD Method
Method ID	#009

REQUIRED REAGENTS

Code	Description	Quantity
HI93716-0	Bromine Reagent	1 packet

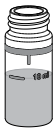
REAGENT SETS

HI93716-01	Reagents for 100 tests
HI93716-03	Reagents for 300 tests

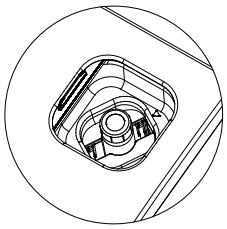
For other accessories see Accessories section.

MEASUREMENT PROCEDURE

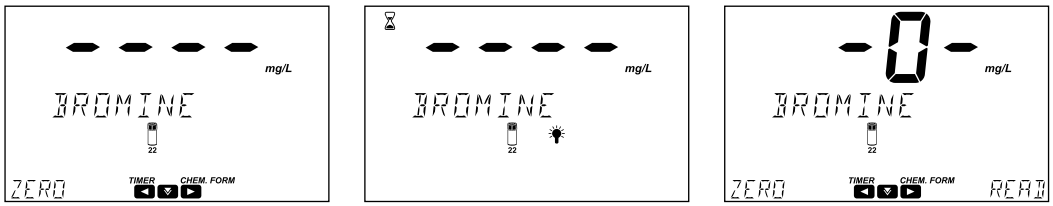
- Select the Bromine method using the procedure described in the Factory Methods section.
- Fill the cuvette with 10 mL of unreacted sample (up to the mark). Replace the plastic stopper and the cap.



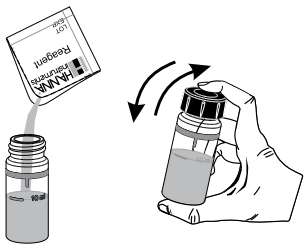
- Insert the cuvette into the holder and close the lid.



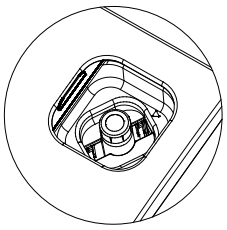
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



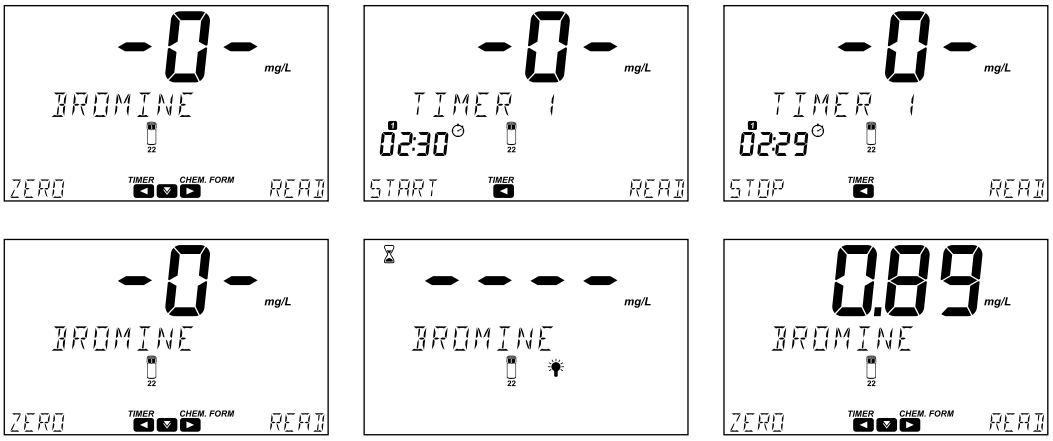
- Remove the cuvette
- Add one packet of HI93716-0 Bromine Reagent. Replace the plastic stopper and the cap. Shake gently for about 20 seconds to dissolve most of the reagent.



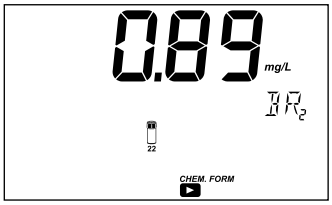
- Insert the cuvette into the holder and close the lid.



- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 2 minutes and 30 seconds.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **bromine (Br_2)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Chlorine, Iodine, Ozone, Oxidized forms of Chromium and Manganese
- Hardness greater than 500 mg/L $CaCO_3$
  To remove the interference shake the sample for approximately 1 minute after adding the reagent.
- Alkalinity greater than 300 mg/L $CaCO_3$ or acidity greater than 150 mg/L $CaCO_3$
  The color of the sample may develop only partially or rapidly fade. To remove the interference neutralize the sample with diluted HCl or NaOH.

Calcium

SPECIFICATIONS

Range	0 to 400 mg/L (as Ca^{2+})
Resolution	1 mg/L
Accuracy	±10 mg/L ±5% of reading at 25 °C
Wavelength	466 nm
Cuvette type	22 mm diameter
Method	Adaptation of the Oxalate Method
Method ID	#010

REQUIRED REAGENTS

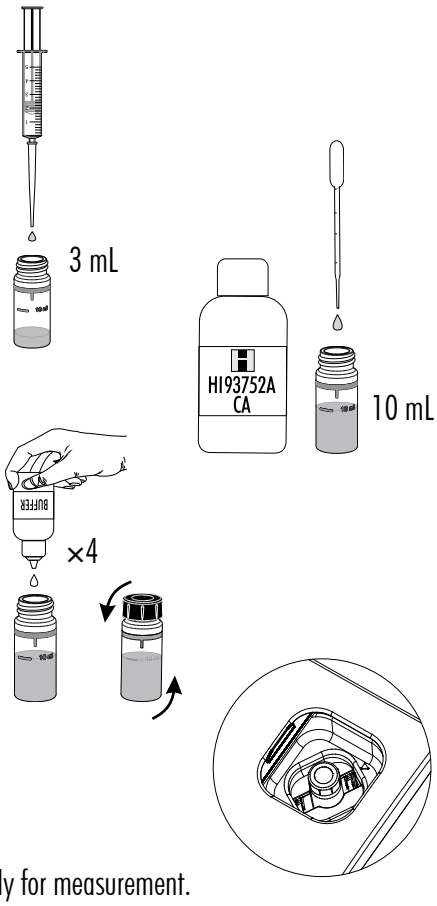
Code	Description	Quantity
-	Buffer Reagent	4 drops
HI93752A-Ca	Calcium Reagent A	7 mL
HI93752B-Ca	Calcium Reagent B	1 mL

REAGENT SETS

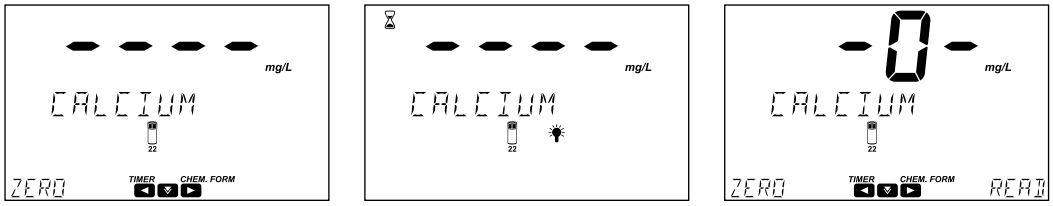
HI937521-01	Reagents for 50 tests
HI937521-03	Reagents for 150 tests

For other accessories see Accessories section.

MEASUREMENT PROCEDURE

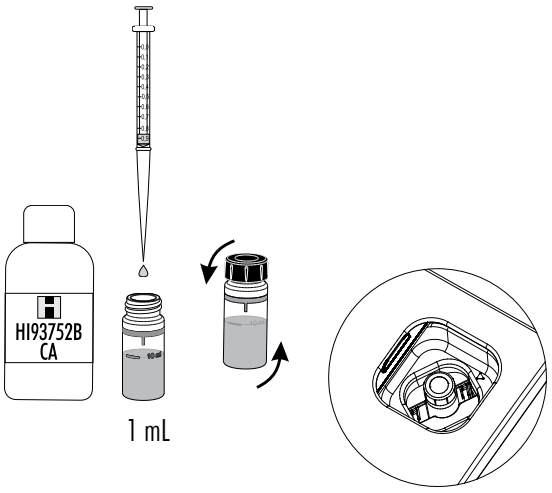


- Select the Calcium method using the procedure described in the Factory Methods section.
- Add 3 mL of unreacted sample to the cuvette using the 5 mL syringe.
- Use the pipette to fill the cuvette up to the 10 mL mark with the HI93752A-Ca Calcium Reagent A.
- Add 4 drops of Buffer Reagent.
- Replace the plastic stopper and the cap. Invert several times to mix.
- Insert the cuvette into the holder and close the lid.
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



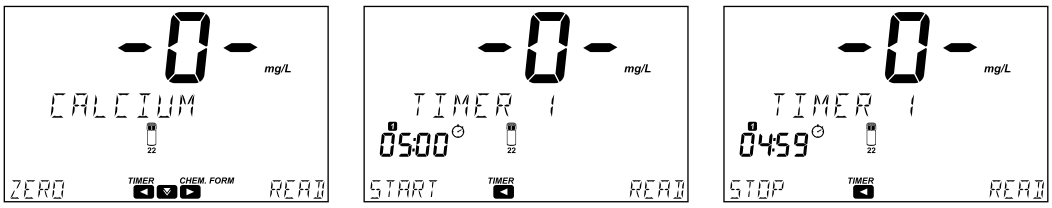
- Remove the cuvette.

- Add 1 mL of HI93752B-Ca Calcium Reagent B to the sample using the 1 mL syringe. Replace the plastic stopper and the cap. Invert the cuvette 10 times to mix (about 15 seconds).



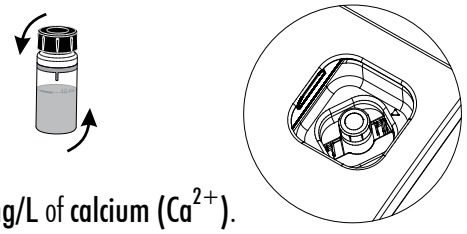
- Insert the cuvette into the holder and close the lid.

- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown or wait 5 minutes.

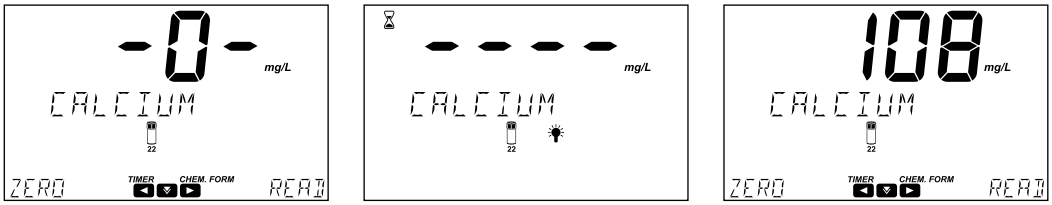


- Invert the cuvette 10 times to mix (about 15 seconds).

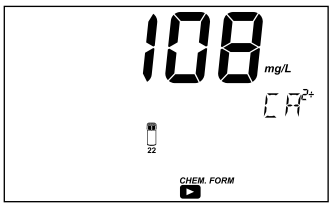
- Insert the cuvette into the holder and close the lid.



- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **calcium (Ca^{2+})**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Acidity, Alkalinity above 1000 mg/L $CaCO_3$
- Magnesium above 400 mg/L

Calcium, Marine

SPECIFICATIONS

Range	200 to 600 mg/L (as Ca^{2+})
Resolution	1 mg/L
Accuracy	± 5% of reading at 25 °C
Wavelength	610 nm
Cuvette type	16 mm diameter
Method	Adaptation of the Zincon Method
Method ID	#011

REQUIRED REAGENTS

Code	Description	Quantity
HI7581	Calcium Reagent A	1 mL
HI7582	Calcium Reagent B	1 packet

REAGENT SETS

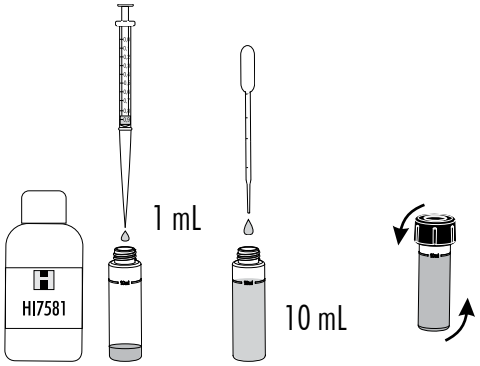
HI758-26	Reagents for 25 tests

For other accessories see Accessories section.

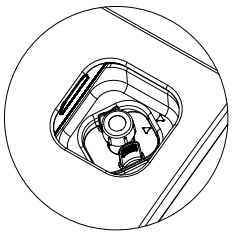
MEASUREMENT PROCEDURE

- Select the Calcium Marine method using the procedure described in the Factory Methods section.
- Insert the 16 mm cuvette adapter using the procedure described in the Cuvette & Vial Adapters section.

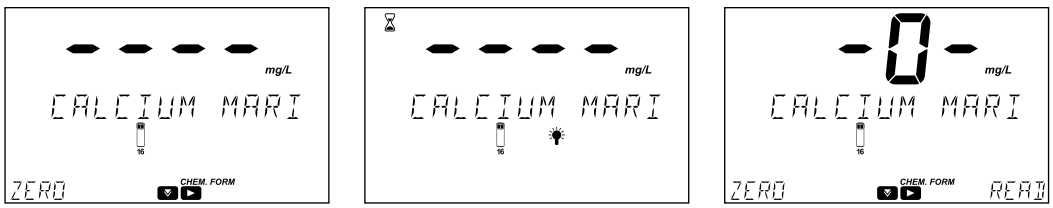
- Add 1 mL of HI7581 Calcium Reagent A to the cuvette using a 1 mL syringe.
- Use the plastic pipette to fill the cuvette to the 10 mL mark with deionized water and replace the plastic stopper and the cap. Invert 5 times to mix.



- Insert the cuvette into the adapter and close the lid.

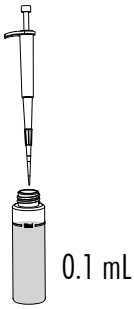


- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.

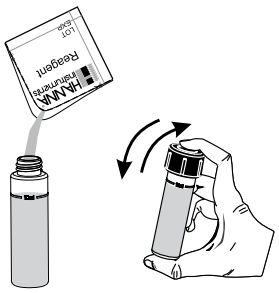


- Remove the cuvette.

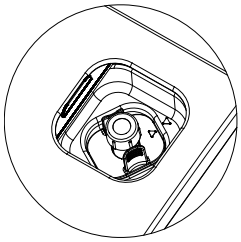
- Use the HI731339 micropipette to add 0.1 mL of sample to the cuvette.



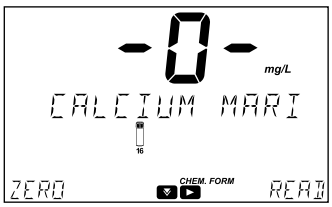
- Add one packet of HI7582 Calcium Reagent B. Replace the plastic stopper and the cap. Shake vigorously for 15 seconds or until the powder is completely dissolved. Allow air bubbles to dissipate for 15 seconds before taking a reading.

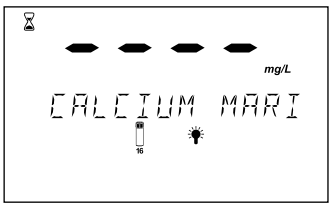


- Insert the cuvette into the adapter and close the lid.

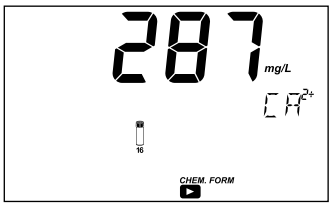


- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **calcium (Ca^{2+})**.





- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

Chloride

SPECIFICATIONS

Range	0.0 to 20.0 mg/L (as Cl^-)
Resolution	0.1 mg/L
Accuracy	±0.5 mg/L ±5% of reading at 25 °C
Wavelength	455 nm
Cuvette type	22 mm diameter
Method	Adaptation of the Mercury (II) Thiocyanate Method
Method ID	#012

REQUIRED REAGENTS

Code	Description	Quantity
HI93753A-0	Chloride Reagent A	1 mL
HI93753B-0	Chloride Reagent B	1 mL

REAGENT SETS

HI93753-01	Reagents for 100 tests
HI93753-03	Reagents for 300 tests

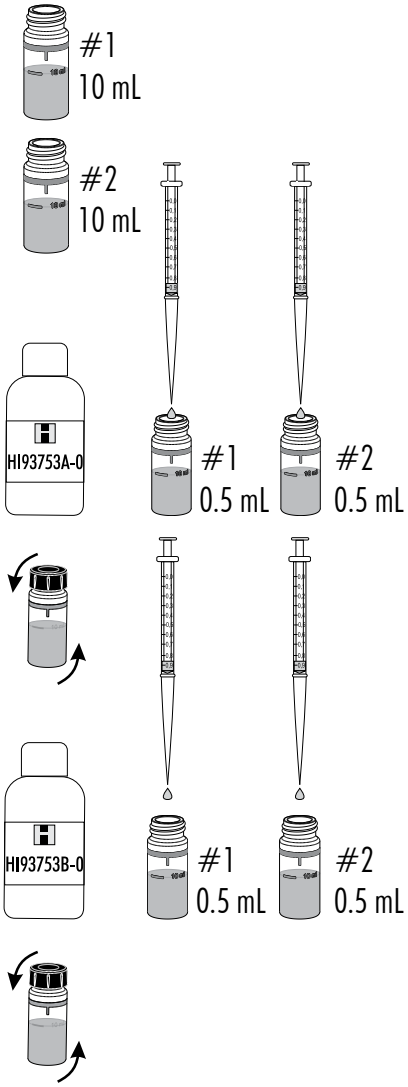
For other accessories see Accessories section.

MEASUREMENT PROCEDURE

- Select the Chloride method using the procedure described in the Factory Methods section.
- Fill one cuvette (#1) with 10 mL of deionized water (up to the mark).
- Fill another cuvette (#2) with 10 mL of sample (up to the mark).

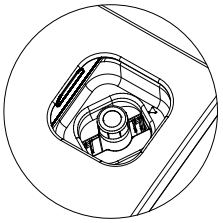
***Note**: For samples with low chloride ion concentration, rinse the cuvette a few times with sample before filling it with 10 mL of sample. For the most accurate results, use two graduated pipettes to deliver exactly 10 mL of deionized water and 10 mL of sample to the cuvettes.*

- Add 0.5 mL of HI93753A-0 Chloride Reagent A to each cuvette using the 1 mL syringe.
- Replace the plastic stoppers and the caps. Mix each cuvette by inverting for approximately 30 seconds.
- Add 0.5 mL of HI93753B-0 Chloride Reagent B to each cuvette using the second 1 mL syringe.
- Replace the plastic stoppers and the caps. Mix each cuvette by inverting for approximately 30 seconds.

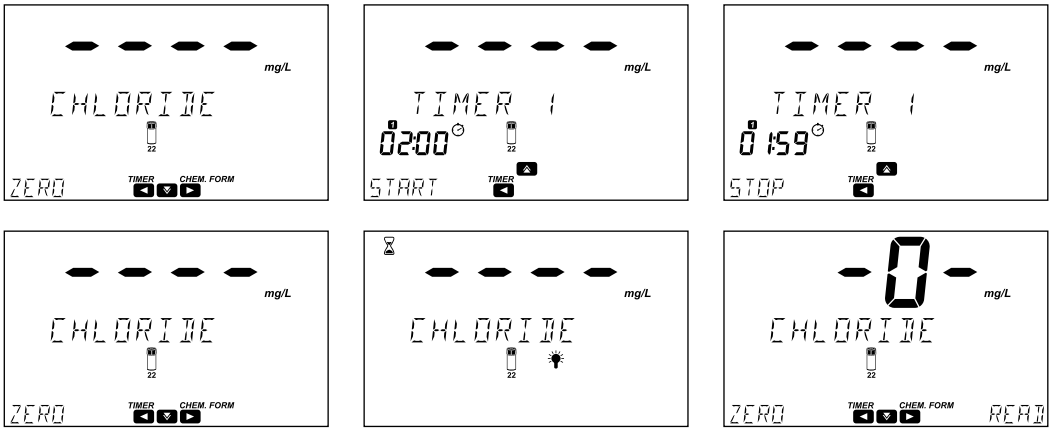


- Insert the cuvette with the reacted deionized water (#1) into the holder and close the lid.

#1

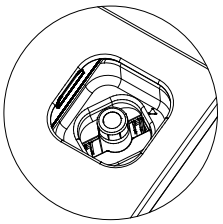


- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to the zero or wait 2 minutes.
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.

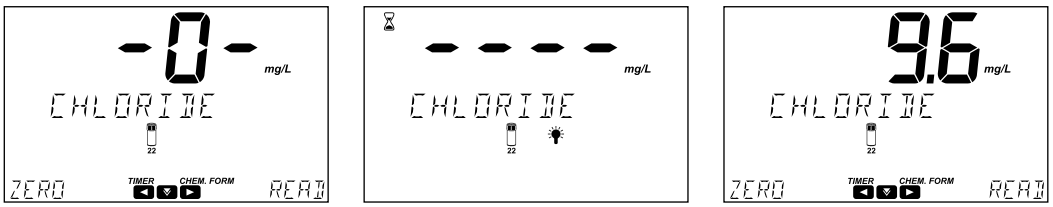


- Remove the cuvette.
- Insert the other cuvette (#2) with the reacted sample into the holder and close the lid.

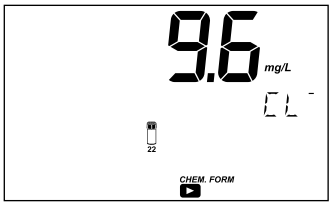
#2



- Press **READ** to start reading. The instrument displays the results in **mg/L** of **chloride (Cl^-)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Intensely colored samples
  Samples should be adequately treated before performing the test.
- Suspended matter in large amount should be removed by prior filtration
- Alkaline samples
  Neutralize before adding reagents, the pH of the sample after addition of reagents should be about 2.

Chlorine Dioxide

SPECIFICATIONS

Range	0.00 to 2.00 mg/L (as ClO_2)
Resolution	0.01 mg/L
Accuracy	±0.10 mg/L ±5% of reading at 25 °C
Wavelength	575 nm
Cuvette type	22 mm diameter
Method	Adaptation of the Chlorophenol Red Method
Method ID	#013

REQUIRED REAGENTS

Code	Description	Quantity
HI93738A-0	Chlorine Dioxide Reagent A	1 mL
HI93738B-0	Chlorine Dioxide Reagent B	1 packet
HI93738C-0	Chlorine Dioxide Reagent C	1 mL
HI93738D-0	Chlorine Dioxide Reagent D	1 mL

REAGENT SETS

HI93738-01	Reagents for 100 tests
HI93738-03	Reagents for 300 tests

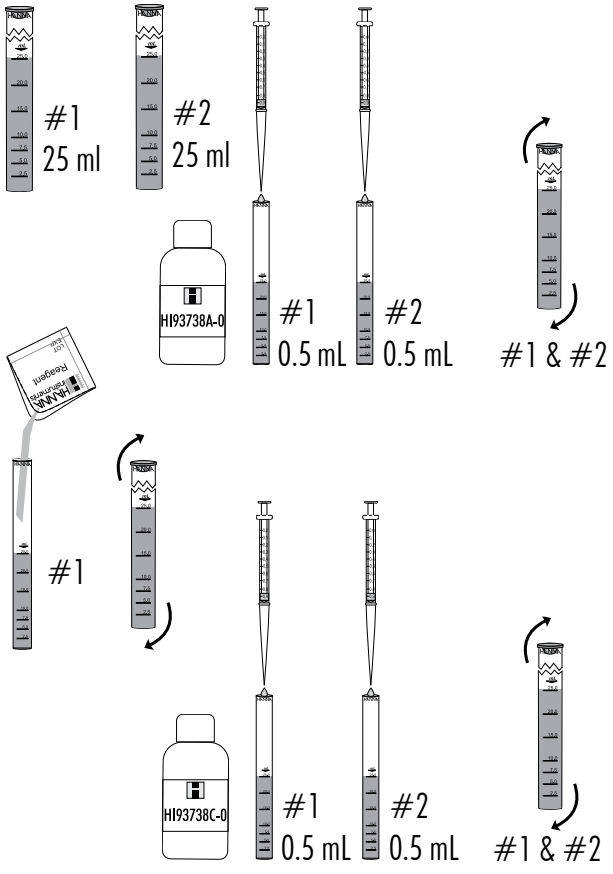
For other accessories see Accessories section.

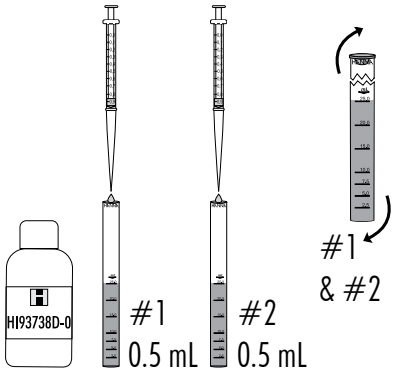
SAMPLING PROCEDURE

It is recommended to analyze chlorine dioxide samples immediately after collection. Chlorine Dioxide samples must be stored in sealed dark glass bottle, with minimal head space. Excessive heat (above 25 °C /77 °F), agitation and exposure to light must be avoided.

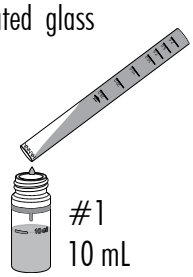
MEASUREMENT PROCEDURE

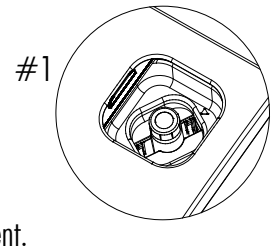
- Select the Chloride Dioxide method using the procedure described in the Factory Methods section.
- Fill two graduated mixing cylinders (#1 & #2) up to the 25 mL mark with the sample.
- Add 0.5 mL of HI93738A-0 Chlorine Dioxide Reagent A to each graduated mixing cylinder (#1 & #2), using a 1 mL syringe, replace the caps. Invert several times to mix.
- Add one packet of HI93738B-0 Chlorine Dioxide Reagent B to one of the two graduated mixing cylinder (#1), replace the cap. Invert several times until the reagent is totally dissolved. This is the blank.
- Add 0.5 mL of HI93738C-0 Chlorine Dioxide Reagent C to each graduated mixing cylinder (#1 & #2), using a 1 mL syringe, replace the cap. Invert several times to mix.



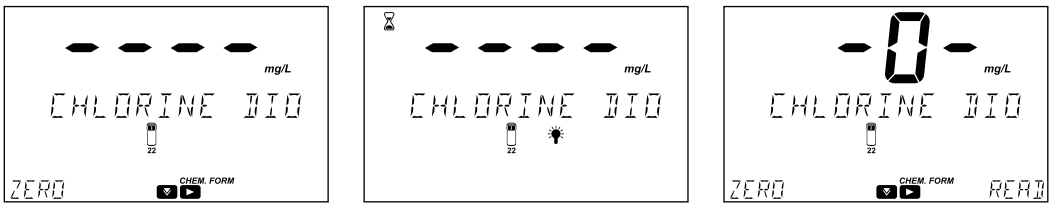


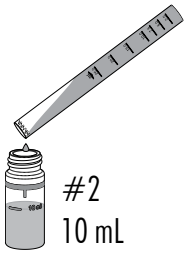
- Add 0.5 mL of HI93738D-0 Chlorine Dioxide Reagent to each graduated mixing cylinder (#1 & #2), using a 1 mL syringe. Replace the cap. Invert several times to mix. Graduated glass cylinder #2 is the reacted sample.

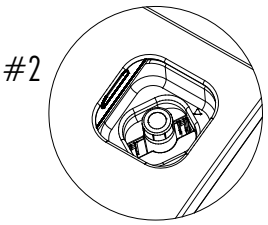




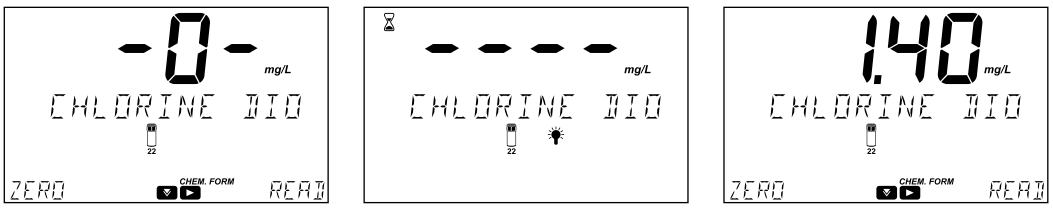
- Fill cuvette (#1) with 10 mL of the blank (up to the mark). Replace the plastic stopper and the cap.
- Insert the blank (#1) into the holder and close the lid.
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



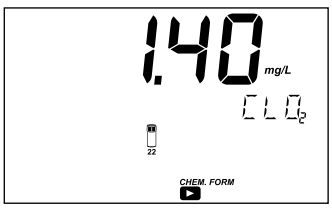




- Fill second cuvette (#2) with 10 mL of the reacted sample (up to the mark). Replace the plastic stopper and the cap.
- Insert the sample (#2) into the holder and close the lid.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **chlorine dioxide (ClO_2)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Strong oxidants

Chlorine Dioxide (Rapid)

SPECIFICATIONS

Range	0.00 to 2.00 mg/L (as ClO_2)
Resolution	0.01 mg/L
Accuracy	±0.10 mg/L ±5% of reading at 25 °C
Wavelength	525 nm
Cuvette type	22 mm diameter
Method	Adaptation of Standard Methods for the Examination of Water and Wastewater, 18th Edition, 4500 ClO_2 D
Method ID	#086

REQUIRED REAGENT

Code	Description	Quantity
HI96779A-0	Chlorine Dioxide Reagent A	5 drops
HI96779B-0	Chlorine Dioxide Reagent B	1 packet

REAGENT SETS

HI96779-01	Reagents for 100 tests
HI96779-03	Reagents for 300 tests

For other accessories see Accessories section.

PRINCIPLE

The reaction between the Chlorine Dioxide and DPD indicator causes a pink tint in the sample, the addition of glycine as a masking agent inhibits the response of free chlorine.

APPLICATION

Drinking water, tap water, treated water

SAMPLING PROCEDURE

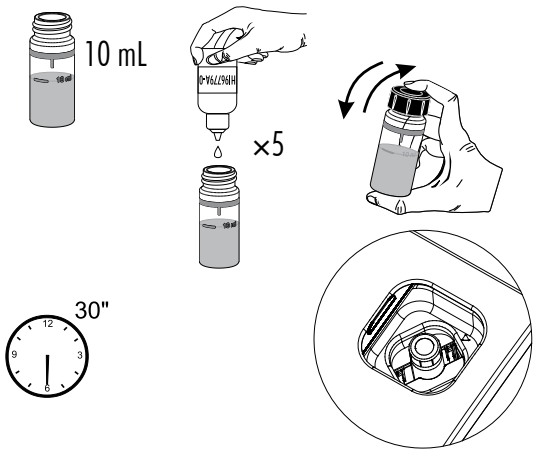
Collect the sample in a clean glass bottle and analyze it immediately. Chlorine dioxide is a strong oxidizing agent and is unstable in water.

SIGNIFICANCE & USE

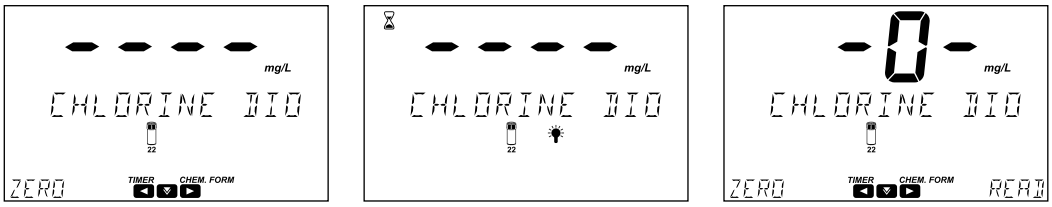
Chlorine Dioxide is a commonly-used alternative to chlorine (Cl_2) as a water disinfectant. The Chlorophenol Red method (non-rapid method) reacts specifically with chlorine dioxide with little interference from free chlorine or chloramines, but the method procedure is cumbersome. The Chlorine Dioxide Rapid Method based on the DPD (N,N-diethyl-p-phenylenediamine) indicator is a much simpler method by comparison, but it is susceptible to interference from other oxidizers. Glycine (Reagent A) is able to convert free chlorine to chloroaminoacetic acid without affecting the analysis of chlorine dioxide content.

MEASUREMENT PROCEDURE

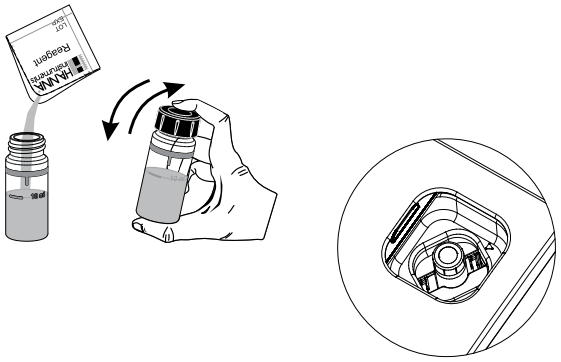
- Select the Chlorine Dioxide (Rapid) method using the procedure described in the Factory Methods section.
- Fill a cuvette with 10 mL of unreacted sample (up to the mark).
- Add 5 drops of HI96779A-0 Chlorine Dioxide Reagent A.
- Replace the plastic stopper and the cap. Shake gently for 30 seconds.
- Wait 30 seconds.
- Insert the cuvette into the holder and close the lid.



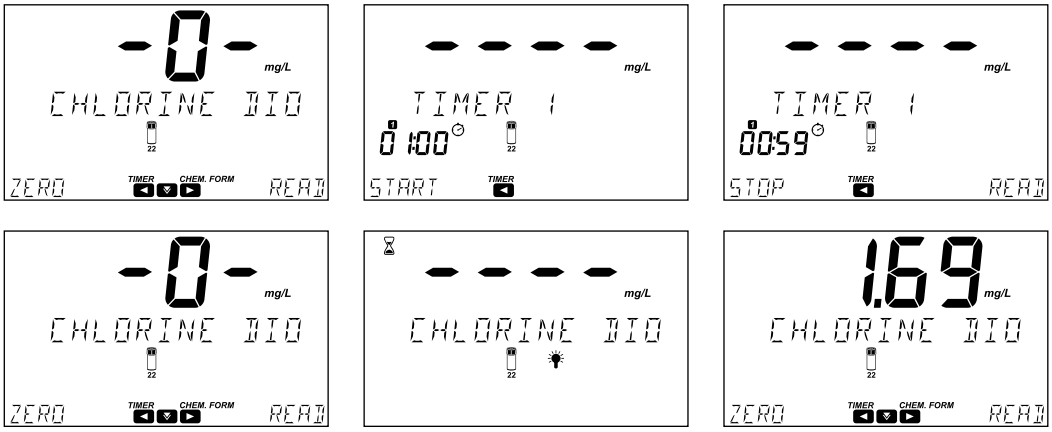
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



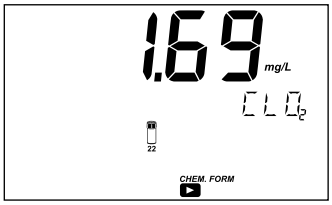
- Remove the cuvette.
- Add one packet of HI96779B-0 Chlorine Dioxide Reagent B to the cuvette. Replace the plastic stopper and the cap. Shake gently for 20 seconds.
- Insert the cuvette into the holder and close the lid.



- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 1 minute.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of ClO_2.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Acidity, Alkalinity, Flocculating agents, Hardness, Inorganic and Organic Chloramines, Manganese, Metals, Monochloramine, Oxidized forms of Chromium and Manganese, Ozone and Peroxides
- Chlorine above 5 mg/L
- Bromine above 0.1 mg/L
- Highly buffered samples or extreme sample pH

Chlorine, Free Ultra Low Range

SPECIFICATIONS

Range	0.000 to 0.500 mg/L (as Cl_2)
Resolution	0.001 mg/L
Accuracy	±0.020 mg/L ±3% of reading at 25 °C
Wavelength	525 nm
Cuvette type	22 mm diameter
Method	Adaptation of the EPA DPD Method 330.5
Method ID	#014

REQUIRED REAGENTS

Code	Description	Quantity
HI95762-0	Free Chlorine Ultra Low Range Reagent	1 packet

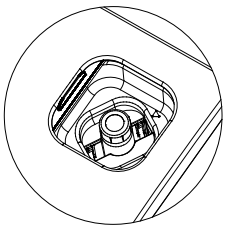
REAGENT SETS

HI95762-01	Reagents for 100 tests
HI95762-03	Reagents for 300 tests

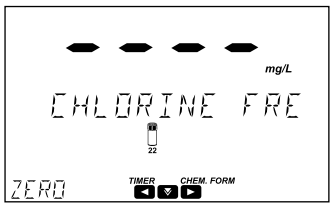
For other accessories see Accessories section.

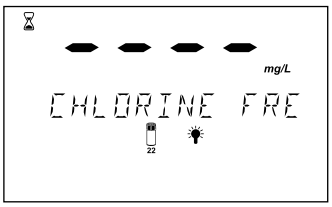
MEASUREMENT PROCEDURE

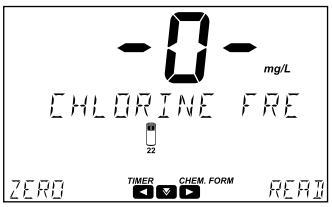
- Select the Chlorine Free ULR method using the procedure described in the Factory Methods section.
- Fill the cuvette with 10 mL of unreacted sample (up to the mark). Replace the plastic stopper and the cap.



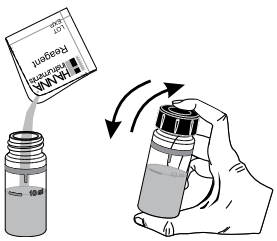
- Insert the cuvette into the holder and close the lid.
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



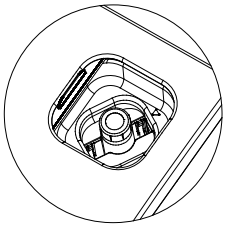




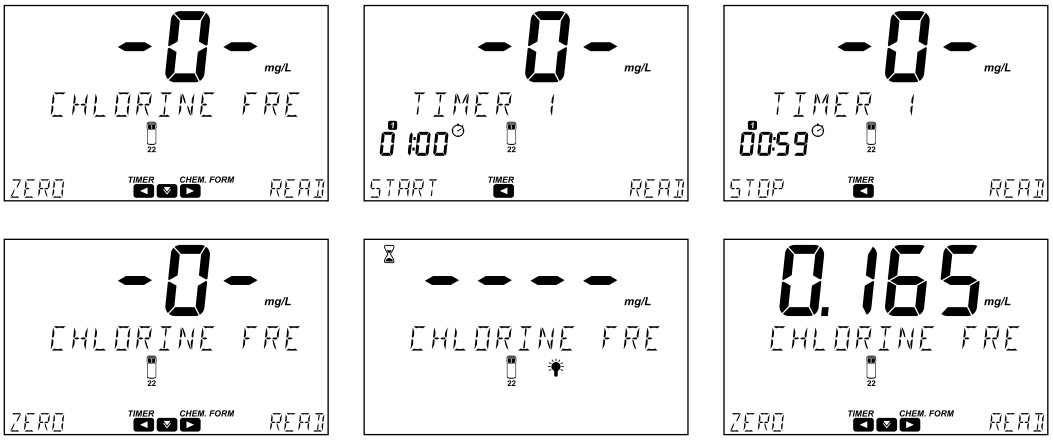
- Remove the cuvette.
- Add one packet of HI95762-0 Free Chlorine ULR Reagent. Replace the plastic stopper and the cap. Shake gently for 20 seconds.



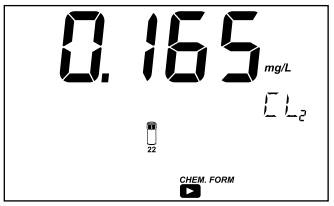
- Insert the cuvette into the holder and close the lid.



- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 1 minute.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **chlorine (Cl_2)**.



- Press the ⩔ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Bromine, Chlorine Dioxide, Iodine, Oxidized forms of Chromium and Manganese, Ozone
- Alkalinity greater than 1000 mg/L $CaCO_3$ if present as bicarbonate (pH $<$ 8.3), above 25 mg/L $CaCO_3$ if present as carbonate (pH $>$ 9.0) or acidity value greater than 150 mg/L $CaCO_3$
- The color of the sample may develop only partially or rapidly fade. To remove the interference neutralize the sample with diluted HCl or NaOH.
- Hardness greater than 500 mg/L $CaCO_3$
  To remove the interference shake the sample for approximately 2 minutes after adding the powder reagent.

Chlorine, Free Low Range (Powder Reagent)

SPECIFICATIONS

Range	0.00 to 5.00 mg/L (as Cl_2)
Resolution	0.01 mg/L
Accuracy	±0.03 mg/L ±3% of reading at 25 °C
Wavelength	525 nm
Cuvette type	22 mm diameter
Method	Adaptation of the EPA DPD Method 330.5
Method ID	#015

REQUIRED REAGENTS

Code	Description	Quantity
HI93701-0	Free Chlorine Reagent	1 packet

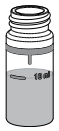
REAGENT SETS

HI93701-01	Reagents for 100 tests
HI93701-03	Reagents for 300 tests

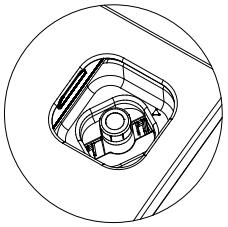
For other accessories see Accessories section.

MEASUREMENT PROCEDURE

- Select the Chlorine Free LR (POWDER) method using the procedure described in the Factory Methods section.
- Fill the cuvette with 10 mL of unreacted sample (up to the mark). Replace the plastic stopper and the cap.

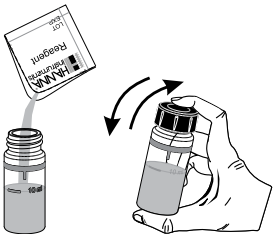


- Insert the cuvette into the holder and close the lid.

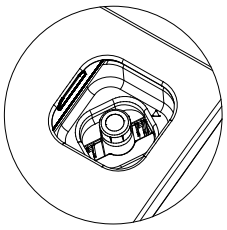


- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.

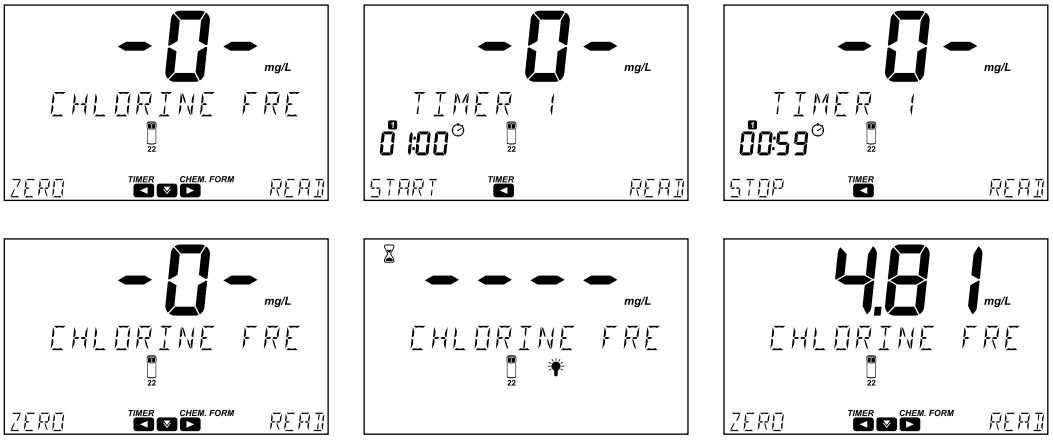
- Remove the cuvette.
- Add one packet of HI93701-0 Free Chlorine Reagent. Replace the plastic stopper and the cap. Shake gently for 20 seconds.



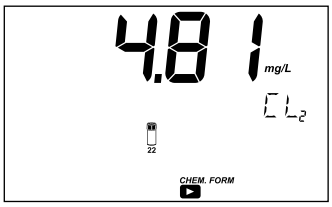
- Insert the cuvette into the holder and close the lid.



- Press the ◄ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 1 minute.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **chlorine (Cl_2)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ► key to view the chemical formula.



- Press the ► key to return to the measurement screen.

***Note**: Free and Total Chlorine have to be measured separately with fresh sample following the related procedure if both values are desired.*

INTERFERENCES

Interference may be caused by:

- Bromine, Iodine, Oxidized forms of Chromium and Manganese, Ozone
- Hardness greater than 500 mg/L $CaCO_3$
  To remove the interference shake the sample for approximately 2 minutes after adding the powder reagent.
- Alkalinity greater than 250 mg/L $CaCO_3$ or acidity value greater than 150 mg/L $CaCO_3$
  The color of the sample may develop only partially or rapidly fade. To remove the interference neutralize the sample with diluted HCl or NaOH.

Chlorine, Free Low Range (Liquid Reagent)

SPECIFICATIONS

Range	0.00 to 5.00 mg/L (as Cl_2)
Resolution	0.01 mg/L
Accuracy	±0.03 mg/L ±3% of reading at 25 °C
Wavelength	525 nm
Cuvette type	22 mm diameter
Method	Adaptation of the EPA DPD Method 330.5
Method ID	#016

REQUIRED REAGENTS

Code	Description	Quantity
HI93701A-F	Free Chlorine Reagent A	3 drops
HI93701B-F	Free Chlorine Reagent B	3 drops

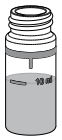
REAGENT SETS

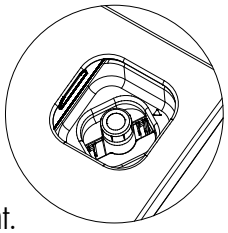
HI93701-F	Reagents for 300 tests (liquid)

For other accessories see Accessories section.

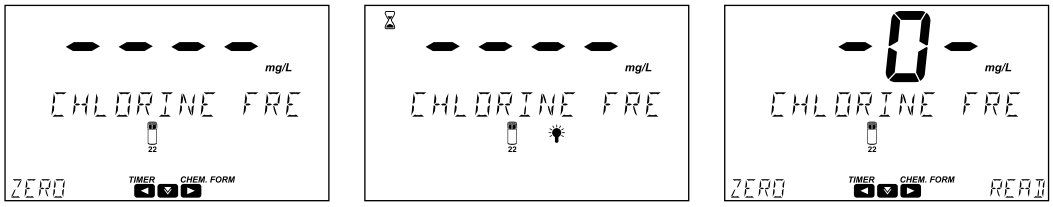
MEASUREMENT PROCEDURE

- Select the Chlorine Free LR (LIQUID) method using the procedure described in the Factory Methods section.
- Fill the cuvette with 10 mL of unreacted sample (up to the mark). Replace the plastic stopper and the cap.

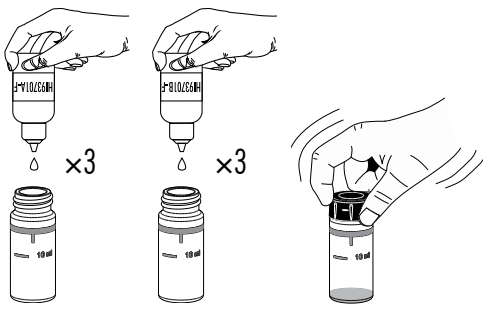




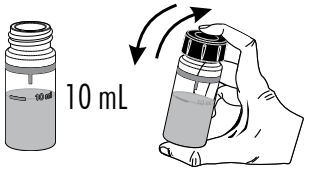
- Insert the cuvette into the holder and close the lid.
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



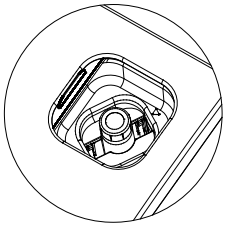
- Remove the cuvette.
- To an empty cuvette add 3 drops of HI93701A-F Free Chlorine Reagent A and 3 drops of HI93701B-F Free Chlorine Reagent B. Replace the plastic stopper and the cap. Swirl gently to mix.



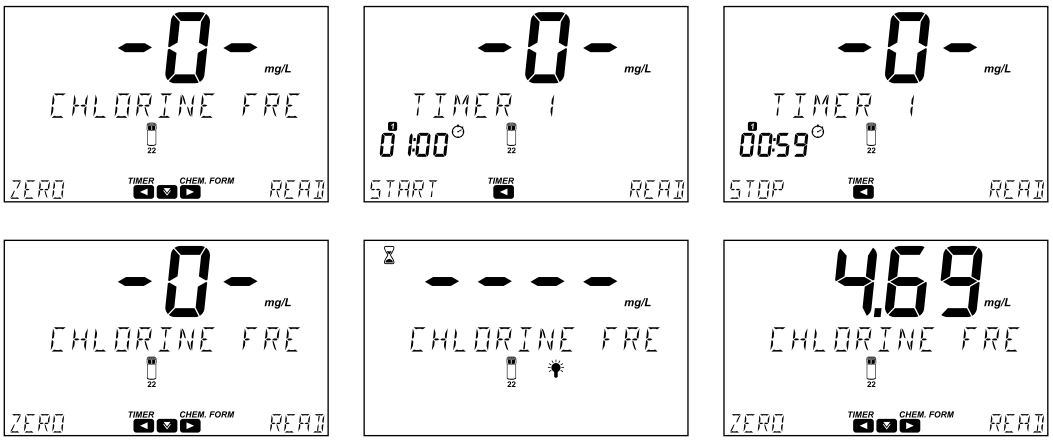
- Add unreacted sample up to the 10 mL mark. Replace the plastic stopper and the cap. Shake gently to mix.



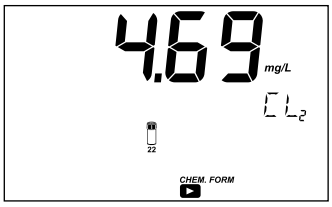
- Insert the cuvette into the holder and close the lid.



- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 1 minute.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **chlorine (Cl_2)**.



- Press the ⩔ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Bromine, Iodine, Oxidized forms of Chromium and Manganese, Ozone
- Hardness greater than 500 mg/L $CaCO_3$
  To remove the interference shake the sample for approximately 2 minutes after adding the powder reagent.
- Alkalinity greater than 250 mg/L $CaCO_3$ or acidity value greater than 150 mg/L $CaCO_3$
  The color of the sample may develop only partially or rapidly fade. To remove the interference neutralize the sample with diluted HCl or NaOH.

Chlorine, Free High Range

SPECIFICATIONS

Range	0.00 to 10.00 mg/L (as Cl_2)
Resolution	0.01 mg/L
Accuracy	±0.03 mg/L ±3% of reading at 25 °C
Wavelength	525 nm
Cuvette type	22 mm diameter
Method	Adaptation of the EPA DPD Method 330.5
Method ID	#017

REQUIRED REAGENTS

Code	Description	Quantity
HI93701-0	Free Chlorine Reagent	1 packet
HI93734B-0	Free & Total Chlorine Reagent	5 mL

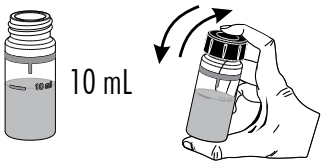
REAGENT SETS

HI93734-01	Reagents for 100 tests
HI93734-03	Reagents for 300 tests

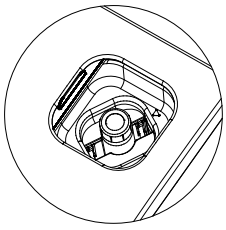
For other accessories see Accessories section.

MEASUREMENT PROCEDURE

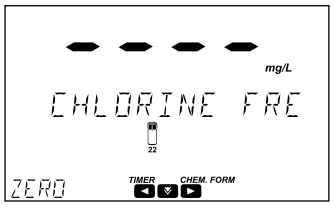
- Select the Chlorine Free HR method using the procedure described in the Factory Methods section.
- Add to the cuvette 5 mL of HI93734B-0 reagent.
- Fill the cuvette up to the 10 mL mark with 5 mL of unreacted sample. Replace the plastic stopper and the cap. Shake gently for a few seconds.

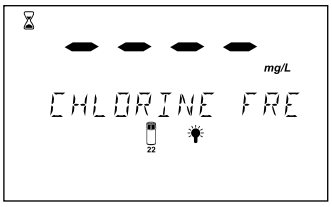


- Insert the cuvette into the holder and close the lid.

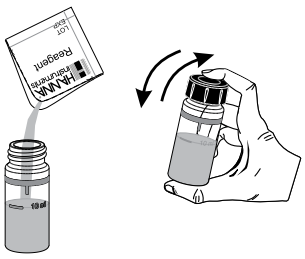


- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.

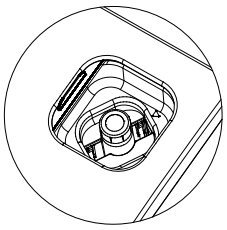




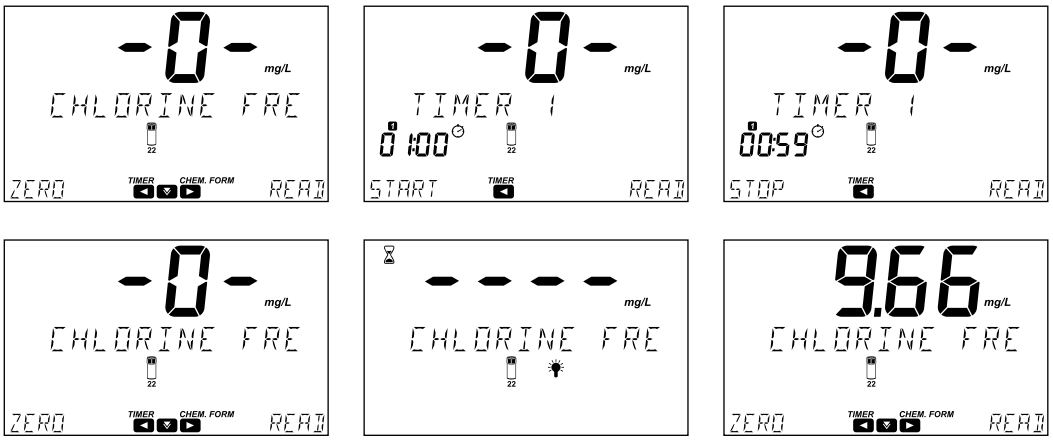
- Remove the cuvette.
- Add one packet of HI93701-0 Free Chlorine Reagent. Replace the plastic stopper and the cap. Shake gently for 20 seconds.



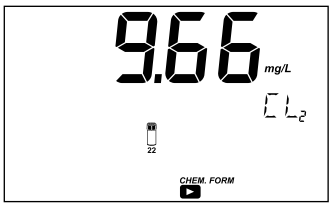
- Insert the cuvette into the holder and close the lid.



- Press the ◄ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 1 minute.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **chlorine (Cl_2)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ► key to view the chemical formula.



- Press the ► key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Bromine, Chlorine Dioxide, Iodine, Oxidized forms of Chromium and Manganese, Ozone
- Alkalinity greater than 1000 mg/L $CaCO_3$ if present as bicarbonate (pH $<$ 8.3), above 25 mg/L $CaCO_3$ if present as carbonate (pH $>$ 9.0) or acidity value greater than 150 mg/L $CaCO_3$
  The color of the sample may develop only partially or rapidly fade. To remove the interference neutralize the sample with diluted HCl or NaOH.
- Hardness greater than 500 mg/L $CaCO_3$
  To remove the interference shake the sample for approximately 2 minutes after adding the powder reagent.

Chlorine, Total Ultra Low Range

SPECIFICATIONS

Range	0.000 to 0.500 mg/L (as Cl_2)
Resolution	0.001 mg/L
Accuracy	±0.020 mg/L ±3% of reading at 25 °C
Wavelength	525 nm
Cuvette type	22 mm diameter
Method	Adaptation of the EPA DPD Method 330.5
Method ID	#018

REQUIRED REAGENTS

Code	Description	Quantity
HI95761-0	Total Chlorine Ultra Low Range Reagent	1 packet

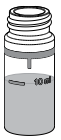
REAGENT SETS

HI95761-01	Reagents for 100 tests
HI95761-03	Reagents for 300 tests

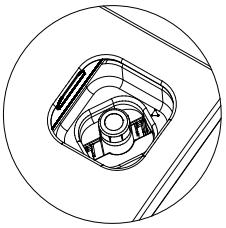
For other accessories see Accessories section.

MEASUREMENT PROCEDURE

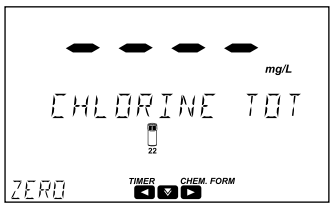
- Select the Chlorine Total ULR method using the procedure described in the Factory Methods section.
- Fill the cuvette with 10 mL of unreacted sample (up to the mark). Replace the plastic stopper and the cap.

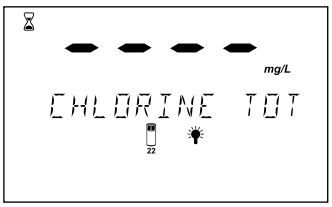


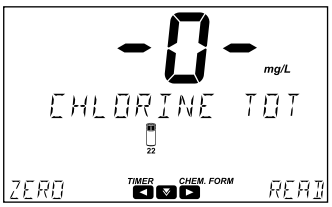
- Insert the cuvette into the holder and close the lid.



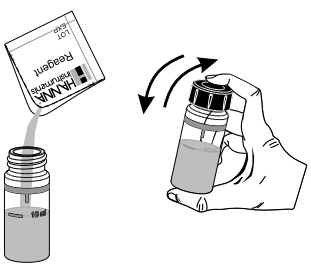
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



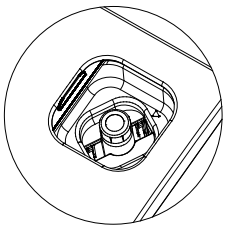




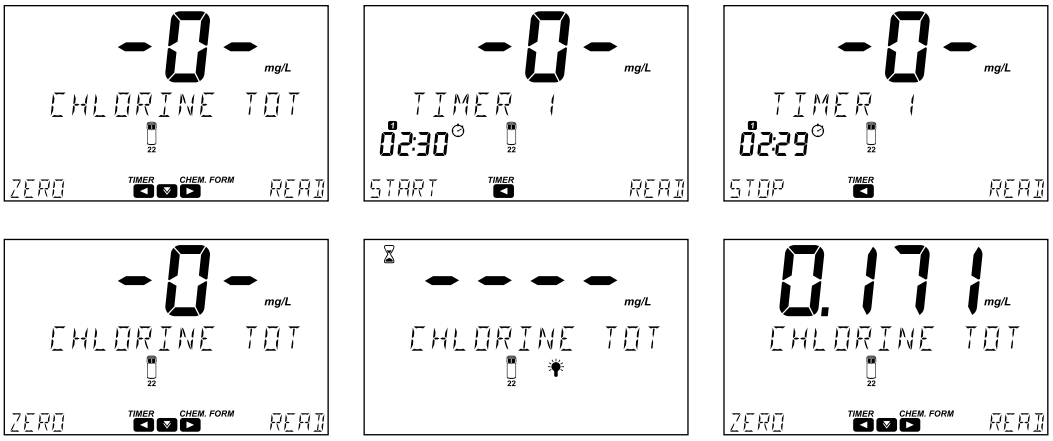
- Remove the cuvette.
- Add one packet of HI95761-0 Total Chlorine Reagent. Replace the plastic stopper and the cap. Shake gently for 20 seconds.



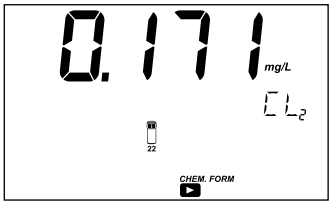
- Insert the cuvette into the holder and close the lid.



- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 2 minutes and 30 seconds.
- Press **READ** to start the reading. The meter displays the results in **mg/L** of **chlorine (Cl_2)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Bromine, Chlorine Dioxide, Iodine, Oxidized forms of Chromium and Manganese, Ozone
- Alkalinity greater than 1000 mg/L $CaCO_3$ if present as bicarbonate (pH $<$ 8.3), above 25 mg/L $CaCO_3$ if present as carbonate (pH $>$ 9.0) or acidity value greater than 150 mg/L $CaCO_3$
  The color of the sample may develop only partially or rapidly fade. To remove the interference neutralize the sample with diluted HCl or NaOH.
- Hardness greater than 500 mg/L $CaCO_3$
  To remove the interference shake the sample for approximately 2 minutes after adding the powder reagent.

Chlorine, Total Low Range (Powder Reagent)

SPECIFICATIONS

Range	0.00 to 5.00 mg/L (as Cl_2)
Resolution	0.01 mg/L
Accuracy	±0.03 mg/L ±3% of reading at 25 °C
Wavelength	525 nm
Cuvette type	22 mm diameter
Method	Adaptation of the EPA DPD Method 330.5
Method ID	#019

REQUIRED REAGENTS

Code	Description	Quantity
HI93711-0	Total Chlorine Reagent	1 packet

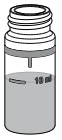
REAGENT SETS

HI93711-01	Reagents for 100 tests (powder)
HI93711-03	Reagents for 300 tests (powder)

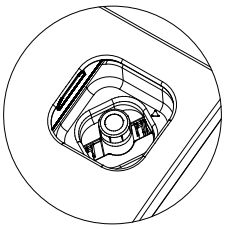
For other accessories see Accessories section.

MEASUREMENT PROCEDURE

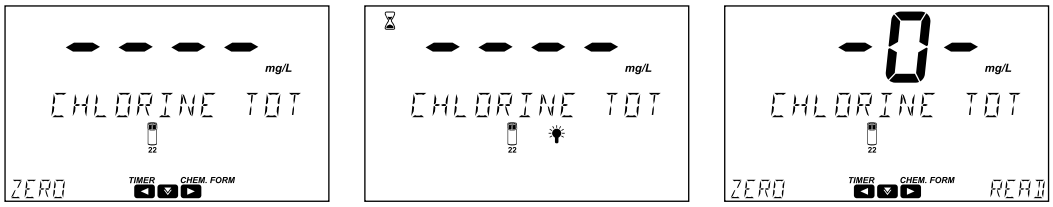
- Select the Chlorine Total LR (POWDER) method using the procedure described in the Factory Methods section.
- Fill the cuvette with 10 mL of unreacted sample (up to the mark). Replace the plastic stopper and the cap.



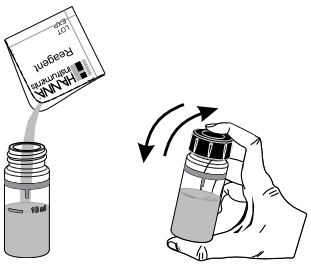
- Insert the cuvette into the holder and close the lid.



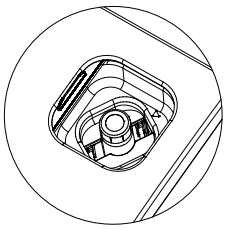
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



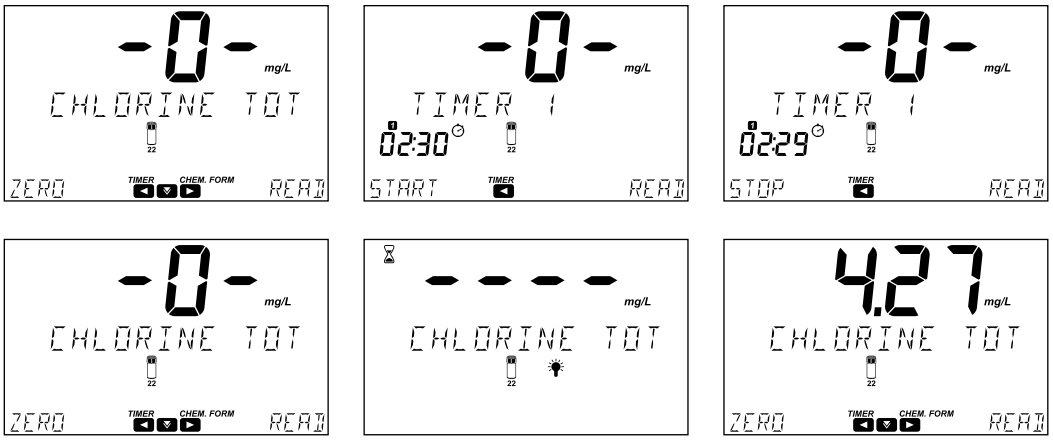
- Remove the cuvette.
- Add one packet of HI93711-0 Total Chlorine Reagent. Replace the plastic stopper and the cap. Shake gently for 20 seconds.



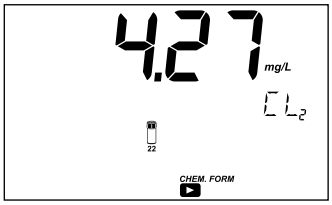
- Insert the cuvette into the holder and close the lid.



- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 2 minutes and 30 seconds.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **chlorine (Cl_2)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

***Note**: Free and Total Chlorine have to be measured separately with fresh unreacted samples following the related procedure if both values are desired.*

INTERFERENCES

Interference may be caused by:

- Bromine, Iodine, Oxidized forms of Chromium and Manganese, Ozone
- Hardness greater than 500 mg/L $CaCO_3$
  To remove the interference shake the sample for approximately 2 minutes after adding the powder reagent.
- Alkalinity greater than 250 mg/L $CaCO_3$ or acidity greater than 150 mg/L $CaCO_3$
  The color of the sample may develop only partially or may rapidly fade. To remove the interference neutralize the sample with diluted HCl or NaOH.

Chlorine, Total Low Range (Liquid Reagent)

SPECIFICATIONS

Range	0.00 to 5.00 mg/L (as Cl_2)
Resolution	0.01 mg/L
Accuracy	±0.03 mg/L ±3% of reading at 25 °C
Wavelength	525 nm
Cuvette type	22 mm diameter
Method	Adaptation of the EPA DPD Method 330.5
Method ID	#020

REQUIRED REAGENTS

Code	Description	Quantity
HI93701A-T	Total Chlorine Reagent A	3 drops
HI93701B-T	Total Chlorine Reagent B	3 drops
HI93701C-T	Total Chlorine Reagent C	1 drop

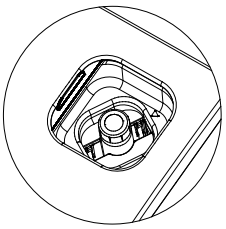
REAGENT SETS

HI93701-T	Reagents for 300 tests (liquid)

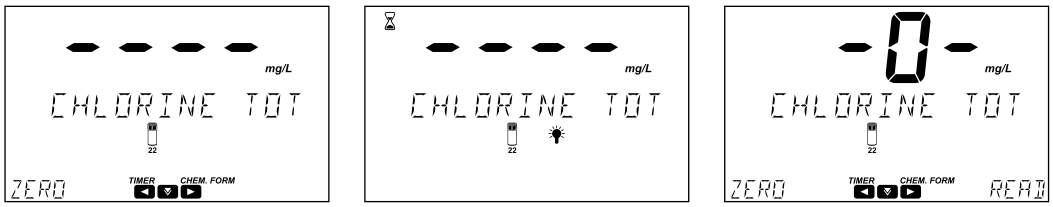
For other accessories see Accessories section.

MEASUREMENT PROCEDURE

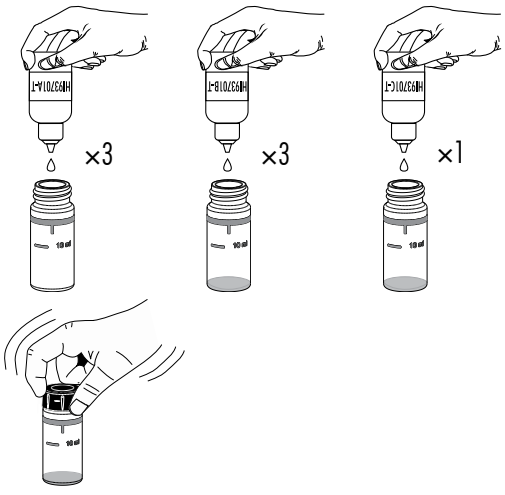
- Select the Chlorine Total LR (LIQUID) method using the procedure described in the Factory Methods section.
- Fill the cuvette with 10 mL of unreacted sample (up to the mark). Replace the plastic stopper and the cap.



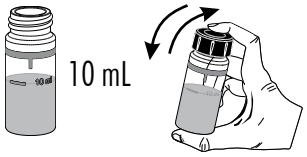
- Insert the cuvette into the holder and close the lid.
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



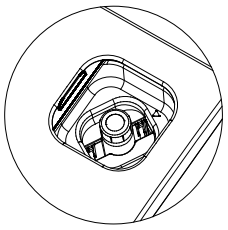
- Remove the cuvette.
- To an empty cuvette add 3 drops of HI93701A-T Total Chlorine Reagent A, 3 drops of HI93701B-T Total Chlorine Reagent B, and 1 drop of HI93701C-T Total Chlorine Reagent C. Replace the plastic stopper and the cap.
  Swirl gently to mix.



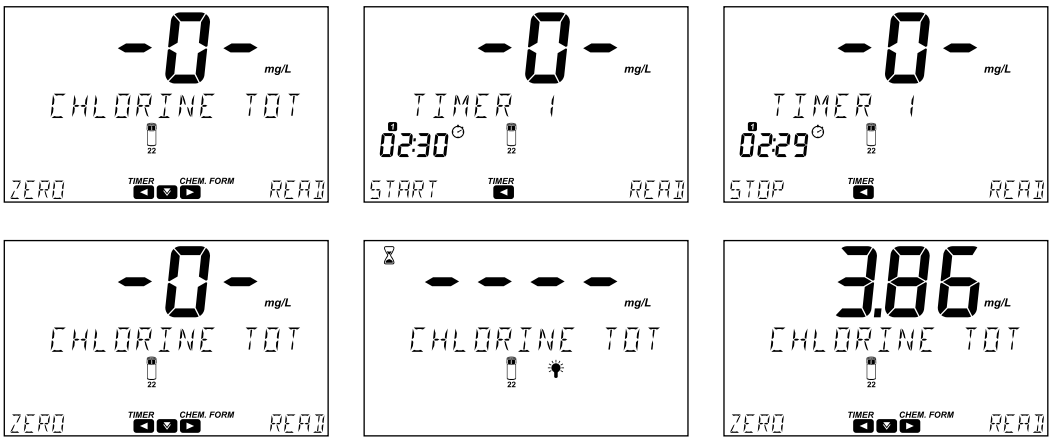
- Add unreacted sample up to the 10 mL mark. Replace the plastic stopper and the cap. Shake gently to mix.



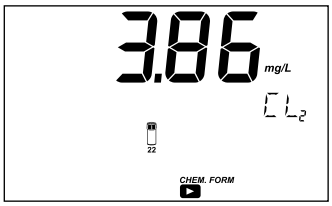
- Insert the cuvette into the holder and close the lid.



- Press the ◄ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 2 minutes and 30 seconds.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **chlorine (Cl_2)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ► key to view the chemical formula.



- Press the ► key to return to the measurement screen.

***Note**: Free and Total Chlorine have to be measured separately with fresh unreacted samples following the related procedure if both values are desired.*

INTERFERENCES

Interference may be caused by:

- Bromine, Iodine, Oxidized forms of Chromium and Manganese, Ozone
- Hardness greater than 500 mg/L $CaCO_3$
  To remove the interference shake the sample for approximately 2 minutes after adding the powder reagent.
- Alkalinity greater than 250 mg/L $CaCO_3$ or acidity greater than 150 mg/L $CaCO_3$
  The color of the sample may develop only partially or may rapidly fade. To remove the interference neutralize the sample with diluted HCl or NaOH.

Chlorine, Total High Range

SPECIFICATIONS

Range	0.00 to 10.00 mg/L (as Cl_2)
Resolution	0.01 mg/L
Accuracy	±0.03 mg/L ±3% of reading at 25 °C
Wavelength	525 nm
Cuvette type	22 mm diameter
Method	Adaptation of the EPA DPD Method 330.5
Method ID	#021

REQUIRED REAGENTS

Code	Description	Quantity
HI93701-0	Free Chlorine Reagent	1 packet
HI93734B-0	Free & Total Chlorine Reagent	5 mL
HI93734C-0	Total Chlorine Reagent	3 drops

REAGENT SETS

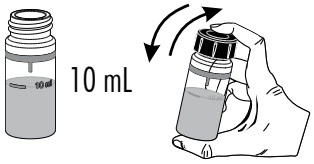
HI93734-01	Reagents for 100 tests
HI93734-03	Reagents for 300 tests

For other accessories see Accessories section.

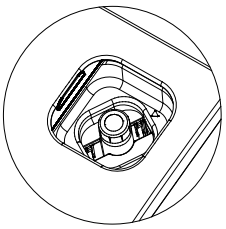
MEASUREMENT PROCEDURE

- Select the Chlorine Total HR method using the procedure described in the Factory Methods section.
- Add to the cuvette 5 mL of HI93734B-0 reagent.

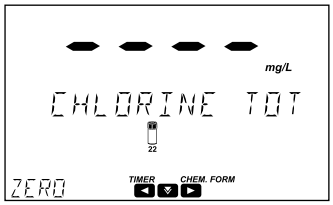
- Fill the cuvette up to the 10 mL mark with 5 mL of unreacted sample. Replace the plastic stopper and the cap. Shake gently for a few seconds.

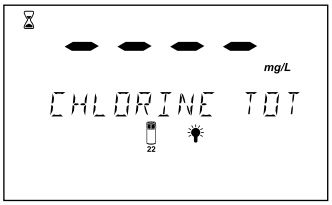


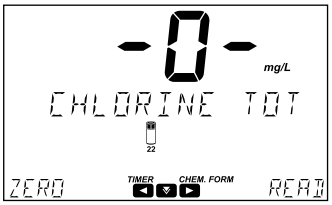
- Insert the cuvette into the holder and close the lid.



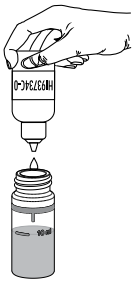
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



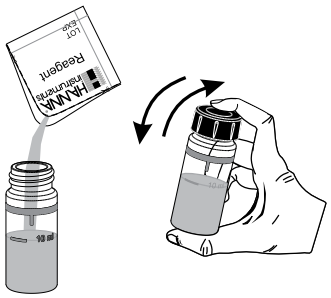




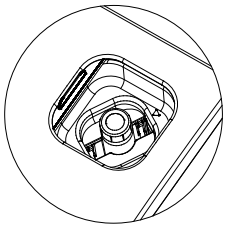
- Remove the cuvette.
- Add 3 drops of HI93734C-0 reagent to the cuvette.



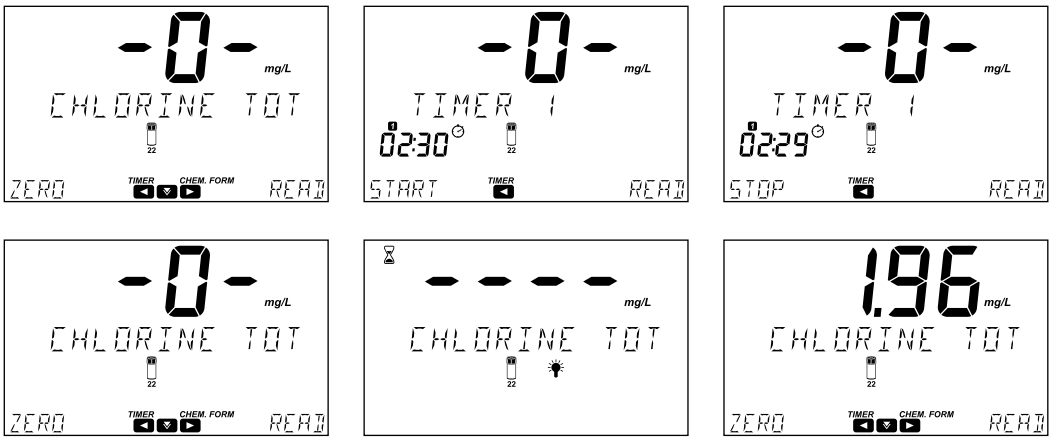
- Add one packet of HI93701-0 Free Chlorine Reagent. Replace the plastic stopper and the cap. Shake gently for 20 seconds.



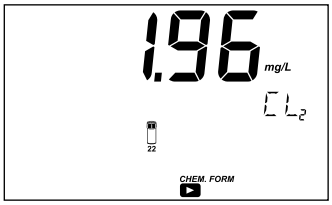
- Insert the cuvette into the holder and close the lid.



- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 2 minutes and 30 seconds.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **chlorine (Cl_2)**.



- Press the ▼▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Bromine, Chlorine Dioxide, Iodine, Oxidized forms of Chromium and Manganese, Ozone
- Alkalinity greater than 1000 mg/L $CaCO_3$ if present as bicarbonate (pH $<$ 8.3), above 25 mg/L $CaCO_3$ if present as carbonate (pH $>$ 9.0) or acidity value greater than 150 mg/L $CaCO_3$
  The color of the sample may develop only partially or rapidly fade, to remove the interference neutralize the sample with diluted HCl or NaOH.
- Hardness greater than 500 mg/L $CaCO_3$
  To remove the interference shake the sample for approximately 2 minutes after adding the powder reagent.

Chlorine, Total Ultra High Range

SPECIFICATIONS

Range	0 to 500 mg/L (as Cl_2)
Resolution	1 mg/L
Accuracy	±3 mg/L ±3% of reading at 25 °C
Wavelength	525 nm
Cuvette type	22 mm diameter
Method	Adaptation of the Standard Methods for Examination of Water and Wastewater, 20th Edition, 4500-Cl
Method ID	#022

REQUIRED REAGENTS

Code	Description	Quantity
HI95771A-0	Total Chlorine Ultra High Range Reagent A	1 packet
HI95771B-0	Total Chlorine Ultra High Range Reagent B	1 packet

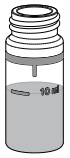
REAGENT SETS

HI95771-01	Reagents for 100 tests
HI95771-03	Reagents for 300 tests

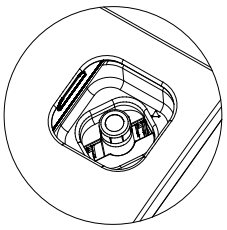
For other accessories see Accessories section.

MEASUREMENT PROCEDURE

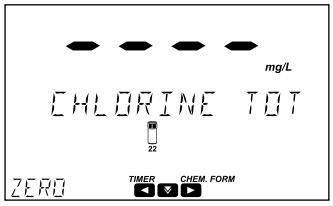
- Select the Chlorine Total UHR method using the procedure described in the Factory Methods section.
- Fill the cuvette with 10 mL of unreacted sample (up to the mark). Replace the plastic stopper and the cap.

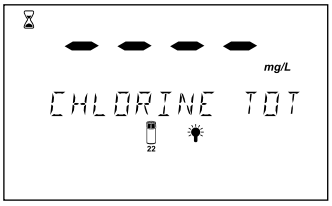


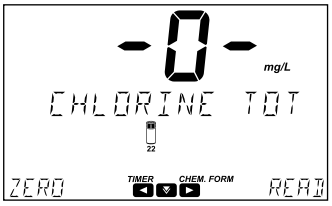
- Insert the cuvette into the holder and close the lid.



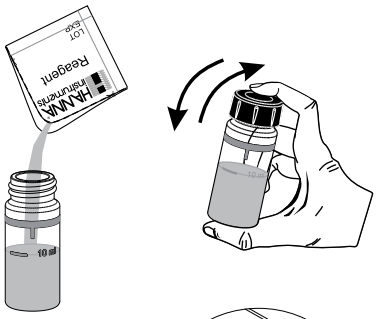
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



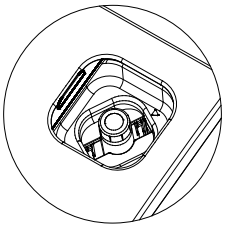




- Remove the cuvette.

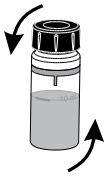


- Add one packet of HI95771A-0 Total Chlorine Ultra High Range Reagent A and one packet HI95771B-0 Total Chlorine Ultra High Range Reagent B. Replace the plastic stopper and the cap. Shake gently for 20 seconds.



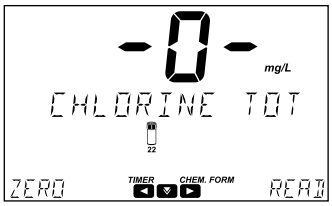
- Insert the cuvette into the holder and close the lid.

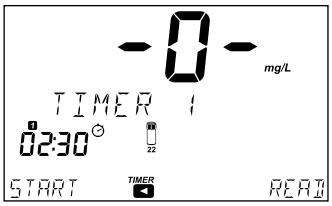
- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 2 minutes and 30 seconds.

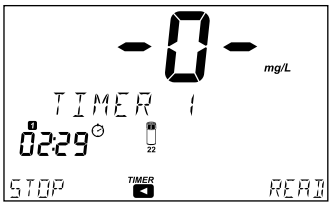


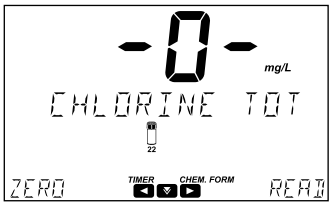
***Note**: After 1 minute invert the cuvette 5 times.*

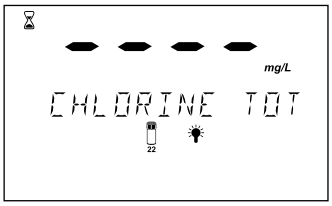
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **chlorine (Cl_2)**.

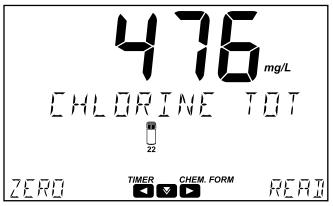




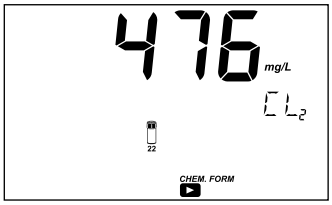








- Press the ▼▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Bromine (Br_2), Iodine (I_2), Chlorine Dioxide (ClO_2), Oxidized Chromium and Manganese and Ozone (O_3)

Chromium (VI) Low Range

SPECIFICATIONS

Range	0 to 300 µg/L (as Cr(VI))
Resolution	1 µg/L
Accuracy	±10 µg/L ±4% of reading at 25 °C
Wavelength	535 nm
Cuvette type	22 mm diameter
Method	Adaptation of the ASTM Manual of Water and Environmental Technology, D1687 Diphenylcarbohydrazide Method
Method ID	#023

REQUIRED REAGENTS

Code	Description	Quantity
HI93749-0	Chromium (VI) Low Range Reagent	1 packet

REAGENT SETS

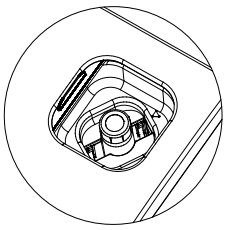
HI93749-01	Reagents for 100 tests
HI93749-03	Reagents for 300 tests

For other accessories see Accessories section.

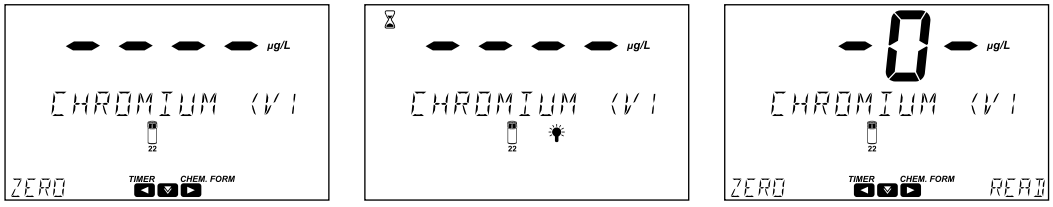
MEASUREMENT PROCEDURE

- Select the Chromium (VI) LR method using the procedure described in the Factory Methods section.
- Fill the cuvette with 10 mL of unreacted sample (up to the mark). Replace the plastic stopper and the cap.

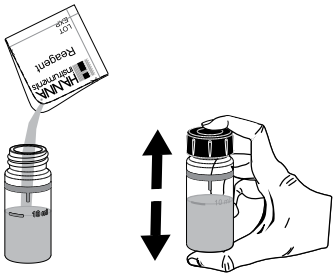
- Insert the cuvette into the holder and close the lid.



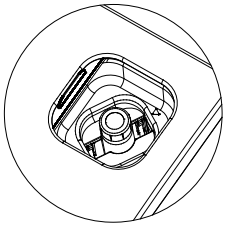
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



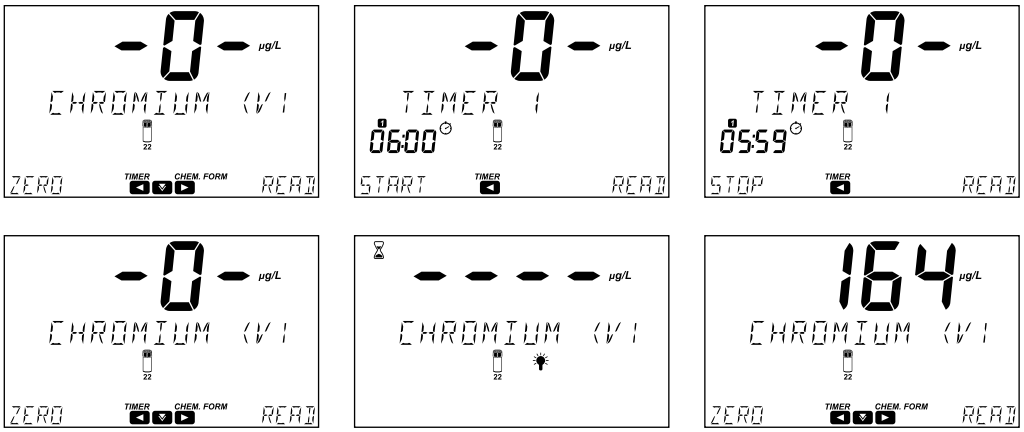
- Remove the cuvette.
- Add one packet of HI93749-0 Chromium (VI) Low Range Reagent. Replace the plastic stopper and the cap. Shake vigorously for about 10 seconds.



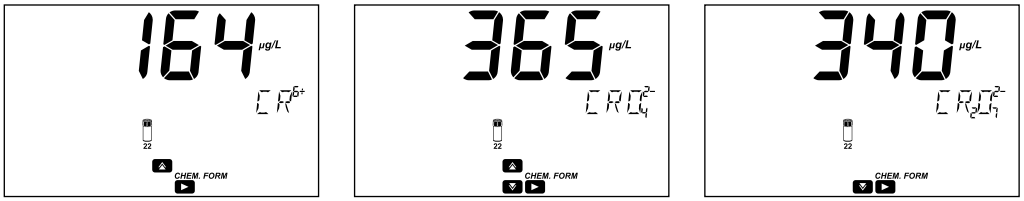
- Insert the cuvette into the holder and close the lid.



- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 6 minutes.
- Press **READ** to start the reading. The instrument displays the results in **µg/L** of **chromium (Cr^{6+})**.



- Press the ▼▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ▲▲ key to convert the results to **µg/L** of **chromate (CrO_4^{2-})** or **dichromate ($Cr_2O_7^{2-}$)**.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Vanadium above 1 mg/L
  Wait 10 minutes before reading to remove the interference.
- Iron above 1 mg/L
- Mercurous and mercuric ions slight inhibition of the reaction

Chromium (VI) High Range

SPECIFICATIONS

Range	0 to 1000 µg/L (as Cr(VI))
Resolution	1 µg/L
Accuracy	±5 µg/L ±4% of reading at 25 °C
Wavelength	535 nm
Cuvette type	22 mm diameter
Method	Adaptation of the ASTM Manual of Water and Environmental Technology, D1687-92, Diphenylcarbohydrazide Method
Method ID	#024

REQUIRED REAGENTS

Code	Description	Quantity
HI93723-0	Chromium (VI) High Range Reagent	1 packet

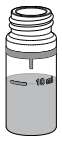
REAGENT SETS

HI93723-01	Reagents for 100 tests
HI93723-03	Reagents for 300 tests

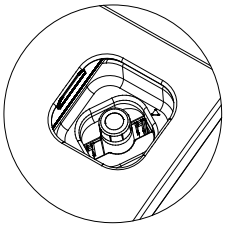
For other accessories see Accessories section.

MEASUREMENT PROCEDURE

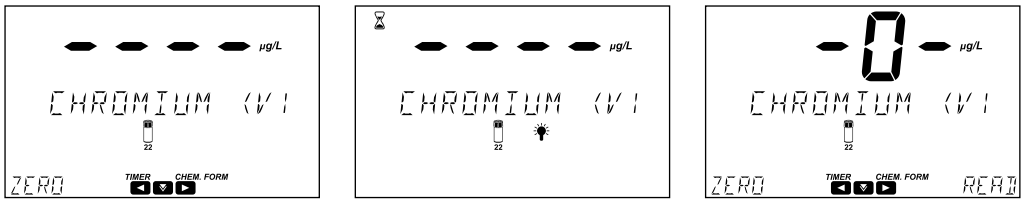
- Select the Chromium (VI) HR method using the procedure described in the Factory Methods section.
- Fill the cuvette with 10 mL of unreacted sample (up to the mark).
  Replace the plastic stopper and the cap.



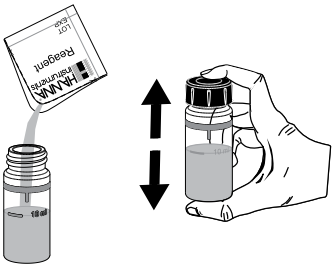
- Insert the cuvette into the holder and close the lid.



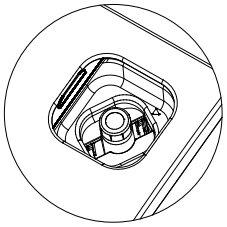
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



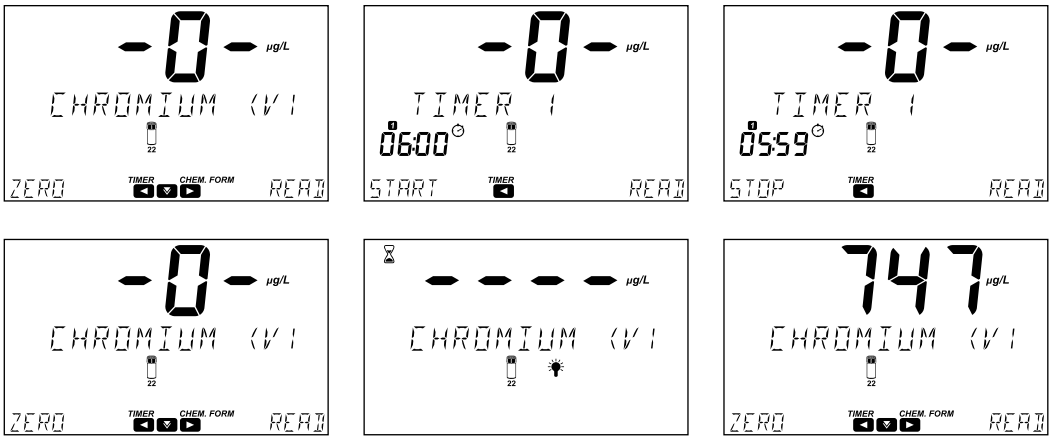
- Remove the cuvette.
- Add one packet of HI93723-0 Chromium (VI) High Range Reagent.
  Replace the plastic stopper and the cap.
  Shake vigorously for about 10 seconds.



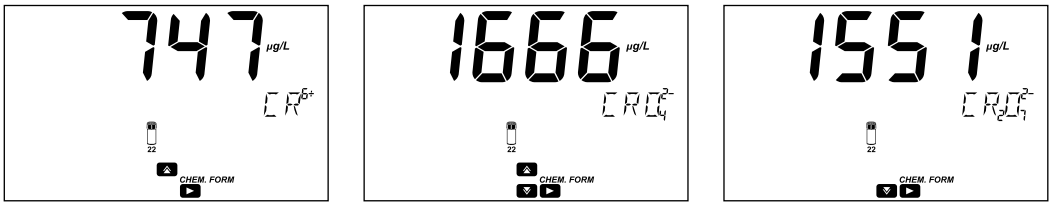
- Insert the cuvette into the holder and close the lid.



- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 6 minutes.
- Press **READ** to start the reading. The instrument displays the results in **µg/L** of **chromium (Cr^{6+})**.



- Press the ⩛ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ⩓ key to convert the results to **µg/L** of **chromate (CrO_4^{2-})** or **dichromate ($Cr_2O_7^{2-}$)**.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Vanadium above 1 mg/L
  Wait 10 minutes before reading to remove the interference.
- Iron above 1 mg/L
- Mercurous and mercuric ions slight inhibition of the reaction

Chromium (VI)/Total (13 mm Vial)

SPECIFICATIONS

Range	0 to 1000 µg/L (as Cr)
Resolution	1 µg/L
Accuracy	±10 µg/L ± 3% of reading
Wavelength	525 nm
Cuvette type	13 mm diameter
Method	Adaptation of the Standard Methods of the Examination of Water and Wastewater, 22nd Edition, 3500-Cr, Diphenylcarbazide Method
Method ID	#087

REQUIRED REAGENT

Code	Description	Quantity
HI96781V-0*	Chromium Digestion Vial	1 vial
HI96781A-0	Chromium Reagent A	1 packet
HI96781B-0	Chromium Reagent B	1 packet

*Reagent vial identification: red label

REAGENT SETS

HI96781-25	Reagents for 25 tests

For other accessories see Accessories section.

***Note**: Store the unused vials in their packaging in a cool and dark place.*

PRINCIPLE

The chromium in the sample is oxidized to hexavalent chromium during digestion. The hexavalent chromium reacts with the Diphenylcarbazide to form a red color proportional to the amount of chromium in the sample. This method has a strong temperature and pH dependence. The sample temperature must be between 18 and 22 °C and the pH between 3 and 9.

APPLICATION

Water, wastewater, process control

SIGNIFICANCE & USE

Chromium(III) is an essential element for humans and can be metabolized in the body. Chromium(III) is found naturally in fruit, vegetables, meat and grains. Chromium(VI) has been identified as a carcinogen and can alter genetic material. Chromium(VI) is discharged from steel and paper mills or through the oxidation of chromium(III). Chromium(VI) has been a regulated drinking water contaminate since the 1940s, the EPA only regulates total chromium.

MEASUREMENT PROCEDURE

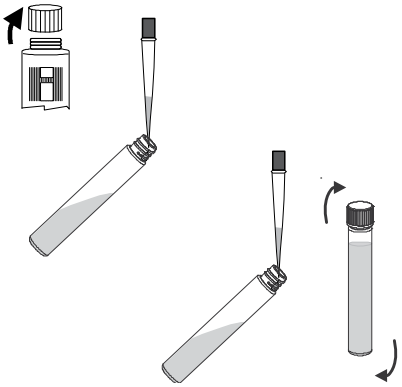
CHROMIUM TOTAL

Before using the reagent kit carefully read all the instructions and the Safety Data Sheets (SDS). Pay particular attention to all warnings, cautions and notes. Failure to do so may result in serious injury to the operator.
The acidification of the sample may result in the release of toxic gas, such as cyanides and sulfides. Sample preparation and digestion should be done in a fume hood.

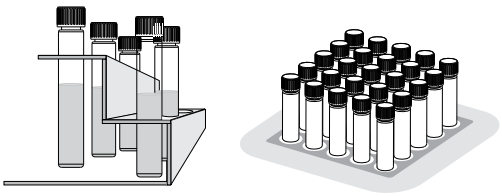
- Preheat the Hanna® Reactor HI839800 to 105 °C (221 °F).
- Use of supplied HI740217 safety shield is strongly recommended.

  ***Warning**: Do not use an oven or microwave! Samples may leak and generate a corrosive and possibly explosive atmosphere.*

- Remove the cap from a barcoded HI96781V-0 Chromium Digestion Vial.
- Add 5 mL of sample to the vial, while keeping the vial at a 45-degree angle.
- Add one packet of HI96781A-0 Chromium Reagent A to the vial. Replace the cap and invert for 30 seconds.

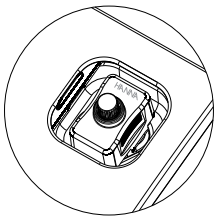


- Insert the vial into the reactor and heat it for 60 minutes at 105 °C.
- At the end of the digestion period switch off the reactor. Allow the vials to cool to room temperature. Invert each vial several times and place them in the test tube rack.

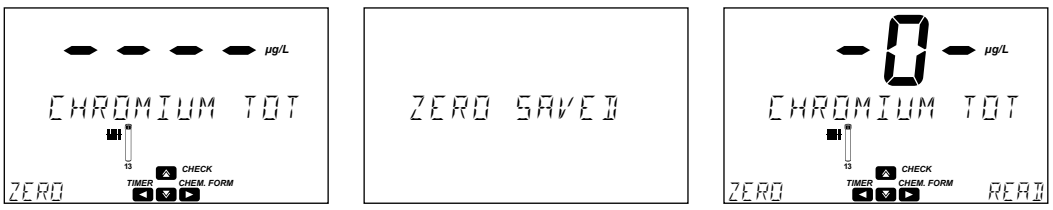


***Note**: Method selection is done automatically using a barcoded HI96781V-0 Chromium Digestion Vial following the procedure described in the Barcode Methods section.*
Alternatively, select the Chromium (VI)/Total (13 mm) method using the procedure described in the Factory Methods section.

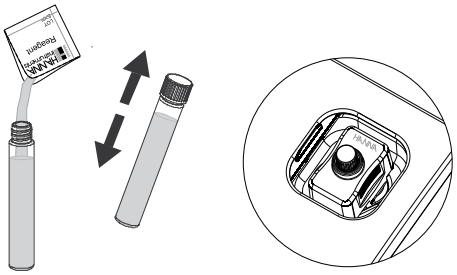
- Insert the supplied 13 mm vial adapter using the procedure described in the Cuvette & Vial Adapters section.
- Insert the vial into the adapter.
  Press steadily down until the vial clicks in place.



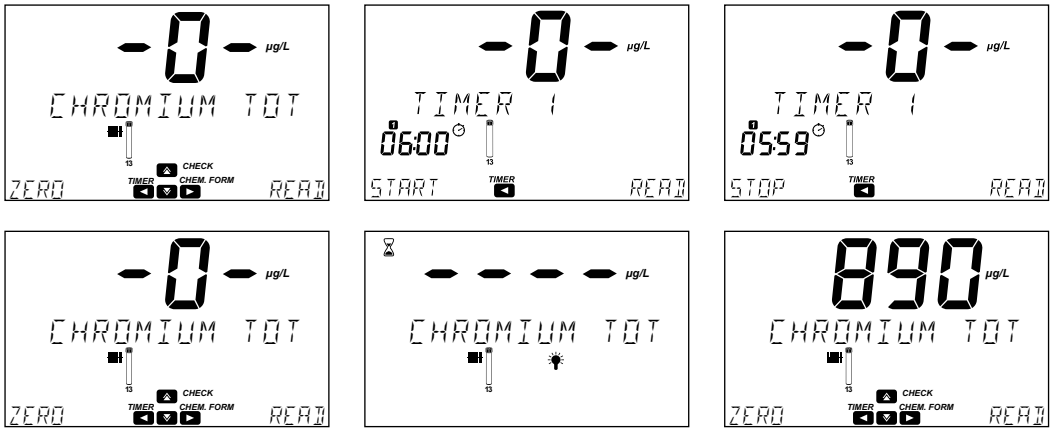
- Press **ZERO**.
  The meter scans the barcode and switches to the correct method automatically.
- The display will show "-0-" when the meter is zeroed and ready for measurement.



- Remove the vial.
- Add one packet of HI96781B-0 Chromium Reagent B. Replace the cap. Shake vigorously for 1 minute.
- Insert the vial into the adapter.
  Press steadily down until the vial clicks in place.

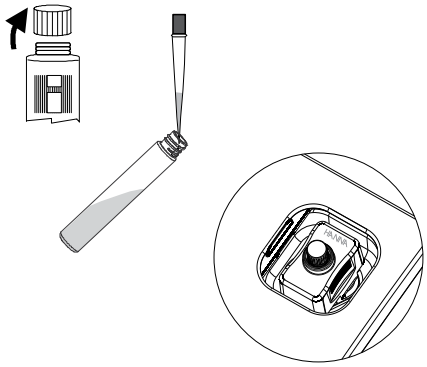


- Press the ◀ key to access the timer menu.
- Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 6 minutes.
- Press **READ** to start the reading. The instrument displays the results in **µg/L** of **chromium (Cr)**.

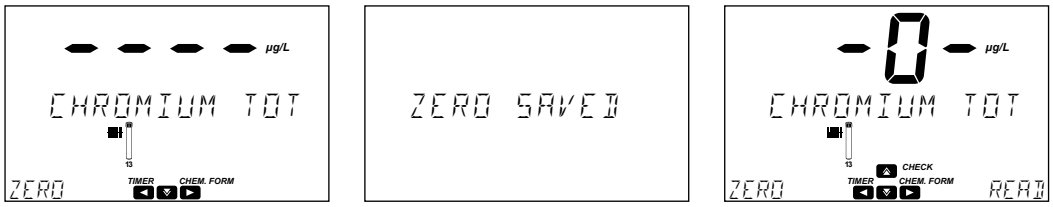


CHROMIUM(VI)

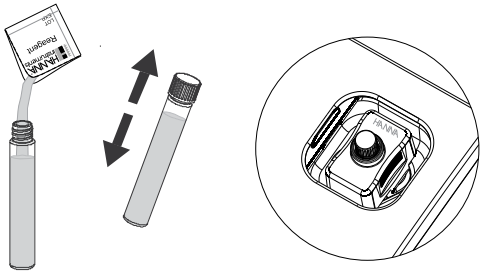
- Insert the supplied 13 mm vial adapter using the procedure described in the Cuvette & Vial Adapters section.
- Remove the cap from a HI96781V-0 Chromium Digestion Vial.
- Add 5 mL of sample to the vial, while keeping the vial at a 45-degree angle. Replace the cap and invert several times to mix.
- Insert the vial into the adapter.
  Press steadily down until the vial clicks in place



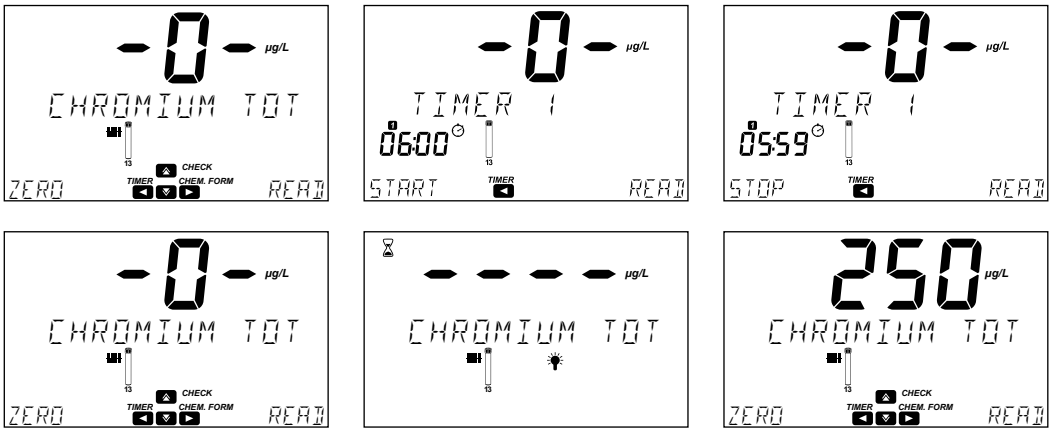
- Press **ZERO**.
  The meter scans the barcode and switches to the correct method automatically.
- The display will show "-0-" when the meter is zeroed and ready for measurement.



- Remove the cap and add one packet of HI96781B-0 Chromium Reagent B. Replace the cap. Shake vigorously for 1 minute.
- Insert the vial into the adapter.
  Press steadily down until the vial clicks in place.



- Press the ◀ key to access the timer menu.
- Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 6 minutes.
- Press **READ** to start the reading. The instrument displays the results in **µg/L** of **chromium (Cr)**.



- To determine the Chromium(III) concentration, subtract the results from the Chromium(VI) procedure from the Chromium Total procedure.

INTERFERENCES

Interference may be caused by:

- Large amounts of iron, copper or reducing and oxidizing agents yield falsely low readings
- Nitrate, Potassium, Sulfate above 2000 mg/L
- Chloride, Sodium above 1000 mg/L
- Calcium above 125 mg/L
- Ammonium, Magnesium above 100 mg/L
- Nickel, Zinc above 25 mg/L
- Copper, Iron above 10 mg/L

Chemical Oxygen Demand Low Range EPA (13 mm Vial)

SPECIFICATIONS

Range	0 to 150 mg/L (as O_2)
Resolution	1 mg/L
Accuracy	±5 mg/L or ±4% of reading at 25 °C, whichever is greater
Wavelength	420 nm
Cuvette type	13 mm diameter
Method	Adaptation of the EPA 410.4 Approved Method for the COD Determination on Surface Waters and Wastewaters
Method ID	#025

REQUIRED REAGENTS

Code	Description	Quantity
HI93754A-0*	COD Low Range Reagent Vial	2 vials
DEIONIZED120	Deionized Water	2 mL

*Reagent vial identification: red label

REAGENT SETS

HI93754A-25	Reagents for 24 tests

For other accessories see Accessories section.

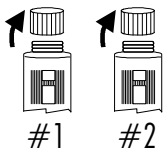
***Note**: Store the unused vials in their packaging in a cool and dark place.*

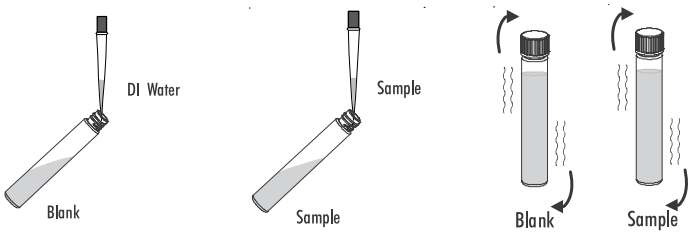
MEASUREMENT PROCEDURE

Before using the reagent kit carefully read all the instructions and the Safety Data Sheets (SDS). Pay particular attention to all warnings, cautions and notes. Failure to do so may result in serious injury to the operator.

Reagent Blank Correction: This method requires a reagent blank correction. A single blank vial may be used more than once. The blank vial is stable for several months at room temperature. For improved accuracy, run a blank for each set of measurements and always use the same lot of reagents for blank and samples.

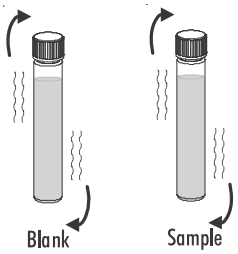
- Choose a homogeneous sample. Samples containing solids capable of settling need to be homogenized with a blender.
- Preheat the Hanna® Reactor HI839800 to 150 °C (302 °F).
- Use of supplied HI740217 safety shield is strongly recommended.
  ***Warning**: Do not use an oven or microwave; samples may leak and generate a corrosive and possibly explosive atmosphere.*
- Remove the cap from two barcoded HI93754A-0 COD Low Range Reagent Vials.
- Add 2 mL of deionized water to the first vial (#1) and 2 mL of sample to the second vial (#2), while keeping the vials at a 45-degree angle.
  Replace the cap and invert several times to mix.
  ***Warning**: The vials will become hot during mixing, use caution when handling.*





- Insert the vials into the reactor and heat them for 2 hours at 150 °C.

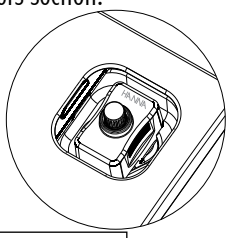
- At the end of the digestion period switch off the reactor. Wait 20 minutes to allow the vials to cool to about 120 °C.
- Invert each vial several times while still warm, then place them in the test tube rack.
  ***Warning**: The vials are still hot, use caution when handling.*
- Leave the vials in the tube rack to cool to room temperature. Do not shake or invert them, the samples may become turbid.



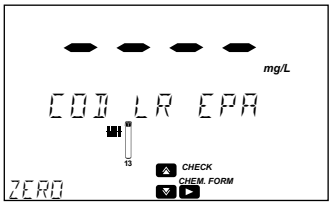
***Note**: Method selection is done automatically using a barcoded HI93754A-0 COD Low Range Reagent Vial following the procedure described in the Barcode Methods section.*
Alternatively, select the COD LR EPA (13 mm) method using the procedure described in the Factory Methods section.

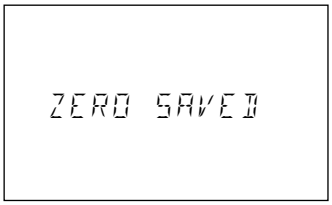
- Insert the supplied 13 mm vial adapter using the procedure described in the Cuvette & Vial Adapters section.
- Insert the blank vial (#1) into the adapter. Press steadily down until the vial clicks in place.

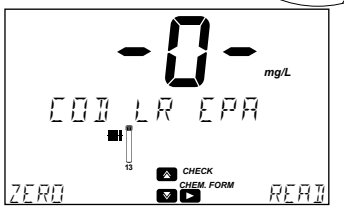
#1



- Press **ZERO**.
  The meter scans the barcode and switches to the correct method automatically.
- The display will show "-0-" when the meter is zeroed and ready for measurement.

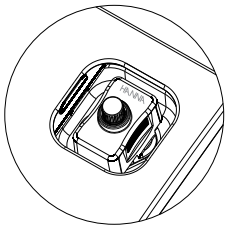


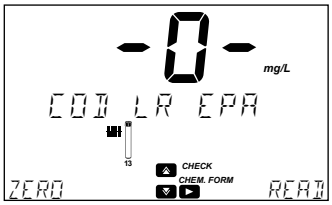


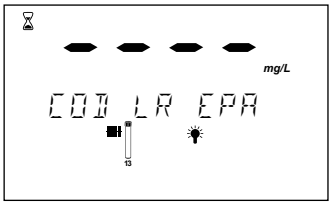


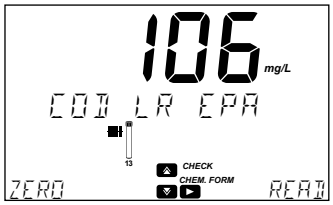
- Remove the vial.
- Insert the sample vial (#2) into the adapter.
  Press steadily down until the vial clicks in place.
- Press **READ** to start the reading.
  The instrument displays the results in **mg/L** of **oxygen (O_2)**.

#2

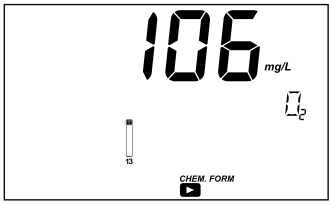








- Press the ⏬ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Chloride (Cl^-) above 2000 mg/L
  Samples with higher chloride concentration should be diluted.

Chemical Oxygen Demand Low Range Mercury Free (13 mm Vial)

SPECIFICATIONS

Range	0 to 150 mg/L (as O_2)
Resolution	1 mg/L
Accuracy	±5 mg/L or ±4% of reading at 25 °C, whichever is greater
Wavelength	420 nm
Cuvette type	13 mm diameter
Method	Dichromate Mercury Free
Method ID	#026

REQUIRED REAGENTS

Code	Description	Quantity
HI93754D-0*	COD Low Range Reagent Vial	2 vials
DEIONIZED120	Deionized Water	2 mL

*Reagent vial identification: red label

REAGENT SETS

HI93754D-25	Reagents for 24 tests

For other accessories see Accessories section.

***Note**: Store the unused vials in their packaging in a cool and dark place.*

MEASUREMENT PROCEDURE

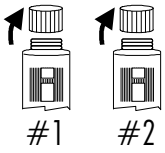
Before using the reagent kit carefully read all the instructions and the Safety Data Sheets (SDS). Pay particular attention to all warnings, cautions and notes. Failure to do so may result in serious injury to the operator.

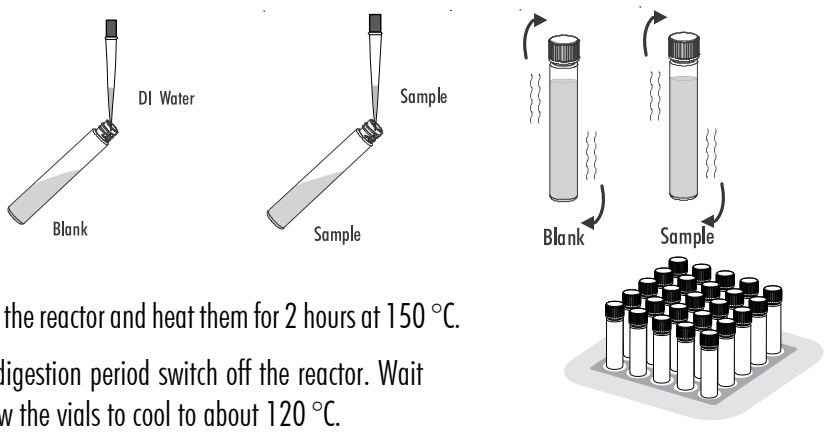
Reagent Blank Correction: This method requires a reagent blank correction. A single blank vial may be used more than once. The blank vial is stable for several months at room temperature. For improved accuracy, run a blank for each set of measurements and always use the same lot of reagents for blank and samples.

- Choose a homogeneous sample. Samples containing solids capable of settling need to be homogenized with a blender.
- Preheat the Hanna® Reactor HI839800 to 150 °C (302 °F).
- Use of supplied HI740217 safety shield is strongly recommended.

  ***Warning**: Do not use an oven or microwave; samples may leak and generate a corrosive and possibly explosive atmosphere.*
- Remove the cap from two barcoded HI93754D-0 COD Low Range Reagent Vials.
- Add 2 mL of deionized water to the first vial (#1) and 2 mL of sample to the second vial (#2), while keeping the vials at a 45-degree angle. Replace the cap and invert several times to mix.

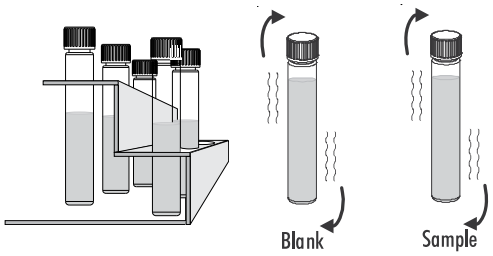
  ***Warning**: The vials will become hot during mixing, use caution when handling.*





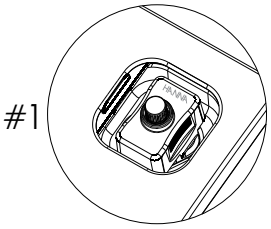
- Insert the vials into the reactor and heat them for 2 hours at 150 °C.
- At the end of the digestion period switch off the reactor. Wait 20 minutes to allow the vials to cool to about 120 °C.

- Invert each vial several times while still warm, then place them in the test tube rack.
  ***Warning**: The vials are still hot, use caution when handling.*
- Leave the vials in the tube rack to cool to room temperature. Do not shake or invert them, the samples may become turbid.

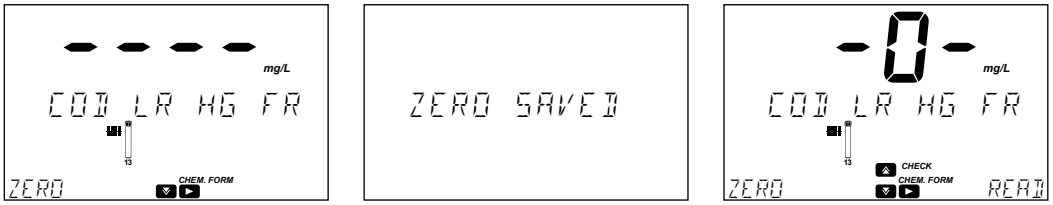


***Note**: Method selection is done automatically using a barcoded HI93754D-0 COD Low Range Reagent Vial following the procedure described in the Barcode Methods section.*
Alternatively, select the COD LR Hg Free (13 mm) method using the procedure described in the Factory Methods section.

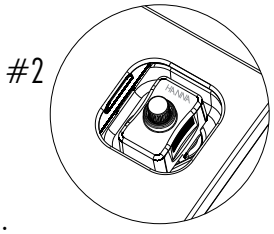
- Insert the supplied 13 mm vial adapter using the procedure described in the Cuvette & Vial Adapters section.
- Insert the blank vial (#1) into the adapter. Press steadily down until the vial clicks in place.



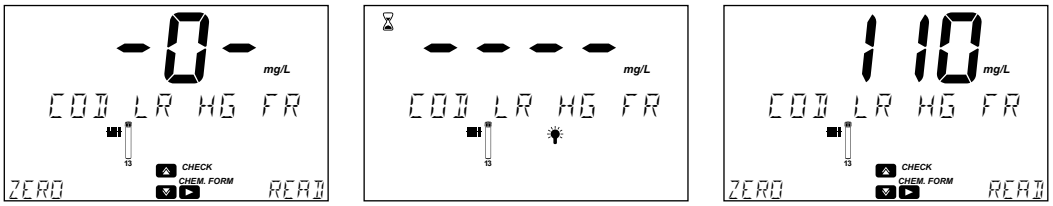
- Press **ZERO**. The meter scans the barcode and switches to the correct method automatically.
- The display will show "-0-" when the meter is zeroed and ready for measurement.



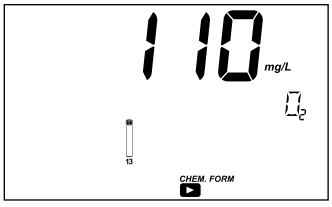
- Remove the vial.
- Insert the sample vial (#2) into the adapter. Press steadily down until the vial clicks in place.



- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **oxygen (O_2)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Chloride (Cl^-) above 2000 mg/L
  Samples with higher chloride concentration should be diluted.

Chemical Oxygen Demand Low Range ISO (13 mm Vial)

SPECIFICATIONS

Range	0 to 150 mg/L (as O_2)
Resolution	1 mg/L
Accuracy	±5 mg/L or ±4% of reading at 25 °C, whichever is greater
Wavelength	420 nm
Cuvette type	13 mm diameter
Method	Dichromate ISO
Method ID	#027

REQUIRED REAGENTS

Code	Description	Quantity
HI93754F-0*	COD Low Range Reagent Vial	2 vials
DEIONIZED120	Deionized Water	2 mL

*Reagent vial identification: red label

REAGENT SETS

HI93754F-25 Reagents for 24 tests

For other accessories see Accessories section.

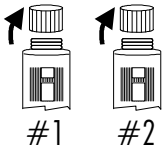
***Note**: Store the unused vials in their packaging in a cool and dark place.*

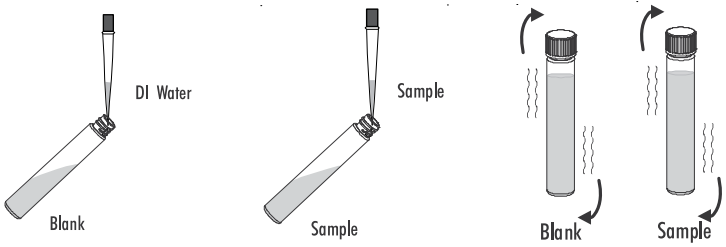
MEASUREMENT PROCEDURE

Before using the reagent kit carefully read all the instructions and the Safety Data Sheets (SDS). Pay particular attention to all warnings, cautions and notes. Failure to do so may result in serious injury to the operator.

Reagent Blank Correction: This method requires a reagent blank correction. A single blank vial may be used more than once. The blank vial is stable for several months at room temperature. For improved accuracy, run a blank for each set of measurements and always use the same lot of reagents for blank and samples.

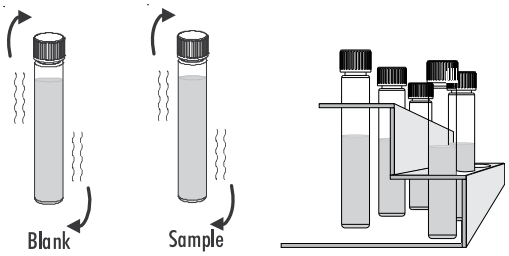
- Choose a homogeneous sample. Samples containing solids capable of settling need to be homogenized with a blender.
- Preheat the Hanna® Reactor HI839800 to 150 °C (302 °F).
- Use of supplied HI740217 safety shield is strongly recommended.
  ***Warning**: Do not use an oven or microwave; samples may leak and generate a corrosive and possibly explosive atmosphere.*
- Remove the cap from two barcoded HI93754F-0 COD Low Range Reagent Vials.
- Add 2 mL of deionized water to the first vial (#1) and 2 mL of sample to the second vial (#2), while keeping the vials at a 45-degree angle. Replace the cap and invert several times to mix.
  ***Warning**: The vials will become hot during mixing, use caution when handling.*





- Insert the vials into the reactor and heat them for 2 hours at 150 °C.
- At the end of the digestion period switch off the reactor. Wait 20 minutes to allow the vials to cool to about 120 °C.

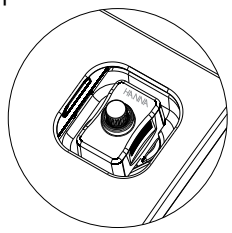
- Invert each vial several times while still warm, then place them in the test tube rack.
  ***Warning**: The vials are still hot, use caution when handling.*
- Leave the vials in the tube rack to cool to room temperature. Do not shake or invert them, the samples may become turbid.



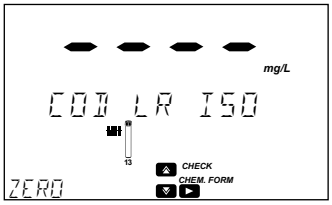
***Note**: Method selection is done automatically using a barcoded HI93754F-0 COD Low Range Reagent Vial following the procedure described in the Barcode Methods section.*

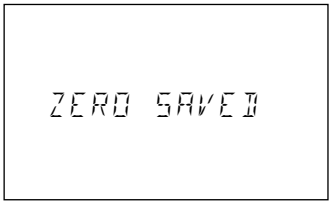
Alternatively, select the COD LR ISO (13 mm) method using the procedure described in the Factory Methods section.

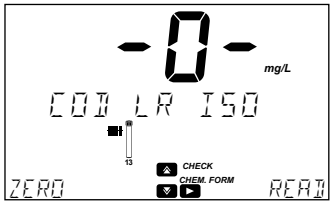
- Insert the supplied 13 mm vial adapter using the procedure described in the Cuvette & Vial Adapters section.
- Insert the blank vial (#1) into the adapter.
  Press steadily down until the vial clicks in place.

#1 

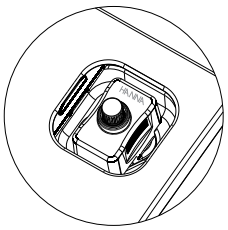
- Press **ZERO**.
  The meter scans the barcode and switches to the correct method automatically.
- The display will show "-0-" when the meter is zeroed and ready for measurement.



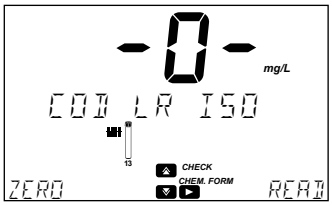


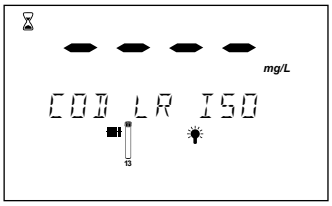


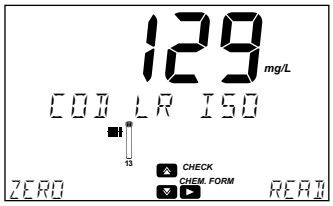
- Remove the vial.
- Insert the sample vial (#2) into the adapter.
  Press steadily down until the vial clicks in place.

#2 

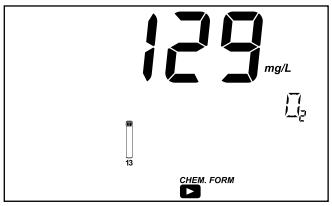
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **oxygen (O_2)**.







- Press the ▼▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Chloride (Cl^-) above 2000 mg/L
  Samples with higher chloride concentration should be diluted.

Chemical Oxygen Demand Medium Range EPA (13 mm Vial)

SPECIFICATIONS

Range	0 to 1500 mg/L (as O_2)
Resolution	1 mg/L
Accuracy	±15 mg/L or ±3% of reading at 25 °C, whichever is greater
Wavelength	610 nm
Cuvette type	13 mm diameter
Method	Adaptation of the EPA 410.4 Approved Method for the COD Determination on Surface Waters and Wastewaters
Method ID	#028

REQUIRED REAGENTS

Code	Description	Quantity
HI93754B-0*	COD Medium Range Reagent Vial	2 vials
DEIONIZED120	Deionized Water	2 mL

*Reagent vial identification: white label

REAGENT SETS

HI93754B-25	Reagents for 24 tests

For other accessories see Accessories section.

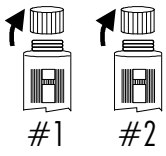
***Note**: Store the unused vials in their packaging in a cool and dark place.*

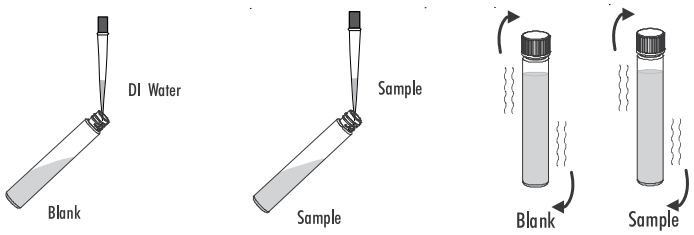
MEASUREMENT PROCEDURE

Before using the reagent kit carefully read all the instructions and the Safety Data Sheets (SDS). Pay particular attention to all warnings, cautions and notes. Failure to do so may result in serious injury to the operator.

Reagent Blank Correction: This method requires a reagent blank correction. A single blank vial may be used more than once. The blank vial is stable for several months at room temperature. For improved accuracy, run a blank for each set of measurements and always use the same lot of reagents for blank and samples.

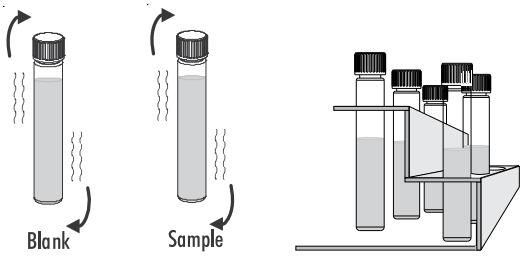
- Choose a homogeneous sample. Samples containing solids capable of settling need to be homogenized with a blender.
- Preheat the Hanna® Reactor HI839800 to 150 °C (302 °F).
- Use of supplied HI740217 safety shield is strongly recommended.
  ***Warning**: Do not use an oven or microwave; samples may leak and generate a corrosive and possibly explosive atmosphere.*
- Remove the cap from two barcoded HI93754B-0 COD Medium Range Reagent Vials.
- Add 2 mL of deionized water to the first vial (#1) and 2 mL of sample to the second vial (#2), while keeping the vials at a 45-degree angle. Replace the cap and invert several times to mix.
  ***Warning**: The vials will become hot during mixing, use caution when handling.*





- Insert the vials into the reactor and heat them for 2 hours at 150 °C.
- At the end of the digestion period switch off the reactor. Wait 20 minutes to allow the vials to cool to about 120 °C.

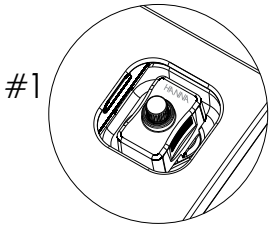
- Invert each vial several times while still warm, then place them in the test tube rack.
  ***Warning**: The vials are still hot, use caution when handling.*
- Leave the vials in the tube rack to cool to room temperature. Do not shake or invert them, the samples may become turbid.



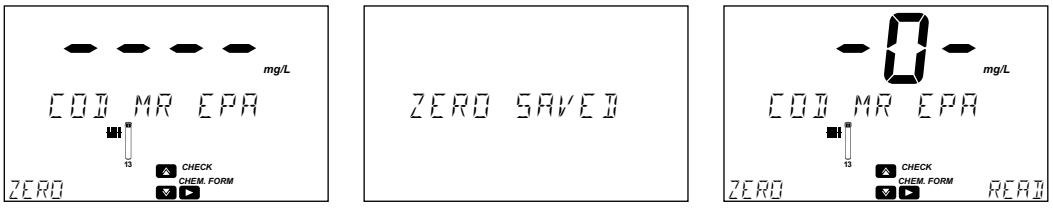
***Note**: Method selection is done automatically using a barcoded HI93754B-0 COD Medium Range Reagent Vial following the procedure described in the Barcode Methods section.*

Alternatively, select the COD MR EPA (13 mm) method using the procedure described in the Factory Methods section.

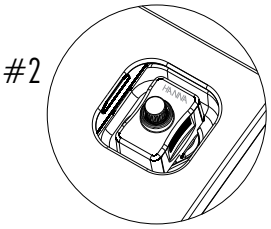
- Insert the supplied 13 mm vial adapter using the procedure described in the Cuvette & Vial Adapters section.
- Insert the blank vial (#1) into the adapter.
  Press steadily down until the vial clicks in place.



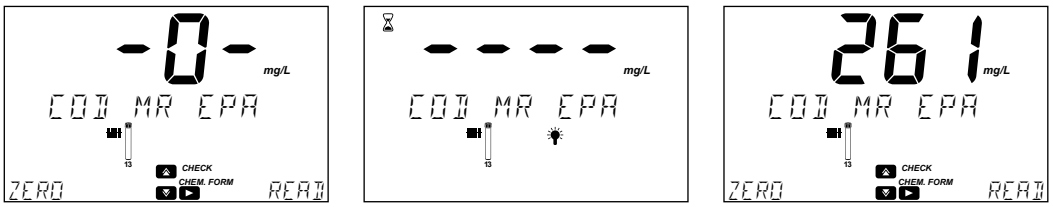
- Press **ZERO**.
  The meter scans the barcode and switches to the correct method automatically.
- The display will show "-0-" when the meter is zeroed and ready for measurement.



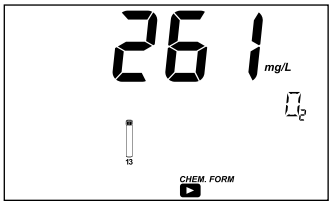
- Remove the vial.
- Insert the sample vial (#2) into the adapter.
  Press steadily down until the vial clicks in place.



- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **oxygen (O_2)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Chloride (Cl^-) above 2000 mg/L
  Samples with higher chloride concentration should be diluted.

Chemical Oxygen Demand Medium Range Mercury Free (13 mm Vial)

SPECIFICATIONS

Range	0 to 1500 mg/L (as O_2)
Resolution	1 mg/L
Accuracy	±15 mg/L or ±3% of reading at 25 °C, whichever is greater
Wavelength	610 nm
Cuvette type	13 mm diameter
Method	Dichromate Mercury Free
Method ID	#029

REQUIRED REAGENTS

Code	Description	Quantity
HI93754E-0*	COD Medium Range Reagent Vial	2 vials
DEIONIZED120	Deionized Water	2 mL

*Reagent vial identification: white label

REAGENT SETS

HI93754E-25	Reagents for 24 tests

For other accessories see Accessories section.

***Note**: Store the unused vials in their packaging in a cool and dark place.*

MEASUREMENT PROCEDURE

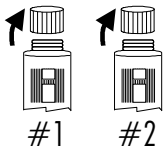
Before using the reagent kit carefully read all the instructions and the Safety Data Sheets (SDS). Pay particular attention to all warnings, cautions and notes. Failure to do so may result in serious injury to the operator.

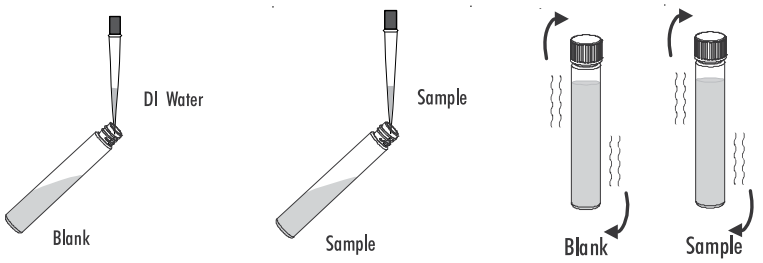
Reagent Blank Correction: This method requires a reagent blank correction. A single blank vial may be used more than once. The blank vial is stable for several months at room temperature. For improved accuracy, run a blank for each set of measurements and always use the same lot of reagents for blank and samples.

- Choose a homogeneous sample. Samples containing solids capable of settling need to be homogenized with a blender.
- Preheat the Hanna® Reactor HI839800 to 150 °C (302 °F).
- Use of supplied HI740217 safety shield is strongly recommended.

  ***Warning**: Do not use an oven or microwave; samples may leak and generate a corrosive and possibly explosive atmosphere.*
- Remove the cap from two barcoded HI93754E-0 COD Medium Range Reagent Vials.
- Add 2 mL of deionized water to the first vial (#1) and 2 mL of sample to the second vial (#2), while keeping the vials at a 45-degree angle. Replace the cap and invert several times to mix.

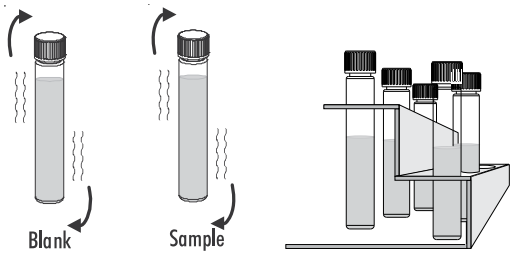
  ***Warning**: The vials will become hot during mixing, use caution when handling.*





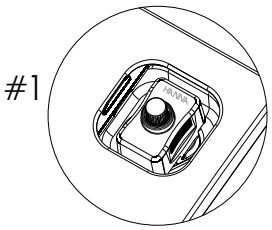
- Insert the vials into the reactor and heat them for 2 hours at 150 °C.
- At the end of the digestion period switch off the reactor. Wait 20 minutes to allow the vials to cool to about 120 °C.

- Invert each vial several times while still warm, then place them in the test tube rack.
  ***Warning**: The vials are still hot, use caution when handling.*
- Leave the vials in the tube rack to cool to room temperature. Do not shake or invert them, the samples may become turbid.

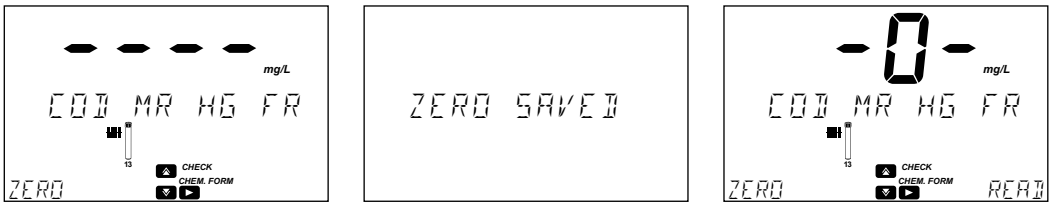


***Note**: Method selection is done automatically using a barcoded HI93754E-0 COD Medium Range Reagent Vial following the procedure described in the Barcode Methods section.*
Alternatively, select the COD MR Hg Free (13 mm) method using the procedure described in the Factory Methods section.

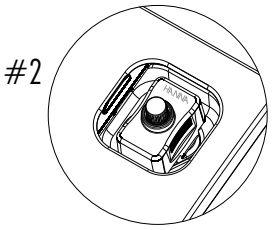
- Insert the supplied 13 mm vial adapter using the procedure described in the Cuvette & Vial Adapters section.
- Insert the blank vial (#1) into the adapter.
  Press steadily down until the vial clicks in place.



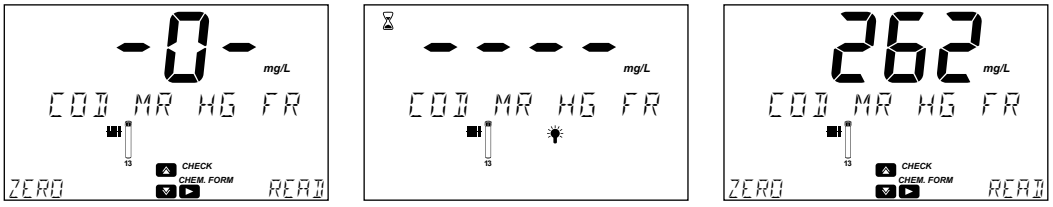
- Press **ZERO**.
  The meter scans the barcode and switches to the correct method automatically.
- The display will show "-0-" when the meter is zeroed and ready for measurement.



- Remove the vial.



- Insert the sample vial (#2) into the adapter.
  Press steadily down until the vial clicks in place.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **oxygen (O_2)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ► key to view the chemical formula.

- Press the ► key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Chloride (Cl^-) above 2000 mg/L
  Samples with higher chloride concentration should be diluted.

Chemical Oxygen Demand Medium Range ISO (13 mm Vial)

SPECIFICATIONS

Range	0 to 1000 mg/L (as O_2)
Resolution	1 mg/L
Accuracy	±15 mg/L or ±3% of reading at 25 °C, whichever is greater
Wavelength	610 nm
Cuvette type	13 mm diameter
Method	Dichromate ISO
Method ID	#030

REQUIRED REAGENTS

Code	Description	Quantity
HI93754G-0*	COD Medium Range Reagent Vial	2 vials
DEIONIZED120	Deionized Water	2 mL

*Reagent vial identification: white label

REAGENT SETS

HI93754G-25	Reagents for 24 tests

For other accessories see Accessories section.

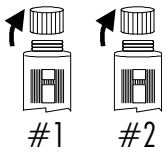
***Note**: Store the unused vials in their packaging in a cool and dark place.*

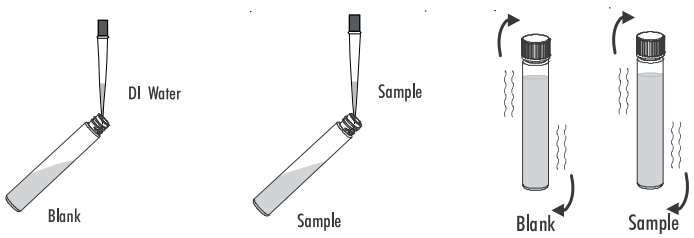
MEASUREMENT PROCEDURE

Before using the reagent kit carefully read all the instructions and the Safety Data Sheets (SDS). Pay particular attention to all warnings, cautions and notes. Failure to do so may result in serious injury to the operator.

Reagent Blank Correction: This method requires a reagent blank correction. A single blank vial may be used more than once. The blank vial is stable for several months at room temperature. For improved accuracy, run a blank for each set of measurements and always use the same lot of reagents for blank and samples.

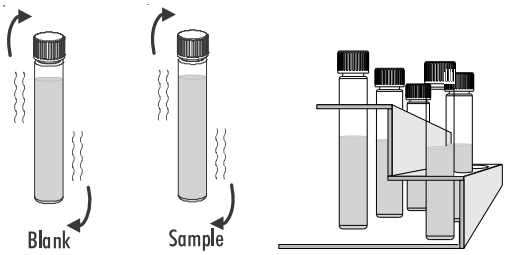
- Choose a homogeneous sample. Samples containing solids capable of settling need to be homogenized with a blender.
- Preheat the Hanna® Reactor HI839800 to 150 °C (302 °F).
- Use of supplied HI740217 safety shield is strongly recommended.
  ***Warning**: Do not use an oven or microwave; samples may leak and generate a corrosive and possibly explosive atmosphere.*
- Remove the cap from two barcoded HI93754G-0 COD Medium Range Reagent Vials.
- Add 2 mL of deionized water to the first vial (#1) and 2 mL of sample to the second vial (#2), while keeping the vials at a 45-degree angle. Replace the cap and invert several times to mix.
  ***Warning**: The vials will become hot during mixing, use caution when handling.*





- Insert the vials into the reactor and heat them for 2 hours at 150 °C.
- At the end of the digestion period switch off the reactor. Wait 20 minutes to allow the vials to cool to about 120 °C.

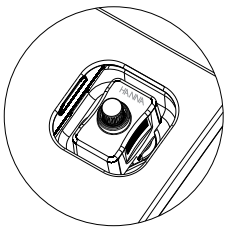
- Invert each vial several times while still warm, then place them in the test tube rack.
  ***Warning**: The vials are still hot, use caution when handling.*
- Leave the vials in the tube rack to cool to room temperature. Do not shake or invert them, the samples may become turbid.



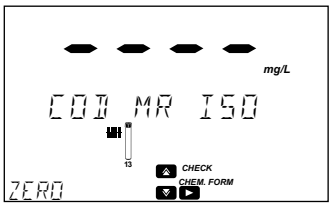
***Note**: Method selection is done automatically using a barcoded HI93754G-0 COD Medium Range Reagent Vial following the procedure described in the Barcode Methods section.*

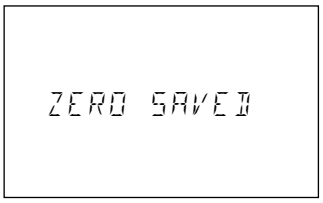
Alternatively, select the COD MR ISO (13 mm) method using the procedure described in the Factory Methods section.

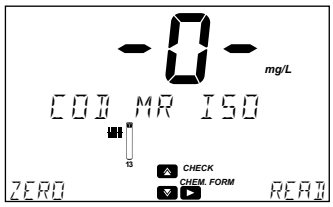
- Insert the supplied 13 mm vial adapter using the procedure described in the Cuvette & Vial Adapters section.
- Insert the blank vial (#1) into the adapter.
  Press steadily down until the vial clicks in place.

#1 

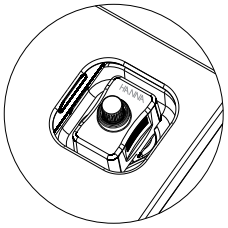
- Press **ZERO**.
  The meter scans the barcode and switches to the correct method automatically.
- The display will show "-0-" when the meter is zeroed and ready for measurement.



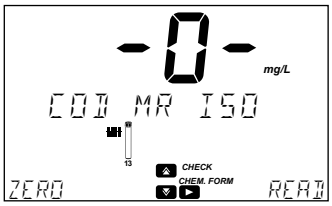


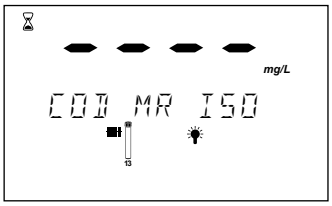


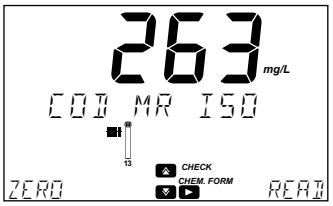
- Remove the vial.
- Insert the sample vial (#2) into the adapter.
  Press steadily down until the vial clicks in place.

#2 

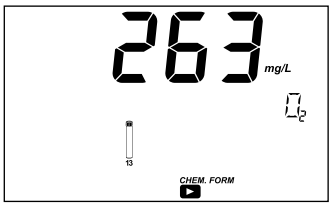
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **oxygen (O_2)**.







- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Chloride (Cl^-) above 2000 mg/L
  Samples with higher chloride concentration should be diluted.

Chemical Oxygen Demand High Range EPA (13 mm Vial)

SPECIFICATIONS

Range	0 to 15000 mg/L (as O_2)
Resolution	1 mg/L
Accuracy	±150 mg/L or ±2% of reading at 25 °C, whichever is greater
Wavelength	610 nm
Cuvette type	13 mm diameter
Method	Adaptation of the EPA 410.4 Approved Method for the COD Determination on Surface Waters and Wastewaters
Method ID	#031

REQUIRED REAGENTS

Code	Description	Quantity
HI93754C-0*	COD High Range Reagent Vial	2 vials
DEIONIZED120	Deionized Water	0.2 mL

*Reagent vial identification: green label

REAGENT SETS

HI93754C-25	Reagents for 24 tests

For other accessories see Accessories section.

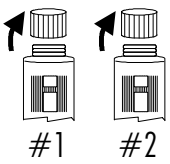
***Note**: Store the unused vials in their packaging in a cool and dark place.*

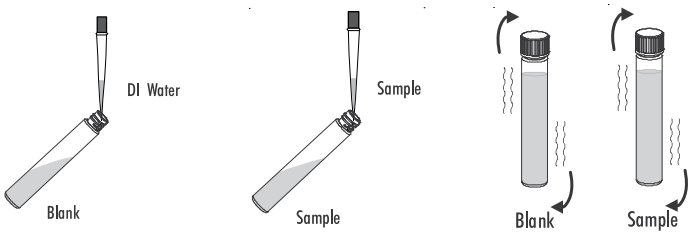
MEASUREMENT PROCEDURE

Before using the reagent kit carefully read all the instructions and the Safety Data Sheets (SDS). Pay particular attention to all warnings, cautions and notes. Failure to do so may result in serious injury to the operator.

Reagent Blank Correction: This method requires a reagent blank correction. A single blank vial may be used more than once. The blank vial is stable for several months at room temperature. For improved accuracy, run a blank for each set of measurements and always use the same lot of reagents for blank and samples.

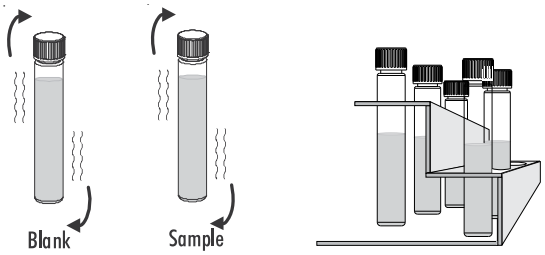
- Choose a homogeneous sample. Samples containing solids capable of settling need to be homogenized with a blender.
- Preheat the Hanna® Reactor HI839800 to 150 °C (302 °F).
- Use of supplied HI740217 safety shield is strongly recommended.
  ***Warning**: Do not use an oven or microwave; samples may leak and generate a corrosive and possibly explosive atmosphere.*
- Remove the cap from two barcoded HI93754C-0 COD High Range Reagent Vials.
- Add 0.2 mL of deionized water to the first vial (#1) and 0.2 mL of sample to the second vial (#2), while keeping the vials at a 45-degree angle. Replace the cap and invert several times to mix.
  ***Warning**: The vials will become hot during mixing, use caution when handling.*





- Insert the vials into the reactor and heat them for 2 hours at 150 °C.
- At the end of the digestion period switch off the reactor. Wait 20 minutes to allow the vials to cool to about 120 °C.

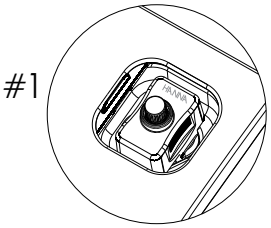
- Invert each vial several times while still warm, then place them in the test tube rack.
  ***Warning**: The vials are still hot, use caution when handling.*
- Leave the vials in the tube rack to cool to room temperature. Do not shake or invert them, the samples may become turbid.



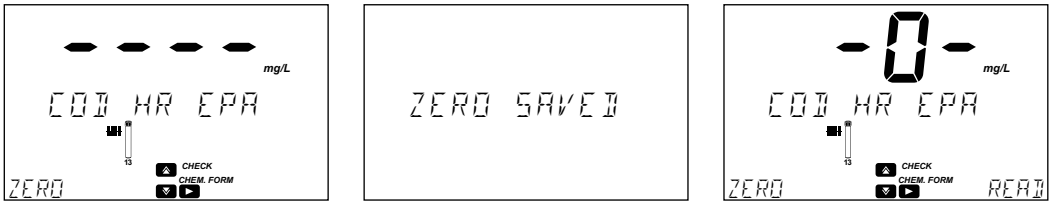
***Note**: Method selection is done automatically using a barcoded HI93754C-0 COD High Range Reagent Vial following the procedure described in the Barcode Methods section.*

Alternatively, select the COD HR EPA (13 mm) method using the procedure described in the Factory Methods section.

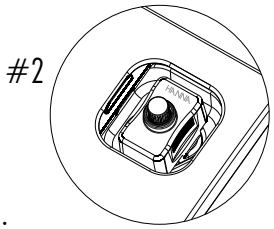
- Insert the supplied 13 mm vial adapter using the procedure described in the Cuvette & Vial Adapters section.
- Insert the blank vial (#1) into the adapter.
  Press steadily down until the vial clicks in place.



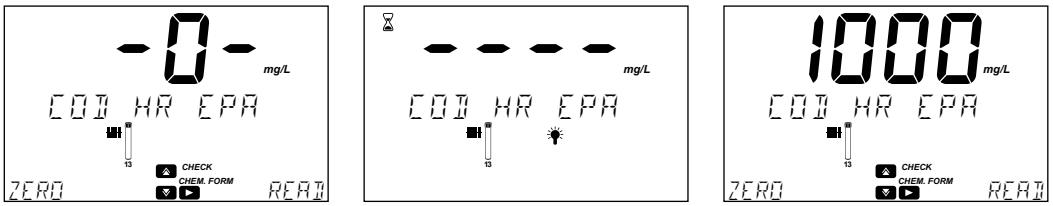
- Press **ZERO**.
  The meter scans the barcode and switches to the correct method automatically.
- The display will show "-0-" when the meter is zeroed and ready for measurement.



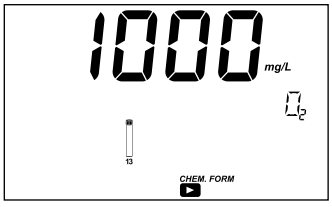
- Remove the vial.
- Insert the sample vial (#2) into the adapter.
  Press steadily down until the vial clicks in place.



- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **oxygen (O_2)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Chloride (Cl^-) above 20000 mg/L
  Samples with higher chloride concentration should be diluted.

Chemical Oxygen Demand Ultra High Range (13 mm Vial)

SPECIFICATIONS

Range	0.0 to 60.0 ppt (as O_2)
Resolution	0.1 ppt
Accuracy	±0.5 ppt ±3% of reading @ 25°C
Wavelength	610 nm
Cuvette type	13 mm diameter
Method	Adaptation of the EPA 410.4 Approved Method for the COD Determination on Surface Waters and Wastewaters
Method ID	#088

REQUIRED REAGENT

Code	Description	Quantity
HI93754J-0*	COD Ultra High Range Reagent Vial	2 vials
DEIONIZED120	Deionized Water	0.1 mL

*Reagent vial identification: blue label

REAGENT SETS

HI93754J-25	Reagents for 24 tests

For other accessories see Accessories section.

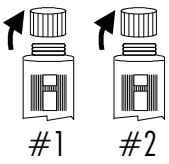
***Note**: Store the unused vials in their packaging in a cool and dark place.*

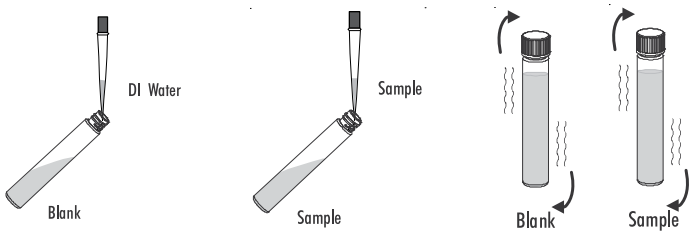
MEASUREMENT PROCEDURE

Before using the reagent kit carefully read all the instructions and the Safety Data Sheets (SDS). Pay particular attention to all warnings, cautions and notes. Failure to do so may result in serious injury to the operator.

Reagent Blank Correction: This method requires a reagent blank correction. A single blank vial may be used more than once. The blank vial is stable for several months at room temperature. For improved accuracy, run a blank for each set of measurements and always use the same lot of reagents for blank and samples.

- Choose a homogeneous sample. Samples containing solids capable of settling need to be homogenized with a blender.
- Preheat the Hanna® Reactor HI839800 to 150 °C (302 °F).
- Use of supplied HI740217 safety shield is strongly recommended.
  ***Warning**: Do not use an oven or microwave; samples may leak and generate a corrosive and possibly explosive atmosphere.*
- Remove the cap from two barcoded HI93754J-0 COD Ultra High Range Reagent Vials.
- Add 0.1 mL of deionized water to the first vial (#1) and 0.1 mL of sample to the second vial (#2), while keeping the vials at a 45-degree angle. Replace the cap and invert several times to mix.
  ***Warning**: The vials will become hot during mixing, use caution when handling.*



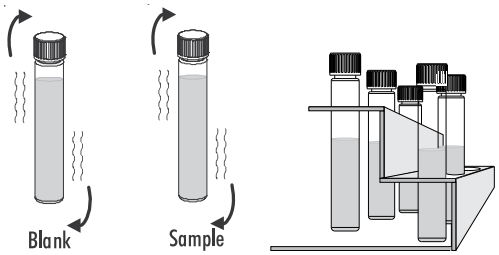


- Insert the vials into the reactor and heat them for 2 hours at 150 °C.
- At the end of the digestion period switch off the reactor. Wait 20 minutes to allow the vials to cool to about 120 °C.

- Invert each vial several times while still warm, then place them in the test tube rack.

  ***Warning**: The vials are still hot, use caution when handling.*

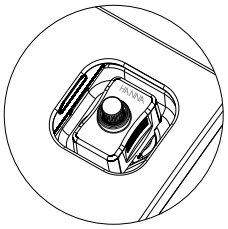
- Leave the vials in the tube rack to cool to room temperature. Do not shake or invert them, the samples may become turbid.



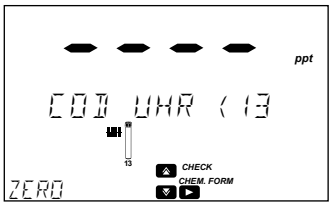
***Note**: Method selection is done automatically using a barcoded HI93754J-0 COD Ultra High Range Reagent Vial following the procedure described in the Barcode Methods section.*

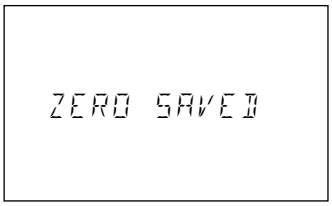
Alternatively, select the COD UHR (13 mm) method using the procedure described in the Factory Methods section.

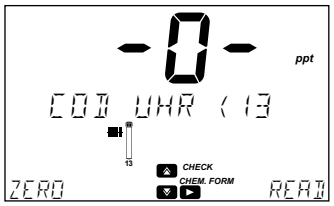
- Insert the supplied 13 mm vial adapter using the procedure described in the Cuvette & Vial Adapters section.
- Insert the blank vial (#1) into the adapter.
  Press steadily down until the vial clicks in place.

#1 

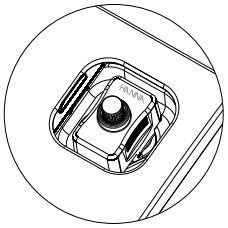
- Press **ZERO**.
  The meter scans the barcode and switches to the correct method automatically.
- The display will show "-0-" when the meter is zeroed and ready for measurement.



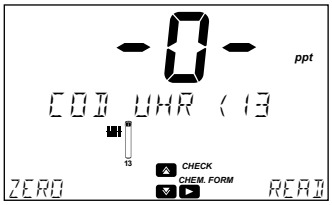


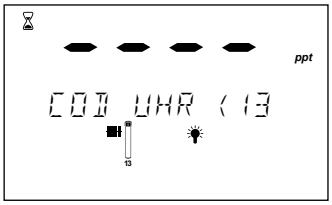


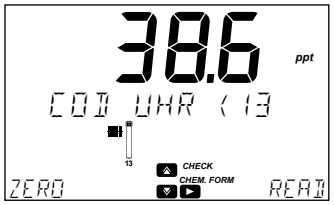
- Remove the vial.
- Insert the sample vial (#2) into the adapter.
  Press steadily down until the vial clicks in place.

#2 

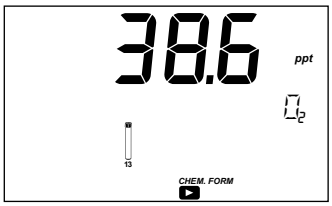
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **oxygen (O_2)**.







- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Chloride (Cl^-) above 20000 mg/L
  Samples with higher chloride concentration should be diluted.

Color ADMI Low Range

SPECIFICATIONS

Range	0 to 250 ADMI Pt-Co
Resolution	1 ADMI Pt-Co
Accuracy	±5 ADMI Pt-Co @ 25 °C
Wavelength	400-700 nm
Cuvette type	50 mm diameter
Method	ADMI weighted ordinate method, analogous APHA 2120F Method
Method ID	#099

***Note**: Transmittance (%T) scan range is 380 to 720 nm. %T range used for calculation of ADMI value is 400 to 700 nm.*

REQUIRED ACCESSORIES

0.45 µm membrane for true color measurement
For other accessories see Accessories section.

PRINCIPLE

Color properties include hue (red, yellow, blue, green), chroma (color intensity), and value (darkness or lightness).

ADMI (American Dye Manufacturers Institute) color value is a metric quantity based on the Adams Nickerson color formula, obtained by transforming CIE (International Commission on Illumination) tristimulus color indices into a uniform metric color scale that is independent of hue and chroma variations.

Transmittance of a clear (or filtered) sample is measured from 380 to 720 nm. Further calculations use values from 400 to 700 nm and give a single number for the color value (see *Reference*). The ADMI uses the platinum-cobalt standard from the American Public Health Association (APHA) as the standard for the color value. Although this standard is yellow, the ADMI method is applicable to all hues.

Reference

1. *Allen, W.; Prescott, W. B.; Derby, R. E.; Garland, C. E.; Peret, J. M.; Saltzman, M.; 1973. Determination of color of water and wastewater by means of ADMI color values. Proc. 28th Ind. Waste Conf., Purdue Univ., Eng. Ext. Ser. No. 142:661ff*
2. *Standard Methods for the Examination of Water and Wastewater, 21st Edition, APHA 2120 F*

APPLICATION

Colored waters, industrial waters, wastewater

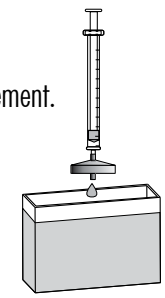
SIGNIFICANCE & USE

ADMI color scale serves as an indicator of water and wastewater quality. Color of water is pH-dependent and increases as water pH increases (APHA 2120F measurements are made on samples with unadjusted pH versus samples with pH adjusted to 7.0 pH). For pH adjustment, either NaOH or H_2SO_4 can be used, with concentrations chosen such that the resulting volume change is less than 3%.

MEASUREMENT PROCEDURE

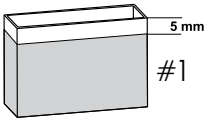
Preparation

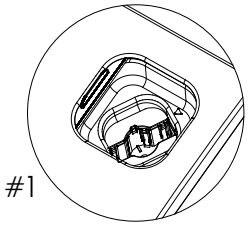
- Collect samples in glass bottles. Fill the bottle to the top, to avoid air exposure.
  Keep sample in the fridge (brief period of time only), to avoid physical and biological changes that may affect color.
- Prior to measurement, acclimate the sample to room temperature.
- Turbid samples:
  Rinse the bottle with 50 mL distilled water and follow with 50 mL water rinse, before collecting for measurement.
  Filter the sample through a 0.45 µm membrane filter.
- Thoroughly rinse the cuvettes with detergent and distilled water.
  Prior to measurement, rinse the cuvettes twice with deionized water (blank cuvette) and with the sample (sample cuvette). Wipe external surfaces with lens paper.



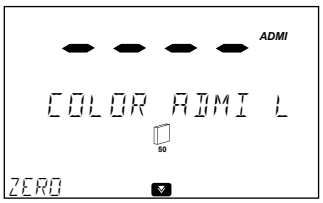
Measurement

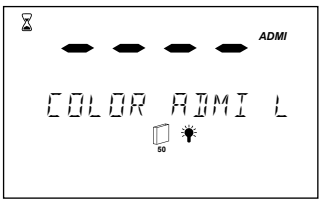
- Select the Color ADMI LR method using the procedure described in the Factory Methods section.

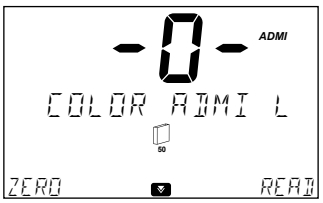




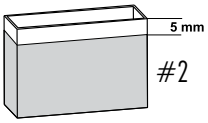
- Fill the first 50 mm cuvette (#1) with deionized water, up to 5 mm (0.2") below the rim.
- Insert the blank cuvette (#1) into the holder and close the lid.
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement (meter is set to 100% transmittance).

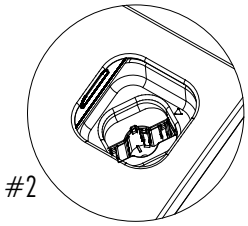




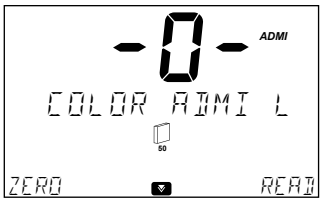


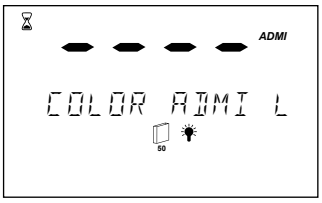
- Remove the cuvette.
- Fill the second 50 mm cuvette (#2) with clear sample, up to 5 mm (0.2") below the rim.
- Insert the sample cuvette (#2) into the holder and close the lid.

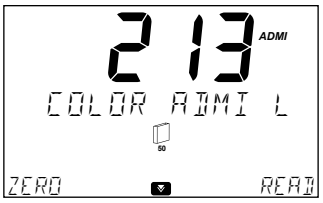




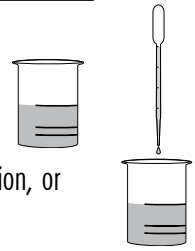
- Press **READ** to start the reading. The instrument displays the results directly in **ADMI Pt-Co**.







Measurement of samples with adjusted pH



A standard pH is necessary because of the pH color changes.

- Fill a beaker with 50 mL of sample.
- Add small drops of sodium hydroxide or sulfuric acid (for significant adjustments 0.1N concentration, or higher) to adjust the pH to 7.6 pH.
- Turbid samples: filter the pH-adjusted sample using a 0.45 μm membrane filter.
- Repeat the previous measurement steps for the sample with pH adjusted to 7.6 pH.
- For US EPA, report both results.

Method check procedure

To check and validate the method and the instrument, use 500 PCU standard solution.
Prepare a 100 ADMI Pt-Co dilution (or desired value) by following these steps:

- Use a pipette to add 10 mL of 500 PCU standard solution (or calculated volume for other ADMI color value) into a 50 mL volumetric flask.
- Add deionized water up to the 50 mL mark.
- Apply the measurement procedure steps to determine the ADMI color value.
- Compare the expected result with the actual result and ensure they fall within the method's accuracy limits.

INTERFERENCES

- Turbidity interferes directly and must be eliminated through sample filtration

Color ADMI High Range

SPECIFICATIONS

Range	0 to 600 ADMI Pt-Co
Resolution	1 ADMI Pt-Co
Accuracy	±20 ADMI Pt-Co @ 25 °C
Wavelength	400-700 nm
Cuvette type	10 mm diameter
Method	ADMI weighted ordinate method, analogous APHA 2120F Method
Method ID	#100

***Note**: Transmittance (%T) scan range is 380 to 720 nm. %T range used for calculation of ADMI value is 400 to 700 nm.*

REQUIRED ACCESSORIES

0.45 µm membrane

For other accessories see Accessories section.

PRINCIPLE

Color properties include hue (red, yellow, blue, green), chroma (color intensity), and value (darkness or lightness).

ADMI (American Dye Manufacturers Institute) color value is a metric quantity based on the Adams Nickerson color formula, obtained by transforming CIE (International Commission on Illumination) tristimulus color indices into a uniform metric color scale that is independent of hue and chroma variations.

Transmittance of a clear (or filtered sample) is measured from 380 to 720 nm. Further calculations use values from 400 to 700 nm and give a single number for the color value (see *Reference*). The ADMI uses the platinum-cobalt standard from the American Public Health Association (APHA) as the standard for the color value. Although this standard is yellow, the ADMI method is applicable to all hues.

Reference

1. *Allen, W.; Prescott, W. B.; Derby, R. E.; Garland, C. E.; Peret, J. M.; Saltzman, M.; 1973. Determination of color of water and wastewater by means of ADMI color values. Proc. 28th Ind. Waste Conf., Purdue Univ., Eng. Ext. Ser. No. 142:661ff*
2. *Standard Methods for the Examination of Water and Wastewater, 21st Edition, APHA 2120 F*

APPLICATION

Colored waters, industrial waters, wastewater

SIGNIFICANCE & USE

ADMI color scale serves as an indicator of water and wastewater quality. Color of water is pH-dependent and increases as water pH increases (APHA 2120F measurements are made on samples with unadjusted pH versus samples with pH adjusted to 7.0 pH). For pH adjustment, either NaOH or H_2SO_4 can be used, with concentrations chosen such that the resulting volume change is less than 3%.

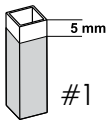
MEASUREMENT PROCEDURE

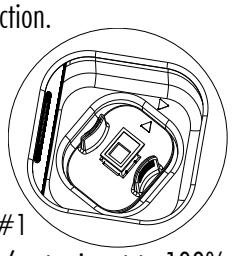
Preparation

- Collect samples in glass bottles. Fill bottles to the top, to avoid air exposure.
  Keep sample in the fridge (brief period of time only), to avoid physical and biological changes that may affect color.
- Prior to measurement, acclimate the sample to room temperature.
- Turbid samples:
  Rinse the bottle with 50 mL distilled water and follow with 50 mL water rinse, before collecting for measurement.
  Filter the sample through a 0.45 µm membrane filter.
- Thoroughly rinse the cuvettes with detergent and distilled water.
  Prior to measurement, rinse the cuvettes twice with deionized water (blank cuvette) and with sample (sample cuvette). Wipe external surfaces with lens paper.

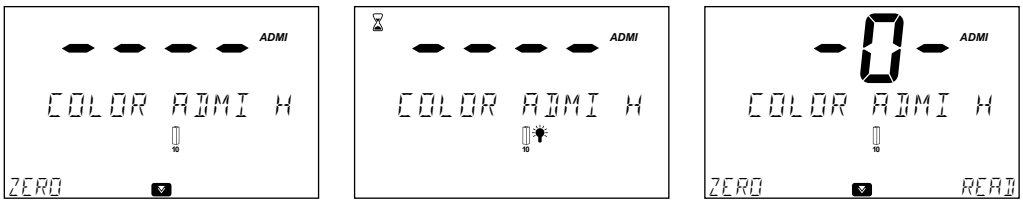
Measurement

- Select the Color ADMI HR method using the procedure described in the Factory Methods section.
- Insert the 10 mm cuvette adapter using the procedure described in the Cuvette & Vial Adapters section.
- Fill the first 10 mm cuvette (#1) with deionized water, up to 5 mm (0.2") below the rim.

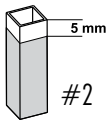


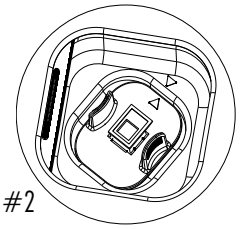


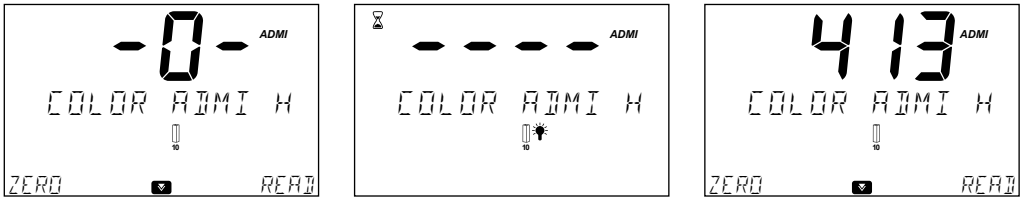
- Insert the blank cuvette (#1) into the adapter and close the lid.
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement (meter is set to 100% transmittance).



- Remove the cuvette.
- Fill the second 10 mm cuvette (#2) with clear sample, up to 5 mm (0.2") below the rim.
- Insert the sample cuvette (#2) into the adapter and close the lid.
- Press **READ** to start the reading. The instrument displays the results directly in **ADMI Pt-Co**.

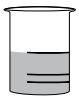






Measurement of samples with adjusted pH

A standard pH is necessary because of the pH color changes.



- Fill a beaker with 50 mL of sample.
- Add small drops of sodium hydroxide or sulfuric acid (recommended concentration 0.1N, or higher, for significant adjustments) to adjust the pH to 7.6 pH.
- Turbid samples: filter the pH-adjusted sample using a 0.45 μm membrane filter.
- Repeat the previous measurement steps for sample with pH adjusted to 7.6 pH.
- For US EPA, report both results.

Method check procedure

To check and validate the method and the instrument, use 500 PCU standard solution.
Prepare a 100 ADMI Pt-Co dilution (or desired value) by following these steps:

- Use a pipette to add 10 mL of 500 PCU standard solution (or calculated volume for other ADMI color value) into a 50 mL volumetric flask.
- Add deionized water up to the 50 mL mark.
- Apply the measurement procedure steps to determine the ADMI color value.
- Compare the expected result with the actual result and ensure they fall within the method's accuracy limits.

INTERFERENCES

- Turbidity interferes directly and must be eliminated through sample filtration

Color of Water

SPECIFICATIONS

Range	0 to 500 PCU (Platinum Cobalt Units)
Resolution	1 PCU
Accuracy	±10 PCU ±5% of reading at 25 °C
Wavelength	460 nm
Cuvette type	22 mm diameter
Method	Adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th Edition, Colorimetric Platinum Cobalt Method
Method ID	#032

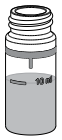
REQUIRED ACCESSORIES

0.45 µm membrane for true color measurement
For other accessories see Accessories section.

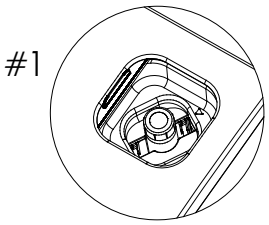
MEASUREMENT PROCEDURE

- Select the Color of Water method using the procedure described in the Factory Methods section.

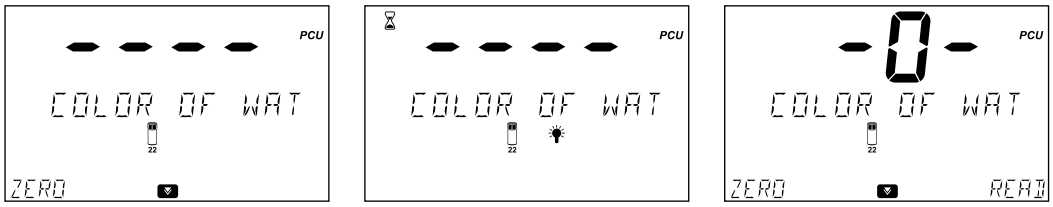
- Fill the first cuvette (#1) with 10 mL of deionized water (up to the mark). Replace the plastic stopper and the cap.



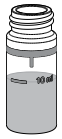
- Insert the blank cuvette (#1) into the holder and close the lid.



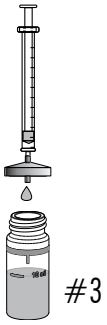
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



- Remove the cuvette.
- Fill the second cuvette (#2) with 10 mL of unfiltered sample (up to the mark). Replace the plastic stopper and the cap. This is the apparent color.

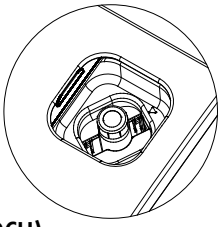


- Filter 10 mL of sample through a filter with a 0.45 µm membrane into the third cuvette (#3), up to the 10 mL mark. Replace the plastic stopper and the cap. This is the true color.

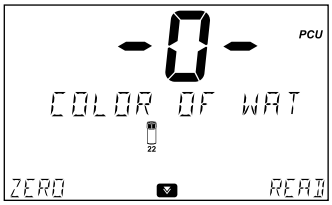


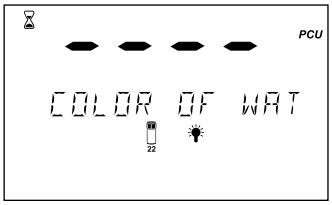
- Insert the apparent color cuvette (#2) into the instrument and close the lid.

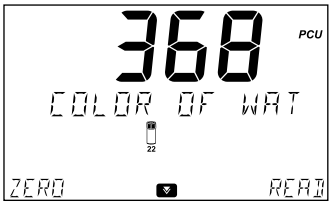
#2



- Press **READ** to start the reading. The instrument displays the results in **Platinum Cobalt Units (PCU)**.

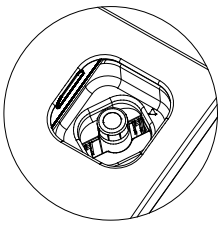




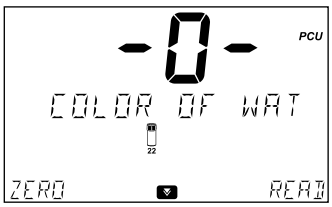


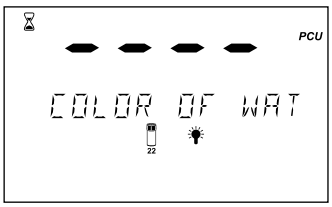
- Remove the apparent color cuvette (#2) from the holder, insert the true color cuvette (#3) into the holder and close the lid.

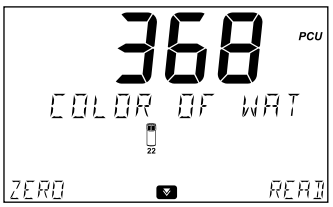
#3



- Press **READ** to start the reading. The instrument displays the results in **Platinum Cobalt Units (PCU)**.







- Press the ⩔ key to view the wavelength, method ID, date and time.

Copper Low Range

SPECIFICATIONS

Range	0 to 1500 µg/L (as Cu)
Resolution	1 µg/L
Accuracy	±10 µg/L ±5% of reading at 25 °C
Wavelength	575 nm
Cuvette type	22 mm diameter
Method	Adaptation of the EPA Method
Method ID	#033

REQUIRED REAGENTS

Code	Description	Quantity
HI95747-0	Copper Low Range Reagent	1 packet

REAGENT SETS

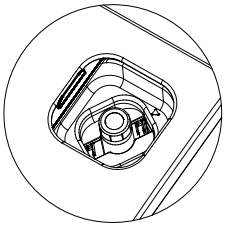
HI95747-01	Reagents for 100 tests
HI95747-03	Reagents for 300 tests

For other accessories see Accessories section.

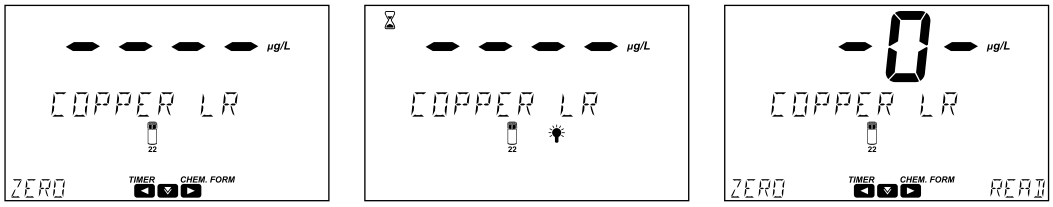
MEASUREMENT PROCEDURE

- Select the Copper LR method using the procedure described in the Factory Methods section.
- Fill the cuvette with 10 mL of unreacted sample (up to the mark). Replace the plastic stopper and the cap.

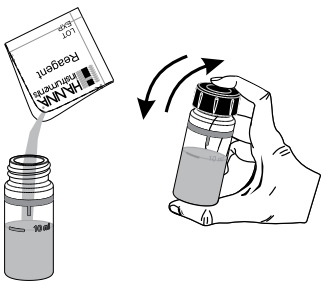
- Insert the cuvette into the holder and close the lid.



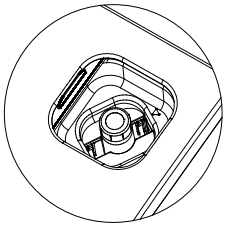
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



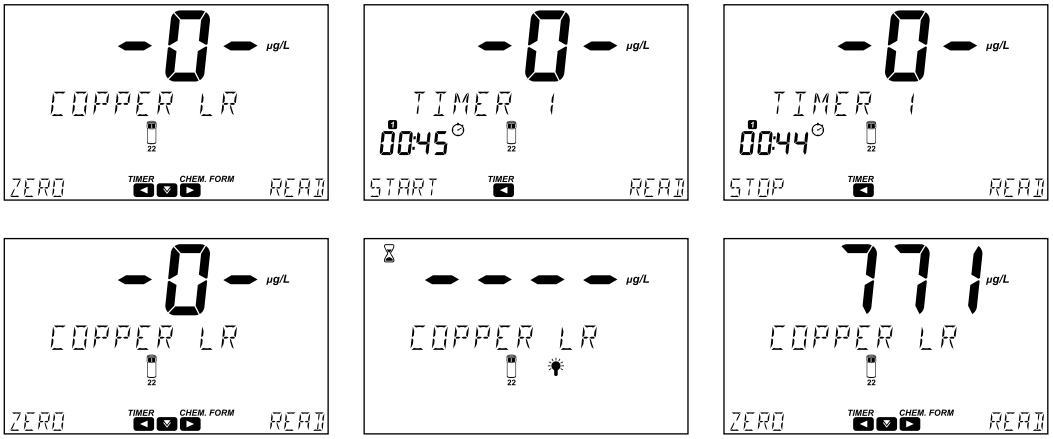
- Remove the cuvette.
- Add one packet of HI95747-0 Copper Low Range Reagent. Replace the plastic stopper and the cap. Shake gently for about 15 seconds.



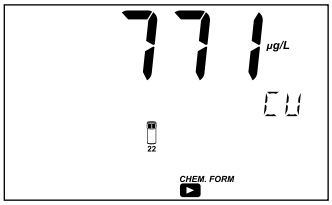
- Insert the cuvette into the holder and close the lid.



- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 45 seconds.
- Press **READ** to start the reading. The instrument displays the results in **µg/L** of **copper (Cu)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Cyanide, Silver
- For samples overcoming buffering capacity of reagent around pH 6.8, pH should be adjusted between 6 and 8.

Copper High Range

SPECIFICATIONS

Range	0.00 to 5.00 mg/L (as Cu)
Resolution	0.01 mg/L
Accuracy	±0.02 mg/L ±4% of reading at 25 °C
Wavelength	560 nm
Cuvette type	22 mm diameter
Method	Adaptation of the EPA Method
Method ID	#034

REQUIRED REAGENTS

Code	Description	Quantity
HI93702-0	Copper High Range Reagent	1 packet

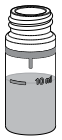
REAGENT SETS

HI93702-01	Reagents for 100 tests
HI93702-03	Reagents for 300 tests

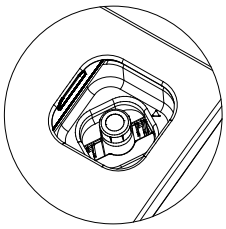
For other accessories see Accessories section.

MEASUREMENT PROCEDURE

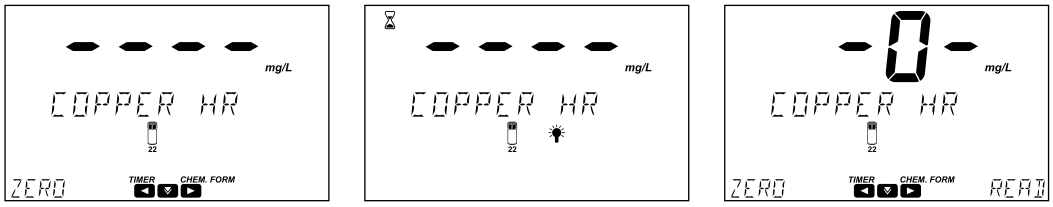
- Select the Copper HR method using the procedure described in the Factory Methods section.
- Fill the cuvette with 10 mL of unreacted sample (up to the mark). Replace the plastic stopper and the cap.



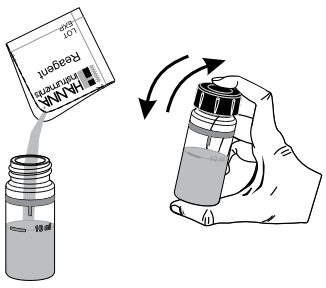
- Insert the cuvette into the holder and close the lid.



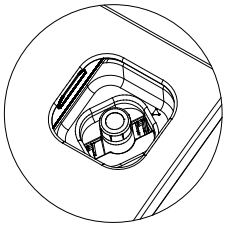
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



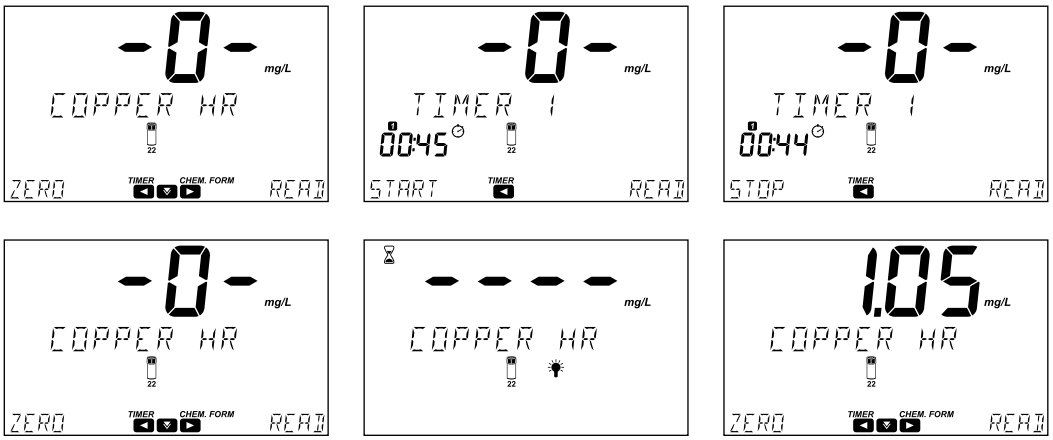
- Remove the cuvette.
- Add one packet of HI93702-0 Copper High Range Reagent. Replace the plastic stopper and the cap. Shake gently for about 15 seconds.



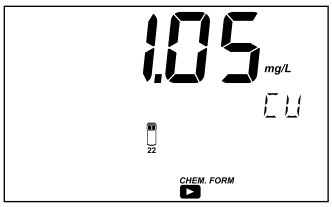
- Insert the cuvette into the holder and close the lid.



- Press the ◄ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 45 seconds.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **copper (Cu)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ► key to view the chemical formula.



- Press the ► key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Cyanide, Silver
- For samples overcoming buffering capacity of reagent around pH 6.8, pH should be adjusted between 6 and 8.

Cyanide

SPECIFICATIONS

Range	0.000 to 0.200 mg/L (as CN^-)
Resolution	0.001 mg/L
Accuracy	±0.005 mg/L ±3% of reading at 25 °C
Wavelength	610 nm
Cuvette type	22 mm diameter
Method	Pyridine-Pyrazalone
Method ID	#035

REQUIRED REAGENTS

Code	Description	Quantity
HI93714A-0	Cyanide Reagent A	1 spoon
HI93714B-0	Cyanide Reagent B	1 packet
HI93714C-0	Cyanide Reagent C	1 packet

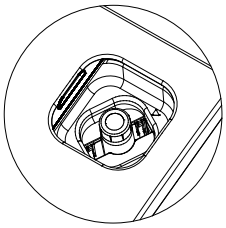
REAGENT SETS

HI93714-01	Reagents for 100 tests
HI93714-03	Reagents for 300 tests

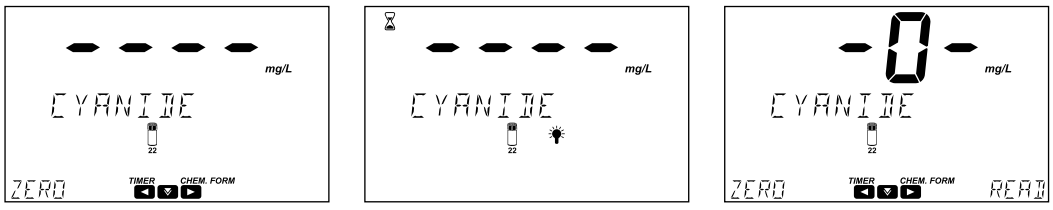
For other accessories see Accessories section.

MEASUREMENT PROCEDURE

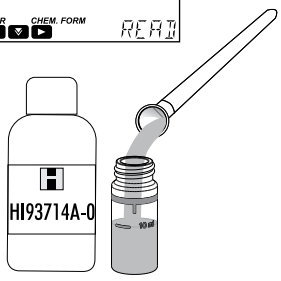
- Select the Cyanide method using the procedure described in the Factory Methods section.
- Fill the cuvette with 10 mL of unreacted sample (up to the mark). Replace the plastic stopper and the cap.



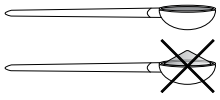
- Insert the cuvette into the holder and close the lid.
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



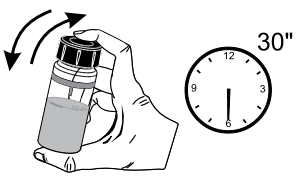
- Remove the cuvette and add 1 level spoon of HI93714A-0 Cyanide Reagent A. Remember to close the reagent bottle immediately after use.



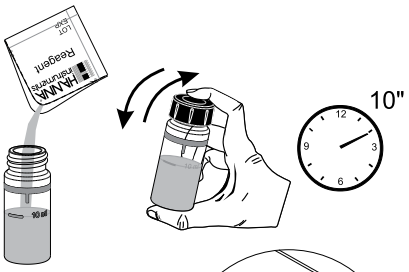
***Note**: Pay attention to the way the spoon is filled: do not press the powder; do not overfill it.*



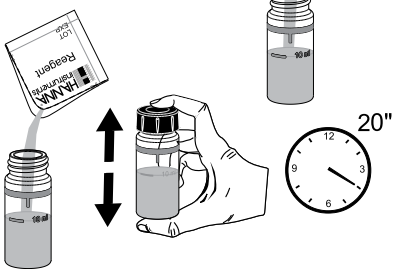
- To prevent the chlorine gas, developed during the reaction, from escaping, replace the plastic stopper and cap immediately. Shake gently for 30 seconds.

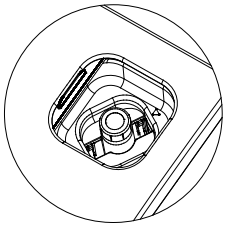


- Wait for 30 seconds leaving the cuvette tightly capped and undisturbed, then add one packet of HI93714B-0 Cyanide Reagent B. Replace the plastic stopper and the cap. Shake gently for 10 seconds.



- Add one packet of HI93714C-0 Cyanide Reagent C. Replace the plastic stopper and the cap. Shake vigorously for 20 seconds.

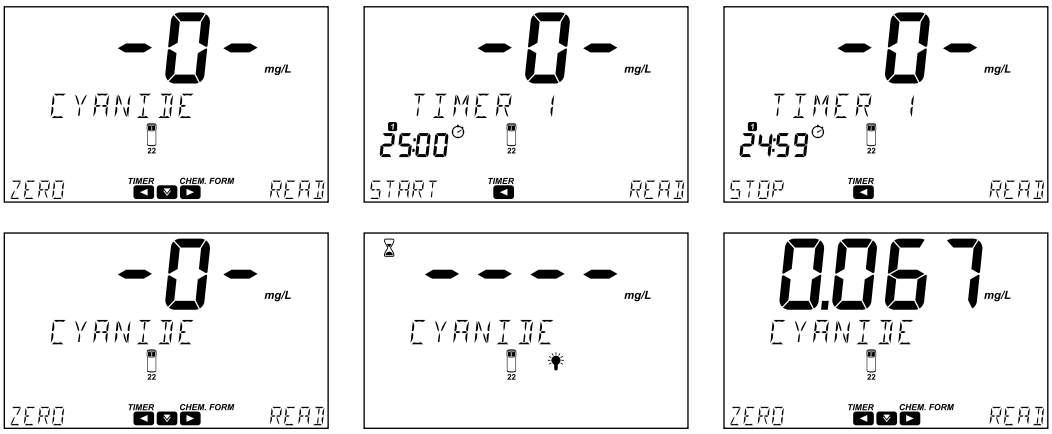




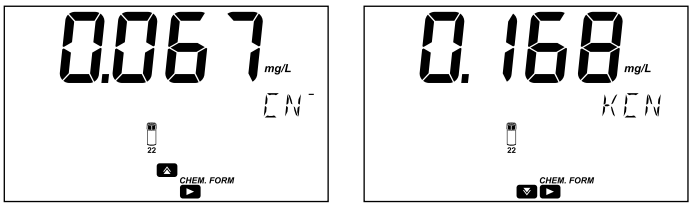
- Insert the cuvette into the holder and close the lid.
- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 25 minutes.

***Note**: Gently shake the cuvettes 4 or 5 times during the first 20 minutes of the timer. Accuracy is not affected by undissolved reagent powder.*

- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **cyanide (CN^-)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ▲ key to convert the results to **mg/L** of **potassium cyanide (KCN)**.



- Press the ▶ key to return to the measurement screen.

***Note**: For the most accurate results perform the test between 20 and 25 °C.*

INTERFERENCES

Interference may be caused by:

- Large amounts of turbidity that will cause high readings
- Oxidizing (such as chlorine) or reducing agents (such as sulfide or sulfur dioxide) are known to interfere with the measurement. Distillation will remove these.
- Samples with high pH values should be adjusted to approximately pH 7 before testing.

CAUTION: Cyanides, their solutions, and hydrogen cyanide liberated by acids, are very poisonous.

Cyanuric Acid

SPECIFICATIONS

Range	0 to100 mg/L (as CYA)
Resolution	1 mg/L
Accuracy	±1 mg/L ±15% of reading at 25 °C
Wavelength	525 nm
Cuvette type	22 mm diameter
Method	Adaptation of the Turbidimetric Method
Method ID	#036

REQUIRED REAGENTS

Code	Description	Quantity
HI93722-0	Cyanuric Acid Reagent	1 packet

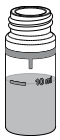
REAGENT SETS

HI93722-01	Reagents for 100 tests
HI93722-03	Reagents for 300 tests

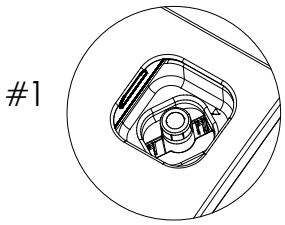
For other accessories see Accessories section.

MEASUREMENT PROCEDURE

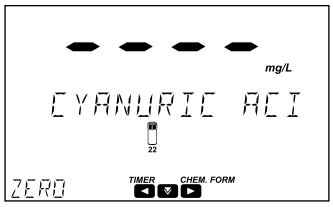
- Select the Cyanuric Acid method using the procedure described in the Factory Methods section.
- Fill the first cuvette (#1) with 10 mL of unreacted sample (up to the mark). Replace the plastic stopper and the cap.

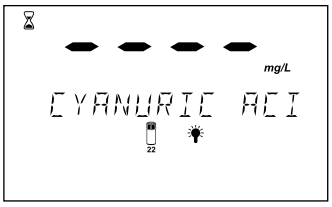


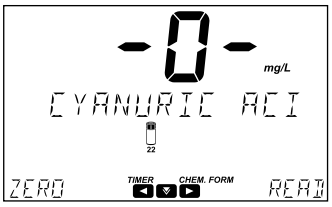
- Insert the cuvette into the holder and close the lid.



- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.

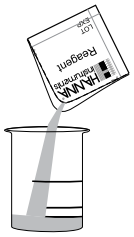




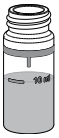


- Fill a beaker with 25 mL sample (up to the mark).

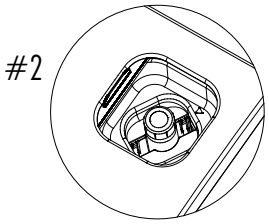
- Add packet of HI93722-0 Cyanuric Acid Reagent and mix to dissolve.



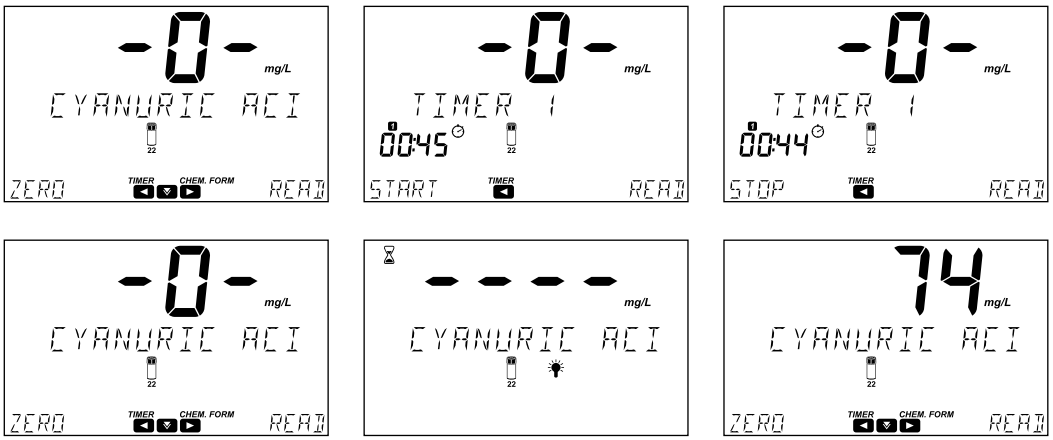
- Fill a second (#2) cuvette with 10 mL of the reacted sample (up to the mark). Replace the plastic stopper and the cap.



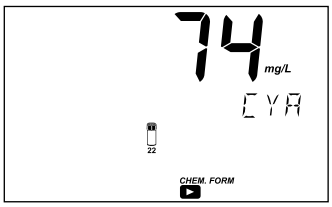
- Insert the cuvette into the holder and close the lid.



- Press the ◄ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 45 seconds.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **cyanuric acid**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ► key to view the chemical formula.



- Press the ► key to return to the measurement screen.

Fluoride Low Range

SPECIFICATIONS

Range	0.00 to 2.00 mg/L (as F^-)
Resolution	0.01 mg/L
Accuracy	±0.03 mg/L ±3% of reading at 25 °C
Wavelength	575 nm
Cuvette type	22 mm diameter
Method	Adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th Edition, SPADNS Method
Method ID	#037

REQUIRED REAGENTS

Code	Description	Quantity
HI93729-0	Fluoride Low Range Reagent	4 mL

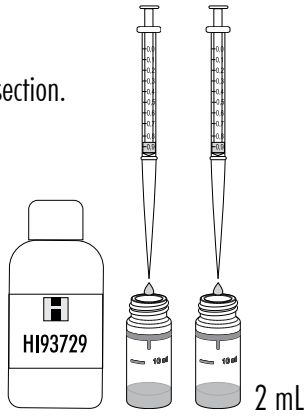
REAGENT SETS

HI93729-01	Reagents for 100 tests
HI93729-03	Reagents for 300 tests

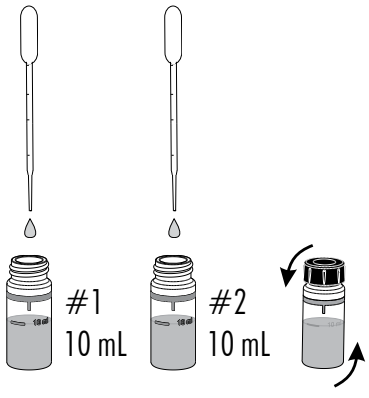
For other accessories see Accessories section.

MEASUREMENT PROCEDURE

- Select the Fluoride LR method using the procedure described in the Factory Methods section.

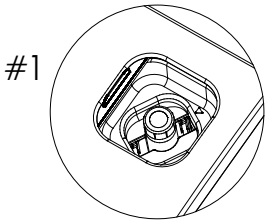


- Add 2 mL of HI93729-0 Fluoride Low Range Reagent to two cuvettes.
- Use a plastic pipette to fill the first cuvette to the 10 mL mark with deionized water (#1). Replace the plastic stopper and the cap. Invert several times to mix.
- Use a plastic pipette to fill the second cuvette to the 10 mL mark with unreacted sample (#2). Replace the plastic stopper and the cap. Invert several times to mix.

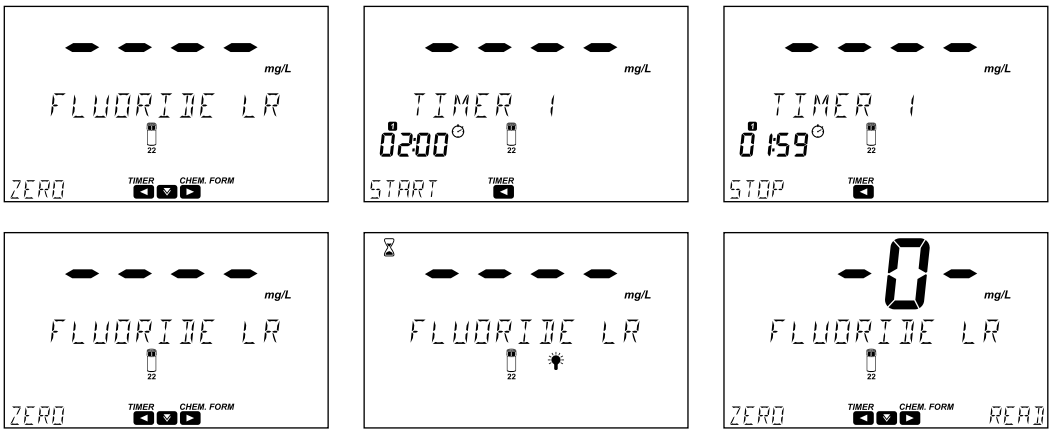


***Note**: For the most accurate results use two graduated pipettes to deliver exactly 8 mL of deionized water and 8 mL of sample.*

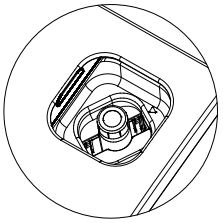
- Insert the first cuvette (#1) into the holder and close the lid.

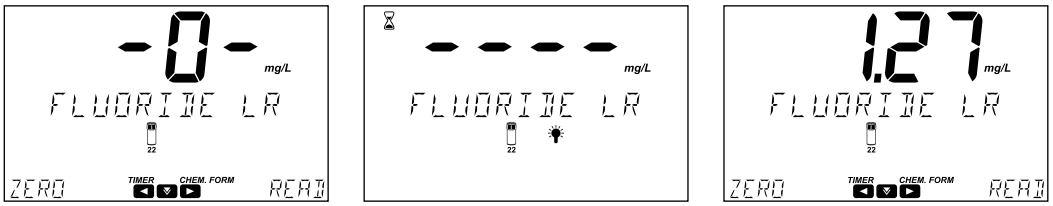


- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to zeroing the blank or wait 2 minutes.
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.

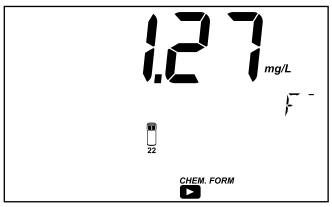


- Remove the cuvette.
- Insert the second cuvette (#2) with the reacted sample into the holder and close the lid.
- Press **READ** to start reading. The instrument displays the results in **mg/L** of **fluoride (F^-)**.





- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

***Note**: For wastewater or seawater samples, before performing measurements, distillation is required.*

INTERFERENCES

Interference may be caused by:

- Alkalinity above 5000 mg/L $CaCO_3$
- Chloride above 700 mg/L
- Sulfate above 200 mg/L
- Orthophosphate above 16 mg/L
- Iron (Ferric) above 10 mg/L
- Sodium hexametaphosphate above 1.0 mg/L
- Aluminum above 0.1 mg/L
- Highly colored and turbid samples may require distillation.
- Highly alkaline samples can be neutralized with nitric acid.

Fluoride High Range

SPECIFICATIONS

Range	0.0 to 20.0 mg/L (as F^-)
Resolution	0.1 mg/L
Accuracy	±0.5 mg/L ±3% of reading at 25 °C
Wavelength	575 nm
Cuvette type	22 mm diameter
Method	Adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th Edition, SPADNS Method
Method ID	#038

REQUIRED REAGENTS

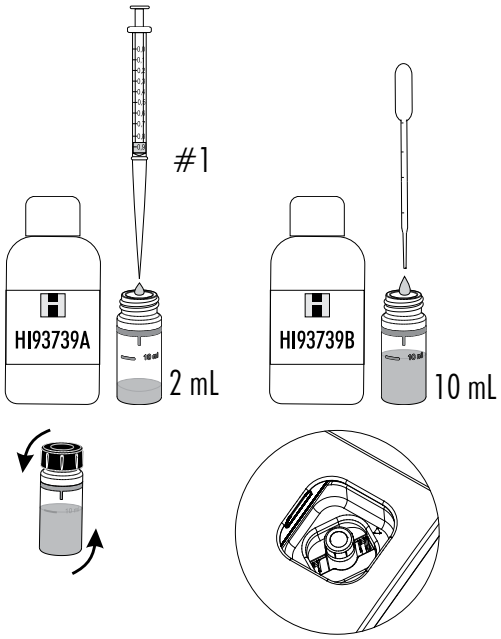
Code	Description	Quantity
HI93739A-0	Fluoride High Range Reagent A	2 mL
HI93739B-0	Fluoride High Range Reagent B	8 mL

REAGENT SETS

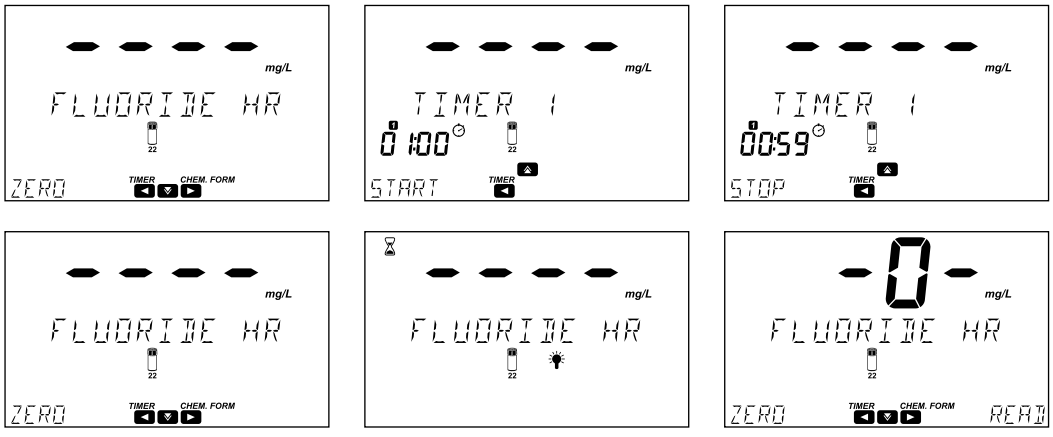
HI93739-01	Reagents for 100 tests
HI93739-03	Reagents for 300 tests

For other accessories see Accessories section.

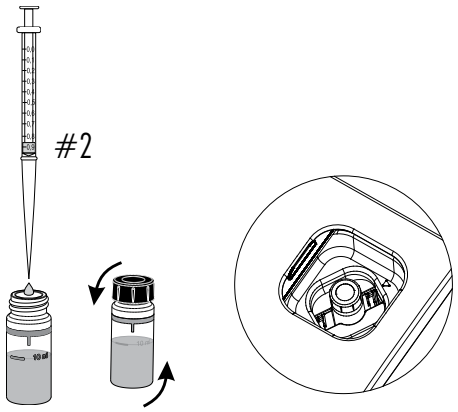
MEASUREMENT PROCEDURE



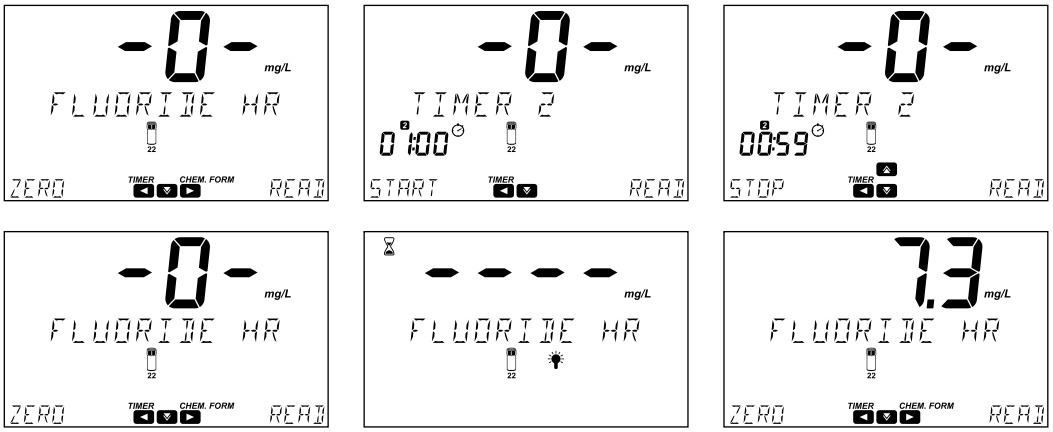
- Select the Fluoride HR method using the procedure described in the Factory Methods section.
- Use 1 mL syringe one and add 2 mL of HI93739A-0 Fluoride High Range Reagent A to the cuvette. Use the plastic pipette to fill up the cuvette to the 10 mL mark with HI93739B-0 Fluoride High Range Reagent B.
- Replace the plastic stopper and the cap. Invert several times to mix.
- Insert the cuvette into the holder and close the lid.
- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to zeroing the blank or wait 1 minute.
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



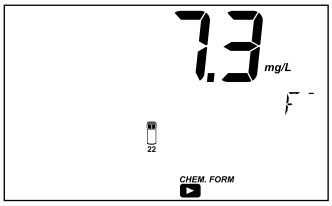
- Remove the cuvette.



- Add 1 mL of sample to the cuvette using the second 1 mL syringe.
- Replace the plastic stopper and the cap. Invert several times to mix.
- Insert the cuvette into the holder and close the lid.
- Press the ◀ key to access the timer menu. Press **START** to start Timer 2, the display will show the countdown prior to measurement or wait 1 minute.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **fluoride (F^-)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

***Note**: For wastewater or seawater samples, before performing measurements, distillation is required.*

INTERFERENCES

Interference may be caused by:

- Alkalinity above 5000 mg/L $CaCO_3$
- Chloride above 700 mg/L
- Sulfate above 200 mg/L
- Orthophosphate above 16 mg/L
- Iron (Ferric) above 10 mg/L
- Sodium hexametaphosphate above 1.0 mg/L
- Aluminum above 0.1 mg/L
- Highly colored and turbid samples may require distillation.
- Highly alkaline samples can be neutralized with nitric acid.

Hardness, Calcium

SPECIFICATIONS

Range	0.00 to 2.70 mg/L (as $CaCO_3$)
Resolution	0.01 mg/L
Accuracy	±0.08 mg/L ±4% of reading at 25 °C
Wavelength	523 nm
Cuvette type	22 mm diameter
Method	Adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th Edition, Calmagite Method
Method ID	#039

REQUIRED REAGENTS

Code	Description	Quantity
HI93720A-0	Calcium Hardness Reagent A	0.5 mL
HI93720B-0	Calcium Hardness Reagent B	0.5 mL
HI93720C-0	Calcium Hardness Reagent C	1 drop

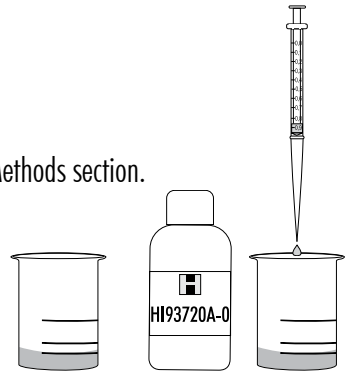
REAGENT SETS

HI93720-01	Reagents for 100 tests
HI93720-03	Reagents for 300 tests

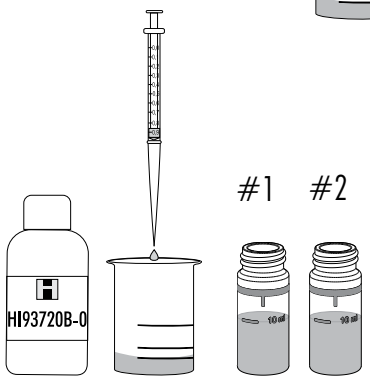
For other accessories see Accessories section.

MEASUREMENT PROCEDURE

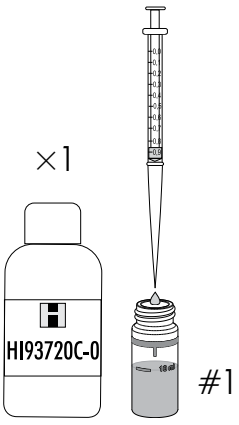
- Select the Hardness (Calcium) method using the procedure described in the Factory Methods section.
- Rinse a graduated beaker several times with unreacted sample, before filling it to the 50 mL mark with the sample.
- Add 0.5 mL of HI93720A-0 Calcium Hardness Reagent A. Swirl to mix the solution.



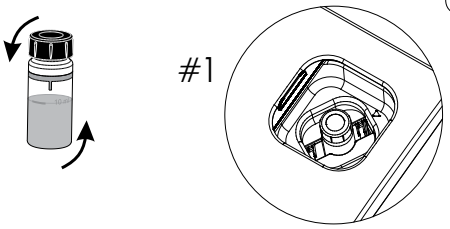
- Add 0.5 mL of HI93720B-0 Calcium Hardness Reagent B. Swirl to mix the solution. Use this solution to rinse 2 cuvettes before filling them up to the 10 mL mark.



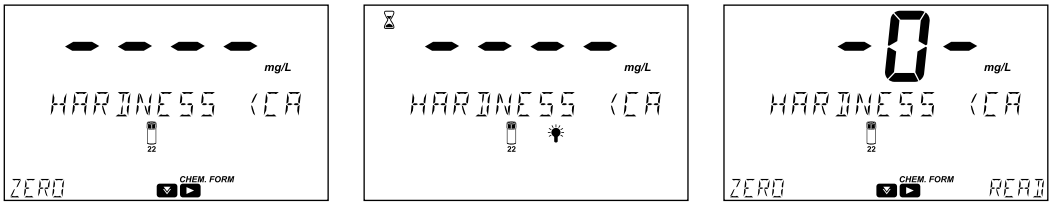
- Add 1 drop of HI93720C-0 Calcium Hardness Reagent C to one cuvette (#1).



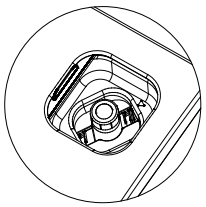
- Replace the plastic stopper and the cap. Invert the cuvette several times to mix. This is the blank.
- Insert the blank cuvette (#1) into the holder and close the lid.



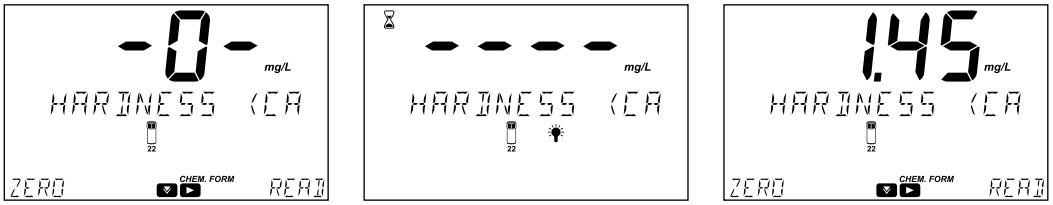
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



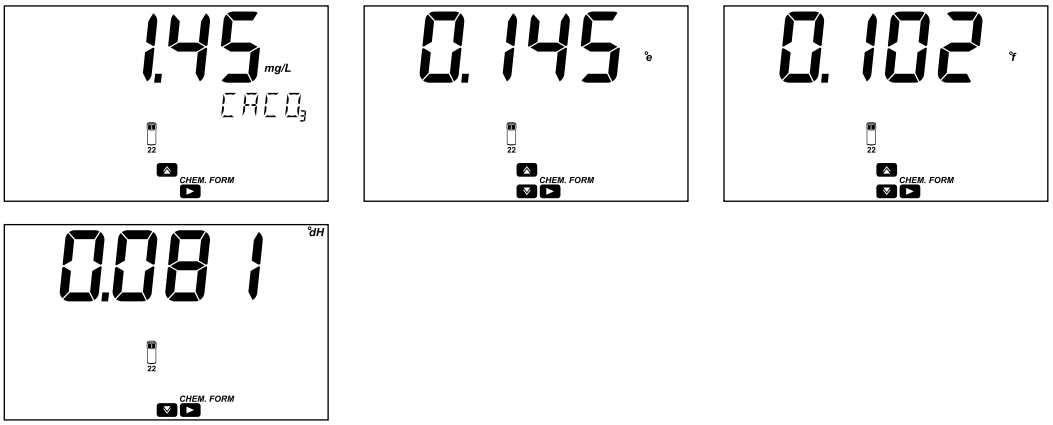
#2



- Remove the blank cuvette (#1) and insert the second cuvette (#2) into the holder.
- Press **READ** to start the reading. The instrument displays concentration in **mg/L** of **calcium carbonate ($CaCO_3$)**.



- Press the ⏬ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ⏫ key to convert the results to **English (°e)**, **French (°f)**, or **German (°dH) degrees**.



- Press the ▶ key to return to the measurement screen.

***Note**: This test will detect any calcium contamination in the beaker, measuring syringes or sample cells. To test cleanliness repeat the test multiple times until consistent results are obtained.*

SAMPLE DILUTION

This method 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 method.

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

To reduce the level of hardness by a factor of one hundred:

- Fill a 1 mL syringe with the sample.
- Add 0.5 mL of sample to a clean, dry 50 mL beaker.
- Fill the beaker up to the 50 mL mark with hardness-free water.

INTERFERENCES

Interference may be caused by:

- Excessive amounts of heavy metals

Hardness, Magnesium

SPECIFICATIONS

Range	0.00 to 2.00 mg/L (as $CaCO_3$)
Resolution	0.01 mg/L
Accuracy	±0.11 mg/L ±5% of reading at 25 °C
Wavelength	523 nm
Cuvette type	22 mm diameter
Method	Adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th Edition, EDTA Colorimetric Method
Method ID	#040

REQUIRED REAGENTS

Code	Description	Quantity
HI93719A-0	Magnesium Hardness Reagent A	0.5 mL
HI93719B-0	Magnesium Hardness Reagent B	0.5 mL
HI93719C-0	Magnesium Hardness Reagent C	1 drop
HI93719D-0	Magnesium Hardness Reagent D	1 drop

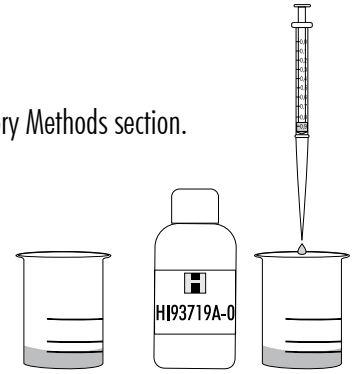
REAGENT SETS

HI93719-01	Reagents for 100 tests
HI93719-03	Reagents for 300 tests

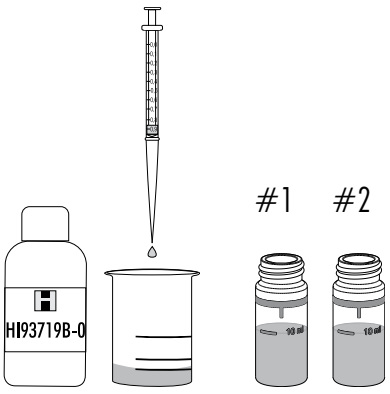
For other accessories see Accessories section.

MEASUREMENT PROCEDURE

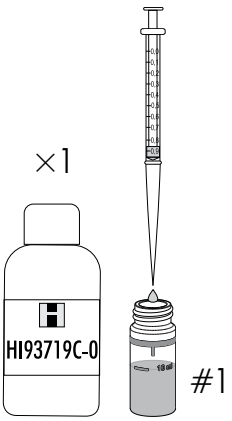
- Select the Hardness (Magnesium) method using the procedure described in the Factory Methods section.
- Rinse a graduated beaker several times with unreacted sample, before filling it to the 50 mL mark with the sample.
- Add 0.5 mL of HI93719A-0 Magnesium Hardness Reagent A. Swirl to mix the solution.



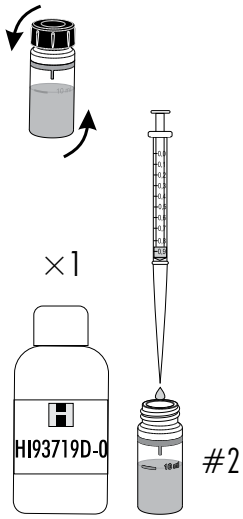
- Add 0.5 mL of HI93719B-0 Magnesium Hardness Reagent B. Swirl to mix the solution. Use this solution to rinse 2 cuvettes. Fill both cuvettes up to the 10 mL mark.



- Add 1 drop of HI93719C-0 Magnesium Hardness Reagent C to one cuvette (#1).

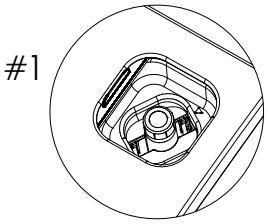


- Replace the plastic stopper and the cap. Invert the cuvette several times to mix the solution. This is the blank.

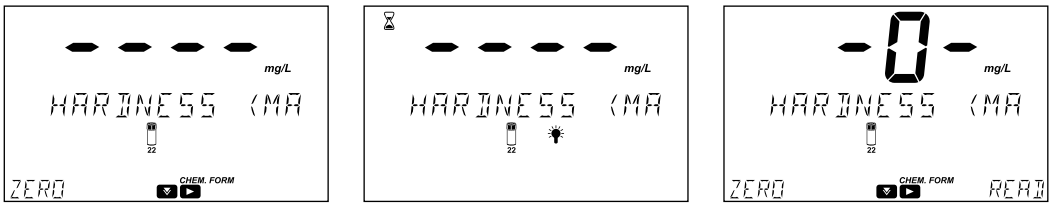


- Add 1 drop of HI93719D-0 Magnesium Hardness Reagent D to the second cuvette (#2). Replace the plastic stopper and the cap. Invert the cuvette several times to mix the solution. This is the sample.

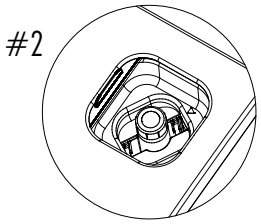
- Insert the blank (#1) into the holder and close the lid.



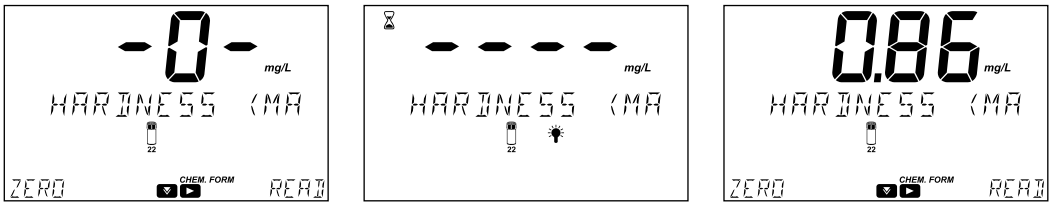
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



- Remove the blank cuvette (#1), insert the second cuvette (#2) into the holder and close the lid.

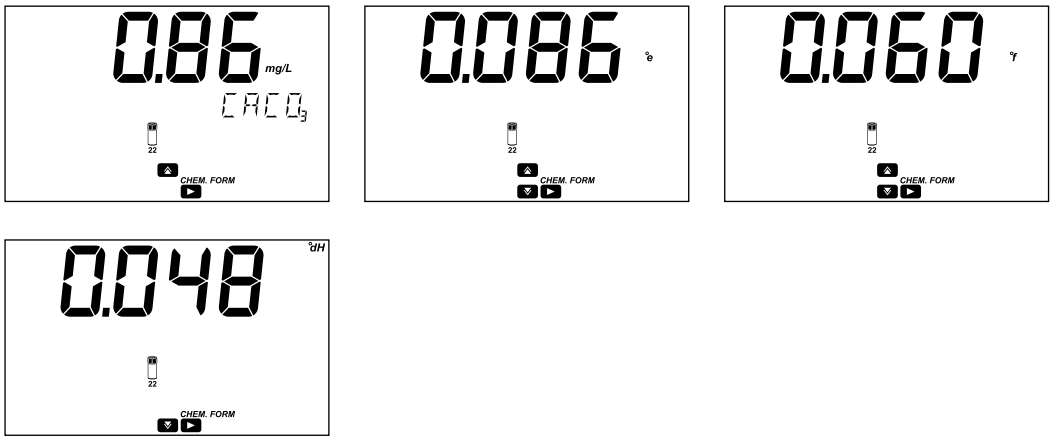


- Press **READ** to start the reading. The instrument displays concentration in **mg/L** of **calcium carbonate ($CaCO_3$)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.

- Press the ▲ key to convert the results to **English (°e)**, **French (°f)**, or **German (°dH) degrees**.



- Press the ► key to return to the measurement screen.

***Note**: This test will detect any calcium contamination in the beaker, measuring syringes or sample cells. To test cleanliness repeat the test multiple times until consistent results are obtained.*

SAMPLE DILUTION

This method 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 method.
This problem can be overcome through dilution. Dilutions must be performed with hardness-free water or the readings will be erroneous.
To reduce the level of hardness by a factor of one hundred a dilution is performed as follows:

- Fill a 1 mL syringe with the sample.
- Add 0.5 mL of sample to a clean, dry 50 mL beaker.
- Fill the beaker up to the 50 mL mark with hardness-free water.

INTERFERENCES

Interference may be caused by:

- Excessive amounts of heavy metals

Hardness, Total Low Range

SPECIFICATIONS

Range	0 to 250 mg/L (as $CaCO_3$)
Resolution	1 mg/L
Accuracy	±5 mg/L ±4% of reading at 25 °C
Wavelength	466 nm
Cuvette type	22 mm diameter
Method	Adaptation of the EPA Method 130.1
Method ID	#041

REQUIRED REAGENTS

Code	Description	Quantity
HI93735IND-0	Hardness Indicator Reagent	0.5 mL
HI93735A-LR	Hardness Low Range Reagent A	9 mL
HI93735B-0	Hardness Buffer Reagent B	2 drops
HI93735C-0	Fixing Reagent	1 packet

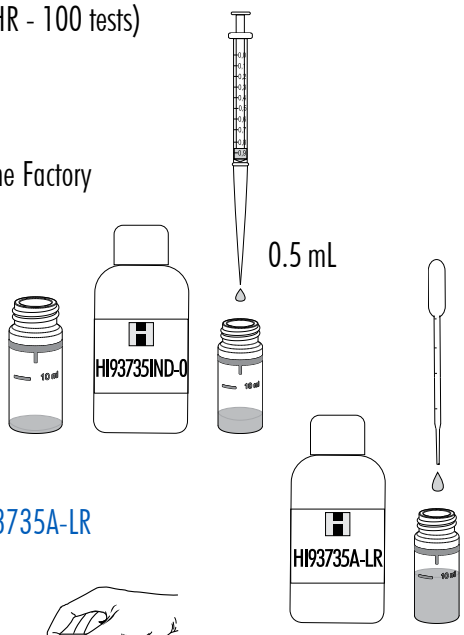
REAGENT SETS

HI93735-00	Reagents for 100 tests (LR)
HI93735-0	Reagents for 300 tests (LR - 100 tests, MR - 100 tests, HR - 100 tests)

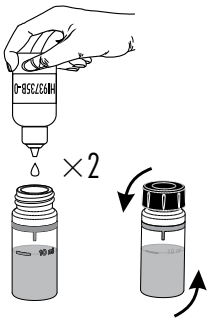
For other accessories see Accessories section.

MEASUREMENT PROCEDURE

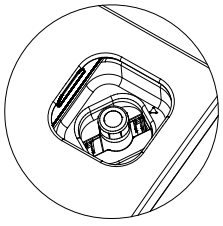
- Select the Hardness Total LR method using the procedure described in the Factory Methods section.



- Add 0.5 mL of unreacted sample to the cuvette. Add 0.5 mL of HI93735IND-0 Hardness Indicator Reagent.
- Use a plastic pipette and fill the cuvette up to the 10 mL mark with HI93735A-LR Hardness Low Range Reagent A.

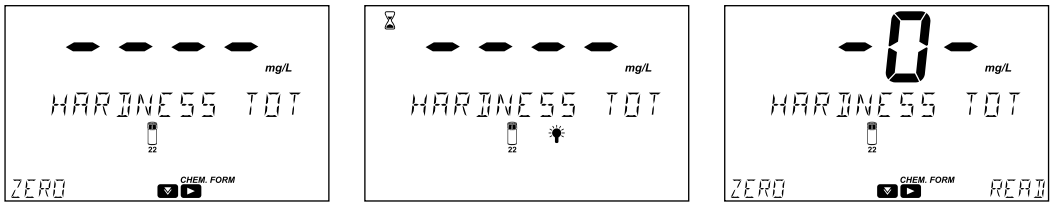


- Add 2 drops of HI93735B-0 Hardness Buffer Reagent B. Replace the plastic stopper and the cap. Invert 5 times to mix.

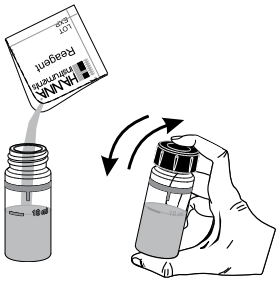


- Insert the cuvette into the holder and close the lid.

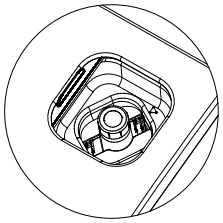
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



- Remove the cuvette.

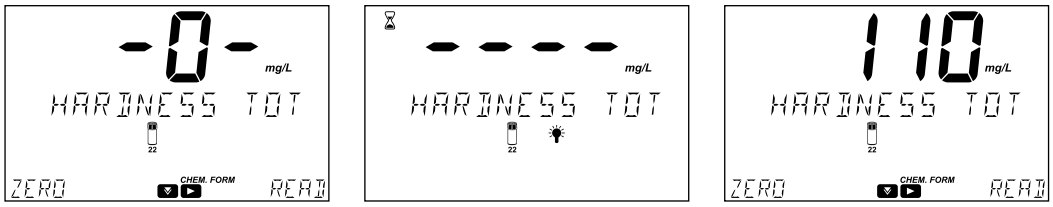


- Add one packet of HI93735C-0 Fixing Reagent. Replace the plastic stopper and the cap. Shake gently to mix 20 seconds.

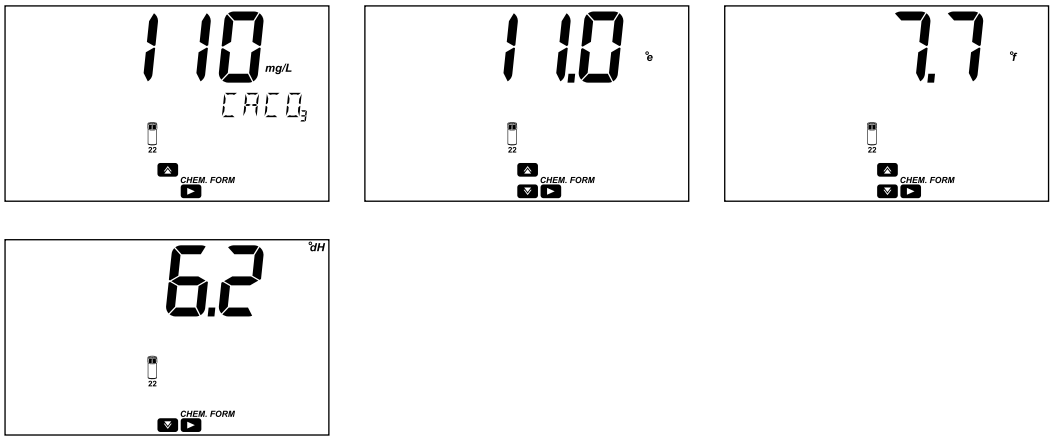


- Insert the cuvette into the holder and close the lid.

- Press **READ** to start the reading. The instrument displays concentration in **mg/L** of **calcium carbonate ($CaCO_3$)**.



- Press the ⏬ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ⏫ key to convert the results to **English (°e)**, **French (°f)**, or **German (°dH) degrees**.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Excessive amounts of heavy metals

Hardness, Total Medium Range

SPECIFICATIONS

Range	200 to 500 mg/L (as $CaCO_3$)
Resolution	1 mg/L
Accuracy	±7 mg/L ±3% of reading at 25 °C
Wavelength	466 nm
Cuvette type	22 mm diameter
Method	Adaptation of the EPA Method 130.1
Method ID	#042

REQUIRED REAGENTS

Code	Description	Quantity
HI93735IND-0	Hardness Indicator Reagent	0.5 mL
HI93735A-MR	Hardness Medium Range Reagent A	9 mL
HI93735B-0	Hardness Buffer Reagent B	2 drops
HI93735C-0	Fixing Reagent	1 packet

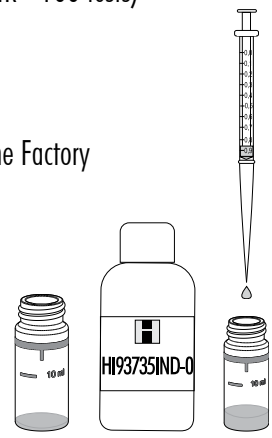
REAGENT SETS

HI93735-01	Reagents for 100 tests (MR)
HI93735-0	Reagents for 300 tests (LR - 100 tests, MR - 100 tests, HR - 100 tests)

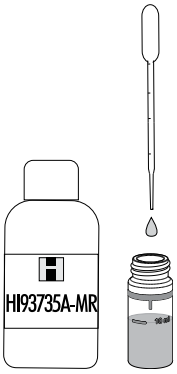
For other accessories see Accessories section.

MEASUREMENT PROCEDURE

- Select the Hardness Total MR method using the procedure described in the Factory Methods section.

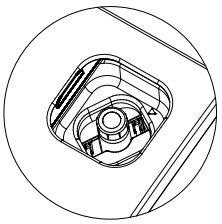


- Add 0.5 mL of unreacted sample to the cuvette. Add 0.5 mL of HI93735IND-0 Hardness Indicator Reagent.



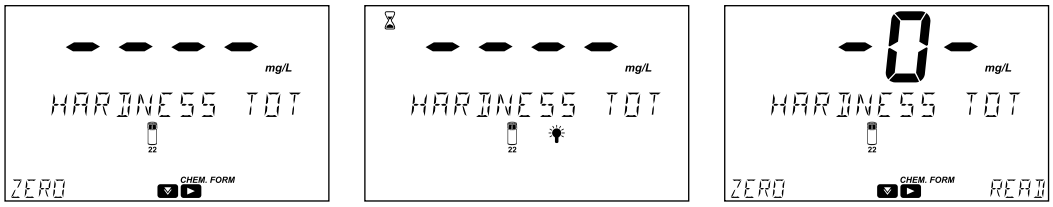
- Use a plastic pipette and fill the cuvette up to the 10 mL mark with HI93735A-MR Hardness Medium Range Reagent A.

- Add 2 drops of HI93735B-0 Hardness Buffer Reagent B. Replace the plastic stopper and the cap. Invert 5 times to mix.

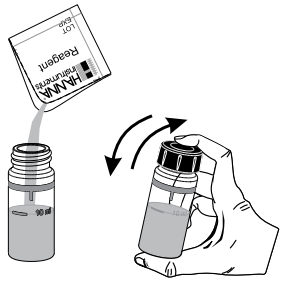


- Insert the cuvette into the holder and close the lid.

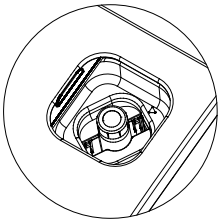
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



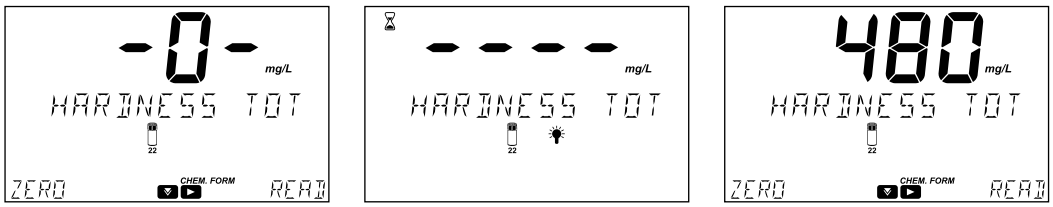
- Remove the cuvette and add one packet of HI93735C-0 Fixing Reagent. Replace the plastic stopper and the cap. Shake gently for 20 seconds to mix the solution.



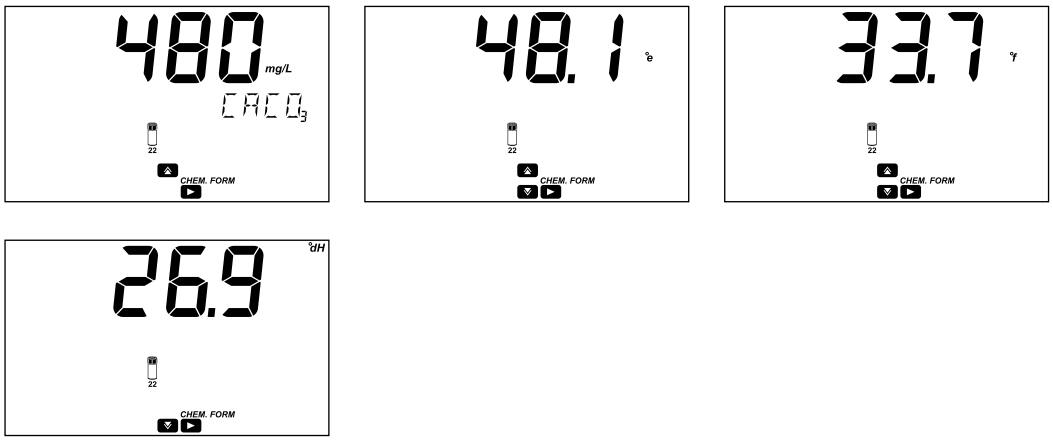
- Insert the cuvette into the holder and close the lid.



- Press **READ** to start the reading. The instrument displays concentrationw in **mg/L** of **calcium carbonate ($CaCO_3$)**.



- Press the ⏬ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ⏫ key to convert the results to **English (°e)**, **French (°f)**, or **German (°dH) degrees**.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Excessive amounts of heavy metals

Hardness, Total High Range

SPECIFICATIONS

Range	400 to 750 mg/L (as $CaCO_3$)
Resolution	1 mg/L
Accuracy	±10 mg/L ±2% of reading at 25 °C
Wavelength	466 nm
Cuvette type	22 mm diameter
Method	Adaptation of the EPA Method 130.1
Method ID	#043

REQUIRED REAGENTS

Code	Description	Quantity
HI93735IND-0	Hardness Indicator Reagent	0.5 mL
HI93735A-HR	Hardness High Range Reagent A	9 mL
HI93735B-0	Hardness Buffer Reagent B	2 drops
HI93735C-0	Fixing Reagent	1 packet

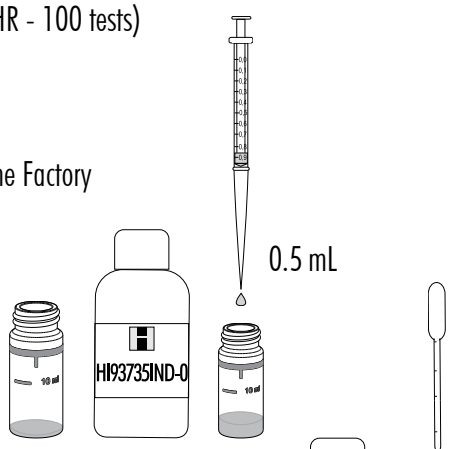
REAGENT SETS

HI93735-02	Reagents for 100 tests (HR)
HI93735-0	Reagents for 300 tests (LR - 100 tests, MR - 100 tests, HR - 100 tests)

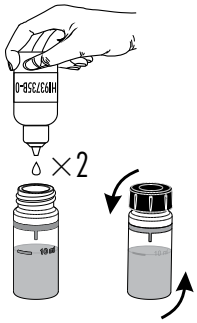
For other accessories see Accessories section.

MEASUREMENT PROCEDURE

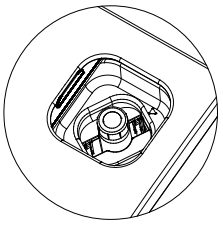
- Select the Hardness Total HR method using the procedure described in the Factory Methods section.



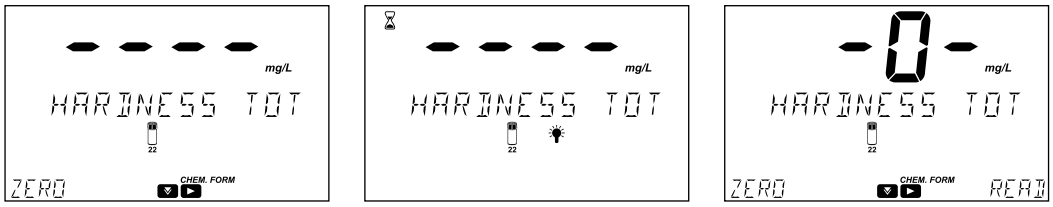
- Add 0.5 mL of unreacted sample to the cuvette. Add 0.5 mL of HI93735IND-0 Hardness Indicator Reagent.
- Use a plastic pipette and fill the cuvette up to the 10 mL mark with HI93735A-HR Hardness High Range Reagent A.



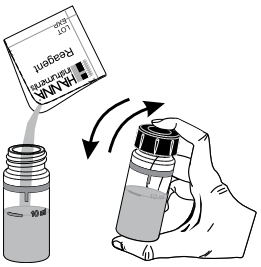
- Add 2 drops of HI93735B-0 Hardness Buffer Reagent B. Replace the plastic stopper and the cap. Invert 5 times to mix.
- Insert the cuvette into the holder and close the lid.



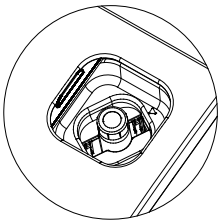
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



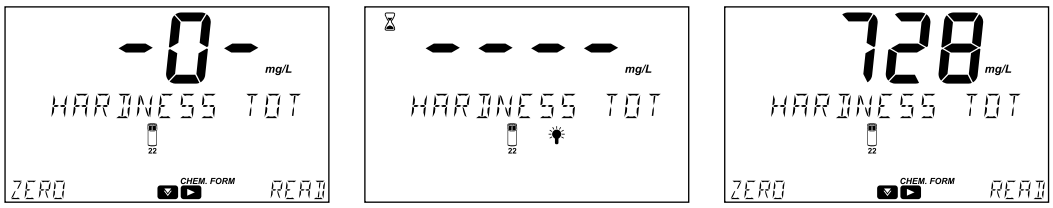
- Remove the cuvette and add the contents of one packet of HI93735C-0 Fixing Reagent. Replace the plastic stopper and the cap. Shake gently for 20 seconds to mix the solution.



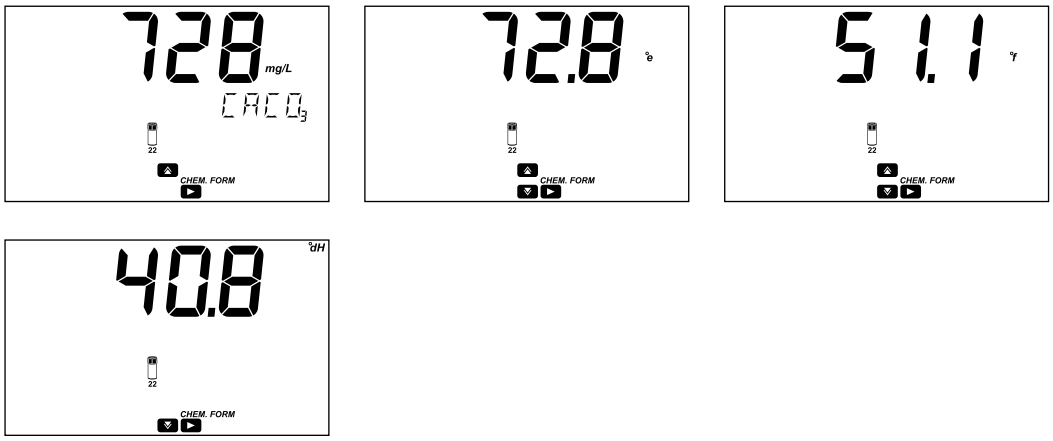
- Insert the cuvette into the holder and close the lid.



- Press **READ** to start the reading. The instrument displays concentration in **mg/L** of **calcium carbonate ($CaCO_3$)**.



- Press the ▼▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ▲▲ key to convert the results to **English (°e)**, **French (°f)**, or **German (°dH) degrees**.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Excessive amounts of heavy metals

Hydrazine

SPECIFICATIONS

Range	0 to 400 µg/L (as N_2H_4)
Resolution	1 µg/L
Accuracy	±3 µg/L ±3 % of reading at 25 °C
Wavelength	466 nm
Cuvette type	22 mm diameter
Method	Adaptation of the ASTM Manual of Water and Environmental Technology, Method D1385, p-Dimethylaminobenzaldehyde Method
Method ID	#044

REQUIRED REAGENT

Code	Description	Quantity
HI93704-0	Hydrazine Reagent	24 drops

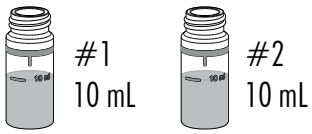
REAGENT SETS

HI93704-01	Reagents for 100 tests
HI93704-03	Reagents for 300 tests

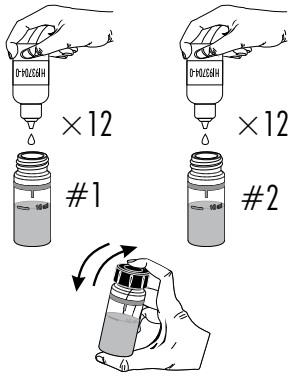
For other accessories see Accessories section.

MEASUREMENT PROCEDURE

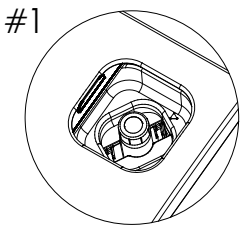
- Select the Hydrazine method using the procedure described in the Factory Methods section.
- Fill the first cuvette (#1) with 10 mL of deionized water (up to the mark). This is the blank.
- Fill a second cuvette (#2) with 10 mL of unreacted sample (up to the mark).



- Add 12 drops of the HI93704-0 Hydrazine Reagent to each cuvette. Replace the plastic stoppers and the caps. Shake gently to mix (about 30 seconds).

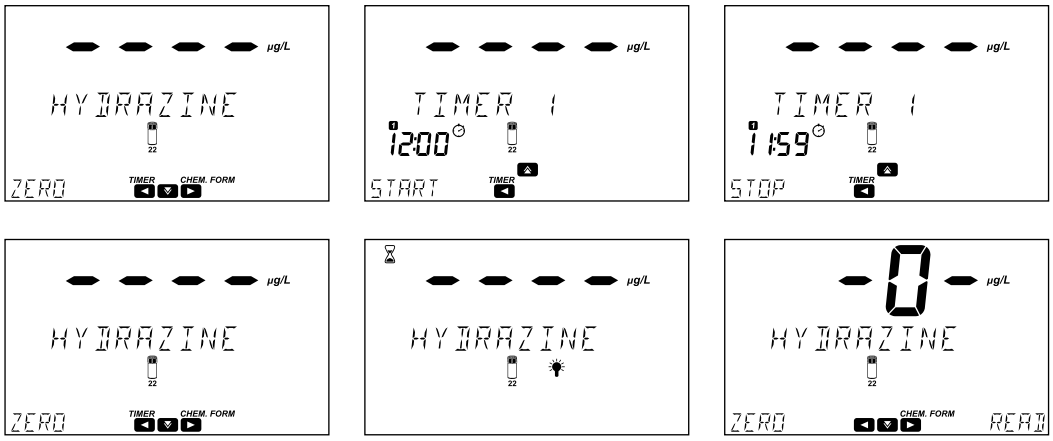


- Insert the first cuvette (#1) into the holder and close the lid.

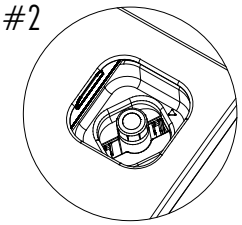


- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to zeroing the blank or wait 12 minutes.

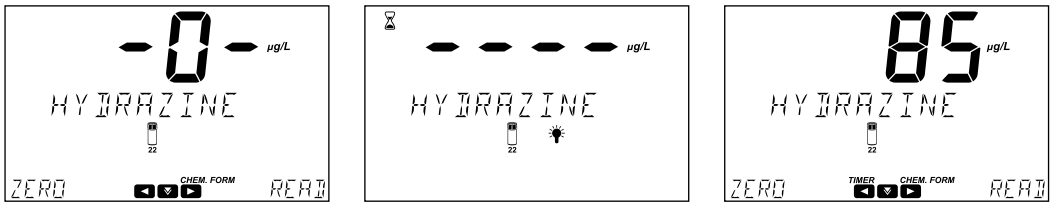
- Press **ZERO**, the display will show "-0-" when the meter is zeroed and ready for measurement.



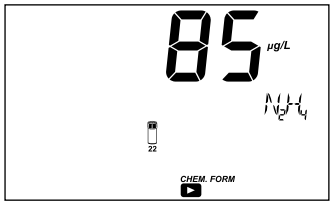
- Remove the blank cuvette.
- Insert the second cuvette with the reacted sample (#2) into the holder and close the lid.



- Press **READ** to start the reading. The instrument displays concentration in **µg/L** of **hydrazine (N_2H_4)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Highly colored samples
- Highly turbid samples
- Aromatic amines

Iodine

SPECIFICATIONS

Range	0.0 to 12.5 mg/L (as I_2)
Resolution	0.1 mg/L
Accuracy	±0.1 mg/L ±5% of reading at 25 °C
Wavelength	525 nm
Cuvette type	22 mm diameter
Method	Adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th Edition, DPD Method
Method ID	#045

REQUIRED REAGENTS

Code	Description	Quantity
HI93718-0	Iodine Reagent	1 packet

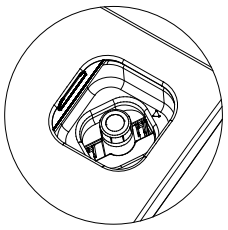
REAGENT SETS

HI93718-01	Reagents for 100 tests
HI93718-03	Reagents for 300 tests

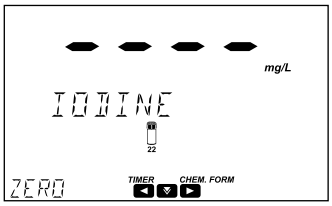
For other accessories see Accessories section.

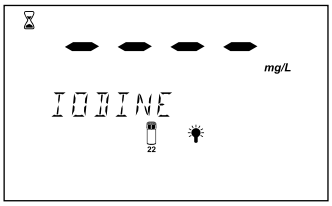
MEASUREMENT PROCEDURE

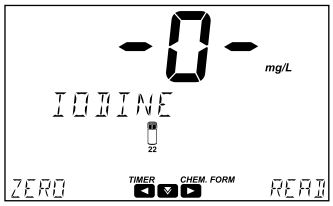
- Select the Iodine method using the procedure described in the Factory Methods section.
- Fill the cuvette with 10 mL of unreacted sample (up to the mark). Replace the plastic stopper and the cap.



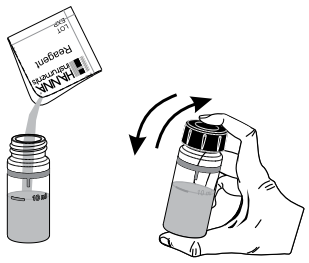
- Insert the cuvette into the holder and close the lid.
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.

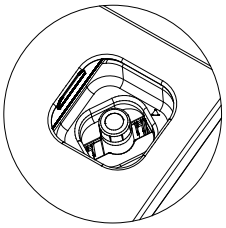






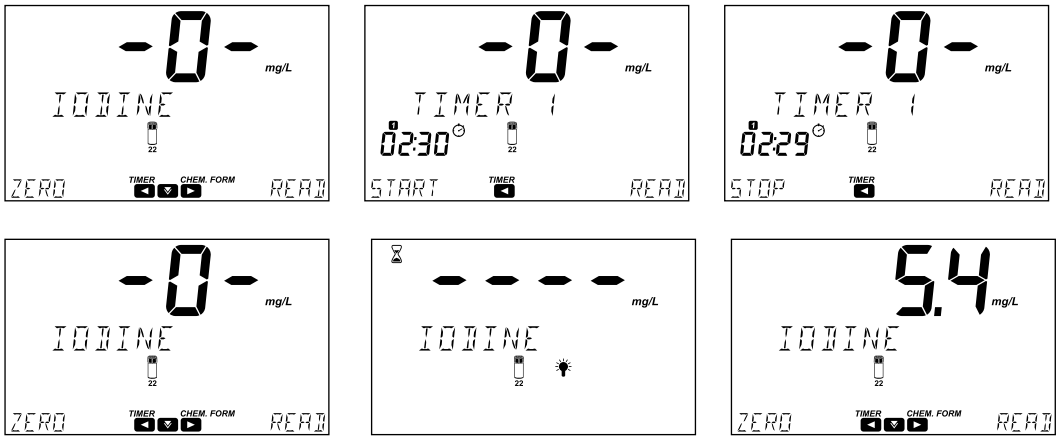
- Remove the cuvette and add one packet of HI93718-0 Iodine Reagent. Replace the plastic stopper and the cap. Shake gently for about 20 seconds to dissolve most of the reagent.



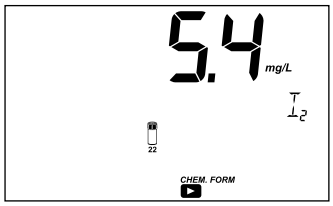


- Insert the cuvette into the holder and close the lid.

- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 2 minutes and 30 seconds.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **iodine (I_2)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Bromine, Chlorine, Oxidized forms of Chromium, Manganese and Ozone
- Hardness greater than 500 mg/L $CaCO_3$
  To remove the interference shake the sample for approximately 2 minutes after adding the reagent.
- Alkalinity greater than 250 mg/L $CaCO_3$ or acidity greater than 150 mg/L $CaCO_3$
  The color of the sample may develop only partially, or may rapidly fade. To remove the interference neutralize the sample with diluted HCl or NaOH.

Iron Low Range

SPECIFICATIONS

Range	0.000 to 1.600 mg/L (as Fe)
Resolution	0.001 mg/L
Accuracy	±0.010 mg/L ±8% of reading at 25 °C
Wavelength	575 nm
Cuvette type	22 mm diameter
Method	Adaptation of the TPTZ Method
Method ID	#046

REQUIRED REAGENTS

Code	Description	Quantity
HI93746-0	Iron Low Range Reagent	2 packets

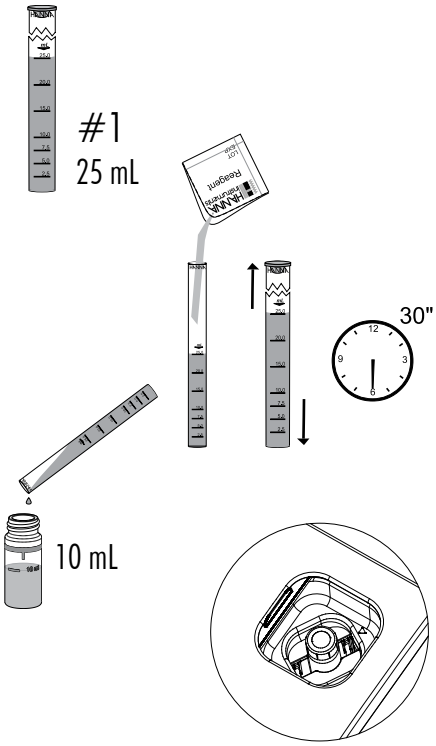
REAGENT SETS

HI93746-01	Reagents for 50 tests
HI93746-03	Reagents for 150 tests

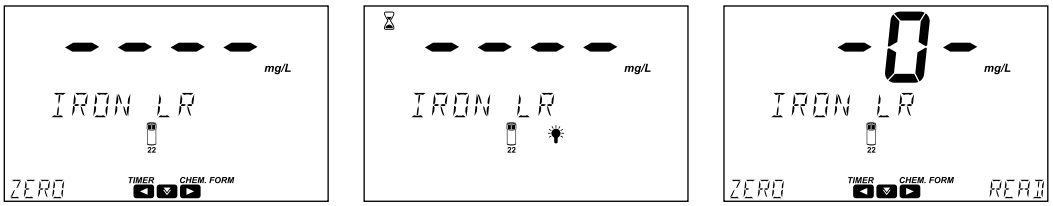
For other accessories see Accessories section.

MEASUREMENT PROCEDURE

- Select the Iron LR method using the procedure described in the Factory Methods section.
- Fill one graduated mixing cylinder up to the 25 mL mark with deionized water.

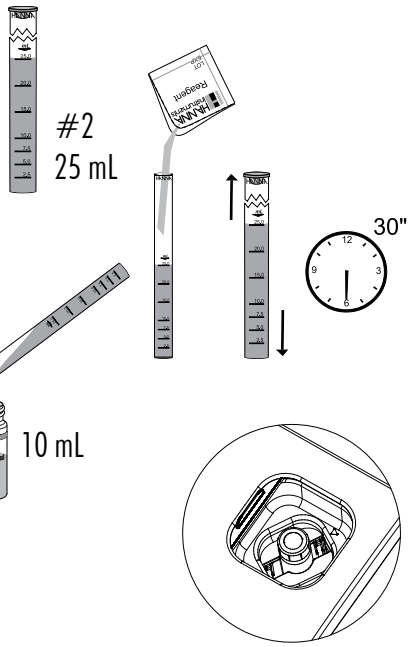


- Add one packet of HI93746-0 Iron Low Range Reagent, close the graduated mixing cylinder. Shake vigorously for 30 seconds. This is the blank.
- Fill a cuvette with 10 mL of the blank (up to the mark). Replace the plastic stopper and the cap.
- Insert the cuvette into the holder and close the lid.
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



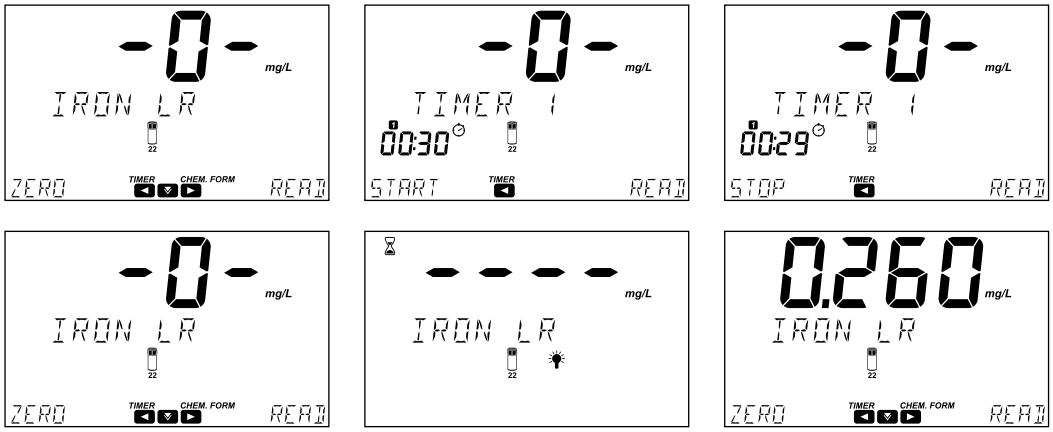
- Remove the cuvette.

- Fill another graduated glass cylinder up to the 25 mL mark with the sample.

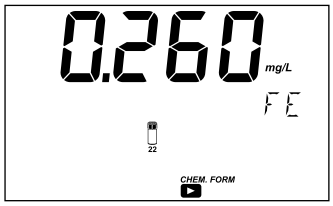


- Add one packet of HI93746-0 Iron Low Range Reagent, close the graduated glass cylinder. Shake vigorously for 30 seconds. This is the reacted sample.
- Fill a cuvette with 10 mL of the reacted sample (up to the mark). Replace the plastic stopper and the cap.
- Insert the sample into the holder and close the lid.

- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 30 seconds.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **iron (Fe)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Manganese above 50.0 mg/L
- Cadmium, Molybdenum above 4.0 mg/L
- Cyanide above 2.8 mg/L
- Chromium^{6+} above 1.2 mg/L
- Nickel above 1.0 mg/L
- Nitrite ion above 0.8 mg/L
- Copper above 0.6 mg/L
- Mercury above 0.4 mg/L
- Chromium^{3+} above 0.25 mg/L
- Cobalt above 0.05 mg/L
- Sample pH should be between 3 and 4 to avoid fading or turbidity formation.

Iron High Range

SPECIFICATIONS

Range	0.00 to 5.00 mg/L (as Fe)
Resolution	0.01 mg/L
Accuracy	±0.04 mg/L ±2% of reading at 25 °C
Wavelength	525 nm
Cuvette type	22 mm diameter
Method	Adaptation of Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 3500-Fe B, Phenanthroline Method
Method ID	#047

REQUIRED REAGENTS

Code	Description	Quantity
HI93721-0	Iron High Range Reagent	1 packet

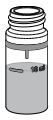
REAGENT SETS

HI93721-01	Reagents for 100 tests
HI93721-03	Reagents for 300 tests

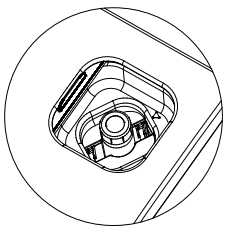
For other accessories see Accessories section.

MEASUREMENT PROCEDURE

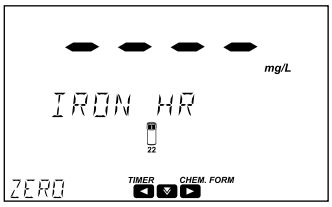
- Select the Iron HR method using the procedure described in the Factory Methods section.
- Fill the cuvette with 10 mL of unreacted sample (up to the mark). Replace the plastic stopper and the cap.

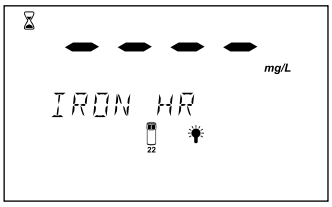


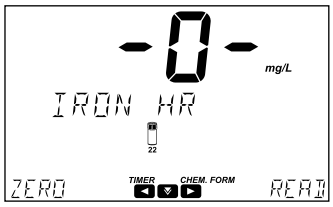
- Insert the cuvette into the holder and close the lid.



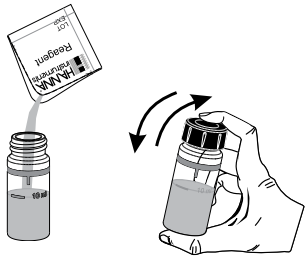
- Press **ZERO**. The display will show "-0-" the meter is zeroed and ready for measurement.

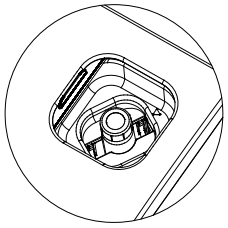






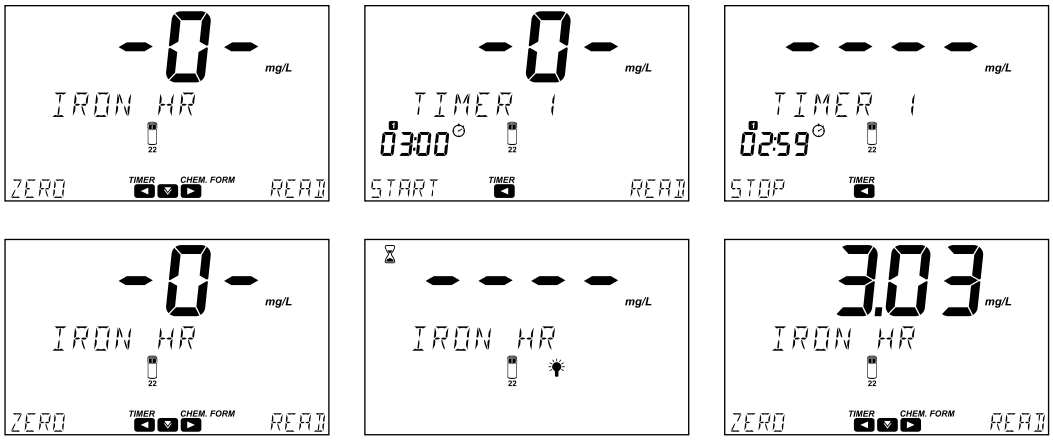
- Remove the cuvette and add one packet of HI93721-0 Iron High Range Reagent. Replace the plastic stopper and the cap. Shake until powder is completely dissolved.





- Insert the cuvette into the holder and close the lid.

- Press the ◄ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 3 minutes.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **iron (Fe)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ► key to view the chemical formula.

- Press the ► key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Chloride above 185000 ppm
- Calcium above 10000 ppm (as $CaCO_3$)
- Magnesium above 100000 ppm (as $CaCO_3$)
- Molybdate Molybdenum above 50 ppm

Iron (II) (Ferrous)

SPECIFICATIONS

Range	0.00 to 6.00 mg/L (as Fe^{2+})
Resolution	0.01 mg/L
Accuracy	±0.10 mg/L ±2% of reading at 25 °C
Wavelength	525 nm
Cuvette type	22 mm diameter
Method	Adaptation of Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 3500-Fe B, Phenanthroline Method
Method ID	#089

REQUIRED REAGENT

Code	Description	Quantity
HI96776-0	Iron(II) Reagent	1 packet

REAGENT SETS

HI96776-01	Reagents for 100 tests
HI96776-03	Reagents for 300 tests

For other accessories see Accessories section.

PRINCIPLE

In aqueous solution, reactive ferrous iron (Fe^{2+}) reacts with 1,10-phenanthroline to form an orange-red complex.

APPLICATION

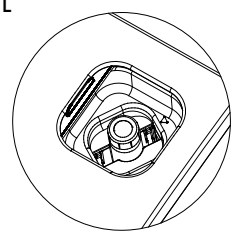
Surface water, drinking water, mineral and groundwater, process control

SIGNIFICANCE & USE

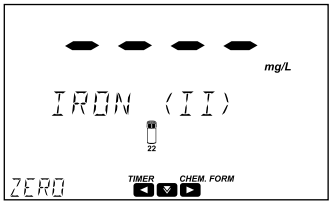
Surface water typically contains up to 0.7 mg/L of iron. Drinking water typically contains up to 0.3 mg/L of iron, but this level may increase significantly if plumbing fixtures contain iron. In well-oxygenated, non-acidic waters, iron exists mainly in the ferric form (Fe^{3+}) and will precipitate as iron oxide hydroxide (FeO(OH)). However, anoxic water may have high levels of dissolved ferrous iron (Fe^{2+}) which could precipitate in heating/cooling systems or other equipment after exposure to air.
The Iron(II) method measures the ferrous (Fe^{2+}) form of iron.

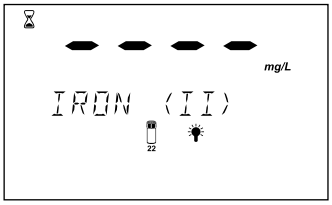
MEASUREMENT PROCEDURE

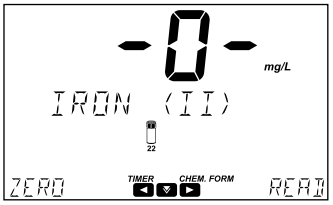
***Warning**: Method is temperature-dependent. Sample temperature must be between 18 and 22 °C.*



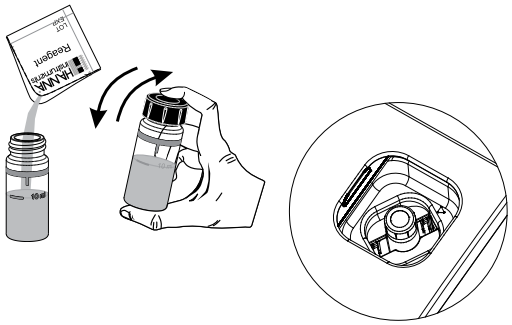
- Select the Iron (II) method using the procedure described in the Factory Methods section.
- Fill a cuvette with 10 mL of unreacted sample (up to the mark). Replace the plastic stopper and the cap.
- Insert the cuvette into the holder and close the lid.
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.





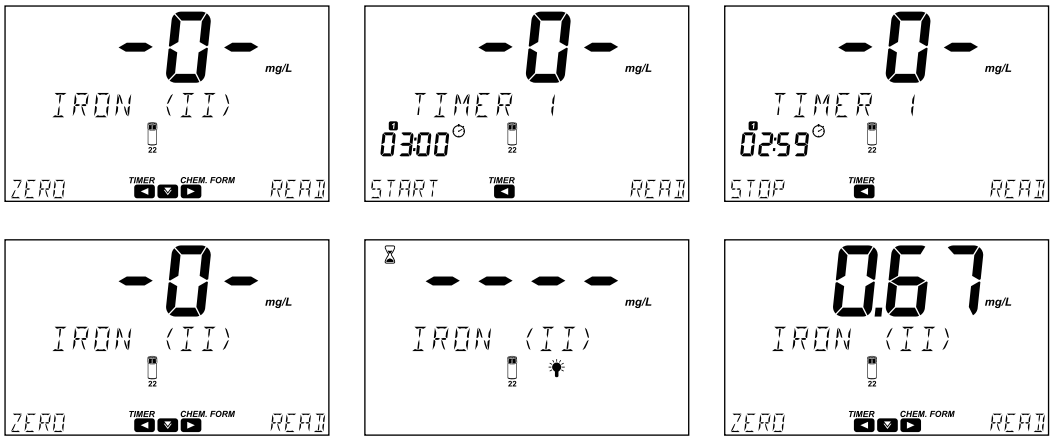


- Remove the cuvette and add one packet of HI96776-0 Iron(II) Reagent. Replace the plastic stopper and the cap. Shake gently for 30 seconds.



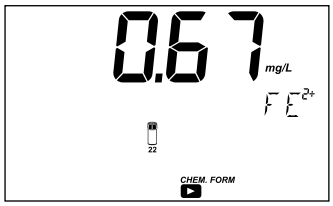
- Insert the cuvette into the holder and close the lid.

- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 3 minutes and press **READ**. The meter displays the results in **mg/L** of **Iron (Fe^{2+})**.



***Warning**: Timing is critical for accurate measurement. Reaction times beyond 3 minutes may cause some ferric iron (Fe^{3+}) to also react, producing false high measurements.*

- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Chloride, Sulfate above 1000 mg/L
- Ammonium, Calcium, Potassium, Sodium above 500 mg/L
- Silver above 100 mg/L
- Carbonate, Chromium(III) and (VI), Cobalt, Lead, Mercury, Nitrate, Zinc above 50 mg/L
- Nickel above 25 mg/L
- Copper above 10 mg/L
- Tin above 5 mg/L
- Extreme pH or highly buffered samples
  The pH of the sample must be between 3.8 and 5.5 after addition of the reagent.

Iron (13 mm Vial)

SPECIFICATIONS

Range	0.00 to 6.00 mg/L (as Fe)
Resolution	0.01 mg/L
Accuracy	±0.10 mg/L or ±3% of reading at 25°C
Wavelength	525 nm
Cuvette type	13 mm diameter
Method	Adaptation of Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 3500-Fe B, Phenanthroline Method
Method ID	#096

REQUIRED REAGENT

Code	Description	Quantity
HI96786V-0	Iron Reagent Vial	1 vial
HI96786-0	Iron Powder Reagent	1 packet

REAGENT SETS

HI96786-25	Reagents for 25 tests

For other accessories see Accessories section.

***Note**: Store the unused vials in their packaging in a cool and dark place.*

PRINCIPLE

Ferrous iron (Fe^{2+}) reacts with 1,10-phenanthroline to form an orange - red colored complex. All Fe^{3+} dissolved and not complexed or chelated is converted to ferrous iron (Fe^{2+}).

APPLICATION

Surface water, drinking water, groundwater, process control, wastewater, pool water

SIGNIFICANCE & USE

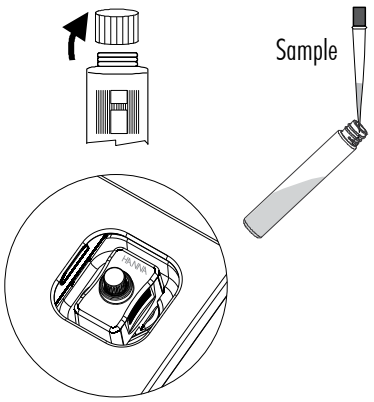
Iron is an abundant, naturally-occurring element found in soils, streams, surface water and groundwater.
High levels of iron in drinking water can cause objectionable taste and can stain plumbing and laundry. Iron in drinking water and wastewater is regulated by the EPA and other regulatory bodies.

MEASUREMENT PROCEDURE

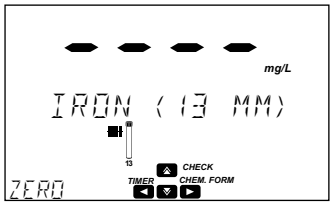
***Note**: Method selection is done automatically using a barcoded HI96786V-0 Iron Reagent Vial following the procedure described in the Barcode Methods section.*

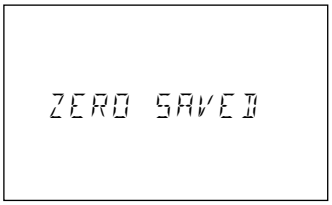
Alternatively, select the Iron (13 mm) method using the procedure described in the Factory Methods section.

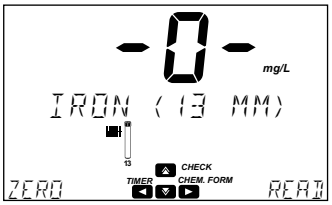
- Insert the supplied 13 mm vial adapter using the procedure described in the Cuvette & Vial Adapters section.
- Remove the cap from a HI96786V-0 Iron Reagent Vial.
- Add 5 mL of sample to the vial, while keeping the vial at a 45-degree angle.
- Replace the cap and invert several times to mix.
- Insert the HI96786V-0 Iron Reagent Vial into the adapter.
  Press steadily down until the vial clicks in place.
- Press **ZERO**.
  The meter scans the barcode and switches to the correct method automatically.



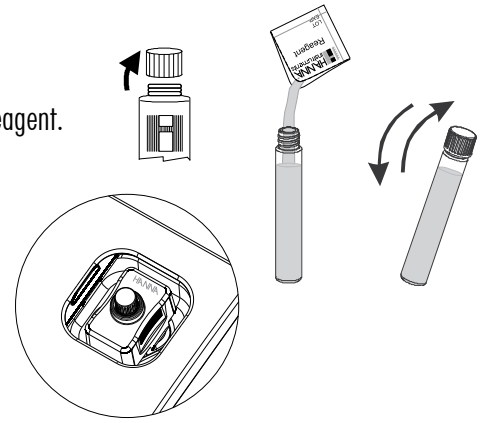
- The display will show "-0-" when the meter is zeroed and ready for measurement.



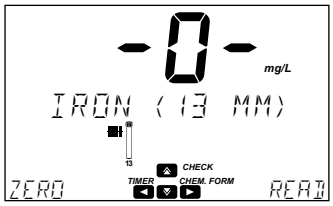


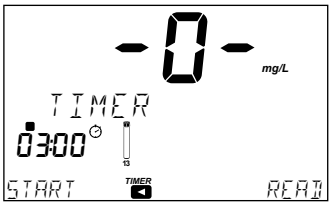


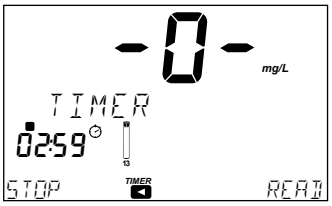
- Remove the vial from the meter.
- Remove the cap and add one packet of HI96786-0 Iron Powder Reagent.
- Replace the cap and shake until powder is dissolved.
- Wipe the vial thoroughly with HI731318 microfiber cleaning cloth or a lint-free wipe prior to insertion.
- Insert the vial into the adapter.
  Press steadily down until the vial clicks in place.

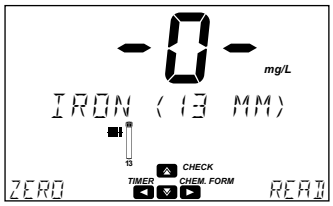


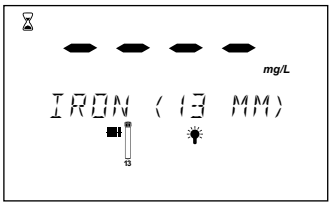
- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement, or wait 3 minutes.
- Press **READ** to start the reading. The instrument displays the result in **mg/L** of **Iron (Fe)**.

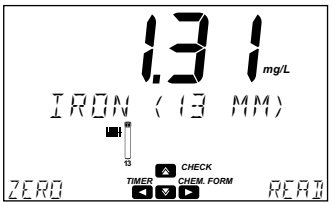




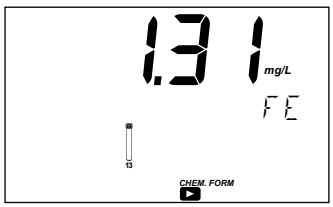








- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Chloride above 185000 mg/L
- Hardness Magnesium above 100000 mg/L $CaCO_3$
- Hardness Calcium above 10000 mg/L $CaCO_3$
- Molybdate Molybdenum above 50 mg/L

Iron Total (13 mm Vial)

SPECIFICATIONS

Range	0.00 to 7.00 mg/L (as Fe)
Resolution	0.01 mg/L
Accuracy	±0.20 mg/L or± 3% of reading, whichever is greater
Wavelength	525 nm
Cuvette type	13 mm diameter
Method	Adaptation of Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 3500-Fe B, Phenanthroline Method
Method ID	#090

REQUIRED REAGENT

Code	Description	Quantity
HI96778V-0*	Total Iron Digestion Vial	1 vial
HI96778A-0	Total Iron Reagent A	1 mL
HI96778B-0	Total Iron Reagent B	1 packet
PERSULFATE/I	Potassium Persulfate Reagent	1 packet

*Reagent vial identification: red label

REAGENT SETS

HI96778-25	Reagents for 25 tests

For other accessories see Accessories section.

PRINCIPLE

Digestion of the sample with sulfuric acid and persulfate liberates iron from organic and inorganic complexes. After digestion, the iron reacts with 1,10-phenanthroline to form an orange-red complex.

APPLICATION

Surface water, drinking water, groundwater, process control, wastewater

SIGNIFICANCE & USE

Iron is an abundant, naturally-occurring element found in soils, streams, surface waters and groundwater. High levels of iron in drinking water can cause objectionable taste and can stain plumbing and laundry. Iron in drinking water and wastewater is regulated by the EPA and other regulatory bodies.

For samples that contain complexed or chelated iron or suspended iron, such as typical wastewater samples, digestion of the sample is required to allow all of the iron to react with the reagent.

The Total Iron method measures all forms of iron, including ferrous, ferric, dissolved, suspended and complexed iron.

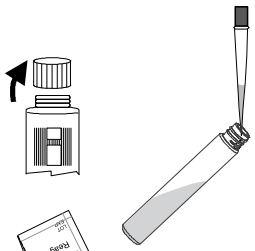
SAFETY

The acidification of samples containing reactive materials may result in the release of toxic gases, such as cyanides or sulfides; the preparation of sample and the digestion should be done in a fume hood. Safety data sheets for all chemical reagents should be read and understood by all personnel using this method. Specifically, concentrated sulfuric acid is moderately toxic and corrosive to skin and mucous membranes. Use these reagents in a fume hood whenever possible. If eye or skin contact occurs, flush with large volumes of water. Always wear skin and eye protection when working with these reagents.

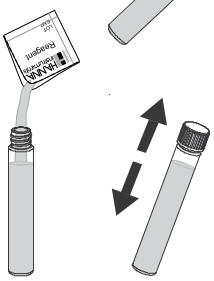
- Preheat the Hanna® Reactor HI839800 to 150 °C (302 °F).
- Use of supplied HI740217 safety shield is strongly recommended.

***Warning**: Do not use an oven or microwave; samples may leak and generate a corrosive and possibly explosive atmosphere.*

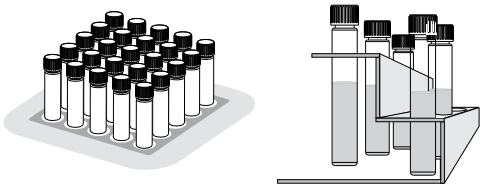
MEASUREMENT PROCEDURE



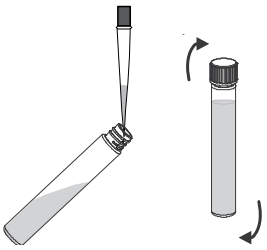
- Remove the cap from a barcoded HI96778V-0 Digestion Vial.
- Add 8 mL of sample to the vial, while keeping the vial at a 45-degree angle. Replace the cap and invert several times to mix.
  ***Warning**: The vials will become hot during mixing, use caution when handling.*



- Remove the cap and add one packet of PERSULFATE/I Potassium Persulfate Reagent. Replace the cap. Shake the vial vigorously for 60 seconds.



- Insert the vial into the reactor and heat it for 30 minutes at 150 °C.
- At the end of the digestion place the vials carefully in the test tube rack and allow to cool to room temperature.

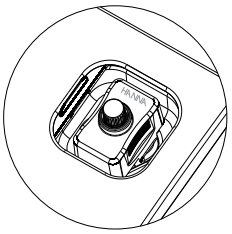


- Remove the cap from the vial and add 1 mL of HI96778A-0 Total Iron Reagent A, while keeping the vial at a 45-degree angle.
- Replace the cap. Invert several times to mix.
  ***Warning**: The vials will become hot during mixing, use caution when handling.*

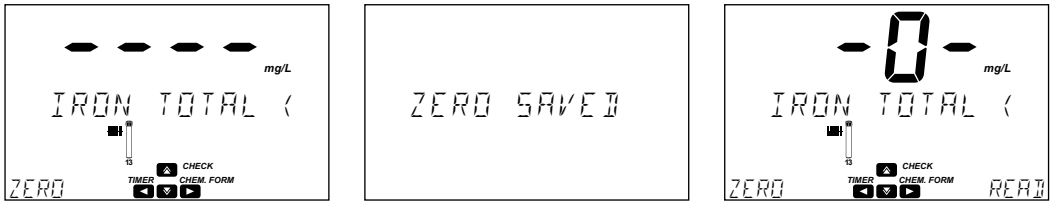
***Note**: Method selection is done automatically using a barcoded HI96786V-0 Iron Reagent Vial following the procedure described in the Barcode Methods section.*

Alternatively, select the Iron (13 mm) method using the procedure described in the Factory Methods section.

- Insert the supplied 13 mm vial adapter using the procedure described in the Cuvette & Vial Adapters section.

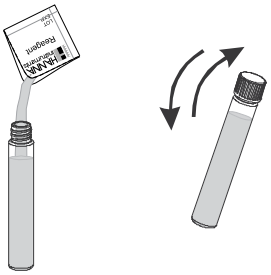


- Insert the vial into the adapter.
  Press steadily down until the vial clicks in place.
- Press **ZERO**.
  The meter scans the barcode and switches to the correct method automatically.
- The display will show "-0-" when the meter is zeroed and ready for measurement.



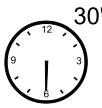
- Remove the vial from the meter.

***Note**: The temperature of the vial must be between 18 and 22 °C before continuing.*

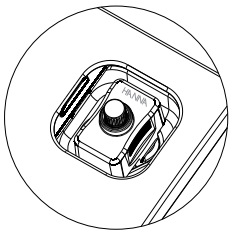


- Remove the cap and add one packet of HI96778B-0 Total Iron Reagent B.

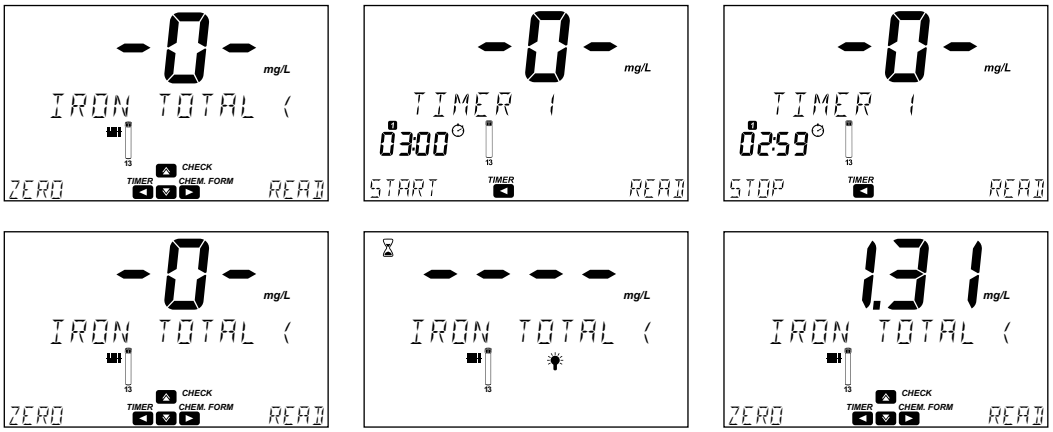
- Replace the cap. Shake gently for 30 seconds.



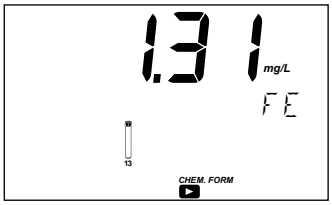
- Insert the vial into the adapter.
  Press steadily down, until the vial clicks in place.



- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 3 minutes.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **iron total (Fe)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may also be caused by:

- Chloride above 185000 mg/L
- Magnesium above 100000 mg/L $CaCO_3$
- Calcium above 10000 mg/L $CaCO_3$
- Molybdate Molybdenum above 50 mg/L
- High pH or highly buffered samples, the pH must be less than 1 after adding the sample to digestion vial.
  After addition of HI96778A-0 Total Iron Reagent A, the pH must be 3.8 to 5.5.
- If turbidity forms after digestions, filter the sample.
- Samples containing suspended solids need to be homogenized before digestion.

Magnesium

SPECIFICATIONS

Range	0 to 150 mg/L (as Mg^{2+})
Resolution	1 mg/L
Accuracy	±5 mg/L ±3% of reading at 25 °C
Wavelength	466 nm
Cuvette type	22 mm diameter
Method	Adaptation of the Calmagite Method
Method ID	#048

REQUIRED REAGENTS

Code	Description	Quantity
HI93752A-Mg	Magnesium Reagent A	1 mL
HI93752B-Mg	Magnesium Reagent B	9 mL

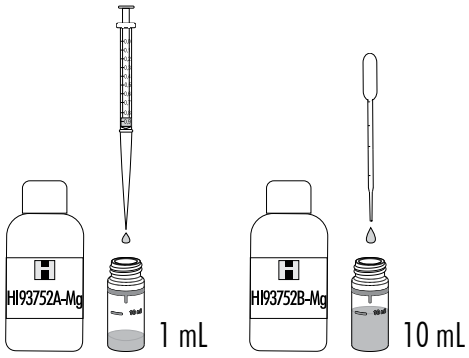
REAGENT SETS

HI937520-01	Reagents for 50 tests
HI937520-03	Reagents for 150 tests

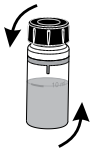
For other accessories see Accessories section.

MEASUREMENT PROCEDURE

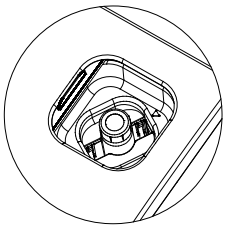
- Select the Magnesium method using the procedure described in the Factory Methods section.



- Add 1 mL of HI93752A-Mg Magnesium Reagent A to the cuvette using a 1 mL syringe and use the pipette to fill the cuvette up to the 10 mL mark with the HI93752B-Mg Magnesium Reagent B.

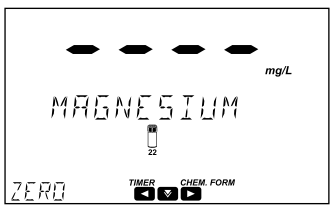


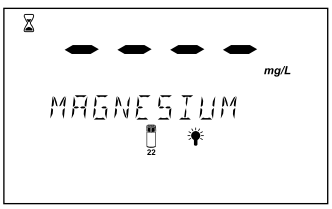
- Replace the plastic stopper and the cap. Invert several times to mix.

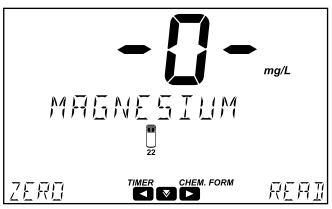


- Insert the cuvette into the holder and close the lid.

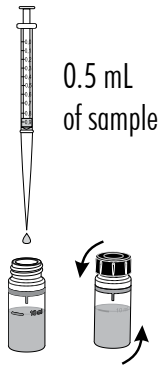
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



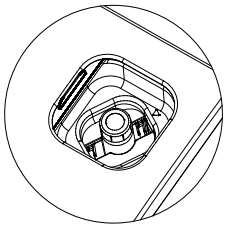




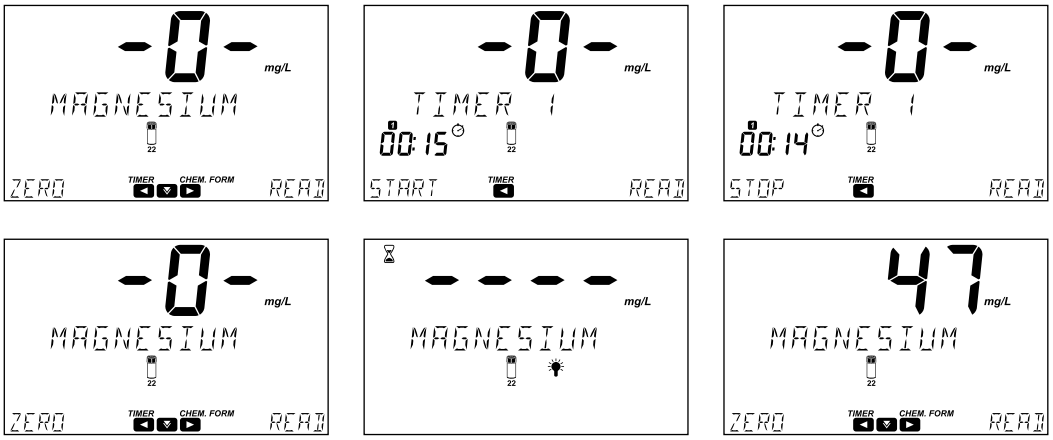
- Remove the cuvette.
- Add 0.5 mL of sample to the cuvette.
- Replace the plastic stopper and the cap. Invert several times to mix.



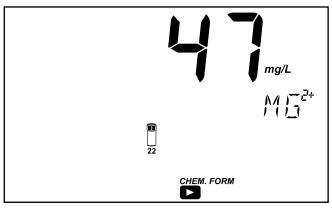
- Insert the cuvette into the holder and close the lid.



- Press the ◄ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 15 seconds.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **magnesium (Mg^{2+})**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ► key to view the chemical formula.



- Press the ► key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Acidity, Alkalinity (as $CaCO_3$) above 1000 mg/L
- Calcium (Ca^{2+}) above 200 mg/L
- Aluminum, Copper, Iron must be absent.

Magnesium, Marine

SPECIFICATIONS

Range	1000 to 1800 mg/L (as Mg^{2+})
Resolution	5 mg/L
Accuracy	±5% of reading
Wavelength	640 nm
Cuvette type	22 mm diameter
Method	Adaptation of Colorimetric EDTA Method using calmagite indicator
Method ID	#103

REQUIRED REAGENTS

Code	Description	Quantity
HI783A-0	Marine Magnesium Reagent A	4 mL
HI783IND-0	Marine Magnesium Indicator Reagent	1 packet

REAGENT SETS

HI783-25	Reagents for 25 tests

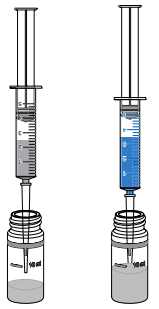
For other accessories see Accessories section.

SAMPLING PROCEDURE

Prepared sample cuvette (sample plus reagents) must be 22 to 28 °C (72 to 82 °F).
Warm or cool prepared cuvettes if needed. Temperature affects accuracy. Handle cuvette by cap to avoid transferring heat from hands through the glass.

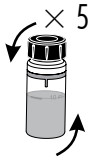
MEASUREMENT PROCEDURE

- Select the Magnesium Marine method using the procedure described in the Factory Methods section.
- Ensure cuvettes, syringes, and tips are completely clean and dry before use.
- Place the syringe tips onto each syringe. Ensure the O-rings remain in the tip for a proper seal.
- Use the 5 mL syringe with black printing to measure 4 mL of HI783A-0 reagent.
  Ensure there is no excess reagent on the syringe tip, then slowly dispense the 4 mL of reagent into a clean, dry cuvette. If excessive reagent remains in the tip, draw a small amount of air into the syringe and use it to expel the remaining reagent into the cuvette.

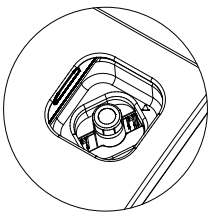


- Use the 5 mL syringe with blue printing to measure 5 mL of unreacted sample.
  Ensure there is no excess sample on the syringe tip, then slowly dispense the sample into the same cuvette. Ensure no sample is remaining in the tip.

  ***Note**: The total liquid volume will be below the 10 mL mark at this step.*

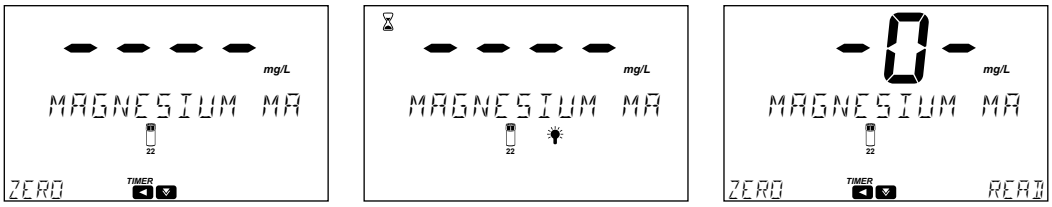


- Replace the plastic stopper and the cap. Gently invert the cuvette 5 times until the solution has been thoroughly mixed. Ensure there are no bubbles in the mixture and that the outside of the cuvette is dry and clean.

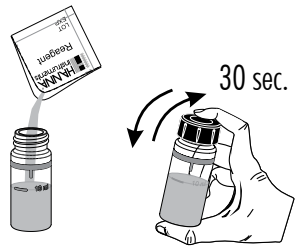


- Insert the cuvette into the holder and close the lid.

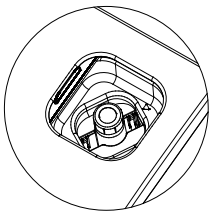
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



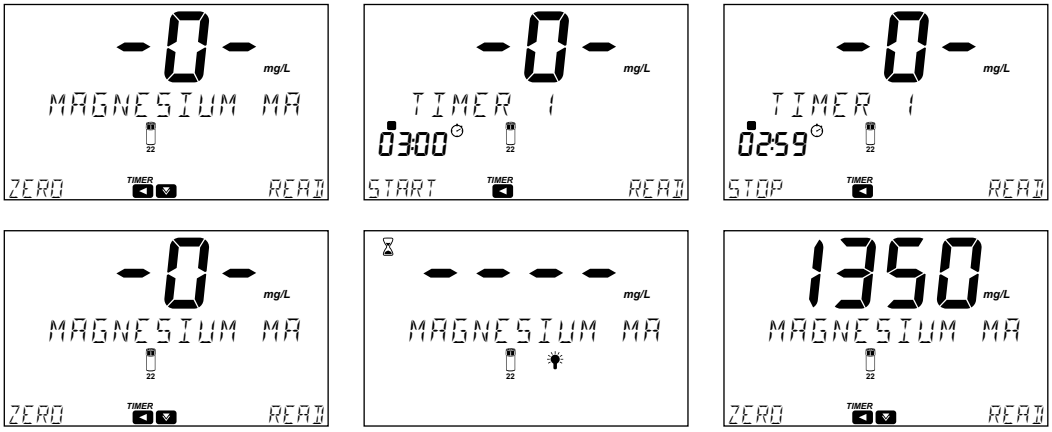
- Remove the cuvette.
- Unscrew the cap and add the content of one packet of HI783IND-0 Marine Magnesium Indicator Reagent. Ensure all powder is added to the sample, loss of powder will result in false high readings. Replace the plastic stopper and the cap.
- Shake gently for 30 seconds.



- Insert the cuvette into the holder and close the lid.



- Press the ◀ key to access the timer menu.
  Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 3 minutes.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **magnesium (Mg^{2+})**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Rinse cuvettes, caps, syringes, and tips thoroughly with deionized (RODI) water and allow to dry completely before storing.

INTERFERENCES

Interference may be caused by:

- Calcium below 300 mgL and above 500 mgL

Manganese Low Range

SPECIFICATIONS

Range	0 to 300 µg/L (as Mn)
Resolution	1 µg/L
Accuracy	±7 µg/L ±3% of reading at 25 °C
Wavelength	560 nm
Cuvette type	22 mm diameter
Method	Adaptation of the PAN Method
Method ID	#049

REQUIRED REAGENTS

Code	Description	Quantity
HI93748A-0	Manganese Low Range Reagent A	2 packets
HI93748B-0	Manganese Low Range Reagent B	0.40 mL
HI93748C-0	Manganese Low Range Reagent C	2 mL
HI93703-51	Dispersing Agent	6 drops

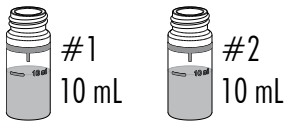
REAGENT SETS

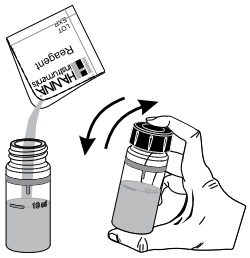
HI93748-01	Reagents for 50 tests
HI93748-03	Reagents for 150 tests

For other accessories see Accessories section.

MEASUREMENT PROCEDURE

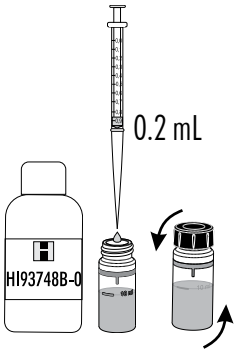
- Select the Manganese LR method using the procedure described in the Factory Methods section.
- Fill one cuvette (#1) with 10 mL of deionized water (up to the mark).
- Fill a second cuvette (#2) with 10 mL of sample (up to the mark).

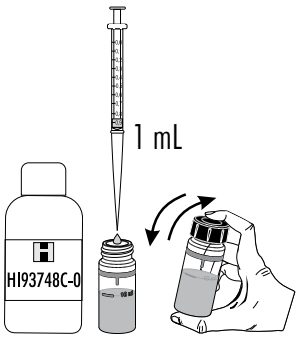




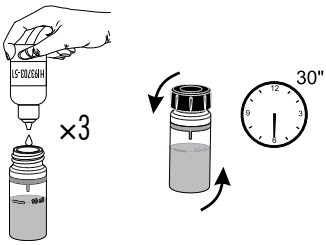
- Add one packet of HI93748A-0 Manganese Low Range Reagent A to each cuvette. Replace the plastic stoppers and the caps. Shake gently until completely dissolved.

- Add 0.2 mL of the HI93748B-0 Manganese Low Range Reagent B to each cuvette. Replace the plastic stoppers and the caps. Invert gently to mix for about 30 seconds.
- Add 1 mL of the HI93748C-0 Manganese Low Range Reagent C to each cuvette. Replace the plastic stoppers and the caps. Shake gently.

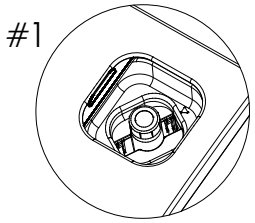




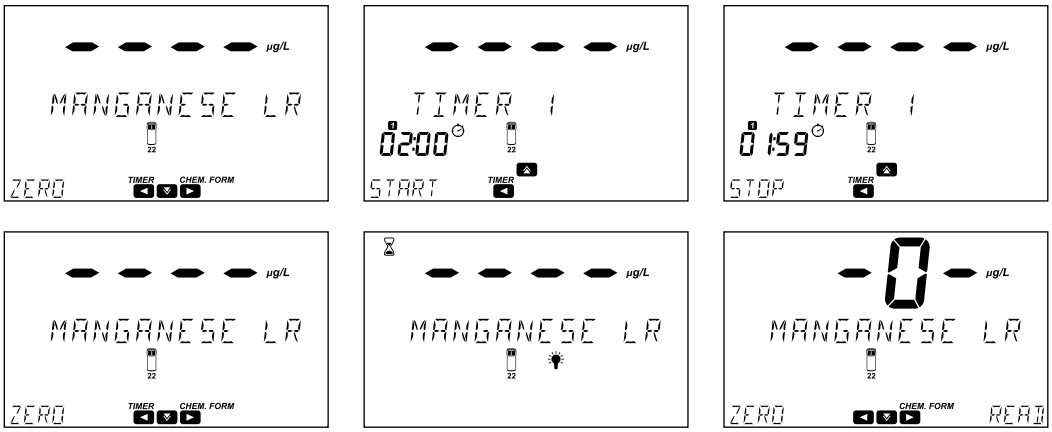
- Add 3 drops of HI93703-51 Dispersing Agent to each cuvette. Replace the plastic stoppers and the caps. Invert gently to mix for about 30 seconds.

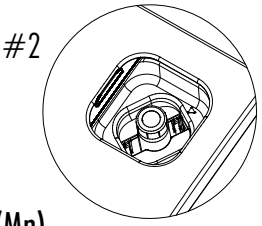


- Insert the first cuvette (#1) with the reacted deionized water into the holder and close the lid.

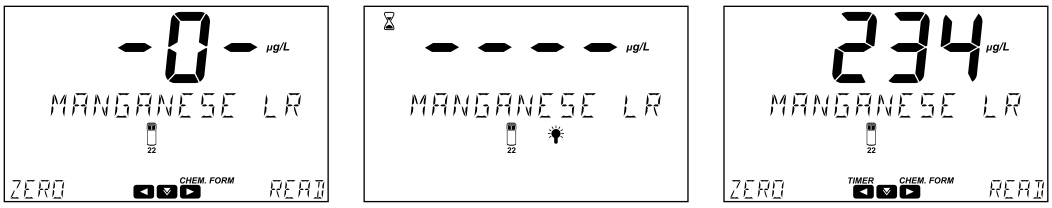


- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to the zero or wait 2 minutes.
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.

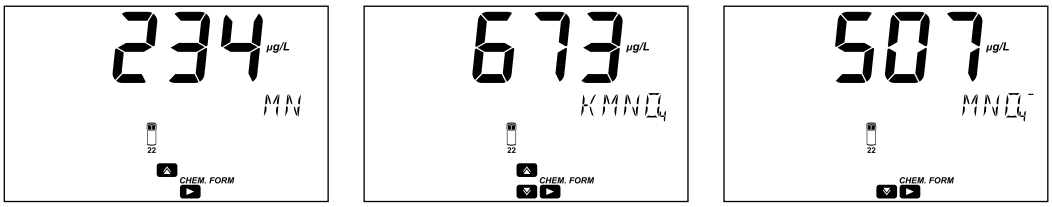




- Insert the second cuvette (#2) with the reacted sample into the holder and close the lid.
- Press **READ** to start the reading. The instrument displays the results in **µg/L** of **manganese (Mn)**.



- Press the ⩔ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ⩓ key to convert the results to **µg/L** of **potassium permanganate ($KMnO_4$)** or **permanganate (MnO_4^-)**.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Calcium above 200 mg/L $CaCO_3$
- Magnesium above 100 mg/L $CaCO_3$
- Copper above 50 mg/L
- Nickel above 40 mg/L
- Aluminum, Cobalt above 20 mg/L
- Zinc above 15 mg/L
- Cadmium, Iron above 10 mg/L
- Lead above 0.5 mg/L

Manganese High Range

SPECIFICATIONS

Range	0.0 to 20.0 mg/L (as Mn)
Resolution	0.1 mg/L
Accuracy	±0.2 mg/L ±3% of reading at 25 °C
Wavelength	525 nm
Cuvette type	22 mm diameter
Method	Adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th Edition, Periodate Method
Method ID	#050

REQUIRED REAGENTS

Code	Description	Quantity
HI93709A-0	Manganese High Range Reagent A	1 packet
HI93709B-0	Manganese High Range Reagent B	1 packet

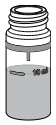
REAGENT SETS

HI93709-01	Reagents for 100 tests
HI93709-03	Reagents for 300 tests

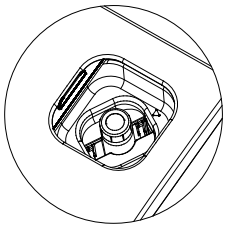
For other accessories see Accessories section.

MEASUREMENT PROCEDURE

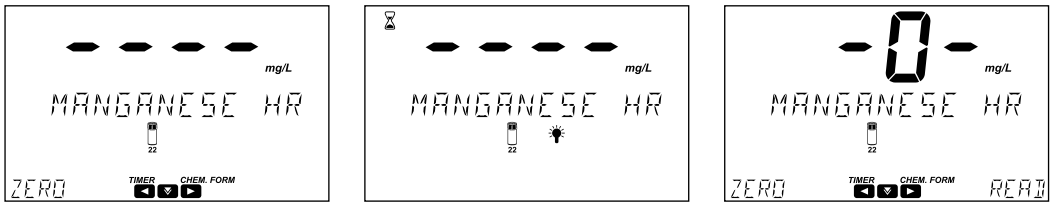
- Select the Manganese HR method using the procedure described in the Factory Methods section.
- Fill the cuvette with 10 mL of unreacted sample (up to the mark). Replace the plastic stopper and the cap.



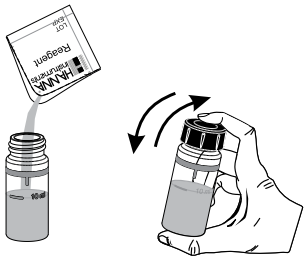
- Insert the cuvette into the holder and close the lid.

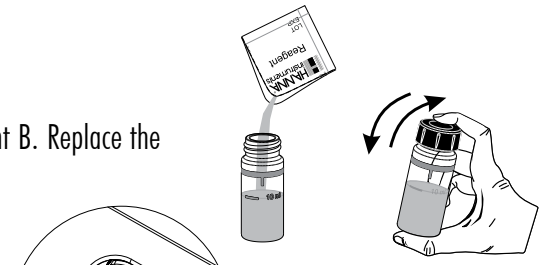


- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.

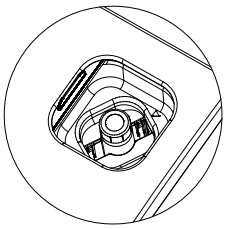


- Remove the cuvette.
- Add one packet of HI93709A-0 Manganese High Range Reagent A. Replace the plastic stopper and the cap. Shake gently for 2 minutes to mix.

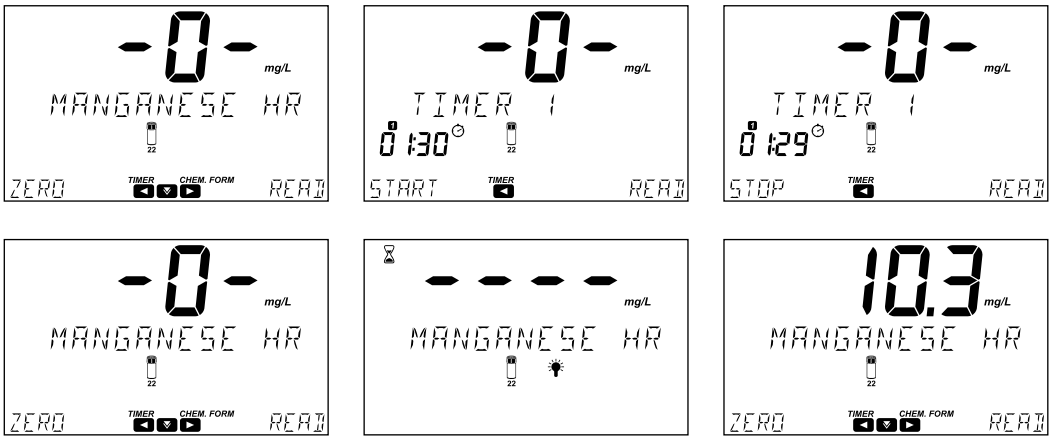




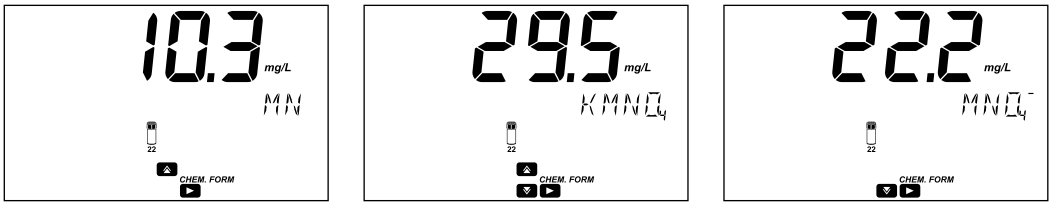
- Add one packet of HI93709B-0 Manganese High Range Reagent B. Replace the plastic stopper and the cap. Shake gently for 2 minutes to mix.



- Insert the cuvette into the holder and close the lid.
- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 1 minute and 30 seconds.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **manganese (Mn)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ▲ key to convert the results in **mg/L** of **potassium permanganate ($KMnO_4$)** or **permanganate (MnO_4^-)**.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Magnesium above 100000 mg/L
- Chloride above 70000 mg/L
- Calcium above 700 mg/L
- Iron above 5 mg/L

Maple Syrup

SPECIFICATIONS

Range	0.00 to 100.00 %T
Resolution	0.01 %T
Accuracy	±3% of reading at 25 °C
Wavelength	560 nm
Cuvette type	10 mm diameter
Method	Direct Measure
Method ID	#051

REQUIRED REAGENT

Code	Description	Quantity
–	Glycerol	3 mL

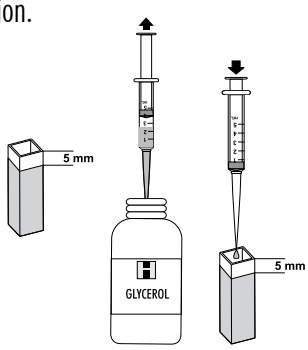
REAGENT SETS

HI93703-57	Glycerol (4 pcs.)	30 mL

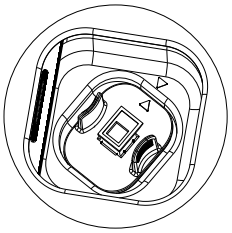
For other accessories see Accessories section.

MEASUREMENT PROCEDURE

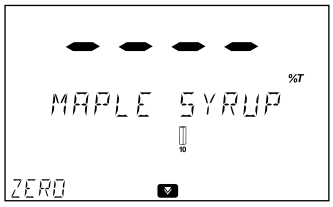
- Select the Maple Syrup method using the procedure described in the Factory Methods section.

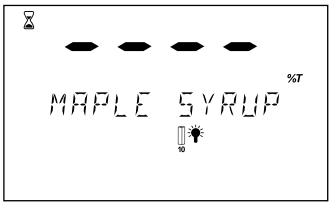


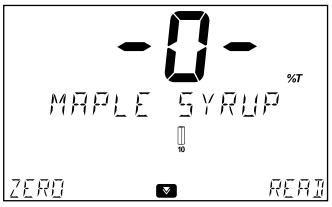
- Use a syringe to fill the cuvette with HI93703-57 glycerol, up to 5 mm (0.2") below the rim.



- Insert the 10 mm cuvette adapter using the procedure described in the Cuvette & Vial Adapters section.
- Insert the cuvette into the adapter and close the lid.
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.

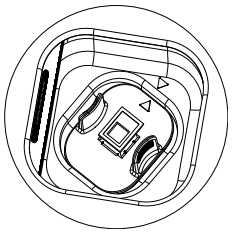






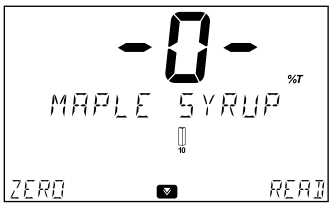
- Remove the blank cuvette.

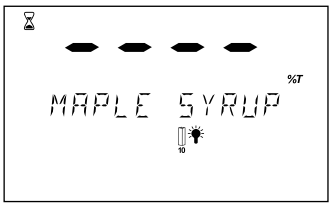
- Use a syringe to add 4 mL of maple syrup to a clean cuvette, up to 5 mm (0.2") below the rim. This is the sample.

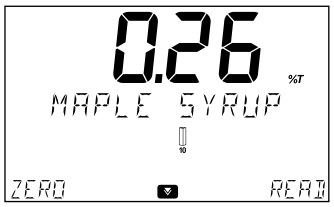


- Insert the sample cuvette into the adapter and close the lid.

- Press **READ** to start the reading. The instrument displays percent of light transmittance as compared to Glycerol Standard (fixed at one hundred percent).







- Press the ▼ key to view the wavelength, method ID, date and time.

USDA Standards

Grade A Color Classes	Taste	Percent Light Transmittance
Grade A Golden	Delicate	≥75
Grade A Amber	Rich	50 to 74
Grade A Dark	Robust	25 to 49
Grade A Very Dark	Strong	<25

INTERFERENCES

Interference may be caused by:

- Air bubbles or turbidity in the sample
- Scratched or dirty cuvettes will also affect readings. Always check clearness of cuvettes prior to use.

Molybdenum

SPECIFICATIONS

Range	0.0 to 40.0 mg/L (as Mo^{6+})
Resolution	0.1 mg/L
Accuracy	±0.3 mg/L ±5% of reading at 25 °C
Wavelength	420 nm
Cuvette type	22 mm diameter
Method	Adaptation of the Mercaptoacetic Acid Method
Method ID	#052

REQUIRED REAGENTS

Code	Description	Quantity
HI93730A-0	Molybdenum Reagent A	1 packet
HI93730B-0	Molybdenum Reagent B	1 packet
HI93730C-0	Molybdenum Reagent C	1 packet

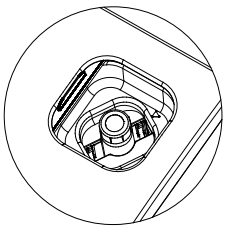
REAGENT SETS

HI93730-01	Reagents for 100 tests
HI93730-03	Reagents for 300 tests

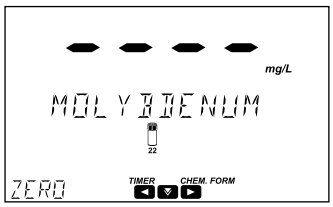
For other accessories see Accessories section.

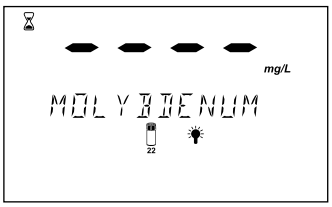
MEASUREMENT PROCEDURE

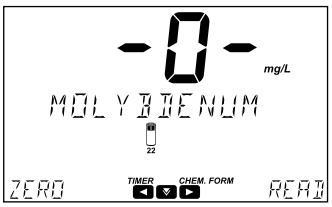
- Select the Molybdenum method using the procedure described in the Factory Methods section.
- Fill the cuvette with 10 mL of unreacted sample (up to the mark). Replace the plastic stopper and the cap.



- Insert the cuvette into the holder and close the lid.
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.

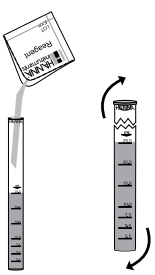


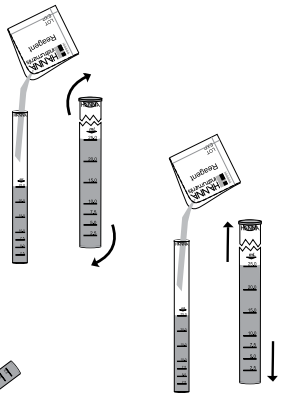




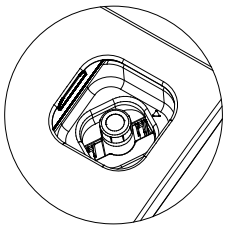
- Fill one graduated mixing cylinder up to the 25 mL mark with the sample.

- Add one packet of HI93730A-0 Molybdenum Reagent A, close the graduated mixing cylinder. Replace the cap. Invert several times until completely dissolved.

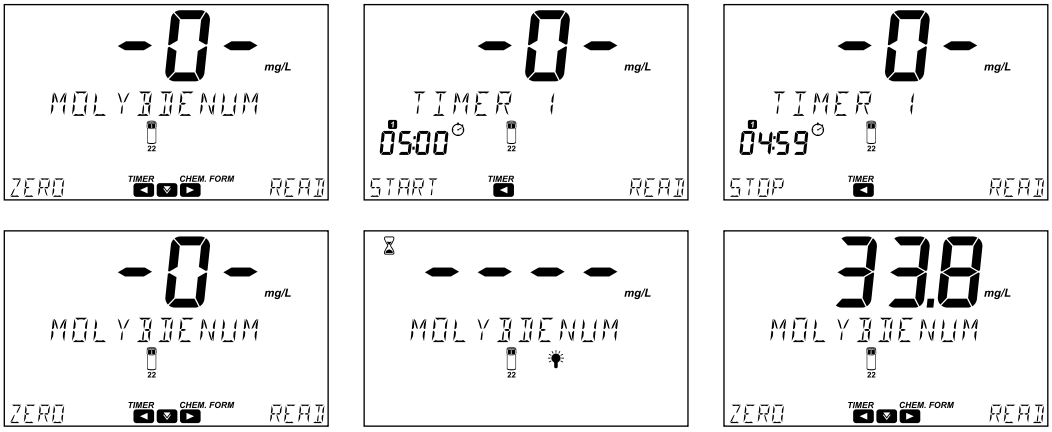




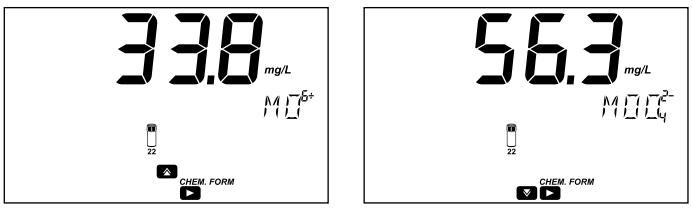
- Add one packet of HI93730B-0 Molybdenum Reagent B to the graduated mixing cylinder. Replace the cap. Invert several times until completely dissolved.
- Add one packet of HI93730C-0 Molybdenum Reagent C to the graduated mixing cylinder. Replace the cap. Shake vigorously.
- Fill an empty cuvette with 10 mL of reacted sample (up to the mark). Replace the plastic stopper and the cap.
- Insert the cuvette into the holder and close the lid.



- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 5 minutes.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **molybdenum (Mo^{6+})**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ▲ key to convert the results to **mg/L** of **molybdate (MoO_4^{2-})**.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Chromium above 1000 mg/L
- Sulfate above 200 mg/L
- Aluminum, Iron, Nickel above 50 mg/L
- Copper above 10 mg/L
- Nitrite must be absent.
- Highly buffered samples or samples with extreme pH may exceed the buffering capacity of the reagents.

Nickel Low Range

SPECIFICATIONS

Range	0.000 to 1.000 mg/L (as Ni)
Resolution	0.001 mg/L
Accuracy	±0.010 mg/L ±7% of reading at 25 °C
Wavelength	565 nm
Cuvette type	16 mm diameter
Method	Adaptation of the PAN Method
Method ID	#053

REQUIRED REAGENTS

Code	Description	Quantity
HI93740A-0	Nickel Low Range Reagent A	2 packets
HI93740B-0	Nickel Low Range Reagent B	2 mL
HI93740C-0	Nickel Low Range Reagent C	2 packets
HI93703-51	Dispersing Agent (optional reagent)	4-6 drops

REAGENT SETS

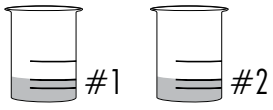
HI93740-01	Reagents for 50 tests
HI93740-03	Reagents for 150 tests

For other accessories see Accessories section.

MEASUREMENT PROCEDURE

- Select the Nickel LR method using the procedure described in the Factory Methods section.

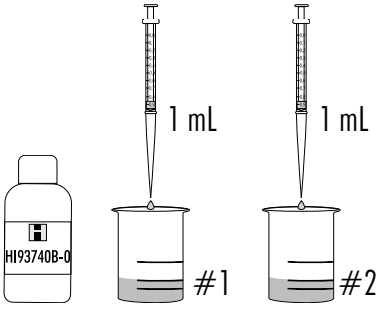
***Note**: For best results samples should be between 20 and 24 °C.*



- Fill one graduated beaker with 25 mL of deionized water (blank) and another one with 25 mL of sample.

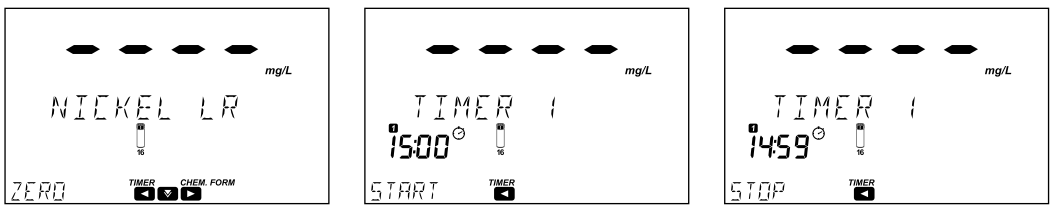
- Add one packet of HI93740A-0 Nickel Low Range Reagent A to each beaker. Swirl gently until the reagent is dissolved.

***Note**: If sample contains iron (Fe^{3+}), it is important that all powder is dissolved before continuing.*



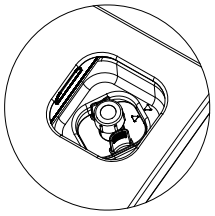
- Add 1 mL of HI93740B-0 Nickel Low Range Reagent B to each beaker. Swirl to mix.

- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown or wait 15 minutes.

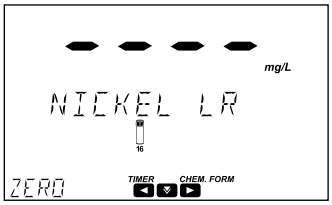


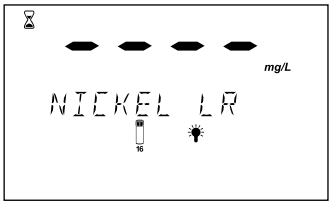
- Add one packet of HI93740C-0 Nickel Low Range Reagent C to each beaker. Swirl to mix until completely dissolved.

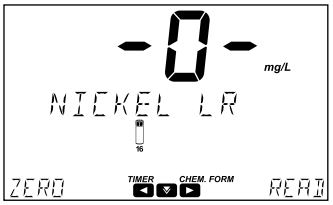
- Insert the 16 mm cuvette adapter using the procedure described in the Cuvette & Vial Adapters section.
- Fill one cuvette (#1) with 10 mL of the blank (up to the mark).
- Insert the cuvette into the adapter and close the lid.



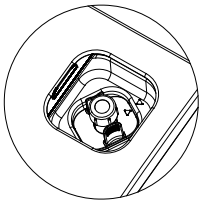
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



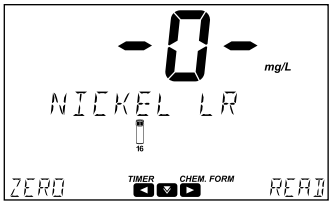


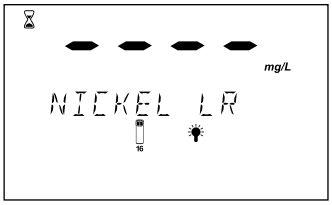


- Fill a second cuvette (#2) with 10 mL of the reacted sample.
- Insert the second cuvette into the adapter and close the lid.

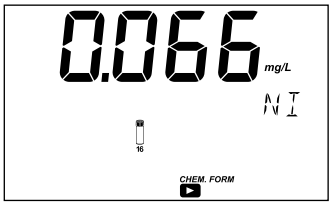


- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **nickel (Ni)**.





- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

***Note**: A temperature above 30 °C may cause turbidity. In this case add 2-3 drops of HI93703-51 Dispersing Agent to each cuvette and swirl until turbidity is removed before zeroing the meter and reading the sample.*

INTERFERENCES

Interference may be caused by:

- Chloride above 8000 mg/L
- Sodium above 5000 mg/L
- Calcium above 1000 mg/L $CaCO_3$
- Potassium above 500 mg/L
- Magnesium above 400 mg/L
- Molybdenum above 60 mg/L
- Chromium(VI) above 40 mg/L
- Aluminum above 32 mg/L
- Zinc above 30 mg/L
- Manganese above 25 mg/L
- Cadmium, Chromium(III), Fluoride, Lead above 20 mg/L
- Copper above 15 mg/L
- Iron (Ferric) above 10 mg/L
- Cobalt, Iron (Ferrous) must not be present.

Nickel High Range

SPECIFICATIONS

Range	0.00 to 7.00 ppt (as Ni)
Resolution	0.01 ppt
Accuracy	±0.07 ppt±4% of reading at 25 °C
Wavelength	575 nm
Cuvette type	22 mm diameter
Method	Adaptation of the Photometric Method
Method ID	#054

REQUIRED REAGENTS

Code	Description	Quantity
HI93726-0	Nickel High Range Reagent	1 packet

REAGENT SETS

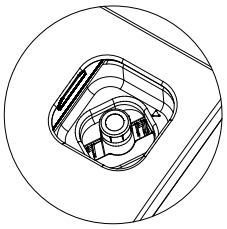
HI93726-01	Reagents for 100 tests
HI93726-03	Reagents for 300 tests

For other accessories see Accessories section.

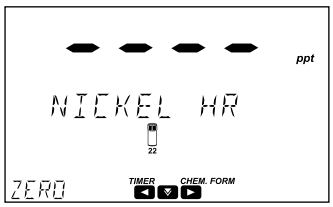
MEASUREMENT PROCEDURE

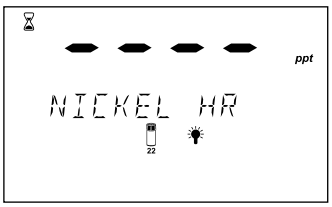
- Select the Nickel HR method using the procedure described in the Factory Methods section.
- Fill the cuvette with 10 mL of unreacted sample (up to the mark). Replace the plastic stopper and the cap.

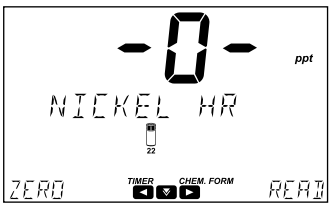
- Insert the cuvette into the holder and close the lid.



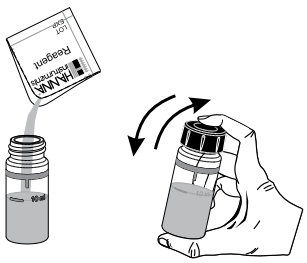
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.

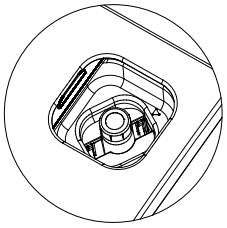






- Remove the cuvette and add one packet of HI93726-0 Nickel High Range Reagent. Replace the plastic stopper and the cap. Shake gently until completely dissolved.

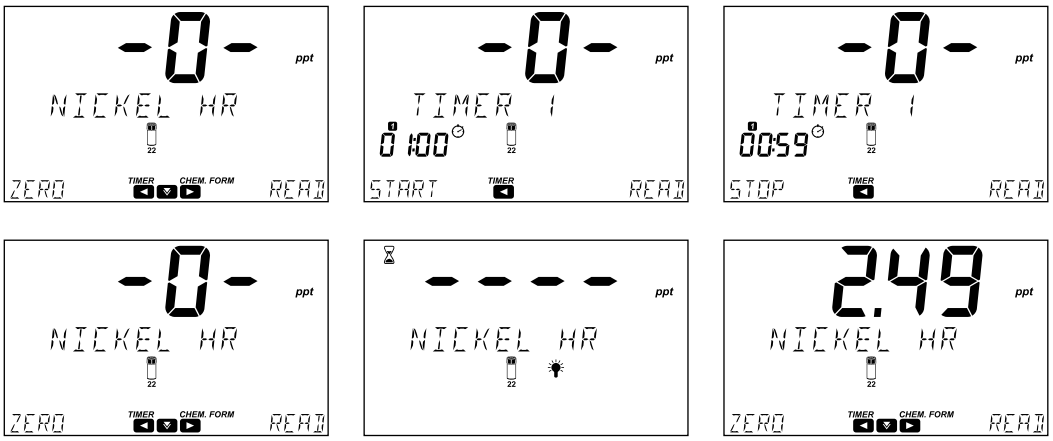




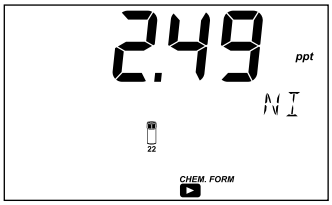
- Insert the cuvette into the holder and close the lid.

- Press the ◄ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 1 minute.

- Press **READ** to start the reading. The instrument displays the results in **ppt** of **nickel (Ni)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ► key to view the chemical formula.



- Press the ► key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Copper

Nitrate

SPECIFICATIONS

Range	0.0 to 30.0 mg/L (as NO_3^--N)
Resolution	0.1 mg/L
Accuracy	±0.5 mg/L ±10% of reading at 25 °C
Wavelength	525 nm
Cuvette type	22 mm diameter
Method	Adaptation of the Cadmium Reduction Method
Method ID	#055

REQUIRED REAGENTS

Code	Description	Quantity
HI93728-0	Nitrate Reagent	1 packet

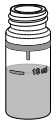
REAGENT SETS

HI93728-01	Reagents for 100 tests
HI93728-03	Reagents for 300 tests

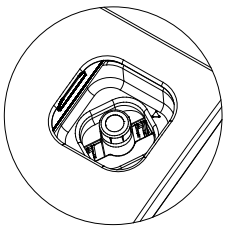
For other accessories see Accessories section.

MEASUREMENT PROCEDURE

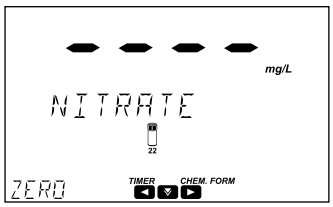
- Select the Nitrate method using the procedure described in the Factory Methods section.
- Fill the cuvette with 10 mL of sample (up to the mark). Replace the plastic stopper and the cap.

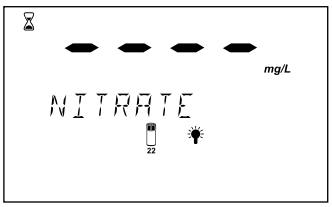


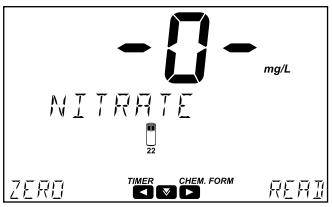
- Insert the cuvette into the holder and close the lid.



- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.

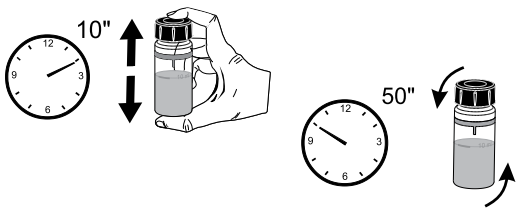




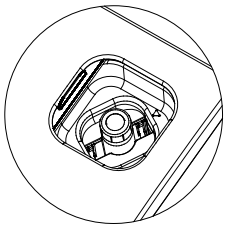


- Remove the cuvette and add one packet of HI93728-0 Nitrate Reagent.

- Replace the plastic stopper and the cap. Shake vigorously up and down for exactly 10 seconds. Continue to mix by inverting the cuvette gently for 50 seconds, while taking care not to induce air bubbles. Powder will not completely dissolve. Time and method of shaking could sensitively affect the measurement.

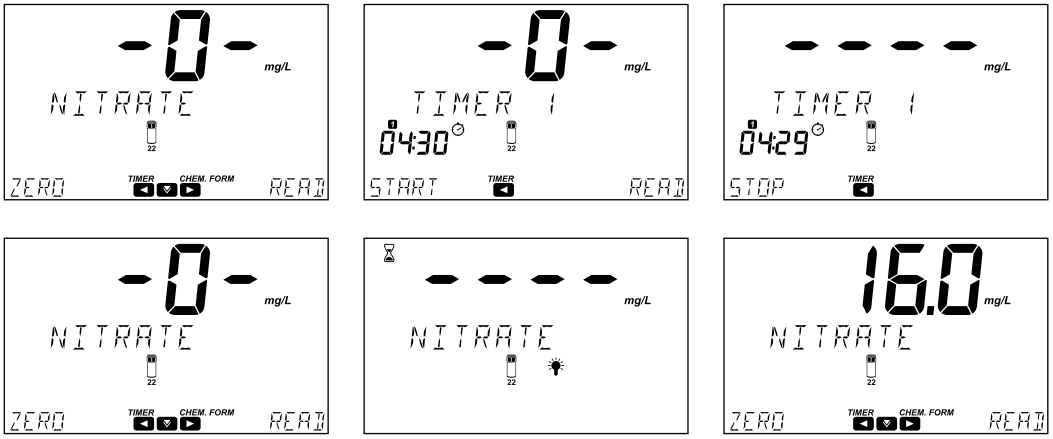


***Note**: The method is technique-sensitive. See procedure described in the Cuvette Preparation section for proper mixing technique.*

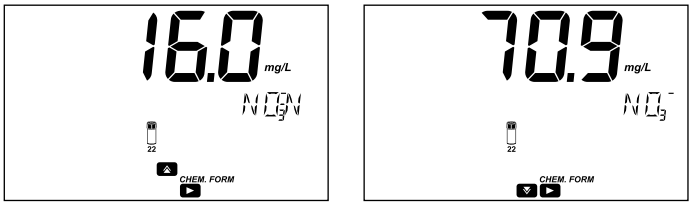


- Insert the cuvette into the holder and close the lid.

- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 4 minutes and 30 seconds.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **nitrate-nitrogen (NO_3^--N)**.



- Press the ⏬ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ⏫ key to convert the results to **mg/L** of **nitrate (NO_3^-)**.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Ammonia and amines, as urea and primary aliphatic amines
- Chloride above 100 mg/L
- Chlorine above 2 mg/L
- Copper, Iron(III), Strong oxidizing and reducing substances
- Sulfide must be absent

Nitrate Chromotropic Acid (13 mm Vials)

SPECIFICATIONS

Range	0.0 to 30.0 mg/L (as NO_3^--N)
Resolution	0.1 mg/L
Accuracy	±1.0 mg/L or ±3% of reading at 25 °C, whichever is greater
Wavelength	410 nm
Cuvette type	13 mm diameter
Method	Chromotropic Acid Method
Method ID	#056

REQUIRED REAGENTS

Code	Description	Quantity
HI93766V-0*	Nitrate Reagent Vial	1 vial
HI93766-0	Nitrate Reagent	1 packet

* Reagent vial identification: white label

REAGENT SETS

HI93766-50	Reagents for 50 tests

For other accessories see Accessories section.

***Note**: Store the unused vials in their packaging in a cool and dark place.*

MEASUREMENT PROCEDURE

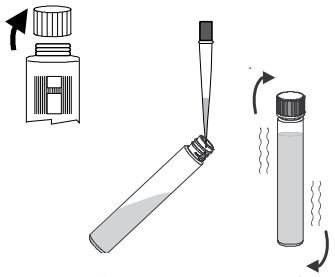
Before using the reagent kit carefully read all the instructions and the Safety Data Sheets (SDS). Pay particular attention to all warnings, cautions, and notes. Failure to do so may result in serious injury to the operator.

***Note**: Method selection is done automatically using a barcoded HI93766V-0 Nitrate Reagent Vial following the procedure described in the Barcode Methods section.*

Alternatively, select the Nitrate (13 mm) method using the procedure described in the Factory Methods section.

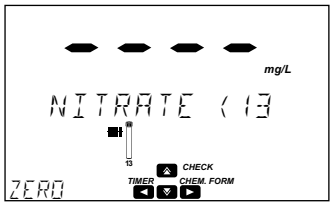
- Insert the supplied 13 mm vial adapter using the procedure described in the Cuvette & Vial Adapters section.
- Remove the cap from a HI93766V-0 Nitrate Reagent Vial.
- Add 1.0 mL of sample to the vial, while keeping the vial at a 45-degree angle.
- Replace the cap and invert the vial 10 times. This is the blank.

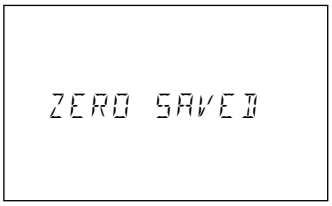
  ***Warning**: The vial will become hot during mixing. Use caution when handling.*

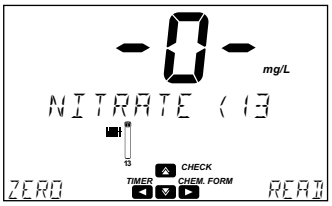


***Note**: The method is technique sensitive. See procedure described in the Cuvette Preparation section for proper mixing technique.*

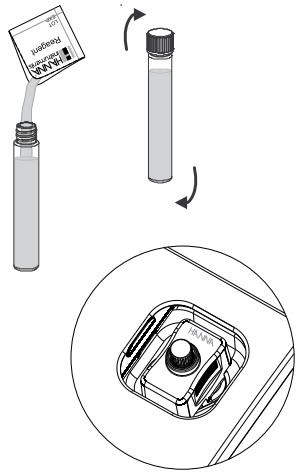
- Insert the vial into the adapter.
  Press steadily down until the vial clicks in place.
- Press **ZERO**.
  The meter scans the barcode and switches to the correct method automatically.
- The display will show "-0-" when the meter is zeroed and ready for measurement.







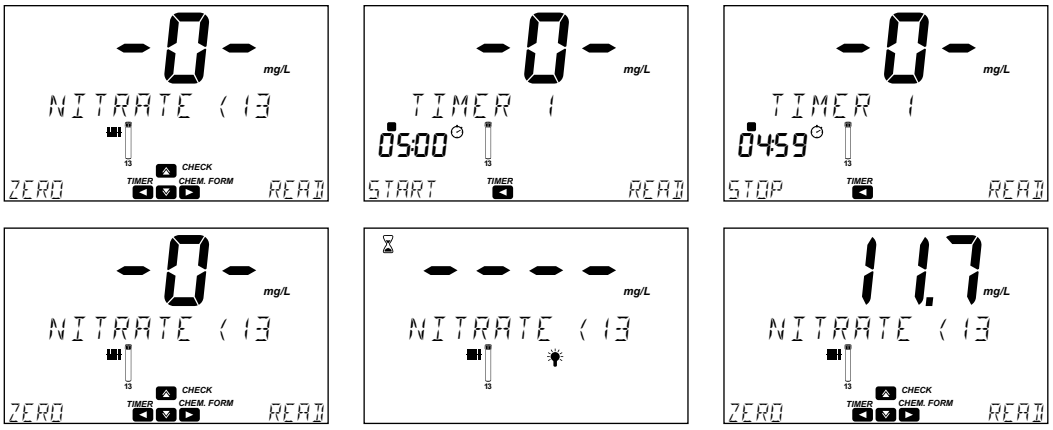
- Remove the vial.
- Add one packet of HI93766-0 Nitrate Reagent.
- Replace the cap and invert the vial 10 times. This is the reacted sample.



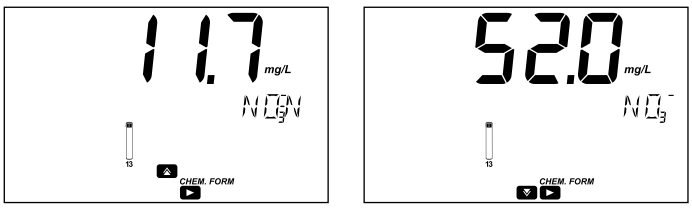
***Note**: The method is technique sensitive. See procedure described in the Cuvette Preparation section for proper mixing technique.*

- Insert the vial into the adapter.
  Press steadily down until the vial clicks in place.

- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 5 minutes.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **nitrate-nitrogen (NO_3^--N)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ▲ key to convert the results to **mg/L** of **nitrate (NO_3^-)**.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Chloride (Cl^-) above 1000 mg/L
- Nitrite (NO_2^-) above 50 mg/L
- Barium (Ba^{2+}) above 1 mg/L
- Samples containing up to 100 mg/L nitrite may be measured after the following treatment:
  Add 400 mg of urea to 10 mL of sample.
  Mix until completely dissolved.
  Proceed with the usual measurement procedure.

Nitrate, Marine High Range

SPECIFICATIONS

Range	0.0 to 75.0 mg/L (as NO_3^-)
Resolution	0.1 mg/L
Accuracy	±2.0 mg/L ± 5 % of reading
Wavelength	505 nm
Cuvette type	16 mm diameter
Method	Zinc Reduction Method
Method ID	#102

REQUIRED REAGENTS

Code	Description	Quantity
HI782-0	Marine Nitrate High Range Reagent	1 packet

REAGENT SETS

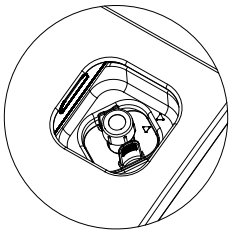
HI782-25 Reagents for 25 tests

For other accessories see Accessories section.

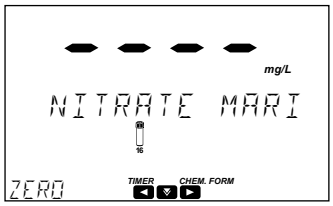
MEASUREMENT PROCEDURE

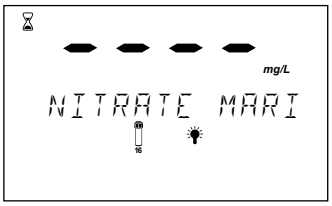
- Select the Nitrate Marine HR method using the procedure described in the Factory Methods section.
- Fill the cuvette with 10 mL of unreacted sample (up to the mark). Replace the plastic stopper and the cap.

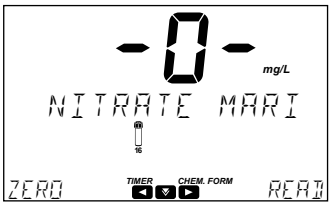
- Insert the 16 mm cuvette adapter using the procedure described in the Cuvette & Vial Adapters section.
- Insert the cuvette into the adapter and close the lid.



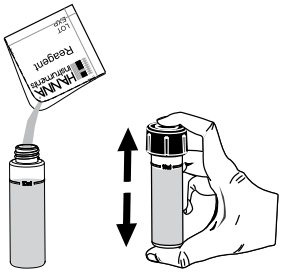
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



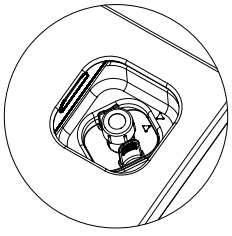




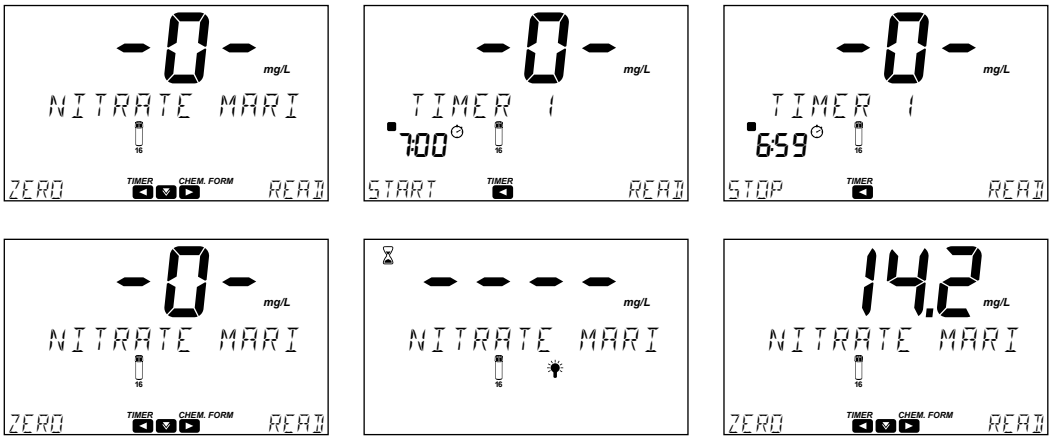
- Remove the cuvette.
- Add the content of one packet of HI782-0 Marine Nitrate HR Reagent. Replace the plastic stopper and the cap. Shake vigorously for 2 minutes.



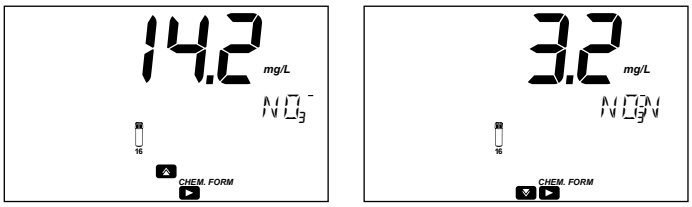
- Insert the cuvette into the adapter and close the lid.



- Press the ◀ key to access the timer menu.
  Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 7 minutes.
- Press **READ** to start the reading. The instrument displays the results in **ppm** of **nitrate (NO_3^-)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ▲ key to convert the results to **mg/L** of **nitrate-nitrogen (NO_3^--N)**.



- Press the ▶ key to return to the measurement screen.

INTERFERENCE

Interference may be caused by:

- Nitrite

Nitrite Low Range

SPECIFICATIONS

Range	0 to 600 µg/L (as NO_2^--N)
Resolution	1 µg/L
Accuracy	±20 µg/L ±4% of reading at 25 °C
Wavelength	480 nm
Cuvette type	22 mm diameter
Method	Adaptation of the EPA Diazotization Method 354.1
Method ID	#058

REQUIRED REAGENTS

Code	Description	Quantity
HI93707-0	Nitrite Low Range Reagent	1 packet

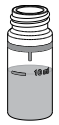
REAGENT SETS

HI93707-01	Reagents for 100 tests
HI93707-03	Reagents for 300 tests

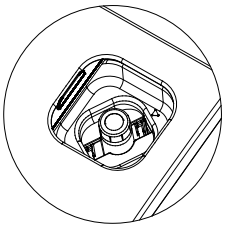
For other accessories see Accessories section.

MEASUREMENT PROCEDURE

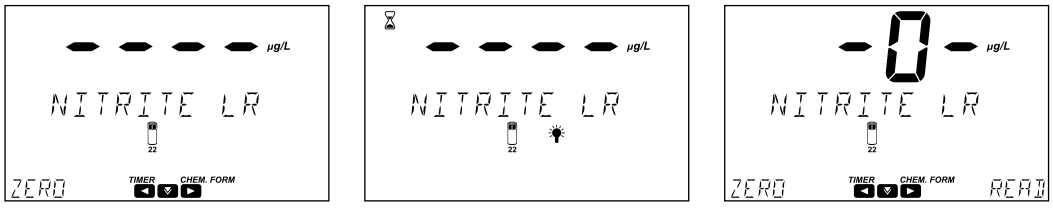
- Select the Nitrite LR method using the procedure described in the Factory Methods section.
- Fill the cuvette with 10 mL of unreacted sample (up to the mark). Replace the plastic stopper and the cap.



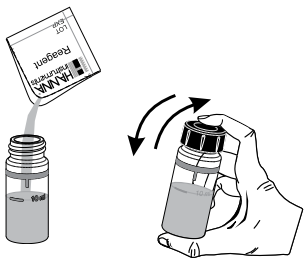
- Insert the cuvette into the holder and close the lid.

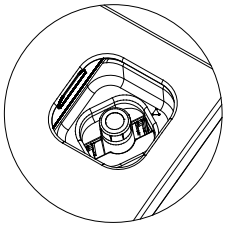


- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



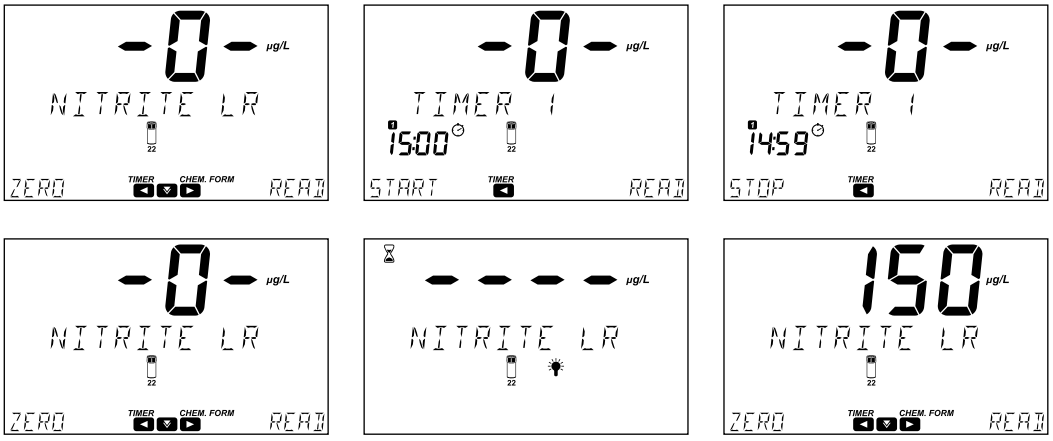
- Remove the cuvette.
- Add one packet of HI93707-0 Nitrite Low Range Reagent. Replace the plastic stopper and the cap. Shake gently for about 15 seconds.



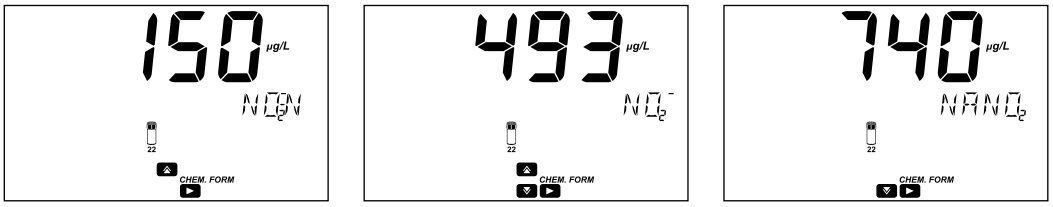


- Insert the cuvette into the holder and close the lid.

- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 15 minutes.
- Press **READ** to start the reading. The instrument displays the results in **µg/L** of **nitrite-nitrogen (NO_2^--N)**.



- Press the ⩔ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ⩓ key to convert the results to **µg/L** of **nitrite (NO_2^-)** or **sodium nitrite ($NaNO_2$)**.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Antimonious, Auric, Bismuth, Chloroplatinate ions, Cupric, Iron (Ferric), Iron (Ferrous), Lead, Mercurous, Silver, Strong reducing or oxidizing agents
- Nitrate above 100 mg/L could yield falsely high readings.

Nitrite Low Range (13 mm Vial)

SPECIFICATIONS

Range	0 to 600 µg/L (as NO_2^--N)
Resolution	1 µg/L
Accuracy	±10 µg/L ± 3% of reading at 25°C , whichever is greater
Wavelength	525 nm
Cuvette type	13 mm diameter
Method	Adaptation of the Standard Method for the Examination of Water and Wastewater, 23rd Edition, 4500B Diazotization Method, Nitrogen Nitrite
Method ID	#091

REQUIRED REAGENT

Code	Description	Quantity
HI96783V-0*	Nitrite Low Range Reagent Vial	1 vial
HI96783-0	Nitrite Low Range Reagent for Vial	1 packet

*Reagent vial identification: green label

REAGENT SETS

HI96783-25	Reagents for 25 tests

For other accessories see Accessories section.

***Note**: Store the unused vials in their packaging in a cool and dark place.*

PRINCIPLE

Nitrite is determined through formation of a reddish purple azo dye produced in acidic solution by coupling diazotized sulfanilamide with aromatic amines.

APPLICATION

Wastewater, drinking water, surface water, mineral water, groundwater

SIGNIFICANCE & USE

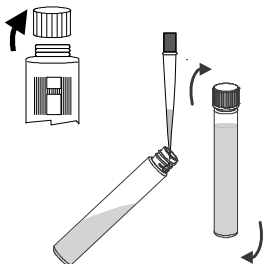
Nitrite is an intermediate oxidation state of nitrogen, both in the oxidation of ammonia to nitrate and in the reduction of nitrate. Such oxidation and reduction may occur in wastewater treatment plants, water distribution systems and natural waters.
Nitrite can enter a water supply system through its use as a corrosion inhibitor in industrial process water.
Nitrite changes the normal form of hemoglobin, which carries oxygen through blood to the rest of the body, into a form called methemoglobin that cannot carry oxygen.

MEASUREMENT PROCEDURE

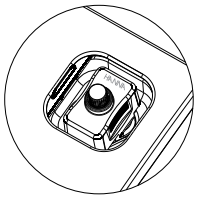
***Note**: Method selection is done automatically using a barcoded HI96783V-0 Nitrite Low Range Reagent Vial following the procedure described in the Barcode Methods section.*

Alternatively, select the Nitrite LR (13 mm) method using the procedure described in the Factory Methods section.

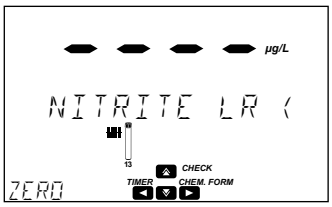
- Insert the supplied 13 mm vial adapter using the procedure described in the Cuvette & Vial Adapters section.
- Remove the cap from a HI96783V-0 Nitrite Low Range Reagent Vial.
- Add 4 mL of sample to the vial, while keeping the vial at a 45-degree angle.
- Replace the cap. Invert several times to mix. This is the blank.

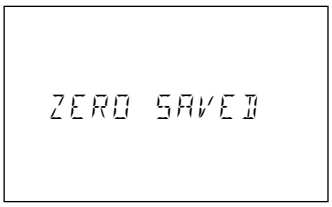


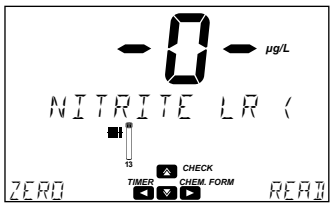
- Insert the vial into the adapter.
  Press steadily down until the vial clicks in place.



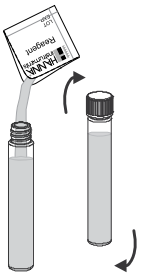
- Press **ZERO**.
  The meter scans the barcode and switches to the correct method automatically.
- The display will show "-0-" when the meter is zeroed and ready for measurement.



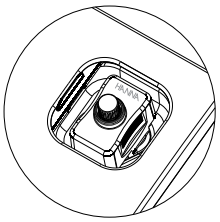




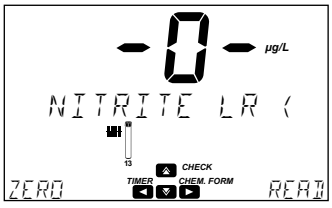
- Remove the vial.
- Remove the cap. Add one packet of HI96783-0 Nitrite Low Range Reagent for Vial.
- Replace the cap. Invert for 30 seconds to mix.

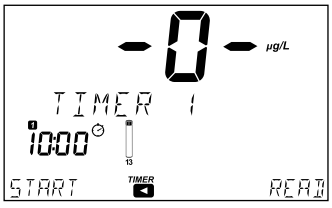


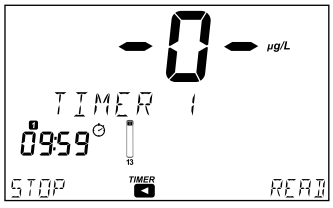
- Insert the vial into the adapter.
  Press steadily down until the vial clicks in place.

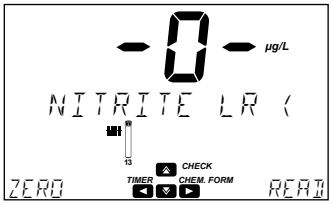


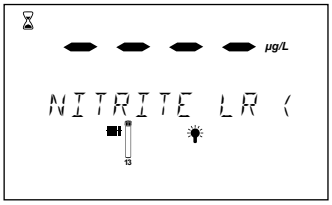
- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 10 minutes.
- Press **READ** to start the reading. The instrument displays the results in **µg/L** of **nitrite-nitrogen (NO_2^--N)**.

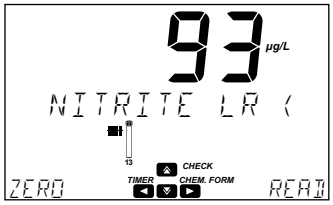




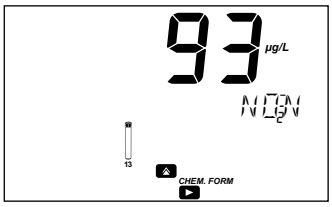


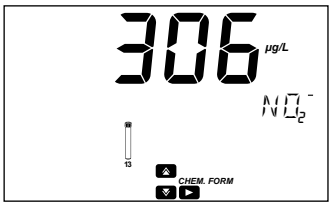






- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ▲ key to convert the results to **µg/L** of **nitrite (NO_2^-) or sodium nitrite ($NaNO_2$)**.





- Press the ▶ key to return to the measurement screen.

INTERFERENCES

The pH of the sample must be between 2.0 and 3.0 after the addition of the reagents.
Interference may be caused by:

- Chlorine, Sodium, Sulfate above 2000 mg/L
- Ammonium, Calcium, Nitrate, Phosphate, Potassium above 1000 mg/L
- Magnesium above 500 mg/L
- Copper above 100 mg/L
- Manganese, Zinc above 25 mg/L
- Nickel above 10 mg/L
- Iron above 5 mg/L

Nitrite Medium Range (13 mm Vial)

SPECIFICATIONS

Range	0.00 to 6.00 mg/L (as NO^-_2-N)
Resolution	0.01 mg/L
Accuracy	±0.10 mg/L ± 3% of reading at 25°C
Wavelength	525 nm
Cuvette type	13 mm diameter
Method	Adaptation of the Standard Method for the Examination of Water and Wastewater, 23rd Edition, 4500B Diazotization Method, Nitrogen Nitrite
Method ID	#092

REQUIRED REAGENT

Code	Description	Quantity
HI96784V-0*	Nitrite Medium Range Reagent Vial	1 vial
HI96784-0	Nitrite Medium Range Reagent for Vial	1 packet

*Reagent vial identification: white label

REAGENT SETS

HI96784-25	Reagents for 25 tests

For other accessories see Accessories section.

***Note**: Store the unused vials in their packaging in a cool and dark place.*

PRINCIPLE

Nitrite is determined through formation of a reddish purple azo dye produced in acidic solution by coupling diazotized sulfanilamide with aromatic amines.

APPLICATION

Wastewater, drinking water, surface water, mineral water, groundwater

SIGNIFICANCE & USE

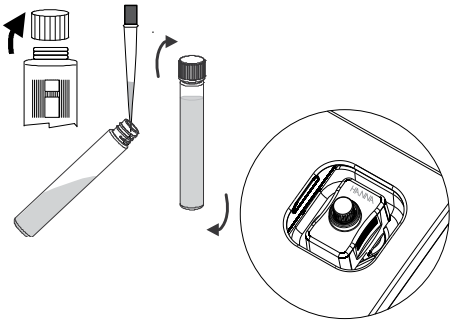
Nitrite is an intermediate oxidation state of nitrogen, both in the oxidation of ammonia to nitrate and in the reduction of nitrate. Such oxidation and reduction may occur in wastewater treatment plants, water distribution systems and natural waters. Nitrite can enter a water supply system through its use as a corrosion inhibitor in industrial process water. Nitrite changes the normal form of hemoglobin, which carries oxygen through blood to the rest of the body, into a form called methemoglobin that cannot carry oxygen.

MEASUREMENT PROCEDURE

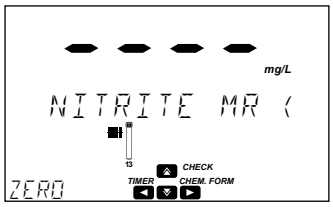
***Note**: Method selection is done automatically using a barcoded HI96784V-0 Nitrite Medium Range Reagent Vial following the procedure described in the Barcode Methods section.*

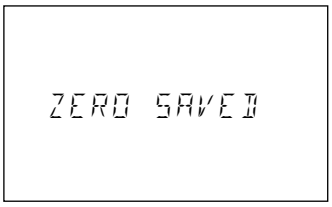
Alternatively, select the Nitrite MR (13 mm) method using the procedure described in the Factory Methods section.

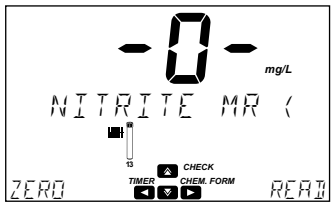
- Insert the supplied 13 mm vial adapter using the procedure described in the Cuvette & Vial Adapters section.
- Remove the cap from a HI96784V-0 Nitrite Medium Range Reagent Vial.
- Add 0.4 mL of sample to the vial, while keeping the vial at a 45-degree angle.
- Replace the cap. Invert several times to mix. This is the blank.
- Insert the vial into the adapter.
  Press steadily down until the vial clicks in place.



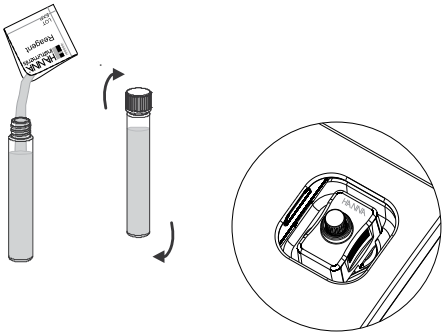
- Press **ZERO**.
  The meter scans the barcode and switches to the correct method automatically.
- The display will show "-0-" when the meter is zeroed and ready for measurement.



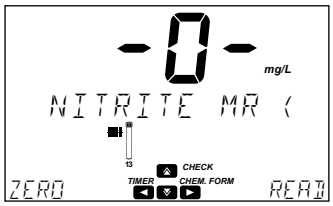


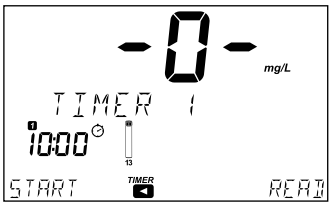


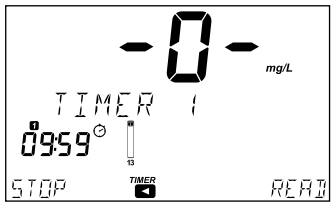
- Remove the vial.
- Remove the cap. Add one packet of HI96784-0 Nitrite Medium Range Reagent for Vial.
- Replace the cap. Invert for 30 seconds to mix.
- Insert the vial into the adapter.
  Press steadily down until the vial clicks in place.

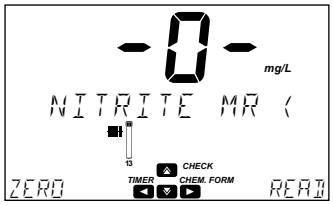


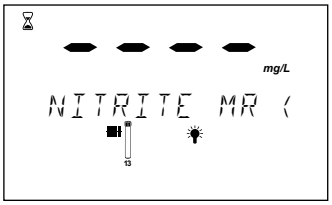
- Press the ◀ key to access the timer menu.
  Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 10 minutes.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **nitrite-nitrogen (NO_2^--N)**.

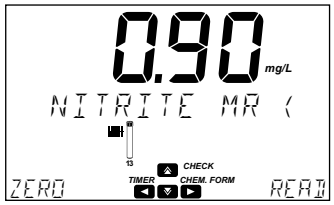




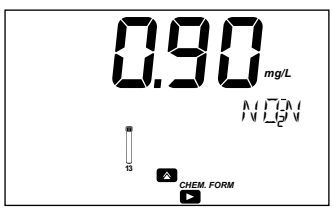


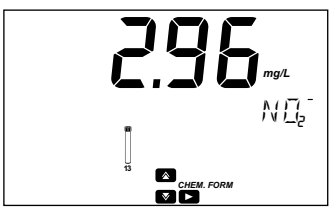






- Press the ⏬ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ⏫ key to convert the results to **mg/L** of **nitrite (NO_2^-)** or **sodium nitrite ($NaNO_2$)**.





- Press the ▶ key to return to the measurement screen.

INTERFERENCES

The pH of the sample must be between 2.0 and 3.0 after the addition of the reagents.
Interference may be caused by:

- Chlorine, Sodium, Sulfate above 4000 mg/L
- Potassium above 3000 mg/L
- Ammonium, Calcium, Nitrate, Phosphate above 2000 mg/L
- Magnesium above 1000 mg/L
- Copper above 200 mg/L
- Manganese, Zinc above 50 mg/L
- Nickel above 20 mg/L
- Iron above 10 mg/L

Nitrite High Range

SPECIFICATIONS

Range	0 to 150 mg/L (as NO_2^-)
Resolution	1 mg/L
Accuracy	±4 mg/L ±4% of reading at 25 °C
Wavelength	575 nm
Cuvette type	22 mm diameter
Method	Adaptation of the Ferrous Sulfate Method
Method ID	#059

REQUIRED REAGENTS

Code	Description	Quantity
HI93708-0	Nitrite High Range Reagent	1 packet

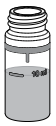
REAGENT SETS

HI93708-01	Reagents for 100 tests
HI93708-03	Reagents for 300 tests

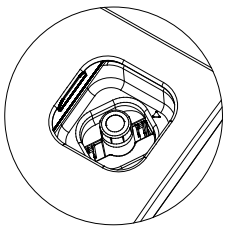
For other accessories see Accessories section.

MEASUREMENT PROCEDURE

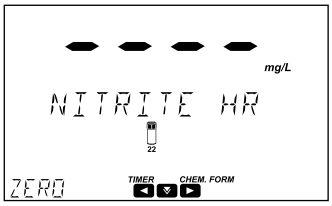
- Select the Nitrite HR method using the procedure described in the Factory Methods section.
- Fill the cuvette with 10 mL of unreacted sample (up to the mark). Replace the plastic stopper and the cap.

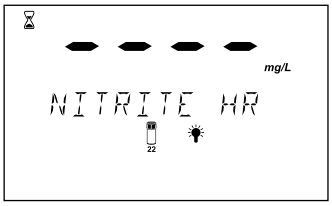


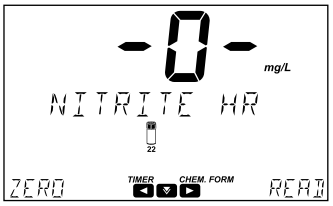
- Insert the cuvette into the holder and close the lid.



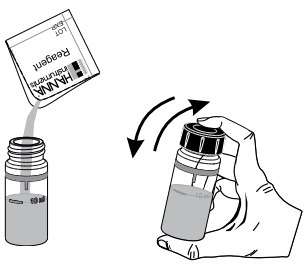
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.

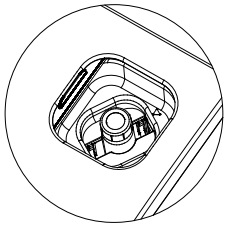






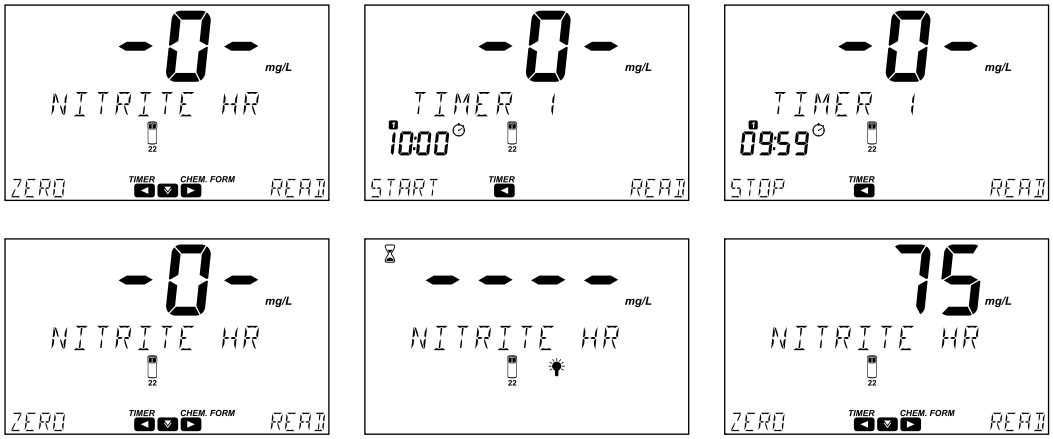
- Remove the cuvette.
- Add one packet of HI93708-0 Nitrite High Range Reagent. Replace the plastic stopper and the cap. Shake gently until completely dissolved.



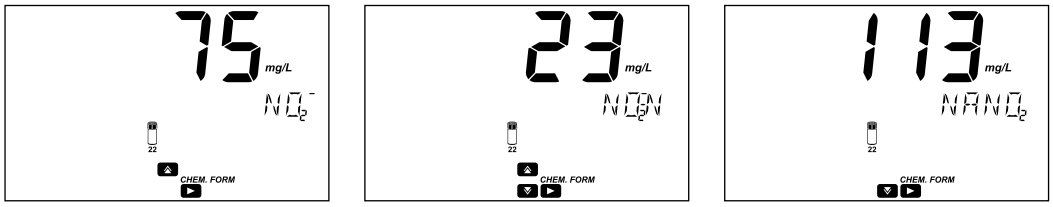


- Insert the cuvette into the holder and close the lid.

- Press the ◄ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 10 minutes.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **nitrite (NO_2^-)**.



- Press the ▼▼ key to view the wavelength, method ID, date and time.
- Press the ► key to view the chemical formula.
- Press the ▲▲ key to convert the results to **mg/L** of **nitrite-nitrogen (NO_2^--N)** or **sodium nitrite ($NaNO_2$)**.



- Press the ► key to return to the measurement screen.

Nitrite, Marine Ultra Low Range

SPECIFICATIONS

Range	0 to 200 µg/L (as NO_2^--N)
Resolution	1 µg/L
Accuracy	±8 µg/L ±4% of reading at 25 °C
Wavelength	480 nm
Cuvette type	22 mm diameter
Method	Adaptation of the EPA Diazotization Method 354.1
Method ID	#057

REQUIRED REAGENTS

Code	Description	Quantity
HI764-25	Nitrite Ultra Low Range Marine Reagent	1 packet

REAGENT SETS

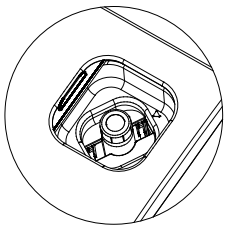
HI764-25	Reagents for 25 tests

For other accessories see Accessories section.

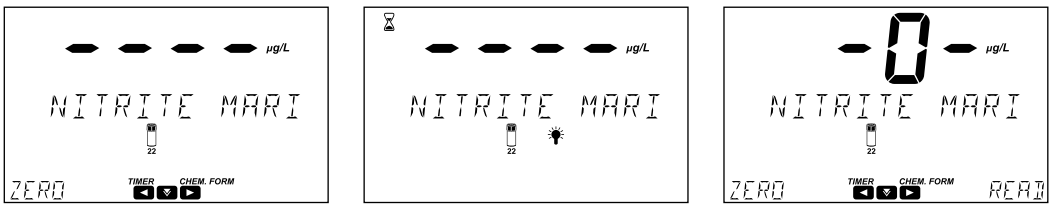
MEASUREMENT PROCEDURE

- Select the Nitrite Marine ULR method using the procedure described in the Factory Methods section.
- Fill the cuvette with 10 mL of unreacted sample (up to the mark). Replace the plastic stopper and the cap.

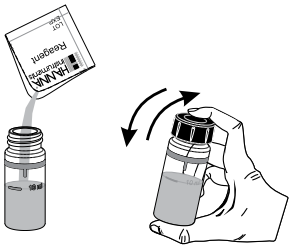
- Insert the cuvette into the holder and close the lid.

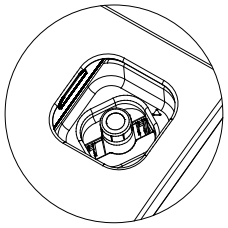


- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



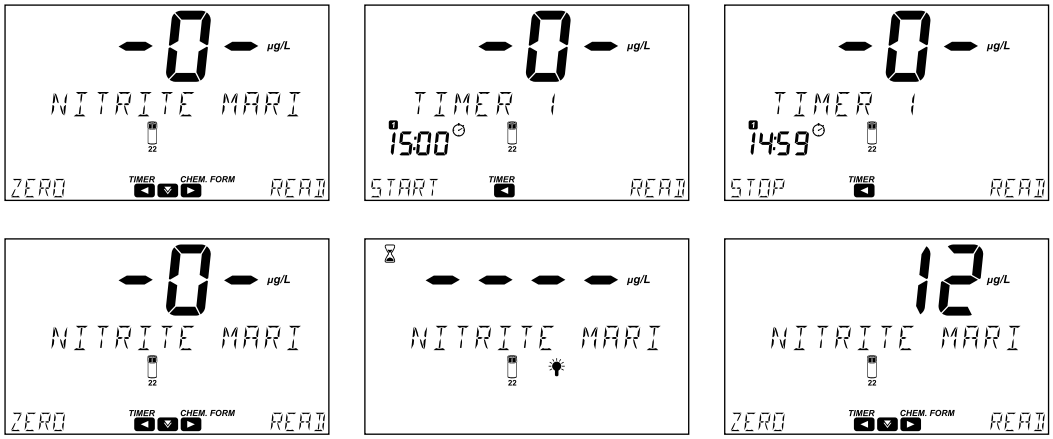
- Remove the cuvette.
- Add one packet of HI764-25 Nitrite Ultra Low Range Marine Reagent. Replace the plastic stopper and the cap. Shake gently for about 15 seconds.



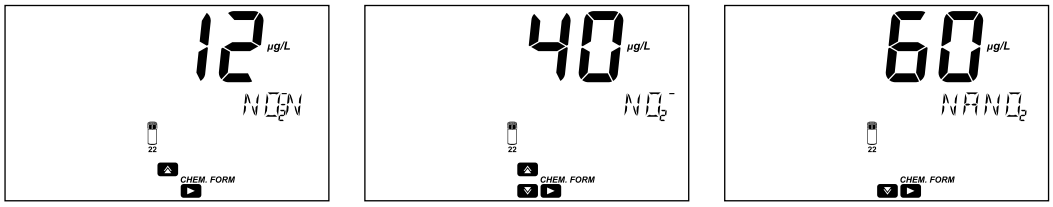


- Insert the cuvette into the holder and close the lid.

- Press the ◄ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 15 minutes.
- Press **READ** to start the reading. The instrument displays the results in **µg/L** of **nitrite-nitrogen (NO_2^--N)**.



- Press the ▼▼ key to view the wavelength, method ID, date and time.
- Press the ► key to view the chemical formula.
- Press the ▲▲ key to convert the results to **µg/L** of **nitrite (NO_2^-)** or **sodium nitrite ($NaNO_2$)**.



- Press the ► key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Antimonious, Auric, Bismuth, Chloroplatinate ions, Cupric, Iron (Ferric), Iron (Ferrous), Lead, Mercurous, Silver, Strong reducing or oxidizing agents
- Nitrate above 100 mg/L could yield falsely high readings.

Nitrite, Seawater (13 mm Vial)

SPECIFICATIONS

Range	0 to 600 µg/L (as NO_2^--N)
Resolution	1 µg/L
Accuracy	±15 µg/L ±5% of reading at 25 °C
Wavelength	525 nm
Cuvette type	13 mm diameter
Method	Adaptation of the Standard Method for the Examination of Water and Wastewater, 23th Edition, 4500B Diazotization Method, Nitrogen Nitrite
Method ID	#098

REQUIRED REAGENTS

Code	Description	Quantity
HI96789V-0*	Nitrite in Seawater Reagent Vial	1 vial
HI96789-0	Nitrite in Seawater Reagent for Vial	1 packet

* Reagent vial identification: red label

REAGENT SETS

HI96789-25	Reagents for 25 tests

For other accessories see Accessories section.

PRINCIPLE

Nitrite is determined through formation of a reddish-purple azo dye produced at acidic solution by coupling diazotized sulfanilamide with aromatic amines.

APPLICATION

Seawater

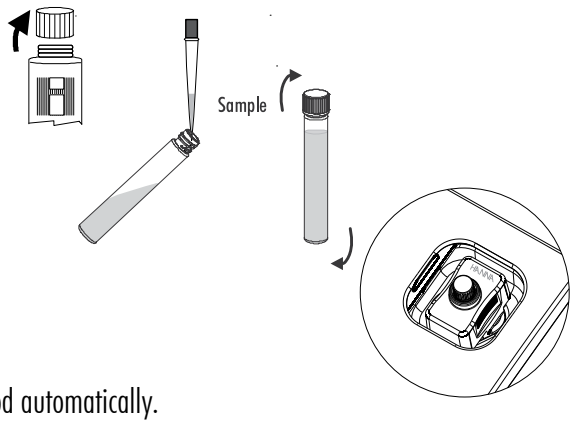
SIGNIFICANCE & USE

Nitrite is an intermediate oxidation state of nitrogen, occurring both during the oxidation of ammonia to nitrate and the reduction of nitrate; and it is part of the "nitrogen cycle".
Nitrite can follow various pathways in the ocean, and many organisms can absorb nitrite through their intestines.
In the ocean, nitrite concentration typically varies from very low levels to about 0.2 ppm. Although nitrite in seawater is not directly toxic, disturbances in the nitrogen cycle can lead to further problems.

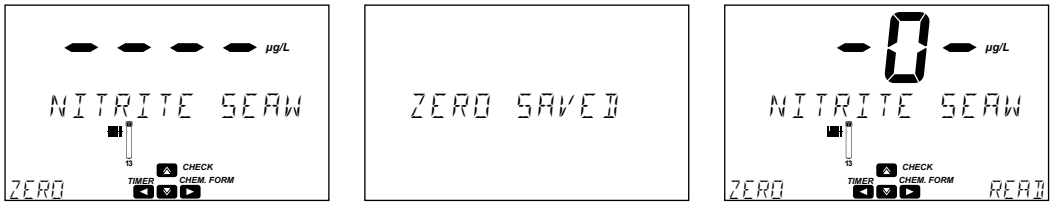
MEASUREMENT PROCEDURE

***Note**: Method selection is done automatically using a barcoded HI96789V-0 Nitrite in Seawater Reagent Vial following the procedure described in the Barcode Methods section.*
Alternatively, select the Nitrite Seawater (13 mm) method using the procedure described in the Factory Methods section.

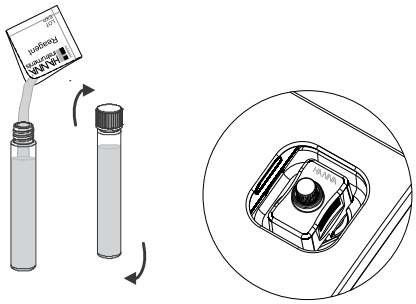
- Insert the supplied 13 mm vial adapter using the procedure described in the Cuvette & Vial Adapters section.
- Remove the cap from a HI96789V-0 Nitrite in Seawater Reagent Vial.
- Add 10 mL of the sample to the vial, while keeping the vial at a 45-degree angle.
- Replace the cap. Invert several times to mix. This is the blank.
- Insert the vial into the adapter.
  Press steadily down until the vial clicks in place.
- Press **ZERO**.
  The meter scans the barcode and switches to the correct method automatically.



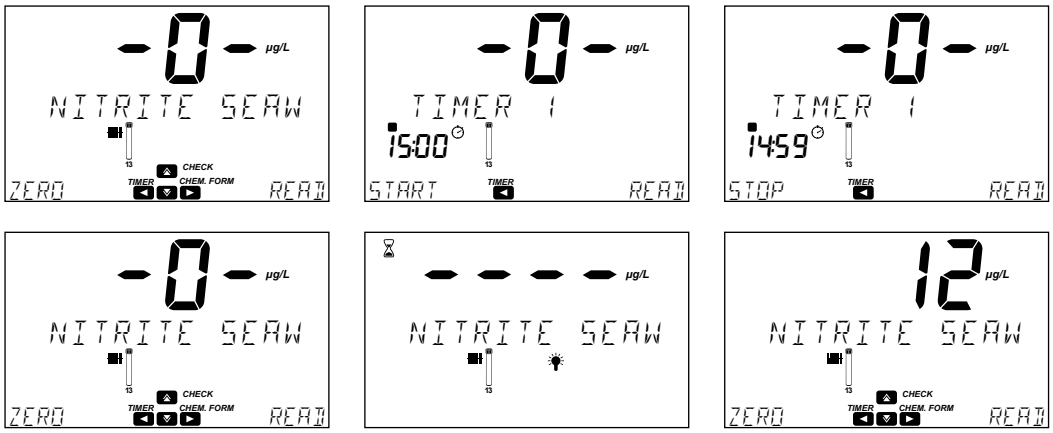
- The display will show "-0-" when the meter is zeroed and ready for measurement.



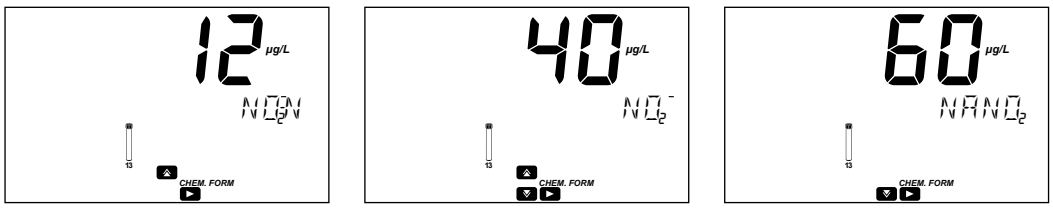
- Remove the vial.
- Remove the cap. Add one packet of HI96789-0 Nitrite in Seawater Reagent.
- Replace the cap. Shake gently for 90 seconds to mix.
- Insert the vial into the adapter.
  Press steadily down until the vial clicks in place.



- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 15 minutes.
- Press **READ** to start the reading. The instrument displays the results in **µg/L** of **nitrite-nitrogen (NO_2^--N)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ▲ key to convert the results to **µg/L** of **nitrite (NO_2^-)** or **sodium nitrite ($NaNO_2$)**.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

The kit has been tested with the following matrix: Synthetic Sea Water, ASTM D665.
Interference may be caused by:

- Chloride (Cl^-) above 24000 mg/L
- Sodium (Na) above 10000 mg/L
- Sulfate (SO_4^{2-}) above 3000 mg/L
- Magnesium (Mg^{2+}) above 2500 mg/L
- Calcium (Ca^{2+}) above 500 mg/L
- Potassium (K) above 400 mg/L
- Carbonate (CO_3^{2-}) above 145 mg/L
- Bromide (Br^-) above 70 mg/L
- Strontium (Sr^-) above 13 mg/L
- Boron (B) above 5.34 mg/L
- Fluoride (F^-) above 1.35 mg/L

Nitrogen, Total Low Range (13 mm Vial)

SPECIFICATIONS

Range	0.0 to 25.0 mg/L (as N)
Resolution	0.1 mg/L
Accuracy	±1.0 mg/L or ±5% of reading at 25 °C, whichever is greater
Wavelength	420 nm
Cuvette type	13 mm diameter
Method	Chromotropic Acid Method
Method ID	#060

REQUIRED REAGENTS

Code	Description	Quantity
HI93767A-B*	Total Nitrogen Low Range Digestion Vial	2 vials
DEIONIZED120	Deionized Water	2 mL
PERSULFATE/N	Potassium Persulfate Reagent	2 packets
BISULFITE/N	Sodium Metabisulfite Reagent	2 packets
HI93767-0	Total Nitrogen Reagent	2 packets
HI93766V-0LR**	Total Nitrogen Low Range Reagent Vial	2 vials

* Reagent vial identification: green label

** Reagent vial identification: red label

REAGENT SETS

HI93767A-50	Reagents for up to 49 tests
Box 1: HI93767A-50	Reagent Set
Box 2: HI93767A&B-50	Reagent Set, for Nitrogen Total Low Range

For other accessories see Accessories section.

***Note**: Store the unused vials in their packaging in a cool and dark place.*

MEASUREMENT PROCEDURE

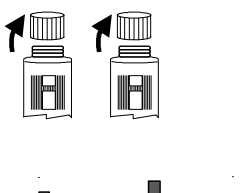
Before using the reagent kit carefully read all the instructions and the Safety Data Sheets (SDS). Pay particular attention to all warnings, cautions and notes. Failure to do so may result in serious injury to the operator.

Reagent Blank Correction: This method requires a reagent blank correction. A single blank vial may be used more than once, the blank vial is stable for one week if stored in a dark place at room temperature. For improved accuracy use the same lot of reagents for the blank and sample, and run a blank for each set of measurements.

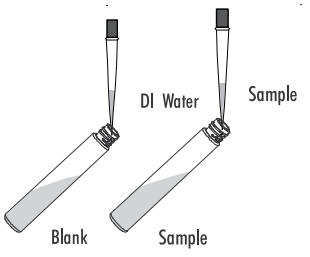
- Preheat the Hanna® Reactor HI839800 to 105 °C (221 °F).
- Use of supplied HI740217 safety shield is strongly recommended.

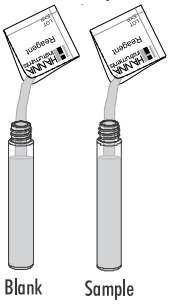
  ***Warning**: Do not use an oven or microwave; samples may leak and generate a corrosive and possibly explosive atmosphere.*

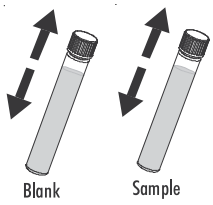
- Remove the cap from two barcoded HI93767A-B Total Nitrogen Low Range Digestion Vials.



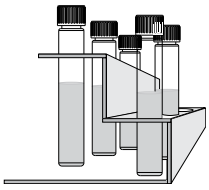
- Add one packet of PERSULFATE/N to each vial.
- Add 2 mL of deionized water to the first vial (#1) and 2 mL of sample to the second vial (#2), while keeping the vials at a 45-degree angle.





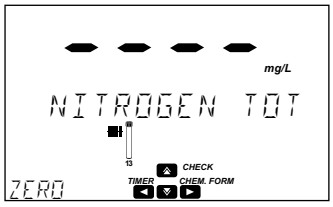


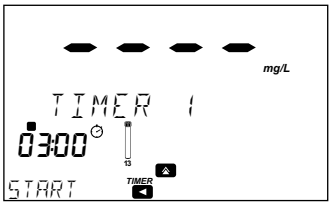
- Replace the cap. Shake vigorously for 30 seconds or until powder is completely dissolved.
- Insert the vials into the reactor and heat them for 30 minutes at 105 °C.
  ***Note**: To obtain most accurate results, it is strongly recommended to remove the vials from the reactor after 30 minutes.*
- At the end of the digestion period switch off the reactor, place the vials in the test tube rack and allow to cool to room temperature.
  ***Warning**: The vials are still hot, use caution when handling.*

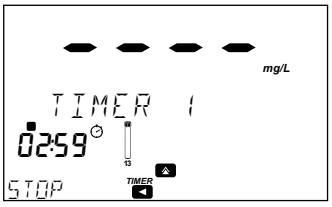


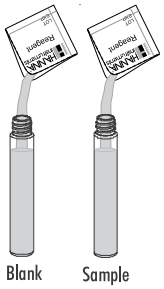
***Note**: Method selection is done automatically using a barcoded HI93766V-0LR Total Nitrogen Low Range Reagent Vial following the procedure described in the Barcode Methods section.*
Alternatively, select the Nitrogen Total LR (13 mm) method using the procedure described in the Factory Methods section.

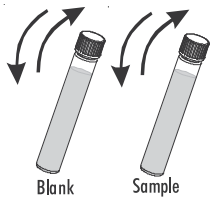
- Insert supplied 13 mm vial adapter using the procedure described in the Cuvette & Vial Adapters section.
- Remove the cap from the vials and add one packet of BISULFITE/N to each vial. Replace the cap.
  Shake gently for 15 seconds.
- Press the ◀ key to access the timer menu.
  Press **START** to start Timer 1, the display will show the countdown or wait 3 minutes.



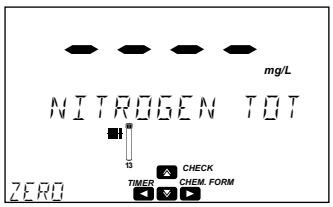


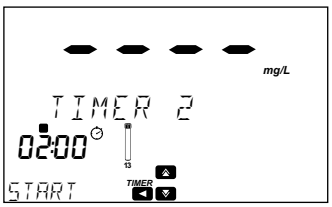


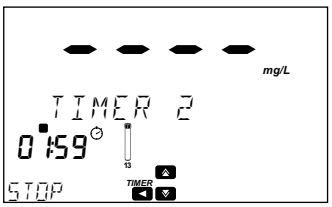




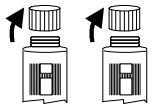
- Remove the cap from the vials.
  Add one packet of HI93767-0 Total Nitrogen Reagent to each vial.
  Replace the cap.
  Shake gently for 15 seconds.
- Press the ◀ key to access the timer menu, press the ⏫ key to select Timer 2.
  Press **START** to start Timer 2, the display will show the countdown or wait 2 minutes.



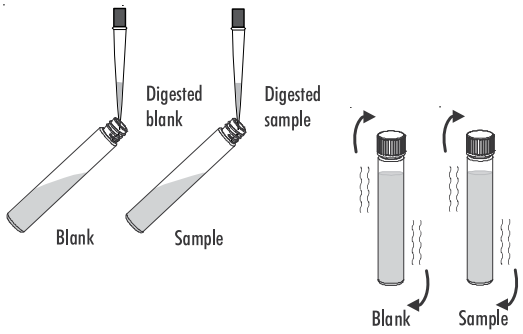




- Remove the cap from two HI93766V-OLR Total Nitrogen Low Range Reagent Vial.



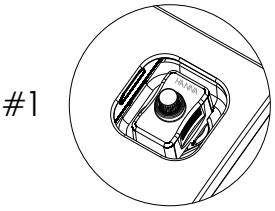
- Add 2 mL of digested blank (#1) to one of the reagent vials and 2 mL of digested sample (#2) to the second reagent vial, while keeping the vials at a 45-degree angle.



- Replace the cap and invert 10 times.

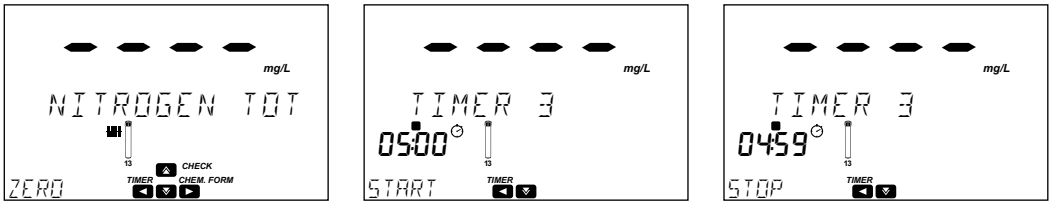
***Warning**: The vials will become hot during mixing, use caution when handling.*

***Note**: The method is technique sensitive. See procedure described in the Cuvette Preparation section for proper mixing technique.*

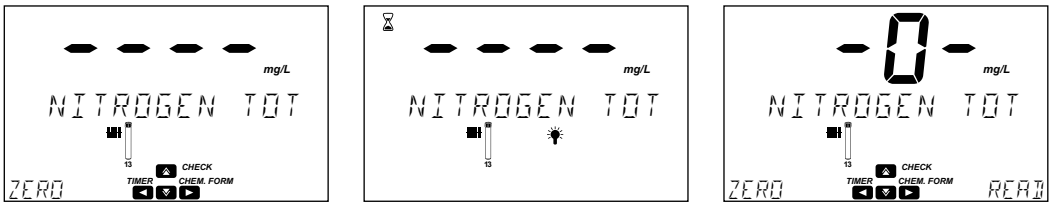


- Insert the blank vial (#1) into the adapter.
  Press steadily down until the vial clicks in place.

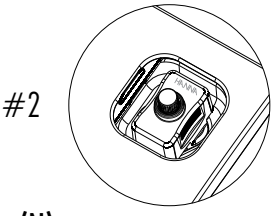
- Press the ◀ key to access the timer menu, press the ⏫ key to select Timer 3. Press **START** to start Timer 3, the display will show the countdown prior to the zero or wait 5 minutes.



- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.

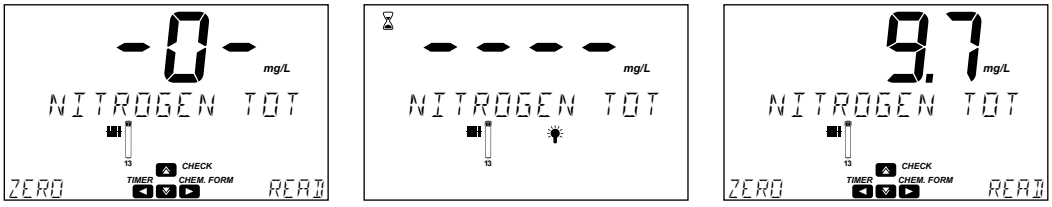


- Remove the blank vial.

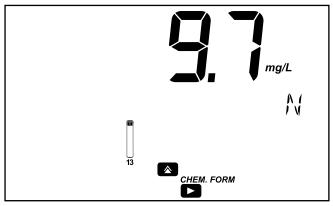


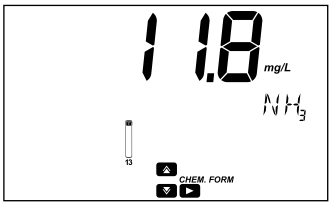
- Insert the sample vial (#2) into the adapter.
  Press steadily down until the vial clicks in place.

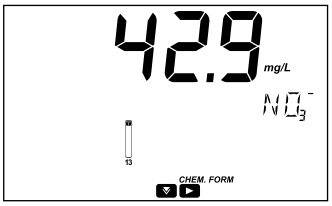
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **nitrogen (N)**.



- Press the ⏬ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ⏫ key to convert the results to **mg/L** of **ammonia (NH_3)** or **nitrate (NO_3^-)**.







- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Chloride above 1000 mg/L
- Bromide above 60 mg/L
- Chromium above 0.5 mg/L

Nitrogen, Total High Range (13 mm Vial)

SPECIFICATIONS

Range	10 to 150 mg/L (as N)
Resolution	1 mg/L
Accuracy	±3 mg/L or ±4% of reading at 25 °C, whichever is greater
Wavelength	420 nm
Cuvette type	13 mm diameter
Method	Chromotropic Acid Method
Method ID	#061

REQUIRED REAGENTS

Code	Description	Quantity
HI93767B-B*	Total Nitrogen High Range Digestion Vial	2 vials
DEIONIZED120	Deionized Water	0.5 mL
PERSULFATE/N	Potassium Persulfate Reagent	2 packets
BISULFITE/N	Sodium Metabisulfite Reagent	2 packets
HI93767-0	Total Nitrogen Reagent	2 packets
HI93766V-0HR**	Total Nitrogen High Range Reagent Vial	2 vials

* Reagent vial identification: red label

** Reagent vial identification: green label

REAGENT SETS

HI93767B-50	Reagents for up to 49 tests
Box 1: HI93767B-50	Reagent Set
Box 2: HI93767A&B-50	Reagent Set, for Nitrogen Total High Range

For other accessories see Accessories section.

***Note**: Store the unused vials in their packaging in a cool and dark place.*

MEASUREMENT PROCEDURE

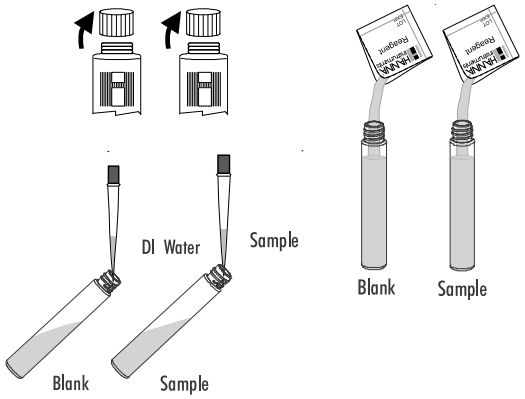
Before using the reagent kit carefully read all the instructions and the Safety Data Sheets (SDS). Pay particular attention to all warnings, cautions and notes. Failure to do so may result in serious injury to the operator.

Reagent Blank Correction: This method requires a reagent blank correction. A single blank vial may be used more than once, the blank vial is stable for one week if stored in a dark place at room temperature. For improved accuracy always use the same lot of reagents for the blank and sample, and run a blank for each set of measurements.

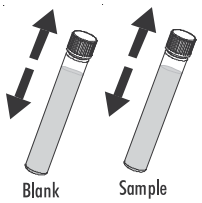
- Preheat the Hanna® Reactor HI839800 to 105 °C (221 °F).
- Use of supplied HI740217 safety shield is strongly recommended.

  ***Warning**: Do not use an oven or microwave; samples may leak and generate a corrosive and possibly explosive atmosphere.*

- Remove the cap from two HI93767B-B barcoded Total Nitrogen High Range Digestion Vials.



- Add one packet of PERSULFATE/N to each vial.
- Add 0.5 mL of deionized water to the first vial (#1) and 0.5 mL of sample to the second vial (#2), while keeping the vials at a 45-degree angle.

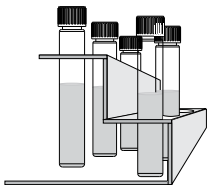


- Replace the cap and shake vigorously for about 30 seconds or until powder is completely dissolved.
- Insert the vials into the reactor and heat them for 30 minutes at 105 °C.

  ***Note**: To obtain most accurate results, it is strongly recommended to remove the vials from the reactor after 30 minutes.*

- At the end of the digestion place the vials in the test tube rack and allow to cool to room temperature.

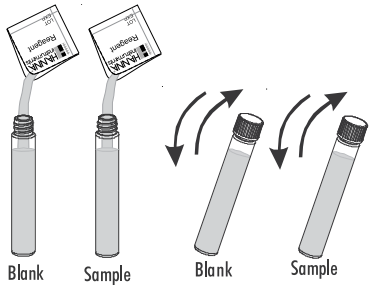
  ***Warning**: The vials are still hot, use caution when handling.*



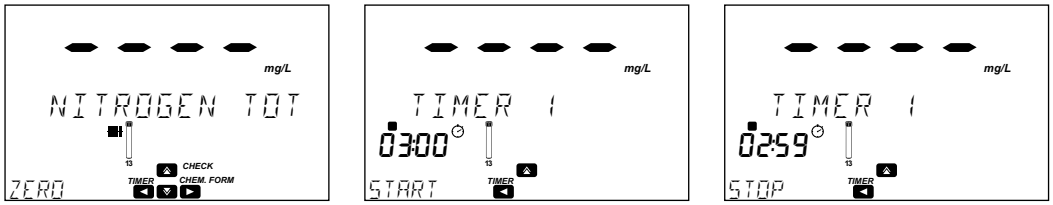
***Note**: Method selection is done automatically using a barcoded HI93766V-0HR Total Nitrogen High Range Reagent Vial following the procedure described in the Barcode Methods section.*

Alternatively, select the Nitrogen Total HR (13 mm) method using the procedure described in the Factory Methods section.

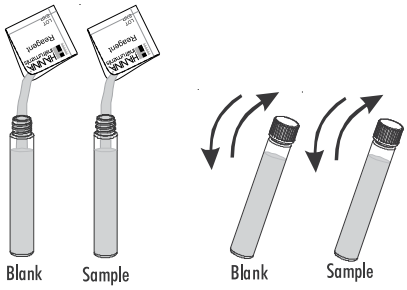
- Insert supplied 13 mm vial adapter using the procedure described in the Cuvette & Vial Adapters section.
- Remove the cap from the vials and add one packet of BISULFITE/N to each vial.
  Replace the cap.
  Shake gently for 15 seconds.



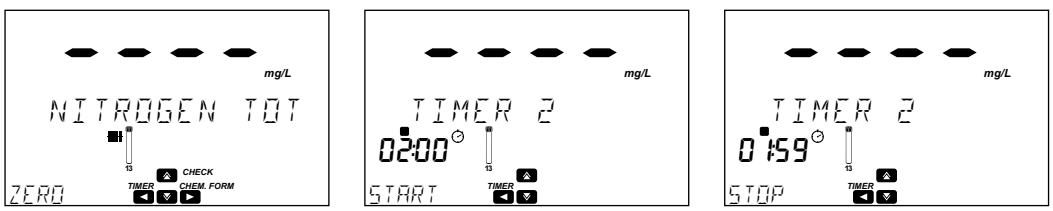
- Press the ◀ key to access the timer menu.
  Press **START** to start Timer 1, the display will show the countdown or wait 3 minutes.



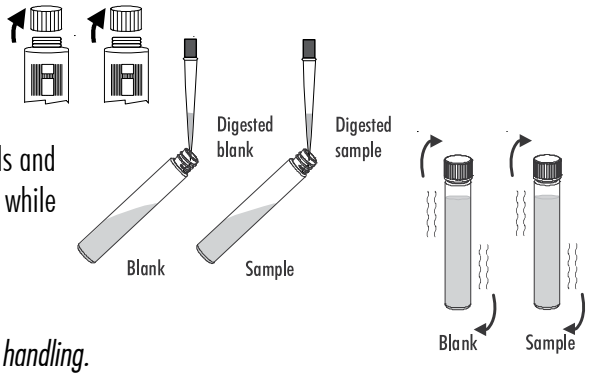
- Remove the cap from the vials and add one packet of HI93767-0 Total Nitrogen Reagent to each vial. Replace the cap.
  Shake gently for 15 seconds.



- Press the ◀ key to access the timer menu, press the ⏫ key to select Timer 2.
  Press **START** to start Timer 2, the display will show the countdown or wait 2 minutes.



- Remove the cap from two HI93766V-0HR Total Nitrogen High Range Reagent Vial.

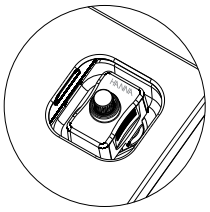


- Add 2 mL of digested blank (#1) to one of the reagent vials and 2 mL of digested sample (#2) to the second reagent vial, while keeping the vials at a 45-degree angle.
- Replace the cap tightly and invert the vials 10 times.

***Warning**: The vials will become hot during mixing, use caution when handling.*

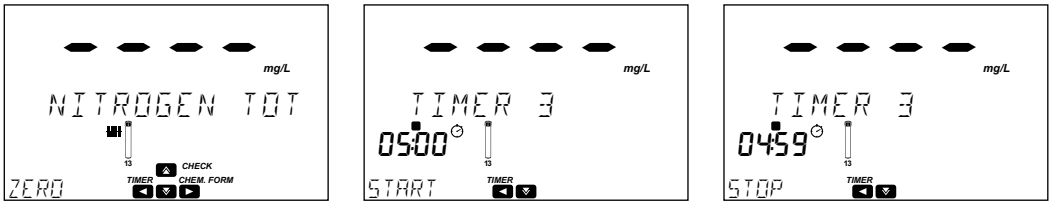
***Note**: The method is technique sensitive. See procedure described in the Cuvette Preparation section for proper mixing technique.*

#1

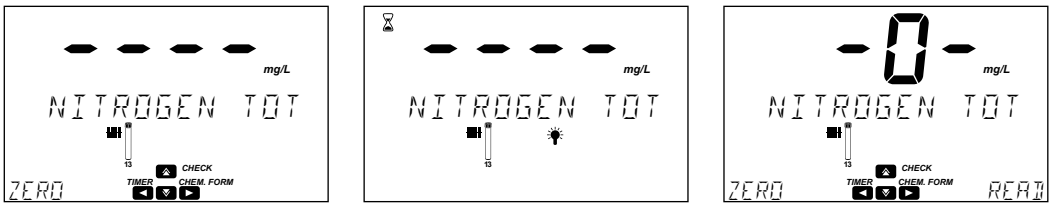


- Insert the blank vial (#1) into the adapter.
  Press steadily down until the vial clicks in place.

- Press the ◀ key to access the timer menu, press the ⏫ key to select Timer 3.
  Press **START** to start Timer 3, the display will show the countdown prior to the zero or wait 5 minutes.

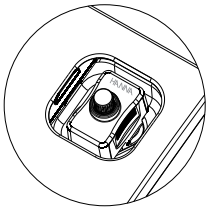


- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.

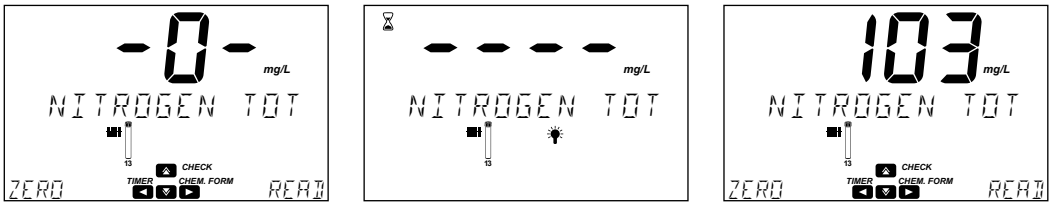


- Remove the blank vial (#1).

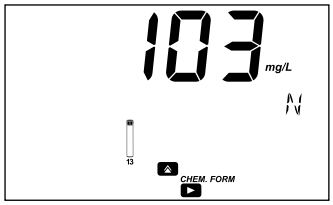
#2

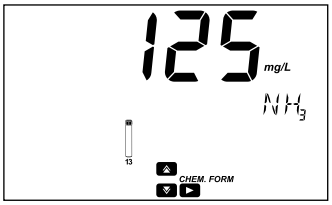


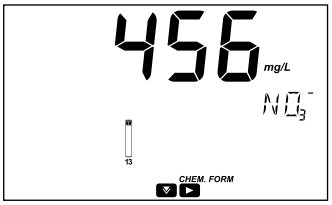
- Insert the sample vial (#2) into the adapter.
  Press steadily down until the vial clicks in place.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **nitrogen (N)**.



- Press the ⏬ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ⏫ key to convert the results to **mg/L** of **ammonia (NH_3)** or **nitrate (NO_3^-)**.







- Press the ▶ key to return to the measurement screen.

The method detects all organic and inorganic forms of nitrogen present in the sample.

INTERFERENCES

Interference may be caused by:

- Chloride above 3000 mg/L
- Bromide above 240 mg/L
- Chromium above 0.5 mg/L

Oxygen, Dissolved

SPECIFICATIONS

Range	0.0 to 10.0 mg/L (as O_2)
Resolution	0.1 mg/L
Accuracy	±0.4 mg/L ±3% of reading at 25 °C
Wavelength	466 nm
Cuvette type	22 mm diameter
Method	Adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th Edition, Azide Modified Winkler Method
Method ID	#062

REQUIRED REAGENTS

Code	Description	Quantity
HI93732A-0	Dissolved Oxygen Reagent A	5 drops
HI93732B-0	Dissolved Oxygen Reagent B	5 drops
HI93732C-0	Dissolved Oxygen Reagent C	10 drops

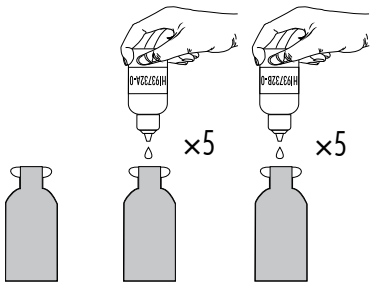
REAGENT SET

HI93732-01	Reagents for 100 tests
HI93732-03	Reagents for 300 tests

For other accessories see Accessories section.

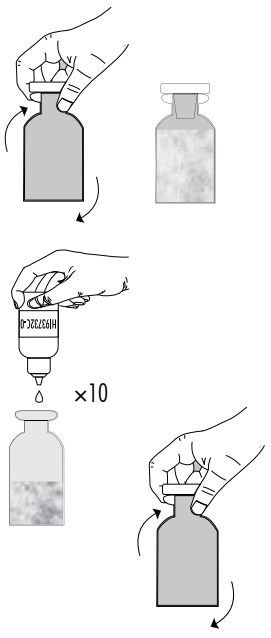
MEASUREMENT PROCEDURE

- Select the Oxygen Dissolved method using the procedure described in the Factory Methods section.
- Fill one 60 mL glass bottle completely with the unreacted sample.
- Replace the cap and ensure that a small part of the sample spills over.
- Remove the cap and add 5 drops of HI93732A-0 and 5 drops of HI93732B-0.
- Add more sample, to fill the bottle completely. Replace the glass stopper and ensure that a part of the sample spills over.



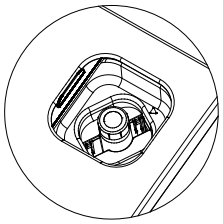
***Note**: This ensures no air bubbles have been trapped inside the bottle. Trapped air bubbles could alter readings.*

- Invert the bottle several times until the sample turns orange-yellow and a flocculating agent appears.
- Let the sample stand for approximately 2 minutes to allow flocculating agent to settle.
- When the upper half of the bottle is clear, add 10 drops of HI93732C-0 Dissolved Oxygen Reagent C.
- Replace the glass stopper. Invert the bottle until the settled flocculating agent dissolves completely. The sample is ready for measurement when it is yellow and completely clear.

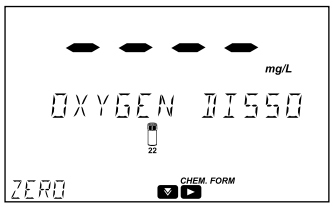


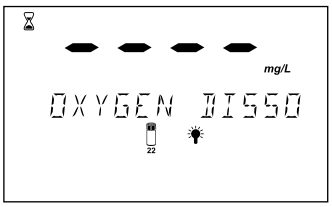
- Fill the first cuvette (#1) with 10 mL of the unreacted sample (up to the mark). Replace the plastic stopper and the cap.

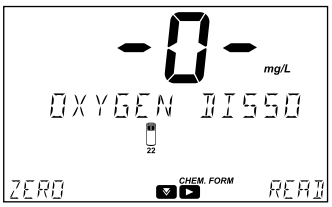
- Insert the cuvette into the holder and close the lid.



- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.

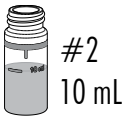




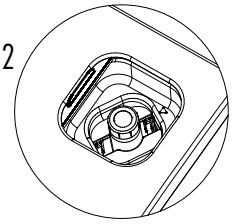


- Remove the cuvette.

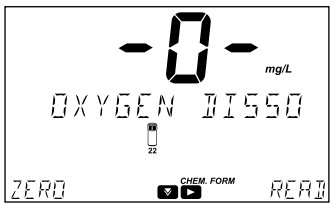
- Fill second cuvette (#2) with 10 mL of the reacted sample (up to the mark). Replace the plastic stopper and the cap.

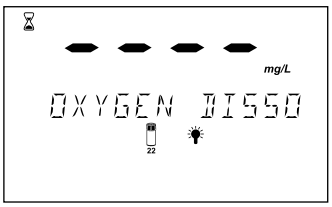


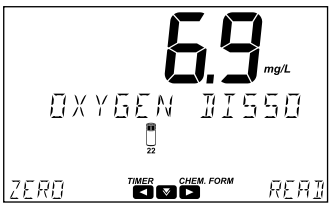
- Insert the cuvette into the holder and close the lid.



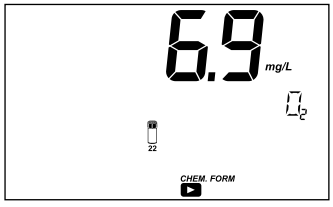
- Press **READ** to start the reading. The instrument will display the results in **mg/L** of **oxygen (O_2)**.







- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interferences may be caused by reducing and oxidizing materials

Oxygen Scavengers (Carbohydrazide)

SPECIFICATIONS

Range	0.00 to 1.50 mg/L (as Carbohydrazide)
Resolution	0.01 mg/L
Accuracy	±0.02 mg/L ±3% of reading at 25 °C
Wavelength	575 nm
Cuvette type	22 mm diameter
Method	Adaptation of the Iron Reduction Method
Method ID	#063

REQUIRED REAGENTS

Code	Description	Quantity
HI96773A-0	Oxygen Scavengers Reagent A	2 packets
HI96773B-0	Oxygen Scavengers Reagent B	1 mL

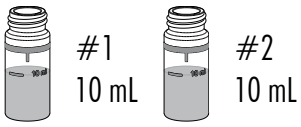
REAGENT SET

HI96773-01	Reagents for 50 tests
HI96773-03	Reagents for 150 tests

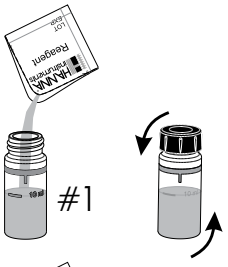
For other accessories see Accessories section.

MEASUREMENT PROCEDURE

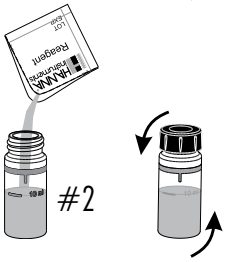
- Select the Oxygen Scavengers (Carbohy) method using the procedure described in the Factory Methods section.
- Fill first cuvette (#1) with 10 mL of deionized water (up to the mark).
- Fill second cuvette (#2) with 10 mL of sample (up to the mark).



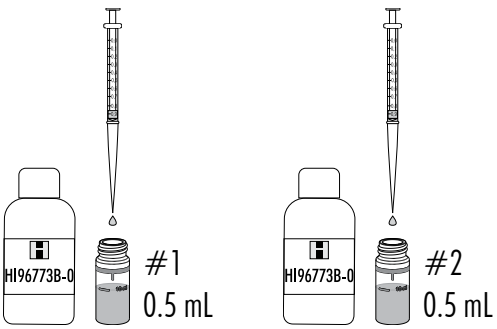
- Add one packet of HI96773A-0 Oxygen Scavengers Reagent A to cuvette #1. Replace the plastic stopper and the cap. Invert for 30 seconds.

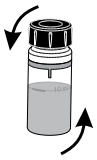


- Add one packet of HI96773A-0 Oxygen Scavengers Reagent A to cuvette #2. Replace the plastic stopper and the cap. Invert for 30 seconds.

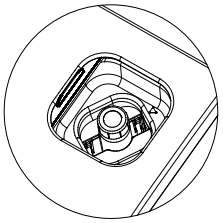


- Add 0.5 mL of HI96773B-0 Oxygen Scavengers Reagent B to each cuvette using the 1 mL syringe.

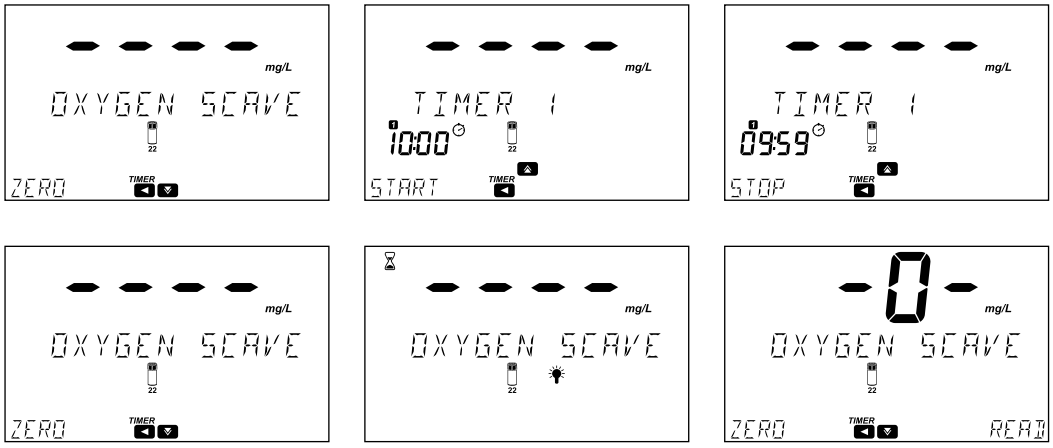




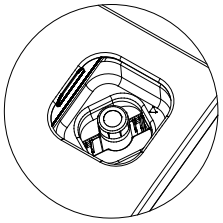
- Replace the plastic stoppers and the caps. Invert for 10 seconds.

#1 

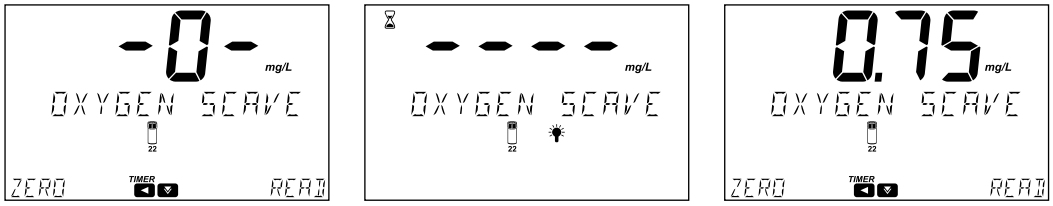
- Insert first cuvette (#1) into the holder and close the lid.
- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to the zero or wait 10 minutes.
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



- Remove the cuvette.
- Insert the second cuvette (#2) into the holder and close the lid.

#2 

- Press **READ** to start reading. The instrument displays the results in **mg/L** of **carbohydrazide**.



- Press the ▼ key to view the wavelength, method ID, date and time.

INTERFERENCES

Interference may be caused by:

- Borate (as $Na_2B_4O_7$), Cobalt, Copper, Iron (Ferrous), Hardness (as $CaCO_3$), Light, Lignosulfonates, Manganese, Molybdenum, Nickel, Phosphate, Phosphonates, Sulfate, Temperature and Zinc

Oxygen Scavengers (Diethylhydroxylamine) (DEHA)

SPECIFICATIONS

Range	0 to 1000 µg/L (as DEHA)
Resolution	1 µg/L
Accuracy	±5 µg/L ±5% of reading at 25 °C
Wavelength	575 nm
Cuvette type	22 mm diameter
Method	Adaptation of the Iron Reduction Method
Method ID	#064

REQUIRED REAGENTS

Code	Description	Quantity
HI96773A-0	Oxygen Scavengers Reagent A	2 packets
HI96773B-0	Oxygen Scavengers Reagent B	1 mL

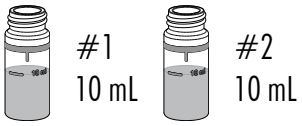
REAGENT SET

HI96773-01	Reagents for 50 tests
HI96773-03	Reagents for 150 tests

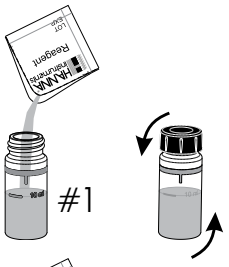
For other accessories see Accessories section.

MEASUREMENT PROCEDURE

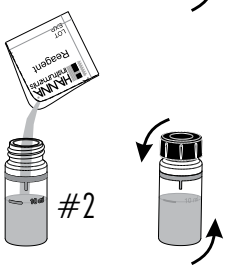
- Select the Oxygen Scavengers (DEHA) method using the procedure described in the Factory Methods section.
- Fill first cuvette (#1) with 10 mL of deionized water (up to the mark).
- Fill second cuvette (#2) with 10 mL of sample (up to the mark).



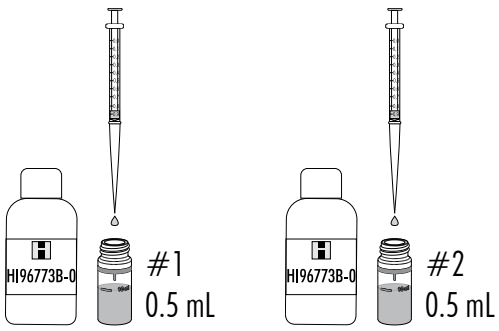
- Add one packet of HI96773A-0 Oxygen Scavengers Reagent A to #1 cuvette. Replace the plastic stopper and the cap. Invert for 30 seconds.

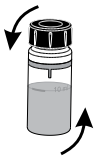


- Add one packet of HI96773A-0 Oxygen Scavengers Reagent A to #2 cuvette. Replace the plastic stopper and the cap. Invert for 30 seconds.

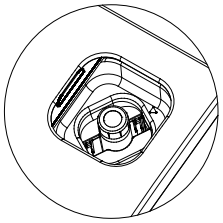


- Add 0.5 mL of HI96773B-0 Oxygen Scavengers Reagent B to each cuvette using the 1 mL syringe.

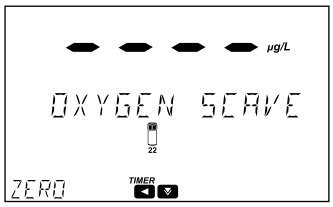


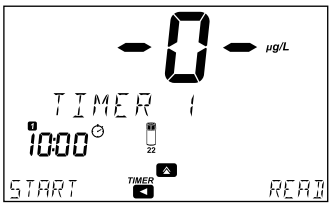


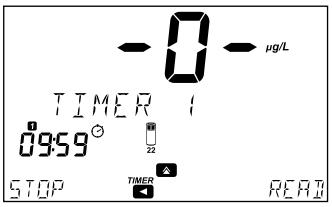
- Replace the plastic stoppers and the caps. Invert for 10 seconds.

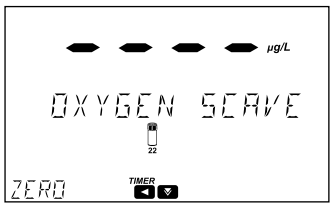
#1 

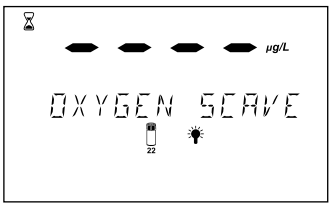
- Insert first cuvette (#1) into the holder and close the lid.
- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to the zero or wait 10 minutes.
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.

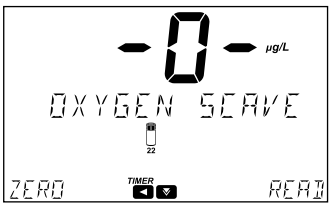




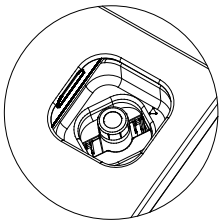




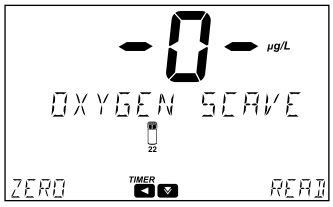


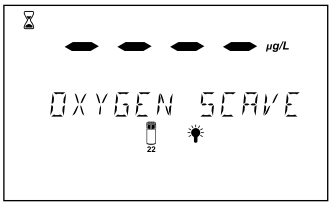


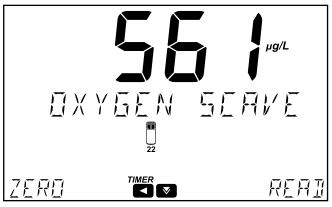
- Remove the cuvette.
- Insert the second cuvette (#2) into the holder and close the lid.

#2 

- Press **READ** to start reading. The instrument displays the results in **µg/L** of **DEHA**.







- Press the ▼ key to view the wavelength, method ID, date and time.

INTERFERENCES

Interference may be caused by:

- Borate (as $Na_2B_4O_7$), Cobalt, Copper, Iron (Ferrous), Hardness (as $CaCO_3$), Light, Lignosulfonates, Manganese, Molybdenum, Nickel, Phosphate, Phosphonates, Sulfate, Temperature and Zinc

Oxygen Scavengers (Hydroquinone)

SPECIFICATIONS

Range	0.00 to 2.50 mg/L (as Hydroquinone)
Resolution	0.01 mg/L
Accuracy	±0.04 mg/L ±3% of reading at 25 °C
Wavelength	575 nm
Cuvette type	22 mm diameter
Method	Adaptation of Iron Reduction Method
Method ID	#065

REQUIRED REAGENTS

Code	Description	Quantity
HI96773A-0	Oxygen Scavengers Reagent A	2 packets
HI96773B-0	Oxygen Scavengers Reagent B	1 mL

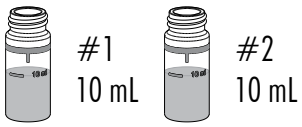
REAGENT SET

HI96773-01	Reagents for 50 tests
HI96773-03	Reagents for 150 tests

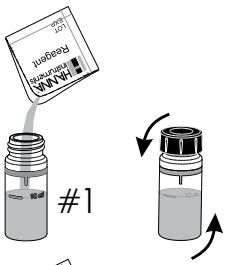
For other accessories see Accessories section.

MEASUREMENT PROCEDURE

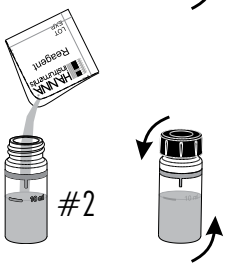
- Select the Oxygen Scavengers (Hydro) method using the procedure described in the Factory Methods section.
- Fill first cuvette (#1) with 10 mL of deionized water (up to the mark).
- Fill second cuvette (#2) with 10 mL of sample (up to the mark).



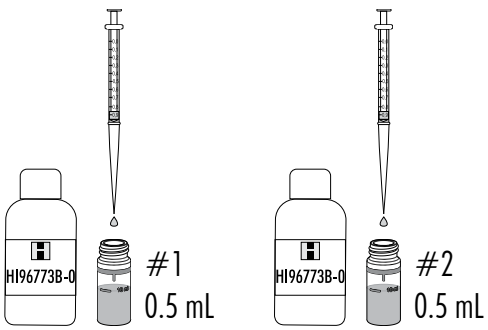
- Add one packet of HI96773A-0 Oxygen Scavengers Reagent A to #1 cuvette. Replace the plastic stopper and the cap. Invert for 30 seconds.

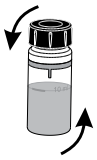


- Add one packet of HI96773A-0 Oxygen Scavengers Reagent A to #2 cuvette. Replace the plastic stopper and the cap. Invert for 30 seconds.



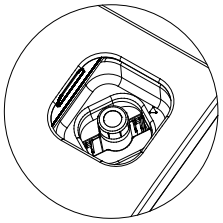
- Add 0.5 mL of HI96773B-0 Oxygen Scavengers Reagent B to each cuvette using the 1 mL syringe.



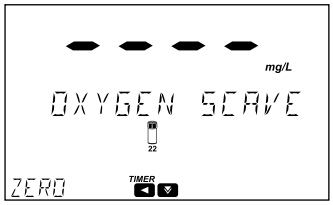


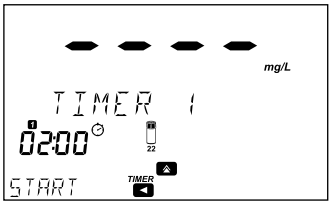
- Replace the plastic stoppers and the caps. Invert for 10 seconds.

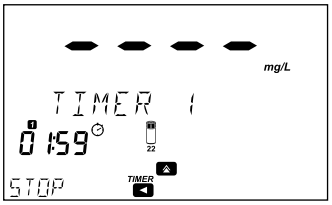
#1

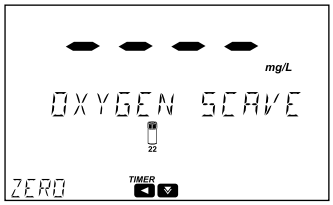


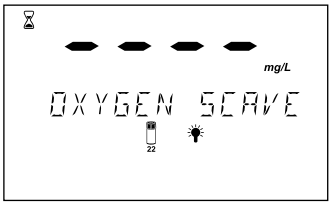
- Insert the first cuvette (#1) into the holder and close the lid.
- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to the zero or wait 2 minutes.
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.

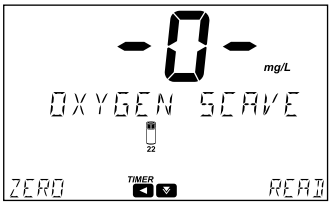






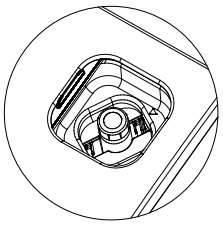




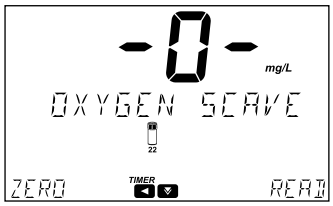


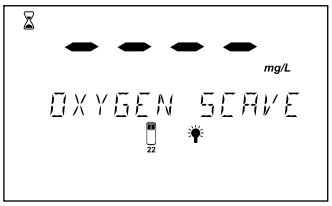
- Remove the cuvette.
- Insert the second cuvette (#2) into the holder and close the lid.

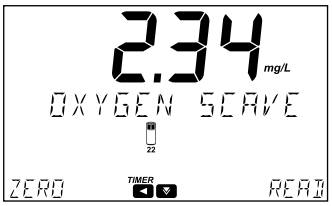
#2



- Press **READ** to start reading. The instrument displays the results in **mg/L** of **hydroquinone**.







- Press the ▼▼ key to view the wavelength, method ID, date and time.

INTERFERENCES

Interference may be caused by:

- Borate (as $Na_2B_4O_7$), Cobalt, Copper, Iron (Ferrous), Hardness (as $CaCO_3$), Light, Lignosulfonates, Manganese, Molybdenum, Nickel, Phosphate, Phosphonates, Sulfate, Temperature and Zinc

Oxygen Scavengers (Isoascorbic Acid)

SPECIFICATIONS

Range	0.00 to 4.50 mg/L (as Iso-Ascorbic Acid)
Resolution	0.01 mg/L
Accuracy	±0.03 mg/L ±3 % of reading at 25 °C
Wavelength	575 nm
Cuvette type	22 mm diameter
Method	Adaptation of the Iron Reduction Method
Method ID	#066

REQUIRED REAGENTS

Code	Description	Quantity
HI96773A-0	Oxygen Scavengers Reagent A	2 packets
HI96773B-0	Oxygen Scavengers Reagent B	1 mL

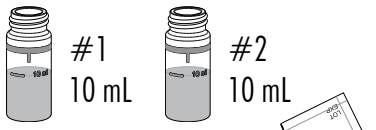
REAGENT SET

HI96773-01	Reagents for 50 tests
HI96773-03	Reagents for 150 tests

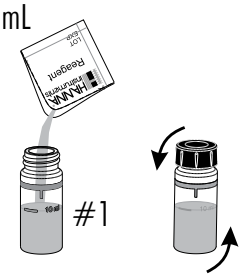
For other accessories see Accessories section.

MEASUREMENT PROCEDURE

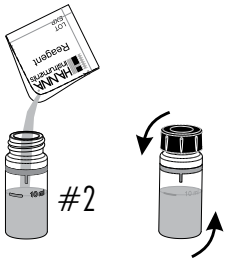
- Select the Oxygen Scavengers (ISA) method using the procedure described in the Factory Methods section.
- Fill first cuvette (#1) with 10 mL of deionized water (up to the mark).
- Fill second cuvette (#2) with 10 mL of sample (up to the mark).



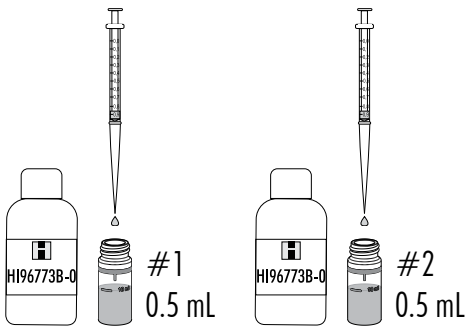
- Add one packet of HI96773A-0 Oxygen Scavengers Reagent A to #1 cuvette. Replace the plastic stopper and the cap. Invert for 30 seconds.



- Add one packet of HI96773A-0 Oxygen Scavengers Reagent A to #2 cuvette. Replace the plastic stopper and the cap. Invert for 30 seconds.

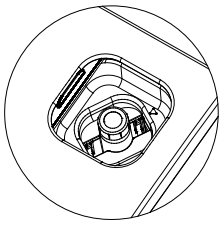


- Add 0.5 mL of HI96773B-0 Oxygen Scavengers Reagent B to each cuvette using the 1 mL syringe.

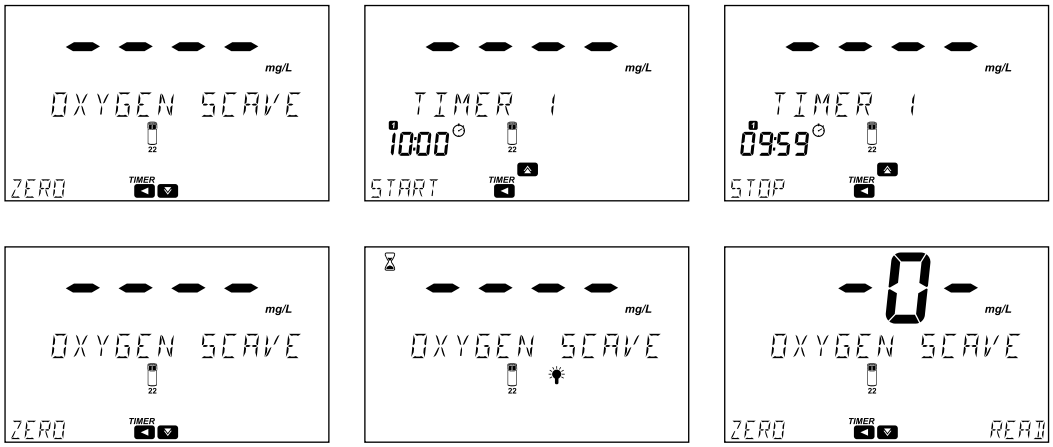


- Replace the plastic stoppers and the caps. Invert for 10 seconds.

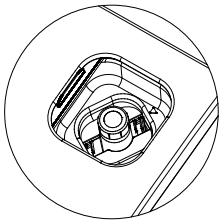
#1



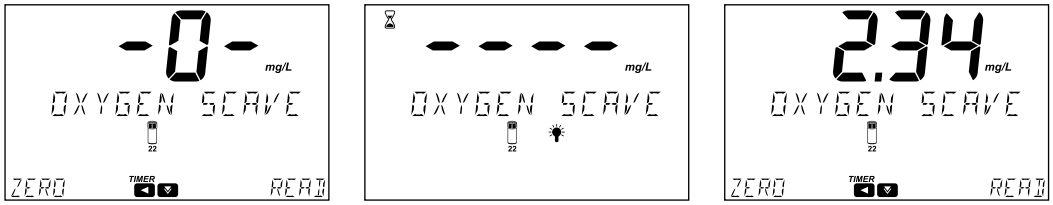
- Insert the first cuvette (#1) into the holder and close the lid.
- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to the zero or wait 10 minutes.
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



#2



- Remove the cuvette.
- Insert the second cuvette (#2) into the holder and close the lid.
- Press **READ** to start reading. The instrument displays the results in **mg/L** of **iso-ascorbic acid**.



- Press the ▼ key to view the wavelength, method ID, date and time.

INTERFERENCES

Interference may be caused by:

- Borate (as $Na_2B_4O_7$), Cobalt, Copper, Iron (Ferrous), Hardness (as $CaCO_3$), Light, Lignosulfonates, Manganese, Molybdenum, Nickel, Phosphate, Phosphonates, Sulfate, Temperature and Zinc

Ozone

SPECIFICATIONS

Range	0.00 to 2.00 mg/L (as O_3)
Resolution	0.01 mg/L
Accuracy	±0.02 mg/L ±3% of reading at 25 °C
Wavelength	525 nm
Cuvette type	22 mm diameter
Method	Colorimetric DPD Method
Method ID	#067

REQUIRED REAGENTS

Code	Description	Quantity
HI93757-0	Ozone Reagent	1 packet
HI93703-52-0	Glycine Powder (Optional Reagent)	1 packet

REAGENT SETS

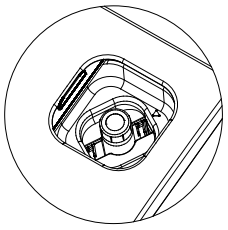
HI93757-01	Reagents for 100 tests
HI93757-03	Reagents for 300 tests
HI93703-52	Reagents for 100 tests (Optional)

For other accessories see Accessories section.

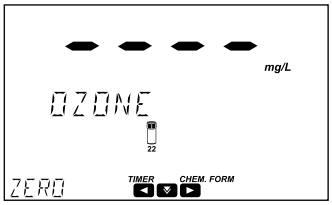
STANDARD MEASUREMENT PROCEDURE

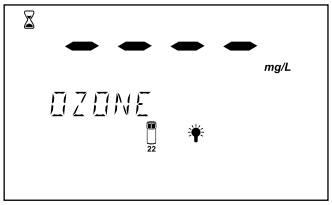
Chlorine free samples

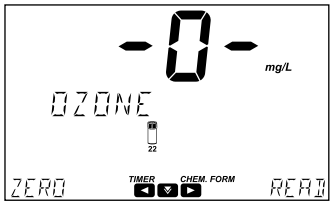
- Select the Ozone method using the procedure described in the Factory Methods section.
- Fill the cuvette with 10 mL of unreacted sample (up to the mark). Replace the plastic stopper and the cap.



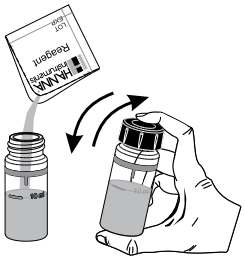
- Insert the cuvette into the holder and close the lid.
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.

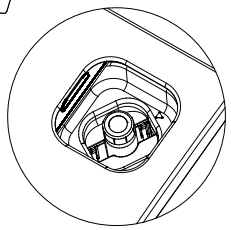






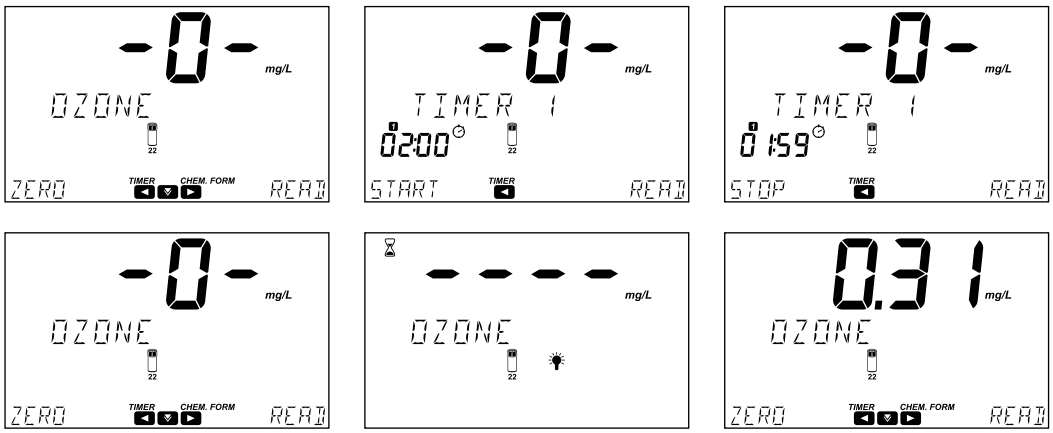
- Remove the cuvette.
- Add one packet of HI93757-0 Ozone Reagent. Replace the plastic stopper and the cap. Shake gently for 20 seconds.





- Insert the cuvette into the holder and close the lid.

- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 2 minutes.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **ozone (O_3)** (chlorine-free sample only). For samples containing chlorine, record this value as A.

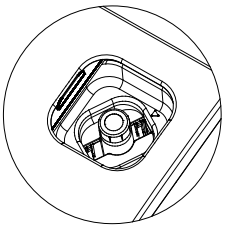


ADDITIONAL MEASUREMENT PROCEDURE

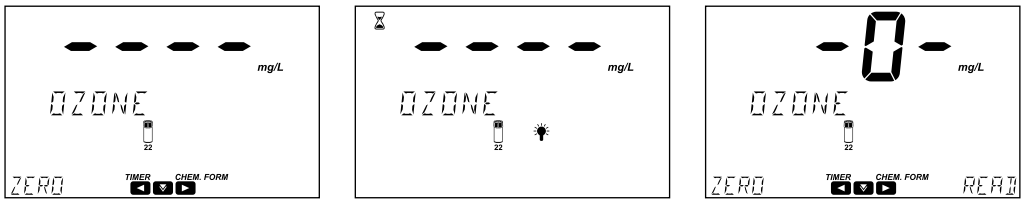
Samples containing chlorine

- Fill the cuvette with 10 mL of unreacted sample (up to the mark). Replace the plastic stopper and the cap.

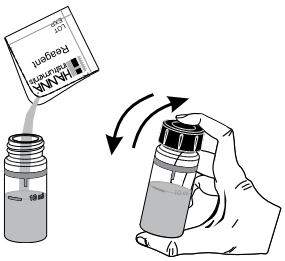

10 mL



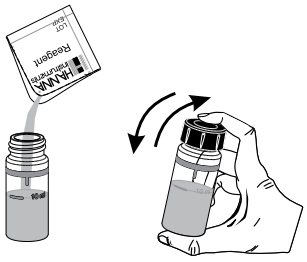
- Insert the cuvette into the holder and close the lid.
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



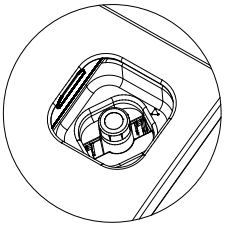
- Remove the cuvette.
- Add one packet of the HI93703-52-0 Glycine Powder. Replace the plastic stopper and the cap. Shake gently until completely dissolved.



- Add one packet of HI93757-0 Ozone Reagent. Replace the plastic stopper and the cap. Shake gently for 20 seconds.

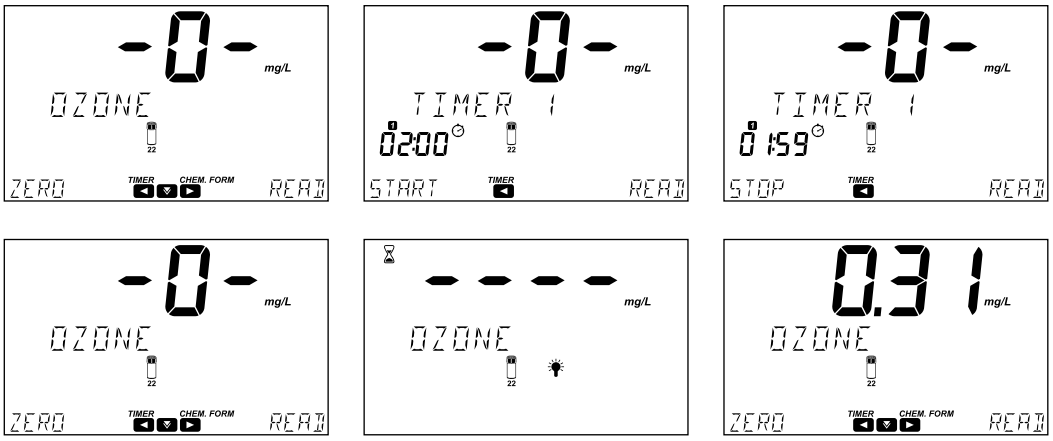


- Insert the cuvette into the holder and close the lid.

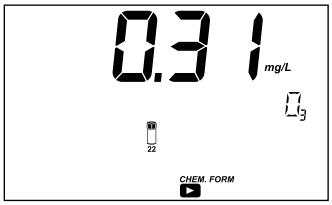


- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 2 minutes.

- Press **READ** to start the reading. Record this value as B.



- To determine the **mg/L** of **ozone (O_3)** concentration in sample containing chlorine, subtract value B (additional measurement procedure) from value A (standard measurement procedure).
- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ► key to view the chemical formula.



- Press the ► key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Bromine, Chlorine Dioxide, Iodine
- Hardness greater than 500 mg/L $CaCO_3$
  Shake the sample for approximately 2 minutes after adding the powder reagent.
- Alkalinity above 250 mg/L $CaCO_3$ will not reliably develop the full amount of color or it may rapidly fade
  Neutralize the sample with diluted HCl.
- Chlorine is a strong interferent.
  If the sample is suspected to contain chlorine residue (free or total chlorine), follow the alternative measurement procedure described below:
  1. Perform the Standard Measurement Procedure. Record the result as Value A.
  2. Perform Additional Measurement Procedure. Record the result as Value B.
  3. To determine the ozone concentration in mg/L, subtract Value B from Value A.

$$\text{mg/L ozone } (O_3) = \text{Value A} - \text{Value B}$$

pH

SPECIFICATIONS

Range	6.5 to 8.5 pH
Resolution	0.1 pH
Accuracy	±0.1 pH at 25 °C
Wavelength	525 nm
Cuvette type	22 mm diameter
Method	Adaptation of the Phenol Red Method
Method ID	#068

REQUIRED REAGENTS

Code	Description	Quantity
HI93710-0	pH Reagent	5 drops

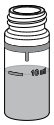
REAGENT SETS

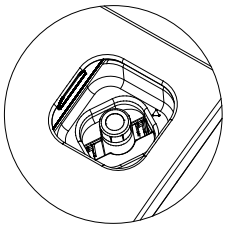
HI93710-01	Reagents for 100 pH tests
HI93710-03	Reagents for 300 pH tests

For other accessories see Accessories section.

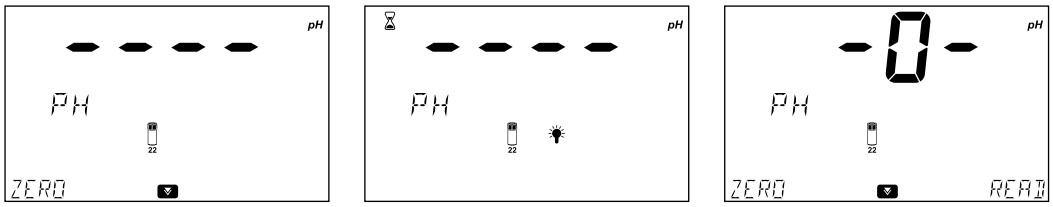
MEASUREMENT PROCEDURE

- Select the pH method using the procedure described in the Factory Methods section.
- Fill the cuvette with 10 mL of unreacted sample (up to the mark). Replace the plastic stopper and the cap.

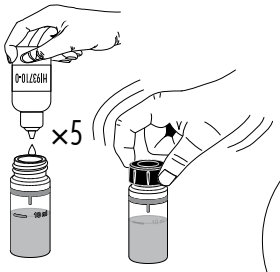


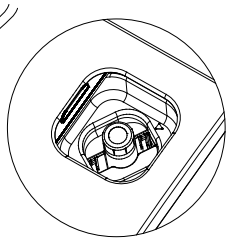


- Insert the cuvette into the holder and close the lid.
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.

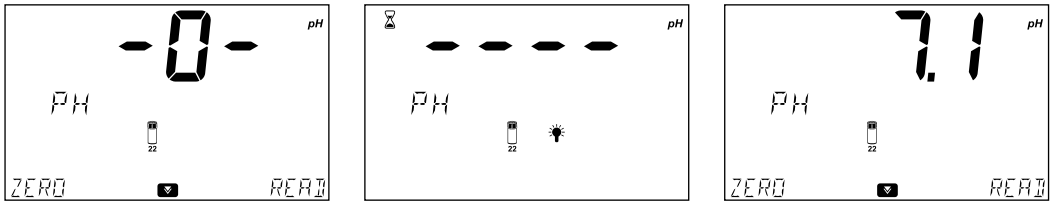


- Remove the cuvette and add 5 drops of HI93710-0 pH Reagent Indicator. Replace the plastic stopper and the cap. Mix the solution.





- Insert the cuvette into the holder and close the lid.
- Press **READ** to start the reading. The instrument displays the result in **pH**.



- Press the ▼▼ key to view the wavelength, method ID, date and time.

Phenols (13 mm Vial)

SPECIFICATIONS

Range	0.00 to 5.00 mg/L
Resolution	0.01 mg/L
Accuracy	±0.05 mg/L ±3% of reading at 25 °C
Wavelength	510 nm
Cuvette type	13 mm diameter
Method	Adaptation of 4-aminoantipyrine method EPA 420.1
Method ID	#097

REQUIRED REAGENTS

Code	Description	Quantity
HI96788V-0*	Phenol Reagent Vial	1 vial
HI96788A-0	Phenol Reagent A	1 packet
HI96788B-0	Phenol Reagent B	1 packet

*Reagent vial identification: red label

REAGENT SETS

HI96788-25	Reagents for 25 tests

For other accessories see Accessories section.

***Note**: Store the unused vials in their packaging in a cool and dark place.*

PRINCIPLE

Non-substituted phenols, as well as ortho- and meta-substituted phenols containing carboxyl, halogen, and sulfonic acid substitued groups will react with 4-aminoantipyrine in the presence of an oxidizer at a pH above 10 to form a yellow to red dye. Because different phenol-containing compounds produce varying color responses, phenol is used as the standard and the measured value is the minimum reported concentration of phenols. To ensure accurate measurements, the sample temperature must be between 10 and 35 °C (50 and 95 °F). To eliminate possible interferences, distillation can be performed.

APPLICATION

Drinking water, wastewater, process water, natural waters

SIGNIFICANCE & USE

Phenols can occur in several sources of water such as natural waters, household and industrial wastewaters, and potable water. It is important to monitor phenol levels, as they can produce unfavorable and malodorous water when undergoing chlorination.

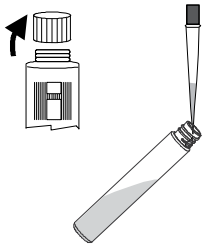
MEASUREMENT PROCEDURE

Before using the reagent kit carefully read all the instructions and the Safety Data Sheets (SDS). Pay particular attention to all warnings, cautions and notes. Failure to do so may result in serious injury to the operator.

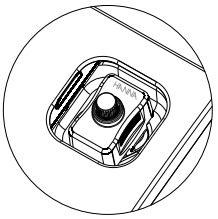
***Note**: Method selection is done automatically using a barcoded HI96788V-0 Phenol Reagent Vial following the procedure described in the Barcode Methods section.*

Alternatively, select the Phenols (13 mm) method using the procedure described in the Factory Methods section.

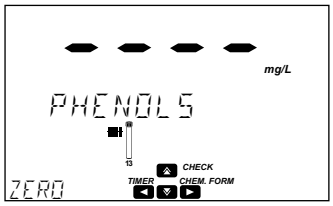
- Remove the cap from a HI96788V-0 Phenol Reagent Vial.
- Add 5.0 mL of sample to the vial, while keeping the vial at a 45-degree angle. Replace the cap.

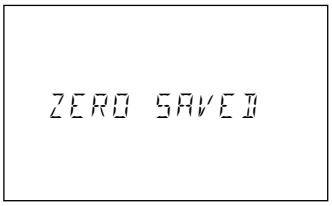


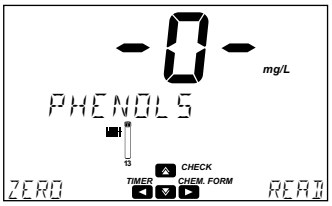
- Insert supplied 13 mm vial adapter using the procedure described in the Cuvette & Vial Adapters section.
- Insert the vial into the adapter. Press steadily down until the vial clicks in place.



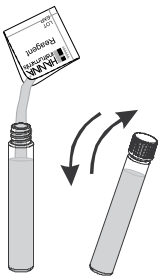
- Press **ZERO**.
  The meter scans the barcode and switches to the correct method automatically.
- The display will show "-0-" when the meter is zeroed and ready for measurement.



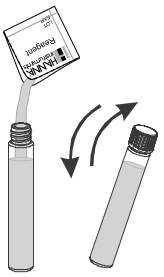




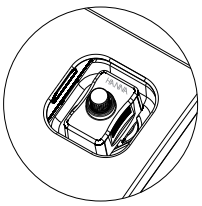
- Remove the vial.



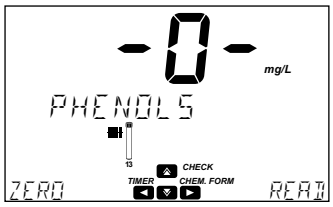
- Remove the cap and add one packet of HI96788A-0 Phenol Reagent A to the vial.
- Replace the cap and shake gently for 15 seconds to dissolve.

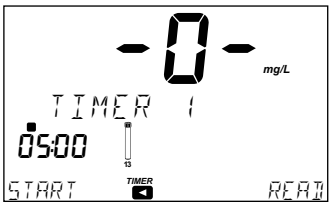


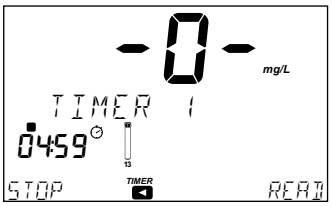
- Remove the cap and add one packet of HI96788B-0 Phenol Reagent B.
- Replace the cap and shake gently for 30 seconds.

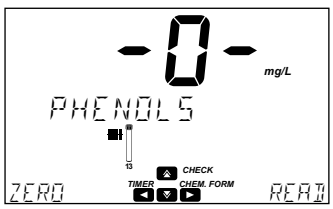


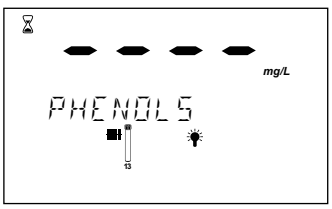
- Insert the vial into the adapter.
  Press steadily down until the vial clicks in place.
- Press the ◀ key to access the timer menu. Press **START** to start Timer.
  The display will show the countdown prior to measurement or, alternatively, wait 5 minutes.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **phenols**.

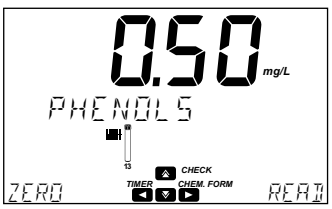




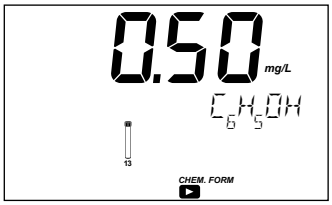








- Press the ⩔ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Sulfate above 2000 mg/L
- Chloride (Cl^-) above 1000 mg/L
- Sodium above 900 mg/L
- Magnesium, Nitrate above 250 mg/L
- Calcium above 125 mg/L
- Copper(II), Zinc above 50 mg/L
- Aluminum(II) above 25 mg/L
- Ammonium above 9.5 mg/L
- Iron(III) above 5 mg/L
- Iron(II) above 2.5 mg/L
- High turbidity
  To eliminate this interference, distillation is required.
- Oxidizing and reducing agents

Phosphate Low Range

SPECIFICATIONS

Range	0.00 to 2.50 mg/L (as PO_4^{3-})
Resolution	0.01 mg/L
Accuracy	±0.04 mg/L ±4% of reading at 25 °C
Wavelength	610 nm
Cuvette type	22 mm diameter
Method	Adaptation of the Ascorbic Acid Method
Method ID	#070

REQUIRED REAGENTS

Code	Description	Quantity
HI93713-0	Phosphate Low Range Reagent	1 packet

REAGENT SETS

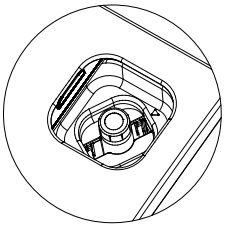
HI93713-01	Reagents for 100 tests
HI93713-03	Reagents for 300 tests

For other accessories see Accessories section.

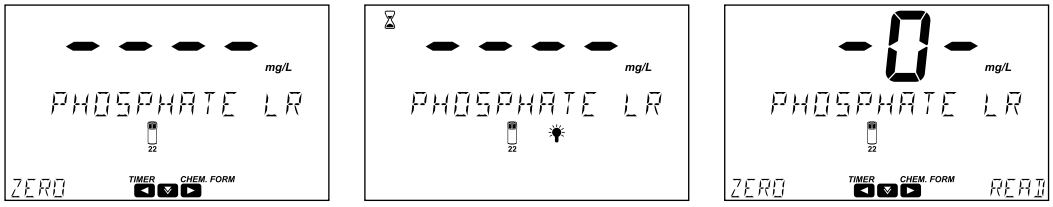
MEASUREMENT PROCEDURE

- Select the Phosphate LR method using the procedure described in the Factory Methods section.
- Rinse cuvette, plastic stopper and cap several times with unreacted sample.
- Fill the cuvette with 10 mL of sample (up to the mark). Replace the plastic stopper and the cap.

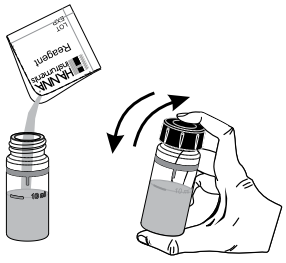
- Insert the cuvette into the holder and close the lid.



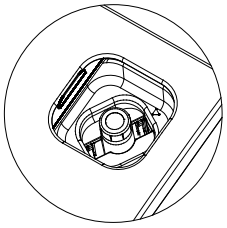
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



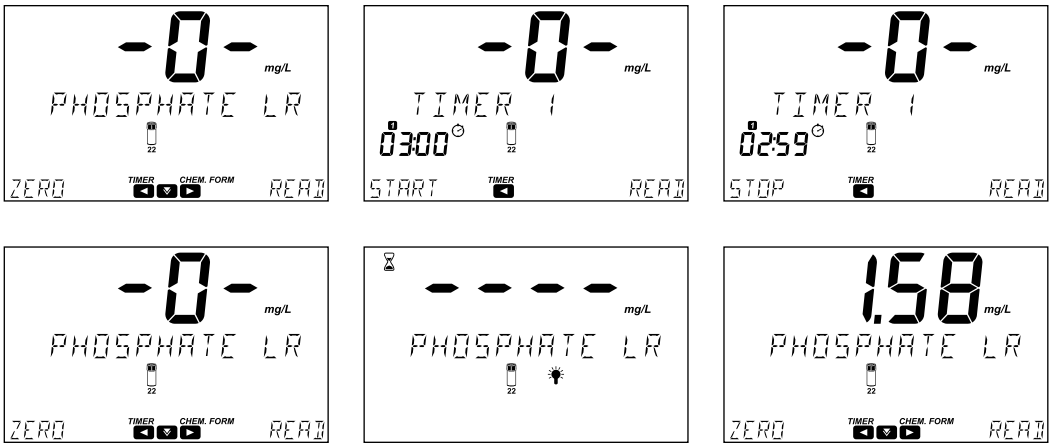
- Remove the cuvette and add one packet of HI93713-0 Phosphate Low Range Reagent. Replace the plastic stopper and the cap.
  Shake gently (for about 2 minutes) until the powder is completely dissolved.



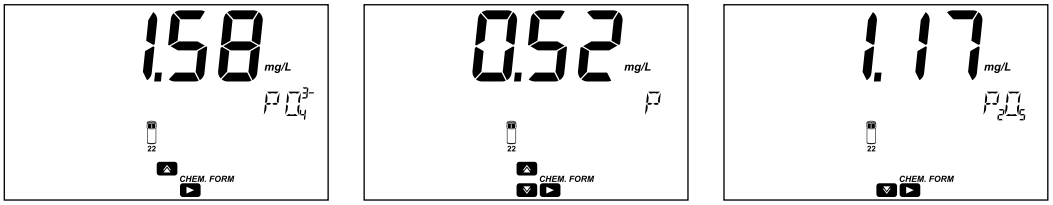
- Insert the cuvette into the holder and close the lid.



- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 3 minutes.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **phosphate (PO_4^{3-})**.



- Press the ▼▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ▲▲ key to convert the results to **mg/L** of **phosphorus (P)** or **phosphorus pentoxide (P_2O_5)**.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Iron, Silica above 50 mg/L
- Copper, Silicate above 10 mg/L
- Arsenate, Highly buffered samples, Hydrogen sulfide, Turbid samples

Phosphate High Range

SPECIFICATIONS

Range	0.0 to 30.0 mg/L (as PO_4^{3-})
Resolution	0.1 mg/L
Accuracy	±1.0 mg/L ±4% of reading at 25 °C
Wavelength	525 nm
Cuvette type	22 mm diameter
Method	Adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th Edition, Amino Acid Method
Method ID	#071

REQUIRED REAGENTS

Code	Description	Quantity
HI93717A-0	Phosphate High Range Reagent A	10 drops
HI93717B-0	Phosphate High Range Reagent B	1 packet

REAGENT SETS

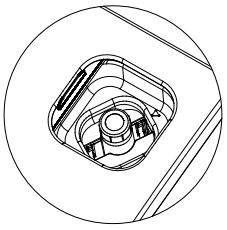
HI93717-01	Reagents for 100 tests
HI93717-03	Reagents for 300 tests

For other accessories see Accessories section.

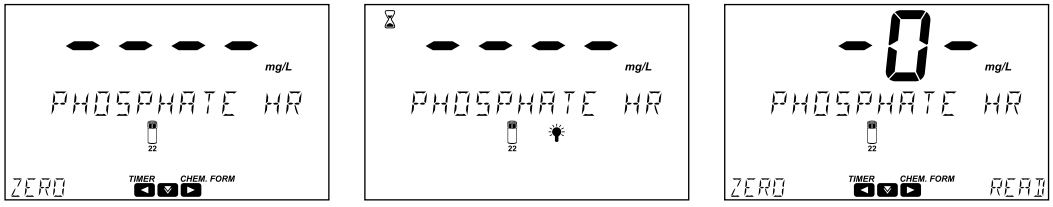
MEASUREMENT PROCEDURE

- Select the Phosphate HR method using the procedure described in the Factory Methods section.
- Fill the cuvette with 10 mL of unreacted sample (up to the mark). Replace the plastic stopper and the cap.

- Insert the cuvette into the holder and close the lid.

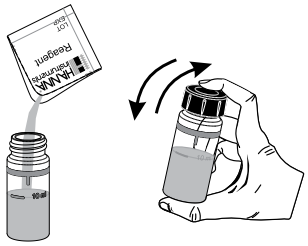


- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.

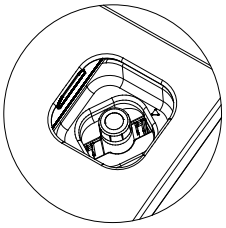


- Add 10 drops of HI93717A-0 Phosphate High Range Reagent A.

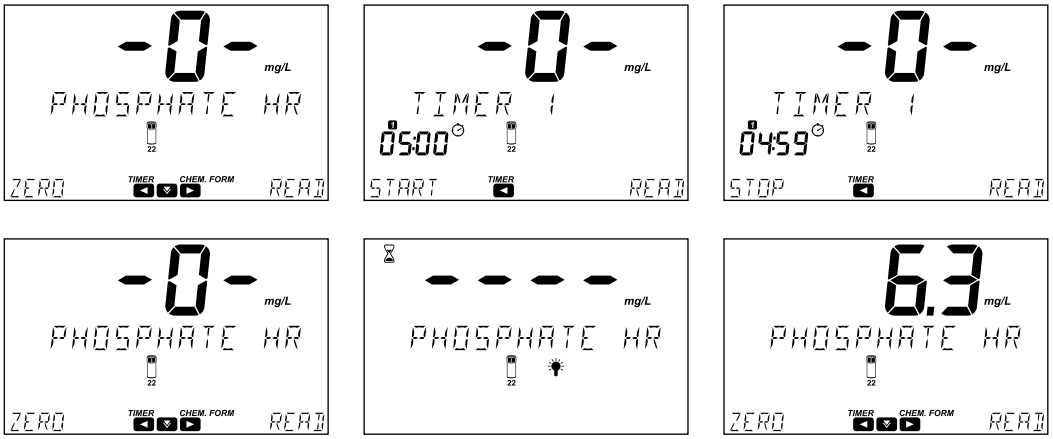
- Add one packet of HI93717B-0 Phosphate High Range Reagent B to the cuvette. Replace the plastic stopper and the cap. Shake gently until completely dissolved.



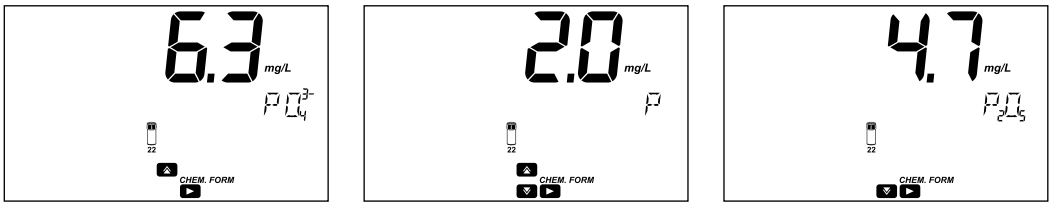
- Insert the cuvette into the holder and close the lid.



- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 5 minutes.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **phosphate (PO_4^{3-})**.



- Press the ⩔ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ⩓ key to convert the results to **mg/L** of **phosphorus (P)** or **phosphorus pentoxide (P_2O_5)**.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Sulfide
- Chloride above 150000 mg/L
- Magnesium above 40000 mg/L $CaCO_3$
- Calcium above 10000 mg/L $CaCO_3$
- Iron (Ferrous) above 100 mg/L

Phosphorus, Acid Hydrolyzable (13 mm Vial)

SPECIFICATIONS

Range	0.00 to 1.60 mg/L (as P)
Resolution	0.01 mg/L
Accuracy	±0.05 mg/L or ±5% of reading at 25 °C, whichever is greater
Wavelength	610 nm
Cuvette type	13 mm diameter
Method	Adaptation of the EPA method 365.2 and Standard Methods for the Examination of Water and Wastewater, 20th Edition, 4500-P E, Ascorbic Acid Method
Method ID	#072

REQUIRED REAGENTS

Code	Description	Quantity
HI93758V-0AH*	Phosphorus Reagent Vial	1 vial
HI93758B-0	NaOH Solution 1.20N	2 mL
HI93758-0	Phosphorous Reagent	1 packet

* Reagent vial identification: white label

REAGENT SETS

HI93758B-50	Reagents for 50 tests

For other accessories see Accessories section.

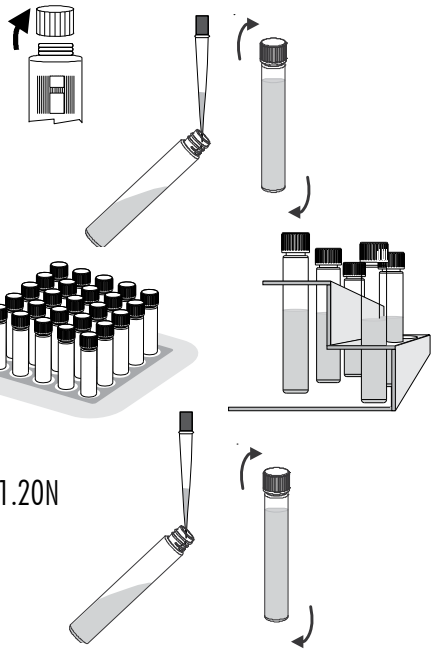
***Note**: Store the unused vials in their packaging in a cool and dark place.*

MEASUREMENT PROCEDURE

Before using the reagent kit carefully read all the instructions and the Safety Data Sheets (SDS). Pay particular attention to all warnings, cautions and notes. Failure to do so may result in serious injury to the operator.

- Preheat the Hanna® Reactor HI839800 to 150 °C (302°F).
- Use of supplied HI740217 safety shield is strongly recommended.

  ***Warning**: Do not use an oven or microwave; samples may leak and generate a corrosive and possibly explosive atmosphere.*



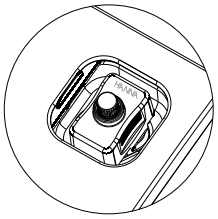
- Remove the cap from a barcoded HI93758V-0AH Phosphorus Reagent Vial.
- Add 5 mL of sample to the vial, while keeping the vial at a 45-degree angle.
- Replace the cap. Invert to mix.
- Insert the vial into the reactor and heat it for 30 minutes at 150 °C.
- At the end of the digestion place the vials carefully in the test tube rack and allow to cool to room temperature.

  ***Warning**: The vials are still hot, use caution when handling.*

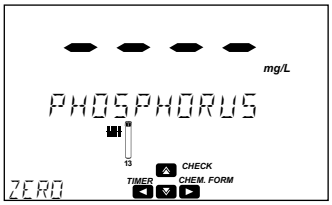
- Remove the cap from the vial and add 2 mL of HI93758B-0 NaOH Solution 1.20N while keeping the vial at a 45-degree angle.
- Replace the cap. Invert to mix.

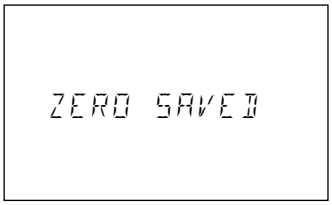
***Note**: Method selection is done automatically using a barcoded HI93758V-0AH Phosphorus Reagent Vial following the procedure described in the Barcode Methods section.*
Alternatively, select the Phosphorous Acid Hydro (13 mm) method using the procedure described in the Factory Methods section.

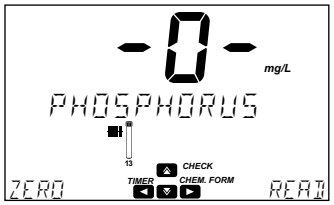
- Insert supplied 13 mm vial adapter using the procedure described in the Cuvette & Vial Adapters section.



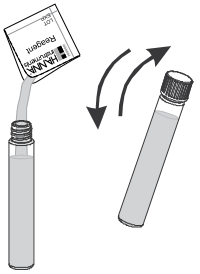
- Insert the vial into the adapter. Press steadily down until the vial clicks in place.
- Press **ZERO**.
  The meter scans the barcode and switches to the correct method automatically.
- The display will show "-0-" when the meter is zeroed and ready for measurement.

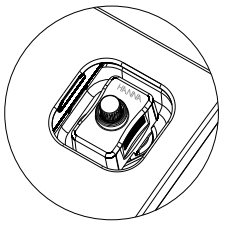






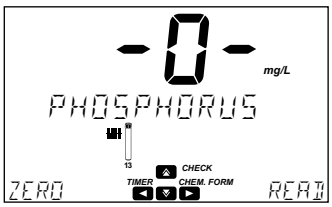
- Remove the vial.
- Remove the cap and add one packet of HI93758-0 Phosphorus Reagent.
- Replace the cap. Shake gently for 2 minutes until most of the powder is dissolved.

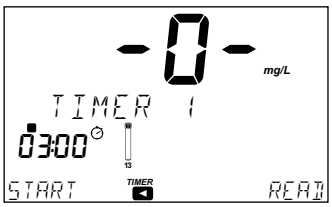


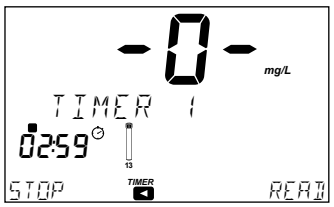


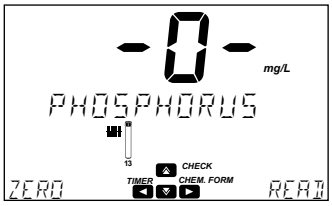
- Insert the vial into the adapter.
  Press steadily down until the vial clicks in place.

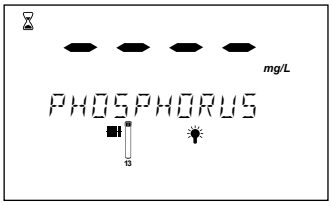
- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 3 minutes.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **phosphorus (P)**.







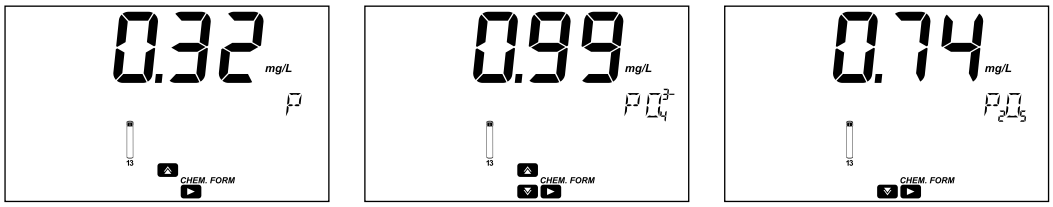




***Note**: The method detects free (orthophosphate) and condensed inorganic forms (meta-, pyro- and other polyphosphates) of phosphates present in the sample.*

- Press the ⏬ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.

- Press the ▲ key to convert the results to **mg/L** of **phosphate (PO_4^{3-})** or **phosphorus pentoxide (P_2O_5)**.



- Press the ► key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Arsenate must be absent
- Silica above 50 mg/L
- Sulfide
  To remove the interferent add Bromine Water drop-wise until a pale yellow color develops
  Remove excess Bromine Water by adding Phenol Solution drop-wise.
- Turbidity and suspended matter in large amounts
  Treat the sample with active carbon and filter, before measuring.

Phosphorus, Reactive Low Range (13 mm Vial)

SPECIFICATIONS

Range	0.00 to 1.60 mg/L (as P)
Resolution	0.01 mg/L
Accuracy	±0.05 mg/L or ±4% of reading at 25 °C, whichever is greater
Wavelength	610 nm
Cuvette type	13 mm diameter
Method	Adaptation of the EPA method 365.2 and Standard Methods for the Examination of Water and Wastewater, 20th Edition, 4500-P E, Ascorbic Acid Method
Method ID	#073

REQUIRED REAGENTS

Code	Description	Quantity
HI93758A-0*	Phosphorus Reactive Reagent Vial	1 vial
HI93758-0	Phosphorus Reagent	1 packet

* Reagent vial identification: red label

REAGENT SETS

HI93758A-50	Reagents for 50 tests

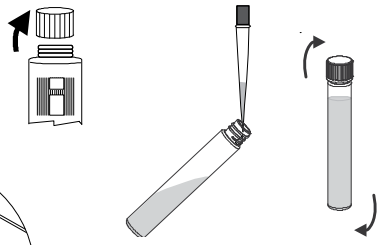
For other accessories see Accessories section.

***Note**: Store the unused vials in their packaging in a cool and dark place.*

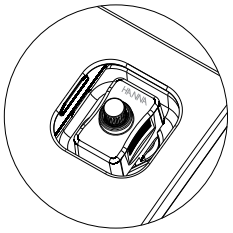
MEASUREMENT PROCEDURE

***Note**: Method selection is done automatically using a barcoded HI93758A-0 Phosphorus Reactive Reagent Vial following the procedure described in the Barcode Methods section.*
Alternatively, select the Phosphorus Reactive LR (13 mm) method using the procedure described in the Factory Methods section.

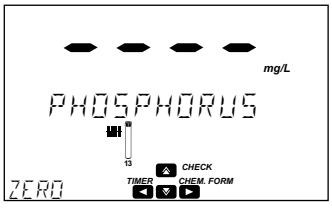
- Insert the 13 mm barcoded vial adapter using the procedure described in the Cuvette & Vial Adapters section.

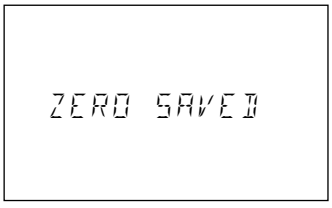


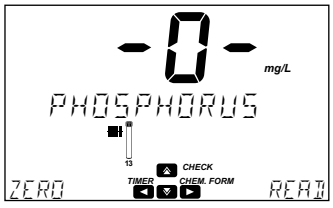
- Remove the cap from HI93758A-0 Phosphorus Reactive Reagent Vial.
- Add 5 mL of sample to the vial, while keeping the vial at a 45-degree angle.
- Replace the cap. Invert several times to mix.
- Insert the vial into the adapter.
  Press steadily down until the vial clicks in place.



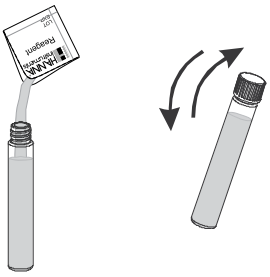
- Press **ZERO**.
  The meter scans the barcode and switches to the correct method automatically.
- The display will show "-0-" when the meter is zeroed and ready for measurement.



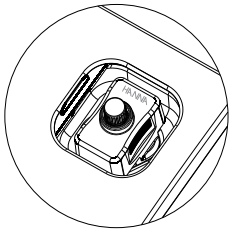




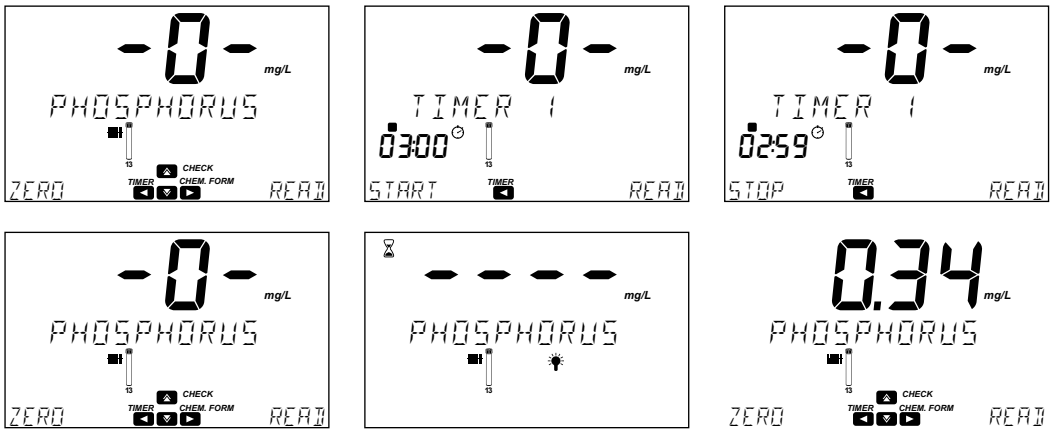
- Remove the vial.
- Remove the cap and add one packet of HI93758-0 Phosphorus Reagent.
- Replace the cap. Shake gently for 2 minutes until most of the powder is dissolved.



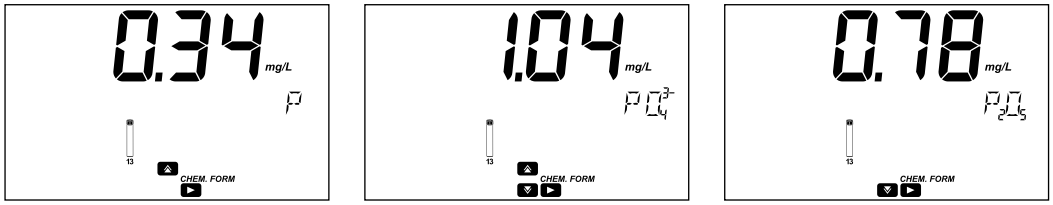
- Insert the vial into the adapter.
  Press steadily down until the vial clicks in place



- Press the ◀ key to access the timer menu.
  Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 3 minutes.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **phosphorus (P)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ▲ key to convert the results to **mg/L** of **phosphate (PO_4^{3-})** or **phosphorus pentoxide (P_2O_5)**.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Arsenate must be absent
- Silica above 50 mg/L
- Sulfide above 6 mg/L, to remove interference add Bromine Water drop-wise until a pale yellow color develops
  To remove excess bromine water add Phenol Solution drop-wise until the solution is clear.
- Turbidity and suspended matter in large amounts
  Treat the sample with active carbon and filter, before measuring.

Phosphorus, Reactive High Range (13 mm Vial)

SPECIFICATIONS

Range	0.0 to 32.6 mg/L (as P)
Resolution	0.1 mg/L
Accuracy	±0.5 mg/L or ±4% of reading at 25 °C, whichever is greater
Wavelength	420 nm
Cuvette type	13 mm diameter
Method	Adaptation of the Standard Methods for the Examination of Water and Wastewater, 20th Edition, 4500-P C, Vanadomolybdophosphoric Acid Method
Method ID	#074

REQUIRED REAGENTS

Code	Description	Quantity
HI93763A-0*	Phosphorus Reactive High Range Reagent Vial	2 vials
DEIONIZED120	Deionized Water	5 mL

*Reagent vial identification: green label

REAGENT SETS

HI93763A-50	Reagents for up to 49 tests

For other accessories see Accessories section.

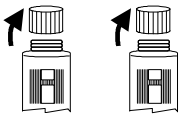
***Note**: Store the unused vials in their packaging in a cool and dark place.*

MEASUREMENT PROCEDURE

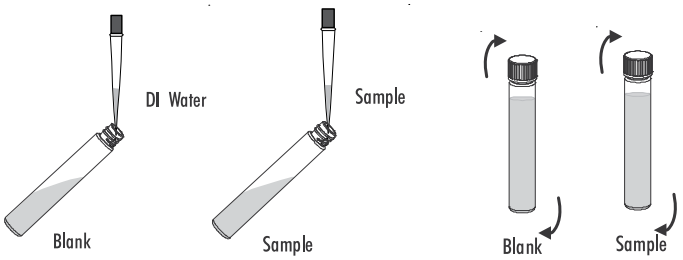
Reagent Blank Correction: This method requires a reagent blank correction. A single blank vial may be used more than once; the blank vial is stable up to two weeks (room temperature). For improved accuracy always use the same lot of reagents for the blank and sample, and run a blank for each set of measurements.

***Note**: Method selection is done automatically using a barcoded HI93763A-0 Phosphorus Reactive High Range Reagent Vial following the procedure described in the Barcode Methods section.*
Alternatively, select the Phosphorus Reactive HR (13 mm) method using the procedure described in the Factory Methods section.

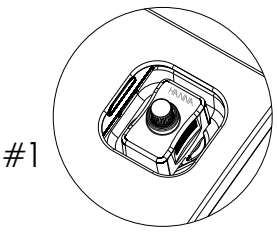
- Insert supplied 13 mm vial adapter using the procedure described in the Cuvette & Vial Adapters section.
- Remove the cap from two HI93763A-0 Phosphorus Reactive High Range Reagent Vials.



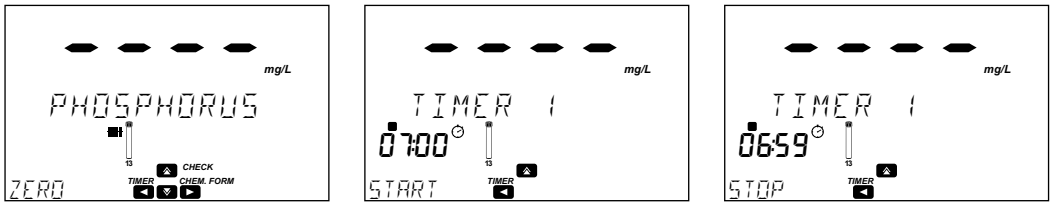
- Add 5 mL of deionized water to the first vial (#1) and 5 mL of sample to the second vial (#2), while keeping the vials at a 45-degree angle. Replace the cap.
- Invert several times to mix.



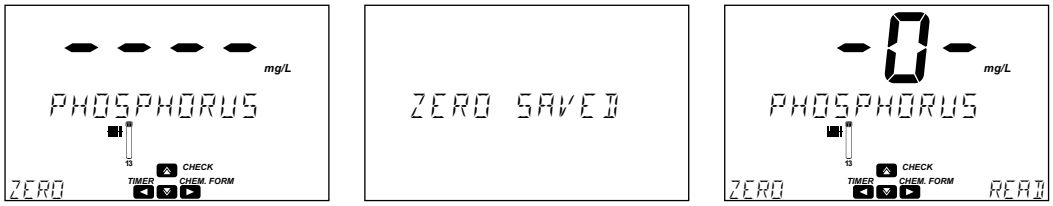
- Insert the blank vial (#1) into the adapter.
  Press down steadily until the vial clicks in place.



- Press the ◀ key to access the timer menu.
  Press **START** to start Timer 1, the display will show the countdown prior to the zero or wait 7 minutes.



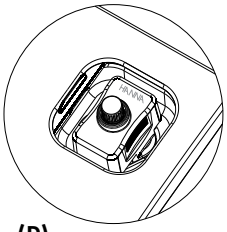
- Press **ZERO**.
  The meter scans the barcode and switches to the correct method automatically.
- The display will show "-0-" when the meter is zeroed and ready for measurement.



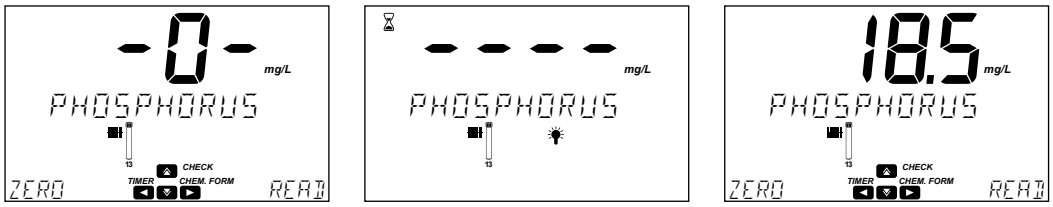
- Remove the blank vial.

- Insert the sample vial (#2) into the adapter.
  Press down steadily until the vial clicks in place.

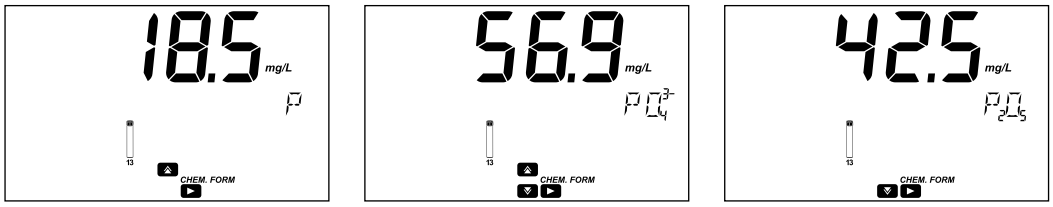
#2



- Press **READ** to start the measurement. The instrument displays the results in **mg/L** of **phosphorus (P)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ▲ key to convert the results to **mg/L** of **phosphate (PO_4^{3-})** or **phosphorus pentoxide (P_2O_5)**.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Bismuth, Fluoride
- The sample should have a neutral pH
- Sulfide, to remove the interferent add Bromine Water drop-wise until a pale yellow color develops
  Remove excess Bromine Water by adding Phenol Solution drop-wise.
- The method is temperature sensitive. It is recommended to run measurements at 20 to 25 °C, temperatures below 20 °C cause a negative error, temperatures above 25 °C cause a positive error.
- Turbidity and suspended matter in large amounts
  Treat the sample with active carbon and filter before measuring.

Phosphorus, Total Low Range (13 mm Vial)

SPECIFICATIONS

Range	0.00 to 1.60 mg/L (as P)
Resolution	0.01 mg/L
Accuracy	±0.05 mg/L or ±5% of reading at 25 °C, whichever is greater
Wavelength	610 nm
Cuvette type	13 mm diameter
Method	Adaptation of the EPA method 365.2 and Standard Methods for the Examination of Water and Wastewater, 20th Edition, 4500-P E, Ascorbic Acid Method
Method ID	#075

REQUIRED REAGENTS

Code	Description	Quantity
HI93758V-0*	Phosphorus Reagent Vial	1 vial
HI93758C-0	NaOH solution 1.54N	2 mL
HI93758-0	Phosphorus Reagent	1 packet
PERSULFATE/P	Potassium Persulfate	1 packet

* Reagent vial identification: red label

REAGENT SETS

HI93758C-50	Reagents for 50 tests

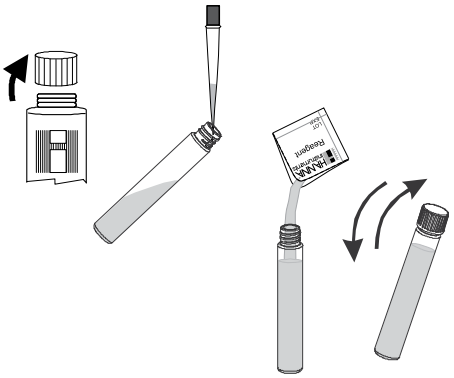
For other accessories see Accessories section.

***Note**: Store the unused vials in their packaging in a cool and dark place.*

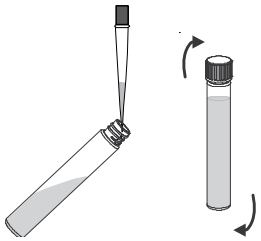
MEASUREMENT PROCEDURE

Before using the reagent kit carefully read all the instructions and the Safety Data Sheets (SDS). Pay particular attention to all warnings, cautions and notes. Failure to do so may result in serious injury to the operator.

- Preheat the Hanna® Reactor HI839800 to 150 °C (302°F).
- Use of supplied HI740217 safety shield is strongly recommended.
  ***Warning**: Do not use an oven or microwave; samples may leak and generate a corrosive and possibly explosive atmosphere.*
- Remove the cap from a barcoded HI93758V-0 Reagent Vial.
- Add 5 mL of sample to the vial, while keeping the vial at a 45-degree angle.



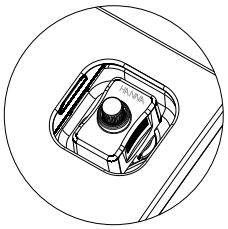
- Add one packet of PERSULFATE/P Potassium Persulfate.
  Replace the cap.
  Shake gently the vial until all the powder is completely dissolved.
- Insert the vial into the reactor and heat it for 30 minutes at 150 °C.
- At the end of the digestion place the vials carefully in the test tube rack and allow to cool to room temperature.
  ***Warning**: The vials are still hot, use caution when handling.*



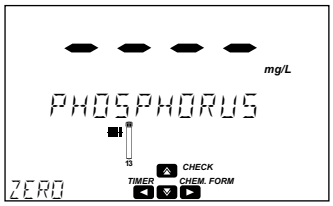
- Remove the cap from the vial and add exactly 2 mL of HI93758C-0 NaOH Solution 1.54N, while keeping the vial at a 45-degree angle.
- Replace the cap. Invert the vial several times to mix.

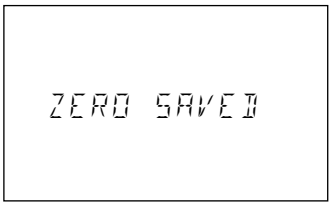
***Note**: Method selection is done automatically using a barcoded HI93758V-0 Phosphorus Reagent Vial following the procedure described in the Barcode Methods section.*
Alternatively, select the Phosphorus Total LR (13 mm) method using the procedure described in the Factory Methods section.

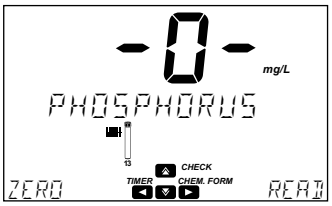
- Insert supplied 13 mm vial adapter using the procedure described in the Cuvette & Vial Adapters section.



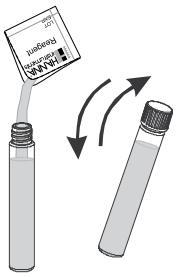
- Insert the vial into the adapter. Press steadily down until the vial clicks in place.
- Press **ZERO**.
  The meter scans the barcode and switches to the correct method automatically.
- The display will show "-0-" when the meter is zeroed and ready for measurement.



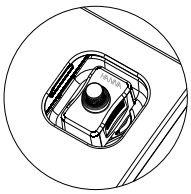




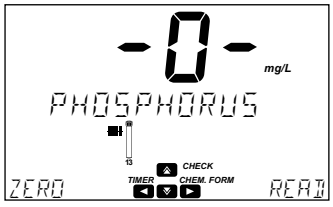
- Remove the vial.

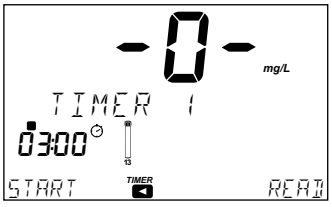


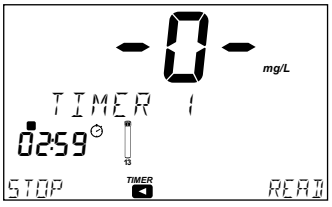
- Remove the cap and add one packet of HI93758-0 Phosphorus Reagent.
- Replace the cap. Shake for 2 minutes until the powder is completely dissolved.

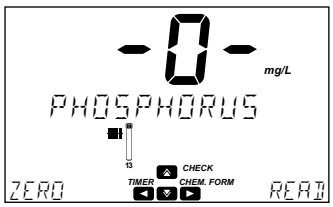


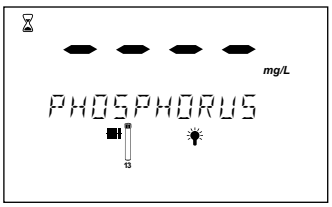
- Insert the vial into the adapter.
  Press steadily down until the vial clicks in place.
- Press the ◀ key to access the timer menu.
  Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 3 minutes.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **phosphorus (P)**.

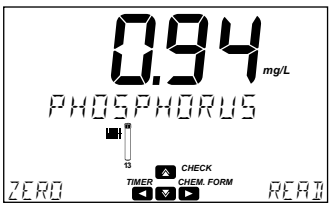






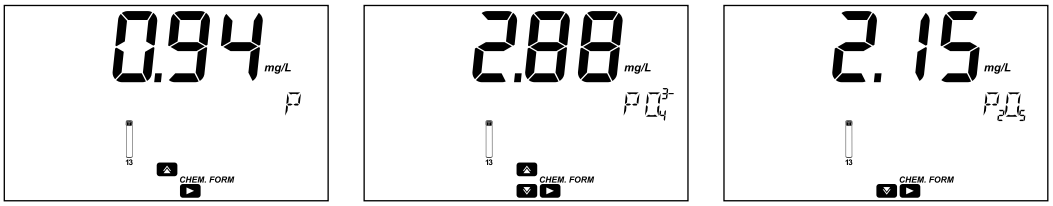






***Note**: The method detects free (orthophosphate) and condensed inorganic forms (meta-, pyro-, and other polyphosphates) of phosphates present in the sample.*

- Press the ⏬ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ⏫ key to convert the results to **mg/L** of **phosphate (PO_4^{3-})** or **phosphorus pentoxide (P_2O_5)**.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Arsenate must be absent
- Silica above 50 mg/L
- Sulfide, to remove the interferent add Bromine Water drop-wise until a pale yellow color develops
  Remove excess Bromine Water by adding Phenol Solution drop-wise.
- Turbidity and suspended matter in large amounts
  Treat the sample with active carbon and filter, before measuring.

Phosphorus, Total High Range (13 mm Vial)

SPECIFICATIONS

Range	0.0 to 32.6 mg/L (as P)
Resolution	0.1 mg/L
Accuracy	±0.5 mg/L or ±5% of reading at 25 °C, whichever is greater
Wavelength	420 nm
Cuvette type	13 mm diameter
Method	Adaptation of the Standard Methods for the Examination of Water and Wastewater, 20th Edition, 4500-P C, Vanadomolybdophosphoric Acid Method
Method ID	#076

REQUIRED REAGENTS

Code	Description	Quantity
HI93758V-0HR	Phosphorus Reagent Vial	2 vials
HI93758C-0	NaOH solution 1.54N	4 mL
HI93763B-0	Total Phosphorous High Range Reagent B	1 mL
DEIONIZED120	Deionized Water	5 mL
PERSULFATE/P	Potassium Persulfate	2 packets

*Reagent vial identification: green label

REAGENT SETS

HI93763B-50	Reagents for up to 50 tests

For other accessories see Accessories section.

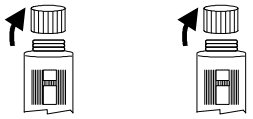
***Note**: Store the unused vials in their packaging in a cool and dark place.*

MEASUREMENT PROCEDURE

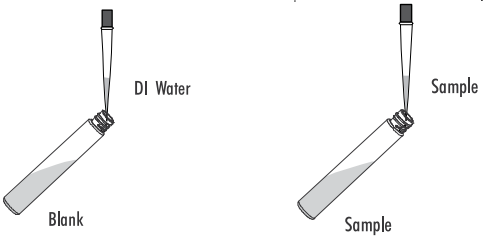
Before using the reagent kit carefully read all the instructions and the Safety Data Sheets (SDS).
Pay particular attention to all warnings, cautions, and notes. Failure to do so may result in serious injury to the operator.

Reagent Blank Correction: This method requires a reagent blank correction.
A single blank vial may be used more than once. The blank vial is stable for one day at room temperature.

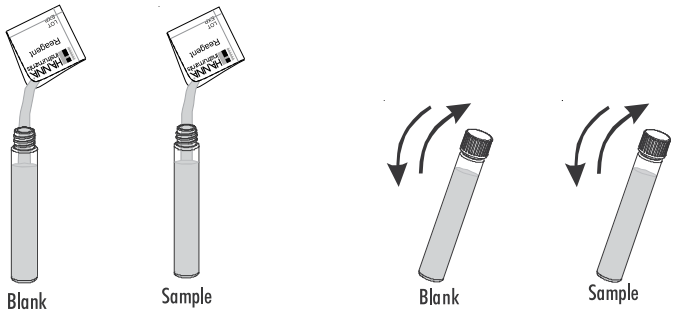
- Preheat the Hanna® Reactor HI839800 to 150 °C (302 °F).
- Use of supplied HI740217 safety shield is strongly recommended.
  ***Warning**: Do not use an oven or microwave; samples may leak and generate a corrosive and possibly explosive atmosphere.*
- Remove the cap from two barcoded HI93758V-0HR Phosphorus Reagent Vials.



- Add 5 mL of deionized water to the first vial (#1) and 5 mL of sample to the second vial (#2), while keeping the vials at a 45-degree angle.

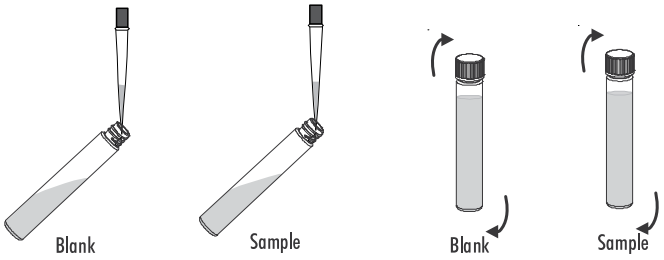


- Add one packet of PERFSULFATE/P Potassium Persulfate to each vial. Replace the cap.
  Shake gently until all the powder is completely dissolved.

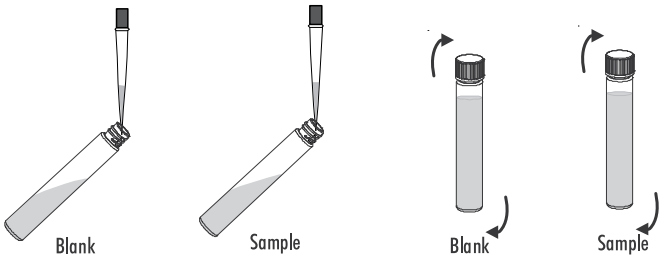


- Insert the vials into the reactor and heat them for 30 minutes at 150 °C.
- At the end of the digestion place the vials carefully in the test tube rack and allow to cool to room temperature.
  ***Warning**: The vials are still hot, use caution when handling.*

- Remove the cap from the vials and add 2 mL of HI93758C-0 NaOH Solution 1.54N to each vial, while keeping the vials at a 45-degree angle. Replace the cap tightly. Invert the vials several times to mix.

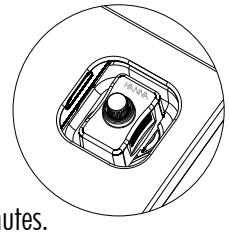


- Remove the cap from the vials and add 0.5 mL of HI93763B-0 Total Phosphorus High Range Reagent B to each vial, while keeping the vial at a 45-degree angle. Replace the cap. Invert several times to mix.

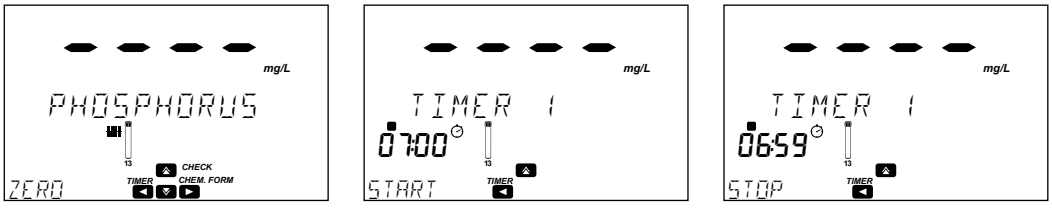


***Note**: Method selection is done automatically using a barcoded HI93758V-0HR Phosphorus Reagent Vial following the procedure described in the Barcode Methods section.*
Alternatively, select the Phosphorus Total HR (13 mm) method using the procedure described in the Factory Methods section.

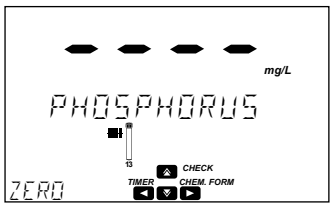
- Insert supplied 13 mm vial adapter using the procedure described in the Cuvette & Vial Adapters section.
- Insert the blank vial (#1) into the adapter.
  Press steadily down until the vial clicks in place.

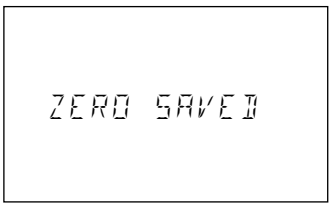


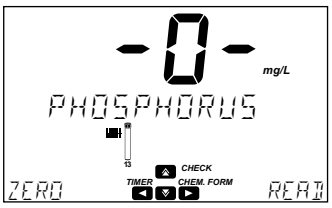
- Press the ◀ key to access the timer menu.
  Press **START** to start Timer 1, the display will show the countdown prior to the zero or wait 7 minutes.



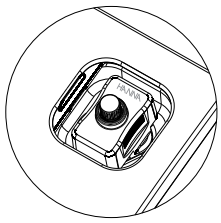
- Press **ZERO**.
  The meter scans the barcode and switches to the correct method automatically.
- The display will show "-0-" when the meter is zeroed and ready for measurement.



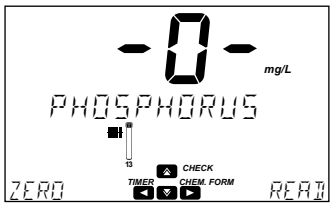


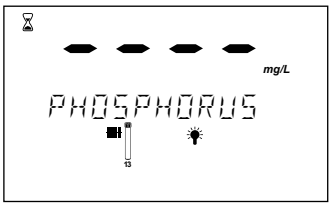


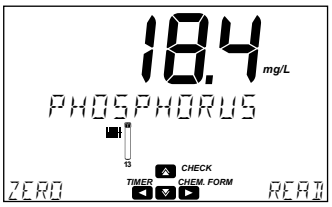
- Remove the blank vial.
- Insert the sample vial (#2) into the adapter.
  Press steadily down, until the vial clicks in place.



- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **phosphorus (P)**.

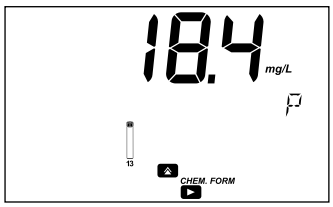


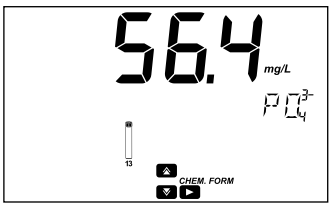


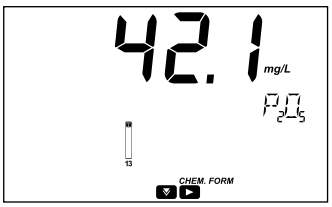


***Note**: The method detects free (orthophosphate), condensed inorganic forms (meta-, pyro-, and other polyphosphates) and organic forms of phosphates present in the sample.*

- Press the ⏬ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ⏫ key to convert the results to **mg/L** of **phosphate (PO_4^{3-})** or **phosphorus pentoxide (P_2O_5)**.







- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Arsenate
- The sample should have a neutral pH
- The method is temperature sensitive.
  It is recommended to add the Molybdovanadate Reagent and to run measurements at 20 to 25 °C. Temperatures below 20 °C cause a negative error, temperatures above 25 °C cause a positive error.
- Turbidity and suspended matter in large amounts
  Treat the sample with active carbon and filter before measuring.

Phosphorus, Marine Ultra Low Range

SPECIFICATIONS

Range	0 to 200 µg/L (as P)
Resolution	1 µg/L
Accuracy	±5 µg/L ±5% of reading at 25 °C
Wavelength	610 nm
Cuvette type	22 mm diameter
Method	Adaptation of Standard Methods for the Examination of Water and Wastewater, 20th Edition, Ascorbic Acid Method
Method ID	#069

REQUIRED REAGENTS

Code	Description	Quantity
HI736-25	Phosphorus Ultra Low Range Marine Reagent	1 packet

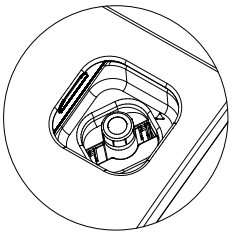
REAGENT SETS

HI736-25	Reagents for 25 tests

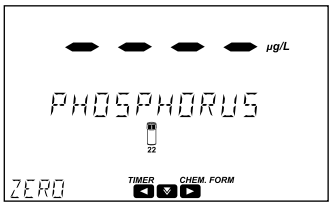
For other accessories see Accessories section.

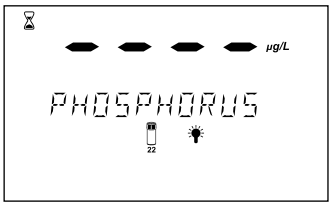
MEASUREMENT PROCEDURE

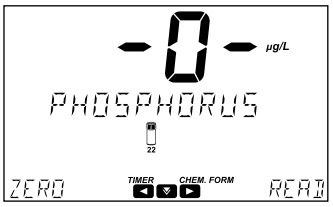
- Select the Phosphorus Marine ULR method using the procedure described in the Factory Methods section.
- Rinse the cuvette, plastic stopper and cap several times with unreacted sample.
- Fill the cuvette with 10 mL of sample (up to the mark). Replace the plastic stopper and the cap.



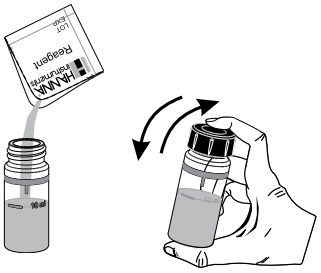
- Insert the cuvette into the holder and close the lid.
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.

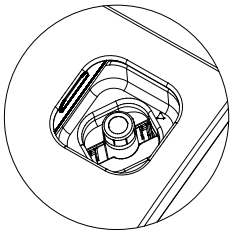






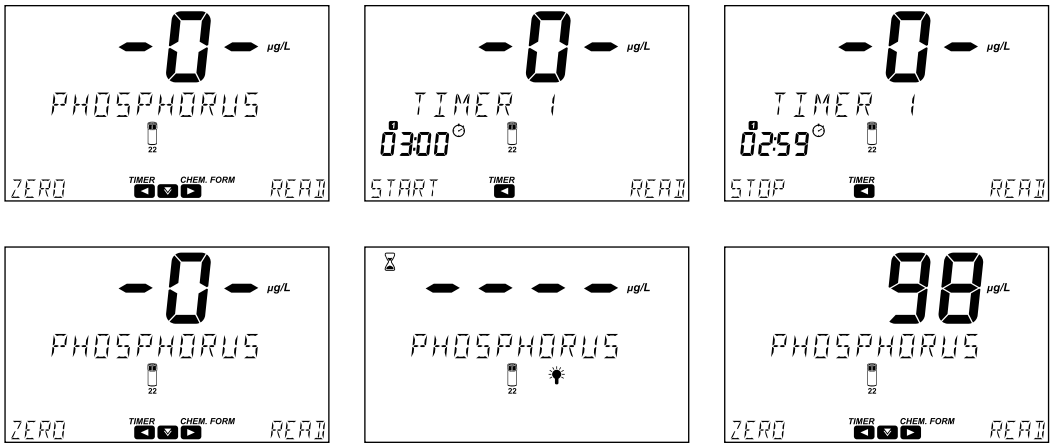
- Add one packet of HI736-25 Phosphorus Ultra Low Range Marine Reagent. Replace the plastic stopper and the cap. Shake gently (for about 2 minutes) until the powder is completely dissolved.



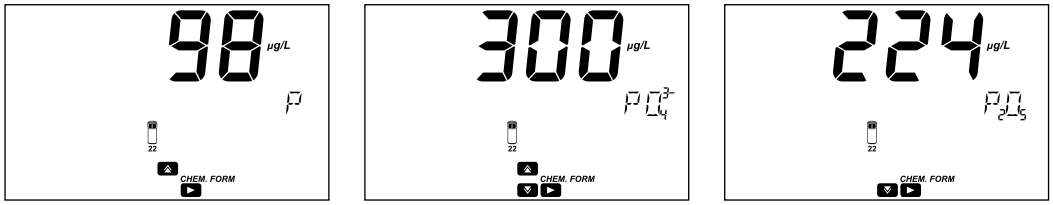


- Insert the cuvette into the holder and close the lid.

- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 3 minutes.
- Press **READ** to start the reading. The instrument displays the results in **µg/L** of **phosphorus (P)**.



- Press the ⏬ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ⏫ key to convert the results to **µg/L** of **phosphate (PO_4^{3-})** or **phosphorus pentoxide (P_2O_5)**.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Iron, Silica above 50 mg/L
- Copper, Silicate above 10 mg/L
- Hydrogen sulfide, arsenate, turbid sample and highly buffered samples

Potassium Low Range

SPECIFICATIONS

Range	0.0 to 20.0 mg/L (as K)
Resolution	0.1 mg/L
Accuracy	±2 mg/L ±7% of reading at 25 °C
Wavelength	466 nm
Cuvette type	22 mm diameter
Method	Adaptation of the Turbidimetric Tetraphenylborate Method
Method ID	#077

REQUIRED REAGENTS

Code	Description	Quantity
HI93750A-0	Potassium Reagent A	6 drops
HI93750B-0	Potassium Reagent B	1 packet

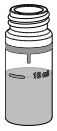
REAGENT SETS

HI93750-01	Reagents for 100 tests
HI93750-03	Reagents for 300 tests

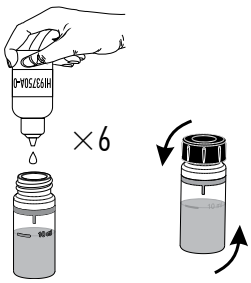
For other accessories see Accessories section.

MEASUREMENT PROCEDURE

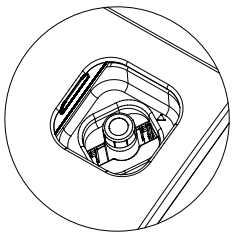
- Select the Potassium LR method using the procedure described in the Factory Methods section.
- Fill the cuvette with 10 mL of sample (up to the mark).



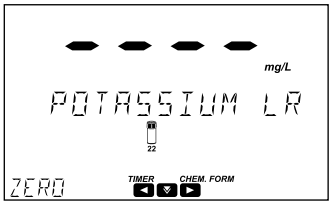
- Add 6 drops of HI93750A-0 Potassium Reagent A. Replace the plastic stopper and the cap. Invert 5 times to mix the solution.

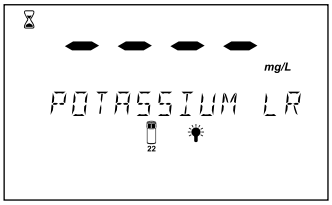


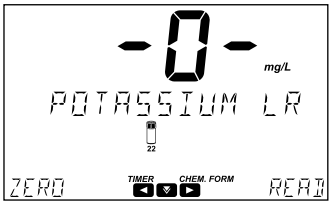
- Insert the cuvette into the holder and close the lid.

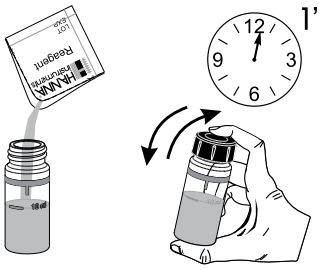


- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.

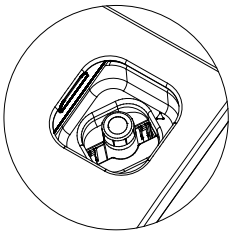






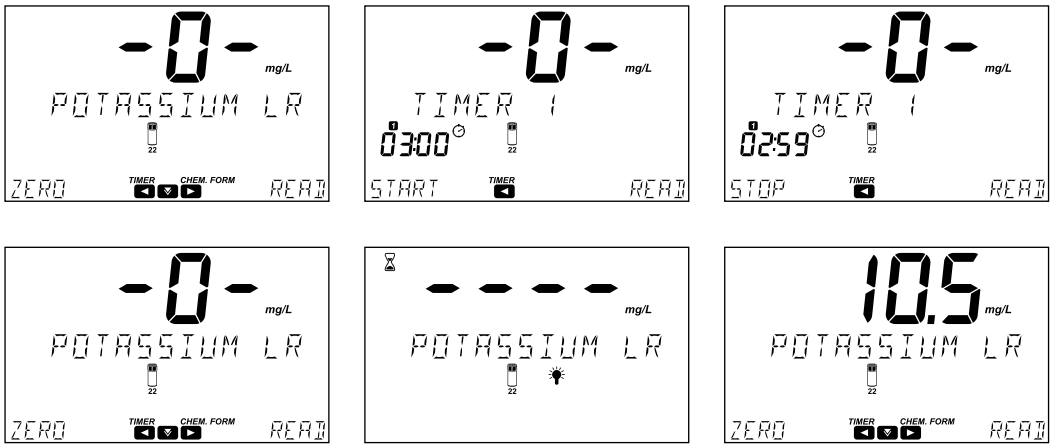


- Add one packet of HI93750B-0 Potassium Reagent B. Replace the plastic stopper and the cap. Shake gently for 1 minute.

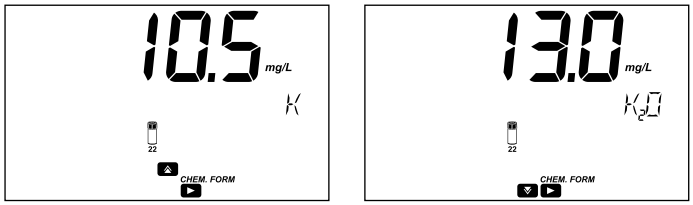


- Insert the cuvette into the holder and close the lid.

- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 3 minutes. After the 3 minutes have passed, invert the cuvette 5 times to mix. Insert the cuvette into the holder and close the lid.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **potassium (K)**.



- Press the ▼▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ▲▲ key to convert the results to **mg/L** of **potassium oxide (K_2O)**.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Chloride above 12000 mg/L
- Calcium above 10000 mg/L $CaCO_3$
- Magnesium above 8000 mg/L $CaCO_3$
- Sodium above 8000 mg/L
- Ammonium above 10 mg/L

Potassium Medium Range

SPECIFICATIONS

Range	10 to 100 mg/L (as K)
Resolution	1 mg/L
Accuracy	±10 mg/L ±7% of reading at 25 °C
Wavelength	466 nm
Cuvette type	22 mm diameter
Method	Adaptation of the Turbidimetric Tetraphenylborate Method
Method ID	#078

REQUIRED REAGENTS

Code	Description	Quantity
HI93750A-0	Potassium Reagent A	6 drops
HI93750B-0	Potassium Reagent B	1 packet

REAGENT SETS

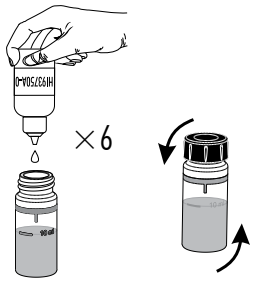
HI93750-01	Reagents for 100 tests
HI93750-03	Reagents for 300 tests

For other accessories see Accessories section.

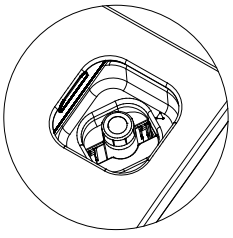
MEASUREMENT PROCEDURE

- Select the Potassium MR method using the procedure described in the Factory Methods section.
- Sample Dilution:
  In a 100 mL volumetric flask accurately add 20 mL of sample and bring to volume with deionized water. This is the sample.
- Fill the cuvette with 10 mL of diluted sample (up to the mark).

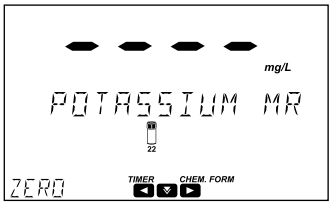
- Add 6 drops of HI93750A-0 Potassium Reagent A. Replace the plastic stopper and the cap. Invert 5 times to mix the solution.

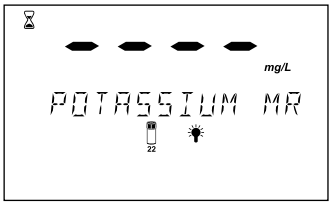


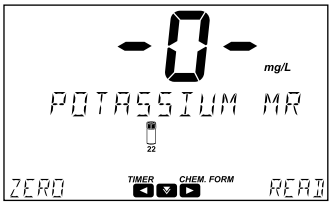
- Insert the cuvette into the holder and close the lid.

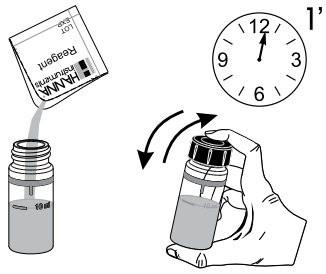


- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.

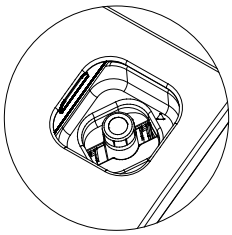






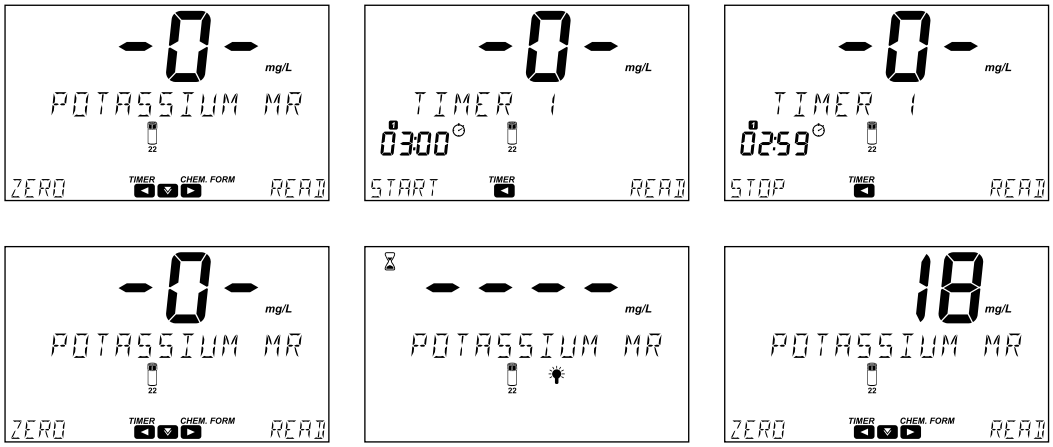


- Add one packet of HI93750B-0 Potassium Reagent B Replace the plastic stopper and the cap. Shake gently for 1 minute.

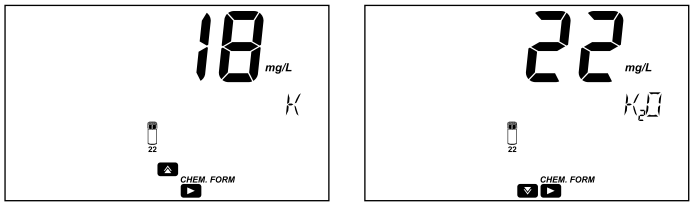


- Insert the cuvette into the holder and close the lid.

- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 3 minutes. After the 3 minutes have passed, invert the cuvette 5 times to mix. Insert the cuvette into the holder and close the lid.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **potassium (K)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ▲ key to convert the results to **mg/L** of **potassium oxide (K_2O)**.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Chloride above 12000 mg/L
- Calcium above 10000 mg/L $CaCO_3$
- Magnesium above 8000 mg/L $CaCO_3$
- Sodium above 8000 mg/L
- Ammonium above 10 mg/L

Potassium High Range

SPECIFICATIONS

Range	20 to 200 mg/L (as K)
Resolution	1 mg/L
Accuracy	±20 mg/L ±7% of reading at 25 °C
Wavelength	466 nm
Cuvette type	22 mm diameter
Method	Adaptation of the Turbidimetric Tetraphenylborate Method
Method ID	#079

REQUIRED REAGENTS

Code	Description	Quantity
HI93750A-0	Potassium Reagent A	6 drops
HI93750B-0	Potassium Reagent B	1 packet

REAGENT SETS

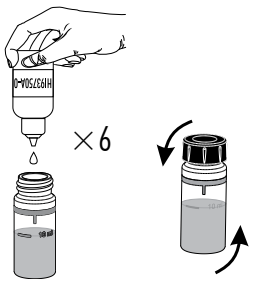
HI93750-01	Reagents for 100 tests
HI93750-03	Reagents for 300 tests

For other accessories see Accessories section.

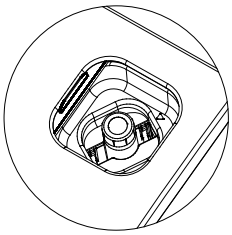
MEASUREMENT PROCEDURE

- Select the Potassium HR method using the procedure described in the Factory Methods section.
- Sample Dilution:
  In a 100 mL volumetric flask accurately add 10 mL of sample and bring to volume with deionized water. This is the sample.
- Fill the cuvette with 10 mL of diluted sample (up to the mark).

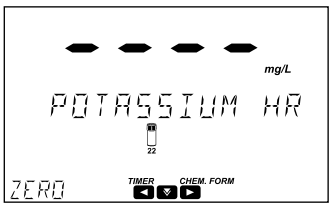
10 mL

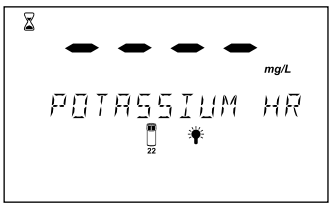


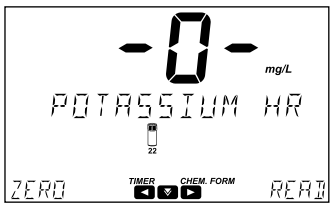
- Add 6 drops of HI93750A-0 Potassium Reagent A. Replace the plastic stopper and the cap. Invert 5 times to mix the solution.
- Insert the cuvette into the holder and close the lid.

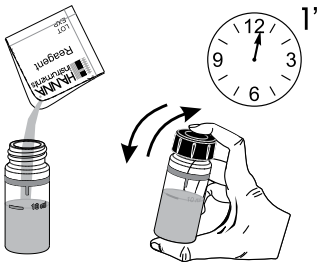


- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.

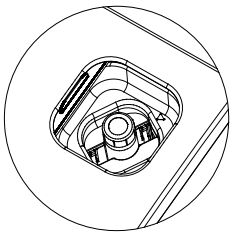




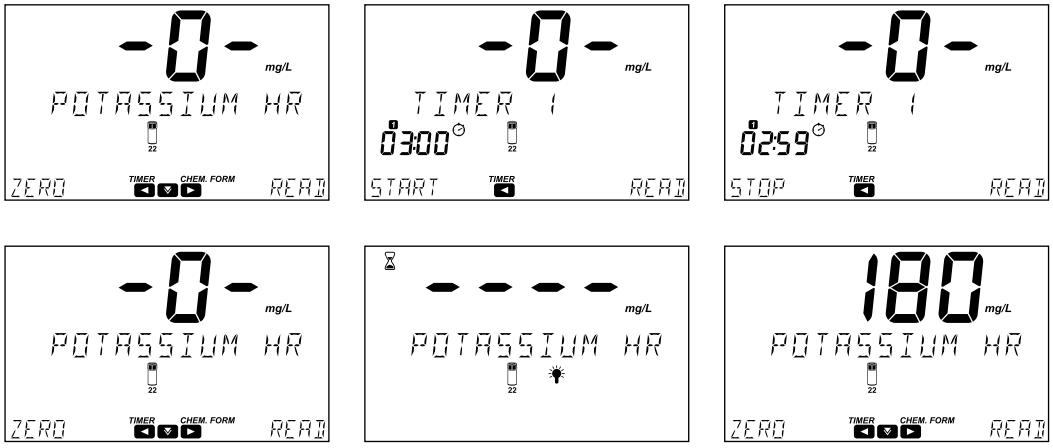




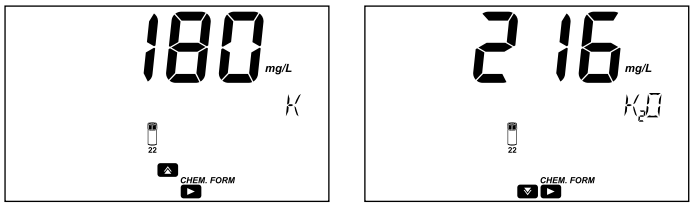
- Add one packet of HI93750B-0 Potassium Reagent B. Replace the plastic stopper and the cap. Shake gently for 1 minute.



- Insert the cuvette into the holder and close the lid.
- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 3 minutes. After the 3 minutes have passed, invert the cuvette 5 times to mix. Insert the cuvette into the holder and close the lid.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **potassium (K)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ▲ key to convert the results to **mg/L** of **potassium oxide (K_2O)**.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Chloride above 12000 mg/L
- Calcium above 10000 mg/L $CaCO_3$
- Magnesium above 8000 mg/L $CaCO_3$
- Sodium above 8000 mg/L
- Ammonium above 10 mg/L

Silica Low Range

SPECIFICATIONS

Range	0.00 to 2.00 mg/L (as SiO_2)
Resolution	0.01 mg/L
Accuracy	±0.03 mg/L ±5% of reading at 25 °C
Wavelength	610 nm
Cuvette type	22 mm diameter
Method	Adaptation of the ASTM Manual of Water and Environmental Technology, D859, Heteropoly Molybdenum Blue Method
Method ID	#080

REQUIRED REAGENTS

Code	Description	Quantity
HI93705A-0	Silica Low Range Reagent A	6 drops
HI93705B-0	Silica Low Range Reagent B	1 packet
HI93705C-0	Silica Low Range Reagent C	1 packet

REAGENT SETS

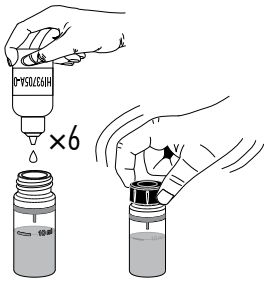
HI93705-01	Reagents for 100 tests
HI93705-03	Reagents for 300 tests

For other accessories see Accessories section.

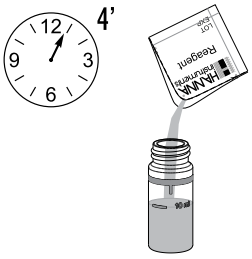
MEASUREMENT PROCEDURE

- Select the Silica LR method using the procedure described in the Factory Methods section.
- Fill the cuvette with 10 mL of unreacted sample (up to the mark).

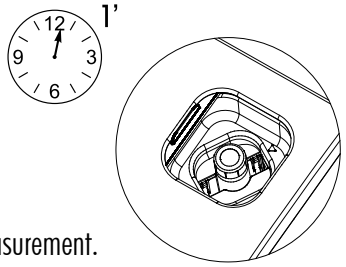
- Add 6 drops of HI93705A-0 Silica Low Range Reagent A. Replace the plastic stopper and the cap. Swirl the solution.



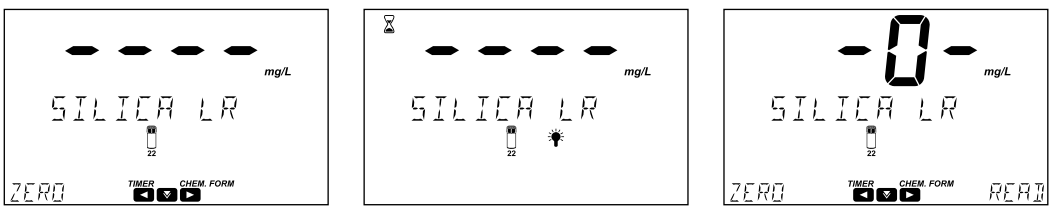
- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to adding HI93705B-0 Silica Low Range Reagent B or wait 4 minutes.



- Add one packet of HI93705B-0 Silica Low Range Reagent B. Replace the plastic stopper and the cap. Shake until it is completely dissolved.
- Press the ◀ key to access the timer menu, press the ⏫ key to select Timer 2. Press **START** to start Timer 2, the display will show the countdown or wait 1 minute.

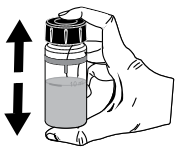


- Insert the cuvette into the holder and close the lid.
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.

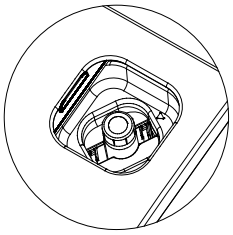


- Remove the cuvette.

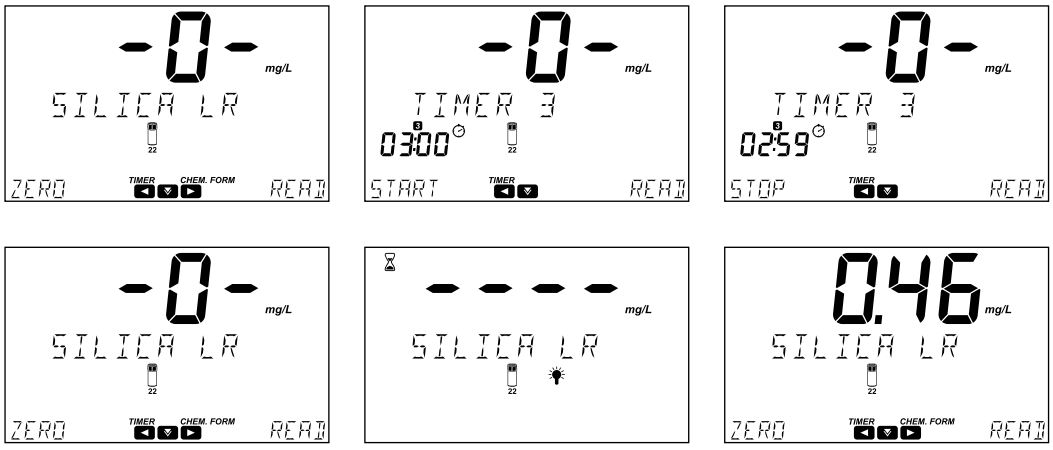
- Add one packet of HI93705C-0 Silica Low Range Reagent C. Replace the plastic stopper and the cap.
  Shake until it is completely dissolved.



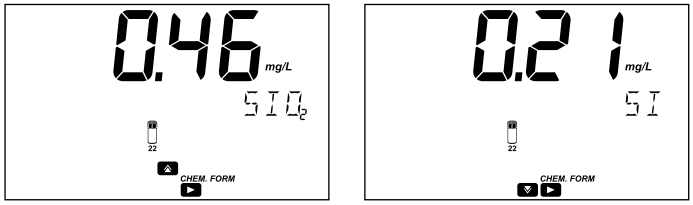
- Insert the cuvette into the holder and close the lid.



- Press the ◀ key to access the timer menu, press the ⏫ key to select Timer 3. Press **START** to start Timer 3, the display will show the countdown prior to measurement or wait 3 minutes.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **silica (SiO_2)**.



- Press the ⏬ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ⏫ key to convert the results to **mg/L** of **silicon (Si)**.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Phosphate above 75 mg/L, causes an 11% reduction in reading
- Phosphate above 60 mg/L, causes a 2% reduction in reading
- Sulfide and high concentration of iron
- Eliminate color and turbidity interferences by zeroing the meter with the original water sample.

Silica High Range

SPECIFICATIONS

Range	0 to 200 mg/L (as SiO_2)
Resolution	1 mg/L
Accuracy	±1 mg/L ±5% of reading at 25 °C
Wavelength	466 nm
Cuvette type	22 mm diameter
Method	Adaptation of the EPA Method 370.1 for Drinking, Surface and Saline Waters, Domestic and Industrial Wastes and Standard Method 4500-SiO_2
Method ID	#081

REQUIRED REAGENTS

Code	Description	Quantity
HI96770A-0	Silica High Range Reagent A	1 packet
HI96770B-0	Silica High Range Reagent B	1 packet
HI96770C-0	Silica High Range Reagent C	1 packet

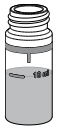
REAGENT SETS

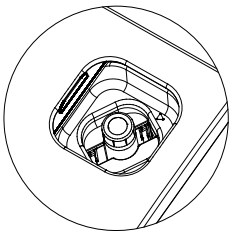
HI96770-01	Reagents for 100 tests
HI96770-03	Reagents for 300 tests

For other accessories see Accessories section.

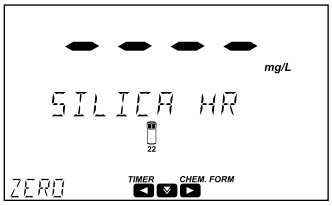
MEASUREMENT PROCEDURE

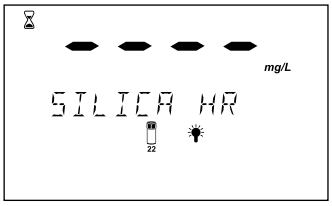
- Select the Silica HR method using the procedure described in the Factory Methods section.
- Fill the cuvette with 10 mL of unreacted sample (up to the mark). Replace the plastic stopper and the cap.

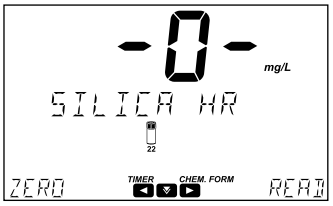




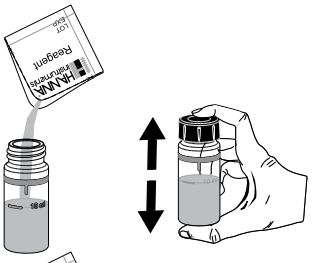
- Insert the cuvette into the holder and close the lid.
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



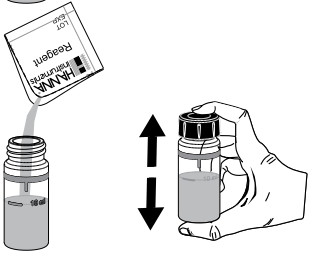




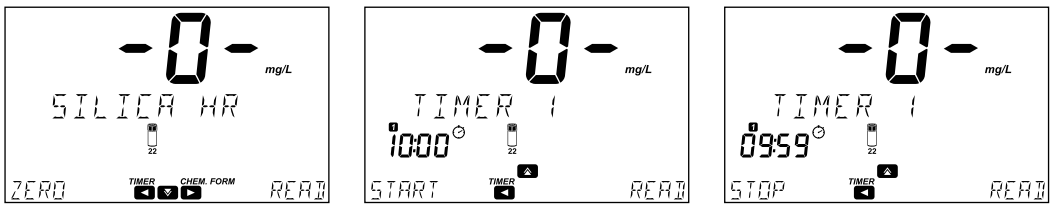
- Remove the cuvette.
- Add one packet of HI96770A-0 Silica High Range Reagent A. Replace the plastic stopper and the cap. Shake vigorously until completely dissolved.



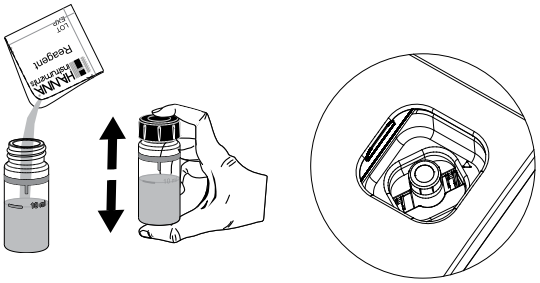
- Add one packet of HI96770B-0 Silica High Range Reagent B. Replace the plastic stopper and the cap. Shake vigorously until completely dissolved.



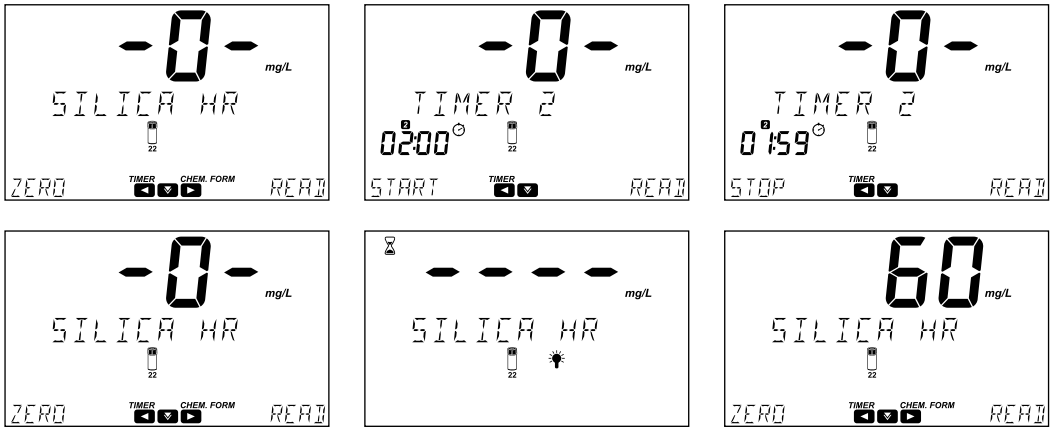
- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown or wait 10 minutes.



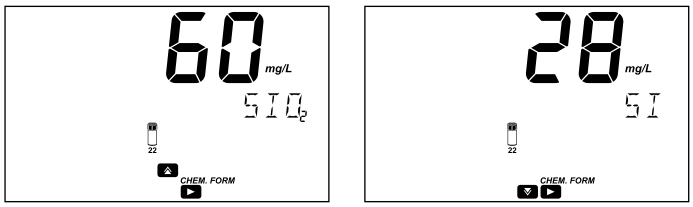
- Add one packet of HI96770C-0 Silica High Range Reagent C. Replace the plastic stopper and the cap. Shake vigorously until completely dissolved.
- Insert the cuvette into the holder and close the lid.



- Press the ◀ key to access the timer menu, press the ⏫ key to select Timer 2. Press **START** to start Timer 2, the display will show the countdown prior to measurement or wait 2 minutes.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **silica (SiO_2)**.



- Press the ⏬ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.
- Press the ⏫ key to convert the results to **mg/L** of **silicon (Si)**.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Phosphate above 75 mg/L, causes an 11% reduction in reading
- Phosphate above 60 mg/L, causes a 2% reduction in reading
- Sulfide and high concentration of iron
- Eliminate color and turbidity interferences by zeroing the meter with the original water sample.

Silver

SPECIFICATIONS

Range	0.000 to 1.000 mg/L (as Ag)
Resolution	0.001 mg/L
Accuracy	±0.020 mg/L ±5% of reading at 25 °C
Wavelength	570 nm
Cuvette type	22 mm diameter
Method	Adaptation of the PAN Method
Method ID	#082

REQUIRED REAGENTS

Code	Description	Quantity
HI93737A-0	Silver Reagent A	1 mL
HI93737B-0	Silver Reagent B	1 mL
HI93737C-0	Silver Reagent C	2 mL
HI93737D-0	Silver Reagent D	2 mL
HI93703-51	Dispersing Agent	6 drops

REAGENT SETS

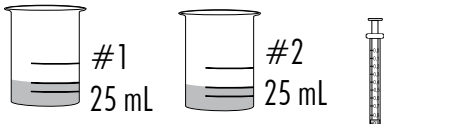
HI93737-01	Reagents for 50 tests
HI93737-03	Reagents for 150 tests

For other accessories see Accessories section.

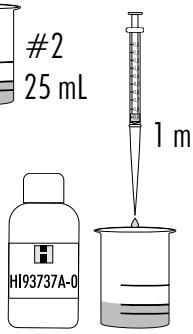
***Note**: For best results perform tests between 20 and 24 °C.*

MEASUREMENT PROCEDURE

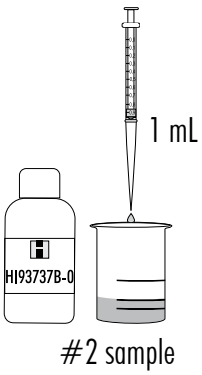
- Select the Silver method using the procedure described in the Factory Methods section.
- Fill two graduated beakers with 25 mL of sample.



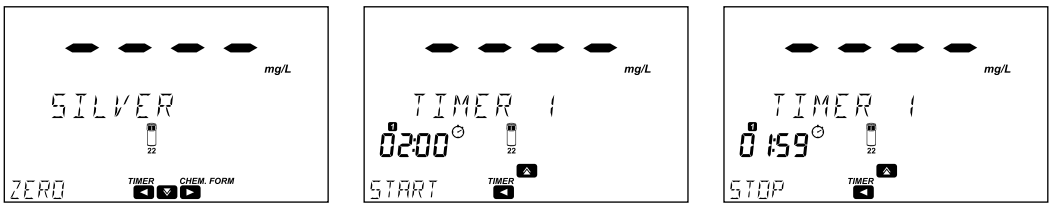
- Add 1 mL of HI93737A-0 Silver Reagent A to beaker #1 (the blank). Swirl gently to mix.

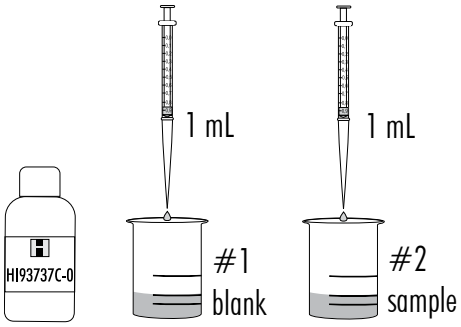


- Add 1 mL of HI93737B-0 Silver Reagent B to beaker #2 (the sample). Swirl gently to mix.



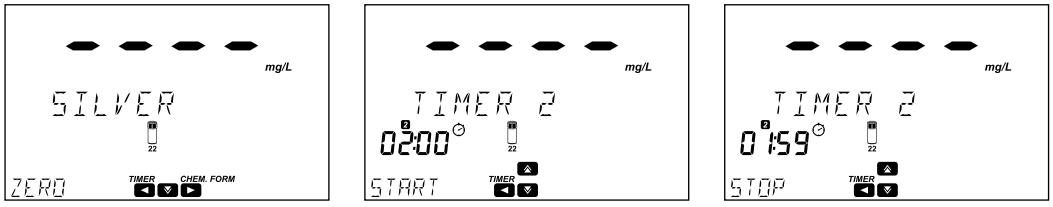
- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to adding HI93737C-0 Silver Reagent C or wait 2 minutes.

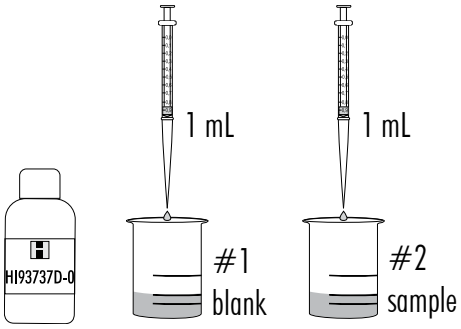




- Add 1 mL of HI93737C-0 Silver Reagent C to each beaker. Swirl to mix.

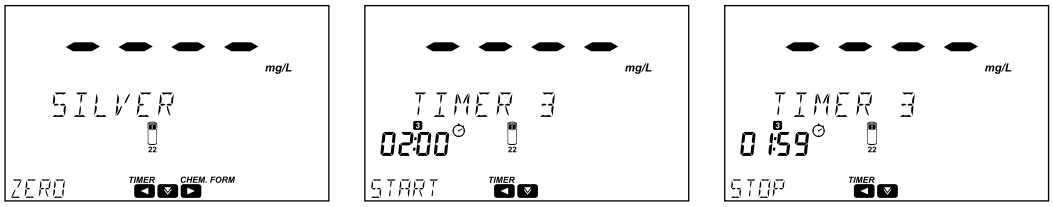
- Press the ◀ key to access the timer menu, press the ⏫ key to select Timer 2. Press **START** to start Timer 2, the display will show the countdown prior to adding HI93737D-0 Silver Reagent D or wait 2 minutes.

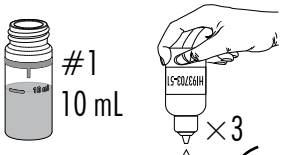




- Add 1 mL of HI93737D-0 Silver Reagent D to each beaker. Swirl to mix.

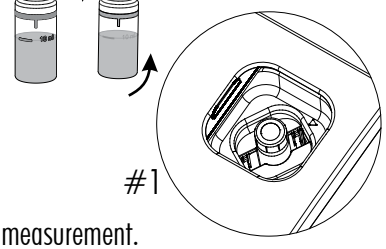
- Press the ◀ key to access the timer menu, press the ⏫ key to select Timer 3. Press **START** to start Timer 3, the display will show the countdown or wait 2 minutes.





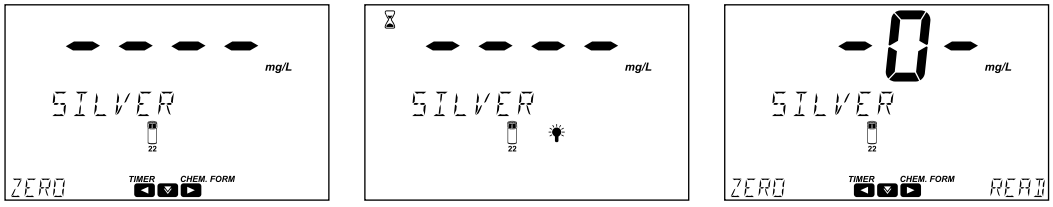
- Fill the first cuvette (#1) with 10 mL of the blank (up to the mark).

- Add 3 drops of HI93703-51 Dispersing Agent. Replace the plastic stopper and the cap. Invert gently for 10 seconds.

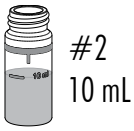


- Insert the cuvette into the holder and close the lid.

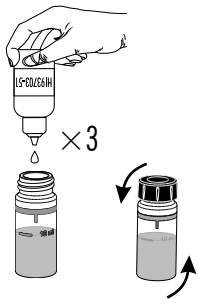
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



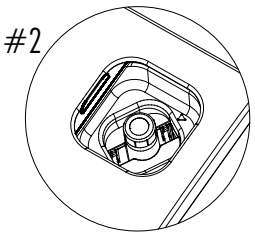
- Fill a second cuvette (#2) with 10 mL of the reacted sample (up to the mark).



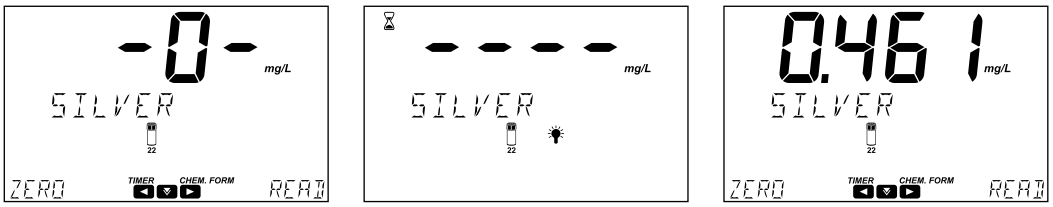
- Add 3 drops of HI93703-51 Dispersing Agent. Replace the plastic stopper and the cap. Invert gently for 10 seconds.



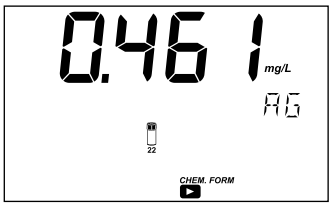
- Insert the second cuvette (#2) into the holder and close the lid.



- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **silver (Ag)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Chloride above 8000 mg/L
- Sodium above 5000 mg/L
- Calcium, Magnesium above 1000 mg/L $CaCO_3$
- Potassium above 500 mg/L
- Aluminum, Zinc above 30 mg/L
- Chromium(VI) above 40 mg/L
- Manganese above 25 mg/L
- Cadmium, Chromium(III), Fluoride, Lead above 20 mg/L
- Copper above 15 mg/L
- Iron (Ferric) above 10 mg/L
- Cobalt, Iron (Ferrous), Nickel above 1.5 mg/L

Sulfate

SPECIFICATIONS

Range	0 to 150 mg/L (as SO_4^{2-})
Resolution	1 mg/L
Accuracy	±5 mg/L ±3% of reading at 25 °C
Wavelength	466 nm
Cuvette type	22 mm diameter
Method	Sulfate is precipitated with barium chloride crystals
Method ID	#083

REQUIRED REAGENTS

Code	Description	Quantity
HI93751-0	Sulfate Reagent	1 packet

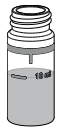
REAGENT SETS

HI93751-01	Reagents for 100 tests
HI93751-03	Reagents for 300 tests

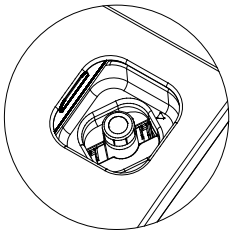
For other accessories see Accessories section.

MEASUREMENT PROCEDURE

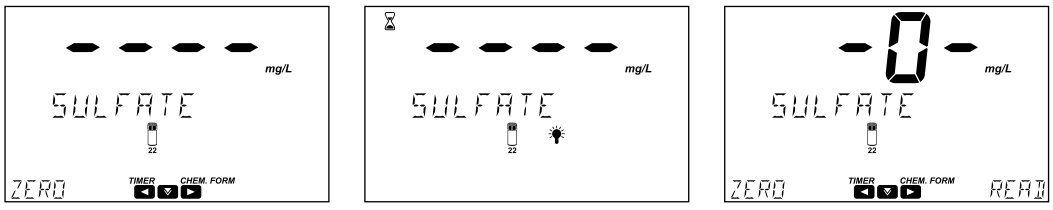
- Select the Sulfate method using the procedure described in the Factory Methods section.
- Fill a cuvette with 10 mL of unreacted sample (up to the mark). Replace the plastic stopper and the cap.



- Insert the cuvette into the holder and close the lid.

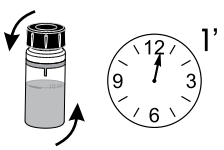


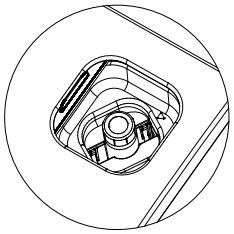
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.



- Add one packet of HI93751-0 Sulfate Reagent.

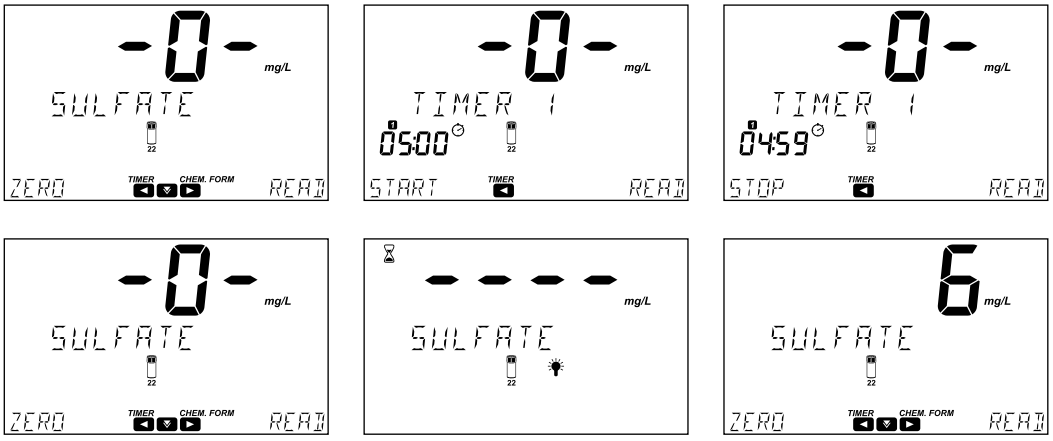
- Replace the plastic stopper and the cap. Invert gently for 1 minute (about 30 inversions).



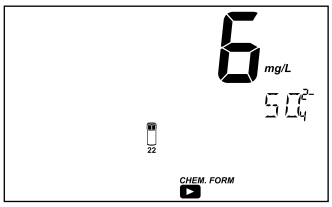


- Insert the cuvette into the holder and close the lid.

- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 5 minutes.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **sulfate (SO_4^{2-})**.



- Press the ⩔ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Chloride above 40000 mg/L
- Calcium above 20000 mg/L $CaCO_3$
- Magnesium above 10000 mg/L $MgCO_3$
- Silica above 500 mg/L SiO_2
- Color or suspended matter
  Filter the sample prior to analysis.
- Organic matter in large amounts may impede the precipitation of barium sulfate

Surfactants, Anionic

SPECIFICATIONS

Range	0.00 to 3.50 mg/L (as SDBS)
Resolution	0.01 mg/L
Accuracy	±0.04 mg/L ±3% of reading at 25 °C
Wavelength	610 nm
Cuvette type	22 mm diameter
Method	Adaptation of the EPA Method 425.1 and Standard Methods for the Examination of Water and Wastewater, 20th Edition, 5540C, Anionic Surfactants as MBAS
Method ID	#084

REQUIRED REAGENTS

Code	Description	Quantity
HI95769A-0	Anionic Surfactants Reagent A	4 drops
HI95769B-0	Anionic Surfactants Reagent B	2 drops
–	Chloroform Reagent	10 mL
DEIONIZED120	Deionized Water	15 mL

REAGENT SETS

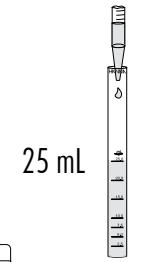
HI95769-01	Reagents for 40 tests

For other accessories see Accessories section.

MEASUREMENT PROCEDURE

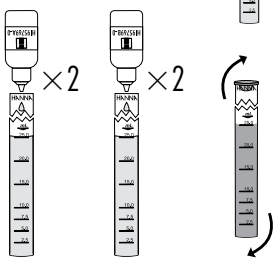
- Select the Surfactants Anionic method using the procedure described in the Factory Methods section.
- Fill the graduated mixing cylinder with 25 mL of sample.

  ***Note**: For improved accuracy the use of class A laboratory pipettes are recommended.*

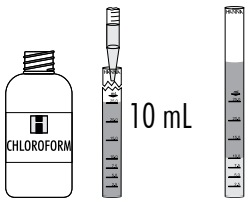


- Add 2 drops of HI95769A-0 Anionic Surfactants Reagent A and 2 drops of HI95769B-0 Anionic Surfactants Reagent B.
- Replace the cap. Invert to mix, the solution will turn blue.
- Add 10 mL of Chloroform. Replace the cap.

  ***Note**: Chloroform is more dense than water and will sink to the bottom of the graduated mixing cylinder.*

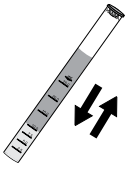


- Invert the vial twice and remove the cap to release any pressure that has built up.

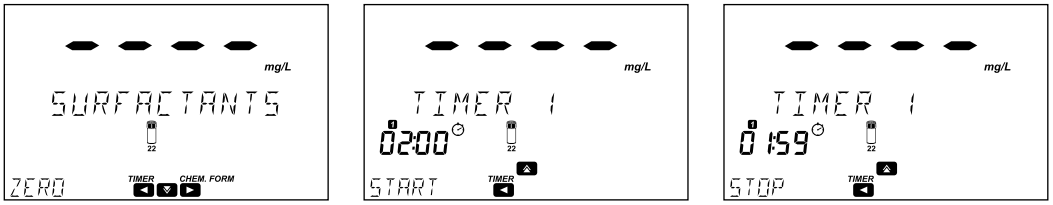


- Replace the cap. Shake it vigorously for 30 seconds.

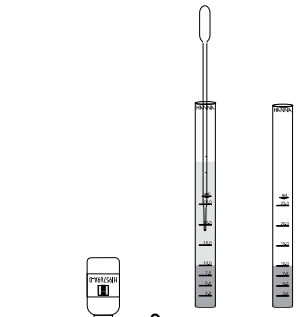
  ***Note**: Ensure the cap is secure when shaking.*



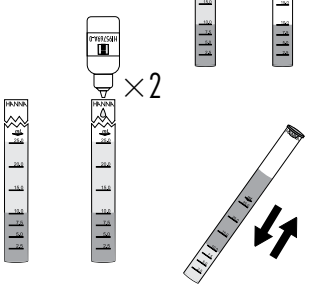
- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown or wait 2 minutes. During this period the chloroform layer separates from the aqueous layer, the color of the aqueous layer will fade slightly, while the chloroform layer will turn blue.



- Remove the cap.

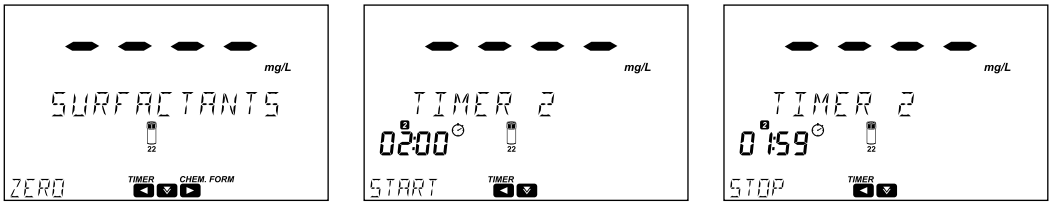


- Remove the upper aqueous layer using the long plastic pipette, do not remove the lower chloroform layer.
- Add 15 mL of deionized water to the graduated mixing cylinder (up to the 25 mL mark).
- Add 2 drops of HI95769A-0 Anionic Surfactants Reagent A. Replace the cap.
- Invert the vial twice and remove the cap to release any pressure that has built up.
- Replace the cap. Shake it vigorously for 30 seconds.

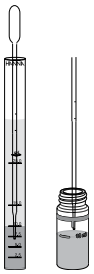


***Note**: Ensure the cap is secure when shaking.*

- Press the ◀ key to access the timer menu, press the ⏫ key to select Timer 2. Press **START** to start Timer 2, the display will show the countdown or wait 2 minutes. During this period, the chloroform layer separates from the aqueous layer.



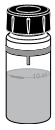
- Remove the cap.



- Insert a clean plastic pipette below the upper aqueous layer to transfer the lower chloroform layer into a cuvette. Do not transfer any of the upper aqueous layer.

***Notes**: The solution in the cuvette must be clear. If the solution is cloudy, the separation between the chloroform and aqueous layer can be improved by gently warming the cuvette (holding the cuvette in hand). If the chloroform layer contains some aqueous drops hanging on the cuvette wall, gently swirl or invert the cuvette. It is important to transfer at least 7 mL of chloroform layer into the measurement cuvette, thus up to 0.5 cm (1/4") below the 10 mL mark. If the transferred volume is lower than 7 mL, the accuracy of the test may be affected. Please repeat the test waiting for longer than 2 minutes to allow complete separation between the two phases.*

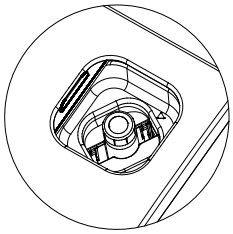
- Replace the plastic stopper and the cap. This is the reacted sample (#2).



#2 sample

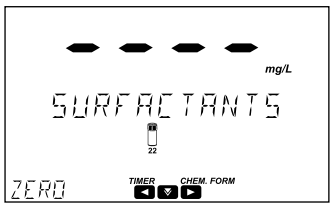
- Fill another cuvette with 10 mL of Chloroform reagent (up to the mark). Replace the plastic stopper and the cap.
  This is the blank (#1).

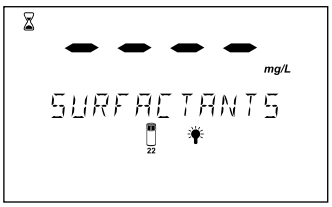
#1 blank

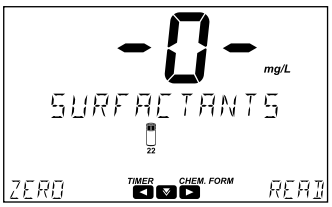


#1

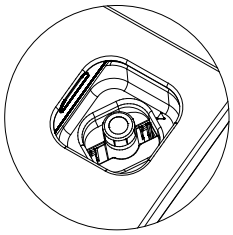
- Insert the blank (#1) into the holder and close the lid.
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.





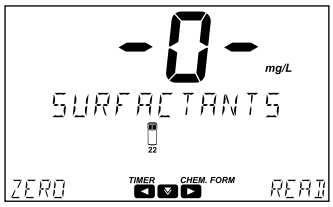


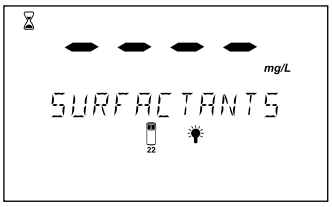
- Remove the cuvette.
- Insert the reacted sample (#2) into the holder and close the lid.



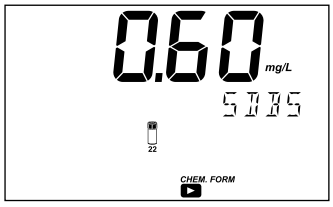
#2

- Press **READ** to start the reading. The instrument displays the result in **mg/L** as **SDBS**.





- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Absorption particulate matter, Cationic surfactants, Strong oxidants (Cl_2, H_2O_2, $S_2O_8^{2-}$ etc.), Sulfide cause negative interference
- Organic sulfates, Sulfonates cause positive interference
- Highly buffered samples or with extreme pH may exceed the buffering capacity of the reagent.
  pH should be adjusted between 4 and 9 with diluted NaOH or HCl prior to addition of the reagent.

Surfactants, Anionic (13 mm Vial)

SPECIFICATIONS

Range	0.00 to 3.50 mg/L (as SDBS)
Resolution	0.01 mg/L
Accuracy	±0.10 mg/L ±5% of reading at 25 °C
Wavelength	610 nm
Cuvette type	13 mm diameter
Method	Adaptation of the Standard Method for the Examination of Water and Wastewater, 23rd Edition, 5540C, Anionic Surfactants as MBAS
Method ID	#093

REQUIRED REAGENT

Code	Description	Quantity
HI96782V-0*	Anionic Surfactants Reagent Vial	1 vial
HI96782A-0	Anionic Surfactants Buffer Reagent A	0.6 mL
HI96782B-0	Anionic Surfactants Buffer Reagent B	0.2 mL

*Reagent vial identification: white label.

REAGENT SETS

HI96782-25	Reagents for 25 tests

For other accessories see Accessories section.

***Note**: Store the unused vials in their packaging in a dark place, between 15 and 25 °C.*

PRINCIPLE

Determination of anionic surfactants by measurement of the Methylene Blue Active Substances (MBAS) index. Anionic surfactants react with methylene blue in an alkaline medium, this reaction results in salts that are extracted using chloroform. The blue color of the organic phase is determined photometrically.

APPLICATION

Water, wastewater, surface water, formulations, degreasing baths, wash solutions, process analysis

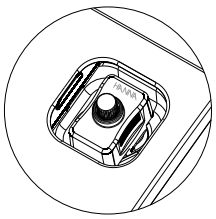
SIGNIFICANCE & USE

Surfactants decrease surface tension at the interface between a liquid and another solid, liquid, or gaseous phase, they are used in industry, agriculture, scientific studies and everyday life (cleaning agents, spot removers, cosmetics, etc.). The most widely used anionic surfactants include sodium dodecyl sulfate (SDS), sodium dodecylbenzene sulfonate (SDBS), sodium dodecane sulfonate (SDSA), sodium dioctyl sulfosuccinate (SDOSSA).

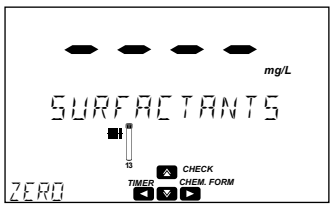
MEASUREMENT PROCEDURE

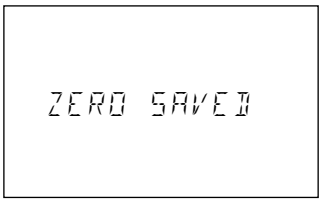
***Note**: Method selection is done automatically using a barcoded HI96782V-0 Anionic Surfactants Reagent Vial following the procedure described in the Barcode Methods section.*
Alternatively, select the Surfactants Anionic (13 mm) method using the procedure described in the Factory Methods section.

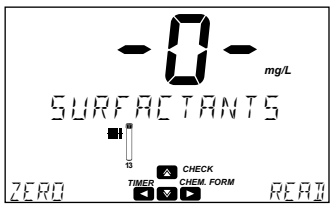
- Insert supplied 13 mm vial adapter using the procedure described in the Cuvette & Vial Adapters section.
- Insert the HI96782V-0 Anionic Surfactants Reagent Vial into the adapter.
  Press steadily down until the vial clicks in place.



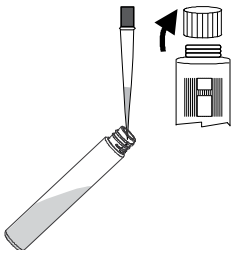
- Press **ZERO**.
  The meter scans the barcode and switches to the correct method automatically.
- The display will show "-0-" when the meter is zeroed and ready for measurement.



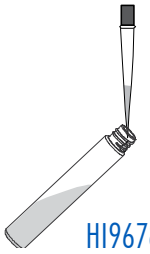




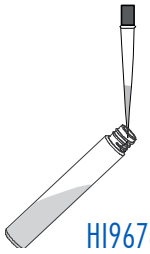
- Remove the vial.



- Add 5 mL of sample to the vial, while keeping the vial at 45-degree angle.

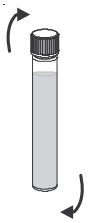


- Add 0.6 mL of HI96782A-0 Anionic Surfactants Buffer Reagent A and 0.2 mL of HI96782B-0 Anionic Surfactants Indicator Reagent B.



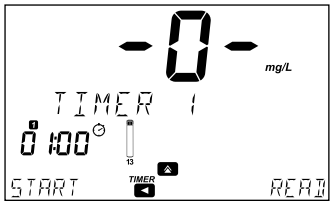
HI96782A-0 HI96782B-0

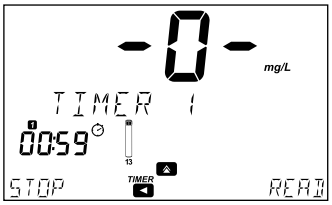
- Replace the cap. Invert for 1 minute (about 45 inversions).



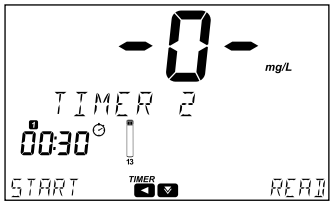
***Note**: This method is technique sensitive. See procedure described in the Cuvette Preparation section for proper mixing technique. If the vial is inverted too slowly the extraction may be incomplete resulting in low readings.*

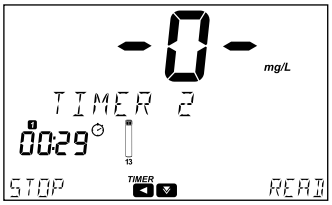
- Press the ◀ key to access the timer menu.
- Press **START** to start Timer 1. The display will show 1 minute countdown. During this period the organic layer separates from the aqueous layer.



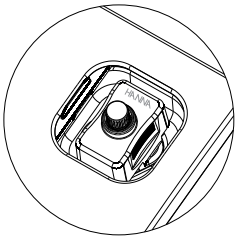


- Invert the vial gently two times.
- Press the ▲ key to select Timer 2.
- Press **START** to start Timer 2, the display will show the countdown or wait 30 seconds.



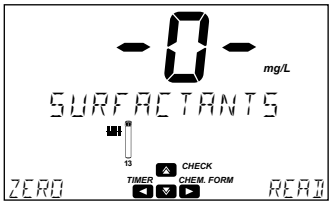


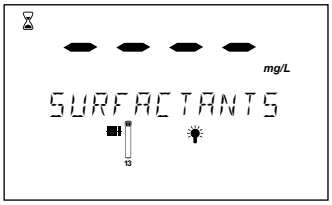
- Insert the vial into the adapter. Press steadily down, until the vial clicks in place.



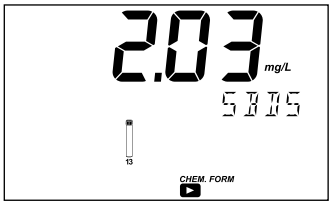
***Note**: Phase separation must be complete before the measurement is taken. If the solution is cloudy, the separation between the organic and aqueous layer can be improved by gently warming the vial (holding the vial in hand). If the organic layer contains some aqueous drops hanging on the vial wall, gently swirl or invert the vial.*

- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **SDBS**.





- Press the ⩔ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Cationic surfactants cause negative interference
- Bicarbonate above 2000 mg/L
- Potassium, Sodium, Sulfate, Chloride above 1000 mg/L
- Phosphate above 300 mg/L
- Magnesium above 250 mg/L
- Calcium, Nitrate above 100 mg/L
- Chromium(VI), Copper above 10 mg/L
- Nickel, Zinc, Iron (Ferric) above 5 mg/L

Surfactants, Cationic (13 mm Vial)

SPECIFICATIONS

Range	0.00 to 2.50 mg/L (as CTAB)
Resolution	0.01 mg/L
Accuracy	±0.15 mg/L ±3% of reading at 25 °C
Wavelength	420 nm
Cuvette type	13 mm diameter
Method	Bromophenol Blue Method
Method ID	#095

REQUIRED REAGENT

Code	Description	Quantity
HI96785V-0	Cationic Surfactants Reagent Vial	1 vial
HI96785-0	Cationic Surfactants Reagent	1 packet

REAGENT SETS

HI96785-25	Reagents for 25 tests

For other accessories see Accessories section.

***Note**: Store the unused vials in their packaging in a dark place, between 15 and 25 °C.*

PRINCIPLE

Determination of cationic surfactants by measurement of the Methylene Blue Active Substances (MBAS) index. Cationic surfactants react with methylene blue in an acid medium, this reaction results in salts that are extracted using chloroform. The yellow color of the organic phase is determined photometrically.

***Note**: The sample temperature must be between 20 and 22 °C, and the pH of the sample between 4 and 9.*

APPLICATION

Water, wastewater, surface water, formulations, degreasing baths, wash solutions, process analysis

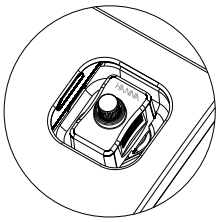
SIGNIFICANCE & USE

Cationic surfactants are positively charged at their hydrophilic ends and as such are active agents in fabric softeners, an important group of detergent products. Most cationic surfactants find use as disinfectants and sanitizers and include: Hexadecyltrimethylammonium bromide (CTAB), Benzalkonium chloride (BAC), Cetylpyridinum chloride (CPC),Benzethonium chloride (BZT).

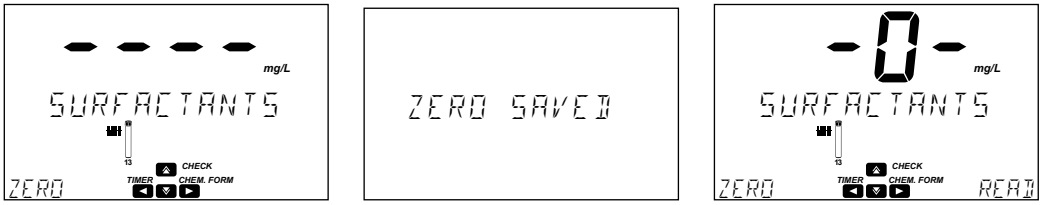
MEASUREMENT PROCEDURE

***Note**: Method selection is done automatically using a barcoded HI96785V-0 Cationic Surfactants Reagent Vial following the procedure described in the Barcode Methods section.*
Alternatively, select the Surfactants Cationic (13 mm) method using the procedure described in the Factory Methods section.

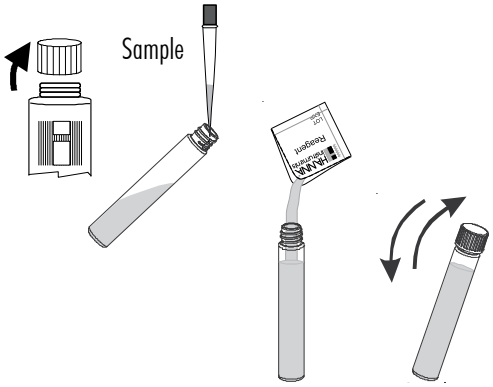
- Insert supplied 13 mm vial adapter using the procedure described in the Cuvette & Vial Adapters section.
- Insert the HI96785V-0 Cationic Surfactants Reagent Vial into the adapter.
  Press steadily down until the vial clicks in place.



- Press **ZERO**.
  The meter scans the barcode and switches to the correct method automatically.
- The display will show "-0-" when the meter is zeroed and ready for measurement.



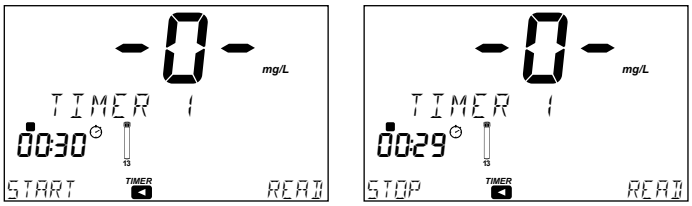
- Remove the vial.
- Remove the cap and add 5 mL of sample to the vial, while keeping the vial at a 45-degree angle.



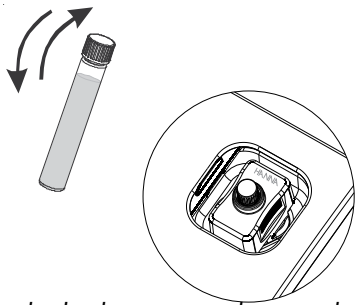
- Add one packet of HI96785-0 Cationic Surfactants Reagent.
- Replace the cap and invert for 2 minutes to mix.

***Note**: This method is technique sensitive. See Cuvette Preparation section for proper mixing technique. If the vial is inverted too slowly the extraction may be incomplete resulting in low readings.*

- Press the ◀ key to access the timer menu.
- Press **START** to start Timer 1. The display will show the 30 seconds countdown prior to measurement. During this period the organic layer separates from the aqueous layer.

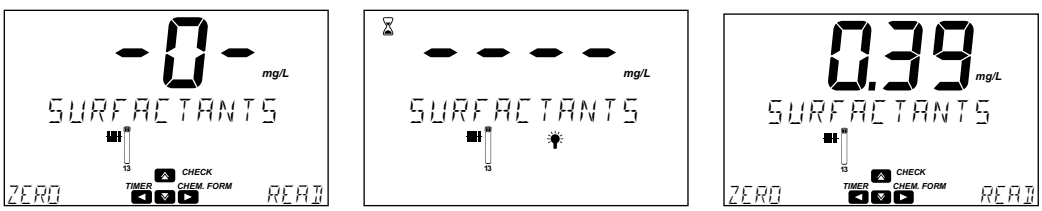


- Invert the vial gently two times.
- Wait for phase separation.
- Wipe the vial thoroughly with HI731318 microfiber cleaning cloth or a lint-free wipe prior to insertion.
- Insert the vial into the adapter. Press steadily down until the vial clicks in place.

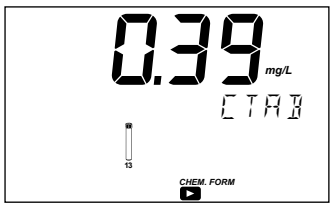


***Note**: Phase separation must be complete before the measurement is taken. If the solution is cloudy, the separation between the organic and aqueous layer can be improved by gently warming the capped vial (holding the vial in your hand). If the organic layer contains some aqueous drops hanging on the vial wall, gently swirl or invert the vial. The phase separation may take several hours if the vial is inverted or shaken too vigorously!*

- Press **READ** to start the reading. The instrument displays the result in **mg/L** of **CTAB**.



- Press the ⏫ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Chloride above 3000 mg/L
- Sodium above 2000 mg/L
- Carbonate, Sulfate, Potassium, Nitrate above 1000 mg/L
- Calcium above 500 mg/L
- Phosphate above 300 mg/L
- Ammonium, Magnesium above 250 mg/L
- Iron (Ferric), Nitrite above 100 mg/L
- Zinc, Nickel, Copper,Iron (Ferrous), Hydrogen peroxide (H_2O_2), Disulfite ($S_2O_5^{2-}$) above 50 mg/L
- Chlorine, Chromium (VI), Chromium (III) above 10 mg/L
- Anionic surfactants cause negative interference

Interferences checked individually in solution containing 1 mg/L of CTAB (Hexadecyltrimethylammonium bromide).
The cumulative effects have not been determined but can not be excluded.
The determination is not yet interfered with up to the concentrations of foreign substances given above.

Surfactants, Nonionic (13 mm Vial)

SPECIFICATIONS

Range	0.00 to 6.00 mg/L (TRITON X-100)
Resolution	0.01 mg/L
Accuracy	±0.10 mg/L* ±5% of reading at 25 °C
Wavelength	610 nm
Cuvette type	13 mm diameter
Method	TBPE Method
Method ID	#094

*When testing using a previously stored zero, accuracy could be affected.

REQUIRED REAGENT

Code	Description	Quantity
HI96780V-0*	Nonionic Surfactants Reagent Vial	1 vial

*Reagent vial identification: blue label

REAGENT SETS

HI96780-25	Reagents for 24 tests

For other accessories see Accessories section.

***Note**: Store the unused vials in their packaging in a dark place, between 15 and 25 °C.*

PRINCIPLE

Nonionic surfactants (ethoxylates with 3 to 20 ether bridges) react with the indicator TBPE to form a green complex, which is then extracted in dichloromethane and photometrically evaluated. This method has a strong temperature and pH dependence. The sample temperature must be between 20 and 22 °C, and the pH between 4 and 9.

APPLICATION

Water, wastewater, surface water, formulations, degreasing baths, wash solutions, process analysis

SIGNIFICANCE & USE

Surfactants are one of many different compounds that make up a detergent. Nonionic surfactants do not bear an electrical charge and are often used together with anionic surfactants. Nonionic surfactants account for nearly 50% of surfactant production. Nonionic surfactants are more surface active and better emulsifiers than anionic surfactants at similar concentrations. They are less soluble than anionic surfactants in hot water and produce less foam. They are more efficient in removing oily and organic dirt. Nonionics are used in fabric washing detergents, hard surface cleaners and in many industrial processes such as emulsion polymerization and agrochemical formulations.

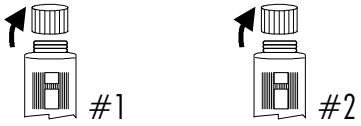
MEASUREMENT PROCEDURE

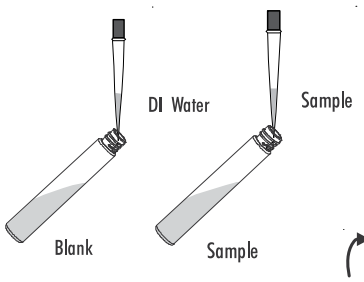
Before using the reagent kit carefully read all the instructions and the Safety Data Sheets (SDS). Pay particular attention to all warnings, cautions and notes. Failure to do so may result in serious injury to the operator.

Reagent Blank Correction: This method requires a reagent blank correction. A single blank vial may be used more than once. The blank vial is stable for several months at room temperature. For improved accuracy, run a blank for each set of measurements and always use the same lot of reagents for blank and samples.

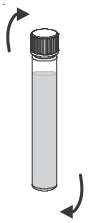
***Note**: Method selection is done automatically using a barcoded HI96780V-0 Nonionic Surfactants Reagent Vial following the procedure described in the Barcode Methods section.*
Alternatively, select the Surfactants Nonionic (13 mm) method using the procedure described in the Factory Methods section.

- Remove the cap from two HI96780V-0 Nonionic Surfactants Reagent Vials.





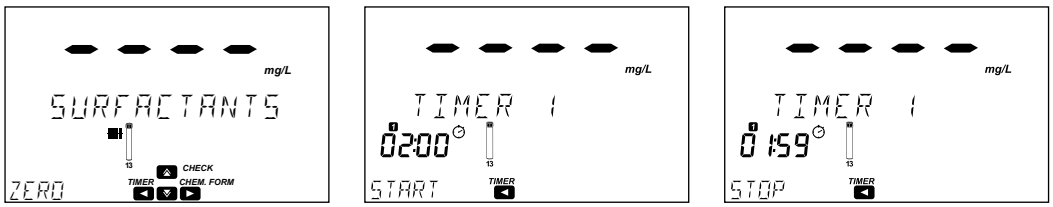
- Add 3 mL of deionized water to the first vial (#1) and 3 mL of sample to the second vial (#2), while keeping the vials at a 45-degree angle.



- Replace the cap. Invert for 2 minutes (about 2 inverts per second).

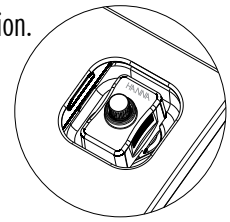
***Note**: The method is technique sensitive. See procedure described in the Cuvette Preparation section for proper mixing technique.*

- Press the ◀ key to access the timer menu.
- Press **START** to start Timer 1, the display will show the countdown or wait 2 minutes.
  During this time, the organic layer separates from the aqueous layer.

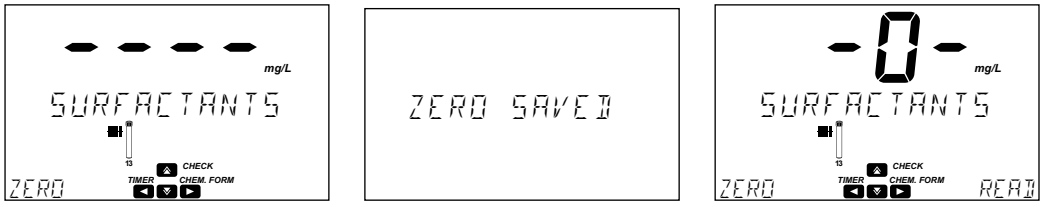


***Note**: Phase separation must be complete before the measurement is taken. If the organic layer contains some aqueous drops hanging on the vial wall, gently swirl or invert the vial.*

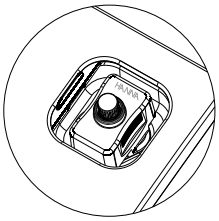
- Insert supplied 13 mm vial adapter using the procedure described in the Cuvette & Vial Adapters section.
- Insert the blank vial (#1) into the adapter. Press steadily down until the vial clicks in place.



- Press **ZERO**.
  The meter scans the barcode and switches to the correct method auromatically.
- The display will show "-0-" when the meter is zeroed and ready for measurement.

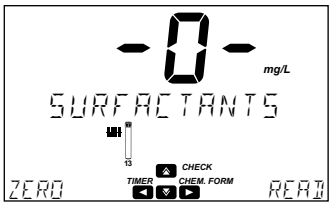


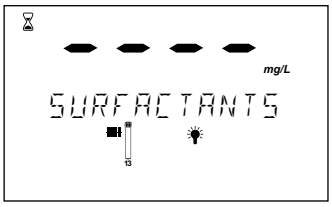
- Remove the blank vial.



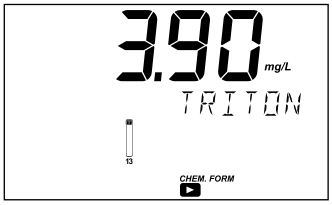
- Insert the sample vial (#2) into the holder.
  Press steadily down until the vial clicks in place.

- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **TRITON X-100**.





- Press the ▼▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Chloride, Nitrate, Sulfate, above 20000 mg/L
- Calcium above 500 mg/L
- Aluminum, Ammonium, Magnesium above 200 mg/L
- Copper, Iron (Ferric), Zinc above 50 mg/L
- Cationic surfactants cause positive interference
- Anionic surfactants cause negative interference

Zinc

SPECIFICATIONS

Range	0.00 to 3.00 mg/L (as Zn)
Resolution	0.01 mg/L
Accuracy	±0.03 mg/L ±3% of reading at 25 °C
Wavelength	620 nm
Cuvette type	22 mm diameter
Method	Adaptation of the Standard Methods for the Examination of Water and Wastewater, 18th Edition, Zincon Method
Method ID	#085

REQUIRED REAGENT

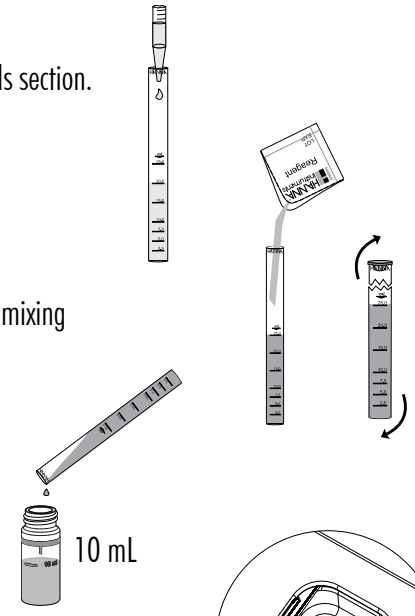
Code	Description	Quantity
HI93731A-0	Zinc Reagent A	1 packet
HI93731B-0	Zinc Reagent B	0.5 mL

REAGENT SETS

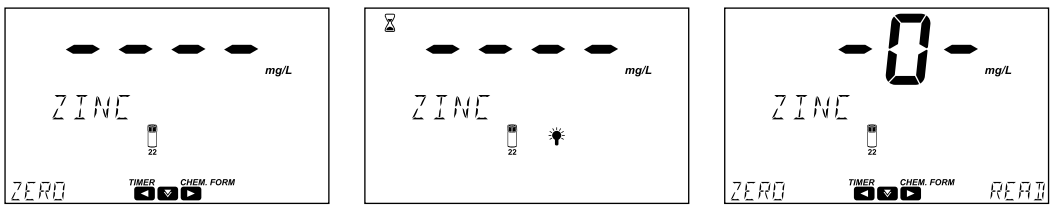
HI93731-01	Reagents for 100 tests
HI93731-03	Reagents for 300 tests

For other accessories see Accessories section.

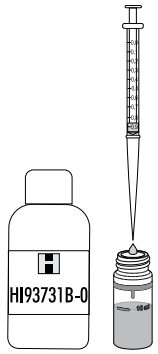
MEASUREMENT PROCEDURE



- Select the Zinc method using the procedure described in the Factory Methods section.
- Fill the graduated cylinder up to the 20 mL mark with the sample.
- Add one packet of HI93731A-0 Zinc Reagent A, close the graduated mixing cylinder. Invert several times to mix until completely dissolved.
- Fill a cuvette with 10 mL of the reacted sample (up to the mark). Replace the plastic stopper and the cap.
- Insert the cuvette into the holder and close the lid.
- Press **ZERO**. The display will show "-0-" when the meter is zeroed and ready for measurement.

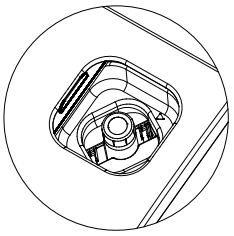


- Add 0.5 mL of HI93731B-0 Zinc Reagent B to the cuvette. Replace the plastic stopper and the cap.

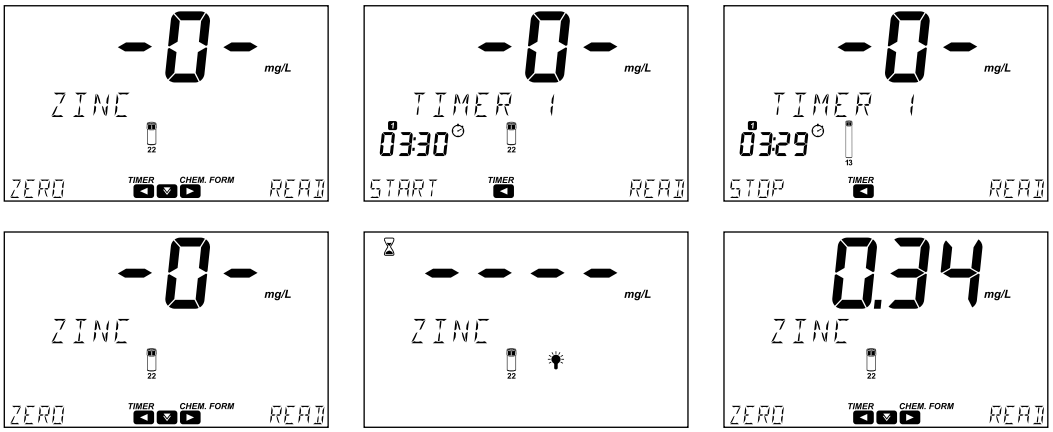


- Swirl gently for 15 seconds.

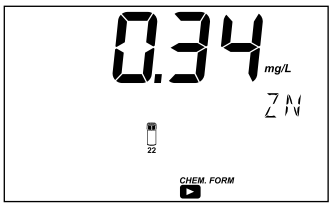
- Insert the sample into the holder and close the lid.



- Press the ◀ key to access the timer menu. Press **START** to start Timer 1, the display will show the countdown prior to measurement or wait 3 minutes and 30 seconds.
- Press **READ** to start the reading. The instrument displays the results in **mg/L** of **zinc (Zn)**.



- Press the ▼ key to view the wavelength, method ID, date and time.
- Press the ▶ key to view the chemical formula.



- Press the ▶ key to return to the measurement screen.

INTERFERENCES

Interference may be caused by:

- Iron above 7 mg/L
- Aluminum above 6 mg/L
- Copper, Manganese, Nickel above 5 mg/L
- Cadmium above 0.5 mg/L

6. ALPHABETICAL LIST OF METHODS

Description	Range	Method
Alkalinity	0 to 500 mg/L	Bromocresol Green
Alkalinity, Marine	0 to 300 mg/L	Bromocresol Green
Aluminum	0.00 to 1.00 mg/L	Aluminon
Ammonia LR	0.00 to 3.00 mg/L	Nessler
Ammonia LR (13 mm Vial)	0.00 to 3.00 mg/L	Nessler
Ammonia LR ISO	0.000 to 2.500 mg/L (NH_4^+)	ISO 23695
Ammonia MR	0.00 to 10.00 mg/L	Nessler
Ammonia HR	0.0 to 100.0 mg/L	Nessler
Ammonia HR (13 mm Vial)	0.0 to 100.0 mg/L	Nessler
Bromine	0.00 to 10.00 mg/L	DPD
Calcium	0 to 400 mg/L	Oxalate
Calcium, Marine	200 to 600 mg/L	Zincon
Chloride	0.0 to 20.0 mg/L	Mercury (II) Thiocyanate
Chlorine Dioxide	0.00 to 2.00 mg/L	Chlorophenol Red
Chlorine Dioxide (Rapid)	0.00 to 2.00 mg/L	Adaptation of the 4500 ClO_2 D
Chlorine, Free ULR	0.000 to 0.500 mg/L	DPD
Chlorine, Free LR (powder)	0.00 to 5.00 mg/L	DPD
Chlorine, Free LR (liquid)	0.00 to 5.00 mg/L	DPD
Chlorine, Free HR	0.00 to 10.00 mg/L	DPD
Chlorine, Total ULR	0.000 to 0.500 mg/L	DPD
Chlorine, Total LR (powder)	0.00 to 5.00 mg/L	DPD
Chlorine, Total LR (liquid)	0.00 to 5.00 mg/L	DPD
Chlorine, Total HR	0.00 to 10.00 mg/L	DPD
Chlorine, Total UHR	0 to 500 mg/L	Standard Methods 4500-Cl
Chromium (VI) LR	0 to 300 µg/L	Diphenylcarbohydrazide
Chromium (VI) HR	0 to 1000 µg/L	Diphenylcarbohydrazide
Chromium (VI)/Total (13 mm Vial)	0 to 1000 µg/L	Diphenylcarbohydrazide
COD LR EPA (13 mm Vial)	0 to 150 mg/L	Adaptation of the EPA 410.4
COD LR FREE Hg (13 mm Vial)	0 to 150 mg/L	Dichromate Hg Free
COD LR ISO (13 mm Vial)	0 to 150 mg/L	Dichromate ISO
COD MR EPA (13 mm Vial)	0 to 1500 mg/L	Adaptation of the EPA 410.4
COD MR FREE Hg (13 mm Vial)	0 to 1500 mg/L	Dichromate Hg Free
COD MR ISO (13 mm Vial)	0 to 1000 mg/L	Dichromate ISO

Description	Range	Method
COD HR EPA (13 mm Vial)	0 to 15000 mg/L	Adaptation of the EPA 410.4
COD UHR (13 mm Vial)	0.0 to 60.0 ppt	Adaptation of the EPA 410.4
Color ADMI LR	0 to 250 ADMI Pt-Co	ADMI
Color ADMI HR	0 to 600 ADMI Pt-Co	ADMI
Color of Water	0 to 500 PCU	Colorimetric Platinum Cobalt
Copper LR	0 to 1500 µg/L	Bicinchoninate
Copper HR	0.00 to 5.00 mg/L	Bicinchoninate
Cyanide	0.000 to 0.200 mg/L	Pyridine-Pyrazalone
Cyanuric Acid	0 to 100 mg/L	Turbidimetric
Fluoride LR	0.00 to 2.00 mg/L	SPADNS
Fluoride HR	0.0 to 20.0 mg/L	SPADNS
Hardness, Calcium	0.00 to 2.70 mg/L	Calmagite
Hardness, Magnesium	0.00 to 2.00 mg/L	EDTA
Hardness, Total LR	0 to 250 mg/L	EPA 130.1
Hardness, Total MR	200 to 500 mg/L	EPA 130.1
Hardness, Total HR	400 to 750 mg/L	EPA 130.1
Hydrazine	0 to 400 µg/L	p-Dimethylaminobenzaldehyde
Iodine	0.0 to 12.5 mg/L	DPD
Iron LR	0.00 to 1.60 mg/L	TPTZ
Iron HR	0.00 to 5.00 mg/L	Phenanthroline
Iron (II) (Ferrous)	0.00 to 6.00 mg/L	3500-Fe B, Phenanthroline
Iron (13 mm Vial)	0.00 to 6.00 mg/L	3500-Fe B, Phenanthroline
Iron Total (13 mm Vial)	0.00 to 7.00 mg/L	3500-Fe B, Phenanthroline
Magnesium	0 to 150 mg/L	Calmagite
Magnesium, Marine	1000 to 1800 mg/L (as Mg^{2+})	EDTA
Manganese LR	0 to 300 µg/L	PAN
Manganese HR	0.0 to 20.0 mg/L	Periodate
Maple Syrup	0.00 to 100.00%T	Direct Measure
Molybdenum	0.0 to 40.0 mg/L	Mercaptoacetic Acid
Nickel LR	0.000 to 1.000 mg/L	PAN
Nickel HR	0.00 to 7.00 ppt	Colorimetric
Nitrate	0.0 to 30.0 mg/L	Cadmium Reduction
Nitrate (Chromotropic Acid, 13 mm Vial)	0.0 to 30.0 mg/L	Chromotropic Acid
Nitrate, Marine HR	0.0 to 75.0 mg/L (as NO_3^-)	Zinc Reduction Method
Nitrite LR	0 to 600 µg/L	Diazotization

Description	Range	Method
Nitrite LR (13 mm Vial)	0 to 600 µg/L	Diazotization
Nitrite MR (13 mm Vial)	0.00 to 6.00 mg/L	Diazotization
Nitrite HR	0 to 150 mg/L	Ferrous Sulfate
Nitrite, Marine ULR	0 to 200 µg/L	Diazotization
Nitrite, Seawater (13 mm Vial)	0 to 600 µg/L	Diazotization
Nitrogen, Total LR (13 mm Vial)	0.0 to 25.0 mg/L	Chromotropic Acid
Nitrogen, Total HR (13 mm Vial)	10 to 150 mg/L	Chromotropic Acid
Oxygen, Dissolved	0.0 to 10.0 mg/L	Winkler
Oxygen Scavengers (Carbohydrazide)	0.00-1.50mg/L	Iron Reduction
Oxygen Scavengers (DEHA)	0 to 1000 µg/L	Iron Reduction
Oxygen Scavengers (Hydroquinone)	0.00-2.50mg/L	Iron Reduction
Oxygen Scavengers (Isoascorbic Acid)	0.00-4.50mg/L	Iron Reduction
Ozone	0.00 to 2.00 mg/L	DPD
pH	6.5 to 8.5 pH	Phenol Red
Phenols (13 mm Vial)	0.00 to 5.00 mg/L	EPA 420.1
Phosphorus, Marine ULR	0 to 200 µg/L	Ascorbic Acid
Phosphate LR	0.00 to 2.50 mg/L	Ascorbic Acid
Phosphate HR	0.0 to 30.0 mg/L	Amino Acid
Phosphorus, Acid Hydrolyzable (13 mm Vial)	0.00 to 1.60 mg/L	Ascorbic Acid
Phosphorus, Reactive LR (13 mm Vial)	0.00 to 1.60 mg/L	Ascorbic Acid
Phosphorus, Reactive HR (13 mm Vial)	0.0 to 32.6 mg/L	Vanadomolybdophosphoric Acid
Phosphorus, Total LR (13 mm Vial)	0.00 to 1.60 mg/L	Ascorbic Acid
Phosphorus, Total HR (13 mm Vial)	0.0 to 32.6 mg/L	Vanadomolybdophosphoric Acid
Potassium LR	0.0 to 20.0 mg/L	Tetraphenylborate
Potassium MR	10 to 100 mg/L	Tetraphenylborate
Potassium HR	20 to 200 mg/L	Tetraphenylborate
Silica LR	0.00 to 2.00 mg/L	Heteropoly Blue
Silica HR	0 to 200 mg/L	EPA
Silver	0.000 to 1.000 mg/L	PAN
Sulfate	0 to 150 mg/L	Barium Chloride
Surfactants, Anionic	0.00 to 3.50 mg/L	EPA 425.1
Surfactants, Anionic (13 mm Vial)	0.00 to 3.50 mg/L	Adaptation of 5540C
Surfactants, Cationic (13 mm Vial)	0.00 to 2.50 mg/L	Bromophenol Blue
Surfactants, Nonionic (13 mm Vial)	0.00 to 6.00 mg/L	TBPE
Zinc	0.00 to 3.00 mg/L	Zincon

7. ACCESSORIES

7.1. REAGENT SETS

Ordering Information	Product Description
HI736-25	25 phosphorus marine ULR tests
HI755-26	25 alkalinity marine tests
HI758-26	25 calcium marine tests
HI764-25	25 nitrite marine ULR tests
HI775-26	25 alkalinity fresh water tests
HI782-25	25 nitrate marine HR tests
HI783-25	25 magnesium marine tests
HI93700-01	100 ammonia LR tests
HI93700-03	300 ammonia LR tests
HI93701-01	100 chlorine free LR tests (powder)
HI93701-03	300 chlorine free LR tests (powder)
HI93701-F	300 chlorine free LR tests (liquid)
HI93701-T	300 chlorine total LR tests (liquid)
HI93702-01	100 copper HR tests
HI93702-03	300 copper HR tests
HI93703-52	100 ozone tests
HI93703-57	Glycerol, (4) 30 mL
HI93704-01	100 hydrazine tests
HI93704-03	300 hydrazine tests
HI93705-01	100 silica LR tests
HI93705-03	300 silica LR tests
HI93707-01	100 nitrite LR tests
HI93707-03	300 nitrite LR tests
HI93708-01	100 nitrite HR tests
HI93708-03	300 nitrite HR tests
HI93709-01	100 manganese HR tests
HI93709-03	300 manganese HR tests
HI93710-01	100 pH tests
HI93710-03	300 pH tests
HI93711-01	100 chlorine total LR tests (powder)
HI93711-03	300 chlorine total LR tests (powder)
HI93712-01	100 aluminum tests
HI93712-03	300 aluminum tests
HI93713-01	100 phosphate LR tests
HI93713-03	300 phosphate LR tests
HI93714-01	100 cyanide tests

Ordering Information	Product Description
HI93714-03	300 cyanide tests
HI93715-01	100 ammonia MR tests
HI93715-03	300 ammonia MR tests
HI93716-01	100 bromine tests
HI93716-03	300 bromine tests
HI93717-01	100 phosphate HR tests
HI93717-03	300 phosphate HR tests
HI93718-01	100 iodine tests
HI93718-03	300 iodine tests
HI93719-01	100 hardness magnesium tests
HI93719-03	300 hardness magnesium tests
HI93720-01	100 hardness calcium tests
HI93720-03	300 hardness calcium tests
HI93721-01	100 iron HR tests
HI93721-03	300 iron HR tests
HI93722-01	100 cyanuric acid tests
HI93722-03	300 cyanuric acid tests
HI93723-01	100 chromium (VI) HR tests
HI93723-03	300 chromium (VI) HR tests
HI93726-01	100 nickel HR tests
HI93726-03	300 nickel HR tests
HI93728-01	100 nitrate tests
HI93728-03	300 nitrate tests
HI93729-01	100 fluoride LR tests
HI93729-03	300 fluoride LR tests
HI93730-01	100 molybdenum tests
HI93730-03	300 molybdenum tests
HI93731-01	100 zinc tests
HI93731-03	300 zinc tests
HI93732-01	100 dissolved oxygen tests
HI93732-03	300 dissolved oxygen tests
HI93733-01	100 ammonia HR tests
HI93733-03	300 ammonia HR tests
HI93734-01	100 chlorine free and total HR tests
HI93734-03	300 chlorine free and total HR tests
HI93735-01	100 hardness total MR tests (200 to 500 mg/L)
HI93735-02	100 hardness total HR tests (400 to 750 mg/L)
HI93735-0	300 hardness total tests (LR - 100 tests, MR - 100 tests, HR - 100 tests)

Ordering Information	Product Description
HI93735-00	100 hardness total LR tests (0 to 250 mg/L)
HI93737-01	50 silver tests
HI93737-03	150 silver tests
HI93738-01	100 chlorine dioxide tests
HI93738-03	300 chlorine dioxide tests
HI93739-01	100 fluoride HR tests
HI93739-03	300 fluoride HR tests
HI93740-01	50 nickel LR tests
HI93740-03	150 nickel LR tests
HI93746-01	50 iron LR tests
HI93746-03	150 iron LR tests
HI93748-01	50 manganese LR tests
HI93748-03	150 manganese LR tests
HI93749-01	100 chromium (VI) LR tests
HI93749-03	300 chromium (VI) LR tests
HI93750-01	100 potassium LR, MR, HR tests
HI93750-03	300 potassium LR, MR, HR tests
HI93751-01	100 sulfate tests
HI93751-03	300 sulfate tests
HI937520-01	50 magnesium tests
HI937520-03	150 magnesium tests
HI937521-01	50 calcium fresh water tests
HI937521-03	150 calcium fresh water tests
HI93753-01	100 chloride tests
HI93753-03	300 chloride tests
HI93754A-25	24 chemical oxygen demand LR EPA tests (Vial)
HI93754B-25	24 chemical oxygen demand MR EPA tests (Vial)
HI93754C-25	24 chemical oxygen demand HR EPA tests (Vial)
HI93754D-25	24 chemical oxygen demand LR Hg free tests (Vial)
HI93754E-25	24 chemical oxygen demand MR Hg free tests (Vial)
HI93754F-25	24 chemical oxygen demand LR ISO tests (Vial)
HI93754G-25	24 chemical oxygen demand MR ISO tests (Vial)
HI93754J-25	24 chemical oxygen demand UHR tests (Vial)
HI93757-01	100 ozone tests
HI93757-03	300 ozone tests
HI93758A-50	50 phosphorus reactive LR tests (Vial)
HI93758B-50	50 phosphorus acid hydolyzable tests (Vial)
HI93758C-50	50 phosphorus total LR tests (Vial)

Ordering Information	Product Description
HI93763A-50	49 phosphorus reactive HR tests (Vial)
HI93763B-50	49 phosphorus total HR tests (Vial)
HI93764A-25	25 ammonia LR tests (Vial)
HI93764B-25	25 ammonia HR tests (Vial)
HI93766-50	50 nitrate tests (Vial)
HI93767A-50	49 nitrogen total LR tests (Vial)
HI93767B-50	49 nitrogen total HR tests (Vial)
HI95747-01	100 copper LR tests
HI95747-03	300 copper LR tests
HI95761-01	100 chlorine total ULR tests
HI95761-03	300 chlorine total ULR tests
HI95762-01	100 chlorine free ULR tests
HI95762-03	300 chlorine free ULR tests
HI95769-01	40 surfactants anionic tests
HI96770-01	100 silica HR tests
HI96770-03	300 silica HR tests
HI95771-01	100 chlorine total UHR tests
HI95771-03	300 chlorine total UHR tests
HI96773-01	50 oxygen scavengers tests
HI96773-03	150 oxygen scavengers tests
HI96779-01	100 chlorine dioxide (rapid) tests
HI96779-03	300 chlorine dioxide (rapid) tests
HI96781-25	25 chromium VI/total tests (Vial)
HI96776-01	100 iron(II) tests
HI96776-03	300 iron(II) tests
HI96778-25	25 total iron tests (Vial)
HI96780-25	24 surfactants, nonionic tests (Vial)
HI96782-25	25 surfactants, anionic tests (Vial)
HI96783-25	25 nitrite LR tests (Vial)
HI96784-25	25 nitrite MR tests (Vial)
HI96785-25	25 surfactants, cationic tests (Vial)
HI96786-25	25 iron tests (Vial)
HI96788-25	25 phenol tests (Vial)
HI96789-25	25 nitrite in seawater tests (Vial)
HI96791-25	25 ammonia LR ISO tests (Vial)

7.2. OTHER ACCESSORIES

Ordering Information	Product Description
HI731311	Vial 13 mm diam (5 pcs.)
HI731318	Cloth for wiping cuvettes (4 pcs.)
HI731321	Glass cuvettes 16 mm diam (4 pcs.)
HI731225	Cap for 16 mm cuvette (4 pcs.)
HI731331	Glass cuvettes 22 mm diam (4 pcs.)
HI731335N	Cap for cuvette 22 mm cuvette (4 pcs.)
HI731339P	100 µL automatic pipette
HI731349P	Pipette tip for 100 µL graduated pipette (10 pcs.)
HI731340	200 µL automatic pipette
HI731350	Pipette tip for 200 µL graduated pipette (25 pcs.)
HI731341	1000 µL automatic pipette
HI731351	Pipette tip for 1000 µL graduated pipette (25 pcs.)
HI731342	2000 µL automatic pipette
HI731352	Pipette tip for 2000 µL graduated pipette (4 pcs.)
HI740034P	Cap for 100 mL beaker (10 pcs.)
HI740036P	100 mL plastic beaker (10 pcs.)
HI740038	60 mL glass bottle and stopper
HI740142P	1 mL graduated syringe (10 pcs)
HI740143	1 mL graduated syringe (6 pcs.)
HI740144P	Pipette tip for 1 mL graduated syringe (10 pcs.)
HI740157P	Plastic refilling pipette (20 pcs.)
HI740216	Cooling rack
HI740217	Safety shield for reactor
HI740220	25 mL glass mixing vial (2 pcs.)
HI740225	60 mL graduated syringe
HI740226	5 mL graduated syringe
HI740227	Filter assembly
HI740228	Filter discs (25 pcs.)
HI740229	100 mL graduated cylinder
HI740230	Demineralized water (230 mL)
HI7408011	16 mm cuvette adapter
HI7408012	10 mm cuvette adapter

Ordering Information	Product Description
HI7408014	Replacement tungsten halogen lamp for HI801 and HI802 iris® spectrophotometers
HI7408015	Replacement battery for HI801 and HI802 iris® spectrophotometers
HI7408018	Cuvette adapter with barcode scanner for HI802
HI801-11	Holmium Oxide Filter for wavelength accuracy verification, with certificate
HI83300-100	Sample preparation kit consisting of activated carbon for 50 tests, demineralizer bottle for 10 L of water, 100 mL graduated beaker with cap, 170 mL graduated beaker with cap, 3 mL pipette, 60 mL syringe, 5 mL syringe, graduated cylinder, spoon, funnel, filter paper (25 pcs.).
HI839800-01	Reactor, 115 VAC (USA plug)
HI839800-02	Reactor, 230 VAC (European plug)
HI93703-50	Cuvette cleaning solution (250 mL)
HI93703-55	Activated carbon (50 pcs.)
HI75110/15	115 VAC to 15 VDC power adapter, USA plug
HI75220/15	230 VAC to 15 VDC power adapter, European plug

CERTIFICATION

All Hanna® instruments conform to the **CE European Directives** and **UK Standards.**

Disposal of Electrical & Electronic Equipment. The product should not be treated as household waste. Instead, hand it over to the appropriate collection point for the recycling of electrical and electronic equipment, which will conserve natural resources.

Disposal of waste batteries. This product contains batteries, do not dispose of them with other household waste. Hand them over to the appropriate collection point for recycling.
Ensuring proper product and battery disposal prevents potential negative consequences for the environment and human health. For more information, contact your city, your local household waste disposal service, or the place of purchase.

RECOMMENDATIONS FOR USERS

Before using this product, make sure it is entirely suitable for your specific application and for the environment in which it is used. Any variation introduced by the user to the supplied equipment may degrade the photometer's performance. For your and the meter's safety do not use or store the meter in hazardous environments.

WARRANTY

The HI802 iris® spectrophotometer is warranted for two years against defects in workmanship and materials when used for its intended purpose and maintained according to instructions. This warranty is limited to repair or replacement free of charge. Damage due to accidents, misuse, tampering, or lack of prescribed maintenance is not covered.

If service is required, contact your local Hanna Instruments® office. If under warranty, report the model number, date of purchase, serial number (engraved on the bottom of the meter), and the nature of the problem. 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 (RGA) number from the Technical Service department and then send it with shipping costs prepaid. When shipping any instrument, make sure it is properly packed for complete protection.