# HI801

iris

# VISIBLE SPECTROPHOTOMETER FACTORY METHODS


INSTRUCTION MANUAL

HANNA instruments

## Dear Customer,

Thank you for choosing a Hanna Instruments product.

Please read this instruction manual carefully before using this instrument. This manual will provide you with the necessary information for correct use of this instrument, as well as a precise idea of its versatility.

If you need additional technical information, do not hesitate to e-mail us at tech@hannainst.com or view our worldwide contact list for a Hanna Instruments representative near you at www.hannainst.com.

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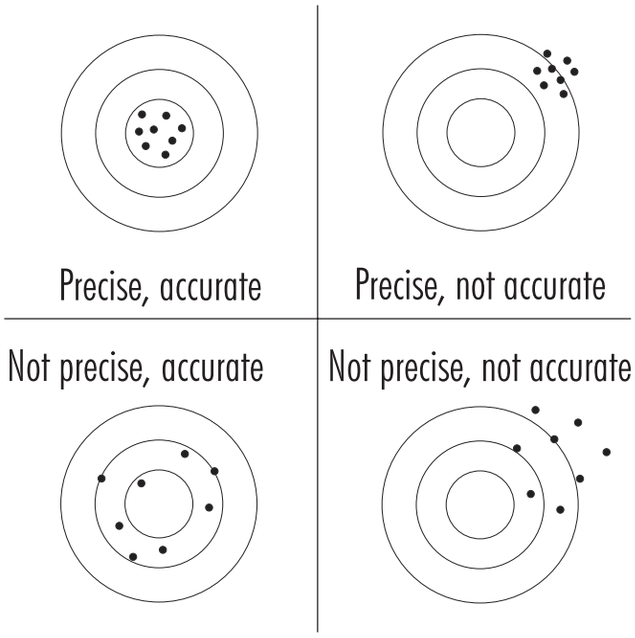
# 1. SAFETY MEASURES

- The chemicals contained in the reagent kits may be hazardous if improperly handled.
- Read the Safety Data Sheets (SDS) 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.

# 2. PRECISION AND ACCURACY

Precision is how closely repeated measurements are to one another. Precision is usually expressed as standard deviation (SD).
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. The adjacent figure explains these definitions.
For each method, the accuracy is expressed in the related measurement section.




# 3. METHODS

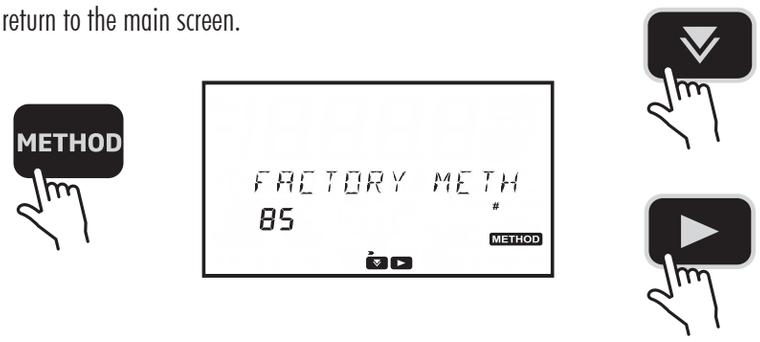
## 3.1. METHOD SELECTION

In order to run an analysis a method needs to be loaded. The following options are available in the methods menu: **FACTORY METHODS**, **USER METHODS**, **FAVORITE METHODS**, and **CREATE NEW**.

Use the ▲ or ▼ key to select factory methods.

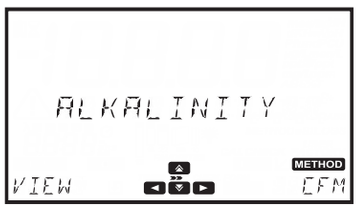
Press the ▶ key to enter the Factory Method menu.

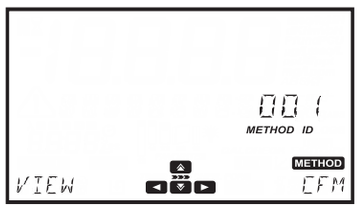
Press the METHOD key to return to the main screen.



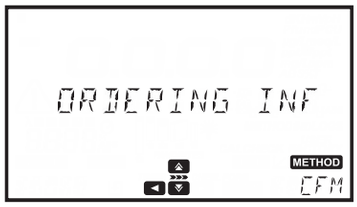

Up to 150 factory methods can be stored on the instrument. The number of methods will be displayed on the lower left side of the screen. Use the ▲ or ▼ key to scroll through the methods.

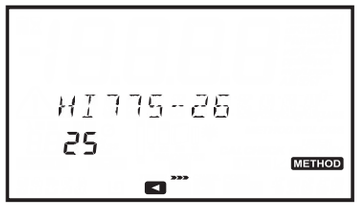
To view the methods by ID press the **VIEW** key.
Press the **CFM** key to load the selected method.



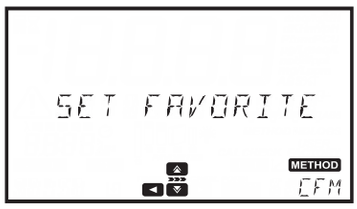




To view the ordering information or to mark the method as a favorite (if enabled) press the ▶ key.
Use the ▲ or ▼ to view the available options.
To view the ordering information press the **CFM** key with "ordering Info" is displayed.




To add the method to the favorites list press the **CFM** key when "Set Favorite" is displayed. If the method is all ready marked as a favorite "Clear Favorite" is displayed.





Press the ◀ key to return to the method list.

# 4. COLLECTING AND MEASURING SAMPLES AND REAGENTS

## 4.1. 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. The following fixed-volume pipettes are available from Hanna:

| HI Code | Volume |
|---|---|
| HI731339 | 100µL |
| HI731340 | 200µL |
| HI731341 | 1000µL |
| HI731342 | 2000µL |

Proper use of automatic fixed-volume pipette:

(a) Attach the pipette tip. Press the button down to the first stop.

(b) Immerse the pipette tip in the liquid approximately 2-3 mm.

(c) Slowly let the button move back to the original position, wait 2 seconds.

(d) Remove the pipette tip from the liquid.

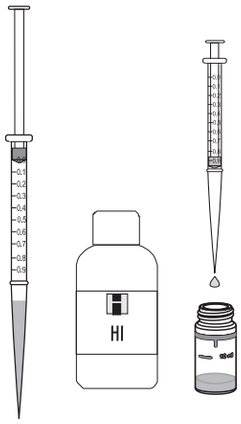
(e) To dispense the liquid, place the pipette tip on the inside wall of the container.

(f) Slowly press the button down to the first stop.

(g) Wait until all of the liquid has been dispensed.

(h) Press the button down to the second stop, this will allow any remaining liquid to be dispensed.

## 4.2. PROPER USE OF SYRINGE




(a) Push the plunger completely into the syringe and insert the tip into the solution.

(b) Pull the plunger up until the lower edge of the seal is exactly on the mark for the desired volume.

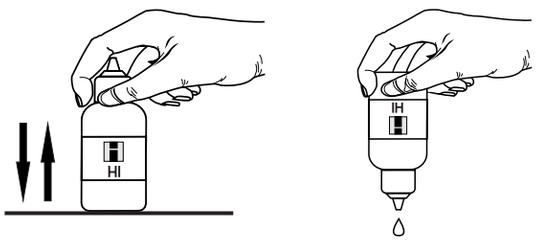
(c) Take out the syringe and clean the outside of the syringe tip, be sure that no drops are hanging on the tip of the syringe.

(d) Then, while keeping the syringe in a vertical position above the cuvette, push the plunger down into the syringe, the desired volume has been delivered into the cuvette.

## 4.3. PROPER USE OF DROPPER

(a) For reproducible results, tap the dropper on the table several times and wipe the outside of the tip with a cloth.

(b) Always keep the dropper bottle in a vertical position while dosing the reagent.

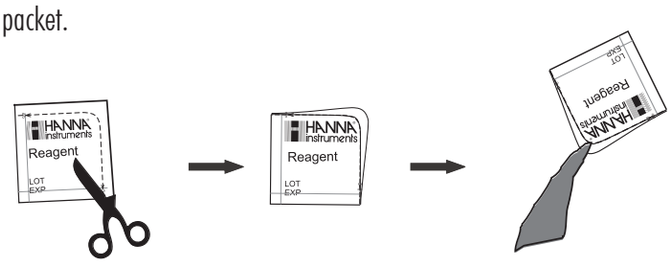


## 4.4. PROPER USE OF POWDER PACKET

(a) Use scissors to open the powder packet.

(b) Push the edges of the packet to form a spout.

(c) Pour out the content of the packet.

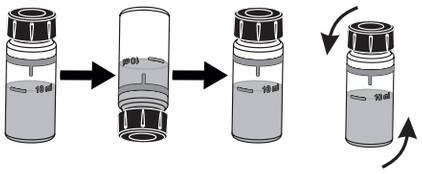



## 5. CUVETTE PREPARATION

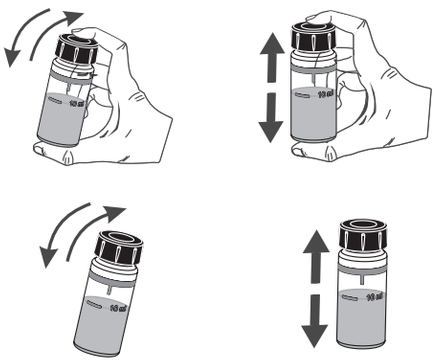
Proper mixing is very important for reproducibility of the measurements. The proper mixing technique for each method is listed in the method procedure.

(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 cuvette bottom. This is one inversion. The correct speed for this mixing technique is 10-15 complete inversions in 30 seconds.

This mixing technique is indicated with "invert to mix" and the following icon:

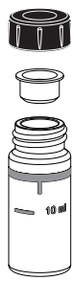


(b) Shaking the cuvette, moving the cuvette up and down. The movement may be gentle or vigorous. This mixing method is indicated with "shake gently" or "shake vigorously", accompanied by one of the following icons:



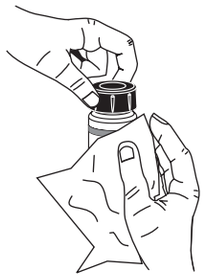
*shake gently* *shake vigorously*

In order to avoid reagent leaking and to obtain more accurate measurements, close the cuvette first with the supplied 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 or dirt. Wipe it thoroughly with HI731318 or a lint-free cloth 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).

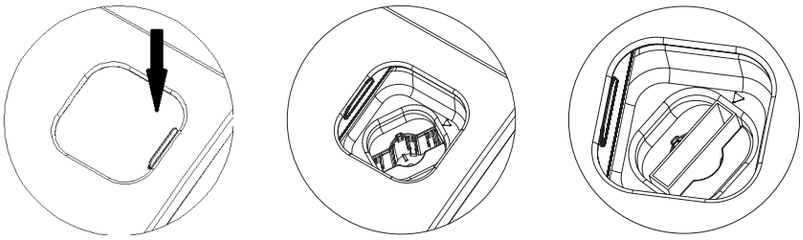


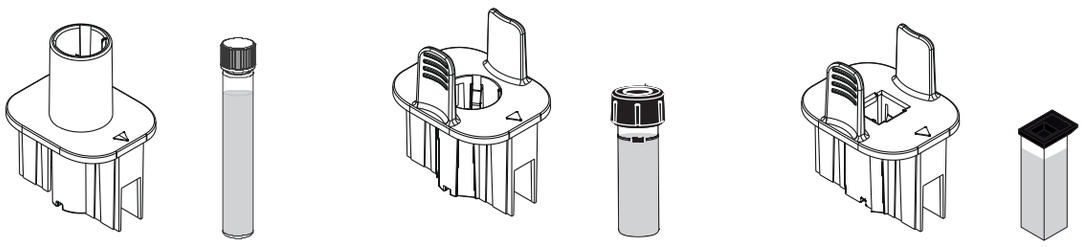
## 6. CUVETTE ADAPTERS

The HI801 iris spectrophotometer is designed to work with five different cuvettes:

- 22 mm round
- 16 mm round
- 13 mm vial
- 10 mm square
- 50 mm rectangular

The meter is supplied with three cuvette adapters:





adapter for 13 mm vial

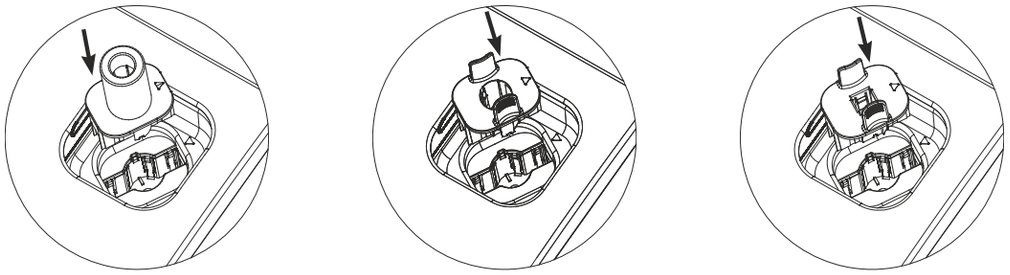
adapter for 16 mm cuvette

adapter for 10 mm square cuvette

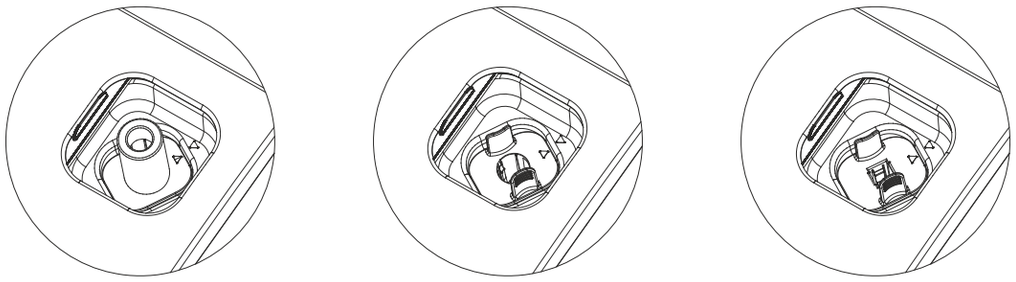
*Note: The 22 mm round and 50 mm rectangular cuvettes do not require adapters. The cuvettes can be directly inserted into the meter.*

To prepare the meter for the use of adapters:

1. Open the meter's lid.
2. Select the adapter according to the cuvette type required by the selected method.
3. Insert the adapter with the direction mark pointing to the mark located inside the meter.



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



5. The meter is ready for use. Always use the selected adapter for both "**ZERO**" and "**READ**" measurements as specified in the parameter instructions.

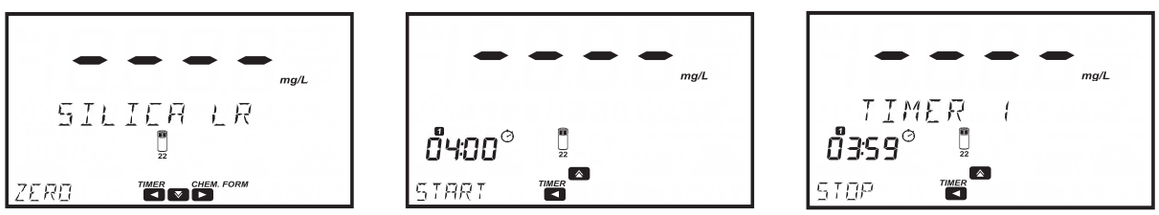
*Note: The meter's lid can't be closed while using the 13 mm vial adapter. This is normal, the vial adapter itself will block out all external light.*

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

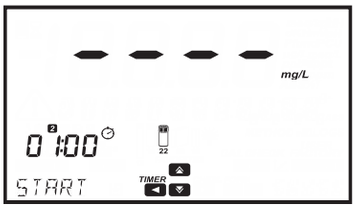
- Never use excessive force to insert the adapter. You should be able to insert the vial with light pressure. If the vial is not reaching the bottom, if there is large resistance, or if you are receiving a "light low" error during the "ZERO" operation, re-check that the arrow shape marks are aligned on the adapter and meter.
- Never insert hot vials/samples into the vial adapter. Samples should be near room temperature before inserting into the meter/adapter.
- Do not attempt to close the sample cover while using the 13 mm vials adapter.

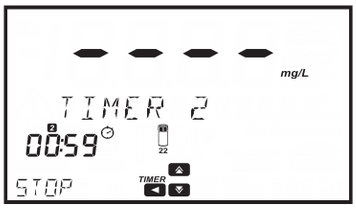
## 7. TIMERS

Each method requires a different measurement procedure.
If a timer or timers 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 the **START** key to start Timer 1, the display will show the countdown. To stop and reset the timer, press the **STOP** key.

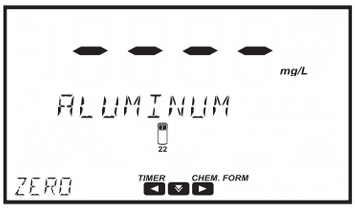


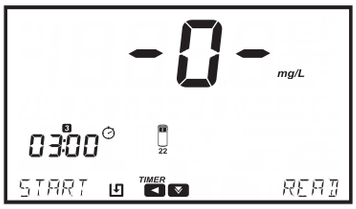
If the method requires more than one timer. Press the ◄ key to access the timer menu and press the ▲ key to select Timer 2 through Timer 5.




When the timer has expired press the **ZERO** or **READ** key to continue. If the timer beeper is enabled a long beep will be heard when the timer reaches "00:00".




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



## 8. CHEMICAL FORMULA / UNIT CONVERSION

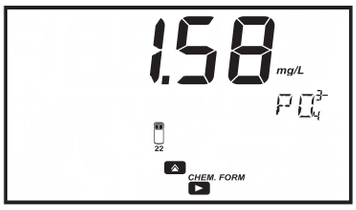
Chemical formulas and conversion factors are preprogrammed into the instrument and are method specific (factory method only).

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.




# 9. METHOD PROCEDURES

## 9.1. 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 |

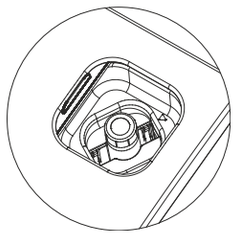
For other accessories see page 236.

### MEASUREMENT PROCEDURE

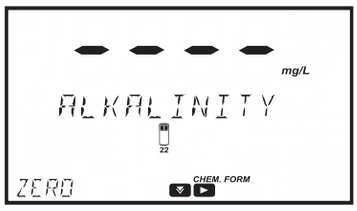
• Select the Alkalinity method using the procedure described in the Method Selection section (see page 6).

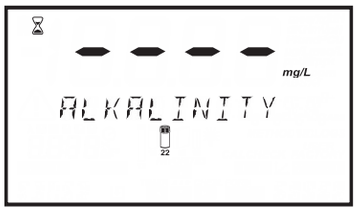
• Fill the cuvette with 10 mL of unreacted sample (up to the mark) and replace the cap.

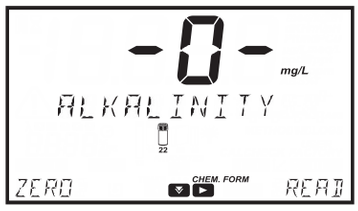

• Place the cuvette into the holder and close the lid.



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

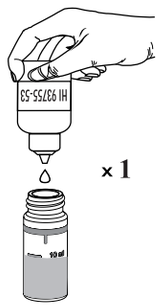


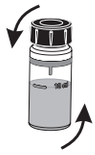

• Remove the cuvette.

*Note: Any chlorine present in the sample will interfere with the reading. To remove the chlorine interference add one drop of HI93755-53 Chlorine Removal Reagent to the unreacted sample.*

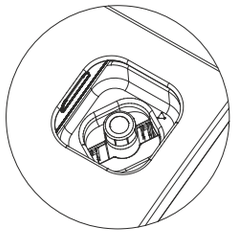


• Add 1mL of HI775S Alkalinity Reagent to the sample using a 1 mL syringe.

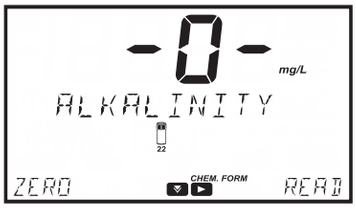

• Replace the cap and invert 5 times.

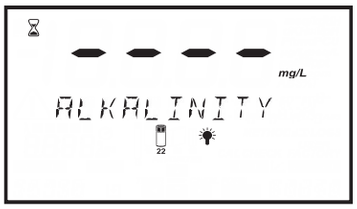


• Reinsert the cuvette into the instrument and close the lid.



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

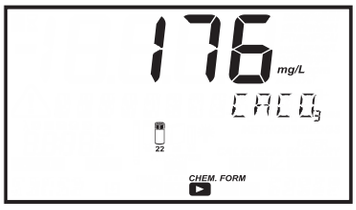




• Press the ▼▼ key to access the second level functions (wavelength, method ID, date and time).

• Press the ▶ key to view the chemical formula.




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

## 9.2. 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 page 236.

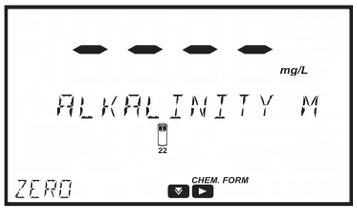
### MEASUREMENT PROCEDURE

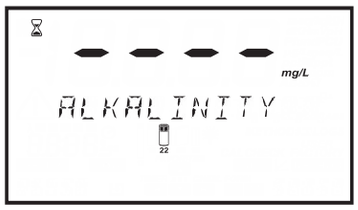
• Select the Alkalinity Marine method using the procedure described in the Method Selection section (see page 6).

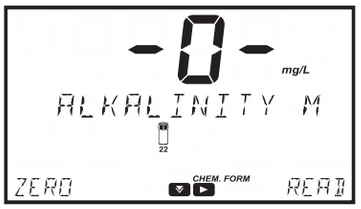
• Fill the cuvette with 10 mL of unreacted sample (up to the mark) and replace the cap.


• Place the cuvette into the holder and close the lid.

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



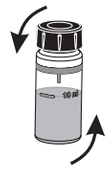



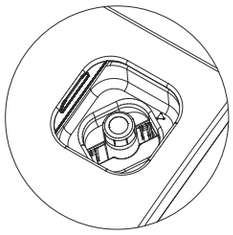

• Remove the cuvette.

• Add 1mL of HI755S Alkalinity Reagent to the sample using a 1 mL syringe.

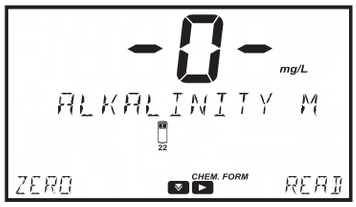
• Replace the cap and gently invert 5 times.

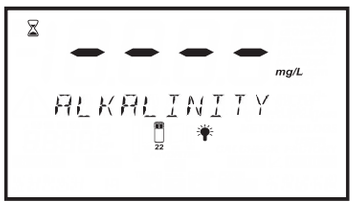


• Reinsert the cuvette into the instrument and close the lid.



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



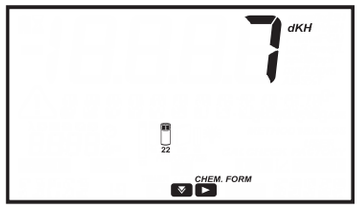





• Press the ▼▼ key to access the second level functions (wavelength, method ID, date and time).

• Press the ▶ key to view the chemical formula.

• Press the ▲▲ key in the chemical formula screen to convert the results to **degree carbonate hardness (dKH)**.


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

## 9.3. 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 page 236.

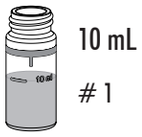
### MEASUREMENT PROCEDURE

- Select the Aluminum method using the procedure described in the Method Selection section (see page 6).

- Fill a graduated beaker with 50 mL of sample.

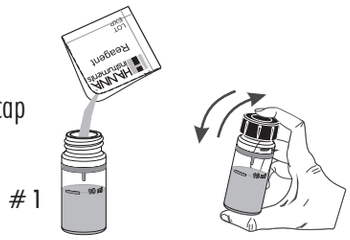

- Add one packet of HI93712A-0 Aluminum Reagent A and mix until completely dissolved.


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

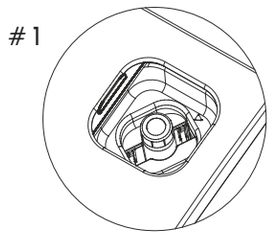




- Fill two cuvettes with 10 mL of sample (up to the mark).



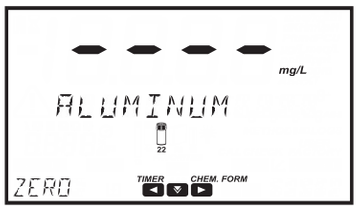

- Add one packet of HI93712C-0 Aluminum Reagent C to one cuvette (#1). Replace the cap and shake gently until completely dissolved. This is the blank.

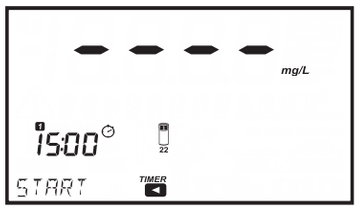


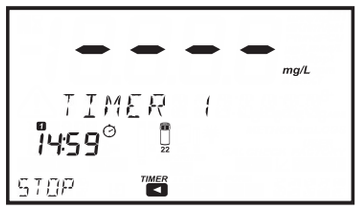

• Place the first cuvette (#1) into the holder and close the lid.

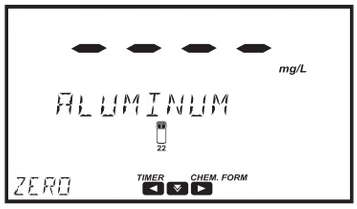
• Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 15 minutes.

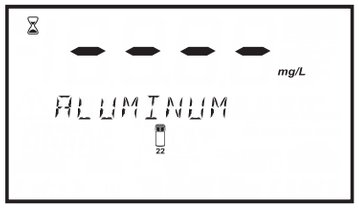
• Press the **ZERO** key, the display will show "-0-" when the meter is zeroed and ready for measurement.

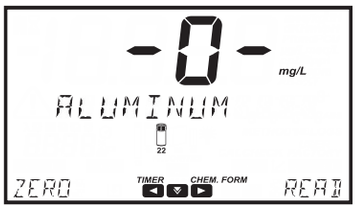


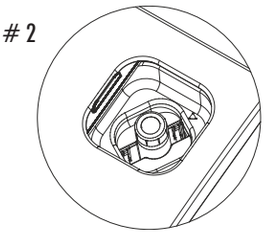



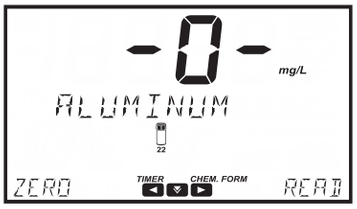



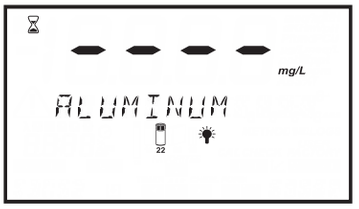




• Remove the blank and insert the second cuvette (#2) into the instrument and close the lid.

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



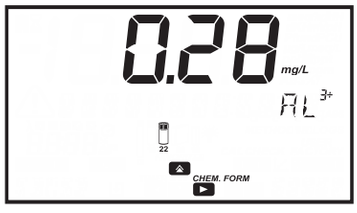





• Press the ▼▼ key to access the second level functions (wavelength, method ID, date and time).

• Press the ► key to view the chemical formula.

• Press the ▲▲ key in the chemical formula screen to convert the results to **mg/L aluminum oxide ($Al_2O_3$)**.




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

## INTERFERENCES

Interference may be caused by:
Iron above 20 mg/L
Alkalinity above 1000 mg/L
Phosphate above 50 mg/L
Fluoride must be absent

## 9.4. 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

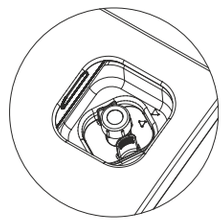
| | |
|---|---|
| HI93700-01 | Reagents for 100 tests |
| HI93700-03 | Reagents for 300 tests |

For other accessories see page 236.

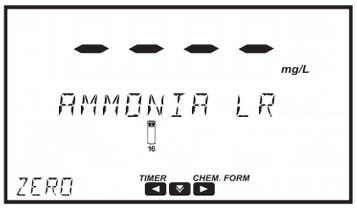
### MEASUREMENT PROCEDURE

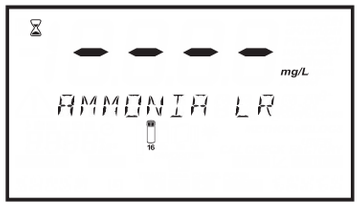
- Select the Ammonia LR method using the procedure described in the Method Selection section (see page 6).
- Fill the cuvette with 10 mL of unreacted sample (up to the mark) and replace the cap.

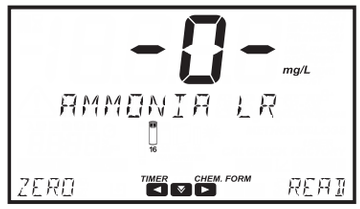

- Insert the 16mm cuvette adapter using the procedure described in the Cuvette Adapters section (see page 10).



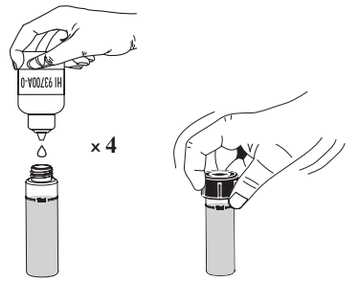
- Place the cuvette into the holder sample and close the lid.
- Press the **ZERO** key. The display will show "-0-" when the meter is zeroed and ready for measurement.



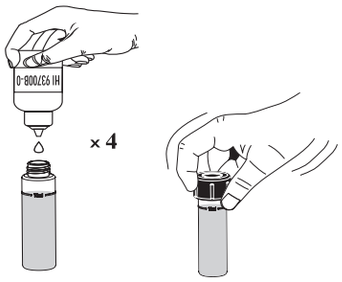



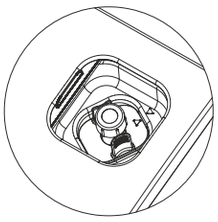

- Remove the cuvette.
- Add 4 drops of HI93700A-0 Ammonia Low Range Reagent A. Replace the cap and mix the solution.



• Add 4 drops of HI93700B-0 Ammonia Low Range Reagent B. Replace the cap and mix the solution.

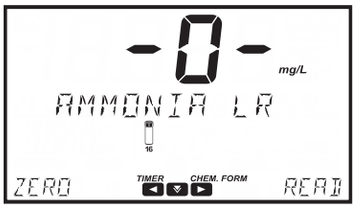


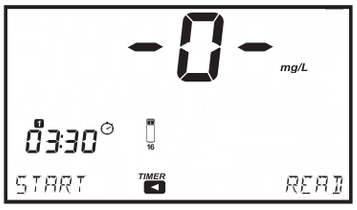

• Reinsert the cuvette into the instrument and close the lid.

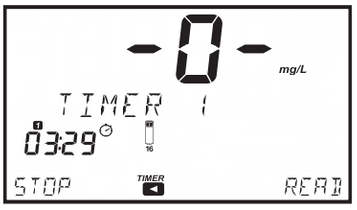


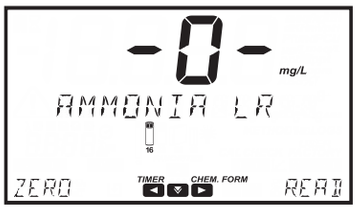
• Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 3 minutes and 30 seconds.

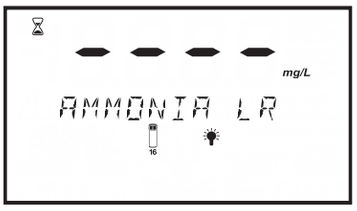
• Press the **READ** key, the meter displays the results in **mg/L of ammonia nitrogen ($NH_3$-N)**.

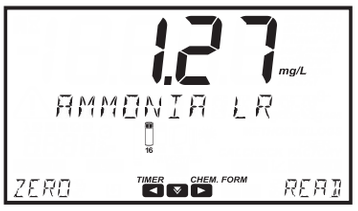


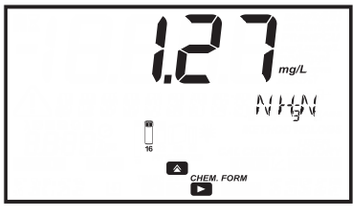



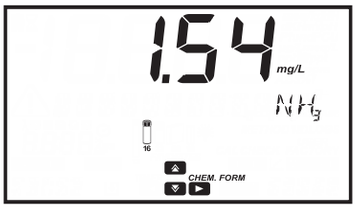



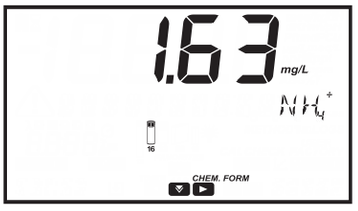

• Press the ▼ key to access the second level functions (wavelength, method ID, date and time).

• Press the ► key to view the chemical formula.

• Press the ▲ key in the chemical formula screen to convert the results to **mg/L ammonia ($NH_3$) or ammonium ($NH_4^+$)**.




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

## INTERFERENCE

Interference may be caused by:

Acetone, Alcohols, Aldehydes, Glycine, Hardness above 1 g/L, Iron, Organic chloramines, Sulfide, Various aliphatic and aromatic amines.

## 9.5. 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: A LR, white label

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

### REAGENT SETS

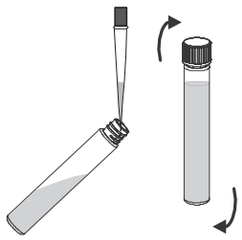
HI93764A-25 Reagents for 25 tests

For other accessories see page 236.

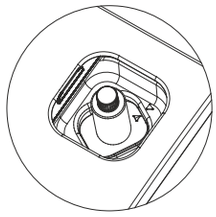
### MEASUREMENT PROCEDURE

- Select the Ammonia LR (13 mm) method following one of the procedures described in the Method Selection section (see page 6).

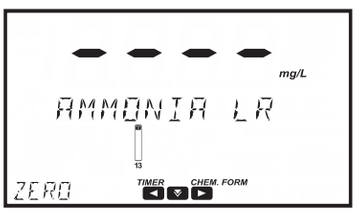
- Insert the 13 mm vial adapter using the procedure described in the Cuvette Adapters section (see page 10).
- Remove the cap from HI93764A-0 Ammonia Low Range Reagent Vial.

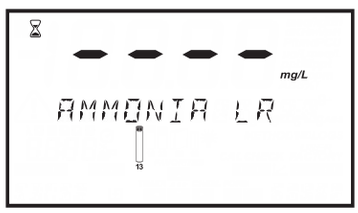


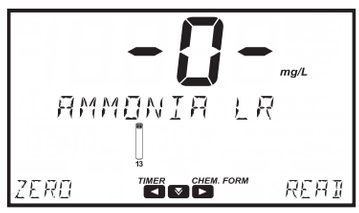
- Add 5.0 mL of sample to the vial, while keeping the vial at a 45-degree angle.
- Replace the cap and invert several times to mix.
- Place the vial into the holder.

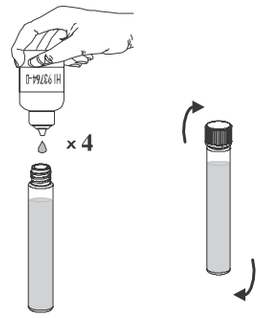


- Press the **ZERO** key. The display will show "-0-" when the meter is zeroed and ready for measurement.



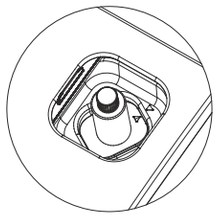



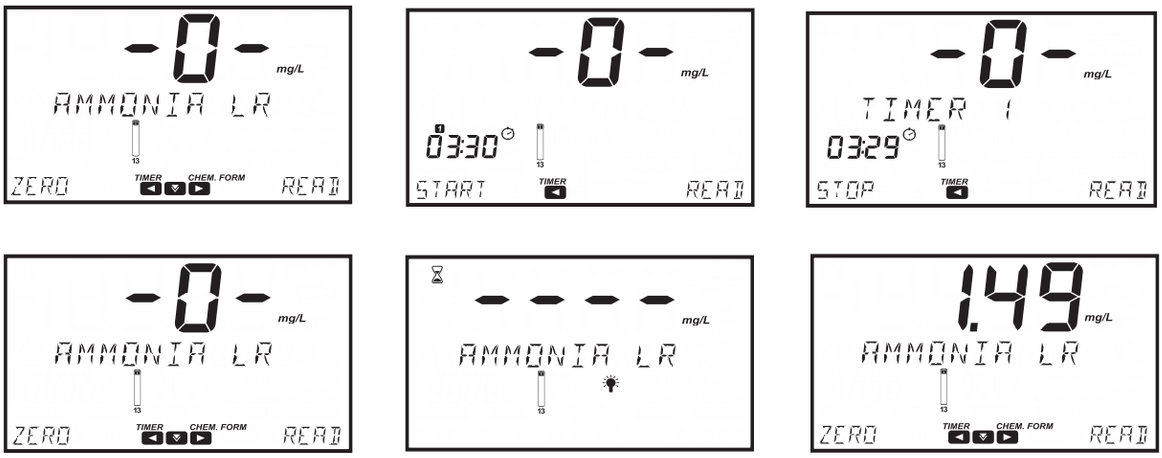



- Remove the vial.
- Remove the cap and add 4 drops of HI93764-0 Nessler Reagent.
- Replace the cap and invert the vial several times to mix.

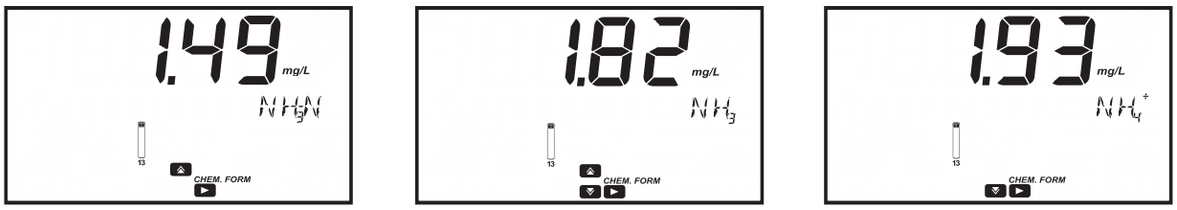
- Place the vial into the holder.



- Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 3 minutes and 30 seconds.
- Press the **READ** key, the meter displays the results in **mg/L of ammonia nitrogen ($NH_3$-N)**.




- Press the ▼ key to access the second level functions (wavelength, method ID, date and time).
- Press the ► key to view the chemical formula.
- Press the ▲ key in the chemical formula screen 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:
Organic compounds like: chloramines, various aliphatic and aromatic amines, glycine or urea above 10 ppm (to eliminate these interferences distillation is required).
Organic compounds like: aldehydes, alcohols (e.g. ethanol), or acetone above 0.1%. (to eliminate these interferences distillation is required). Sulfide: may cause turbidity.

## 9.6. 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 |
| 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

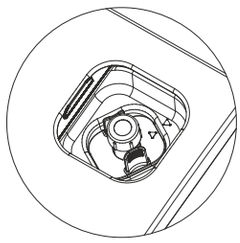
| | |
|---|---|
| HI93715-01 | Reagents for 100 tests |
| HI93715-03 | Reagents for 300 tests |

For other accessories see page 236.

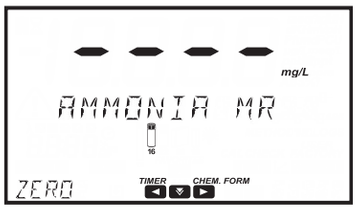
### MEASUREMENT PROCEDURE

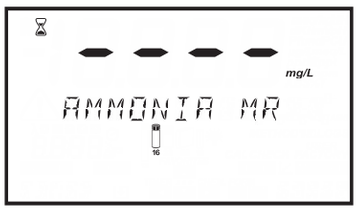
- Select the Ammonia MR method using the procedure described in the Method Selection section (see page 6).
- Fill the cuvette with 10 mL of unreacted sample (up to the mark) and replace the cap.

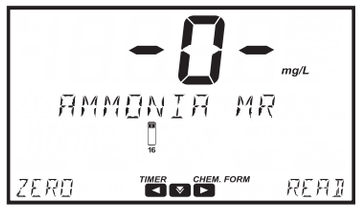

- Insert the 16 mm cuvette adapter using the procedure described in the Cuvette Adapters section (see page 10).
- Place the cuvette into the holder and close the lid.



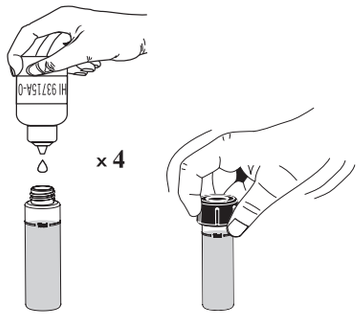
- Press the **ZERO** key. The display will show "-0-" when the meter is zeroed and ready for measurement.



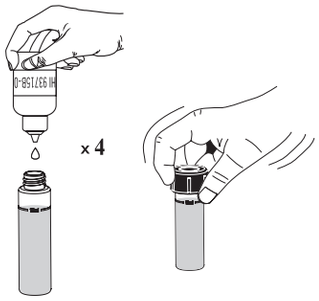



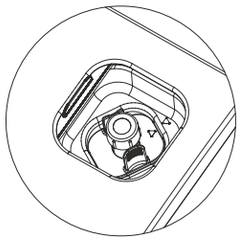

- Remove the cuvette.
- Add 4 drops of HI93715A-0 Ammonia Medium Range Reagent A. Replace the cap and mix the solution.



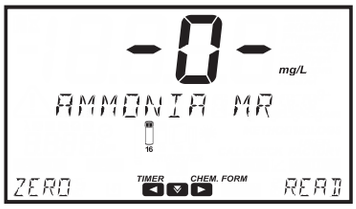
- Add 4 drops of HI93715B-0 Ammonia Medium Range Reagent B. Replace the cap and mix the solution.

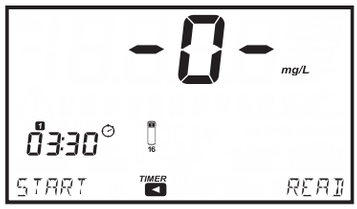


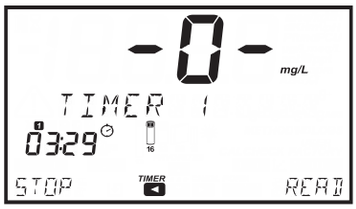

- Reinsert the cuvette into the instrument and close the lid.

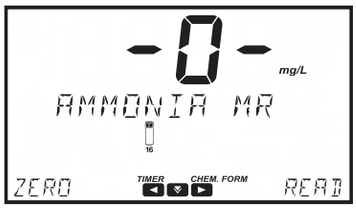


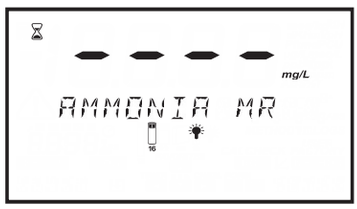
- Press the ◀ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 3 minutes and 30 seconds.
- Press the **READ** key, the meter displays the results in **mg/L of ammonia nitrogen ($NH_3$-N)**.



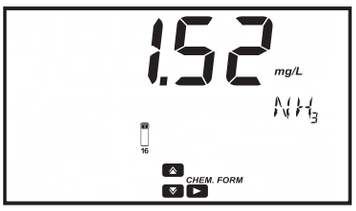



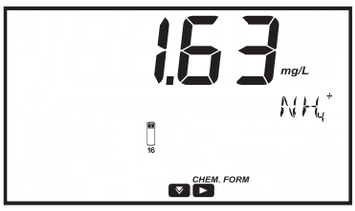





- Press the ▼ key to access the second level functions (wavelength, method ID, date and time).
- Press the ▶ key to view the chemical formula.
- Press the ▲ key in the chemical formula screen to convert the results to **mg/L ammonia ($NH_3$) or ammonium ($NH_4^+$)**.


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

## INTERFERENCES

Interference may be caused by:
Acetone, Alcohols, Aldehydes, Glycine, Hardness above 1 g/L, Iron, Organic chloramines, Sulfide, Various aliphatic and aromatic amines.

## 9.7. 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 |

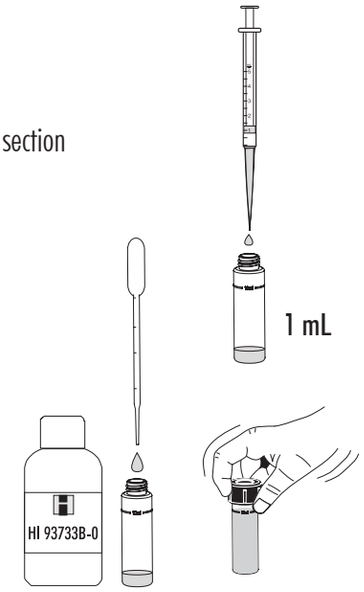
### REAGENT SETS

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

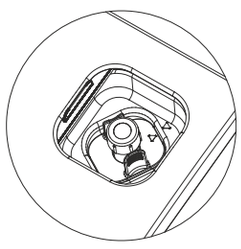
For other accessories see page 236.

### MEASUREMENT PROCEDURE

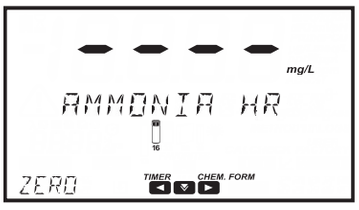
- Select the Ammonia HR method using the procedure described in the Method Selection section (see page 6).
- Add 1mL of unreacted sample to the cuvette using 1mL syringe.

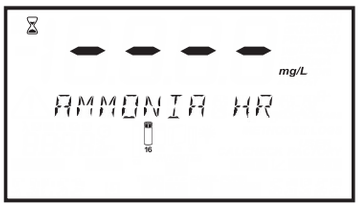


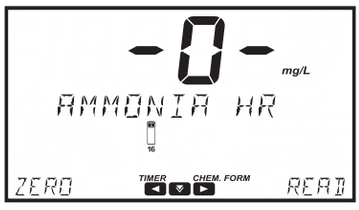

- Insert the 16 mm cuvette adapter using the procedure described in the Cuvette Adapters section (see page 10).
- Use the pipette to fill the cuvette up to the 10 mL mark with HI93733B-0 Ammonia High Range Reagent B. Replace the cap and mix the solution.
- Place the cuvette into the holder and close the lid.



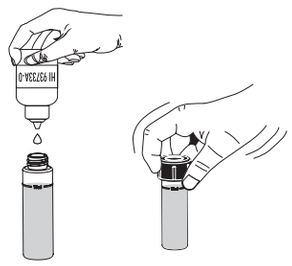
- Press the **ZERO** key. The display will show "-0-" when the meter is zeroed and ready for measurement.



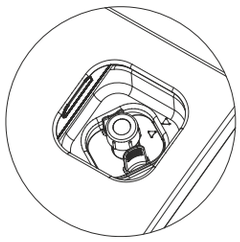




- Remove the cuvette.

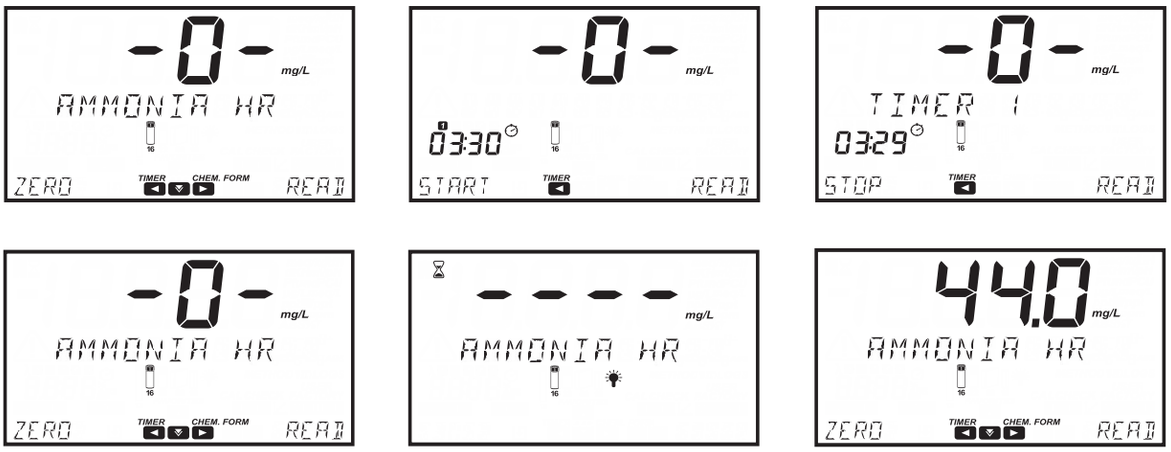


- Add 4 drops of HI93733A-0 Ammonia High Range Reagent A. Replace the cap and swirl the solution.

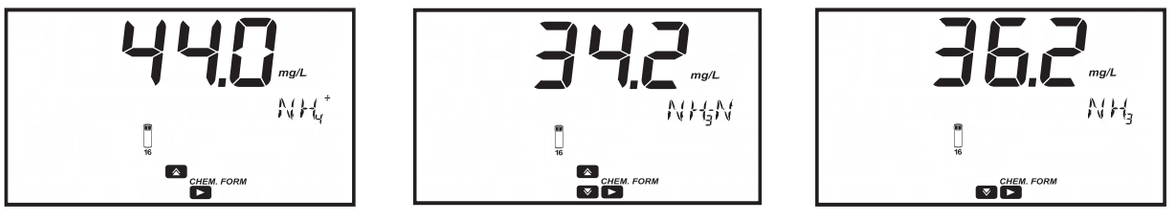


- Reinsert the cuvette into the instrument and close the lid.

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




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




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

## INTERFERENCES

Interference may be caused by:
Acetone, Alcohols, Aldehydes, Glycine, Hardness above 1 g/L, Iron, Organic chloramines, Sulfide, various aliphatic and aromatic amines.

## 9.8. 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: A HR, green label.

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

### REAGENT SETS

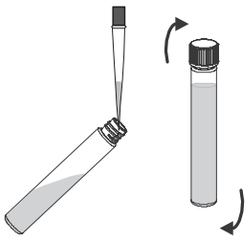
HI93764B-25 Reagents for 25 tests

For other accessories see page 236.

### MEASUREMENT PROCEDURE

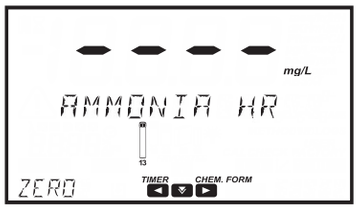
- Select the Ammonia HR (13 mm) method using the procedure described in the Method Selection section (see page 6).

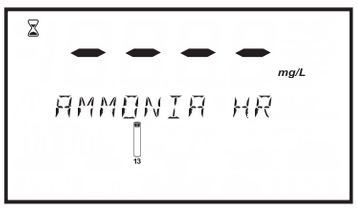
- Insert the 13 mm vial adapter using the procedure described in the Cuvette Adapters section (see page 10).
- Remove the cap from HI93764B-0 Ammonia High Range Reagent Vial.

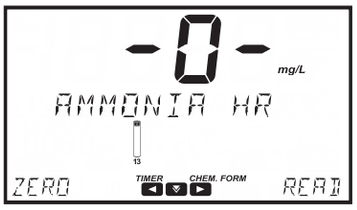


- Add 1.0 mL of sample to the vial, while keeping the vial at a 45-degree angle.
- Replace the cap and invert several times to mix.
- Place the vial into the holder.

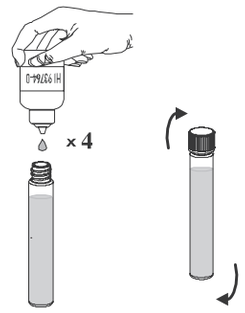
- Press the **ZERO** key. The display will show "-0-" when the meter is zeroed and ready for measurement.



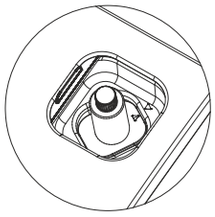




- Remove the vial.

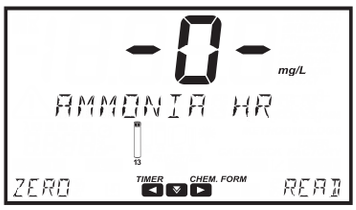


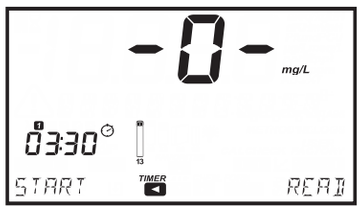

- Add 4 drops of HI93764-0 Nessler Reagent.
- Replace the cap and invert several times to mix.

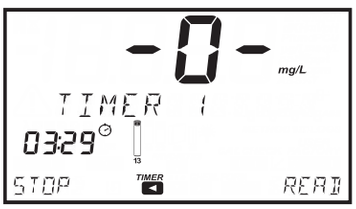


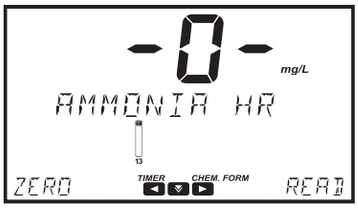
- Place the vial into the holder.

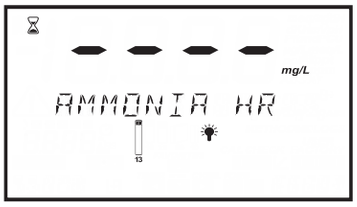
- Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 3 minutes and 30 seconds.
- Press the **READ** key, the meter displays the results in **mg/L of ammonia nitrogen ($NH_3$-N)**.

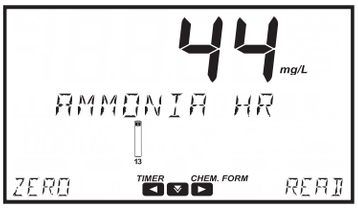


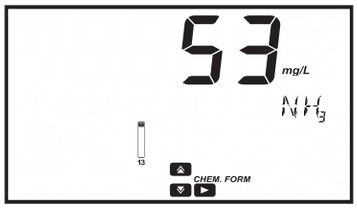



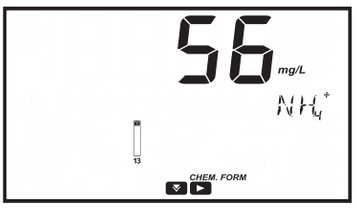




- Press the ▼ key to access the second level functions (wavelength, method ID, date and time).
- Press the ► key to view the chemical formula.
- Press the ▲ key in the chemical formula screen to convert the results to **mg/L ammonia ($NH_3$) or ammonium ($NH_4^+$)**.


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

## INTERFERENCES

Interference may be caused by:
Organic compounds like: chloramines, various aliphatic and aromatic amines, glycine or urea above 100 ppm; to eliminate these interferences distillation is required.
Organic compounds like: aldehydes, alcohols (e.g. ethanol) or acetone above 1 %; to eliminate these interferences distillation is required. Sulfide: may cause turbidity.

## 9.9. 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 |

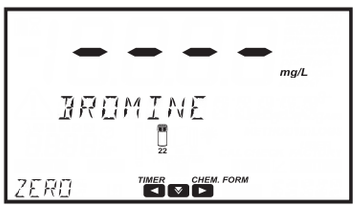
For other accessories see page 236.

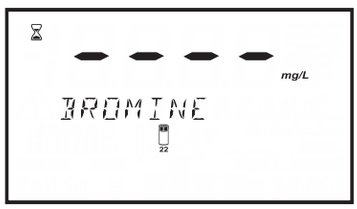
### MEASUREMENT PROCEDURE

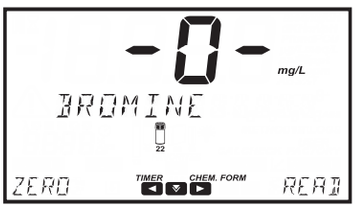
- Select the Bromine method using the procedure described in the Method Selection section (see page 6).
- Fill the cuvette with 10 mL of unreacted sample (up to the mark) and replace the cap.


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

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

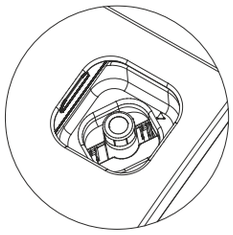


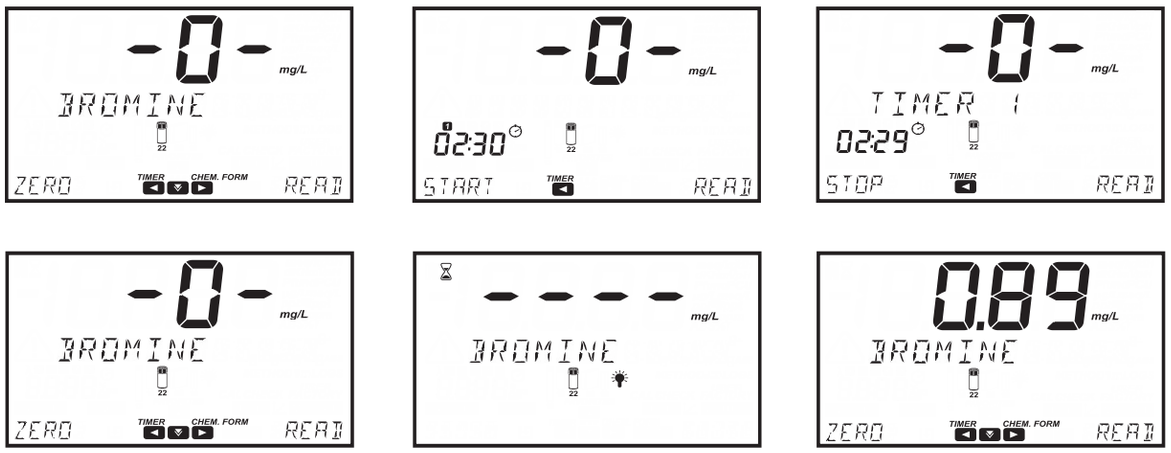

- Remove the cuvette.
- Add one packet of HI93716-0 Bromine Reagent. Replace the cap and shake gently for about 20 seconds to dissolve most of the reagent.

• Reinsert the cuvette into the instrument and close the lid.



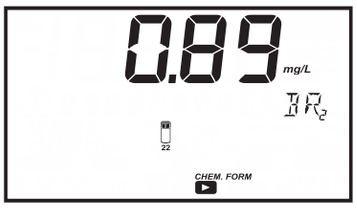
• Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 2 minutes and 30 seconds.

• Press the **READ** key, the meter displays the results in **mg/L of bromine ($Br_2$)**.




• Press the ▼▼ key to access the second level functions (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.
In case of water with hardness greater than 500 mg/L $CaCO_3$, shake the sample for approximately 1 minute after adding the reagent.
In case of water with alkalinity greater than 300 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 resolve this, neutralize the sample with diluted HCl or NaOH.

## 9.10. 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

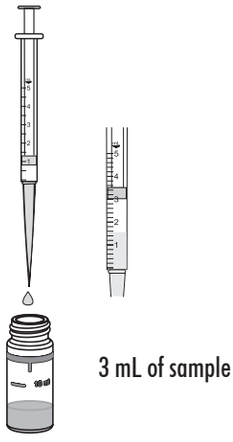
| | |
|---|---|
| HI937521-01 | Reagents for 50 tests |
| HI937521-03 | Reagents for 150 tests |

For other accessories see page 236.

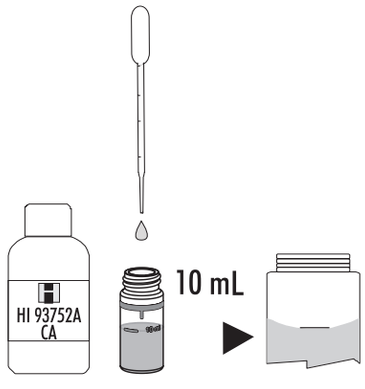
### MEASUREMENT PROCEDURE

• Select the Calcium method using the procedure described in the Method Selection section (see page 6).

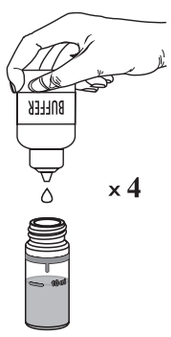
• Add 3 mL of unreacted sample to the cuvette using the 5 mL syringe.



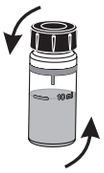

• Use the pipette to fill the cuvette up to the 10 mL mark with the HI93752A-Ca Calcium Reagent A.



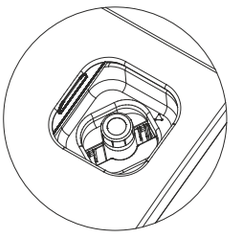

• Add 4 drops of Buffer Reagent.



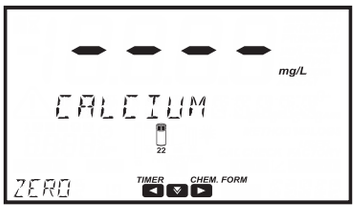
• Replace the cap and invert several times to mix.

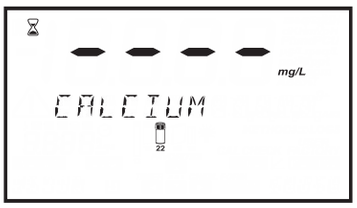


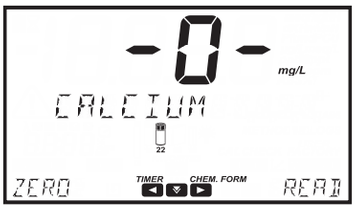
• Place the cuvette into the holder and close the lid.



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

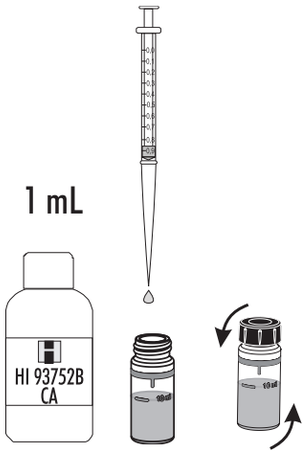


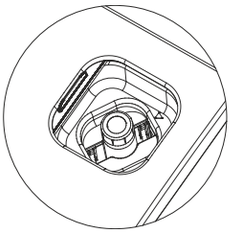




• Remove the cuvette.

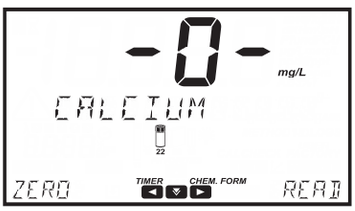
• Add 1 mL of HI93752B-Ca Calcium Reagent B to the sample using the 1 mL syringe. Invert the cuvette 10 times to mix (about 15 seconds).

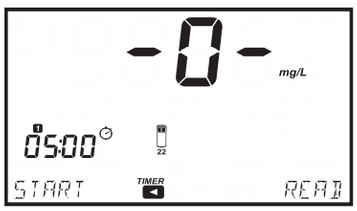


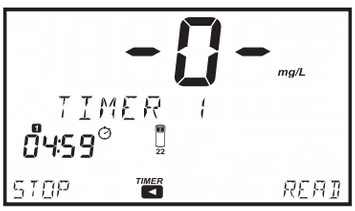

• Reinsert the cuvette into the instrument.



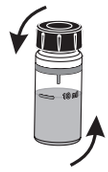
• Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 5 minutes.



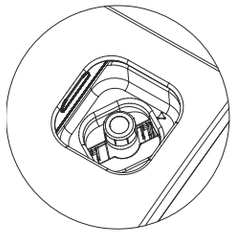



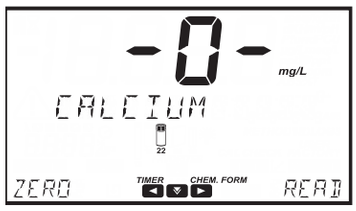
• Invert the cuvette 10 times to mix (about 15 seconds).

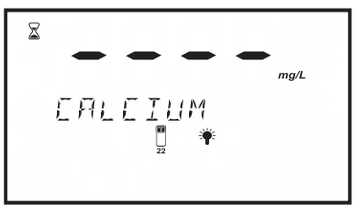


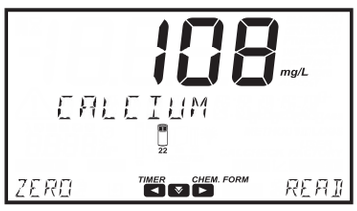
• Reinsert the cuvette into the instrument and close the lid.



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

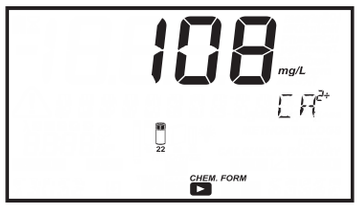



• Press the ▼▼ key to access the second level functions (wavelength, method ID, date and time).

• Press the ▶ key to view the chemical formula.




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

## INTERFERENCES

Interferences may be caused by:
Acidity (as $CaCO_3$) above 1000 mg/L
Alkalinity (as $CaCO_3$) above 1000 mg/L
Magnesium ($Mg^{2+}$) above 400 mg/L

## 9.11. 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 |

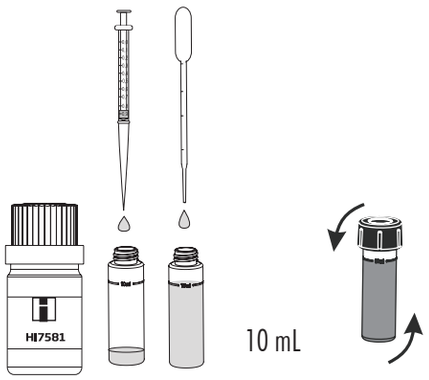
### REAGENT SETS

HI758-26 Reagents for 25 tests

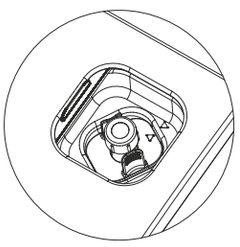
For other accessories see page 236.

### MEASUREMENT PROCEDURE

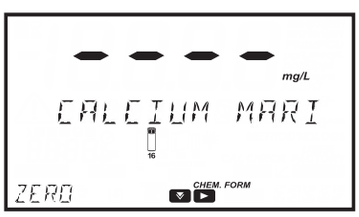
- Select the Calcium Marine method using the procedure described in the Method Selection section (see page 6).
- Add 1 mL of HI7581 Calcium Reagent A to the cuvette using a 1 mL syringe.
- Insert the 16 mm vial adapter using the procedure described in the Cuvette Adapters section (see page 10).
- Use the plastic pipette to fill the cuvette to the 10 mL mark with deionized water and replace the cap. Invert 5 times to mix.

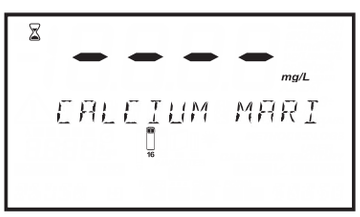


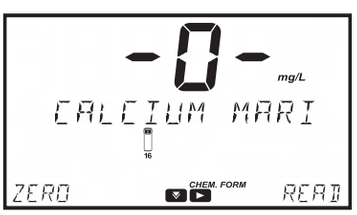

- Place the cuvette into the holder and close the lid.



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

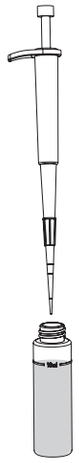


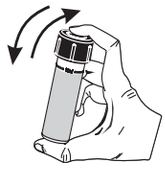




- Remove the cuvette.

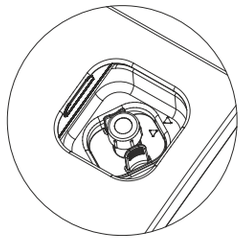
• Use the HI731339 micropipette to add 0.1 mL of sample to the cuvette.



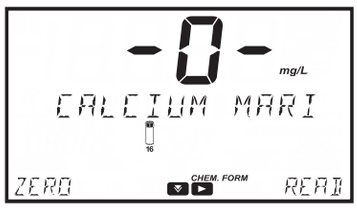
• Add one packet of HI7582 Calcium Reagent B. Replace the cap and shake vigorously for 15 seconds or until the powder is completely dissolved. Allow air bubbles to dissipate for 15 seconds before taking a reading.

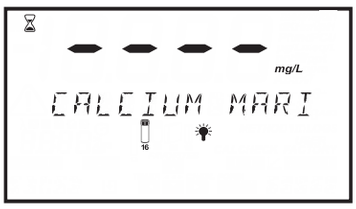



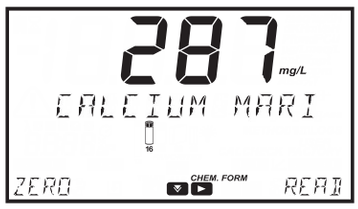
• Reinsert the cuvette into the instrument and close the lid.



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

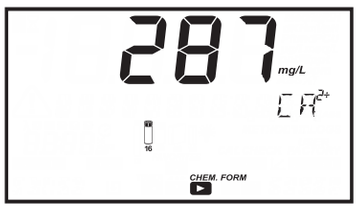



• Press the ▼▼ key to access the second level functions (wavelength, method ID, date and time).

• Press the ▶ key to view the chemical formula.




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

## 9.12. 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

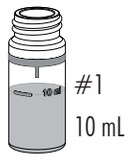
| | |
|---|---|
| HI93753-01 | Reagents for 100 tests |
| HI93753-03 | Reagents for 300 tests |

For other accessories see page 236.

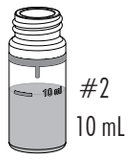
### MEASUREMENT PROCEDURE

• Select the Chloride method using the procedure described in the Method Selection section (see page 6).

• Fill one cuvette (#1) with 10 mL of deionized water (up to the mark).



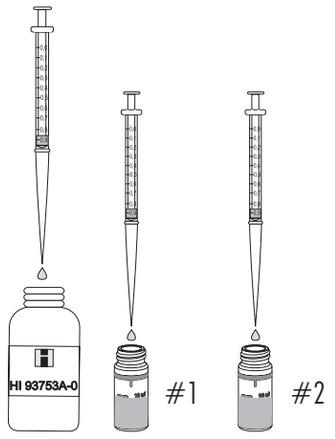

• Fill another cuvette (#2) with 10 mL of sample (up to the mark).



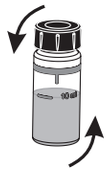

*Notes: • For samples with low chloride ion concentration, rinse the cuvette a few times with sample before filling it with 10 mL of sample.*

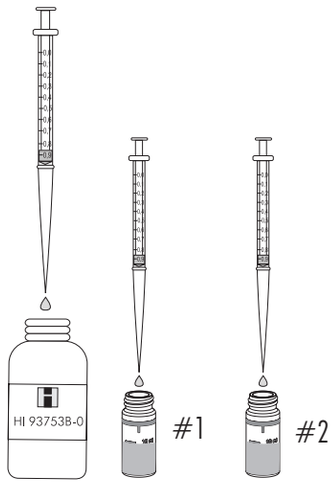
*• For the most accurate results, use two graduated pipettes to deliver exactly10 mL of deionized water and 10 mL of sample to the cuvettes.*

• Add 0.5 mL of HI93753A-0 Chloride Reagent A to each cuvette using the 1 mL syringe.



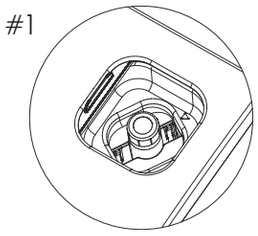

• Replace the caps and mix each cuvette by inverting for approximately 30 seconds.






• Add 0.5 mL of HI93753B-0 Chloride Reagent B to each cuvette using the second 1 mL syringe.

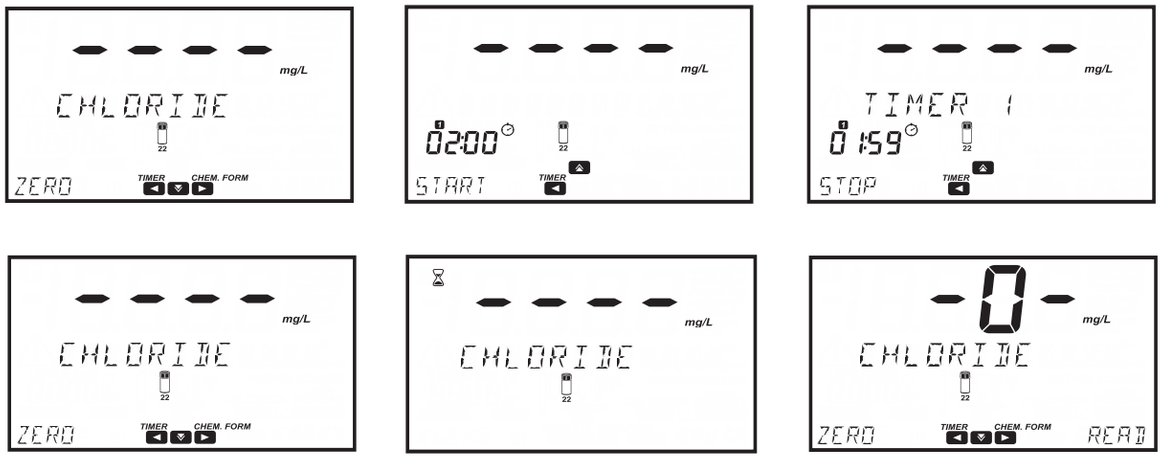
• Replace the caps and mix each cuvette by inverting for approximately 30 seconds.



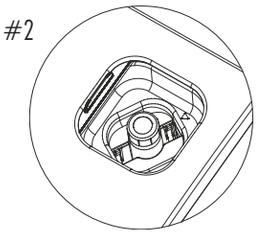

• Place the cuvette with the reacted deionized water (#1) into the holder and close the lid.

• Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 2 minutes.

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

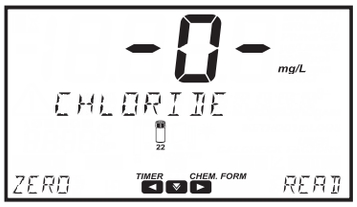


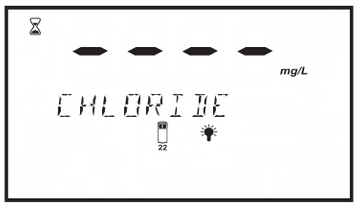

• Remove the cuvette.

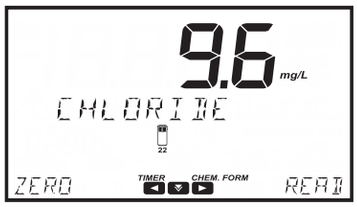



• Insert the other cuvette (#2) with the reacted sample into the instrument and close the lid.

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

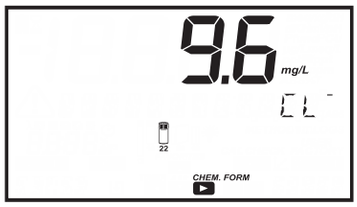



• Press the ⏬ key to access the second level functions (wavelength, method ID, date and time).

• Press the ▶ key to view the chemical formula.




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

## INTERFERENCES

Interference may be caused by:

For alkaline samples, neutralize before adding reagents. The pH of the sample after addition of reagents should be about 2.

Intensely colored samples will cause interference, therefore they should be adequately treated before performing the test. Suspended matter in large amount should be removed by prior filtration.

## 9.13. 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 REAGENT

| 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

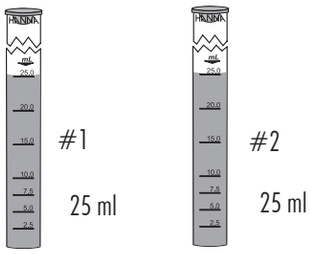
| | |
|---|---|
| HI93738-01 | Reagents for 100 tests |
| HI93738-03 | Reagents for 300 tests |

For other accessories see page 236.

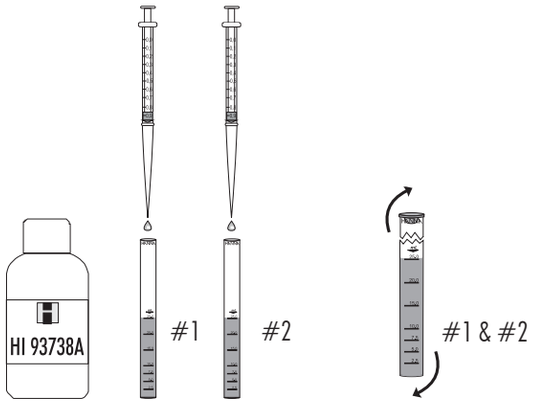
### MEASUREMENT PROCEDURE

• Select the Chlorine Dioxide method using the procedure described in the Method Selection section (see page 6).

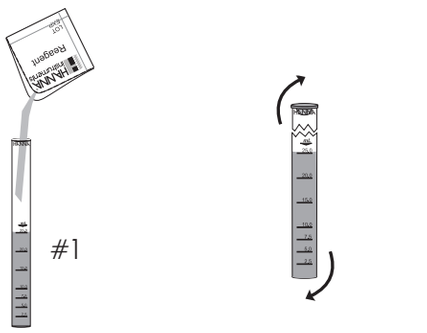
• Fill two graduated mixing vials (#1 & #2) up to the 25 mL mark with the sample.



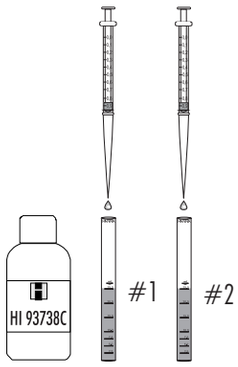

• Add 0.5 mL of HI93738A-0 Chlorine Dioxide Reagent A to each graduated mixing vial (#1 & #2), using a 1mL syringe, cap them and invert several times to mix.

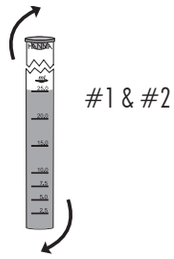



• Add one packet of HI93738B-0 Chlorine Dioxide Reagent B to one of the two graduated mixing vial (#1), cap and invert it several times until it is totally dissolved. This is the blank.

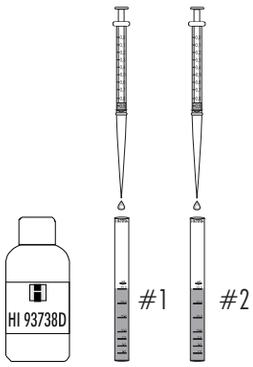


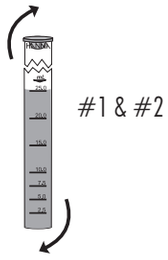
• Add 0.5 mL of HI93738C-0 Chlorine Dioxide Reagent C to each graduated mixing vial (#1 & #2), using a 1 mL syringe, cap, and invert several times to mix.

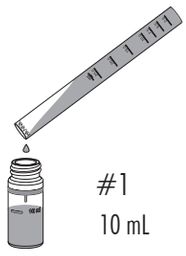


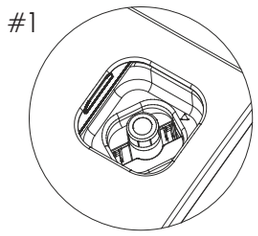




• Add 0.5 mL of HI93738D-0 Chlorine Dioxide Reagent to each graduated mixing vial (#1 & #2), using a 1 mL syringe, cap and invert several times to mix. Graduated glass vial #2 is the reacted sample.



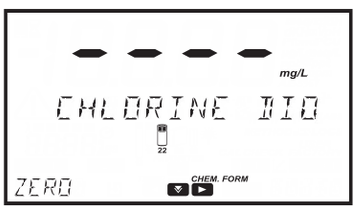



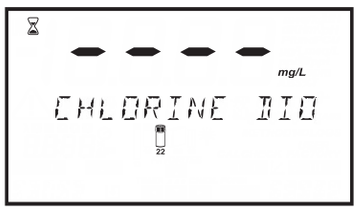



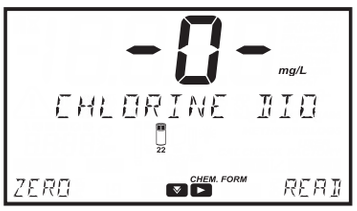

• Fill cuvette (#1) with 10 mL of the blank (up to the mark) and replace the cap.

• Place the blank (#1) into the holder and close the lid.

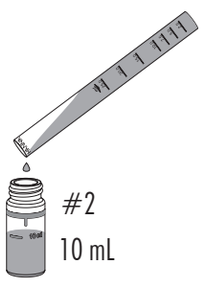
• Press the **ZERO** key. The display will show "-0-" when the meter is zeroed and ready for measurement.

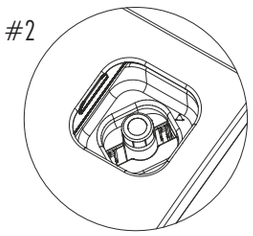


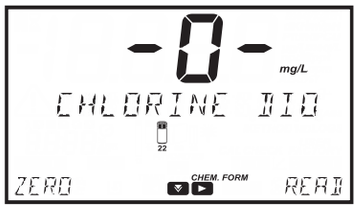

• Fill second cuvette (#2) with 10 mL of the reacted sample (up to the mark) and replace the cap.

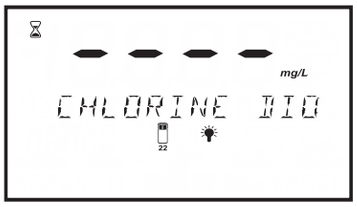


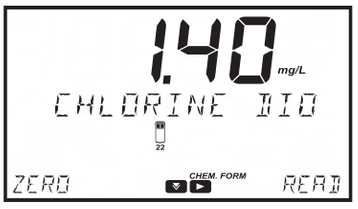



• Insert the sample into the instrument and close the lid.

• Press the **READ** key to start the reading. The instrument displays the results in **mg/L of chlorine dioxide ($ClO_2$)**.

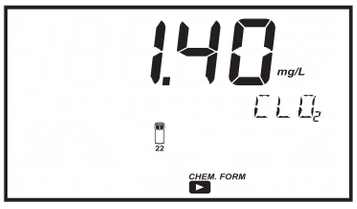



• Press the ▼▼ key to access the second level functions (wavelength, method ID, date and time).

• Press the ▶ key to view the chemical formula.




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

## 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.

## INTERFERENCES

Interferences may be caused by strong oxidants.

## 9.14. 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 |

### REAGENTS SETS

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

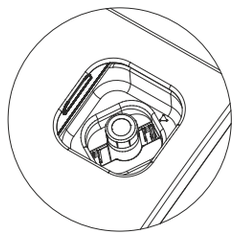
For other accessories see page 236.

### MEASUREMENT PROCEDURE

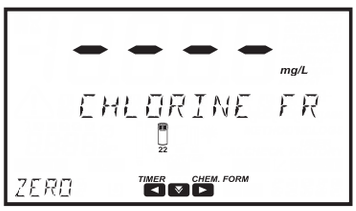
• Select the Chlorine Free ULR method using the procedure described in the Method Selection section (see page 6).

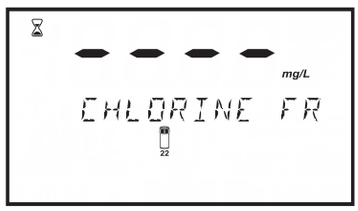
• Fill the cuvette with 10 mL of unreacted sample (up to the mark) and replace the cap.


• Place the cuvette into the holder and close the lid.



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

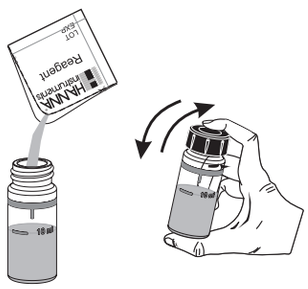


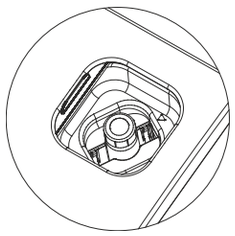





• Remove the cuvette.

• Add one packet of HI95762-0 Free Chlorine Reagent. Replace the cap and shake gently for 20 seconds.

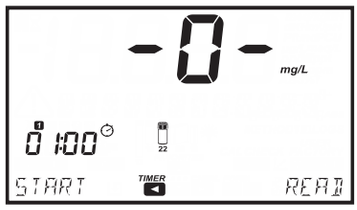


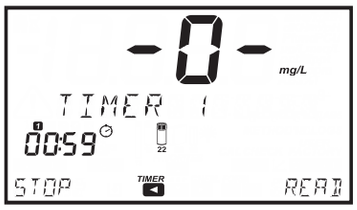


• Reinsert the cuvette into the instrument and close the lid.

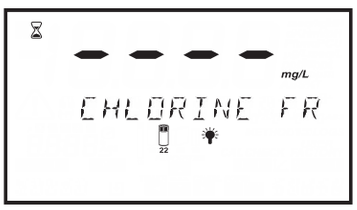
• Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 1 minute.

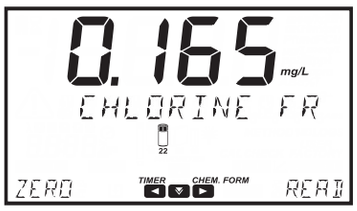
• Press the **READ** key, the meter displays the results i**n mg/L of chlorine ($Cl_2$).**

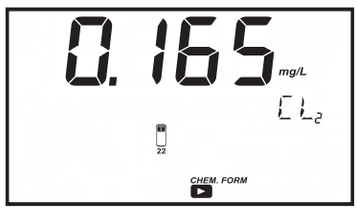





• Press the ▼ key to access the second level functions (wavelength, method ID, date and time).

• Press the ► key to view the chemical formula.




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

## INTERFERENCES

Interference may be caused by:

Alkalinity: above 1,000 mg/L $CaCO_3$ if present as bicarbonate ($HCO_3$ sample pH $<$ 8.3); above 25 mg/L $CaCO_3$ if present as carbonate ($CO_3^{2-}$, sample pH $>$ 9.0). In both cases, it will not reliably develop the full amount of color or it may rapidly fade (negative error). To resolve this, neutralize the sample with diluted HCl.

Acidity: above 150 mg/L $CaCO_3$. May not reliably develop the full amount of color or it may rapidly fade (negative error). To resolve this, neutralize the sample with diluted NaOH.

Hardness: in case of water with hardness greater than 500 mg/L $CaCO_3$, shake the sample for approximately 2 minutes after adding the powder reagent.

Bromine ($Br_2$), Chloride dioxide ($ClO_2$), Iodine ($I_2$), Oxidized Manganese and Chromium, Ozone ($O_3$): positive error.

## 9.15. CHLORINE, FREE LR (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

**POWDER:**

| Code | Description | Quantity |
|---|---|---|
| HI93701-0 | Free Chlorine Reagent | 1 packet |

### REAGENT SETS

| | |
|---|---|
| HI93701-01 | Reagents for 100 tests (powder) |
| HI93701-03 | Reagents for 300 tests (powder) |

For other accessories see page 236.

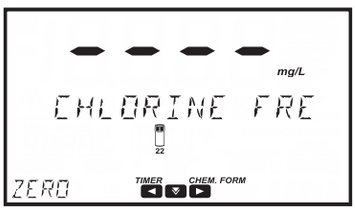
### MEASUREMENT PROCEDURE

• Select the Chlorine Free LR (POWDER) method using the procedure described in the Method Selection section (see page 6).

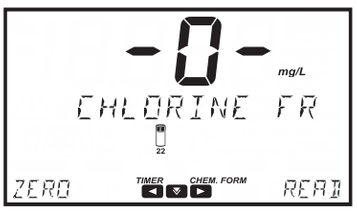
• Fill the cuvette with 10 mL of unreacted sample (up to the mark) and replace the cap.


• Place the cuvette into the holder and close the lid.

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

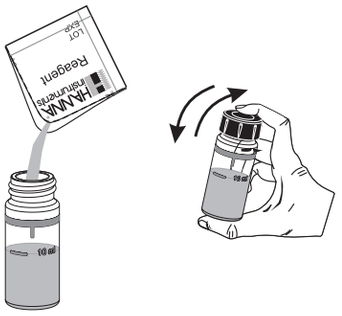


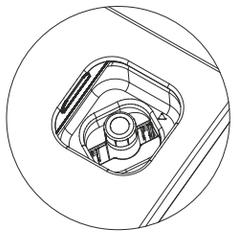





• Remove the cuvette.

• Add the content of one packet of HI93701-0 Free Chlorine Reagent. Replace the cap and shake gently for 20 seconds.

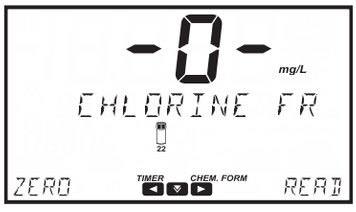


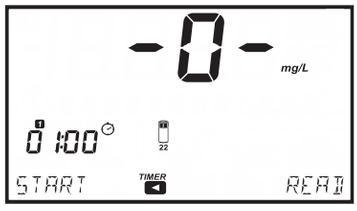


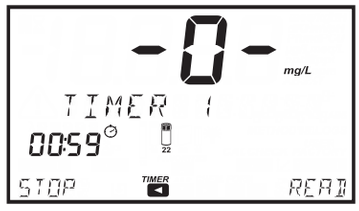
• Reinsert the cuvette into the instrument and close the lid.

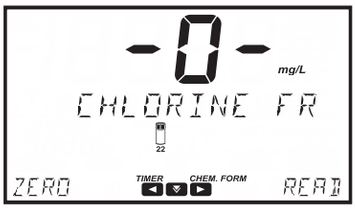
• Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 1 minute.

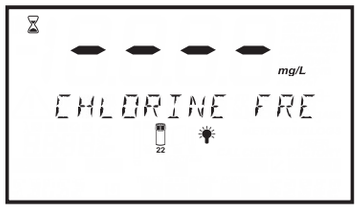
• Press the **READ** key, the meter displays the results in **mg/L of chlorine ($Cl_2$)**.

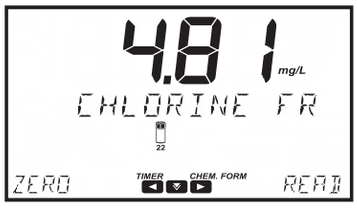


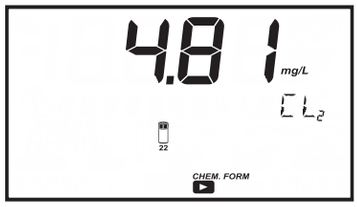




• Press the ▼ key to access the second level functions (wavelength, method ID, date and time).

• 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, Ozone, Oxidized forms of Chromium and Manganese. In case of water with hardness greater than 500 mg/L $CaCO_3$, shake the sample for approximately 2 minutes after adding the powder reagent.

If the water used for this procedure has an alkalinity value 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 may rapidly fade. To resolve this, neutralize the sample with diluted HCl or NaOH.

## 9.16. CHLORINE, FREE LR (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

LIQUID:

| 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 page 236.

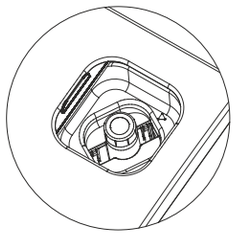
### MEASUREMENT PROCEDURE

• Select the Chlorine Free LR (LIQUID) method using the procedure described in the Method Selection section (see page 6).

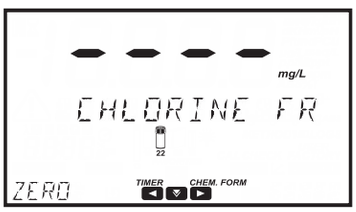
• Fill the cuvette with 10 mL of unreacted sample (up to the mark) and replace the cap.

10 mL

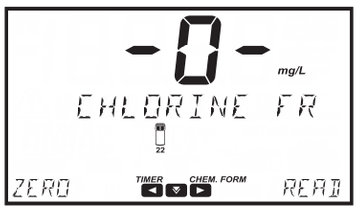
• Place the cuvette into the holder and close the lid.



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

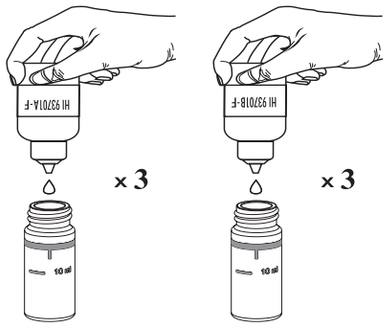






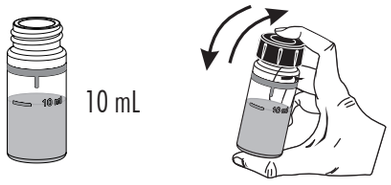

• Remove the cuvette.

- To an empty cuvette add 3 drops of HI93701A-F Free Chlorine Reagent A and 3 drops of HI93701B-F Free Chlorine Reagent B.

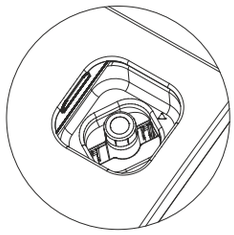



- Swirl gently to mix.

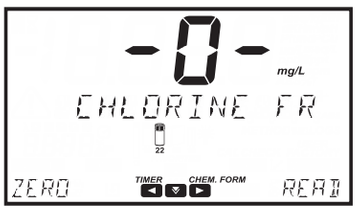
- Add 10 mL of unreacted sample. Replace the cap and shake gently.

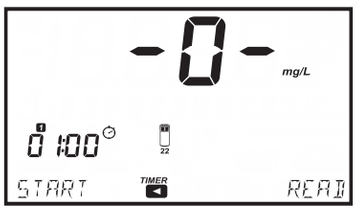


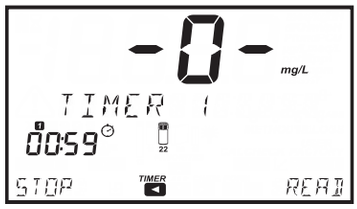

- Insert the cuvette into the instrument and close the lid.

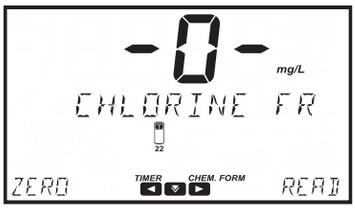


- Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 1 minute.
- Press the **READ** key, the meter displays the results in **mg/L of chlorine ($Cl_2$)**.

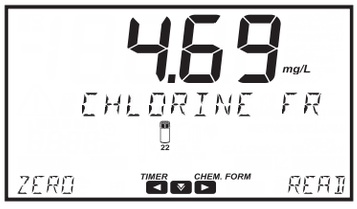


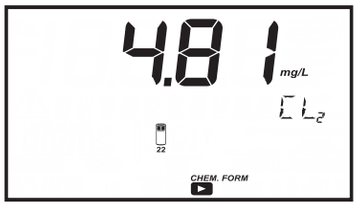







• Press the ▼▼ key to access the second level functions (wavelength, method ID, date and time).

• 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, Ozone, Oxidized forms of Chromium and Manganese.
In case of water with hardness greater than 500 mg/L $CaCO_3$, shake the sample for approximately 2 minutes after adding the powder reagent.
If the water used for this procedure has an alkalinity value 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 may rapidly fade.
To resolve this, neutralize the sample with diluted HCl or NaOH.

## 9.17. 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 |
|---|---|---|
| HI 93701-0 | Free Chlorine Reagent | 1 packet |
| HI 93734B-0 | Free & Total Chlorine Reagent | 5 mL |

### REAGENTS SETS

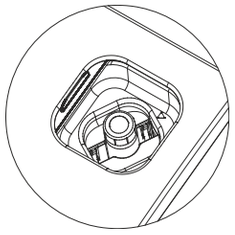
| | |
|---|---|
| HI93734-01 | Reagents for 100 tests |
| HI93734-03 | Reagents for 300 tests |

For other accessories see page 236.

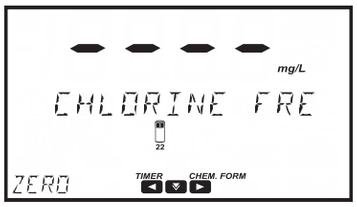
### MEASUREMENT PROCEDURE

- Select the Chlorine Free HR method using the procedure described in the Method Selection section (see page 6).
- 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 and replace the cap. Shake gently for a few seconds.

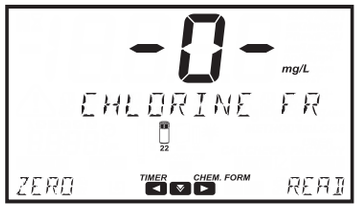

- Place the cuvette into the holder and close the lid.



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

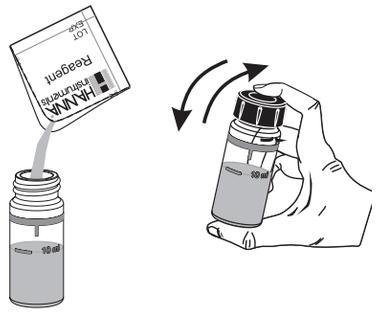






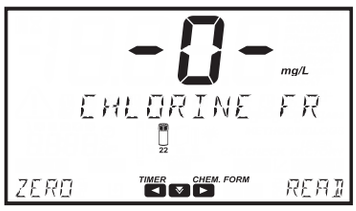

- Remove the cuvette.

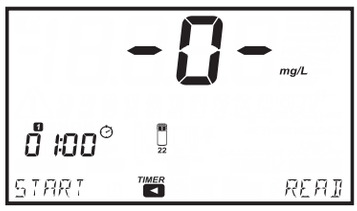
- Add one packet of HI93701-0 Free Chlorine Reagent. Replace the cap and shake gently for 20 seconds.

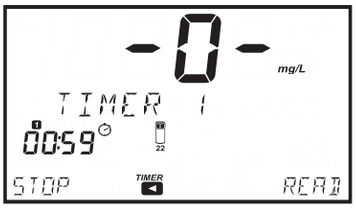


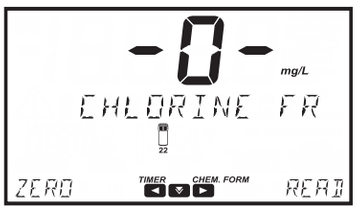

- Reinsert the cuvette into the instrument and close the lid.

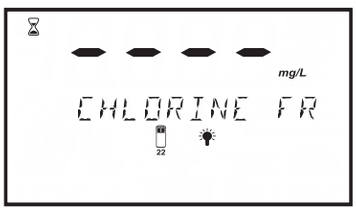
- Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 1 minute.
- Press the **READ** key, the meter displays the results in **mg/L of chlorine ($Cl_2$)**.

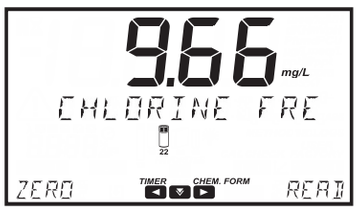


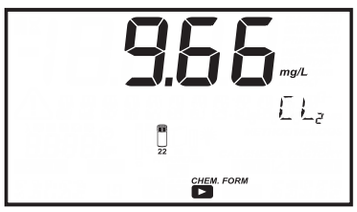




- Press the ▼ key to access the second level functions (wavelength, method ID, date and time).
- Press the ► key to view the chemical formula.




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

## INTERFERENCES

Interference may be caused by:

Alkalinity: above 1,000 mg/L $CaCO_3$ if present as bicarbonate ($HCO_3$ sample pH $<$ 8.3); above 25 mg/L $CaCO_3$ if present as carbonate ($CO_3^{2-}$, sample pH $>$ 9.0). In both cases, it will not reliably develop the full amount of color or it may rapidly fade (negative error). To resolve this, neutralize the sample with diluted HCl.

Acidity: above 150 mg/L $CaCO_3$. May not reliably develop the full amount of color or it may rapidly fade (negative error). To resolve this, neutralize the sample with diluted NaOH.

Hardness: in case of water with hardness greater than 500 mg/L $CaCO_3$, shake the sample for approximately 2 minutes after adding the powder reagent.

Bromine ($Br_2$), Chloride dioxide ($ClO_2$), Iodine ($I_2$), Oxidized Manganese and Chromium, Ozone ($O_3$): positive error.

## 9.18. 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

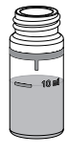
| | |
|---|---|
| HI95761-01 | Reagents for 100 tests |
| HI95761-03 | Reagents for 300 tests |

For other accessories see page 236.

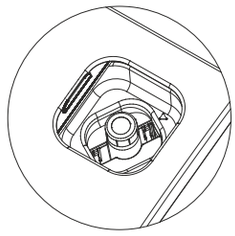
### MEASUREMENT PROCEDURE

• Select the Chlorine Total ULR method using the procedure described in the Method Selection section (see page 6).

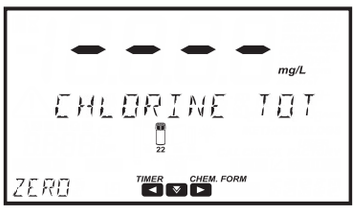
• Fill the cuvette with 10 mL of unreacted sample (up to the mark) and replace the cap.

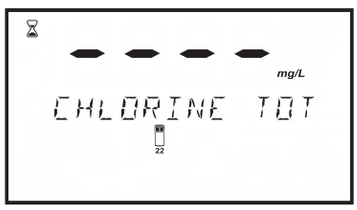



• Place the cuvette into the holder and close the lid.



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

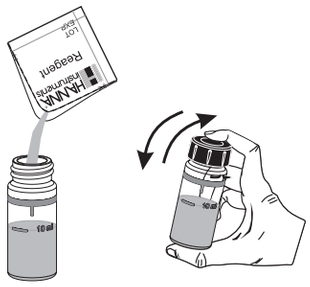


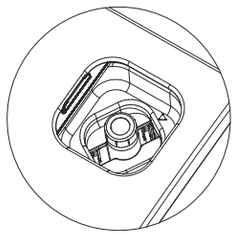





• Remove the cuvette.

• Add one packet of HI95761-0 Total Chlorine Reagent. Replace the cap and shake gently for 20 seconds.

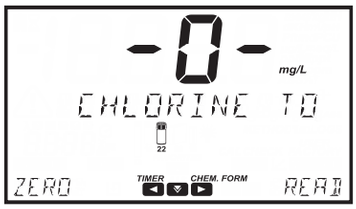


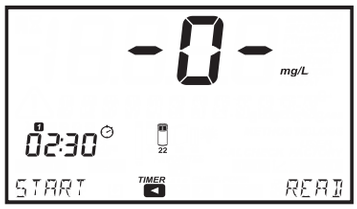


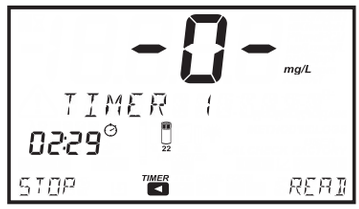
• Reinsert the cuvette into the instrument and close the lid.

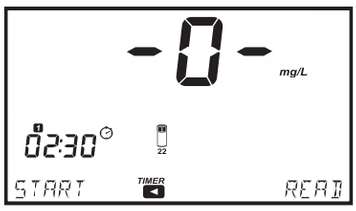
• Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 2 minutes and 30 seconds.

• Press the **READ** key, the meter displays the results in **mg/L of chlorine ($Cl_2$)**.

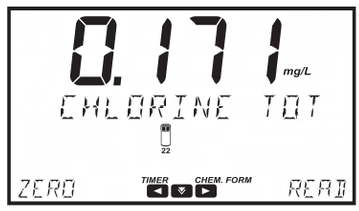


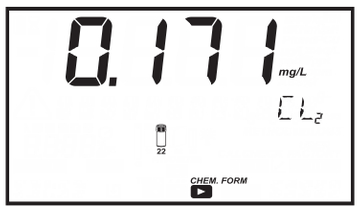








• Press the ▼ key to access the second level functions (wavelength, method ID, date and time).

• Press the ► key to view the chemical formula.




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

## INTERFERENCES

Interference may be caused by:

Alkalinity: above 1,000 mg/L $CaCO_3$ if present as bicarbonate ($HCO_3$ sample pH $<$ 8.3); above 25 mg/L $CaCO_3$ if present as carbonate ($CO_3^{2-}$, sample pH $>$ 9.0). In both cases, it will not reliably develop the full amount of color or it may rapidly fade (negative error). To resolve this, neutralize the sample with diluted HCl.

Acidity: above 150 mg/L $CaCO_3$. May not reliably develop the full amount of color or it may rapidly fade (negative error). To resolve this, neutralize the sample with diluted NaOH.

Hardness: in case of water with hardness greater than 500 mg/L $CaCO_3$, shake the sample for approximately 2 minutes after adding the powder reagent.

Bromine ($Br_2$), Ozone ($O_3$) and Chlorine dioxide ($ClO_2$): positive error.

## 9.19. CHLORINE, TOTAL LR (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

**POWDER:**

| Code | Description | Quantity |
|---|---|---|
| HI93711-0 | Total Chlorine Reagent | 1 packet |

### REAGENT SETS

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

For other accessories see page 236.

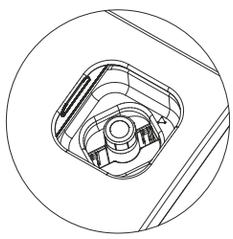
### MEASUREMENT PROCEDURE

• Select the Chlorine Total LR (POWDER) method using the procedure described in the Method Selection section (see page 6).

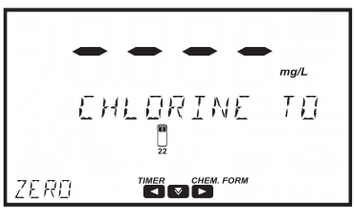
• Fill the cuvette with 10 mL of unreacted sample (up to the mark) and replace the cap.

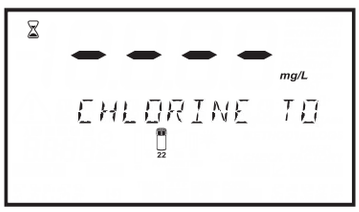

10 mL

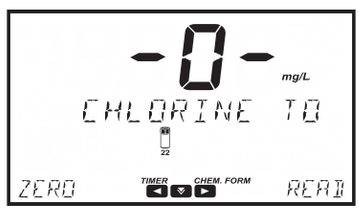
• Place the cuvette into the holder and close the lid.



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

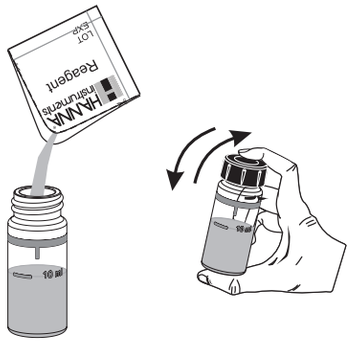


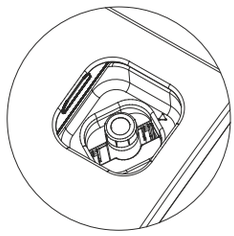




• Remove the cuvette.

• Add 1 packet of HI93711-0 Total Chlorine Reagent. Replace the cap and shake gently for 20 seconds.

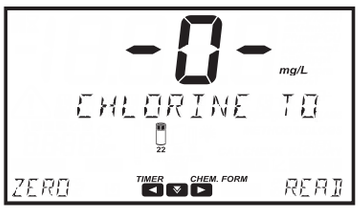


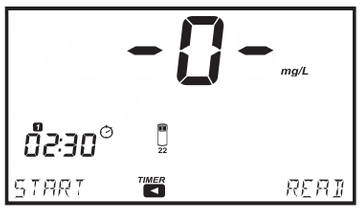


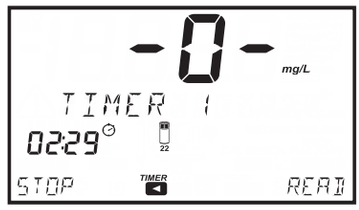
• Reinsert the cuvette into the instrument and close the lid.

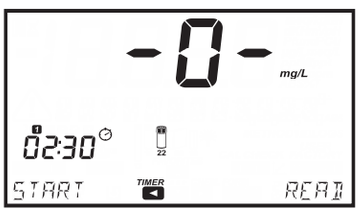
• Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 2 minutes and 30 seconds.

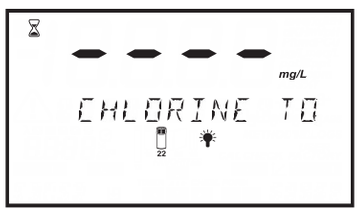
• Press the **READ** key, the meter displays the results in **mg/L of chlorine ($Cl_2$)**.



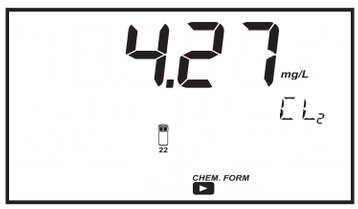





• Press the ▼ key to access the second level functions (wavelength, method ID, date and time).

• 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, Ozone, Oxidized forms of Chromium and Manganese. In case of water with hardness greater than 500 mg/L $CaCO_3$ shake the sample for approximately 2 minutes after adding the powder reagent.

If the water used for this procedure has an alkalinity value 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 may rapidly fade. To resolve this, neutralize the sample with diluted HCl or NaOH.

## 9.20. CHLORINE, TOTAL LR (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

LIQUID:

| 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

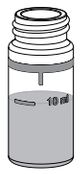
HI93701-T Reagents for 300 tests (liquid)

For other accessories see page 236.

### MEASUREMENT PROCEDURE

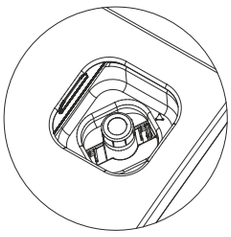
• Select the Chlorine Total LR (LIQUID) method using the procedure described in the Method Selection section (see page 6).

• Fill the cuvette with 10 mL of unreacted sample (up to the mark) and replace the cap.

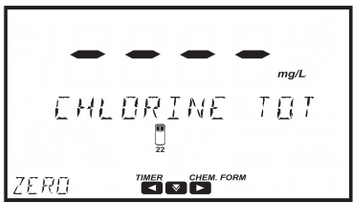


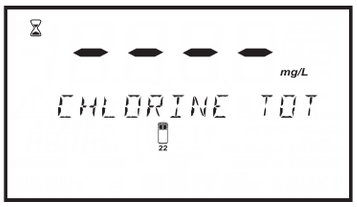

10 mL

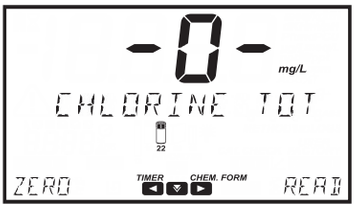
• Place the cuvette into the holder and close the lid.



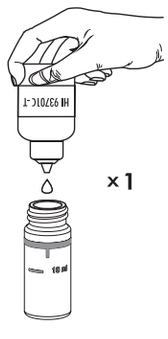
• Press the **ZERO** key. The display will show "-0-" when the meter is zeroed and ready for measurement.



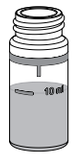



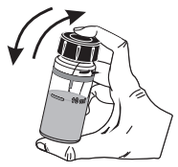




• Remove the cuvette.

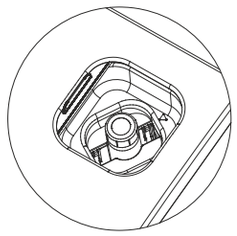



- To an empty cuvette add 3 drops of HI93701A-T Total Chlorine Reagent A, 3 drops of HI93701B-T Total Chlorine Reagent B, and 1 drop of HI93701C-T Total Chlorine Reagent C. Swirl gently to mix.



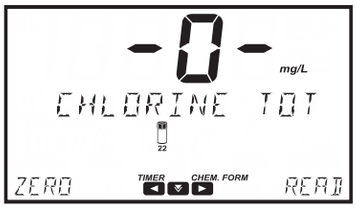



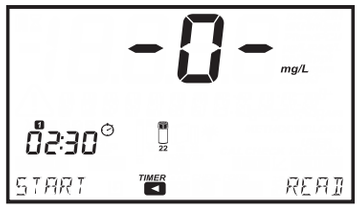
- Add 10 mL of unreacted sample. Replace the cap and shake gently.

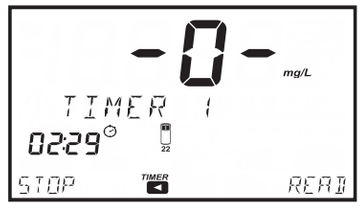


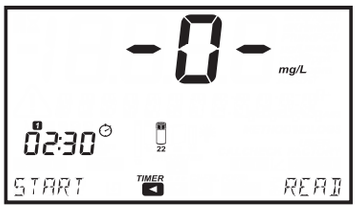
- Insert the cuvette into the instrument and close the lid.

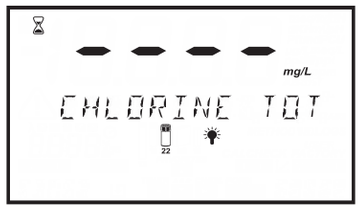
- Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 2 minutes and 30 seconds
- Press the **READ** key, the meter displays the results in **mg/L of chlorine ($Cl_2$)**.





- Press the ▼ key to access the second level functions (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, Ozone, Oxidized forms of Chromium and Manganese. In case of water with hardness greater than 500 mg/L $CaCO_3$ shake the sample for approximately 2 minutes after adding the powder reagent.
If the water used for this procedure has an alkalinity value 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 may rapidly fade. To resolve this, neutralize the sample with diluted HCl or NaOH.

## 9.21. 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 |

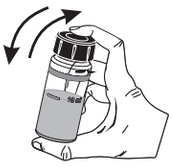
For other accessories see page 236.

### MEASUREMENT PROCEDURE

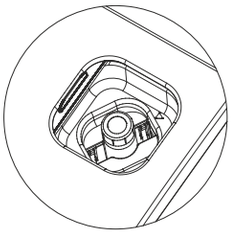
• Select the Chlorine Total HR method using the procedure described in the Method Selection section (see page 6).

• Add to the cuvette 5 mL of HI93734B-0 reagent.

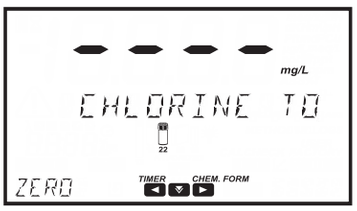

• Fill the cuvette up to the 10 mL mark with 5 mL of unreacted sample and replace the cap. Shake gently for a few seconds.

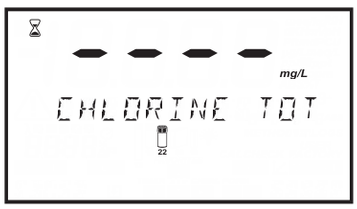



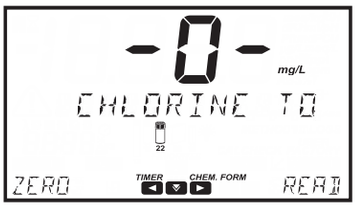
• Place the cuvette into the holder and close the lid.



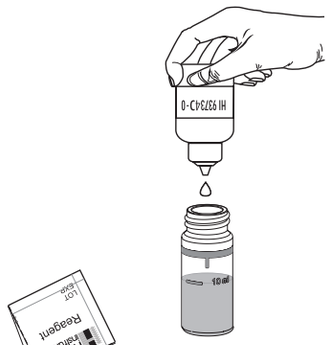
• Press the **ZERO** key. The display will show "-0-" when the meter is zeroed and ready for measurement.



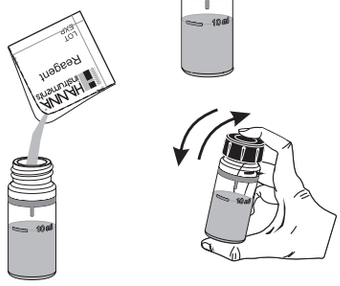



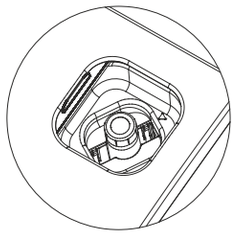
- Remove the cuvette.
- Add 3 drops of HI93734C-0 reagent to the cuvette.



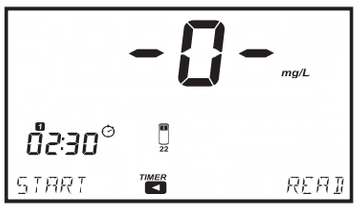

- Add one packet of HI93701-0 Free Chlorine Reagent. Replace the cap and shake gently for 20 seconds.

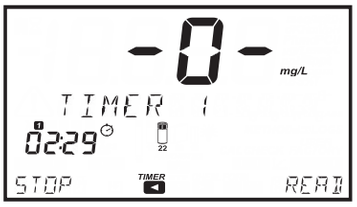


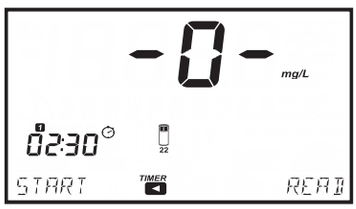

- Reinsert the cuvette into the instrument and close the lid.

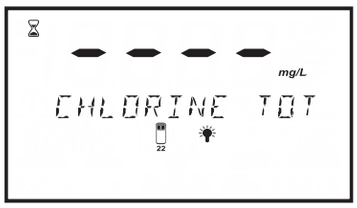


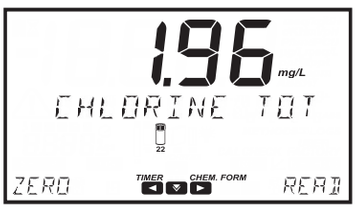
- Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 2 minutes and 30 seconds.
- Press the **READ** key, the meter displays the results in **mg/L of chlorine ($Cl_2$)**.


- Press the ▼ key to access the second level functions (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:

Alkalinity: above 1,000 mg/L $CaCO_3$ if present as bicarbonate ($HCO_3$ sample pH $<$ 8.3); above 25 mg/L $CaCO_3$ if present as carbonate ($CO_3^{2-}$, sample pH $>$ 9.0). In both cases, it will not reliably develop the full amount of color or it may rapidly fade (negative error). To resolve this, neutralize the sample with diluted HCl.

Acidity: above 150 mg/L $CaCO_3$. May not reliably develop the full amount of color or it may rapidly fade (negative error). To resolve this, neutralize the sample with diluted NaOH.

Hardness: in case of water with hardness greater than 500 mg/L $CaCO_3$, shake the sample for approximately 2 minutes after adding the powder reagent. Bromine ($Br_2$), Ozone ($O_3$) and Chlorine dioxide ($ClO_2$): positive error.

## 9.22. 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 |

### REAGENTS SETS

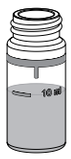
| | |
|---|---|
| HI95771-01 | Reagents for 100 tests |
| HI95771-03 | Reagents for 300 tests |

For other accessories see page 236.

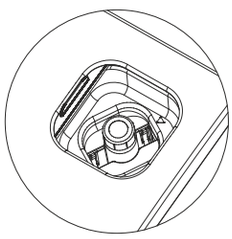
### MEASUREMENT PROCEDURE

• Select the Chlorine Total UHR method using the procedure described in the Method Selection section (see page 6).

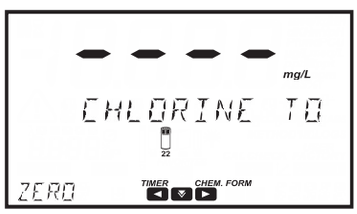
• Fill the cuvette with 10 mL of unreacted sample (up to the mark) and replace the cap.

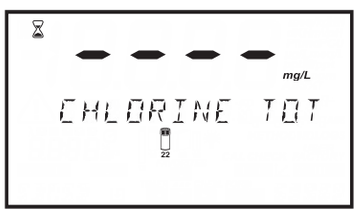


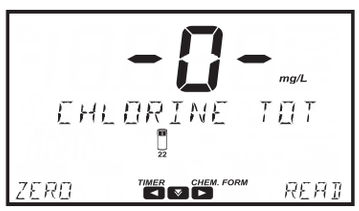

• Place the cuvette into the holder and close the lid.



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

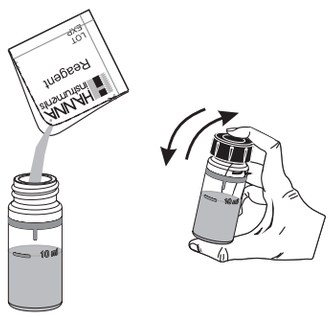


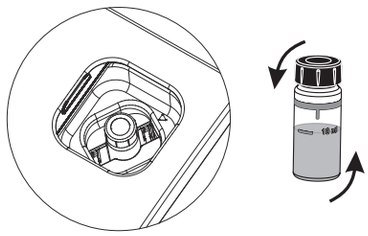




• Remove the cuvette.

• 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 cap and shake gently for 20 seconds.



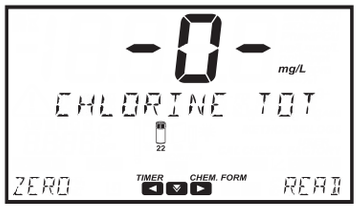


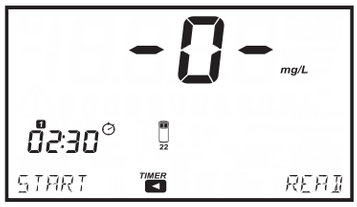
• Reinsert the cuvette into the instrument and close the lid.

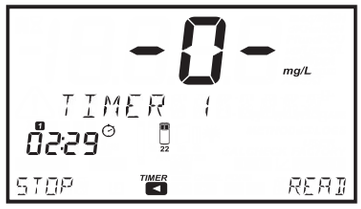
• Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 2 minute and 30 seconds.

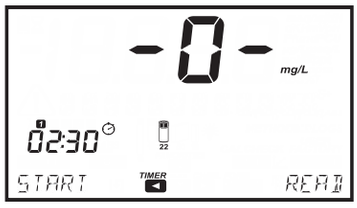
*Note: After 1 minute invert the cuvette 5 times.*

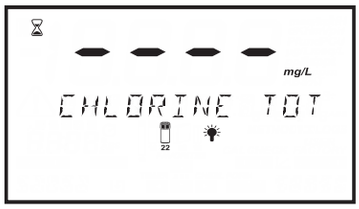
• Press the **READ** key, the meter displays the results in **mg/L of chlorine ($Cl_2$)**.

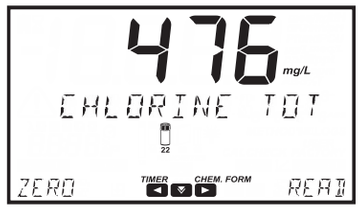


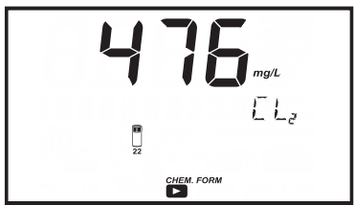




• Press the ▼ key to access the second level functions (wavelength, method ID, date and time).

• Press the ► key to view the chemical formula.




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

## INTERFERENCES

Interference may be caused by:
Bromine ($Br_2$), Oxidized Manganese, Chromium, Chlorine Dioxide ($ClO_2$), Ozone ($O_3$) and Iodine ($I_2$).

## 9.23. 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

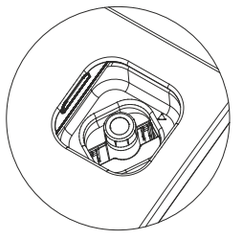
| | |
|---|---|
| HI93749-01 | Reagents for 100 tests |
| HI93749-03 | Reagents for 300 tests |

For other accessories see page 236.

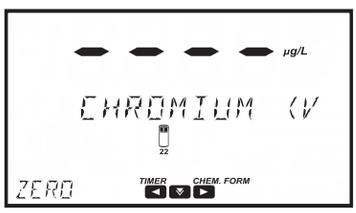
### MEASUREMENT PROCEDURE

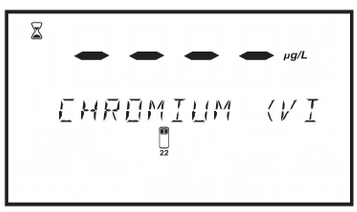
- Select the Chromium (VI) LR method using the procedure described in the Method Selection section (see page 6).
- Fill the cuvette with 10 mL of unreacted sample (up to the mark) and replace the cap.

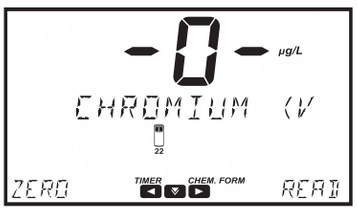

- Place the cuvette into the holder and close the lid.



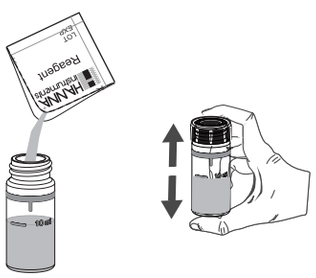
- Press the **ZERO** key. The display will show "-0-" when the meter is zeroed and ready for measurement.

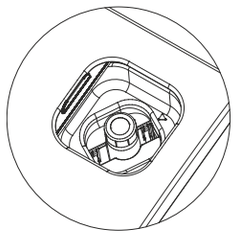



- Remove the cuvette.
- Add one packet of HI93749-0 Chromium (VI) Low Range Reagent. Replace the cap and shake vigorously for about 10 seconds.

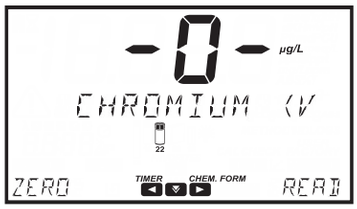


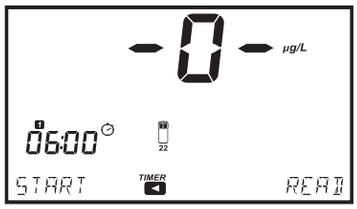


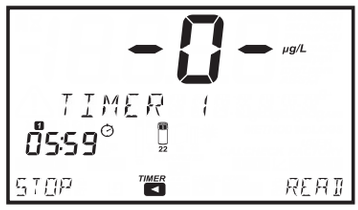
• Reinsert the cuvette into the instrument and close the lid.

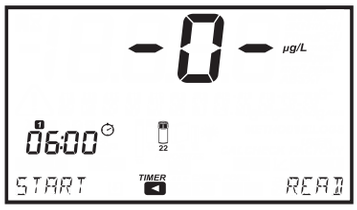
• Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 6 minutes.

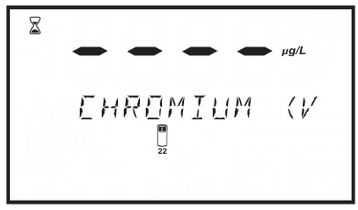
• Press the **READ** key, the meter displays the results in **µg/L chromium ($Cr^{6+}$)**.

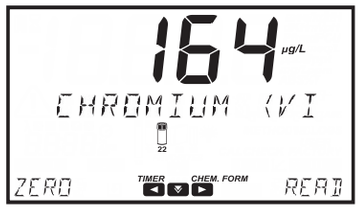


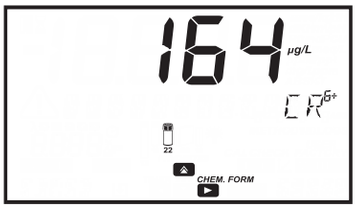



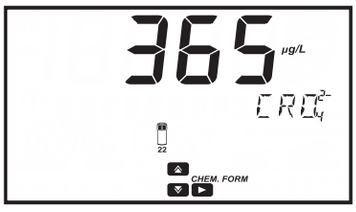



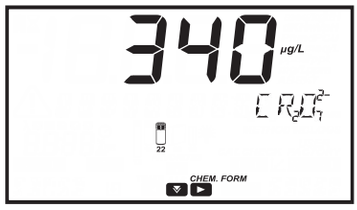

• Press the ▼▼ key to access the second level functions (wavelength, method ID, date and time).

• Press the ► key to view the chemical formula.

• Press the ▲▲ key in the chemical formula screen 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 ppm. However, waiting 10 minutes before reading removes the interference.
Iron above 1 ppm. Mercurous and mercuric ions cause slight inhibition of the reaction.

## 9.24. 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 |

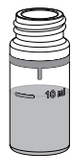
### REAGENT SETS

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

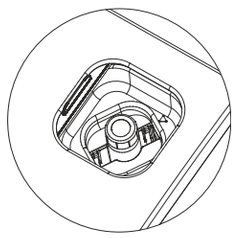
For other accessories see page 236.

### MEASUREMENT PROCEDURE

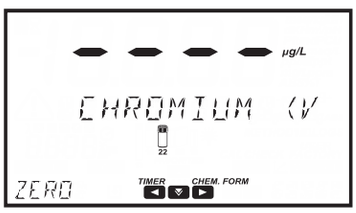
- Select the Chromium (VI) HR method using the procedure described in the Method Selection section (see page 6).
- Fill the cuvette with 10 mL of unreacted sample (up to the mark) and replace the cap.

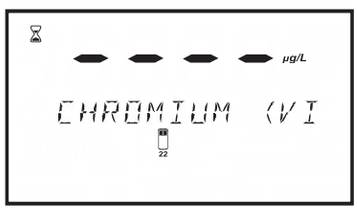


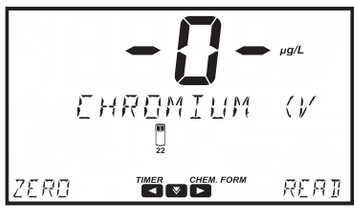

- Place the cuvette into the holder and close the lid.



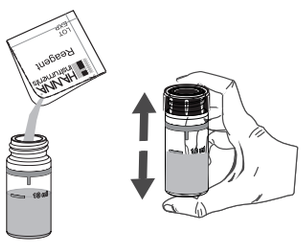
- Press the **ZERO** key. The display will show "-0-" when the meter is zeroed and ready for measurement.



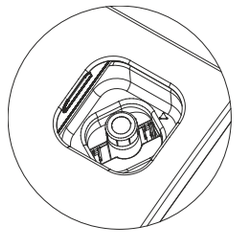




- Remove the cuvette.
- Add one packet of HI93723-0 Chromium(VI) High Range Reagent. Replace the cap and shake vigorously for about 10 seconds.

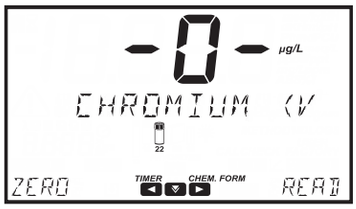


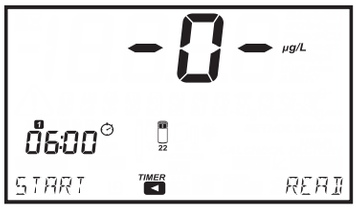
• Reinsert the cuvette into the instrument and close the lid.

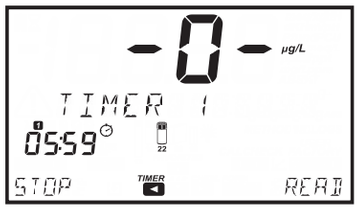


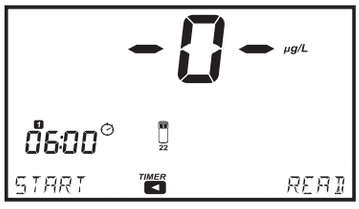
• Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 6 minutes.

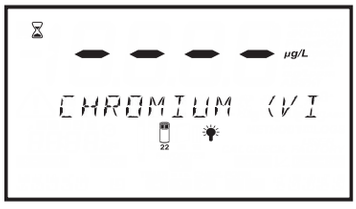
• Press the **READ** key, the meter displays the results in **µg/L chromium ($Cr^{6+}$)**.

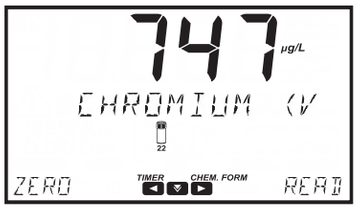


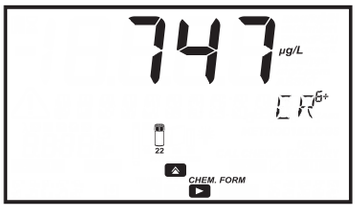



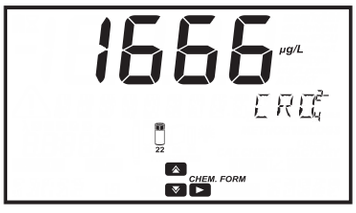



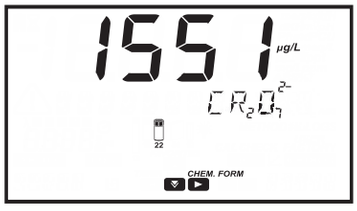

• Press the ▼ key to access the second level functions (wavelength, method ID, date and time).

• Press the ► key to view the chemical formula.

• Press the ▲ key in the chemical formula screen 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 ppm. However, waiting 10 minutes before reading removes the interference. Iron above 1 ppm.
Mercurous and mercuric ions cause slight inhibition of the reaction.

## 9.25. 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 USEPA 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: COD A, red label.

### REAGENT SETS

HI93754A-25 Reagents for 24 tests

For other accessories see page 236.

*Note: Store the unused vials 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.

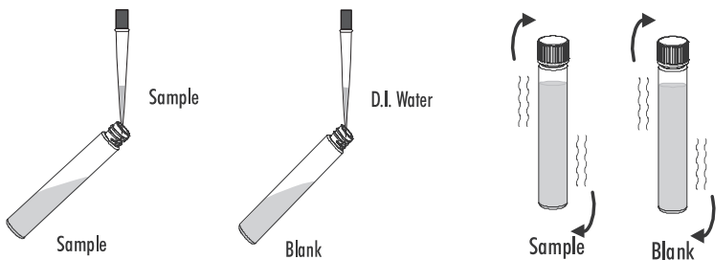
Reagent Blank Correction: This method requires a reagent blank correction. A single blank vial may be used more than once. The blank vial is stable for several months at room temperature. For improved accuracy, run a blank for each set of measurements and always use the same lot of reagents for blank 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).The optional HI740217 safety shield is strongly recommended.

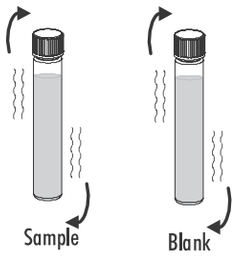
  **DO NOT USE AN OVEN OR MICROWAVE** samples may leak and generate a corrosive and possibly explosive atmosphere.
- Remove the cap from two HI93754A-0 COD Low Range Reagent Vials.

- Add 2.0 mL of deionized water to the first vial (#1) and 2.0 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.

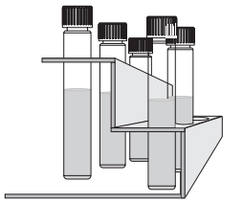


- Insert the vials into the reactor and heat them for 2 hours at 150 °C.
- At the end of the digestion period switch off the reactor. Wait for twenty minutes to allow the vials to cool to about 120 °C.




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

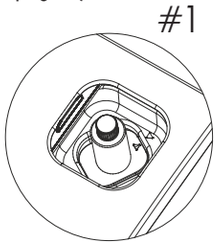
  **WARNING:** The vials are still hot, use caution when handling.



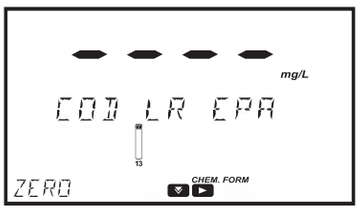
- Leave the vials in the tube rack to cool to room temperature. Do not shake or invert them, the samples may become turbid.

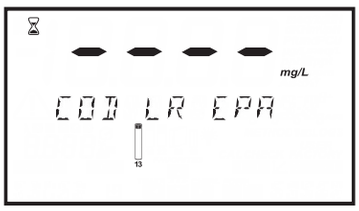
- Select COD LR EPA (13 mm) method using the procedure described in the Method Selection section (see page 6).

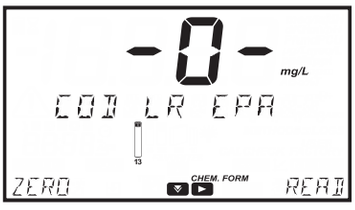
#1



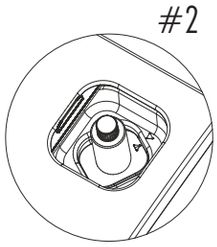
- Insert the 13 mm vial adapter using the procedure described in the Cuvette Adapters section (see page 10).
- Place the blank vial (#1) into the holder.
- Press the **ZERO** key. The display will show -0- when the meter is zeroed and ready for measurement.



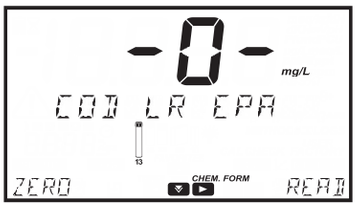



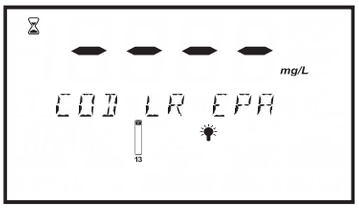



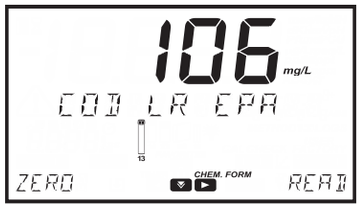

#2



- Remove the vial.
- Place the sample vial (#2) into the holder.
- Press the **READ** key to start the reading. The instrument displays the results in **mg/L of oxygen ($O_2$)**.

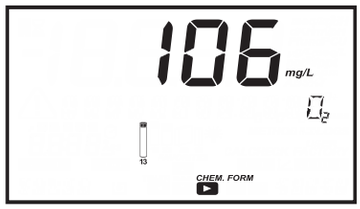


• Press the ⏬ key to access the second level functions (wavelength, method ID, date and time).

• 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.

## 9.26. 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: COD D, red label.

### REAGENT SETS

HI93754D-25 Reagents for 24 tests

For other accessories see page 236.

*Note: Store the unused vials 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.

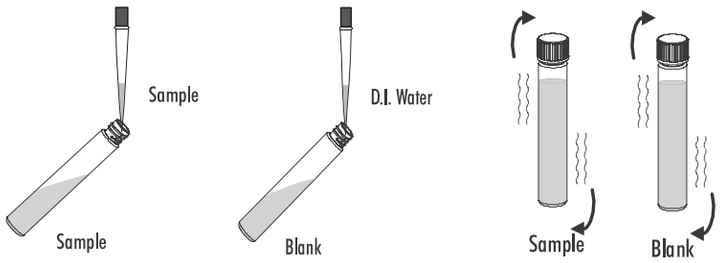
- Choose a homogeneous sample. Samples containing solids capable of settling need to be homogenized with a blender.
- Preheat the HANNA® Reactor HI839800 to 150 °C (302 °F).The optional HI740217 safety shield is strongly recommended.

**DO NOT USE AN OVEN OR MICROWAVE** samples may leak and generate a corrosive and possibly explosive atmosphere.

- Remove the cap from two HI93754D-0 COD Low Range Reagent Vials.

- Add 2.0 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.

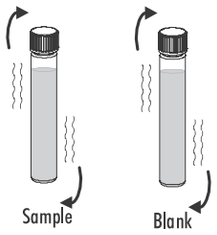


- Insert the vials into the reactor and heat them for 2 hours at 150 °C.

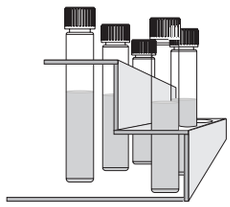
- At the end of the digestion period switch off the reactor. Wait for twenty minutes to allow the vials to cool to about 120 °C.

- 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.

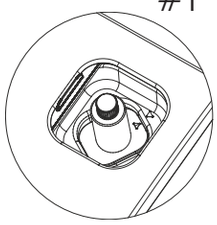


- Select COD LR Hg Free (13 mm ) method using the procedure described in the Method Selection section (see page 6).

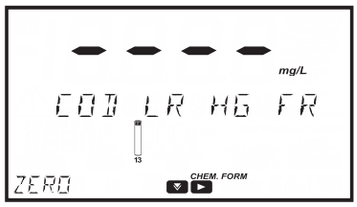
- Insert the 13 mm vial adapter using the procedure described in the Cuvette Adapters section (see page 10).

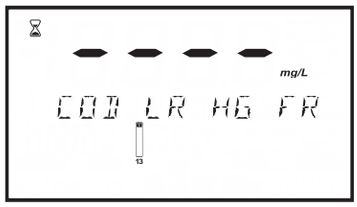
- Place the blank vial (#1) into the holder.

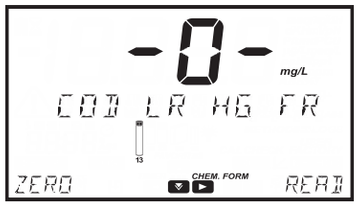
#1



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



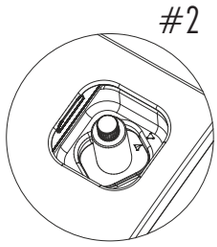



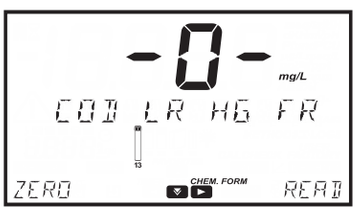

- Remove the vial.

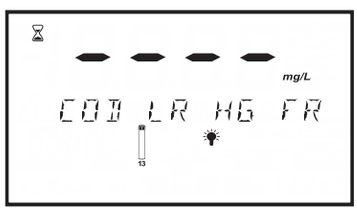
- Place the sample vial (#2) into the holder.

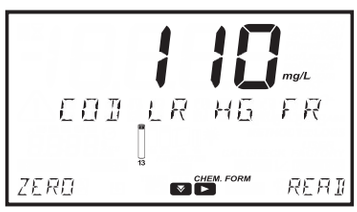
#2



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

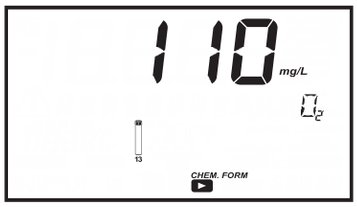


• Press the ▼▼ key to access the second level functions (wavelength, method ID, date and time).

• 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.

## 9.27. 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: COD F, red label.

### REAGENT SETS

HI93754F-25 Reagents for 24 tests

For other accessories see page 236.

*Note: Store the unused vials 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.

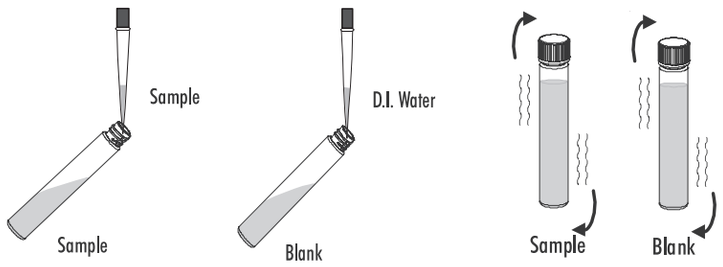
Reagent Blank Correction: This method requires a reagent blank correction. A single blank vial may be used more than once. The blank vial is stable for several months at room temperature. For improved accuracy, run a blank for each set of measurements and always use the same lot of reagents for blank 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).The optional HI740217 safety shield is strongly recommended.

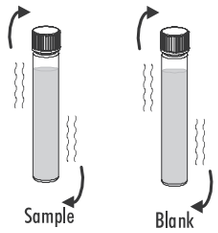
  **DO NOT USE AN OVEN OR MICROWAVE** samples may leak and generate a corrosive and possibly explosive atmosphere.
- Remove the cap from two HI93754F-0 COD Low Range Reagent Vials.

- Add 2.0 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.

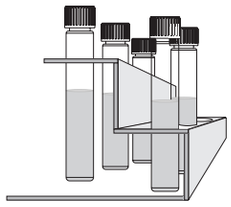


- Insert the vials into the reactor and heat them for 2 hours at 150 °C.
- At the end of the digestion period switch off the reactor. Wait for twenty minutes to allow the vials to cool to about 120 °C.




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

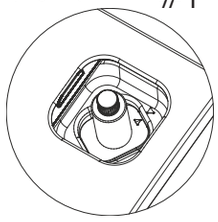
  WARNING: The vials are still hot, use caution when handling.



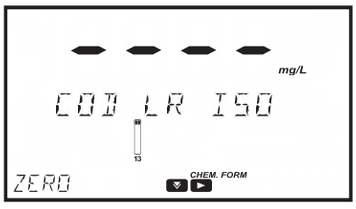
- Leave the vials in the tube rack to cool to room temperature. Do not shake or invert them, the samples may become turbid.

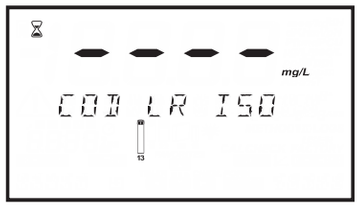
- Select COD LR ISO (13 mm) method using the procedure described in the Method Selection section (see page 6).

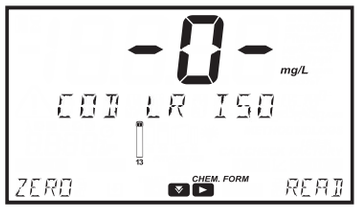
#1



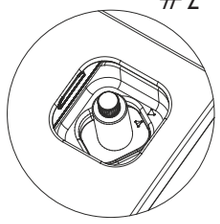
- Insert the 13 mm vial adapter using the procedure described in the Cuvette Adapters section (see page 10).
- Place the blank vial (#1) into the holder.
- Press the **ZERO** key. The display will show -0- when the meter is zeroed and ready for measurement.



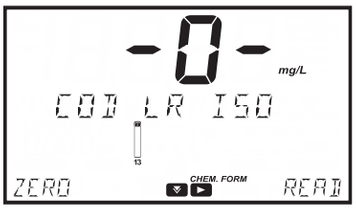



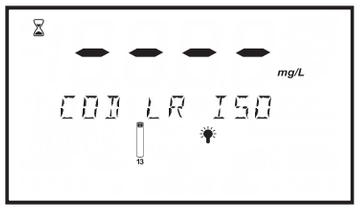



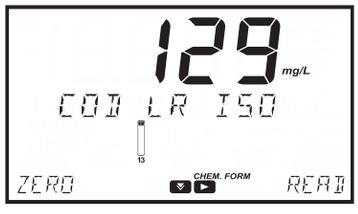

#2



- Remove the vial.
- Place the sample vial (#2) into the holder.
- Press the **READ** key to start the reading. The instrument displays the results in **mg/L of oxygen ($O_2$)**.

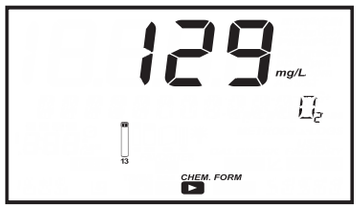


• Press the ⏬ key to access the second level functions (wavelength, method ID, date and time).

• 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.

## 9.28. 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 | 13mm diameter |
| Method | Adaptation of the USEPA 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: COD B, white label.

### REAGENT SETS

HI93754B-25 Reagents for 24 tests

For other accessories see page 236.

*Note: Store the unused vials 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.

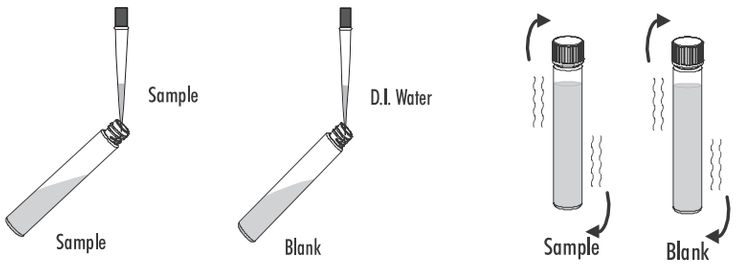
Reagent Blank Correction: This method requires a reagent blank correction. A single blank vial may be used more than once. The blank vial is stable for several months at room temperature. For improved accuracy measurement, run a blank for each set of measurements and always use the same lot of reagents 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 the optional HI740217 safety shield is strongly recommended.

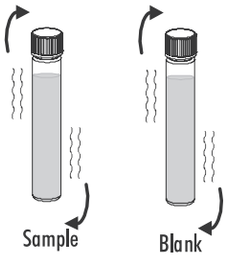
  **DO NOT USE AN OVEN OR MICROWAVE** samples may leak and generate a corrosive and possibly explosive atmosphere.
- Remove the cap from two HI93754B-0 COD Medium Range Reagent Vials.

- Add 2.0 mL of deionized water to the first vial (#1) and 2.0 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

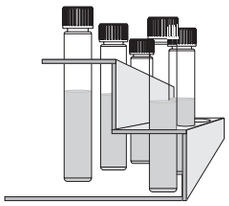


- Insert the vials into the reactor and heat them for 2 hours at 150 °C.
- At the end of the digestion period switch off the reactor. Wait for twenty minutes to allow the vials to cool to about 120 °C.



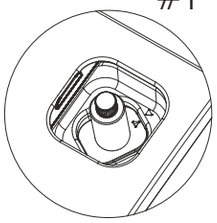

- Invert each vial several times while still warm, then place them in the test tube rack.

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

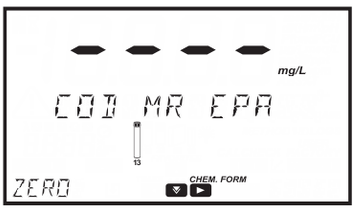


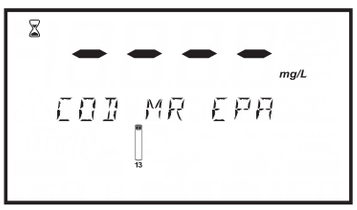
- Leave the vials in the tube rack to cool to room temperature. Do not shake or invert them, the samples may become turbid.
- Select COD MR EPA (13 mm) method using the procedure described in the Method Selection section (see page 6).

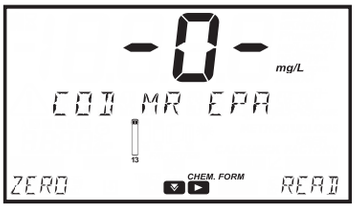
#1



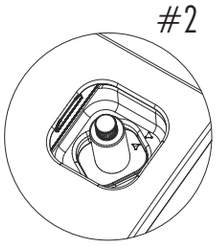
- Insert the 13 mm vial adapter using the procedure described in the Cuvette Adapters section (see page 10).
- Place the blank vial into the holder.
- Press the **ZERO** key. The display will show -0- when the meter is zeroed and ready for measurement.



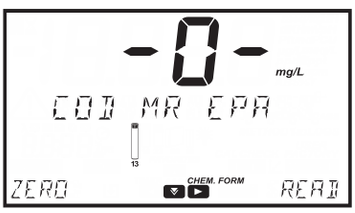



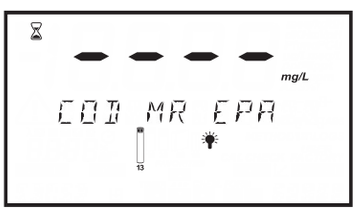



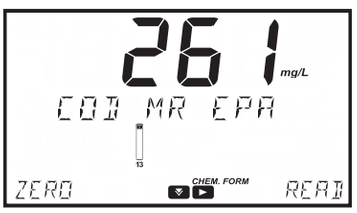

#2



- Remove the vial.
- Place the sample vial (#2) into the holder.
- Press the **READ** key to start the reading. The instrument displays the results in **mg/L of oxygen ($O_2$)**.

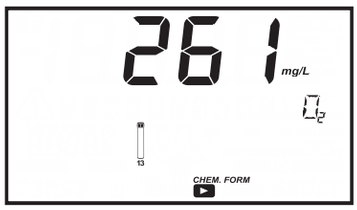


• Press the key to access the second level functions (wavelength, method ID, date and time).

• 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.

## 9.29. 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: COD E, white label.

### REAGENT SETS

HI93754E-25 Reagents for 24 tests

For other accessories see page 236.

*Note: Store the unused vials 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.

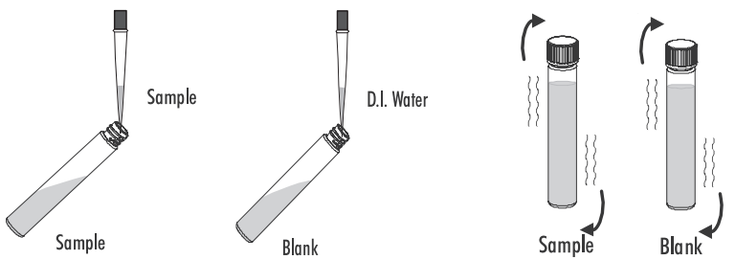
Reagent Blank Correction: This method requires a reagent blank correction. A single blank vial may be used more than once. The blank vial is stable for several months at room temperature. For improved accuracy measurement, run a blank for each set of measurements and always use the same lot of reagents 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 the optional HI740217 safety shield is strongly recommended.

  **DO NOT USE AN OVEN OR MICROWAVE** samples may leak and generate a corrosive and possibly explosive atmosphere.
- Remove the cap from two HI93754E-0 COD Medium Range Reagent Vials.

- Add 2.0 mL of deionized water to the first vial (#1) and 2.0 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

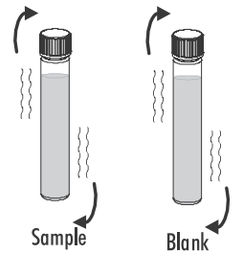


- Insert the vials into the reactor and heat them for 2 hours at 150 °C.

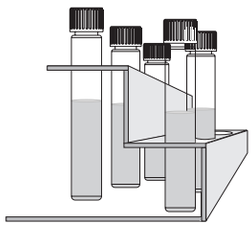
- At the end of the digestion period switch off the reactor. Wait for twenty minutes to allow the vials to cool to about 120 °C.

- 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.

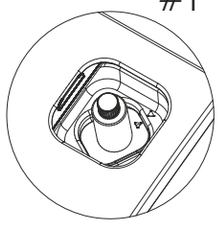



- Leave the vials in the tube rack to cool to room temperature. Do not shake or invert them, the samples may become turbid.

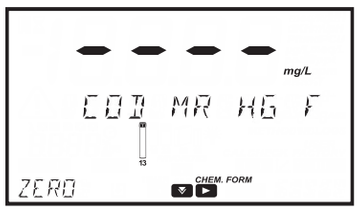


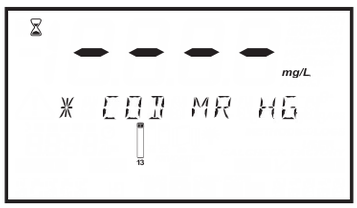
- Select COD MR Hg Free (13 mm) method using the procedure described in the Method Selection section (see page 6).

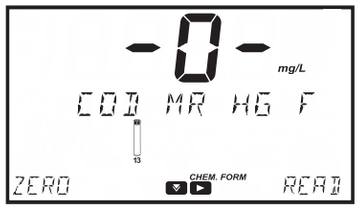
#1



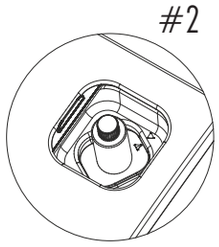
- Insert the 13 mm vial adapter using the procedure described in the Cuvette Adapters section (see page 10).
- Place the blank vial into the holder.
- Press the **ZERO** key. The display will show -0- when the meter is zeroed and ready for measurement.



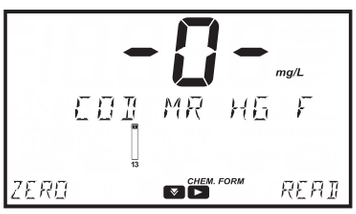



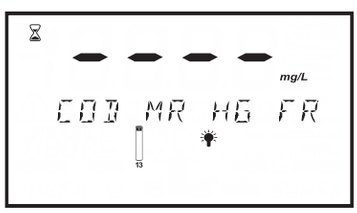



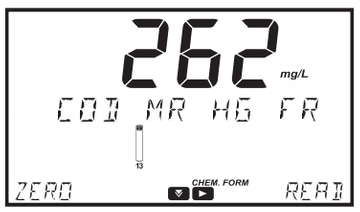

#2



- Remove the vial.
- Place the sample vial (#2) into the holder.
- Press the **READ** key to start the reading. The instrument displays the results in **mg/L of oxygen ($O_2$)**.

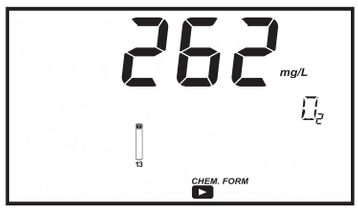


• Press the ▼▼ key to access the second level functions (wavelength, method ID, date and time).

• 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.

## 9.30. CHEMICAL OXYGEN DEMAND MEDIUM RANGE ISO (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 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: COD G, white label.

### REAGENT SETS

HI93754G-25 Reagents for 24 tests

For other accessories see page 236.

*Note: Store the unused vials 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.

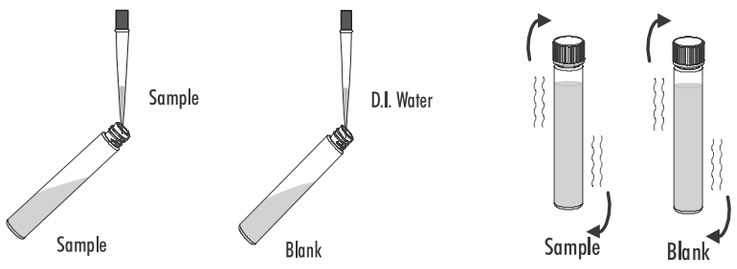
Reagent Blank Correction: This method requires a reagent blank correction. A single blank vial may be used more than once. The blank vial is stable for several months at room temperature. For improved accuracy measurement, run a blank for each set of measurements and always use the same lot of reagents 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 the optional HI740217 safety shield is strongly recommended.

  **DO NOT USE AN OVEN OR MICROWAVE** samples may leak and generate a corrosive and possibly explosive atmosphere.
- Remove the cap from two HI93754G-0 COD Medium Range Reagent Vials.

- Add 2.0 mL of deionized water to the first vial (#1) and 2.0 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.

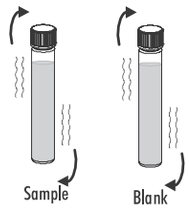
  WARNING: The vials will become hot during mixing, use caution when handling



- 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 for twenty 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.

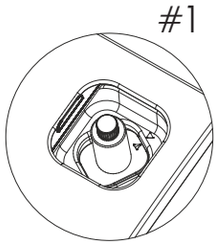
  WARNING: The vials are still hot, use caution when handling.



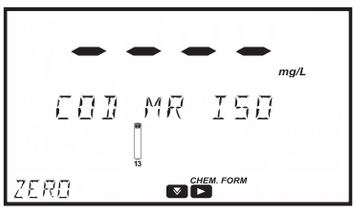

- Leave the vials in the tube rack to cool to room temperature. Do not shake or invert them, the samples may become turbid.

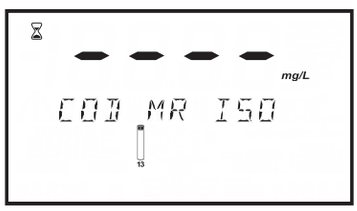
- Select COD MR ISO (13 mm) method using the procedure described in the Method Selection section (see page 6).
- Insert the 13 mm vial adapter using the procedure described in the Cuvette Adapters section (see page 10).

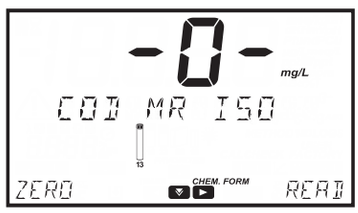
#1



- Place the blank vial into the holder.
- Press the **ZERO** key. The display will show -0- when the meter is zeroed and ready for measurement.

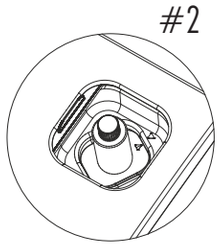


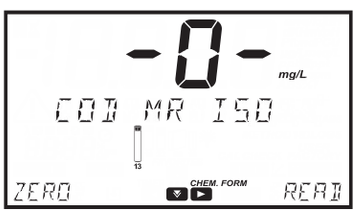



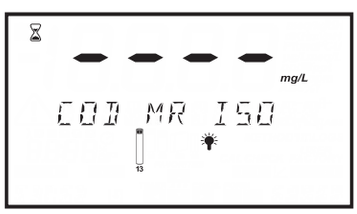

#2

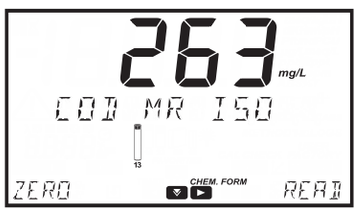
- Remove the vial.
- Place the sample vial (#2) into the holder.



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

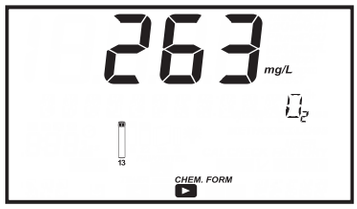


• Press the ⏬ key to access the second level functions (wavelength, method ID, date and time).

• 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.

## 9.31. 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 USEPA 410.4 approved method for the COD determination on surface waters and waste waters. |
| 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: COD C, green label

### REAGENT SETS

HI93754C-25 Reagents for 24 tests

For other accessories see page 236.

*Note: Store the unused vials in their container 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.

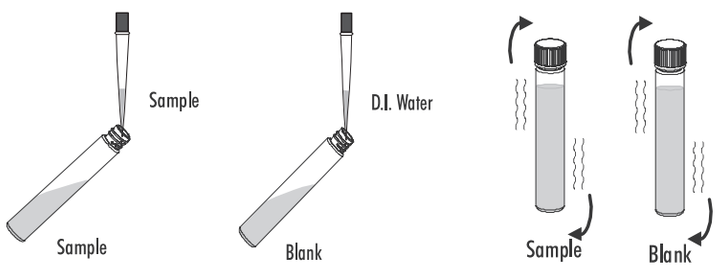
Reagent Blank Correction: This method requires a reagent blank correction. A single blank vial may be used more than once. The blank vial is stable for several months at room temperature. For improved accuracy measurement, run a blank for each set of measurements and always use the same lot of reagents 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 the optional HI740217 safety shield is strongly recommended.

  **DO NOT USE AN OVEN OR MICROWAVE** samples may leak and generate a corrosive and possibly explosive atmosphere.
- Remove the cap from two 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.

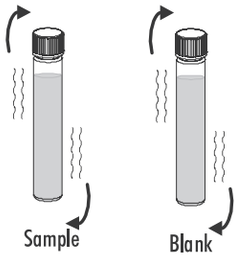
  **WARNING:** The vials will become hot during mixing, use caution when handling.



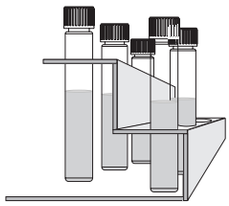
- Insert the vials into the reactor and heat them for 2 hours at 150 °C.
- At the end of the digestion period switch off the reactor. Wait for twenty minutes to allow the vials to cool to about 120 °C.

- 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.

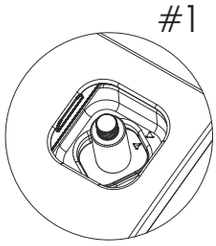



- Leave the vials in the tube rack to cool to room temperature. Do not shake or invert them, the samples may become turbid.

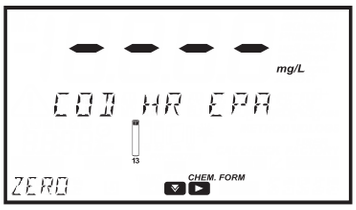


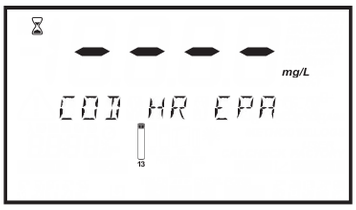
- Select COD HR EPA (13 mm) method using the procedure described in the Method Selection section (see page 6).
- Insert the 13 mm vial adapter using the procedure described in the Cuvette Adapters section (see page 10).
- Place the blank vial (#1) into the holder.

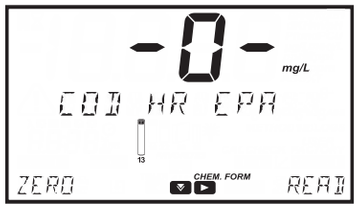
#1



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

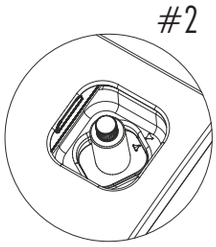


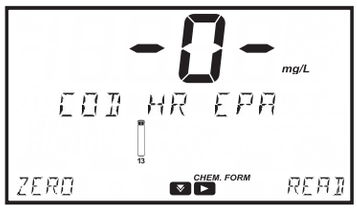



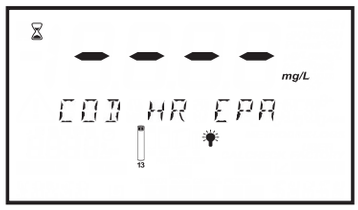

- Remove the vial.
- Place the sample vial (#2) into the holder.

#2



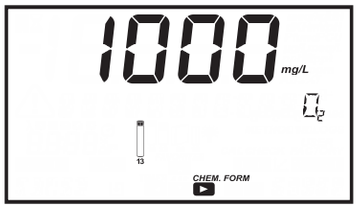
- Press the **READ** key to start the reading. The instrument displays the results in **mg/L of oxygen ($O_2$)**.




• Press the ▼▼ key to access the second level functions (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.

## 9.32. 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 |

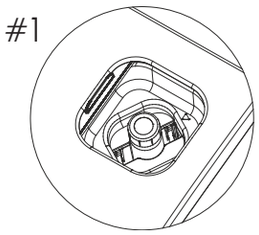
### REQUIRED ACCESSORIES

0.45 µm membrane for true color measurement.
For other accessories see page 236.

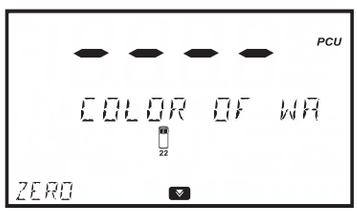
### MEASUREMENT PROCEDURE

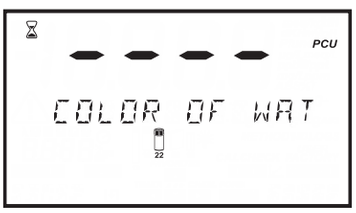
- Select the Color of Water method using the procedure described in the Method Selection section (see page 6).
- Fill the first cuvette (#1) up to the mark with deionized water and replace the cap.

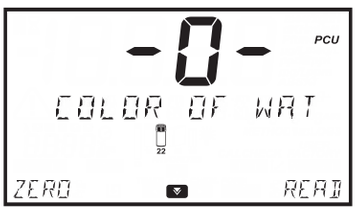

- Place the blank (#1) into the holder and close the lid.




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



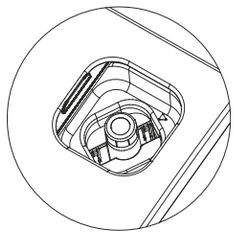




- Remove the cuvette.
- Fill the second cuvette (#2) up to the mark with unfiltered sample and replace the cap. This is the apparent color.

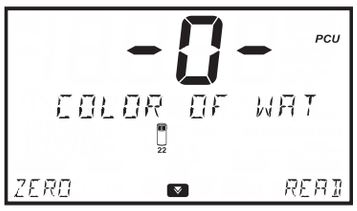

- Filter 10 mL of sample through a filter with a 0.45 µm membrane into the third cuvette (#3), up to the 10 mL mark and replace the cap. This is the true color.

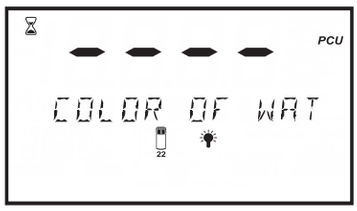
#2



• Insert the apparent color cuvette (#2) into the instrument and close the lid.

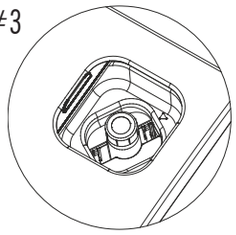
• Press the **READ** key to start the reading. The meter displays the value of apparent color in **Platinum Cobalt Units (PCU)**.



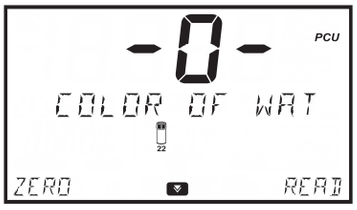


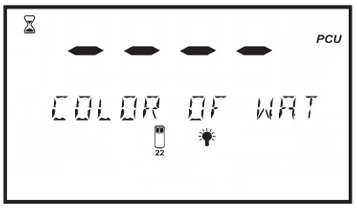
#3

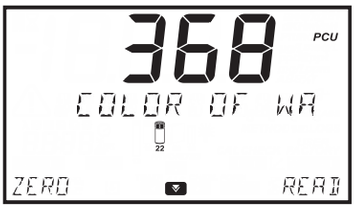


• Remove the apparent color cuvette (#2) from the instrument, insert the true color cuvette (#3) into the instrument and close the lid.

• Press the **READ** key to start the reading. The meter displays the true color in **Platinum Cobalt Units (PCU)**.




• Press the ▼▼ key to access the second level functions (wavelength, method ID, date and time).

## 9.33. 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

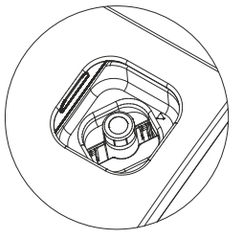
| | |
|---|---|
| HI95747-01 | Reagents for 100 tests |
| HI95747-03 | Reagents for 300 tests |

For other accessories see page 236.

### MEASUREMENT PROCEDURE

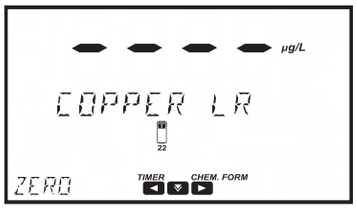
- Select the Copper LR method using the procedure described in the Method Selection section (see page 6).

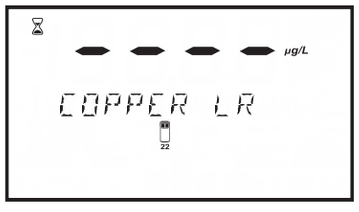

- Fill the cuvette with 10 mL of unreacted sample (up to the mark) and replace the cap.

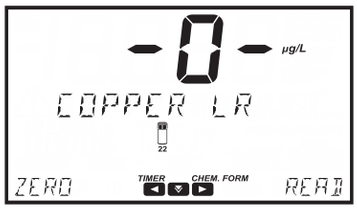


- Place the cuvette into the holder and close the lid.

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

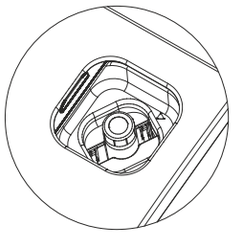


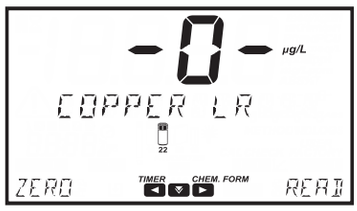

- Remove the cuvette.

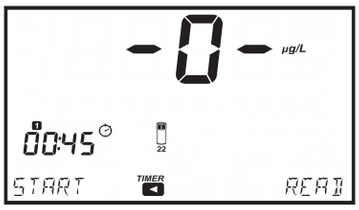

- Add one packet of HI95747-0 Copper Low Range Reagent. Replace the cap and shake gently for about 15 seconds.

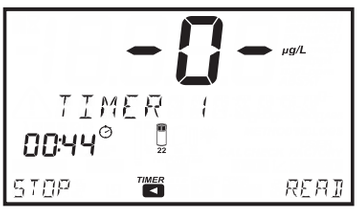


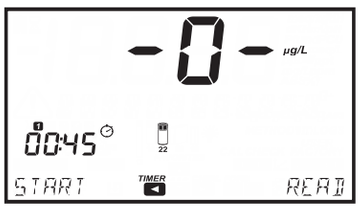
- Reinsert the cuvette into the instrument and close the lid.

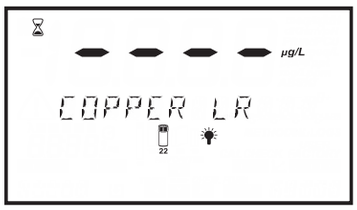
- Press the ◀ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 45 seconds.
- Press the **READ** key to start the reading. The meter displays the results in **µg/L of copper (Cu).**

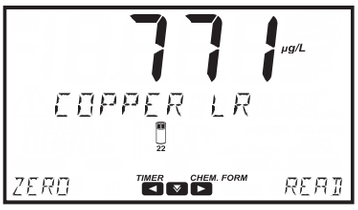


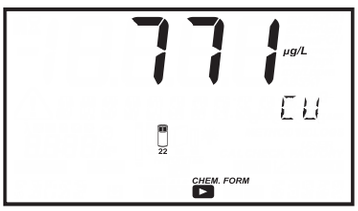




- Press the ▼ key to access the second level functions (wavelength, method ID, date and time).
- Press the ▶ key to view the chemical formula.




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

## INTERFERENCES

Interference may be caused by:
Silver, Cyanide.
For samples overcoming buffering capacity of reagent (around pH 6.8), pH should be adjusted between 6 and 8.

## 9.34. 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 |

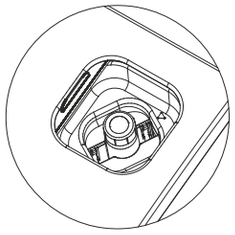
For other accessories see page 236.

### MEASUREMENT PROCEDURE

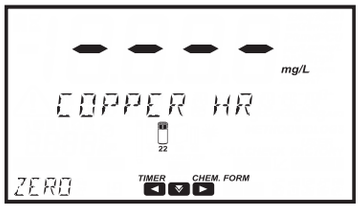
- Select the Copper HR method using the procedure described in the Method Selection section (see page 6).

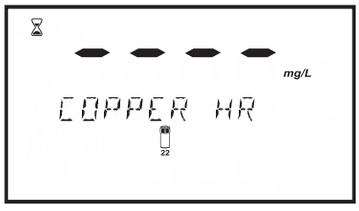
- Fill the cuvette with 10 mL of unreacted sample (up to the mark) and replace the cap.

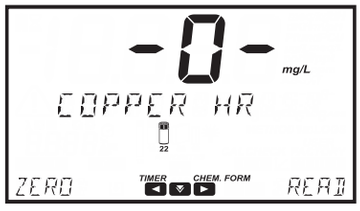

- Place the cuvette into the holder and close the lid.



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

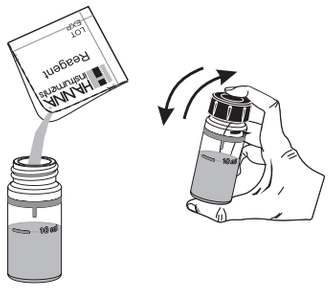


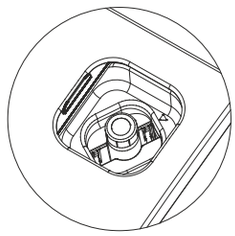




- Remove the cuvette.

- Add one packet of HI93702-0 Copper High Range Reagent. Replace the cap and shake gently for about 15 seconds.

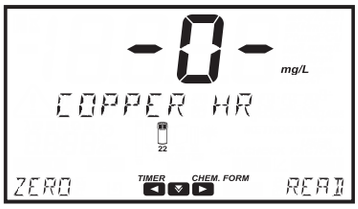


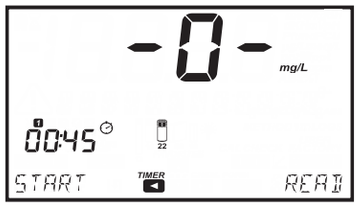
• Reinsert the cuvette into the instrument and close the lid.

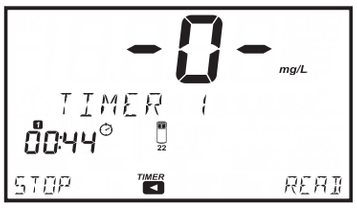


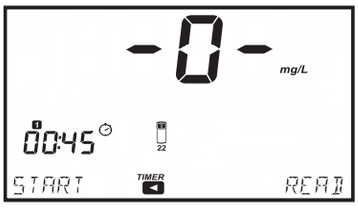
• Press the ◀ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 45 seconds.

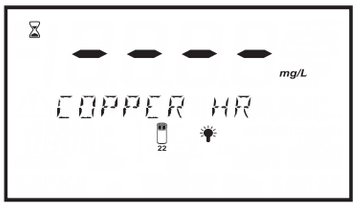
• Press the **READ** key to start the reading. The meter displays the results in **mg/L of copper (Cu)**.

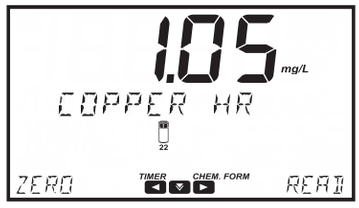


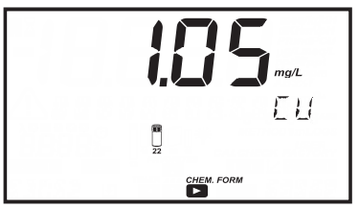




• Press the ▼ key to access the second level functions (wavelength, method ID, date and time).

• Press the ▶ key to view the chemical formula.




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

## INTERFERENCES

Interference may be caused by:
Silver, Cyanide.
For samples overcoming buffering capacity of reagent (around pH 6.8), pH should be adjusted between 6 and 8.

## 9.35. 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 |

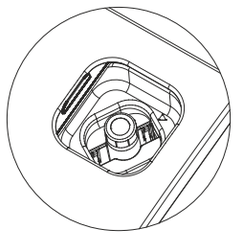
For other accessories see page 236.

### MEASUREMENT PROCEDURE

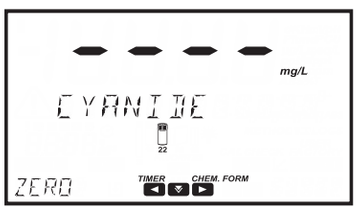
• Select the Cyanide method using the procedure described in the Method Selection section (see page 6).

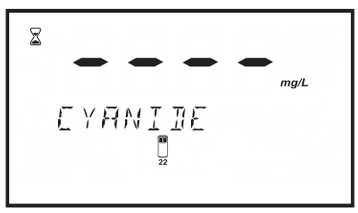
• Fill the cuvette with 10 mL of unreacted sample (up to the mark) and replace the cap.

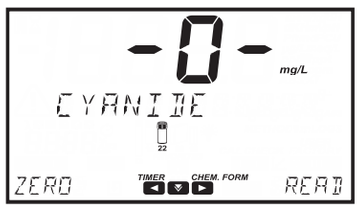

• Place the cuvette into the holder and close the lid.



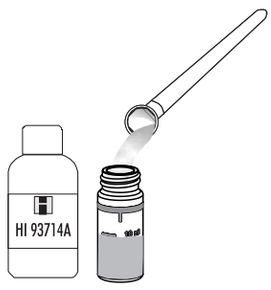
• Press the **ZERO** key. The display will show "-0-" when the meter is zeroed and ready for measurement.



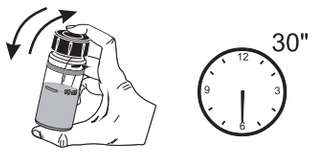




• Remove the cuvette and add 1 level spoon of HI93714A-0 Cyanide Reagent A. Remember to close the reagent bottle immediately after use.

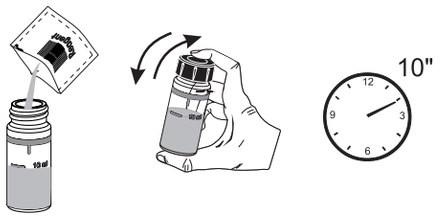


*Note: Pay attention to the way the spoon is filled:*
*- do not press the powder;*
*- do not overfill it.*

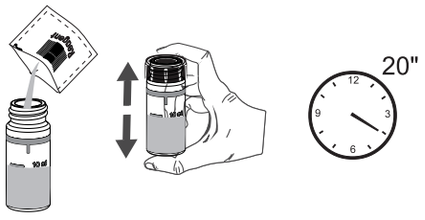
- Place the HDPE plastic stopper and cap immediately, to prevent the escape of chlorine gas which is developed during the reaction, and shake gently for 30 seconds.



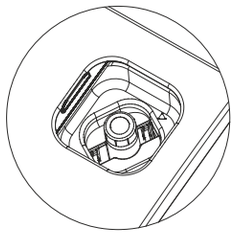

- Wait for 30 seconds leaving the cuvette tightly capped and undisturbed, then add one packet of HI93714B-0 Cyanide Reagent B. Replace the cap and shake gently for 10 seconds.




- Add one packet of HI93714C-0 Cyanide Reagent C. Replace the cap and shake vigorously for 20 seconds.



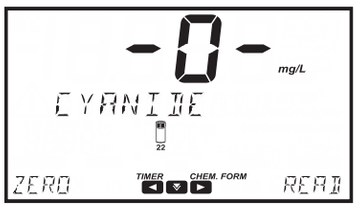

- Reinsert the cuvette into the instrument and close the lid.

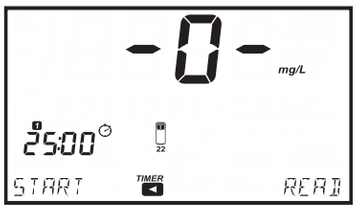


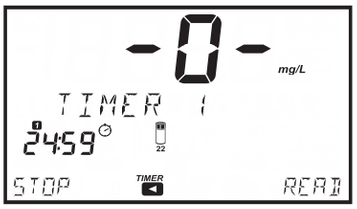
- Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 25 minutes.

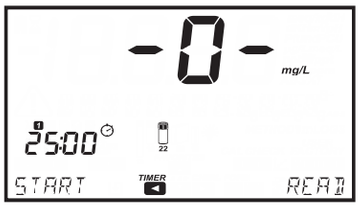
*Note: Gently shake the cuvettes 4 or 5 times during the first 20 minutes of the timer. Accuracy is not affected by undissolved reagent powder.*

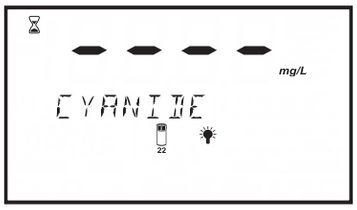
- Press the **READ** key to start the reading. The meter displays results in **mg/L of cyanide ($CN^-$)**.

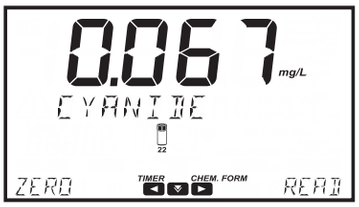


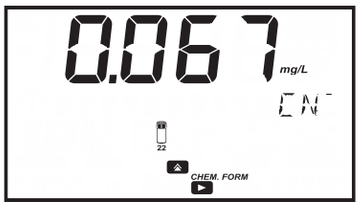



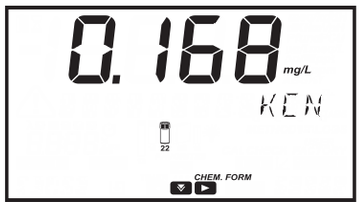



• Press the ⏬ key to access the second level functions (wavelength, method ID, date and time).

• Press the ▶ key to view the chemical formula.

• Press the ⏫ key in the chemical formula screen to convert the results to **mg/L potassium cyanide (KCN)**.




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

*Note: For the most accurate results perform the test at 20-25 °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.**

## 9.36. CYANURIC ACID

### SPECIFICATIONS

| | |
|---|---|
| Range | 0 to 100 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

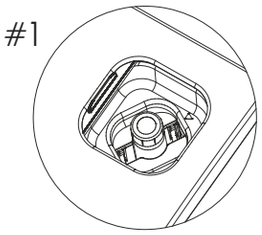
| | |
|---|---|
| HI93722-01 | Reagents for 100 tests |
| HI93722-03 | Reagents for 300 tests |

For other accessories see page 236.

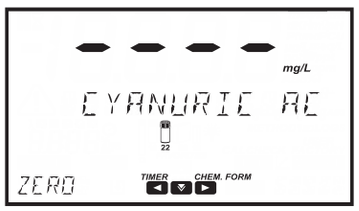
### MEASUREMENT PROCEDURE

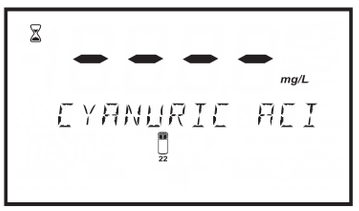
- Select the Cyanuric Acid method using the procedure described in the Method Selection section (see page 6).
- Fill the first cuvette with 10 mL of unreacted sample (up to the mark) and replace the cap.

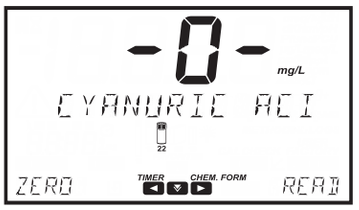

- Place the cuvette into the holder and close the lid.




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



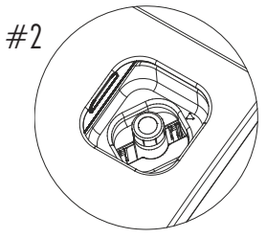




- Fill a beaker with 25 mL sample (up to the mark).

- Add one packet of HI93722-0 Cyanuric Acid Reagent and mix to dissolve.

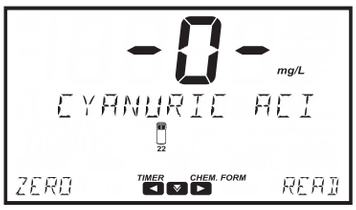

• Fill a second cuvette with 10 mL of the reacted sample, up to the mark, and replace the cap.

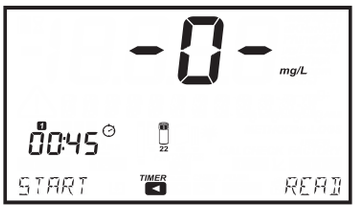


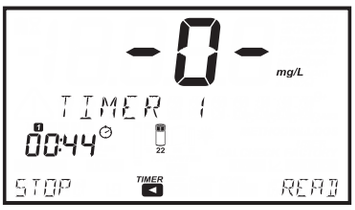

• Reinsert the cuvette into the instrument and close the lid.

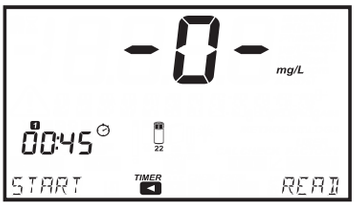
• Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 45 seconds.

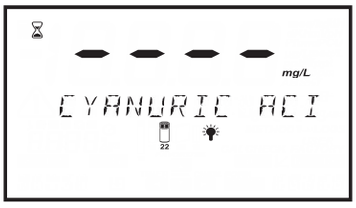
• Press the **READ** key to start the reading. The meter displays the results in **mg/L of cyanuric acid**.



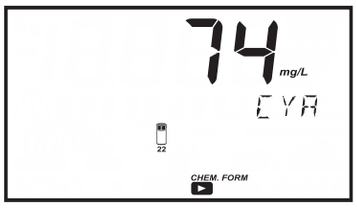





• Press the ▼▼ key to access the second level functions (wavelength, method ID, date and time).

• Press the ► key to view the chemical formula.




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

## 9.37. 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 REAGENT

| Code | Description | Quantity |
|---|---|---|
| HI93729-0 | Fluoride Low Range Reagent | 4 mL |

### REAGENT SETS

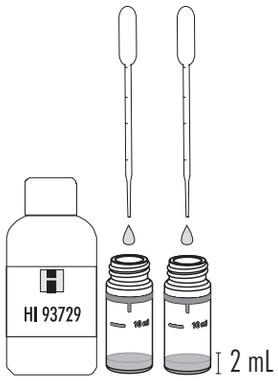
| | |
|---|---|
| HI93729-01 | Reagents for 100 tests |
| HI93729-03 | Reagents for 300 tests |

For other accessories see page 236.

### MEASUREMENT PROCEDURE

- Select the Fluoride LR method using the procedure described in the Method Selection section (see page 6).

- Add 2 mL of HI93729-0 Fluoride Low Range Reagent to two cuvettes.

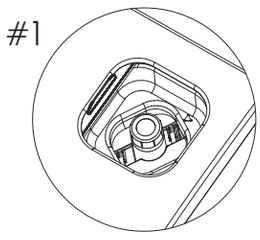



- Use a plastic pipette to fill the first cuvette to the 10 mL mark with deionized water (#1), replace the cap and invert several times to mix.

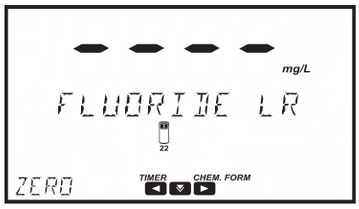
- Use a plastic pipette to fill the second cuvette to the 10 mL mark with unreacted sample (#2), replace the cap and invert several times to mix.

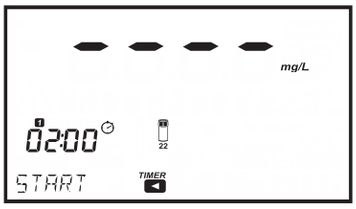

*Note: For the most accurate results use two graduated pipettes to deliver exactly 8 mL of deionized water and 8 mL of sample.*

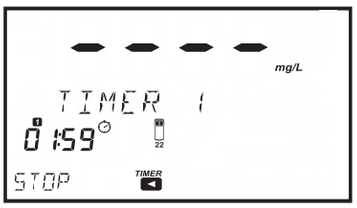
- Place the first cuvette (#1) into the holder and close the lid.

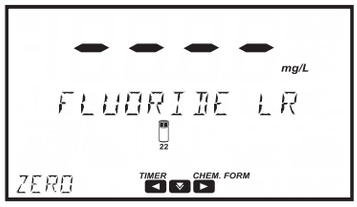


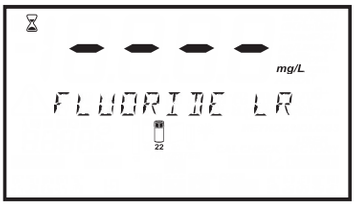
- Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 2 minutes.
- Press the **ZERO** key, the display will show "-0-" when the meter is zeroed and ready for measurement.

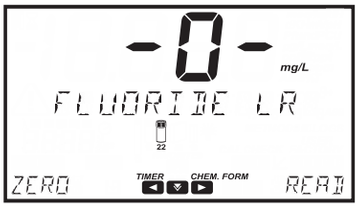


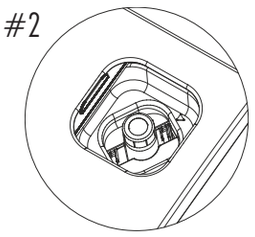



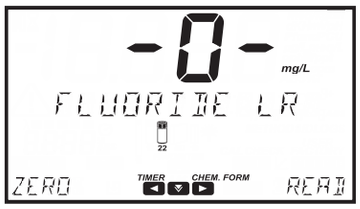



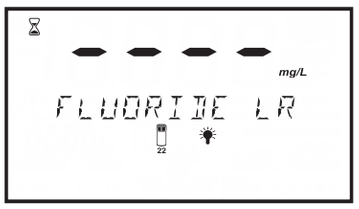

- Remove the cuvette.

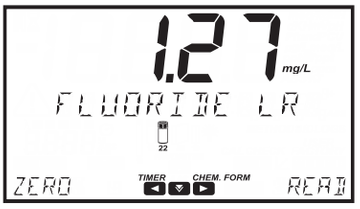
- Insert the second cuvette (#2) with the reacted sample into the instrument and close the lid.



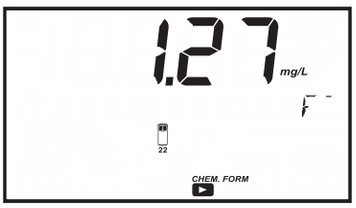

- Press the **READ** key to start reading. The instrument displays the results in **mg/L of fluoride ($F^-$)**.




- Press the ▼ key to access the second level functions (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

Interferences may be caused by:
Alkalinity (as $CaCO_3$) above 5000 mg/L; Aluminum above 0.1 mg/L; Iron, ferric above 10 mg/L; Chloride above 700 mg/L; orthoPhosphate above 16 mg/L; Sodium hexametaphosphate above 1.0 mg/L; Sulfate above 200 mg/L;
Highly colored and turbid samples may require distillation; Highly alkaline samples can be neutralized with nitric acid.

## 9.38. 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 REAGENT

| Code | Description | Quantity |
|---|---|---|
| HI93739A-0 | Fluoride High Range Reagent A | 2 mL |
| HI93739B-0 | Fluoride High Range Reagent B | 8 mL |

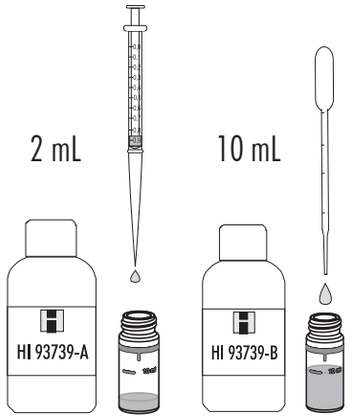
### REAGENT SETS

| | |
|---|---|
| HI93739-01 | Reagents for 100 tests |
| HI93739-03 | Reagents for 300 tests |

For other accessories see page 236.

### MEASUREMENT PROCEDURE

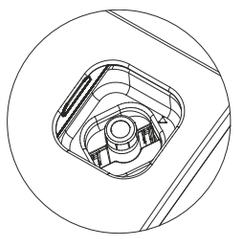
- Select the Fluoride HR method using the procedure described in the Method Selection section (see page 6).



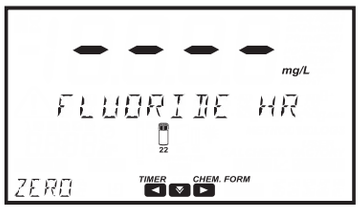

- Add 2.00 mL of HI93739A-0 Fluoride High Range Reagent A to the cuvette using a 1mL syringe. Use the plastic pipette to fill up the cuvette to the 10mL mark with HI93739B-0 Fluoride High Range Reagent B.

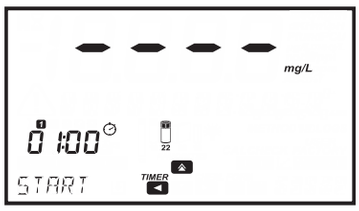
- Replace the cap and invert several times to mix.

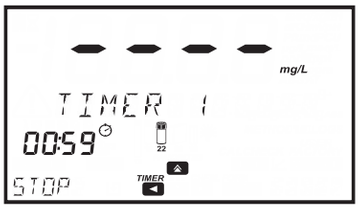
- Place the cuvette into the holder and close the lid.

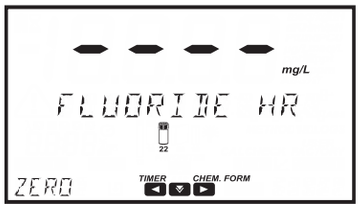


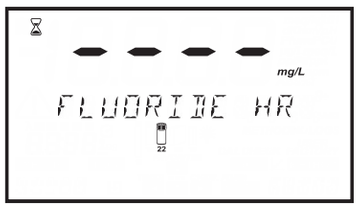
- Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 1 minutes.
- Press the **ZERO** key, the display will show "-0-" when the meter is zeroed and ready for measurement.

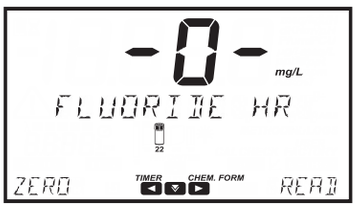


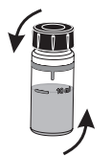



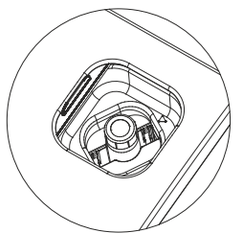

- Remove the cuvette.

- Add 1mL of sample to the cuvette using the second 1mL syringe.

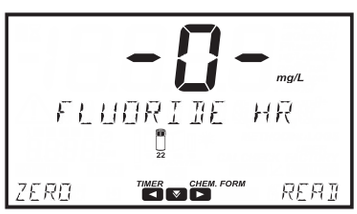
- Replace the cap and invert several times to mix.

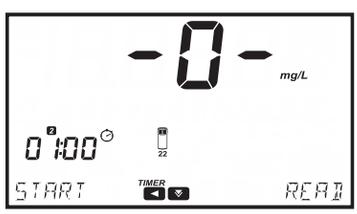


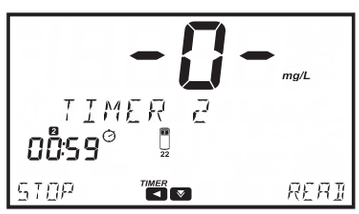
- Insert the cuvette into the instrument and close the lid.

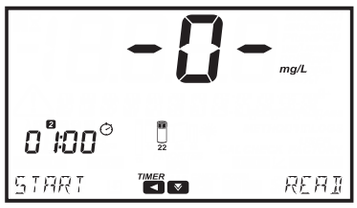


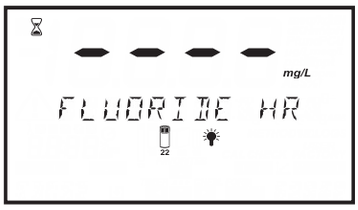
- Press the ◄ key to access the timer menu, press the ▲ key to select Timer 2. Press the **START** key to start Timer 2, the display will show the countdown or, alternatively wait for 1 minutes.
- Press the **READ** to start the reading. The meter displays the results in **mg/L of fluoride ($F^-$)**.

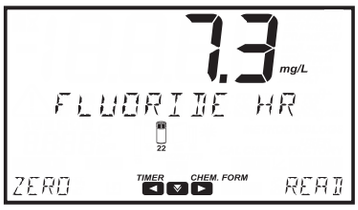


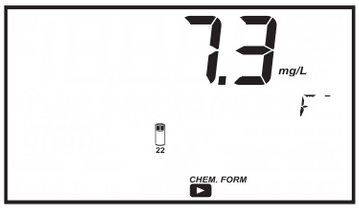



• Press the ▼▼ key to access the second level functions (wavelength, method ID, date and time).

• 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

Interferences may be caused by:
Alkalinity (as $CaCO_3$) above 5000 mg/L;
Aluminum above 0.1 mg/L;
Iron, ferric above 10 mg/L;
Chloride above 700 mg/L
orthoPhosphate above 16 mg/L;
Sodium hexametaphosphate above 1.0 mg/L;
Sulfate above 200 mg/L
Highly colored and turbid samples may require distillation
Highly alkaline samples can be neutralized with nitric acid.

## 9.39. 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

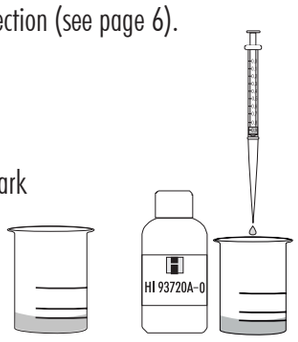
| | |
|---|---|
| HI93720-01 | Reagents for 100 tests |
| HI93720-03 | Reagents for 300 tests |

For other accessories see page 236.

### MEASUREMENT PROCEDURE

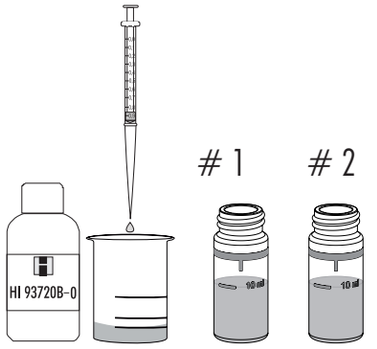
- Select the Hardness (Calcium) method using the procedure described in the Method Selection section (see page 6).

- Rinse a graduated beaker several times with unreacted sample, before filling it to the 50 mL mark with the sample.

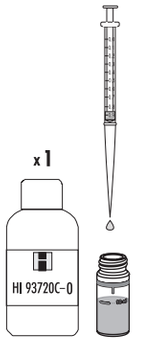



- Add 0.5 mL of HI93720A-0 Calcium Hardness Reagent A and swirl to mix.

- Add 0.5 mL of HI93720B-0 Calcium Hardness Reagent B and swirl to mix. Use this solution to rinse 2 cuvettes before filling them up to the 10 mL mark.

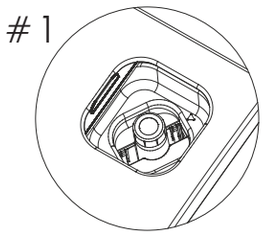



- Add 1 drop of HI93720C-0 Calcium Hardness Reagent C to one cuvette (#1).

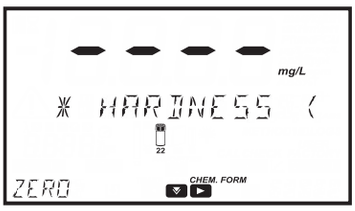


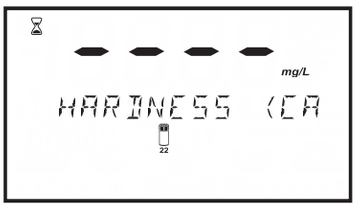
• Replace the cap and invert the cuvette several times to mix. This is the blank.

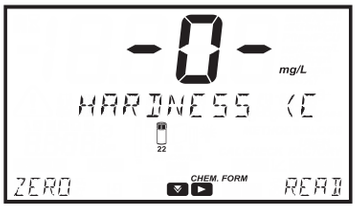
• Place the blank (#1) into the holder and close the lid.

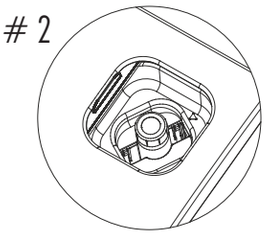



• Press the **ZERO** key. The display will show "-0-" when the meter is zeroed and ready for measurement.



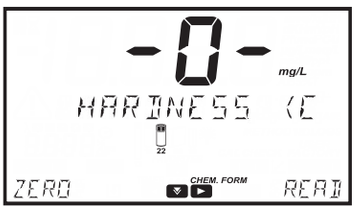



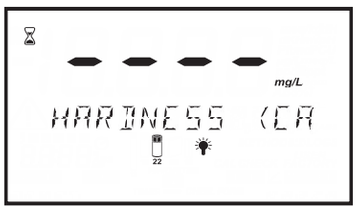



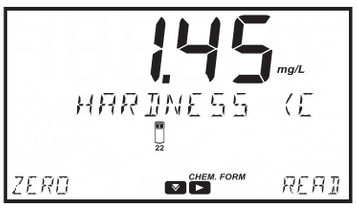




• Remove the blank (#1) and insert the second cuvette (#2) into the instrument.

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



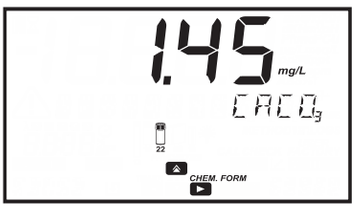



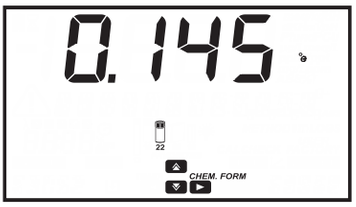



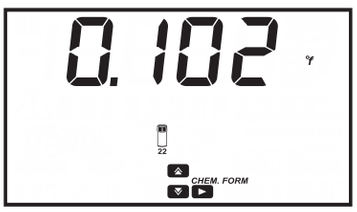

• Press the ▼ key to access the second level functions (wavelength, method ID, date and time).

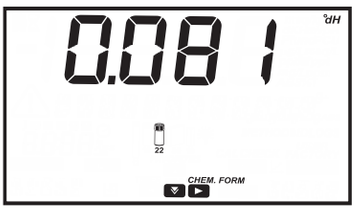
• Press the ▶ key to view the chemical formula.

• Press the ▲ key in the chemical formula screen to convert the results to **English degrees (°e), French degrees (°f) or German degrees (°dH)**.



• 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 you obtain consistent results.*

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

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

## INTERFERENCES

Interference may be caused by excessive amounts of heavy metals.

## 9.40. 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 |

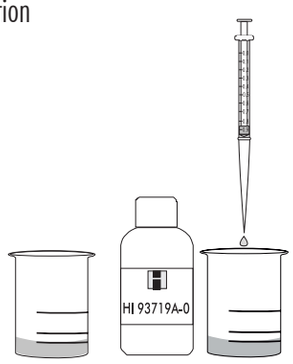
For other accessories see page 236.

### MEASUREMENT PROCEDURE

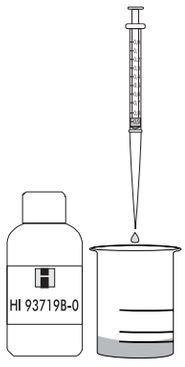
- Select the Hardness (Magnesium) method using the procedure described in the Method Selection section (see page 6).

- Rinse a graduated beaker several times with unreacted sample before filling it to the 50 mL mark with the sample.

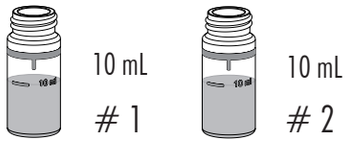
- Add 0.5 mL of HI93719A-0 Magnesium Hardness Reagent A, then swirl to mix.



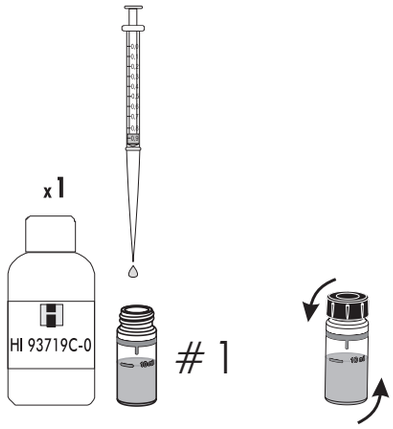

- Add 0.5 mL of HI93719B-0 Magnesium Hardness Reagent B and swirl to mix. Use this solution to rinse 2 cuvettes.



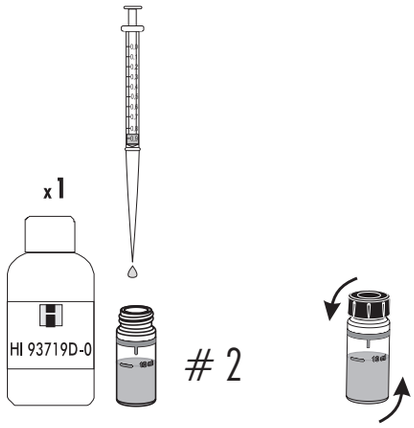

- Fill both cuvettes up to the 10 mL mark.



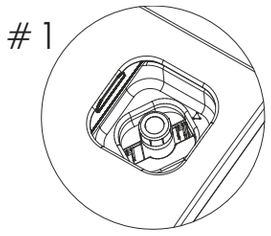
• Add 1 drop of HI93719C-0 Magnesium Hardness Reagent C to one cuvette (#1), replace the cap and invert the cuvette several times to mix. This is the blank.



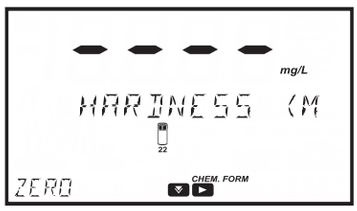

• Add 1 drop of HI93719D-0 Magnesium Hardness Reagent D to the second cuvette (#2), replace the cap and invert the cuvette several times to mix. This is the sample.

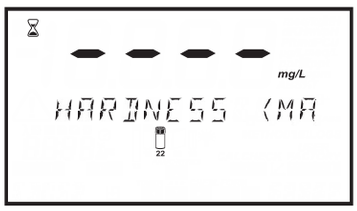


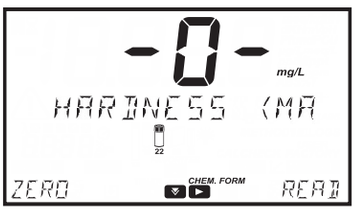

• Place the blank (#1) into the holder and close the lid.



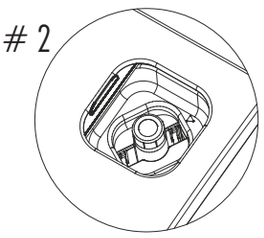

• Press the **ZERO** key. The display will show "-0-" when the meter is zeroed and ready for measurement.



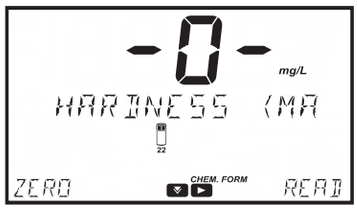



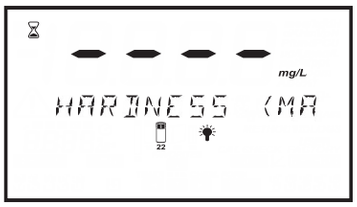



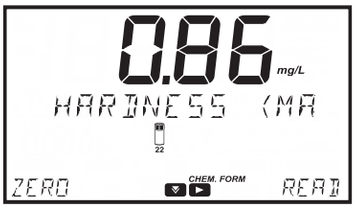

• Remove the blank (#1), insert the sample (#2) into the instrument and close the lid.



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



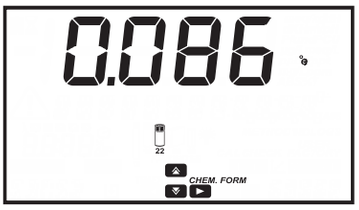



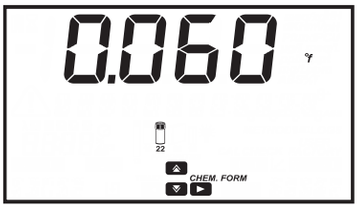



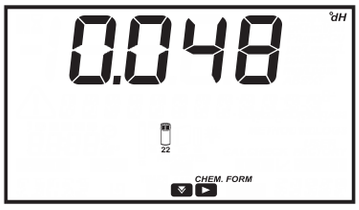

• Press the ⏬ key to access the second level functions (wavelength, method ID, date and time).

• Press the ▶ key to view the chemical formula.

• Press the ⏫ key in the chemical formula screen to convert the results to **English degrees (°e), French degrees (°f) or German degrees (°dH).**


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

*Note: This test will detect any magnesium contamination in the beakers, measuring syringes, or sample cells. To test cleanliness repeat the test multiple times until you obtain consistent results.*

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

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

## INTERFERENCES

Interference may be caused by excessive amounts of heavy metals.

## 9.41. 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 recommended 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 |

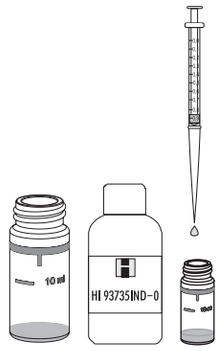
### REAGENT SETS

| | |
|---|---|
| HI93735-00 | Reagents for 100 tests (LR, 0 to 250 mg/L) |
| HI93735-0 | Reagents for 300 tests (LR - 100 tests, MR - 100 tests, HR - 100 tests) |

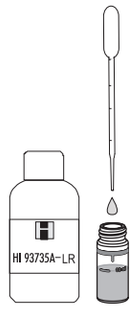
For other accessories see page 236.

### MEASUREMENT PROCEDURE

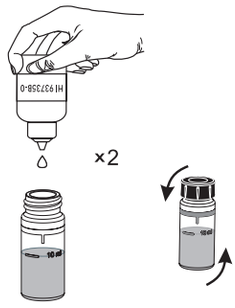
- Select the Hardness Total LR method using the procedure described in the Method Selection section (see page 6).




- Add 0.5 mL of unreacted sample to the cuvette. Add 0.5 mL of HI93735IND-0 Hardness Indicator Reagent.

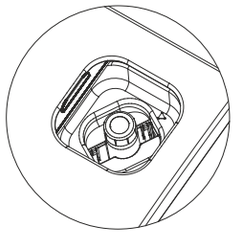



- Use the plastic pipette to fill the cuvette up to the 10 mL mark with HI93735A-LR Hardness Low Range Reagent A.

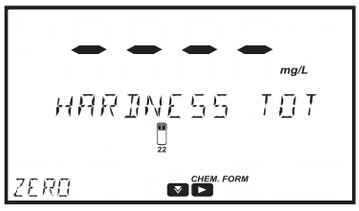


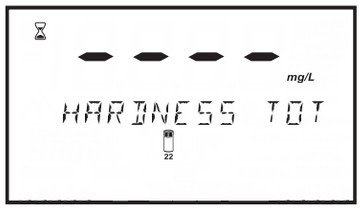

- Add two drops of HI93735B-0 Hardness Buffer Reagent B. Replace the cap and invert 5 times to mix.

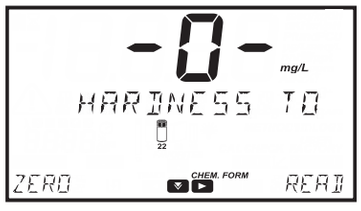
• Place the cuvette into the holder and close the lid.



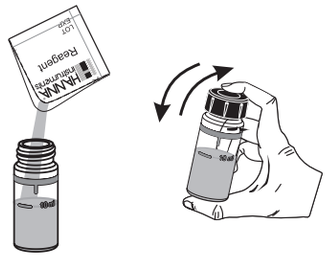
• Press the **ZERO** key. The display will show "-0-" when the meter is zeroed and ready for measurement.



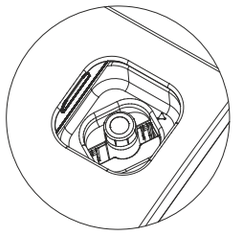



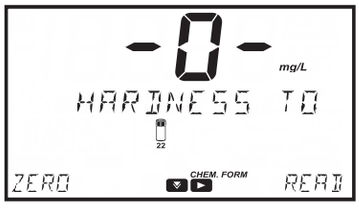

• Remove the cuvette and add the contents of one packet of HI93735C-0 Fixing Reagent. Replace the cap and shake gently to mix 20 seconds.

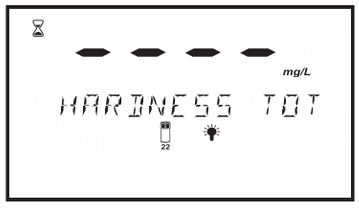


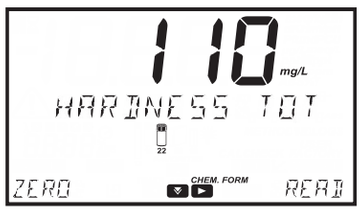

• Place the cuvette into the holder and close the lid.



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



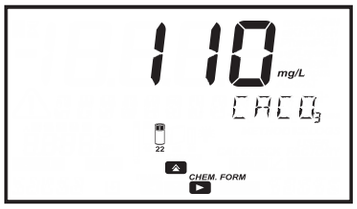



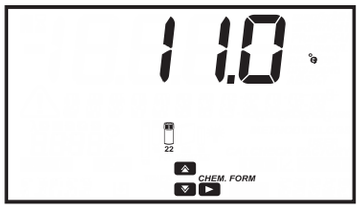



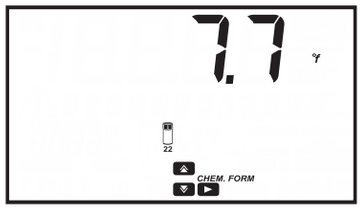

• Press the ▼ key to access the second level functions (wavelength, method ID, date and time).

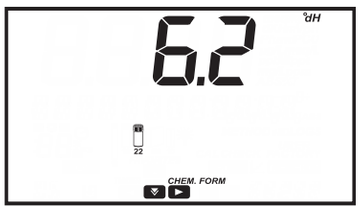
• Press the ▶ key to view the chemical formula.

• Press the ⏫ key in the chemical formula screen to convert the results to **English degrees (°e), French degrees (°f) or German degrees (°dH).**




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

## INTERFERENCE

Interferences may be caused by excessive amounts of heavy metals.

## 9.42. 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 recommended 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 |

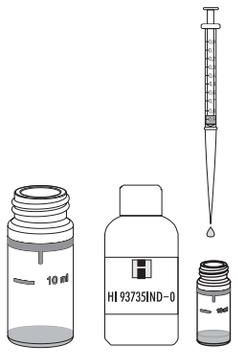
### REAGENT SETS

| | |
|---|---|
| HI93735-01 | Reagents for 100 tests (MR, 200 to 500 mg/L) |
| HI93735-0 | Reagents for 300 tests (LR - 100 tests, MR - 100 tests, HR - 100 tests) |

For other accessories see page 236.

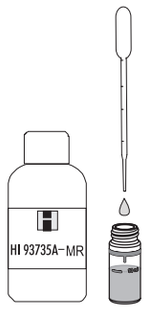
### MEASUREMENT PROCEDURE

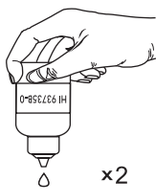
- Select the Hardness Total MR method using the procedure described in the Method Selection section (see page 6).




- Add 0.5 mL of unreacted sample to the cuvette. Add 0.5 mL of HI93735IND-0 Hardness Indicator Reagent.

- Use the plastic pipette to fill the cuvette up to the 10 mL mark with HI93735A-MR Hardness Medium Range Reagent A.



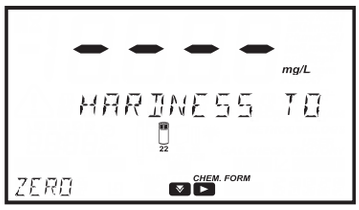



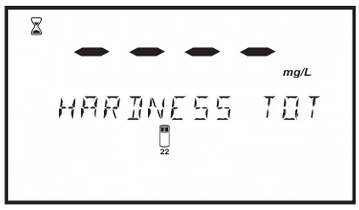

×2

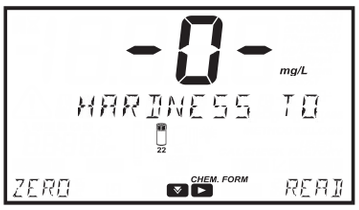
- Add two drops of HI93735B-0 Hardness Buffer Reagent B. Replace the cap and invert 5 times to mix.

• Place the cuvette into the holder and close the lid.

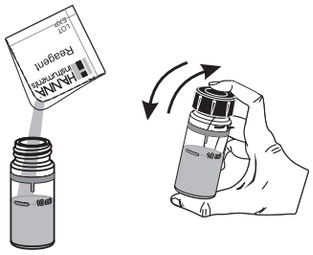
• Press the **ZERO** key. The display will show "-0-" when the meter is zeroed and ready for measurement.



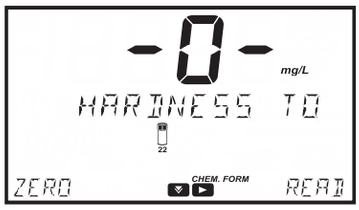



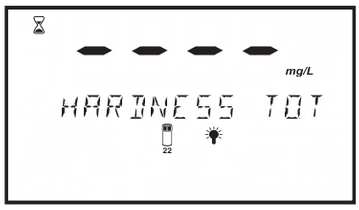



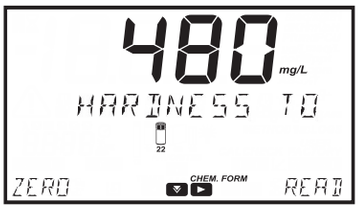

• Remove the cuvette and add one packet of HI93735C-0 Fixing Reagent.
Replace the cap and shake gently to mix 20 seconds.




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



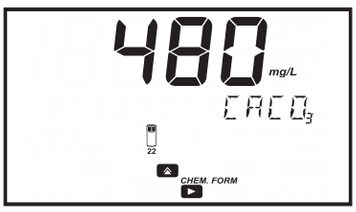



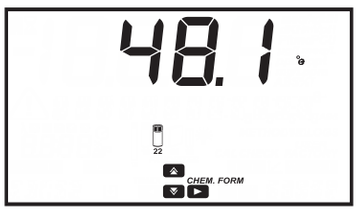



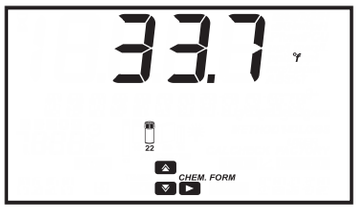

• Press the ▼▼ key to access the second level functions (wavelength, method ID, date and time).

• Press the ▶ key to view the chemical formula.

• Press the ▲▲ key in the chemical formula screen to convert the results to **English degrees (°e), French degrees (°f) or German degrees (°dH).**





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

## INTERFERENCES

Interferences may be caused by excessive amounts of heavy metals.

## 9.43. 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 recommended 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 |

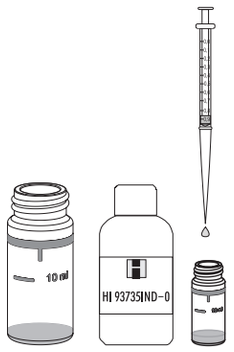
### REAGENT SETS

| | |
|---|---|
| HI93735-02 | Reagents for 100 tests (HR, 400 to 750 mg/L) |
| HI93735-0 | Reagents for 300 tests (LR - 100 tests, MR - 100 tests, HR - 100 tests) |

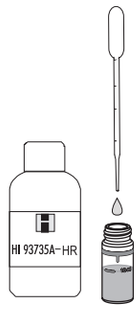
For other accessories see page 236.

### MEASUREMENT PROCEDURE

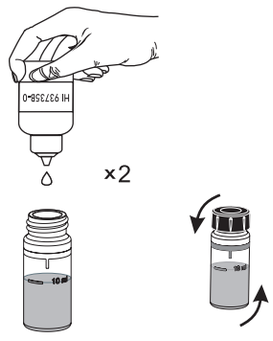
- Select the Total Hardness HR method using the procedure described in the Method Selection section (see page 6).




- Add 0.5 mL of unreacted sample to the cuvette. Add 0.5 mL of HI93735IND-0 Hardness Indicator Reagent.

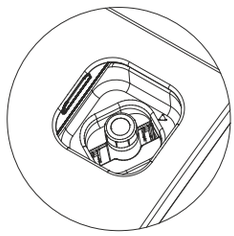



- Use the plastic pipette to fill the cuvette up to the 10 mL mark with HI93735A-HR Hardness High Range Reagent A.

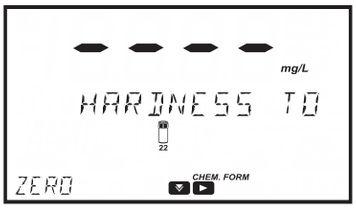


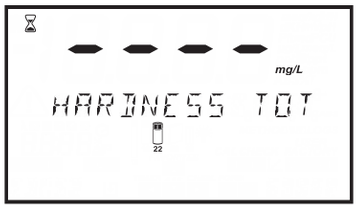

- Add two drops of HI93735B-0 Hardness Buffer Reagent B. Replace the cap and invert 5 times to mix.

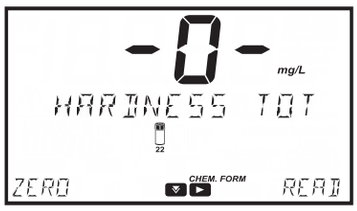
• Place the cuvette into the holder and close the lid.



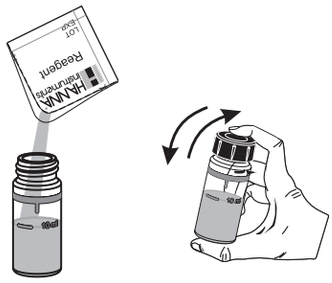
• Press the **ZERO** key. The display will show "-0-" when the meter is zeroed and ready for measurement.



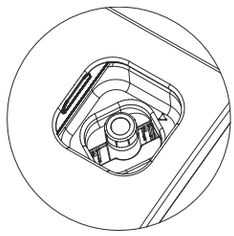



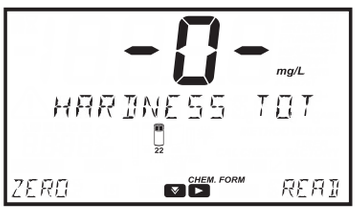

• Remove the cuvette and add one packet of HI93735C-0 Fixing Reagent. Replace the cap and shake gently to mix 20 seconds.

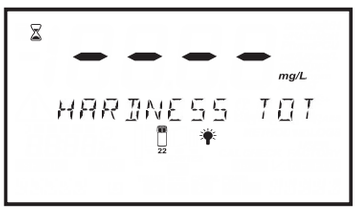



• Place the cuvette into the holder and close the lid.



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



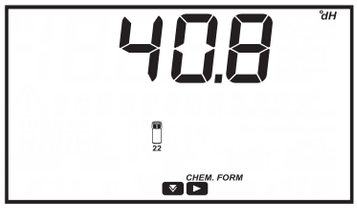


• Press the ▼▼ key to access the second level functions (wavelength, method ID, date and time).

• Press the ▶ key to view the chemical formula.

• Press the ▲▲ key in the chemical formula screen to convert the results to **English degrees (°e), French degrees (°f) or German degrees (°dH)**.






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

## INTERFERENCES

Interferences may be caused by excessive amounts of heavy metals

## 9.44. 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 |

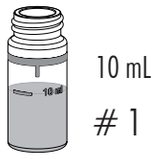
### REAGENT SETS

| | |
|---|---|
| HI93704-01 | Reagents for 100 tests |
| HI93704-03 | Reagents for 300 tests |

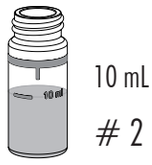
For other accessories see page 236.

### MEASUREMENT PROCEDURE

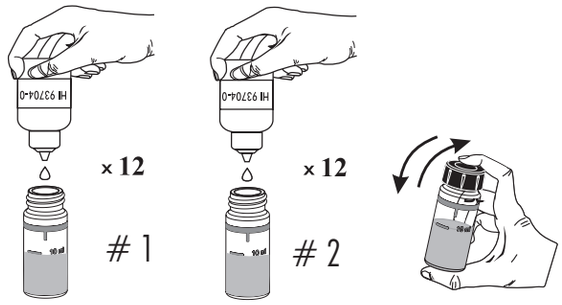
- Select the Hydrazine method using the procedure described in the Method Selection section (see page 6).



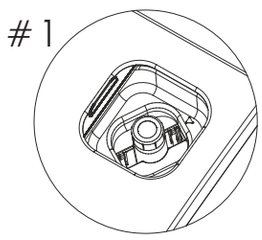

- Fill the first cuvette (#1) with 10 mL of deionized water (up to the mark).




- Fill a second cuvette (#2) with 10 mL of unreacted sample (up to the mark).

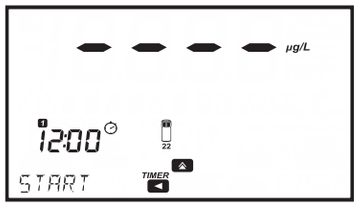


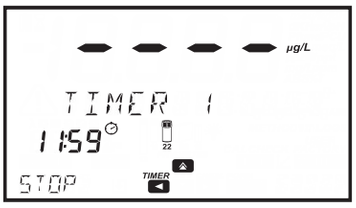

- Add 12 drops of the HI93704-0 reagent to each cuvette. Replace the caps and shake gently to mix (about 30 seconds).



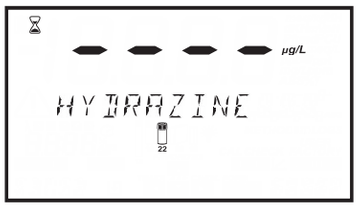

- Place the cuvette (#1) into the holder and close the lid.

• Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 12 minutes. Press the **ZERO** key, the display will show "-0-" when the meter is zeroed and ready for measurement.

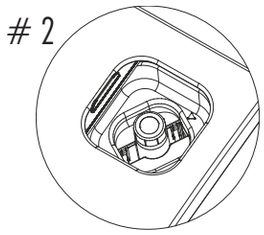




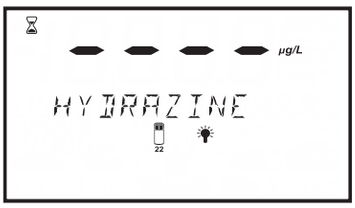


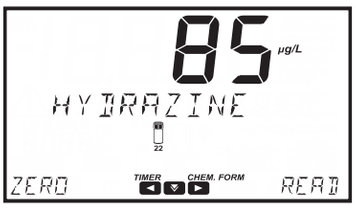
• Remove the blank.

• Insert the cuvette with the reacted sample (#2) into the instrument and close the lid.



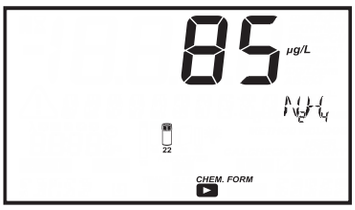

• Press **READ** to start the reading. The instrument displays concentration in **µg/L of hydrazine ($N_2H_4$).**


• Press the ▼ key to access the second level functions (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.

## 9.45. 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 |

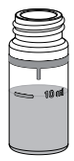
### REAGENT SETS

| | |
|---|---|
| HI93718-01 | Reagents for 100 tests |
| HI93718-03 | Reagents for 300 tests |

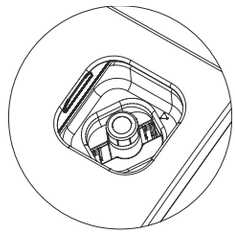
For other accessories see page 236.

### MEASUREMENT PROCEDURE

• Select the Iodine method using the procedure described in the Method Selection section (see page 6).

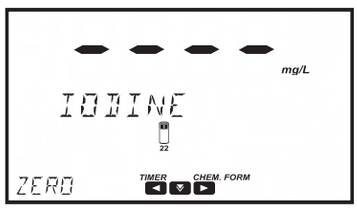


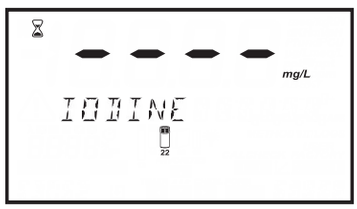

• Fill the cuvette with 10 mL of unreacted sample (up to the mark) and replace the cap.

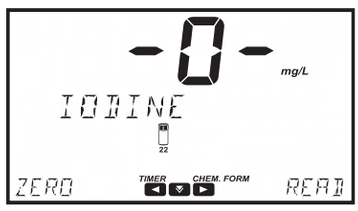


• Place the cuvette into the holder and close the lid.

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

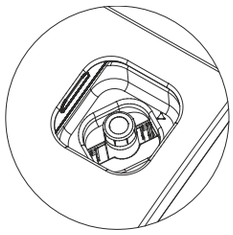


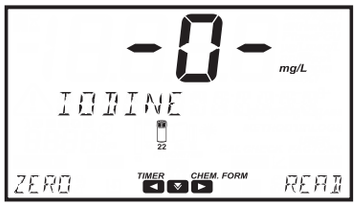

• Remove the cuvette and add one packet of HI93718-0 Iodine Reagent.
Replace the cap and shake gently for about 20 seconds to dissolve most of the reagent.

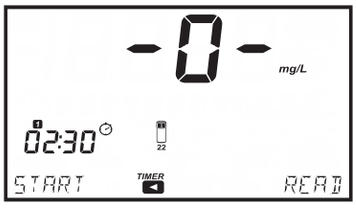
• Reinsert the cuvette into the instrument and close the lid.

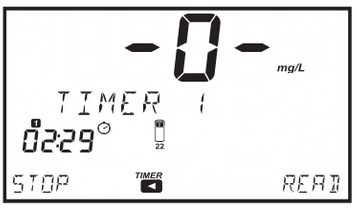


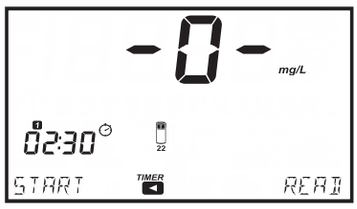
• Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 2 minutes and 30 seconds.

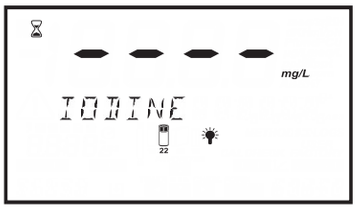
• Press the **READ** key, the instrument displays the results in **mg/L of iodine ($I_2$)**.

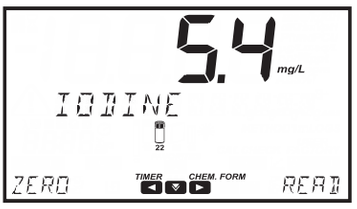


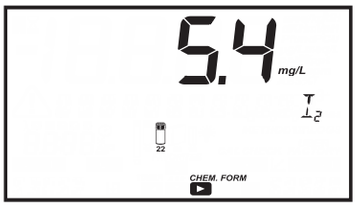




• Press the ▼ key to access the second level functions (wavelength, method ID, date and time).

• 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, Ozone, Oxidized forms of Chromium and Manganese.

In case of water with hardness greater than 500 mg/L $CaCO_3$, shake the sample for approximately 2 minutes after adding the reagent.

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

## 9.46. IRON LOW RANGE

### SPECIFICATIONS

| | |
|---|---|
| Range | 0.000 to 1.600 mg/L (as Fe) |
| Resolution | 0.001 mg/L |
| Accuracy | ±0.01 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 |

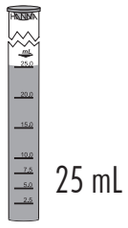
### REAGENT SETS

| | |
|---|---|
| HI93746-01 | Reagents for 50 tests |
| HI93746-03 | Reagents for 150 tests |

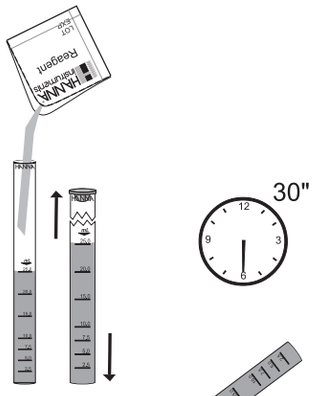
For other accessories see page 236.

### MEASUREMENT PROCEDURE

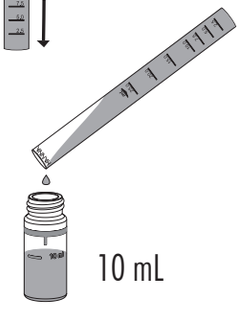
- Select the Iron LR method using the procedure described in the Method Selection section (see page 6).



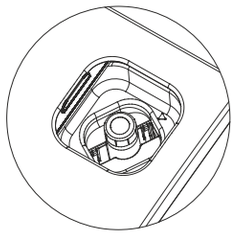

- Fill one graduated mixing cylinder up to the 25 mL mark with deionized water.




- Add one packet of HI93746-0 Iron Low Range Reagent, close the graduated mixing cylinder and shake vigorously for 30 seconds. This is the blank.

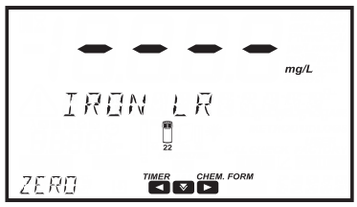


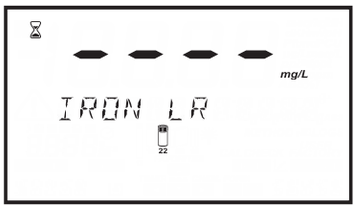

- Fill a cuvette with 10 mL of the blank (up to the mark) and replace the cap.

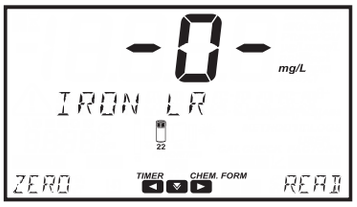


- Place the cuvette into the holder and close the lid.

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



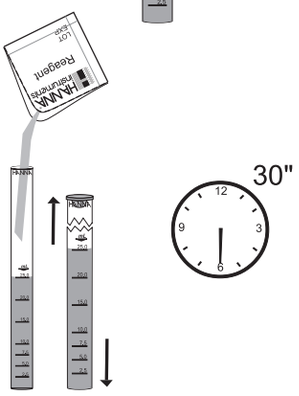



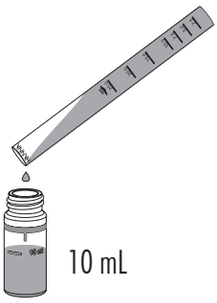

• Remove the cuvette.

• Fill another graduated glass vial up to the 25 mL mark with the sample.

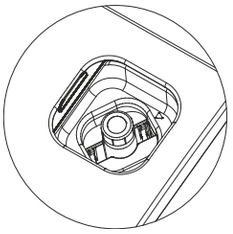

• Add one packet of HI93746-0 Iron Low Range Reagent, close the graduated glass vial and shake vigorously for 30 seconds. This is the reacted sample.




• Fill a cuvette with 10 mL of the reacted sample (up to the mark) and replace the cap.

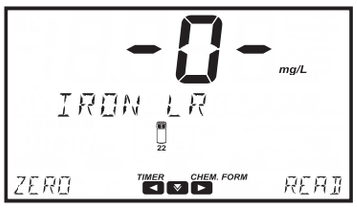


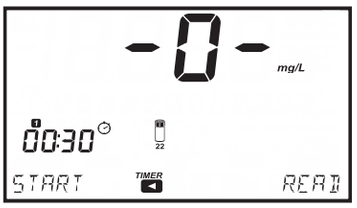

• Insert the sample into the instrument and close the lid.

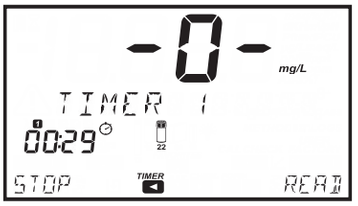


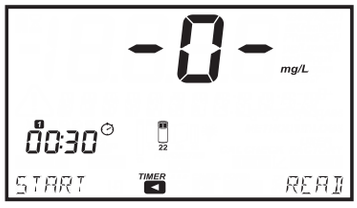
• Press the ◀ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 30 seconds.

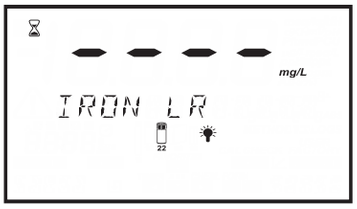
• Press the **READ** key, the instrument displays the results in **mg/L of iron (Fe)**.

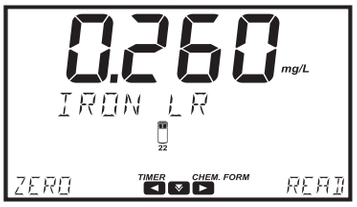


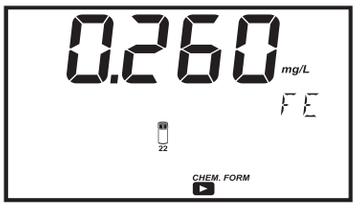



• Press the ▼▼ key to access the second level functions (wavelength, method ID, date and time).

• Press the ▶ key to view the chemical formula.




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

## INTERFERENCES

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

## 9.47. 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 the EPA Phenanthroline method 315B, for natural and treated waters. |
| Method ID | #047 |

### REQUIRED REAGENTS

| Code | Description | Quantity |
|---|---|---|
| HI93721-0 | Iron High Range Reagent | 1 packet |

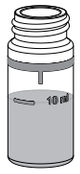
### REAGENT SETS

| | |
|---|---|
| HI93721-01 | Reagents for 100 tests |
| HI93721-03 | Reagents for 300 tests |

For other accessories see page 236.

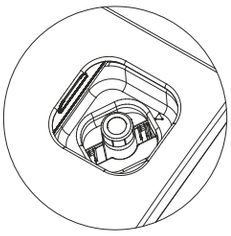
### MEASUREMENT PROCEDURE

• Select the Iron HR method using the procedure described in the Method Selection section (see page 6).



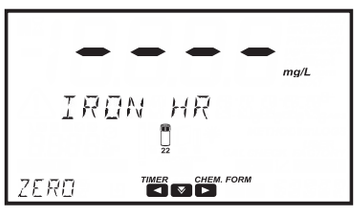

10 mL

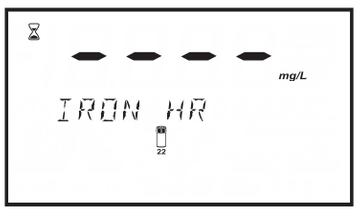
• Fill the cuvette with 10 mL of unreacted sample (up to the mark) and replace the cap.

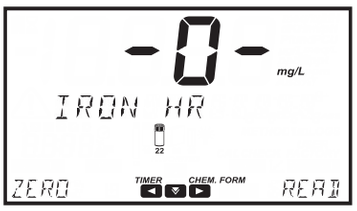


• Place the cuvette into the holder and close the lid.

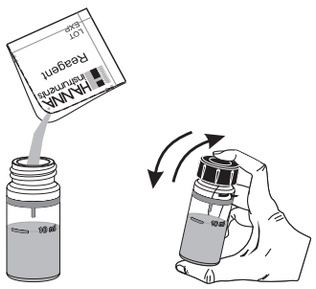
• Press the **ZERO** key. The display will show "-0-" the meter is zeroed and ready for measurement.



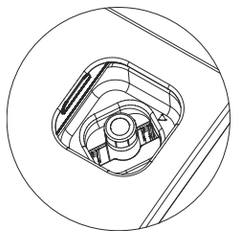




• Remove the cuvette and add the content of one packet of HI93721-0 Iron High Range Reagent. Replace the cap and shake until powder is completely dissolved.

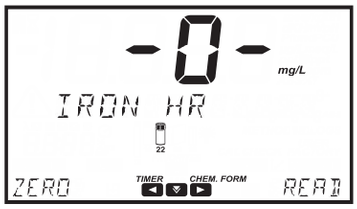


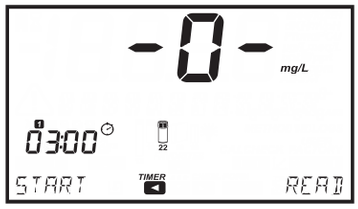
• Reinsert the cuvette into the instrument and close the lid.

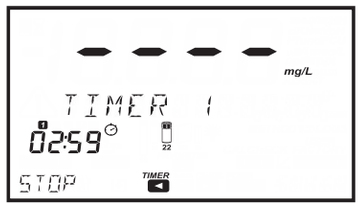


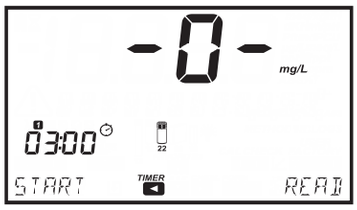
• Press the ◄ key to access the timer menu. Press the START key to start Timer 1, the display will show the countdown or, alternatively, wait for 3 minutes.

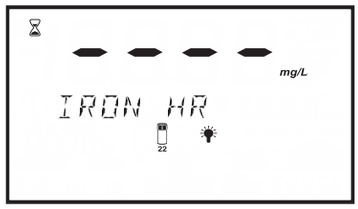
• Press the **READ** key, the instrument displays the results in **mg/L of iron (Fe)**.



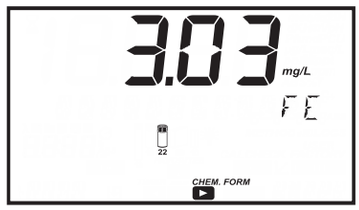





• Press the ▼ key to access the second level functions (wavelength, method ID, date and time).

• Press the ► key to view the chemical formula.




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

## INTERFERENCES

Interference may be caused by:
Molybdate Molybdenum above 50 ppm
Calcium above 10000 ppm (as $CaCO_3$)
Magnesium above 100000 ppm (as $CaCO_3$)
Chloride above 185000 ppm.

## 9.48. 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 |

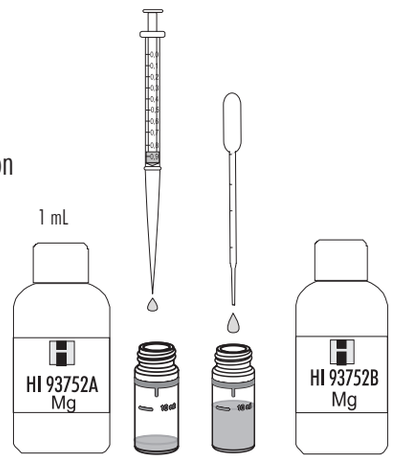
### REAGENT SETS

| | |
|---|---|
| HI937520-01 | Reagents for 50 tests |
| HI937520-03 | Reagents for 150 tests |

For other accessories see page 236.

### MEASUREMENT PROCEDURE

- Select the Magnesium method using the procedure described in the Method Selection section (see page 6).

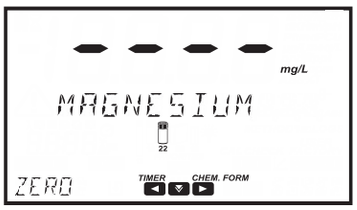


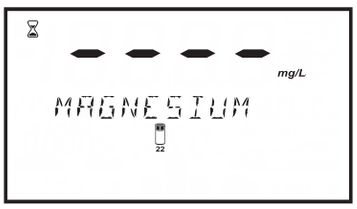

- Add 1 mL of HI93752A-Mg Magnesium Reagent A to the cuvette using a 1 mL syringe and use the pipette to fill the cuvette up to the 10 mL mark with the HI93752B-Mg Magnesium Reagent B.

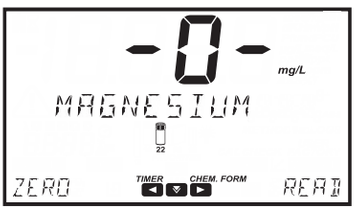
- Replace the cap and invert several times to mix.

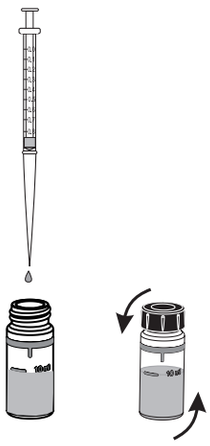
- Place the cuvette into the holder and close the lid.

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

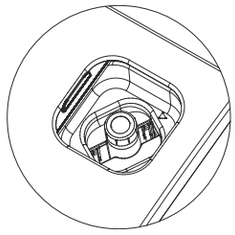


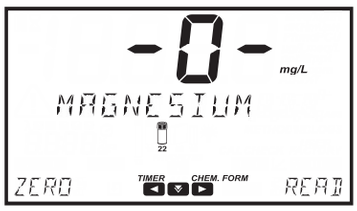


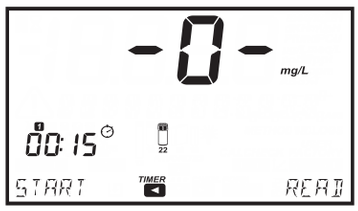
- Remove the cuvette.
- Add 0.5 mL of sample to the cuvette.
- Replace the cap and invert several times to mix.

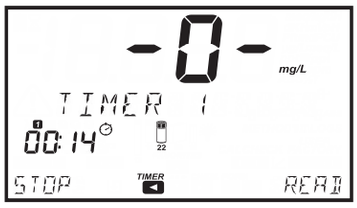


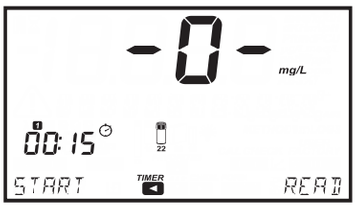
- Reinsert the cuvette into the instrument and close the lid.

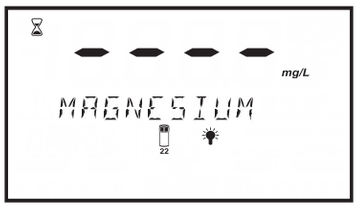
- Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 15 seconds.
- Press the **READ** key, the instrument displays the results in **mg/L of magnesium ($Mg^{2+}$)**.

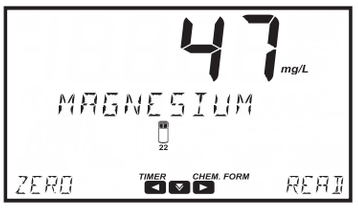


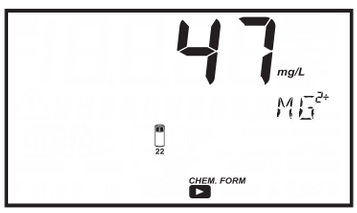




- Press the ▼▼ key to access the second level functions (wavelength, method ID, date and time).
- Press the ► key to view the chemical formula.




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

## INTERFERENCES

Interferences may be caused by: acidity (as $CaCO_3$) above 1000 mg/L, alkalinity (as $CaCO_3$) above 1000 mg/L, Calcium ($Ca^{2+}$) above 200 mg/L, Iron must be absent, Aluminum must be absent, Copper must be absent.

## 9.49. 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 |

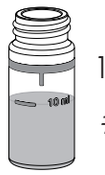
For other accessories see page 236.

### MEASUREMENT PROCEDURE

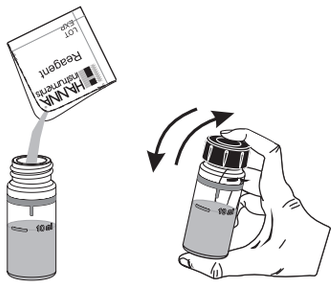
• Select the Manganese LR method using the procedure described in the Method Selection section (see page 6).

• Fill one cuvette (#1) with 10 mL of deionized water (up to the mark).

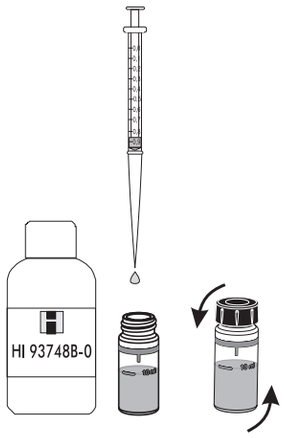

• Fill a second cuvette (#2) with 10 mL of sample (up to the mark).



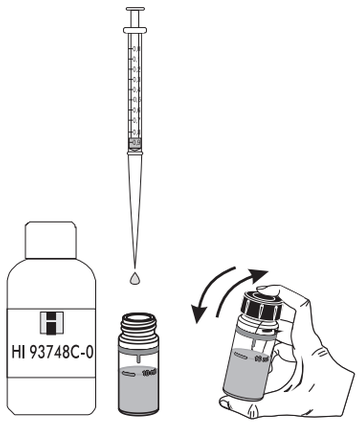

• Add one packet of HI93748A-0 Manganese Low Range Reagent A to each cuvette, replace the caps and shake gently until completely dissolved.



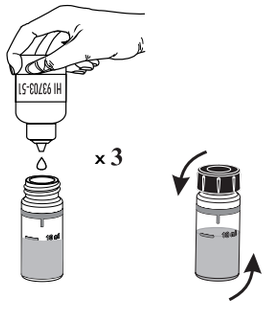
• Add 0.2 mL of the HI93748B-0 Manganese Low Range Reagent B to each cuvette, replace the caps and invert gently to mix for about 30 seconds.



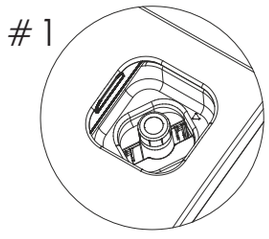

• Add 1 mL of the HI93748C-0 Manganese Low Range Reagent C to each cuvette, replace the caps and shake gently.



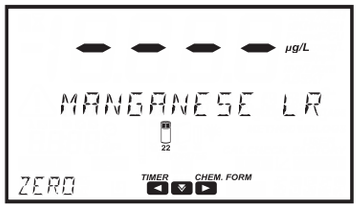

• Add 3 drops of HI93703-51 Dispersing Agent to each cuvette, replace the caps and invert gently to mix for about 30 seconds.

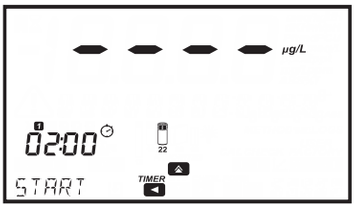


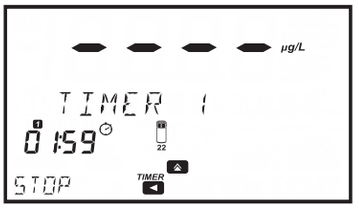

• Place the first cuvette (#1) with the reacted deionized water into the holder and close the lid.

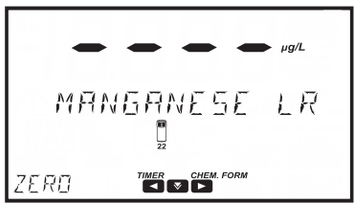


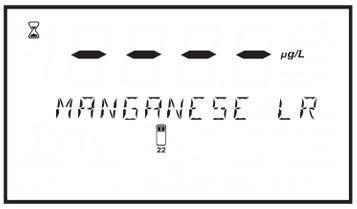

• Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 2 minutes. Press the **ZERO** key, the display will show "-0-" when the meter is zeroed and ready for measurement.

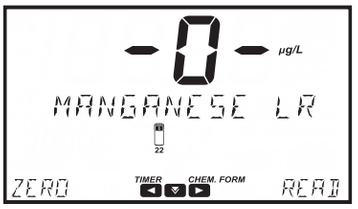


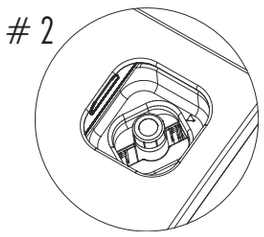





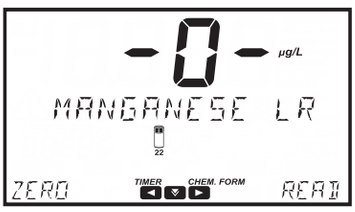



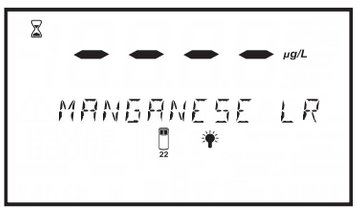




• Insert the second cuvette (#2) with the reacted sample into the instrument.




• Press **READ** to start the reading. The instrument displays the results in **µg/L of manganese (Mn).**



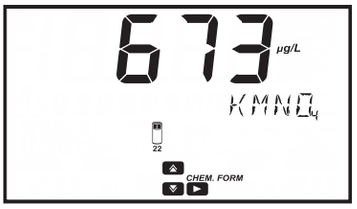





• Press the ▼▼ key to access the second level functions (wavelength, method ID, date and time).

• Press the ▶ key to view the chemical formula.

• Press the ▲▲ key in the chemical formula screen 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:
Aluminum above 20 mg/L
Cadmium above 10 mg/L
Calcium above 200 mg/L as $CaCO_3$
Cobalt above 20 mg/L
Copper above 50 mg/L
Iron above 10 mg/L
Lead above 0.5 mg/L
Magnesium above 100 mg/L as $CaCO_3$
Nickel above 40 mg/L
Zinc above 15 mg/L

## 9.50. 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 |

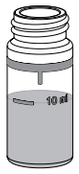
### REAGENT SETS

| | |
|---|---|
| HI93709-01 | Reagents for 100 tests |
| HI93709-03 | Reagents for 300 tests |

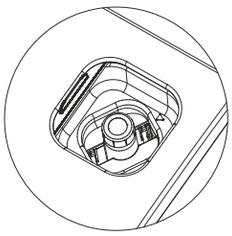
For other accessories see page 236.

### MEASUREMENT PROCEDURE

- Select the Manganese HR method using the procedure described in the Method Selection section (see page 6).

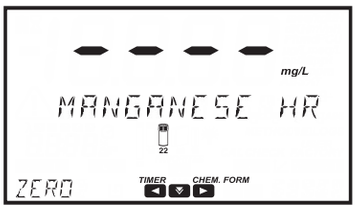


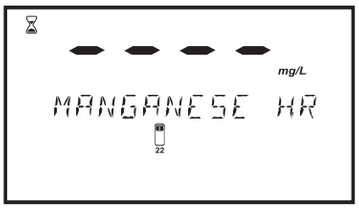

- Fill the cuvette with 10 mL of unreacted sample (up to the mark) and replace the cap.

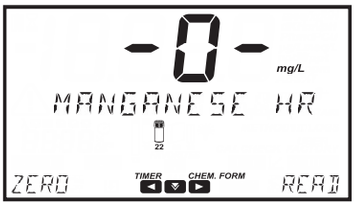


- Place the cuvette into the holder and close the lid.

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

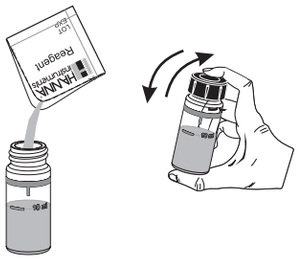


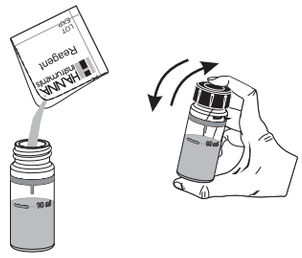




- Remove the cuvette.

- Add one packet of HI93709A-0 Manganese High Range Reagent A. Replace the cap and shake gently for 2 minutes to mix.

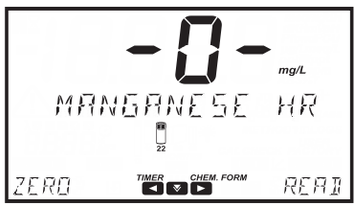


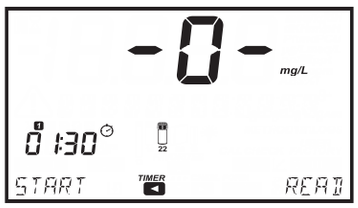
- Add one packet of HI93709B-0 Manganese High Range Reagent B. Replace the cap and shake gently for 2 minutes to mix.

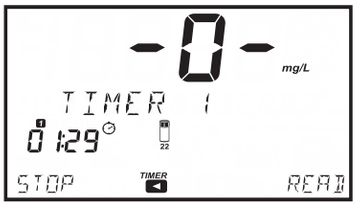


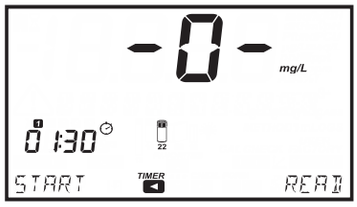

- Reinsert the cuvette into the instrument and close the lid.

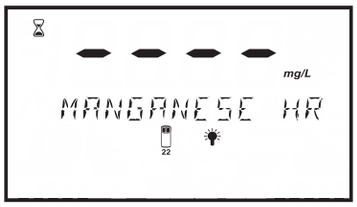
- Press the ◀ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 1 minute and 30 seconds.
- Press the **READ** key, the instrument displays the results in **mg/L of manganese (Mn)**.

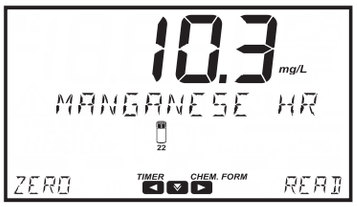


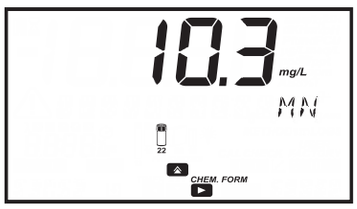



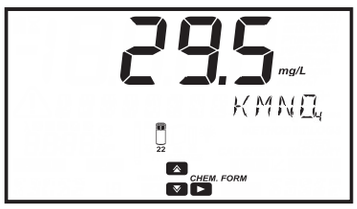



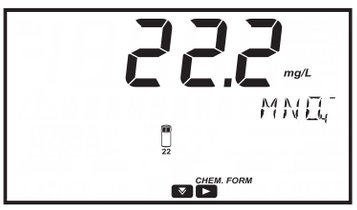




- Press the ▼ key to access the second level functions (wavelength, method ID, date and time).
- Press the ▶ key to view the chemical formula.
- Press the ▲ key in the chemical formula screen to convert the results to **mg/L potassium permanganate ($KMnO_4$) or permanganate ($MnO_4^-$)**.




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

## INTERFERENCES

Interference may be caused by:
Calcium above 700 mg/L;
Chloride above 70000 mg/L
Iron above 5 mg/L;
Magnesium above 100000 mg/L

## 9.51. 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

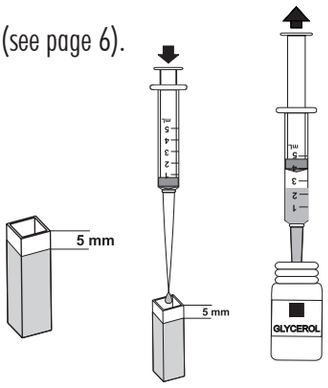
| | | |
|---|---|---|
| HI93703-57 | Glycerol, (4) | 30 mL |

For other accessories see page 236.

### MEASUREMENT PROCEDURE

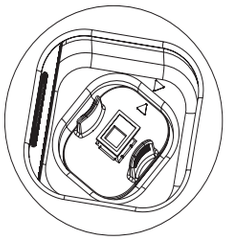
- Select the Maple Syrup method using the procedure described in the Method Selection section (see page 6).

- Use a syringe to fill the cuvette with glycerol, up to 5 mm (0.2") below the rim.

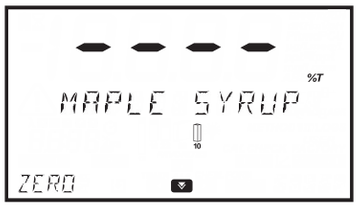


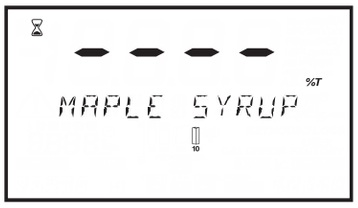

- Insert the 10 mm cuvette adapter using the procedure described in the Cuvette Adapters section (see page 10).

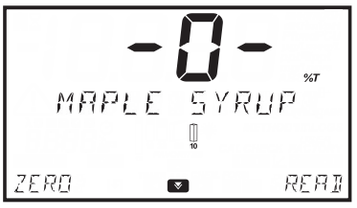
- Place the cuvette into the cuvette holder paying attention to the direction of the light indicated by the arrow on the instrument.



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

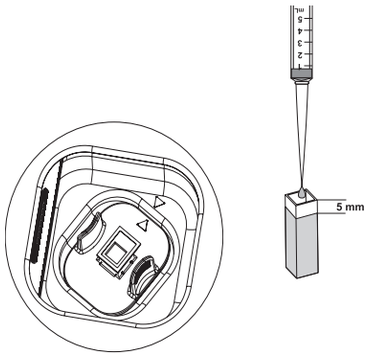


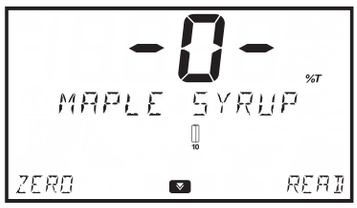

- Remove the blank cuvette.

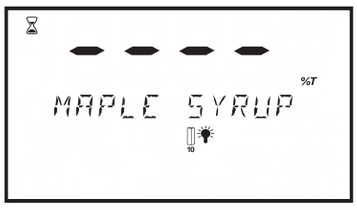
• Use a syringe to add 4 mL of maple syrup to a clean cuvette, up to 5 mm (0.2") below the rim. This is the sample.




• Place the sample cuvette into the cuvette holder paying attention to the direction of the light indicated by the arrow on the instrument.

• Press the **READ** key 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 access the second level functions (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.

## 9.52. 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 |

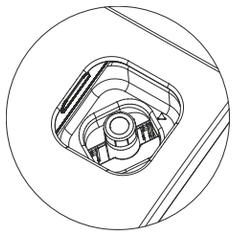
For other accessories see page 236.

### MEASUREMENT PROCEDURE

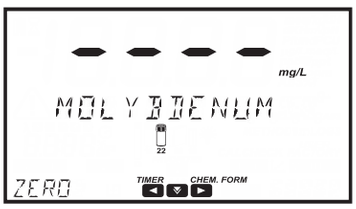
• Select the Molybdenum method using the procedure described in the Method Selection section (see page 6).

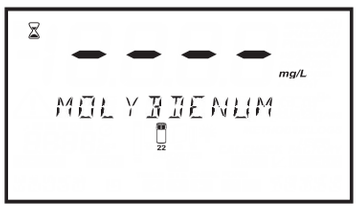
• Fill the cuvette with 10 mL of unreacted sample (up to the mark) and replace the cap.

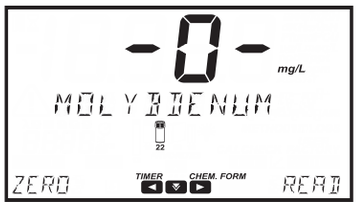

• Place the cuvette into the holder and close the lid.



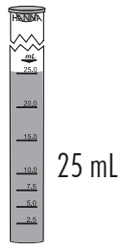
• Press the **ZERO** key. The display will show "-0-" when the meter is zeroed and ready for measurement.



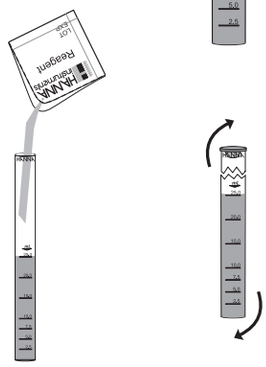



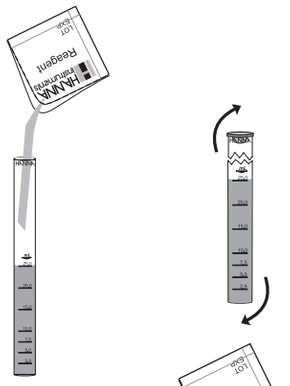
• Fill one graduated mixing vial up to the 25 mL mark with the sample.



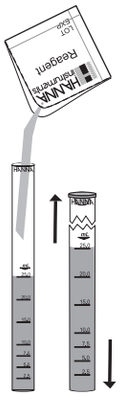

• Add one packet of HI93730A-0 Molybdenum Reagent A, close the graduated mixing vial and invert several times until completely dissolved.



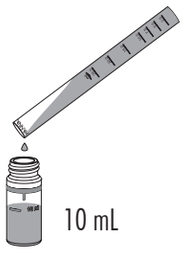
• Add one packet of HI93730B-0 Molybdenum Reagent B to the graduated mixing vial, close and invert several times until completely dissolved.



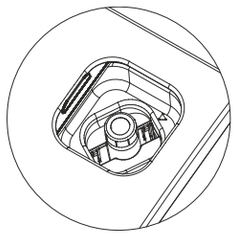
• Add one packet of HI93730C-0 Molybdenum Reagent C to the graduated mixing vial, close and shake vigorously.



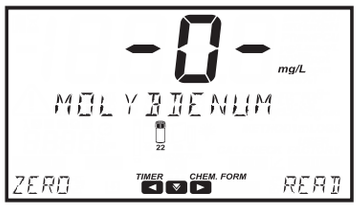
• Fill an empty cuvette with 10 mL of reacted sample (up to the mark) and replace the cap.

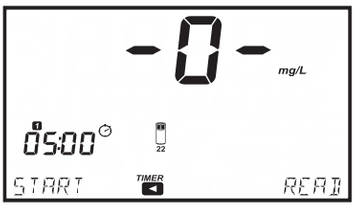


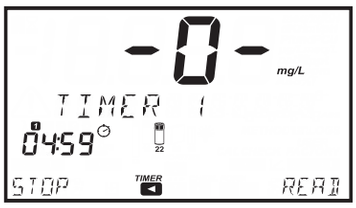

• Insert the cuvette into the instrument and close the lid.

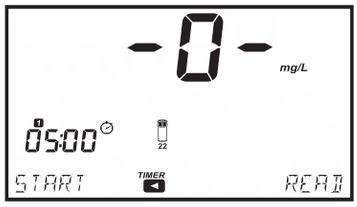


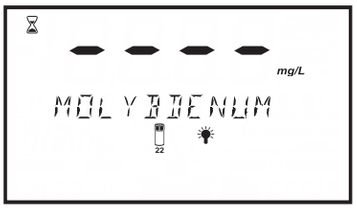
- Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 5 minutes.
- Press the **READ** key, the instrument displays the results in **mg/L of molybdenum ($Mo^{6+}$)**.

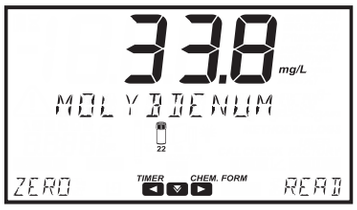


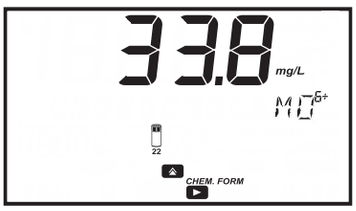



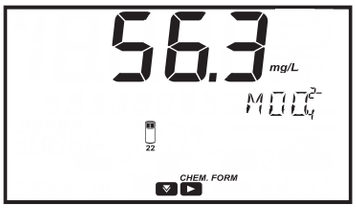




- Press the ▼ key to access the second level functions (wavelength, method ID, date and time).
- Press the ► key to view the chemical formula.
- Press the ▲ key in the chemical formula screen to convert the results to **mg/L of molybdate ($MoO_4^{2-}$)**.




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

## INTERFERENCES

Interference may be caused by:
Aluminum above 50 mg/L
Chromium above 1000 mg/L
Copper above 10 mg/L
Iron above 50 mg/L
Nickel above 50 mg/L
Nitrite, as $NO_2^-$
Sulfate above 200 mg/L
Highly buffered samples or with extreme pH may exceed the buffering capacity of the reagents

## 9.53. 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 page 236.

### MEASUREMENT PROCEDURE

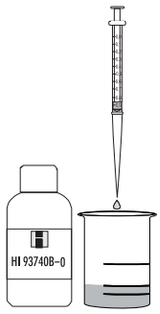
- Select the Nickel LR method using the procedure described in the Method Selection section (see page 6).

  *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.

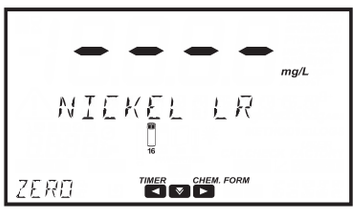
- Add one packet of HI93740A-0 Nickel Low Range Reagent A to each beaker. Cap and swirl gently until the reagent is dissolved.

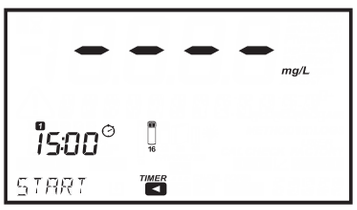
  *Note: If sample contains iron ($Fe^{3+}$), it is important that all powder is dissolved before continuing.*

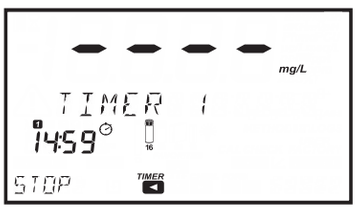



- Add 1 mL of HI93740B-0 Nickel Low Range Reagent B to each beaker, and swirl to mix.

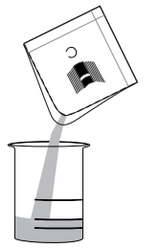
- Press the ◀ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 15 minutes.



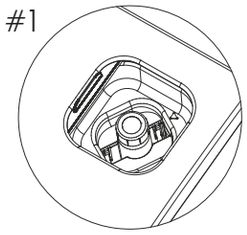



• Add one packet of HI93740C-0 Nickel Low Range Reagent C to each beaker, cap and swirl to mix until completely dissolved.

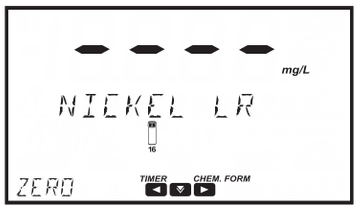


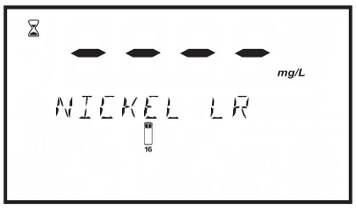
• Fill one cuvette (#1) with 10 mL of the blank (up to the mark).

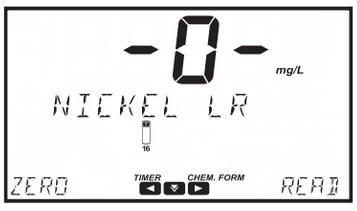

• Place the cuvette into the holder and close the lid.




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

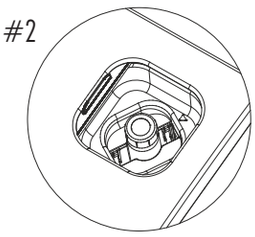


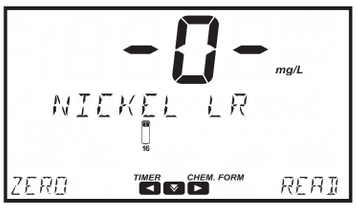



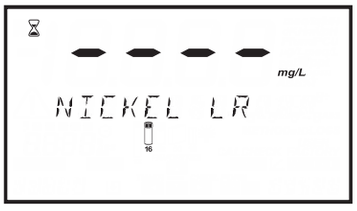

• Fill a second cuvette (#2) with 10 mL of the reacted sample.

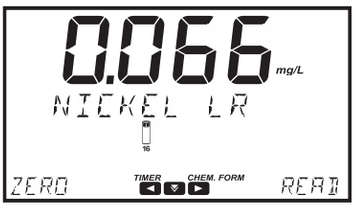

• Insert the second cuvette into the instrument and close the lid.




• Press **READ** the to start the reading. The instrument displays the results in **mg/L of nickel (Ni)**.

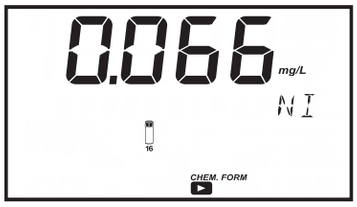



• Press the ▼ key to access the second level functions (wavelength, method ID, date and time).

• 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:
$Co^{2+}$ must not be present
$Fe^{2+}$ must not be present
$Al^{3+}$ above 32 mg/L
$Ca^{2+}$ above 1000 mg/L (as $CaCO_3$)
$Cd^{2+}$ above 20 mg/L
$Cl^-$ above 8000 mg/L
$Cr^{3+}$ above 20 mg/L
$Cr^{6+}$ above 40 mg/L
$Cu^{2+}$ above 15 mg/L
$F^-$ above 20 mg/L
$Fe^{3+}$ above 10 mg/L
$K^+$ above 500 mg/L
$Mg^{2+}$ above 400 mg/L
$Mn^{2+}$ above 25 mg/L
$Mo^{6+}$ above 60 mg/L
$Na^+$ above 5000 mg/L
$Pb^{2+}$ above 20 mg/L
$Zn^{2+}$ above 30 mg/L

## 9.54. 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

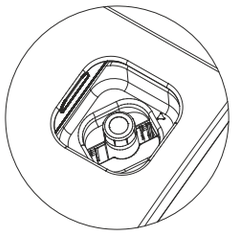
| | |
|---|---|
| HI93726-01 | Reagents for 100 tests |
| HI93726-03 | Reagents for 300 tests |

For other accessories see page 236.

### MEASUREMENT PROCEDURE

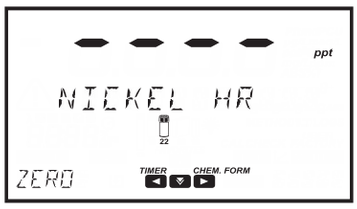

- Select the Nickel HR method using the procedure described in the Method Selection section (see page 6).

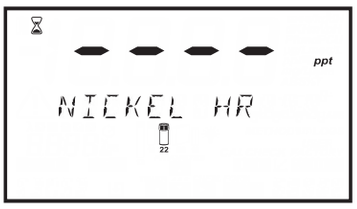
- Fill the cuvette with 10 mL of unreacted sample (up to the mark) and replace the cap.

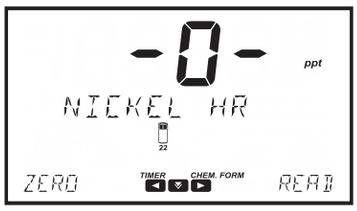


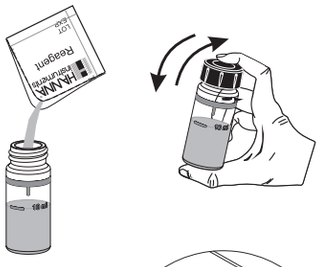
- Place the cuvette into the holder and close the lid.

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

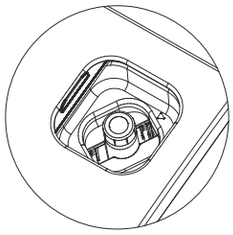


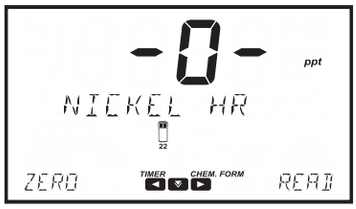
- Remove the cuvette and add one packet of HI93726-0 Nickel High Range Reagent. Replace the cap and shake gently until completely dissolved.

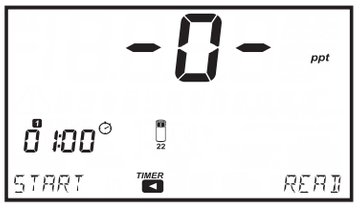


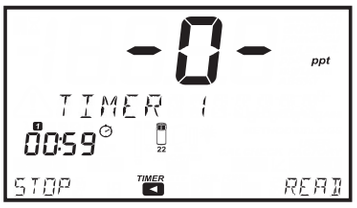
- Reinsert the cuvette into the instrument and close the lid.

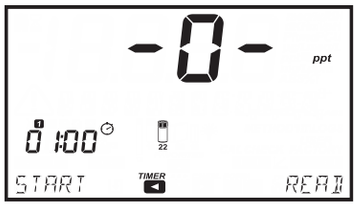
• Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 1 minute.

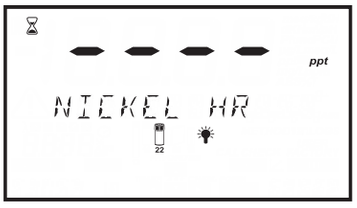
• Press the **READ** key, the instrument displays the results in **mg/L of nickel (Ni).**





• Press the ▼ key to access the second level functions (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.

## 9.55. 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 |

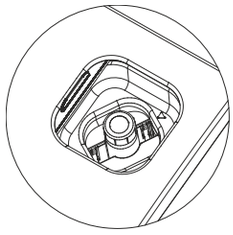
For other accessories see page 236.

### MEASUREMENT PROCEDURE

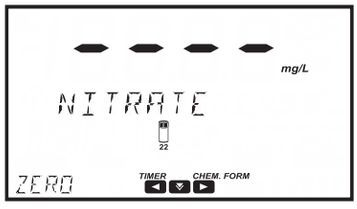
• Select the Nitrate method using the procedure described in the Method Selection section (see page 6).

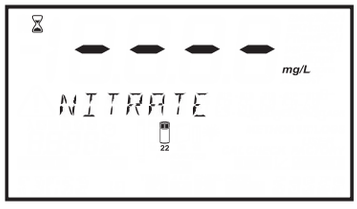
• Fill the cuvette with 10 mL of sample, (up to the mark), and replace the cap.

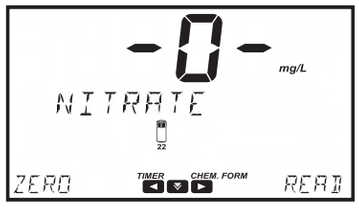

• Place the cuvette into the holder and close the lid.



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

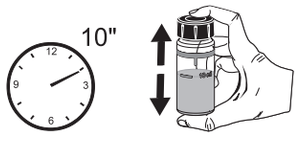


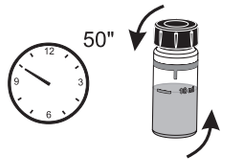



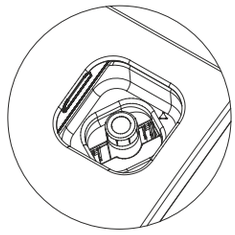

• Remove the cuvette and add one packet of HI93728-0 Nitrate Reagent.

• Replace the cap and 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.



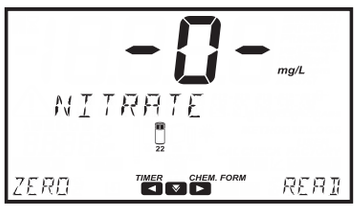
*Note: The method is technique-sensitive. See procedure on page 9 Cuvette Preparation for proper mixing technique.*

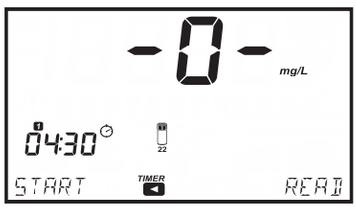


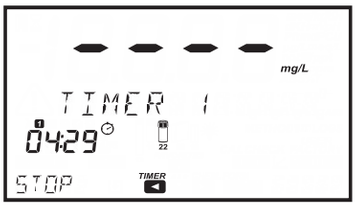



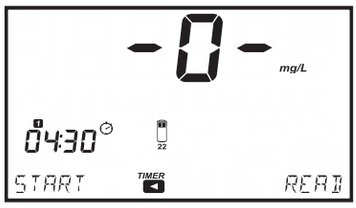
- Reinsert the cuvette into the instrument and close the lid.

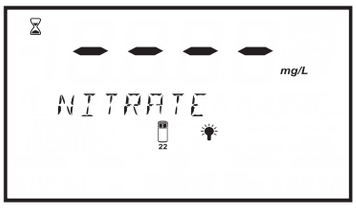
- Press the ◀ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 4 minutes and 30 seconds.
- Press the **READ** key, the meter displays the results in **mg/L of nitrate-nitrogen ($NO_3^-$-N)**.

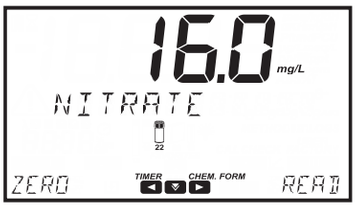


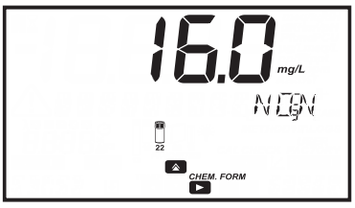



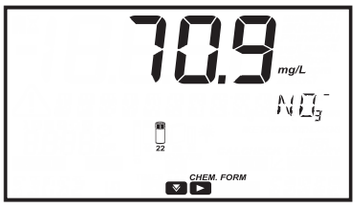




- Press the ▼ key to access the second level functions (wavelength, method ID, date and time).
- Press the ▶ key to view the chemical formula.
- Press the ▲ key in the chemical formula screen to convert the results to **mg/L of nitrate ($NO_3^-$)**.




- 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 ppm;
Chlorine above 2 ppm
Copper; Iron(III);
Strong oxidizing and reducing substances
Sulfide must be absent

## 9.56. NITRATE CHROMOTROPIC ACID (13 mm VIAL)

### 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: N, white label.*

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

### REAGENT SETS

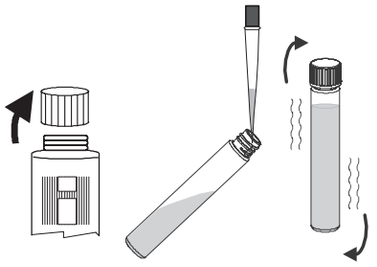
HI93766-50 Reagents for 50 tests

For other accessories see page 236.

### MEASUREMENT PROCEDURE

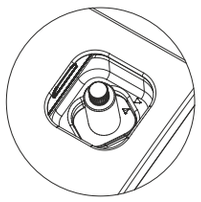
Before using the reagent kit carefully read all the instructions and the Safety Data Sheets (SDS). Pay particular attention to all warnings, cautions, and notes. Failure to do so may result in serious injury to the operator.

- Select the Nitrate Chromotropic Acid (13 mm) method using the procedure described in the Method Selection section (see page 6).
- Insert the 13 mm vial adapter using the procedure described in the Cuvette Adapters section (see page 10).
- 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.

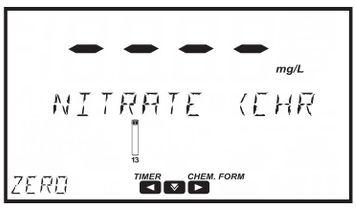


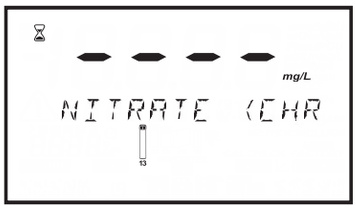
**WARNING:** The vial will become hot during mixing. Use caution when handling.

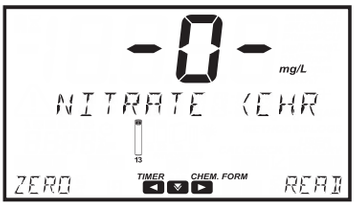
*Note: The method is technique sensitive. See procedure on page 9 Cuvette Preparation for proper mixing technique.*



- Place the vial into the holder.
- Press **ZERO**, the display will show "-0-" when the meter is zeroed and ready for measurement.

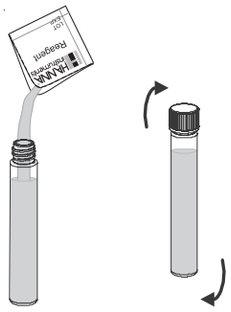


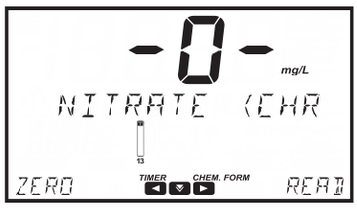
- Remove the vial.
- Add one packet of HI93766-0 Nitrate Reagent.
- Replace the cap and invert the vial 10 times. This is the reacted sample.

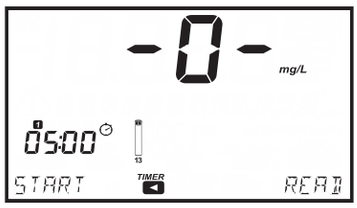
*Note: The method is technique sensitive. See procedure on page 9 Cuvette Preparation for proper mixing technique.*

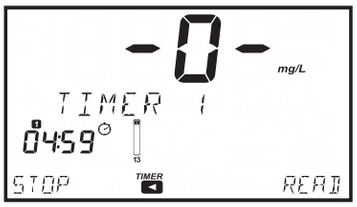


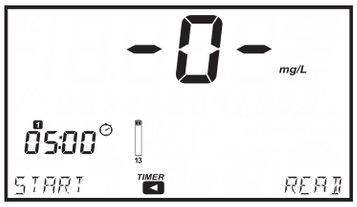
- Place the vial into the holder.

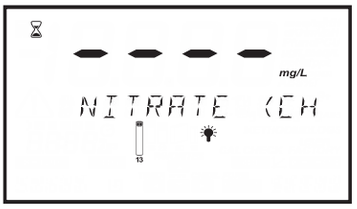
- Press the ◀ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 5 minutes.
- Press the **READ** key, the instrument displays the results in **mg/L of nitrate-nitrogen ($NO_3^-$-N)**.

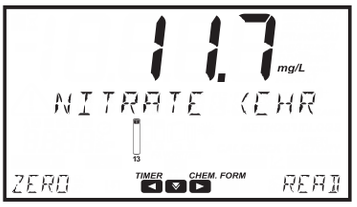


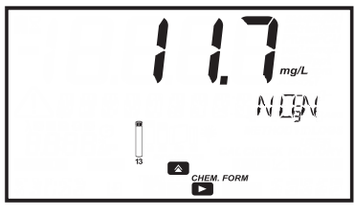



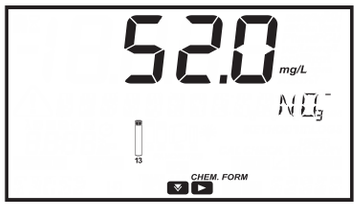




- Press the ▼ key to access the second level functions (wavelength, method ID, date and time).
- Press the ▶ key to view the chemical formula.
- Press the ▲ key in the chemical formula screen to convert the results to **mg/L of nitrate ($NO_3^-$)**.




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

## INTERFERENCES

Interference may be caused by:
Barium ($Ba^{2+}$) above 1 mg/L; Chloride ($Cl^-$) above 1000 mg/L; Nitrite ($NO_2^-$) above 50 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, then proceed with the usual measurement procedure.

## 9.57. 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

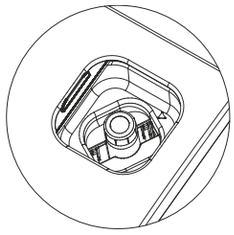
HI764-25 Reagents for 25 tests

For other accessories see page 236.

### MEASUREMENT PROCEDURE

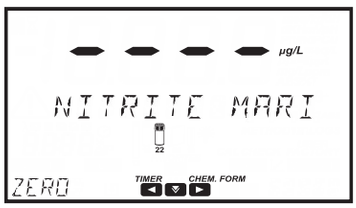
- Select the Nitrite Marine ULR method using the procedure described in the Method Selection section (see page 6).

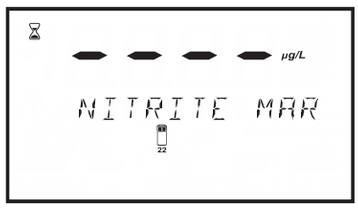

- Fill the cuvette with 10 mL of unreacted sample (up to the mark) and replace the cap.

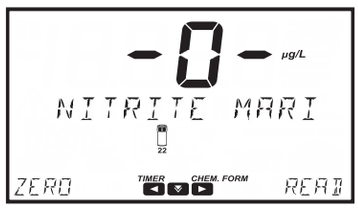


- Place the cuvette into the holder and close the lid.

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

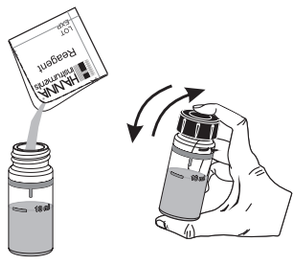


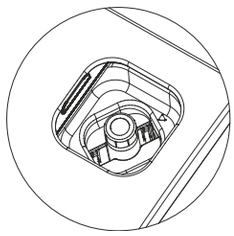




- Remove the cuvette.

- Add one packet of HI764-25 Nitrite Ultra Low Range Marine Reagent. Replace the cap and shake gently for about 15 seconds.

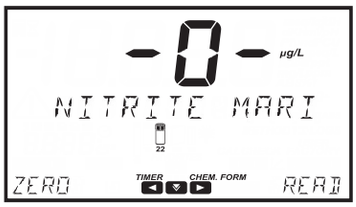


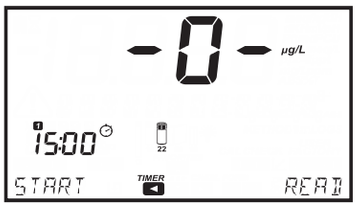
• Reinsert the cuvette into the instrument and close the lid.

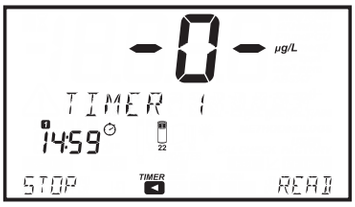


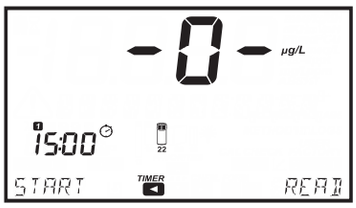
• Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 15 minutes.

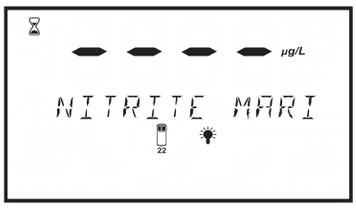
• Press the **READ** key, the instrument displays the results in **µg/L of nitrite-nitrogen ($NO_2^-$-N).**



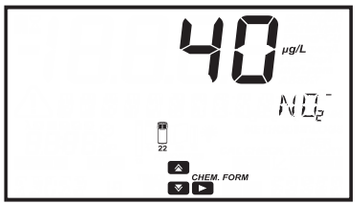



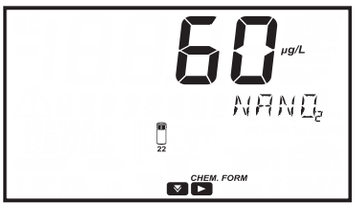


• Press the ▼ key to access the second level functions (wavelength, method ID, date and time).

• Press the ► key to view the chemical formula.

• Press the ▲ key in the chemical formula screen 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 the following ions: ferrous, ferric, cupric, mercurous, silver, antimonious, bismuth, auric, lead, metavanadate and chloroplatinate.
Strongly reducing and oxidizing reagents.
High levels of nitrate (above 100 mg/L) could yield falsely high readings due to a minute amount of reduction to nitrite that could occur at these levels.

## 9.58. 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 |

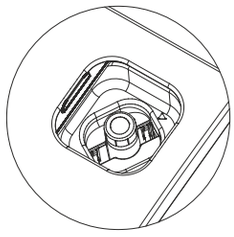
For other accessories see page 236.

### MEASUREMENT PROCEDURE

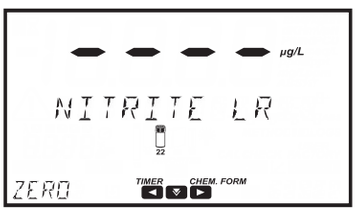
• Select the Nitrite LR method using the procedure described in the Method Selection section (see page 6).

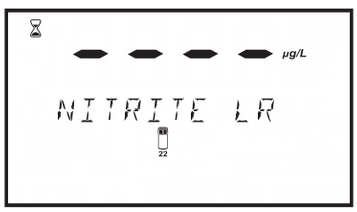
• Fill the cuvette with 10 mL of unreacted sample (up to the mark) and replace the cap.

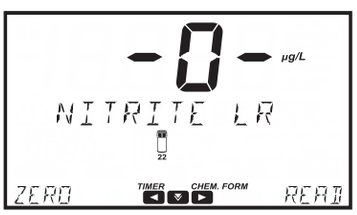

• Place the cuvette into the holder and close the lid.



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

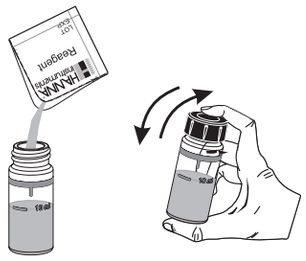


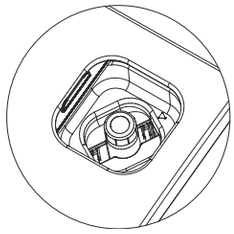




• Remove the cuvette.

• Add one packet of HI93707-0 Nitrite Low Range Reagent. Replace the cap and shake gently for about 15 seconds.

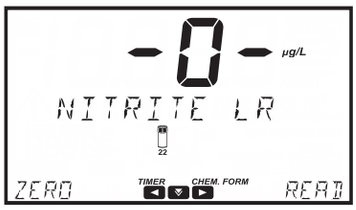


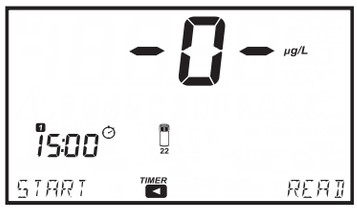
• Reinsert the cuvette into the instrument and close the lid.

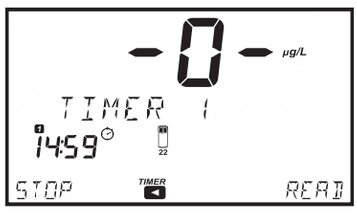


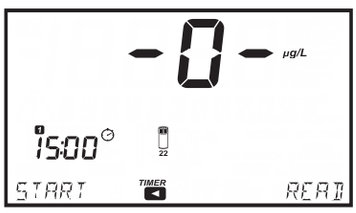
• Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 15 minutes.

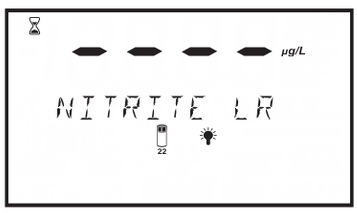
• Press the **READ** key, the instrument displays the results in **µg/L of nitrite-nitrogen ($NO_2^-$-N)**.

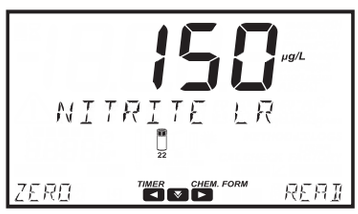


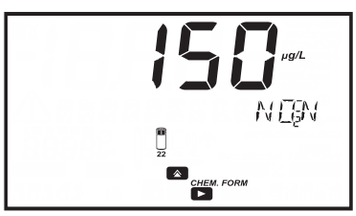



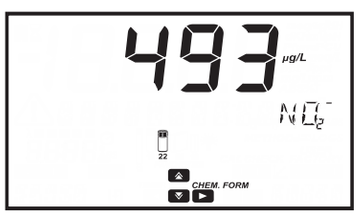



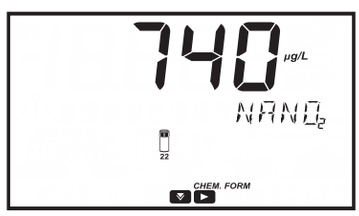

• Press the ▼ key to access the second level functions (wavelength, method ID, date and time).

• Press the ► key to view the chemical formula.

• Press the ▲ key in the chemical formula screen 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 the following ions: ferrous, ferric, cupric, mercurous, silver, antimonious, bismuth, auric, lead, metavanadate and chloroplatinate. Strongly reducing and oxidizing reagents.
High levels of nitrate (above 100 mg/L) could yield falsely high readings due to a minute amount of reduction to nitrite that could occur at these levels.

## 9.59. 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 page 236.

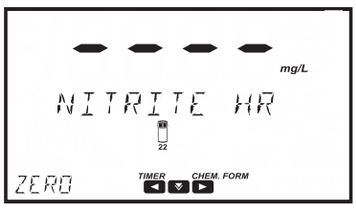
### MEASUREMENT PROCEDURE

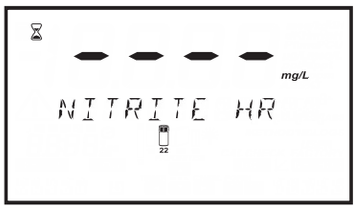
• Select the Nitrite HR method using the procedure described in the Method Selection section (see page 6).

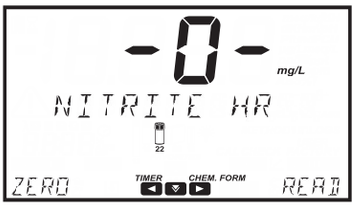

• Fill the cuvette with 10 mL of unreacted sample (up to the mark) and replace the cap.

• Place the cuvette into the holder and close the lid.

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

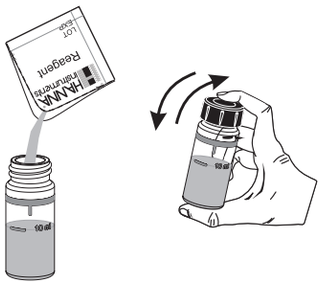


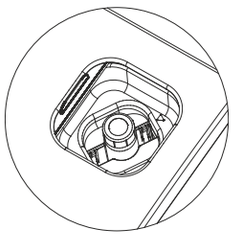




• Remove the cuvette.

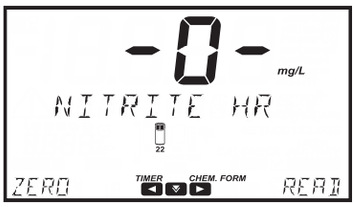
• Add one packet of HI93708-0 Nitrite High Range Reagent. Replace the cap and shake gently until completely dissolved.

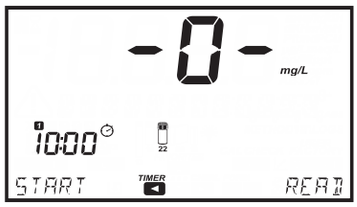


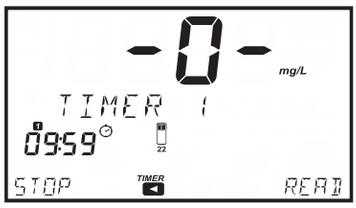
- Reinsert the cuvette into the instrument and close the lid.

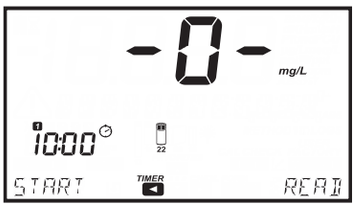


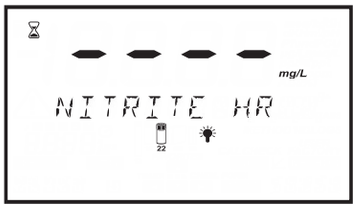
- Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 10 minutes.
- Press the **READ** key, the instrument displays the results in **mg/L of nitrite ($NO_2^-$)**.



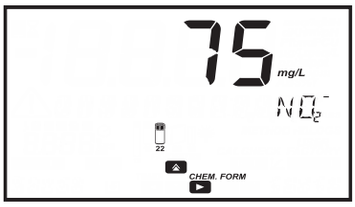



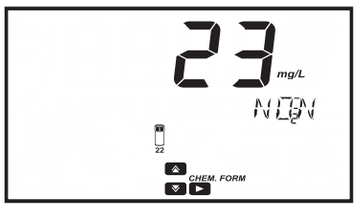



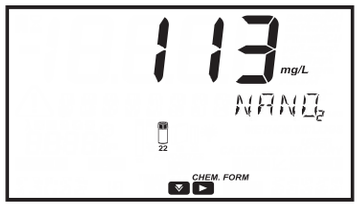





- Press the ▼ key to access the second level functions (wavelength, method ID, date and time).
- Press the ► key to view the chemical formula.
- Press the ▲ key in the chemical formula screen to convert the results to **mg/L of nitrite-nitrogen ($NO_2^-$-N) or sodium nitrite ($NaNO_2$)**.




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

## 9.60. 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: N LR, green label*

*** Reagent Vial identification: N LR, red label*

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

### 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 page 236.

### 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.

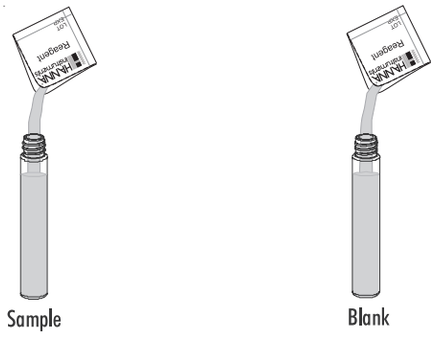
Reagent Blank Correction: This method requires a reagent blank correction. A single blank vial may be used more than once, the blank vial is stable for one week if stored in a dark place at room temperature. For improved accuracy use the same lot of reagents for the blank and sample, and run a blank for each set of measurements.

- Preheat the HANNA® Reactor HI839800 to 105 °C (221 °F). The optional HI740217 safety shield is strongly recommended.

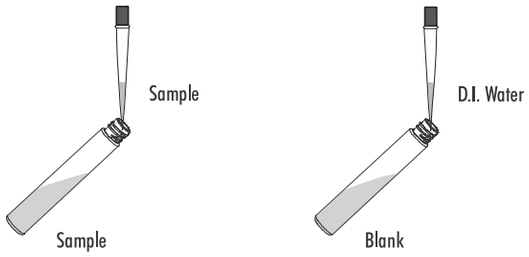
  **DO NOT USE AN OVEN OR MICROWAVE** samples may leak and generate a corrosive and possibly explosive atmosphere.

- Remove the cap from two HI93767A-B Total Nitrogen Low Range Digestion Vials.

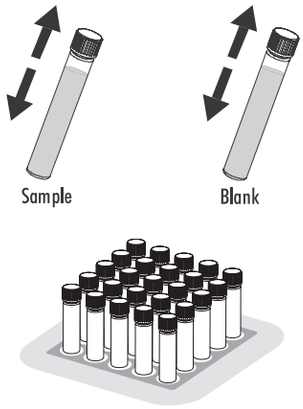
- Add one packet of Persulfate/N to each vial.




- 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.

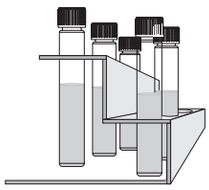



- Replace the cap and shake vigorously for 30 seconds or until powder is completely dissolved.




- Insert the vials into the reactor and heat them for 30 minutes at 105 °C.

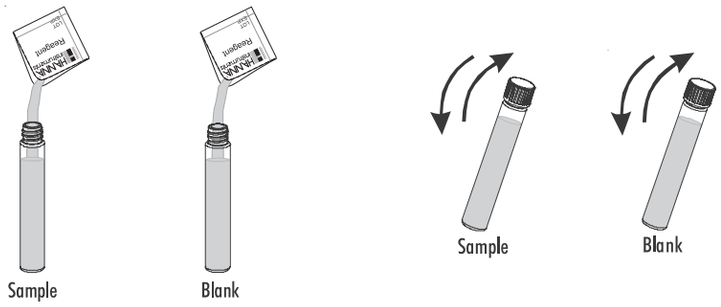
- At the end of the digestion period switch off the reactor, place the vials in the test tube rack and allow to cool to room temperature.



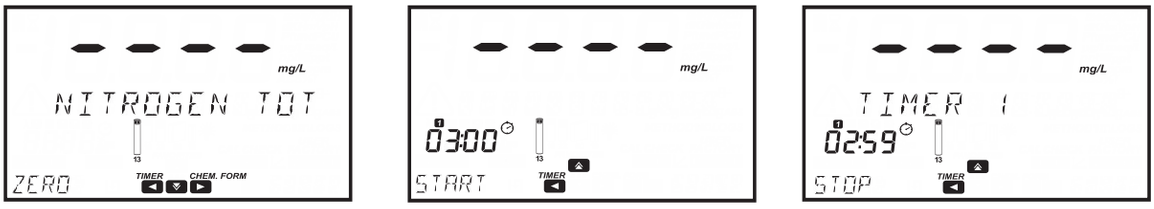
**WARNING:** The vials are still hot, use caution when handling.

- Select Nitrogen Total LR (13 mm) method using the procedure described in Method Selection section (see page 6).
- Insert 13 mm vial adapter using the procedure described in the Cuvette Adapters section (see page 10).

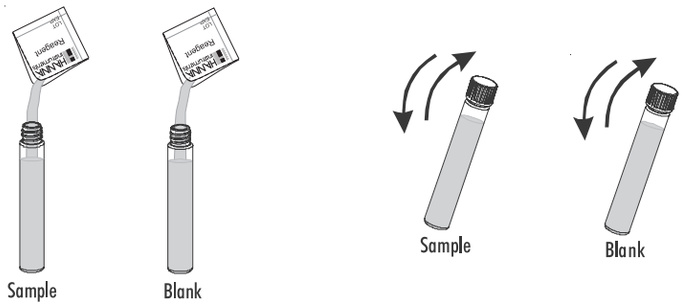
• Remove the cap from the vials and add one packet of BISULFITE/N to each vial. Replace the cap and shake gently for 15 seconds.



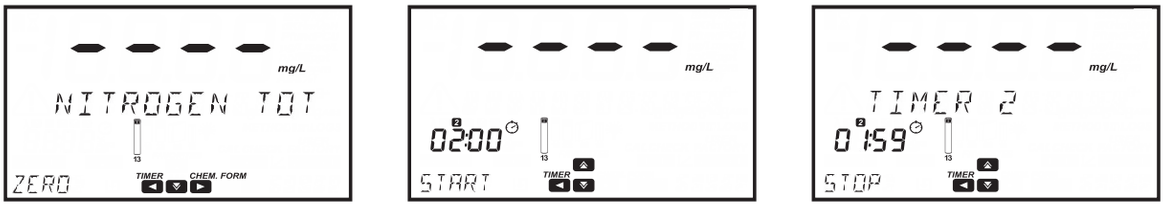

• Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 3 minutes.




• Remove the cap from the vials and add one packet of HI93767-0 Total Nitrogen Reagent to each vial. Replace the cap and shake gently for 15 seconds.



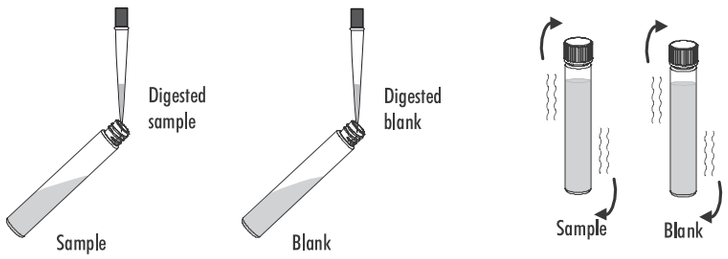

• Press the ◄ key to access the timer menu, press the ▲ key to select Timer 2. Press the **START** key to start Timer 2, the display will show the countdown or, alternatively, wait for 2 minutes.



• Remove the cap from two HI93766V-0LR 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.

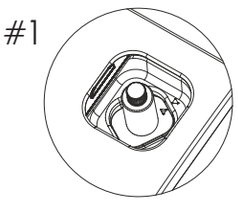
• Replace the cap and invert 10 times.



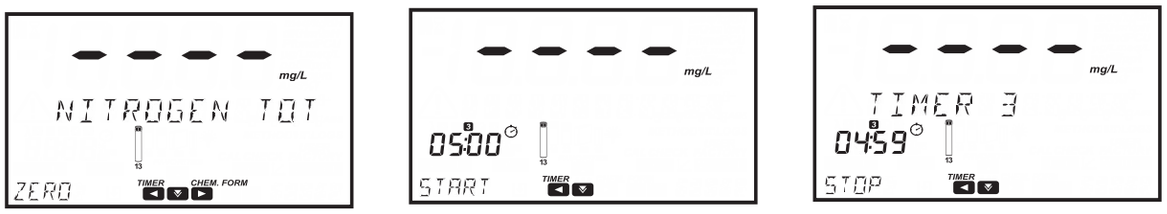

**WARNING:** The vials will become hot during mixing, use caution when handling.

*Note: The method is technique sensitive. See procedure on page 9 Cuvette preparation for proper mixing technique.*

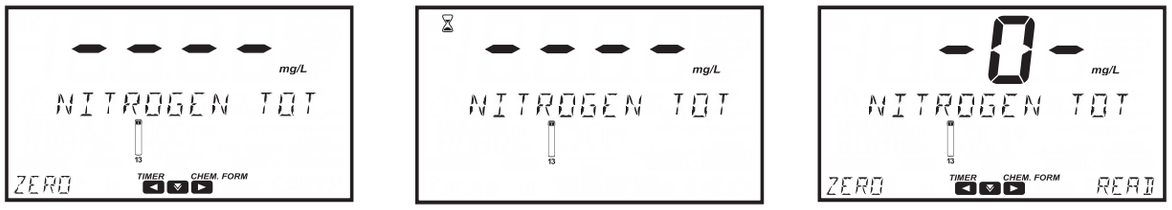
• Place the blank vial (#1) into the holder




• Press the ◀ key to access the timer menu, press the ⏫ key to select Timer 3. Press the **START** key to start Timer 3, the display will show the countdown or, alternatively, wait for 5 minutes.

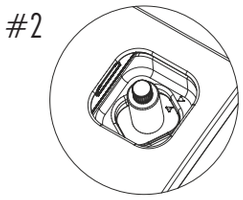



• Press the **ZERO** key, the display will show "-0-" when the meter is zeroed and ready for measurement.

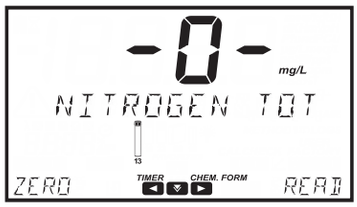


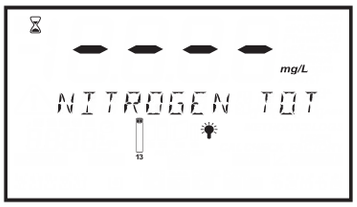
• Remove the blank vial.

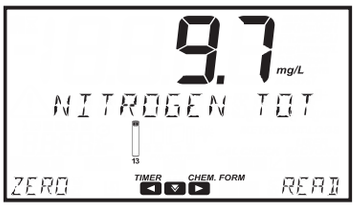
• Place the sample vial (#2) into the holder.




• Press the **READ** key to start the reading. The instrument displays the results in **mg/L of nitrogen (N)**.



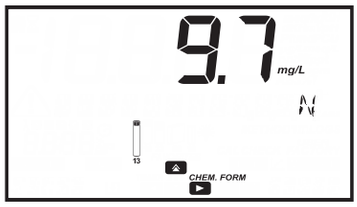



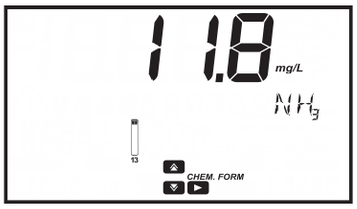



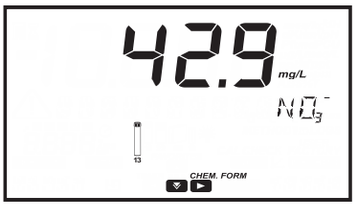

• Press the ▼▼ key to access the second level functions (wavelength, method ID, date and time).

• Press the ▶ key to view the chemical formula.

• Press the ▲▲ key in the chemical formula screen 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:
Bromide ($Br^-$) above 60 mg/L
Chloride ($Cl^-$) above 1000 mg/L
Chromium ($Cr^{3+}$) above 0.5 mg/L

## 9.61. 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: N HR, red label*

*** Reagent Vial identification: N HR, green label*

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

### 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 page 236.

### MEASUREMENT PROCEDURE

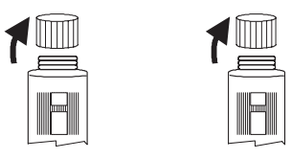
Before using the reagent kit carefully read all the instructions and the Safety Data Sheets (SDS). Pay particular attention to all warnings, cautions and notes. Failure to do so may result in serious injury to the operator.

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.

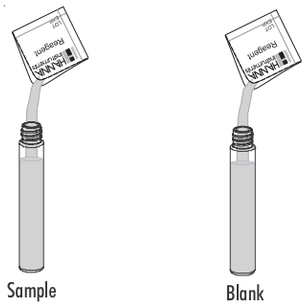
- Preheat the HANNA® Reactor HI839800 to 105 °C (221 °F). The optional HI740217 safety shield is strongly recommended.

  **DO NOT USE AN OVEN OR MICROWAVE** samples may leak and generate a corrosive and possibly explosive atmosphere.

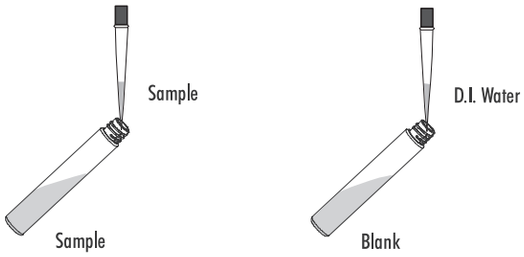
- Remove the cap from two HI93767B-B Total Nitrogen High Range Digestion Vials.



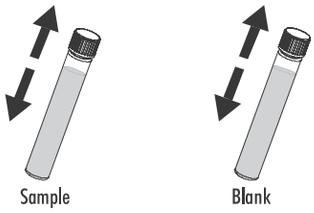
• Add one packet of PERSULFATE/N to each vial.




• 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.



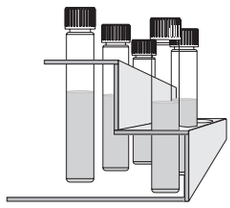

• Replace the cap and shake vigorously for about 30 seconds or until powder is completely dissolved.




• Insert the vials into the reactor and heat them for 30 minutes at 105°C.

• At the end of the digestion place the vials in the test tube rack and allow to cool to room temperature.

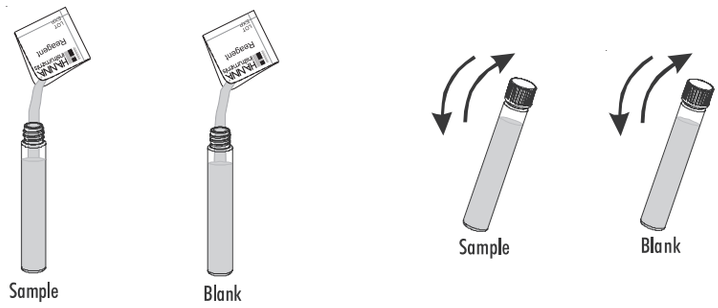
WARNING: The vials are still hot, use caution when handling.



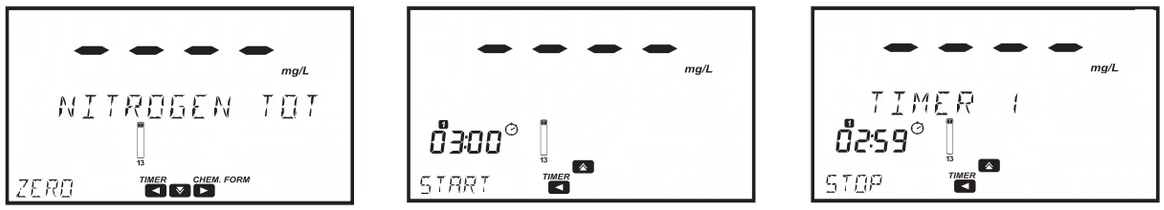
• Select Nitrogen Total HR (13 mm) method using the procedure described in Method Selection section (page 6).

• Insert the 13 mm vial adapter using the procedure described in the Cuvette Adapters section (see page 10).

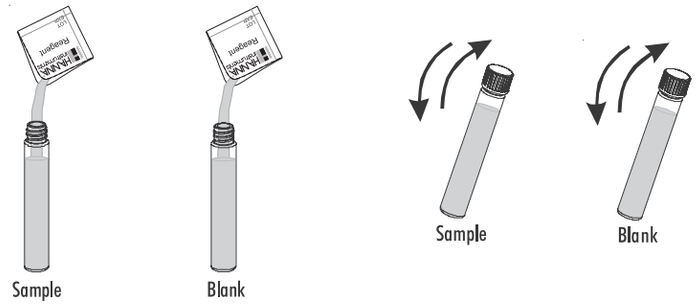
• Remove the cap from the vials and add one packet of BISULFITE/N to each vial. Replace the cap and shake gently for 15 seconds.



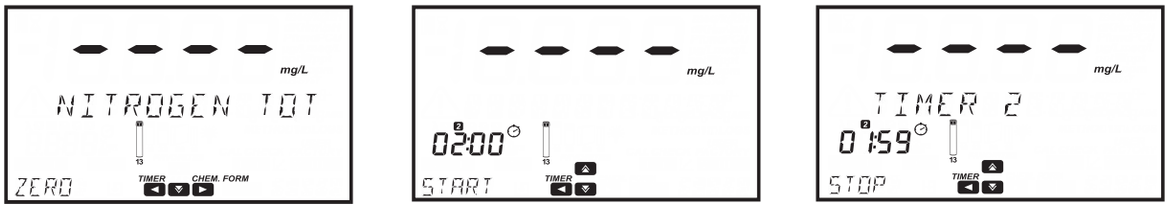

• Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 3 minutes.



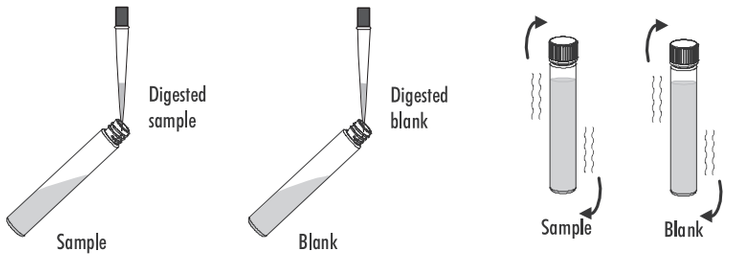

• Remove the cap from the vials and add one packet of HI93767-0 Total Nitrogen Reagent to each vial. Replace the cap and shake gently for 15 seconds.




• Press the ◄ key to access the timer menu, press the ▲ key to select Timer 2. Press the START key to start Timer 2, the display will show the countdown or, alternatively, wait for 2 minutes.



• 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.

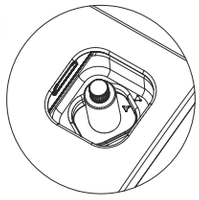



• Replace the cap tightly and invert the vials 10 times.

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

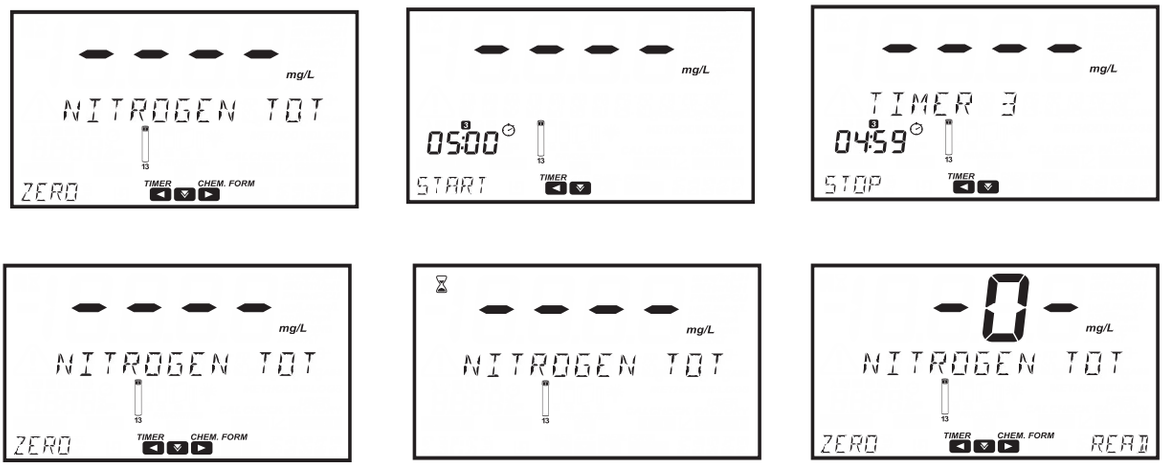
*Note: The method is technique sensitive, see procedure on page 9 Cuvette preparation for proper mixing technique.*

#1



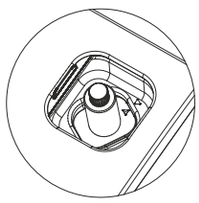
• Place the sample vial (#1) into the holder.

• Press the ◄ key to access the timer menu, press the ▲ key to select Timer 3. Press the START key to start Timer 3, the display will show the countdown or, alternatively, wait for 5 minutes. Press the **ZERO** key, the display will show "-0-" when the meter is zeroed and ready for measurement.



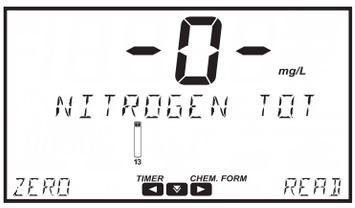

• Remove the blank vial.

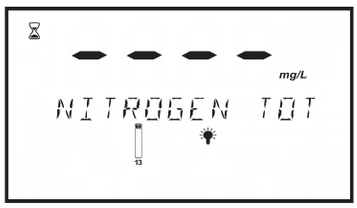
#2

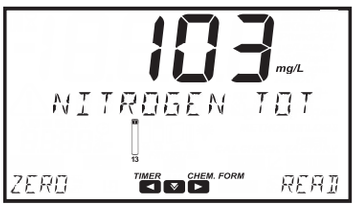


• Place the sample vial (#2) into the holder.

• Press the **READ** key to start the reading. The instrument displays the results in **mg/L nitrogen (N).**



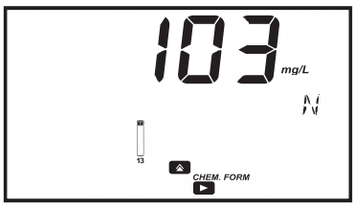



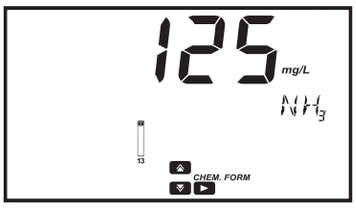



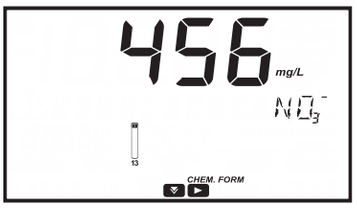

• Press the ▼ key to access the second level functions (wavelength, method ID, date and time).

• Press the ▶ key to view the chemical formula.

• Press the ▲ key in the chemical formula screen 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:
Bromide ($Br^-$) above 240 mg/L
Chloride ($Cl^-$) above 3000 mg/L
Chromium ($Cr^{3+}$) above 0.5 mg/L

## 9.62. 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 |

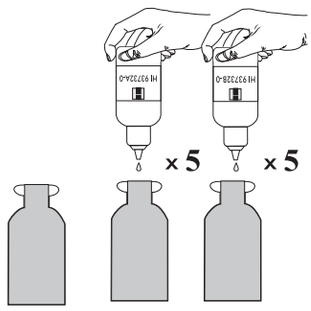
### REAGENT SET

| | |
|---|---|
| HI93732-01 | Reagents for 100 tests |
| HI93732-03 | Reagents for 300 tests |

For other accessories see page 236.

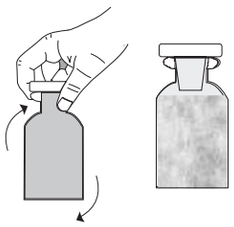
### MEASUREMENT PROCEDURE

- Select the Oxygen Dissolved method using the procedure described in the Method Selection section (see page 6).
- 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.

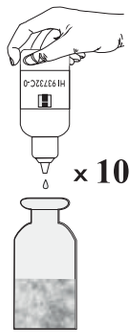



- Add more sample, to fill the bottle completely. Replace the cap and ensure that a part of the sample spills over.

*Note: This ensures no air bubbles have been trapped inside the bottle. Trapped air bubbles could alter readings.*



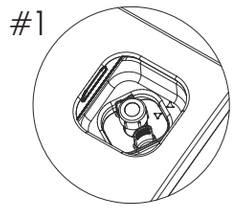
- Invert the bottle several times until the sample turns orange-yellow and a flocculating agent appears.




- 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.

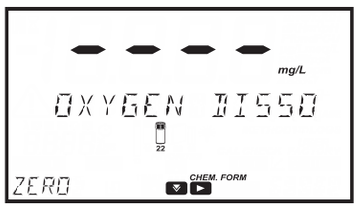
- Replace the cap and invert the bottle until the settled flocculating agent dissolves completely. The sample is ready for measurement when it is yellow and completely clear.

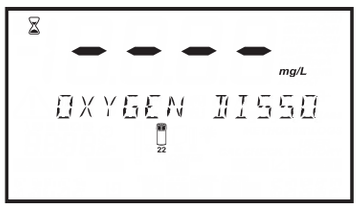

- Fill the first cuvette (#1) with 10 mL of the unreacted sample (up to the mark), and replace the cap.

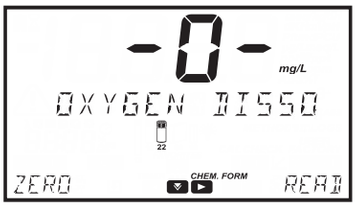



- Place the cuvette into the holder and close the lid.

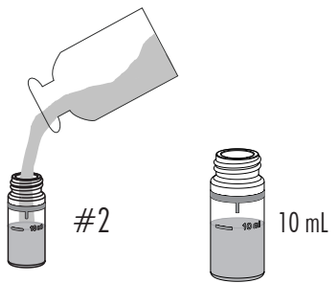
- Press the **ZERO** key. The display will show "-0-" when the meter is zeroed and ready for measurement.

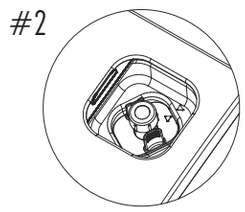


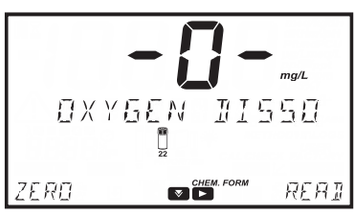

- Remove the cuvette.
- Fill second cuvette (#2) with 10 mL of the reacted sample (up to the mark) and replace the cap.

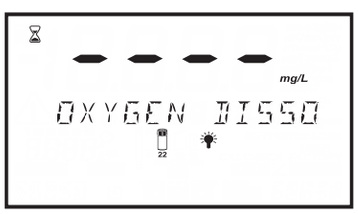


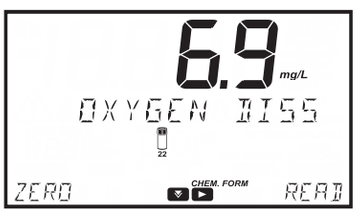




- Insert the cuvette into the holder and close the lid.

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

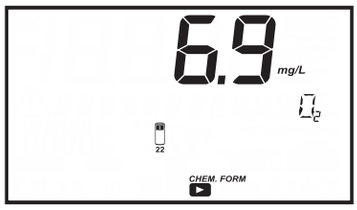


• Press the ▼▼ key to access the second level functions (wavelength, method ID, date and time).

• 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.

## 9.63. 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 |

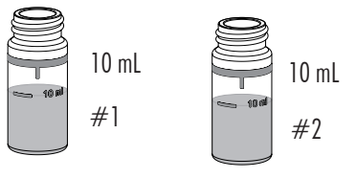
### REAGENT SET

| | |
|---|---|
| HI96773-01 | Reagents for 50 tests |
| HI96773-03 | Reagents for 150 tests |

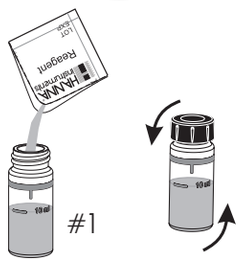
For other accessories see page 236.

### MEASUREMENT PROCEDURE

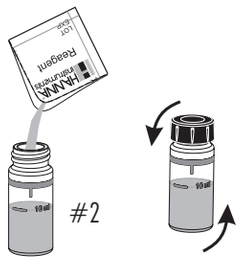
- Select the Oxygen Scavengers (Carbohydrazide) method using the procedure described in the Method Selection section (see page 6).



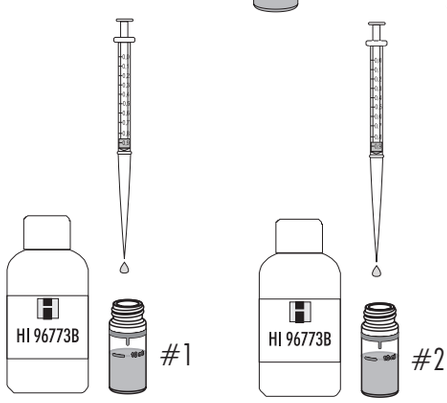

- Fill first cuvette (#1) with 10 mL of deionized water (up to the mark).
- Fill second cuvette (#2) with 10 mL of sample (up to the mark).
- Add one packet of HI96773A-0 Oxygen Scavengers Reagent A to cuvette #1. Replace the cap and invert for 30 seconds.



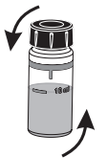

- Add one packet of HI96773A-0 Oxygen Scavengers Reagent A to cuvette #2. Replace the cap and invert for 30 seconds.



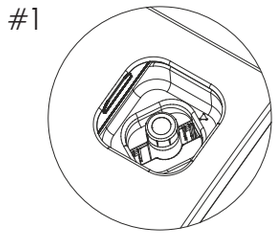

- Add 0.5 mL of HI96773B-0 Oxygen Scavengers Reagent B to each cuvette using the 1 mL syringe.



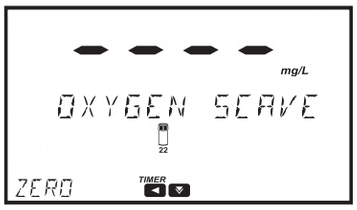
• Replace the caps and invert for 10 seconds.

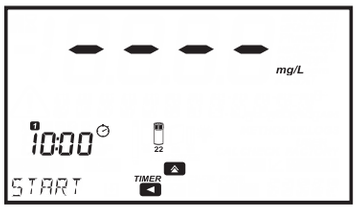


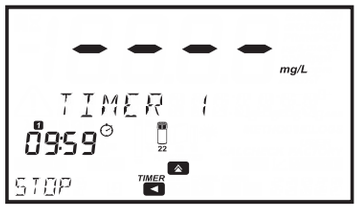
• Place first cuvette (#1) into the holder and close the lid.

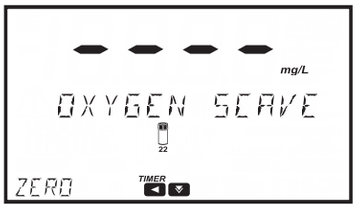



• Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 10 minutes. Press the **ZERO** key, the display will show "-0-" when the meter is zeroed and ready for measurement.

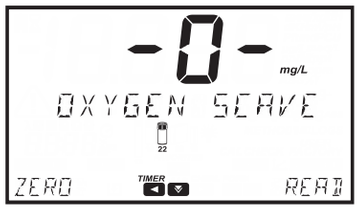


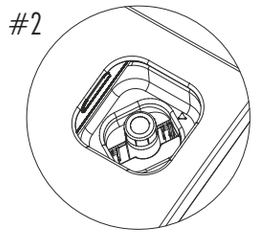





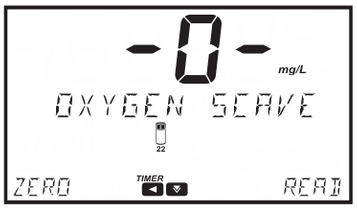


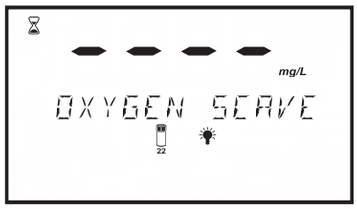

• Remove the cuvette.




• Insert the second cuvette (#2) into the instrument and close the lid.

• Presst the **READ** key to start reading. The instrument displays the results in **mg/L of carbohydrazide.**





• Press the ▼▼ key to access the second level functions (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.

## 9.64. OXYGEN SCAVENGERS (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 |

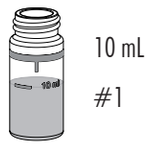
### REAGENT SET

| | |
|---|---|
| HI96773-01 | Reagents for 50 tests |
| HI96773-03 | Reagents for 150 tests |

For other accessories see page 236.

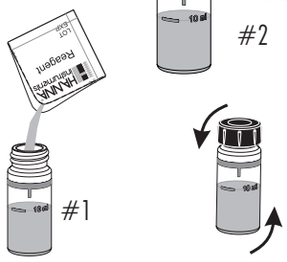
### MEASUREMENT PROCEDURE

- Select the Oxygen Scavengers (DEHA) method using the procedure described in the Method Selection section (see page 6).
- Fill first cuvette (#1) with 10 mL of deionized water (up to the mark).

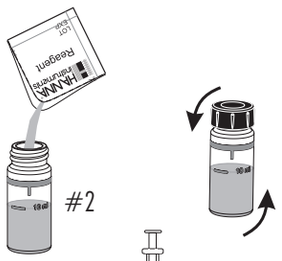



- Fill second cuvette (#2) with 10 mL of sample (up to the mark).

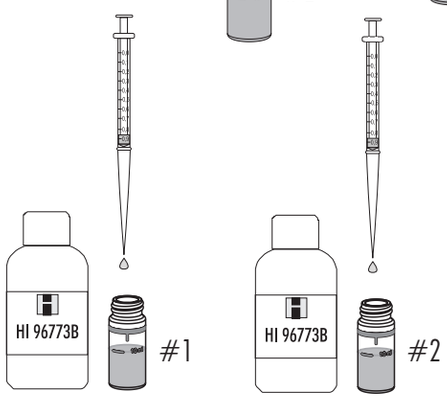

- Add one packet of HI96773A-0 Oxygen Scavengers Reagent A to #1 cuvette. Replace the cap and invert for 30 seconds.



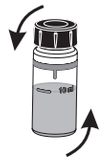

- Add one packet of HI96773A-0 Oxygen Scavengers Reagent A to #2 cuvette. Replace the cap and invert for 30 seconds.



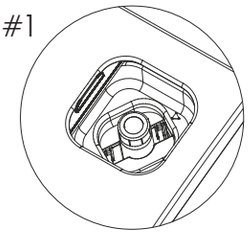

- Add 0.5 mL of HI96773B-0 Oxygen Scavengers Reagent B to each cuvette using the 1 mL syringe.



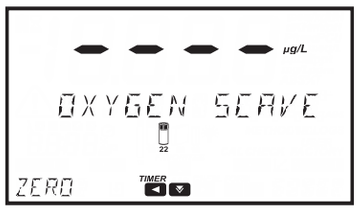
• Replace the caps and invert for 10 seconds.

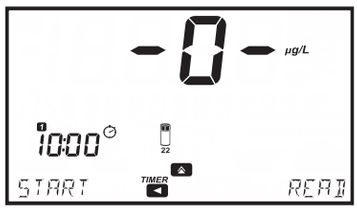


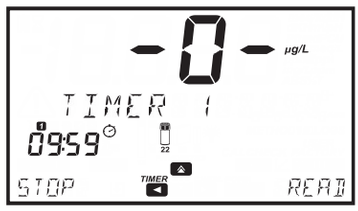
• Place first cuvette (#1) into the holder and close the lid.

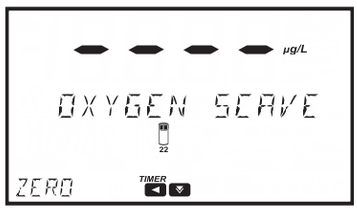


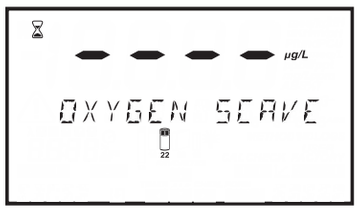

• Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 10 minutes. Press the **ZERO** key, the display will show "-0-" when the meter is zeroed and ready for measurement.

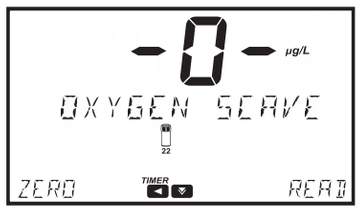


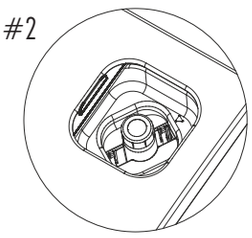



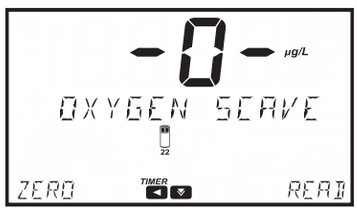



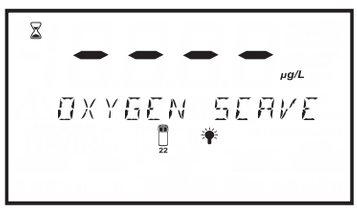

• Remove the cuvette.

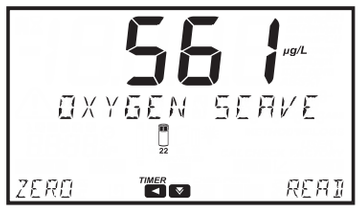



• Insert the second cuvette (#2) into the holder and close the lid.

• Press the **READ** key to start reading. The instrument displays the results in **µg/L of DEHA.**




• Press the ▼ key to access the second level functions (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.

## 9.65. 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 |

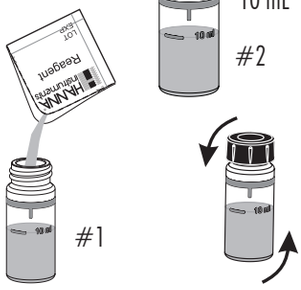
For other accessories see page 236.

### MEASUREMENT PROCEDURE

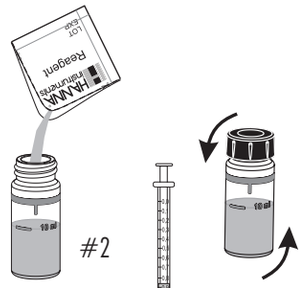
- Select the Oxygen Scavengers (Hydro) method using the procedure described in the Method Selection section (see page 6).
- Fill first cuvette (#1) with 10 mL of deionized water (up to the mark).


- Fill second cuvette (#2) with 10 mL of sample (up to the mark).

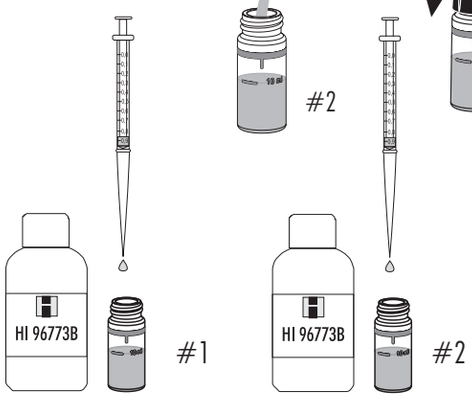

- Add one packet of HI96773A-0 Oxygen Scavengers Reagent A to #1 cuvette. Replace the cap and invert for 30 seconds.



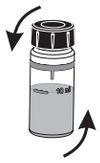

- Add one packet of HI96773A-0 Oxygen Scavengers Reagent A to #2 cuvette. Replace the cap and invert for 30 seconds.



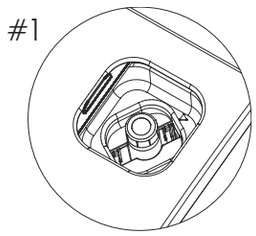

- Add 0.5 mL of HI96773B-0 Oxygen Scavengers Reagent B to each cuvette using the 1 mL syringe.



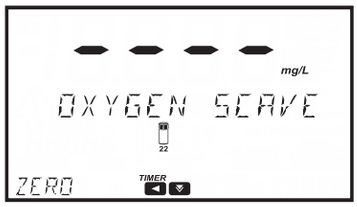
• Replace the caps and invert for 10 seconds.

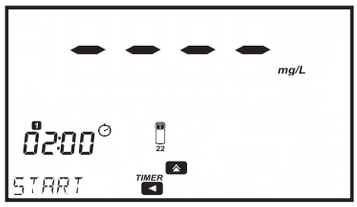


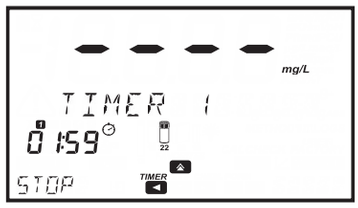
• Place first cuvette (#1) into the holder and close the lid.

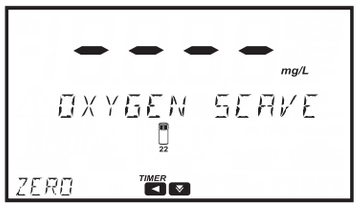


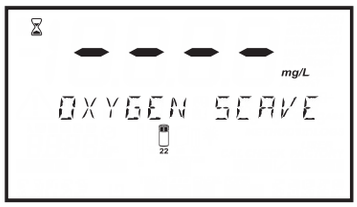

• Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 2 minutes. Press the **ZERO** key, the display will show "-0-" when the meter is zeroed and ready for measurement.

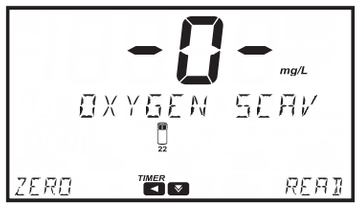


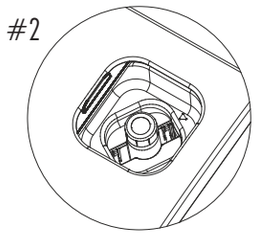



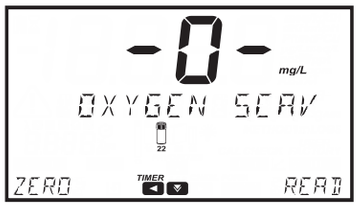



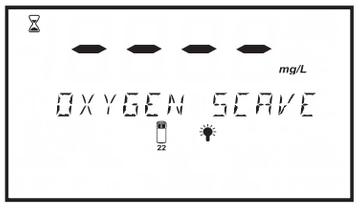

• Remove the cuvette.




• Insert the second cuvette (# 2) into the holder and close the lid.

• Press the **READ** key to start reading. The instrument displays the results in **mg/L of hydroquinone.**





• Press the ▼ key to access the second level functions (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.

## 9.66. OXYGEN SCAVENGERS (ISOASCORBIC ACID)

### SPECIFICATIONS

| | |
|---|---|
| Range | 0.00 to 4.50 mg/L (as Isoascorbic 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 |

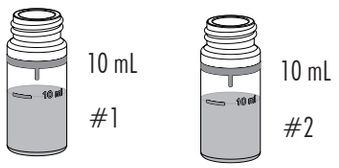
### REAGENT SET

| | |
|---|---|
| HI96773-01 | Reagents for 50 tests |
| HI96773-03 | Reagents for 150 tests |

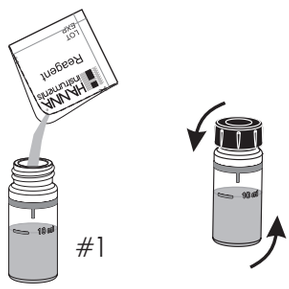
For other accessories see page 236.

### MEASUREMENT PROCEDURE

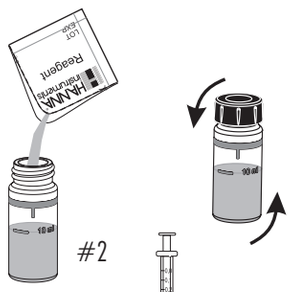
- Select the Oxygen Scavengers (ISA) method using the procedure described in the Method Selection section (see page 6).



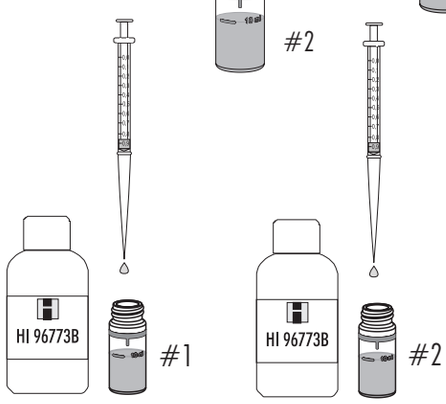

- Fill first cuvette (#1) with 10 mL of deionized water (up to the mark).
- Fill second cuvette (#2) with 10 mL of sample (up to the mark).
- Add one packet of HI96773A-0 Oxygen Scavengers Reagent A to #1 cuvette. Replace the cap and invert for 30 seconds.



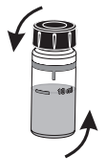

- Add one packet of HI96773A-0 Oxygen Scavengers Reagent A to #2 cuvette. Replace the cap and invert for 30 seconds.

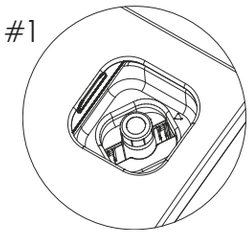



- Add 0.5 mL of HI96773B-0 Oxygen Scavengers Reagent B to each cuvette using the 1 mL syringe.



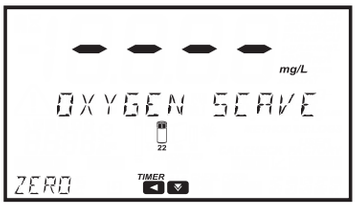
• Replace the caps and invert for 10 seconds.

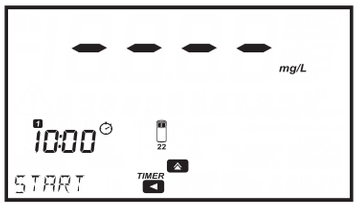


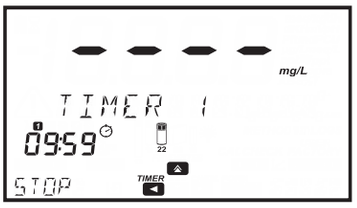


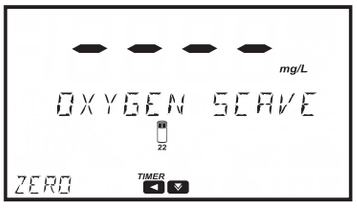

• Place first cuvette (#1) into the holder and close the lid.

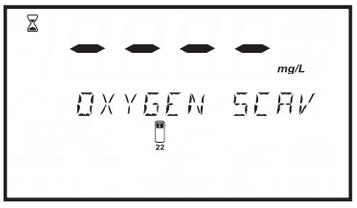
• Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 10 minutes. Press the **ZERO** key, the display will show "-0-" when the meter is zeroed and ready for measurement.

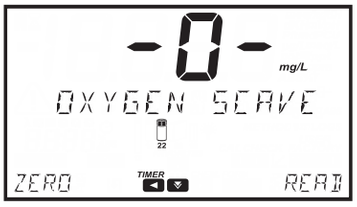


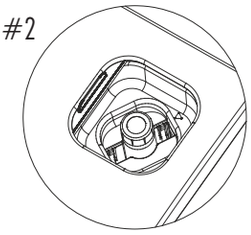



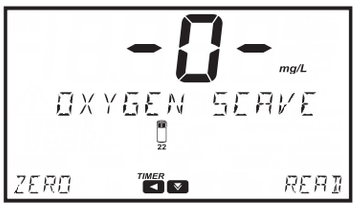



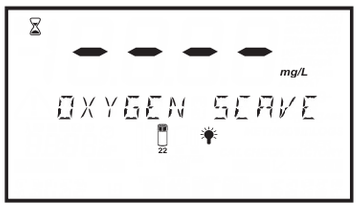

• Remove the cuvette.

• Insert the second cuvette (#2) into the instrument and close the lid.




• Press the **READ** key to start reading. The instrument displays the results in **mg/L of Isoascorbic acid.**





• Press the ▼ key to access the second level functions (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.

## 9.67. 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 |
| HI93757-52 | Reagents for 100 tests (Optional) |

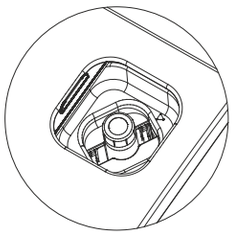
For other accessories see page 236.

*Note: If the sample is suspected to contain chlorine residue (free or total chlorine), follow the alternative measurement procedure described below, chlorine is a strong interferent.*

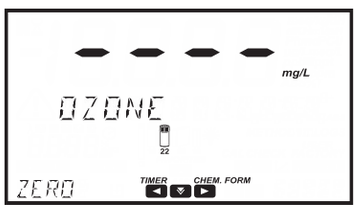
### STANDARD MEASUREMENT PROCEDURE

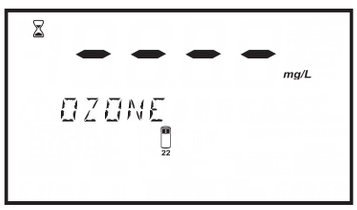
- Select the Ozone method using the procedure described in the Method Selection section (see page 6).
- Fill the cuvette with 10 mL of unreacted sample (up to the mark) and replace the cap.

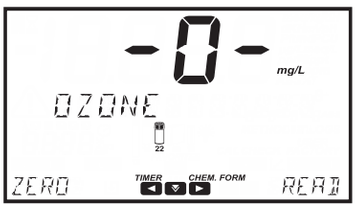

- Place the cuvette into the holder and close the lid.



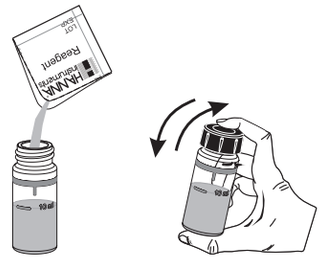
- Press the **ZERO** key. The display will show "-0-" when the meter is zeroed and ready for measurement.



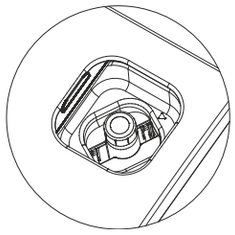



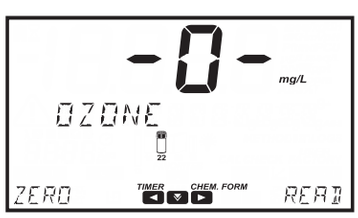
- Remove the cuvette.
- Add one packet of HI93757-0 Ozone Reagent. Replace the cap and shake gently for 20 seconds.

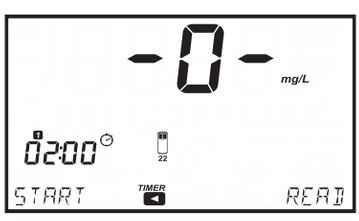


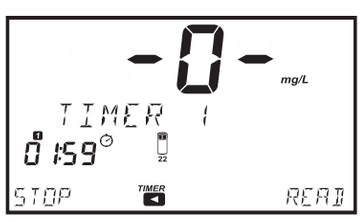
- Replace the cuvette into the instrument and close the lid.

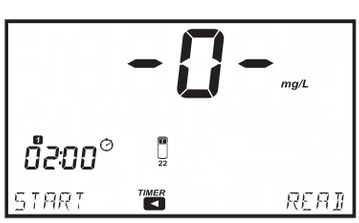


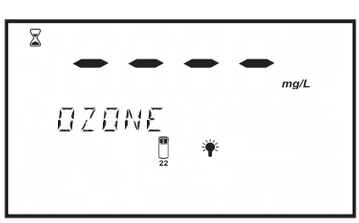
- Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 2 minutes.
- Press the **READ** key, the instrument displays the results in **mg/L ozone ($O_3$) (chlorine free sample only)**.

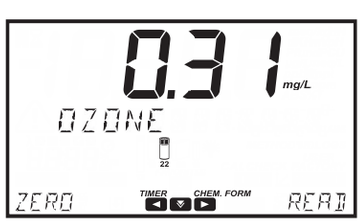


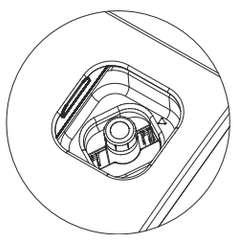

*Note: For samples containing chlorine, record this value as A.*

## ADDITIONAL MEASUREMENT PROCEDURE

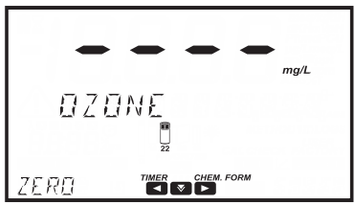
### For samples containing chlorine

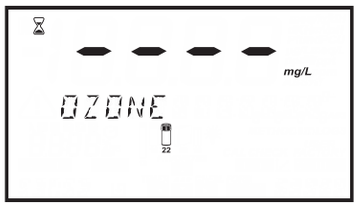
- Fill the cuvette with 10 mL of unreacted sample (up to the mark).

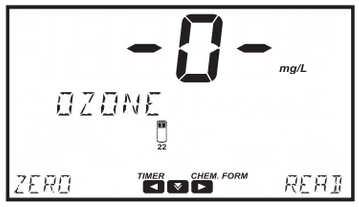

- Place the cuvette into the holder and close the lid.



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

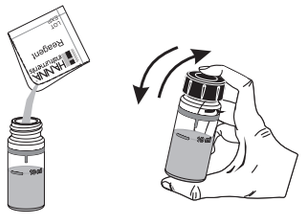


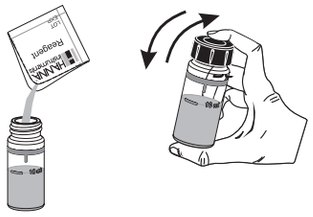




• Remove the cuvette.

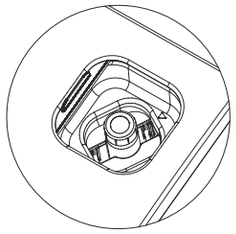
• Add one packet of the HI93703-52-0 Glycine Powder. Replace the cap and shake gently until completely dissolved.



• Add one packet of HI93757-0 Ozone Reagent. Replace the cap and shake gently for 20 seconds.

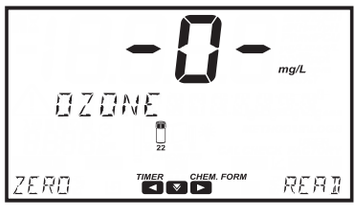


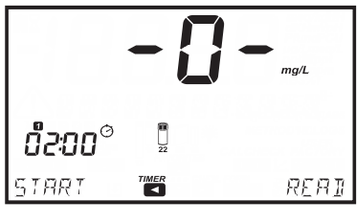
• Insert the cuvette into the instrument and close the lid.

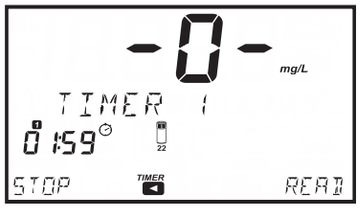


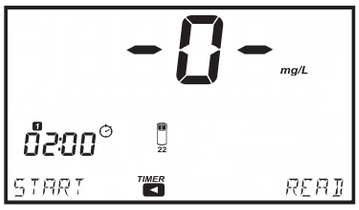
• Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 2 minutes.

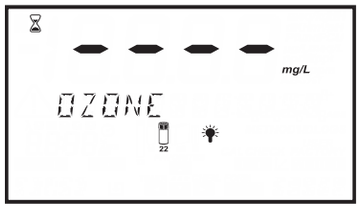
• Press the **READ** key, record this value as B.

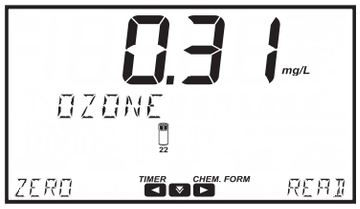



• To determine the **mg/L ozone ($O_3$)** concentration in sample containing chlorine subtract value B (additional measurement procedure) from value A (standard measurement procedure).

• Press the ▼▼ key to access the second level functions (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.
Alkalinity above 250 mg/L $CaCO_3$ will not reliably develop the full amount of color or it may rapidly fade. To resolve this, neutralize the sample with diluted HCl. In case of water with hardness greater than 500 mg/L $CaCO_3$, shake the sample for approximately 2 minutes after adding the powder reagent.

## 9.68. 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 | Phenol Red. |
| Method ID | #068 |

### REQUIRED REAGENTS

| Code | Description | Quantity |
|---|---|---|
| HI 93710-0 | pH Reagent | 5 drops |

### REAGENT SETS

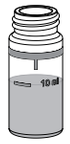
| | |
|---|---|
| HI 93710-01 | Reagents for 100 pH tests |
| HI 93710-03 | Reagents for 300 pH tests |

For other accessories see page 236.

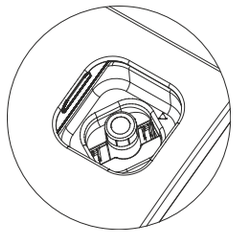
### MEASUREMENT PROCEDURE

• Select the pH method using the procedure described in the Method Selection section (see page 6).

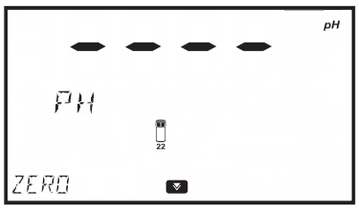
• Fill the cuvette with 10 mL of unreacted sample (up to the mark) and replace the cap.

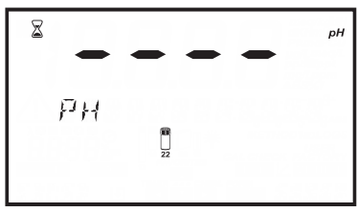


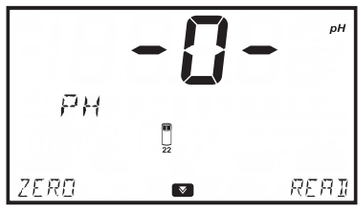

• Place the cuvette into the holder and close the lid.



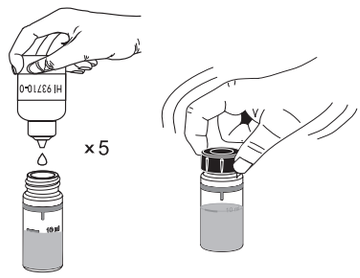
• Press the **ZERO** key. The display will show "-0-" when the meter is zeroed and ready for measurement.

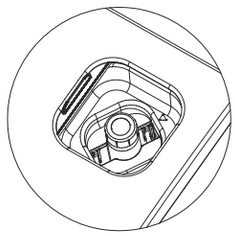


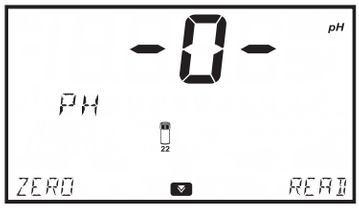

• Remove the cuvette and add 5 drops of HI93710-0 pH Reagent Indicator. Replace the cap and mix the solution.

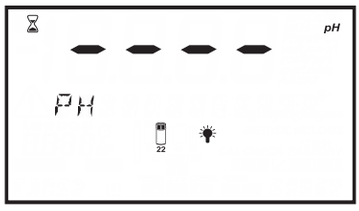


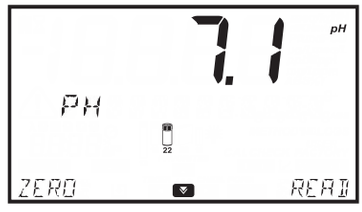


• Reinsert the cuvette into the instrument and close the lid.

• Press the **READ** key to start the reading. The instrument displays the result in **pH**.




• Press the ⌄⌄ key to access secondary functions (wavelength, method ID, date and time).

## 9.69. 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 the Standard Methods for the Examination of Water and Wastewater, 18th edition, Amino Acid method. |
| Method ID | #069 |

### REQUIRED REAGENTS

| Code | Description | Quantity |
|---|---|---|
| HI736-25 | Phosphorus Ultra Low Range Marine Reagent | 1 packet |

### REAGENT SETS

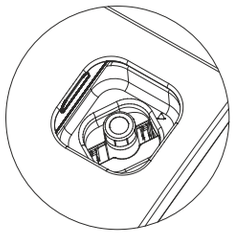
HI736-25 Reagents for 25 tests

For other accessories see page 236.

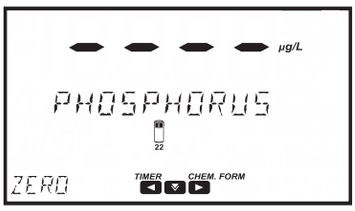
### MEASUREMENT PROCEDURE

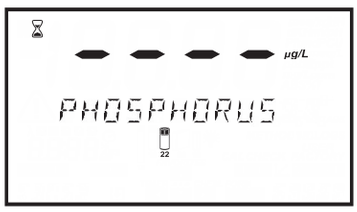
- Select the Phosphorus Marine ULR method using the procedure described in the Method Selection section (see page 6).

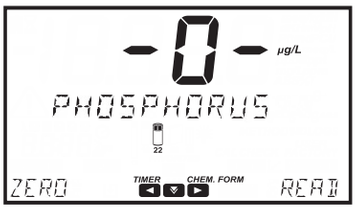

- Rinse, cap and shake the cuvette several times with unreacted sample.
- Fill the cuvette with 10 mL of sample (up to the mark) and replace the cap.
- Place the cuvette into the holder and close the lid.



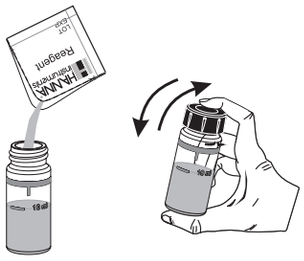
- Press the **ZERO** key. The display will show "-0-" when the meter is zeroed and ready for measurement.



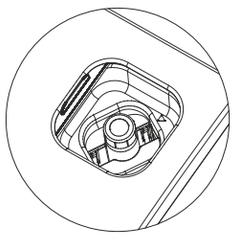



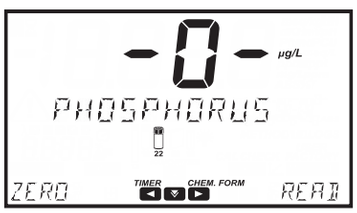

- Add one packet of HI736-25 Phosphorus Ultra Low Range Marine Reagent. Replace the cap and shake gently (for about 2 minutes) until the powder is completely dissolved.

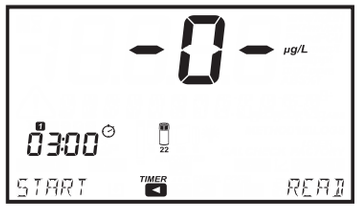


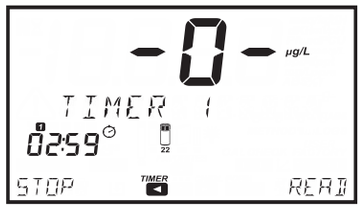

- Reinsert the cuvette into the instrument and close the lid.

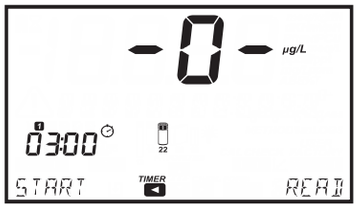


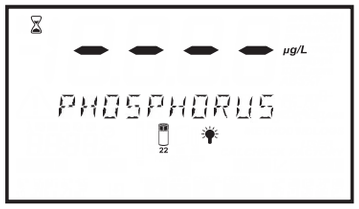
- Press the ◀ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 3 minutes.
- Press the **READ** key, the instrument displays the results in **µg/L of phosphorus (P)**.

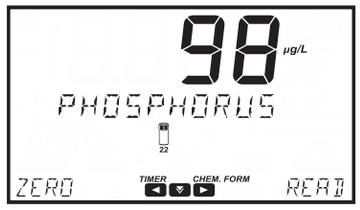


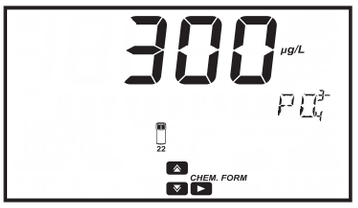




- Press the ▼▼ key to access the second level functions (wavelength, method ID, date and time).
- Press the ▶ key to view the chemical formula.
- Press the ▲▲ key in the chemical formula screen to convert the results to **µg/L of phosphate ($PO_4^{3-}$) or phosphorus pentoxide ($P_2O_5$)**.



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

## INTERFERENCES

Interference may be caused by:
Iron above 50 mg/L
Silica above 50 mg/L
Silicate above 10 mg/L
Copper above 10 mg/L
Hydrogen sulfide, arsenate, turbid sample and highly buffered samples also interfere.

## 9.70. 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

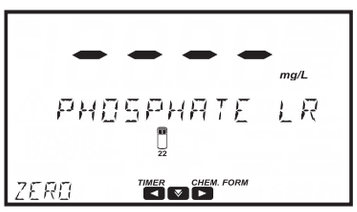
| | |
|---|---|
| HI93713-01 | Reagents for 100 tests |
| HI93713-03 | Reagents for 300 tests |

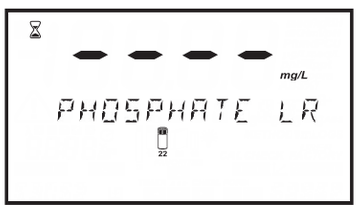
For other accessories see page 236.

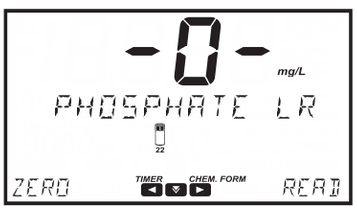
### MEASUREMENT PROCEDURE

- Select the Phosphate LR method using the procedure described in the Method Selection section (see page 6).
- Rinse, cap and shake the cuvette several times with unreacted sample.
- Fill the cuvette with 10 mL of sample (up to the mark) and replace the cap.
- Place the cuvette into the holder and close the lid.

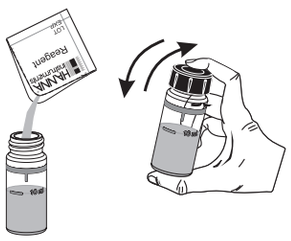

- Press the **ZERO** key. The display will show "-0-" when the meter is zeroed and ready for measurement.



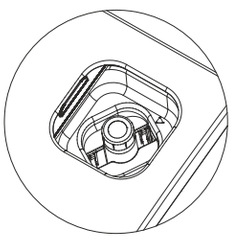



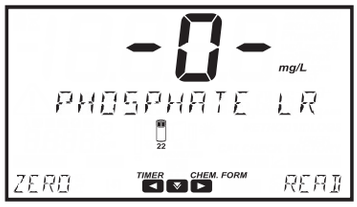

- Remove the cuvette and add the content of one packet of HI93713-0 Phosphate Low Range Reagent. Replace the cap and shake gently (for about 2 minutes) until the powder is completely dissolved.

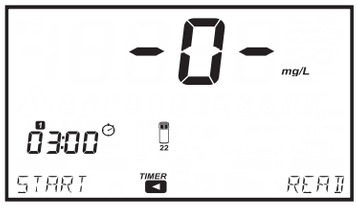


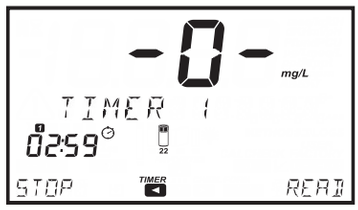
- Reinsert the cuvette into the instrument and close the lid.

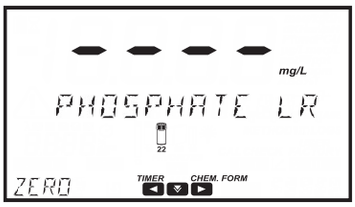


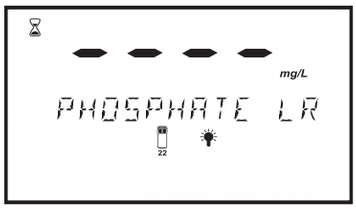
- Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 3 minutes.
- Press the **READ** key, the instrument displays the results in **mg/L of phosphate ($PO_4^{3-}$)**.

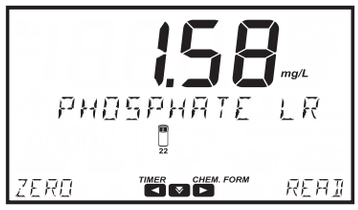


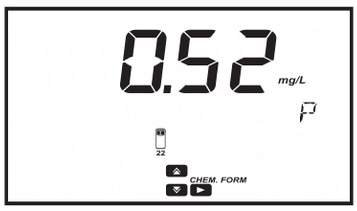




- Press the ▼▼ key to access the second level functions (wavelength, method ID, date and time).
- Press the ► key to view the chemical formula.
- Press the ▲▲ key in the chemical formula screen to convert the results to **mg/L of phosphorus (P) or phosphorus pentoxide ($P_2O_5$)**.



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

## INTERFERENCES

Interference may be caused by:
Iron above 50 mg/L
Silica above 50 mg/L
Silicate above 10 mg/L
Copper above 10 mg/L
Hydrogen sulfide, arsenate, turbid sample and highly buffered samples also interfere.

## 9.71. PHOSPHATE HIGH RANGE

### SPECIFICATIONS

| | |
|---|---|
| Range | 0.0 to 30.0 mg/L (as $PO_4^{3-}$) |
| Resolution | 0.1 mg/L |
| Accuracy | ±1 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

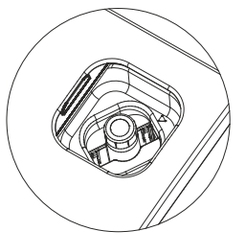
| | |
|---|---|
| HI93717-01 | Reagents for 100 tests |
| HI93717-03 | Reagents for 300 tests |

For other accessories see page 236.

### MEASUREMENT PROCEDURE

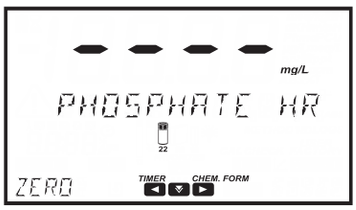
- Select the Phosphate HR method using the procedure described in the Method Selection section (see page 6).


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

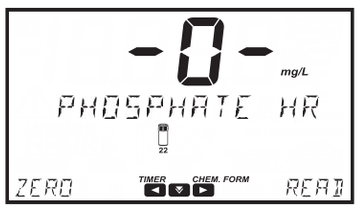


- Place the cuvette into the holder and close the lid.

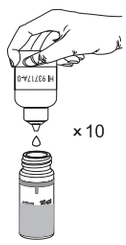
- Press the **ZERO** key. The display will show "-0-" when the meter is zeroed and ready for measurement.



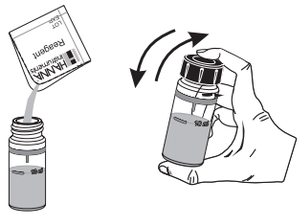




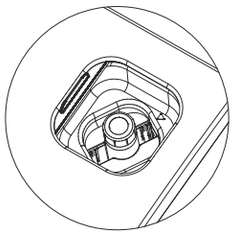

- Add 10 drops of HI93717A-0 Phosphate High Range Reagent A.



• Add one packet of HI93717B-0 Phosphate High Range Reagent B to the cuvette. Replace the cap and shake gently until completely dissolved.

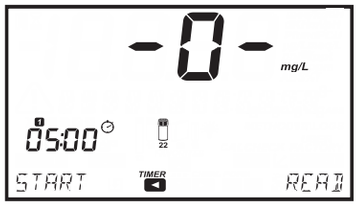


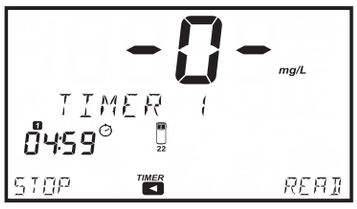
• Reinsert the cuvette into the instrument and close the lid.

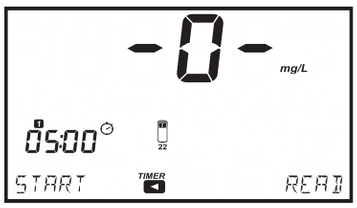


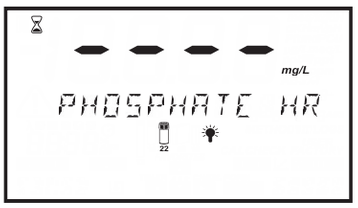
• Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 5 minutes.

• Press the **READ** key, the instrument displays the results in **mg/L of phosphate ($PO_4^{3-}$)**.

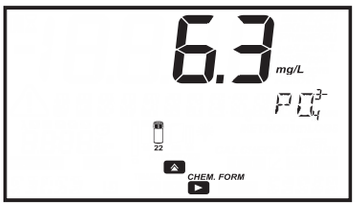



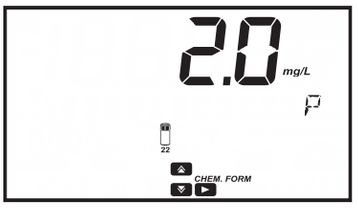


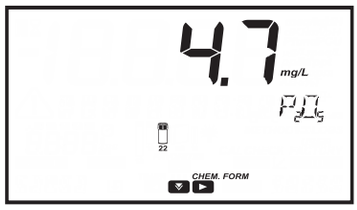
• Press the ▼ key to access the second level functions (wavelength, method ID, date and time).

• Press the ► key to view the chemical formula.

• Press the ▲ key in the chemical formula screen 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
Calcium above 10000 mg/L as $CaCO_3$
Magnesium above 40000 mg/L as $CaCO_3$
Ferrous iron above 100 mg/L

## 9.72. 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: P AH, white label*

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

### REAGENT SETS

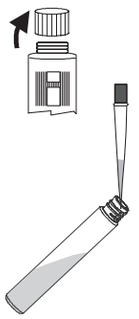
HI93758B-50 Reagents for 50 tests

For other accessories see page 236.

### 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.

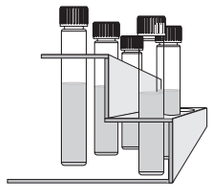
- Preheat the HANNA® Reactor HI839800 to 150 °C (302°F). The optional HI740217 safety shield is strongly recommended. **DO NOT USE AN OVEN OR MICROWAVE** samples may leak and generate a corrosive and possibly explosive atmosphere.
- Remove the cap from a HI93758V-0AH Phosphorus Reagent Vial.



- Add 5 mL of sample to the vial, while keeping the vial at a 45-degree angle.
- Replace the cap and invert to mix.

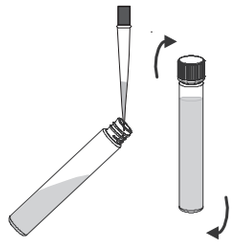
- Insert the vial into the reactor and heat it for 30 minutes at 150°C.

- At the end of the digestion place the vials carefully in the test tube rack and allow to cool to room temperature.



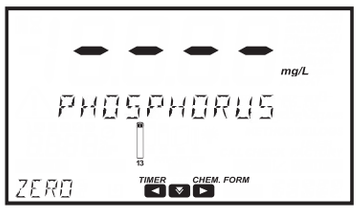
**WARNING:** The vials are still hot, use caution when handling.

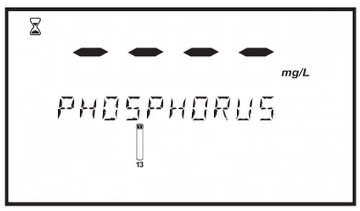
- Select the Phosphorous Acid Hydrolyzable (13 mm) method using the procedure described in the Method Selection section (see page 6).
- Insert the 13 mm vial adapter using the procedure described in the Cuvette Adapters section (see page 10).
- Remove the cap from the vial and add 2 mL of HI93758B-0 NaOH Solution 1.20 N while keeping the vial at a 45-degree angle.

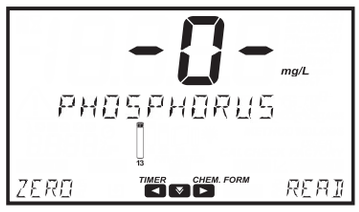


- Replace the cap and invert to mix.
- Place the vial into the holder.

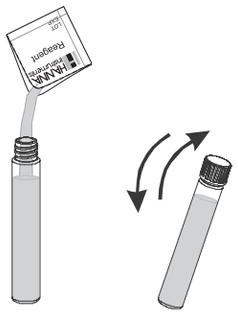
- Press the **ZERO** key. The display will show "-0-". Now the meter is zeroed and ready for measurement.



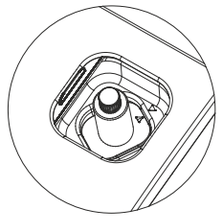



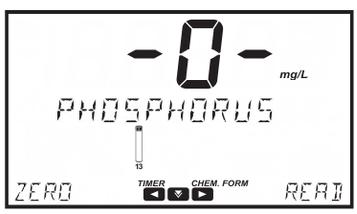

- Remove the vial.
- Remove the cap and add one packet of HI93758-0 Phosphorus Reagent.
- Replace the cap and shake gently for 2 minutes until most of the powder is dissolved.

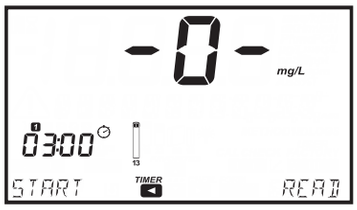


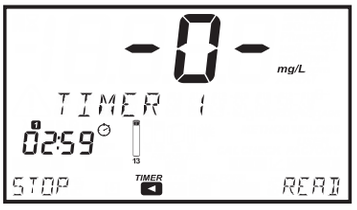
- Place the vial into the holder.

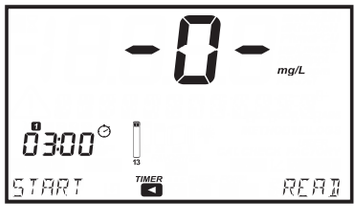


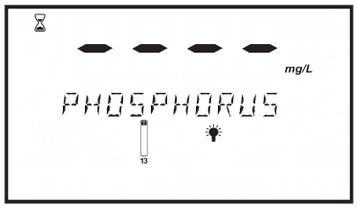
- Press the ◀ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 3 minutes.
- Press the **READ** key, the instrument displays the results in **mg/L of phosphorus (P).**

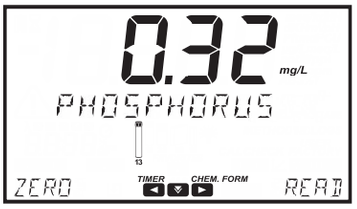


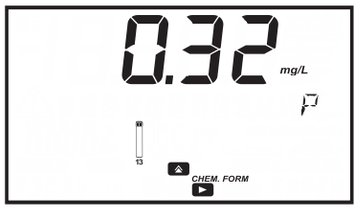



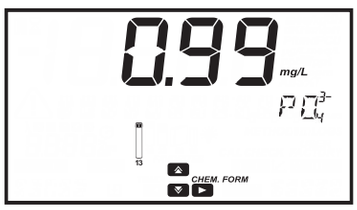



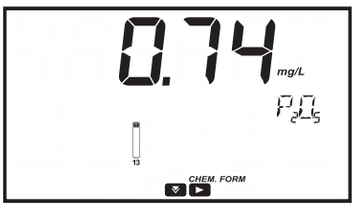




*Note: The method detects free (orthophosphate) and condensed inorganic forms (meta-, pyro- and other polyphosphates) of phosphates present in the sample.*

- Press the ▼ key to access the second level functions (wavelength, method ID, date and time).
- Press the ▶ key to view the chemical formula.
- Press the ▲ key in the chemical formula screen 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 at any level
Silica above 50 mg/L
Sulfide above 9 mg/L
To eliminate sulfide: add Bromine Water drop-wise until a pale yellow color develops; remove Bromine Water excess by adding Phenol solution drop-wise.
Turbidity and suspended matter in large amounts may cause interference because the strongly acidic reaction conditions may dissolve suspended matter or cause desorption of phosphates from particles. Before measurement, turbidity or suspended matter should be removed by treatment with active carbon and by prior filtration.

## 9.73. 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: P R, red label*

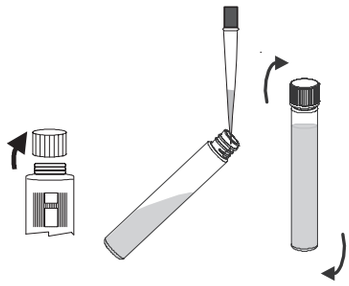
### REAGENT SETS

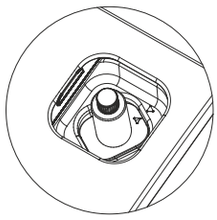
HI93758A-50 Reagents for 50 tests

For other accessories see page 236.

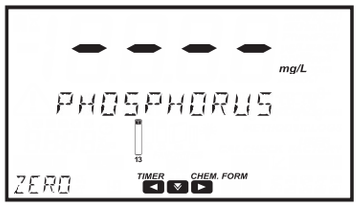
### MEASUREMENT PROCEDURE

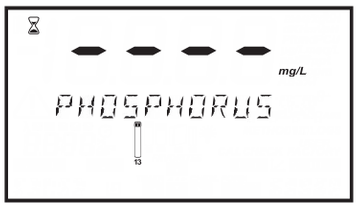
- Select the Phosphorus Reactive LR (13 mm) method using the procedure described in the Method Selection section (see page 6).
- Insert the 13 mm vial adapter using the procedure described in the Cuvette Adapters section (see page 10).
- Remove the cap from HI93758A-0 Phosphorus Reactive Reagent Vial.
- Add 5 mL of sample to the vial, while keeping the vial at a 45-degree angle.
- Replace the cap and invert several times to mix.
- Place the vial into the holder.

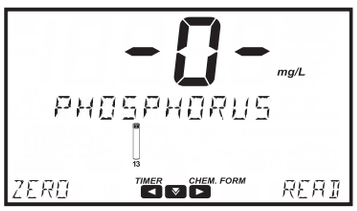




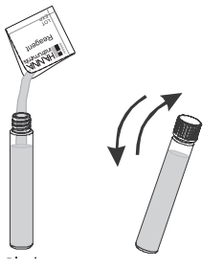
- Press the **ZERO** key. The display will show "-0-" when the meter is zeroed and ready for measurement.



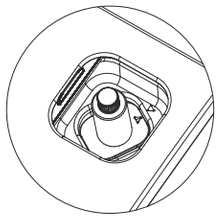




- Remove the vial.
- Remove the cap and add one packet of HI93758-0 Phosphorus Reagent.
- Replace the cap and shake gently for 2 minutes until most of the powder is dissolved.

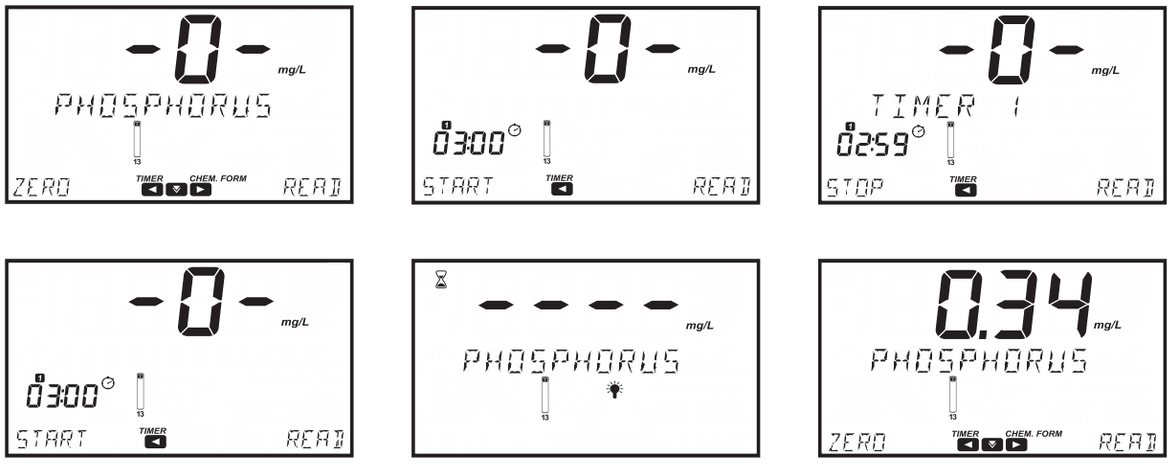


• Place the vial into the holder.



• Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 3 minutes.

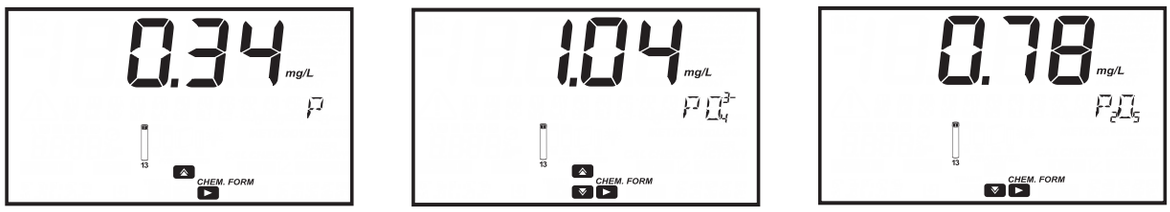
• Press the **READ** key, the instrument displays the results in **mg/L of phosphorus (P)**.




• Press the ▼ key to access the second level functions (wavelength, method ID, date and time).

• Press the ► key to view the chemical formula.

• Press the ▲ key in the chemical formula screen 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 at any level; Silica above 50 mg/L; Sulfide above 6 mg/L

To eliminate sulfide: add Bromine Water drop-wise until a pale yellow color develops; remove Bromine Water excess by adding Phenol solution drop-wise. Turbidity and suspended matter in large amounts may cause interference because the reaction conditions may dissolve suspended matter or cause desorption of phosphates from particles. Turbidity or suspended matter should be removed before measurement by treatment with active carbon and by prior filtration.

## 9.74. 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: P RHR, green label*

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

### REAGENT SETS

HI93763A-50 Reagents for up to 49 tests

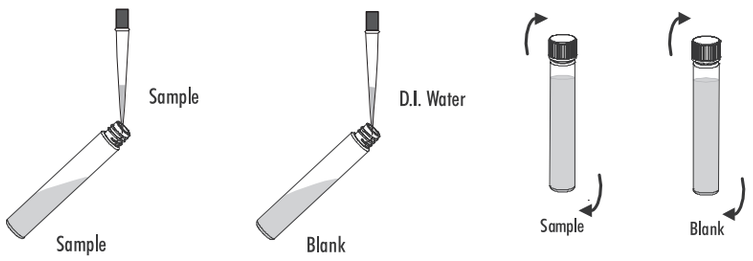
For other accessories see page 236.

### 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.

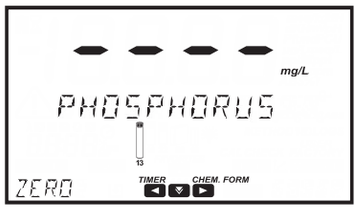
- Select the Phosphorus Reactive HR (13 mm) method using the procedure described in the Method Selection section (see page 6).
- Insert the 13 mm vial adapter using the procedure described in the Cuvette Adapters section (see page 10).
- Remove the cap from two HI93763A-0 Phosphorus Reactive High Range Reagent Vials.

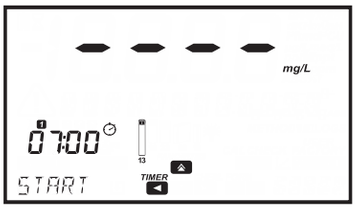
- Add 5 mL of deionized water to the first vial (#1) and 5 mL of sample to the second vial (#2), while keeping the vials at a 45-degree angle.
- Replace the cap and invert several times to mix.

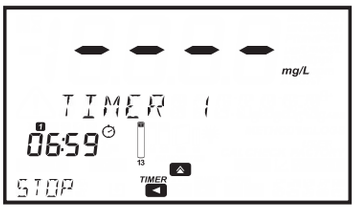


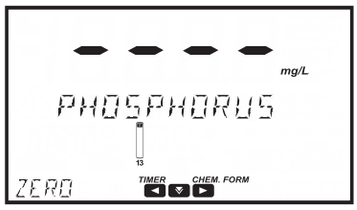

- Place the blank vial (#1) into the holder and push it completely down.

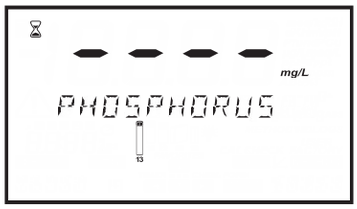
• Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 7 minutes. Press the **ZERO** key, the display will show "-0-" when the meter is zeroed and ready for measurement.

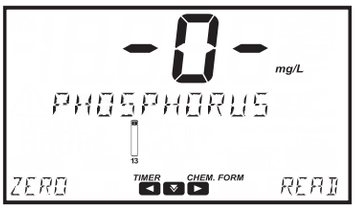


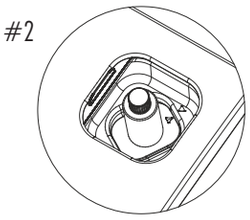



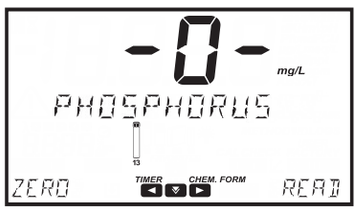



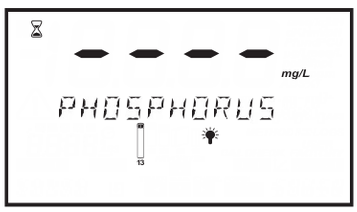

• Remove the blank vial.

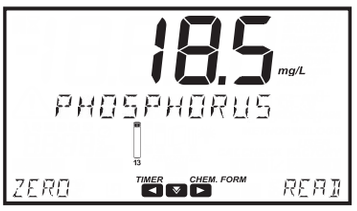
• Place the sample vial (#2) into the holder.




• Press the **READ** key to start the measurement. The instrument displays the results in **mg/L of phosphorus (P)**.



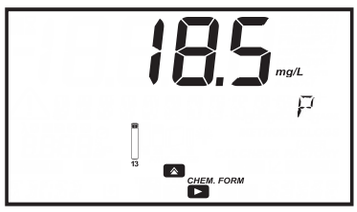



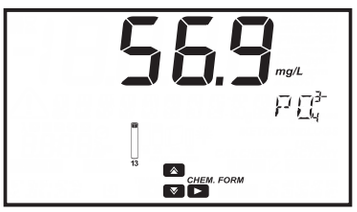



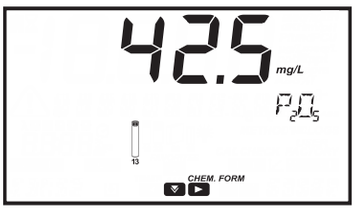

• Press the ▼ key to access the second level functions (wavelength, method ID, date and time).

• Press the ► key to view the chemical formula.

• Press the ▲ key in the chemical formula screen 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
pH: the sample should have a neutral pH
Sulfide: to eliminate sulfide add Bromine Water drop-wise until a pale yellow color develops; remove Bromine Water excess by adding Phenol solution drop-wise.
Temperature: the method is temperature sensitive.
It is recommended to run measurements at T = 20 to 25 °C:
T < 20 °C causes a negative error
T > 25 °C causes a positive error
Turbidity and suspended matter in large amounts may cause interference because the strongly acidic reaction conditions may dissolve suspended matter or cause desorption of phosphates from particles. Before measurement, turbidity or suspended matter should be removed by treatment with active carbon and by prior filtration.

## 9.75. 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: P TLR, red label*

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

### REAGENT SETS

HI93758C-50 Reagents for 50 tests

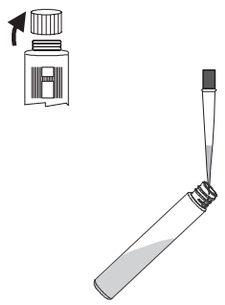
For other accessories see page 236.

### 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.

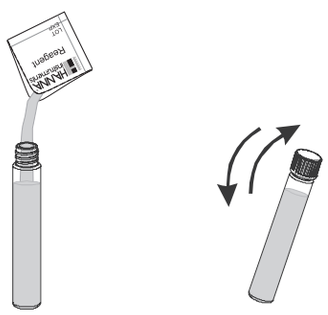
- Preheat the HANNA® Reactor HI839800 to 150 °C (302°F). The optional HI740217 safety shield is strongly recommended. **DO NOT USE AN OVEN OR MICROWAVE** samples may leak and generate a corrosive and possibly explosive atmosphere.

- Remove the cap from a HI93758V-0 Reagent Vial.



- Add 5 mL of sample to the vial, while keeping the vial at a 45-degree angle.

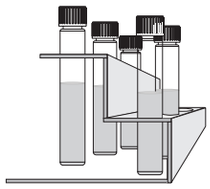
- Add one packet of PERSULFATE/P. Replace the cap and shake gently the vial until all the powder is completely dissolved.



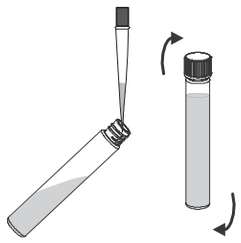
- Insert the vial into the reactor and heat it for 30 minutes at 150°C.
- At the end of the digestion place the vials carefully in the test tube rack and allow to cool to room temperature.

**WARNING**: the vials are still hot, use caution when handling.

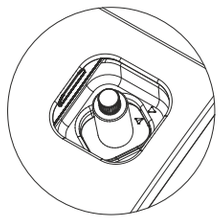
- Select the Phosphorus Total LR (13 mm) method using the procedure described in the Method Selection section (see page 6).



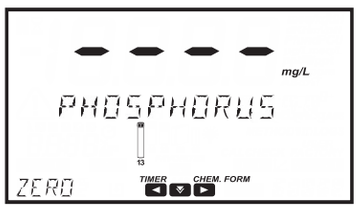
- Insert the 13 mm vial adapter using the procedure described in the Cuvette Adapters section (see page 10).
- Remove the cap from the vial and add exactly 2 mL of HI93758C-0 NaOH Solution 1.54 N, while keeping the vial at a 45-degree angle.
- Replace the cap and invert the vial several times to mix.

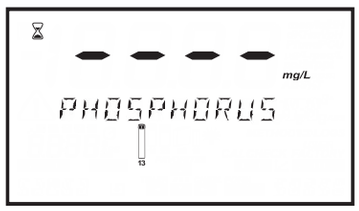


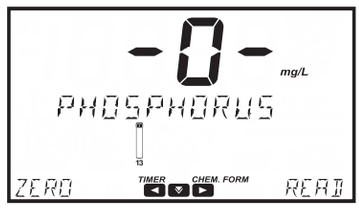
- Place the vial into the holder.



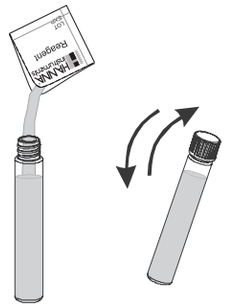
- Press the **ZERO** key. The display will show"-0-" when the meter is zeroed and ready for measurement.



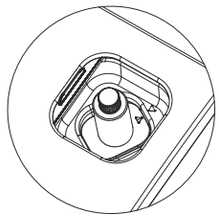




- Remove the vial.
- Remove the cap and add one packet of HI93758-0 Phosphorus Reagent.
- Replace the cap and shake for 2 minutes until the powder is completely dissolved.

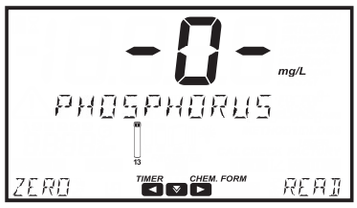


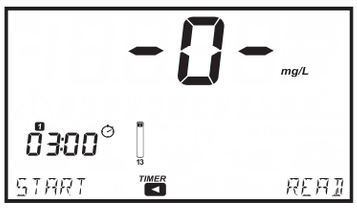
- Place the vial into the holder.

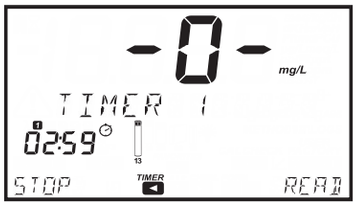


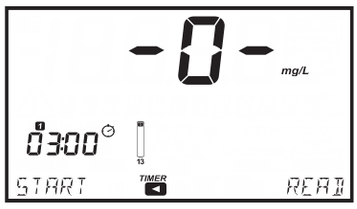
• Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 3 minutes.

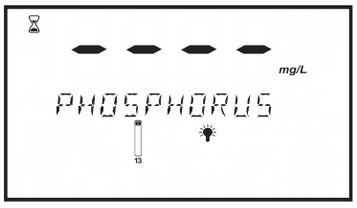
• Press the **READ** key, the instrument displays the results in **mg/L of phosphorus (P)**.

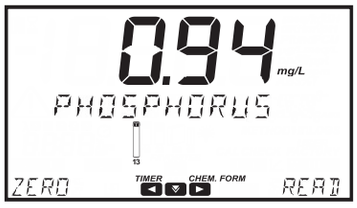


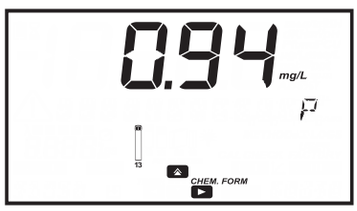



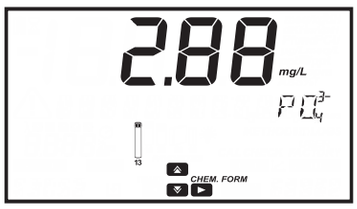

*Note: The method detects free (orthophosphate) and condensed inorganic forms (meta-, pyro- and other polyphosphates) of phosphates present in the sample.*

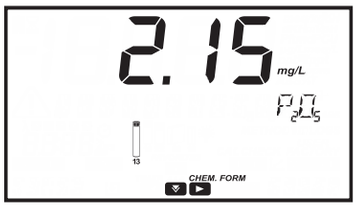
• Press the ▼▼ key to access the second level functions (wavelength, method ID, date and time).

• Press the ► key to view the chemical formula.

• Press the ▲▲ key in the chemical formula screen 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 at any level
Silica above 50 mg/L
Sulfide above 90 mg/L.
Turbidity and suspended matter in large amounts may cause interference because the strongly acidic reaction conditions may dissolve suspended matter or cause desorption of phosphates from particles. Before measurement, turbidity or suspended matter should be removed by treatment with active carbon and by prior filtration.

## 9.76. 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: P THR, green label*

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

### REAGENT SETS

HI93763B-50 Reagents for up to 49 tests

For other accessories see page 236.

### 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.

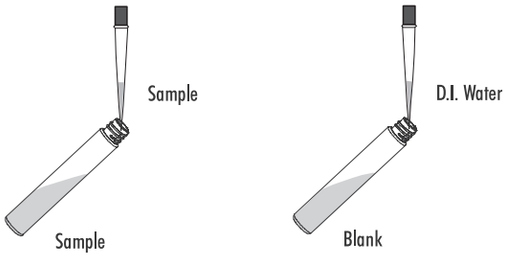
Reagent Blank Correction: This method requires a reagent blank correction. A single blank vial may be used more than once. The blank vial is stable for one day at room temperature.

- Preheat the HANNA® Reactor HI839800 to 150 °C (302°F). The optional HI740217 safety shield is strongly recommended.

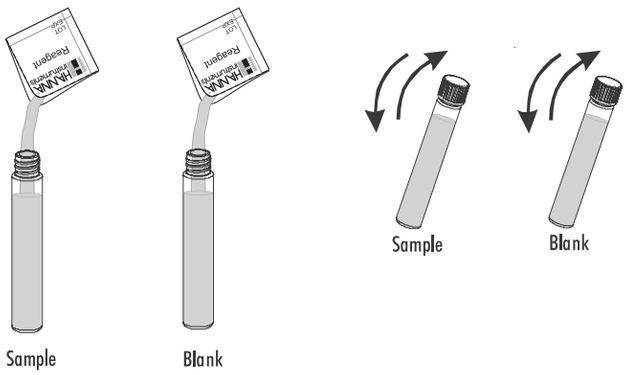
**DO NOT USE AN OVEN OR MICROWAVE** samples may leak and generate a corrosive and possibly explosive atmosphere.

- Remove the cap from two 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.



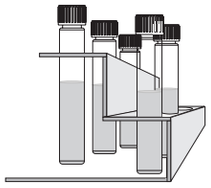
• Add one packet of PERFSULFATE/P to each vial. Replace the cap and shake gently until all the powder is completely dissolved.




• 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.

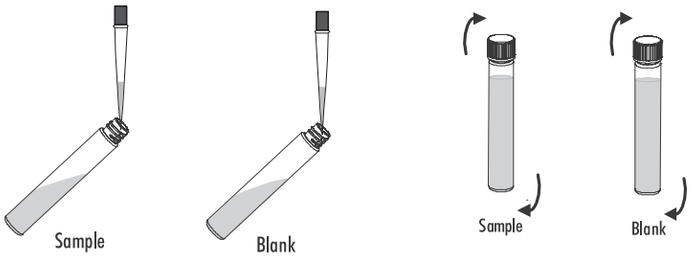
**WARNING:** The vials are still hot, use caution when handling.



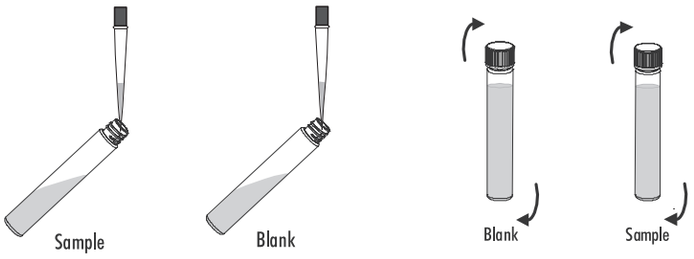
• Select the Phosphorus Total HR (13 mm) method using the procedure described in the Method Selection section (see page 6).

• Insert the 13 mm vial adapter using the procedure described in the Cuvette Adapters section (see page 10).

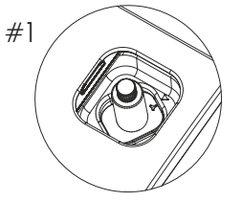
• Remove the cap from the vials and add 2 mL of HI93758C-0 NaOH Solution 1.54N to each vial, while keeping the vials at a 45-degree angle. Replace the cap tightly and invert the vials several times to mix.



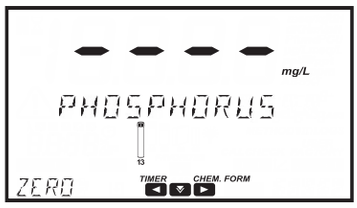

• Remove the cap from the vials and add 0.5 mL of HI93763B-0 Total Phosphorus High Range Reagent B to each vial, while keeping the vial at a 45-degree angle. Replace the cap and invert several times to mix.

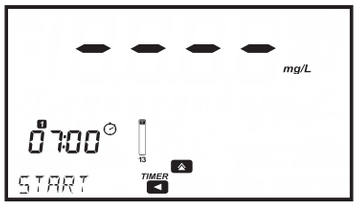


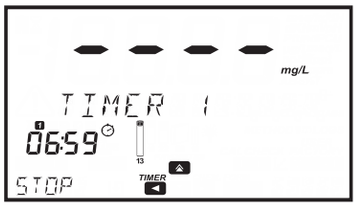

• Place the blank vial (#1) into the holder.

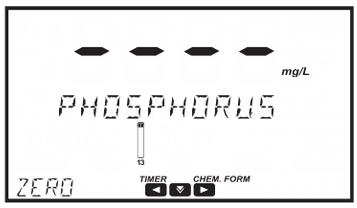


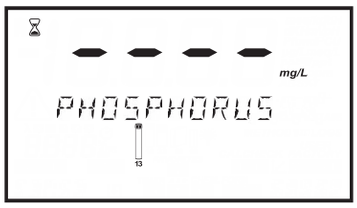
• Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 7 minutes. Press the **ZERO** key, the display will show "-0-" when the meter is zeroed and ready for measurement.

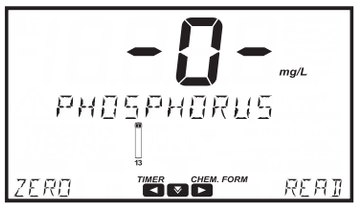


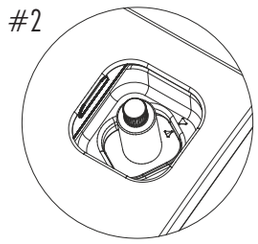



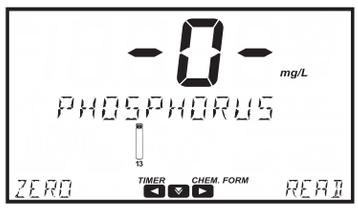



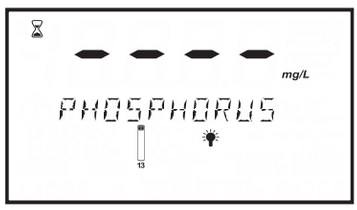

• Remove the blank vial.

• Place the sample vial (#2) into the holder.




• Press the **READ** key. The instrument displays the results in **mg/L phosphorus (P)**.



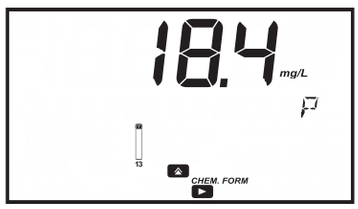


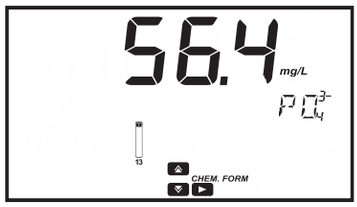
*Note: The method detects free (orthophosphate), condensed inorganic forms (meta-, pyro- and other polyphosphates) and organic forms of phosphates present in the sample.*

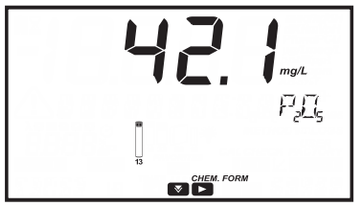
• Press the ▼▼ key to access the second level functions (wavelength, method ID, date and time).

• Press the ► key to view the chemical formula.

• Press the ▲▲ key in the chemical formula screen 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;
pH: the sample should have a neutral pH.
Temperature: the method is temperature sensitive.
It is recommended to add the Molybdovanadate Reagent and to run measurements at T = 20 to 25 °C:
T < 20 °C causes a negative error
T > 25 °C causes a positive error
Turbidity and suspended matter in large amounts may cause interference because the strongly acidic reaction conditions may dissolve suspended matter or cause desorption of phosphates from particles. Before measurement, turbidity or suspended matter should be removed by treatment with active carbon and by prior filtration.

## 9.77. 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 |

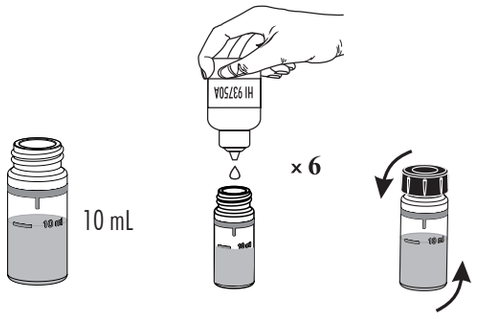
For other accessories see page 236.

### MEASUREMENT PROCEDURE

• Select the Potassium LR method using the procedure described in the Method Selection section (see page 6).

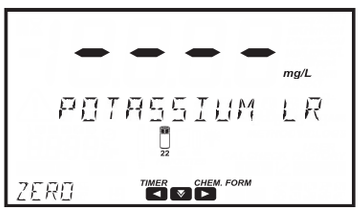
• Fill the cuvette with 10 mL of sample (up to the mark).

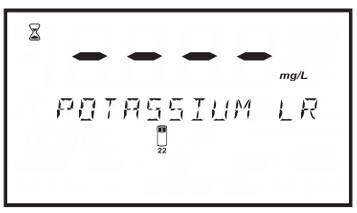
• Add 6 drops of HI93750A-0 Potassium Reagent A.
Replace the cap and invert 5 times to mix the solution.

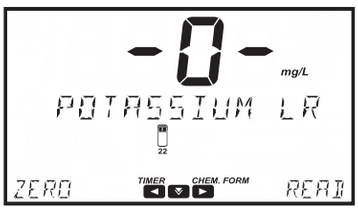



• Place the cuvette into the holder and close the lid.

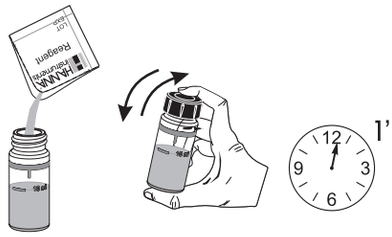
• Press the **ZERO** key. The display will show "-0-" when the meter is zeroed and ready for measurement.



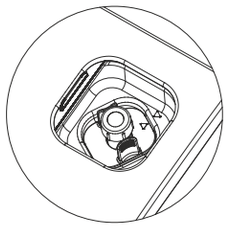



• Add one packet of HI93750B-0 Potassium Reagent B. Replace the cap and shake gently for 1 minute.

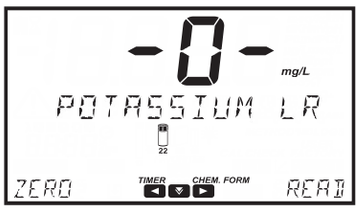


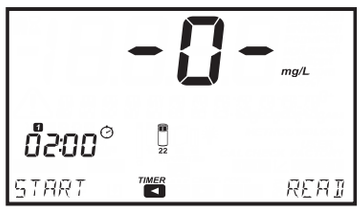

• Reinsert the cuvette into the instrument and close the lid.

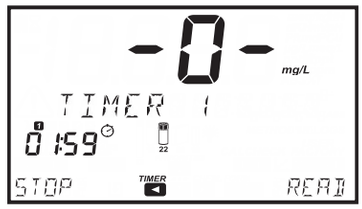


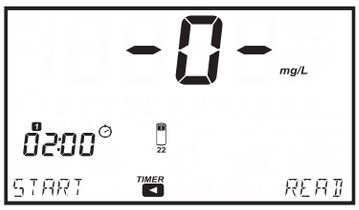
• Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 2 minutes.

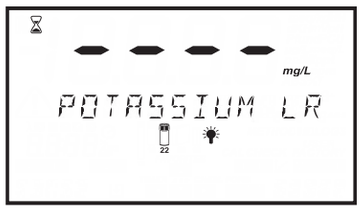
• Press the **READ** key, the instrument displays the results in **mg/L of potassium (K)**.



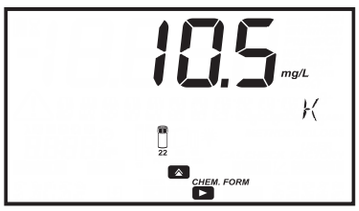





• Press the ▼ key to access the second level functions (wavelength, method ID, date and time).

• Press the ► key to view the chemical formula.

• Press the ▲ key in the chemical formula screen to convert the results to **mg/L of potassium oxide ($K_2O$)**.





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

## INTERFERENCES

Interferences may be caused by:
Ammonium above 10 ppm
Calcium above 10000 ppm as $CaCO_3$
Chloride above 12000 ppm
Magnesium above 8000 ppm as $CaCO_3$
Sodium above 8000 ppm

## 9.78. 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 |

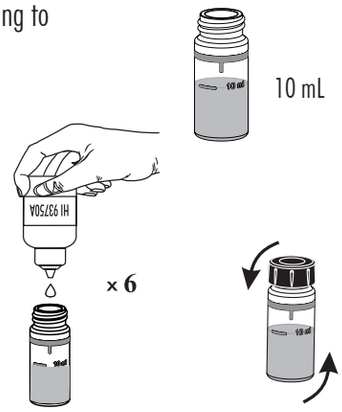
### REAGENT SETS

| | |
|---|---|
| HI93750-01 | Reagents for 100 tests |
| HI93750-03 | Reagents for 300 tests |

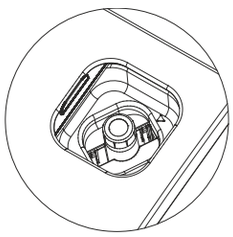
For other accessories see page 236.

### MEASUREMENT PROCEDURE

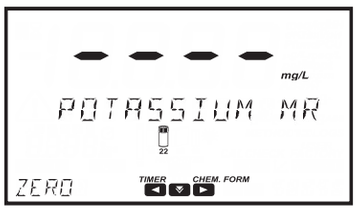
- Select the Potassium MR method using the procedure described in the Method Selection section (see page 6).
- Sample Dilution: In a 100 mL volumetric flask accurately add 20 mL of sample and bring to volume with deionized water. This is the sample.
- Fill the cuvette with 10 mL of sample (up to the mark).
- Add 6 drops of HI93750A-0 Potassium Reagent A. Replace the cap and invert 5 times to mix the solution.

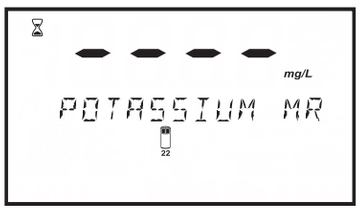


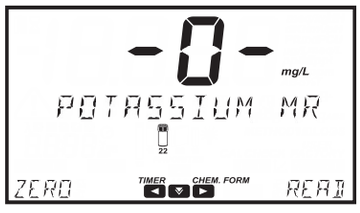

- Place the cuvette into the holder and close the lid.



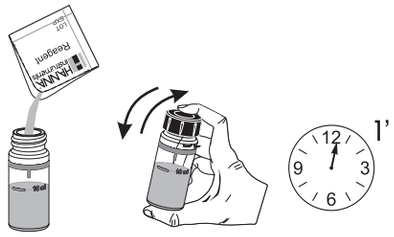
- Press the **ZERO** key. The display will show "-0-" when the meter is zeroed and ready for measurement.



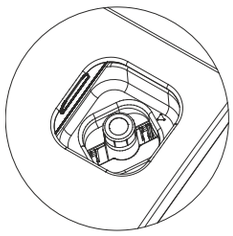



• Add one packet of HI93750B-0 Potassium Reagent B Replace the cap and shake gently for 1 minute.

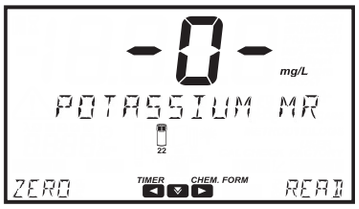


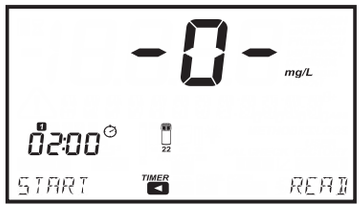

• Reinsert the cuvette into the instrument and close the lid.

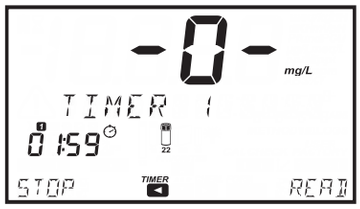


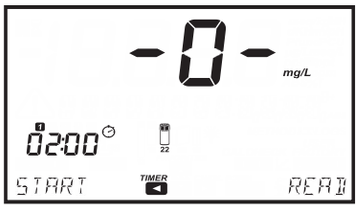
• Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively wait for 2 minutes.

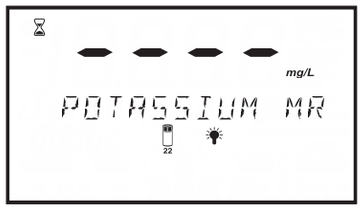
• Press the **READ** key, the instrument displays the results in **mg/L of potassium (K)**.

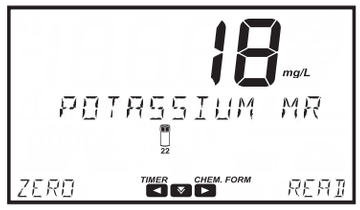


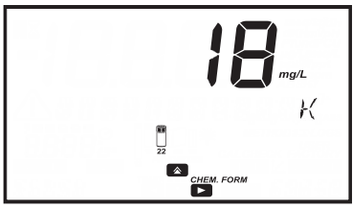



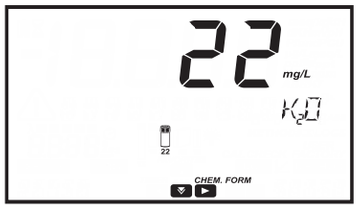




• Press the ▼ key to access the second level functions (wavelength, method ID, date and time).

• Press the ► key to view the chemical formula.

• Press the ▲ key in the chemical formula screen to convert the results to **mg/L of potassium oxide ($K_2O$)**.




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

## INTERFERENCES

Interferences may be caused by:
Ammonium above 10 ppm
Calcium above 10000 ppm as $CaCO_3$
Chloride above 12000 ppm
Magnesium above 8000 ppm as $CaCO_3$
Sodium above 8000 ppm

## 9.79. 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 |

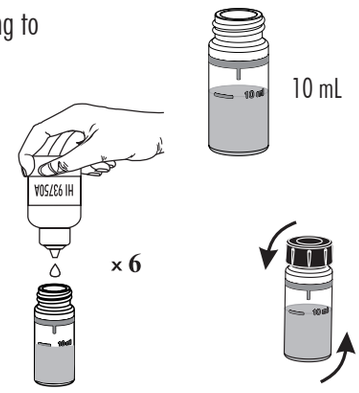
### REAGENT SETS

| | |
|---|---|
| HI93750-01 | Reagents for 100 tests |
| HI93750-03 | Reagents for 300 tests |

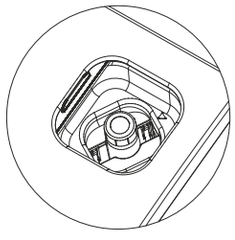
For other accessories see page 236.

### MEASUREMENT PROCEDURE

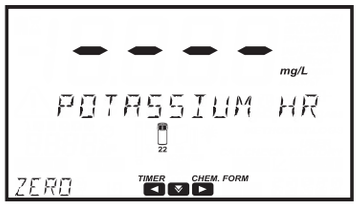
- Select the Potassium HR method using the procedure described in the Method Selection section (see page 6).
- Sample Dilution: In a 100 mL volumetric flask accurately add 10 mL of sample and bring to volume with deionized water. This is the sample
- Fill the cuvette with 10 mL of sample (up to the mark).
- Add 6 drops of HI93750A-0 Potassium Reagent A. Replace the cap and invert 5 times to mix the solution.

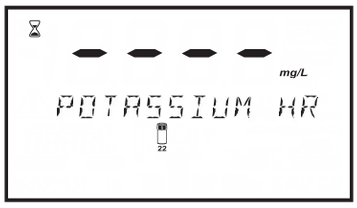


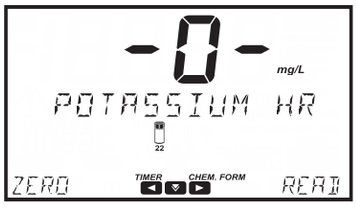

- Place the cuvette into the holder and close the lid.



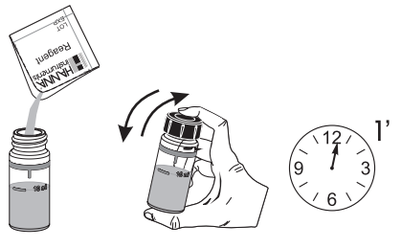
- Press the **ZERO** key. The display will show "-0-" when the meter is zeroed and ready for measurement.



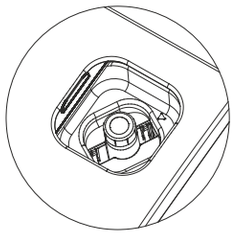



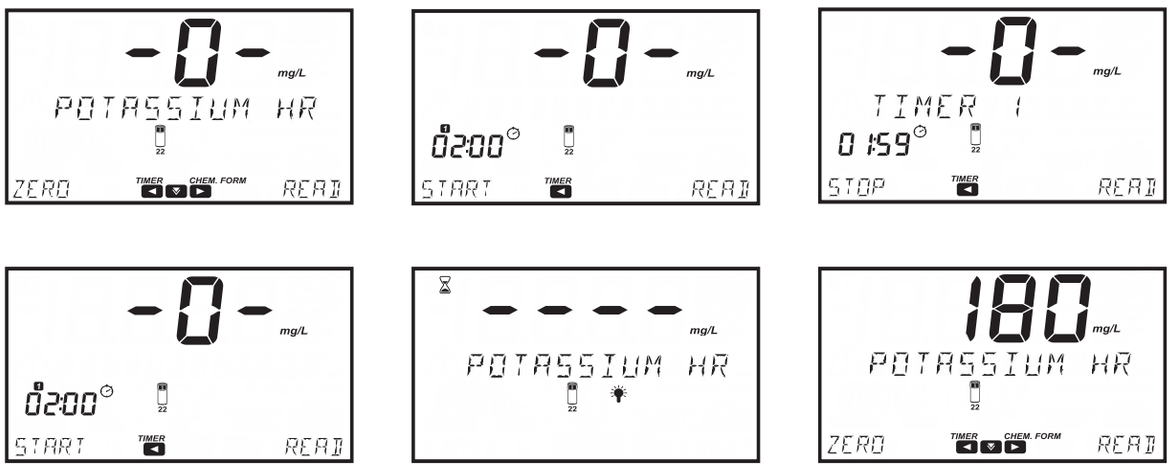
- Add one packet of HI93750B-0 Potassium Reagent B. Replace the cap and shake gently for 1 minute.



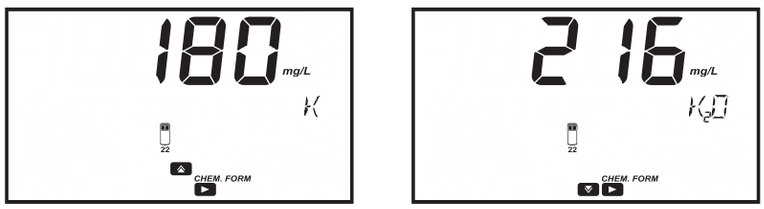

- Reinsert the cuvette into the instrument and close the lid.



- Press the ◄ key to access the timer menu. Press the start key to start Timer 1, the display will show the countdown or, alternatively, wait for 2 minutes.
- Press the **READ** key, the instrument displays the results in **mg/L of potassium (K)**.




- Press the ▼ key to access the second level functions(wavelength, method ID, date and time).
- Press the ► key to view the chemical formula.
- Press the ▲ key in the chemical formula screen to convert the results to **mg/L of potassium oxide ($K_2O$)**.




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

## INTERFERENCES

Interferences may be caused by:
Ammonium above 10 ppm
Calcium above 10000 ppm as $CaCO_3$
Chloride above 12000 ppm
Magnesium above 8000 ppm as $CaCO_3$
Sodium above 8000 ppm

## 9.80. 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

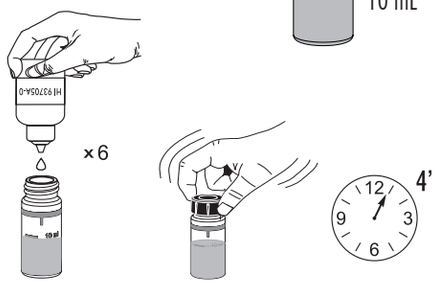
| | |
|---|---|
| HI93705-01 | Reagents for 100 tests |
| HI93705-03 | Reagents for 300 tests |

For other accessories see page 236.

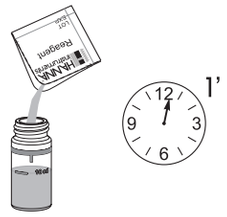
### MEASUREMENT PROCEDURE

- Select the Silica LR method using the procedure described in the Method Selection section (see page 6).
- Fill the cuvette with 10 mL of unreacted sample (up to the mark).

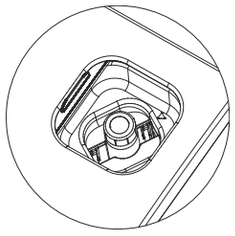

- Add 6 drops of HI93705A-0 Silica Low Range Reagent A. Replace the cap and swirl the solution.
- Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively, wait for 4 minutes.



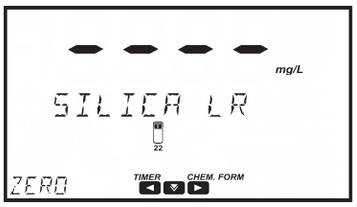

- Add one packet of HI93705B-0 Silica Low Range Reagent B and shake until it is completely dissolved.
- Press the ◄ key to access the timer menu, press the ⌃ key to select Timer 2. Press the **START** key to start Timer 2, the display will show the countdown or, alternatively, wait for 1 minute.

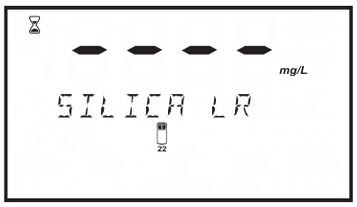


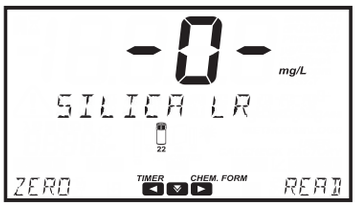

- Place the cuvette into the holder and close the lid.



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

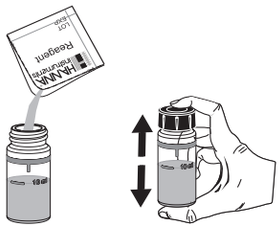


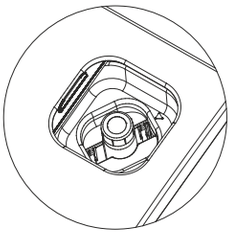




• Remove the cuvette.

• Add one packet of HI93705C-0 Silica Low Range Reagent C and shake until it is completely dissolved.

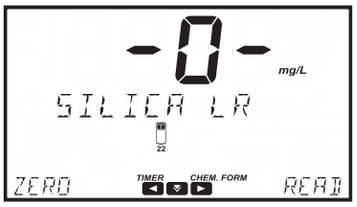


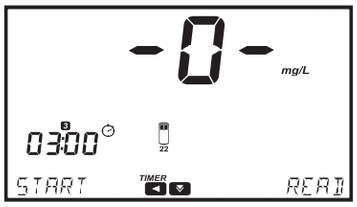



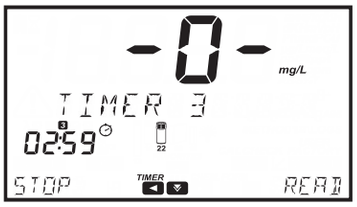
• Reinsert the cuvette into the instrument and close the lid.

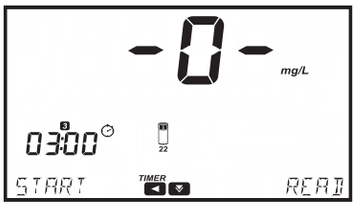
• Press the ◀ key to access the timer menu, press the ⏶ key to select Timer 3. Press the **START** key to start Timer 3, the display will show the countdown or, alternatively, wait for 3 minutes.

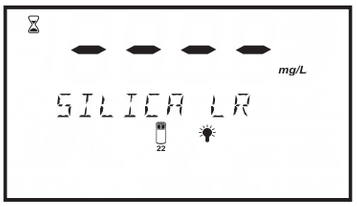
• Press the **READ** key, the instrument displays the results in **mg/L of silica ($SiO_2$)**.

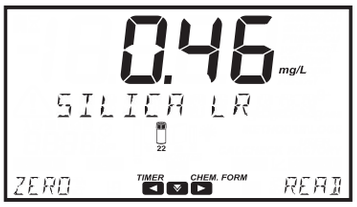


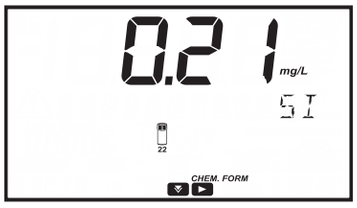




• Press the ⏷ key to access the second level functions (wavelength, method ID, date and time).

• Press the ▶ key to view the chemical formula.

• Press the ⏶ key in the chemical formula screen 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 60 mg/L (causes a 2% reduction in reading)
Phosphate above 75 mg/L (causes an 11% reduction in reading)
Sulfide and high concentration of iron
Eliminate color and turbidity interferences by zeroing the meter with the original water sample.

## 9.81. 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 USEPA 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 |

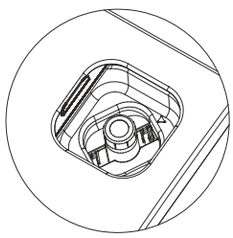
For other accessories see page 236.

### MEASUREMENT PROCEDURE

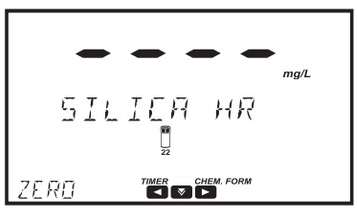
• Select the Silica HR method using the procedure described in the Method Selection section (see page 6).

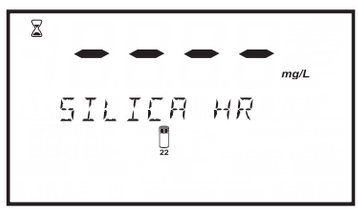
• Fill the cuvette with 10 mL of unreacted sample (up to the mark) and replace the cap.

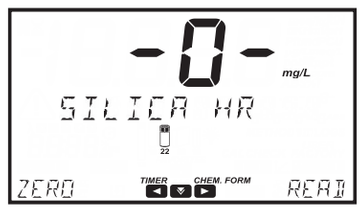

• Place the cuvette into the holder and close the lid.



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

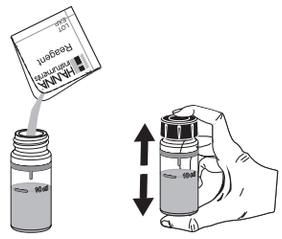


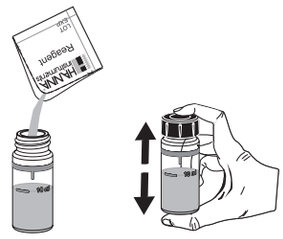




• Remove the cuvette.

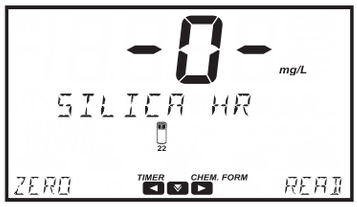
• Add one packet of HI96770A-0 Silica High Range Reagent A and shake until completely dissolved.

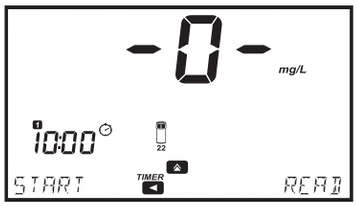


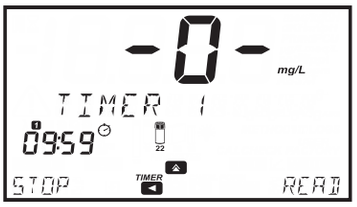
• Add one packet of HI96770B-0 Silica High Range Reagent B. Replace the cap and shake vigorously until completely dissolved.



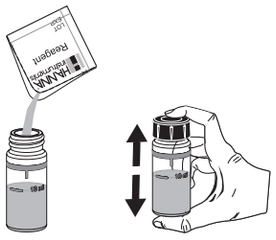
• Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively, wait for 10 minutes.



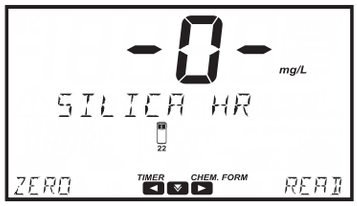

• Add one packet of HI96770C-0 Silica High Range Reagent C and shake vigorously until completely dissolved.

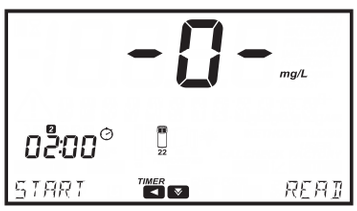


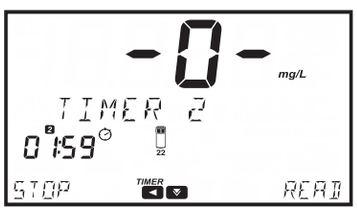
• Reinsert the cuvette into the instrument and close the lid.

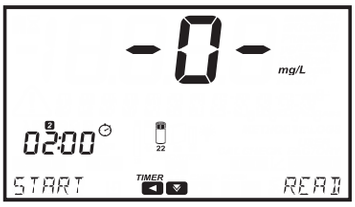
• Press the ◄ key to access the timer menu, press the ▲▲ key to select Timer 2. Press the **START** key to start Timer 2, the display will show the countdown or, alternatively, wait for 2 minutes.

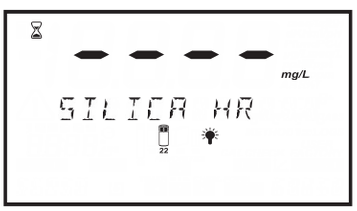
• Press the **READ** key, the instrument displays the results in **mg/L silica ($SiO_2$)**.

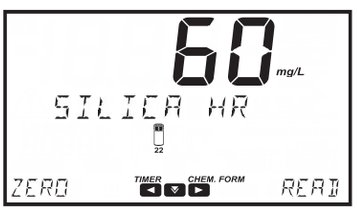


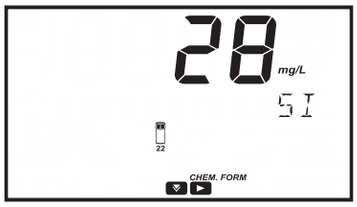




• Press the ▼▼ key to access the second level functions (wavelength, method ID, date and time).

• Press the ▶ key to view the chemical formula.

• Press the ⌃ key in the chemical formula screen 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 60 mg/L (causes a 2% reduction in reading)
Phosphate above 75 mg/L (causes an 11% reduction in reading)
Sulfide and high concentration of iron
Eliminate color and turbidity interferences by zeroing the meter with the original water sample.

## 9.82. 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 |

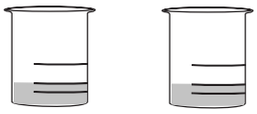
For other accessories see page 236.

### MEASUREMENT PROCEDURE

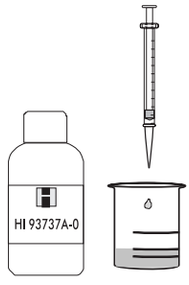
• Select the Silver method using the procedure described in the Method Selection section (see page 6).

*Note:* For best results perform your tests between 20-24 °C.

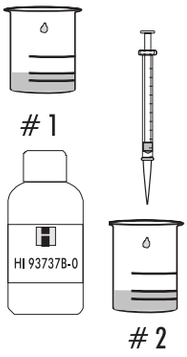
• Fill two graduated beakers with 25 mL of sample.



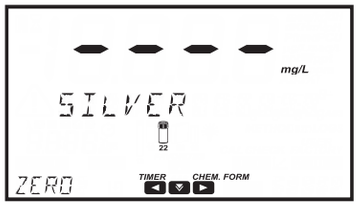

• Add 1 mL of HI93737A-0 Silver Reagent A to beaker #1 (the blank) and swirl gently to mix.

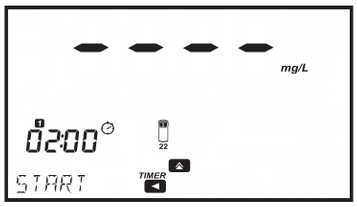


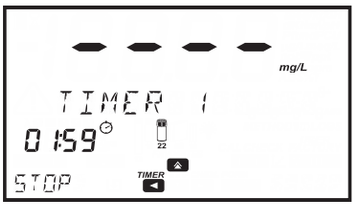

• Add 1mL of HI93737B-0 Silver Reagent B to beaker #2 (the sample) and swirl gently to mix.



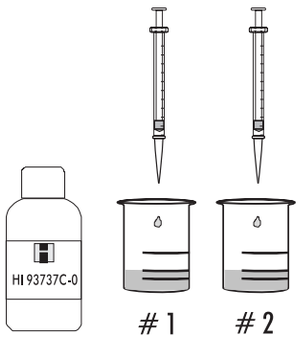

• Press the ◄ key to access the timer menu. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively, wait for 2 minutes



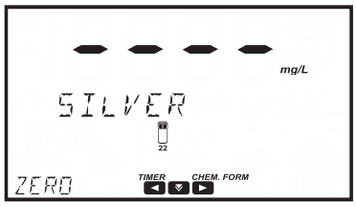



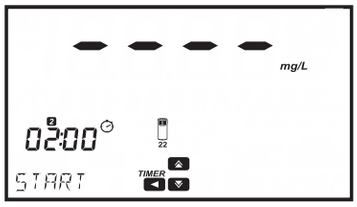



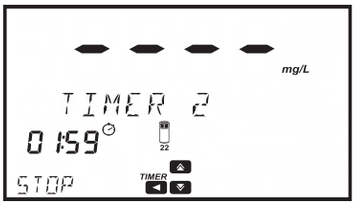
• Add 1 mL of HI93737C-0 Silver Reagent C to each beaker and swirl.



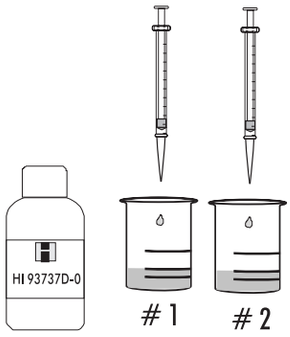

• Press the ◀ key to access the timer menu, press the ▲ key to select Timer 2. Press the **START** key to start Timer 2, the display will show the countdown or, alternatively, wait for 2 minutes.



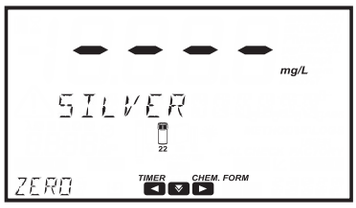



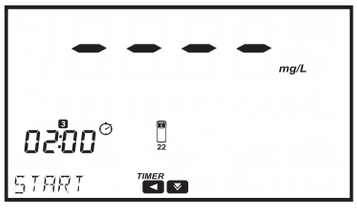



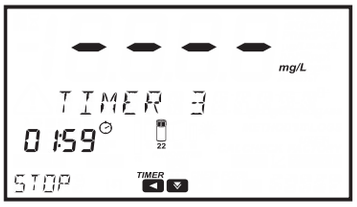

• Add 1 mL of HI93737D-0 Silver Reagent D to each beaker and swirl.




• Press the ◀ key to access the timer menu, press the ▲ key to select Timer 3. Press the **START** key to start Timer 3, the display will show the countdown or, alternatively, wait for 2 minutes

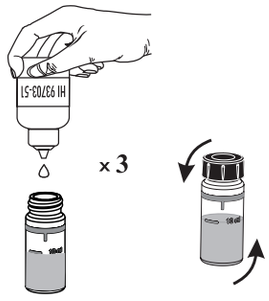


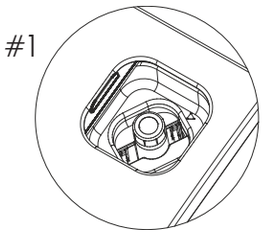




• Fill the first cuvette (#1) with 10 mL of the blank (up to the mark).

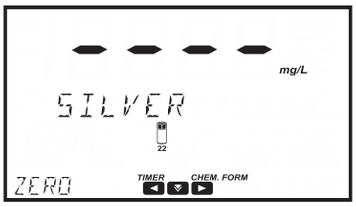

• Add 3 drops of HI93703-51 Dispersing Agent, replace the cap and invert gently for 10 seconds.

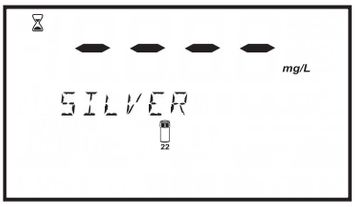


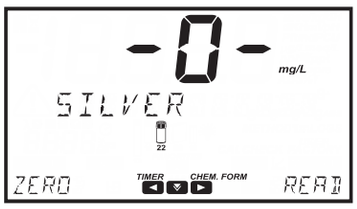
• Place the cuvette into the holder and close the lid.




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

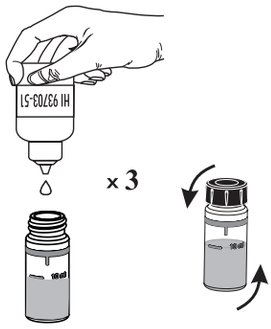


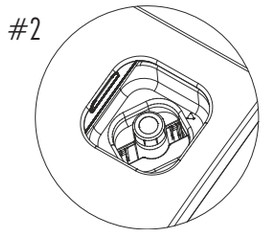




• Fill a second cuvette (#2) with 10 mL of the reacted sample (up to the mark).

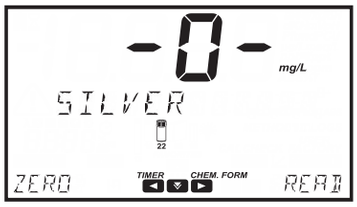

• Add 3 drops of HI93703-51 Dispersing Agent, replace the cap and invert gently for 10 seconds.

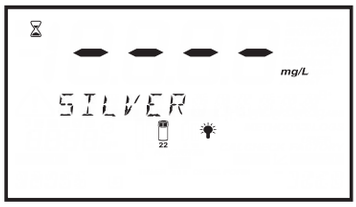


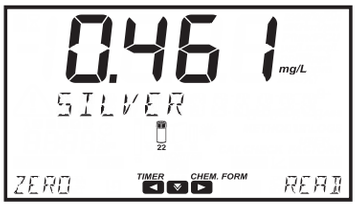

• Insert the second cuvette (#2) into the instrument.




• Press the **READ** key to start the reading. The instrument displays the results in **mg/L of silver (Ag)**.

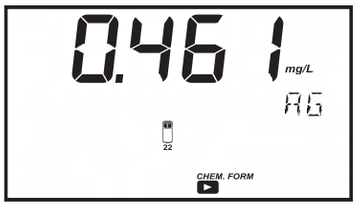



• Press the ▼▼ key to access the second level functions (wavelength, method ID, date and time).

• Press the ▶ key to view the chemical formula.




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

## INTERFERENCES

Interference may be caused by:

$Al^{3+}$ above 30 mg/L
$Ca^{2+}$ above 1000 mg/L (as $CaCO_3$)
$Cd^{2+}$ above 20 mg/L
$Cl^-$ above 8000 mg/L
$Co^{2+}$ above 1.5 mg/L
$Cr^{3+}$ above 20 mg/L
$Cr^{6+}$ above 40 mg/L
$Cu^{2+}$ above 15 mg/L
$F^-$ above 20 mg/L
$Fe^{2+}$ above 1.5 mg/L
$Fe_3^+$ above 10 mg/L
$K^+$ above 500 mg/L
$Mn^{2+}$ above 25 mg/L
$Mg^{2+}$ above 1000 mg/L (as $CaCO_3$)
$Na^+$ above 5000 mg/L
$Ni^{2+}$ above 1.5 mg/L
$Pb^{2+}$ above 20 mg/L
$Zn^{2+}$ above 30 mg/L

## 9.83. 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 |

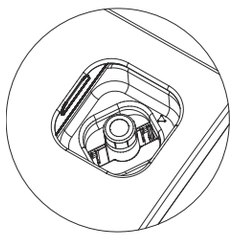
For other accessories see page 236.

### MEASUREMENT PROCEDURE

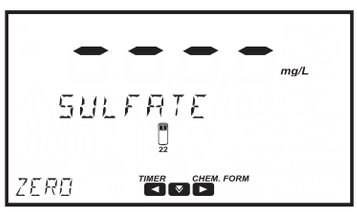
• Select the Sulfate method using the procedure described in the Method Selection section (see page 6).

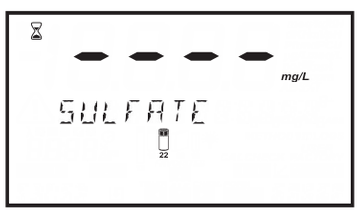
• Fill a cuvette with 10 mL of unreacted sample (up to the mark) and replace the cap.

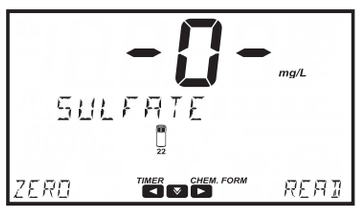

• Place the cuvette into the holder and close the lid.



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

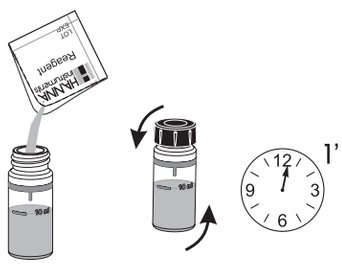


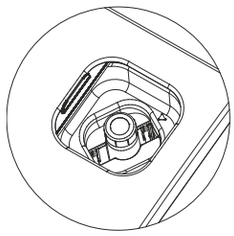




• Add one packet of HI93751-0 Sulfate Reagent.

• Replace the cap and invert gently for 1 minute (about 30 inversions).

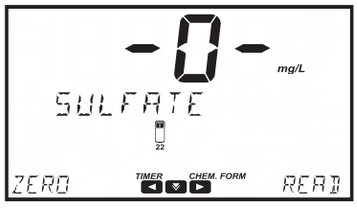


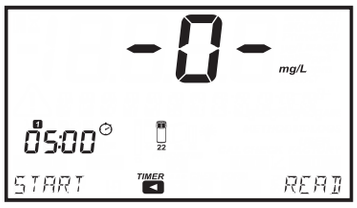


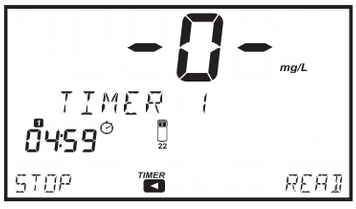
• Reinsert the cuvette into the instrument and close the lid.

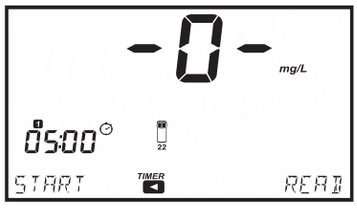
• Press the ◄ key to access the timer menu, press the ▲ key to select Timer 1. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively, wait for 5 minutes.

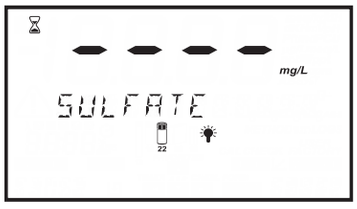
• Press the **READ** key, the instrument displays the results in **mg/L of sulfate ($SO_4^{2-}$)**.

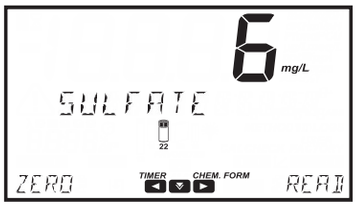


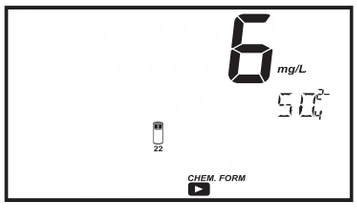




• Press the ▼ key to access the second level functions (wavelength, method ID, date and time).

• Press the ► key to view the chemical formula.




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

## INTERFERENCES

Interferences may be caused by:
Calcium (as $CaCO_3$) above 20000 mg/L
Chloride (as $Cl^-$) above 40000 mg/L
Magnesium (as $MgCO_3$) above 10000 mg/L
Silica (as $SiO_2$) above 500 mg/L
Color or suspended matter in large amounts will interfere: suspended matter should be removed by previous filtration.
Organic matter in large amounts may impede the precipitation of barium sulfate.

## 9.84. 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 USEPA 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

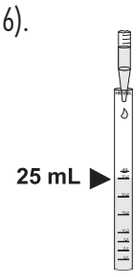
HI95769-01 Reagents for 40 tests

For other accessories see page 236.

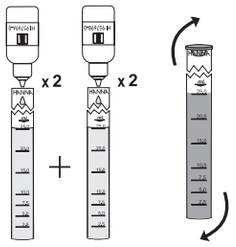
### MEASUREMENT PROCEDURE

- Select the Surfactants Anionic method using the procedure described in the Method Selection section (see page 6).
- Fill the graduated mixing cylinder with 25 mL of sample.

*Note: For improved accuracy the use of class A laboratory pipettes are recommended.*

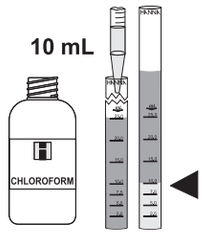



- Add 2 drops of HI95769A-0 Anionic Surfactants Reagent A and 2 drops of HI95769B-0 Anionic Surfactants Reagent B.



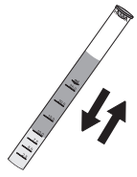

- Close vial with its cap and invert to mix, the solution will turn blue.
- Add 10 mL of Chloroform.

*Note: Chloroform is more dense than water and will sink to the bottom of the graduated mixing vial.*

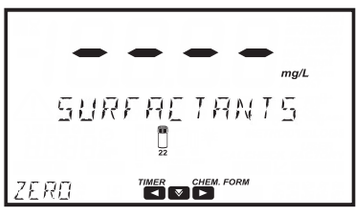


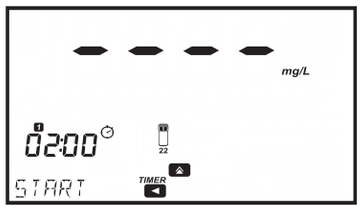

- Invert the vial twice and remove the cap to release any pressure that has built up.
- Close the graduated mixing cylinder with its cap and shake it vigorously for 30 seconds.

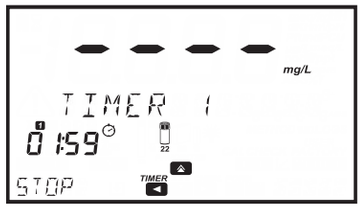
*Note: Ensure the cap is secure when shaking.*



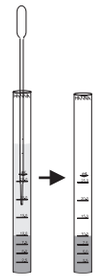
• Press the ◀ key to access the timer menu, press the ⏫ key to select Timer 1. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively, wait for 2 minutes. During this period the chloroform layer separates from the aqueous layer, the color of the aqueous layer will fade slightly, while the chloroform layer will turn blue.



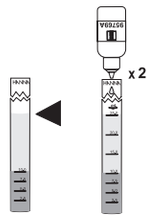

• Remove the cap.



• 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 vial (up to the 25 mL mark).

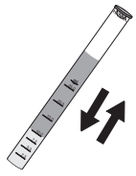
• Add 2 drops of HI95769A-0 Anionic Surfactants Reagent A.



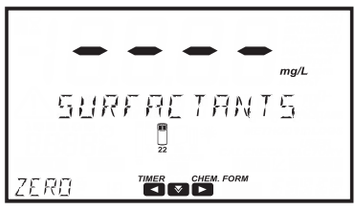

• Invert the vial twice and remove the cap to release any pressure that has built up.

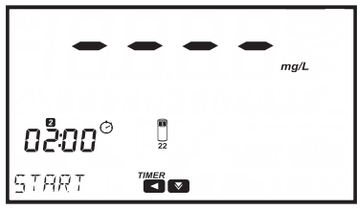
• Close the graduated mixing vial with its cap and shake it vigorously for 30 seconds.

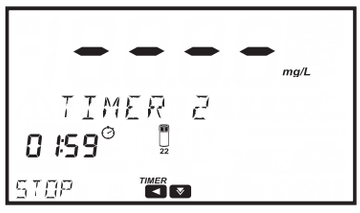
*Note: Ensure the cap is secure when shaking.*



• Press the ◀ key to access the timer menu, press the ⏫ key to select Timer 2. Press the **START** key to start Timer 2, the display will show the countdown or, alternatively, wait for 2 minutes. During this period, the chloroform layer separates from the aqueous layer.

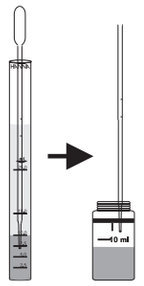



• Remove the cap.

• 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.

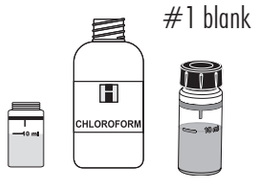



*Notes: The solution in the cuvette must be clear. If the solution is cloudy, the separation between the chloroform and aqueous layer can be improved by gently warming the cuvette (holding the cuvette in your hand). If the chloroform layer contains some aqueous drops hanging on the cuvette wall, gently swirl or invert the cuvette.*

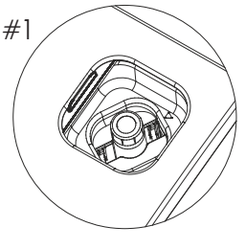
*It is important to transfer at least 7 mL of chloroform layer into the measurement cuvette, thus up to 0.5 cm (1/4") below the 10 mL mark. If the transferred volume is lower than 7 mL, the accuracy of the test may be affected. Please repeat the test waiting for longer than 2 minutes to allow complete separation between the two phases.*

• Cap the cuvette. This is the reacted sample (#2).

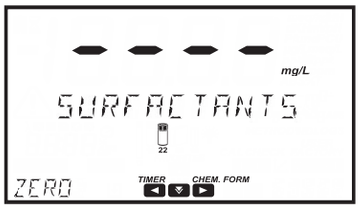

• Fill another cuvette with 10 mL of Chloroform reagent (up to the mark) and place the cap. This is the blank (#1).

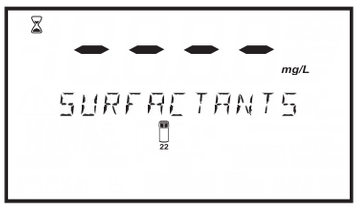


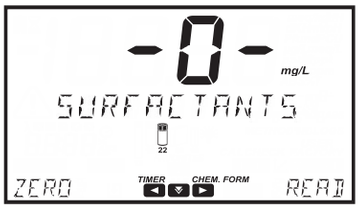

• Place the blank (#1) into the holder and close the lid.



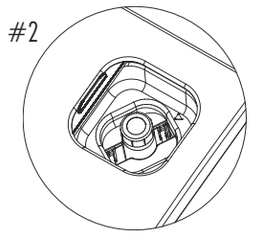

• Press the **ZERO** key. The display will show "-0-" when the meter is zeroed and ready for measurement.



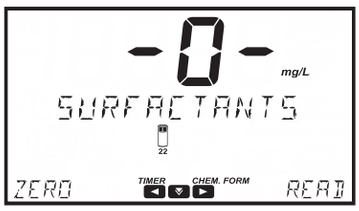



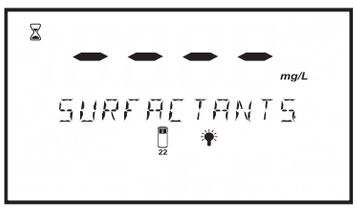

• Remove the cuvette.

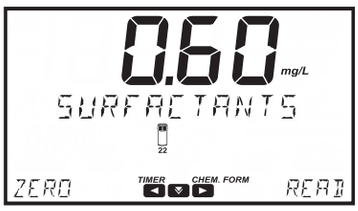



• Place the reacted sample (#2) into the instrument and close the lid.

• Press the **READ** key to start the reading. The instrument displays the result in **mg/L as SDBS.**

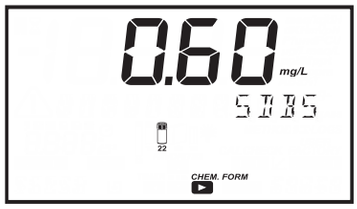



• Press the ▼ key to access the second level functions (wavelength, method ID, date and time).

• 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 - negative interference
Absorption particulate matter - negative interference
Sulfide - negative interference
Organic sulfates, sulfonates - positive interference
Strong oxidants ($Cl_2$, $H_2O_2$, $S_2O_8^{2-}$, etc.) - negative 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 for acidic samples or with diluted HCl for alkaline samples, prior to addition of the reagent.

## 9.85. 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

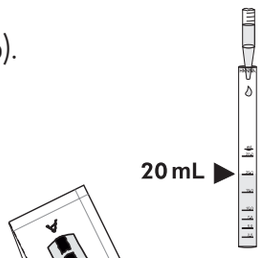
| | |
|---|---|
| HI93731-01 | Reagents for 100 tests |
| HI93731-03 | Reagents for 300 tests |

For other accessories see page 236.

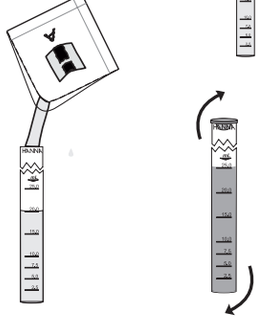
### MEASUREMENT PROCEDURE

- Select the Zinc method using the procedure described in the Method Selection section (see page 6).

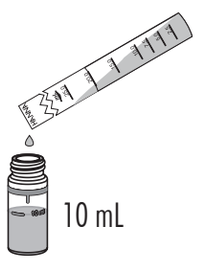
- Fill the graduated glass mixing vial up to the 20 mL mark with the sample.



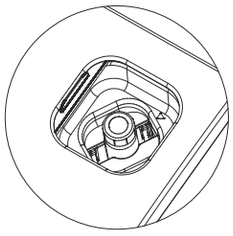

- Add one packet of HI93731A-0 Zinc Reagent A, close the graduated glass mixing vial, and invert several times to mix until completely dissolved.



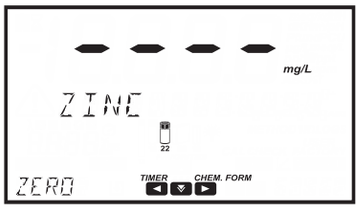
- Fill a cuvette with 10 mL of the reacted sample (up to the mark) and close the cap.

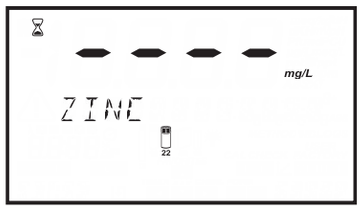


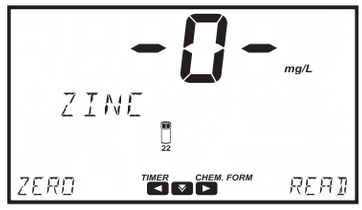

- Place the cuvette into the holder and close the lid.



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

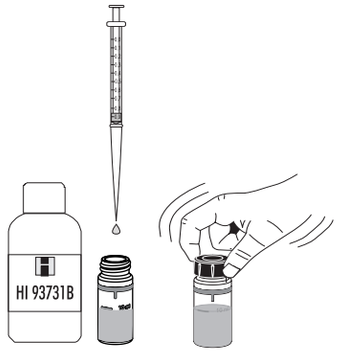


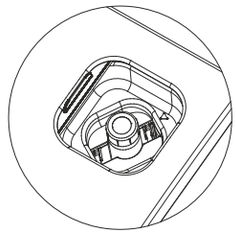




• Add 0.5 mL of HI93731B-0 Zinc Reagent B to the cuvette, close the cuvette with the supplied HDPE plastic stopper to prevent contamination.

• Replace the cap and mix for 15 seconds.

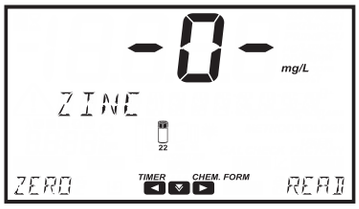


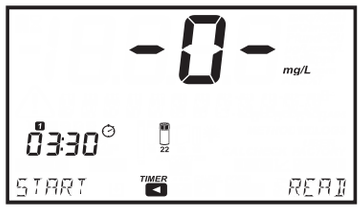

• Insert the sample into the instrument and close the lid.

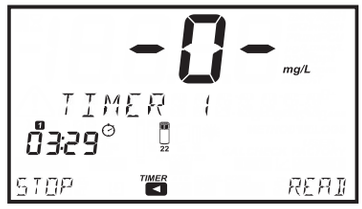


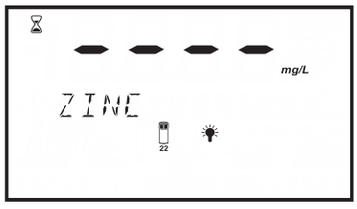
• Press the ◀ key to access the timer menu, press the ▲ key to select Timer 1. Press the **START** key to start Timer 1, the display will show the countdown or, alternatively, wait for 3 minutes 30 seconds.

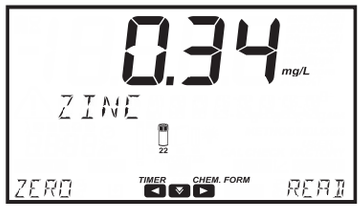
• Press the **READ** key, the instrument displays the results in **mg/L of zinc (Zn)**.




• Press the ▼ key to access the second level functions (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:
Aluminum above 6 mg/L;
Iron above 7 mg/L;
Cadmium above 0.5 mg/L;
Manganese above 5 mg/L;
Copper above 5 mg/L;
Nickel above 5 mg/L.

## 10. STANDARD 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 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, 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 |
| COD LR EPA (13 mm Vial) | 0 to 150 mg/L | Adaptation of the USEPA 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 USEPA 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 1500 mg/L | Dichromate ISO |
| COD HR EPA (13 mm Vial) | 0 to 15000 mg/L | Adaptation of the USEPA 410.4 |
| 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 |

| Description | Range | Method |
|---|---|---|
| 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 |
| Magnesium | 0 to 150 mg/L | Calmagite |
| Manganesse LR | 0 to 300 µg/L | PAN |
| Manganesse HR | 0.0 to 20.0 mg/L | Periodate |
| 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 |
| Nitrite, Marine ULR | 0 to 200 µg/L | Diazotization |
| Nitrite LR | 0 to 600 µg/L | Diazotization |
| Nitrite HR | 0 to 150 mg/L | Ferrous Sulfate |
| 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 |
| 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, 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, Acid Hydrolyzable (13 mm Vial) | 0.00 to 1.60 mg/L | Ascorbic Acid |
| Phosphorus, Total LR (13mm 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 |

| Description | Range | Method |
|---|---|---|
| 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 |
| Zinc | 0.00 to 3.00 mg/L | Zincon |
| Maple Syrup | 0.00 to 100.00%T | Direct measure |

# 11. ACCESSORIES

## 11.1. REAGENT SETS

| Code | 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 |
| 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 |
| HI93714-03 | 300 cyanide tests |
| HI93715-01 | 100 ammonia MR tests |
| HI93715-03 | 300 ammonia MR tests |

| Code | Description |
|---|---|
| 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) |
| 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 |

| Code | Description |
|---|---|
| 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) |
| HI93757-01 | 100 ozone tests |
| HI93757-03 | 300 ozone tests |
| HI93758A-50 | 50 phosphorus reactive LR tests (Vial) |
| HI93758B-50 | 50 phosphorus acid hydrolyzed tests (Vial) |
| HI93758C-50 | 50 phosphorus total LR tests (Vial) |
| 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) |

| Code | Description |
|---|---|
| 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 |

## 11.2. OTHER ACCESSORIES

| Code | Description |
|---|---|
| HI731311 | vial 13 mm diam (5 pcs.) |
| HI731318 | cloth for wiping cuvettes (4 pcs.) |
| HI731321 | glass cuvettes 16 mm diam (4 pcs.) |
| HI731335N | cap for 16 mm cuvette (4 pcs.) |
| HI731331 | glass cuvettes 22 mm diam (4 pcs.) |
| HI731335N | cap for cuvette 22mm 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 (25 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 (6 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 |
| HI7408011 | 16 mm cuvette adapter |
| HI7408012 | 10 mm cuvette adapter |
| HI7408013 | 13 mm cuvette adapter |
| HI740230 | demineralized water (230 mL) |
| DEMI-02 | demineralizer |
| 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, 230 VAC to 15 VDC power adapter, European plug |
| HI839800-02 | reactor, 115 VAC to 15 VDC power adapter, USA plug |

| | |
|---|---|
| HI93703-50 | cuvette cleaning solution (230 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 |

## 12. ABBREVIATIONS

| | |
|---|---|
| EPA | US Environmental Protection Agency |
| ISO | International Organization for Standardization |
| °C | degree Celsius |
| °F | degree Fahrenheit |
| µg/L | micrograms per liter (ppb) |
| mg/L | milligrams per liter (ppm) |
| g/L | grams per liter (ppt) |
| mL | milliliter |
| ULR | ultra low range |
| LR | low range |
| MR | medium range |
| HR | high range |
| UHR | ultra high range |
| PAN | 1-(2-pyridylazo)-2-naphtol |
| TPTZ | 2,4,6-tri-(2-pyridyl)-1,3,5-triazine |
| %T | Transmittance |
| ABS | Absorbance |
| °f | Hardness in French degree |
| °e | Hardness in English degree |
| meq/L | milli equivalents per liter |
| PCU | Platinum Cobalt Unit |
| Pfund | Honey color grading scale in millimeters |
| pH | -log of the hydrogen ion activity |
| °dH | Hardness in German degree |
| mV | millivolt |
| meq/kg | milli equivalents per kilogram |
| dkH | Degrees of carbonate hardness |
| EDTA | Ethylenediamine tetra acetic acid |
| DPD | N,N-diethyl-p-phenylenediamine |
| SPANDS | sodium 2-(parasulphophenylazo-)-1,8-dihydroxy-3,6-naphthalene disulphonate |
| ASTM | Adaptation of the Standard Methods |
| MBAS | methylene blue active substances |

## Recommendations for Users

Before using this product make sure that they are entirely suitable for your specific application and for the environment in which it will be used.
Operation of these instruments may cause unacceptable interferences to other electronic equipment. Take all necessary steps to correct such interferences. Any modifications made to the instrument or variations from the operating instructions by the user may degrade the instruments EMC performance.
To avoid damages or burns, do not put the instrument in a microwave oven. For your safety and to prevent damage from occurring, do not use or store the instrument in hazardous environments.

## Warranty

The HI 801 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 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 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.

## World Headquarters

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