VALIDATION AND CALIBRATION PROCEDURES

Warning: Do not validate or calibrate the instrument with standard solutions other than the Hanna Instruments **CAL Check**™ Standards, otherwise erroneous results will be obtained.

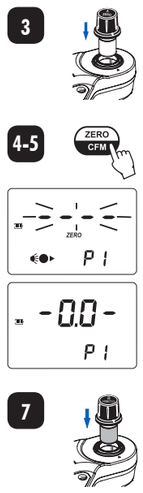
For accurate validation and calibration results, please perform tests at room temperature (18 to 25 °C; 64.5 to 77.0 °F).

Use the Hanna Instruments CAL Check™ cuvettes (see "Accessories") to validate or calibrate instruments.

VALIDATION

Note: The validation is performed only for the selected parameter. For full validation of the instrument, the following procedure must be performed for each parameter.

Validation ▼



1• Turn the meter on by pressing **ON/OFF**.
2• When the beeper sounds briefly and the LCD displays dashes, the meter is ready.
3• Place the **CAL Check**™ Standard Cuvette A into the cuvette holder and ensure that the notch on the cap is positioned securely into the groove.
4• Press **ZERO/CFM** and the lamp, cuvette and detector icons will appear on the display, depending on the measurement phase.
5• After a few seconds the display will show "**-0.0-**". The meter is now zeroed and ready for validation.
6• Remove the cuvette.
7• Place the specific **CAL Check**™ Standard Cuvette B into the cuvette holder, for:
pH: B, HI96710-11
Free Chlorine: B, HI96701-11
Total Chlorine: B, HI96711-11
Cyanuric Acid: B, HI96722-11
Ensure that the notch on the cap is positioned securely into the groove.
8• Press **CAL CHECK** key and the lamp, cuvette and detector icons together with "**CAL CHECK**" will appear on the display, depending on the measurement phase.
9• At the end of the measurement, the display will show the validation standard value.
The reading should be within specifications as reported in the **CAL Check**™ Standard Certificate. If the value is found to be out of specifications, please check that the cuvettes are free of fingerprints, oil or dirt and repeat validation. If results are still found to be out of specifications, then recalibrate the instrument.

CALIBRATION

Note: It is possible to interrupt the calibration procedure at any time by pressing CAL CHECK or ON/OFF keys. When calibrating, only the selected range is affected.

1• Turn the meter on by pressing **ON/OFF**.
2• When the beeper sounds briefly and the LCD displays dashes, the meter is ready.
3• To change the range, simply press **RANGE/GLP▲**.
4• Press and hold **CAL CHECK** for three seconds to enter calibration mode. The display will show "**CAL**" during calibration procedure. The blinking "**ZERO**" asks for instrument zeroing.
5• Place the **CAL Check**™ Standard Cuvette A into the cuvette holder and ensure that the notch on the cap is positioned securely into the groove.
6• Press **ZERO/CFM** and the lamp, cuvette and detector icons will appear on the display, depending on the measurement phase.
7• After a few seconds the display will show "**-0.0-**". The meter is now zeroed and ready for calibration. The blinking "**READ**" asks for reading calibration standard.
8• Remove the cuvette.
9• Place the specific **CAL Check**™ Standard Cuvette B into the cuvette holder, for:
pH: B, HI96710-11
Free Chlorine: B, HI96701-11
Total Chlorine: B, HI96711-11
Cyanuric Acid: B, HI96722-11
Ensure that the notch on the cap is positioned securely into the groove.
10• Press **READ▶/TIMER** and the lamp, cuvette and detector icons will appear on the display, depending on the measurement phase.
11• After measurement the instrument will show for three seconds the **CAL Check**™ Standard value.
Note: If the display shows "STD HIGH", the standard value was too high. If the display shows "STD LOW", the standard value was too low. Verify that all CAL Check™ Standard Cuvettes, A and B are free of fingerprints or dirt and that they are inserted correctly.
12• Then the date of last calibration (e.g.: "01.08.2009") appears on the display, or "01.01.2009" if the factory calibration was selected before. In both cases the year number is blinking, ready for date input.
13• Press **RANGE/GLP▲** to edit the desired year (2009-2099). If the key is kept pressed, the year number is automatically increased.
14• When the correct year has been set, press **ZERO/CFM** or **READ▶/TIMER** to confirm. Now the display will show the month blinking.

Calibration ▼

15• Press **RANGE/GLP▲** to edit the desired month (01-12). If the key is kept pressed, the month number is automatically increased.
16• When the correct month has been set, press **ZERO/CFM** or **READ▶/TIMER** to confirm. Now the display will show the day blinking.
17• Press **RANGE/GLP▲** to edit the desired day (01-31). If the key is kept pressed, the day number is automatically increased.
Note: It is possible to change the editing from day to year and to month by pressing READ▶/TIMER.
18• Press **ZERO/CFM** to save the calibration date.
19• The instrument displays "**Stor**" for one second and the calibration is saved.
20• The instrument will return automatically to measurement mode by displaying dashes on the LCD.

GLP

In GLP mode, the last calibration date can be verified and the factory calibration can be restored.

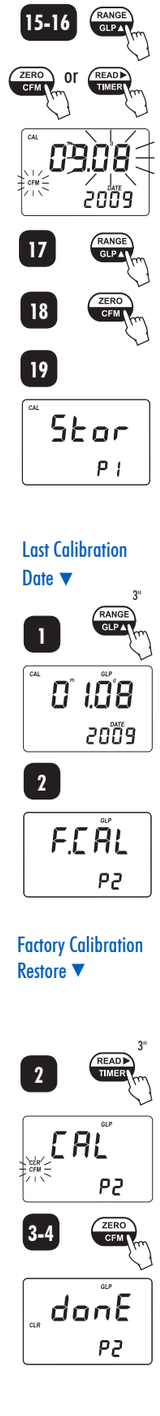
Last Calibration Date

1• Press and hold **RANGE/GLP▲** for three seconds to enter GLP mode. The calibration month and day will appear on the main display and the year on the secondary display.
2• If no calibration was performed, the factory calibration message, "**F.CAL**" will appear on the main display and the instrument returns to measurement mode after three seconds.

Factory Calibration Restore

It is possible to delete the calibration and restore factory calibration.

1• Press and hold **RANGE/GLP▲** for three seconds to enter GLP mode.
2• Press **READ▶/TIMER** to enter the factory calibration restore screen. The instrument asks for confirmation of user calibration delete.
3• Press **ZERO/CFM** to restore the factory calibration or press **RANGE/GLP▲** again to abort factory calibration restore.
4• The instrument briefly indicates "**donE**" upon restoration of factory calibration prior to returning to measurement mode.



Last Calibration Date ▼

Factory Calibration Restore ▼

RECOMMENDATIONS FOR USERS

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

Operation of these instruments may cause unacceptable interferences to other electronic equipments, this requiring the operator to take all necessary steps to correct interferences.

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

To avoid damages or burns, do not put the instrument in microwave oven.

For yours and the instrument safety do not use or store the instrument in hazardous environments.

BATTERY MANAGEMENT

To save the battery, the instrument shuts down after 10 minutes of non-use in measurement mode and after 1 hour of non-use in calibration mode.

If a valid measurement was displayed before auto-shut off, the value is displayed when the instrument is switched on. The blinking "**ZERO**" means that a new zero has to be performed.

One fresh battery lasts for around 750 measurements, depending on the light level.

The remaining battery capacity is evaluated at the instrument's startup and after each measurement.

The instrument displays a battery indicator with three levels as follows:

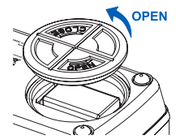
- 3 lines for 100 % capacity
- 2 lines for 66 % capacity
- 1 line for 33 % capacity
- The battery icon is blinking if the capacity is under 10 %.

If the battery is empty and accurate measurements can't be taken any more, the instrument shows "**dEAd bAtt**" and turns off.

To restart the instrument, the battery must be replaced with a fresh one.

To replace the instrument's battery, follow the steps:

- Turn the instrument off by pressing **ON/OFF**.
- Turn the instrument upside down and remove the battery cover by turning it counterclockwise.



- Extract the battery from its location and replace it with a fresh one.
- Insert back the battery cover and turn it clockwise to close.

INSTRUCTION MANUAL

HI96104

pH, Chlorine and Cyanuric Acid ISM

HANNA® instruments

Thank You

Thank you for choosing a Hanna Instruments product. Please read this instruction manual carefully before using the instrument.

For more information about Hanna Instruments and our products, visit www.hannainst.com.

For technical support, contact your local Hanna Instruments Office or e-mail us at tech@hannainst.com

Find your local Hanna Instruments Office at www.hannainst.com

PRELIMINARY EXAMINATION

Please examine this product carefully. Make sure that the instrument is not damaged. If any damage has occurred during shipment, please contact your local Hanna Instruments Office.

Each HI96104 Ion Selective Meter is supplied complete with:

- Sample Cuvettes and Caps (2 pcs.)
- 9V Battery
- Instruction Manual
- Quality Certificate

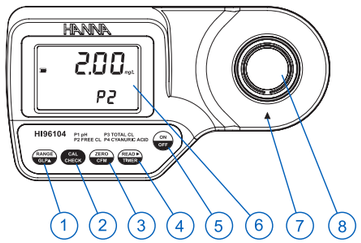
Note: Save all packing material until you are sure that the instrument works correctly. Any defective item must be returned in its original packing.

For more details about spare parts and accessories see "Accessories".

SPECIFICATIONS

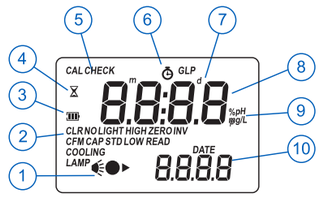
Range	pH	6.5 to 8.5 pH
	Free Chlorine	0.00 to 5.00 mg/L
	Total Chlorine	0.00 to 5.00 mg/L
	Cyanuric Acid	0 to 80 mg/L
Resolution	0.1 pH 0.01 mg/L under 3.50 mg/L Chlorine 0.01 mg/L above 3.50 mg/L Chlorine 1 mg/L Cyanuric Acid	
Accuracy @25 °C/77 °F	pH	±0.1 pH
	Free Chlorine	±0.03 mg/L ± 3% of reading
	Total Chlorine	±0.03 mg/L ±3% of reading
	Cyanuric Acid	±1 mg/L ± 15% of reading
Light Source	Tungsten lamp	
Light Detector	Silicon Photocell with narrow band interference filter @525 nm	
Method	**For pH:** Phenol red method. The reaction with the reagent causes a red tint in the sample. **For Chlorine:** Adaptation of the EPA, DPD method and Standard Method 4500-Cl G. The reaction between chlorine and the reagent causes a pink tint in the sample. **For Cyanuric Acid:** Adaptation of the turbidimetric method. The reaction between cyanuric acid and the reagent causes a white suspension in the sample.	
Environment	0 to 50 °C (32 to 122 °F) max 95 % RH non-condensing	
Battery Type	9V (1 pc.)	
Auto-Shut off	After 10' of non-use in measurement mode; after 1 hour of non-use in calibration mode; with last reading reminder	
Dimensions	192 x 104 x 69 mm (7.6 x 4.1 x 2.7")	
Weight	320 g (11.3 oz.)	

FUNCTIONAL DESCRIPTION



1. **RANGE/GLP▲** key: press to change the parameter, press and hold for three seconds to enter GLP mode. In calibration mode, press to edit the date and time.
2. **CAL CHECK** key: press to perform the validation of the meter, or press and hold for three seconds to enter calibration mode.
3. **ZERO/CFM** key: press to zero the meter prior to measurement, to confirm edited values or to confirm factory calibration restore.
4. **READ▶/TIMER** key: In measurement mode, press to take a measurement, or press and hold for three seconds to start a pre-programmed countdown prior to measurement. In GLP mode, press to view the next screen.
5. **ON/OFF** key: to turn the meter on and off.
6. Liquid Crystal Display (LCD)
7. Cuvette alignment indicator
8. Cuvette holder

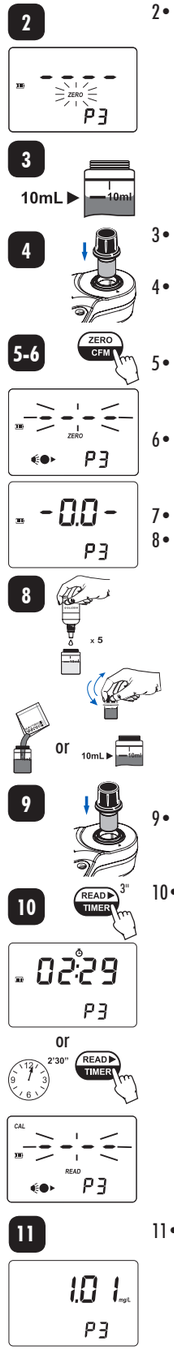
DISPLAY ELEMENTS DESCRIPTION



1. The measuring scheme (lamp, cuvette, detector), appears during different phases of zero or reading measurement
2. Error messages and warnings
3. The battery icon indicates the charge state of the battery
4. The hourglass appears when an internal check is in progress
5. Status messages
6. The chronometer appears when the reaction timer is running
7. The month, day and date icons appear when a date is displayed
8. Four digit main display
9. Measuring units
10. Four digit secondary display

MEASUREMENT PROCEDURE

Measurement ▼



1• Turn the meter on by pressing **ON/OFF**.

2• When the beeper sounds briefly and the LCD displays dashes and "**P1**" (pH), "**P2**" (Free Chlorine), "**P3**" (Total Chlorine) or "**P4**" (Cyanuric Acid), the meter is ready. The code that appears on the secondary display is the one of the last selected parameter. If necessary, press **RANGE/GLP▲** to change parameter. The blinking "**ZERO**" indicates that the instrument needs to be zeroed first.

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

4• Place the cuvette into the holder and ensure that the notch on the cap is positioned securely into the groove.

5• Press **ZERO/CFM** and the lamp, cuvette and detector icons will appear on the display, depending on the measurement phase.

6• After a few seconds the display will show "**-0.0-**". The meter is now zeroed and ready for measurement.

7• Remove the cuvette.

8• Add the specific test reagent for each parameter:
pH: 5 drops of HI93710-0. Replace the cap and shake gently the solution.
Free Chlorine: 1 packet of HI93701-0. Replace the cap and shake gently for 20 seconds.
Total Chlorine: 1 packet of HI93711-0. Replace the cap and shake gently for 20 seconds.
Cyanuric Acid: fill a beaker with 25 mL of sample, add 1 packet of HI93722-0 and swirl gently. Fill a second cuvette with 10 mL of reacted sample.

9• Replace the cuvette into the holder and ensure that the notch on the cap is positioned securely into the groove.

10• Press and hold **READ▶/TIMER** for three seconds. The display will show the countdown prior to measurement. The beeper is playing a beep at the end of countdown period.
Alternatively, wait for:
Free Chlorine: 1 minute
Total Chlorine: 2 minutes and 30 seconds
Cyanuric Acid: 45 seconds
Then press **READ▶/TIMER**.
For pH press **READ▶/TIMER** directly.
In all cases the lamp, cuvette and detector icons will appear on the display, depending on the measurement phase.

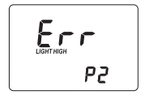
11• The instrument directly displays the pH value or the concentration in mg/L of free chlorine, total chlorine or cyanuric acid on the LCD, depending on the selected parameter.

INTERFERENCES for FREE CHLORINE and TOTAL CHLORINE:

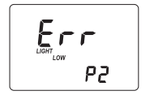
- Bromine, Iodine, Chlorine dioxide, Ozone and Oxidized forms of Manganese and Chromium. In case of water with alkalinity greater than 250 mg/L $CaCO_3$ or acidity greater than 150 mg/L $CaCO_3$, the color of the sample may develop only partially, or may rapidly fade. To resolve this, neutralize the sample with diluted HCl or NaOH. 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.

ERRORS AND WARNINGS

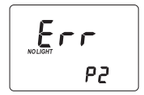
ON ZERO READING:



Light High: There is too much light to perform a measurement. Please check the preparation of the zero cuvette.

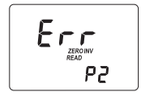


Light Low: There is not enough light to perform a measurement. Please check the preparation of the zero cuvette.

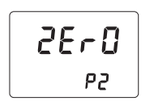


No Light: The instrument cannot adjust the light level. Please check that the sample does not contain any debris.

ON SAMPLE READING:



Inverted Cuvettes: The sample and the zero cuvette are inverted.

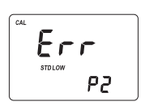


Zero: A zero reading was not taken. Follow the instructions of the measurement procedure for zeroing the meter.

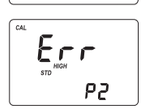
Under Range: A blinking "**0.00**" indicates that the sample absorbs less light than the zero reference. Check the procedure and make sure you use the same cuvette for reference (zero) and measurement.

Over Range: A flashing value of the maximum concentration indicates an over range condition. The concentration of the sample is beyond the programmed range: dilute the sample and re-run the test.

DURING CALIBRATION PROCEDURE:

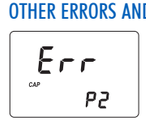


Standard Low: The standard reading is less than expected.

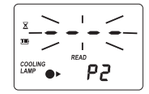


Standard High: The standard reading is higher than expected.

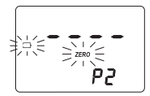
OTHER ERRORS AND WARNINGS:



Cap Error: Appears when external light enters the analysis cell. Ensure that the cuvette cap is present.



Cooling Lamp: The instrument waits for the lamp to cool down.



Battery Low: The battery must be replaced soon.

Dead Battery: This indicates that the battery is dead and must be replaced. Once this indication is displayed, normal operation of the instrument will be interrupted. Change the battery and restart the meter.

ACCESSORIES

Reagent Sets

HI93701-01	Reagents for 100 free chlorine tests
HI93701-03	Reagents for 300 free chlorine tests
HI93710-01	Reagents for 100 pH tests
HI93710-03	Reagents for 300 pH tests
HI93711-01	Reagents for 100 total chlorine tests
HI93711-03	Reagents for 300 total chlorine tests
HI93722-01	Reagents for 100 cyanuric acid tests
HI93722-03	Reagents for 300 cyanuric acid tests

Other Accessories

HI96701-11	**CAL Check**™ Standard Cuvettes for Free Chlorine (1 set)
HI96710-11	**CAL Check**™ Standard Cuvettes for pH (1 set)
HI96711-11	**CAL Check**™ Standard Cuvettes for Total Chlorine (1 set)
HI96722-11	**CAL Check**™ Standard Cuvettes for Cyanuric Acid (1 set)
HI740029P	9V battery (10 pcs.)
HI731318	Cloth for wiping cuvettes (4 pcs.)
HI731331	Glass cuvettes (4 pcs.)
HI731335	Caps for cuvettes (4 pcs.)
HI93703-50	Cuvette cleaning solution (230 mL)

WARRANTY

HI96104 is warranted for two years against defects in workmanship and materials when used for its intended purpose and maintained according to the instructions.
This warranty is limited to repair or replacement free of charge.
Damages due to accident, misuse, tampering or lack of prescribed maintenance are 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 failure. If the repair is not covered by the warranty, you will be notified of the charges incurred.
If the instrument is to be returned to Hanna Instruments, first obtain a Returned Goods Authorization Number from the Customer Service Department and then send it with shipment costs prepaid. When shipping any instrument, make sure it is properly packaged for complete protection.
To validate your warranty, fill out and return the enclosed warranty card within 14 days from the date of purchase.

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

IST96104 01/18