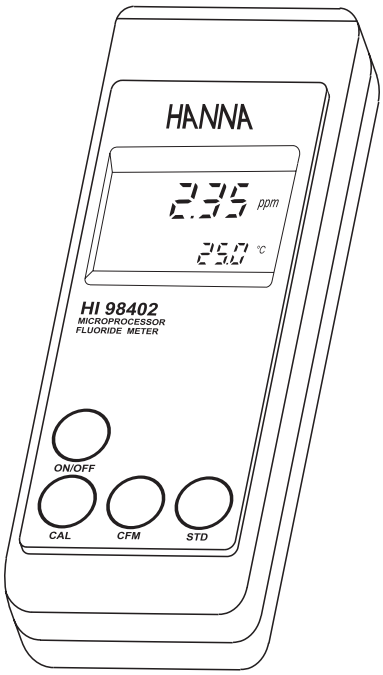
Instruction Manual

HI 98402

Waterproof and Accurate Fluoride Meter



HANNA instruments®

www.hannainst.com

Dear Customer,

Thank you for choosing a Hanna product.

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

If you need additional technical information, do not hesitate to e-mail us at **tech@hannainst.com**.

This instrument is in compliance with the CE directives.

TABLE OF CONTENTS

PRELIMINARY EXAMINATION

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

Each meter is supplied complete with:

- Batteries (4 x 1.5V AA)
- Instruction manual
- Rugged carrying case

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

GENERAL DESCRIPTION

HI 98402 measures fluoride from 0.05 mg/L to 1.9 g/L in 5 distinct scales. With auto-ranging **HI 98402** automatically selects the range that provides the best resolution. All results are displayed directly in fluoride concentration. In order to guarantee maximum repeatability, measurements are performed using the **HI 4010** fluoride specific electrode and the separate **HI 5313** reference electrode.

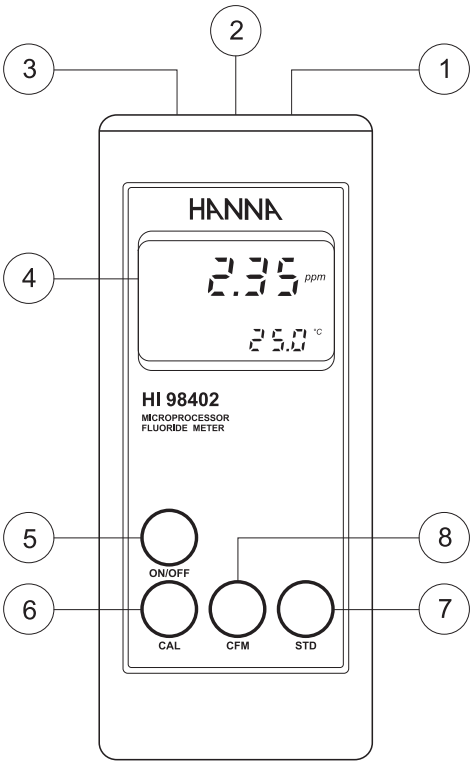
HI 98402 compensates for temperature automatically from 5 to 35°C using the optional **HI 7662** stainless steel temperature probe. The temperature measured together with fluoride concentrations are displayed on the large LCD simultaneously.

All operations are microprocessor controlled for added precision and simplicity. The calibration is automatic at one or two points.

The calibration points can be chosen among 1 mg/L (ppm), 2 mg/L, 10 mg/L, 100 mg/L and 1000 mg/L.

HI 98402 is supplied in a rugged carrying casing complete with 4 batteries, that provide up to 120 hours of continuous operation.

FUNCTIONAL DESCRIPTION



1) Connector for temperature probe
2) Connector for reference electrode
3) BNC connector for fluoride electrode
4) Liquid Crystal Display (LCD)
5) **ON/OFF** button
6) **CAL** button
7) **STD** button
8) **CFM** button

SPECIFICATIONS

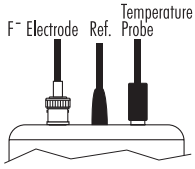
Range	0.050 to 0.500 mg/L (ppm) / 0.50 to 5.00 mg/L 5.0 to 50.0 mg/L / 50 to 500 mg/L / 0.50 to 1.90 g/L Fluoride 0.0 to 50.0°C
Resolution	0.001 mg/L (ppm) / 0.01 mg/L 0.1 mg/L / 1 mg/L / 0.01 g/L Fluoride 0.1°C
Accuracy	±5% of reading or ±0.02 ppm Fluoride (with ±3°C from calibration temperature) ±0.5 °C
Typical EMC Deviation	± 2% FS (Fluoride) / ±0.5°C
Calibration	Automatic, 1 or 2 point at 1 mg/L, 2 mg/L, 10 mg/L, 100 mg/L and 1000 mg/L
Temperature Compensation	Automatic, 5 to 35 °C (with temperature probe)
Electrodes	**HI 4010** fluoride electrode with BNC and 1 m (3.3') cable **HI 5313** reference electrode with 1 m (3.3') cable (not included)
Temperature Probe	**HI 7662** with 1 m (3.3') cable
Battery Type / Life	4 x 1.5V AA / approx. 120 hours of use
Environment	0 to 50°C (32 to 122°F); RH max 100%
Dimensions	196 x 80 x 60 mm (7.7 x 3.1 x 2.4")
Weight	500 g (1.1 lb.)

OPERATIONAL GUIDE

INITIAL PREPARATION:

The meter is supplied with four 1.5V AA alkaline batteries. Remove the battery cover on the back of the meter and insert the batteries while paying attention to their polarity.

Attach the fluoride electrode (#3 on page 4), the reference electrode (#2) and the temperature probe (#1) to their respective connectors on top of the meter.



Press ON/OFF to turn the meter on.

Note: The temperature probe can also be used on its own to measure the temperature independently.

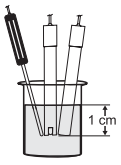
Note: If the temperature probe is not connected, the lower display will indicate 25.0°C with the "°C" symbol blinking.

MEASUREMENT OF FLUORIDE ION CONCENTRATION

Note: Ensure the meter is calibrated prior to proceeding any further. In order to obtain accurate results, calibrate the meter at a temperature no more than ±3°C away from the sample to be measured subsequently.

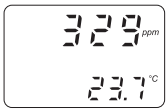
Note: If the fluoride electrode is new, or it has not been used for a few days, it must be soaked in a solution of **HI 4010-10** (10 ppm fluoride solution + TISAB) **for at least 3 hours prior to measurement.**

- Pour about 10-20 mL of the sample in a clean beaker and add the same quantity of **HI 4010-00** (TISAB) solution to the beaker. Mix the solution for a few minutes.
- Rinse the electrodes with deionized water and dry them attentively with a non-abrasive cloth.
- Immerse the fluoride and the reference electrode as well as the temperature probe to a depth of at least 1 cm (½") in the prepared sample.

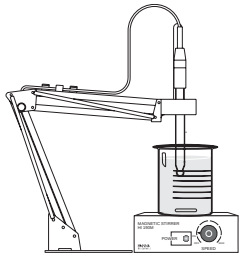


Make sure that the electrodes are not touching the bottom of the beaker. Position the temperature probe close to the tip of the other electrodes.

- Wait until the display stabilizes (about 10-15 minutes). The fluoride ion concentration and the temperature will be displayed on the upper and lower displays, respectively.



Note: It is recommended to mix the sample during the measurement, using a magnetic stirrer set at around 100 rpm.

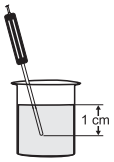


Note: If the temperature probe is not connected, the meter will not compensate for the temperature variance. In this case, accurate fluoride measurements are only possible if the temperature of the sample and the calibration solutions are close (no more than ±3°C apart).

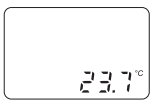
TEMPERATURE MEASUREMENT

The temperature can be measured independently from fluoride concentration.

- Immerse the temperature probe at least 1 cm (½") in the prepared sample.



- Wait for the reading to stabilize. The temperature of the solution will be shown on the lower part of the display.



CALIBRATION

In order to obtain accurate measurements, frequent calibration is recommended.

For better results, calibrate at a temperature close to that of the solution to be tested (no more than ±3°C apart).

The instrument can be calibrated at 1 or 2 points. Two-point calibration is always recommended for better accuracy.

Calibration points can be chosen among 1 ppm fluoride, 2 ppm , 10 ppm, 100 ppm and 1000 ppm.

PREPARATION

- The HANNA calibration solutions at 1 ppm (**HI 4010-11**), 2 ppm (**HI 4010-12**) and 10 ppm (**HI 4010-10**) are already mixed with TISAB II solution, while for 100 ppm (**HI 4010-02**) and 1000 ppm (**HI 4010-05**) it is necessary to prepare the calibration solutions by mixing with TISAB II (**HI 4010-00**), 50% and 50%.
- Attach the fluoride and reference electrodes and the temperature probe to their respective connectors on top of the meter.
- Switch the meter on by pressing the ON/OFF button.

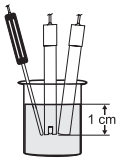
Note: For best results, it is recommended to prepare two beakers for each calibration point: the first one to rinse the probes and the second one to calibrate.

Note: It is recommended to use clean plastic beakers.

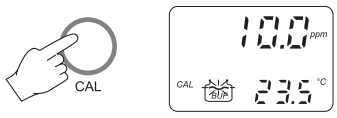
CALIBRATION PROCEDURE

Note: If the fluoride electrode is new, or it has not been used for a few days, it must be soaked in a solution of **HI 4010-10** (10 ppm fluoride solution + TISAB) **for at least 3 hours prior to measurement.**

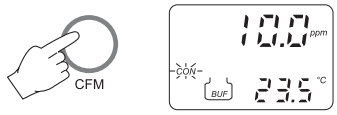
- Rinse the electrodes with deionized water and dry them attentively with a non-abrasive cloth.
- Immerse the fluoride and the reference electrode as well as the temperature probe at least 1 cm (½") in the calibration solution. Make sure that the electrodes are not touching the bottom of the beaker. Immerse the temperature probe close to the tip of the other electrodes.



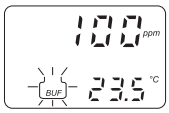
- Press CAL. The display will show "CAL" and "BUF" together with an intermittent "∼" symbol. The upper display will show the calibration point (10 ppm) with the temperature of the solution shown on the lower LCD.



- If the STD button is pressed, the instrument cycles through all the available calibration values. Choose the point corresponding to the first calibration solution.
- When the CON symbol appears, it means that the calibration solution has been recognized and the reading has stabilized. Press CFM to confirm the first calibration point.



Note: If the calibration solution value measured by the meter is too far from the ideal value, the " BUF " symbol starts blinking to indicate an error in the calibration procedure.



Ensure that the calibration solution is fresh and the correct one (in this case 10 ppm), and that the electrodes are in good working condition. Repeat the procedure with fresh and/or new solutions and electrodes.

- After pressing CFM, the display shows the second calibration point. It is always recommended to perform a two-point calibration. However, to exit the calibration procedure at this point, press CAL.
- Press STD to choose the point corresponding to the second calibration solution. The instrument cycles through all the available calibration values, skipping the standard used as the first calibration point.

- Immerse the fluoride and reference electrodes at least 1 cm (½") in the second calibration solution. Make sure that the electrodes are not touching the bottom of the beaker. Immerse the temperature probe close to the tip of the other electrodes.
- The CON symbol appears to indicate that the second calibration solution has also been recognized and the reading is stable. Press CFM to confirm.
- Calibration is now complete and the meter automatically returns to the normal operational mode.

TEMPERATURE CALIBRATION (for technical personnel only)

The meter is factory calibrated for temperature.

The HANNA instruments® temperature probes are interchangeable and no temperature calibration is needed when they are replaced.

If, for any reason, the temperature measurements seem inaccurate, temperature recalibration may be carried out.

For an accurate recalibration however contact your dealer or the nearest HANNA Customer Service Center.

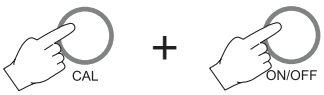
PREPARATION

- Prepare a vessel containing ice and water and another one containing hot water (at a temperature of around 50°C). Place insulation material around the vessels to minimize temperature changes.
- Connect the temperature probe (#1 on page 4) to the connector on top of the instrument.

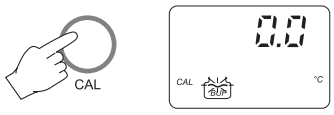
Note: If "°C" blinks, it means that the temperature probe is not connected properly.

CALIBRATION PROCEDURE

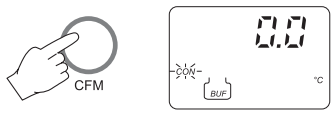
- To enter the temperature calibration mode, with the instrument off, press and hold the CAL button, and then ON/OFF.



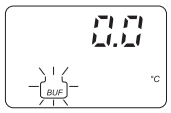
- The measured temperature is shown on the upper display.
- Immerse the temperature probe in a bath at 0.0°C.
- Press CAL. *CAL* and *BUF* will appear on the display with the "~" symbol blinking. The upper part of the display shows the calibration point (0.0 °C).



- CON appears on the display to indicate that the value has been recognized and the reading is stable. Press CFM to confirm.



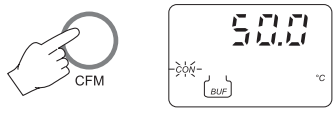
Note: If the reading is too far from the expected value (in this case 0.0°C), the "BUF" symbol starts blinking to warn the user.



Verify if the temperature of the bath is correct (for best results, use a stirrer to agitate a solution of ice and water), and if the probe is functioning properly.

- Press CAL and then press STD to visualize the second calibration point (50.0 °C).

- Immerse the temperature probe in a bath at 50.0°C.
- CON appears to indicate that the value has been recognized and the reading is stable. Press CFM to confirm.



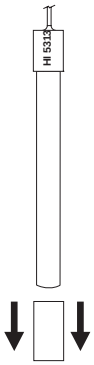
- Switch the meter off and back on again to return to normal measurement mode.

ELECTRODE MAINTENANCE

PREPARATION

The **HI 4010** fluoride electrode is shipped dry.

The **HI 5313** reference electrode should be maintained wet with some storage solution in the protective cap. Remove the protective cap from the reference electrode.



Any salt deposit around the electrode tip is normal and it will dissolve if rinsed with water.

If the junction of the **HI 5313** reference electrode is dry, soak the tip in **HI 7082** solution for at least one hour prior to operation.

If the bulb of the **HI 4010** fluoride electrode is dry, soak the tip in **HI 4010-10** solution (10 ppm fluoride) **for at least 3 hours before using it.**

STORAGE

The **HI 4010** fluoride electrode must be stored dry to prolong its life. After use, rinse it with deionized water, dry it attentively with a non-abrasive cloth and store it dry.

The **HI 5313** reference electrode should be kept wet for a rapid response. After use, rinse the electrode with deionized water and store it with a few drops of **HI 7082** solution in the protective cap.

PERIODIC MAINTENANCE

Periodically check electrodes and cables. The cables should be intact and show no sign of wear and tear. The electrode bulb and stem should present no cracks (in which case it, must be replaced). The connectors must be clean and dry. Rinse the reference electrode with deionized water to wash away any salt deposits that there might be.

REFERENCE ELECTRODE CLEANING

General: immerse the reference electrode in **HI 7061** general cleaning solution for about one hour.

Protein: immerse the reference electrode in **HI 7073** protein cleaning solution for about 15 minutes.

Oil and fat: rinse the electrode with **HI 7077** cleaning solution.

FLUORIDE ELECTRODE CLEANING

General: Rinse the fluoride electrode with deionized water.

Protein, oil & fat: Clean the electrode tip with a cotton wool soaked in alcohol, then rinse with deionized water.

IMPORTANT: After cleaning, rinse the fluoride electrode thoroughly with deionized water and dry it attentively with a non-abrasive cloth.

TROUBLESHOOTING

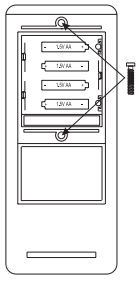
- ***Reading fluctuates***: could be due to dirty or blocked reference electrode junction. Follow the cleaning procedure above.
- ***Reading drifts***: submerge the tip of the reference electrode in **HI 7082** solution at a temperature of 50-60°C for about 1 hour. Afterwards, rinse with deionized water.
- ***No slope (meter always reads the same value)***: the bulb or stem of the fluoride electrode might be cracked. Repeat the measurement with a new fluoride electrode.
- ***Response (of the fluoride electrode) is sluggish***: immerse the fluoride electrode in **HI 4010-10** solution for 3 hours.

BATTERY REPLACEMENT

When the batteries become weak, the "LOBAT" indication is displayed to warn the user. It is recommended to change the batteries as soon as possible.

Battery replacement must only take place in a safe area and using 1.5V AA batteries.

For replacing batteries, remove the two screws on the rear of the instrument and replace all four batteries with new ones, while paying attention to the correct polarity.



ACCESSORIES

Standard Fluoride Solutions

HI 4010-00	TISAB II fluoride solution, 500 mL bottle
HI 4010-01	0.1 M fluoride solution, 500 mL bottle
HI 4010-02	100 ppm fluoride solution, 500 mL bottle
HI 4010-03	1000 ppm fluoride solution, 500 mL bottle
HI 4010-05	TISAB II fluoride solution, 1 gallon bottle
HI 4010-10	10 ppm mixed with TISAB II fluoride solution, 500 mL
HI 4010-11	1 ppm mixed with TISAB II fluoride solution, 500 mL
HI 4010-12	2 ppm mixed with TISAB II fluoride solution, 500 mL
HI 4010-30	Kit of fluoride solutions including **HI 4010-00**, **HI 4010-10** and **HI 4010-11**

Maintenance Solutions

HI 7061M	General purpose cleaning solution, 230 mL bottle
HI 8061M	General cleaning solution, 230 mL FDA bottle
HI 7061L	General cleaning solution, 500 mL bottle
HI 8061L	General cleaning solution, 500 mL FDA bottle
HI 7073M	Protein cleaning solution, 230 mL bottle
HI 8073M	Protein cleaning solution, 230 mL FDA bottle
HI 7073L	Protein cleaning solution, 500 mL bottle
HI 8073L	Protein cleaning solution, 500 mL FDA bottle
HI 7077M	Oil and fat cleaning solution, 230 mL bottle
HI 8077M	Oil & fat cleaning solution, 230 mL FDA bottle
HI 7077L	Oil and fat cleaning solution, 500 mL bottle
HI 8077L	Oil & fat cleaning solution, 500 mL FDA bottle
HI 7082	3.5M KCl electrolyte solution, 4 x 50 mL bottle
HI 8082	3.5M KCl electrolyte solution, 4 x 50 mL FDA bottle

Other Accessories

HI 4010	Fluoride electrode with BNC and 1 m (3.3') cable
HI 5313	Reference electrode with 1 m (3.3') cable
HI 7662	Temperature probe with 1 m (3.3') cable
HI 76405	Electrode holder

WARRANTY

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

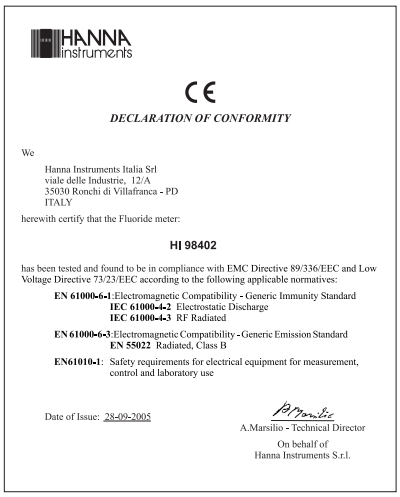
Electrodes and probes are warranted for a period of six months.

This warranty is limited to repair or replacement free of charge. Damages due to accidents, misuse, tampering or lack of prescribed maintenance are not covered.

If service is required, contact the dealer from whom you purchased the instrument. If under warranty, report the model number, date of purchase, serial number and the nature of the failure. If the repair is not covered by the warranty, you will be notified of the charges incurred. If the instrument is to be returned to Hanna Instruments, first obtain a Returned Goods Authorization number from the Customer Service department and then send it with shipping costs prepaid.

When shipping any instrument, make sure it is properly packaged for complete protection.

CE DECLARATION OF CONFORMITY



HANNA instruments

CE

DECLARATION OF CONFORMITY

We

Hanna Instruments Italia Srl
viale delle Industrie, 12/A
35050 Ronchi di Villafranca - PD
ITALY

herewith certify that the Fluoride meter:

HI 98402

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

EN 61000-6-1:Electromagnetic Compatibility - Generic Immunity Standard
IEC 61000-4-2 Electrostatic Discharge
IEC 61000-4-3 RF Radiated

EN 61000-6-3:Electromagnetic Compatibility - Generic Emission Standard
EN 55022 Radiated, Class B

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

Date of Issue: 28-09-2005

A.Marsilio - Technical Director
On behalf of
Hanna Instruments S.r.l.

Recommendations for Users

Before using this product, make sure that it is entirely suitable for the environment in which it is used.

Operation of this instrument in residential areas could cause unacceptable interferences to radio and TV equipment.

Any variation introduced by the user to the supplied equipment may degrade the instrument's EMC performance. To avoid electrical shock, do not use these instruments when voltages at the measurement surface exceed 24 Vac or 60 Vdc.

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

SALES AND TECHNICAL SERVICE CONTACTS

Australia:
Tel. (03) 9769.0666 • Fax (03) 9769.0699

China:
Tel. (10) 88570068 • Fax (10) 88570060

Egypt:
Tel. & Fax (02) 2758.683

Germany:
Tel. (07851) 9129-0 • Fax (07851) 9129-99

Greece:
Tel. (210) 823.5192 • Fax (210) 884.0210

Indonesia:
Tel. (21) 4584.2941 • Fax (21) 4584.2942

Japan:
Tel. (03) 3258.9565 • Fax (03) 3258.9567

Korea:
Tel. (02) 2278.5147 • Fax (02) 2264.1729

Malaysia:
Tel. (603) 5638.9940 • Fax (603) 5638.9829

Singapore:
Tel. 6296.7118 • Fax 6291.6906

South Africa:
Tel. (011) 615.6076 • Fax (011) 615.8582

Taiwan:
Tel. 886.2.2739.3014 • Fax 886.2.2739.2983

Thailand:
Tel. 66.2619.0708 • Fax 66.2619.0061

United Kingdom:
Tel. (01525) 850.855 • Fax (01525) 853.668

USA:
Tel. (401) 765.7500 • Fax (401) 765.7575

For e-mail contacts and complete list of Sales and Technical offices, please see ***www.hannainst.com***

MAN98402 09/05