Instruction Manual
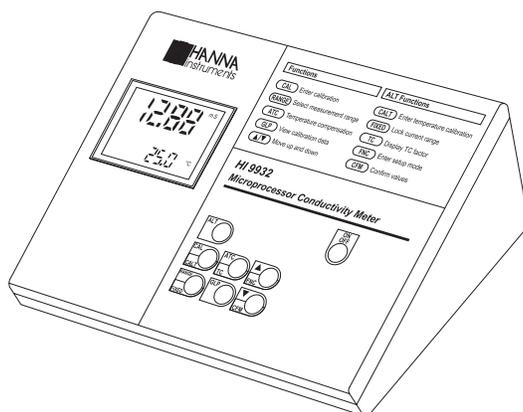
HI 9932

Autoranging Bench Microprocessor EC/TDS/NaCl/°C Meter

HANNA
instruments
Manufacturers since 1978

$C\epsilon$

This Instrument is in Compliance with the CE Directives

Dear Customer,

Thank you for choosing a Hanna Instruments Product.

Please read this instruction manual carefully before using the instrument.

This manual will provide you with the necessary information for a correct use of the 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.

These instruments are in compliance with C€ directives.

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Visit our Internet Home Page:
http://www.hannainst.com

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 damage, notify your Dealer.

Each meter is supplied complete with:

- **HI 76310** *Conductivity/TDS probe*
- *12V DC power adapter*
- *Dust Cover.*

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

GENERAL DESCRIPTION

HI 9932 *is a bench microprocessor-based Conductivity/TDS/NaCl/temperature meter.*

The autoranging feature of the EC and TDS ranges automatically sets the meter to the scale with the highest possible resolution.

The measurements are automatically (ATC) or manually (MTC) compensated for temperature. The temperature coefficient value is user selectable. It is possible to disable the temperature compensation and measure the actual conductivity.

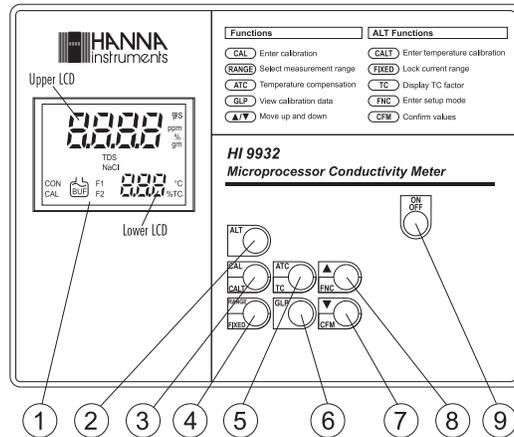*The meter is equipped with a stability indicator.*

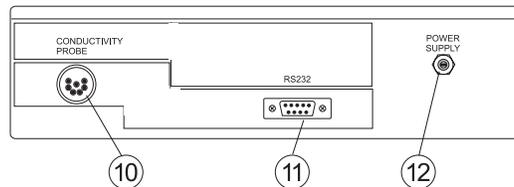**HI 9932** *includes also GLP capability and transfer of data to a computer through an RS232 port.*

In addition, the meter allows the user to enter an ID code to uniquely identify the instrument.

FUNCTIONAL DESCRIPTION

Front Panel

Rear Panel

1) Liquid Crystal Display (LCD)
2) **ALT** key, to alternate key function
3) **CAL / CALT** key, to enter calibration mode
4) **RANGE / FIXED** key, to select measurement range or (with ALT) to freeze the current range on the LCD
5) **ATC / TC** key, to select temperature compensation mode or (with ALT) to view the temperature coefficient value
6) **GLP** key, to display GLP data
7) ▼**CFM** key, to move down or (with ALT) confirm values
8) ▲**FNC** key, to move up or (with ALT) enter setup mode
9) **ON/OFF** key, to turn the meter on and off
10) Probe Connector
11) RS232 connector.
12) Power adapter socket

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SPECIFICATIONS

| Range	EC	0.00 to 29.99 µS/cm
	(Autoranging)	30.0 to 299.9 µS/cm
		300 to 2999 µS/cm
		3.00 to 29.99 mS/cm
		30.0 to 200.0 mS/cm
		Up to 500.0 mS/cm actual[*] Conductivity
	TDS	0.00 to 14.99 ppm
	(Autoranging)	15.0 to 149.9 ppm
		150 to 1499 ppm
		1.50 to 14.99 g/L
		15.0 to 100.0 g/L
		Up to 400.0 g/L actual[*] TDS (with 0.80 factor)
	NaCl	0.0 to 400.0 %
	Temp.	0.0 to 60.0 C
Resolution	EC	0.01 µS/cm (from 0.00 to 29.99 µS/cm)
		0.1 µS/cm (from 30.0 to 299.9 µS/cm)
		1 µS/cm (from 300 to 2999 µS/cm)
		0.01 mS/cm (from 3.00 to 29.99 mS/cm)
		0.1 mS/cm (over 30.0 mS/cm)
	TDS	0.01 ppm (from 0.00 to 14.99 ppm)
		0.1 ppm (from 15.0 to 149.9 ppm)
		1 ppm (from 150 to 1499 ppm)
		0.01 g/L (from 1.50 to 14.99 g/L)
		0.1 g/L (over 15.0 g/L)
	NaCl	0.1 %
	Temp.	01 C
Accuracy	EC	±1% of reading ± (0.05 µS/cm or 1 digit, whichever greater)
	TDS	±1% of reading ± (0.03 ppm or 1 digit, whichever greater)
	NaCl	±1% of reading
	Temp.	±0.4 C
Typical EMC	EC	±1% of reading
Deviation	TDS	±1% of reading
	NaCl	±1% of reading
	Temp.	±0.1 C

[*] Actual conductivity (or TDS) is the non-temperature compensated conductivity (or TDS) value of a solution.

EC Calibration	1 point with 6 memorized buffers 84,1413,5000,12880,80000,111800 µS/cm
NaCl Calibration	1 point with **HI 7037** buffer (optional)
Temperature Calibration	2 points at 0 and 50 C (plus ±1 C adjustment)
Temperature Compensation	Automatic or Manual from 0 to 60 C (can be disabled to measure actual conductivity)
Temperature Coefficient	0.00 to 6.00 %/ C (for EC and TDS only) Default value is 1.90%/ C
TDS Factor	0.40 to 0.80 (default value is 0.50)
Probe	**HI 76310** Platinum 4-ring probe, K=1 nominal and built-in temperature sensor (included)
GLP	Storing of last calibration data
Serial Interface	RS232 - downloading of last calibration data
Auto Off	After 5 minutes (can be disabled)
Power supply	12 VDC adapter (included)
Casing	Bench-top
Environment	0 to 50 C ; 95% RH non-condensing
Dimensions	230 x 170 x 70 mm (9.1 x 6.7 x 2.7")
Weight	1 Kg (2.2 lb.)

CONNECTIONS

The connectors are located on the rear panel.

Connect the voltage adapter to the power adapter socket. Connect the EC/TDS probe to the 7-pin connector. Tighten the threaded ring.

Make sure the probe sleeve is properly inserted, as shown below.
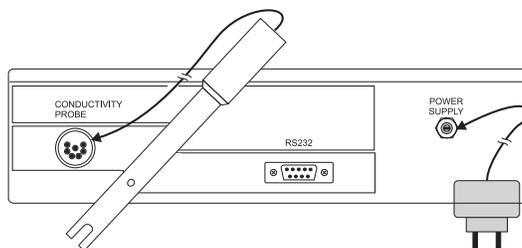
TAKING MEASUREMENTS

Press the ON/OFF key to turn the meter on.

Immerse the probe into the solution to be tested. The sleeve holes must be completely submerged. Tap the probe repeatedly to remove any air bubbles that may be trapped inside the sleeve.

If needed, press the RANGE key repeatedly until the desired range (EC, TDS, NaCl) is selected on the LCD.

Allow for the reading to stabilize. The upper LCD displays the measure in the selected range while the temperature is displayed on the lower LCD.

Notes

I   *If the meter displays "----" the reading is out of range.*

II   *If the reading is unstable, the stability indicator "∼" blinks.*

III *The "gm" indication on the LCD means g/L.*

IV   *Make sure the meter is calibrated before taking measurements.*

V   *If measurements are taken successively in different samples, to have accurate readings it is recommended to rinse the probe thoroughly with deionized water before immersion in the samples.*

VI   *TDS reading is obtained multiplying the EC reading by the TDS factor, which has a default value of 0.50. It is possible to change the TDS factor in the 0.40 to 0.80 range by entering the setup mode and selecting the "tdS" item (see SETUP for details).*

VII *When the use of an alternate function (FNC, CFM,FIXED,TC and CALT) is requested, press and hold the ALT key first and then the second key.*

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AUTORANGING

The EC and TDS scales are autoranging. The meter automatically sets the scale with the highest possible resolution.

By pressing ALT+FIXED, the autoranging feature is disabled and the current range is frozen on the LCD. "F1" symbol blinks on the LCD.

To restore the autoranging option press ALT+FIXED again.

Note: *Autoranging is automatically restored if the range is changed, if the setup or calibration modes are entered and if the meter is turned off and back on again.*

TEMPERATURE COMPENSATION

Three options of compensating temperature are available:

Automatic (Atc)*: The probe has a built-in temperature sensor; the value of the temperature is used to automatically compensate the EC/ TDS reading using 25 C as reference temperature. This is the default option.*

Manual (Mtc)*: The temperature value, shown on the lower LCD, can be manually set with the arrow keys. The compensation is referenced at 25 C. The " C" symbol blinks when this option is active.*

No Compensation (notc)*: The temperature value shown on the lower LCD is not taken into account. The reading displayed on the upper LCD is the actual EC or TDS value. The " C" and "%TC" symbols blink when this option is active.*

To select the desired option press the ATC key until the option is briefly displayed on the LCD.

Note*: The default compensation mode is ATC.*

If temperature compensation is active, measurements are compensated using a default temperature coefficient of 1.90 %/ C.

It is possible to select a different temperature coefficient (TC) in the 0.00 to 6.00 %/ C range. To change the TC factor enter the setup mode and select the "tc" item (see SETUP for details).

The current temperature coefficient can be quickly viewed pressing ALT+TC. The value is briefly displayed on the lower LCD.

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EC/TDS/MΩ CALIBRATION

Calibration is a 1-point procedure. Selectable calibration points are: 0.0, 84.0μS, 1413μS, 5.00mS, 12.88mS, 80.0mS,111.8mS.

To enter EC calibration select the EC range and press the CAL key.

Note: *TDS reading is automatically derived from the EC reading and no specific calibration for TDS is needed. Pressing CAL while TDS range is selected has no effect.*

Rinse the probe with some of the calibration solution or deionized water. Immerse the probe into the solution. The sleeve holes must be completely submerged. Tap the probe repeatedly to remove any air bubbles that may be trapped inside the sleeve.

For zero calibration, just leave the dry probe in air.

The indications "BUF" and "CAL" are displayed. The upper LCD shows the uncalibrated EC reading. The lower LCD shows the buffer value. The stability indicator "∼" blinks.
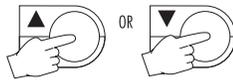
Select the desired value with the ▲ and ▼ keys, if necessary.

When the "∼" symbol stops blinking, the reading is stable. The "CON" indication starts blinking on the LCD asking for confirmation.

Press ALT + CFM to confirm the calibration.

If everything is satisfactory, the meter displays the "Stor Good" message and returns to measurement mode.

Notes

I   *If the uncalibrated reading is too far from the expected value, calibration is not recognized. The "CON" indication does not appear; the "∼" and "BUF" symbols blink to signal wrong or contaminated calibration solution.*

II   *For best results choose an EC buffer value close to the sample to be measured.*

III *In order to minimize any EMC interference, use plastic beakers.*

IV *The meter uses 1.90%/℃ compensation factor during calibration. If the setup item "tc" has been set to a different value, when exiting the calibration mode the value displayed on the upper LCD could be different from the nominal buffer value.*

V *It is possible to set the cell constant value directly without following the calibration procedure. To set the cell constant enter the setup mode and select "CEL" (see SETUP for details).*

NaCl CALIBRATION

Calibration is 1-point at 100.0% NaCl. Use the **HI 7037** *calibration solution (sea water solution) as a 100% NaCl standard solution.*

To enter NaCl calibration select the NaCl range and press the CAL key.

Rinse the probe with some of the calibration solution or deionized water. Immerse the probe into HI 7037 solution. The sleeve holes must be completely submerged. Tap the probe repeatedly to remove any air bubbles that may be trapped inside the sleeve.

The indications "BUF" and "CAL" are displayed. The upper LCD shows the uncalibrated NaCl reading in percentage. The lower LCD shows "100".

When the "∼" symbol stops blinking, the reading is stable. The "CON" indication starts blinking on the LCD asking for confirmation.

Press ALT + CFM to confirm the calibration.

If everything is satisfactory, the meter displays the "Stor Good" message and returns to measurement mode.

Note: *If the uncalibrated reading is too far from the expected value, the calibration is not recognized. The "CON" indication does not appear; the "∼" and "BUF" symbols blink to signal wrong or contaminated calibration solution.*

Note: *The meter uses 1.90%/℃ compensation factor during calibration. If the setup item "tc" has been set to a different value, when exiting the calibration mode the value displayed on the LCD could be different from the nominal calibration value.*

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TEMPERATURE CALIBRATION
(for technical personnel only)

The calibration is 2 points at 0.0, 50.0°C.

- *Immerse the probe in a 0°C temperature bath.*
- *Press ALT+CALT to enter temperature calibration mode.*
- *The lower LCD displays "0.0°C"; "BUF" and "CAL" tags appear.*
- *When the reading is stable, "CON" symbol starts to blink.*
- *Press ALT+CFM to confirm. The lower LCD displays 50.0°C.*
- *Immerse the probe in a 50°C temperature bath.*
- *When the reading is stable, "CON" symbol starts to blink.*
- *Press ALT+CFM to confirm and return to normal operation.*
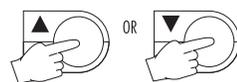
TEMPERATURE ADJUSTMENT

The temperature reading can be manually fine-tuned by following this procedure:

Press ALT+CALT to enter the temperature calibration mode.

Press CAL to enter the temperature adjustment mode. The upper and lower LCD will display the current temperature reading.

Adjust the temperature reading on the upper LCD using the arrow keys. The maximum adjustment is ±1°C around current reading.

Press ALT+CFM to confirm. The meter returns to measurement mode and displays the new temperature.

Note: *Press ALT+CALT to escape without any changes.*

Note: *It is possible to enter the temperature adjustment mode* **only if the probe is connected**.

CONDUCTIVITY VERSUS TEMPERATURE CHART

The conductivity of an aqueous solution is the measure of its ability to carry an electrical current by means of ionic motion.

The conductivity invariably increases with increasing temperature.

It is affected by the type and number of ions in the solution and by the viscosity of the solution itself. Both parameters are temperature dependent. The dependency of conductivity on temperature is expressed as a relative change per degree Celsius at a particular temperature, commonly as percent per °C.

The following table lists the temperature dependence of the HANNA calibration buffers.

| C	F	HI 7030 HI 8030 (µS/cm)	HI 7031 HI 8031 (µS/cm)	HI 7033 HI 8033 (µS/cm)	HI 7034 HI 8034 (µS/cm)	HI 7035 HI 8035 (µS/cm)	HI 7039 HI 8039 (µS/cm)
0	32	7150	776	64	48300	65400	2760
5	41	8220	896	65	53500	74100	3180
10	50	9330	1020	67	59600	83200	3615
15	59	10480	1147	68	65400	92500	4063
16	60.8	10720	1173	70	67200	94400	4155
17	62.6	10950	1199	71	68500	96300	4245
18	64.4	11190	1225	73	69800	98200	4337
19	66.2	11430	1251	74	71300	100200	4429
20	68	11670	1278	76	72400	102100	4523
21	69.8	11910	1305	78	74000	104000	4617
22	71.6	12150	1332	79	75200	105900	4711
23	73.4	12390	1359	81	76500	107900	4805
24	75.2	12640	1386	82	78300	109800	4902
25	77	12880	1413	84	80000	111800	5000
26	78.8	13130	1440	86	81300	113800	5096
27	80.6	13370	1467	87	83000	115700	5190
28	82.4	13620	1494	89	84900	117700	5286
29	84.2	13870	1521	90	86300	119700	5383
30	86	14120	1548	92	88200	121800	5479
31	87.8	14370	1575	94	90000	123900	5575

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SETUP

Setup is used to view or change the instrument parameters.

To enter setup press ALT+FNC when the meter is in measurement mode.

"Set" is displayed on the upper LCD. The lower LCD displays the blinking code of the current setup item.
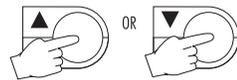
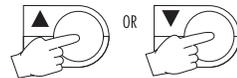*Select the desired setup item using the ▲ or ▼ key.*

Press ALT+CFM to confirm.

Note: *If ALT+FNC are pressed before item confirmation, the meter will escape and return to measurement mode.*

Once the desired setup item has been selected, its current value blinks (if it is a changeable parameter).

To change the value use the ▲ or ▼ key.

If there is another part of the item to be set (e.g. month in setting up the correct date), press RANGE to gain access to it.

The value of the flashing part can be changed with the arrow keys.

Press ALT+CFM to confirm.

Note: *Press ALT+FNC before confirmation to escape without changing the previously set value.*

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The following table lists the setup items, their valid range of values and the factory settings (default):

Item	Description	Valid values	Default
tc	Temp. compensation coeff.	0.00 to 6.00 %/ C	1.90
tcE	Temp. compensation mode	Atc, Mtc, notc	Atc
tdS	TDS factor	0.40 to 0.80	0.50
CEL	Cell constant (K)	0.500 to 1.700	1.000
AoF	Auto-Off enabled	On, OFF	OFF
YEA	Year	1999 to 2098	1999
dAt	Date (DD.MM)	01.01 to 31.12	01.01
hou	Time (hh.mm)	00.00 to 23.59	00.00
id	Meter identification code	0000 to 9999	0000
vEr	Firmware release		

Notes:

I   *Once enabled, the Auto-Off time is fixed at 5 minutes.*

II   *Assigning an ID code is helpful in identifying a particular meter from others.*

GOOD LABORATORY PRACTICE

Good Laboratory Practice (GLP) is a set of functions that allows the storage and retrieval of data regarding the status of the system.

After a successful calibration, the meter automatically stores the date and time of calibration, the calibration solution used and the resulting cell constant value. All such information can be recalled by the user.

To view last calibration data select the desired range (EC or NaCl) and press the GLP key.
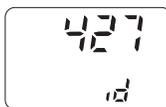
The first information appearing on the LCD is the meter "id" code.

By repeatedly pressing the RANGE key, the GLP data are displayed in the following order:
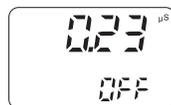

Last calibration date.

20.00 *dAt*	Last calibration year.
15.32 *hou*	Last calibration time.
1.025 *CEL*	Cell constant value (K).
0.23 µS *OFF*	Offset value. This information is displayed only if the last calibration was performed at 0.00 µS.
1413 µS BUF	Calibration solution used. If the cell constant was changed after calibration (through "CEL" setup function), this information is not displayed.
44.3 mS BUF *10.5* °C	For NaCl GLP, the last parameter is not the nominal value of the calibration solution but the actual conductivity (non-temperature compensated) and the temperature of the calibration solution used.

If the RANGE key is pressed when the last parameter is displayed, the meter returns to measurement mode.

Notes

I   *It is possible to escape from GLP at any time by pressing ALT+GLP.*

II   *If the calibration procedure was never performed, after displaying the ID code the LCD will show the* "**no CAL**" *message. Press RANGE or ALT+GLP to escape to measurement mode.*

III *Last calibration data are available for EC and NaCl only. No calibration data can be recalled for TDS. If the meter is in TDS mode, by pressing ALT+GLP it is only possible to view the ID code. Press ALT+GLP again to return to measurement mode.*

IV   *The meter has an internal lithium battery that allows to correctly update the date and time even if the power is disconnected.*

DATA TRANSFER TO PC

Connect the meter to a PC through the RS232 output (#11 on page 4). Use **HI 920010** *(9 to 9-pin) connection cable.*
The meter must be in measurement mode to communicate.
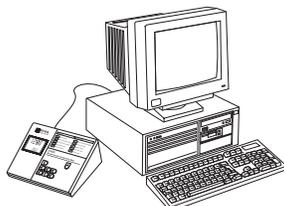
The meter RS232 port is optoisolated and transmits data with a Baud rate of 2400 bps.
*Retrieve the GLP data and request the meter parameters and the current reading (of the current range only) from the PC directly. It is also possible to send a command from the PC to set the meter in a different range.*
To communicate with the PC use the **HI 92000** *communication software. The software is provided with an exhaustive on-line guide of all the commands available and allows data printing, plotting and exporting.*

PROBE MAINTENANCE

Rinse the probe with clean water after measurements. If a more thorough cleaning is required, remove the probe sleeve and clean the probe with a cloth or a nonabrasive detergent. Make sure to reinsert the sleeve onto the probe properly and in the right direction. After cleaning the probe, recalibrate the instrument.
The platinum rings support is made of glass. Take great care while handling the probe.

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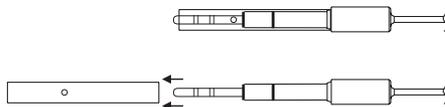
ACCESSORIES

CONDUCTIVITY BUFFER SOLUTIONS

HI 70030P	*12880 µS/cm (µmho/cm), 20mL sachets (25 pcs.)*
HI 7030L	*12880 µS/cm (µmho/cm), 460mL bottle*
HI 7030M	*12880 µS/cm (µmho/cm), 230mL bottle*
HI 70031P	*1413 µS/cm (µmho/cm), 20mL sachets (25 pcs.)*
HI 7031L	*1413 µS/cm (µmho/cm), 460mL bottle*
HI 7031M	*1413 µS/cm (µmho/cm), 230mL bottle*
HI 70033P	*84 µS/cm (µmho/cm), 20mL sachets (25 pcs.)*
HI 7033L	*84 µS/cm (µmho/cm), 460mL bottle*
HI 7033M	*84 µS/cm (µmho/cm), 230mL bottle*
HI 7034L	*80000 µS/cm (µmho/cm), 460mL bottle*
HI 7034M	*80000 µS/cm (µmho/cm), 230mL bottle*
HI 7035L	*111800 µS/cm (µmho/cm), 460mL bottle*
HI 7035M	*111800 µS/cm (µmho/cm), 230mL bottle*
HI 70039P	*5000 µS/cm (µmho/cm), 20mL sachets (25 pcs.)*
HI 7039L	*5000 µS/cm (µmho/cm), 460mL bottle*
HI 7039M	*5000 µS/cm (µmho/cm), 230mL bottle*
HI 8030L	*12880 µS/cm (µmho/cm), 460mL FDA approved bottle*
HI 8031L	*1413 µS/cm (µmho/cm), 460mL FDA approved bottle*
HI 8033L	*84 µS/cm (µmho/cm), 460mL FDA approved bottle*
HI 8034L	*80000 µS/cm (µmho/cm), 460mL FDA approved bottle*
HI 8035L	*111800 µS/cm (µmho/cm),460mL FDA approved bottle*
HI 8039L	*5000 µS/cm (µmho/cm), 460mL FDA approved bottle*
HI 7037L	*100% NaCl sea water standard solution, 460mL*

PROBE CLEANING SOLUTIONS

HI 7061M	*General Cleaning Sol., 230mL bottle*
HI 7061L	*General Cleaning Sol., 460mL bottle*
HI 8061M	*General Cleaning Sol., 230mL FDA approved bottle*
HI 8061L	*General Cleaning Sol., 460mL FDA approved bottle*

OTHER ACCESSORIES

HI 76310	*platinum 4-ring conductivity/TDS probe with temperature sensor and 1m (3.3') cable.*
HI 710005	*12VDC voltage adapter (US plug)*
HI 710006	*12VDC voltage adapter (European plug)*
HI 920010	*9 to 9-pin connection cable*
HI 92000	*Windows® compatible software*

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.* **The electrodes and the probes are warranted for a period of six months.** *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 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.

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

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

CE DECLARATION OF CONFORMITY

HANNA instruments

$C\,E$

DECLARATION OF CONFORMITY

We

Hanna Instruments Italia Srl
via E.Fermi, 10
35030 Sarmeola di Rubano - PD
ITALY

herewith certify that the EC/TDS meter

HI 9932

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

EN 50082-1: Electromagnetic Compatibility - Generic Immunity Standard
       IEC 801-2 Electrostatic Discharge
       IEC 801-3 RF Radiated
       IEC 801-4 Fast Transient

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

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

Date of Issue: 24-1-2000

P. Cesa - 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 area could cause unacceptable interference to radio and TV equipment, requiring the operator to take all necessary steps to correct interference.

The metal bands of the probe are sensitive to electrostatic discharges. Avoid touching these metal bands at all times.

To maintain the EMC performance of this equipment the recommended cables must be used.

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

To avoid electrical shock, do not use this instrument when voltage at the measurement surface exceeds 24 VAC or 60 VDC.

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

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HANNA LITERATURE

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

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

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

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

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