

## Instruction Manual

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**HI 8510 • HI 8512  
HI 8710 • HI 8711  
HI 8720**

**Panel Mounted  
pH and ORP  
Indicators and Controllers**



[www.hannainst.com](http://www.hannainst.com)

Dear Customer,  
 Thank you for choosing a HANNA instruments® product.  
 Please read this instruction manual carefully before using the instrument.  
 If you need additional technical information, do not hesitate to e-mail us at **tech@hannainst.com**.  
 These instruments are in compliance with the **CE** directives.

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## 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 model is supplied complete with transparent splash-proof front cover, mounting brackets and instruction manual

**Note:** Save all packing materials until you are sure that the instrument functions correctly. All defective items must be returned in the original packing materials together with the supplied accessories.

## GENERAL DESCRIPTION

**HI 8510** and **HI8512** pH and ORP panel-mounted indicators, and **HI 8710**, **HI 8711** and **HI 8720** pH and ORP controllers, are ideal for process control monitoring in a wide range of industrial applications.

These instruments have been designed for easy and fast installation, and are provided with membrane keypads on the front panel, large display and autodiagnostic functions.

All connections are made through screw terminals on the rear panel.

Two versions are available for each model, to accept either a direct input from a pH or ORP electrode (E version) or from a transmitter through 4-20 mA input (T version).

Moreover, you can choose the output configuration for connecting a recorder or a PLC, between 0-20 or 4-20 mA.

## AVAILABLE MODELS

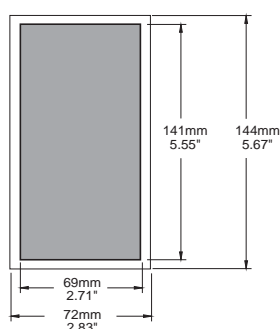
<b>HI 8510E020</b>	pH indicator with electrode input and 0-20 mA recorder output
<b>HI 8510E420</b>	pH indicator with electrode input and 4-20 mA recorder output
<b>HI 8510T020</b>	pH indicator with input from transmitter and 0-20 mA recorder output
<b>HI 8510T420</b>	pH indicator with input from transmitter and 4-20 mA recorder output
<b>HI 8512E020</b>	ORP indicator with electrode input and 0-20 mA recorder output
<b>HI 8512E420</b>	ORP indicator with electrode input and 4-20 mA recorder output
<b>HI 8512T020</b>	ORP indicator with input from transmitter and 0-20 mA recorder output
<b>HI 8512T420</b>	ORP indicator with input from transmitter and 4-20 mA recorder output
<b>HI 8710E020</b>	pH controller with electrode input and 0-20 mA recorder output
<b>HI 8710E420</b>	pH controller with electrode input and 4-20 mA recorder output

<b>HI 8710T020</b>	pH controller with input from transmitter and 0-20 mA recorder output
<b>HI 8710T420</b>	pH controller with input from transmitter and 4-20 mA recorder output
<b>HI 8711E020</b>	pH controller with 2 setpoints, electrode input and 0-20 mA recorder output
<b>HI 8711E420</b>	pH controller with 2 setpoints, electrode input and 4-20 mA recorder output
<b>HI 8711T020</b>	pH controller with 2 setpoints, input from transmitter and 0-20 mA recorder output
<b>HI 8711T420</b>	pH controller with 2 setpoints, input from transmitter and 4-20 mA recorder output
<b>HI 8720E020</b>	ORP controller with electrode input and 0-20 mA recorder output
<b>HI 8720E420</b>	ORP controller with electrode input and 4-20 mA recorder output
<b>HI 8720T020</b>	ORP controller with input from transmitter and 0-20 mA recorder output
<b>HI 8720T420</b>	ORP controller with input from transmitter and 4-20 mA recorder output

## MECHANICAL DIMENSIONS

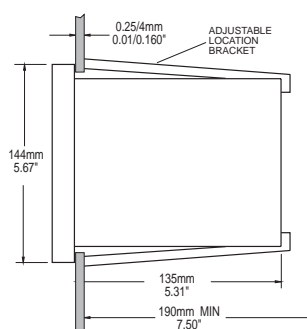
The meters are provided with a black anodized aluminum body, front and back panels in shockproof ABS plastic and a transparent splash-proof front cover.

*Front view of the panel-mounted unit*



The dimensions show the cutout size for the installation.

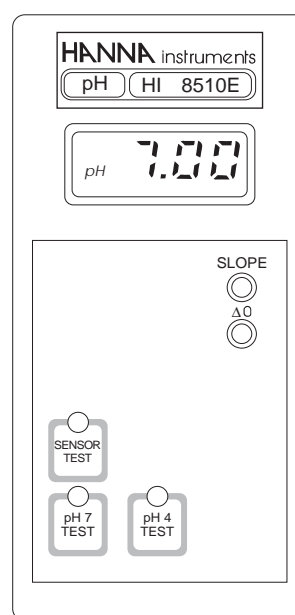
*Side view of the panel-mounted unit*



Adjustable location brackets (supplied with the meter) allow the indicator to slide into the cutout and will hold the unit securely in place. 190 mm (7.50") is the minimum space required to install the indicator with complete wiring.

## FUNCTIONAL DESCRIPTION HI 8510

### FRONT PANEL



### Keypad

#### SENSOR TEST

To display the mV reading of the electrode and, therefore, verify its working condition

#### pH 7 TEST

To verify the internal circuit of the meter in terms of Offset compensation

#### pH 4 TEST

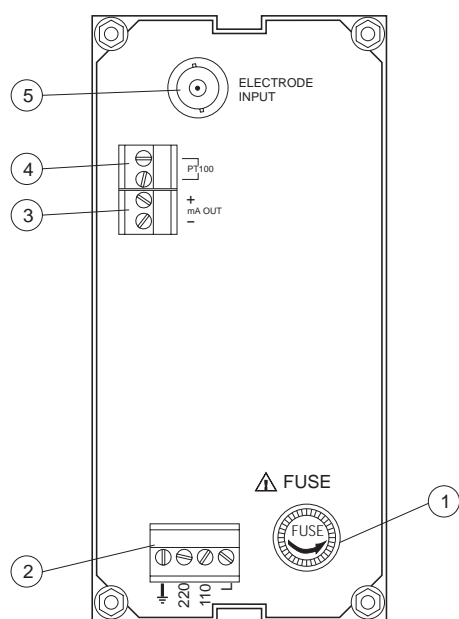
To verify the amplifier circuit of the meter

### Trimmers

**ΔO** For Offset calibration

**SLOPE** For Slope calibration

### REAR PANEL HI8510E

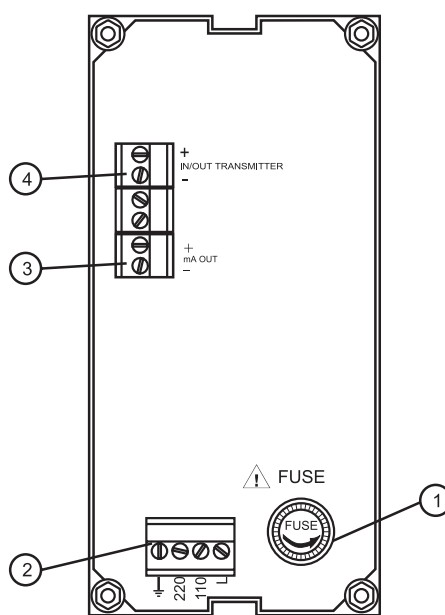


1. Fuse holder
2. Power supply terminals
3. Recorder output terminals
4. Connections for Pt100 temperature sensor
5. BNC socket for pH electrode



Unplug the instrument from the power supply before replacing the fuse.

### REAR PANEL HI8510T



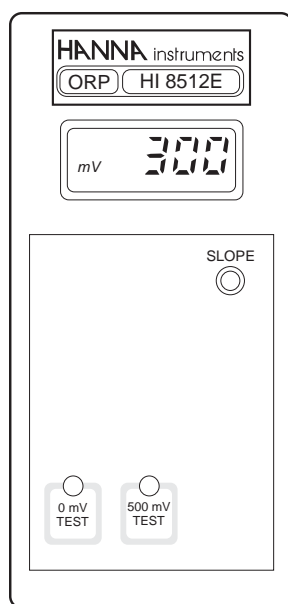
1. Fuse holder
2. Power supply terminals
3. Recorder output terminals
4. Connections to the transmitter



Unplug the instrument from the power supply before replacing the fuse.

## FUNCTIONAL DESCRIPTION HI 8512

### FRONT PANEL



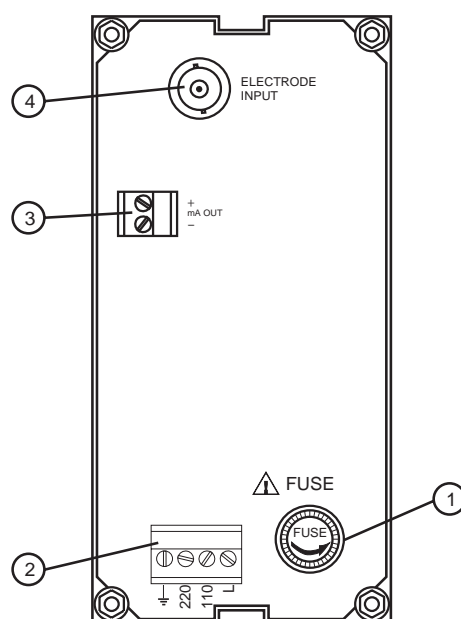
### Keypad

- 0 mV TEST** To verify the instrument calibration at 0 mV
- 500 mV TEST** To verify the slope at 500 mV

### Trimmers

- SLOPE** For slope calibration

### REAR PANEL HI8512E

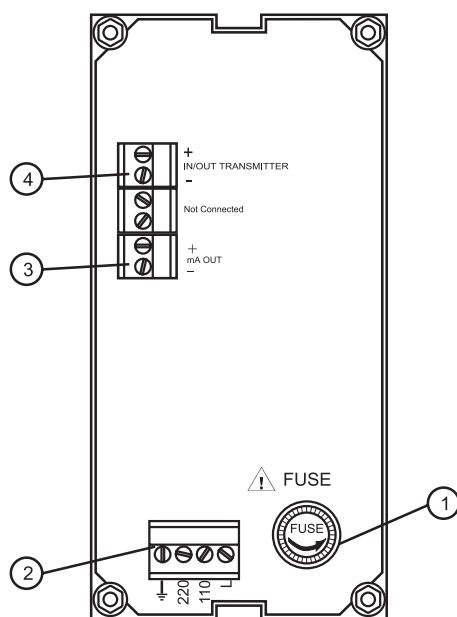


1. Fuse holder
2. Power supply terminals
3. Recorder output terminals
4. BNC socket for ORP electrode



Unplug the instrument from the power supply before replacing the fuse.

## REAR PANEL HI 8512T



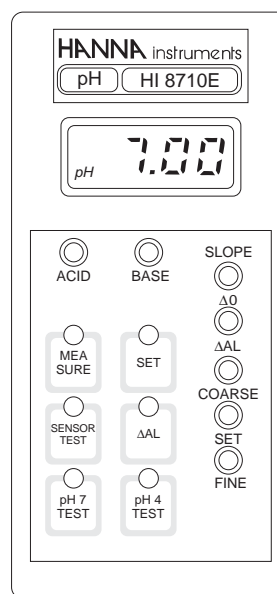
1. Fuse holder
2. Power supply terminals
3. Recorder output terminals
4. Connections to the transmitter



Unplug the instrument from the power supply before replacing the fuse.

## FUNCTIONAL DESCRIPTION HI 8710

## FRONT PANEL



### Keypad

<b>SET</b>	To set the pH dosage limit
<b>MEASURE</b>	To enter measurement mode and to enable diagnostic tests
<b>SENSOR TEST</b>	To display electrode mV reading and verify its working condition
<b>ΔAL</b>	To display & set alarm tolerance
<b>pH 7 TEST</b>	To verify Offset compensation
<b>pH 4 TEST</b>	To verify amplifier circuit

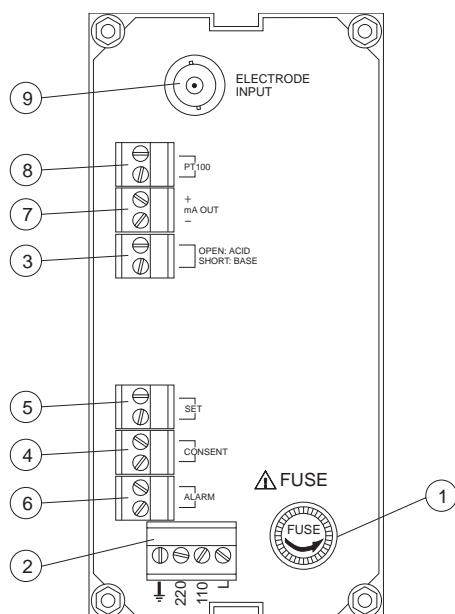
### Trimmers

<b>ΔO</b>	For Offset calibration
<b>SLOPE</b>	For Slope calibration
<b>ΔAL</b>	To set the alarm tolerance
<b>SET/COARSE</b>	To coarsely adjust the setpoint
<b>SET/FINE</b>	To finely adjust the setpoint


### LEDs

<b>ACID</b>	Show that acid dosage is active
<b>BASE</b>	Show that basic dosage is active
<b>ΔAL (blinking)</b>	Indicate an active alarm

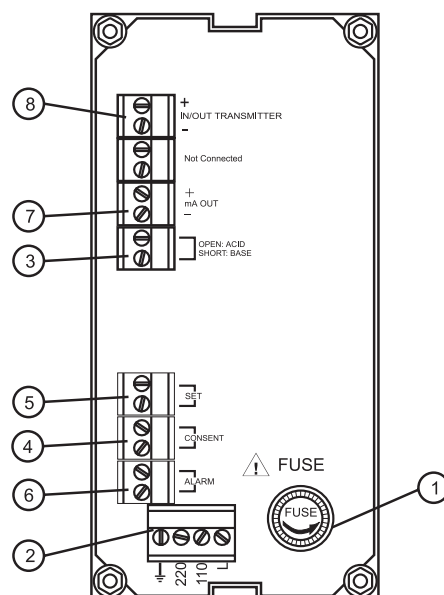
## REAR PANEL HI8710E




1. Fuse holder
2. Power supply terminals
3. Acid/Basic dosage selection terminals
4. Red/ox dosage consent terminals
5. Connections for dosing pump
6. Alarm contacts
7. Recorder output contacts
8. Connections for Pt100 temperature sensor
9. BNC socket for pH electrode

 Unplug the instrument from the power supply before replacing the fuse.

## REAR PANEL HI8710T



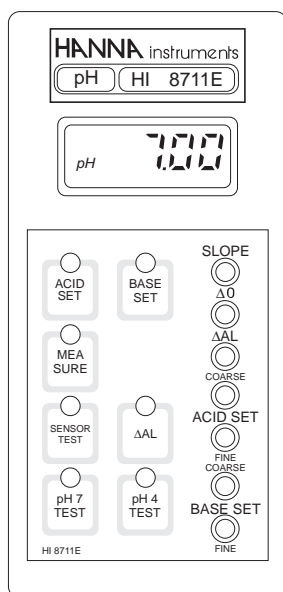
1. Fuse holder
2. Power supply terminals
3. Acid/Basic dosage selection terminals
4. Red/ox dosage consent terminals
5. Connections for dosing pump
6. Alarm contacts
7. Recorder output contacts
8. Connections to the transmitter

 Unplug the instrument from the power supply before replacing the fuse.



## FUNCTIONAL DESCRIPTION HI 8711

### FRONT PANEL



#### Keypad

<b>ACID SET</b>	To set the working point of acid dosage
<b>BASE SET</b>	To set the working point of basic dosage
<b>MEASURE</b>	To enter measurement mode and to enable diagnostic tests
<b>SENSOR TEST</b>	To display electrode mV reading and, therefore, verify its working condition

<b>ΔAI</b>	To display and set the alarm tolerance
<b>pH 7 TEST</b>	To verify Offset compensation
<b>pH 4 TEST</b>	To verify amplifier circuit

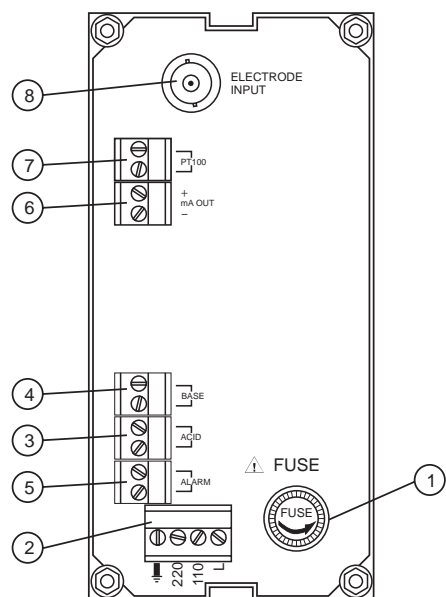
#### Trimmers

<b>ΔO</b>	For Offset calibration
<b>SLOPE</b>	For Slope calibration
<b>ΔAL</b>	To set the tolerance of the alarm
<b>ACID SET/COARSE</b>	To coarsely adjust acid setpoint
<b>ACID SET/FINE</b>	To finely adjust acid setpoint
<b>BASE SET/COARSE</b>	To coarsely adjust basic setpoint
<b>BASE SET/FINE</b>	To finely adjust basic setpoint

#### LEDs

<b>ACID SET (Blinking)</b>	Show that acid dosage is active
<b>BASE SET (Blinking)</b>	Show that basic dosage is active
<b>ΔAL (Blinking)</b>	Indicate active alarm

## REAR PANEL HI 8711E

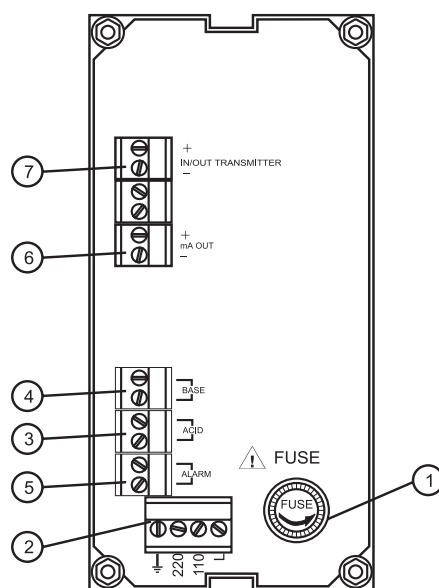


1. Fuse holder
2. Power supply terminals
3. Connections for dosing pump for acid
4. Connections for dosing pump for base
5. Alarm contacts
6. Recorder output contacts
7. Connections for Pt100 temperature sensor
8. BNC socket for pH electrode



Unplug the instrument from the power supply before replacing the fuse.

## REAR PANEL HI 8711T



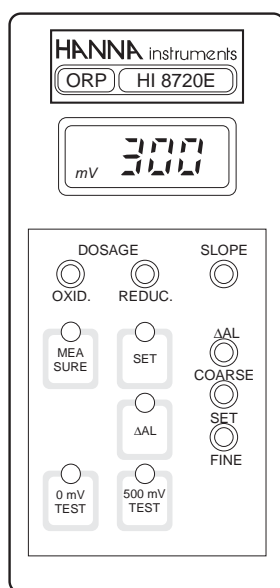
1. Fuse holder
2. Power supply terminals
3. Connections for dosing pump for acid
4. Connections for dosing pump for base
5. Alarm contacts
6. Recorder output contacts
7. Connections to the transmitter



Unplug the instrument from the power supply before replacing the fuse.

## FUNCTIONAL DESCRIPTION HI 8720

### FRONT PANEL



### Trimmers

- SLOPE** For Slope calibration
- ΔAL** To display and set the alarm tolerance
- SET/COARSE** To coarsely adjust the setpoint
- SET/FINE** To finely adjust the setpoint

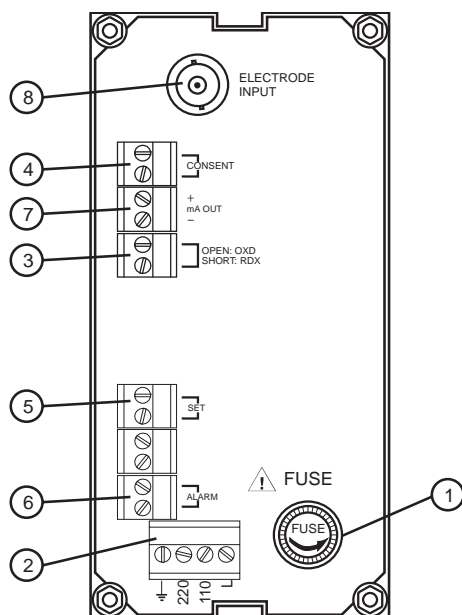
### LEDs

- OXID** Show that the oxidant dosage is active
- REDUC** Show that the reductant dosage is active
- ΔAL (blinking)** Indicate an active alarm


### Keypad

- SET** To set the working point of ORP dosage
- MEASURE** To enter measurement mode and to enable diagnostic tests
- ΔAI** To display and set the alarm tolerance
- 0 mV TEST** To verify the instrument calibration at 0 mV
- 500 mV TEST** To verify the slope at 500 mV

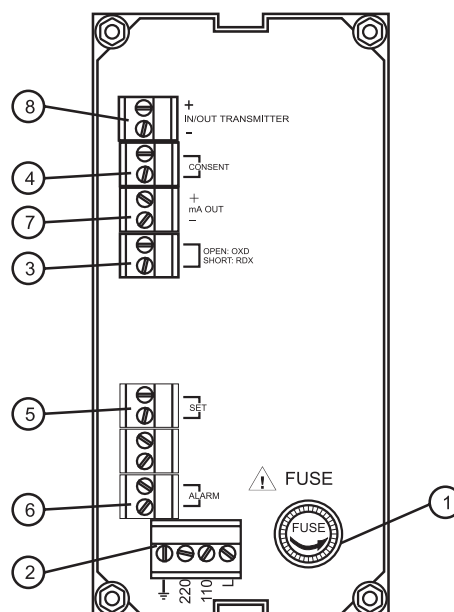
## REAR PANEL HI 8720E




1. Fuse holder
2. Power supply terminals
3. Ox/Red dosage selection terminals
4. Ox/red dosage consent terminals
5. Connections for dosing pump
6. Alarm contacts
7. Recorder output contacts
8. BNC socket for ORP electrode

 Unplug the instrument from the power supply before replacing the fuse.

## REAR PANEL HI 8720T



1. Fuse holder
2. Power supply terminals
3. Ox/Red dosage selection terminals
4. Ox/red dosage consent terminals
5. Connections for dosing pump
6. Alarm contacts
7. Recorder output contacts
8. Connections to the transmitter

 Unplug the instrument from the power supply before replacing the fuse.

## SPECIFICATIONS

	HI 8510E	HI 8510T
<b>Range</b>	0.00 to 14.00 pH	
<b>Resolution</b>	0.01 pH	
<b>Accuracy</b>	±0.02 pH	±0.5%
<b>Typical EMC Dev.</b>	±0.1 pH / ±0.2 mA	
<b>Installation Category</b>	II	
<b>Input</b>	10 <sup>12</sup> Ohm	4 to 20 mA
<b>Calibration</b>	Offset: ±2 pH with Δ0 trimmer Slope: 80 to 110% with slope trimmer	
<b>Temperature Compensation</b>	Fixed or automatic with Pt100 from 0 to 100°C (32 to 212°F)	
<b>Recorder Output</b>	0-20 mA or 4-20 mA (isolated)	
<b>Power Supply</b>	115 or 230 Vac; 50/60 Hz	
<b>Environment</b>	-10 to 50°C (14 to 122°F); RH max 95% non condensing	
<b>Panel Cutout</b>	141 x 69 mm (5.6 x 2.7")	
<b>Weight</b>	1 kg (2.2 lb.)	

	HI 8512E	HI 8512T
<b>Range</b>	±1000 mV	
<b>Resolution</b>	1 mV	
<b>Accuracy</b>	±5 mV	±0.5%
<b>Typical EMC Dev.</b>	±6 mV / ±0.2 mA	
<b>Installation Category</b>	II	
<b>Input</b>	10 <sup>12</sup> Ohm	4 to 20 mA
<b>Calibration</b>	Slope: 90 to 110% with slope trimmer	
<b>Recorder Output</b>	0-20 mA or 4-20 mA (isolated)	
<b>Power Supply</b>	115 or 230 Vac; 50/60 Hz	
<b>Environment</b>	-10 to 50°C (14 to 122°F); RH max 95% non condensing	
<b>Panel Cutout</b>	141 x 69 mm (5.6 x 2.7")	
<b>Weight</b>	1 kg (2.2 lb.)	

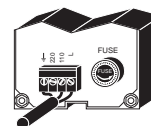
	HI 8710E	HI 8710T
<b>Range</b>	0.00 to 14.00 pH	
<b>Resolution</b>	0.01 pH	
<b>Accuracy</b>	±0.02 pH	±0.5%
<b>Typical EMC Dev.</b>	±0.1 pH / ±0.2 mA	
<b>Installation Category</b>	II	
<b>Input</b>	10 <sup>12</sup> Ohm	4 to 20 mA
<b>Calibration</b>	Offset: ±2 pH with Δ0 trimmer Slope: 80 to 110% with slope trimmer	
<b>Temperature Compensation</b>	Fixed or automatic with Pt100 from 0 to 100°C (32 to 212°F)	
<b>Relays</b>	1 for setpoint and 1 for alarm, max 2A, 240 V resistive load (isolated)	
<b>Recorder Output</b>	0-20 mA or 4-20 mA (isolated)	
<b>Power Supply</b>	115 or 230 Vac; 50/60 Hz	
<b>Environment</b>	-10 to 50°C (14 to 122°F); RH max 95% non condensing	
<b>Panel Cutout</b>	141 x 69 mm (5.6 x 2.7")	
<b>Weight</b>	1 kg (2.2 lb.)	

	HI 8711E	HI 8711T
<b>Range</b>	0.00 to 14.00 pH	
<b>Resolution</b>	0.01 pH	
<b>Accuracy</b>	±0.02 pH	±0.5%
<b>Typical EMC Dev.</b>	±0.1 pH / ±0.2 mA	
<b>Installation Category</b>	II	
<b>Input</b>	10 <sup>12</sup> Ohm	4 to 20 mA
<b>Calibration</b>	Offset: ±2 pH with Δ0 trimmer Slope: 80 to 110% with slope trimmer	
<b>Temperature Compensation</b>	Fixed or automatic with Pt100 from 0 to 100°C (32 to 212°F)	
<b>Relays</b>	2 for setpoint and 1 for alarm, max 2A, 240 V resistive load (isolated)	
<b>Recorder Output</b>	0-20 mA or 4-20 mA (isolated)	
<b>Power Supply</b>	115 or 230 Vac; 50/60 Hz	
<b>Environment</b>	-10 to 50°C (14 to 122°F); RH max 95% non condensing	
<b>Panel Cutout</b>	141 x 69 mm (5.6 x 2.7")	
<b>Weight</b>	1 kg (2.2 lb.)	

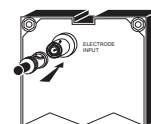
	HI 8720E	HI 8720T
Range	$\pm 1000$ mV	
Resolution	1 mV	
Accuracy	$\pm 5$ mV	$\pm 0.5\%$
Typical EMC Dev.	$\pm 6$ mV / $\pm 0.2$ mA	
Installation Category	II	
Input	$10^{12}$ Ohm	4 to 20 mA
Calibration	Slope: 90 to 110% with slope trimmer	
Relays	1 for setpoint and 1 for alarm, max 2A, 240 V resistive load (isolated)	
Recorder Output	0-20 mA or 4-20 mA (isolated)	
Power Supply	115 or 230 Vac; 50/60 Hz	
Environment	-10 to 50°C (14 to 122°F); RH max 95% non condensing	
Panel Cutout	141 x 69 mm (5.6 x 2.7")	
Weight	1 kg (2.2 lb.)	

## INITIAL PREPARATION

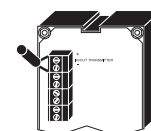
- Connect a 3-wire cable to the power supply terminal according to the voltage level as indicated, and pay particular attention to the correct live, earth and neutral connections.



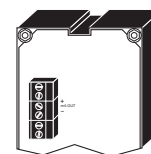
- For **E models**, connect the electrode to the BNC plug on the rear panel.



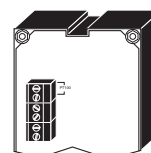
- For **T models**, connect the 2 signal wires of the analog transmitter to the "IN/OUT TRANSMITTER" terminals, while paying attention to the indicated polarity.



- Recorder output terminals: these contacts are used for connection to a recorder. The output can be 0-20 mA or 4-20 mA depending on model, and is proportional to the pH or ORP reading.

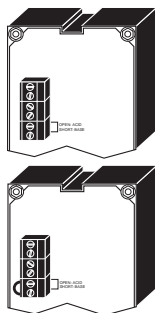


- Pt100 terminals: these contacts are used to connect the Pt100 temperature sensor for automatic temperature compensation of pH readings. If temperature compensation is not required, connect a 110 Ohm/0.25W resistor across the terminals (equivalent to a fixed temperature of 25°C/77°F).



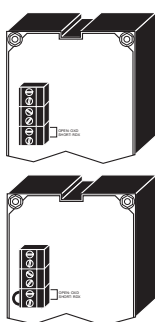
- The **HI 8710** models are single dosage controllers with acid/alkaline selection.

If acid dosage is needed (e.g. in chromium VI reduction), leave open the ACID/BASE selection terminals (see picture), while for alkaline dosage (e.g. in cyanide oxidation), make a short circuit across the ACID/BASE selection terminals with a jumper wire.

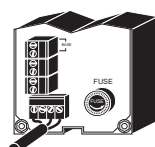
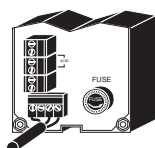
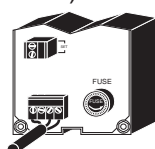


- The **HI 8720** models are single dosage controllers with oxidant/reductant selection.

If oxidant dosage is needed (e.g. in cyanide oxidation), leave open the OX/RED selection terminals (see picture), while for reductant dosage (e.g. in chromium VI reduction), make a short circuit across the OX/RED selection terminals with a jumper wire.



- Set contacts (**HI 8710** and **HI 8720**): these contacts (max. 2A, 240 V) are used to connect the dosing pump, and act only as a switch for the power to the drive.
- Acid contacts (**HI 8711**): these contacts are used to connect the dosing pump for acid, and act as a switch for the power to the drive.
- Base contact (**HI 8711**): these contacts are used to connect the dosing pump for base, and act as a switch for the power to the drive.



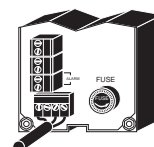
- Consent contacts (**HI 8710** and **HI 8720**): these contacts (max. 2A, 240 V) are used for reduction and oxidation reactions when the pH controller works in conjunction with an ORP controller and vice versa.

In these applications, the consent contacts of both meters are connected together to link the ORP and pH controllers, so that ORP dosage will occur only if the actual pH value is correct. This feature avoids overdosages which may lead to undesirable pollution.

For **HI 8710**, the "Consent" contacts can be left open if the instrument is used independently as pH controller only.

For **HI 8720**, the "Consent" contacts should be shorted if the instrument is used independently as ORP controller only.

- Alarm contacts (**HI 8710**, **HI 8711** and **HI 8720**): if the pH or ORP measurement is not within the set value tolerance, the alarm contact is closed.



**Note:** All external cables connected to the rear panel should be ended with cable lugs.

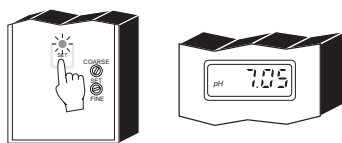
## OPERATIONAL GUIDE

All instrument settings are made via front panel keys and trimmers.

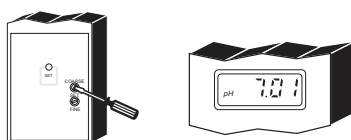
When each key is pressed, the corresponding LED lights up to show the operating function. If using a model with input from electrode, make sure that the meter is calibrated before starting any operation (see "Calibration" section for details).

### **SET POINTS (HI 8710 and HI 8720)**

To set the working point for pH or ORP dosage, press SET and the display will show the set value.

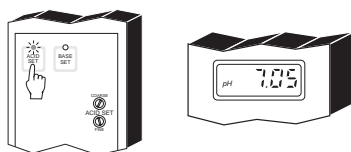


Using a small screwdriver adjust the COARSE and FINE trimmers to display the desired set value.

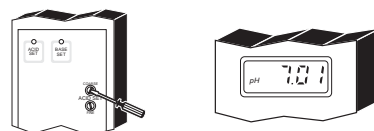


### **SET POINTS (HI 8711)**

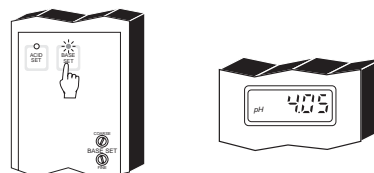
To set the working point for acid dosage, press the ACID SET key and the display will show the set value for acid dosage.



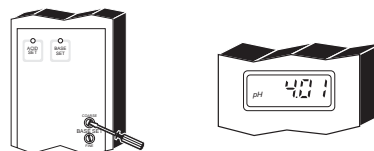
Using a small screwdriver adjust the ACID SET COARSE and FINE trimmers to display the desired acid set value.



To set the working point for alkaline dosage, press the BASE SET key and the display will show the set value for base dosage.

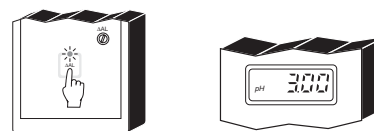


Using a small screwdriver adjust the BASE SET COARSE and FINE trimmers to display the desired base set value.



### **ALARMS (HI 8710, HI 8711 and HI 8720)**

To set the alarm tolerance, press  $\Delta$ AL key and the display will show the current value.



Using a small screwdriver adjust the  $\Delta$ AL trimmer to display the desired tolerance.





Examples:

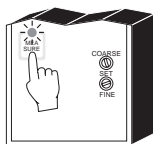
For **HI 8710**, if the set value is pH 3 and the  $\Delta$ Alarm is 1.5 pH, the instrument generates an alarm every time the pH reading is higher than 4.5 pH or lower than 1.5pH.

For **HI 8711**, if the set values are pH 7 and pH 8, and the  $\Delta$  Alarm is 1.5 pH, the instrument generates an alarm every time the pH reading is higher than 9.5 pH or lower than 5.5 pH.

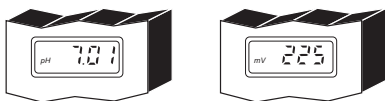
For **HI 8720**, if the set value is 300 mV and the  $\Delta$ Alarm is 100 mV, the instrument generates an alarm every time the ORP reading is higher than 400 mV or lower than 200 mV.

## MEASUREMENTS

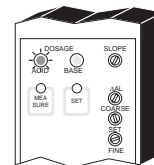
After setting the pH (or ORP) and alarm (if available) thresholds, immerse the electrode in the solution to be tested and press MEASURE.



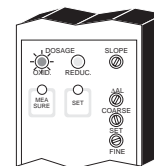
The actual pH or ORP value of the test solution is displayed.



When acid dosage is active, the ACID LED lights up, while during alkaline dosage, the BASE LED turns on (**HI 8710** only).



When oxidant dosage is active, the OXID LED lights up, while during reductant dosage, the REDUC LED turns on (**HI 8720** only).

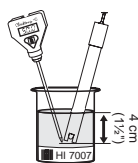


## pH CALIBRATION

Make sure that the instrument is in measurement mode (MEASURE LED is on) before proceeding with calibration.

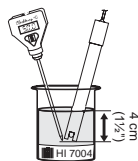


Measure the temperature of the calibration buffer with a *ChecktempC* or another accurate thermometer.

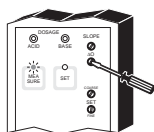


Remove the protective cap from the electrode, rinse and immerse in pH 7.01 solution (HI 7007).

**Note:** The electrode should be submerged at least 4 cm (1½") into the solution. The thermometer should be located as close as possible to the pH electrode.



Shake briefly and wait one minute before adjusting the Δ0 trimmer to display the buffer solution value, i.e. "pH 7.01" at 25°C (77°F).

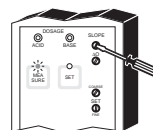


If the buffer solution temperature is different from 25°C (77°F), refer to the "pH vs. temperature" chart on page 36 for the appropriate pH value at the noted temperature.

Rinse pH electrode and thermometer probe thoroughly with water, then immerse them in pH4.01 (HI 7004) or pH 10.01 (HI 7010) buffer solution.

**Note:** For accurate readings, use pH 4.01 if you are going to measure acid samples or pH 10.01 for alkaline measurements.

Shake briefly and wait one minute before adjusting the slope trimmer to display the pH value of the buffer solution, i.e. pH4.01 (or 10.01) at 25°C (77°F).



If the buffer solution temperature is different from 25°C (77°F), refer to the "pH vs. temperature" chart on page 36 for the appropriate pH value at the noted temperature.

The calibration is now complete and the instrument is ready for use.

**Note:** If a Pt100 temperature sensor is used, immerse it into the buffer solutions during calibration.

## pH VALUES AT VARIOUS TEMPERATURE

Temperature has an effect on the pH. The calibration buffer solutions are affected by temperature changes to a lesser degree than normal solutions.

Please refer to the following chart to perform the pH calibration:

TEMP		pH VALUE				
°C	°F	4.01	6.86	7.01	9.18	10.01
0	32	4.01	6.98	7.13	9.46	10.32
5	41	4.00	6.95	7.10	9.39	10.24
10	50	4.00	6.92	7.07	9.33	10.18
15	59	4.00	6.90	7.04	9.27	10.12
20	68	4.00	6.88	7.03	9.22	10.06
25	77	4.01	6.86	7.01	9.18	10.01
30	86	4.02	6.85	7.00	9.14	9.96
35	95	4.03	6.84	6.99	9.10	9.92
40	104	4.04	6.84	6.98	9.07	9.88
45	113	4.05	6.83	6.98	9.04	9.85
50	122	4.06	6.83	6.98	9.01	9.82
55	131	4.07	6.84	6.98	8.99	9.79
60	140	4.09	6.84	6.98	8.97	9.77
65	149	4.11	6.85	6.99	8.95	9.76
70	158	4.12	6.85	6.99	8.93	9.75

For instance, if the buffer temperature is 25°C (77°F), calibrate to read on the display pH 4.01 or 7.01 or 10.01.

If the buffer temperature is 20°C, calibrate to read on the display pH 4.00 or 7.03 or 10.06.

If the buffer temperature is 50°C, calibrate to read on the display pH 4.06 or 6.98 or 9.82.

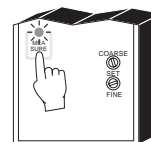
## pH DIAGNOSTIC TESTS

HI 8510, HI 8710 and HI 8711 are provided with autodiagnostic functions that allow to check and troubleshoot any malfunctioning.

The functions are made via front panel keys to isolate the cause of malfunction whether it is due to pH electrode contamination, internal offset circuit or amplifier circuit.

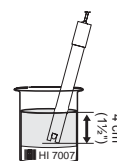
Follow the procedure described below.

First press the MEASURE key, then one of the following keys.



### A) Sensor Test

Immerse the electrode in pH 7.01 buffer solution (HI 7007), press SENSOR TEST key and the display shows the mV response of the electrode.



If the electrode is in good working condition, the value should be within  $\pm 30$  mV. A value between 30 and 60 mV or -60 and -30 mV, indicates some contamination of the electrode.

If the value is higher than 60 mV or lower than -60 mV, the contamination is too high and the electrode should be replaced.

### B) Internal Offset Circuit Test

Press the pH7 TEST key and the display should show a value within  $7 \pm 1$  pH, to verify the internal circuit of the meter in terms of the offset compensation.



### C) Amplifier Circuit Test

Press the pH4 TEST key and the display should show a value within the 3.30 to 4.30 pH range, to verify the amplifier circuit of the meter.



## ORP DIAGNOSTIC TESTS

**HI 8512** and **HI 8720** are ORP controllers provided with autodiagnostic functions that allow to check and troubleshoot any malfunctioning.

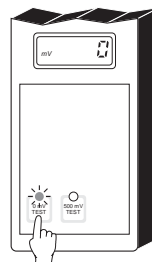
The functions are made via front panel keys to isolate the cause of malfunction.

For **HI 8720** only, press **MEASURE** key before proceeding with the following tests.



### A) 0 mV Test

Press the 0 mV TEST key and the display should show a value of  $0 \pm 10$  mV, to verify the "zero" calibration of the instrument.



### B) 500 mV Test

Press the 500 mV TEST key and the display should show a value of  $500 \pm 20$  mV, to verify the slope at 500 mV.



## LED INDICATION

All LEDs above the keys indicate the state of each function, whether it is active or the display is indicating the mode.

### ***For HI 8711 only***

Each LED can be in one of the following states:

- |                                   |   |
|-----------------------------------|---|
| A) Light on                       | The mode is displayed on the LCD but is not active, e.g. the alarm setpoint is displayed but the alarm contact is open. |
| B) Light blinking 25% on, 75% off | The mode is not displayed but it is active, e.g. the alarm contact is closed but the alarm setpoint is not displayed.   |
| C) Light blinking 75% on, 25% off | The mode is active and being displayed.   |
| D) Light off                      | The function is neither active nor displayed.   |

## TAKING REDOX MEASUREMENTS

Redox measurements allow the quantification of the solution oxidizing/reducing power, and are commonly expressed in mV.

Oxidation may be defined as the process during which a molecule (or an ion) loses electrons and reduction as the process by which electrons are gained.

Oxidation is always coupled together with reduction, so that as one element gets oxidized, the other is automatically reduced, therefore the term oxidation-reduction is frequently used.

Redox potentials are measured by an electrode capable of absorbing or releasing electrons without causing any chemical reaction.

The most common ORP electrodes are provided with gold or platinum surfaces; gold features a higher resistance than platinum in conditions of strong oxidation, while platinum is preferred for measuring oxidizing solutions containing halides, and for general purposes.

When a platinum electrode is immersed in an oxidizing solution, a monomolecular layer of oxygen is developed on its surface. This layer does not prevent the electrode from functioning, but it increases the response time. The opposite effect is obtained when the platinum surface absorbs hydrogen in the presence of reducing mediums. This phenomenon is rough on the electrode.

To make correct redox measurements, it is necessary that the surface of the electrode is clean and smooth, and that a preventive treatment is performed.

Because the Pt/PtO system depends on the solution pH level, the electrode pre-treatment may be determined by the pH and the redox potential of the solution to be measured.

Generally, if the ORP (mV) reading corresponding to the pH solution value is higher than the value in the table below, an oxidizing pre-treatment is necessary; otherwise a reducing pre-treatment is necessary:

pH	mV	pH	mV	pH	mV	pH	mV	pH	mV
0	990	1	920	2	860	3	800	4	740
5	680	6	640	7	580	8	520	9	460
10	400	11	340	12	280	13	220	14	160

Reducing pre-treatment: immerse the electrode for some minutes in **HI 7091** solution.

Oxidizing pre-treatment: immerse the electrode for some minutes in **HI 7092** solution.

If no pre-treatment is performed, the electrode will have long response times.

If working with refillable electrodes, always check the internal electrolyte level and refill with **HI 7071** solution, if necessary (the level must be at least 2.5 cm below the filling hole).

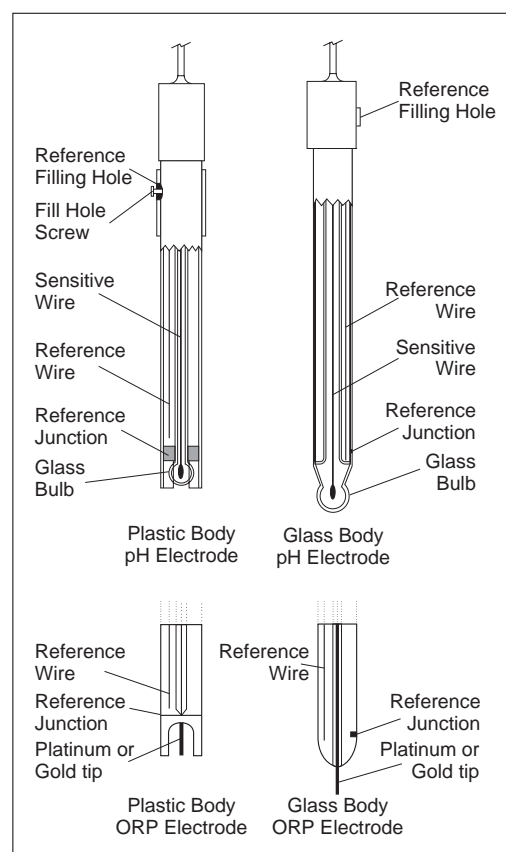
If measurements are taken in solutions containing sulfides or proteins, the cleaning of the electrode junction must be performed (see "Cleaning Procedure" section for details).

To check the correct functioning of the ORP electrode, immerse it into **HI 7020** test solution and verify that the reading is within 200 and 275 mV.

After the test, rinse the electrode thoroughly with water and proceed with the oxidizing or reducing pre-treatment before taking any measurement.

When not in use, the electrode tip should be kept moist and far from any type of mechanical stress which might cause damage. For this reason, it is recommended to store the electrode with a few drops of **HI 70300** storage solution in the supplied protective cap.

## ELECTRODE MAINTENANCE



### PREPARATION

Remove the protective cap.

**DO NOT BE ALARMED IF ANY SALT DEPOSITS ARE PRESENT.** This is normal with electrodes and they will disappear when rinsed with water.

During transport tiny air bubbles may form inside the glass bulb, and the electrode cannot function properly under these conditions. Remove the bubbles by "shaking down" the electrode as you would do with a glass thermometer.

If the bulb and/or junction are dry, soak the electrode in **HI 70300** storage solution for at least one hour.

***For refillable electrodes:***

If the internal electrolyte solution is more than 1 cm (½") below the filling hole, add **HI 7082** solution (3.5M KCl) for double junction electrodes or **HI 7071** (3.5M KCl+AgCl) for single junction electrodes.

For a faster response unscrew the filling hole screw during measurements.

***For AmpHel® electrodes:***

If the electrode does not respond to pH changes, the battery is run down and the electrode should be replaced.

**MEASUREMENT**

Rinse the electrode tip with distilled water.

Immerse the electrode tip (4 cm) in the sample and stir gently for approximately 30 seconds.

For a faster response and to avoid cross contaminations, before taking measurements, rinse the electrode tip with some solution to be tested.

**STORAGE**

To minimize clogging and assure a quick response time, the electrode glass bulb and junction should be kept moist at any time.

Store the electrode with a few drops of **HI 70300** storage solution in the protective cap (in its absence, use **HI 7071** electrolyte for single junction, or **HI 7082** for double junction electrodes).

Follow the above "Preparation Procedure" before taking measurements.

**Note:** NEVER STORE THE ELECTRODE IN DISTILLED WATER OR DRY.

**PERIODIC MAINTENANCE**

Inspect electrode and cable. The cable used for the connection to the meter must be intact and there must be no points of broken insulation on the cable or cracks on the electrode stem or bulb.

Connectors must be perfectly clean and dry. If any scratches or cracks are noted, replace the electrode.

Rinse off any salt deposits with water.

***For refillable electrodes:***

Refill the electrode with fresh electrolyte solution (**HI 7071** for single junction electrodes or **HI 7082** for double junction). Allow the electrode to stand upright for 1 hour.

Follow the above "Storage Procedure".

**CLEANING PROCEDURE**

*General* Soak in **HI 7061** general cleaning solution for approximately 1 hour.

Removal of films, dirt or deposits on the membrane/junction:

*Protein* Soak in Hanna **HI 7073** protein cleaning solution for 15 minutes.

*Inorganic* Soak in Hanna **HI 7074** inorganic cleaning solution for 15 minutes.

*Oil/grease* Rinse with Hanna **HI 7077** oil & fat cleaning solution.

**IMPORTANT:** After performing any of the cleaning procedures, rinse the electrode thoroughly with distilled water, drain and refill the reference chamber with fresh electrolyte, (not necessary for gel-filled electrodes) and soak the electrode in **HI 70300** storage solution for at least 1 hour before taking measurements.

## **TROUBLESHOOTING**

Evaluate your electrode performance based on the following:

- **Noise** (readings fluctuate up and down) could be due to:
  - **Clogged/Dirty Junction:** refer to the above "Cleaning Procedure"
  - **Loss of shielding** due to low electrolyte level (in refillable electrodes only): refill with **HI 7071** solution for single junction or **HI 7082** for double junction electrodes
- **Dry Membrane/Junction:** soak in **HI70300** storage solution for at least 1 hour
- **Drifting:** soak the electrode tip in warm **HI7082** solution for one hour and rinse the tip with distilled water; refill with fresh electrolyte (**HI 7071** for single junction and **HI 7082** for double junction electrodes)
- **Low Slope:** refer to the above "Cleaning Procedure"
- **No Slope:** check the electrode for cracks in glass stem or bulb (replace the electrode if cracks are found)
- **Slow Response/Excessive Drift:** soak the tip in **HI 7061** solution for 30 minutes, rinse thoroughly in distilled water and then follow the above "Cleaning Procedure"
- **For ORP Electrodes:** polish the metal tip with a light abrasive paper (pay attention not to scratch the surface) and rinse thoroughly with water

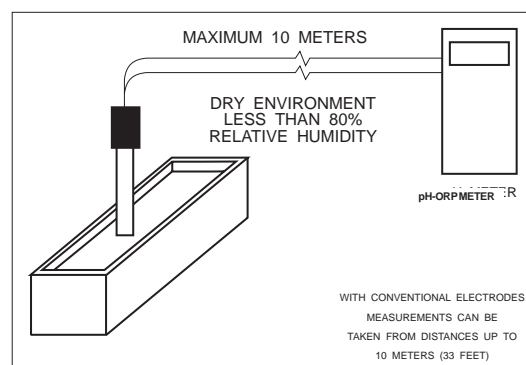
## **SUGGESTED INSTALLATIONS**

### **SHORT DISTANCE, INDOOR INSTALLATION**

Due to the low current involved, a very high grade of insulation is required.

A dry environment is needed in order to obtain a insulation level not lower than  $10^{12} \Omega$ . This type of connection is very delicate and requires constant attention to maintain proper operating conditions.

Conventional electrodes should be used in indoor applications only, with a cable not longer than 10 m (33').



### **MEDIUM DISTANCE, INDOOR/OUTDOOR INSTALLATION**

When an outdoor installation is required, to obtain accurate readings at distances from 10 to 50 m (33-165'), it is necessary to install a transmitter.

Since the introduction of AmpHel® electrodes, these distances are no longer a problem. You can now connect the meter directly to an AmpHel® electrode, saving the cost of a transmitter or expensive coaxial cable.

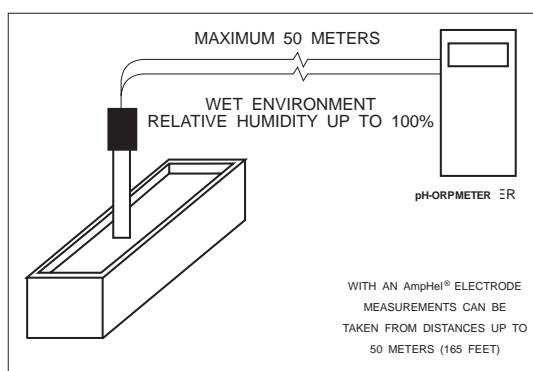
The standard cable length for AmpHel® electrodes is 5 m (16.5'). Additional lengths



of regular cable up to 50 m (165'), can be installed without special connectors.

AmpHel® electrodes feature a built-in micro-amplifier to boost the signal, drastically reducing susceptibility to noise and drift.

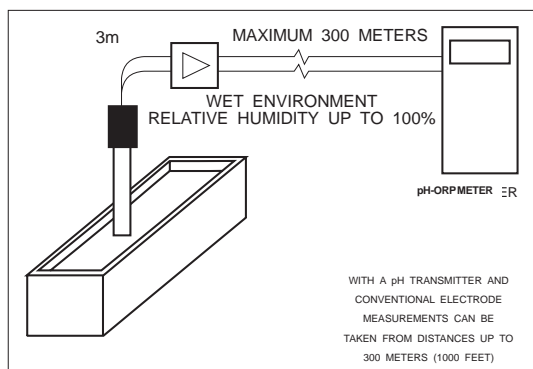
The sealed electrode body can stand a moisture up to 100% RH without any effect on the signal.



#### LONG DISTANCE INSTALLATIONS, ISOLATED OUTPUT FOR PC INTERFACE

If the needed installation distance is greater than 50 m (165'), it is necessary the use of a transmitter.

HANNA instruments® offers a full line of pH and ORP transmitters with or without display.



AmpHel® is a registered Trademark of "Hanna Instruments"

## ACCESSORIES

### pH CALIBRATION SOLUTIONS

<b>HI 7004M</b>	pH 4.01 buffer solution, 230 mL
<b>HI 7004L</b>	pH 4.01 buffer solution, 500 mL
<b>HI 7006M</b>	pH 6.86 buffer solution, 230 mL
<b>HI 7006L</b>	pH 6.86 buffer solution, 500 mL
<b>HI 7007M</b>	pH 7.01 buffer solution, 230 mL
<b>HI 7007L</b>	pH 7.01 buffer solution, 500 mL
<b>HI 7009M</b>	pH 9.18 buffer solution, 230 mL
<b>HI 7009L</b>	pH 9.18 buffer solution, 500 mL
<b>HI 7010M</b>	pH 10.01 buffer solution, 230 mL
<b>HI 7010L</b>	pH 10.01 buffer solution, 500 mL

### ORP SOLUTIONS

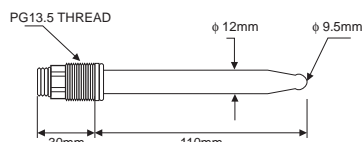
<b>HI 7020M</b>	ORP test solution @200/275 mV, 230 mL bottle
<b>HI 7020L</b>	ORP test solution @200/275 mV, 500 mL bottle
<b>HI 7091M</b>	Pre-treatment reducing solution, 230 mL bottle
<b>HI 7091L</b>	Pre-treatment reducing solution, 500 mL bottle
<b>HI 7092M</b>	Pre-treatment oxidizing solution, 230 mL bottle
<b>HI 7092L</b>	Pre-treatment oxidizing solution, 500 mL bottle

### ELECTRODE MAINTENANCE SOLUTIONS

<b>HI 70300M</b>	Storage solution, 230 mL bottle
<b>HI 70300L</b>	Storage solution, 500 mL bottle
<b>HI 7061M</b>	General cleaning, 230 mL bottle
<b>HI 7061L</b>	General cleaning, 500 mL bottle
<b>HI 7073M</b>	Protein cleaning solution, 230 mL
<b>HI 7073L</b>	Protein cleaning solution, 500 mL
<b>HI 7074M</b>	Inorganic cleaning, 230 mL
<b>HI 7074L</b>	Inorganic cleaning, 500 mL
<b>HI 7077M</b>	Oil & fat cleaning, 230 mL
<b>HI 7077L</b>	Oil & fat cleaning, 500 mL
<b>HI 7071</b>	3.5M KCl+AgCl electrolyte solution (4 x 50 mL)
<b>HI 7072</b>	1M KNO <sub>3</sub> electrolyte (4 x 50 mL)
<b>HI 7082</b>	3.5M KCl electrolyte solution (4 x 50 mL)

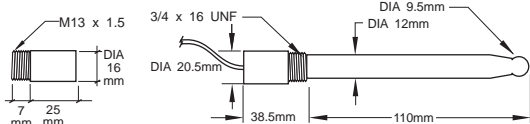
## ***pH ELECTRODES***

**HI 1090T** Screwcap PG13.5 connector, double junction, glass body



**HI 1110S** Screw connector, single junction, glass body

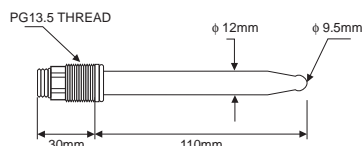
**HI 1130B/3** BNC connector, 3 m (9.9') cable, single junction, glass body



**HI 1110S**

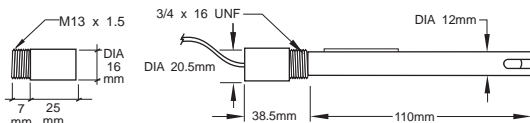
**HI 1130B/3**

**HI 1110T** Screwcap PG13.5 connector, double junction, glass body



**HI 1114S** Screw connector, double junction, plastic body

**HI 1134B/3** BNC connector, 3 m (9.9') cable, double junction plastic body

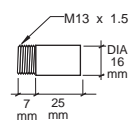


**HI 1114S**

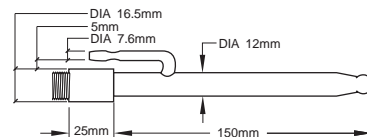
**HI 1134B/3**

**HI 1115S** Screw connector, single junction, glass body

**HI 1135B/3** BNC connector, 3 m (9.9') cable, single junction, glass body

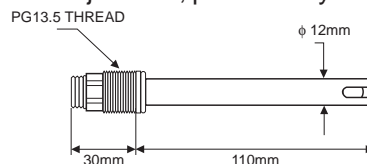


**HI 1115S**

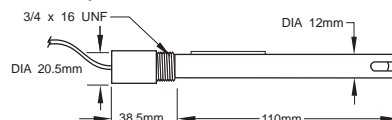


**HI 1135B/3**

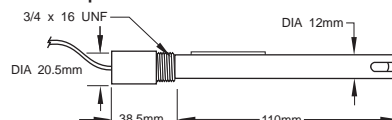
**HI 1210T** Screwcap PG13.5 connector, double junction, plastic body



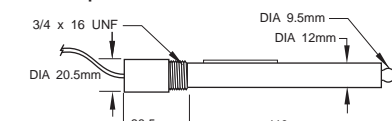
**HI 1910B** BNC connector, 1 m (3.3') cable, double junction, plastic body, built-in amplifier



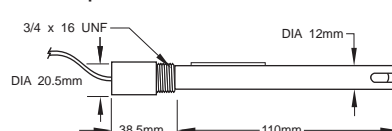
**HI 1911B** BNC connector, 1 m (3.3') cable, double junction, plastic body, built-in amplifier



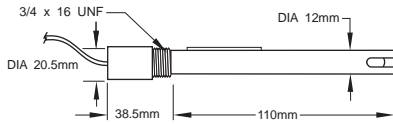
**HI 1912B** BNC connector, 1 m (3.3') cable, double junction, plastic body, built-in amplifier



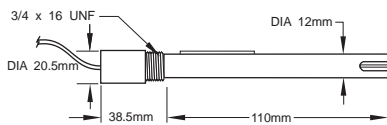
**HI 1912B/5** BNC connector, 5 m (16.5') cable, double junction, plastic body, built-in amplifier



**HI 2114B/5** BNC connector, 5 m (16.5') cable, double junction, plastic body



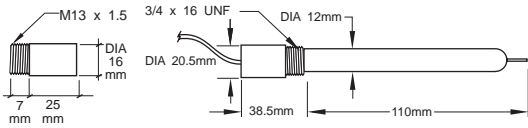
**HI 2910B/5** BNC connector, 5 m (16.5') cable, double junction, plastic body, built-in amplifier



### **ORPELECTRODES**

**HI 2930B/5** BNC connector, 5 m (16.5') cable, Pt, plastic body, built-in amplifier

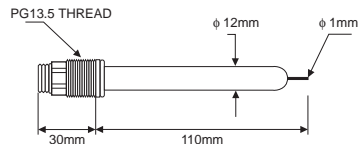
**HI 3110S** Screw connector, Pt, glass body  
**HI 3130B/3** BNC connector, 3 m (9.9') cable, Pt, glass body



**HI 3110S**

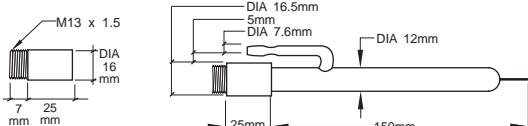
**HI 3130B/3**

**HI 3110T** Screwcap PG13.5 connector, Pt, glass body



**HI 3115S** Screw-type connector, side-arm, Pt, glass body

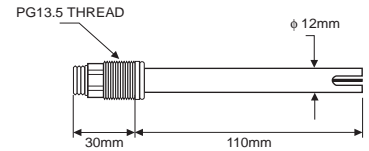
**HI 3135B/3** BNC connector, 3 m (9.9') cable, side-arm, Pt, glass body



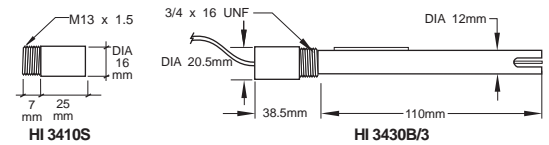
**HI 3115S**

**HI 3135B/3**

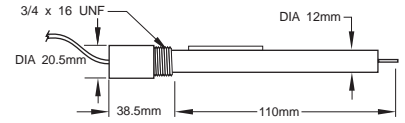
**HI 3210T** Screwcap PG13.5 connector, Pt, plastic body



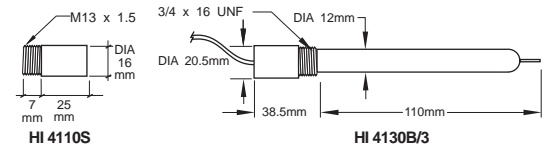
**HI 3410S** Screw connector, Pt, plastic body  
**HI 3430B/3** BNC connector, 3 m (9.9') cable, Pt, plastic body



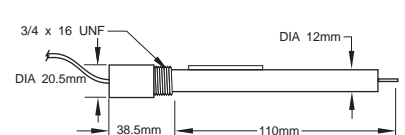
**HI 3932B/5** BNC connector, 5 m (16.5') cable, Pt, plastic body, built-in amplifier



**HI 4110S** Screw connector, Au, glass body  
**HI 4130B/3** BNC connector, 3 m (9.9') cable, Au, glass body



**HI 4932B/5** BNC connector, 5 m (16.5') cable, Au, plastic body, built-in amplifier



## OTHER ACCESSORIES

HI 98501	ChecktempC thermometer with penetration probe and 0.1°C resolution (-50.0 to 150.0°C)
HI 8614	pH transmitter
HI 8614L	pH transmitter with display
HI 8615	ORP transmitter
HI 8615L	ORP transmitter with display
BL PUMPS	Dosing pumps with flow rate from 1.5 to 20 lph
HI 7871 & HI 7873	Level controllers
HI 6050 & HI 6051	Submersible electrode holders
HI 6054 & HI 6057	Electrode holders for in-line applications
HI 778P	Coaxial cable and connectors for screw-type electrodes
HI 8427	pH/ORP electrode simulator with 1 m (3.3') coaxial cable ending with female BNC connectors (HI 7858/1)
HI 931001	pH/ORP electrode simulator with display and 1 m (3.3') coaxial cable ending with female BNC connectors (HI 7858/1)

### Recommendations for Users

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

Operation of these instruments in residential area could cause unacceptable interferences to radio and TV equipments, requiring the operator to take all necessary steps to correct interferences.

The trimmers are sensitive to electrostatic discharges. It is recommended to use antistatic screwdrivers.

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

## 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.

**Probes, electrodes and sensors are warranted for a period of six months.**

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

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. Obtain a Returned Goods Authorization from the Customer Service department first and then return the instrument with the Authorization # included along with shipment costs prepaid. If the repair is not covered by the warranty, you will be notified of the charge for repair or replacement. When shipping any instrument, make sure it is properly packaged for complete protection.

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

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