PEWA
Messtechnik GmbH

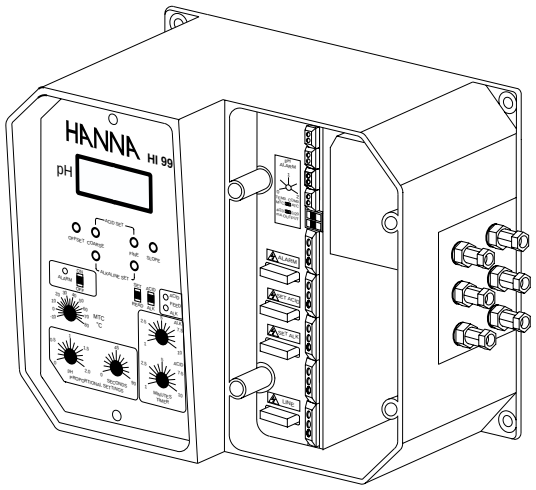
Weidenweg 21
58239 Schwerte

Tel.: 02304-96109-0
Fax: 02304-96109-88
E-Mail: info@pewa.de
Homepage : www.pewa .de

Instruction Manual

HI 9910 - HI 9911
HI 9920

Wall Mounted
pH & ORP
Controllers



HANNA instruments
http://www.hannainst.com

CE
These Instruments are in Compliance with the CE Directives

Dear Customer,

Thank you for choosing a Hanna 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 more precise idea of its versatility. If you need more technical information, do not hesitate to e-mail us at tech@hannainst.com.

These instruments are in compliance with the CE directives EN 50081-1, 50082-1 and 61010-1.

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HANNA instruments *ISO 9000 Certified Company since 1992*

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, notify your Dealer.

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

IMPORTANT:

1. *Read the instructions before using the instrument.*
2. *The instrument should be connected to a mains socket.*
3. *Never install the controller outdoors, in a wet or humid area or under direct sun light. Nor install the controller where liquids may be sprayed or poured on it.*
4. *The instrument's main power line as well as the dosage and alarm terminals are protected by separate 2A fuses. Use only 2A fuses for replacement.*

GENERAL DESCRIPTION

Hanna's wall-mounted pH and ORP controllers *with proportional control are designed to meet a variety of process control requirements.*

The electrodes can be installed quickly and easily. Simply plug the universal BNC connector into the socket and twist it into a secured position. Accurate measurements are displayed on a large LCD.

The controllers come equipped with relays operating at a maximum of 2A (240V).

The Hanna controllers incorporate a triple contact alarm system. When activated, the alarm contacts will open or close, triggering the mechanism of your choice, whether a buzzer, light or any other electrical device.

The recorder output terminals are isolated from the controller circuitry to avoid any interference and are user-switchable between 0 to 20 mA or 4 to 20 mA.

In order to avoid electrical noise and interference all models provide for a ground probe (differential input).

These controllers are housed in a rugged, modular, fiber-reinforced ABS housing.

All models can be wired to work with 110/115V or 220/240V 50/60 Hz power supplies.

The models covered in this manual are:

HI 9910 *a single setpoint* pH controller

HI 9911 *a dual setpoint* pH controller, *specifically designed for all those applications in which the pH value intends to oscillate both up and down*

HI 9920 ORP controller, *designed for numerous industrial applications, but in particular for swimming pools and drinking water sanitation*

MECHANICAL LAYOUTS

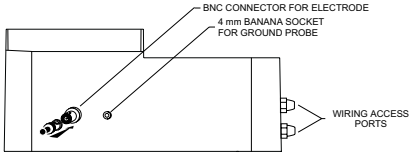


Fig. 1

Figure 1: displays the connector for electrode and the wiring access ports.

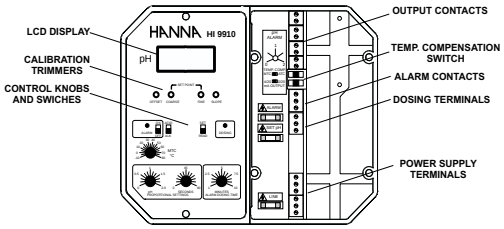


Fig. 2

Figure 2 illustrates the controls and terminals on the HI 9910 pH controller. Layouts vary from model to model based on their features and capabilities.

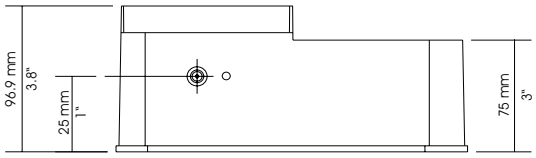


Fig. 3

Figure 3 is a dimensioned, bottom view of the wall mounted controllers. The modular design isolates the control circuitry from the contacts making it possible to make the connections and then close the compartment. Adjustments can then be made only in the control area, without having to open the contacts compartment.

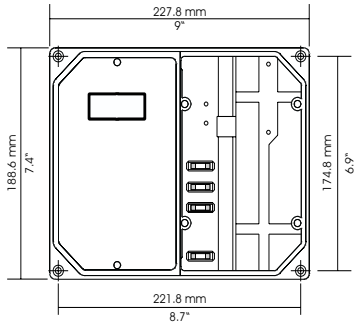
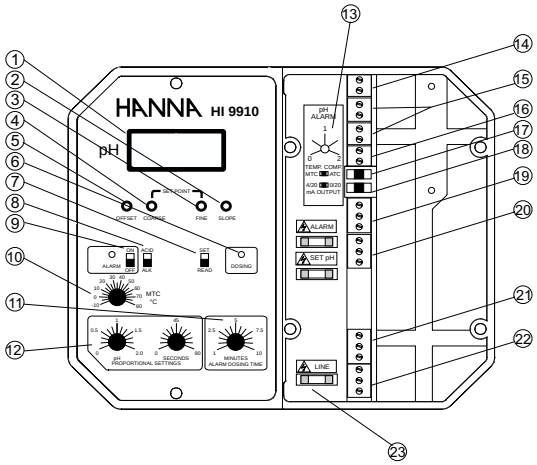


Fig. 4

Figure 4 is a dimensioned front view of the wall mounted controllers. The molded, mounting holes in the corners provide for quick and secure installation. No additional hardware is needed for mounting. All electrical connections and controls are located on the front of the instrument so that adjustment can be made without having to remove the unit.

FUNCTIONAL DIAGRAM HI 9910
SINGLE SETPOINT, pH CONTROLLER

FRONT PANEL



Left panel

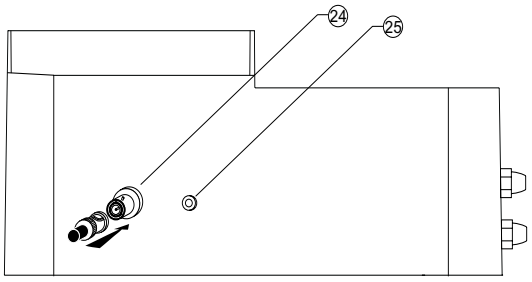
1. *Liquid Crystal Display*
2. *Slope calibration trimmer*
3. *Fine setpoint trimmer*
4. *Coarse setpoint trimmer*
5. *Offset calibration trimmer*
6. *Dosing LED visual signal*
7. *READ for actual measurement and SET for setpoint adjustment*
8. *Acid or Alkaline Dosage selection*
9. *Alarm LED and switch to disable the alarm*
10. *Graded dial for Manual Temperature Compensation*
11. *Overdosage timer*
12. *Proportional pH band and time cycle settings*

Right panel

13. *pH alarm setting from 0 to 2 pH*
14. *Short the terminals if a ground probe is not in use, or connect the ground probe wire to the Matching Pin terminal*
15. *Three-wire Pt 100 plus a shield protection*

16. *Recorder output contacts*
17. *Automatic or Manual Temperature Compensation switch*
18. *0 to 20 or 4 to 20 mA isolated output switch*
19. *Triple contact alarm in a Normally Closed (NC) or a Normally Open (NO) position.*
20. *Powered dosage terminals (Relay)*
21. *110/115V or 220/240V power configuration*
22. *Incoming power terminals*
23. *Fuses*

BOTTOM VIEW



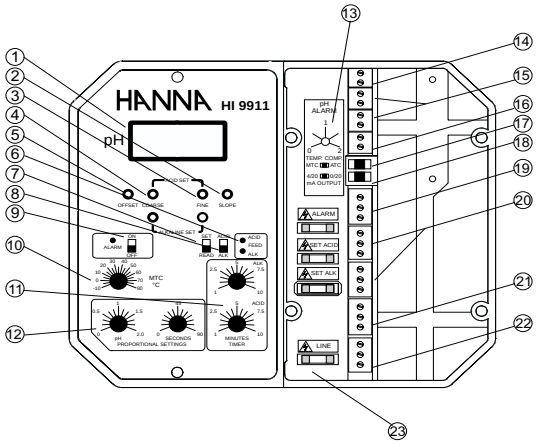
24. *Female BNC socket for combination pH electrode*
25. *4-mm Banana socket for ground probe*

⚠ *Unplug the instrument from the power supply before wiring and replacing the fuses.*

Specifications	HI 9910
RANGE	*0.00 to 14.00 pH*
RESOLUTION	*0.01 pH*
ACCURACY (@20°C/68°F)	*±0.02 pH*
TYPICAL EMC DEVIATION	*±0.1 pH*
mA OUTPUT	*User-selectable 0 to 20 mA or 4 to 20 mA over the 0-14 pH range with isolated output*
CALIBRATION	*Through "OFFSET" and "SLOPE" trimmers (Max. ±1.5 pH for offset and 80% to 110% for slope)*
TEMPERATURE COMPENSATION	*Manual from -10 to 80 °C (14 to 176 °F) or automatic with a 3-wire Pt 100 probe from 0 to 50 °C (32 to 122 °F)*
SETPOINT RANGE	*From 0.00 to 14.00 pH with "COARSE" and "FINE" trimmers with "ACID" or "ALK" (alkaline) selection*
PROPORTIONAL CONTROL	*pH is user adjustable from 0.0 to 2.0 and time cycle from 0 to 90 seconds*
ALARM CONTACT	*Terminals can be configured as normally open or normally closed (isolated output Max. 2A, Max. 240V, resistive load, 1,000,000 strokes). The alarm is activated if pH varies by more than user-selectable interval (0 to 2 pH) from setpoint or due to overdosage*
DOSING TERMINALS	*Relay terminals (115 to 240V, Max.2A,1,000,000 strokes) are activated when pH exceeds the setpoint with "ACID" dosage or falls below the setpoint with "ALK" selection (Alkaline dosage)*
POWER SUPPLY	*220/240V or110/115V at 50/60Hz*
ENVIRONMENT	*-10 to 50 °C (14 to 122 °F) max. 95% RH non-condensing*
WEIGHT	*1.6 Kg (3.5 lb.)*
ENCLOSURE	*181 x 221 x 142mm (7.1 x 8.7 x 5.6")*
CASE MATERIAL	*Fiber-reinforced, self-extinguishing ABS*

FUNCTIONAL DIAGRAM HI 9911
DUAL SETPOINT, pH CONTROLLER

FRONT PANEL



Left panel

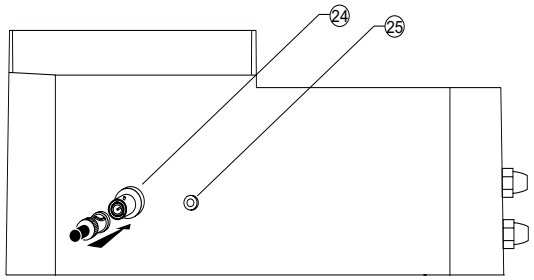
1. *Liquid Crystal Display*
2. *Slope calibration trimmer*
3. *Fine setpoint trimmers for acid and alkaline feed*
4. *Coarse setpoint trimmers for acid and alkaline feed*
5. *Offset calibration trimmer*
6. *Dosing LED signals for acid and alkaline feed*
7. *READ for actual measurement and SET for setpoint adjustment*
8. *Acid or Alkaline selection for setpoint*
9. *Alarm LED and switch to disable the alarm*
10. *Graded dial for Manual Temperature Compensation*
11. *Two independent overdosage timers*
12. *Proportional pH band and time cycle settings*

Right panel

13. *pH alarm setting from 0 to 2 pH*
14. *Short the terminals if a ground probe is not in use, or connect the ground probe wire to the Matching Pin terminal*
15. *Three-wire Pt 100 plus a shield protection*
16. *Recorder output contacts*
17. *Automatic or Manual Temperature Compensation switch*

18. *0 to 20 or 4 to 20 mA isolated output switch*
19. *Triple contact alarm in a Normally Closed (NC) or a Normally Open (NO) position.*
20. *Powered dosage terminals (Relays)*
21. *110/115V or 220/240V power configuration*
22. *Incoming power terminals*
23. *Fuses*

BOTTOM CONNECTION

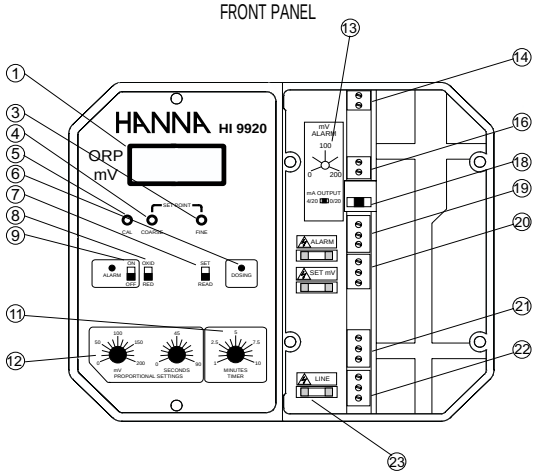


24. *Female BNC socket for combination pH electrode*
25. *4-mm Banana socket for ground probe*

⚠ *Unplug the instrument from the power supply before wiring and replacing the fuses.*

Specifications	HI 9911
RANGE	*0.00 to 14.00 pH*
RESOLUTION	*0.01 pH*
ACCURACY (@20°C/68°F)	*±0.02 pH*
TYPICAL EMC DEVIATION	*±0.1 pH*
mA OUTPUT	*User-selectable 0 to 20 mA or 4 to 20 mA over the 0-14 pH range with isolated output*
CALIBRATION	*Through "OFFSET" and "SLOPE" trimmers (Max. ±1.5 pH for offset and 80% to 110% for slope)*
TEMPERATURE COMPENSATION	*Manual from -10 to 80 °C (14 to 176 °F) or automatic with 3-wire Pt 100 probe from 0 to 50 °C (32 to 122 °F)*
SETPOINT RANGE	*From 0.00 to 14.00 pH with 2 trimmers: "COARSE" for approx. regulation, "FINE" for fine tuning.*
PROPORTIONAL CONTROL	*pH is user adjustable from 0.0 to 2.0 and time cycle from 0 to 90 seconds*
ALARM CONTACT	*Terminals can be configured as normally open or normally closed (isolated output Max. 2A, Max. 240V, resistive load, 1,000,000 strokes). The alarm is activated if pH varies by more than user-selectable interval (0 to 2 pH) from setpoint or due to overdosage*
DOSING TERMINALS	*Two sets of independent relay terminals (115 to 240V, Max.2A, 1,000,000 strokes) are activated whenever pH exceeds the "ACID" setpoint or falls below the "ALK" setpoint (Alkaline dosage)*
POWER SUPPLY	*220/240V or110/115V at 50/60Hz*
ENVIRONMENT	*-10 to 50 °C (14 to 122 °F) max. 95% RH non-condensing*
WEIGHT	*1.6 Kg (3.5 lb.)*
ENCLOSURE	*181 x 221 x 142mm (7.1 x 8.7 x 5.6")*
CASE MATERIAL	*Fiber-reinforced, self-extinguishing ABS*

FUNCTIONAL DIAGRAM HI 9920
ORP CONTROLLER



Left panel

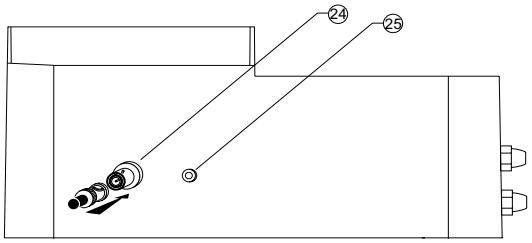
1. *Liquid Crystal Display*
3. *Fine setpoint trimmer*
4. *Coarse setpoint trimmer*
5. *Calibration trimmer*
6. *Dosing LED visual signal*
7. *READ for actual measurement and SET for setpoint adjustment*
8. *Oxidization or Reduction Dosage selection*
9. *Alarm LED and switch to disable the alarm*
11. *Overdosage timer*
12. *Proportional ORP band and time cycle settings*

Right panel

13. *ORP alarm setting from 0 to 200 mV*
14. *Short the terminals if a ground probe is not in use, or connect the ground probe wire to the Matching Pin terminal*
16. *Recorder output contacts*
18. *0 to 20 or 4 to 20 mA isolated output switch*
19. *Triple contact alarm in a normally-closed (NC) or a normally open (NO) position.*

20. *Powered dosage terminals (Relay)*
21. *110/115V or 220/240V power configuration*
22. *Incoming power terminals*
23. *Fuses*

BOTTOM CONNECTION



24. *Female BNC socket for combination ORP electrode*
25. *4-mm Banana socket for ground probe*

⚠ *Unplug the instrument from the power supply before wiring and replacing the fuses.*

Specifications	HI 9920
RANGE	*-500 to 1500 mV*
RESOLUTION	*1 mV*
ACCURACY (@20°C/68°F)	*± 5 mV*
TYPICAL EMC DEVIATION	*±6 mV*
mA OUTPUT	*User-selectable 0 to 20 mA or 4 to 20 mA over the -500 to 1500 mV range with isolated output*
CALIBRATION	*Through "CAL" trimmer*
SETPOINT RANGE	*From -500 to 1500 mV with "COARSE" and "FINE" 2 trimmers with "OXID" or "RED" selection for oxidizing or reducing dosage*
PROPORTIONAL CONTROL	*ORP setting is adjustable from 0 to 200 mV and time cycle from 0 to 90 seconds*
ALARM CONTACT	*Normally open or normally closed isolated outputs (Max. 2A, Max. 240V, resistive load, 1,000,000 strokes). Terminals are activated when the ORP value varies by more than the user selectable interval (0 to 200mV) from setpoint, or due to overdosage*
DOSING TERMINALS	*Relay terminals (115 to 240V, Max.2A,1,000,000 strokes) are activated when mV exceeds the setpoint with "RED" dosage or when mV falls below the setpoint with "OXID" selection*
POWER SUPPLY	*220/240V or110/115V at 50/60Hz*
ENVIRONMENT	*-10 to 50 °C (14 to 122 °F) max. 95% RH non-condensing*
WEIGHT	*1.6 Kg (3.5 lb.)*
ENCLOSURE	*181 x 221 x 142mm (7.1 x 8.7 x 5.6")*
CASE MATERIAL	*Fiber-reinforced, self-extinguishing ABS*

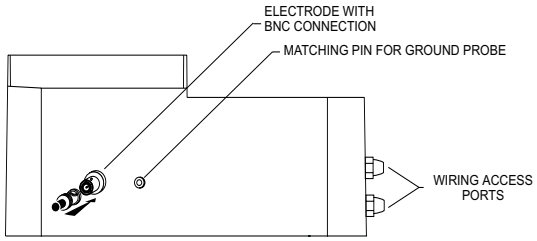
CONECTIONS & WIRING

GENERAL POINTS

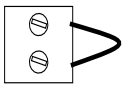
- *The **relay terminals** of the controllers are **powered**. This means that you can simply hook up your pumps or electrovalves directly to the controller and do not need additional power supply.*
- *Unscrew the 4 screws on the right hand panel and remove the cover and the gasket. Thread the wires through the access ports on the right hand side of the controller.*

- ***Before* connecting the controller to the mains, wire the controller completely** *and make all the connections for pumps, alarm, electrode, set the alarm threshold and adjust the settings. Upon completion,* **replace the cover**. *Only then connect the controller to the power supply.*

ELECTRODE & GROUND PROBE CONNECTIONS



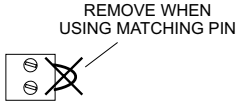
- *Simply attach any combination* pH or ORP electrode *with a male BNC connector (such as HI 1002/3 or HI 2002/3) to the female BNC socket located on the bottom of the casing and twist it into a secure position.*
- *All models provide for a Ground Probe (differential input) to reduce electrical noise and interference. The controllers are shipped with the Matching Pin and Reference terminals shorted (see 14 - Functional Diagram). If you are not using a matching pin (ground probe),* **leave the terminals shorted** *and skip the next two paragraphs.*



- *It is recommended that only electrodes that incorporate a matching pin (such as HI 1003/3 or HI 2003/3) are utilized. In this case simply* **attach the 4-mm banana connector of the matching pin to the socket** *located next to the BNC connector on the outer casing (see 25 - Functional Diagram) and* **remove the jumper** *shorting the matching pin terminals.*
- *When using a separate probe for grounding purposes, wire it to the Matching Pin terminal on the right hand panel and* **remove the jumper** *(see 14 Functional Diagram).*

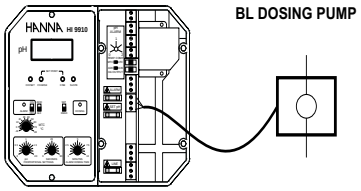
NOTE:

NEVER leave the jumper in when using an electrode with a matching pin. This can shorten the life of the electrode (reference) drastically.

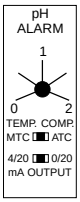


RELAY CONNECTIONS

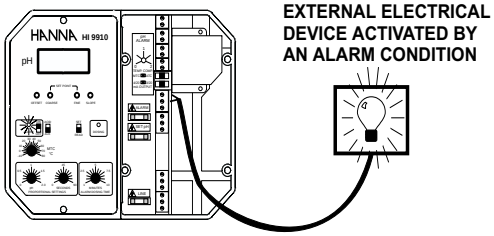
- *Wire the external device or devices (pumps or electrovalves) directly to the relay terminal strip of the controller (see 20 - Functional Diagram). The* ***terminals are powered*** *and hence you* ***do not need an external power supply*** *for the pump or electrovalve. There is one terminal strip for* HI 9910 and HI 9920 *and two for* HI 9911.



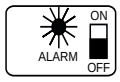
ALARM CONNECTIONS



- *The operator can select an alarm threshold of 0.0 to 2.0 pH for HI 9910 and HI 9911 or 0 to 200 mV for HI 9920 by turning the alarm knob (see 13 of Functional Diagram). If the actual measurements are above or below the setpoint by a margin greater than the user-selectable alarm threshold, the alarm terminal is activated. The alarm can be selected as normally closed ("NC") by connecting the external device to the C and NC terminals or normally open ("NO") by connecting the external device to the C and NO terminals.*
- *When activated, the alarm contacts will open or close, triggering the mechanism of your choice. When the* ***alarm is activated all other terminals*** *(such as dosing relay etc.)* ***are disactivated****. The alarm LED light also comes on.*



- *The alarm ON/OFF switch is only to **disable the alarm terminal** (e.g. the buzzer will not sound). However, all other functions such as disactivation of the dosing relay remain unvaried, i.e. the pump ceases to dose until the alarm condition is alleviated.*



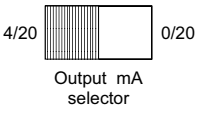
- *The controllers provide for **automatic fail-safe** security by activating the alarm if there is a power failure, regardless of whether the NC or NO configurations were chosen.*
- *The alarm is also activated if the maximum dosage time is exceeded. The overdosage timer can be set from 1 to 10 minutes. For HI 9911, two timers for acid and alkaline corrections can be independently selected.*

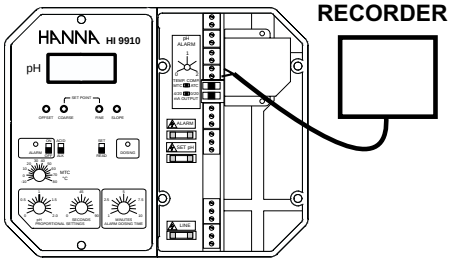
- *Once in an alarm condition, the alarm contact remains activated until the switch is manually put in the off position or the measurements returns to normal values.*

Model	*Alarm is activated when the reading varies by :*
HI 9910	*0 to 2.0 pH (selectable) above or below the setpoint*
HI 9911	*0 to 2.0 pH (selectable) lower than the ALKALINE setpoint or higher than the ACID setpoint*
HI 9920	*0 to 200 mV (selectable) above or below the setpoint*

RECORDER OUTPUT CONNECTIONS

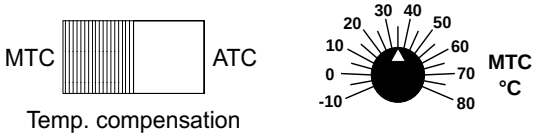
- *The* recorder output contacts *are **isolated** from the controller circuitry to avoid interference. Select between 0 to 20 or 4 to 20 mA with the selector (see 18 - Functional Diagram) before wiring. The output mA value is proportional and is the pH or ORP value over the entire range. For example, when measuring pH 7, the output values are 10 mA or 12 mA based on whether the 0-20 or 4-20 output were respectively selected.*



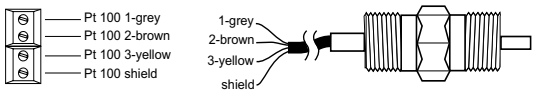


TEMPERATURE COMPENSATION
(HI 9910 and HI 9911 only)

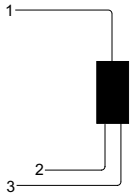
- Manual Temperature Compensation: *Move the selector to the MTC position (see 17-Functional Diagram). Then manually set the temperature by turning the dial (see 10 - Functional Diagram) to the correct working temperature.*



- Automatic Temperature Compensation: *Move the selector to the ATC position (see 17-Functional Diagram). Then wire a Pt 100 probe such as HI 5001/5 to the controller's terminals as shown.*



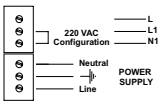
HI 5001/5 is made of stainless steel. For solutions not compatible with stainless steel, use the glass-body HI 5002/5 or other appropriate 3-wire Pt 100 probe.



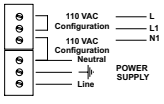
MAIN POWER SUPPLY CONNECTION

- ***Before connecting the unit to the mains**, make sure that the **controller is completely wired** and that all connections for pump, alarm, electrode, etc. have been made.*

- *For 220-240V, short the L1 and N1 terminals. Then wire the external power supply to the three terminals as shown.*



- *For 110-115V, short the L and L1 terminals and the N1 and Neutral. Then wire the external power supply to the three terminals as shown.*

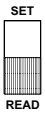


- *Replace the cover with the gasket and screw it tight with the 4 screws provided. **Only then** connect the controller to the mains.*

NORMAL OPERATION and MEASUREMENT

Make sure that the controller has been properly calibrated before commencing and that the pH or ORP setpoint(s) have been adjusted (see the following pages).

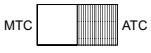
The pH or ORP electrodes and any ground probes must be properly connected and wired to the controller (see preceding pages). Remove the protecteive cap if it is still on the tip of the electrode.

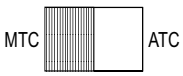


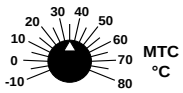
Ensure that the electrode is properly installed and lies permanently in the solution to a depth of at least 4cm/1.5". The selector (see 7 - Functional Diagram) must be on the "READ" position.

If temperature compensation is necessary (HI 9910 and HI 9911), make sure that the temperature probe is also immersed in the solution and the selector is on ATC (see 17 - Functional Diagram).

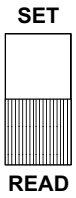
For manual temperature compensation, the selector should be on MTC with the dial showing the temperature of the solution.





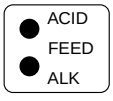


The actual pH or ORP value of the solution will be displayed on the LCD.



All controllers provide for a visual dosing status through an LED. With HI 9910 and HI 9920 the DOSING LED lights up when the controller is in the pH or ORP dosage mode and the terminals are activated.

Likewise, HI 9911 provides for two LED's, one for ACID and another for ALK (alkaline) dosage when the appropriate terminals are activated.



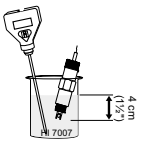
pH CALIBRATION
(HI 9910 and HI 9911)

Make sure that the pH electrode and any ground probe have been properly connected and wired to the controller (see preceding pages) and that the meter is plugged to the mains.

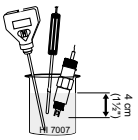
Calibration should be ideally performed at a temperature similar to that of the liquid to be monitored.

Use a Checktemp (or an accurate thermometer) as reference for temperature compensation.

Remove the electrode cap if it is still on the electrode.

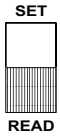


During calibration, move the electrode and the separate ground probe (if in use) together from one buffer to the next.



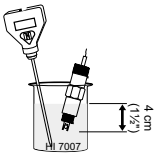
If no separate ground probe is being used, make sure that the Reference and the Matching Pin terminals are shorted (see 14 - Functional Diagram).

If the electrode incorporates a ground probe/matching pin (HI 1003/3) then remove the jumper.

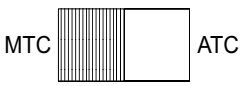


- *Turn the switch to the "READ" position.*

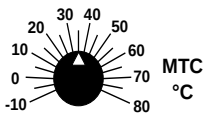
OFFSET ADJUSTMENT:



- *Rinse the tip of the electrode with pH 7.01 solution (*HI 7007*), then dip the bottom 4 cm (1.5") of the electrode (and ground probe) in the pH 7.01 buffer.*
- *Place the Checktemp thermometer in the buffer solution. Turn the dial (see 10 - Functional Diagram) to show the same temperature*

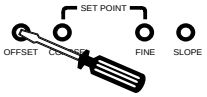


Temp. compensation selector



as that on the Checktemp and make sure the selector is in the MTC position (see 17 - Functional Diagram).

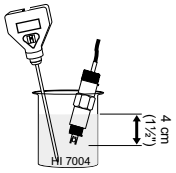
- *Wait for the measurement to stabilize and then adjust the "OFFSET" trimmer to display pH 7.01 on the LCD if the temperature of the buffer solution is at 25°C (77°F).*



- *If the temperature of the buffer solution is not 25°C (77°F), refer to the chart at the end of the manual for the appropriate buffer value at a given temperature and adjust the trimmer accordingly.*

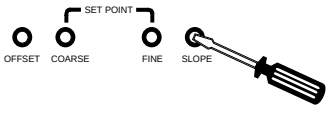
SLOPE ADJUSTMENT:

- *Rinse the electrode (and ground probe) thoroughly with water and immerse the bottom 4 cm (1.5") in a pH 4.01 (*HI 7004*) or a pH 10.01 (*HI 7010*) buffer solution.*



Note: *Use pH 4.01 if you are going to be monitoring acidic solutions or pH 10.01 for alkaline samples.*

- *Stir the electrode and wait for the display to stabilize before adjusting the "SLOPE" trimmer to display pH 4.01 (or 10.01) on the LCD if the temperature of the buffer solution is at 25 °C (77 °F). Otherwise, refer to the chart at the end of the manual for the appropriate buffer value and adjust the trimmer accordingly.*



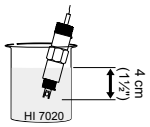
The pH calibration is now complete.

ORP CALIBRATION
(HI 9920)

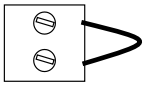
Make sure that the ORP electrode and any ground probe have been properly connected and wired to the controller (see preceding pages) and that the meter is plugged to the mains.

Remove the electrode cap if it is still on the electrode.

During calibration, introduce both the electrode and the ground probe (if in use) to the known solution. An immersion level of 4 cm (1.5") is recommended.

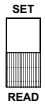


If no separate ground probe is being used, make sure that the Reference and the Matching Pin terminals are shorted (see 14 - Functional Diagram).

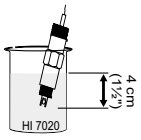


If the electrode incorporates a ground probe/matching pin (HI 2003/3) then remove the jumper.

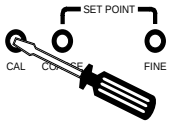
- *Turn the switch to the "READ" position.*



- *Immerse the electrode in a* HI 7020 *(or another known) ORP solution and wait for a few minutes for the reading to stabilize.*



- *Adjust the CAL trimmer to 230 ±20 mV (or a known value).*



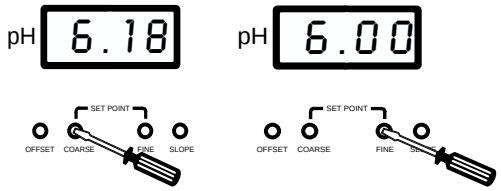
ADJUSTEMENT OF SETPOINT(S)

Make sure that the electrode (and any ground probe) is properly installed and calibrated (see the preceding pages).

FOR HI 9910

Turn the switch to the "SET" position (see 7 - Functional Diagram). The display will show the previously adjusted value (e.g. pH 8.00).

Using a small screwdriver, first adjust the setpoint through the COARSE trimmer and then fine tune it to your required level with the FINE trimmer (see 3 and 4 - Functional Diagram) until the desired set value is displayed (e.g. pH 6.00).



DOSING DIRECTION

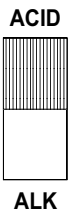
Select the direction of dosing through the "ACID"/"ALK" switch (see 8 - Functional Diagram). In order to dose acidic substances (i.e. lower the pH value) leave the selector on "ACID". When dosing base or alkaline solutions (to increase the pH) select the "ALK" position.

e.g. Dosing acidic liquids

Setpoint = pH 6.00

Measured value = pH 7.00

To reach the setpoint you need to dose acid, therefore move the switch to the "ACID" position (see 8 - Functional Diagram).

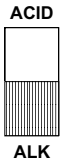


e.g. Dosing base liquids

Set point = pH 6.00

Measured value = pH 4.00

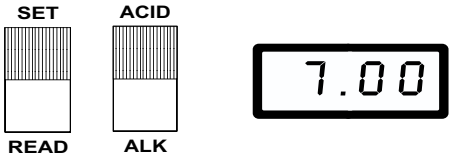
To adjust the sample stream to the setpoint, you need to dose base, therefore select "ALK".



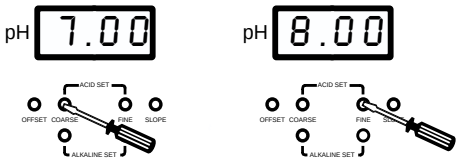
FOR HI 9911 (DUAL-POINT ADJUSTMENT)

a) ACID SETPOINT and DOSAGE

Turn the switches to "SET" and "ACID" (see 7 and 8 - Functional Diagram) to ***set the upper limit*** *and to direct the controller to lower the pH. The display will show the higher setpoint (e.g. pH 7.00).*



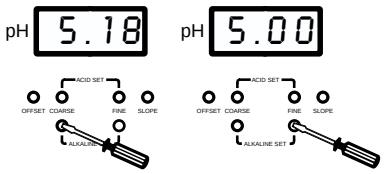
Using a small screwdriver, adjust the "ACID SET" trimmers. First adjust the "COARSE" trimmer and then fine tune with the "FINE" trimmer (see 3 and 4 - Functional Diagram) until the desired set value is displayed (e.g. pH 8.00).



a) ALKALINE SETPOINT and DOSAGE

Turn the switches to "SET" and "ALK" (see 7/8 - Functional Diagram) to ***set the lower limit*** *and to direct the controller to increase the pH. The display will show the lower setpoint (e.g. pH 6.00).*

Using a small screwdriver, adjust the "ALKALINE SET" trimmers. First adjust the "COARSE" trimmer and then fine tune with the "FINE"



trimmer (see 3 and 4 - Functional Diagram) until the desired set value is displayed (e.g. pH 5.00).

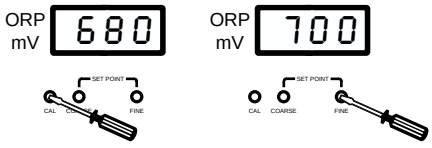
NOTE:

- *The "FINE" trimmer can adjust up to ±1.5 pH.*
- *Should you use the* HI 9911 *for a single-point dosage, it is recommended to adjust the "ALKALINE SET" trimmers to 0.00 pH if you are dosing acid solutions to lower the pH and adjust the "ACID SET" trimmers to your desired values. Likewise, when dosing only base solutions, set the "ACID SET" trimmers to 14.00 pH and adjust the "ALKALINE SET" trimmers to your desired value.*

FOR HI 9920

Turn the switch to the "SET" position (see 7 - Functional Diagram). The display will show the previously adjusted value (e.g. mV 650).

Using a small screwdriver, first adjust the setpoint through the "COARSE" trimmer and then fine tune it with the "FINE" trimmer (see 3 and 4 - Functional Diagram) until the desired set value is displayed (e.g. mV 700).



DOSING DIRECTION

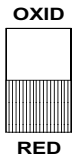
Select the direction of dosing through the "OXID"/"RED" switch (see 8 - Functional Diagram). For reducing dosage (i.e. lowering the mV value) leave the selector on "RED". Likewise, for oxidizing solutions (to increase the mV) select the "OXID" position.

e.g. Dosing reducing substances

Setpoint = mV 650

Measured value = mV 700

switch to the "RED" position (see 8 - Functional Diagram).

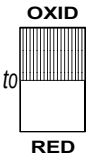


e.g. Dosing oxidizing substances

Setpoint = mV 650

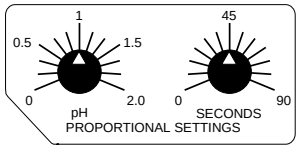
Measured value = mV 500

To adjust the sample stream to the setpoint, you need to dose oxidants, therefore select "OXID".



PROPORTIONAL CONTROL

In order to optimize the controlling process and reduce the amount of chemicals used, it is recommended to use a proportional dosage appropriate for the system.



All models allow for a proportional band (0 to 2.0 pH or 0 to 200 mV delta) as well as a time cycle (from 0 to 90 seconds) to be set. The proportional dosage is obtained by personalizing a current pulse whose height equals the pH or ORP proportional delta and the length corresponds to the selected time cycle.

The controller will enter ***proportional dosage*** *at* ***setpoint plus or minus the preselected*** *delta. It will then keep the dosing relay activated for a period proportional to the difference between the measurement and the setpoint over the cycle.*

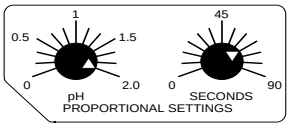
e.g. pH proportional control

Setpoint = pH 5.00

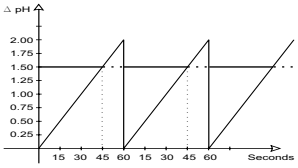
Measured value = 6.50

Delta = 6.5 - 5.0 = 1.5 pH

Proportional settings: pH set to 2 and time cycle to 60 seconds.

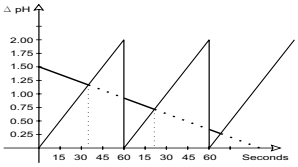


The controller will be dosing acids to reduce pH to the desired limit. Since it is 1.50/2.00 = 75% away from the ideal setting, it will keep the dosing terminals activated for 75% of the time over the predetermined 60 seconds. The relay is hence theoretically activated for 45 seconds and off for 15 seconds.

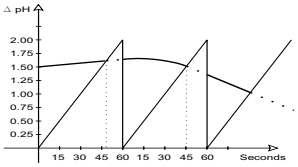


In order to avoid over dosage with fast responding samples or highly concentrated chemicals or under dosage with slow reacting or weak chemicals, the controller provides even a more accurate control.

As the graphs show, it does that by stopping the dosage as soon as the current pulse curve intersects the dosage curve.



This means shortening the dosage period if the chemicals have reacted quickly or lengthening it if the measured pH continues to drift from the ideal setpoint as can be seen from the graphs.



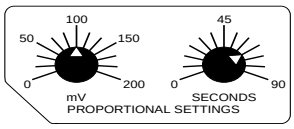
.g. ORP proportional control

Setpoint = 725 mV

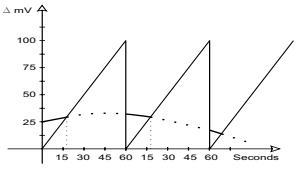
Measured value = 700 mV

Delta = 725 - 700 = 25 mV

Proportional settings = mV set to 100 and time cycle to 60 seconds.



The controller will be dosing reductants to reduce redox to the desired value. Since it is 25/100 = 25% away from the ideal setting, it will keep the dosing relay activated for 25% of the time over the predetermined 60 seconds. The terminals are hence activated for 15 seconds and off for 45 seconds until the next cycle.

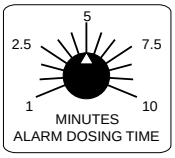


NOTE:

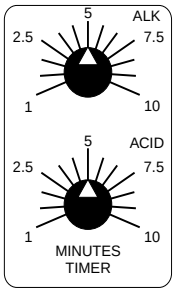
- *If the setting is left at 0 pH or 0 mV, the controller will operate as an on/off control with no proportional dosage. In this case the controller will operate with a 0.1 pH or 7 mV hysteresis.*
- ***Do not set the time cycle to zero**. This causes the relay to chatter and can be detrimental to your system and pumps.*

OVERDOSAGE TIMER

All models provide for an overdosage alarm system ranging from 1 to 10 minutes . The operator can set the maximum amount of time that the dosage terminals should continuously remain activated. Should this period elapse, the alarm terminals are activated (and dosage disactivated to ensure that chemicals have not run out or pumps or electrovalves have not ceased to function properly).



HI 9911 provides for two independent such controls, one for acid dosage and another for alkaline.



pH VALUES AT VARIOUS TEMPERATURES

Please refer to the following chart for a more accurate pH calibration:

TEMP		pH VALUES				
℃	℉	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 the meter to read 4.01, 7.01 or 10.01 on the display.

If the buffer temperature is 20°C, calibrate it to 4.00, 7.03 or 10.06.

If the buffer temperature is 50°C, calibrate it to 4.06, 6.98 or 9.82.

REDOX MEASUREMENT (HI 9920)

Redox measurements allow the quantification of the oxidizing or reducing power of a solution, 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 a chemical reaction with the elements with which it comes into contact.

The electrodes most usually available for this purpose have gold or platinum surfaces; gold possesses a higher resistance than platinum in conditions of strong oxidation such as cyanide, while platinum is preferred for the measurements of oxidizing solutions containing halides and for general use.

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 accurate redox measurements the surface of the electrode must be clean and smooth. At certain mV and pH values, the ORP electrode requires a considerable amount of time before it reads the proper value. This is at times due to the fact that it is moving from a reducing to an oxidizing state. Once it reaches a stable condition though, it reacts rapidly to changes.

Hence when the process is first set up allow sufficient time for the ORP electrode to adapt itself to the sample stream.

As with pH electrodes, gel-filled redox electrodes are more suitable for industrial applications due to less maintenance requirements.

In the event that measurements are made in solutions containing heavy doses of sulfide or protein, the diaphragm of the reference electrode must be cleaned more often.

In order to test that the ORP electrode is functioning properly, immerse it into a HI 7020 *solution. The measured value should be*

between 200 and 250 mV.

When not in use, the electrode tip should be kept moist in order for the reference junction, especially Teflon models, to respond quickly. Otherwise, soak the electrode overnight in a HI 70300 *storage solution or allow more time upon installation for its stabilization. Also keep the electrode far from any type of mechanical stress which might cause damage.*

Install the electrode in such a way that it is constantly in a well filled with the sample (stream or tank) and does not dry up.

The protective cap should also be filled with a few drops of HI 70300 *storage solution if the electrode is not being used at all.*

Note: *With industrial applications, it is always good practice to keep at least one spare electrode handy. When anomalies are not resolved with a simple maintenance, change the electrode to see if the problem is alleviated.*

ELECTRODE CONDITIONING & 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 bubbles of air may have formed inside the glass bulb (membrane). Shake down the electrode as you would do with a glass thermometer to remove these bubbles.

If the bulb and/or junction are dry, soak the electrode in a HI 70300 Storage Solution *overnight.*

STORAGE

To minimize clogging and assure a quick response time, the glass bulb and the junction should be kept moist and not allowed to dry out. This can be achieved by installing the electrode in such a way that it is constantly in a well filled with the sample (stream or tank).

When not in use, pour a few drops of HI 70300 *Storage Solution or, in its absence,* HI 7007 *pH 7.01 Buffer Solution in the protective cap and replace it on the electrode.*

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

PERIODIC MAINTENANCE

Inspect the electrode and the cable. The cable used for the connection to the controller 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 present, replace the electrode. Rinse off any salt deposits with water.

CLEANING PROCEDURE

Soak in Hanna HI 7061 *General Cleaning Solution for ½ hour.*

For more specific cleaning procedures, refer to the electrode's instruction manual.

IMPORTANT: *After performing any of the cleaning procedures rinse the electrode thoroughly with distilled water and recalibrate the controller.*

TROUBLESHOOTING

Evaluate your electrode performance based on the following.

- Noise *(Readings fluctuate up and down) could be due to a clogged/dirty junction: Refer to the Cleaning Procedure above.*
- Dry Membrane/Junction: *Soak in Storage Solution* HI 70300 *overnight. Check to make sure the installation is such as to create a well for the electrode bulb to constantly remain moist.*
- Low Slope: *Refer to the cleaning procedure above.*
- No Slope: - *Check the electrode for cracks in glass stem or bulb (replace the electrode if cracks are found).*
  - *Make sure cable and connections are not damaged nor lying in a pool of water or solution.*
- Slow Response/Excessive Drift: *Soak the tip in Hanna Solution* HI 7061 *for 30 minutes, rinse thoroughly with distilled water and then recalibrate the meter.*
- For ORP Electrodes: *Polish the metal tip with a lightly abrasive paper (paying attention not to scratch the surface) and wash thoroughly with water.*

Note: *With industrial applications, it is always recommended to keep at least one spare electrode handy. When anomalies are not resolved with a simple maintenance, change the electrode (and recalibrate the controller) to see if the problem is alleviated.*

SUGGESTED INSTALLATIONS for pH/ORP ELECTRODES

The electrode should be installed in such a way that its tip permanently lies in the solution whether in a well, tank or on the discharge pipe.

SHORT DISTANCE, INDOOR INSTALLATION

Due to the low currents involved, a very high grade of insulation is required. A dry environment is needed in order to obtain a level of insulation not lower than $10^{12}\ \Omega$.

This type of connection is very delicate and requires constant attention to maintain proper operating conditions.

The conventional electrodes may be used for indoor applications but the cable length should not exceed 10 m (33').

MEDIUM DISTANCE, INDOOR/OUTDOOR INSTALLATION

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

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

The standard cable length of the AmpHel electrode is 5 m (16.5'). Additional lengths of regular cable up to 50 m (165'), can be installed without special connectors. It is recommended to use coaxial cables due to their excellent insulation, even though, Amphel electrodes can operate with both.

AmpHel electrodes have a micro-amplifier in the electrode cap to boost the signal, drastically reducing susceptibility to noise and drift.

For more details about these or other specially made electrodes, consult the Hanna process and water treatment literature, or call the Hanna Office nearest to you.

ACCESSORIES

pH ELECTRODES

HI 1002/3 *Double Teflon junction with external threads*
HI 1003/3 *Double Teflon junction with matching pin*
HI 2911B/5 *Preamplified, double Teflon junction*

ORP (Pt) ELECTRODES

HI 2002/3 *Double Teflon junction with external threads*
HI 2003/3 *Double Teflon junction with matching pin*
HI 2931B/5 *Preamplified, double Teflon junction*

ORP (AU) ELECTRODES

HI 2012/3 *Double Teflon junction with external threads*
HI 2013/3 *Double Teflon junction with matching pin*

Hanna manufactures hundreds of pH and ORP electrodes for a wide variety of process and water treatment applications. Consult the specific handbooks for electrodes and process instrumentation, or simply call the Hanna Office nearest to you for a complete list.

pH CALIBRATION SOLUTIONS

HI 7004L	*pH 4.01 buffer solution, 460 mL*
HI 7007L	*pH 7.01 buffer solution, 460 mL*
HI 7010L	*pH 10.01 buffer solution, 460 mL*

ORP SOLUTIONS

HI 7020L	*200-275mV ORP solution, 460 mL*
HI 7091L	*Pretreatment reducing solution, 460 mL*
HI 7092L	*Pretreatment oxidizing solution, 460 mL*

ELECTRODE STORAGE SOLUTION

HI 70300L	*Storage solution, 460 mL*

ELECTRODE CLEANING SOLUTIONS

HI 7061L	*General purpose cleaning solution, 460 mL*
HI 7073L	*Protein cleaning solution, 460mL*
HI 7074L	*Inorganic cleaning solution, 460mL*
HI 7077L	*Oil & fat cleaning solution, 460 mL*

OTHER ACCESSORIES

BL PUMPS	*Dosing pumps (several models are available with flow rates from 1.5 to 18.3 lph / 0.4 to 4.8 gph)*
ChecktempC	*Pocket-size thermometer (range -50.0 to 150.0°C)*
ChecktempF	*Pocket-size thermometer (range -58.0 to 302.0°F)*
HI 6050	*Submersible electrode holder (605 mm/23.8" long)*
HI 6051	*Submersible electrode holder (1105 mm/43.5" long)*
HI 6054B	*Electrode holder for in-line applications*
HI 5001/5	*3-wire Pt100 stainless steel temperature probe*
HI 5002/5	*3-wire Pt100 glass temperature probe*
HI 8427	*pH and ORP Electrode Simulator and high impedance tester with 1 m (3.3') Coaxial Cable ending in a male BNC connector (HI 7858/1)*
HI 931001	*pH and ORP Electrode Simulator with LCD Display and 1 m (3.3') Coaxial Cable ending in a male BNC connector (HI 7858/1)*

WARRANTY

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

Damages due to accident, misuse, tampering or lack of prescribed maintenance are not covered. This warranty is limited to free of charge repair or replacement of the meter only, if any malfunctioning is due to manufacturing defects.

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

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

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

OTHER PRODUCTS FROM HANNA

- *CABLES AND CONNECTORS*
- *CALIBRATION AND MAINTENANCE SOLUTIONS*
- *CHEMICAL TEST KITS*
- *CHLORINE METERS*
- *CONDUCTIVITY/TDS METERS*
- *DISSOLVED OXYGEN METERS*
- *HYGROMETERS*
- *ION SPECIFIC METERS (Colorimeters)*
- *MAGNETIC STIRRERS*
- *Na/NaCl METERS*
- *pH/ORP/Na ELECTRODES*
- *pH METERS*
- *PROBES (DO, µS/cm, RH, T, TDS)*
- *PUMPS*
- *REAGENTS*
- *SOFTWARE*
- *THERMOMETERS*
- *TITRATORS*
- *TRANSMITTERS*
- *TURBIDITY METERS*
- *Wide Range of ACCESSORIES*

Most Hanna meters are available in the following formats:

- *BENCH-TOP METERS*
- *POCKET-SIZED METERS*
- *PORTABLE METERS*
- *PRINTING/LOGGING METERS*
- *PROCESS METERS (Panel and Wall-mounted)*
- *WATERPROOF METERS*
- *METERS FOR FOOD INDUSTRY*

For additional information, contact your dealer or the nearest Hanna Customer Service Center.
You can also e-mail us at tech@hannainst.com.

CE DECLARATION OF CONFORMITY

HANNA instruments

CE

DECLARATION OF CONFORMITY

We

Hanna Instruments Srl
V.le delle industrie 12
35010 Ronchi di Villafranca (PD)
ITALY

herewith certify that the wall-mounted instruments:

HI 9910 HI 9911 HI 9920

have been tested and found to be in compliance with the following regulations:

IEC 801-2	Electrostatic Discharge
IEC 801-3	RF Radiated
IEC 801-4	Fast Transient
EN 55022	Radiated, Class B
EN 61010-1	User Safety Requirement

Date of Issue: 07-06-1999

D.Volpato - Engineering Manager
On behalf of
Hanna Instruments S.r.l.

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 areas could cause unacceptable interference to radio and TV equipment.

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

Unplug the instruments from power supply before replacing the fuse or making any electrical connections.

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 other 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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