Industrial Division
Industrial Probes

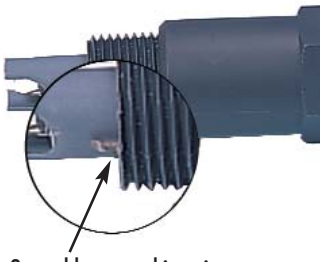
HANNA instruments
CANADA

Features

- *Self clean sensors*
- *Built-in amplifier and replaceable battery*
- *Ground loop matching pin*
- *PVDF body material*
- *Incorporated 3 wires Pt100 sensors*
- *Four different glass type pH sensors*
  - *standard*
  - *low T°*
  - *high T°*
  - *HF resistant*
- *Two different metal type ORP sensors*
  - *platinum*
  - *gold*

Built-in amplifier and replaceable battery

The Hanna AmpHel system is a breakthrough in pH/ORP electrode technology. Hanna`s new wastewater line of electrodes feature a replaceable battery on electrode cable to ensure longer battery life in high temperature applications where regular head built-in battery may fail rapidely.



Ground loop matching pin

Ground loop matching pin

Fluctuation of readings and short electrode life can be related to a ground loop current problem. The solution to this problem is Hanna's electrode with ground loop matching pin. Hanna's pH 500, pH 502, mV 600, mV 602, HI 21 & HI 22 controllers now come with a differential input to prevent such problems. With this new feature, the life of the electrodes will be greatly extended and expensive labor and time will be eliminated.

PVDF body material

Agressive chemicals and high temperature are common agressors of pH and ORP probes. For those applications, Hanna has developed a complete line of sensors with PVDF body.

Industrial challenges

Process applications present some major challenges to the pH measurement system. The most common of these are long distances between the sample and the meter, high and low temperature extremes, electrical interferences, high pressure, clogging of the junction/reference electrode and chemical/physical breakdown. For each of these common problems, Hanna has developed specific electrodes features for excellent performance in all types of process applications.

pH measurement over long distances

Due to the high resistance of the glass membrane of a pH electrode, conventional pH measuring systems utilize high impedance signal transmission. Poor insulation of the electrode connectors and cables results in high susceptibility to leakage, stray noise and humidity which tends to give erroneous pH readings. As a result, particular care has to be taken in connecting the electrode to the metering system. For this conventional system, the cable length is restricted to typically less than 10 meters. For measurements to be accurate the use of a high impedance meter is required and it is necessary to provide for high insulation at all connections.

With Hanna's AmpHel electrodes there is an amplifier built into the electrode, problems associated with high impedance are now isolated to one location. The high impedance circuitry is located at the top of the electrode which is completely encapsulated. As a result you now have low output impedance signals from the electrode to the metering system. This means you can use ordinary connections with long unshielded cables (up to 50 meters) and an ordinary meter. For greater distances up to 300 meters it is recommended that you use a Hanna 2-wire transmitter.

High and low temperature extremes

As we have discussed the pH glass membrane is sensitive to the temperature of the solution. Prolonged use and/or exposure to temperatures above 35 °C will accelerate the aging and increase chemical attack to the glass membrane which will shorten the overall service life of an ordinary sensor. With advanced sensor glass technology and construction, Hanna has developed electrodes that will perform consistently in higher and lower temperature extremes. These new sensors will deliver a useful life comparable to a standard electrode under optimum conditions.

Industrial applications up to 87 psi (6 BAR)

Standard electrodes are not suitable to perform measurements in pressurized systems over 44 psi (3 BAR). An electrode not engineered for high pressure applications could cause a major leak in the process and even be dangerously projected from the system. Hanna's high pressure electrodes have been constructed to operate reliably in pressurized systems up to 87 psi (6 BAR).

Electrolyte contamination and junction clogging

One of the most common causes of electrode failure is clogging of the junction. The junction simply becomes physically clogged due to either solids in the sample solution or by precipitation (of AgCl for instance). To help overcome this problem Hanna has increased the physical size of the junction with the result of increasing the life of the electrode when introduced into applications that would normally quickly clog the junction. Hanna's glass sensors are thicker and the composition has been formulated to offer greater chemical resistance and an increased impedance range. Electrolyte contamination was a common problem before the introduction of double junction technology. Contaminated ions will actually stick onto the sensor of the reference compartment when the positive flow of electrolyte is reversed in a single junction system. In a double junction system the reference electrode is not in direct contact with the sample and the problem of reference contamination is nearly eliminated.

Physical breakdown

Normal maintenance is usually the main cause of electrode breakdown. The delicate sensor must be treated with extreme care. A glass bulb electrode in a process stream will also become dirty with deposits such as silicate or phosphate. These deposits may not be visible but the electrode will become sluggish or generate a dramatic change in the slope value. Hanna's flat tip process electrodes have shown significantly less breakdown than glass bulb electrodes. Flat electrodes also experience less abrasion in a flow application and nearly eliminate deposits.

Process pH and ORP electrodes

Hanna's latest additions to the range of industrial combination pH and ORP electrodes incorporate over 20 years of electrode manufacturing experience. These advanced electrodes feature proven flat tip technology for superior in line performance. The flat tip virtually eliminates deposits that can clog the electrode significantly reducing necessary maintenance.

Each electrode has a built-in potential matching pin. With this feature, the electrode's unstable readings fouling due to ground loop current through the reference of the sensor is a thing of the past. These electrodes have been engineered with a replaceable battery to power the amplifier. This feature adds life to the electrode and aids in troubleshooting. Some electrode models are available with a built-in 3-wire Pt100 sensor allowing the user to do without any additional probe or thermometer for temperature compensation. For those applications that have proven particularly hostile to glass sensors, Hanna Instruments has developed four types of specialized glass. First is an extremely durable sensor glass for general purpose industrial use. This glass can withstand sudden impacts and extreme mechanical stress. The remaining types of electrode glass allow continuous monitoring in highly acidic solutions containing fluoride ions, as well as high or low temperature process streams significantly increasing the useful life of the electrode.

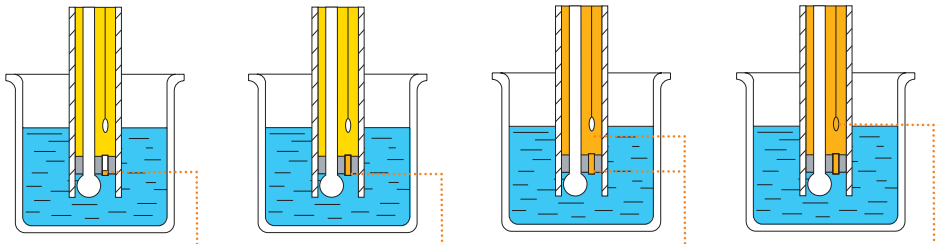
Hanna has been at the forefront of sensor research and development in the 80s and 90s. The increasing demand for reliable, rugged and high quality electrodes for the laboratory, water treatment and process industries has motivated us to increase our commitment to innovative developments. The most common sensing problems related to pH electrodes are the contamination and clogging of the reference junction, resulting in slow, drifty and noisy measurements. Hanna's vast experience in the manufacturing of electrodes has enabled us to introduce innovative ideas, developing dedicated answers to specific problems in the measurement of pH.

Advantages of double junction electrodes

Minimizing Contamination
Reduction in Clogging of Junctions

Minimizing Contamination

Conventional electrodes are normally single junction. As depicted by the figures below, these electrodes have only a single junction which serves to put the reference electrode system in contact with the sample. Under adverse conditions e.g. high pressure, high temperature, highly acidic or alkaline solutions etc., the positive flow of the electrolyte through the junction is often reversed resulting in the ingress of sample solution into the reference compartment. If this is left unchecked, the reference electrode ultimately is contaminated, leading to complete electrode failure.



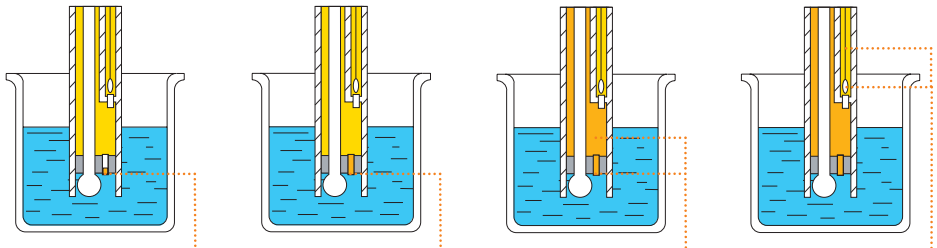
STEP 1
Junction contamination begins

STEP 2
Junction contaminated

STEP 3
Junction contaminated + reference chamber contaminated

STEP 4
Contamination of AgCl reference wire leads to electrode failure

Hanna's double junction system, as the name implies, has two junctions, only one of which is in contact with the sample. As illustrated in the figures below, under adverse conditions, the same tendency of sample ingress is evident. However, as the reference electrode system is separated physically from the intermediate electrolyte area, the contamination of the electrode is minimized. This leads to long electrode life. The chances of recovery are also higher if proper maintenance procedures are taken.



STEP 1
First junction contamination begins

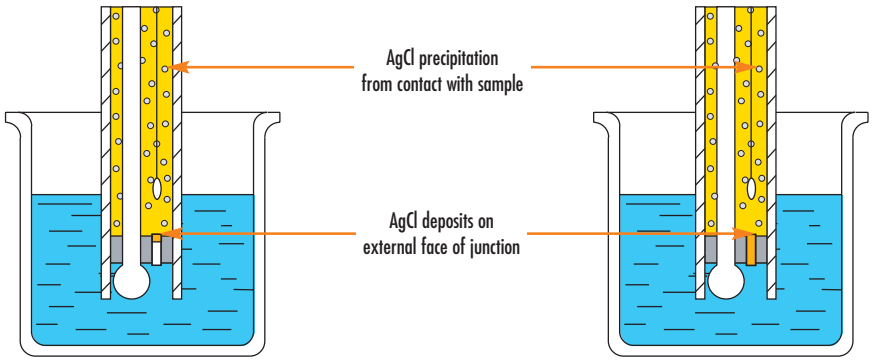
STEP 2
First junction contaminated

STEP 3
First junction contaminated + first reference chamber contaminated

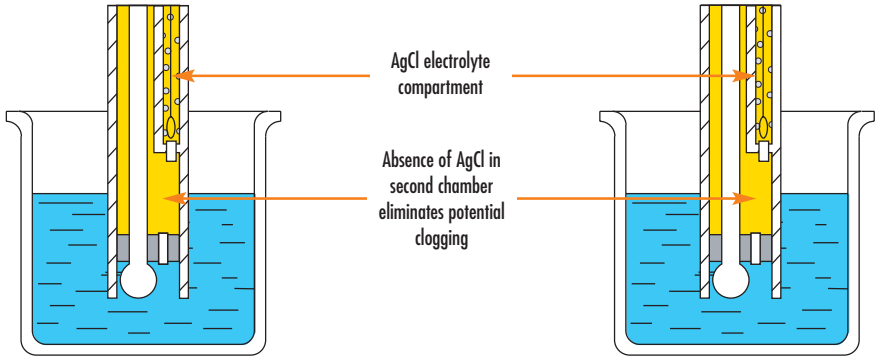
STEP 4
Second junction + second reference system is untouched, electrode still working

Reduction in Clogging of Junctions

A common cause of clogged junctions in conventional electrodes is due to the common ion effect. AgCl is less soluble in the sample than the reference electrolyte solution. Therefore, when the electrolyte solution makes contact with the sample, some AgCl will precipitate on the external face of the junction. Even though regular maintenance procedures and backflushing eliminates clogging, often the severity of this problem is not comprehended. The result is drifty readings obtained from the sensor.



In Hanna's double junction electrodes, the secondary compartment electrolyte which contacts the sample through the junction does not contain any Silver Chloride ions. As such, this problem is non existent. Though the primary compartment contains heavy ions, the contact across the primary junction is purely by ionic diffusion and as such in contrast to the high flow junctions in contact with the sample, the clogging effect is negligible.



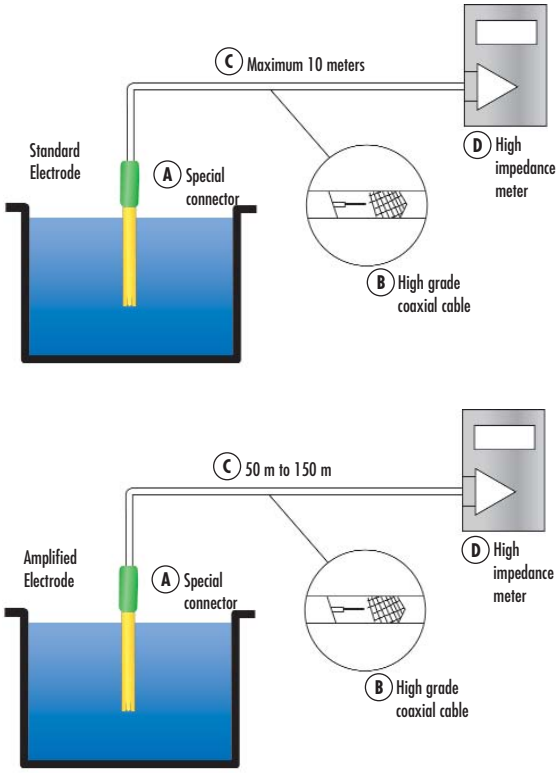
AmpHel : Amplified pH Electrode

Conventional pH Technology

Due to the high resistance of the glass membrane of a pH electrode, conventional pH measuring systems utilize high impedance signal transmission. Bad insulation of the electrode connectors (A) and cables (B) results in high susceptibility to leakage, stray noise and humidity which tends to give erroneous pH readings. As a result, particular care has to be taken in connecting the electrode to the metering system. For this conventional system, the cable length (C) is restricted to typically less than 10 meters because of the low signal transmission. For measurements to be accurate the use of a high impedance meter (D) is required and it is necessary to provide for high insulation in the meter connections. For these reasons the conventional pH measuring system is delicate.

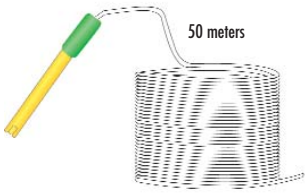
Breakthrough by HANNA

With an amplifier built into the electrode, the problems associated with high impedance is now isolated to one location (see Figure on the right). The high impedance circuitry is now located at the top of the electrode which is completely encapsulated. As a result, you now have low output impedance signals from the electrode to the metering system. This means you can use ordinary connectors (A) with long unshielded cables (B, C) and an ordinary meter (D). This breakthrough in pH technology provides you with a rugged system for all industrial pH measurements and monitoring.

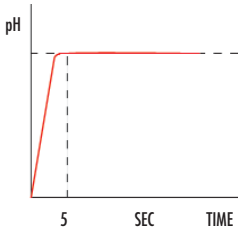


Characteristics and Advantages

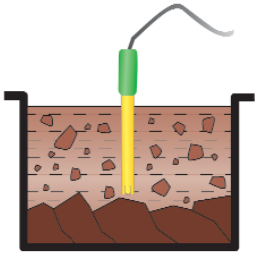
- *Combination Ag/AgCl sensor & reference system.*
- *Rugged design with epoxy body housing and sensor protection.*
- *Battery life of 2 years.*
- *Very low output impedance (typically 10K ohms) for:*
  - *instantaneous response*
  - *unsurpassed stability*
  - *connections with long unshielded cables (up to 50 meters)*
  - *high mechanical and electrical noise immunity*
  - *compatibility with existing pH meters in the market*
  - *on-line process control applications*
- *Double junction reference system for minimization of contamination due to clogged pores or ingress of sample.*
- *Refillable external reference system for versatility and durability.*
- *High flow rate fiber junction for optimum ionic conduction.*
- *Complete pH range from 0 to 14 & temperature range from 0 to 80°C.*



LONG UNSHIELDED CABLE



FAST AND STABLE RESPONSE


MINIMAL CONTAMINATION

Standard glass type pH sensors

HI 6100405 Flat tip, 0-13 pH, double Teflon® junction, polymer electrolyte, matching pin, AmpHel, -5 to 80°C, 6 bars (87 PSI) pressure, PVDF body, BNC connector & 5 m cable.

HI 6101405 Flat tip, 0-13 pH, double Teflon® junction, polymer electrolyte, matching pin, Pt 100, AmpHel, -5 to 80°C, 6 bars (87 PSI) pressure, PVDF body, BNC & lead connectors & 5 m cable.

HI 1006-2005 Flat tip with guard, 0-13 pH, double Teflon® junction, polymer electrolyte, matching pin, -5 to 80°C, 6 bars (87 PSI) pressure, PVDF body, BNC connector & 5 m cable.

Low T° glass type pH sensors

HI 6100605 Flat tip, 0-12 pH, double Teflon® junction, polymer electrolyte, matching pin, AmpHel, -10 to 80°C, 6 bars (87 PSI) pressure, PVDF body, BNC connector & 5 m cable.

HI 6101605 Flat tip, 0-12 pH, double Teflon® junction, polymer electrolyte, matching pin, Pt 100, AmpHel, -10 to 80°C, 6 bars (87 PSI) pressure, PVDF body, BNC & lead connectors & 5 m cable.

HI 1006-1007 Flat tip with guard, 0-12 pH, double Teflon® junction, polymer electrolyte, matching pin, -10 to 80°C, 6 bars (87 PSI) pressure, PVDF body, BNC connector & 7 m cable.

High T° glass type pH sensors

HI 6100805 Flat tip with guard, 0-14 pH, double Teflon® junction, polymer electrolyte, matching pin, AmpHel, 0 to 100°C, 6 bars (87 PSI) pressure, PVDF body, BNC connector & 5 m cable.

HI 6101805 Flat tip with guard, 0-14 pH, double Teflon® junction, polymer electrolyte, matching pin, Pt 100, AmpHel, 0 to 100°C, 6 bars (87 PSI) pressure, PVDF body, BNC & lead connectors & 5 m cable.

HI 1006-3007 Flat tip with guard, 0-14 pH, double Teflon® junction, polymer electrolyte, matching pin, 0 to 100°C, 6 bars (87 PSI) pressure, PVDF body, BNC connector & 7 m cable.

HF resistant glass type pH sensors

pH electrodes for acid samples with Fluoride ions (F^- max 2 g/l, < 60°C, > 2 pH)*
* Conditions listed are true in the presence of Fluoride

HI 6100205 Flat tip, 0-10 pH, double Teflon® junction, polymer electrolyte, matching pin, AmpHel, -5 to 60°C, 6 bars (87 PSI) pressure, PVDF body, BNC connector & 5 m cable.

HI 6101205 Flat tip, 0-10 pH, double Teflon® junction, polymer electrolyte, matching pin, Pt 100, AmpHel, -5 to 60°C, 6 bars (87 PSI) pressure, PVDF body, BNC & lead connectors & 5 m cable.

HI 1006-4005 Flat tip with guard, 0-10 pH, double Teflon® junction, polymer electrolyte, matching pin, -5 to 60°C, 6 bars (87 PSI) pressure, PVDF body, BNC connector & 5 m cable.

Platinum type ORP sensors

HI 6200405 ± 2000 mV, double Teflon® junction, polymer electrolyte, matching pin, AmpHel, -5 to 100°C, 6 bars (87 PSI) pressure, PVDF body, BNC connector & 5 m cable.

HI 2004-1007 ± 2000 mV, double Teflon® junction, polymer electrolyte, matching pin, -5 to 100°C, 6 bars (87 PSI) pressure, PVDF body, BNC connector & 7 m cable.

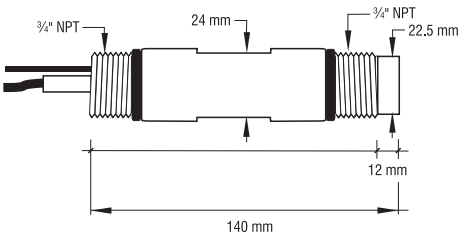
Gold type ORP sensors

HI 6200505 ± 2000 mV, double Teflon® junction, polymer electrolyte, matching pin, AmpHel, -5 to 100°C, 6 bars (87 PSI) pressure, PVDF body, BNC connector & 5 m cable.

HI 2004-2007 ± 2000 mV, double Teflon® junction, polymer electrolyte, matching pin, -5 to 100°C, 6 bars (87 PSI) pressure, PVDF body, BNC connector & 7 m cable.

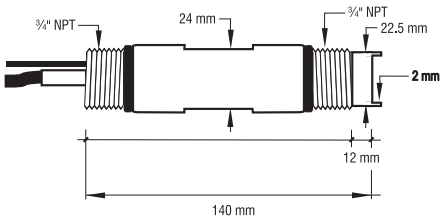
Flat tip probe diagram

HI 6100405 **HI 6100605** **HI 6100205**
HI 6101405 **HI 6101605** **HI 6101205**

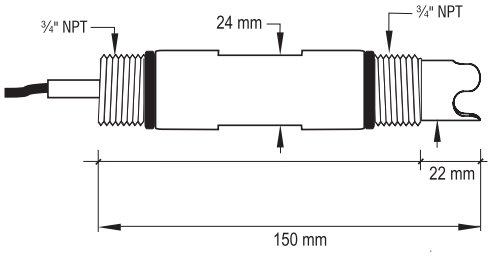


Flat tip probe (with guard) diagram

HI 1006-2005 **HI 6100805** **HI 1006-3007**
HI 1006-1007 **HI 6101805** **HI 1006-4005**



Platinum and gold probe diagram



Standard glass type pH sensors

HI 1002/3 0-14 pH, double Teflon® junction, polymer electrolyte, -5 to 80°C, 6 bars (87 PSI) pressure, polypropylene body, BNC connector & 3 m cable.

HI 1002/5 0-14 pH, double Teflon® junction, polymer electrolyte, -5 to 80°C, 6 bars (87 PSI) pressure, polypropylene body, BNC connector & 5 m cable.

HI 1003/3 0-14 pH, double Teflon® junction, polymer electrolyte, matching pin, -5 to 80°C, 6 bars (87 PSI) pressure, polypropylene body, BNC connector & 3 m cable.

HI 1003/5 0-14 pH, double Teflon® junction, polymer electrolyte, matching pin, -5 to 80°C, 6 bars (87 PSI) pressure, polypropylene body, BNC connector & 5 m cable.

HI 1001 0-14 pH, double Teflon® junction, polymer electrolyte, -5 to 80°C, 6 bars (87 PSI) pressure, polypropylene body, BNC connector & 3 m cable.

HI 101 0-14 pH, double Teflon® junction, polymer electrolyte, -5 to 100°C, 6 bars (87 PSI) pressure, PVDF body & BNC connector.

HI 2910B/5 Double cloth junction, gel electrolyte, -5 to 80°C, 3 bars (43.5 PSI) pressure, Ultem® body, BNC connector & 5 m cable.

Platinum type ORP sensors

HI 2002/3 ± 2000 mV, double Teflon® junction, polymer electrolyte, -5 to 80°C, 6 bars (87 PSI) pressure, polypropylene body, BNC connector & 3 m cable.

HI 2002/5 ± 2000 mV, double Teflon® junction, polymer electrolyte, -5 to 80°C, 6 bars (87 PSI) pressure, polypropylene body, BNC connector & 5 m cable.

HI 2003/3 ± 2000 mV, double Teflon® junction, polymer electrolyte, matching pin, -5 to 80°C, 6 bars (87 PSI) pressure, polypropylene body, BNC connector & 3 m cable.

HI 2003/5 ± 2000 mV, double Teflon® junction, polymer electrolyte, matching pin, -5 to 80°C, 6 bars (87 PSI) pressure, polypropylene body, BNC connector & 5 m cable.

HI 2001 ± 2000 mV, double Teflon® junction, polymer electrolyte, -5 to 80°C, 6 bars (87 PSI) pressure, polypropylene body, BNC connector & 3 m cable.

HI 2930B/5 Double cloth junction, gel electrolyte, -5 to 80°C, 3 bars (43.5 PSI) pressure, Ultem® body, BNC connector & 5 m cable.

Gold type ORP sensors

HI 2012/3 ± 2000 mV, double Teflon® junction, polymer electrolyte, -5 to 80°C, 6 bars (87 PSI) pressure, polypropylene body, BNC connector & 3 m cable.

HI 2012/5 ± 2000 mV, double Teflon® junction, polymer electrolyte, -5 to 80°C, 6 bars (87 PSI) pressure, polypropylene body, BNC connector & 5 m cable.

HI 2013/3 ± 2000 mV, double Teflon® junction, polymer electrolyte, matching pin, -5 to 80°C, 6 bars (87 PSI) pressure, polypropylene body, BNC connector & 3 m cable.

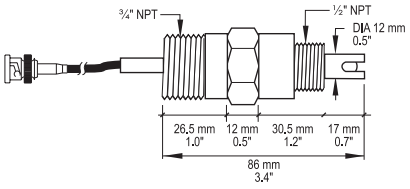
HI 2013/5 ± 2000 mV, double Teflon® junction, polymer electrolyte, matching pin, -5 to 80°C, 6 bars (87 PSI) pressure, polypropylene body, BNC connector & 5 m cable.

HI 201 ± 2000 mV, double Teflon® junction, polymer electrolyte, -5 to 100°C, 6 bars (87 PSI) pressure, PVDF body & BNC connector.

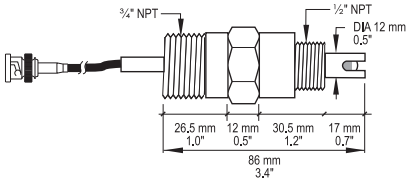
SUGGESTED ACCESSORIES

HI 101/3	3 m cable for HI 101 & HI 201 probes	**HI 101/7**	7 m cable for HI 101 & HI 201 probes

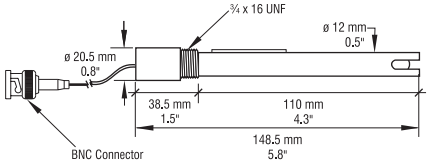
HI 1001 probe diagram



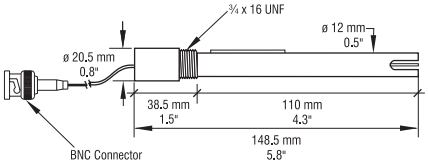
HI 2001 probe diagram



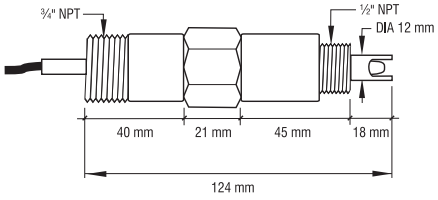
HI 2910B/5 probe diagram



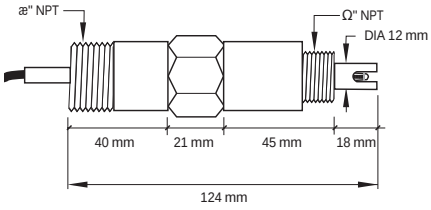
HI 2930B/5 probe diagram



HI 1002 & HI 1003 series pH probe diagram



HI 2002, HI 2003, HI 2012 & HI 2013 series ORP probe diagram



Platinum type sensors

HI 7638 4-rings potentiometric method, up to 120°C, 5 bars pressure, Ultem® body, NTC sensor, stainless steel external thread.

HI 7639 4-rings potentiometric method, up to 120°C, 5 bars pressure, Ultem® body, 3-wires Pt100 sensor, stainless steel external thread.

HI 7640 4-rings potentiometric method, up to 120°C, 5 bars pressure, Ultem® body, stainless steel external thread.

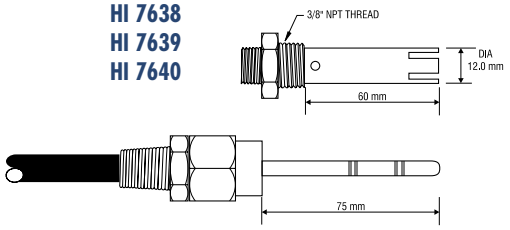
HI 3001 4-rings potentiometric method, up to 80°C, 6 bars pressure, polypropylene body, NTC sensor up to 60°C, 12.5 mm external thread & 3 m cable.

HI 3002 4-rings potentiometric method, up to 80°C, 6 bars pressure, polypropylene body, NTC sensor up to 50°C, 12.5 mm external thread & 3 m cable.

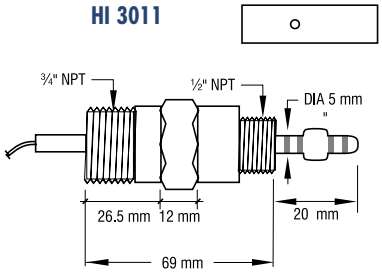
HI 3011 4-rings potentiometric method, up to 80°C, 6 bars pressure, polypropylene body, 12.5 mm external thread & 3 m cable.

HI 3012 4-rings potentiometric method, up to 80°C, 6 bars pressure, polypropylene body, 12.5 mm externa thread & 3 m cable.

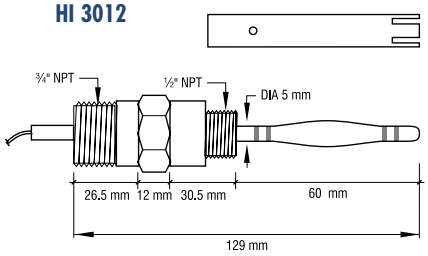
HI 7638
HI 7639
HI 7640



HI 3001
HI 3011



HI 3002
HI 3012



HANNA instruments
CANADA

Quebec Office
T (450) 629-1444
F (450) 629-3335

Ontario Office
T (905) 876-9358
F (905) 876-9359

BC Office
T (604) 572-7647
F (604) 572-7648

Toll Free
1-800-842-6629

Your authorized Hanna dealer