

HI 1000
S E R I E S

ISO 9001:2000 CERTIFIED

INDUSTRIAL pH/ORP ELECTRODES



FLAT-TIP TECHNOLOGY

HANNA[®]
instruments
With Great Products, Come Great Results™

HI 1000 SERIES

INDUSTRIAL PH/ORP ELECTRODES

WITH **FLAT-TIP TECHNOLOGY**

- SELF-CLEANING FLAT TIP SENSOR
- SIGNIFICANTLY REDUCED MAINTENANCE
- MODELS SPECIALLY DESIGNED FOR PLATING BATHS
- PVDF BODY
- THREE JUNCTION TYPES: CERAMIC, PTFE AND OPEN JUNCTION
- BUILT-IN POTENTIAL MATCHING PIN
- FOUR DIFFERENT GLASS TYPE PH SENSORS
- ORP ELECTRODES WITH PLATINUM OR GOLD SENSOR
- MODELS WITH BUILT-IN Pt100 OR Pt1000 TEMPERATURE SENSOR
- MODELS WITH INTERNAL AMPLIFIER POWERED BY THE PROCESS CONTROLLER
- 3/4" NPT EXTERNAL THREAD ON BOTH ENDS FOR EASY INSTALLATION

HANNA instruments® presents a new series of combination pH and ORP electrodes, including more than 300 models, incorporating over 20 years of electrode manufacturing experience.

The most advanced feature of this series is the electrode shape with flat tip, which virtually eliminates deposits that can foul the electrode, significantly reducing necessary maintenance. This characteristic makes flat tip electrodes ideal for continuous in-line monitoring, and with solutions containing aggressive chemicals. The PVDF body offers a higher level of mechanical and temperature resistance. Moreover, the PVDF material is non-toxic and compatible with food applications.

Each pH and ORP electrode is provided with an internal matching pin that can avoid typical problems caused by grounding loop current, such as:

- > progressive damage of the electrode
- > fluctuating measurements
- > poor process regulation

Glass Type	Application	pH Range	Temperature Range
LT	Low Temperature	0 to 12	-10 to 80°C
HT	High Temperature	0 to 14	0 to 100°C
HF	Acid Samples with F ⁻ (*)	0 to 10	-5 to 60°C

(*) F⁻ max 2 g/L, temperature max 60°C, pH >2

Select the flat tip electrode that best fits your process requirements, by choosing from the following technical characteristics:

1. Junction

Three junction types are available:

- **Annular** non-clogging PTFE junction, for testing solutions with high content of suspended solids or for high pressure installation
- **Open** junction, ideal for waste water analysis
- **Ceramic** junction

2a. Sensitive Glass

Membrane (pH Electrodes)

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 electrode life.

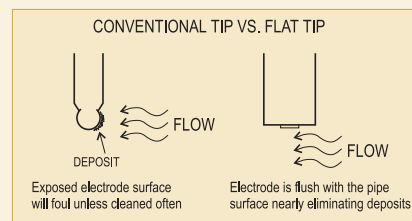
HANNA Specialized Electrode Glass		
Glass Type	Application	pH Range
GP	General Purpose	0 to 13 pH
LT	Low Temperature	0 to 12 pH
HT	High Temperature	0 to 14 pH
HF	Acid Samples w/F ⁻	0 to 10 pH

2b. ORP Sensor

ORP electrodes are provided with a platinum sensor for most applications, while a gold sensor is required for measurement of cyanide or highly oxidant environments.

3. Temperature Sensor

pH electrodes with built-in 3-wire Pt100 or Pt1000 temperature sensor allow automatic temperature compensation of pH readings, as well as temperature measurements.



4. Connection Type

Electrodes can be provided with wire for direct connection to a transmitter or process controller, or with the standard BNC connector.

5. Built-in Amplifier

Models with a built-in amplifier are necessary for long distance measurements, where it is not feasible to install a transmitter. The internal amplifier can be powered directly from a HANNA Instruments® process controller.

6. Cable Length

Non-amplified electrodes can be provided with a 5, 10 or 15 meter cable (16, 33 or 49 feet), while the amplified models can be provided with a 15, 25, 50 or 75 meter cable (49, 82, 164 or 246 feet).

Process pH and ORP Electrodes with Flat-tip Technology



Industrial Challenges and Hanna Solutions

INDUSTRIAL CHALLENGES

Process applications present some major challenges to the pH measurement system. The most common are long distances, temperature extremes, electrical interferences, high pressure, junction poisoning or fouling and chemical/physical breakage. For each of these common problems, HANNA has developed specific electrodes for excellent performance in all types of process applications.

PH MEASUREMENT OVER LONG DISTANCES

Due to the high resistance of the glass membrane inside 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 electrical leakage/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 33' (10 m). 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 have been isolated. The high impedance circuitry is encapsulated at the top of the electrode. As a result, you now have low output impedance signals from the electrode to the metering system. A high impedance meter is no longer necessary. This means standard connections with long, unshielded cables up to 165' (50 m) can be used with an ordinary meter. For greater distances up to 990' (300 m), it is recommended that you use a HANNA 2-wire transmitter.

HIGH AND LOW TEMPERATURE EXTREMES

As we have mentioned, the pH glass membrane is sensitive to the temperature of the solution. Prolonged use and/or exposure to temperatures above 35°C (95°F) 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 formulation and construction, HANNA has developed electrodes that will perform consistently in high and low 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).

REFERENCE POISONING AND JUNCTION FOULING

One of the most common causes of electrode failure is fouling of the junction. The junction becomes physically clogged due to either solids in the sample solution or by precipitation (of AgCl for instance). To 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.

Reference fouling was a common problem before the introduction of double junction technology. Poisoning ions will actually plate 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. The problem of reference poisoning is nearly eliminated.

PHYSICAL BREAKAGE

Normal maintenance is usually the main cause of electrode breakage. The delicate sensor must be treated with extreme care. A bulbous 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 exhibit a dramatic change in the slope value. Hanna's flat-tip process electrodes have shown significantly less breakage than bulbous electrodes. Flat-tip electrodes also experience less abrasion in a flow application and nearly eliminate deposits.



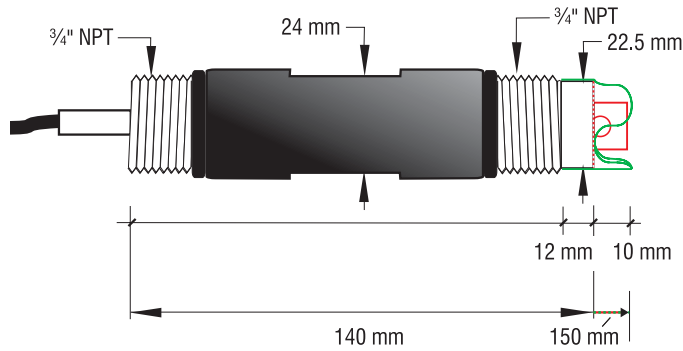
GROUND LOOP MATCHING PIN

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 an electrode with ground loop matching pin. HANNA's pH 500, pH 502, HI 504, mV 600, mV 602, HI 21 & HI 22 controllers now come with differential input to prevent such problems. With this new technology, the life of the electrodes are greatly extended.

PVDF BODY MATERIAL

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



pH electrodes/ORP electrodes with Platinum sensor
 pH electrodes with HT type sensor
 ORP electrodes with Gold sensor

ORDERING INFORMATION



Match the numbers below to the corresponding boxes at left according to desired configuration.

Electrode type

- 1006: pH electrodes with PTFE junction
- 1016: pH electrodes with ceramic junction
- 1026: pH electrodes with open junction (*)
- 2004: ORP electrodes with PTFE junction
- 2014: ORP electrodes with ceramic junction
- 2024: ORP electrodes with open junction

Sensor type (pH electrodes)

- 1: LT (-10 to 80°C / 23 to 156°F; 0 to 12 pH)
- 2: GP (General Purpose)
- 3: HT (0 to 100°C / 32 to 212°F; 0 to 14 pH)
- 4: HF (Fluoride-resistant) (**)

Sensor type (ORP electrodes)

- 1: Platinum
- 2: Gold

0: BNC connector

- 1: wire direct connection
- 2: BNC + Pt100 temperature sensor (***)
- 3: direct wire + Pt 100 temperature sensor (***)
- 4: BNC + Pt 1000 temperature sensor (***)
- 5: direct wire + Pt1000 temperature sensor (***)
- 6: BNC connector, amplified
- 7: BNC + Pt 100 sensor, amplified (***)

Cable length

05, 10, 15 m for non-amplified electrodes
 15, 25, 50, 75 m for amplified electrodes

TECHNICAL DATA

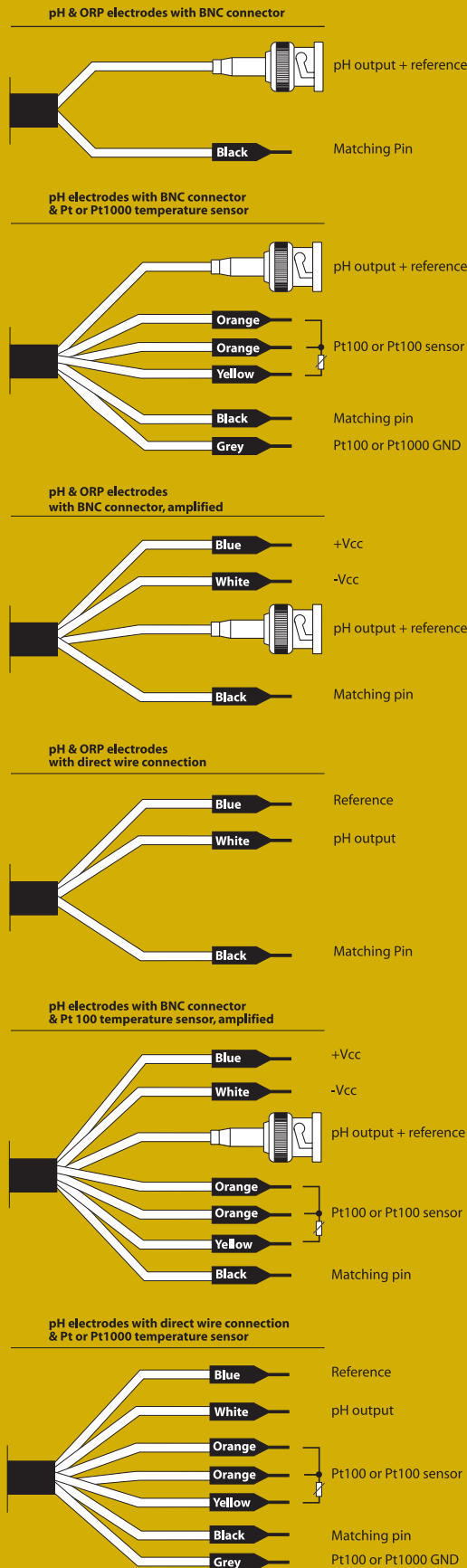
Body material: PVDF
 Reference cell: Polymer filled
 Matching Pin
 Max. operating pressure: 6 bar (87 psi)

(*) Available with GP sensor type only

(**) Fluoride-resistant glass sensor (F<2g/L, temperature<60°C, pH>2)

(***) Not for ORP electrodes

ELECTRICAL CONNECTIONS



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