

Industrial Process Control & Monitoring

- Patented Axial Ion Path® Reference
- Specialized pH Glass Formulations and ORP Electrodes
- Proprietary Low-Noise, High Temperature Signal Cable
- Sensors are Compatible with Most Major Manufacturer's Analyzers
- Industrial Mounting Options
- Industry Leading Pressure and Temperature Ratings
- NEW O-ring and Seal Options: Viton® Extreme™, EPDM & FFKM



Axial Ion Path® Reference

- Patented design increases sensor life, accuracy and reliability
- High resistance to poison: Reduced calibration offset error
- Large surface area reference junction eliminates plugging issues
- Eliminates error due to fluctuating pressure
- No exotic gel or polymer electrolyte which may be incompatible with the process

Specialized Electrode Glass Formulations & Styles

- High accuracy and lifespan in strong acids and bases
- Coating resistant glass electrode reduces fouling
- Silica resistant option to eliminate bonding to glass
- Ruggedized hemispherical and flat glass options resist breaking

Proprietary Sensor Signal Cable

- Designed to eliminate measurement fluctuation due to noise
- Chemical and UV resistant
- Highest temperature rating (130°C)

Compatibility with Most Major Vendor's Electronics

- Proven with major vendors of pH analyzers (Rosemount, ABB, Foxboro, E&H, Mettler Toledo, GLI/Hach, Knick)
- Get higher accuracy and longer life in your application by upgrading the sensor

Industrial Mounting Options

- Mounting fittings for sample line installations
- Submersible cleaners and scrubbers
- Ball Valve "Hot Tap" retraction solutions
- Variety of materials for corrosive applications

Highest Pressure & Temperature Ratings

- In-line sensor installation to 2,500 PSIG (172 BAR)
- Quick Change "Nut Lock" to 300 PSIG (20 BAR)
- Retractable "Hot Tap" to 300 PSIG (20 BAR)
- Process temperature to 266°F (130°C)

Performance Series pH/ORP Sensors

Performance Series

The Barben Analytical Performance Series products are 3rd generation combination pH/ORP electrodes targeted at harsh, industrial measurement applications. High pressures, strong chemicals, and elevated temperatures typically shorten the lifespan of conventional double-junction pH probes. In these applications the Performance Series sensor offers extended sensor lifespan, as well as decreased drift, and longer calibration intervals.

Each sensor is manufactured with our patented Axial Ion Path[®] reference technology, proprietary Low-Noise & High-Temp Signal Cable along with proprietary ruggedized, high temp and coat resistant glass formulations.

A wide selection of sensor body styles and process fittings in a variety of corrosion resistant materials allow direct replacement of short-lived OEM pH/ORP sensors. Barben Performance Series sensors are compatible with all major manufacturers of pH analyzers and transmitters. Upgrade your analytical measurement without the hassle and expense of replacing costly field instruments.

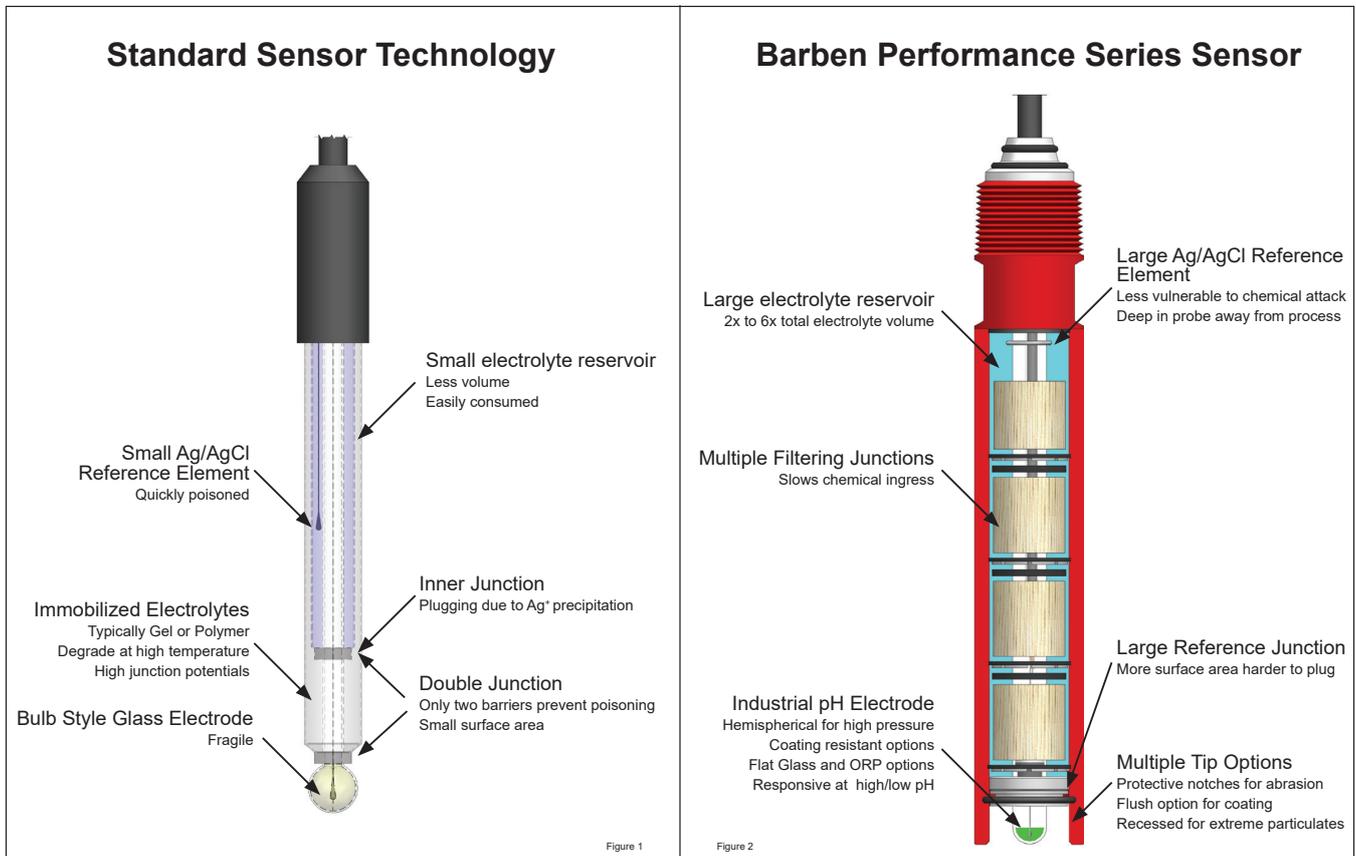
Typical Process Applications

Many industrial processes shorten pH/ORP sensor lifespan. Barben Performance Series sensors excel in applications that may have the following characteristics:

- **H₂S (Sulfides)¹**
- **High Ion-Strength Solutions**
- **Ammonia**
- **Heavy Metals [Ag, Pb, Hg]²**
- **Strong Caustics**
- **Strong Acids**
- **High Cyclic Pressures**
- **High Temperature**
- **Proteins¹**
- **Organics**
- **Mercaptans¹**
- **Cyanides¹**
- **Iodides¹**
- **Bromines**

NOTES

1. Chemicals that react with Ag⁺ (Silver) and restrict traditional reference junction designs
2. Heavy metals which react with Cl⁻ (Chloride) and reduce the voltage potential of the sensor.



Performance Series pH/ORP Sensors

Industry Leading Reference Technology Axial Ion Path®

In 90% of industrial applications the reference cell is the cause of sensor failure. The typical industry standard “double junction” pH sensor (fig. 1) uses reference technology designed to minimize mixing of internal electrolyte and process liquid. This simplistic design is achieved by dividing the reference cell into two chambers, each protected with a porous junction. Once process liquid penetrates each junction, poisoning of the sensor may occur or the measurement signal may be impeded by plugging of the porous junction.

The Barben sensor (fig. 2) has a unique, patented reference cell design which combats these common problems.

Performance Series sensor’s reference technology utilizes multiple innovations within the reference cell to greatly extend sensor life.

- Multiple annular wood filtering junctions
- Axial Ion Path® Communication Disks
- Large volume of electrolyte
- Large surface area Ag/AgCl reference element
- Teflon junction

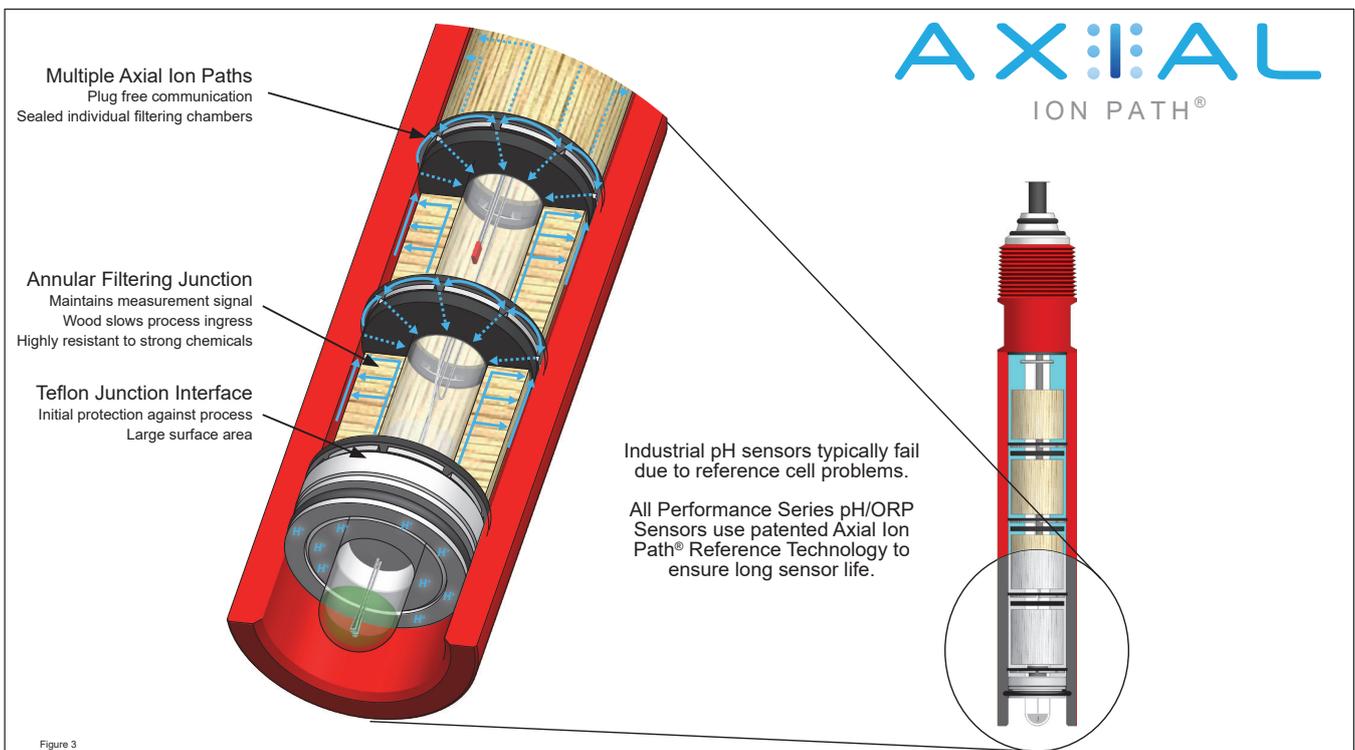
Each sensor uses multiple “solid-state” annular wood

filtering junctions. Wood’s natural cellular makeup greatly slows the ingress of process liquid into the sensor. Each wood filtering junction chamber is separated by patented Axial Ion Path® communication disks. The communication disk seals each chamber while providing multiple electrolyte paths thus ensuring a reliable measurement signal.

Barben Performance Series sensors contain a much higher volume of KCl electrolyte than typically found in double junction sensors. More electrolyte provides on-going insurance against the leaching effects of fluctuating process pressure and temperature.

An oversized Ag/AgCl reference element is located near the rear of the sensor. This innovation serves two purposes. Distancing the reference element far from the sensor tip keeps it away from process chemicals. Over time, if chemicals such as sulfides were to penetrate within the sensor, then the large reference element is capable of withstanding long-term poisoning while maintaining a stable measurement.

As a final preventative measure, a porous Teflon insert placed at the tip of the sensor provides a large surface area to prevent plugging. Teflon also serves as a great initial barrier to chemical attack. All of these features combine to make the Performance Series sensors the best choice for industrial measurement applications.



Performance Series pH/ORP Sensors

Low Noise, High Temperature Cable

Since Performance Series sensors are often mounted directly into the process, all products are manufactured with proprietary low-noise, high temperature cable. Competitive designs may use low-temperature cable to reduce signal noise (thus de-rating the sensor). Alternately, when high temperature cable is improperly specified, triboelectric noise can cause signal error. Barben Analytical has developed a proprietary cable that can withstand 130°C (266°F) process temperatures while providing stable pH measurement.

Specialized Glass Formulations and Configurations

Barben glass pH measurement electrodes are designed with unique formulations to prevent coating and scaling. Additional coating resistant options further improve lifespan in strong caustic (NaOH) and silica applications. These specialty glass formulations are manufactured to precision impedance ranges to ensure the best balance between high strength signal, speed of response, structural integrity under high pressure, long life in high temperatures and extreme acid and caustic pH conditions. Unique billet style ORP electrodes completely eliminate glass from the process thus further eliminating potential breakage.

Industrial Grade Mounting Options and Accessories

Barben Analytical provides a comprehensive offering of accessories to ensure convenient, safe and economical installation into your applications. In-line, submersible and hot tap (retractable through a isolation ball valve) are all standard options. In-line sensors with quick change “Nut Lock” adapters, rated to 300 psig, allow for easy access for calibration or maintenance in an isolated sample stream. In-line high pressure housings allow for operations up to 2,500 psig. Hot-Tap or Ball-valve retraction systems, rated to 300 psig allow for direct use into process without the need for sample or bypass lines. We offer hardware in 316 Stainless, Titanium and Hastelloy C-276, sensor bodies in Kynar and PEEK and seals in Viton® Extreme™, EPDM, and FFKM (Kalrez) to meet the specific demands of your process.

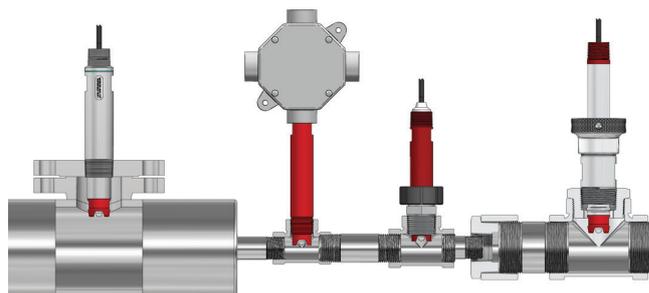
Interconnection with Existing pH and ORP Analyzers

Performance Series sensors are compatible with all major manufacturer’s pH analyzers with voltage input. Temperature compensation options for PT100, PT1000, 3kΩ (Balco), and 8550Ω (Honeywell) ensure full compatibility with existing analyzers. Now you can upgrade your process without replacing your field instrument. Wiring diagrams for many analyzers can be found at BarbenAnalytical.com.

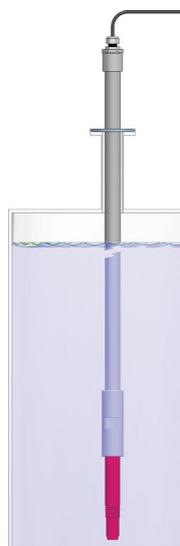
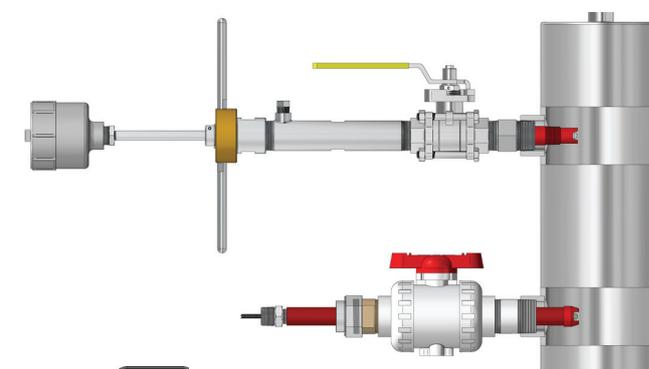
Sensor Selection: Mounting

The first consideration when selecting a pH sensor is how will it be mounted into the process. Examples of various process mounting configurations are provided below.

In-line Sensor Mounting: In-line installations are common on sample streams off the main process. Isolation valves should be upstream / downstream of sensor for removal.



Hot Tap Sensor Mounting: Hot Tap refers to the ability to remove the sensor from the process while under pressure. A ball valve is used to isolate the sensor for removal.

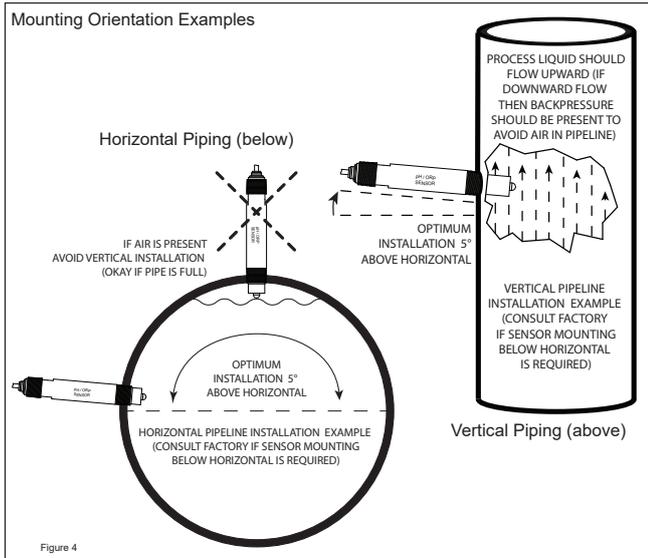


Submersible Sensor Mounting: Submersible mounting installations are required when the measurement is needed directly into a tank, reactor vessel or open channel. Typically the sensor must be mounted on a “dip tube” which is the hardware to submerge the sensor in the application.

Performance Series pH/ORP Sensors

Sensor Selection: Installation Mounting Orientation

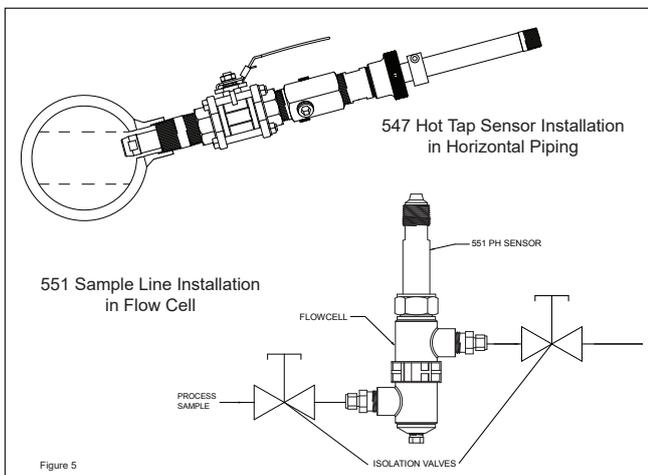
Sensor mounting for optimum performance should be considered prior to installation. The illustration below shows examples of vertical and horizontal installations.



Isolation

pH / ORP sensors require periodic removal for cleaning, calibration, and eventual sensor replacement. Consideration in the piping design should be given as to how to isolate the sensor from the process.

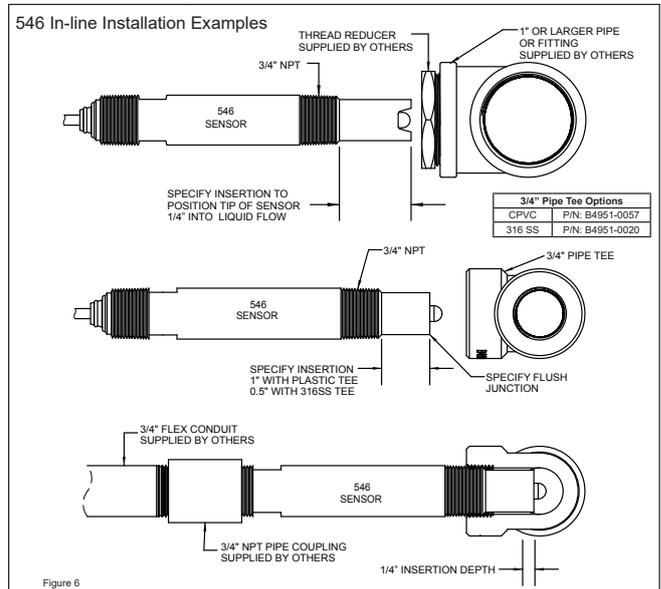
Hot tap retractable sensors are popular since they can be extracted from the flowing process, isolated with a ball valve, and then removed. If a non-retractable sensor is installed then isolation valves need to be installed upstream and downstream.



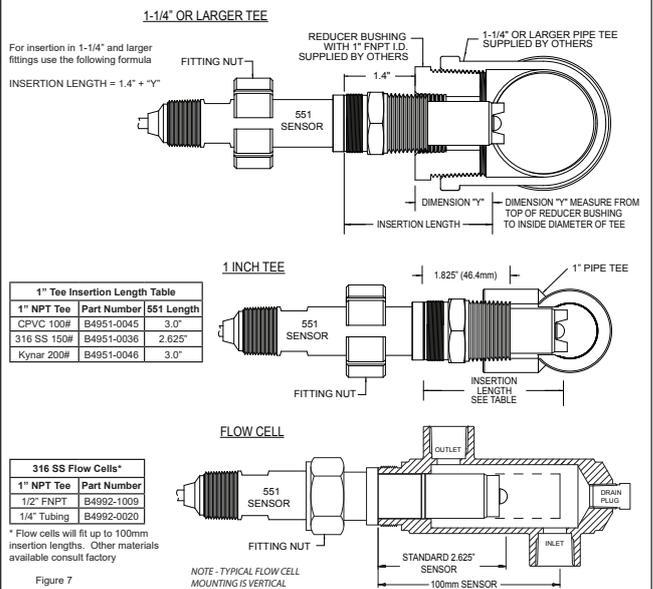
Insertion Depth

The depth that pH / ORP sensor protrudes into the pipeline can greatly affect the measurement. Applications where the sensor tip is recessed can lead to coating and slow response. In high particulate applications abrasion of the electrode can be a concern.

A typical installation goal is to get the sensor tip at least 1/4" (6mm) into the stream. At this depth coating issues lessen and response improves due to flow velocity. 546, 551 and 547 sensors offer a variety of insertion depths. Here are some guidelines.



551 In-line Installation Examples - Tee & Flow Cell Fittings



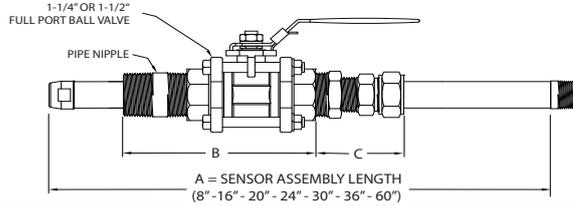
Performance Series pH/ORP Sensors

547 In-line Sizing Example

Insertion
Depth = (A) - (B) - (C)

The insertion depth should exceed any mounting hardware (flange, standoff or thread-o-let) plus the pipe wall thickness by at least 1/4" (6mm) to get the tip of the sensor into the process.

Figure 8



Valve & Nipple	"B" Dim.	Compression Fitting	"C" Dim.
1-1/4" SS Valve	6.5"	Wrench Tight	3.0"
		Hand Tight	3.5"
1-1/2" SS Valve	7.1"	Wrench Tight	3.0"
		Hand Tight	4.5"
1-1/4" Kynar Valve	8.0"	Wrench Tight	3.0"
		Hand Tight	3.5"
1-1/2" Kynar Valve	8.6"	Wrench Tight	3.0"
		Hand Tight	4.5"

Sensor Selection: Electrode Options

Code	Glass Type	Suggested Applications	Recommended Measurement Range	Recommended Temp Range	Maximum Temp Range
R CR	Industrial High Temp (Hemi) Industrial High Temp Coat Resist (Hemi)	Best choice for hi/low pH & high pressure. Coat resistant excels in NaOH. Hemispherical glass.	0 to 14 pH	15 to 100°C 59 to 212°F	15 to 130°C 59 to 266°F
FG CF	Flat Industrial Glass Flat Industrial Glass Coat Resist	Best choice for in-line slurries. Consult if rapid pressure changes are present.	0 to 14 pH	20 to 85°C 68 to 185°F	20 to 130°C 68 to 266°F
PX	Redox (ORP)	Flat Platinum (Pt) Billet. Non-glass. Easy to clean.	0 to ±1500mV	0 to 130°C 32 to 266°F	0 to 130°C 32 to 266°F
E CE	General Purpose General Purpose Coating Resist	Light to medium duty pH electrode for low temperature applications. Not for high pH.	2 to 11 pH	-10 to 40°C 14 to 104°F	-20 to 50°C -4 to 122°F
FA	Antimony (Sb) Non-glass Electrode	Antimony (metal) pH electrode for abrasives or HF acid or low temperature applications.	3 to 11 pH	-20 to 80°C -4 to 176°F	-20 to 80°C -4 to 176°F
FR	Fluoride / HF Acid (Hemi)	Resistant to etching by HF and other strong acids. Hemispherical pH glass.	1 to 14 pH	15 to 100°C 59 to 212°F	15 to 130°C 59 to 266°F
HR	Silica Resistant High Temp (Hemi)	Best choice for extreme pH where silica may coat traditional electrodes. Hemispherical glass.	1 to 14 pH	15 to 100°C 59 to 212°F	15 to 130°C 59 to 266°F
FH	Silica Resistant Flat Glass	Best choice for slurries and heavy fouling where silica may coat traditional glass electrodes.	1 to 14 pH	15 to 85°C 59 to 185°F	15 to 130°C 59 to 266°F

= Most common electrodes

= Special Application (Consult with factory)

Sensor Selection: Additional Options

Temperature Compensation

- PT100 RTD
- PT1000 RTD
- 3.01K Ohm RTD Balco
- 8550 Ohm (Honeywell / Leeds & Northrup)

Sensor Body Material

- Kynar PVDF: *Red, White, or Blue based on model*
- PEEK: *Beige*

Sensor O-Ring Material

- Viton® Extreme™ ETP-600S
- EPDM
- FFKM (perfluoro-elastomer: i.e. Kalrez)

Sensor Tip Examples



Figure 9

Sensor Wiring Termination Examples

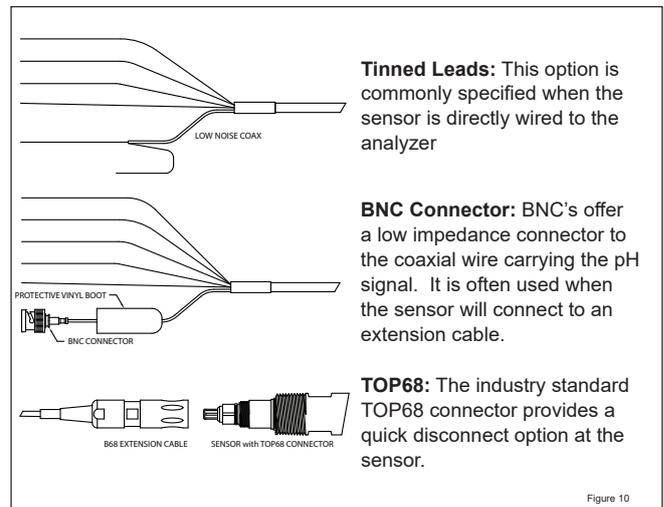


Figure 10