

## Bulletin No. 203

### pH Measurement in Pressure Vessels

pH Measurement to 500 psi and 135°C

We occasionally get inquiries concerning the installation of pH electrodes in Parr High Pressure Reactors or Pressure Vessels. Here is what we have found for this application.

#### Electrode

The pH electrode we have found so far with the highest temperature and pressure rating is one custom made for us by Innovative Sensors Inc. This special pH electrode is rated for pressures to 500 psi (34 bar) and temperatures to 135°C.

The specifications for this sensor are:

#### Features

- Steam Sterilizable up to 135°C
- Rugged Polymer Body
- Double Junction Reference Cell
- Non-fouling Porous Teflon Liquid Junctions
- Internal Pressure Compensation
- **New** TOP68 Quick Disconnect Cable Connector.
- **New** Cast-In-Place Solid Reference Electrolyte



#### Description

The **SPECTRA pH Sensor** is designed for use in all high temperature pH applications. The use of pressure compensating devices placed inside the reference cell provides proven protection from extreme temperature induced pressure deviations. The double junction reference cell coupled with the non-fouling porous Teflon liquid junction assures long life in tough process applications.

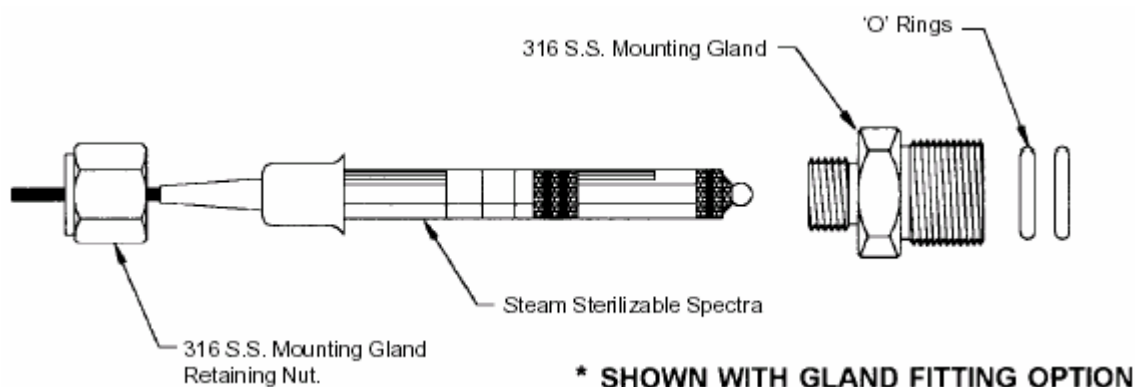
The optional TOP68 quick disconnect cable system provides ease of use and the reliability of fixed cable. The TOP68 has an IP68 environmental rating, which means it's water tight, corrosion resistant and suitable for wet areas high in humidity or where hose down cleaning operations are standard operating procedure. The TOP68 should be selected where autoclaving is required.

## Specifications

Body Material	Polymer (PES)
Measuring Range	0 to 14 pH
Temperature Range	-5 to 135°C (23 to 275°F)
Pressure Range	0 to 34.4 bar (0 to 500 psig)
Drift	< 2.0 mV/week
Response Time @ 25°C (77°F)	95% of reading in 10 seconds
Asymmetry Potential	7.0 pH ± 0.2 pH
Theoretical Slope	±59.16 mV / pH unit @ 25°C (77°F)
Sodium Error	< 0.05 pH in 0.1 Molar Na <sup>+</sup> Ion @ 12.8 pH
pH Glass Bulb Impedance @ 25°C (77°F)	125 Megohms

## Mounting Gland

These electrodes are mounted into the pressure vessel with the special gland shown below.



## Transmitter

Innovative Sensors offers a readout and transmitter for use with these pH electrodes. The specifications for these are shown below.

### Features

- Measures Conductivity, Resistivity, % Concentration, TDS, ppm
- 96 X 96 mm Panel Mount Enclosure Takes Up Less Panel Space
- Temperature Slope Adjustment Provides Greater Accuracy in Chemical Concentration Control
- "Live Check" Continuously Monitors Sensor Performance
- Up To Four Alarm Contacts Including Temperature
- Dedicated Fault Alarm
- NAMUR Fault Current Alarm
- PID Controller
  - 2nd Current Output for Temperature



## Description

The Model 223 Conductivity Transmitter with the appropriate sensor measures conductivity up to 2000 mS/cm, resistivity in megohms and concentration in percent, ppm, mg/l or TDS. The basic transmitter is available with either a 115 VAC or 24 Volt AC/DC power supply, linear isolated current output and one alarm. Features include the addition of a second output for temperature and up to four alarms which may be configured for on-off control functions, alarm limits, timer for cleaning or PID control functions. The PS version adds the diagnostic function Live Check as well as a non-linear programmable current output. Live Check signals an alarm when the sensor signal does not change over a defined period.

Base Transmitter (PR)	Plus Package (PS)
Measurement, display and calibration of the process variable (PV) and temperature. Isolated current output (Code 0) Temperature output (Code 1) One alarm (Code 05) <ul style="list-style-type: none"> <li>On – Off</li> </ul> Dedicated fault alarm (Standard) NAMUR fault current (Standard) <ul style="list-style-type: none"> <li>2.4 or 22.0 mA</li> </ul>	Adaptive Calibration for Inductive Conductivity Cells  Polarization Detection  Live Check sensor signal monitoring and alarm.  Programmable non-linear current output.
Code 10	Additional Features
Two Alarm Contacts for PV and Temperature <ul style="list-style-type: none"> <li>On – Off</li> <li>Timer for cleaning</li> <li>P(ID) Controller</li> </ul>	USP 24 Alarm for Pharmaceutical Grade Water (WFI Systems)  Automatic Cleaning initiated by an internal alarm or limit violation
Code 16	Additional Features
Four Alarm Contacts for PV and Temperature <ul style="list-style-type: none"> <li>On – Off</li> <li>Timer for cleaning</li> <li>P(ID) Controller</li> </ul>	Cleaning initiated externally or automatically by an internal alarm or limit violation

## Possible Installations

The pH probes mount thru an adapter with a ½” NPT mounting thread. We can fit these into the head of reactors one liter and larger. On smaller vessels we have mounted them thru the bottom of the cylinder as there is not room for this large an adapter and the stirrer on the head.

We will be happy to quote on the installation of one of these electrodes provided your application is for pressures below 500 psi and temperatures below 135°C.

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