

## Optical pH Sensors

Polestar's optical pH Sensors are designed specifically to work with Polestar's DSP Series Optical Process Monitors. A fully configured Polestar Process Monitoring system includes a DSP Series transmitter (available in 1- or multi-channel formats), an optical cable (available in a variety of lengths), a probe housing (available in a range of traditional and single-use formats), and a sensor. pH sensors are available in 2 detection ranges; choose the one best suited to your application:

- "mid-physiologic"      pH 5.5 – 8.5
- "low-physiologic"      pH 3.5 – 6.5



**Polestar Probes and Sensors are available in a variety of formats**

## Features and Benefits

- Rugged, glass-free construction suitable for use where glass electrodes are not
- Rapid response:  $t_{90} < 40$  seconds
- Available in 2 detection ranges spanning pH 3.5 – 8.5
- Made from USP Class VI materials
- Compatible with real-world process conditions, including CIP
- Sterilizable by gamma, autoclave, SIP
- Available in any of Polestar's traditional or single-use probe configurations
- Pre-calibrated for plug-and-play use (or simple 1-point user standardization)
- Minimal maintenance
- Long-term dry storage

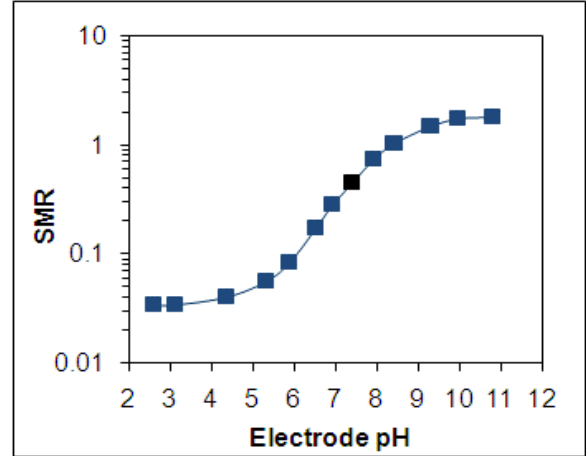
## Diverse Applications

By virtue of its rugged design and reliable, long-term measurement performance, Polestar pH sensors and DSP Series process monitors are suitable for use in a range of environments, including laboratories, pilot and production plants, as well as outdoors. Applications enabled by the robust, non-electrode design include bioprocessing, food & beverage, high purity water, fuels and biofuels, and environmental monitoring.

## Basis of Detection

Polestar's optical pH sensors operate on the principle of "signal magnitude ratio" (SMR). Each sensor film incorporates a fluorescent indicator covalently attached to a robust hydrophilic polymer membrane. The DSP detector sequentially excites the indicator at two distinct wavelengths (isosbestic point and deprotonated maximum), and then ratios the two emission signals. This ratio becomes 'dimensionless' and robust to variations in optical coupling efficiency, etc. (in a way that absolute fluorescence intensity measurements could never be). Using the supplied lot-specific calibration factors, the DSP then converts SMR to pH.

While SMR varies with pH across a range somewhat wider than the specified limits for any given sensor, the narrower specified range is given, as it is the range over which the system is most responsive – at the extremes of the response range, the change in SMR per change in pH decreases sharply. Among the calibration parameters included with each lot of pH sensor are the detection limits over which the DSP will be allowed to compute pH values. Measured SMR values outside this range will return the appropriate upper or lower pH reading, along with an indication of “pHUR” (under range) or “pHOR” (over range), indicating that the computed pH for the measured SMR is outside the defined range.



Because it is inherently self-referencing, this detection approach eliminates the potential for measurement error arising from changes in sample turbidity, refractive index, viscosity, or color. This ensures stable, drift-free calibration and hence reliable measurements throughout the lifespan of a sensing element.

### Performance Specifications

Detection range	pH 3.5 - 6.5	pH 5.5 - 8.5
<b>Precision</b>	±0.005 @ pH 5.0	±0.005 @ pH 7.0
<b>Accuracy (delivered)</b>	±0.1 @ pH 4.0 -6.0	±0.1 @ pH 6.0 – 8.0
<b>Accuracy (1-point cal)</b>	±0.02 @ pH 4.0 -6.0	±0.02 @ pH 6.0 – 8.0
<b>Response time (t<sub>90</sub>)</b>	40 seconds	
<b>Temperature range</b>	2 – 50 °C	
<b>Calibration</b>	1-point user defined within range of operation	
<b>Cross-sensitivity</b>	Low ionic strength, fluorescent molecules	
<b>Sterilization</b>	Autoclave, SIP, gamma	
<b>Materials</b>	USP Class VI certified	
<b>Storage conditions</b>	Dry and dark preferred	
<b>Shelf life</b>	2 years stored dry and in the dark	
<b>Clean-in-place</b>	Yes	

For more information visit Polestar’s website at [www.polestartech.com](http://www.polestartech.com); or contact Customer Service at 781-449-2284



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