

## Optical Oxygen Sensors

Polestar's optical Oxygen 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 single- 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. Oxygen sensors are available in three detection ranges:

- High: 0-500% air sat.
- Medium: 0-500% air sat.
- Low: 0-20% air sat.



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

## Features and Benefits

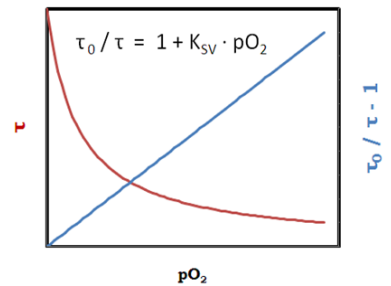
- Rugged, glass-free construction suitable for use where glass electrodes are not
- Versatile sensing chemistry measures in both liquid and gas-phase
- Compatible with 0-100% ethanol, as well as numerous other organics
- Rapid response:  $t_{90} < 15$  sec
- Available in three detection ranges: sub-ppb to 100%  $O_2$
- 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- or 2-point user calibration)
- Minimal maintenance
- Dry storage
- Suitable for use in lab, pilot and/or production plants, and outdoors.

## Applications

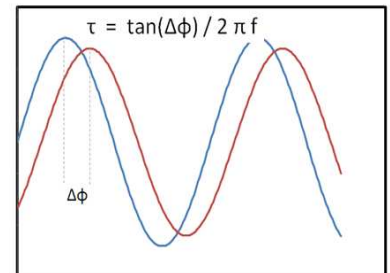
- Bioprocessing
- Food and beverage
- High-purity water
- Fuels and Biofuels
- Environmental monitoring.

## Basis of Detection

Polestar's optical oxygen sensors operate on the principle of fluorescence quenching. Fluorescence properties of the organo-metallic indicator are reversibly and predictably quenched by oxygen. Fluorescence intensity and lifetime vary inversely with oxygen content.



The detector measures the phase shift of fluorescence excitation relative to a reference condition, and from this it computes fluorescence lifetime. From lifetime it computes  $pO_2$ , which is then displayed in the user-specified units.



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. The inverse relationship between oxygen content and fluorescence quenching makes this method extremely sensitive at low  $pO_2$ , in stark contrast to traditional electrode-based methods.

## Ordering Information

You will require a DSP Series optical process monitor equipped to measure oxygen at the correct level in order to perform measurements of O<sub>2</sub>. The system is programmed to measure the parameter of interest, which is typically specified at the time the DSP is ordered.

Sensors and probes are available in a range of formats

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

## Oxygen Sensor Specifications

Performance	High	Mid	Low
<b>Operating range gas phase</b>	0 - 100% O <sub>2</sub> (1 atm)	0 - 100% O <sub>2</sub> (1 atm)	0 - 5% O <sub>2</sub> (1 atm)
<b>Operating range dissolved</b>	0 - 40 ppm (25° C)	0 - 40 ppm (25° C)	0 - 2 ppm (25° C)
<b>Precision</b>	0.3% air sat. (ambient)	0.5% air sat	0.5 ppb
<b>Accuracy (as delivered)</b>	3% air sat. (ambient)	2% air sat	
<b>Accuracy (w/ standardization)</b>	0.2% air sat. (ambient)	0.4% air sat	0.2 ppb or 2% of reading
<b>t<sub>90</sub> response</b>	< 15 sec		
<b>Calibration</b>	Ships pre-calibrated; optional 1- or 2-point user standardization		
<b>Cross-sensitivity</b>	SO <sub>2</sub> and Cl <sub>2</sub> gas		
<b>Chemical incompatibility</b>	DMF (> 50° C)		
<b>Environmental</b>			
<b>Operating temperature</b>	Known to withstand up to at least 135° C		
<b>Operating pressure</b>	Sensing element has been integrity tested to 1200 psi		
<b>Operating humidity</b>	0 – 100% RH		
<b>Storage conditions</b>	Wet or dry, <u>dark</u>		
<b>Materials</b>	USP Class VI-certified <sup>1</sup>		
<b>Chemical incompatibility</b>	DMF (> 50° C)		
<b>Clean-in-Place</b>	Yes <sup>2</sup>		
<b>Sterilizable</b>	Autoclave, Steam-in-Place, Gamma		
<b>Shelf life</b>	2 years if stored dry in the dark		

<sup>1</sup> Certification documents available on Polestar website

<sup>2</sup> Details available upon request