

## Optical CO<sub>2</sub> Sensors

Polestar's optical Carbon Dioxide 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. The Carbon Dioxide sensor is available in the 0-30% CO<sub>2</sub> detection range.



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

### Features and Benefits

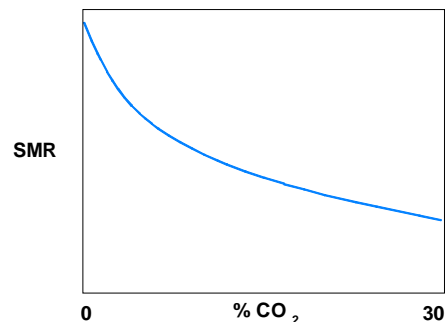
- Rugged, glass-free construction suitable for use where glass electrodes are not
- Versatile sensing chemistry measures in both liquid and gas-phase
- Rapid response:  $t_{90} < 90$  sec
- Made from USP Class VI materials
- Compatible with real-world process conditions, including CIP
- Sterilizable 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
- Can be stored dry
- Suitable for use in lab, pilot or production plants, and outdoors.

### Applications

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

### Basis of Detection

Polestar's optical CO<sub>2</sub> sensors are based on ratiometric fluorescent indicator chemistry immobilized in a rugged, hydrophobic polymer sensing membrane. Light Emitting Diodes (LED) within Polestar's DSP series Optical Process Monitors generate the light signals used to sequentially excite the fluorescent indicator of the sensing membrane at two select wavelengths yielding the reference and sensing fluorescence signals that are used to determine the CO<sub>2</sub> content of the solution being monitored. A "reference signal" is generated by exciting the indicator of the sensing membrane at a point in its fluorescence excitation spectrum where both tautomeric forms (CO<sub>2</sub> bound and unbound) excite with equal efficiency so that fluorescence emission intensities reflects the total concentration of indicator available for making measurements of CO<sub>2</sub>. A "sensing signal" is generated by exciting the indicator in the region of the spectrum where only the CO<sub>2</sub>-free form of the indicator is excited. The fluorescence signal levels observed during sensing wavelength excitation and reference wavelength excitation are used to calculate a Signal Magnitude Ratio (SMR) that varies with CO<sub>2</sub> in a predictable manner as illustrated below.



### Performance Specifications

#### Ordering Information

To perform measurements of CO<sub>2</sub>, you need a DSP Series optical process monitor equipped to measure carbon dioxide. Which detection capability a system is programmed to measure 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

<b>Detection range gas phase</b>	0-30% (1atm)
<b>Detection range dissolved</b>	0-30% (25 °C)
<b>Precision</b>	0.05% @ 5%
<b>Accuracy (as delivered)</b>	0.5% @ 5%
<b>Accuracy (w/ standardization)</b>	0.1%
<b>t<sub>90</sub> response</b>	< 90 sec
<b>Calibration</b>	Ships pre-calibrated; optional 1- or 2-point user standardization
<b>Cross-sensitivity</b>	Volatile acids or strong bases

### Environmental Specifications

<b>Operating temperature</b>	0-50°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 <sup>1</sup>
<b>Clean-in-place</b>	Yes <sup>2</sup>
<b>Sterilizable</b>	Autoclave, steam-in-place, gamma

<sup>1</sup> USP Class VI tests are being performed and will be available on the Polestar website.

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