

## Corrosion Prevention in the Transportation of Ethanol



The transportation of ethanol through the nation's pipeline system is critical to providing a cost-effective fuel. The potential for stress cracking of steel pipes when transporting ethanol has been determined to be a serious cause for concern. Stress cracking can lead to ethanol leakage and release. Research conducted to date indicates several contributors to stress cracking of steel, one of which is related to the presence of oxygen in the ethanol mixture. Monitoring and controlling the amount of

oxygen in the ethanol is an important factor in its safe transport. The explosive nature of ethanol, as well as other fuels, requires an intrinsically safe sensor as well as a sensor rugged enough to perform reliably in this medium. Polestar's optical oxygen sensor has been proven to operate successfully in a variety of fuel mixtures for extended periods of time, and at extreme temperatures. The required electronics can easily be deployed at a distance from the sensing location to preserve the intrinsically safe nature of the sensor.

### Benefits offered by Polestar's Oxygen Sensor and DSP Series Process Monitors

- Intrinsically safe optical sensors
- Sensors are compatible with 0-100% ethanol as well as other fuels
- Remote location of the electronics allows use of the sensors in explosive environments
- Oxygen and carbon dioxide sensors can measure either dissolved or gas-phase
- Gas-phase readings are unaffected by humidity or ambient light
- Liquid readings are unaffected by solids, turbidity, etc.
- Sensor calibration is unaffected by fouling
- No glass electrodes
- No aqueous electrolytes to replace



## DSP 4000 MC Product Specifications

Enclosure/Power	
Operator Interface	4-line VFD Display, 8 tactile keys
¼ DIN Dimensions (H x W x D)	6.40 x 6.40 x 5.94 in.
Max Depth – panel mounted	5.94 in.
Mounting	Panel, Pipe, or Wall
Material	Polycarbonate, NEMA 12/4X, IP 65
Weight	5 lbs.
Ratings/Approvals	CE compliant; NEMA 12/4X, IP 65
Power	24 VDC
Environmental	
Storage Temperature	-40 to 70 ° C (-40 to 158 ° F)
Ambient Operating Range	-10 to 50 ° C (-14 to 122 ° F)
Relative Humidity	0 to 95%
Outputs – Independent outputs for each active channel	
Analog output	16-bit isolated 4-20 mA. 10-300 V
Analog output scaling	Used defined
Digital output protocols	RS232/RS485, Modbus@ TCP, Profibus@, @, DeviceNet
Inputs – Independent inputs for each active channel	
Sensors	4 channels (customer choice)
Temperature	PT100 RTD; 4-20 mA signal; manual
Pressure	4-20 mA signal; manual

## Oxygen Sensor Specifications

Performance	High	Mid	Low
<b>Detection range gas phase</b>	0.02 - 100% O <sub>2</sub> (1 atm)	0.002 - 30% O <sub>2</sub> (1 atm)	0.0002 - 4% O <sub>2</sub> (1 atm)
<b>Detection range dissolved</b>	0.01 - 40 ppm (25° C)	1 ppb - 12 ppm (25° C)	0.1 ppb - 1.6 ppm (25° C)
<b>Precision</b>	0.2% air sat. (ambient)	5 ppb @ 500 ppb	0.1 ppb @ 5 ppb
<b>Accuracy (as delivered)</b>	< 2% air sat. (ambient)	10 ppb or 5% of reading	0.4 ppb or 3% of reading
<b>Accuracy (w/ standardization)</b>	< 0.3% air sat. (ambient)	7 ppb or 1 % of reading	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)		
Environmental			
<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>	Dry		
<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		

<sup>1</sup> Certification documents available upon request

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

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



Polestar Technologies, Inc.  
220 Reservoir Street, Suite 32  
Needham Heights, MA 02494 USA