

Optical Process Monitoring in Pharmaceutical Applications



Polestar offers a wide range of sterilizable/ autoclavable measurements for drug development and manufacturing in the pharmaceutical industry. Polestar's proprietary technology and technical expertise enable solutions for a variety of applications which require the measurement and control of oxygen and CO₂ (dissolved or gas-phase) and in situ pH. Whether you are using a stirred tank or single-use system, Polestar offers a sensor configuration to meet your needs.

Polestar's sensing technology, which is reliable, accurate, versatile, and maintenance free, allows the user to simplify and optimize their processes, saving time and money.

Within the pharmaceutical market there are a number of applications that require oxygen, pH, and CO₂ measurements. The accurate and reliable measurement of these parameters is paramount to the survival and propagation of most living organisms. Polestar's rugged optical sensors and associated electronics were designed to perform in demanding applications. The Polestar sensor probes fit into existing headplates and side ports of all fermentors and bioreactors and can also be used to monitor in shake flasks and other small-scale vessels. In particular, Polestar's sensors are ideal for disposable reactors. They offer many features including low maintenance, automatic calibration, and automatic gain control. The sensors withstand CIP (Clean-In-Place), SIP (Steam-In-Place), gamma, and autoclave conditions. Polestar's USP Class VI-certified sensors are shipped pre-calibrated although the system allows the user to perform a simple standardization procedure.

Our systems allow the user to scale the process from drug development to production while maintaining traceability requirements. Polestar's DSP series Optical Process Monitors, single channel or up to four channels, provide flexibility, reliability, ease of use, and cost savings to the customer.



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Benefits offered by the DSP Series and Optical Sensors:

- Designed for easy installation and operation
- Large, easy-to-read four-line VFD display and intuitive menu-driven software
- In-line QC streamlines production
- Measurements, whether oxygen, pH, or carbon dioxide, are inherently self-referencing
- Stable, drift-free calibration
- Sensor calibration is unaffected by fouling
- Sensors are shipped pre-calibrated
- Sensors are immune to gamma sterilization



Applications include

- Package Integrity Testing
- Single-use bioreactors
- Media prep & downstream processing
- Shake flasks
- Stirred-tank reactors

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
Detection range gas phase	0.02 - 100% O ₂ (1 atm)	0.002 - 30% O ₂ (1 atm)	0.0002 - 4% O ₂ (1 atm)
Detection range dissolved	0.01 - 40 ppm (25° C)	1 ppb - 12 ppm (25° C)	0.1 ppb - 1.6 ppm (25° C)
Precision	0.2% air sat. (ambient)	5 ppb @ 500 ppb	0.1 ppb @ 5 ppb
Accuracy (as delivered)	< 2% air sat. (ambient)	10 ppb or 5% of reading	0.4 ppb or 3% of reading
Accuracy (w/ standardization)	< 0.3% air sat. (ambient)	7 ppb or 1 % of reading	0.2 ppb or 2% of reading
t₉₀ response	< 15 sec		
Calibration	Ships pre-calibrated; optional 1- or 2-point user standardization		
Cross-sensitivity	SO ₂ and Cl ₂ gas		
Chemical incompatibility	DMF (> 50° C)		
Environmental			
Operating temperature	Known to withstand up to at least 135° C		
Operating pressure	Sensing element has been integrity tested to 1200 psi		
Operating humidity	0 – 100% RH		
Storage conditions	Dry		
Materials	USP Class VI-certified ¹		
Chemical incompatibility	DMF (> 50° C)		
Clean-in-Place	Yes ²		
Sterilizable	Autoclave, Steam-in-Place, Gamma		

¹ Certification documents available upon request

² Details available upon request

For more information
visit Polestar's website at
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