

## Optical Process Monitoring in BREWING applications



While based upon the centuries-old art of fermentation, the brewing industry is interested in applying the best of modern process monitoring technology to ensure product quality and optimal process economics. Understanding oxygen and carbon dioxide content are critical to process quality at several stages in the overall process. Because of the risks associated with traditional glass sensor probes, these analyses are frequently made offline, which is not ideal because it is both disruptive and labor-intensive.

Polestar's DSP Series optical process monitoring systems are ideal for brewing applications, as they overcome the key limitations of traditional electrode-based sensors. This, in turn, allows for far more preferable in-line analyses

### Benefits offered by the DSP Series

- In-line QC streamlines production
- Measures O<sub>2</sub> and CO<sub>2</sub> in liquid or gas phase
- No glass electrodes breaking in your lines
- No electrolytes to replace
- Gas-phase measurements are highly specific:
  - no cross-sensitivity between O<sub>2</sub> and CO<sub>2</sub>
  - allows sub-ppb detection of O<sub>2</sub> in otherwise pure CO<sub>2</sub> (or vice versa)
- Gas-phase readings are unaffected by humidity or ambient light
- Liquid readings are unaffected by solids, turbidity, etc.
- Sensor calibration is unaffected by fouling
- Sensors may be left in-line during sanitization
- 24 VDC hardwiring enables washdown-compatibility



### Applications include

- Headspace oxygen during fill tank CO<sub>2</sub> purge
- Fill tank DO
- DO and pH of yeast culture seed trains
- Headspace O<sub>2</sub> during CO<sub>2</sub> purge during bottling
- Repeat measurement over time of DO inside sealed bottles (using peel & stick sensors) to validate package integrity

## 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  
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