



**BlueSens –
Gas analyzer for
bioprocesses**

...makes sense!

BlueSens gas sensor GmbH develops and markets PAT (Process Analytical Technology) conform sensors compliant with FDA for many gases like CO₂ and O₂.

Founded in 2001 as a specialist for gas analysis in bioprocesses, BlueSens is meanwhile the market leader and supplies the sensors worldwide.

The applications stretch from basic research through GMP production. The innovative structure allows using the sensors without having to take samples wherever gas analysis during bioprocesses makes sense.

New combined gas analyzers for CO₂ and O₂: The BlueInOne series

The state-of-the-art BlueInOne gas analyzers combine the parallel measurement of CO₂ and O₂ in one space-saving analyzer. The BlueInOne Ferm is the modern tool for monitoring fermentations and the BlueInOne Cell is the perfect device for the measurement of cell growth processes.

The BlueInOne series stands for highest precision and reliability.

Advantages

- > Parallel measurement of O₂ and CO₂
- > Compact stainless steel housing (IP65)
- > PAT conform in-situ-measurement
- > Auto compensated humidity and pressure
- > No gas cooler, pumps or valves needed
- > Connectable to any hose/tube or pipe
- > RS485 Modbus, RS232, USB, 2x4-20mA Output, Modbus OPC server available



We help you understand, control and optimize your process!

BCpreFerm

Simple tool for process optimization

The same sensors are also used in the **BCpreFerm** system, which is designed for process optimization (scale up) for flasks up to large-scale fermenters. The system comprises up to 12 sensors that are linked to a computer via an electronic multiplexer. The related software visualizes the results and can calculate parameters such as the oxygen uptake-rate (OUR), the carbon-dioxide emission rate (CER) and the respiration quotients (RQ) both on fermenters as well as on flasks.

- > Visualization of the process
- > Increase of reliability and repeatability
- > Dedicated process optimization without limitations (e.g. oxygen, nutrients etc.)
- > Predictions for the scale up



YieldMaster

Measure the gas yield and quality in every anaerobic process

The unique structure of the CH_4 sensors from BlueSens facilitate measuring methane concentrations in processes that sometimes produce much, sometimes little gas. The use of sample taking is impossible there, so conventional systems fail.

The CH_4 sensors are simply screwed onto the fermentation container and measure the methane content directly over the sample. Even at 55 °C (131 °F) in water-saturated atmospheres. The accruing volumes are precisely registered via a precision volumenometer (Milligascounter®*).

The data are registered online with the corresponding software and visualized on the computer. Optionally, BlueSens can provide everything as accessories; from the stirrer through the incubator.

Additional sensors: To cover as many measurement parameters as possible, BlueSens also offers sensors for ethanol ($\text{C}_2\text{H}_6\text{O}$), hydrogen (H_2) and carbon monoxide (CO).



* Registered trademark. The MilliGas-counter was developed at the University of Applied Science Hamburg under the leadership of Prof. Dr. Paul Scherer.

Everything at a glance: product overview

Sensor	CO ₂	CH ₄	CO	EtOH	BlueInOne Ferm
<i>Measuring range</i>	0 ... 10 Vol. %	0 ... 100 Vol. %	0 ... 30 Vol. %	0.2 ... 25 Vol. % ⁶	0 ... 10 Vol. % CO ₂ , 0.1 ... 25 Vol. % O ₂
	0 ... 25 Vol. %		0 ... 100 Vol. %		0 ... 25 Vol. % CO ₂ , 0.1 ... 25 Vol. % O ₂
	0 ... 50 Vol. % ¹				0 ... 10 Vol. % CO ₂ , 1 ... 50 Vol. % O ₂
					0 ... 25 Vol. % CO ₂ , 1 ... 50 Vol. % O ₂
<i>Measuring Principle</i>	Infrared, dual wavelengths				Infrared, dual wavelengths (CO ₂) / ZrO ₂ (O ₂)
<i>Accuracy</i>	< ± 0.2 % FS* ± 3% reading				
<i>Long-term stability²</i>	< ± 2% reading / year				
<i>Lifetime sensor element</i>	> 3 years				Approx. 3 years (CO ₂), 15,000 operating hours (O ₂)
Housing Aluminum, IP 65 <i>Dimension (WxDxH) mm</i> <i>Dimension (WxDxH) inch</i> <i>Weight</i>	100 x 131 x 118 3.94 x 5.16 x 4.64 900 g (1.98 lb)	100 x 131 x 118 3.94 x 5.16 x 4.64 900 g (1.98 lb)	100 x 131 x 118 3.94 x 5.16 x 4.64 900 g (1.98 lb)	100 x 131 x 118 3.94 x 5.16 x 4.64 3000 g (6.61 lb)	170 x 150 x 120 ⁵ 6.69 x 5.91 x 4.72 ⁵ 4000 g (8.82 lb)
Housing PA6 <i>Dimension (DxH) mm</i> <i>Dimension (DxH) inch</i> <i>Weight</i>	80 x 130 3.15 x 5.12 350 g (0.77 lb)	80 x 130 3.15 x 5.12 350 g (0.77 lb)	80 x 130 3.15 x 5.12 350 g (0.77 lb)	80 x 130 3.15 x 5.12 350 g (0.77 lb)	Not available
<i>Material in contact with gas</i>	Steel 1.4404 / Sapphire / Viton / PTFE				Stainless steel / Viton / Sapphire / PTFE / Polymer H.L. / Nitrile
<i>Connection⁶</i>	G 1¼", GL 45, Tri-Clamp, hose connection 4-12mm etc.				¼" - 1 ¼" ⁶ , hose connection 4-12mm etc.
General					
<i>Operating temperature</i>	Max. -25 - 55 °C / -13 - 131 °F ⁶				15 - 40 °C / 59 - 104 °F
<i>Storage temperature</i>	0 - 60 °C / 32 - 140 °F				
<i>Pressure range (absolute):</i>	0.8 - 1.3 bar / 11.6 - 18.85 psi ⁶ absolute pressure				
<i>Storage humidity</i>	75% RH noncondensing				> 75% RH noncondensing
<i>Operating humidity</i>	0 ... 100% RH ³				0...100% RH
					Integrated humidity compensation
<i>Power supply (max.)</i>	12 or 24 VDC, 1-2 A				24 VDC, 1 A
<i>Output</i>	RS232, 4-20mA, USB, Ethernet ⁴				RS232, RS485 Modbus, 2x 4-20mA, USB, Modbus OPC Server
<i>Maintenance once a month</i>	1-point calibration with ambient air or nitrogen (other conditions on request)				One point calibration with ambient air once a month (other conditions on request)
<i>Maintenance yearly</i>	Optional factory calibration with certified gases				
<i>CE</i>	EN61326-1:1997 +A2:1998				EN61326-1:2006 / FCC 15:2009 Subpart 107/109, ICES - 001:2006

full scale ¹ accuracy < ± 0.5 % FS ± 5% reading ² with monthly 1-point calibration ³ not compensated ⁴ Ethernet with BACCom

All the BlueSens' gas analyzers can be easily integrated directly into the gas lines independent of the gas flow. Additional gas coolers, pumps and valves are not needed to make the measurements.

The sensors measure at the point where things are happening. Fast and reliable measurement data without a lot of maintenance are the result. With the aid of standard interfaces, the sensors can be connected to any process control system or computer.

BlueInOne Cell	O₂	O₂ec	H₂	Sensor
0 ... 10 Vol. % CO ₂ , 0 ... 100 Vol. % O ₂	0.1 ... 25 Vol. %	0 ... 100 Vol. %	0 ... 100 Vol. % ⁷	<i>Measuring range</i>
0 ... 25 Vol. % CO ₂ , 0 ... 100 Vol. % O ₂	1 ... 50 Vol. %			
Infrared, dual wavelengths (CO ₂) / Galvanic cell (O ₂)	ZrO ₂	Galvanic cell	Thermal conductivity	<i>Measuring Principle</i>
< ± 0.2 % FS* ± 3% reading				<i>Accuracy</i>
< ± 2% reading / year				<i>Long-term stability²</i>
Approx. 3 years (CO ₂), approx. 900 000 Vol. h operating hours at 1 bar (14.5 psi) (O ₂)	15,000 operating hours	Approx. 900.000 Vol.% h operating hours at 1 bar (14.5 psi)	> 3 years	<i>Lifetime sensor element</i>
170 x 150 x 120 ⁵ 6.69 x 5.91 x 4.72 ⁵ 4000 g (8.82 lb)	100 x 131 x 118 3.94 x 5.16 x 4.64 900 g (1.98 lb)	100 x 131 x 118 3.94 x 5.16 x 4.64 900 g (1.98 lb)	100 x 131 x 118 3.94 x 5.16 x 4.64 900 g (1.98 lb)	Housing Aluminum, IP 65 <i>Dimension (WxDxH) mm</i> <i>Dimension (WxDxH) inch</i> <i>Weight</i>
Not available	80 x 130 3.15 x 5.12 350 g (0.77 lb)	80 x 130 3.15 x 5.12 350 g (0.77 lb)	80 x 130 3.15 x 5.12 350 g (0.77 lb)	Housing PA6 <i>Dimension (DxH) mm</i> <i>Dimension (DxH) inch</i> <i>Weight</i>
Stainless steel / Viton / Sapphire / PTFE / Polymer H.L. / Nitrile	Steel 1.4404 / Viton / PTFE		Steel 1.4404 / Viton	<i>Material in contact with gas</i>
¼" - 1 ¼" ⁶ , hose connection 4-12mm etc.	G 1 ¼", GL 45, Tri-Clamp, hose connection 4-12mm etc.			<i>Connection⁶</i>
				General
15 - 40 °C / 59 - 104 °F	Max. -25 - 55 °C / -13 - 131 °F ⁶			<i>Operating temperature</i>
0 - 60 °C / 32 - 140 °F				<i>Storage temperature</i>
0.8 - 1.3 bar / 11.6 - 18.85 psi ⁶ absolute pressure				<i>Pressure range (absolute):</i>
5...100% RH noncondensing	> 75% RH noncondensing	5...100% RH noncondensing	75% RH noncondensing	<i>Storage humidity</i>
5...100% RH noncondensing	0 ... 100% RH ³	5...100% RH noncondensing	0 ... 100% RH ³	<i>Operating humidity</i>
Integrated humidity compensation				
24 VDC, 1 A	12 or 24 VDC, 1-2 A		24 VDC, 1-2 A	<i>Power supply (max.)</i>
RS232, RS485 Modbus, 2x 4-20mA, USB, Modbus OPC Server	RS232, 4-20mA, USB, Ethernet ⁴			<i>Output</i>
One point calibration with ambient air once a month (other conditions on request)	1-point calibration with ambient air or nitrogen (other conditions on request)			<i>Maintenance once a month</i>
Optional factory calibration with certified gases				<i>Maintenance yearly</i>
EN61326-1:2006 / FCC 15:2009 Subpart 107/109, ICES - 001:2006	EN61326-1:1997 +A2:1998			<i>CE</i>

⁵ stainless steel housing, dimensions depends on flow adapter ⁶ others on request ⁷ binary mixture



Questions?

Please ask directly!

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