

Off-Gas Analysis

Online Monitoring of Oxygen and Carbon Dioxide

Technology

The DASGIP Off-Gas Analysis Module GA4 supports precise online monitoring of exhaust oxygen (O₂) and carbon dioxide (CO₂) in four discrete analyzer channels each. Systems of up to 16 parallel bioreactors can be monitored and controlled.

O₂ and CO₂ concentrations are continuously measured with precise sensors. An integrated mass flow sensor enables automatic calculation of Oxygen Transfer Rate (OTR), Carbon Dioxide Transfer Rate (CTR) and Respiratory Quotient (RQ), permitting direct conclusions on the metabolic state of the culture.

■ Sensors

DASGIP's Off-Gas Analyzer GA4 is available with two alternative electrochemical O₂ sensors, thus serving each individual customer's needs best. The zirconia sensor stands out due to his good long-term stability. Off-gas analysis with a Galvanic Cell sensor provides a broad measurement range for oxygen concentrations and is suitable for anaerobic fermentations as well. CO₂ concentrations are determined by infrared measurement utilizing the characteristic absorption spectrum of the gas. All sensors guarantee highly accurate and valuable cultivation data.

For cell culture and other applications demanding highest precision control the GA4 module can additionally be upgraded with the rHT Option for measurement of relative humidity and temperature. The obtained values are taken as analog input signals; inaccuracies due to water vapor in the off-gas are directly compensated.



Modules GA4

■ 3rd Party Integration

Optionally, the Off-Gas Analyzer can be equipped with an analog input/output interface for easy integration into 3rd party bioreactors. O₂ and CO₂ bioreactor inlet concentrations can be received as analog input. Measured O₂ and CO₂ off-gas concentrations as well as calculated OTR, CTR and RQ can be transmitted as analog output signals thus supporting automated bioprocess control.

Application

DASGIP's Off-Gas Analyzer GA4 provides key information on the metabolism of animal and human cell cultures as well as microbial fermentations.

■ System Integration and Stand-Alone Solution

DASGIP's Off-Gas Analyzer is a tried and tested component of the DASGIP Parallel Bioreactor Systems. With its modular design, it can also be adapted to any existing bioreactor system to be used as a stand-alone analyzer. Additionally, OPC connectivity allows for integration into supervisory process control systems. Hence, process implementation according to the FDA's Quality by Design approach and PAT requirements is enabled.

Quality System certified by DQS ■ DIN EN ISO 9001 ■ Reg.-No. 63431

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■ Laboratory, Production and Quality Assurance

Whether used in research laboratories, production or as part of quality assurance – the DASGIP Off-Gas Analyzer GA4 provides key metabolic data at a highly precise level. Like all DASGIP products the GA4 module's technology meets industry standards.

Benefits

The DASGIP Off-Gas Analyzer GA4 boosts accurate individual control and high process automation at the same time. Integration into the DASGIP Parallel

Bioreactor Systems allows automated control of O₂ and CO₂ values in up to 16 bioreactors simultaneously. Additionally, key metabolic data such as OTR, CTR, RQ and mass flow can directly be obtained. Hence, researchers gain valuable insights into critical culture parameters such as biomass development, substrate consumption and product formation. Data can be used for automated process control e.g. of agitation, gassing, substrate feed or anti foam addition. Therefore, DASGIP's Off-Gas Analyzer GA4 embodies an effective and time-saving tool for bioprocess control.

Modules GA4

Technical Data

gas sensors by
BlueSens

	GA4	GA4E
Module		
Dimensions (WxDxH)	300 x 320 x 190 mm	
Ambient Conditions	5 °C to 40 °C; max. 80 % humidity	
Electrical Supply	110 to 240 V _{AC} , 50 / 60 Hz	
Weight in kg	12.1	
Digital Interfaces	RS232 / RS485	

O₂		
Measuring Principle	zirconium dioxide ZrO ₂ *	Galvanic Cell**
Measuring Range	1 to 50 %	0 to 100 %
Accuracy (25 °C, 1 bar)	≤ ± 0.2 % measuring range full-scale value, ± 3 % measured value	
Pressure Range	0.8 to 2.0 bar	0.8 to 1.2 bar
Pressure Regulation	ambient pressure compensated	

* not usable for anaerobic processes, good long-term stability

** not usable for high ammonia concentrations, calibration more often necessary

	GA4	GA4E
CO₂		
Measuring Principle	dual-beam infrared	
Measuring range	0 to 25 %	
Accuracy (25 °C, 1 bar)	≤ ± 0.2 % measuring range full-scale value, ± 3 % measured value	
Pressure range	0.8 to 2.0 bar	
Pressure Regulation	ambient pressure compensated	

Mass flow		
Measuring Principle	thermal mass flow measuring with bypass	
Measuring Range	0 to 300 sL/h	
Accuracy (25 °C, 1 bar)	± 1 % off measuring range full-scale value, ± 2 % off measured value	

Pressure		
Measuring Principle	absolute pressure measurement bridge, temperature compensated	
Measuring Range	500 to 1150 hPa	
Accuracy (25 °C, 1 bar)	1 hPa	

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