







NDIR Gas Sensors For the measurement of CO2 and CH4 in biogas applications

Biogas has become an important source of energy in recent years and helps to sustainably implement the climate goals set. In order to control the biogas plants efficiently, the composition of the biogas, especially with regards to the CO2 and CH4 content, is precisely analysed.

This allows both conclusions to be drawn on the fermentation process for gas production, as well as controlling the biogas station in favor of the best possible energy yield.

smartGAS supports ...

... this special measuring task with specially adapted NDIR gas sensors for methane and carbon dioxide. In addition to the optical quality of the components, the know-how for the calibration of the sensors is of particular importance. Measuring inaccuracies caused by the use of NDIR sensors that are not specially adapted to biogas can be avoided with smartGAS.

Thus, the biogas plant can implement their best efficiency and contribute efficiently to environmental protection.



CO2

50 Vol.-% | F3-214507-05000 100 Vol.-% | F3-214108-05000

CH4

50 Vol.-% | F3-043507-05000 100 Vol.-% | F3-043108-05000

MADE IN GERMANY

FLOW^{EVO} for Biogas application

Infrared gas Sensor Carbon dioxide CO₂ 50 Vol.-% smartGAS item number: F3-214507-05000

- Pre calibrated
- Compact Design
- 3/5 mm gas line connector
- 3.3–6 V DC supply voltage
- Modbus ASCII or RTU
- Status indicated by LED
- Low drift



Application examples

Gas analysis Biogas application Process control

Available equipment

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Gas cooler Particle filter Gas pump Calibration Software Mounting equipment





Available design in support Mechanical Installation Data communication Gas pre-treatment

FLOW^{EVO} I Carbon dioxide CO₂ I F3-214507-05000 I Biogas application

Measurement principle:	Non-Dispersive Infra-Red (NDIR), dual wavelength
Measurement range:	0 50 Vol% Full Scale (FS)
Gas supply:	by flow (nearly atmospheric pressure)
Flow rate:	0.1 1.0 l / min
Mounting dimensions:	76 mm x 30 mm x 50 mm (L x W x H)
Warm-up time:	< 2 minutes (start-up time)
	< 30 minutes (full specification)

Measuring response*

Digital resolution:	0.01 Vol%	
Response time @ 0.7 I / min**:	Standard:	Fast:
t ₉₀ (10 to 90 % FS):	≤ 9.9 s	≤ 0.7 s
t _{on} (0 to 90 % FS):	≤ 16.5 s	≤ 1.8 s
Detection limit (3 σ):	≤ 0.2 Vol%	≤ 0.36 Vol%
Repeatability:	≤±0.4 Vol%	
Linearity error (straight line deviation):	≤ ± 0.6 Vol%	
Long term stability (zero):	\leq ± 0.5 Vol% over 1000 h per	riod
Long term stability (span):	≤ ± 1.0 Vol% over 1000 h per	riod

Influence of T, P, flow rate, other*

Temp. dependence (zero):	\leq ± 0.1 Vol% per °C
Temp. dependence (span):	≤ ± 0.2 Vol% per °C
Pressure dependence:	+ 0.156 % of actual reading / hPa
Flow rate dependence:	≤ ± 0.1 Vol% per 0.1 I / min
Cross sensitivity (zero) other gases:	consult factory
Gas dew point requirement:	< + 5°C dew point (stable), particle free and clean sample gas

Electrical parameters

Air pressure: Ambient humidity:

Supply voltage	3.3 V 6.0 VDC
Supply current (peak):	< 400 mA @ 3.3 V, < 240 mA @ 5.0 V
Inrush current:	< 600 mA
Average power consumption:	< 800 mW
Digital output signal:	Modbus ASCII / RTU via UART, autobaud, autoframe
Calibration:	zero and span by SW
Climatic conditions	
Operating temperature:	0 +50 °C
Storage temperature:	-20 +60 °C

800 ... 1150 hPa

0 ... 95 % relative humidity (not condensing)

* Typical values related to 1013 hPa, Ta = 22 °C, flow = 0.7 l / min for dry (not condensing) and clean sample gas.

Stated values exclude calibration gas tolerance.

** Adjustable only via smartGAS Calibration-Tool SW.

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Please consult smartGAS sales for parts specified with other temperature and measurement ranges. At first initiation and depending on application and ambient conditions recalibration is recommended. Recurring cycles of recalibration are recommended.



MADE IN GERMANY

FLOW^{EVO} for Biogas application

Infrared gas Sensor Carbon dioxide CO₂ 100 Vol.-% smartGAS item number: F3-214108-05000

- Pre calibrated
- Compact Design
- 3/5 mm gas line connector
- 3.3–6 V DC supply voltage
- Modbus ASCII or RTU
- Status indicated by LED
- Low drift



Application examples

Gas analysis Biogas application Process control

Available equipment Gas cooler

Particle filter Gas pump Calibration Software Mounting equipment

Available design in support

Mechanical Installation Data communication Gas pre-treatment

FLOW^{EVO} I Carbon dioxide CO₂ I F3-214108-05000 I Biogas application

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Detection limit (3 σ):	≤ 0.2 Vol%	≤ 0.36 Vol%
Repeatability:	≤±0.6 Vol%	
Linearity error (straight line deviation):	≤ ± 0.9 Vol%	
Long term stability (zero):	\leq ± 1.0 Vol% over 1000 h per	riod
Long term stability (span):	\leq ± 1.5 Vol% over 1000 h per	riod

Influence of T, P, flow rate, other*

Temp. dependence (zero):	$\leq \pm 0.1$ Vol% per °C
Temp. dependence (span):	≤ ± 0.2 Vol% per °C
Pressure dependence:	+ 0.156 % of actual reading / hPa
Flow rate dependence:	≤ ± 0.1 Vol% per 0.1 I / min
Cross sensitivity (zero) other gases:	consult factory
Gas dew point requirement:	< + 5°C dew point (stable), particle free and clean sample gas

Electrical parameters

Air pressure:

Ambient humidity:

Supply voltage	3.3 V 6.0 VDC
Supply current (peak):	< 400 mA @ 3.3 V, < 240 mA @ 5.0 V
Inrush current:	< 600 mA
Average power consumption:	< 800 mW
Digital output signal:	Modbus ASCII / RTU via UART, autobaud, autoframe
Calibration:	zero and span by SW
Climatic conditions	
Operating temperature:	0 +50 °C
Storage temperature:	-20 +60 °C

800 ... 1150 hPa

0 ... 95 % relative humidity (not condensing)

 Typical values related to 1013 hPa, Ta = 22 °C, flow = 0.7 l / min for dry (not condensing) and clean sample gas. Stated values exclude calibration gas tolerance.

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MADE IN GERMANY

FLOW^{EVO} for Biogas application

Infrared gas Sensor Methane CH₄ 50 Vol.-% smartGAS item number: F3-043507-05000

- Pre calibrated
- Compact Design
- 3/5 mm gas line connector
- 3.3–6 V DC supply voltage
- Modbus ASCII or RTU
- Status indicated by LED
- Low drift





Application examples

Gas analysis Biogas application Process control

Available equipment

Gas cooler Particle filter Gas pump Calibration Software Mounting equipment

Available design in support

Mechanical Installation Data communication Gas pre-treatment

FLOW^{EVO} I Methane CH₄ I F3-043507-05000 I Biogas application

General features

Measurement principle:	Non-Dispersive Infra-Red (NDIR), dual wavelength
Measurement range:	0 50 Vol% Full Scale (FS)
Gas supply:	by flow (nearly atmospheric pressure)
Flow rate:	0.1 1.0 l / min
Mounting dimensions:	76 mm x 30 mm x 50 mm (L x W x H)
Warm-up time:	< 2 minutes (start-up time)
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Measuring response*

Digital resolution:	0.01 Vol%	
Response time @ 0.7 I / min**:	Standard:	Fast:
t ₉₀ (10 to 90 % FS):	≤ 9.9 s	≤ 0.7 s
t _{on} (0 to 90 % FS):	≤ 16.5 s	≤ 1.8 s
Detection limit (3 σ):	≤ 0.2 Vol%	≤ 0.38 Vol%
Repeatability:	≤±0.4 Vol%	
Linearity error (straight line deviation):	≤ ± 0.6 Vol%	
Long term stability (zero):	≤ ± 0.6 Vol% over 1000 h per	riod
Long term stability (span):	\leq ± 1.8 Vol% over 1000 h per	riod

Influence of T, P, flow rate, other*

Temp. dependence (zero):	≤ ± 0.1 Vol% per °C
Temp. dependence (span):	≤ ± 0.2 Vol% per °C
Pressure dependence:	+ 0.100 % of actual reading / hPa
Flow rate dependence:	≤ ± 0.1 Vol% per 0.1 I / min
Cross sensitivity (zero) other gases:	consult factory
Gas dew point requirement:	< + 5°C dew point (stable), particle free and clean sample gas

Electrical parameters

Supply voltage	3.3 V 6.0 VDC
Supply current (peak):	< 400 mA @ 3.3 V, < 240 mA @ 5.0 V
Inrush current:	< 600 mA
Average power consumption:	< 800 mW
Digital output signal:	Modbus ASCII / RTU via UART, autobaud, autoframe
Calibration:	zero and span by SW
Climatic conditions	

0 +50 °C
-20 +60 °C
800 1150 hPa
0 95 % relative humidity (not condensing)

* Typical values related to 1013 hPa, Ta = 22 °C, flow = 0.7 l / min for dry (not condensing) and clean sample gas.

Stated values exclude calibration gas tolerance.

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FLOW^{EVO} for Biogas application

Infrared gas Sensor Methane CH₄ 100 Vol.-% smartGAS item number: F3-043108-05000

- Pre calibrated
- Compact Design
- 3/5 mm gas line connector
- 3.3–6 V DC supply voltage
- Modbus ASCII or RTU
- Status indicated by LED
- Low drift







Application examples

Gas analysis Biogas application Process control

Available equipment

Gas cooler Particle filter Gas pump Calibration Software Mounting equipment

Available design in support

Mechanical Installation Data communication Gas pre-treatment

FLOW^{EVO} | Methane CH₄ | F3-043108-05000 | Biogas application

General features

Measurement principle:	Non-Dispersive Infra-Red (NDIR), dual wavelength
Measurement range:	0 100 Vol% Full Scale (FS)
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Detection limit (3 σ):	≤ 0.2 Vol%	≤ 0.38 Vol%
Repeatability:	≤ ± 0.6 Vol%	
Linearity error (straight line deviation):	≤±0.9 Vol%	
Long term stability (zero):	\leq ± 1.0 Vol% over 1000 h per	riod
Long term stability (span):	\leq ± 2.0 Vol% over 1000 h per	riod

Influence of T, P, flow rate, other*

Temp. dependence (zero):	$\leq \pm 0.1$ Vol% per °C
Temp. dependence (span):	≤ ± 0.2 Vol% per °C
Pressure dependence:	+ 0.100 % of actual reading / hPa
Flow rate dependence:	≤ ± 0.1 Vol% per 0.1 I / min
Cross sensitivity (zero) other gases:	consult factory
Gas dew point requirement:	< + 5°C dew point (stable), particle free and clean sample gas

Electrical parameters

Supply voltage	3.3 V 6.0 VDC
Supply current (peak):	< 400 mA @ 3.3 V, < 240 mA @ 5.0 V
Inrush current:	< 600 mA
Average power consumption:	< 800 mW
Digital output signal:	Modbus ASCII / RTU via UART, autobaud, autoframe
Calibration:	zero and span by SW
Climatic conditions	
Operating temperature:	0 +50 °C

Operating temperature:	0 +50 °C
Storage temperature:	-20 +60 °C
Air pressure:	800 1150 hPa
Ambient humidity:	0 95 % relative humidity (not condensing)

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