NDIR-Multi gas sensor

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1.1　Intended Use

The m-u-t multi-gas sensor measures the concentrations of up to eight optically active gases using the NDIR method. In addition, a maximum of six other sensors with a different measuring principle, e.g. electrochemical gas sensors, temperature and relative humidity can be integrated. The m-u-t multi-gas sensors are intended as OEM components for integration into online analysis systems, e.g. for process control, for permanent installation and are intended exclusively for monitoring applications. The infrared multi-gas sensor has a non-extractive sample feed, i.e. the gas sample must be conveyed into the measuring chamber of the infrared multi-gas sensor by means of a pressure difference (sample feed).

1.1.1　Operating principle

The m-u-t multi-gas sensors are based on the measuring principle of NDIR spectroscopy[1] (Figure 1).
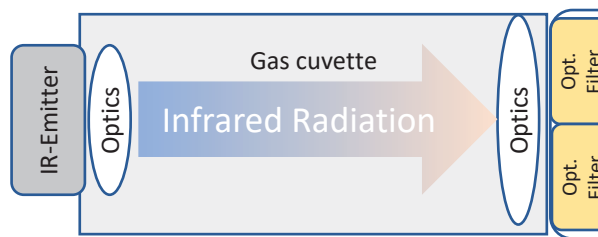

Figure 1: Schematic structure of NDIR gas spectroscopy

Figure 2: View of IR gas sensor 1011 genX

1.1.2　H_2-Measurement

A heated semiconductor sensor is used for the H_2 measurement. The H_2 sensor is sensitive to other substances, including methane, ethanol, carbon monoxide, oxygen and water (humidity). Contact with silicone vapors or alkali metals or their salts (e.g. from sea water) as well as with water (e.g. condensed moisture) can change the sensor properties and lead to a loss of function. Corrosive substances such as H_2S, SO_X, Cl_2, HCl, etc. attack the internal electrical contacts and components and can lead to sensor failure.

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[1]　NDIR Spectroscopy – Non-Dispersive Infrared Spectroscopy

1.1.3 Technical specifications

General	
Power supply	+24 / ±10 % SELV (safety extra-low voltage)
Power consumption	max. 6 W
Dimensions (H x W x D)	ca. 100 mm x 140 mm x 140 mm (plus gas connections)
Weight complete	ca. 2700 g
Gas space temperature during the measurement	10 °C bis +55 °C
Measuring room volume	ca. 300 cm³
Storage temperature	-25 °C until +75 °C, momentarily (4 h) until 85 °C
Relative humidity	3 % until 90 %, not condensing
Air pressure	Atmosphere equivalent up to 1000 m altitude. The housing is vacuum-tight and evacuatable.
Valve connections for hose with dimensions	d_{inside} = 3,2 mm (1/8 ") and d_{inside} = 6,4 mm (1/4 ")
Communication interface	RS422 (full duplex mode), serielles ASCII-Protokoll; 9600 Baud, 8N1

Security	
CE certified	Degree of protection housing IP-20
Use with combustible gases or within explosive atmospheres is not permitted.	

Measurand	Measuring rang[3]	Accuracy
Temperature in the gas space	0 °C until +60 °C	±0,2 °C Drift < 0,05 K/Year
Relative humidity in the gas space	0 % RF until 100 % RF	±1,8% RF Drift < 0,5 % RF / Year
Gas pressure	200 hPa until 1100 hPa	typ. <= ±4 hPa Drift typ. ±1 hPa after a half Year

[3] Measuring ranges of the sensors integrated in the OEM component infrared multi-gas sensor.

Gas		Measuring range	Max. deviation
Carbon monoxide	CO	0 – 6000 ppm	±3 % ±10 ppm
Ethin	C_2H_2	0 – 3000 ppm	±3 % ±10 ppm
Ethene	C_2H_4	0 – 2000 ppm	±3 % ±10 ppm
Methane	CH_4	0 – 4000 ppm	±3 % ±20 ppm
Ethane	C_2H_6	0 – 3000 ppm	±3% ±10 ppm
Propane	C_3H_8	0 – 2000 ppm	±3 % ±25 ppm
Carbon dioxide	CO_2	0 – 2500 ppm	±3 % ±10 ppm
Hydrogen	H_2	10 – 5000 ppm	±15 % ±25 ppm
Oxygen	O_2	0,1 – 25 %	±1 %

Type. Measuring ranges and accuracies in the range 10-55°C / 0-25% RH

We are happy to offer special calibrations on request.

1.2 O_2-Sensor

A sensor with a heated sensor element is implemented for the O_2 measurement.

Therefore, gases such as CH_4 | C_2H_2 | C_2H_4 | C_2H_6 | CO, etc. are oxidized

Gas	Max. concentration of the examined gas	Cross sensitivity [Δ%O2/%gas]	At oxygen concentration
CO_2	40 %	-0,027	20 % O_2
CO_2	40 %	-0,01	5 % O_2
CO	1000 ppm	-0,73	20 % O_2
CO	1000 ppm	-0,83	5 % O_2
NO_2	1000 ppm	1,06	
SO_2	1000 ppm	-0,24	
CH_4	1000 ppm	-1,77	5 % O_2
H_2S	400 ppm	~0,0	
H_2O (humidity)	90 % abs	~0,0	

Table 1: Cross-sensitivities of the O_2 sensor

ontact of the O_2 sensor with water (e.g. condensed moisture), gases and compounds containing halogen, organic vapors as well as with H_2S or SO_X can change the sensor properties or lead to a loss of function.

Technical changes reserved

Footprints für Heizwiderstände
symbolhaft dargestellt:
Footprints for heating elements
represented as example

Interface:
interface

Winkelschwenkverschraubung M5 (3x),
bei Anlieferung mit Staubschutzkappe
verschlossen:
Angle swivel screw connection M5 (3x),
when delivered locked with dust protection cap

Prüfsiegel:
seal of approval

140

144.4

100

140

152.5

M3x5
(16x)

Vers., ECN | Änderung
DIN A3
Maßstab 1:2
Werkst.:
Halbz.:

Gew.:
Allgemeintol. | Oberfläche
DIN ISO | DIN ISO
2768-m-K | 1302

Datum | Name
Erst. | 14.11.2022 | Entwicklung
Gepr.
Norm

PDM-0000124389 - Mod. - Zng.

IR-Gassensor
Basismodul

30-xxxxxxx

Ers.f.: | Ers.d.:

Datum | Name

Blatt 1
1 Bl.

Do you have any questions
or would you like advice? You are welcome to make an appointment directly.

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