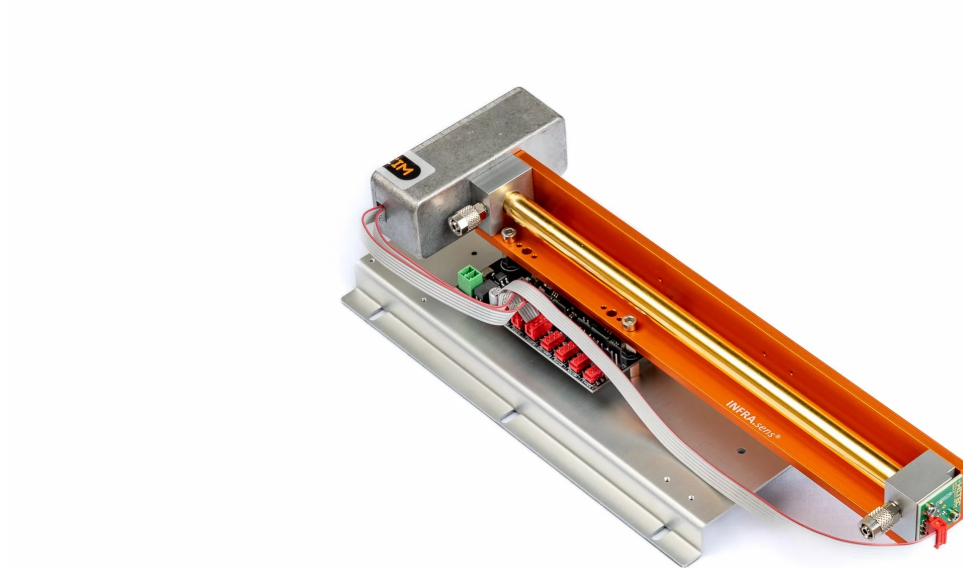


# RITTER »MultiGas« Infrared Modules NDIR

RITTER DATA SHEET / SENSORS, NON-DISPERSIVE INFRARED SENSOR (NDIR) / MULTIGAS



## Description

Gas analysis based on the NDIR technique is an established method to determine the concentrations of gases in complex mixtures. The RITTER »MultiGas« sensors use new optical components for optimal analysis results: Up to 3 optical filters analyse the gas which flows through the sensor as one gas stream. The optional oxygen, pressure, and humidity sensors are in-line with the same single gas stream. The individual internal modules are sealed by means of O-ring connections. In order to achieve an optimum adaptation to the required measuring range, the lengths of the modular measurement cells (= cuvettes) can be implemented in the range of 5 mm (large measurement range in percentage level) up to 250 mm (small measurement range in ppm level). Cuvettes with a length  $\geq 20$  mm are coated with a resistant gold layer in order to improve the reflection properties for low concentration level detection. Cuvettes used with aggressive gases are gold-coated as well. The other internal mechanical parts are made out of aluminium, optionally out of stainless steel. For fast response applications the measuring system delivers a stable result within  $t_{90} \approx 3$  seconds. The entire unit can be disassembled for easy maintenance/service.

## Applications

- › Biogas analysis
- › Natural gas analysis
- › Environmental and Process Measurement
- › TOC analysers
- › Continuous Emission Monitoring (CEM)
- › Elemental analysis
- › Industrial gas analysis

## Specifications

### General features

Measurement technology:	Innovative NDIR Sensor (non-dispersive infrared sensor)
Detectable gases:	CO <sub>2</sub> CO N <sub>2</sub> O C <sub>N</sub> H <sub>M</sub> CH <sub>4</sub> CF <sub>4</sub> SF <sub>6</sub> H <sub>2</sub> O
Number of simultaneously detectable gases:	max. 3 per sensor unit
Measurement ranges:	See <a href="#">Table of Measurement Ranges</a>
Flow rate range:	5 ~ 300 ltr/h For higher flow rates the sensor can be operated in bypass
Max. gas inlet pressure:	300 mbar
Pressure loss (without additional optional sensors):	10 @ 100 / 35 @ 200 / 70 @ 300 (mbar @ ltr/h)
Temperature compensation:	Yes
Data acquisition software:	Yes
Lifetime of IR radiation source:	> 40 000 h
Measurement cuvette:	Aluminium, with measurement ranges ≤1% gold-plated inside
Cuvette sealing:	Viton O-ring
Casing:	High-quality table-top casing, aluminium
Dimensions (W x H x L):	171 x 86 x 290 mm
Weight:	approx. 2 kg
Gas connections:	PVDF screw-type tube connection for tube Ø <sub>i</sub> 4 mm, Ø <sub>o</sub> 6 mm

### Measuring response

Linearity error:	< ± 1% F.S.
Repeatability:	± 0.5% F.S.
Long term stability zero:	< ± 2% F.S. / week
Long term stability span:	< ± 2% F.S. / month
Temperature influence of zero point:	< 1% F.S. / 10K
Temperature influence of span:	< 2% F.S. / 10K
Cross sensitivity:	< 2% F.S.
Pressure influence:	< 1.5% / 10hPa of reading
Warm-up time:	2 min
Response time (t <sub>90</sub> ):	≈ 3 sec
Sampling frequency by software:	≤ 10 Hz
Detection limit:	See <a href="#">Table of Detection Limits</a>
Resolution:	0.5 x detection limit
Water vapour:	No influence with measurements of CO <sub>2</sub> and CH <sub>4</sub>

## Electrical features

Power supply:	24 VDC incl. power plug 100 ~ 240 VAC 50/60 Hz: 24 VDC
Average power consumption:	< 1W
Interface:	USB (standard), RS232 / CANbus / CANopen (options) incl. data transmission cable 1 m
Analogue voltage output (option):	0 – 2 V / 0 – 5 V / 0 – 10 V

## Climatic conditions

Operating temperature:	+15 ~ +45 °C
Storage temperature:	–20 ~ +60 °C
Operating pressure:	800 ~ 1200 hPa (mbar)
Ambient humidity:	0 ~ 95% rel. humidity <b>Condensing inside of sensor must be prevented!</b>

\* Analysis of  $C_nH_m$ : The calibration of sensors for  $C_nH_m$  will be performed with propane. Aromatic hydrocarbons are also measured but with a different weighting. This means that the sensitivity of the sensor is significantly smaller with these gases than with other hydrocarbons.

## List of standard measurement ranges <sup>\*1</sup> (and detection limits <sup>\*2</sup> )

Standard Measuring Ranges with respective Detection Limits (% of F.S. <sup>*3</sup> )																
	100 Vol. %	50 Vol. %	30 Vol. %	20 Vol. %	10 Vol. %	5 Vol. %	1 Vol. %	5,000 ppm	2,000 ppm	1,000 ppm	500 ppm	300 ppm	100 ppm	50 ppm	10 ppm	1 ppm
CO <sub>2</sub>	✓ ( < 0.1% )	✓ ( < 0.1% )		✓ ( < 0.1% )	✓ ( < 0.1% )	✓ ( < 0.1% )	✓ ( < 0.1% )	✓ ( < 0.1% )	✓ ( < 0.1% )	✓ ( < 0.1% )	✓ ( < 0.1% )	✓ ( < 0.1% )	✓ ( < 0.3% )	✓ ( < 0.3% )		
CO	✓ ( < 0.2% )	✓ ( < 0.2% )	✓ ( < 0.2% )		✓ ( < 0.2% )	✓ ( < 0.2% )	✓ ( < 0.2% )	✓ ( < 0.2% )	✓ ( < 0.3% )	✓ ( < 0.5% )	✓ ( < 0.5% )					
N <sub>2</sub> O	✓ ( < 0.1% )	✓ ( < 0.1% )	✓ ( < 0.1% )	✓	✓			✓	✓ ( < 0.1% )	✓ ( < 0.1% )	✓ ( < 0.1% )	✓ ( < 0.1% )	✓ ( < 0.3% )			
C <sub>n</sub> H <sub>m</sub> <sup>*4</sup>	✓ ( < 0.1% )	✓ ( < 0.1% )	✓ ( < 0.1% )	✓	✓ ( < 0.2% )	✓ ( < 0.2% )	✓ ( < 0.2% )	✓ ( < 0.2% )	✓ ( < 0.5% )	✓ ( < 0.5% )						
CH <sub>4</sub>	✓ ( < 0.1% )	✓ ( < 0.1% )	✓ ( < 0.1% )	✓	✓ ( < 0.1% )	✓ ( < 0.1% )	✓ ( < 0.1% )	✓ ( < 0.1% )	✓ ( < 0.3% )	✓ ( < 0.5% )						
CF <sub>4</sub>	✓ ( < 0.2% )	✓ ( < 0.2% )	✓ ( < 0.2% )					✓	✓							
SF <sub>6</sub>	✓ ( < 0.1% )	✓ ( < 0.1% )	✓ ( < 0.1% )					✓ ( < 0.2% )	✓	✓ ( < 0.5% )			✓ ( < 0.3% )	✓ ( < 0.3% )		
H <sub>2</sub> O						✓	✓	✓								

<sup>\*1</sup> A standard measurement range is defined by ✓ / <sup>\*2</sup> (= 3 σ) in Percent of Full Scale / <sup>\*3</sup> F.S. = Full Scale / <sup>\*4</sup> Calibration with Propane

Infrared module NDIR

Ultraviolet module NDUV

### Definition of Detection Limit

The Detection Limit is the smallest measurement value which can be obtained with a specific uncertainty. This uncertainty includes the resolution, noise and stability of the gas sensor for a specific gas and specific measurement range. For evaluation of the detection limit value, several single measurements are taken at the identical measurement conditions. With the obtained single measurement results the standard deviation "Sigma" (σ) is calculated. The values given in the table equal the triple amount of Sigma.

### Recalibrations

The following recalibration intervals are recommended for IR sensors:

- Zero-point: Weekly with inert gas, e.g. Nitrogen  
The recalibration of the zero point is described in the software manual.
- End-point (full scale): Every 3 months with suitable calibration gas

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The most recent version of this data-sheet can be found at ...

<https://www.ritter.de/en/multigas-ndir-infrared-modules/>

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