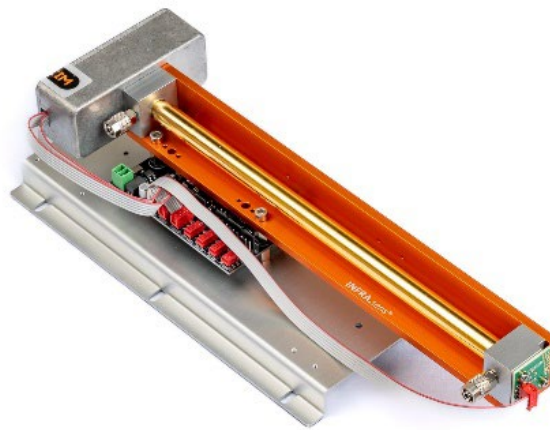


MultiGas Infrared Module NDIR

- NON-DISPERSIVE INFRARED SENSOR (NDIR), SENSORS
- MULTIGASNDIR
 - CO₂ CO N₂O CNHM CH₄ C₂H₆ C₃H₈ C₄H₁₀ CF₄ H₂O

NDIR Sensor = non-dispersive infrared sensor Featuring high-performance light-emitting diodes (IR-LED) and thermal micro-radiators



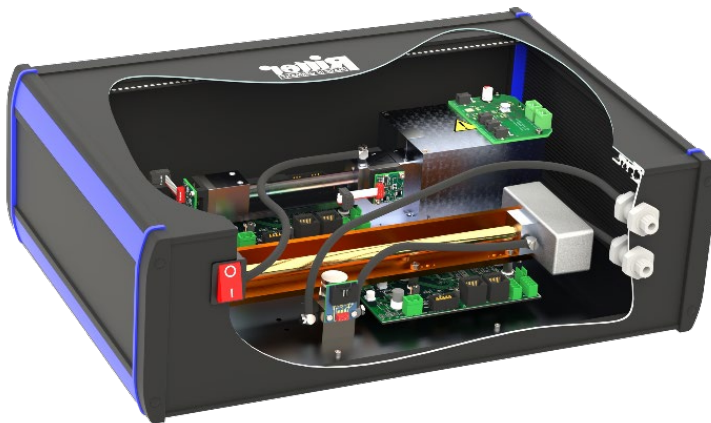
Overview

The RITTER MultiGas Sensors NDIR Module (non-dispersive IR sensor) has been specially developed for use in high-quality gas analysis. In the design phase special emphasis was placed on high stability and a low detection limit. These goals could be fully achieved by using high-performance light-emitting diodes (IR-LED) and thermal micro-radiators which were adapted to the requirements of gas detection. In the spectral range from 2 μm to 12 μm , carbon dioxide, carbon monoxide, hydrocarbons, water vapor and sulphur hexafluoride can be safely detected down to the ppm range with this innovative sensor platform.

The various photometric components such as detectors, emitters, measuring sample cell, etc. will be assembled user-specifically in a high-quality tabletop casing by RITTER.

Applications

- Biogas research
- Environmental and process measuring technology.
- Elemental analysis
- TOC-analysers
- Industrial gas analysis
- Natural gas analysis



Characteristics and Benefits

- Group of detectable gases:
CO₂ CO N₂O CH₄ C_nH_m* CF₄ SF₆ H₂O
- Measurement technology: NDIR-Sensor (non-dispersive IR sensor)
- Measurement accuracy ±2% of Full Scale (F.S.)
- No cross-sensitivity to H₂
- Operating temperature: 5 – 45 °C
- Operating pressure: 800 – 1200 mbar (hPa) abs.
- Flow rate range: 1 ltr/day – 100 ltr/h
- Warm-up time: 2 min
- Response time (t₉₀): ≈ 3 sec
- Interface USB, on request RS 232
- Sensor cuvette: Aluminium, gold plated for sensor length 100 ≥ mm.
- Incl. temperature compensation
- Incl. data acquisition software
- In tabletop casing, overall dimensions W x H x L 171 x 85 x 246 mm, weight approx. 1,9 kg
- Gas connection: PVDF screw-type tube connection for tube Ø_i 4 mm, Ø_a 6 mm
- Power supply: 24 VDC (incl. power plug 100 – 240 VAC / 24 VDC)

General Features	
Measurement technology	Innovative NDIR Sensor (non-dispersive infrared sensor)
Detectable gases:	CO CH CF SF
Number of simultaneously detectable gases:	max. 3 per sensor unit
Measurement ranges:	See Table of Measurement Ranges
Flow rate range:	5 ~ 300 ltr/h For higher flow rates the sensor can be operated in bypass 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 $\leq 1\%$ 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 \varnothing 4 mm, \varnothing 6 mm
Measuring response	
Linearity error:	$< \pm 1\%$ F.S.
Repeatability:	$\pm 0.5\%$ F.S.
Long term stability zero:	$< \pm 2\%$ F.S. / week
Long term stability span:	$< \pm 2\%$ 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 ₁):	≈ 3 sec
Sampling frequency by software:	≤ 10 Hz
Detection limit:	See Table of Detection Limits
Resolution:	0.5 x detection limit
Water vapour:	No influence with measurements of CO and CH

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

Condensing inside of sensor must be prevented!

** Analysis of C H: The calibration of sensors for C H 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.
Recalibration*

List of standard measurement ranges *1 (and detection limits *2)

Standard Measuring Ranges with respective Detection Limits (% of F.S. *3)																
	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
CO₂	✓ (< 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%)					
N₂O	✓ (< 0.1%)	✓ (< 0.1%)	✓ (< 0.1%)	✓	✓			✓	✓ (< 0.1%)	✓ (< 0.1%)	✓ (< 0.1%)	✓ (< 0.1%)	✓ (< 0.3%)			
C_nH_m *4	✓ (< 0.1%)	✓ (< 0.1%)	✓ (< 0.1%)	✓	✓ (< 0.2%)	✓ (< 0.2%)	✓ (< 0.2%)	✓ (< 0.2%)	✓ (< 0.5%)	✓ (< 0.5%)						
CH₄	✓ (< 0.1%)	✓ (< 0.1%)	✓ (< 0.1%)	✓	✓ (< 0.1%)	✓ (< 0.1%)	✓ (< 0.1%)	✓ (< 0.1%)	✓ (< 0.3%)	✓ (< 0.5%)						
CF₄	✓ (< 0.2%)	✓ (< 0.2%)	✓ (< 0.2%)					✓ (< 0.02%)	✓ (< 0.05%)							
SF₆	✓ (< 0.1%)	✓ (< 0.1%)	✓ (< 0.1%)					✓ (< 0.2%)	✓	✓ (< 0.5%)			✓ (< 0.3%)	✓ (< 0.3%)		
H₂O						✓	✓	✓								

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

Infrared module NDIR Ultraviolet module NDUV

Calibration

- Readjustment of the zero-point is recommended once a week.
- Contamination of the measuring cuvette can lead to shifting of the endpoint. Due to the integrated filter, re-adjustment of the endpoint is generally not required – but can be performed once a year.
- Additionally, cartridges filled with an inert and the respective test gas for recalibration of the zero and endpoint can be provided.
- Long-term drift is < 1% of Full Scale (F.S.) / 24 h.

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.
- Endpoint (full scale): Every 3 months with suitable calibration gas