

RITTER »MultiGas« Ultraviolet Modules NDUV



RITTER DATA SHEET / SENSORS, NON-DISPERSIVE ULTRAVIOLET SENSOR (NDUV) / MULTIGAS



Description

The RITTER »MultiGas« UV sensor is the world's first gas analysis module based on miniaturized UV-LEDs. The stability and lifetime of these UV-LEDs enables high-precision gas analysis down to the ppm range. By using two UV-LEDs two gases can be detected simultaneously. Furthermore, with this approach measuring ranges from ppm to Vol.-% can be realized. In the spectral range from 200 nm to 500 nm, nitrogen oxides (NO + NO₂), aromatic hydrocarbons, hydrogen sulphide, ozone, sulphur dioxide and chlorine can be reliably detected with this new sensor platform. The entire unit can be disassembled for easy maintenance/service. 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 ≥ 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 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 $t_{90} \approx 1-2$ seconds.

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 NDUV Sensor (non-dispersive ultraviolet sensor)
Detectable gases:	O₃ CL₂ SO₂ H₂S NO₂
Number of simultaneously detectable gases:	max. 2
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
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 UV radiation source:	> 8 000 h
Measurement cuvette:	Stainless steel with silicone coating inside
Cuvette sealing:	Viton O-ring
Internal tubing:	FKM / Viton (fluorinated rubber)
Casing:	High-quality table-top casing, aluminium
Dimensions (W x H x L):	464 x 189 x 305 mm
Weight:	approx. 6.5+ kg
Gas connections:	PVDF screw-type tube connection for tube Ø _i 4 mm, Ø _o 6 mm

Measuring response

Linearity error:	< ± 1% F.S.
Repeatability:	± 0.5% F.S.
Long term stability zero:	< ± 1% F.S. / 24 h
Long term stability span:	< ± 1% 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% / 10 hPa of reading
Warm-up time:	1 min (initial), < 60 min for full specification
Response time (t90):	1.5 – 15 sec
Sampling frequency by software:	≤ 10 Hz
Detection limit:	See Table of Measurement Ranges
Resolution:	0.5 x detection limit

Electrical features

Power supply:	24 VDC incl. power plug 100 ~ 240 VAC 50/60 Hz: 24 VDC
Supply current (peak)	< 0.4 A
Average power consumption	< 7.5 W
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:	+25 ~ +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!

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
O ₃								✓ (< 0.1%)	✓ (< 0.1%)	✓ (< 0.1%)	✓ (< 0.2%)		✓ (< 0.5%)	✓ (< 0.5%)	✓ (< 0.5%)	✓
Cl ₂	✓		✓ (< 0.1%)	✓	✓ (< 0.1%)	✓ (< 0.1%)	✓ (< 0.1%)	✓ (< 0.1%)	✓ (< 0.1%)	✓ (< 0.1%)	✓ (< 0.2%)	✓	✓ (< 0.5%)			
SO ₂					✓ (< 0.1%)	✓ (< 0.1%)	✓ (< 0.1%)	✓ (< 0.1%)	✓ (< 0.1%)	✓ (< 0.1%)	✓ (< 0.1%)	✓ (< 0.1%)	✓ (< 0.5%)	✓ (< 0.5%)	✓ (< 0.5%)	
H ₂ S							✓ (< 0.1%)	✓ (< 0.1%)	✓ (< 0.1%)	✓ (< 0.1%)	✓ (< 0.2%)	✓	✓ (< 0.5%)			
NO ₂								✓ (< 0.1%)	✓ (< 0.1%)	✓ (< 0.1%)	✓ (< 0.2%)	✓ (< 0.2%)	✓ (< 0.5%)	✓ (< 0.5%)	✓ (< 0.5%)	
NO								✓ (< 0.1%)	✓ (< 0.1%)	✓ (< 0.1%)	✓ (< 0.2%)	✓ (< 0.2%)				

^{*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

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 UV sensors:

- Zero-point:
 - Concentrations < 300 ppm: Every 48 hours with inert gas, e.g. Nitrogen
 - Concentrations ≥ 300 ppm: Every 24 hours 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

V 1.0 / Rev. 2023-07-05 / Subject to alterations.

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

<https://www.ritter.de/en/multigas-nduv-ultraviolet-modules/>

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