LFE CONTHOS 3 -PMD

Paramagnetic Oxygen Gas Analyzer

Key Features

- ⇨Oxygen specific analysis utilizing paramagnetic sensor
- ⇨Magnetomechanical measuring principle (dumbbell principle)
- ⇨Temperature controlled for increased stability and performance
- ⇨Fast response $T_{90} \leq 5$ sec
- ⇨Up to 3 measuring ranges

Typical Applications

- ⇨Flue gas control
- ⇨Inertization plants
- ⇨Biogas O_2 measurement
- ⇨Air separation, O_2 gas purity
- ⇨Power plants, metallurgical, chemistry, petrochemistry

Description

The CONTHOS 3 PMD state-of-the-art process gas analyzer is an analytical instrument developed for use in process industry.

Some of the outstanding technical features of LFE's 3rd generation, microprocessor-controlled gas analyzer for oxygen analysis are:

- ⇨Temperature controlled paramagnetic sensor
- ⇨Magnetomechanical measuring principle ("dumbbell" type)
- ⇨High selectivity to O_2
- ⇨Fast response time: time constant < 5 sec
- ⇨Excellent precision and outstanding performance for ranges from 0 - 5 vol.% O_2 up to 0 - 100 vol.% O_2
- ⇨Optional automatic pressure compensation
- ⇨Intuitive user-interface based on NAMUR recommendations
- ⇨Automatic self-diagnosis
- ⇨Optional paramagnetic cells for corrosive gases and solvents
- ⇨Optional intrinsically safe measuring cell for flammable gases

LFE Process Analytical Instrumentation
Am Germanenring 54 D-63486 Bruchköbel / Germany
Tel. : +49 6181-495302 | www.LFE.de | sales@LFE.de

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Options

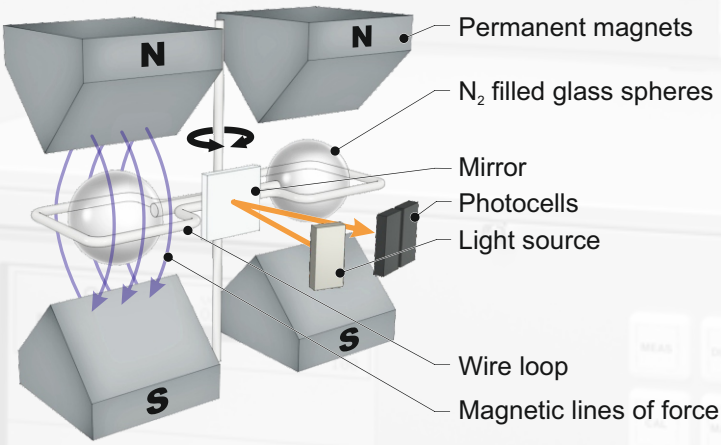
- ⇨Maximum 3 switchable ranges: independently configurable; suppressed ranges as special solution on request
- ⇨Automatic pressure compensation (from 800 to 1200 mbar absolute; extended pressure range on request)
- ⇨Digital I/O board for remote range switching, threshold contacts, etc.
- ⇨RS-485 interface with Modbus RTU protocol
- ⇨Modbus TCP
- ⇨Interference correction in conjunction with external, selective gas analyzers for multiple gas constituents

Oxygen Sensor

The basic measuring principle of the CONTHOS 3 PMD makes use of the fact that oxygen has a paramagnetic susceptibility that is significantly greater than other gases. This property causes oxygen molecules to be attracted much more strongly into an inhomogeneous magnetic field than other gases.

The paramagnetic sensor employed in the CONTHOS 3 PMD is of the so-called "dumbbell" type utilizing the magnetomechanical measuring principle. Two miniaturized, nitrogen filled gas spheres configured in a dumbbell shape are symmetrically suspended in a strong, inhomogeneous magnetic field. Any oxygen contained in the surrounding (sample) gas is drawn into the magnetic field thereby displacing the glass spheres and forcing the dumbbell to rotate outward. The resulting torque is proportional to the oxygen concentration.

A mirror mounted on the rotational axis of the dumbbell reflects a beam of light onto a pair of photocells which detect any rotational displacement. The photocells are part of a control loop which subsequently drives current through windings arranged around the dumbbell. The current through the windings generates an electromagnetic counter moment which moves the dumbbell back to its null position. The required current level is proportional to the oxygen concentration and as such is passed on to the CONTHOS' signal processing unit.



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Technical Data

Enclosure & electical data

	CONTHOS 3E PMD 19” rack housing	CONTHOS 3F PMD Field housing
Housing		
	3HE/ 84TE housing for mounting in 19" cabinet	purgeable steel housing for wall mounting; with separate compartments for the electronic components and the analytical components
Protection class	IP40	IP65
Dimensions (H x W x D)	3HU / 84TE (133 x 483 x 427 mm)	434 x 460 x 266 mm
Weight	approx. 10 kg	approx. 25 kg
Power requirements	100-240 VAC (48-62Hz; nominal voltage range: 88-253 VAC; 100 VA max. during warm-up period)	
Sample gas connectors	Standard: Swagelok® (SS 316) for tubing o.d 6 mm Option: Swagelok® (SS 316) for tubing o.d. ¼"	

Measuring characteristics

Measuring principle	Paramagnetic sensor ("dumbbell" type)
Measured quantity Gas interference	Oxygen concentration in gas mixtures Note: Although the paramagnetic susceptibility of O_2 is much greater than other gases, these can also exhibit lower degrees of paramagnetic susceptibility and therefore as interfering components possibly influence the accuracy of the analysis. For this reason the gas matrix should be evaluated.
Measuring ranges	Up to 3 independently configurable, switchable ranges. Standard measuring range: 0-100% or 0-25% O_2 (other ranges on request) Suppressed ranges as special solution on request Range switching is accomplished manually, automatically and/or remotely (via optional digital inputs). • lowest range: 0 - 5% O_2 • largest range: 0 - 100% O_2
Response time T_{90}	< 5 sec (dependent upon gas flow and analyzer configuration; integration time configurable)
Detector operating temperature	Standard operating temperature: 55°C
Pressure influence	No pressure influence at 0% O_2 Without optional pressure compensation: response changes proportional to pressure With pressure compensation: no influence btwn. 800 - 1200 mbar
Detection limit [1]	? 1% of span
Reproducibility [1]	< ± 0.03 % O_2
Linearity [1]	Response intrinsically linear
Zero drift [1]	< ± 0.1 % O_2 / week
Ambient temperature influence	Zero: < ± 0.5 % O_2 per 10 K Span: < ± 2% of measured value per 10 K
Influence of inclination	Baseline offset ? 0.02 vol.-% O2 per 1° deviation from the horizontal
Calibration	Manual: 2-point (offset/span) calibration (The optimal span gas concentrations should be chosen between 75 and 100 % of the corresponding range). Option: automatic or remote calibration in conjunction with the optional digital I/O board or Modbus interface (RS485 or TCP)
Pressure compensation	optional: from 800 to 1200 mbar absolute; extended pressure range on request
Interference correction	for static and/or dynamic interference correction (dynamic correction only in conjunction with the optional digital I/O board or Modbus interface (RS485 or TCP). One of the prerequisites for dynamic interference correction is the availability of a selective signal, proportional to the particular gas component to be corrected for. The processing of analyzer ranges with a suppressed zero range is not possible.

[1] at constant temperature and pressure

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Technical Data (continued)

Materials in contact with sample gas

Paramagnetic sensor	glass, stainless steel 1.4571, Gold, Viton, Platinum-Iridium, Epoxy, Nickel
Sample-gas connectors	standard : stainless steel (SS 316)
Sample gas lines	standard: PTFE optional: stainless steel tubing (SS 321; similar to 1.4541) and 1.4571

Data display, inputs and outputs

User interface	LC display (40 characters x 16 lines) + bar graph Plain text description of instrument status as well as digital status output Language: switchable between English & German
Analog signal output	2 independently configurable, galvanically isolated analog outputs (with common ground; R_{Load} = 600 Ohm max.) Available output levels: 0 - 20 mA, 4 - 20 mA, 4 - 20 mA with superimposed instrument status (NAMUR NE 43 compliant) as well as test signal levels (0, 4, 10, 12 & 20 mA)
Digital outputs 1 to 3 (instrument status)	Instrument status (NAMUR NE 107 compliant) via floating contacts (28 V max.; 350 mA max.) FAILURE (DO 1) | MAINTENANCE REQUIRED (DO 2) | FUNCTION CHECK (DO 3)
Analog inputs (optional)	3 galvanically isolated, configurable analog inputs for interference correction and pressure compensation 0 – 20mA or 4 – 20mA (R_i = 50 Ohm)
Digital I/O (optional)	Digital inputs: 8 configurable optically isolated inputs (6 – 24 VDC; 10 mA max.) • remote range selection • remote triggering of zero and span calibration • switching of interference correction analog inputs to a secondary input range • mapping of user defined input to a digital output Digital outputs: 7 configurable, floating relay contacts (28 V max.; 350 mA max.) • threshold monitoring (1 threshold per measuring range) • feedback as to the current range • calibration gas selection • mapping of user defined input to a digital output
Modbus Interface (optional)	• Modbus RTU - RS485 • Modbus TCP
Service interface	non-isolated serial interface for accessing the instrument's configuration

The stability data is valid for analyzer operation with pure bottled gases. Instrument accuracy is based on binary or quasi-binary gas mixtures. Deviations from the above data can occur in conjunction with process gases depending upon the gas quality and the degree of gas handling.
Unless otherwise specified the CONTHOS gas analyzer is neither ex-proof nor intrinsically safe in terms of explosion protection.

The CONTHOS may not be employed for the analysis of ignitable gas-mixtures. The customer must ensure compliance with applicable regulations when using the analyzer with inflammable or toxic gases or when installing within explosion endangered environments.
The customer must ensure that the sample gas is dry and free of particulates.

Note:
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