

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
- ⇒ Up to 3 measuring ranges
- ⇒ Optional paramagnetic cells for corrosive gases and solvents
- ⇒ Optional intrinsically safe measuring cell for flammable gases

Typical Applications

- ⇒ Fast response process gas measurement
- ⇒ Flue gas control
- ⇒ Inertization plants
- ⇒ Biogas measurement
- ⇒ Air separation, 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 O₂
- ⇒ Fast response time: time constant < 5 sec

- ⇒ Excellent precision and outstanding performance for ranges from 0 - 1 vol.% O₂ up to 0 - 100 vol.% O₂
- ⇒ 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 CONTHOS 3E

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
- ⇒ Interference correction in conjunction with external, selective gas analyzers for multiple gas constituents

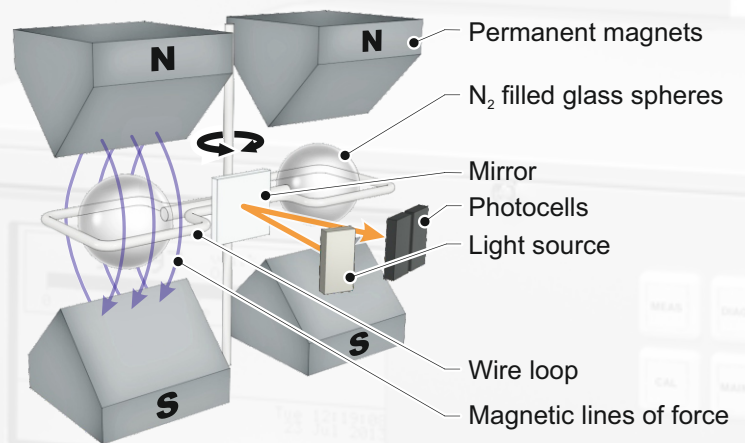
Oxygen Sensor

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.



Technical Data

Enclosure & electrical 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. 1/4"	

Measuring characteristics

Measuring principle	Paramagnetic sensor ("dumbbell" type)
Measured quantity	Oxygen concentration in gas mixtures
Gas interference	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. Suppressed ranges as special solution on request. Range switching is accomplished manually, automatically and/or remotely (via optional digital inputs). lowest range: 0 - 1% O ₂ largest range: 0 - 100% O ₂
Response time T ₉₀	< 5 sec (dependent upon gas flow and analyzer configuration; integration time configurable)
Influence of gas flow	between 30 – 60 l/h: < 1% of range span for a gas flow of change of ±10 l/h
Detection limit ¹	< 1% of span
Reproducibility ¹	< 1% of span
Linearity ¹	< 1% of span
Response drift ¹	Zero: < 2% of span per week Span: < 1% of span per week
Ambient temperature influence	Zero: < 1% of span per 10 K Span: < 1% of span per 10 K
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 RS-485
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 analog inputs or RS-485). 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

Technical Data (continued)

Materials in contact with sample gas

Paramagnetic sensor	platinum, epoxy, glass, FPM, stainless steel 1.4571
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; $R_{load} = 600 \text{ Ohm max.}$) 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 ($R_i = 50 \text{ Ohm}$)
Digital I/O (optional)	Digital inputs: 8 configurable optically isolated inputs (6 – 24 VDC; 10 mA max.) <ul style="list-style-type: none">remote range selectionremote triggering of zero and span calibrationswitching of interference correction analog inputs to a secondary input rangemapping of user defined input to a digital output Digital outputs: 7 configurable, floating relay contacts (28 V max.; 350 mA max.) <ul style="list-style-type: none">threshold monitoring (1 threshold per measuring range)feedback as to the current rangecalibration gas selectionmapping of user defined input to a digital output
Modbus Interface (optional)	<ul style="list-style-type: none">Modbus RTU - RS485Modbus 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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