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Overview



The function of the OXYMAT 6 gas analyzers is based on the paramagnetic alternating pressure method and are used to measure oxygen in gases.

Benefits

- Paramagnetic alternating pressure principle
  - Small measuring ranges (0 to 0.5% or 99.5 to 100% O_2)
  - Absolute linearity
- Detector element has no contact with the sample gas
  - Can be used under "harsh conditions"
  - Long service life
- Physically suppressed zero through suitable selection of reference gas (air or O_2), e.g. 98 to 100% O_2 for purity monitoring/air separation
- Open interface architecture (RS 485, RS 232, PROFIBUS)
- SIPROM GA network for maintenance and service information (option)
- Electronics and physics: gas-tight isolation, purging is possible, IP65, long service life even in harsh environments (field device only)
- Heated versions (option), use also in presence of gases condensing at low temperature (field device only)
- Ex(p) for zones 1 and 2 according to ATEX 2G and ATEX 3G (field device only)

Application

- For boiler control in combustion plants
- For safety-relevant applications (SIL)
- In chemical plants
- For ultra-pure gas quality monitoring
- Environmental protection
- Quality monitoring
- Versions for analyzing flammable and non-flammable gases or vapors for use in hazardous areas

Special versions

Special applications

Besides the standard combinations, special applications concerning the material in the gas path and the material in the sample chambers are also available on request.

Performance-tested version / QAL

As a reference value for emission measurements according to TA Luft, sections 13 and 27 of the German Federal Immission Protection Regulations

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Design

19" rack unit

- With 4 U for installation
  - In hinged frame
  - In cabinets with or without telescopic rails
- Front plate can be swung down for servicing purposes (laptop connection)
- Internal gas paths: hose made of FKM (Viton) or pipe made of titanium or stainless steel (mat. No. 1.4571)
- Gas connections for sample gas inlet and outlet and for reference gas: Fittings, pipe diameter of 6 mm or ¼"
- Flow indicator for sample gas on front plate (option)
- Pressure switch in sample gas path for flow monitoring (option)

Field device

- Two-door enclosure with gas-tight separation of analyzer and electronics sections
- Individually purgeable enclosure halves
- Analyzer unit and piping can be heated up to 130 °C (option)
- Gas path and stubs made of stainless steel (mat. No. 1.4571) or titanium, Hastelloy C22
- Purging gas connections: pipe diameter 10 mm or 3/8"
- Gas connections for sample gas inlet and outlet and for reference gas: Clamping ring connection for a pipe diameter of 6 mm or ¼"

Display and operator panel

- Large LCD panel for simultaneous display of:
  - Measured value (digital and analog displays)
  - Status bar
  - Measuring ranges
- Contrast of LCD panel adjustable using menu
- Permanent LED backlighting
- Washable membrane keyboard with five softkeys
- Menu-driven operation for parameterization, test functions, adjustment
- User help in plain text
- Graphic display of concentration trend; programmable time intervals
- Bilingual operating software German/English, English/Spanish, French/English, Spanish/English, Italian/English

Inputs and outputs

- One analog output per medium (from 0, 2, 4 to 20 mA; NAMUR parameterizable)
- Two analog inputs configurable (e.g. correction of cross-interference, external pressure sensor)
- Six digital inputs freely configurable (e.g. for measurement range switchover, processing of external signals from sample preparation)
- Six relay outputs freely configurable (failure, maintenance demanded, maintenance switch, limit alarm, external solenoid valves)
- Expansion: Eight additional digital inputs and eight additional relay outputs each e.g. for autocalibration with up to four calibration gases

Communication

RS 485 present in basic unit (connection from the rear; for the slide-in module also behind the front plate).

Options

- RS 485/RS 232 converter
- RS 485/Ethernet converter
- RS 485/USB converter
- Connection to networks via PROFIBUS DP/PA interface
- SIPROM GA software as the service and maintenance tool

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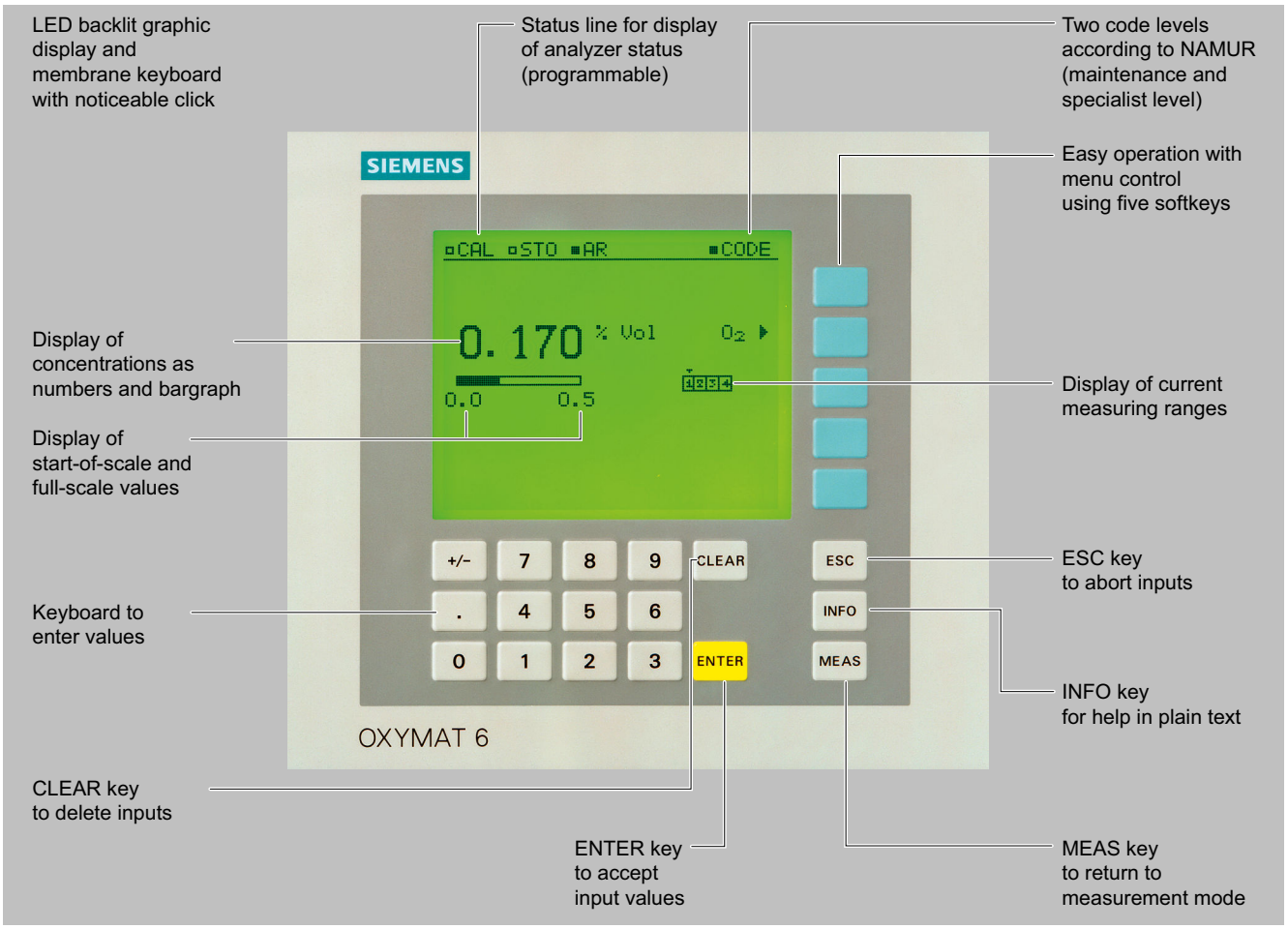
Design (continued)



OXYMAT 6, membrane keyboard and graphic display

Designs – Parts wetted by sample gas, standard

Gas path		19" rack unit	Field device	Field device Ex
With hoses	Bushing	Stainless steel, mat. No. 1.4571	-	-
	Hose	FKM (e.g. Viton)	-	-
	Sample chamber	Stainless steel, mat. No. 1.4571 or tantalum	-	-
	Fittings for sample chamber	Stainless steel, mat. No. 1.4571	-	-
	Restrictor	PTFE (e.g. Teflon)	-	-
	O-rings	FKM (e.g. Viton)	-	-
With pipes	Bushing Pipe Sample chamber Restrictor O-rings	Titanium Titanium Stainless steel, mat. No. 1.4571 or tantalum Titanium FKM (Viton) or FFKM (Kalrez)	Titanium Titanium Stainless steel, mat. No. 1.4571 or tantalum Titanium FKM (Viton) or FFKM (Kalrez)	Titanium Titanium Stainless steel, mat. No. 1.4571 or tantalum Titanium FKM (Viton) or FFKM (Kalrez)
With pipes	Bushing Pipe Sample chamber Restrictor O-rings	Stainless steel, mat. No. 1.4571 Stainless steel, mat. No. 1.4571 Stainless steel, mat. No. 1.4571 or tantalum Stainless steel, mat. No. 1.4571 FKM (Viton) or FFKM (Kalrez)	Stainless steel, mat. No. 1.4571 Stainless steel, mat. No. 1.4571 Stainless steel, mat. No. 1.4571 or tantalum Stainless steel, mat. No. 1.4571 FKM (Viton) or FFKM (Kalrez)	Stainless steel, mat. No. 1.4571 Stainless steel, mat. No. 1.4571 Stainless steel, mat. No. 1.4571 or tantalum Stainless steel, mat. No. 1.4571 FKM (Viton) or FFKM (Kalrez)

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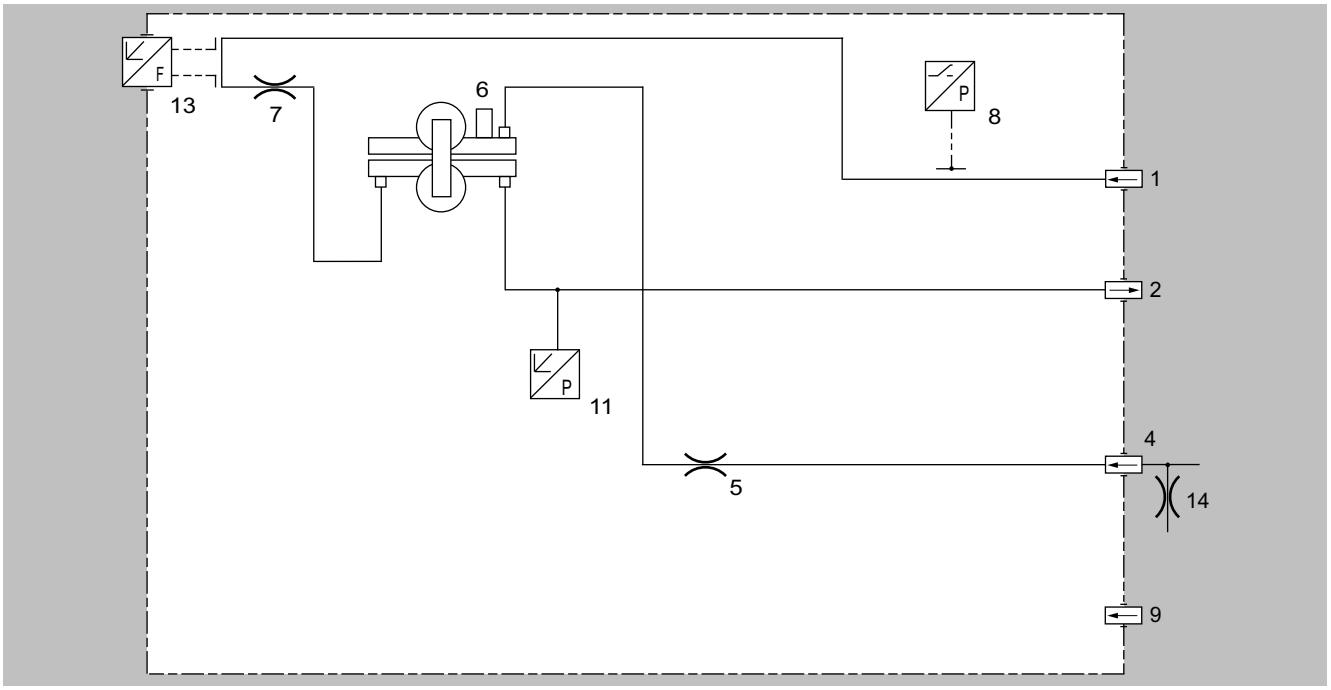
Design (continued)

Gas path		19" rack unit	Field device	Field device Ex
With pipes	Bushing Pipe Sample chamber Restrictor O-rings	Bushing Pipe Sample chamber Restrictor O-rings	Hastelloy C 22 Hastelloy C 22 Stainless steel, mat. No. 1.4571 or tantalum Hastelloy C 22 FKM (e.g. Viton) or FFKM (e.g. Kalrez)	Hastelloy C 22 Hastelloy C 22 Stainless steel, mat. No. 1.4571 or tantalum Hastelloy C 22 FKM (e.g. Viton) or FFKM (e.g. Kalrez)

Options

Gas path		19" rack unit	Field device	Field device Ex
Flow indicator	Measuring tube Variable area Suspension boundary Angle units	Duran glass Duran glass, black PTFE (Teflon) FKM (Viton)	-	-
Pressure switch	Diaphragm Enclosure	FKM (Viton) PA 6.3 T	-	-

Gas path (19" rack unit)



Gas path, reference gas connection 1 100 hPa, absolute

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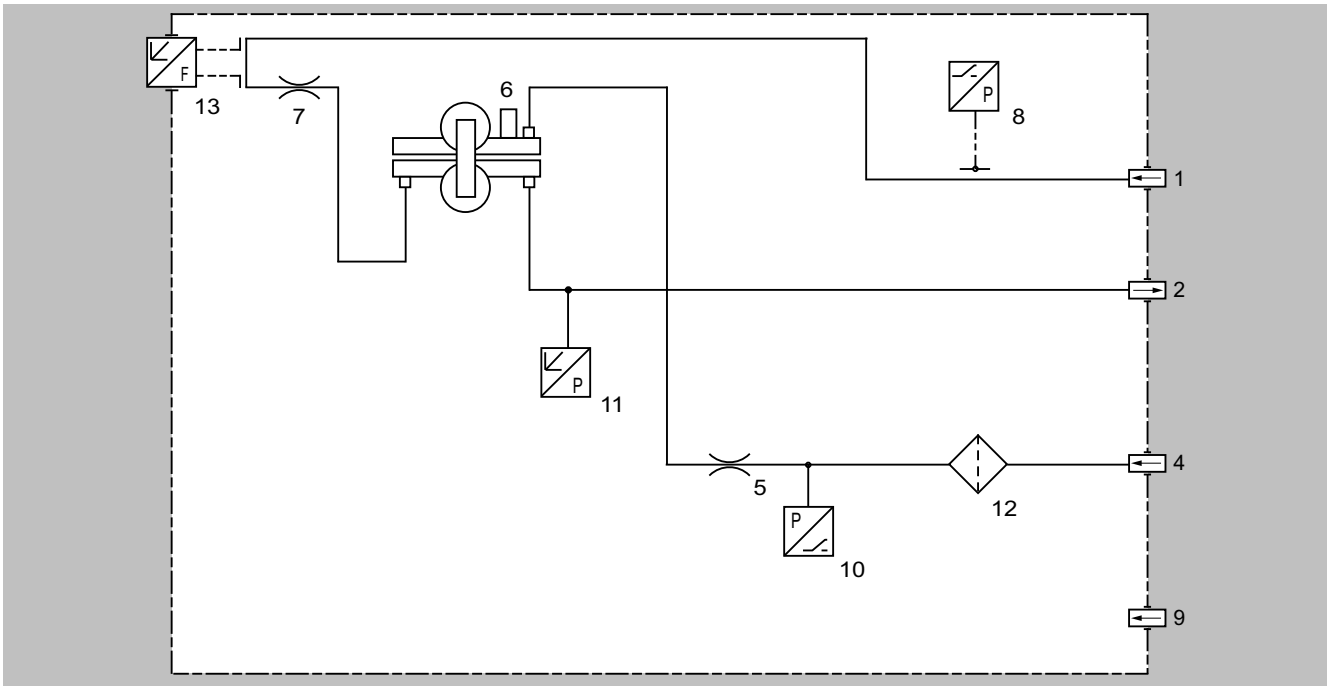
Design (continued)



Gas path, reference gas connection 3 000 to 5 000 hPa, absolute

Legend for the gas path 19" rack unit figures			
1	Sample gas inlet	8	Pressure switch in sample gas path (option)
2	Sample gas outlet	9	Purging gas
3	Not used	10	Pressure switch in reference gas path (option)
4	Reference gas inlet	11	Pressure sensor
5	Restrictor in reference gas inlet	12	Filter
6	O_2 physical system	13	Flow indicator in sample gas path (option)
7	Restrictor in sample gas path	14	Outlet restrictor

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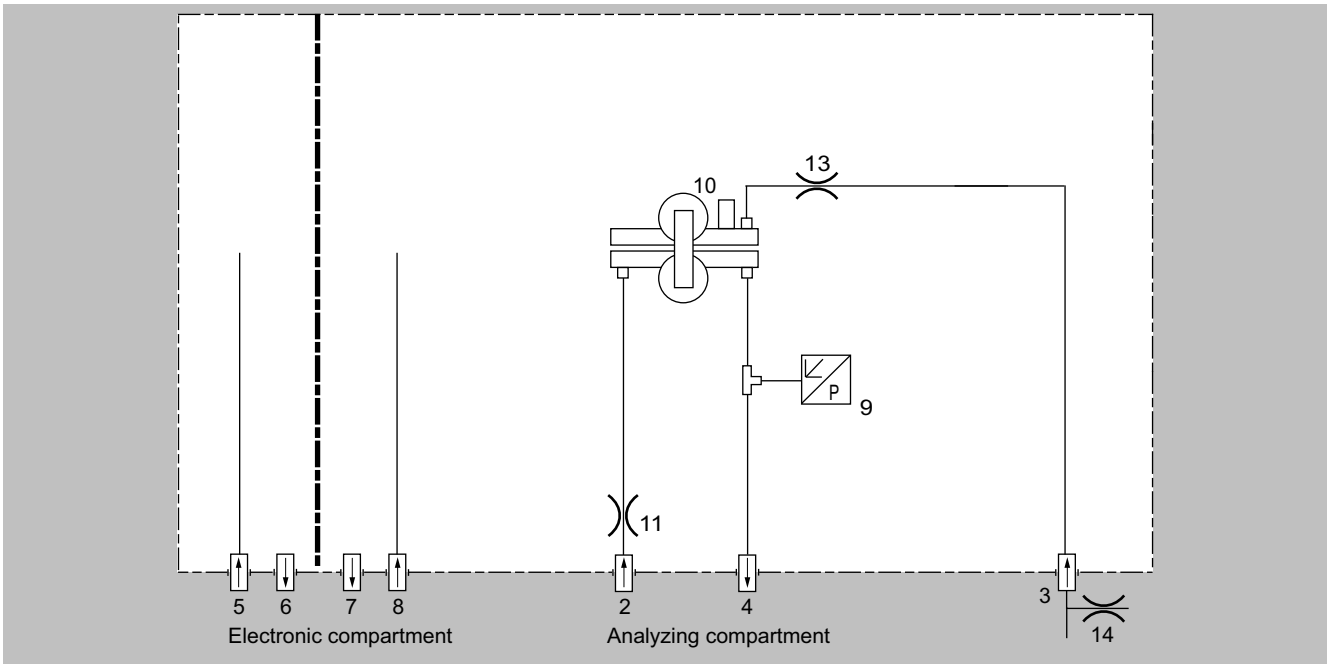
Design (continued)

Gas path (field device)



Gas path, reference gas connection 1 100 hPa, absolute

Legend for the gas path field device figures			
1	Not used	8	Purging gas inlet (analyzer side)
2	Sample gas inlet	9	Pressure sensor
3	Reference gas inlet	10	O_2 physical system
4	Sample gas outlet	11	Restrictor in sample gas path
5	Purging gas inlet (electronics side)	12	Pressure sensor in reference gas path (option)
6	Purging gas outlet (electronics side)	13	Restrictor
7	Purging gas outlet (analyzer side)	14	Outlet restrictor

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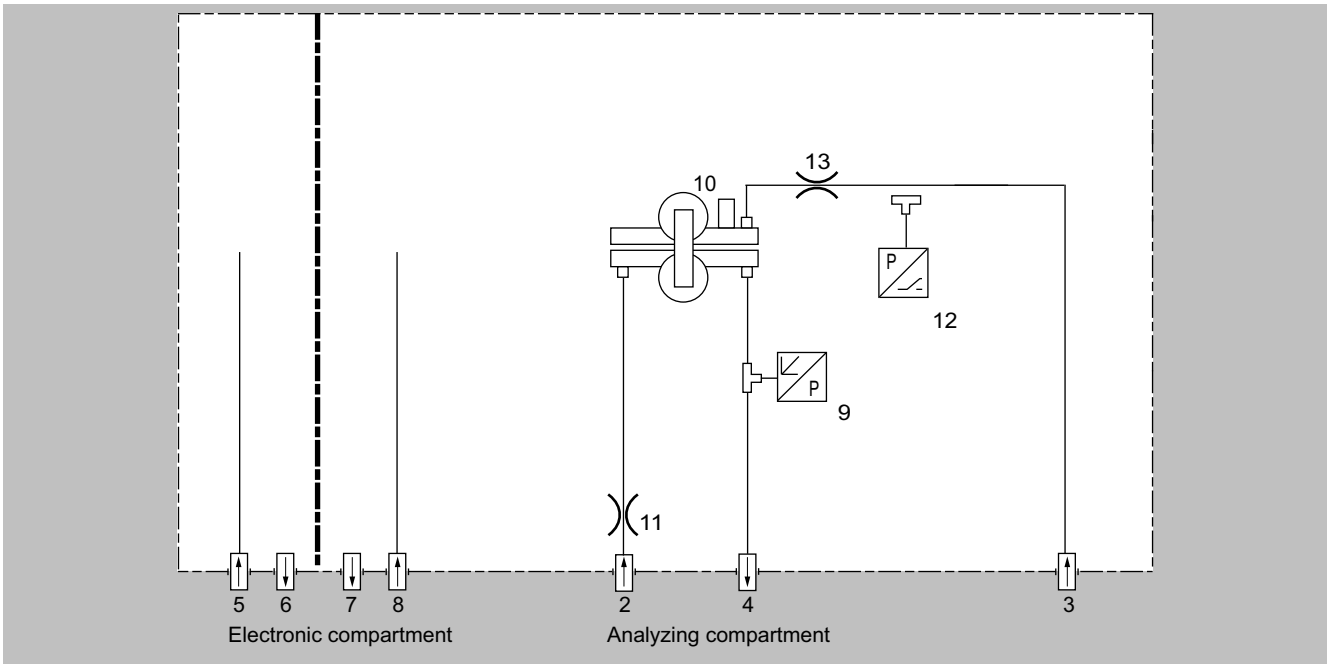
Design (continued)



Gas path, reference gas connection 3 000 to 5 000 hPa, absolute

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Mode of operation

In contrast to almost all other gases, oxygen is paramagnetic. This property is utilized as the measuring principle by the OXYMAT 6 gas analyzers.

Oxygen molecules in an inhomogeneous magnetic field are drawn in the direction of increased field strength due to their paramagnetism. When two gases with different oxygen contents meet in a magnetic field, a pressure difference is produced between them.

In the case of OXYMAT 6, one gas (1) is a reference gas (N_2, O_2 or air), the other is the sample gas (5). The reference gas is introduced into the sample chamber (6) through two channels (3). One of these reference gas streams meets the sample gas within the area of a magnetic field (7). Because the two channels are connected, the pressure, which is proportional to the oxygen content, causes a cross flow. This flow is converted into an electric signal by a microflow sensor (4).

The microflow sensor consists of two nickel-plated grids heated to approximately 120 °C, which, along with two supplementary resistors, form a Wheatstone bridge. The pulsating flow results in a change in the resistance of the Ni grids. This leads to an offset in the bridge which is dependent on the oxygen concentration of the sample gas.

Because the microflow sensor is located in the reference gas stream, the measurement is not influenced by the thermal conductivity, the specific heat or the internal friction of the sample gas. This also provides a high degree of corrosion resistance because the microflow sensor is not exposed to the direct influence of the sample gas.

By using a magnetic field with alternating strength (8), the effect of the background flow in the microflow sensor is not detected, and the measurement is thus independent of the sample chamber position as well as the gas analyzer's operating position.

The sample chamber is directly in the sample path and has a small volume, and the microflow sensor is a low-lag sensor. This results in a very short response time for the OXYMAT 6.

Vibrations frequently occur at the place of installation and may falsify the measured signal (noise). A further microflow sensor (10) through which no gas passes acts as a vibration sensor. Its signal is applied to the measured signal as compensation.

If the density of the sample gas deviates by more than 50% from that of the reference gas, the compensation microflow sensor (10) is flushed with reference gas just like the measuring sensor (4).

Note

The sample gases must be fed into the analyzers free of dust. Condensation in the sample chambers must be prevented. Therefore, the use of gas modified for the measuring task is necessary in most application cases.

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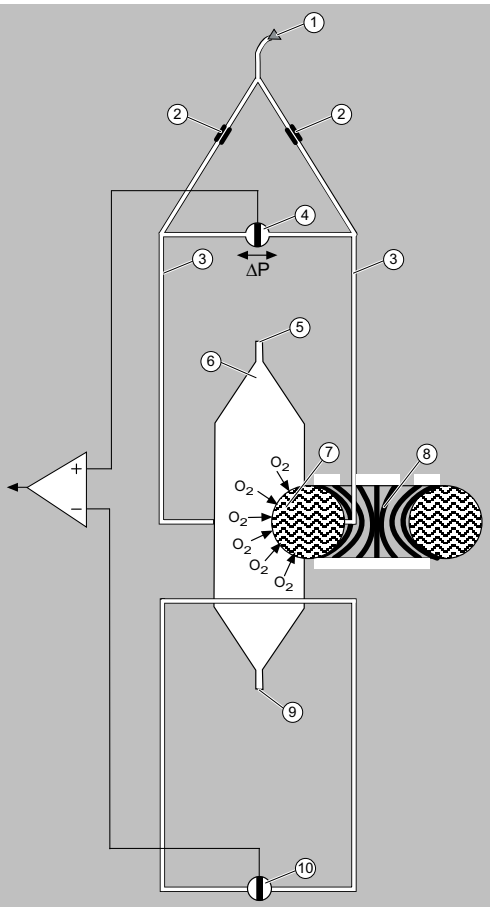
Mode of operation (continued)



1 Reference gas inlet
2 Restrictors
3 Reference gas channels
4 Microflow sensor for measurement
5 Sample gas inlet
6 Sample cell
7 Paramagnetic effect
8 Electromagnet with alternating field strength
9 Sample gas and reference gas outlet
10 Microflow sensor in compensation system (without flow)

OXYMAT 6, mode of operation

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Function

Advantages of the function-based application of reference gas

- The zero point can be defined specific to the application. It is then also possible to set "physically" suppressed zero points. For example, it is possible when using pure oxygen as the zero gas to set a measuring range of 99.5 to 100% O_2 with a resolution of 50 vpm.
- The sensor (microflow sensor) is located outside the sample gas. Through use of an appropriate material in the gas path, this also allows measurements in highly corrosive gases.
- Pressure variations in the sample gas can be compensated better since the reference gas is subjected to the same fluctuations.
- No influences on the thermal conductivity of the sample gas since the sensor is positioned on the reference gas side.
- The same gas is used for the zero gas calibration and as the reference gas. As a result of the low reference gas consumption (3 to 10 ml/min), one calibration gas cylinder can be used for both gases.
- No measuring effect is generated in the absence of oxygen. The measured signal need not therefore be set electronically to zero, and is thus extremely stable with regard to temperature and electronic influences.

Main features

- Four measuring ranges which can be freely configured, even with suppressed zero point; all measuring ranges are linear
- Measuring ranges with physically suppressed zero point possible
- Measuring range identification
- Electrically isolated measured value output 0/2/4 through to 20 mA (including inverted)
- Choice of automatic or manual measuring range switchover; remote switching is also possible
- Storage of measured values possible during calibration
- Wide range of selectable time constants (static/dynamic noise damping); i.e. the response time of the device can be adapted to the respective measuring task
- Short response time
- Low long-term drift
- Measuring point switchover for up to 6 measuring points (parameterizable)
- Measuring point identification
- Internal pressure sensor for correction of pressure variations in sample gas range 500 to 2 000 hPa (abs.)
- External pressure sensor - only with piping as the gas path - can be connected for correction of variations in the sample gas pressure up to 3 000 hPa absolute (option)
- Monitoring of sample gas flow (option for version with hoses)
- Monitoring of sample gas and/or reference gas (option)
- Monitoring of reference gas with reference gas connection 3 000 to 5 000 hPa (abs.) (option)
- Automatic measuring range calibration parameterizable
- Operation based on NAMUR recommendation
- Two control levels with separate authorization codes for the prevention of accidental and unauthorized operator interventions
- Simple handling using a numerical membrane keyboard and operator prompting
- Custom-made device designs, such as:
  - Customer acceptance
  - TAG plates
  - Drift recording
  - Clean for O_2 service
  - Kalrez gaskets
- Analyzer unit with flow-type compensation circuit: a flow is passed through the compensation branch (option) to reduce the vibration dependency in the case of sample and reference gases with significantly different densities
- Sample chamber for use in presence of highly corrosive sample gases

Reference gases for OXYMAT 6

Measuring range	Recommended reference gas	Reference gas connection pressure	Comments
0 to ... vol.% O_2	N_2	2 000 ... 4 000 hPa above sample gas pressure (max. 5 000 hPa absolute)	The reference gas flow is set automatically to 5 ... 10 ml/min (up to 20 ml/min with flow-type compensation branch)
... to 100 vol.% O_2[1)]	O_2	2 000 ... 4 000 hPa above sample gas pressure (max. 5 000 hPa absolute)	
Approx. 21 vol.% O_2[2)]	Air	100 hPa with respect to sample gas pressure, which may vary by max. 50 hPa around the air pressure	

1) Suppressed zero point with measuring range end value 100 vol.% O_2.
2) Suppressed zero point with 21 vol.% O_2 within the measuring span.

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Function (continued)

Correction of zero-point error/cross-sensitivities

Accompanying gas (concentration 100 vol.%)	Zero point deviation in vol.% O_2 absolute	Accompanying gas (concentration 100 vol.%)	Zero point deviation in vol.% O_2 absolute
Organic gases		**Inert gases**	
Ethane C_2H_6	-0.49	Helium He	+0.33
Ethene (ethylene) C_2H_4	-0.22	Neon Ne	+0.17
Ethine (acetylene) C_2H_2	-0.29	Argon Ar	-0.25
1,2-butadiene C_4H_6	-0.65	Krypton Kr	-0.55
1,3-butadiene C_4H_6	-0.49	Xenon Xe	-1.05
N-butane C_4H_{10}	-1.26	**Inorganic gases**	
Isobutane C_4H_{10}	-1.30	Ammonia NH_3	-0.20
1-butene C_4H_8	-0.96	Hydrogen bromide HBr	-0.76
Isobutene C_4H_8	-1.06	Chlorine Cl_2	-0.94
Dichlorodifluoromethane (R12) CCl_2F_2	-1.32	Hydrogen chloride HCl	-0.35
Acetic acid CH_3COOH	-0.64	Dinitrogen monoxide N_2O	-0.23
N-heptane C_7H_{16}	-2.40	Hydrogen fluoride HF	+0.10
N-hexane C_6H_{14}	-2.02	Hydrogen iodide HI	-1.19
Cyclo-hexane C_6H_{12}	-1.84	Carbon dioxide CO_2	-0.30
Methane CH_4	-0.18	Carbon monoxide CO	+0.07
Methanol CH_3OH	-0.31	Nitrogen oxide NO	+42.94
N-octane C_8H_{18}	-2.78	Nitrogen N_2	0.00
N-pentane C_5H_{12}	-1.68	Nitrogen dioxide NO_2	+20.00
Isopentane C_5H_{12}	-1.49	Sulfur dioxide SO_2	-0.20
Propane C_3H_8	-0.87	Sulfur hexafluoride SF_6	-1.05
Propylene C_3H_6	-0.64	Hydrogen sulfide H_2S	-0.44
Trichlorofluoromethane (R11) CCl_3F	-1.63	Water H_2O	-0.03
Vinyl chloride C_2H_3Cl	-0.77	Hydrogen H_2	+0.26
Vinyl fluoride C_2H_3F	-0.55		
1,1 vinylidene chloride $C_2H_2Cl_2$	-1.22		

Zero point error due to diamagnetism or paramagnetism of some accompanying gases with reference to nitrogen at 60 °C und 1 000 hPa absolute (according to IEC 1207/3)

Conversion to other temperatures

The zero point deviations listed in the table must be multiplied by an adjustment factor (k):

- with diamagnetic gases: $k = 333\ K / (\vartheta\ [°C] + 273\ K)$
- with paramagnetic gases: $k = [333\ K / (\vartheta\ [°C] + 273\ K)]^2$

All diamagnetic gases have a negative zero point deviation.

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Selection and ordering data

OXYMAT 6 gas analyzer 19" rack unit for installation in cabinets	Article No. 7MB2021-	●	●	●	●	0	-	●	●	●	●
Click on the Article No. for online configuration in the PIA Life Cycle Portal.											
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".											
Gas connections											
Pipe with 6 mm outer diameter		0									
Pipe with ¼" outer diameter		1									
Smallest possible measuring span O_2											
0.5% reference gas pressure 3 000 hPa			A								
0.5% reference gas pressure 100 hPa (external pump)			B								
2% reference gas pressure 3 000 hPa			C								
2% reference gas pressure 100 hPa (external pump)			D								
5% reference gas pressure 3 000 hPa			E								
5% reference gas pressure 100 hPa (external pump)			F								
Sample chamber											
Non-flow-type compensation branch											
• Made of stainless steel, mat. No. 1.4571				A							
• Made of tantalum				B							
• Made of Hastelloy				E							
Flow-type compensation branch											
• Made of stainless steel, mat. No. 1.4571				C							
• Made of tantalum				D							
• Made of Hastelloy				F							
• Made of stainless steel, mat. No. 1.4571 / for O_2 in H_2 measurements				G							
Internal gas paths											
Hose made of FKM (Viton)					0						
Pipe made of titanium					1						
Stainless steel pipe (mat. No. 1.4571)					2						
Auxiliary power											
100 V ... 120 V AC, 48 ... 63 Hz								0			
200 V ... 240 V AC, 48 ... 63 Hz								1			
Monitoring (reference gas, sample gas)											
Without									A		
Reference gas only									B		
Reference gas and sample gas (with flow indicator and pressure switch for sample gas)									C		
Sample gas only									D		
Add-on electronics											
Without										A	
AUTOCAL function with 8 digital inputs/outputs										B	
AUTOCAL function with 8 additional digital inputs/outputs and PROFIBUS PA interface										E	
AUTOCAL function with 8 additional digital inputs/outputs and PROFIBUS DP interface										F	
Language of the operating software											
German											0
English											1
French											2
Spanish											3
Italian											4

Options	Order code
Add "**-Z**" to article number and then add order code.	
Settings	
Telescopic rails (2 units)	**A31**
Set of Torx screwdrivers	**A32**

Options	Order code
Kalrez gaskets in sample gas path	**B01**
Tag plates (specific inscription based on customer information)	**B03**
SIL Declaration of Conformity (SIL 2) Functional Safety according to IEC 61508 and IEC 61511	**C20**

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Selection and ordering data (continued)

Options	Order code
FM/CSA certificate – Class I Div 2	**E20**
Clean for O_2 service (specially cleaned gas path)	**Y02**
Measuring range indication in plain text, if different from default setting	**Y11**
Performance-tested according to EN 15267	**Y27**

Accessories	Article No.
RS 485/Ethernet converter	**A5E52327218**
RS 485/RS 232 converter	**A5E52327214**
RS 485/USB converter	**A5E52327216**
AUTOCAL function with 8 digital inputs/outputs	**C79451-A3480-D511**
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS PA	**A5E00057307**
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS DP	**A5E00057312**
Set of Torx screwdrivers	**A5E34821625**

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Technical specifications

OXYMAT 6, 19" rack unit	
General information	
Measuring ranges	4, internally and externally switchable; automatic measurement range switchover is also possible
Smallest possible measuring span (relating to sample gas pressure 1 000 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature)	0.5 vol.%, 2 vol.% or 5 vol.% O_2
Largest possible measuring span	100 vol.% O_2 (for a pressure above 2 000 hPa: 25 vol.% O_2)
Measuring ranges with suppressed zero point	Any zero point can be implemented within 0 ... 100 vol.%, provided that a suitable reference gas is used (see Table 1 in "Function")
Service position	Front wall, vertical
Conformity	CE mark in accordance with EN 50081-1, EN 50082-2
Design, enclosure	
Degree of protection	IP20 according to EN 60529
Weight	Approx. 13 kg
Electrical characteristics	
Auxiliary power	100 ... 120 V AC (nominal range of use 90 ... 132 V), 48 ... 63 Hz or 200 ... 240 V AC (nominal range of use 180 ... 264 V), 48 ... 63 Hz
Power consumption	Approx. 35 VA
EMC (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98), EN 61326
Electrical safety	According to EN 61010-1, overvoltage category III
Fuse ratings	100 ... 120 V: 1.0T/250 200 ... 240 V: 0.63T/250
Gas inlet conditions	
Permissible sample gas pressure	
• With pipes	500 ... 3 000 hPa absolute
• With hoses	
- Without pressure switch	500 ... 1 500 hPa absolute
- With pressure switch	500 ... 1 300 hPa absolute
Sample gas flow	18 ... 60 l/h (0.3 ... 1 l/min)
Sample gas temperature	Min. 0 ... max. 50 °C, but above the dew point
Sample gas humidity	< 90% RH (RH: relative humidity)
Reference gas pressure (high-pressure version)	2 000 ... 4 000 hPa above sample gas pressure, but max. 5 000 hPa
Reference gas pressure (low-pressure version)	Min. 100 hPa above sample gas pressure
Time response	
Warm-up period	At room temperature < 30 min (the technical specification will be met after 2 hours)
Delayed display (T_{90} time)	Min. 1.5 ... 3.5 s depending on the version
Damping (electrical time constant)	0 ... 100 s, configurable
Dead time (purging time of the gas path in the device at 1 l/min)	Approx. 0.5 ... 2.5 s, depending on the version
Time for device-internal signal processing	< 1 s
Pressure correction range	
Pressure sensor	
• Internal	500 ... 2 000 hPa absolute
• External	500 ... 3 000 hPa absolute
Measuring response	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation	< ± 0.75% of the smallest possible measuring range according to nameplate, with electronic damping constant of 1 s (corresponds to ±0.25% at 2 σ)
Zero point drift	< ± 0.5%/month of the smallest possible measuring span according to nameplate

Technical specifications (continued)

OXYMAT 6, 19" rack unit	
Measured-value drift	< ± 0.5%/month of the current measuring range
Repeatability	< 1% of the current measuring range
Detection limit	1% of the current measuring range
Linearity error	< 0.1% of the current measuring range
Influencing quantities	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Ambient temperature	< 0.5%/10 K relating to the smallest possible measuring range according to nameplate, with measuring span 0.5%: 1%/10 K
Sample gas pressure (with air (100 hPa) as reference gas, correction of the atmospheric pressure fluctuations is only possible if the sample gas can vent to ambient air)	• With disabled pressure compensation: < 2% of the current measuring range/1% pressure variation • With enabled pressure compensation: < 0.2% of the current measuring range/1% pressure variation
Accompanying gases	Zero point deviation corresponding to paramagnetic or diamagnetic deviation of accompanying gas
Sample gas flow at zero point	< 1% of the current measuring range according to nameplate with a change in flow of 0.1 l/min within the permissible flow range
Auxiliary power	< 0.1% of the current measuring range with nominal voltage ± 10%
Electrical inputs and outputs	
Analog output	0/2/4 ... 20 mA, floating; max. output load 750 Ω
Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load rating: 24 V AC/DC/1 A, floating
Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and correction of influence of accompanying gas (correction of cross-interference)
Digital inputs	6, designed for 24 V, floating, freely configurable, e.g. for measurement range switchover
Serial interface	RS 485
Options	AUTOCAL function each with 8 additional digital inputs and relay outputs, also with PROFIBUS PA or PROFIBUS DP
Climatic conditions	
Permissible ambient temperature	-30 ... +70 °C during storage and transportation, 5 ... 45 °C during operation
Permissible humidity	< 90% RH (RH: relative humidity) within average annual value, during storage and transportation (must not fall below dew point)

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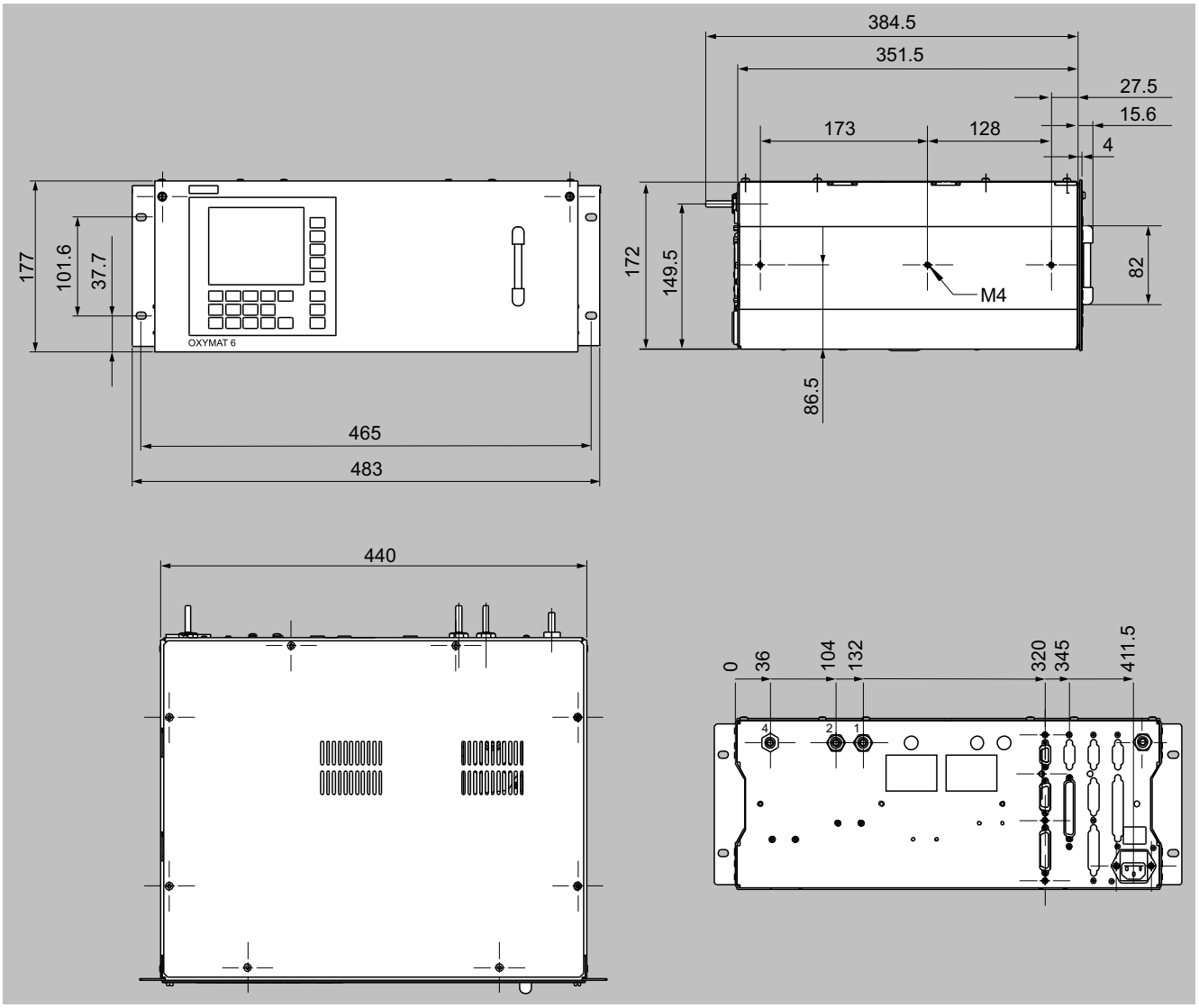
Dimensional drawings



OXYMAT 6, 19" rack unit, dimensions in mm

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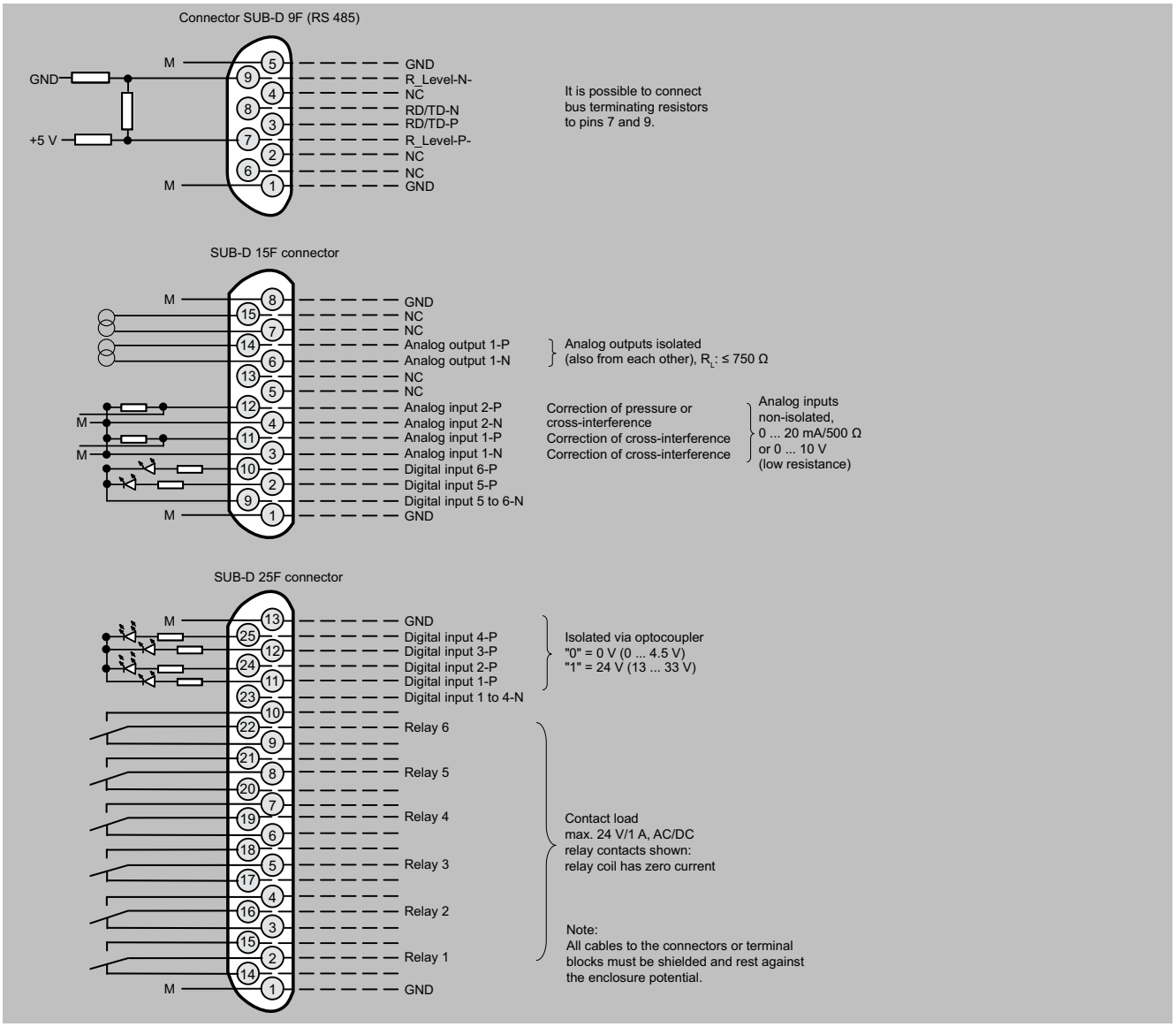
Circuit diagrams



OXYMAT 6, 19" rack unit, pin assignment

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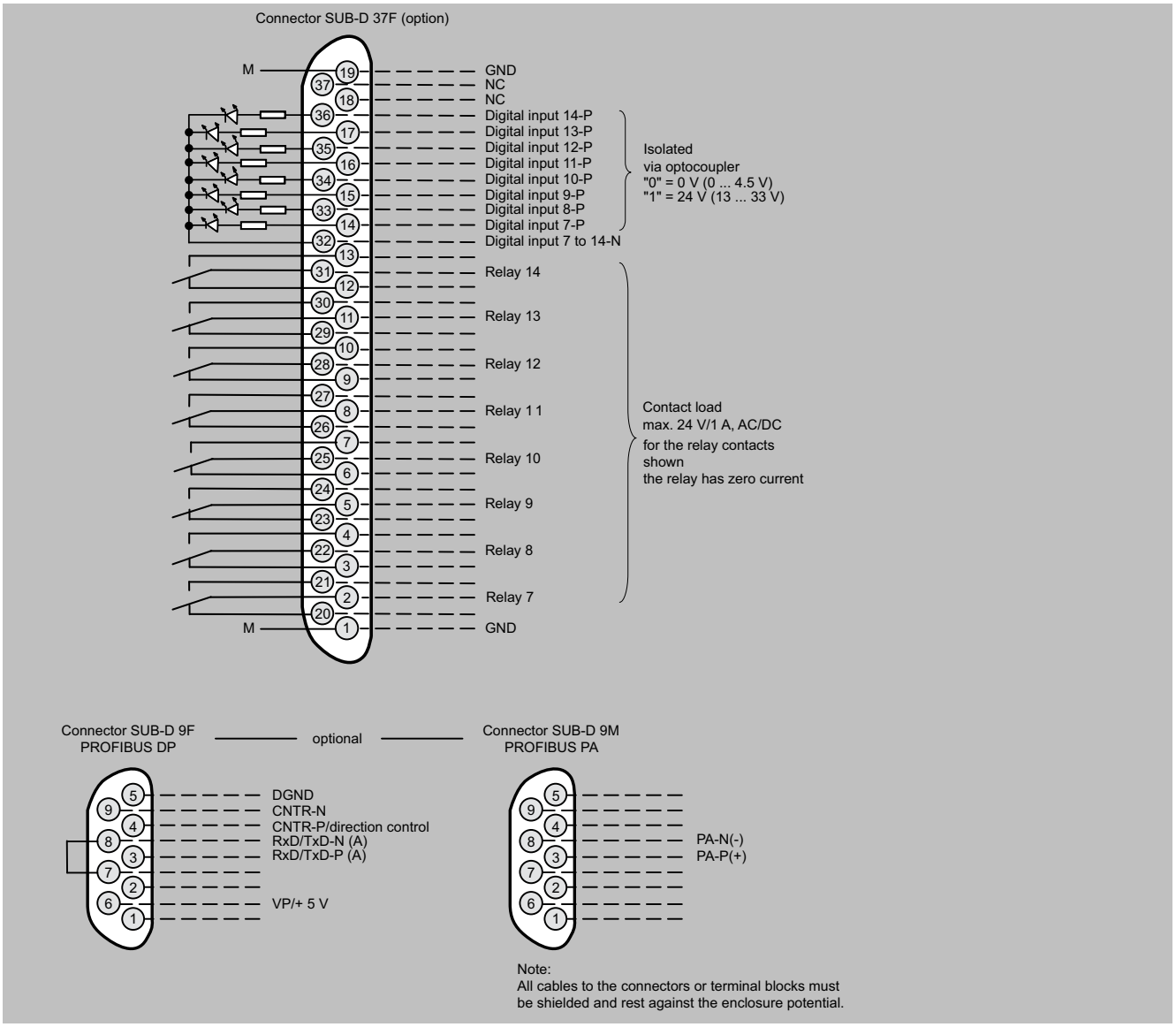
Circuit diagrams (continued)



OXYMAT 6, 19" rack unit, pin assignment of the AUTOCAL board and PROFIBUS plugs

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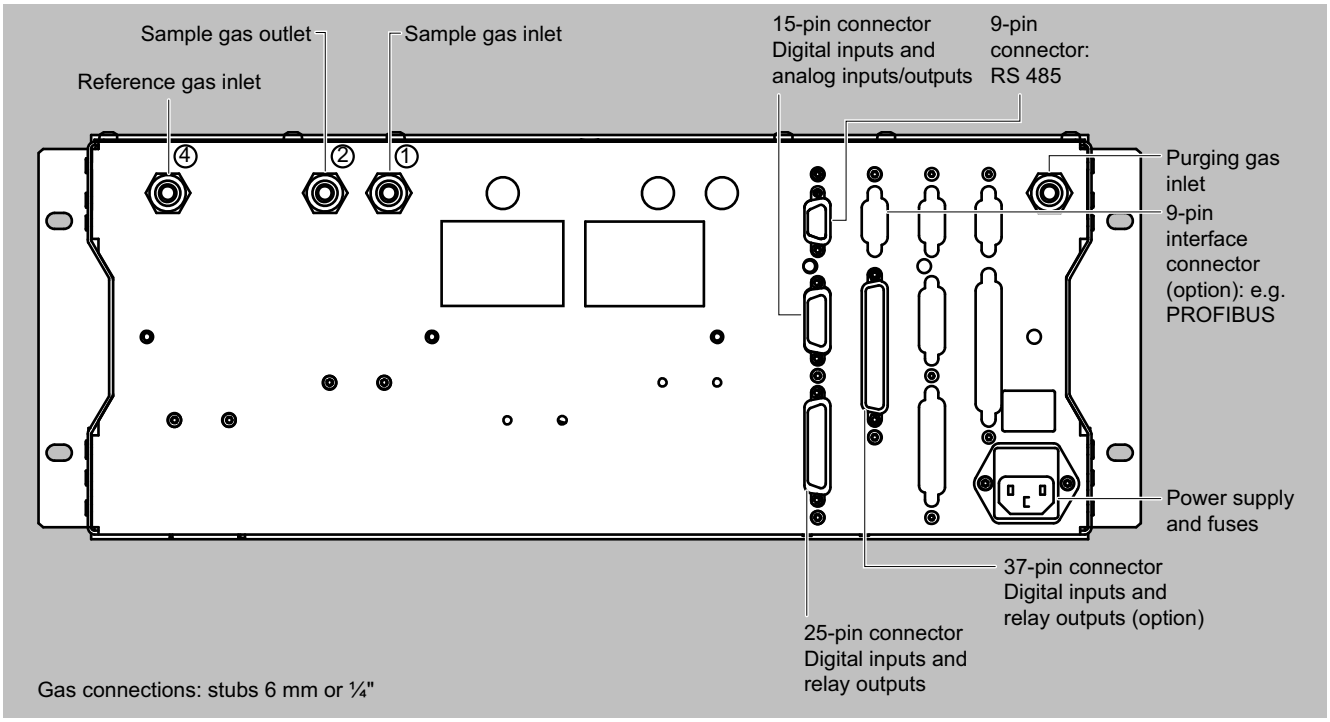
Circuit diagrams (continued)



OXYMAT 6, 19" rack unit, gas and electrical connections

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Selection and ordering data

OXYMAT 6 gas analyzer For field-mount installation	Article No. 7MB2011-	●	●	●	0	●	-	●	●	●	●
Click on the Article No. for online configuration in the PIA Life Cycle Portal.											
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".											
Gas connections for sample gas and reference gas											
Cutting ring fitting made of stainless steel (mat. no. 1.4571)											
• Pipe with 6 mm outer diameter		0									
• Pipe with ¼" outer diameter		1									
Cutting ring fitting made of titanium											
• Pipe with 6 mm outer diameter		2									
• Pipe with ¼" outer diameter		3									
Piping and gas connections made of Hastelloy C22: 7MB2011-0/1.... + order code D01 or D02											
Smallest possible measuring span O_2											
0.5% reference gas pressure 3 000 hPa			A								
0.5% reference gas pressure 100 hPa (external pump)			B								
2% reference gas pressure 3 000 hPa			C								
2% reference gas pressure 100 hPa (external pump)			D								
5% reference gas pressure 3 000 hPa			E								
5% reference gas pressure 100 hPa (external pump)			F								
Sample chamber											
Non-flow-type compensation branch											
• Made of stainless steel, mat. no. 1.4571				A							
• Made of tantalum				B							
• Made of Hastelloy				E							
Flow-type compensation branch											
• Made of stainless steel, mat. no. 1.4571				C							
• Made of tantalum				D							
• Made of Hastelloy				F							
• Made of stainless steel, mat. no. 1.4571 / for O_2 in H_2 measurements				G							
Heating of internal gas paths and analyzer unit											
Without						0					
With (65 ... 130 °C)						1					
Auxiliary power											
Standard device and versions acc. to ATEX II 3G (Zone 2)											
• 100 ... 120 V AC, 48 ... 63 Hz								0			
• 200 ... 240 V AC, 48 ... 63 Hz								1			
ATEX II 2G versions (Zone 1), including certificate											
• 100 ... 120 V AC, 48 ... 63 Hz, according to ATEX II 2G[1)] (operating mode: continuous purging)								6			
• 200 ... 240 V AC, 48 ... 63 Hz, according to ATEX II 2G[1)] (operating mode: continuous purging)								7			
Reference gas monitoring											
Without									A		
With									B		
Add-on electronics											
Without										A	
AUTOCAL function with 8 additional digital inputs and 8 additional relay outputs										B	
AUTOCAL function with 8 additional digital inputs/outputs and PROFIBUS PA interface										E	
AUTOCAL function with 8 additional digital inputs/outputs and PROFIBUS DP interface										F	
Language of the operating software											
German											0
English											1
French											2
Spanish											3
Italian											4

[1)] See also "Additional units for Ex-versions".

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Selection and ordering data (continued)

Options	Order code
Add "-**Z**" to article number and then add order code	
Settings	
Set of Torx screwdrivers	**A32**
Kalrez gaskets in sample gas path	**B01**
Tag plates (customized inscription)	**B03**
SIL Declaration of Conformity (SIL 2) Functional Safety according to IEC 61508 and IEC 61511	**C20**
Gas connections and piping made of Hastelloy C22	
• Outer diameter 6 mm	**D01 (cannot be combined with E20)**
• Outer diameter ¼"	**D02 (cannot be combined with E20)**
Ex-versions	
For combination options, see table "Ex configurations – Main selection criteria series 6", page 5/17	
ATEX II 3G certificate; restrictive breathing enclosure, non-flammable gases	**E11**
ATEX II 3G certificate; flammable gases	**E12**
FM/CSA certificate – Class I Div 2	**E20**
ATEX II 3D certificate; potentially explosive dust atmospheres	
• In non-hazardous gas zone	**E40**
• In hazardous zone acc. to ATEX II 3G, non-flammable gases	**E41**
• In hazardous zone acc. to ATEX II 3G, flammable gases[1)]	**E42**
BARTEC Ex p purging unit for use in ATEX or IEC-Ex Zone 1	**E74**
• BARTEC Ex p control unit for continuous flow	
• BARTEC Ex control station with bypass key-switch	
BARTEC Ex purging unit for use in ATEX or IEC-Ex Zone 1	**E75**
• BARTEC Ex p control unit for continuous flow	
• BARTEC Ex control station with bypass key-switch	
• Operator display for visualization of system states	
Clean for O_2 service (specially cleaned gas path)	**Y02**
Defined firmware version 4.2.1 for use in safety-related systems	**Y05**
Measuring range indication in plain text, if different from default setting	**Y11**

1) Only in connection with an approved purging unit.

Additional units for Ex-versions	Article No.
Category ATEX II 2G (Zone 1)	
BARTEC Ex p purging unit for use in ATEX or IEC-Ex Zone 1	
• BARTEC Ex p control unit for continuous flow	**7MB8000-7CA**
• BARTEC Ex control station with bypass key-switch	
• BARTEC Ex p control unit for continuous flow	**7MB8000-7CB**
• BARTEC Ex control station with bypass key-switch	
• Operator display for visualization of system states	
Ex i isolating transformer	**7MB8000-3AB**
Ex isolating relay, 230 V	**7MB8000-4AA**
Ex isolating relay, 110 V	**7MB8000-4AB**
Differential pressure switch for corrosive and non-corrosive gases	**7MB8000-5AA**
Stainless steel flame arrestor	**7MB8000-6BA**
Hastelloy flame arrestor	**7MB8000-6BB**
Category ATEX II 3G (Zone 2)	
BARTEC Ex p purging unit for use in ATEX or IEC-Ex Zone 1	
• BARTEC Ex p control unit for continuous flow	**7MB8000-7CA**
• BARTEC Ex control station with bypass key-switch	
• BARTEC Ex p control unit for continuous flow	**7MB8000-7CB**
• BARTEC Ex control station with bypass key-switch	
• Operator display for visualization of system states	
FM/CSA (Class I Div 2)	
Ex purging unit MiniPurge FM	**7MB8000-1AA**

Accessories	Article No.
RS 485/Ethernet converter	**A5E52327218**
RS 485/RS 232 converter	**A5E52327214**
RS 485/USB converter	**A5E52327216**
AUTOCAL function with 8 digital inputs/outputs	**A5E00064223**
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS PA	**A5E00057315**
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS DP	**A5E00057318**
Set of Torx screwdrivers	**A5E34821625**

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Technical specifications

OXYMAT 6, field device	
General information	
Measuring ranges	4, internally and externally switchable; automatic measurement range switchover is also possible
Smallest possible measuring span (relating to sample gas pressure 1 000 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature, smallest possible measuring span with heated version: 0.5% (< 65 °C); 0.5 ... 1% (65 ... 90 °C); 1 ... 2% (90 ... 130 °C))	0.5 vol.%, 2 vol.% or 5 vol.% O_2
Largest possible measuring span	100 vol.% O_2 (for a pressure above 2 000 hPa: 25 vol.% O_2)
Measuring ranges with suppressed zero point	Any zero point can be implemented within 0 ... 100 vol.%, provided that a suitable reference gas is used (see Table 1 in "Function")
Service position	Front wall, vertical
Conformity	CE mark in accordance with EN 50081-1, EN 50082-2
Design, enclosure	
Degree of protection	IP65 in accordance with EN 60529, restricted breathing enclosure to EN 50021
Weight	Approx. 28 kg
Electrical characteristics	
Auxiliary power	100 ... 120 V AC (nominal range of use 90 ... 132 V), 48 ... 63 Hz or 200 ... 240 V AC (nominal range of use 180 ... 264 V), 48 ... 63 Hz
Power consumption	Approx. 35 VA, approx. 330 VA with heated version
EMC (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98), EN 61326
Electrical safety	In accordance with EN 61010-1
• Heated devices	Overvoltage category II
• Unheated devices	Overvoltage category III
Fuse ratings (unheated device)	
• 100 ... 120 V	F3: 1 T/250; F4: 1 T/250
• 200 ... 240 V	F3: 0.63T/250; F4: 0.63T/250
Fuse ratings (heated device)	
• 100 ... 120 V	F1: 1 T/250; F2: 4 T/250 F3: 4 T/250; F4: 4 T/250
• 200 ... 240 V	F1: 0.63T/250; F2: 2.5 T/250 F3: 2.5 T/250; F4: 2.5 T/250
Gas inlet conditions	
Permissible sample gas pressure	
• With pipes	500 ... 3 000 hPa absolute
• With pipes, Ex-version	
- Leakage compensation	500 ... 1 160 hPa absolute
- Continuous purging	500 ... 3 000 hPa absolute
Reference gas pressure (high-pressure version)	2 000 ... 4 000 hPa above sample gas pressure, but max. 5 000 hPa
Reference gas pressure (low-pressure version)	Min. 100 hPa above sample gas pressure
Purging gas pressure	
• Permanent	< 165 hPa above ambient pressure
• For short periods	Max. 250 hPa above ambient pressure
Sample gas flow	18 ... 60 l/h (0.3 ... 1 l/min)
Sample gas temperature	• Min. 0 ... max. 50 °C, but above the dew point (unheated) • 15 °C above temperature analyzer unit (heated)
Sample gas humidity	< 90% relative humidity

Technical specifications (continued)

OXYMAT 6, field device	
Time response	
Warm-up period	At room temperature < 30 min (the technical specification will be met after 2 hours)
Delayed display (t_{90} time)	< 1.5 s
Damping (electrical time constant)	0 ... 100 s, configurable
Dead time (purging time of the gas path in the device at 1 l/min)	Approx. 0.5 s
Time for device-internal signal processing	< 1 s
Pressure correction range	
Pressure sensor	
• Internal	500 ... 2 000 hPa absolute
• External	500 ... 3 000 hPa absolute
Measuring response	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation	< ± 0.75% of the smallest possible measuring range according to nameplate, with electronic damping constant of 1 s (corresponds to ± 0.25% at 2 σ)
Zero point drift	< ± 0.5%/month of the smallest possible measuring span according to nameplate
Measured-value drift	< ± 0.5%/month of the current measuring range
Repeatability	< 1% of the current measuring range
Detection limit	1% of the current measuring range
Linearity error	< 0.1% of the current measuring range
Influencing quantities	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Ambient temperature	< 0.5%/10 K relating to the smallest possible measuring range according to nameplate, with measuring span 0.5%: 1%/10 K
Sample gas pressure (with air (100 hPa) as reference gas, correction of the atmospheric pressure fluctuations is only possible if the sample gas can vent to ambient air)	• With disabled pressure compensation: < 2% of the current measuring range /1% pressure variation • With enabled pressure compensation: < 0.2% of the current measuring range /1% pressure variation
Accompanying gases	Zero point deviation corresponding to paramagnetic or diamagnetic deviation of accompanying gas
Sample gas flow at zero point	< 1% of the current measuring range according to nameplate with a change in flow of 0.1 l/min within the permissible flow range; heated version up to double error
Auxiliary power	< 0.1% of the current measuring range with nominal voltage ± 10%
Electrical inputs and outputs	
Analog output	0/2/4 ... 20 mA, floating; max. output load 750 Ω
Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load rating: 24 V AC/DC/1 A, floating
Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and correction of influence of accompanying gas (correction of cross-interference)
Digital inputs	6, designed for 24 V, floating, freely configurable, e.g. for measurement range switchover
Serial interface	RS 485
Options	AUTOCAL function each with 8 additional digital inputs and relay outputs, also with PROFIBUS PA or PROFIBUS DP

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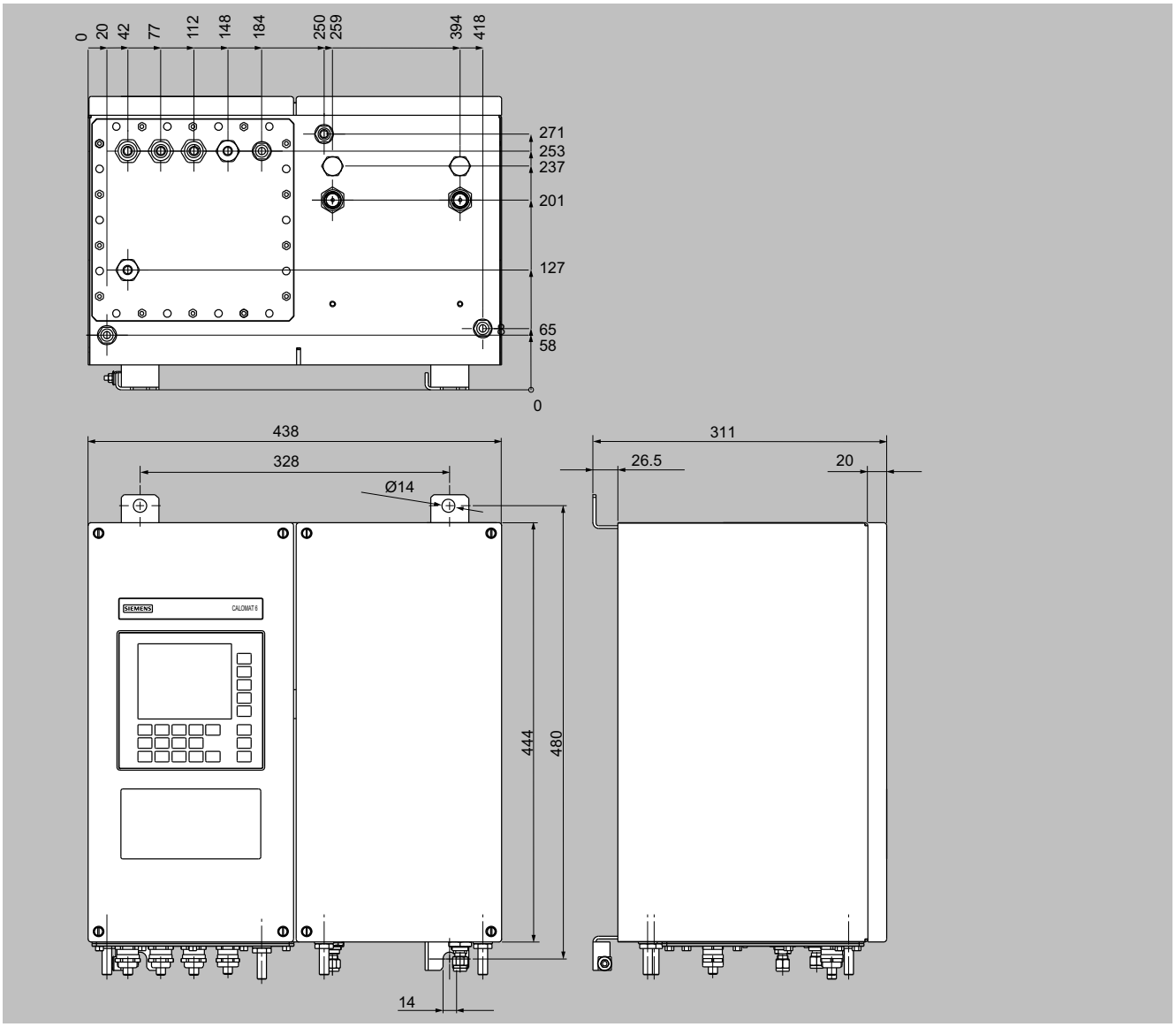
Technical specifications (continued)

OXYMAT 6, field device	
Climatic conditions	
Permissible ambient temperature	-30 ... +70 °C during storage and transportation, 5 ... 45 °C during operation
Permissible humidity	< 90% relative humidity as annual average (maximum accuracy achieved after 2 hours), during storage and transportation (must not fall below dew point)

Dimensional drawings



OXYMAT 6, field unit, dimensions in mm

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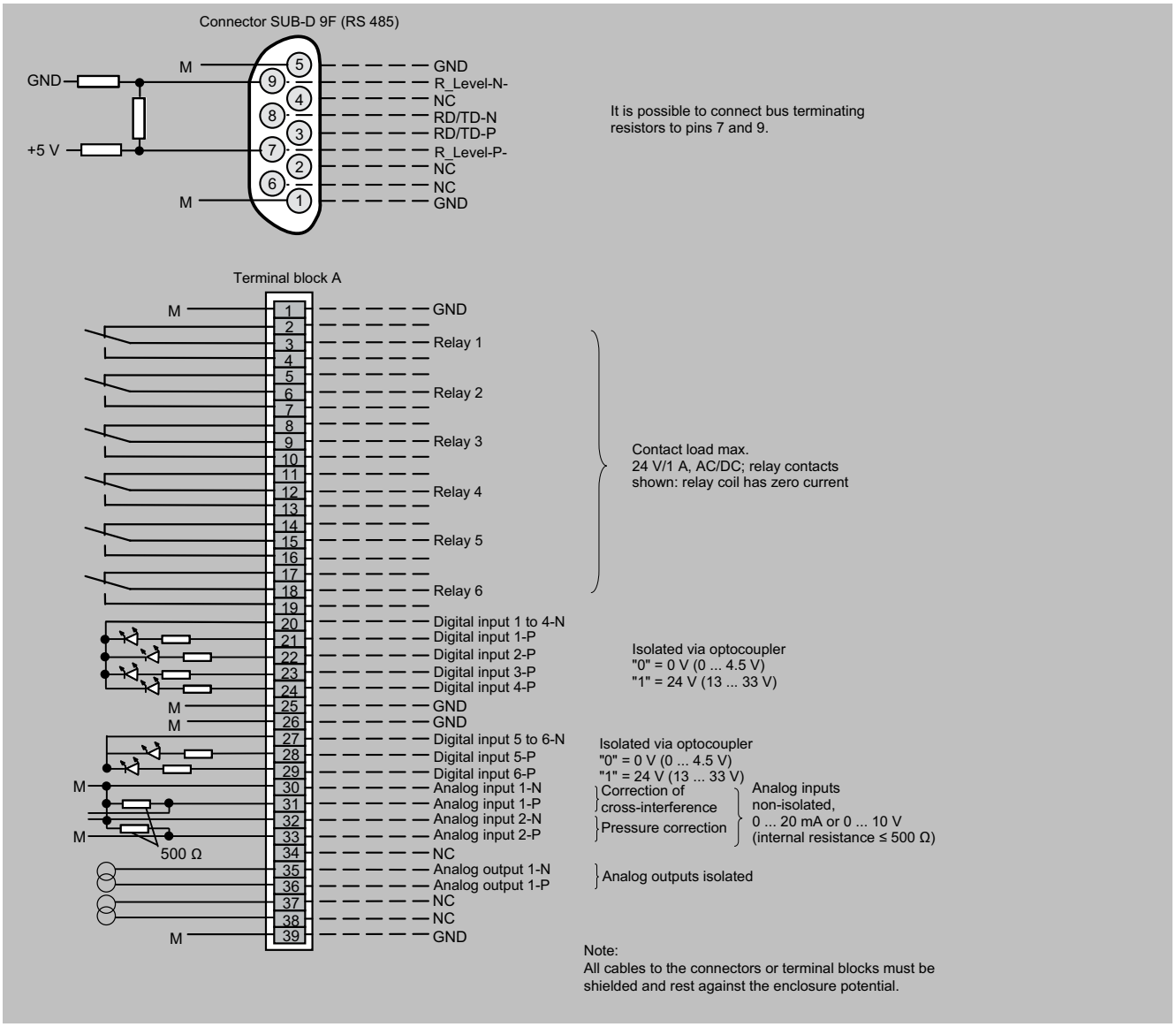
Circuit diagrams



OXYMAT 6, field device, pin and terminal assignment

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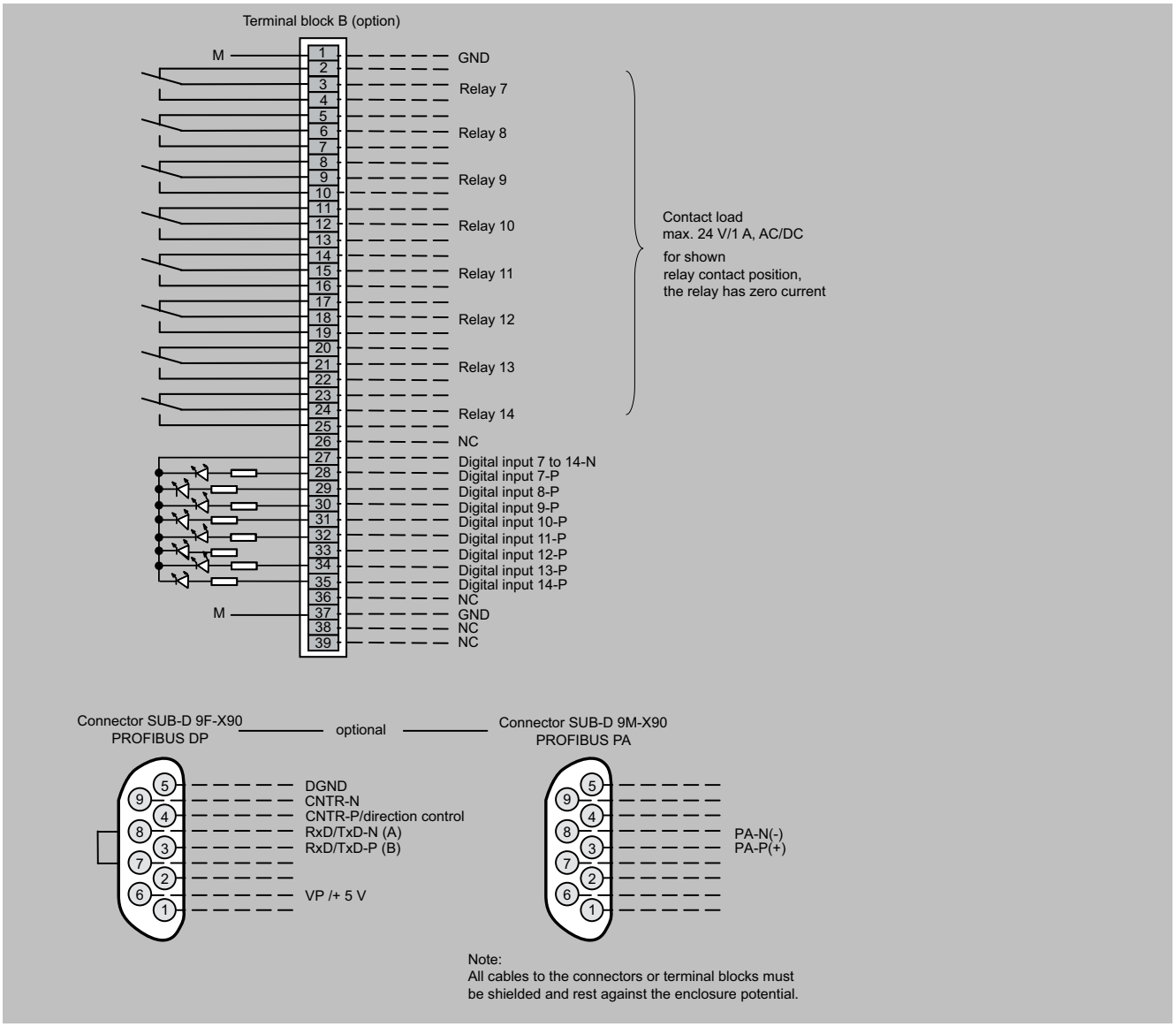
Circuit diagrams (continued)



OXYMAT 6, field device, pin and terminal assignment of the AUTOCAL board and PROFIBUS plugs

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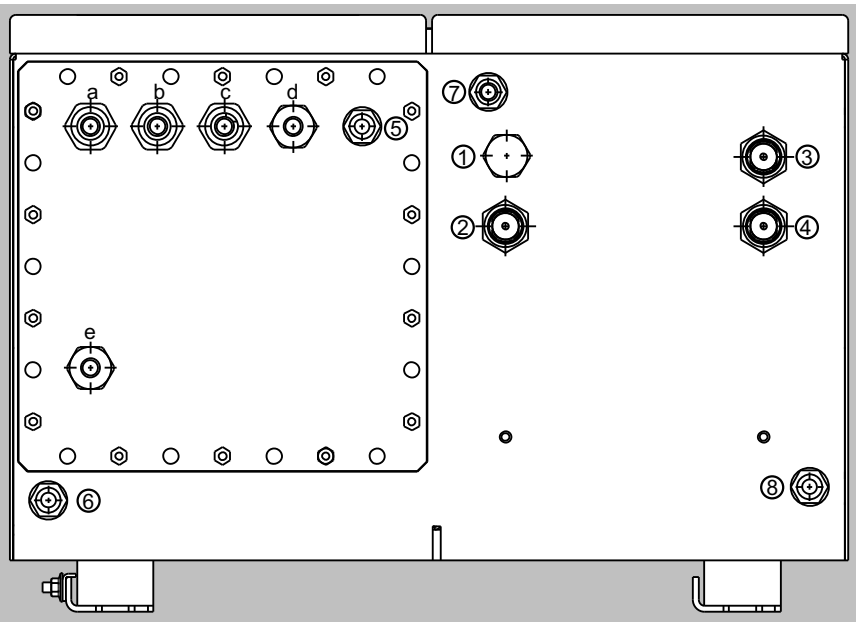
Circuit diagrams (continued)



Gas connections

1	not used	Clamping gland for pipe Ø 6 mm or ¼"
2	Sample gas inlet	
3	not used	
4	Sample gas outlet	
5 ... 8	Purging gas inlets/outlets stubs Ø 10 mm or 3/8 "	

Electrical connections

a - c	Signal cable (Ø 10 ... 14 mm) (analog + digital): cable gland M20x1.5
d	Interface connection: (Ø 7 ... 12 mm) cable gland M20x1.5
e	Power supply: (Ø 7 ... 12 mm) cable gland M20x1.5

OXYMAT 6, field device, gas connections and electrical connections

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Selection and ordering data

Description	7MB2021	7MB2011	7MB2011 Ex	2 years (unit)	5 years (unit)	Article No.
Analyzer unit						
O-ring (sample chamber)	x	x	x	2	4	C71121-Z100-A159
O-ring (fitting)	x	x	x	1	2	C74121-Z100-A6
O-ring (measuring head)	x	x	x	2	4	C79121-Z100-A32
Spacer		x	x	-	1	C79451-A3277-B22
Sample chamber, stainless steel, mat. no. 1.4571; non-flow-type compensation branch	x	x	x	-	1	C79451-A3277-B535
Sample chamber, tantalum, non-flow-type compensation branch	x	x	x	-	1	C79451-A3277-B536
Sample chamber, stainless steel, mat. no. 1.4571; flow-type compensation branch	x	x	x	-	1	C79451-A3277-B537
Sample chamber, tantalum, flow-type compensation branch	x	x	x	-	1	C79451-A3277-B538
Measuring head, non-flow-type compensation branch	x	x	x	1	1	C79451-A3460-B525
Measuring head, flow-type compensation branch	x	x	x	1	1	C79451-A3460-B526
Magnetic field connection plate	x	x	x	-	1	C79451-A3474-B606
Temperature sensor		x	x	-	1	C79451-A3480-B25
Heating cartridge		x	x	-	1	W75083-A1004-F120
Sample gas path						
Pressure switch (sample gas)	x			1	2	C79302-Z1210-A2
Flowmeter	x			1	2	C79402-Z560-T1
Restrictor, stainless steel, mat. no. 1.4571; hose gas path	x			2	2	C79451-A3480-C10
Restrictor, titanium, pipe gas path	x	x	x	2	2	C79451-A3480-C37
Reference gas path, 3000 hPa	x	x	x	1	1	C79451-A3480-D518
Capillary, 100 hPa, connection set	x	x	x	1	1	C79451-A3480-D519
Restrictor, stainless steel, mat. no. 1.4571; pipe gas path	x	x	x	1	1	C79451-A3520-C5
Electronics						
Temperature controller - electronics, 230 V AC		x	x	-	1	A5E00118527
Temperature controller - electronics, 115 V AC		x	x	-	1	A5E00118530
Fusible element (analyzer fuse) T 0.125 A/250 V			x	1	2	A5E00061505
Front plate with keyboard	x			1	1	C79165-A3042-B505
Motherboard, with firmware: see spare parts list	x	x	x	-	1	
Adapter plate, LCD/keyboard	x	x		1	1	C79451-A3474-B605
LC display	x	x		1	1	A5E31474846
Plug-in filter	x	x	x	-	1	W75041-E5602-K2
Temperature fuse (heated version only)		x		-	1	W75054-T1001-A150
Fusible element, T 0.63 A/250 V	x	x	x	2	3	W79054-L1010-T630
Fusible element, T 1 A/250 V	x	x	x	2	3	W79054-L1011-T100
Fusible element, T 2.5 A/250 V		x	x	2	3	W79054-L1011-T250

If the OXYMAT 6 was supplied with a specially cleaned gas path for high oxygen context (so-called "Clean for O_2 service"), please specify when ordering spare parts. This is the only way to ensure that the gas path will continue to comply with the special requirements of this version.

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More information

If the OXYMAT 6 was supplied with a specially cleaned gas path for high oxygen context ("Clean for O_2 service"), please ensure that you specify this when ordering spare parts. This is the only way to ensure that the gas path will continue to comply with the special requirements for this version.