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

Fields of application

- For boiler control in incineration plants
- For safety-relevant applications (SIL)
- In the automotive industry (testbed systems)
- 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.

TÜV version QAL

As a reference variable for emission measurements according to TA-Luft, 13th and 17th BImSchV

Design

19" rack unit

- With 4 HU 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
- Each half of the enclosure can be purged separately
- 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 control 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

General information

Input and outputs

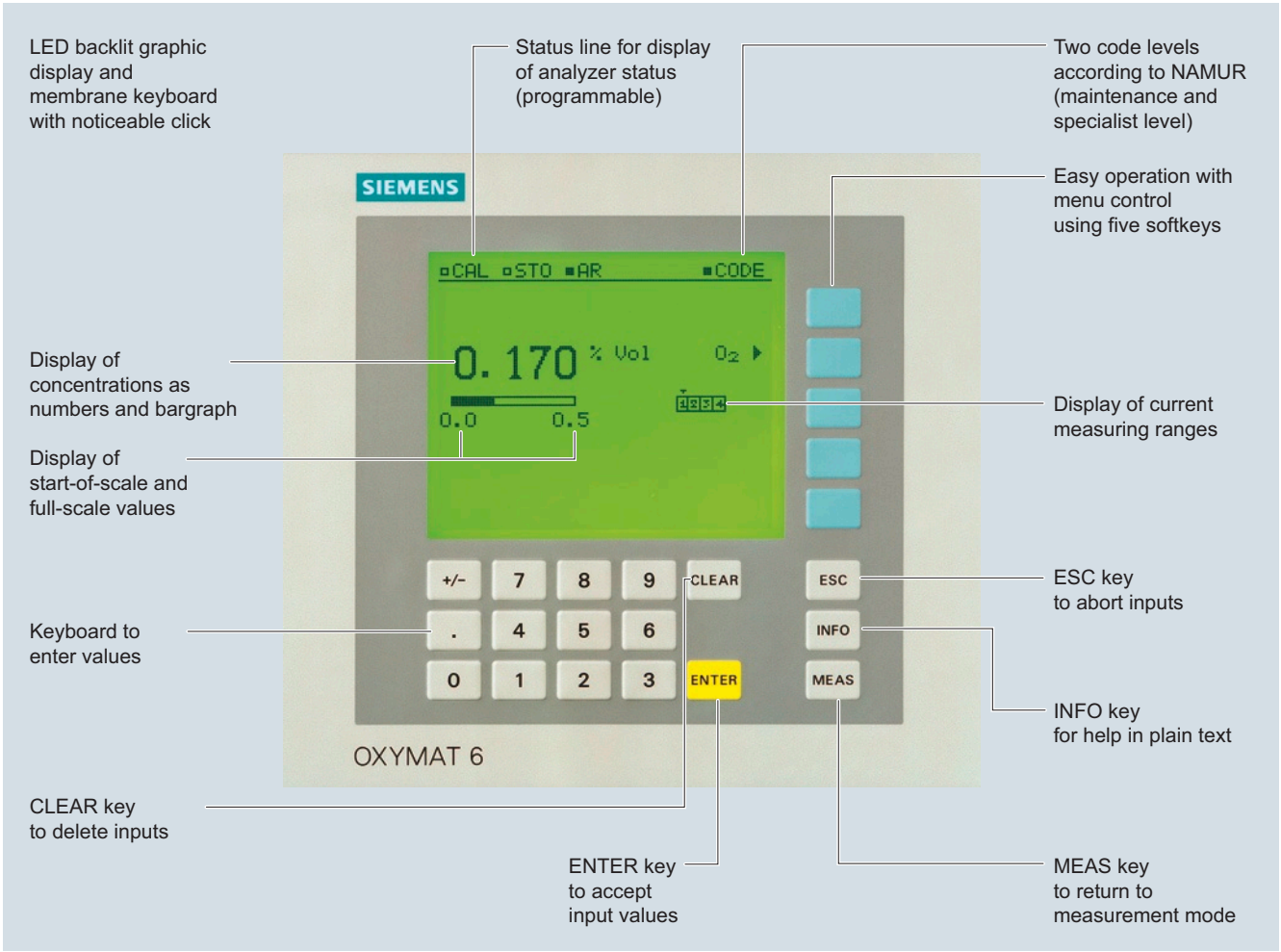
- One analog output per measured component (from 0, 2, 4 to 20 mA; NAMUR parameterizable)
- Two analog inputs configurable (e.g. correction of cross-interference, external pressure sensor)
- Six binary inputs freely configurable (e.g. for measurement range switchover, processing of external signals from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

Communication

RS 485 present in the basic unit (connection at the rear; for the rack unit also behind the front plate).

Options

- AK interface for the automotive industry with extended functions
- 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



OXYMAT 6, membrane keyboard and graphic display

Designs – Parts touched 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	Titanium		
	Pipe	Titanium		
	Sample chamber	Stainless steel, mat. no. 1.4571 or Tantalum		
	Restrictor	Titanium		
	O-rings	FKM (Viton) or FFKM (Kalrez)		
With pipes	Bushing	Stainless steel, mat. no. 1.4571		
	Pipe	Stainless steel, mat. no. 1.4571		
	Sample chamber	Stainless steel, mat. no. 1.4571 or tantalum		
	Restrictor	Stainless steel, mat. no. 1.4571		
	O-rings	FKM (Viton) or FFKM (Kalrez)		
With pipes	Bushing		Hastelloy C 22	
	Pipe		Hastelloy C 22	
	Sample chamber		Stainless steel, mat. no. 1.4571 or tantalum	
	Restrictor		Hastelloy C 22	
	O-rings		FKM (e.g. Viton) or FFKM (e.g. Kalrez)	

Options

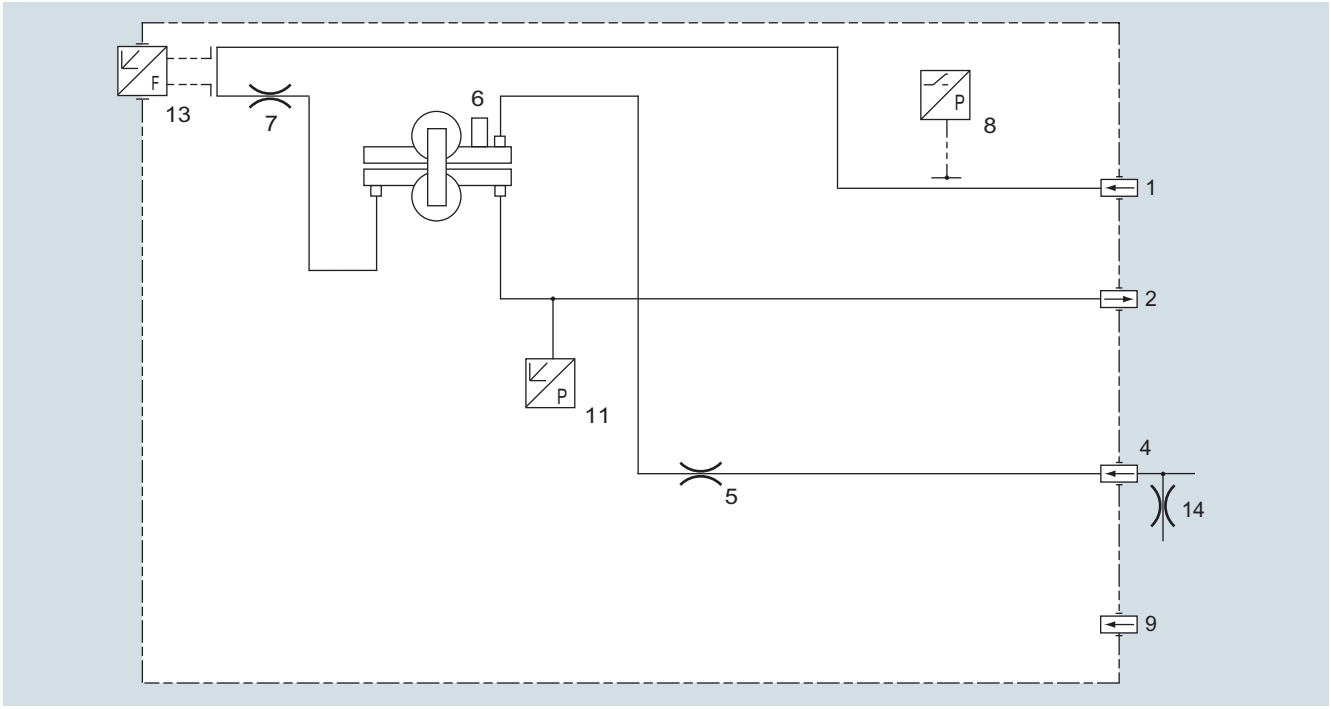
Flow indicator	Measurement pipe	Duran glass	-	-
	Variable area	Duran glass, black		
	Suspension boundary	PTFE (Teflon)		
	Angle pieces	FKM (Viton)		
Pressure switch	Membrane	FKM (Viton)	-	-
	Enclosure	PA 6.3 T		

General information

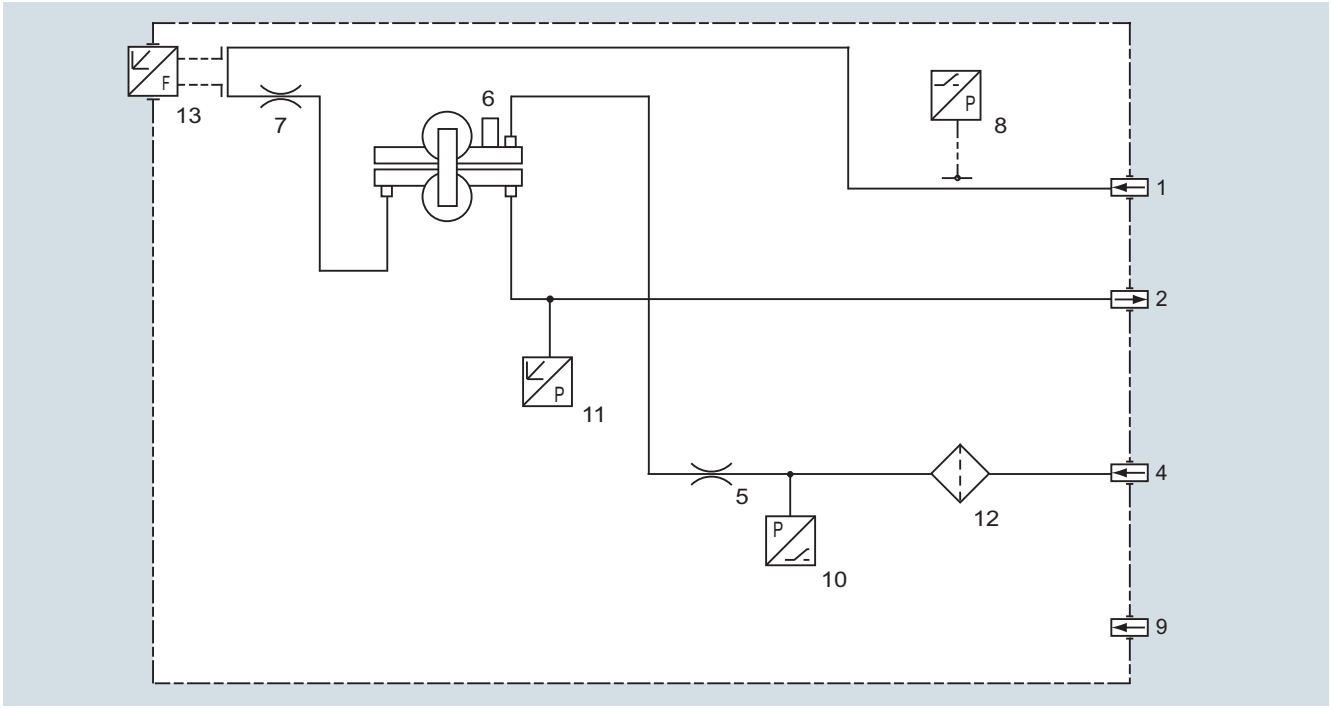
Gas path (19" rack unit)

Legend for the gas path 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



Gas path, reference gas connection 1 100 hPa, absolute

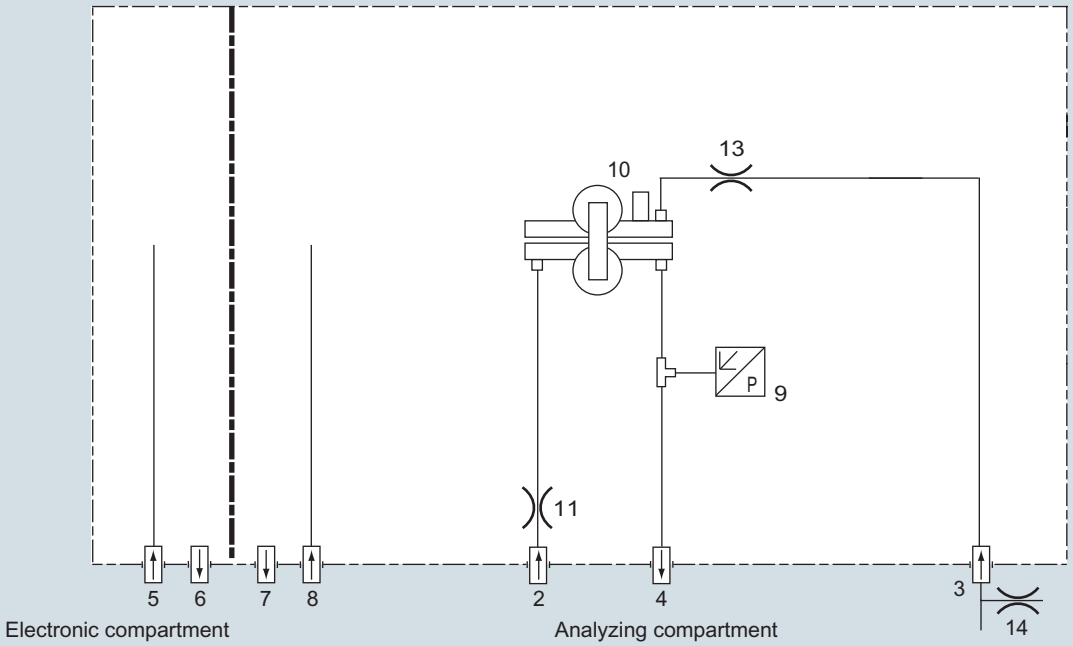


Gas path, reference gas connection 3 000 to 5 000 hPa, absolute

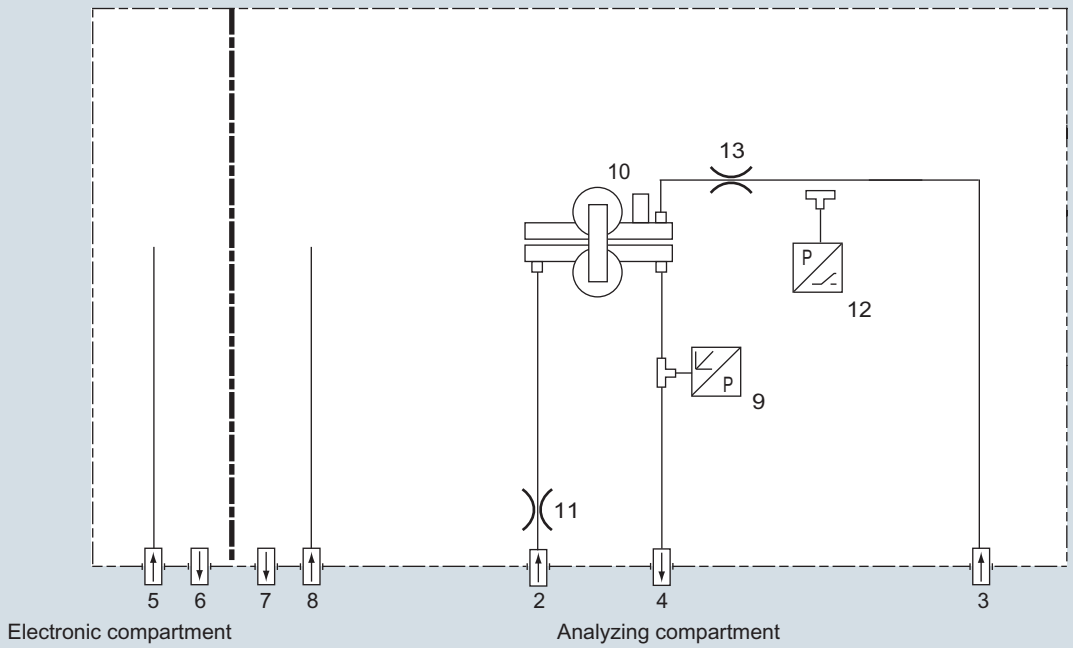
Gas path (field device)

Legend for the gas path 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



Gas path, reference gas connection 1 100 hPa, absolute



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

Function

Principle 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 instrument's operating position.

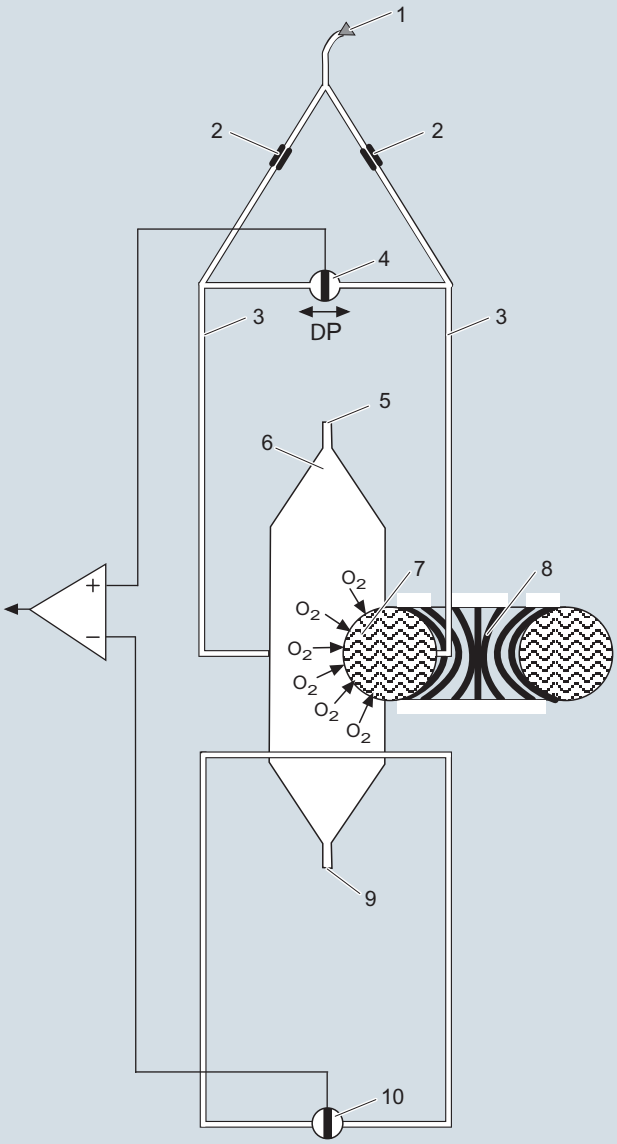
The sample chamber is directly in the sample path and has a small volume, and the microflow sensor is a low-lag sensor. This results in a very short response time for the OXYMAT 6.

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 should be prevented from occurring in the sample chambers. Therefore, the use of gas modified for the measuring task is necessary in most application cases.



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, principle of operation

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 serial gas calibration and as the reference gas. As a result of the low consumption of reference gas (3 to 10 ml/min), one calibration 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.

Essential characteristics

- Four freely parameterizable measuring ranges, also with suppressed zero point, all measuring ranges linear
- Measuring ranges with physically suppressed zero point possible
- Measuring range identification
- Galvanically isolated measured-value output 0/2/4 to 20 mA (also inverted)
- Autoranging possible; remote switching is also possible
- Storage of measured values possible during adjustments
- Wide range of selectable time constants (static/dynamic noise suppression); i.e. the response time of the analyzer can be matched to the respective measuring task
- Short response time
- Low long-term drift
- Measuring point switchover for up to 6 measuring points (programmable)
- 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, parameterizable measuring range calibration
- Operation based on the NAMUR recommendation
- Two control levels with their own authorization codes for the prevention of accidental and unauthorized operator interventions
- Simple handling using a numerical membrane keyboard and operator prompting
- Customer-specific analyzer options such as:
  - Customer acceptance
  - TAG labels
  - Drift recording
  - Clean for O_2 service
  - Kalrez gaskets
- Analyzer unit with flow-type compensation branch: a flow is passed through the compensation branch (option) to reduce the vibration dependency in the case of highly different densities of the sample and reference gases
- Sample chamber for use in presence of highly corrosive sample gases

General information

Reference gases

Measuring range	Recommended reference gas	Reference gas connection pressure	Remarks
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 (suppressed zero point with full-scale value 100 vol.% O_2)	O_2		
Around 21 vol.% O_2 (suppressed zero point with 21 vol.% O_2 within the measuring span)	Air	100 hPa with respect to sample gas pressure which may vary by max. 50 hPa around the atmospheric pressure	

Table 1: Reference gases for OXYMAT 6

Correction of zero point error / cross-sensitivities

Accompanying gas (concentration 100 vol. %)	Deviation from zero point in vol. % O_2 absolute	Accompanying gas (concentration 100 vol. %)	Deviation from zero point 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		
iso-butane C_4H_{10}	-1.30	**Inorganic gases**	
1-butene C_4H_8	-0.96	Ammonia NH_3	-0.20
iso-butene C_4H_8	-1.06	Hydrogen bromide HBr	-0.76
Dichlorodifluoromethane (R12) CCl_2F_2	-1.32	Chlorine Cl_2	-0.94
Acetic acid CH_3COOH	-0.64	Hydrogen chloride HCl	-0.35
n-heptane C_7H_{16}	-2.40	Dinitrogen monoxide N_2O	-0.23
n-hexane C_6H_{14}	-2.02	Hydrogen fluoride HF	+0.10
Cyclo-hexane C_6H_{12}	-1.84	Hydrogen iodide HI	-1.19
Methane CH_4	-0.18	Carbon dioxide CO_2	-0.30
Methanol CH_3OH	-0.31	Carbon monoxide CO	+0.07
n-octane C_8H_{18}	-2.78	Nitrogen oxide NO	+42.94
n-pentane C_5H_{12}	-1.68	Nitrogen N_2	0.00
iso-pentane C_5H_{12}	-1.49	Nitrogen dioxide NO_2	+20.00
Propane C_3H_8	-0.87	Sulfur dioxide SO_2	-0.20
Propylene C_3H_6	-0.64	Sulfur hexafluoride SF_6	-1.05
Trichlorofluoromethane (R11) CCl_3F	-1.63	Hydrogen sulfide H_2S	-0.44
Vinyl chloride C_2H_3Cl	-0.77	Water H_2O	-0.03
Vinyl fluoride C_2H_3F	-0.55	Hydrogen H_2	+0.26
1.1 vinylidene chloride $C_2H_2Cl_2$	-1.22		

Table 2: Zero point error due to diamagnetism or paramagnetism of some accompanying gases with reference to nitrogen at 60 °C and 1 000 hPa absolute (according to IEC 1207/3)

Conversion to other temperatures:

The deviations from the zero point listed in Table 2 must be multiplied by a correction 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 deviation from zero point)

Technical specifications

General information

Measuring ranges	4, internally and externally switchable; autoranging is also possible
Smallest possible 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")
Operating 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

Power supply	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 (**E**lectro**m**agnetic **C**ompatibility)	In accordance with standard requirements of NAMUR NE21 (08/98), EN 61326
Electrical safety	According to EN 61010-1, overvoltage category III
Fuse values	100 ... 120 V: 1.0 T/250 200 ... 240 V: 0.63 T/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

Dynamic 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 version
Damping (electrical time constant)	0 … 100 s, parameterizable
Dead time (purging time of the gas path in the unit at 1 l/min)	Approximately 0.5 ... 2.5 s, depending on 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 (relating to 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 rating plate, with electronic damping constant of 1 s (corresponds to ± 0.25 % at 2 σ)
Zero point drift	< ± 0.5 %/month of the smallest possible span according to rating plate
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 variables (relating to 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 rating plate, 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)	• When pressure compensation is switched off: < 2 % of the current measuring range/1 % pressure change • When pressure compensation is switched on: < 0.2 % of the current measuring range/1 % pressure change
Carrier gases	Deviation from zero point corresponding to paramagnetic or diamagnetic deviation of carrier gas
Sample gas flow at zero point	< 1 % of the current measuring range according to rating plate with a change in flow of 0.1 l/min within the permissible flow range
Power supply	< 0.1 % of the current measuring range with rated voltage ± 10 %

Electrical inputs and outputs	
Analog output	0/2/4 … 20 mA, isolated; max. load 750 Ω
Relay outputs	6, with changeover contacts, freely parameterizable, e.g. for measuring range identification; load: 24 V AC/DC/1 A, isolated
Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and residual gas influence correction (correction of cross-interference)
Binary inputs	6, designed for 24 V, isolated, freely parameterizable, e.g. for measuring range switchover
Serial interface	RS 485
Options	AUTOCAL function with 8 additional binary inputs and relay outputs each, 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 (dew point must not be undershot)

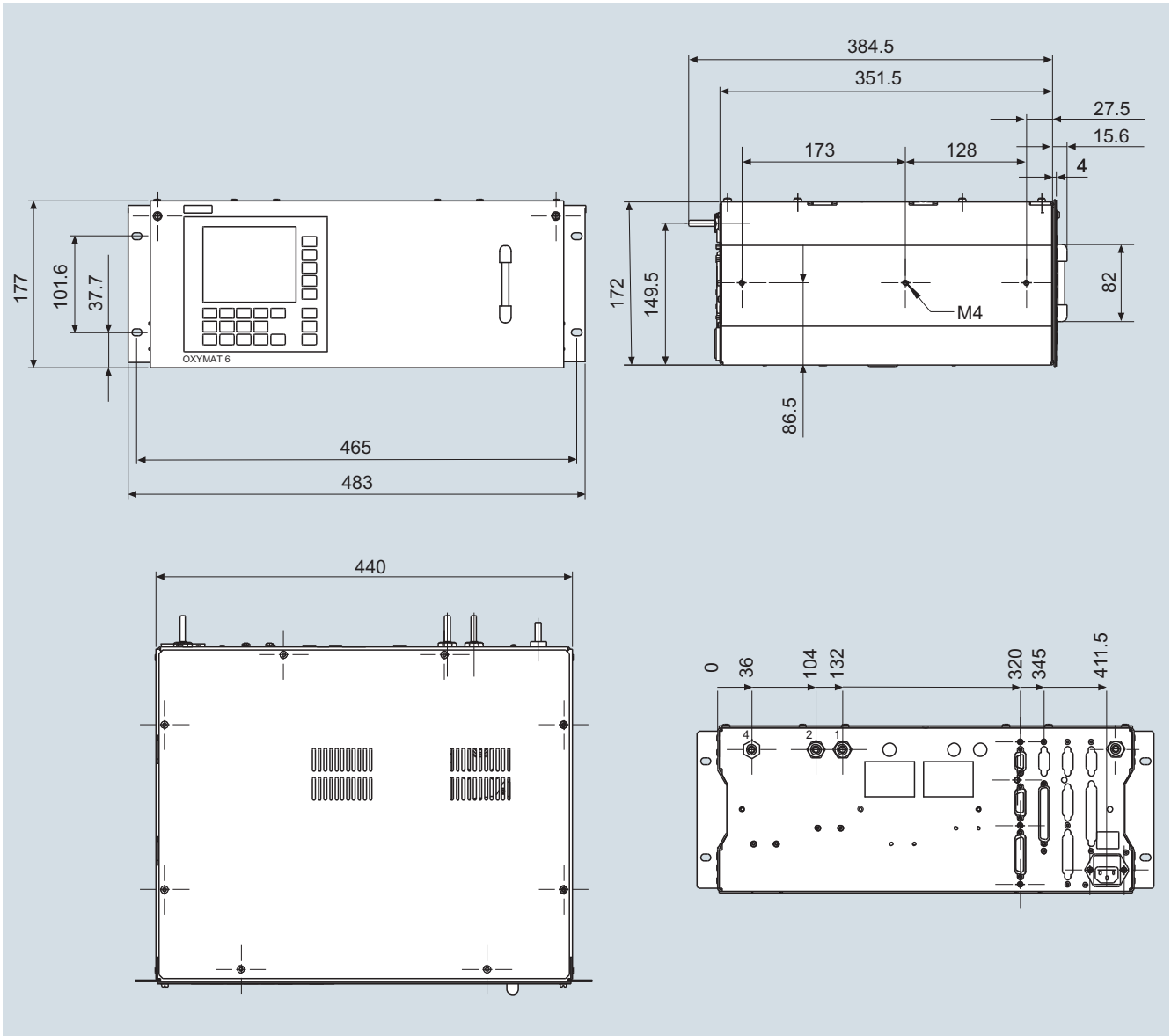
Selection and ordering data	Article No.	
OXYMAT 6 gas analyzer 19" rack unit for installation in cabinets	↗ **7MB2021-** ■■■■ **0 -** ■■■■	Cannot be combined
↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.		
Gas connections		
Pipe with 6 mm outer diameter	**0**	
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**	**B** **B** **B → Y02**
2 % reference gas pressure 3 000 hPa	**C**	
2 % reference gas pressure 100 hPa (external pump)	**D**	**D** **D** **D → Y02**
5 % reference gas pressure 3 000 hPa	**E**	
5 % reference gas pressure 100 hPa (external pump)	**F**	**F** **F** **F → Y02**
Sample chamber		
Non-flow-type compensation branch		
• Made of stainless steel, mat. no. 1.4571	**A**	
• Made of tantalum	**B**	
Flow-type compensation branch		
• Made of stainless steel, mat. no. 1.4571	**C**	**C**
• Made of tantalum	**D**	**D**
Internal gas paths		
Hose made of FKM (Viton)	**0**	
Pipe made of titanium	**1**	**1** **1 → Y02**
Pipe made of stainless steel, mat. no. 1.4571	**2**	**2**
Power supply		
100 ... 120 V AC, 48 ... 63 Hz	**0**	
200 ... 240 V AC, 48 ... 63 Hz	**1**	
Monitoring (reference gas, sample gas)		
Without	**A**	
Reference gas only	**B**	**B**
Reference gas and sample gas (with flow indicator and pressure switch for sample gas)	**C**	**C** **C**
Sample gas only	**D**	**D**
Add-on electronics		
Without	**A**	
AUTOCAL function		
• With 8 additional digital inputs/outputs	**B**	
• With serial interface for the automotive industry (AK)	**D**	**D → E20**
• With 8 additional digital inputs/outputs and PROFIBUS PA interface	**E**	
• With 8 additional digital inputs/outputs and PROFIBUS DP interface	**F**	
Language		
German	**0**	
English	**1**	
French	**2**	
Spanish	**3**	
Italian	**4**	

Additional versions	Order code	Cannot be combined
Add "-Z" to Article No. and specify Order codes.		
Telescopic rails (2 units)	**A31**	
Kalrez gaskets in sample gas path	**B01**	
TAG labels (specific lettering based on customer information)	**B03**	
SIL conformity declaration (SIL 2) Functional Safety according to IEC 61508 and IEC 61511	**C20**	
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 the standard setting	**Y11**	

Selection and ordering data

Accessories	Article No.
RS 485/Ethernet converter	**A5E00852383**
RS 485/RS 232 converter	**C79451-Z1589-U1**
RS 485/USB converter	**A5E00852382**
AUTOCAL function with serial interface for the automotive industry (AK)	**C79451-A3480-D512**
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**

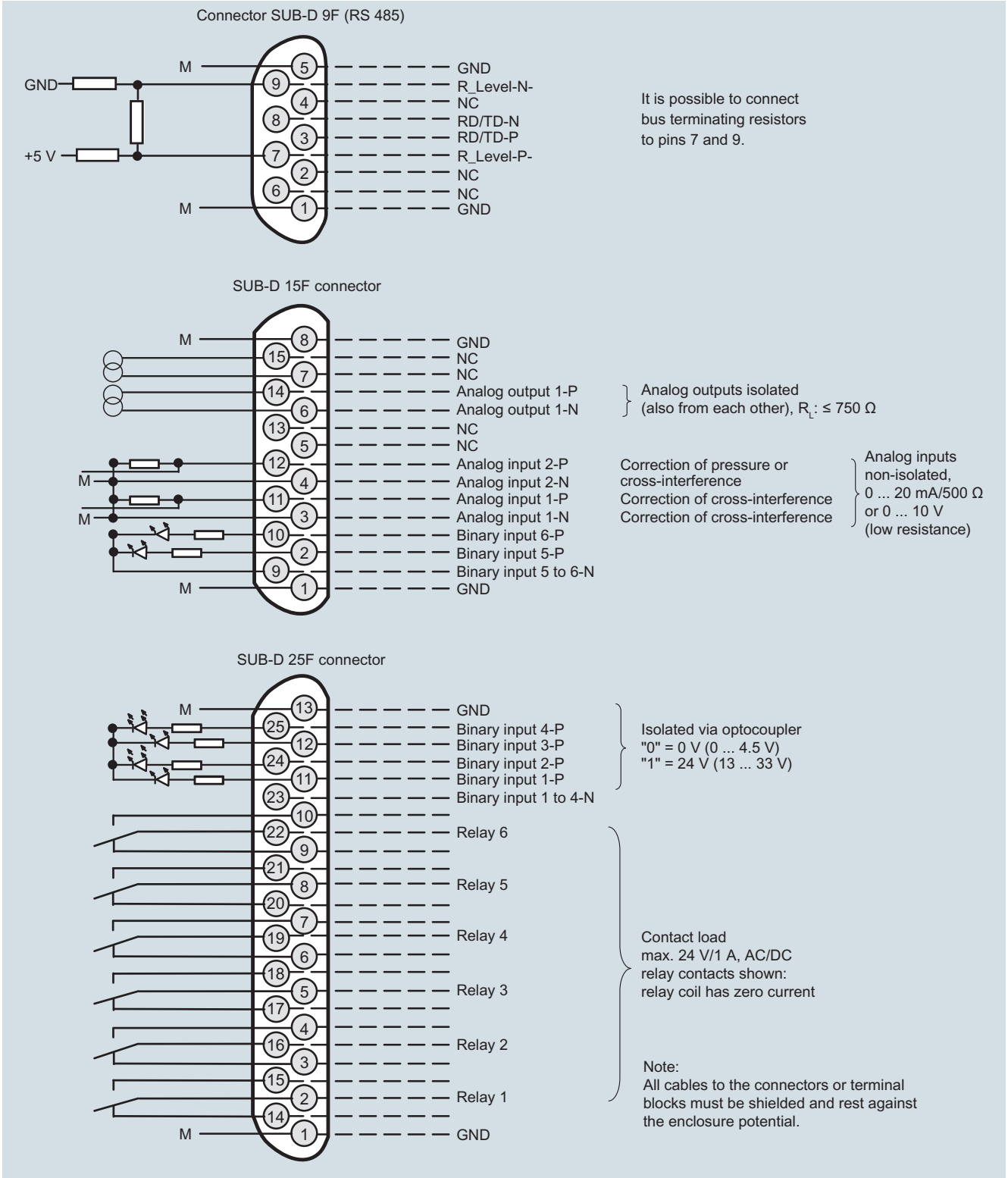
Dimensional drawings



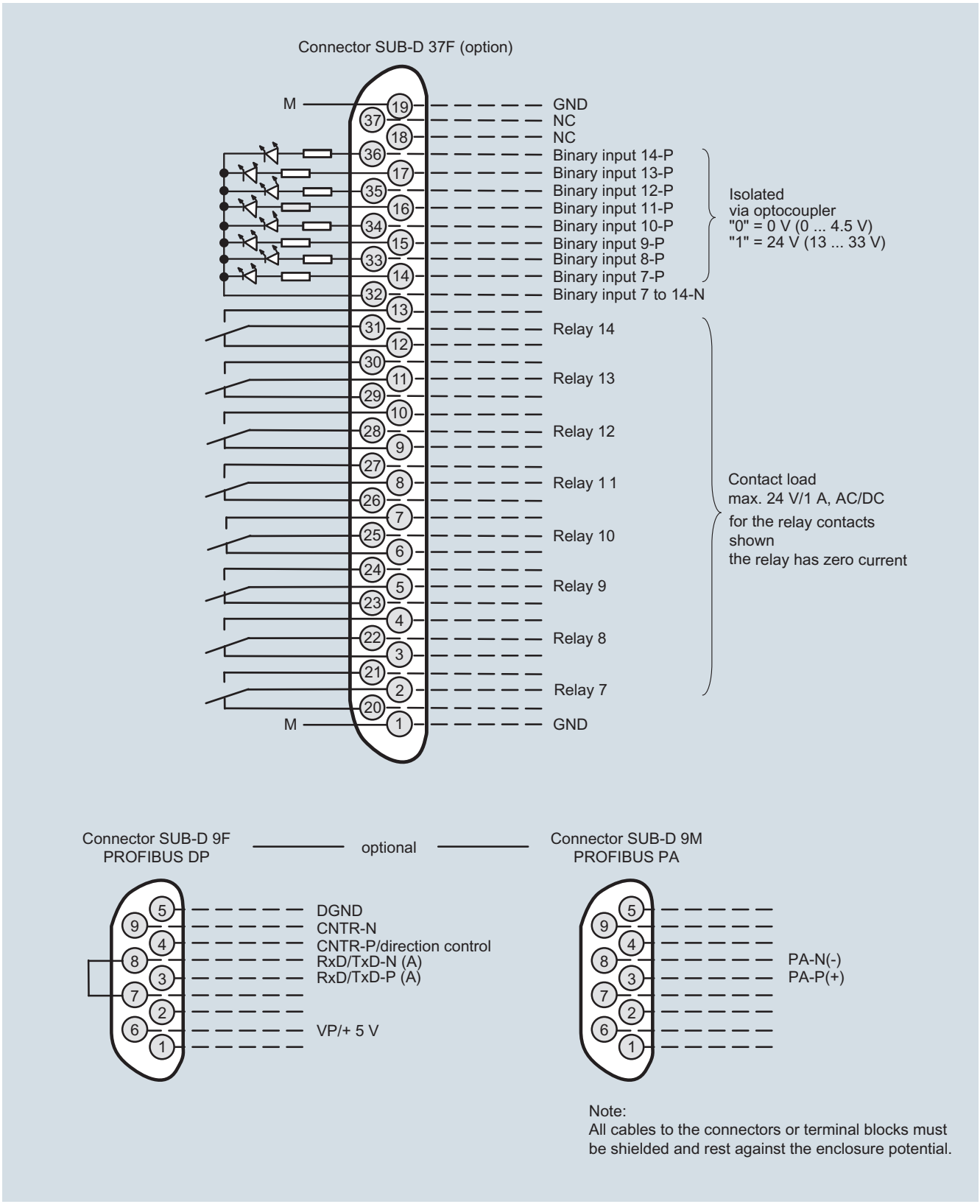
OXYMAT 6, 19“ unit, dimensions in mm

Schematics

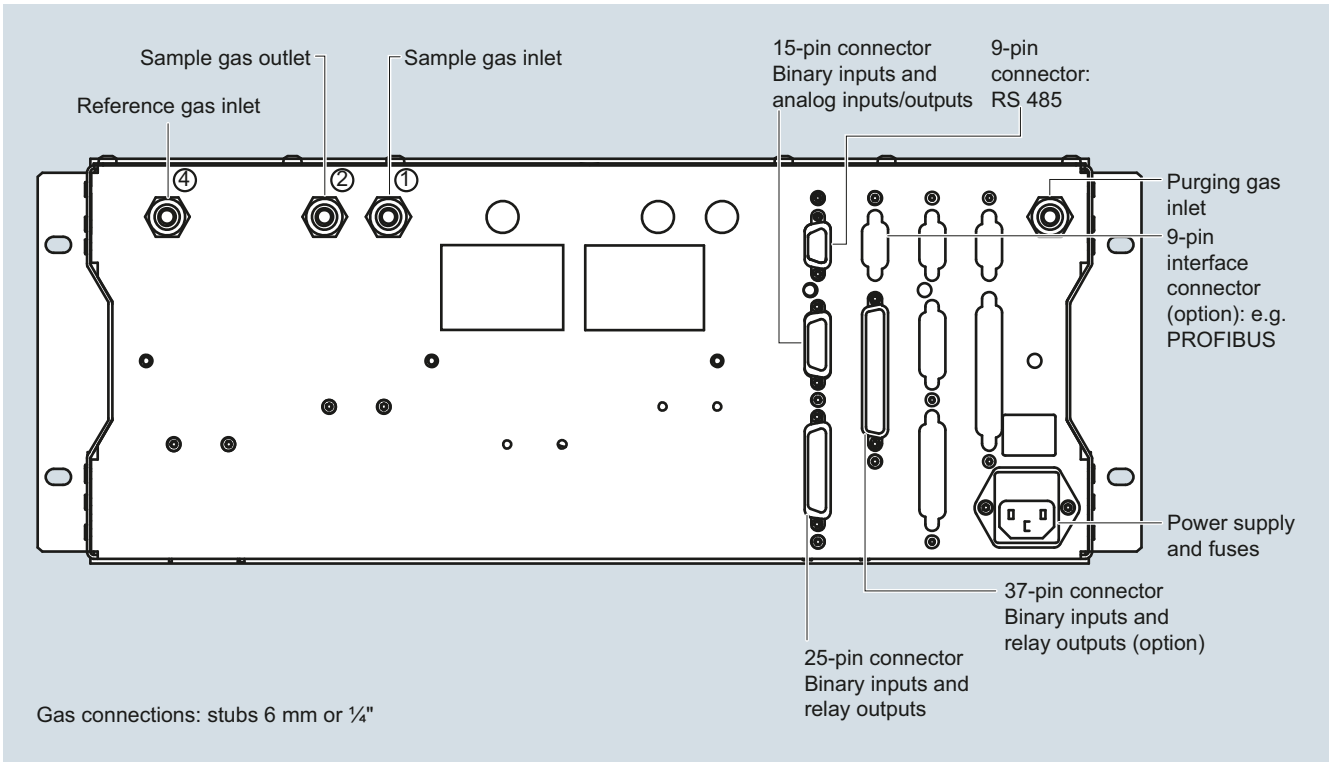
Pin assignment (electrical and gas connections)



OXYMAT 6, 19“ unit, pin assignment



OXYMAT 6, 19“ unit, pin assignment of AUTOCAL board and PROFIBUS connectors



OXYMAT 6, 19“ unit, gas and electrical connections

Technical specifications

General information

Measuring ranges	4, internally and externally switchable; autoranging is also possible
Smallest possible span (relating to sample gas pressure 1 000 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature), smallest possible 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")
Operating 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

Power supply	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 (**E**lectro**m**agnetic **C**ompatibility)	In accordance with standard requirements of NAMUR NE21 (08/98), EN 61326
Electrical safety	In accordance with EN 61010-1
• Heated units	Overvoltage category II
• Unheated units	Overvoltage category III
Fuse values (unheated unit)	
• 100 ... 120 V	F3: 1 T/250; F4: 1 T/250
• 200 ... 240 V	F3: 0.63 T/250; F4: 0.63 T/250
Fuse values (heated unit)	
• 100 ... 120 V	F1: 1 T/250; F2: 4 T/250 F3: 4 T/250; F4: 4 T/250
• 200 ... 240 V	F1: 0.63 T/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 to max. 50 °C, but above the dew point (unheated) • 15 °C above temperature analyzer unit (heated)
Sample gas humidity	< 90 % relative humidity

Dynamic 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, parameterizable
Dead time (purging time of the gas path in the unit 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 (relating to 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 rating plate, with electronic damping constant of 1 s (corresponds to ± 0.25 % at 2 σ)
Zero point drift	< ± 0.5 %/month of the smallest possible span according to rating plate
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 variables (relating to 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 rating plate, 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)	• When pressure compensation is switched off: < 2 % of the current measuring range/1 % pressure change • When pressure compensation is switched on: < 0.2 % of the current measuring range/1 % pressure change
Carrier gases	Deviation from zero point corresponding to paramagnetic or diamagnetic deviation of carrier gas
Sample gas flow at zero point	< 1 % of the current measuring range according to rating plate with a change in flow of 0.1 l/min within the permissible flow range; heated version up to double error
Power supply	< 0.1 % of the current measuring range with rated voltage ± 10 %
Electrical inputs and outputs	
Analog output	0/2/4 … 20 mA, isolated; max. load 750 Ω
Relay outputs	6, with changeover contacts, freely parameterizable, e.g. for measuring range identification; load: 24 V AC/DC/1 A, isolated
Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and residual gas influence correction (correction of cross-interference)
Binary inputs	6, designed for 24 V, isolated, freely parameterizable, e.g. for measuring range switchover
Serial interface	RS 485
Options	AUTOCAL function with 8 additional binary inputs and relay outputs each, 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 (relative humidity) as annual average (maximum accuracy achieved after 2 hours), during storage and transportation (dew point must not be undershot)

1

Field device

Selection and ordering data	Article No.	
OXYMAT 6 gas analyzer For field installation	↗ **7MB2011-** ■■■ **0** ■ **-** ■■■■	Cannot be combined
↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.		
Gas connections for sample gas and reference gas		
Ferrule screw connection made of stainless steel (mat. no. 1.4571)		
• Pipe with 6 mm outer diameter	**0**	**0 → D02**
• Pipe with ¼" outer diameter	**1**	**1 → D01**
Ferrule screw connection made of titanium		
• Pipe with 6 mm outer diameter	**2**	**2 → D01, D02, Y02**
• Pipe with ¼" outer diameter	**3**	**3 → D01, D02, Y02**
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**	**B B B B B → Y02**
2 % reference gas pressure 3 000 hPa	**C**	
2 % reference gas pressure 100 hPa (external pump)	**D**	**D D D D → Y02**
5 % reference gas pressure 3 000 hPa	**E**	
5 % reference gas pressure 100 hPa (external pump)	**F**	**F F F F → Y02**
Sample chamber		
Non-flow-type compensation branch		
• Made of stainless steel, mat. no. 1.4571	**A**	
• Made of tantalum	**B**	
Flow-type compensation branch		
• Made of stainless steel, mat. no. 1.4571	**C**	**C**
• Made of tantalum	**D**	**D**
Heating of internal gas paths and analyzer unit		
None	**0**	
With (65 ... 130 °C)	**1**	**1**
Power supply		
Standard unit and acc. to ATEX II 3G version (Zone 2)		
• 100 ... 120 V AC, 48 ... 63 Hz	**0**	
• 200 ... 240 V AC, 48 ... 63 Hz	**1**	
ATEX II 2G versions (Zone 1), incl. certificate		
• 100 ... 120 V AC, 48 ... 63 Hz, according to ATEX II 2G[1)] (operating mode: leakage compensation)	**2**	**2 2 2 → E11, E12**
• 200 ... 240 V AC, 48 ... 63 Hz, according to ATEX II 2G[1)] (operating mode: leakage compensation)	**3**	**3 3 3 → E11, E12**
• 100 ... 120 V AC, 48 ... 63 Hz, according to ATEX II 2G[1)] (operating mode: continuous purging)	**6**	**6 6 6 → E11, E12**
• 200 ... 240 V AC, 48 ... 63 Hz, according to ATEX II 2G[1)] (operating mode: continuous purging)	**7**	**7 7 7 → E11, E12**
Reference gas monitoring		
Without	**A**	**A**
With	**B**	**B**
Add-on electronics		
Without	**A**	
AUTOCAL function		
• With 8 additional digital inputs and 8 additional relay outputs	**B**	
• With 8 additional digital inputs/outputs and PROFIBUS PA interface	**E**	**E → E12**
• With 8 additional digital inputs/outputs and PROFIBUS DP interface	**F**	**F → E12**
• With 8 additional digital inputs/outputs and PROFIBUS PA Ex-i	**G**	
Language		
German	**0**	
English	**1**	
French	**2**	
Spanish	**3**	
Italian	**4**	

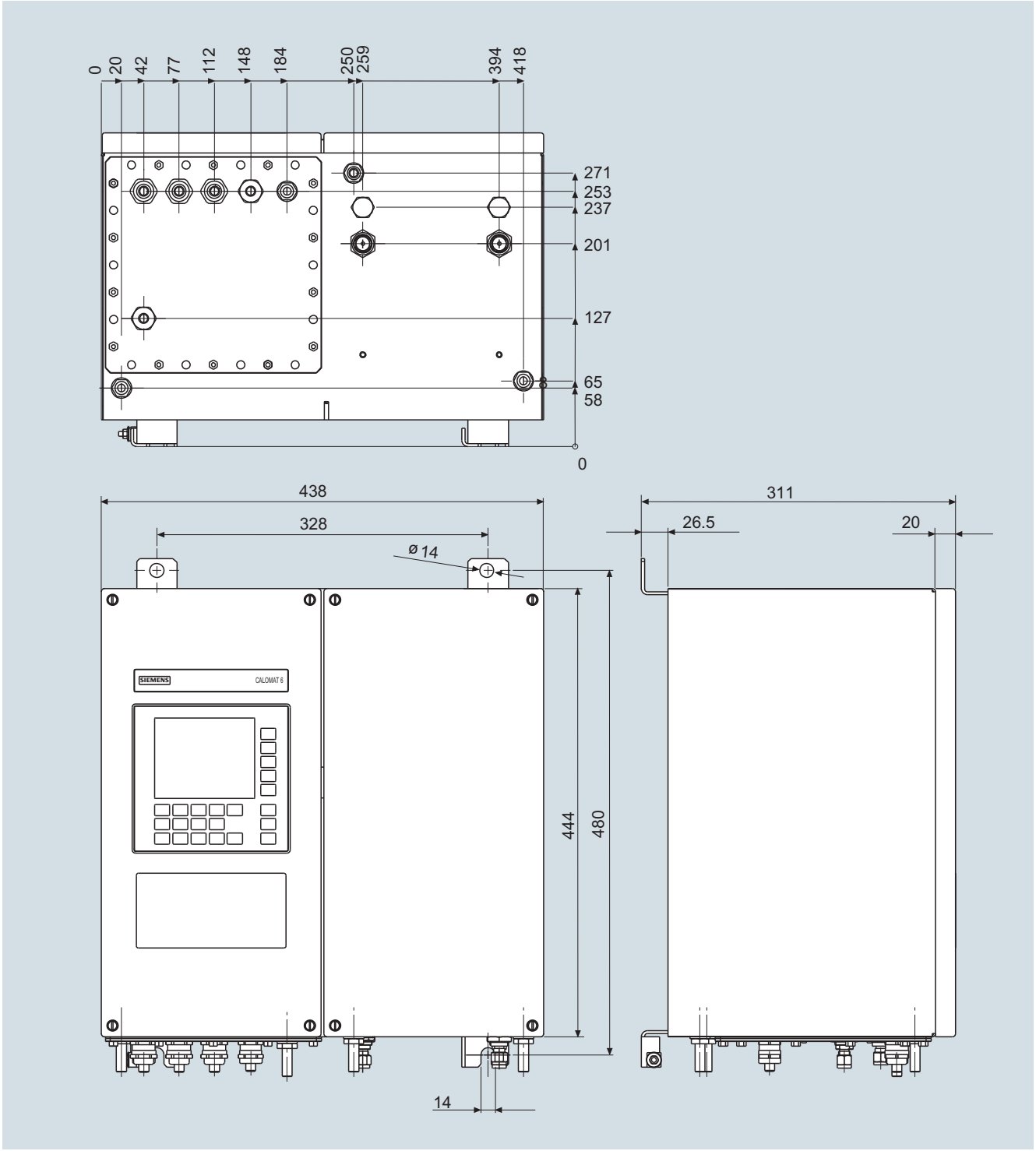
[1)] See also next page, "Additional units for Ex versions".

Selection and ordering data

Additional versions	**Order code**	Cannot be combined
Add "-Z" to Article No. and specify Order codes.		
Set of Torx screwdrivers	**A32**	
Kalrez gaskets in sample gas path	**B01**	
TAG labels (specific lettering based on customer information)	**B03**	
SIL conformity declaration (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**	→ **E20**
• Outer diameter ¼"	**D02**	→ **E20**
Ex versions		
For possible combinations, see Table "Ex configurations – principle selection criteria", page 5/17		
ATEX II 3G certificate; restricted 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 Ex zone acc. to ATEX II 3G, non-flammable gases	**E41**	
• In Ex zone acc. to ATEX II 3G, flammable gases[1)]	**E42**	
BARTEC Ex p control unit "Leakage compensation"	**E71**	
BARTEC Ex p control unit "Continuous purging"	**E72**	
Clean for O_2 service (specially cleaned gas path)	**Y02**	
Measuring range indication in plain text, if different from the standard setting	**Y11**	
Additional units for Ex versions	**Article No.**	
Category ATEX II 2G (zone 1)		
BARTEC Ex p control unit, 230 V, "leakage compensation"	**7MB8000-2BA**	
BARTEC Ex p control unit, 115 V, "leakage compensation"	**7MB8000-2BB**	
BARTEC Ex p control unit, 230 V, "continuous purging"	**7MB8000-2CA**	
BARTEC Ex p control unit, 115 V, "continuous purging"	**7MB8000-2CB**	
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 control unit, 230 V, "continuous purging"	**7MB8000-2CA**	
BARTEC Ex p control unit, 115 V, "continuous purging"	**7MB8000-2CB**	
FM/CSA (Class I Div. 2)		
Ex purging unit MiniPurge FM	**7MB8000-1AA**	
Accessories		
RS 485/Ethernet converter	**A5E00852383**	
RS 485/RS 232 converter	**C79451-Z1589-U1**	
RS 485/USB converter	**A5E00852382**	
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**	
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS PA Ex i (firmware 4.1.10 required)	**A5E00057317**	
Set of Torx screwdrivers	**A5E34821625**	

[1)] Only in connection with an approved purging unit

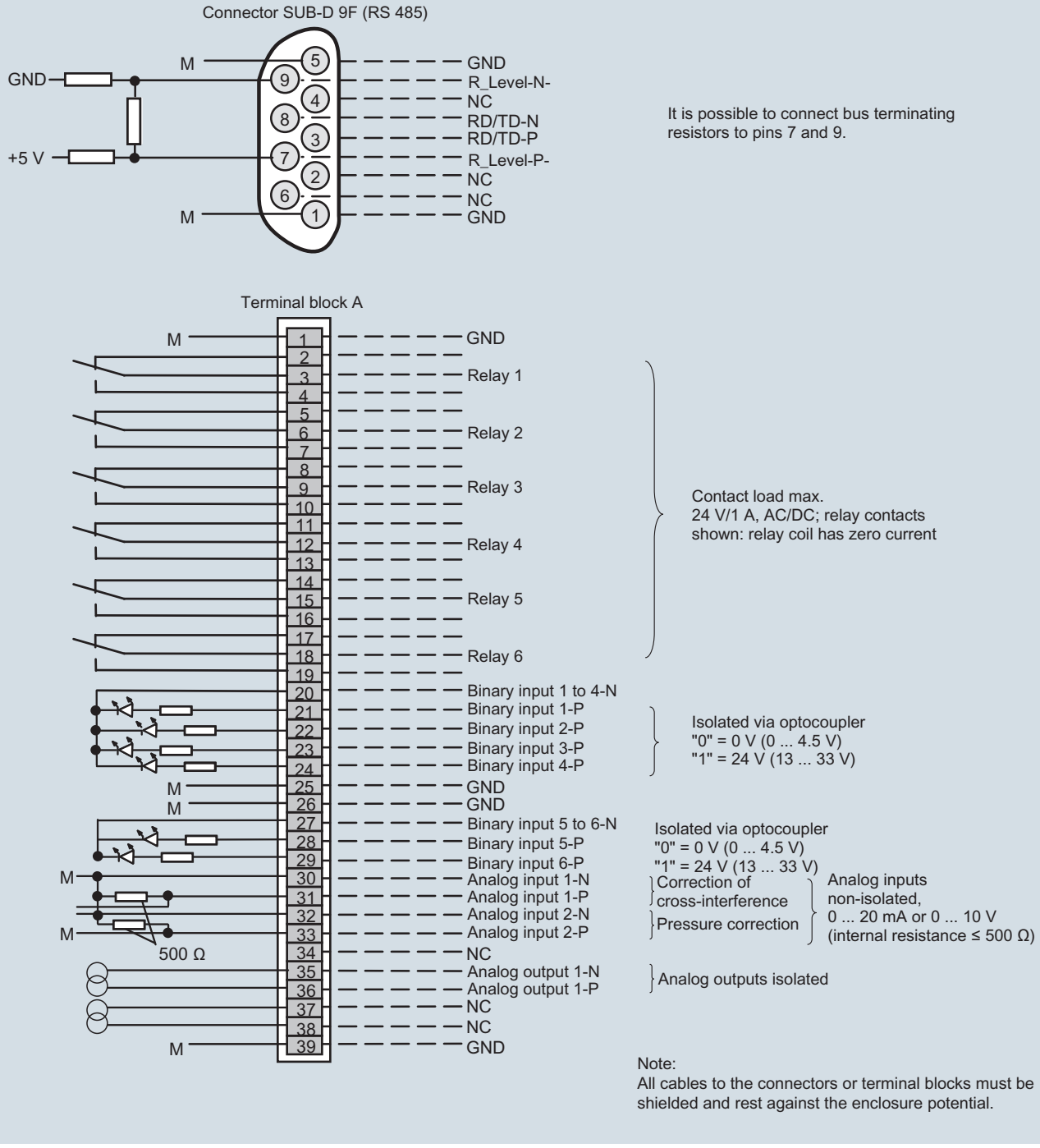
Dimensional drawings



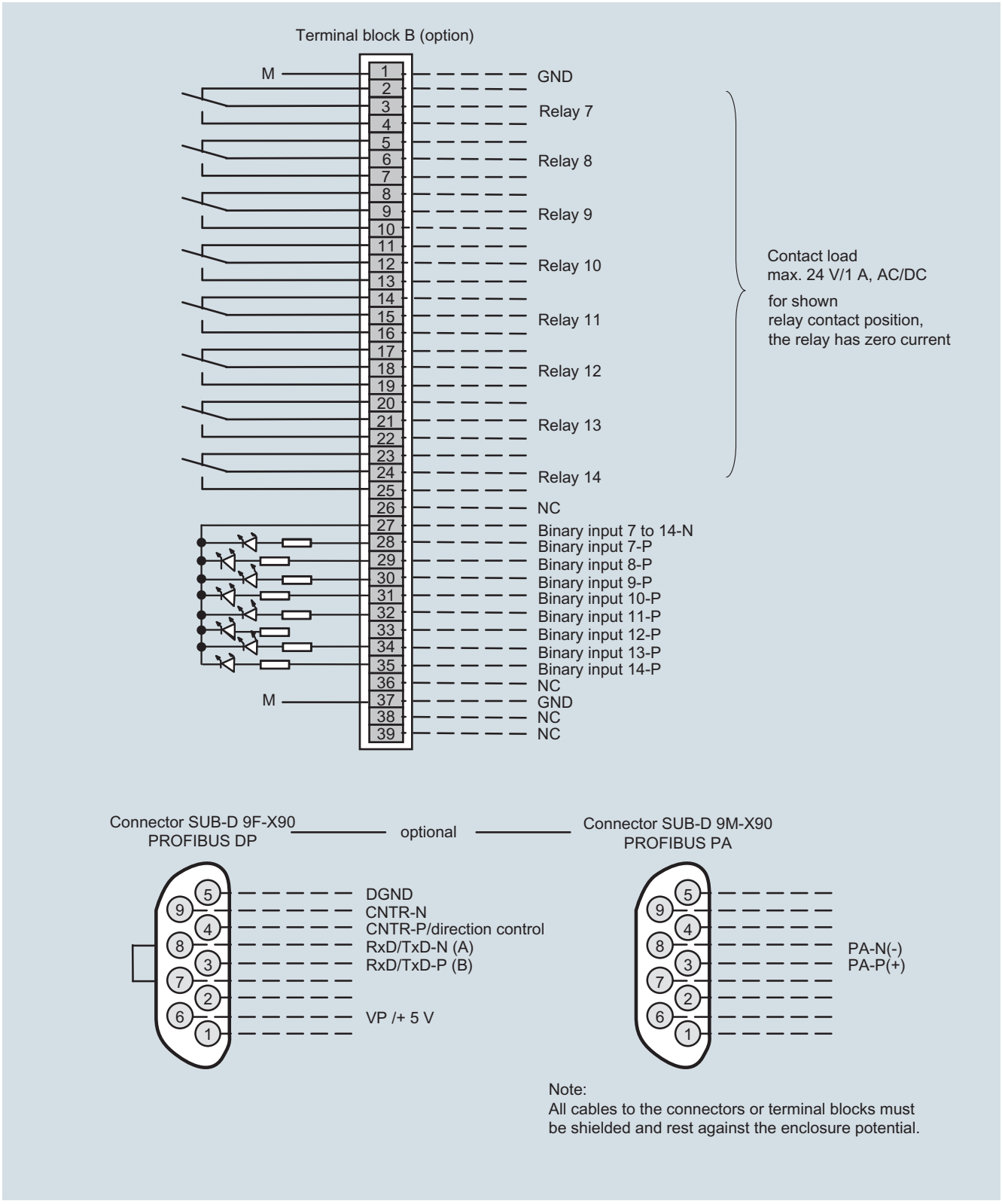
OXYMAT 6, field unit, dimensions in mm

Schematics

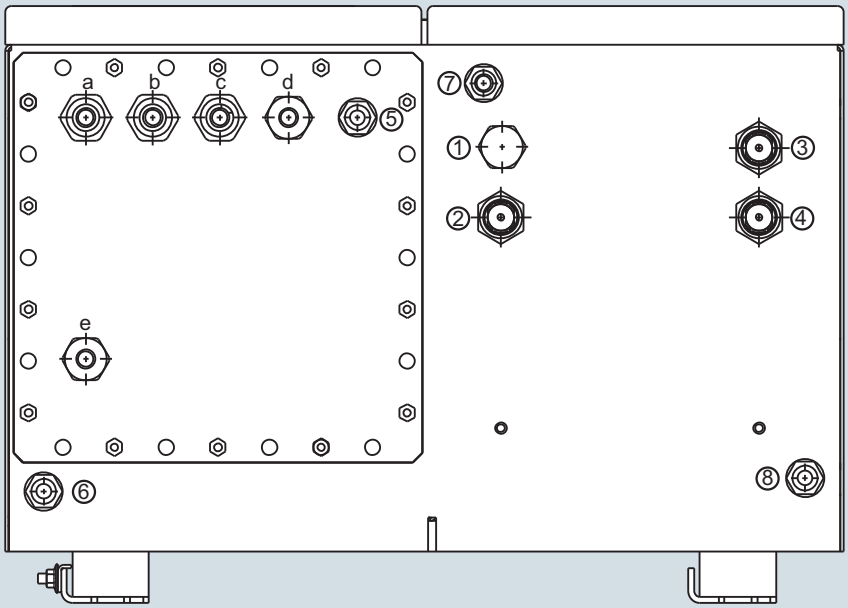
Pin assignment (electrical and gas connections)



OXYMAT 6, field unit, connector and terminal assignment



OXYMAT 6, field unit, connector and terminal assignment of the AUTOCAL board and PROFIBUS connectors



Gas connections

①	not used	Clamping gland for pipe Ø 6 mm or ¼"
②	Sample gas inlet	
③	Reference gas inlet	
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 unit, gas and electrical connections

Documentation

Selection and ordering data

Operating instructions	Article No.
ULTRAMAT 6 / OXYMAT 6	
Gas analyzer for IR-absorbing gases and oxygen	
• German	**C79000-G5200-C143**
• English	**C79000-G5276-C143**
• French	**C79000-G5277-C143**
• Spanish	**C79000-G5278-C143**
• Italian	**C79000-G5272-C143**

Selection and ordering data

Description	7MB2021	7MB2011	7MB2011 Ex	2 years (quantity)	5 years (quantity)	Article No.
Analyzer unit						
O ring (sample cell)	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	**W75025-B5001-B1**
Connector 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 ("Clean for O_2 service"), please ensure that you specify this when ordering spare parts. This is the only way to guarantee that the gas path will continue to comply with the special requirements for this version.