

# Continuous Gas Analyzers, extractive

## OXYMAT 6

### General information

#### 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<sub>2</sub>)
  - 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<sub>2</sub>) e.g. 98 to 100 % O<sub>2</sub> for purity monitoring / air separation
- Open interface architecture (RS 485, RS 232, PROFIBUS)
- SIPROM GA network for maintenance and service information (option)
- Electronics and analyzer part: 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)
- EEx(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
- In safety-related areas
- In the automotive industry (testbed systems)
- Warning equipment
- In chemical plants
- For ultra-pure gas quality monitoring
- Environmental protection
- Quality monitoring
- Inert gas monitoring with certified gas warning equipment (DMT certificate)
- 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 material in the gas path, material in the sample cells 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 telescope rails
- Front plate for service purposes can be pivoted down (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 1/4"
- 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 1/4"

##### 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

# Continuous Gas Analyzers, extractive OXYMAT 6

## 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.

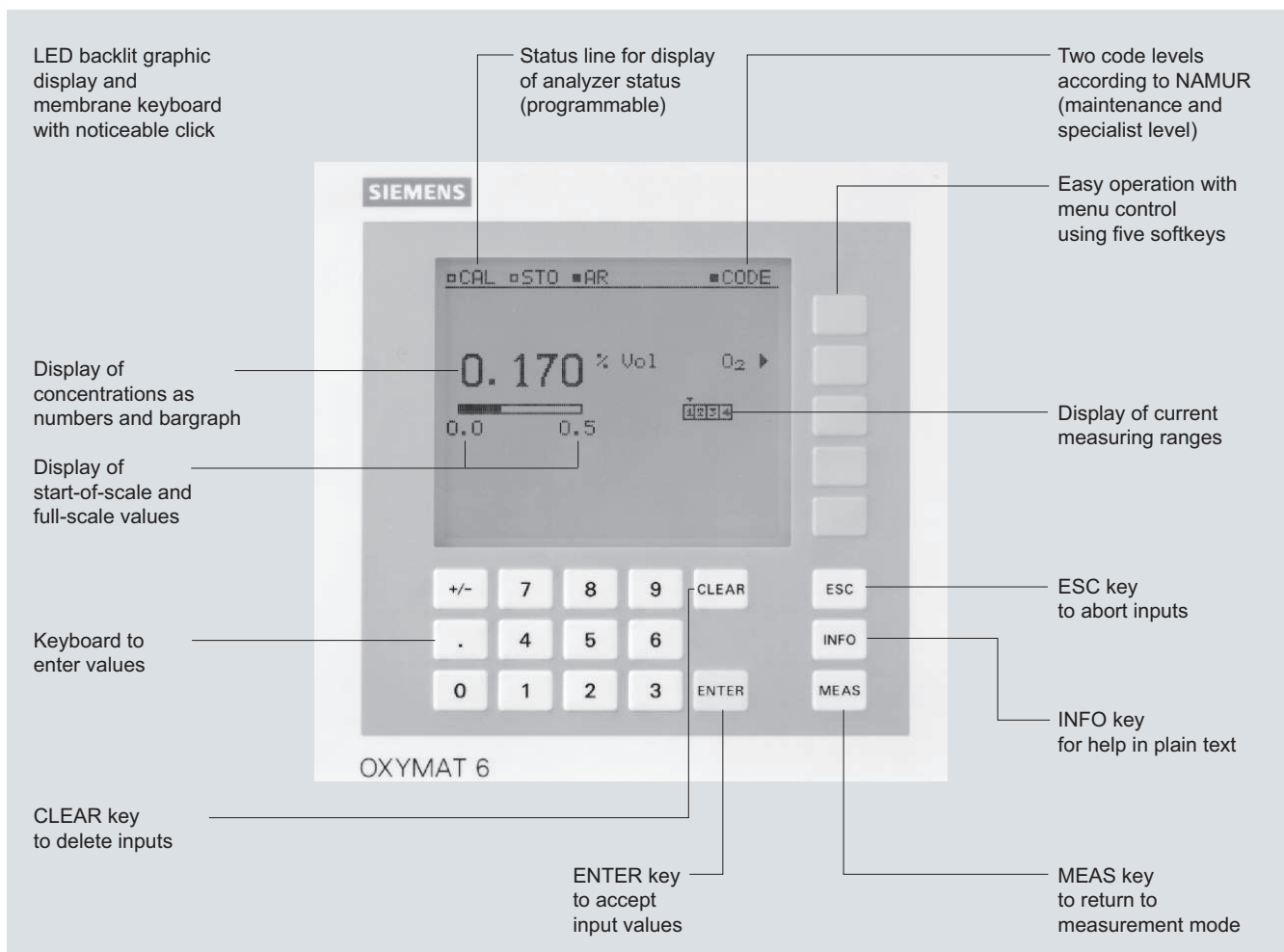
### Communication

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.

2



OXYMAT 6, membrane keyboard and graphic display

# Continuous Gas Analyzers, extractive

## OXYMAT 6

### General information

#### Designs – Parts touched by sample gas, standard

Gas path		19" rack unit	Field device	Field device Ex
With hoses	Connection	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	Implementation	Titanium		
	Pipe	Titanium		
	Sample chamber	Stainless steel, mat. no. 1.4571 or Tantalum		
	Restrictor	Titanium		
	O-rings	FKM (Viton) or FFKM (Kalrez)		
With pipes	Implementation	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	Implementation		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)	

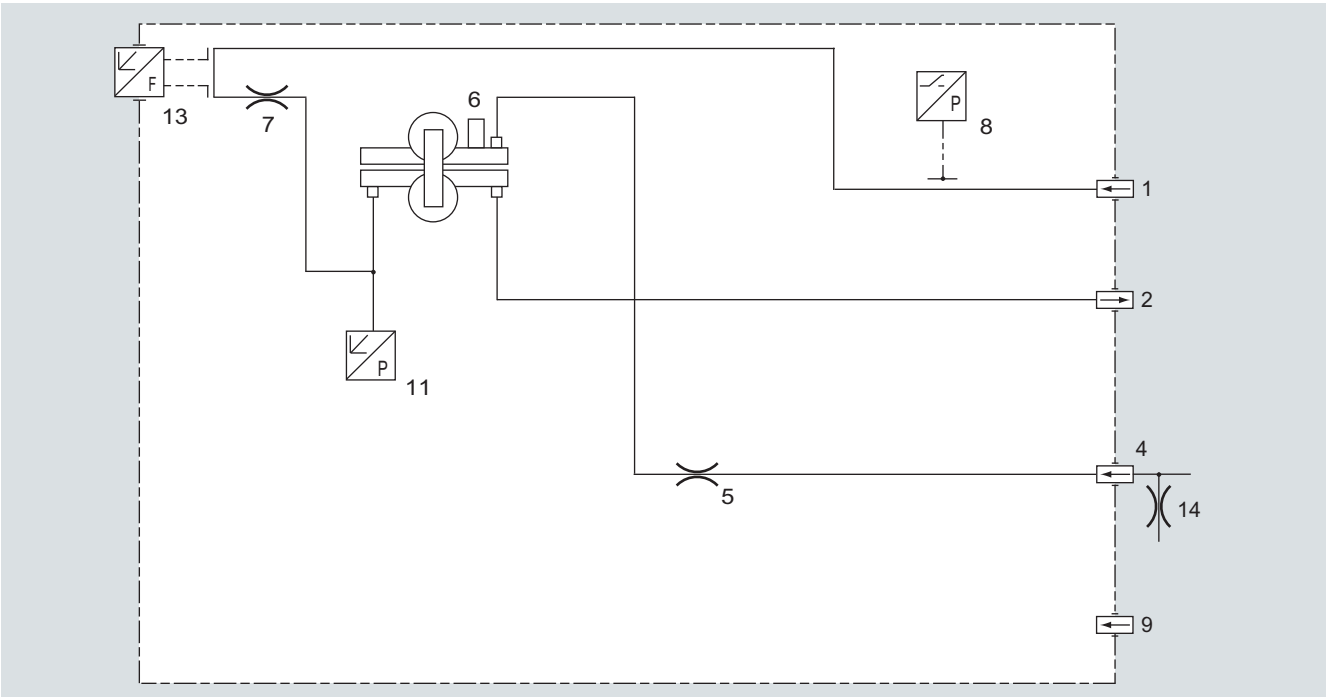
#### Options

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		

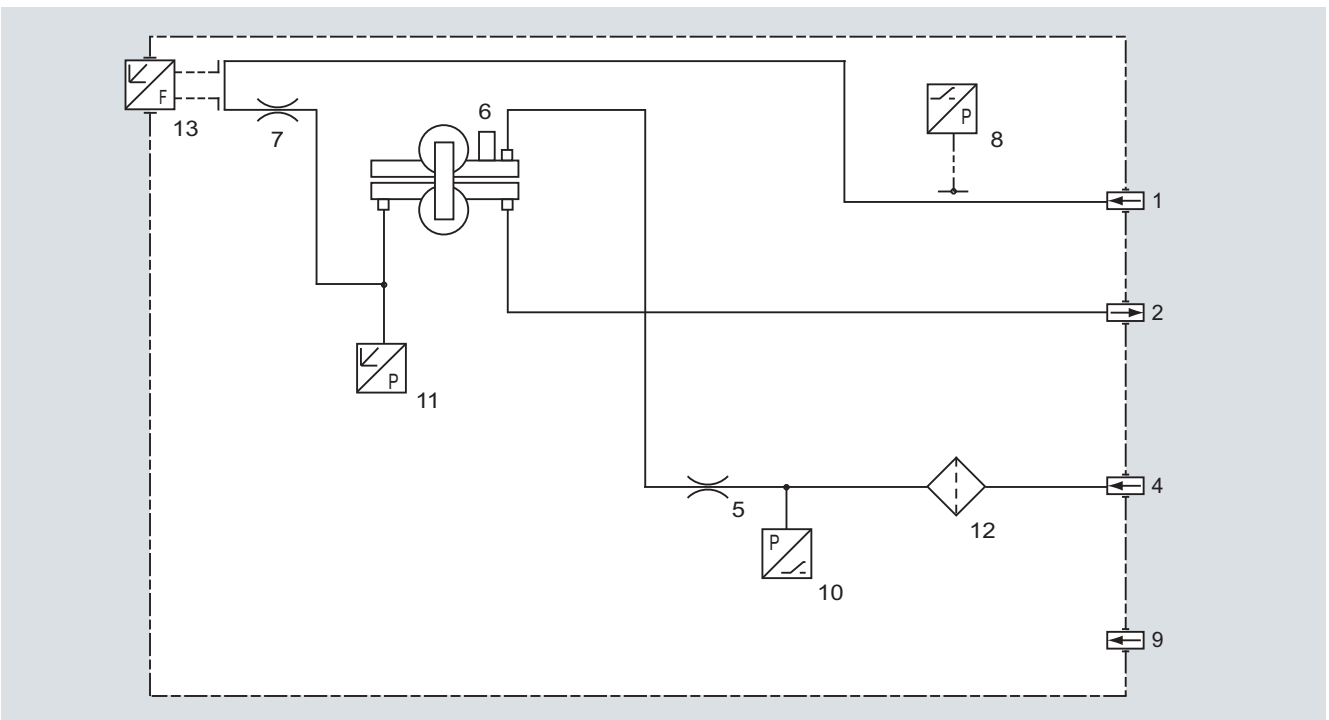
**Gas path (19" rack unit)**

**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 <sub>2</sub> 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 3 000 to 5 000 hPa, absolute

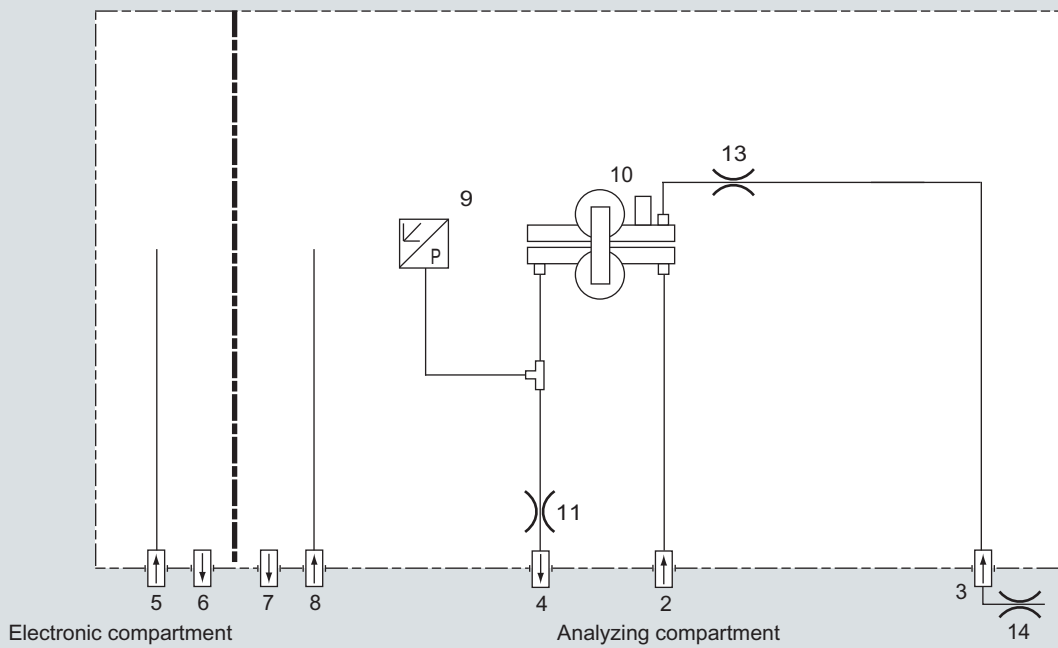
# Continuous Gas Analyzers, extractive OXYMAT 6

## General information

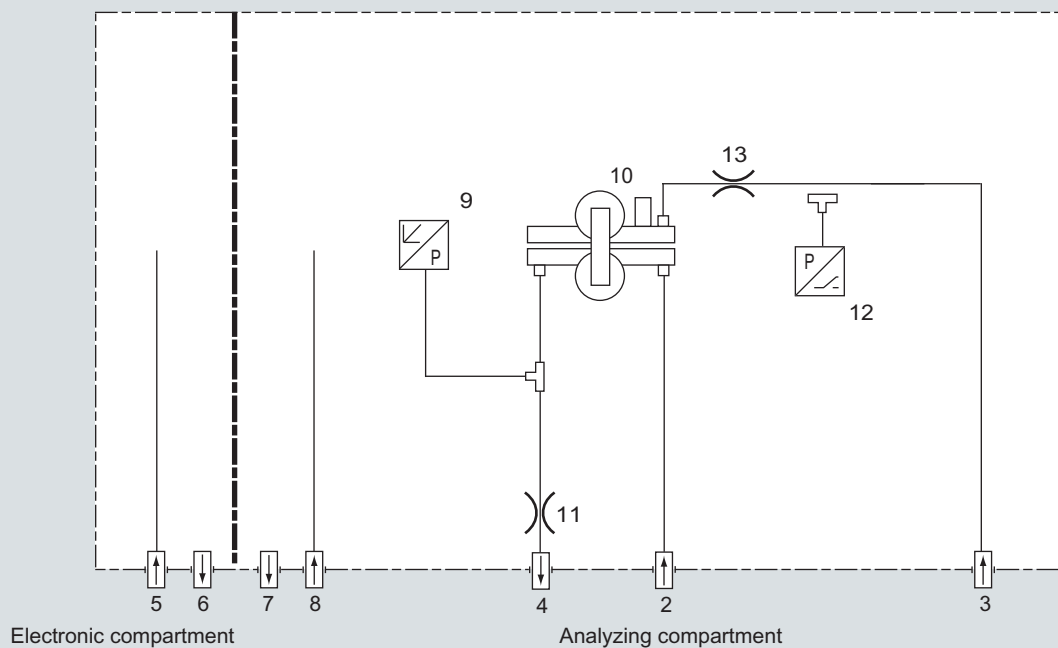
### Gas path (field device)

#### 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 <sub>2</sub> physical system                |
| 4 | Sample gas outlet                     | 11 | Restrictor in sample gas path                 |
| 5 | Purging gas inlet (electronics side)  | 12 | Flow indicator 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  $120\text{ }^\circ\text{C}$ , 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 content 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.

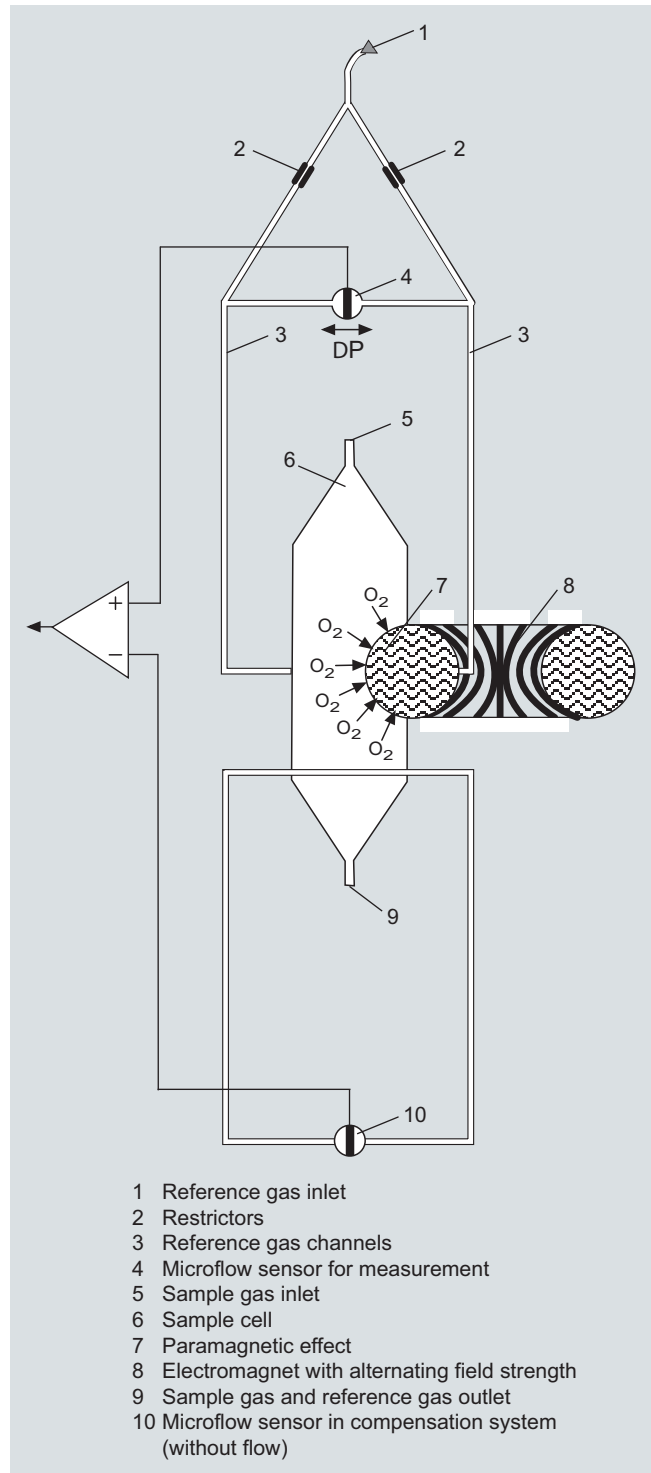
The sample chamber is directly in the sample path and has a small volume, and the microflow sensor is a low-lag sensor. This results in a very short response time for the OXYMAT 6.

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.



OXYMAT 6, principle of operation

# Continuous Gas Analyzers, extractive

## OXYMAT 6

### General information

#### 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 range calibration can be parameterized
- 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<sub>2</sub> 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

### Reference gases

Measuring range	Recommended reference gas	Reference gas connection pressure	Remarks
0 to . . . vol.% O <sub>2</sub>	N <sub>2</sub>	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 the flow-type compensation branch).
... to 100 vol.% O <sub>2</sub> (suppressed zero point with full-scale value 100 vol.% O <sub>2</sub> )	O <sub>2</sub>		
around 21 vol.% O <sub>2</sub> (suppressed zero point with 21 vol.% O <sub>2</sub> within the 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

Residual gas (concentration 100 vol.%)	Deviation from zero point in vol.% O <sub>2</sub> absolute	Residual gas (concentration 100 vol.%)	Deviation from zero point in vol.% O <sub>2</sub> absolute
<b>Organic gases</b>		<b>Inert gases</b>	
Ethane C <sub>2</sub> H <sub>6</sub>	-0,49	Helium He	+0,33
Ethene (ethylene) C <sub>2</sub> H <sub>4</sub>	-0,22	Neon Ne	+0,17
Ethine (acetylene) C <sub>2</sub> H <sub>2</sub>	-0,29	Argon Ar	-0,25
1,2 butadiene C <sub>4</sub> H <sub>6</sub>	-0,65	Krypton Kr	-0,55
1,3 butadiene C <sub>4</sub> H <sub>6</sub>	-0,49	Xenon Xe	-1,05
n-butane C <sub>4</sub> H <sub>10</sub>	-1,26		
iso-butane C <sub>4</sub> H <sub>10</sub>	-1,30	<b>Inorganic gases</b>	
1-butene C <sub>4</sub> H <sub>8</sub>	-0,96	Ammonia NH <sub>3</sub>	-0,20
iso-butene C <sub>4</sub> H <sub>8</sub>	-1,06	Hydrogen bromide HBr	-0,76
Dichlorodifluoromethane (R12) CCl <sub>2</sub> F <sub>2</sub>	-1,32	Chlorine Cl <sub>2</sub>	-0,94
Acetic acid CH <sub>3</sub> COOH	-0,64	Hydrogen chloride HCl	-0,35
n-heptane C <sub>7</sub> H <sub>16</sub>	-2,4	Dinitrogen monoxide N <sub>2</sub> O	-0,23
n-hexane C <sub>6</sub> H <sub>14</sub>	-2,02	Hydrogen fluoride HF	-0,10
Cyclo-hexane C <sub>6</sub> H <sub>12</sub>	-1,84	Hydrogen iodide HI	-1,19
Methane CH <sub>4</sub>	-0,18	Carbon dioxide CO <sub>2</sub>	-0,30
Methanol CH <sub>3</sub> OH	-0,31	Carbon monoxide CO	+0,07
n-octane C <sub>8</sub> H <sub>18</sub>	-2,78	Oxygen O <sub>2</sub>	+100
n-pentane C <sub>5</sub> H <sub>12</sub>	-1,68	Nitrogen oxide NO	+42,94
iso-pentane C <sub>5</sub> H <sub>12</sub>	-1,49	Nitrogen N <sub>2</sub>	0,00
Propane C <sub>3</sub> H <sub>8</sub>	-0,87	Nitrogen dioxide NO <sub>2</sub>	+20,00
Propylene C <sub>3</sub> H <sub>6</sub>	-0,64	Sulfur dioxide SO <sub>2</sub>	-0,20
Trichlorofluoromethane (R11) CCl <sub>3</sub> F	-1,63	Sulfur hexafluoride SF <sub>6</sub>	-1,05
Vinyl chloride C <sub>2</sub> H <sub>3</sub> Cl	-0,77	Hydrogen sulfide H <sub>2</sub> S	-0,44
Vinyl fluoride C <sub>2</sub> H <sub>3</sub> F	-0,55	Water H <sub>2</sub> O	-0,03
1,1 vinylidene chloride C <sub>2</sub> H <sub>2</sub> Cl <sub>2</sub>	-1,22	Hydrogen H <sub>2</sub>	+0,26

Table 2: Zero point error due to diamagnetism or paramagnetism of some residual gases with nitrogen as the reference gas 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:  $k = 333 \text{ K} / (9 [^{\circ}\text{C}] + 273 \text{ K})$
- with paramagnetic gases:  $k = [333 \text{ K} / (9 [^{\circ}\text{C}] + 273 \text{ K})]^2$

(all diamagnetic gases have a negative deviation from zero point)



# Continuous Gas Analyzers, extractive

## OXYMAT 6

19" rack unit

### Technical specifications

#### General

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 <sub>2</sub>
Largest possible measuring range	100 vol.% O <sub>2</sub> (for a pressure above 2 000 hPa: 25 vol.% O <sub>2</sub> )
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	Approximately 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, EN 50270 (with gas warning unit)
Electrical safety	According to EN 61010-1, over-voltage 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	500 ... 3 000 hPa absolute
• 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	2 000 ... 4 000 hPa above sample gas pressure, but max. 5 000 hPa

#### Dynamic response

Warm-up period	At room temperature < 30 min (the technical specification will be met after 2 hours)
Delayed display (T <sub>90</sub> -time)	Approximately 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 variable (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 range 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 has been switched on: < 2 % of the current measuring range/1 % pressure change When pressure compensation has been switched off: < 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	< 1 % of the smallest possible span according to rating plate 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 rated voltage ± 10 %

#### Electrical inputs and outputs

Analog output	0/2/4 ... 20 mA, isolated; load max. 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 measurement range switchover
Serial interface	RS 485
Options	AUTOCAL function each with 8 additional binary 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 (dew point must not be under-shot)

# Continuous Gas Analyzers, extractive OXYMAT 6

19" rack unit

2

Selection and ordering Data	Order No.	
<b>OXYMAT 6 gas analyzer</b> 19" rack unit for installation in cabinets	7MB2021- 0 -	Cannot be combined
<u>Gas connections</u> Pipe with 6 mm outer diameter Pipe with 1/4" outer diameter	0 1	
<u>Smallest possible span O<sub>2</sub></u> 0.5 % reference gas pressure 3 000 hPa 0.5 % reference gas pressure 100 hPa (external pump) 2 % reference gas pressure 3 000 hPa 2 % reference gas pressure 100 hPa (external pump) 5 % reference gas pressure 3 000 hPa 5 % reference gas pressure 100 hPa (external pump)	A B C D E F	A → E30 B → E30, Y02 D → E30, Y02 F → E30, Y02
<u>Sample chamber</u> Non-flow-type compensation branch • Made of stainless steel, mat. no. 1.4571 • Made of tantalum Flow-type compensation branch • Made of stainless steel, mat. no. 1.4571 • Made of tantalum	A B C D	C D
<u>Internal gas paths</u> Hose made of FKM (Viton) Pipe made of titanium Pipe made of stainless steel, mat. no. 1.4571	0 1 2	1 → Y02 2
<u>Auxiliary power</u> 100 ... 120 V AC, 48 ... 63 Hz 200 ... 240 V AC, 48 ... 63 Hz	0 1	
<u>Monitoring (reference gas, sample gas)</u> without Reference gas only Reference gas and sample gas (with flow indicator and pressure switch for sample gas) Sample gas only	A B C D	A → E30 C → E30 D → E30
<u>Supplementary electronics</u> without AUTOCAL function • With 8 additional binary inputs/outputs • With serial interface for the automotive industry (AK) • With 8 additional binary inputs/outputs and PROFIBUS PA interface • With 8 additional binary inputs/outputs and PROFIBUS DP interface	A B D E F	D → E20
<u>Language</u> German English French Spanish Italian	0 1 2 3 4	
<b>Further versions</b>	<b>Order code</b>	Cannot be combined
Add "-Z" to Order No. and specify order codes.		
Telescopic rails (2 units)	A31	
Kalrez gaskets in sample gas path	B01	
TAG labels (specific inscription based on customer information)	B03	
CSA certificate – Class I Div 2	E20	→ E30
ATEX II G certificate; safety-related measurements in non-hazardous gas zone	E30	→ E20
Clean for O <sub>2</sub> service (specially cleaned gas path)	Y02	
Measuring range indication in plain text, if different from the standard setting	Y11	

# Continuous Gas Analyzers, extractive OXYMAT 6

19" rack unit

## Selection and ordering Data

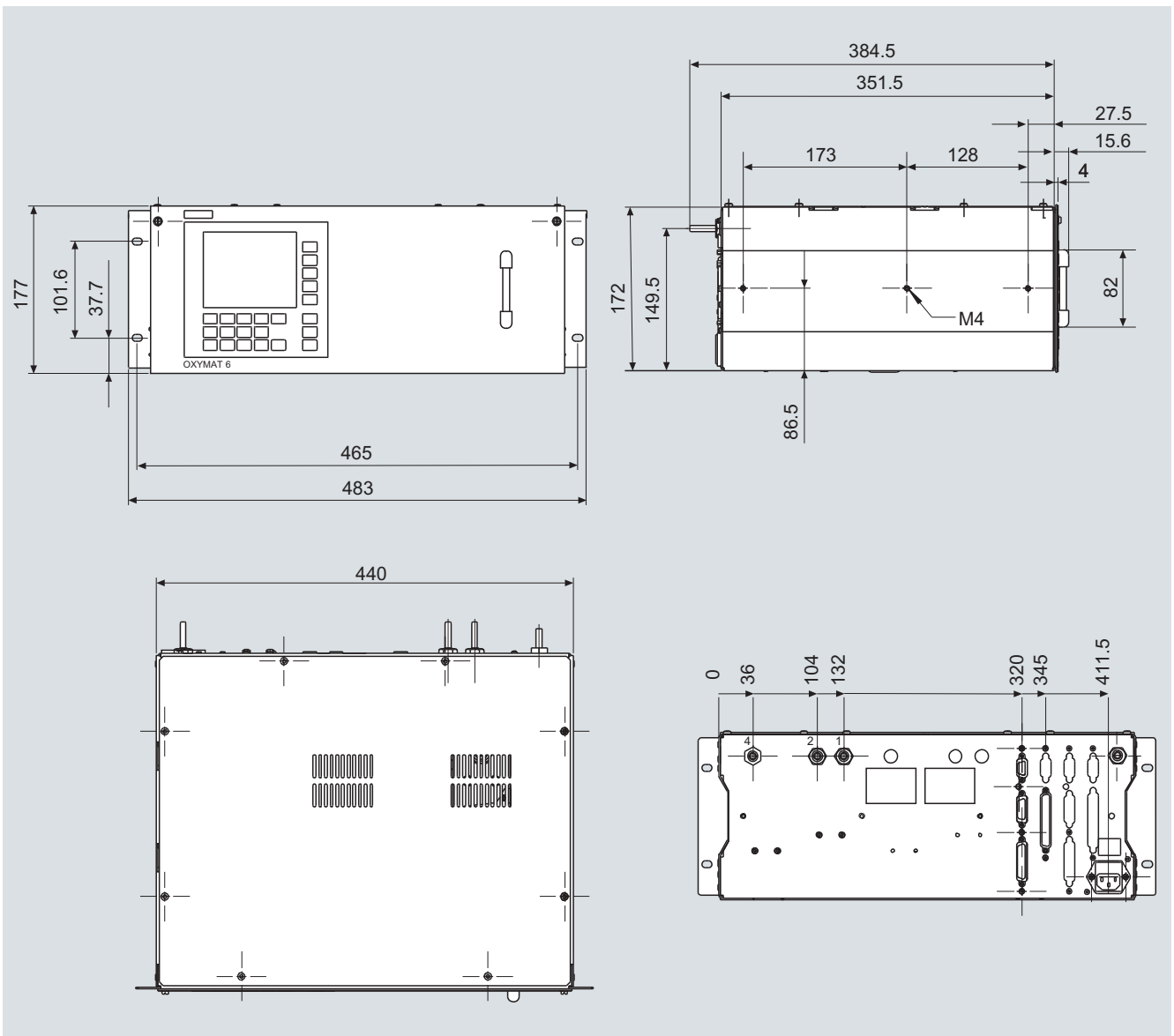
### Retrofit kits

- RS 485/Ethernet converter
- RS 485/RS 232 converter
- RS 485/USB converter
- AUTOCAL function with serial interface for the automotive industry (AK)
- AUTOCAL function with 8 binary inputs/outputs
- AUTOCAL function with 8 binary inputs/outputs and PROFIBUS PA
- AUTOCAL function with 8 binary inputs/outputs and PROFIBUS DP
- E) Subject to export regulations AL: 91999, ECCN: EAR99

### Order No.

- A5E00852383**
- C79451-Z1589-U1**
- A5E00852382**
- E) **C79451-A3480-D512**
- C79451-A3480-D511**
- A5E00057307**
- A5E00057312**

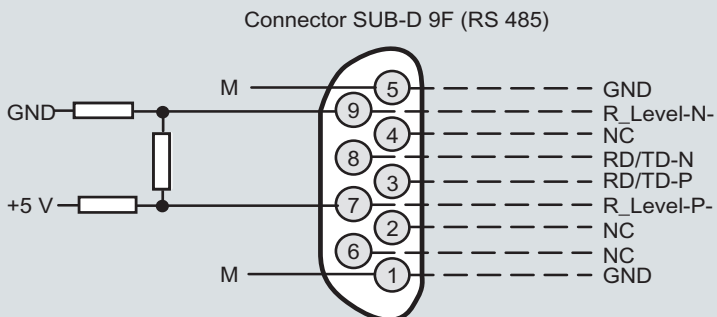
## Dimensional drawings



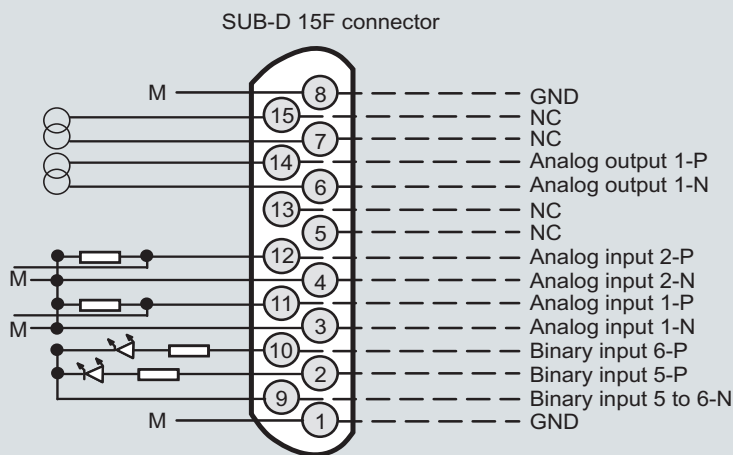
OXYMAT 6, 19" unit, dimensions in mm

**Schematics**

*Pin assignment (electrical and gas connections)*

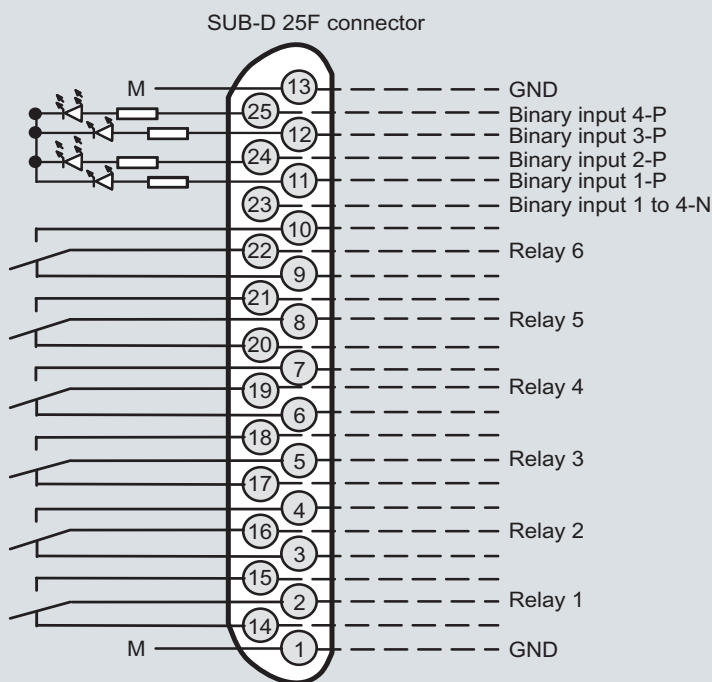


It is possible to connect bus terminating resistors to pins 7 and 9.



Analog outputs isolated (also from each other),  $R_L \leq 750 \Omega$

Correction of pressure or cross-interference } Analog inputs non-isolated, 0 ... 20 mA/500  $\Omega$   
 Correction of cross-interference } or 0 ... 10 V (low resistance)  
 Correction of cross-interference }



Isolated via optocoupler  
 "0" = 0 V (0 ... 4.5 V)  
 "1" = 24 V (13 ... 33 V)

Contact load  
 max. 24 V/1 A, AC/DC  
 relay contacts shown:  
 relay coil has zero current

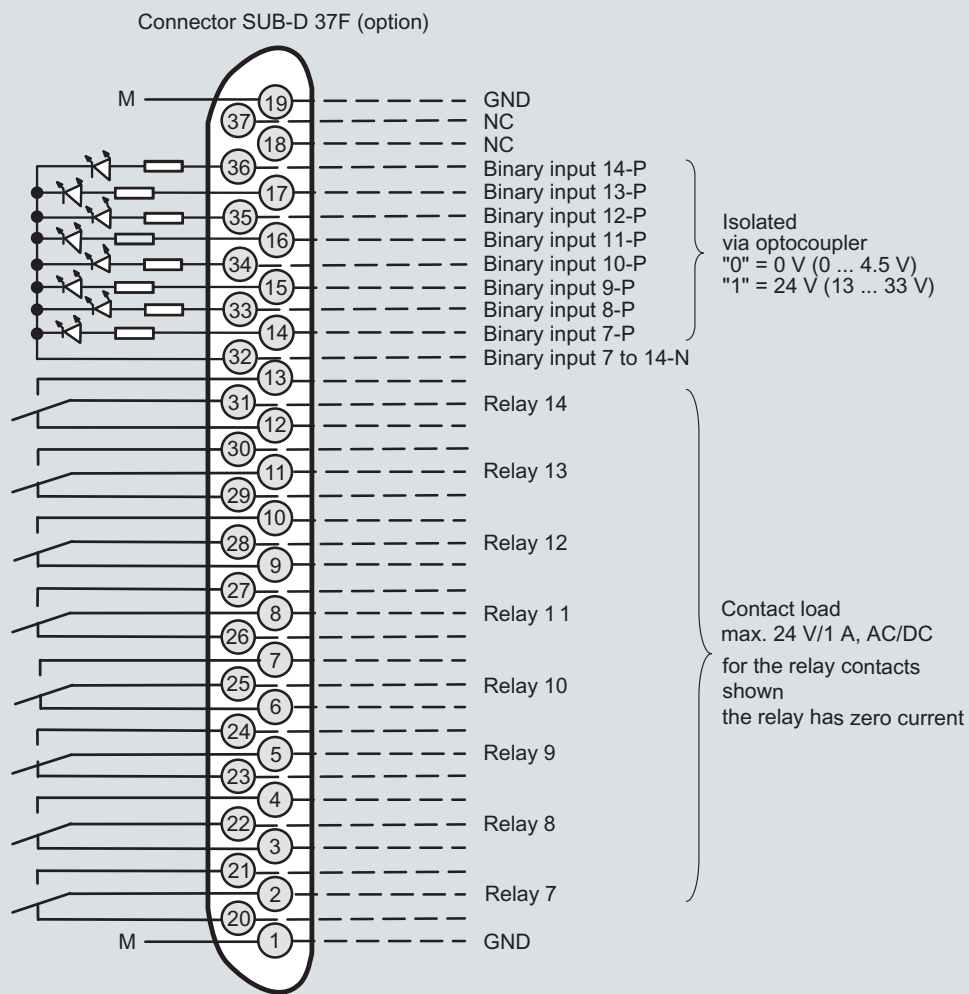
Note:  
 All cables to the connectors or terminal blocks must be shielded and rest against the enclosure potential.

OXYMAT 6, 19" unit, pin assignment

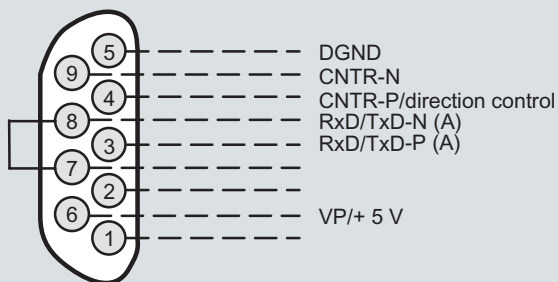
# Continuous Gas Analyzers, extractive OXYMAT 6

19" rack unit

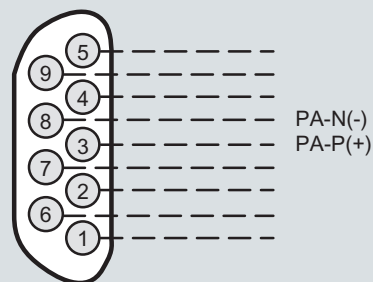
2



Connector SUB-D 9F -X90 optional PROFIBUS DP



Connector SUB-D 9M -X90 PROFIBUS PA

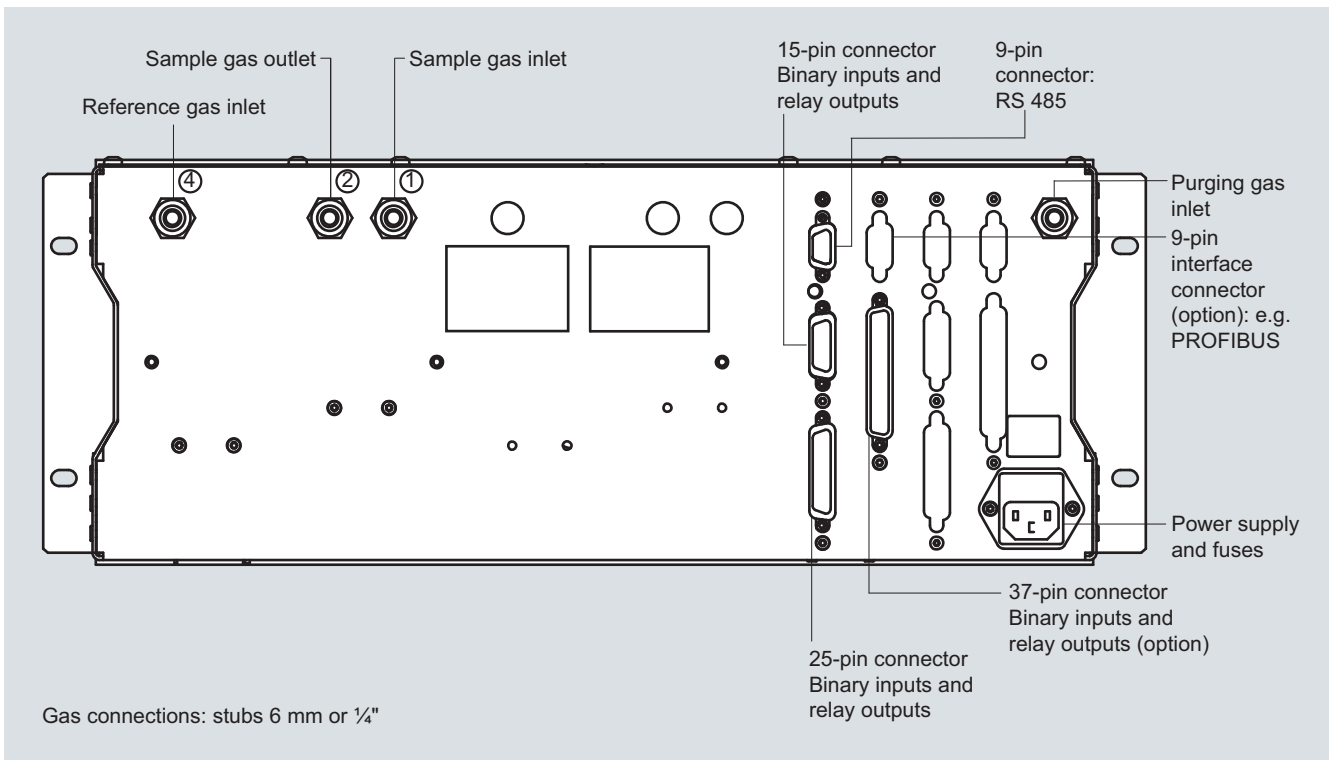


Note:  
All cables to the connectors or terminal blocks must be shielded and rest against the enclosure potential.

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

# Continuous Gas Analyzers, extractive OXYMAT 6

19" rack unit



OXYMAT 6, 19" unit, gas and electrical connections

# Continuous Gas Analyzers, extractive

## OXYMAT 6

### Field device

#### Technical specifications

##### General

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 <sub>2</sub>
Largest possible measuring range	100 vol.% O <sub>2</sub> (for a pressure above 2 000 hPa: 25 vol.% O <sub>2</sub> )
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	Approximately 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	Approximately 35 VA; approximately 330 VA for heated version
EMC (Electromagnetic Compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98), EN 61326, EN 50270 (with gas warning unit)
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	2 000 ... 4 000 hPa above sample gas pressure, but max. 5 000 hPa
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	<ul style="list-style-type: none"> <li>• Min. 0 ... max. 50 °C, but above the dew point (unheated)</li> <li>• 15 °C above temperature analyzer unit (heated)</li> </ul>
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 <sub>90</sub> -time)	< 1,5 sec
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 range 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 has been switched off: < 2 % of the current measuring range/1 % pressure change When pressure compensation has been 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	< 1 % of the smallest possible 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
Auxiliary power	< 0.1 % of the current measuring range with rated voltage ± 10 %

### Electrical inputs and outputs

Analog output	0/2/4 ... 20 mA, isolated; load max. 750 $\Omega$
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 measurement range switchover
Serial interface	RS 485
Options	AUTOCAL function each with 8 additional binary 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 % relative humidity (maximum accuracy achieved after 2 hours) within average annual value, during storage and transportation (dew point must not be undershot)



# Continuous Gas Analyzers, extractive OXYMAT 6

## Field device

2

### Selection and ordering Data

### Order No.

**OXYMAT 6 gas analyzer**  
for field installation

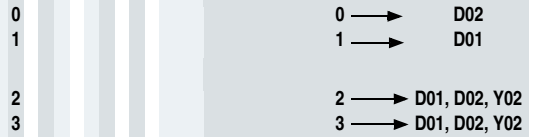
7MB2011- **0** -

Cannot be combined

#### 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
- Pipe with 1/4" outer diameter



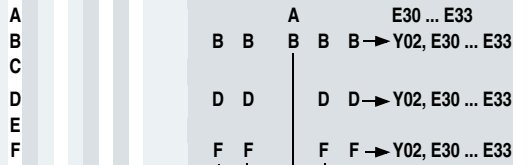
Ferrule screw connection made of titanium

- Pipe with 6 mm outer diameter
- Pipe with 1/4" outer diameter

Piping and gas connections made of Hastelloy C22:  
7MB2011-0/1... + Order code D01 or D02

#### Smallest possible span O<sub>2</sub>

- 0.5 % reference gas pressure 3 000 hPa
- 0.5 % reference gas pressure 100 hPa (external pump)
- 2 % reference gas pressure 3 000 hPa
- 2 % reference gas pressure 100 hPa (external pump)
- 5 % reference gas pressure 3 000 hPa
- 5 % reference gas pressure 100 hPa (external pump)



#### Sample chamber

Non-flow-type compensation branch

- Made of stainless steel, mat. no. 1.4571
- Made of tantalum

Flow-type compensation branch

- Made of stainless steel, mat. no. 1.4571
- Made of tantalum



#### Heating of internal gas paths and analyzer unit

without

With (65 ... 130 °C)



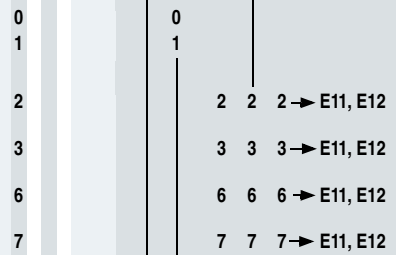
#### Auxiliary power

Standard unit and acc. to ATEX II 3G version (Zone 2)

- 100 ... 120 V AC, 48 ... 63 Hz
- 200 ... 240 V AC, 48 ... 63 Hz

ATEX II 2G versions (Zone 1), incl. certificate

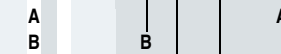
- 100 ... 120 V AC, 48 ... 63 Hz, according to ATEX II 2G<sup>1)</sup> (operating mode: leakage compensation)
- 200 ... 240 V AC, 48 ... 63 Hz, according to ATEX II 2G<sup>1)</sup> (operating mode: leakage compensation)
- 100 ... 120 V AC, 48 ... 63 Hz, according to ATEX II 2G<sup>1)</sup> (operating mode: continuous purging)
- 200 ... 240 V AC, 48 ... 63 Hz, according to ATEX II 2G<sup>1)</sup> (operating mode: continuous purging)



#### Reference gas monitoring

without

With

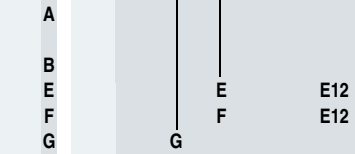


#### Supplementary electronics

without

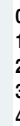
AUTOCAL function

- With 8 additional binary inputs and 8 additional relay outputs
- With 8 additional binary inputs/outputs and PROFIBUS PA interface
- With 8 additional binary inputs/outputs and PROFIBUS DP interface
- With 8 additional binary inputs/outputs and PROFIBUS PA Ex-i



#### Language

- German
- English
- French
- Spanish
- Italian



<sup>1)</sup> See also next page, "Additional units for Ex versions".

### Selection and ordering Data

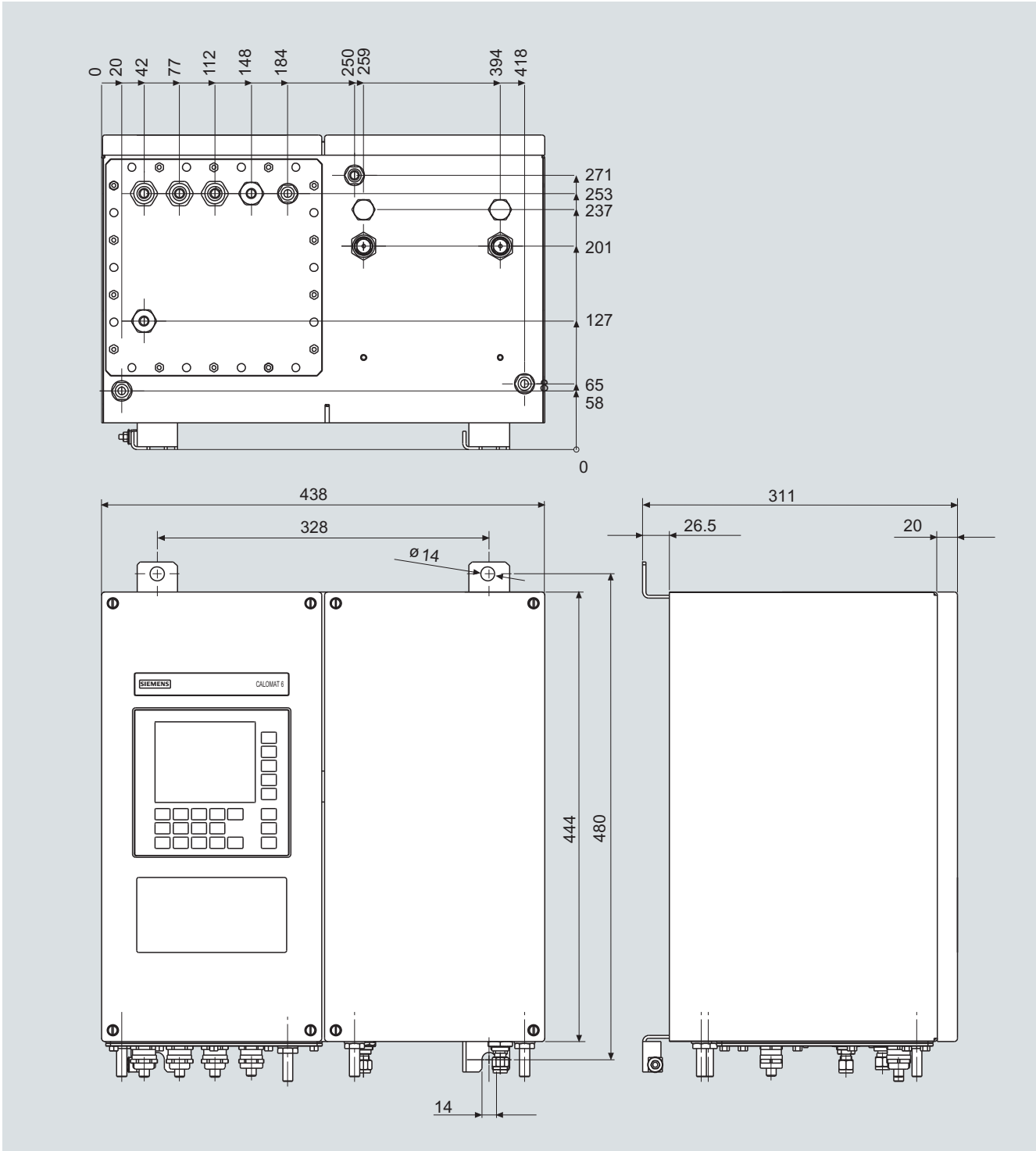
<i>Further versions</i>	<b>Order code</b>	Cannot be combined
Add "-Z" to Order No. and specify order codes.		
Kalrez gaskets in sample gas path	<b>B01</b>	
TAG labels (specific inscription based on customer information)	<b>B03</b>	
Gas connections and piping made of Hastelloy C22		
• Outer diameter 6 mm	<b>D01</b>	→ <b>E20</b>
• Outer diameter 1/4"	<b>D02</b>	→ <b>E20</b>
<u>Ex versions</u>		
For possible combinations, see Table "Ex configurations – principle selection criteria", Page 6/14		
ATEX II 3G certificate; restricted breathing enclosure, non-flammable gases	<b>E11</b>	
ATEX II 3G certificate; flammable gases	<b>E12</b>	
CSA certificate – Class I Div 2	<b>E20</b>	
ATEX II G certificate; safety-related measurements		
• In non-hazardous gas zone	<b>E30</b>	
• In Ex zone acc. to ATEX II 2G, leakage compensation	<b>E31</b>	
• In Ex zone acc. to ATEX II 2G, continuous purging	<b>E32</b>	
• In Ex zone acc. to ATEX II 3G, flammable and non-flammable gases	<b>E33</b>	
- Extended element with heated units; 110/120 V	<b>E38</b>	
- Extended element with heated units; 220/240 V	<b>E39</b>	
ATEX II 3D certificate; potentially explosive dust atmospheres		
• In non-hazardous gas zone	<b>E40</b>	
• In Ex zone acc. to ATEX II 3G, non-flammable gases	<b>E41</b>	
Clean for O <sub>2</sub> service (specially cleaned gas path)	<b>Y02</b>	
Measuring range indication in plain text, if different from the standard setting	<b>Y11</b>	
<u>Additional units for Ex versions</u>	<b>Order No.</b>	
<u>Category ATEX II 2G (zone 1)</u>		
BARTEC EEx p control unit, 230 V, "leakage compensation"	<b>7MB8000-2BA</b>	
BARTEC EEx p control unit, 115 V, "leakage compensation"	<b>7MB8000-2BB</b>	
BARTEC EEx p control unit, 230 V, "continuous purging"	<b>7MB8000-2CA</b>	
BARTEC EEx p control unit, 115 V, "continuous purging"	<b>7MB8000-2CB</b>	
Ex isolation amplifier	<b>7MB8000-3AA</b>	
Ex isolating relay, 230 V	<b>7MB8000-4AA</b>	
Ex isolating relay, 110 V	<b>7MB8000-4AB</b>	
Differential pressure switch for corrosive and non-corrosive gases	F) <b>7MB8000-5AA</b>	
Stainless steel flame arrestor	<b>7MB8000-6BA</b>	
Hastelloy flame arrestor	<b>7MB8000-6BB</b>	
<u>Category ATEX II 3G (zone 2)</u>		
BARTEC EEx p control unit, 230 V, "continuous purging"	<b>7MB8000-2CA</b>	
BARTEC EEx p control unit, 115 V, "continuous purging"	<b>7MB8000-2CB</b>	
<u>FM/CSA (Class I Div. 2)</u>		
Ex purging unit MiniPurge FM	<b>7MB8000-1AA</b>	
<u>Retrofit kits</u>		
RS 485/Ethernet converter	<b>A5E00852383</b>	
RS 485/RS 232 converter	<b>C79451-Z1589-U1</b>	
RS 485/USB converter	<b>A5E00852382</b>	
AUTOCAL function with 8 binary inputs/outputs	<b>A5E00064223</b>	
AUTOCAL function with 8 binary inputs/outputs and PROFIBUS PA	<b>A5E00057315</b>	
AUTOCAL function with 8 binary inputs/outputs and PROFIBUS DP	<b>A5E00057318</b>	
AUTOCAL function with 8 binary inputs/outputs and PROFIBUS PA Ex i (firmware 4.1.10 required)	<b>A5E00057317</b>	
F) Subject to export regulations AL: N, ECCN: EAR99H		

# Continuous Gas Analyzers, extractive OXYMAT 6

Field device

## Dimensional drawings

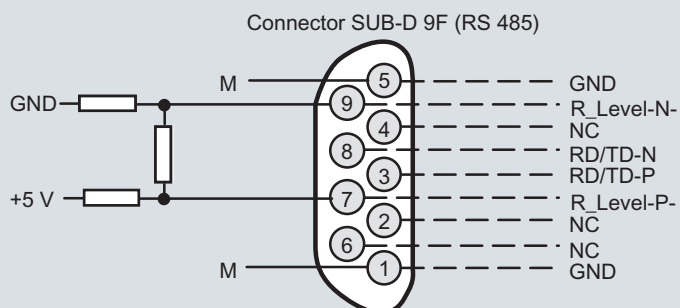
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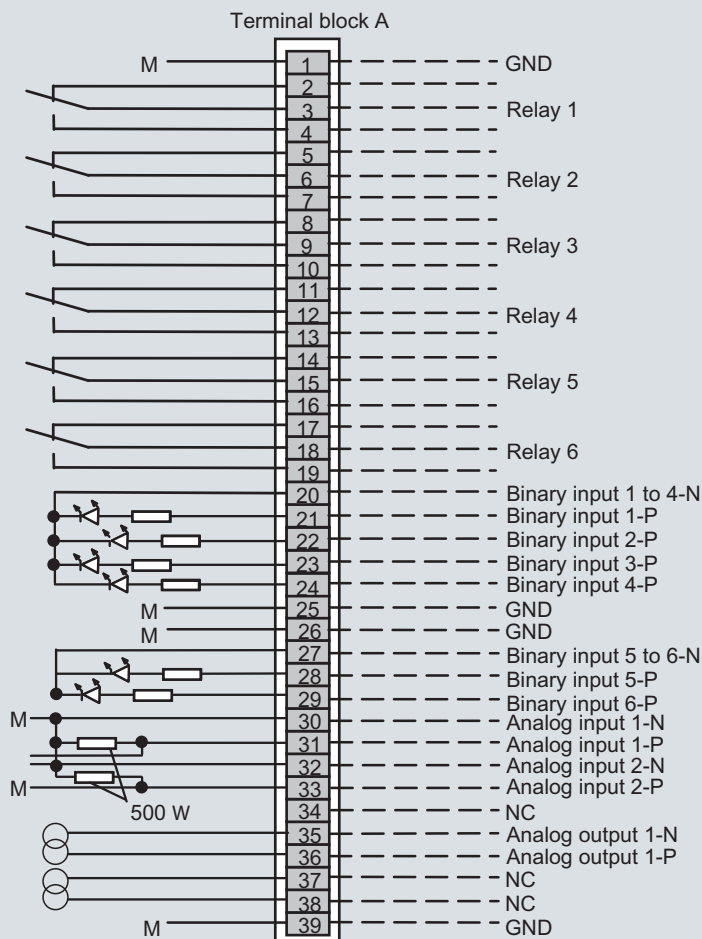
OXYMAT 6, field unit, dimensions in mm

## Schematics

### Pin assignment (electrical and gas connections)



It is possible to connect bus terminating resistors to pins 7 and 9.



Contact load max.  
24 V/1 A, AC/DC; relay contacts shown: relay coil has zero current

Isolated via optocoupler  
"0" = 0 V (0 ... 4.5 V)  
"1" = 24 V (13 ... 33 V)

Isolated via optocoupler  
"0" = 0 V (0 ... 4.5 V)  
"1" = 24 V (13 ... 33 V)  
Correction of cross-interference  
Pressure correction  
Analog inputs non-isolated, 0 ... 20 mA or 0 ... 10 V (internal resistance ≤ 500 Ω)  
Analog outputs isolated

Note:  
All cables to the connectors or terminal blocks must be shielded and rest against the enclosure potential.

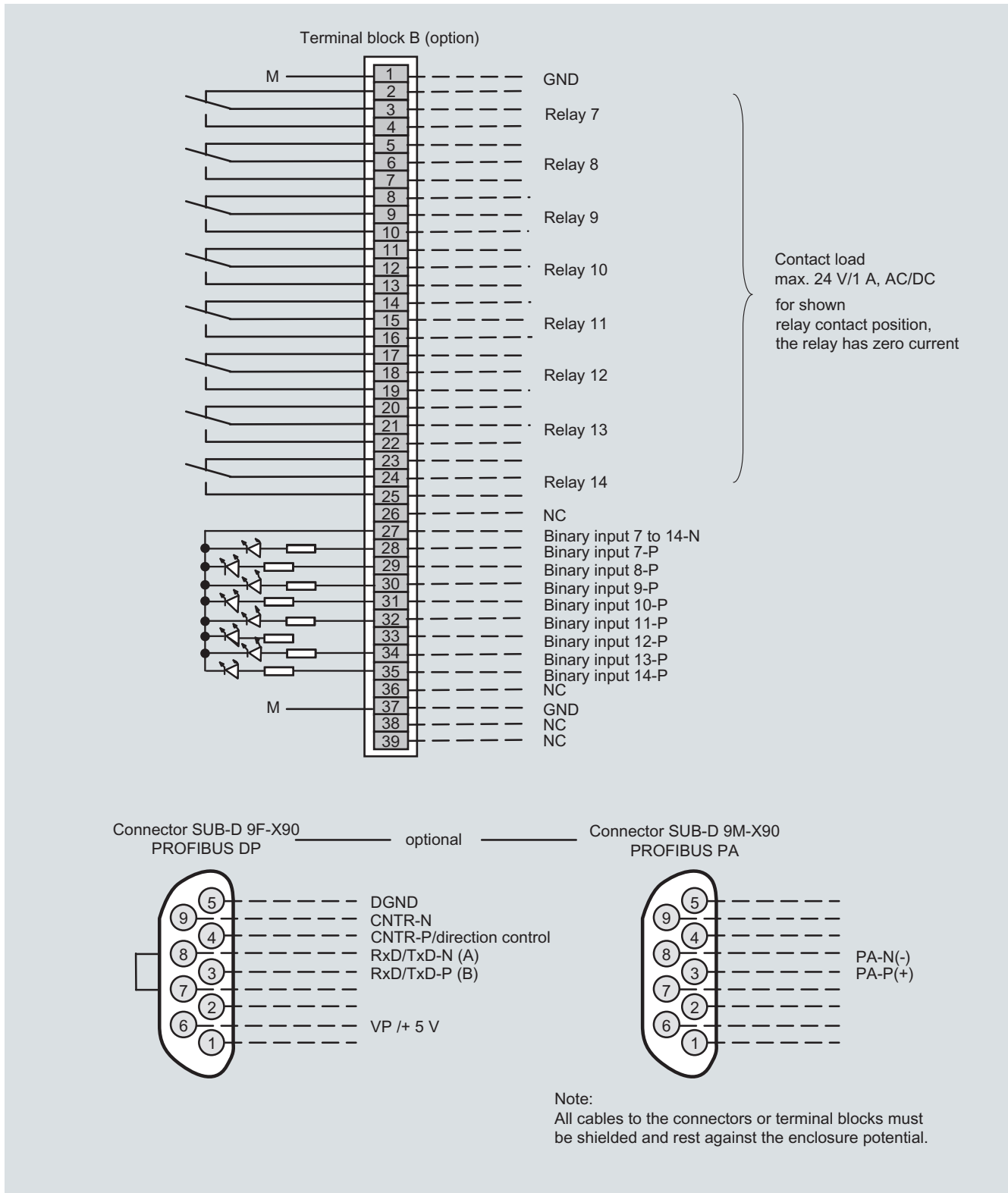
OXYMAT 6, field unit, connector and terminal assignment

2

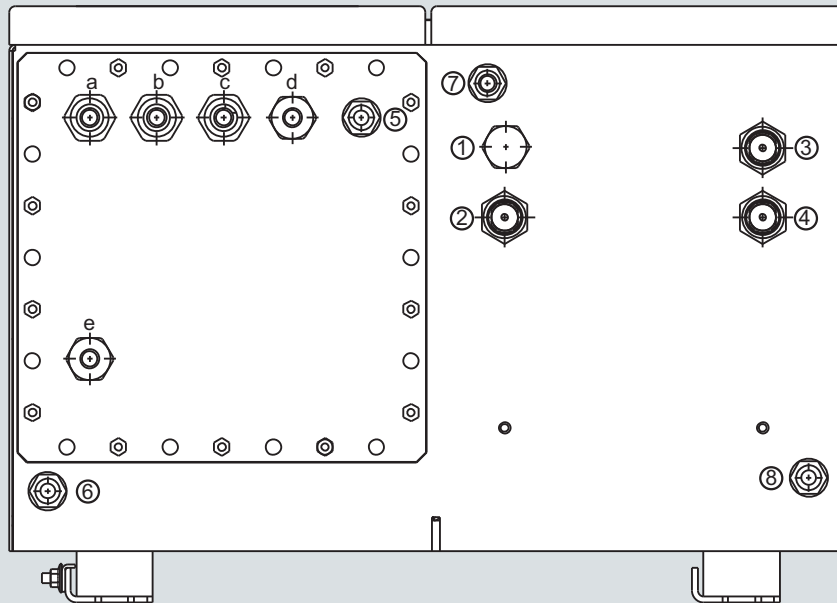
# Continuous Gas Analyzers, extractive OXYMAT 6

Field device

2



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



Gas connections

- |     |   |   |
|-----|---|---|
| ①   | not used  | } Clamping gland for pipe<br>Ø 6 mm or 1/4" |
| 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)<br>(analog + digital): cable gland M20x1.5 |
| d     | Interface connection: (Ø 7 ... 12 mm)<br>cable gland M20x1.5             |
| e     | Power supply: (Ø 7 ... 12 mm)<br>cable gland M20x1.5                     |

OXYMAT 6, field unit, gas and electrical connections

# Continuous Gas Analyzers, extractive

## OXYMAT 6

### Documentation

#### Selection and ordering Data (Paper)

Manual	Order No.
<b>ULTRAMAT 6/OXYMAT 6</b> Gas analyzer for IR-absorbing gases and oxygen	
• German	<b>C79000-G5200-C143</b>
• English	<b>C79000-G5276-C143</b>
• French	<b>C79000-G5277-C143</b>
• Spanish	<b>C79000-G5278-C143</b>
• Italian	<b>C79000-G5272-C143</b>

2

#### Selection and ordering Data

Description	7MB2021	7MB2011	7MB2011 Ex	2 years (quantity)	5 years (quantity)		Order No.
<b>Analyzer unit</b>							
O ring (sample cell)	x	x	x	2	4	D)	C71121-Z100-A159
O ring (fitting)	x			1	2	D)	C74121-Z100-A6
O-ring (measuring head)	x	x	x	2	4	D)	C79121-Z100-A32
Spacer		x	x	-	1	D)	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	D)	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	C)	C79451-A3474-B606
Temperature sensor		x	x	-	1		C79451-A3480-B25
Heating cartridge		x	x	-	1		W75083-A1004-F120
<b>Messgasweg</b>							
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
<b>Elektronik</b>							
Temperature controller - electronics, 230 V AC		x	x	-	1	D)	A5E00118527
Temperature controller - electronics, 115 V AC		x	x	-	1		A5E00118530
Fusible element (analyzer fuse) T 0.125 A/250 V			x	1	2	D)	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	F)	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	4		W79054-L1010-T630
Fusible element, T 1 A/250 V	x	x	x	2	4		W79054-L1011-T100
Fusible element, T 2.5 A/250 V		x	x	2	3	D)	W79054-L1011-T250

C) Subject to export regulations AL: N, ECCN: EAR99

D) Subject to export regulations AL: 9I999, ECCN: N

F) Subject to export regulations AL: N, ECCN: EAR99H

If the OXYMAT 6 is supplied with a specially cleaned gas path for high oxygen context ("Cleaned for O<sub>2</sub> 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.