

### Overview

The measuring principle of the OXYMAT 61 gas analyzer is based on the paramagnetic alternating pressure method and is used to measure oxygen in gases in standard applications.



OXYMAT 61

### Benefits

- Integrated pump for reference gas circulation (option e.g. ambient air)
- High linearity
- Compact design
- Possibility of physical elevated zero.

### Application

#### Application areas

- Environmental protection
- Boiler control in firing systems
- Quality monitoring (e.g. in ultra-pure gas)
- Process exhaust monitoring
- Process optimization.

#### Further applications

- Chemical plants
- Gas manufacturers
- Research and development.

### Design

- 19" unit with 4 HU for installation
  - in hinged frames
  - in cabinets, with or without slide rails
- Front panel for service can be hinged down (laptop connection)
- Gas connections for sample gas input and output: pipe diameter 6 mm or 1/4"
- Gas and electrical connections at the rear.

#### Display and control panel

- Large LCD panel for simultaneous display of:
  - Measured value
  - Status line
  - Measuring ranges
- Contrast of LCD panel adjustable via menu
- Permanent LED backlighting
- Washable membrane keyboard with five softkeys
- Menu-based operation for configuration, test functions and calibration
- User help in plain text
- Graphic display of concentration trend; programmable time intervals.

#### Inputs and outputs

- Six binary inputs freely configurable (e.g. for range switching, processing of external signals from sample preparation)
- Six relay outputs freely configurable (failure, maintenance request, maintenance switch, limit alarm, external solenoid valves)
- Two programmable analog inputs (e.g. cross interference correction, external pressure sensor)
- Extension with eight additional binary inputs and eight additional relay outputs for automatic calibration with up to four calibration gases.

#### Communication

- RS 485 included in basic unit (connection at the rear).

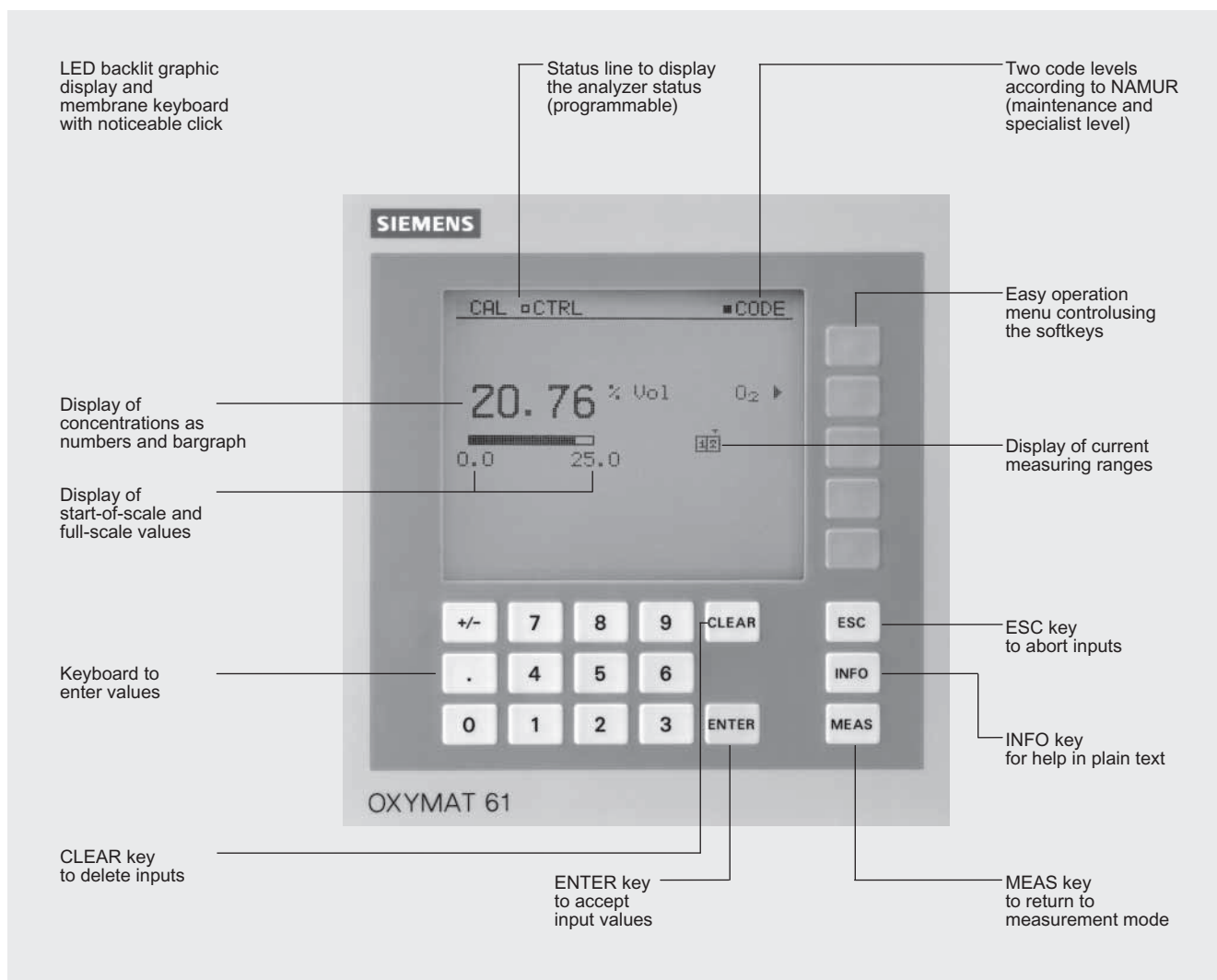
#### Options

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

# Continuous Gas Analyzers, extractive OXYMAT 61

## General

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OXYMAT 61, membrane keyboard and graphic display

### Verions –Wetted parts, standard

Gas path		19" unit
with hoses	Connection Hose Sample cell Stub sample cell Restrictor O-rings Hose coupling	SS, type No. 1.4571 Viton SS, type No. 1.4571 SS, type No. 1.4571 Teflon Viton Polyamide 6

# Continuous Gas Analyzers, extractive

## OXYMAT 61

General

### Options

Flowmeter	Metering pipe Float Float limit Elbows	Duran glass Duran glass, black Teflon Viton
Sample gas pressure switch	Membrane Enclosure	Viton PA 6.3T

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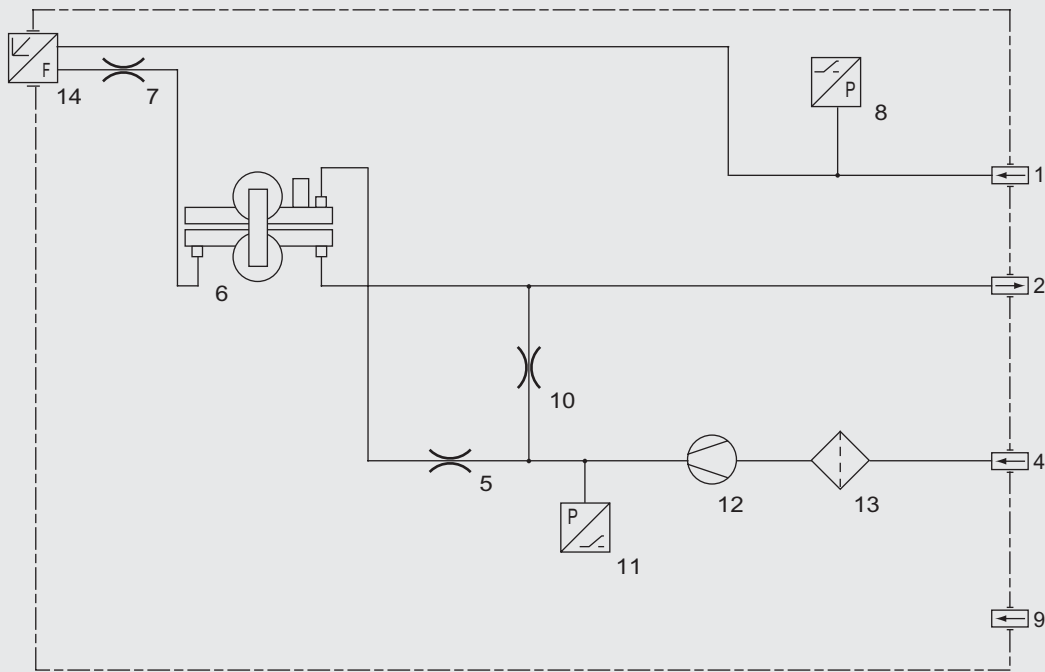
# Continuous Gas Analyzers, extractive OXYMAT 61

## General

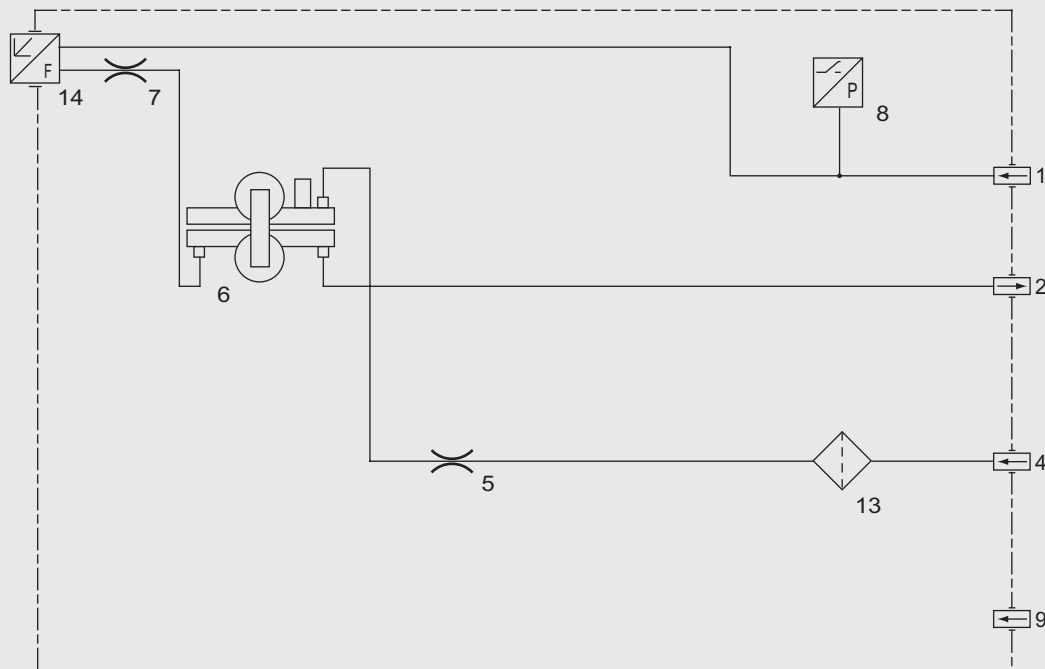
### Gas path

#### Keys to 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 Restrictor in reference gas path (outlet)    |
| 4 Reference gas inlet              | 11 Pressure switch for reference gas monitoring |
| 5 Restrictor in reference gas path | 12 Pump   |
| 6 O <sub>2</sub> bench             | 13 Filter                                       |
| 7 Restrictor in sample gas path    | 14 Flowmeter in sample gas path (option)        |



Gas path OXYMAT 61 with integrated reference gas pump (connection for 100 hPa)



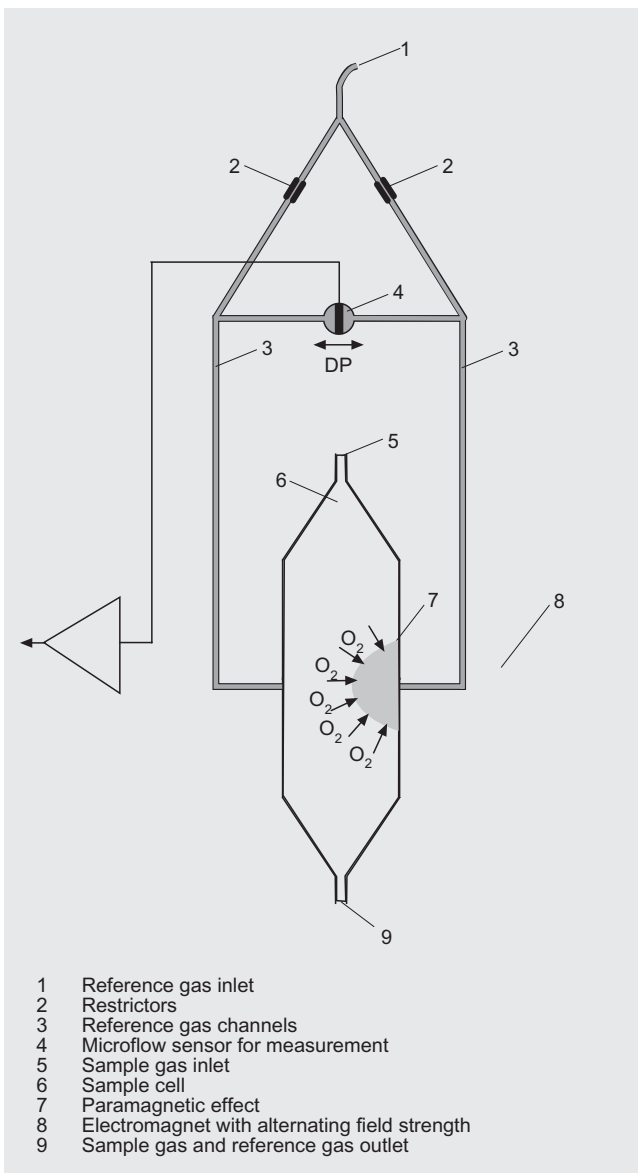
Gas path OXYMAT 61 with reference gas connection 3000 to 4000 hPa

### Function

In contrast to almost all other gases, oxygen is paramagnetic. This property is utilized as the measuring principle by the OXYMAT 61 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 concentrations meet in a magnetic field, a pressure difference is produced between them.

In the case of OXYMAT 61, 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 concentration, causes a cross flow. This flow is converted into an electric signal by a microflow sensor (4).



OXYMAT 61, mode of operation

The microflow sensor consists of two nickel grids heated to approx. 120 °C which form a Wheatstone bridge together with two supplementary resistors. The pulsating flow results in a change in the resistance of the Ni grids. This results in a bridge offset which depends on the oxygen concentration in 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 flow 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 orientation.

The sample cell is directly in the sample path and has a small volume. The microflow sensor thus responds quickly, resulting in a very short response time for the OXYMAT 61.

### Note

The sample gas needs to be free of dust. Condensate in the cells must be avoided. That is why the most measuring tasks require an appropriate gas preparation.

### Essential characteristics

- Four freely-parameterizable measuring ranges, also with zero offset, all measuring ranges linear
- Electrically isolated signal output selectable as 0/2/4 to 20 mA (also inverted)
- Autoranging or manual range switching possible; remote switching is also possible
- Storage of measured values possible during calibration
- Time constants selectable within wide limits (static/dynamic noise suppression); i.e. the response time of the analyzer can be matched to the respective application
- Simple handling using menu-based operation
- Low long-term drift
- Two operation levels with separate access code to prevent unintentional and unauthorized inputs
- Automatic range calibration can be parameterized
- Operation based on NAMUR Recommendation
- Monitoring of sample gas (option)
  - Customer acceptance
  - TAG labels
  - Drift recording
- Simple handling using a digital membrane keyboard and menu-based operation
- Short response time
- Reference gas supply external ( $N_2$ ,  $O_2$  or air, approx. 3000 hPa) or via an integrated reference gas pump (ambient air, approx. 100 hPa)
- Monitoring of reference gas with reference gas connection 3000 to 4000 hPa
- Different smallest spans, depending on version 2.0% or 5.0%  $O_2$
- Internal pressure sensor to correct sample gas variations.

# Continuous Gas Analyzers, extractive

## OXYMAT 61

### General

#### Correction of zero error / Cross-interferences

Residual gas (concentration 100 % v/v)	Zero deviation in % v/v O <sub>2</sub> absolute
<b>Organic gases</b>	
Acetic acid CH <sub>3</sub> COOH	-0.64
Acetylene C <sub>2</sub> H <sub>2</sub>	-0.29
1,2 butadiene C <sub>4</sub> H <sub>6</sub>	-0.65
1,3 butadiene C <sub>4</sub> H <sub>6</sub>	-0.49
iso-butane C <sub>4</sub> H <sub>10</sub>	-1.30
n-butane C <sub>4</sub> H <sub>10</sub>	-1.26
1-butene C <sub>4</sub> H <sub>6</sub>	-0.96
iso-butene C <sub>4</sub> H <sub>8</sub>	-1.06
Cyclo-hexane C <sub>6</sub> H <sub>12</sub>	-1.84
Dichlorodifluoromethane (R12) CCl <sub>2</sub> F <sub>2</sub>	-1.32
Ethane C <sub>2</sub> H <sub>6</sub>	-0.49
Ethylene C <sub>2</sub> H <sub>4</sub>	-0.22
n-heptane C <sub>7</sub> H <sub>16</sub>	-2.4
n-hexane C <sub>6</sub> H <sub>14</sub>	-2.02
Methane CH <sub>4</sub>	-0.18
Methanol CH <sub>3</sub> OH	-0.31
n-octane C <sub>8</sub> H <sub>18</sub>	-2.78
n-pentane C <sub>5</sub> H <sub>12</sub>	-1.68
iso-pentane C <sub>5</sub> H <sub>12</sub>	-1.49
Propane C <sub>3</sub> H <sub>8</sub>	-0.87
Propylene C <sub>3</sub> H <sub>6</sub>	-0.64
Trichlorofluoromethane (R11) CCl <sub>3</sub> F	-1.63
Vinyl chloride C <sub>2</sub> H <sub>3</sub> Cl	-0.77
Vinyl fluoride C <sub>2</sub> H <sub>3</sub> F	-0.55
1,1 vinylidene chloride C <sub>2</sub> H <sub>2</sub> Cl <sub>2</sub>	-1.22

Residual gas (concentration 100 % v/v)	Zero deviation in % v/v O <sub>2</sub> absolute
<b>Inert gases</b>	
Argon Ar	-0.25
Helium He	+0.33
Krypton Kr	-0.55
Neon Ne	+0.17
Xenon Xe	-1.05
<b>Anorganic gases</b>	
Ammonia NH <sub>3</sub>	-0.20
Carbon dioxide CO <sub>2</sub>	-0.30
Carbon monoxide CO	+0.07
Chlorine Cl <sub>2</sub>	-0.94
Dinitrogen monoxide N <sub>2</sub> O	-0.23
Hydrogen H <sub>2</sub>	+0.26
Hydrogen bromide HBr	-0.76
Hydrogen chloride HCl	-0.35
Hydrogen fluoride HF	-0.10
Hydrogen iodide HI	-1.19
Hydrogen sulphide H <sub>2</sub> S	-0.44
Oxygen O <sub>2</sub>	+100
Nitrogen N <sub>2</sub>	0.00
Nitrogen dioxide NO <sub>2</sub>	+20.00
Nitrogen oxide NO	+42.94
Sulphur dioxide SO <sub>2</sub>	-0.20
Sulphur hexafluoride SF <sub>6</sub>	-1.05
Water H <sub>2</sub> O	-0.03

Zero error due to diamagnetism or paramagnetism of residual gases with nitrogen as the reference gas at 60 °C and 1000 hPa absolute (according to IEC 1207/3)

#### Conversion to other temperatures:

The zero errors mentioned in Table 2 must be multiplied with a correction factor (k):

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

(all diamagnetic gases have a negative zero error).

#### Reference gases

Measuring range	Recommended reference gas	Refer. gas connection pressure	Remarks
0 to ... % v/v O <sub>2</sub>	N <sub>2</sub>	2000 to 4000 hPa above sample gas pressure (max. 5000 hPa absolute)	The reference gas flow is set automatically to 5 to 10 ml/min (up to 20 ml/min when also flowing through compensation branch)
... to 100% v/v O <sub>2</sub> (physical elevated zero with full-scale value 100% v/v O <sub>2</sub> )	O <sub>2</sub>		
Around 21% v/v O <sub>2</sub> (physical elevated zero with 21% v/v 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	

# Continuous Gas Analyzers, extractive

## OXYMAT 61

19" unit

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### Technical specifications

#### General

Measuring ranges	4, switchable internally and externally; autoranging is also possible
Smallest possible measuring span (referred to 1000 hPa absolute sample gas pressure, 0.5 l/min sample gas flow and 25 °C ambient temperature)	2% v/v or 5% v/v O <sub>2</sub>
Largest possible measuring span	100% v/v O <sub>2</sub>
Measuring ranges with physical elevated zero	Any zero point is possible between 0 ... 100% v/v as long as a suitable reference gas is used
Position of use	Front panel vertical
Conformity	CE identification 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 (rated range 90 V ... 132 V), 48 ... 63 Hz or 200 ... 240 V AC (rated range 180 V ... 264 V), 48 ... 63 Hz
Power consumption	Approx. 37 VA
EMC interference immunity (ElectroMagnetic Compatibility)	According to standard requirements of NAMUR NE21 (08/98)
Electrical safety	According to EN 61010-1, overvoltage category III
Fuse links	100...120 V: 1.0T/250 200...240 V: 0.63T/250

#### Gas inlet conditions

Perm. sample gas pressure	800 ... 1200 hPa
• External reference gas supply	atmospheric pressure ± 50 hPa
• With integrated pump	
Sample gas flow	18 ... 60 l/h (0.3 ... 1 l/min)
Sample gas temperature	0 ... 50 °C
Sample gas humidity	< 90% relative humidity

#### Time response

Warm-up period	With ambient temperature < 30 min (maximum accuracy achieved after 2 hours)
Response time (T <sub>90</sub> )	3.5 s
Damping (electric time constant)	0 ... 100 s, programmable
Dead time (purging time of gas path in analyzer at 1 l/min)	Approx. 0.5 ... 2.5 s, depending on version
Time for internal signal processing	< 1 s

#### Pressure correction range

Pressure sensor, internal	500 ... 2000 hPa (permitted sample gas pressure see gas inlet conditions)
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#### Measuring response (referred to 1000 hPa absolute sample gas pressure, 0.5 l/min sample gas flow and 25 °C ambient temperature)

Output signal fluctuation	< 0.75% of smallest possible measuring range specified on rating plate with an electronic time constant of 1 s (corresponds to ± 0.25% with 2 σ)
Zero drift	< 0.5%/month of smallest possible meas. span specified on rating plate
Measured-value drift	< 0.5%/month of respective measuring span
Repeatability	< 1% of respective measuring span
Minimum detection limit	1% of current measuring range
Linearity error	< 1% of respective measuring span

#### Influencing variables (referred to 1000 hPa absolute sample gas pressure, 0.5 l/min sample gas flow and 25 °C ambient temperature)

Ambient temperature	< 0.1% [% O <sub>2</sub> ] / 1 K referred to the smallest possible measuring span according to rating plate
Sample gas pressure with air (approx. 100 hPa) as reference gas supply, a correction of the atmospheric pressure fluctuations is only possible when the sample gas is vented to ambient air)	Without pressure compensation: < 2% of measuring span / 1% change in pressure With pressure compensation: < 0.2% of measuring span / 1% change in pressure
Residual gases	Deviation in zero point corresponding to paramagnetic or diamagnetic deviation of residual gas (see Table)
Sample gas flow	< 1% of smallest possible measuring span according to rating plate with a change in flow of 0.1 l/min within the permissible flow range
Power supply	< 0.1% of output signal span with rated voltage ± 10%

#### Electric inputs and outputs

Analog output	0/2/4 ... 20 mA, floating; max. load 750 Ω
Relay outputs	6, with changeover contacts, freely selectable, e.g. for range identification; loading capacity: 24 V AC/DC/ 1 A, floating
Analog inputs	2, designed for 0/2/4 ... 20 mA, for external pressure sensor and correction of influence of residual gas (correction of cross interference)
Binary inputs	6, designed for 24 V, floating, freely selectable, e.g. for range switching
Serial interface	RS 485
Options	Autocal function with 8 additional binary inputs and 8 relay outputs; also with PROFIBUS PA or PROFIBUS DP

#### Ambient conditions

Perm. ambient temperature	-30 ... +70 °C during storage and transport, +5 ... +45 °C during operation
Permissible humidity	< 90% relative humidity as annual average, during storage and transport (dew point must not be fallen below)

# Continuous Gas Analyzers, extractive

## OXYMAT 61

19" unit

### Selection and Ordering Data

**OXYMAT 61 gas analyzer**  
19" unit for installation in cabinets

#### Gas connections for sample gas and reference gas

Piping with outer diameter 6 mm  
Piping with outer diameter 1/4"

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

2% reference gas pressure 3000 hPa  
2% reference gas supply with internal pump  
5% reference gas pressure 3000 hPa  
5% reference gas supply with internal pump

#### Power supply

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

#### Sample gas monitoring

Without  
With (incl. flowmeter and pressure switch)

#### Supplementary electronics

Without  
Autocal function

- With additional 8 binary inputs/outputs
- With serial interface for the automotive industry (AK)
- With additional 8 binary inputs/outputs and PROFIBUS PA interface
- With additional 8 binary inputs/outputs and PROFIBUS DP interface

#### Language

German  
English  
French  
Spanish  
Italian

Order No.

7MB2001 - A00 -

cannot be combined

0  
1

C  
D  
E  
F

0  
1

A  
D

A  
B  
D  
E  
F

0  
1  
2  
3  
4

→ Y02  
→ Y02

### Further versions

Please add „-Z“ to Order No. and specify Order code

Order code

RS 485/RS 232 converter

A11

Slide rails (2 rails)

A31

Set of Torx tools, socket spanner

A32

TAG labels (customer-defined inscriptions)

B03

Damping element for sample gas

B04

→ Y02

Clean for O<sub>2</sub>-Service (special-cleaned gas path)

Y02

Measuring range in plain text, if different from standard setting <sup>1)</sup>

Y11

### Retrofitting sets

Order No.

RS 485/Ethernet converter

C79451-A3364-D61

RS 485/RS 232 converter

C79451-Z1589-U1

Autocal function with 8 binary inputs/outputs

C79451-A3480-D511

Autocal function with 8 binary inputs/outputs and PROFIBUS-PA

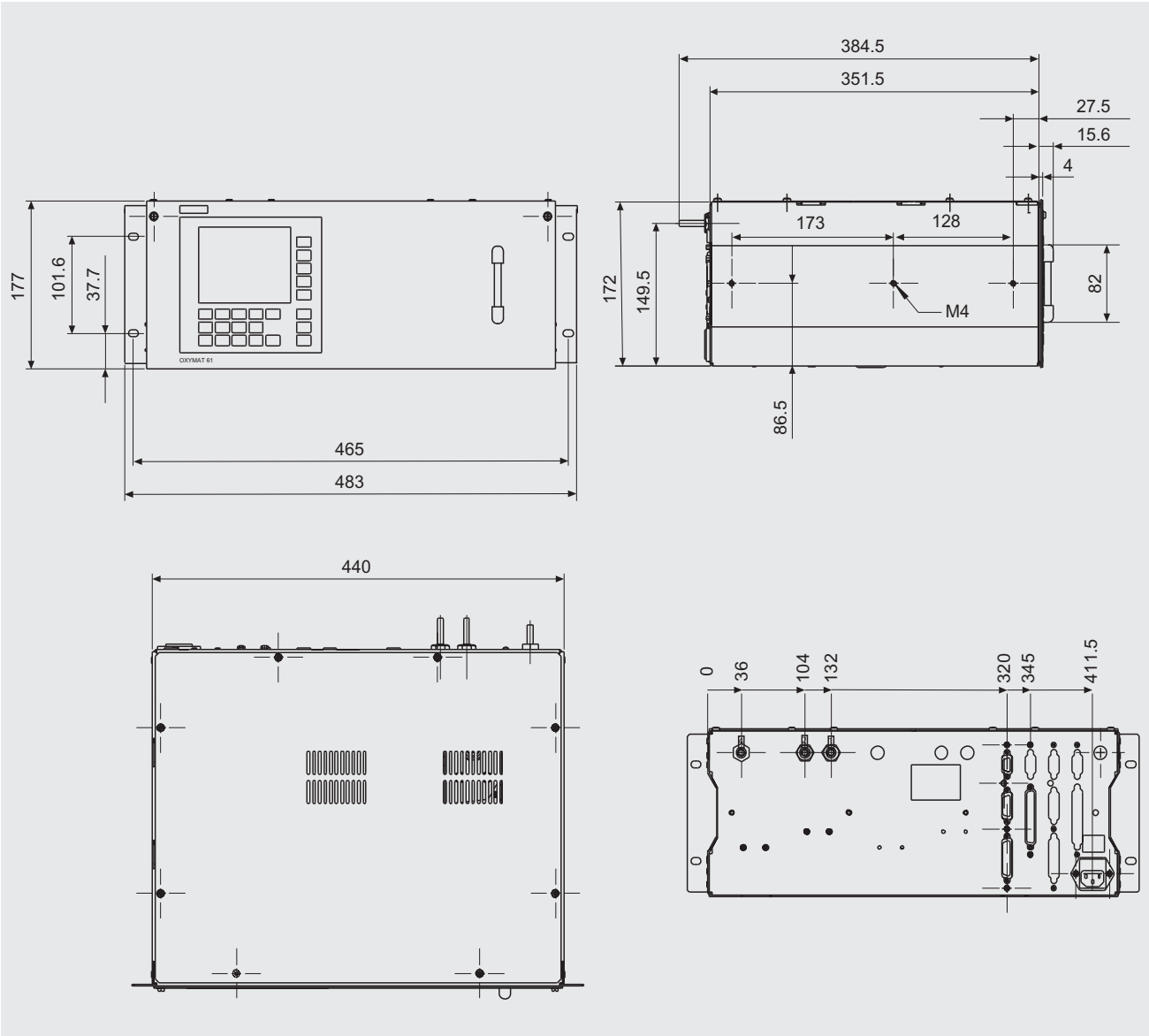
A5E00057307

Autocal function with 8 binary inputs/outputs and PROFIBUS-DP

A5E00057312

1) Standard setting: Measuring range 1: 0 to smallest possible span  
Measuring range 2: 0 to 10%  
Measuring range 3: 0 to 25%  
Measuring range 4: 0 to 100%.

## Dimensional drawings



OXYMAT 61, 19" unit, dimensions in mm

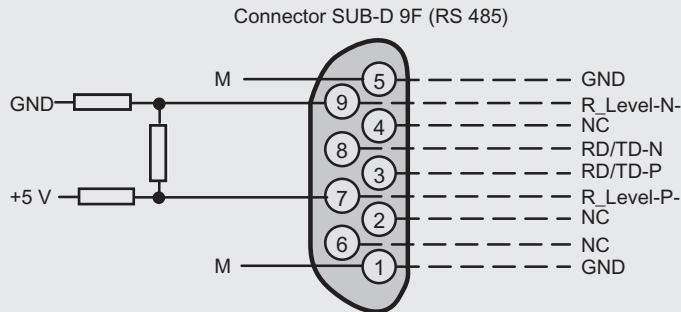
# Continuous Gas Analyzers, extractive OXYMAT 61

19" unit

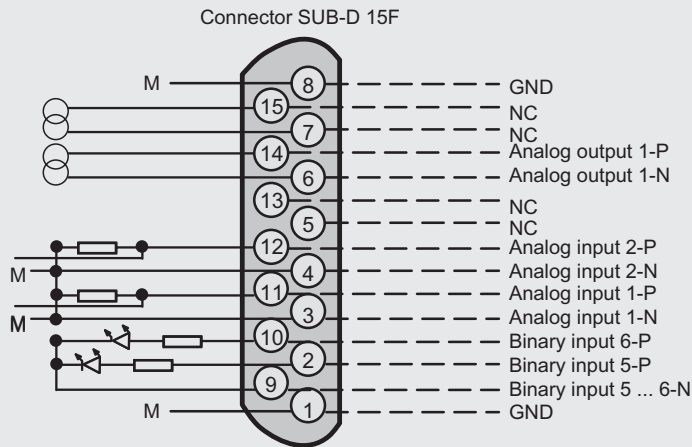
## Schematics

### Pin assignment (electrical connections)

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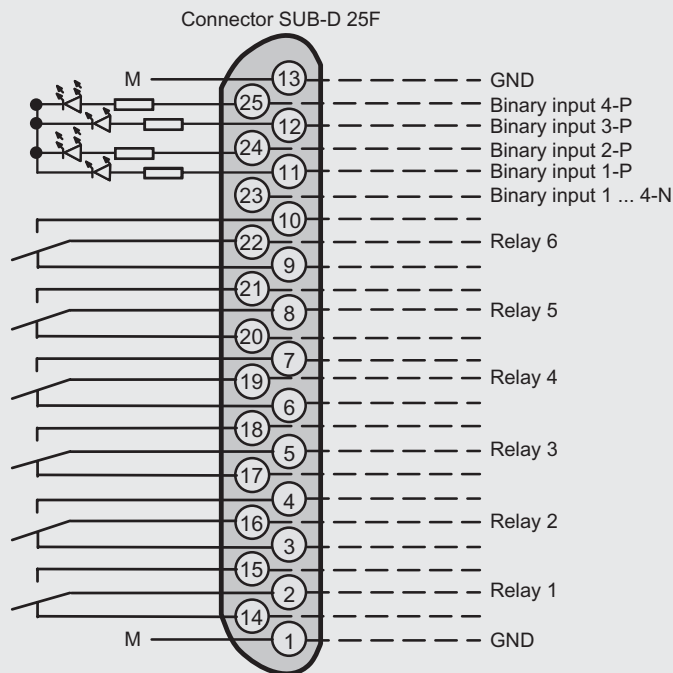
Possibility for connection of bus terminating resistors to pins 7 and 9.



Floating analog outputs (also with respect to one another),  $R_L \leq 750 \Omega$

Pressure correction  
Pressure correction  
Interfering gas correction  
Interfering gas correction

Non-floating analog inputs,  
0 ... 20 mA/500  $\Omega$   
or 0 ... 10 V  
(low-resistance)



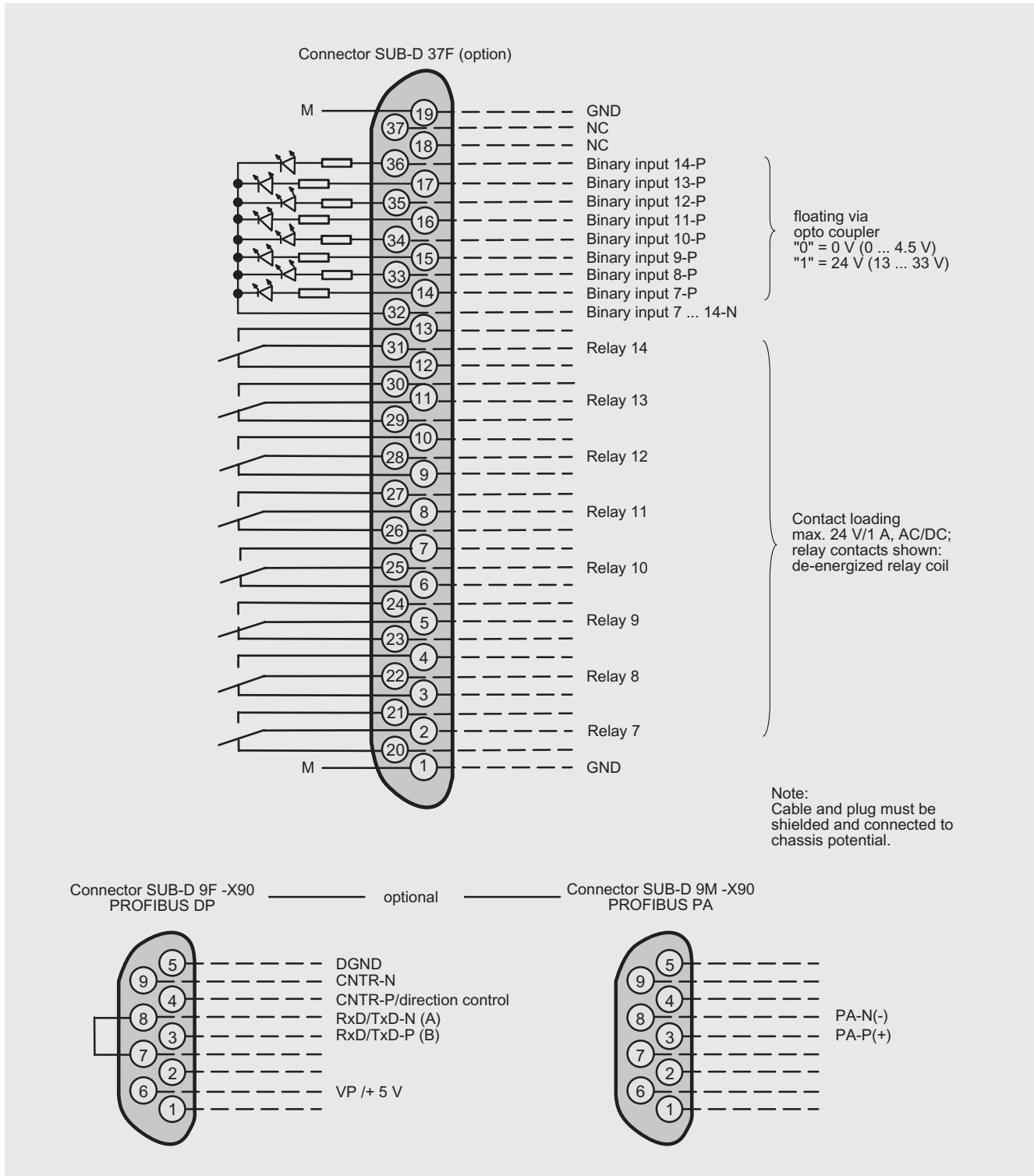
Floating via opto isolator  
"0" = 0 V (0 ... 4.5 V)  
"1" = 24 V (13 ... 33 V)

Contact loadingmax.  
24 V/1 A, AC/DC; relay  
contacts shown:  
de-energized relay coil

Note:  
Cable and plug must be  
shielded and connected to  
chassis potential.

OXYMAT 61, 19" unit, pin assignment

Pin assignment (electrical connections)

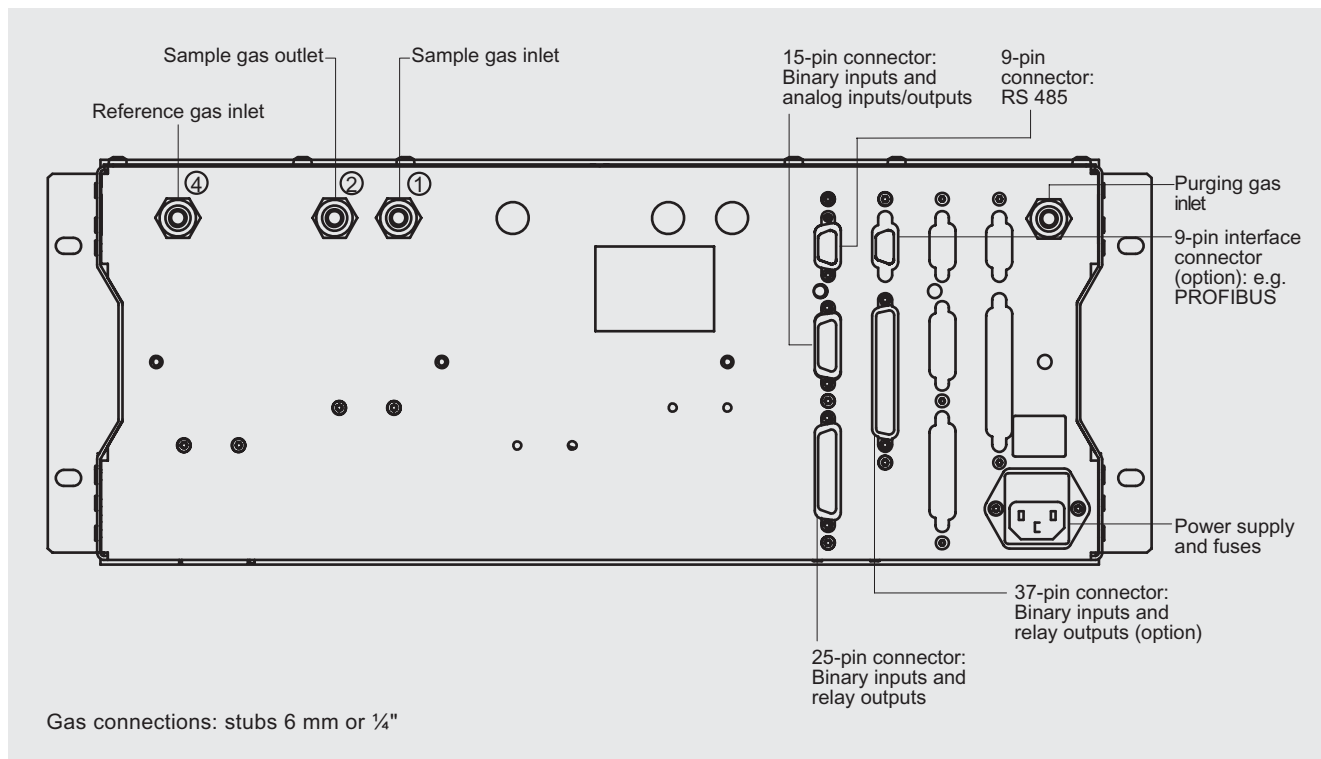


OXYMAT 61, 19" unit, pin assignment of the AUTOCAL board and PROFIBUS connectors

# Continuous Gas Analyzers, extractive OXYMAT 61

19" unit

## Gas and electrical connections



OXYMAT 61, 19" unit, gas and electrical connections

### Selection and Ordering Data

Manual	Order No.
<b>OXYMAT 61</b> Gasanalysengerät für IR-absorbierende Gase und Sauerstoff (German)	<b>A5E00123066</b>
<b>OXYMAT 61</b> Gas Analyzers for IR-absorbing Gases and Oxygen (English)	<b>A5E00123067</b>
<b>OXYMAT 61</b> Analyseurs de gaz pour la mesure de composants infrarouges et d'oxygène (French)	<b>A5E00123068</b>
<b>OXYMAT 61</b> Analizadores para gases absorbentes de infrarrojo y oxígeno (Spanish)	<b>A5E00123069</b>
<b>OXYMAT 61</b> Analizzatori per i gas assorbenti raggi infrarossi ed ossigeno (Italian)	<b>A5E00123070</b>

# Continuous Gas Analyzers, extractive

## OXYMAT 61

### Proposition of spare parts

#### Selection and Ordering Data

Description	Qty for 2 years	Qty for 5 years	Order No.
<b>Analyzer section</b>			
Reference gas supply (pump, restrictor, pressure switch, hose)	1	1	<b>A5E00114838</b>
O-ring	1	2	<b>C74121-Z100-A6</b>
Pressure switch (sample gas)	1	2	<b>C79302-Z1210-A2</b>
Flowmeter (only version with pump)	1	2	<b>C79402-Z560-T1</b>
Measuring cell			
• SS, type No. 1.4571, without flow-type compensation branch	-	1	<b>C79451-A3277-B535</b>
• O-ring (measuring head)	2	4	<b>C79121-Z100-A32</b>
• O-ring (stub)	2	4	<b>C71121-Z100-A159</b>
Measuring head (non-flow-type compensation branch)	1	1	<b>C79451-A3460-B525</b>
Restrictor for sample gas path, hose	2	2	<b>C79451-A3480-C10</b>
Reference gas path, 3000 hPa (set of parts)	1	1	<b>C79451-A3480-D518</b>
<b>Electronics</b>			
Front panel with keyboard	1	1	<b>A5E00259978</b>
Motherboard (without firmware)	-	1	<b>C79451-A3474-B601</b>
Adapter board LCD/keyboard	1	1	<b>C79451-A3474-B605</b>
Magnet terminal board	-	1	<b>C79451-A3474-B606</b>
LC display	1	1	<b>W75025-B5001-B1</b>
Connector filter	-	1	<b>W75041-E5602-K2</b>
Fuse link			
• 0.63 A / 250 V (230-V version)	2	4	<b>W79054-L1010-T630</b>
• 1.0 A / 250 V (110-V version)	2	4	<b>W79054-L1011-T100</b>

If the OXYMAT 61 was delivered with specially cleaned gas path for high oxygen content (so-called "Cleaned for O<sub>2</sub> service"), please absolutely specify it for a spare part order. This is the only way to guarantee that the gas path furthermore corresponds to the special requirements for this variant.