

Overview



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

Benefits

- Integrated pump for reference gas (option, e.g. ambient air)
- High linearity
- Compact design
- Physically suppressed zero possible

Application

Application areas

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

Further applications

- Chemical plants
- Gas manufacturers
- Research and development

Design

- 19" rack unit with 4 HU for installation
 - in hinged frame
 - in cabinets with or without telescope rails
- Front plate can be swung down for servicing purposes (laptop connection)
- Gas connections for sample gas inlet and outlet; pipe diameter 6 mm or 1/4"
- Gas and electrical connections at the rear

Display and control panel

- Large LCD field for simultaneous display of:
 - Measured value
 - 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

Input and outputs

- One analog output per medium (from 0, 2, 4 to 20 mA; NAMUR parameterizable)
- 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)
- Two analog inputs configurable (e.g. correction of cross-interference, external pressure sensor)
- Extension with eight additional binary inputs and eight additional relay outputs, e.g. for autocalibration with up to four calibration gases

Communication

RS 485 present in basic unit (connection from the rear).

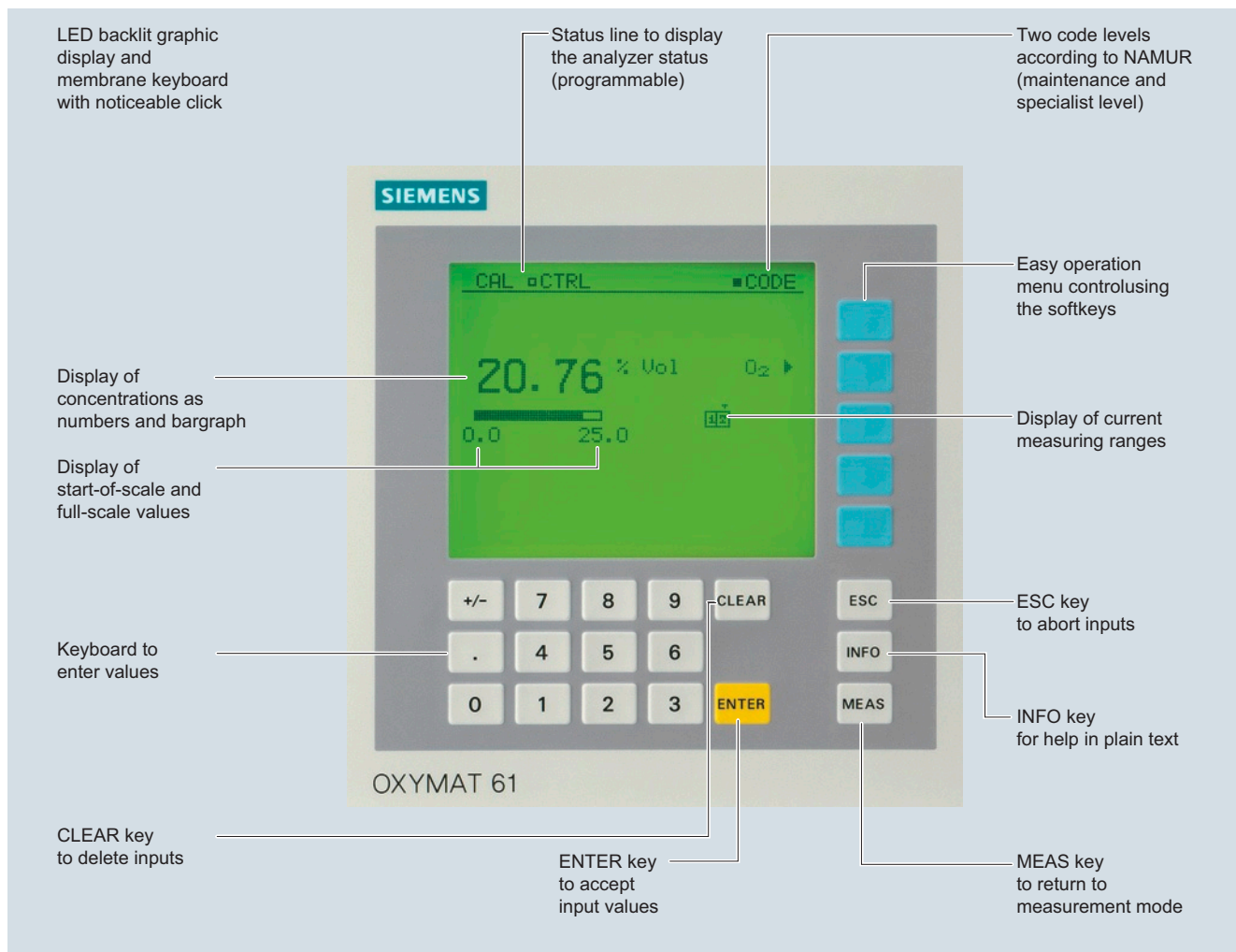
Options

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

Continuous Gas Analyzers, extractive

OXYMAT 61

General information



OXYMAT 61, membrane keyboard and graphic display

Designs – Parts touched by sample gas, standard

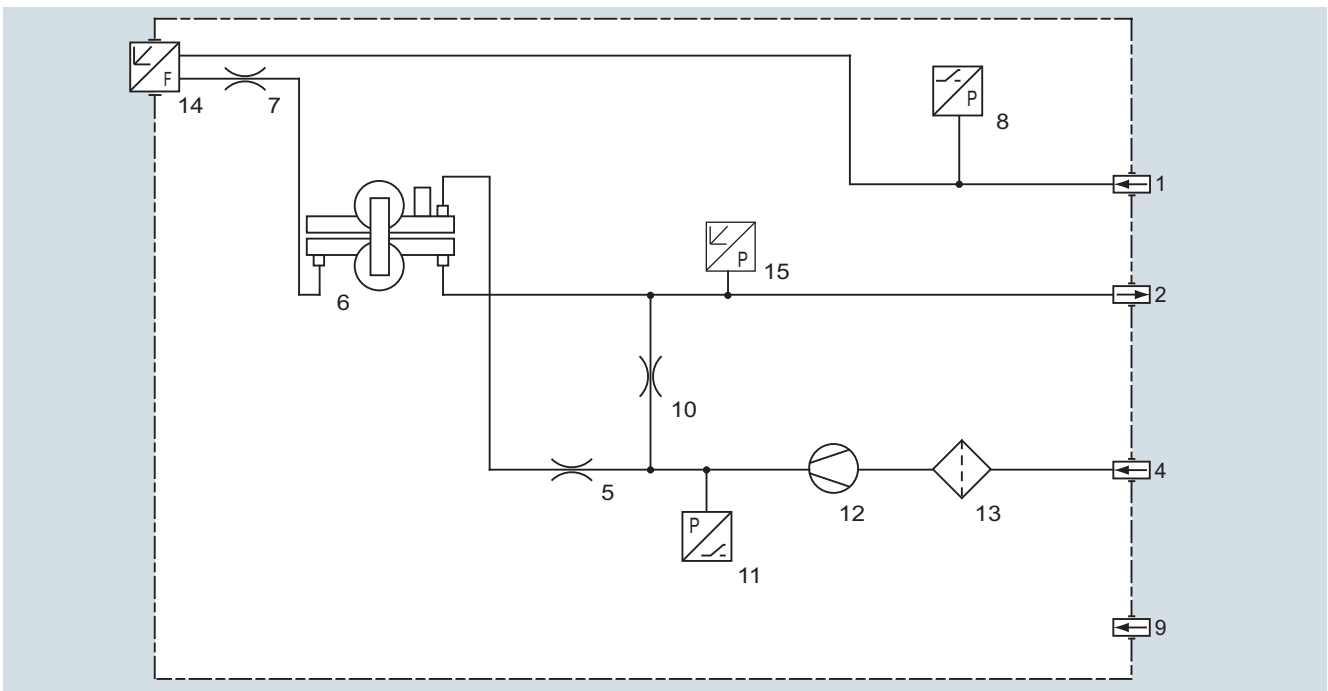
Gas path		19" rack unit
With hoses	Bushing	Stainless steel, mat. no. 1.4571
	Hose	FKM (Viton)
	Sample chamber	Stainless steel, mat. no. 1.4571
	Fittings for sample chamber	Stainless steel, mat. no. 1.4571
	Restrictor	PTFE (Teflon)
	O-rings	FKM (Viton)
	Hose coupling	Polyamide 6

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

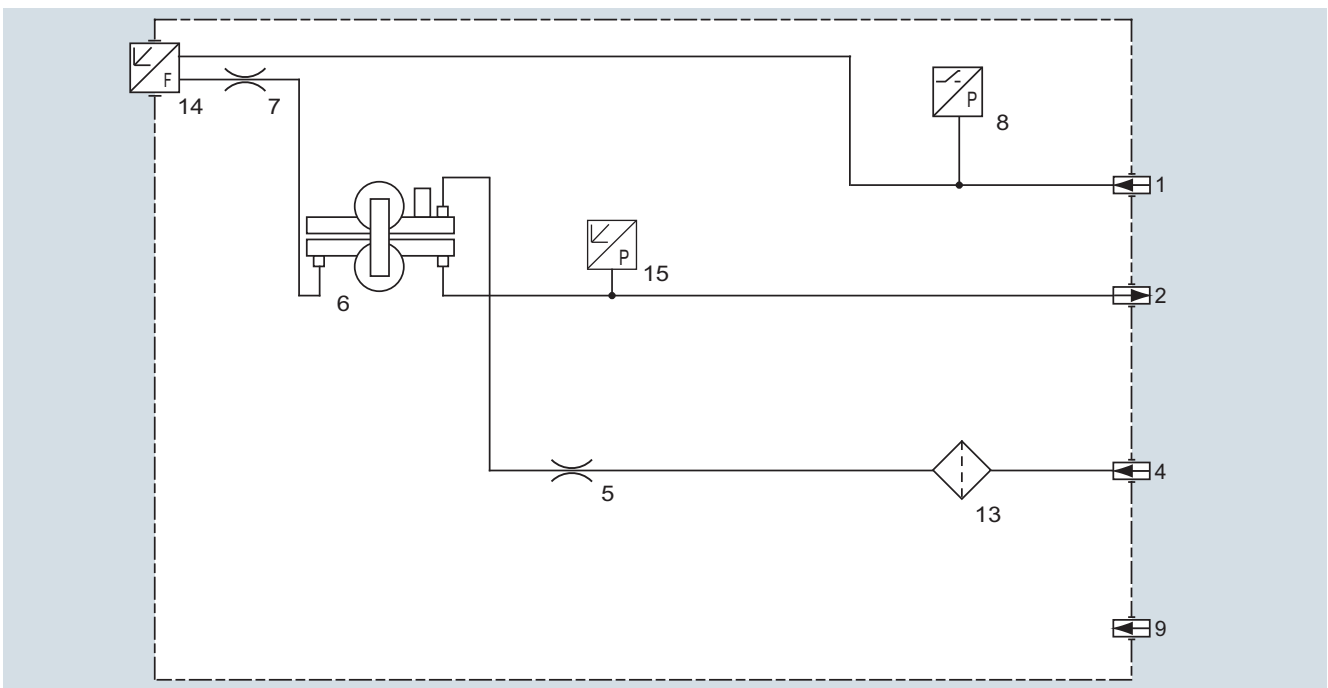
Gas path

Legend for the gas path figures

- | | | | |
|---|---|----|--|
| 1 | Sample gas inlet | 9 | Purging gas |
| 2 | Sample gas outlet | 10 | Restrictor in reference gas path (outlet) |
| 3 | Not used | 11 | Pressure switch for reference gas monitoring |
| 4 | Reference gas inlet | 12 | Pump |
| 5 | Restrictor in reference gas path | 13 | Filter |
| 6 | O ₂ physical system | 14 | Flow indicator in sample gas path (option) |
| 7 | Restrictor in sample gas path | 15 | Pressure sensor |
| 8 | Pressure switch in sample gas path (option) | | |



Gas path OXYMAT 61 with integrated reference gas pump (connection for 1 100 hPa, absolute)



Gas path OXYMAT 61 with reference gas connection 3 000 to 5 000 hPa, absolute

Continuous Gas Analyzers, extractive

OXYMAT 61

General information

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 contents 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 content, causes a cross flow. This flow is converted into an electric signal by a microflow sensor (4).

OXYMAT 61, principle of operation

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.

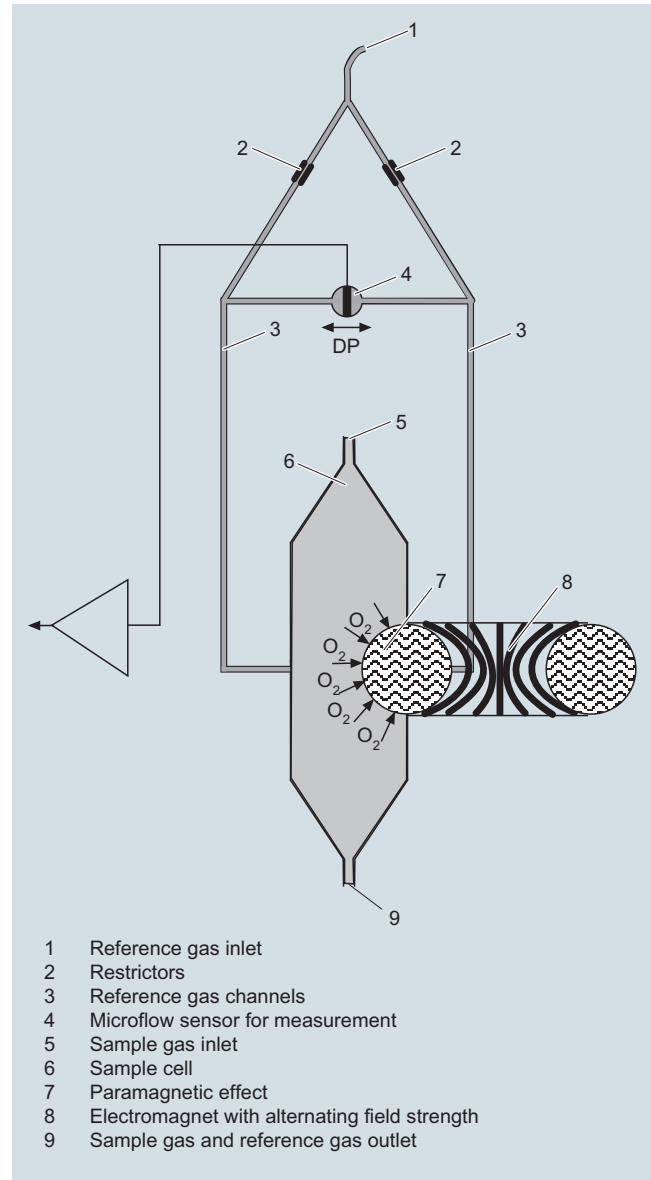
The sample chamber is directly in the sample path and has a small volume, and the microflow sensor is a low-lag sensor. This results in a very short response time for the OXYMAT 61.

Note

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

Essential characteristics

- Four freely parameterizable measuring ranges, also with suppressed zero point, all measuring ranges linear
- 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 device can be adapted to the respective measuring task
- Easy handling thanks to menu-driven operation
- Low long-term drift
- Two control levels with their own authorization codes for the prevention of accidental and unauthorized operator interventions
- Automatic, parameterizable measuring range calibration
- Operation based on the NAMUR recommendation
- Monitoring of sample gas (option)



OXYMAT 61, principle of operation

- Customer-specific analyzer options such as:
 - Customer acceptance
 - TAG labels
 - Drift recording
- Simple handling using a numerical membrane keyboard and operator prompting
- Short response time
- Reference gas supply either externally (N_2 , O_2 or air, approx. 3 000 hPa) or via built-in reference gas pump (ambient air, approx. 1 100 hPa abs.)
- Monitoring of reference gas with reference gas connection; only on version with built-in reference gas pump
- Different smallest measuring ranges, depending on version 2.0 % or 5.0 % O_2
- Internal pressure sensor for correction of fluctuations in the sample gas pressure

Correction of zero 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 ₂ H ₆	-0.49	Helium He	+0.33
Ethene (ethylene) C ₂ H ₄	-0.22	Neon Ne	+0.17
Ethine (acetylene) C ₂ H ₂	-0.29	Argon Ar	-0.25
1.2 butadiene C ₄ H ₆	-0.65	Krypton Kr	-0.55
1.3 butadiene C ₄ H ₆	-0.49	Xenon Xe	-1.05
n-butane C ₄ H ₁₀	-1.26		
iso-butane C ₄ H ₁₀	-1.30	Inorganic gases	
1-butene C ₄ H ₈	-0.96	Ammonia NH ₃	-0.20
iso-butene C ₄ H ₈	-1.06	Hydrogen bromide HBr	-0.76
Dichlorodifluoromethane (R12) CCl ₂ F ₂	-1.32	Chlorine Cl ₂	-0.94
Acetic acid CH ₃ COOH	-0.64	Hydrogen chloride HCl	-0.35
n-heptane C ₇ H ₁₆	-2.40	Dinitrogen monoxide N ₂ O	-0.23
n-hexane C ₆ H ₁₄	-2.02	Hydrogen fluoride HF	+0.10
Cyclo-hexane C ₆ H ₁₂	-1.84	Hydrogen iodide HI	-1.19
Methane CH ₄	-0.18	Carbon dioxide CO ₂	-0.30
Methanol CH ₃ OH	-0.31	Carbon monoxide CO	+0.07
n-octane C ₈ H ₁₈	-2.78	Nitrogen oxide NO	+42.94
n-pentane C ₅ H ₁₂	-1.68	Nitrogen N ₂	0.00
iso-pentane C ₅ H ₁₂	-1.49	Nitrogen dioxide NO ₂	+20.00
Propane C ₃ H ₈	-0.87	Sulfur dioxide SO ₂	-0.20
Propylene C ₃ H ₆	-0.64	Sulfur hexafluoride SF ₆	-1.05
Trichlorofluoromethane (R11) CCl ₃ F	-1.63	Hydrogen sulfide H ₂ S	-0.44
Vinyl chloride C ₂ H ₃ Cl	-0.77	Water H ₂ O	-0.03
Vinyl fluoride C ₂ H ₃ F	-0.55	Hydrogen H ₂	+0.26
1.1 vinylidene chloride C ₂ H ₂ Cl ₂	-1.22		

Table 1: Zero error due to diamagnetism or paramagnetism of some accompanying 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 1 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)

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
... 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	Atmospheric pressure with internal reference gas pump	

Continuous Gas Analyzers, extractive

OXYMAT 61

19" rack unit

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)	2 vol. % or 5 vol. % O ₂
Largest possible measuring span	100 vol. % O ₂
Measuring ranges with suppressed zero point	Any zero point within 0 ... 100 vol.% can be implemented, provided that a suitable reference gas is used
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. 45 VA
EMC (Electromagnetic Compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98)
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	
• External reference gas supply	800 ... 1 200 hPa absolute
• With integrated pump	Atmospheric pressure ± 50 hPa
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
Sample gas humidity	< 90 % relative humidity
Reference gas pressure (high-pressure version)	2 000 ... 4 000 hPa above sample gas pressure, but max. 5 000 hPa absolute (version without reference gas pump)
Reference gas pressure (low-pressure version) with external pump	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)	3.5 s
Damping (electrical time constant)	0 ... 100 s, parameterizable
Dead time (purging time of the gas path in the unit at 1 l/min)	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 (see gas inlet conditions for permissible sample gas pressure)
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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	< 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	< 2 %/10 K with span 5 %
Sample gas pressure (with air (100 hPa) as internal reference gas supply, correction of the atmospheric pressure fluctuations is only possible if the sample gas can vent to ambient air.)	<ul style="list-style-type: none"> 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
Accompanying gases	Deviation from zero point corresponding to paramagnetic or diamagnetic deviation of accompanying gas (see table)
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, potential-free
Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and accompanying 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, 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 as annual average, during storage and transportation (must not fall below dew point)

Continuous Gas Analyzers, extractive

OXYMAT 61

19" rack unit

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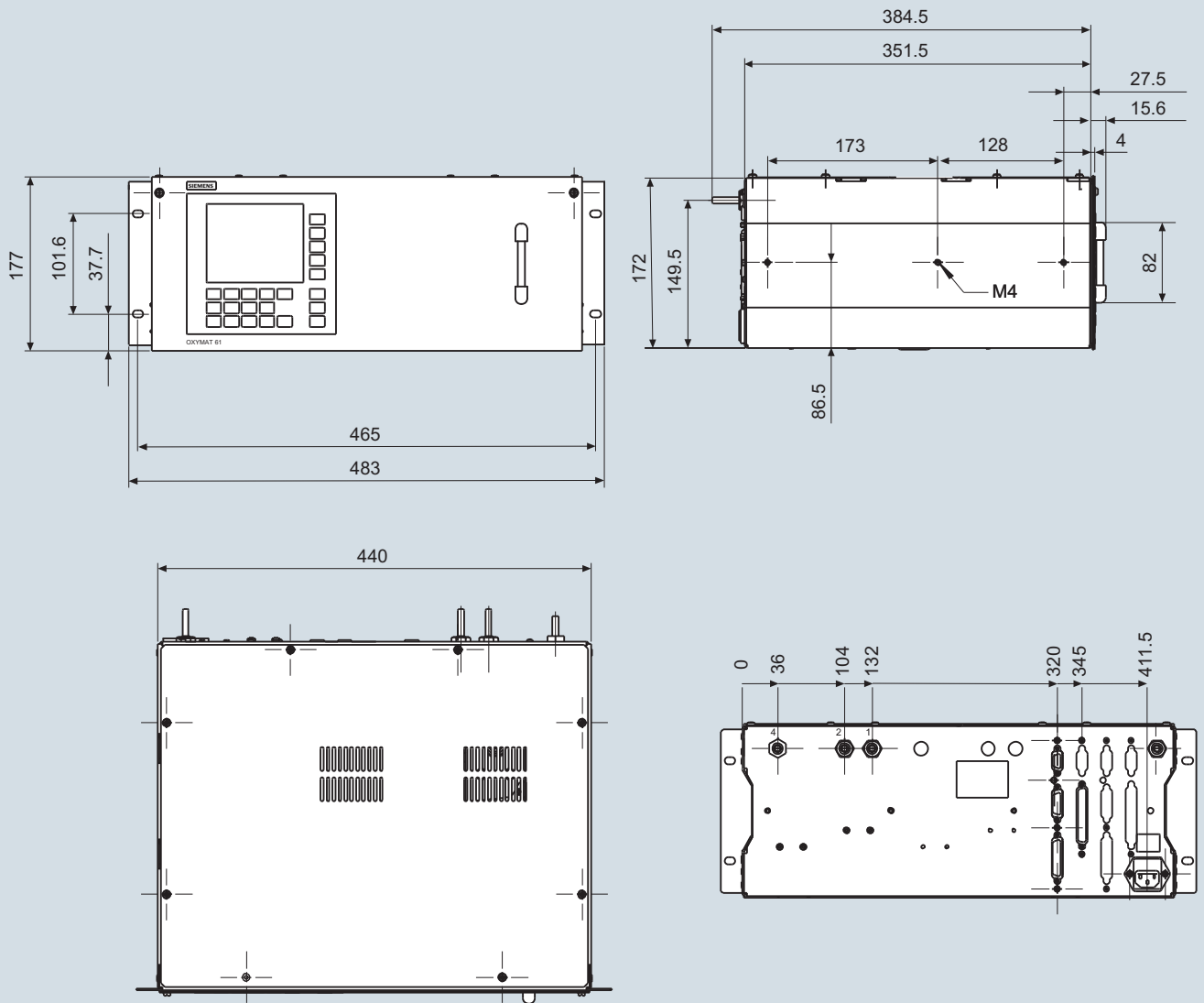
Selection and ordering data		Article No.	
OXYMAT 61 gas analyzer 19" rack unit for installation in cabinets		7MB2001-	A 0 0 -
Click on the Article No. for the online configuration in the PIA Life Cycle Portal.			Cannot be combined
<u>Gas connections for sample gas and reference gas</u> Pipe with 6 mm outer diameter Pipe with 1/4" outer diameter		0 1	
<u>Smallest possible measuring span O₂</u> 2 % Reference gas pressure 3 000 hPa 2 % reference gas supply with internal pump 5 % Reference gas pressure 3 000 hPa 5 % reference gas supply with internal pump		C D E F	D → Y02 F → Y02
<u>Power supply</u> 100 ... 120 V AC, 48 ... 63 Hz 200 ... 240 V AC, 48 ... 63 Hz			0 1
<u>Sample gas monitoring</u> Without With (incl. flow indicator and pressure switch)			A D
<u>Add-on electronics</u> Without AUTOCAL function			A
<ul style="list-style-type: none"> With 8 additional digital inputs/outputs With serial interface for the automotive industry (AK) With 8 additional digital inputs/outputs and PROFIBUS PA interface With 8 additional digital inputs/outputs and PROFIBUS DP interface 			B D E F
<u>Language</u> German English French Spanish Italian			0 1 2 3 4
Additional versions		Order code	
Add "-Z" to Article No. and specify Order code			
Telescopic rails (2 units)		A31	
TAG labels (specific lettering based on customer information)		B03	
Attenuation element for sample gas		B04	→ Y02
SIL conformity declaration (SIL 2) Functional Safety according to IEC 61508 and IEC 61511		C20	
Clean for O ₂ service (specially cleaned gas path)		Y02	
Measuring range indication in plain text, if different from the standard setting ¹⁾		Y11	
Accessories		Article No.	
RS 485/Ethernet converter		A5E00852383	
RS 485/RS 232 converter		C79451-Z1589-U1	
RS 485/USB converter		A5E00852382	
AUTOCAL function each with 8 digital inputs/outputs		C79451-A3480-D511	
AUTOCAL function 8 digital inputs/outputs each and PROFIBUS PA		A5E00057307	
AUTOCAL function 8 digital inputs/outputs each and PROFIBUS DP		A5E00057312	
Set of Torx screwdrivers		A5E34821625	
¹⁾ Standard setting: <ul style="list-style-type: none"> Measuring range 1: 0 to smallest measuring span Measuring range 2: 0 to 10 % Measuring range 3: 0 to 25 % Measuring range 4: 0 to 100 % 			

Continuous Gas Analyzers, extractive

OXYMAT 61

19" rack unit

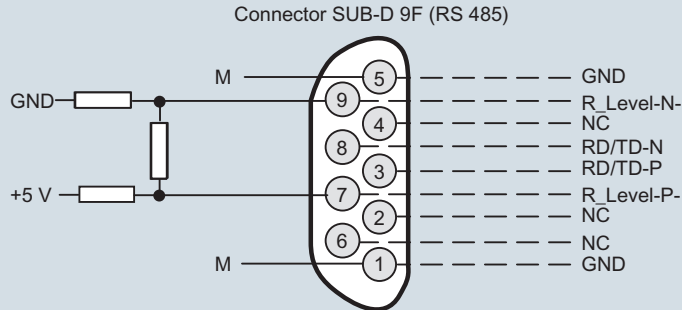
Dimensional drawings



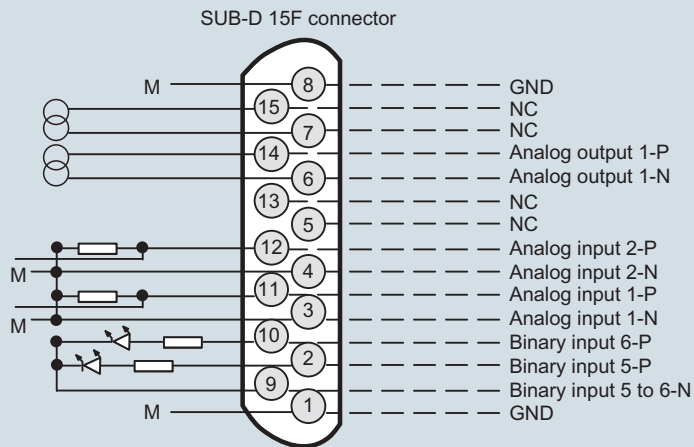
OXYMAT 61, 19" unit, dimensions in mm

Schematics

Pin assignment (electrical connections)



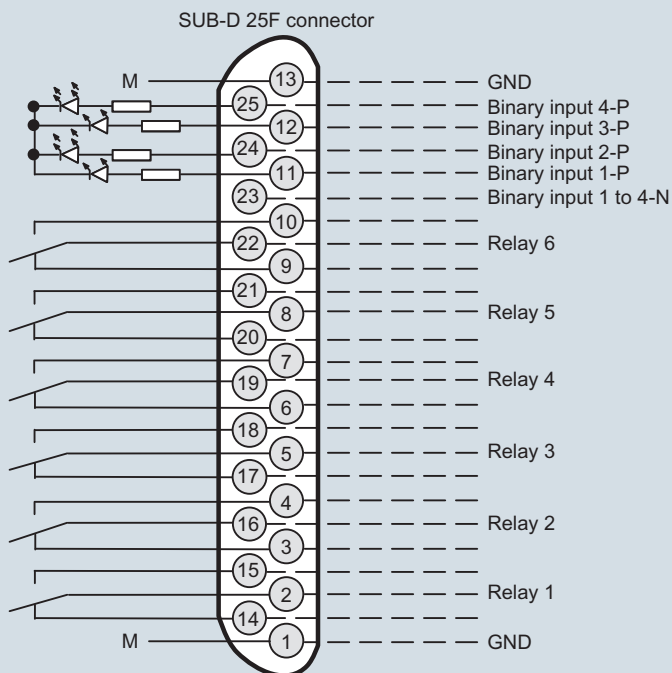
It is possible to connect bus terminating resistors to pins 7 and 9.



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

Pressure correction
Pressure correction
Correction of cross-interference
Correction of cross-interference

Non-isolated analogue inputs,
0 ... 20 mA/500 Ω or
0 ... 10 V (low resistance)



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

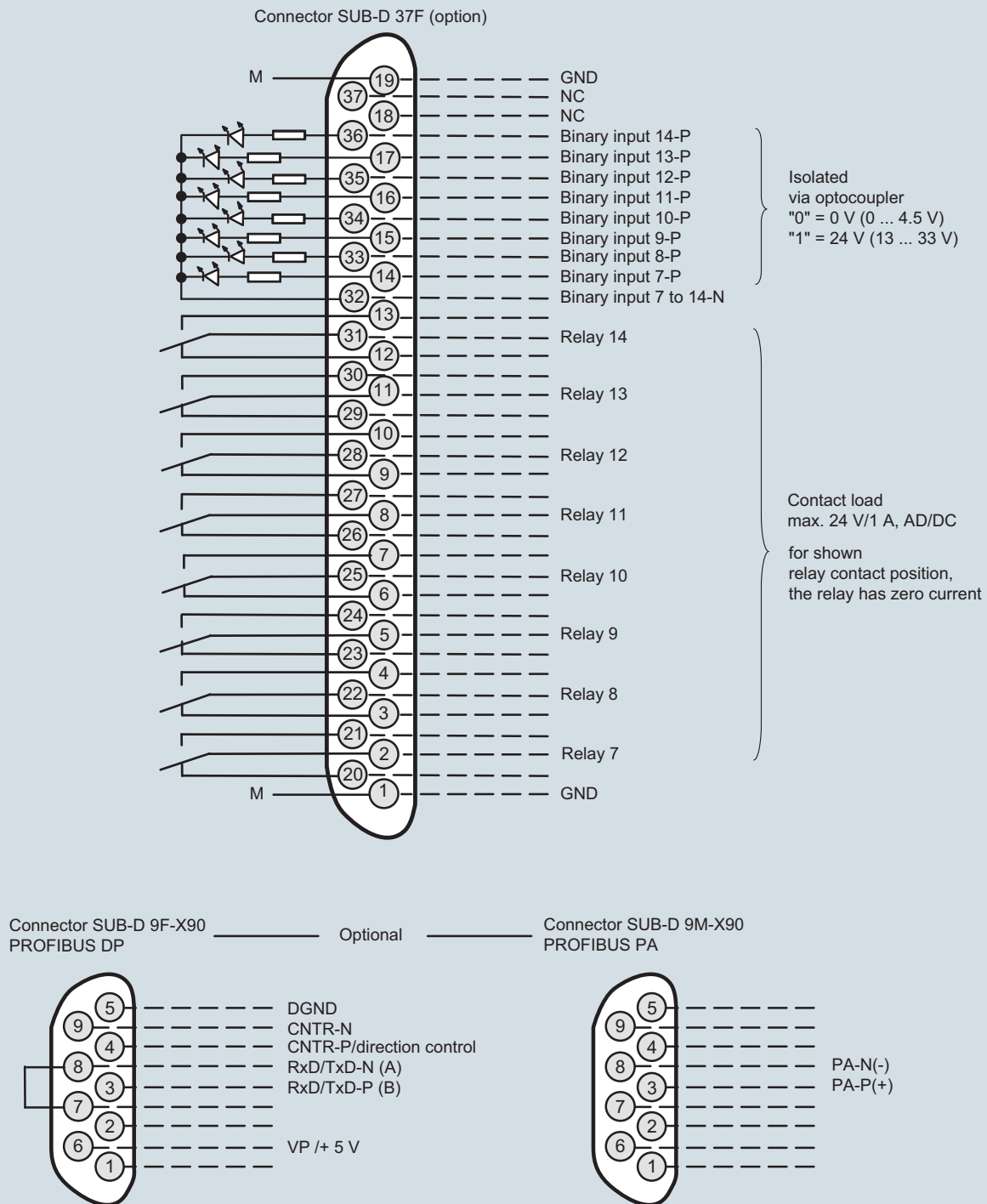
Contact load
max. 24 V/1 A, AC/DC
The relay is current-free for the relay contact position shown

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

Continuous Gas Analyzers, extractive

OXYMAT 61

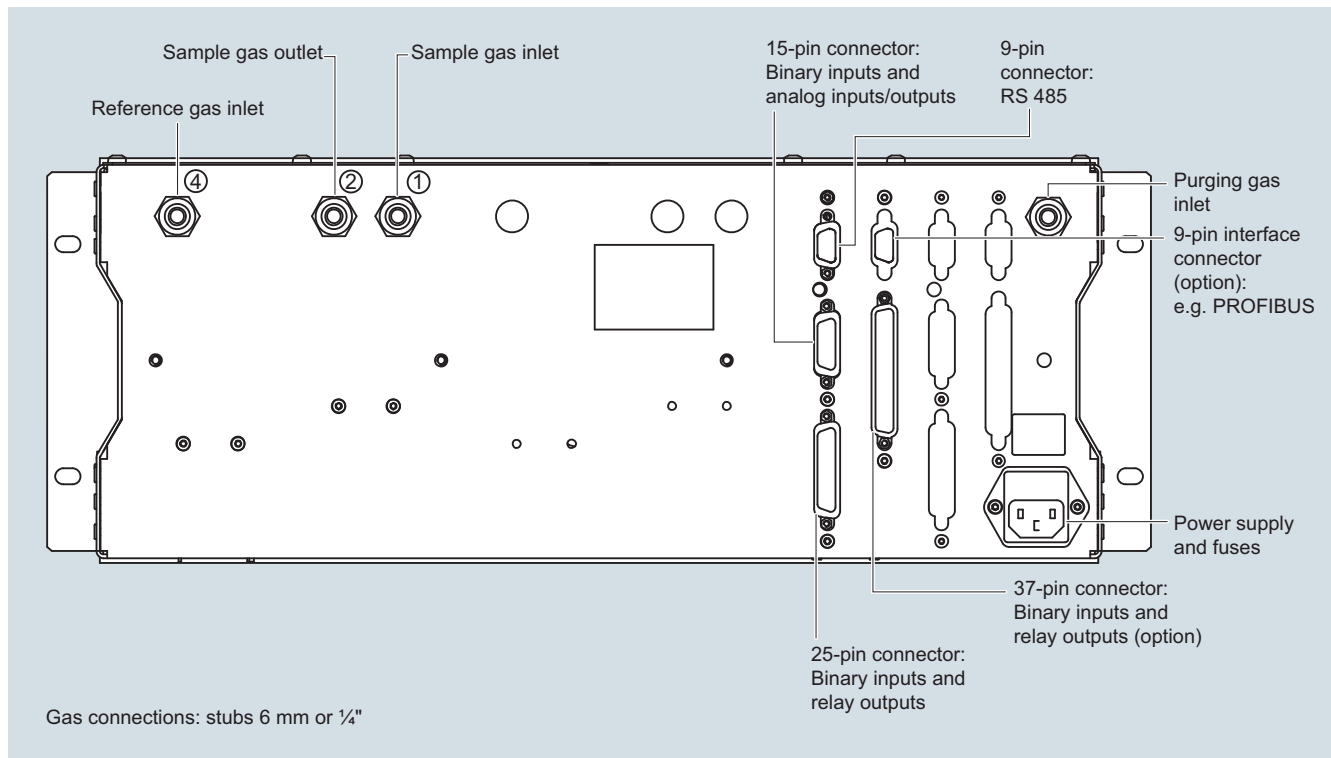
19" rack unit

Pin assignment (electrical connections)

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

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

Gas and electrical connections



OXYMAT 61, 19" unit, gas and electrical connections

Selection and ordering data

Operating instructions	Article No.
OXYMAT 61	
Gas analyzer for measurement of oxygen	
• German	A5E00123066
• English	A5E00123067
• French	A5E00123068
• Spanish	A5E00123069
• Italian	A5E00123070

Continuous Gas Analyzers, extractive

OXYMAT 61

Suggestions for spare parts

Selection and ordering data

Description	Quantity for 2 years	Quantity for 5 years	Article No.
Analyzer unit			
Reference gas supply (pump, restrictor, pressure switch, hose)	1	1	A5E00114838
Set of gaskets for sample gas pump	2	5	A5E35875733
O-ring	1	2	C74121-Z100-A6
Pressure switch (sample gas)	1	2	C79302-Z1210-A2
Flowmeter	1	2	C79402-Z560-T1
Sample chamber			
• Stainless steel, mat. no. 1.4571; non-flow-type compensation branch	-	1	C79451-A3277-B535
• O-ring (measuring head)	2	4	C79121-Z100-A32
• O ring (fitting)	2	4	C71121-Z100-A159
Measuring head (non-flow-type compensation branch)	1	1	C79451-A3460-B525
Restrictor for sample gas path, hose	2	2	C79451-A3480-C10
Reference gas path, 3000 hPa (set of parts)	1	1	C79451-A3480-D518
Electronics			
Front plate with keyboard	1	1	A5E00259978
Motherboard, with firmware: see spare parts list	-	1	
Adapter plate, LCD/keyboard	1	1	C79451-A3474-B605
Magnetic field connection plate	-	1	C79451-A3474-B606
LC display	1	1	W75025-B5001-B1
Connector filter	-	1	W75041-E5602-K2
Fuse			
• 0.63 A/250 V (230 V version)	2	3	W79054-L1010-T630
• 1.0 A/250 V (110 V version)	2	3	W79054-L1011-T100

If the OXYMAT 61 was supplied with a specially cleaned gas path for high oxygen context ("Clean for O₂ 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.