OXYMAT 64

General

Overview

OXYMAT 64

The OXYMAT 64 gas analyzer is used for the trace measurement of oxygen.

Benefits

- High linearity
- Compact design
- Open interface architecture (RS 485, RS 232, PROFIBUS)
- SIPROM GA network for maintenance and service information (optional)

Application

- *Production of technical gases*:
  Measurements in N_2, H_2, CO CO_2 and HC
- *Welding*:
  Measurements in inert gases during welding of highly alloyed steels, titanium, etc.
- *Systems for air separation*:
  Measurements in N_2 and in inert gases (e.g. Ne, Ar)
  Measurements in CO_2
- *Metallurgy, hardening shops*:
  Measurements in NH_3
- *Chemical industry*:
  Measurements in polyolefin and ethylene production, in H_2 or in complex gas mixtures.
- *Food production*:
  Measurement in CO_2 (e.g. breweries)
- *Chemical applications*:
  Polyethylene systems

Design

- 19" unit with 4 HE for installation
  - in hinged frame
  - in cabinets with or without telescope rails
- Front plate for service purposes can be pivoted down (laptop connection)
- Gas connections for sample gas
  - Input: Clamping ring connection for a pipe diameter of 6 mm or ¼"
  - Output: Pipe connection with diameter 6 mm or ¼"

Display and control panel

- Large LCD field for simultaneous display of
  - Measured value
  - Status bar
  - Measurement ranges
- Contrast of the LCD field adjustable via the menu
- Permanent LED backlighting
- Washable membrane keyboard with five softkeys
- Five-digit measured value display
  (decimal point counts as one digit)
- Menu-driven operator control for parameterization, configuration, test functions, adjustment
- Operator support in plain text
- Graphical display of the concentration progression; time intervals parameterizable
- Bilingual operator software German/English, English/Spanish, French/English, Spanish/English, Italian/English

Input and outputs

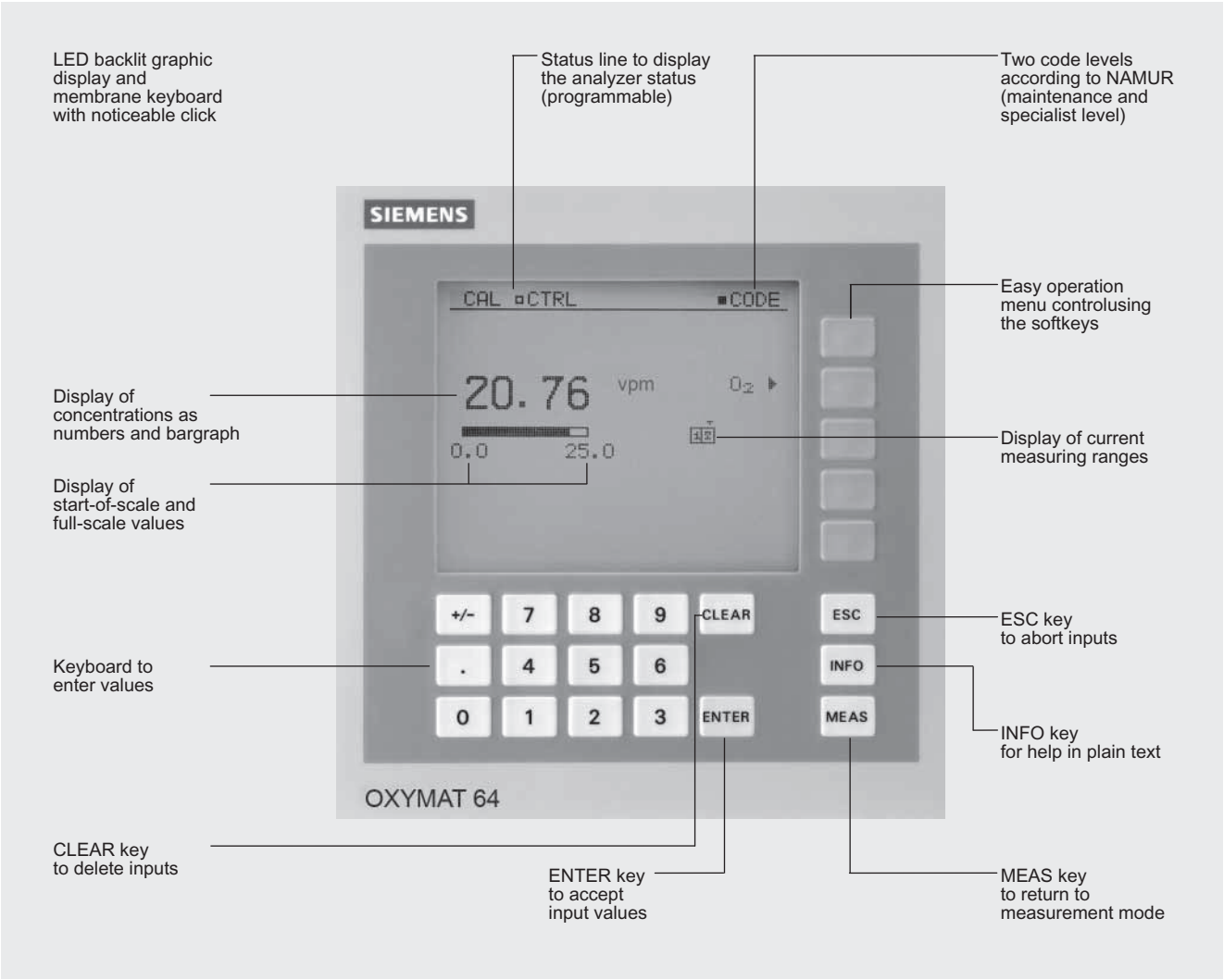
- One analog output per measurement element (from 0, 2, 4 to 20 mA; NAMUR parameterizable)
- Six binary inputs freely configurable (e.g. measurement range changeover, processing of external signals from the sample preparation)
- Six relay outputs freely configurable (outage, maintenance request, maintenance switch, threshold alarm, external magnetic valves)
- Two analog inputs configurable (e.g. diagonal correction, external pressure transducer)
- Each can be expanded by eight additional binary inputs and relay outputs for automatic adjustment with max. four sample gases

Communication

- RS 485 contained in the basic device
  (connection on the rear side)

Options

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



OXYMAT 64, membrane keyboard and graphic display

Designs – Parts touched by sample gas, standard

Gas route		**19" unit**
Sample gas route	Implementation	Stainless steel, mat. no. 1.4571
	Pipe inlet	Stainless steel
	O_2 sensor	ZrO_2 ceramic
	Bypass line	FPM (Viton)
	Connection pieces	PTFE (Teflon)
Pressure sensor	Enclosure	Polycarbonate
	Membrane	SiO_4
	Sensor adapter	Aluminum
	Bypass restrictor	Stainless steel, mat. no. 1.4571
Flow indicator	Measurement pipe	Duran glass
	Variable area	Duran glass, black
	Suspension boundary	PTFE (Teflon)
	Angle pieces	FKM (Viton)
Pressure switch	Enclosure	Polycarbonate
	Membrane	NBR

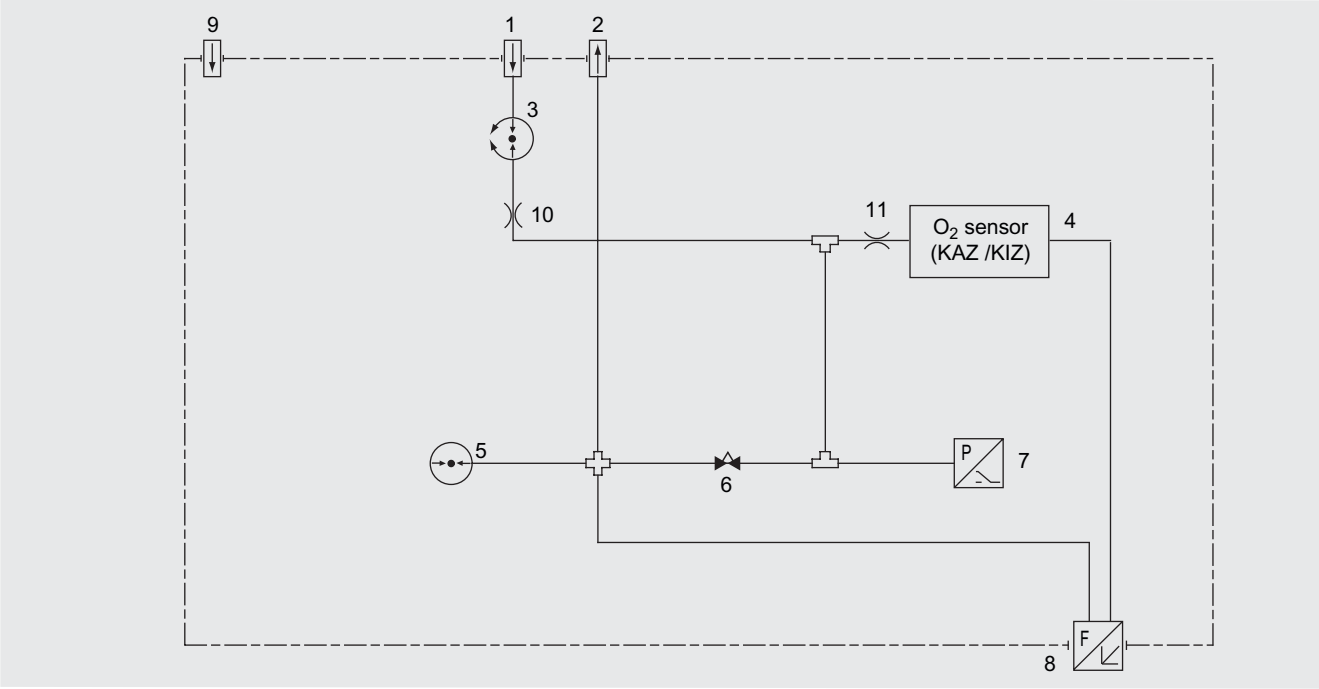
General

Gas route

Legend for the gas route image

1 Sample gas inlet; inlet pressure
- without internal pressure regulator: 200 kPa, regulated
- with internal pressure regulator: 200 ... 600 kPa

2 Sample gas output; sample gas flows off free of dynamic pressure
3 Pressure regulator (order version)
4 O_2 sensor
5 Pressure sensor
6 Bypass restrictor
7 Pressure switch
8 Flow measurement pipe
9 Purge gas connection
10 Restrictor
11 Restrictor



Gas route OXYMAT 64

The sample gas pressure (2000 to 6000 hPA) is regulated by the pressure regulator (3) at approx. 2000 hPA or is offered by the operator with 2000 hPA. This pressure is applied at the restrictor (10). The restrictor (10) reduces the pressure such that a sample gas flow of 15 to 30 l/h is created. This flow is subdivided via the sample gas restrictor (11) and the adjustable bypass restrictor (6) such that there is a sample gas flow of 7.5 l/h through the sensor.

If the sample gas can flow off into the atmosphere unhampered, the sample gas pressure corresponds with the ambient pressure. If the sample gas flows off via an exhaust gas line, it works like a flow resistance. If the resulting dynamic pressure exceeds 100 hPa (rel.), maintenance is requested.

Function

The measuring cell consists of a cylindrical (pipe-shaped) ZrO_2 membrane. The sample gas (low O_2 content) flows at a constant rate through the inside of the membrane, which is regulated at 650 °C. The exterior of the sensor is exposed to the ambient air (approx. 21% O_2).

Both sides of the ZrO_2 membrane are coated with thin platinum films that act as electrodes. This forms a solid, electrochemical cell. The amount of oxygen atoms ionized depends on the oxygen concentration at the electrodes.

The differences in concentration at each side means that a differential partial pressure prevails. Since ZrO_2 is electrically conductive at 650 °C, ionic migration takes place in the direction of the lower partial pressure.

An oxygen gradient arises across the width of the ZrO_2 membrane, which, according to equation (1), results in an electrical potential difference between the platinum electrodes.

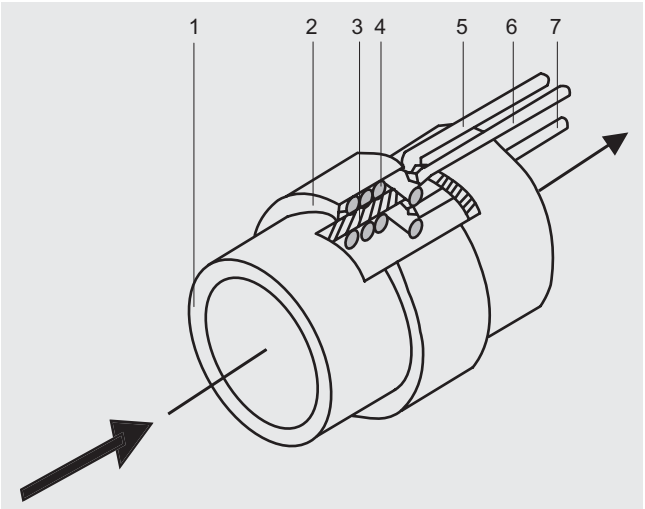
Defects in the crystal lattice, caused by contamination of the ZrO_2 material with Y_2O_3 and/or CaO (introduced originally to prevent cracks forming in ceramic material) make it easier for O_2 ions to diffuse in the ZrO_2 grid.

Catalytically active ZrO2 sensor (CAZ)

The electrode material consists of platinum (Pt). This type of sensor has a higher sensitivity to interference when flammable gas components are present.

Catalytically inactive ZrO2 sensor (CAZ)

The catalytically inactive sensor has the same general design as the CAZ. The contacts and electrode surface inside the pipe are made of a specially developed material, which largely prevents catalytic oxidation of H_2, CO and CH_4.



1 Pipe made of ZrO_2 and Y_2O_3 or ceramic CaO-mixed oxide
2 Ceramic protective coating
3 Sample electrode (Pt)
4 Reference electrode (Pt)
5 Thermoelement
6 Contact to reference electrode
7 Contact to heating

OXYMAT 64, mode of operation

Measuring effect

$U = U_A + RT/4F (\ln [O_2,air] - \ln [O_2])$ (equation 1)

U	measuring effect
U_A	asymmetric voltage (voltage, at $[O_2] = [O_2,air]$
T	ceramic temperature
$[O_2,air]$	O_2 concentration in the air
$[O_2]$	O_2 concentration in sample gas

Note

The sample gas must be fed into the analyzer free of dust. Condensation should be avoided. Therefore, gas modified for the measurement tasks is necessary in most application cases.

Important features

- Four measurement ranges freely parameterizable, all measurement ranges linear
- Galvanically isolated measurement value output 0/2/4 through 20 mA (also inverted) and as per NAMUR
- Automatic measurement range changeover selectable; possibility of remote switching
- Measurement value can be saved during adjustment
- Wide range of selectable time constants (static/dynamic noise suppression); i.e. the response time of the device can be adapted to the respective measurement task
- Easy to use 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 measurement range adjustment
- Operation based on the NAMUR recommendation
- Monitoring of the sample gas (via pressure switch)
- Customer-specific device versions, such as:
  - Customer acceptance
  - TAG labels
  - Drift recording
- Ease of use thanks to a numerical membrane keyboard and operator guide
- Smallest measurement span 0 to 10 vpm O_2
- Internal pressure sensor for correction of the influence of sample gas pressure fluctuations

Diagonal gas effect

Catalytically active sensor (CAZ)

Very large diagonal gas effect of all combustible carrier gases. Thus not suitable for use with combustible carrier gases!

Catalytically inactive sensor (CIZ)

There is only a slight diagonal gas effect in the case of carrier gases with concentration in the range of the O_2 concentration. H_2, CO and CH_4 only have a nominal effect on the combustible carrier gas components.

Measuring elements/diagonal gas	Diagonal gas offset
5 vpm O_2/9.6 vpm CO	0.55 vpm
10 vpm O_2/10 vpm CO	0.6 vpm
74 vpm O_2/25 vpm CO	0.3 vpm
25 vpm O_2/70 vpm CO	3 vpm
78 vpm O_2/140 vpm CO	6.1 vpm
25 vpm O_2/357 vpm CO	1.1 vpm
170 vpm O_2/930 vpm CO	118 vpm

Examples of typical diagonal gas offsets on a catalytically inactive sensor

The listed deviations depend on the exemplar and can deviate up to ± 0.2 vpm. The actual deviation must be determined individually or the error will be eliminated through a corresponding calibration measure (displacement of the diagonal gas offset).

OXYMAT 64

19" unit

Technical specifications

General

Measurement ranges	4, internally and externally switchable; automatic measurement range changeover also possible
Smallest possible measuring span (relating to sample gas pressure 1000 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature)	0 ... 10 vpm O_2
Largest possible measuring span	0 ... 99999 vpm
Operating position	Front wall vertical
Conformity	CE mark in accordance with EN 50081-1, EN 50082-2 and RoHS

Design, enclosure

Degree of protection	IP20 according to EN 60529
Weight	Approx. 11 kg

Electrical characteristics

EMC (**E**lectro**m**agnetic **C**ompatibility)	In accordance with standard requirements of NAMUR NE21 (08/98) and EN 61326
Electrical safety	According to EN 61010-1, overvoltage category II
Auxiliary power	100 ... 120 V AC (nominal use range 90 ... 132 V), 48 ... 63 Hz or 200 ... 240 V AC (nominal use range 180 ... 264 V), 48 ... 63 Hz
Power consumption	Approx. 37 VA
Fuse values	100 ... 120 V: 1.0T/250 200 ... 240 V: 0.63T/250

Gas inlet conditions

Sample gas flow	
• through the sensor	7.5 l/h
• Overall consumption	15 ... 30 l/h
Permissible sample gas pressure	
• without internal pressure regulator	2000 hPa (abs.)
• with internal pressure regulator	2000 ... 6000 hPa (abs.)
Sample gas temperature	0 ... 50 °C
Sample gas humidity	< 1% relative humidity

Dynamic response

Heating time	at room temperature < 30 min (the technical specification is will be observed after 2 hours)
Damping (electrical time constant)	0 ... 100 s, parameterizable
Dead time (purge time of the gas route in the device at 125 ml/min)	10 ... 30 s
Time for device-internal signal processing	< 1 sec

Pressure correction range

Pressure sensor internal	800 ... 1100 hPa (abs.) (permissible sample gas pressure, see gas inlet conditions)

Measuring response (relating to sample gas pressure 1013 hPa absolute, 7.5 l/min sample gas flow and 25 °C ambient temperature)

Output signal fluctuation	< 1 % of the smallest possible measurement range as per nameplate with electronic damping constant of 1 s
Zero point drift	< ± 1% of the current measuring span/month
Measured value drift	< ± 1% of the current measuring span/month
Repeat precision	< 3% of the current measuring span
Minimum detectable quantity	1% of current measurement range, < 0.1 vpm in measurement range 0 ... 10 vpm
Deviation of linearity	< 2% of the current measuring span

Influencing variables (relating to sample gas pressure 1013 hPa absolute, 7.5 l/min sample gas flow and 25 °C ambient temperature)

Ambient temperature	< 2%/10 K relating to the current measuring span
Sample gas pressure only possible if the sample gas can flow out into the ambient air	When pressure compensation has been switched off: < 1% of the current measuring span/ 1% pressure change When pressure compensation has been switched on: < 0.2% of the current measuring span/ 1% pressure change
Carrier gases, zero point deviation	
• Catalytically active sensor (CAZ)	Only gases with non-combustible carrier gas components can be introduced
• Catalytically inactive sensor (CIZ)	Carrier gas concentration of 10 vpm H_2; CO and CH_4 have a low diagonal effect; higher CVs (concentration values) are negligible
Sample gas flow	< 2% of the smallest possible measuring span with a flow change of 10 ml/min
Auxiliary power	< 0.1% of the current measurement range with nominal voltage ± 10%

Electrical inputs and outputs

Analog output	0/2/4 ... 20 mA, 4 ... 20 mA (NAMUR), potential-free; apparent ohmic resistance max. 750 Ω
Relay outputs	6, with changeover contacts, freely parameterizable, e.g. for measurement range identification; load capacity: 24 V AC/DC/1 A, potential-free
Analog inputs	2, designed for 0/2/4 ... 20 mA for pressure sensor external and carrier gas inflow correction (diagonal gas correction)
Binary inputs	6, designed for 24 V, potential-free, freely parameterizable, e.g. for measurement range changeover
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	-40 ... +70 °C during storage and transportation, 5 ... +45 °C during operation
Permissible humidity	< 90% relative humidity within average annual value, during storage and transportation (no passing below the dew point)

Selection and Ordering Data		Order No.	Cannot be combined
OXYMAT 64 gas analyzer 19" unit for installation in cabinets	D)	**7MB2041-** ■■■■■ - ■■■■	
Sensor			
ZrO_2: Catalytically active cell (CAC)		0	
ZrO_2: Catalytically inactive cell (CIC)		1	
Sample gas pressure			
High pressure, without pressure regulator	2000 hPa (abs.)	A	A
High pressure, with pressure regulator	2000 ... 6000 hPa (abs.)	B	B
Low pressure, with suction pump	atm.	C	C
Gas connection			
High pressure Input Output	Clamping ring gland 3 mm Stub 6 mm	A	A
Input Output	Clamping ring gland 1/8" Stub ¼"	B	B
Low pressure Input/output	Stub 6 mm	C	C
Input/output	Stub ¼"	D	D
Sample gas monitoring			
Flow measurement pipe		0	
Flow measurement pipe and threshold switch (internal)		1	
Supplementary electronics			
Without		0	
AUTOCAL function			
• With 8 additional binary inputs/outputs		1	
• With 8 additional binary inputs/outputs and PROFIBUS PA interface		6	
• With 8 additional binary inputs/outputs and PROFIBUS DP interface		7	
Auxiliary power			
100 ... 120 V AC, 48 ... 63 Hz		0	
200 ... 240 V AC, 48 ... 63 Hz		1	
Purging gas			
Without		A	
With monitoring		B	
Ex protection			
Without		A	
Language			
German		0	
English		1	
French		2	
Spanish		3	
Italian		4	

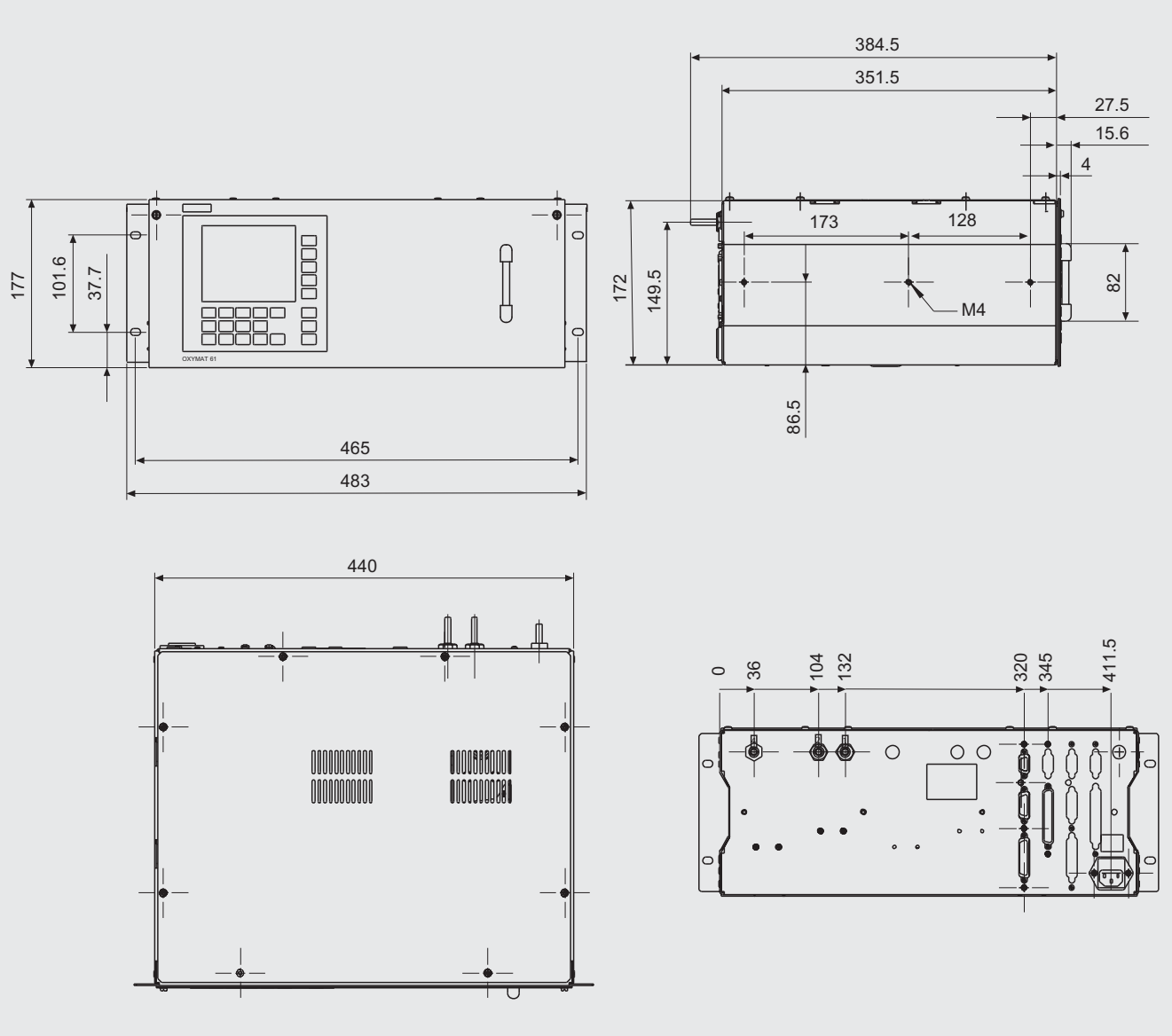
Further versions		Order code
Add "-Z" to Order No. and specify order code		
Telescopic rails (2 units)		**A31**
Set of Torx screwdrivers		**A32**
TAG labels (specific inscription based on customer information)		**B03**
Measuring range indication in plain text, if deviating from standard setting		**Y11**

Retrofitting sets		Order No.
RS 485/Ethernet converter		**A5E00852383**
RS 485/RS 232 converter	D)	**C79451-Z1589-U1**
RS 185/USB converter		**A5E00852382**
AUTOCAL function each with 8 binary inputs/outputs	D)	**C79451-A3480-D511**
AUTOCAL function 8 binary inputs/outputs each and PROFIBUS PA	D)	**A5E00057307**
AUTOCAL function 8 binary inputs/outputs each and PROFIBUS DP	D)	**A5E00057312**

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

19" unit

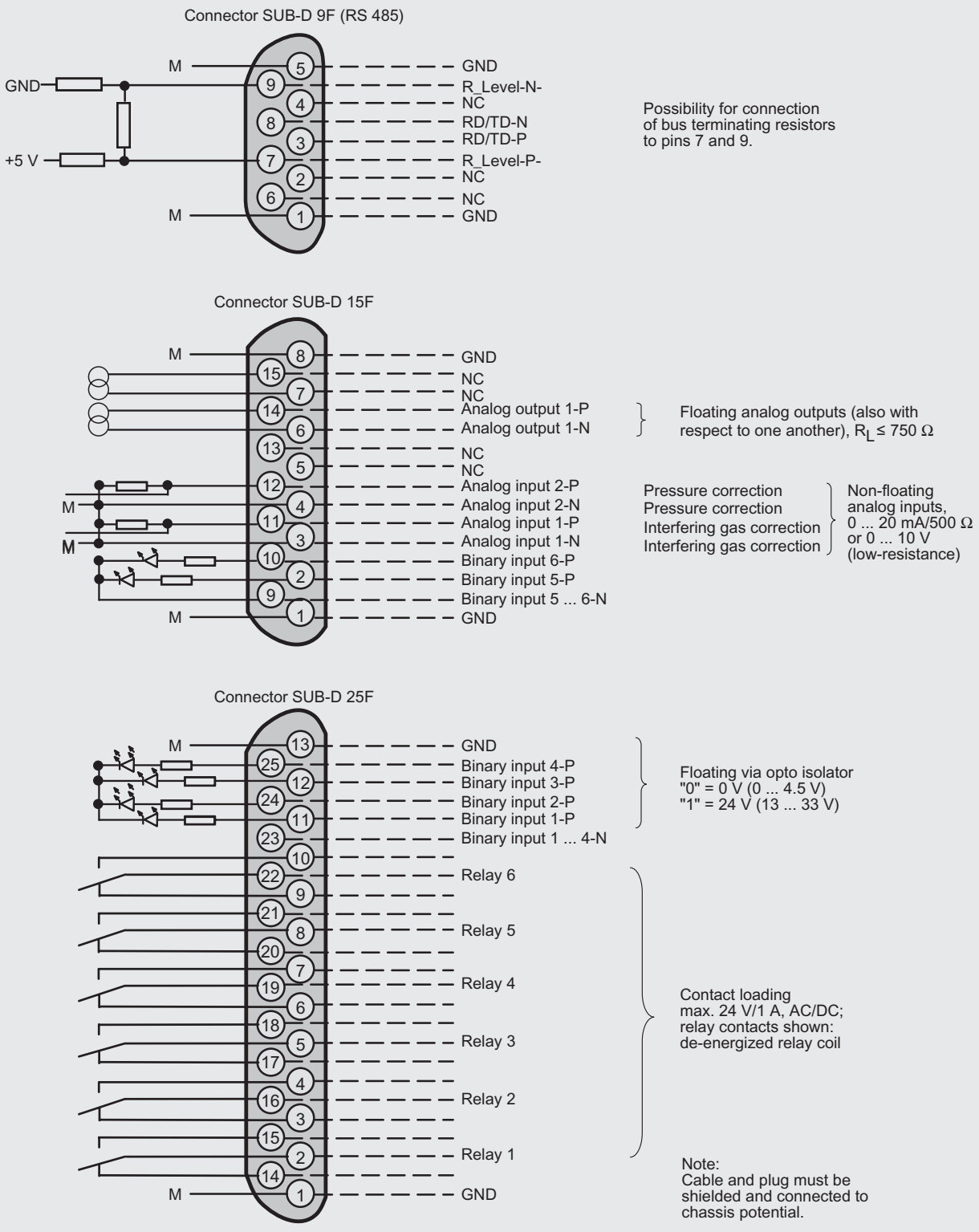
Dimensional drawings



OXYMAT 64, 19" unit, size in mm

Schematics

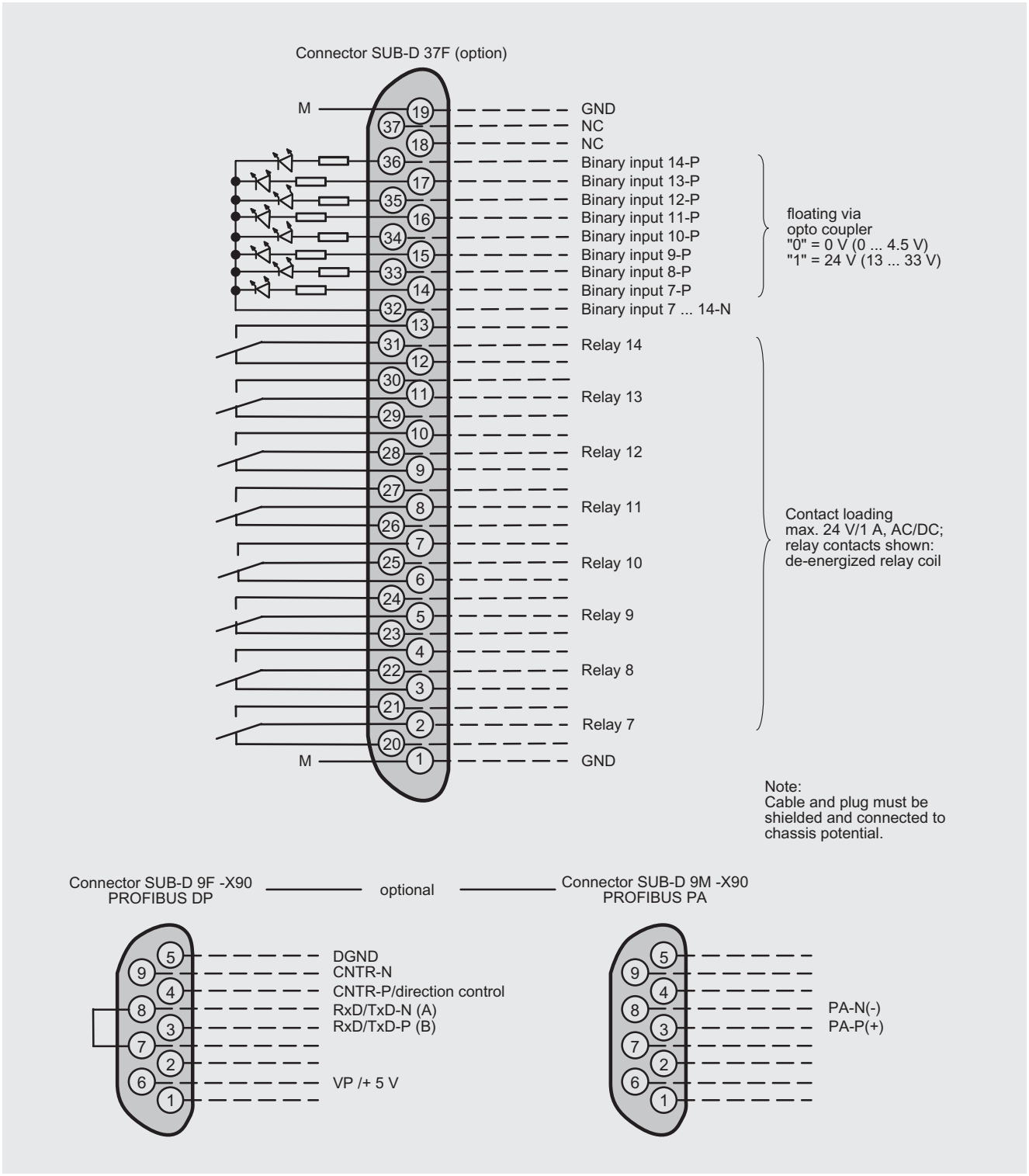
Pin assignment (electrical connections)



OXYMAT 64, 19" unit, pin assignment

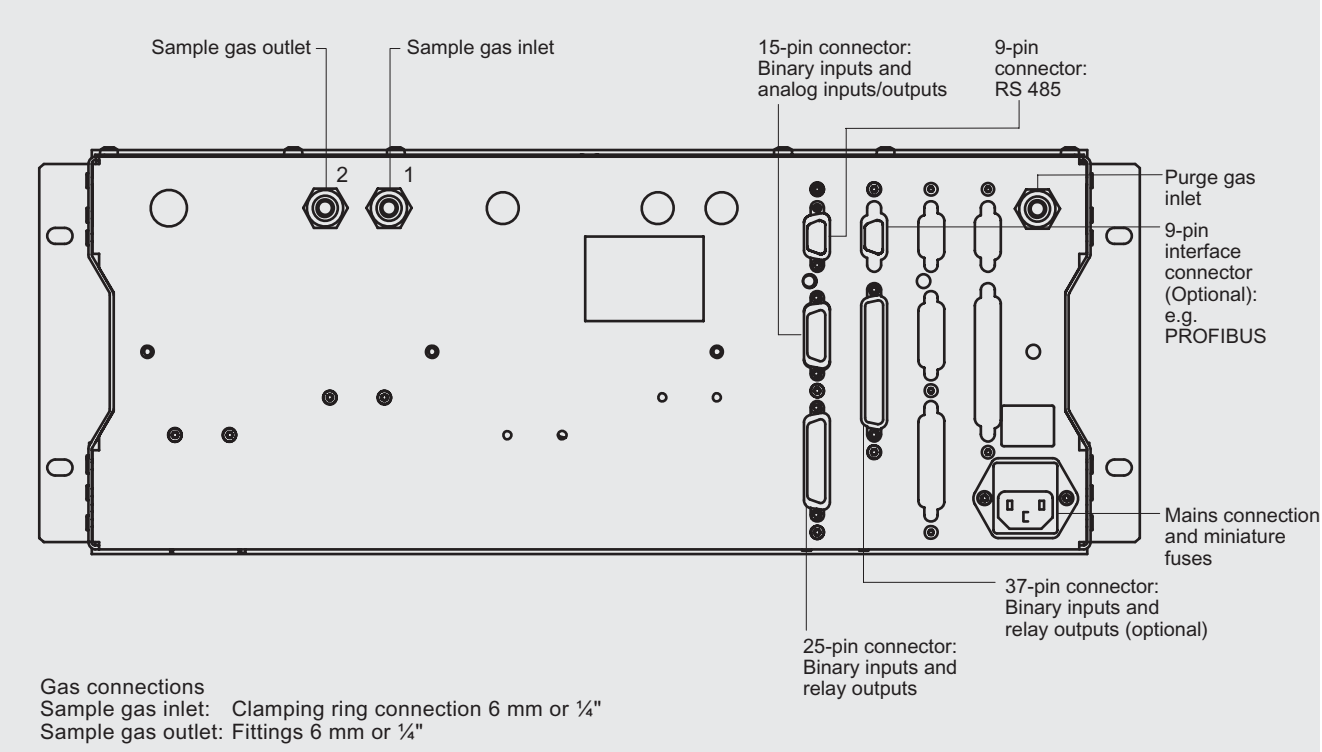
19" unit

Pin assignment (electrical connections)



OXYMAT 64, 19" unit, pin assignment of the AUTOCAL plate and PROFIBUS plug

Gas connections and pin assignment



OXYMAT 64, 19" unit, gas connections and electrical connections

Documentation

Selection and Ordering Data

Manual		Order No.
OXYMAT 64 Gasanalysengerät zur Messung von Spurensauerstoff (German)	D)	**A5E00880382**
OXYMAT 64 Gas Analyzer for measuring oxygen traces (English)	D)	**A5E00880383**
OXYMAT 64 Analyseur de gaz pour la mesure de traces d'ogygène (French)	D)	**A5E00880384**
OXYMAT 64 Analizadores para gases absorbentes de infrarrojo y oxígeno (Spanish)	D)	**A5E00880385**
OXYMAT 64 Analizzatori per i gas assorbenti raggi infrarossi ed ossigeno (Italian)	D)	**A5E00880386**
ULTRAMAT 6, OXYMAT 6, OXYMAT 61, CALOMAT 6, ULTRAMAT 23 Schnittstelle/Interface PROFIBUS DP/PA (German and English)	D)	**A5E00054148**

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

Proposition of spare parts

Selection and Ordering Data

Description	7MB2041	2 years (qty)	5 years (qty)		Order No.
Pressure regulator as spare part	x	—	1		**A5E01008972**
Flow measurement pipe	x	—	1		**A5E01061561**
Adapter plate, LC display/keypad	x	—	1	D)	**C79451-A3474-B605**
LC display	x	—	1	D)	**W75025-B2001-B1**
Connector filter	x	—	1	D)	**W75041-E5602-K2**
Fusible plug (fuse), T 0.63 A, system voltage 200 V ... 240 V	x	2	4	D)	**W79054-L1010-T630**
Fusible plug (fuse), T 1 A, system voltage 200 V ... 240 V	x	2	4	D)	**W79054-L1011-T100**

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