Overview

The ULTRAMAT/OXYMAT 6 gas analyzer is a practical combination of the ULTRAMAT 6 and OXYMAT 6 analyzers in a single enclosure.

The ULTRAMAT 6 channel operates according to the NDIR two-beam alternating light principle and measures one or two gases highly selectively whose absorption bands lie in the infrared wavelength range from 2 to 9 µm, such as CO, CO_2, NO, SO_2, NH_3, H_2O as well as CH_4 and other hydrocarbons.

The OXYMAT 6 channel is based on the paramagnetic alternating pressure method and is used to measure oxygen in gases.

Benefits

- Corrosion-resistant materials in gas path (option)
  - Measurement possible in highly corrosive sample gases
- Sample chambers can be cleaned as required on site
  - Cost savings due to reuse after contamination
- Open interface architecture (RS 485, RS 232, PROFIBUS)
- SIPROM GA network for maintenance and servicing information (option)

ULTRAMAT channel

- High selectivity with double-layer detector and optical coupler
  - Reliable measurements even in complex gas mixtures
- Low detection limits
  - Measurements with low concentrations

OXYMAT channel

- Paramagnetic alternating pressure principle
  - Small measuring ranges (0 to 0.5% or 99.5 to 100% O_2)
  - Absolute linearity
- Detector element has no contact with the sample gas
  - Can be used to measure corrosive gases
  - Long service life
- Physically suppressed zero through suitable selection of reference gas (air or O_2), e.g. 98 to 100% O_2 for purity monitoring/air separation

Application

Fields of application

- Measurement for boiler control in incineration plants
- Emission measurements in incineration plants
- Measurement in the automotive industry (test benches)
- Process gas concentrations in chemical plants
- Trace measurements in pure gas processes
- Environmental protection
- TLV (Threshold Limit Value) monitoring at the workplace
- Quality monitoring

Special versions

Special applications

Besides the standard combinations, special applications concerning material in the gas path, material in the sample chambers (e.g. titanium, Hastelloy C22) and measured components are available on request.

Performance-tested version / QAL

For measurements of CO, NO, SO_2 and O_2 according to 13th and 27th BImSchV and TA Luft, performance-tested versions according to EN 15267 of the ULTRAMAT/OXYMAT 6 are available.
Certified measuring ranges:

- 1-component analyzer
  CO: 0 to 75 mg/m³; 0 to 10 000 mg/m³
  NO: 0 to 100 mg/m³; 0 to 10 000 mg/m³
  SO_2: 0 to 75 mg/m³; 0 to 1 500 mg/m³
- O_2: 0 to 5 vol.%; 0 to 25 vol.%

All larger measuring ranges are also approved.

In addition, performance-tested versions of the ULTRAMAT/OXYMAT 6 meet the requirements set forth in EN 14956 and QAL 1 according to EN 14181. Conformity of the analyzers with both standards is TÜV-certified.

Determination of the analyzer drift according to EN 14181 (QAL 3) can be carried out manually or also with a PC using the SIPROM GA maintenance and servicing software. In addition, selected manufacturers of emission evaluation computers offer the possibility for downloading the drift data via the analyzer's serial interface and to automatically record and process it in the evaluation computer.

Flow-type reference compartment

- The flow through the reference compartment should be adapted to the sample gas flow
- The gas supply of the reduced flow-type reference compartment should have an upstream pressure of 3 000 to 5 000 hPa (abs.). Then a restrictor will automatically adjust the flow to approximately 8 hPa

Design

19" rack unit

- 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)
- Internal gas paths: hose made of FKM (Viton) or pipe made of titanium or stainless steel
- Gas connections for sample gas inlet and outlet: pipe diameter 6 mm or 1/4"
- Flow indicator for sample gas on front plate (option)
- Sample chamber (OXYMAT channel) – with or without flow-type compensation branch – made of stainless steel (mat. no. 1.4571) or of tantalum for highly corrosive sample gases (e.g. HCl, Cl_2, SO_2, SO_3, etc.)
- Monitoring (option) of sample gas and/or reference gas (both channels)

General information

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, Italian/English, Spanish/English

Inputs and outputs (per channel)

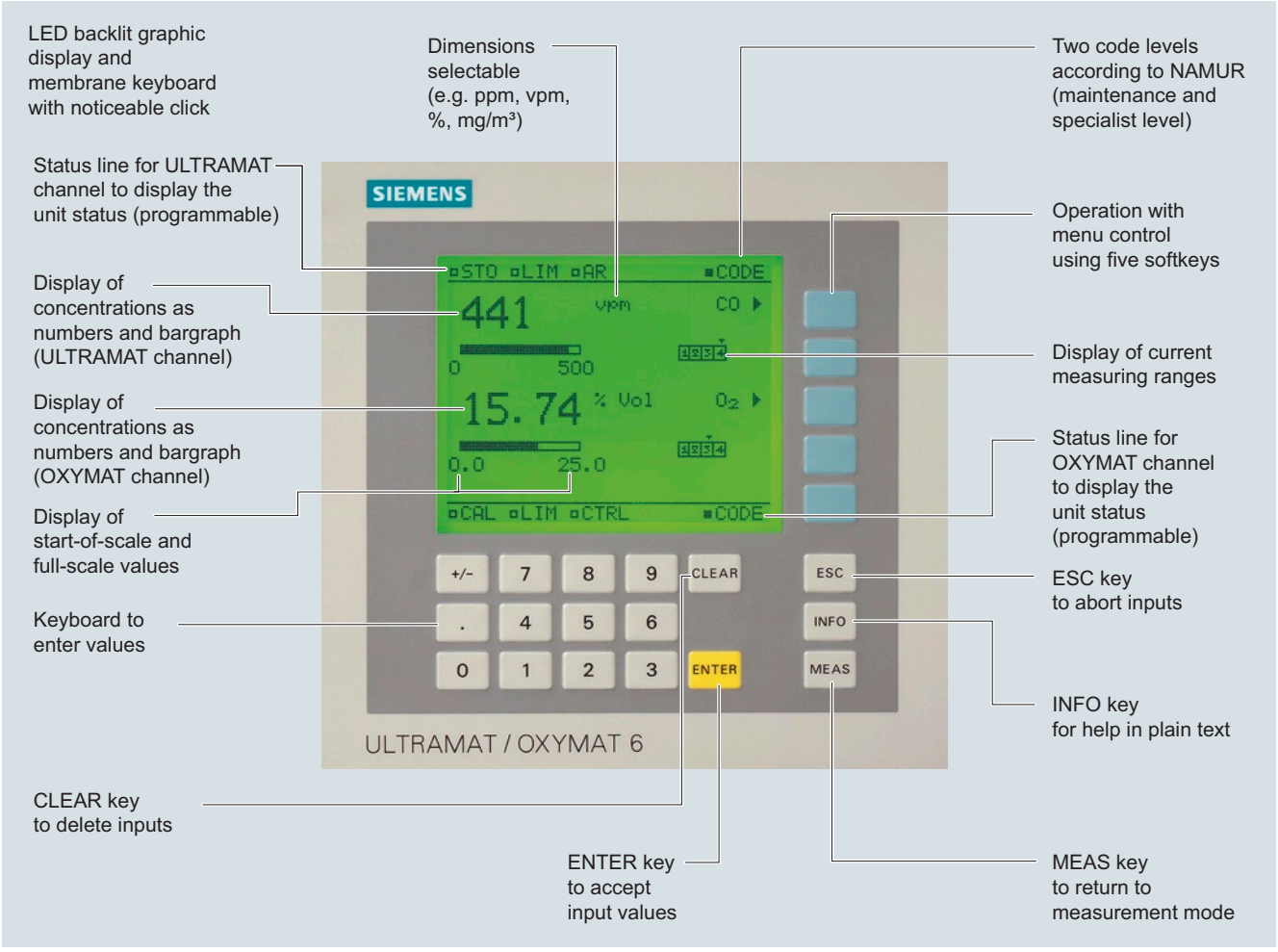
- One analog output for each measured component
- Two analog inputs freely configurable (e.g. correction of cross-interference or external pressure sensor)
- Six digital inputs freely configurable (e.g. for measurement range switchover, processing of external signals from sample preparation)
- Six relay outputs freely configurable e.g. for fault, maintenance demanded, limit alarm, external solenoid valves
- Expansion by eight additional digital inputs and eight additional relay outputs 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



ULTRAMAT/OXYMAT 6, membrane keyboard and graphic display

Designs – Parts wetted by sample gas, standard

Gas path ULTRAMAT channel		19" rack unit
With hoses	Bushing	Stainless steel, mat. no. 1.4571
	Hose	FKM (e.g. Viton)
	Sample chamber:	
	• Body	Aluminum
	• Lining	Aluminum
	• Fitting	Stainless steel, mat. no. 1.4571, O-ring: FKM (e.g. Viton) or FFKM (Kalrez)
	• Window	CaF_2, adhesive: E353, O-ring: FKM (e.g. Viton) or FFKM (Kalrez)
With pipes	Bushing	Titanium
	Pipe	Titanium, O-ring: FKM (e.g. Viton) or FFKM (Kalrez)
	Sample chamber:	
	• Body	Aluminum
	• Lining	Tantalum (only for cell length 20 mm to 180 mm)
	• Window	CaF_2, adhesive: E353, O-ring: FKM (e.g. Viton) or FFKM (Kalrez)
With pipes	Bushing	Stainless steel, mat. no. 1.4571
	Pipe	Stainless steel, mat. no. 1.4571, O-ring: FKM (e.g. Viton) or FFKM (Kalrez)
	Sample chamber:	
	• Body	Aluminum
	• Lining	Aluminum or tantalum (Ta: only for cell length 20 mm to 180 mm)
	• Window	CaF_2, adhesive: E353, O-ring: FKM (e.g. Viton) or FFKM (Kalrez)
Flow indicator	Measurement pipe	Duran glass
	Variable area	Duran glass
	Suspension boundary	PTFE (Teflon)
	Angle pieces	FKM (e.g. Viton)
Pressure switch	Diaphragm	FKM (e.g. Viton)
	Enclosure	PA 6.3T

Options

Gas path ULTRAMAT channel		19" rack unit
Flow indicator	Measurement pipe	Duran glass
	Variable area	Duran glass
	Suspension boundary	PTFE (Teflon)
	Angle pieces	FKM (e.g. Viton)
Pressure switch	Diaphragm	FKM (e.g. Viton)
	Enclosure	PA 6.3T

Versions – Parts wetted by sample gas, special applications (examples)

Gas path ULTRAMAT channel		19" rack unit
With pipes	Bushing	e.g. Hastelloy C22
	Pipe	e.g. Hastelloy C22, O-ring: FKM (e.g. Viton) or FFKM (Kalrez)
	Sample chamber:	
	• Body	e.g. Hastelloy C22
	• Window	CaF_2, without adhesive O-ring: FKM (e.g. Viton) or FFKM (Kalrez)

General information

Designs – Parts wetted by sample gas, standard

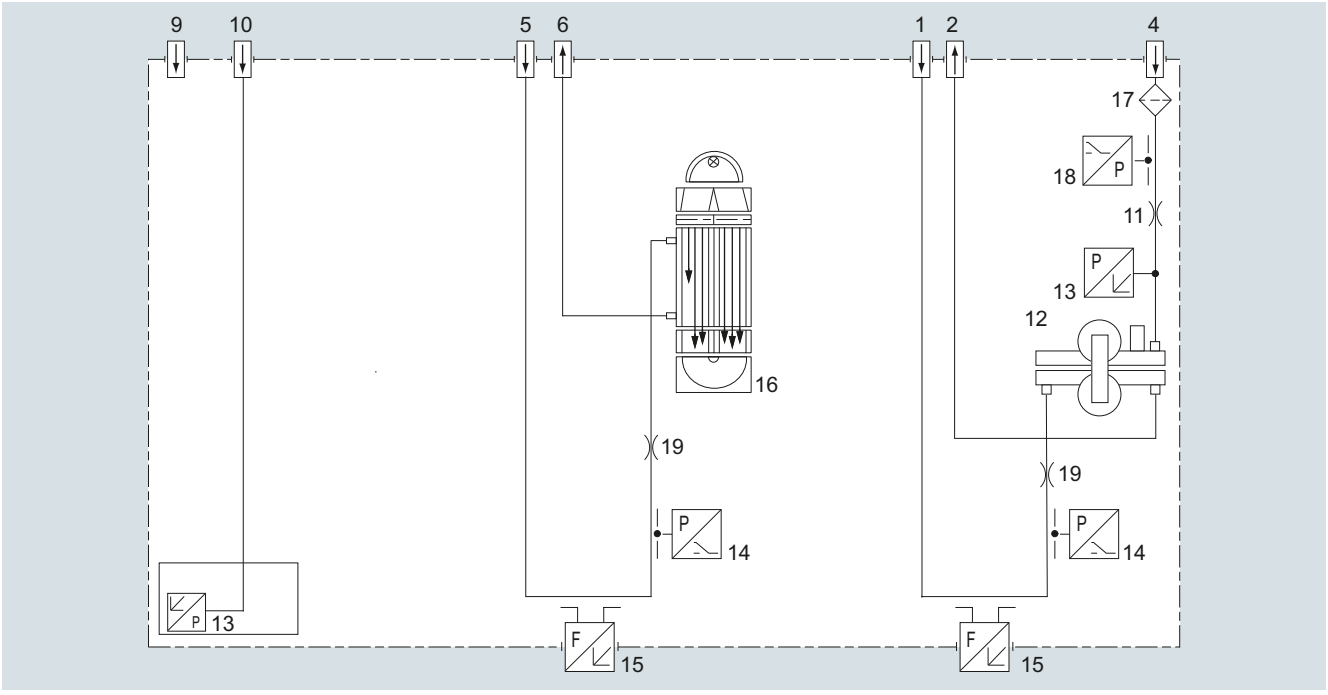
Gas path OXYMAT channel		19" rack unit
With hoses	Bushing	Stainless steel, mat. no. 1.4571
	Hose	FKM (e.g. Viton)
	Sample chamber	Stainless steel, mat. no. 1.4571 or tantalum
	Fittings for sample chamber	Stainless steel, mat. no. 1.4571
	Restrictor	PTFE (e.g. Teflon)
	O-rings	FKM (e.g. Viton)
With pipes	Bushing	Titanium
	Pipe	Titanium
	Sample chamber	Stainless steel, mat. no. 1.4571 or Tantalum
	Restrictor	Titanium
	O-rings	FKM (Viton) or FFKM (Kalrez)
With pipes	Bushing	Stainless steel, mat. no. 1.4571
	Pipe	Stainless steel, mat. no. 1.4571
	Sample chamber	Stainless steel, mat. no. 1.4571 or Tantalum
	Restrictor	Stainless steel, mat. no. 1.4571
	O-rings	FKM (Viton) or FFKM (Kalrez)
With pipes	Bushing	Hastelloy C 22
	Pipe	Hastelloy C 22
	Sample chamber	Stainless steel, mat. no. 1.4571 or Tantalum
	Restrictor	Hastelloy C 22
	O-rings	FKM (e.g. Viton) or FFKM (e.g. Kalrez)

Options

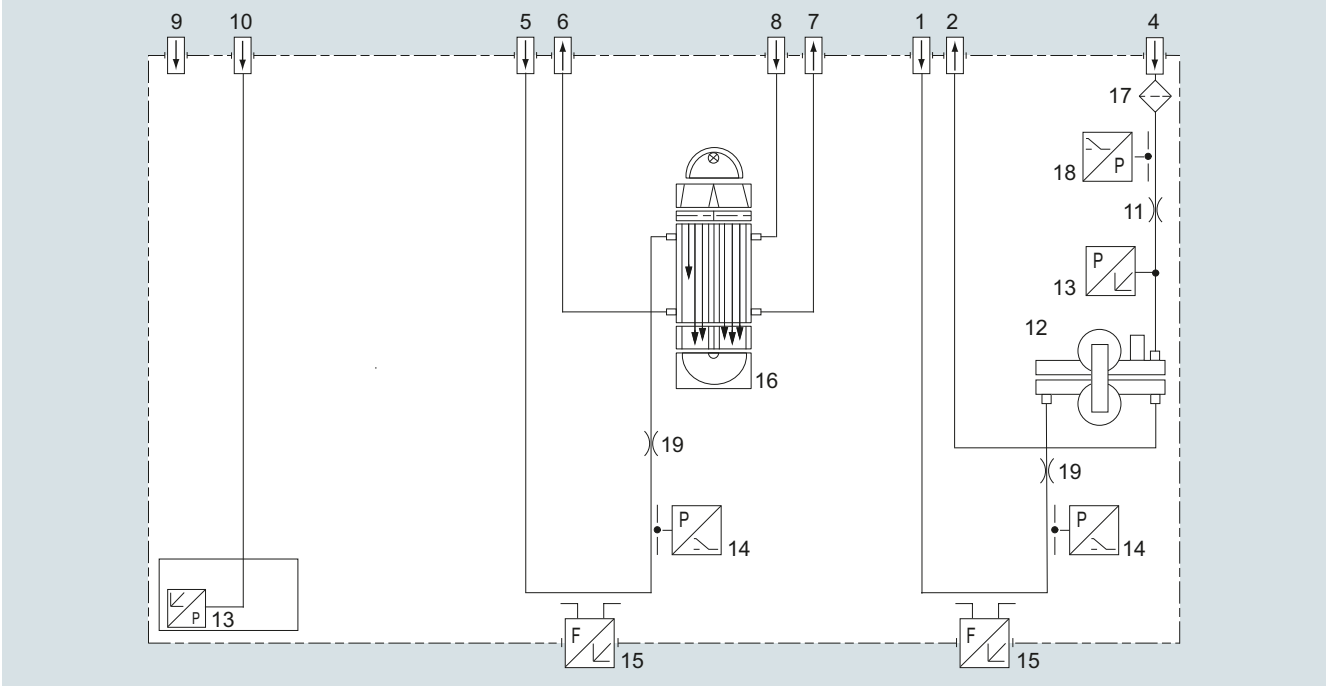
Gas path ULTRAMAT channel and OXYMAT channel		19" rack unit
Flow indicator	Measurement pipe	Duran glass
	Variable area	Duran glass
	Suspension boundary	PTFE (Teflon)
	Angle pieces	FKM (e.g. Viton)
Pressure switch	Diaphragm	FKM (e.g. Viton)
	Enclosure	PA 6.3T

Gas path

Legend for the gas path figures			
1	Sample gas inlet (OXYMAT channel)	11	Restrictor (in reference gas inlet)
2	Sample gas outlet (OXYMAT channel)	12	O_2 physical system
3	Not used	13	Pressure sensor
4	Reference gas inlet	14	Pressure switch in sample gas path (option)
5	Sample gas inlet (ULTRAMAT channel)	15	Flow indicator in sample gas path (option)
6	Sample gas outlet (ULTRAMAT channel)	16	IR hardware
7	Reference gas outlet (ULTRAMAT channel, option)	17	Filter
8	Reference gas inlet (ULTRAMAT channel, option)	18	Pressure switch (reference gas) (option)
9	Purging gas	19	Restrictor in sample gas path (option)
10	Pressure sensor connection (ULTRAMAT channel)		



ULTRAMAT/OXYMAT 6, gas path (example) IR channel without flow-type reference side



ULTRAMAT/OXYMAT 6, gas path (example) IR channel with flow-type reference side

Function

Principle of operation, ULTRAMAT channel

The ULTRAMAT channel operates according to the infrared two-beam alternating light principle with double-layer detector and optical coupler.

The measuring principle is based on the molecule-specific absorption of bands of infrared radiation. The absorbed wavelengths are characteristic to the individual gases, but may partially overlap. This results in cross-sensitivities which are reduced to a minimum by the following measures:

- Gas-filled filter cell (beam divider)
- Double-layer detector with optical coupler
- Optical filters if necessary

The figure shows the measuring principle. An IR source (1) which is heated to approx. 700 °C and which can be shifted to balance the system is divided by the beam divider (3) into two equal beams (sample and reference beams). The beam divider also acts as a filter cell.

The reference beam passes through a reference cell (8) filled with N_2 (a non-infrared-active gas) and reaches the right-hand side of the detector (11) practically unattenuated. The sample beam passes through the sample chamber (7) through which the sample gas flows and reaches the left-hand side of the detector (10) attenuated to a lesser or greater extent depending on the concentration of the sample gas. The detector is filled with a defined concentration of the gas component to be measured.

The detector is designed as a double-layer detector. The center of the absorption band is preferentially absorbed in the upper detector layer, the edges of the band are absorbed to approximately the same extent in the upper and lower layers. The upper and lower detector layers are connected together via the microflow sensor (12). This coupling means that the spectral sensitivity has a very narrow band.

The optical coupler (13) lengthens the lower receiver cell layer optically. The infrared absorption in the second detector layer is varied by changing the slider position (14). It is thus possible to individually minimize the influence of interfering components.

A chopper (5) rotates between the beam divider and the sample chamber and interrupts the two beams alternately and periodically. If absorption takes place in the sample chamber, a pulsating flow is generated between the two detector levels which is converted by the microflow sensor (12) into an electric signal.

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 together with the dense arrangement of the Ni grids causes a change in resistance. This leads to an offset in the bridge, which is dependent on the concentration of the sample gas.

Note

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

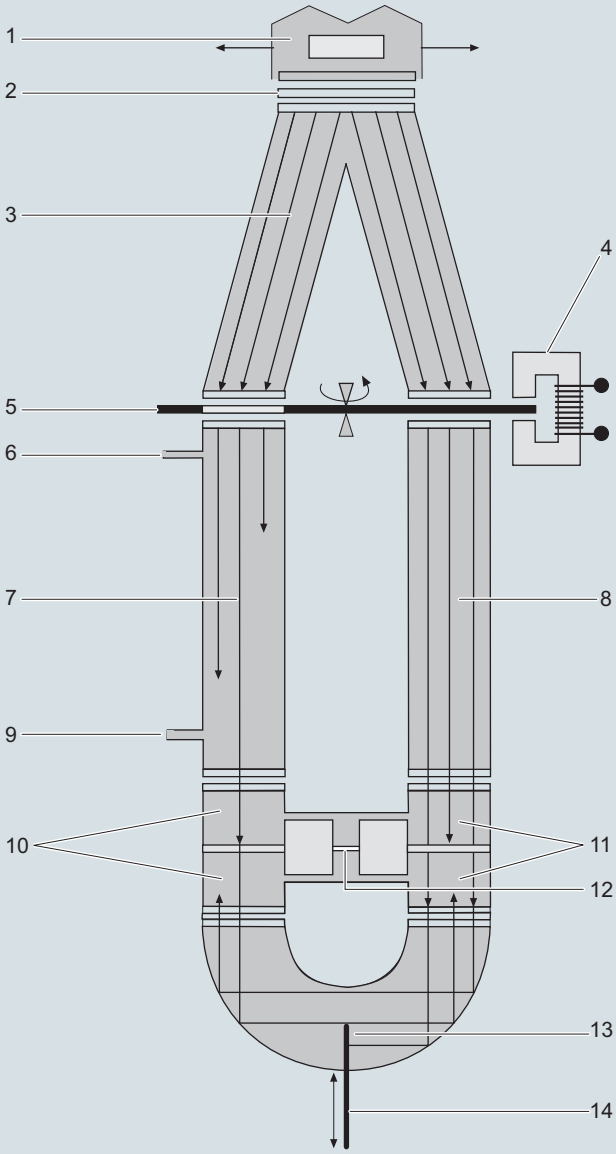
As far as possible, the ambient air of the analyzer should not have a large concentration of the gas components to be measured.

Flow-type reference sides with reduced flow must not be operated with flammable or toxic gases.

Flow-type reference sides with reduced flow and an O_2 content > 70% may only be used together with Y02.

Channels with electronically suppressed zero point only differ from the standard version in the measuring range parameterization.

Physically suppressed zeros can be provided as a special application.



1	IR source, adjustable	8	Reference cell
2	Optical filter	9	Sample gas outlet
3	Beam divider	10	Detector, meas. side
4	Eddy current drive	11	Detector, reference side
5	Chopper	12	Microflow sensor
6	Sample gas inlet	13	Optical coupler
7	Sample cell	14	Slider, adjustable

ULTRAMAT channel, principle of operation

Principle of operation, OXYMAT channel

In contrast to almost all other gases, oxygen is paramagnetic. This property is utilized as the measuring principle by the OXYMAT channel.

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.

One gas (1) is a reference gas (N_2, O_2 or air), the other is the sample gas (5). The reference gas is introduced into the sample chamber (6) through two channels (3). One of these reference gas streams meets the sample gas within the area of a magnetic field (7). Because the two channels are connected, the pressure, which is proportional to the oxygen content, causes a cross flow. This flow is converted into an electric signal by a microflow sensor (4).

The microflow sensor consists of two nickel-plated grids heated to approximately 120 °C, which, along with two supplementary resistors, form a Wheatstone bridge. The pulsating flow results in a change in the resistance of the Ni grids. This leads to an offset in the bridge which is dependent on the oxygen concentration of the sample gas.

Because the microflow sensor is located in the reference gas stream, the measurement is not influenced by the thermal conductivity, the specific heat or the internal friction of the sample gas. This also provides a high degree of corrosion resistance because the microflow sensor is not exposed to the direct influence of the sample gas.

By using a magnetic field with alternating strength (8), the effect of the background flow in the microflow sensor is not detected, and the measurement is thus independent of the instrument's operating position.

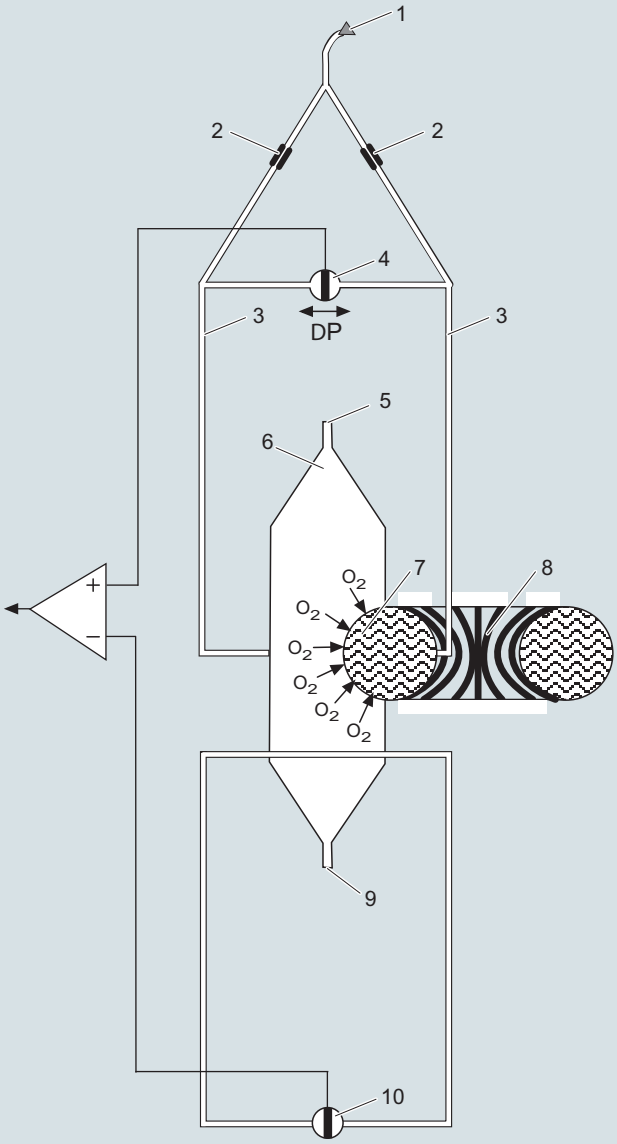
The sample chamber is directly in the sample path and has a small volume, and the microflow sensor is a low-lag sensor. This results in a very short response time.

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) (option).

Note

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



1 Reference gas inlet
2 Restrictors
3 Reference gas channels
4 Microflow sensor for measurement
5 Sample gas inlet
6 Sample cell
7 Paramagnetic effect
8 Electromagnet with alternating field strength
9 Sample gas and reference gas outlet
10 Microflow sensor in compensation system (without flow)

OXYMAT channel, principle of operation

General information

Essential characteristics

- Dimension of measured value freely selectable (e.g. vpm, mg/m^3)
- Four freely-configurable measuring ranges per component
- Measuring ranges with suppressed zero point possible
- Measuring range identification
- Galvanically isolated signal output 0/2/4 to 20 mA per component
- Automatic or manual measuring range switchover selectable; remote switching is also possible
- Storage of measured values possible during adjustments
- Time constants selectable within wide limits (static/dynamic noise suppression); i.e. the response time of the analyzer or component 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
- Monitoring of sample gas flow (option)
- Two control levels with separate authorization codes to prevent unintentional and unauthorized inputs
- Automatic measuring range calibration can be configured
- Simple handling using a numerical membrane keyboard and operator prompting
- Operation based on NAMUR recommendation
- Customer-specific analyzer options such as:
  - Customer acceptance
  - TAG labels
  - Drift recording

ULTRAMAT channel

- Differential measuring ranges with flow-type reference cell
- Internal pressure sensor for correction of variations in atmospheric pressure in the range 700 to 1 200 hPa absolute
- External pressure sensor - only with piping as the gas path - can be connected for correction of variations in the process gas pressure in the range 700 to 1 500 hPa absolute (option)
- Sample chambers for use in presence of highly corrosive sample gases (e.g. tantalum layer or Hastelloy C22)

OXYMAT channel

- Monitoring of sample gas and/or reference gas (option)
- Different smallest measuring ranges (0.5%, 2.0% or 5.0% O_2)
- Analyzer unit with flow-type compensation circuit (option): a flow is passed through the compensation branch to reduce the vibration dependency in the case of highly different densities of the sample and reference gases
- Internal pressure sensor for correction of pressure variations in sample gas (range 500 to 2 000 hPa absolute)
- 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 reference gas with reference gas connection 3 000 to 5 000 hPa (option), absolute
- 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_2	N_2	2 000 … 4 000 hPa above sample gas pressure (max. 5 000 hPa absolute)	The reference gas flow is set automatically to 5 … 10 ml/min (up to 20 ml/min with flow-type compensation branch)
... to 100 vol.% O_2 (suppressed zero point with full-scale value 100 vol.% O_2)	O_2		
Around 21 vol.% O_2 (suppressed zero point with 21 vol.% O_2 within the measuring span)	Air	100 hPa with respect to sample gas pressure, which may vary by max. 50 hPa around the atmospheric pressure	

Table 1: Reference gases for OXYMAT channel

Correction of zero error / cross-sensitivities (OXYMAT channel)

Accompanying gas (concentration 100 vol.%)	Deviation from zero point in vol. % O_2 absolute
Organic gases	
Ethane C_2H_6	-0.49
Ethene (ethylene) C_2H_4	-0.22
Ethine (acetylene) C_2H_2	-0.29
1.2 butadiene C_4H_6	-0.65
1.3 butadiene C_4H_6	-0.49
n-butane C_4H_{10}	-1.26
iso-butane C_4H_{10}	-1.30
1-butene C_4H_8	-0.96
iso-butene C_4H_8	-1.06
Dichlorodifluoromethane (R12) CCl_2F_2	-1.32
Acetic acid CH_3COOH	-0.64
n-heptane C_7H_{16}	-2.40
n-hexane C_6H_{14}	-2.02
Cyclo-hexane C_6H_{12}	-1.84
Methane CH_4	-0.18
Methanol CH_3OH	-0.31
n-octane C_8H_{18}	-2.78
n-pentane C_5H_{12}	-1.68
iso-pentane C_5H_{12}	-1.49
Propane C_3H_8	-0.87
Propylene C_3H_6	-0.64
Trichlorofluoromethane (R11) CCl_3F	-1.63
Vinyl chloride C_2H_3Cl	-0.77
Vinyl fluoride C_2H_3F	-0.55
1.1 vinylidene chloride $C_2H_2Cl_2$	-1.22

Accompanying gas (concentration 100 vol.%)	Deviation from zero point in vol. % O_2 absolute
Inert gases	
Helium He	+0.33
Neon Ne	+0.17
Argon Ar	-0.25
Krypton Kr	-0.55
Xenon Xe	-1.05
Inorganic gases	
Ammonia NH_3	-0.20
Hydrogen bromide HBr	-0.76
Chlorine Cl_2	-0.94
Hydrogen chloride HCl	-0.35
Dinitrogen monoxide N_2O	-0.23
Hydrogen fluoride HF	+0.10
Hydrogen iodide HI	-1.19
Carbon dioxide CO_2	-0.30
Carbon monoxide CO	+0.07
Nitrogen oxide NO	+42.94
Nitrogen N_2	0.00
Nitrogen dioxide NO_2	+20.00
Sulfur dioxide SO_2	-0.20
Sulfur hexafluoride SF_6	-1.05
Hydrogen sulfide H_2S	-0.44
Water H_2O	-0.03
Hydrogen H_2	+0.26

Table 2: Zero point error due to diamagnetism or paramagnetism of some accompanying gases with reference to nitrogen at 60 °C and 1 000 hPa absolute (according to IEC 61207/3)

Conversion to other temperatures:

The deviations from the zero point listed in Table 2 must be multiplied by a correction factor (k):

- with diamagnetic gases: $k = 333\ K / (\varphi\ [°C] + 273\ K)$
- with paramagnetic gases: $k = [333\ K / (\varphi\ [°C] + 273\ K)]^2$

All diamagnetic gases have a negative deviation from zero point.

Technical specifications

19" rack unit

General information	
Operating position	Front wall, vertical
Conformity	CE mark in accordance with EN 50081-1 and EN 50082-2
Design, enclosure	
Weight	Approx. 21 kg
Degree of protection	IP20 according to EN 60529
Electrical characteristics	
EMC (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98)
Electrical safety	According to EN 61010-1, overvoltage category III
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. 70 VA
Fuse values	120 ... 120 V: F1/F2 = T 1.6 A 200 ... 240 V: F1/F2 = T 1 A
Electrical inputs and outputs (per channel)	
Analog output	0/2/4 ... 20 mA, floating; max. load 750 Ω
Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load: 24 V AC/DC/1 A, floating, non-sparking
Analog inputs	2, dimensioned for 0/2/4 … 20 mA for external pressure sensor and correction of influence of accompanying gas (correction of cross-interference)
Digital inputs	6, designed for 24 V, floating, freely configurable, e.g. for measuring range switchover
Serial interface	RS 485
Options	AUTOCAL function each with 8 additional digital 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, during storage and transportation (dew point must not be undershot)

ULTRAMAT channel

Measuring ranges	4, internally and externally switchable; autoranging is also possible
Smallest possible measuring range	Dependent on the application, e.g. CO: 0 ... 10 vpm CO_2: 0 ... 5 vpm
Largest possible measuring range	Dependent on the application
Measuring ranges with suppressed zero point	Any zero point within 0 ... 100 vol.% can be implemented; smallest possible span 20%
Characteristic	Linearized
Influence of interfering gases must be considered separately	

Gas inlet conditions	
Permissible sample gas pressure	
• Without pressure switch	700 ... 1 500 hPa (absolute)
• With integrated pressure switch	700 ... 1 300 hPa (absolute)
Sample gas flow	18 ... 90 l/h (0.3 ... 1.5 l/min)
Sample gas temperature	Min. 0 to max. 50 °C, but above the dew point
Sample gas humidity	< 90% (relative humidity), or dependent on measuring task, non-condensing
Dynamic response	
Warm-up period	At room temperature < 30 min (the technical specification will be met after 2 hours)
Delayed display (T_{90}-time)	Dependent on length of analyzer chamber, sample gas line and configurable damping
Damping (electrical time constant)	0 ... 100 s, configurable
Dead time (purging time of the gas path in the unit at 1 l/min)	Approx. 0.5 ... 5 s, depending on version
Time for device-internal signal processing	< 1 s
Pressure correction range	
Pressure sensor	
• Internal	700 ... 1 200 hPa absolute
• External	700 ... 1 500 hPa absolute
Measuring response	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation	< ± 1% of the smallest possible measuring range according to rating plate
Zero point drift	<± 1% of the current measuring range/week
Measured-value drift	<± 1% of the current measuring range/week
Repeatability	≤ 1% of the current measuring range
Detection limit	1% of the smallest possible measuring range
Linearity error	< 0.5% of the full-scale value
Influencing variables	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Ambient temperature	< 1% of current measuring range/10 K (with constant receiver cell temperature)
Sample gas pressure	• With disabled pressure compensation: < 0.15% of the span/1% change in atmospheric pressure • With disabled pressure compensation: < 1.5% of the span/1% change in atmospheric pressure
Sample gas flow	Negligible
Auxiliary power	< 0.1% of the current measuring range with rated voltage ± 10%
Environmental conditions	Application-specific measuring influences possible if ambient air contains measured component or cross interference-sensitive gases

OXYMAT channel

Measuring ranges	4, internally and externally switchable; automatic measuring range switchover also possible
Smallest possible span (relating to sample gas pressure 1 000 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature)	0.5 vol.%, 2 vol.% or 5 vol.% O_2
Largest possible measuring range	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
Gas inlet conditions	
Permissible sample gas pressure	
• With pipes	500 ... 3 000 hPa absolute
• With hoses	
- Without pressure switch	500 ... 1 500 hPa absolute
- With pressure switch	500 ... 1 300 hPa absolute
Sample gas flow	18 ... 60 l/h (0.3 ... 1 l/min)
Sample gas temperature	0 ... 50 °C
Sample gas humidity	< 90% RH (relative humidity)
Reference gas pressure (high-pressure version)	2 000 ... 4 000 hPa above sample gas pressure, but max. 5 000 hPa
Reference gas pressure (low-pressure version)	Min. 100 hPa above sample gas pressure
Dynamic response	
Warm-up period	At room temperature < 30 min (the technical specification will be met after 2 hours)
Delayed display (T_{90}-time)	Min. 1.5 ... 3.5 s, depending on version
Damping (electrical time constant)	0 ... 100 s, configurable
Dead time (purging time of the gas path in the unit at 1 l/min)	Approx. 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	Based on 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 2σ)
Zero point drift	< 0.5%/month of the smallest possible measuring span according to rating plate
Measured-value drift	≤ 0.5%/month of the current measuring range
Repeatability	≤ 1%/month of the current measuring range
Detection limit	1% of the current measuring range
Linearity error	1% of the current measuring range
Influencing variables	Based on 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 referred to smallest possible span according to rating plate • With measuring span 0.5%: 1%/10 K
Sample gas pressure (with air (100 hPa) as reference gas, correction of the atmospheric pressure fluctuations is only possible if the sample gas can vent to ambient air)	• With disabled pressure compensation: < 2% of the current measuring range /1 % change in atmospheric pressure • With disabled pressure compensation: < 0.2% of the current measuring range /1 % change in atmospheric pressure
Accompanying gases	Deviation from zero point corresponding to paramagnetic or diamagnetic deviation of accompanying 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%

Selection and ordering data			Article No.	Cannot be combined
ULTRAMAT/OXYMAT 6 gas analyzer 19" rack unit for installation in cabinets Combined measurement of IR-absorbing gas and O_2			↗ **7MB2023- ■■■■■ - ■■■■**	
↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.				
Gas connections for sample gas and reference gas				
Pipe with 6 mm outer diameter			0	0 → A21
Pipe with ¼" outer diameter			1	1 → A20
Smallest possible measuring span O_2				
0.5 % reference gas pressure 3 000 hPa			A	
0.5 % reference gas pressure 100 hPa (external pump)			B	B	B → A26, Y02
2 % reference gas pressure 3 000 hPa			C	
2 % reference gas pressure 100 hPa (external pump)			D	D	D → A26, Y02
5 % reference gas pressure 3 000 hPa			E	
5 % reference gas pressure 100 hPa (external pump)			F	F	F → A26, Y02
Sample chamber (OXYMAT channel)				
Non-flow-type compensation branch				
• Made of stainless steel, mat. no. 1.4571			A	
• Made of tantalum			B	
Flow-type compensation branch				
• Made of stainless steel, mat. no. 1.4571			C	C
• Made of tantalum			D	D
Internal gas paths (both channels)	Sample chamber[1] (lining) (ULTRAMAT channel)	Reference chamber (flow-type) (ULTRAMAT channel)		
Hose made of FKM (Viton)	Aluminum	Non-flow-type	0	0	0 → A20, A21
	Aluminum	Flow-type	1	1
Pipe made of titanium	Tantalum	Non-flow-type	4	4 → A20, A21, Y02
	Tantalum	Flow-type	5	5 → Y02
Stainless steel pipe (mat. no. 1.4571)	Aluminum	Non-flow-type	6	6 → A20, A21
	Tantalum	Non-flow-type	8	8 → A20, A21
With sample gas monitoring (both channels)				
Hose made of FKM (Viton)	Aluminum	Non-flow-type	2	2	2 → A20, A21
	Aluminum	Flow-type	3	3
Add-on electronics				
Without			0	0 → Y27, Y28
AUTOCAL function				
• With 8 additional digital inputs and outputs for OXYMAT channel			1	
• With 8 additional digital inputs and outputs for ULTRAMAT channel			2	
• With 8 additional digital inputs and 8 additional digital outputs for ULTRAMAT channel and OXYMAT channel			3	
• With serial interface for the automotive industry (AK)			5	5 → Y02
• With 8 additional digital inputs/outputs and PROFIBUS PA interface for ULTRAMAT channel and OXYMAT channel			6	
• With 8 additional digital inputs/outputs and PROFIBUS DP interface for ULTRAMAT channel and OXYMAT channel			7	
Power supply				
100 ... 120 V AC, 48 ... 63 Hz			0	
200 ... 240 V AC, 48 ... 63 Hz			1	

Footnotes, see next page

Selection and ordering data			Article No.		
ULTRAMAT/OXYMAT 6 gas analyzer 19" rack unit for installation in cabinets Combined measurement of IR-absorbing gas and O_2			**7MB2023-** ■■■■■-		Cannot be combined
ULTRAMAT channel Measured component		Possible with measuring range identification			
CO		11[2], 12 ... 30		**A**	
CO highly selective (with optical filter)[3]		12[2], 13 ... 30		**B**	
CO[4]				**X**	
CO_2		10[2], 11 ... 30		**C**	
CH_4		13[2], 14 ... 30		**D**	
C_2H_2		15[2], 16 ... 30		**E**	
C_2H_4		15[2], 16 ... 30		**F**	
C_2H_6		14[2], 15 ... 30		**G**	
C_3H_6		14[2], 15 ... 30		**H**	
C_3H_8		13[2], 14 ... 30		**J**	
C_4H_6		15[2], 16 ... 30		**K**	
C_4H_{10}		14[2], 15 ... 30		**L**	
C_6H_{14}		14[2], 15 ... 30		**M**	
SO_2[5]		13[2], 14 ... 30		**N**	
NO[5]		14[2], 15 ... 20, 22		**P**	
NH_3 (dry)		14[2], 15 ... 30		**Q**	**Q**
H_2O		17[2], 18 ... 20, 22		**R**	**R**
N_2O		13[2], 14 ... 30		**S**	
Smallest measuring range	Largest measuring range	Measuring range identification			
0 ... 5 vpm	0 ... 100 vpm	10		**A**	
0 ... 10 vpm	0 ... 200 vpm	11		**B**	
0 ... 20 vpm	0 ... 400 vpm	12		**C**	
0 ... 50 vpm	0 ... 1 000 vpm	13		**D**	
0 ... 100 vpm	0 ... 1 000 vpm	14		**E**	
0 ... 300 vpm	0 ... 3 000 vpm	15		**F**	
0 ... 500 vpm	0 ... 5 000 vpm	16		**G**	
0 ... 1 000 vpm	0 ... 10 000 vpm	17		**H**	
0 ... 3 000 vpm	0 ... 10 000 vpm	18		**J**	
0 ... 3 000 vpm	0 ... 30 000 vpm	19		**K**	
0 ... 5 000 vpm	0 ... 15 000 vpm	20		**L**	
0 ... 5 000 vpm	0 ... 50 000 vpm	21		**M**	
0 ... 1 %	0 ... 3 %	22		**N**	
0 ... 1 %	0 ... 10 %	23		**P**	
0 ... 3 %	0 ... 10 %	24		**Q**	
0 ... 3 %	0 ... 30 %	25		**R**	
0 ... 5 %	0 ... 15 %	26		**S**	
0 ... 5 %	0 ... 50 %	27		**T**	
0 ... 10 %	0 ... 30 %	28		**U**	
0 ... 10 %	0 ... 100 %	29		**V**	
0 ... 30 %	0 ... 100 %	30		**W**	
Operating software and documentation					
German					**0**
English					**1**
French					**2**
Spanish					**3**
Italian					**4**

1) Only for cell length 20 to 180 mm

2) Can be ordered as special application (no. 3100 with order code Y12)

3) QAL1: see table "Performance tested according to EN 15267 (single component)", page 1/88

4) QAL1: See table "Based on QAL1 according to SIRA/MCERTS (single component)", page 1/88

5) QAL1: See table "Based on QAL1 according to SIRA/MCERTS (single component) and performance-tested according to EN 15267 (single component)", page 1/88

Selection and ordering data

Additional versions	**Order code**	Cannot be combined
Add "-Z" to Article No. and specify Order codes.		
Flow-type reference cell with reduced flow, 6 mm (ULTRAMAT channel)[1]	**A20**	
Flow-type reference cell with reduced flow, ¼" (ULTRAMAT channel)[1]	**A21**	
Reference gas monitoring (pressure switch ... 3 000 hPa), for OXYMAT channel only	**A26**	
Connection pipes (can only be combined with the appropriate gas connection diameter and internal gas path materials)		
• Titanium connection pipe, 6 mm, complete with screwed gland, for sample gas side	**A22**	
• Titanium connection pipe, ¼", complete with screwed gland, for sample gas side	**A24**	
• Stainless steel connection pipe (mat. no. 1.4571), 6 mm, complete with screwed gland, for sample gas side	**A27**	
• Stainless steel connection pipe (mat. no. 1.4571), ¼", complete with screwed gland, for sample gas side	**A29**	
Telescopic rails (2 units)	**A31**	
Kalrez gaskets in sample gas path (O_2 side)	**B01**	
TAG labels (specific lettering based on customer information)	**B03**	
Kalrez gaskets in sample gas path (IR side)	**B04**	
SIL conformity declaration (SIL 2) Functional Safety according to IEC 61508 and IEC 61511	**C20**	
FM/CSA certificate – Class I Div 2	**E20**	
Clean for O_2 service (specially cleaned gas path) (ULTRAMAT channel and OXYMAT channel)	**Y02**	
Measuring range indication in plain text[2], if different from the standard setting	**Y11**	
Special setting (only in conjunction with an application no., e.g. extended measuring range, only ULTRAMAT channel)	**Y12**	
Extended special setting (only in conjunction with an application no., e.g. determination of interference influences, only ULTRAMAT channel)	**Y13**	
QAL1 according to SIRA/MCERTS (ULTRAMAT channel only)	**Y17**	→ **E20**
Performance-tested according to EN 15267 (1st channel)	**Y27**	
Performance-tested according to EN 15267 (2nd channel)	**Y28**	

Accessories	**Article No.**
RS 485/Ethernet converter	**A5E00852383**
RS 485/RS 232 converter	**C79451-Z1589-U1**
RS 485/USB converter	**A5E00852382**
AUTOCAL function with serial interfaces for the automotive industry (AK)	**C79451-A3480-D33**
AUTOCAL function with 8 digital inputs/outputs for ULTRAMAT channel or OXYMAT channel	**C79451-A3480-D511**
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS PA for ULTRAMAT channel or OXYMAT channel	**A5E00057307**
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS DP for ULTRAMAT channel or OXYMAT channel	**A5E00057312**
Set of Torx screwdrivers	**A5E34821625**

[1] Cannot be combined with non-flow-type reference cell.

[2] Standard setting: Smallest measuring range, 25 % of largest measuring range, 50 % of largest measuring range, Largest measuring range } in % or ppm (vpm)

Selection and ordering data			Article No.		Cannot be combined
ULTRAMAT/OXYMAT 6 gas analyzer ↗ 19" rack unit for installation in cabinets Combined measurement of IR-absorbing gas and O_2			**7MB2024-**	-	
↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.					
Gas connections for sample gas and reference gas					
Pipe with 6 mm outer diameter			0		0 → A21
Pipe with ¼" outer diameter			1		1 → A20
Smallest possible measuring span O_2					
0.5 % reference gas pressure 3 000 hPa			A		
0.5 % reference gas pressure 100 hPa (external pump)			B		B B → A26, Y02
2 % reference gas pressure 3 000 hPa			C		
2 % reference gas pressure 100 hPa (external pump)			D		D D → A26, Y02
5 % reference gas pressure 3 000 hPa			E		
5 % reference gas pressure 100 hPa (external pump)			F		F F → A26, Y02
Sample chamber (OXYMAT channel)					
Non-flow-type compensation branch					
• Made of stainless steel, mat. no. 1.4571			A		
• Made of tantalum			B		
Flow-type compensation branch					
• Made of stainless steel, mat. no. 1.4571			C		C
• Made of tantalum			D		D
Internal gas paths (both channels)	Sample chamber[1] (lining) (ULTRAMAT channel)	Reference chamber (flow-type) (ULTRAMAT channel)			
Hose made of FKM (Viton)	Aluminum	Non-flow-type	0		0 → A20, A21
	Aluminum	Flow-type	1		
Pipe made of titanium	Tantalum	Non-flow-type	4		4 → A20, A21, Y02
	Tantalum	Flow-type	5		5 → Y02
Stainless steel pipe (mat. no. 1.4571)	Aluminum	Non-flow-type	6		6 → A20, A21
	Tantalum	Non-flow-type	8		8 → A20, A21
With sample gas monitoring (both channels)					
Hose made of FKM (Viton)	Aluminum	Non-flow-type	2		2 → A20, A21
	Aluminum	Flow-type	3		
Add-on electronics					
Without			0		
AUTOCAL function					
• With 8 additional digital inputs and outputs for ULTRAMAT channel and OXYMAT channel			1		
• With serial interface for the automotive industry (AK)			5		5 → Y02
• With 8 additional digital inputs/outputs and PROFIBUS PA interface for ULTRAMAT channel and OXYMAT channel			6		
• With 8 additional digital inputs/outputs and PROFIBUS DP interface for ULTRAMAT channel and OXYMAT channel			7		
Power supply					
100 ... 120 V AC, 48 ... 63 Hz				0	
200 ... 240 V AC, 48 ... 63 Hz				1	

Footnote, see next page

19" rack unit

Selection and ordering data				Article No.	
ULTRAMAT/OXYMAT 6 gas analyzer 19" rack unit for installation in cabinets Combined measurement of IR-absorbing gas and O_2				**7MB2024-** ■■■■■ - ■■■■	Cannot be combined
ULTRAMAT channel Measured component		Smallest measuring range	Largest measuring range		
CO/NO	CO	0 ... 100 vpm	0 ... 1 000 vpm	**A H**	
	NO	0 ... 300 vpm	0 ... 1 000 vpm		
CO/NO	CO	0 ... 300 vpm	0 ... 3 000 vpm	**A J**	
	NO	0 ... 500 vpm	0 ... 3 000 vpm		
CO/NO	CO	0 ... 1 000 vpm	0 ... 10 000 vpm	**A C**	
	NO	0 ... 1 000 vpm	0 ... 10 000 vpm		
For CO/NO (QAL1; see table "Based on QAL1 according to SIRA/MCERTS (2 components in series)", page 1/88)					
CO_2/CO	CO_2	0 ... 100 vpm	0 ... 1 000 vpm	**B A**	
	CO	0 ... 100 vpm	0 ... 1 000 vpm		
CO_2/CO	CO_2	0 ... 300 vpm	0 ... 3 000 vpm	**B B**	
	CO	0 ... 300 vpm	0 ... 3 000 vpm		
CO_2/CO	CO_2	0 ... 1 000 vpm	0 ... 10 000 vpm	**B C**	
	CO	0 ... 1 000 vpm	0 ... 10 000 vpm		
CO_2/CO	CO_2	0 ... 3 000 vpm	0 ... 30 000 vpm	**B D**	
	CO	0 ... 3 000 vpm	0 ... 30 000 vpm		
CO_2/CO	CO_2	0 ... 1 %	0 ... 10 %	**B E**	
	CO	0 ... 1 %	0 ... 10 %		
CO_2/CO	CO_2	0 ... 3 %	0 ... 30 %	**B F**	
	CO	0 ... 3 %	0 ... 30 %		
CO_2/CO	CO_2	0 ... 10 %	0 ... 100 %	**B G**	
	CO	0 ... 10 %	0 ... 100 %		
CO_2/CH_4	CO_2	0 ... 10 %	0 ... 100 %	**C G**	
	CH_4	0 ... 10 %	0 ... 100 %		
CO_2/NO	CO_2	0 ... 300 vpm	0 ... 3 000 vpm	**D J**	
	NO	0 ... 500 vpm	0 ... 3 000 vpm		
Operating software and documentation					
German					**0**
English					**1**
French					**2**
Spanish					**3**
Italian					**4**

1) Only for cell length 20 to 180 mm

Selection and ordering data

Additional versions	**Order code**	Cannot be combined
Add "-Z" to Article No. and specify Order codes.		
Flow-type reference cell with reduced flow, 6 mm (ULTRAMAT channel)[1]	**A20**	
Flow-type reference cell with reduced flow, ¼" (ULTRAMAT channel)[1]	**A21**	
Reference gas monitoring (pressure switch ... 3 000 hPa), for OXYMAT channel only	**A26**	
Connection pipes (can only be combined with the appropriate gas connection diameter and internal gas path materials)		
• Titanium connection pipe, 6 mm, complete with screwed gland, for sample gas side	**A22**	
• Titanium connection pipe, ¼", complete with screwed gland, for sample gas side	**A24**	
• Stainless steel connection pipe (mat. no. 1.4571), 6 mm, complete with screwed gland, for sample gas side	**A27**	
• Stainless steel connection pipe (mat. no. 1.4571), ¼", complete with screwed gland, for sample gas side	**A29**	
Telescopic rails (2 units)	**A31**	
Kalrez gaskets in sample gas path (O_2 side)	**B01**	
TAG labels (specific lettering based on customer information)	**B03**	
Kalrez gaskets in sample gas path (IR side)	**B04**	
SIL conformity declaration (SIL 2) Functional Safety according to IEC 61508 and IEC 61511	**C20**	
FM/CSA certificate – Class I Div 2	**E20**	
Clean for O_2 service (specially cleaned gas path) (ULTRAMAT channel and OXYMAT channel)	**Y02**	
Measuring range indication in plain text[2], if different from the standard setting	**Y11**	
Special setting (only in conjunction with an application no., e.g. extended measuring range, only ULTRAMAT channel)	**Y12**	
Extended special setting (only in conjunction with an application no., e.g. determination of interference influences, only ULTRAMAT channel)	**Y13**	
QAL1 according to SIRA/MCERTS (ULTRAMAT channel only)	**Y17**	→ **E20**
Accessories	**Article No.**	
RS 485/Ethernet converter	**A5E00852383**	
RS 485/RS 232 converter	**C79451-Z1589-U1**	
RS 485/USB converter	**A5E00852382**	
AUTOCAL function with serial interfaces for the automotive industry (AK)	**C79451-A3480-D33**	
AUTOCAL function with 8 digital inputs/outputs for ULTRAMAT channel or OXYMAT channel	**C79451-A3480-D511**	
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS PA for ULTRAMAT channel or OXYMAT channel	**A5E00057307**	
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS DP for ULTRAMAT channel or OXYMAT channel	**A5E00057312**	
Set of Torx screwdrivers	**A5E34821625**	

[1] Cannot be combined with non-flow-type reference cell.

[2] Standard setting:
Smallest measuring range
25 % of largest measuring range
50 % of largest measuring range
Largest measuring range
} in % or ppm (vpm)

19" rack unit

Based on QAL1 according to SIRA/MCERTS (single component)

Only in conjunction with order code Y17

Component	CO (QAL1)		SO_2 (QAL1)		NO (QAL1)	
Measuring range identification	**Smallest measuring range from 0 to ...**	**Largest measuring range from 0 to ...**	**Smallest measuring range from 0 to ...**	**Largest measuring range from 0 to ...**	**Smallest measuring range from 0 to ...**	**Largest measuring range from 0 to ...**
C			75 mg/m^3	1 500 mg/m^3		
D	50 mg/m^3	1 000 mg/m^3	300 mg/m^3	3 000 mg/m^3		
E			500 mg/m^3	5 000 mg/m^3	100 mg/m^3	2 000 mg/m^3
F	300 mg/m^3	3 000 mg/m^3	1 000 mg/m^3	10 000 mg/m^3	300 mg/m^3	3 000 mg/m^3
G	500 mg/m^3	5 000 mg/m^3			500 mg/m^3	5 000 mg/m^3
H	1 000 mg/m^3	10 000 mg/m^3	3 000 mg/m^3	30 000 mg/m^3	1 000 mg/m^3	10 000 mg/m^3
K	3 000 mg/m^3	30 000 mg/m^3	10 g/m^3	100 g/m^3	3 000 mg/m^3	30 000 mg/m^3

Performance-tested according to EN 15267 (single component)

Only in conjunction with order code Y27/Y28

Component	CO (QAL1)		SO_2 (QAL1)		NO (QAL1)	
Measuring range identification	**Smallest measuring range from 0 to ...**	**Largest measuring range from 0 to ...**	**Smallest measuring range from 0 to ...**	**Largest measuring range from 0 to ...**	**Smallest measuring range from 0 to ...**	**Largest measuring range from 0 to ...**
C			75 mg/m^3	1 500 mg/m^3		
D	75 mg/m^3	1 250 mg/m^3				
E	125 mg/m^3	1 250 mg/m^3			100 mg/m^3	2 000 mg/m^3
F	300 mg/m^3	3 000 mg/m^3			300 mg/m^3	3 000 mg/m^3
G	500 mg/m^3	5 000 mg/m^3			500 mg/m^3	5 000 mg/m^3
H	1 000 mg/m^3	10 000 mg/m^3			1 000 mg/m^3	10 000 mg/m^3
J	3 000 mg/m^3	10 000 mg/m^3			3 000 mg/m^3	10 000 mg/m^3

Example for ordering

ULTRAMAT/OXYMAT 6, performance-tested according to EN 15267
IR channel
Component: CO
Measuring range: 0 to 75/1 250 mg/m^3
with hoses, non-flow-type reference compartment
with automatic adjustment (AUTOCAL)
230 V AC; German
7MB2023-0EA03-1BD0-Z Y27+Y28

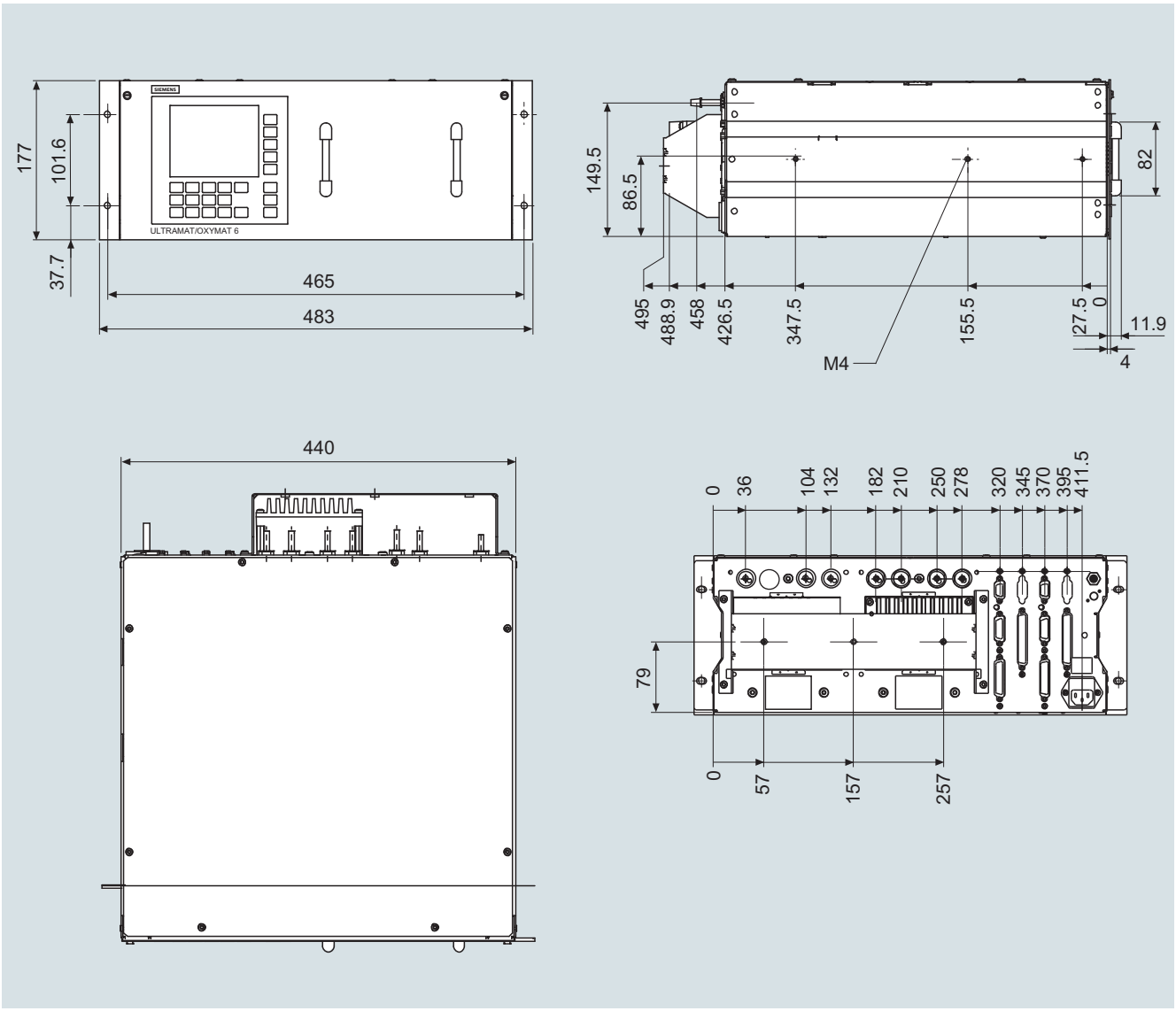
Based on QAL1 according to SIRA/MCERTS (2 components in series)

Component	CO (QAL1)		NO (QAL1)	
Measuring range identification	**Smallest measuring range from 0 to ...**	**Largest measuring range from 0 to ...**	**Smallest measuring range from 0 to ...**	**Largest measuring range from 0 to ...**
AH	75 mg/m^3	1 000 mg/m^3	200 mg/m^3	2 000 mg/m^3
AJ	300 mg/m^3	3 000 mg/m^3	500 mg/m^3	3 000 mg/m^3
AC	1 000 mg/m^3	10 000 mg/m^3	1 000 mg/m^3	10 000 mg/m^3

Example for ordering

ULTRAMAT/OXYMAT 6, QAL1
IR channel
Components: CO/NO
Measuring range CO: 0 to 75 / 1 000 mg/m^3, NO: 0 to 200/2 000 mg/m^3
with hoses, non-flow-type reference cell
without automatic adjustment (AUTOCAL)
230 V AC; German
7MB2024-0EA00-1AH0-Z +Y17

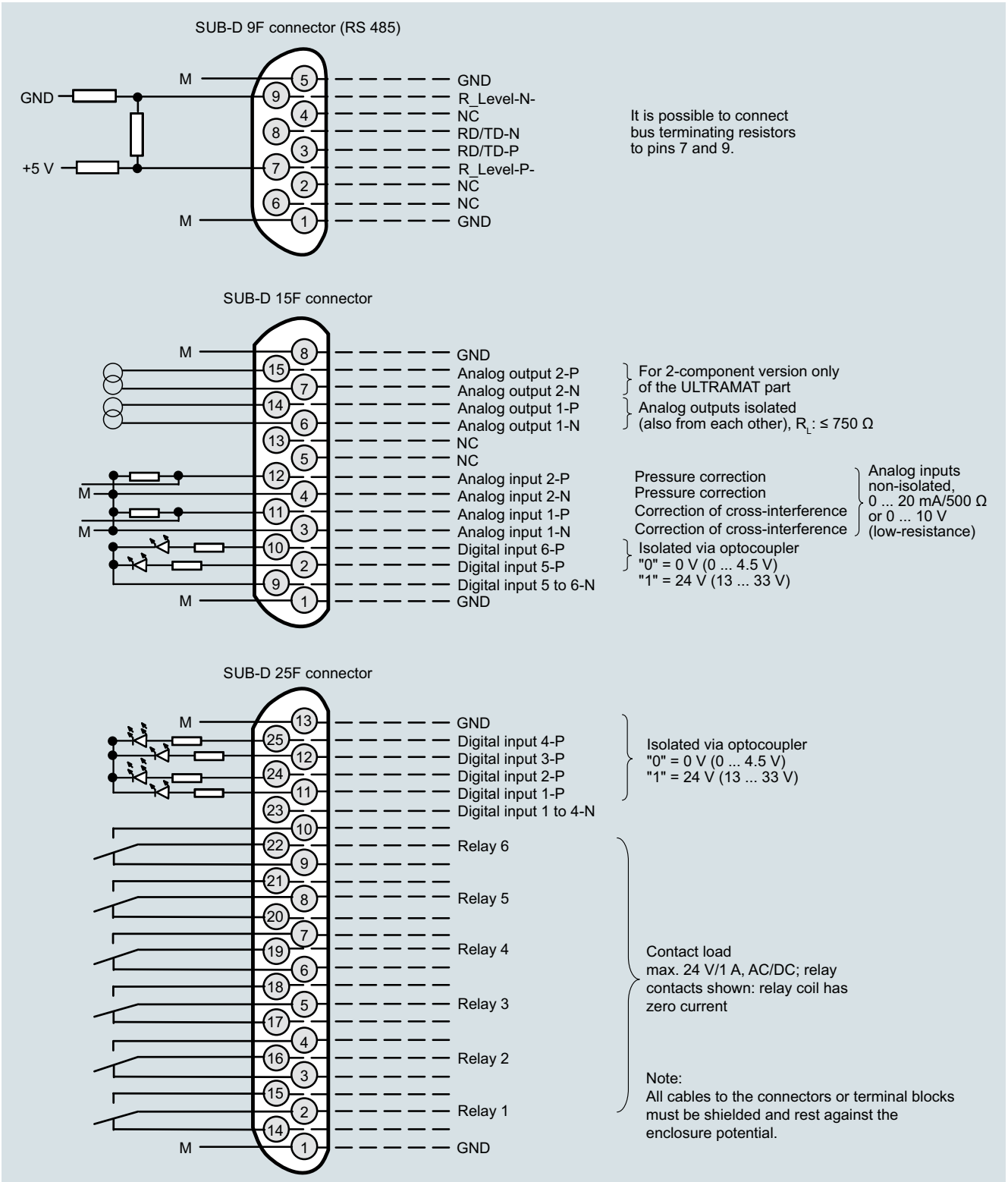
Dimensional drawings



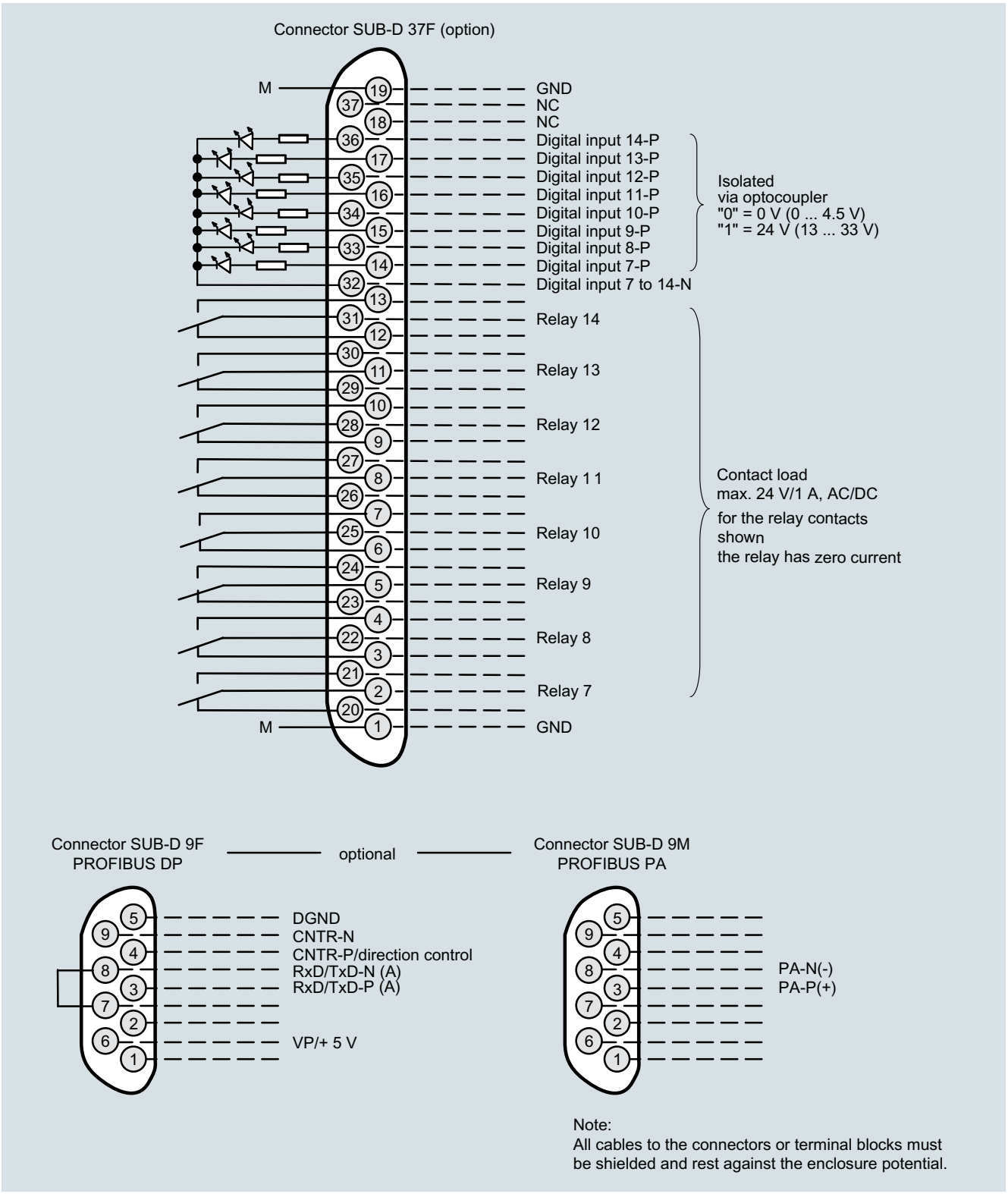
ULTRAMAT/OXYMAT 6, 19" unit, dimensions in mm

Circuit diagrams

Pin assignment (electrical and gas connections)

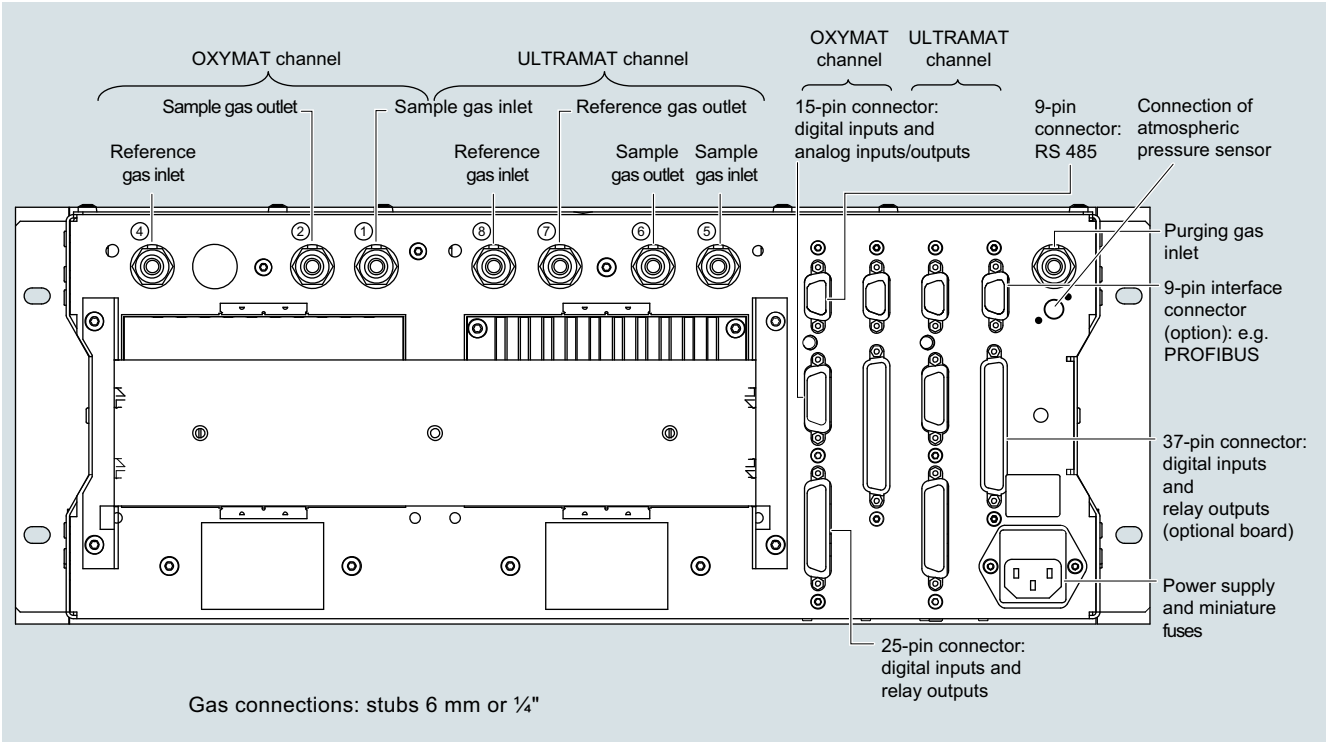


ULTRAMAT/OXYMAT 6, 19" unit, pin assignment



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

19" rack unit



ULTRAMAT/OXYMAT 6, 19" unit, gas and electrical connections