

Extractive continuous process gas analysis



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Extractive continuous process gas analysis

Introduction

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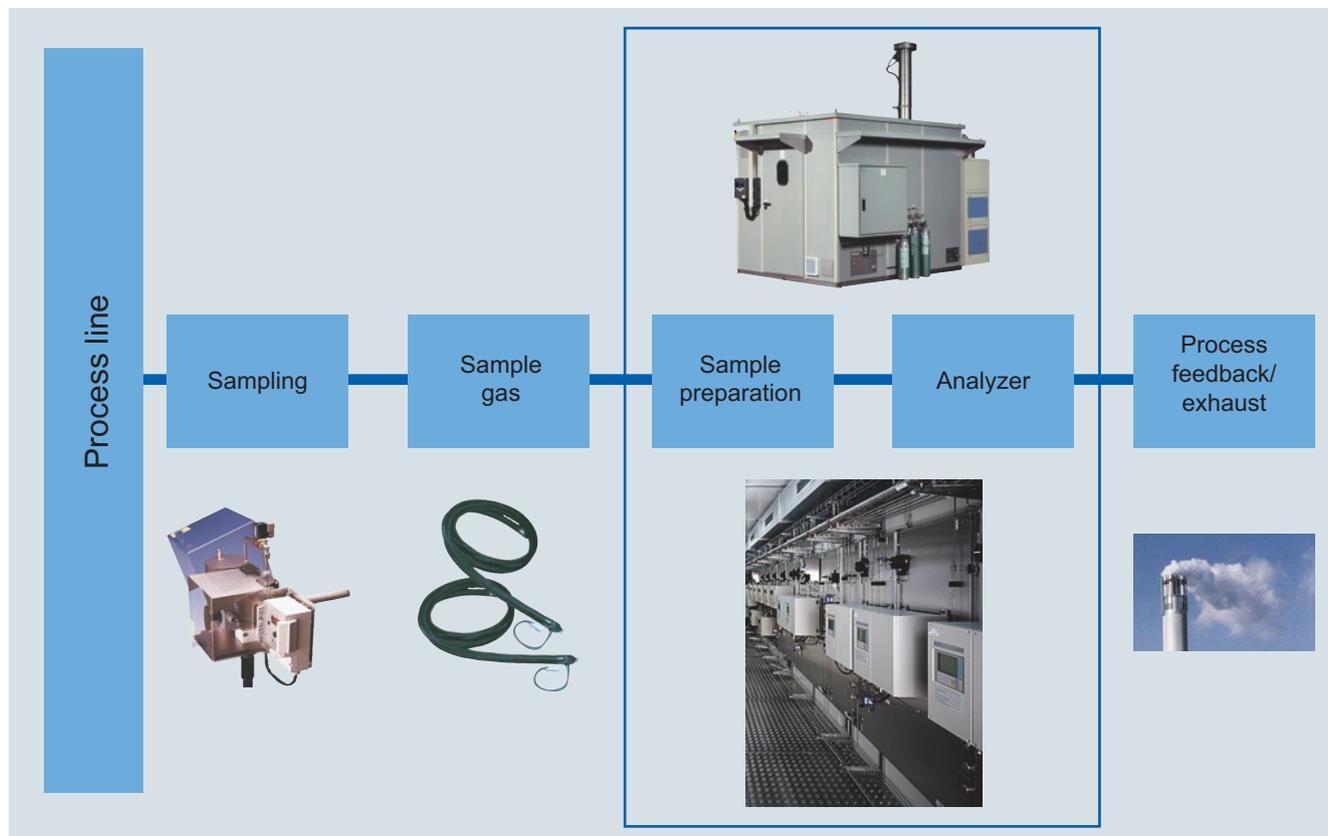
Overview

Siemens process gas analyzers have been used in the process industry for more than 40 years, and are renowned for their quality, reliability and accuracy. The flexibility provided by the continuous process gas analyzers with respect to housing design, explosion protection, corrosion resistance and communications capability means that optimum solutions can be found for all applications.

Nowadays, the communications capability of analyzers is becoming increasingly important. Siemens process gas analyzers are an integral component of Siemens' "Totally Integrated Auto-

mation" concept which is globally unique. This concept permits design of uniform process communication from the operations management level down to the field level. The simple integration of analyzers into the host control systems is the basis for a uniform automation and analysis solution.

Many years of experience in the development and production of analyzers as well as in the planning and installation of analyzer systems distinguishes Siemens as a solution provider - reliable, innovative and with global presence.



Schematic representation of the measuring setup of extractive site installations

Extractive procedures for process gas analysis

Extractive process gas analyzers are used for continuous determination of the concentrations of one or more gases in a gas mixture. Determination of the concentration of gases in a process is used to control and monitor process flows, and is therefore decisive for the automation and optimization of processes and ensuring product quality. In addition, process gas analyzers are used to check emissions, thus making an important contribution to environmental protection, as well as for ensuring compliance with statutory directives.

With extractive measuring procedures, the sample to be analyzed is extracted from the process line and applied preconditioned to the analyzer via a sample line and a sample preparation system. This system, for example, adjusts the pressure, temperature and flow of the sample, and frees the sample gas of dust and moisture if necessary. This guarantees that the measurement can be carried out under defined conditions. Furthermore, the analyzer is protected from damaging influences.

Various measuring procedures with different physical and electrochemical methods are used depending on the type of components to be measured and the measuring point. Siemens offers a range of measuring procedures for extractive gas analysis in two types of devices, SIPROCESS GA700 and Series 6 / ULTRAMAT 23. Each type of device provides peak analytical performances for its class.

SIPROCESS GA700

The SIPROCESS GA700 range is the latest generation of Siemens gas analyzers, and features a modular design. Up to two modules can be used per base unit.

Base unit

The base unit is available in three models: as a 19" rack unit with 3 height units, in a housing for wall mounting and as an Ex d field device. The communication interfaces present in the base units can be adapted to the respective process environment or the process control system using additional optionally available electronics modules.

Modules

Depending on the measuring task, the SIPROCESS GA700 can be individually adapted to the respective analytical or process requirements by fitting selectable modules.

Module	Measuring task
ULTRAMAT 7	The ULTRAMAT 7 module is used for highly-selective measurement of infrared-active components such as CO, CO ₂ , NO, CH ₄ or SO ₂ . In general, the field of application ranges from all types of emission measurements to use in processes. These are used to control production processes and guarantee product quality, even in the presence of highly corrosive gases.
OXYMAT 7	The OXYMAT 7 module is used to measure oxygen between 0 to 0.5% (smallest measuring range) and 0 to 100% (largest measuring range). It is designed for use at ambient temperatures up to 50 °C and allows highly exact measurements through application of the paramagnetic alternating pressure principle. Thanks to the modular design, the OXYMAT 7 module can be combined with an additional module.
CALOMAT 7	For determining the concentration of hydrogen and inert gases in digital mixtures through measurement of thermal conductivity. The CALOMAT 7 module features a high dynamic measuring range (e.g. 0 ... 0.5% and 0 ... 100% H ₂ , configurable) and a short T ₉₀ time.

Field control unit

The field control unit with Ex-d explosion protection and flame-proof enclosure is approved for use in Zone 1 (ATEX / IECEx approval). Together with the OXYMAT 7 analyzer module it can be used for measuring the oxygen content of flammable or non-flammable gases.

Series 6 / ULTRAMAT 23

The classic analyzers from Siemens, Series 6 and ULTRAMAT 23, have been proven at our customers all over the globe in many years of use.

ULTRAMAT 6

For highly-selective measurement of infrared-active components such as CO, CO₂, NO, SO₂, NH₃, H₂O, CH₄ and other hydrocarbons. The ULTRAMAT 6 is a high-end analyzer in 19" format or in a sturdy field housing for use in harsh atmospheres. In general, the field of application ranges from all types of emission measurements to use in processes. These serve to control production processes and guarantee product quality, even in the presence of highly corrosive gases.

ULTRAMAT 23

The ULTRAMAT 23 is an innovative multi-component gas analyzer for measuring up to three infrared-sensitive gases using the NDIR principle. Use of a UV photometer enables you to measure even smaller concentrations of SO₂ and NO₂. Measurement of oxygen (O₂) is also possible through the use of electrochemical oxygen sensors or measuring cells operating according to the paramagnetic principle ("dumbbell"). The use of an additional electrochemical H₂S measuring cell permits use in biogas applications.

ULTRAMAT/OXYMAT 6

For combined measurement of infrared-active components and oxygen in complex applications.

OXYMAT 6

For measurement of oxygen concentration according to the paramagnetic principle in complex applications. The OXYMAT 6 measures oxygen according to the paramagnetic alternating pressure principle. This guarantees absolute linearity and allows the use of very small measuring ranges from 0 to 0.5% (detection limit 50 vpm), up to 0 to 100%, and even 99.5 to 100% in one unit.

Suitable materials in the gas path even permit the analyzers to be used for measurement of corrosive gas mixtures. The detector unit does not come into contact with the sample gas, and therefore permits use in harsh atmospheres while simultaneously guaranteeing a long service life.

OXYMAT 61

For measurement of oxygen concentrations according to the paramagnetic principle in standard applications. Ambient air can be used as the reference gas for OXYMAT 61. This is supplied by a pump integrated in the analyzer housing.

OXYMAT 64

For measurement of oxygen concentrations in the trace range by means of ZrO₂ sensors. The OXYMAT 64 can be used to measure very small traces of oxygen, down to the smallest measuring range of 0 to 10 vpm. This is particularly interesting in systems for air separation. A catalytically inactive ZrO₂ sensor or a catalytically active ZrO₂ sensor can be selected, depending on the application.

CALOMAT 6

For determining the concentration of hydrogen and inert gases in digital mixtures through measurement of thermal conductivity. The CALOMAT 6 features a high dynamic measuring range (e.g. 0 ... 1% and 0 ... 100% H₂, configurable) and a short T₉₀ time.

CALOMAT 62

The CALOMAT 62 is a thermal conductivity analyzer that has been specially designed for applications with corrosive gases. It is possible to directly measure the concentration of gas components such as Cl₂, HCl and NH₃, as well as e.g. H₂ and N₂ in a corrosive atmosphere.

Extractive continuous process gas analysis

Introduction

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FIDAMAT 6

For measurement of total hydrocarbons according to the flame ionization principle.

The FIDAMAT versions feature a highly varied field of application. From monitoring for traces of hydrocarbons in ultra-pure gases - made possible by the high resolution and small differences in response factors - up to measurements of total hydrocarbons in the % range.

The widely adjustable operating temperature for the sample gas path and detector also allows measurement of high-boiling mixtures and of hydrocarbons at water vapor concentrations up to 100%.

SIPROCESS UV600

Gas analyzer based on UV resonance absorption spectrometry for measuring even very low NO, NO₂, SO₂, and H₂S concentrations.

General information

Introducing flammable gases

Introducing frequently or permanently explosive gas/air mixtures to the gas analyzers mentioned in this chapter is not permitted.

The introduction of gases with flammable components at concentrations above the lower explosive limit (LEL) should only be carried out with analyzers fitted with piping. Purging of the housing as well as further measures must be carried out depending on the application. When using SIPROCESS UV600, please contact the technical department. An inert gas must be used for purging (see manual for further information).

Cross-sensitivity

Exact measurement results with regard to the technical specifications can only be expected if a sample gas is free to the greatest possible extent of gases exhibiting a cross-sensitivity with the measured component. The influences of these interfering components can be reduced using various measures. Please contact our specialists if you have any questions.

General installation guide and operating instructions

- Protected against low temperatures and thermal radiation (see technical specifications)
- Protected against temperature variations
- To achieve the best possible measuring quality, the installation location should be free from vibrations
- Protection of electronics from corrosive environments (use field devices with purging if necessary)
- Observation of directives for installation in hazardous areas (see manual)
- Observation of directives for measurement in the presence of toxic gases, provide purging of housing and further safety measures if necessary (see manual)
- The analyzers in the basic version are set to a cross-influence of water vapor with a dew point of 4 °C (standard cooler temperature for sample preparation).
- When calibrating with zero gas and span gas, these must be connected via the sample gas cooler analogous to the sample gases to allow correct adjustment.
- In special cases (test measurements or long-term adjustments), it is recommendable to connect the calibration gases via a humidifier upstream of the cooler to avoid "drying-out" of the gas cooler and thus changes in the concentration of the water vapor.
- Correction of cross-interference which may be activated for a gas is canceled for the duration of a calibration procedure (zero point and sensitivity).

Calibration/adjustment

The Series 6 analyzers (ULTRAMAT 6, OXYMAT 6, CALOMAT 6) as well as the SIPROCESS GA700 analyzers (ULTRAMAT 7, OXYMAT 7, CALOMAT 7) should be calibrated with zero and span gas at least every 14 days.

Standard	Zero gas N ₂ (5.0)
Calibration gas	Sample gas with approx. 60 to 90% of measuring range in residual N ₂ (5.0)

Note: With OXYMAT 6/61 and OXYMAT 7, the zero gas and the reference gas must be the same.

- Pre-purging of sample gas path via the sample gas inlet with nitrogen (N₂, quality 5.0), duration: min. 1 min, one further minute in addition for each 10 m of sample gas line.
- Calibration gases for zero-point calibration (ULTRAMAT 6, OXYMAT 6, CALOMAT 6, OXYMAT 7, OXYMAT 7, CALOMAT 7)
Sufficient supply of inert gas via the sample gas inlet (free from measured component and free from gases with a cross-interference on the measured component), usually N₂, quality 5.0.
- Gases for calibration of deflection
Connection of calibration gas via the sample gas inlet (approx. 60 to 90% of the measuring range of the measured component with inert gas as the residual gas (e.g. N₂, quality 5.0)).
- Gases for calibration of the CALOMAT 62
Since every residual gas (including nitrogen) has a specific thermal conductivity, the gases used for calibrating the zero point and full-scale values of the CALOMAT 62 must take this into account. When calibrating e.g. H₂ in HCl, HCl can be used as the zero gas (or an appropriate substitute in accordance with the data sheet enclosed with the device) and H₂ in HCl (or a substitute gas) as the span gas.

You can find details on FIDAMAT 6, OXYMAT 64 and ULTRAMAT 23 (AUTOCAL) in the chapters describing the respective device.

Explosion protection

Refer to the separate manuals, references and standards concerning the topic of explosion protection.

Overview



The entire SIPROCESS GA700 device is configured in a modular fashion and consists of a base unit and at least one – maximum two – modules. It can optionally be fitted with up to two interface modules.

Benefits

The base unit provides:

- Transmission and evaluation of measurement results
- Display and transmission of device parameters
- Operation (parameterization, configuration)

In addition to the modules, the base unit contains the interfaces for the peripherals.

Application

Application areas

Depending on the modules installed, the device is predominantly used in the following sectors:

- Chemical industry
- Petrochemicals
- Steel
- Cement
- Power generation
- Environmental protection

Design

19" rack unit

- 19" rack unit with 3 height units (HU) for installation
 - in hinged frames
 - in cabinets
- Gas connections directly on the analyzer module for sample gas inlet and outlet: for pipe diameter 6 mm
- Purging gas connections (optional), purging gas connection for 6 mm or 1/4" hose (optional)
- ATEX-/IECEx approval for Zone 2

Wall-mounted device

- Gas connections directly on the analyzer module for sample gas inlet and outlet: Pipe union for pipe diameter 6 mm
- Purging gas connections (optional): Pipe diameter 12 mm
- ATEX-/IECEx approval for Zones 1 and 2

Field device

- Field control unit: Flameproof encapsulated enclosure with mounted Ex e connection enclosure (IP55)
- Ex-d field module with installed module (IP65)
- ATEX-/IECEx approval for Zone 1
- Maximum cable length of the cable between field module and field control unit: 7 m

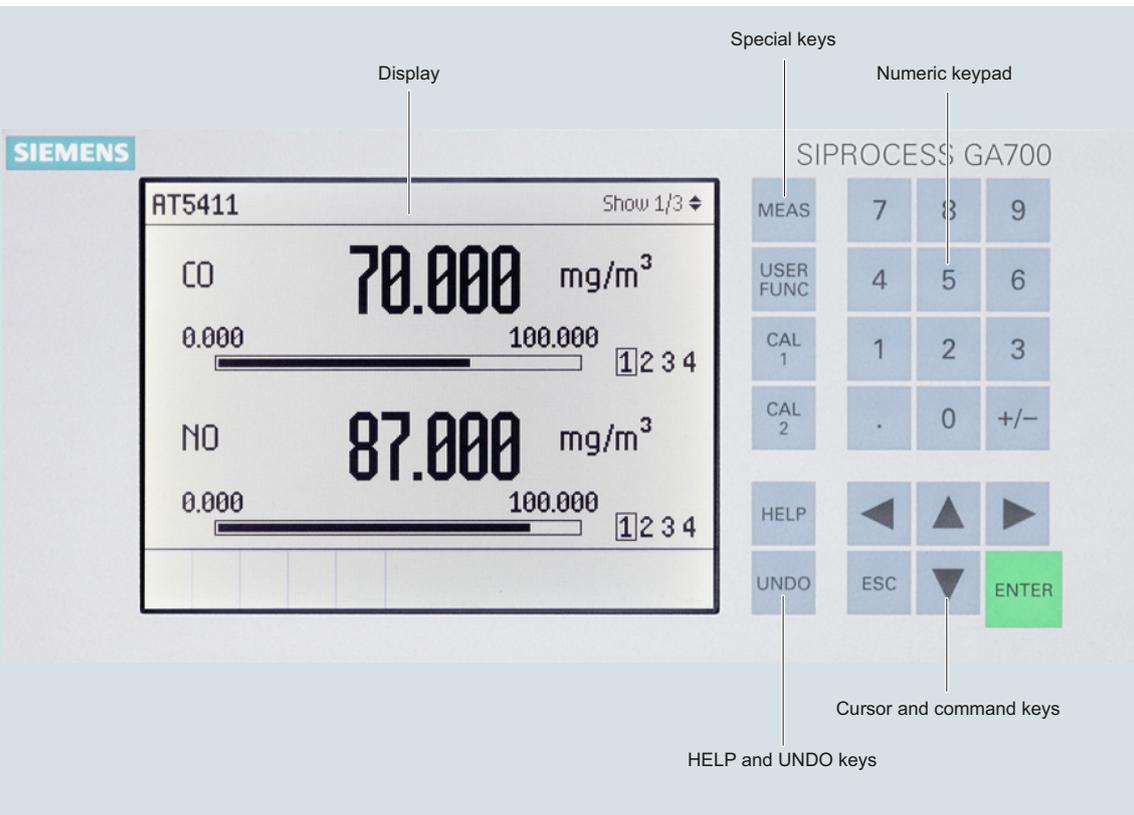
Display and control panel

- LCD panel for simultaneous display of:
 - Measured value
 - Status bar
 - Measuring ranges
- Menu-driven operation for parameterization, test functions, adjustment
- Operator support in plain text
- Operating software in six languages (English, German, French, Italian, Spanish, Portuguese)

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SIPROCESS GA700

Base unit



Display and operator panel of the SIPROCESS GA700 devices

Inputs and outputs

- 19" rack unit and wall-mounted unit
 - 8 digital inputs, designed for 24 V, floating, freely configurable (e.g. for measurement range switchover, processing of external signals from sample preparation)
 - 8 relay outputs, with changeover contacts, freely configurable (e.g. for faults, maintenance requests, limit alarms, external solenoid valves)
 - Ethernet connection contained in the base unit (connection on the rear side, Ethernet RJ 45, 100 MBit)
 - Service interface (front side); Ethernet RJ 45, 100 MBit.
- Field control unit
 - 1 analog output for each component 0/4 to 20 mA
 - 5 relay outputs, with changeover contacts, freely configurable, e.g. for faults or measuring range identification
 - 5 digital inputs, designed for 24 V, floating, freely configurable, e.g. for measurement range switchover

Interface modules

- 19" rack unit and wall-mounted unit
 - Interface module 1.1:
 - 12 relay outputs and 8 digital inputs
 - Interface module 2.1:
 - 1 analog output for each measuring component (0/4 to 20 mA or configurable according to NAMUR), plus 3 relay outputs for each module
 - Interface module 2.2:
 - One analog output for each measured component (0/4 to 20 mA or configurable according to NAMUR), 4 analog inputs and 4 digital inputs
- Field control unit
 - Interface module 2.2:
 - 4 analog inputs 0/4 to 20 mA

Function

Essential characteristics

- Measuring range identification
- Storage of measured values possible during adjustments
- Four freely parameterizable measuring ranges, also with suppressed zero point
- Autoranging possible; remote switching is also possible
- Wide range of selectable time constants (static/dynamic noise suppression); i.e. the response time of the analyzer can be matched to the respective measuring task
- Measuring point switchover for up to 12 measuring points (programmable)
- Parameterizable measuring point identification
- Automatic, parameterizable measuring range calibration
- Operation based on the NAMUR recommendation
- Three control levels with their own authorization codes for the prevention of accidental and unauthorized operator interventions
- Simple handling using a numerical membrane keyboard and operator prompting
- Customer-specific analyzer options such as:
 - Customer acceptance
 - TAG labels

Technical specifications

	19" rack unit	Wall enclosure	Field control unit
General information			
Operating position	Horizontal	Vertical	Horizontal
Conformity	CE mark in accordance with EN 50081-1 and EN 50082-2		
Design, enclosure			
Weight without module	8.6 kg	23 kg	27 kg
Degree of protection	IP20 according to EN 60529	IP65 in accordance with EN 60529, restricted breathing enclosure to EN 50021	IP55 according to EN 60529
Electrical characteristics			
Auxiliary power	100 ... 240 V AC (nominal range of use 85 ... 264 V), 50 ... 60 Hz (nominal range of use 47 ... 63 Hz)		
Power consumption	Max. 280 VA		
EMC interference immunity (electromagnetic compatibility)	In accordance with the standard requirements of NAMUR NE21 (05/2006) and EN 61326-1 (2013)		
Electrical safety	In accordance with EN 61010-1, overvoltage category II		
Gas inlet conditions, purging gas pressure			
Continuous (recommended)	-	30 hPa above atmospheric pressure	-
Continuous (maximum)	-	< 100 hPa above atmospheric pressure	-
Transient (maximum)	-	165 hPa above atmospheric pressure	-
Electrical inputs and outputs			
Analog outputs	-	-	1 for each component 0/4 ... 20 mA, floating; load $\leq 100 \Omega$, $R_L \leq 750 \Omega$
Relay outputs	8, with changeover contacts, can be freely parameterized, e.g. for measuring range identification; max. load: 24 V AC/DC/1.7 A (total load for all 8 relay outputs in continuous operation max. 160 W), floating, non-sparking		5, with changeover contacts, can be freely configured, e.g. for measuring range identification; load rating: 24 V AC/DC/1.7 A, isolated, non-sparking
Digital inputs	8, designed for 24 V, floating, freely configurable, e.g. for measuring range switchover		5, designed for 24 V, floating, can be freely configured, e.g. for measuring range switchover
Ethernet interface Ethernet RJ 45, 100-megabit	Rear	Underside	Underside
Service interface Ethernet RJ 45, 100-megabit	Front (behind door)	Inside on the processing unit	Inside on the processing unit
Interface module 1.1	12 relay outputs, with changeover contacts, load rating: 24 V AC/DC/1.7 A (total load for all 12 relay outputs in continuous operation max. 244 W), floating, non-sparking 8 digital inputs, designed for 24 V, floating, freely configurable		-
Interface module 2.1	1 analog output for each component 0/4 ... 20 mA, floating; load $100 \Omega \leq R_L \leq 750 \Omega$; 3 relay outputs per module, load rating: 24 V AC/DC/1.7 A (total load for all 6 relay outputs in continuous operation max. 122 W), floating, non-sparking		-
Interface module 2.2	1 analog output for each component 0/4 ... 20 mA, floating; load $100 \Omega \leq R_L \leq 750 \Omega$; 4 analog inputs 0/4 ... 20 mA, non-isolated, internal resistance $\leq 100 \Omega$ 4 digital inputs, designed for 24 V, floating		4 analog inputs 0/4 ... 20 mA, non-floating, internal resistance $\leq 100 \Omega$
Climatic conditions			
Permissible operating altitude	3 000 m above sea level		2 000 m above sea level
Permissible ambient temperature (with one module; application-dependent with two modules)	Depends on application, See technical specifications of the modules Ventilation slits must not be covered (recommended minimum clearance upward from the next device when installing 2 modules and at maximum ambient temperature: min. 1 HU)	Depends on application, See technical specifications of the modules	-30 ... + 70 °C during storage and transportation 5 ... 55 °C for regular operation with OXYMAT 7 5 ... 60 °C for operation with OXYMAT 7 and with limited measuring accuracy
Permissible humidity	< 90% RH (RH: relative humidity), during storage, transportation and operation (must not fall below dew point)		

Extractive continuous process gas analysis

SIPROCESS GA700

Base unit

Selection and ordering data

SIPROCESS GA700

Article No.

7MB3000-00-00

Cannot be combined

Click on the Article No. for the online configuration in the PIA Life Cycle Portal.

Base unit versions

19"-rack unit enclosure
 Wall housing
 Wall housing (bushing with support for shielding)
 Field control unit, Ex d (including 1 analog output, 5 relay outputs and 5 digital inputs)

Module 1 (slot 1)

Without
 ULTRAMAT 7
 OXYMAT 7
 CALOMAT 7

Module 2 (slot 2)

Without
 ULTRAMAT 7
 OXYMAT 7
 CALOMAT 7

Interface module 1

Without
 Interface module 1.1 (12 relay outputs + 8 digital inputs)

Interface module 2

Without
 Interface module 2.1 (1 analog output for each component + 3 additional relay outputs for each module)
 Interface module 2.2 (1 analog output for each component + 4 analog inputs + 4 additional digital inputs)
 Interface module 2.2 for field control unit (4 analog outputs)

Language of the Compact Operating Instructions / Explosion Protection Manuals

Language of the Compact Operating Instructions	Language of the Ex manuals
• German	• German, English
• English	• German, English
• French	• French, Dutch
• Italian	• Italian, Spanish, Portuguese
• Spanish	• Italian, Spanish, Portuguese
• Portuguese	• Italian, Spanish, Portuguese
	• Finnish, Swedish, Danish
	• Estonian, Latvian, Lithuanian
	• Czech, Polish, Slovak
	• Romanian, Bulgarian, Greek
	• Hungarian, Slovenian, Croatian

Ex-version

Standard, operation in non-hazardous zone
 Standard, operation in non-hazardous zone with purging gas connection (wall housing only)
 Operation in hazardous zone 2 (ATEX/IECEx approval), flammable or non-flammable gases
 Ex nA nC ic IIC T4 Gc (19" rack unit only)
 Operation in hazardous zone 2 (ATEX/IECEx approval), non-flammable gases
 Ex nR ic IIC T4 Gc (wall housing only)
 Operation in hazardous zone 1 and 2 (ATEX/IECEx approval), flammable or non-flammable gases
 Ex pxb ib IIC T4 Gb, Ex pzc ib IIC T4 Gc (wall housing only)
 Operation in hazardous zone 1, 2, 22 (ATEX/IECEx approval), flammable or non-flammable gases
 Ex pxb ib IIC T4 Gb, Ex pzc ib IIC T4 Gc, Ex nR ib IIC T4 Gc, Ex pxb ib IIIC T65°C Dc,
 Ex pzc ib IIIC T65°C Dc, Ex tc ib IIIC T65°C Dc (wall housing only)
 Setup in hazardous zone 1 and 2 (ATEX/IECEx approval) for flammable or non-flammable gases
 (for Ex d only)

0	0	0	0
3	3	3	3
4	4	4	4
6	6	6	6
X	X	X	X
B	B	B	B
C	C	C	C
F	F	F	F
X	X	X	X
B	B	B	B
C	C	C	C
F	F	F	F
0	0	0	0
1	1	1	1
0	0	0	0
1	1	1	1
2	2	2	2
6	6	6	6
A	A	A	A
B	B	B	B
C	C	C	C
D	D	D	D
E	E	E	E
G	G	G	G
M	M	M	M
N	N	N	N
P	P	P	P
Q	Q	Q	Q
R	R	R	R
A	A	A	A
B	B	B	B
C	C	C	C
D	D	D	D
E	E	E	E
G	G	G	G
H	H	H	H

Selection and ordering data

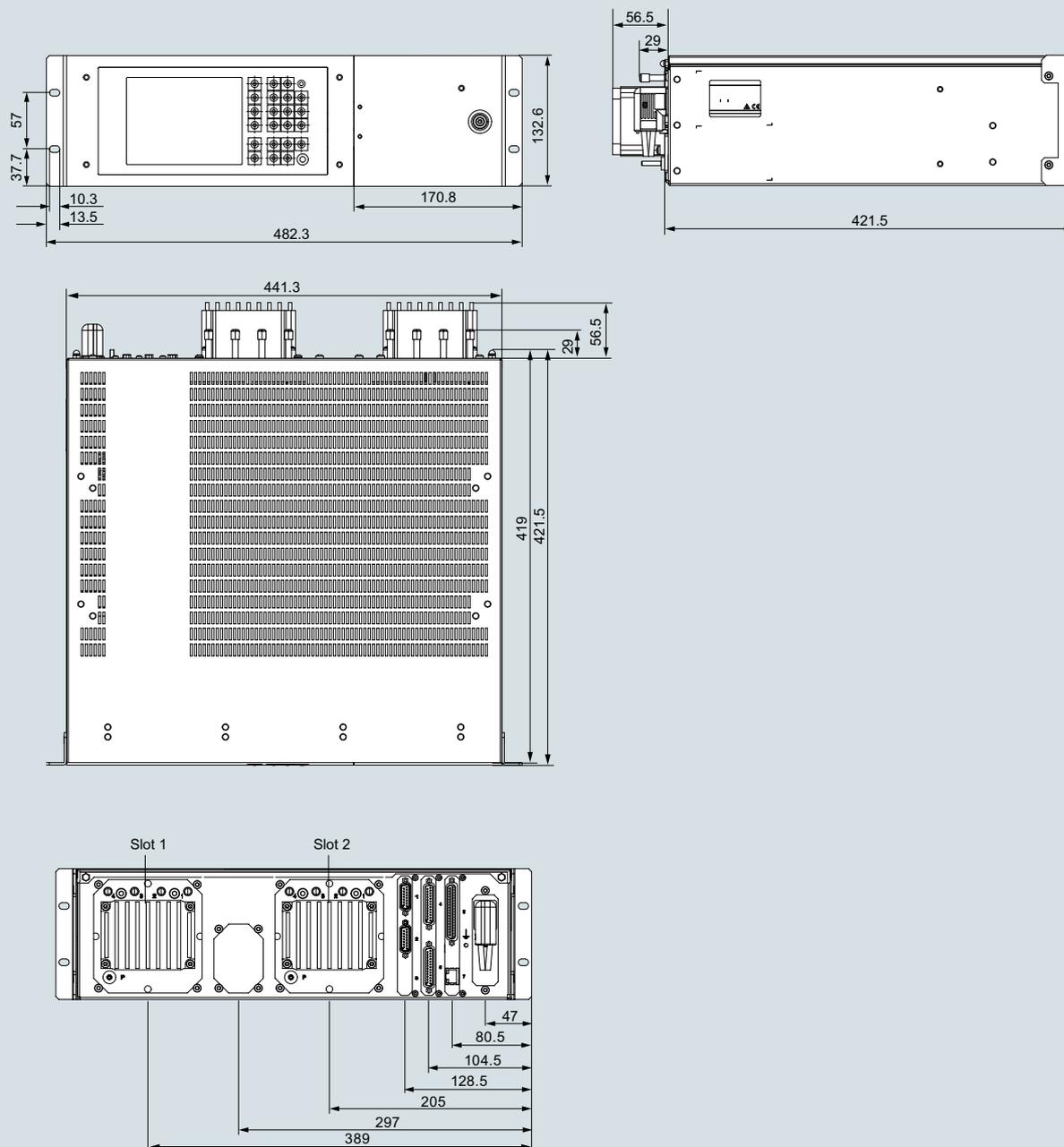
Additional versions

Add ***-Z*** to Article No. and specify Order code
 TAG labels (specific inscription based on customer information)
 Base unit module assignment number

Order Code

B03
D00 ... D99

Dimensional drawings

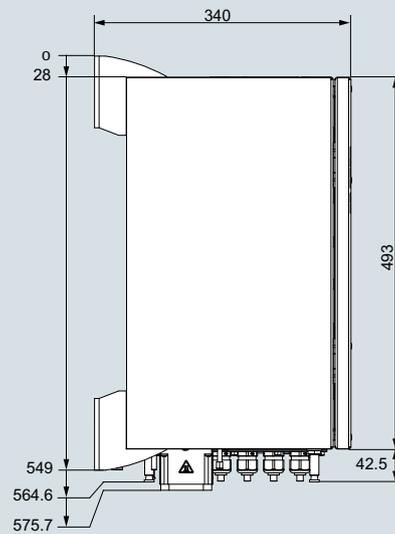
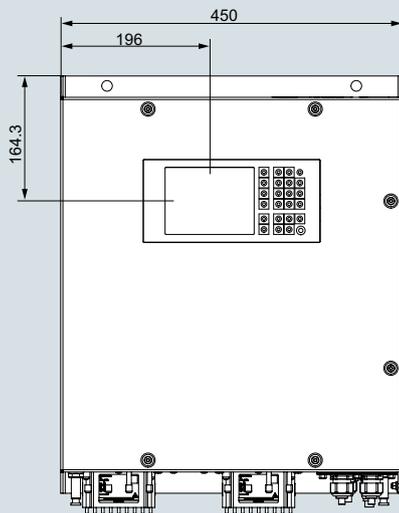
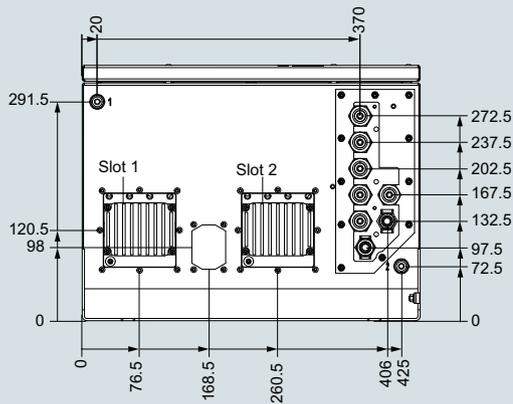


SIPROCESS GA700, rack unit, dimensions in mm

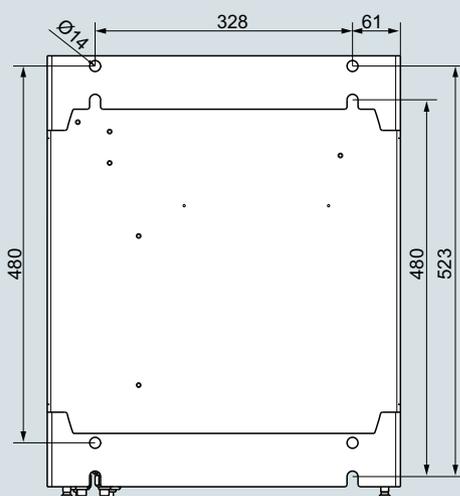
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SIPROCESS GA700

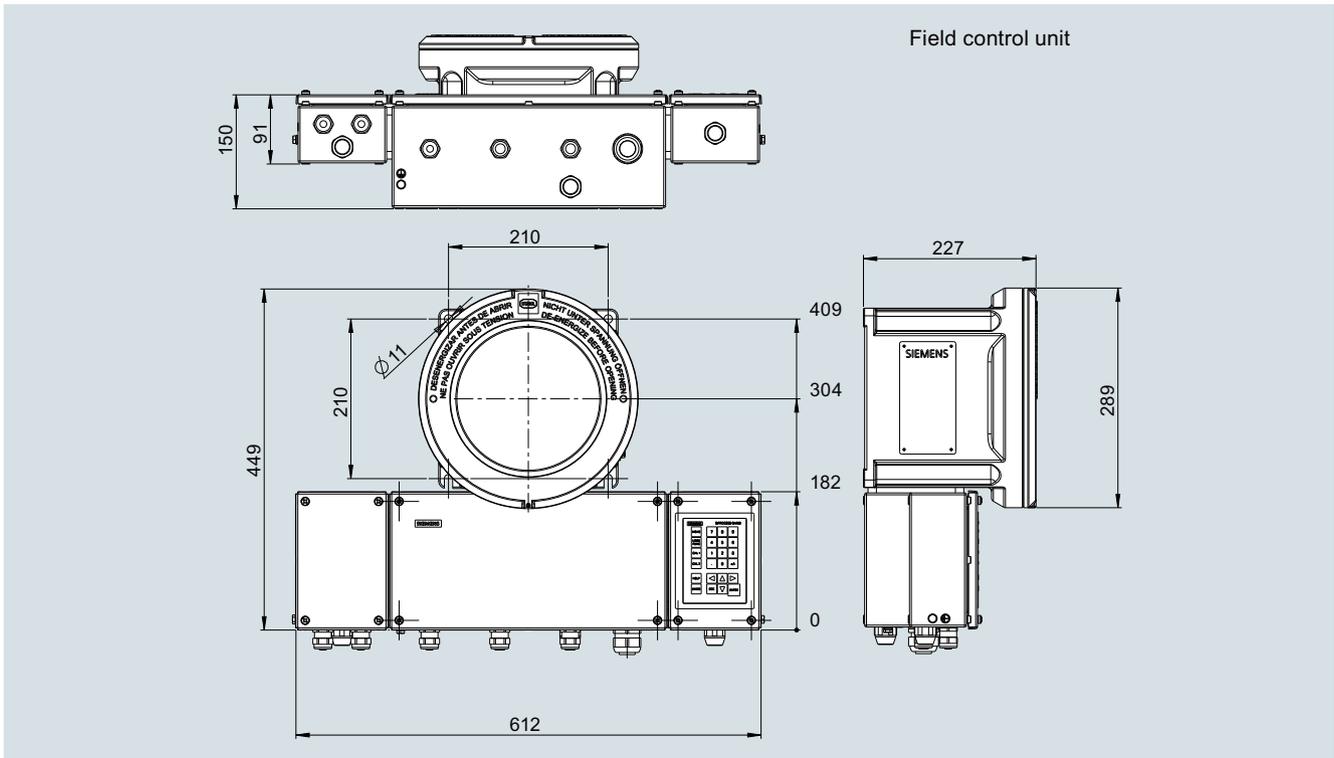
Base unit



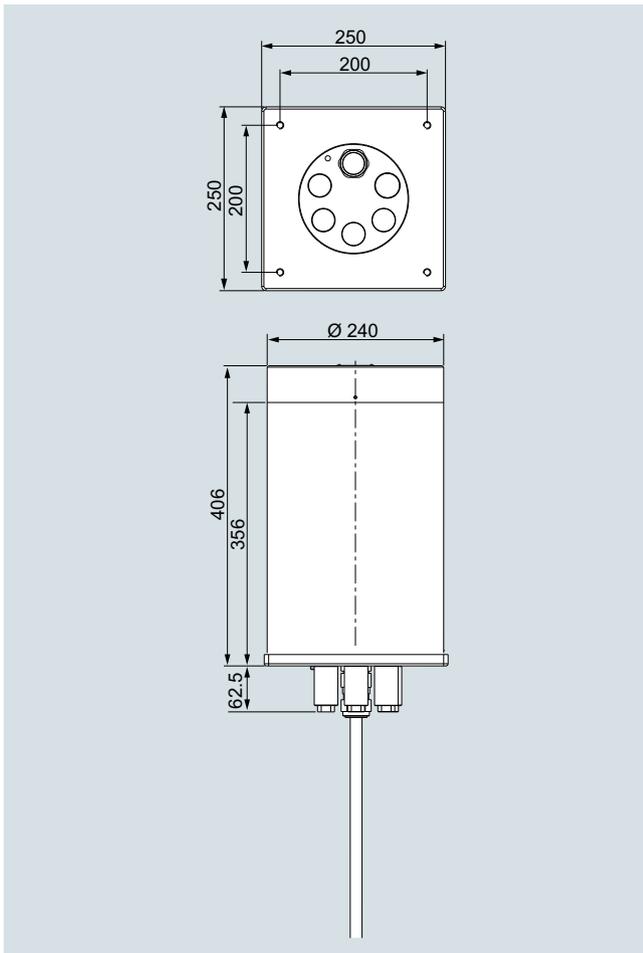
SIPROCESS GA700, wall enclosure, dimensions in mm



SIPROCESS GA700, wall housing, drilling pattern, dimensions in mm



SIPROCESS GA700, field control unit, dimensions in mm



SIPROCESS GA700, field module, dimensions in mm

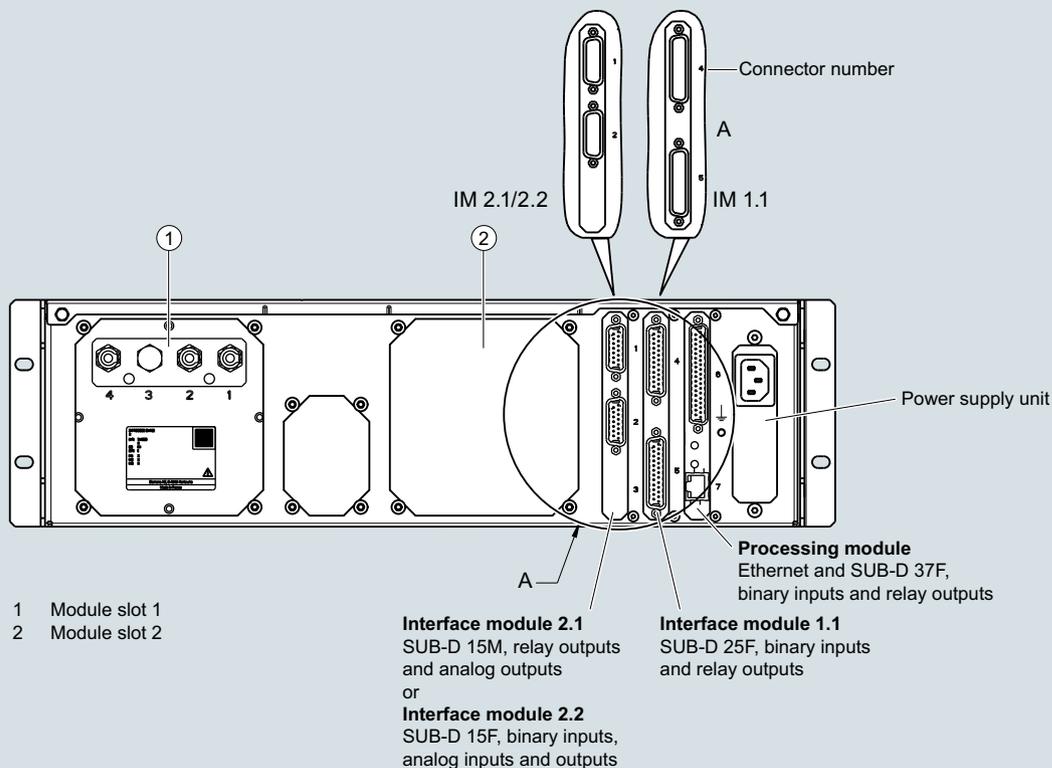
Extractive continuous process gas analysis

SIPROCESS GA700

Base unit

Circuit diagrams

Connection of the signal cables



Expansion options for interface modules with the example of the rear wall of the rack unit

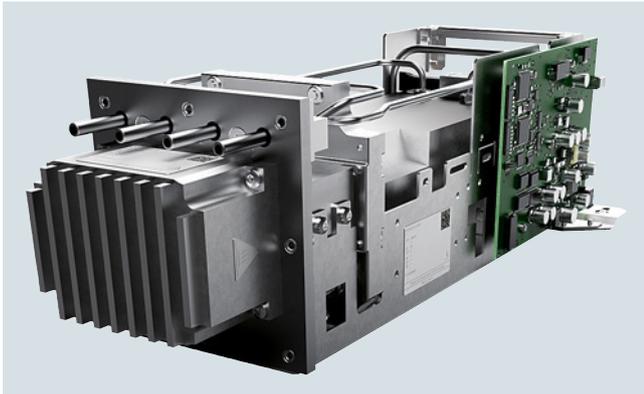
Possible combinations

You can install a maximum of two analyzer modules in the wall-mounted and rack-mounted enclosures of the SIPROCESS GA700 series. No fixed allocation rules apply. Every module can be operated in every slot.

The following restrictions must be observed:

- Change to measuring frequency required:
 - [O7 and O7]: 8.33 Hz (O7 No. 1) - 10 Hz (O7 No. 2)
 - [O7 and U7]: 10 Hz (O7) - 12.5 Hz (U7)
- Restricted temperature range:
 - [U7 and O7] or [U7 and C7]: 5 to 45 °C
- Restricted smallest measuring range:
 - [U7 and O7]
- NAMUR NE21 does not apply in combination:
 - [C7 and U7] or [C7 and O7]

Overview



The ULTRAMAT 7 module functions according to the NDIR dual-beam differential mode process and measures gases whose absorption bands in the infrared wavelength range are between 2 and 9 μm , such as CO , CO_2 , CH_4 , SO_2 or NO . Up to two components can be measured per module.

Benefits

- High selectivity due to double-layer detector
- Reliable measurements even in complex gas mixtures
- Low detection limits
 - Measurements with low concentrations
- Analyzer cells can be cleaned as required on site
 - Cost savings due to reuse after contamination
- Corrosion-resistant materials in gas path (option)
 - Measurement of highly corrosive gases possible

Application

Application areas

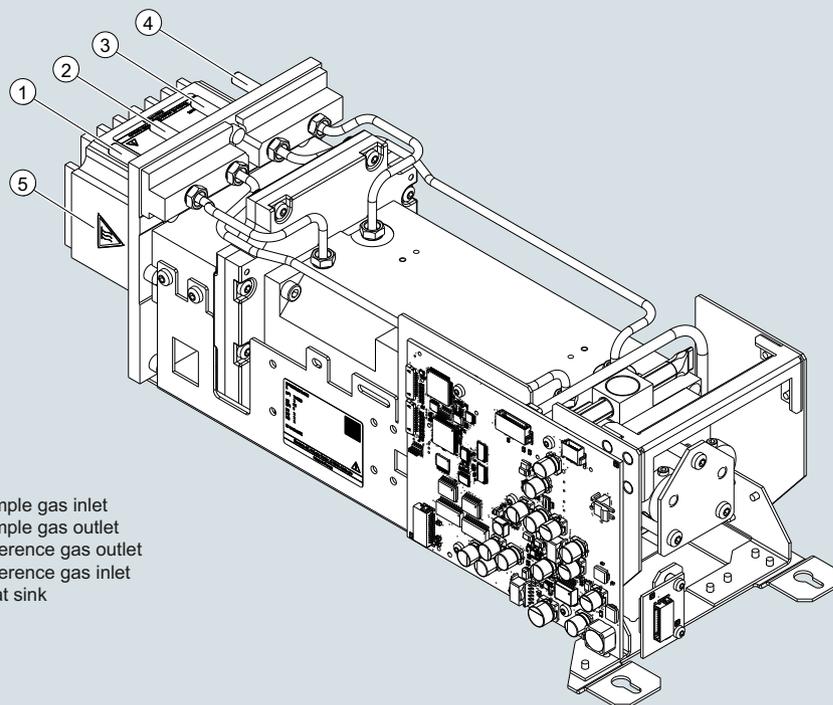
- Measurement for boiler control in incineration plants
- Process gas concentrations in chemical plants
- Trace measurements in pure gas processes
- Environmental protection
- TLV (Threshold Limit Value) monitoring at the workplace
- Quality monitoring
- introduction of flammable gases possible

Special versions

Flow-type reference compartment

The flow through the reference compartment should be adapted to the sample gas flow.

Design



- 1 Sample gas inlet
- 2 Sample gas outlet
- 3 Reference gas outlet
- 4 Reference gas inlet
- 5 Heat sink

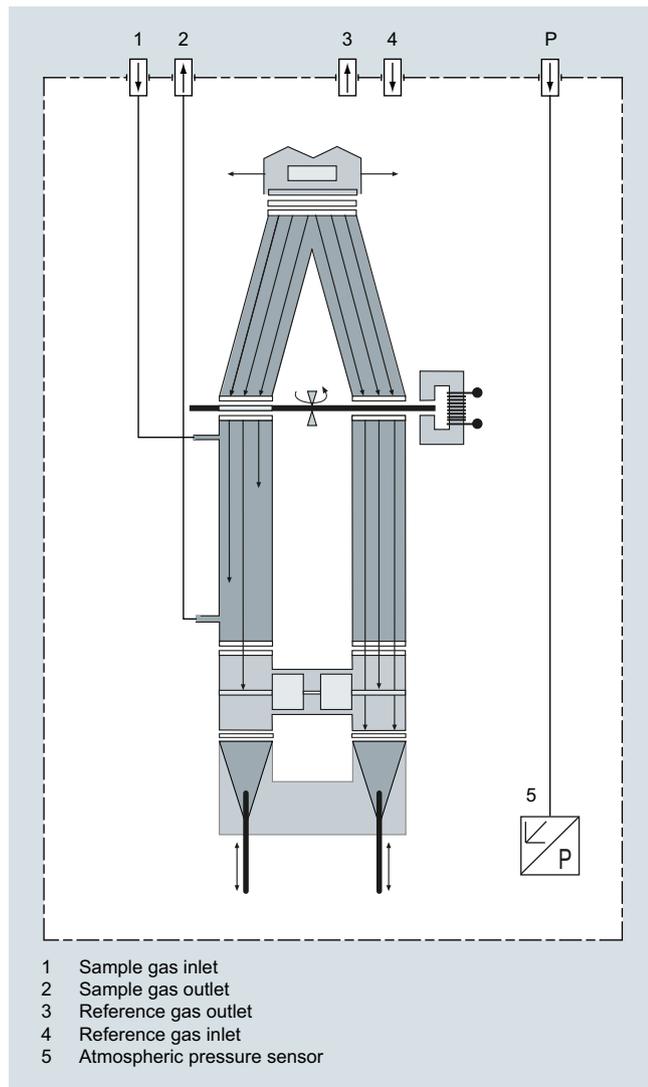
Structure of ULTRAMAT 7

Extractive continuous process gas analysis

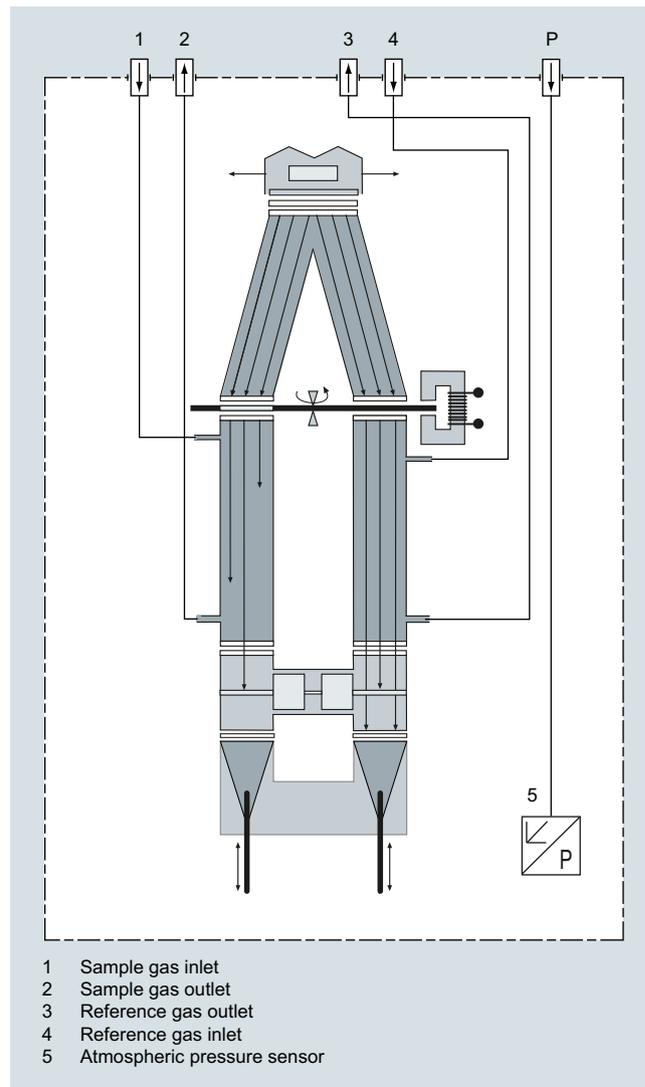
SIPROCESS GA700

ULTRAMAT 7 module

Gas path



ULTRAMAT 7, gas path, without flow-type reference side



ULTRAMAT 7, gas path, with flow-type reference side

Mode of operation

Measuring principle

The measurements are based on the molecular-specific absorption of infrared radiation bands (absorption bands).

ULTRAMAT 7 modules use a spectral range which includes wavelengths of 2 to 9 μm . Although the absorbing wavelengths are characteristic of individual gases, they may partially overlap. This results in cross-sensitivities which are reduced to a minimum by the following measures:

- Beam splitter (gas filter)
- Double-layer detector, each gas compartment with adjustable weighting between the first and second detector layer
- Application-specific pre-installed interference filter

Principle of operation

ULTRAMAT 7 modules operate according to the infrared push-pull chopped radiation principle and are equipped with a double-layer detector.

A source with a temperature of approx. 600 °C generates infrared radiation which is emitted in the beam splitter. The beam splitter acts as a filter chamber and divides the beam equally between the sample gas and reference gas compartments.

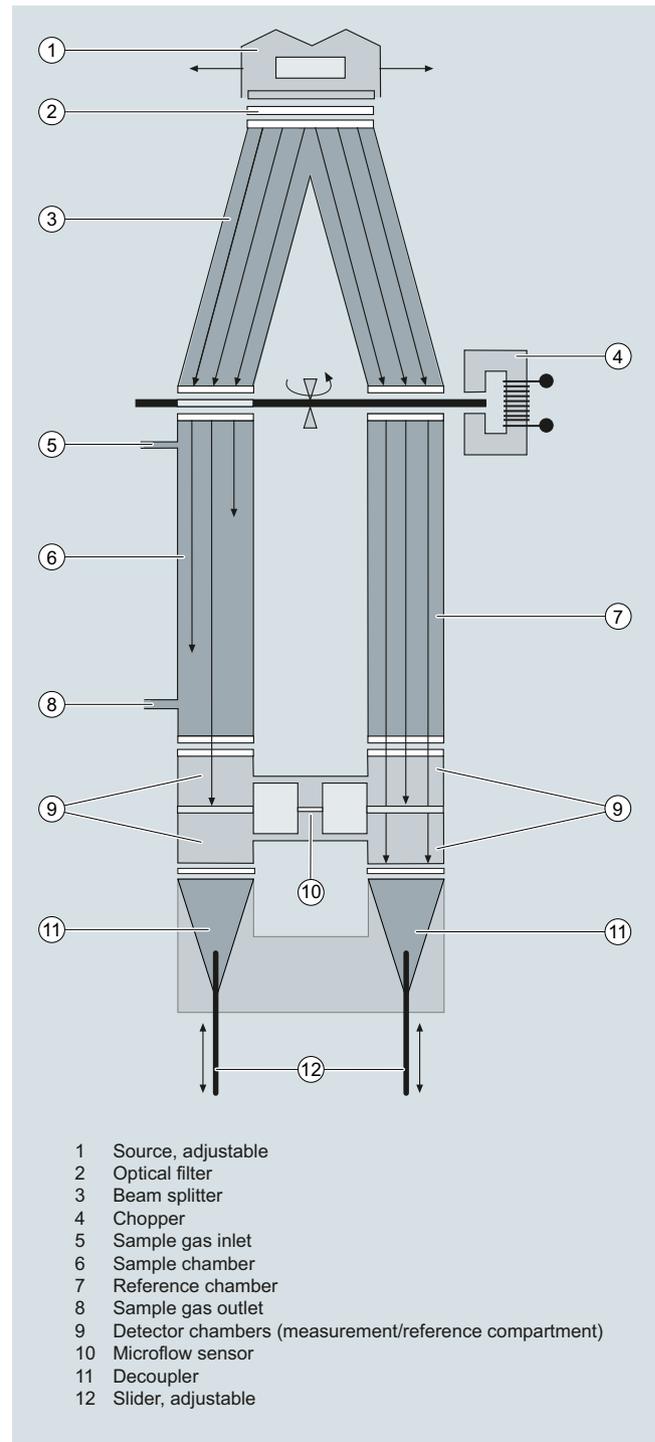
The chopper produces a periodic modulation of the infrared radiation, and thus enables relaxation of the detector.

The reference beam passes through the reference chamber and enters the detector chamber virtually unattenuated. The detector chamber is filled with a precisely defined concentration of the gas component to be measured. The sample beam, in contrast, passes through the sample chamber filled with sample gas and enters the detector chamber attenuated to various degrees. The degree of attenuation depends on the respective sample gas concentration.

The detector is designed as a double-layer detector. The detector layer at the source end serves primarily to absorb the middle of the band. The band edges, however, are absorbed equally by both of the layers.

The detector layers at both compartments of the detector are pneumatically connected to each other via a microflow sensor. This sensor element converts the pressure difference in the detector into an electrical signal.

The weighting between the first and second detector layer is preset at the factory depending on the application. To ensure the long-term stability of the measured value, the ULTRAMAT 7 module supports the predictive self-diagnostics of the analyzer. This function enables you to plan maintenance measures in a timely manner.



ULTRAMAT 7, principle of operation of the infrared channel

Extractive continuous process gas analysis

SIPROCESS GA700

ULTRAMAT 7 module

1

Essential characteristics

- Dimension of measured value freely selectable (e.g. vpm, mg/m³)
- Four freely-configurable measuring ranges per component
- Measuring ranges with suppressed zero point possible
- Measuring range identification
- Autoranging or manual measurement range switchover possible; remote switching is also possible
- Differential measuring ranges with flow-type reference cell
- 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 4 measuring points (programmable)
- Measuring point identification
- Internal pressure sensor for correction of atmospheric pressure fluctuations in the range 700 to 1 200 hPa absolute
- Automatic measuring range calibration can be configured
- Operation based on NAMUR recommendation
- Preventive maintenance / IR source monitoring
- Sample chamber for use in presence of highly corrosive sample gases, e.g. tantalum inlay sheet or Hastelloy C22 (special application)

Technical specifications

The technical specifications are based on the definitions of DIN EN 61207-1.

Unless specified otherwise, the data listed below relates to the following measurement conditions:

Ambient temperature	25 °C
Atmospheric pressure	Atmospheric (approx. 1 000 hPa)
Sample gas flow	0.6 l/min (or NI/min)
Sample gas humidity	Dew point < -40 °C
Site of installation	Vibration- and impact-free

General information

Weight	Max. 5.2 kg (standard version)
--------	--------------------------------

Measuring ranges

Number of measuring ranges	Max. 4; parameters can be assigned freely
Parameters can be assigned in the measuring ranges	
• Smallest possible measuring span	CO: 0 ... 10 vpm CO ₂ : 0 ... 5 vpm CH ₄ : 0 ... 50 vpm C ₂ H ₄ : 0 ... 300 vpm SO ₂ : 0 ... 50 vpm NO: 0 ... 100 vpm N ₂ O: 0 ... 50 vpm NH ₃ : 0 ... 100 vpm CO/NO: 0 ... 100 vpm CO ₂ /CO: 0 ... 100 vpm
• Largest possible measuring span	CO: 0 ... 100% CO ₂ : 0 ... 100% CH ₄ : 0 ... 100% C ₂ H ₄ : 0 ... 100% SO ₂ : 0 ... 100% NO: 0 ... 30 000 vpm N ₂ O: 0 ... 100% NH ₃ : 0 ... 100% CO/NO: 0 ... 10 000 vpm CO ₂ /CO: 0 ... 100%

Gas inlet conditions

Sample gas pressure	
• Standard pressure (atmospheric pressure compensation)	500 to 1 500 hPa (absolute)
Pressure drop between sample gas inlet and sample gas outlet	< 10 hPa at 1.5 l/min
Sample gas flow	18 ... 90 l/h (0.3 ... 1.5 l/min)
Sample gas temperature	0 to 50 °C
Sample gas humidity (rel. humidity)	< 90% (condensation inside the gas path is to be avoided)

Dynamic response

Warm-up period at room temperature	< 2 h
Response characteristics	
• Dead time (T ₁₀)	Application-specific (max. 3.6 s)
• Signal rise time (T _r) or fall time (T _f) with application-specific electronic damping of 10 s	Application specific < 14 s
• Time for device-internal signal processing T _v	Approx. 1 s
• Delayed display T ₉₀	Rule: T ₉₀ < T ₁₀ + T _{r/f} + T _v

Measuring response	
Output signal fluctuation	$\leq \pm 1\%$ of smallest measuring range acc. to nameplate
Zero point drift	$< \pm 1\%$ /week of smallest measuring range acc. to nameplate
Measured-value drift	$\leq 1\%$ of the current measuring range per week
Repeatability	$\leq \pm 1\%$ of the current full-scale value
Linearity error	$< \pm 0.5\%$ of the current full-scale value
Influencing variables	
Ambient temperature	
• Measured value	$\leq 1\%$ of the current measuring range/ 10 K (at constant receiver cell temperature)
Sample gas pressure	
• Without pressure compensation	$\leq 1.5\%$ of the current measuring range/1% pressure variation
• With pressure compensation switched on	$\leq 0.15\%$ of the current measuring range/1% pressure variation
Sample gas flow	$\leq 1\%$ of the current full-scale value/ 0.1 l/min change in flow
Supply voltage	$\leq 0.1\%$ of the current measuring range (with the nominal range of use)
Electrical outputs	
Analog and digital interfaces	See base unit
Climatic conditions	
Storage and transport	-30 ... 70 °C
Permissible ambient temperature (during operation in base unit) ¹⁾	5 ... 45 °C
Relative humidity (RH) during storage, transport or operation	$< 90\%$ (condensation from the installed components is to be avoided)
Gas connections	
Connection fittings	Pipe connection with 6 mm outer diameter
Materials of wetted parts	
Bushing	Stainless steel mat. no. 1.4571, Hastelloy C22
Pipe	Stainless steel mat. no. 1.4571, Hastelloy C22, O-ring: FKM (e.g. Viton) or FFKM (Kalrez 6375)
Sample chamber	
• Body	Aluminum
• Lining	Aluminum, tantalum
• Window	CaF ₂ , adhesive: E353, O-ring: FKM (e.g. Viton) or FFKM (Kalrez 6375)

¹⁾ Applies also in combination with OXYMAT 7 or CALOMAT 7 modules

Extractive continuous process gas analysis

SIPROCESS GA700

ULTRAMAT 7 module

1

Selection and ordering data

Article No.

ULTRAMAT 7 module

7MB3010- - A

For measuring IR-absorbing gases

Cannot be combined

Click on the Article No. for the online configuration in the PIA Life Cycle Portal.

Module version

Standard module for 19" rack unit and wall housing

0

Measured components¹⁾

Possible with measuring range identification

CO	B ²⁾ , C ... P
CO ₂	A ²⁾ , B ... P
CH ₄	D ²⁾ , E ... P
C ₂ H ₄	F ²⁾ , G... P
SO ₂	D ²⁾ , E... P
NO	E ²⁾ , F... P
N ₂ O	D ²⁾ , E ... P
NH ₃ (dry)	E ²⁾ , F... P
CO, NO	E ²⁾ , F, H, R, S
CO ₂ , CO	E, F, H, J, L, M, P

A
C
D
E
F
G
H
J
Q
R

A
D
E
F
G
H
J

Smallest measuring range

Largest measuring range

0 ... 5 vpm	0 ... 100 vpm
0 ... 10 vpm	0 ... 200 vpm
0 ... 20 vpm	0 ... 400 vpm
0 ... 50 vpm	0 ... 1 000 vpm
0 ... 100 vpm	0 ... 1 000 vpm
0 ... 300 vpm	0 ... 3 000 vpm
0 ... 500 vpm	0 ... 5 000 vpm
0 ... 1 000 vpm	0 ... 10 000 vpm
0 ... 3 000 vpm	0 ... 30 000 vpm
0 ... 5 000 vpm	0 ... 50 000 vpm
0 ... 1 %	0 ... 10 %
0 ... 3 %	0 ... 30 %
0 ... 5 %	0 ... 50 %
0 ... 10 %	0 ... 100 %
0 ... 100 vpm (CO), 0 ... 300 vpm (NO)	0 ... 1 000 vpm CO, NO
0 ... 300 vpm (CO), 0 ... 500 vpm (NO)	0 ... 3 000 vpm CO, NO

A
B
C
D
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F
G
H
J
K
L
M
N
P
R
S

A A A A A A A
B B B B B B
C C C C C C
D D D
E
K
L
M
N
P
R
S

Gas path

Material of gas path

Material of sample chamber

Pipe made of stainless steel	with aluminum lining
Pipe made of stainless steel	with tantalum lining ³⁾
Pipe made of Hastelloy	with tantalum lining ³⁾

1
2
3

Reference chamber

Non-flow-type

0

Flow-type

1

Pressure compensation

Atmospheric pressure compensation

0

Module variant

For rack-mounted enclosure

A

For wall enclosure

B

Version

Standard

0

¹⁾ C₂H₂, C₂H₆, C₃H₆, C₃H₈, C₄H₆, C₄H₁₀, C₆H₁₄, H₂O, possible as special application 7MB3017..

²⁾ Not possible in combination with an OXYMAT 7 module.

³⁾ Only for cell length 20 ... 180 mm.

Selection and ordering data

Additional versions

Add "-Z" to Article No. and specify Order code

Order Code

Settings

Kalrez (6375) seals in sample gas path

B04

Clean for O₂ service (specially cleaned gas path)

B06

Measuring range indication in plain text, if different from the default setting

Y11

Special setting (only together with an application no., e.g. extended measuring range)

Y12

Extended special setting (only together with an application no., e.g. determination of cross-interferences)

Y13

Base unit module assignment number

D00 ... D99

Ordering example

ULTRAMAT 7 module installed in rack unit enclosure

7MB3000-0BX00-1AA0-Z+D03

7MB3010-0AB10-0AA0-Z+D03

ULTRAMAT 7 module and rack unit enclosure supplied separately

7MB3000-0BX00-1AA0

7MB3010-0AB10-0AA0

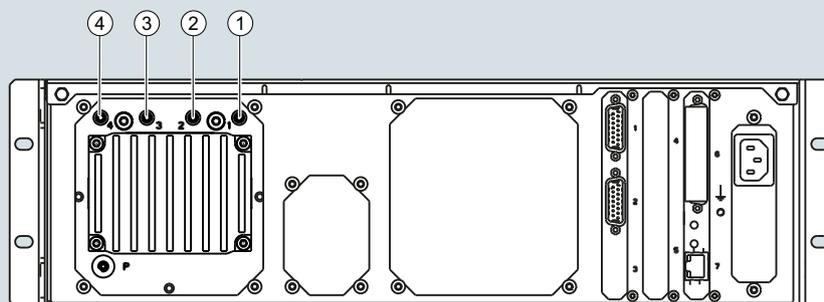
Extractive continuous process gas analysis

SIPROCESS GA700

ULTRAMAT 7 module

Circuit diagrams

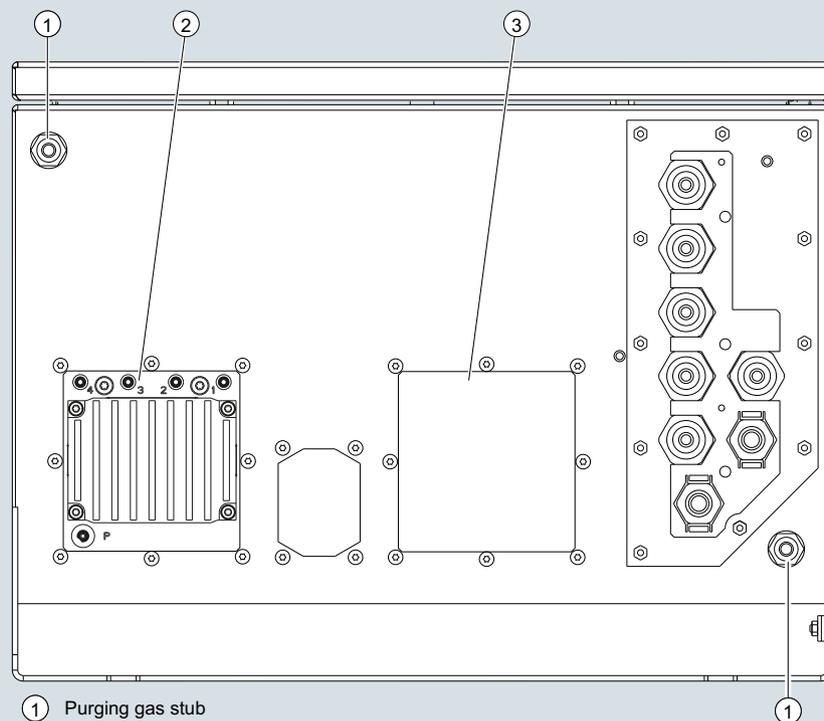
Gas connections



- 1 Sample gas inlet
- 2 Sample gas outlet
- 3 Reference gas outlet
- 4 Reference gas inlet
- P Atmospheric pressure sensor

The sample gas connections and the reference gas connections are made of stainless steel, mat. no. 1.4404. The gas connections are designed as connection fittings with a pipe diameter of 6 mm.

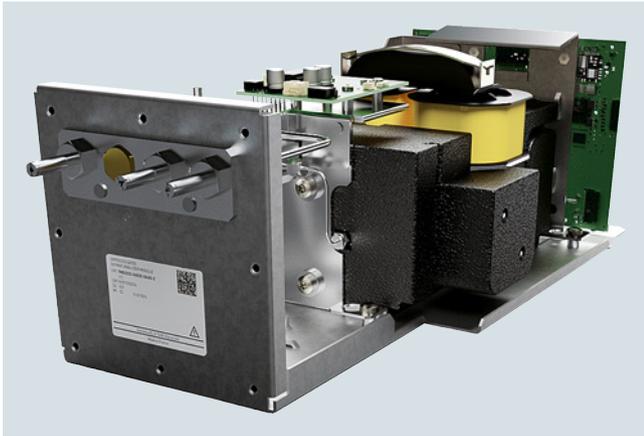
Wall-mounted device



- ① Purging gas stub
- ② Slot of module 1: ULTRAMAT 7
- ③ Slot of module 2

Wall-mounted device, bottom

Overview



The function of the OXYMAT 7 module is based on the paramagnetic alternating pressure method and is used to measure oxygen in gases.

Benefits

Paramagnetic alternating pressure principle

- Small measuring ranges (0 to 0.5% or 99.5 to 100% O₂)
- Absolute linearity

Detector element has no contact with the sample gas

- Applicable in the absence of corrosive sample gases
- Long service life

Physically suppressed zero point possible, e.g. in the measuring range 98% or 99.5% to 100% O₂

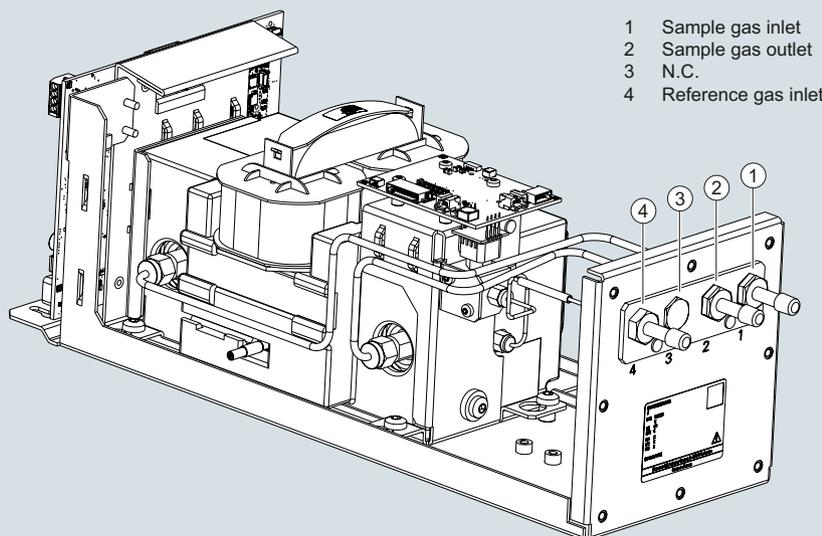
Ex (p) for Zones 1 and 2 according to ATEX-/IECEx approval, introduction of flammable gases possible

Application

Application areas

- For boiler control in incineration plants
- In chemical plants
- For ultra-pure gas quality monitoring
- In environmental protection
- For quality control
- Purity control/air separator
- Versions for analyzing flammable and non-flammable gases or vapors for use in hazardous areas

Design



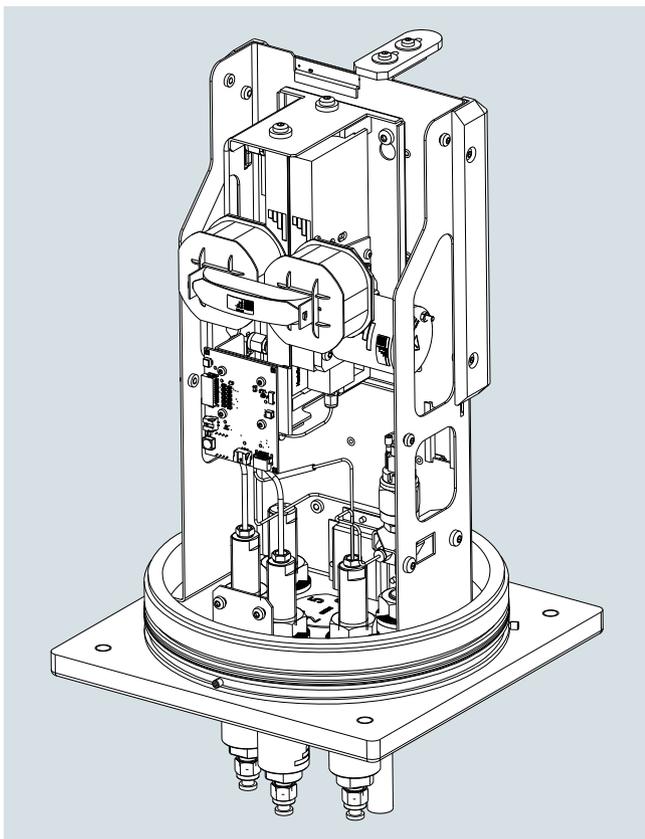
Structure of high-pressure version, standard module, sample gas path with pipes

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OXYMAT 7 module

1

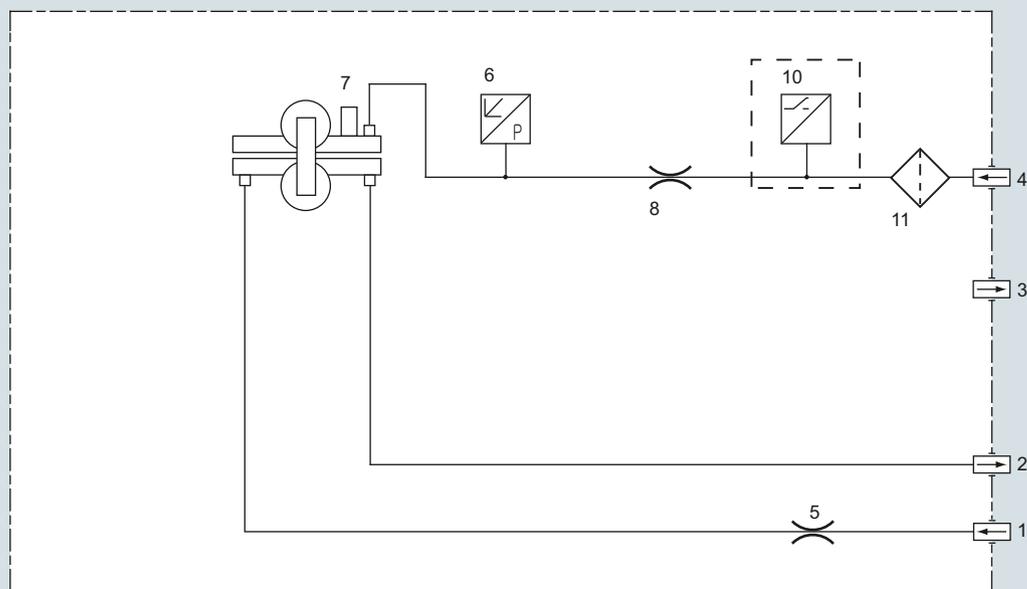


Structure of high-pressure version, field module, sample gas path with pipes

Gas path

High-pressure version with optional pressure switch for monitoring reference gas pressure

Reference gas pressure	2 000 ... 4 000 hPa above sample gas pressure, but max. 5 000 hPa
Sample gas pressure	
• With hoses	500 ... 1 500 hPa (abs.)
• With pipes	500 ... 2 500 hPa (abs.) with internal pressure sensor 500 ... 3 000 hPa (abs.) with external pressure sensor
Sample gas path	With hoses or with pipes

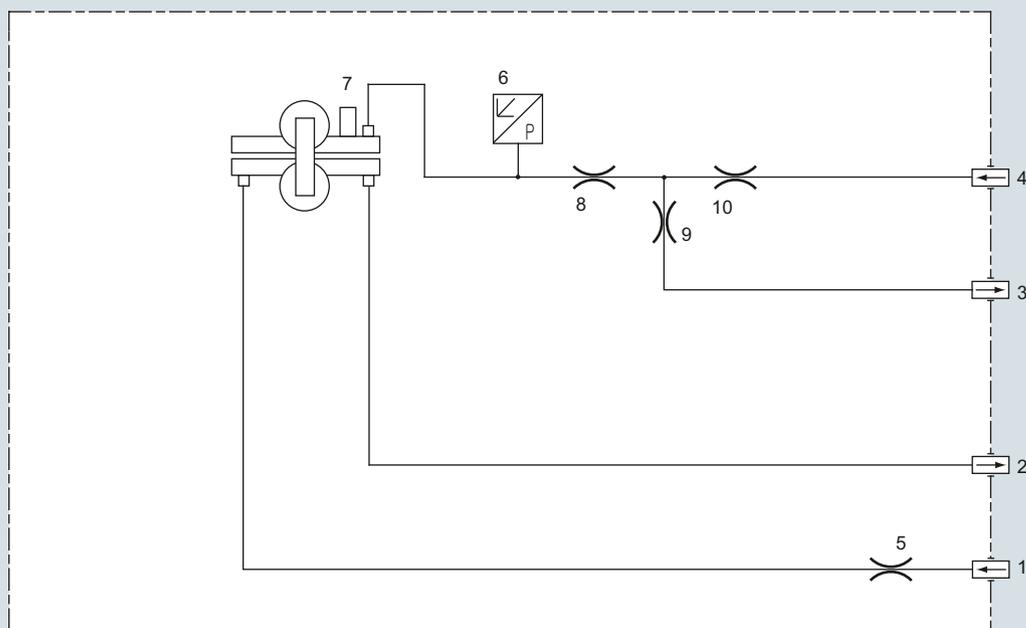


- | | |
|-------------------------|--|
| 1 Sample gas inlet | 6 Pressure sensor p for sample gas pressure |
| 2 Sample gas outlet | 7 Analyzer unit |
| 3 N. C. | 8 Reference gas restrictor |
| 4 Reference gas inlet | 10 Pressure switch for reference gas monitoring (optional) |
| 5 Sample gas restrictor | 11 Reference gas fine filter |

Gas path plan, high-pressure version with optional pressure switch for monitoring reference gas pressure

Low-pressure version with external reference gas pump

Reference gas pressure	100 hPa above the sample gas pressure (low-pressure version) for the connection of an external pump
Sample gas pressure	Atmospheric pressure ± 50 hPa
Sample gas path	With hoses
Reference gas path	With hoses



- | | |
|---|---|
| 1 Sample gas inlet | 6 Pressure sensor p for sample gas pressure |
| 2 Sample gas outlet | 7 Analysis part |
| 3 Bypass outlet | 8 Reference gas restrictor |
| 4 Reference gas inlet, external pump, delivery pressure approx. 100 hPa | 9 Bypass restrictor |
| 5 Sample gas restrictor | 10 Damping restrictor |

Gas path plan, low-pressure with external reference gas pump, with hoses

Extractive continuous process gas analysis

SIPROCESS GA700

OXYMAT 7 module

1

Mode of operation

Oxygen is highly paramagnetic. This outstanding property of paramagnetism is used as a physical measuring effect for oxygen analysis.

Oxygen molecules in an inhomogeneous magnetic field always move toward the higher field strength. This results in a higher oxygen concentration where the field strength is higher (higher oxygen partial pressure). If two gases with differing oxygen content are combined in a magnetic field, a (O_2 partial) pressure difference arises between them.

Since the measuring effect is always based on the difference of the oxygen content of the two gases, one refers to the sample and reference gases.

For measuring oxygen in the OXYMAT 7, the reference gas (N_2 , O_2 or air) flows through two channels into the sample chamber (6). One of these partial flows enters the measuring chamber (7) in the area of the magnetic field. If the sample gas is O_2 -free, the reference gas can flow out freely. If the sample gas does contain O_2 , however, the oxygen molecules concentrate in the area of the magnetic field. The reference gas can then no longer flow off freely. An alternating pressure results between the two reference gas inlets. This pulsates in step with the magnetic field and depends on the oxygen concentration. This causes an alternating flow in the 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 alternating flow results in a change in the resistance of the nickel-plated grids. The resulting offset in the bridge is a measure of the concentration of oxygen in the sample gas.

Because the microflow sensor is located in the reference gas flow, the measurement is not influenced by the thermal conductivity, the specific heat or the internal friction of the sample gas. Additionally, the microflow sensor is protected through this arrangement from corrosion caused by the sample gas.

Further information

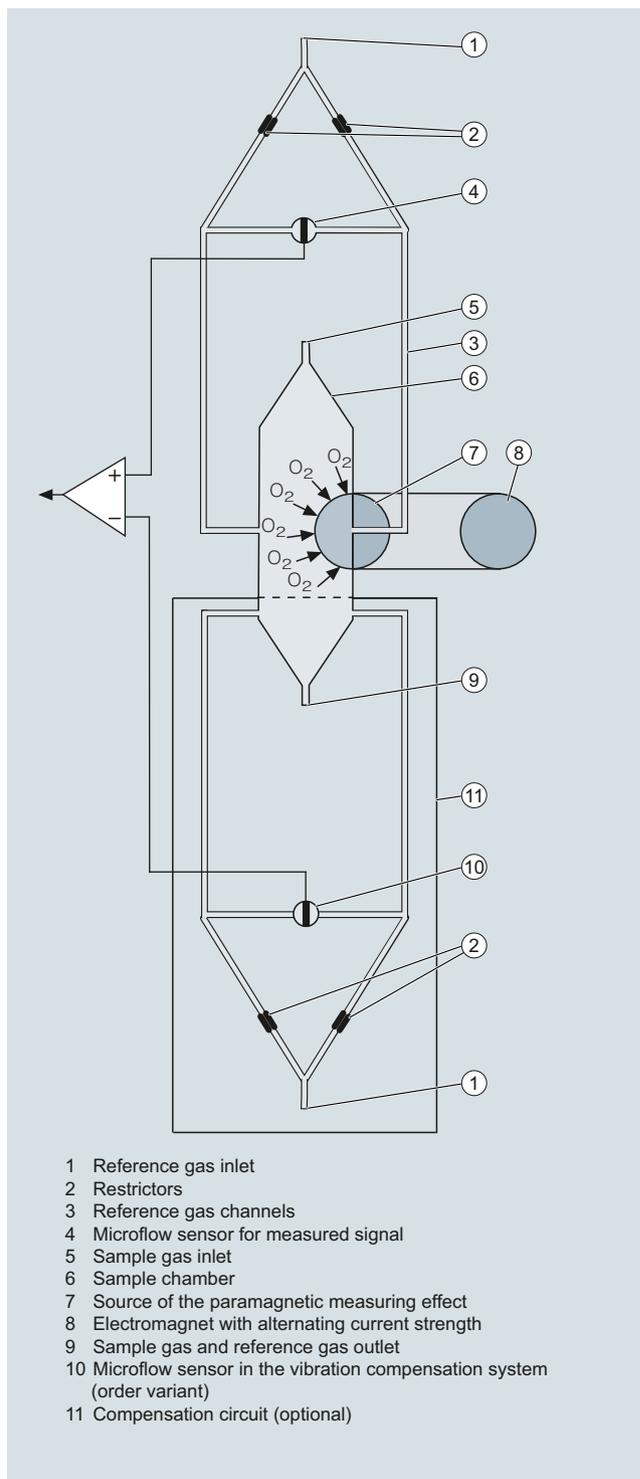
The oscillating magnetic field (8) means that the basic flow at the microflow sensor is not detected. The measurement is, thus, independent of the module's operating position or the position of the sample chamber.

The sample chamber is directly in the sample path and has a small volume, and the microflow sensor is a low-lag sensor. As a result, extremely short response times are realized.

Vibrations at the installation site can interfere with the measured signal (e.g. large fluctuations in the output signal). This behavior can be compensated for by a second (optional) microflow sensor (10), which functions as a vibration sensor. Since large differences in density between the sample and reference gases further amplify the undesired influence of vibration, reference gas is channeled to both the compensation microflow sensor (10) and the sample microflow sensor (4).

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.

Flowing reference gas prevents the microflow sensor from being damaged and maintains the measurement capability of the module.



OXYMAT 7, principle of operation

Essential characteristics

Technical features

Depending on the reference gas, the physical zero point can be set between 0% and 100% oxygen.

- Smallest measuring spans (up to 0.5% O₂) possible
- Measuring ranges with physically suppressed zero points possible (e.g. 99.5% to 100%)
- Short response time
- Low long-term drift
- Monitoring of reference gas pressure with reference gas connection 2 500 to 5 000 hPa (abs.) (option): reference gas pressure must be 2 000 ± 150 hPa higher than the sample gas pressure.

Reference gases

Measuring range	Recommended reference gas	Reference gas connection pressure	Comments
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 7

Features

- Internal pressure sensor for correction of pressure variations in sample gas in the range from 500 to 2 500 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 (option)
- Analysis part with flow-type compensation circuit as an order variant for reducing the vibration impact at the installation site
- For sample gas path with hoses: Connection cable to the pressure sensor with hoses
- Hardware adapted to application
- Customer-specific analyzer options such as:
 - Clean for O₂ service (specially cleaned gas path)
 - Kalrez-6375 seals

Extractive continuous process gas analysis

SIPROCESS GA700

OXYMAT 7 module

Correction of zero-point error/cross-sensitivities

Accompanying gas (concentration 100 vol.%)	Zero point deviation in vol.% O ₂ absolute		
Organic gases			
Ethane C ₂ H ₆	-0.49		
Ethene (ethylene) C ₂ H ₄	-0.22		
Ethine (acetylene) C ₂ H ₂	-0.29		
1.2 butadiene C ₄ H ₆	-0.65		
1.3 butadiene C ₄ H ₆	-0.49		
n-butane C ₄ H ₁₀	-1.26		
iso-butane C ₄ H ₁₀	-1.30		
1-butene C ₄ H ₈	-0.96		
iso-butene C ₄ H ₈	-1.06		
Dichlorodifluoromethane (R12) CCl ₂ F ₂	-1.32		
Acetic acid CH ₃ COOH	-0.64		
n-heptane C ₇ H ₁₆	-2.40		
n-hexane C ₆ H ₁₄	-2.02		
Cyclo-hexane C ₆ H ₁₂	-1.84		
Methane CH ₄	-0.18		
Methanol CH ₃ OH	-0.31		
n-octane C ₈ H ₁₈	-2.78		
n-pentane C ₅ H ₁₂	-1.68		
iso-pentane C ₅ H ₁₂	-1.49		
Propane C ₃ H ₈	-0.87		
Propylene C ₃ H ₆	-0.64		
Trichlorofluoromethane (R11) CCl ₃ F	-1.63		
Vinyl chloride C ₂ H ₃ Cl	-0.77		
Vinyl fluoride C ₂ H ₃ F	-0.55		
1.1 vinylidene chloride C ₂ H ₂ Cl ₂	-1.22		
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 ₂ O		-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 ₂ S		-0.44	
Water H ₂ O		-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 und 1 000 hPa absolute (according to IEC 1207/3)

Conversion to other temperatures:

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

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

All diamagnetic gases have a negative deviation from zero point.

Technical specifications

The technical specifications are based on the definitions of DIN EN 61207-1.

Unless specified otherwise, the data listed below relates to the following measurement conditions:

Ambient temperature	25 °C
Atmospheric pressure	Atmospheric (approx. 1 000 hPa)
Sample gas flow	0.6 l/min (or NI/min)
Reference gas	Nitrogen
Site of installation	Vibration- and impact-free

General information

Weight: Approx. 5.5 kg (standard version)

Measuring ranges

Number of measuring ranges: Max. 4; parameters can be assigned freely

Parameters can be assigned in the measuring ranges

- Smallest possible measuring spans: 0.5%, 1%, 2% or 5% O₂
- Largest possible measuring span: 100% O₂

Gas inlet conditions

Sample gas pressure

- Standard devices with hoses: 500 ... 1 500 hPa (abs.)
- Standard devices with hoses and ext. RG pump: Atmospheric pressure ± 50 hPa
- Standard devices with pipes: 500 ... 3 000 hPa (abs.); briefly < 5 000 hPa (abs.)

• Field module

- For non-combustible gases: 500 ... 2 500 hPa (abs.)
- For combustible gases up to gas mixtures which are occasionally explosive: 800 ... 1 100 hPa (abs.)

Reference gas pressure

- High-pressure connection: 2000 hPa above sample gas pressure (within permitted reference gas pressure range 2500 to 5000 hPa, abs.)
- Low-pressure connection with external reference gas pump: 100 hPa above sample gas pressure

Pressure drop between sample gas inlet and sample gas outlet: < 100 hPa at 1 l/min

Sample gas flow: 18 ... 60 l/h (0.3 ... 1 l/min)

Sample gas temperature: 0 ... 60 °C

Sample gas humidity (rel. humidity): < 90% (condensation inside the gas path is to be avoided)

Sample chamber temperature

Standard version: Approx. 72 °C

Time response

Warm-up period at room temperature: < 2 h

Response characteristics

- Display delay T₉₀ with an electronic damping setting of 0 s and a sample gas flow of 1 NI/min: ≤ 1.9 s; ≤ 2.4 s (field module including flame arrestor)
- Dead time T₁₀: ≤ 1.1 s; < 1.6 s (field module)

Measuring response

Output signal fluctuation with static damping constant of 0 s and dynamic noise suppression of 5% / 10 s: ≤ ±0.5% of smallest measuring span (noise bandwidth corresponds to 1% = 6σ value or 0.333% = 2σ value), with vibration compensation activated: < 1.5 times the value

Detection limit: ≤ 1% of smallest measuring span according to nameplate (with vibration compensation activated: < 1.5 times the value)

Measured-value drift	
• At the zero point	≤ ±0.5% of the smallest span/month or ≤ ±50 vpm O ₂ /month, whichever is greater
• For span gas	≤ ±0.5% of the current measuring span/month or ≤ ±50 vpm O ₂ /month, whichever is greater
Repeatability	
• At the zero point	≤ ±0.5% of the smallest measuring span/month or ≤ ±50 vpm O ₂ /month, whichever is greater
• For span gas	d ≤ ±0.5% of the current measuring span/month or ≤ ±50 vpm O ₂ , whichever is greater
Linearity error with dry ambient air ¹⁾	< 0.1%
Influencing variables	
Ambient temperature	
• Deviation at zero point	≤ 0.5% of the smallest measuring span / 10 K or ≤ 50 vpm O ₂ /10 K, whichever is greater
• Deviation of the span gas	≤ 0.5% of the current measuring span / 10 K or ≤ 50 vpm O ₂ /10 K, whichever is greater
Sample gas pressure	
• Deviation at zero point	≤ 0.2% of the smallest measuring span / 1% pressure variation or ≤ 50 vpm O ₂ /1% pressure variation, whichever is greater
• Deviation of the span gas	≤ 0.2% of the current measuring span / 1% pressure variation or ≤ 50 vpm O ₂ /1% pressure variation, whichever is greater
Sample gas flow	
• Deviation at zero point	≤ 1% of smallest measuring span per 0.1 l/min change in flow or ≤ 50 vpm O ₂ per 0.1 l/min change in flow within the permissible flow range (0.3 to 1 l/min), whichever is greater
• Deviation of the span gas	≤ 1% of current measuring span per 0.1 l/min change in flow or ≤ 50 vpm O ₂ per 0.1 l/min change in flow within the permissible flow range (0.3 to 1 l/min), whichever is greater
Accompanying gases	Zero point deviation (cross-sensitivity) in accordance with Table A.1 of EN 61207-3
Supply voltage	< 0.1% of the current measuring span (within the nominal range of use)

Electrical inputs and outputs

Analog and digital interfaces: See base unit

Gas connections

Connection fittings: Pipe connection with 6 mm outer diameter

Climatic conditions

Storage and transport: -30 ... 70 °C

Permissible ambient temperature²⁾: 0 ... 50 °C

Relative humidity (RH) during storage, transport or operation: < 90% (condensation from the installed components is to be avoided)

¹⁾ Untreated ambient air contains less than 20.95% O₂ (literature value) since existing humidity of the oxygen content is decreased relatively.

²⁾ Restriction for installing together with an ULTRAMAT 7 module: 5 ... 45 °C

Extractive continuous process gas analysis

SIPROCESS GA700

OXYMAT 7 module

1

Selection and ordering data

OXYMAT 7 module

For measurement of oxygen

➤ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.

Module version

Standard module (for rack mounted and wall enclosure)

Standard module for hazardous zone (for rack mounted and wall enclosure)

Field module for field housing Ex d without purging gas connections

Reference gas pressure

Low-pressure version 100 hPa (for the connection of an external pump; without pressure switch)

High pressure (2 000 ... 4 000 hPa above sample gas pressure)

High pressure (2 000 ... 4 000 hPa above sample gas pressure), with pressure switch

Smallest possible measuring span

0.5 %

1 %

2 %

5 %

Gas path

Material of gas path

Hose made of FKM (Viton)

Pipe made of stainless steel (1.4404)

Pipe made of Hastelloy C22

Material of sample chamber

Stainless steel (1.4571)

Stainless steel (1.4571)

Hastelloy C22

Material of seal

FKM (Viton)

FKM/Ex: Kalrez (6375)

Kalrez (6375)

Vibration compensation

Without

With

Version

Standard

Article No.

7MB3020-

0 - AA

Cannot be combined

0

2

4

A

C

D

B

C

D

E

2

2

4

A

A

A

0

0

1

2

0

1

0

Selection and ordering data

Additional versions

Add "-Z" to Article No. and specify Order code

Settings

Kalrez (6375) seals in sample gas path

Clean for O₂ service (specially cleaned gas path)

Measuring range indication in plain text, if different from the default setting

Exclusively for measuring non-toxic sample gases

Base unit module assignment number

Order code

B04

B06

Y11

Y16

D00 ... D99

Ordering example

OXYMAT 7 module installed in wall enclosure

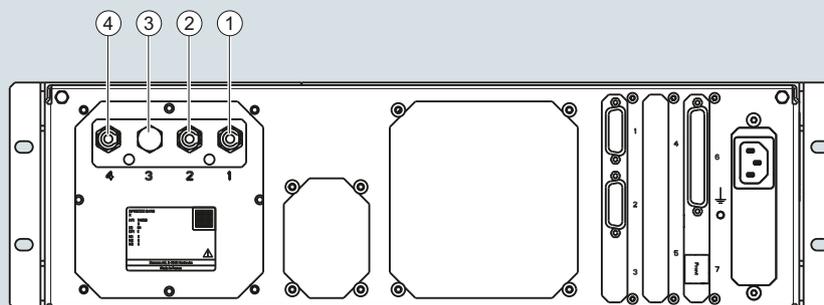
7MB3000-3CX00-1AA0-Z+D02**7MB3020-0CE00-0AA0-Z+D02**

OXYMAT 7 module and ULTRAMAT 7 installed in rack unit enclosure

7MB3000-0CB00-1AA0-Z+D05**7MB3020-0CE00-0AA0-Z+D05****7MB3010-0CA10-0AA0-Z+D05**

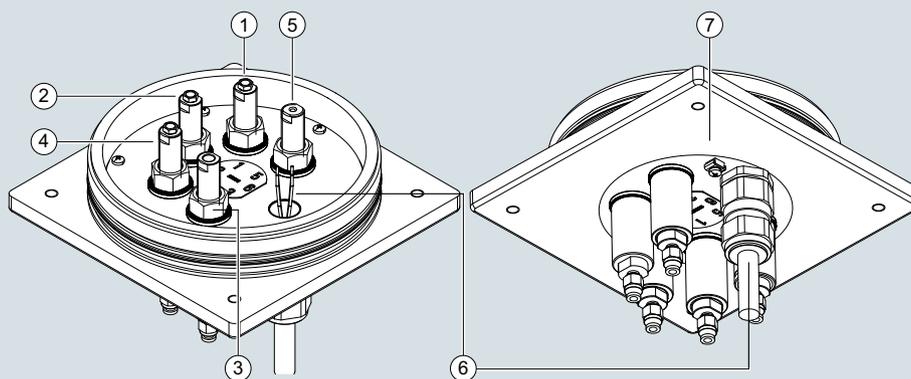
OXYMAT 7 module and wall enclosure supplied separately

7MB3000-3CX00-1AA0**7MB3020-0CE00-0AA0**

Circuit diagrams
Gas connections


- 1 Sample gas inlet
- 2 Sample gas outlet
- 3 N.C., bypass outlet for version with external reference gas pump
- 4 Reference gas inlet

Gas connections for sample gas inlet and outlet, reference gas: Fittings, 6 mm pipe diameter



- 1 Sample gas inlet
- 2 Sample gas outlet
- 3 Blanking plug or purging gas connection
- 4 Reference gas inlet
- 5 Breathing apparatus (pressure compensation coupling)
- 6 Cable bushing
- 7 Ground connection

The sample gas connections are made of stainless steel Mat. No. 1.4571 or Hastelloy Mat. No. 2.4819.
 The reference gas connection is made of stainless steel Mat. No. 1.4571.
 Gas connections are fitted with a clamping ring screw connection for 6 mm pipes.

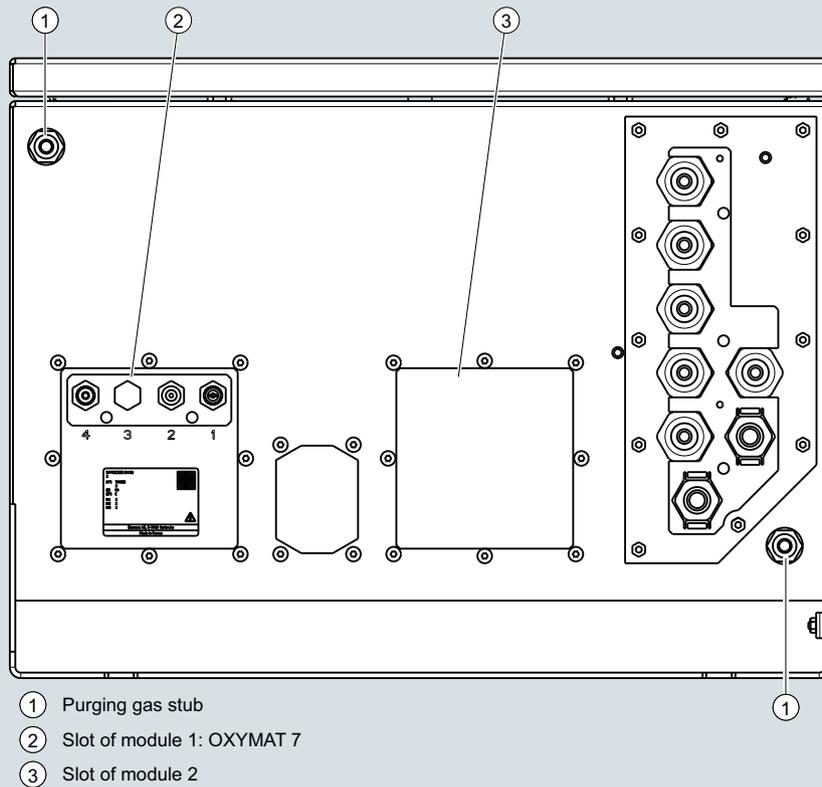
Gas connections of the field module

Extractive continuous process gas analysis

SIPROCESS GA700

OXYMAT 7 moduleWall-mounted device

1



Wall-mounted device, bottom

Overview



The CALOMAT 7 module is primarily used for quantitative determination of H_2 or He in digital or quasi-digital non-corrosive gas mixtures.

Concentrations of other gases can also be measured if their thermal conductivity differs significantly from their accompanying gases, such as Ar, CO_2 , CH_4 .

Benefits

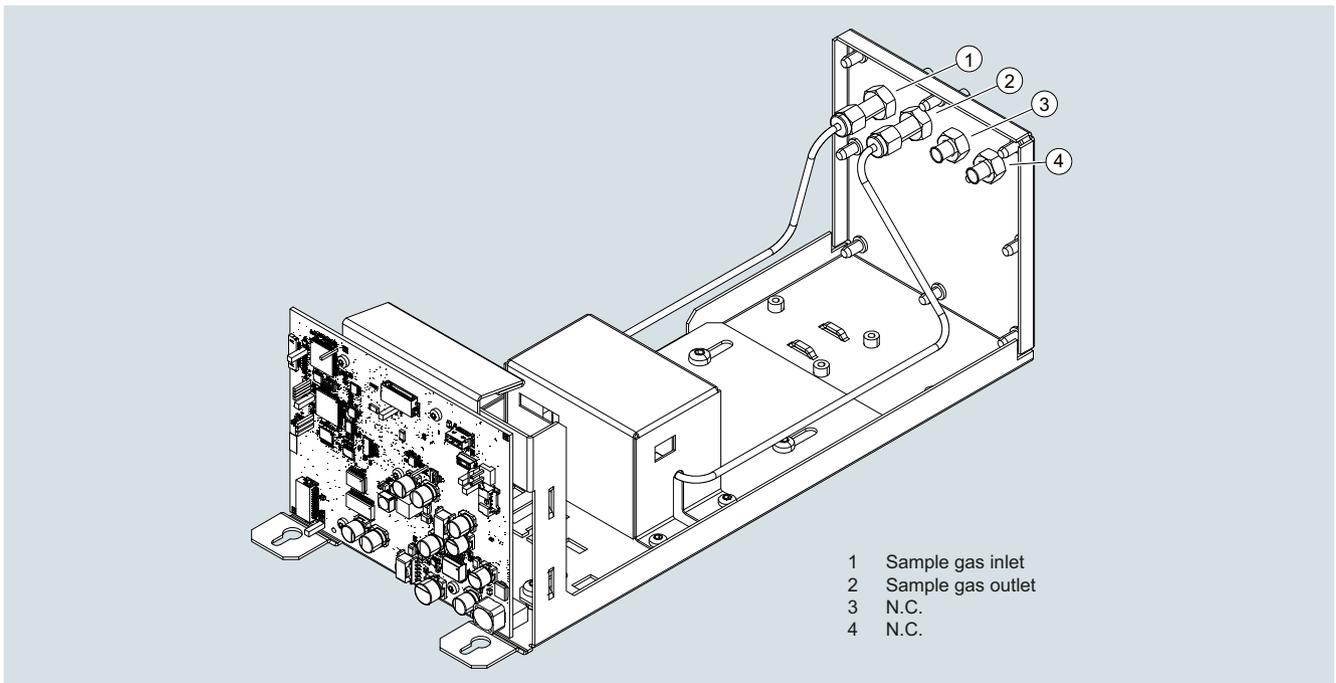
- Small T_{90} time due to micromechanical-produced Si sensor
- Universally applicable hardware basis, high measuring range dynamics (e.g. 0 to 0.5%, 0 to 100%, 95 to 100% H_2)
- Open interface architecture (analog, digital, Ethernet)
- SIMATIC PDM network for maintenance and servicing information (optional)
- Introduction of flammable gas possible

Application

Application areas

- Pure gas monitoring (0 to 0.5 % H_2 in Ar)
- Protective gas monitoring (0 to 2 % He in N_2)
- Hydroargon gas monitoring (0 to 25 % H_2 in Ar)
- Forming gas monitoring (0 to 25 % H_2 in N_2)
- Gas production:
 - 0 to 2 % He in N_2
 - 0 to 10 % Ar in O_2
- Chemical applications:
 - 0 to 2 % H_2 in NH_3
 - 50 to 70 % H_2 in N_2
- Wood gasification (0 to 30 % H_2 in $CO/CO_2/CH_4$)
- Blast furnace gas (0 to 5 % H_2 in $CO/CO_2/CH_4/N_2$)
- Bessemer converter gas (0 to 20 % H_2 in CO/CO_2)

Design



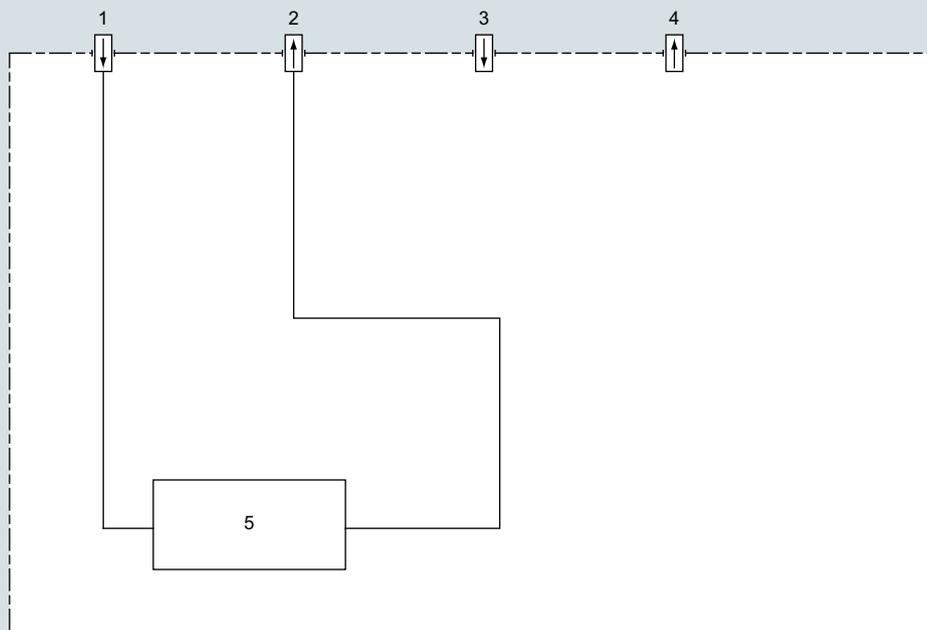
Structure of CALOMAT 7

Extractive continuous process gas analysis

SIPROCESS GA700

CALOMAT 7 module

Gas path



- 1 Sample gas inlet
- 2 Sample gas outlet
- 3 N. C.
- 4 N. C.
- 5 Sensor module

CALOMAT 7, gas path

Mode of operation

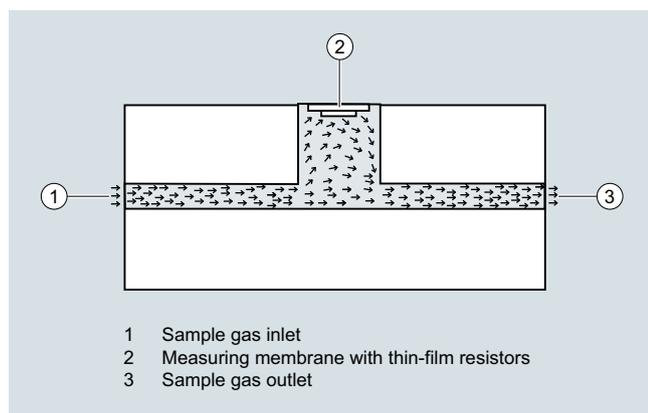
The measuring method is based on the different levels of thermal conductivity of gases. CALOMAT 7 modules work with a micro-mechanically produced Si chip, the measuring membrane of which is equipped with thin-film resistors.

The resistors contained in the diaphragm are regulated for constant temperature. The amperage required fluctuates in accordance with the thermal conductivity of the sample gas. This raw value determined in this way is processed further electronically to calculate the gas concentration.

The sensor is in a thermostatically controlled stainless steel enclosure in order to suppress the effect of the ambient temperature. To rule out flow influences, the sensor is mounted in a bore hole next to the flow channel.

Note

The sample gases must be fed into the analyzers free of dust. Condensation (dew point sample gas < ambient temperature) is to be avoided in the sample chambers. Therefore, the use of gas modified for the measuring tasks is necessary in most application cases.



CALOMAT 7, mode of operation

Essential characteristics

- Four measuring ranges which can be freely configured, even with suppressed zero point, all measuring ranges are linear
- Smallest spans down to 0.5% H₂ (with suppressed zero: 95 to 100% H₂) possible
- Autoranging or manual measurement range switchover possible; remote switching is also possible
- Storage of measured values possible during adjustments
- Time constants can be selected within wide ranges (static/dynamic noise suppression); i.e. the response time of the device can be adapted to the respective measuring task.
- Short response time
- Low long-term drift
- Measuring point switchover for up to 6 measuring points (programmable)
- Measuring range identification
- Measuring point identification
- External pressure sensor can be connected – for correction of variations in sample gas pressure
- Automatic measuring range calibration can be configured
- Operation based on the NAMUR recommendation

Cross-interferences

To determine the cross-interferences of accompanying gases with several interfering gas components, you must know the sample gas composition. The following table contains the zero offsets for the carrier gas N₂ as H₂ equivalent values with 10% interference gas

Interference gas	H ₂ equivalent values with 10% interference gas
CH ₄	+1.77%
C ₂ H ₆	+0.47%
C ₃ H ₈	-0.28%
CO	-0.10%
CO ₂	-0.84%
O ₂	+0.19%
N ₂ O	-0.83%
NH ₃	+1.45%
Ar	-1.22%
He	+6.32%
SF ₆	-2.15%
SO ₂	-1.47%
Synth. Air	+0.40%
H ₂ O (3%)	+0.38%

Zero offset in the system H₂ in N₂

If you are using accompanying gas concentrations ≠ 10%, you can use the corresponding multiples of the respective table value as an approximation. This procedure applies depending on the type of gas for an accompanying gas concentration range up to approx. 25%.

The thermal conductivity of most gas mixtures has a non-linear response. Even ambiguous results can occur in specific concentration ranges, e.g. with H₂ in He mixtures.

In addition to the zero offset, the accompanying gas also affect the characteristic curve. For most gases, however, the effect on the characteristic curve is negligible.

Extractive continuous process gas analysis

SIPROCESS GA700

CALOMAT 7 module

1

Technical specifications

The technical specifications are based on the definitions of DIN EN 61207-1.

Unless specified otherwise, the data listed below relates to the following measurement conditions:

Ambient temperature	25 °C
Atmospheric pressure	Atmospheric (approx. 1 000 hPa)
Sample gas flow	0.6 l/min (or NI/min)
Reference application	H ₂ in N ₂ *
Site of installation	Vibration- and impact-free

* The technical specifications for time and measuring response as well as for the influencing variables can sometimes differ significantly for other gas mixtures

General information	
Weight	Approx. 3 kg
Measuring ranges	
Number of measuring ranges	Max. 4; parameters can be assigned freely
Parameters can be assigned in the measuring ranges	
• Smallest possible span	0.5% H ₂ in N ₂
• Largest possible span	100% H ₂ in N ₂
• Smallest possible span with suppressed zero point	5% (e.g. 95% to 100%) H ₂ in N ₂
Gas inlet conditions	
Sample gas pressure	700 to 1200 hPa (abs.)
Pressure drop between sample gas inlet and sample gas outlet	< 50 hPa at 1.5 l/min
Sample gas flow	30 to 90 l/h (0.5 to 1.5 l/min)
Sample gas temperature	0 to 70 °C
Sample gas humidity (rel. humidity)	< 90% (condensation inside the gas path is to be avoided)
Sample chamber temperature	
Standard version	Approx. 72 °C
Time response	
Warm-up period at room temperature	< 30 min (max. accuracy after 2 h)
Response characteristics	
• Delay display T ₉₀ with device-internal signal damping (low pass filter) of 1 s	< 2.5 s
• Dead time (T ₁₀) at 1 l/min	< 0.5 s
• Adjustable signal damping range	0 to 100 s
Measuring response	
Output signal fluctuation with device-internal signal damping of 1 s	≤ ± 0.5% of the smallest span acc. to nameplate (σ < ± 8.33 vpm H ₂)
Detection limit	≤ 1% of the smallest measuring span according to nameplate
Measured-value drift	≤ ± 1%/week of smallest span according to nameplate or ≤ 50 vpm H ₂ / week, whichever is greater
Repeatability	≤ ± 1% of the current measuring span or 100 vpm H ₂
Linearity error	≤ ± 1% of the current measuring span or 100 vpm H ₂

Influencing variables

Ambient temperature	≤ ± 0.5% ¹⁾ /10 K of the current measuring span or ≤ ± 50 vpm H ₂ / 10 K
Sample gas pressure	≤ ± 0.5% ¹⁾ of the current measuring span/1% pressure variation or ≤ ± 50 vpm H ₂ / 1% pressure change
Sample gas flow	≤ ± 0.2% of the smallest possible measuring span with a change in flow of 1 dl/min within the permissible flow range
Accompanying gases (interference gases)	The interference gas sensitivity depends on the application and must be determined in each case except for applications with blast furnace gas / converter gas / wood gasification (pre-adjusted).
Supply voltage	≤ ± 0.1% of full-scale value (within the nominal range of use)

Electrical inputs and outputs

Analog and digital interfaces	See base unit
-------------------------------	---------------

Climatic conditions

Storage and transport	-30 ... 70 °C
Permissible ambient temperature (during operation in base unit) ²⁾	0 ... 50 °C
Relative humidity (RH) during storage, transport or operation	< 90% (condensation from the installed components is to be avoided)

Gas connections

Connection fittings	Pipe connection with 6 mm outer diameter
---------------------	--

Materials of wetted parts

Gas connection	Stainless steel material no. 1.4571
Clamping rings and union nut (set)	Stainless steel material no. 1.4401
Sample gas pipes	Stainless steel material no. 1.4404
Sensor mounting block	Stainless steel material no. 1.4571
Sensor	Si, SiO _x N _y , Au, epoxy resin, glass
Gasket, contained in the sensor module	Perfluorelastomere FFKM

¹⁾ Values less than the detection limit are not useful

²⁾ Restriction for installing an ULTRAMAT 7 module: 5 ... 45 °C

Selection and ordering data	Article No.
CALOMAT 7 module For the measurement of gases in binary or quasi-binary gas mixtures Click on the Article No. for the online configuration in the PIA Life Cycle Portal.	7MB3040- - 0 - 0 Cannot be combined
<u>Module version</u>	0
Standard module for 19" rack unit and wall housing	
<u>Measuring components, corrosive gas mixtures</u>	X
Only non-corrosive mixtures	
<u>Measuring range, corrosive gas mixtures</u>	X
Only non-corrosive mixtures	
<u>Material of gas path</u>	0
Stainless steel	
<u>Reference chamber</u>	0
None	
<u>Measuring components, non-corrosive mixtures</u>	
H ₂ in N ₂	A
H ₂ in Ar	B
He in N ₂	C
He in Ar	D
He in H ₂	E
Ar in N ₂	F
Ar in O ₂	G
CH ₄ in N ₂	H
CH ₄ in Ar	J
CO ₂ in N ₂	K
Special version: H ₂ in N ₂ (for blast furnace gas, converter gas, wood gasification)	Q
<u>Smallest measuring range</u>	<u>Largest measuring range</u>
0 ... 0.5 %	0 ... 100 %
0 ... 1 %	0 ... 100 %
0 ... 2 %	0 ... 100 %
0 ... 5 %	0 ... 100 %
0 ... 10 %	0 ... 100 %
0 ... 10 %	0 ... 80 %
<u>Version</u>	
Standard	0

Selection and ordering data	Order code
<u>Additional versions</u>	
Add "-Z" to Article No. and specify Order code	
<u>Settings</u>	
Clean for O ₂ service (specially cleaned gas path)	B06
Measuring range indication in plain text, if different from the default setting	Y11
Base unit module assignment number	D00 ... D99

Ordering example

CALOMAT 7 module installed in wall enclosure

7MB3000-3FX00-1AA0-Z+D12

7MB3040-0XX00-0BB0-Z+D12

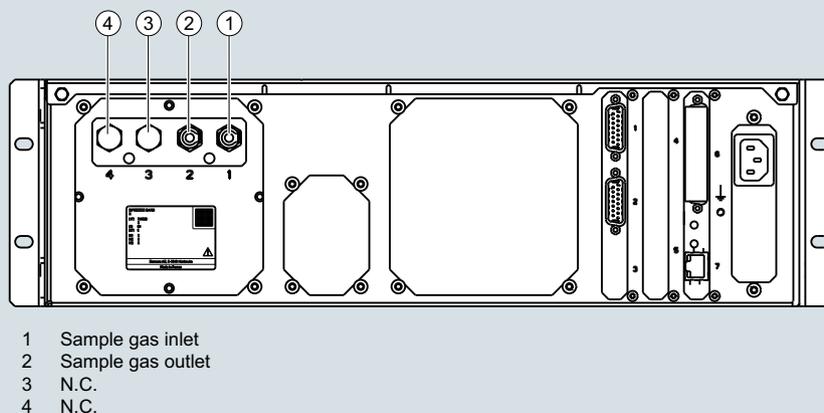
Extractive continuous process gas analysis

SIPROCESS GA700

CALOMAT 7 module

Circuit diagrams

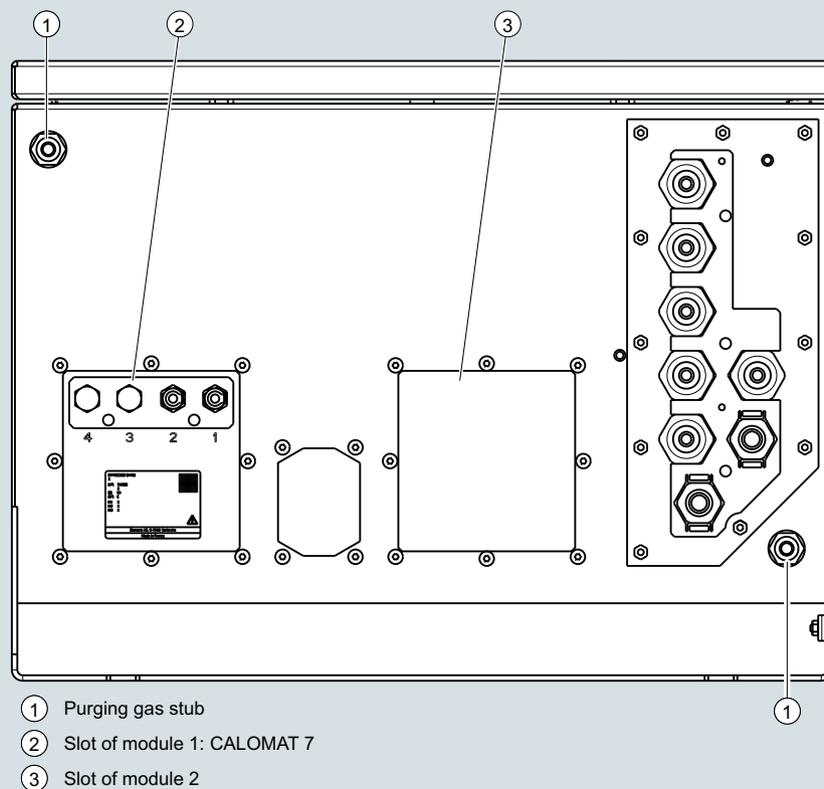
Gas connections



CALOMAT 7 gas connections

The sample gas connections are made of stainless steel with material no. 1.4571 and are designed as connecting fittings with a pipe diameter of 6 mm.

Wall-mounted device



Wall-mounted device, bottom

Design

Gas path		ULTRAMAT 7	OXYMAT 7	CALOMAT 7
With hoses (Viton)	Bushing	–	PVDF	–
	Hose	–	FKM (Viton)	–
	Sample chamber	–	Stainless steel 1.4571	–
	Nozzle (sample chamber)	–	Stainless steel 1.4571	–
	Restrictor	–	PTFE (Teflon)	–
	O-ring	–	FKM (Viton)	–
With pipes (stainless steel)	Bushing	Stainless steel 1.4571	Stainless steel 1.4571	Stainless steel 1.4571
	Pipe	Stainless steel 1.4571	Stainless steel 1.4404	Stainless steel 1.4404
	Sample chamber			
	• Body	Aluminum	Stainless steel 1.4571	–
	• Lining	Aluminum or tantalum	–	–
	• Window	CaF ₂ , adhesive: E353	–	–
	Sensor mounting block	–	–	Stainless steel 1.4571
	Sensor	–	–	Si, SiO _x N _y , AU, epoxy resin, glass
Sample gas restrictor	–	Stainless steel 1.4571	–	
O-rings	FKM (Viton) or FFKM (Kalrez 6375)	FKM (Viton) or FFKM (Kalrez 6375)	FFKM (Kalrez 6375)	
With pipes (Hastelloy)	Bushing	Hastelloy C22	Hastelloy C22	–
	Pipe	Hastelloy C22	Hastelloy C22	–
	Sample chamber			
	• Body	Aluminum	Hastelloy C22	–
	• Lining	Tantalum	–	–
	• Window	CaF ₂ , adhesive: E353	–	–
	Sample gas restrictor	–	Hastelloy C22	–
	O-rings	FKM (Viton) or FFKM (Kalrez 6375)	FFKM (Kalrez 6375)	–

Extractive continuous process gas analysis

Series 6

ULTRAMAT 6

General information

1

Overview



The ULTRAMAT 6 single-channel or dual-channel gas analyzers operate according to the NDIR two-beam alternating light principle and measure gases highly selectively whose absorption bands lie in the infrared wavelength range from 2 to 9 μm , such as CO, CO₂, NO, SO₂, NH₃, H₂O as well as CH₄ and other hydrocarbons.

Single-channel analyzers can simultaneously measure up to 2 gas components, while dual-channel analyzers can simultaneously measure 3 (or 4 on request) gas components.

Benefits

High selectivity with double-layer detector and optical coupler

- Reliable measurements even in complex gas mixtures

Low detection limits

- Measurements with low concentrations

Corrosion-resistant materials in gas path (option)

- Measurement possible in highly corrosive sample gases

Analyzer cells can be cleaned as required on site

- Cost savings due to reuse after contamination

Electronics and physics: gas-tight isolation, purging is possible, IP65

- Long service life even in harsh environments

Heated versions (option)

- Use also in presence of gases condensing at low temperature

Ex(p) for Zones 1 and 2 (in accordance with to ATEX 2G and ATEX 3G)

Application

Fields of application

- Measurement for boiler control in incineration plants
- Emission measurements in incineration plants
- Measurement in the automotive industry (test benches)
- Warning equipment
- Process gas concentrations in chemical plants
- Trace measurements in pure gas processes
- Environmental protection
- TLV (Threshold Limit Value) monitoring at the workplace
- Quality monitoring
- Ex versions for analyzing flammable and non-flammable gases or vapors for use in hazardous areas

Special versions

Special applications

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

Performance-tested version / QAL

For measurements of CO, NO, SO₂ and O₂ according to 13th and 27th BImSchV and TA Luft, performance-tested versions according to EN 15267 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
 - SO₂: 0 to 75 mg/m³; 0 to 1 500 mg/m³
- O₂: 0 to 5 vol.%; 0 to 25 vol.%

In addition, performance-tested versions of the ULTRAMAT 6 meet the requirements set forth in EN 14956 and QAL 1 according to EN 14181. The conformity of devices with both standards is accelerated by the TÜV.

The determination of the device drift according to EN 14181 (QAL 3) can be done manually as well as with the SIPROM GA maintenance and service software on the PLC. 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.). The flow is then automatically regulated at approximately 8 ml/min using a restrictor.

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 swiveled downwards for service 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)
- Pressure switch in sample gas path for flow monitoring (option)

Field device

- Two-door enclosure with gas-tight separation of analyzer and electronics sections from gas path
- Individually purgeable enclosure halves
- Parts in contact with sample gas can be heated up to 65 °C (option)
- Gas path: hose made of FKM (Viton) or pipe made of titanium or stainless steel (further materials possible as special applications)
- Gas connections for sample gas inlet and outlet: pipe union for pipe diameter 6 mm or 1/4"
- Purging gas connections: pipe diameter 10 mm or 3/8"

Display and control panel

- Large LCD panel for simultaneous display of:
 - Measured value (digital and analog displays)
 - Status bar
 - Measuring ranges
- Contrast of the LCD field adjustable via the menu
- Washable membrane keyboard with five softkeys
- Menu-driven operation for parameterization, test functions, adjustment
- Operator support in plain text
- Graphic display of concentration trend; programmable time intervals
- Bilingual operating software: German/English, English/Spanish, French/English, Spanish/English, Italian/English

Inputs and outputs

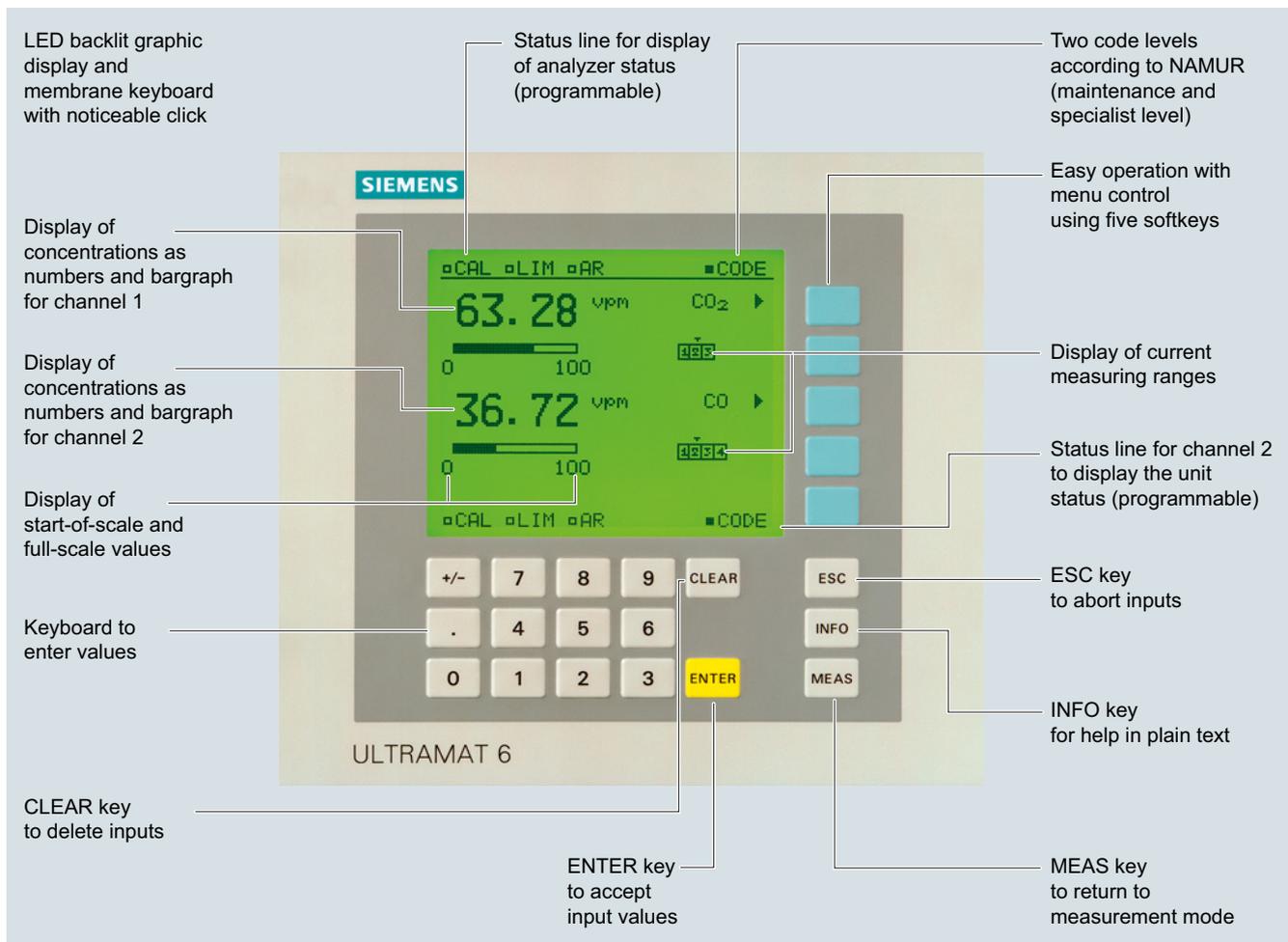
- One analog output per medium (from 0, 2, 4 to 20 mA; NAMUR configurable)
- Two analog inputs freely configurable (e.g. correction of cross-interferences or external pressure sensor)
- Six digital inputs freely configurable (e.g. for measurement range switchover, processing of external signals from sample preparation)
- Six relay outputs freely configurable e.g. for fault, maintenance request, 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 6, membrane keyboard and graphic display

Extractive continuous process gas analysis

Series 6

ULTRAMAT 6

General information

Designs – Parts wetted by sample gas, standard

Gas path		19" rack unit	Field device	Field device Ex
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 (tantalum only for cell length 20 mm to 180 mm)	
• Window		CaF ₂ , adhesive: E353, O-ring: FKM (e.g. Viton) or FFKM (Kalrez)		

Options

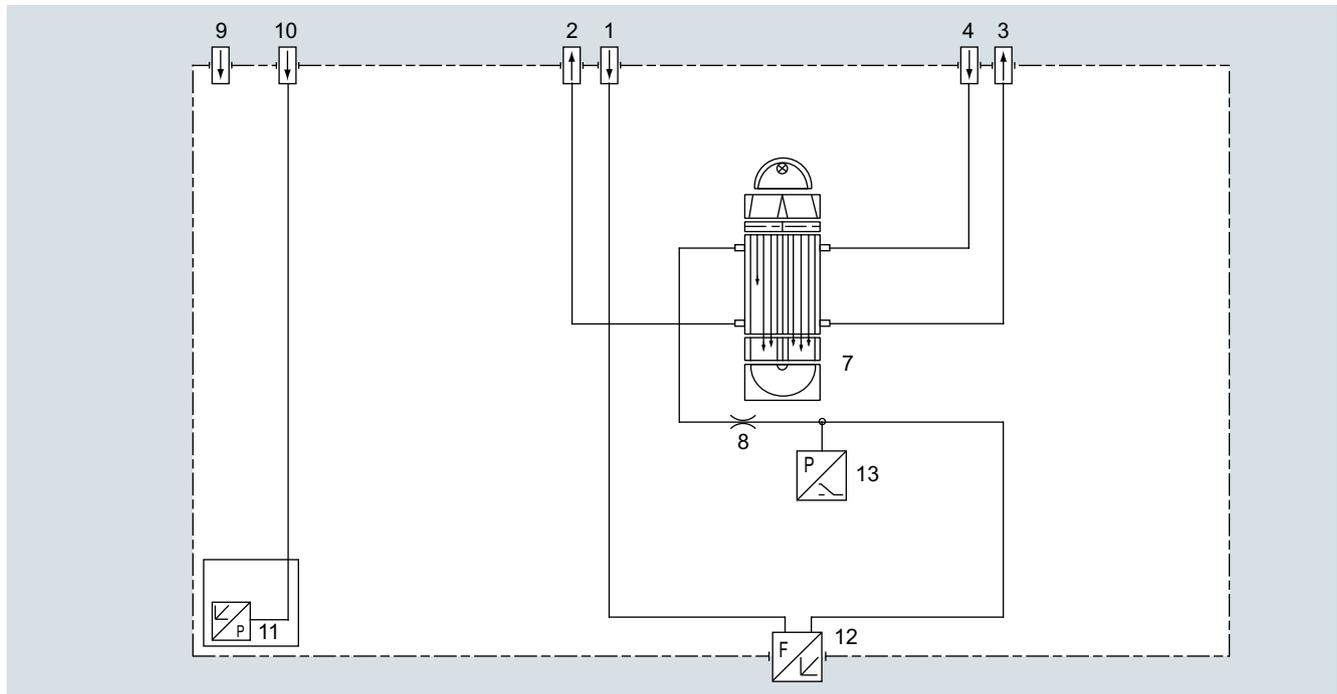
Gas path		19" rack unit	Field device	Field device Ex
Flow indicator	Measurement pipe		Duran glass	-
	Variable area		Duran glass	
	Suspension boundary		PTFE (Teflon)	
	Angle pieces		FKM (e.g. Viton)	
Pressure switch	Membrane		FKM (e.g. Viton)	-
	Enclosure		PA 6.3T	

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

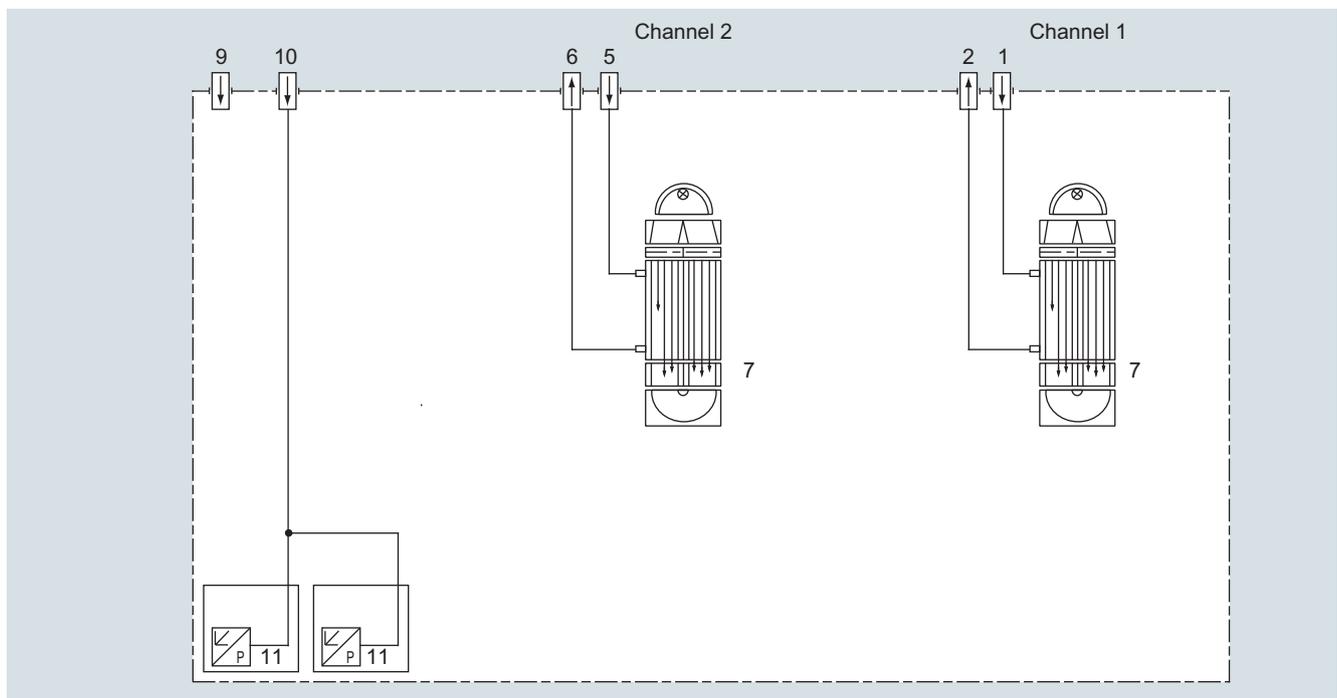
Gas path		19" rack unit	Field device	Field device Ex
With pipes	Bushing		e.g. Hastelloy C22	
	Pipe		e.g. Hastelloy C22, O-ring: FKM (e.g. Viton) or FFKM (Kalrez)	
	Sample chamber:			
	• Body		e.g. Hastelloy C22	
	• Window		CaF ₂ , without adhesive O-ring: FKM (e.g. Viton) or FFKM (Kalrez)	

Gas path (19" rack unit)**Legend for the gas path figures**

1	Sample gas inlet channel 1	8	Restrictor
2	Sample gas outlet channel 1	9	Purge gas inlet
3	Reference gas outlet (option)	10	Connection of atmospheric pressure sensor
4	Reference gas inlet (option)	11	Atmospheric pressure sensor
5	Sample gas inlet channel 2	12	Flow indicator in sample gas path (option)
6	Sample gas outlet channel 2	13	Pressure switch in sample gas path (option)
7	IR physical system		



Gas path ULTRAMAT 6, single-channel unit, 19" unit, with flow-type reference cell (option)



Gas path ULTRAMAT 6, dual-channel unit, 19" unit

Extractive continuous process gas analysis

Series 6

ULTRAMAT 6

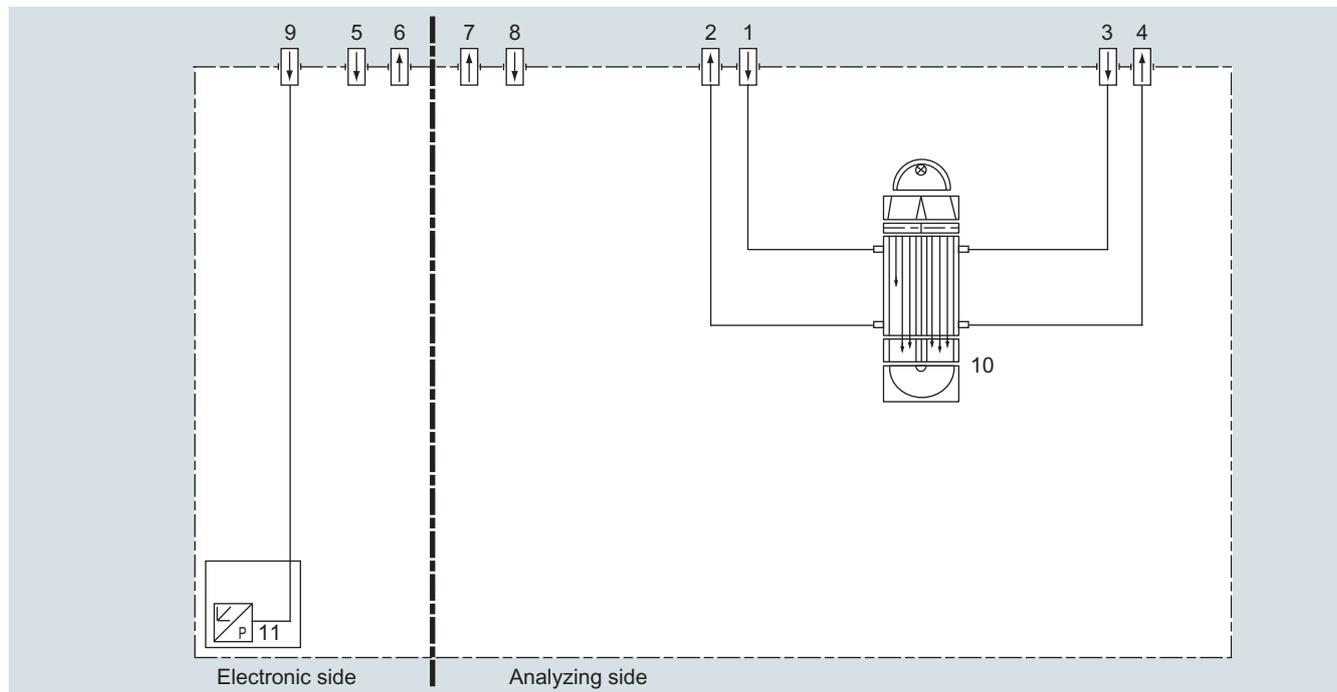
1

General information

Gas path (field device)

Legend for the gas path figures

1	Sample gas inlet	7	Purging gas outlet (analyzer side)
2	Sample gas outlet	8	Purging gas inlet (analyzer side)
3	Reference gas inlet (option)	9	Connection of atmospheric pressure sensor
4	Reference gas outlet (option)	10	IR physical system
5	Purging gas inlet (electronics side)	11	Atmospheric pressure sensor
6	Purging gas outlet (electronics side)		



Gas path ULTRAMAT 6, field unit, with flow-type reference cell (option)

Function

Principle of operation

The ULTRAMAT 6 gas analyzer 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 in the ULTRAMAT 6 gas analyzers 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 N₂ (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.

Notes

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

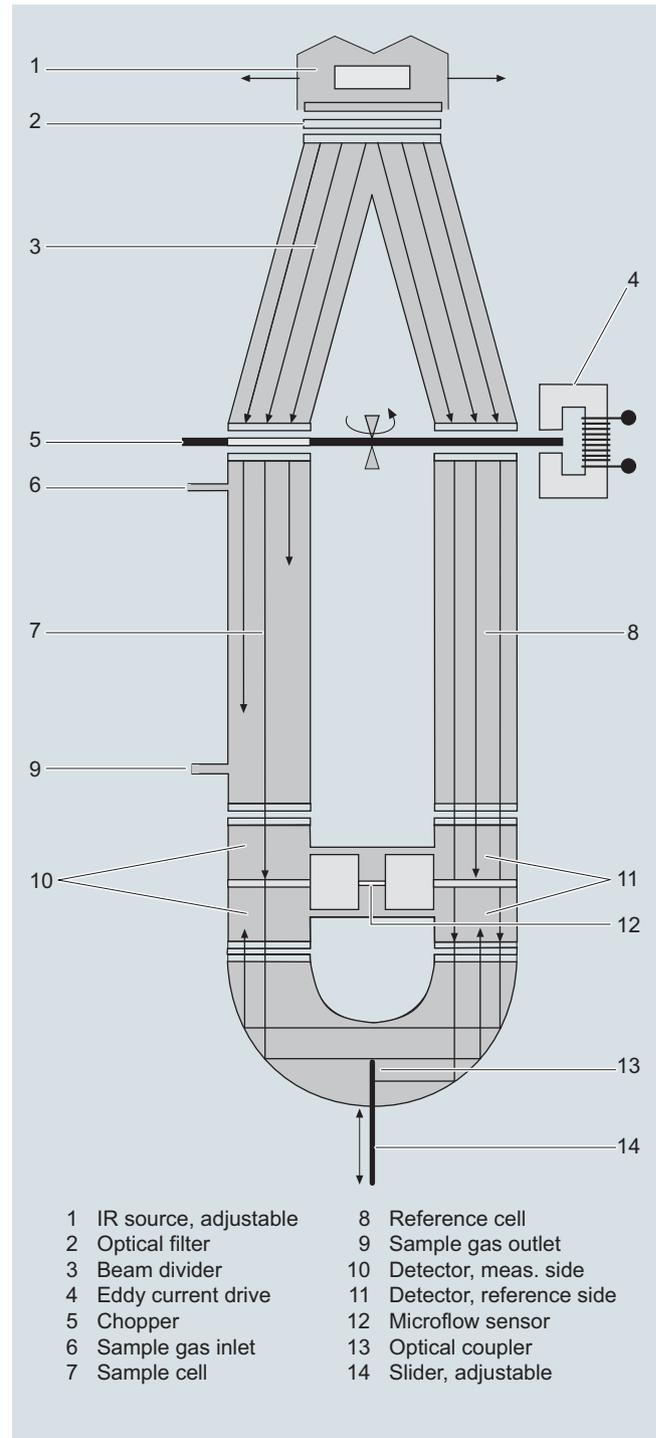
As far as possible, the ambient air of the analyzer should not have a large concentration of the gas components to be measured.

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 O₂ content > 70% may only be used together with Y02 (Clean for O₂).

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.



ULTRAMAT 6, principle of operation

Extractive continuous process gas analysis

Series 6

ULTRAMAT 6

1

General information

Essential characteristics

- Dimension of measured value freely selectable (e.g. vpm, mg/m³)
- 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
- Differential measuring ranges with flow-type reference cell
- 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)
- Internal pressure sensor for correction of variations in atmospheric pressure in the range 700 to 1 200 hPa absolute
- External pressure sensor can be connected for correction of variations in the process gas pressure in the range 700 to 1 500 hPa absolute (option)
- Two control levels with separate authorization codes to prevent unintentional and unauthorized inputs
- Automatic, configurable measuring range calibration
- 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
 - Clean for O₂ service (specially cleaned gas path)
- Easy device replacement since electric connections can be simply disconnected from the device
- Sample chambers for use in presence of highly corrosive sample gases, e.g. tantalum layer or sample chamber made of Hastelloy C22 (special application)

Additional features, dual-channel version

- Separate design of physical unit, electronics, inputs/outputs and power supply for each channel
- Display and operation via common LCD panel and keyboard
- Measurement channels 1 and 2 can be converted to series connection (linking of gas connections from channel 1 to channel 2 on rear)

Technical specifications

General information		Measuring response	
Measuring ranges	4, internally and externally switchable; autoranging is also possible	Output signal fluctuation	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature < ± 1% of the smallest possible measuring range according to rating plate
Smallest possible measuring range	Dependent on the application: e.g. CO: 0 ... 10 vpm, CO ₂ : 0 ... 5 vpm	Zero point drift	< ± 1% of the current measuring range/week
Largest possible measuring span	Dependent on the application	Measured-value drift	< ± 1% of the current measuring range/week
Measuring range with suppressed zero point	Any zero point within 0 ... 100 vol.% can be implemented; smallest possible span 20%	Repeatability	≤ 1% of the current measuring range
Operating position	Front wall, vertical	Detection limit	1% of the smallest possible measuring range
Conformity	CE mark in accordance with EN 50081-1, EN 50082-2	Linearity error	± 0.5 % of the full-scale value
Influence of interfering gases must be considered separately		Influencing variables	
Design, enclosure		Ambient temperature	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature < 1% of current measuring range/10 K (with constant receiver cell temperature)
Weight	Approx. 15 kg (with one IR channel) Approx. 21 kg (with two IR channels)	Sample gas pressure	<ul style="list-style-type: none"> 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
Degree of protection	IP20 according to EN 60529	Sample gas flow	Negligible
Electrical characteristics		Auxiliary power	< 0.1% of the current measuring range with rated voltage ± 10%
EMC (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98)	Environmental conditions	Application-specific measuring influences possible if ambient air contains measured components or cross interference-sensitive gases
Electrical safety	According to EN 61010-1, overvoltage category III	Electrical inputs and outputs	
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	Analog output	0/2/4 ... 20 mA, isolated; load ≤ 750 Ω
Power consumption	1-channel unit: Approx. 40 VA 2-channel unit: Approx. 70 VA	Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load: 24 V AC/DC/1 A, isolated, non-sparking
Fuse values		Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and accompanying gas influence correction (correction of cross-interference)
• 100 ... 120 V	1 T/250 (7MB2121) 1.6 T/250 (7MB2123)	Digital inputs	6, designed for 24 V, isolated, freely configurable, e.g. for measuring range switchover
• 200 ... 240 V	0.63 T/250 (7MB2121) 1 T/250 (7MB2123)	Serial interface	RS 485
Gas inlet conditions		Options	AUTOCAL function each with 8 additional digital inputs and relay outputs, also with PROFIBUS PA or PROFIBUS DP
Permissible sample gas pressure		Climatic conditions	
• With hoses		Permissible ambient temperature	-30 ... +70 °C during storage and transportation, 5 ... 45 °C during operation
- Without pressure switch	600 ... 1 500 hPa (absolute)	Permissible humidity	< 90% RH (relative humidity) as annual average, during storage and transportation (dew point must not be under-shot)
- With pressure switch	700 ... 1 300 hPa (absolute)		
• With pipes (without pressure switch)	600 ... 1 500 hPa (absolute)		
Sample gas flow	18 ... 90 l/h (0.3 ... 1.5 l/min)		
Sample gas temperature	Min. 0 ... max. 50 °C, but above the dew point		
Sample gas humidity	< 90% RH (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)	Approximately 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		

Extractive continuous process gas analysis

Series 6

ULTRAMAT 6

19" rack unit

1

Selection and ordering data

Article No.

ULTRAMAT 6 gas analyzer

Single-channel 19" rack unit for installation in cabinets

7MB2121- - - - - A A

Cannot be combined

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 1/4" outer diameter

1

1 → A20

Measured component	Possible with measuring range identification
--------------------	--

CO	11 ... 30
CO highly selective (with optical filter) ²⁾	12 ... 30
CO ³⁾	
CO ₂	10 ... 30
CH ₄	13 ... 30
C ₂ H ₂	15 ... 30
C ₂ H ₄	15 ... 30
C ₂ H ₆	14 ... 30
C ₃ H ₆	14 ... 30
C ₃ H ₈	13 ... 30
C ₄ H ₆	15 ... 30
C ₄ H ₁₀	14 ... 30
C ₆ H ₁₄	14 ... 30
SO ₂ ⁴⁾	13 ... 30
NO ⁴⁾	14 ... 20, 22
NH ₃ (dry)	14 ... 30
H ₂ O	17 ... 20, 22
N ₂ O	13 ... 30

A
B
X
C
D
E
F
G
H
J
K
L
M
N
P
Q
R
S

Q
R

Smallest measuring range	Largest measuring range	Measuring range identification
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0 ... 5 vpm	0 ... 100 vpm	10
0 ... 10 vpm	0 ... 200 vpm	11
0 ... 20 vpm	0 ... 400 vpm	12
0 ... 50 vpm	0 ... 1 000 vpm	13
0 ... 100 vpm	0 ... 1 000 vpm	14
0 ... 300 vpm	0 ... 3 000 vpm	15
0 ... 500 vpm	0 ... 5 000 vpm	16
0 ... 1 000 vpm	0 ... 10 000 vpm	17
0 ... 3 000 vpm	0 ... 10 000 vpm	18
0 ... 3 000 vpm	0 ... 30 000 vpm	19
0 ... 5 000 vpm	0 ... 15 000 vpm	20
0 ... 5 000 vpm	0 ... 50 000 vpm	21
0 ... 1 %	0 ... 3 %	22
0 ... 1 %	0 ... 10 %	23
0 ... 3 %	0 ... 10 %	24
0 ... 3 %	0 ... 30 %	25
0 ... 5 %	0 ... 15 %	26
0 ... 5 %	0 ... 50 %	27
0 ... 10 %	0 ... 30 %	28
0 ... 10 %	0 ... 100 %	29
0 ... 30 %	0 ... 100 %	30

A
B
C
D
E
F
G
H
J
K
L
M
N
P
Q
R
S
T
U
V
W

Internal gas paths	Sample chamber ¹⁾ (lining)	Reference chamber (flow-type)
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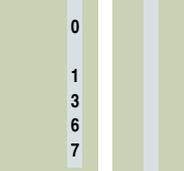
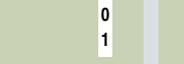
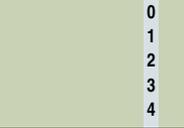
Hose made of FKM (Viton)	Aluminum	Non-flow-type	0
	Aluminum	Flow-type	1
Pipe made of titanium	Tantalum	Non-flow-type	4
	Tantalum	Flow-type	5
Stainless steel pipe (mat. no. 1.4571)	Aluminum	Non-flow-type	6
	Tantalum	Non-flow-type	8

With sample gas monitoring

Hose made of FKM (Viton)	Aluminum	Non-flow-type	2
	Aluminum	Flow-type	3

0 → A20, A21
1
4 → A20, A21, Y02
5 → Y02
6 → A20, A21
8 → A20, A21
2 → A20, A21
3

Footnotes: see next page

Selection and ordering data	Article No.	
ULTRAMAT 6 gas analyzer Single-channel 19" rack unit for installation in cabinets	7MB2121-  - A A	Cannot be combined
<u>Add-on electronics</u> Without AUTOCAL function • With 8 additional digital inputs/outputs • With serial interface for the automotive industry (AK) • With 8 digital inputs/outputs, PROFIBUS PA interface • With 8 digital inputs/outputs, PROFIBUS DP interface	 0 1 3 6 7	0 → Y27 3 → E20
<u>Power supply</u> 100 ... 120 V AC, 48 ... 63 Hz 200 ... 240 V AC, 48 ... 63 Hz	 0 1	
<u>Operating software and documentation</u> German English French Spanish Italian	 0 1 2 3 4	
Additional versions	Order code	
Add "-Z" to Article No. and specify Order code		
Flow-type reference cell with reduced flow, 6 mm	A20	
Flow-type reference cell with reduced flow, 1/4"	A21	
Telescopic rails (2 units)	A31	
TAG labels (specific lettering based on customer information)	B03	
Kalrez gaskets in sample gas path	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)	Y02	
Measuring range indication in plain text, if different from the standard setting	Y11	
Special setting (only in conjunction with an application no., e.g. extended measuring range)	Y12	
Extended special setting (only in conjunction with an application no., e.g. determination of cross-interferences)	Y13	
QAL1 according to SIRA/MCERTS	Y17	
Performance-tested according to EN 15267	Y27	
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 interface for the automotive industry (AK)	C79451-A3480-D512	
AUTOCAL function with 8 digital inputs/outputs	C79451-A3480-D511	
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS PA	A5E00057307	
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS DP	A5E00057312	
Set of Torx screwdrivers	A5E34821625	

1) Only for cell length 20 to 180 mm

2) QAL1: see table "Performance tested according to EN 15267 (single component)", page 1/54

3) QAL1: see table "Based on QAL1 according to SIRA/MCERTS (single component)", page 1/54

4) QAL1: See table "Based on QAL1 according to SIRA/MCERTS (single component) and performance-tested according to EN 15267 (single component)", page 1/54

Extractive continuous process gas analysis

Series 6

ULTRAMAT 6

19" rack unit

1

Selection and ordering data

Article No.

ULTRAMAT 6 gas analyzer

Two-channel 19" rack unit for installation in cabinets
for measuring 2 IR components

7MB2123-

Cannot be combined

➤ Click on the Article No. in the online configuration in the PIA Life Cycle Portal.

Gas connections for sample gas and reference gas

Pipe with 6 mm outer diameter

Pipe with 1/4" outer diameter

Channel 1 Measured component	Possible with measuring range identification
CO	11 ... 30
CO highly selective (with optical filter) ²⁾	12 ... 30
CO ³⁾	
CO ₂	10 ... 30
CH ₄	13 ... 30
C ₂ H ₂	15 ... 30
C ₂ H ₄	15 ... 30
C ₂ H ₆	14 ... 30
C ₃ H ₆	14 ... 30
C ₃ H ₈	13 ... 30
C ₄ H ₆	15 ... 30
C ₄ H ₁₀	14 ... 30
C ₆ H ₁₄	14 ... 30
SO ₂ ⁴⁾	13 ... 30
NO ⁴⁾	14 ... 20, 22
NH ₃ (dry)	14 ... 30
H ₂ O	17 ... 20, 22
N ₂ O	13 ... 30

Smallest measuring range	Largest measuring range	Measuring range identification
0 ... 5 vpm	0 ... 100 vpm	10
0 ... 10 vpm	0 ... 200 vpm	11
0 ... 20 vpm	0 ... 400 vpm	12
0 ... 50 vpm	0 ... 1 000 vpm	13
0 ... 100 vpm	0 ... 1 000 vpm	14
0 ... 300 vpm	0 ... 3 000 vpm	15
0 ... 500 vpm	0 ... 5 000 vpm	16
0 ... 1 000 vpm	0 ... 10 000 vpm	17
0 ... 3 000 vpm	0 ... 10 000 vpm	18
0 ... 3 000 vpm	0 ... 30 000 vpm	19
0 ... 5 000 vpm	0 ... 15 000 vpm	20
0 ... 5 000 vpm	0 ... 50 000 vpm	21
0 ... 1 %	0 ... 3 %	22
0 ... 1 %	0 ... 10 %	23
0 ... 3 %	0 ... 10 %	24
0 ... 3 %	0 ... 30 %	25
0 ... 5 %	0 ... 15 %	26
0 ... 5 %	0 ... 50 %	27
0 ... 10 %	0 ... 30 %	28
0 ... 10 %	0 ... 100 %	29
0 ... 30 %	0 ... 100 %	30

Internal gas paths	Sample chamber ¹⁾ (lining)	Reference chamber (flow-type)
Hose made of FKM (Viton)	Aluminum	Non-flow-type
	Aluminum	Flow-type
Pipe made of titanium	Tantalum	Non-flow-type
	Tantalum	Flow-type
Stainless steel pipe (mat. no. 1.4571)	Aluminum	Non-flow-type
	Tantalum	Non-flow-type
With sample gas monitoring		
Hose made of FKM (Viton)	Aluminum	Non-flow-type
	Aluminum	Flow-type

0
10 → A21, A41
1 → A20, A40A
B
X
C
D
E
F
G
H
J
K
L
M
N
P
Q
R
SQ
RA
B
C
D
E
F
G
H
J
K
L
M
N
P
Q
R
S
T
U
V
W0
1
4
5
6
8
2
30 → A20, A21, A40, A41
1
4 → A20, A21, A40, A41, Y02
5 → Y02
6 → A20, A21, A40, A41
8 → A20, A21, A40, A41
2 → A20, A21, A40, A41
3

¹⁾ Only for cell length 20 to 180 mm

²⁾ QAL1: see table "Performance tested according to EN 15267 (single component)", page 1/54

³⁾ QAL1: see table "Based on QAL1 according to SIRA/MCERTS (single component)", page 1/54

⁴⁾ QAL1: See table "Based on QAL1 according to SIRA/MCERTS (single component) and performance-tested according to EN 15267 (single component)", page 1/54

Extractive continuous process gas analysis

Series 6
ULTRAMAT 6

19" rack unit

1

Selection and ordering data			Article No.	
ULTRAMAT 6 gas analyzer			7MB2123-	Cannot be combined
Two-channel 19" rack unit for installation in cabinets for measuring 2 IR components				
<u>Add-on electronics</u>				
Without			0	0 → Y27, Y28
AUTOCAL function			1	
• With 8 additional digital inputs/outputs each for channel 1			2	
• With 8 additional digital inputs/outputs each for channel 2			3	
• With 8 additional digital inputs/outputs each for channel 1 and channel 2			5	5 → E20
• With serial interface for the automotive industry (AK)			6	
• With 8 additional digital inputs/outputs each for channel 1 and channel 2 and PROFIBUS PA interface			7	
• With 8 additional digital inputs/outputs each for channel 1 and channel 2 and PROFIBUS DP interface				
<u>Power supply</u>				
100 ... 120 V AC, 48 ... 63 Hz			0	
200 ... 240 V AC, 48 ... 63 Hz			1	
<u>Channel 2</u>		<u>Possible with measuring range identification</u>		
<u>Measured component</u>				
CO	11 ... 30	A		
CO highly selective (with optical filter) ¹⁾	12 ... 30	B		
CO ²⁾		X		
CO ₂	10 ... 30	C		
CH ₄	13 ... 30	D		
C ₂ H ₂	15 ... 30	E		
C ₂ H ₄	15 ... 30	F		
C ₂ H ₆	14 ... 30	G		
C ₃ H ₆	14 ... 30	H		
C ₃ H ₈	13 ... 30	J		
C ₄ H ₆	15 ... 30	K		
C ₄ H ₁₀	14 ... 30	L		
C ₆ H ₁₄	14 ... 30	M		
SO ₂ ³⁾	13 ... 30	N		
NO ³⁾	14 ... 20, 22	P		
NH ₃ (dry)	14 ... 30	Q		Q
H ₂ O	17 ... 20, 22	R		R
N ₂ O	13 ... 30	S		
<u>Smallest measuring range</u>	<u>Largest measuring range</u>	<u>Measuring range identification</u>		
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	
<u>Operating software and documentation</u>				
German			0	
English			1	
French			2	
Spanish			3	
Italian			4	

¹⁾ QAL1: see table "Performance tested according to EN 15267 (single component)", page 1/54

²⁾ QAL1: see table "Based on QAL1 according to SIRA/MCERTS (single component)", page 1/54

³⁾ QAL1: See table "Based on QAL1 according to SIRA/MCERTS (single component) and performance-tested according to EN 15267 (single component)", page 1/54

Extractive continuous process gas analysis

Series 6

ULTRAMAT 6

19" rack unit

1

Selection and ordering data

<i>Additional versions</i>	Order code	Cannot be combined
Add "-Z" to Article No. and specify Order codes.		
Flow-type reference cell with reduced flow, 6 mm (channel 1)	A20	
Flow-type reference cell with reduced flow, ¼" (channel 1)	A21	
Flow-type reference cell with reduced flow, 6 mm (channel 2)	A40	
Flow-type reference cell with reduced flow, ¼" (channel 2)	A41	
Connection pipe (can only be combined with the appropriate gas connection diameter and internal gas path materials)		
• Made of titanium, 6 mm, complete with screwed gland, for sample gas side	A22	
• Made of titanium, 6 mm, complete with screwed gland, for reference gas side	A23	
• Made of titanium, ¼", complete with screwed gland, for sample gas side	A24	
• Made of titanium, ¼", complete with screwed gland, for reference gas side	A25	
• Made of stainless steel (mat. no. 1.4571), 6 mm, complete with screwed gland, for sample gas side	A27	
• Made of stainless steel (mat. no. 1.4571), ¼", complete with screwed gland, for sample gas side	A29	
Telescopic rails (2 units)	A31	
TAG labels (specific lettering based on customer information)	B03	
Kalrez gaskets in sample gas path (channel 1)	B04	
Kalrez gaskets in sample gas path (channel 2)	B05	
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; channels 1 + 2)	Y02	
Measuring range indication in plain text, if different from the standard setting	Y11	
Special setting (only in conjunction with an application no., e.g. extended measuring range)	Y12	
Extended special setting (only in conjunction with an application no., e.g. determination of cross-interferences)	Y13	
QAL1 according to SIRI/MCERTS (1st channel)	Y17	
QAL1 according to SIRI/MCERTS (2nd channel)	Y18	
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 interface for the automotive industry (AK)	C79451-A3480-D33	
AUTOCAL function with 8 digital inputs/outputs for channel 1 or channel 2	C79451-A3480-D511	
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS PA for channel 1 or channel 2	A5E00057307	
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS DP for channel 1 or channel 2	A5E00057312	
Set of Torx screwdrivers	A5E34821625	

Selection and ordering data			Article No.	
ULTRAMAT 6 gas analyzer			7MB2124-	
Single-channel or dual-channel 19" rack unit for installation in cabinets for measuring 2 or 3 IR components			Cannot be combined	
Click on the Article No. for the online configuration in the PIA Life Cycle Portal.				
<u>Gas connections for sample gas and reference gas</u>				
Pipe with 6 mm outer diameter			0	0 → A21, A41
Pipe with 1/4" outer diameter			1	1 → A20, A40
<u>Measured component</u>	<u>Smallest measuring range</u>	<u>Largest measuring range</u>		
CO	0 ... 100 vpm	0 ... 1 000 vpm	AA	
NO	0 ... 100 vpm	0 ... 1 000 vpm		
CO	0 ... 300 vpm	0 ... 3 000 vpm	AB	
NO	0 ... 300 vpm	0 ... 3 000 vpm		
CO	0 ... 1 000 vpm	0 ... 10 000 vpm	AC	
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 1/54)				
CO ₂	0 ... 100 vpm	0 ... 1 000 vpm	BA	
CO	0 ... 100 vpm	0 ... 1 000 vpm		
CO ₂	0 ... 300 vpm	0 ... 3 000 vpm	BB	
CO	0 ... 300 vpm	0 ... 3 000 vpm		
CO ₂	0 ... 1 000 vpm	0 ... 10 000 vpm	BC	
CO	0 ... 1 000 vpm	0 ... 10 000 vpm		
CO ₂	0 ... 3 000 vpm	0 ... 30 000 vpm	BD	
CO	0 ... 3 000 vpm	0 ... 30 000 vpm		
CO ₂	0 ... 1 %	0 ... 10 %	BE	
CO	0 ... 1 %	0 ... 10 %		
CO ₂	0 ... 3 %	0 ... 30 %	BF	
CO	0 ... 3 %	0 ... 30 %		
CO ₂	0 ... 10 %	0 ... 100 %	BG	
CO	0 ... 10 %	0 ... 100 %		
CO ₂	0 ... 10 %	0 ... 100 %	CG	
CH ₄	0 ... 10 %	0 ... 100 %		
CO ₂	0 ... 300 vpm	0 ... 3 000 vpm	DB	
NO	0 ... 300 vpm	0 ... 3 000 vpm		
<u>Internal gas paths</u>	<u>Sample chamber¹⁾ (lining)</u>	<u>Reference chamber (flow-type)</u>		
Hose made of FKM (Viton)	Aluminum	Non-flow-type	0	0 → A20, A21, A40, A41
	Aluminum	Flow-type	1	
Pipe made of titanium	Tantalum	Non-flow-type	4	4 → A20, A21, A40, A41, Y02
	Tantalum	Flow-type	5	
Stainless steel pipe (mat. no. 1.4571)	Aluminum	Non-flow-type	6	5 → Y02 6 → A20, A21, A40, A41
	Tantalum	Non-flow-type	8	
<u>With sample gas monitoring</u>				
Hose made of FKM (Viton)	Aluminum	Non-flow-type	2	2 → A20, A21, A40, A41
	Aluminum	Flow-type	3	
<u>Add-on electronics</u>				
Without			0	
AUTOCAL function				
• With 8 additional digital inputs/outputs each for channel 1			1	
• With 8 additional digital inputs/outputs each for channel 1 and channel 2			2	
• With serial interface for the automotive industry (AK), channel 1			3	2 → E20 3 → E20
• With serial interface for the automotive industry (AK), channel 1 and channel 2			4	
• With 8 additional digital inputs/outputs for channel 1 and PROFIBUS PA interface			5	
• With 8 additional digital inputs/outputs each for channel 1 and channel 2 and PROFIBUS PA interface			6	6 → E20
• With 8 additional digital inputs/outputs for channel 1 and PROFIBUS DP interface			7	
• With 8 additional digital inputs/outputs each for channel 1 and channel 2 and PROFIBUS DP interface			8	

1) Only for cell length 20 to 180 mm

Extractive continuous process gas analysis

Series 6

ULTRAMAT 6

19" rack unit

1

Selection and ordering data

Article No.

ULTRAMAT 6 gas analyzer

7MB2124-

Cannot be combined

Single-channel or dual-channel 19" rack unit for installation in cabinets for measuring 2 or 3 IR components

Power supply

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

Channel 2

Measured component

Possible with measuring range identification

Without channel 2

CO	11 ... 30
CO highly selective (with optical filter)	12 ... 30
CO (QAL1; see table "Based on QAL1 according to SIRA/MCERTS (single component)", page 1/54)	
CO ₂	10 ... 30
CH ₄	13 ... 30
C ₂ H ₂	15 ... 30
C ₂ H ₄	15 ... 30
C ₂ H ₆	14 ... 30
C ₃ H ₆	14 ... 30
C ₃ H ₈	13 ... 30
C ₄ H ₆	15 ... 30
C ₄ H ₁₀	14 ... 30
C ₆ H ₁₄	14 ... 30
SO ₂ (QAL1; see table "Based on QAL1 according to SIRA/MCERTS (single component)", page 1/54)	13 ... 30
NO (QAL1; see table "Based on QAL1 according to SIRA/MCERTS (single component)", page 1/54)	14 ... 20, 22
NH ₃ (dry)	14 ... 30
H ₂ O	17 ... 20, 22
N ₂ O	13 ... 30

Smallest measuring range

Largest measuring range

Measuring range identification

Without channel 2

0 ... 5 vpm	0 ... 100 vpm	10
0 ... 10 vpm	0 ... 200 vpm	11
0 ... 20 vpm	0 ... 400 vpm	12
0 ... 50 vpm	0 ... 1 000 vpm	13
0 ... 100 vpm	0 ... 1 000 vpm	14
0 ... 300 vpm	0 ... 3 000 vpm	15
0 ... 500 vpm	0 ... 5 000 vpm	16
0 ... 1 000 vpm	0 ... 10 000 vpm	17
0 ... 3 000 vpm	0 ... 10 000 vpm	18
0 ... 3 000 vpm	0 ... 30 000 vpm	19
0 ... 5 000 vpm	0 ... 15 000 vpm	20
0 ... 5 000 vpm	0 ... 50 000 vpm	21
0 ... 1 %	0 ... 3 %	22
0 ... 1 %	0 ... 10 %	23
0 ... 3 %	0 ... 10 %	24
0 ... 3 %	0 ... 30 %	25
0 ... 5 %	0 ... 15 %	26
0 ... 5 %	0 ... 50 %	27
0 ... 10 %	0 ... 30 %	28
0 ... 10 %	0 ... 100 %	29
0 ... 30 %	0 ... 100 %	30

Operating software and documentation

German
English
French
Spanish
Italian

0

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X → A40, A41, B05

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Selection and ordering data

<i>Additional versions</i>	Order code	Cannot be combined
Add "-Z" to Article No. and specify Order codes.		
Flow-type reference cell with reduced flow, 6 mm (channel 1)	A20	
Flow-type reference cell with reduced flow, 1/4" (channel 1)	A21	
Flow-type reference cell with reduced flow, 6 mm (channel 2)	A40	
Flow-type reference cell with reduced flow, 1/4" (channel 2)	A41	
Connection pipe (can only be combined with the appropriate gas connection diameter and internal gas path materials)		
• Made of titanium, 6 mm, complete with screwed gland, for sample gas side	A22	
• Made of titanium, 6 mm, complete with screwed gland, for reference gas side	A23	
• Made of titanium, 1/4", complete with screwed gland, for sample gas side	A24	
• Made of titanium, 1/4", complete with screwed gland, for reference gas side	A25	
• Made of stainless steel (mat. no. 1.4571), 6 mm, complete with screwed gland, for sample gas side	A27	
• Made of stainless steel (mat. no. 1.4571), 1/4", complete with screwed gland, for sample gas side	A29	
Telescopic rails (2 units)	A31	
TAG labels (specific lettering based on customer information)	B03	
Kalrez gaskets in sample gas path (channel 1)	B04	
Kalrez gaskets in sample gas path (channel 2)	B05	
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; channels 1 + 2)	Y02	
Measuring range indication in plain text, if different from the standard setting	Y11	
Special setting (only in conjunction with an application no., e.g. extended measuring range)	Y12	
Extended special setting (only in conjunction with an application no., e.g. determination of cross-interferences)	Y13	
QAL1 according to SIRA/MCERTS (1st channel)	Y17	
QAL1 according to SIRA/MCERTS (2nd channel)	Y18	
<i>Accessories</i>	Article No.	
RS 485/Ethernet converter	A5E00852383	
RS 485/RS 232 converter	C79451-Z1589-U1	
RS 485/USB converter	A5E00852382	
AUTOCAL function with serial interface for the automotive industry (AK)	C79451-A3480-D33	
AUTOCAL function with 8 digital inputs/outputs for channel 1 or channel 2	C79451-A3480-D511	
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS PA for channel 1 or channel 2	A5E00057307	
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS DP for channel 1 or channel 2	A5E00057312	
Set of Torx screwdrivers	A5E34821625	

Extractive continuous process gas analysis

Series 6

ULTRAMAT 6

19" rack unit

Based on QAL1 according to SIRAMCERTS (single component)

Only in conjunction with order code Y17/Y18

Component Measuring range identification	CO (QAL1)		SO ₂ (QAL1)		NO (QAL1)	
	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

Example for ordering

ULTRAMAT 6, QAL1

Component: CO

Measuring range: 0 to 50 / 1 000 mg/m³

with hoses, non-flow-type reference compartment

without automatic adjustment (AUTOCAL)

230 V AC; German

7MB2121-0XD00-1AA0-Z +Y17

Performance-tested according to EN 15267 (single component)

Only in conjunction with order code Y27/Y28

Component Measuring range identification	CO (QAL1)		SO ₂ (QAL1)		NO (QAL1)	
	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 6 2-channel, performance-tested according to EN 15267

Components: CO + SO₂Measuring range: CO: 0 to 75 / 1 250 mg/m³, SO₂: 0 to 75 / 1 500 mg/m³

with hoses, non-flow-type reference compartment

with automatic adjustment (AUTOCAL)

230 V AC; German

7MB2123-0BD03-1NC0-Z +Y27+Y28

Based on QAL1 according to SIRAMCERTS (2 components in series)

Only in conjunction with order code Y17

Component Measuring range identification	CO (QAL1)		NO (QAL1)	
	Smallest measuring range from 0 to ...	Largest measuring range from 0 to ...	Smallest measuring range from 0 to ...	Largest measuring range from 0 to ...
AA	75 mg/m ³	1 000 mg/m ³	200 mg/m ³	2 000 mg/m ³
AB	300 mg/m ³	3 000 mg/m ³	300 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 6 2-channel, QAL1

Components: CO/NO + SO₂Measuring range: CO: 0 to 75 / 1 000 mg/m³, NO: 0 to 200 / 2 000 mg/m³, SO₂: 0 to 75 / 1 500 mg/m³

with hoses, non-flow-type reference compartment

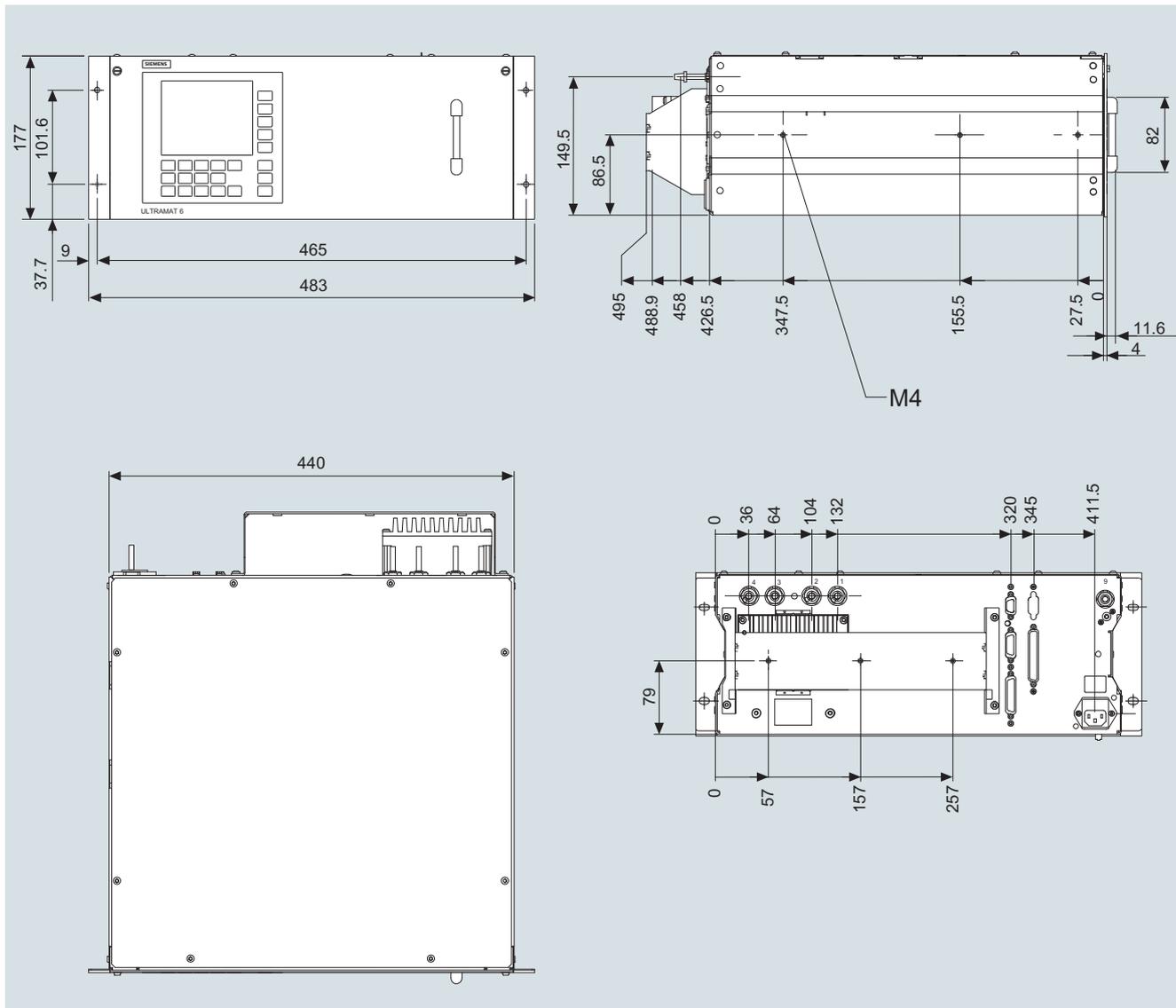
without automatic adjustment (AUTOCAL)

230 V AC; German

7MB2124-0AA00-1NC0-Z+Y17+Y18Ordering information measured component N₂OCertification in accordance with AM0028 and AM0034 (Kyoto Protocol) for measuring N₂O, measuring range 0 ... 300 vpm / 3 000 vpm.

Version: Standard device

Dimensional drawings



ULTRAMAT 6, 19" rack unit, dimensions in mm (example: 1-channel version)

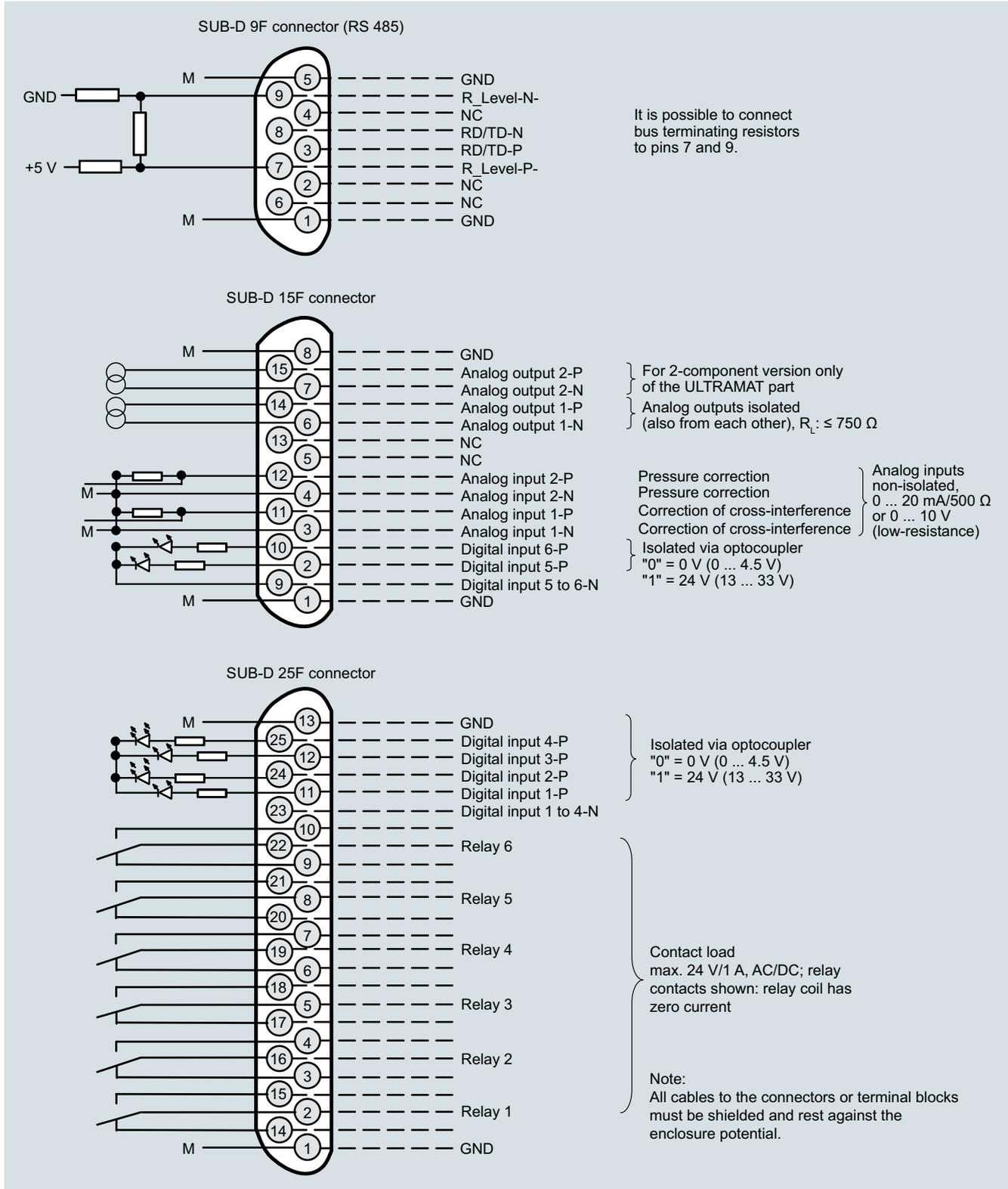
Extractive continuous process gas analysis

Series 6
ULTRAMAT 6

19" rack unit

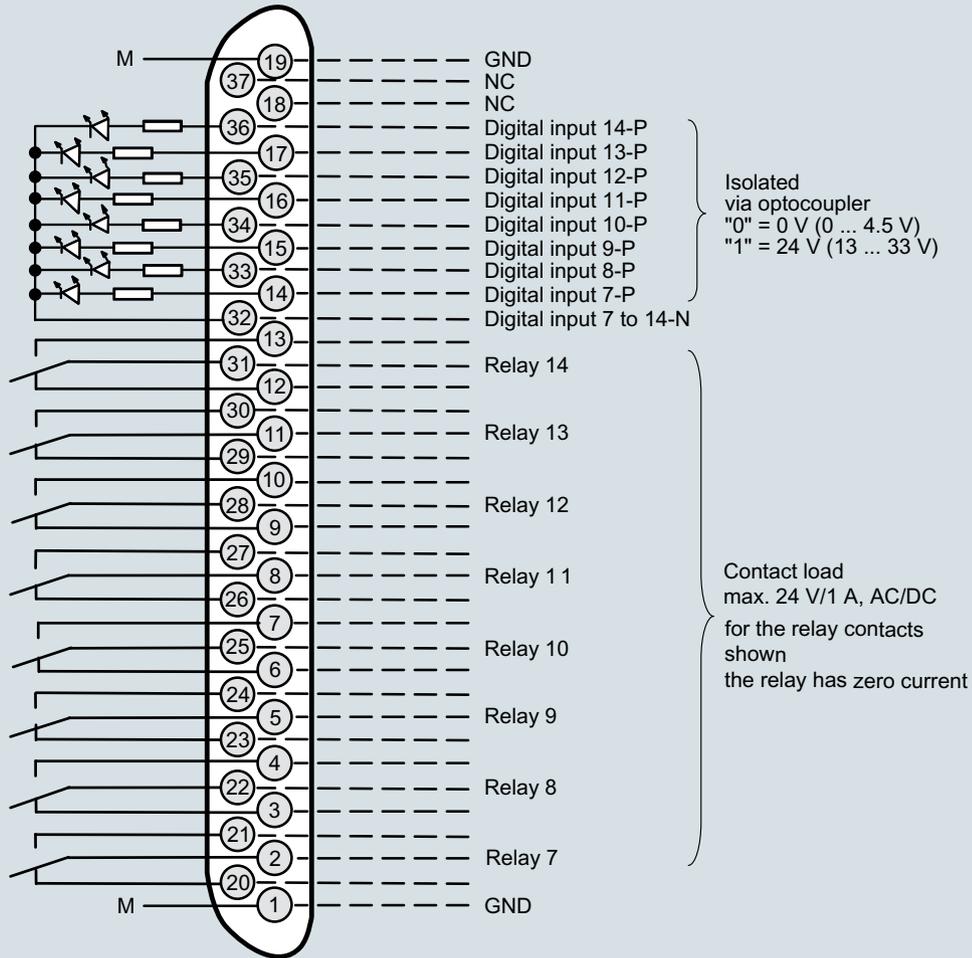
Circuit diagrams

Pin assignment (electrical and gas connections)



ULTRAMAT 6, 19" rack unit, pin assignment

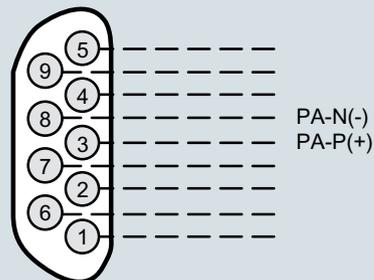
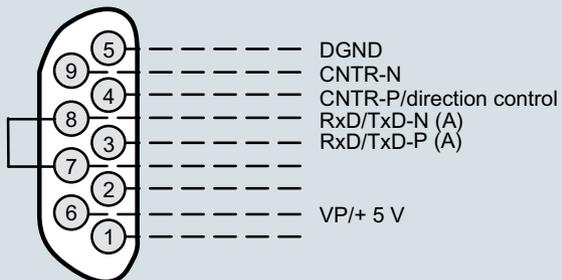
Connector SUB-D 37F (option)



Connector SUB-D 9F
PROFIBUS DP

optional

Connector SUB-D 9M
PROFIBUS PA



Note:

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

ULTRAMAT 6, 19" rack unit, pin assignment of the AUTOCAL board and PROFIBUS connectors

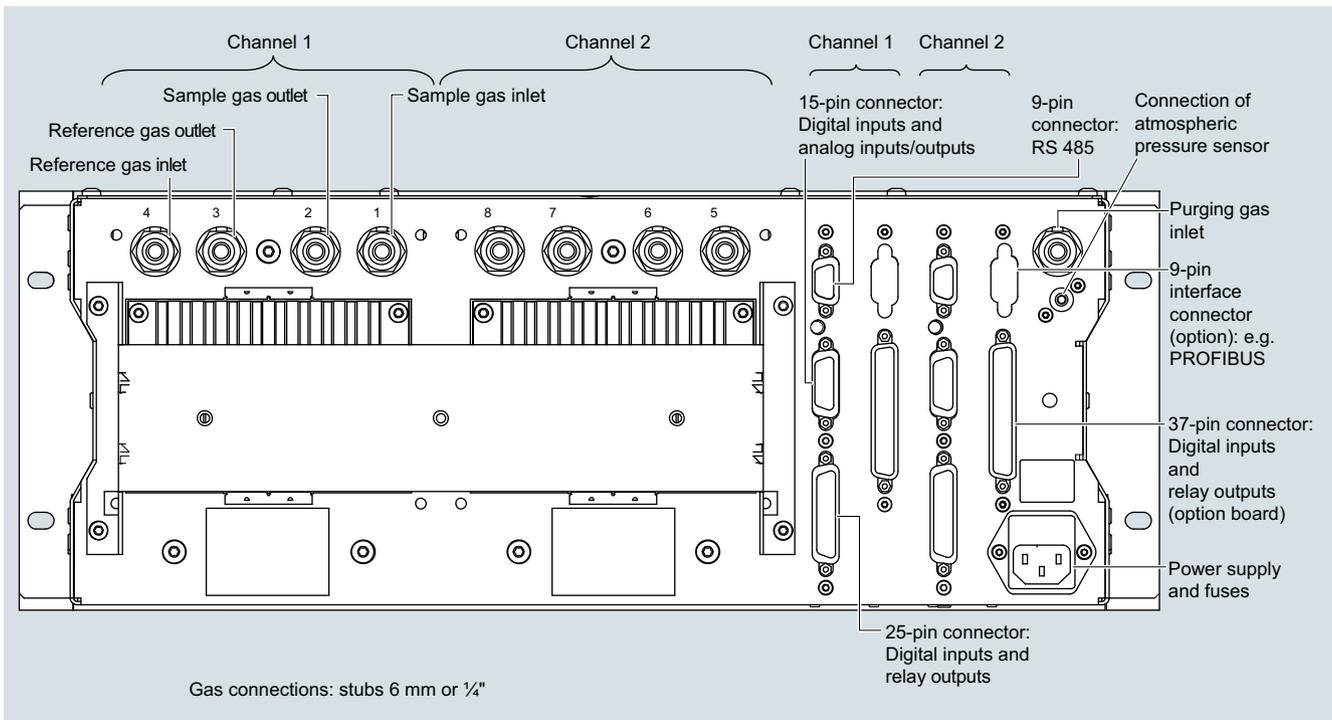
Extractive continuous process gas analysis

Series 6

ULTRAMAT 6

19" rack unit

1



ULTRAMAT 6, 19" rack unit, gas connections and electrical connections (example: 2-channel version)

Technical specifications

General information		Damping (electrical time constant)	0 ... 100 s, configurable
Measuring ranges	4, internally and externally switchable; autoranging is also possible	Dead time (purging time of the gas path in the unit at 1 l/min)	Approximately 0.5 ... 5 s, depending on version
Smallest possible measuring range	Dependent on the application, e.g. CO: 0 ... 10 vpm, CO ₂ : 0 ... 5 vpm	Time for device-internal signal processing	< 1 s
Largest possible measuring range	Dependent on the application	Pressure correction range	
Measuring range with suppressed zero point	Any zero point within 0 ... 100 vol.% can be implemented; smallest possible span 20%	Pressure sensor	
Heated version	65 °C	• Internal	700 ... 1 200 hPa absolute
Operating position	Front wall, vertical	• External	700 ... 1 500 hPa absolute
Conformity	CE mark in accordance with EN 50081-1, EN 50082-2	Measuring response	
Influence of interfering gases must be considered separately		Output signal fluctuation	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Design, enclosure		Zero point drift	< ± 1% of the smallest possible measuring range according to rating plate
Weight	Approx. 32 kg	Zero point drift	< ± 1% of the current measuring range/week
Degree of protection	IP65 in accordance with EN 60529, restricted breathing enclosure to EN 50021	Measured-value drift	< ± 1% of the current measuring range/week
Electrical characteristics		Repeatability	≤ 1% of the current measuring range
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	Detection limit	1% of the smallest possible measuring range
Power consumption	Approx. 35 VA; approx. 330 VA with heated version	Linearity error	± 0.5 % of the full-scale value
EMC (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98)	Influencing variables	
Electrical safety	In accordance with EN 61010-1	Ambient temperature	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
• Heated units	Overvoltage category II	Sample gas pressure	< 1% of current measuring range/10 K (with constant receiver cell temperature)
• Unheated units	Overvoltage category III	Sample gas pressure	With disabled pressure compensation: < 0.15% of the setpoint/1 % change in atmospheric pressure
Fuse values (unheated unit)		Sample gas flow	Negligible
• 100 ... 120 V	F3: 1 T/250; F4: 1 T/250	Auxiliary power	< 0.1% of the current measuring range with rated voltage ± 10%
• 200 ... 240 V	F3: 0.63 T/250; F4: 0.63 T/250	Environmental conditions	Application-specific measuring influences possible if ambient air contains measured component or cross interference-sensitive gases
Fuse values (heated unit)		Electrical inputs and outputs	
• 100 ... 120 V	F1: 1 T/250; F2: 4 T/250 F3: 4 T/250; F4: 4 T/250	Analog output	0/2/4 ... 20 mA, isolated; load 750 Ω
• 200 ... 240 V	F1: 0.63 T/250; F2: 2.5 T/250 F3: 2.5 T/250; F4: 2.5 T/250	Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load: 24 V AC/DC/1 A, isolated, non-sparking
Gas inlet conditions		Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and accompanying gas influence correction (correction of cross-interference)
Permissible sample gas pressure		Digital inputs	6, designed for 24 V, isolated, freely configurable, e.g. for measuring range switchover
• With hoses (without pressure switch)	600 ... 1 500 hPa (absolute)	Serial interface	RS 485
• With pipes (without pressure switch)	600 ... 1 500 hPa (absolute)	Options	AUTOCAL function each with 8 additional digital inputs and relay outputs, also with PROFIBUS PA or PROFIBUS DP
- Ex (leakage compensation)	600 ... 1 160 hPa (absolute)	Climatic conditions	
- Ex (continuous purging)	600 ... 1 500 hPa (absolute)	Permissible ambient temperature	-30 ... +70 °C during storage and transportation; 5 ... 45 °C during operation
Purging gas pressure		Permissible humidity	< 90% RH (RH: relative humidity) within average annual value, during storage and transportation (dew point must not be undershot)
• Permanent	< 165 hPa above ambient pressure		
• For short periods	250 hPa above ambient pressure		
Sample gas flow	18 ... 90 l/h (0.3 ... 1.5 l/min)		
Sample gas temperature	Min. 0 ... max. 50 °C, but above the dew point, for heated version min. 0 ... max. 80 °C		
Sample gas humidity	< 90% RH (RH: relative humidity) or dependent on measuring task		
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		

Extractive continuous process gas analysis

Series 6

ULTRAMAT 6

Field device

1

Selection and ordering data

Article No.

ULTRAMAT 6 gas analyzer

For installation in the field, single-channel, 1 component

7MB2111-

- - - - - A

Cannot be combined

➤ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.

Gas connections

Ferrule screw connection for pipe, outer diameter 6 mm

0

0 → A29

Ferrule screw connection for pipe, outer diameter 1/4"

1

1 → A28

Measured component

Possible with measuring range identification

CO	11 ... 30	A
CO highly selective (with optical filter)	12 ... 30	B
CO (QAL1; see table "Based on QAL1 according to SIRA/MCERTS (single component)", page 1/65)		X
CO ₂	10 ... 30	C
CH ₄	13 ... 30	D
C ₂ H ₂	15 ... 30	E
C ₂ H ₄	15 ... 30	F
C ₂ H ₆	14 ... 30	G
C ₃ H ₆	14 ... 30	H
C ₃ H ₈	13 ... 30	J
C ₄ H ₆	15 ... 30	K
C ₄ H ₁₀	14 ... 30	L
C ₆ H ₁₄	14 ... 30	M
SO ₂ (QAL1; see table "Based on QAL1 according to SIRA/MCERTS (single component)", page 1/65)	13 ... 30	N
NO (QAL1; see table "Based on QAL1 according to SIRA/MCERTS (single component)", page 1/65)	14 ... 20, 22	P
NH ₃ (dry)	14 ... 30	Q
H ₂ O	17 ... 20; 22 (17 to 24, 26; heated)	R
N ₂ O	13 ... 30	S

Q
R

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	19	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

Selection and ordering data

Article No.

ULTRAMAT 6 gas analyzer

7MB2111- - - - - A

Cannot be combined

For installation in the field, single-channel, 1 component

Internal gas paths	Sample chamber (lining)	Reference chamber (flow-type)			
Hose made of FKM (Viton)	Aluminum	Non-flow-type	0	0	0 → A28, A29
	Aluminum	Flow-type	1	1	1 →
Pipe made of titanium	Tantalum ¹⁾	Non-flow-type	2	2	2 → A28, A29, Y02
	Tantalum ¹⁾	Flow-type	3	3	3 → Y02
Stainless steel pipe (mat. no. 1.4571)	Aluminum	Non-flow-type	6	6	6 → A28, A29
	Tantalum ¹⁾	Non-flow-type	8	8	8 → A28, A29
<u>Add-on electronics</u>					
Without			0		
AUTOCAL function					
• With 8 additional digital inputs/outputs			1		
• With 8 digital inputs/outputs and PROFIBUS PA interface			6		6 → E12
• With 8 digital inputs/outputs and PROFIBUS DP interface			7		7 → E12
• With 8 digital inputs/outputs and PROFIBUS PA Ex i			8		
<u>Power supply</u>					
Standard unit and acc. to ATEX II 3G version (Zone 2)					
• 100 ... 120 V AC, 48 ... 63 Hz			0	0	
• 200 ... 240 V AC, 48 ... 63 Hz			1	1	
ATEX II 2G versions (Zone 1), incl. certificate					
• 100 ... 120 V AC, 48 ... 63 Hz, according to ATEX II 2G ²⁾ (operating mode: leakage compensation)			2	2	
• 200 ... 240 V AC, 48 ... 63 Hz, according to ATEX II 2G ²⁾ (operating mode: leakage compensation)			3	3	
• 100 ... 120 V AC, 48 ... 63 Hz, according to ATEX II 2G ²⁾ (operating mode: continuous purging)			6	6	
• 200 ... 240 V AC, 48 ... 63 Hz, according to ATEX II 2G ²⁾ (operating mode: continuous purging)			7	7	
<u>Heating of internal gas paths and analyzer unit</u>					
Without					
With (max. 65 °C)					
<u>Language (supplied documentation, software)</u>					
German				0	
English				1	
French				2	
Spanish				3	
Italian				4	

1) Only for cell length 20 to 180 mm

2) Only in connection with an approved purging unit

Extractive continuous process gas analysis

Series 6

ULTRAMAT 6

Field device

1

Selection and ordering data

<u>Additional versions</u>	Order code
Add "-Z" to Article No. and specify Order codes.	
Flow-type reference cell with reduced flow, 6 mm	A28
Flow-type reference cell with reduced flow, 1/4"	A29
TAG labels (specific lettering based on customer information)	B03
Kalrez gaskets in sample gas path	B04
SIL conformity declaration (SIL 2) Functional Safety according to IEC 61508 and IEC 61511	C20
<u>Ex versions</u>	
Possible combinations: see table "Ex configurations – principle selection criteria (Series 6)", chapter "General information"	
ATEX II 3G certificate; restricted breathing enclosure, non-flammable gases	E11
ATEX II 3G certificate; flammable gases	E12
FM/CSA certificate – Class I Div 2	E20
ATEX II 3D certificate; potentially explosive dust atmospheres	
<ul style="list-style-type: none"> In non-hazardous gas zone 	E40
<ul style="list-style-type: none"> In Ex zone acc. to ATEX II 3G, non-flammable gases 	E41
<ul style="list-style-type: none"> In Ex zone acc. to ATEX II 3G, flammable gases¹⁾ 	E42
BARTEC Ex p purging unit "Leakage compensation"	E71
BARTEC Ex p purging unit "Continuous purging"	E72
Clean for O ₂ service (specially cleaned gas path)	Y02
Measuring range indication in plain text, if different from the standard setting	Y11
Special setting (only in conjunction with an application no., e.g. extended measuring range)	Y12
Extended special setting (only in conjunction with an application no., e.g. determination of cross-interferences)	Y13
QAL1 according to SIRAMCERTS	Y17
<u>Additional units for Ex versions</u>	Article No.
<u>Category ATEX II 2G (zone 1)</u>	
BARTEC Ex p purging unit, 230 V, "leakage compensation"	7MB8000-2BA
BARTEC Ex p purging unit, 115 V, "leakage compensation"	7MB8000-2BB
BARTEC Ex p purging unit, 230 V, "continuous purging"	7MB8000-2CA
BARTEC Ex p purging unit, 115 V, "continuous purging"	7MB8000-2CB
Ex i isolating transformer	7MB8000-3AB
Ex isolating relay, 230 V	7MB8000-4AA
Ex isolating relay, 110 V	7MB8000-4AB
Differential pressure switch for corrosive and non-corrosive gases	7MB8000-5AA
Stainless steel flame arrestor	7MB8000-6BA
Hastelloy flame arrestor	7MB8000-6BB
<u>Category ATEX II 3G (Zone 2)</u>	
BARTEC Ex p purging unit, 230 V, "continuous purging"	7MB8000-2CA
BARTEC Ex p purging unit, 115 V, "continuous purging"	7MB8000-2CB
<u>FM/CSA (Class I Div. 2)</u>	
Ex purging unit MiniPurge FM	7MB8000-1AA
<u>Accessories</u>	Article No.
RS 485/Ethernet converter	A5E00852383
RS 485/RS 232 converter	C79451-Z1589-U1
RS 485/USB converter	A5E00852382
AUTOCAL function with 8 digital inputs/outputs	A5E00064223
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS PA	A5E00057315
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS DP	A5E00057318
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS PA Ex i (firmware 4.1.10 required)	A5E00057317
Set of Torx screwdrivers	A5E34821625

¹⁾ Only in connection with an approved purging unit

Selection and ordering data			Article No.	
ULTRAMAT 6 gas analyzer			7MB2112- - - - - A	
For installation in the field, single-channel, 2 components			Cannot be combined	
Click on the Article No. for the online configuration in the PIA Life Cycle Portal.				
Gas connections				
Ferrule screw connection for pipe, outer diameter 6 mm			0	0 → A29
Ferrule screw connection for pipe, outer diameter 1/4"			1	1 → A28
<u>Measured component</u>	<u>Smallest measuring range</u>	<u>Largest measuring range</u>		
CO	0 ... 100 vpm	0 ... 1 000 vpm	AA	
NO	0 ... 100 vpm	0 ... 1 000 vpm		
CO	0 ... 300 vpm	0 ... 3 000 vpm	AB	
NO	0 ... 300 vpm	0 ... 3 000 vpm		
CO	0 ... 1 000 vpm	0 ... 10 000 vpm	AC	
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 1/65)				
CO ₂	0 ... 100 vpm	0 ... 1 000 vpm	BA	
CO	0 ... 100 vpm	0 ... 1 000 vpm		
CO ₂	0 ... 300 vpm	0 ... 3 000 vpm	BB	
CO	0 ... 300 vpm	0 ... 3 000 vpm		
CO ₂	0 ... 1 000 vpm	0 ... 10 000 vpm	BC	
CO	0 ... 1 000 vpm	0 ... 10 000 vpm		
CO ₂	0 ... 3 000 vpm	0 ... 30 000 vpm	BD	
CO	0 ... 3 000 vpm	0 ... 30 000 vpm		
CO ₂	0 ... 1 %	0 ... 10 %	BE	
CO	0 ... 1 %	0 ... 10 %		
CO ₂	0 ... 3 %	0 ... 30 %	BF	
CO	0 ... 3 %	0 ... 30 %		
CO ₂	0 ... 10 %	0 ... 100 %	BG	
CO	0 ... 10 %	0 ... 100 %		
CO ₂	0 ... 10 %	0 ... 100 %	CG	
CH ₄	0 ... 10 %	0 ... 100 %		
CO ₂	0 ... 100 vpm	0 ... 1 000 vpm	DA	
NO	0 ... 100 vpm	0 ... 1 000 vpm		
CO ₂	0 ... 300 vpm	0 ... 3 000 vpm	DB	
NO	0 ... 300 vpm	0 ... 3 000 vpm		
<u>Internal gas paths</u>	<u>Sample chamber (lining)</u>	<u>Reference chamber (flow-type)</u>		
Hose made of FKM (Viton)	Aluminum	Non-flow-type	0	0 → A28, A29
	Aluminum	Flow-type	1	1
Pipe made of titanium	Tantalum ¹⁾	Non-flow-type	2	2 → A28, A29, Y02
	Tantalum ¹⁾	Flow-type	3	3 → Y02
Stainless steel pipe (mat. no. 1.4571)	Aluminum	Non-flow-type	6	6 → A28, A29
	Tantalum ¹⁾	Non-flow-type	8	8 → A28, A29
<u>Add-on electronics</u>				
Without			0	
AUTOCAL function				
• With 8 additional digital inputs/outputs			1	
• With 8 digital inputs/outputs and PROFIBUS PA interface			6	6
• With 8 digital inputs/outputs and PROFIBUS DP interface			7	7
• With 8 digital inputs/outputs and PROFIBUS PA Ex i			8	8
<u>Power supply</u>				
Standard unit and acc. to ATEX II 3G version (Zone 2)				
• 100 ... 120 V AC, 48 ... 63 Hz			0	
• 200 ... 240 V AC, 48 ... 63 Hz			1	1
ATEX II 2G versions (Zone 1), incl. certificate				
• 100 ... 120 V AC, 48 ... 63 Hz, according to ATEX II 2G ²⁾ (operating mode: leakage compensation)			2	2
• 200 ... 240 V AC, 48 ... 63 Hz, according to ATEX II 2G ²⁾ (operating mode: leakage compensation)			3	3
• 100 ... 120 V AC, 48 ... 63 Hz, according to ATEX II 2G ²⁾ (operating mode: continuous purging)			6	6
• 200 ... 240 V AC, 48 ... 63 Hz, according to ATEX II 2G ²⁾ (operating mode: continuous purging)			7	7
<u>Heating of internal gas paths and analyzer unit</u>				
none				
With (max. 65 °C)			A	
			B	

Extractive continuous process gas analysis

Series 6

ULTRAMAT 6

Field device

1

Selection and ordering data

ULTRAMAT 6 gas analyzer

For installation in the field, single-channel, 2 components

Article No.

7MB2112-  Cannot be combined

Language (supplied documentation, software)

German
English
French
Spanish
Italian

0
1
2
3
4

1) Only for cell length 20 to 180 mm.

2) See also "Additional units for Ex versions".

Additional versions

Order code

Add "-Z" to Article No. and specify Order codes.

Flow-type reference cell with reduced flow, 6 mm

A28

Flow-type reference cell with reduced flow, 1/4"

A29

TAG labels (specific lettering based on customer information)

B03

Kalrez gaskets in sample gas path

B04

SIL conformity declaration (SIL 2) Functional Safety according to IEC 61508 and IEC 61511

C20

Ex versions

Possible combinations: see table "Ex configurations – principle selection criteria (Series 6), chapter "General information"

ATEX II 3G certificate; restricted breathing enclosure, non-flammable gases

E11

ATEX II 3G certificate; flammable gases

E12

CSA certificate – Class I Div 2

E20

ATEX II 3D certificate; potentially explosive dust atmospheres

- In non-hazardous gas zone

E40

- In Ex zone acc. to ATEX II 3G, non-flammable gases

E41

- In Ex zone acc. to ATEX II 3G, flammable gases

E42

BARTEC Ex p purging unit "Leakage compensation"

E71

BARTEC Ex p purging unit "Continuous purging"

E72

Clean for O₂ service (specially cleaned gas path)

Y02

Measuring range indication in plain text, if different from the standard setting

Y11

Special setting (only in conjunction with an application no., e.g. extended measuring range)

Y12

Extended special setting

Y13

(only in conjunction with an application no., e.g. determination of cross-interferences)

QAL1 according to SIRA/MCERTS

Y17

Additional units for Ex versions

Article No.

Category ATEX II 2G (zone 1)

BARTEC Ex p purging unit, 230 V, "leakage compensation"

7MB8000-2BA

BARTEC Ex p purging unit, 115 V, "leakage compensation"

7MB8000-2BB

BARTEC Ex p purging unit, 230 V, "continuous purging"

7MB8000-2CA

BARTEC Ex p purging unit, 115 V, "continuous purging"

7MB8000-2CB

Ex i isolating transformer

7MB8000-3AB

Ex isolating relay, 230 V

7MB8000-4AA

Ex isolating relay, 110 V

7MB8000-4AB

Differential pressure switch for corrosive and non-corrosive gases

7MB8000-5AA

Stainless steel flame arrestor

7MB8000-6BA

Hastelloy flame arrestor

7MB8000-6BB

Category ATEX II 3G (Zone 2)

BARTEC Ex p purging unit, 230 V, "continuous purging"

7MB8000-2CA

BARTEC Ex p purging unit, 115 V, "continuous purging"

7MB8000-2CB

FM/CSA (Class I Div. 2)

Ex purging unit MiniPurge FM

7MB8000-1AA

Accessories

Article No.

RS 485/Ethernet converter

A5E00852383

RS 485/RS 232 converter

C79451-Z1589-U1

RS 485/USB converter

A5E00852382

AUTOCAL function with 8 digital inputs/outputs

A5E00064223

AUTOCAL function with 8 digital inputs/outputs and PROFIBUS PA

A5E00057315

AUTOCAL function with 8 digital inputs/outputs and PROFIBUS DP

A5E00057318

AUTOCAL function with 8 digital inputs/outputs and PROFIBUS PA Ex i (firmware 4.1.10 required)

A5E00057317

Set of Torx screwdrivers

A5E34821625

Based on QAL1 according to SIRAMCERTS (single component)

Only with additional suffix Z (Y17, Y18)

Component Measuring range identification	CO (QAL1)		SO ₂ (QAL1)		NO (QAL1)	
	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

Example for ordering

ULTRAMAT 6, QAL1 (1-component unit)

Component: CO

Measuring range: 0 to 50 / 1 000 mg/m³

with hoses, non-flow-type reference compartment

without automatic adjustment (AUTOCAL)

230 V AC; without heating, German

7MB2111-0XD00-1AA0-Z +Y17**Based on QAL1 according to SIRAMCERTS (2 components in series)**

Component Measuring range identification	CO (QAL1)		NO (QAL1)	
	Smallest measuring range from 0 to ...	Largest measuring range from 0 to ...	Smallest measuring range from 0 to ...	Largest measuring range from 0 to ...
AA	75 mg/m ³	1 000 mg/m ³	200 mg/m ³	2 000 mg/m ³
AB	300 mg/m ³	3 000 mg/m ³	300 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 6, QAL1 (2 components in series)

Components: CO/NO

Measuring range CO: 0 to 75 / 1 000 mg/m³, NO: 0 to 200 / 2 000 mg/m³

with hoses, non-flow-type reference compartment

without automatic adjustment (AUTOCAL)

230 V AC; without heating, German

7MB2112-0AA00-1AA0-Z +Y17**Note:** for 3 components take both tables into consideration.Ordering information measured component N₂OCertification in accordance with AM0028 and AM0034 (Kyoto Protocol) for measuring N₂O, measuring range 0 to 300 vpm / 3 000 vpm.

Version: Standard device

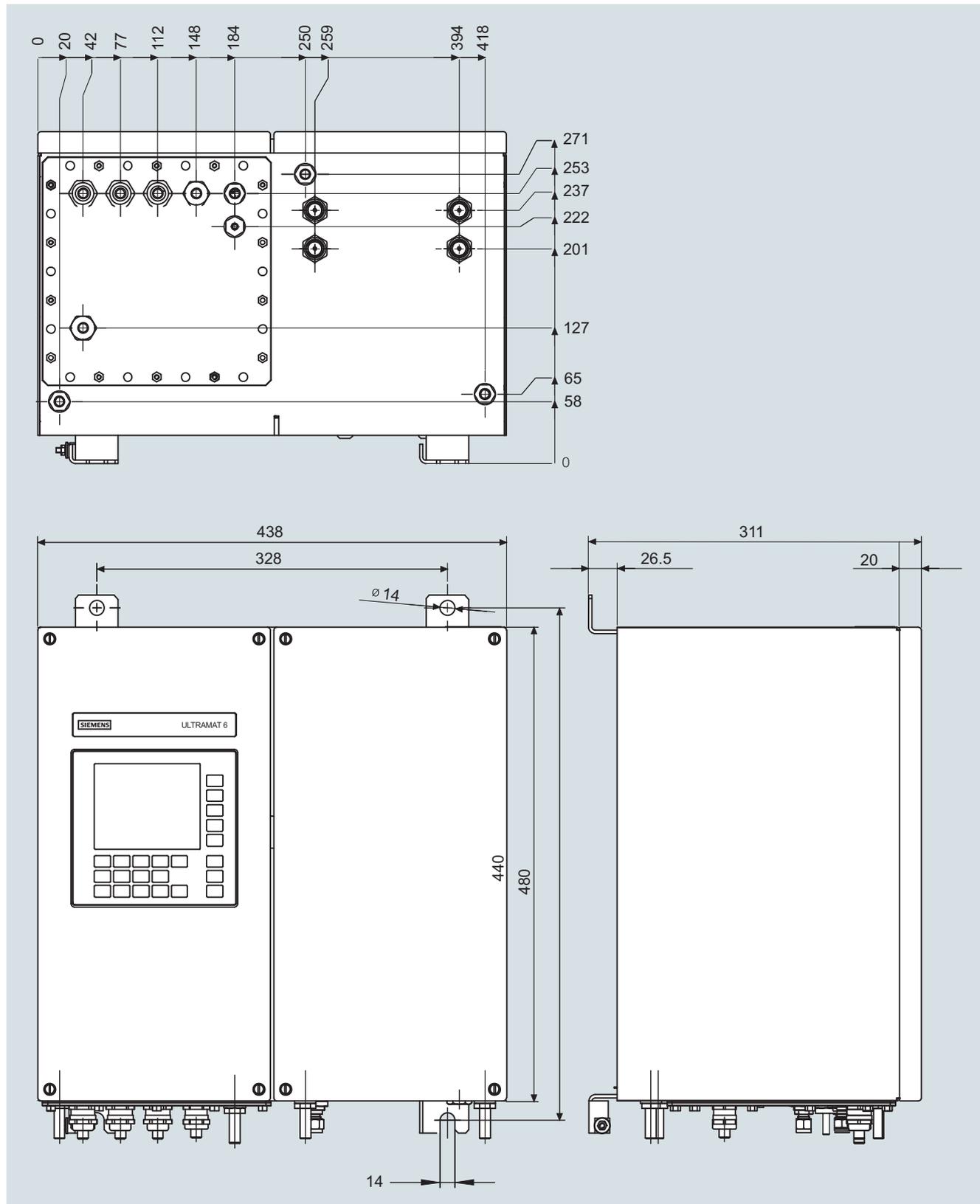
Extractive continuous process gas analysis

Series 6

ULTRAMAT 6

Field device

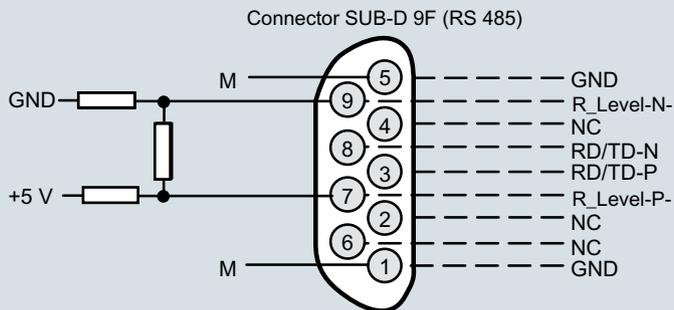
1

Dimensional drawings

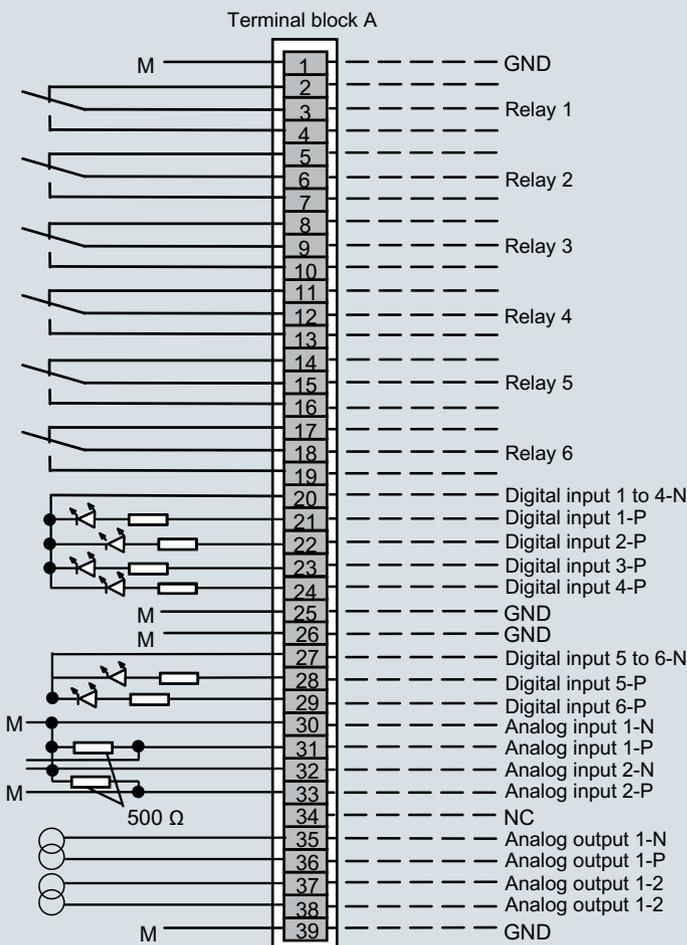
ULTRAMAT 6, field unit, dimensions in mm

Circuit diagrams

Pin assignment (electrical and gas connections)



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



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

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

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

} Component 1 } Analog outputs isolated
} Component 2 (if available) }

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

ULTRAMAT 6, field device, pin and terminal assignment

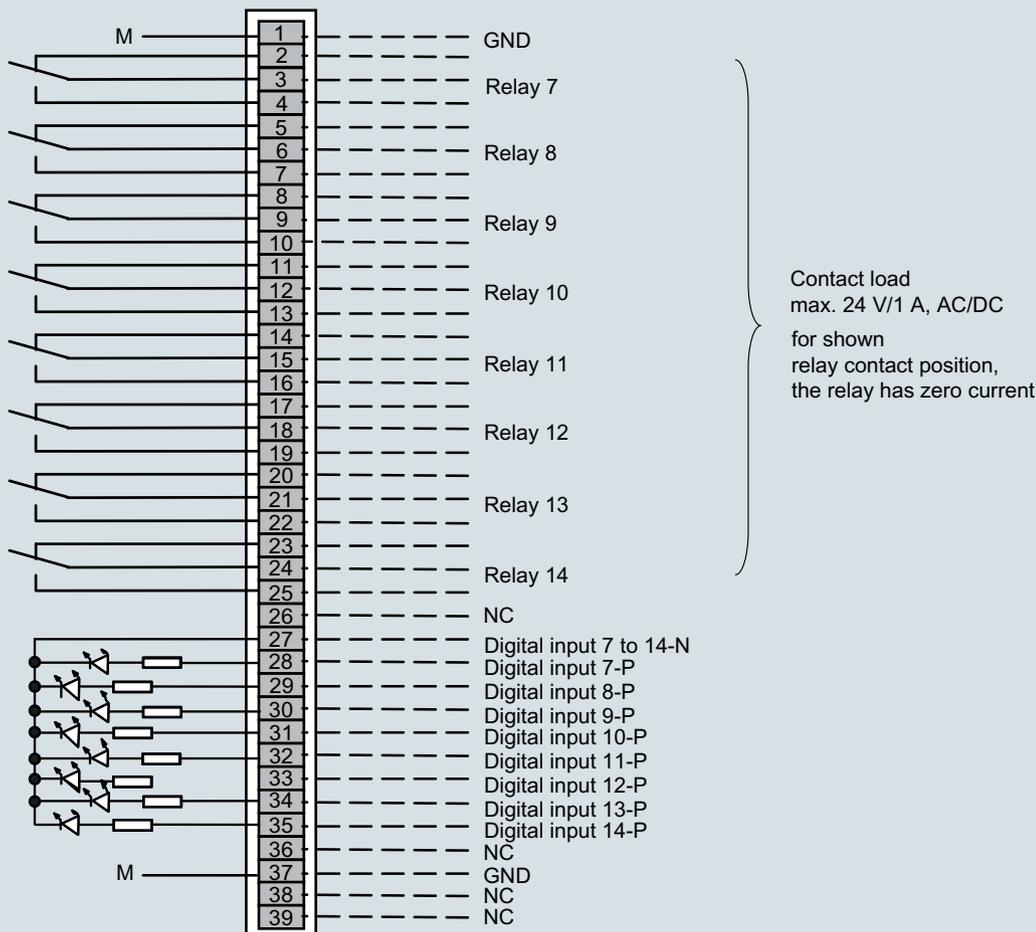
Extractive continuous process gas analysis

Series 6
ULTRAMAT 6

Field device

1

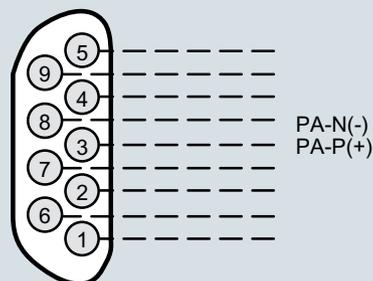
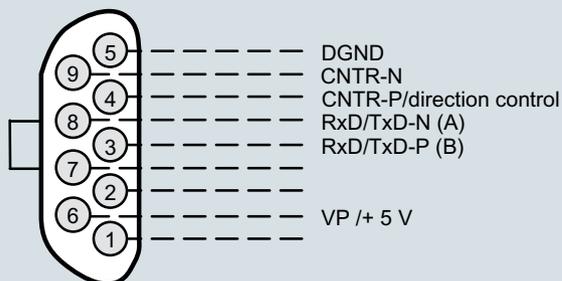
Terminal block B (option)



Connector SUB-D 9F-X90
PROFIBUS DP

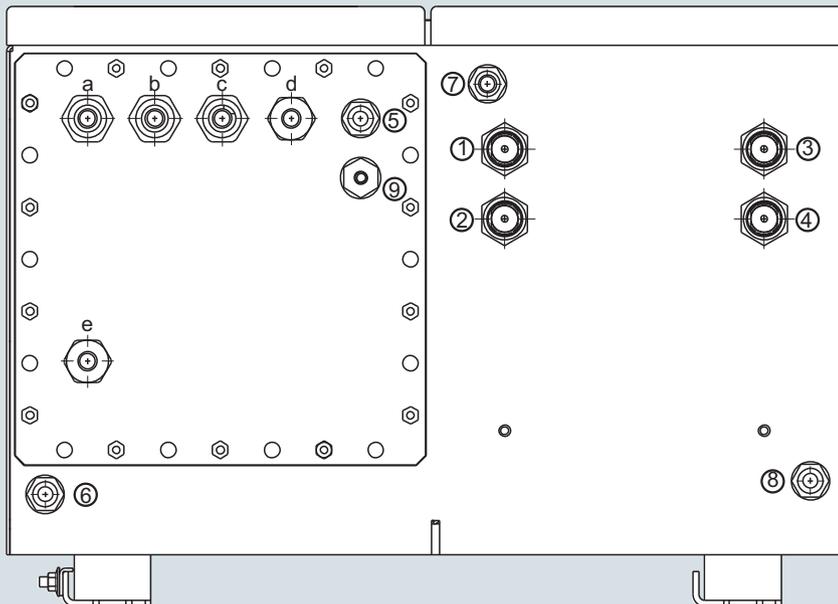
optional

Connector SUB-D 9M-X90
PROFIBUS PA



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

ULTRAMAT 6, field device, pin and terminal assignment of the AUTOCAL board and PROFIBUS connectors



Gas connections

- | | | |
|-----|--|---|
| ① | Sample gas inlet | } Clamping gland for pipe
Ø 6 mm or 1/4" |
| ② | Sample gas outlet | |
| ③ | Reference gas inlet (option) | |
| ④ | Reference gas outlet (option) | |
| ⑤-⑧ | Purging gas inlets/outlets, stubs Ø 10 mm or 3/8" | |
| ⑨ | Connection atmospheric pressure sensor, stubs Ø 1/4" | |

Electrical connections

- | | |
|-------|--|
| a - c | Signal cable (Ø 10 ... 14 mm)
(analog + digital): cable gland M20x1.5 |
| d | Interface connection: (Ø 7 ... 12 mm)
cable gland M20x1.5 |
| e | Power supply: (Ø 7 ... 12 mm)
cable gland M20x1.5 |

ULTRAMAT 6, field device, gas connections and electrical connections

Extractive continuous process gas analysis

Series 6

ULTRAMAT 6

Documentation, suggestions for spare parts

1

Selection and ordering data

Operating instructions	Article No.
ULTRAMAT 6 / OXYMAT 6 Gas analyzer for IR-absorbing gases and oxygen	
• German	C79000-G5200-C143
• English	C79000-G5276-C143
• French	C79000-G5277-C143
• Spanish	C79000-G5278-C143
• Italian	C79000-G5272-C143

More information

The complete documentation is available in various languages for downloading free of charge:

<http://www.siemens.com/processanalytics/documentation>

Selection and ordering data

Description							2 years (quantity)	5 years (quantity)	Article No.
	7MB-2121	7MB-2123	7MB-2124	7MB-2111	7MB-2112	7MB-2111/2 Ex			
Analyzer unit									
O-ring for cover (window)	x	x	x	x	x	x	2	4	C79121-Z100-A24
Cover (cell length 20 ... 180 mm)	x	x	x	x	x	x	2	2	C79451-A3462-B151
Cover (cell length 0.2 ... 6 mm)	x	x	x	x	x	x	2	2	C79451-A3462-B152
O-rings, set	x	x	x	x	x	x		1	C79451-A3462-D501
Sample gas path									
O-ring (hose clip)				x	x	x	2	4	C71121-Z100-A159
Pressure switch	x	x	x				1	2	C79302-Z1210-A2
Flow indicator	x	x	x				1	2	C79402-Z560-T1
Hose clip	x	x	x	x	x	x		1	C79451-A3478-C9
Heating cartridge (heated unit)				x	x	x		1	W75083-A1004-F120
Electronics									
Temperature fuse (heated unit)				x	x			1	W75054-T1001-A150
Fuse (device fuse)						x	1	2	A5E00061505
Temperature controller - electronics, 230 V AC				x	x	x		1	A5E00118527
Temperature controller - electronics, 115 V AC				x	x	x		1	A5E00118530
Fan, 24 V DC (heated unit)				x	x	x		1	A5E00302916
Front plate with keyboard	x	x	x				1	1	C79165-A3042-B504
Temperature sensor				x	x	x		1	C79165-A3044-B176
Adapter plate, LCD/keyboard	x	x	x	x	x		1	1	C79451-A3474-B605
Motherboard, with firmware: see spare parts list	x	x	x	x	x	x		1	
LC display	x	x	x	x	x		1	1	A5E31474846
Connector filter	x	x	x	x	x			1	W75041-E5602-K2
Fusible element, T 0.63 A/250 V	x		x	x	x	x	2	3	W79054-L1010-T630
Fusible element, T 1 A/250 V	x	x	x	x	x	x	2	3	W79054-L1011-T100
Fusible element, T 1.6 A/250 V		x	x				2	3	W79054-L1011-T160
Fusible element, T 2.5 A/250 V				x	x	x	2	3	W79054-L1011-T250

If the ULTRAMAT 6 is supplied with a specially cleaned gas path for high oxygen content ("Cleaned 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.

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, CO₂, NO, SO₂, NH₃, H₂O as well as CH₄ 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% O₂)
 - 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 O₂), e.g. 98 to 100% O₂ 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, SO₂ and O₂ 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
 - SO₂: 0 to 75 mg/m³; 0 to 1 500 mg/m³
- O₂: 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, Cl₂, SO₂, SO₃, etc.)
- Monitoring (option) of sample gas and/or reference gas (both channels)

Extractive continuous process gas analysis

Series 6

ULTRAMAT/OXYMAT 6

1

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)

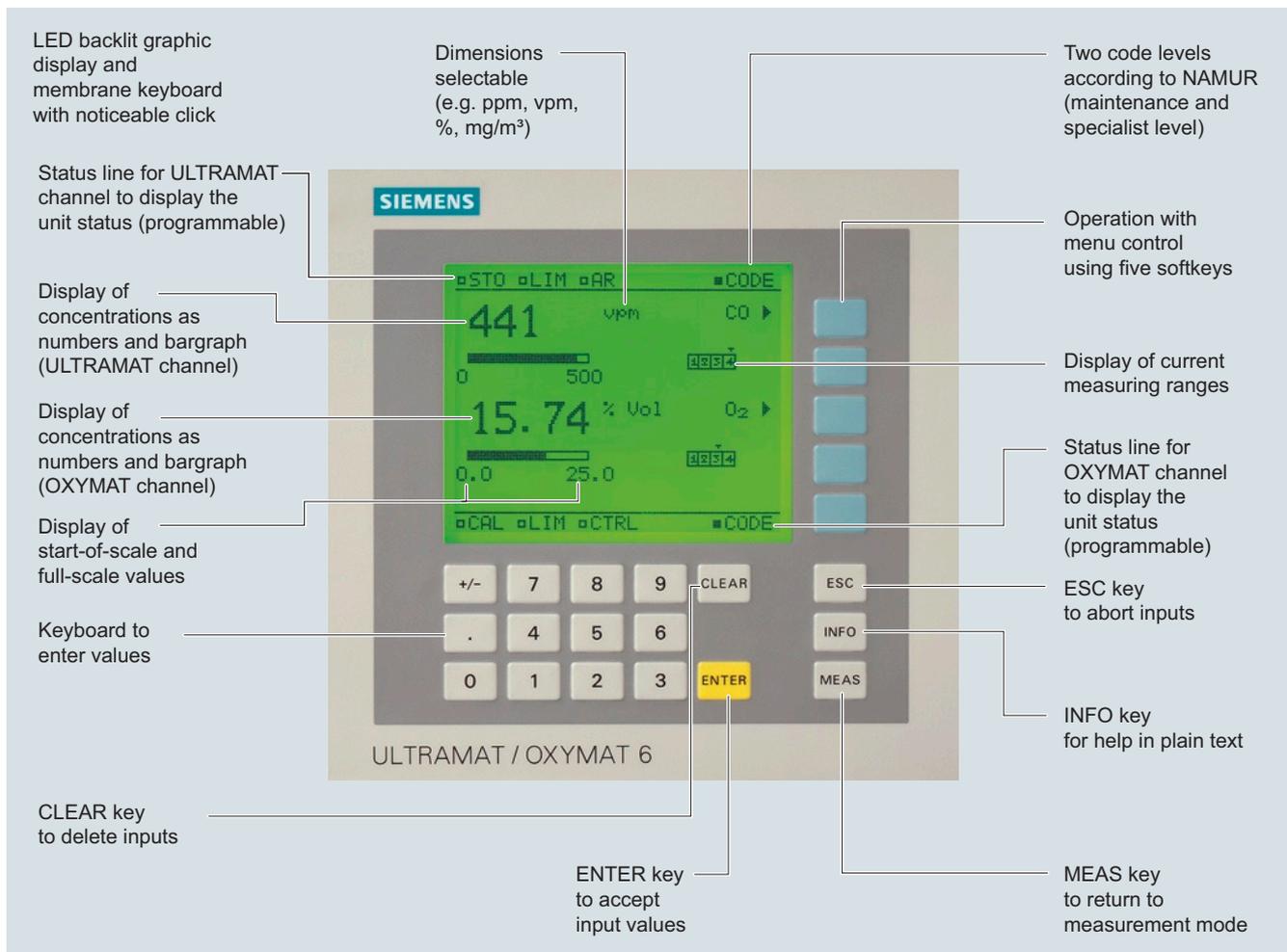
- One analog output for each measured component
- Two analog inputs freely configurable (e.g. correction of cross-interference or external pressure sensor)
- Six digital inputs freely configurable (e.g. for measurement range switchover, processing of external signals from sample preparation)
- Six relay 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
With pipes	• 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)
	Bushing	Titanium
	Pipe	Titanium, O-ring: FKM (e.g. Viton) or FFKM (Kalrez)
	Sample chamber:	
With pipes	• 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)
	Bushing	Stainless steel, mat. no. 1.4571
	Pipe	Stainless steel, mat. no. 1.4571, O-ring: FKM (e.g. Viton) or FFKM (Kalrez)
With pipes	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
	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)

Extractive continuous process gas analysis

Series 6

ULTRAMAT/OXYMAT 6

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
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
	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)

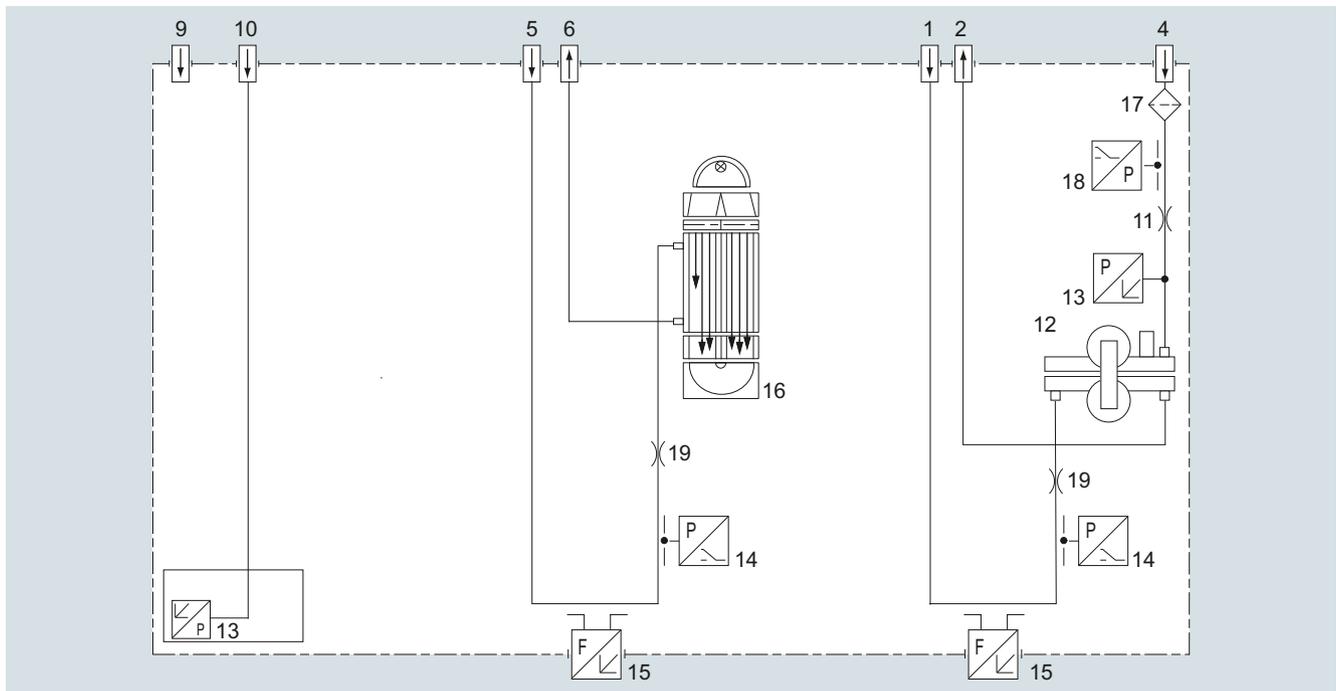
Options

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

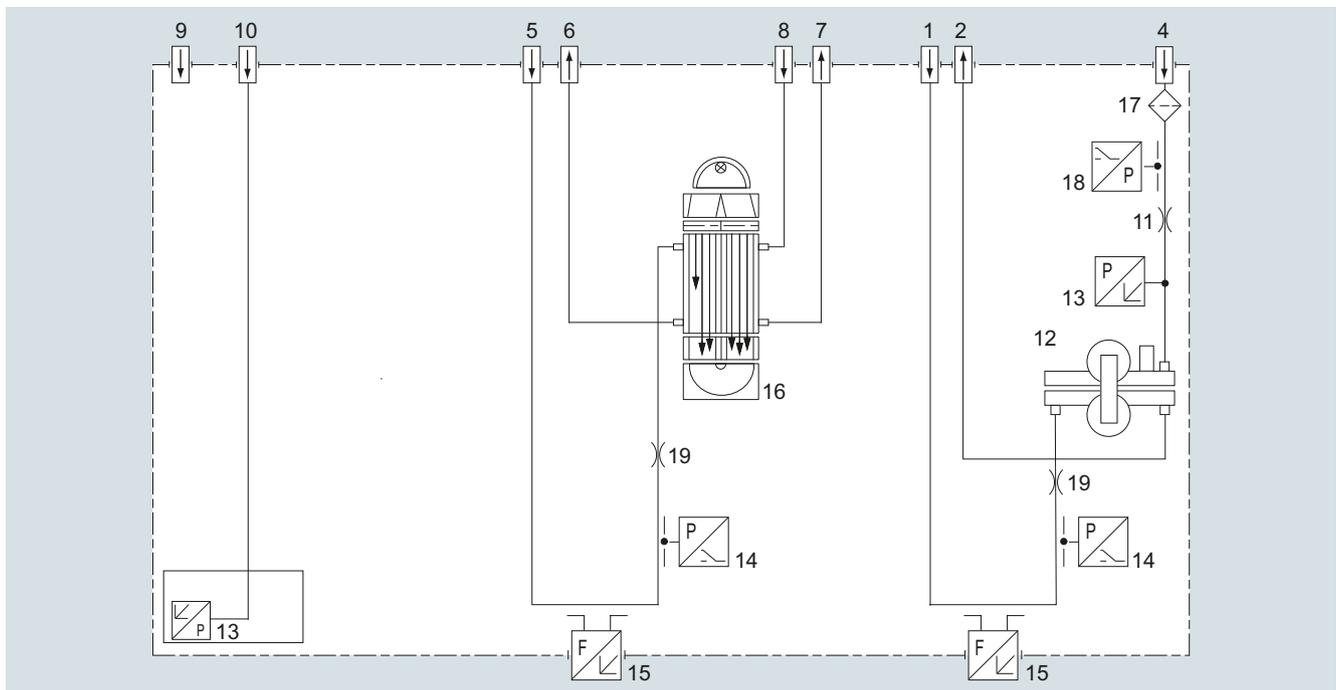
Gas path

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

Extractive continuous process gas analysis

Series 6

ULTRAMAT/OXYMAT 6

General information

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 N₂ (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.

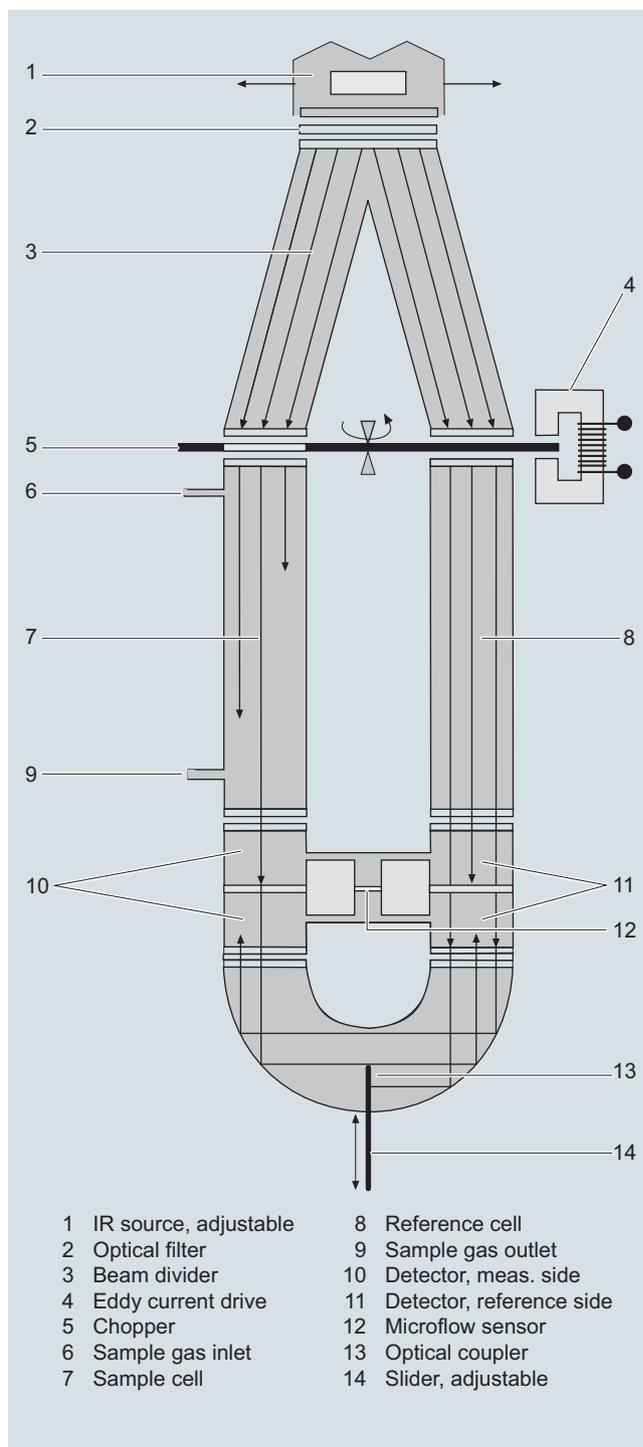
As far as possible, the ambient air of the analyzer should not have a large concentration of the gas components to be measured.

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 O₂ 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.



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.

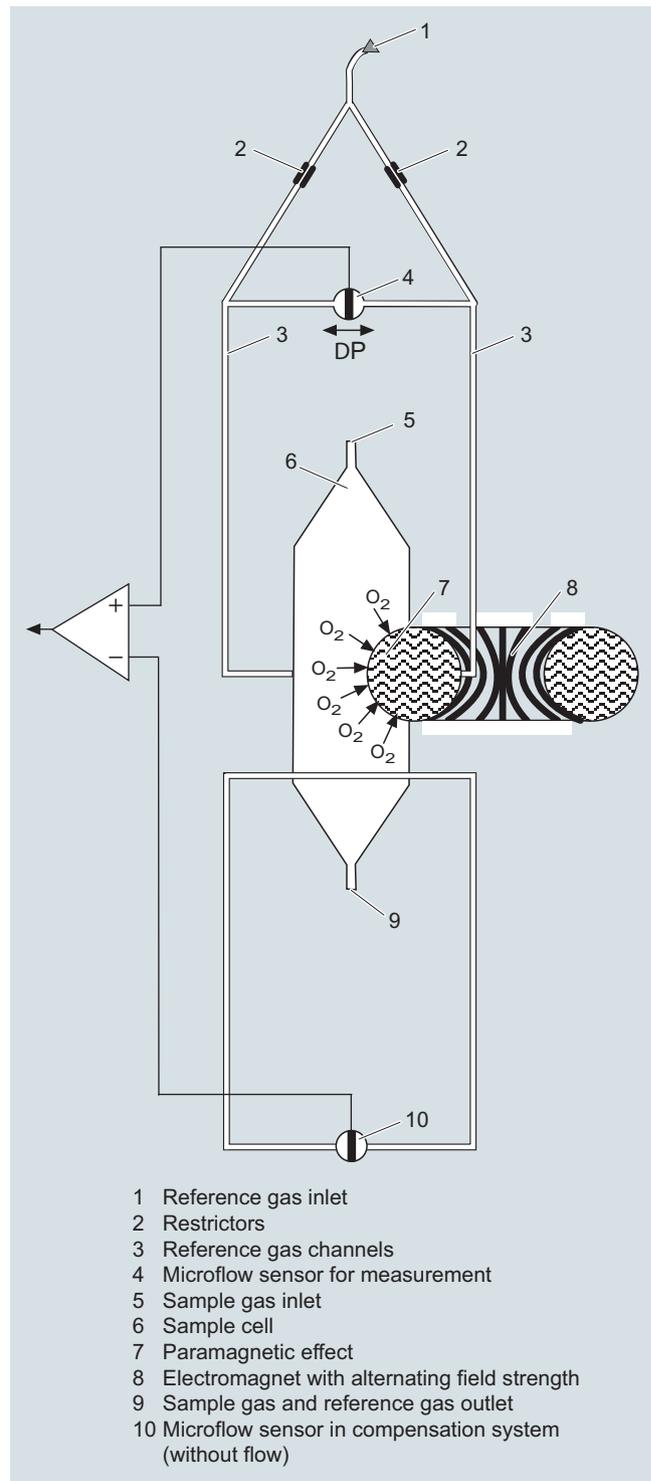
The sample chamber is directly in the sample path and has a small volume, and the microflow sensor is a low-lag sensor. This results in a very short response time.

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.



OXYMAT channel, principle of operation

Extractive continuous process gas analysis

Series 6

ULTRAMAT/OXYMAT 6

1

General information

Essential characteristics

- Dimension of measured value freely selectable (e.g. vpm, mg/m³)
- 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% O₂)
- 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	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	Inorganic gases	
iso-butane C ₄ H ₁₀	-1.30	Ammonia NH ₃	-0.20
1-butene C ₄ H ₈	-0.96	Hydrogen bromide HBr	-0.76
iso-butene C ₄ H ₈	-1.06	Chlorine Cl ₂	-0.94
Dichlorodifluoromethane (R12) CCl ₂ F ₂	-1.32	Hydrogen chloride HCl	-0.35
Acetic acid CH ₃ COOH	-0.64	Dinitrogen monoxide N ₂ O	-0.23
n-heptane C ₇ H ₁₆	-2.40	Hydrogen fluoride HF	+0.10
n-hexane C ₆ H ₁₄	-2.02	Hydrogen iodide HI	-1.19
Cyclo-hexane C ₆ H ₁₂	-1.84	Carbon dioxide CO ₂	-0.30
Methane CH ₄	-0.18	Carbon monoxide CO	+0.07
Methanol CH ₃ OH	-0.31	Nitrogen oxide NO	+42.94
n-octane C ₈ H ₁₈	-2.78	Nitrogen N ₂	0.00
n-pentane C ₅ H ₁₂	-1.68	Nitrogen dioxide NO ₂	+20.00
iso-pentane C ₅ H ₁₂	-1.49	Sulfur dioxide SO ₂	-0.20
Propane C ₃ H ₈	-0.87	Sulfur hexafluoride SF ₆	-1.05
Propylene C ₃ H ₆	-0.64	Hydrogen sulfide H ₂ S	-0.44
Trichlorofluoromethane (R11) CCl ₃ F	-1.63	Water H ₂ O	-0.03
Vinyl chloride C ₂ H ₃ Cl	-0.77	Hydrogen H ₂	+0.26
Vinyl fluoride C ₂ H ₃ F	-0.55		
1.1 vinylidene chloride C ₂ H ₂ Cl ₂	-1.22		

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

All diamagnetic gases have a negative deviation from zero point.

Extractive continuous process gas analysis

Series 6

ULTRAMAT/OXYMAT 6

19" rack unit

Technical specifications

19" rack unit

General information		Gas inlet conditions	
Operating position	Front wall, vertical	Permissible sample gas pressure	
Conformity	CE mark in accordance with EN 50081-1 and EN 50082-2	<ul style="list-style-type: none"> Without pressure switch With integrated pressure switch 	700 ... 1 500 hPa (absolute) 700 ... 1 300 hPa (absolute)
Design, enclosure		Sample gas flow	18 ... 90 l/h (0.3 ... 1.5 l/min)
Weight	Approx. 21 kg	Sample gas temperature	Min. 0 to max. 50 °C, but above the dew point
Degree of protection	IP20 according to EN 60529	Sample gas humidity	< 90% (relative humidity), or dependent on measuring task, non-condensing
Electrical characteristics		Dynamic response	
EMC (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98)	Warm-up period	At room temperature < 30 min (the technical specification will be met after 2 hours)
Electrical safety	According to EN 61010-1, overvoltage category III	Delayed display (T ₉₀ -time)	Dependent on length of analyzer chamber, sample gas line and configurable damping
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	Damping (electrical time constant)	0 ... 100 s, configurable
Power consumption	Approx. 70 VA	Dead time (purging time of the gas path in the unit at 1 l/min)	Approx. 0.5 ... 5 s, depending on version
Fuse values	120 ... 120 V: F1/F2 = T 1.6 A 200 ... 240 V: F1/F2 = T 1 A	Time for device-internal signal processing	< 1 s
Electrical inputs and outputs (per channel)		Pressure correction range	
Analog output	0/2/4 ... 20 mA, floating; max. load 750 Ω	Pressure sensor	
Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load: 24 V AC/DC/1 A, floating, non-sparking	<ul style="list-style-type: none"> Internal External 	700 ... 1 200 hPa absolute 700 ... 1 500 hPa absolute
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)	Measuring response	
Digital inputs	6, designed for 24 V, floating, freely configurable, e.g. for measuring range switchover	Output signal fluctuation	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Serial interface	RS 485	Zero point drift	< ± 1% of the smallest possible measuring range according to rating plate
Options	AUTOCAL function each with 8 additional digital inputs and relay outputs; also with PROFIBUS PA or PROFIBUS DP	Measured-value drift	< ± 1% of the current measuring range/week
Climatic conditions		Repeatability	≤ 1% of the current measuring range
Permissible ambient temperature	-30 ... +70 °C during storage and transportation, 5 ... 45 °C during operation	Detection limit	1% of the smallest possible measuring range
Permissible humidity	< 90% relative humidity, during storage and transportation (dew point must not be undershot)	Linearity error	< 0.5% of the full-scale value
ULTRAMAT channel		Influencing variables	
Measuring ranges	4, internally and externally switchable; autoranging is also possible	Ambient temperature	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Smallest possible measuring range	Dependent on the application, e.g. CO: 0 ... 10 vpm CO ₂ : 0 ... 5 vpm	Sample gas pressure	<ul style="list-style-type: none"> 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
Largest possible measuring range	Dependent on the application	Sample gas flow	Negligible
Measuring ranges with suppressed zero point	Any zero point within 0 ... 100 vol.% can be implemented; smallest possible span 20%	Auxiliary power	< 0.1% of the current measuring range with rated voltage ± 10%
Characteristic	Linearized	Environmental conditions	Application-specific measuring influences possible if ambient air contains measured component or cross interference-sensitive gases
Influence of interfering gases must be considered separately			

OXYMAT channel

Measuring ranges	4, internally and externally switchable; automatic measuring range switchover also possible	Measuring response	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
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	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)
Largest possible measuring range	100 vol.% O ₂	Zero point drift	< 0.5%/month of the smallest possible measuring span according to rating plate
Measuring ranges with suppressed zero point	Any zero point within 0 ... 100 vol.% can be implemented, provided that a suitable reference gas is used	Measured-value drift	≤ 0.5%/month of the current measuring range
Gas inlet conditions		Repeatability	≤ 1%/month of the current measuring range
Permissible sample gas pressure		Detection limit	1% of the current measuring range
• With pipes	500 ... 3 000 hPa absolute	Linearity error	1% of the current measuring range
• With hoses		Influencing variables	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
- Without pressure switch	500 ... 1 500 hPa absolute	Ambient temperature	<ul style="list-style-type: none"> < 0.5%/10 K referred to smallest possible span according to rating plate With measuring span 0.5%: 1%/10 K
- With pressure switch	500 ... 1 300 hPa absolute	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)	<ul style="list-style-type: none"> 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
Sample gas flow	18 ... 60 l/h (0.3 ... 1 l/min)	Accompanying gases	Deviation from zero point corresponding to paramagnetic or diamagnetic deviation of accompanying gas
Sample gas temperature	0 ... 50 °C	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
Sample gas humidity	< 90% RH (relative humidity)	Auxiliary power	< 0.1% of the current measuring range with rated voltage ± 10%
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		

Extractive continuous process gas analysis

Series 6

ULTRAMAT/OXYMAT 6

19" rack unit

1

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 O₂

7MB2023- - - - - Cannot be combined

➤ 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
Pipe with 1/4" outer diameter

0 → A21
1 → A20

Smallest possible measuring span O₂

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

A
B B → A26, Y02
C

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

D D → A26, Y02
E
F F → A26, Y02

Sample chamber (OXYMAT channel)

Non-flow-type compensation branch
• Made of stainless steel, mat. no. 1.4571
• Made of tantalum

A
B

Flow-type compensation branch
• Made of stainless steel, mat. no. 1.4571
• Made of tantalum

C
D

Internal gas paths

Sample chamber¹⁾

Reference chamber

(both channels) (ULTRAMAT channel) (ULTRAMAT channel)

Hose made of FKM (Viton) Aluminum Non-flow-type
Aluminum Flow-type

0 0 → A20, A21
1 1

Pipe made of titanium Tantalum Non-flow-type
Tantalum Flow-type

4 4 → A20, A21, Y02
5 5 → Y02

Stainless steel pipe (mat. no. 1.4571) Aluminum Non-flow-type
Tantalum Non-flow-type

6 6 → A20, A21
8 8 → A20, A21

With sample gas monitoring (both channels)

Hose made of FKM (Viton) Aluminum Non-flow-type
Aluminum Flow-type

2 2 → A20, A21
3 3

Add-on electronics

Without

0 0 → Y27, Y28

AUTOCAL function

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

1
2
3
5 5 → Y02
6
7

Power supply

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

0
1

Footnotes, see next page

Extractive continuous process gas analysis

Series 6

ULTRAMAT/OXYMAT 6

19" rack unit

1

Selection and ordering data

<i>Additional versions</i>	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, 1/4" (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, 1/4", 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), 1/4", 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 SIRAMCERTS (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: $\left. \begin{array}{l} \text{Smallest measuring range} \\ 25 \% \text{ of largest measuring range} \\ 50 \% \text{ of largest measuring range} \\ \text{Largest measuring range} \end{array} \right\} \text{ in } \% \text{ or ppm (vpm)}$

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	
Click on the Article No. for the online configuration in the PIA Life Cycle Portal.				
<u>Gas connections for sample gas and reference gas</u>				
Pipe with 6 mm outer diameter			0	0 → A21
Pipe with ¼" outer diameter			1	1 → A20
<u>Smallest possible measuring span O₂</u>				
0.5 % reference gas pressure 3 000 hPa			A	B B → A26, Y02
0.5 % reference gas pressure 100 hPa (external pump)			B	
2 % reference gas pressure 3 000 hPa			C	D D → A26, Y02
2 % reference gas pressure 100 hPa (external pump)			D	
5 % reference gas pressure 3 000 hPa			E	F F → A26, Y02
5 % reference gas pressure 100 hPa (external pump)			F	
<u>Sample chamber (OXYMAT channel)</u>				
Non-flow-type compensation branch				
• Made of stainless steel, mat. no. 1.4571			A	C
• Made of tantalum			B	
Flow-type compensation branch				
• Made of stainless steel, mat. no. 1.4571			C	D
• Made of tantalum			D	
<u>Internal gas paths</u>	<u>Sample chamber¹⁾ (lining) (ULTRAMAT channel)</u>	<u>Reference chamber (flow-type) (ULTRAMAT channel)</u>		
(both channels)			0	0 → A20, A21
Hose made of FKM (Viton)	Aluminum Aluminum	Non-flow-type Flow-type	1	
Pipe made of titanium	Tantalum Tantalum	Non-flow-type Flow-type	4	4 → A20, A21, Y02
			5	5 → Y02
Stainless steel pipe (mat. no. 1.4571)	Aluminum Tantalum	Non-flow-type Non-flow-type	6	6 → A20, A21
			8	8 → A20, A21
<u>With sample gas monitoring (both channels)</u>				
Hose made of FKM (Viton)	Aluminum Aluminum	Non-flow-type Flow-type	2	2 → A20, A21
			3	
<u>Add-on electronics</u>				
Without			0	
AUTOCAL function				
• With 8 additional digital inputs and outputs for ULTRAMAT channel and OXYMAT channel			1	5 → Y02
• With serial interface for the automotive industry (AK)			5	
• 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	
<u>Power supply</u>				
100 ... 120 V AC, 48 ... 63 Hz			0	
200 ... 240 V AC, 48 ... 63 Hz			1	

Footnote, see next page

Extractive continuous process gas analysis

Series 6

ULTRAMAT/OXYMAT 6

19" rack unit

1

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 O₂

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	
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	
<u>Operating software and documentation</u>				
German				0
English				1
French				2
Spanish				3
Italian				4

For CO/NO (QAL1; see table "Based on QAL1 according to SIRAMCERTS (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
English
French
Spanish
Italian

0
1
2
3
4

1) Only for cell length 20 to 180 mm

Selection and ordering data

<i>Additional versions</i>	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, 1/4" (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, 1/4", 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), 1/4", 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 SIR/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	}	in % or ppm (vpm)
25 % of largest measuring range		
50 % of largest measuring range		
Largest measuring range		

Extractive continuous process gas analysis

Series 6

ULTRAMAT/OXYMAT 6

19" rack unit**Based on QAL1 according to SIRA/MCERTS (single component)**

Only in conjunction with order code Y17

Component Measuring range identification	CO (QAL1)		SO ₂ (QAL1)		NO (QAL1)	
	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 Measuring range identification	CO (QAL1)		SO ₂ (QAL1)		NO (QAL1)	
	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/m³

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 Measuring range identification	CO (QAL1)		NO (QAL1)	
	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/m³, NO: 0 to 200/2 000 mg/m³

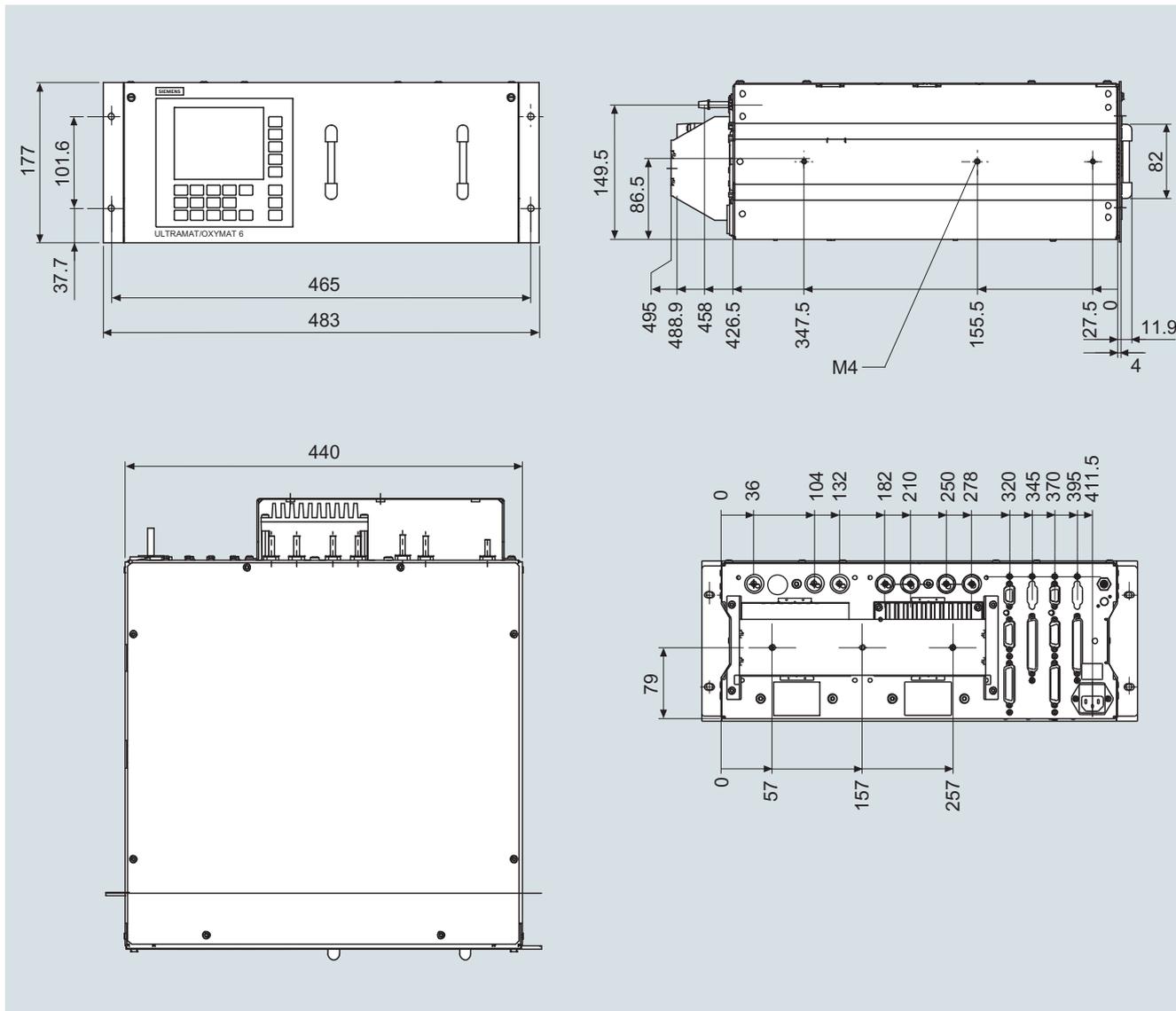
with hoses, non-flow-type reference cell

without automatic adjustment (AUTOCAL)

230 V AC; German

7MB2024-0EA00-1AH0-Z +Y17

Dimensional drawings



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

Extractive continuous process gas analysis

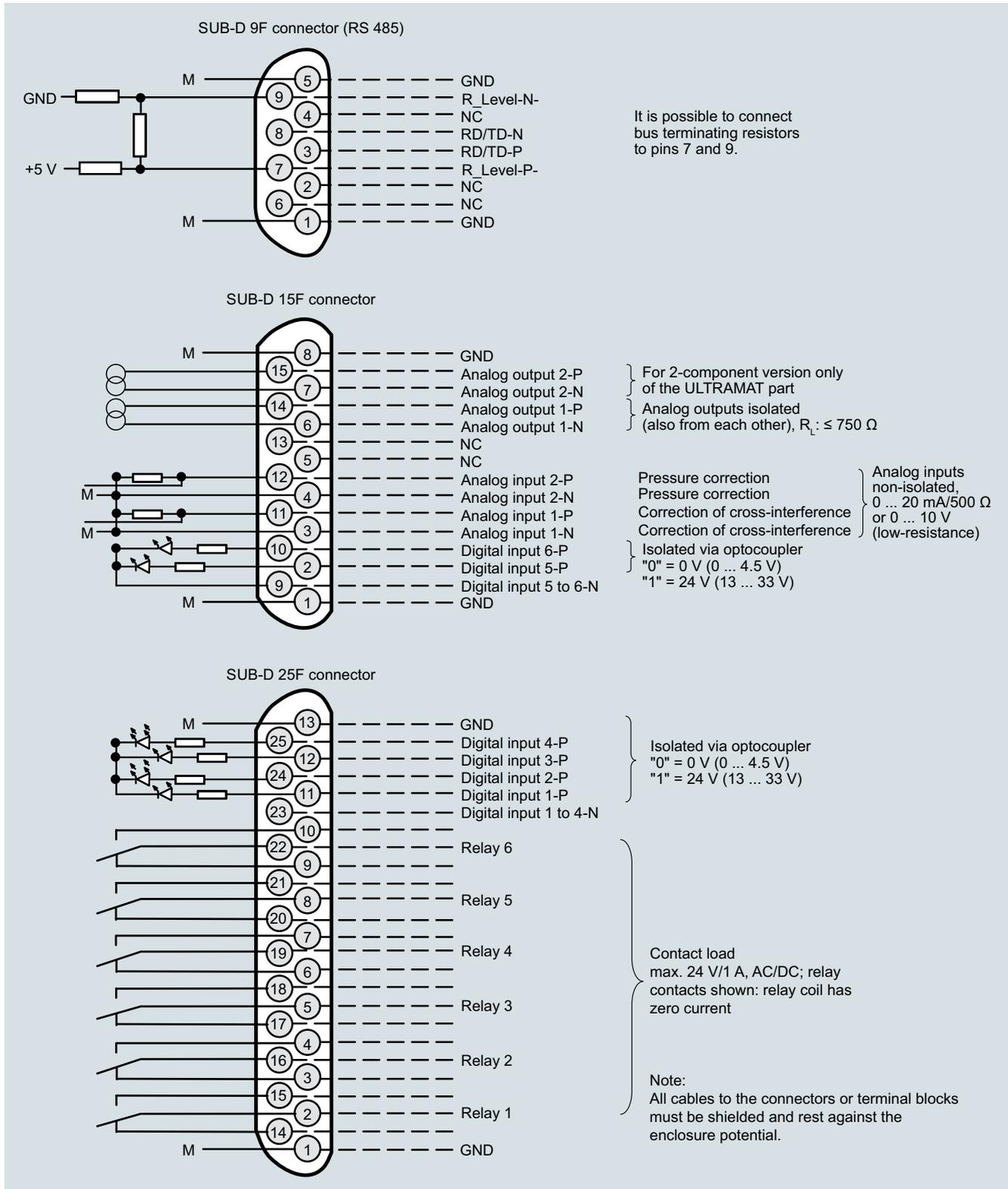
Series 6

ULTRAMAT/OXYMAT 6

19" rack unit

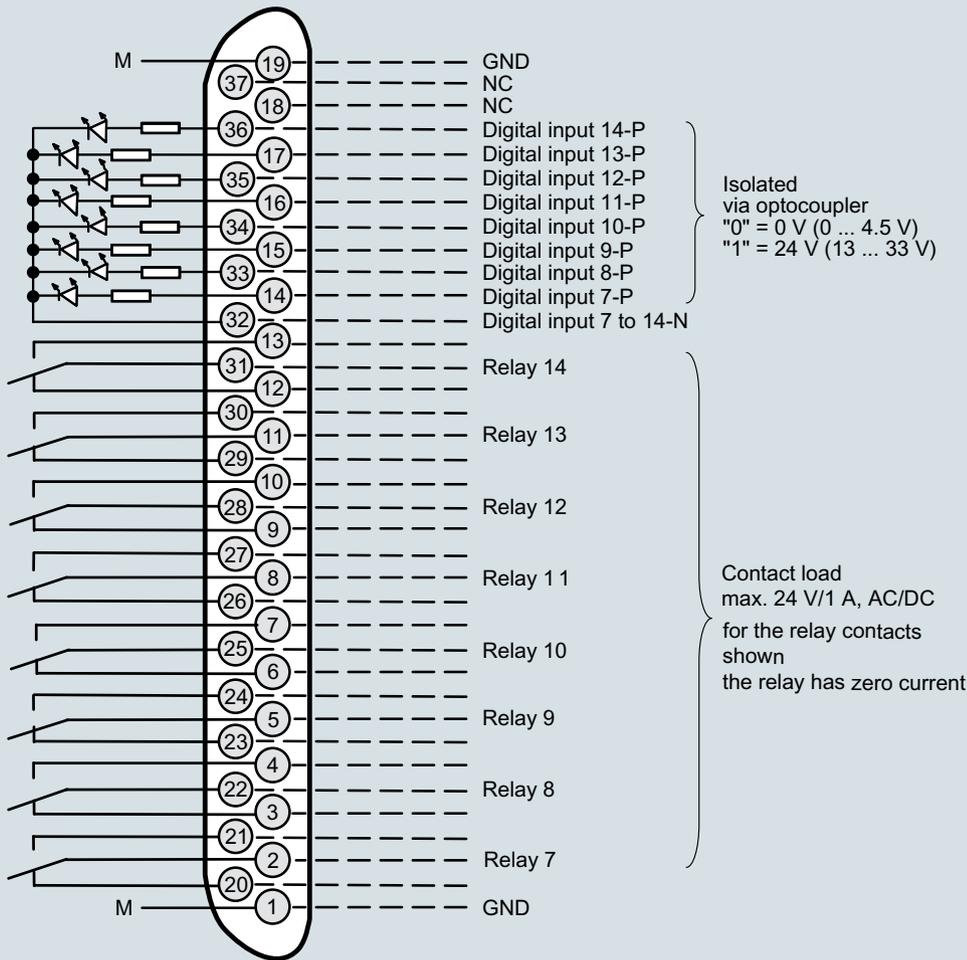
Circuit diagrams

Pin assignment (electrical and gas connections)



ULTRAMAT/OXYMAT 6, 19" unit, pin assignment

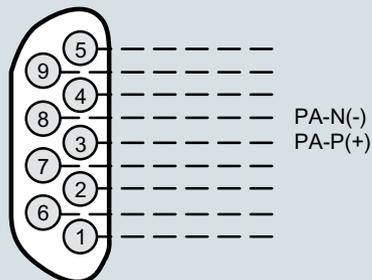
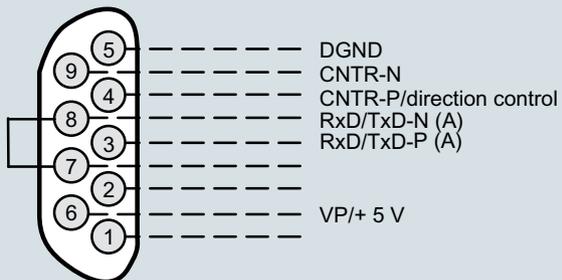
Connector SUB-D 37F (option)



Connector SUB-D 9F
PROFIBUS DP

optional

Connector SUB-D 9M
PROFIBUS PA



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

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

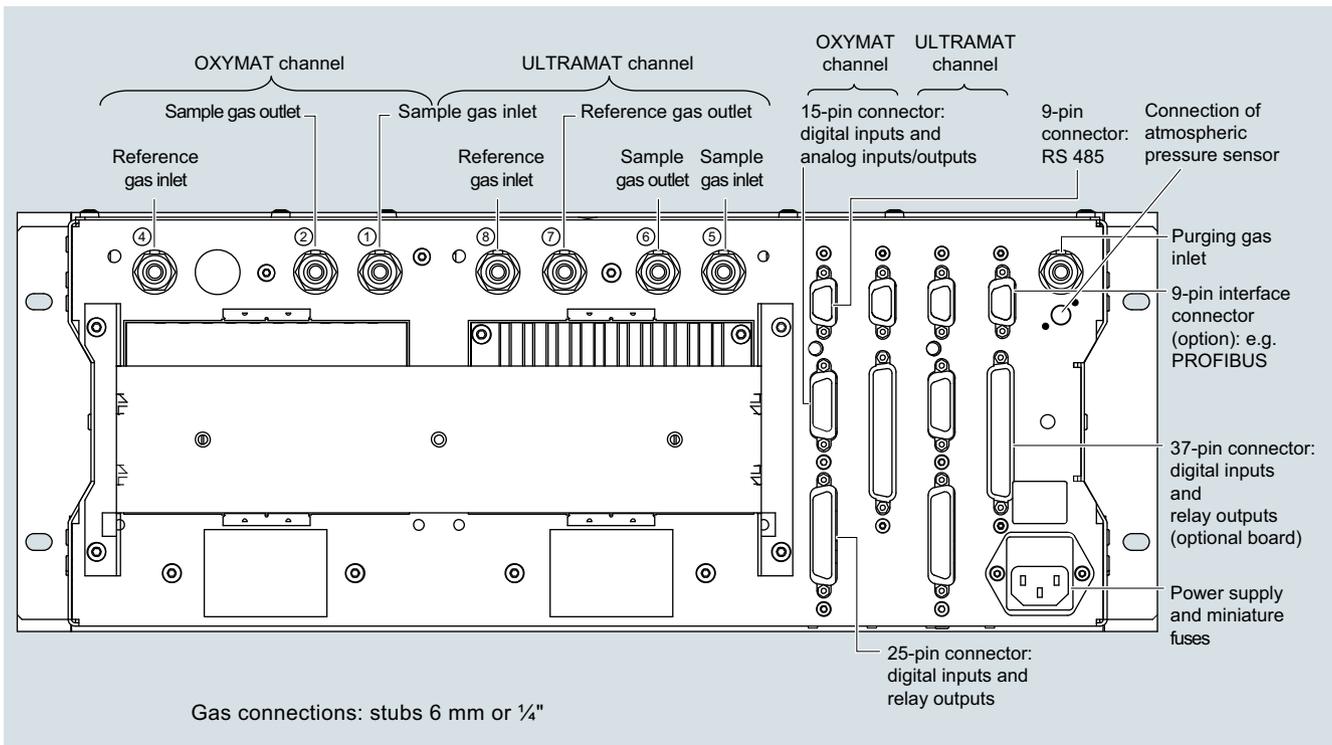
Extractive continuous process gas analysis

Series 6

ULTRAMAT/OXYMAT 6

19" rack unit

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

Selection and ordering data

Operating instructions	Article No.
ULTRAMAT 6 / OXYMAT 6 Gas analyzer for IR-absorbing gases and oxygen	
• German	C79000-G5200-C143
• English	C79000-G5276-C143
• French	C79000-G5277-C143
• Spanish	C79000-G5278-C143
• Italian	C79000-G5272-C143

More information

The complete documentation is available in various languages
for downloading free of charge:

<http://www.siemens.com/processanalytics/documentation>

Extractive continuous process gas analysis

Series 6

ULTRAMAT/OXYMAT 6

Suggestions for spare parts

1

Selection and ordering data

Description	7MB2023	7MB2024	2 years (quantity)	5 years (quantity)	Article No.
Analyzer unit					
ULTRAMAT channel					
• O-ring for cover (window, rear)	x	x	2	2	C79121-Z100-A24
• Cover (cell length 20 ... 180 mm)	x	x	2	2	C79451-A3462-B151
• Cover (cell length 0.2 ... 6 mm)	x	x	2	2	C79451-A3462-B152
• O-rings, set (ULTRAMAT)	x	x	—	1	C79451-A3462-D501
OXYMAT channel					
• O-ring	x	x	1	2	C74121-Z100-A6
• O-ring (measuring head)	x	x	2	4	C79121-Z100-A32
• O-ring	x	x	2	4	C71121-Z100-A159
• Sample chamber, stainless steel, mat. no. 1.4571; non-flow-type compensation branch	x	x	—	1	C79451-A3277-B535
• Sample chamber, tantalum, non-flow-type compensation branch	x	x	—	1	C79451-A3277-B536
• Sample chamber, stainless steel, mat. no. 1.4571; flow-type compensation branch	x	x	—	1	C79451-A3277-B537
• Sample chamber, tantalum, flow-type compensation branch	x	x	—	1	C79451-A3277-B538
• Measuring head, non-flow-type compensation branch	x	x	1	1	C79451-A3460-B525
• Measuring head, flow-type compensation branch	x	x	1	1	C79451-A3460-B526
Sample gas path					
Pressure switch	x	x	1	2	C79302-Z1210-A2
Restrictor, stainless steel, mat. no. 1.4571; hose gas path	x	x	2	2	C79451-A3480-C10
Flow indicator	x	x	1	2	C79402-Z560-T1
ULTRAMAT channel					
• Hose clip	x	x	—	1	C79451-A3478-C9
OXYMAT channel					
• Restrictor, titanium, pipe gas path	x	x	2	2	C79451-A3480-C37
• Reference gas path, 3000 hPa	x	x	1	1	C79451-A3480-D518
• Capillary, 100 hPa, connection set	x	x	1	1	C79451-A3480-D519
• Restrictor, stainless steel, mat. no. 1.4571; pipe gas path	x	x	1	1	C79451-A3520-C5
Electronics					
Front plate with keyboard	x	x	1	1	C79165-A3042-B506
Adapter plate, LCD/keyboard	x	x	1	1	C79451-A3474-B605
LC display	x	x	1	1	A5E31474846
Connector filter	x	x	—	1	W75041-E5602-K2
Fusible element, T 0.63 A/250 V	x	x	2	3	W79054-L1010-T630
Fusible element, T 1 A/250 V	x	x	2	3	W79054-L1011-T100
Fusible element, T 2.5 A/250 V	x	x	2	3	W79054-L1011-T250
ULTRAMAT channel					
• Motherboard, with firmware: see spare parts list	x	x	—	1	
OXYMAT channel					
• Motherboard, with firmware: see spare parts list	x	x	—	1	

If the device 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.

Overview

The function of the OXYMAT 6 gas analyzers is based on the paramagnetic alternating pressure method and are used to measure oxygen in gases.

Benefits

- Paramagnetic alternating pressure principle
 - Small measuring ranges (0 to 0.5% or 99.5 to 100% O₂)
 - Absolute linearity
- Detector element has no contact with the sample gas
 - Can be used under "harsh conditions"
 - Long service life
- Physically suppressed zero through suitable selection of reference gas (air or O₂), e.g. 98 to 100% O₂ for purity monitoring/air separation
- Open interface architecture (RS 485, RS 232, PROFIBUS)
- SIPROM GA network for maintenance and service information (option)
- Electronics and physics: gas-tight isolation, purging is possible, IP65, long service life even in harsh environments (field device only)
- Heated versions (option), use also in presence of gases condensing at low temperature (field device only)
- Ex(p) for zones 1 and 2 according to ATEX 2G and ATEX 3G (field device only)

Application**Fields of application**

- For boiler control in incineration plants
- For safety-relevant applications (SIL)
- In the automotive industry (testbed systems)
- In chemical plants
- For ultra-pure gas quality monitoring
- Environmental protection
- Quality monitoring
- Versions for analyzing flammable and non-flammable gases or vapors for use in hazardous areas

Special versionsSpecial applications

Besides the standard combinations, special applications concerning the material in the gas path and the material in the sample chambers are also available on request.

Performance-tested version / QAL

As a reference value for emission measurements according to TA-Luft, 13th and 27th BImSchV, federal emission law

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)
- Internal gas paths: hose made of FKM (Viton) or pipe made of titanium or stainless steel (mat. no. 1.4571)
- Gas connections for sample gas inlet and outlet and for reference gas: fittings, pipe diameter of 6 mm or ¼"
- Flow indicator for sample gas on front plate (option)
- Pressure switch in sample gas path for flow monitoring (option)

Field device

- Two-door enclosure with gas-tight separation of analyzer and electronics sections
- Individually purgeable enclosure halves
- Analyzer unit and piping can be heated up to 130 °C (option)
- Gas path and stubs made of stainless steel (mat. no. 1.4571) or titanium, Hastelloy C22
- Purging gas connections: pipe diameter 10 mm or 3/8"
- Gas connections for sample gas inlet and outlet and for reference gas: clamping ring connection for a pipe diameter of 6 mm or ¼"

Display and control panel

- Large LCD panel for simultaneous display of:
 - Measured value (digital and analog displays)
 - Status bar
 - Measuring ranges
- Contrast of LCD panel adjustable using menu
- Permanent LED backlighting
- Washable membrane keyboard with five softkeys
- Menu-driven operation for parameterization, test functions, adjustment
- User help in plain text
- Graphic display of concentration trend; programmable time intervals
- Bilingual operating software German/English, English/Spanish, French/English, Spanish/English, Italian/English

Extractive continuous process gas analysis

Series 6

OXYMAT 6

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General information

Input and outputs

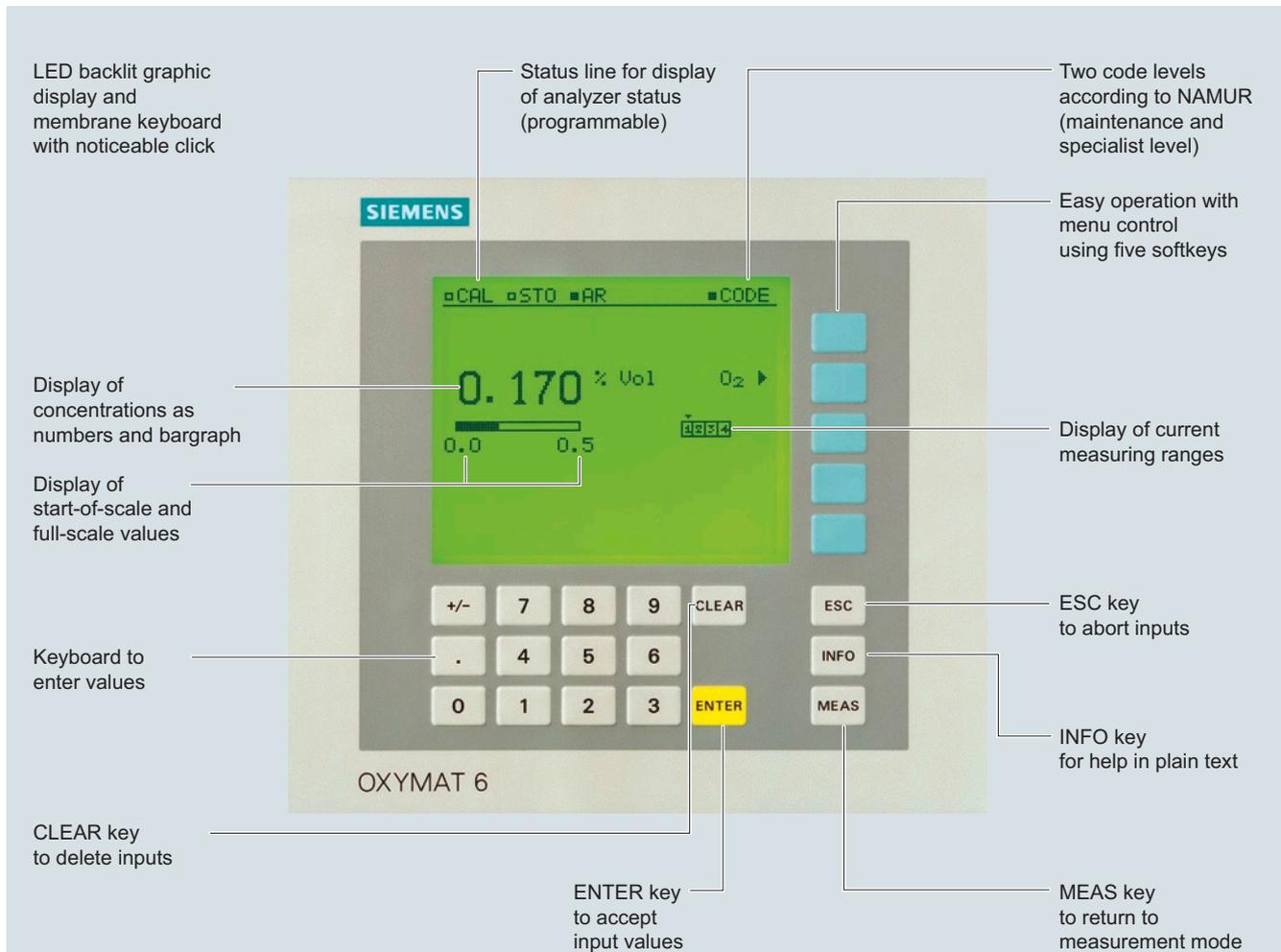
- One analog output per measured component (from 0, 2, 4 to 20 mA; NAMUR configurable)
- Two analog inputs configurable (e.g. correction of cross-interference, external pressure sensor)
- Six digital inputs freely configurable (e.g. for measurement range switchover, processing of external signals from sample preparation)
- Six relay outputs freely configurable (failure, maintenance demanded, maintenance switch, threshold alarm, external magnetic valves)
- Expansion: Eight additional digital inputs and eight additional relay outputs each e.g. for autocalibration with up to four calibration gases

Communication

RS 485 present in basic unit (connection from the rear; for the slide-in module 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



OXYMAT 6, membrane keyboard and graphic display

Designs – Parts wetted by sample gas, standard

Gas path		19" rack unit	Field device	Field device Ex
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

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		

Extractive continuous process gas analysis

Series 6

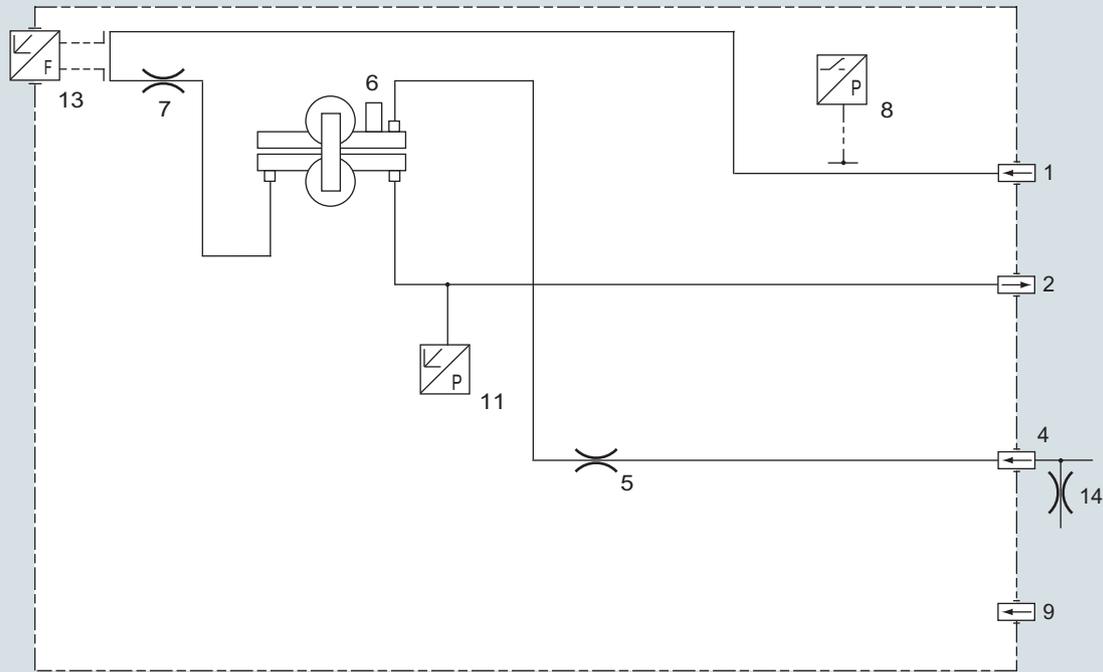
OXYMAT 6

General information

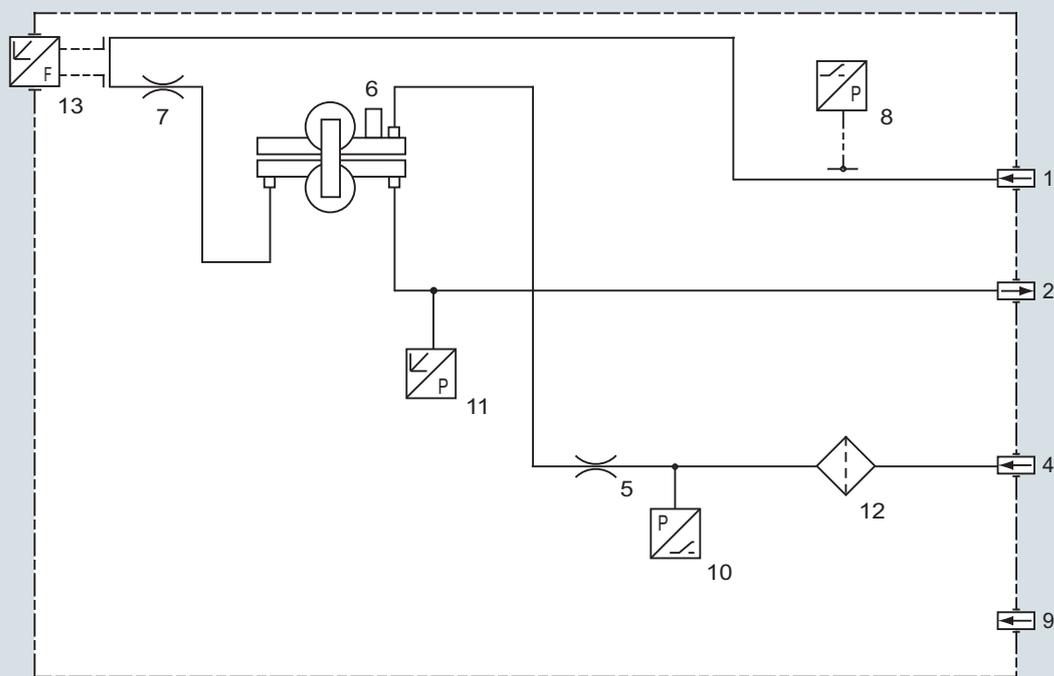
Gas path (19" rack unit)

Legend for the gas path figures

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



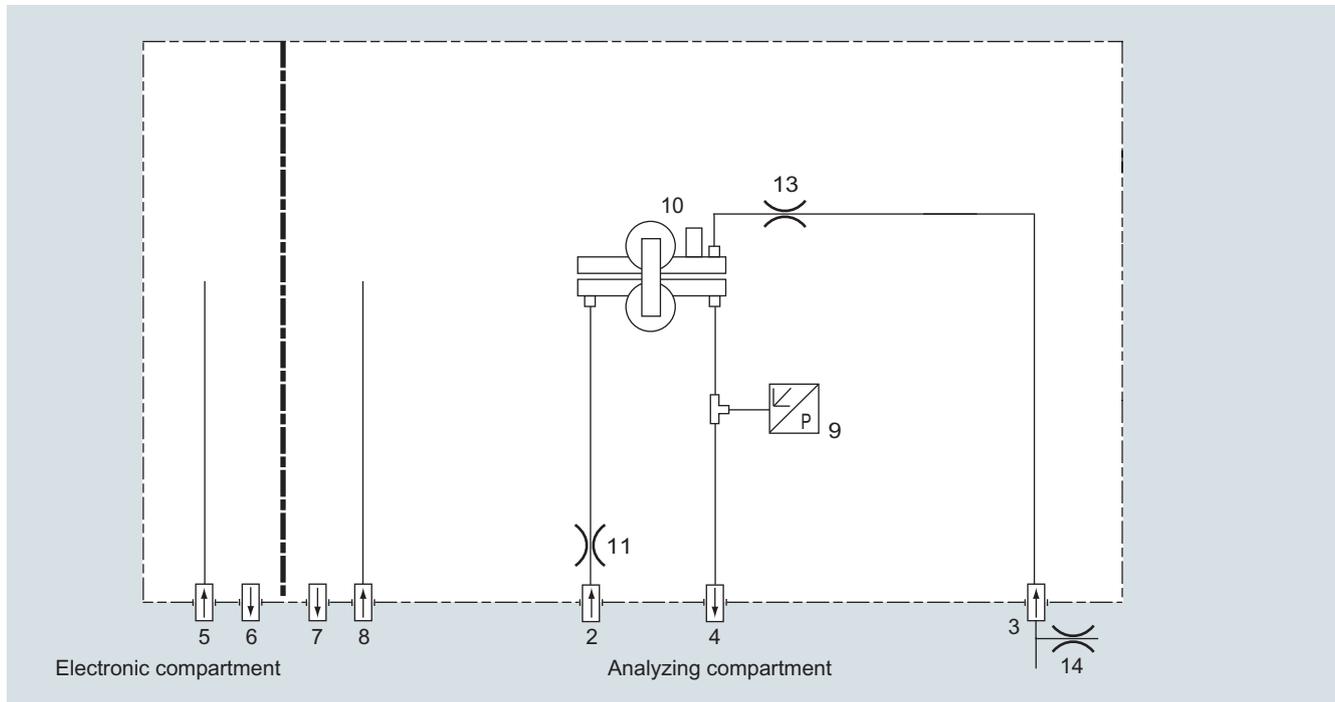
Gas path, reference gas connection 1 100 hPa, absolute



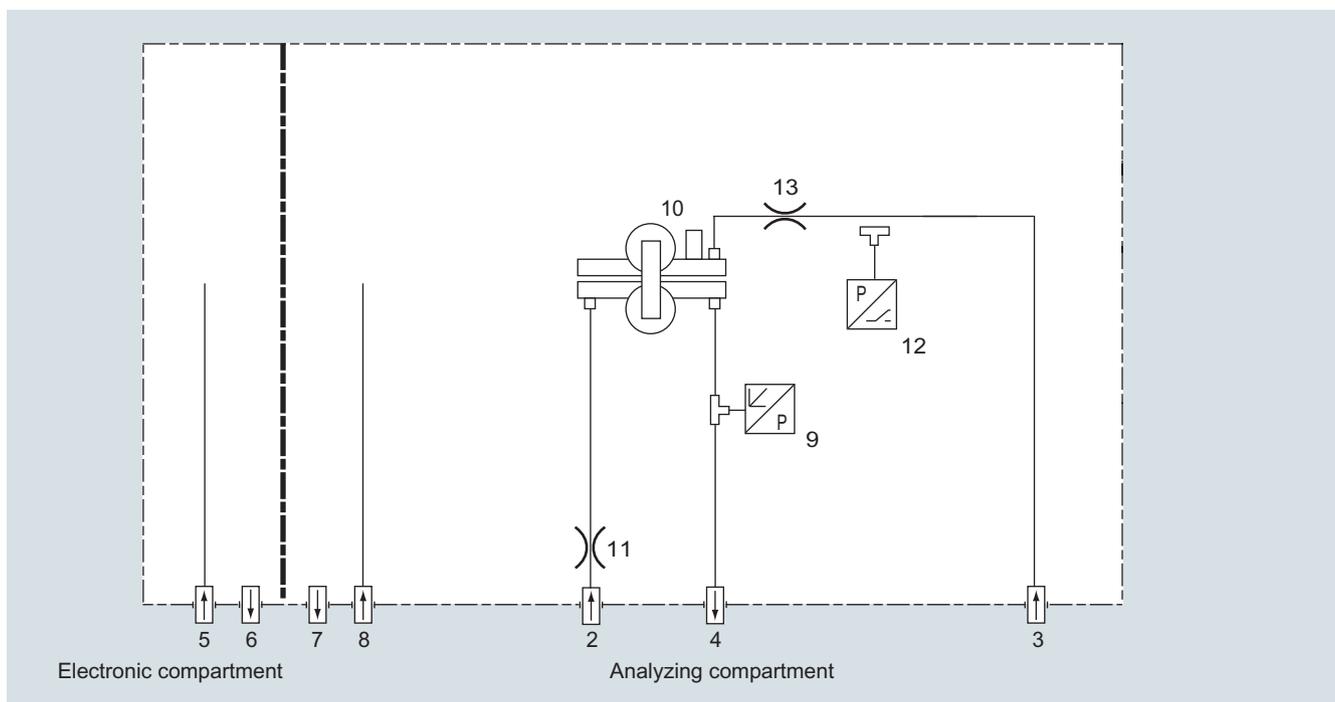
Gas path, reference gas connection 3 000 to 5 000 hPa, absolute

Gas path (field device)**Legend for the gas path figures**

1	Not used	8	Purging gas inlet (analyzer side)
2	Sample gas inlet	9	Pressure sensor
3	Reference gas inlet	10	O ₂ physical system
4	Sample gas outlet	11	Restrictor in sample gas path
5	Purging gas inlet (electronics side)	12	Pressure sensor in reference gas path (option)
6	Purging gas outlet (electronics side)	13	Restrictor
7	Purging gas outlet (analyzer side)	14	Outlet restrictor



Gas path, reference gas connection 1 100 hPa, absolute



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

Extractive continuous process gas analysis

Series 6

OXYMAT 6

General information

Function

Principle of operation

In contrast to almost all other gases, oxygen is paramagnetic. This property is utilized as the measuring principle by the OXYMAT 6 gas analyzers.

Oxygen molecules in an inhomogeneous magnetic field are drawn in the direction of increased field strength due to their paramagnetism. When two gases with different oxygen contents meet in a magnetic field, a pressure difference is produced between them.

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

The microflow sensor consists of two nickel-plated grids heated to approximately 120 °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.

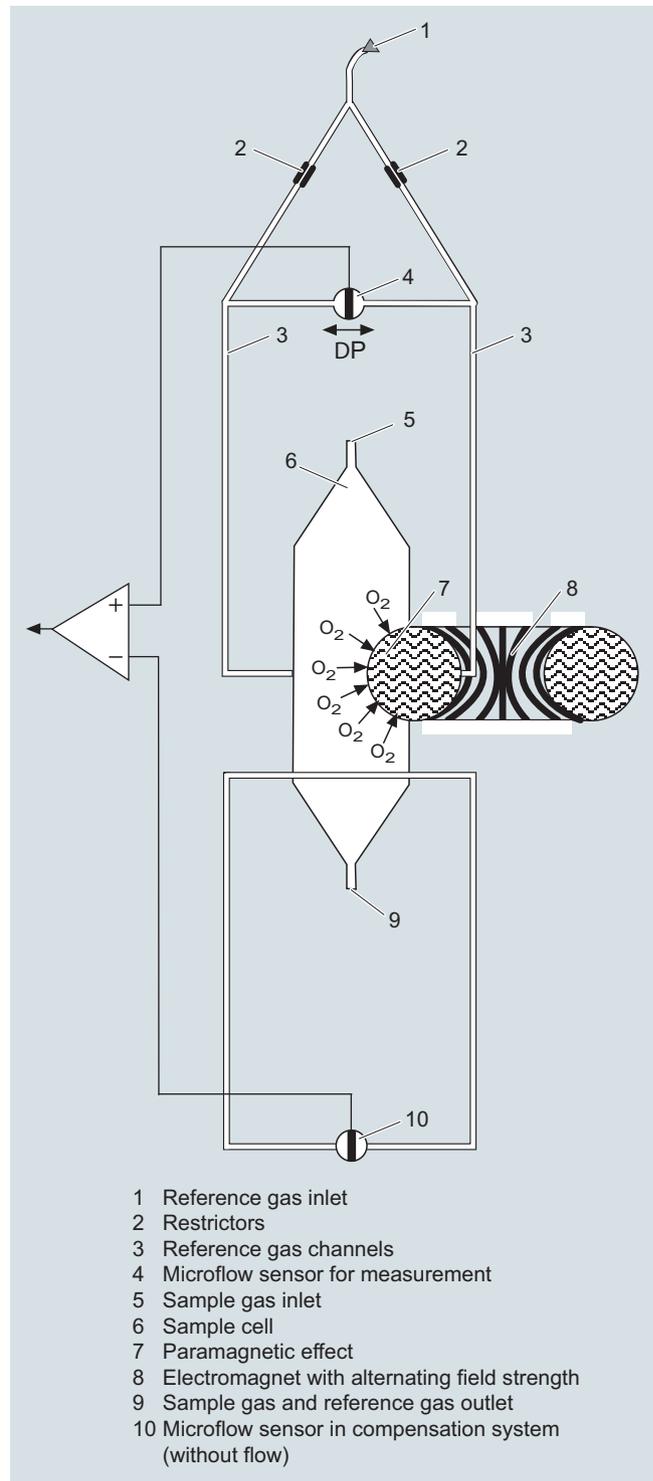
The sample chamber is directly in the sample path and has a small volume, and the microflow sensor is a low-lag sensor. This results in a very short response time for the OXYMAT 6.

Vibrations frequently occur at the place of installation and may falsify the measured signal (noise). A further microflow sensor (10) through which no gas passes acts as a vibration sensor. Its signal is applied to the measured signal as compensation.

If the density of the sample gas deviates by more than 50% from that of the reference gas, the compensation microflow sensor (10) is flushed with reference gas just like the measuring sensor (4).

Note

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



OXYMAT 6, principle of operation

Advantages of the function-based application of reference gas

- The zero point can be defined specific to the application. It is then also possible to set "physically" suppressed zero points. For example, it is possible when using pure oxygen as the zero gas to set a measuring range of 99.5 to 100% O₂ with a resolution of 50 vpm.
- The sensor (microflow sensor) is located outside the sample gas. Through use of an appropriate material in the gas path this also allows measurements in highly corrosive gases.
- Pressure variations in the sample gas can be compensated better since the reference gas is subjected to the same fluctuations.
- No influences on the thermal conductivity of the sample gas since the sensor is positioned on the reference gas side.
- The same gas is used for the serial gas calibration and as the reference gas. As a result of the low consumption of reference gas (3 to 10 ml/min), one calibration cylinder can be used for both gases.
- No measuring effect is generated in the absence of oxygen. The measured signal need not therefore be set electronically to zero, and is thus extremely stable with regard to temperature and electronic influences.

Essential characteristics

- Four measuring ranges which can be freely configured, even with suppressed zero point, all measuring ranges are linear
- Measuring ranges with physically suppressed zero point possible
- Measuring range identification
- Galvanically isolated measured-value output 0/2/4 to 20 mA (also inverted)
- Autoranging possible; remote switching is also possible
- Storage of measured values possible during adjustments
- Wide range of selectable time constants (static/dynamic noise suppression); i.e. the response time of the analyzer can be matched to the respective measuring task
- Short response time
- Low long-term drift
- Measuring point switchover for up to 6 measuring points (programmable)
- Measuring point identification
- Internal pressure sensor for correction of pressure variations in sample gas range 500 to 2 000 hPa (abs.)
- External pressure sensor - only with piping as the gas path - can be connected for correction of variations in the sample gas pressure up to 3 000 hPa absolute (option)
- Monitoring of sample gas flow (option for version with hoses)
- Monitoring of sample gas and/or reference gas (option)
- Monitoring of reference gas with reference gas connection 3 000 to 5 000 hPa (abs.) (option)
- Automatic measuring range calibration can be configured
- Operation based on the NAMUR recommendation
- Two control levels with their own authorization codes for the prevention of accidental and unauthorized operator interventions
- Simple handling using a numerical membrane keyboard and operator prompting
- Customer-specific analyzer options such as:
 - Customer acceptance
 - TAG labels
 - Drift recording
 - Clean for O₂ service
 - Kalrez gaskets
- Analyzer unit with flow-type compensation branch: a flow is passed through the compensation branch (option) to reduce the vibration dependency in the case of highly different densities of the sample and reference gases
- Sample chamber for use in presence of highly corrosive sample gases

Extractive continuous process gas analysis

Series 6

OXYMAT 6

General information

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 6

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

Table 2: Zero point error due to diamagnetism or paramagnetism of some accompanying gases with reference to nitrogen at 60 °C und 1 000 hPa absolute (according to IEC 1207/3)

Conversion to other temperatures

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

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

All diamagnetic gases have a negative deviation from zero point.

Technical specifications

General information		Pressure correction range	
Measuring ranges	4, internally and externally switchable; autoranging is also possible	Pressure sensor	
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	• Internal	500 ... 2 000 hPa absolute
Largest possible measuring span	100 vol.% O ₂ (for a pressure above 2 000 hPa: 25 vol.% O ₂)	• External	500 ... 3 000 hPa absolute
Measuring ranges with suppressed zero point	Any zero point can be implemented within 0 ... 100 vol.%, provided that a suitable reference gas is used (see Table 1 in "Function")	Measuring response	
Operating position	Front wall, vertical	Output signal fluctuation	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Conformity	CE mark in accordance with EN 50081-1, EN 50082-2	Zero point drift	< ± 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)
Design, enclosure		Measured-value drift	< ±0.5%/month of the current measuring range
Degree of protection	IP20 according to EN 60529	Repeatability	< 1% of the current measuring range
Weight	Approx. 13 kg	Detection limit	1% of the current measuring range
Electrical characteristics		Linearity error	< 0.1% of the current measuring range
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	Influencing variables	
Power consumption	Approx. 35 VA	Ambient temperature	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
EMC (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98), EN 61326	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)	< 0.5%/10 K relating to the smallest possible measuring range according to rating plate, with measuring span 0.5%: 1%/10 K
Electrical safety	According to EN 61010-1, overvoltage category III	Accompanying gases	• With disabled pressure compensation: < 2% of the current measuring range /1% pressure change • With disabled pressure compensation: < 0.2% of the current measuring range /1% pressure change
Fuse values	100 ... 120 V: 1.0 T/250 200 ... 240 V: 0.63 T/250	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
Gas inlet conditions		Auxiliary power	< 0.1% of the current measuring range with rated voltage ± 10%
Permissible sample gas pressure		Electrical inputs and outputs	
• With pipes	500 ... 3 000 hPa absolute	Analog output	0/2/4 ... 20 mA, isolated; max. load 750 Ω
• With hoses		Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load: 24 V AC/DC/1 A, isolated
- Without pressure switch	500 ... 1 500 hPa absolute	Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and residual gas influence correction (correction of cross-interference)
- With pressure switch	500 ... 1 300 hPa absolute	Digital inputs	6, designed for 24 V, isolated, freely configurable, e.g. for measuring range switchover
Sample gas flow	18 ... 60 l/h (0.3 ... 1 l/min)	Serial interface	RS 485
Sample gas temperature	Min. 0 ... max. 50 °C, but above the dew point	Options	AUTOCAL function each with 8 additional digital inputs and relay outputs, also with PROFIBUS PA or PROFIBUS DP
Sample gas humidity	< 90% RH (RH: relative humidity)	Climatic conditions	
Reference gas pressure (high-pressure version)	2 000 ... 4 000 hPa above sample gas pressure, but max. 5 000 hPa	Permissible ambient temperature	-30 ... +70 °C during storage and transportation, 5 ... 45 °C during operation
Reference gas pressure (low-pressure version)	Min. 100 hPa above sample gas pressure	Permissible humidity	< 90% RH (RH: relative humidity) within average annual value, during storage and transportation (dew point must not be undershot)
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)	Approximately 0.5 ... 2.5 s, depending on version		
Time for device-internal signal processing	< 1 s		

Extractive continuous process gas analysis

Series 6

OXYMAT 6

19" rack unit

1

Selection and ordering data

OXYMAT 6 gas analyzer

19" rack unit for installation in cabinets

➤ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.

Gas connections

Pipe with 6 mm outer diameter

Pipe with 1/4" outer diameter

Smallest possible measuring span O₂

0.5 % reference gas pressure 3 000 hPa

0.5 % reference gas pressure 100 hPa (external pump)

2 % reference gas pressure 3 000 hPa

2 % reference gas pressure 100 hPa (external pump)

5 % reference gas pressure 3 000 hPa

5 % reference gas pressure 100 hPa (external pump)

Sample chamber

Non-flow-type compensation branch

• Made of stainless steel, mat. no. 1.4571

• Made of tantalum

Flow-type compensation branch

• Made of stainless steel, mat. no. 1.4571

• Made of tantalum

Internal gas paths

Hose made of FKM (Viton)

Pipe made of titanium

Pipe made of stainless steel, mat. no. 1.4571

Power supply

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

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

Monitoring (reference gas, sample gas)

Without

Reference gas only

Reference gas and sample gas (with flow indicator and pressure switch for sample gas)

Sample gas only

Add-on electronics

Without

AUTOCAL function

• 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

Language

German

English

French

Spanish

Italian

Article No.

7MB2021- 0 -

Cannot be combined

Gas connections

Pipe with 6 mm outer diameter

Pipe with 1/4" outer diameter

Smallest possible measuring span O₂

0.5 % reference gas pressure 3 000 hPa

0.5 % reference gas pressure 100 hPa (external pump)

2 % reference gas pressure 3 000 hPa

2 % reference gas pressure 100 hPa (external pump)

5 % reference gas pressure 3 000 hPa

5 % reference gas pressure 100 hPa (external pump)

Sample chamber

Non-flow-type compensation branch

• Made of stainless steel, mat. no. 1.4571

• Made of tantalum

Flow-type compensation branch

• Made of stainless steel, mat. no. 1.4571

• Made of tantalum

Internal gas paths

Hose made of FKM (Viton)

Pipe made of titanium

Pipe made of stainless steel, mat. no. 1.4571

Power supply

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

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

Monitoring (reference gas, sample gas)

Without

Reference gas only

Reference gas and sample gas (with flow indicator and pressure switch for sample gas)

Sample gas only

Add-on electronics

Without

AUTOCAL function

• 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

Language

German

English

French

Spanish

Italian

Order code

Cannot be combined

Add "-Z" to Article No. and specify Order codes.

Telescopic rails (2 units)

A31

Kalrez gaskets in sample gas path

B01

TAG labels (specific lettering based on customer information)

B03

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 O₂ service (specially cleaned gas path)

Y02

Measuring range indication in plain text, if different from the standard setting

Y11

Performance-tested according to EN 15267

Y27

Selection and ordering data

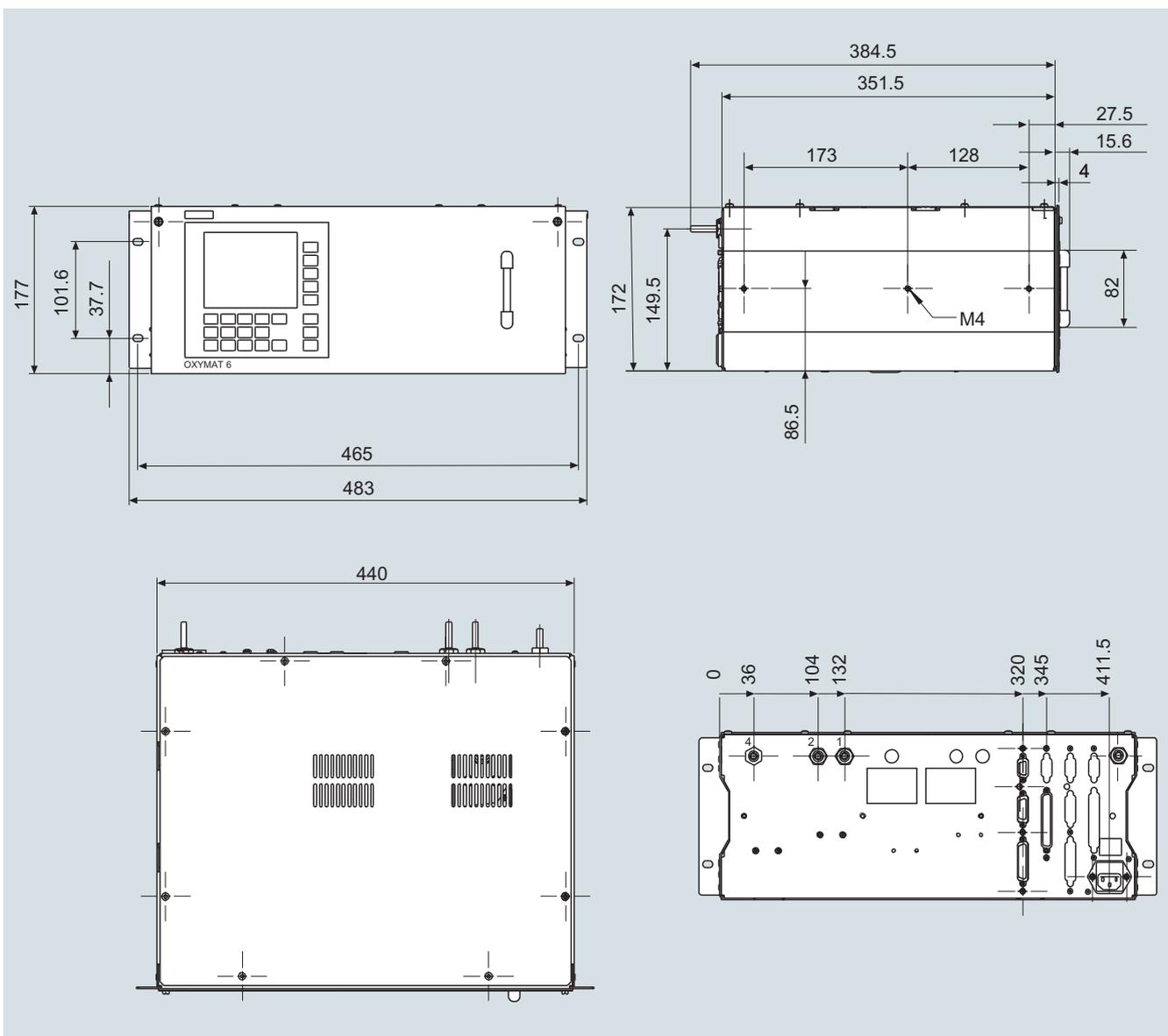
Accessories

RS 485/Ethernet converter
 RS 485/RS 232 converter
 RS 485/USB converter
 AUTOCAL function with serial interface for the automotive industry (AK)
 AUTOCAL function with 8 digital inputs/outputs
 AUTOCAL function with 8 digital inputs/outputs and PROFIBUS PA
 AUTOCAL function with 8 digital inputs/outputs and PROFIBUS DP
 Set of Torx screwdrivers

Article No.

A5E00852383
 C79451-Z1589-U1
 A5E00852382
 C79451-A3480-D512
 C79451-A3480-D511
 A5E00057307
 A5E00057312
 A5E34821625

Dimensional drawings



OXYMAT 6, 19" unit, dimensions in mm

Extractive continuous process gas analysis

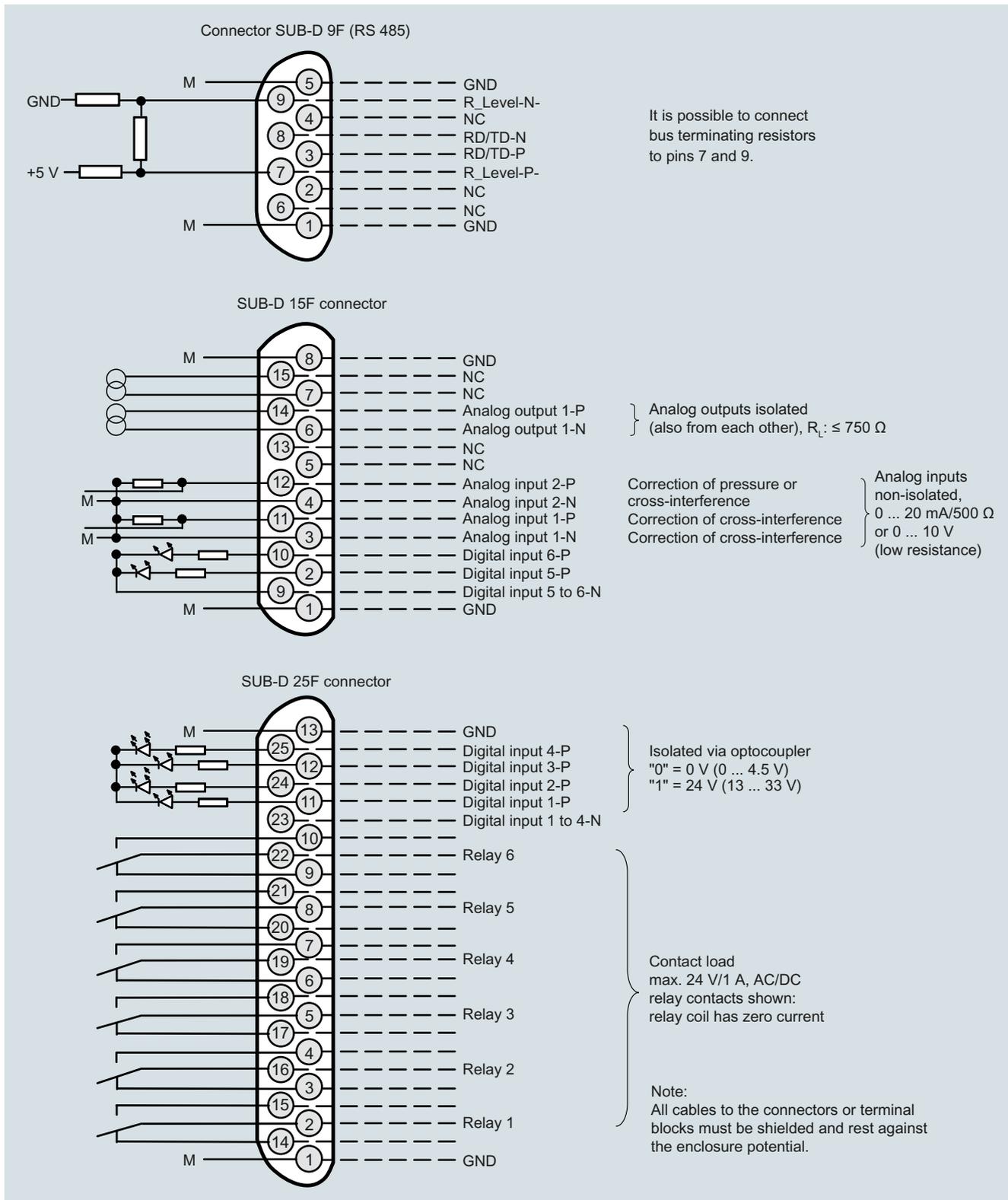
Series 6
OXYMAT 6

19" rack unit

1

Circuit diagrams

Pin assignment (electrical and gas connections)



OXYMAT 6, 19" unit, pin assignment

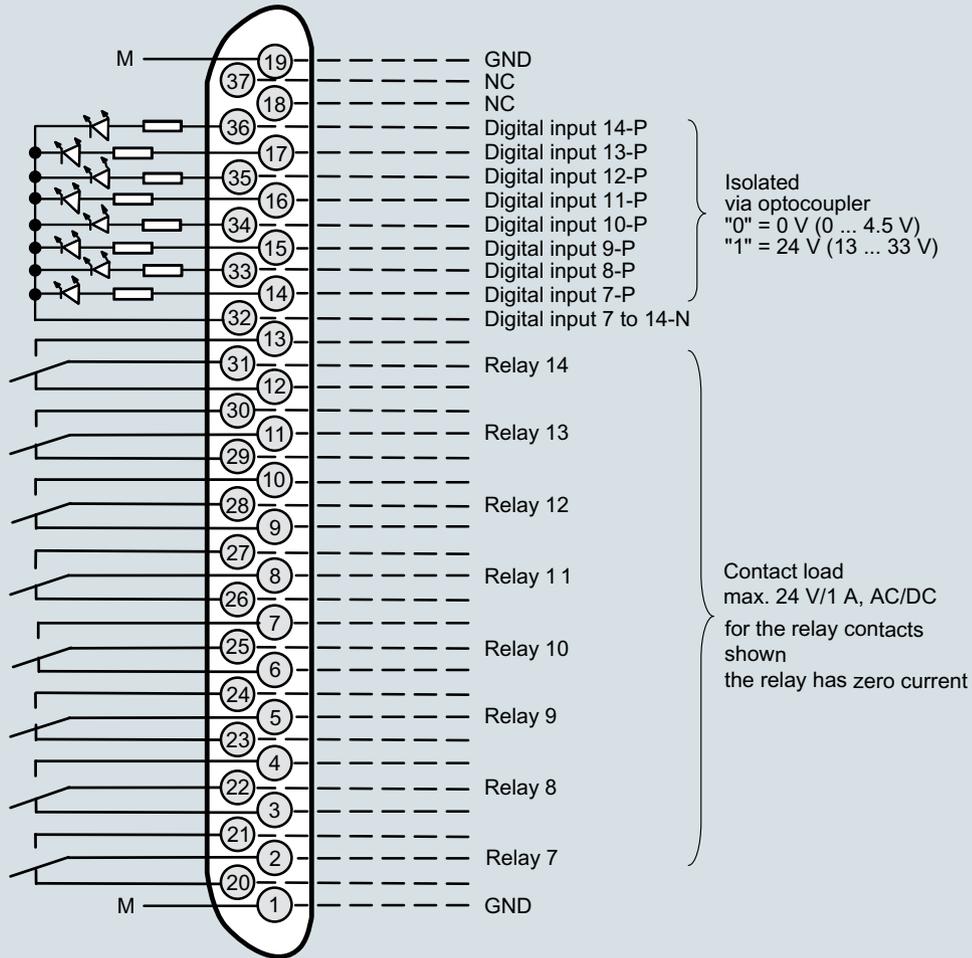
Extractive continuous process gas analysis

Series 6
OXYMAT 6

19" rack unit

1

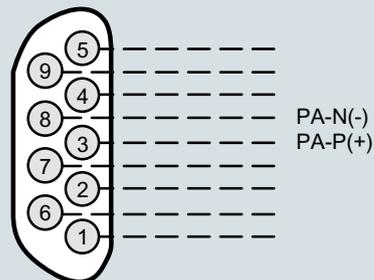
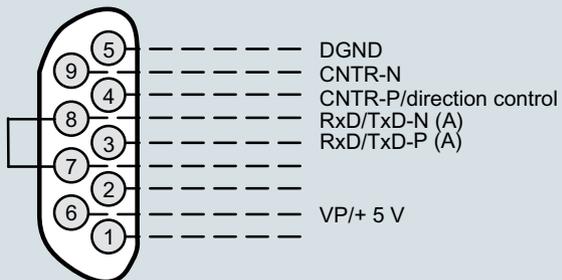
Connector SUB-D 37F (option)



Connector SUB-D 9F
PROFIBUS DP

optional

Connector SUB-D 9M
PROFIBUS PA



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

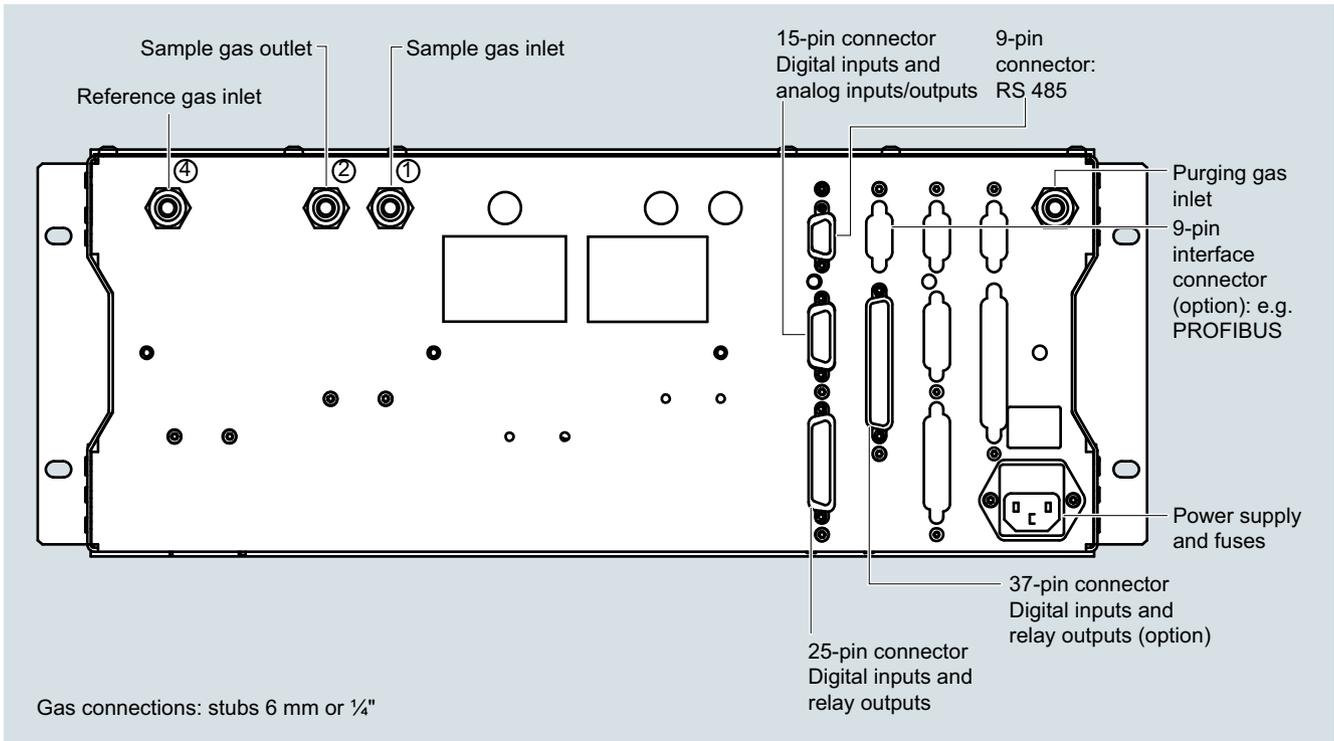
OXYMAT 6, 19" unit, pin assignment of AUTOCAL board and PROFIBUS connectors

Extractive continuous process gas analysis

Series 6
OXYMAT 6

19" rack unit

1



OXYMAT 6, 19" unit, gas and electrical connections

Technical specifications

General information		Dynamic response	
Measuring ranges	4, internally and externally switchable; autoranging is also possible	Warm-up period	At room temperature < 30 min (the technical specification will be met after 2 hours)
Smallest possible span (relating to sample gas pressure 1 000 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature), smallest possible span with heated version: 0.5% (< 65 °C); 0.5 ... 1% (65 ... 90 °C); 1 ... 2% (90 ... 130 °C)	0.5 vol.%, 2 vol.% or 5 vol.% O ₂	Delayed display (t ₉₀ -time)	< 1.5 s
Largest possible measuring span	100 vol.% O ₂ (for a pressure above 2 000 hPa: 25 vol.% O ₂)	Damping (electrical time constant)	0 ... 100 s, configurable
Measuring ranges with suppressed zero point	Any zero point can be implemented within 0 ... 100 vol.%, provided that a suitable reference gas is used (see Table 1 in "Function")	Dead time (purging time of the gas path in the unit at 1 l/min)	Approx. 0.5 s
Operating position	Front wall, vertical	Time for device-internal signal processing	< 1 s
Conformity	CE mark in accordance with EN 50081-1, EN 50082-2	Pressure correction range	
Design, enclosure		Pressure sensor	
Degree of protection	IP65 in accordance with EN 60529, restricted breathing enclosure to EN 50021	• Internal	500 ... 2 000 hPa absolute
Weight	Approx. 28 kg	• External	500 ... 3 000 hPa absolute
Electrical characteristics		Measuring response	
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	Output signal fluctuation	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Power consumption	Approx. 35 VA, approx. 330 VA with heated version	Zero point drift	< ± 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)
EMC (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98), EN 61326	Measured-value drift	< ± 0.5%/month of the smallest possible span according to rating plate
Electrical safety	In accordance with EN 61010-1	Repeatability	< 1% of the current measuring range
• Heated units	Overvoltage category II	Detection limit	1% of the current measuring range
• Unheated units	Overvoltage category III	Linearity error	< 0.1% of the current measuring range
Fuse values (unheated unit)		Influencing variables	
• 100 ... 120 V	F3: 1 T/250; F4: 1 T/250	Ambient temperature	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
• 200 ... 240 V	F3: 0.63 T/250; F4: 0.63 T/250	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)	< 0.5%/10 K relating to the smallest possible measuring range according to rating plate, with measuring span 0.5%: 1%/10 K
Fuse values (heated unit)		Accompanying gases	• With disabled pressure compensation: < 2% of the current measuring range /1% pressure change • With disabled pressure compensation: < 0.2% of the current measuring range /1% pressure change
• 100 ... 120 V	F1: 1 T/250; F2: 4 T/250	Sample gas flow at zero point	Deviation from zero point corresponding to paramagnetic or diamagnetic deviation of carrier gas
• 200 ... 240 V	F3: 4 T/250; F4: 4 T/250 F1: 0.63 T/250; F2: 2.5 T/250 F3: 2.5 T/250; F4: 2.5 T/250	Auxiliary power	< 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; heated version up to double error
Gas inlet conditions			
Permissible sample gas pressure			
• With pipes	500 ... 3 000 hPa absolute		
• With pipes, Ex version			
- Leakage compensation	500 ... 1 160 hPa absolute		
- Continuous purging	500 ... 3 000 hPa absolute		
Reference gas pressure (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		
Purging gas pressure			
• Permanent	< 165 hPa above ambient pressure		
• For short periods	Max. 250 hPa above ambient pressure		
Sample gas flow	18 ... 60 l/h (0.3 ... 1 l/min)		
Sample gas temperature	• Min. 0 to max. 50 °C, but above the dew point (unheated) • 15 °C above temperature analyzer unit (heated)		
Sample gas humidity	< 90% relative humidity		

Extractive continuous process gas analysis

Series 6

OXYMAT 6

Field device

1

Electrical inputs and outputs

Analog output	0/2/4 ... 20 mA, isolated; 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, isolated
Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and residual gas influence correction (correction of cross-interference)
Digital inputs	6, designed for 24 V, isolated, 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% RH (relative humidity) as annual average (maximum accuracy achieved after 2 hours), during storage and transportation (dew point must not be undershot)

Selection and ordering data	Article No.	
OXYMAT 6 gas analyzer For field installation ↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.	7MB2011- 0 0 -	Cannot be combined
<u>Gas connections for sample gas and reference gas</u> Ferrule screw connection made of stainless steel (mat. no. 1.4571) <ul style="list-style-type: none"> • Pipe with 6 mm outer diameter • Pipe with ¼" outer diameter Ferrule screw connection made of titanium <ul style="list-style-type: none"> • Pipe with 6 mm outer diameter • Pipe with ¼" outer diameter Piping and gas connections made of Hastelloy C22: 7MB2011-0/1.... + order code D01 or D02	0 1 2 3	0 → D02 1 → D01 2 → D01, D02, Y02 3 → D01, D02, Y02
<u>Smallest possible measuring span O₂</u> 0.5 % reference gas pressure 3 000 hPa 0.5 % reference gas pressure 100 hPa (external pump) 2 % reference gas pressure 3 000 hPa 2 % reference gas pressure 100 hPa (external pump) 5 % reference gas pressure 3 000 hPa 5 % reference gas pressure 100 hPa (external pump)	A B C D E F	B B B B B → Y02 D D D D → Y02 F F F F → Y02
<u>Sample chamber</u> Non-flow-type compensation branch <ul style="list-style-type: none"> • Made of stainless steel, mat. no. 1.4571 • Made of tantalum Flow-type compensation branch <ul style="list-style-type: none"> • Made of stainless steel, mat. no. 1.4571 • Made of tantalum 	A B C D	C D
<u>Heating of internal gas paths and analyzer unit</u> None With (65 ... 130 °C)	0 1	1
<u>Power supply</u> Standard unit and acc. to ATEX II 3G version (Zone 2) <ul style="list-style-type: none"> • 100 ... 120 V AC, 48 ... 63 Hz • 200 ... 240 V AC, 48 ... 63 Hz ATEX II 2G versions (Zone 1), incl. certificate <ul style="list-style-type: none"> • 100 ... 120 V AC, 48 ... 63 Hz, according to ATEX II 2G¹⁾ (operating mode: leakage compensation) • 200 ... 240 V AC, 48 ... 63 Hz, according to ATEX II 2G¹⁾ (operating mode: leakage compensation) • 100 ... 120 V AC, 48 ... 63 Hz, according to ATEX II 2G¹⁾ (operating mode: continuous purging) • 200 ... 240 V AC, 48 ... 63 Hz, according to ATEX II 2G¹⁾ (operating mode: continuous purging) 	0 1 2 3 6 7	2 2 2 → E11, E12 3 3 3 → E11, E12 6 6 6 → E11, E12 7 7 7 → E11, E12
<u>Reference gas monitoring</u> Without With	A B	B A
<u>Add-on electronics</u> Without AUTOCAL function <ul style="list-style-type: none"> • With 8 additional digital inputs and 8 additional relay outputs • With 8 additional digital inputs/outputs and PROFIBUS PA interface • With 8 additional digital inputs/outputs and PROFIBUS DP interface • With 8 additional digital inputs/outputs and PROFIBUS PA Ex-i 	A B E F G	E → E12 F → E12
<u>Language</u> German English French Spanish Italian	0 1 2 3 4	

¹⁾ See also next page, "Additional units for Ex versions".

Extractive continuous process gas analysis

Series 6

OXYMAT 6

Field device

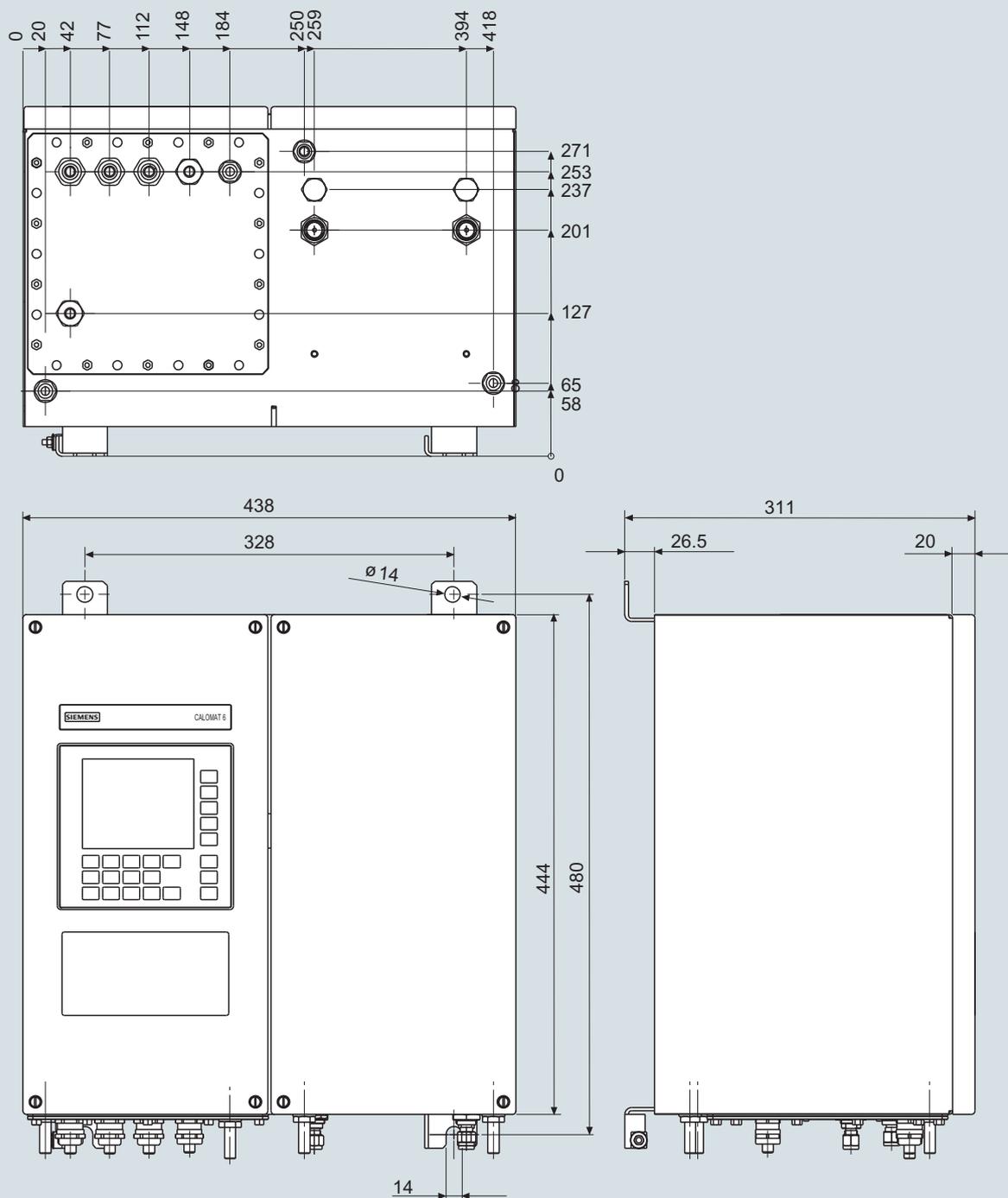
1

Selection and ordering data

<i>Additional versions</i>	Order code	Cannot be combined
Add "-Z" to Article No. and specify Order codes.		
Set of Torx screwdrivers	A32	
Kalrez gaskets in sample gas path	B01	
TAG labels (specific lettering based on customer information)	B03	
SIL conformity declaration (SIL 2) Functional Safety according to IEC 61508 and IEC 61511	C20	
Gas connections and piping made of Hastelloy C22		
• Outer diameter 6 mm	D01	→ E20
• Outer diameter ¼"	D02	→ E20
<u>Ex versions</u>		
Combination options see table "Ex configurations – principle selection criteria Series 6", chapter "General information"		
ATEX II 3G certificate; restricted breathing enclosure, non-flammable gases	E11	
ATEX II 3G certificate; flammable gases	E12	
FM/CSA certificate – Class I Div 2	E20	
ATEX II 3D certificate; potentially explosive dust atmospheres		
• In non-hazardous gas zone	E40	
• In Ex zone acc. to ATEX II 3G, non-flammable gases	E41	
• In Ex zone acc. to ATEX II 3G, flammable gases ¹⁾	E42	
BARTEC Ex p purging unit "Leakage compensation"	E71	
BARTEC Ex p purging unit "Continuous purging"	E72	
Clean for O ₂ service (specially cleaned gas path)	Y02	
Measuring range indication in plain text, if different from the standard setting	Y11	
<u>Additional units for Ex versions</u>	Article No.	
<u>Category ATEX II 2G (zone 1)</u>		
BARTEC Ex p purging unit, 230 V, "leakage compensation"	7MB8000-2BA	
BARTEC Ex p purging unit, 115 V, "leakage compensation"	7MB8000-2BB	
BARTEC Ex p purging unit, 230 V, "continuous purging"	7MB8000-2CA	
BARTEC Ex p purging unit, 115 V, "continuous purging"	7MB8000-2CB	
Ex i isolating transformer	7MB8000-3AB	
Ex isolating relay, 230 V	7MB8000-4AA	
Ex isolating relay, 110 V	7MB8000-4AB	
Differential pressure switch for corrosive and non-corrosive gases	7MB8000-5AA	
Stainless steel flame arrester	7MB8000-6BA	
Hastelloy flame arrester	7MB8000-6BB	
<u>Category ATEX II 3G (Zone 2)</u>		
BARTEC Ex p purging unit, 230 V, "continuous purging"	7MB8000-2CA	
BARTEC Ex p purging unit, 115 V, "continuous purging"	7MB8000-2CB	
<u>FM/CSA (Class I Div. 2)</u>		
Ex purging unit MiniPurge FM	7MB8000-1AA	
<u>Accessories</u>		
RS 485/Ethernet converter	A5E00852383	
RS 485/RS 232 converter	C79451-Z1589-U1	
RS 485/USB converter	A5E00852382	
AUTOCAL function with 8 digital inputs/outputs	A5E00064223	
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS PA	A5E00057315	
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS DP	A5E00057318	
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS PA Ex i (firmware 4.1.10 required)	A5E00057317	
Set of Torx screwdrivers	A5E34821625	

1) Only in connection with an approved purging unit

Dimensional drawings



OXYMAT 6, field unit, dimensions in mm

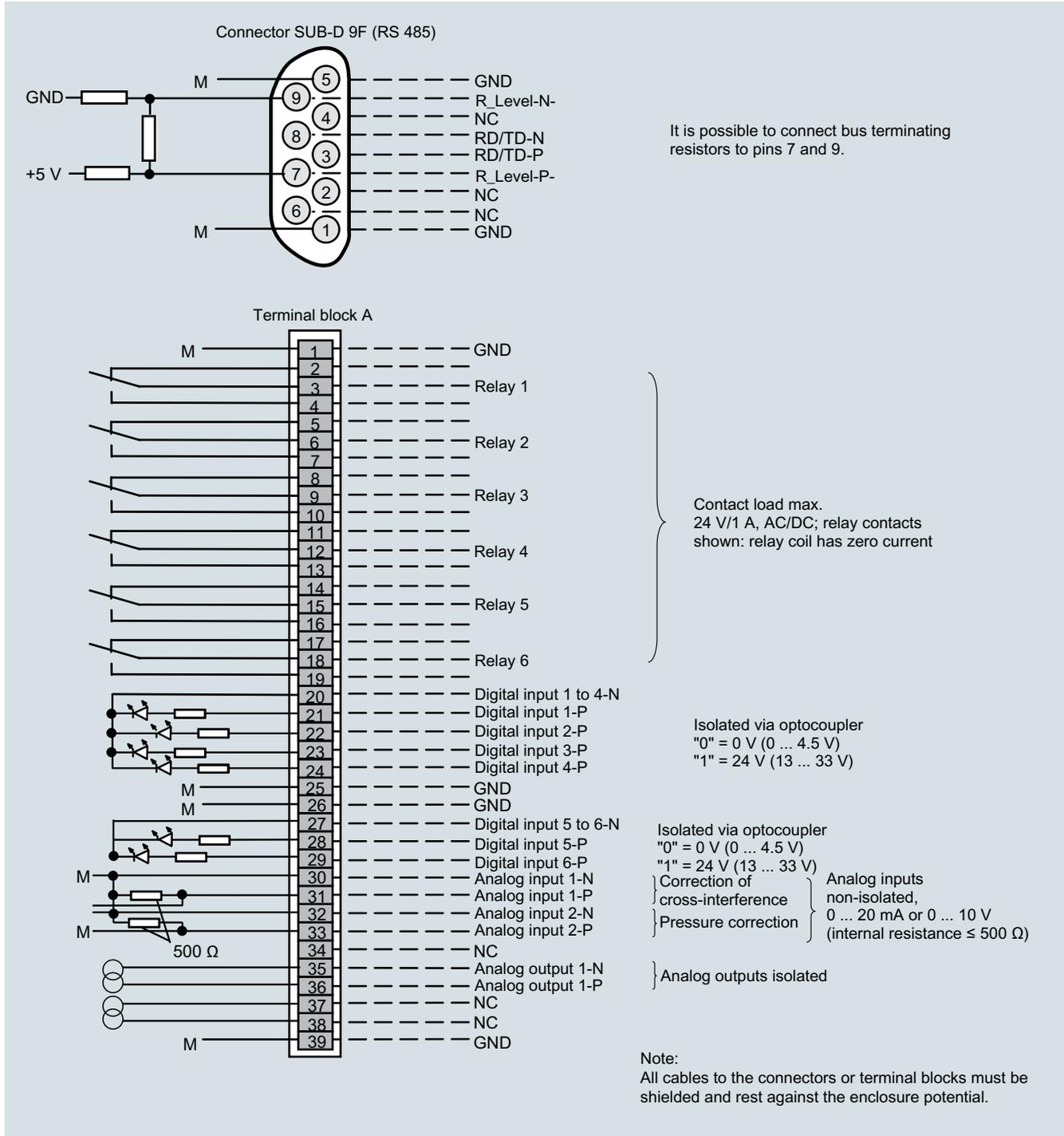
Extractive continuous process gas analysis

Series 6
OXYMAT 6

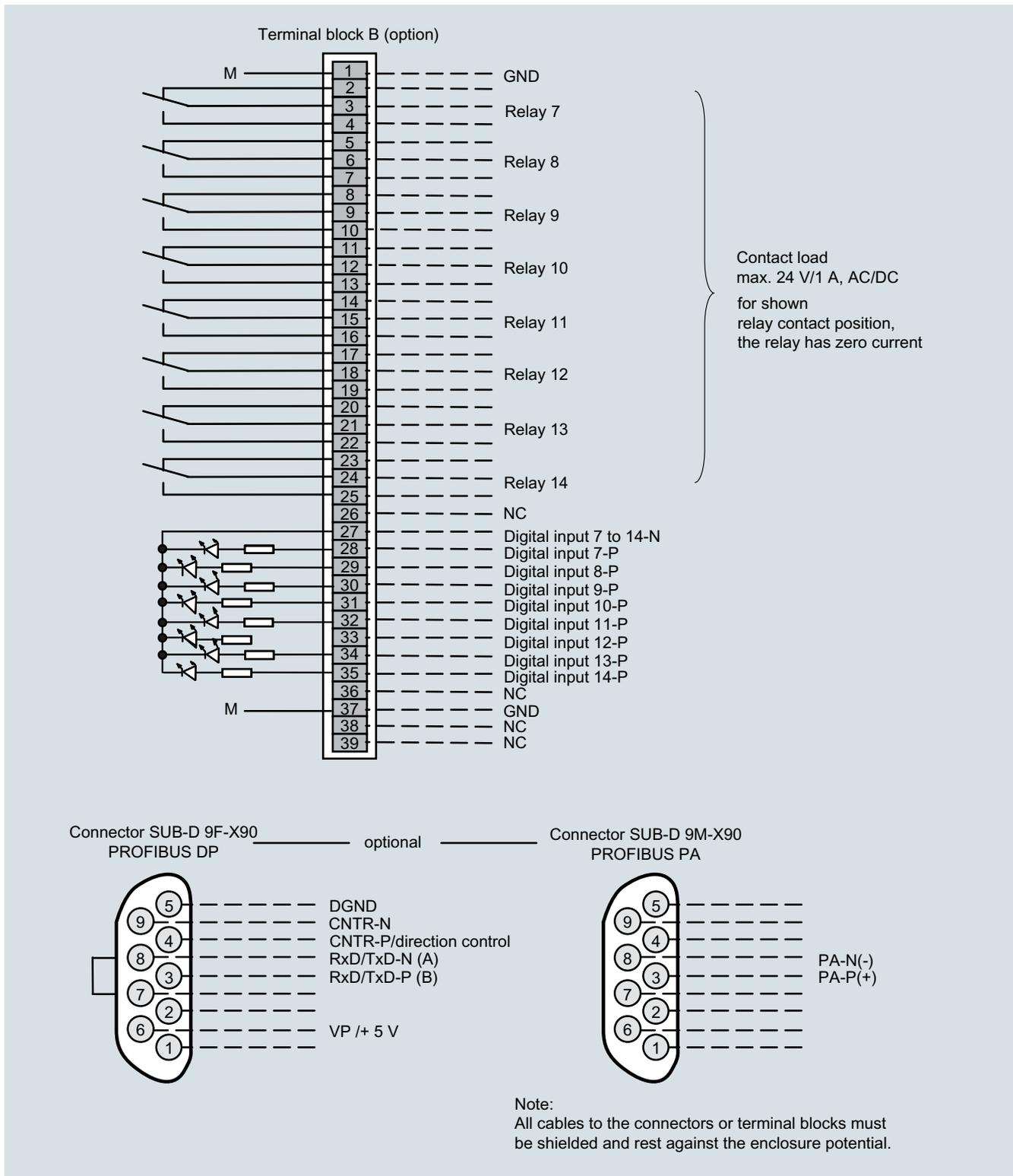
Field device

Circuit diagrams

Pin assignment (electrical and gas connections)



OXYMAT 6, field unit, connector and terminal assignment

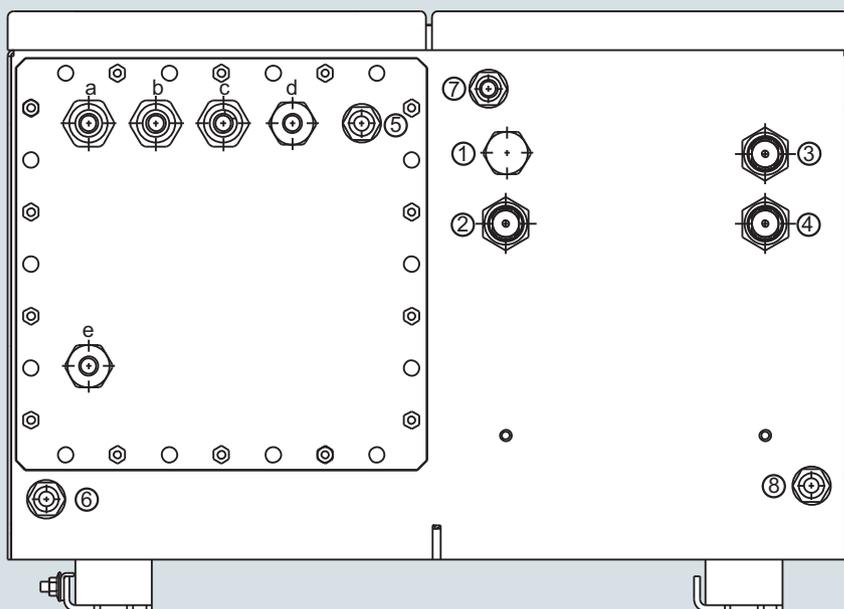


OXYMAT 6, field unit, connector and terminal assignment of the AUTOCAL board and PROFIBUS connectors

Extractive continuous process gas analysis

Series 6

OXYMAT 6

Field device**Gas connections**

- | | | |
|-----|---|--|
| ① | not used | } Clamping
gland for pipe
Ø 6 mm or 1/4" |
| ② | Sample gas inlet | |
| ③ | Reference gas inlet | |
| ④ | Sample gas outlet | |
| ⑤-⑧ | Purging gas inlets/outlets stubs Ø 10 mm or 3/8 " | |

Electrical connections

- | | |
|-------|--|
| a - c | Signal cable (Ø 10 ... 14 mm)
(analog + digital): cable gland M20x1.5 |
| d | Interface connection: (Ø 7 ... 12 mm)
cable gland M20x1.5 |
| e | Power supply: (Ø 7 ... 12 mm)
cable gland M20x1.5 |

OXYMAT 6, field unit, gas and electrical connections

Selection and ordering data

Operating instructions	Article No.
ULTRAMAT 6 / OXYMAT 6 Gas analyzer for IR-absorbing gases and oxygen	
• German	C79000-G5200-C143
• English	C79000-G5276-C143
• French	C79000-G5277-C143
• Spanish	C79000-G5278-C143
• Italian	C79000-G5272-C143

More information

The complete documentation is available in various languages for downloading free of charge:

<http://www.siemens.com/processanalytics/documentation>

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OXYMAT 6

Suggestions for spare parts

1

Selection and ordering data

Description	7MB2021	7MB2011	7MB2011 Ex	2 years (quantity)	5 years (quantity)	Article No.
Analyzer unit						
O ring (sample cell)	x	x	x	2	4	C71121-Z100-A159
O ring (fitting)	x	x	x	1	2	C74121-Z100-A6
O-ring (measuring head)	x	x	x	2	4	C79121-Z100-A32
Spacer		x	x	-	1	C79451-A3277-B22
Sample chamber, stainless steel, mat. no. 1.4571; non-flow-type compensation branch	x	x	x	-	1	C79451-A3277-B535
Sample chamber, tantalum, non-flow-type compensation branch	x	x	x	-	1	C79451-A3277-B536
Sample chamber, stainless steel, mat. no. 1.4571; flow-type compensation branch	x	x	x	-	1	C79451-A3277-B537
Sample chamber, tantalum, flow-type compensation branch	x	x	x	-	1	C79451-A3277-B538
Measuring head, non-flow-type compensation branch	x	x	x	1	1	C79451-A3460-B525
Measuring head, flow-type compensation branch	x	x	x	1	1	C79451-A3460-B526
Magnetic field connection plate	x	x	x	-	1	C79451-A3474-B606
Temperature sensor		x	x	-	1	C79451-A3480-B25
Heating cartridge		x	x	-	1	W75083-A1004-F120
Sample gas path						
Pressure switch (sample gas)	x			1	2	C79302-Z1210-A2
Flowmeter	x			1	2	C79402-Z560-T1
Restrictor, stainless steel, mat. no. 1.4571; hose gas path	x			2	2	C79451-A3480-C10
Restrictor, titanium, pipe gas path	x	x	x	2	2	C79451-A3480-C37
Reference gas path, 3000 hPa	x	x	x	1	1	C79451-A3480-D518
Capillary, 100 hPa, connection set	x	x	x	1	1	C79451-A3480-D519
Restrictor, stainless steel, mat. no. 1.4571; pipe gas path	x	x	x	1	1	C79451-A3520-C5
Electronics						
Temperature controller - electronics, 230 V AC		x	x	-	1	A5E00118527
Temperature controller - electronics, 115 V AC		x	x	-	1	A5E00118530
Fusible element (analyzer fuse) T 0.125 A/250 V			x	1	2	A5E00061505
Front plate with keyboard	x			1	1	C79165-A3042-B505
Motherboard, with firmware: see spare parts list	x	x	x	-	1	
Adapter plate, LCD/keyboard	x	x		1	1	C79451-A3474-B605
LC display	x	x		1	1	A5E31474846
Connector filter	x	x	x	-	1	W75041-E5602-K2
Temperature fuse (heated version only)		x		-	1	W75054-T1001-A150
Fusible element, T 0.63 A/250 V	x	x	x	2	3	W79054-L1010-T630
Fusible element, T 1 A/250 V	x	x	x	2	3	W79054-L1011-T100
Fusible element, T 2.5 A/250 V		x	x	2	3	W79054-L1011-T250

If the OXYMAT 6 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.

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" slide-in module 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 digital inputs freely configurable (e.g. for measurement range switchover, processing of external signals from sample preparation)
- Six relay outputs freely configurable (failure, maintenance demanded, maintenance switch, threshold alarm, external magnetic valves)
- Two analog inputs configurable (e.g. correction of cross-interference, external pressure sensor)
- Expansion by eight additional digital inputs and eight additional relay outputs 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

Extractive continuous process gas analysis

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OXYMAT 61

General information

LED backlit graphic display and membrane keyboard with noticeable click

Status line to display the analyzer status (programmable)

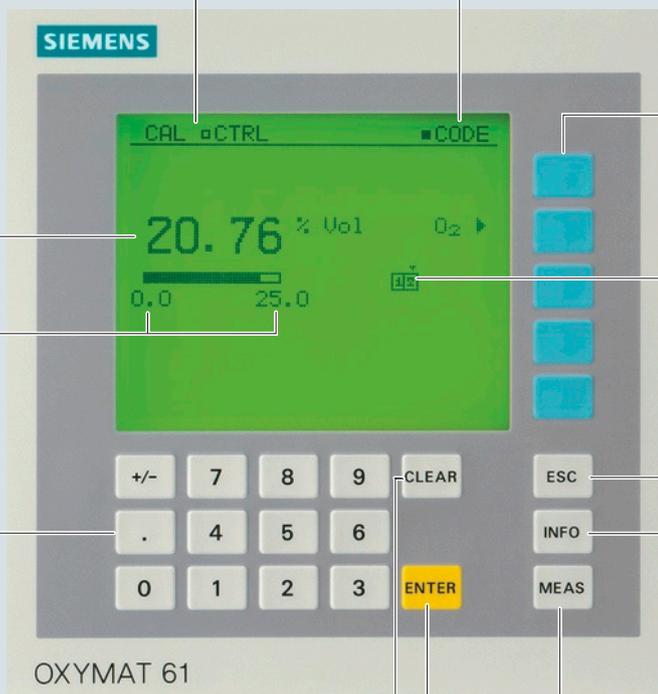
Two code levels according to NAMUR (maintenance and specialist level)

Display of concentrations as numbers and bargraph

Display of start-of-scale and full-scale values

Keyboard to enter values

CLEAR key to delete inputs



Easy operation menu controlling the softkeys

Display of current measuring ranges

ESC key to abort inputs

INFO key for help in plain text

MEAS key to return to measurement mode

ENTER key to accept input values

OXYMAT 61, membrane keyboard and graphic display

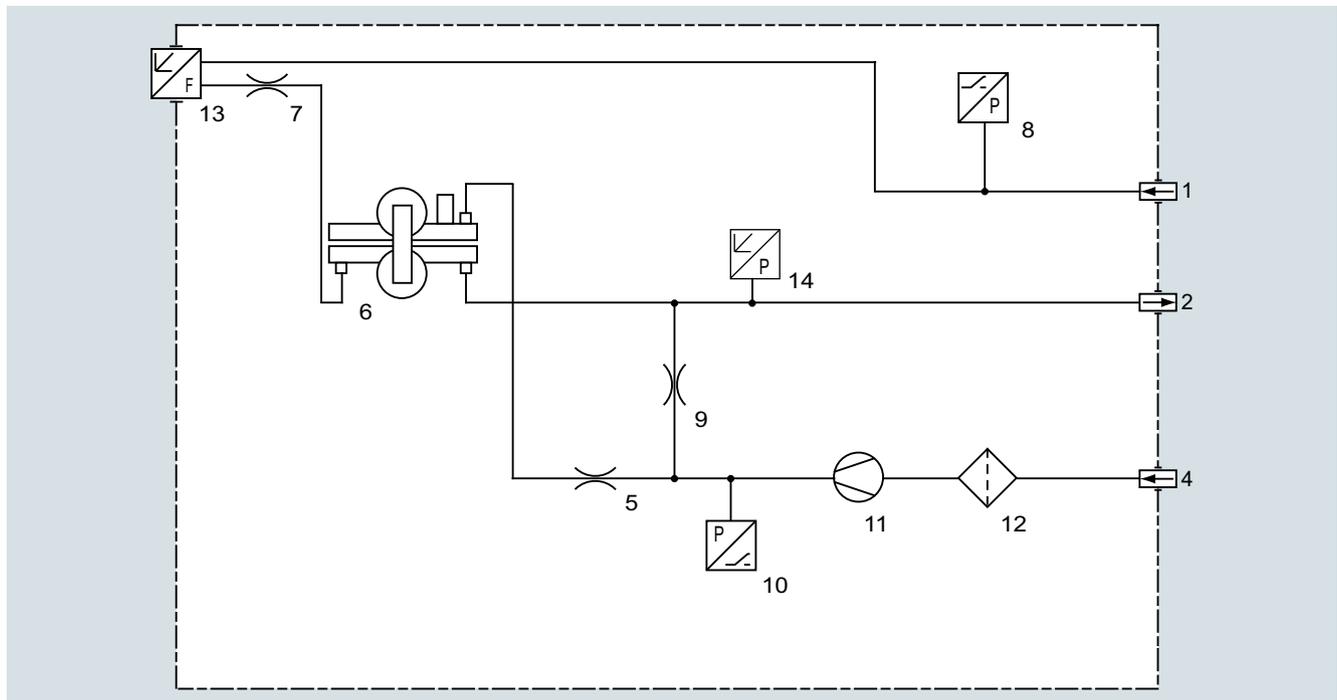
Designs – Parts wetted by sample gas, standard

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	Diaphragm	FKM (Viton)
	Enclosure	PA 6.3 T

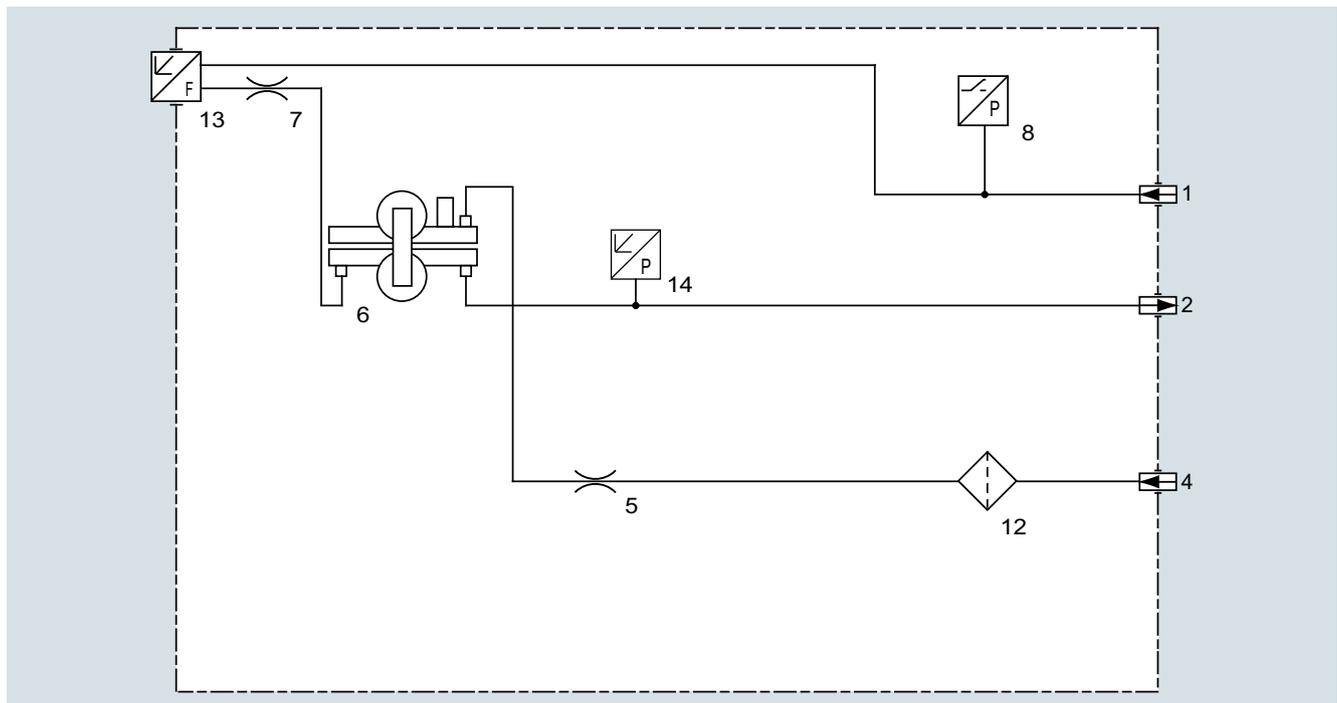
Gas path

Legend for the gas path figures

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



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

Extractive continuous process gas analysis

Series 6

OXYMAT 61

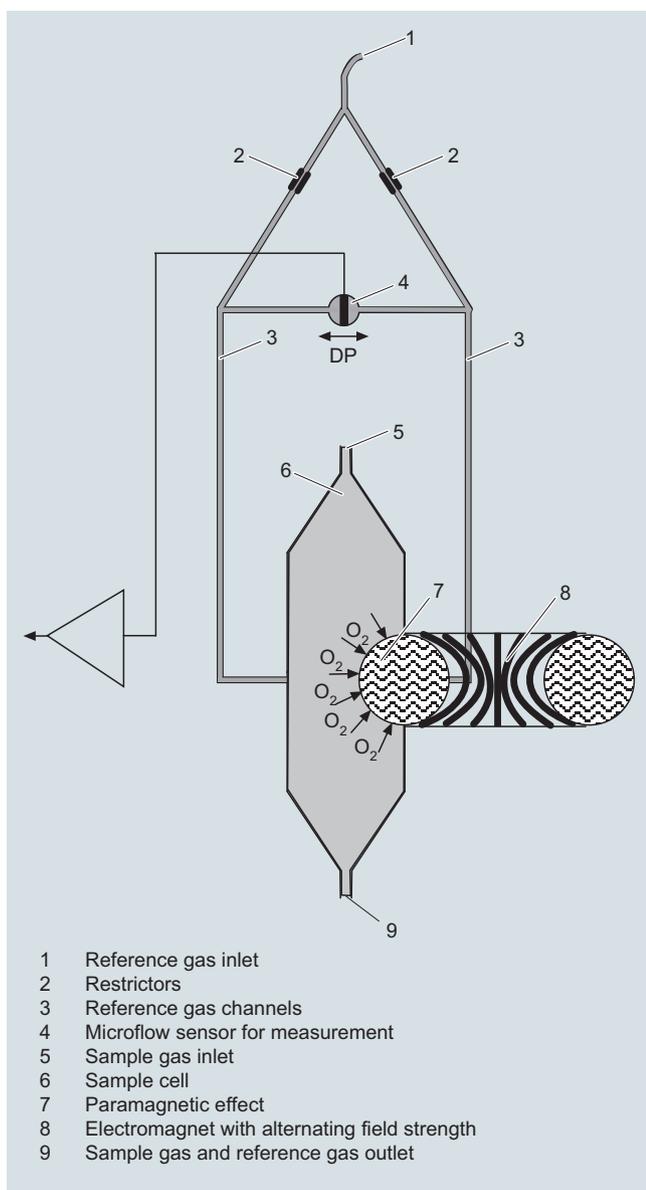
General information

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 in the sample chambers must be prevented. Therefore, gas modified for the measuring tasks is necessary in most application cases.

Essential characteristics

- Four measuring ranges which can be freely configured, even with suppressed zero point, all measuring ranges are 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 measuring range calibration can be configured
- Operation based on the NAMUR recommendation
- Monitoring of sample gas (option)
- 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	Inorganic gases	
iso-butane C ₄ H ₁₀	-1.30	Ammonia NH ₃	-0.20
1-butene C ₄ H ₈	-0.96	Hydrogen bromide HBr	-0.76
iso-butene C ₄ H ₈	-1.06	Chlorine Cl ₂	-0.94
Dichlorodifluoromethane (R12) CCl ₂ F ₂	-1.32	Hydrogen chloride HCl	-0.35
Acetic acid CH ₃ COOH	-0.64	Dinitrogen monoxide N ₂ O	-0.23
n-heptane C ₇ H ₁₆	-2.40	Hydrogen fluoride HF	+0.10
n-hexane C ₆ H ₁₄	-2.02	Hydrogen iodide HI	-1.19
Cyclo-hexane C ₆ H ₁₂	-1.84	Carbon dioxide CO ₂	-0.30
Methane CH ₄	-0.18	Carbon monoxide CO	+0.07
Methanol CH ₃ OH	-0.31	Nitrogen oxide NO	+42.94
n-octane C ₈ H ₁₈	-2.78	Nitrogen N ₂	0.00
n-pentane C ₅ H ₁₂	-1.68	Nitrogen dioxide NO ₂	+20.00
iso-pentane C ₅ H ₁₂	-1.49	Sulfur dioxide SO ₂	-0.20
Propane C ₃ H ₈	-0.87	Sulfur hexafluoride SF ₆	-1.05
Propylene C ₃ H ₆	-0.64	Hydrogen sulfide H ₂ S	-0.44
Trichlorofluoromethane (R11) CCl ₃ F	-1.63	Water H ₂ O	-0.03
Vinyl chloride C ₂ H ₃ Cl	-0.77	Hydrogen H ₂	+0.26
Vinyl fluoride C ₂ H ₃ F	-0.55		
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: $k = 333 \text{ K} / (\varphi [^{\circ}\text{C}] + 273 \text{ K})$
- with paramagnetic gases: $k = [333 \text{ K} / (\varphi [^{\circ}\text{C}] + 273 \text{ K})]^2$

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	Atm. pressure with internal reference gas pump	

Extractive continuous process gas analysis

Series 6

OXYMAT 61

19" rack unit

1

Technical specifications

General information		Measuring response	
Measuring ranges	4, internally and externally switchable; autoranging is also possible	Output signal fluctuation	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
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	Zero point drift	< ± 0.5%/month of the smallest possible span according to rating plate
Largest possible measuring span	100 vol.% O ₂	Measured-value drift	< ± 0.5%/month of the current measuring range
Measuring ranges with suppressed zero point	Any zero point within 0 ... 100 vol.% can be implemented, provided that a suitable reference gas is used	Repeatability	< 1% of the current measuring range
Operating position	Front wall, vertical	Detection limit	1% of the current measuring range
Conformity	CE mark in accordance with EN 50081-1 and EN 50082-2	Linearity error	< 1% of the current measuring range
Design, enclosure		Influencing variables	
Degree of protection	IP20 according to EN 60529	Ambient temperature	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Weight	Approx. 13 kg	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.)	< 1% of the current measuring range/10 K Zero offset: < 0.1 vol.% O ₂ absolute/10 K
Electrical characteristics		Accompanying gases	<ul style="list-style-type: none"> With disabled pressure compensation: < 2% of the current measuring range/1% pressure change With enabled pressure compensation: < 0.2% of the current measuring range/1% pressure change
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	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 consumption	Approx. 45 VA	Auxiliary power	< 0.1% of the current measuring range with rated voltage ± 10%
EMC (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98)	Electrical inputs and outputs	
Electrical safety	According to EN 61010-1, overvoltage category III	Analog output	0/2/4 ... 20 mA, floating; max. load 750 Ω
Fuse values	100 ... 120 V: 1.0 T/250 200 ... 240 V: 0.63 T/250	Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load: 24 V AC/DC/1 A, floating
Gas inlet conditions		Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and accompanying gas influence correction (correction of cross-interference)
Permissible sample gas pressure	800 ... 1 200 hPa absolute	Digital inputs	6, designed for 24 V, floating, freely configurable, e.g. for measuring range switchover
• External reference gas supply	Atmospheric pressure ± 50 hPa	Serial interface	RS 485
• With integrated pump		Options	AUTOCAL function each with 8 additional digital inputs and relay outputs, also with PROFIBUS PA or PROFIBUS DP
Sample gas flow	18 ... 60 l/h (0.3 ... 1 l/min)	Climatic conditions	
Sample gas temperature	Min. 0 to max. 50 °C, but above the dew point	Permissible ambient temperature	-30 ... +70 °C during storage and transportation 5 ... 45 °C during operation
Sample gas humidity	< 90% relative humidity	Permissible humidity	< 90% relative humidity as annual average, during storage and transportation (must not fall below dew point)
Reference gas pressure (high-pressure version)	2 000 to 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, configurable		
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)		

Selection and ordering data	Article No.	
OXYMAT 61 gas analyzer 19" rack unit for installation in cabinets	7MB2001- A 0 0 -	Cannot be combined
➤ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.		
<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 <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 	A 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	

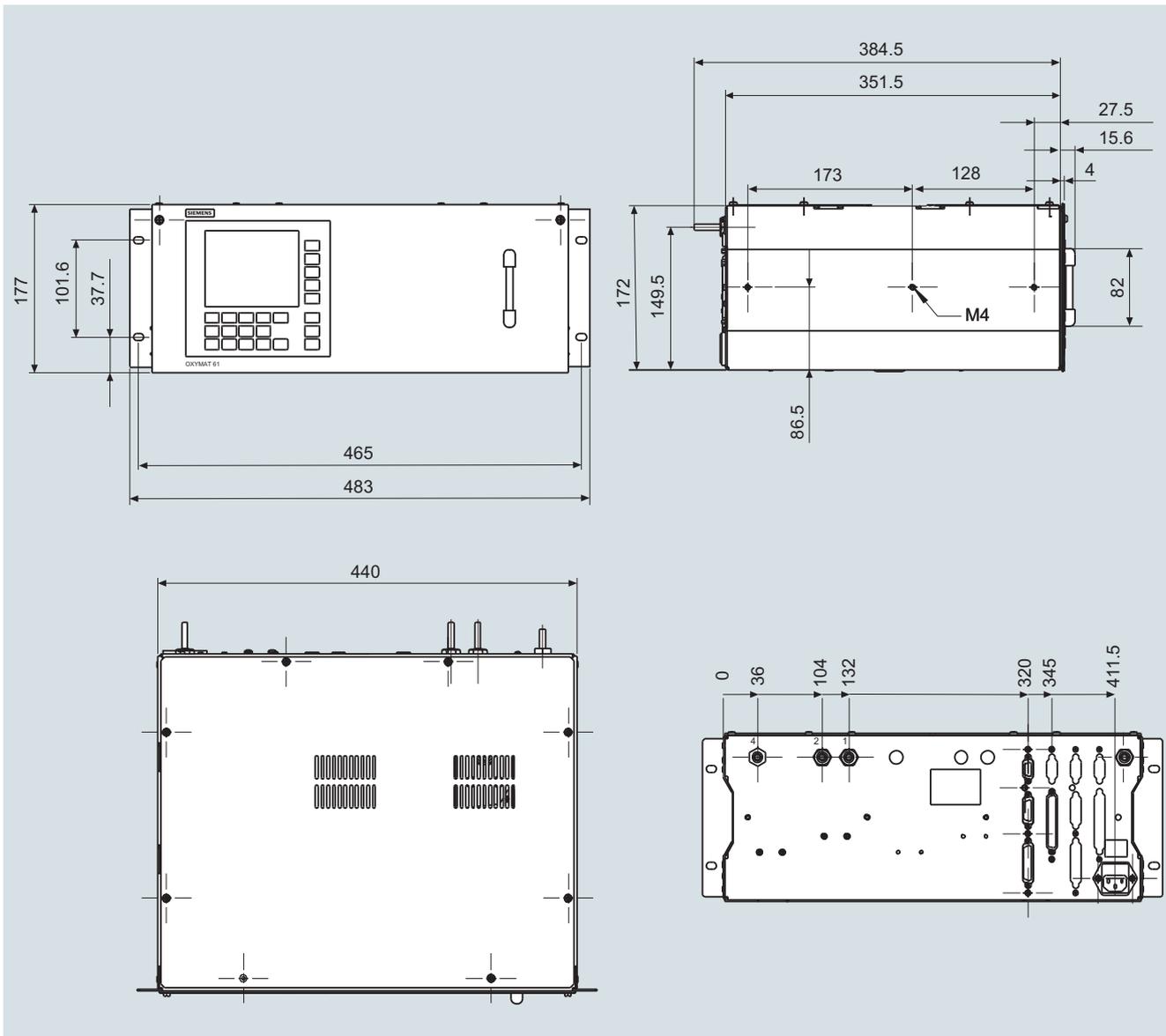
¹⁾ Standard setting:
 Measuring range 1: 0 to smallest measuring span
 Measuring range 2: 0 to 10 %
 Measuring range 3: 0 to 25 %
 Measuring range 4: 0 to 100 %

Extractive continuous process gas analysis

Series 6

OXYMAT 61

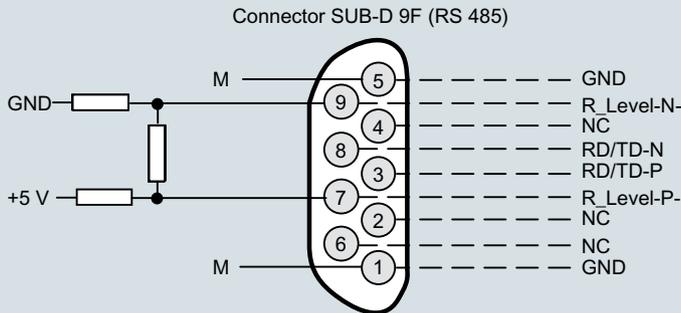
19" rack unit

Dimensional drawings

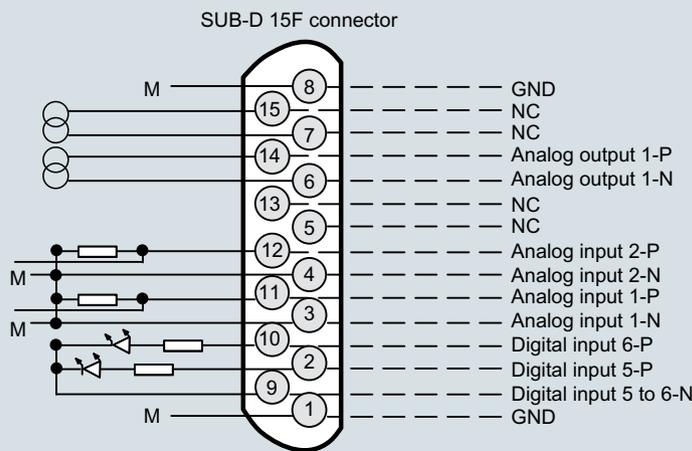
OXYMAT 61, 19" unit, dimensions in mm

Circuit diagrams

Pin assignment (electrical connections)

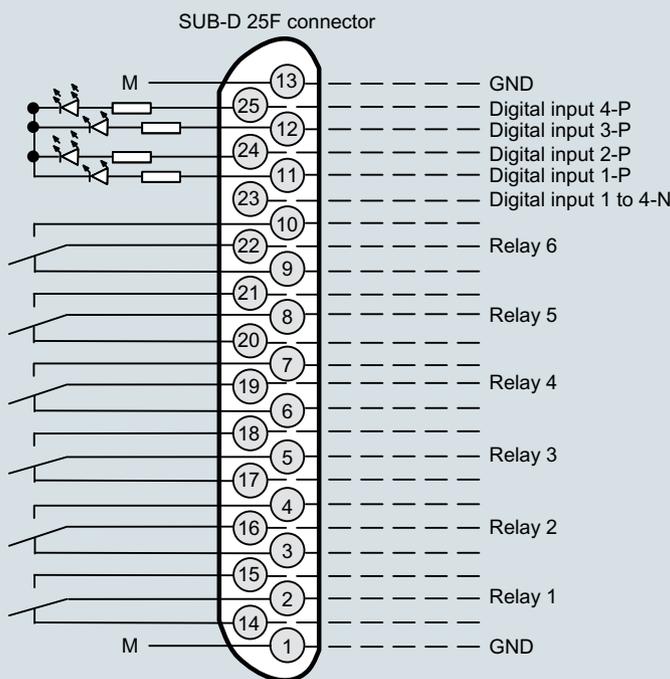


It is possible to connect bus terminating resistors to pins 7 and 9.



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

Pressure correction } Non-isolated analog inputs,
 Pressure correction } 0 ... 20 mA/500 Ω or
 Correction of cross-interference } 0 ... 10 V (low resistance)
 Correction of cross-interference }



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

Contact load max. 24 V/1 A, AC/DC
 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.

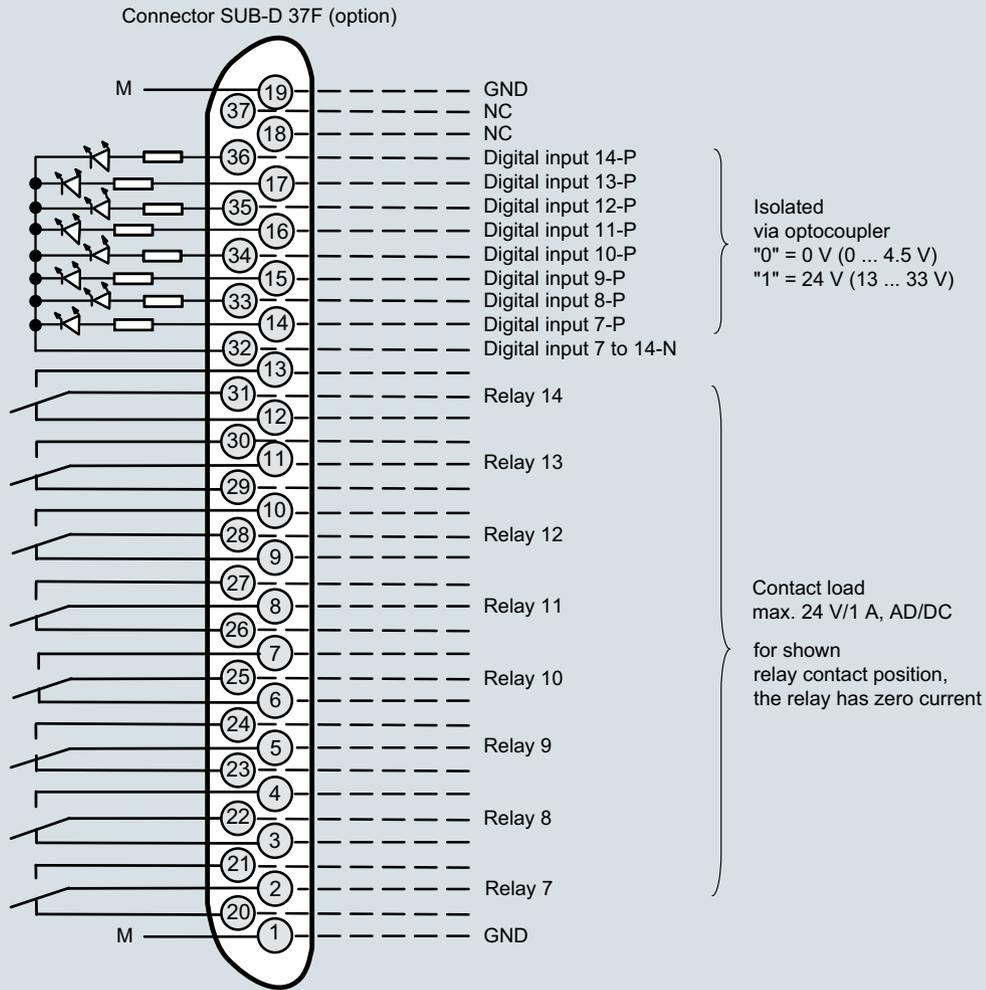
OXYMAT 61, 19" unit, pin assignment

Extractive continuous process gas analysis

Series 6
OXYMAT 61

19" rack unit

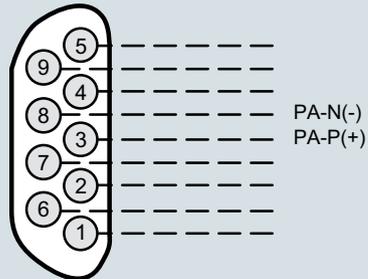
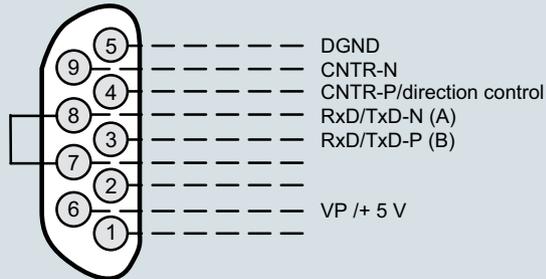
Pin assignment (electrical connections)



Connector SUB-D 9F-X90
PROFIBUS DP

Optional

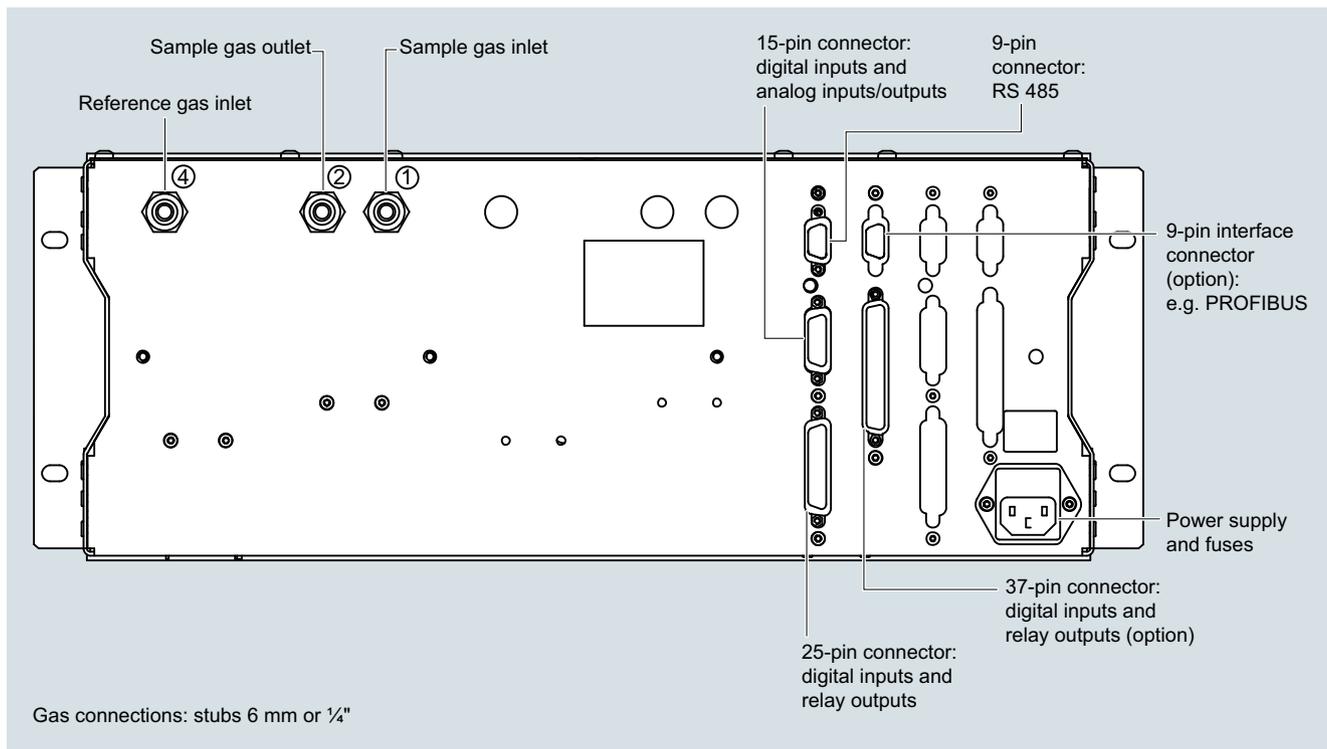
Connector SUB-D 9M-X90
PROFIBUS PA



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

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

Gas and electrical connections



OXYMAT 61, 19" unit, gas and electrical connections

Extractive continuous process gas analysis

Series 6

OXYMAT 61

Documentation, suggestions for spare parts

1

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

More information

The complete documentation is available in various languages for downloading free of charge:

<http://www.siemens.com/processanalytics/documentation>

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	A5E31474846
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.

Overview

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 (option)

Application

Production of technical gases

- Measurements in N₂ and CO₂

Welding

- Measurements in protective gases during welding of highly alloyed steels, titanium, etc.

Systems for air separation

- Measurements in N₂ and in inert gases (e.g. Ne, Ar)
Measurements in CO₂

Food production

- Measurement in CO₂ (e.g. breweries)

Electronics industry

- Low-pressure version with pump

Flow soldering systems

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)
- Connections for sample gas
 - Input: Clamping ring connection for a pipe diameter of 6 mm or 1/4"
 - Output: Pipe connection with diameter 6 mm or 1/4"
- High-pressure and low-pressure versions
- Catalytically active and inactive cell

Display and control panel

- Large LCD field for simultaneous display of
 - Measured value
 - Status bar
 - Measuring 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 operation for parameterization, configuration, 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
- Switchover from ppm/vpm measuring range to % measuring range

Input and outputs

- One analog output per medium (from 0, 2, 4 to 20 mA; NAMUR parameterizable)
- Six digital inputs freely configurable (e.g. for measurement range switchover, processing of external signals from sample preparation)
- Six relay outputs freely configurable (failure, maintenance demanded, maintenance switch, threshold alarm, external magnetic valves)
- Two analog inputs configurable (e.g. correction of cross-interference, external pressure sensor)
- Expansion by eight additional digital inputs and eight additional relay outputs 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 the service and maintenance tool

Extractive continuous process gas analysis

Series 6

OXYMAT 64

General information

LED backlit graphic display and membrane keyboard with noticeable click

Status line to display the analyzer status (programmable)

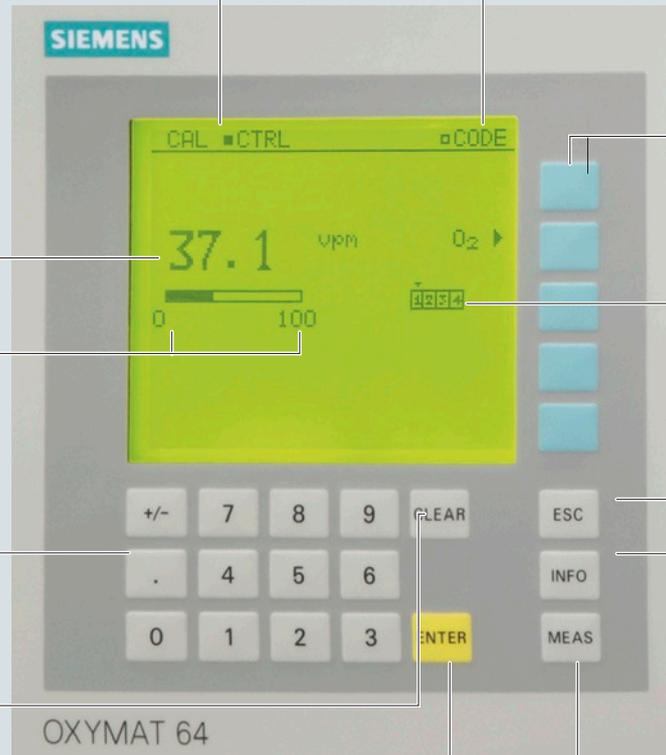
Two code levels according to NAMUR (maintenance and specialist level)

Display of concentrations as numbers and bargraph

Display of start-of-scale and full-scale values

Keyboard to enter values

CLEAR key to delete inputs



Easy operation menu controlling the softkeys

Display of current measuring ranges

ESC key to abort inputs

INFO key for help in plain text

MEAS key to return to measurement mode

ENTER key to accept input values

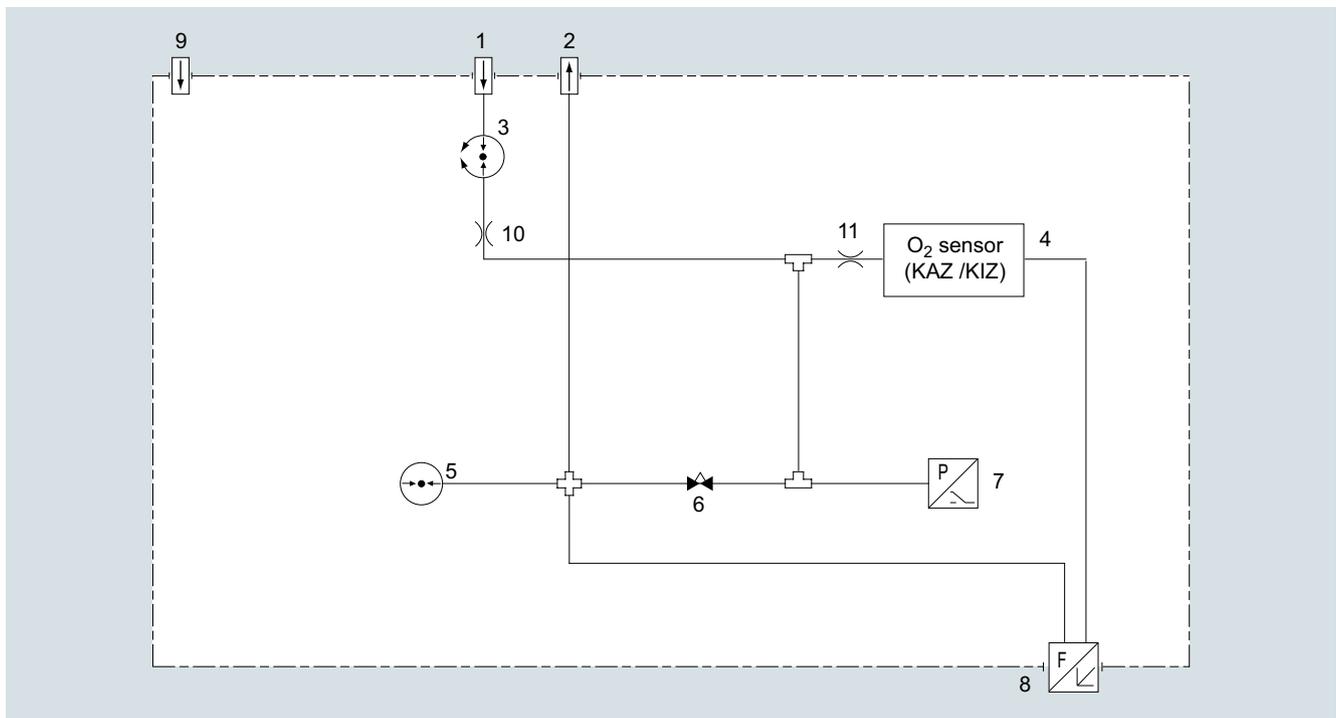
OXYMAT 64, membrane keyboard and graphic display

Designs – Parts wetted by sample gas, standard

Gas path		19" rack unit
Sample gas path	Bushing	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
	Diaphragm	NBR

Gas path (high-pressure version)**Legend for the gas path figure**

1	Sample gas inlet; inlet pressure - Without internal pressure regulator: 2 000 hPa (abs.), regulated - With internal pressure regulator: 2 000 ... 6 000 hPa (abs.)	6	Bypass restrictor
2	Sample gas outlet; sample gas flows off free of dynamic pressure	7	Pressure switch
3	Pressure regulator (order version)	8	Flow measuring tube
4	O ₂ sensor	9	Purging gas connection
5	Pressure sensor	10	Restrictor
		11	Sample gas restrictor



Gas path OXYMAT 64, high-pressure version

The sample gas pressure (2 000 to 6 000 hPa) is regulated by the pressure regulator (3) at approx. 2 000 hPa or is provided by the operator with 2 000 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 to the atmospheric 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.), a maintenance demanded is output.

Extractive continuous process gas analysis

Series 6

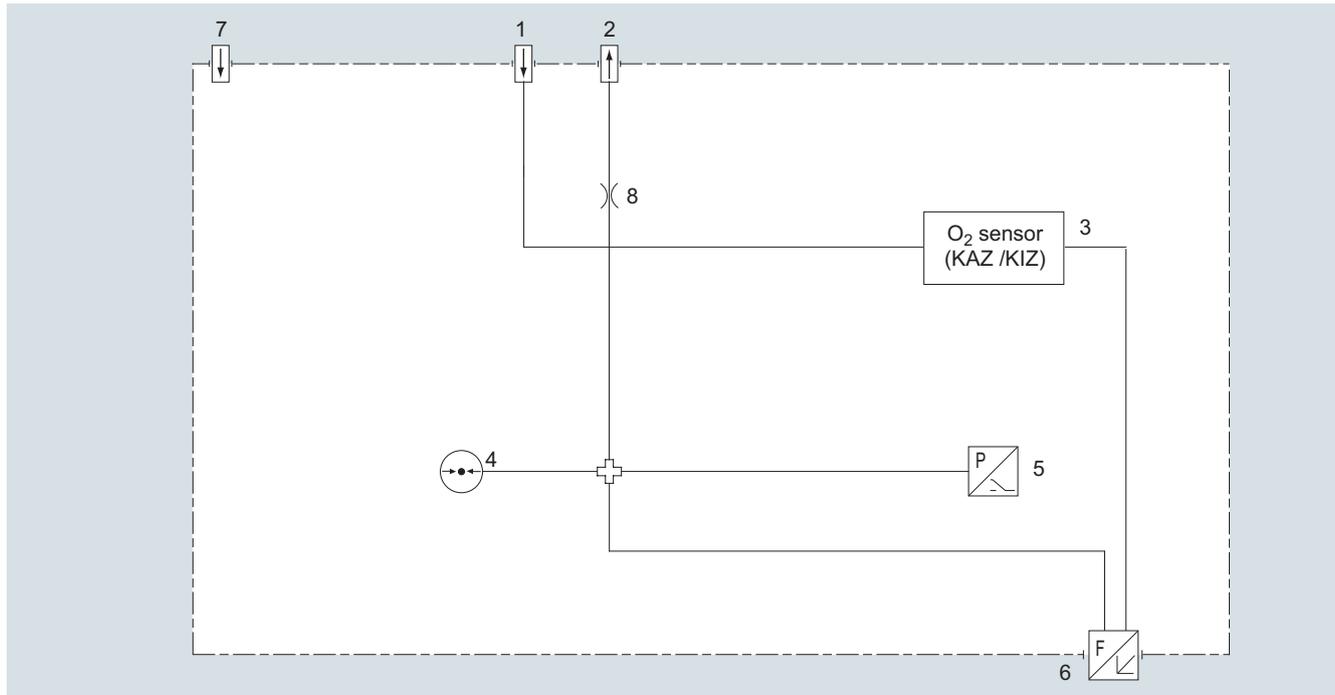
OXYMAT 64

General information

Gas path (low pressure)

Legend for the gas path figure

1	Sample gas inlet; flow 125 ml/min (7.5 l/h)	5	Pressure switch
2	Sample gas outlet; sample gas flows off free of dynamic pressure	6	Flow measuring tube
3	O ₂ sensor	7	Purging gas connection
4	Pressure sensor	8	Restrictor

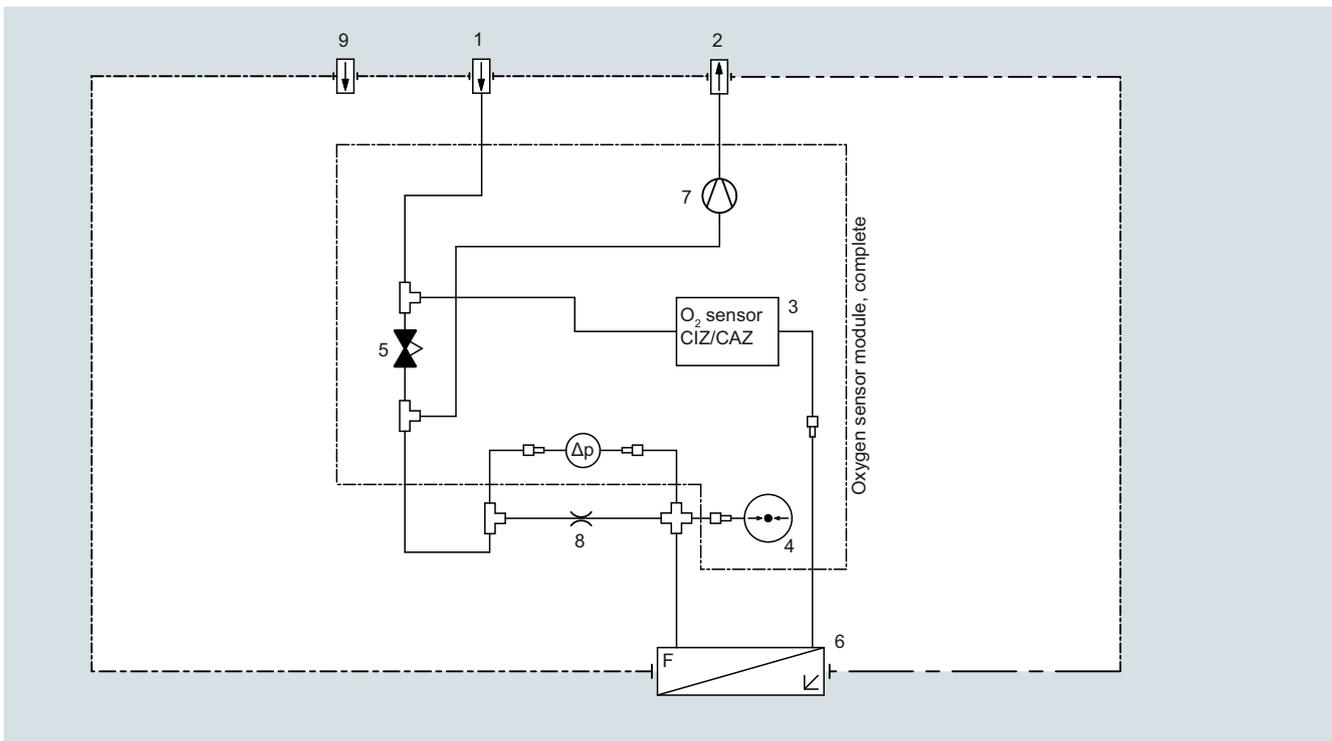


Gas path OXYMAT 64, low-pressure version

With the low-pressure version, the sample gas flow must be set externally to 125 ml/min. With a built-in pressure switch, the sample gas pressure is approx. 30 hPa above the current atmospheric pressure since the sample gas flows off via a restrictor. If the resulting dynamic pressure exceeds 100 hPa (rel.), a maintenance demanded is output. In order to reduce the 90% time, we recommend installation of a bypass upstream of the gas inlet which then provides a faster exchange of gas. This is particularly important with long sample gas lines between the gas sampling point and the analyzer. Please make absolutely sure that the flow in the OXYMAT 64 does not exceed 125 ml/min.

Gas path (low pressure with integrated sample gas pump)**Legend for the gas path figure**

1	Sample gas inlet	6	Flow measuring tube
2	Sample gas outlet; sample gas flows off free of dynamic pressure	7	Sample gas pump
3	O ₂ sensor	8	Restrictor
4	Pressure sensor	9	Purging gas connection
5	Needle valve		

**Low-pressure version with integral sample gas pump**

The device version "OXYMAT 64 low-pressure with pump" is equipped with a sample gas pump which automatically provides a constant sample gas flow of 125 ml/min through the sensor. By means of an internal bypass, the total flow of sample gas through the analyzer is increased to approx. 0.4 l/min. This measure significantly improves the analyzer's response time.

Extractive continuous process gas analysis

Series 6

OXYMAT 64

General information

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 $650\text{ }^\circ\text{C}$. 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 conducts ions at $650\text{ }^\circ\text{C}$, 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.

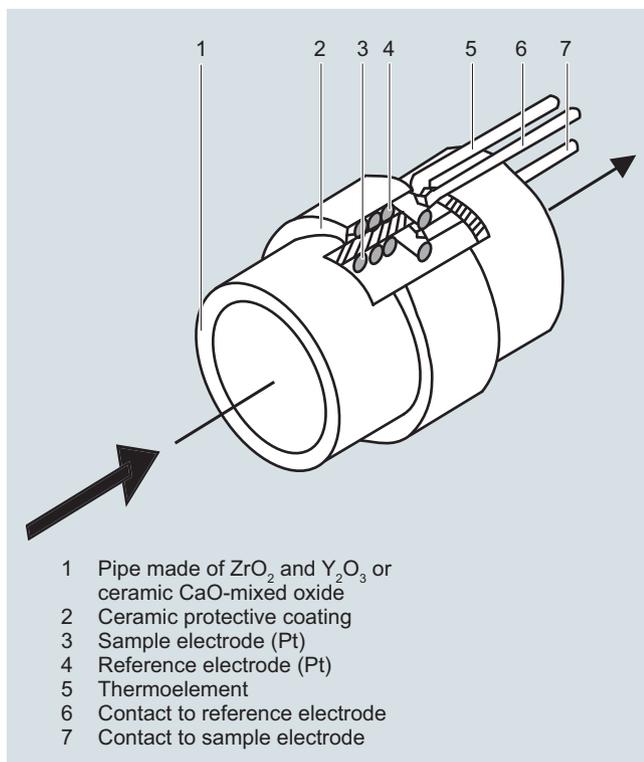
Defects in the crystal lattice, caused by contamination of the ZrO_2 material with Y_2O_3 and/or CaO (introduced originally to prevent cracks forming in ceramic material) make it easier for O_2 ions to diffuse in the ZrO_2 grid.

Catalytically active ZrO_2 sensor (CAZ)

The electrode material is made of platinum (Pt). This type of sensor has a higher cross-sensitivity when flammable accompanying gas components are present.

Catalytically inactive ZrO_2 sensor (CIZ)

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 except of H_2 , CO and CH_4 .



OXYMAT 64, principle of operation

Measuring effect

$$U = U_A + RT/4F (\ln [O_{2,air}] - \ln [O_2]) \text{ (equation 1)}$$

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 measuring tasks is necessary in most application cases.

Calibration

Calibration of the calibration point is carried out as with the other analyzers of Series 6 after a maximum of 14 days by connecting the calibration gas O_2 in residual N_2 at concentrations of approx. 60 to 90% of the master measuring range.

Contrary to the other analyzers of Series 6, the zero point calibration cannot be carried out using pure nitrogen, but with a "small" concentration of oxygen in nitrogen appropriate to the selected measuring range (e.g.: Measuring range 0 to 10 vpm; calibration gas approx. 2 vpm O_2 in residual N_2).

Essential characteristics

- 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
- Autoranging selectable; possibility of remote switching
- 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 measuring range calibration can be configured
- Operation based on the NAMUR recommendation
- Monitoring of the sample gas (via pressure switch)
- Customer-specific analyzer options such as:
 - Customer acceptance
 - TAG labels
 - Drift recording
- Simple handling using a numerical membrane keyboard and operator prompting
- Smallest span 0 to 10 vpm O_2
- Largest span 0 to 100 % (testing with ambient air)
- Internal pressure sensor for correction of the influence of sample gas pressure fluctuations

Influence of interfering gasCatalytically active sensor (CAZ)

Very large cross-interference of all combustible accompanying gases. Thus not suitable for use with combustible accompanying gases!

Catalytically inactive sensor (CIZ)

There is only a slight cross-interference in the case of accompanying gases with a concentration in the range of the O₂ concentration. H₂, CO and CH₄ still have a noticeable effect in the case of flammable accompanying gas components.

Measured component / interfering gas	Diagonal gas offset
78 vpm O ₂ /140 vpm CO	-6.1 vpm
10 vpm O ₂ /10 vpm CO	-0.6 vpm
74 vpm O ₂ / 25 vpm CH ₄	-0.3 vpm
25 vpm O ₂ / 357 vpm CH ₄	-1.1 vpm
25 vpm O ₂ / 70 vpm H ₂	-3 vpm
5 vpm O ₂ / 9.6 vpm H ₂	-0.55 vpm
170 vpm O ₂ / 930 vpm C ₂ H ₄	-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).

Extractive continuous process gas analysis

Series 6

OXYMAT 64

19" rack unit

1

Technical specifications

General

Measurement 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 ... 10 vpm O ₂
Largest possible measuring span	0 ... 100%
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 interference immunity (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98) and EN 61326
Electrical safety	In accordance with EN 61010-1, overvoltage category II
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. 37 VA
Fuse values	100 ... 120 V: 1.0T/250 200 ... 240 V: 0.63T/250

Gas inlet conditions

Sample gas flow	7.5 l/h
• through the sensor	
• Overall consumption	15 ... 30 l/h
Permissible sample gas pressure	
• Without internal pressure regulator	2 000 hPa (abs.)
• With internal pressure regulator	2 000 ... 6 000 hPa (abs.)
Sample gas temperature	Min. 0 ... max. 50 °C, but above the dew point
Sample gas humidity	< 1% relative humidity

Dynamic response

Warm-up period	At room temperature < 30 min (the technical specification will be met after 2 hours)
Damping (electrical time constant)	0 ... 100 s, configurable
Dead time (high-pressure version) (purging time of the gas path in the unit at 125 ml/min)	10 ... 30 s
Dead time (low-pressure version without pump)	< 5 s
Dead time (low-pressure version with pump)	< 10 s
Time for device-internal signal processing	< 1 s

Pressure correction range

Pressure sensor internal	800 ... 1 100 hPa (abs.)
--------------------------	--------------------------

Measuring response

	Based on sample gas pressure 1 013 hPa absolute, 7.5 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation	< ± 1% of the smallest possible measuring range according to rating plate, with electronic damping constant of 1 s
Zero point drift	< ± 1% of the current span/month
Measured-value drift	< ± 1% of the current span/month
Repeatability	< 3% of the current measuring span
Detection limit	1% of current measuring range, < 0.1 vpm in measuring range 0 ... 10 vpm
Linearity error	< 2% of the current measuring span

Influencing variables

	Based on sample gas pressure 1 013 hPa absolute, 7.5 l/min sample gas flow and 25 °C ambient temperature
Ambient temperature	< 2%/10 K referred to current measuring span
Sample gas pressure only possible if the sample gas can flow out into the ambient air	<ul style="list-style-type: none"> • With deactivated pressure compensation: < 1% of current span/1% pressure change • With activated pressure compensation: < 0.2% of current span / 1% pressure change
Residual gases, deviation from zero point	Only gases with non-combustible residual gas components can be introduced
• Catalytically active sensor (CAZ)	Residual gas concentration of 10 vpm H ₂ ; CO and CH ₄ have a lower cross-interference; higher HCs are negligible
• Catalytically inactive sensor (CIZ)	
Sample gas flow	< 2% of the smallest possible span with a change in flow of 10 ml/min
Power supply	< 0.1% of the current measuring range with rated voltage ± 10%

Electrical inputs and outputs

Analog output	0/2/4 ... 20 mA, 4 ... 20 mA (NAMUR), 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, isolated
Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and correction of influence of residual gas (correction of cross-interference)
Digital inputs	6, designed for 24 V, isolated, freely parameterizable, e.g. for measurement range switchover
Serial interface	RS 485
Options	AUTOCAL function each with 8 additional digital 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 in operation
Permissible humidity	< 90% relative humidity as annual average, during storage and transportation (must not fall below dew point)

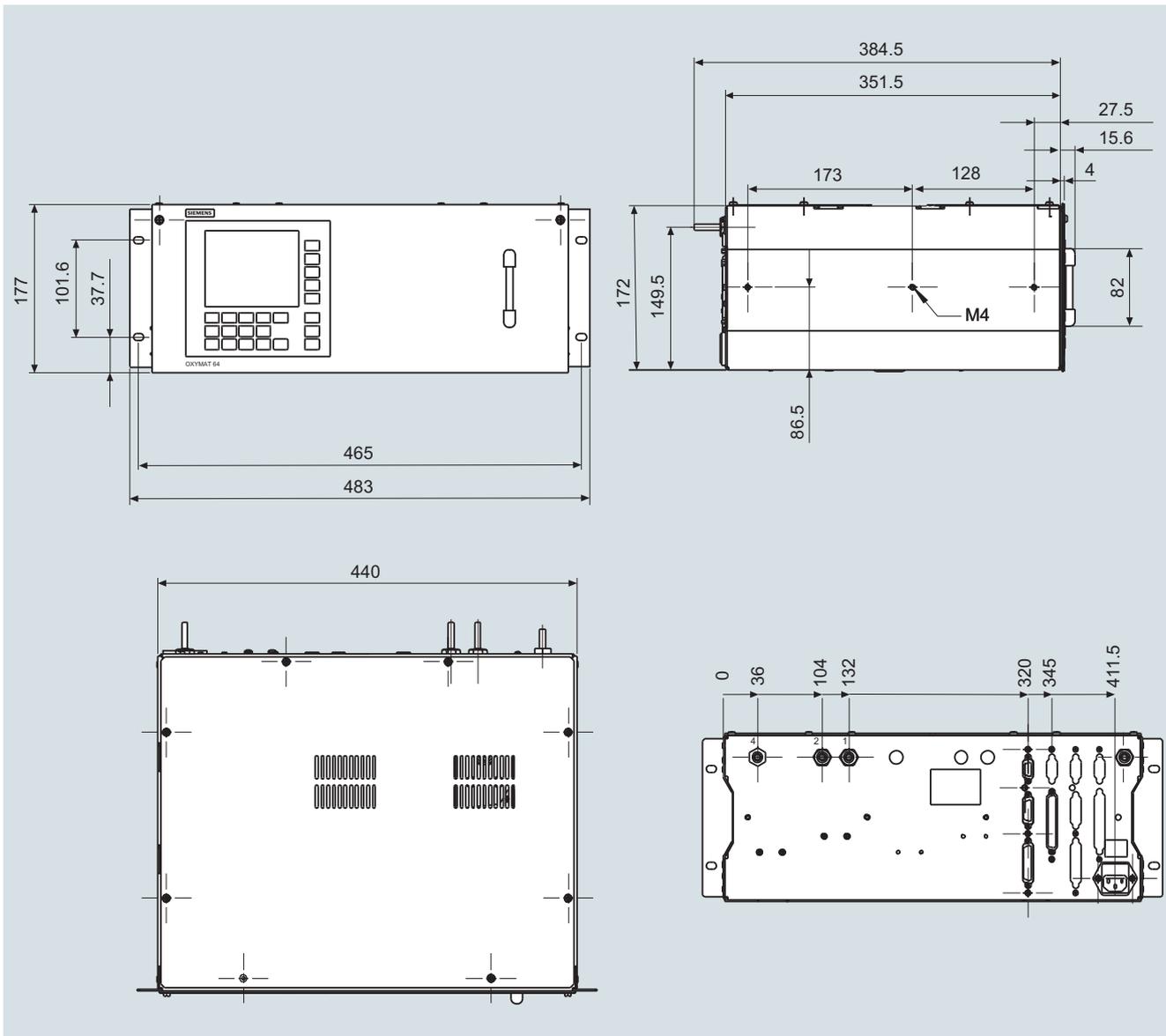
Selection and ordering data	Article No.	
OXYMAT 64 gas analyzer 19" rack unit for installation in cabinets	7MB2041- 0 1 - A	Cannot be combined
➤ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.		
<u>Sensor</u> ZrO ₂ : Catalytically active cell (CAC) ZrO ₂ : Catalytically inactive cell (CIC) ZrO ₂ : Catalytically active cell (CAC); with differential pressure sensor ZrO ₂ : Catalytically inactive cell (CIC); with differential pressure sensor	0 1 2 3	0 1 2 3
<u>Sample gas pressure</u> High pressure, without pressure regulator 2 000 hPa (abs.) High pressure, with pressure regulator 2 000 ... 6 000 hPa (abs.) Low pressure, with pump Atmosphere Low pressure, without suction pump Atmosphere	A B C D	C A B D
<u>Gas connection</u> Input Clamping ring connection 6 mm Output Fittings 6 mm Input Clamping ring connection ¼" Output Fitting ¼"	A B	
<u>Add-on electronics</u> Without AUTOCAL function • With 8 additional digital inputs/outputs • With 8 additional digital inputs/outputs and PROFIBUS PA interface • With 8 additional digital inputs/outputs and PROFIBUS DP interface	0 1 6 7	
<u>Power supply</u> 100 to 120 V AC, 48 to 63 Hz 200 to 240 V AC, 48 to 63 Hz	0 1	
<u>Explosion protection</u> Without	A	
<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	
Clean for O ₂ service (specially cleaned gas path)	Y02	
Measuring range indication in plain text, if different from the standard setting	Y11	
Special setting (only in conjunction with an application no., e.g. extended measuring range)	Y12	
Extended special setting (only in conjunction with an application no., e.g. determination of cross-interferences)	Y13	
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	

Extractive continuous process gas analysis

Series 6

OXYMAT 64

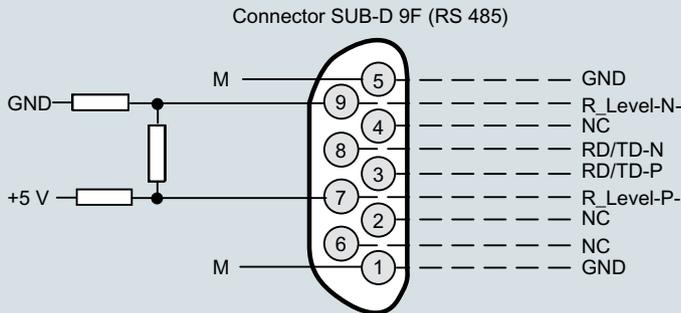
19" rack unit

Dimensional drawings

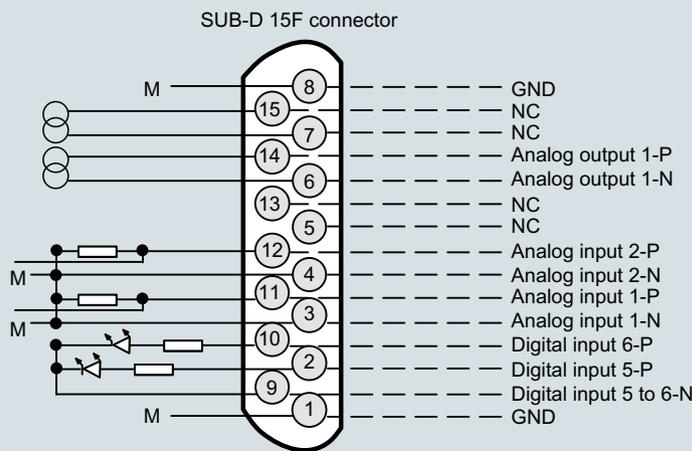
OXYMAT 64, 19" rack unit, size in mm

Circuit diagrams

Pin assignment (electrical connections)

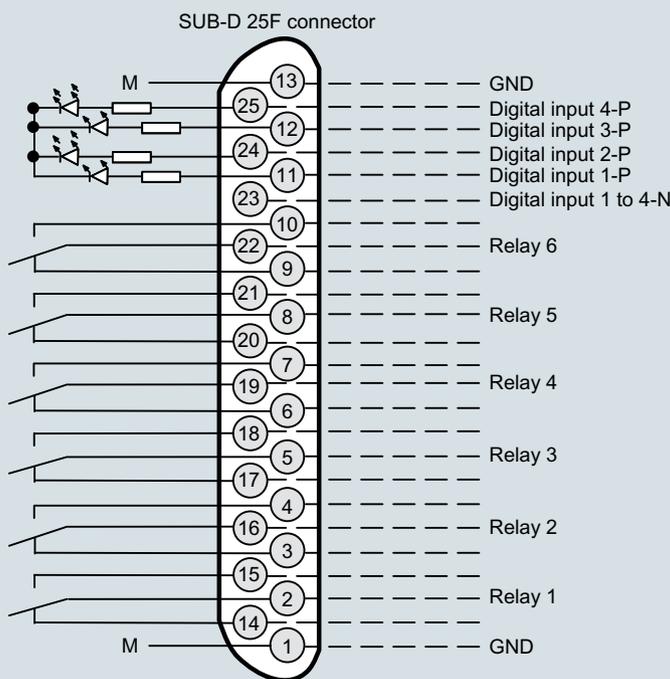


It is possible to connect bus terminating resistors to pins 7 and 9.



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

Pressure correction } Non-isolated analog inputs,
 Pressure correction } 0 ... 20 mA/500 Ω or
 Correction of cross-interference } 0 ... 10 V (low resistance)
 Correction of cross-interference }



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

Contact load max. 24 V/1 A, AC/DC
 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.

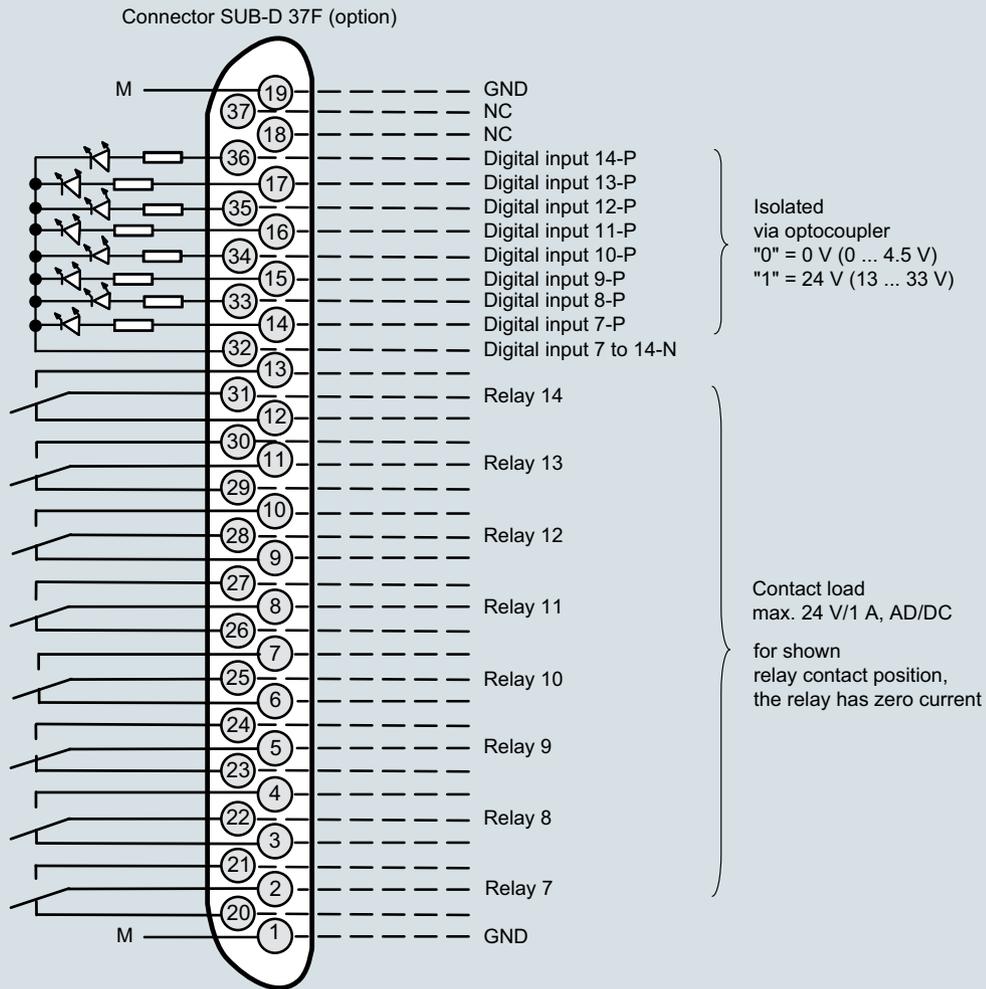
OXYMAT 64, 19" rack unit, pin assignment

Extractive continuous process gas analysis

Series 6
OXYMAT 64

19" rack unit

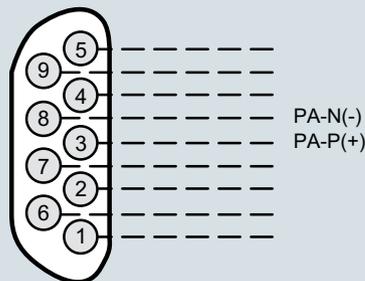
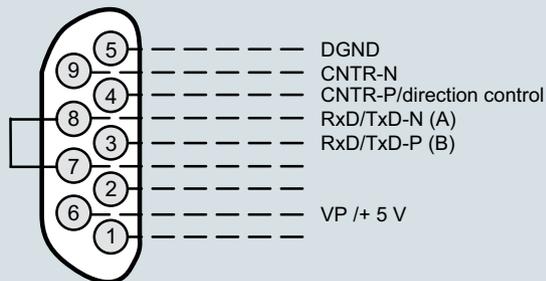
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Connector SUB-D 9F-X90
PROFIBUS DP

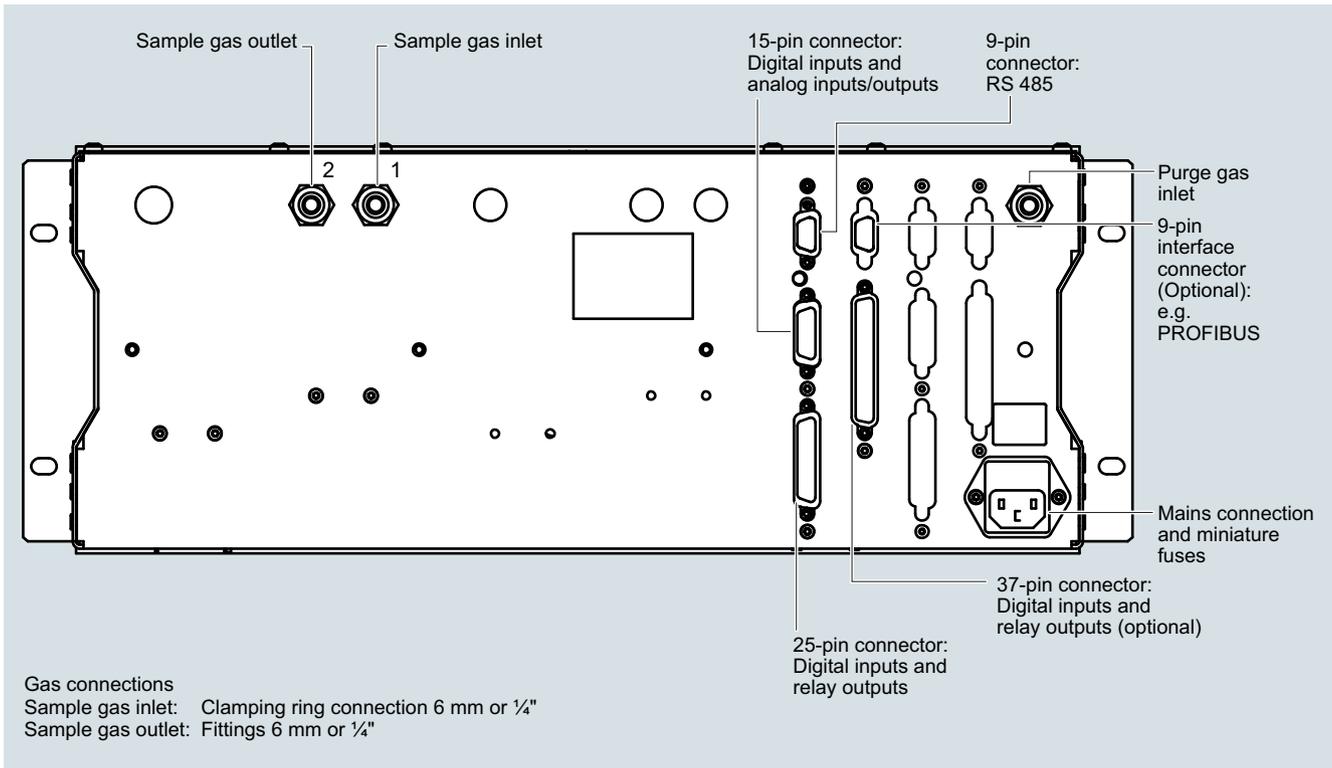
Optional

Connector SUB-D 9M-X90
PROFIBUS PA



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

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

Gas connections and pin assignment

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

Extractive continuous process gas analysis

Series 6

OXYMAT 64

Documentation, suggestions for spare parts

1

Selection and ordering data

Operating instructions	Article No.
Gas analyzers of Series 6 and ULTRAMAT 23 Schnittstelle/Interface PROFIBUS DP/PA • German and English	A5E00054148

More information

The complete documentation is available in various languages for downloading free of charge:
<http://www.siemens.com/processanalytics/documentation>

Selection and ordering data

Description	7MB2041	2 years (quantity)	5 years (quantity)	Article No.
Pressure regulator as spare part	x	–	1	A5E01008972
Flowmeter	x	–	1	A5E01061561
Adapter plate, LC display/keypad	x	1	1	C79451-A3474-B605
LC display	x	–	1	A5E31474846
Connector filter	x	–	1	W75041-E5602-K2
Fuse, T 0.63 A, line voltage 200 ... 240 V	x	2	4	W79054-L1010-T630
Fuse, T 1 A, line voltage 100 ... 120 V	x	2	4	W79054-L1011-T100

Overview

The CALOMAT 6 gas analyzer is primarily used for quantitative determination of H₂ or He in digital or quasi-digital non-corrosive gas mixtures.

Concentrations of other gases can also be measured if their thermal conductivities differ significantly from the residual gases like Ar, CO₂, CH₄, NH₃.

Benefits

- Small T₉₀ time due to micromechanical-produced Si sensor
- Universally applicable hardware basis, high measuring range dynamics (e.g. 0 to 1 %, 0 to 100 %, 95 to 100 % H₂)
- Integrated correction of cross-interference, no external calculation required
- Open interface architecture (RS 485, RS 232, PROFIBUS)
- SIPROM GA network for maintenance and service information (option)
- Electronics and physics: gas-tight separation, purgeable, IP65, long service life even in harsh environments
- Ex(p) for Zones 1 and 2 (in accordance with 94/9/EC (ATEX 2G and ATEX 3G), and Class I Div 2 (CSA) Ex(n))

Application**Fields of application**

- Pure gas monitoring (0 to 1 % H₂ in Ar)
- Protective gas monitoring (0 to 2 % He in N₂)
- Hydroargon gas monitoring (0 to 25 % H₂ in Ar)
- Forming gas monitoring (0 to 25 % H₂ in N₂)
- Gas production:
 - 0 to 2 % He in N₂
 - 0 to 10 % Ar in O₂
- Chemical applications:
 - 0 to 2 % H₂ in NH₃
 - 50 to 70 % H₂ in N₂
- Wood gasification (0 to 30 % H₂ in CO/CO₂/CH₄)
- Blast furnace gas (0 to 5 % H₂ in CO/CO₂/CH₄/N₂)
- Bessemer converter gas (0 to 20 % H₂ in CO/CO₂)
- Monitoring equipment for hydrogen-cooled turbo-alternators:
 - 0 to 100 % CO₂/Ar in air
 - 0 to 100 % H₂ in CO₂/Ar
 - 80 to 100 % H₂ in air
- Versions for the analysis of flammable and non-flammable gases or vapors for use in hazardous areas (Zone 1 and Zone 2)

Special versions**Special applications**

In addition to the standard combinations, special applications are also available upon request (e.g. higher sample gas pressure up to 2 000 hPa absolute).

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)
- Internal gas paths: stainless steel pipe (mat. no. 1.4571)
- Gas connections for sample gas inlet and outlet and for purging gas: fittings, pipe diameter of 6 mm or ¼"

Field device

- Two-door enclosure (IP65) with gas-tight separation of analyzer and electronics sections
- Individually purgeable enclosure halves
- Stainless steel gas path and stubs (mat. no. 1.4571)
- Purging gas connections: pipe diameter 10 mm or 3/8"
- Gas connections for sample gas inlet and outlet: clamping ring connection for a pipe diameter of 6 mm or ¼"

Display and control panel

- Large LCD panel for simultaneous display of:
 - Measured value (digital and analog displays)
 - Status bar
 - Measuring ranges
- Contrast of LCD panel adjustable using menu
- Permanent LED backlighting
- Washable membrane keyboard with five softkeys
- Menu-driven operation for parameterization, test functions, adjustment
- User help in plain text
- Graphic display of concentration trend; programmable time intervals
- Bilingual operating software German/English, English/Spanish, French/English, Spanish/English, Italian/English

Input and outputs

- One analog output per medium (from 0, 2, 4 to 20 mA; NAMUR parameterizable)
- Two analog inputs 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. failure, maintenance demanded, threshold alarm, external magnetic valves)
- Expansion by eight additional digital inputs and eight additional relay outputs each (e.g. for autocalibration with up to four calibration gases)

Communication

RS 485 present in basic unit (connection from the rear; for the slide-in module also behind the front plate).

Options

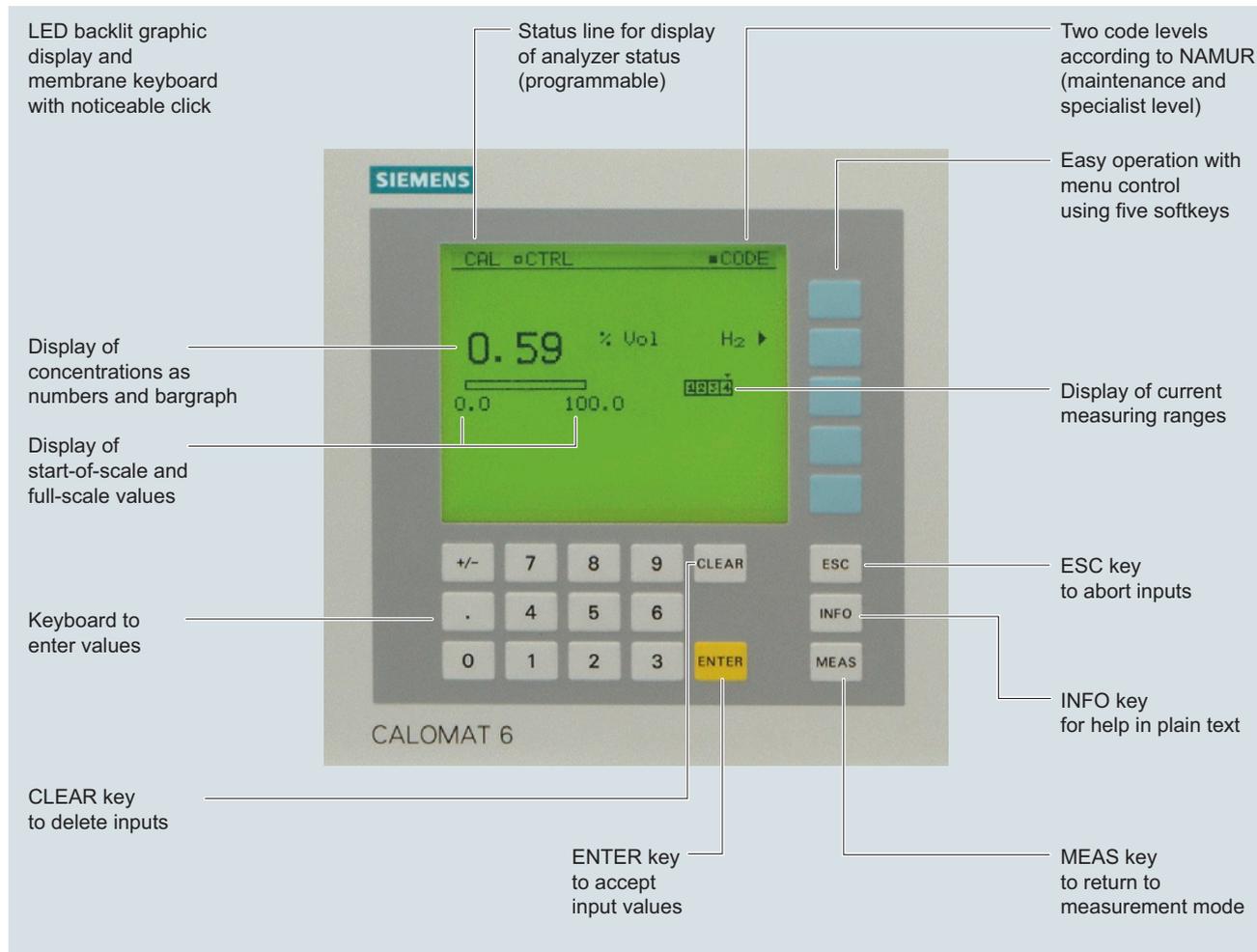
- RS 485/RS 232 converter
- RS 485/Ethernet converter
- RS 485/USB converter
- Connection to networks via PROFIBUS DP/PA interface
- SIPROM GA software as the service and maintenance tool

Extractive continuous process gas analysis

Series 6

CALOMAT 6

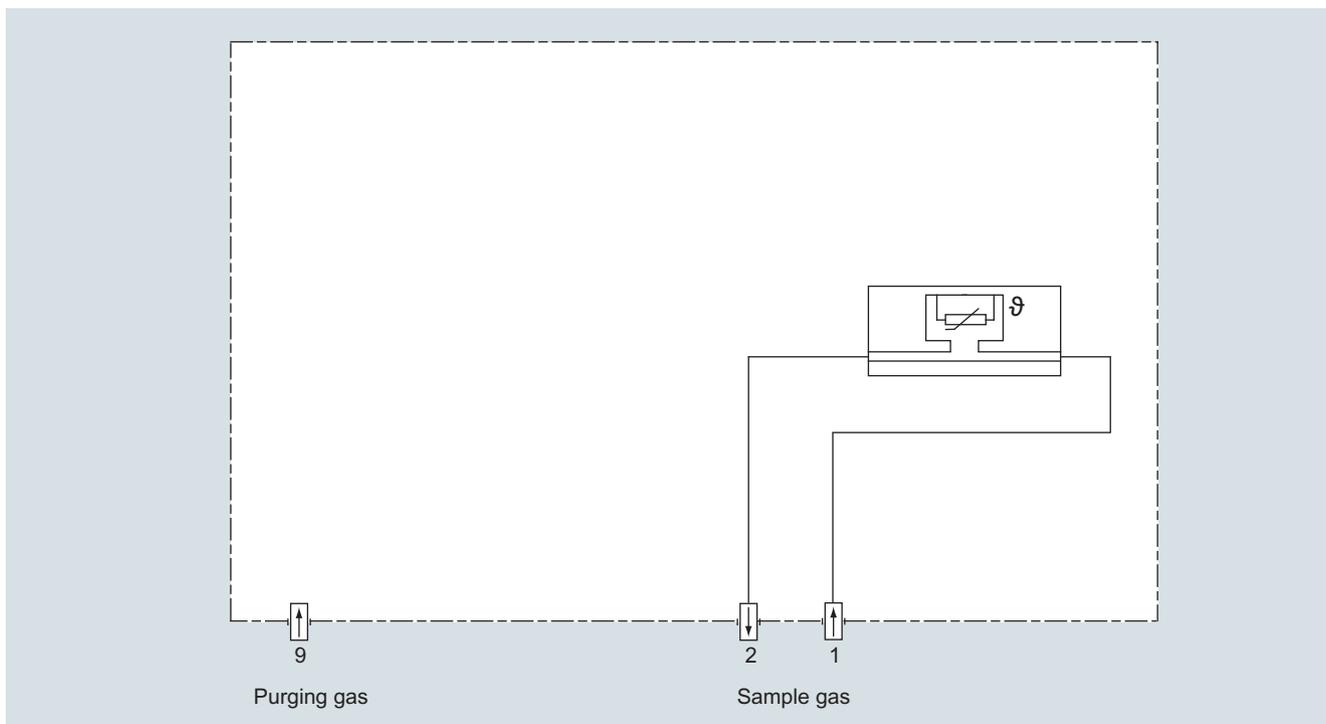
General information



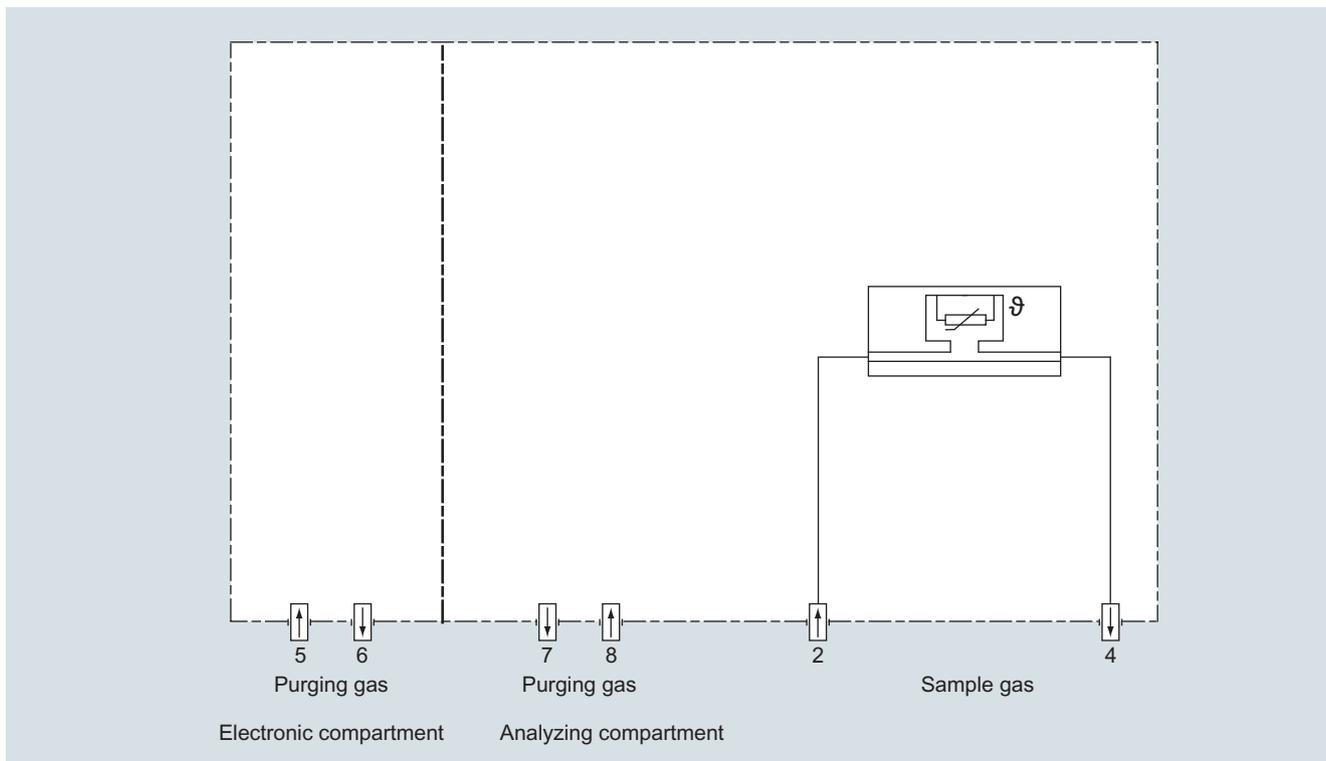
CALOMAT 6, membrane keyboard and graphic display

Designs – parts wetted by sample gas

Gas path		19" rack unit	Field device	Field device Ex
With pipes	Bushing	Stainless steel, mat. no. 1.4571		
	Pipe	Stainless steel, mat. no. 1.4571		
	Sample cell body	Stainless steel, mat. no. 1.4571		
	O-rings	FFKM-Chemraz		
	Sensor	Si, SiO _x N _y , AU, epoxy resin, glass		
	Tightness	Leakage < 1 µl/s		



CALOMAT 6, 19" rack unit, gas path



CALOMAT 6, field device, gas path

Extractive continuous process gas analysis

Series 6

CALOMAT 6

General information

Function

Principle of operation

The measuring principle is based on the different thermal conductivity of gases.

The CALOMAT 6 works with a micromechanically produced Si chip whose measuring membrane is equipped with thin-film resistors.

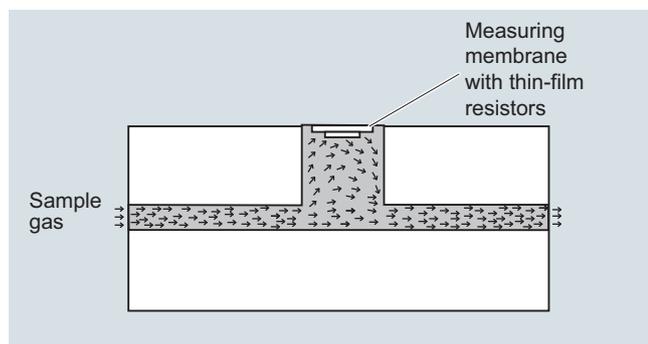
The resistors are kept at a constant temperature. This requires an current intensity depending on the thermal conductivity of the sample gas. This "raw value" is processed further electronically to calculate the gas concentration.

The sensor is located in a thermostatically-controlled stainless steel enclosure in order to prevent the influence of changes in ambient temperature.

To prevent the influence of changes in flow, the sensor is positioned in a bore located to the side of the main flow.

Note

The sample gases must be fed into the analyzers free of dust. Condensation (dew point sample gas < ambient temperature) is to be avoided in the measurement chambers. Therefore, the use of gas modified for the measuring tasks is necessary in most application cases.



CALOMAT, principle of operation

Essential characteristics

- Four freely parameterizable measuring ranges, also with suppressed zero point, all measuring ranges linear
- Smallest measuring spans up to 1 % H₂ (with disabled zero point: 95 to 100 % H₂) possible
- Measuring range identification
- Galvanically isolated measured-value output 0/2/4 to 20 mA (also inverted)
- Autoranging or manual measurement range switchover possible; remote switching is also possible
- Storage of measured values possible during adjustments
- Wide range of selectable time constants (static/dynamic noise suppression); i.e. the response time of the analyzer can be matched to the respective measuring task
- Short response time
- Low long-term drift
- Measuring point switchover for up to 6 measuring points (programmable)
- Measuring range identification
- Measuring point identification
- External pressure sensor can be connected – for the correction of sample gas fluctuations
- Automatic range calibration can be parameterized

- Operation based on the NAMUR recommendation
- Two control levels with their own authorization codes for the prevention of accidental and unauthorized operator interventions
- Simple handling using a numerical membrane keyboard and operator prompting
- Customer-specific analyzer options such as:
 - Customer acceptance
 - TAG labels
 - Drift recording
 - Clean for O₂ service

Measuring spans

The smallest and largest possible spans depend on both the measured component (type of gas) and the respective application.

The smallest possible spans listed below refer to N₂ as the residual gas. With other gases which have a larger/smaller thermal conductivity than N₂, the smallest possible span is also larger/smaller.

Component	Smallest possible span
H ₂	0 ... 1 % (95 ... 100 %)
He	0 ... 2 %
Ar	0 ... 10 %
CO ₂	0 ... 20 %
CH ₄	0 ... 15 %
H ₂ in blast furnace gas	0 ... 10 %
H ₂ in converter gas	0 ... 20 %
H ₂ with wood gasification	0 ... 30 %

Influence of interfering gases

Knowledge of the sample gas composition is necessary to determine the influence of residual gases with several interfering components.

The following table lists the zero offsets expressed in % H₂ resulting from 10 % residual gas (interfering gas) in each case.

Component	Zero offset
Ar	-1.28 %
CH ₄	+1.59 %
C ₂ H ₆ (non-linear response)	+0.04 %
C ₃ H ₈	-0.80 %
CO	-0.11 %
CO ₂	-1.07 %
He	+6.51 %
H ₂ O (non-linear response)	+1.58 %
NH ₃ (non-linear response)	+1.3 %
O ₂	+0.18 %
SF ₆	-2.47 %
SO ₂	-1.34 %
100 % air (dry)	+0.27 %

For residual gas concentrations differing from 10 %, the corresponding multiple of the associated value in the table provides an acceptable approximation. This is valid for residual gas concentrations up to 25 % (dependent on type of gas).

The thermal conductivity of most gas mixtures has a non-linear response. Even ambiguous results, such as e.g. with NH₃/N₂ mixtures, can occur within a specific concentration range.

In addition to a zero offset, it should also be noted that the gradient of the characteristic is influenced by the residual gas. However, this effect is negligible for most gases.

In case of correction of the influence of interfering gases with additional analyzers (ULTRAMAT 6/ULTRAMAT 23), the resulting measuring error can – depending on the application – amount up to 5 % of the smallest measuring range of the respective application.

Example of correction of cross-interference

Specification for the interface cable

Surge impedance	100 ... 300 Ω , with a measuring frequency of > 100 kHz
Cable capacitance	Typ. < 60 pF/m
Core cross-section	> 0.22 mm ² , corresponds to AWG 23
Cable type	Twisted pair, 1 x 2 conductors of cable section
Signal attenuation	Max. 9 dB over the whole length
Shielding	Copper braided shield or braided shield and foil shield
Connection	Pin 3 and pin 8

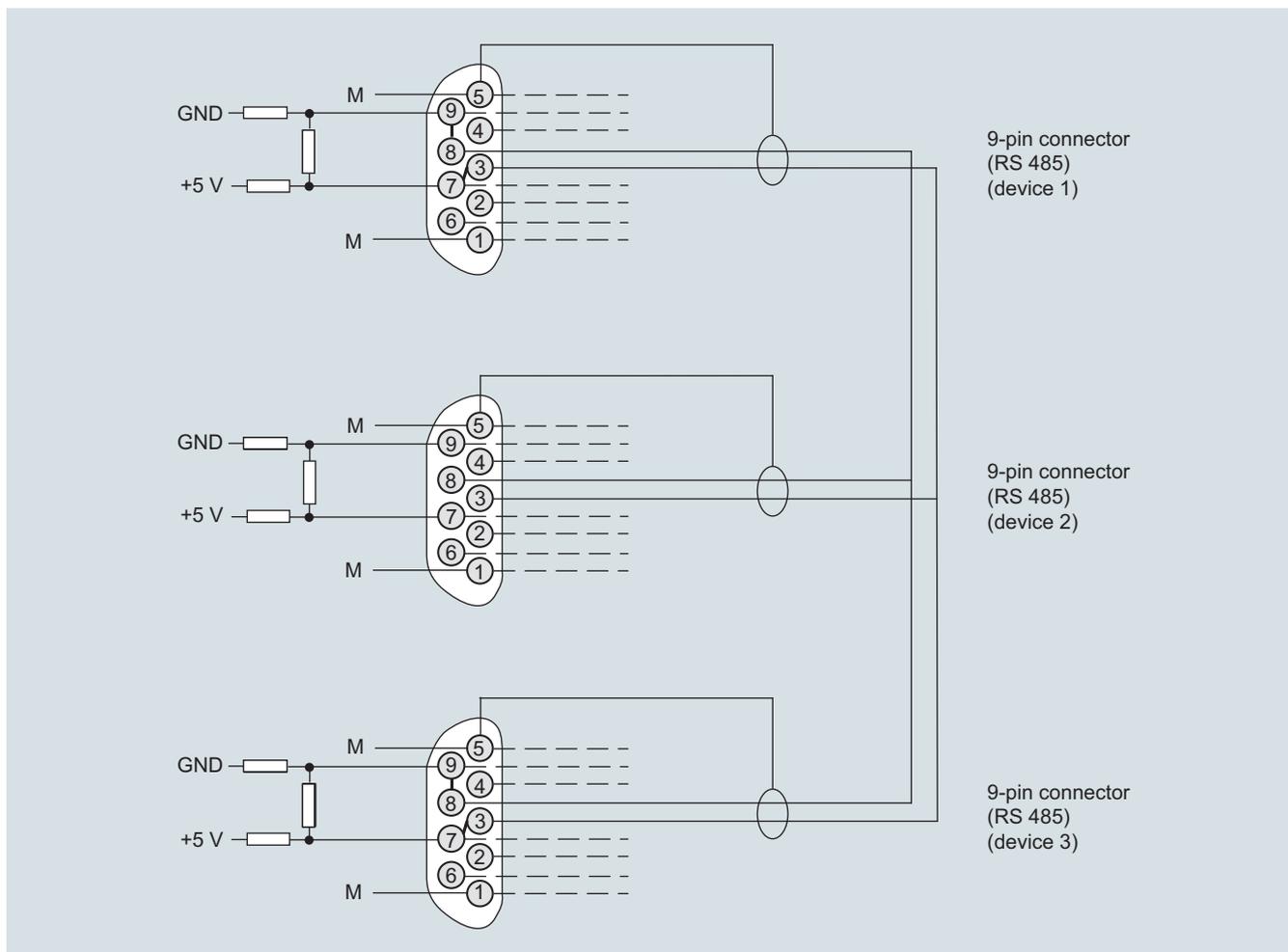
Bus terminating resistors

Pins 3-7 and 8-9 of the first and last connectors of a bus cable must be bridged (see graphic).

Note

It is advisable to install a repeater on the device side in the case of a cable length of more than 500 m or with high interferences.

Up to four components can be corrected via the ELAN bus, correction of cross-interference can be carried out for one or two components via the analog input.



Bus cable with plug connections, example

Extractive continuous process gas analysis

Series 6

CALOMAT 6

19" rack unit

1

Technical specifications

General information	Based on DIN EN 61207 / IEC 1207. All data based on digital gas mixture H ₂ in N ₂	Measuring response	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Measuring ranges	4, internally and externally switchable; automatic measuring range switchover also possible	Output signal fluctuation	< ± 0.75% of the smallest possible measuring range according to rating plate, with electronic damping constant of 1 s ($\sigma = 0.25\%$)
Largest possible measuring span	100 vol.% H ₂ (for smallest measuring span, see "Function")	Zero point drift	< ± 1%/week of the smallest possible measuring span according to rating plate
Measuring ranges with suppressed zero point	Any zero point within 0 ... 100 vol.% can be implemented, smallest possible measuring span: 5% H ₂	Measured-value drift	< ± 1%/week of the smallest possible measuring span according to rating plate
Operating position	Front wall, vertical	Repeatability	< 1% of the current measuring range
Conformity	CE mark in accordance with EN 61326/A1 and EN 61010/1	Detection limit	1% of the current measuring range
Design, enclosure		Linearity error	< ± 1% of the current measuring range
Degree of protection	IP20 according to EN 60529	Influencing variables	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Weight	Approx. 10 kg	Ambient temperature	< 1%/10 K referred to smallest possible measuring span according to rating plate
Electrical characteristics		Accompanying gases	Deviation from zero point (for influence of interfering gas see paragraph titled "Interference influences")
EMC interference immunity (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98)	Sample gas flow	< 0.2% of the smallest possible span according to rating plate with a change in flow of 0.1 l/min within the permissible flow range
All signal lines must be shielded. Measured value deviations of up to 4% of the smallest measuring range may occur in ranges with strong electromagnetic interference.		Sample gas pressure	< 1% of the current measuring range with a pressure change of 100 hPa
Electrical safety	In accordance with EN 61010-1; over-voltage category II	Auxiliary power	< 0.1% of the current measuring range with rated voltage ± 10%
Auxiliary power (see nameplate)	100 V -10% ... 120 V +10% AC, 48 ... 63 Hz or 200 V -10% ... 240 V +10% AC, 48 ... 63 Hz	Electrical inputs and outputs	
Power consumption	Approx. 20 VA	Analog output	0/2/4 ... 20 mA, floating; load max. 750 Ω
Fuse values	100 to 120 V: 1.0T/250 200 ... 240 V: 0.63 T/250	Relay outputs	6, with changeover contacts, freely parameterizable, e.g. for measuring range identification; load: 24 V AC/DC/1 A, isolated
Gas inlet conditions		Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and correction of cross-interference
Sample gas pressure	800 ... 1 100 hPa (absolute)	Digital inputs	6, designed for 24 V, isolated, freely parameterizable, e.g. for measurement range switchover
Sample gas flow	30 ... 90 l/h (0.5 ... 1.5 l/min)	Serial interface	RS 485
Sample gas temperature	Min. 0 to max. 50 °C, but above the dew point	Options	AUTOCAL function each with 8 additional digital inputs and relay outputs, also with PROFIBUS PA or PROFIBUS DP
Temperature of the measuring cell	Approx. 60 °C	Climatic conditions	
Sample gas humidity	< 90% relative humidity	Permissible ambient temperature	-30 ... +70 °C during storage and transportation, 5 ... 45 °C during operation
Dynamic response		Permissible humidity (dew point must not be fallen below)	< 90% relative humidity as annual average, during storage and transportation
Warm-up period	< 30 min (the technical specification will be met after 2 hours)		
Delayed display (T ₉₀)	< 5 s		
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 s		

Selection and ordering data	Article No.	
CALOMAT 6 gas analyzer 19" rack unit for installation in cabinets	7MB2521- 0 - A	Cannot be combined
Click on the Article No. for the online configuration in the PIA Life Cycle Portal.		
<u>Connections for sample gas</u>		
Pipe with 6 mm outer diameter	0	
Pipe with 1/4" outer diameter	1	
<u>Measured component</u>	<u>Smallest/largest measuring range</u>	
H ₂ in N ₂	0 ... 1/100 %	AA
H ₂ in N ₂ (blast furnace gas measurement) ¹⁾	0 ... 5/100 %	AW
H ₂ in N ₂ (converter measurement) ¹⁾	0 ... 5/100 %	AX
H ₂ in N ₂ (wood gasification) ¹⁾	0 ... 5/100 %	AY
H ₂ in Ar	0 ... 1/100 %	AB
H ₂ in NH ₃	0 ... 1/100 %	AC
He in N ₂	0 ... 2/100 %	BA
He in Ar	0 ... 2/100 %	BB
He in H ₂	0 ... 10/80 %	BC
Ar in N ₂	0 ... 10/100 %	CA
Ar in O ₂	0 ... 10/100 %	CB
CO ₂ in N ₂	0 ... 20/100 %	DA
CH ₄ in Ar	0 ... 15/100 %	EA
NH ₃ in N ₂	0 ... 10/30 %	FA
H ₂ monitoring (turbo generators)		GA
• CO ₂ in air	0 ... 100 %	
• H ₂ in CO ₂	0 ... 100 %	
• H ₂ in air	80 ... 100 %	
<u>Add-on electronics</u>		
Without	0	
AUTOCAL function		
• With 8 additional digital inputs and outputs	1	
• With 8 additional digital inputs/outputs and PROFIBUS PA interface	6	
• With 8 additional digital inputs/outputs and PROFIBUS DP interface	7	
<u>Power supply</u>		
100 ... 120 V AC, 48 ... 63 Hz	0	
200 ... 240 V AC, 48 ... 63 Hz	1	
<u>Explosion protection</u>		
Without		A
Certificate: ATEX II 3G, flammable and non-flammable gases		B
FM/CSA certificate – Class I Div 2		D
<u>Language (supplied documentation, software)</u>		
German		0
English		1
French		2
Spanish		3
Italian		4

¹⁾ Ready to enter external correction of cross-interferences for CO, CO₂ and CH₄ (CH₄ only for blast furnace gas and wood gasification).

Extractive continuous process gas analysis

Series 6

CALOMAT 6

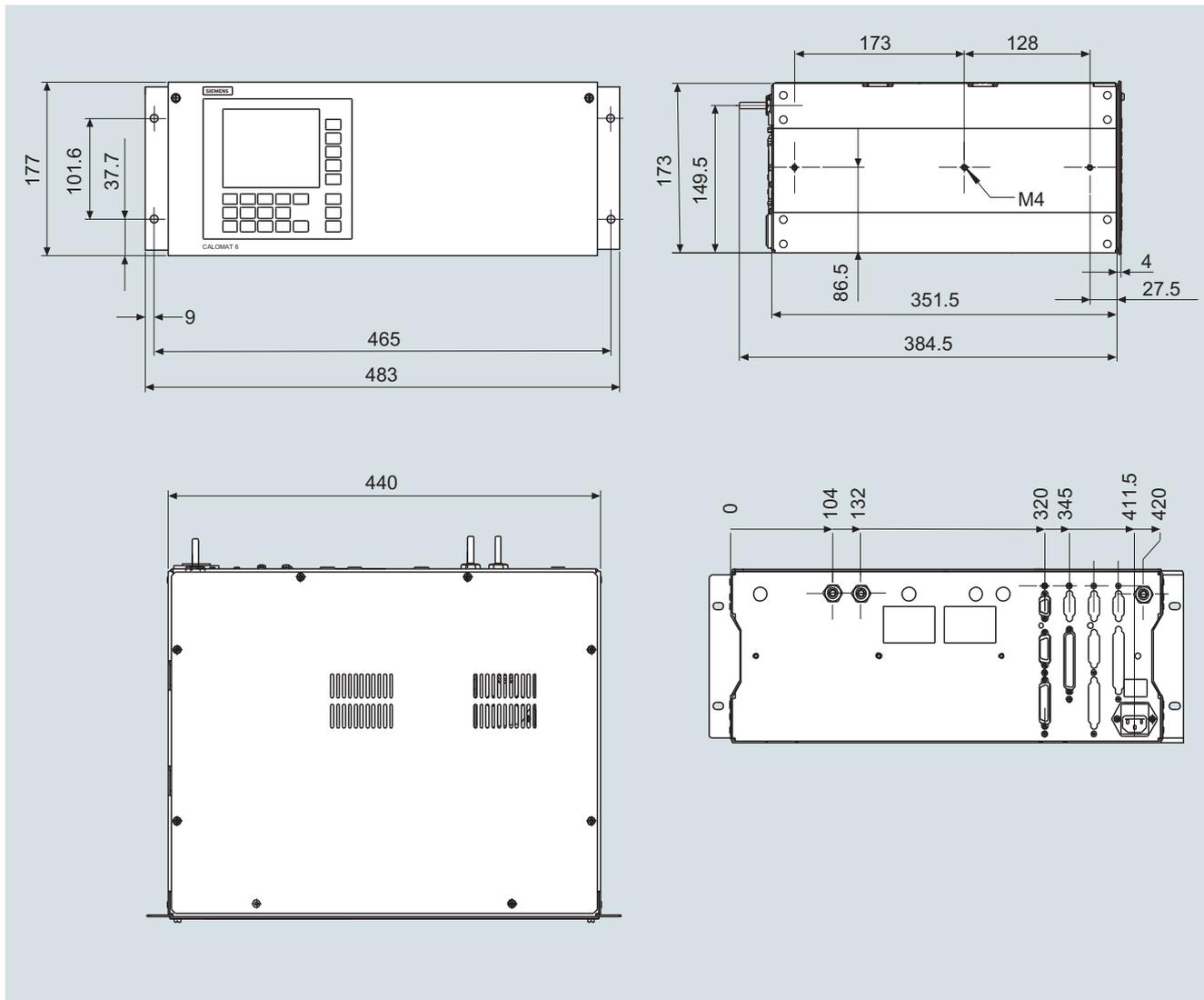
19" rack unit

1

Selection and ordering data

<i>Additional versions</i>	Order code
Add "-Z" to Article No. and specify Order codes.	
Telescopic rails (2 units)	A31
TAG labels (specific lettering based on customer information)	B03
Clean for O ₂ service (specially cleaned gas path)	Y02
Measuring range indication in plain text, if different from the standard setting	Y11
Special setting (only in conjunction with an application no.)	Y12
<i>Accessories</i>	Article No.
RS 485/Ethernet converter	A5E00852383
RS 485/RS 232 converter	C79451-Z1589-U1
RS 485/USB converter	A5E00852382
AUTOCAL function with 8 digital inputs/outputs	C79451-A3480-D511
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS PA	A5E00057307
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS DP	A5E00057312
Set of Torx screwdrivers	A5E34821625

Dimensional drawings



CALOMAT 6, 19" unit, dimensions in mm

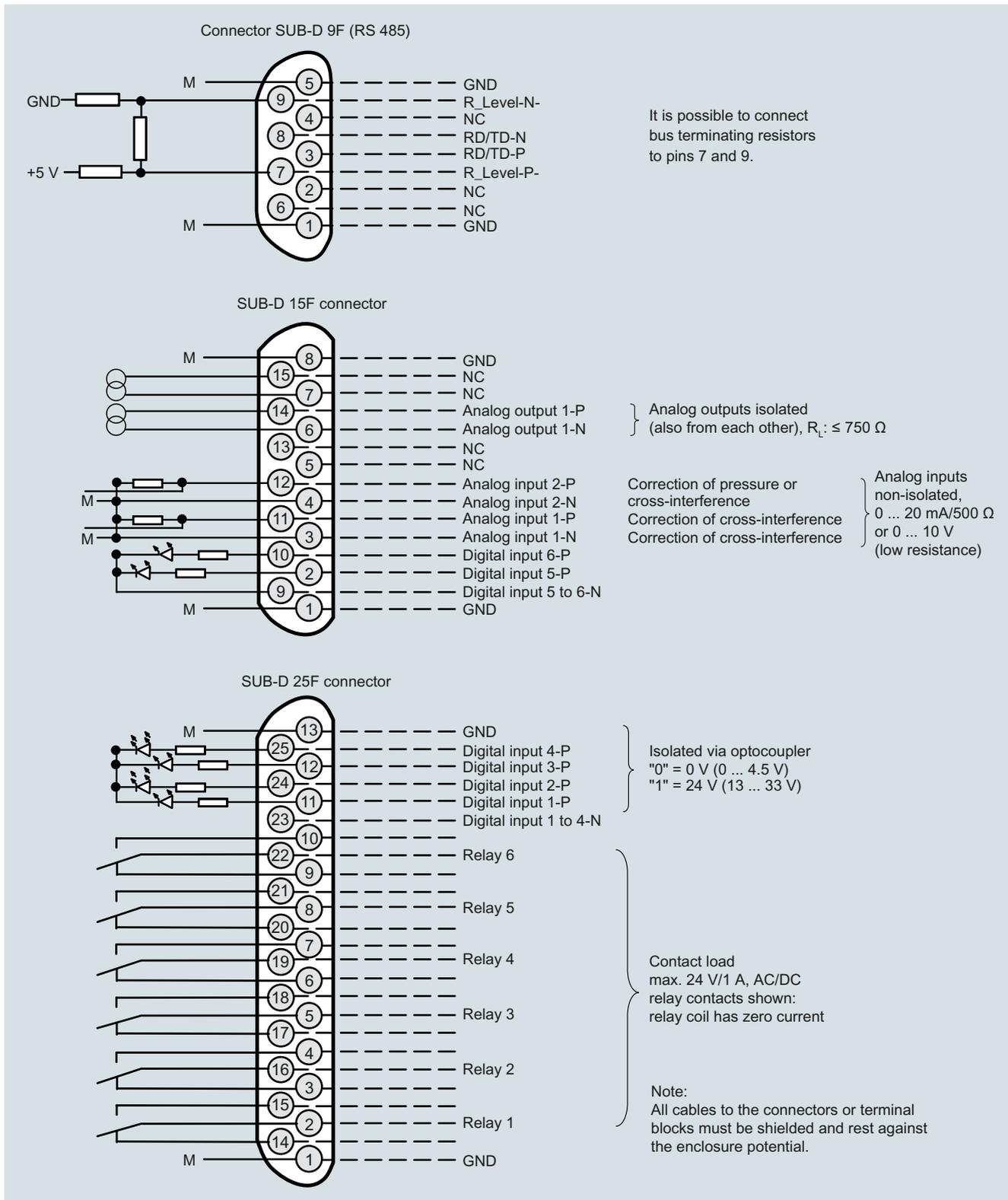
Extractive continuous process gas analysis

Series 6
CALOMAT 6

19" rack unit

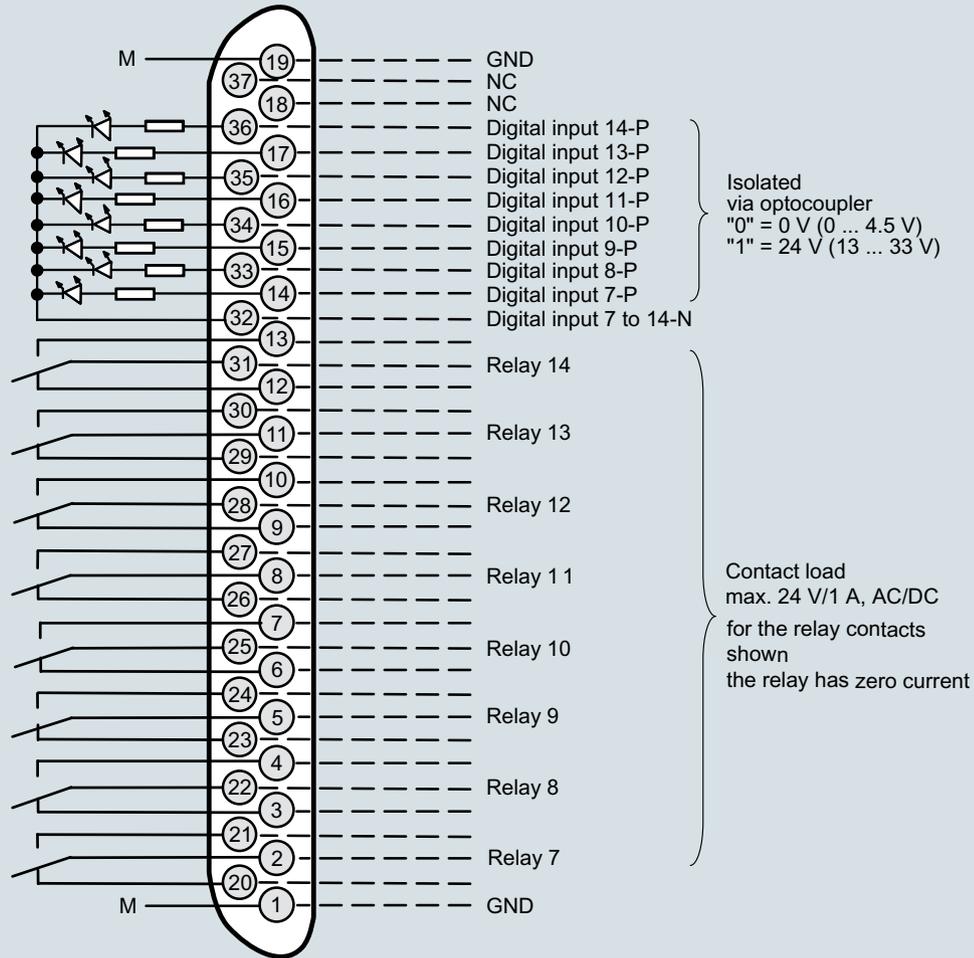
Circuit diagrams

Pin assignment (electrical and gas connections)



CALOMAT 6, 19" unit, pin assignment

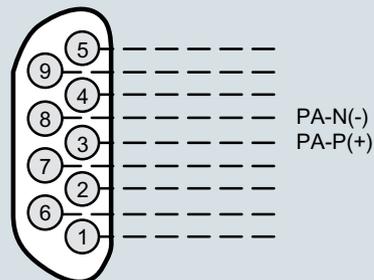
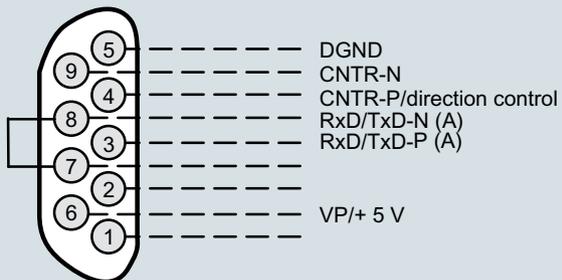
Connector SUB-D 37F (option)



Connector SUB-D 9F
PROFIBUS DP

optional

Connector SUB-D 9M
PROFIBUS PA



Note:

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

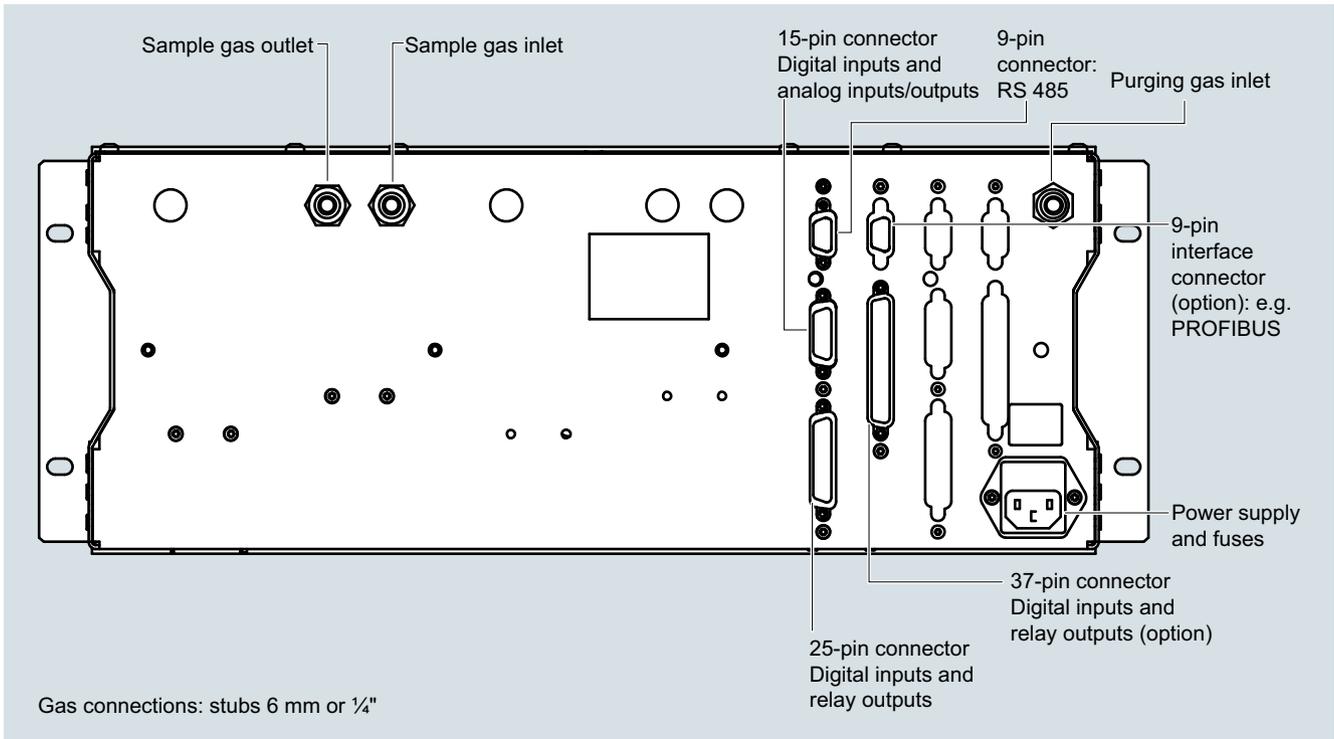
CALOMAT 6, 19" unit, pin assignment of AUTOCAL board and PROFIBUS connectors

Extractive continuous process gas analysis

Series 6
CALOMAT 6

1

19" rack unit



CALOMAT 6, 19" unit, gas and electrical connections

Technical specifications

General information	Based on DIN EN 61207/IEC 1207. All data based on digital gas mixture H ₂ in N ₂	Measuring response	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Measuring ranges	4, internally and externally switchable; automatic measuring range change-over also possible	Output signal fluctuation (maximum accuracy achieved after 2 hours)	< ± 0.75% of the smallest possible measuring range according to rating plate, with electronic damping constant of 1 s ($\sigma = 0.25\%$)
Largest possible measuring span	100 vol.% H ₂ (for smallest measuring span, see "Function")	Zero point drift	< ± 1%/week of the smallest possible measuring span according to rating plate
Measuring ranges with suppressed zero point	Any zero point within 0 ... 100 vol.% can be implemented; smallest possible measuring span: 5% H ₂	Measured-value drift	< ± 1%/week of the smallest possible measuring span according to rating plate
Operating position	Front wall, vertical	Repeatability	< 1% of the current measuring range
Conformity	CE mark in accordance with EN 61326/A1 and EN 61010/1	Detection limit	1% of the current measuring range
Design, enclosure		Linearity error	< ± 1% of the current measuring range
Degree of protection	IP65 according to EN 60529	Influencing variables	Based on sample gas pressure 1013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Weight	Approx. 25 kg	Ambient temperature	< 1%/10 K referred to smallest possible measuring span according to rating plate
Electrical characteristics		Accompanying gases	Deviation from zero point (for influence of interfering gas, see section "Cross-interference")
EMC interference immunity (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98)	Sample gas flow	< 0.2% of the smallest possible span according to rating plate with a change in flow of 0.1 l/min within the permissible flow range
All signal lines must be shielded. Measured value deviations of up to 4% of the smallest measuring range may occur in ranges with strong electromagnetic interference.		Sample gas pressure	< 1% of the current measuring range with a pressure change of 100 hPa
Electrical safety	In accordance with EN 61010-1; over-voltage category II	Electrical inputs and outputs	
Auxiliary power (see nameplate)	100 V -10% ... 120 V +10% AC, 48 ... 63 Hz or 200 V -10% ... 240 V +10% AC, 48 ... 63 Hz	Analog output	0/2/4 ... 20 mA, floating; load max. 750 Ω
Power consumption (unit)	Approx. 20 VA	Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load: 24 V AC/DC/1 A, floating
Fuse values	100 to 120 V: 1.0T/250 200 ... 240 V: 0.63 T/250	Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and correction of cross-interference
Gas inlet conditions		Digital inputs	6, designed for 24 V, floating, freely configurable, e.g. for measuring range switchover
Sample gas pressure	800 to 1 100 hPa (absolute)	Serial interface	RS 485
Sample gas flow	30 to 90 l/h (0.5 to 1.5 l/min)	Options	AUTOCAL function each with 8 additional digital inputs and relay outputs, also with PROFIBUS PA or PROFIBUS DP
Sample gas temperature	Min. 0 to max. 50 °C, but above the dew point	Climatic conditions	
Temperature of the measuring cell	Approx. 60 °C	Permissible ambient temperature	-30 ... +70 °C during storage and transportation, 5 ... 45 °C in operation
Sample gas humidity	< 90% relative humidity	Permissible humidity (dew point must not be fallen below)	< 90% relative humidity as annual average, during storage and transportation
Purging gas pressure			
• Permanent	165 hPa above ambient pressure		
• For short periods	Max. 250 hPa above ambient pressure		
Time response			
	Based on sample gas pressure 1 000 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature		
Warm-up period	< 30 min (the technical specification will be met after 2 hours)		
Delayed display (T ₉₀)	< 5 s		
Electrical damping	0 ... 100 s, configurable		
Dead time (at 1 l/min)	Approx. 0.5 s		

Extractive continuous process gas analysis

Series 6

CALOMAT 6

Field device

1

Selection and ordering data

CALOMAT 6 gas analyzer

For field installation

➤ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.

Connections for sample gas

Ferrule screw connection for pipe, outer diameter 6 mm
 Ferrule screw connection for pipe, outer diameter 1/4"

Measured component	Smallest/largest measuring range	Article No.	
7MB2511- 0 - A			
Cannot be combined			
0 1			
H ₂ in N ₂	0 ... 1/100 %	AA	AA
H ₂ in N ₂ (blast furnace gas measurement) ¹⁾	0 ... 5/100 %	AW	AW
H ₂ in N ₂ (converter measurement) ¹⁾	0 ... 5/100 %	AX	AX
H ₂ in N ₂ (wood gasification) ¹⁾	0 ... 5/100 %	AY	AY
H ₂ in Ar	0 ... 1/100 %	AB	AB
H ₂ in NH ₃	0 ... 1/100 %	AC	AC
He in N ₂	0 ... 2/100 %	BA	BC
He in Ar	0 ... 2/100 %	BB	
He in H ₂	0 ... 10/80 %	BC	BC
Ar in N ₂	0 ... 10/100 %	CA	
Ar in O ₂	0 ... 10/100 %	CB	EA
CO ₂ in N ₂	0 ... 20/100 %	DA	
CH ₄ in Ar	0 ... 15/100 %	EA	EA
NH ₃ in N ₂	0 ... 10/30 %	FA	
H ₂ monitoring (turbo generators)		GA	GA
• CO ₂ in air	0 ... 100 %		
• H ₂ in CO ₂	0 ... 100 %		GA
• H ₂ in air	80 ... 100 %		
Add-on electronics			
Without			
AUTOCAL function			
• With 8 additional digital inputs and outputs			
• With 8 additional digital inputs/outputs and PROFIBUS PA interface			
• With 8 additional digital inputs/outputs and PROFIBUS DP interface			
• With 8 additional digital inputs/outputs and PROFIBUS PA Ex-i interface			
Power supply			
100 ... 120 V AC, 48 ... 63 Hz			
200 ... 240 V AC, 48 ... 63 Hz			
Explosion protection, incl. certificate			
Without			
Acc. to ATEX II 3G, non-flammable gases			
Acc. to ATEX II 3G; flammable gases ²⁾			
FM/CSA certificate – Class I Div 2			
According to ATEX II 2G, leakage compensation ²⁾			
According to ATEX II 2G, continuous purging ²⁾			
ATEX II 3D certificate; potentially explosive dust atmospheres			
• In non-hazardous gas zone			
• In Ex zone acc. to ATEX II 3G, non-flammable gases			
• In Ex zone acc. to ATEX II 3G, flammable gases ²⁾			
Language (supplied documentation, software)			
German			
English			
French			
Spanish			
Italian			

¹⁾ Ready to enter external correction of cross-interferences for CO, CO₂ and CH₄ (CH₄ only for blast furnace gas and wood gasification).

²⁾ Only in connection with an approved purging unit.

Selection and ordering data

<i>Additional versions</i>	Order code
Add "-Z" to Article No. and specify Order codes.	
TAG labels (specific lettering based on customer information)	B03
BARTEC Ex p purging unit "Leakage compensation"	E71
BARTEC Ex p purging unit "Continuous purging"	E72
Clean for O ₂ service (specially cleaned gas path)	Y02
Measuring range indication in plain text, if different from the standard setting	Y11
<i>Additional units for Ex versions</i>	Article No.
<u>ATEX Category II 2G (zone 1)</u>	
BARTEC Ex p purging unit, 230 V, "leakage compensation"	7MB8000-2BA
BARTEC Ex p purging unit, 115 V, "leakage compensation"	7MB8000-2BB
BARTEC Ex p purging unit, 230 V, "continuous purging"	7MB8000-2CA
BARTEC Ex p purging unit, 115 V, "continuous purging"	7MB8000-2CB
Ex i isolating transformer	7MB8000-3AB
Ex isolating relay, 230 V	7MB8000-4AA
Ex isolating relay, 110 V	7MB8000-4AB
Differential pressure switch for corrosive and non-corrosive gases	7MB8000-5AA
Stainless steel flame arrestor	7MB8000-6BA
Hastelloy flame arrestor	7MB8000-6BB
<u>ATEX Category II 3G (zone 2)</u>	
BARTEC Ex p purging unit, 230 V, "continuous purging"	7MB8000-2CA
BARTEC Ex p purging unit, 115 V, "continuous purging"	7MB8000-2CB
<u>FM/CSA (Class I Div. 2)</u>	
Ex purging unit Minipurge FM	7MB8000-1AA
<i>Accessories</i>	
RS 485/Ethernet converter	A5E00852383
RS 485/RS 232 converter	C79451-Z1589-U1
RS 485/USB converter	A5E00852382
AUTOCAL function with 8 digital inputs/outputs	A5E00064223
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS PA	A5E00057315
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS DP	A5E00057318
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS PA Ex i (firmware 4.1.10 required)	A5E00057317
Set of Torx screwdrivers	A5E34821625

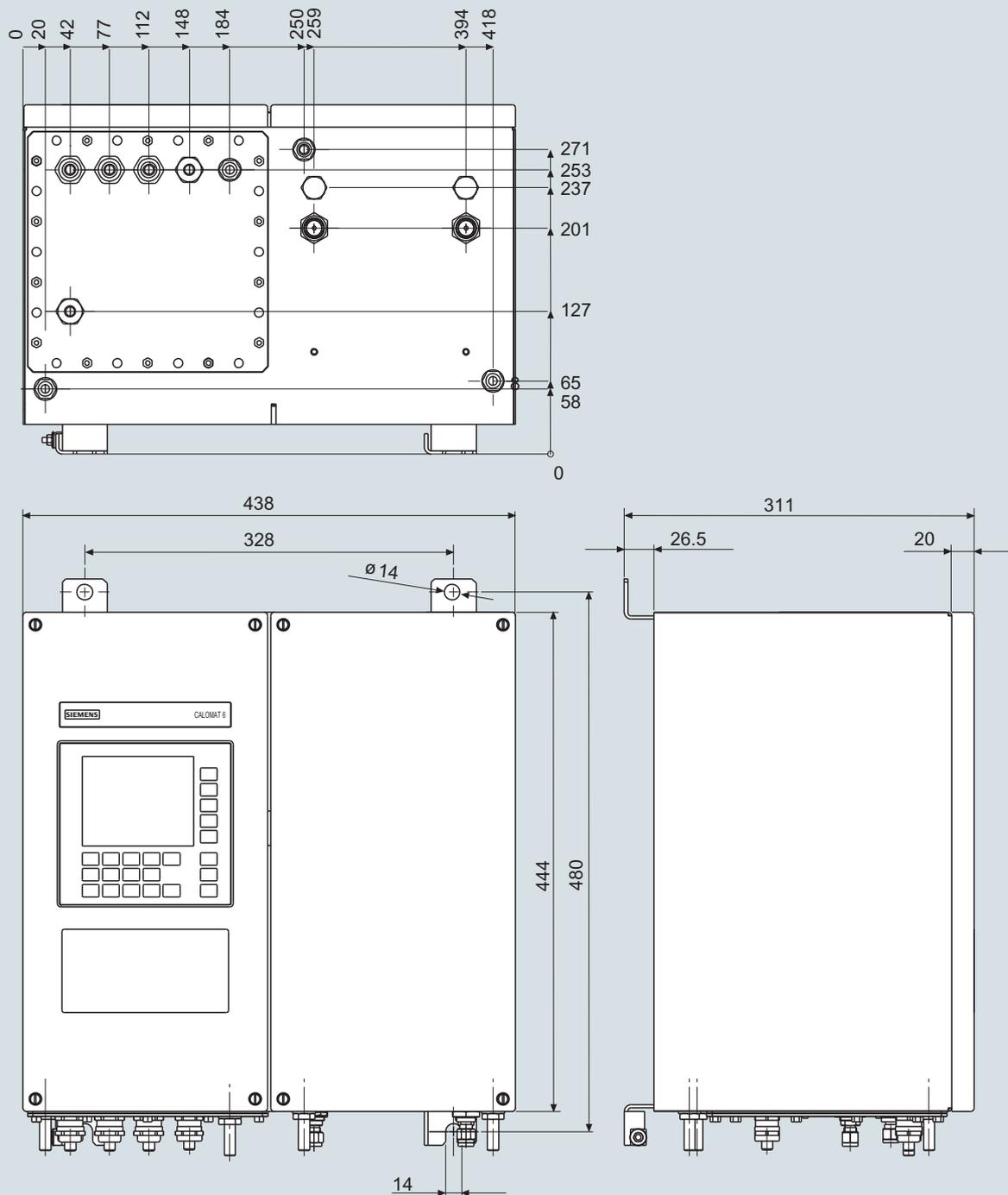
Extractive continuous process gas analysis

Series 6

CALOMAT 6

Field device

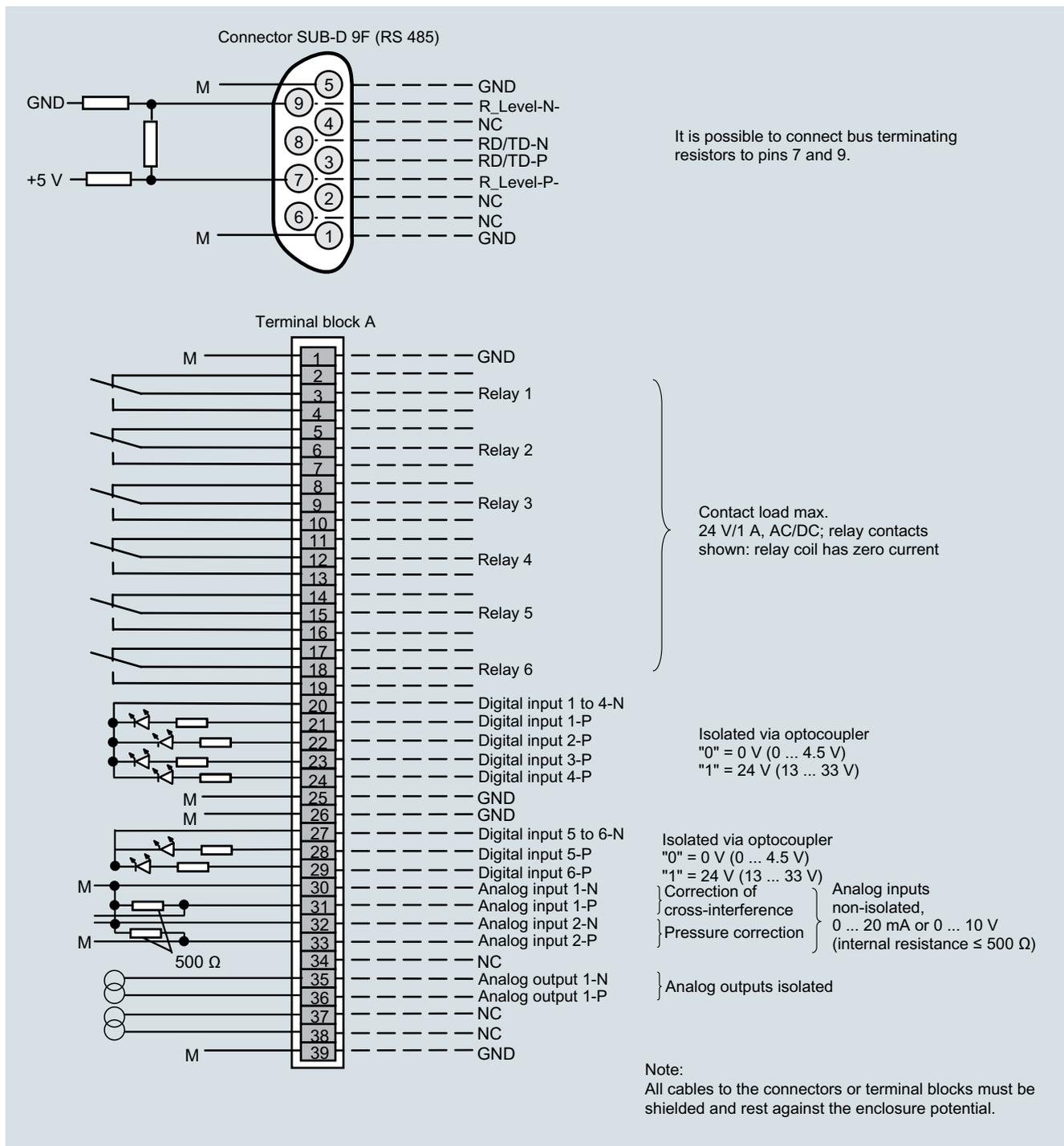
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Dimensional drawings

CALOMAT 6, field unit, dimensions in mm

Circuit diagrams

Pin assignment (electrical and gas connections)



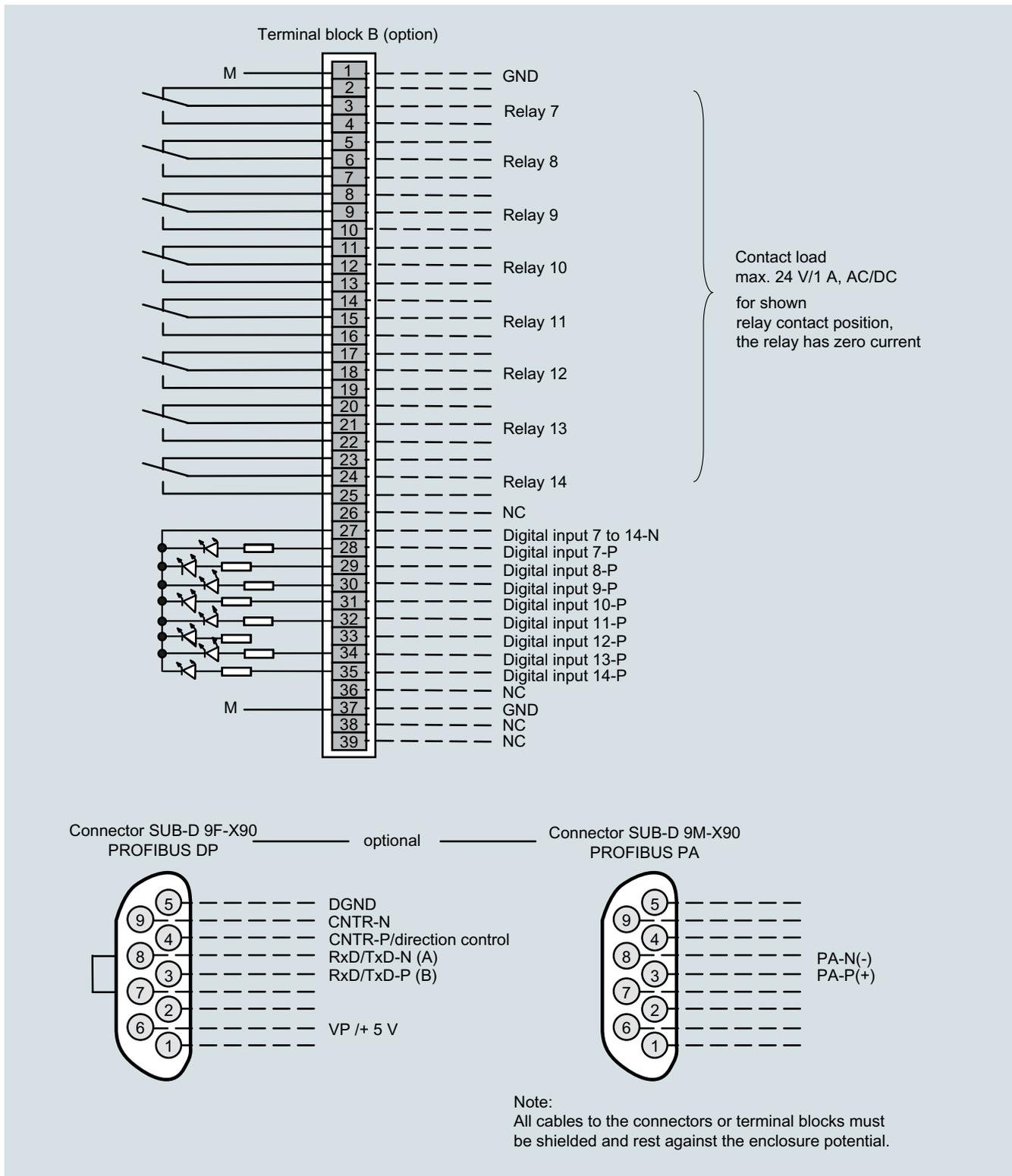
CALOMAT 6, field unit, connector and terminal assignment

Extractive continuous process gas analysis

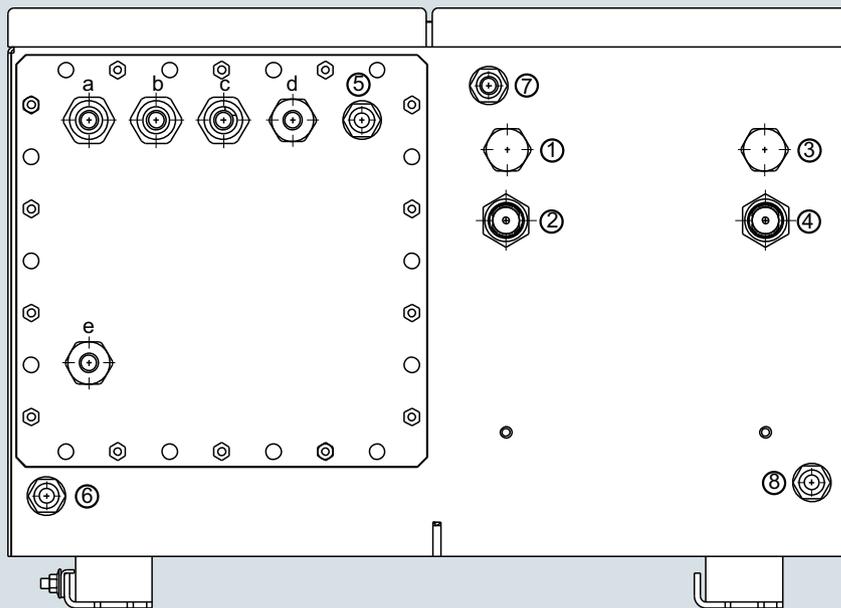
Series 6
CALOMAT 6

Field device

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



Gas connections

- | | | |
|-----|--|--|
| ① | not used | } Clamping
gland for pipe
Ø 6 mm or ¼" |
| ② | Sample gas inlet | |
| ③ | not used | |
| ④ | Sample gas outlet | |
| ⑤-⑧ | Purging gas inlets/outlets stubs Ø 10 mm or 3/8" | |

Electrical connections

- | | |
|-------|--|
| a - c | Signal cable (Ø 10 ... 14 mm)
(analog + digital): cable gland M20x1.5 |
| d | Interface connection: (Ø 7 ... 12 mm)
cable gland M20x1.5 |
| e | Power supply: (Ø 7 ... 12 mm)
cable gland M20x1.5 |

CALOMAT 6, field unit, gas and electrical connections

Extractive continuous process gas analysis

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CALOMAT 6

Documentation, suggestions for spare parts

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Selection and ordering data

Operating instructions	Article No.
CALOMAT 6 Thermal conductivity gas analyzer	
• German	A5E00116454
• English	A5E00116455
• French	A5E00116456
• Italian	A5E00116457
• Spanish	A5E00116458
Gas analyzers of Series 6 and ULTRAMAT 23 Schnittstelle/Interface PROFIBUS DP/PA	
• German and English	A5E00054148

More information

The complete documentation is available in various languages for downloading free of charge:

<http://www.siemens.com/processanalytics/documentation>

Selection and ordering data

	7MB2521	7MB2511	7MB2511 Ex	2 years (quantity)	5 years (quantity)	Article No.
Analyzer unit						
Measuring cell	x	x	x	1	1	A5E00095332
O ring (set of 4)	x	x	x	1	2	A5E00124182
Electronics						
Fuse (device fuse)			x	1	2	A5E00061505
Front plate without LC display	x			1	1	C79165-A3042-B508
Motherboard, with firmware: see spare parts list	x	x	x	-	1	
Adapter plate, LCD/keyboard	x	x		1	1	C79451-A3474-B605
LC display (non-Ex version)	x			1	1	A5E31474846
Line transformer, 115 V	x	x	x	-	1	W75040-B21-D80
Line transformer, 230 V	x	x	x	-	1	W75040-B31-D80
Connector filter	x	x	x	-	1	W75041-E5602-K2
Fusible element, T 0.63/250 V	x	x		2	3	W79054-L1010-T630
Fusible element, 1 A, 110/120 V	x	x	x	2	3	W79054-L1011-T100

If the CALOMAT 6 is supplied with a specially cleaned gas path for high oxygen context ("Cleaned 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.

Overview

The CALOMAT 62 gas analyzer is primarily used for quantitative determination of one gas component (e.g. H_2 , N_2 , Cl_2 , HCl , NH_3) in binary or quasi-binary gas mixtures.

The CALOMAT 62 is specially designed for use in corrosive gas mixtures.

Benefits

- Universally applicable hardware basis
- Integrated correction of cross-interference, no external calculation required
- Open interface architecture (RS 485, RS 232, PROFIBUS)
- SIPROM GA network for maintenance and servicing information (option)
- Electronics and analyzer unit: gas-tight isolation, purging is possible, IP65, long service life even in harsh environments (field device)

Application**Fields of application**

- Chlorine-alkali electrolysis
- Metallurgy (steel production and processing)
- H_2 measurement in LNG (Liquefied Natural Gas) process
- Ammonia synthesis
- Fertilizer production
- Petrochemicals

Special versionsSpecial applications

In addition to the standard combinations, special applications are also available upon request (e.g. higher sample gas pressure up to 2 000 hPa absolute).

Design**19" rack unit**

- With 4 HU for installation
 - in hinged frame
 - In cabinets with or without telescope rails
 - With closed or flow-type reference chambers
- Front plate for service purposes can be pivoted down (laptop connection)
- IP20 degree of protection, with purging gas connection
- Internal gas routes: Pipe made of stainless steel (mat. no. 1.4571)
- Gas connections for sample gas inlet and outlet and for reference gas: Internal thread 1/8" – 27 NPT
- Purging gas connections: Pipe diameter 6 mm or 1/4"
- With closed or flow-type reference chambers

Field device

- Two-door enclosure (IP65) for wall mounting with gas-tight separation of analyzer and electronic parts, purgeable
- Individually purgeable enclosure halves
- Gas path with screw pipe connection made of stainless steel (mat. no. 1.4571), or Hastelloy C22
- Purging gas connections: Pipe diameter 10 mm or 3/8"
- Gas connections for sample gas inlet and outlet and for reference gas: Internal thread 1/8" – 27 NPT
- With closed or flow-type reference chambers

Display and control panel

- Large LCD panel for simultaneous display of:
 - Measured value (digital and analog displays)
 - Status bar
 - Measuring ranges
- Contrast of the LCD field adjustable via the menu
- Permanent LED backlighting
- Washable membrane keyboard with five softkeys
- Menu-driven operator control for parameterization, test functions, adjustment
- Operator support in plain text
- Graphical display of the concentration progression; time intervals parameterizable
- 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)
- Two analog inputs 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. failure, maintenance request, threshold alarm, external magnetic valves)
- Expansion by eight additional digital inputs and eight additional relay outputs each (e.g. for autocalibration with up to four calibration gases)

Communication

RS 485 present in basic unit (connection from the rear; for the rack unit also behind the front plate).

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

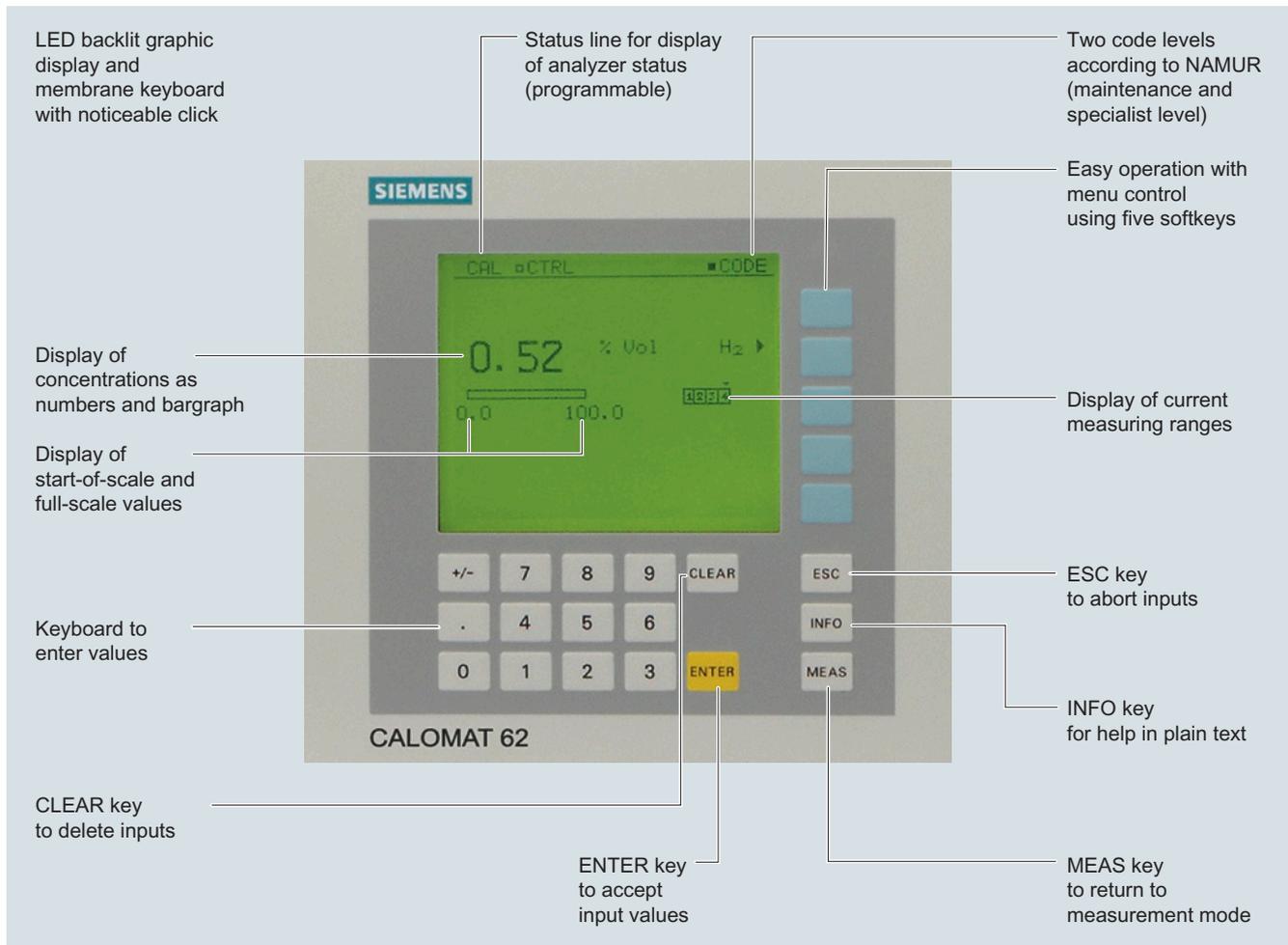
Extractive continuous process gas analysis

Series 6

CALOMAT 62

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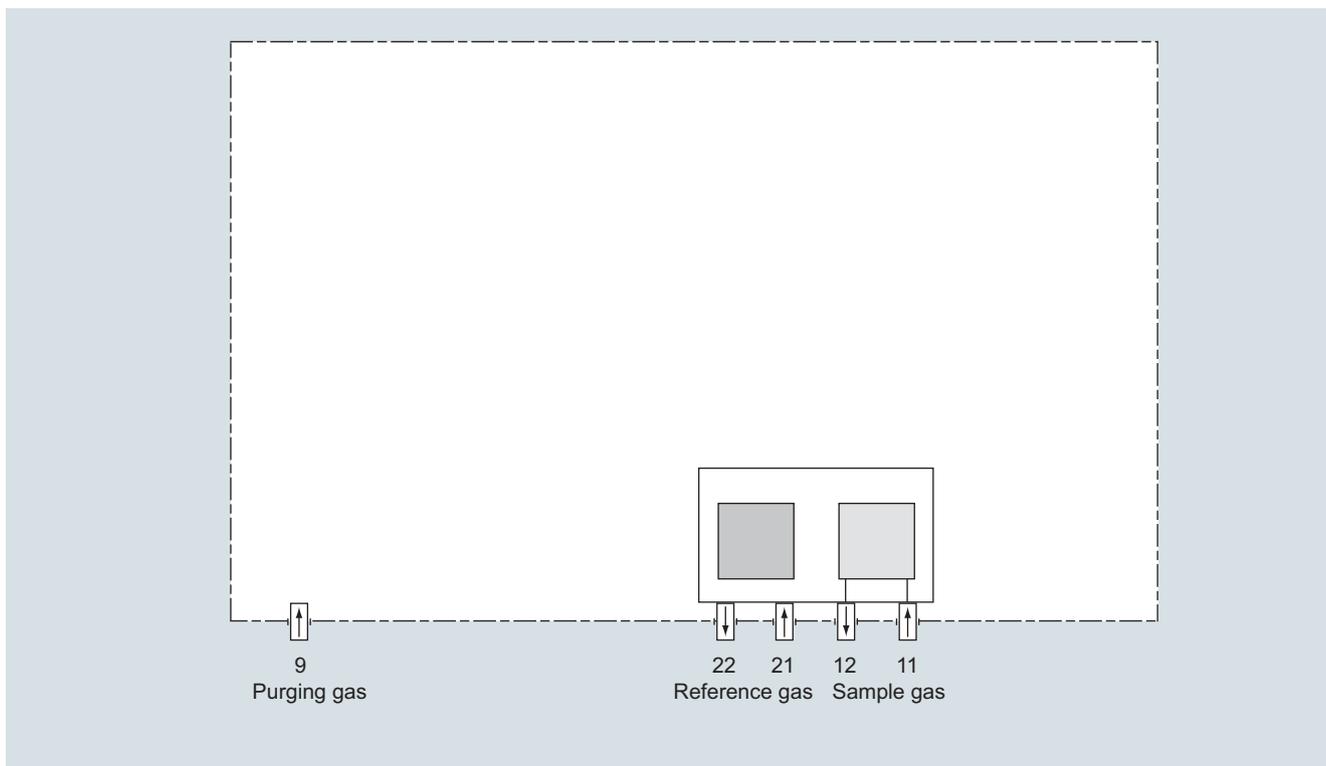
General information



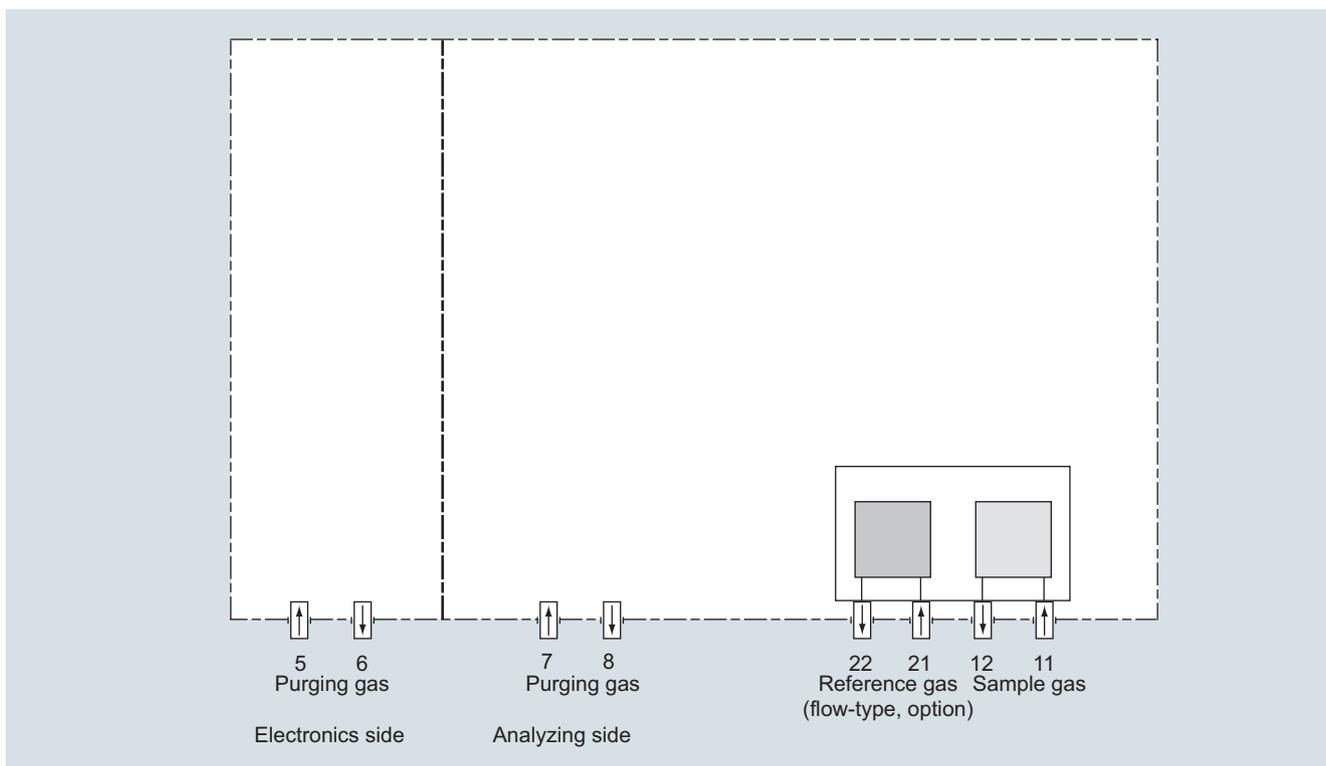
CALOMAT 62, membrane keyboard and graphic display

Designs – parts wetted by sample gas

Gas connection	19" rack unit	Field device
Input block with gas connection	Stainless steel, mat. no. 1.4571	Stainless steel, mat. no. 1.4571
Seal	FPM (e.g. Viton) or FFPM	FPM (e.g. Viton) or FFPM
Sensor	Glass	Glass
Input block with gas connection		Hastelloy C22
Seal		FFPM (e.g. Kalrez)
Sensor		Glass



CALOMAT 62, 19" rack unit, gas path



CALOMAT 62, field device, gas path

Extractive continuous process gas analysis

Series 6

CALOMAT 62

General information

Function

Principle of operation

The measuring principle is based on the different thermal conductivity of gases.

The temperature of a heated resistor surrounded by gas is determined by the thermal conductivity of the gas. Four such resistors are connected as a bridge.

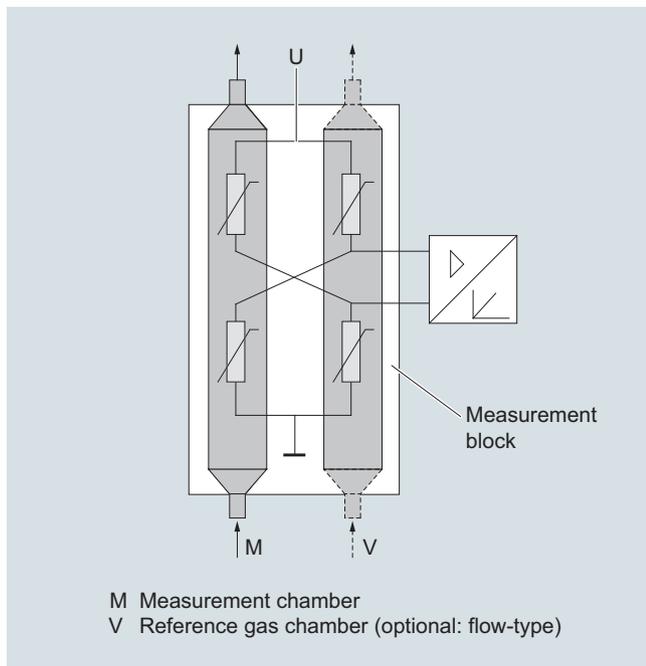
Sample gas flows around two of them, reference gas surrounds the other two. A constant DC voltage heats the resistors above the temperature of the measurement block.

The different thermal conductivities of the sample and reference gases result in different temperatures of the resistors. A change in the composition of the sample gas thus also causes a change in the resistance values.

The electrical equilibrium of the measuring bridge is disrupted, and a voltage is generated in the bridge diagonal. This is a measure of the concentration of the measured component.

Note

The sample gases must be fed into the analyzers free of oil, grease, and dust. The formation of condensation in the sample chambers (dew point of sample gas < ambient temperature) must be avoided. Therefore, gas prepared for the respective task must be provided in most applications.



CALOMAT 62, principle of operation, example of a non-flow-type reference chamber

Important features

- Four freely-programmable measuring ranges, also with suppressed zero, all ranges linear
- Smallest spans down to 1 % H₂ (with suppressed zero: 99 to 100 % H₂) possible
- Measuring range identification
- Electrically isolated measured-value output 0/2/4 to 20 mA (also inverted)
- Automatic or manual measuring range switchover selectable; remote switching is also possible
- Measured value can be saved during adjustment

- Time constants are selectable within wide ranges (static/dynamic noise suppression); i.e. the response time of the analyzer can be adapted to the respective task
- Short response time
- Low long-term drift
- Measuring point switchover for up to 6 measuring points (parameterizable)
- Measuring point identification
- External pressure sensor can be connected – for correction of variations in sample gas pressure
- Possibility for correcting the influence of residual gases (correction of cross-interference)
- Automatic measuring range calibration can be programmed
- Operation based on the NAMUR recommendation
- Two operator input levels with their own authorization codes to prevent unintentional and unauthorized interventions
- Simple handling using a numerical membrane keyboard and operator prompting
- Customer-specific device versions, such as:
 - Customer acceptance
 - TAG labels
 - Drift recording
 - Clean for O₂ service

Spans

The smallest and largest possible spans depend on both the measured component (gas type) and the respective application (see ordering data).

Cross-interferences

Information on the sample gas composition is required in order to determine the cross-interference of residual gases with several interfering components.

The zero offsets in % H₂ which result from 1 % residual gas (interfering gas) are listed in the following table; the specified values are approximate values.

It should be noted that the influence of interfering gas is not linear to its concentration. Information on the sample gas composition is required in order to determine the cross-interference of residual gases with several interfering components.

Ar	Approx. - 0.15 %
O ₂	Approx. + 0.02 %
CO ₂	Approx. - 0.13 %
CH ₄	Approx. + 0.17 %
SO ₂	Approx. - 0.31 %
Air (dry)	Approx. + 0.25 %

Effect of 1 % gas component with nitrogen as the residual gas, expressed in % H₂

Moreover, it must be noted that - in addition to a zero offset - the gradient of the characteristic can also be affected by the residual gas. However, this effect is negligible in the case of variations in the interfering gas concentration below 10 %.

Taking these facts into consideration and due to the fact that the cross-interference analyzers cause further measuring inaccuracies, a larger error in measurement occurs than with digital gas mixtures despite correction of cross-interference.

Specification for the interface cable

Surge impedance	100 ... 300 Ω , with a measuring frequency of > 100 kHz
Cable capacitance	Typ. < 60 pF/m
Core cross-section	> 0.22 mm ² , corresponds to AWG 23
Cable type	Twisted pair, 1 x 2 conductors of cable section
Signal attenuation	Max. 9 dB over the whole length
Shielding	Copper braided shield or braided shield and foil shield
Connection	Pin 3 and pin 8

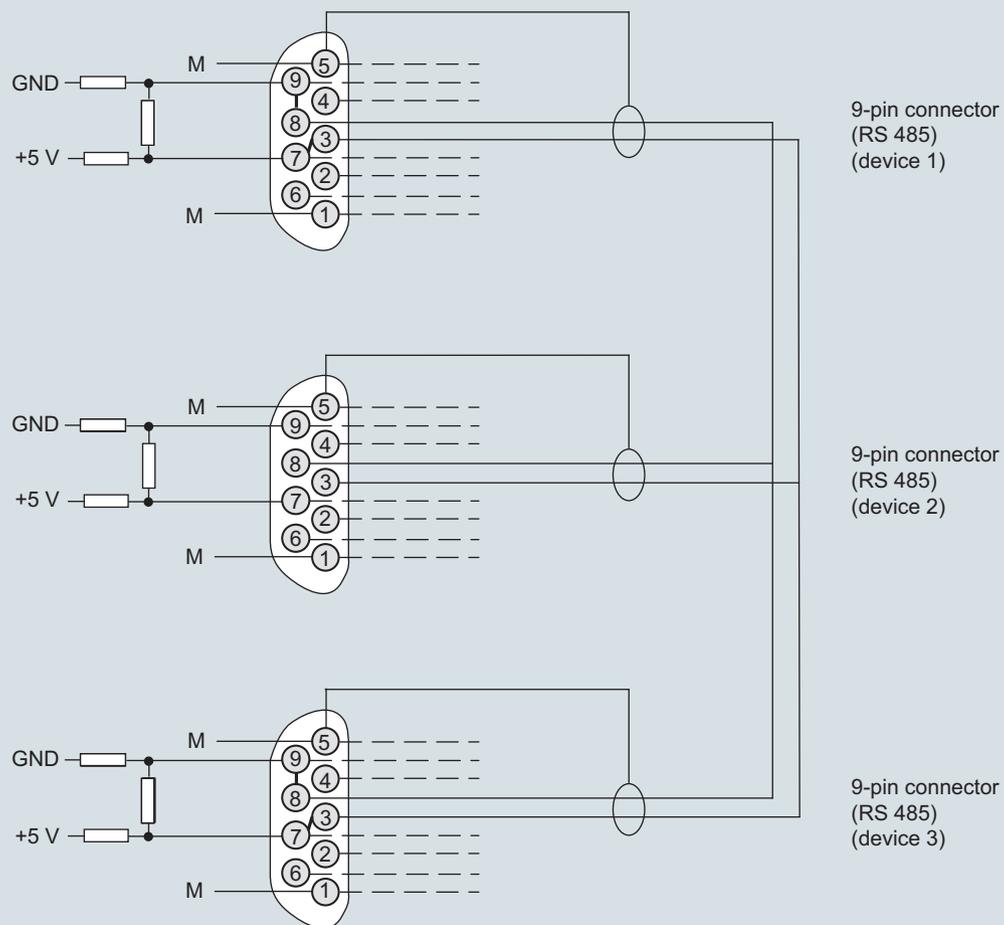
Bus terminating resistors

Pins 3-7 and 8-9 of the first and last connectors of a bus cable must be bridged (see graphic).

Note

It is advisable to install a repeater on the device side in the case of a cable length of more than 500 m or with high interferences.

Up to four components can be corrected via the ELAN bus, correction of cross-interference can be carried out for one or two components via the analog input.



Bus cable with plug connections, example

Extractive continuous process gas analysis

Series 6

CALOMAT 62

19" rack unit

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Technical specifications

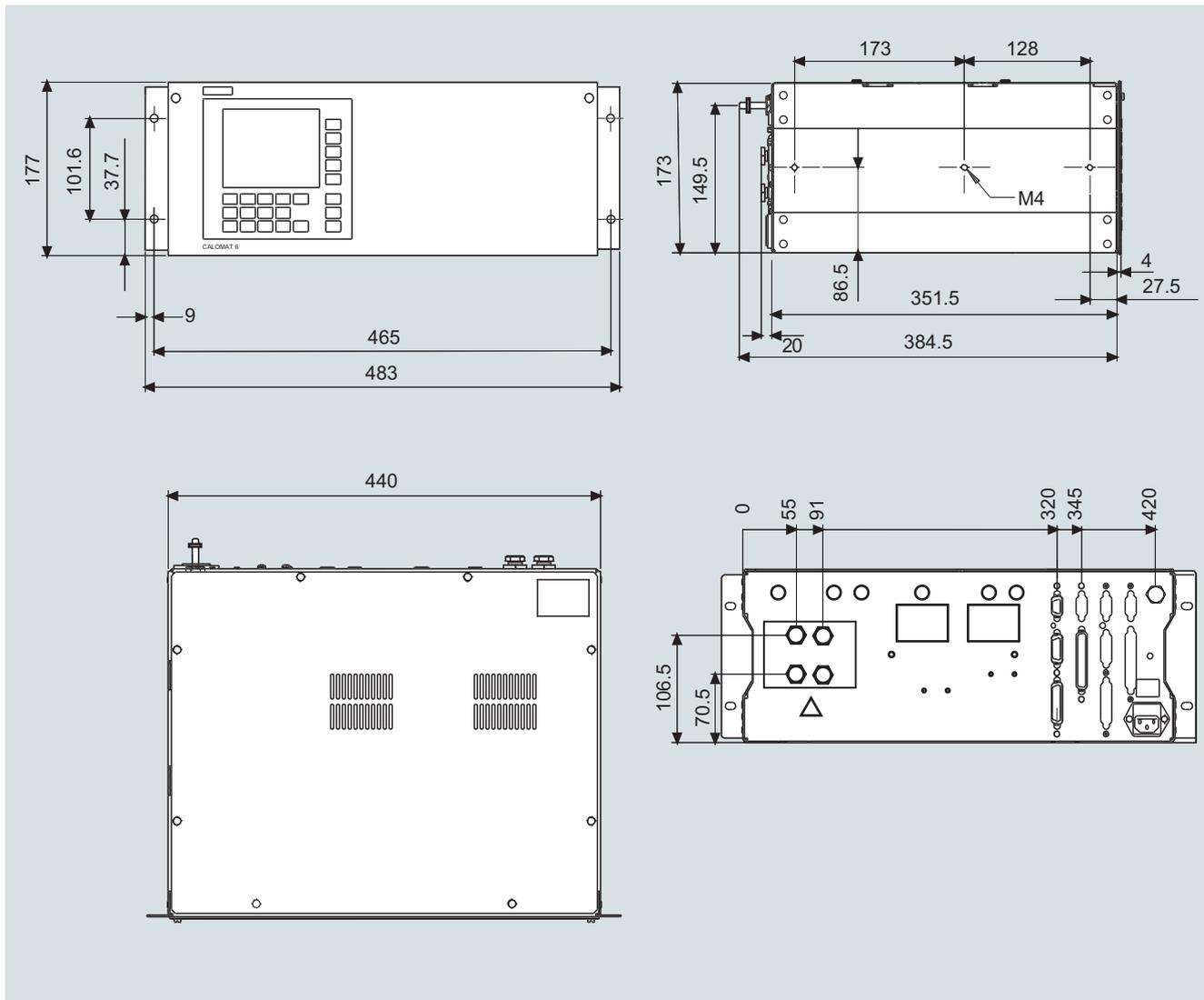
General information	Based on DIN EN 61207/IEC 1207. All data based on digital gas mixture H ₂ in N ₂	Measuring response	The time and measuring response refers to the measurement of H ₂ in N ₂ (based on the sample gas pressure 1 000 hPa absolute, sample gas flow 0.5 l/min, and ambient temperature 25 °C)
Measuring ranges	4, internally and externally switchable; automatic measuring range switchover also possible	Output signal fluctuation (3σ value)	< ± 1% of the smallest possible span according to rating plate with electronic damping constant of 1 s
Span	Application-dependent (see ordering data)	Zero point drift	< ± 1% of the current span/week
Measuring ranges with suppressed zero point	Application-dependent (see ordering data)	Measured-value drift	< ± 1% of the smallest possible span (according to rating plate)/week
Operating position	Front wall, vertical	Repeatability	< ± 1% of the current span
Conformity	CE marking in accordance with EN 50081-1/EN 50081-2 and RoHS	Detection limit	1% of the smallest possible span according to rating plate
Design, enclosure		Linearity error	< ± 1% of the current span
Degree of protection	IP20 according to EN 60529	Influencing variables	Based on sample gas pressure 1 000 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Weight	Approx. 13 kg	Ambient temperature	< 2%/10 K referred to smallest possible span according to label
Electrical characteristics		Accompanying gases	Deviation from zero point (for influence of interfering gas, see section "Cross-interference")
EMC interference immunity (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98) and EN 61326	Sample gas flow	0.2% of the current measuring span with a change in flow of 0.1 l/min within the permissible flow range
Electrical safety	In accordance with EN 61010-1; overvoltage category II	Sample gas pressure	< 1% of the current span with a change in pressure of 100 hPa
Auxiliary power (see nameplate)	100 V AC -10% ... 120 V AC +10%, 48 ... 63 Hz or 200 V AC -10% ... 240 V AC +10%, 48 ... 63 Hz	Auxiliary power	< 0.1% of the current span with rated voltage ± 10%
Power consumption	Approx. 30 VA	Electrical inputs and outputs	
Fuse values	100 to 120 V: 1.0 T/250 200 ... 240 V: 0.63 T/250	Analog output	0/2/4 ... 20 mA, floating; max. load 750 Ω
Gas inlet conditions		Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load: 24 V AC/DC/1 A, isolated
Sample gas pressure	800 ... 1 100 hPa (absolute)	Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and correction of cross-interference
Sample gas flow	30 ... 90 l/h	Digital inputs	6, designed for 24 V, isolated, freely configurable, e.g. for measuring range switchover
Sample gas temperature	Min. 0 to max. 50 °C, but above the dew point	Serial interface	RS 485
Temperature of the measuring cell	70 °C	Options	AUTOCAL function with 8 additional digital inputs and 8 additional relay outputs, also with PROFIBUS PA (on request) or PROFIBUS DP (on request)
Time response		Climatic conditions	
Warm-up period	The time and measuring response refers to the measurement of H ₂ in N ₂ < 30 min at room temperature (the technical specification will be met after 2 hours)	Permissible ambient temperature	-40 ... +70 °C during storage and transportation, 5 ... 45 °C in operation
Delayed display (T ₉₀)	Approx. 35 s (including dead time)	Permissible humidity (dew point must not be fallen below)	< 90% relative humidity as annual average, during storage and transportation
Damping (electrical time constant)	0 ... 100 s, configurable		
Dead time (the diffusion to the probes is the determining variable)	Approx. 34 s		

Extractive continuous process gas analysis

Series 6

CALOMAT 62

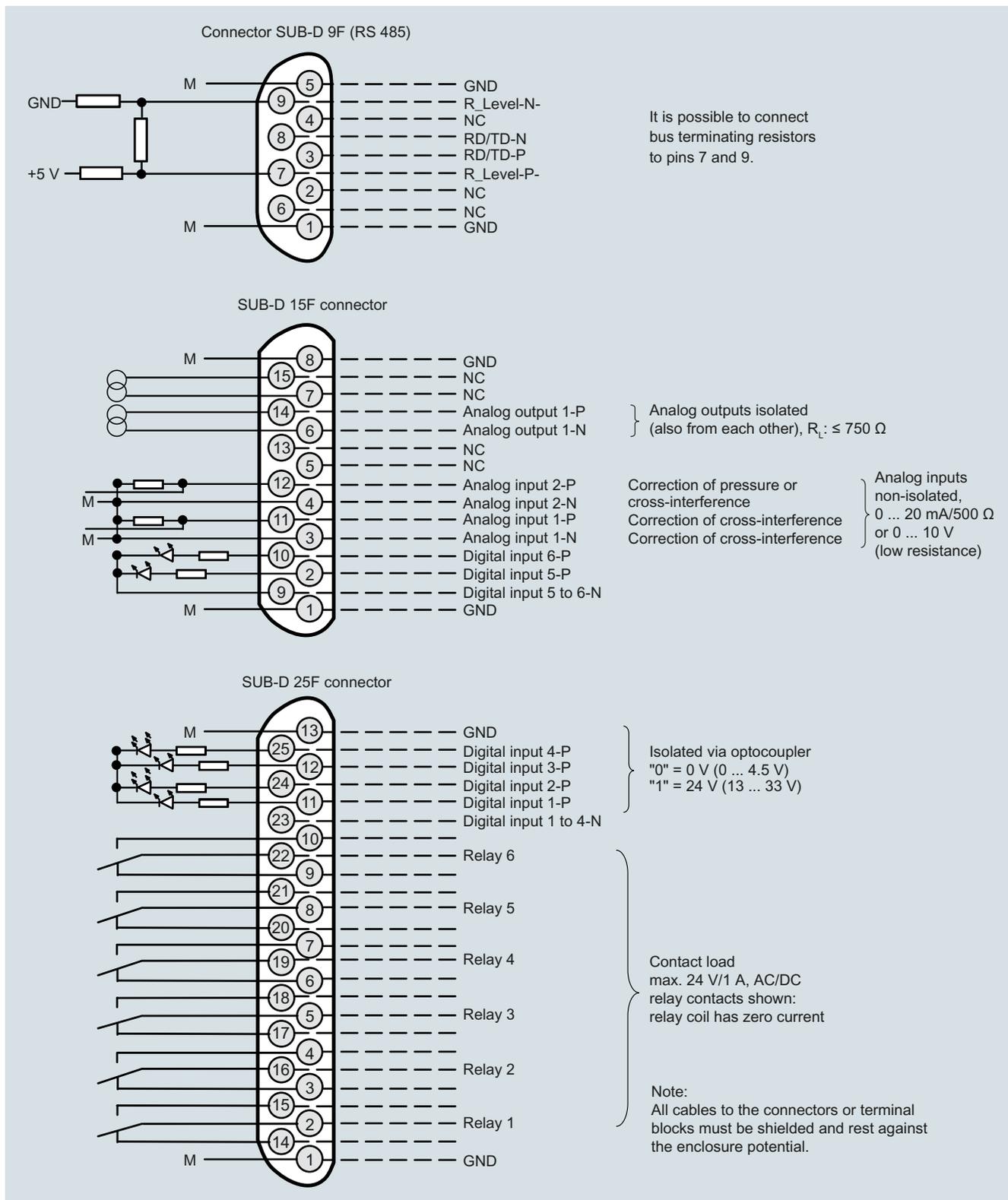
19" rack unit

Dimensional drawings

CALOMAT 62, 19" rack unit, dimensions in mm

Circuit diagrams

Pin assignment (electrical and gas connections)



CALOMAT 62, 19" rack unit, pin assignment

Extractive continuous process gas analysis

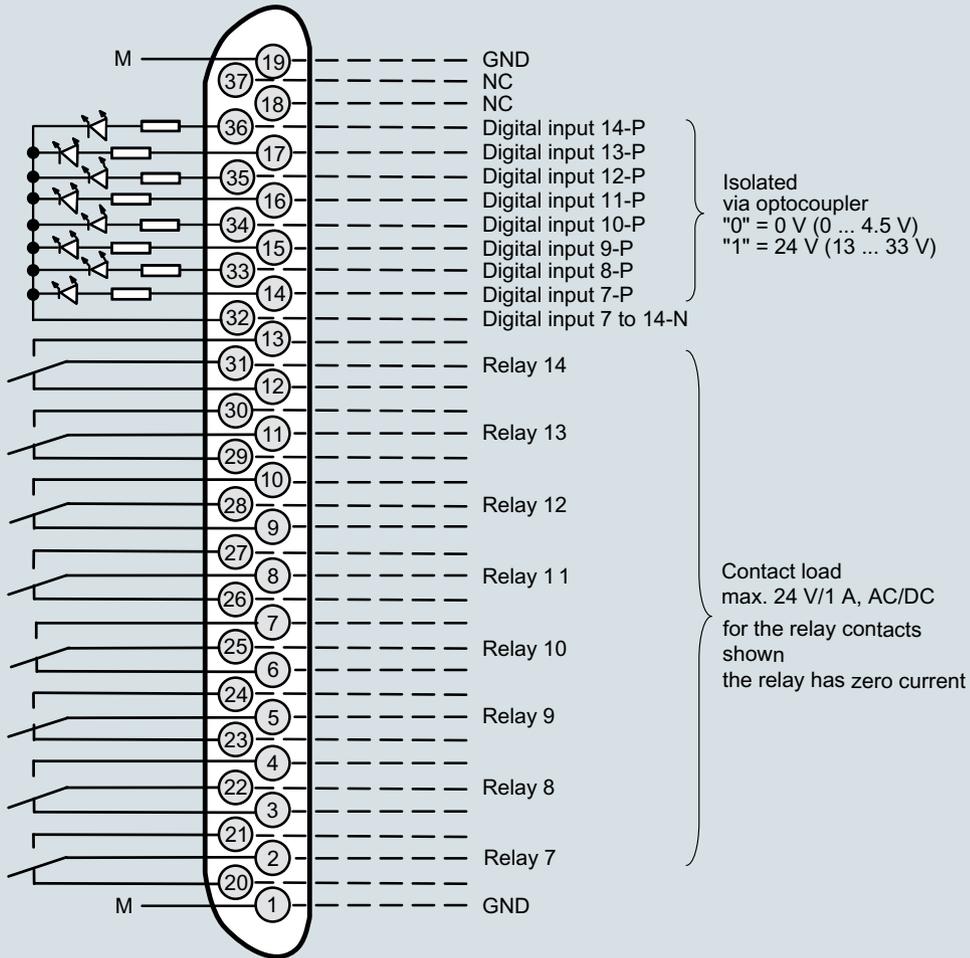
Series 6

CALOMAT 62

19" rack unit

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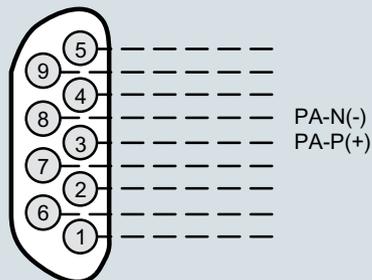
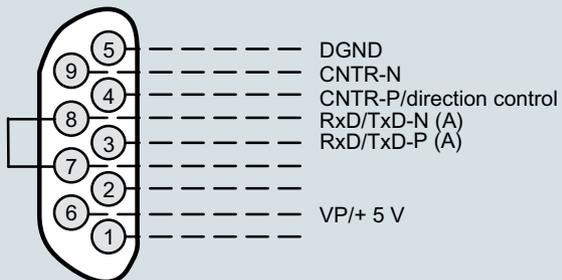
Connector SUB-D 37F (option)



Connector SUB-D 9F
PROFIBUS DP

optional

Connector SUB-D 9M
PROFIBUS PA



Note:

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

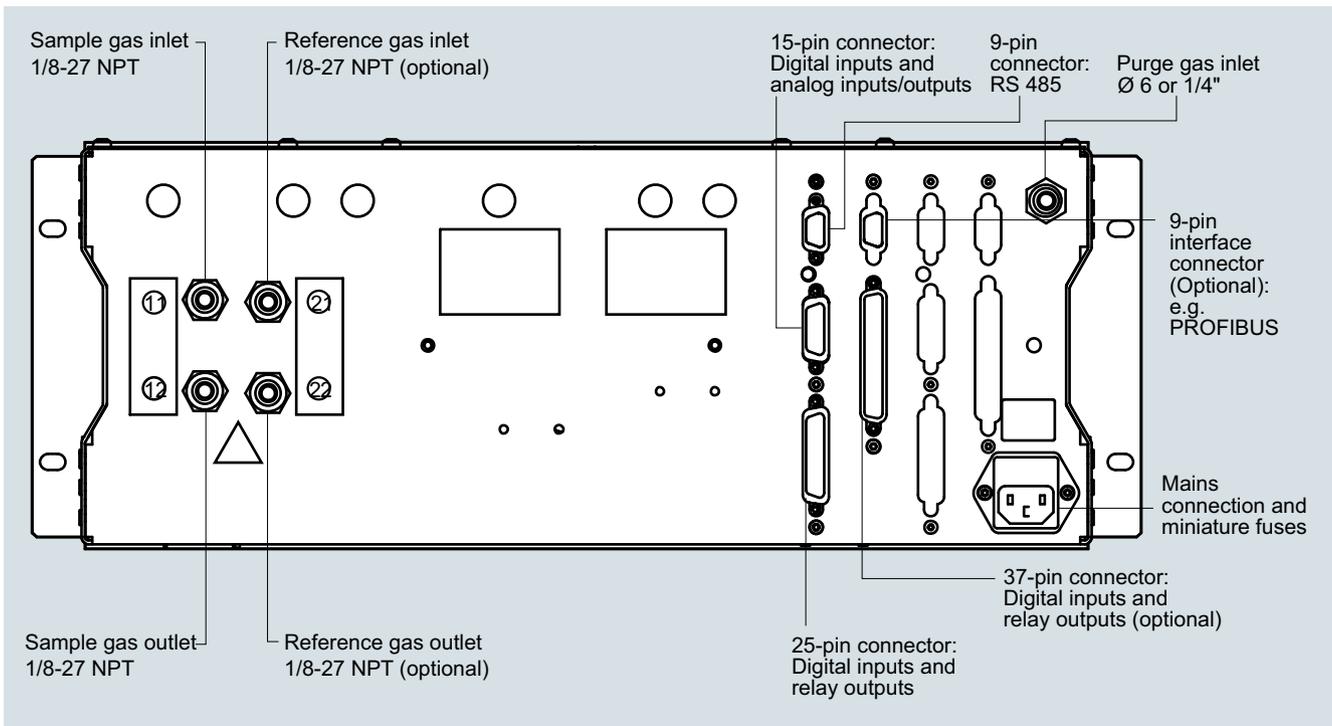
CALOMAT 62, 19" rack unit, pin assignment of the AUTOCAL board and PROFIBUS connectors

Extractive continuous process gas analysis

Series 6
CALOMAT 62

19" rack unit

1



CALOMAT 62, 19" rack unit, gas connections and electrical connections

Extractive continuous process gas analysis

Series 6

CALOMAT 62

Field device

1

Technical specifications

General information	Based on DIN EN 61207/IEC 1207. All data based on digital gas mixture H ₂ in N ₂	Time response	The dynamic and measuring response refers to the measurement of H ₂ in N ₂ (based on the sample gas pressure 1 000 hPa absolute, sample gas flow 0.5 l/min, and ambient temperature 25 °C)
Measuring ranges	4, internally and externally switchable; automatic measuring range switchover also possible	Warm-up period	< 30 min at room temperature (the technical specification will be met after 2 hours)
Span	Application-dependent (see ordering data)	Delayed display (T ₉₀)	Approx. 35 s (including dead time)
Measuring ranges with suppressed zero point	Application-dependent (see ordering data)	Electrical damping	0 ... 100 s, configurable
Operating position	Front wall, vertical	Dead time (the diffusion to the probes is the determining variable)	Approx. 34 s
Conformity	CE marking in accordance with EN 50081-1/EN 50081-2 and RoHS	Measuring response	The dynamic and measuring response refers to the measurement of H ₂ in N ₂ (based on the sample gas pressure 1 000 hPa absolute, sample gas flow 0.5 l/min, and ambient temperature 25 °C)
Design, enclosure		Output signal fluctuation (3σ value)	< ± 1% of the smallest possible span according to rating plate with electronic damping constant of 1 s
Degree of protection	IP65 according to EN 60529	Zero point drift	< ± 1% of the current span/week
Weight	Approx. 25 kg	Measured-value drift	< ± 1% of the smallest possible span (according to rating plate)/week
Electrical characteristics		Repeatability	< ± 1% of the current span
EMC interference immunity (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98) and EN 61326	Detection limit	1% of the smallest possible span according to rating plate
Electrical safety	In accordance with EN 61010-1; overvoltage category II	Linearity error	< ± 1% of the current span
Auxiliary power (see nameplate)	100 V-10% ... 120 V +10% AC, 48 ... 63 Hz or 200 V-10% ... 240 V +10% AC, 48 ... 63 Hz	Influencing variables	Based on sample gas pressure 1 000 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Power consumption	<ul style="list-style-type: none"> • Approx. 25 VA (gas connection block unheated) • Approx. 330 VA (gas connection block heated) 	Ambient temperature	< 2%/10 K referred to smallest possible span according to rating plate
Fuse values (gas connection unheated)	100 ... 120 V F3 1T/250 F4 1T/250 200 ... 240 V F3 0.63T/250 F4 0.63T/250	Accompanying gases	Deviation from zero point (for influence of interfering gas, see section "Cross-interference")
Fuse values (gas connection heated)	100 ... 120 V F1 1T/250 F2 4T/250 F3 4T/250 F4 4T/250 200 ... 240 V F1 0.63T/250 F2 2.5T/250 F3 2.5T/250 F4 2.5T/250	Sample gas flow	0.2% of the current measuring span with a change in flow of 0.1 l/min within the permissible flow range
Gas inlet conditions		Sample gas pressure	< 1% of the span with a change in pressure of 100 hPa
Sample gas pressure	800 ... 1 100 hPa (absolute)	Auxiliary power	< 0.1% of the output signal span with rated voltage ± 10%
Sample gas flow	30 ... 90 l/h	Electrical inputs and outputs	
Sample gas temperature	Min. 0 to max. 50 °C, but above the dew point	Analog output	0/2/4 ... 20 mA, floating; load max. 750 Ω
Temperature		Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load: 24 V AC/DC/1 A, floating
• of the measuring cell (sensor)	70 °C	Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and correction of cross-interference
• of the measurement cell block (base)	80 °C (heated)	Digital inputs	6, designed for 24 V, floating, freely configurable, e.g. for measuring range switchover
Sample gas humidity	< 90% relative humidity	Serial interface	RS 485
Purging gas pressure		Options	AUTOCAL function with 8 additional digital inputs and 8 additional relay outputs, also with PROFIBUS PA (on request) or PROFIBUS DP (on request)
• Permanent	165 hPa above ambient pressure	Climatic conditions	
• For short periods	Max. 250 hPa above ambient pressure	Permissible ambient temperature	-40 ... +70 °C during storage and transportation, 5 ... 45 °C in operation
		Permissible humidity (dew point must not be fallen below)	< 90% relative humidity as annual average, during storage and transportation

Extractive continuous process gas analysis

Series 6

CALOMAT 62

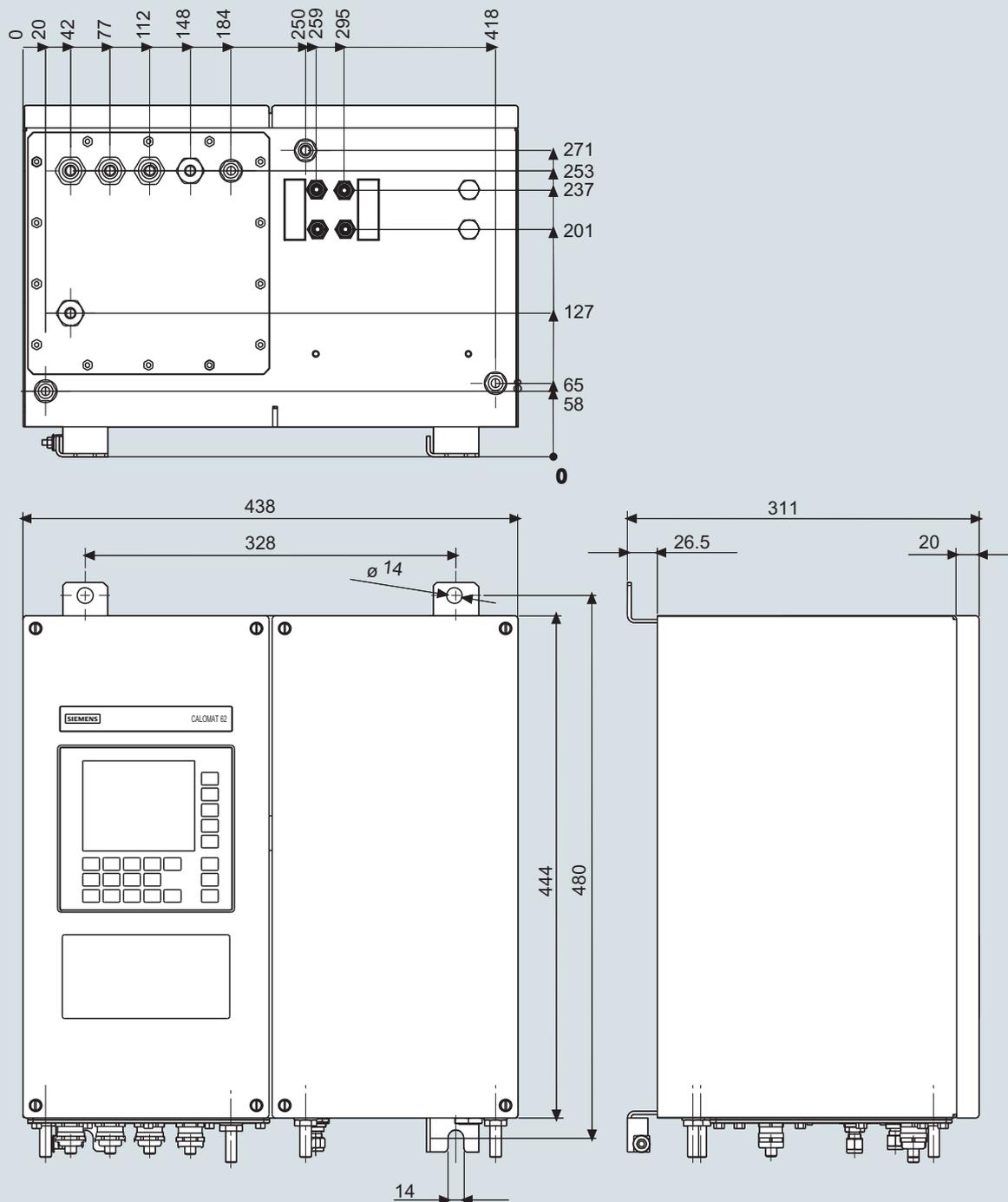
Field device

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Selection and ordering data

<i>Additional versions</i>	Order code
Add "-Z" to Article No. and specify Order codes.	
TAG labels (specific lettering based on customer information)	B03
BARTEC Ex p purging unit "Leakage compensation"	E71
BARTEC Ex p purging unit "Continuous purging"	E72
Clean for O ₂ service (specially cleaned gas path)	Y02
Measuring range indication in plain text, if different from the standard setting	Y11
Special setting (only in conjunction with an application no., e.g. extended measuring range)	Y12
Extended special setting (only in conjunction with an application no., e.g. determination of cross-interferences)	Y13
<i>Accessories</i>	Article No.
RS 485/Ethernet converter	A5E00852383
RS 485/RS 232 converter	C79451-Z1589-U1
RS 485/USB converter	A5E00852382
AUTOCAL function with 8 digital inputs/outputs	A5E00064223
AUTOCAL function 8 digital inputs/outputs each and PROFIBUS PA	A5E00057315
AUTOCAL function 8 digital inputs/outputs each and PROFIBUS DP	A5E00057318
Set of Torx screwdrivers	A5E34821625

Dimensional drawings



CALOMAT 62, field device, dimensions in mm

Extractive continuous process gas analysis

Series 6

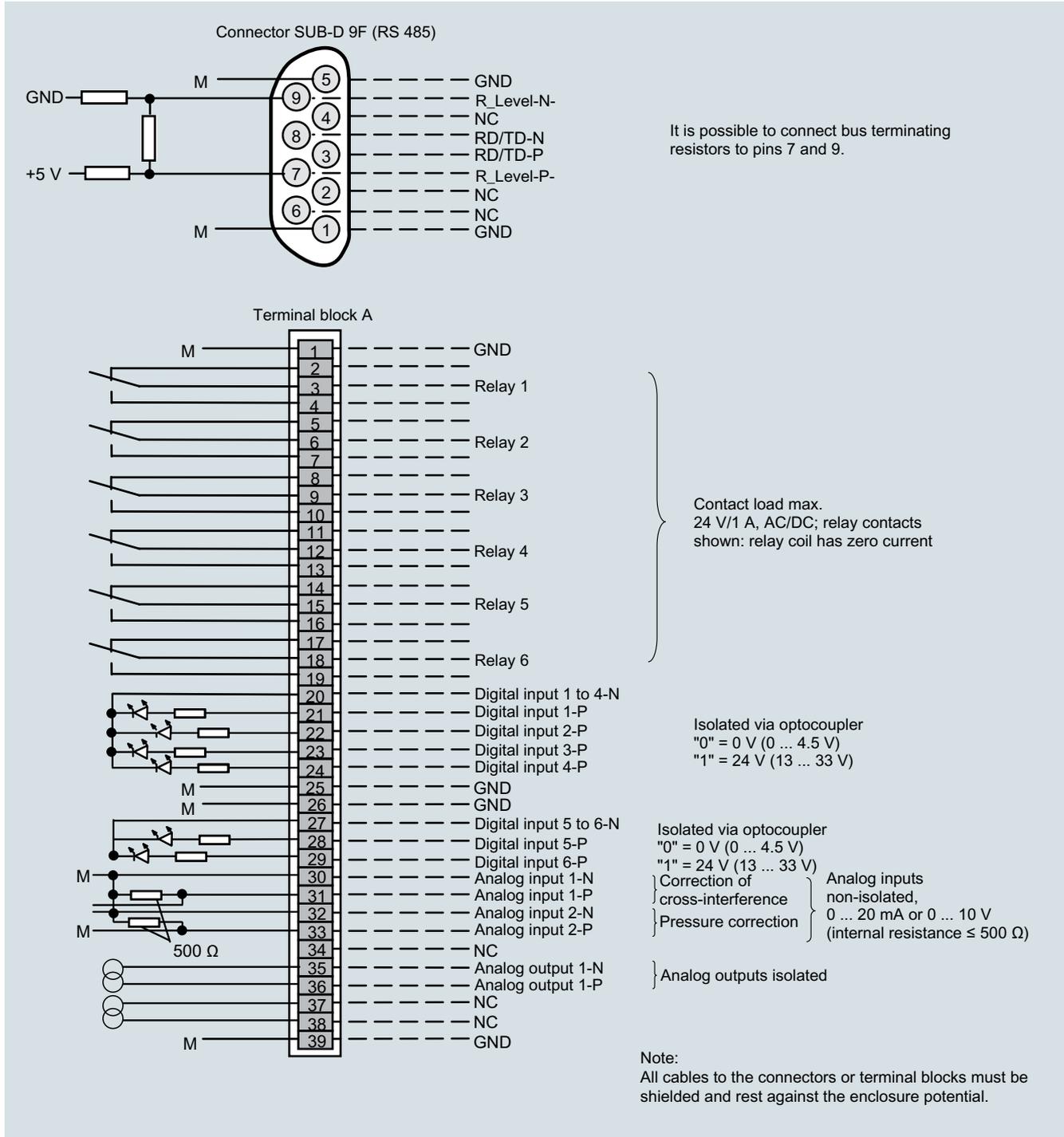
CALOMAT 62

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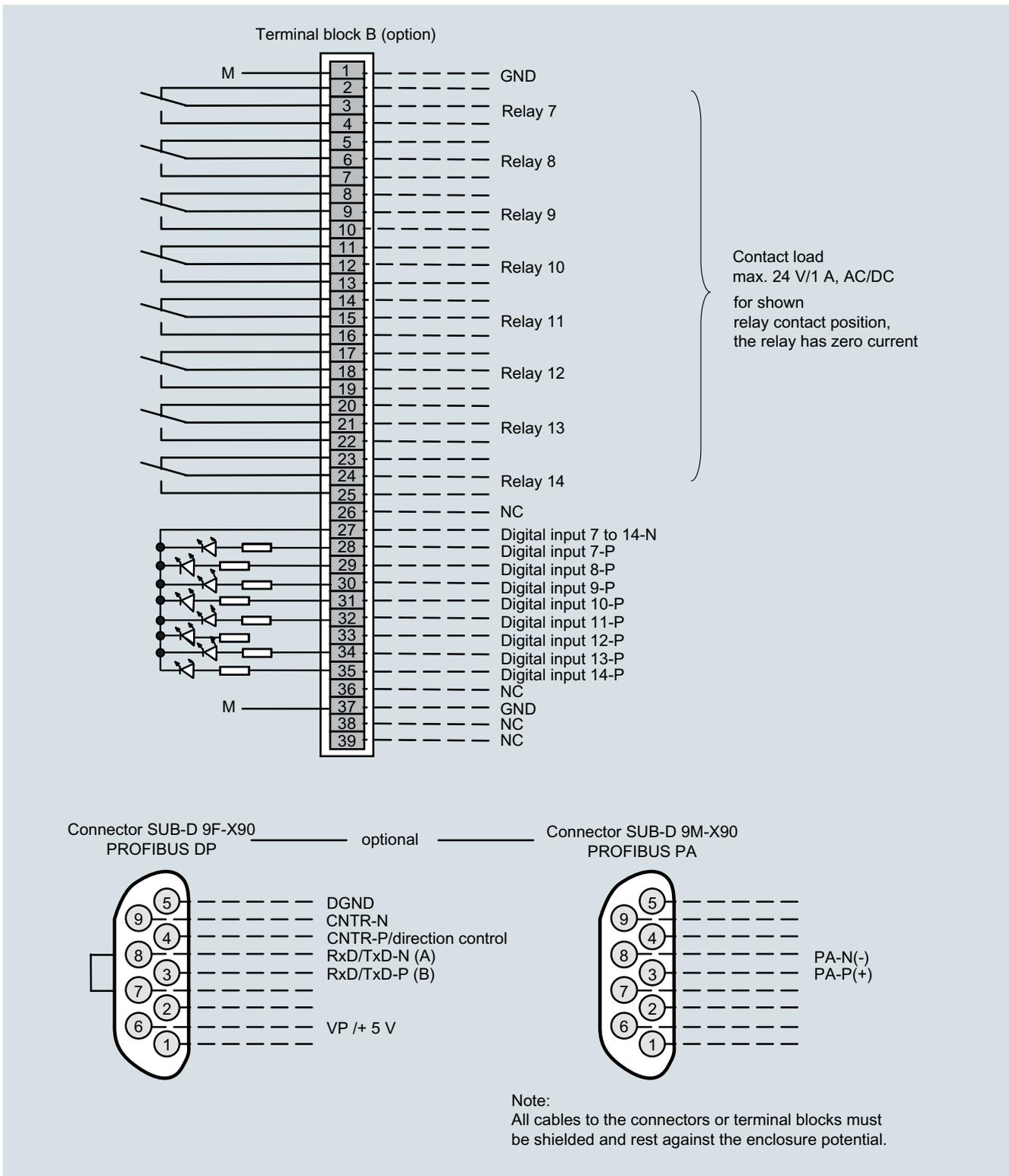
Field device

Circuit diagrams

Pin assignment (electrical and gas connections)



CALOMAT 62, field device, pin and terminal assignment



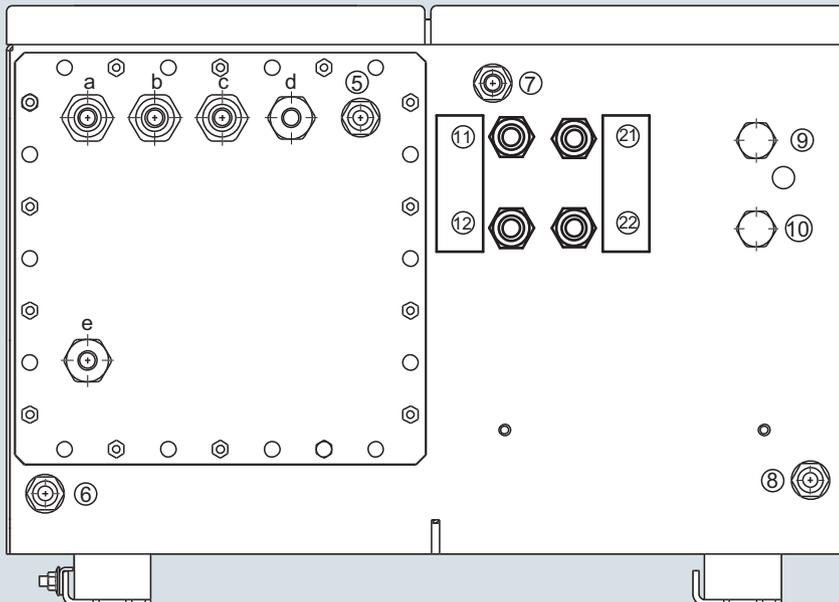
CALOMAT 62, field device, pin and terminal assignment of the AUTOCAL board and PROFIBUS connectors

Extractive continuous process gas analysis

Series 6

CALOMAT 62

Field device



Gas connections

- | | | |
|-------|--------------------------|------------------------------------|
| ⑪ | Sample gas inlet | } Internal thread
1/8" - 27 NPT |
| ⑫ | Sample gas outlet | |
| ⑰ | Reference gas inlet | |
| ⑱ | Reference gas outlet | |
| ⑤ - ⑧ | Purge gas inlets/outlets | Fittings Ø 10 mm or 3/8" |
| ⑨ | Unassigned | |
| ⑩ | Unassigned | |

Electrical connections

- | | |
|-------|--|
| a - c | Signal cable (Ø 10 ... 14 mm)
(analog + digital): cable gland M20x1.5 |
| d | Interface connection: (Ø 7 ... 12 mm)
cable gland M20x1.5 |
| e | Power supply: (Ø 7 ... 12 mm)
cable gland M20x1.5 |

CALOMAT 62, field device, gas connections and electrical connections

Selection and ordering data

Operating instructions	Article No.
Gas analyzers of Series 6 and ULTRAMAT 23 Schnittstelle/Interface PROFIBUS DP/PA • German and English	A5E00054148

More information

The complete documentation is available in various languages for downloading free of charge:
<http://www.siemens.com/processanalytics/documentation>

Selection and ordering data

Description	7MB2541	7MB2531	2 years (quantity)	5 years (quantity)	Article No.
Temperature limiter		x	–	1	A5E00891855
Adapter plate, LC display/keypad	x	x	1	1	C79451-A3474-B605
Temperature sensor		x	–	1	C79451-A3480-B25
LC display	x		–	1	A5E31474846
Line transformer, 115 V	x	x	–	1	W75040-B21-D80
Line transformer, 230 V	x	x	–	1	W75040-B31-D80
Fuse, T 0.63 A, line voltage 200 ... 240 V	x	x	2	3	W79054-L1010-T630
Fuse, T 1 A, supply voltage 100 ... 120 V	x	x	2	3	W79054-L1011-T100
Heating cartridge		x	–	1	W75083-A1004-F120

Extractive continuous process gas analysis

Series 6

FIDAMAT 6

General information

1

Overview



The FIDAMAT 6 gas analyzer is suitable for the determination of the total hydrocarbon content in the air and high-boiling gas mixtures.

Benefits

The FIDAMAT 6 gas analyzer is distinguished by its wide range of applications:

- In the presence of up to 100 % H₂O vapor
- In ultra-pure gas applications
- With high-boiling components (up to 200 °C)
- In the presence of corrosive gases (with preliminary filter)

The FIDAMAT 6 exhibits:

- Extremely low cross-sensitivity to interfering gases
- Low consumption of combustion air
- Low influence of oxygen on measured value

The analyzer is additionally equipped with warning and fault messages:

- For failure of combustion gas
- If the flame is extinguished
- To indicate pump and filter faults

Application

Areas of application

- Environmental protection
- Wastewater (in conjunction with a stripping device, verification of the hydrocarbon content of liquids)
- TLV (Threshold Limit Value) monitoring at places of work
- Quality monitoring
- Process exhaust monitoring
- Ultra-pure gas measurements in media such as O₂, CO₂, inert gases and cold sample gases
- Measurement of corrosive and condensing gases
- Process optimization

Further applications

- Chemical plants
- Gas manufacturers (ultra-pure gas monitoring)
- Research and development
- Cement industry (measurement of emissions)
- Paint shops and dry-cleaning systems
- Refineries (tank farms, wastewater)
- Drying systems
- Solvent recovery systems
- Pharmaceutical industry
- Automotive industry (engine development, engine and transmission development and certification)

Special applications

Special applications

Special applications are available on request in addition to the standard combinations, e.g. measuring range 0 to 100 %.

Performance-tested version

Configuration prepared based on QAL1 according to EN 15267 for systems 13th BImSchV/27th BImSchV and TA Luft.

Design

- 19" slide-in module with 4 HU for installation
 - In hinged frame
 - In cabinets with or without telescopic rails
- Front plate can be swung down for servicing purposes (laptop connection)
- Gas connections for sample gas inlet and outlet as well as combustion gas and combustion air; pipe diameter 6 mm or 1/4"
- Gas and electrical connections at the rear
- Internal gas paths: stainless steel (mat. no. 1.4571)

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

Input and outputs

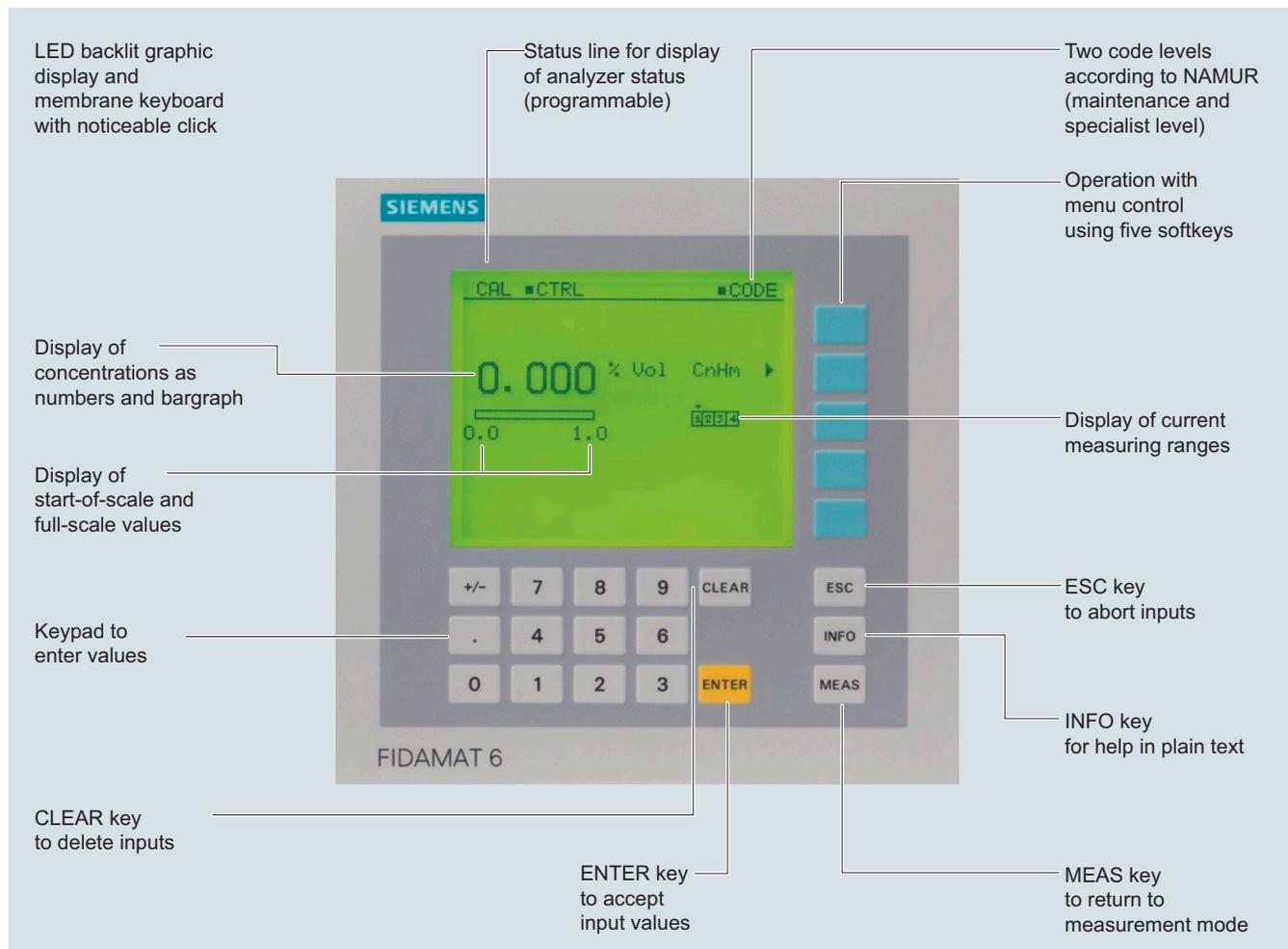
- One analog output for each measured component
- Two programmable analog inputs
- Six digital inputs freely configurable (e.g. for measurement range switchover, processing of external signals from sample preparation)
- Six relay outputs freely configurable (failure, maintenance demanded, maintenance switch, limit alarm, external solenoid valves, measuring point switchover)
- Expansion by eight additional digital inputs and eight additional relay outputs 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
- Incorporation in networks via PROFIBUS DP/PA interface
- SIPROM GA software as service and maintenance tool



FIDAMAT 6, membrane keyboard and graphic display

Extractive continuous process gas analysis

Series 6

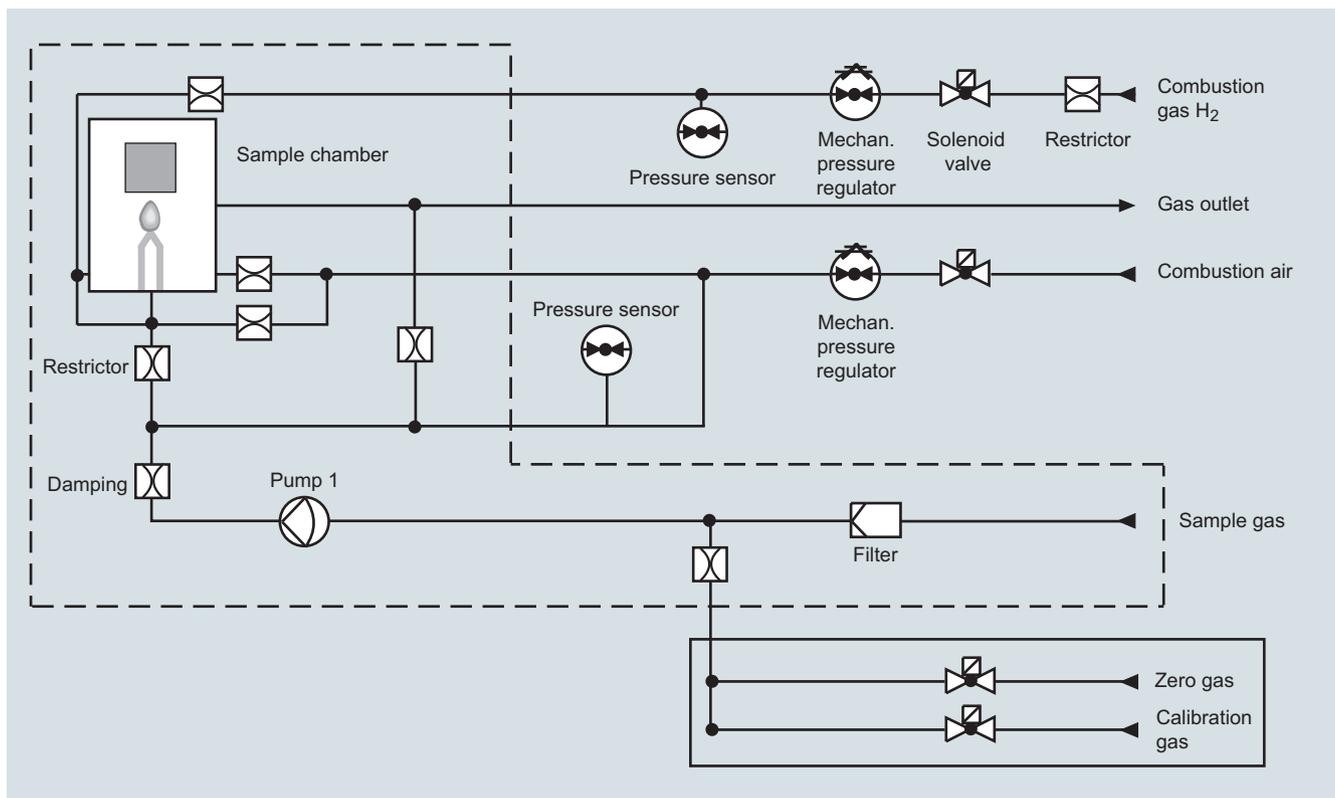
FIDAMAT 6

General information

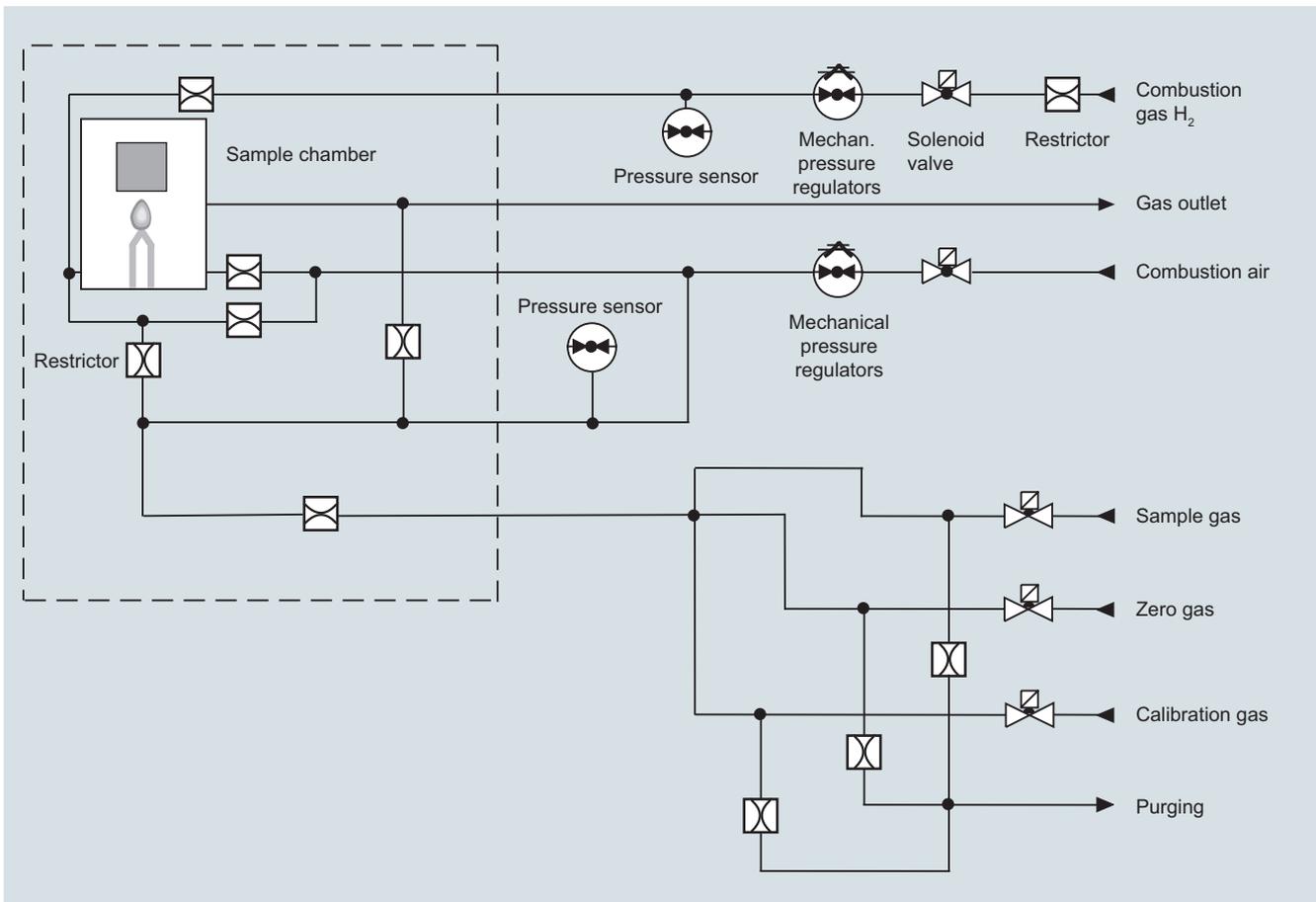
Designs – parts wetted by sample gas

Gas path	Material
Piping	Stainless steel, mat. no. 1.4571
Gas inlet	Stainless steel, mat. no. 1.4571
Gaskets	Graphite
Sample gas restrictor	Quartz
Auxiliary gas restrictors	Stainless steel, mat. no. 1.4571
Pump membrane	PTFE
Pump head	Stainless steel, mat. no. 1.4571
Detector	
• Nozzle	Quartz
• FID housing	Stainless steel, mat. no. 1.4571

Gas path



FIDAMAT 6 total hydrocarbon analyzer, gas path with pump and with connection for combustion air



FIDAMAT 6 total hydrocarbon analyzer, gas path without pump and with connection for combustion air

Extractive continuous process gas analysis

Series 6

FIDAMAT 6

General information

Function

Principle of operation

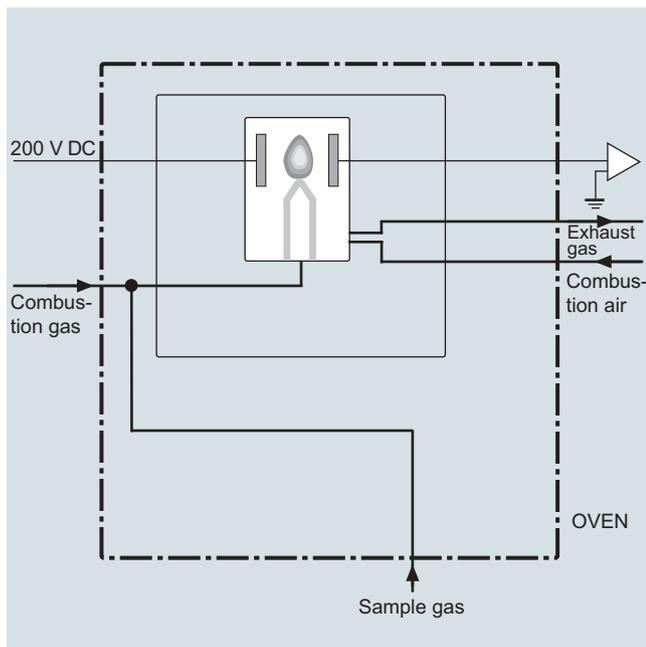
The FIDAMAT 6 carries out substance-specific measurements and not component-specific measurements. It measures the total of all hydrocarbons in a sample gas, but with different weighting of the hydrocarbon molecules. To a first approximation, the display is proportional to the number of C atoms in the respective molecule. However, there are fluctuations in practice. The display deviation for the respective molecule is expressed by the response factor.

The sample gas is supplied to the FIDAMAT 6 through overpressure or drawn in by the built-in diaphragm pump (optionally via a heated line and an additional filter) and passed on to the flame ionization detector via an obstruction-proof fused-silica restrictor.

In the detector, the hydrocarbons in the sample gas are burned in an oxyhydrogen gas flame. Burning partially ionizes the proportion of organically-bound hydrocarbons. The released ions are converted into an ionic current by the voltage present between two electrodes, and measured using a highly sensitive amplifier. The current measured is proportional to the quantity of organically-bound C atoms in the sample gas.

A pressure regulator keeps the combustion gas pressure constant. The balanced system of pump, capillary tubes, and pressure regulator for combustion air ensures that the sample gas pressure is kept constant.

When the analyzer is switched on, ignition is carried out automatically when the setpoint temperature has been reached and, for versions "with pump", the pump is also started up.



FIDAMAT 6, principle of operation

The FIDAMAT 6 provides various messages in the form of floating contacts:

- Maintenance request
E.g. sample gas flow (filter/pump)
Fan failure (advance warning for measuring accuracy)
The measured value remains unaffected.
- Fault
e. g., hydrogen, combustion air and sample gas pressures, temperature, analyzer part and pump, fault in the electronics (temperature).
The measured value may be influenced.
- Failure
In the event of failure of, for example, the electronics, power supply, combustion gas, combustion air or sample gas, the analyzer automatically shuts down (the combustion gas valve is closed).

Note

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

Calibration

The calibrating interval should be adapted to the respective measuring task. We recommend N_2 as zero gas (at least 5.0; for measuring of hydrocarbons < 1 vpm: at least 6.0).

The calibration gas should have a concentration of at least 60 % of the leading measuring range. The concentration of residual hydrocarbons must not exceed 0.1 vpm.

For pure gas measurement, use suitable additional gases.

Example:

1. Emission measurement

Measuring range	0 ... 50 mg C/m ³
Zero gas	N ₂ (5.0 or better)
Calibration gas	21 vpm C ₃ H ₈ in N ₂ (corresponds to 31.43 mg C/m ³ at 20 °C)

2. Purity measurement in 100 % O₂

Measuring range	0 ... 50 vpm C ₁
Zero gas	N ₂ (5.0 or better)
Calibration gas	At least 30 vpm CH ₄ in O ₂

Essential characteristics

- Four measuring ranges which can be freely configured, even with suppressed zero point, all measuring ranges are 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
- Measuring range identification
- Measuring point switchover for up to 6 measuring points
- Measuring point identification
- 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 measuring range calibration can be configured
- Operation based on the NAMUR recommendation
- Customer-specific analyzer options such as:
 - Customer acceptance
 - TAG labels
 - Drift recording
- Wear-free, corrosion-proof filter housing
- No blocking of the sample gas capillaries through the use of a quartz restrictor
- Purge function in the event of analyzer or power supply failure (avoids build-up of toxic and corrosive substances in the device)
- Low consumption of combustion air
- Response factors comply with the minimum requirements in accordance with German air purity guidelines and the Working Group of the German automotive Industry
- Simple handling using a numerical membrane keyboard and operator prompting

Response factors (examples, mean values)

Substance	Mean response factor
n-butane	1.00
n-propane	1.00
n-heptane	1.00
Cyclohexane	1.08
Isopropanol	0.81
Toluene	1.06
Acetone	0.92
Ethyl acetate	0.76
Isobutyl acetate	0.83
Methane	1.06
Ethane	0.99
n-hexane	1.01
iso-octane	1.04
Ethine (acetylene)	0.91
Propene	0.84
Methanol	0.87
Ethanol	0.83
Ethanoic acid	1.13
Methyl acetate	0.67
Benzene	1.01
Ethyl benzene	0.96
p-xylene	1.03
Dichloromethane	1.13
Trichloroethene	1.01
Tetrachlorethene	1.07
Chloroform	0.72
Chlorobenzene	1.15

Cross-interferences (examples)¹⁾

Interfering component	Concentration of the interfering component	Induced cross-interference
O ₂ in N ₂	(21 vol. %)	< 0.3 mg/m ³
SO ₂ in N ₂	(258 mg/m ³)	< 0.15 mg/m ³
NO in N ₂	(310 mg/m ³)	< 0.5 mg/m ³
NO ₂ in synth. Air	(146 mg/m ³)	< 0.1 mg/m ³
CO in N ₂	(461 mg/m ³)	< 0.15 mg/m ³
CO ₂ in N ₂	(18 vol. %)	< 0.1 mg/m ³
HCl in N ₂	(78 mg/m ³)	< 0.3 mg/m ³

¹⁾ With measuring range 0 to 15 mg/m³.

Extractive continuous process gas analysis

Series 6
FIDAMAT 6

19" rack unit

1

Technical specifications

General information		Measuring response	
Measuring ranges	4, internally and externally switchable; manual and autoranging possible	Output signal fluctuation	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature < 0.75% of the smallest possible measuring range according to rating plate, with electronic damping constant of 1 s (corresponds to $\pm 0.25\%$ at 2σ)
Smallest possible measuring span	0 ... 10 vpm	Zero point drift	< 0.5%/month of the smallest possible measuring span according to rating plate
Largest possible measuring span	99.999 vpm ^{*)}	Measured-value drift	< 1%/week of the current measuring range
Concentration units	vpm, C ₁ , C ₃ , C ₆ or mgC/m ³	Repeatability	< 1% of the current measuring range
Autoranging	Hysteresis, selectable	Detection limit	0.1 vpm (version for ultra-pure gas measurement: 50 ppb)
Measured-value display	Digital concentration display (5 digits with floating point)	Linearity error	< 1% of the current measuring range
Resolution of digital display	0.1% of measured value	Influencing variables	
Operating position	Front wall, vertical	Ambient temperature	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature < 1%/10 K referred to smallest possible span according to rating plate
Conformity	CE mark in accordance with EN 50081-1, EN 50082-2	Atmospheric pressure	< 1%/50 hPa
Oven temperature	Adjustable, 100 ... 200 °C	Sample gas pressure	< 2% of the current measuring range/ 1% pressure change (within 600 ... 1 100 hPa)
Design, enclosure		Auxiliary power	< 1% of the current measuring range with rated voltage $\pm 10\%$
Degree of protection	IP20 according to EN 60529	Position influence	< 1% with < 15° inclination
Weight	Approx. 23 kg	Electrical inputs and outputs	
Electrical characteristics		Analog output	0/2/4 ... 20 mA, isolated; max. load 750 Ω
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	Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load: 24 V AC/DC/1 A, potential-free
Power consumption	<ul style="list-style-type: none"> • Approx. 150 VA during operation, • Approx. 350 VA during warm-up phase 	Analog inputs	2, dimensioned for 0/2/4 to 20 mA for external pressure sensor and correction of influence of accompanying gas (correction of cross-interference)
EMC interference immunity (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98)	Digital inputs	6, designed for 24 V, floating, freely configurable, e.g. for measuring range switchover
Electrical safety	In accordance with EN 61010-1, overvoltage category II	Serial interface	RS 485
Fuse values	<ul style="list-style-type: none"> • 100 ... 120 V: 4.0T/250 • 200 ... 240 V: 2.5 T/250 	Options	AUTOCAL function each with 8 additional digital inputs and relay outputs, also with PROFIBUS PA or PROFIBUS DP
Gas inlet conditions		Climatic conditions	
Permissible sample gas pressure	< 2 000 hPa abs.	Permissible ambient temperature	5 ... 45 °C in operation, -30 ... +70 °C during storage and transportation
<ul style="list-style-type: none"> • Without pump • With integrated pump 	600 ... 1 100 hPa	Permissible humidity	< 90% RH (RH: relative humidity) as annual average, during storage and transportation (must not fall below dew point)
Sample gas temperature	0 ... 200 °C		
Sample gas humidity	< 90% RH (RH: relative humidity)		
Dynamic response			
Warm-up period	At room temperature, approx. 2 ... 3 h		
Delayed display (T ₉₀)	2 ... 3 s		
Damping (electrical time constant)	0 ... 100 s, configurable		
Dead time (purging time of the gas path in the unit at 1 l/min)	With filter, 2 ... 3 s		
Time for device-internal signal processing	< 1 s		

^{*)} 100% as special application

FIDAMAT 6 with pump and heated oven, with combustion air connection					
Gases	Inlet pressure hPa (abs.)	Operating pressure Pump startup		Flow through FID ml/min	Flow through bypass ml/min
		Without hPa (abs.)	With hPa (abs.)		
		Combustion gas	3 000 ... 5 000		
Combustion air	3 000 ... 5 000	1 420 ± 20	1 500	~ 320	~ 500
Sample gas	~ 1000	—	1 500 ± 2	~ 3	~ 1 000
Zero gas	3 500 ... 4 000	—	1 500 ± 2	~ 3	~ 1 000
Calibration gas	3 500 ... 4 000	—	1 500 ± 2	~ 3	~ 1 000

FIDAMAT 6 without pump, with heated oven, with combustion air connection					
Gases	Inlet pressure hPa (abs.)	Operating pressure Sample/calibration gas		Flow through FID ml/min	Flow through bypass ml/min
		Without hPa (abs.)	With hPa (abs.)		
		Combustion gas	3 000 ... 5 000		
Combustion air	3 000 ... 5 000	1 480 ± 5	—	~ 320	~ 300
Sample gas	1 500 ... 2 000	—	1 500 ± 2	~ 3	~ 500
Zero gas	1 500 ... 2 000	—	1 500 ± 2	~ 3	~ 500
Calibration gas	1 500 ... 2 000	—	1 500 ± 2	~ 3	~ 500

The supply gases (combustion gas, combustion air) must have a degree of purity of 5.0 in order to guarantee correct measurements. The degree of purity must be increased in the case of very small hydrocarbon concentrations (< 1 ppm).

Extractive continuous process gas analysis

Series 6

FIDAMAT 6

19" rack unit

1

Selection and ordering data

FIDAMAT 6 gas analyzer

19" rack unit for installation in cabinets

➔ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.

Gas connections

Pipe with 6 mm outer diameter

Pipe with 1/4" outer diameter

Version

Without pump, for sample gas with overpressure¹⁾

With heated pump, for sample gas with atm. pressure

Combustion air feed

With connection for combustion air

Number of channels

1-channel version

Add-on electronics

Without

AUTOCAL function

- With 8 additional digital inputs/outputs
- With 8 digital inputs/8 digital outputs, PROFIBUS PA interface
- With 8 digital inputs/8 digital outputs, PROFIBUS DP interface

Power supply

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

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

Combustion gases

H₂

Language (supplied documentation, software)

German

English

French

Spanish

Italian

Article No.

7MB2421-

0	1	B	D	A
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0

1

B

D

A

1

0

1

6

7

0

1

A

0

1

2

3

4

Additional versions

Add "-Z" to Article No. and specify Order code

Telescopic rails (2 units)

TAG labels (specific lettering based on customer information)

Clean for O₂ service (specially cleaned gas path)

Measuring range indication in plain text, if different from the standard setting

Special setting (only in conjunction with an application No.)

Extended special setting (only in conjunction with an application No.)

Configuration according to EN 14181:2004

Prepared for EN 15267:2015²⁾

Order code

A31

B03

Y02

Y11

Y12

Y13

Y17

Y27

Accessories

RS 485/Ethernet converter

RS 485/RS 232 converter

RS 485/USB converter

AUTOCAL function each with 8 digital inputs/outputs

AUTOCAL function 8 digital inputs/outputs each and PROFIBUS PA

AUTOCAL function 8 digital inputs/outputs each and PROFIBUS DP

Set of Torx screwdrivers

Article No.

A5E00852383

C79451-Z1589-U1

A5E00852382

C79451-A3480-D511

A5E00057307

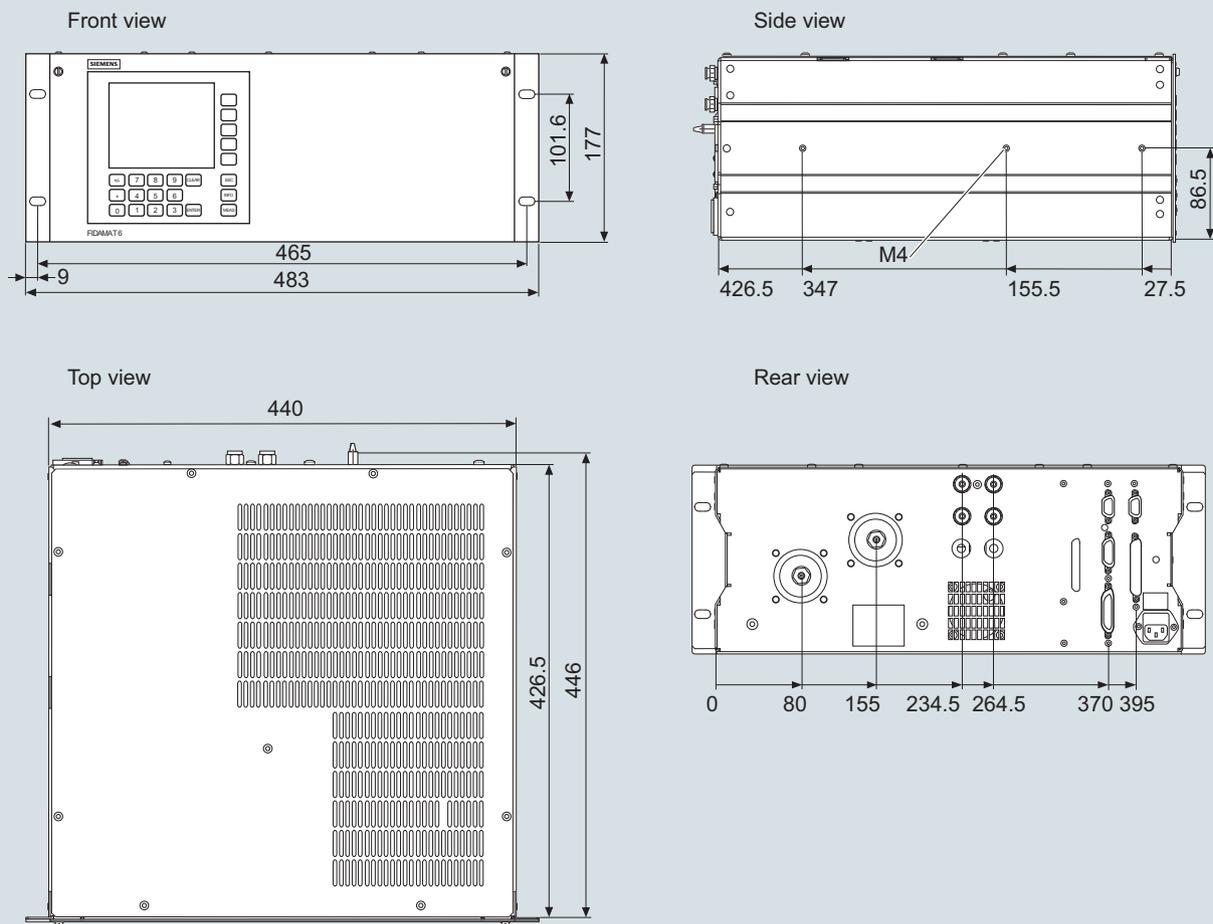
A5E00057312

A5E34821625

¹⁾ No QAL1 certification according to EN 15267

²⁾ For certified operation, compensation of the cross-interference caused by the oxygen is required. To do this, the device must be supplied with the current oxygen concentration value of the sample gas. The supply takes place over an external measuring instrument that must also meet the requirements of EN 15267-3 (e.g. ULTRAMAT 23 or OXYMAT 6). The FIDAMAT 6E -Y27 is preconfigured accordingly and expects an analog signal of 4 ... 20 mA corresponding to 0 ... 21 vol % O₂ at analog input AI2.

Dimensional drawings



FIDAMAT 6, 19" unit, dimensions in mm

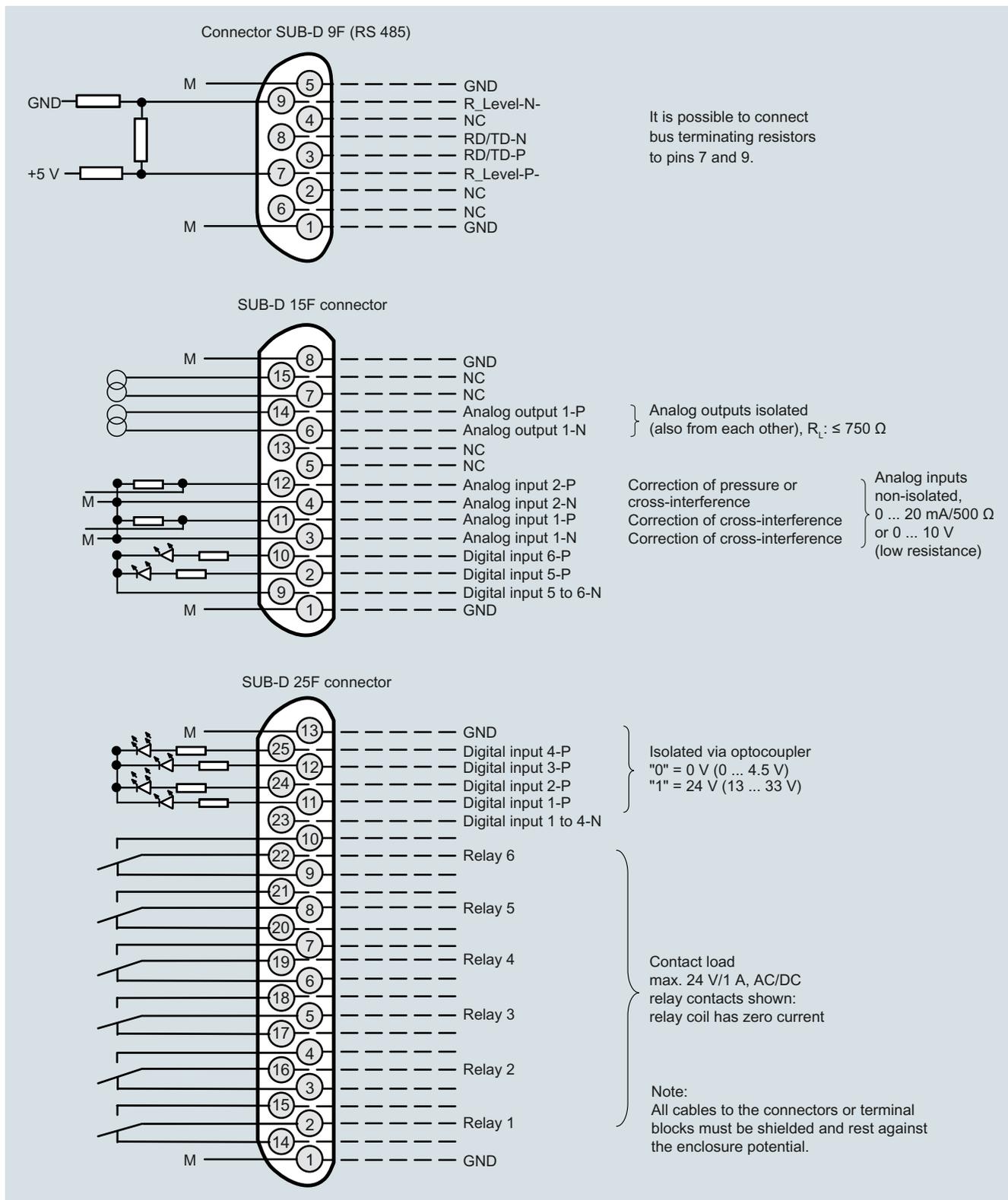
Extractive continuous process gas analysis

Series 6
FIDAMAT 6

19" rack unit

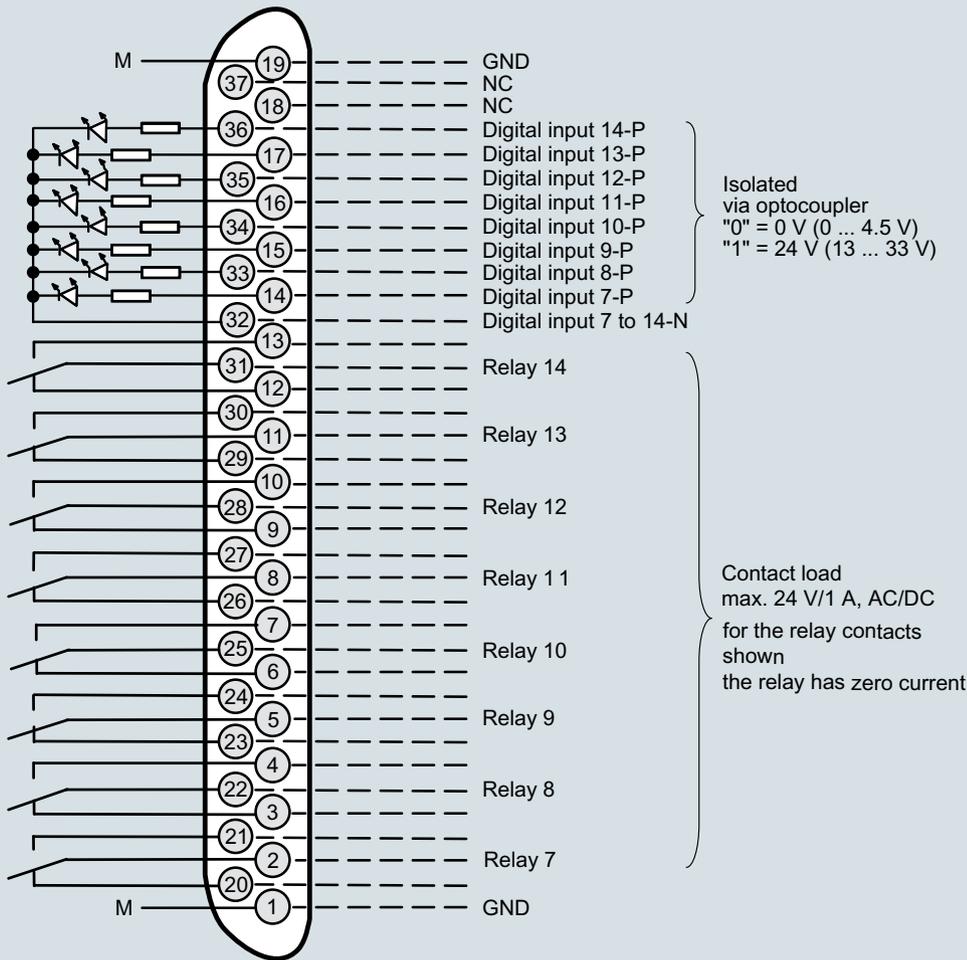
Circuit diagrams

Pin assignment (electrical and gas connections)



FIDAMAT 6, 19" rack unit, pin assignment

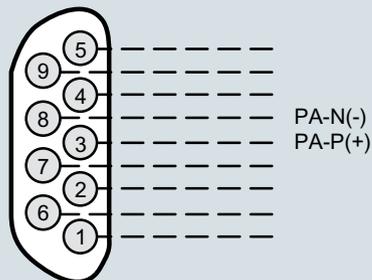
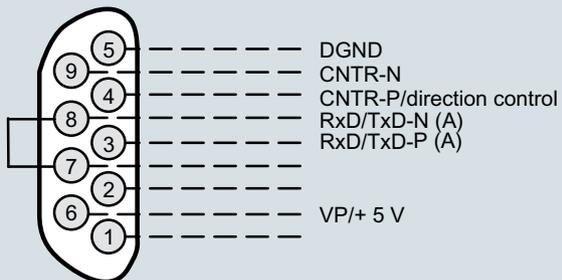
Connector SUB-D 37F (option)



Connector SUB-D 9F
PROFIBUS DP

optional

Connector SUB-D 9M
PROFIBUS PA



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

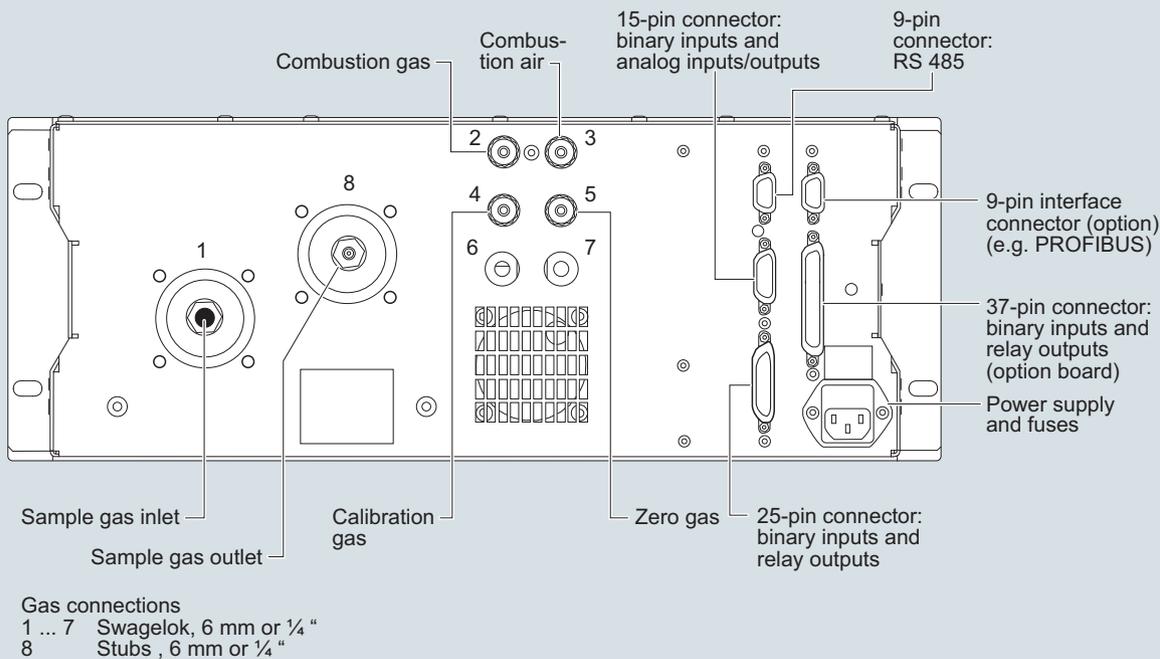
FIDAMAT 6, 19" rack unit, pin assignment of the AUTOCAL board and PROFIBUS connectors

Extractive continuous process gas analysis

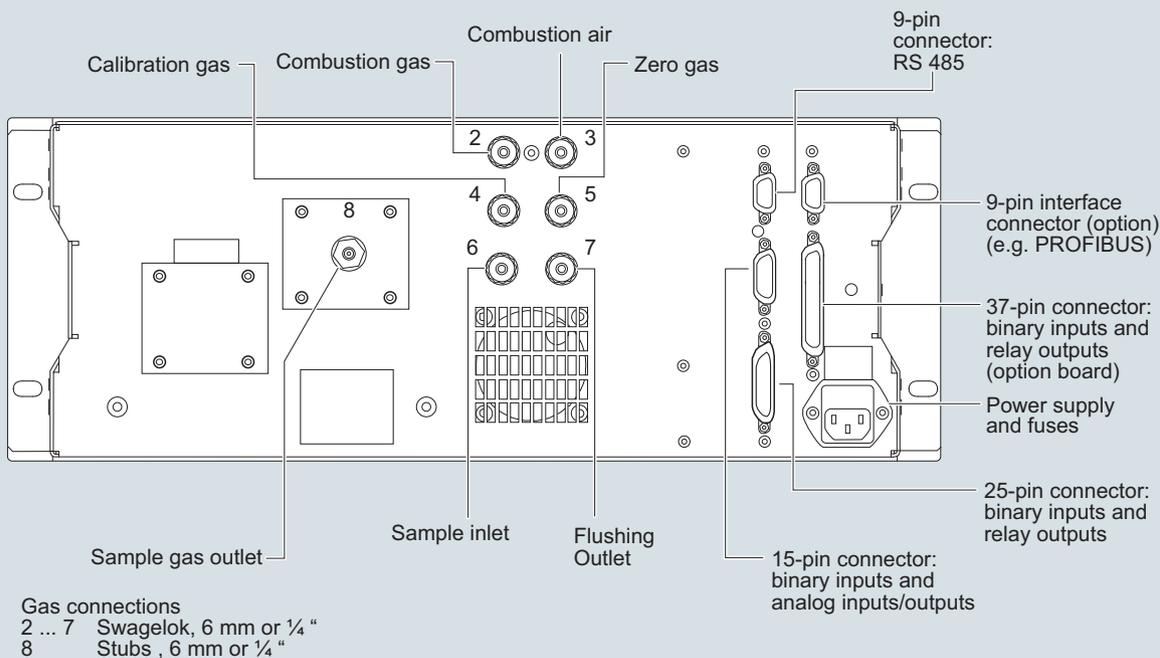
Series 6
FIDAMAT 6

19" rack unit

1



FIDAMAT 6, gas connections and pin assignment, version with pump



FIDAMAT 6, gas connections and pin assignment, version without pump

Selection and ordering data

Operating instructions	Article No.
FIDAMAT 6 Gas analyzer for determination of total hydrocarbon concentration	
• German	A5E00221703
• English	A5E00222135
• French	A5E00222138
• Spanish	A5E00222141
• Italian	A5E00222144
FIDAMAT 6-G Gas analyzer for determination of total hydrocarbon content	
• German	A5E00476038

More information

The complete documentation is available in various languages for downloading free of charge:
<http://www.siemens.com/processanalytics/documentation>

Extractive continuous process gas analysis

Series 6

FIDAMAT 6

Suggestions for spare parts

1

Selection and ordering data

Description			Article No. FIDAMAT 6	
	2 years (quantity)	5 years (quantity)	With pump	Without pump
Analyzer unit				
FI detector, complete		1	A5E00295816	A5E00295816
Sample gas path				
Pump (KNF)	1	1	A5E00882121	
Set of gaskets for pump (KNF)	4	10	A5E03792459	
Filter, with gasket for sample gas	1	3	A5E00248845	
Pressure regulators	1	1	A5E00248851	A5E00248851
Gasket for pressure regulator	1	2	A5E00295107	A5E00295107
Filter, complete (sample gas inlet, 6 mm)		1	A5E00295928	
Filter, complete (sample gas inlet, ¼")		1	A5E00295976	
Solenoid valve (1-way)	1	2	A5E00296562	A5E00296562
Solenoid valve (2-way)	1	2	A5E00296565	
Gasket, PTFE, 1.5 mm (20 units)	1	2	C79451-A3040-D101	C79451-A3040-D101
Gasket, graphite, 0.5 to 1 mm (20 units)	1	2	C79451-A3040-D102	C79451-A3040-D102
Gasket, graphite, 1.5 mm (20 units)	1	2	C79451-A3040-D103	C79451-A3040-D103
Gasket, graphite, 3 mm (20 units)	1	2	C79451-A3040-D105	C79451-A3040-D105
Pressure ring, 1 mm (20 units)		1	C79451-A3040-D112	C79451-A3040-D112
Pressure ring, 1.5 mm (20 units)		1	C79451-A3040-D113	C79451-A3040-D113
Pressure ring, 3 mm (20 units)		1	C79451-A3040-D115	C79451-A3040-D115
Outer rings, 0.5 ... 1 mm (20 units)		1	C79451-A3040-D121	C79451-A3040-D121
Outer rings, 1.5 ... 3 mm (1/8") (20 units)		1	C79451-A3040-D122	C79451-A3040-D122
Electronics				
Front plate	1	1	A5E00248790	A5E00248790
Adapter plate	1	1	A5E00248795	A5E00248795
Temperature fuse (retrofitting set)	1	2	A5E01040317	A5E01040317
Fusible element, 230 V AC	2	3	A5E00248819	A5E00248819
Fusible element, 110 V AC	2	3	A5E00248822	A5E00248822
LC display	1	1	A5E00248920	A5E00248920
Cable, temperature sensor for oven		1	A5E00283770	A5E00283770
Cable, temperature sensor for analyzer part		1	A5E00283780	A5E00283780
Cable, magnetic distributor		1	A5E00283800	A5E00283800
Cable, heater for oven, 230 V AC		1	A5E00283817	A5E00283817
Cable, heater for oven, 110 V AC		1	A5E00295469	A5E00295469
Cable, electrode voltage, complete		1	A5E00284092	A5E00284092
Cable, signal cable		1	A5E00284094	A5E00284094
Cable, connecting cable (4-pole)	1	1	A5E00284095	A5E00284095
Cable, connecting cable (5-pole)	1	1	A5E00284096	A5E00284096
Axial-flow fan, 24 V DC		1	A5E00313839	A5E00313839

If the device 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.

Overview



Up to four gas components can be measured continuously at the same time with the ULTRAMAT 23 gas analyzer. The device can be equipped with the following sensors:

- IR detector for IR-active gases
- UV photometer for UV-active gases
- H₂S sensor (electrochemical)
- O₂ sensor (electrochemical)
- O₂ sensor (paramagnetic)
- With the ULTRAMAT 23 gas analyzer for use in biogas plants, up to four gas components can be measured continuously: two infrared-sensitive gases (CO₂ and CH₄), plus O₂ and H₂S with electrochemical measuring cells.
- Up to four gas components can be measured continuously using the ULTRAMAT 23 gas analyzer with paramagnetic oxygen cell: three infrared-sensitive gases, plus O₂ ("dumbbell" measuring cell).
- With the ULTRAMAT 23 gas analyzer with UV photometer, one infrared-sensitive gas, UV-active gases (SO₂, NO₂) as well as O₂ can be measured with an electrochemical sensor.

Benefits

- AUTOCAL with ambient air (depending on on the measured component)
 - Highly cost-effective as calibration gases are not required
- High selectivity thanks to multi-layer detectors, e.g. low cross-sensitivity to water vapor
- Analyzer cells can be cleaned on site as required
 - Cost savings due to reuse after contamination
- Menu-assisted operation in plain text
 - No manual required for operation, high level of operator safety
- Service information and logbook
 - Preventive maintenance; help for service and maintenance personnel; cost savings
- Coded input levels protect against unauthorized access
 - Increased safety
- Open interface architecture (RS 485, RS 232, PROFIBUS, SIPROM GA)
 - Simplified process integration; remote operation and control

Special benefits when used in biogas plants

- Continuous measurement of all four key components, including H₂S
- Long service life of the H₂S sensor even at increased concentrations; no diluting or backflushing necessary
- Introduction and measurement of flammable gases as occurring in biogas plants (e.g. 70% CH₄), is permissible (TÜV certification)

Extractive continuous process gas analysis

ULTRAMAT 23

General information

Application

Areas of application

- Optimization of small firing systems
- Monitoring of exhaust gas concentration from firing systems with all types of fuel (oil, gas and coal) as well as operational measurements with thermal incineration plants
- Room air monitoring
- Monitoring of air in fruit stores, greenhouses, fermenting cellars and warehouses
- Monitoring of process control functions
- Atmosphere monitoring during heat treatment of steel
- For use in non-potentially-explosive atmospheres

Application areas in biogas plants

- Monitoring of fermenters for generating biogas (input and pure sides)
- Monitoring of gas-driven motors (power generation)
- Monitoring of feeding of biogas into the commercial gas network

Application area of paramagnetic oxygen sensor

- Flue gas analysis
- Inerting plants
- Room air monitoring
- Medical engineering

Further applications

- Environmental protection
- Chemical plants
- Cement industry

Special versions

Separate gas paths

The ULTRAMAT 23 with 2 IR components without pump is also available with two separate gas paths. This allows the measurement of two measuring points as used e.g. for the NO_x measurement before and after the NO_x converter.

The ULTRAMAT 23 gas analyzer can be used in emission measuring systems and for process and safety monitoring.

Versions conforming to EN 14181 and EN 15267

According to EN 14181, which is standardized in the EU and required in many European countries, a QAL 1 qualification test, i.e. certification of the complete measuring system including gas paths and conditioning, is required for continuous emission monitoring systems (CEMS). In accordance with EN 15267, this must be performed by an independent accredited authority. In Germany, for example, the test is performed by the German Technical Inspectorate (TÜV) and the test report is submitted to the Federal/State Workgroup for Emission Control (Bund/Länder-Arbeitsgemeinschaft für Immissionsschutz - LAI) for examination/approval. Notification is also issued by the German Federal Environment Agency (Umweltbundesamt - UBA) in the Federal Gazette as well as by the German Technical Inspectorate (TÜV) <http://www.qal1.en>.

In Britain, the QAL 1 test reports are prepared by Sira Environmental of the Environmental Agency in accordance with the MCERTS scheme and submitted for approval and publication on the SIRA Environmental websites. The other European countries rely either on the German or English certification scheme.

For use in EN 14181 applications, the devices with the article numbers 7MB235X in the CEM CERT set (7MB1957) have undergone qualification testing according to German standards of EN 15267. These German Technical Inspectorate versions of the ULTRAMAT are suitable for measurement of CO, NO, SO₂ and O₂ according to 13th and 27th BImSchV as well as TA Luft. Smallest measuring range tested and approved by the German Technical Inspectorate:

1 and 2-component analyzer

- CO: 0 to 150 mg/m³
- NO: 0 to 150 mg/m³
- SO₂: 0 to 400 mg/m³

3-component analyzer

- CO: 0 to 250 mg/m³
- NO: 0 to 250 mg/m³
- SO₂: 0 to 400 mg/m³

Also tested as additional measuring ranges in accordance with EN 15267-3:

- CO: 0 to 1 250 mg/m³
- NO: 0 to 2 000 mg/m³
- SO₂: 0 to 7 000 mg/m³

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

Version with faster response time

The connection between the two condensation traps is equipped with a stopper to lead the complete flow through the measuring cell (otherwise only 1/3 of the flow), i.e. the response time is 2/3 faster. The functions of all other components remain unchanged

Chopper compartment purging

Consumption 100 ml/min (upstream pressure: approx. 3 000 hPa)

Design

- 19" rack unit with 4 HU for installation
 - In hinged frame
 - in cabinets
- Flow indicator for sample gas on front plate; option: integrated sample gas pump (standard for bench-top version)
- Gas connections for sample gas inlet and outlet as well as zero gas; pipe diameter 6 mm or ¼"
- Gas and electrical connections at the rear (portable version: sample gas inlet at front)

Display and control panel

- Operation based on NAMUR recommendation
- Simple, fast parameterization and commissioning of analyzer
- Large, backlit LCD for measured values
- Menu-driven inputs for parameterization, test functions and calibration
- Washable membrane keyboard
- User help in plain text
- 6-language operating software

Inputs/outputs

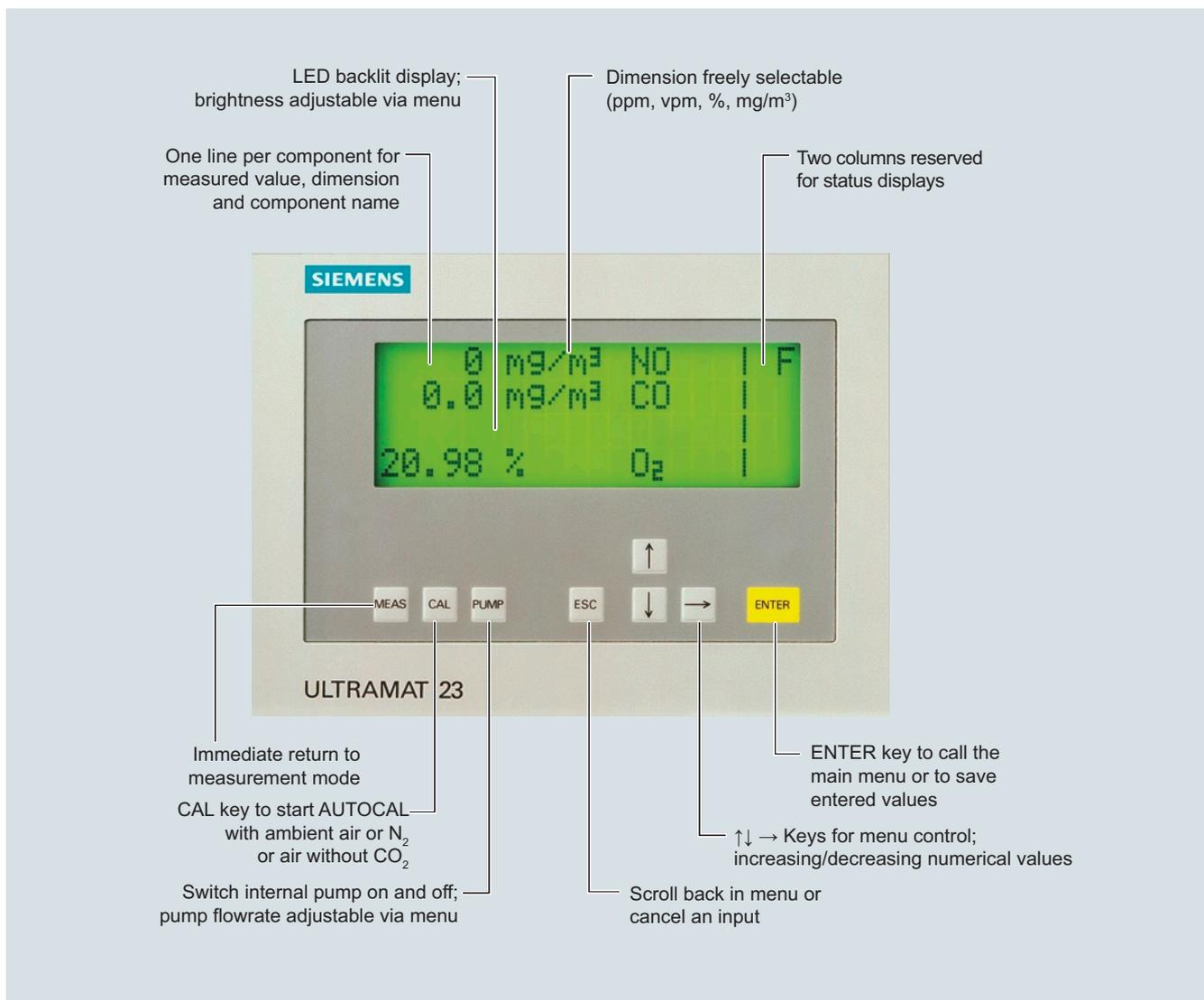
- Three digital inputs for sample gas pump On/Off, triggering of AUTOCAL and synchronization of several devices
- Eight relay outputs can be freely configured for fault, maintenance request, maintenance switch, limits, measuring range identification and external solenoid valves
- Eight additional digital inputs and relay outputs as an option
- Galvanically isolated analog outputs

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
- Incorporation in networks via PROFIBUS DP/PA interface
- SIPROM GA software as service and maintenance tool



ULTRAMAT 23, membrane keyboard and graphic display

Extractive continuous process gas analysis

ULTRAMAT 23

General information

Designs – parts wetted by sample gas

Gas path	19" rack unit	Desktop unit	
With hoses	Condensation trap/gas inlet	-	PA (polyamide)
	Condensation trap	-	PE (polyethylene)
	Gas connections 6 mm	PA (polyamide)	PA (polyamide)
	Gas connections 1/4"	Stainless steel, mat. no. 1.4571	Stainless steel, mat. no. 1.4571
	Hose	FPM (Viton)	FPM (Viton)
	Pressure switch	FPM (Viton) + PA6-3-T (Trogamide)	FPM (Viton) + PA6-3-T (Trogamide)
	Flowmeter	PDM/Duran glass/X10CrNiTi1810	PDM/Duran glass/X10CrNiTi1810
	Elbows/T-pieces	PA6	PA6
	Internal pump, option	PVDF/PTFE/EPDM/FPM/Trolene/ stainless steel, mat. no. 1.4571	PVDF/PTFE/EPDM/FPM/Trolene/ stainless steel, mat. no. 1.4571
	Solenoid valve	FPM70/Ultramide/ stainless steel, mat. no. 1.4310/1.4305	FPM70/Ultramide/ stainless steel, mat. no. 1.4310/1.4305
	Safety condensation trap	PA66/NBR/PA6	PA66/NBR/PA6
	Analyzer chamber		
	<ul style="list-style-type: none"> • Body • Lining • Fitting 	Aluminum Aluminum Stainless steel, black anodized, mat. no. 1.4571	Aluminum Aluminum, black anodized Stainless steel, mat. no. 1.4571
	<ul style="list-style-type: none"> • Window • Adhesive • O-ring 	CaF ₂ , quartz E353 FPM (Viton)	CaF ₂ E353 FPM (Viton)
With pipes, only available in version "without pump"	Gas connections 6 mm / 1/4"	Stainless steel, mat. no. 1.4571	
	Pipes	Stainless steel, mat. no. 1.4571	
	Analyzer chamber		
	<ul style="list-style-type: none"> • Body • Lining • Fitting 	Aluminum Aluminum Stainless steel, mat. no. 1.4571	
	<ul style="list-style-type: none"> • Window • Adhesive • O-ring 	CaF ₂ E353 FPM (Viton)	

ULTRAMAT 23 also available as bench-top unit:

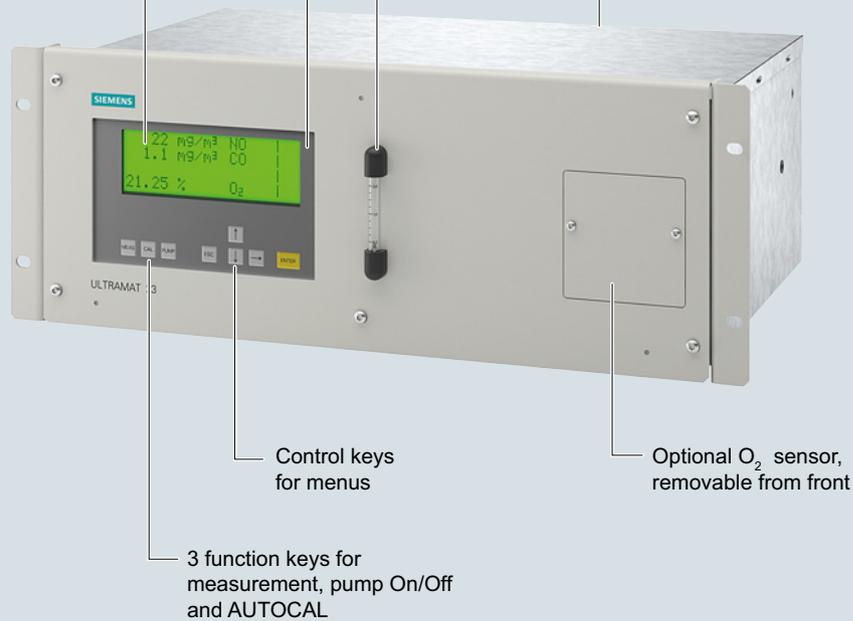
- 2 handles on top cover
- 4 rubber feet for setting up
- No mounting frame

80-digit display
(4 lines/20 characters)

Dust-tight and washable
membrane keypad

Flowmeter in conjunction with
pressure switch for monitoring
the sample gas flow

Gas and electrical
connections on rear
panel (portable version
simple gas at front)



Control keys
for menus

Optional O₂ sensor,
removable from front

3 function keys for
measurement, pump On/Off
and AUTO CAL

ULTRAMAT 23, design

Extractive continuous process gas analysis

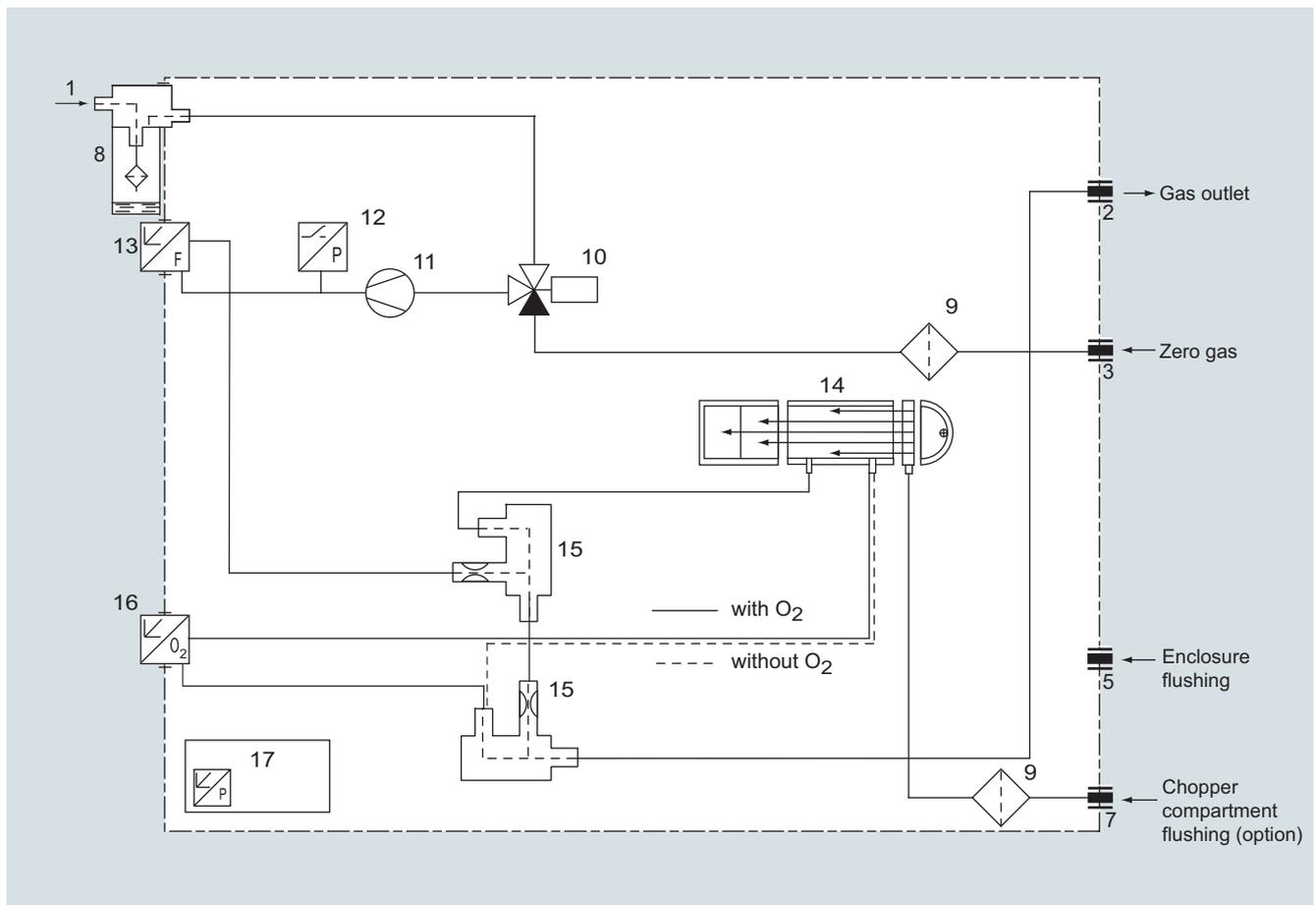
ULTRAMAT 23

General information

Gas path

Legend for the gas path figures

1	Inlet for sample gas/calibration gas	11	Sample gas pump
2	Gas outlet	12	Pressure switch
3	Inlet for AUTOCAL/zero gas or inlet for sample gas/calibration gas (channel 2)	13	Flow indicator
4	Gas outlet (channel 2)	14	Analyzer unit
5	Enclosure purging	15	Safety condensation trap
6	Enclosure purging	16	Oxygen sensor (electrochemical)
7	Inlet of atmospheric pressure sensor	17	Atmospheric pressure sensor
8	Inlet of chopper compartment purging	18	Hydrogen sulfide sensor
9	Condensation trap with filter	19	Oxygen measuring cell (paramagnetic)
10	Safety fine filter	20	UV photometer (UV module)

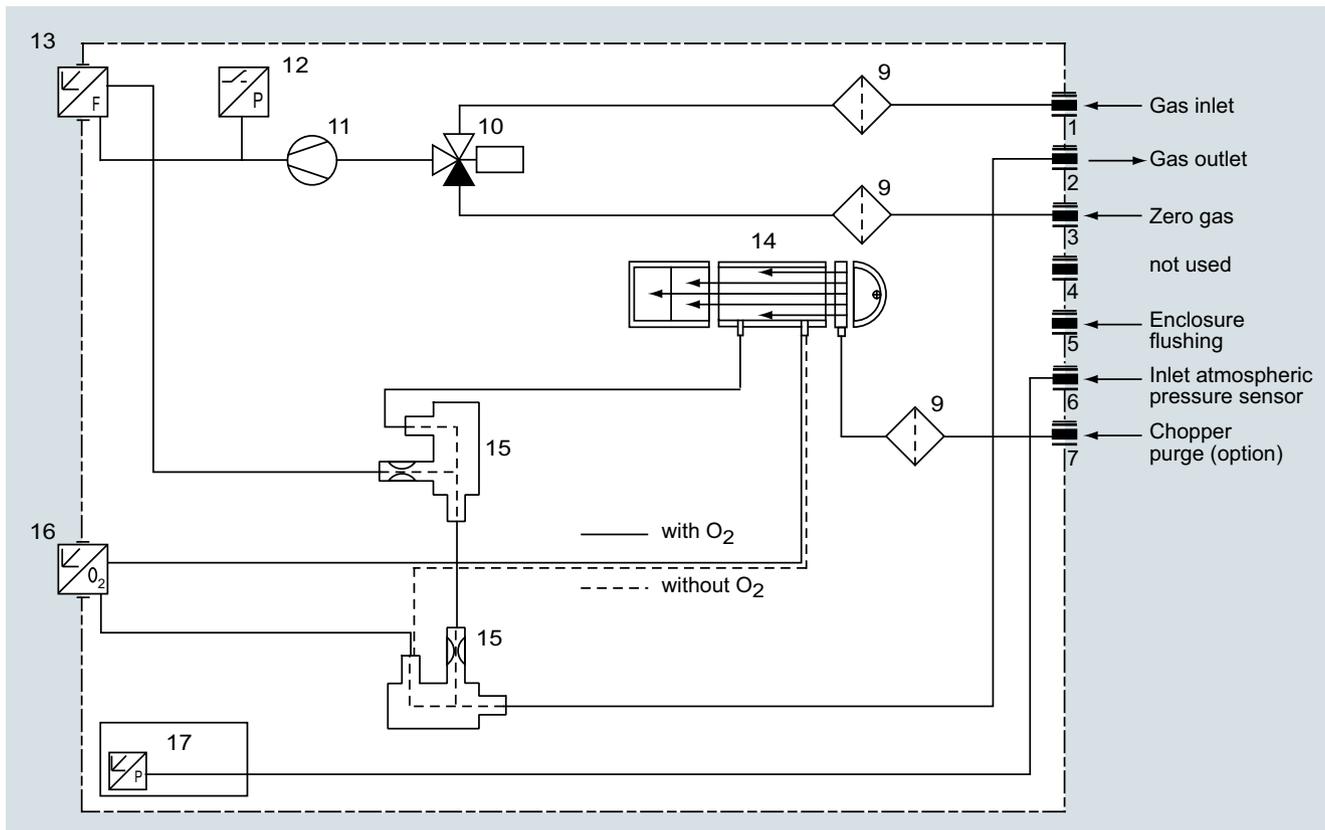


ULTRAMAT 23, portable, in sheet-steel housing with internal sample gas pump, condensation trap with safety filter on front plate, optional oxygen measurement

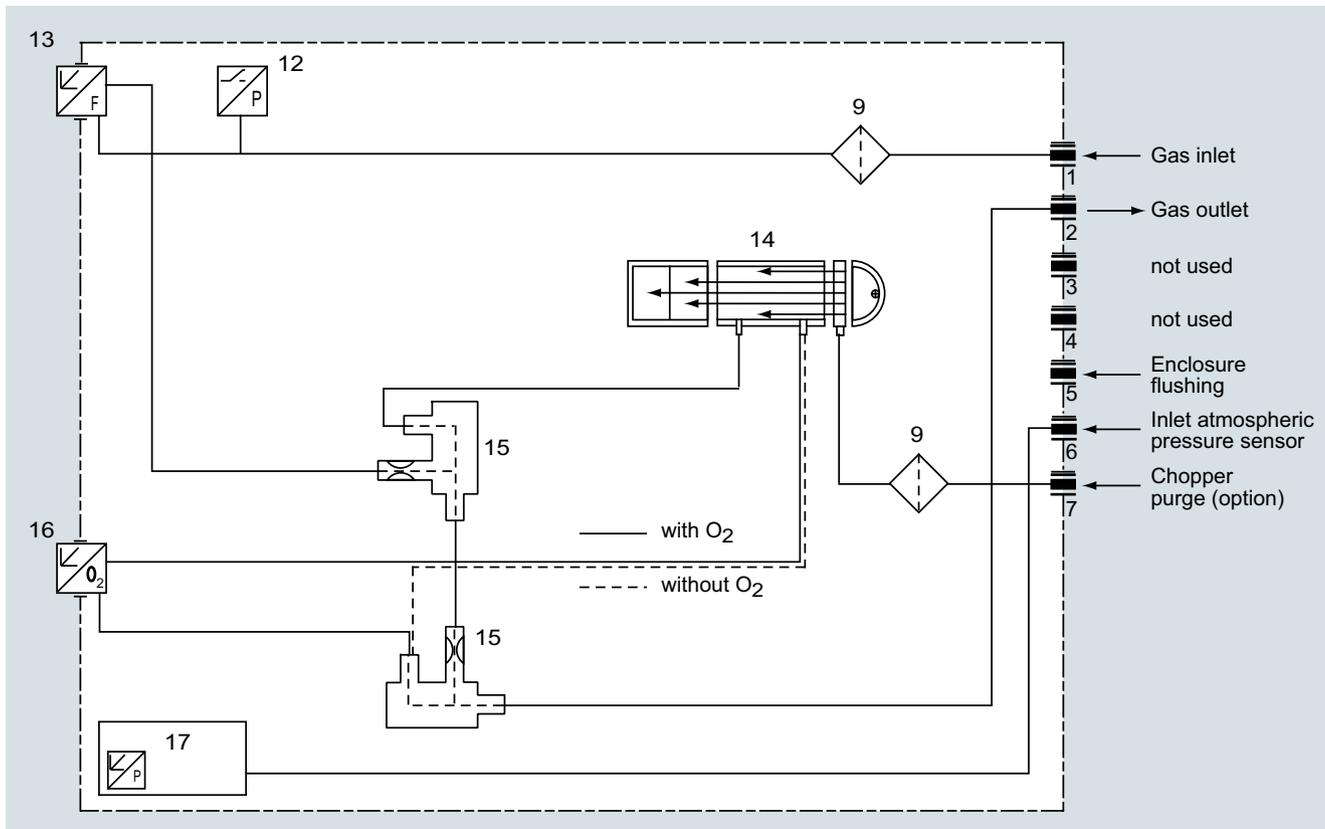
Extractive continuous process gas analysis ULTRAMAT 23

General information

1



ULTRAMAT 23, 19" rack-mounted enclosure with internal sample gas pump; optional oxygen measurement



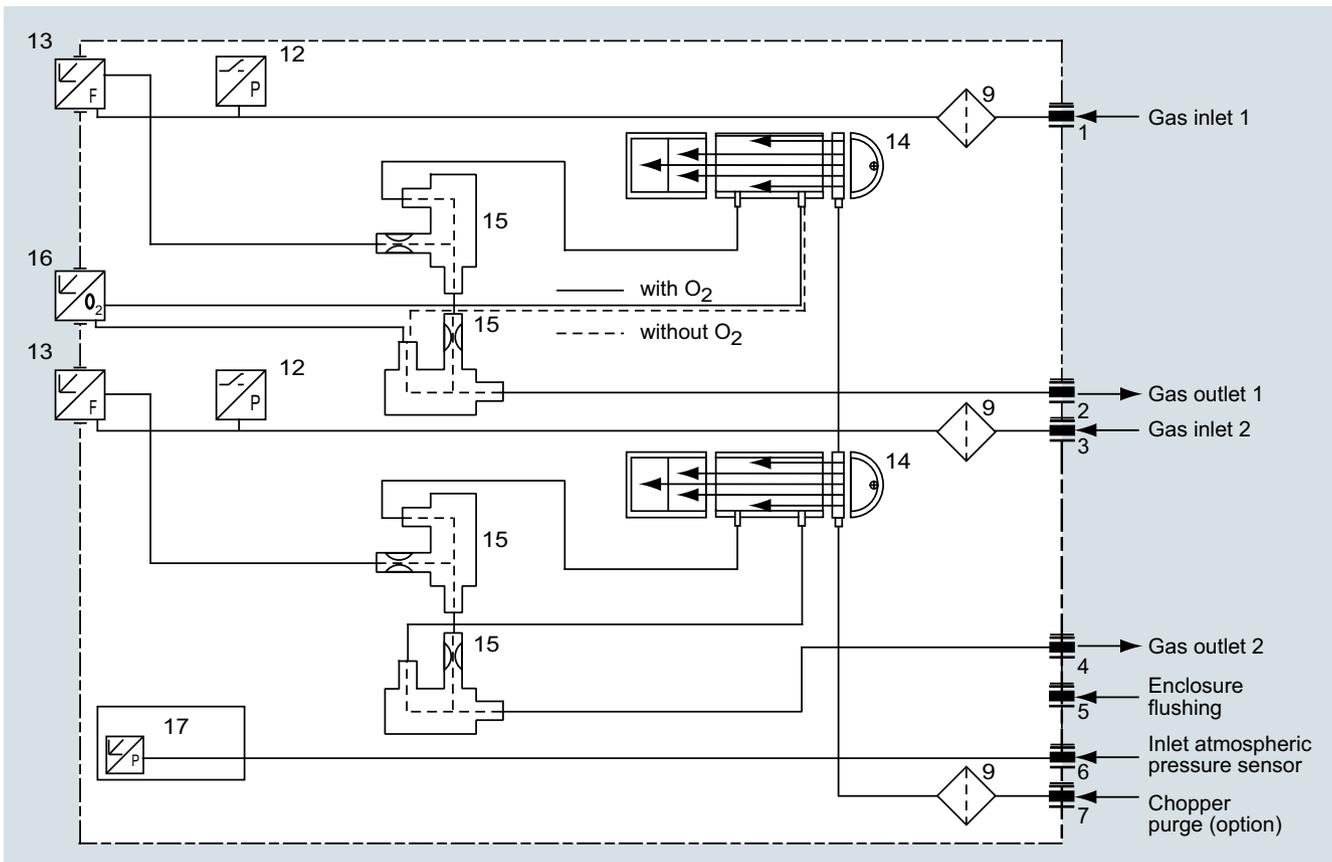
ULTRAMAT 23, 19" rack-mounted enclosure without internal sample gas pump; optional oxygen measurement

Extractive continuous process gas analysis

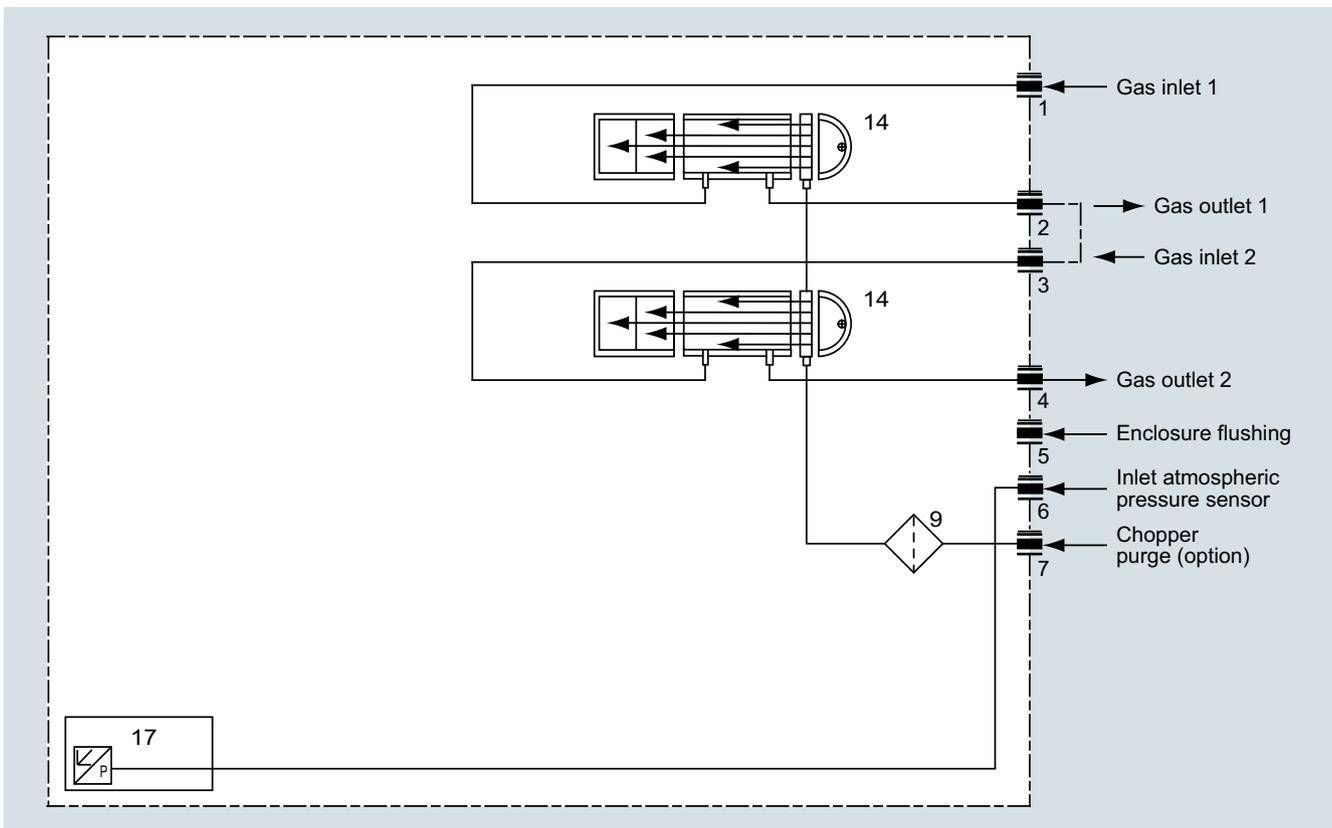
ULTRAMAT 23

General information

1



ULTRAMAT 23, 19" rack unit housing without internal sample gas pump, with separate gas path for the 2nd measured component or for the 2nd and 3rd measured component, optional oxygen measurement

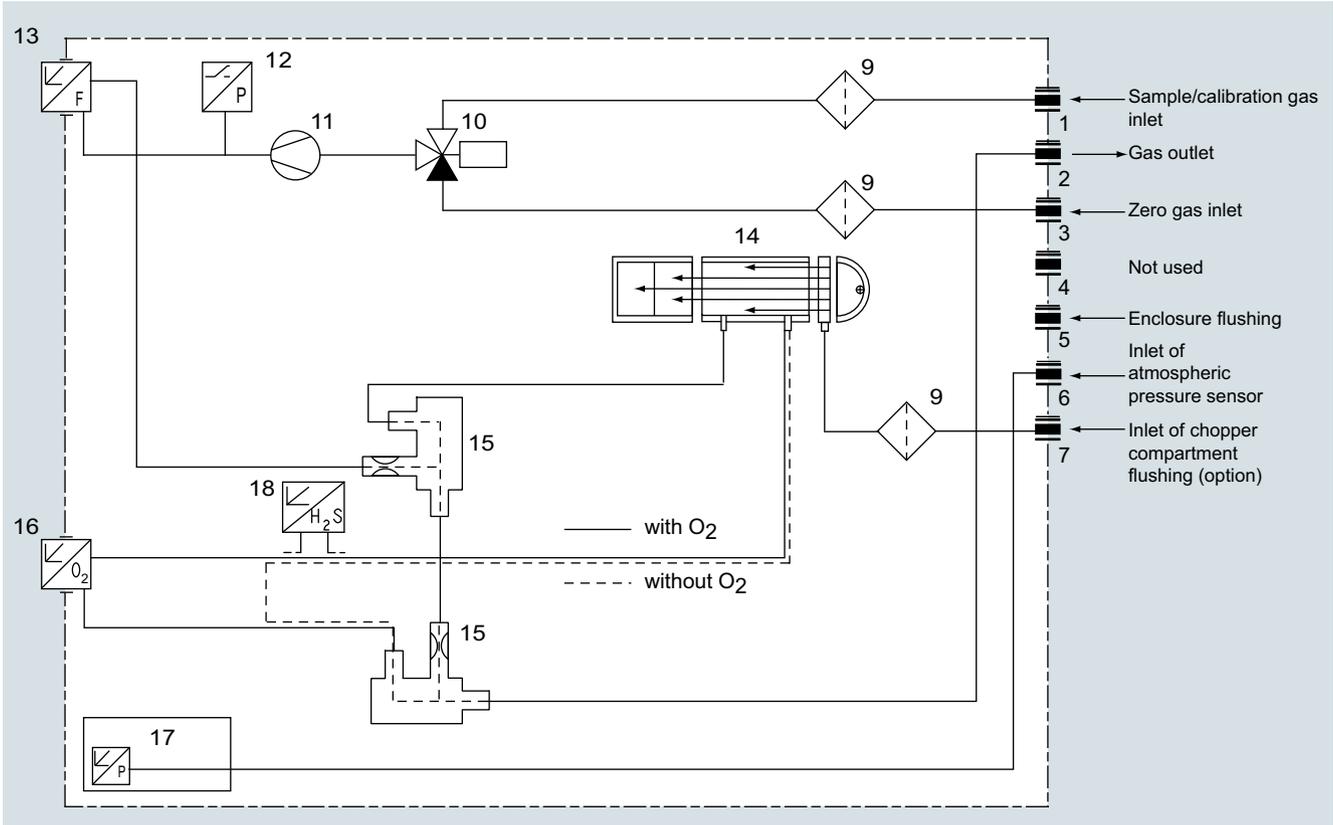


ULTRAMAT 23, 19" rack-mounted enclosure, sample gas path version in pipes, separate gas path, always without sample gas pump, without safety filter and without safety condensation trap

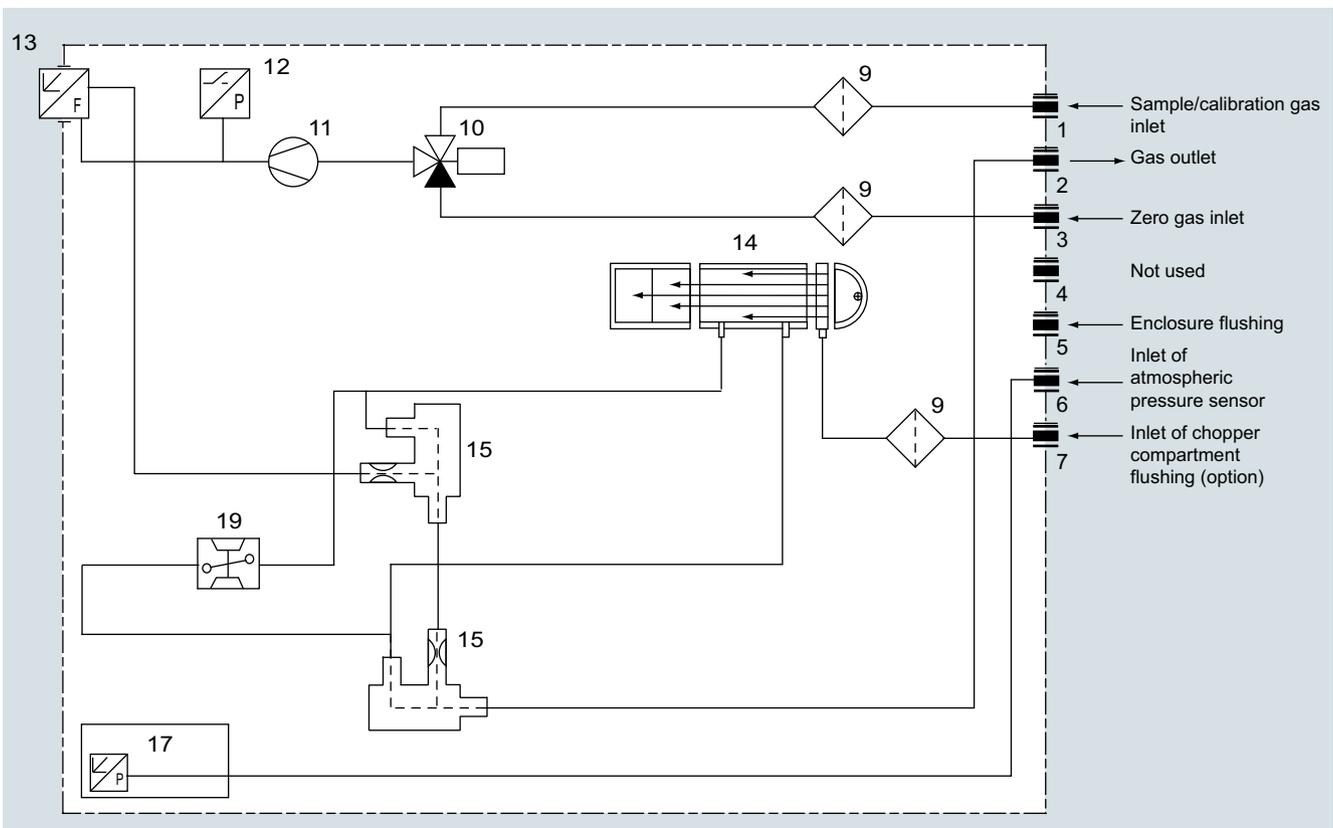
Extractive continuous process gas analysis ULTRAMAT 23

General information

1



ULTRAMAT 23, 19" rack-mounted enclosure with internal sample gas pump and H₂S sensor



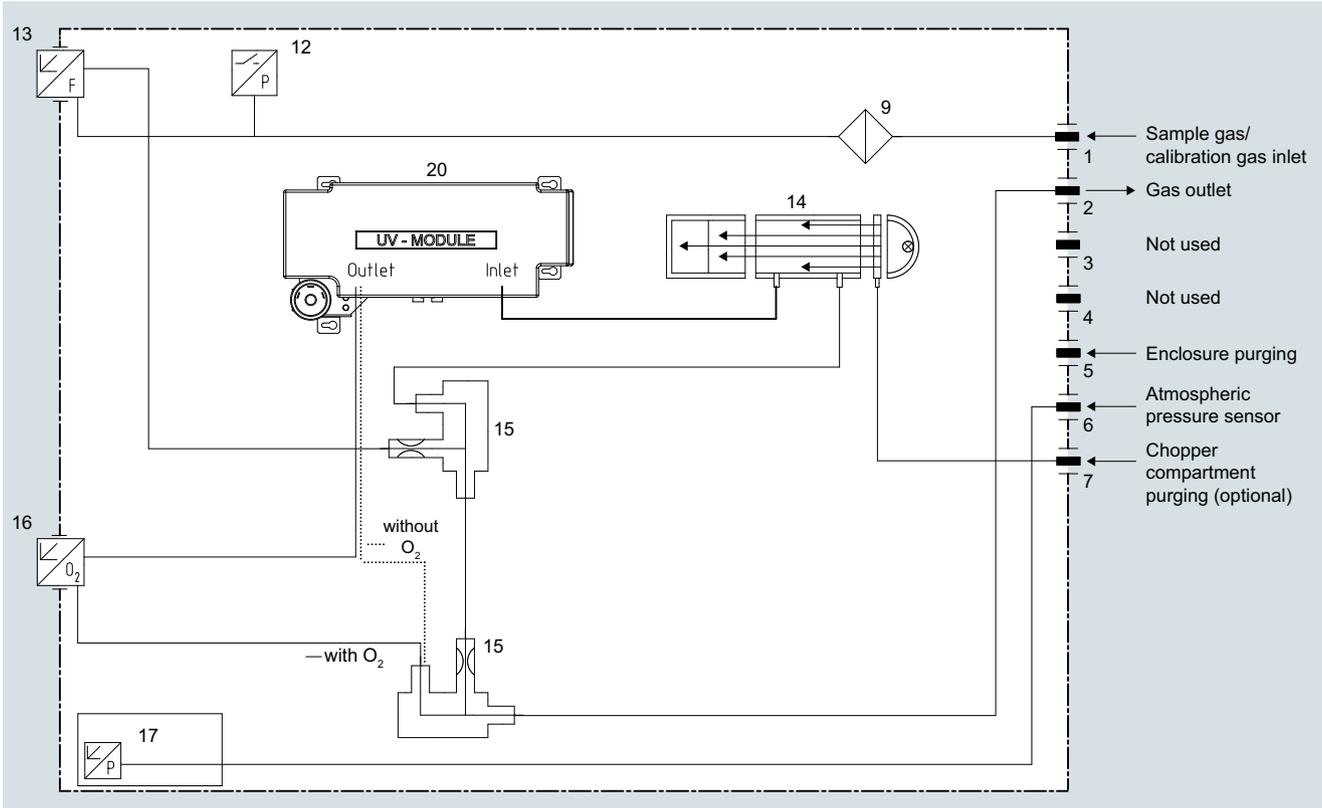
ULTRAMAT 23, 19" rack-mounted enclosure with internal sample gas pump and paramagnetic oxygen measurement

Extractive continuous process gas analysis

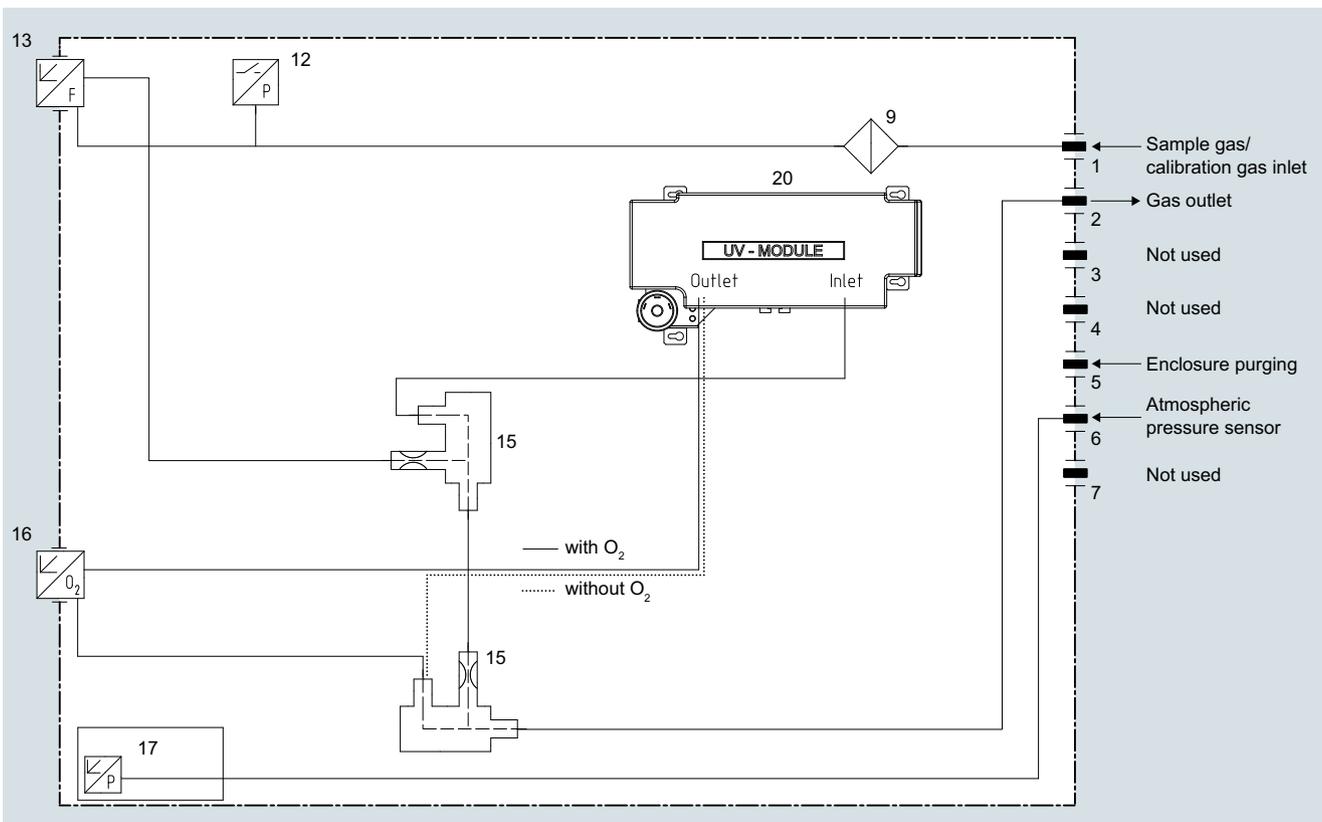
ULTRAMAT 23

General information

1



ULTRAMAT 23, 19" rack unit enclosure with IR detector, UV photometer (UV module); optional oxygen measurement



ULTRAMAT 23, 19" rack-mounted enclosure with UV photometer (UV module); optional oxygen measurement

Function

The ULTRAMAT 23 uses multiple independent measuring principles which work selectively.

Infrared measurement

The measuring principle of the ULTRAMAT 23 is based on the molecule-specific absorption of bands of infrared radiation, which in turn is based on the "single-beam procedure". A radiation source (7) operating at 600 °C emits infrared radiation, which is then modulated by a chopper (5) at 8 1/3 Hz.

The IR radiation passes through the sample chamber (4), into which sample gas is flowing, and its intensity is weakened as a function of the concentration of the measured component.

The receiver chamber - set up as a two- or three-layer detector - is filled with the component to be measured.

The first detector layer (11) primarily absorbs energy from the central sections of the sample gas IR bands. Energy from the peripheral sections of the bands is absorbed by the second (2) and third (12) detector layers.

The microflow sensor generates a pneumatic connection between the upper layer and the lower layers. Negative feedback from the upper and lower layers leads to an overall narrowing of the spectral sensitivity band. The volume of the third layer and, therefore, the absorption of the bands, can be varied using a "slide switch" (10), thereby increasing the selectivity of each individual measurement.

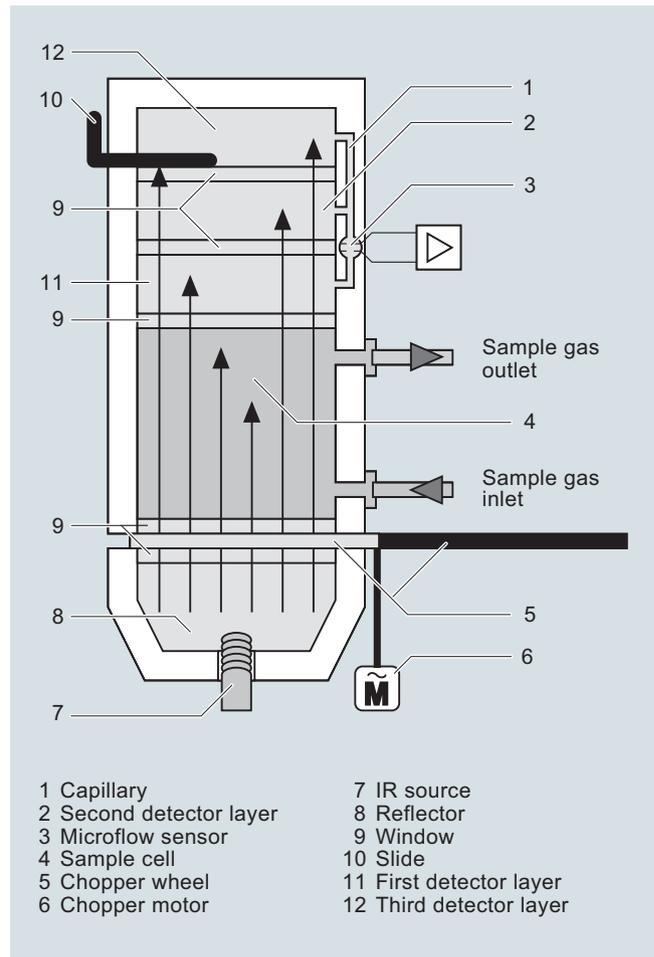
The rotating chopper (5) generates a pulsating flow in the receiver chamber that the microflow sensor (3) converts into an electrical signal.

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 also not have a large concentration of the gas components to be measured.



ULTRAMAT 23, principle of operation of the infrared channel (example with three-layer detector)

Extractive continuous process gas analysis

ULTRAMAT 23

General information

Automatic calibration with air (AUTOCAL)

The ULTRAMAT 23 can be calibrated using, for example, ambient air. During this process (between 1 and 24 hours (adjustable), 0 = no AUTOCAL), the chamber is purged with air. The detector then generates the largest signal U_0 (no pre-absorption in the sample chamber). This signal is used as the reference signal for zero point calibration, and also serves as the initial value for calculating the full-scale value in the manner described below.

As the concentration of the measured component increases, so too does absorption in the sample chamber. As a result of this preabsorption, the detectable radiation energy in the detector decreases, and thus also the signal voltage. For the single-beam procedure of the ULTRAMAT 23, the mathematical relationship between the concentration of the measured component and the measured voltage can be approximately expressed as the following exponential function:

$$U = U_0 \cdot e^{-kc}$$

c Concentration

k Device-specific constant

U_0 Basic signal with zero gas (sample gas without measured component)

U Detector signal

Changes in the radiation power, contamination of the sample chamber, or aging of the detector components have the same effect on both U_0 and U, and result in the following:

$$U' = U'_0 \cdot e^{-kc}$$

Apart from being dependent on concentration c, the measured voltage thus changes continuously as the IR source ages, or with persistent contamination.

Each AUTOCAL thus tracks the total characteristic according to the currently valid value. Temperature and pressure influences are also compensated in this way.

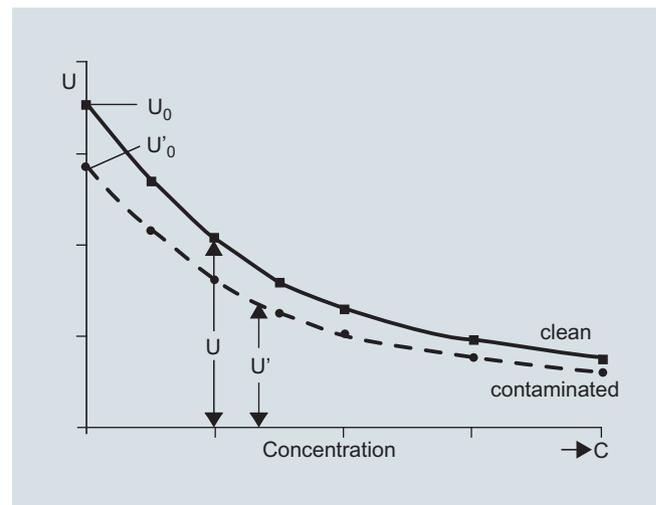
The influences of contamination and aging, as mentioned above, have a negligible influence on the measurement as long as U' remains in a certain tolerance range monitored by the unit.

The tolerance range between two or more AUTOCALs can be individually configured on the ULTRAMAT 23 and an alarm message output. An alarm message is output when the value falls below the original factory setting of $U_0 < 50\% U$. In most cases, this is due to the sample chamber being contaminated.

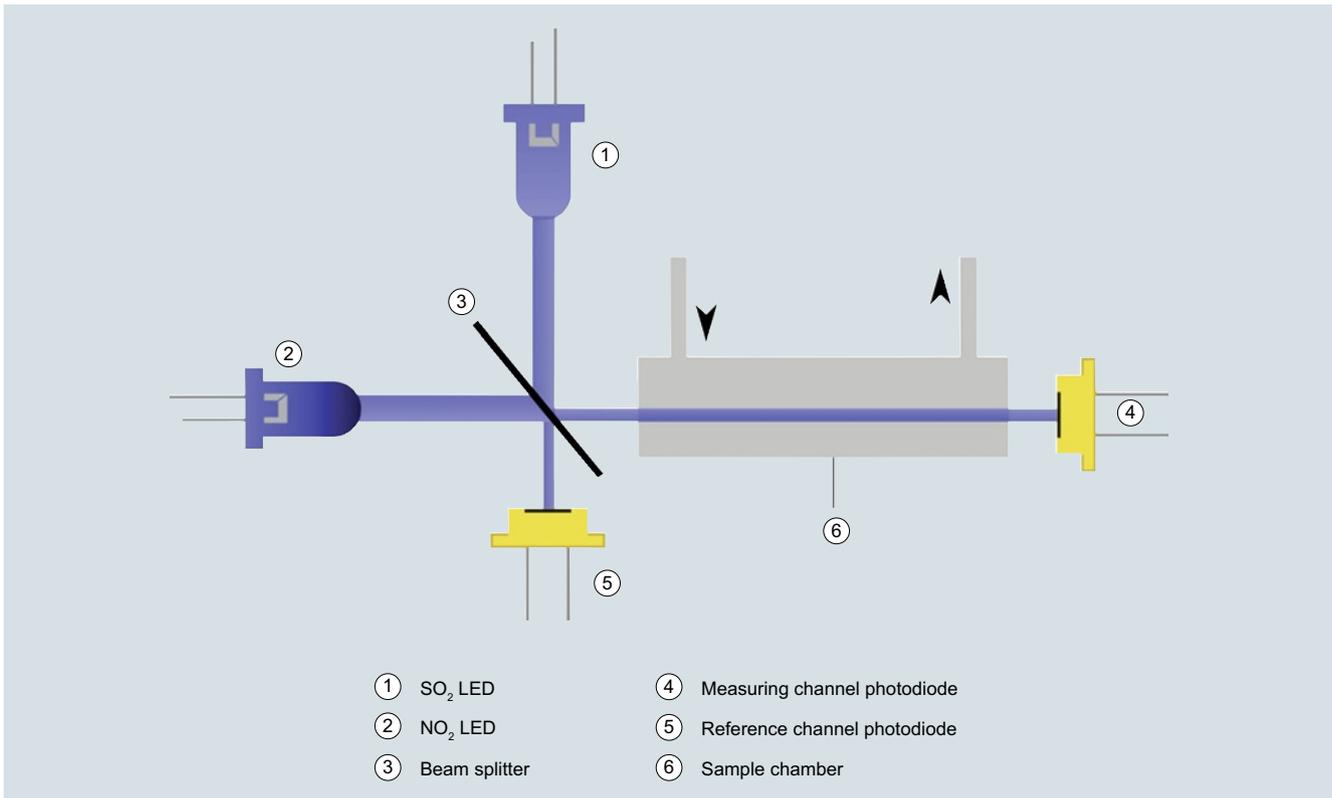
Calibration

The units can be set to automatically calibrate the zero point every 1 to 24 hours, using ambient air or nitrogen. The calibration point for the IR-sensitive components is calculated mathematically from the newly determined U'_0 and the device-specific parameters stored as default values. We recommend checking the calibration point once a year using a calibration gas. (For details on TÜV measurements, see Table "Calibration intervals (TÜV versions)" under Selection and ordering data).

If an electrochemical sensor is installed, it is recommendable to use air for the AUTOCAL. In addition to calibration of the zero point of the IR-sensitive components, it is then also possible to simultaneously calibrate the calibration point of the electrochemical O_2 sensor automatically. The characteristic of the O_2 sensor is sufficiently stable following the single-point calibration. The zero point of the electrochemical sensor only needs be checked once a year by connecting nitrogen.



Calibration

Ultraviolet measurement


ULTRAMAT 23, ultraviolet measurement principle

This measuring principle is also based on the molecule-specific absorption of bands of ultraviolet radiation using a double-beam photometer.

The light source is a solid-state diode (LED) based on AlGaIn or InGaIn semiconductors (1). To improve the signal evaluation, the light source is operated as a pulsed light source.

The ultraviolet radiation is collimated and first passes through a beam splitter (3), which generates two identically sized ray bundles (measuring and reference radiation). The measuring ray bundle passes through the sample chamber (6) into which the sample gas is flowing, and is attenuated as a function of the concentration of the measured component. This attenuation is evaluated according to the Lambert-Beer absorption law.

The measuring radiation is recorded by a photodiode (4) downstream of the sample chamber into which the sample gas is flowing (measuring signal). Likewise, the reference radiation is recorded by a second photodiode (5, reference signal). The ratio of measured signal and reference signal is used to calculate the concentration of the gas component.

The beam splitter also enables the coupling of a second light source (2) for measuring a second gas component. In this way, the absorption of sulfur dioxide (SO₂) and nitrogen dioxide (NO₂) is measured in alternating cycles and converted into continuous concentration values in sensor-level electronics. Additional sample gas applications are possible through a suitable selection of LEDs.

Extractive continuous process gas analysis

ULTRAMAT 23

General information

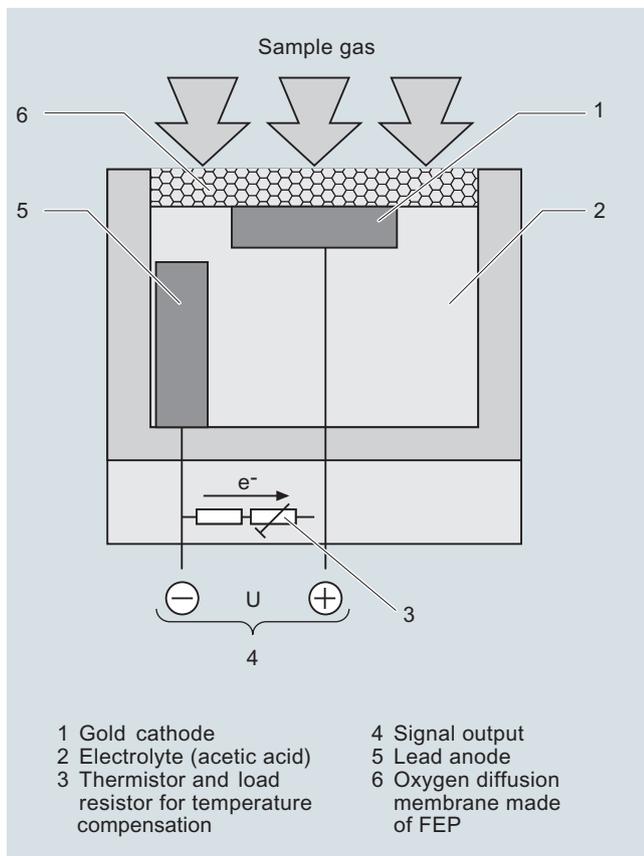
Oxygen measurement

The oxygen sensor operates according to the principle of a fuel cell. The oxygen is converted at the boundary layer between the cathode and electrolyte. An electron emission current flows between the lead anode and cathode and via a resistor, where a measured voltage is present. This measured voltage is proportional to the concentration of oxygen in the sample gas.

The oxygen electrolyte used is less influenced by interference influences (particularly CO_2 , CO , H_2 and CH_4) than other sensor types.

Note

The oxygen sensor can be used for concentrations of both $> 1\%$ and $< 1\%$ O_2 . In the event of sudden changes from high concentrations to low concentrations ($< 1\%$), the sensor will, however, require longer running-in times to get a constant measured value. This is to be taken into consideration when switching between measuring points in particular, and appropriate rinsing times are to be set.



ULTRAMAT 23, operating principle of the oxygen sensor

Electrochemical sensor for H_2S determination

The hydrogen sulfide enters through the diffusion barrier (gas diaphragm) into the sensor and is oxidized at the working electrode. A reaction in the form of a reduction of atmospheric oxygen takes place on the counter electrode. The transfer of electrons can be tapped on the connector pins as a current which is directly proportional to the gas concentration.

Calibration

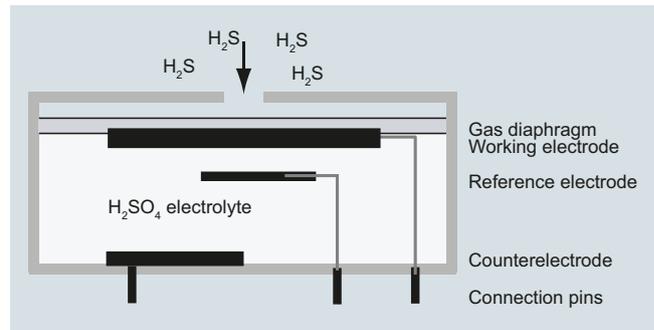
The zero point is automatically recalibrated by the AUTOCAL function when connecting e.g. nitrogen or air. It is recommendable to check the calibration point monthly using calibration gas (45 to 50 vpm).

The AUTOCAL (with ambient air, for example) must be performed every hour. In so doing, you must ensure that the ambient air is saturated in accordance with a dew point of $11\text{ }^\circ\text{C}$.

If this cannot be constantly ensured with dry ambient air, the adjustment gas must be fed through a humidifier and subsequently through a cooler (dew point $11\text{ }^\circ\text{C}$).

If the accompanying gas contains the following components, the hydrogen sulfide sensor must not be used:

- Compounds containing chlorine
- Compounds containing fluorine
- Heavy metals
- Aerosols
- Alkaline components
- $\text{NH}_3 > 5\text{ vpm}$



Operating principle of the H_2S sensor

Paramagnetic oxygen cell

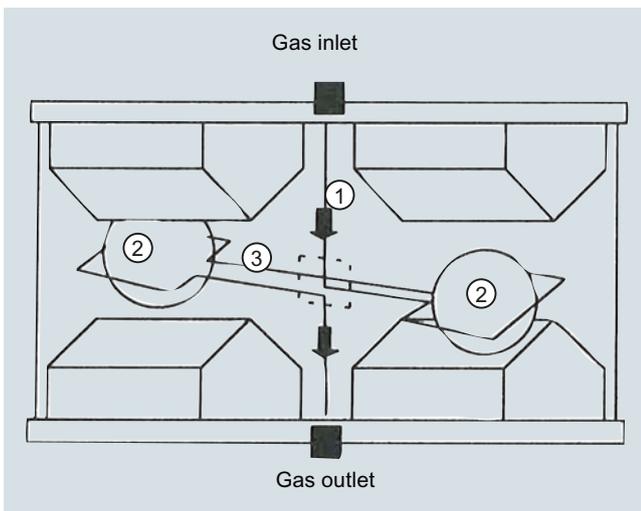
In contrast to other gases, oxygen is highly paramagnetic. This property is used as the basis for the method of measurement.

Two permanent magnets generate an inhomogeneous magnetic field in the measuring cell. If oxygen molecules flow into the measuring cell (1), they are drawn into the magnetic field. This results in the two diamagnetic hollow spheres (2) being displaced out of the magnetic field. This rotary motion is recorded optically, and serves as the input variable for control of a compensation flow. This generates a torque opposite to the rotary motion around the two hollow spheres by means of a wire loop (3). The compensation current is proportional to the concentration of oxygen.

Calibration

The calibration point is calibrated with the AUTOCAL function when processing air (corresponding to calibration with the electrochemical O₂ sensor). In order to comply with the technical data, the zero point of the paramagnetic measuring cell must be calibrated with nitrogen weekly in the case of measuring ranges < 5% or every two months in the case of larger measuring ranges.

Alternatively, inert gases (such as nitrogen) can be used for AUTOCAL. As the limit point of the measuring range remains largely stable, an annual limit point adjustment will suffice.



Operating principle of the paramagnetic oxygen cell

Extractive continuous process gas analysis

ULTRAMAT 23

General information

Cross-interferences, paramagnetic oxygen cells

Accompanying gas	Formula	Deviation at 20 °C	Deviation at 50 °C
Acetaldehyde	C ₂ H ₄ O	-0.31	-0.34
Acetone	C ₃ H ₆ O	-0.63	-0.69
Acetylene, ethyne	C ₂ H ₂	-0.26	-0.28
Ammonia	NH ₃	-0.17	-0.19
Argon	Ar	-0.23	-0.25
Benzene	C ₆ H ₆	-1.24	-1.34
Bromine	Br ₂	-1.78	-1.97
Butadiene	C ₄ H ₆	-0.85	-0.93
n-butane	C ₄ H ₁₀	-1.1	-1.22
Iso-butylene	C ₄ H ₈	-0.94	-1.06
Chlorine	Cl ₂	-0.83	-0.91
Diacetylene	C ₄ H ₂	-1.09	-1.2
Dinitrogen monoxide	N ₂ O	-0.2	-0.22
Ethane	C ₂ H ₆	-0.43	-0.47
Ethyl benzene	C ₈ H ₁₀	-1.89	-2.08
Ethylene, ethene	C ₂ H ₄	-0.2	-0.22
Ethylene glycol	C ₂ H ₆ O ₂	-0.78	-0.88
Ethylene oxide	C ₂ H ₄ O	-0.54	-0.6
Furan	C ₄ H ₄ O	-0.9	-0.99
Helium	He	0.29	0.32
n-hexane	C ₆ H ₁₄	-1.78	-1.97
Hydrogen chloride, hydrochloric acid	HCl	-0.31	-0.34
Hydrogen fluoride, hydrofluoric acid	HF	0.12	0.14
Carbon dioxide	CO ₂	-0.27	-0.29
Carbon monoxide	CO	-0.06	-0.07
Krypton	Kr	-0.49	-0.54
Methane	CH ₄	-0.16	-0.17
Methanol	CH ₄ O	-0.27	-0.31
Methylene chloride	CH ₂ Cl ₂	-1	-1.1
Monosilane, silane	SiH ₄	-0.24	-0.27
Neon	Ne	0.16	0.17
n-octane	C ₈ H ₁₈	-2.45	-2.7
Phenol	C ₆ H ₆ O	-1.4	-1.54
Propane	C ₃ H ₈	-0.77	-0.85
Propylene, propene	C ₃ H ₆	-0.57	-0.62
Propylene chloride	C ₃ H ₇ Cl	-1.42	-1.44
Propylene oxide	C ₃ H ₆ O	-0.9	-1
Oxygen	O ₂	100	100
Sulfur dioxide	SO ₂	-0.18	-0.2
Sulfur hexafluoride	SF ₆	-0.98	-1.05
Hydrogen sulfide	H ₂ S	-0.41	-0.43
Nitrogen	N ₂	0	0
Nitrogen dioxide	NO ₂	5	16
Nitrogen monoxide	NO	42.7	43

Accompanying gas	Formula	Deviation at 20 °C	Deviation at 50 °C
Styrene	C ₈ H ₈	-1.63	-1.8
Toluene	C ₇ H ₈	-1.57	-1.73
Vinyl chloride	C ₂ H ₃ Cl	-0.68	-0.74
Vinyl fluoride	C ₂ H ₃ F	-0.49	-0.54
Water (vapor)	H ₂ O	-0.03	-0.03
Hydrogen	H ₂	0.23	0.26
Xenon	Xe	-0.95	-1.02

Cross-sensitivities (with accompanying gas concentration 100%)

ULTRAMAT 23 essential characteristics

- Practically maintenance-free thanks to AUTOCAL with ambient air (or with N₂, only for units without an oxygen sensor); both the zero point and the sensitivity are calibrated in the process
- Calibration with calibration gas only required every twelve months, depending on the application
- Two measuring ranges per component can be set within specified limits; all measuring ranges linearized; autoranging with measuring range identification
- Automatic correction of variations in atmospheric pressure
- Sample gas flow monitoring; error message output if flow < 1 l/min (only with Viton sample gas path)
- Maintenance demanded
- Two freely configurable undershooting or overshooting limit values per measured component

Technical specifications

19" rack unit and portable version

General information		Gas inlet conditions	
Measured components	Maximum of 4	Sample gas pressure	
Measuring ranges	2 per measured component	• Without pump	Unpressurized (< 1 200 hPa, absolute)
Display	LCD with LED backlighting and contrast control; function keys; 80 characters (4 lines/20 characters)	• With pump	Depressurized suction mode, factory preset with 2 m hose at sample gas outlet; full-scale value calibration necessary under different restrictor conditions (800 ... 1 050 hPa, absolute)
Operating position	Front wall, vertical	Sample gas flow	72 ... 120 l/h (1.2 ... 2 l/min)
Conformity	CE marking EN 61000-6-2, EN 61000-6-4	Sample gas temperature	Min. 0 ... max. 50 °C, but above the dew point
Design, enclosure		Sample gas humidity	< 90% RH (relative humidity), non-condensing
Weight	Approximately 10 kg	Infrared channel	
Degree of protection, 19" rack unit and desktop model	<ul style="list-style-type: none"> • 7MB2335, 7MB2337 and 7MB2338: IP20 according to EN 60529 • 7MB2355, 7MB2357 and 7MB2358: IP40 according to EN 60529 	So that the technical data can be complied with, a cycle time of ≤ 24 hours must be activated for the AUTOCAL. The cycle time of the AUTOCAL function must be ≤ 6 hours when measuring small NO and SO ₂ measuring ranges (≤ 400 mg/m ³) on TÜV/QAL-certified systems.	
Electrical characteristics		Measuring ranges	
EMC interference immunity (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 or EN 61326-1	Chopper compartment flushing	See ordering data
Safety extra-low voltage (SELV) with safe isolation		Upstream pressure approximately 3 000 hPa; purging gas consumption approximately 100 ml/min	
Auxiliary power	<ul style="list-style-type: none"> • 100 V AC, +10%/-15%, 50 Hz • 120 V AC, +10%/-15%, 50 Hz • 200 V AC, +10%/-15%, 50 Hz • 230 V AC, +10%/-15%, 50 Hz • 100 V AC, +10%/-15%, 60 Hz • 120 V AC, +10%/-15%, 60 Hz • 230 V AC, +10%/-15%, 60 Hz 	Time response	
Power consumption	Approx. 60 VA	Warm-up period	Approx. 30 min (at room temperature); the technical specification will be met after 2 h
Electrical inputs and outputs		Delayed display (T ₉₀ time)	Dependent on length of analyzer chamber, sample gas line and configurable attenuation
Analog output	Per component, 0/2/4 ... 20 mA, NAMUR, isolated, max. load 750 Ω	Damping (electrical time constant)	Configurable from 0 ... 99.9 s
Relay outputs	8, with changeover contacts, freely configurable, e.g. for measuring range identification; 24 V AC/DC/1 A load, potential-free, non-sparking	Measuring response	
Digital inputs	3, dimensioned for 24 V, potential-free <ul style="list-style-type: none"> • Pump • AUTOCAL • Synchronization 	Output signal fluctuation	Based on sample gas pressure 1 013 hPa absolute, 1.0 l/min sample gas flow and 25 °C ambient temperature < ± 1% of the current measuring range (see rating plate)
Serial interface	RS 485	Detection limit	1% of the current measuring range
AUTOCAL function	Automatic unit calibration with ambient air (depending on measured component); adjustable cycle time from 0 (1) ... 24 hours	Linearity error	<ul style="list-style-type: none"> • In the largest possible measuring range: < ± 1% of the measuring range full scale value • In the smallest possible measuring range: < ± 2% of the measuring range full scale value
Options	Add-on electronics, each with 8 additional digital inputs and relay outputs, e.g. for triggering of automatic calibration and for PROFIBUS PA or PROFIBUS DP	Repeatability	≤ ± 1% of the current measuring range
Climatic conditions		Drift	
Permissible ambient temperature		Zero point	≤ 1% of the current measuring range/week
• During operation	<ul style="list-style-type: none"> • +5 ... 45 °C (IR detector, O₂) • +5 ... 40 °C (H₂S sensor) • +15 ... 35 °C (UV photometer) 	Full-scale value drift	≤ 1% of the current measuring range/week
• During storage and transportation	<ul style="list-style-type: none"> • -25 ... 60 °C (IR detector, O₂, UV photometer) • -10 ... 60 °C (H₂S sensor) 	Influencing variables	
Permissible ambient humidity	< 90% RH (relative humidity) during storage and transportation	Temperature	Based on sample gas pressure 1 013 hPa absolute, 1.0 l/min sample gas flow and 25 °C ambient temperature Max. 2% of the smallest possible measuring range according to rating plate per 10 K with an AUTOCAL cycle time of 6 h
Permissible pressure fluctuations	<ul style="list-style-type: none"> • 600 ... 1 200 hPa (IR detector, O₂, UV photometer) • 750 ... 1 200 hPa (H₂S sensor) 	Atmospheric pressure	< 0.2% of the current measuring range per 1% pressure variation
		Auxiliary power	< 0.1% of the current measuring range with a change of ± 10%

Extractive continuous process gas analysis

ULTRAMAT 23

19" rack unit and portable version

Oxygen channel (electrochemical)

Measuring ranges	0 ... 5 % to 0 ... 25 % O ₂ , configurable
Service life	Approx. 2 years with 21% O ₂
Detection limit	1% of the current measuring range
Time response	
Delayed display (T ₉₀ time)	Dependent on dead time and configurable attenuation, not > 30 s at approximately 1.2 l/min sample gas flow
Measuring response	Based on sample gas pressure 1 013 hPa absolute, 1.0 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation	< ± 0.5% of the current measuring range
Linearity error	< ± 0.2% of the current measuring range
Repeatability	≤ 0.05% O ₂
Drift	
• With AUTOCAL	Negligible
Influencing variables	Based on sample gas pressure 1 013 hPa absolute, 1.0 l/min sample gas flow and 25 °C ambient temperature
Temperature	< ± 0.5% O ₂ per 20 K, relating to a measured value at 20 °C
Atmospheric pressure	< 0.2% of the measured value per 1% pressure variation
Accompanying gases	The oxygen sensor must not be used if the accompanying gas contains the following components: Chlorine or fluorine compounds, heavy metals, aerosols, mercaptans, alkaline components (such as NH ₃ in % range)
Typical combustion exhaust gases	Influence: < 0.05% O ₂
Humidity	H ₂ O dew point ≥ 2 °C; the oxygen sensor must not be used with dry sample gases (however, no condensation either)

Ultraviolet photometer

To ensure compliance with the technical specifications, a cycle time of ≤ 24 hours must be activated for the AUTOCAL. The technical specifications are based on a sample gas pressure of 1 013 ± 5 hPa absolute, a sample gas flow of 1.2 ± 0.2 l/min and an ambient temperature of 25 ± 2 °C. They apply to the SO₂ and NO₂ sample gas components.

Measuring ranges	The measuring ranges are calibrated with a certified calibration gas, whereby a concentration specification in ppm in accordance with EN1343 must be converted to the unit mg/m ³ at a reference temperature of 0 °C and a reference pressure of 1 013 hPa.
SO ₂	
• Smallest measuring range	0 ... 50 mg/m ³
• Largest measuring range	0 ... 1 250 mg/m ³
NO ₂	
• Smallest measuring range	0 ... 50 mg/m ³
• Largest measuring range	0 ... 1 250 mg/m ³

Time response	
Warm-up period	30 min The technical specification will be met after 2 h
Response time (T ₉₀ time)	Dependent on the external gas preparation, the length of the sample gas feed line and the configurable damping (see below) of the analyzer. Note: SO ₂ is highly soluble in water! ≤ 30 s after sample gas input at a damping of ≤ 12 s
Damping (electronic time constant)	0 ... 99.9 s, can be set
Measuring response	
Output signal fluctuation	≤ 1% of set full-scale value
Detection limit	1% of set full-scale value or: • 1 mg/m ³ (SO ₂) • 0.8 mg/m ³ (NO ₂) This corresponds to 0.4 ppm for both components
Linearity error	
• In the largest measuring range	≤ 1% of set full-scale value
• In the smallest measuring range	≤ 2% of set full-scale value
Repeatability	≤ 1% of set full-scale value
Influencing variables	
Temperature error	≤ 4% of smallest full-scale value/10 K in ambient temperature range of 5 ... 45 °C
Air pressure	≤ 1% of set full-scale value per 1% pressure change
Auxiliary power supply	≤ 0.1% of set full-scale value with a change of ±10%
Drift (zero point and full-scale value)	
• AUTOCAL activated	Negligible depending on the cycle time setting
• AUTOCAL deactivated	
- NO ₂	≤ 0.85 mg/m ³ /day
- SO ₂	≤ 1.25 mg/m ³ /day
Note	It can take up to 12 hours after the device is put into operation before these values are reached.
Accompanying gases	
• Humidity up to 20 °C dew point	Negligible
• CO ₂ ≤ 16% vol	Negligible
• Exclusions	• Sulfur compounds other than SO ₂ • Halogen compounds • Chlorine • Acetone • Ozone

H₂S channel for measuring ranges of 5 ... 50 vpm

Measured components	Maximum of 4, comprising up to 2 infrared-sensitive gases, an oxygen component and a hydrogen sulfide component
Measuring ranges	
• Smallest measuring range	0 ... 5 vpm
• Largest measuring range	0 ... 50 vpm
Service life of the sensor	Approx. 12 months
Permissible atmospheric pressure	750 ... 1 200 hPa
Permissible operating temperature	5 ... 40 °C (41 ... 104 °F)
Operating mode	<ul style="list-style-type: none"> • Continuous measurement between 0 and 12.5 vpm • Discontinuous measurement between 12.5 and 50 vpm
Influencing variables	
Accompanying gases	<p>The hydrogen sulfide sensor must not be used if the accompanying gas contains the following components:</p> <ul style="list-style-type: none"> • Compounds containing chlorine • Compounds containing fluorine • Heavy metals • Aerosols • Alkaline components (e.g. NH₃ > 5 vpm)
Cross-interferences (interfering gases)	<p>1 360 vpm SO₂ result in a cross-interference of < 20 vpm H₂S</p> <p>180 vpm NO result in a cross-interference of < 150 vpm H₂S</p> <p>No cross-interference of CH₄, CO₂ and H₂ (1 000 vpm)</p>
Temperature	< 3% /10 K referred to full-scale value
Atmospheric pressure	< 0.2% of the measured value per 1% pressure variation
Measuring response	
Delayed display (T90 time)	< 40 s with sample gas flow of approx. 1 ... 1.2 l/min
Output signal noise	< 2% of smallest measuring range with an attenuation constant of 30 s
Display resolution	< 0.01 vpm H ₂ S
Output signal resolution	< 1% of smallest measuring range with an attenuation constant of 30 s
Repeatability	< 4% of smallest measuring range
Drift	< 1% of the current measuring range per month

Paramagnetic oxygen cell

Measured components	Maximum of 4, comprising up to 3 infrared-sensitive gases and an oxygen component
Measuring ranges	<p>2 per component</p> <ul style="list-style-type: none"> • Min. 0 ... 2% vol O₂ • Max. 0 ... 100% vol O₂ • Suppressed measuring range possible; e.g. 95 ... 100%
Permissible operating temperature	5 ... 45 °C (41 ... 113 °F)
Cross-interferences (interfering gases)	See "Paramagnetic oxygen cell cross-interference" table (page 1/214)
Zero point drift	<ul style="list-style-type: none"> • Measuring range 2%: max. 0.1% with weekly zero adjustment • Measuring range 5%: max. 0.1% with weekly zero adjustment • Measuring range 25% or greater: max. 0.5% with monthly zero adjustment
Measured-value drift	Negligible with AUTOCAL
Temperature error	<p>< 2%/10 K referred to measuring range 5%</p> <p>< 5%/10 K referred to measuring range 2%</p>
Humidity error for N ₂ with 90% relative humidity after 30 min	< 0.6% at 50 °C
Atmospheric pressure	< 0.2% of measured value per 1% pressure variation
Delayed display (T90 time)	< 60 s
Output signal noise	< 1% of smallest measuring range
Repeatability	< 1% of the current measuring range

Extractive continuous process gas analysis

ULTRAMAT 23

19" rack unit and portable version

1

Selection and ordering data

Article No.

ULTRAMAT 23 gas analyzer

For measuring 1 infrared component, UV components, oxygen and hydrogen sulfide

7MB2335- - - - - A A

Cannot be combined

Click on the Article No. for the online configuration in the PIA Life Cycle Portal.

Enclosure, version and gas paths

19" rack unit for installation in cabinets

Gas connections	Gas path	Internal sample gas pump
6 mm pipe	Viton	Without ⁽²⁾
¼" pipe	Viton	Without ⁽²⁾
6 mm pipe	Viton	With
¼" pipe	Viton	With
6 mm pipe	Stainless steel, mat. no. 1.4571	Without ⁽²⁾
¼" pipe	Stainless steel, mat. no. 1.4571	Without ⁽²⁾

0
1
2
3
6
7
8

6 6 → E20
7 7 → E20
8 8 8 → E20

Portable, in sheet steel enclosure, 6 mm gas connections, Viton gas path, with integrated sample gas pump, condensation trap with safety filter on the front plate

Measured component

Possible with measuring range identification

CO	D, E, F, G ... R, U, X
CO ₂ ¹⁾	D ⁽⁶⁾ , G ⁽⁶⁾ , H ⁽⁶⁾ , J ⁽⁶⁾ , K ... R
CH ₄	E, H, L, N, P, R
C ₂ H ₄	K
C ₆ H ₁₄	K
SO ₂ ¹³⁾	B ⁽¹⁰⁾ , F ... L, S ⁽¹²⁾ , T ⁽¹¹⁾ , W
NO	E, G ... J, T, V, W
N ₂ O ⁽⁷⁾	E
SF ₆	H

A
C
D
F
M
N
P
S
V

Smallest measuring range

Largest measuring range

0 ... 200 mg/m ³	0 ... 1 000 mg/m ³
0 ... 50 vpm	0 ... 250 vpm
0 ... 100 vpm	0 ... 500 vpm
0 ... 150 vpm	0 ... 750 vpm
0 ... 200 vpm	0 ... 1 000 vpm
0 ... 500 vpm	0 ... 2 500 vpm
0 ... 1 000 vpm	0 ... 5 000 vpm
0 ... 2 000 vpm	0 ... 10 000 vpm
0 ... 0.5 %	0 ... 2.5 %
0 ... 1 %	0 ... 5 %
0 ... 2 %	0 ... 10 %
0 ... 5 %	0 ... 25 %
0 ... 10 %	0 ... 50 %
0 ... 20 %	0 ... 100 %
0 ... 50 mg/m ³	0 ... 1 250 mg/m ³
0 ... 100 mg/m ³	0 ... 750 mg/m ³
0 ... 150 mg/m ³	0 ... 750 mg/m ³
0 ... 250 mg/m ³	0 ... 1 250 mg/m ³
0 ... 400 mg/m ³	0 ... 2 000 mg/m ³
0 ... 50 vpm	0 ... 2 500 vpm

B
D
E
F
G
H
J
K
L
M
N
P
Q
R
S
T
U
V
W
X

Oxygen measurement⁽⁵⁾

Without O₂ sensor
With electrochemical O₂ sensor
With paramagnetic oxygen measuring cell

0
1
8

Hydrogen sulfide measurement

Without
With H₂S sensor 0 ... 5/50 vpm

6
7

Power supply

100 V AC, 50 Hz
120 V AC, 50 Hz
200 V AC, 50 Hz
230 V AC, 50 Hz
100 V AC, 60 Hz
120 V AC, 60 Hz
230 V AC, 60 Hz

0
1
2
3
4
5
6

Operating software, documentation⁽³⁾

German
English
French
Spanish
Italian

0
1
2
3
4

Footnotes: See next page.

Selection and ordering data

<i>Additional versions</i>	Order code
Add "-Z" to Article No. and specify Order code	
Add-on electronics with 8 digital inputs/outputs, PROFIBUS PA interface	A12
Add-on electronics with 8 digital inputs/outputs, PROFIBUS DP interface	A13
IEC plug, 37-pin sub-D connector, 9-pin sub-D connector	A33
TAG labels (specific lettering based on customer information)	B03
Clean for O ₂ service (specially cleaned gas path)	B06
Gas path for short response time ⁹⁾	C01
Chopper compartment purging for 6 mm gas connection	C02
Chopper compartment purging for 1/4" gas connection	C03
Presetting to reference temperature 0 °C for conversion into mg/m ³ , applies to all components	D15
IEC Ex: Ex ec ic nC IIC T4 Gc	E20
ATEX: II 3G Ex ec ic nC IIC T4 Gc	
CSA:	
• Class I, Div. 2, Gps ABCD, T4	
• Class I, Zone 2 Ex nA ic nC II T4Gc	
Introduction of flammable gases is not permitted	
Measuring range indication in plain text ⁴⁾	Y11
Measurement of CO ₂ in forming gas ⁸⁾ (only in conjunction with measuring range 0 to 20/0 to 100 %)	Y14
<i>Accessories</i>	Article No.
CO ₂ absorber cartridge	7MB1933-8AA
RS 485/Ethernet converter	A5E00852383
RS 485/RS 232 converter	C79451-Z1589-U1
RS 485/USB converter	A5E00852382
Add-on electronics with 8 digital inputs/outputs and PROFIBUS PA	A5E00056834
Add-on electronics with 8 digital inputs/outputs and PROFIBUS DP	A5E00057159
Set of Torx screwdrivers	A5E34821625

¹⁾ For measuring ranges below 1 %, a CO₂ absorber cartridge can be used for setting the zero point (see accessories)

²⁾ Without separate zero gas input or solenoid valve

³⁾ User language can be changed

⁴⁾ Standard setting: smallest measuring range, largest measuring range

⁵⁾ O₂ sensor/O₂ measuring cell in gas path of infrared measured component 1

⁶⁾ With chopper compartment purging (N₂ approx. 3 000 hPa required for measuring ranges below 0.1 % CO₂), to be ordered separately (see order code C02 or C03)

⁷⁾ Not suitable for use with emission measurements since the cross-sensitivity is too high

⁸⁾ CO₂ measurement in accompanying gas Ar or Ar/He (3:1); forming gas

⁹⁾ Only for version with Viton hose

¹⁰⁾ Maximum possible AUTOCAL cycle ≤ 6 h, constant ambient conditions (max. deviation ±1 °C (1.8 °F)): see table "Calibration intervals, standard devices", page 1/230.

¹¹⁾ Maximum possible AUTOCAL cycle ≤ 3 h, constant ambient conditions (max. deviation ±1 °C (1.8 °F)): see table "Calibration intervals, standard devices", page 1/230.

¹²⁾ Measured with UV technology

¹³⁾ When measuring range identification "S" selected: parallel measurement of SO₂ and NO₂ with UV photometer

Extractive continuous process gas analysis

ULTRAMAT 23

19" rack unit and portable version

1

Selection and ordering data

Article No.

ULTRAMAT 23 gas analyzer

7MB2337-

For measuring 2 infrared components, UV components, oxygen and hydrogen sulfide

Cannot be combined

Click on the Article No. for the online configuration in the PIA Life Cycle Portal.

Enclosure, version and gas paths

19" rack unit for installation in cabinets

Gas connections Gas paths Internal sample gas pump

6 mm pipe	Viton, not separate	Without ⁽²⁾	0
1/4" pipe	Viton, not separate	Without ⁽²⁾	1
6 mm pipe	Viton, not separate	With	2
1/4" pipe	Viton, not separate	With	3
6 mm pipe	Viton, separate	Without ⁽²⁾	4
1/4" pipe	Viton, separate	Without ⁽²⁾	5
6 mm pipe	Stainless steel, mat. no. 1.4571, separate	Without ⁽²⁾	6
1/4" pipe	Stainless steel, mat. no. 1.4571, separate	Without ⁽²⁾	7

4 → A27, A29
5 → A27, A29

6 6
7 7

Portable, in sheet steel enclosure, 6 mm gas connections, Viton gas path, with integrated sample gas pump, condensation trap with safety filter on the front plate

8

8 8 8 → E20

1st infrared measured component

Measured component Possible with measuring range identification

CO	D, E, F, G ... R, U, X
CO ₂ ¹⁾	D ⁽⁶⁾ , G ⁽⁶⁾ , H ⁽⁶⁾ , J ⁽⁶⁾ , K ... R
CH ₄	E, H, L, N, P, R
C ₂ H ₄	K
C ₆ H ₁₄	K
SO ₂	B ⁽¹⁾ , F ... L, T ⁽²⁾ , W
NO	E, G ... J, T, V, W
N ₂ O ⁽⁷⁾	E
SF ₆	H

A
C
D
F
M
N
P
S
V

N
P

Smallest measuring range

Largest measuring range

0 ... 200 mg/m ³	0 ... 1 000 mg/m ³
0 ... 50 vpm	0 ... 250 vpm
0 ... 100 vpm	0 ... 500 vpm
0 ... 150 vpm	0 ... 750 vpm
0 ... 200 vpm	0 ... 1 000 vpm
0 ... 500 vpm	0 ... 2 500 vpm
0 ... 1 000 vpm	0 ... 5 000 vpm
0 ... 2 000 vpm	0 ... 10 000 vpm
0 ... 0.5 %	0 ... 2.5 %
0 ... 1 %	0 ... 5 %
0 ... 2 %	0 ... 10 %
0 ... 5 %	0 ... 25 %
0 ... 10 %	0 ... 50 %
0 ... 20 %	0 ... 100 %
0 ... 100 mg/m ³	0 ... 750 mg/m ³
0 ... 150 mg/m ³	0 ... 750 mg/m ³
0 ... 250 mg/m ³	0 ... 1 250 mg/m ³
0 ... 400 mg/m ³	0 ... 2 000 mg/m ³
0 ... 50 vpm	0 ... 2 500 vpm

B
D
E
F
G
H
J
K
L
M
N
P
Q
R
T
U
V
W
X

Oxygen measurement⁽⁵⁾

Without O₂ sensor
With electrochemical O₂ sensor
With paramagnetic oxygen measuring cell

0
1
8

1
8 8

Hydrogen sulfide measurement

Without
With H₂S sensor 0 ... 5/50 vpm

6
7

7 7 7

Power supply

100 V AC, 50 Hz
120 V AC, 50 Hz
200 V AC, 50 Hz
230 V AC, 50 Hz
100 V AC, 60 Hz
120 V AC, 60 Hz
230 V AC, 60 Hz

0
1
2
3
4
5
6

Extractive continuous process gas analysis ULTRAMAT 23

19" rack unit and portable version

1

Selection and ordering data		Article No.	
ULTRAMAT 23 gas analyzer For measuring 2 infrared components, UV components, oxygen and hydrogen sulfide		7MB2337-	Cannot be combined
2nd infrared measured component			
<u>Measured component</u>	<u>Possible with measuring range identification</u>		
CO	D, E, F, G ... R, U, X	A	A
CO ₂ ¹⁾	D ⁶⁾ , G ⁶⁾ , H ⁶⁾ , J ⁶⁾ , K ... R	C	C
CH ₄	E, H, L, N, P, R	D	D
C ₂ H ₄	K	F	F
C ₆ H ₁₄	K	M	M
SO ₂ ¹⁴⁾	B ¹¹⁾ , F ... L, S ¹³⁾ , T ¹²⁾ , W	N	
NO	E, G ... J, T, V, W	P	P
N ₂ O	E ⁷⁾ , Y ¹⁰⁾	S	S
SF ₆	H	V	V
<u>Smallest measuring range</u>	<u>Largest measuring range</u>		
0 ... 200 mg/m ³	0 ... 1 000 mg/m ³	B	
0 ... 50 vpm	0 ... 250 vpm	D	
0 ... 100 vpm	0 ... 500 vpm	E	
0 ... 150 vpm	0 ... 750 vpm	F	
0 ... 200 vpm	0 ... 1 000 vpm	G	
0 ... 500 vpm	0 ... 2 500 vpm	H	
0 ... 1 000 vpm	0 ... 5 000 vpm	J	
0 ... 2 000 vpm	0 ... 10 000 vpm	K	
0 ... 0,5 %	0 ... 2,5 %	L	
0 ... 1 %	0 ... 5 %	M	
0 ... 2 %	0 ... 10 %	N	
0 ... 5 %	0 ... 25 %	P	
0 ... 10 %	0 ... 50 %	Q	
0 ... 20 %	0 ... 100 %	R	
0 ... 50 mg/m ³	0 ... 1 250 mg/m ³	S	S
0 ... 100 mg/m ³	0 ... 750 mg/m ³	T	
0 ... 150 mg/m ³	0 ... 750 mg/m ³	U	
0 ... 250 mg/m ³	0 ... 1 250 mg/m ³	V	
0 ... 400 mg/m ³	0 ... 2 000 mg/m ³	W	
0 ... 50 vpm	0 ... 2 500 vpm	X	
0 ... 500 vpm	0 ... 5 000 vpm	Y	
<u>Operating software, documentation³⁾</u>			
German		0	
English		1	
French		2	
Spanish		3	
Italian		4	

Footnotes: See next page.

Extractive continuous process gas analysis

ULTRAMAT 23

19" rack unit and portable version

Selection and ordering data

<i>Additional versions</i>	Order code
Add "-Z" to Article No. and specify Order code	
Add-on electronics with 8 digital inputs/outputs, PROFIBUS PA interface	A12
Add-on electronics with 8 digital inputs/outputs, PROFIBUS DP interface	A13
Stainless steel (mat. no. 1.4571) connection pipe, 6 mm, complete with screwed gland (cannot be combined with Viton hose)	A27
Stainless steel (mat. no. 1.4571) connection pipe, 1/4", complete with screwed gland (cannot be combined with Viton hose)	A29
IEC plug, 37-pin sub-D connector, 9-pin sub-D connector	A33
TAG labels (specific lettering based on customer information)	B03
Clean for O ₂ service (specially cleaned gas path)	B06
Gas path for short response time ⁹⁾	C01
Chopper compartment purging for 6 mm gas connection	C02
Chopper compartment purging for 1/4" gas connection	C03
Application with paramagnetic oxygen measuring cell and separate gas path	C11
Presetting to reference temperature 0 °C for conversion into mg/m ³ , applies to all components	D15
IEC Ex: Ex ec ic nC IIC T4 Gc	E20
ATEX: II 3G Ex ec ic nC IIC T4 Gc	
CSA:	
• Class I, Div. 2, Gps ABCD, T4	
• Class I, Zone 2 Ex nA ic nC II T4Gc	
Introduction of flammable gases is not permitted	
Measuring range indication in plain text ⁴⁾	Y11
Measurement of CO ₂ in forming gas ⁸⁾ (only in conjunction with measuring range 0 to 20/0 to 100 %)	Y14
Accessories	Article No.
CO ₂ absorber cartridge	7MB1933-8AA
RS 485/Ethernet converter	A5E00852383
RS 485/RS 232 converter	C79451-Z1589-U1
RS 485/USB converter	A5E00852382
Add-on electronics with 8 digital inputs/outputs and PROFIBUS PA	A5E00056834
Add-on electronics with 8 digital inputs/outputs and PROFIBUS DP	A5E00057159
Set of Torx screwdrivers	A5E34821625

¹⁾ For measuring ranges below 1 %, a CO₂ absorber cartridge can be used for setting the zero point (see accessories)

²⁾ Without separate zero gas input or solenoid valve

³⁾ User language can be changed

⁴⁾ Standard setting: smallest measuring range, largest measuring range

⁵⁾ O₂ sensor/O₂ measuring cell in gas path of infrared measured component 1

⁶⁾ With chopper compartment purging (N₂ approx. 3 000 hPa required for measuring ranges below 0.1 % CO₂), to be ordered separately (see order code C02 or C03)

⁷⁾ Not suitable for use with emission measurements since the cross-sensitivity is too high

⁸⁾ CO₂ measurement in accompanying gas Ar or Ar/He (3:1); forming gas

⁹⁾ Only for version with Viton hose

¹⁰⁾ Only in conjunction with CO₂ measuring range 0 to 5 % to 0 to 25 % (CP)

¹¹⁾ Maximum possible AUTOCAL cycle ≤ 6 h, constant ambient conditions (max. deviation ±1 °C (1.8 °F): see table "Calibration intervals, standard devices", page 1/230.

¹²⁾ Maximum possible AUTOCAL cycle ≤ 3 h, constant ambient conditions (max. deviation ±1 °C (1.8 °F): see table "Calibration intervals, standard devices", page 1/230.

¹³⁾ Measured with UV technology

¹⁴⁾ When measuring range identification "S" selected: parallel measurement of SO₂ and NO₂ with UV photometer

Extractive continuous process gas analysis ULTRAMAT 23

19" rack unit and portable version

1

Selection and ordering data			Article No.	
ULTRAMAT 23 gas analyzer For measuring 3 infrared components, UV components, oxygen or 2 infrared components and UV components ↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.			7MB2338- 6 - Cannot be combined	
Enclosure, version and gas paths 19" rack unit for installation in cabinets				
<u>Gas connections</u>	<u>Gas paths</u>	<u>Internal sample gas pump</u>		
6 mm pipe	Viton, not separate	Without ⁽²⁾	0	
¼" pipe	Viton, not separate	Without ⁽²⁾	1	
6 mm pipe	Viton, not separate	With	2	
¼" pipe	Viton, not separate	With	3	
6 mm pipe	Viton, separate	Without ⁽²⁾	4	4 → A27, A29
¼" pipe	Viton, separate	Without ⁽²⁾	5	5 → A27, A29
6 mm pipe	Stainless steel, mat. no. 1.4571, separate	Without ⁽²⁾	6	6
¼" pipe	Stainless steel, mat. no. 1.4571, separate	Without ⁽²⁾	7	7
Portable, in sheet steel enclosure, 6 mm gas connections, Viton gas path, with integrated sample gas pump, condensation trap with safety filter on the front plate			8	8 → E20
1st and 2nd infrared measured component				
<u>Measured component</u>	<u>Smallest measuring range</u>	<u>Largest measuring range</u>		
CO	0 ... 500 vpm	0 ... 2 500 vpm	AA	
NO	0 ... 500 vpm	0 ... 2 500 vpm	AB	
CO	0 ... 2 000 vpm	0 ... 10 000 vpm	AC	
NO	0 ... 1 000 vpm	0 ... 5 000 vpm	AD	
CO	0 ... 1 000 vpm	0 ... 5 000 vpm	AK	
NO	0 ... 1 000 vpm	0 ... 5 000 vpm	BA	
CO	0 ... 1 %	0 ... 5 %	BB	
NO	0 ... 1 000 vpm	0 ... 5000 vpm	BD	
CO	0 ... 250 mg/m ³	0 ... 1 250 mg/m ³	BJ	
NO	0 ... 400 mg/m ³	0 ... 2 000 mg/m ³	BK	
CO	0 ... 10 %	0 ... 50 %	CA	
CO ₂	0 ... 10 %	0 ... 50 %	CB	
CO	0 ... 10 %	0 ... 50 %	DC	
CO ₂	0 ... 0.5 %	0 ... 2.5 %		
CO	0 ... 20 %	0 ... 100 %		
CO ₂	0 ... 20 %	0 ... 100 %		
CO ₂	0 ... 5 %	0 ... 25 %		
CO	0 ... 100 vpm	0 ... 500 vpm		
CO ₂	0 ... 10 %	0 ... 50 %		
CO	0 ... 0.5 %	0 ... 2.5 %		
CO ₂	0 ... 5 %	0 ... 25 %		
CH ₄	0 ... 1 %	0 ... 5 %		
CO ₂	0 ... 5 %	0 ... 25 %		
CH ₄	0 ... 2 %	0 ... 10 %		
CO ₂	0 ... 5 %	0 ... 25 %		
NO	0 ... 500 vpm	0 ... 2 500 vpm		
<u>Oxygen measurement⁽⁵⁾</u> Without O ₂ sensor			0	
With electrochemical O ₂ sensor			1	1
With paramagnetic oxygen measuring cell			8	8 8
<u>Power supply</u> 100 V AC, 50 Hz 120 V AC, 50 Hz 200 V AC, 50 Hz 230 V AC, 50 Hz 100 V AC, 60 Hz 120 V AC, 60 Hz 230 V AC, 60 Hz			0 1 2 3 4 5 6	

Footnotes: See page 1/225.

Extractive continuous process gas analysis**ULTRAMAT 23****19" rack unit and portable version****1****Selection and ordering data****Article No.****ULTRAMAT 23 gas analyzer****7MB2338-**

For measuring 3 infrared components, UV components, oxygen or 2 infrared components and UV components

6 -

Cannot be combined

3rd infrared measured component**Measured component** **Possible with measuring range identification**

CO	D, E, F, G ... R, U, X
CO ₂ ¹⁾	D ⁶⁾ , G ⁶⁾ , H ⁶⁾ , J ⁶⁾ , K ... R
CH ₄	E, H, L, N, P, R
C ₂ H ₄	K
C ₆ H ₁₄	K
SO ₂ ¹³⁾	B ¹⁾ , F ... L, T ¹²⁾ , W
NO	E, G ... J, V, W
N ₂ O	E ⁷⁾ , Y ¹⁰⁾
SF ₆	H

Smallest measuring range **Largest measuring range**

0 ... 200 mg/m ³	0 ... 1 000 mg/m ³
0 ... 50 vpm	0 ... 250 vpm
0 ... 100 vpm	0 ... 500 vpm
0 ... 150 vpm	0 ... 750 vpm
0 ... 200 vpm	0 ... 1 000 vpm
0 ... 500 vpm	0 ... 2 500 vpm
0 ... 1 000 vpm	0 ... 5 000 vpm
0 ... 2 000 vpm	0 ... 10 000 vpm
0 ... 0,5 %	0 ... 2,5 %
0 ... 1 %	0 ... 5 %
0 ... 2 %	0 ... 10 %
0 ... 5 %	0 ... 25 %
0 ... 10 %	0 ... 50 %
0 ... 20 %	0 ... 100 %
0 ... 50 mg/m ³	0 ... 1 250 mg/m ³
0 ... 100 mg/m ³	0 ... 750 mg/m ³
0 ... 150 mg/m ³	0 ... 750 mg/m ³
0 ... 250 mg/m ³	0 ... 1 250 mg/m ³
0 ... 400 mg/m ³	0 ... 2 000 mg/m ³
0 ... 50 vpm	0 ... 2 500 vpm
0 ... 500 vpm	0 ... 5 000 vpm

Operating software, documentation³⁾

German
English
French
Spanish
Italian

Footnotes: See page 1/225.

A
C
D
F
M
N
P
S
VB
D
E
F
G
H
J
K
L
M
N
P
Q
R
S
T
U
V
W
X
Y0
1
2
3
4

Selection and ordering data

<i>Additional versions</i>	Order code
Add "-Z" to Article No. and specify Order code	
Add-on electronics with 8 digital inputs/outputs, PROFIBUS PA interface	A12
Add-on electronics with 8 digital inputs/outputs, PROFIBUS DP interface	A13
Stainless steel (mat. no. 1.4571) connection pipe, 6 mm, complete with screwed gland (cannot be combined with Viton hose)	A27
Stainless steel (mat. no. 1.4571) connection pipe, 1/4", complete with screwed gland (cannot be combined with Viton hose)	A29
IEC plug, 37-pin sub-D connector, 9-pin sub-D connector	A33
TAG labels (specific lettering based on customer information)	B03
Clean for O ₂ service (specially cleaned gas path)	B06
Gas path for short response time ⁹⁾	C01
Chopper compartment purging for 6 mm gas connection	C02
Chopper compartment purging for 1/4" gas connection	C03
Application with paramagnetic oxygen measuring cell and separate gas path	C11
Presetting to reference temperature 0 °C for conversion into mg/m ³ , applies to all components	D15
IEC Ex: Ex ec ic nC IIC T4 Gc	E20
ATEX: II 3G Ex ec ic nC IIC T4 Gc	
CSA:	
• Class I, Div. 2, Gps ABCD, T4	
• Class I, Zone 2 Ex nA ic nC II T4Gc	
Introduction of flammable gases is not permitted	
Measuring range indication in plain text ⁴⁾	Y11
Measurement of CO ₂ in forming gas ⁸⁾ (only in conjunction with measuring range 0 to 20/0 to 100 %)	Y14
<i>Accessories</i>	Article No.
CO ₂ absorber cartridge	7MB1933-8AA
RS 485/Ethernet converter	A5E00852383
RS 485/RS 232 converter	C79451-Z1589-U1
RS 485/USB converter	A5E00852382
Add-on electronics with 8 digital inputs/outputs and PROFIBUS PA	A5E00056834
Add-on electronics with 8 digital inputs/outputs and PROFIBUS DP	A5E00057159
Set of Torx screwdrivers	A5E34821625

¹⁾ For measuring ranges below 1 %, a CO₂ absorber cartridge can be used for setting the zero point (see accessories)

²⁾ Without separate zero gas input or solenoid valve

³⁾ User language can be changed

⁴⁾ Standard setting: smallest measuring range, largest measuring range

⁵⁾ O₂ sensor/O₂ measuring cell in gas path of infrared measured component 1

⁶⁾ With chopper compartment purging (N₂ approx. 3 000 hPa required for measuring ranges below 0.1 % CO₂), to be ordered separately (see order code C02 or C03)

⁷⁾ Not suitable for use with emission measurements since the cross-sensitivity is too high

⁸⁾ CO₂ measurement in accompanying gas Ar or Ar/He (3:1); forming gas

⁹⁾ Only for version with Viton hose

¹⁰⁾ Only in combination with CO₂/NO, measuring range 0 to 5/25 %, 0 to 500/5 000 vpm [-DC-]

¹¹⁾ Maximum possible AUTOCAL cycle ≤ 6 h, constant ambient conditions (max. deviation ±1 °C (1.8 °F)); see table "Calibration intervals, standard devices", page 1/230.

¹²⁾ Maximum possible AUTOCAL cycle ≤ 3 h, constant ambient conditions (max. deviation ±1 °C (1.8 °F)); see table "Calibration intervals, standard devices", page 1/230.

¹³⁾ When measuring range identification "S" selected: parallel measurement of SO₂ and NO₂ with UV photometer

Extractive continuous process gas analysis

ULTRAMAT 23

19" rack unit and portable version

1

Selection and ordering data			Article No.	
Gas analyzer ULTRAMAT 23 - TÜV version For measuring 2 infrared components, UV components and oxygen ↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.			7MB2357- 6 -	
Enclosure, version and gas paths 19" rack unit for installation in cabinets			Cannot be combined	
<u>Gas connections</u>	<u>Gas paths</u>	<u>Internal sample gas pump</u>		
6 mm	FPM (Viton, not separate)	without	0	
1st infrared measured component				
<u>Measured component</u>	<u>Possible with measuring range identification</u>			
CO	G, J		A	
CO ₂	P		C	
SO ₂	F, G, H, W		N	
NO	F, G, H, U, V, W		P	
<u>Smallest measuring range</u>	<u>Largest measuring range</u>			
0 ... 150 vpm	0 ... 750 vpm		F	
0 ... 200 vpm	0 ... 1 000 vpm		G	
0 ... 500 vpm	0 ... 2 500 vpm		H	
0 ... 1 000 vpm	0 ... 5 000 vpm		J	
0 ... 5 %	0 ... 25 %		P	
0 ... 150 mg/m ³	0 ... 750 mg/m ³		U	
0 ... 250 mg/m ³	0 ... 1 250 mg/m ³		V	
0 ... 400 mg/m ³	0 ... 2 000 mg/m ³		W	
<u>Oxygen measurement</u> Without O ₂ sensor With electrochemical O ₂ sensor With paramagnetic oxygen measuring cell			0 1 8	
<u>Power supply</u> 230 V AC, 50 Hz			3	
2nd infrared measured component				
<u>Measured component</u>	<u>Possible with measuring range identification</u>			
CO	G, J		A	
CO ₂	P		C	
SO ₂ ¹⁾	F, G, H, W		N	
NO	F, G, H, U, V, W		P	
<u>Smallest measuring range</u>	<u>Largest measuring range</u>			
0 ... 150 vpm	0 ... 750 vpm		F	
0 ... 200 vpm	0 ... 1 000 vpm		G	
0 ... 500 vpm	0 ... 2 500 vpm		H	
0 ... 1 000 vpm	0 ... 5 000 vpm		J	
0 ... 5 %	0 ... 25 %		P	
0 ... 50 mg/m ³	0 ... 1 250 mg/m ³		S	
0 ... 150 mg/m ³	0 ... 750 mg/m ³		U	
0 ... 250 mg/m ³	0 ... 1 250 mg/m ³		V	
0 ... 400 mg/m ³	0 ... 2 000 mg/m ³		W	
<u>Operating software, documentation</u> German English French Spanish Italian			0 1 2 3 4	

¹⁾ When measuring range identification "S" selected: parallel measurement of SO₂ and NO₂ with UV photometer

Selection and ordering data	Order code
<u>Additional versions</u>	
Add "-Z" to Article No. and specify Order code	
Add-on electronics with 8 digital inputs/outputs, PROFIBUS PA interface	A12
Add-on electronics with 8 digital inputs/outputs, PROFIBUS DP interface	A13
IEC plug, 37-pin sub-D connector, 9-pin sub-D connector	A33
O ₂ paramagnetic, suitability-tested EN 15267, IR measuring range in mg/m ³	T13
O ₂ paramagnetic, suitability-tested EN 15267, IR measuring range in mg/m ³ , greater measuring range	T14
O ₂ electrochemical, suitability-tested EN 15267, IR measuring range in mg/m ³	T23
O ₂ paramagnetic, suitability-tested EN 15267, IR measuring range in mg/m ³ , greater measuring range	T24
Without O ₂ , suitability-tested EN 15267, IR measuring range in mg/m ³	T33
Without O ₂ , suitability-tested EN 15267, IR measuring range in mg/m ³ , greater measuring range	T34
SO ₂ with measuring range 0 ... 400/7000 mg/m ³	Y15

Extractive continuous process gas analysis

ULTRAMAT 23

19" rack unit and portable version

1

Selection and ordering data

Gas analyzer ULTRAMAT 23 - TÜV version

For measuring 3 infrared components, UV components, oxygen or 2 infrared components and UV components

➤ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.

Enclosure, version and gas paths

19" rack unit for installation in cabinets

Gas connections

6 mm

Gas paths

FPM (Viton, not separate)

Internal sample gas pump

without

1st and 2nd infrared measured component

Measured component

CO

NO

Smallest measuring range

0 ... 250 mg/m³

0 ... 400 mg/m³

Largest measuring range

0 ... 1 250 mg/m³

0 ... 2 000 mg/m³

Oxygen measurement

Without O₂ sensor

With electrochemical O₂ sensor

With paramagnetic oxygen measuring cell

Power supply

230 V AC, 50 Hz

3rd infrared measured component

Measured component

SO₂¹⁾

Possible with measuring range identification

F, G, H, W

Smallest measuring range

0 ... 150 vpm

0 ... 200 vpm

0 ... 500 vpm

0 ... 50 mg/m³

0 ... 400 mg/m³

Largest measuring range

0 ... 750 vpm

0 ... 1 000 vpm

0 ... 2 500 vpm

0 ... 1 250 mg/m³

0 ... 2 000 mg/m³

TÜV: see table "TÜV, 3-component analyzer" page 1/229

Operating software, documentation

German

English

French

Spanish

Italian

Article No.

7MB2358-

0 1 2 3 4

Cannot be combined

6 -

0 1 2 3 4

0 1 2 3 4

0 1 2 3 4

0 1 2 3 4

0 1 2 3 4

0 1 2 3 4

0 1 2 3 4

0 1 2 3 4

0 1 2 3 4

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0 1 2 3 4

0 1 2 3 4

¹⁾ When measuring range identification "S" selected: parallel measurement of SO₂ and NO₂ with UV photometer

Selection and ordering data

Additional versions

Add "-Z" to Article No. and specify Order code

Add-on electronics with 8 digital inputs/outputs, PROFIBUS PA interface

Add-on electronics with 8 digital inputs/outputs, PROFIBUS DP interface

IEC plug, 37-pin sub-D connector, 9-pin sub-D connector

O₂ paramagnetic, suitability-tested EN 15267, IR measuring range in mg/m³

O₂ electrochemical, suitability-tested EN 15267, IR measuring range in mg/m³

Without O₂, suitability-tested EN 15267, IR measuring range in mg/m³

SO₂ with measuring range 0 ... 400/7000 mg/m³

Order code

A12

A13

A33

T13

T23

T33

Y15

TÜV, 1 and 2-component analyzer

Only in conjunction with order code T13/T23/T33

Component	CO (TÜV)		SO ₂ (TÜV)		NO (TÜV)	
	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 ...	Largest measuring range from 0 to ...
F				400 mg/m ³	2 000 mg/m ³	1 000 mg/m ³
G		200 mg/m ³	1 250 mg/m ³	500 mg/m ³	2 500 mg/m ³	1 250 mg/m ³
H				1 400 mg/m ³	7 000 mg/m ³	
S				75 mg/m ³	1 250 mg/m ³	

Only in conjunction with order code T14/T24/T34

Component	CO (TÜV)		SO ₂ (TÜV)		NO (TÜV)	
	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 ...	Largest measuring range from 0 to ...
H					600 mg/m ³	3 000 mg/m ³
J		1 250 mg/m ³	6 000 mg/m ³			

Ordering example

ULTRAMAT 23, TÜV
 IR component: CO
 Measuring range: 0 to 200 / 1 250 mg/m³
 with electrochem. O₂ sensor
 230 V AC; German
7MB2355-0AG16-3AA0-Z +T23

TÜV, 3-component analyzer

(only in conjunction with order code T13/T23/T33)

Component	CO (TÜV)		SO ₂ (TÜV)		NO (TÜV)	
	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 ...	Largest measuring range from 0 to ...
F				400 mg/m ³	2 000 mg/m ³	
G				500 mg/m ³	2 500 mg/m ³	
H				1 400 mg/m ³	7 000 mg/m ³	

Ordering example

ULTRAMAT 23, TÜV
 IR component: CO/NO + SO₂
 Measuring range: CO: 0 to 250 / 1 250 mg/m³, NO: 0 to 400 / 2 000 mg/m³, SO₂: 0 to 400 / 2 000 mg/m³
 with paramagnetic oxygen measuring cell
 230 V AC; German
7MB2358-0AK86-3NF0-Z +T13

Extractive continuous process gas analysis**ULTRAMAT 23****19" rack unit and portable version****Ordering notes**

Special selection rules must be observed when measuring some components.

Measured component N₂O

7MB2335, 7MB2337 and 7MB2338

(application: Si chip production)

- Measuring range 0 to 100 / 500 vpm (MB designation "E")
- Can only be used to measure N₂O in ultra-pure gases

7MB2337 and 7MB2338

(application: measurement in accordance with the requirements of the Kyoto protocol)

- Measuring range 0 to 500 / 5 000 vpm (MB designation "Y")
- Requires simultaneous measurement of CO₂ for correction of cross-interference

7MB2337-*CP*6-*SY* or

7MB2338-*DC*6-*SY* (including NO measurement)

7MB2337 and 7MB2338

(application with paramagnetic oxygen measuring cell and separate gas path)

7MB2337-4**86-**** - Z + C11

7MB2337-5**86-**** - Z + C11

7MB2338-4**86-**** - Z + C11

7MB2338-5**86-**** - Z + C11

Measured component SF₆

7MB2335, 7MB2337 and 7MB2338

(application: Si chip production)

- Measuring range 0 to 500 / 2 500 vpm (MB designation "H")
- Can only be used to measure SF₆ in inert gases

	Calibration with calibration gas		Comment (keep to technical specs)
	Zero point	Calibration point	
	Weeks		
IR components	0	52	
O ₂ - electrical chemical sensor	52	0	
O ₂ paramagnetic Cell	1	0	at MB < 5 %
	8	0	at MB > 5 %
O ₂ paramagnetic Cell	0	52	at MB < 5 %
	0	52	at MB > 5 %
H ₂ S sensor	0	4	

0 = with AutoCal, with ambient air or N₂, every 3 ... 24h - depending on measuring range

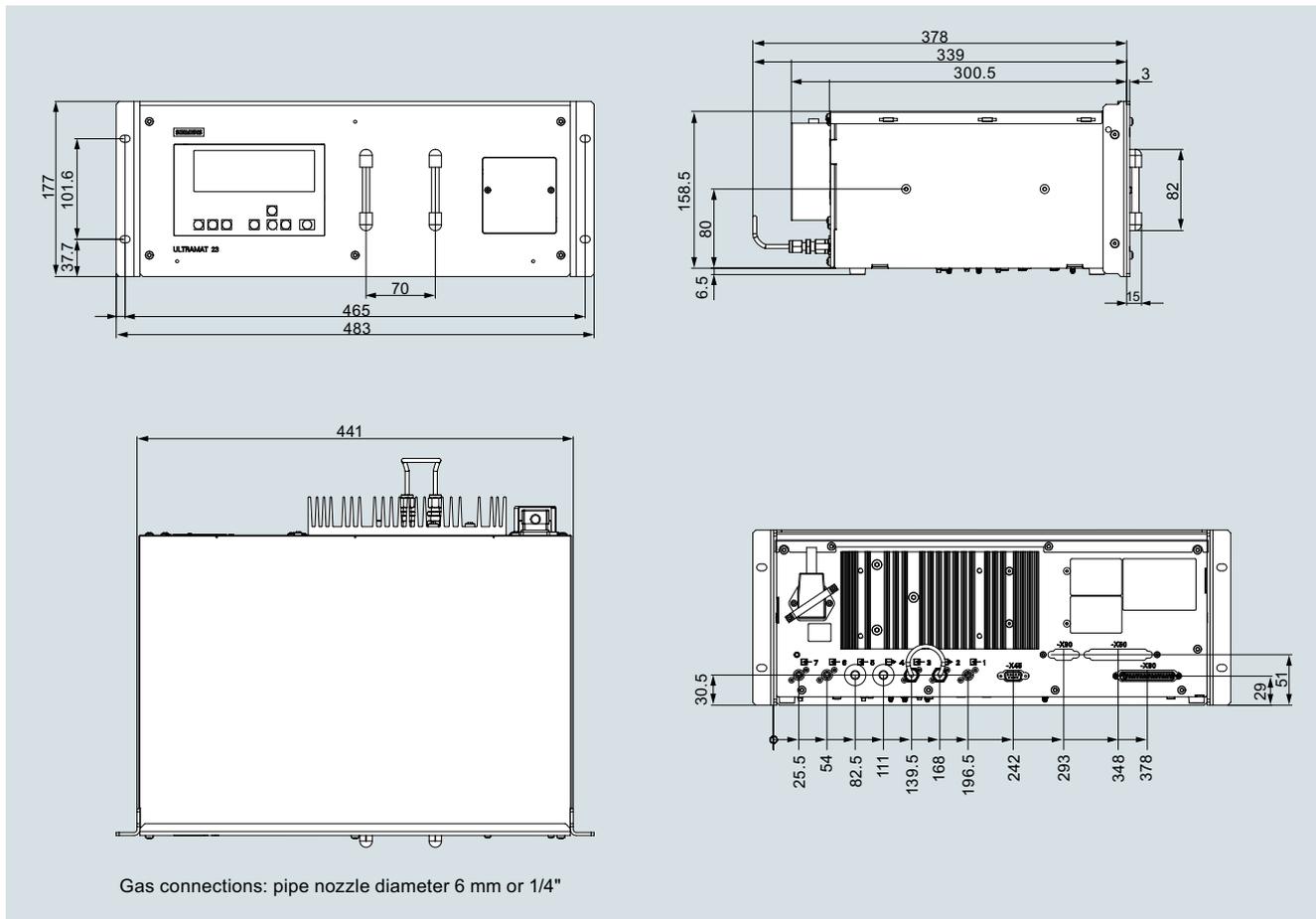
Calibration intervals, standard devices

Extractive continuous process gas analysis ULTRAMAT 23

19" rack unit and portable version

1

Dimensional drawings



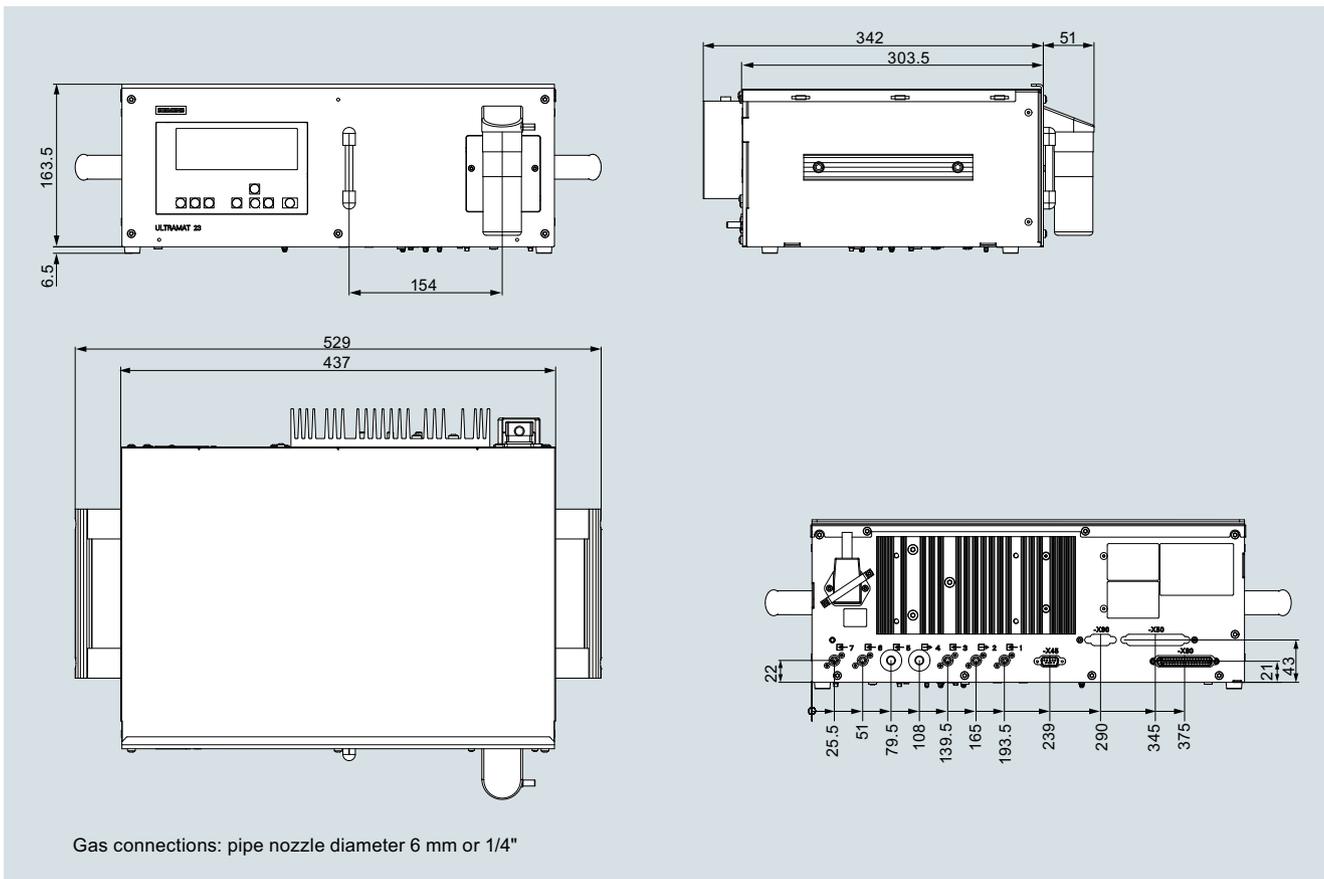
ULTRAMAT 23, 19" rack unit, dimensions in mm

Extractive continuous process gas analysis

ULTRAMAT 23

19" rack unit and portable version

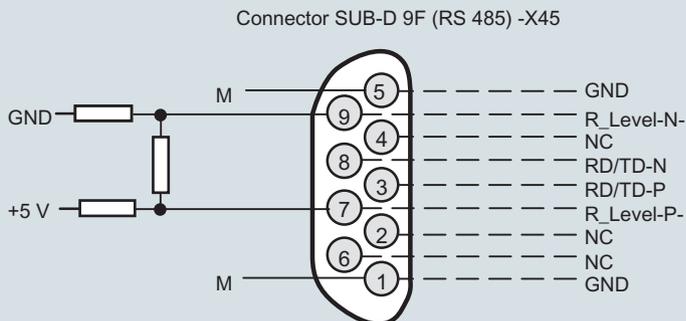
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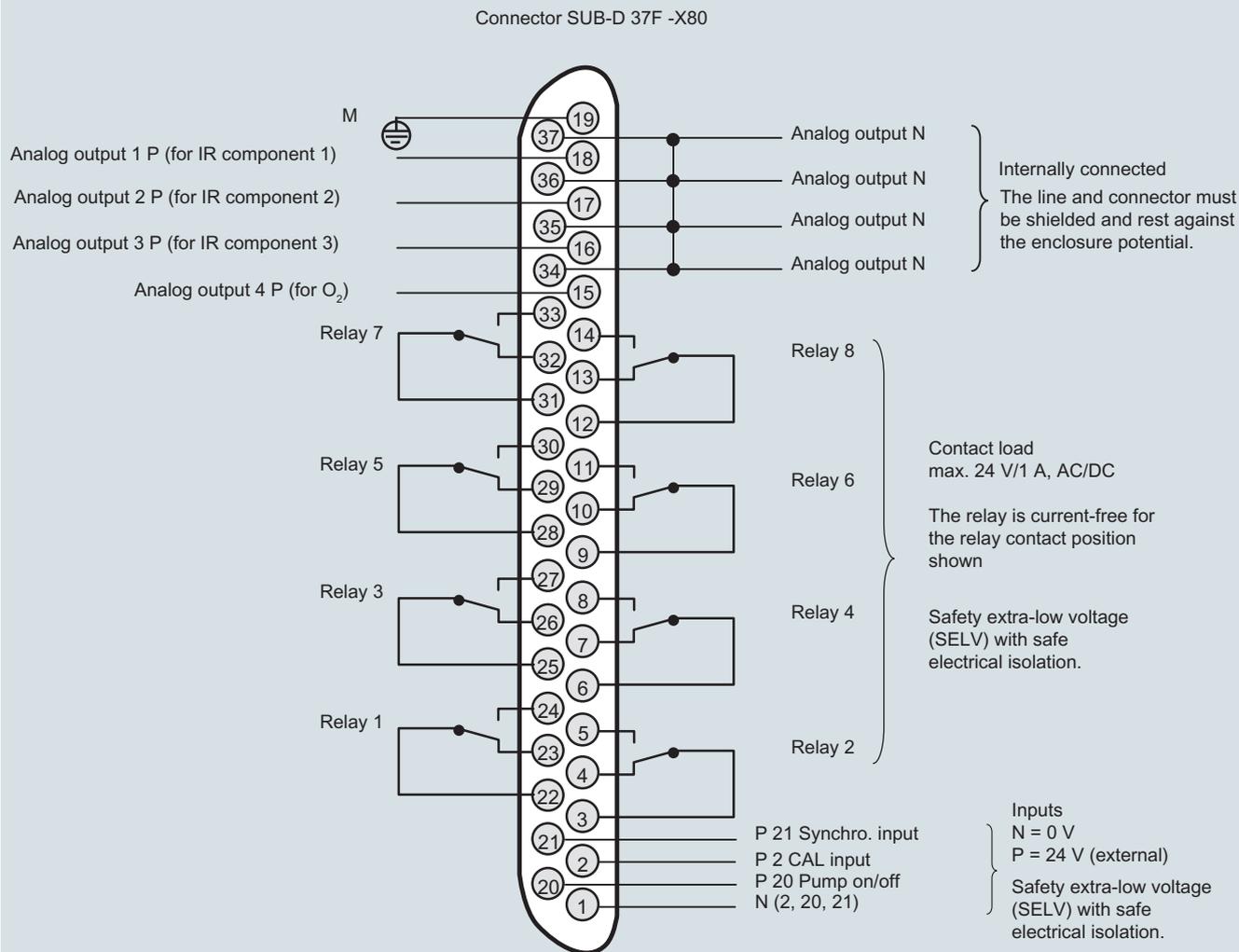
ULTRAMAT 23, bench-top unit, dimensions in mm

Circuit diagrams

Pin assignment (electrical and gas connections)



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



Internally connected
The line and connector must be shielded and rest against the enclosure potential.

Contact load
max. 24 V/1 A, AC/DC

The relay is current-free for the relay contact position shown

Safety extra-low voltage (SELV) with safe electrical isolation.

Inputs
N = 0 V
P = 24 V (external)
Safety extra-low voltage (SELV) with safe electrical isolation.

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

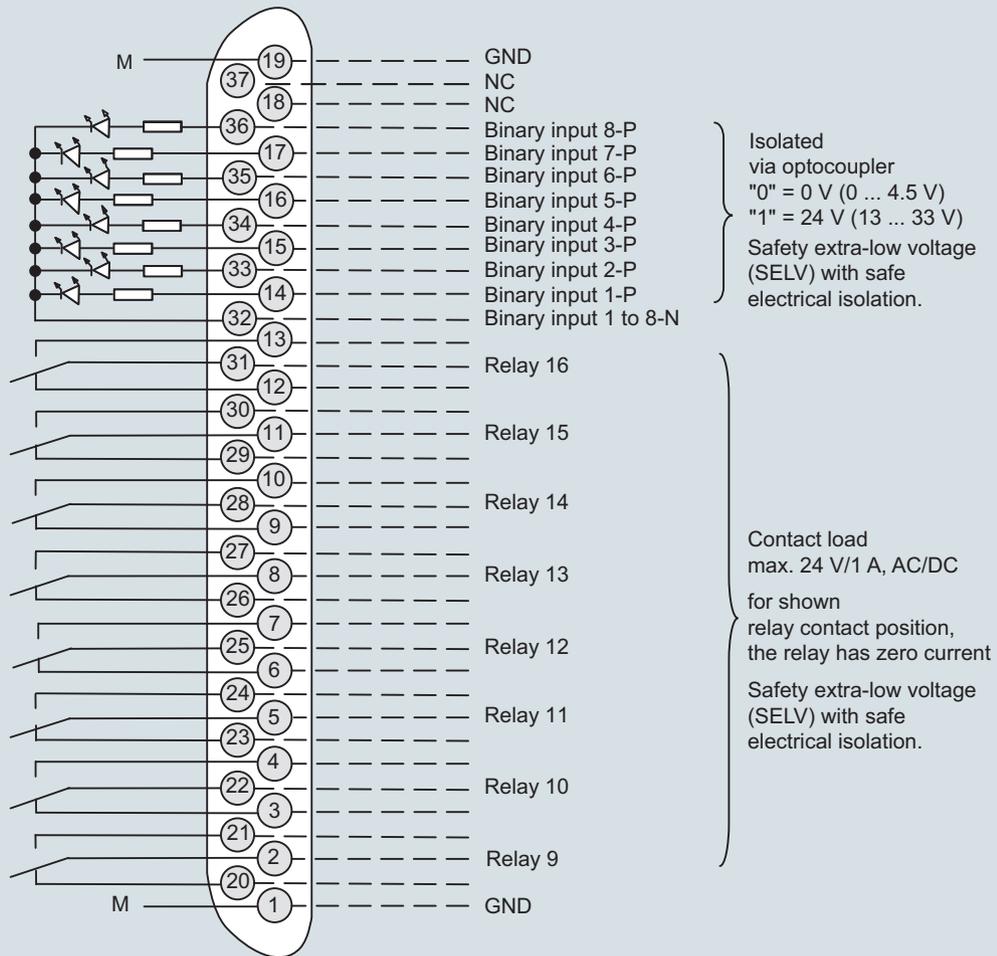
Extractive continuous process gas analysis

ULTRAMAT 23

19" rack unit and portable version

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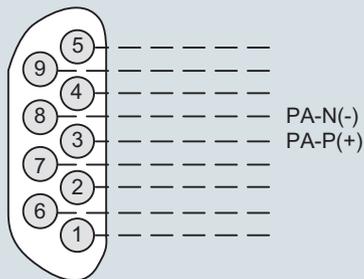
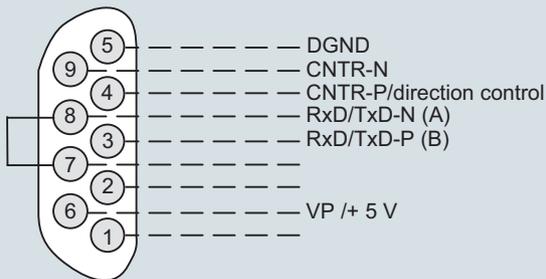
Connector SUB-D 37F (option) -X50



Connector SUB-D 9F-X90 PROFIBUS DP

optional

Connector SUB-D 9M-X90 PROFIBUS PA



Note:

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

ULTRAMAT 23, pin assignment of optional PROFIBUS interface card

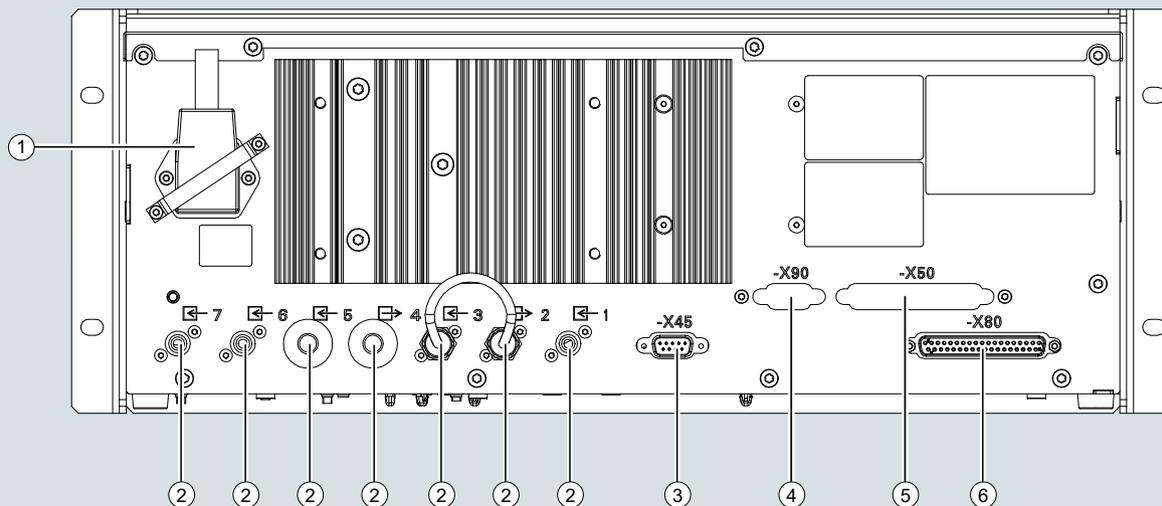
Extractive continuous process gas analysis

ULTRAMAT 23

19" rack unit and portable version

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19" rack unit

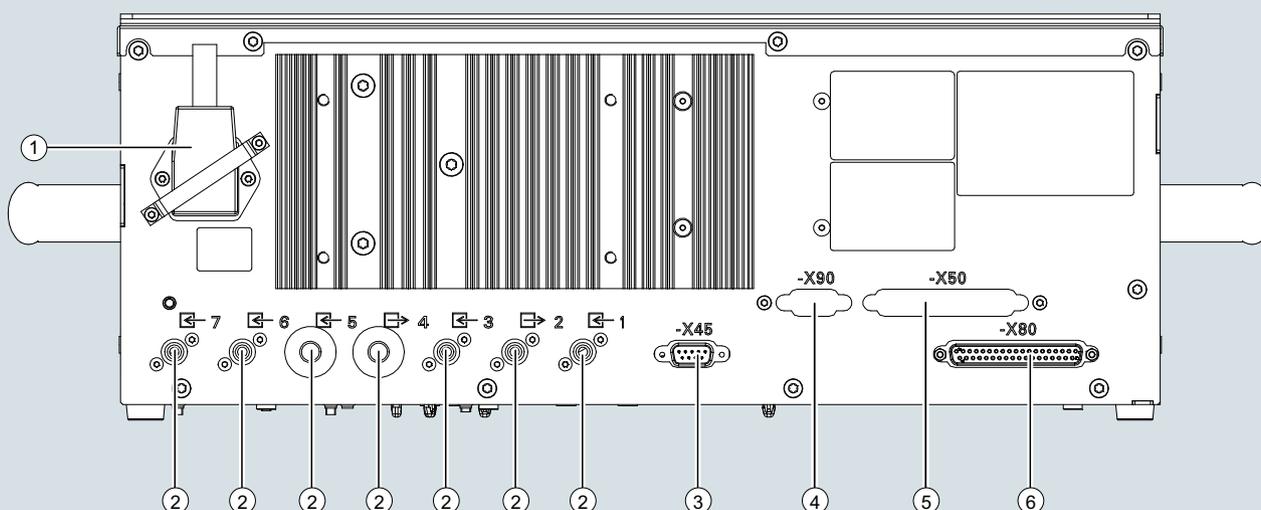


- ① Auxiliary power and fine fuse
- ② Gas connections: nozzles 6 mm or 1/4"
- ③ -X45: ELAN (RS485) 9-pin connector
- ④ -X90: 9-pin interface connector (option board with PROFIBUS-DP/PA)
- ⑤ -X50: 37-pin connector: Option board; binary inputs/relay outputs
- ⑥ -X80: 37-pin connector: Analog and digital inputs and outputs

When installing in a cabinet: mount analyzer on support rails.

ULTRAMAT 23, 19" rack unit, e.g. an IR measured component with oxygen measurement

Portable unit

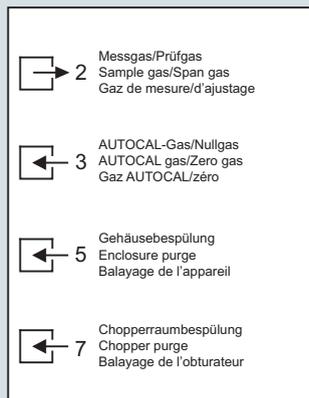


- ① Power connector
- ② Gas connections: nozzles 6 mm or 1/4"
- ③ -X45: ELAN (RS485) 9-pin connector
- ④ -X90: 9-pin interface connector (option board with PROFIBUS-DP/PA)
- ⑤ -X50: 37-pin connector: Option board; binary inputs/relay outputs
- ⑥ -X80: 37-pin connector: Analog and digital inputs and outputs

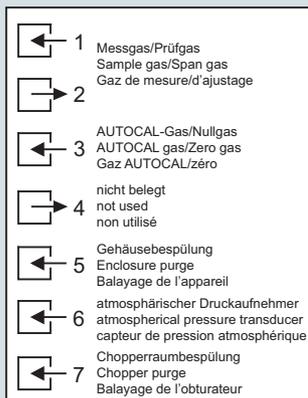
ULTRAMAT 23 portable, in sheet-steel enclosure, gas connections and electrical connections

Extractive continuous process gas analysis**ULTRAMAT 23****19" rack unit and portable version**

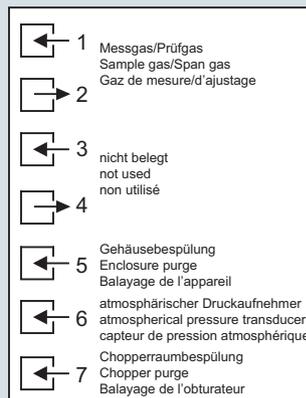
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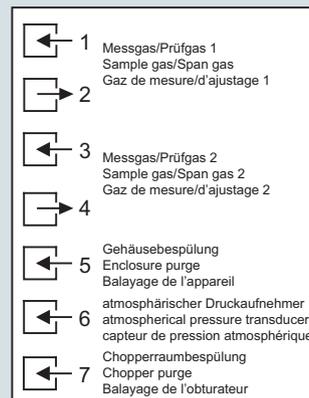
Key to symbols
 ULTRAMAT 23
 portable, in sheet-steel housing



Key to symbols
 ULTRAMAT 23
 19" rack unit
 with sample gas pump



Key to symbols
 ULTRAMAT 23
 19" rack unit
 without sample gas pump



Key to symbols
 ULTRAMAT 23
 19" rack unit
 with two separate
 gas paths or pipe version

ULTRAMAT 23, designation of the different labels

More information

The complete documentation is available in various languages for downloading free of charge:

<http://www.siemens.com/processanalytics/documentation>

Selection and ordering data

Description	Quantity for 2 years	Quantity for 5 years	Article No.
Analyzer unit			
O-ring for analyzer chamber: 180, 90, 60, 20 mm	2	4	C71121-Z100-A99
Chopper			
• With motor, for 1 IR channel (7MB23X5-...)	1	1	C79451-A3468-B515
• With motor, for 2 IR channels (7MB23X7-..., 7MB23X8-...)	1	1	C79451-A3468-B516
Electronics			
Motherboard, with firmware	-	1	C79451-A3494-D501
Keypad	1	1	C79451-A3492-B605
LCD module	1	1	C79451-A3494-B16
Connector filter	-	1	W75041-E5602-K2
Line switch (portable analyzer)	-	1	W75050-T1201-U101
Fusible element 220 ... 240 V	2	4	W79054-L1010-T630
Fusible element 100 ... 120 V	2	4	W79054-L1011-T125
Other			
Safety filter (zero gas), internal	2	2	C79127-Z400-A1
Safety filter (sample gas), internal	2	3	C79127-Z400-A1
Pressure switch	1	2	C79302-Z1210-A2
Flowmeter	1	2	C79402-Z560-T1
Set of gaskets for sample gas pump	2	5	C79402-Z666-E20
Condensation trap (for portable unit, in sheet steel enclosure)	1	2	C79451-A3008-B43
Filter (for portable unit, in sheet steel enclosure)	1	2	C79451-A3008-B60
Oxygen sensor	1	1	C79451-A3458-B55
Sample gas pump 50 Hz	1	1	C79451-A3494-B10
Sample gas pump 60 Hz	1	1	C79451-A3494-B11
Solenoid valve	1	1	C79451-A3494-B33

Extractive continuous process gas analysis

SIPROCESS UV600

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Overview



The function of the SIPROCESS UV600 gas analyzer is based on UV resonance absorption spectrometry. It also is used to measure very low NO, NO₂, SO₂ or H₂S concentrations in gases.

Benefits

- For NO, NO₂, SO₂: Very low cross-sensitivity with other gases
- All modules are thermostatically-controlled, and thus independent of the ambient temperature
- Simultaneous measurement of NO and NO₂ with subsequent calculation of total. Therefore neither an NO₂ converter nor a CLD analyzer is required.
- Measurement in the UV range:
 - No cross-sensitivity with H₂O and CO₂
 - Very low SO₂ and NO measuring ranges possible
- UV resonance absorption spectrometry:
 - Measurement of very low NO concentrations
 - Very low cross-sensitivity possible
- Very long service life of UV lamp (usually 2 years)
- Low drifts and high stability thanks to four-channel measuring method with double generation of quotient
- True reference measurement for low-drift, stable results
- Interface for remote monitoring in networks and linking to process control systems
- Optional calibration unit
 - Filter wheel with calibration cells which can be automatically swung into the optical path
 - Low consumption of calibration gas
 - Manual or automatic calibration possible

Application

Fields of application

Emission measurements

- Measurement of low NO concentrations in power plants or gas turbines
- Monitoring of NO_x in denitrification plants by direct measurement of NO and NO₂, as well as summation to NO_x in the analyzer
- Efficient measurement in desulfurization plants
- Monitoring of very small SO₂ and NO concentrations
- Emission measurements in the paper and cellulose industries

Process monitoring

- Measurement of SO₂ in process gases in the paper and petrochemical industries
- Optimization of NO_x emissions in exhaust gas in the automotive industry

H₂S measurement

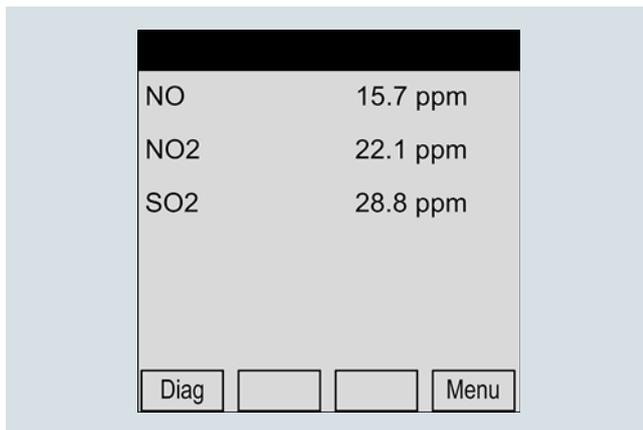
- In typical emission applications
- Taking account of possible cross-sensitivities (e.g. from mercaptan)"

Design

- 19" rack unit with 4 HU for installation
 - in hinged frame
 - in cabinets with or without telescopic rails
- Internal gas paths: hose made of FKM (Viton™) or pipe made of PTFE or stainless steel
- Gas connections for sample gas inlet and outlet and for reference gas: fittings, pipe diameter of 6 mm or ¼"

Display and control panel

- Large LCD panel for simultaneous display of measured value and device status
- Sensor buttons with context-based functions
- Display protected by glass pane
- Contrast of the LC display can be adjusted



SIPROCESS UV600, display and control panel

Inputs and outputs

- 2 configurable analog inputs
- 4 configurable analog outputs
- 8 digital inputs
- 8 digital outputs

Communications

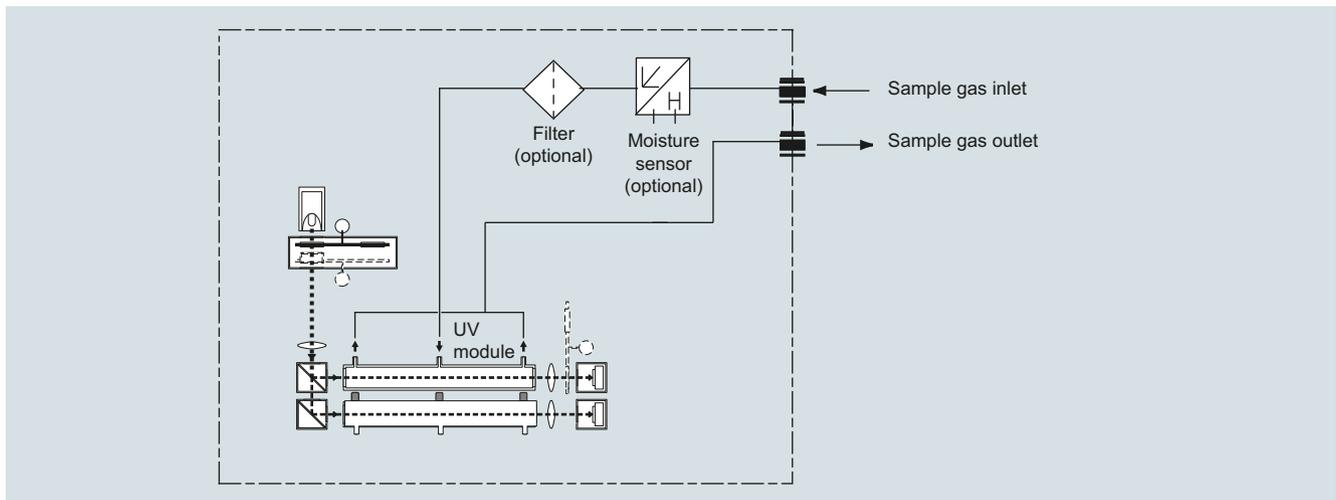
Connection via SIPROCESS-UV600-specific software tool

Materials wetted by sample gas

Component	Material
Analyzer unit (sample chamber)	Aluminum or stainless steel mat. no. 1.4404 ¹⁾ , epoxy resin
Optical window	CaF ₂ or quartz ¹⁾ , epoxy resin
Gas path, gaskets	FKM (Viton), PTFE, stainless steel mat. no. 1.4571 ¹⁾
Chamber	Aluminum or stainless steel ¹⁾
Gas inlet/outlet	PVDF, stainless steel, mat. no. 1.4401 ¹⁾
Moisture sensor	Stainless steel mat. no. 1.4571, platinum, epoxy resin
Diaphragm pump	
• Central body	PVDF
• Diaphragm	FKM (Viton), EPDM

¹⁾ Depending on the version

Gas flow chart



SIPROCESS UV600, gas flow chart

Extractive continuous process gas analysis

SIPROCESS UV600

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Mode of operation

The measuring principle of the SIPROCESS UV600 is based on the molecule-specific absorption of gases in the ultraviolet wavelength range. Radiation of a wavelength appropriate to the measurement is passed through the sample, and the selective absorption which is proportional to the concentration of the measured component is determined.

Measuring method

An electrodeless discharge lamp (1) emits broadband in the ultraviolet spectral range. A filter wheel unit (2) generates the ultraviolet radiation suitable for the respective measured component. Either interference filter correlation (IFC) or gas filter correlation (GFC), or a combination of the two methods, can be used for this purpose.

Interference filter correlation (IFC)

The sample and reference radiations are generated alternately with two different interference filters being swung into the beam path (filter wheel 2a).

Gas filter correlation (GFC)

Especially when NO is the measured component, the reference radiation is generated by swinging in a gas filter which is filled with the associated gas (filter wheel 2b).

IFC and GFC

The two filter wheels are combined in order to measure NO in combination with other measured components.

Design of the UV analyzer module

After passing through the filter unit, the beam is directed via a lens (3), a beam divider (4) and a mirror (4) into the sample chamber (6) and reference chamber (7).

The sample beam passes through the sample chamber (6), into which sample gas flows, and its intensity is weakened in line with the concentration of the measured component. The reference beam is directed via a mirror (5) into the reference chamber (7). This is filled with a neutral gas.

The detectors (9) receive the sample and reference beams in succession. These measured signals are amplified and evaluated using electronics.

The measuring system is temperature-controlled to minimize external temperature influences.

The physical state of the measuring system is recorded simultaneously through time-offset detection of the reference beam, and compensated if necessary.

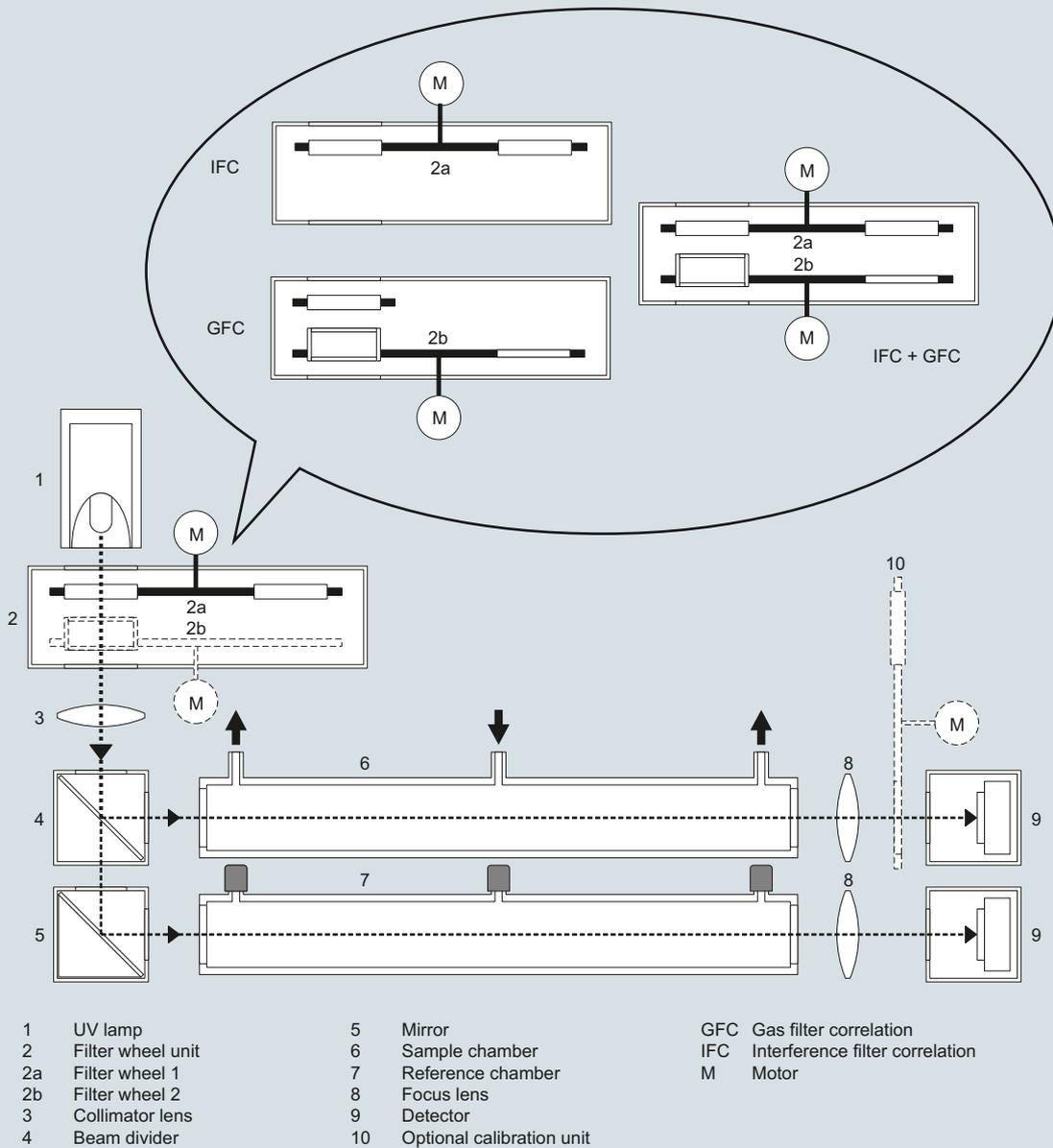
A quotient is generated for each detector from the determined signal values, and the ratio of these quotients determined. This double generation of quotients means that symmetrical signal drifts are compensated in the best possible manner in addition to proportional signal drifts.

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.

Additional measures depending on the application must be taken when introducing gases with flammable components at concentrations above the lower explosive limit (LEL). Please contact the technical department in such cases.

Function



SIPROCESS UV600, operating principle

Extractive continuous process gas analysis

SIPROCESS UV600

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Technical specifications

General information

Measuring ranges	3, automatic measuring range switching
Detection limit (2σ)	< 1% of span
Smallest possible span	Dependent on order configuration NO: 0 ... 10 / 0 ... 20 / 0 ... 25 / 0 ... 50 vpm NO ₂ : 0 ... 10 ¹ / 0 ... 20 / 0 ... 25 / 0 ... 50 vpm SO ₂ : 0 ... 10 ¹ / 0 ... 20 / 0 ... 25 / 0 ... 50 vpm H ₂ S: 0 ... 25 / 0 ... 50 vpm
Largest possible span	Dependent on order configuration NO, NO ₂ , SO ₂ : 0 ... 300 to 0 ... 1 000 vpm H ₂ S: 0 ... 500 to 0 ... 1 000 vpm
UV lamp	
• Design	EDL, electrodeless discharge lamp
• Service life	≈ 2 years (17 500 h)
Conformity	CE mark

Design, enclosure

Degree of protection	IP40
Weight	approx. 17 kg

Requirements of location of use

Installation location	Within closed building
Atmospheric pressure in the environment	700 ... 1 200 hPa
Relative humidity	10 ... 95 %, non-condensing
Permissible contamination	Pollution degree 1
Maximum geographic altitude of location of use	2 500 m above sea level
Permissible ambient temperature	
• Operation	+5 ... +45 °C (41 ... 113 °F)
• Transport and storage	-10 ... +70 °C (14 ... 158 °F)
Operating position	Front wall, vertical , max. ± 15° angle for each spatial axis (maximum permissible inclination of the base surface during operation with constant operating position)
Permissible vibrations/shocks	
• Vibration displacement	0.035 mm (in the range 5 ... 59 Hz)
• Amplitude of the starting acceleration	5 m/s ² (in the range 59 ... 160 Hz)

Electrical characteristics

Line voltage (optional, see nameplate)	93 ... 132 V AC, 186 ... 264 V AC
Line frequency (AC)	47 ... 63 Hz
Permissible overvoltages (transient surges in the power supply network)	Up to overvoltage category II in accordance with IEC 60364-4-443
Power consumption	Approx. 50 VA, max. 300 VA
EMC interference immunity (electromagnetic compatibility)	In accordance with EN 61326-1, EN 61326-2-1, EN 61000-6-2, EN 61000-6-4 and EU Directive 2004/108/EC. In the case of electromagnetic radiation in the frequency range from 750 MHz ± 20 MHz, increased measuring errors can occur for small measuring ranges
Electrical safety	In accordance with EN 61010-1
Internal line fuses	
• primary	6.3 A, not replaceable
• secondary	8 A

Gas inlet conditions

Permissible sample gas pressure	Relative to ambient/atmospheric air pressure: -200 ... +300 hPa (-0.2 ... +0.3 bar)
Sample gas flow	20 ... 120 l/h (333 ... 2 000 ml/min)
Sample gas temperature	5 ... 55 °C

Measuring response

	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Reference point drift	< ± 1%/week of respective span
Zero point drift	
• Standard measuring ranges	< ± 1%/week of respective span
• Small measuring ranges (≤ 2x smallest measuring range)	< ± 2%/week of respective span
• Measured components NO, NO ₂ , SO ₂	< ± 1%/day of respective span
Repeatability (reproducibility)	< ± 1% of respective span
Linearity error	< ± 1% of respective span

Electric inputs and outputs

Analog output	4, 0 ... 24 mA ; floating (electrically isolated), residual ripple 0.02 mA, resolution 0.1 % (20 μA), max. load 500 Ω, max. voltage ± 50 V
Relay outputs	8, with changeover contacts, max. voltage ± 50 V loading capacity: Max. 30 V AC / max. 48 V DC / max. 500 mA
Analog inputs	2, 0 ... 20 mA, reference potential GND, max. signal strength 30 mA, max. overcurrent protection ± 1 A, max. voltage ± 50 V
Digital inputs	8, switching range 14 ... 42 V (external control voltage), max. voltage ± 50 V
Serial interface	RS485, Ethernet (LAN)

¹⁾ Only for daily recalibration and air-conditioned environment (± 2 °C)

Selection and ordering data

Product description			Article No.			
SIPROCESS UV600 gas analyzer, incl. gas module and barometric pressure compensation			7MB2621-		Cannot be combined	
Click on the Article No. for the online configuration in the PIA Life Cycle Portal.						
Enclosure, version and gas paths 19" rack unit for installation in cabinets						
<u>Gas connections</u>	<u>Gas connections</u>	<u>Gas paths</u>				
Diameter	Material	Material				
• 6 mm pipe	• PVDF	• Hose / Viton				
• 6 mm pipe	• Swagelok	• PTFE				
• 6 mm pipe	• Swagelok	• Stainless steel, with pipes				
• 1/4" pipe	• Swagelok	• Stainless steel, with pipes				
1. UV measured component						
<u>Measured component</u>	<u>Smallest/largest measuring range</u>	<u>corresponds to</u>				
NO	0 ... 10 / 0 ... 300 ppmv	0 ... 15 / 0 ... 450 mg/m ³	AA			AA → Y17
	0 ... 20 / 0 ... 400 ppmv	0 ... 25 / 0 ... 500 mg/m ³	AB			AB → Y17
	0 ... 25 / 0 ... 500 ppmv	0 ... 35 / 0 ... 700 mg/m ³	AC			AC → Y17
	0 ... 50 / 0 ... 1 000 ppmv	0 ... 70 / 0 ... 1 250 mg/m ³	AD			
NO ₂	0 ... 10 / 0 ... 300 ppmv ¹⁾	0 ... 20 / 0 ... 600 mg/m ³ ¹⁾	BA	BA	BA	BA → Y17
	0 ... 20 / 0 ... 400 ppmv	0 ... 40 / 0 ... 800 mg/m ³	BB	BB	BB	BB → Y17
	0 ... 25 / 0 ... 500 ppmv	0 ... 50 / 0 ... 1 000 mg/m ³	BC	BC	BC	
	0 ... 50 / 0 ... 1 000 ppmv	0 ... 100 / 0 ... 2 000 mg/m ³	BD	BD	BD	
SO ₂	0 ... 10 / 0 ... 300 ppmv ¹⁾	0 ... 25 / 0 ... 750 mg/m ³ ¹⁾	CA		CA	CA → Y17
	0 ... 20 / 0 ... 400 ppmv	0 ... 50 / 0 ... 1 000 mg/m ³	CB		CB	CB → Y17
	0 ... 25 / 0 ... 500 ppmv	0 ... 75 / 0 ... 1 500 mg/m ³	CC		CC	
	0 ... 50 / 0 ... 1 000 ppmv	0 ... 130 / 0 ... 2 600 mg/m ³	CD		CD	
H ₂ S	0 ... 25 / 0 ... 500 ppmv	0 ... 40 / 0 ... 800 mg/m ³	DC	DC	DC	DC → Y17
	0 ... 50 / 0 ... 1 000 ppmv	0 ... 75 / 0 ... 1 500 mg/m ³	DD	DD	DD	DD → Y17
2. UV measured component						
<u>Measured component</u>	<u>Smallest/largest measuring range</u>					
None			00	00	00	00 → B12
NO ₂	0 ... 10 / 0 ... 300 ppmv ¹⁾	0 ... 20 / 0 ... 600 mg/m ³ ¹⁾	21	21	21	21 → B11, Y17
	0 ... 20 / 0 ... 400 ppmv	0 ... 40 / 0 ... 800 mg/m ³	22	22	22	22 → B11, Y17
	0 ... 25 / 0 ... 500 ppmv	0 ... 50 / 0 ... 1 000 mg/m ³	23	23	23	23 → B11
	0 ... 50 / 0 ... 1 000 ppmv	0 ... 100 / 0 ... 2 000 mg/m ³	24	24	24	24 → B11
SO ₂	0 ... 10 / 0 ... 300 ppmv ¹⁾	0 ... 25 / 0 ... 750 mg/m ³ ¹⁾	31		31	31 → B11, Y17
	0 ... 20 / 0 ... 400 ppmv	0 ... 50 / 0 ... 1 000 mg/m ³	32		32	32 → B11, Y17
	0 ... 25 / 0 ... 500 ppmv	0 ... 75 / 0 ... 1 500 mg/m ³	33		33	33 → B11
	0 ... 50 / 0 ... 1 000 ppmv	0 ... 130 / 0 ... 2 600 mg/m ³	34		34	34 → B11
H ₂ S	0 ... 25 / 0 ... 500 ppmv	0 ... 40 / 0 ... 800 mg/m ³	43	43	43	43 → B11, Y17
	0 ... 50 / 0 ... 1 000 ppmv	0 ... 75 / 0 ... 1 500 mg/m ³	44	44	44	44 → B11, Y17
3. UV measured component						
<u>Measured component</u>	<u>Smallest/largest measuring range</u>					
None			XX		XX	XX → B13
SO ₂	0 ... 10 / 0 ... 300 ppmv ¹⁾	0 ... 25 / 0 ... 750 mg/m ³ ¹⁾	CA	CA	CA	CA → B11, B12, Y17
	0 ... 20 / 0 ... 400 ppmv	0 ... 50 / 0 ... 1 000 mg/m ³	CB	CB	CB	CB → B11, B12, Y17
	0 ... 25 / 0 ... 500 ppmv	0 ... 75 / 0 ... 1 500 mg/m ³	CC	CC	CC	CC → B11, B12
	0 ... 50 / 0 ... 1 000 ppmv	0 ... 130 / 0 ... 2 600 mg/m ³	CD	CD	CD	CD → B11, B12
H ₂ S	0 ... 25 / 0 ... 500 ppmv	0 ... 40 / 0 ... 800 mg/m ³	DC	DC	DC	DC → B11, B12, Y17
	0 ... 50 / 0 ... 1 000 ppmv	0 ... 75 / 0 ... 1 500 mg/m ³	DD	DD	DD	DD → B11, B12, Y17
Language of software and documentation						
German			0			
English			1			
French			2			
Spanish			3			
Italian			4			

¹⁾ Smallest measuring range 0...10 ppmv requires daily calibration and temperature-controlled environment (± 2 °C). Use of an additional calibration unit (B11, B12 or B13) recommended. 2 measured-value outputs are required on the I/O module for this measurement range switchover. A maximum of 4 measured-value outputs are available per I/O module. For versions with 3 sample gas components - including more than 1 component with measuring range 0...10/0...300 vpm - a second I/O module (option: A13) is required!

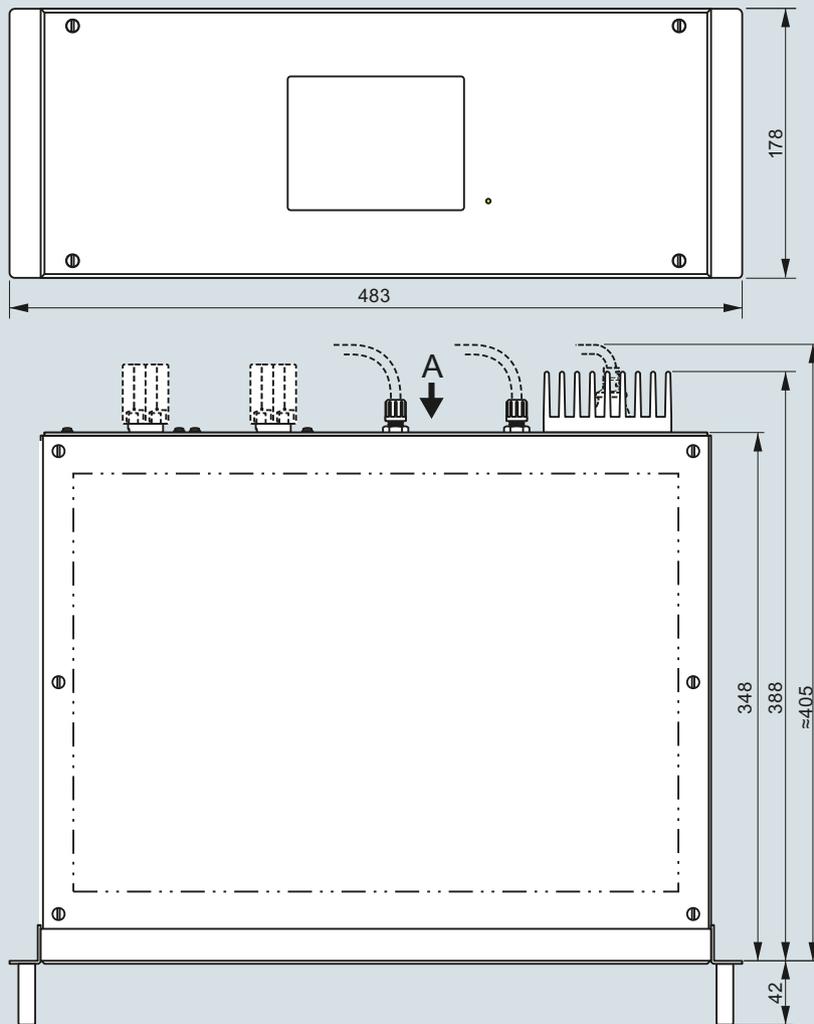
Extractive continuous process gas analysis

SIPROCESS UV600

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Product description			
<i>Additional versions</i>	Order code		
Please add "-Z" to Article No. and specify Order code.			
Second IO module	A13		
Calibration unit for 1st sample gas component	B11		
Calibration unit for 1st and 2nd sample gas components	B12		
Calibration unit for all 3 sample gas components	B13		
Flow monitor	C11		
Humidity monitor	C12		
Pressure sensor (sample gas)	C14		
Internal sample gas pump	C15		
Special setting (only in conjunction with an application no., e.g. special measuring range)	Y12		
Extended special setting (only in conjunction with an application no., e.g. determination of cross-interferences)	Y13		
Prepared for QAL1, standard measured-value output in mg/m ³	Y17		
Spare parts recommendation for preventative maintenance	Quantity for 2 years	Quantity for 5 years	Article No.
Article No.Safety filter FI64	1	2	A5E03707235
Power supply units, 24 V DC, 10 A		1	A5E03707236
Distribution board		1	A5E03707240
FKM hose d = 3/5, length = 1 m	2	5	A5E03707757
MEDL UV lamp with heater	1	1 ... 2	A5E03707918
Motor flange 3		1	A5E03707919
Motor flange 2		1	A5E03707920
Gas filter with holder, for measurement of NO	1	2	A5E03707921
SIPROCESS UV600 chamber H = 300 mm, aluminum		1	A5E03707925
Calibration chamber with holder for NO		1	A5E03707941
Calibration chamber with holder for SO ₂ and H ₂ S		1	A5E03707942
Calibration chamber with holder for NO ₂		1	A5E03707943
Heater with 380 mm long cable, for SIPROCESS UV600: MEDL, chamber, motor flange	1	2	A5E03707968
Moisture sensor	1	2	A5E41110446
Spare parts set - pressure sensor with gasket and O-ring		1	A5E03707970
Flow sensor with temperature sensor	1	2	A5E03707971
Diaphragm pump type 123, 24 V DC / 50 Hz		1	A5E03707986
Diaphragm assembly, EPDM for types 110-125	1	2	A5E03707987
O-ring for gas pump suspension	1	2	A5E03707988

Dimensional drawings



SIPROCESS UV600, 19" rack unit, dimensions in mm

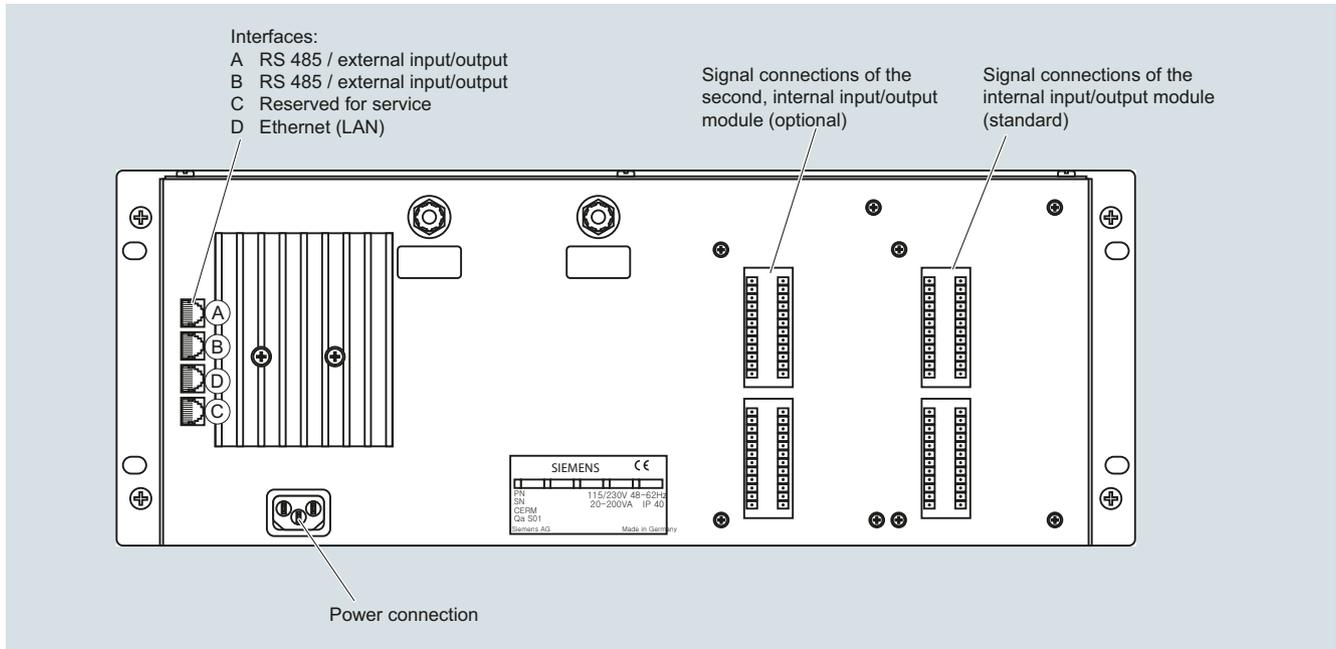
Extractive continuous process gas analysis

SIPROCESS UV600

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Circuit diagrams

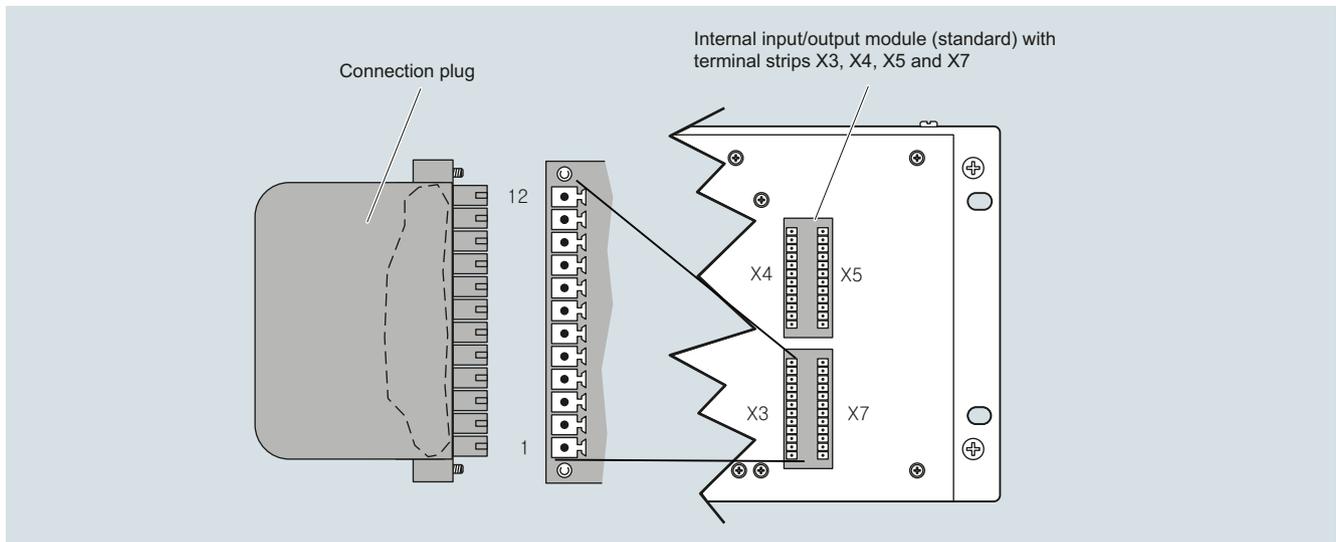
Electrical connections



SIPROCESS UV600, gas connections and electrical connections

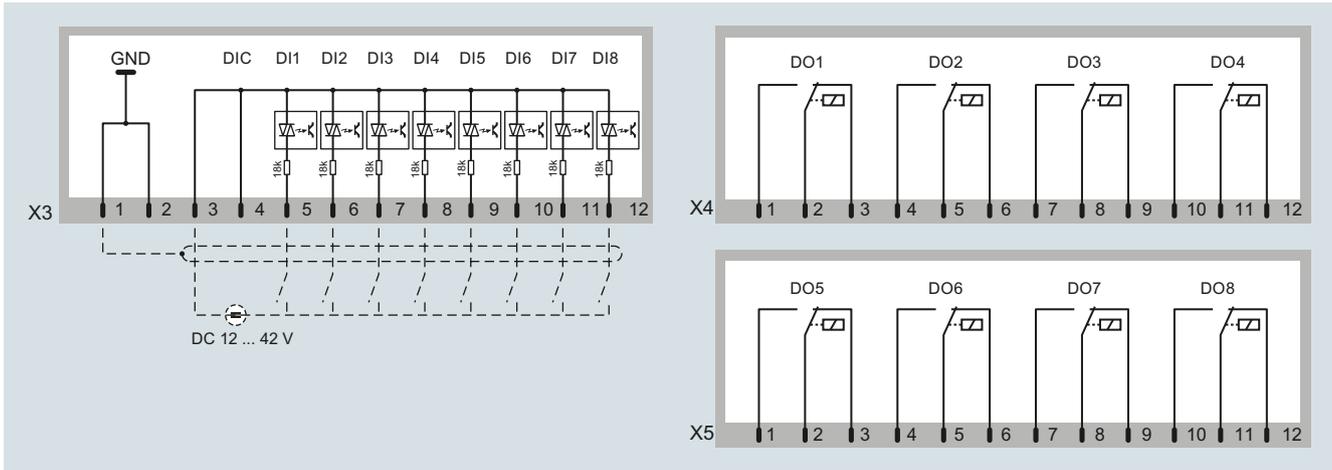
The SIPROCESS UV600 is supplied as standard with one or (optionally) two input/output modules. The logic function of the signal connections can be configured individually with the service and maintenance software specific to SIPROCESS UV600.

The signal connections are available at terminal strips X3, X4, X5 and X7 on the 12-pin plug connectors of the input/output modules. The scope of delivery includes the corresponding counterparts (plug connectors) with screw terminals.



SIPROCESS UV600, signal connections and plug connectors

Pin assignments



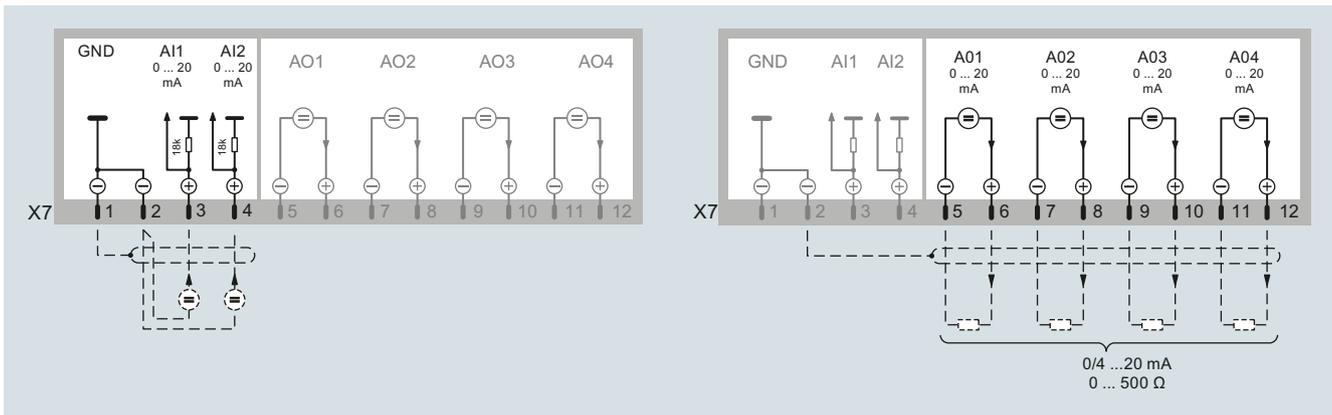
SIPROCESS UV600, pin assignments of digital inputs X3 (DI1 to DI8) and digital outputs X4 (DO1 to DO4) and X5 (DO5 to DO8)

Characteristics of the digital inputs:

- Floating optocouplers with common reference potential (DIC)
- Switching range 14 ... 42 V DC (external control voltage)
- The digital inputs can be operated either with positive or negative voltage
- With inverted switching logic, the logic function of the control input is active if no current is flowing through the control input
- Maximum voltage: ± 50 V

Characteristics of the digital outputs:

- Floating relay changeover contacts
- Single-pole changeover switch, three connections
- Maximum voltage: ± 50 V
- Connect inductive loads (e.g. relays, solenoid valves ...) via spark-quenching diodes only
- Maximum load-carrying capacity (standard): Max. 30 V AC, max. 48 V DC, max. 500 mA.



SIPROCESS UV600, pin assignment of the analog inputs X7 (AI1 and AI2) and analog outputs X7 (AO1 to AO4)

Characteristics of the analog inputs:

- The input signal is an analog current signal (standard 0 ... 20 mA, maximum 30 mA)
- The signal current must be provided by an external current source
- Load (internal resistance) of analog input: 10Ω
- Reference potential GND (see figure, analog inputs)
- Overcurrent protection: $\pm 1\,000$ mA
- Max. voltage: ± 50 V

Characteristics of the analog outputs:

- Analog outputs are floating (electrically isolated) and provide a load-independent current signal
- Signal range 0 ... 24 mA
- Residual ripple 0.02 mA
- Resolution 0.1%
- Accuracy 0.25% of full-scale value
- Maximum load 500Ω
- Maximum voltage ± 50 V
- Adjustable start or error state

Note for electrical isolation:

The electrical isolation is canceled if the negative poles of the analog outputs are connected to GND.

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Notes

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