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Extractive continuous process gas analysis

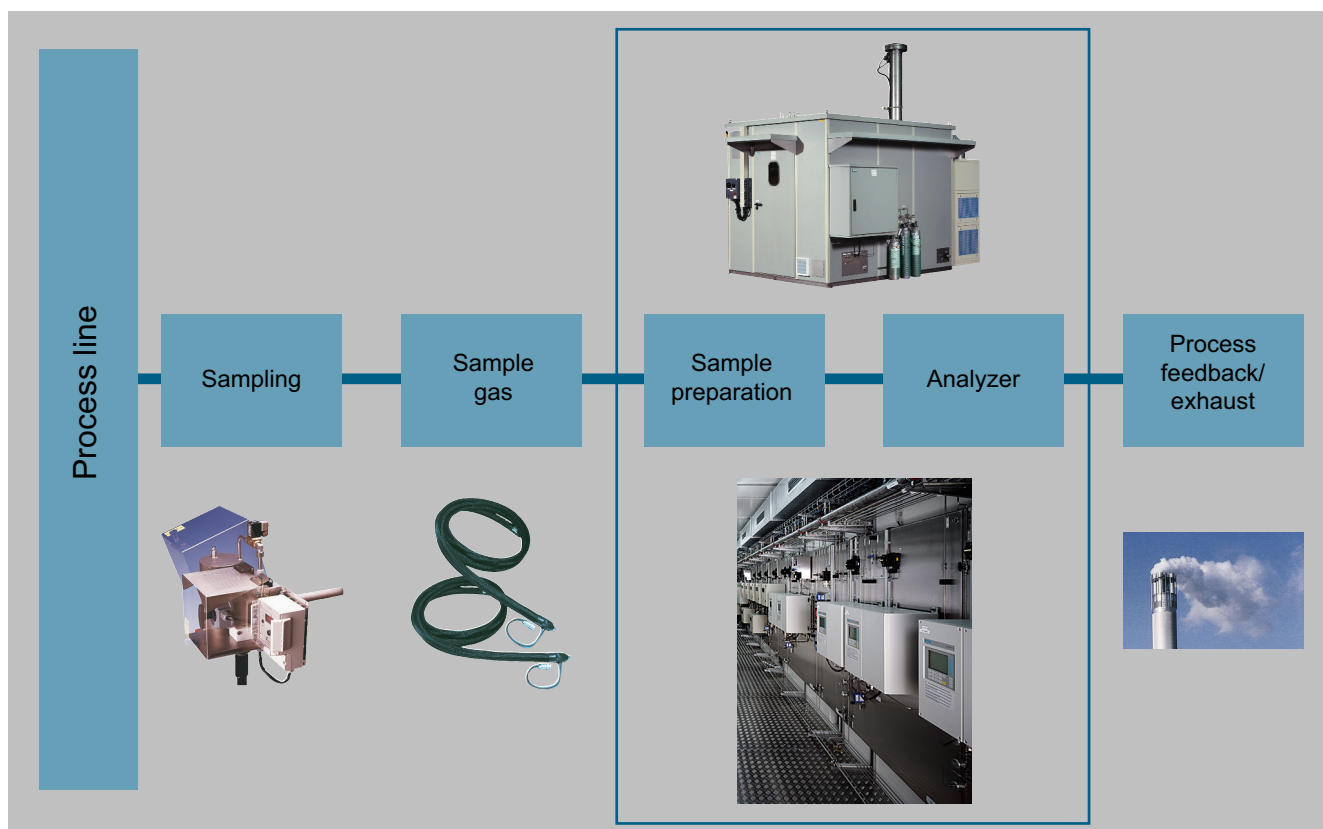
Introduction

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 measuring accuracy. The flexibility provided by the continuous process gas analyzers with respect to enclosure 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 Automation" 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 procedure 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 preparation, 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 device families, SIPROCESS GA700 and series 6 / ULTRAMAT 23. Each device family provides peak analytical performances for its class.

SIPROCESS GA700

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

Basic unit

The basic unit is available in three versions: As a 19" rack unit with 3 height units, in an enclosure for wall mounting, and as an Ex-d field device. The communications interfaces present in the basic units can be adapted to the respective process environment or the process control system using additional optionally available electronic modules.

Overview (Continued)**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 application area covers many areas, e.g. the use in processes. These are used to control production processes and ensure 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 as a field device at ambient temperatures up to 60 °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 binary mixtures by measuring the 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 flameproof 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 enclosure for use in harsh atmospheres. In general, the application area 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 measuring 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 parameterization 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 device. 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 conditions 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 enclosure.

OXYMAT 64

For measurement of oxygen concentrations in the trace range by means of ZrO₂ sensor technology. The OXYMAT 64 can be used to measure very small traces in the oxygen concentration, 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 binary mixtures by measuring the 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

Overview (Continued)

FIDAMAT 6

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

The FIDAMAT variants feature a highly varied application area. 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 mixtures to the gas analyzers mentioned in this section is not permitted.

The introduction of gases with flammable components at concentrations above the lower explosive limit (LEL) should only be carried out with devices fitted with piping. Purging of the enclosure as well as further measures must be carried out depending on the application. You can find more on this in the section "Extractive continuous process gas analytics" under "Ex-versions". 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 gas 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 conditions

- Protected against low temperatures and thermal radiation (see technical specifications)
- Protected against temperature fluctuations
- To achieve the best possible measuring quality, the mounting location should be free from vibrations
- Protection of electronics from corrosive environments (use field devices with purging if necessary)
- Observation of regulations for installation in hazardous areas (see manual)
- Observation of regulations for measurement in the presence of toxic gases, provide purging of enclosure and further safety measures if necessary (see manual)
- The analyzers in the basic version are set to an interference gas 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 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.

Calibration of the analyzers

Standard	Zero gas N ₂ (5.0)
Span 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, ULTRAMAT 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 measuring range end 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 sections describing the respective device.

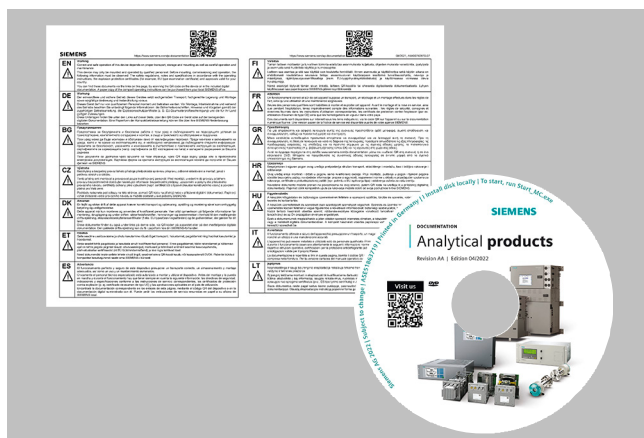
Overview (Continued)

Explosion protection

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

More information

Supplied product documentation on DVD and safety notes



The scope of delivery of the Siemens products for process analytics includes a multilingual instruction sheet with **safety notes** as well as a uniform **DVD - "Analytical products"**.

This DVD contains the most important manuals and certificates for the Siemens process analytics portfolio. The delivery may also contain product-specific or order-specific printed materials. For more information, see section 7 "Appendix".

Download catalogs

The entire documentation is available for download free of charge in various languages at:

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

Certificates

All available certificates are listed on the internet at:

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

Extractive continuous process gas analysis

SIPROCESS GA700

Basic unit

Overview



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

Benefits

The basic unit provides:

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

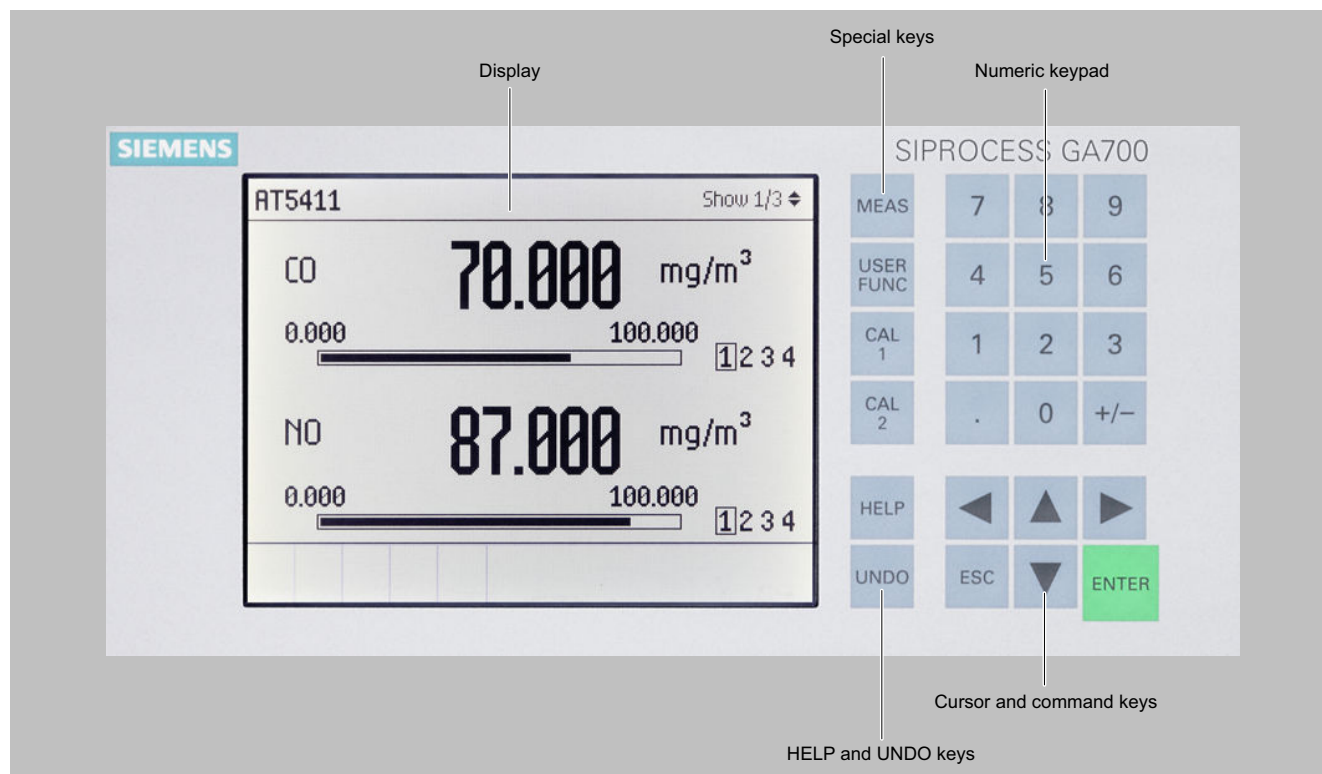
In addition to the modules, the basic unit contains the interfaces for the peripherals.

Application

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

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

Design



Display and operator panel of the SIPROCESS GA700 devices

19" rack unit

- 19" rack unit with 3 height units (U) for installation
 - In hinged frame
 - 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 connection cable between field module and field control unit: 7 m

Display and operator panel

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

Extractive continuous process gas analysis

SIPROCESS GA700

Basic unit

Design (Continued)

Inputs and outputs

- 19" rack unit and wall-mounted unit
 - 8 digital inputs, designed for 24 V, floating, freely configurable (e.g. for measuring range switchover, processing of external signals from sample preparation)
 - 8 relay outputs, with changeover contacts, freely configurable (e.g. for faults, maintenance demanded, limit alarms, external solenoid valves)
 - Ethernet connection contained in the basic unit (connection on the rear side, Ethernet RJ45, 100 Mbit)
 - Service interface (front side); Ethernet RJ45, 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 measuring 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:
 - 1 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

Extractive continuous process gas analysis

SIPROCESS GA700

Basic unit

Selection and ordering data

SIPROCESS GA700		Article No. 7MB3000- ● ● ● 0 ● - ● ● ● 0							
Click on the Article No. for online configuration in the PIA Life Cycle Portal.									
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".									
Basic device version									
19 inch rack enclosure				0					
Wall box				3					
Wall box (bushing with support for shielding)				4					
Field control unit Ex-d (incl. 3 analog outputs and 3 digital outputs)				6					
Module 1 (slot 1)									
Without				X					
ULTRAMAT 7				B					
OXYMAT 7				C					
CALOMAT 7				F					
ULTRAMAT 7 heated (65 °C)				J					
OXYMAT 7 high temperature (130 °C)				K					
Module 2 (slot 2)									
Without				X					
ULTRAMAT 7				B					
OXYMAT 7				C					
CALOMAT 7				F					
Interface module 1									
Without						0			
Interface module 1.1 (12 digital outputs + 8 digital inputs)						1			
Interface module 2									
Without							0		
Interface module 2.1 (6 analog outputs + 6 additional digital outputs)							1		
Interface module 2.2 (6 analog outputs, 4 analog inputs + 4 additional digital inputs)							2		
Interface module 2.2 for field control unit (4 analog inputs)							6		
Language of the compact operating instructions/explosion protection manuals									
Language of the compact operating instructions	Language of the explosion protection manuals								
• German	• German, English							A	
• English	• German, English							B	
• French	• French, Dutch							C	
• Italian	• Italian, Spanish, Portuguese							D	
• Spanish	• Italian, Spanish, Portuguese							E	
• Portuguese	• Italian, Spanish, Portuguese							G	
	• Finnish, Swedish, Danish							M	
	• Estonian, Latvian, Lithuanian							N	
	• Czech, Polish, Slovakian							P	
	• Romanian, Bulgarian, Greek							Q	
	• Hungarian, Slovenian, Croatian							R	
Ex version									
Standard, operation in non-hazardous zone								A	
Standard, operation in non-hazardous zone with purging gas connection (wall unit only)								B	
Setup in hazardous zone 2 (IECEx, ATEX II 3G), flammable or non-flammable gases Ex nA IIC Gc (rack unit only)								C	
Setup in hazardous zone 2 (IECEx, ATEX II 3G), non-flammable gases Ex nR IIC Gc (wall unit only)								D	
Setup in hazardous zone 1 and 2 (IECEx, ATEX II 2G, 3G) flammable or non-flammable gases Ex pyb IIC Gb (wall unit only)								E	
Setup in hazardous zone 1, 2, 22 (IECEx, ATEX II 2G, 2G, 3D) flammable or non-flammable gases								G	
Ex pyb IIC Gb Ex ec IIC Gc Ex pyb IIIC/IIC Dc/Gb Ex tc IIIC Dc									
Setup in hazardous zone 1 and 2 (IECEx, ATEX II 2G) flammable or non-flammable gases Ex db IIC Gb (field device only)								H	

Options	Order code
Add "-Z" to article number and then add order code	

Extractive continuous process gas analysis

SIPROCESS GA700

Basic unit

Selection and ordering data (Continued)

Options	Order code
Settings	
Tag plates (specific inscription based on customer information)	B03
Gönnheimer Ex p control unit (ATEX and IECEx) continuous purging	E72
SIMATIC PDM software with single point license	E73
Plug set D-sub for 19" rack enclosure	E74
Basic unit module assignment number	D00 ... D99

Technical specifications

	19" rack unit enclosure	Wall box	Field control unit
General information			
Operating position	Horizontal	Vertical	Horizontal
Design, enclosure			
Weight without module	8.6 kg	23 kg	27 kg
Degree of protection	IP20 according to EN 60529	IP65 according to EN 60529	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)	100 ... 240 V AC (nominal range of use 85 ... 264 V), 50 ... 60 Hz (nominal range of use 47 ... 63 Hz)	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	Max. 280 VA	Max. 280 VA
EMC interference immunity (electromagnetic compatibility)	In accordance with the standard requirements of NAMUR NE21 (05/2006) and EN 61326-1	In accordance with the standard requirements of NAMUR NE21 (05/2006) and EN 61326-1	In accordance with the standard requirements of NAMUR NE21 (05/2006) and EN 61326-1
Electrical safety	In accordance with EN 61010-1, over-voltage category II	In accordance with EN 61010-1, over-voltage category II	In accordance with EN 61010-1, over-voltage 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 configured, e.g. for measuring range identification; max. load rating: 24 V AC/DC/1.7 A (total load for all 8 relay outputs in continuous operation max. 160 W), floating, non-sparking	8, with changeover contacts, can be freely configured, e.g. for measuring range identification; max. load rating: 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, floating, non-sparking
Digital inputs	8, designed for 24 V, floating, freely configurable, e.g. for measuring range switchover	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 RJ45, 100 Mbit	Rear	Underside	Underside
Service port Ethernet RJ45, 100 Mbit	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	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	-

Technical specifications (Continued)

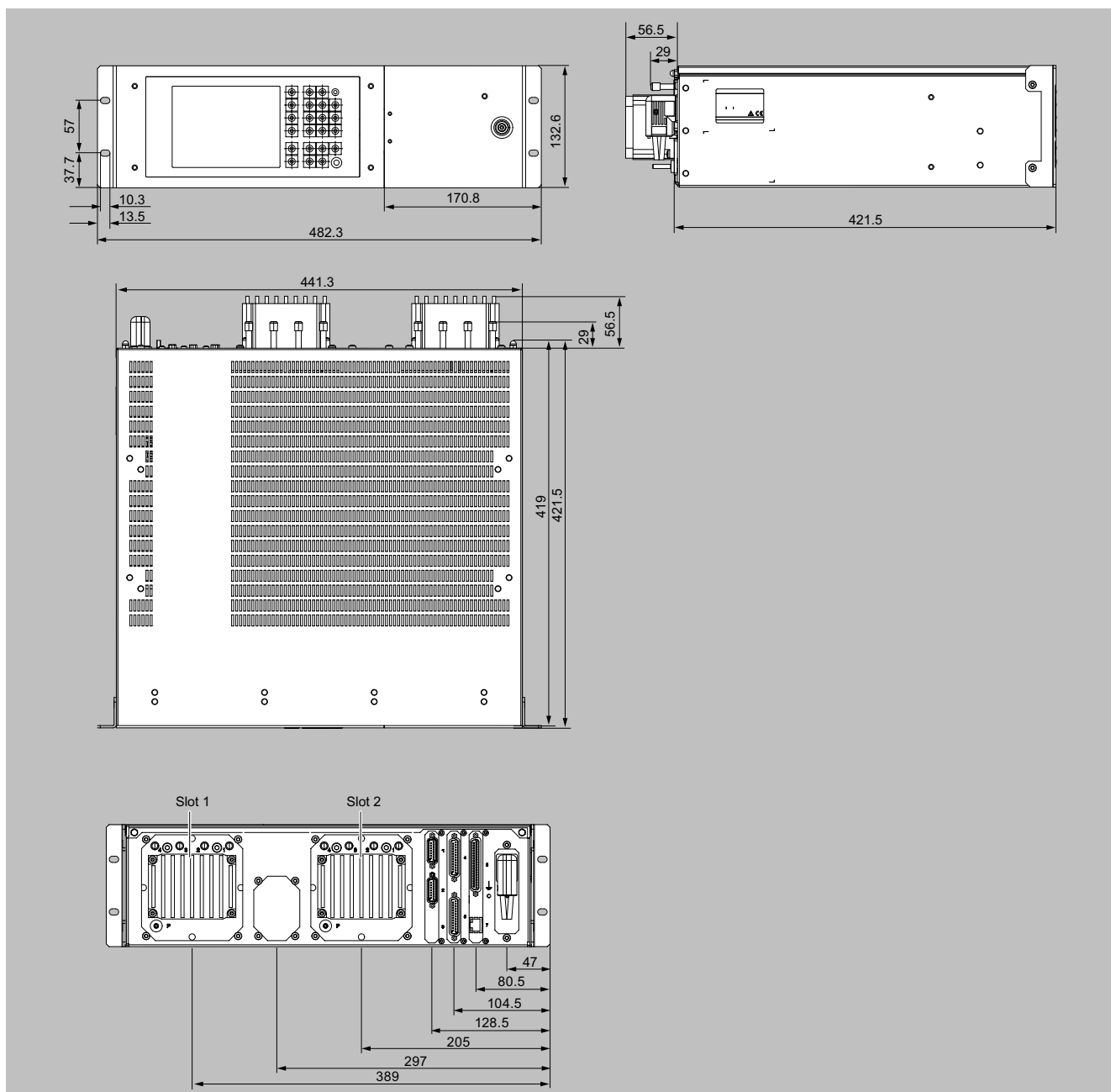
	19" rack unit enclosure	Wall box	Field control unit
Interface module 2.1	1 analog output for each component 0/4 ... 20 mA, floating; load $100\ \Omega \leq R_L \leq 750\ \Omega$; 3 relay outputs per module, load rating: 24 V AC/DC/1.7 A (total load for all 6 relay outputs in continuous operation max. 122 W), floating, non-sparking	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	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-isolated, internal resistance $\leq 100\ \Omega$
Climatic conditions			
Permissible operating altitude	3 000 m above sea level	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 slots must not be covered (recommended minimum clearance upward from the next device when installing 2 modules and at maximum ambient temperature: min. 1 U)	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)	< 90% RH (RH: relative humidity), during storage, transportation and operation (must not fall below dew point)	< 90% RH (RH: relative humidity), during storage, transportation and operation (must not fall below dew point)

Extractive continuous process gas analysis

SIPROCESS GA700

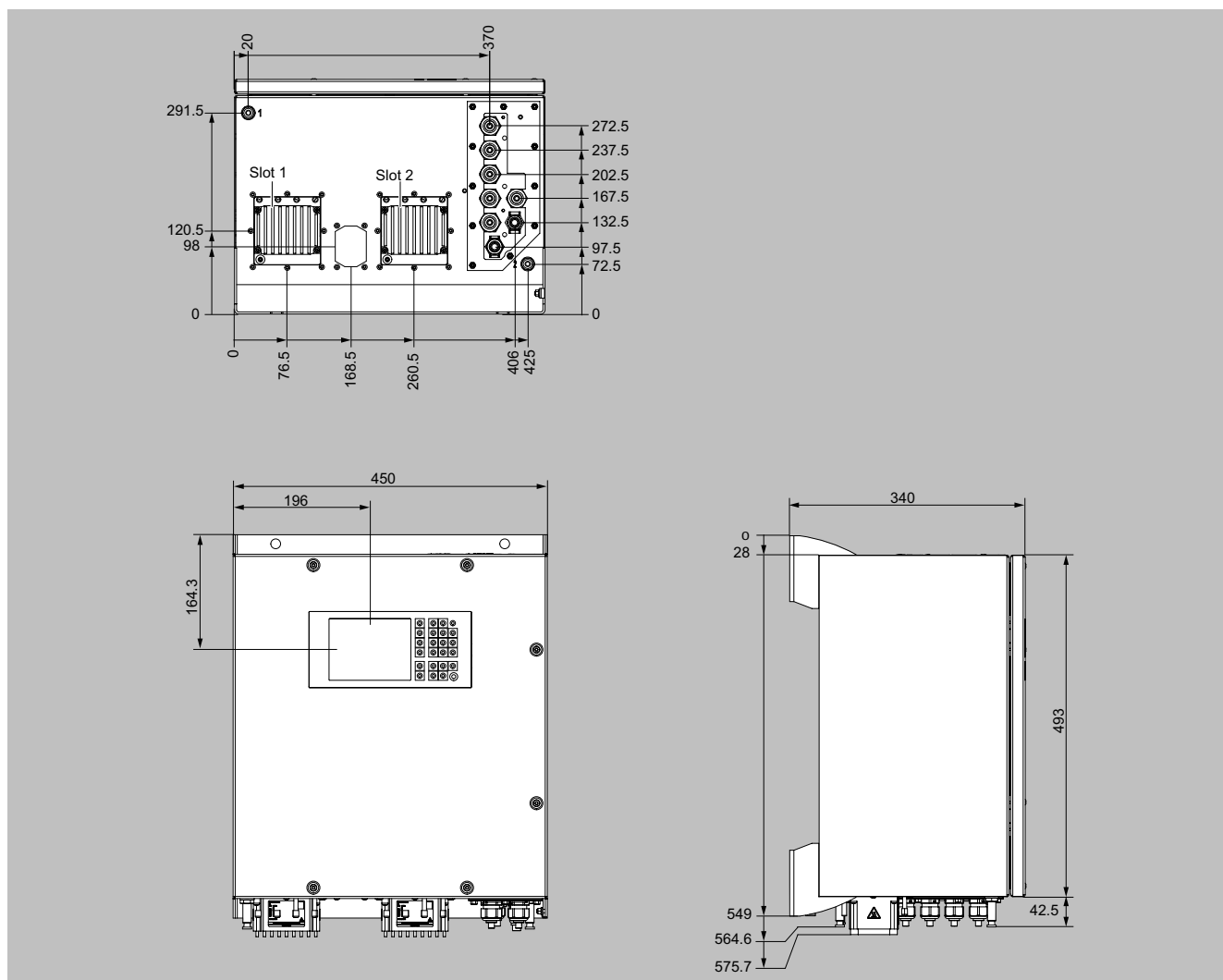
Basic unit

Dimensional drawings



SIPROCESS GA700, rack unit, dimensions in mm

Dimensional drawings (Continued)



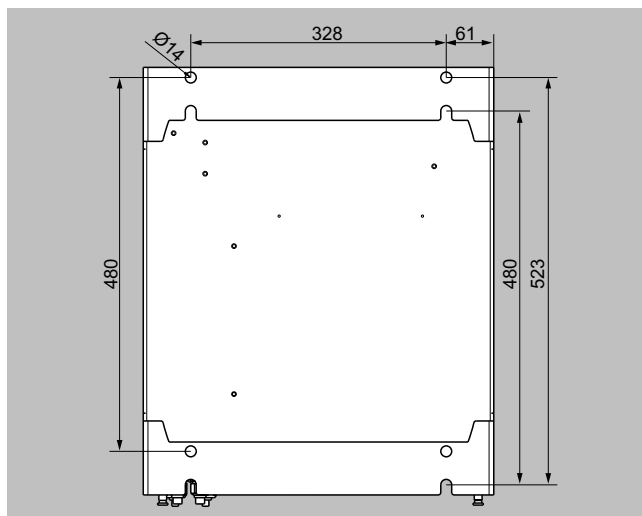
SIPROCESS GA700, wall enclosure, dimensions in mm

Extractive continuous process gas analysis

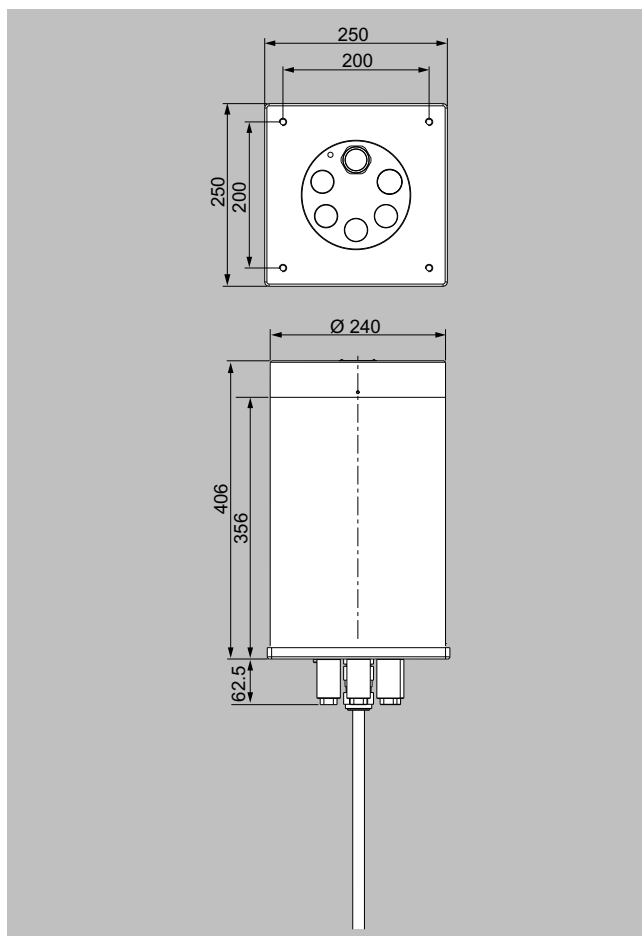
SIPROCESS GA700

Basic unit

Dimensional drawings (Continued)

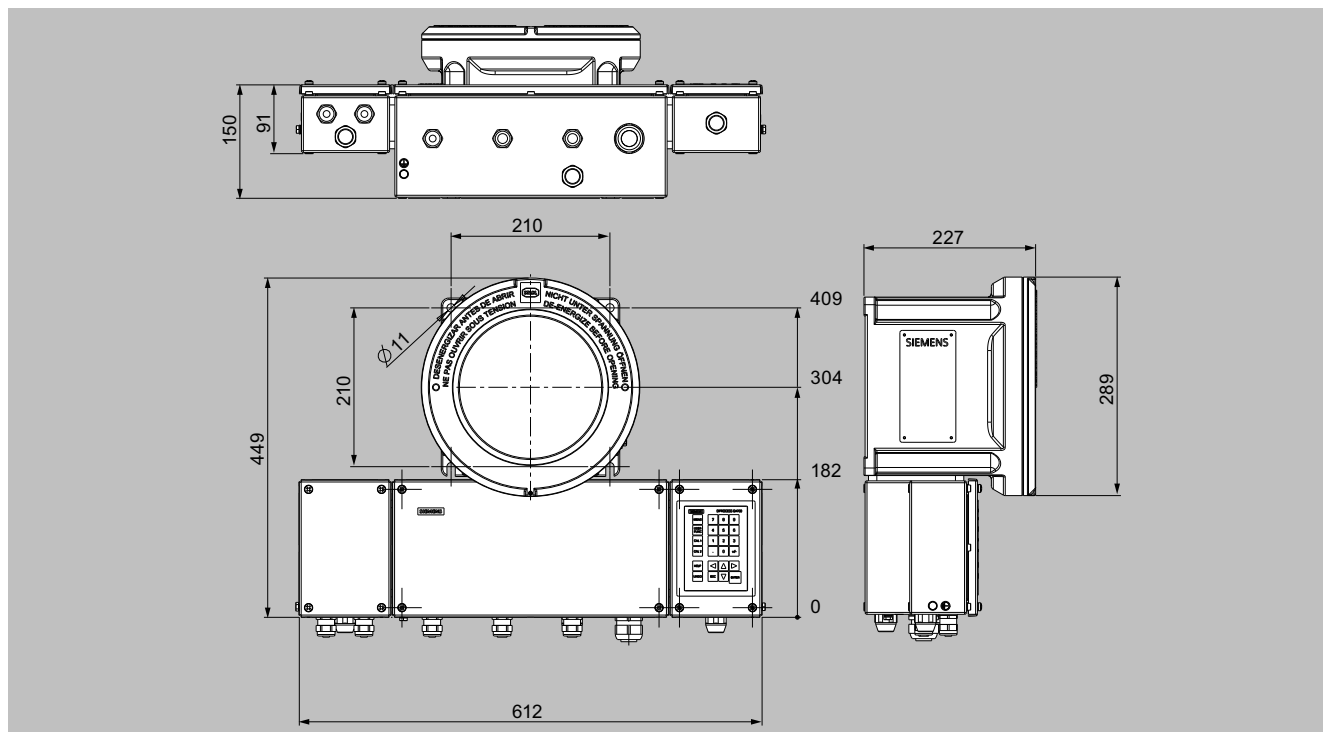


SIPROCESS GA700, wall enclosure, drilling pattern, dimensions in mm



SIPROCESS GA700, field module, dimensions in mm

Dimensional drawings (Continued)



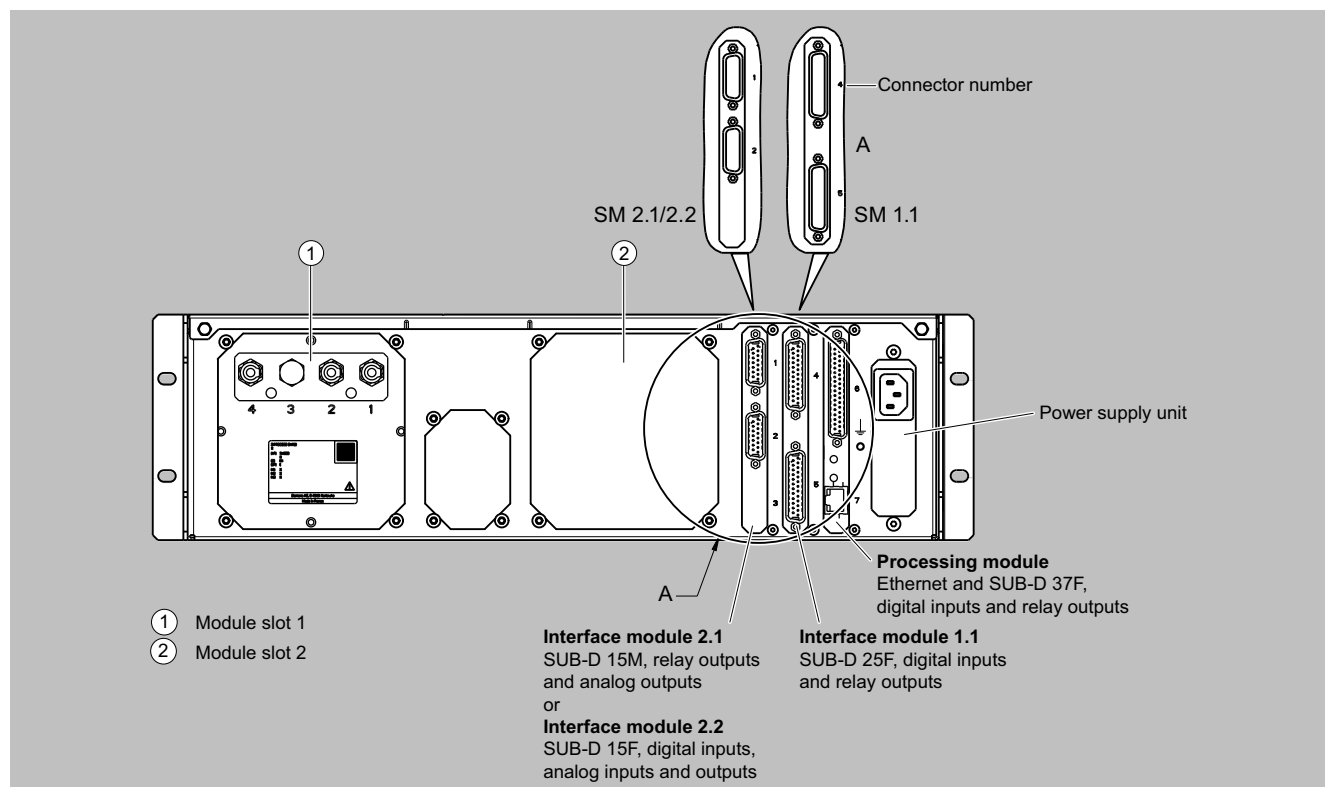
SIPROCESS GA700, field control unit, dimensions in mm

Extractive continuous process gas analysis

SIPROCESS GA700

Basic unit

Circuit diagrams



Connection of the signal cables: Expansion options for interface modules; example of rear wall of rack unit

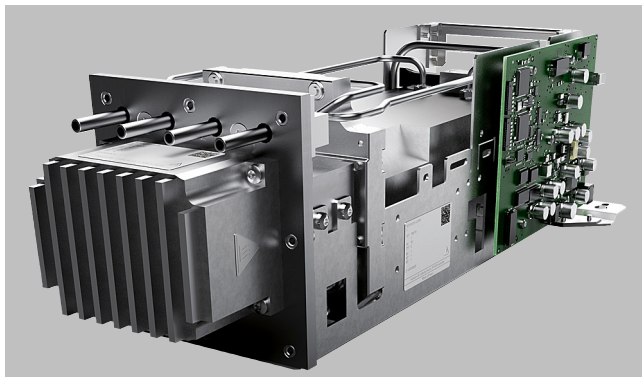
Possible combinations

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, CO₂, CH₄, SO₂ 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 sample gases possible
- Heating possible

Application

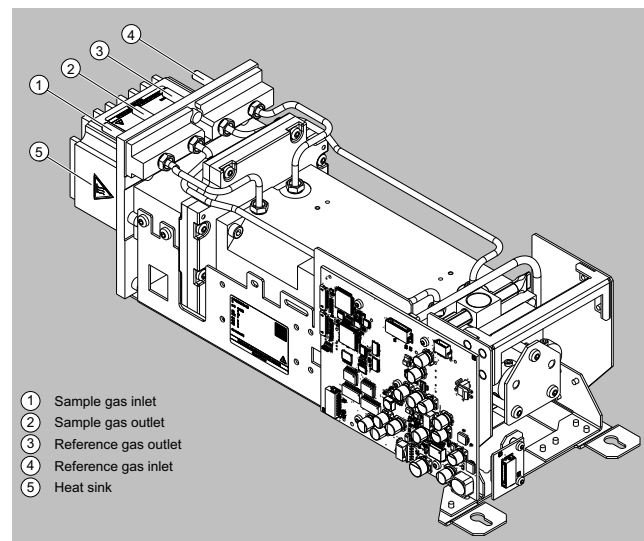
- Measurement for boiler control in combustion plants
- Process gas concentrations in chemical plants
- Trace measurements in pure gas processes
- Environmental protection
- TLV (Threshold Limit Value) monitoring at the workplace
- Quality monitoring
- introduction of flammable gases possible

Special versions

Flow-type reference cell

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

Design



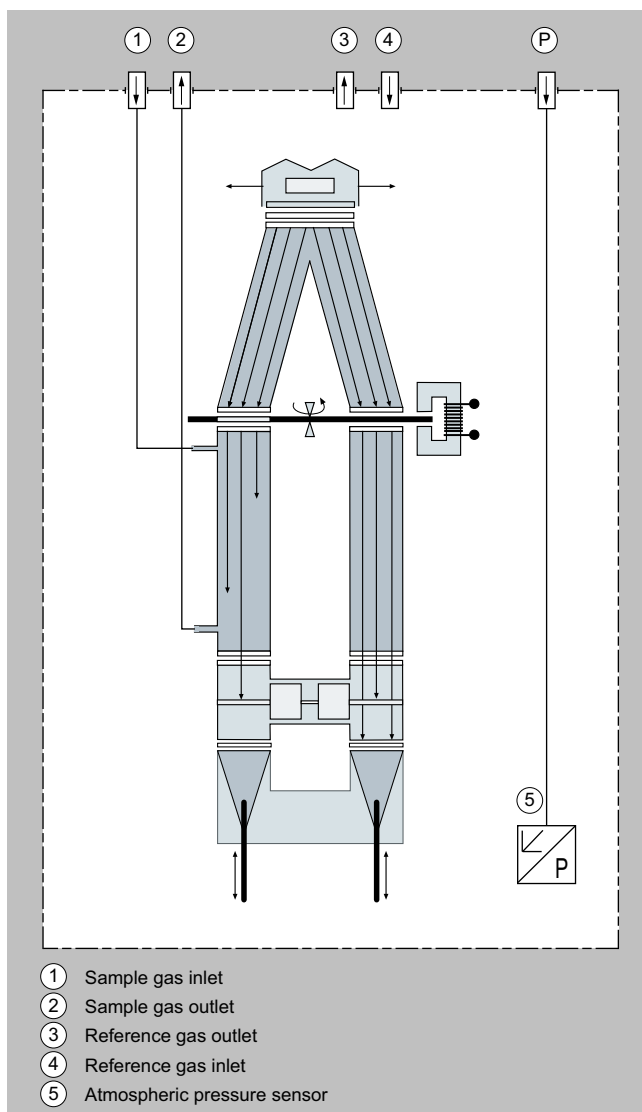
ULTRAMAT 7 design

Extractive continuous process gas analysis

SIPROCESS GA700

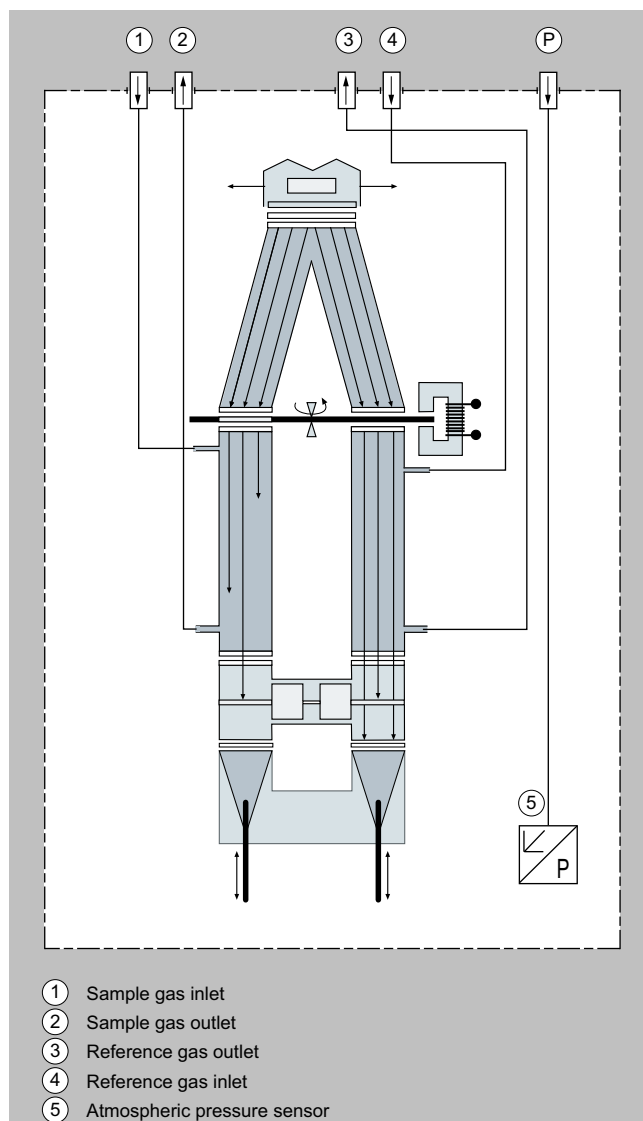
ULTRAMAT 7 module

Design (Continued)



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

Design (Continued)



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

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.

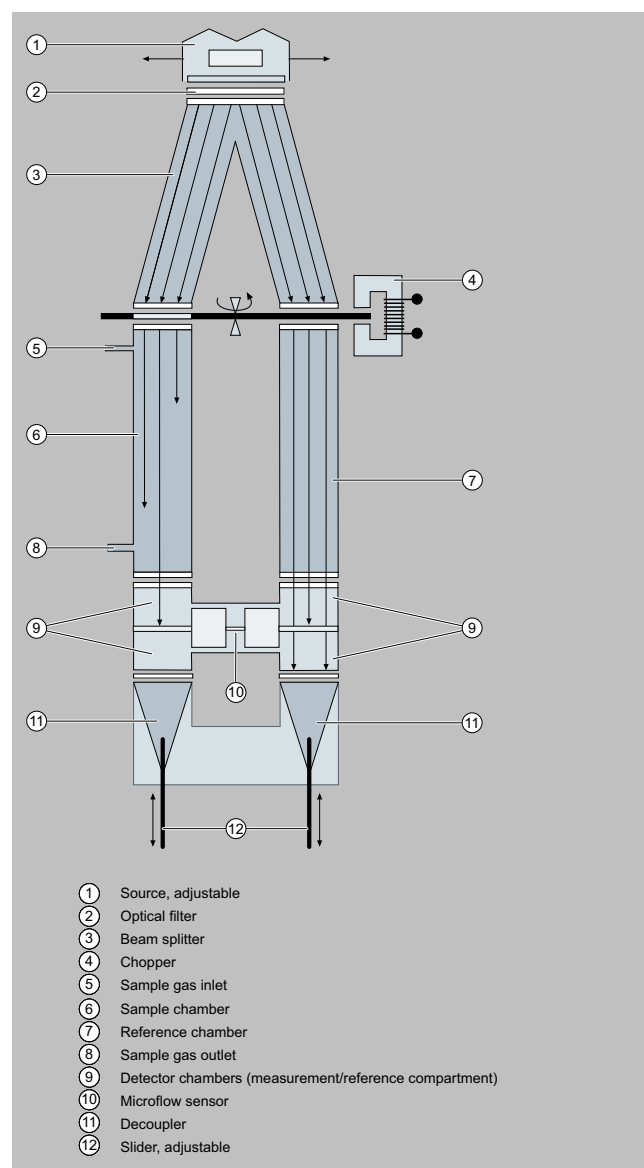
The chopper produces a periodic modulation of the infrared radiation, and thus enables relaxation of the detector.

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. The influence of interfering components is minimized as a result. 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.

Mode of operation (Continued)



ULTRAMAT 7, principle of operation of the infrared channel

Extractive continuous process gas analysis

SIPROCESS GA700

ULTRAMAT 7 module

Function

Main features

- Dimension of measured value freely selectable (e.g. vpm, mg/m³)
- Four freely parameterizable measuring ranges per component
- Measuring ranges with suppressed zero point possible
- Measuring range identification
- 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 calibration
- Time constants selectable within wide limits (static/dynamic noise damping); i.e. the response time of the device or component can be adapted to the respective measuring task
- Short response time
- Low long-term drift
- Measuring point switchover for up to 4 measuring points (parameterizable)
- Measuring point identification
- Internal pressure sensor for correction of variations in atmospheric pressure in the range 700 to 1 200 hPa absolute
- Automatic measuring range calibration parameterizable
- 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)

Selection and ordering data

ULTRAMAT 7 module		Article No.									
For measuring IR-absorbing gases		7MB3010- ● ● ● ● ● - ● A ● ●									
Click on the Article No. for online configuration in the PIA Life Cycle Portal.											
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".											
Module version											
Standard module for 19 inch rack unit enclosure and wall box		0									
Heated module 65 °C for wall box		1									
Standard module for hazardous zone 19 inch rack unit enclosure and wall box		2									
Heated Ex module 65 °C for wall box		3									
Measured components¹⁾	Possible with measuring range identification										
CO	B ²⁾ , C ... P	A									
CO (selective)	C, D ... P	B									
CO ₂	A ²⁾ , B ... P	C									
CH ₄	D ²⁾ , E ... P	D									
C ₂ H ₄	F ²⁾ , G ... P	E									
SO ₂	D ²⁾ , E ... P	F									
NO	E ²⁾ , F ... J	G									
N ₂ O	D ²⁾ , E ... P	H									
NH ₃ (dry)	E ²⁾ , F ... P	J									
CO, NO	E ²⁾ , F, H, R, S	Q									
CO ₂ , CO	E, F, H, J, L, M, P	R									
Smallest measuring range	Largest measuring range										
0 ... 5 vpm	0 ... 100 vpm	A									
0 ... 10 vpm	0 ... 200 vpm	B									
0 ... 20 vpm	0 ... 400 vpm	C									
0 ... 50 vpm	0 ... 1 000 vpm	D									
0 ... 100 vpm	0 ... 1 000 vpm	E									
0 ... 300 vpm	0 ... 3 000 vpm	F									
0 ... 500 vpm	0 ... 5 000 vpm	G									

Extractive continuous process gas analysis

SIPROCESS GA700

ULTRAMAT 7 module

Selection and ordering data (Continued)

ULTRAMAT 7 module For measuring IR-absorbing gases		Article No. 7MB3010- ● ● ● ● - ● A ● ●									
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 ... 30%	0 ... 300%										
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										
Material: Gas paths, sample chambers											
Gas path	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⁾										
Reference gas chamber											
Non-flow-type											
Flow-type											
Pressure compensation											
Atmospheric pressure compensation											
Module version											
For 19 inch rack enclosure											
For wall box											
Version											
Standard											

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

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

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

Options	Order code
Add "-Z" to article number and then add order code	
Settings	
Kalrez (6375) gaskets in sample gas path	B04
Clean for O ₂ service (specially cleaned gas path)	B06
Measuring range indication in plain text, if different from default setting	Y11
Special setting (only together 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
Basic unit module assignment number	D00 ... D99

Note

See order example under "More information".

Extractive continuous process gas analysis

SIPROCESS GA700

ULTRAMAT 7 module

Technical specifications

The technical specifications are based on the definitions of EN 61207-1. Unless specified otherwise, the data listed below relates to the following measurement conditions:

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

ULTRAMAT 7 module	
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 ... 50 °C
Sample gas humidity (rel. humidity)	< 90% (condensation inside the gas path is to be avoided)
Time 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	T ₉₀ < T ₁₀ + T _{off} + T _v applies
Measuring response	
Output signal fluctuation	± 1% of smallest measuring range acc. to nameplate
Zero point drift	< ± 1%/week of smallest measuring range acc. to nameplate
Measured value drift	± 1% of the current measuring range per week

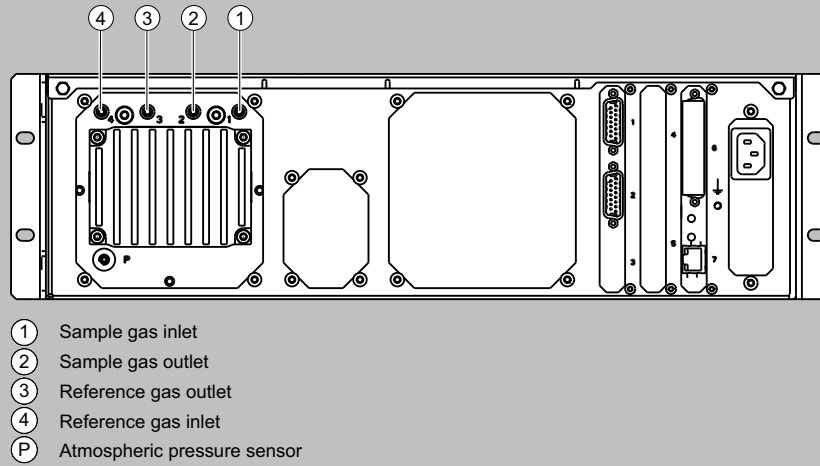
Technical specifications (Continued)

ULTRAMAT 7 module	
Repeatability	± 1% of the current measuring range end value
Linearity error	< ± 0.5% of the current measuring range end value
Influencing variables	
Ambient temperature	
• Measured value	± 1% of the current measuring range/10 K (at constant receiver cell temperature)
Sample gas pressure	
• Without pressure compensation	± 1.5% of the current measuring range/1% pressure variation
• With pressure compensation switched on	± 0.15% of the current measuring range/1% pressure variation
Sample gas flow	± 1% of the current measuring range end value/0.1 l/min change in flow
Supply voltage	± 0.1% of the current measuring range (within the nominal range of use)
Electrical outputs	
Analog and digital interfaces	See basic unit
Climatic conditions	
Storage and transport	-30 ... 70 °C
Permissible ambient temperature (during operation in basic unit) ¹⁾	5 ... 45 °C
Relative humidity (RH) during storage, transport or operation	< 90% (condensation on 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

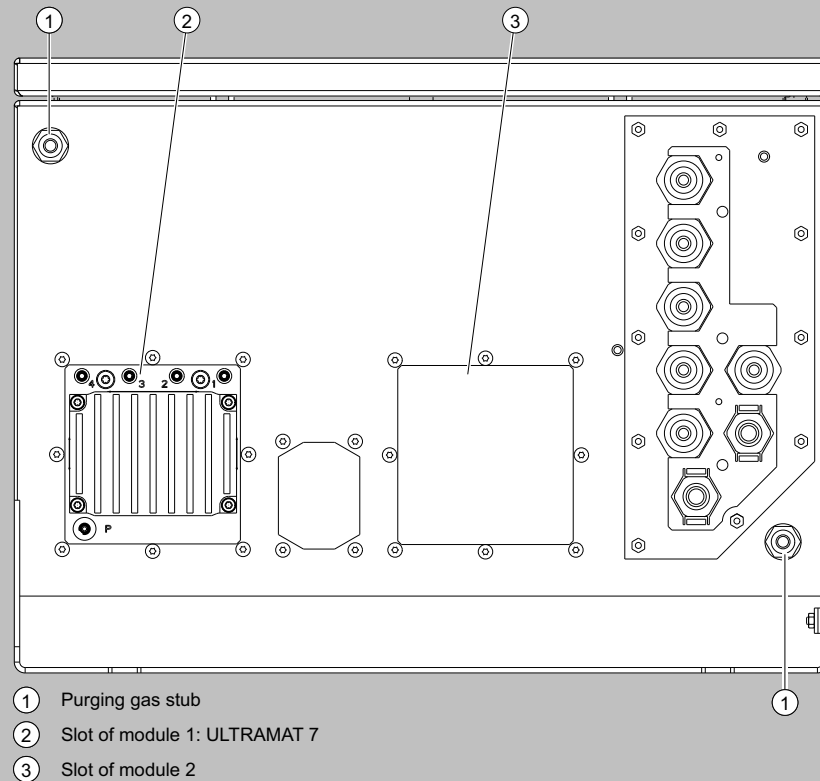
Circuit diagrams

Gas connections



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



Wall-mounted device, bottom

Extractive continuous process gas analysis

SIPROCESS GA700

ULTRAMAT 7 module

More information

Ordering example

ULTRAMAT 7 module installed in rack-mounted enclosure

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

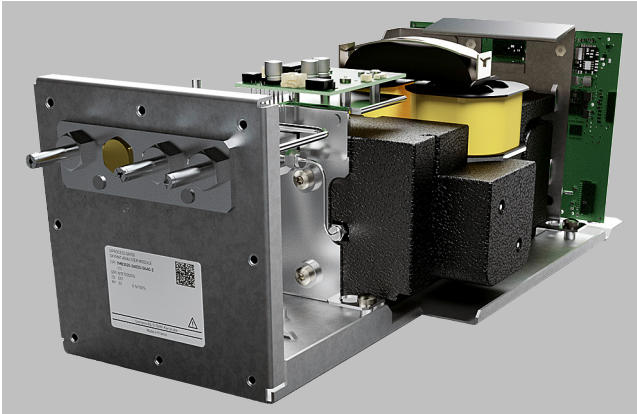
7MB3010-0AB10-0AA0-Z+D03

ULTRAMAT 7 module and rack-mounted enclosure supplied unassembled

7MB3000-0BX00-1AA0

7MB3010-0AB10-0AA0

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
- High-heated variant

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

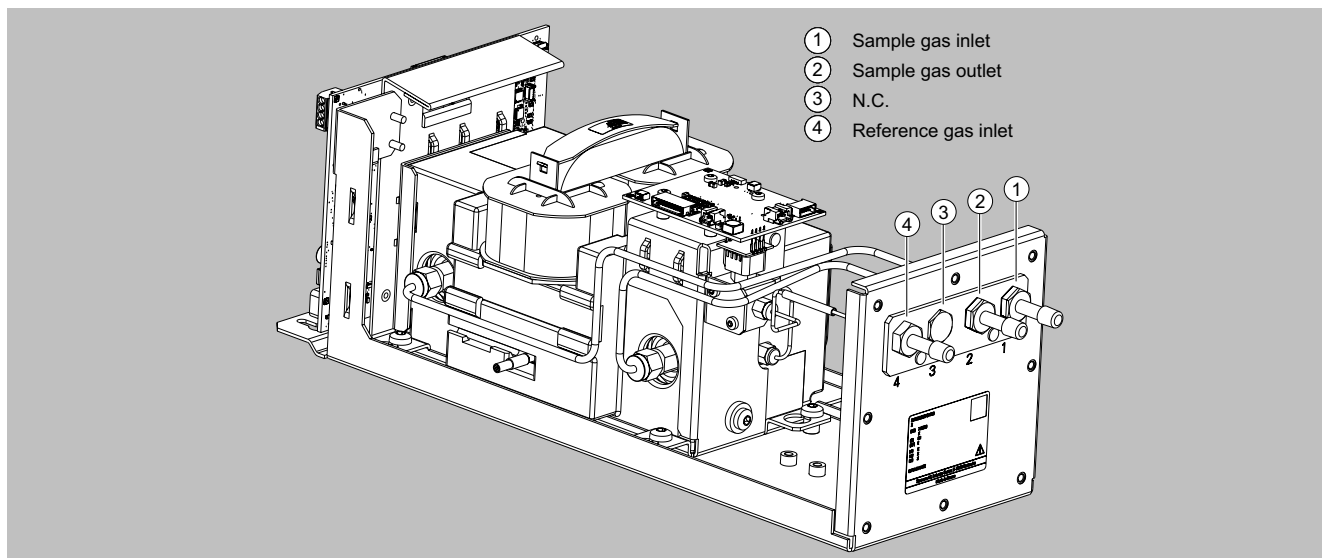
- For boiler control in combustion plants
- In chemical plants
- For ultra-pure gas quality monitoring
- In environmental protection
- For quality control
- Purity control/air separator
- Versions for analyzing flammable and non-flammable gases or vapors for use in hazardous areas

Extractive continuous process gas analysis

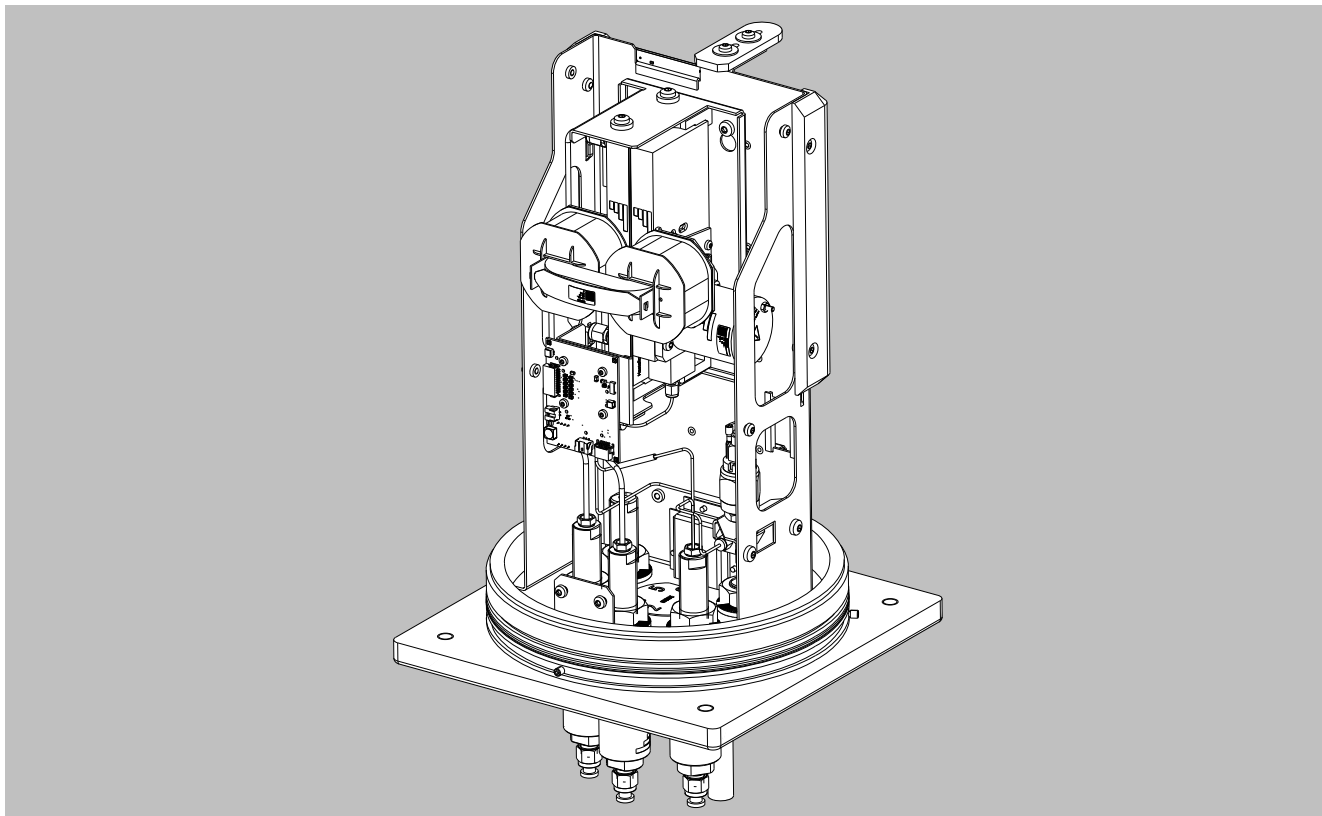
SIPROCESS GA700

OXYMAT 7 module

Design



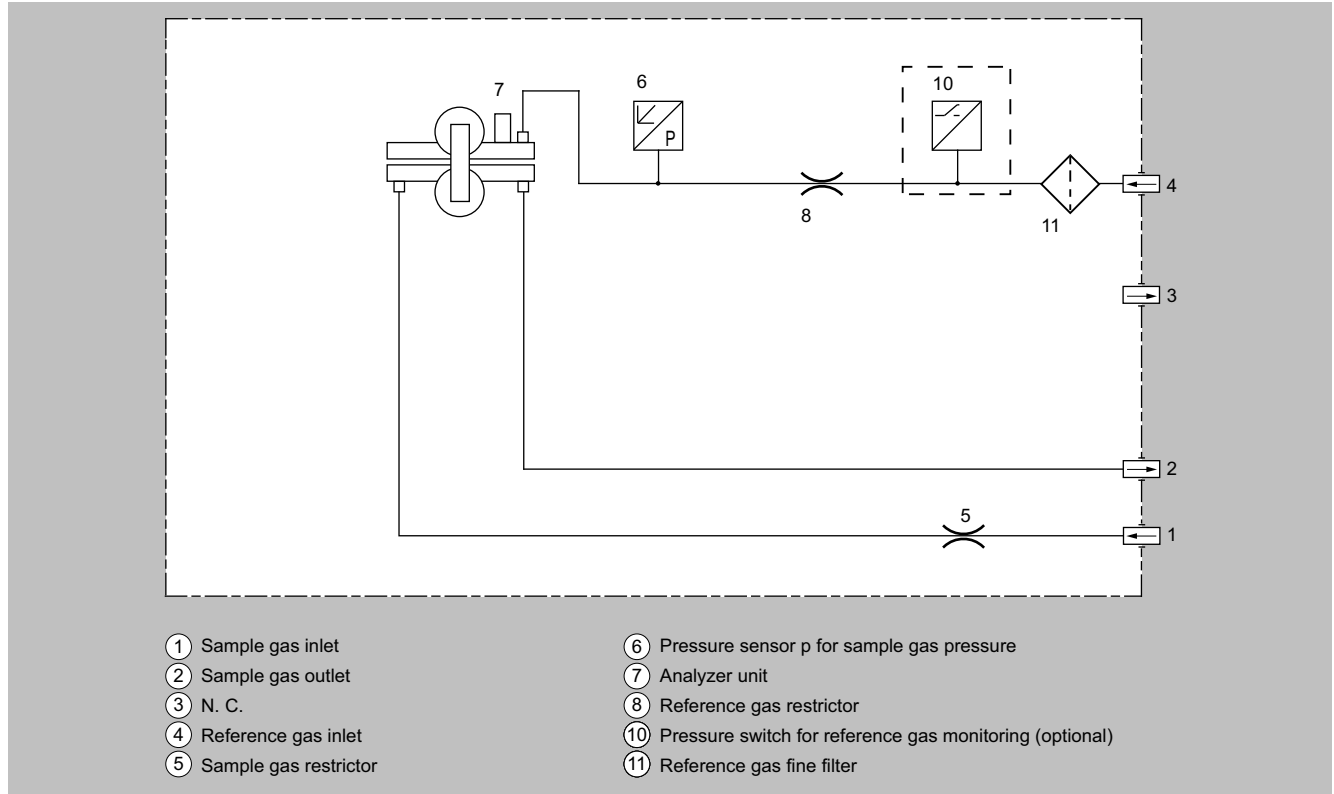
Design of high-pressure version, standard module, sample gas path with pipes



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

Design (Continued)**Gas path**

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



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

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

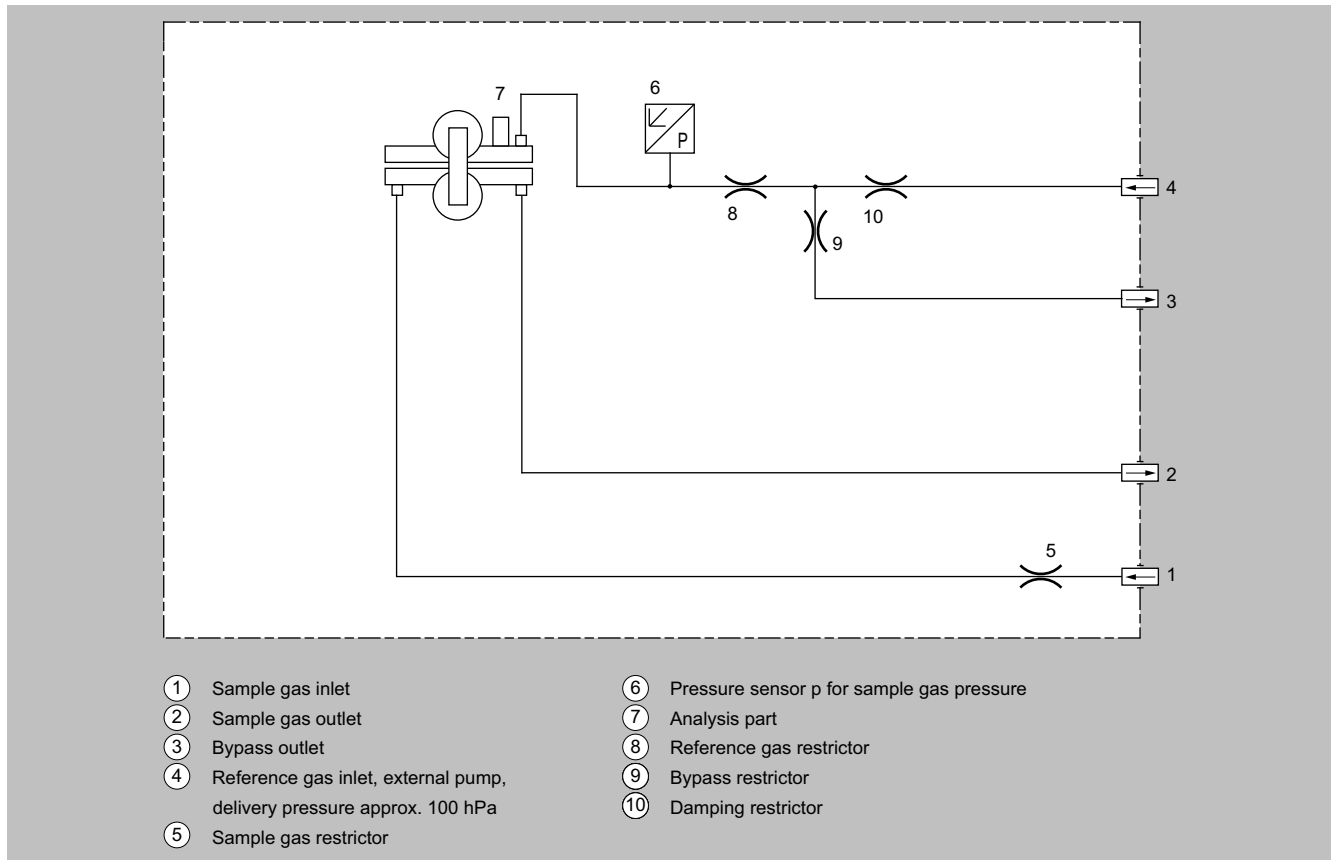
Extractive continuous process gas analysis

SIPROCESS GA700

OXYMAT 7 module

Design (Continued)

Low-pressure version with external reference gas pump



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

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 $\pm$ 50 hPa
Sample gas path	With hoses
Reference gas path	With hoses

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.

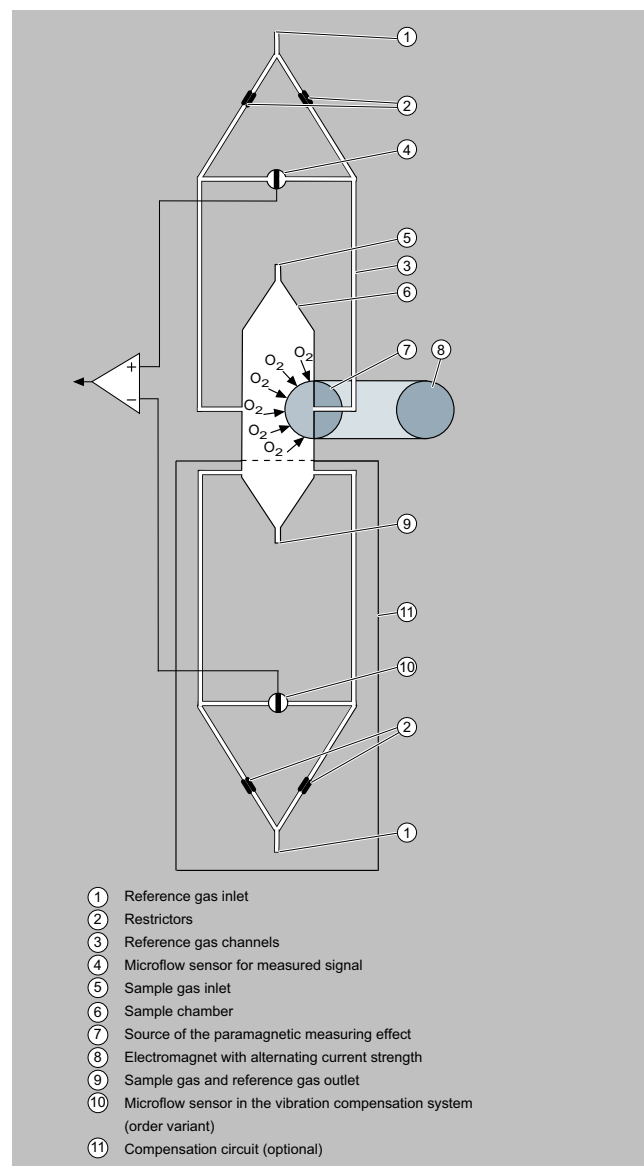
The sample chamber is directly in the sample path and has a small volume, and the microflow sensor is a low-lag sensor. As a result, extremely short response times are realized.

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.

Mode of operation (Continued)



OXYMAT 7, principle of operation

Extractive continuous process gas analysis

SIPROCESS GA700

OXYMAT 7 module

Function

Main features

Technical features

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

- Smallest measuring spans (down 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 $2\,000 \pm 150$ hPa higher than the sample gas pressure

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 device designs, such as:
 - Clean for O₂ service (specially cleaned gas path)
 - Kalrez-6375 gaskets

Reference gases for OXYMAT 7

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 ¹⁾	O ₂	2 000 ... 4 000 hPa above sample gas pressure (max. 5 000 hPa absolute)	
Approx. 21 vol.% O ₂ ²⁾	Air	100 hPa with respect to sample gas pressure, which may vary by max. 50 hPa around the air pressure	

¹⁾ Suppressed zero point with measuring range end value 100 vol.% O₂.

²⁾ Suppressed zero point with 21 vol.% O₂ within the measuring span.

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
Isobutane C ₄ H ₁₀	-1.30
1-butene C ₄ H ₈	-0.96
Isobutene 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

Function (Continued)

Accompanying gas (concentration 100 vol.%)	Zero point deviation in vol.% O ₂ absolute
N-octane C ₈ H ₁₈	-2.78
N-pentane C ₅ H ₁₂	-1.68
Isopentane 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

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 zero point deviations listed in the table must be multiplied by an adjustment factor (k):

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

All diamagnetic gases have a negative deviation from zero point.

Extractive continuous process gas analysis

SIPROCESS GA700

OXYMAT 7 module

Selection and ordering data

OXYMAT 7 module For measurement of oxygen			Article No. 7MB3020- ● ● ● ● 0 - ● A A ●									
Click on the Article No. for online configuration in the PIA Life Cycle Portal.												
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".												
Module version												
Standard module (for 19 inch rack unit enclosure and wall box)			0									
Standard module, high temperature 130 °C (for wall box)			1									
Standard module for hazardous zone (for 19 inch rack unit enclosure and wall box)			2									
Standard module, high temperature for hazardous zone 130 °C (for wall box)			3									
Field module for field enclosure Ex d without purging gas connections			4									
Field module for field enclosure Ex d with purging gas connections			5									
Reference gas pressure												
Low-pressure version 100 hPa (for connecting an external pump; without pressure switch)				A								
High pressure (2 000 ... 4 000 hPa above sample gas pressure)				C								
High pressure (2 000 ... 4 000 hPa above sample gas pressure), with pressure switch				D								
Smallest possible measuring span												
0.5%					B							
1%					C							
2%					D							
5%					E							
Material: gas paths, sample chambers, gaskets												
Gas path	Sample chamber	Gasket										
• Hose made of FKM (Viton)	• Stainless steel (1.4571)	• FKM (Viton)				0						
• Pipe made of stainless steel (1.4404)	• Stainless steel (1.4571)	• FKM / Ex: Kalrez (6375)				1						
• Pipe made of Hastelloy C22	• Hastelloy C22	• Kalrez (6375)				2						
• High-temperature gas path, pipe made of stainless steel (1.4571)	• Stainless steel (1.4571)	• Kalrez (6375)				4						
• High-temperature gas path, pipe made of Hastelloy C22	• Hastelloy C22	• Kalrez (6375)				5						
Vibration compensation												
Without									0			
With									1			
Version												
Standard												0

Options	Order code
Add "-Z" to article number and then add order code	
Settings	
Kalrez (6375) gaskets in sample gas path	B04
Clean for O2 service (specially cleaned gas path)	B06
Emission software for Korea	B51
Measuring range indication in plain text, if different from default setting	Y11
Exclusively for measuring non-toxic sample gases (field device only)	Y16
Basic unit module assignment number	D00 ... D99

Note

See order example under "More information".

Extractive continuous process gas analysis

SIPROCESS GA700

OXYMAT 7 module

Technical specifications

The technical specifications are based on the definitions of EN 61207-1. Unless specified otherwise, the data listed below relates to the following measurement conditions:

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

OXIMAT 7 module	
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% O ₂
• Largest possible measuring span	100% O ₂
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 to 3 000 hPa (abs.); short-term max. 5 000 hPa (abs.)
• Field module	
- For non-flammable gases	500 ... 2 500 hPa (abs.)
- For flammable gases up to gas mixtures which are occasionally explosive	800 ... 1 100 hPa (abs.)
Reference gas pressure	
• High-pressure connection	2 000 hPa above sample gas pressure (within the permissible reference gas pressure range 2 500 ... 5 000 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	
• Delayed display T ₉₀ with an electronic damping setting of 0 s and a sample gas flow of 1 Nl/min.	≤ 1.9 s; ≤ 2.4 s (field module including flame arrestor)
• Dead time T ₁₀	≤ 1.1 s; < 1.6 s (field module)
Measuring response	
Output signal fluctuation with static damping constant of 0 s and dynamic noise damping 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	

Technical specifications (Continued)

OXIMAT 7 module	
• At the zero point	≤ ±0.5% of the smallest measuring 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 or ≤ ± 50 vpm O ₂ , whichever is greater
• For span gas	≤ ±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 basic unit
Gas connections	
Connection fittings	Pipe connection with 6 mm outer diameter
Climatic conditions	
Storage and transport	-30 ... 70 °C
Permissible ambient temperature ²⁾	0 ... 50 °C
Relative humidity (RH) during storage, transport or operation	< 90% (condensation on 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.

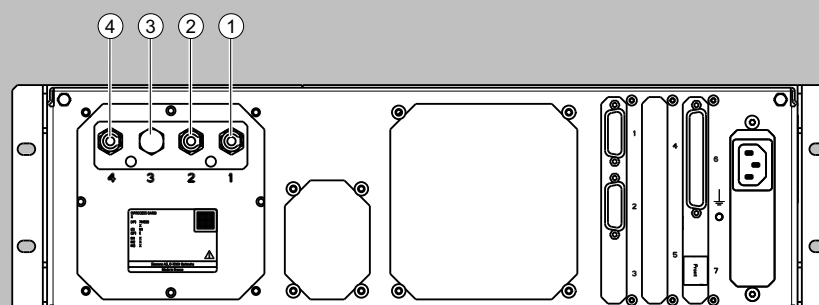
²⁾ Restriction for installing together with an ULTRAMAT 7 module: 5 ... 45 °C.

Extractive continuous process gas analysis

SIPROCESS GA700

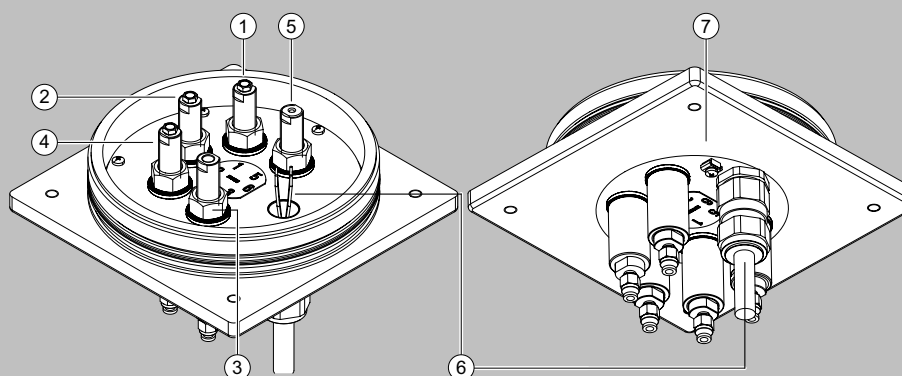
OXYMAT 7 module

Circuit diagrams



- 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

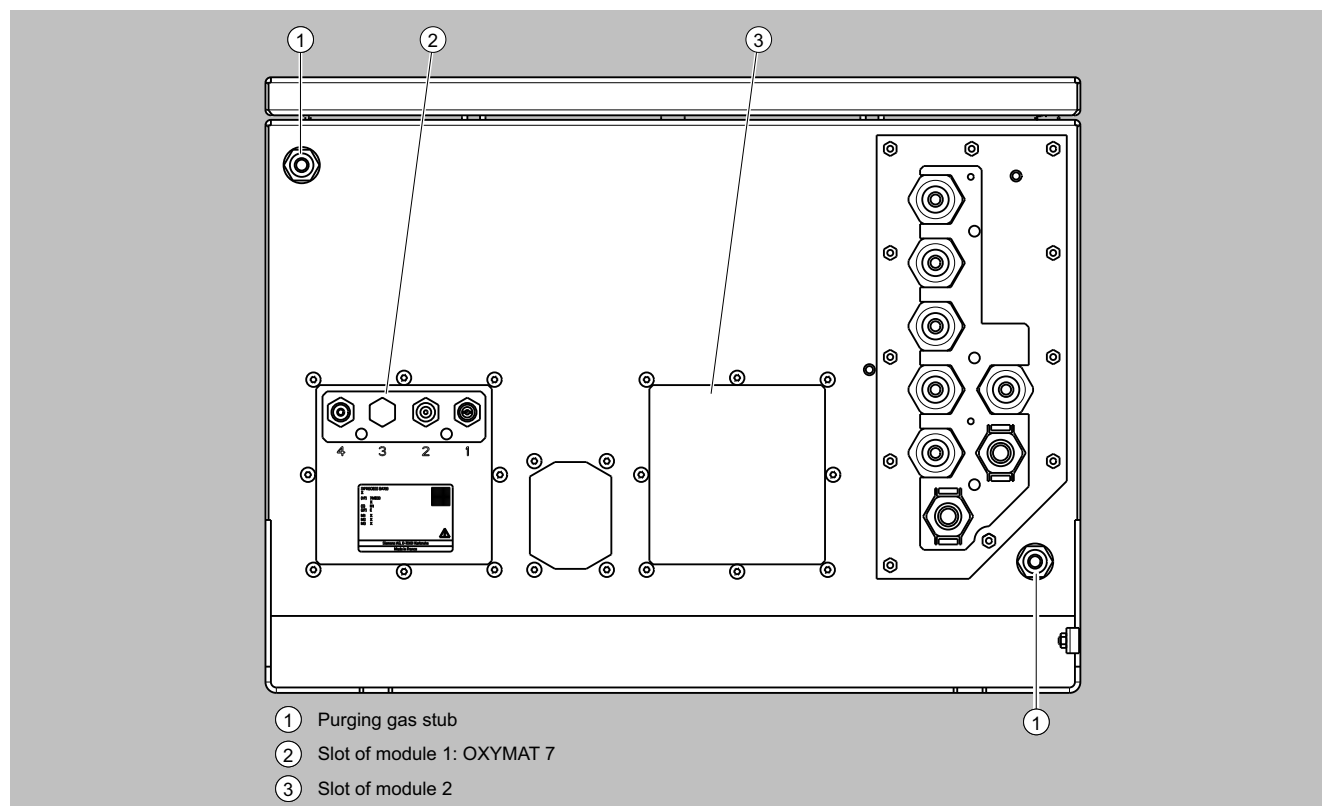
The sample gas connections are made of stainless steel Mat. No. 1.4571 or Hastelloy Mat. No. 2.4819.

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

Circuit diagrams (Continued)



Wall-mounted device, bottom

More information

Ordering example

OXYMAT 7 module installed in wall box

7MB3000-3AX00-1AA0-Z+D02**7MB3020-0CE00-0AA0-Z+D02**

OXYMAT 7 module and ULTRAMAT 7 module built into rack-mounted enclosure

7MB3000-0AA00-1AA0-Z+D05**7MB3020-0CE00-0AA0-Z+D05****7MB3010-0CA10-0AA0-Z+D05**

OXYMAT 7 module and wall box supplied unassembled

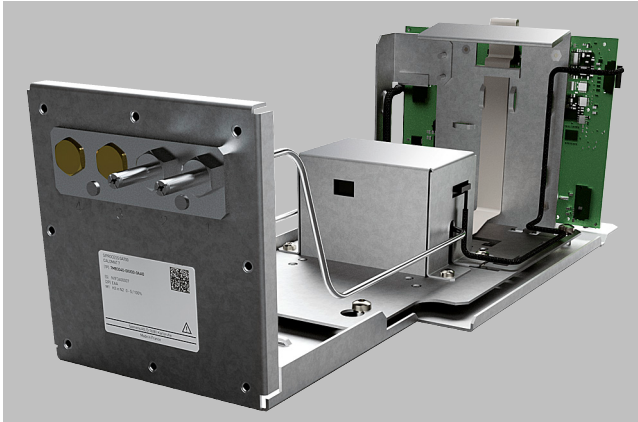
7MB3000-3CX00-1AA0**7MB3020-0CE00-0AA0**

Extractive continuous process gas analysis

SIPROCESS GA700

CALOMAT 7 module

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 .

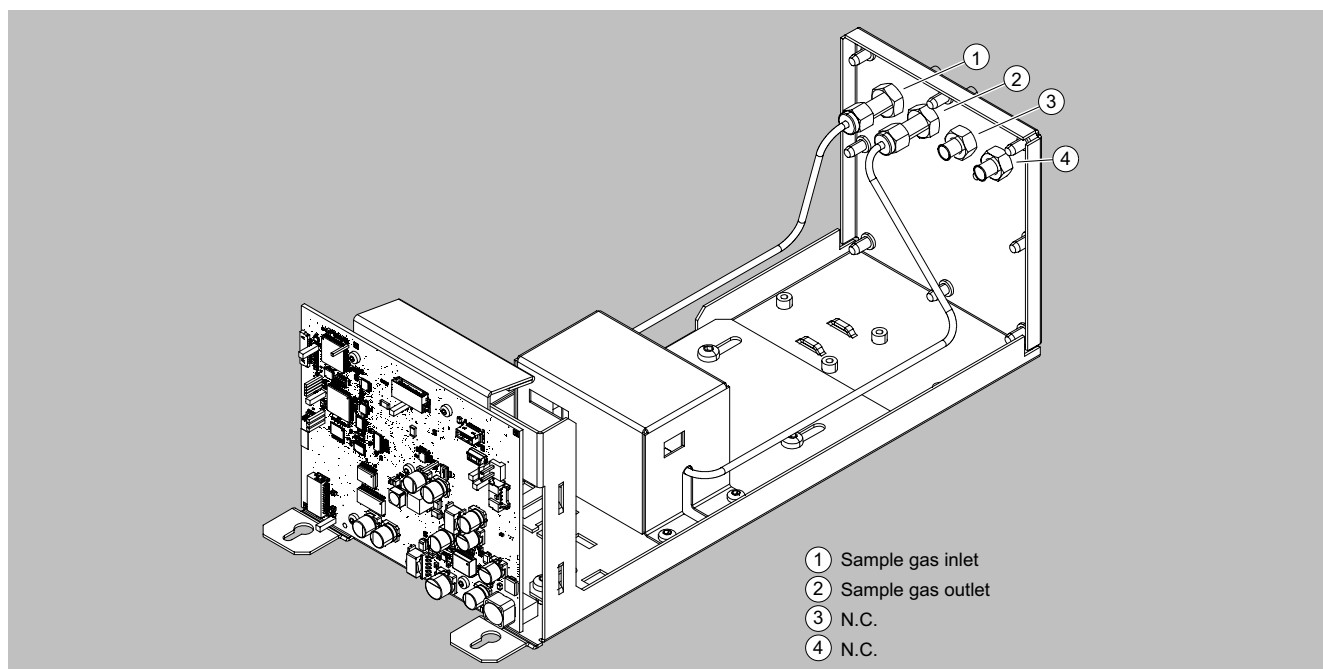
Benefits

- 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

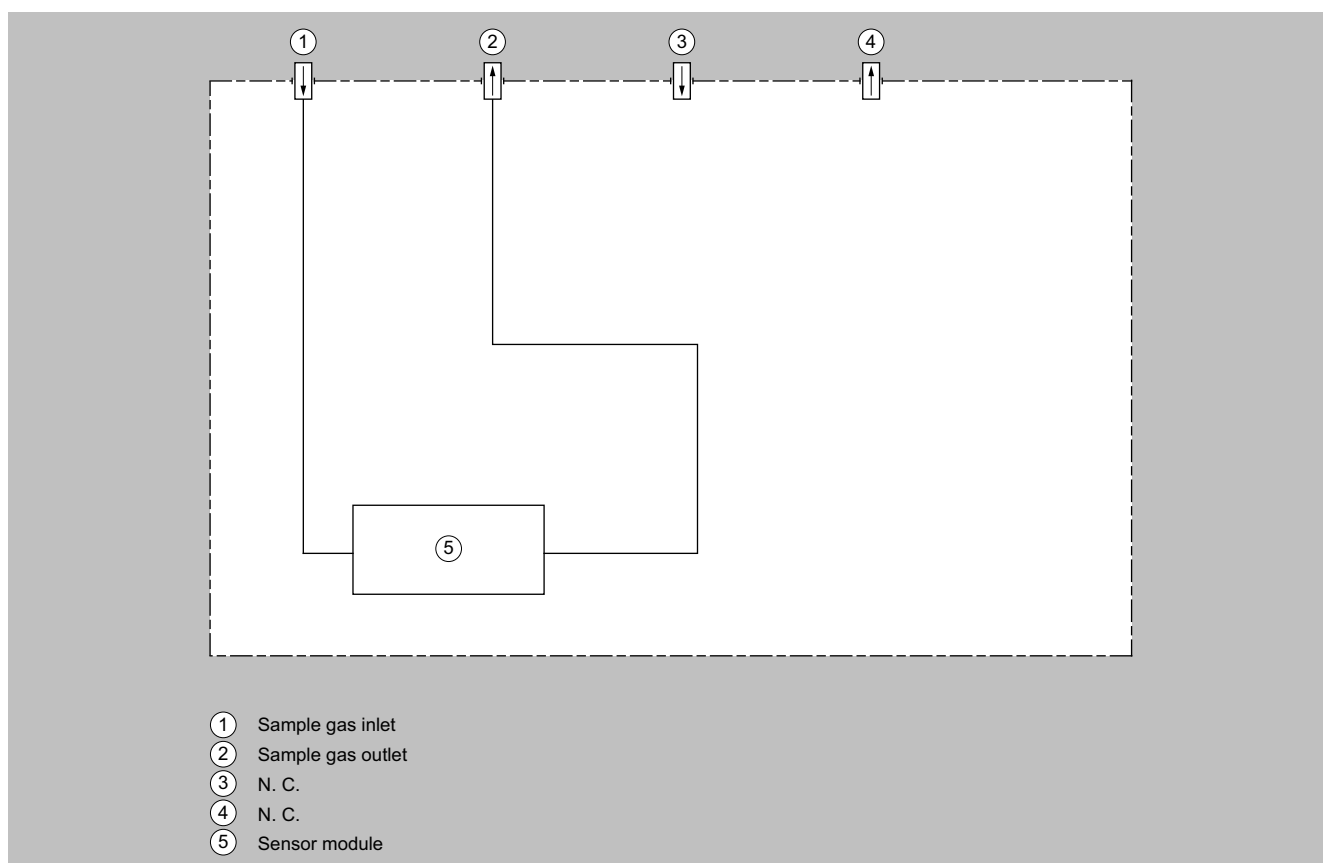
Application

- 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



CALOMAT 7, gas path

Extractive continuous process gas analysis

SIPROCESS GA700

CALOMAT 7 module

Mode of operation

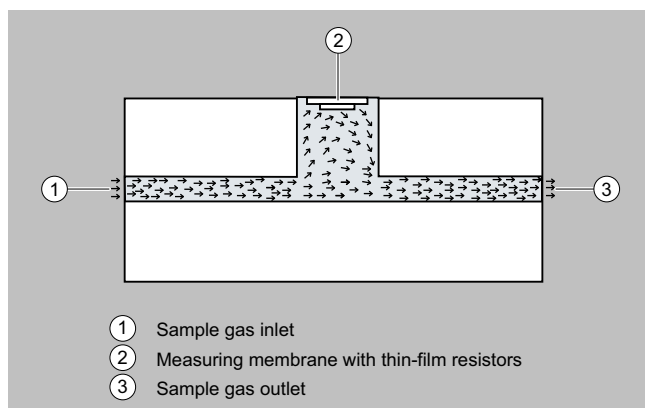
The measuring method is based on the different levels of thermal conductivity of gases. CALOMAT 7 modules work with a micromechanically produced Si chip, the measuring membrane of which is equipped with thin-film resistors.

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

Function (Continued)

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 can also affect the characteristic curve. For most gases, however, the effect on the characteristic curve is negligible.

Function

Main features

- Four freely parameterizable measuring ranges, also with suppressed zero point; all measuring ranges are linear
- Smallest measuring spans down to 0.5 % H₂ (with suppressed zero point: 95 to 100 % H₂) possible
- Automatic or manual measuring range switchover selectable; remote switching is also possible
- Storage of measured values possible during calibration
- Time constants selectable within wide limits (static/dynamic noise damping); 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 (parameterizable)
- Measuring range identification
- Measuring point identification
- External pressure sensor can be connected – for correction of variations in sample gas pressure
- Automatic measuring range calibration parameterizable
- Operation based on the NAMUR recommendation

Extractive continuous process gas analysis

SIPROCESS GA700

CALOMAT 7 module

Selection and ordering data

CALOMAT 7 module		Article No. 7MB3040- ● ● ● ● ● - 0 ● ● ●									
For the measurement of gases in binary or quasi-binary gas mixtures											
Click on the Article No. for online configuration in the PIA Life Cycle Portal.											
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".											
Module version											
Standard module for 19 inch rack unit enclosure and wall box											
Standard module for hazardous zone for 19 inch rack unit enclosure and wall box											
Measured components, corrosive gas mixtures											
Non-corrosive gas mixtures only											
Measuring range, corrosive mixtures											
Non-corrosive gas mixtures only											
Material of gas path											
Stainless steel 1.4571											
Reference gas chamber											
None (for non-corrosives gas mixtures)											
Measured components, non-corrosive mixtures											
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
Smallest measuring range											
0 ... 0.5%											A
0 ... 1%											B
0 ... 2%											C
0 ... 5%											D
0 ... 10%											E
0 ... 10%											F
Version											
Standard											0

The following mixtures are available as a special application (7MB3047):

H ₂ in He	N ₂ in O ₂
H ₂ in CO ₂	N ₂ in H ₂
H ₂ in synthetic air	Synthetic air in Ar
H ₂ in CH ₄	Synthetic air in CO ₂
He in synthetic air	Synthetic air in H ₂
Ar in He	Synthetic air in He
Ar in CO ₂	CO ₂ in Ar
Ar in synthetic air	CO ₂ in synthetic air
Ar in H ₂	CO ₂ in H ₂
N ₂ in Ar	CH ₄ in synthetic air
N ₂ in He	CH ₄ in H ₂
N ₂ in CH ₄	O ₂ in N ₂

Options	Order code
Add "-Z" to article number and then add order code	
Settings	
Clean for O ₂ service (specially cleaned gas path)	B06
Measuring range indication in plain text, if different from default setting	Y11

Extractive continuous process gas analysis

SIPROCESS GA700

CALOMAT 7 module

Selection and ordering data (Continued)

Options	Order code
Special setting (only in conjunction with application no.)	Y12
Extended special setting (only in conjunction with application no.)	Y13
Basic unit module assignment number	D00 ... D99

Note

See order example under "More information".

Technical specifications

The technical specifications are based on the definitions of EN 61207-1.
Unless specified otherwise, the data listed below relates to the following measurement conditions:

Measuring conditions	
Ambient temperature	25 °C
Atmospheric pressure	Atmospheric (approx. 1 000 hPa)
Sample gas flow	0.6 l/min (or nl/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.

CALOMAT module	
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 measuring span	0.5% H ₂ in N ₂
• Largest possible measuring span	100% H ₂ in N ₂
• Smallest possible measuring span with suppressed zero point	5% (e.g. 95% ... 100%) H ₂ in N ₂
Gas inlet conditions	
Sample gas pressure	700 ... 1 200 hPa (abs.)
Pressure drop between sample gas inlet and sample gas outlet	< 50 hPa at 1.5 l/min
Sample gas flow	30 ... 90 l/h (0.5 ... 1.5 l/min)
Sample gas temperature	0 ... 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	
• Delayed 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 measuring span acc. to nameplate (σ < ± 8.33 vpm H ₂)

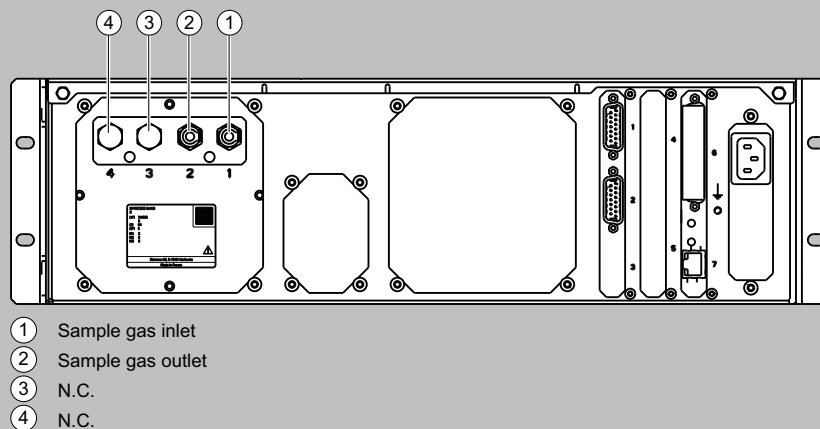
Technical specifications (Continued)

CALOMAT module	
Detection limit	≤ 1% of the smallest measuring span according to nameplate
Measured value drift	≤ ± 1%/week of smallest measuring 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 variation
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 characteristic curve end value (within the nominal range of use)
Electrical inputs and outputs	
Analog and digital interfaces	See basic unit
Climatic conditions	
Storage and transport	-30 ... 70 °C
Permissible ambient temperature (during operation in basic unit) ²⁾	0 ... 50 °C
Relative humidity (RH) during storage, transport or operation	< 90% (condensation on 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 ₂ N ₂ , Au, epoxy resin, glass
Gasket, contained in the sensor module	Perfluorelastomere FFKM

¹⁾ Values less than the detection limit are not useful

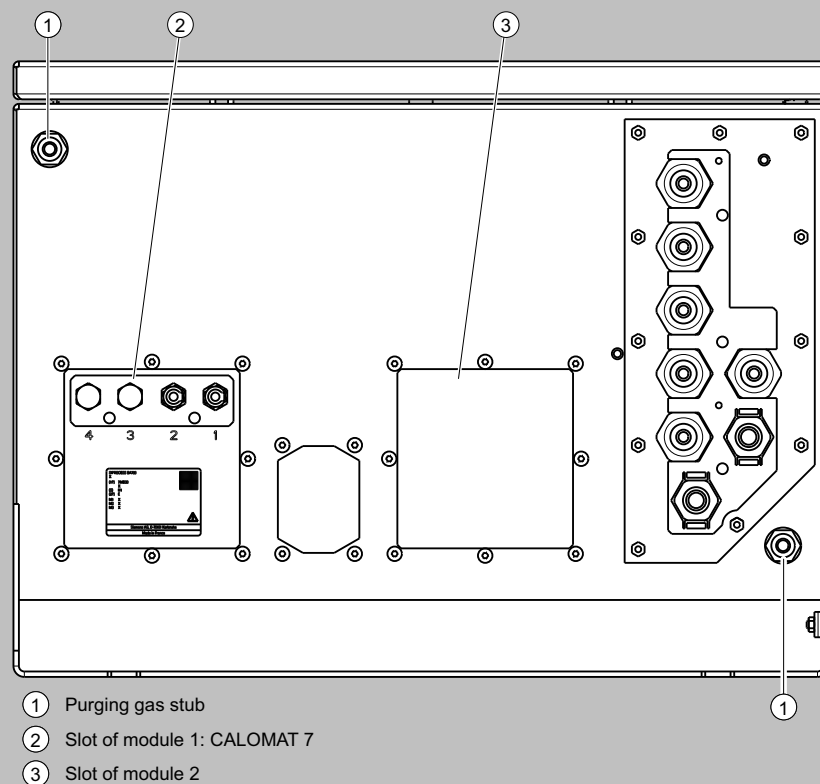
²⁾ Restriction for installing an ULTRAMAT 7 module: 5 ... 45 °C.

Circuit diagrams



CALOMAT 7 gas connections

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



Wall-mounted device, bottom

More information

Ordering example

CALOMAT 7 module installed in wall box

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

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

Extractive continuous process gas analysis

SIPROCESS GA700

Parts for the SIPROCESS GA700 modules wetted by sample gas

Overview

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	CaF2, 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	–
With pipes (Hastelloy)	O-rings	FKM (Viton) or FFKM (Kalrez 6375)	FKM (Viton) or FFKM (Kalrez 6375)	FFKM (Kalrez 6375)
	Bushing	Hastelloy C22	Hastelloy C22	–
	Pipe	Hastelloy C22	Hastelloy C22	–
	Sample chamber			
	• Body	Aluminum	Hastelloy C22	–
	• Lining	Tantalum	–	–
	• Window	CaF2, adhesive: E353	–	–
	Sample gas restrictor	–	Hastelloy C22	–
	O-rings	FKM (Viton) or FFKM (Kalrez 6375)	FFKM (Kalrez 6375)	–

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 , CO_2 , NO , SO_2 , NH_3 , H_2O as well as CH_4 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 ATEX 2G and ATEX 3G)

Application

- Measurement for boiler control in combustion plants
- Emission measurements in combustion 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

Application (Continued)

Performance-tested version / QAL

For measurements of CO , NO , SO_2 and O_2 according to sections 13 and 27 of the German Federal Immission Protection Regulations and TA Luft, performance-tested versions according to EN 15267 are available.

Certified measuring range:

- 1-component analyzer
 - CO : 0 to 75 mg/m^3 ; 0 to 10 000 mg/m^3
 - NO : 0 to 100 mg/m^3 ; 0 to 10 000 mg/m^3
 - SO_2 : 0 to 75 mg/m^3 ; 0 to 1 500 mg/m^3
- O_2 : 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 QAL1 according to EN 14181. Conformity of the analyzers with both standards is TÜV-certified.

Determination of the analyzer drift according to EN 14181 (QAL3) 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 cell

- The flow through the reference cell should be adapted to the sample gas flow
- The gas supply of the reduced flow-type reference cell should have a primary pressure of 3 000 to 5 000 hPa (abs.). The flow is then automatically regulated at approximately 8 ml/min using a restrictor

Extractive continuous process gas analysis

Series 6

ULTRAMAT 6

Design

19" rack unit

- 19" rack unit with 4 U for installation
 - In hinged frame
 - In cabinets with or without telescopic 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)
- Pressure switch in sample gas path for flow monitoring (option)

Field device

- Two-door enclosure with gas-tight separation of the electronics modules from parts conveying gas
- 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 operator 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
- 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

- One analog output per medium (from 0, 2, 4 to 20 mA; NAMUR parameterizable)
- Two analog inputs freely configurable (e.g. correction of cross-interference or external pressure sensor)
- Six digital inputs freely configurable (e.g. for measuring 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
- Expandable with 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

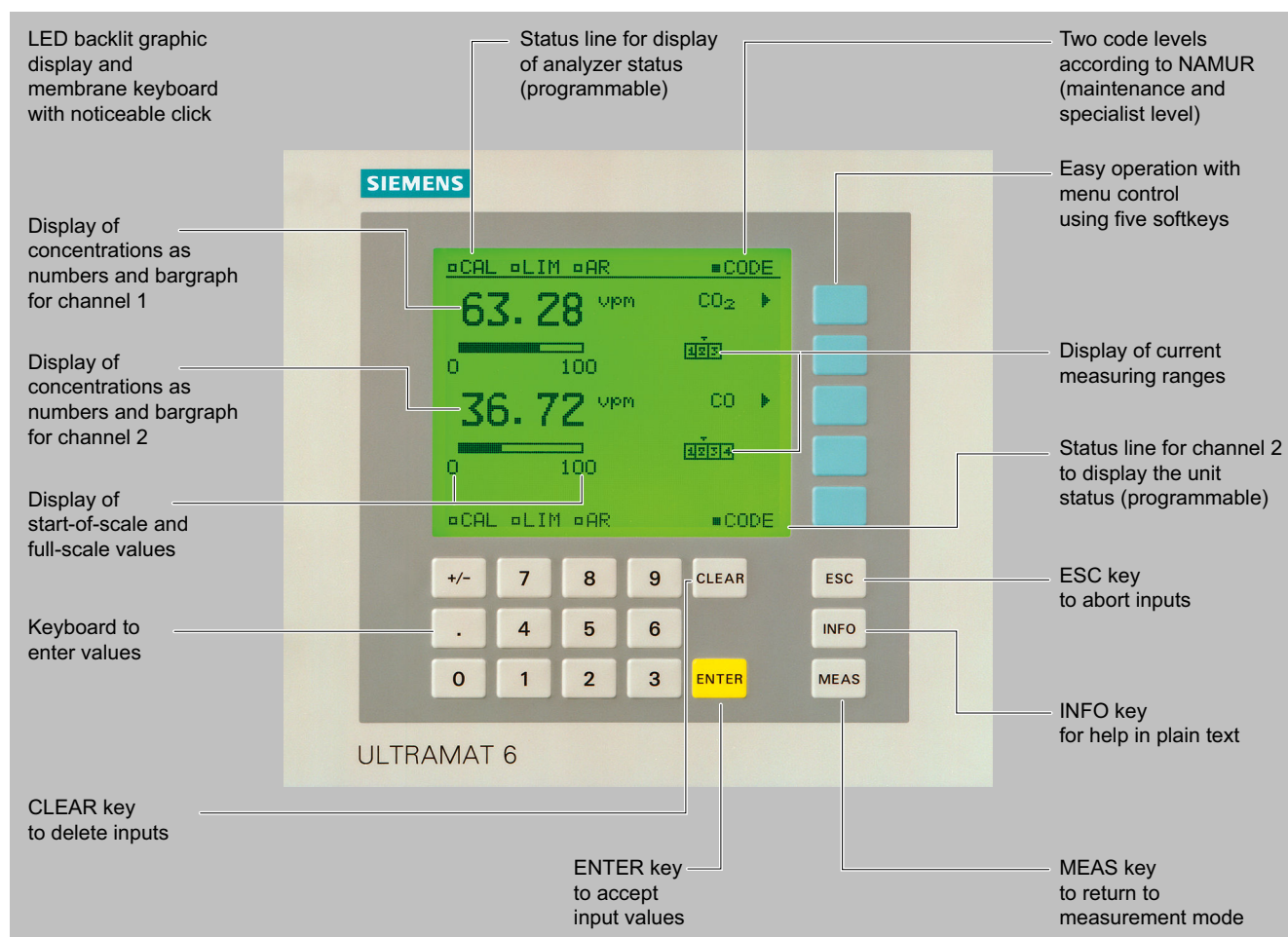
- AK interface for the automotive industry with extended functions
- RS 485/RS 232 converter
- RS 485/Ethernet converter
- RS 485/USB converter
- Connection to networks via PROFIBUS DP/PA interface
- SIPROM GA software as the service and maintenance tool

Extractive continuous process gas analysis

Series 6

ULTRAMAT 6

Design (Continued)



ULTRAMAT 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	Stainless steel, mat. no. 1.4571	-
	Hose	FKM (e.g. Viton)	FKM (e.g. Viton)	-
	Sample chamber:			
	• Body	Aluminum	Aluminum	-
	• Lining	Aluminum	Aluminum	-
	• Fitting	Stainless steel, mat. no. 1.4571 O-ring: FKM (e.g. Viton) or FFKM (Kalrez)	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)	CaF ₂ , adhesive: E353, O-ring: FKM (e.g. Viton) or FFKM (Kalrez)	-
With pipes	Bushing	Titanium	Titanium	Titanium
	Pipe	Titanium O-ring: FKM (e.g. Viton) or FFKM (Kalrez)	Titanium O-ring: FKM (e.g. Viton) or FFKM (Kalrez)	Titanium O-ring: FKM (e.g. Viton) or FFKM (Kalrez)
	Sample chamber:			
	• Body	Aluminum	Aluminum	Aluminum

Extractive continuous process gas analysis

Series 6

ULTRAMAT 6

Design (Continued)

Gas path		19" rack unit	Field device	Field device Ex
With pipes	• Lining	Tantalum (only for cell length 20 ... 180 mm)	Tantalum (only for cell length 20 ... 180 mm)	Tantalum (only for cell length 20 ... 180 mm)
	• Window	CaF ₂ , adhesive: E353, O-ring: FKM (e.g. Viton) or FFKM (Kalrez)	CaF ₂ , adhesive: E353, O-ring: FKM (e.g. Viton) or FFKM (Kalrez)	CaF ₂ , adhesive: E353, O-ring: FKM (e.g. Viton) or FFKM (Kalrez)
With pipes	Bushing	Stainless steel, mat. no. 1.4571	Stainless steel, mat. no. 1.4571	Stainless steel, mat. no. 1.4571
	Pipe	Stainless steel, mat. no. 1.4571 O-ring: FKM (e.g. Viton) or FFKM (Kalrez)	Stainless steel, mat. no. 1.4571 O-ring: FKM (e.g. Viton) or FFKM (Kalrez)	Stainless steel, mat. no. 1.4571 O-ring: FKM (e.g. Viton) or FFKM (Kalrez)
	Sample chamber:			
	• Body	Aluminum	Aluminum	Aluminum
	• Lining	Aluminum or tantalum (tantalum only for cell length 20 ... 180 mm)	Aluminum or tantalum (tantalum only for cell length 20 ... 180 mm)	Aluminum or tantalum (tantalum only for cell length 20 ... 180 mm)
	• Window	CaF ₂ , adhesive: E353, O-ring: FKM (e.g. Viton) or FFKM (Kalrez)	CaF ₂ , adhesive: E353, O-ring: FKM (e.g. Viton) or FFKM (Kalrez)	CaF ₂ , adhesive: E353, O-ring: FKM (e.g. Viton) or FFKM (Kalrez)

Options

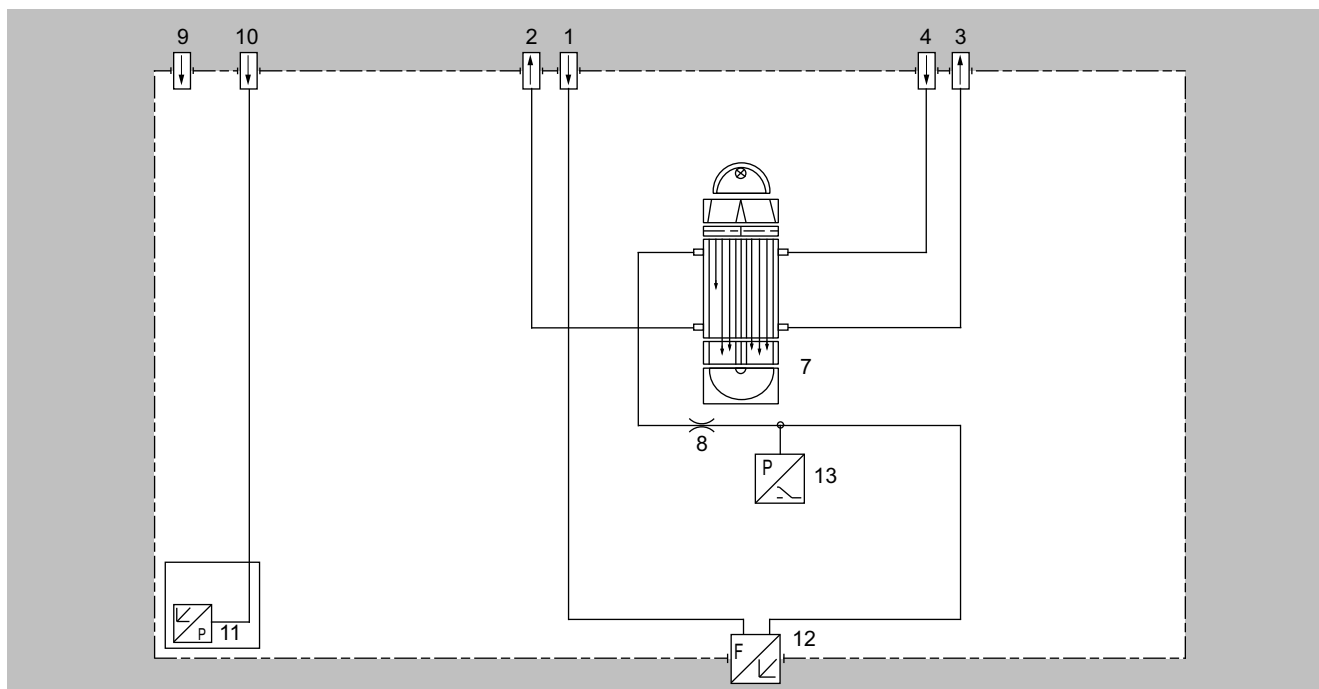
Gas path		19" rack unit	Field device	Field device Ex
Flow indicator	Measuring tube	Duran glass	-	-
	Variable area	Duran glass	-	-
	Suspension boundary	PTFE (Teflon)	-	-
	Angle units	FKM (e.g. Viton)	-	-
Pressure switch	Diaphragm	FKM (e.g. Viton)	-	-
	Enclosure	PA 6.3T	-	-

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

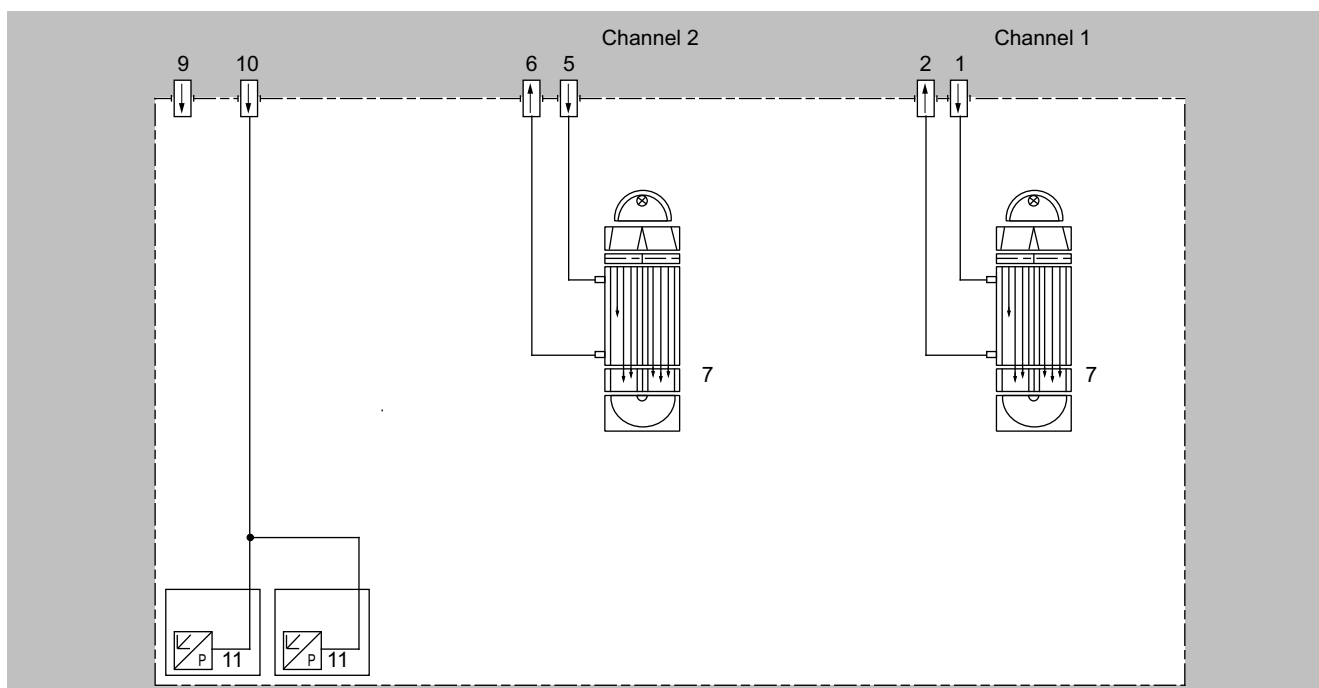
Gas path		19" rack unit	Field device	Field device Ex
With pipes	Bushing	e.g. Hastelloy C22	e.g. Hastelloy C22	e.g. Hastelloy C22
	Pipe	e.g. Hastelloy C22 O-ring: FKM (e.g. Viton) or FFKM (Kalrez)	e.g. Hastelloy C22 O-ring: FKM (e.g. Viton) or FFKM (Kalrez)	e.g. Hastelloy C22 O-ring: FKM (e.g. Viton)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

Design (Continued)

Gas path (19" rack unit)



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



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

Extractive continuous process gas analysis

Series 6

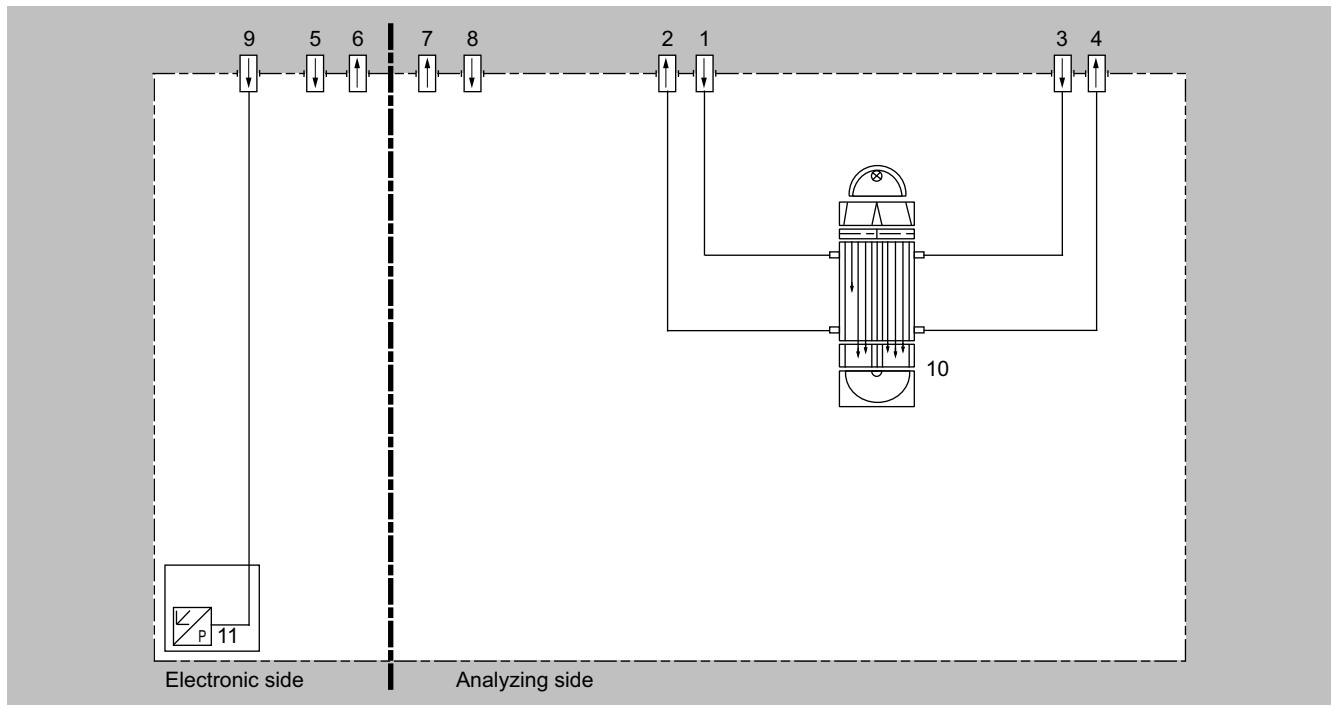
ULTRAMAT 6

Design (Continued)

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

1	Sample gas inlet channel 1	8	Restrictor
2	Sample gas outlet channel 1	9	Purging 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 (field device)



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

Legend for figure "Gas path (field device)"

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)		

Mode of operation

The ULTRAMAT 6 gas analyzer operates according to the infrared two-beam modulated 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 chamber (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 chamber 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 detector chamber layer optically. The infrared absorption in the second detector chamber 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

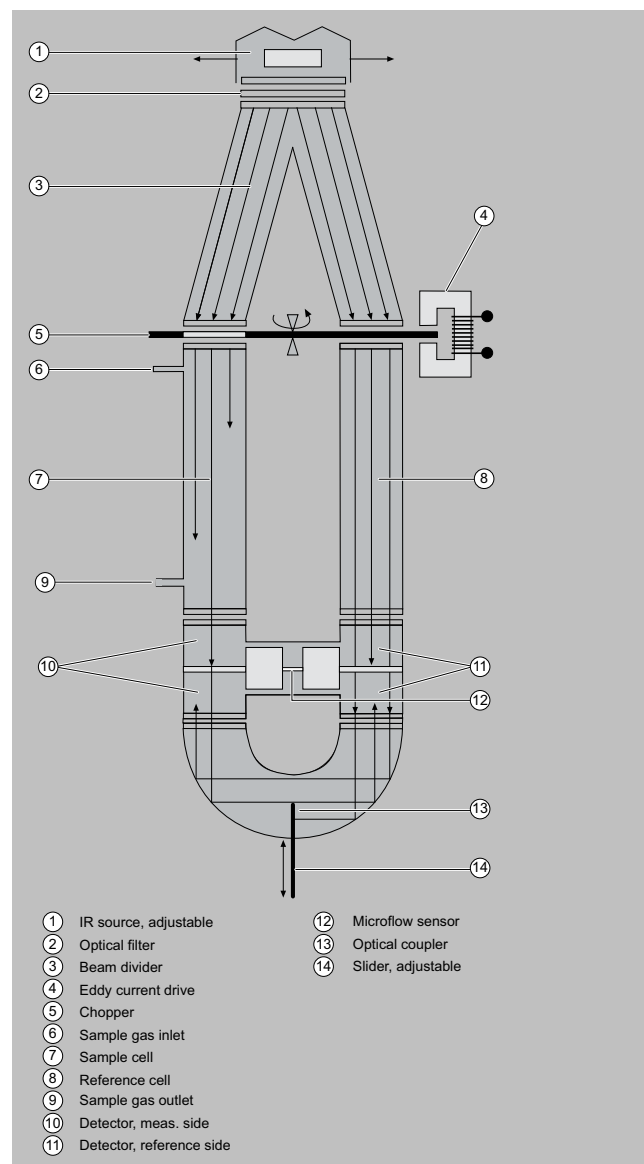
The sample gases must be fed into the analyzers free of dust. Condensation in the sample chambers must be prevented. Therefore, the use of gas modified for the measuring task is necessary in most application cases.

As far as possible, the ambient air of the analyzer unit should not have a large concentration of the gas components to be measured. Flow-type reference cells with reduced flow must not be operated with flammable or toxic gases.

Flow-type reference cells 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.

Mode of operation (Continued)



ULTRAMAT 6, principle of operation

Extractive continuous process gas analysis

Series 6

ULTRAMAT 6

Function

Main features

- Dimension of measured value freely selectable (e.g. vpm, mg/m³)
- Four freely parameterizable measuring ranges per component
- Measuring ranges with suppressed zero point possible
- Measuring range identification
- Electrically isolated measured value output 0/2/4 up 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 calibration
- Wide range of selectable time constants (static/dynamic noise damping); i.e. the response time of the device or component can be adapted to the respective measuring task
- Short response time
- Low long-term drift
- Measuring point switchover for up to 6 measuring points (parameterizable)
- 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 input levels with separate authorization codes to prevent unintentional and unauthorized operator intervention
- Automatic measuring range calibration parameterizable
- Simple handling using a numerical membrane keyboard and operator prompting
- Operation based on NAMUR recommendation
- Custom-made device designs, such as:
 - Customer acceptance
 - TAG plates
 - Clean for O₂ service (specially cleaned gas path)
- Easy device replacement since electrical 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 at the rear of the device)

Extractive continuous process gas analysis

Series 6

ULTRAMAT 6 / 19" rack unit

Selection and ordering data

ULTRAMAT 6 gas analyzer			Article No.									
Single-channel 19" rack unit for installation in cabinets			7MB2121- ● ● ● ● ● - ● A A ●									
Click on the Article No. for online configuration in the PIA Life Cycle Portal.												
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".												
Gas connections for sample gas and reference gas												
Pipe with 6 mm outer diameter											0	
Pipe with 1/4" outer diameter											1	
Measured component	Possible with measuring range identification											
CO	11 ... 30										A	
CO highly selective (with optical filter) ²⁾	12 ... 30										B	
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 ⁴⁾	12 ... 30										N	
NO ⁴⁾	14 ... 30										P	
NH ₃ (dry)	14 ... 30										Q	
H ₂ O	17 ... 22										R	
N ₂ O	13 ... 30										S	
CO ³⁾	13, 15 ... 17, 19, 23, 25, 29										X	
Smallest measuring range	Largest measuring range	Measuring range identification										
0 ... 5 vpm	0 ... 100 vpm	10									A	
0 ... 10 vpm	0 ... 200 vpm	11									B	
0 ... 20 vpm	0 ... 400 vpm	12									C	
0 ... 50 vpm	0 ... 1 000 vpm	13									D	
0 ... 100 vpm	0 ... 1 000 vpm	14									E	
0 ... 300 vpm	0 ... 3 000 vpm	15									F	
0 ... 500 vpm	0 ... 5 000 vpm	16									G	
0 ... 1 000 vpm	0 ... 10 000 vpm	17									H	
0 ... 3 000 vpm	0 ... 10 000 vpm	18									J	
0 ... 3 000 vpm	0 ... 30 000 vpm	19									K	
0 ... 5 000 vpm	0 ... 15 000 vpm	20									L	
0 ... 5 000 vpm	0 ... 50 000 vpm	21									M	
0 ... 1%	0 ... 3%	22									N	
0 ... 1%	0 ... 10%	23									P	
0 ... 3%	0 ... 10%	24									Q	
0 ... 3%	0 ... 30%	25									R	
0 ... 5%	0 ... 15%	26									S	
0 ... 5%	0 ... 50%	27									T	
0 ... 10%	0 ... 30%	28									U	
0 ... 10%	0 ... 100%	29									V	
0 ... 30%	0 ... 100%	30									W	
Internal gas paths	Sample chamber¹⁾ (lining)	Reference chamber (flow-type)										
Hose made of FKM (Viton)	Aluminum	Non-flow-type									0	
Hose made of FKM (Viton)	Aluminum	Flow-type									1	
Hose made of FKM (Viton) with sample gas monitoring	Aluminum	Non-flow-type									2	
Hose made of FKM (Viton) with sample gas monitoring	Aluminum	Flow-type									3	
Pipe made of titanium	Tantalum	Non-flow-type									4	
Pipe made of titanium	Tantalum	Flow-type									5	
Stainless steel pipe (mat. no. 1.4571)	Aluminum	Non-flow-type									6	
Stainless steel pipe (mat. no. 1.4571)	Tantalum	Non-flow-type									8	

Extractive continuous process gas analysis

Series 6

ULTRAMAT 6 / 19" rack unit

Selection and ordering data (Continued)

ULTRAMAT 6 gas analyzer						Article No.					
Single-channel 19" rack unit for installation in cabinets						7MB2121-	●	●	●	●	●
Add-on electronics											
Without										0	
AUTOCAL function with 8 additional digital inputs/outputs each										1	
AUTOCAL function with serial interface for the automotive industry (AK)										3	
AUTOCAL function with 8 digital inputs/outputs each and PROFIBUS PA interface										6	
AUTOCAL function with 8 digital inputs/outputs each and PROFIBUS DP interface										7	
Auxiliary power											
100 ... 120 V AC, 48 ... 63 Hz										0	
200 ... 240 V AC, 48 ... 63 Hz										1	
Language of the operating software											
German											0
English											1
French											2
Spanish											3
Italian											4

¹⁾ Only for cell lengths 20 to 180 mm.

²⁾ QAL1: See table "Performance tested according to EN 15267 (single component)".

³⁾ QAL1: See table "Based on QAL1 according to SIRA/MCERTS (single component)".

⁴⁾ QAL1: See tables "Based on QAL1 according to SIRA/MCERTS (single component)" and "Performance-tested according to EN 15267 (single component)".

Options	Order code
Add "-Z" to article number and then add order code	
Settings	
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
Set of Torx screwdrivers	A32
Tag plates (customized inscription)	B03
Kalrez gaskets in sample gas path	B04
SIL Declaration of Conformity (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 default 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
Hardware/software configuration conforming to QAL1 suitability test according to EN 14181:2004	Y17
Performance-tested according to EN 15267	Y27

Accessories	Article No.
RS 485/Ethernet converter	A5E00852383

Selection and ordering data (Continued)

Accessories	Article No.
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

ULTRAMAT 6 gas analyzer			Article No.									
Two-channel 19" rack unit for installation in cabinets for measuring 2 IR components			7MB2123-●●●●●-●●●●●									
Click on the Article No. for online configuration in the PIA Life Cycle Portal.												
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".												
Gas connections for sample gas and reference gas												
Pipe with 6 mm outer diameter								0				
Pipe with 1/4" outer diameter								1				
Channel 1 Measured component	Possible with measuring range identification											
CO	11 ... 30								A			
CO highly selective (with optical filter) ²⁾	12 ... 30								B			
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 ⁴⁾	12 ... 30								N			
NO ⁴⁾	14 ... 30								P			
NH ₃ (dry)	14 ... 30								Q			
H ₂ O	17 ... 22								R			
N ₂ O	13 ... 30								S			
CO ³⁾	13, 15 ... 17, 19, 23, 25, 29								X			
Smallest measuring range	Largest measuring range	Measuring range identification										
0 ... 5 vpm	0 ... 100 vpm	10							A			
0 ... 10 vpm	0 ... 200 vpm	11							B			
0 ... 20 vpm	0 ... 400 vpm	12							C			
0 ... 50 vpm	0 ... 1 000 vpm	13							D			
0 ... 100 vpm	0 ... 1 000 vpm	14							E			
0 ... 300 vpm	0 ... 3 000 vpm	15							F			
0 ... 500 vpm	0 ... 5 000 vpm	16							G			
0 ... 1 000 vpm	0 ... 10 000 vpm	17							H			
0 ... 3 000 vpm	0 ... 10 000 vpm	18							J			
0 ... 3 000 vpm	0 ... 30 000 vpm	19							K			
0 ... 5 000 vpm	0 ... 15 000 vpm	20							L			
0 ... 5 000 vpm	0 ... 50 000 vpm	21							M			
0 ... 1%	0 ... 3%	22							N			
0 ... 1%	0 ... 10%	23							P			
0 ... 3%	0 ... 10%	24							Q			
0 ... 3%	0 ... 30%	25							R			
0 ... 5%	0 ... 15%	26							S			

Extractive continuous process gas analysis

Series 6

ULTRAMAT 6 / 19" rack unit

Selection and ordering data (Continued)

ULTRAMAT 6 gas analyzer			Article No.									
Two-channel 19" rack unit for installation in cabinets for measuring 2 IR components			7MB2123-	●	●	●	●	●	-	●	●	●
0 ... 5%	0 ... 50%	27						T				
0 ... 10%	0 ... 30%	28						U				
0 ... 10%	0 ... 100%	29						V				
0 ... 30%	0 ... 100%	30						W				
Internal gas paths	Sample chamber¹⁾ (lining)	Reference chamber (flow-type)										
Hose made of FKM (Viton)	Aluminum	Non-flow-type						0				
Hose made of FKM (Viton)	Aluminum	Flow-type						1				
Hose made of FKM (Viton) with sample gas monitoring	Aluminum	Non-flow-type						2				
Hose made of FKM (Viton) with sample gas monitoring	Aluminum	Flow-type						3				
Pipe made of titanium	Tantalum	Non-flow-type						4				
Pipe made of titanium	Tantalum	Flow-type						5				
Stainless steel pipe (mat. no. 1.4571)	Aluminum	Non-flow-type						6				
Stainless steel pipe (mat. no. 1.4571)	Tantalum	Non-flow-type						8				
Add-on electronics												
Without								0				
AUTOCAL function with 8 additional digital inputs/outputs each for channel 1								1				
AUTOCAL function with 8 additional digital inputs/outputs each for channel 2								2				
AUTOCAL function with 8 additional digital inputs/outputs for channel 1 and channel 2								3				
AUTOCAL function with serial interface for the automotive industry (AK)								5				
AUTOCAL function with 8 additional digital inputs/outputs each for channel 1 and channel 2 and PROFIBUS PA interface								6				
AUTOCAL function with 8 additional digital inputs/outputs each for channel 1 and channel 2 and PROFIBUS DP interface								7				
Auxiliary power												
100 ... 120 V AC, 48 ... 63 Hz										0		
200 ... 240 V AC, 48 ... 63 Hz										1		
Channel 2 Measured component	Possible with measuring range identification											
CO	11 ... 30										A	
CO highly selective (with optical filter) ²⁾	12 ... 30										B	
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 ⁴⁾	12 ... 30										N	
NO ⁴⁾	14 ... 30										P	
NH ₃ (dry)	14 ... 30										Q	
H ₂ O	17 ... 22										R	
N ₂ O	13 ... 30										S	
CO ³⁾	13, 15 ... 17, 19, 23, 25, 29										X	
Smallest measuring range	Largest measuring range	Measuring range identification										
0 ... 5 vpm	0 ... 100 vpm	10									A	
0 ... 10 vpm	0 ... 200 vpm	11									B	
0 ... 20 vpm	0 ... 400 vpm	12									C	
0 ... 50 vpm	0 ... 1 000 vpm	13									D	
0 ... 100 vpm	0 ... 1 000 vpm	14									E	
0 ... 300 vpm	0 ... 3 000 vpm	15									F	
0 ... 500 vpm	0 ... 5 000 vpm	16									G	
0 ... 1 000 vpm	0 ... 10 000 vpm	17									H	
0 ... 3 000 vpm	0 ... 10 000 vpm	18									J	
0 ... 3 000 vpm	0 ... 30 000 vpm	19									K	
0 ... 5 000 vpm	0 ... 15 000 vpm	20									L	
0 ... 5 000 vpm	0 ... 50 000 vpm	21									M	

Extractive continuous process gas analysis

Series 6

ULTRAMAT 6 / 19" rack unit

Selection and ordering data (Continued)

ULTRAMAT 6 gas analyzer			Article No.									
Two-channel 19" rack unit for installation in cabinets for measuring 2 IR components			7MB2123-	●	●	●	●	●	-	●	●	●
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
Language of the operating software												
German												0
English												1
French												2
Spanish												3
Italian												4

¹⁾ Only for cell lengths 20 to 180 mm.

²⁾ QAL1: See table "Performance tested according to EN 15267 (single component)".

³⁾ QAL1: See table "Based on QAL1 according to SIRA/MCERTS (single component)".

⁴⁾ QAL1: See tables "Based on QAL1 according to SIRA/MCERTS (single component)" and "Performance-tested according to EN 15267 (single component)".

Options	Order code
Add "-Z" to article number and then add order code	
Settings	
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 pipes(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
Set of Torx screwdrivers	A32
Without Siemens logo	B02
Tag plates (customized inscription)	B03
Kalrez gaskets in sample gas path (channel 1)	B04
Kalrez gaskets in sample gas path (channel 2)	B05

Extractive continuous process gas analysis

Series 6

ULTRAMAT 6 / 19" rack unit

Selection and ordering data (Continued)

Options	Order code
SIL Declaration of Conformity (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, channel 1+2)	Y02
Measuring range indication in plain text, if different from default 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
Hardware/software configuration conforming to QAL1 suitability test according to EN 14181:2004 (Channel 1)	Y17
German Technical Inspectorate version according to 13th and 17th German Federal Immission Protection Regulations (channel 2)	Y18
Performance-tested according to EN 15267 (channel 1)	Y27
Performance-tested according to EN 15267 (channel 2)	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 each 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

ULTRAMAT 6 gas analyzer			Article No.									
Single-channel or dual-channel 19" rack unit for installation in cabinets for measuring 2 or 3 IR components			7MB2124- ● ● ● ● ● - ● ● ● ●									
Click on the Article No. for online configuration in the PIA Life Cycle Portal.												
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".												
Gas connections for sample gas and reference gas												
Pipe with 6 mm outer diameter			0									
Pipe with 1/4" outer diameter			1									
Measured component	Smallest measuring range	Largest measuring range										
CO and NO ⁽¹⁾	0 ... 100 vpm	0 ... 1 000 vpm			A	A						
CO and NO ⁽¹⁾	0 ... 300 vpm	0 ... 3 000 vpm			A	B						
CO and NO ⁽¹⁾	0 ... 1 000 vpm	0 ... 10 000 vpm			A	C						
CO ₂ and CO	0 ... 100 vpm	0 ... 1 000 vpm			B	A						
CO ₂ and CO	0 ... 300 vpm	0 ... 3 000 vpm			B	B						
CO ₂ and CO	0 ... 1 000 vpm	0 ... 10 000 vpm			B	C						
CO ₂ and CO	0 ... 3 000 vpm	0 ... 30 000 vpm			B	D						

Extractive continuous process gas analysis

Series 6

ULTRAMAT 6 / 19" rack unit

Selection and ordering data (Continued)

ULTRAMAT 6 gas analyzer			Article No.									
Single-channel or dual-channel 19" rack unit for installation in cabinets for measuring 2 or 3 IR components			7MB2124-	●	●	●	●	●	-	●	●	●
CO ₂ and CO	0 ... 1%	0 ... 10%		B	E							
CO ₂ and CO	0 ... 3%	0 ... 30%		B	F							
CO ₂ and CO	0 ... 10%	0 ... 100%		B	G							
CO ₂ and CH ₄	0 ... 10%	0 ... 100%		C	G							
CO ₂ and NO	0 ... 300 vpm	0 ... 3 000 vpm		D	B							
Internal gas paths	Sample chamber²⁾ (lining)	Reference chamber (flow-type)										
Hose made of FKM (Viton)	Aluminum	Non-flow-type				0						
Hose made of FKM (Viton)	Aluminum	Flow-type				1						
Hose made of FKM (Viton) with sample gas monitoring	Aluminum	Non-flow-type				2						
Hose made of FKM (Viton) with sample gas monitoring	Aluminum	Flow-type				3						
Pipe made of titanium	Tantalum	Non-flow-type				4						
Pipe made of titanium	Tantalum	Non-flow-type				5						
Stainless steel pipe (mat. no. 1.4571)	Aluminum	Non-flow-type				6						
Stainless steel pipe (mat. no. 1.4571)	Aluminum	Non-flow-type				8						
Add-on electronics												
Without						0						
AUTOCAL function with 8 additional digital inputs/outputs each for channel 1						1						
AUTOCAL function with 8 additional digital inputs/outputs for channel 1 and channel 2						2						
AUTOCAL function with serial interface for the automotive industry (AK), channel 1						3						
AUTOCAL function with serial interface for the automotive industry (AK), channel 1 and channel 2						4						
AUTOCAL function with 8 additional digital inputs/outputs each for channel 1 and PROFIBUS PA interface						5						
AUTOCAL function with 8 additional digital inputs/outputs each for channel 1 and channel 2 and PROFIBUS PA interface						6						
AUTOCAL function with 8 additional digital inputs/outputs each for channel 1 and PROFIBUS DP interface						7						
AUTOCAL function with 8 additional digital inputs/outputs each for channel 1 and channel 2 and PROFIBUS DP interface						8						
Auxiliary power												
100 ... 120 V AC, 48 ... 63 Hz						0						
200 ... 240 V AC, 48 ... 63 Hz						1						
Channel 2 Measured component	Possible with measuring range identification											
CO	11 ... 30										A	
CO highly selective (with optical filter)	12 ... 30										B	
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⁾	12 ... 30										N	
NO ³⁾	14 ... 23, 25, 29										P	
NH ₃ (dry)	14 ... 30										Q	
H ₂ O	17 ... 30										R	
N ₂ O	13 ... 30										S	
Without channel 2											W	
CO ³⁾											X	
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	

Extractive continuous process gas analysis

Series 6

ULTRAMAT 6 / 19" rack unit

Selection and ordering data (Continued)

ULTRAMAT 6 gas analyzer			Article No.									
Single-channel or dual-channel 19" rack unit for installation in cabinets for measuring 2 or 3 IR components			7MB2124-	●	●	●	●	●	-	●	●	●
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
Without channel 2												X
Language of the operating software												
German												0
English												1
French												2
Spanish												3
Italian												4

¹⁾ QAL1: See table "Based on QAL1 according to SIRA/MCERTS (2 components in series)".

²⁾ Only for cell lengths 20 to 180 mm.

³⁾ QAL1: See table "Based on QAL1 according to SIRA/MCERTS (single component)".

Options	Order code
Add "-Z" to article number and then add order code	
Settings	
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 pipes(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 plates (customized inscription)	B03
Kalrez gaskets in sample gas path (channel 1)	B04
Kalrez gaskets in sample gas path (channel 2)	B05

Selection and ordering data (Continued)

Options	Order code
SIL Declaration of Conformity (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, channel 1+2)	Y02
Measuring range indication in plain text, if different from default 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
Hardware/software configuration conforming to QAL1 suitability test according to EN 14181:2004 (Channel 1)	Y17
Hardware/software configuration conforming to QAL1 suitability test according to EN 14181:2004 (Channel 2)	Y18

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 each 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

Note

See table QAL1 and order examples under "More information".

Extractive continuous process gas analysis

Series 6

ULTRAMAT 6 / 19" rack unit

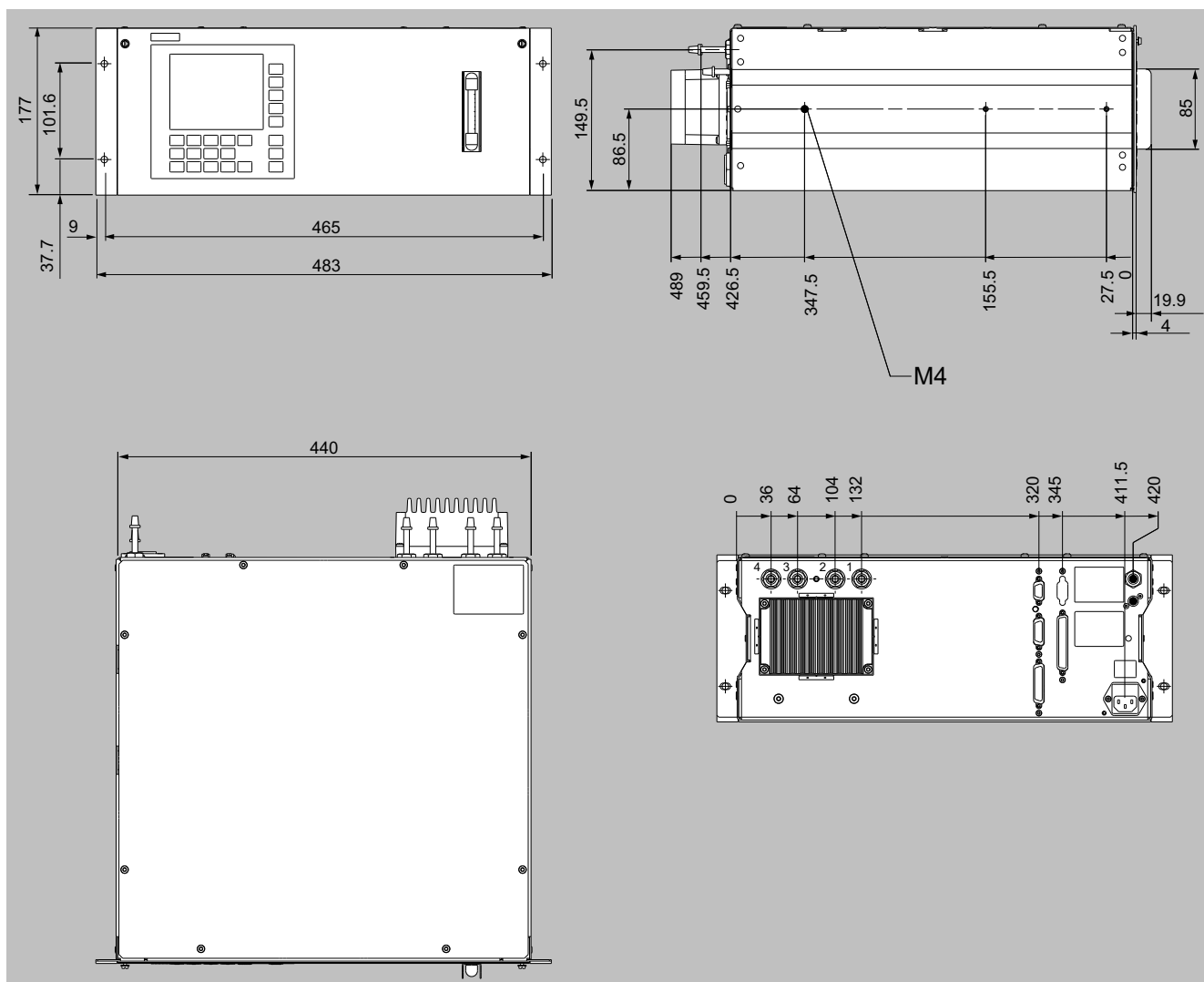
Technical specifications

ULTRAMAT 6, 19" rack unit	
General information	
Measuring ranges	4, internally and externally switchable; automatic measuring range switchover is also possible
Smallest possible measuring range	Dependent on the application: e.g. CO: 0 ... 10 vpm, CO ₂ : 0 ... 5 vpm
Largest possible measuring span	Dependent on the application
Measuring range with suppressed zero point	Any zero point within 0 ... 100 vol.% can be implemented; smallest possible span 20%
Operating position	Front wall, vertical
Conformity	CE mark in accordance with EN 50081-1, EN 50082-2
Influence of interference gases must be considered separately	
Design, enclosure	
Weight	Approx. 15 kg (with one IR channel) Approx. 21 kg (with two IR channels)
Degree of protection	IP20 according to EN 60529
Electrical characteristics	
EMC (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98)
Electrical safety	According to EN 61010-1, overvoltage category III
Auxiliary power	100 ... 120 V AC (nominal range of use 90 ... 132 V), 48 ... 63 Hz or 200 ... 240 V AC (nominal range of use 180 ... 264 V), 48 ... 63 Hz
Power consumption	1-channel device: approx. 40 VA 2-channel device: approx. 70 VA
Fuse ratings	100 ... 120 V: 1T/250 (7MB2121); 1.6T/250 (7MB2123) 200 ... 240 V: 0.63T/250 (7MB2121); T/250 (7MB2123)
Gas inlet conditions	
Permissible sample gas pressure	
• With hoses	
- Without pressure switch	600 ... 1 500 hPa (absolute)
- 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
Time 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 device at 1 l/min)	Approx. 0.5 ... 5 s, depending on the version
Time for device-internal signal processing	< 1 s
Pressure correction range	
Pressure sensor	
• Internal	700 ... 1 200 hPa absolute
• External	700 ... 1 500 hPa absolute
Measuring response	
	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation	< ± 1% of the smallest possible measuring range according to nameplate
Zero point drift	< ± 1% of the current measuring range/week
Measured value drift	< ± 1% of the current measuring range/week
Repeatability	≤ 1% of the current measuring range
Detection limit	1% of the smallest possible measuring range
Linearity error	± 0.5% of the measuring range end value

Technical specifications (Continued)

ULTRAMAT 6, 19" rack unit	
Influencing variables	
	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Ambient temperature	< 1% of current measuring range/10 K (with constant receiver cell temperature)
Sample gas pressure	- With enabled pressure compensation: < 0.15% of the measuring span/1% change in atmospheric pressure - With disabled pressure compensation: < 1.5% of the measuring span/1% change in atmospheric pressure
Sample gas flow	Negligible
Auxiliary power	< 0.1% of the current measuring range with nominal voltage ± 10%
Environmental conditions	Application-specific measuring influences possible if ambient air contains measured components or cross interference-sensitive gases
Electrical inputs and outputs	
Analog output	0/2/4 ... 20 mA, floating; load ≤ 750 Ω
Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load rating: 24 V AC/DC/1 A, floating, non-sparking
Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and accompanying gas influence correction (correction of cross-interference)
Digital inputs	6, designed for 24 V, floating, freely configurable, e.g. for measuring range switchover
Serial interface	RS 485
Options	AUTOCL 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 during storage and transportation (must not fall below dew point)

Dimensional drawings



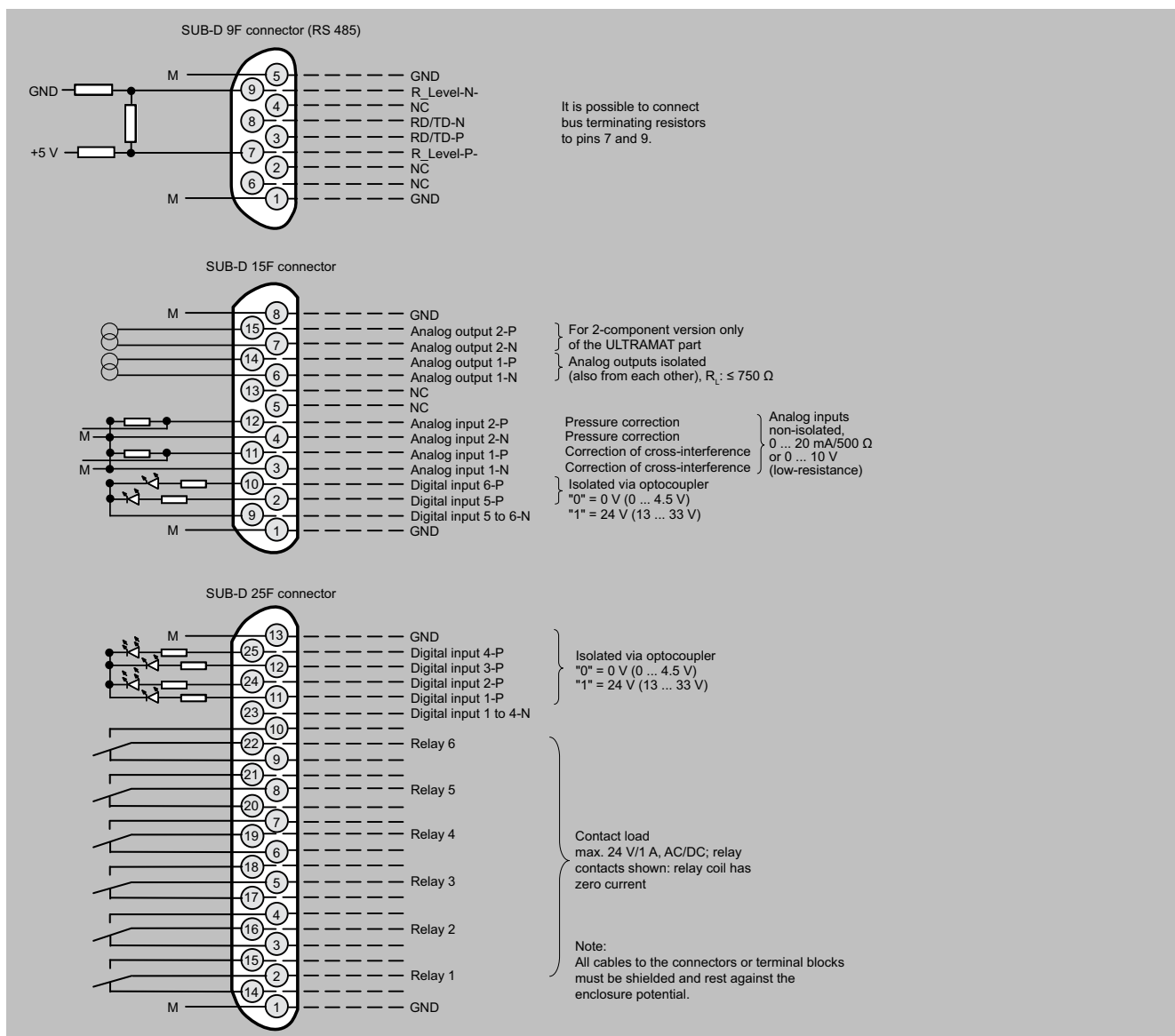
ULTRAMAT 6, 19" rack unit, dimensions in mm (example: 1-channel version)

Extractive continuous process gas analysis

Series 6

ULTRAMAT 6 / 19" rack unit

Circuit diagrams



ULTRAMAT 6, 19" rack unit, pin assignment

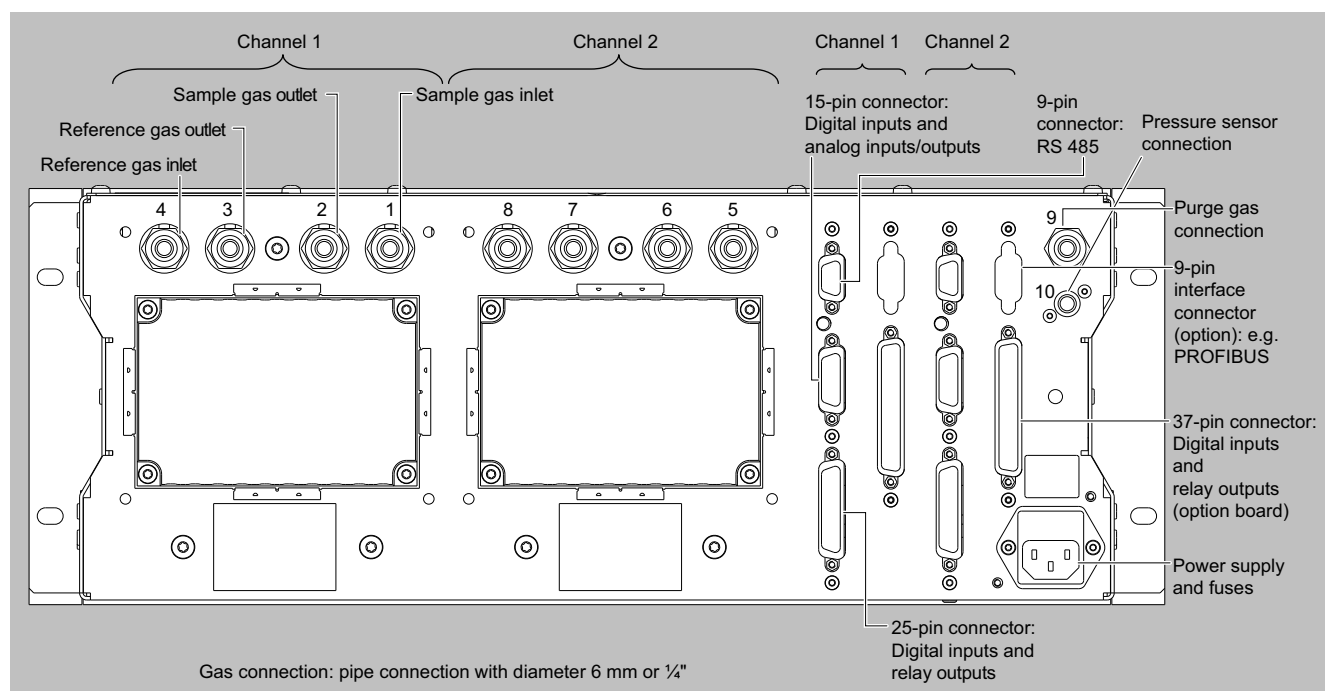
ULTRAMAT 6, 19" rack unit, pin assignment of the AUTOCAL board and PROFIBUS plugs

Extractive continuous process gas analysis

Series 6

ULTRAMAT 6 / 19" rack unit

Circuit diagrams (Continued)



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

More information

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

Only in conjunction with order code Y17/Y18

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

Ordering example

ULTRAMAT 6, QAL1

Component: CO

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

With hoses, non-flow-type reference cell

Without automatic adjustment (AUTOCAL)

230 V AC; German

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

Extractive continuous process gas analysis

Series 6

ULTRAMAT 6 / 19" rack unit

More information (Continued)**Performance-tested according to EN 15267 (single component)**

Only in conjunction with order code Y27/Y28

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

Ordering example

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 cell

With automatic calibration (AUTOCAL)

230 V AC; German

7MB2123-0BD03-1NC0-Z+Y27+Y28**Based on QAL1 according to SIRA/MCERTS (2 components in series)**

Only in conjunction with order code Y17

Component	CO (QAL1)		NO (QAL1)	
Measuring range identification	Smallest measuring range from 0 to ...	Largest measuring range from 0 to ...	Smallest measuring range from 0 to ...	Largest measuring range from 0 to ...
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

Ordering example

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 cell

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

Extractive continuous process gas analysis

Series 6

ULTRAMAT 6 / Field device

Selection and ordering data

ULTRAMAT 6 gas analyzer			Article No.									
For installation in the field, single-channel, 1 component			7MB2111- ● ● ● ● ● - ● ● A ●									
Click on the Article No. for online configuration in the PIA Life Cycle Portal.												
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".												
Gas connections												
Cutting ring fitting for pipe, outer diameter 6 mm										0		
Cutting ring fitting for pipe, outer diameter ¼"										1		
Measured component		Possible with measuring range identification										
CO		11 ... 30								A		
CO highly selective (with optical filter)		12 ... 30								B		
CO2		10 ... 30								C		
CH4		13 ... 30								D		
C2H2		15 ... 30								E		
C2H4		15 ... 30								F		
C2H6		14 ... 30								G		
C3H6		14 ... 30								H		
C3H8		13 ... 30								J		
C4H6		15 ... 30								K		
C4H10		14 ... 30								L		
C6H14		14 ... 30								M		
SO2¹)		12 ... 30								N		
NO¹)		14 ... 30								P		
NH3 (dry)		14 ... 30								Q		
H2O		17 ... 24, 26								R		
N2O		13 ... 30								S		
CO¹)										X		
Smallest measuring range	Largest measuring range	Measuring range identification										
0 ... 5 vpm	0 ... 100 vpm	10								A		
0 ... 10 vpm	0 ... 200 vpm	11								B		
0 ... 20 vpm	0 ... 400 vpm	12								C		
0 ... 50 vpm	0 ... 1 000 vpm	13								D		
0 ... 100 vpm	0 ... 1 000 vpm	14								E		
0 ... 300 vpm	0 ... 3 000 vpm	15								F		
0 ... 500 vpm	0 ... 5 000 vpm	16								G		
0 ... 1 000 vpm	0 ... 10 000 vpm	17								H		
0 ... 3 000 vpm	0 ... 10 000 vpm	18								J		
0 ... 3 000 vpm	0 ... 30 000 vpm	19								K		
0 ... 5 000 vpm	0 ... 15 000 vpm	20								L		
0 ... 5 000 vpm	0 ... 50 000 vpm	21								M		
0 ... 1%	0 ... 3%	22								N		
0 ... 1%	0 ... 10%	23								P		
0 ... 3%	0 ... 10%	24								Q		
0 ... 3%	0 ... 30%	25								R		
0 ... 5%	0 ... 15%	26								S		
0 ... 5%	0 ... 50%	27								T		
0 ... 10%	0 ... 30%	28								U		
0 ... 10%	0 ... 100%	29								V		
0 ... 30%	0 ... 100%	30								W		
Internal gas paths	Sample chamber (lining)	Reference chamber (flow-type)										
Hose made of FKM (Viton)	Aluminum	Non-flow-type								0		
Hose made of FKM (Viton)	Aluminum	Flow-type								1		
Pipe made of titanium	Tantalum²)	Non-flow-type								2		
Pipe made of titanium	Tantalum²)	Flow-type								3		
Stainless steel pipe (mat. no. 1.4571)	Aluminum	Non-flow-type								6		
Stainless steel pipe (mat. no. 1.4571)	Tantalum²)	Non-flow-type								8		
Add-on electronics												
Without										0		
AUTOCAL function with 8 additional digital inputs/outputs each										1		
AUTOCAL function 8 additional digital inputs/outputs and PROFIBUS PA interface										6		

Extractive continuous process gas analysis

Series 6

ULTRAMAT 6 / Field device

Selection and ordering data (Continued)

ULTRAMAT 6 gas analyzer		Article No.									
For installation in the field, single-channel, 1 component		7MB2111- ● ● ● ● ● - ● ● A ●									
AUTOCAL function with 8 additional digital inputs/outputs and PROFIBUS DP interface								7			
AUTOCAL function with 8 additional digital inputs/outputs and PROFIBUS PA Ex i								8			
Auxiliary power											
Standard device acc. to ATEX II 3G version (Zone 2)											
• 100 ... 120 V AC, 48 ... 63 Hz									0		
• 200 ... 240 V AC, 48 ... 63 Hz									1		
ATEX II 2G versions (Zone 1), including certificate											
• 100 ... 120 V AC, 48 ... 63 Hz, according to ATEX II 2G ³⁾ (operation mode: leakage compensation)									2		
• 200 ... 240 V AC, 48 ... 63 Hz, according to ATEX II 2G ³⁾ (operation mode: leakage compensation)									3		
• 100 ... 120 V AC, 48 ... 63 Hz, according to ATEX II 2G ³⁾ (operation mode: continuous purging)									6		
• 200 ... 240 V AC, 48 ... 63 Hz, according to ATEX II 2G ³⁾ (operation mode: continuous purging)									7		
Heating of internal gas paths and analyzer unit											
Without										A	
With (max. 65 °C)										B	
Language of the operating software											
German											0
English											1
French											2
Spanish											3
Italian											4

¹⁾ QAL1: See table "Based on QAL1 according to SIRA/MCERTS (single component)" under "More information".

¹⁾ Only for cell lengths 20 to 180 mm

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

ULTRAMAT 6 gas analyzer			Article No.									
For installation in the field, single-channel, 2 components			7MB2112- ● ● ● ● ● - ● ● A ●									
Click on the Article No. for online configuration in the PIA Life Cycle Portal.												
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".												
Gas connections												
Cutting ring fitting for pipe, outer diameter 6 mm								0				
Cutting ring fitting for pipe, outer diameter 1/4"								1				
Measured component	Smallest measuring range	Largest measuring range										
CO and NO ³⁾	0 ... 100 vpm	0 ... 1 000 vpm						A	A			
CO and NO ³⁾	0 ... 300 vpm	0 ... 3 000 vpm						A	B			
CO and NO ³⁾	0 ... 1 000 vpm	0 ... 10 000 vpm						A	C			
CO ₂ and CO	0 ... 100 vpm	0 ... 1 000 vpm						B	A			
CO ₂ and CO	0 ... 300 vpm	0 ... 3 000 vpm						B	B			
CO ₂ and CO	0 ... 1 000 vpm	0 ... 10 000 vpm						B	C			
CO ₂ and CO	0 ... 3 000 vpm	0 ... 30 000 vpm						B	D			
CO ₂ and CO	0 ... 1%	0 ... 10%						B	E			
CO ₂ and CO	0 ... 3%	0 ... 30%						B	F			
CO ₂ and CO	0 ... 10%	0 ... 100%						B	G			
CO ₂ and CH ₄	0 ... 10%	0 ... 100%						C	G			
CO ₂ and NO	0 ... 100 vpm	0 ... 1 000 vpm						D	A			
CO ₂ and NO	0 ... 300 vpm	0 ... 3 000 vpm						D	B			
Internal gas paths	Sample chamber (lining)	Reference chamber (flow-type)										
Hose made of FKM (Viton)	Aluminum	Non-flow-type								0		
Hose made of FKM (Viton)	Aluminum	Flow-type								1		
Pipe made of titanium	Tantalum ¹⁾	Non-flow-type								2		
Pipe made of titanium	Tantalum ¹⁾	Flow-type								3		
Stainless steel pipe (mat. no. 1.4571)	Aluminum	Non-flow-type								6		
Stainless steel pipe (mat. no. 1.4571)	Tantalum ¹⁾	Non-flow-type								8		
Add-on electronics												
Without										0		

Extractive continuous process gas analysis

Series 6

ULTRAMAT 6 / Field device

Selection and ordering data (Continued)

		Article No.									
ULTRAMAT 6 gas analyzer		7MB2112- ● ● ● ● ● - ● ● A ●									
For installation in the field, single-channel, 2 components											
AUTOCAL function with 8 additional digital inputs/outputs each								1			
AUTOCAL function 8 additional digital inputs/outputs and PROFIBUS PA interface								6			
AUTOCAL function with 8 additional digital inputs/outputs and PROFIBUS DP interface								7			
AUTOCAL function with 8 additional digital inputs/outputs and PROFIBUS PA Ex i								8			
Auxiliary power											
Standard device acc. to ATEX II 3G version (Zone 2)											
• 100 ... 120 V AC, 48 ... 63 Hz									0		
• 200 ... 240 V AC, 48 ... 63 Hz									1		
ATEX II 2G versions (Zone 1), including certificate											
• 100 ... 120 V AC, 48 ... 63 Hz, according to ATEX II 2G ²⁾ (operation mode: continuous purging)									6		
• 200 ... 240 V AC, 48 ... 63 Hz, according to ATEX II 2G ²⁾ (operation mode: continuous purging)									7		
Heating of internal gas paths and analyzer unit											
Without										A	
With (max. 65 °C)										B	
Language (supplied documentation, software)											
German											0
English											1
French											2
Spanish											3
Italian											4

¹⁾ Only for cell lengths 20 to 180 mm

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

³⁾ QAL1: See table "Based on QAL1 according to SIRA/MCERTS (2 components in series)" under "More information".

Options	Order code
Add "-Z" to article number and then add order code	
Settings	
Flow-type reference cell with reduced flow, 6 mm	A28
Flow-type reference cell with reduced flow, 1/4"	A29
Set of Torx screwdrivers	A32
Tag plates (customized inscription)	B03
Kalrez gaskets in sample gas path	B04
SIL Declaration of Conformity (SIL 2) Functional Safety according to IEC 61508 and IEC 61511	C20
Ex versions	
For combination options see "Ex configurations – principle selection criteria series 6" table, "General information" section	
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 hazardous zone acc. to ATEX II 3G, non-flammable gases ¹⁾	E41
• In hazardous zone acc. to ATEX II 3G, flammable gases	E42

Selection and ordering data (Continued)

Options	Order code
BARTEC Ex p purging unit for use in ATEX or IECEx Zone 1	E74
• BARTEC Ex p control unit for continuous flow	
• BARTEC Ex e control station with bypass key switch	
BARTEC Ex purging unit for use in ATEX or IECEx Zone 1	E75
• BARTEC Ex p control unit for continuous flow	
• BARTEC Ex control station with bypass key switch	
• Operator display for visualization of system states	
Clean for O ₂ service (specially cleaned gas path)	Y02
Measuring range indication in plain text, if different from default 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
Hardware/software configuration conforming to QAL1 suitability test according to EN 14181:2004	Y17

¹⁾ Only in connection with an approved purging unit

Additional units for Ex versions	Article No.
ATEX Category II 2G (Zone 1)	
BARTEC Ex p purging unit for use in ATEX or IECEx Zone 1	
• BARTEC Ex p control unit for continuous flow	7MB8000-7CA
• BARTEC Ex control station with bypass key switch	
• BARTEC Ex p control unit for continuous flow	7MB8000-7CB
• BARTEC Ex control station with bypass key switch	
• Operator display for visualization of system states	
Ex isolating relay, 230 V	7MB8000-4AA
Ex isolating relay, 110 V	7MB8000-4AB
EX isolation amplifier	7MB8000-3AB
Differential pressure switch for corrosive and non-corrosive gases	7MB8000-5AA
Stainless steel flame arrestor	7MB8000-6BA
Hastelloy flame arrestor	7MB8000-6BB
ATEX Category II 3G (Zone 2)	
BARTEC Ex p purging unit for use in ATEX or IECEx Zone 1	
• BARTEC Ex p control unit for continuous flow	7MB8000-7CA
• BARTEC Ex control station with bypass key switch	
• BARTEC Ex p control unit for continuous flow	7MB8000-7CB
• BARTEC Ex control station with bypass key switch	
• Operator display for visualization of system states	
FM/CSA (Class I Div 2)	
Ex purging unit MiniPurge FM	7MB8000-1AA

Extractive continuous process gas analysis

Series 6

ULTRAMAT 6 / Field device

Selection and ordering data (Continued)

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

Note

See table QAL1 and order examples under "More information".

Technical specifications

ULTRAMAT 6, field device	
General information	
Measuring ranges	4, internally and externally switchable; automatic measuring range switchover is also possible
Smallest possible measuring range	Dependent on the application, e.g. CO: 0 ... 10 vpm, CO ₂ : 0 ... 5 vpm
Largest possible measuring range	Dependent on the application
Measuring range with suppressed zero point	Any zero point within 0 ... 100 vol.% can be implemented; smallest possible span 20%
Heated version	65 °C
Operating position	Front wall, vertical
Conformity	CE mark in accordance with EN 50081-1, EN 50082-2
Influence of interference gases must be considered separately	
Design, enclosure	
Weight	Approx. 32 kg
Degree of protection	IP65 in accordance with EN 60529, restricted breathing enclosure according to EN 50021
Electrical characteristics	
Auxiliary power	100 ... 120 V AC (nominal range of use 90 ... 132 V), 48 ... 63 Hz or 200 ... 240 V AC (nominal range of use 180 ... 264 V), 48 ... 63 Hz
Power consumption	Approx. 35 VA; approx. 330 VA with heated version
EMC (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98)
Electrical safety	In accordance with EN 61010-1
• Heated devices	Overvoltage category II
• Unheated devices	Overvoltage category III
Fuse ratings (unheated device)	100 ... 120 V: F3 1T/250; F4 1T/250 200 ... 240 V: F3 0.63T/250; F4 0.63T/250
Fuse ratings (heated device)	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
Gas inlet conditions	
Permissible sample gas pressure	
• With hoses (without pressure switch)	600 ... 1 500 hPa (absolute)
• With pipes (without pressure switch)	600 ... 1 500 hPa (absolute)
- Ex (leakage compensation)	600 ... 1 160 hPa (absolute)
- Ex (continuous purging)	600 ... 1 500 hPa (absolute)

Technical specifications (Continued)

ULTRAMAT 6, field device	
Purging gas pressure	
• 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
Time 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 device at 1 l/min)	Approx. 0.5 ... 5 s, depending on the version
Time for device-internal signal processing	< 1 s
Pressure correction range	
Pressure sensor	
• Internal	700 ... 1 200 hPa absolute
• External	700 ... 1 500 hPa absolute
Measuring response	
	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation	< ± 1% of the smallest possible measuring range according to nameplate
Zero point drift	< ± 1% of the current measuring range/week
Measured value drift	< ± 1% of the current measuring range/week
Repeatability	≤ 1% of the current measuring range
Detection limit	1% of the smallest possible measuring range
Linearity error	± 0.5% of the measuring range end value
Influencing variables	
	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Ambient temperature	< 1% of current measuring range/10 K (with constant receiver cell temperature)
Sample gas pressure	With enabled pressure compensation: < 0.15% of the setpoint/1% change in atmospheric pressure
Sample gas flow	Negligible
Auxiliary power	< 0.1% of the current measuring range with nominal voltage ± 10%

Technical specifications (Continued)

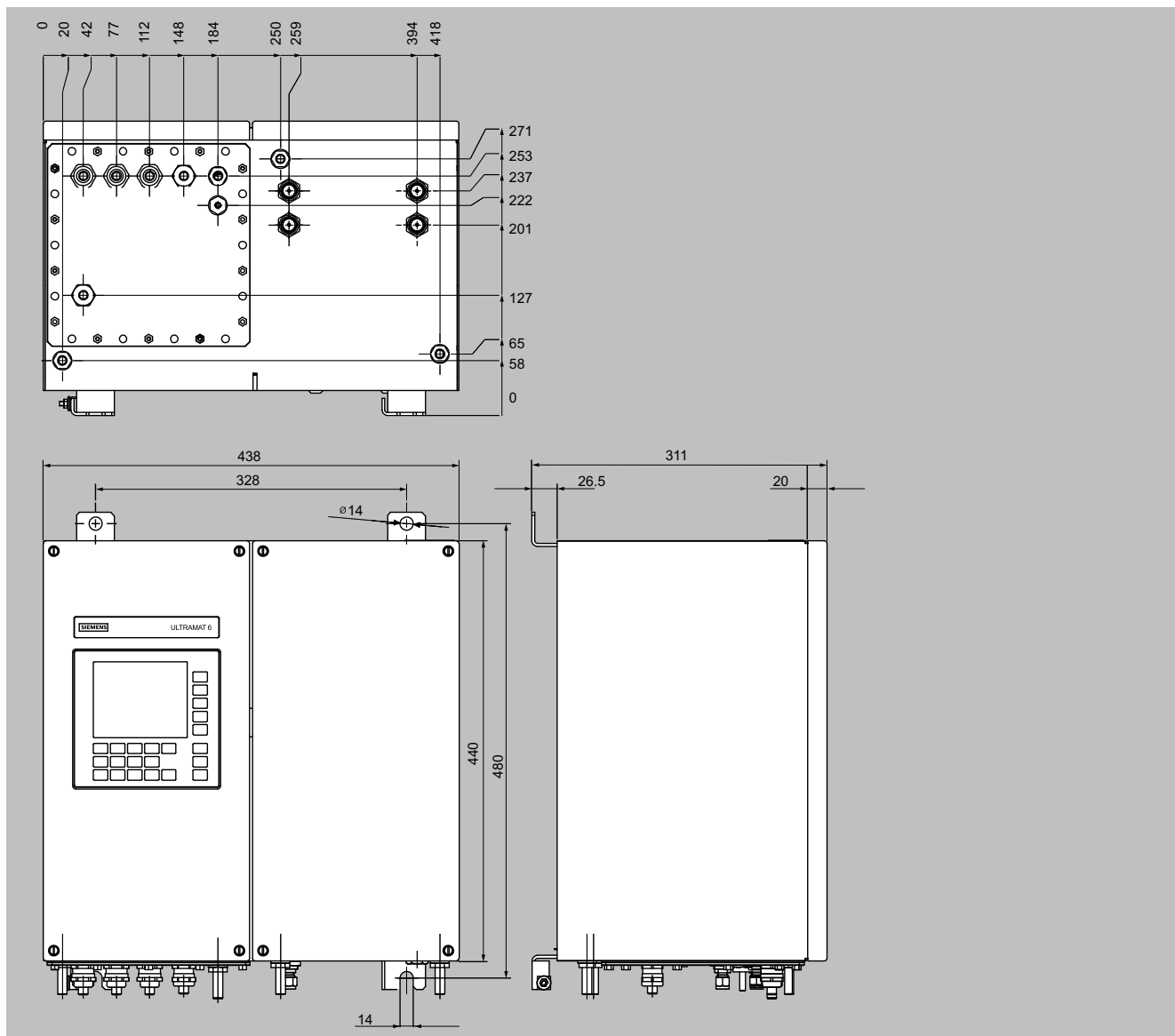
ULTRAMAT 6, field device	
Environmental conditions	Application-specific measuring influences possible if ambient air contains measured component or cross interference-sensitive gases
Electrical inputs and outputs	
Analog output	0/2/4 ... 20 mA, floating; load 750 Ω
Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load rating: 24 V AC/DC/1 A, floating, non-sparking
Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and accompanying gas influence correction (correction of cross-interference)
Digital inputs	6, designed for 24 V, floating, freely configurable, e.g. for measuring range switchover
Serial interface	RS 485
Options	AUTOCAL function each with 8 additional digital inputs and relay outputs, also with PROFIBUS PA or PROFIBUS DP
Climatic conditions	
Permissible ambient temperature	-30 ... +70 °C during storage and transportation; 5 ... 45 °C during operation
Permissible humidity	< 90% RH (RH: relative humidity) within average annual value, during storage and transportation (must not fall below dew point)

Extractive continuous process gas analysis

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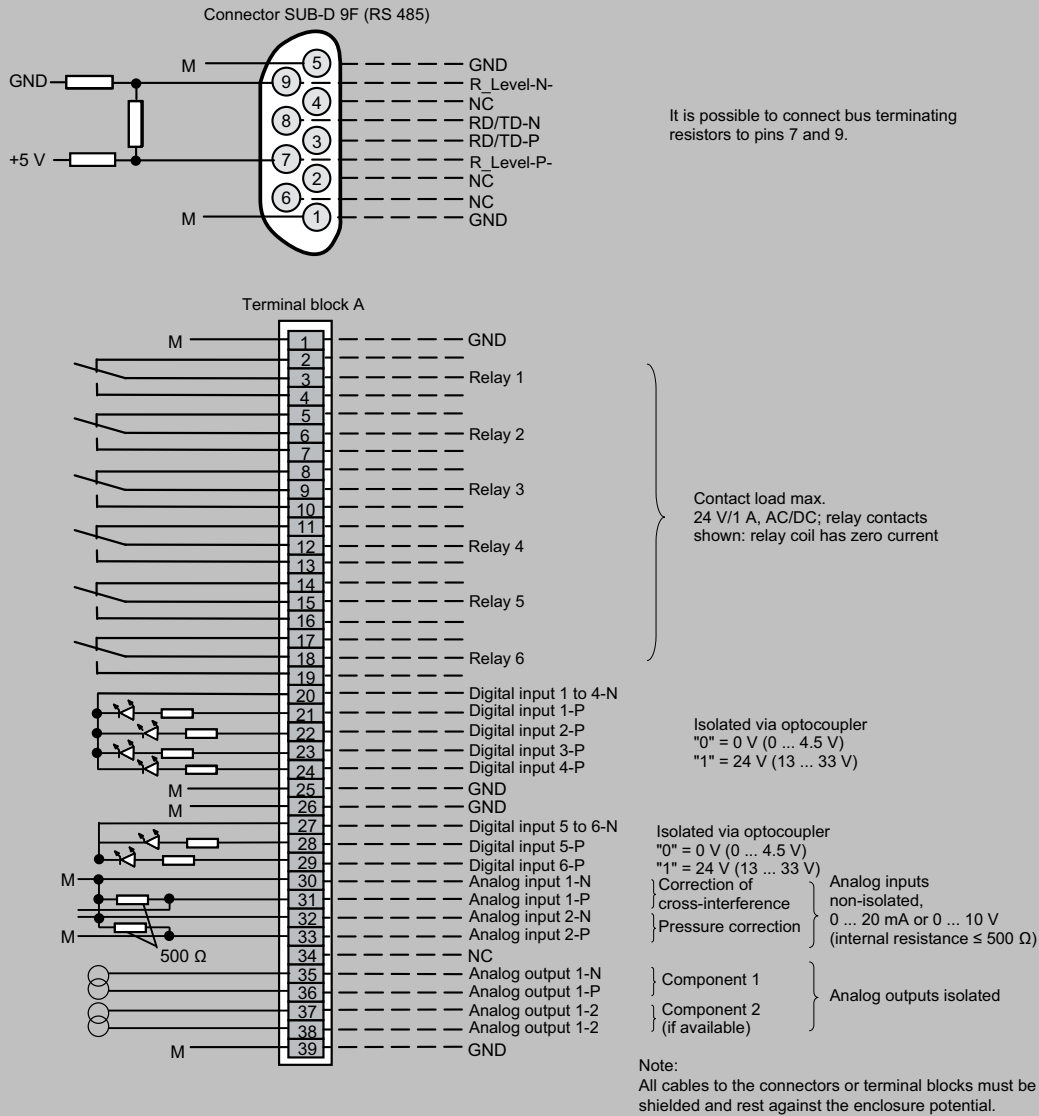
ULTRAMAT 6 / Field device

Dimensional drawings



ULTRAMAT 6, field unit, dimensions in mm

Circuit diagrams



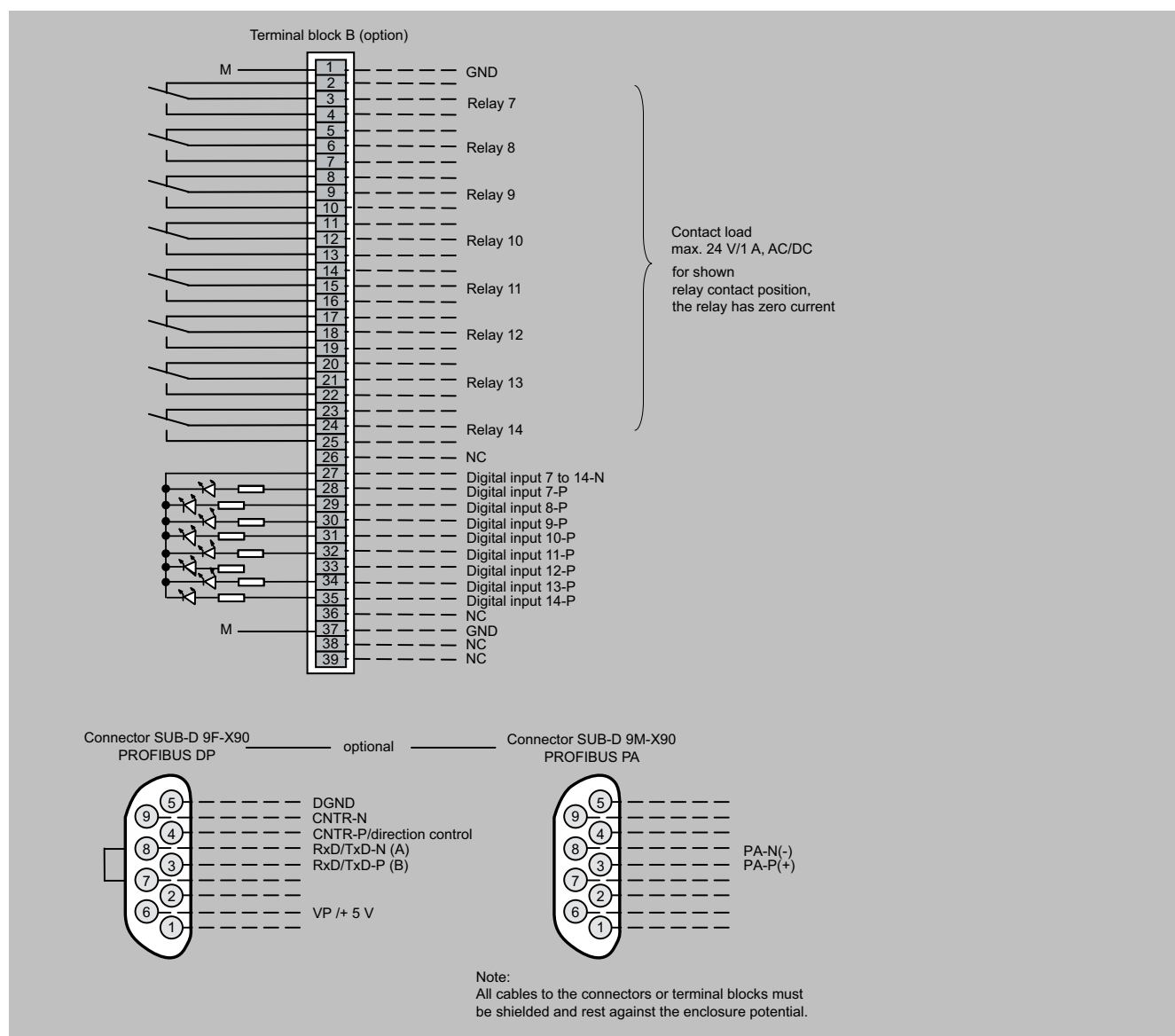
ULTRAMAT 6, field device, pin and terminal assignment

Extractive continuous process gas analysis

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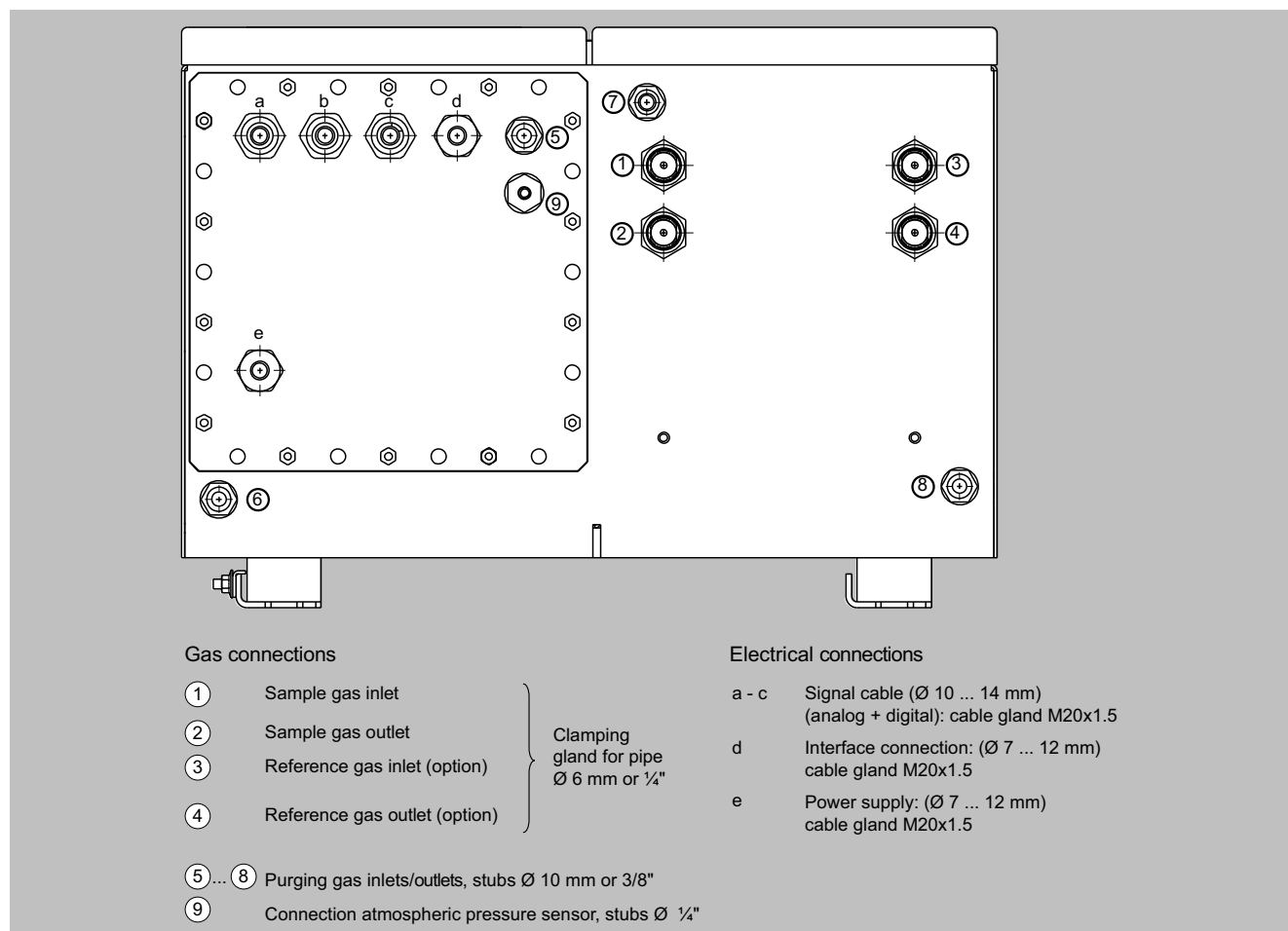
ULTRAMAT 6 / Field device

Circuit diagrams (Continued)



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

Circuit diagrams (Continued)



ULTRAMAT 6, field device, gas connections and electrical connections

More information

Based on QAL1 according to SIRA/MCERTS (single component)Only with additional suffix Z (Y17, Y18)

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

Ordering example

ULTRAMAT 6, QAL1 (1-component unit)

Component: CO

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

With hoses, non-flow-type reference cell

Extractive continuous process gas analysis

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ULTRAMAT 6 / Field device

More information (Continued)

Without automatic adjustment (AUTOCAL)
230 V AC; Without heating, German
7MB2111-0XD00-1AA0-Z +Y17

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

Component	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

Ordering example

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 cell

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 N₂O

Certification 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 / Suggestion for spare parts

Selection and ordering data

Description	7MB2121	7MB2123	7MB2124	7MB2111	7MB2112	7MB2111/- 2 Ex	2 years (unit)	5 years (unit)	Article No.
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-D50-1
Sample gas path									
O-ring (hose gland)				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 gland	x	x	x	x	x	x		1	C79451-A3478-C9
Heating cartridge (heated device)				x	x	x		1	W75083-A1004-F12-0
Electronics									
Temperature fuse (heated device)				x	x			1	W75054-T1001-A15-0
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 device)				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
Plug-in 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-T63-0
Fusible element, T 1 A/250 V	x	x	x	x	x	x	2	3	W79054-L1011-T10-0
Fusible element, T 1.6 A/250 V		x	x				2	3	W79054-L1011-T16-0
Fusible element, T 2.5 A/250 V				x	x	x	2	3	W79054-L1011-T25-0

If the ULTRAMAT 6 was supplied with a specially cleaned gas path for high oxygen content (so-called "Clean for O₂ service"), please specify when ordering spare parts. This is the only way to ensure that the gas path will continue to comply with the special requirements of this version.

More information

If the ULTRAMAT 6 was supplied with a specially cleaned gas path for high oxygen content (so-called "Clean for O₂ service"), please specify this when ordering spare parts. This is the only way to ensure that the gas path will continue to comply with the special requirements for this version.

Extractive continuous process gas analysis

Series 6

ULTRAMAT/OXYMAT 6

Overview



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

The ULTRAMAT 6 measurement channel functions according to the NDIR dual-beam differential mode process and highly selectively measures gases whose absorption bands are in the infrared wavelength range between 2 and 9 μm , for example CO , CO_2 , NO , SO_2 , NH_3 , H_2O as well as CH_4 and other hydrocarbons. The OXYMAT 6 measurement channel is based on the paramagnetic alternating pressure method and is used to measure oxygen in gases.

Benefits

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

ULTRAMAT channel

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

OXYMAT channel

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

Application

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

Special versions

Special applications

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

Performance-tested version / QAL

For measurements of CO , NO , SO_2 and O_2 according to sections 13 and 27 of the German Federal Immission Protection Regulations and TA Luft, performance-tested versions according to EN 15267 of the ULTRAMAT/OXYMAT 6 are available.

Certified measuring range:

- 1-component analyzer
 - CO : 0 to 75 mg/m^3 ; 0 to 10 000 mg/m^3
 - NO : 0 to 100 mg/m^3 ; 0 to 10 000 mg/m^3
 - SO_2 : 0 to 75 mg/m^3 ; 0 to 1 500 mg/m^3
- O_2 : 0 to 5 vol.%; 0 to 25 vol.%

All larger measuring ranges are also approved.

In addition, performance-tested versions of the ULTRAMAT/OXYMAT 6 meet the requirements set forth in EN 14956 and QAL1 according to EN 14181. Conformity of the analyzers with both standards is TÜV-certified.

Determination of the analyzer drift according to EN 14181 (QAL3) 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 cell

- The flow through the reference cell should be adapted to the sample gas flow
- The gas supply of the reduced flow-type reference cell should have a primary 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 U for installation
 - In hinged frame
 - In cabinets with or without telescopic 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)

Display and operator 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 measuring 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
- Expandable with 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

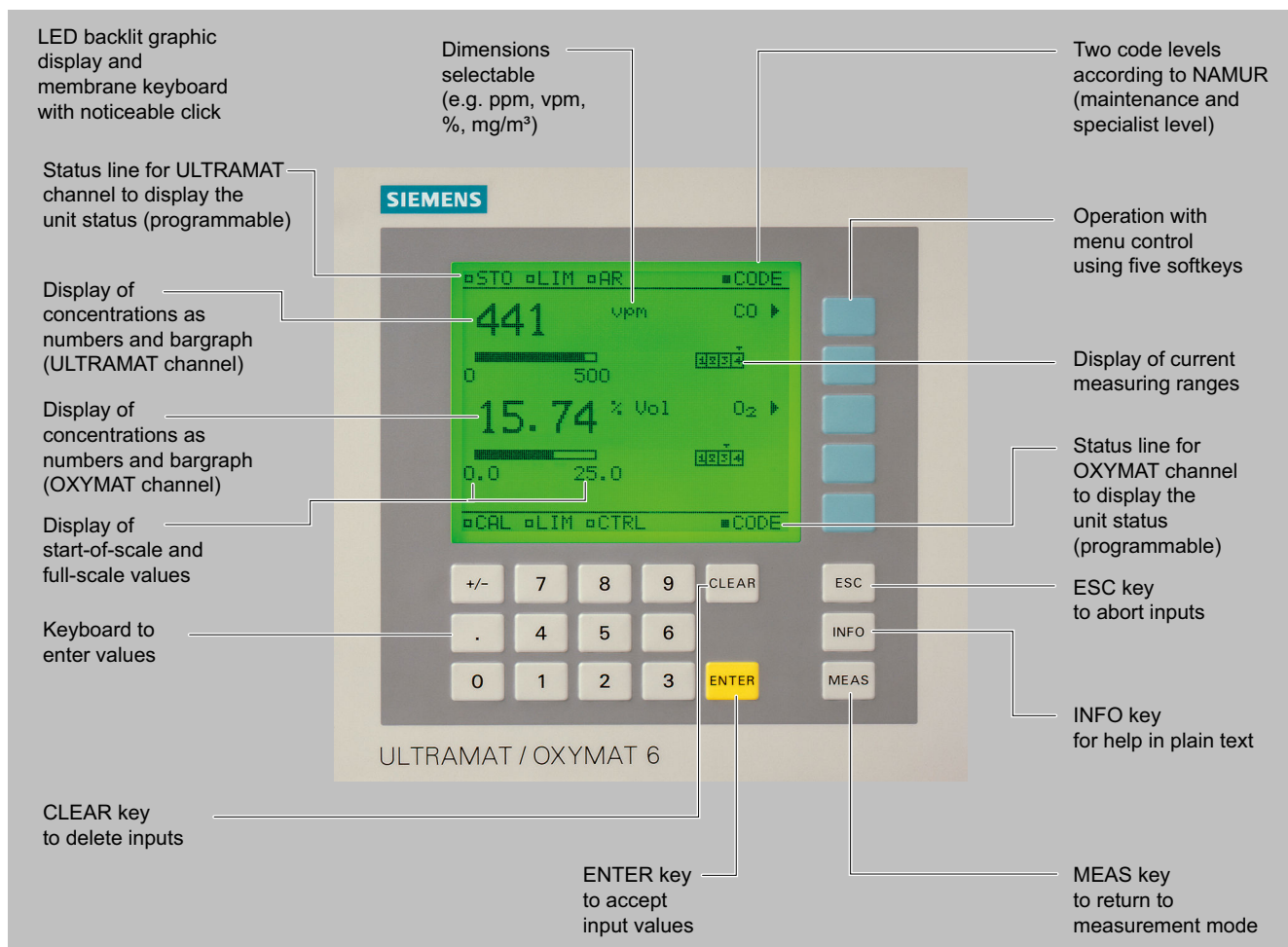
- AK interface for the automotive industry with extended functions
- RS 485/RS 232 converter
- RS 485/Ethernet converter
- RS 485/USB converter
- Connection to networks via PROFIBUS DP/PA interface
- SIPROM GA software as the service and maintenance tool

Extractive continuous process gas analysis

Series 6

ULTRAMAT/OXYMAT 6

Design (Continued)



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
	• Window	O-Ring: FKM (e.g. Viton) or FFKM (Kalrez)
		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)

Design (Continued)

Gas path ULTRAMAT channel		19" rack unit
With pipes	• Window	CaF ₂ , adhesive: E353 O-Ring: FKM (e.g. Viton) or FFKM (Kalrez)
	Bushing Pipe Sample chamber: • Body • Lining • Window	Stainless steel, mat. no. 1.4571 Stainless steel, mat. no. 1.4571 O-Ring: FKM (e.g. Viton) or FFKM (Kalrez) Aluminum Aluminum or tantalum (Ta: only for cell length 20 mm to 180 mm) CaF ₂ , adhesive: E353 O-Ring: FKM (e.g. Viton) or FFKM (Kalrez)
Flow indicator	Measuring tube	Duran glass
	Variable area	Duran glass
	Suspension boundary	PTFE (Teflon)
	Angle units	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	Measuring tube	Duran glass
	Variable area	Duran glass
	Suspension boundary	PTFE (Teflon)
	Angle units	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)

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)

Extractive continuous process gas analysis

Series 6

ULTRAMAT/OXYMAT 6

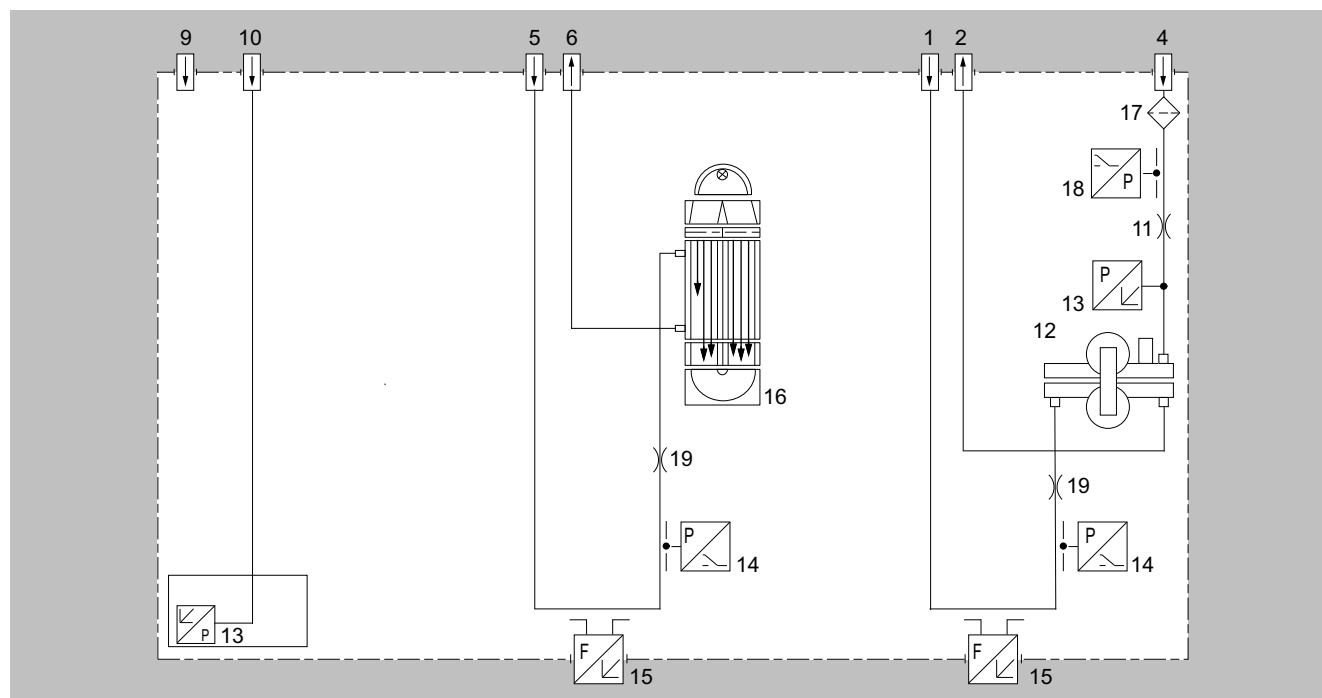
Design (Continued)

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

Options

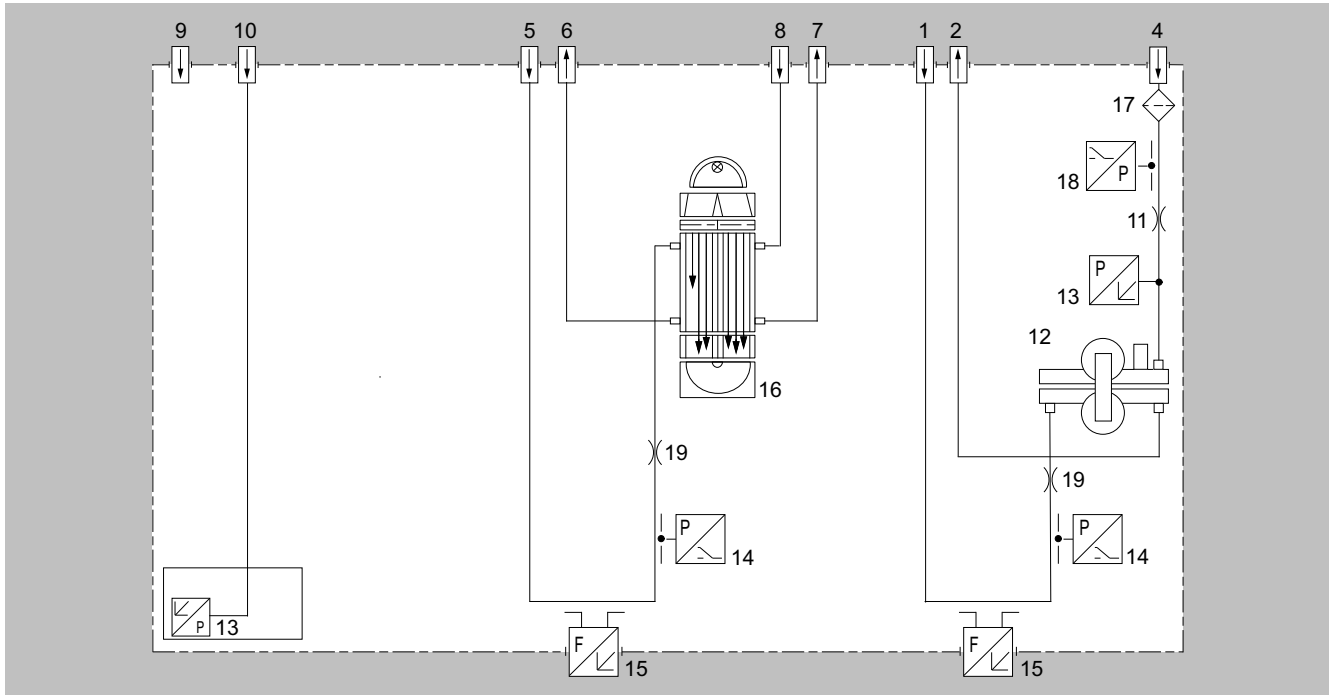
Gas path ULTRAMAT channel and OXYMAT channel		19" rack unit
Flow indicator	Measuring tube	Duran glass
	Variable area	Duran glass
	Suspension boundary	PTFE (Teflon)
	Angle units	FKM (e.g. Viton)
Pressure switch	Diaphragm	FKM (e.g. Viton)
	Enclosure	PA 6.3T

Gas path



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

Design (Continued)



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

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 physical system
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)		

Extractive continuous process gas analysis

Series 6

ULTRAMAT/OXYMAT 6

Mode of operation

ULTRAMAT channel

The ULTRAMAT channel operates according to the infrared two-beam modulated 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 chamber (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 chamber 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 detector chamber layer optically. The infrared absorption in the second detector chamber 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

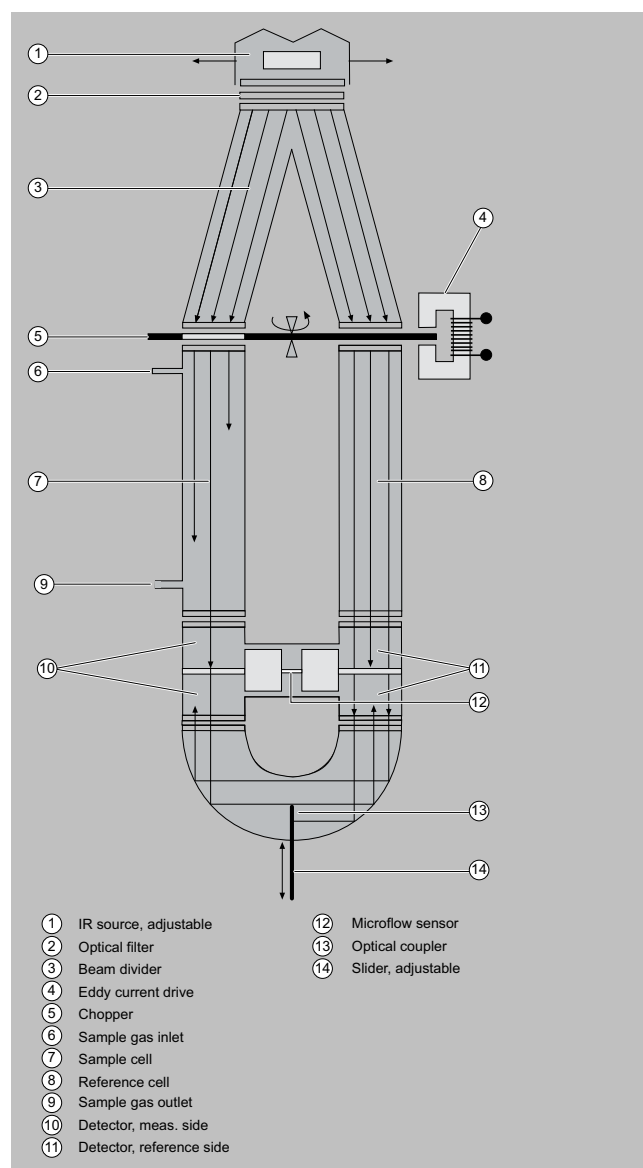
The sample gases must be fed into the analyzers free of dust. Condensation in the sample chambers must be prevented. Therefore, the use of gas modified for the measuring task is necessary in most application cases.

As far as possible, the ambient air of the analyzer unit should not have a large concentration of the gas components to be measured. Flow-type reference cells with reduced flow must not be operated with flammable or toxic gases.

Flow-type reference cells 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.

Mode of operation (Continued)



ULTRAMAT channel, 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 (N₂, O₂ 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 resist-

Mode of operation (Continued)

ors, 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 sample chamber position as well as the gas analyzer's operating position.

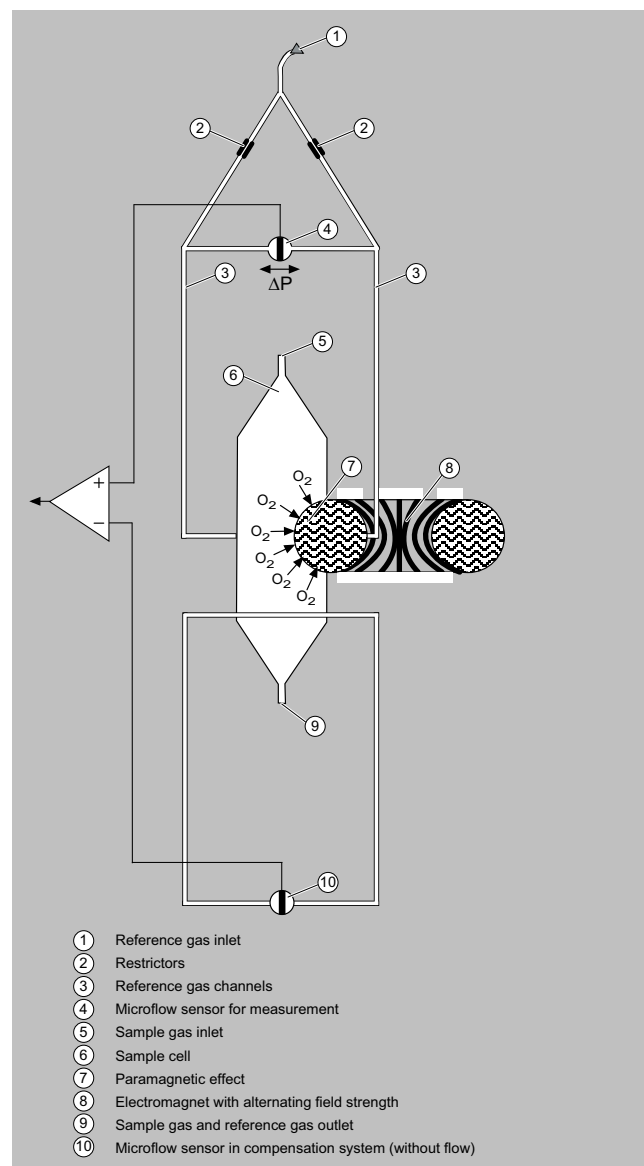
The sample chamber is directly in the sample path and has a small volume, and the microflow sensor is a low-lag sensor. This results in a very short response time.

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.

Mode of operation (Continued)

OXYMAT channel, principle of operation

Extractive continuous process gas analysis

Series 6

ULTRAMAT/OXYMAT 6

Function

Main features

- Dimension of measured value freely selectable (e.g. vpm, mg/m³)
- Four freely parameterizable measuring ranges per component
- Measuring ranges with suppressed zero point possible
- Measuring range identification
- Electrically isolated measured value output 0/2/4 up to 20 mA per component
- Automatic or manual measuring range switchover selectable; remote switching is also possible
- Storage of measured values possible during calibration
- Wide range of selectable time constants (static/dynamic noise damping); i.e. the response time of the device or component can be adapted to the respective measuring task
- Short response time
- Low long-term drift
- Measuring point switchover for up to 6 measuring points (parameterizable)
- Measuring point identification
- Monitoring of sample gas flow (option)
- Two input levels with separate authorization codes to prevent unintentional and unauthorized operator intervention
- Automatic measuring range calibration parameterizable
- Simple handling using a numerical membrane keyboard and operator prompting
- Operation based on NAMUR recommendation
- Custom-made device designs, such as:
 - Customer acceptance
 - TAG plates
 - 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 spans (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 sample and reference gases with significantly different densities
- 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 for OXYMAT channel

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 ¹⁾	O ₂	2 000 ... 4 000 hPa above sample gas pressure (max. 5 000 hPa absolute)	
Approx. 21 vol.% O ₂ ²⁾	Air	100 hPa with respect to sample gas pressure, which may vary by max. 50 hPa around the air pressure	

¹⁾ Suppressed zero point with measuring range end value 100 vol.% O₂.

²⁾ Suppressed zero point with 21 vol.% O₂ within the measuring span.

Function (Continued)

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

Accompanying gas (concentration 100 vol.%)	Zero point deviation in vol.% O ₂ absolute	Accompanying gas (concentration 100 vol.%)	Zero point deviation 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	
Isobutane C ₄ H ₁₀	-1.30	Ammonia NH ₃	-0.20
1-butene C ₄ H ₈	-0.96	Hydrogen bromide HBr	-0.76
Isobutene 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
Isopentane 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		

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 zero point deviations listed in the table must be multiplied by an adjustment factor (k):

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

All diamagnetic gases have a negative zero point deviation.

Extractive continuous process gas analysis

Series 6

ULTRAMAT/OXYMAT 6 / 19" rack unit

Selection and ordering data

			Article No.									
ULTRAMAT/OXYMAT 6 gas analyzer			7MB2023- ● ● ● ● ● - ● ● ● ●									
19" rack unit for installation in cabinets												
Combined measurement of IR-absorbing gas and O ₂												
Click on the Article No. for online configuration in the PIA Life Cycle Portal.												
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".												
Gas connections for sample gas and reference gas												
Pipe with 6 mm outer diameter			0									
Pipe with 1/4" outer diameter			1									
Smallest possible measuring span O₂												
0.5% reference gas pressure 3 000 hPa			A									
0.5% reference gas pressure 100 hPa (external pump)			B									
2% reference gas pressure 3 000 hPa			C									
2% reference gas pressure 100 hPa (external pump)			D									
5% reference gas pressure 3 000 hPa			E									
5% reference gas pressure 100 hPa (external pump)			F									
Sample chamber (OXYMAT channel)												
Non-flow-type compensation branch												
• Made of stainless steel, mat. no. 1.4571			A									
• Made of tantalum			B									
Flow-type compensation branch												
• Made of stainless steel, mat. no. 1.4571			C									
• Made of tantalum			D									
Internal gas paths (both channels)	Sample chamber¹⁾ (lining) (ULTRAMAT channel)	Reference chamber (flow-type) (ULTRAMAT channel)										
Hose made of FKM (Viton)	Aluminum	Non-flow-type	0									
Hose made of FKM (Viton)	Aluminum	Flow-type	1									
Hose made of FKM (Viton) with sample gas monitoring (both channels)	Aluminum	Non-flow-type	2									
Hose made of FKM (Viton) with sample gas monitoring (both channels)	Aluminum	Flow-type	3									
Pipe made of titanium	Tantalum	Non-flow-type	4									
Pipe made of titanium	Tantalum	Flow-type	5									
Stainless steel pipe (mat. no. 1.4571)	Aluminum	Non-flow-type	6									
Stainless steel pipe (mat. no. 1.4571)	Tantalum	Non-flow-type	8									
Add-on electronics												
Without			0									
AUTOCAL function with 8 additional digital inputs and outputs for OXYMAT channel			1									
AUTOCAL function with 8 additional digital inputs and outputs for ULTRAMAT channel			2									
AUTOCAL function with 8 additional digital inputs/outputs each for ULTRAMAT channel and OXYMAT channel			3									
AUTOCAL function with serial interface for the automotive industry (AK)			5									
AUTOCAL function with 8 additional digital inputs/outputs and PROFIBUS PA interface for ULTRAMAT channel and OXYMAT channel			6									
AUTOCAL function with 8 additional digital inputs/outputs and PROFIBUS DP interface for ULTRAMAT channel and OXYMAT channel			7									
Auxiliary power												
100 ... 120 V AC, 48 ... 63 Hz			0									
200 ... 240 V AC, 48 ... 63 Hz			1									
Footnotes, see next page												
ULTRAMAT channel measured component	Possible with measuring range identification											
CO	11 ²⁾ , 12 ... 30		A									
CO highly selective (with optical filter) ³⁾	12 ²⁾ , 13 ... 30		B									
CO ₂	10 ²⁾ , 11 ... 30		C									
CH ₄	13 ²⁾ , 14 ... 30		D									
C ₂ H ₂	15 ²⁾ , 16 ... 30		E									
C ₂ H ₄	15 ²⁾ , 16 ... 30		F									
C ₂ H ₆	14 ²⁾ , 15 ... 30		G									
C ₃ H ₆	14 ²⁾ , 15 ... 30		H									
C ₃ H ₈	13 ²⁾ , 14 ... 30		J									
C ₄ H ₆	15 ²⁾ , 16 ... 30		K									
C ₄ H ₁₀	14 ²⁾ , 15 ... 30		L									

Extractive continuous process gas analysis

Series 6

ULTRAMAT/OXYMAT 6 / 19" rack unit

Selection and ordering data (Continued)

ULTRAMAT/OXYMAT 6 gas analyzer 19" rack unit for installation in cabinets Combined measurement of IR-absorbing gas and O ₂			Article No. 7MB2023- ● ● ● ● ● - ● ● ● ●									
C ₆ H ₁₄		14 ²⁾ , 15 ... 30									M	
SO ₂ ⁵⁾		12 ²⁾ , 14 ... 30									N	
NO ⁵⁾		14 ²⁾ , 15 ... 30									P	
NH ₃ (dry)		14 ²⁾ , 15 ... 30									Q	
H ₂ O		17 ²⁾ , 18 ... 22									R	
N ₂ O		13 ²⁾ , 14 ... 30									S	
CO ⁴⁾											X	
Smallest measuring range	Largest measuring range	Measuring range identification										
0 ... 5 vpm	0 ... 100 vpm	10									A	
0 ... 10 vpm	0 ... 200 vpm	11									B	
0 ... 20 vpm	0 ... 400 vpm	12									C	
0 ... 50 vpm	0 ... 1 000 vpm	13									D	
0 ... 100 vpm	0 ... 1 000 vpm	14									E	
0 ... 300 vpm	0 ... 3 000 vpm	15									F	
0 ... 500 vpm	0 ... 5 000 vpm	16									G	
0 ... 1 000 vpm	0 ... 10 000 vpm	17									H	
0 ... 3 000 vpm	0 ... 10 000 vpm	18									J	
0 ... 3 000 vpm	0 ... 30 000 vpm	19									K	
0 ... 5 000 vpm	0 ... 15 000 vpm	20									L	
0 ... 5 000 vpm	0 ... 50 000 vpm	21									M	
0 ... 1%	0 ... 3%	22									N	
0 ... 1%	0 ... 10%	23									P	
0 ... 3%	0 ... 10%	24									Q	
0 ... 3%	0 ... 30%	25									R	
0 ... 5%	0 ... 15%	26									S	
0 ... 5%	0 ... 50%	27									T	
0 ... 10%	0 ... 30%	28									U	
0 ... 10%	0 ... 100%	29									V	
0 ... 30%	0 ... 100%	30									W	
Language of the operating software												
German												0
English												1
French												2
Spanish												3
Italian												4

1) Only for cell lengths 20 to 180 mm

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

3) QAL1: See table "Performance tested according to EN 15267 (single component)" under "More information".

4) QAL1: See table "Based on QAL1 according to SIRA/MCERTS (single component)" under "More information".

5) QAL1: See tables "Based on QAL1 according to SIRA/MCERTS (single component)" and "Performance-tested according to EN 15267 (single component)" under "More information".

Options	Order code
Add "-Z" to article number and then add order code	
Settings	
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)	

Extractive continuous process gas analysis

Series 6

ULTRAMAT/OXYMAT 6 / 19" rack unit

Selection and ordering data (Continued)

Options	Order code
• 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
Set of Torx screwdrivers	A32
Kalrez gaskets in sample gas path (O ₂ side)	B01
Tag plates (customized inscription)	B03
Kalrez gaskets in sample gas path (IR side)	B04
SIL Declaration of Conformity (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 default setting	Y11
Special setting (only in conjunction with an application no., e.g. extended measuring range, ULTRAMAT channel only)	Y12
Extended special setting (only in conjunction with an application no., e.g. determination of cross-interference, only ULTRAMAT channel)	Y13
QAL1 according to SIRA/MCERTS (ULTRAMAT channel only)	Y17 (cannot be combined with E20)
Performance-tested according to EN 15267 (channel 1)	Y27
Performance-tested according to EN 15267 (channel 2)	Y28

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

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

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 each for ULTRAMAT channel or OXYMAT channel	A5E00057312
Set of Torx screwdrivers	A5E34821625

Extractive continuous process gas analysis

Series 6

ULTRAMAT/OXYMAT 6 / 19" rack unit

Selection and ordering data (Continued)

			Article No. 7MB2024- ● ● ● ● ● - ● ● ● ● ●									
ULTRAMAT/OXYMAT 6 gas analyzer 19" rack unit for installation in cabinets Combined measurement of IR-absorbing gas and O ₂												
Click on the Article No. for online configuration in the PIA Life Cycle Portal.												
Gas connections for sample gas and reference gas												
Pipe with 6 mm outer diameter			0									
Pipe with 1/4" outer diameter			1									
Smallest possible measuring span O₂												
0.5% reference gas pressure 3 000 hPa			A									
0.5% reference gas pressure 100 hPa (external pump)			B									
2% reference gas pressure 3 000 hPa			C									
2% reference gas pressure 100 hPa (external pump)			D									
5% reference gas pressure 3 000 hPa			E									
5% reference gas pressure 100 hPa (external pump)			F									
Sample chamber (OXYMAT channel)												
Non-flow-type compensation branch												
• Made of stainless steel, mat. no. 1.4571			A									
• Made of tantalum			B									
• Made of Hastelloy			E									
Flow-type compensation branch												
• Made of stainless steel, mat. no. 1.4571			C									
• Made of tantalum			D									
• Made of Hastelloy			F									
Internal gas paths (both channels)	Sample chamber¹⁾ (lining) (ULTRAMAT channel)	Reference chamber (flow-type) (ULTRAMAT channel)										
Hose made of FKM (Viton)	Aluminum	Non-flow-type	0									
Hose made of FKM (Viton)	Aluminum	Flow-type	1									
Hose made of FKM (Viton) with sample gas monitoring (both channels)	Aluminum	Non-flow-type	2									
Hose made of FKM (Viton) with sample gas monitoring (both channels)	Aluminum	Flow-type	3									
Pipe made of titanium	Tantalum	Non-flow-type	4									
Pipe made of titanium	Tantalum	Flow-type	5									
Stainless steel pipe (mat. no. 1.4571)	Aluminum	Non-flow-type	6									
Stainless steel pipe (mat. no. 1.4571)	Tantalum	Non-flow-type	8									
Add-on electronics												
Without			0									
AUTOCAL function												
AUTOCAL function with 8 additional digital inputs/outputs each for ULTRAMAT channel and OXYMAT channel			1									
AUTOCAL function with serial interface for the automotive industry (AK)			5									
AUTOCAL function with 8 additional digital inputs/outputs and PROFIBUS PA interface for ULTRAMAT channel and OXYMAT channel			6									
AUTOCAL function with 8 additional digital inputs/outputs and PROFIBUS DP interface for ULTRAMAT channel and OXYMAT channel			7									
Auxiliary power												
100 ... 120 V AC, 48 ... 63 Hz			0									
200 ... 240 V AC, 48 ... 63 Hz			1									
ULTRAMAT channel measured component	Smallest measuring range	Largest measuring range										
CO and NO ²⁾	0 ... 1 000 vpm	0 ... 10 000 vpm	A C									
CO and NO ²⁾	0 ... 100 vpm (CO) 0 ... 300 vpm (NO)	0 ... 1 000 vpm	A H									
CO and NO ²⁾	0 ... 300 vpm (CO) 0 ... 500 vpm (NO)	0 ... 3 000 vpm	A J									
CO and NO ²⁾	0 ... 1 000 vpm	0 ... 10 000 vpm	A C									
CO ₂ and CO	0 ... 100 vpm	0 ... 1 000 vpm	B A									
CO ₂ and CO	0 ... 300 vpm	0 ... 3 000 vpm	B B									
CO ₂ and CO	0 ... 1 000 vpm	0 ... 10 000 vpm	B C									
CO ₂ and CO	0 ... 3 000 vpm	0 ... 30 000 vpm	B D									
CO ₂ and CO	0 ... 1%	0 ... 10%	B E									
CO ₂ and CO	0 ... 3%	0 ... 30%	B F									
CO ₂ and CO	0 ... 10%	0 ... 100%	B G									

Extractive continuous process gas analysis

Series 6

ULTRAMAT/OXYMAT 6 / 19" rack unit

Selection and ordering data (Continued)

ULTRAMAT/OXYMAT 6 gas analyzer			Article No.									
19" rack unit for installation in cabinets			7MB2024- ● ● ● ● ● - ● ● ● ●									
Combined measurement of IR-absorbing gas and O ₂												
CO ₂ and CO	0 ... 100 vpm (CO ₂) 0 ... 300 vpm (CO)	0 ... 1 000 vpm									B	H
CO ₂ and CO	0 ... 300 vpm (CO ₂) 0 ... 500 vpm (CO)	0 ... 3 000 vpm									B	J
CO ₂ and CH ₄	0 ... 10%	0 ... 100%									C	G
CO ₂ and CH ₄	0 ... 300 vpm (CO ₂) 0 ... 500 vpm (CH ₄)	0 ... 3 000 vpm									C	J
CO ₂ and NO	0 ... 300 vpm (CO ₂) 0 ... 500 vpm (NO)	0 ... 3 000 vpm									D	J
Language of the operating software												
German												0
English												1
French												2
Spanish												3
Italian												4

¹⁾ Only for cell lengths 20 to 180 mm

²⁾ QAL1; see table "Based on QAL1 according to SIRA/MCERTS (2 components in series)" under "More information".

Options	Order code
Add "-Z" to article number and then add order code	
Settings	
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
Set of Torx screwdrivers	A32
Kalrez gaskets in sample gas path (O ₂ side)	B01
Tag plates (customized inscription)	B03
Kalrez gaskets in sample gas path (IR side)	B04
SIL Declaration of Conformity (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 default setting	Y11

Selection and ordering data (Continued)

Options	Order code
Special setting (only in conjunction with an application no., e.g. extended measuring range, ULTRAMAT channel only)	Y12
Extended special setting (only in conjunction with an application no., e.g. determination of cross-interference, only ULTRAMAT channel)	Y13
QAL1 according to SIRA/MCERTS (ULTRAMAT channel only)	Y17 (cannot be combined with E20)

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

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

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 each for ULTRAMAT channel or OXYMAT channel	A5E00057312
Set of Torx screwdrivers	A5E34821625

Note

See table QAL1 and order examples under "More information".

Technical specifications

ULTRAMAT/OXYMAT 6, 19" rack unit	
General information	
Operating position	Front wall, vertical
Conformity	CE mark in accordance with EN 50081-1 and EN 50082-2
Design, enclosure	
Weight	Approx. 21 kg
Degree of protection	IP20 according to EN 60529
Electrical characteristics	
EMC (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98)
Electrical safety	According to EN 61010-1, overvoltage category III
Auxiliary power	100 ... 120 V AC (nominal range of use 90 ... 132 V), 48 ... 63 Hz or 200 ... 240 V AC (nominal range of use 180 ... 264 V), 48 ... 63 Hz
Power consumption	Approx. 70 VA
Fuse ratings	120 ... 120 V: F1/F2 = T 1.6 A 200 ... 240 V: F1/F2 = T 1 A
Electrical inputs and outputs (per channel)	
Analog output	0/2/4 ... 20 mA, floating; max. load 750 Ω
Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load rating: 24 V AC/DC/1 A, floating, non-sparking

Technical specifications (Continued)

ULTRAMAT/OXYMAT 6, 19" rack unit	
Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and accompanying gas influence correction (correction of cross-interference)
Digital inputs	6, designed for 24 V, floating, freely configurable, 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	-30 ... +70 °C during storage and transportation, 5 ... 45 °C during operation
Permissible humidity	< 90% relative humidity during storage and transportation (must not fall below dew point)

ULTRAMAT channel	
Measuring ranges	4, internally and externally switchable; automatic measuring range switchover is also possible
Smallest possible measuring range	Dependent on the application, e.g. CO: 0 ... 10 vpm CO ₂ : 0 ... 5 vpm

Extractive continuous process gas analysis

Series 6

ULTRAMAT/OXYMAT 6 / 19" rack unit

Technical specifications (Continued)

ULTRAMAT channel	
Largest possible measuring range	Dependent on the application
Measuring ranges with suppressed zero point	Any zero point within 0 ... 100 vol.% can be implemented; smallest possible span 20%
Characteristic curve	Linearized
Influence of interference gases must be considered separately	
Gas inlet conditions	
Permissible sample gas pressure	
• Without pressure switch	700 ... 1 500 hPa (absolute)
• With integrated pressure switch	700 ... 1 300 hPa (absolute)
Sample gas flow	18 ... 90 l/h (0.3 ... 1.5 l/min)
Sample gas temperature	Min. 0 ... max. 50 °C, but above the dew point
Sample gas humidity	< 90% (relative humidity), or dependent on measuring task, non-condensing
Time 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 device at 1 l/min)	Approx. 0.5 ... 5 s, depending on the version
Time for device-internal signal processing	< 1 s
Pressure correction range	
Pressure sensor	
• Internal	700 ... 1 200 hPa absolute
• External	700 ... 1 500 hPa absolute
Measuring response	
	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation	< ± 1% of the smallest possible measuring range according to nameplate
Zero point drift	< ± 1% of the current measuring range/week
Measured value drift	< ± 1% of the current measuring range/week
Repeatability	≤ 1% of the current measuring range
Detection limit	1% of the smallest possible measuring range
Linearity error	< 0.5% of the measuring range end value
Influencing variables	
	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Ambient temperature	< 1% of current measuring range/10 K (with constant receiver cell temperature)
Sample gas pressure	- With enabled pressure compensation: < 0.15% of the measuring span/1% change in atmospheric pressure - With disabled pressure compensation: < 1.5% of the measuring span/1% change in atmospheric pressure
Sample gas flow	Negligible
Auxiliary power	< 0.1% of the current measuring range with nominal voltage ± 10%
Environmental conditions	Application-specific measuring influences possible if ambient air contains measured component or cross interference-sensitive gases

OXYMAT channel	
Measuring ranges	4, internally and externally switchable; automatic measuring range switchover also possible
Smallest possible measuring span (relating to sample gas pressure 1 000 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature)	0.5 vol.%, 2 vol.% or 5 vol.% O ₂
Largest possible measuring range	100 vol.% O ₂

Technical specifications (Continued)

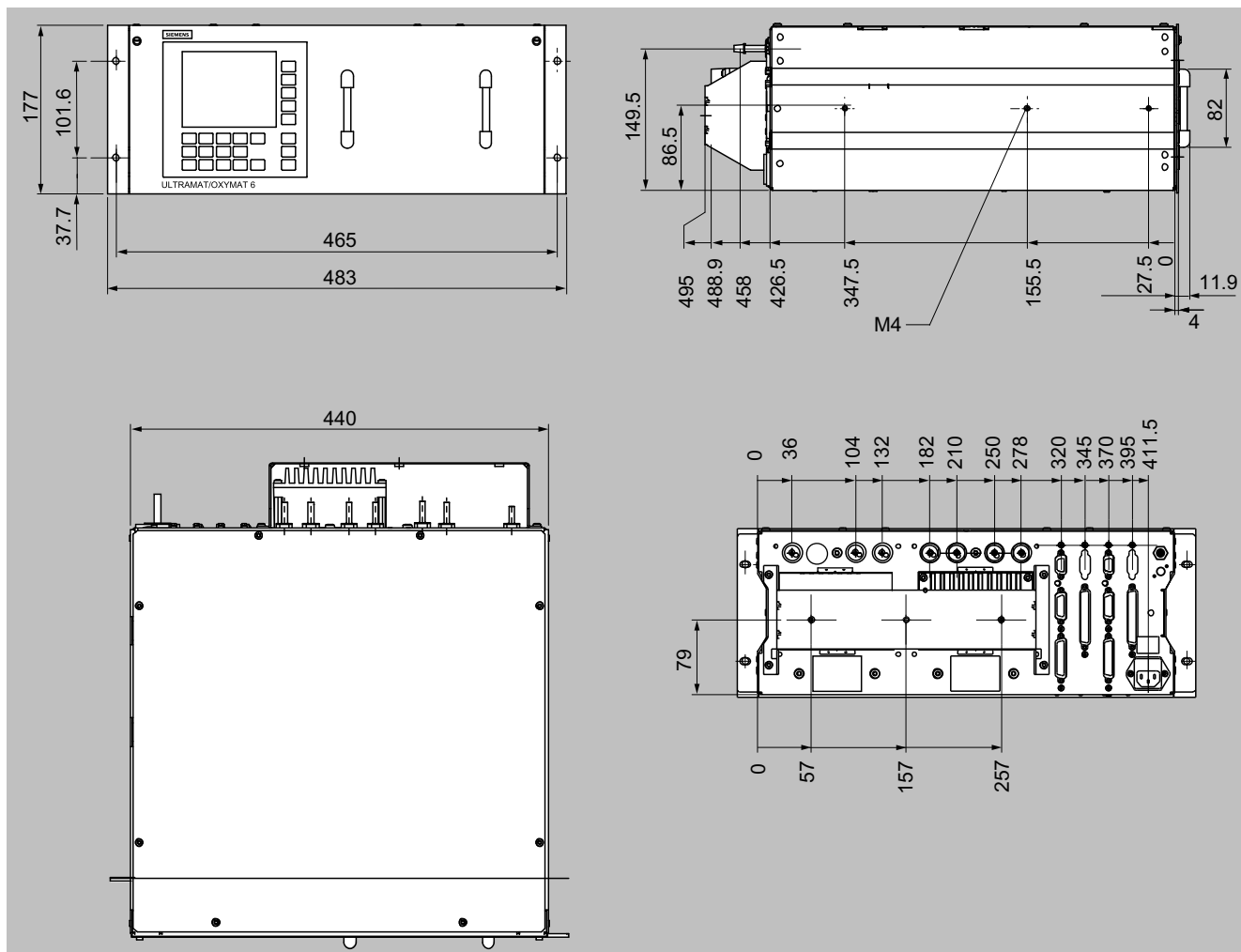
OXYMAT channel	
Measuring ranges with suppressed zero point	Any zero point within 0 ... 100 vol.% can be implemented, provided that a suitable reference gas is used
Gas inlet conditions	
Permissible sample gas pressure	
• With pipes	500 ... 3 000 hPa absolute
• With hoses	
- Without pressure switch	500 ... 1 500 hPa absolute
- With pressure switch	500 ... 1 300 hPa absolute
Sample gas flow	18 ... 60 l/h (0.3 ... 1 l/min)
Sample gas temperature	0 ... 50 °C
Sample gas humidity	< 90% RH (relative humidity)
Reference gas pressure (high-pressure version)	2 000 ... 4 000 hPa above sample gas pressure, but max. 5 000 hPa
Reference gas pressure (low-pressure version)	Min. 100 hPa above sample gas pressure
Time 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 the version
Damping (electrical time constant)	0 ... 100 s, configurable
Dead time (purging time of the gas path in the device at 1 l/min)	Approx. 0.5 ... 2.5 s, depending on the version
Time for device-internal signal processing	< 1 s
Pressure correction range	
Pressure sensor	
• Internal	500 ... 2 000 hPa absolute
• External	500 ... 3 000 hPa absolute
Measuring response	
	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation	< 0.75% of the smallest possible measuring range according to nameplate, with electronic damping constant of 1 s (corresponds to ± 0.25% at 2σ)
Zero point drift	< 0.5%/month of the smallest possible measuring span according to nameplate
Measured value drift	≤ 0.5%/month of the current measuring range
Repeatability	≤ 1%/month of the current measuring range
Detection limit	1% of the current measuring range
Linearity error	1% of the current measuring range
Influencing variables	
	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Ambient temperature	< 0.5%/10 K referred to smallest possible measuring span according to nameplate - With measuring span 0.5%: 1%/10 K
Sample gas pressure (with air (100 hPa) as reference gas, correction of the atmospheric pressure fluctuations is only possible if the sample gas can vent to ambient air)	- With disabled pressure compensation: < 2% of the current measuring range/1% change in atmospheric pressure - With enabled pressure compensation: < 0.2% of the current measuring range/1% change in atmospheric pressure
Accompanying gases	Zero point deviation corresponding to paramagnetic or diamagnetic deviation of accompanying gas
Sample gas flow	< 1% of the smallest possible measuring span according to nameplate with a change in flow of 0.1 l/min within the permissible flow range
Auxiliary power	< 0.1% of the current measuring range with nominal voltage ± 10%

Extractive continuous process gas analysis

Series 6

ULTRAMAT/OXYMAT 6 / 19" rack unit

Dimensional drawings



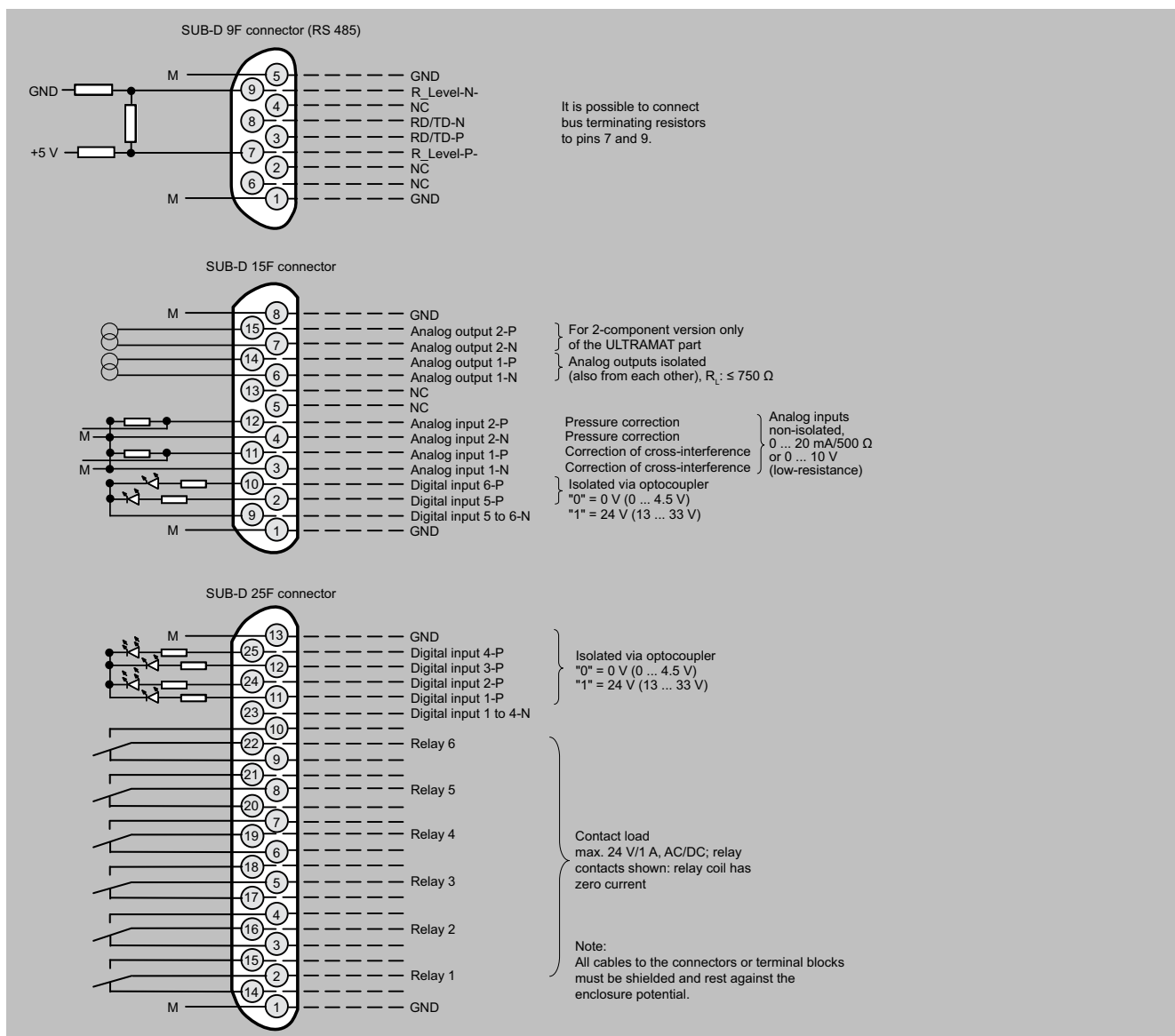
ULTRAMAT/OXYMAT 6, 19" rack unit, dimensions in mm

Extractive continuous process gas analysis

Series 6

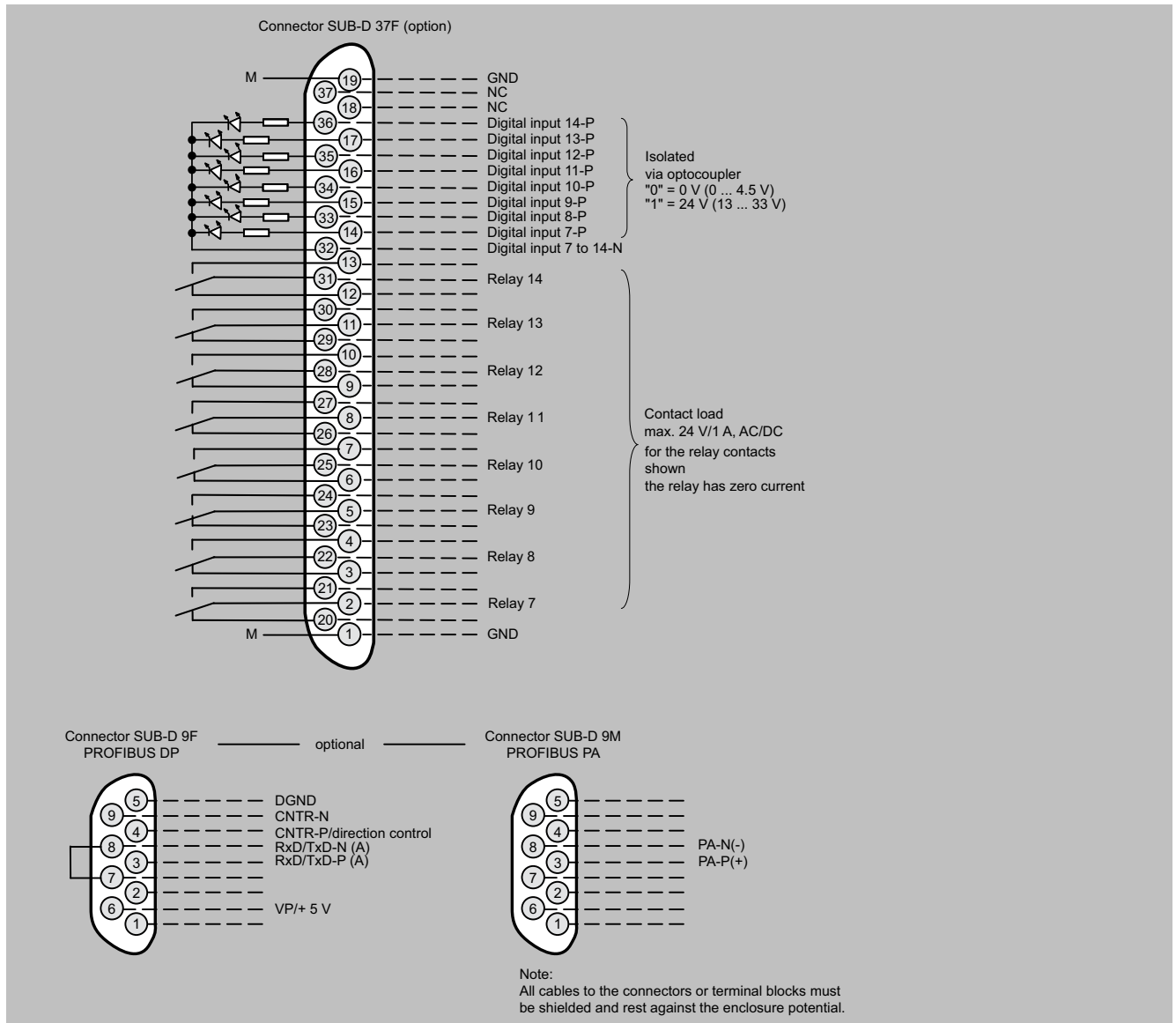
ULTRAMAT/OXYMAT 6 / 19" rack unit

Circuit diagrams



ULTRAMAT/OXYMAT 6, 19" rack unit, pin assignment

Circuit diagrams (Continued)



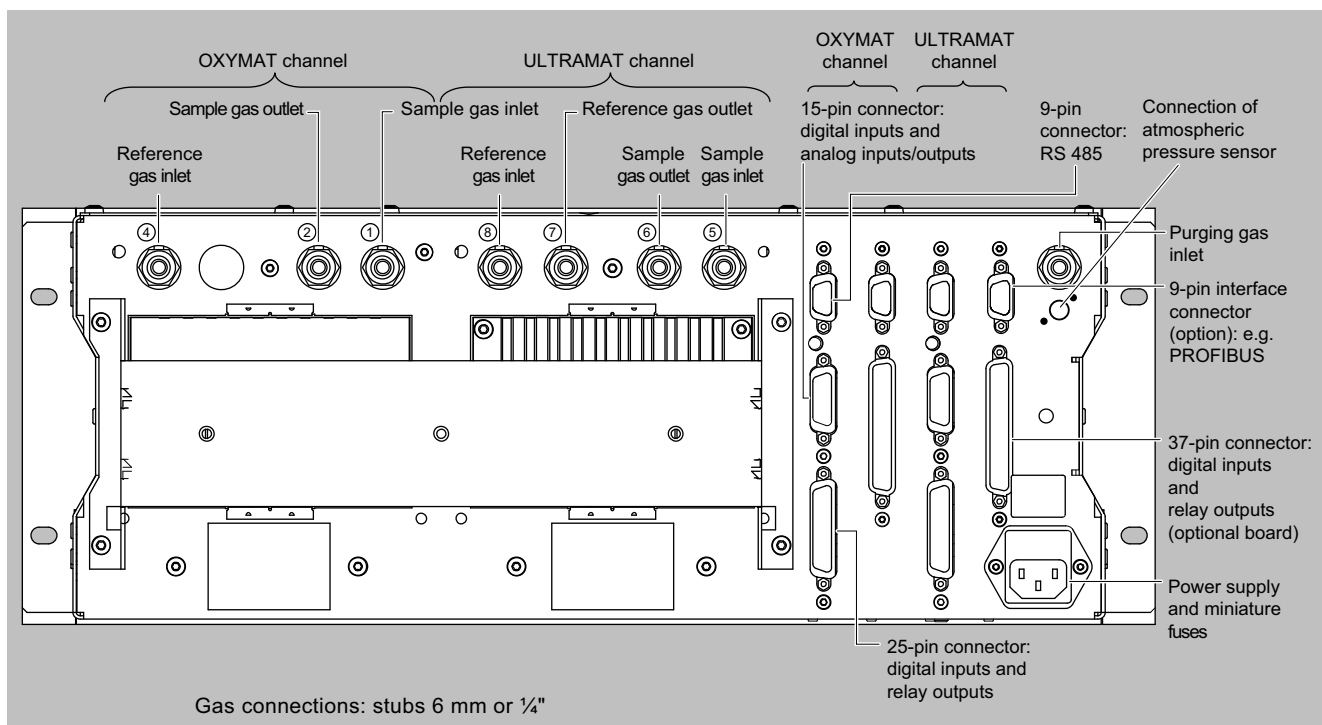
ULTRAMAT/OXYMAT 6, 19" rack unit, pin assignment of the AUTOCAL board and PROFIBUS plugs

Extractive continuous process gas analysis

Series 6

ULTRAMAT/OXYMAT 6 / 19" rack unit

Circuit diagrams (Continued)



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

More information

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

Only in conjunction with order code Y17

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

Performance-tested according to EN 15267 (single component)

Only in conjunction with order code Y27/Y28

Component	CO (QAL1)		SO ₂ (QAL1)		NO (QAL1)	
Measuring range identification	Smallest measuring range from 0 to ...	Largest measuring range from 0 to ...	Smallest measuring range from 0 to ...	Largest measuring range from 0 to ...	Smallest measuring range from 0 to ...	Largest measuring range from 0 to ...
C	-	-	75 mg/m ³	1 500 mg/m ³	-	-
D	75 mg/m ³	1 250 mg/m ³	-	-	-	-
E	125 g/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

Extractive continuous process gas analysis

Series 6

ULTRAMAT/OXYMAT 6 / 19" rack unit

More information (Continued)

Component	CO (QAL1)		SO ₂ (QAL1)		NO (QAL1)	
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

Ordering example

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 cell

With automatic calibration (AUTOCAL)

230 V AC; German

7MB2023-0EA03-1BD0-Z Y27+Y28

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

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

Ordering example

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

Extractive continuous process gas analysis

Series 6

ULTRAMAT/OXYMAT 6 / Suggestion for spare parts

Selection and ordering data

Description	7MB2023	7MB2024	2 years (unit)	5 years (unit)	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 gland	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
Plug-in 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 (so-called "Clean for O₂ service"), please specify when ordering spare parts. This is the only way to ensure that the gas path will continue to comply with the special requirements of this version.

More information

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 ensure 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

- For boiler control in combustion 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 versions

Special 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 German Technical Instructions on Air Quality Control (TA Luft), 13th and 27th BImSchV, federal emission law

Extractive continuous process gas analysis

Series 6

OXYMAT 6

Design

19" rack unit

- With 4 U for installation
 - In hinged frame
 - In cabinets with or without telescopic 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 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
- 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 1/4"

Display and operator 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

Inputs 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, external pressure sensor)
- Six digital inputs freely configurable (e.g. for measuring range switchover, processing of external signals from sample preparation)
- Six relay outputs freely configurable (failure, maintenance demanded, maintenance switch, limit alarm, external solenoid 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

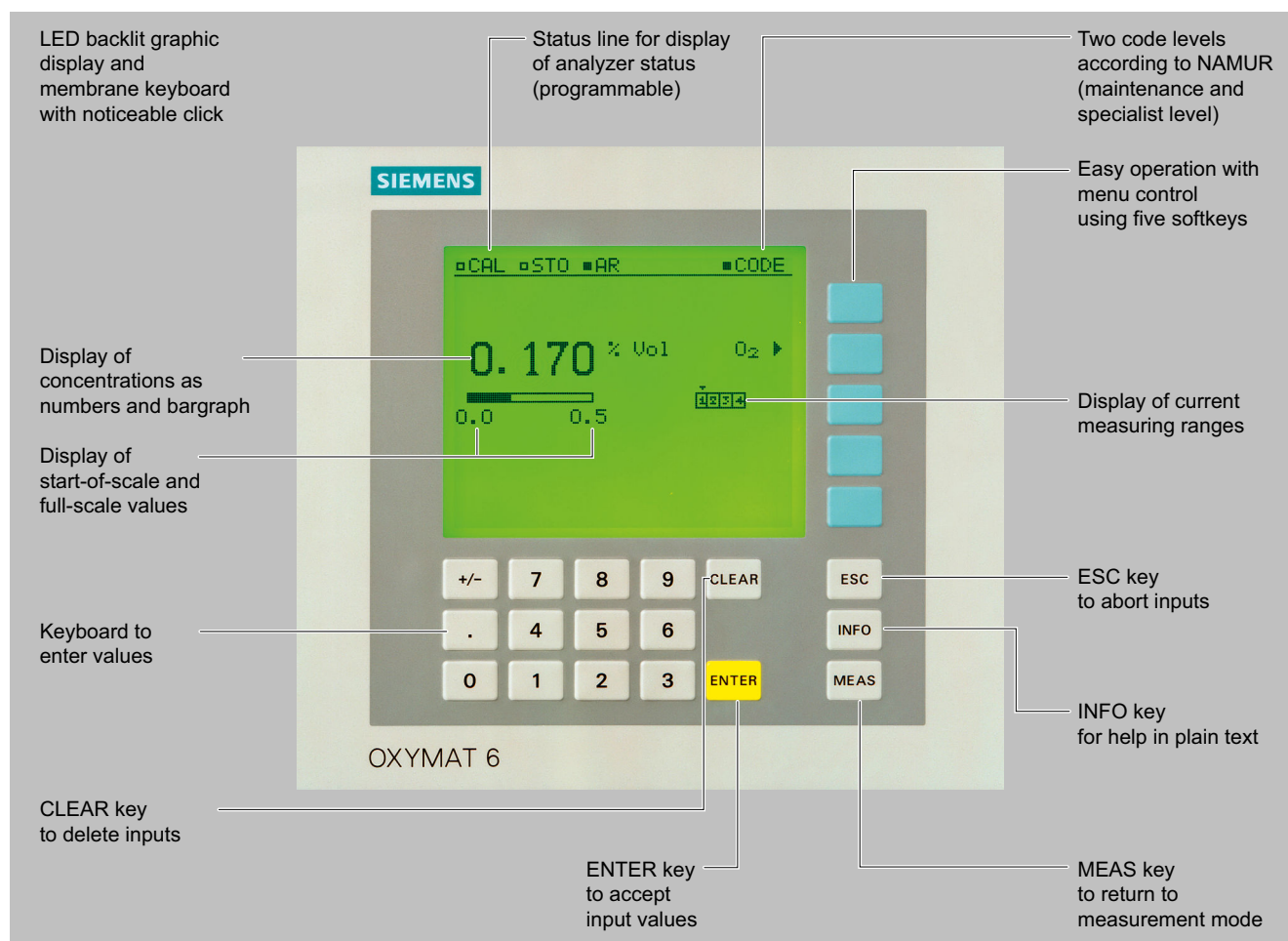
- AK interface for the automotive industry with extended functions
- RS 485/RS 232 converter
- RS 485/Ethernet converter
- RS 485/USB converter
- Connection to networks via PROFIBUS DP/PA interface
- SIPROM GA software as the service and maintenance tool

Extractive continuous process gas analysis

Series 6

OXYMAT 6

Design (Continued)



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	Titanium	Titanium
	Pipe	Titanium	Titanium	Titanium
	Sample chamber	Stainless steel, mat. no. 1.4571 or tantalum	Stainless steel, mat. no. 1.4571 or tantalum	Stainless steel, mat. no. 1.4571 or tantalum
	Restrictor	Titanium	Titanium	Titanium
	O-rings	FKM (Viton) or FFKM (Kalrez)	FKM (Viton) or FFKM (Kalrez)	FKM (Viton) or FFKM (Kalrez)
With pipes	Bushing	Stainless steel, mat. no. 1.4571	Stainless steel, mat. no. 1.4571	Stainless steel, mat. no. 1.4571
	Pipe	Stainless steel, mat. no. 1.4571	Stainless steel, mat. no. 1.4571	Stainless steel, mat. no. 1.4571
	Sample chamber	Stainless steel, mat. no. 1.4571 or tantalum	Stainless steel, mat. no. 1.4571 or tantalum	Stainless steel, mat. no. 1.4571 or tantalum
	Restrictor	Stainless steel, mat. no. 1.4571	Stainless steel, mat. no. 1.4571	Stainless steel, mat. no. 1.4571
	O-rings	FKM (Viton) or FFKM (Kalrez)	FKM (Viton) or FFKM (Kalrez)	FKM (Viton) or FFKM (Kalrez)

Extractive continuous process gas analysis

Series 6

OXYMAT 6

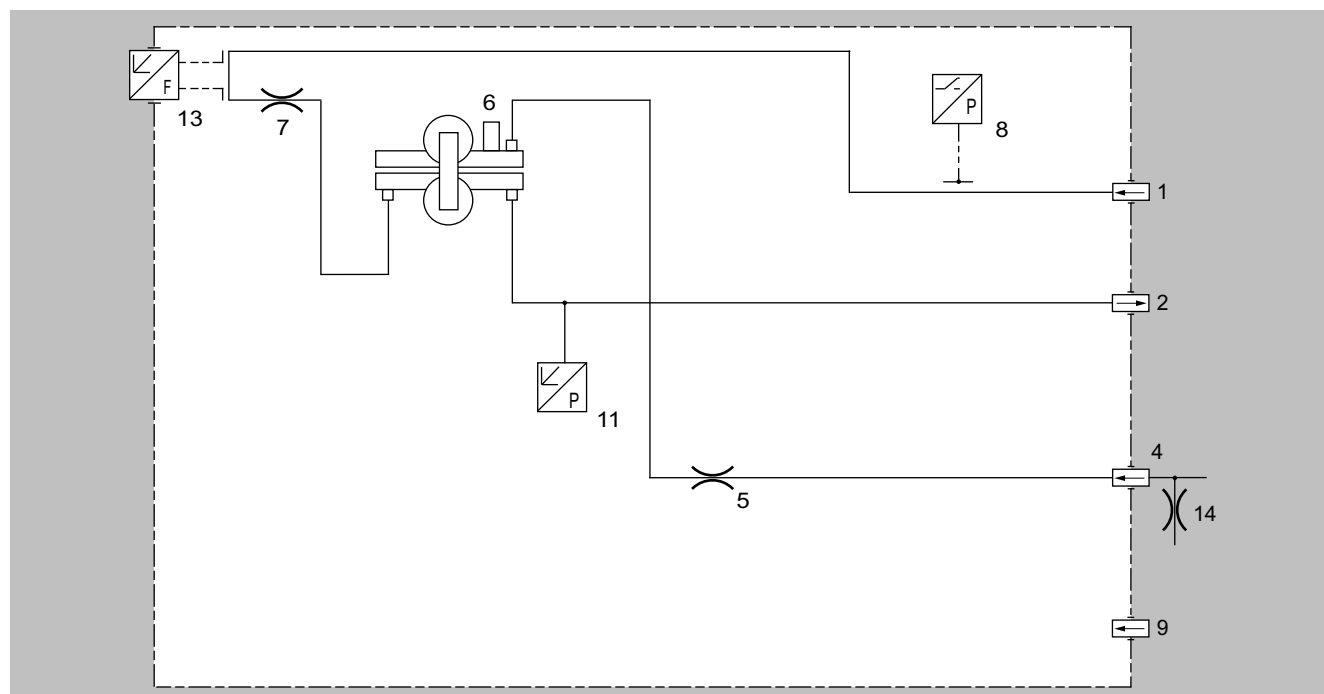
Design (Continued)

Gas path		19" rack unit	Field device	Field device Ex
With pipes	Bushing	Bushing	Hastelloy C 22	Hastelloy C 22
	Pipe	Pipe	Hastelloy C 22	Hastelloy C 22
	Sample chamber	Sample chamber	Stainless steel, mat. no. 1.4571 or tantalum	Stainless steel, mat. no. 1.4571 or tantalum
	Restrictor	Restrictor	Hastelloy C 22	Hastelloy C 22
	O-rings	O-rings	FKM (e.g. Viton) or FFKM (e.g. Kalrez)	FKM (e.g. Viton) or FFKM (e.g. Kalrez)

Options

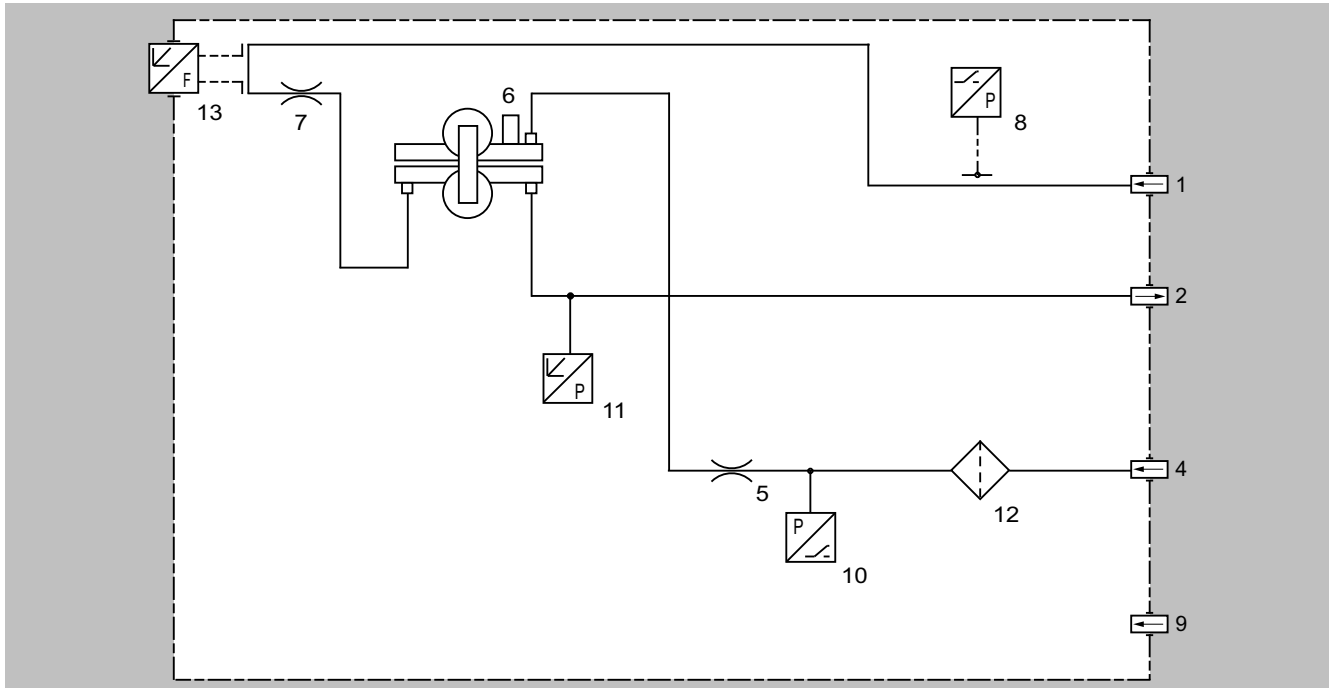
Flow indicator	Measuring tube	Duran glass	-	-
	Variable area	Duran glass, black	-	-
Pressure switch	Suspension boundary	PTFE (Teflon)	-	-
	Angle units	FKM (Viton)	-	-
Pressure switch	Diaphragm	FKM (Viton)	-	-
	Enclosure	PA 6.3 T	-	-

Gas path (19" rack unit)



Gas path, reference gas connection 1 100 hPa, absolute

Design (Continued)



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

Legend for the gas path 19" rack unit 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

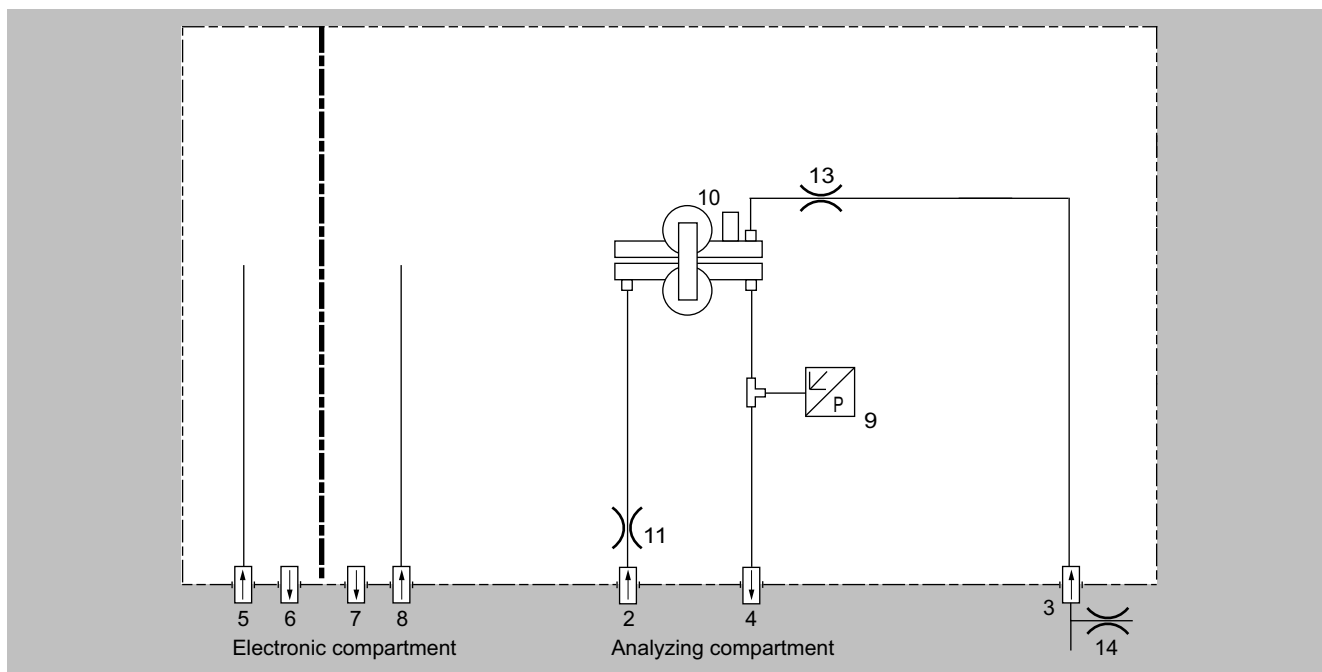
Extractive continuous process gas analysis

Series 6

OXYMAT 6

Design (Continued)

Gas path (field device)



Gas path, reference gas connection 1 100 hPa, absolute

Legend for the gas path field device 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

The diagram illustrates a closed-loop hydraulic system divided into two main sections by a vertical dashed line: the 'Electronic compartment' on the left and the 'Analyzing compartment' on the right. The system consists of several interconnected components and flow paths:

- Electronic compartment:** Contains four vertical lines representing ports or sensors, labeled 5, 6, 7, and 8 from left to right. Below these lines are four rectangular components with arrows indicating flow direction: 5 (upward), 6 (downward), 7 (downward), and 8 (upward).
- Analyzing compartment:** Contains three vertical lines labeled 2, 4, and 3 from left to right. Below these lines are three rectangular components with arrows: 2 (upward), 4 (downward), and 3 (upward).
- Flow Paths and Components:**
 - A flow path starts from the bottom of port 5, goes down, then right, then up through component 2.
 - From component 2, the flow goes up through a valve labeled 11, then right through a pump labeled 10, then up through a valve labeled 13.
 - From valve 13, the flow goes right through a pressure sensor labeled 12 (represented by a square with a diagonal line and a 'P'), then down through a valve labeled 3.
 - From valve 3, the flow goes left through component 4, then down through a pump labeled 9, then left through component 6.
 - From component 6, the flow goes down, then left, then up through component 5.

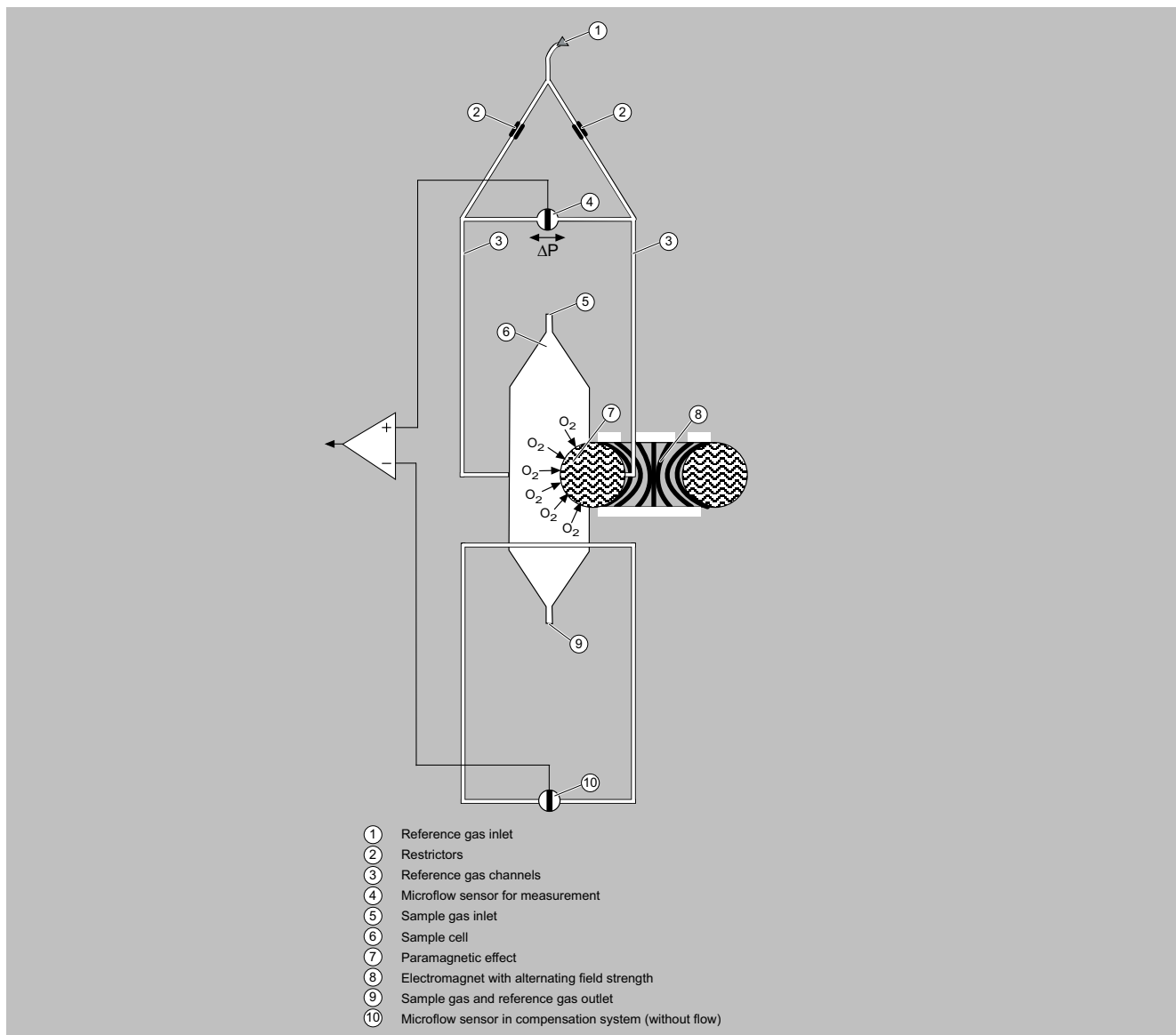
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Extractive continuous process gas analysis

Series 6

OXYMAT 6

Mode of operation (Continued)



OXYMAT 6, mode of operation

Function**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 zero gas calibration and as the reference gas. As a result of the low reference gas consumption (3 to 10 ml/min), one calibration gas 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.

Main features

- 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
- Electrically isolated measured value output 0/2/4 through to 20 mA (including inverted)
- Choice of automatic or manual measuring range switchover; remote switching is also possible
- Storage of measured values possible during calibration
- Wide range of selectable time constants (static/dynamic noise damping); 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 (parameterizable)
- 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 parameterizable
- Operation based on NAMUR recommendation
- Two control levels with separate authorization codes for the prevention of accidental and unauthorized operator interventions
- Simple handling using a numerical membrane keyboard and operator prompting
- Custom-made device designs, such as:
 - Customer acceptance
 - TAG plates
 - Drift recording
 - Clean for O₂ service
 - Kalrez gaskets
- Analyzer unit with flow-type compensation circuit: a flow is passed through the compensation branch (option) to reduce the vibration dependency in the case of sample and reference gases with significantly different densities
- Sample chamber for use in presence of highly corrosive sample gases

Reference gases for OXYMAT 6

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 ¹⁾	O ₂	2 000 ... 4 000 hPa above sample gas pressure (max. 5 000 hPa absolute)	
Approx. 21 vol.% O ₂ ²⁾	Air	100 hPa with respect to sample gas pressure, which may vary by max. 50 hPa around the air pressure	

Extractive continuous process gas analysis

Series 6

OXYMAT 6

Function (Continued)

¹⁾ Suppressed zero point with measuring range end value 100 vol.% O₂.

²⁾ Suppressed zero point with 21 vol.% O₂ within the measuring span.

Correction of zero-point error/cross-sensitivities

Accompanying gas (concentration 100 vol.%)	Zero point deviation in vol.% O ₂ absolute	Accompanying gas (concentration 100 vol.%)	Zero point deviation 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	
Isobutane C ₄ H ₁₀	-1.30	Ammonia NH ₃	-0.20
1-butene C ₄ H ₈	-0.96	Hydrogen bromide HBr	-0.76
Isobutene 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
Isopentane 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		

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 zero point deviations listed in the table must be multiplied by an adjustment factor (k):

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

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

All diamagnetic gases have a negative zero point deviation.

Extractive continuous process gas analysis

Series 6

OXYMAT 6 / 19" rack unit

Selection and ordering data

OXYMAT 6 gas analyzer 19" rack unit for installation in cabinets		Article No. 7MB2021- ● ● ● ● 0 - ● ● ● ●									
Click on the Article No. for online configuration in the PIA Life Cycle Portal.											
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".											
Gas connections											
Pipe with 6 mm outer diameter			0								
Pipe with 1/4" outer diameter			1								
Smallest possible measuring span O₂											
0.5% reference gas pressure 3 000 hPa				A							
0.5% reference gas pressure 100 hPa (external pump)				B							
2% reference gas pressure 3 000 hPa				C							
2% reference gas pressure 100 hPa (external pump)				D							
5% reference gas pressure 3 000 hPa				E							
5% reference gas pressure 100 hPa (external pump)				F							
Sample chamber											
Non-flow-type compensation branch											
• Made of stainless steel, mat. no. 1.4571				A							
• Made of tantalum				B							
• Made of Hastelloy				E							
Flow-type compensation branch											
• Made of stainless steel, mat. no. 1.4571				C							
• Made of tantalum				D							
• Made of Hastelloy				F							
Internal gas paths											
Hose made of FKM (Viton)					0						
Pipe made of titanium					1						
Stainless steel pipe (mat. no. 1.4571)					2						
Auxiliary power											
100 V ... 120 V AC, 48 ... 63 Hz								0			
200 V ... 240 V AC, 48 ... 63 Hz								1			
Monitoring (reference gas, sample gas)											
Without									A		
Reference gas only									B		
Reference gas and sample gas (with flow indicator and pressure switch for sample gas)									C		
Sample gas only									D		
Add-on electronics											
Without										A	
AUTOCAL function with 8 digital inputs/outputs										B	
AUTOCAL function with serial interface for the automotive industry (AK)										D	
AUTOCAL function 8 additional digital inputs/outputs and PROFIBUS PA interface										E	
AUTOCAL function with 8 additional digital inputs/outputs and PROFIBUS DP interface										F	
Language of the operating software											
German											0
English											1
French											2
Spanish											3
Italian											4

Options	Order code
Add "-Z" to article number and then add order code.	
Settings	
Telescopic rails (2 units)	A31
Set of Torx screwdrivers	A32
Kalrez gaskets in sample gas path	B01

Extractive continuous process gas analysis

Series 6

OXYMAT 6 / 19" rack unit

Selection and ordering data (Continued)

Options	Order code
Tag plates (specific inscription based on customer information)	B03
SIL Declaration of Conformity (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 default setting	Y11
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

Technical specifications

OXIMAT 6, 19" rack unit	
General information	
Measuring ranges	4, internally and externally switchable; automatic measuring range switchover is also possible
Smallest possible measuring span (relating to sample gas pressure 1 000 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature)	0.5 vol.%, 2 vol.% or 5 vol.% O ₂
Largest possible measuring span	100 vol.% O ₂ (for a pressure above 2 000 hPa: 25 vol.% O ₂)
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")
Operating position	Front wall, vertical
Conformity	CE mark in accordance with EN 50081-1, EN 50082-2
Design, enclosure	
Degree of protection	IP20 according to EN 60529
Weight	Approx. 13 kg
Electrical characteristics	
Auxiliary power	100 ... 120 V AC (nominal range of use 90 ... 132 V), 48 ... 63 Hz or 200 ... 240 V AC (nominal range of use 180 ... 264 V), 48 ... 63 Hz
Power consumption	Approx. 35 VA
EMC (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98), EN 61326
Electrical safety	According to EN 61010-1, overvoltage category III
Fuse ratings	100 ... 120 V: 1.0T/250 200 ... 240 V: 0.63T/250
Gas inlet conditions	
Permissible sample gas pressure	
• With pipes	500 ... 3 000 hPa absolute

Technical specifications (Continued)

OXIMAT 6, 19" rack unit	
With hoses	
- Without pressure switch	500 ... 1 500 hPa absolute
- With pressure switch	500 ... 1 300 hPa absolute
Sample gas flow	18 ... 60 l/h (0.3 ... 1 l/min)
Sample gas temperature	Min. 0 ... max. 50 °C, but above the dew point
Sample gas humidity	< 90% RH (RH: relative humidity)
Reference gas pressure (high-pressure version)	2 000 ... 4 000 hPa above sample gas pressure, but max. 5 000 hPa
Reference gas pressure (low-pressure version)	Min. 100 hPa above sample gas pressure
Time 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 the version
Damping (electrical time constant)	0 ... 100 s, configurable
Dead time (purging time of the gas path in the device at 1 l/min)	Approx. 0.5 ... 2.5 s, depending on the version
Time for device-internal signal processing	< 1 s
Pressure correction range	
Pressure sensor	
• Internal	500 ... 2 000 hPa absolute
• External	500 ... 3 000 hPa absolute
Measuring response	
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 nameplate, with electronic damping constant of 1 s (corresponds to ± 0.25% at 2 σ)
Zero point drift	< ± 0.5%/month of the smallest possible measuring span according to nameplate

Technical specifications (Continued)

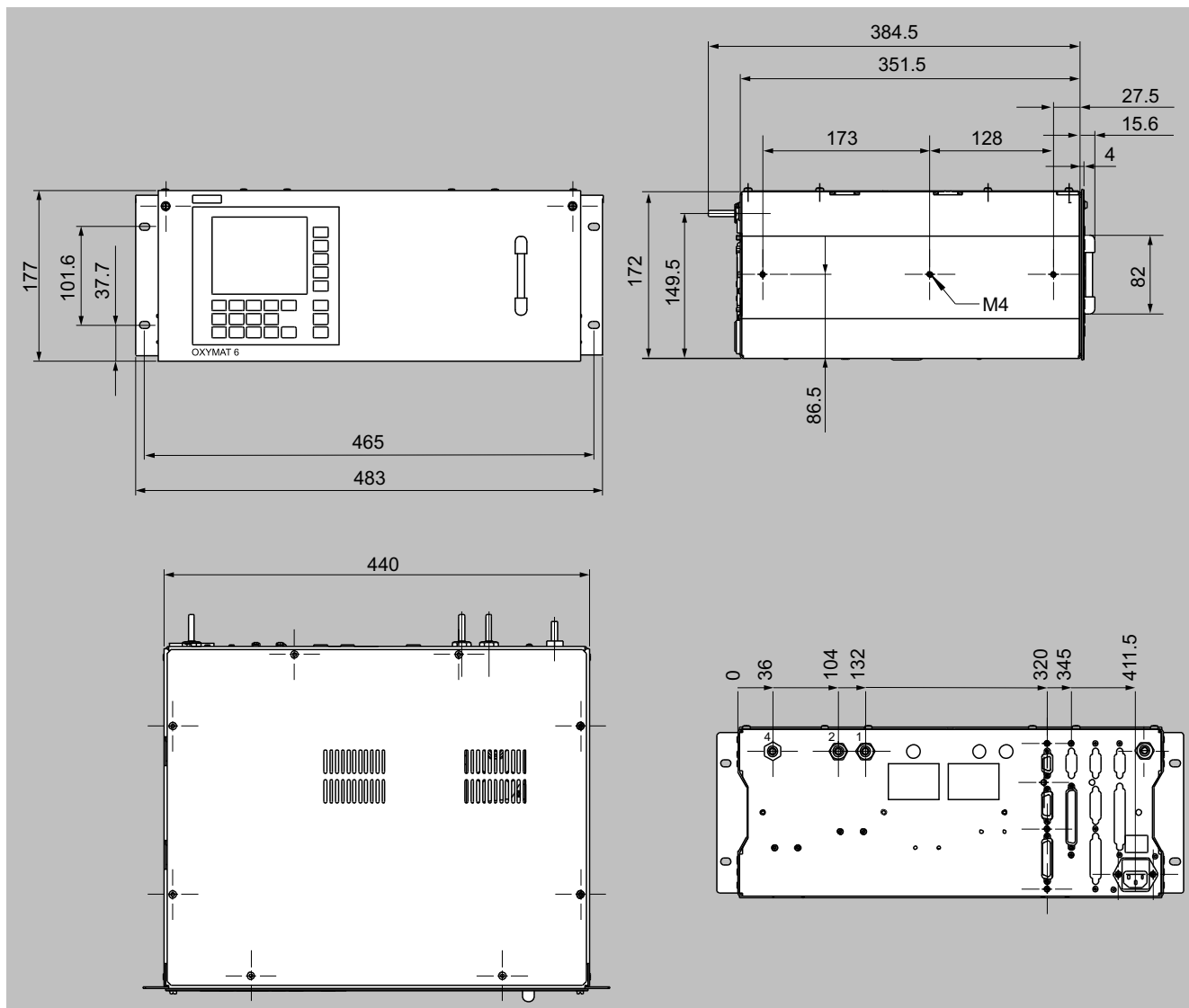
OXIMAT 6, 19" rack unit	
Measured value drift	< $\pm 0.5\%$ /month of the current measuring range
Repeatability	< 1% of the current measuring range
Detection limit	1% of the current measuring range
Linearity error	< 0.1% of the current measuring range
Influencing variables	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Ambient temperature	< 0.5%/10 K relating to the smallest possible measuring range according to nameplate, with measuring span 0.5%: 1%/10 K
Sample gas pressure (with air (100 hPa) as reference gas, correction of the atmospheric pressure fluctuations is only possible if the sample gas can vent to ambient air)	• With disabled pressure compensation: < 2% of the current measuring range/1% pressure variation • With enabled pressure compensation: < 0.2% of the current measuring range/1% pressure variation
Accompanying gases	Zero point deviation corresponding to paramagnetic or diamagnetic deviation of accompanying gas
Sample gas flow at zero point	< 1% of the current measuring range according to nameplate with a change in flow of 0.1 l/min within the permissible flow range
Auxiliary power	< 0.1% of the current measuring range with nominal voltage $\pm 10\%$
Electrical inputs and outputs	
Analog output	0/2/4 ... 20 mA, floating; max. load 750 Ω
Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load rating: 24 V AC/DC/1 A, floating
Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and accompanying gas influence correction (correction of cross-interference)
Digital inputs	6, designed for 24 V, floating, freely configurable, e.g. for measuring range switchover
Serial interface	RS 485
Options	AUTOCAL function each with 8 additional digital inputs and relay outputs, also with PROFIBUS PA or PROFIBUS DP
Climatic conditions	
Permissible ambient temperature	-30 ... +70 °C during storage and transportation, 5 ... 45 °C during operation
Permissible humidity	< 90% RH (RH: relative humidity) within average annual value, during storage and transportation (must not fall below dew point)

Extractive continuous process gas analysis

Series 6

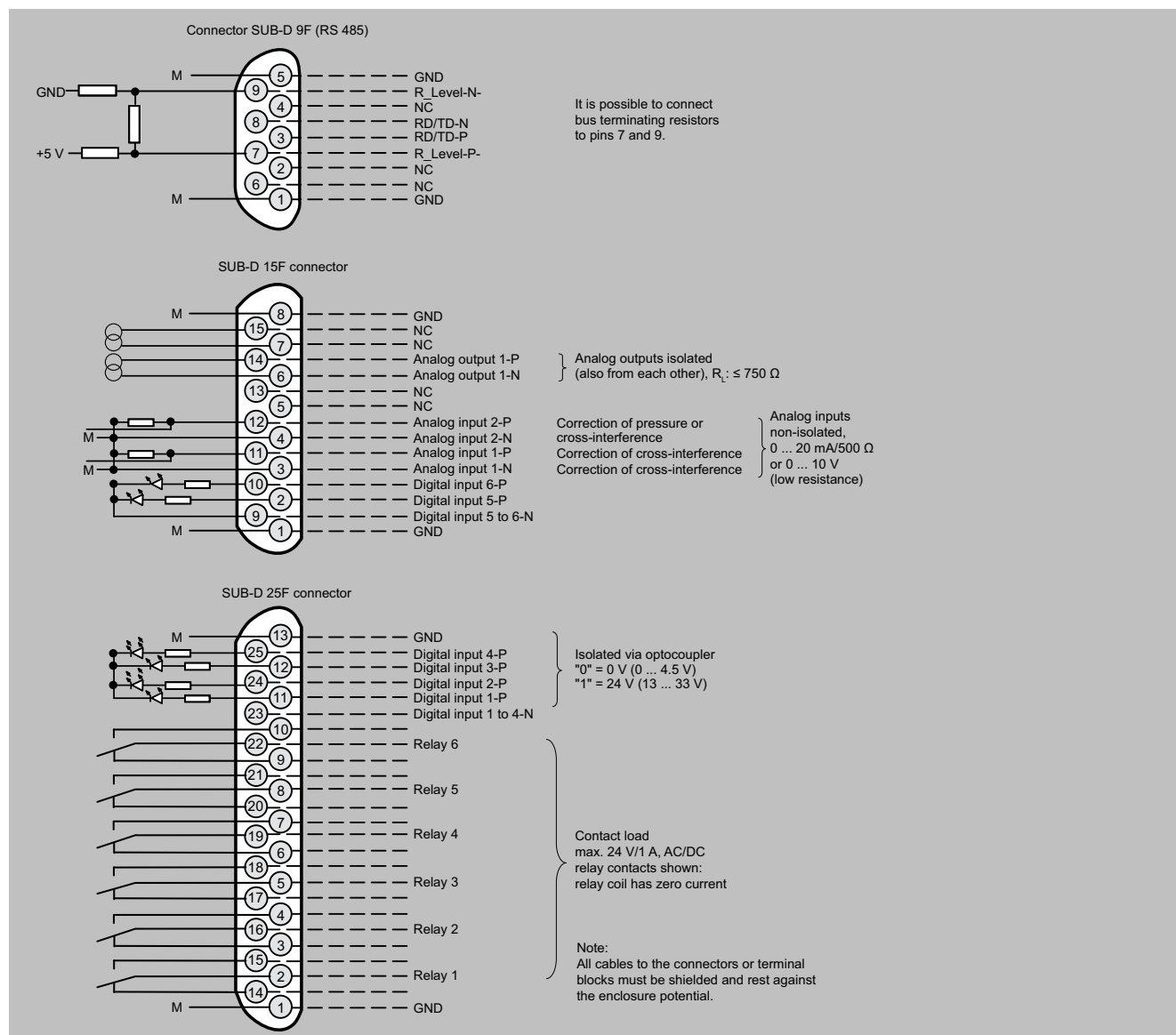
OXYMAT 6 / 19" rack unit

Dimensional drawings



OXYMAT 6, 19" rack unit, dimensions in mm

Circuit diagrams



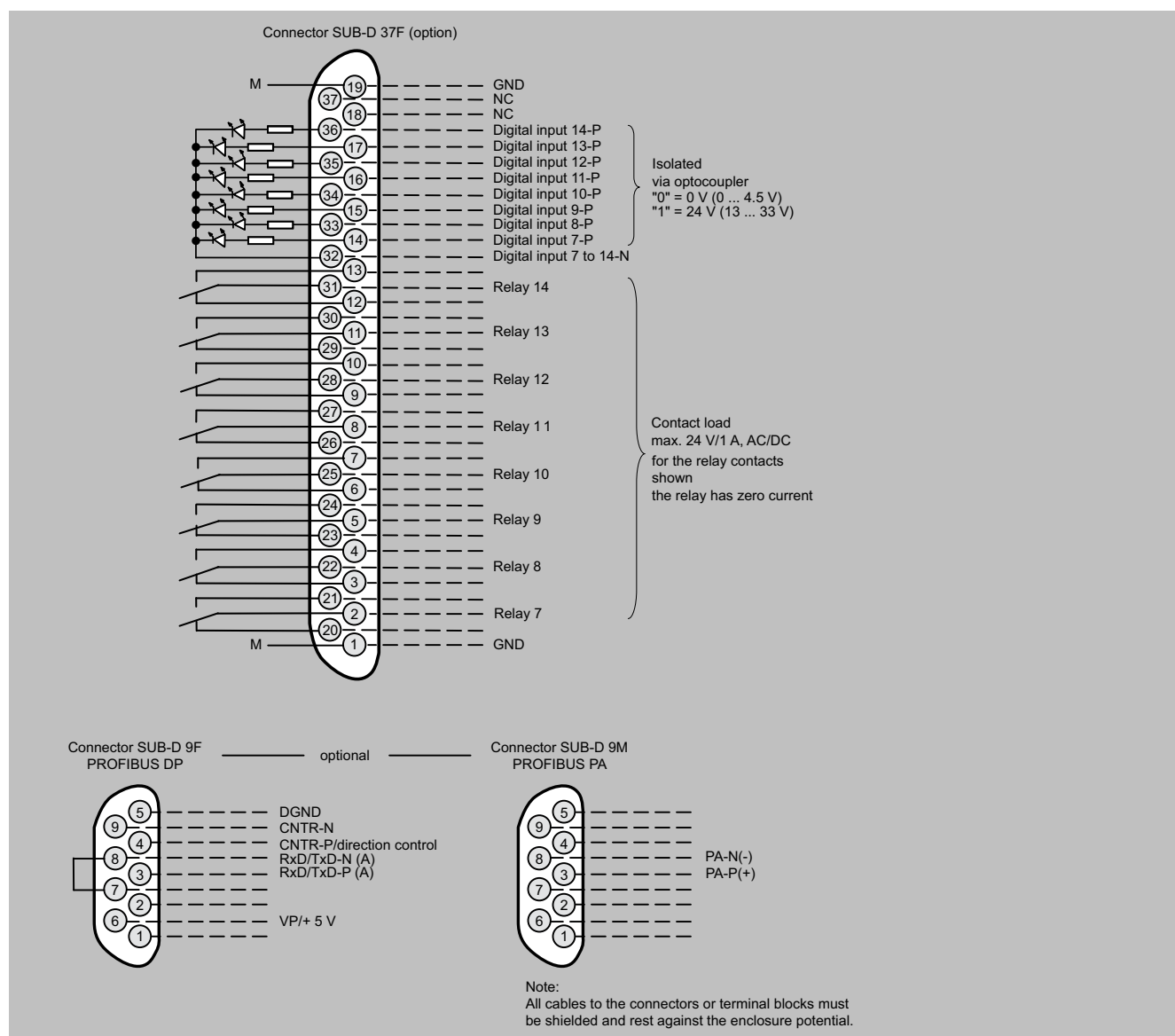
OXYMAT 6, 19" rack unit, pin assignment

Extractive continuous process gas analysis

Series 6

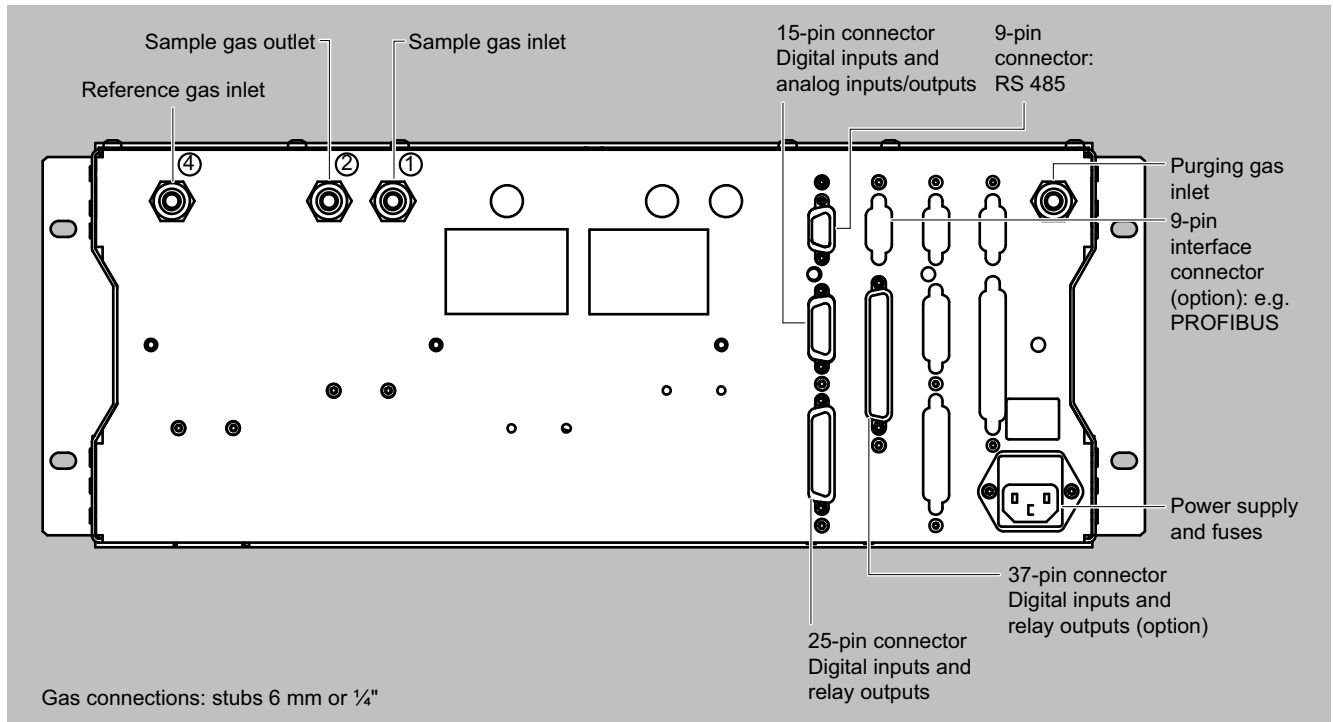
OXYMAT 6 / 19" rack unit

Circuit diagrams (Continued)



OXYMAT 6, 19" rack unit, pin assignment of the AUTOCAL board and PROFIBUS plugs

Circuit diagrams (Continued)



OXYMAT 6, 19" rack unit, gas and electrical connections

Extractive continuous process gas analysis

Series 6

OXYMAT 6 / Field device

Selection and ordering data

OXYMAT 6 gas analyzer For installation in the field		Article No. 7MB2011- ● ● ● 0 ● - ● ● ● ●									
Click on the Article No. for online configuration in the PIA Life Cycle Portal.											
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".											
Gas connections for sample gas and reference gas											
Cutting ring fitting made of stainless steel (mat. no. 1.4571)											
• Pipe with 6 mm outer diameter								0			
• Pipe with 1/4" outer diameter								1			
Cutting ring fitting made of titanium											
• Pipe with 6 mm outer diameter								2			
• Pipe with 1/4" outer diameter								3			
Piping and gas connections made of Hastelloy C22: 7MB2011-0/1.... + order code D01 or D02											
Smallest possible measuring span O₂											
0.5% reference gas pressure 3 000 hPa								A			
0.5% reference gas pressure 100 hPa (external pump)								B			
2% reference gas pressure 3 000 hPa								C			
2% reference gas pressure 100 hPa (external pump)								D			
5% reference gas pressure 3 000 hPa								E			
5% reference gas pressure 100 hPa (external pump)								F			
Sample chamber											
Non-flow-type compensation branch											
• Made of stainless steel, mat. no. 1.4571								A			
• Made of tantalum								B			
• Made of Hastelloy								E			
Flow-type compensation branch											
• Made of stainless steel, mat. no. 1.4571								C			
• Made of tantalum								D			
• Made of Hastelloy								F			
Heating of internal gas paths and analyzer unit											
Without								0			
With (65 ... 130 °C)								1			
Auxiliary power											
Standard device and versions acc. to ATEX II 3G (Zone 2)											
• 100 ... 120 V AC, 48 ... 63 Hz									0		
• 200 ... 240 V AC, 48 ... 63 Hz									1		
ATEX II 2G versions (Zone 1), including certificate											
• 100 ... 120 V AC, 48 ... 63 Hz, according to ATEX II 2G ¹⁾ Operation mode: continuous purging									6		
• 200 ... 240 V AC, 48 ... 63 Hz, according to ATEX II 2G ¹⁾ (operation mode: continuous purging)									7		
Reference gas monitoring											
Without									A		
With									B		
Add-on electronics											
Without											
AUTOCAL function with 8 additional digital inputs and 8 additional relay outputs									A		
AUTOCAL function 8 additional digital inputs/outputs and PROFIBUS PA interface									B		
AUTOCAL function with 8 additional digital inputs/outputs and PROFIBUS DP interface									E		
AUTOCAL function with 8 additional digital inputs/outputs and PROFIBUS PA Ex i									F		
AUTOCAL function with 8 additional digital inputs/outputs and PROFIBUS PA Ex i									G		
Language of the operating software											
German										0	
English										1	
French										2	
Spanish										3	
Italian										4	

¹⁾ See also "Additional units for Ex versions".

Selection and ordering data (Continued)

Options	Order code
Add "-Z" to article number and then add order code	
Settings	
Set of Torx screwdrivers	A32
Kalrez gaskets in sample gas path	B01
Tag plates (customized inscription)	B03
SIL Declaration of Conformity (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 (cannot be combined with E20)
• Outer diameter 1/4"	D02 (cannot be combined with E20)
Ex versions	
For combination options, see table "Ex configurations – Main selection criteria series 6", page 5/17	
ATEX II 3G certificate; restrictive breathing enclosure, non-flammable gases	E11
ATEX II 3G certificate; flammable gases	E12
FM/CSA certificate – Class I Div 2	E20
Approval ATEX IIG safety-related measurements	
• In non-hazardous gas zone	E30
• In hazardous zone acc. to ATEX II 2G, leakage compensation	E31
• In hazardous zone acc. to ATEX II 2G, continuous purging	E32
• In hazardous zone acc. to ATEX II 3G, flammable and non-flammable gases	E33
• Add-on for heated devices 110 V/120 V	E38
• Add-on for heated devices 220 V/240 V	E39
ATEX II 3D certificate; potentially explosive dust atmospheres	
• In non-hazardous gas zone	E40
• In hazardous zone acc. to ATEX II 3G, non-flammable gases	E41
• In hazardous zone acc. to ATEX II 3G, flammable gases ¹⁾	E42
BARTEC Ex p purging unit for use in ATEX or IECEx Zone 1	E74
• BARTEC Ex p control unit for continuous flow	
• BARTEC Ex control station with bypass key switch	
BARTEC Ex purging unit for use in ATEX or IECEx Zone 1	E75
• BARTEC Ex p control unit for continuous flow	
• BARTEC Ex control station with bypass key switch	
• Operator display for visualization of system states	
Clean for O ₂ service (specially cleaned gas path)	Y02
Defined firmware version 4.2.1 for use in safety-related systems	Y05
Measuring range indication in plain text, if different from default setting	Y11

¹⁾ Only in connection with an approved purging unit.

Extractive continuous process gas analysis

Series 6

OXYMAT 6 / Field device

Selection and ordering data (Continued)

Additional units for Ex versions	Article No.
Category ATEX II 2G (Zone 1)	
BARTEC Ex p purging unit for use in ATEX or IECEx Zone 1	
• BARTEC Ex p control unit for continuous flow	7MB8000-7CA
• BARTEC Ex control station with bypass key switch	
• BARTEC Ex p control unit for continuous flow	7MB8000-7CB
• BARTEC Ex control station with bypass key switch	
• Operator display for visualization of system states	
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 for use in ATEX or IECEx Zone 1	
• BARTEC Ex p control unit for continuous flow	7MB8000-7CA
• BARTEC Ex control station with bypass key switch	
• BARTEC Ex p control unit for continuous flow	7MB8000-7CB
• BARTEC Ex control station with bypass key switch	
• Operator display for visualization of system states	
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

Extractive continuous process gas analysis

Series 6

OXYMAT 6 / Field device

Technical specifications

OXIMAT 6, field device	
General information	
Measuring ranges	4, internally and externally switchable; automatic measuring range switchover is also possible
Smallest possible measuring span (relating to sample gas pressure 1 000 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature, smallest possible measuring 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
Largest possible measuring span	100 vol.% O ₂ (for a pressure above 2 000 hPa: 25 vol.% O ₂)
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")
Operating position	Front wall, vertical
Conformity	CE mark in accordance with EN 50081-1, EN 50082-2
Design, enclosure	
Degree of protection	IP65 in accordance with EN 60529, restricted breathing enclosure to EN 50021
Weight	Approx. 28 kg
Electrical characteristics	
Auxiliary power	100 ... 120 V AC (nominal range of use 90 ... 132 V), 48 ... 63 Hz or 200 ... 240 V AC (nominal range of use 180 ... 264 V), 48 ... 63 Hz
Power consumption	Approx. 35 VA, approx. 330 VA with heated version
EMC (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98), EN 61326
Electrical safety	In accordance with EN 61010-1
• Heated devices	Overvoltage category II
• Unheated devices	Overvoltage category III
Fuse ratings (unheated device)	
• 100 ... 120 V	F3: 1 T/250; F4: 1 T/250
• 200 ... 240 V	F3: 0.63T/250; F4: 0.63T/250
Fuse ratings (heated device)	
• 100 ... 120 V	F1: 1 T/250; F2: 4 T/250 F3: 4 T/250; F4: 4 T/250
• 200 ... 240 V	F1: 0.63T/250; F2: 2.5 T/250 F3: 2.5 T/250; F4: 2.5 T/250
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 ... max. 50 °C, but above the dew point (unheated) 15 °C above temperature analyzer unit (heated)
Sample gas humidity	< 90% relative humidity
Time response	
Warm-up period	At room temperature < 30 min (the technical specification will be met after 2 hours)
Delayed display (t ₉₀ time)	< 1.5 s

Technical specifications (Continued)

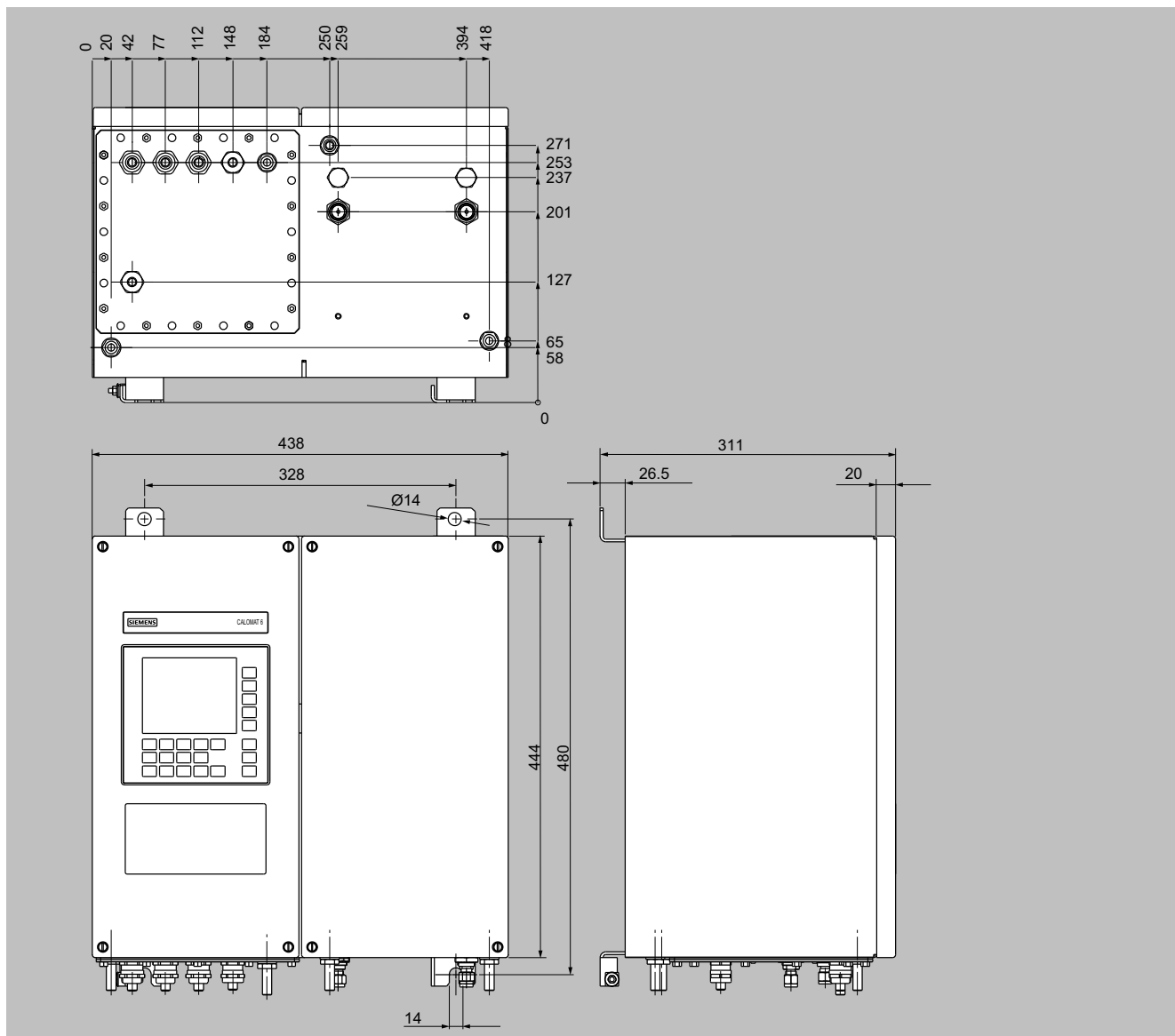
OXIMAT 6, field device	
Damping (electrical time constant)	0 ... 100 s, configurable
Dead time (purging time of the gas path in the device at 1 l/min)	Approx. 0.5 s
Time for device-internal signal processing	< 1 s
Pressure correction range	
Pressure sensor	
• Internal	500 ... 2 000 hPa absolute
• External	500 ... 3 000 hPa absolute
Measuring response	
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 nameplate, with electronic damping constant of 1 s (corresponds to ± 0.25% at 2 σ)
Zero point drift	< ± 0.5%/month of the smallest possible measuring span according to nameplate
Measured value drift	< ± 0.5%/month of the current measuring range
Repeatability	< 1% of the current measuring range
Detection limit	1% of the current measuring range
Linearity error	< 0.1% of the current measuring range
Influencing variables	
Ambient temperature	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature < 0.5%/10 K relating to the smallest possible measuring range according to nameplate, with measuring span 0.5%: 1%/10 K
Sample gas pressure (with air (100 hPa) as reference gas, correction of the atmospheric pressure fluctuations is only possible if the sample gas can vent to ambient air)	- With disabled pressure compensation: < 2% of the current measuring range /1% pressure variation - With enabled pressure compensation: < 0.2% of the current measuring range /1% pressure variation
Accompanying gases	Zero point deviation corresponding to paramagnetic or diamagnetic deviation of accompanying gas
Sample gas flow at zero point	< 1% of the current measuring range according to nameplate with a change in flow of 0.1 l/min within the permissible flow range; heated version up to double error
Auxiliary power	< 0.1% of the current measuring range with nominal voltage ± 10%
Electrical inputs and outputs	
Analog output	0/2/4 ... 20 mA, floating; max. load 750 Ω
Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load rating: 24 V AC/DC/1 A, floating
Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and accompanying gas influence correction (correction of cross-interference)
Digital inputs	6, designed for 24 V, floating, freely configurable, e.g. for measuring range switchover
Serial interface	RS 485
Options	AUTOCL function each with 8 additional digital inputs and relay outputs, also with PROFIBUS PA or PROFIBUS DP
Climatic conditions	
Permissible ambient temperature	-30 ... +70 °C during storage and transportation, 5 ... 45 °C during operation
Permissible humidity	< 90% relative humidity as annual average (maximum accuracy achieved after 2 hours), during storage and transportation (must not fall below dew point)

Extractive continuous process gas analysis

Series 6

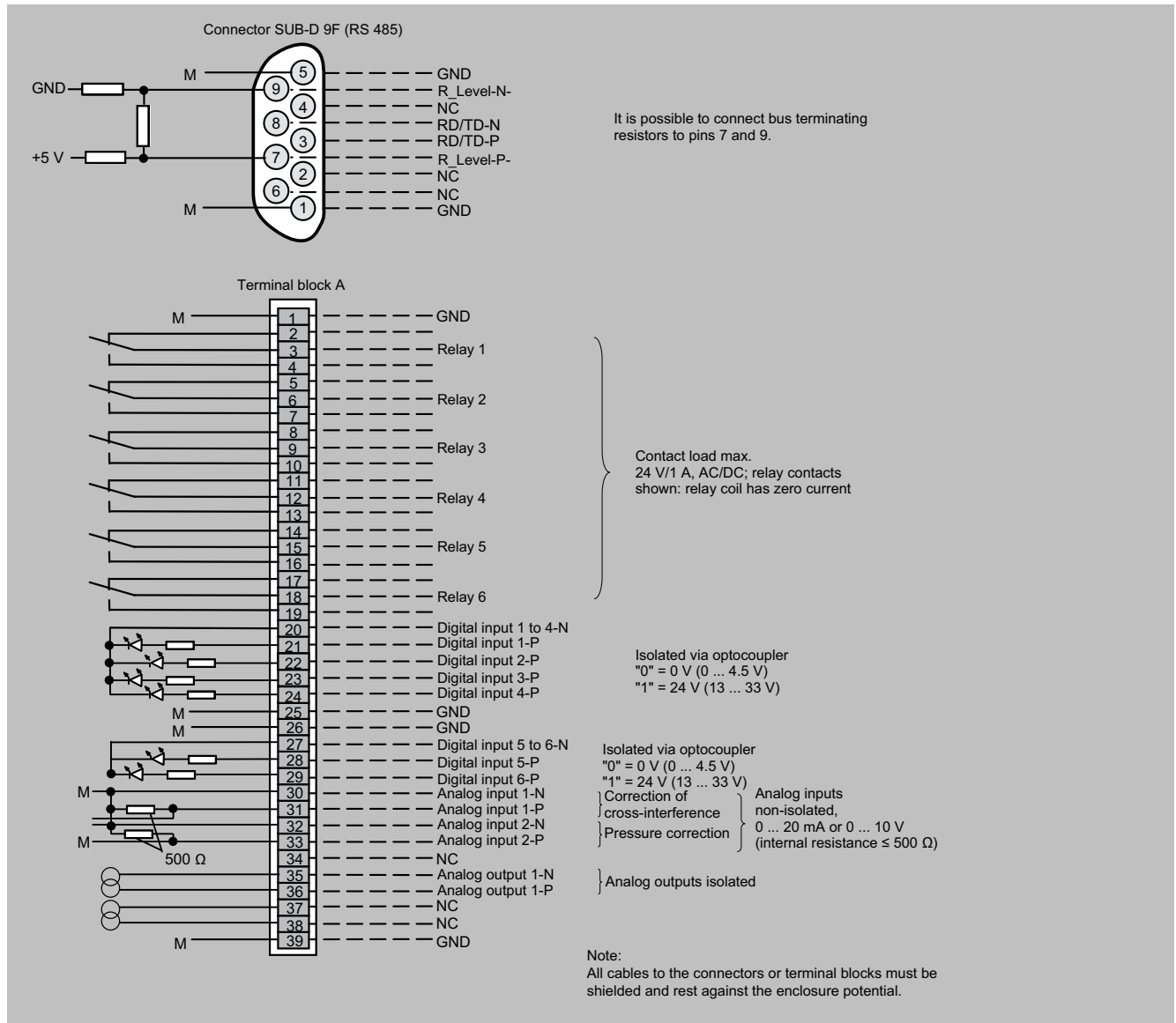
OXYMAT 6 / Field device

Dimensional drawings



OXYMAT 6, field unit, dimensions in mm

Circuit diagrams



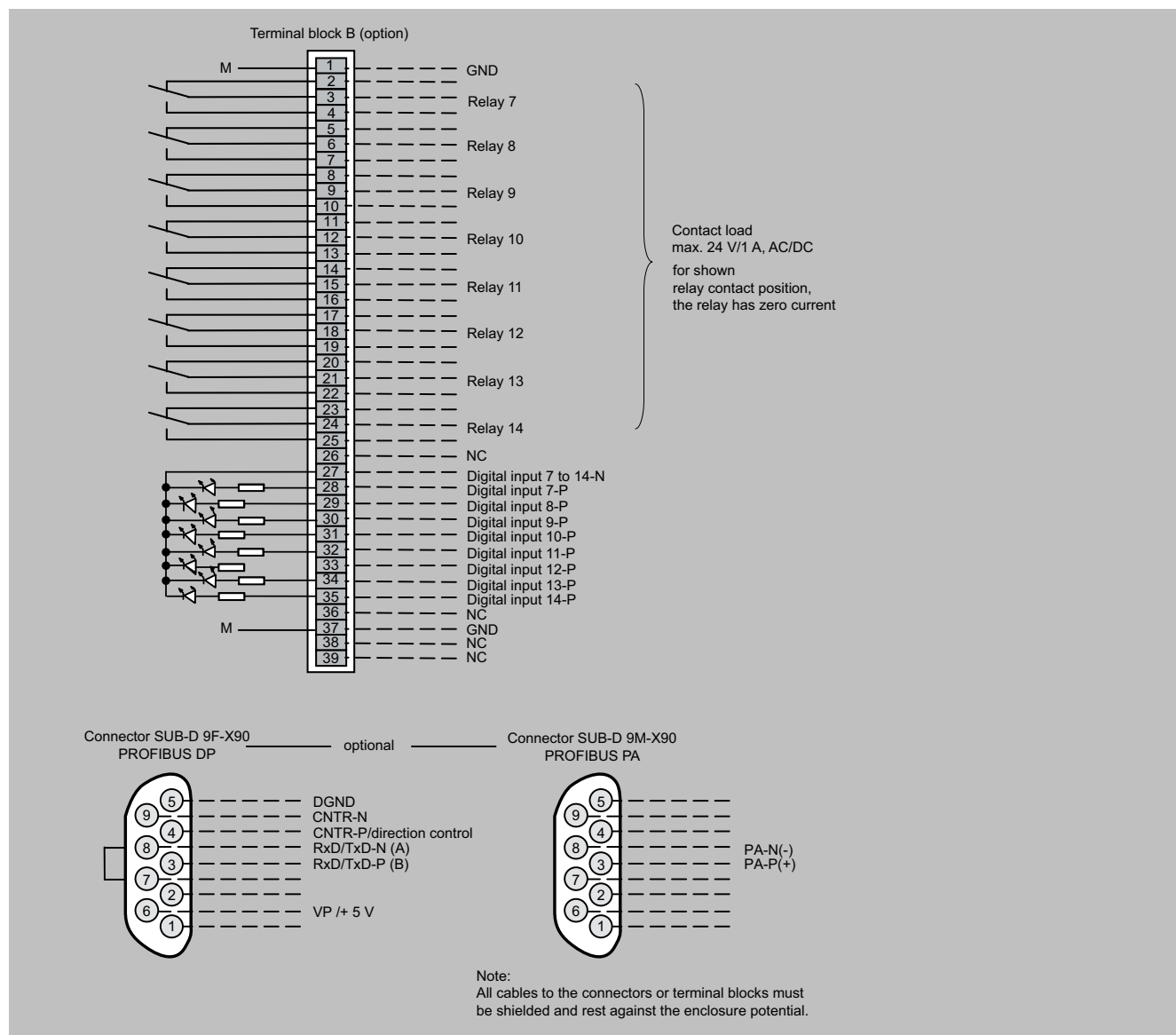
OXYMAT 6, field device, pin and terminal assignment

Extractive continuous process gas analysis

Series 6

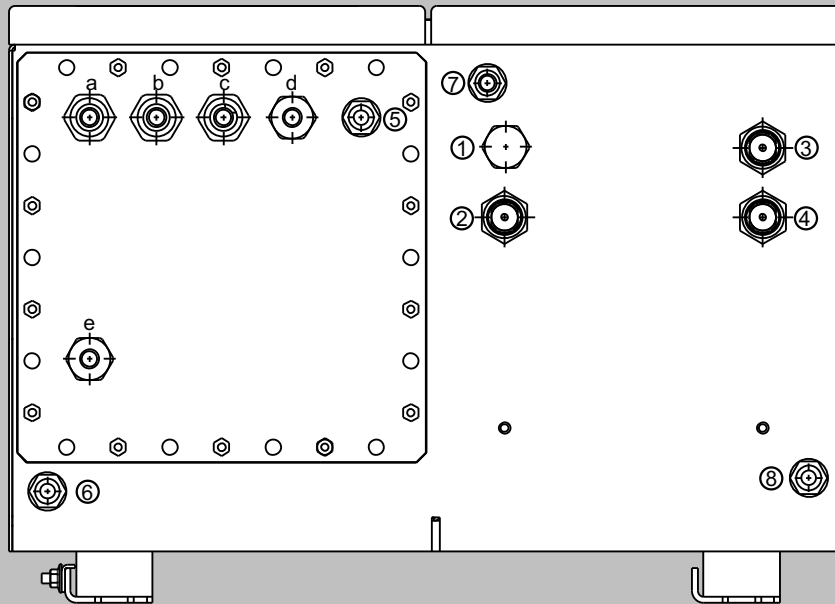
OXYMAT 6 / Field device

Circuit diagrams (Continued)



OXYMAT 6, field device, pin and terminal assignment of the AUTOCAL board and PROFIBUS plugs

Circuit diagrams (Continued)



Gas connections

- | | | |
|-------|--|--|
| ① | not used | } Clamping
gland for pipe
Ø 6 mm or 1/4" |
| 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 |

OXYMAT 6, field device, gas connections and electrical connections

Extractive continuous process gas analysis

Series 6

OXYMAT 6 / Suggestion for spare parts

Selection and ordering data

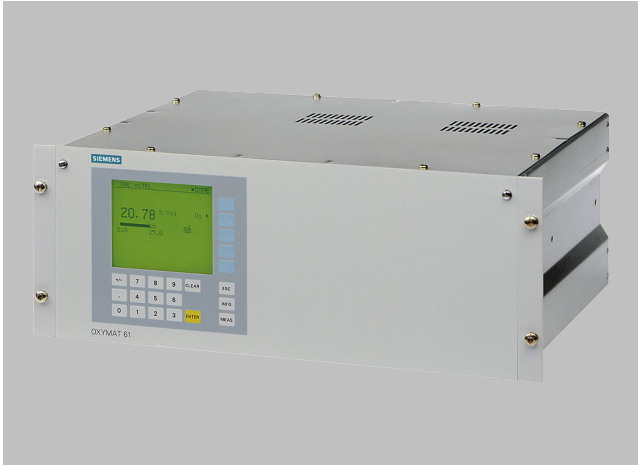
Description	7MB2021	7MB2011	7MB2011 Ex	2 years (unit)	5 years (unit)	Article No.
Analyzer unit						
O-ring (sample chamber)	x	x	x	2	4	C71121-Z100-A159
O-ring (fitting)	x	x	x	1	2	C74121-Z100-A6
O-ring (measuring head)	x	x	x	2	4	C79121-Z100-A32
Spacer		x	x	-	1	C79451-A3277-B22
Sample chamber, stainless 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
Plug-in 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 (so-called "Clean for O₂ service"), please specify when ordering spare parts. This is the only way to ensure that the gas path will continue to comply with the special requirements of this version.

More information

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 ensure that the gas path will continue to comply with the special requirements for this version.

Overview



The OXYMAT 61 gas analyzers use a measuring principle based on the paramagnetic alternating pressure method and are used to measure oxygen in gases.

Benefits

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

Application

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

Further applications

- Chemical plants
- Gas manufacturers
- Research and development

Extractive continuous process gas analysis

Series 6

OXYMAT 61

Design

- 19" rack unit with 4 U 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; pipe diameter 6 mm or ¼"
- Gas and electrical connections at the rear of the device

Display and operator 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

Inputs and outputs

- One analog output per medium (from 0, 2, 4 to 20 mA; NAMUR parameterizable)
- Six digital inputs freely configurable (e.g. for measuring range switchover, processing of external signals from sample preparation)
- Six relay outputs freely configurable (failure, maintenance demanded, maintenance switch, limit alarm, external solenoid 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

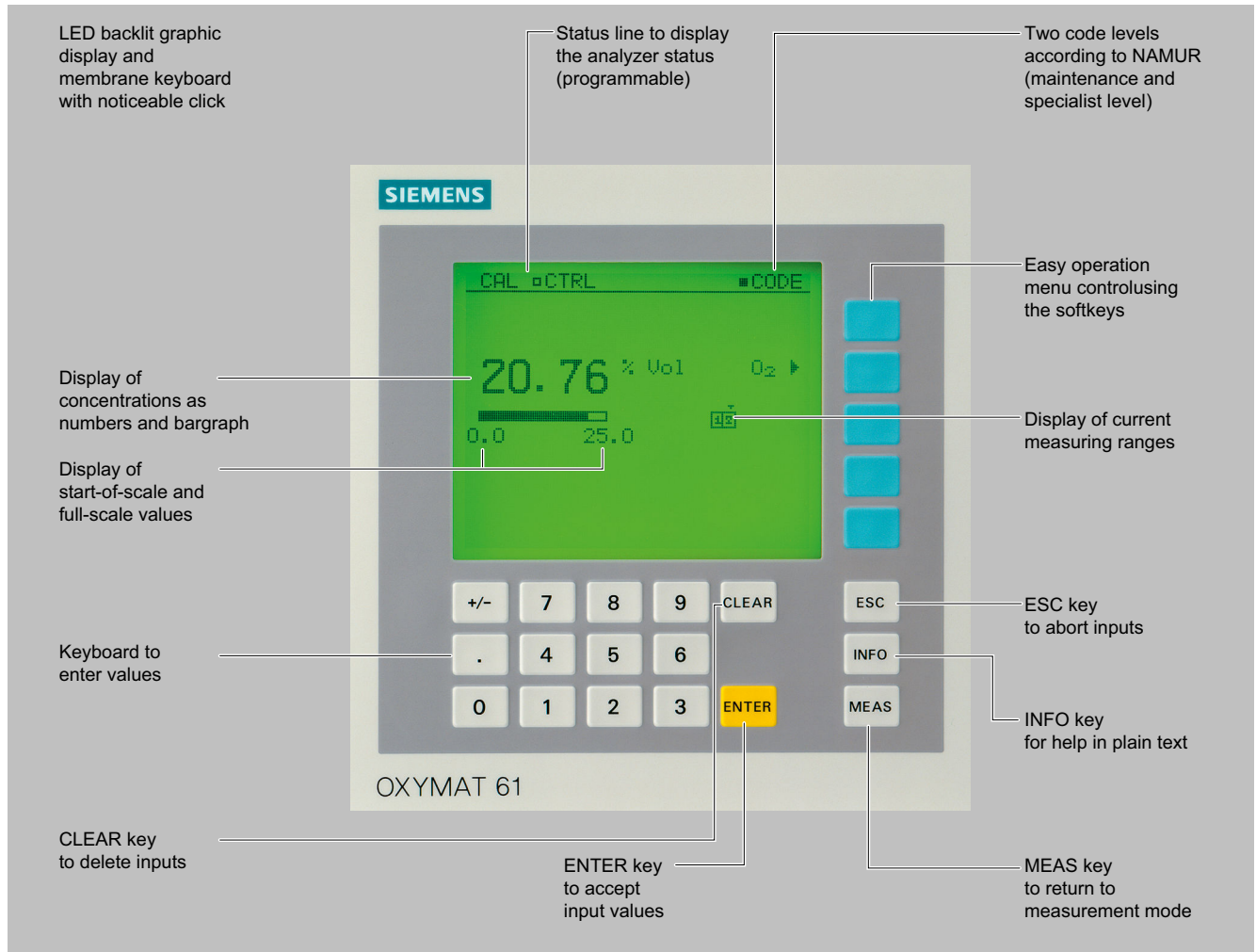
- RS 485/RS 232 converter
- RS 485/Ethernet converter
- RS 485/USB converter
- Connection to networks via PROFIBUS DP/PA interface
- SIPROM GA software as service and maintenance tool

Extractive continuous process gas analysis

Series 6

OXYMAT 61

Design (Continued)



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	Measuring tube	Duran glass
	Variable area	Duran glass, black
	Suspension boundary	PTFE (Teflon)
	Angle units	FKM (Viton)

Extractive continuous process gas analysis

Series 6

OXYMAT 61

Design (Continued)

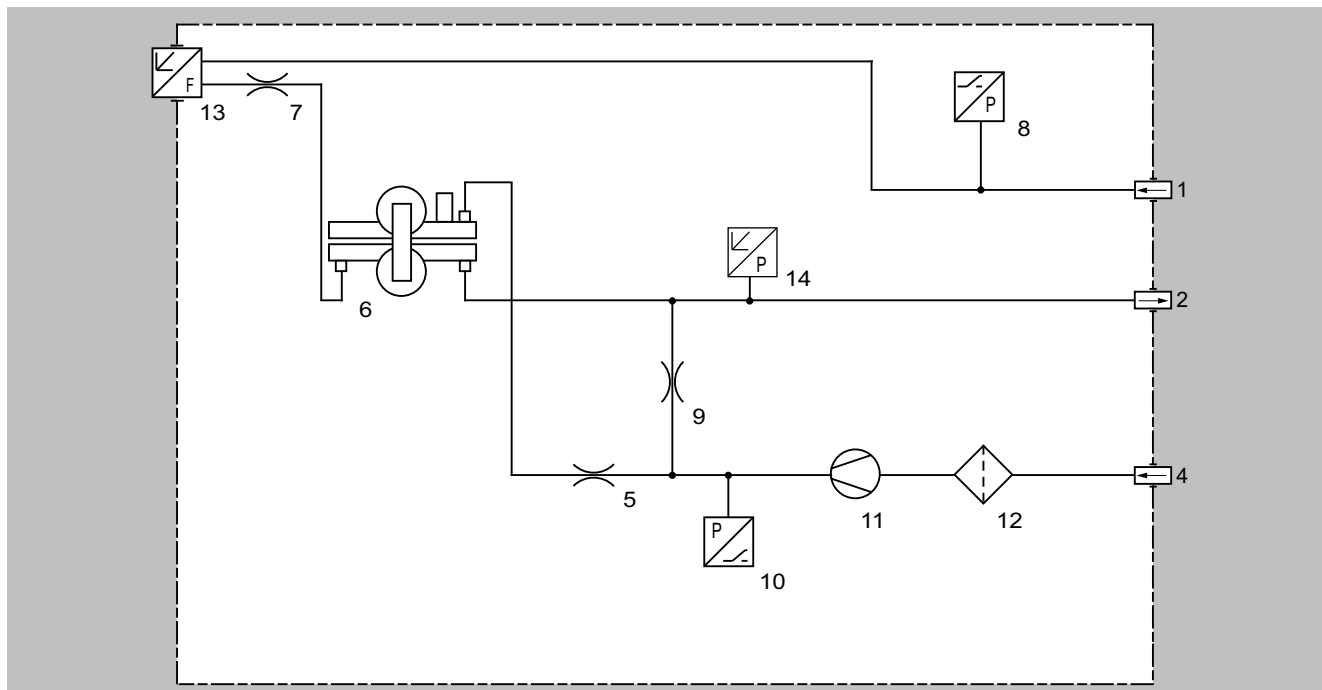
Options

Pressure switch

Diaphragm
Enclosure

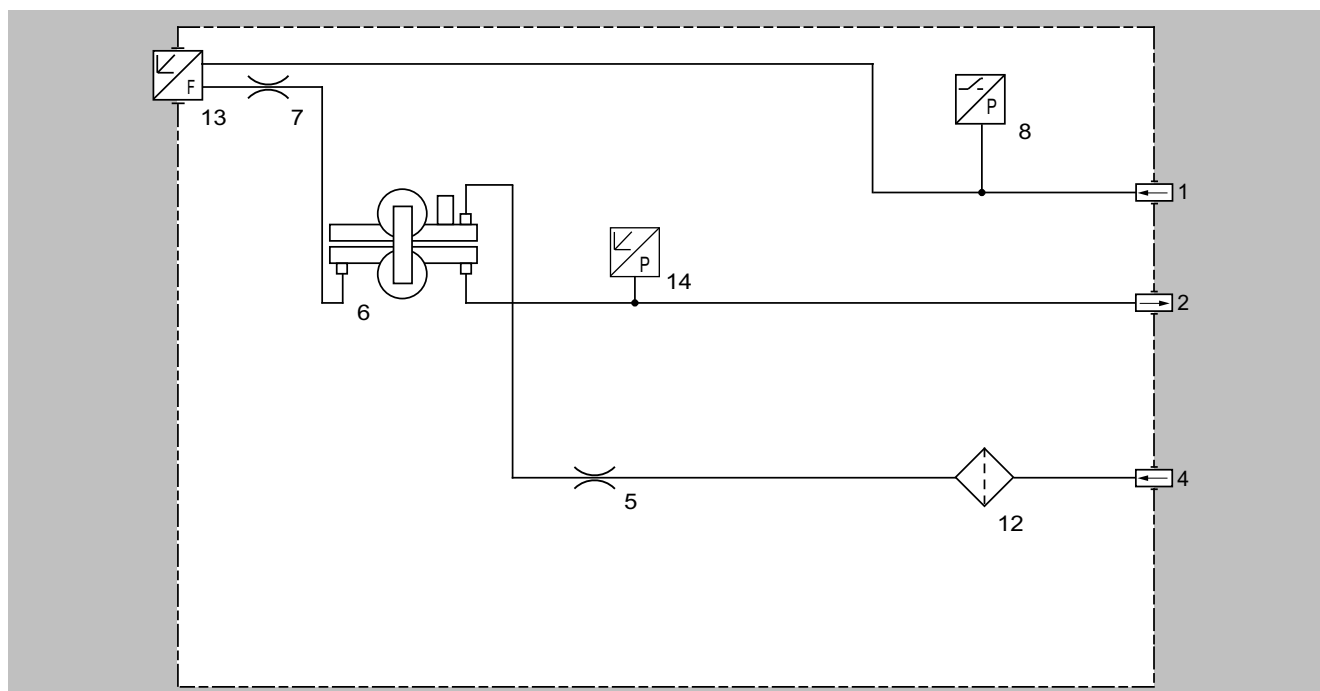
FKM (Viton)
PA 6.3 T

Gas path



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

Design (Continued)



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

Legend for the gas path figures

1	Sample gas inlet	8	Pressure switch in sample gas path (option)
2	Sample gas outlet	9	Restrictor in reference gas channel (outlet)
3	Not used	10	Pressure switch for reference gas monitoring
4	Reference gas inlet	11	Pump
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	Pressure sensor

Mode of operation

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 (N₂, O₂ 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 sample chamber position as well as the gas analyzer'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.

Extractive continuous process gas analysis

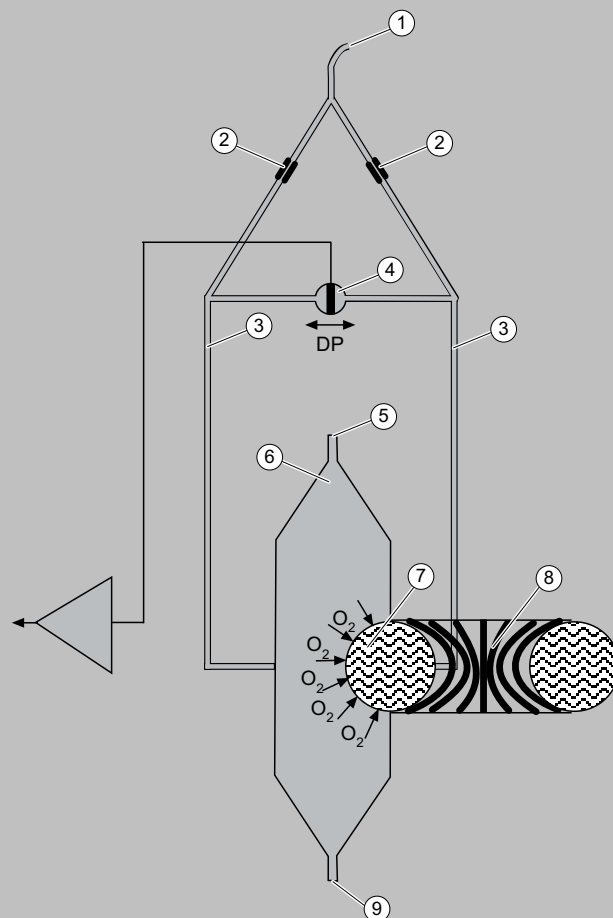
Series 6

OXYMAT 61

Mode of operation (Continued)

Note

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



- ① Reference gas inlet
- ② Restrictors
- ③ Reference gas channels
- ④ Microflow sensor for measurement
- ⑤ Sample gas inlet
- ⑥ Sample cell
- ⑦ Paramagnetic effect
- ⑧ Electromagnet with alternating field strength
- ⑨ Sample gas and reference gas outlet

OXYMAT 61, mode of operation

Function**Main features**

- Four measuring ranges which can be freely configured, even with suppressed zero point; all measuring ranges are linear
- Electrically isolated measured value output 0/2/4 through to 20 mA (including inverted)
- Choice of automatic or manual measuring range switchover; remote switching is also possible
- Storage of measured values possible during calibration
- Wide range of selectable time constants (static/dynamic noise damping); 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 separate authorization codes for the prevention of accidental and unauthorized operator interventions
- Automatic measuring range calibration parameterizable
- Operation based on NAMUR recommendation
- Monitoring of sample gas (option)
- Custom-made device designs, such as:
 - Customer acceptance
 - TAG plates
 - Drift recording
- Simple handling using a numerical membrane keyboard and operator prompting
- Short response time
- Reference gas supply either externally (N₂, O₂ 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 for version with built-in reference gas pump
- Different smallest measuring spans, depending on version 2.0% or 5.0% O₂
- Internal pressure sensor for correction of fluctuations in the sample gas pressure

Reference gases for OXYMAT 61

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.
... to 100 vol.% O ₂	O ₂	2 000 ... 4 000 hPa above sample gas pressure (max. 5 000 hPa absolute)	
Approx. 21 vol.% O ₂	Air	Atm. air pressure with internal reference gas pump	

¹⁾ Suppressed zero point with measuring range end value 100 vol.% O₂.

²⁾ Suppressed zero point with 21 vol.% O₂ within the measuring span.

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
Isobutane C ₄ H ₁₀	-1.30
1-butene C ₄ H ₈	-0.96
Isobutene 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

Extractive continuous process gas analysis

Series 6

OXYMAT 61

Function (Continued)

Accompanying gas (concentration 100 vol.%)	Zero point deviation in vol.% O ₂ absolute
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
Isopentane 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

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 zero point deviations listed in Table 1 must be multiplied by an adjustment factor (k):

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

All diamagnetic gases have a negative zero point deviation.

Extractive continuous process gas analysis

Series 6

OXYMAT 61 / 19" rack unit

Selection and ordering data

OXYMAT 61 gas analyzer 19" rack unit for installation in cabinets		Article No. 7MB2001- ● ● A 0 0 - ● ● ● ●									
Click on the Article No. for online configuration in the PIA Life Cycle Portal.											
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".											
Gas connections for sample gas and reference gas											
Pipe with 6 mm outer diameter			0								
Pipe with 1/4" outer diameter			1								
Smallest possible measuring span O₂											
2% reference gas pressure 3 000 hPa				C							
2% reference gas supply with internal pump				D							
5% reference gas pressure 3 000 hPa				E							
5% reference gas supply with internal pump				F							
Auxiliary power											
100 V ... 120 V AC, 48 ... 63 Hz								0			
200 V ... 240 V AC, 48 ... 63 Hz								1			
Sample gas monitoring											
Without									A		
With (including flow indicator and pressure switch)									D		
Add-on electronics											
Without										A	
AUTOCAL function with 8 additional digital inputs and outputs										B	
AUTOCAL function with serial interface for the automotive industry (AK)										D	
AUTOCAL function 8 additional digital inputs/outputs and PROFIBUS PA interface										E	
AUTOCAL function with 8 additional digital inputs/outputs and PROFIBUS DP interface										F	
Language of the operating software											
German											0
English											1
French											2
Spanish											3
Italian											4

Options	Order code
Add "-Z" to article number and then add order code.	
Settings	
Telescopic rails (2 units)	A31
Set of Torx screwdrivers, ball Allen screwdrivers	A32
Tag plates (specific inscription based on customer information)	B03
Damping element for sample gas	B04 (cannot be combined with Y02)
SIL Declaration of Conformity (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 default 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 with 8 digital inputs/outputs each	C79451-A3480-D511
AUTOCAL function with 8 digital inputs/outputs each and PROFIBUS PA	A5E00057307

Extractive continuous process gas analysis

Series 6

OXYMAT 61 / 19" rack unit

Selection and ordering data (Continued)

Accessories	Article No.
AUTOCAL function with 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%.

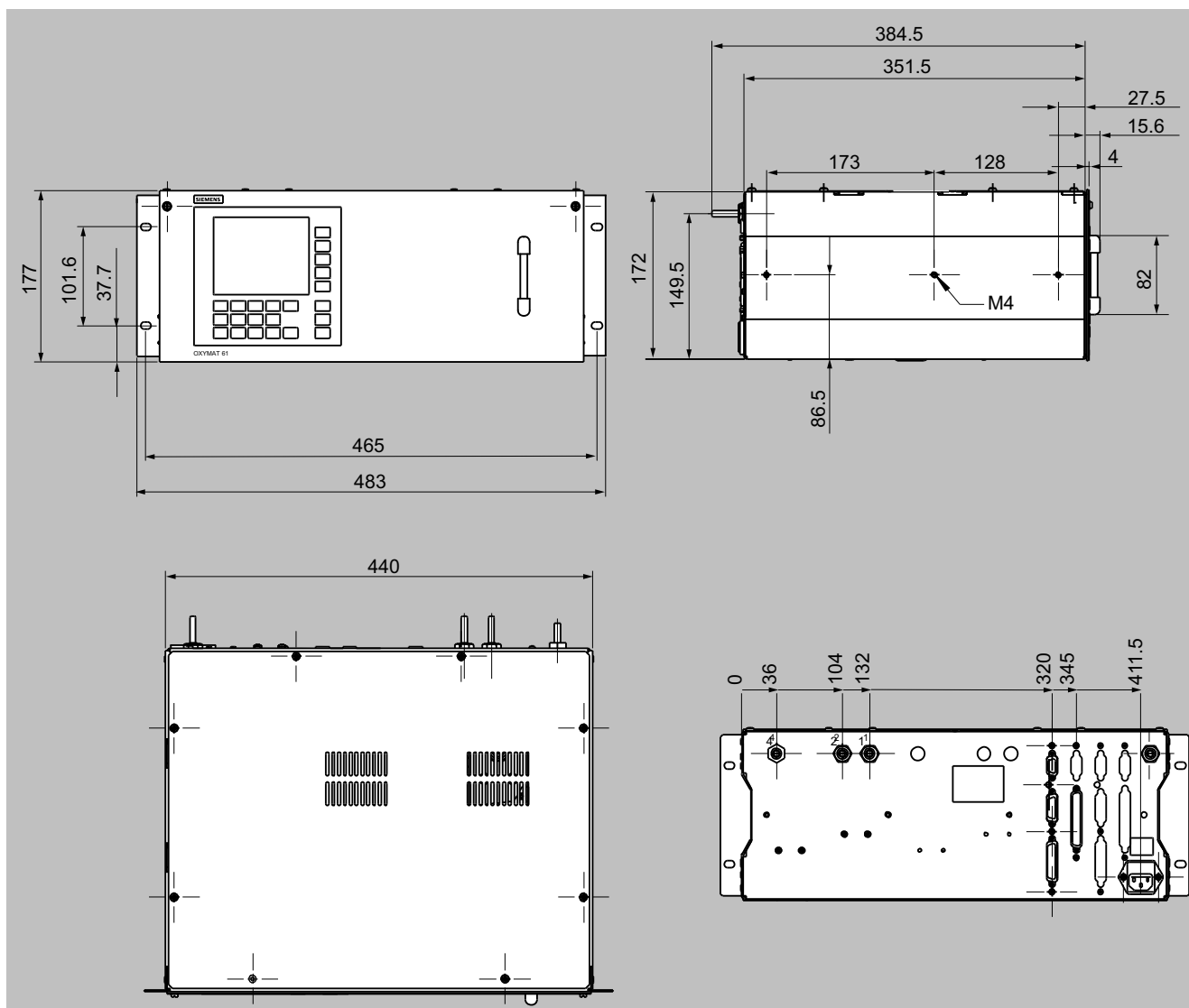
Technical specifications

OXYMAT 61, 19" rack unit	
General information	
Measuring ranges	4, internally and externally switchable; automatic measuring range switchover is also possible
Smallest possible measuring span (relating to sample gas pressure 1 000 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature)	2 vol.% or 5 vol.% O ₂
Largest possible measuring span	100 vol.% O ₂
Measuring ranges with suppressed zero point	Any zero point within 0 ... 100 vol.% can be implemented, provided that a suitable reference gas is used
Operating position	Front wall, vertical
Conformity	CE mark in accordance with EN 50081-1 and EN 50082-2
Design, enclosure	
Degree of protection	IP20 according to EN 60529
Weight	Approx. 13 kg
Electrical characteristics	
Auxiliary power	100 ... 120 V AC (nominal range of use 90 ... 132 V), 48 ... 63 Hz or 200 ... 240 V AC (nominal range of use 180 ... 264 V), 48 ... 63 Hz
Power consumption	Approx. 45 VA
EMC (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98)
Electrical safety	According to EN 61010-1, overvoltage category III
Fuse ratings	100 ... 120 V: 1.0T/250 200 ... 240 V: 0.63T/250
Gas inlet conditions	
Permissible sample gas pressure	
• External reference gas supply	800 ... 1 200 hPa, absolute
• With integrated pump	Atmospheric pressure ± 50 hPa
Sample gas flow	18 ... 60 l/h (0.3 ... 1 l/min)
Sample gas temperature	Min. 0 ... max. 50 °C, but above the dew point
Sample gas humidity	< 90% relative humidity
Reference gas pressure (high-pressure version)	2 000 ... 4 000 hPa above sample gas pressure, but max. 5 000 hPa, absolute (version without reference gas pump)
Reference gas pressure (low-pressure version) with external pump	Min. 100 hPa above sample gas pressure
Time 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 device at 1 l/min)	Approx. 0.5 ... 2.5 s, depending on the 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)

Technical specifications (Continued)

OXYMAT 61, 19" rack unit	
Measuring response	
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 nameplate, with electronic damping constant of 1 s (corresponds to ± 0.25% at 2 σ)
Zero point drift	< ± 0.5%/month of the smallest possible measuring span according to nameplate
Measured value drift	< ± 0.5%/month of the current measuring range
Repeatability	< 1% of the current measuring range
Detection limit	1% of the current measuring range
Linearity error	< 1% of the current measuring range
Influencing variables	
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 the current measuring range/ 10 K Zero offset: < 0.1 vol.% O ₂ absolute/10 K
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.)	- With disabled pressure compensation: < 2% of the current measuring range/1% pressure variation - With enabled pressure compensation: < 0.2% of the current measuring range/1% pressure variation
Accompanying gases	Zero point deviation corresponding to paramagnetic or diamagnetic deviation of accompanying gas (see table)
Sample gas flow at zero point	< 1% of the current measuring range according to nameplate with a change in flow of 0.1 l/min within the permissible flow range
Auxiliary power	< 0.1% of the current measuring range with nominal voltage ± 10%
Electrical inputs and outputs	
Analog output	0/2/4 ... 20 mA, floating; max. load 750 Ω
Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load rating: 24 V AC/DC/1 A, floating
Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and accompanying gas influence correction (correction of cross-interference)
Digital inputs	6, designed for 24 V, floating, freely configurable, e.g. for measuring range switchover
Serial interface	RS 485
Options	AUTOCAL function each with 8 additional digital inputs and relay outputs, also with PROFIBUS PA or PROFIBUS DP
Climatic conditions	
Permissible ambient temperature	-30 ... +70 °C during storage and transportation, 5 ... 45 °C during operation
Permissible humidity	< 90% relative humidity as annual average during storage and transportation (must not fall below dew point)

Dimensional drawings



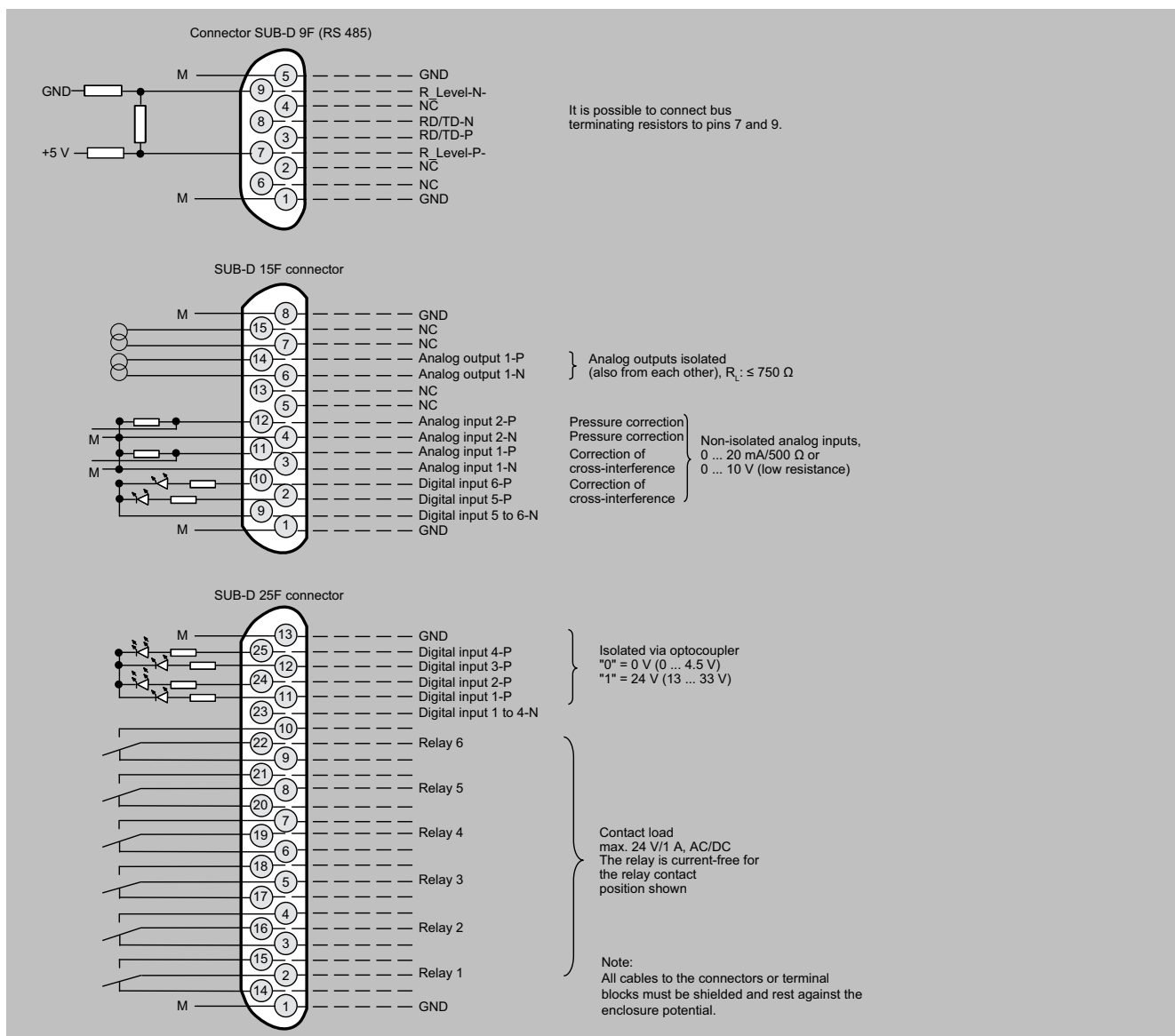
OXYMAT 61, 19" rack unit, dimensions in mm

Extractive continuous process gas analysis

Series 6

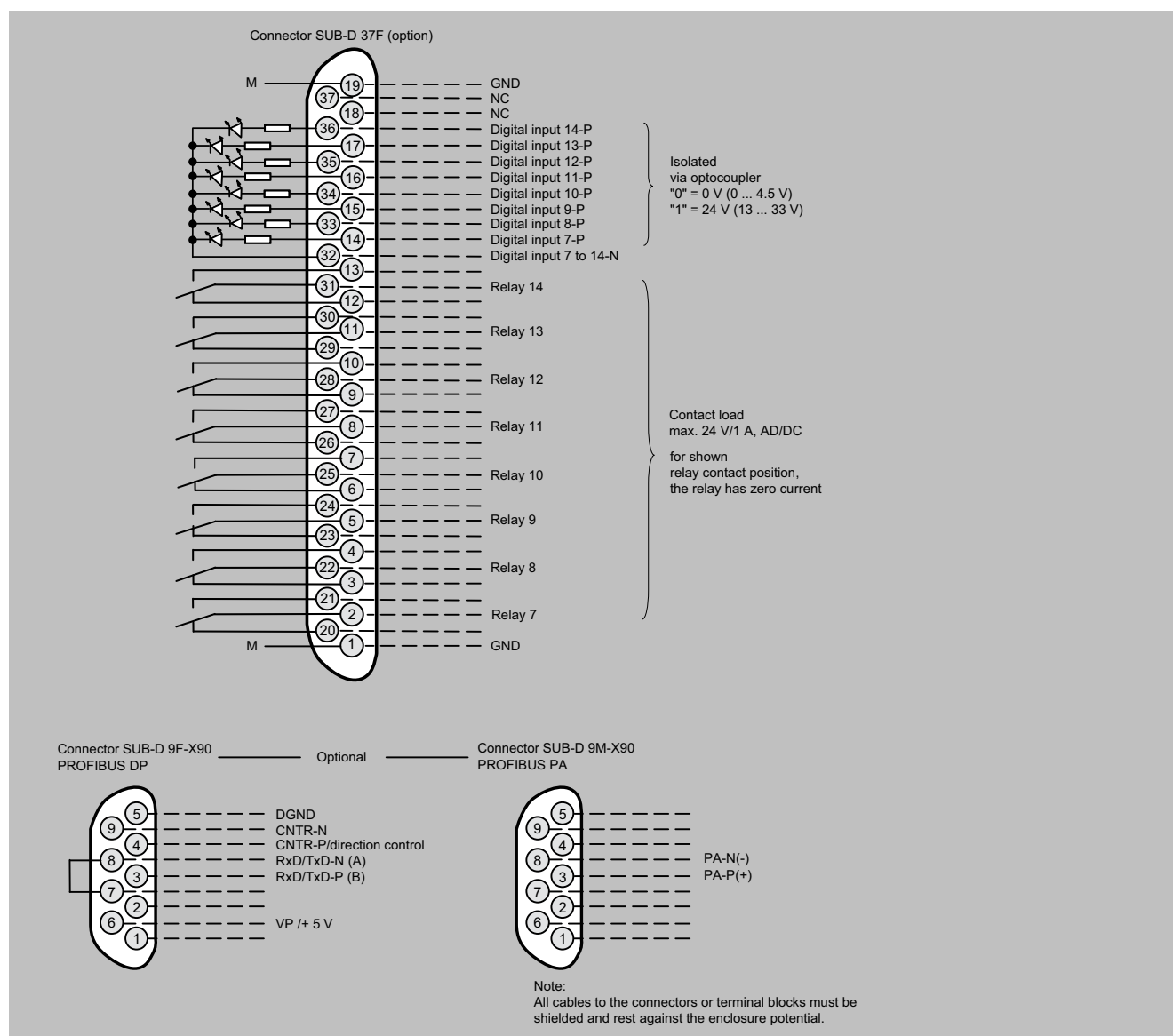
OXYMAT 61 / 19" rack unit

Circuit diagrams



OXYMAT 61, 19" rack unit, pin assignment

Circuit diagrams (Continued)



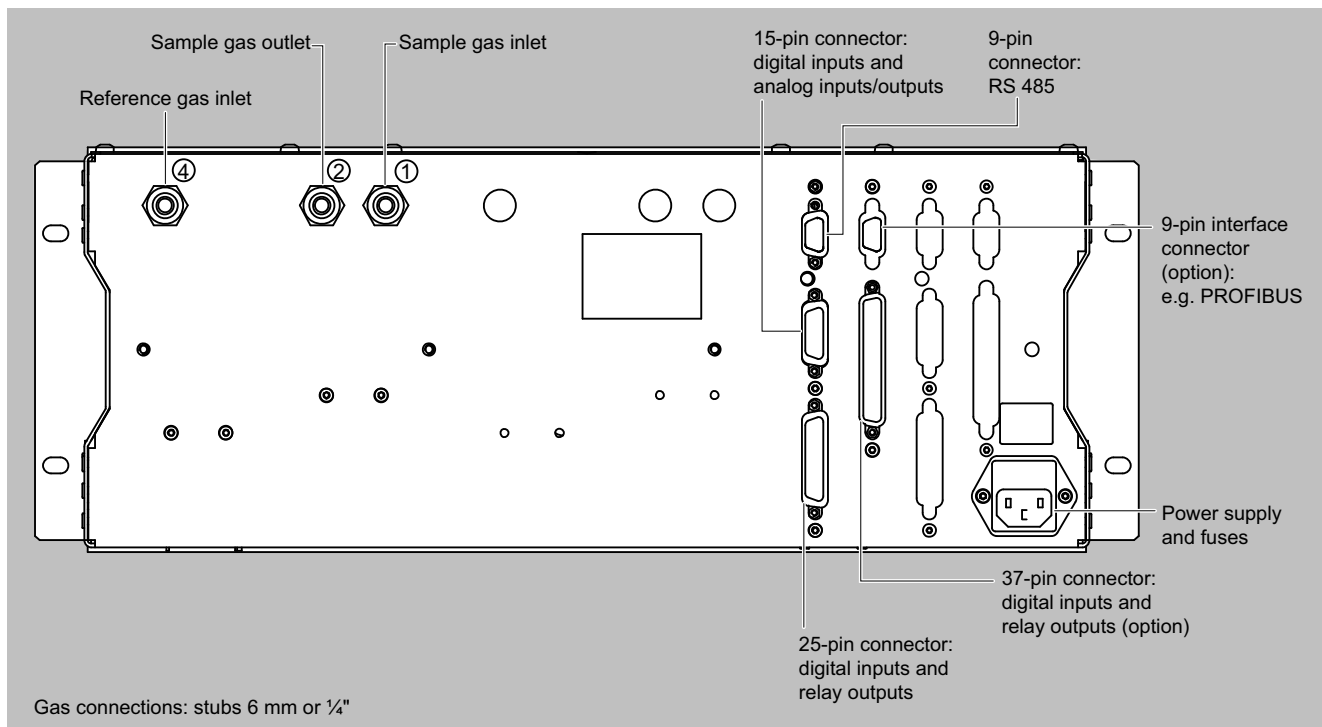
OXYMAT 61, 19" rack unit, pin assignment of the AUTOCAL board and PROFIBUS plugs

Extractive continuous process gas analysis

Series 6

OXYMAT 61 / 19" rack unit

Circuit diagrams (Continued)



OXYMAT 61, 19" rack unit, gas and electrical connections

Selection and ordering data

Description	2 years (unit)	5 years (unit)	Article No.
Analyzer unit			
Reference gas supply (pump, restrictor, pressure switch, hose)	1	1	A5E00114838
Set of gaskets for reference 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
Plug-in filter	-	1	W75041-E5602-K2
Fusible element			
• 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 (so-called "Clean for O₂ service"), please specify when ordering spare parts. This is the only way to ensure that the gas path will continue to comply with the special requirements for this version.

More information

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 ensure that the gas path will continue to comply with the special requirements for this version.

Extractive continuous process gas analysis

Series 6

OXYMAT 64

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 N_2 and CO_2

Welding

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

Systems for air separation

- Measurements in N_2 and in inert gases (e.g. Ne, Ar)
- Measurements in CO_2

Food production

- Measurement in CO_2 (e.g. breweries)

Electronics industry

- Low-pressure version with pump

Flow soldering systems

Design

- 19" rack unit with 4 U for installation
 - In hinged frame
 - In cabinets with or without telescopic 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 $\frac{1}{4}$ "
 - Output: Pipe connection with diameter 6 mm or $\frac{1}{4}$ "
- High-pressure and low-pressure versions
- Catalytically active and inactive cell

Display and operator panel

- Large LCD field for simultaneous display of
 - Measured value
 - Status bar
 - Measuring ranges
- Contrast of the LCD display adjustable via the menu
- Permanent LED backlighting
- Washable membrane keyboard with five softkeys
- Five-digit measured value display (decimal point counts as one digit)

Design (Continued)

- 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

Inputs and outputs

- One analog output per medium (from 0, 2, 4 to 20 mA; NAMUR parameterizable)
- Six digital inputs freely configurable (e.g. for measuring range switchover, processing of external signals from sample preparation)
- Six relay outputs freely configurable (failure, maintenance demanded, maintenance switch, limit alarm, external solenoid valves)
- Two analog inputs configurable (e.g. correction of cross-interference, external pressure sensor)
- Expandable with 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

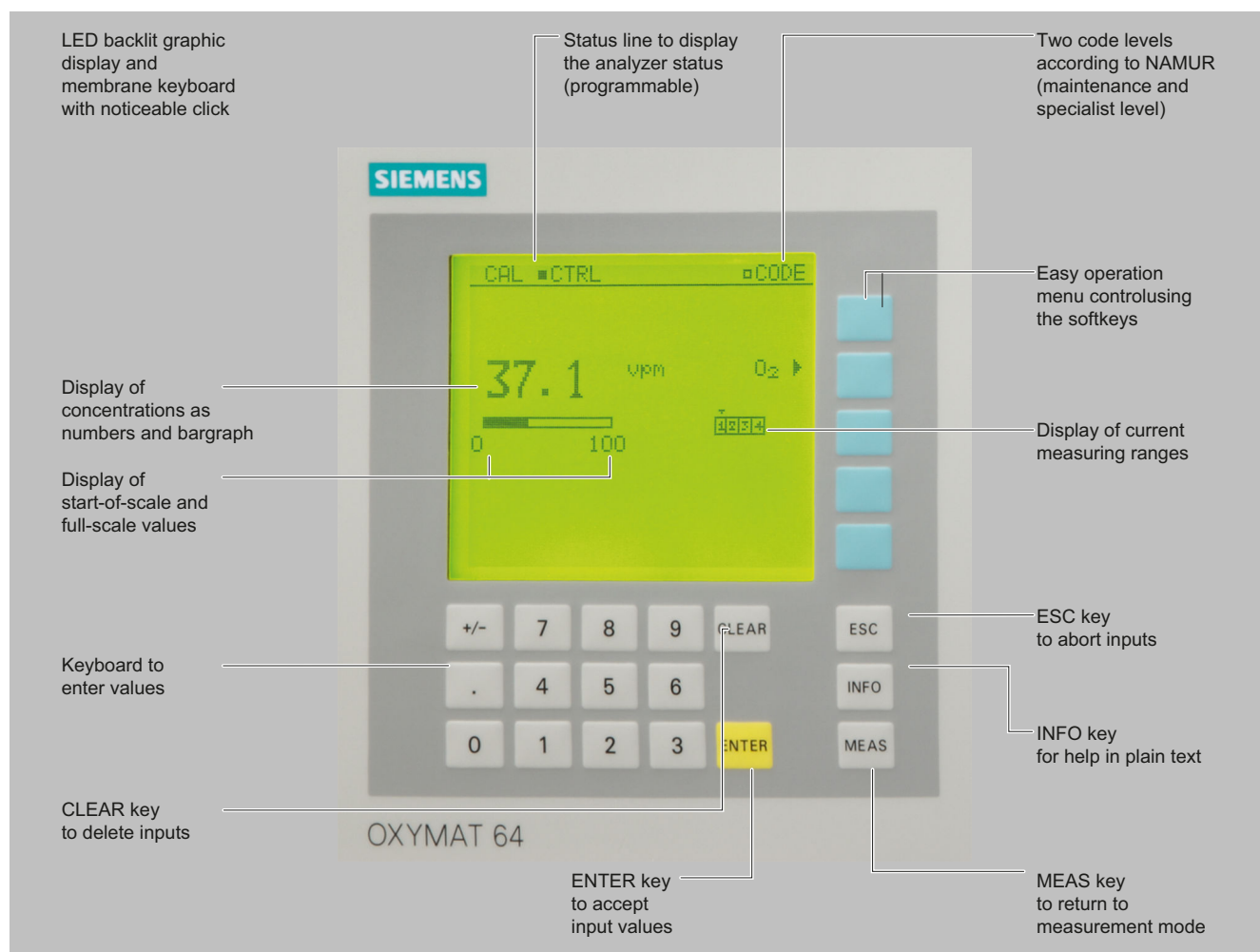
- RS 485/RS 232 converter
- RS 485/Ethernet converter
- RS 485/USB converter
- Connection to networks via PROFIBUS DP/PA interface
- SIPROM GA software as the service and maintenance tool

Extractive continuous process gas analysis

Series 6

OXYMAT 64

Design (Continued)



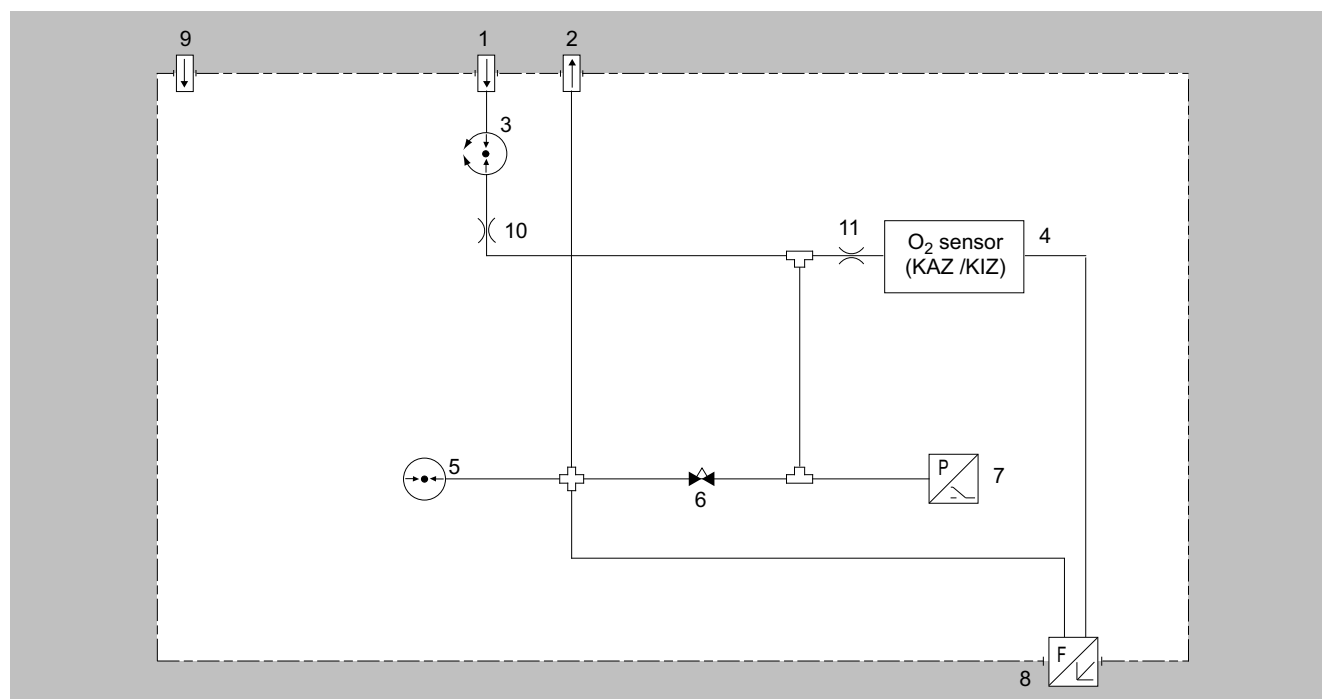
OXYMAT 64, membrane keyboard and graphic display

Designs – Parts wetted by sample gas, standard

Gas path		19" rack unit
Sample gas path	Bushing Pipe inlet O ₂ sensor Bypass line Connection pieces	Stainless steel, mat. no. 1.4571 Stainless steel ZrO ₂ ceramic FPM (Viton) PTFE (Teflon)
Pressure sensor	Enclosure Diaphragm Sensor adapter Bypass restrictor	Polycarbonate SiO ₄ Aluminum Stainless steel, mat. no. 1.4571
Flow indicator	Measuring tube Variable area Suspension boundary Angle units	Duran glass Duran glass, black PTFE (Teflon) FKM (Viton)
Pressure switch	Enclosure Diaphragm	Polycarbonate NBR

Design (Continued)

Gas path (high-pressure version)



Gas path OXYMAT 64, 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.)	7	Pressure switch
2	Sample gas outlet; sample gas flows off free of dynamic pressure	8	Flow measuring tube
3	Pressure regulator (order version)	9	Purging gas connection
4	O ₂ sensor	10	Restrictor
5	Pressure sensor	11	Sample gas restrictor
6	Bypass restrictor		

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.

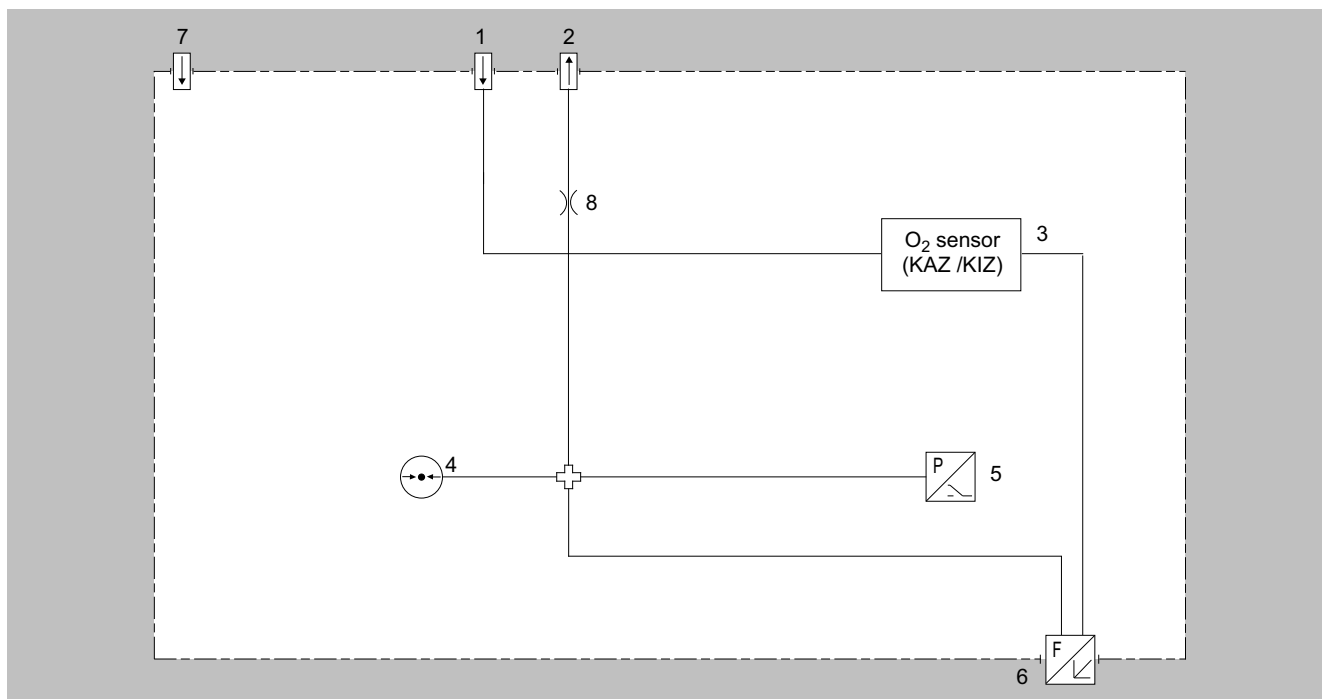
Extractive continuous process gas analysis

Series 6

OXYMAT 64

Design (Continued)

Gas path (low pressure)



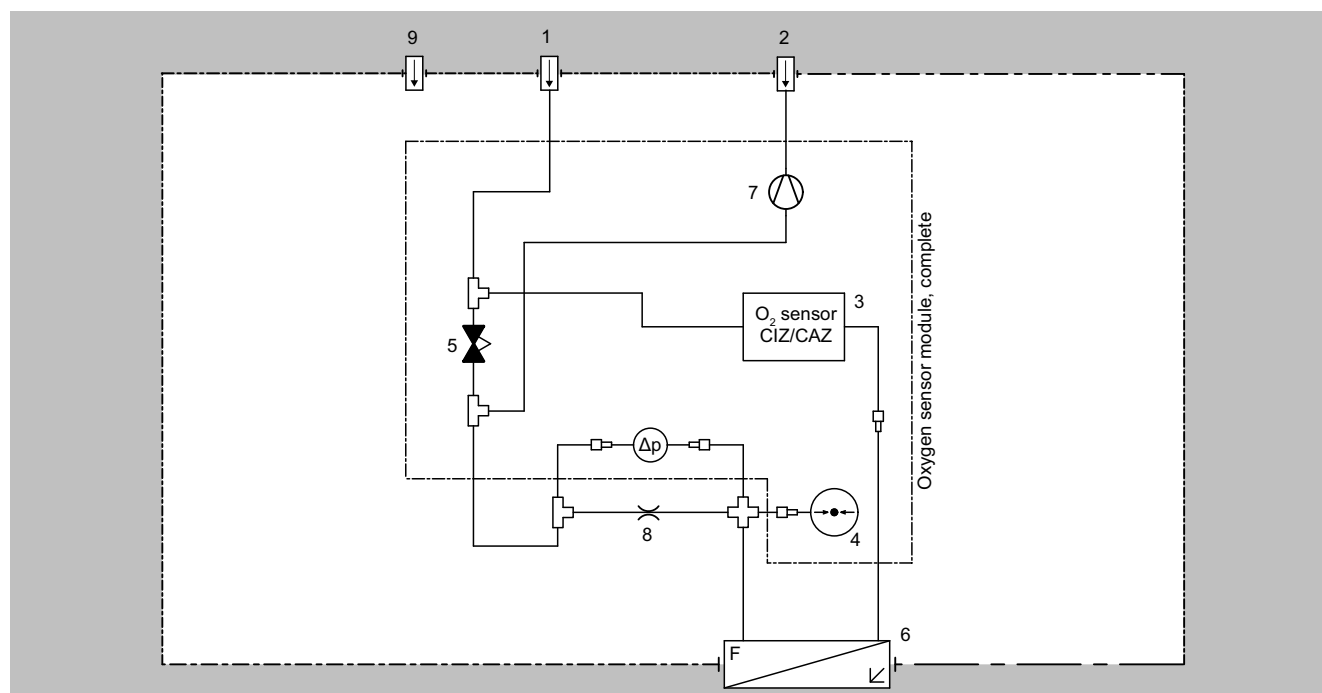
Gas path OXYMAT 64, low-pressure version

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

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.

Design (Continued)

Gas path (low pressure with integrated sample gas pump)

Low-pressure version 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		

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

Mode of operation

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

Both sides of the ZrO_2 diaphragm 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 °C, ionic migration takes place in the direction of the lower partial pressure.

An oxygen gradient arises across the width of the ZrO_2 diaphragm, 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 (CAC)

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 (CIC)

The catalytically inactive sensor has the same general design as the CAC. 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 .

Measuring effect

$$U = U_A + RT/4F (\ln [\text{O}_2, \text{air}] - \ln [\text{O}_2]) \quad (\text{equation 1})$$

U measuring effect

U_A asymmetric voltage (voltage, at $[\text{O}_2] = [\text{O}_2, \text{air}]$)

T ceramic temperature

$[\text{O}_2, \text{air}]$ O_2 concentration in the air

$[\text{O}_2]$ O_2 concentration in sample gas

Note

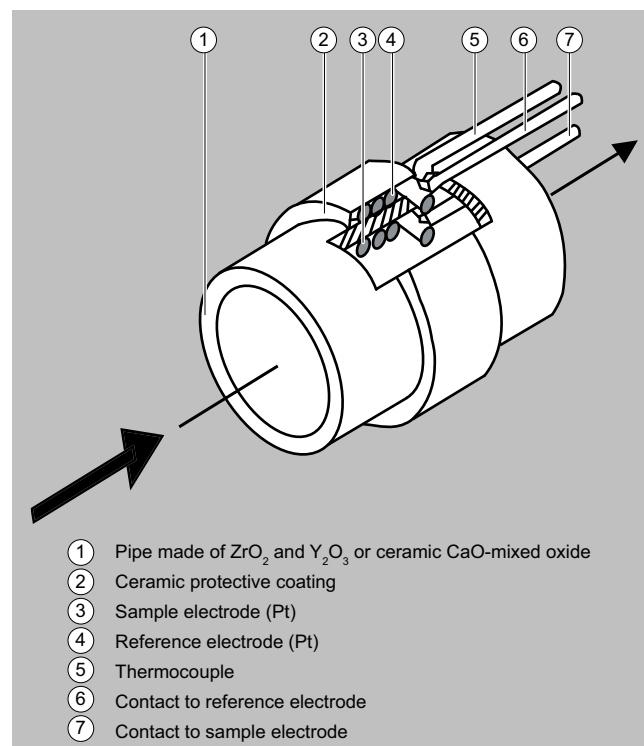
The sample gas must be fed into the analyzer free of dust. Condensation should be avoided. Therefore, gas modified for the measuring tasks is necessary in most application cases.

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 series 6 analyzers, 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).

Mode of operation (Continued)



OXYMAT 64, principle of operation

Function

Main features

- Four measuring ranges freely parameterizable, all measuring ranges linear
- Electrically isolated measured value output 0/2/4 through to 20 mA (including inverted) and as per NAMUR
- Automatic measuring range switchover selectable; remote switching option
- Storage of measured values possible during calibration
- Wide range of selectable time constants (static/dynamic noise damping); 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 separate authorization codes for the prevention of accidental and unauthorized operator interventions
- Automatic measuring range calibration parameterizable
- Operation based on NAMUR recommendation
- Monitoring of sample gas (via pressure switch)
- Custom-made device designs, such as:
 - Customer acceptance
 - TAG plates
 - Drift recording
- Simple handling using a numerical membrane keyboard and operator prompting
- Smallest measuring span 0 to 10 vpm O_2
- Largest measuring span 0 to 100% (testing with ambient air)

Function (Continued)

- Internal pressure sensor for correction of the influence of sample gas pressure fluctuations

Cross-interferenceCatalytically active sensor (CAC)

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

Catalytically inactive sensor (CIC)

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 / interference gas		Interference 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 interference gas offsets on a catalytically inactive sensor

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

Extractive continuous process gas analysis

Series 6

OXYMAT 64 / 19" rack unit

Selection and ordering data

OXYMAT 64 gas analyzer 19" rack unit for installation in cabinets		Article No. 7MB2041- ● ● ● 1 ● - ● A ● ●									
Click on the Article No. for online configuration in the PIA Life Cycle Portal.											
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".											
Sensor											
ZrO ₂ : catalytically active cell (CAC)											0
ZrO ₂ : catalytically inactive cell (CIC)											1
ZrO ₂ : catalytically active cell (CAC); with differential pressure sensor											2
ZrO ₂ : catalytically inactive cell (CIC); with differential pressure sensor											3
Sample gas pressure											
High pressure, without pressure regulator; 2 000 hPa (abs.)									A		
High pressure, with pressure regulator; 2 000 ... 6 000 hPa (abs.)									B		
Low pressure, with pump, atmosphere									C		
Low pressure, without suction pump, atmosphere									D		
Gas connection											
Input: Clamping ring connection 6 mm / outlet: Fittings 6 mm									A		
Input: Clamping ring connection 1/4" / outlet: Fittings 1/4"									B		
Add-on electronics											
Without											0
AUTOCAL function with 8 additional digital inputs and outputs											1
AUTOCAL function 8 additional digital inputs/outputs and PROFIBUS PA interface											6
AUTOCAL function with 8 additional digital inputs/outputs and PROFIBUS DP interface											7
Auxiliary power											
100 V ... 120 V AC, 48 ... 63 Hz										0	
200 V ... 240 V AC, 48 ... 63 Hz										1	
Explosion protection											
Without											A
Language of the operating software											
German											0
English											1
French											2
Spanish											3
Italian											4

Options	Order code
Add "-Z" to article number and then add order code.	
Settings	
Telescopic rails (2 units)	A31
Tag plates (specific inscription based on customer information)	B03
Clean for O ₂ service (specially cleaned gas path)	Y02
Measuring range indication in plain text, if different from default setting	Y11
Special setting (only together 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 with 8 digital inputs/outputs each	C79451-A3480-D511

Extractive continuous process gas analysis

Series 6

OXYMAT 64 / 19" rack unit

Selection and ordering data (Continued)

Accessories	Article No.
AUTOCAL function with 8 digital inputs/outputs each and PROFIBUS PA	A5E00057307
AUTOCAL function with 8 digital inputs/outputs each and PROFIBUS DP	A5E00057312
Set of Torx screwdrivers	A5E34821625

Technical specifications

OXYMAT 64, 19" rack unit	
General information	
Measuring ranges	4, internally and externally switchable; automatic measuring range switchover also possible
Smallest possible measuring 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
Auxiliary power	100 ... 120 V AC (nominal range of use 90 ... 132 V), 48 ... 63 Hz or 200 ... 240 V AC (nominal range of use 180 ... 264 V), 48 ... 63 Hz
Power consumption	Approx. 37 VA
Fuse ratings	100 ... 120 V: 1.0T/250 200 ... 240 V: 0.63T/250
Gas inlet conditions	
Sample gas flow	
• Through the sensor	7.5 l/h
• Total 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
Time 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 device 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.)

Technical specifications (Continued)

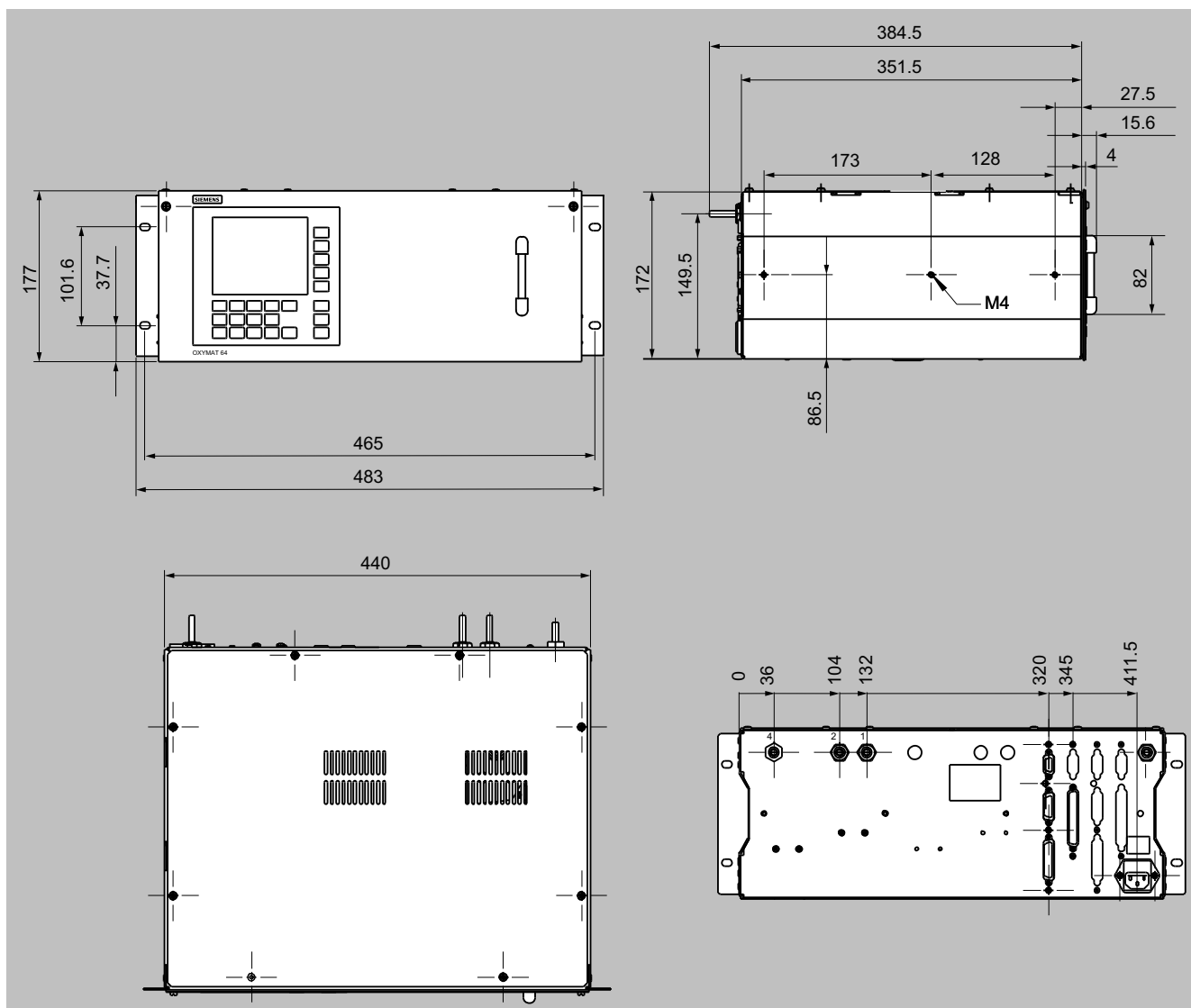
OXYMAT 64, 19" rack unit	
Measuring response	Based on sample gas pressure 1 013 hPa absolute, 7.5 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation	< ± 1% of the smallest possible measuring range according to nameplate, with electronic damping constant of 1 s
Zero point drift	< ± 1% of the current measuring span/month
Measured value drift	< ± 1% of the current measuring span/month
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	- With disabled pressure compensation: < 1% of current measuring span/1% pressure variation - With enabled pressure compensation: < 0.2% of current measuring span/1% pressure variation
Accompanying gases, deviation from zero point	Only gases with non-flammable accompanying gas components can be introduced
• Catalytically active cell (CAC)	Accompanying gas concentration of 10 vpm H ₂ ; CO and CH ₄ have a lower cross-interference; higher HCs are negligible
• Catalytically inactive cell (CIC)	< 2% of the smallest possible measuring span with a change in flow of 10 ml/min
Sample gas flow	< 0.1% of the current measuring range with nominal voltage ± 10%
Auxiliary power	
Electrical inputs and outputs	
Analog output	0/2/4 ... 20 mA, 4 ... 20 mA (NAMUR), floating; max. load 750 Ω
Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load rating: 24 V AC/DC/1 A, floating
Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and accompanying gas influence correction (correction of cross-interference)
Digital inputs	6, designed for 24 V, floating, freely configurable, e.g. for measuring range switchover
Serial interface	RS 485
Options	AUTOCAL function each with 8 additional digital inputs and relay outputs; also with PROFIBUS PA or PROFIBUS DP
Climatic conditions	
Permissible ambient temperature	-40 ... +70 °C during storage and transportation, 5 ... 45 °C during operation
Permissible humidity	< 90% relative humidity as annual average during storage and transportation (must not fall below dew point)

Extractive continuous process gas analysis

Series 6

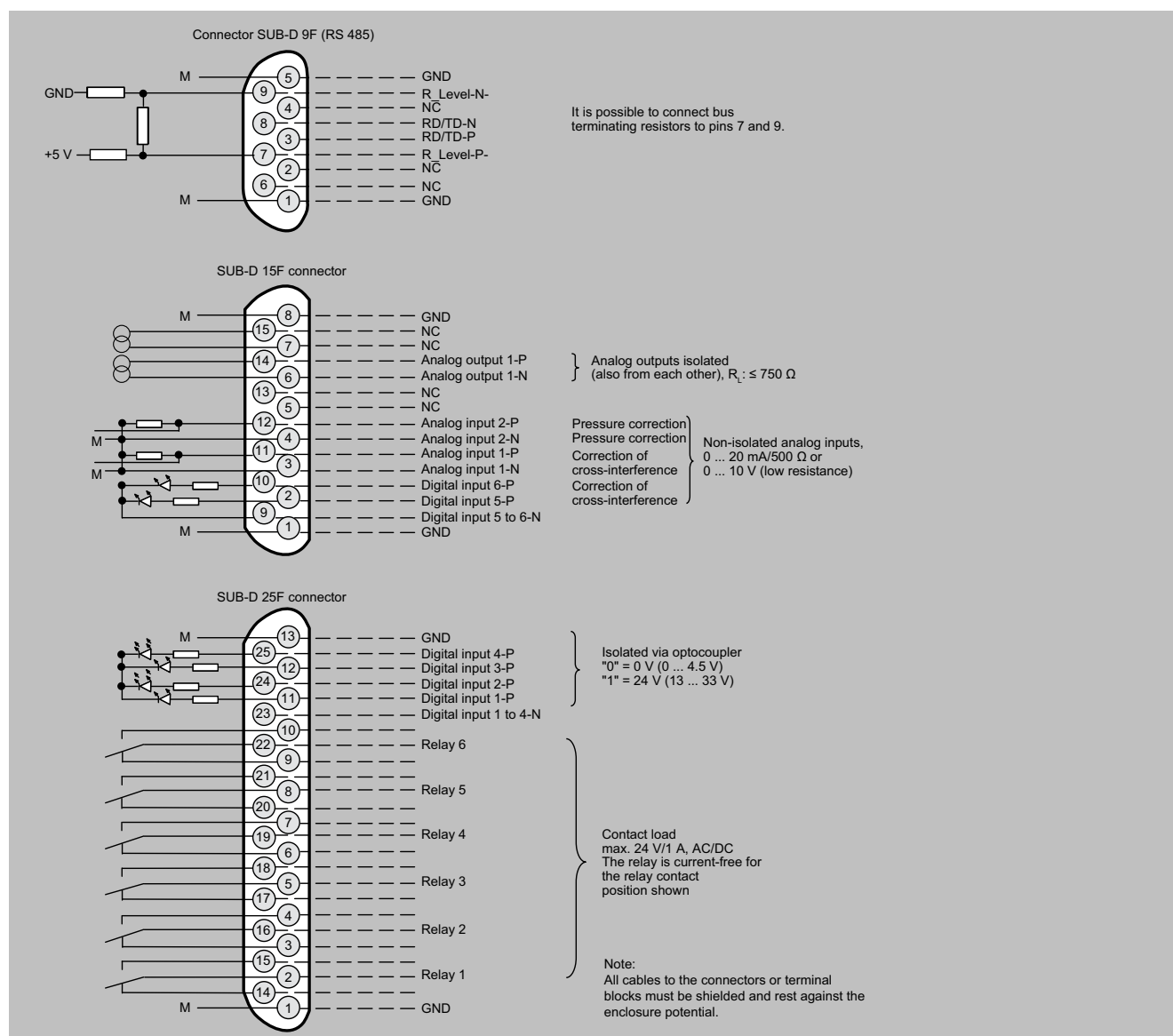
OXYMAT 64 / 19" rack unit

Dimensional drawings



OXYMAT 64, 19" rack unit, dimensions in mm

Circuit diagrams



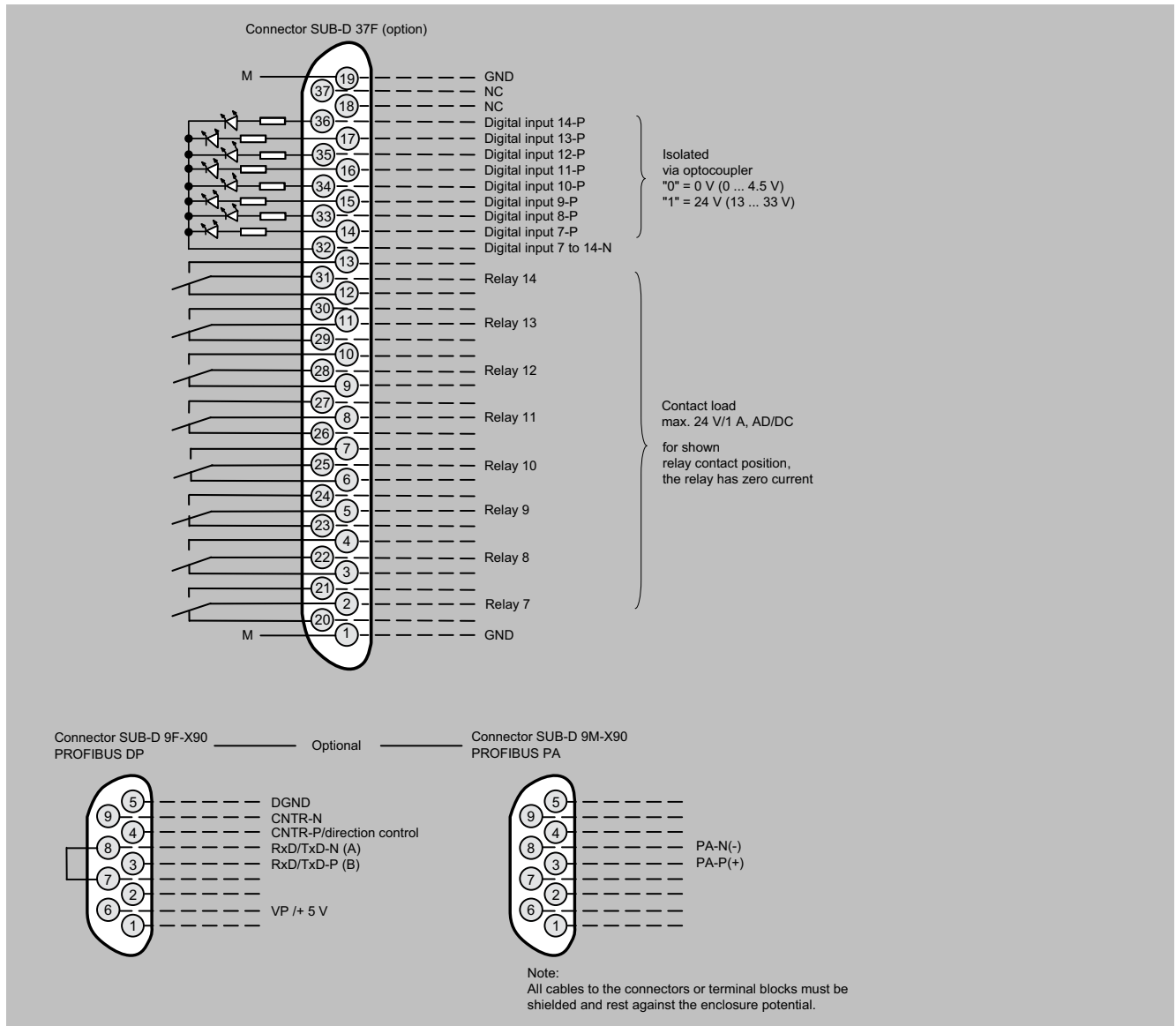
OXYMAT 64, 19" rack unit, pin assignment

Extractive continuous process gas analysis

Series 6

OXYMAT 64 / 19" rack unit

Circuit diagrams (Continued)



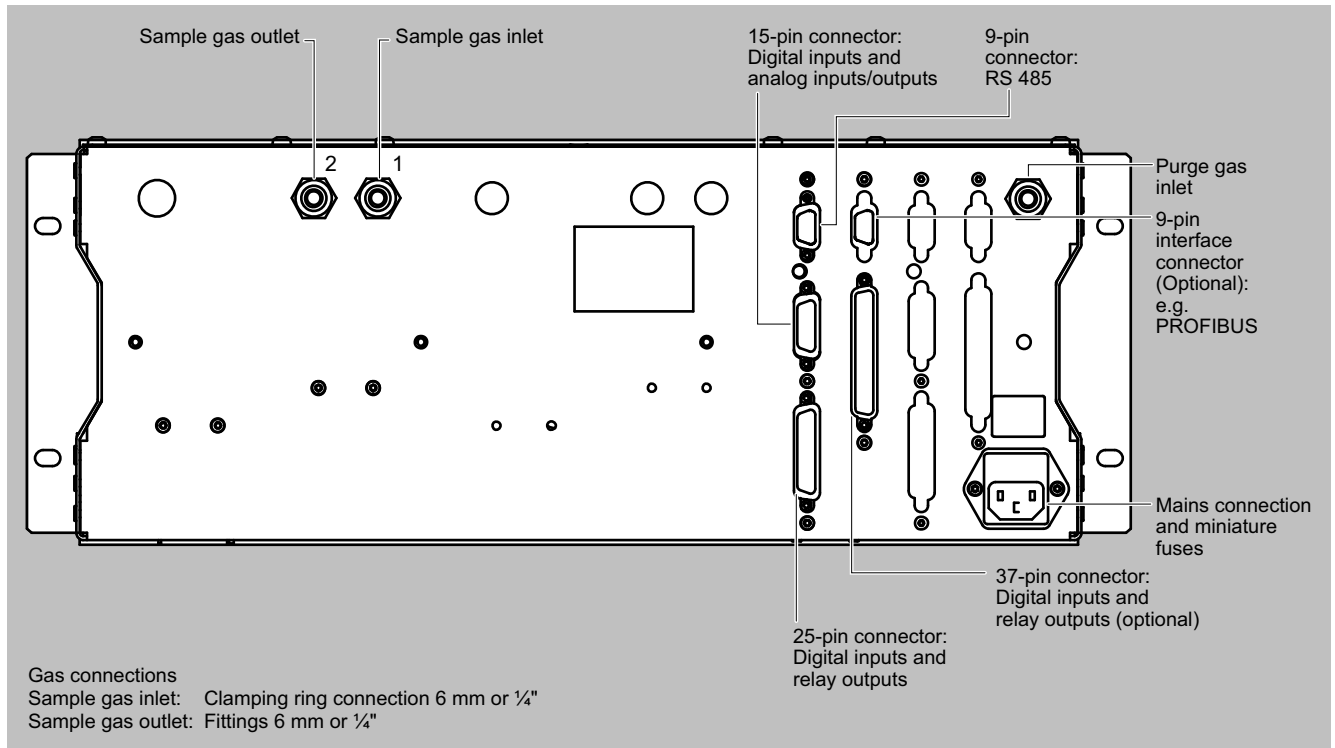
OXYMAT 64, 19" rack unit, pin assignment of the AUTOCAL board and PROFIBUS plugs

Extractive continuous process gas analysis

Series 6

OXYMAT 64 / 19" rack unit

Circuit diagrams (Continued)



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

Extractive continuous process gas analysis

Series 6

OXYMAT 64 / Suggestion for spare parts

Selection and ordering data

Description	7MB2041	2 years (unit)	5 years (unit)	Article No.
Pressure regulator as spare part	x	–	1	A5E01008972
Flowmeter	x	–	1	A5E01061561
Adapter plate, LC display/keyboard	x	1	1	C79451-A3474-B605
LC display	x	–	1	A5E31474846
Plug-in 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, supply voltage 100 ... 120 V	x	2	4	W79054-L1011-T100

Overview

The CALOMAT 6 gas analyzer is primarily used for quantitative determination of H_2 or He in binary or quasi-binary non-corrosive gas mixtures. Concentrations of other gases can also be measured if their thermal conductivities differ significantly from the accompanying gases like Ar, CO_2 , CH_4 , NH_3 .

Benefits

- Small T_{90} 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% H_2)
- 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**Application areas**

- Pure gas monitoring (0 to 1% 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)
- Monitoring equipment for hydrogen-cooled turbo-alternators:
 - 0 to 100% CO_2 /Ar in air
 - 0 to 100% H_2 in CO_2 /Ar
 - 80 to 100% H_2 in air
- Versions for analyzing flammable and non-flammable gases or vapors for use in hazardous areas (Zone 1 and Zone 2)

Application (Continued)**Special versions****Special applications**

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

Extractive continuous process gas analysis

Series 6

CALOMAT 6

Design

19" rack unit

- With 4 U for installation
 - In hinged frame
 - In cabinets with or without telescopic 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 1/4"

Field device

- Two-door enclosure (IP65) with gas-tight separation of analyzer and electronics sections
- Individually purgeable enclosure halves
- Gas path and stubs made of stainless steel (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 1/4"

Display and operator 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

Inputs 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 measuring range switchover, processing of external signals from sample preparation)
- Six relay outputs, freely configurable (e.g. failure, maintenance demanded, limit alarm, external solenoid 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

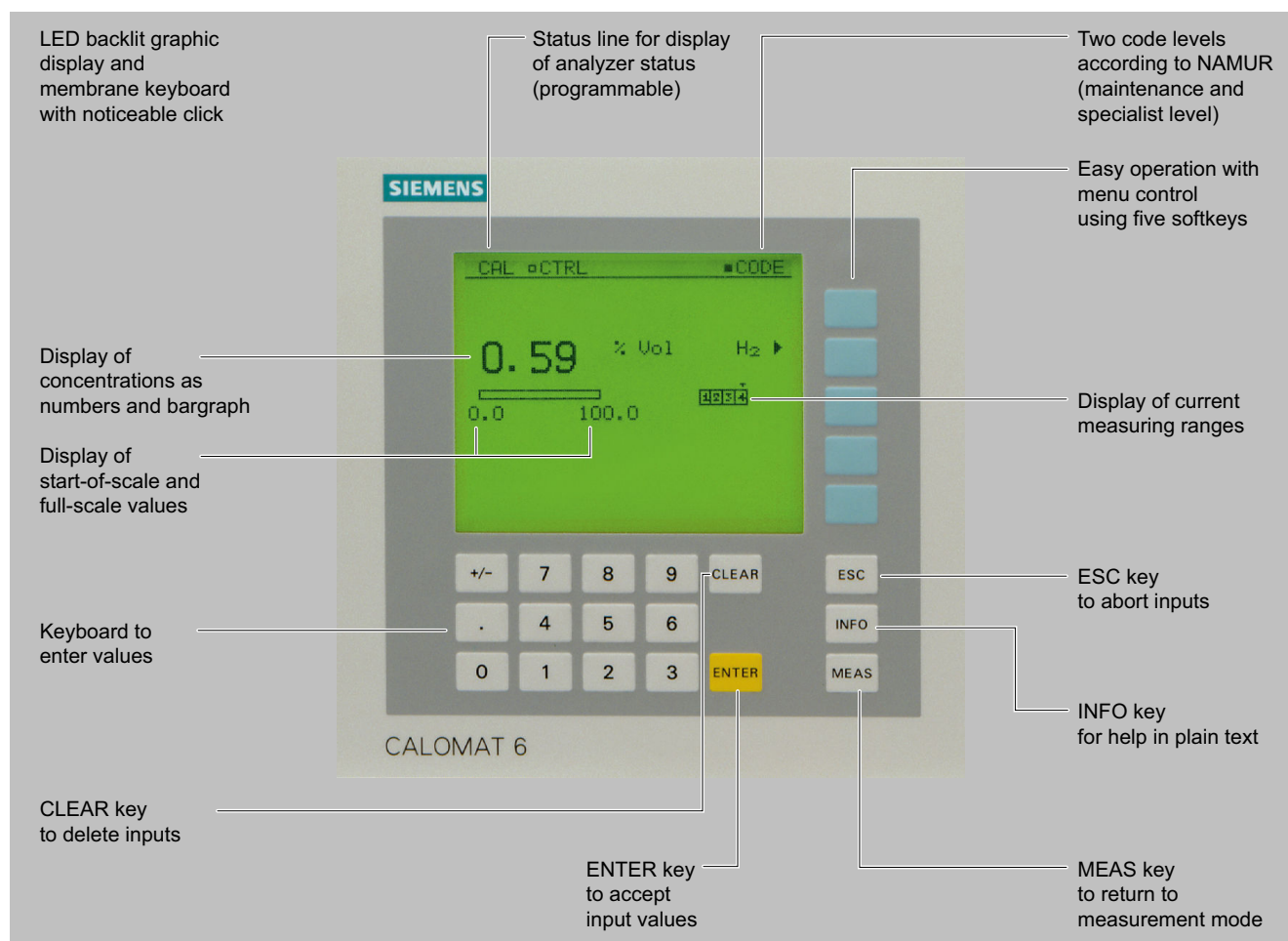
- RS 485/RS 232 converter
- RS 485/Ethernet converter
- RS 485/USB converter
- Connection to networks via PROFIBUS DP/PA interface
- SIPROM GA software as the service and maintenance tool

Extractive continuous process gas analysis

Series 6

CALOMAT 6

Design (Continued)



CALOMAT 6, membrane keyboard and graphic display

Designs – parts wetted by sample gas

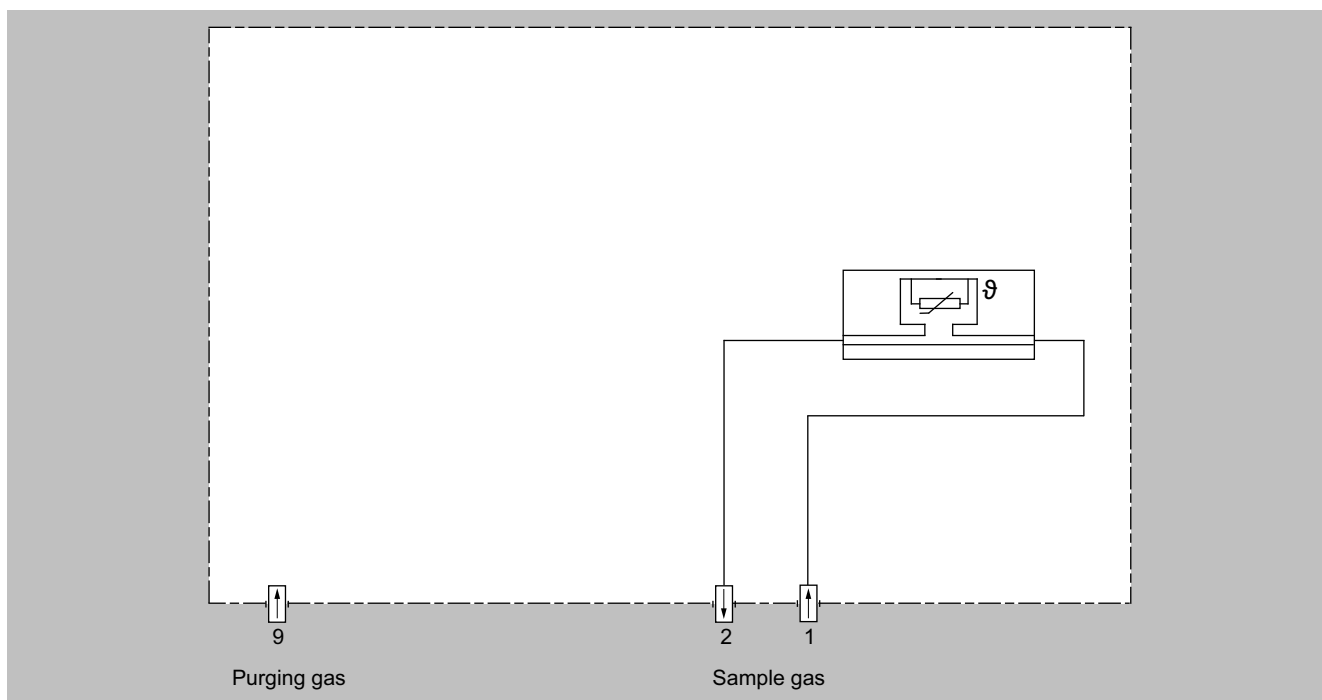
Gas path		19" rack unit	Field device	Field device Ex
With pipes	Bushing	Stainless steel, mat. no. 1.4571	Stainless steel, mat. no. 1.4571	Stainless steel, mat. no. 1.4571
	Pipe	Stainless steel, mat. no. 1.4571	Stainless steel, mat. no. 1.4571	Stainless steel, mat. no. 1.4571
	Sample cell body	Stainless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

Extractive continuous process gas analysis

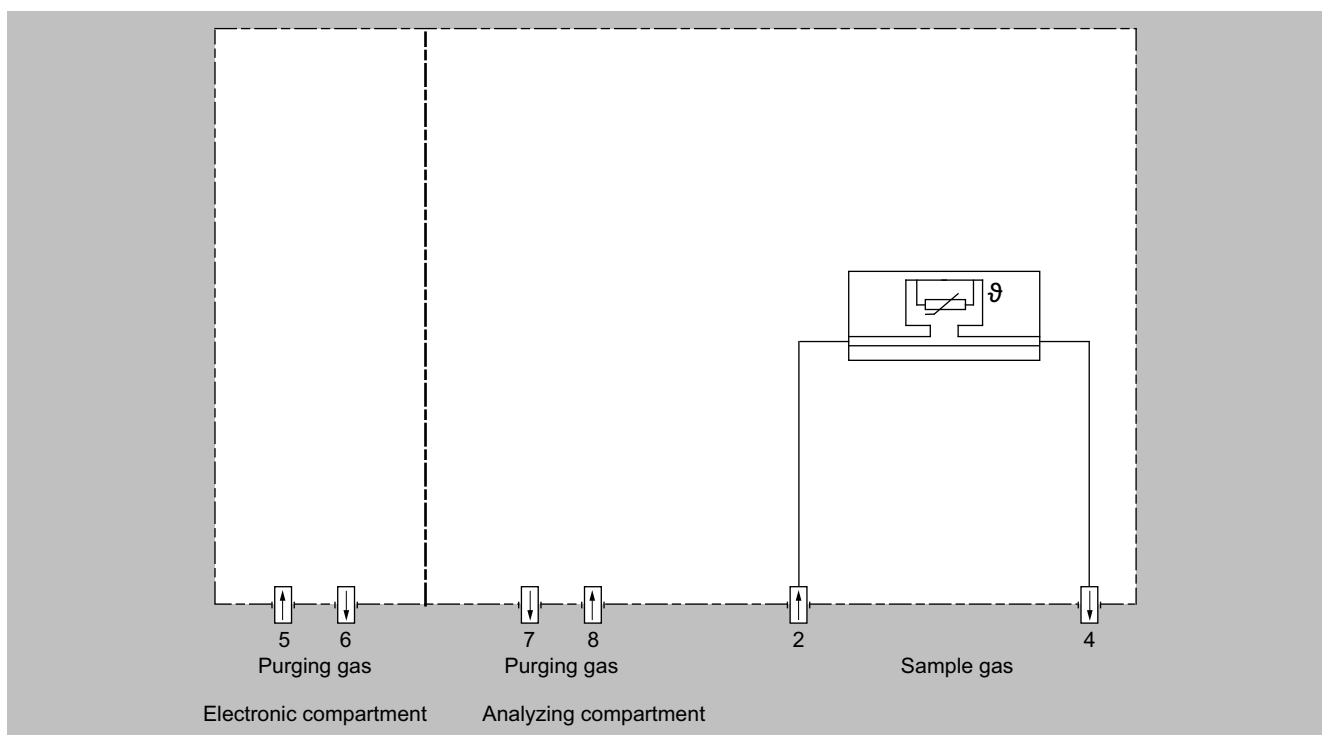
Series 6

CALOMAT 6

Design (Continued)



CALOMAT 6, 19" rack unit, gas path



CALOMAT 6, field device, gas path

Extractive continuous process gas analysis

Series 6

CALOMAT 6

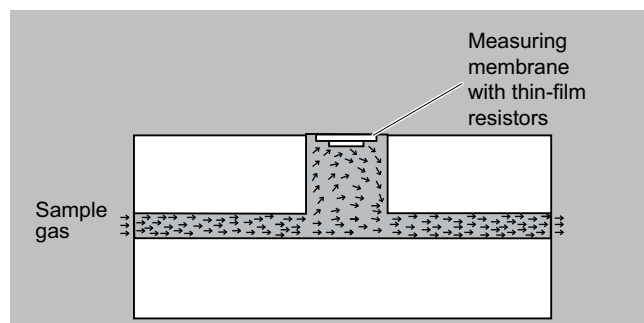
Mode of operation

The measuring principle is based on the different thermal conductivity of gases. The CALOMAT 6 works with a micromechanically produced Si chip whose measuring diaphragm is equipped with thin-film resistors. The resistors are kept at a constant temperature. This requires a current intensity that takes on a specific value depending on the thermal conductivity of the sample gas. This "raw value" is electronically further processed 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 hole 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 sample chambers. Therefore, the use of gas modified for the measuring tasks is necessary in most application cases.



CALOMAT, principle of operation

Function

Main features

- Four measuring ranges which can be freely configured, even with suppressed zero point; all measuring ranges are linear
- Smallest measuring spans down to 1% H₂ (with suppressed zero point: 95 to 100% H₂) possible
- Measuring range identification
- Electrically isolated measured value output 0/2/4 through to 20 mA (including inverted)
- Automatic or manual measuring range switchover selectable; remote switching is also possible
- Storage of measured values possible during calibration
- Wide range of selectable time constants (static/dynamic noise damping); 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 (parameterizable)
- Measuring range identification
- Measuring point identification
- External pressure sensor can be connected – for correction of variations in sample gas pressure
- Automatic measuring range calibration parameterizable
- Operation based on NAMUR recommendation

Function (Continued)

- Two control levels with separate authorization codes for the prevention of accidental and unauthorized operator interventions
- Simple handling using a numerical membrane keyboard and operator prompting
- Custom-made device designs, such as:
 - Customer acceptance
 - TAG plates
 - Drift recording
 - Clean for O₂ service

Measuring spans

The smallest and largest possible measuring spans depend on both the measured component (gas type) and the respective application. The smallest possible measuring spans listed below refer to N₂ as the accompanying gas. With other gases which have a larger/smaller thermal conductivity than N₂, the smallest possible measuring span is also larger/smaller.

Component	Smallest possible measuring 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%

Cross-interferences

Knowledge of the sample gas composition is necessary to determine the cross-interference of accompanying gases with multiple interference gas components.

The following table lists the zero offsets expressed in % H₂ resulting from 10% accompanying gas (interference 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 accompanying gas concentrations differing from 10%, the corresponding multiple of the associated value in the table provides an acceptable approximation. This is valid for accompanying gas concentrations up to 25% (dependent on gas type).

The thermal conductivity of most gas mixtures has a non-linear response. Even ambiguous measurement 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 curve is influenced by the accompanying gas. However, this effect is negligible for most gases.

Extractive continuous process gas analysis

Series 6

CALOMAT 6

Function (Continued)

When correcting cross-interferences with additional analyzers (ULTRAMAT 6/ULTRAMAT 23), the resulting measuring error can – depending on the application – amount to 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

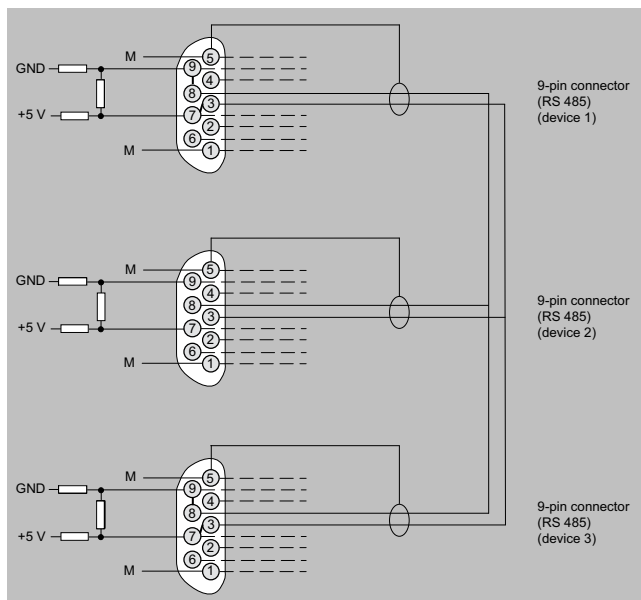
Bus terminating resistors

Pins 3-7 and 8-9 of the first and last plugs of bus cables must be bridged (see Graphic "Bus line with plug connection, example").

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

Selection and ordering data

CALOMAT 6 gas analyzer 19" rack unit for installation in cabinets			Article No. 7MB2521- ● ● ● 0 ● - ● A ● ●									
Click on the Article No. for online configuration in the PIA Life Cycle Portal.												
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".												
Connections for sample gas												
Pipe with 6 mm outer diameter						0						
Pipe with 1/4" outer diameter						1						
Measured component	Smallest measuring range	Largest measuring range										
H ₂ in N ₂	0 ... 1%	0 ... 100%					A	A				
H ₂ in N ₂ (blast furnace gas measurement) ¹⁾	0 ... 5%	0 ... 100%					A	W				
H ₂ in N ₂ (converter measurement) ¹⁾	0 ... 5%	0 ... 100%					A	X				
H ₂ in N ₂ (wood gasification) ¹⁾	0 ... 5%	0 ... 100%					A	Y				
H ₂ in Ar	0 ... 1%	0 ... 100%					A	B				
H ₂ in NH ₃	0 ... 1%	0 ... 100%					A	C				
He in N ₂	0 ... 2%	0 ... 100%					B	A				
He in Ar	0 ... 2%	0 ... 100%					B	B				
He in H ₂	0 ... 10%	0 ... 80%					B	C				
Ar in N ₂	0 ... 10%	0 ... 100%					C	A				
Ar in O ₂	0 ... 10%	0 ... 100%					C	B				
CO ₂ in N ₂	0 ... 20%	0 ... 100%					D	A				
CH ₄ in Ar	0 ... 15%	0 ... 100%					E	A				
NH ₃ in N ₂	0 ... 10%	0 ... 30%					F	A				
H₂ monitoring (turbo generators)												
• CO ₂ in air	0 ... 100%						G	A				
• H ₂ in CO ₂	0 ... 100%						G	A				
• H ₂ in air	80 ... 100%						G	A				
Add-on electronics												
Without									0			
AUTOCAL function with 8 additional digital inputs and outputs									1			
AUTOCAL function 8 additional digital inputs/outputs and PROFIBUS PA interface									6			
AUTOCAL function with 8 additional digital inputs/outputs and PROFIBUS DP interface									7			
Auxiliary power												
100 V ... 120 V AC, 48 ... 63 Hz										0		
200 V ... 240 V AC, 48 ... 63 Hz										1		
Explosion protection												
Without											A	
Certificate: ATEX II 3G, flammable and non-flammable gases											B	
FM/CSA certificate – Class I Div 2											D	
Language of the operating software												
German												0
English												1
French												2
Spanish												3
Italian												4

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

Options	Order code
Add "-Z" to article number and then add order code.	
Settings	
Telescopic rails (2 units)	A31
Set of Torx screwdrivers, ball Allen screwdrivers	A32
Tag plates (specific inscription based on customer information)	B03

Extractive continuous process gas analysis

Series 6

CALOMAT 6 / 19" rack unit

Selection and ordering data (Continued)

Options	Order code
Clean for O ₂ service (specially cleaned gas path)	Y02
Measuring range indication in plain text, if different from default setting	Y11
Special setting (only in conjunction with an application no.)	Y12

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	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

Technical specifications

CALOMAT 6, 19" rack unit	
General information	Based on EN 61207/IEC 1207. All data based on H ₂ in N ₂ binary mixture
Measuring ranges	4, internally and externally switchable; automatic measuring range switchover also possible
Largest possible measuring span	100 vol.% H ₂ (see "Function" for smallest measuring span)
Measuring ranges with suppressed zero point	Any zero point within 0 ... 100 vol.% can be implemented, smallest possible measuring span: 5% H ₂
Operating position	Front wall, vertical
Conformity	CE mark in accordance with EN 61326/A1 and EN 61010/1
Design, enclosure	
Degree of protection	IP20 according to EN 60529
Weight	Approx. 10 kg
Electrical characteristics	
EMC interference immunity (electromagnetic compatibility) 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.	In accordance with standard requirements of NAMUR NE21 (08/98)
Electrical safety	In accordance with EN 61010-1; overvoltage category II
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
Power consumption	Approx. 20 VA
Fuse ratings	100 ... 120 V: 1.0T/250 200 ... 240 V: 0.63T/250
Gas inlet conditions	
Sample gas pressure	800 ... 1 100 hPa (absolute)
Sample gas flow	30 ... 90 l/h (0.5 ... 1.5 l/min)
Sample gas temperature	Min. 0 ... max. 50 °C, but above the dew point
Temperature of the measuring cell	Approx. 60 °C
Sample gas humidity	< 90% relative humidity
Time response	
Warm-up period	< 30 min (the technical specification will be met after 2 hours)

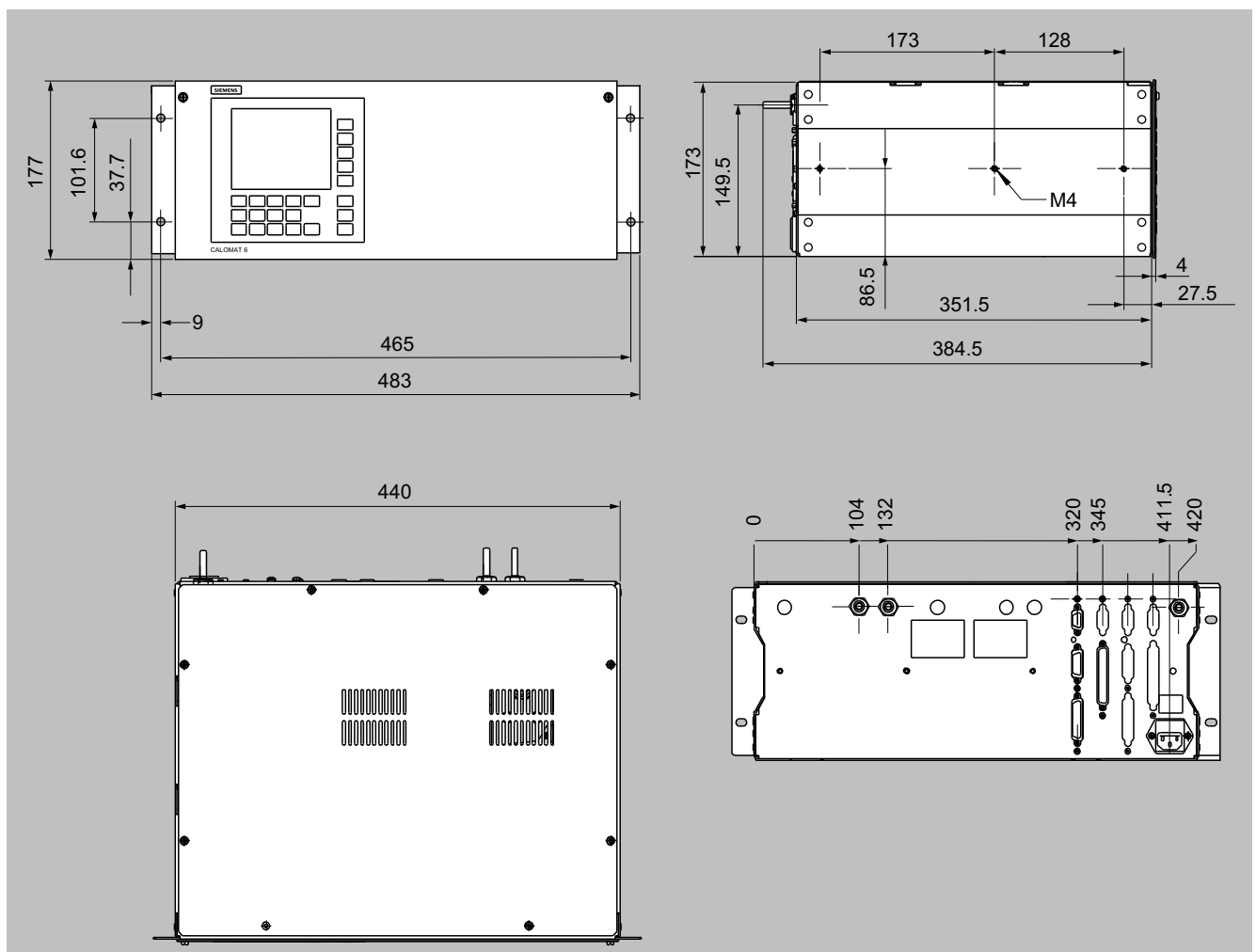
Technical specifications (Continued)

CALOMAT 6, 19" rack unit	
Delayed display (T ₉₀)	< 5 s
Damping (electrical time constant)	0 ... 100 s, configurable
Dead time (purging time of the gas path in the device at 1 l/min)	Approx. 0.5 s
Measuring response	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation	< ± 0.75% of the smallest possible measuring range according to nameplate, with electronic damping constant of 1 s (σ = 0.25%)
Zero point drift	< ± 1%/week of the smallest possible measuring span according to nameplate
Measured value drift	< ± 1%/week of the smallest possible measuring span according to nameplate
Repeatability	< 1% of the current measuring range
Detection limit	1% of the current measuring range
Linearity error	< ± 1% of the current measuring range
Influencing variables	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Ambient temperature	< 1%/10 K referred to smallest possible measuring span according to nameplate
Accompanying gases	Zero point deviation (for influence of interference gas, see "Cross-interferences")
Sample gas flow	< 0.2% of the smallest possible measuring span according to nameplate with a change in flow of 0.1 l/min within the permissible flow range
Sample gas pressure	< 1% of the current measuring range with a pressure variation of 100 hPa
Auxiliary power	< 0.1% of the current measuring range with nominal voltage ± 10%
Electrical inputs and outputs	
Analog output	0/2/4 ... 20 mA, floating; max. load 750 Ω
Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load rating: 24 V AC/DC/1 A, floating
Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and correction of cross-interference

Technical specifications (Continued)

CALOMAT 6, 19" rack unit	
Digital inputs	6, designed for 24 V, floating, freely configurable, e.g. for measuring range switchover
Serial interface	RS 485
Options	AUTOCAL function each with 8 additional digital inputs and relay outputs, also with PROFIBUS PA or PROFIBUS DP
Climatic conditions	
Permissible ambient temperature	-30 ... +70 °C during storage and transportation, 5 ... 45 °C during operation
Permissible humidity (must not fall below dew point)	< 90% relative humidity as annual average during storage and transportation

Dimensional drawings



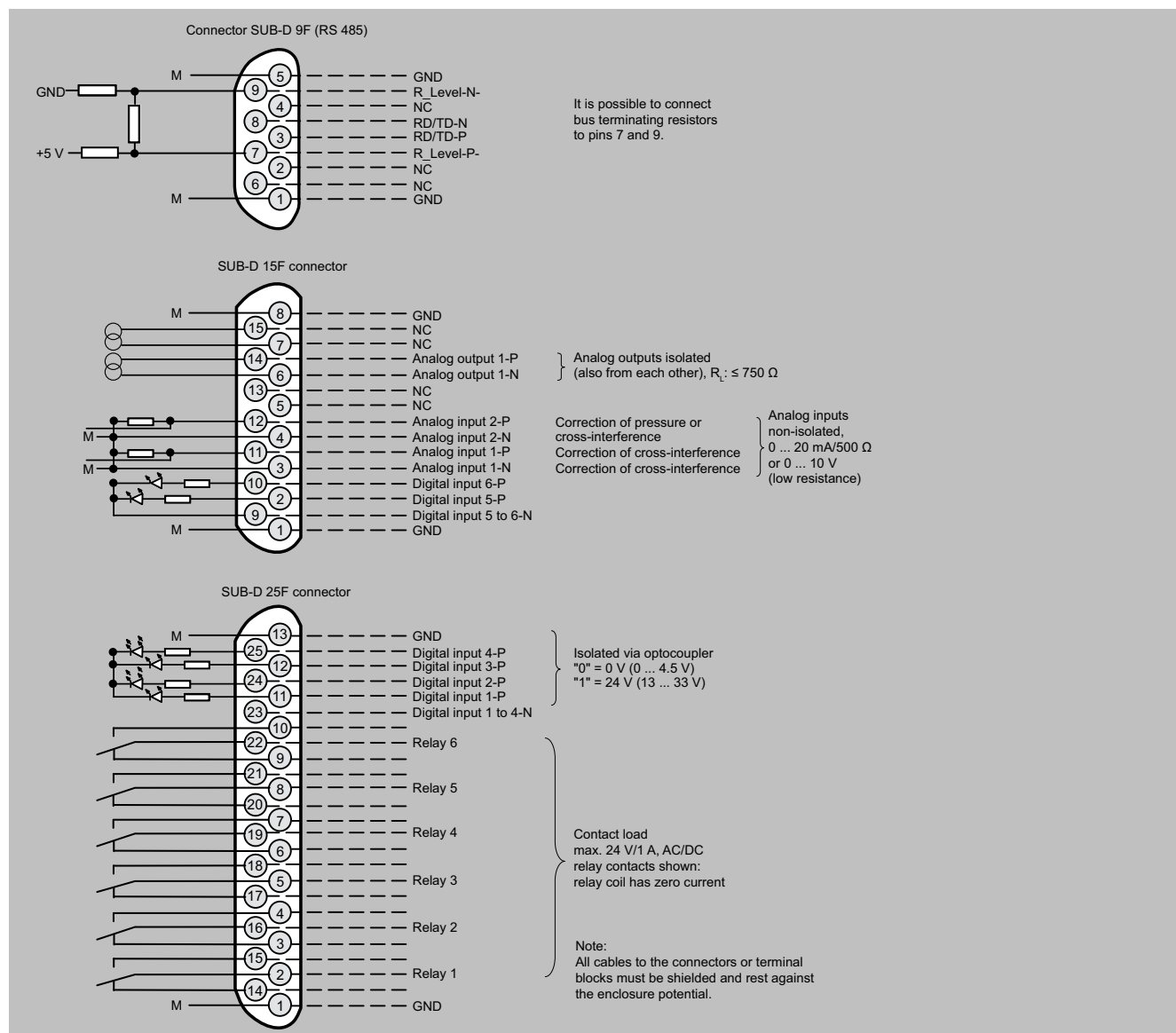
CALOMAT 6, 19" rack unit, dimensions in mm

Extractive continuous process gas analysis

Series 6

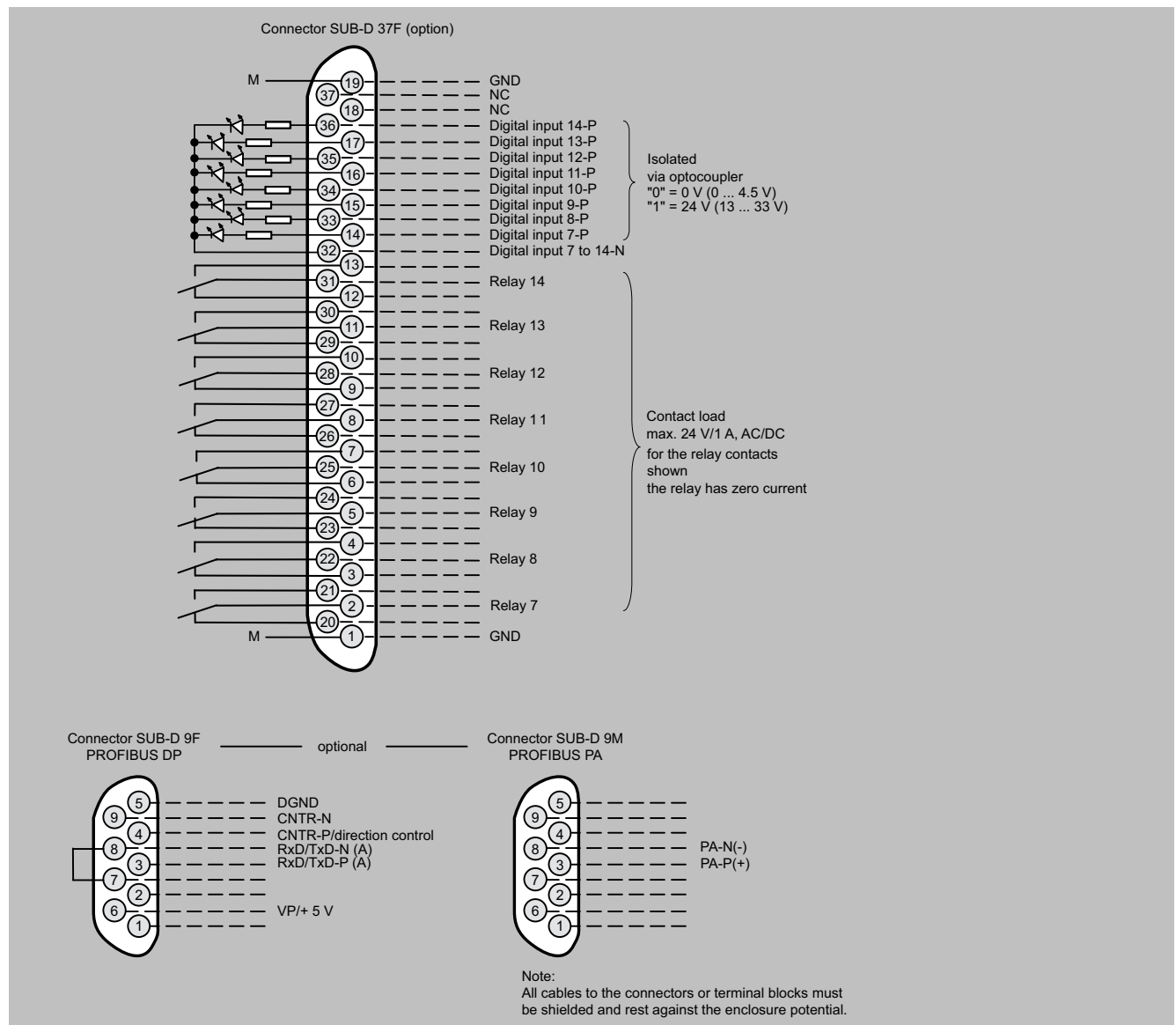
CALOMAT 6 / 19" rack unit

Circuit diagrams



CALOMAT 6, 19" rack unit, pin assignment

Circuit diagrams (Continued)



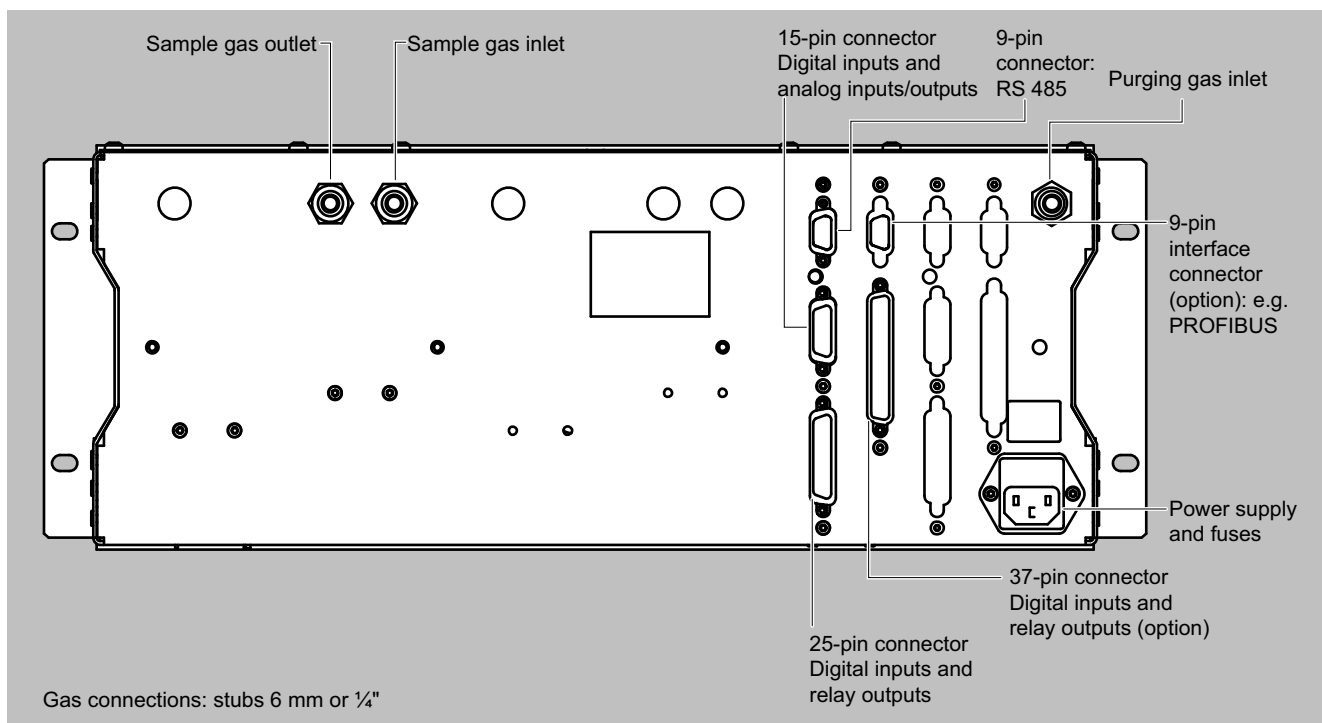
CALOMAT 6, 19" rack unit, pin assignment of AUTOCAL board and PROFIBUS plugs

Extractive continuous process gas analysis

Series 6

CALOMAT 6 / 19" rack unit

Circuit diagrams (Continued)



CALOMAT 6, 19" rack unit, gas and electrical connections

Extractive continuous process gas analysis

Series 6

CALOMAT 6 / Field device

Selection and ordering data

CALOMAT 6 gas analyzer For installation in the field			Article No. 7MB2511- ● ● ● 0 ● - ● A ● ●									
Click on the Article No. for online configuration in the PIA Life Cycle Portal.												
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".												
Connections for sample gas												
Cutting ring fitting for pipe, outer diameter 6 mm								0				
Cutting ring fitting for pipe, outer diameter 1/4"								1				
Measured component	Smallest measuring range	Largest measuring range										
H ₂ in N ₂	0 ... 1%	0 ... 100%							A	A		
H ₂ in N ₂ (blast furnace gas measurement) ¹⁾	0 ... 5%	0 ... 100%							A	W		
H ₂ in N ₂ (converter measurement) ¹⁾	0 ... 5%	0 ... 100%							A	X		
H ₂ in N ₂ (wood gasification) ¹⁾	0 ... 5%	0 ... 100%							A	Y		
H ₂ in Ar	0 ... 1%	0 ... 100%							A	B		
H ₂ in NH ₃	0 ... 1%	0 ... 100%							A	C		
He in N ₂	0 ... 2%	0 ... 100%							B	A		
He in Ar	0 ... 2%	0 ... 100%							B	B		
He in H ₂	0 ... 10%	0 ... 80%							B	C		
Ar in N ₂	0 ... 10%	0 ... 100%							C	A		
Ar in O ₂	0 ... 10%	0 ... 100%							C	B		
CO ₂ in N ₂	0 ... 20%	0 ... 100%							D	A		
CH ₄ in Ar	0 ... 15%	0 ... 100%							E	A		
NH ₃ in N ₂	0 ... 10%	0 ... 30%							F	A		
H ₂ monitoring (turbo generators)												
• CO ₂ in air	0 ... 100%								G	A		
• H ₂ in CO ₂	0 ... 100%								G	A		
• H ₂ in air	80 ... 100%								G	A		
Add-on electronics												
Without											0	
AUTOCAL function with 8 additional digital inputs and outputs											1	
AUTOCAL function 8 additional digital inputs/outputs and PROFIBUS PA interface											6	
AUTOCAL function with 8 additional digital inputs/outputs and PROFIBUS DP interface											7	
AUTOCAL function with 8 additional digital inputs/outputs and PROFIBUS PA Ex i interface											8	
Auxiliary power												
100 V ... 120 V AC, 48 ... 63 Hz											0	
200 V ... 240 V AC, 48 ... 63 Hz											1	
Explosion protection, including certificates												
Without												A
According to ATEX II 3G, non-flammable gases												B
According to ATEX II 3G, flammable gases ²⁾												C
FM/CSA certificate – Class I Div 2												D
According to ATEX II 2G, continuous purging ²⁾												F
ATEX II 3D certificate; potentially explosive dust atmospheres												
• In non-hazardous gas zone												G
• In hazardous zone according to ATEX II 3G; non-flammable gases												H
• In hazardous zone according to ATEX II 3G; flammable gases ²⁾												J
Language of the operating software												
German												0
English												1
French												2
Spanish												3
Italian												4

¹⁾ Ready to enter external correction of cross-interference for CO, CO₂ and CH₄ (CH₄ only for blast furnace gas and wood gasification).²⁾ Only in connection with an approved purging unit.

Extractive continuous process gas analysis

Series 6

CALOMAT 6 / Field device

Selection and ordering data (Continued)

Options	Order code
Add "-Z" to article number and then add order code.	
Settings	
Set of Torx screwdrivers, ball Allen screwdrivers	A32
Tag plates (specific inscription based on customer information)	B03
BARTEC Ex p control station	
• "Leakage compensation"	E71
• "Continuous purging"	E72
BARTEC Ex p purging unit for use in ATEX or IECEx Zone 1	E74
• BARTEC Ex p control unit for continuous flow	
• BARTEC Ex control station with bypass key switch	
BARTEC Ex purging unit for use in ATEX or IECEx Zone 1	E75
• BARTEC Ex p control unit for continuous flow	
• BARTEC Ex control station with bypass key switch	
• Operator display for visualization of system states	
Clean for O ₂ service (specially cleaned gas path)	Y02
Measuring range indication in plain text, if different from default setting	Y11
Special setting (only in conjunction with an application no., e.g. additional components, measuring range)	Y12

Additional units for Ex versions	Article No.
ATEX Category II 2G (Zone 1)	
BARTEC Ex p purging unit for use in ATEX or IECEx Zone 1	
• BARTEC Ex p control unit for continuous flow, BARTEC Ex control station with bypass key-switch	7MB8000-7CA
• BARTEC Ex p control unit for continuous flow, BARTEC Ex control station with bypass key-switch, operator display for visualization of system states	7MB8000-7CB
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
ATEX Category II 3G (Zone 2)	
BARTEC Ex p purging unit for use in ATEX or IECEx Zone 1	
• BARTEC Ex p control unit for continuous flow, BARTEC Ex control station with bypass key-switch	7MB8000-7CA
• BARTEC Ex p control unit for continuous flow, BARTEC Ex control station with bypass key-switch, operator display for visualization of system states	7MB8000-7CB

Extractive continuous process gas analysis

Series 6

CALOMAT 6 / Field device

Selection and ordering data (Continued)

Additional units for Ex versions	Article No.
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

Technical specifications

CALOMAT 6, field device	
General information	Based on EN 61207/IEC 1207. All data based on H ₂ in N ₂ binary mixture
Measuring ranges	4, internally and externally switchable; automatic measuring range switchover also possible
Largest possible measuring span	100 vol.% H ₂ (see "Function" for smallest measuring span)
Measuring ranges with suppressed zero point	Any zero point within 0 ... 100 vol.% can be implemented; smallest possible measuring span: 5% H ₂
Operating position	Front wall, vertical
Conformity	CE mark in accordance with EN 61326/A1 and EN 61010/1
Design, enclosure	
Degree of protection	IP65 according to EN 60529
Weight	Approx. 25 kg
Electrical characteristics	
EMC interference immunity (electromagnetic compatibility) 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.	In accordance with standard requirements of NAMUR NE21 (08/98)
Electrical safety	In accordance with EN 61010-1; overvoltage category II
Auxiliary power (see nameplate)	100 V AC -10% ... 120 V AC +10%, 48 ... 63 Hz or 200 AC -10% ... 240 V AC +10%, 48 ... 63 Hz
Power consumption (device)	Approx. 20 VA
Fuse ratings	100 ... 120 V: 1.0T/250 200 ... 240 V: 0.63T/250
Gas inlet conditions	
Sample gas pressure	800 to 1 100 hPa (absolute)
Sample gas flow	30 ... 90 l/h (0.5 ... 1.5 l/min)
Sample gas temperature	Min. 0 to max. 50 °C, but above the dew point
Temperature of the measuring cell	Approx. 60 °C
Sample gas humidity	< 90% relative humidity
Purging gas pressure	
• Permanent	165 hPa above atmospheric pressure
• For short periods	Max. 250 hPa above ambient pressure

Technical specifications (Continued)

CALOMAT 6, field device	
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
Measuring response	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation (maximum accuracy achieved after 2 hours)	< ± 0.75% of the smallest possible measuring range according to nameplate, with electronic damping constant of 1 s ($\sigma = 0.25\%$)
Zero point drift	< ± 1%/week of the smallest possible measuring span according to nameplate
Measured value drift	< ± 1%/week of the smallest possible measuring span according to nameplate
Repeatability	< 1% of the current measuring range
Detection limit	1% of the current measuring range
Linearity error	< ± 1% of the current measuring range
Influencing variables	Based on sample gas pressure 1013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Ambient temperature	< 1%/10 K referred to smallest possible measuring span according to nameplate
Accompanying gases	Zero point deviation (for influence of interference gas, see "Cross-interferences")
Sample gas flow	< 0.2% of the smallest possible measuring span according to nameplate with a change in flow of 0.1 l/min within the permissible flow range
Sample gas pressure	< 1% of the current measuring range with a pressure variation of 100 hPa
Electrical inputs and outputs	
Analog output	0/2/4 ... 20 mA, floating; max. load 750 Ω
Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load rating: 24 V AC/DC/1 A, floating
Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and correction of cross-interference

Extractive continuous process gas analysis

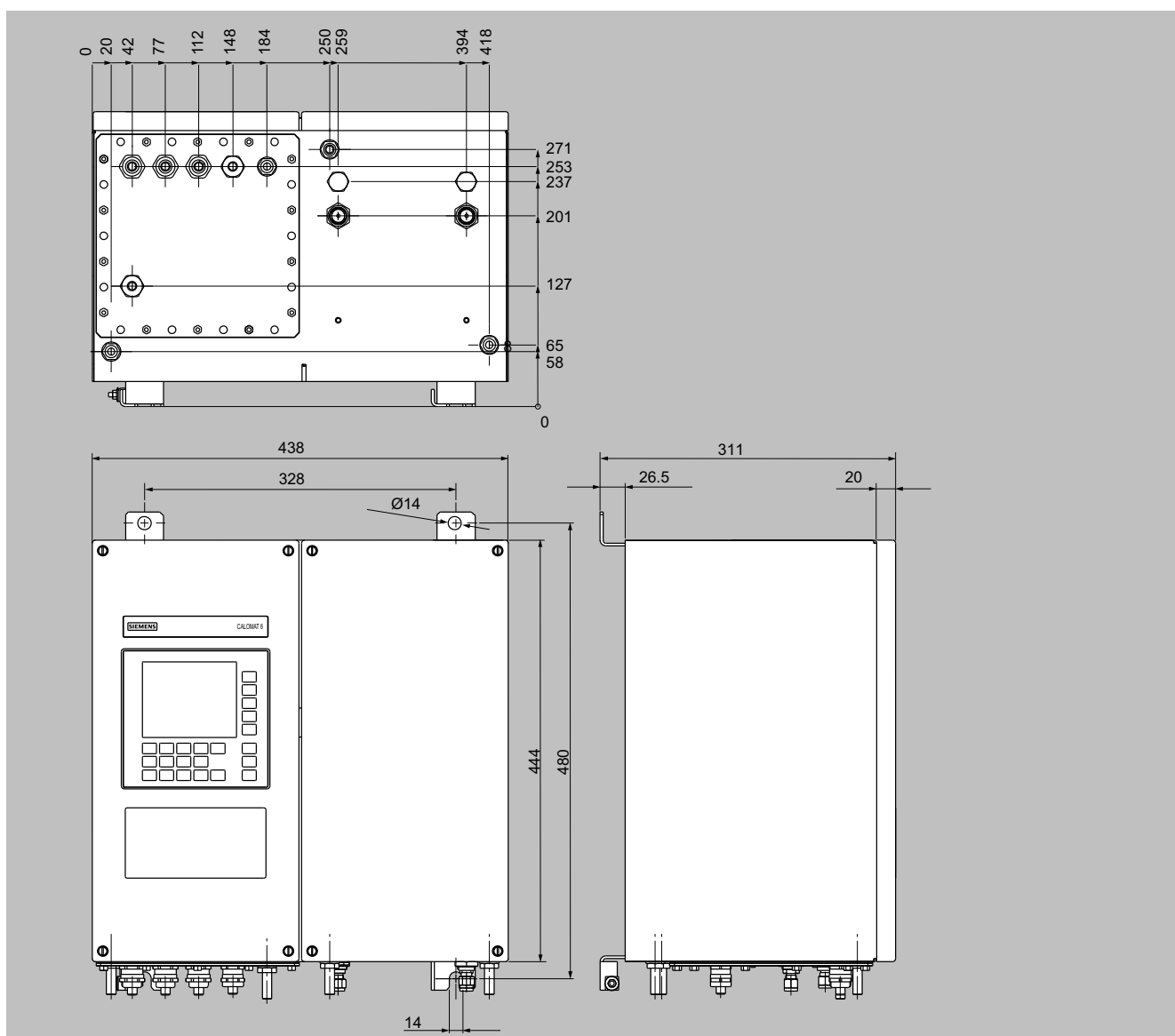
Series 6

CALOMAT 6 / Field device

Technical specifications (Continued)

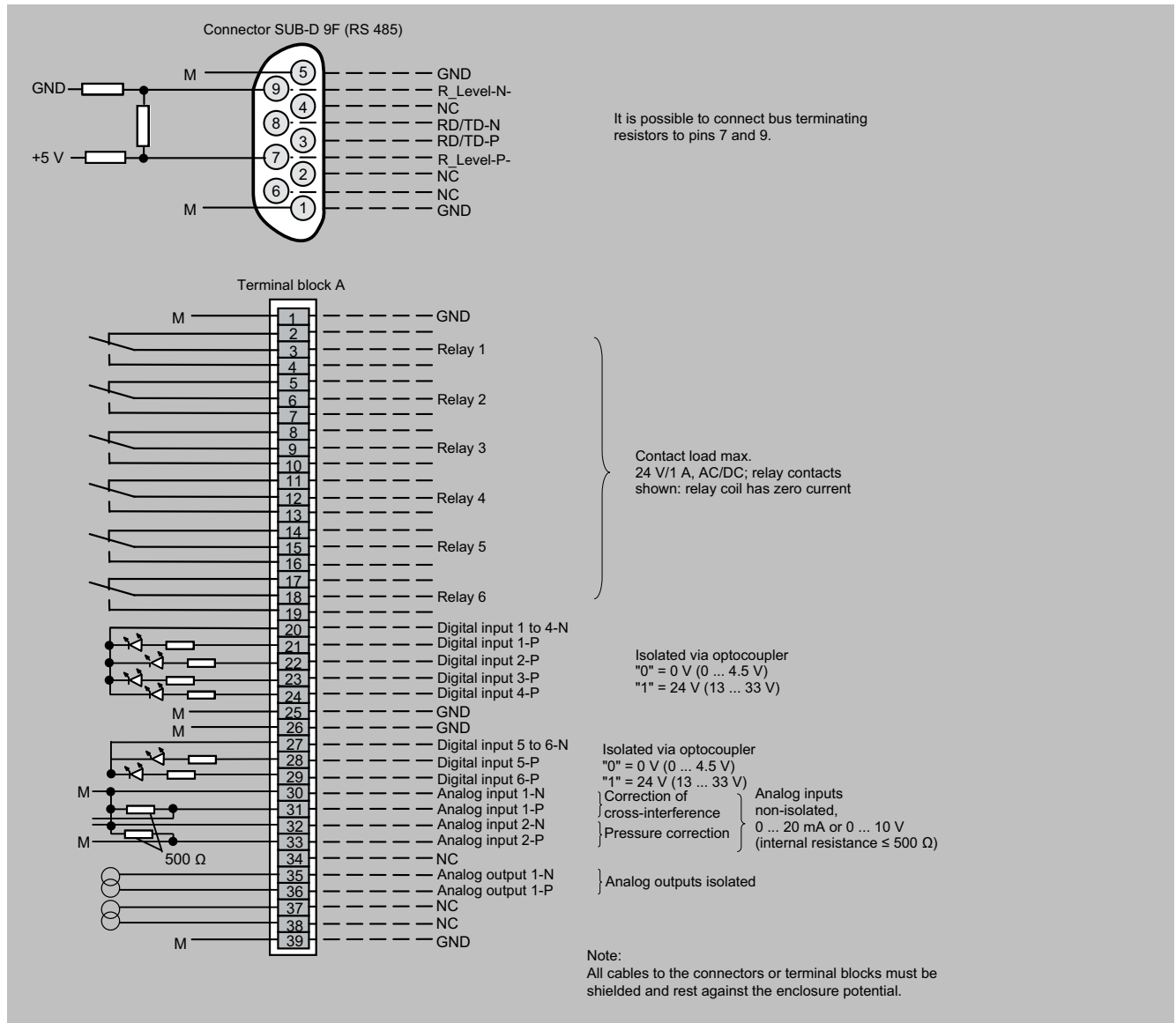
CALOMAT 6, field device	
Digital inputs	6, designed for 24 V, floating, freely configurable, e.g. for measuring range switchover
Serial interface	RS 485
Options	AUTOCAL function each with 8 additional digital inputs and relay outputs, also with PROFIBUS PA or PROFIBUS DP
Climatic conditions	
Permissible ambient temperature	-30 ... +70 °C during storage and transportation, 5 ... 45 °C during operation
Permissible humidity (must not fall below dew point)	< 90% relative humidity as annual average during storage and transportation

Dimensional drawings



CALOMAT 6, field unit, dimensions in mm

Circuit diagrams



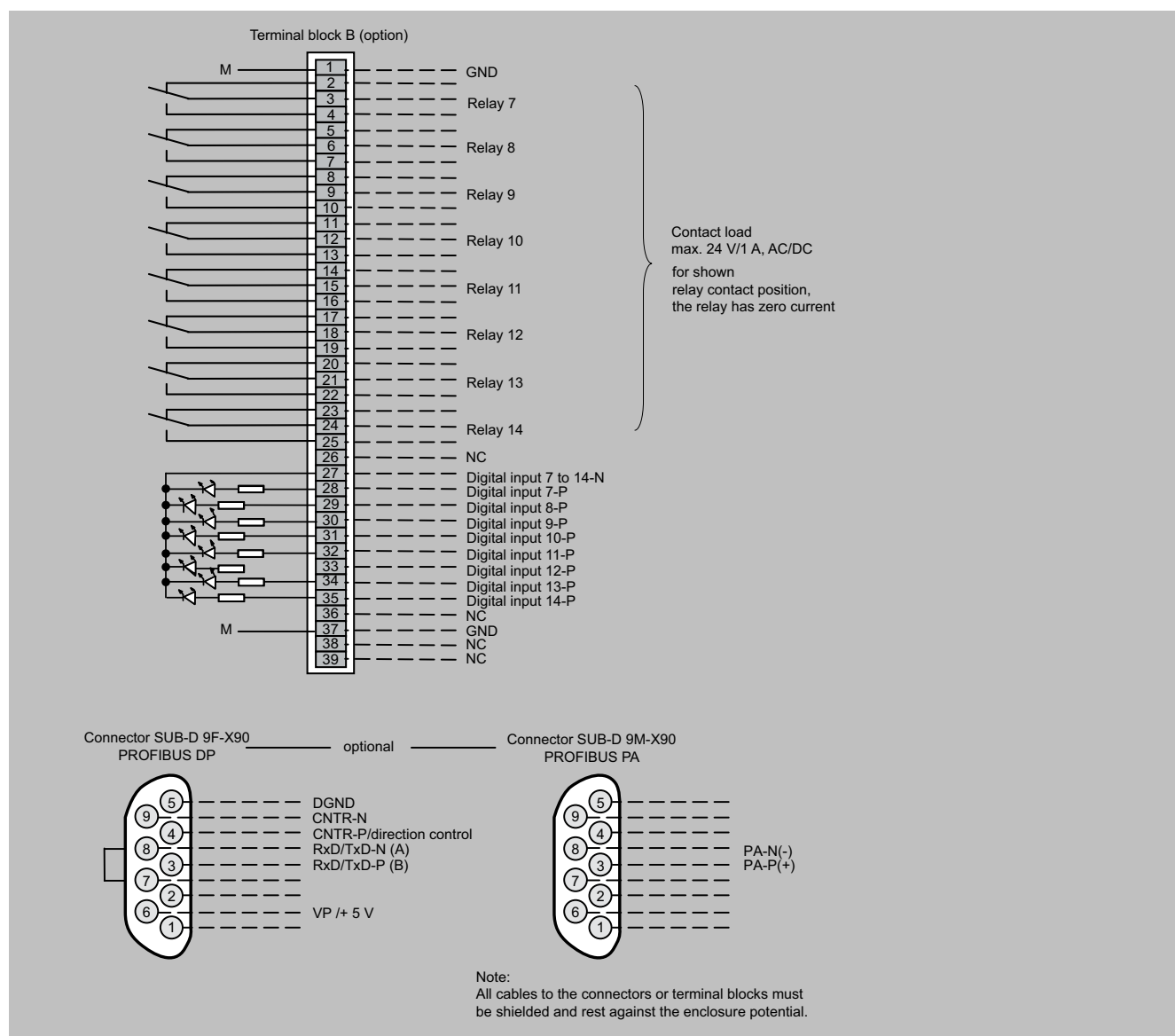
CALOMAT 6, field device, pin and terminal assignment

Extractive continuous process gas analysis

Series 6

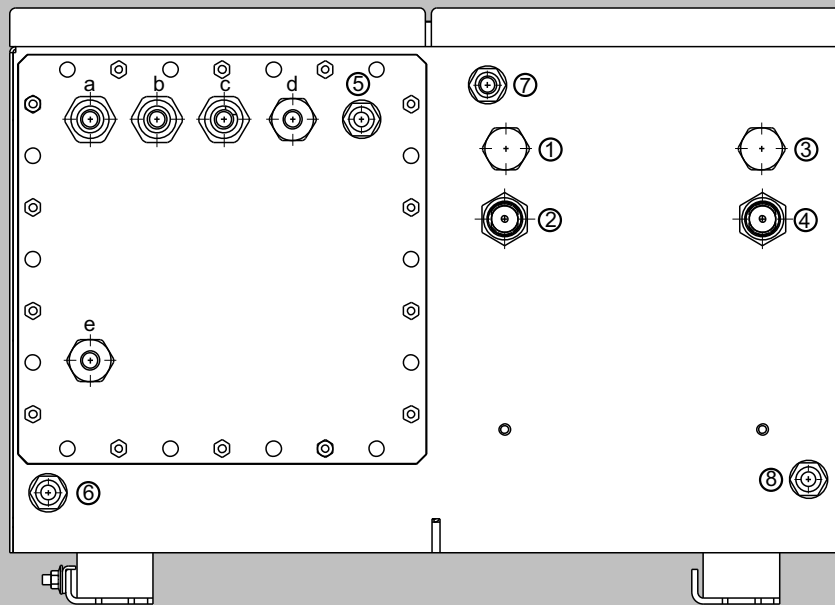
CALOMAT 6 / Field device

Circuit diagrams (Continued)



CALOMAT 6, field device, pin and terminal assignment of the AUTOCAL board and PROFIBUS plugs

Circuit diagrams (Continued)



Gas connections

- | | | |
|--|-------------------|--|
| ① | not used | } Clamping
gland for pipe
Ø 6 mm or 1/4" |
| 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 device, gas connections and electrical connections

Extractive continuous process gas analysis

Series 6

CALOMAT 6 / Suggestion for spare parts

Selection and ordering data

Description	7MB2521	7MB2511	7MB2511 Ex	2 years (unit)	5 years (unit)	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
Plug-in 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 was supplied with a specially cleaned gas path for high oxygen context (so-called "Clean for O₂ service"), please ensure that you specify this when ordering spare parts. This is the only way to ensure that the gas path will continue to comply with the special requirements for this version.

More information

If the CALOMAT 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 ensure 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 platform
- 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

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

Special versions

Special applications

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

Extractive continuous process gas analysis

Series 6

CALOMAT 62

Design

19" rack unit

- With 4 U for installation
 - In hinged frame
 - In cabinets with or without telescopic rails
 - With closed or flow-type reference chambers
- Front plate can be swung down for servicing purposes (laptop connection)
- IP20 degree of protection, with purging gas connection
- Internal gas paths: Stainless steel pipe (mat. no. 1.4571)
- Gas connections for sample gas inlet and outlet and for reference gas: Female 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 pipe union 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: Female thread 1/8"-27 NPT
- With closed or flow-type reference chambers

Display and operator 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

Inputs 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 measuring range switchover, processing of external signals from sample preparation)
- Six relay outputs, freely configurable (e.g. failure, maintenance demanded, limit alarm, external solenoid valves)
- Expansion by eight additional digital inputs and eight additional relay outputs each (e.g. for autocalibration with up to four calibration gases)

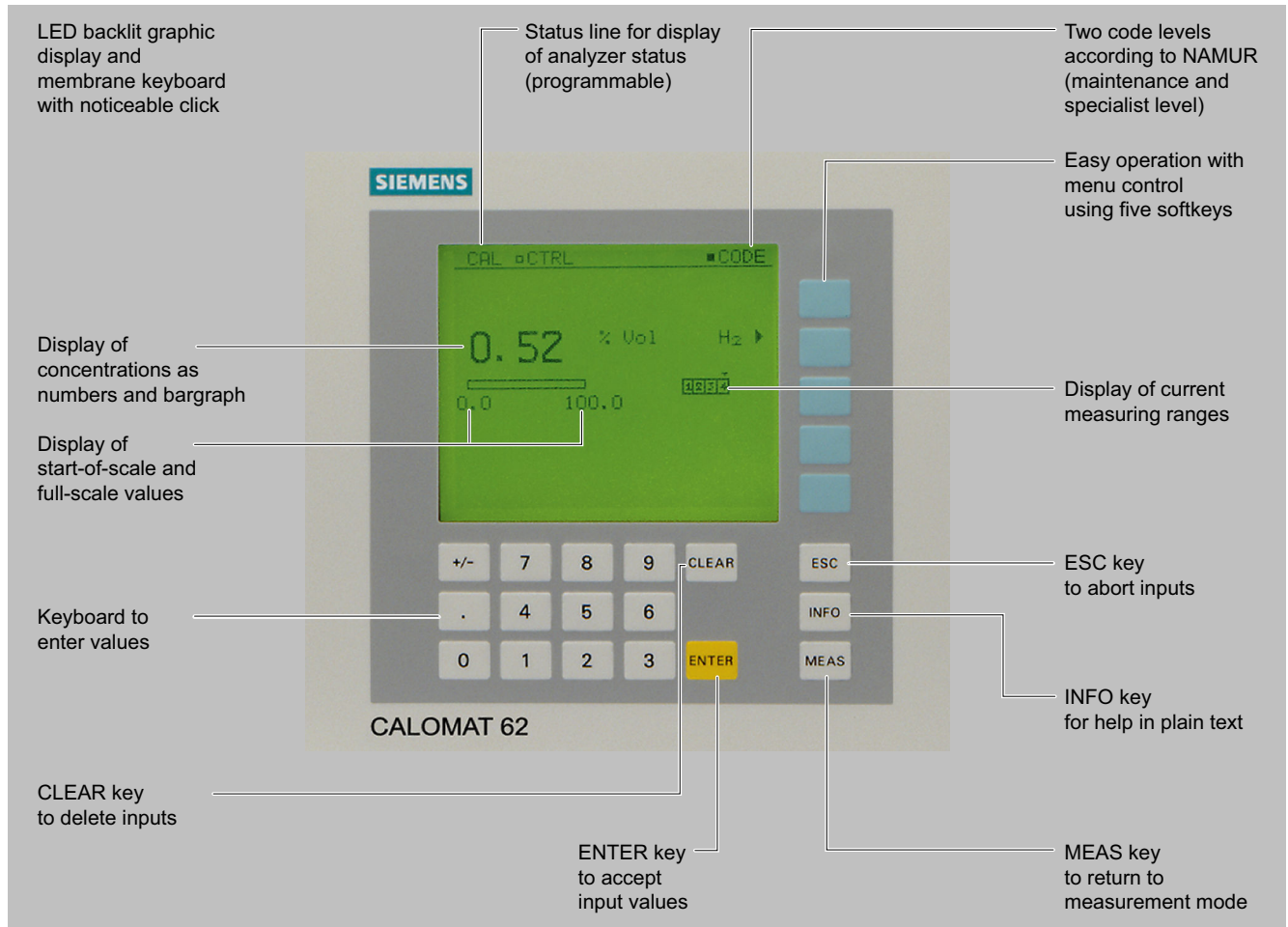
Communication

RS 485 present in the basic unit (connection at 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

Design (Continued)



CALOMAT 62, membrane keyboard and graphic display

Designs – parts wetted by sample gas

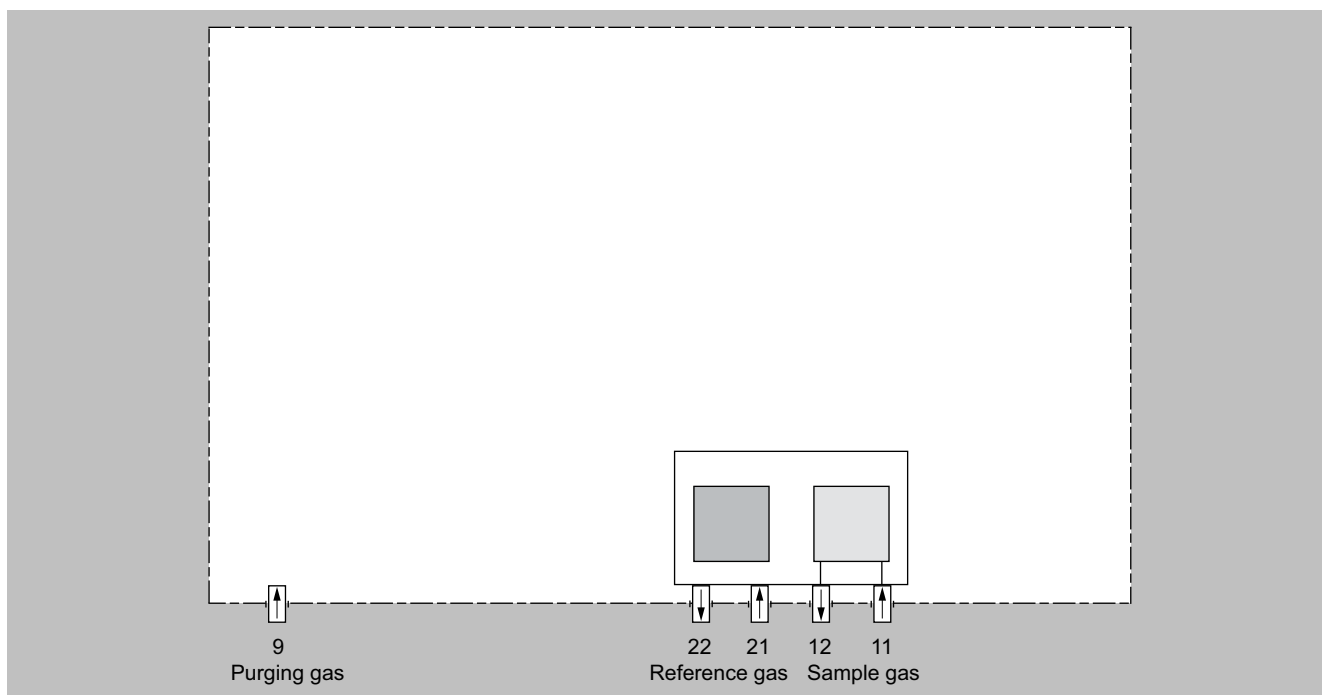
Gas connection	19" rack unit	Field device
Input block with gas connection	Stainless steel, mat. no. 1.4571	Stainless steel, mat. no. 1.4571
Gasket	FPM (e.g. Viton) or FFPM	FPM (e.g. Viton) or FFPM
Sensor	Glass	Glass
Input block with gas connection		Hastelloy C22
Gasket		FFPM (e.g. Kalrez)
Sensor		Glass

Extractive continuous process gas analysis

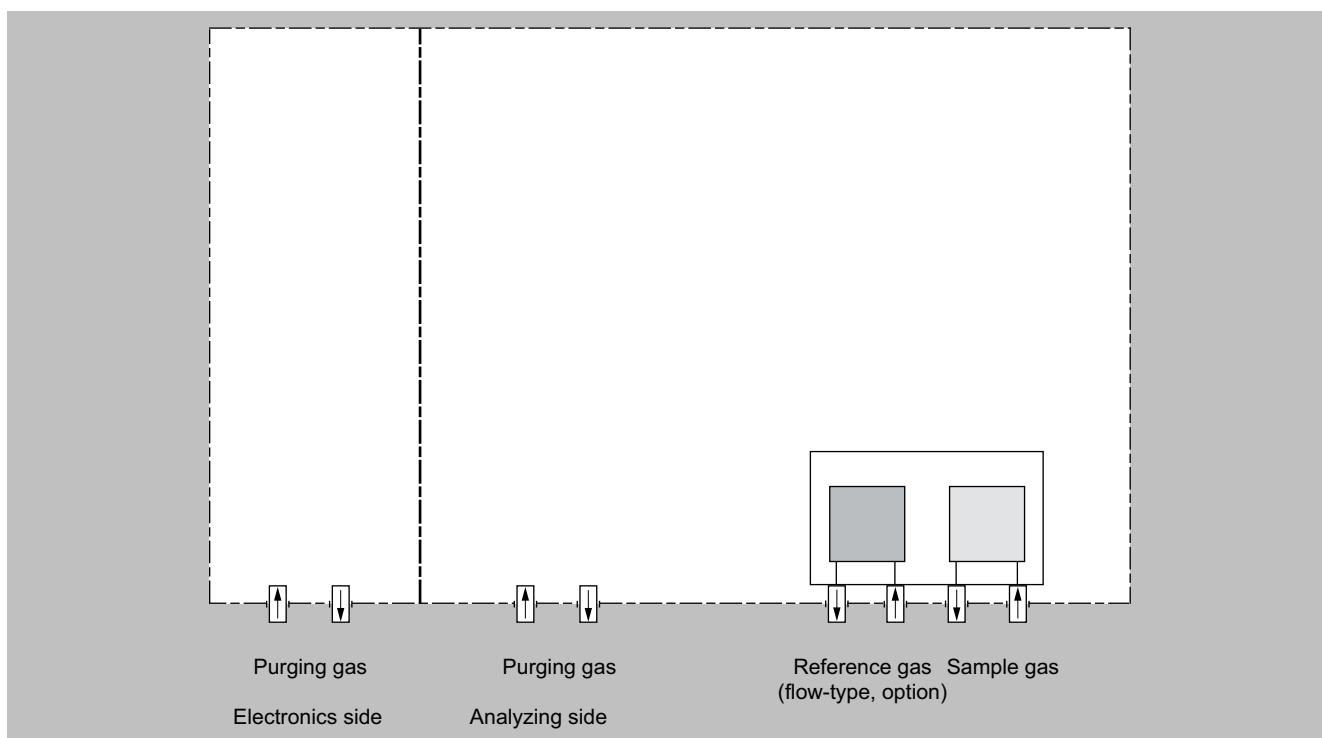
Series 6

CALOMAT 62

Design (Continued)



CALOMAT 62, 19" rack unit, gas path



CALOMAT 62, field device, gas path

Mode of operation

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

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

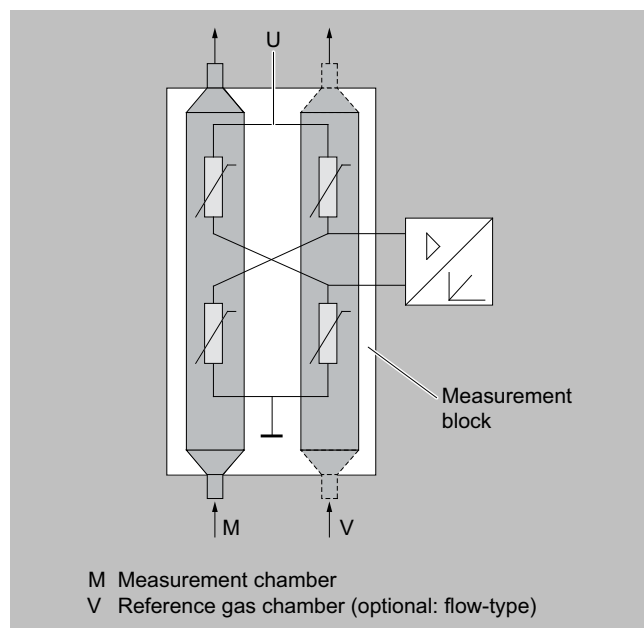
Sample gas flows around two of them, reference gas surrounds the other two. A constant DC voltage heats the resistances above the temperature of the transducer block.

The different thermal conductivity of the sample and reference gases result in different temperatures of the resistances. 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

Function

Main features

- Four measuring ranges which can be freely configured, even with suppressed zero point; all measuring ranges are linear
- Smallest measuring spans down to 1% H₂ (with suppressed zero point: 99 to 100% H₂) possible
- Measuring range identification
- Electrically isolated measured value output 0/2/4 through to 20 mA (including inverted)
- Automatic or manual measuring range switchover selectable; remote switching is also possible
- Storage of measured values possible during calibration
- Wide range of selectable time constants (static/dynamic noise damping); 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 (parameterizable)
- Measuring point identification
- External pressure sensor can be connected – for correction of variations in sample gas pressure
- Possibility for correcting the influence of accompanying gases (correction of cross-interference)
- Automatic measuring range calibration parameterizable
- Operation based on NAMUR recommendation
- Two control levels with separate authorization codes for the prevention of accidental and unauthorized operator interventions
- Simple handling using a numerical membrane keyboard and operator prompting
- Custom-made device designs, such as:
 - Customer acceptance
 - TAG plates
 - Drift recording
 - Clean for O₂ service

Measuring spans

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

Cross-interferences

Knowledge of the sample gas composition is necessary to determine the cross-interference of accompanying gases with multiple interference gas components.

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

It should be noted that the cross-interference is not linear to their concentration. Knowledge of the sample gas composition is necessary to determine the cross-interference of accompanying gases with multiple interference gas components.

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

Ar	Approx. - 0.15%
O ₂	Approx. + 0.02%
CO ₂	Approx. -0.13%
CH ₄	Approx. + 0.17%
SO ₂	Approx. - 0.31%

Extractive continuous process gas analysis

Series 6

CALOMAT 62

Function (Continued)

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

Air (dry)	Approx. + 0.25%
-----------	-----------------

Moreover, it must be noted that - in addition to a zero offset - the gradient of the characteristic curve can also be affected by the accompanying gas. However, this effect is negligible in the case of variations in the interference gas concentration below 10%. Taking these facts into consideration and due to the fact that the interference gas analyzers cause further measuring inaccuracies, a larger measuring error occurs than with binary gas mixtures despite correction of cross-interference.

Specification for the interface cable

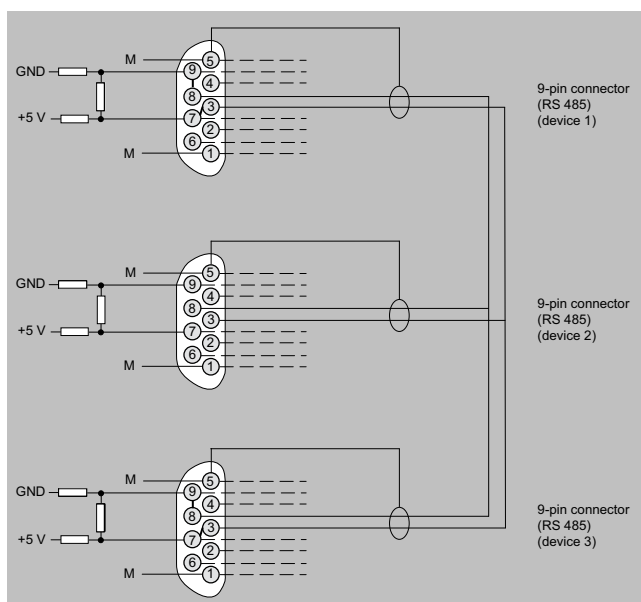
Surge impedance	100 ... 300 Ω, with a measuring frequency of > 100 kHz
Cable capacitance	Typ. < 60 pF/m
Core cross-section	> 0.22 mm ² , corresponds to AWG 23
Cable type	Twisted pair, 1 x 2 conductors of cable section
Signal attenuation	Max. 9 dB over the whole length
Shielding	Copper braided shield 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 plugs of bus cables must be bridged (see Graphic "Bus line with plug connection, example").

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

Selection and ordering data

CALOMAT 62 gas analyzer 19" rack unit for installation in cabinets			Article No. 7MB2541- ● ● ● ● ● - ● A ● ●									
Click on the Article No. for online configuration in the PIA Life Cycle Portal.												
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".												
Material of sample gas path												
Purging gas stub 6 mm												
• Stainless steel, mat. no. 1.4571; non-flow-type reference chamber, 1/8"-27 NPT												
Purging gas stub ¼"												
• Stainless steel, mat. no. 1.4571; non-flow-type reference chamber, 1/8"-27 NPT												
Application	Possible with measuring range identification											
H ₂ in N ₂	0; 5											
SO ₂ in air	1; 6											
CO ₂ in H ₂	0; 5											
CO ₂ in N ₂	1; 6											
Smallest measuring range	Largest measuring range	Reference gas or filling gas										
0 ... 1%	0 ... 100%	Accompanying gas component										
0 ... 5%	0 ... 100%											
100 ... 99%	100 ... 0%											
100 ... 95%	100 ... 0%											
Add-on electronics												
Without												
AUTOCAL function with 8 additional digital inputs/outputs each												
AUTOCAL function with 8 additional digital inputs/outputs each and PROFIBUS PA interface												
AUTOCAL function with 8 additional digital inputs/outputs each and PROFIBUS DP interface												
Auxiliary power												
100 ... 120 V AC, 48 ... 63 Hz												
200 ... 240 V AC, 48 ... 63 Hz												
Explosion protection												
Without												
Language of the operating software												
German												
English												
French												
Spanish												
Italian												

Options	Order code
Add "-Z" to article number and then add order code.	
Settings	
Tag plates (specific inscription based on customer information)	B03
Clean for O ₂ service (specially cleaned gas path)	Y02
Measuring range indication in plain text, if different from default setting	Y11
Special setting (only together 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

Extractive continuous process gas analysis

Series 6

CALOMAT 62 / 19" rack unit

Selection and ordering data (Continued)

Accessories	Article No.
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

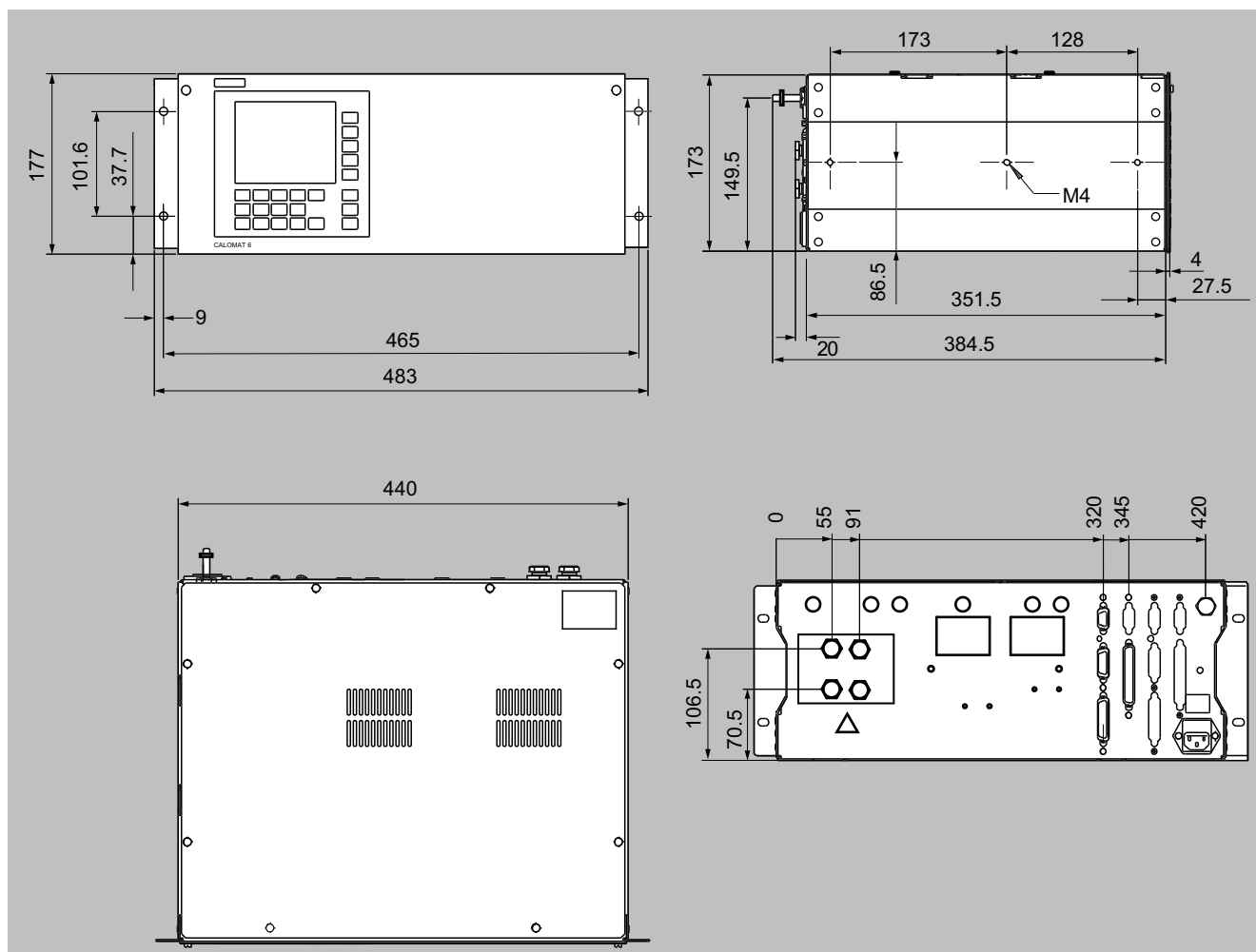
Technical specifications

CALOMAT 62, 19" rack unit	
General information	Based on EN 61207/IEC 1207. All data based on H ₂ in N ₂ binary mixture
Measuring ranges	4, internally and externally switchable; automatic measuring range switchover also possible
Measuring span	Application-dependent (see ordering data)
Measuring ranges with suppressed zero point	Application-dependent (see ordering data)
Operating position	Front wall, vertical
Conformity	CE mark in accordance with EN 50081-1/EN 50081-2 and RoHS
Design, enclosure	
Degree of protection	IP20 according to EN 60529
Weight	Approx. 13 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
Auxiliary power (see nameplate)	100 V AC -10% ... 120 V AC +10%, 48 ... 63 Hz or 200 AC -10% ... 240 V AC +10%, 48 ... 63 Hz
Power consumption	Approx. 30 VA
Fuse ratings	100 ... 120 V: 1.0T/250 200 ... 240 V: 0.63T/250
Gas inlet conditions	
Sample gas pressure	800 ... 1 100 hPa (absolute)
Sample gas flow	30 ... 90 l/h
Sample gas temperature	Min. 0 ... max. 50 °C, but above the dew point
Temperature of the measuring cell	70 °C
Time response	The time and measuring response refers to the measurement of H ₂ in N ₂
Warm-up period	< 30 min at room temperature (the technical specification will be met after 2 hours)
Delayed display (T ₉₀)	Approx. 35 s (including dead time)
Damping (electrical time constant)	0 ... 100 s, configurable
Dead time (the diffusion to the probes is the determining variable)	Approx. 34 s
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)
Output signal fluctuation (3σ value)	< ± 1% of the smallest possible measuring span according to nameplate with electronic damping constant of 1 s
Zero point drift	< ± 1% of the current measuring span/week
Measured value drift	< ± 1% of the smallest possible measuring span (according to nameplate)/week
Repeatability	< ± 1% of the current measuring span
Detection limit	1% of the smallest possible measuring span according to nameplate
Linearity error	< ± 1% of the current measuring span

Technical specifications (Continued)

CALOMAT 62, 19" rack unit	
Influencing variables	Based on sample gas pressure 1 000 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Ambient temperature	< 2%/10 K referred to smallest possible measuring span according to nameplate
Accompanying gases	Zero point deviation (for influence of interference gas, see "Cross-interferences")
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
Sample gas pressure	< 1% of the current measuring span with a pressure variation of 100 hPa
Auxiliary power	< 0.1% of the current measuring span with nominal voltage ± 10%
Electrical inputs and outputs	
Analog output	0/2/4 ... 20 mA, floating; max. load 750 Ω
Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load rating: 24 V AC/DC/1 A, floating
Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and correction of cross-interference
Digital inputs	6, designed for 24 V, floating, freely configurable, e.g. for measuring range switchover
Serial interface	RS 485
Options	AUTOCAL function with 8 additional digital inputs and relay outputs, also with PROFIBUS PA (on request) or PROFIBUS DP (on request)
Climatic conditions	
Permissible ambient temperature	-40 ... +70 °C during storage and transportation, 5 ... 45 °C during operation
Permissible humidity (must not fall below dew point)	< 90% relative humidity as annual average during storage and transportation

Dimensional drawings



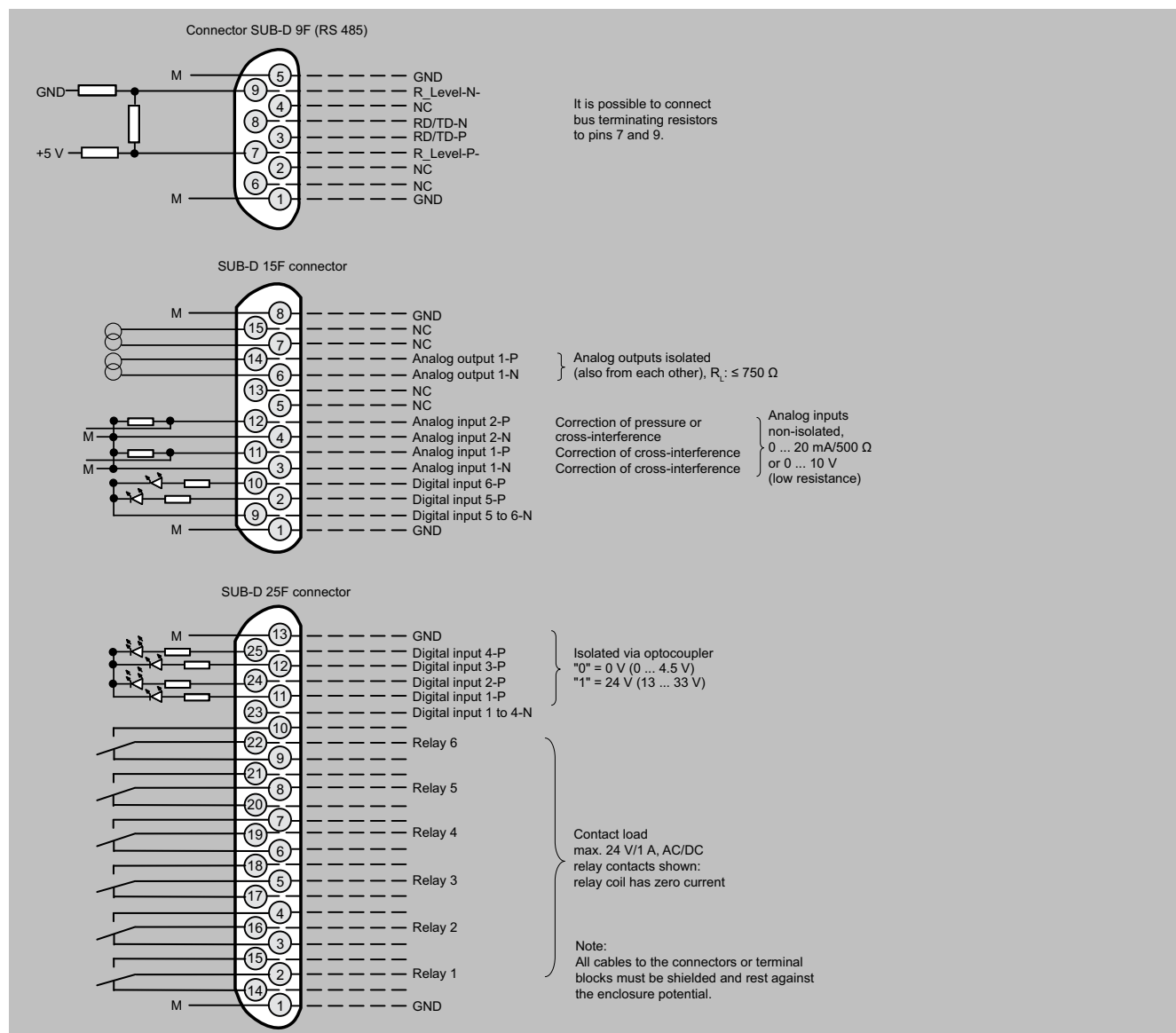
CALOMAT 62, 19" rack unit, dimensions in mm

Extractive continuous process gas analysis

Series 6

CALOMAT 62 / 19" rack unit

Circuit diagrams



CALOMAT 62, 19" rack unit, pin assignment

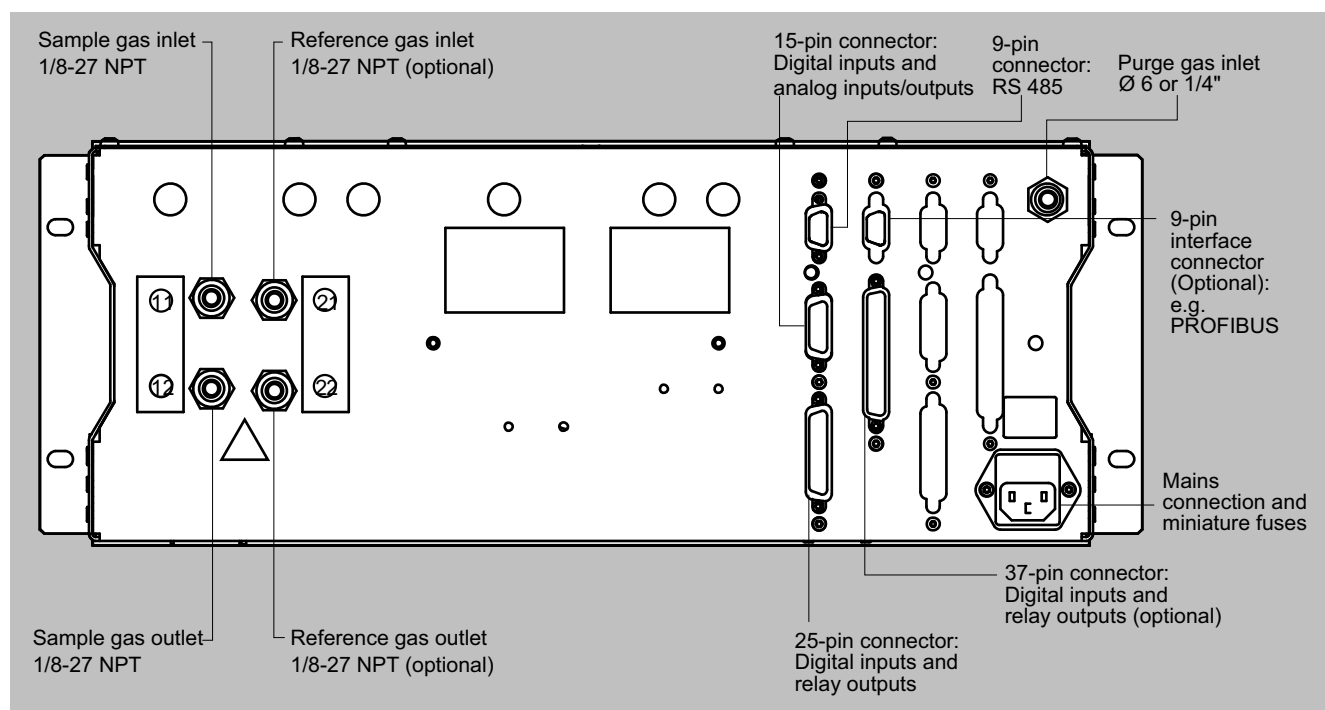
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Extractive continuous process gas analysis

Series 6

CALOMAT 62 / 19" rack unit

Circuit diagrams (Continued)



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

Extractive continuous process gas analysis

Series 6

CALOMAT 62 / Field device

Selection and ordering data

CALOMAT 62 gas analyzer For installation in the field			Article No. 7MB2531- ● ● ● ● ● - ● ● ● ●									
Click on the Article No. for online configuration in the PIA Life Cycle Portal.												
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".												
Material of sample gas path												
Purging gas stub 10 mm												
• Stainless steel, mat. no. 1.4571; non-flow-type reference chamber, 1/8"-27 NPT												0
• Hastelloy C22; non-flow-type reference chamber, 1/8"-27 NPT												2
• Hastelloy C22; flow-type reference chamber, 1/8"-27 NPT												3
Purging gas stub 3/8"												
• Stainless steel, mat. no. 1.4571; non-flow-type reference chamber, 1/8"-27 NPT												4
• Hastelloy C22; non-flow-type reference chamber, 1/8"-27 NPT												6
• Hastelloy C22; flow-type reference chamber, 1/8"-27 NPT												7
Application	Possible with measuring range identification											
H ₂ in N ₂	0; 5							A	N			
H ₂ in Cl ₂	0; 5							A	B			
Cl ₂ in air	1; 6							B	L			
HCl in air	1; 6							C	L			
SO ₂ in air	1; 6							E	L			
CO ₂ in H ₂	0; 5							K	A			
CO ₂ in N ₂	1; 6							K	N			
Smallest measuring range	Largest measuring range	Reference gas or filling gas										
0 ... 1%	0 ... 100%	Accompanying gas component						0				
0 ... 5%	0 ... 100%							1				
0 ... 5%	0 ... 60%							2				
0 ... 10%	0 ... 100%							3				
0 ... 20%	0 ... 40%							4				
100 ... 99%	100 ... 0%							5				
100 ... 95%	100 ... 0%							6				
100 ... 90%	100 ... 0%							7				
100 ... 80%	100 ... 60%							8				
Add-on electronics												
Without								0				
AUTOCAL function with 8 additional digital inputs/outputs each								1				
AUTOCAL function with 8 additional digital inputs/outputs each and PROFIBUS PA interface								6				
AUTOCAL function with 8 additional digital inputs/outputs each and PROFIBUS DP interface								7				
Auxiliary power												
100 ... 120 V AC, 48 ... 63 Hz										0		
200 ... 240 V AC, 48 ... 63 Hz										1		
Heating of internal gas paths and analyzer unit												
Without											A	
With (max. 80 °C)											B	
Explosion protection												
Without												A
According to ATEX II 3G												
• Restrictive breathing for Zone 2												B
• Simplified pressurized enclosure (pz) for Zone 2												C
According to ATEX II 2G												
• Continuous purging ¹⁾												F
According to ATEX II 3D												
• Dust Ex enclosure for Zone 22												G
According to ATEX II 3D or 3G												
• Zone 22 or restrictive breathing for Zone 2												H
• Zone 22 or simplified pressurized enclosure for Zone 2												J
Language of the operating software												
German												0

Extractive continuous process gas analysis

Series 6

CALOMAT 62 / Field device

Selection and ordering data (Continued)

CALOMAT 62 gas analyzer For installation in the field		Article No. 7MB2531- ● ● ● ● - ● ● ● ●									
English											1
French											2
Spanish											3
Italian											4

¹⁾ Only in connection with an approved purging unit.

Options	Order code
Add "-Z" to article number and then add order code.	
Settings	
Tag plates (specific inscription based on customer information)	B03
BARTEC Ex p purging unit for use in ATEX or IECEx Zone 1	E74
• BARTEC Ex p control unit for continuous flow	
• BARTEC Ex control station with bypass key switch	
BARTEC Ex purging unit for use in ATEX or IECEx Zone 1	E75
• BARTEC Ex p control unit for continuous flow	
• BARTEC Ex control station with bypass key switch	
• Operator display for visualization of system states	
Clean for O ₂ service (specially cleaned gas path)	Y02
Measuring range indication in plain text, if different from default setting	Y11
Special setting (only together 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 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
Set of Torx screwdrivers	A5E34821625

Extractive continuous process gas analysis

Series 6

CALOMAT 62 / Field device

Technical specifications

CALOMAT 62, field device	
General information	Based on EN 61207/IEC 1207. All data based on H ₂ in N ₂ binary mixture
Measuring ranges	4, internally and externally switchable; automatic measuring range switchover also possible
Measuring span	Application-dependent (see ordering data)
Measuring ranges with suppressed zero point	Application-dependent (see ordering data)
Operating position	Front wall, vertical
Conformity	CE mark in accordance with EN 50081-1/EN 50081-2 and RoHS
Design, enclosure	
Degree of protection	IP65 according to EN 60529
Weight	Approx. 25 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
Auxiliary power (see nameplate)	100 V AC -10% ... 120 V AC +10%, 48 ... 63 Hz or 200 AC -10% ... 240 V AC +10%, 48 ... 63 Hz
Power consumption	- Approx. 25 VA (gas connection block unheated) - Approx. 330 VA (gas connection block heated)
Fuse ratings (gas connection unheated)	100 ... 120 V: F3 1T/250, F4 1T/250 200 ... 240 V: F3 0.63T/250, F4 0.63T/250
Fuse ratings (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
Gas inlet conditions	
Sample gas pressure	800 ... 1 100 hPa (absolute)
Sample gas flow	30 ... 90 l/h
Sample gas temperature	Min. 0 ... max. 50 °C, but above the dew point
Temperature	
• of the measuring cell (sensor)	70 °C
• of the measurement cell block (base)	80 °C (heated)
Sample gas humidity	< 90% relative humidity
Purging gas pressure	
• Permanent	165 hPa above atmospheric pressure
• For short periods	Max. 250 hPa above ambient pressure
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)
Warm-up period	< 30 min at room temperature (the technical specification will be met after 2 hours)
Delayed display (T ₉₀)	Approx. 35 s (including dead time)
Electrical damping	0 ... 100 s, configurable
Dead time (the diffusion to the probes is the determining variable)	Approx. 34 s
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)
Output signal fluctuation (3σ value)	< ± 1% of the smallest possible measuring span according to nameplate with electronic damping constant of 1 s
Zero point drift	< ± 1% of the current measuring span/week
Measured value drift	< ± 1% of the smallest possible measuring span (according to nameplate)/week
Repeatability	< ± 1% of the current measuring span

Technical specifications (Continued)

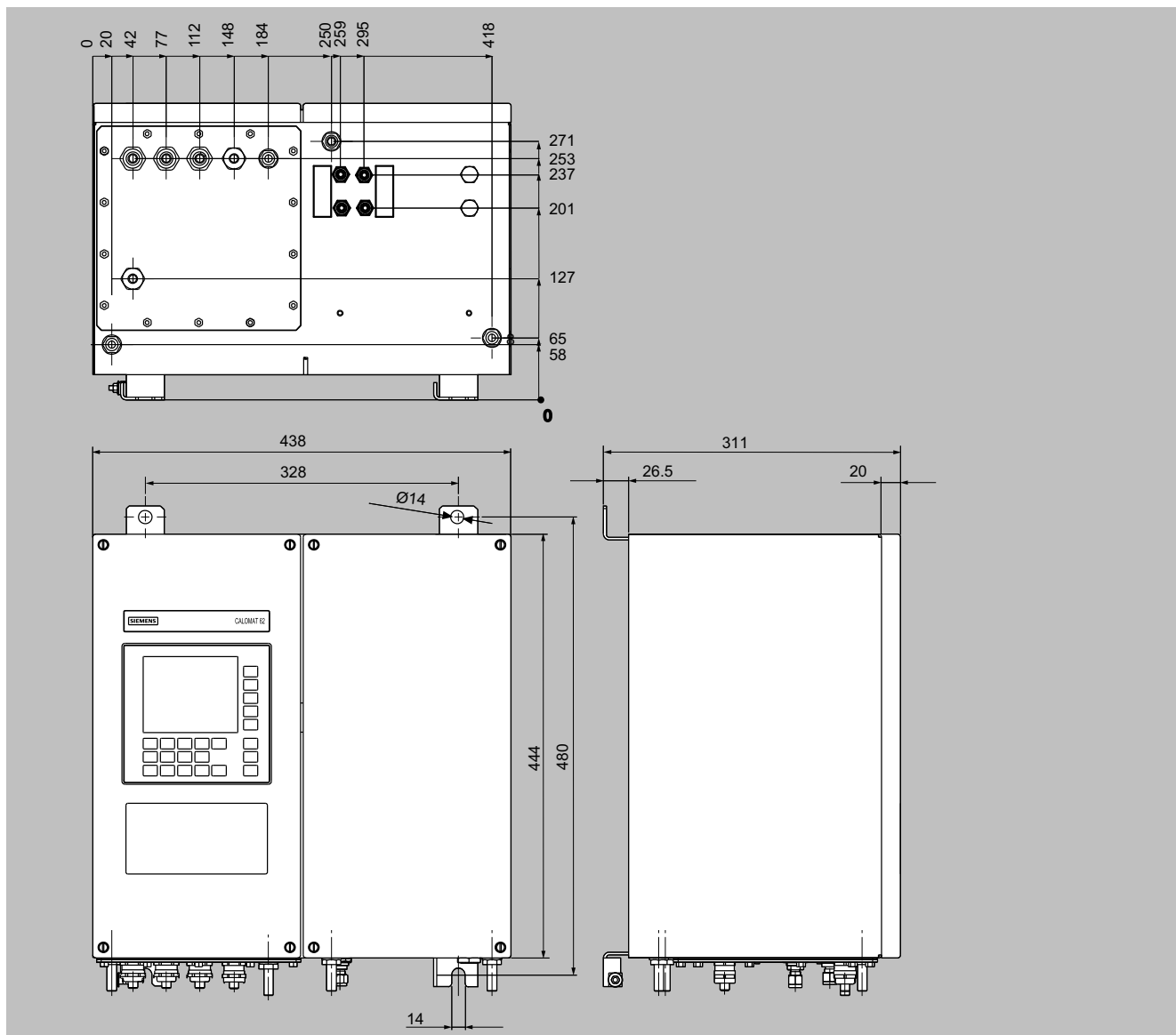
CALOMAT 62, field device	
Detection limit	1% of the smallest possible measuring span according to nameplate
Linearity error	< ± 1% of the current measuring span
Influencing variables	Based on sample gas pressure 1 000 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Ambient temperature	< 2%/10 K referred to smallest possible measuring span according to nameplate
Accompanying gases	Zero point deviation (for influence of interference gas, see "Cross-interferences")
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
Sample gas pressure	< 1% of the measuring span with a pressure variation of 100 hPa
Auxiliary power	< 0.1% of the output signal span with nominal voltage ± 10%
Electrical inputs and outputs	
Analog output	0/2/4 ... 20 mA, floating; load max. 750 Ω
Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load rating: 24 V AC/DC/1 A, floating
Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and correction of cross-interference
Digital inputs	6, designed for 24 V, floating, freely configurable, e.g. for measuring range switchover
Serial interface	RS 485
Options	AUTOCAL function with 8 additional digital inputs and relay outputs, also with PROFIBUS PA (on request) or PROFIBUS DP (on request)
Climatic conditions	
Permissible ambient temperature	-40 ... +70 °C during storage and transportation, 5 ... 45 °C during operation
Permissible humidity (must not fall below dew point)	< 90% relative humidity as annual average during storage and transportation

Extractive continuous process gas analysis

Series 6

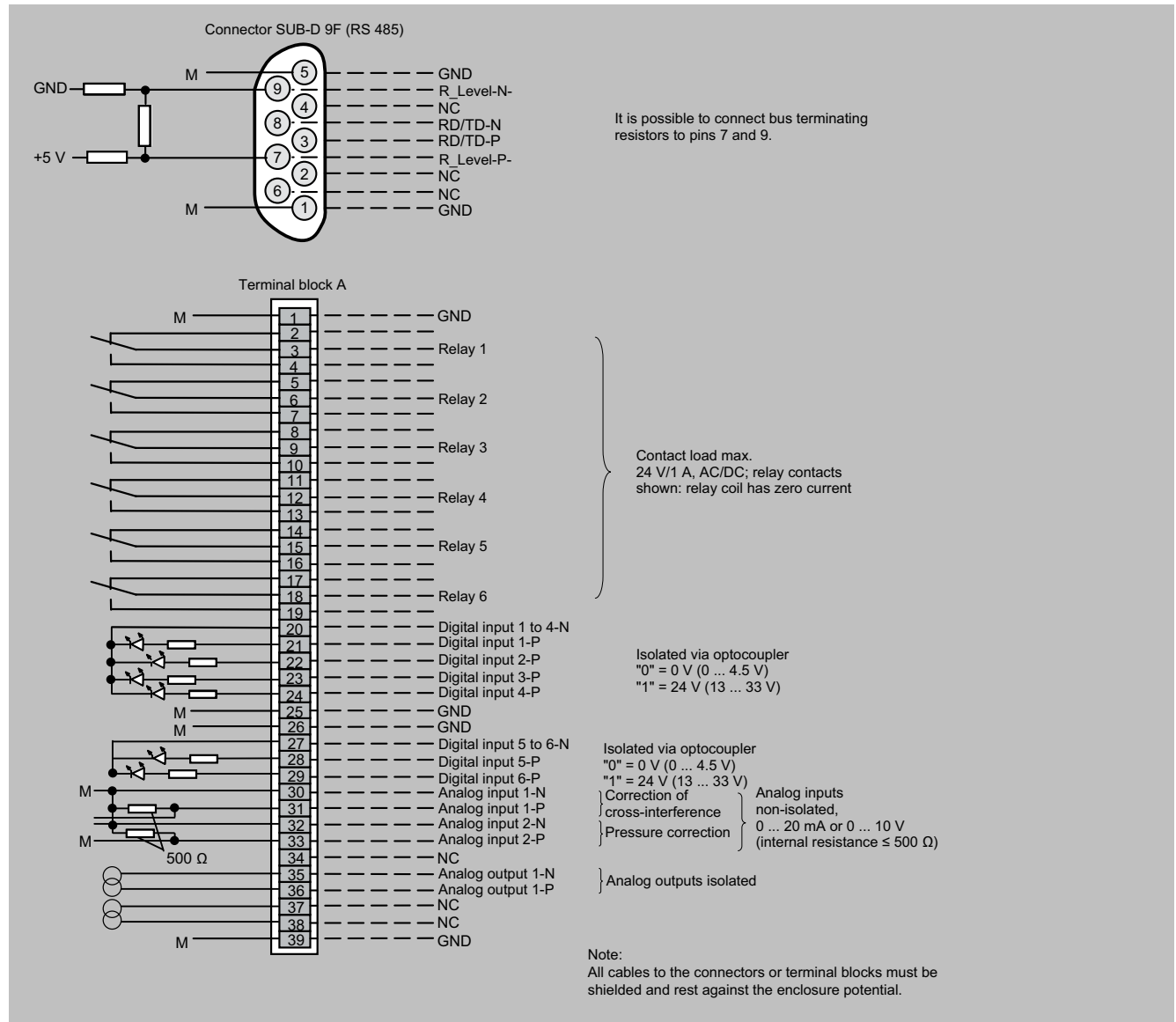
CALOMAT 62 / Field device

Dimensional drawings



CALOMAT 62, field device, dimensions in mm

Circuit diagrams



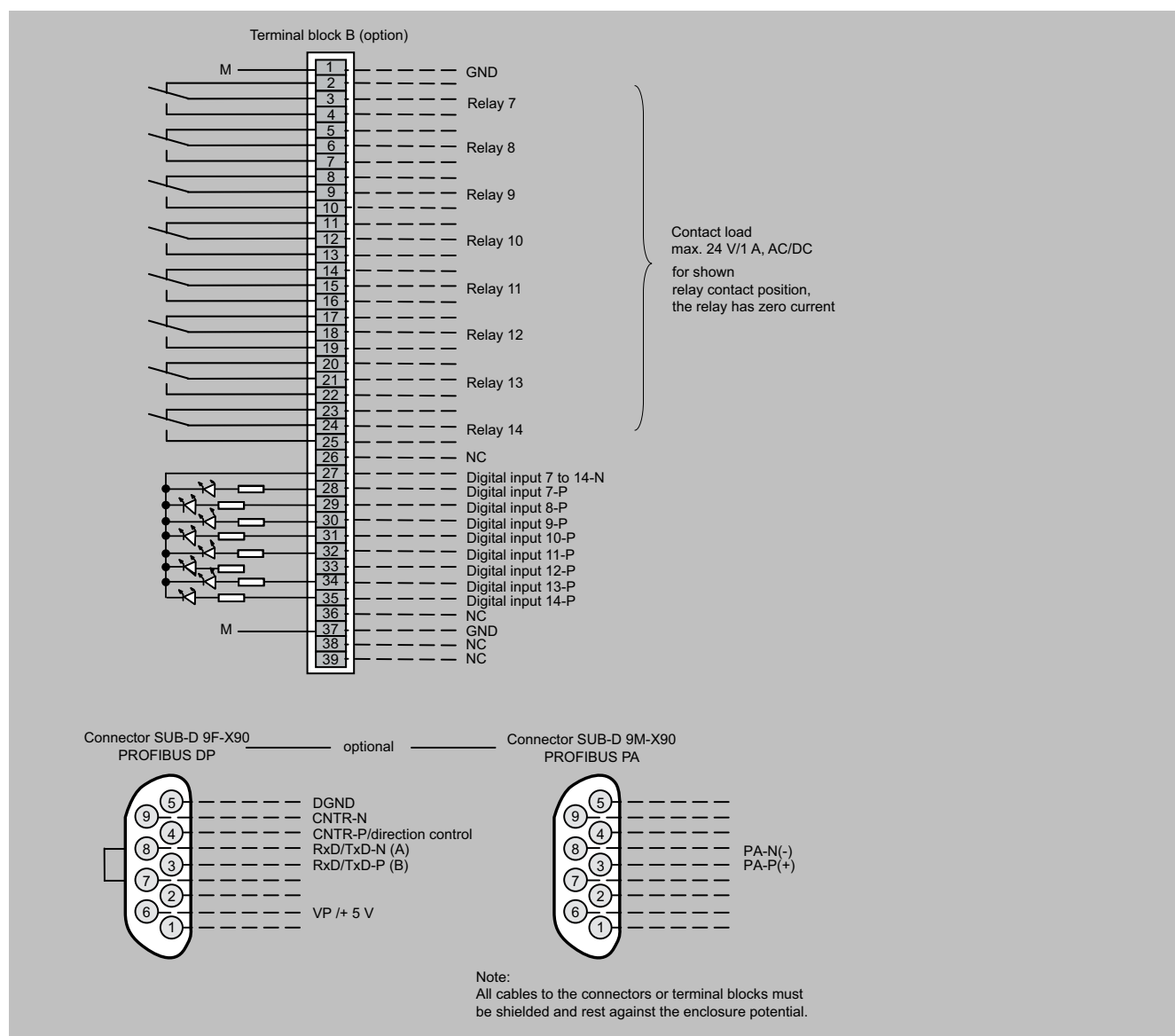
CALOMAT 62, field device, pin and terminal assignment

Extractive continuous process gas analysis

Series 6

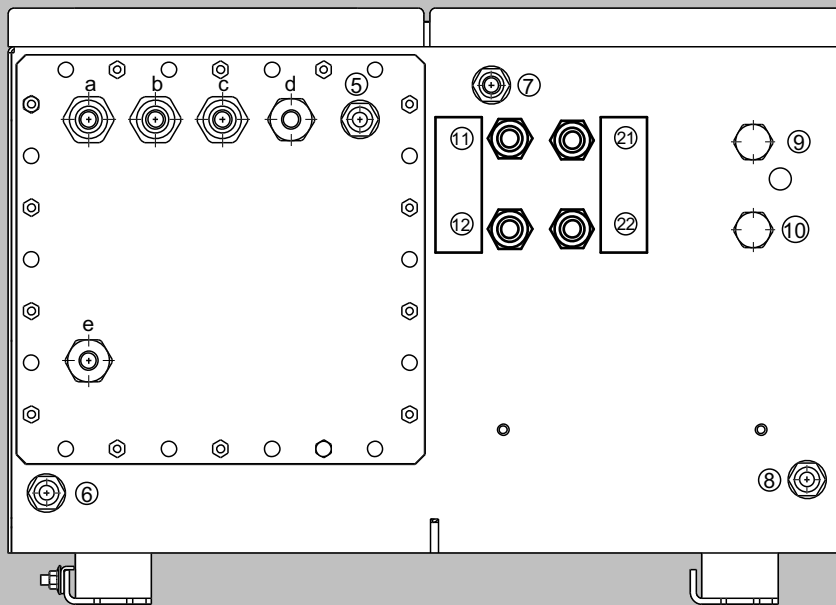
CALOMAT 62 / Field device

Circuit diagrams (Continued)



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

Circuit diagrams (Continued)



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

Extractive continuous process gas analysis

Series 6

CALOMAT 62 / Suggestion for spare parts

Selection and ordering data

Description	7MB2541	7MB2531	2 years (unit)	5 years (unit)	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, line voltage 100 ... 120 V	x	x	2	3	W79054-L1011-T100
Heating cartridge		x	–	1	W75083-A1004-F120

Overview



The FIDAMAT 6 gas analyzer is suitable for determination of the total hydrocarbon content in 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 interference gases
- Low consumption of combustion air
- Low influence of oxygen on measured value

Moreover, the device provides warning and error messages:

- Failure of combustion gas
- Flame is extinguished
- Malfunction of pump and filter

Application

- Environmental protection
- Wastewater (in combination with a stripping device, detection of hydrocarbon content of liquids)
- TLV (Threshold Limit Value) monitoring at places of work
- Quality monitoring
- Process exhaust monitoring
- Ultra-pure gas measurement 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

Application (Continued)

- Pharmaceutical industry
- Automotive industry (engine development, engine and transmission development and certification)

Specific 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 - sections 13 and 27 of the German Federal Immission Protection Regulations and German Technical Instructions on Air Quality Control (TA Luft).

Extractive continuous process gas analysis

Series 6

FIDAMAT 6

Design

- 19" rack unit with 4 U 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 of the device
- Internal gas paths: stainless steel (mat. no. 1.4571)

Display and operator 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

Inputs and outputs

- One analog output for each measured component
- Two programmable analog inputs
- Six digital inputs freely configurable (e.g. for measuring 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 with eight additional digital inputs and eight additional relay outputs for autocalibration with up to four calibration gases

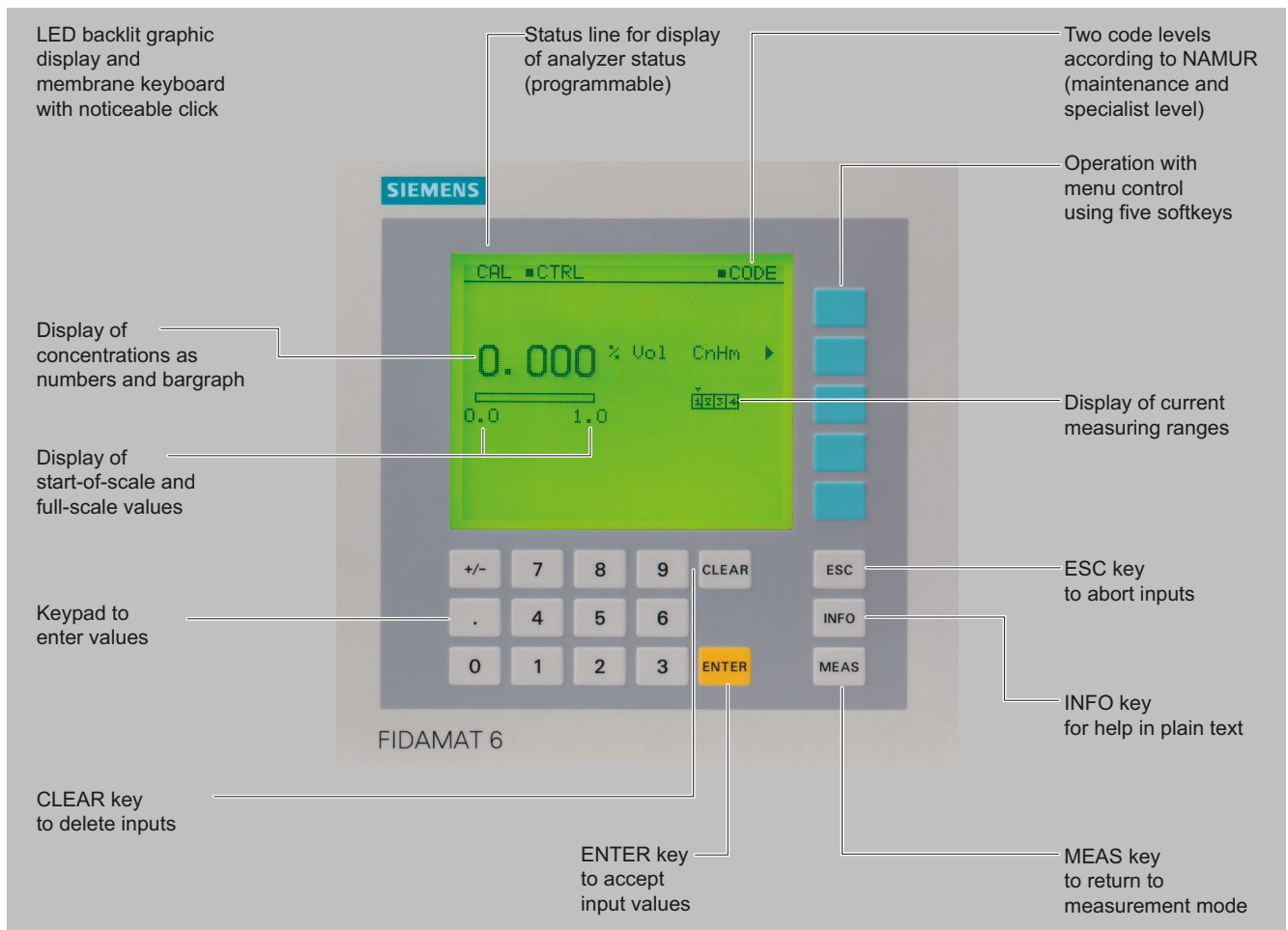
Communication

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

Design (Continued)



FIDAMAT 6, membrane keyboard and graphic display

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 diaphragm	PTFE
Pump head	Stainless steel, mat. no. 1.4571
Detector	
• Nozzle	Quartz
• FID enclosure	Stainless steel, mat. no. 1.4571

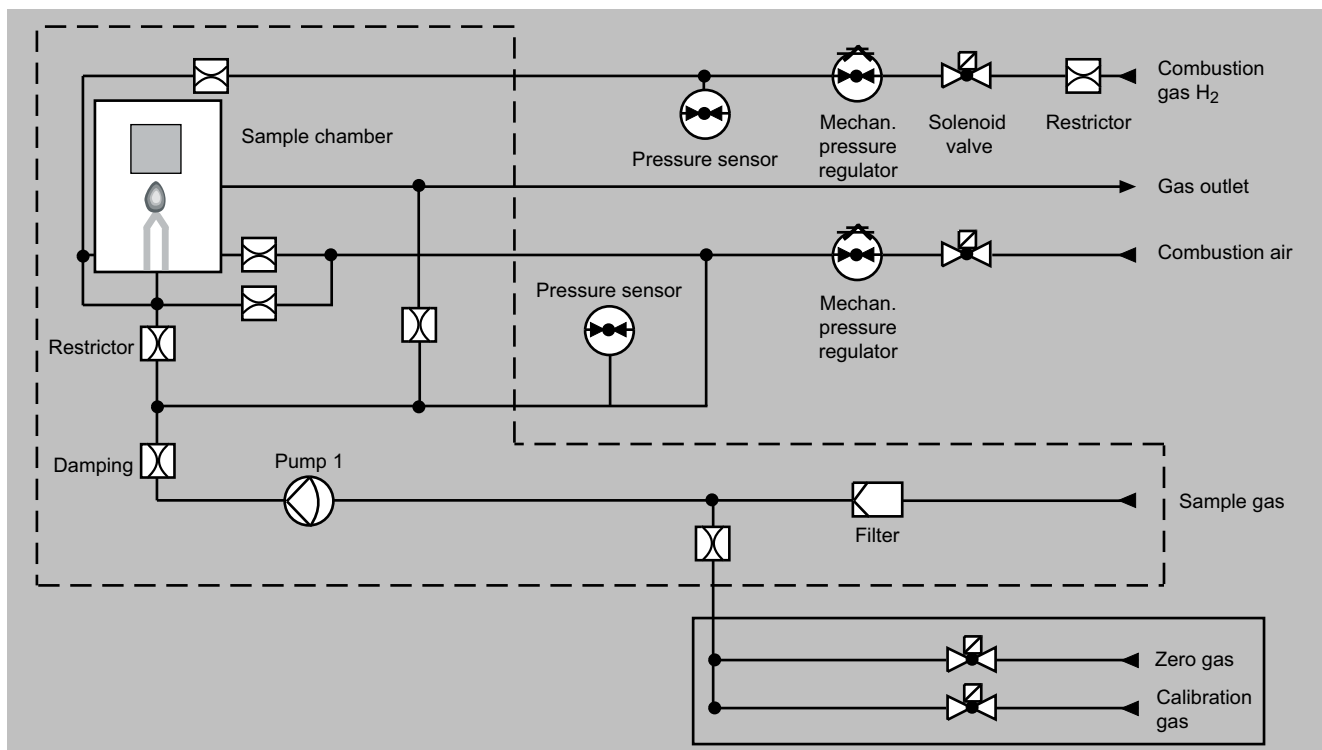
Extractive continuous process gas analysis

Series 6

FIDAMAT 6

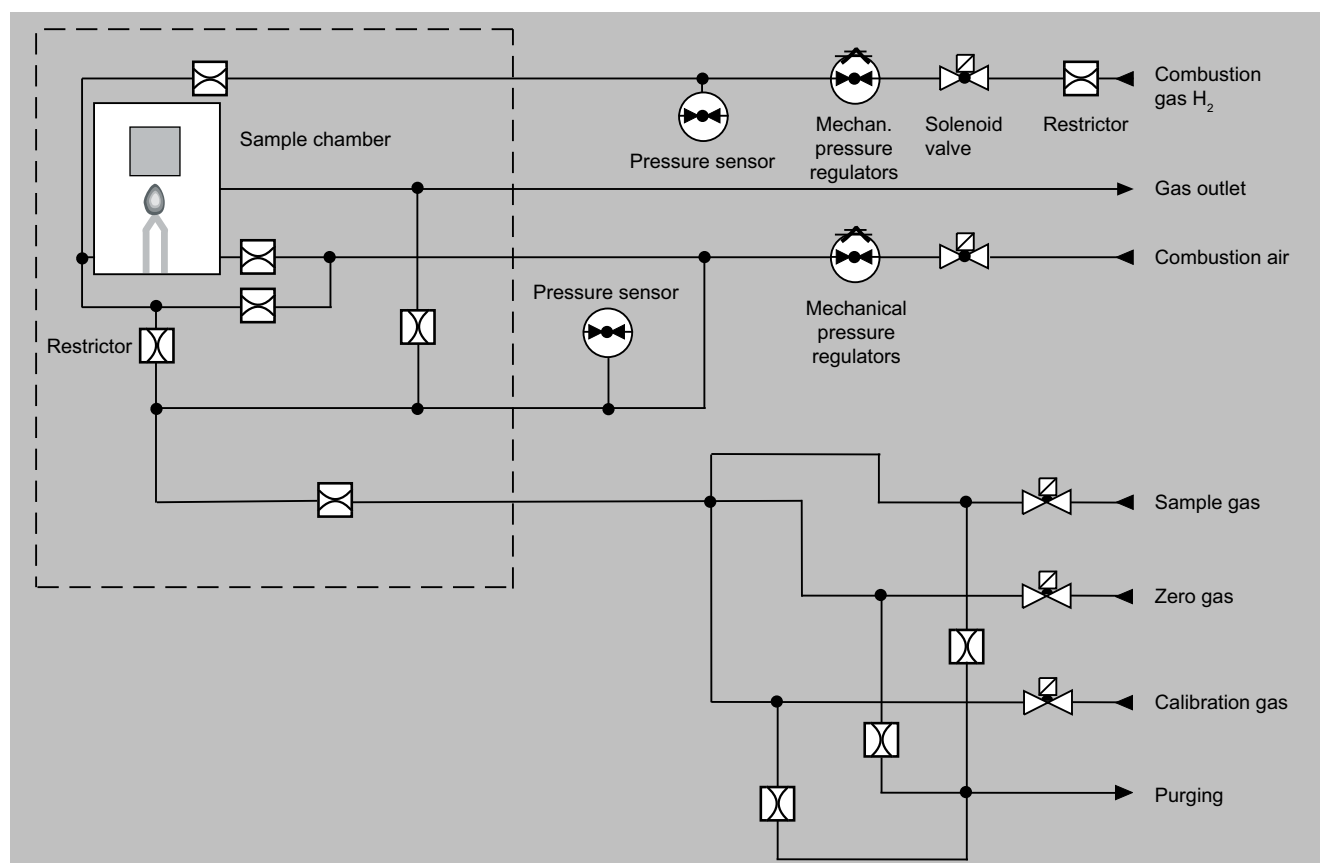
Design (Continued)

Gas path



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

Design (Continued)



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

Mode 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 measured current 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.

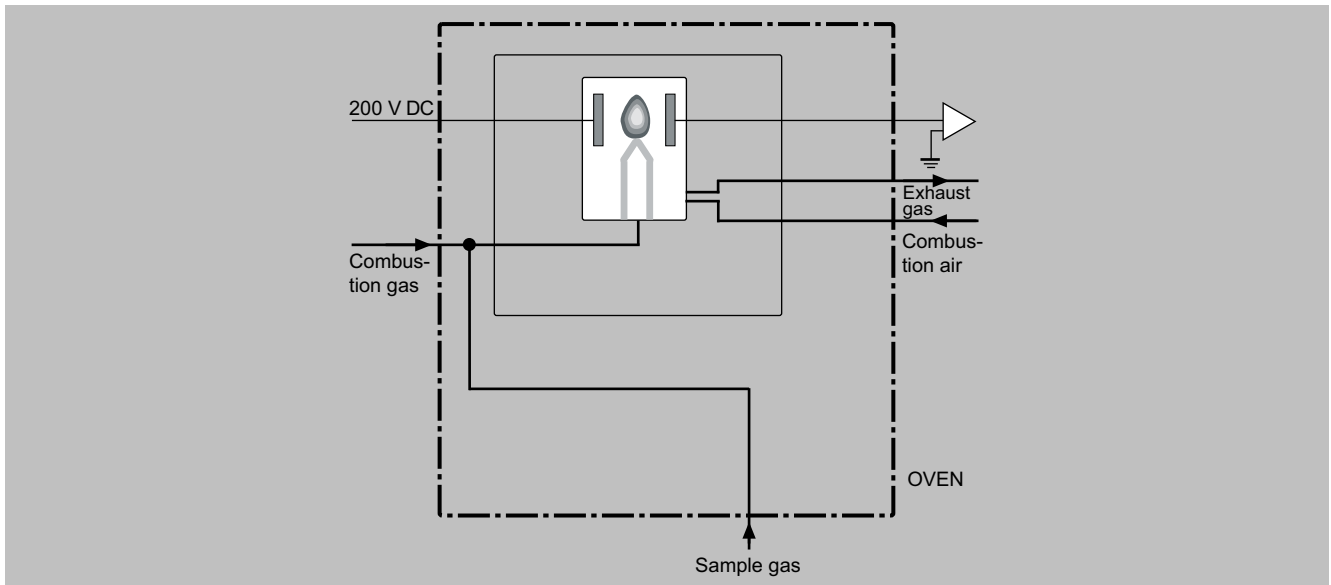
When the analyzer is switched on, ignition is automatic when the setpoint temperature is reached; for "with pump" versions, the pump is also started up.

Extractive continuous process gas analysis

Series 6

FIDAMAT 6

Mode of operation (Continued)



FIDAMAT 6, mode of operation

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

- Maintenance demanded
E.g. sample gas flow (filter/pump)
Fan failure (advance warning for measuring accuracy)
The measured value remains unaffected.
- Fault
Hydrogen, combustion air and sample gas pressure, temperature, physical part and pump, error in the electronics (temperature). The measured value can be influenced.
- Failure
In the event of failure of, for example, the electronics, power supply, combustion gas, combustion air or sample gas, the device 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 accompanying gases.

Calibration (example)	
1. Emission measurement	
Measuring range	0 ... 50 mg C/m ³
Zero gas	N ₂ (5.0 or better)
Span 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)
Span gas	At least 30 vpm CH ₄ in O ₂

Function

Main features

- Four measuring ranges which can be freely configured, even with suppressed zero point; all measuring ranges are linear
- Electrically isolated measured value output 0/2/4 through to 20 mA (including inverted)
- Choice of automatic or manual measuring range switchover; remote switching is also possible
- Storage of measured values possible during calibration
- Measuring range identification
- Measuring point switchover for up to 6 measuring points
- Measuring point identification
- Wide range of selectable time constants (static/dynamic noise damping); 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 separate authorization codes for the prevention of accidental and unauthorized operator interventions
- Automatic measuring range calibration parameterizable
- Operation based on NAMUR recommendation
- Custom-made device designs, such as:
 - Customer acceptance
 - TAG plates
 - Drift recording
- Wear-free, corrosion-resistant filter housing
- No blocking of the sample gas capillaries through the use of a quartz capillary
- Purge function in the event of device 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 "Technical Instructions on Air Quality Control" guideline 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
Isooctane	1.04
Ethine (acetylene)	0.91
Propene	0.84
Methanol	0.87
Ethanol	0.83
Acetic acid	1.13
Methyl acetate	0.67
Benzene	1.01
Ethyl benzene	0.96
p-xylene	1.03
Dichloromethane	1.13
Trichloroethene	1.01
Tetrachloroethene	1.07
Chloroform	0.72
Chlorobenzene	1.15

Extractive continuous process gas analysis

Series 6

FIDAMAT 6

Function (Continued)

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 contact in N ₂	(310 mg/m ³)	< 0.5 mg/m ³
NO contact 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

Selection and ordering data

FIDAMAT 6 gas analyzer 19" rack unit for installation in cabinets		Article No. 7MB2421- ● ● ● ● ● - ● ● A ●									
Click on the Article No. for online configuration in the PIA Life Cycle Portal.											
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".											
Gas connections											
Pipe with 6 mm outer diameter				0							
Pipe with 1/4" outer diameter				1							
Version											
Without pump, for sample gas with overpressure ¹⁾					B						
With heated pump, for sample gas with atmospheric pressure					D						
Combustion air feed											
With connection for combustion air						A					
Number of channels											
1-channel version							1				
Add-on electronics											
Without								0			
AUTOCAL function with 8 additional digital inputs/outputs each								1			
AUTOCAL function with 8 digital inputs/outputs each and PROFIBUS PA interface								6			
AUTOCAL function with 8 digital inputs/outputs each and PROFIBUS DP interface								7			
Auxiliary power											
100 ... 120 V AC, 48 ... 63 Hz									0		
200 ... 240 V AC, 48 ... 63 Hz									1		
Combustion gases											
H ₂										A	
Language of the operating software											
German											0
English											1
French											2
Spanish											3
Italian											4

¹⁾ No QAL1 approval according to EN 15267.

Options	Order code
Add "-Z" to article number and then add order code.	
Settings	
Telescopic rails (2 units)	A31
Tag plates (specific inscription based on customer information)	B03
Clean for O ₂ service (specially cleaned gas path)	Y02
Measuring range indication in plain text, if different from default setting	Y11
Special setting (only in conjunction with an application no.)	Y12
Extended special setting (only in conjunction with an application no.)	Y13
Configuration according to certificate (QAL1) ¹⁾	Y37

¹⁾ For certified operation, compensation of the influence of interference gas 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 -Y37 is pre-parameterized accordingly and expects an analog signal of 4 ... 20 mA corresponding to 0 ... 21 vol.% O₂ at analog input AI2.

Accessories	Article No.
RS 485/Ethernet converter	A5E00852383
RS 485/RS 232 converter	C79451-Z1589-U1

Extractive continuous process gas analysis

Series 6

FIDAMAT 6 / 19" rack unit

Selection and ordering data (Continued)

Accessories	Article No.
RS 485/USB converter	A5E00852382
AUTOCAL function with 8 digital inputs/outputs each	C79451-A3480-D511
AUTOCAL function with 8 digital inputs/outputs each and PROFIBUS PA	A5E00057307
AUTOCAL function with 8 digital inputs/outputs each and PROFIBUS DP	A5E00057312
Set of Torx screwdrivers	A5E34821625

Technical specifications

FIDAMAT 6, 19" rack unit	
General information	
Measuring ranges	4, internally and externally switchable; manual and automatic measuring range switchover possible
Smallest possible measuring span	0 ... 10 vpm
Largest possible measuring span	99.999 vpm*)
Concentration units	vpm, C ₁ , C ₃ , C ₆ or mg/Cm ³
Automatic measuring range switchover	Hysteresis, selectable
Measured value display	Digital concentration indicator (5 digits with floating point)
Resolution of digital display	0.1% of measured value
Operating position	Front wall, vertical
Conformity	CE mark EN 50081-1, EN 50082-2
Oven temperature	Adjustable 100 ... 200 °C
Design, enclosure	
Degree of protection	IP20 according to EN 60529
Weight	Approx. 23 kg
Electrical characteristics	
Auxiliary power	100 ... 120 V AC (nominal range of use 90 ... 132 V), 48 ... 63 Hz or 200 ... 240 V AC (nominal range of use 180 ... 264 V), 48 ... 63 Hz
Power consumption	• Approx. 150 VA during operation, • Approx. 350 VA during warm-up phase
EMC interference immunity (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98)
Electrical safety	In accordance with EN 61010-1, overvoltage category II
Fuse ratings	100 ... 120 V: 4.0T/250 200 ... 240 V: 2.5 T/250
Gas inlet conditions	
Permissible sample gas pressure	
• Without pump	< 2 000 hPa abs.
• With integrated pump	600 ... 1 100 hPa
Sample gas temperature	0 ... 200 °C
Sample gas humidity	< 90% RH (RH: relative humidity)
Time 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 device at 1 l/min)	With filter 2 ... 3 s
Time for device-internal signal processing	< 1 s
Measuring response	
	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation	< 0.75% of the smallest possible measuring range according to nameplate, with electronic damping constant of 1 s (corresponds to ± 0.25% at 2 σ)

Technical specifications (Continued)

FIDAMAT 6, 19" rack unit	
Zero point drift	< 0.5%/month of the smallest possible measuring span according to nameplate
Measured value drift	< 1%/week of the current measuring range
Repeatability	< 1% of the current measuring range
Detection limit	0.1 vpm (version for ultra-pure gas measurement: 50 ppb)
Linearity error	< 1% of the current measuring range
Influencing variables	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Ambient temperature	< 1%/10 K referred to smallest possible measuring span according to nameplate
Atmospheric pressure	< 1%/50 hPa
Sample gas pressure	< 2% of the current measuring range/1% pressure variation (within 600 ... 1 100 hPa)
Auxiliary power	< 1% of the current measuring range with nominal voltage $\pm$ 10%
Position influence	< 1% with < 15° inclination
Electrical inputs and outputs	
Analog output	0/2/4 ... 20 mA, floating; max. load 750 Ω
Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load rating: 24 V AC/DC/1 A, floating
Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and correction of influence of accompanying gas (correction of cross-interference)
Digital inputs	6, designed for 24 V, floating, freely configurable, e.g. for measuring range switchover
Serial interface	RS 485
Options	AUTOCAL function each with 8 additional digital inputs and relay outputs; also with PROFIBUS PA or PROFIBUS DP
Climatic conditions	
Permissible ambient temperature	-30 ... +70 °C during storage and transportation, 5 ... 45 °C during operation
Permissible humidity	< 90% RH (RH: relative humidity) as annual average, during storage and transportation (must not fall below dew point)

*) 100% as special application

FIDAMAT 6 with pump and heated oven, with combustion air connection						
Gases	Inlet pressure		Operating pressure		Flow through FID ml/min	Flow through bypass ml/min
	hPa (abs.)	hPa (abs.)	Pump startup			
			Without	With		
	hPa (abs.)	hPa (abs.)	hPa (abs.)			
Combustion gas	3 000 ... 5 000	2 000 ± 20	2 000 ± 20	~ 25		—
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
Span 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		Operating pressure		Flow through FID	Flow through bypass
	hPa (abs.)	hPa (abs.)	Sample/calibration gas			
			Without	With		
	hPa (abs.)	hPa (abs.)	hPa (abs.)	ml/min	ml/min	
Combustion gas	3 000 ... 5 000	2 000 ± 20	2 000 ± 20	~ 25	—	
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	

Extractive continuous process gas analysis

Series 6

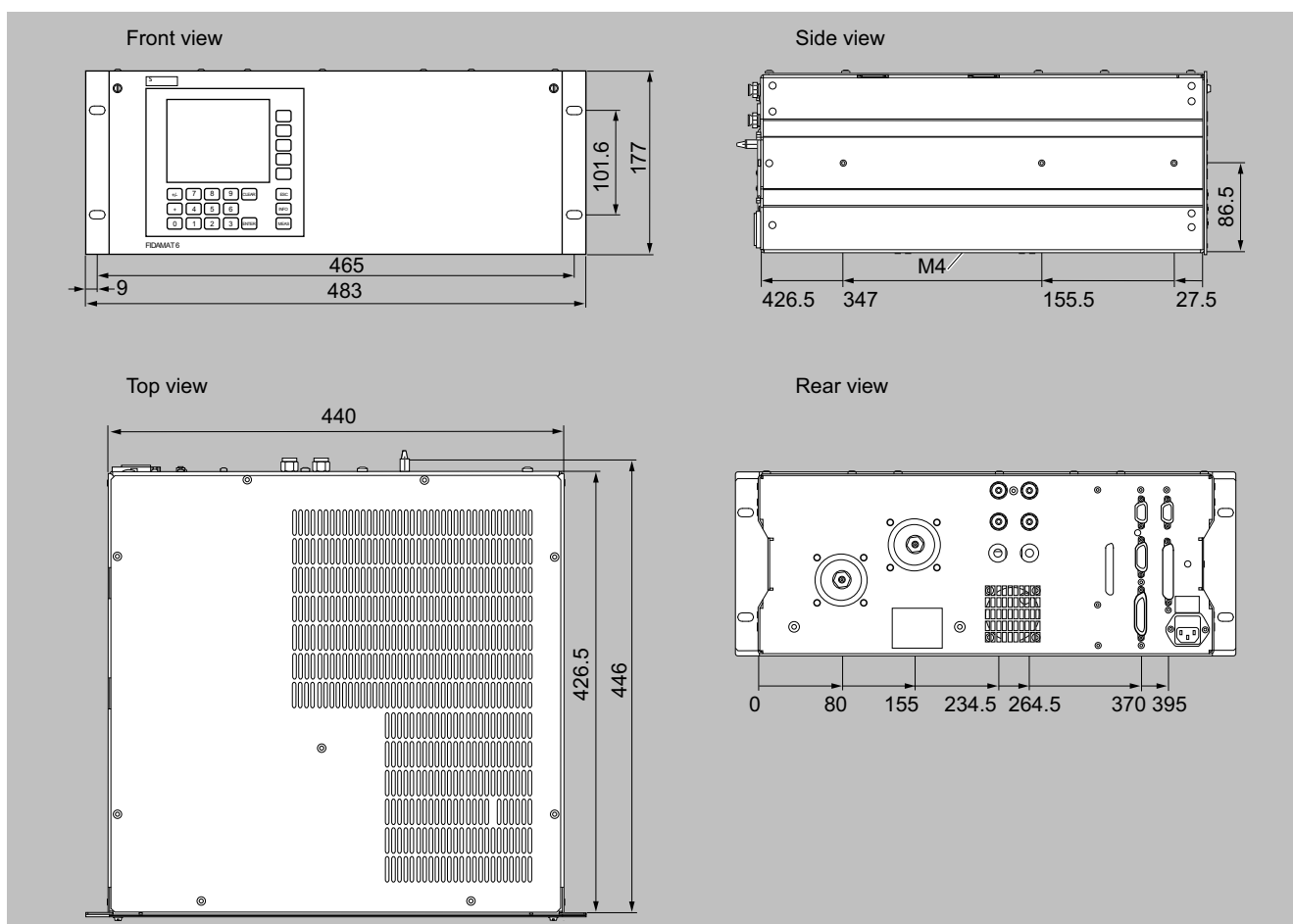
FIDAMAT 6 / 19" rack unit

Technical specifications (Continued)

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

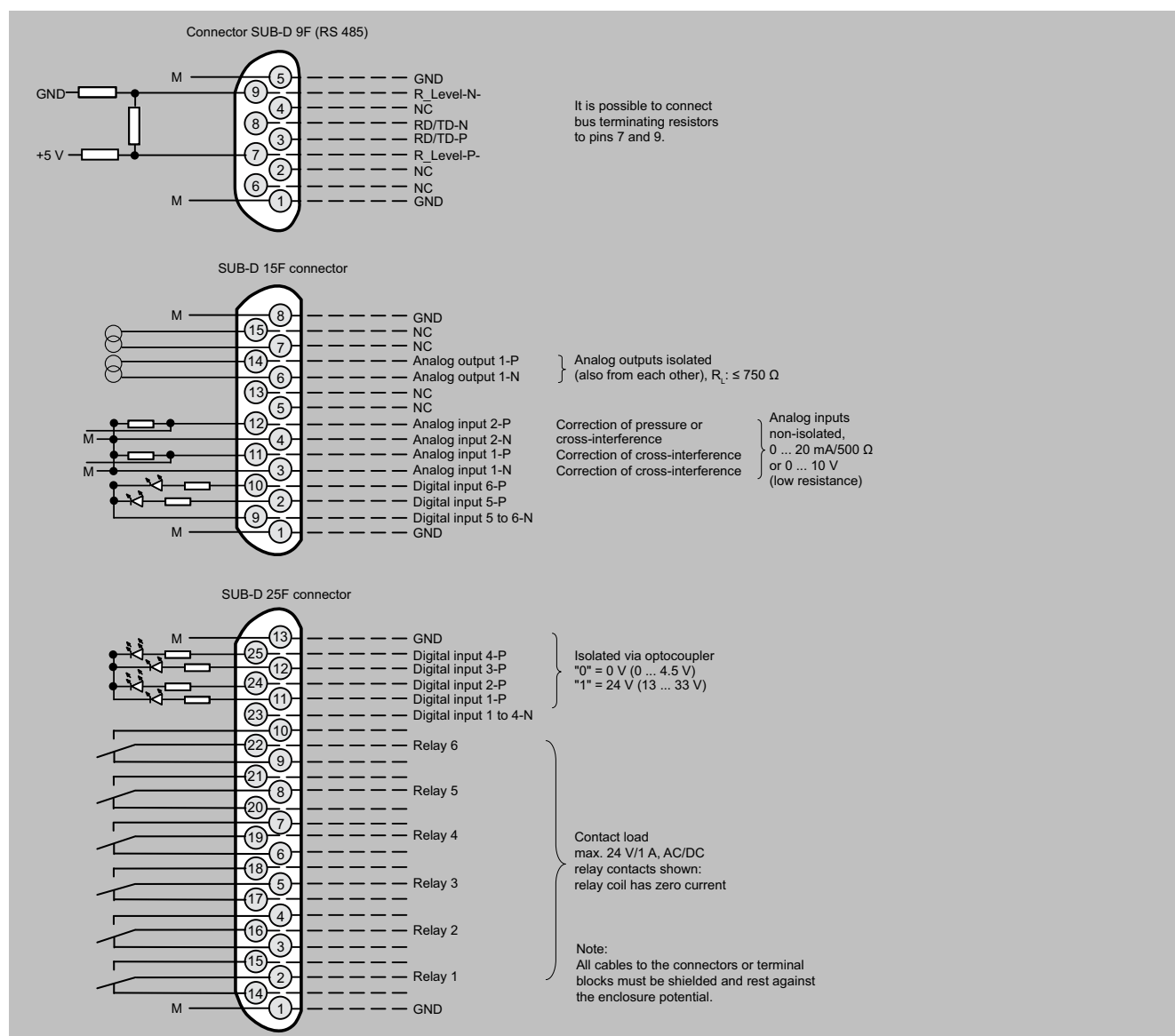
The supply gases (combustion gas, combustion air) must have a degree of purity of 5.0 in order to guarantee correct measurements. The degree of purity must be increased in the case of very small hydrocarbon concentrations (< 1 vpm).

Dimensional drawings



FIDAMAT 6, 19" rack unit, dimensions in mm

Circuit diagrams



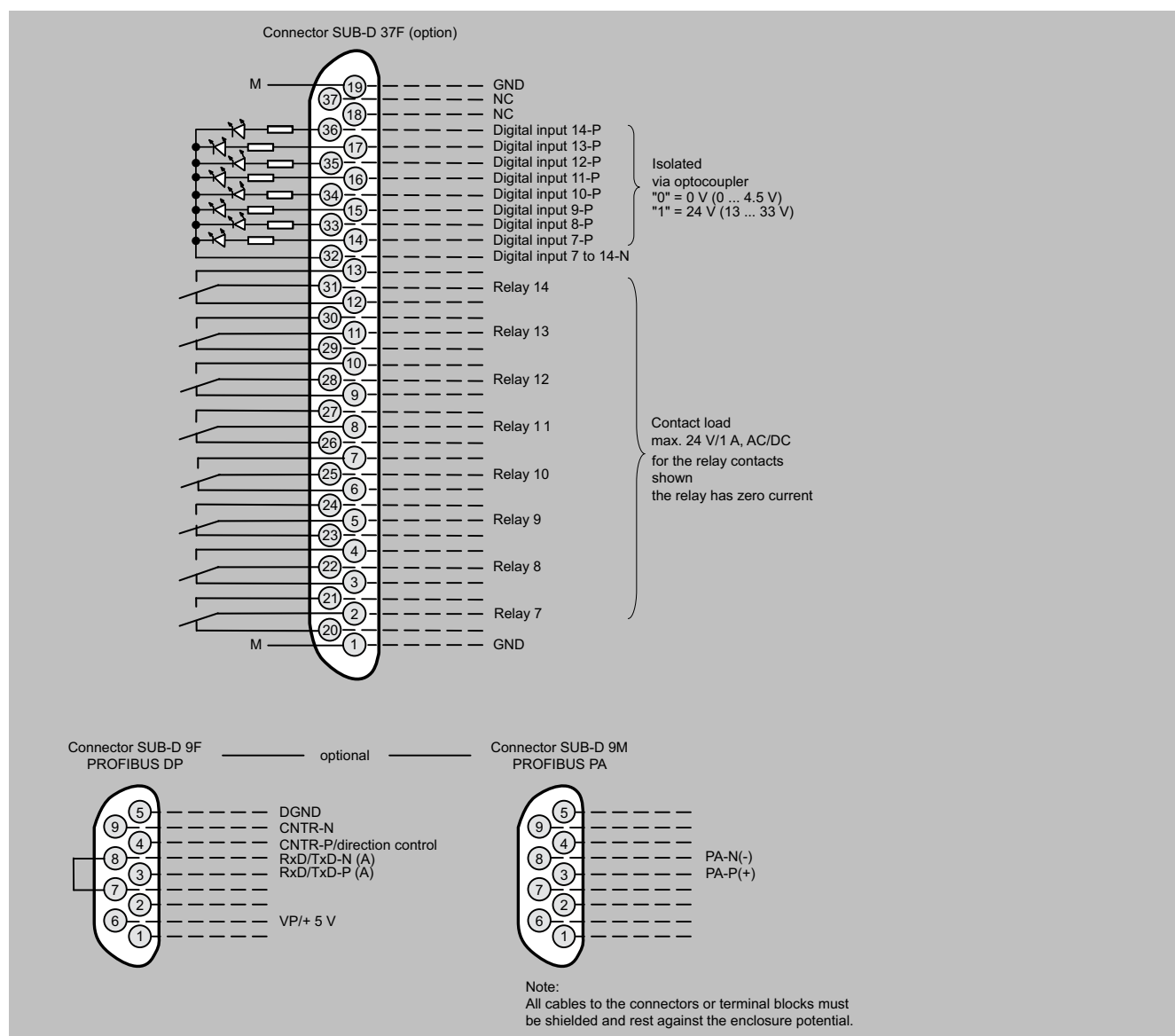
FIDAMAT 6, 19" rack unit, pin assignment

Extractive continuous process gas analysis

Series 6

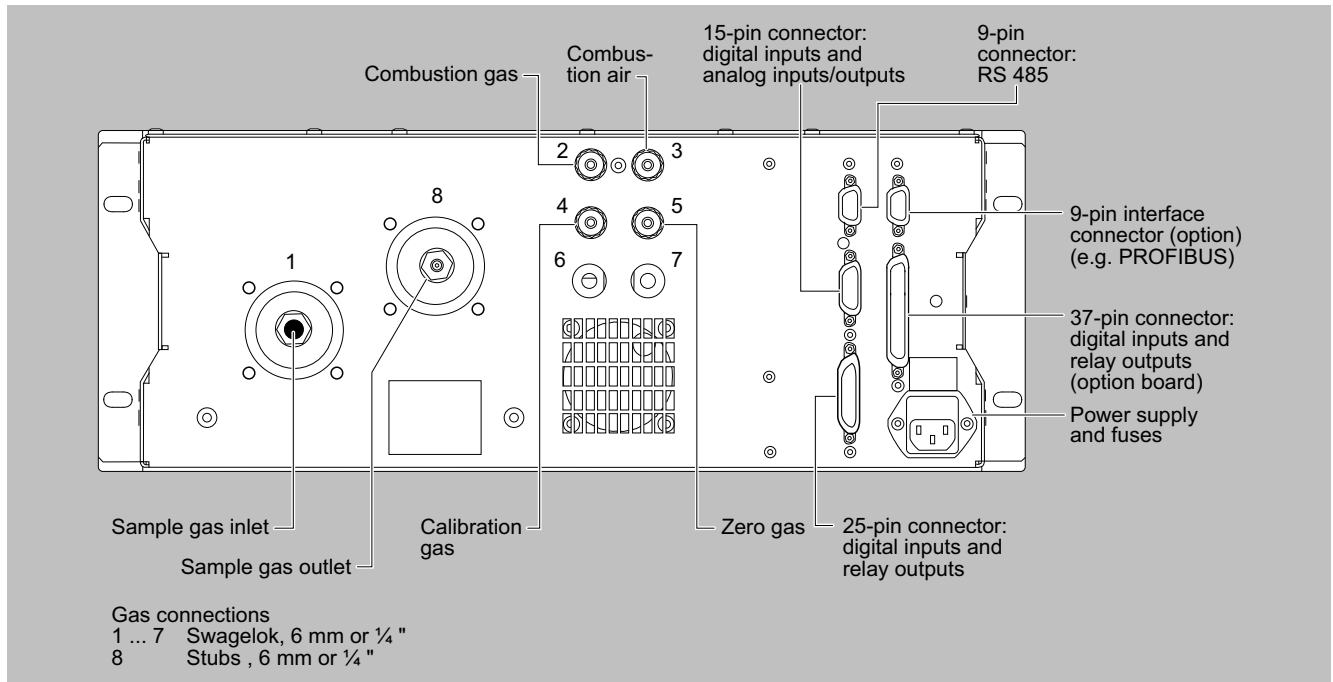
FIDAMAT 6 / 19" rack unit

Circuit diagrams (Continued)

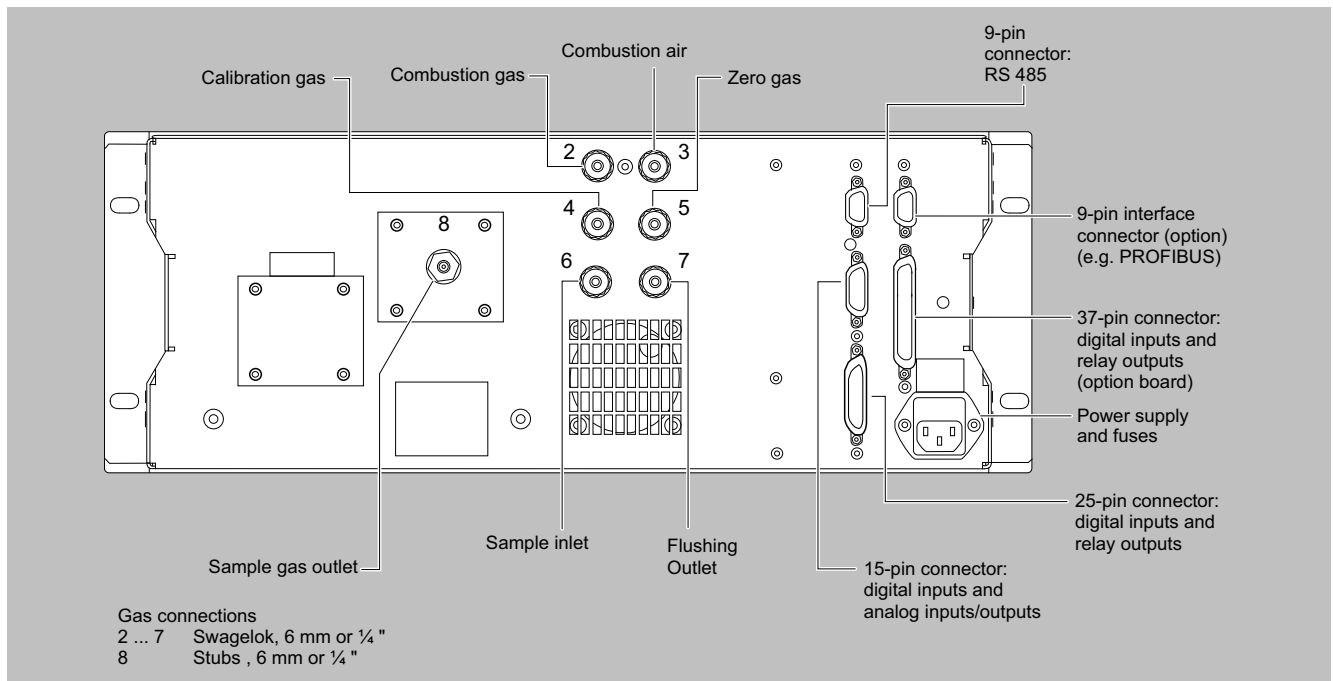


FIDAMAT 6, 19" rack unit, pin assignment of AUTOCAL board and PROFIBUS plugs

Circuit diagrams (Continued)



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



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

Extractive continuous process gas analysis

Series 6

FIDAMAT 6 / Suggestion for spare parts

Selection and ordering data

Description	2 years (unit)	5 years (unit)	Article No. FIDAMAT 6 with pump	FIDAMAT 6 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, 1/4")		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 (retrofit kit)	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 (so-called "Clean for O₂ service"), please specify when ordering spare parts. This is the only way to ensure that the gas path will continue to comply with the special requirements for this version.

More information

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 ensure that the gas path will continue to comply with the special requirements for this version.

Extractive continuous process gas analysis

ULTRAMAT 23

Overview



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 measuring principle ("dumbbell"). The use of an additional electrochemical H₂S measuring cell permits use in biogas applications.

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 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

Benefits (Continued)

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 (German Technical Inspectorate/TÜV certificate)

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-hazardous areas

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 versionsSeparate 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 devices 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 QAL1 qualification test, i.e. certification of the complete measuring device 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 then issued by the German Federal Environment Agency (Umweltbundesamt - UBA) in the Federal Gazette (Bundesanzeiger) as well

Extractive continuous process gas analysis

ULTRAMAT 23

Application (Continued)

as by the German Technical Inspectorate (TÜV) here:

<https://www.qal1.en>.

In the UK, the QAL1 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 Set CEM CERT (7MB1957) have undergone qualification testing according to German standards of EN 15267.

These German Technical Inspectorate (TÜV) versions of the ULTRAMAT are suitable for measurement of CO, NO, SO₂ and O₂ according to sections 13 and 27 of the BImSchV (Federal Emission Law of Germany) and 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 (QAL3) 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 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 purge

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

Design

- 19" rack unit with 4 U 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 of the device (portable version: sample gas inlet at front)

Display and operator panel

- Operation based on NAMUR recommendation
- Simple, fast parameterization and commissioning of analyzer
- Large, backlit LCD for measured values
- Menu-driven operator functions 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 demanded, maintenance switch, limits, measuring range identification and external solenoid valves
- Eight additional digital inputs and relay outputs as an option
- Electrically isolated analog outputs

Communication

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

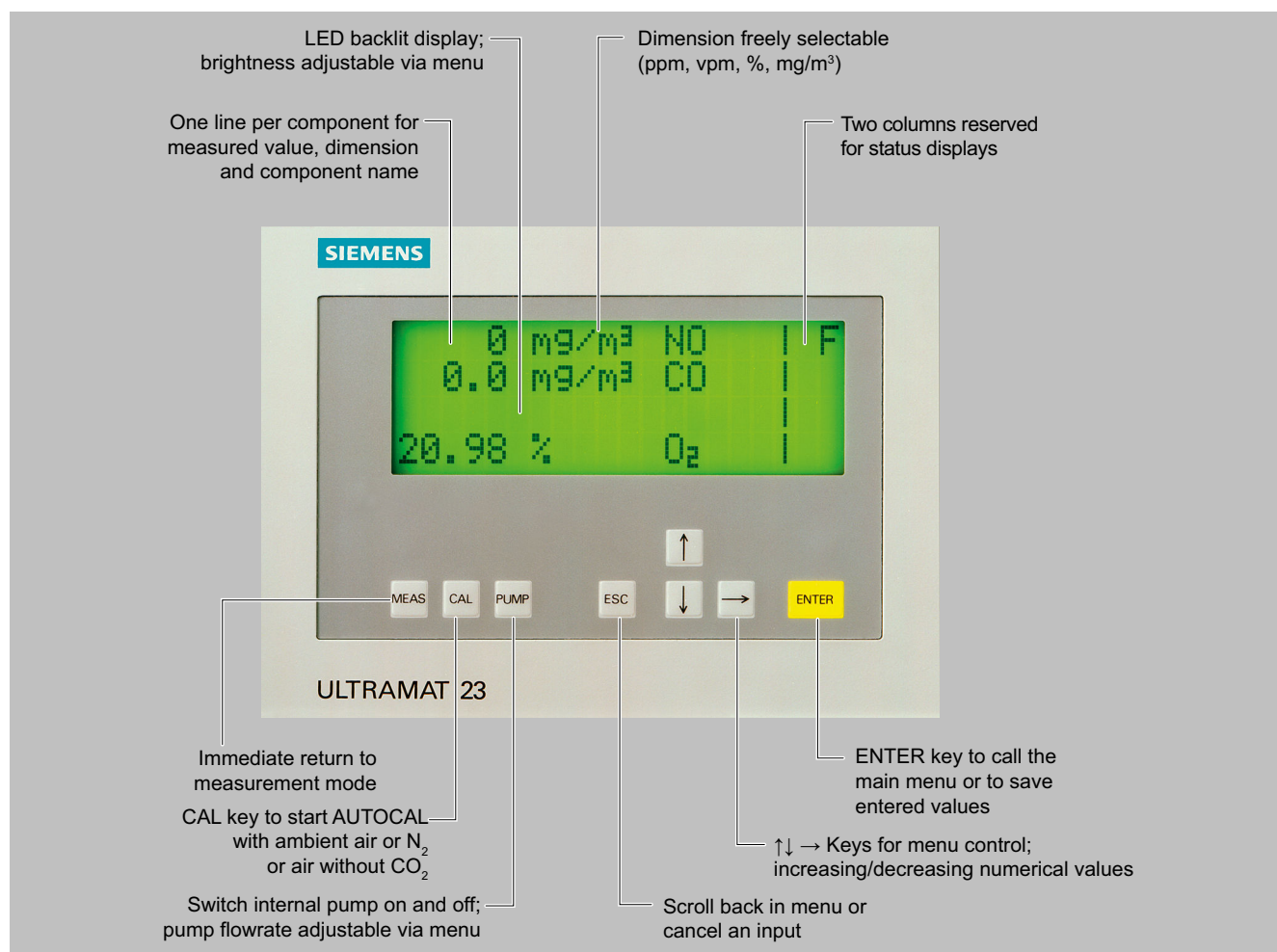
Options

- 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

Extractive continuous process gas analysis

ULTRAMAT 23

Design (Continued)



ULTRAMAT 23, membrane keyboard and graphic display

Extractive continuous process gas analysis

ULTRAMAT 23

Design (Continued)

ULTRAMAT 23 also available as bench-top unit:

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



ULTRAMAT 23, design

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
	Angle units/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

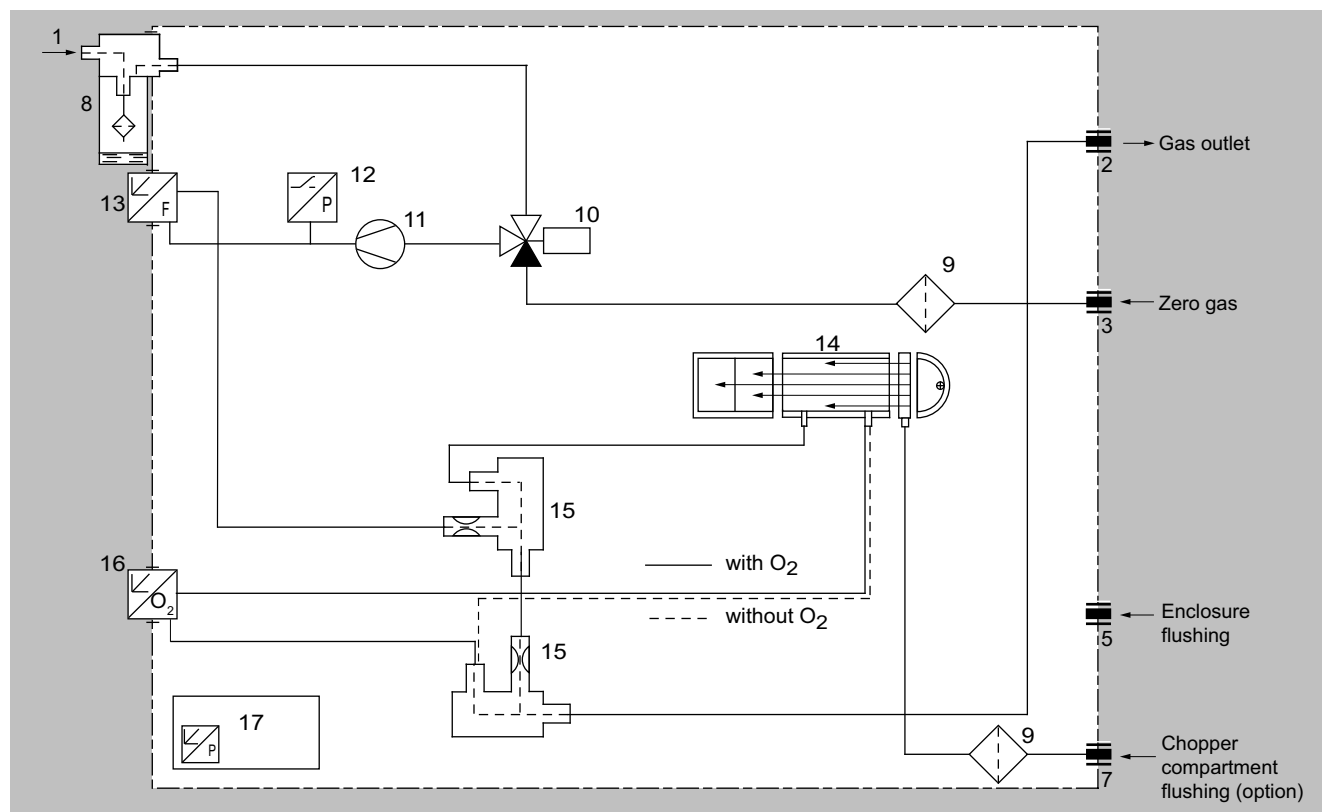
Extractive continuous process gas analysis

ULTRAMAT 23

Design (Continued)

Designs – parts wetted by sample gas		19" rack unit	Desktop unit
Gas path			
With hoses	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		
	• Body	Aluminum	Aluminum
	• Lining	Aluminum	Aluminum, black anodized
	• Fitting	Stainless steel, black anodized, mat. no. 1.4571	Stainless steel, mat. no. 1.4571
	• Window	CaF ₂ , quartz	CaF ₂
With pipes, only available in version "without pump"	• Adhesive	E353	E353
	• O-ring	FPM (Viton)	FPM (Viton)
	Gas connections 6 mm/¼"	Stainless steel, mat. no. 1.4571	-
	Pipes	Stainless steel, mat. no. 1.4571	-
	Analyzer chamber		
	• Body	Aluminum	-
	• Lining	Aluminum	-
	• Fitting	Stainless steel, mat. no. 1.4571	-
	• Window	CaF ₂	-
	• Adhesive	E353	-
	• O-ring	FPM (Viton)	-

Gas path

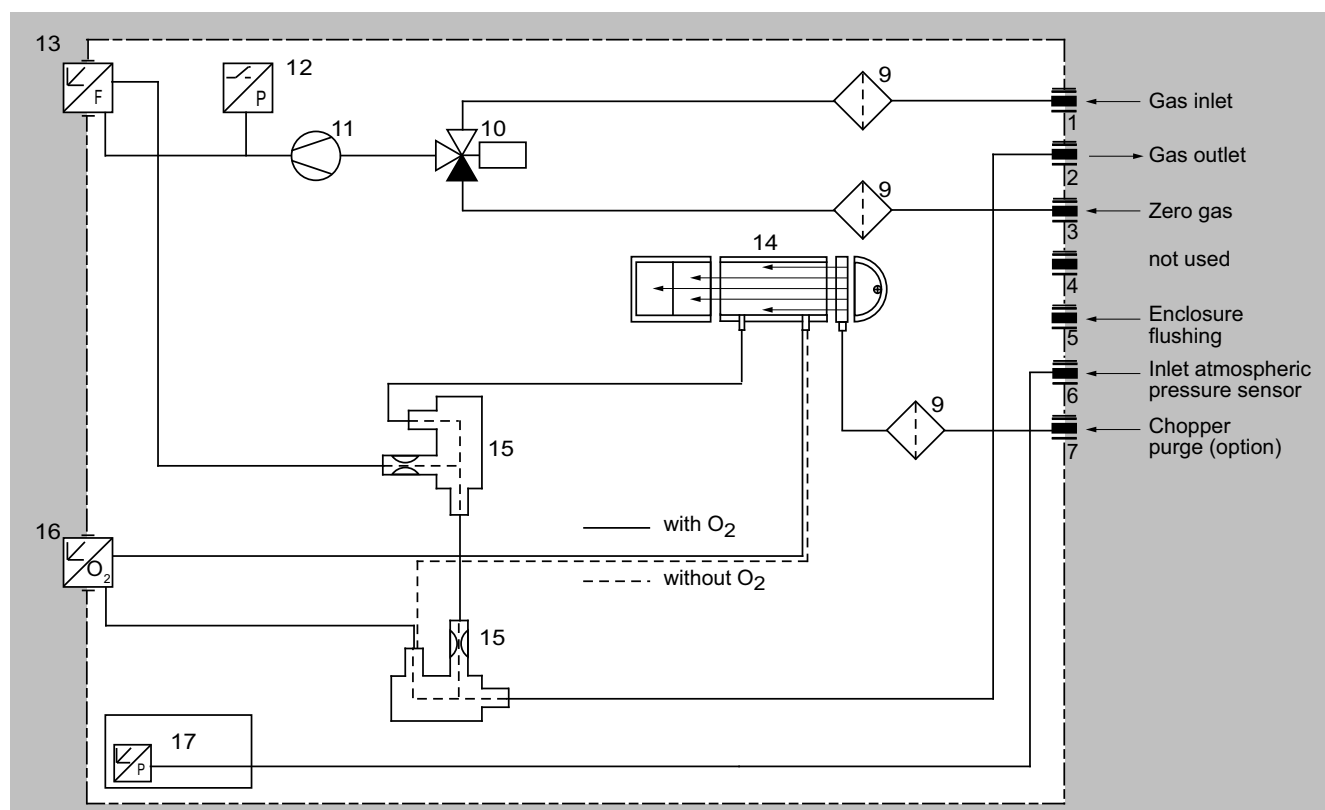


ULTRAMAT 23, portable, in sheet-steel housing with internal sample gas pump, condensation trap with safety filter on front plate, optional oxygen measurement

Extractive continuous process gas analysis

ULTRAMAT 23

Design (Continued)

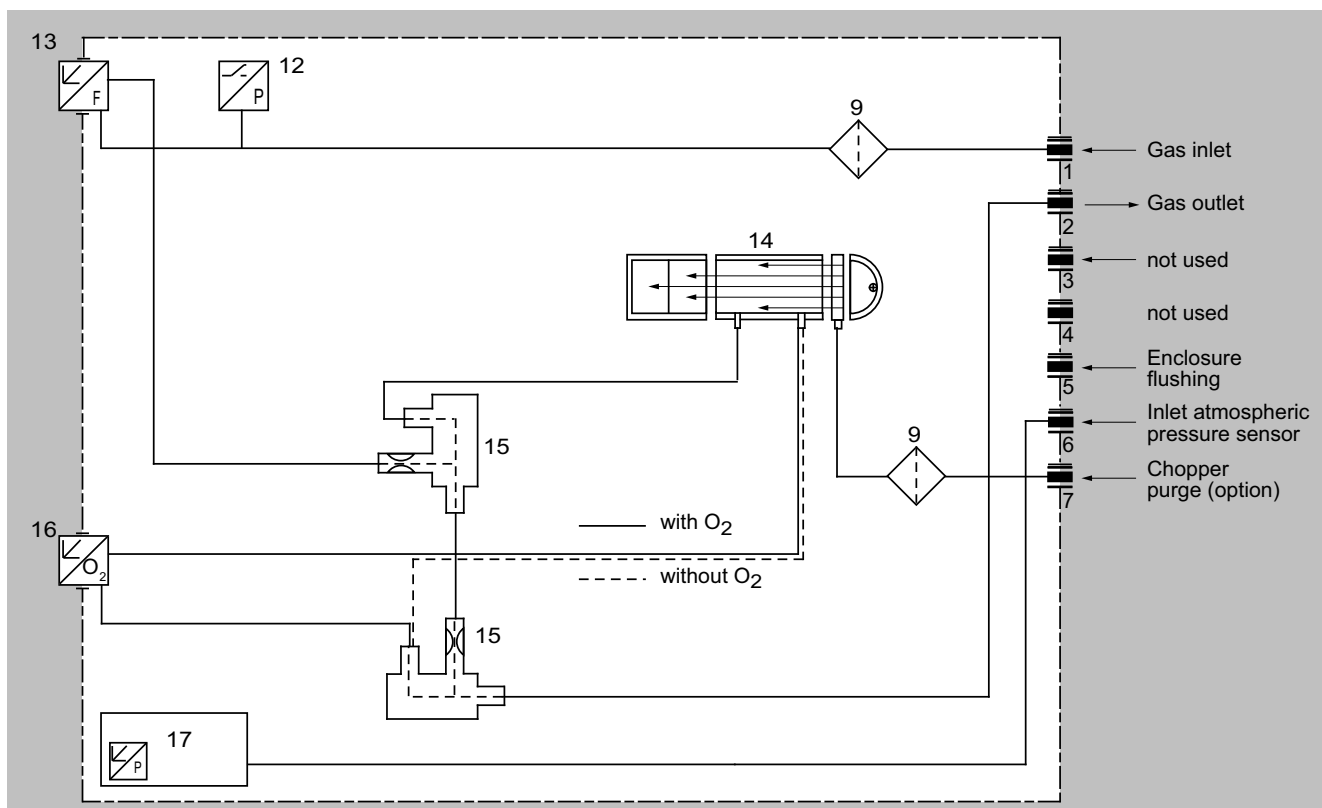


ULTRAMAT 23, 19" rack-mounted enclosure with internal sample gas pump; optional oxygen measurement

Extractive continuous process gas analysis

ULTRAMAT 23

Design (Continued)

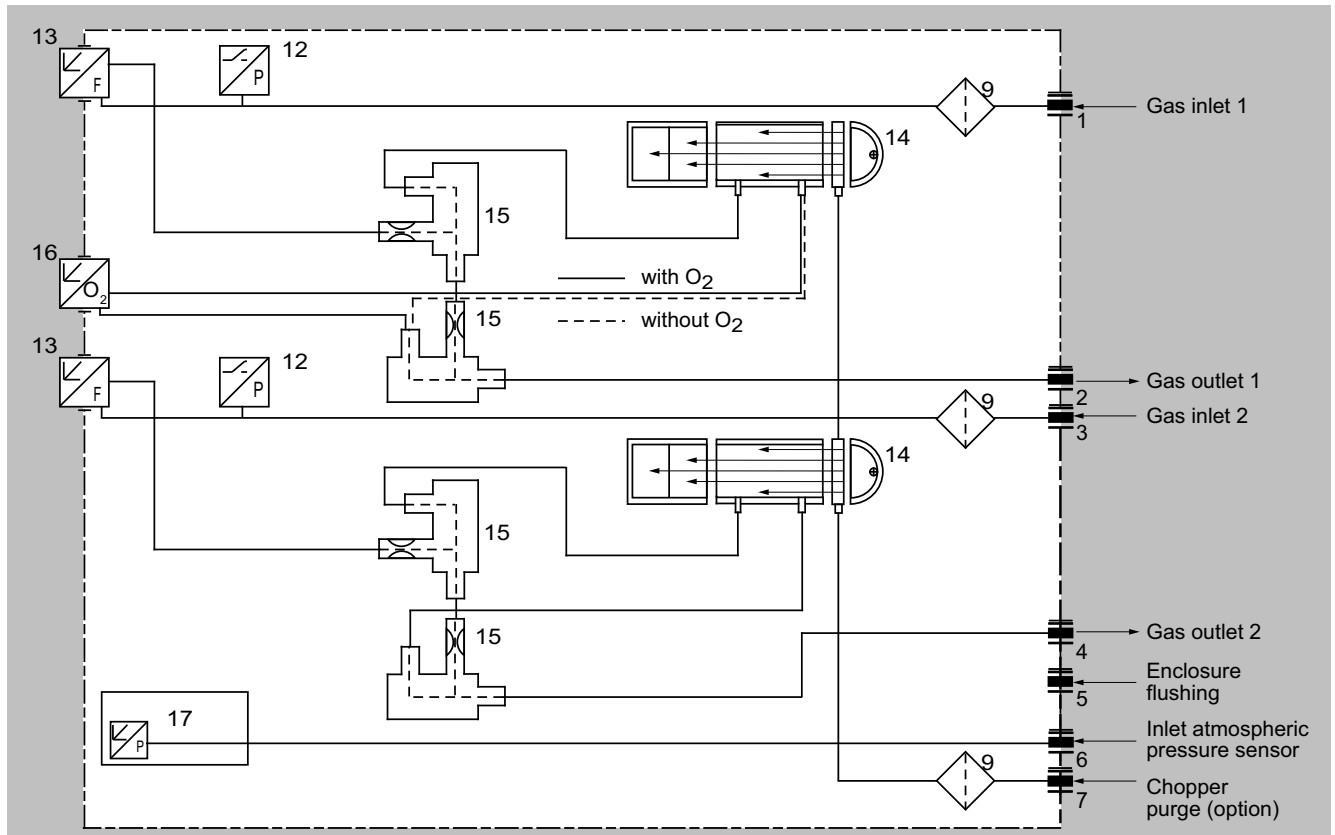


ULTRAMAT 23, 19" rack-mounted enclosure without internal sample gas pump; optional oxygen measurement

Extractive continuous process gas analysis

ULTRAMAT 23

Design (Continued)

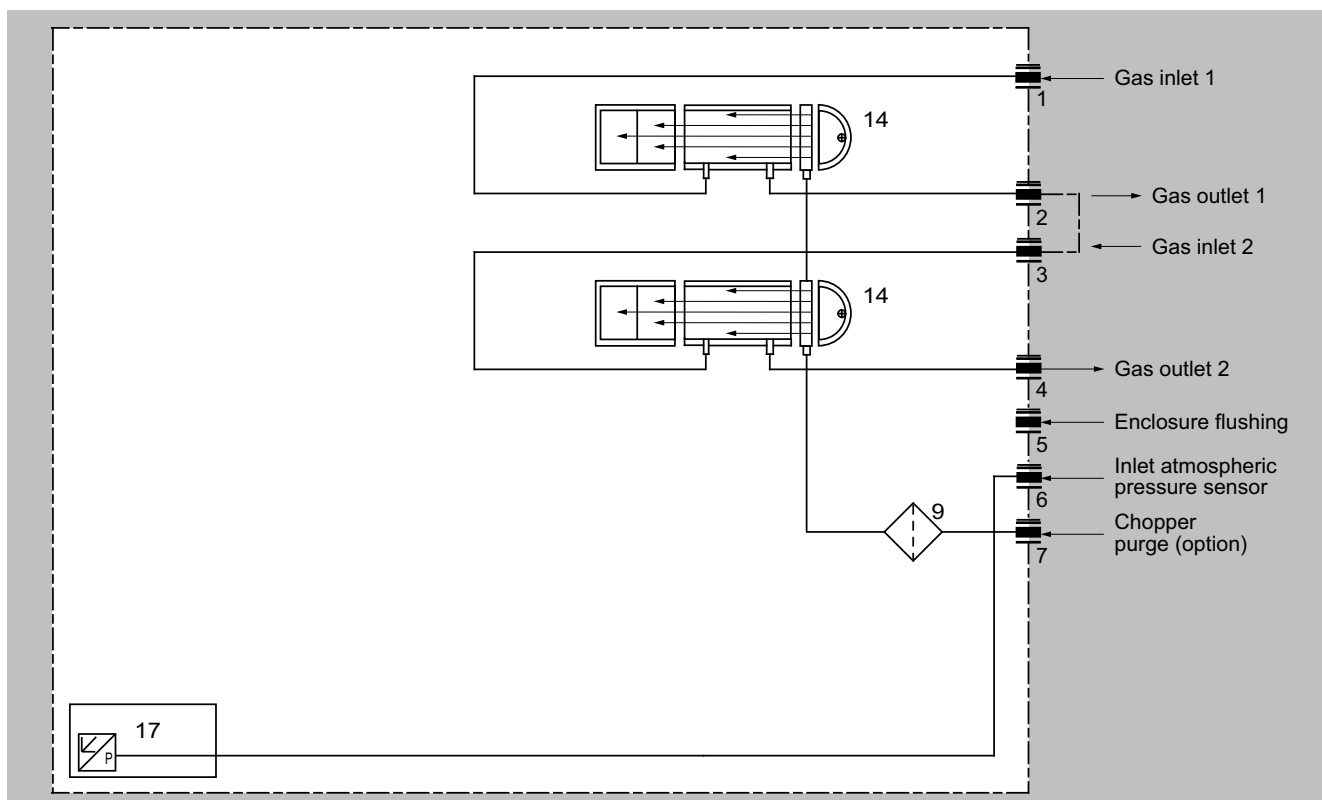


ULTRAMAT 23, 19" rack unit housing without internal sample gas pump, with separate gas path for the 2nd measured component or for the 2nd and 3rd measured component, optional oxygen measurement

Extractive continuous process gas analysis

ULTRAMAT 23

Design (Continued)

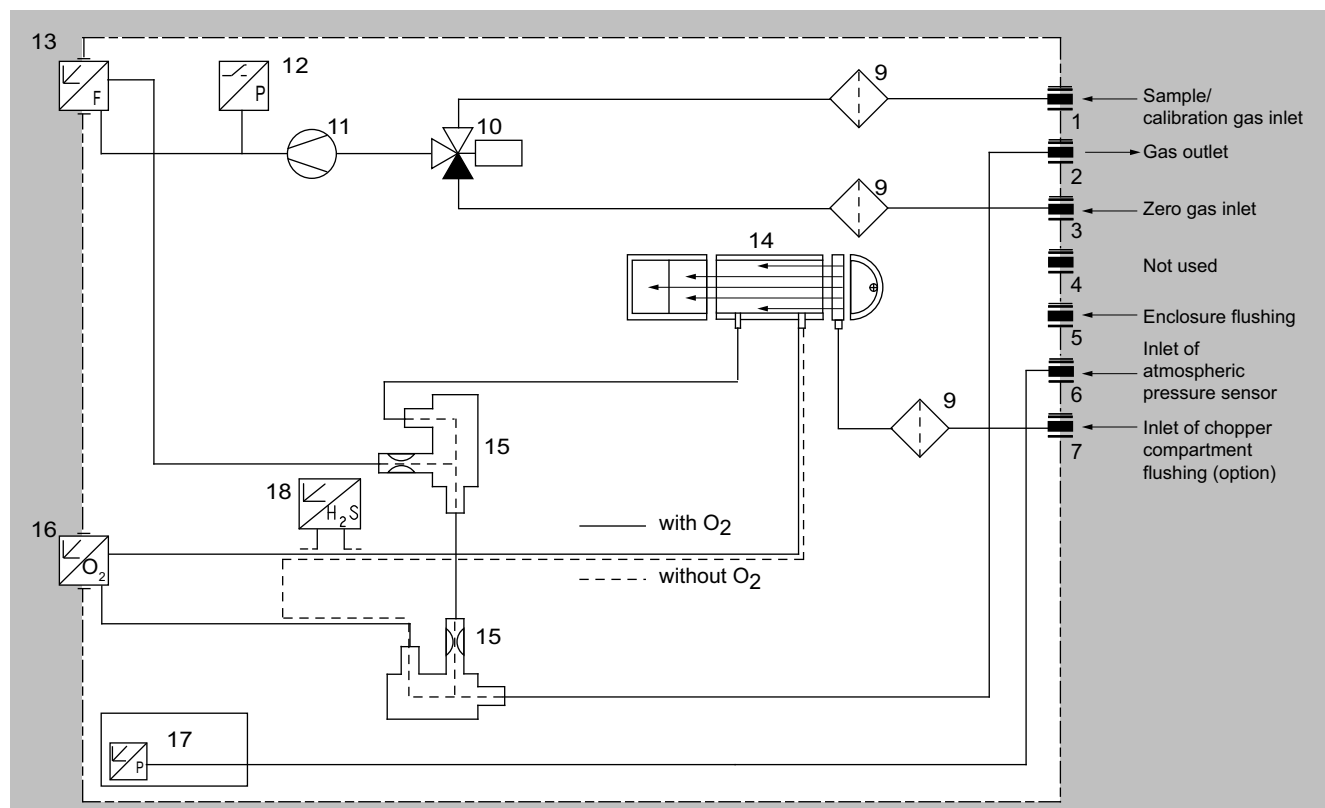


ULTRAMAT 23, 19" rack-mounted enclosure, sample gas path version in pipes, separate gas path, always without sample gas pump, without safety filter and without safety condensation trap

Extractive continuous process gas analysis

ULTRAMAT 23

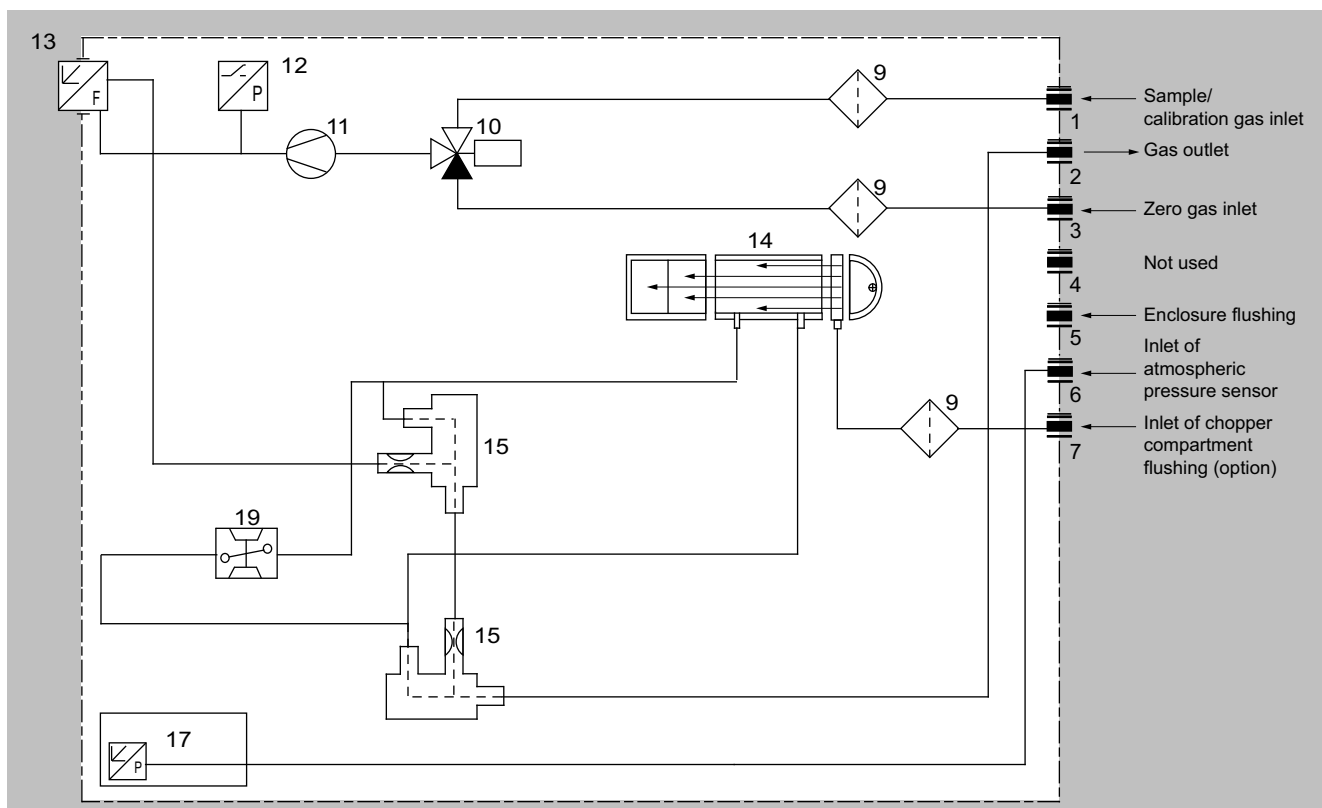
Design (Continued)

ULTRAMAT 23, 19" rack-mounted enclosure with internal sample gas pump and H_2S sensor

Extractive continuous process gas analysis

ULTRAMAT 23

Design (Continued)

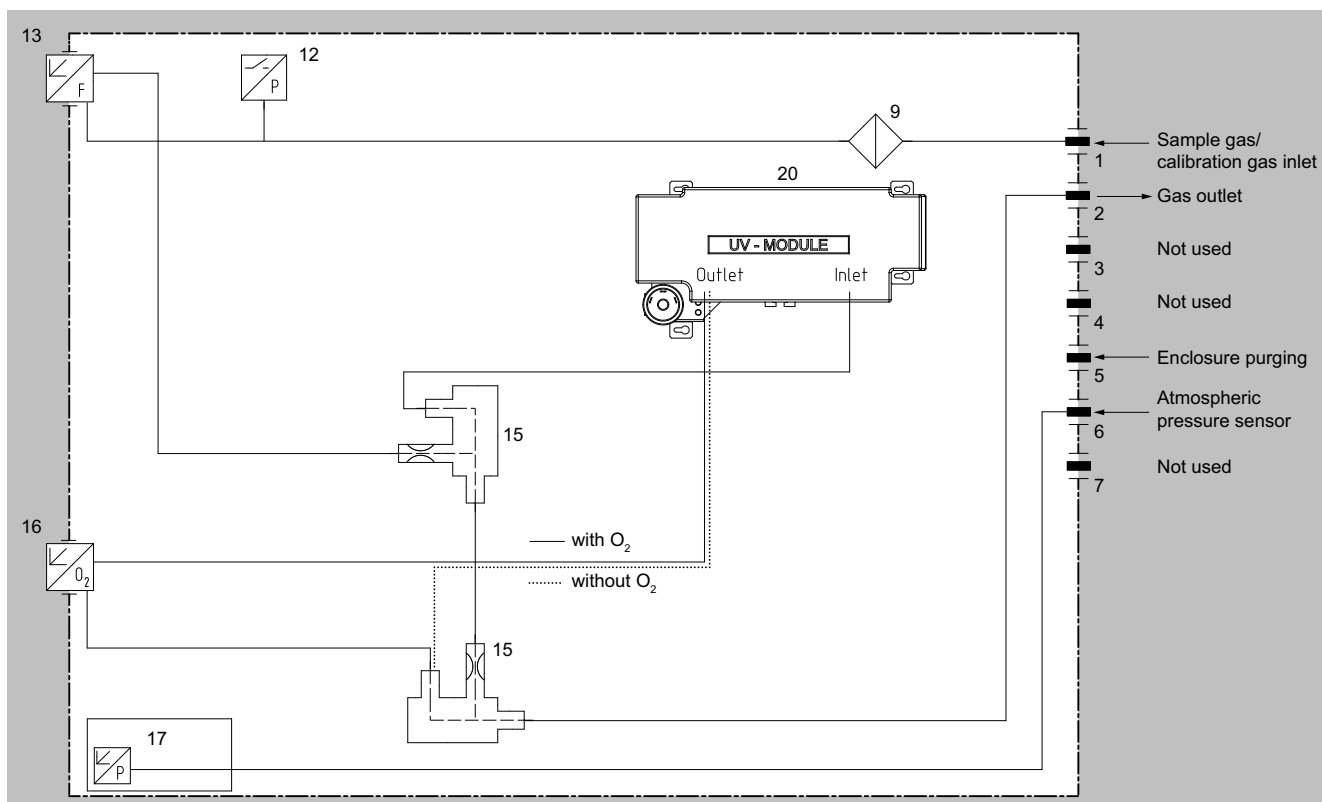


ULTRAMAT 23, 19" rack-mounted enclosure with internal sample gas pump and paramagnetic oxygen measurement

Extractive continuous process gas analysis

ULTRAMAT 23

Design (Continued)



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

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	Inlet of atmospheric pressure sensor	16	Oxygen sensor (electrochemical)
7	Inlet/chopper purge	17	Atmospheric pressure sensor
8	Condensation trap with filter	18	Hydrogen sulfide sensor
9	Safety fine filter	19	Oxygen measuring cell (paramagnetic)
10	Solenoid valve	20	UV photometer (UV module)

Mode of operation

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 detector chamber - set up as a two- or three-layer detector chamber - 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.

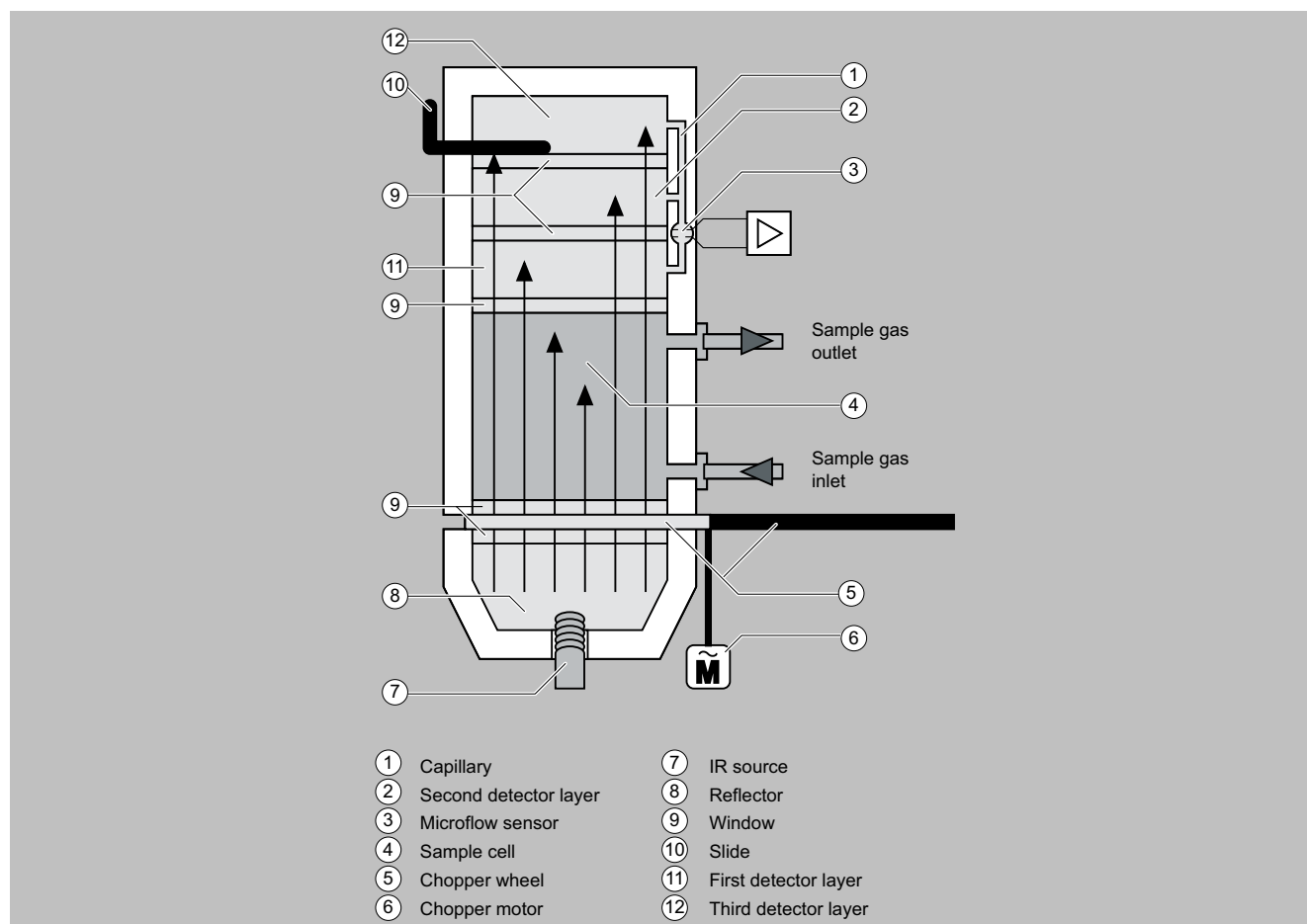
The rotating chopper (5) generates a pulsating flow in the detector chamber that the microflow sensor (3) converts into an electrical signal.

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



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

Automatic calibration with air (AUTOCAL)

The ULTRAMAT 23 can be calibrated using, for example, ambient air. During this process (adjustable between 1 and 24 hours, 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).

Extractive continuous process gas analysis

ULTRAMAT 23

Mode of operation (Continued)

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 pre-absorption, 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 curve according to the currently valid value. Temperature and pressure influences are also compensated in this way.

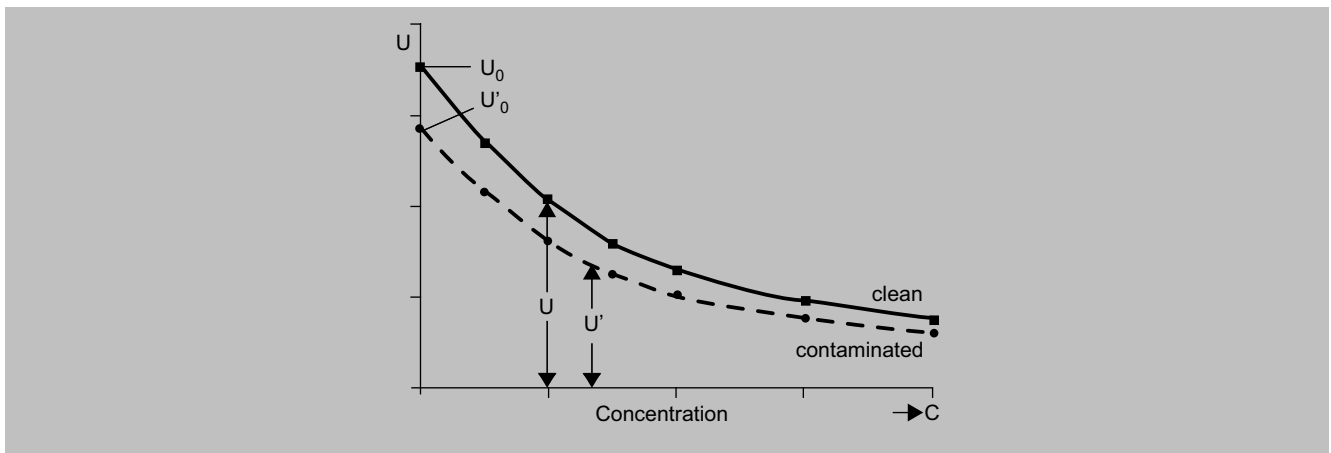
The influences of contamination and aging, as mentioned above, have a negligible influence on the measurement as long as U' remains in a certain tolerance range monitored by the device.

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.

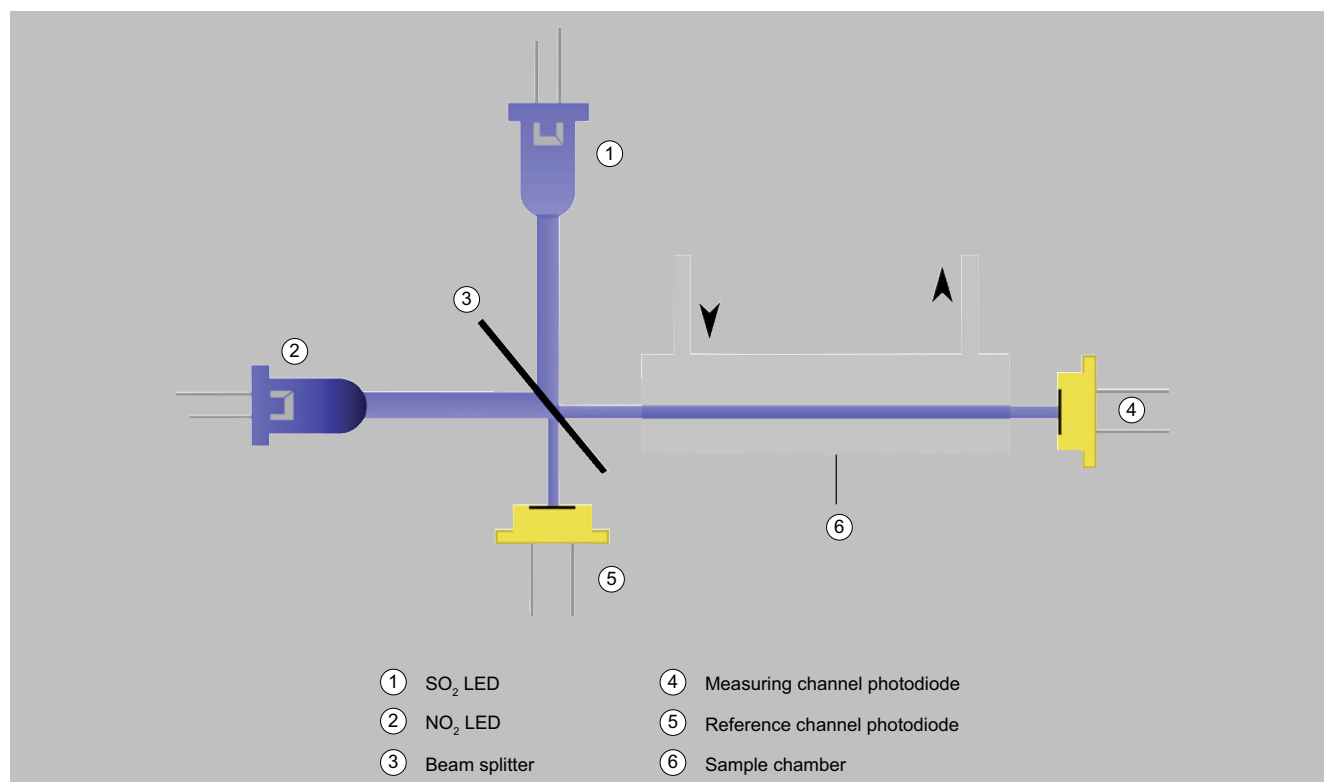
Calibration

The devices 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 German Technical Inspectorate/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 curve 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

Mode of operation (Continued)**Ultraviolet measurement**

ULTRAMAT 23, ultraviolet measurement mode of operation

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.

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 resistance, 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 CO₂, CO, H₂ and CH₄) than other sensor types.

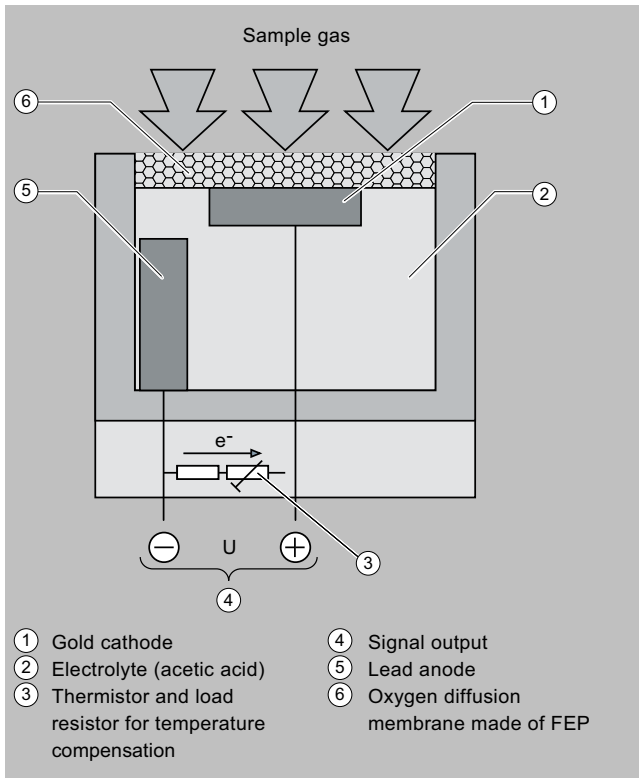
Note

The oxygen sensor can be used for concentrations of both > 1% and < 1% O₂. 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 purging times are to be set.

Extractive continuous process gas analysis

ULTRAMAT 23

Mode of operation (Continued)



ULTRAMAT 23, oxygen sensor mode of operation

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

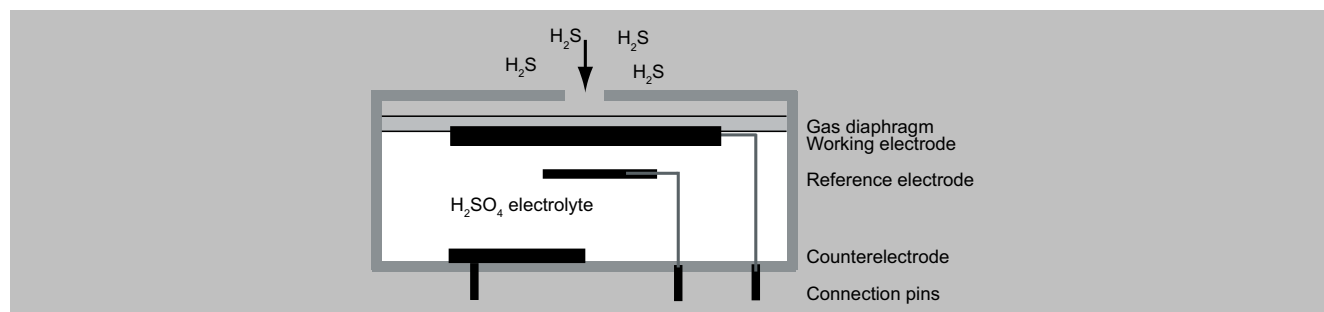
The zero point is automatically recalibrated by the AUTOCAL function when connecting e.g. nitrogen or air. It is recommendable to check the calibration point monthly using calibration gas (45 to 50 vpm).

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 °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 °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
- $NH_3 > 5$ vpm

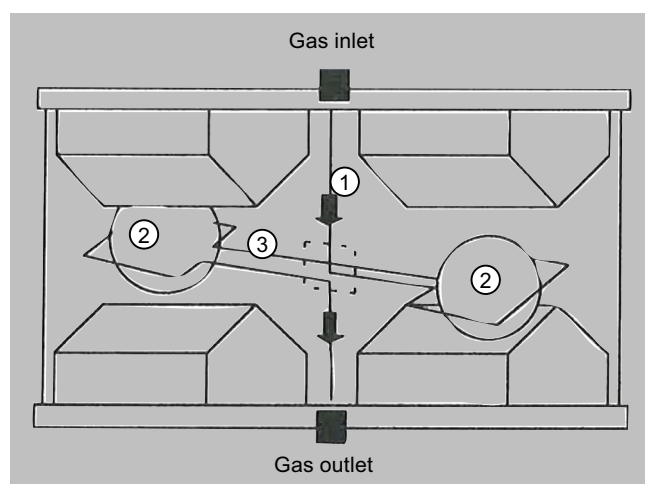
Mode of operation (Continued)Operating principle of the H₂S sensor**Paramagnetic oxygen cell**

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

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

Extractive continuous process gas analysis

ULTRAMAT 23

Mode of operation (Continued)

Accompanying gas	Formula	Deviation at 20 °C	Deviation at 50 °C
Butadiene	C ₄ H ₆	-0.85	-0.93
n-butane	C ₄ H ₁₀	-1.1	-1.22
Isobutylene	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
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%)

Function

Main features

- Practically maintenance-free thanks to AUTOCAL with ambient air (or with N₂, only for devices 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 limits per measured component

Extractive continuous process gas analysis

ULTRAMAT 23

19" rack unit and portable version

Selection and ordering data

ULTRAMAT 23 gas analyzer			Article No. 7MB2335- ● ● ● ● ● - ● A A ●											
For measuring 1 infrared component, UV components, oxygen and hydrogen sulfide														
Click on the Article No. for online configuration in the PIA Life Cycle Portal.														
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".														
Enclosure, version and gas paths														
19" rack unit for installation in cabinets														
Gas connections	Gas paths	Internal sample gas pump												
6 mm pipe	Viton	Without ²⁾	0											
¼" pipe	Viton	Without ²⁾	1											
6 mm pipe	Viton	With	2											
¼" pipe	Viton	With	3											
6 mm pipe	Stainless steel, mat. no. 1.4571, separate	Without ²⁾	6											
¼" pipe	Stainless steel, mat. no. 1.4571, separate	Without ²⁾	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											
Infrared measured component														
Measured component	Possible with measuring range identification													
CO	C, D, E, F, G ... R, T, U, X								A					
CO ₂ ¹⁾	D ⁵⁾ , G ⁵⁾ , H ⁵⁾ , J ⁵⁾ , K ... R								C					
CH ₄	E, H, L, N, P, R								D					
C ₂ H ₄	K								F					
C ₆ H ₁₄	K								M					
SO ₂ ¹⁰⁾	B ⁷⁾ , F ... L, S ⁹⁾ , T ⁸⁾ , W								N					
NO	C, E, G ... J, T, U, V, W								P					
N ₂ O ⁶⁾	E								S					
SF ₆	H								V					
Smallest measuring range	Largest measuring range													
0 ... 200 mg/m ³	0 ... 1 000 mg/m ³								B					
0 ... 100 mg/m ³	0 ... 1 000 mg/m ³								C					
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					
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					
Oxygen measurement ⁴⁾														
Without O ₂ sensor									0					
With electrochemical O ₂ sensor									1					
With paramagnetic oxygen measuring cell									8					
Hydrogen sulfide measurement														
Without									6					
With H ₂ S sensor 0 ... 5 / 50 vpm									7					
Auxiliary power														
100 V AC, 50 Hz												0		
120 V AC, 50 Hz												1		
200 V AC, 50 Hz												2		

Extractive continuous process gas analysis

ULTRAMAT 23

19" rack unit and portable version

Selection and ordering data (Continued)

ULTRAMAT 23 gas analyzer		Article No.									
For measuring 1 infrared component, UV components, oxygen and hydrogen sulfide		7MB2335-	●	●	●	●	●	-	●	A	A
230 V AC, 50 Hz									3		
100 V AC, 60 Hz									4		
120 V AC, 60 Hz									5		
230 V AC, 60 Hz									6		
Language of the operating software ³⁾											
German											0
English											1
French											2
Spanish											3
Italian											4

¹⁾ For measuring ranges below 1%, a CO₂ absorber cartridge can be used for zero point adjustment (see Accessories).

²⁾ Without separate zero gas input or solenoid valve.

³⁾ Language for operation can be changed.

⁴⁾ O₂ sensor/O₂ measuring cell in gas path of infrared measured component 1.

⁵⁾ 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).

⁶⁾ Not suitable for use with emission measurements since cross-sensitivity too high.

⁷⁾ Maximum possible AUTOCAL cycle ≤ 6 h, constant ambient conditions (max. deviation ±1 °C (1.8 °F)): see table "Calibration intervals, standard devices" under "More information".

⁸⁾ Maximum possible AUTOCAL cycle ≤ 3 h, constant ambient conditions (max. deviation ±1 °C (1.8 °F)): see table "Calibration intervals, standard devices" under "More information".

⁹⁾ Measured with UV technology

¹⁰⁾ When measuring range identification "S" selected: Parallel measurement of SO₂ and NO₂ with UV photometer.

Options	Order code
Add "-Z" to article number and then add order code	
Settings	
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 D-sub connector, 9-pin D-sub connector	A33
Tag plates (customized inscription)	B03
Clean for O ₂ service (specially cleaned gas path)	B06
Gas path for short response time ³⁾	C01
Chopper compartment purging for 6 mm gas connection	C02
Chopper compartment purging for 1/4" gas connection	C03
Selection of the conversion mg/m ³ in ppm at 293K or 273K	D15
Certificate FM/CSA Class I Div 2, ATEX II 3G	E20
Calibration interval 5 months (TÜV, QAL) measuring ranges: CO 0 - 150/750 mg/m ³ ; NO 0 - 100/750 mg/m ³	E50
Measuring range indication in plain text ¹⁾	Y11
Measurement of CO ₂ in forming gas ²⁾ (only in conjunction with measuring range 0 ... 20 / 0 ... 100%)	Y14

¹⁾ Default setting: smallest measuring range, largest measuring range.

²⁾ CO₂ measurement in accompanying gas Ar or Ar/He (3:1); forming gas.

³⁾ Only for version with Viton hose.

Accessories	Article No.
CO ₂ absorber cartridge	7MB1933-8AA

Extractive continuous process gas analysis

ULTRAMAT 23

19" rack unit and portable version

Selection and ordering data (Continued)

ULTRAMAT 23 gas analyzer		Article No.									
For measuring 2 infrared components, UV components, oxygen and hydrogen sulfide		7MB2337- ● ● ● ● ● - ● ● ● ●									
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						
Oxygen measurement⁴⁾											
Without O ₂ sensor						0					
With electrochemical O ₂ sensor						1					
With paramagnetic oxygen measuring cell						8					
Hydrogen sulfide measurement											
Without						6					
With H ₂ S sensor 0 ... 5 / 50 vpm						7					
Auxiliary power											
100 V AC, 50 Hz									0		
120 V AC, 50 Hz									1		
200 V AC, 50 Hz									2		
230 V AC, 50 Hz									3		
100 V AC, 60 Hz									4		
120 V AC, 60 Hz									5		
230 V AC, 60 Hz									6		
2nd infrared measured component											
Measured component	Possible with measuring range identification										
CO	C, D, E, F, G ... R, T, U, X									A	
CO ₂ ¹⁾	D ⁵⁾ , G ⁵⁾ , H ⁵⁾ , J ⁵⁾ , K ... R									C	
CH ₄	E, H, L, N, P, R									D	
C ₂ H ₄	K									F	
C ₆ H ₁₄	K									M	
SO ₂ ¹¹⁾	B ⁸⁾ , F ... L, S ¹⁰⁾ , T ⁹⁾ , W									N	
NO	C, E, G ... J, T, U, V, W									P	
N ₂ O	E ⁶⁾ , Y ⁷⁾									S	
SF ₆	H									V	
Smallest measuring range	Largest measuring range										
0 ... 200 mg/m ³	0 ... 1 000 mg/m ³									B	
0 ... 100 mg/m ³	0 ... 1 000 mg/m ³									C	
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	
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	
Language of the operating software³⁾											
German											0
English											1
French											2
Spanish											3
Italian											4

Extractive continuous process gas analysis

ULTRAMAT 23

19" rack unit and portable version

Selection and ordering data (Continued)

- ¹⁾ For measuring ranges below 1%, a CO₂ absorber cartridge can be used for zero point adjustment (see Accessories).
²⁾ Without separate zero gas input or solenoid valve.
³⁾ Language for operation can be changed.
⁴⁾ O₂ sensor/O₂ measuring cell in gas path of infrared measured component 1.
⁵⁾ 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).
⁶⁾ Not suitable for use with emission measurements since cross-sensitivity too high.
⁷⁾ Only in conjunction with CO₂ measuring range 0 to 5% to 0 to 25% (CP).
⁸⁾ Maximum possible AUTOCAL cycle ≤ 6 h, constant ambient conditions (max. deviation ±1 °C (1.8 °F)): see table "Calibration intervals, standard devices" under "More information".
⁹⁾ Maximum possible AUTOCAL cycle ≤ 3 h, constant ambient conditions (max. deviation ±1 °C (1.8 °F)): see table "Calibration intervals, standard devices" under "More information".
¹⁰⁾ Measured with UV technology
¹¹⁾ When measuring range identification "S" selected: Parallel measurement of SO₂ and NO₂ with UV photometer.

Options	Order code
Add "-Z" to article number and then add order code	
Settings	
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 connection pipe (mat. no. 1.4571), 6 mm, complete with screwed gland (cannot be combined with Viton hose)	A27
Stainless steel connection pipe (mat. no. 1.4571), 1/4", complete with screwed gland (cannot be combined with Viton hose)	A29
IEC plug, 37-pin D-sub connector, 9-pin D-sub connector	A33
Tag plates (customized inscription)	B03
Clean for O ₂ service (specially cleaned gas path)	B06
Gas path for short response time ³⁾	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
Selection of the conversion mg/m ³ in ppm at 293K or 273K	D15
Certificate FM/CSA Class I Div 2, ATEX II 3G	E20
Calibration interval 5 months (TÜV, QAL) measuring ranges: CO 0 - 150/750 mg/m ³ ; NO 0 - 100/750 mg/m ³	E50
DNV-GL statement of conformity for use in marine CEMS according to MEPC.259(68)	E60
Measuring range indication in plain text ¹⁾	Y11
Measurement of CO ₂ in forming gas ²⁾ (only in conjunction with measuring range 0 ... 20 / 0 ... 100%)	Y14

- ¹⁾ Default setting: smallest measuring range, largest measuring range.
²⁾ CO₂ measurement in accompanying gas Ar or Ar/He (3:1); forming gas.
³⁾ Only for version with Viton hose.

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

Extractive continuous process gas analysis

ULTRAMAT 23

19" rack unit and portable version

Selection and ordering data (Continued)

Accessories	Article No.
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

ULTRAMAT 23 gas analyzer			Article No. 7MB2338- ● ● ● ● 6 - ● ● ● ●									
For measuring 3 infrared components, UV components, oxygen or 2 infrared components and UV components												
Click on the Article No. for online configuration in the PIA Life Cycle Portal.												
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".												
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									
¼" pipe	Viton, separate	Without ²⁾	5									
6 mm pipe	Stainless steel, mat. no. 1.4571, separate	Without ²⁾	6									
¼" pipe	Stainless steel, mat. no. 1.4571, separate	Without ²⁾	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									
1st and 2nd Infrared measured component												
Measured component	Smallest measuring range	Largest measuring range										
CO and NO	0 ... 500 vpm	0 ... 2 500 vpm						A	A			
CO and NO	0 ... 2 000 vpm (CO) 0 ... 1000 vpm (NO)	0 ... 10 000 vpm (CO) 0 ... 5000 vpm (NO)						A	B			
CO and NO	0 ... 1 000 vpm	0 ... 5 000 vpm						A	C			
CO and NO	0 ... 1% (CO) 0 ... 1000 vpm (NO)	0 ... 5% (CO) 0 ... 5000 vpm (NO)						A	D			
CO and NO	0 ... 250 mg/m ³ (CO) 0 ... 400 mg/m ³ (NO)	0 ... 1 250 mg/m ³ (CO) 0 ... 2 000 mg/m ³ (NO)						A	K			
CO and NO	0 ... 50 vpm (CO) 0 ... 100 vpm (NO)	0 ... 250 vpm (CO) 0 ... 500 vpm (NO)						A	P			
CO and NO	0 ... 100 vpm	0 ... 500 vpm						A	R			
CO and CO ₂	0 ... 10%	0 ... 50%						B	A			
CO and CO ₂	0 ... 10% (CO) 0 ... 0.5% (CO ₂)	0 ... 50% (CO) 0 ... 2.5% (CO ₂)						B	B			
CO and CO ₂	0 ... 20%	0 ... 100%						B	D			
CO and CO ₂	0 ... 100 vpm (CO) 0 ... 5% (CO ₂)	0 ... 500 vpm (CO) 0 ... 25% (CO ₂)						B	J			
CO and CO ₂	0 ... 0.5% (CO) 0 ... 10% (CO ₂)	0 ... 2.5% (CO) 0 ... 50% (CO ₂)						B	K			
CO and CO ₂	0 ... 75 mg/m ³ (CO) 0 ... 5% (CO ₂)	0 ... 750 mg/m ³ (CO) 0 ... 25% (CO ₂)						B	L			
CO ₂ and CH ₄	0 ... 5% (CO ₂) 0 ... 1% (CH ₄)	0 ... 25% (CO ₂) 0 ... 5% (CH ₄)						C	A			
CO ₂ and CH ₄	0 ... 5% (CO ₂) 0 ... 2% (CH ₄)	0 ... 25% (CO ₂) 0 ... 10% (CH ₄)						C	B			
CO ₂ and NO	0 ... 5% (CO ₂) 0 ... 500 vpm (NO)	0 ... 25% (CO ₂) 0 ... 2500 vpm (NO)						D	C			
Oxygen measurement⁴⁾												
Without O ₂ sensor									0			
With electrochemical O ₂ sensor									1			
With paramagnetic oxygen measuring cell									8			
Auxiliary power												
100 V AC, 50 Hz										0		
120 V AC, 50 Hz										1		

Extractive continuous process gas analysis

ULTRAMAT 23

19" rack unit and portable version

Selection and ordering data (Continued)

ULTRAMAT 23 gas analyzer		Article No.									
For measuring 3 infrared components, UV components, oxygen or 2 infrared components and UV components		7MB2338-	●	●	●	●	6	-	●	●	●
200 V AC, 50 Hz										2	
230 V AC, 50 Hz										3	
100 V AC, 60 Hz										4	
120 V AC, 60 Hz										5	
230 V AC, 60 Hz										6	
3rd infrared measured component											
Measured component	Possible with measuring range identification										
CO	C, D, E, F, G ... R, U, X										A
CO ₂ ¹⁾	D ⁵⁾ , G ⁵⁾ , H ⁵⁾ , J ⁵⁾ , K ... R										C
CH ₄	E, H, L, N, P, R										D
C ₂ H ₄	K										F
C ₆ H ₁₄	K										M
SO ₂ ¹⁰⁾	PIA B ⁸⁾ , F ... L, S, T ⁹⁾ , W										N
NO	C, E, G ... J, T, U, V, W										P
N ₂ O	E ⁶⁾ , Y ⁷⁾										S
SF ₆	H										V
Smallest measuring range	Largest measuring range										
0 ... 200 mg/m ³	0 ... 1 000 mg/m ³										B
0 ... 100 mg/m ³	0 ... 1 000 mg/m ³										C
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
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
Language of the operating software³⁾											
German											0
English											1
French											2
Spanish											3
Italian											4

¹⁾ For measuring ranges below 1%, a CO₂ absorber cartridge can be used for zero point adjustment (see Accessories).

²⁾ Without separate zero gas input or solenoid valve.

³⁾ Language for operation can be changed.

⁴⁾ O₂ sensor/O₂ measuring cell in gas path of infrared measured component 1.

⁵⁾ 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).

⁶⁾ Not suitable for use with emission measurements since cross-sensitivity too high.

⁷⁾ Only in conjunction with CO₂/NO, measuring range 0 to 5/25%, 0 to 500/5 000 vpm [-DC-].

⁸⁾ Maximum possible AUTOCAL cycle ≤ 6 h, constant ambient conditions (max. deviation ±1 °C (1.8 °F)): see table "Calibration intervals, standard devices" under "More information".

⁹⁾ Maximum possible AUTOCAL cycle ≤ 3 h, constant ambient conditions (max. deviation ±1 °C (1.8 °F)): see table "Calibration intervals, standard devices" under "More information".

¹⁰⁾ 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

Selection and ordering data (Continued)

Options	Order code
Add "-Z" to article number and then add order code	
Settings	
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 connection pipe (mat. no. 1.4571), 6 mm, complete with screwed gland (cannot be combined with Viton hose)	A27
Stainless steel connection pipe (mat. no. 1.4571), 1/4", complete with screwed gland (cannot be combined with Viton hose)	A29
IEC plug, 37-pin D-sub connector, 9-pin D-sub connector	A33
Tag plates (customized inscription)	B03
Clean for O ₂ service (specially cleaned gas path)	B06
Gas path for short response time ³⁾	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
Selection of the conversion mg/m ³ in ppm at 293K or 273K	D15
Certificate FM/CSA Class I Div 2, ATEX II 3G	E20
Measuring range indication in plain text ¹⁾	Y11
Measurement of CO ₂ in forming gas ²⁾ (only in conjunction with measuring range 0 ... 20 / 0 ... 100%)	Y14

¹⁾ Default setting: smallest measuring range, largest measuring range.

²⁾ CO₂ measurement in accompanying gas Ar or Ar/He (3:1); forming gas.

³⁾ Only for version with Viton hose.

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

ULTRAMAT 23 gas analyzer - German Technical Inspectorate version			Article No.									
For measuring 1 infrared component, UV components and oxygen			7MB2355-	●	●	●	●	6	-	●	A	A
Click on the Article No. for online configuration in the PIA Life Cycle Portal.												
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".												
Enclosure, version and gas paths												
19" rack unit for installation in cabinets												
<u>Gas connections</u>	<u>Gas path</u>	<u>Internal sample gas pump</u>										
6 mm	FPM (Viton)	Without						0				
Measured component	Possible with measuring range identification											
CO	G, J							A				

Extractive continuous process gas analysis

ULTRAMAT 23

19" rack unit and portable version

Selection and ordering data (Continued)

ULTRAMAT 23 gas analyzer - German Technical Inspectorate version For measuring 1 infrared component, UV components and oxygen		Article No. 7MB2355- ● ● ● ● 6 - ● A A ●									
CO ₂	P				C						
SO ₂ ¹⁾	F, G, H, S, W				N						
NO	F, G, H, U, V, W				P						
Smallest measuring range³⁾	Largest measuring range³⁾										
SO ₂ : 0 ... 400 mg/m ³	SO ₂ : 0 ... 2 000 mg/m ³										
NO: 0 ... 200 mg/m ³	NO: 0 ... 1 000 mg/m ³					F					
CO: 0 ... 200 mg/m ³	CO: 0 ... 1 250 mg/m ³					G					
SO ₂ : 0 ... 500 mg/m ³	SO ₂ : 0 ... 2 500 mg/m ³										
NO: 0 ... 250 mg/m ³	NO: 0 ... 1 250 mg/m ³					H					
NO: 0 ... 600 mg/m ³	NO: 0 ... 3 000 mg/m ³										
SO ₂ : 0 ... 1 400 mg/m ³	SO ₂ : 0 ... 7 000 mg/m ³										
0 ... 1 250 vpm	0 ... 6 000 vpm					J					
0 ... 5% ²⁾	0 ... 25% ²⁾					P					
0 ... 50 mg/m ^{3 2)}	0 ... 1 250 mg/m ^{3 2)}					S					
0 ... 150 mg/m ^{3 2)}	0 ... 750 mg/m ^{3 2)}					U					
0 ... 250 mg/m ^{3 2)}	0 ... 1 250 mg/m ^{3 2)}					V					
0 ... 400 mg/m ^{3 2)}	0 ... 2 000 mg/m ^{3 2)}					W					
Oxygen measurement											
Without O ₂ sensor							0				
With electrochemical O ₂ sensor							1				
With paramagnetic oxygen measuring cell							8				
Auxiliary power											
230 V AC, 50 Hz								3			
Language of the operating software											
German											0
English											1
French											2
Spanish											3
Italian											4

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

²⁾ Only in conjunction with order code T13/T23/T33

³⁾ German Technical Inspectorate: see table "TUV/German Technical Inspectorate, 1 and 2-component analyzer" under "More information".

Options	Order code
Add "-Z" to article number and then add order code.	
Settings	
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 D-sub connector, 9-pin D-sub 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 , wide measuring range	T14
O ₂ electrochemical, suitability-tested EN 15267, IR measuring range in mg/m ³	T23
O ₂ electrochemical, suitability-tested EN 15267, IR measuring range in mg/m ³ , wide measuring range	T24
O ₂ electrochemical cell	T25
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 , wide measuring range	T34
No O ₂ cell integrated	T35

Extractive continuous process gas analysis

ULTRAMAT 23

19" rack unit and portable version

Selection and ordering data (Continued)

Options	Order code
Measuring range indication in plain text	Y11
SO ₂ with measuring range 0 ... 400/7 000 mg/m ³	Y15

Article No.	
7MB2357- ● ● ● ● 0 - ● ● ● ●	
ULTRAMAT 23 gas analyzer - German Technical Inspectorate version	
For measuring 2 infrared components, UV components and oxygen	
Click on the Article No. for online configuration in the PIA Life Cycle Portal.	
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".	
Enclosure, version and gas paths	
19" rack unit for installation in cabinets	
<u>Gas connections</u>	<u>Gas path</u>
6 mm	FPM (Viton, not separate)
	<u>Internal sample gas pump</u>
	Without
	0
1st infrared measured component	
Measured component	Possible with measuring range identification
CO	G, J
CO ₂	P
SO ₂	F, G, H, W
NO	F, G, H, U, V, W
Smallest measuring range³⁾	Largest measuring range³⁾
SO ₂ : 0 ... 400 mg/m ³	SO ₂ : 0 ... 2 000 mg/m ³
NO: 0 ... 200 mg/m ³	NO: 0 ... 1 000 mg/m ³
CO: 0 ... 200 mg/m ³	CO: 0 ... 1 250 mg/m ³
SO ₂ : 0 ... 500 mg/m ³	SO ₂ : 0 ... 2 500 mg/m ³
NO: 0 ... 250 mg/m ³	NO: 0 ... 1 250 mg/m ³
NO: 0 ... 600 mg/m ³	NO: 0 ... 3 000 mg/m ³
SO ₂ : 0 ... 1 400 mg/m ³	SO ₂ : 0 ... 7 000 mg/m ³
0 ... 1 250 vpm	0 ... 6 000 vpm
0 ... 5% ²⁾	0 ... 25% ²⁾
0 ... 150 mg/m ³ ²⁾	0 ... 750 mg/m ³ ²⁾
0 ... 250 mg/m ³ ²⁾	0 ... 1 250 mg/m ³ ²⁾
0 ... 400 mg/m ³ ²⁾	0 ... 2 000 mg/m ³ ²⁾
Oxygen measurement	
Without O ₂ sensor	0
With electrochemical O ₂ sensor	1
With paramagnetic oxygen measuring cell	8
Auxiliary power	
230 V AC, 50 Hz	3
2nd infrared measured component	
Measured component	Possible with measuring range identification
CO	G, J
CO ₂	P
SO ₂ ¹⁾	F, G, H, S, W
NO	F, G, H, U, V, W
Smallest measuring range³⁾	Largest measuring range³⁾
SO ₂ : 0 ... 400 mg/m ³	SO ₂ : 0 ... 2 000 mg/m ³
NO: 0 ... 200 mg/m ³	NO: 0 ... 1 000 mg/m ³
CO: 0 ... 200 mg/m ³	CO: 0 ... 1 250 mg/m ³
SO ₂ : 0 ... 500 mg/m ³	SO ₂ : 0 ... 2 500 mg/m ³
NO: 0 ... 250 mg/m ³	NO: 0 ... 1 250 mg/m ³
NO: 0 ... 600 mg/m ³	NO: 0 ... 3 000 mg/m ³
SO ₂ : 0 ... 1 400 mg/m ³	SO ₂ : 0 ... 7 000 mg/m ³
0 ... 1 250 vpm	0 ... 6 000 vpm
0 ... 5% ²⁾	0 ... 25% ²⁾
0 ... 50 mg/m ³ ²⁾	0 ... 1 250 mg/m ³ ²⁾
0 ... 150 mg/m ³ ²⁾	0 ... 750 mg/m ³ ²⁾
0 ... 250 mg/m ³ ²⁾	0 ... 1 250 mg/m ³ ²⁾
0 ... 400 mg/m ³ ²⁾	0 ... 2 000 mg/m ³ ²⁾
Language of the operating software	
German	0

Extractive continuous process gas analysis

ULTRAMAT 23

19" rack unit and portable version

Selection and ordering data (Continued)

ULTRAMAT 23 gas analyzer - German Technical Inspectorate version		Article No.									
For measuring 2 infrared components, UV components and oxygen		7MB2357-	●	●	●	●	0	-	●	●	●
English											1
French											2
Spanish											3
Italian											4

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

²⁾ Only in conjunction with order code T13/T23/T33

³⁾ German Technical Inspectorate: see table "TÜV/German Technical Inspectorate, 1 and 2-component analyzer" under "More information".

Options	Order code
Add "-Z" to article number and then add order code.	
Settings	
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 D-sub connector, 9-pin D-sub 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 , wide measuring range	T14
O ₂ electrochemical, suitability-tested EN 15267, IR measuring range in mg/m ³	T23
O ₂ electrochemical, suitability-tested EN 15267, IR measuring range in mg/m ³ , wide measuring range	T24
O ₂ electrochemical, suitability-tested EN 15267, measuring range in mg/m ³ with UV photometer	T25
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 , wide measuring range	T34
Suitability-tested EN 15267, measuring range in mg/m ³ with UV photometer	T35
Measuring range indication in plain text	Y11
SO ₂ with measuring range 0 ... 400/7 000 mg/m ³	Y15

ULTRAMAT 23 gas analyzer - German Technical Inspectorate version		Article No.									
For measuring 3 infrared components, UV components, oxygen or 2 infrared components and UV components		7MB2358-	●	●	●	●	6	-	●	●	●
Click on the Article No. for online configuration in the PIA Life Cycle Portal.											
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".											
Enclosure, version and gas paths											
19" rack unit for installation in cabinets											
<u>Gas connections</u>	<u>Gas path</u>	<u>Internal sample gas pump</u>									
6 mm	FPM (Viton, not separate)	Without									
1st and 2nd Infrared measured component											
Measured component	Smallest measuring range	Largest measuring range									
CO and NO	0 ... 250 vpm (CO) 0 ... 400 vpm (NO)	0 ... 1 250 vpm (CO) 0 ... 2000 vpm (NO)		A	K						
CO and NO	0 ... 200 vpm (CO) 0 ... 150 vpm (NO)	0 ... 1 250 vpm (CO) 0 ... 750 vpm (NO)		A	S						
Oxygen measurement											
Without O ₂ sensor							0				

Extractive continuous process gas analysis

ULTRAMAT 23

19" rack unit and portable version

Selection and ordering data (Continued)

ULTRAMAT 23 gas analyzer - German Technical Inspectorate version		Article No. 7MB2358- ● ● ● ● 6 - ● ● ● ●									
For measuring 3 infrared components, UV components, oxygen or 2 infrared components and UV components											
With electrochemical O ₂ sensor								1			
With paramagnetic oxygen measuring cell								8			
Auxiliary power											
230 V AC, 50 Hz									3		
3rd infrared measured component											
Measured component	Possible with measuring range identification										
SO ₂ ¹⁾	F, G, H, S, W								N		
Smallest measuring range ²⁾	Largest measuring range ²⁾										
0 ... 400 vpm	0 ... 2 000 vpm									F	
0 ... 500 vpm	0 ... 2 500 vpm									G	
0 ... 1 400 vpm	0 ... 7 000 vpm									H	
0 ... 50 mg/m ³	0 ... 1 250 mg/m ³									S	
0 ... 400 mg/m ³	0 ... 2 000 mg/m ³									W	
Language of the operating software											
German											0
English											1
French											2
Spanish											3
Italian											4

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

²⁾ German Technical Inspectorate: see table "TÜV/German Technical Inspectorate, 3-component analyzer" under "More information".

Options	Order code
Add "-Z" to article number and then add order code.	
Settings	
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 D-sub connector, 9-pin D-sub connector	A33
O ₂ paramagnetic, suitability-tested EN 15267, IR measuring range in mg/m ³	T13
O ₂ electrochemical, suitability-tested EN 15267, IR measuring range in mg/m ³	T23
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 , with UV photometer	T35
Measuring range indication in plain text	Y11
SO ₂ with measuring range 0 ... 400/7 000 mg/m ³	Y15

Note

See table for German Technical Inspectorate (TÜV), Component analyzer and order examples under "More information".

Extractive continuous process gas analysis

ULTRAMAT 23

19" rack unit and portable version

Technical specifications

ULTRAMAT 23, 19" rack unit and portable version	
General information	
Measured components	Maximum of 4
Measuring ranges	2 per measured component
Display	LCD with LED backlighting and contrast control; function keys; 80 characters (4 lines/20 characters)
Operating position	Front wall, vertical
Conformity	CE marking EN 61000-6-2, EN 61000-6-4
Design, enclosure	
Weight	Approximately 10 kg
Degree of protection, 19" rack unit and desktop model	7MB2335, 7MB2337 and 7MB2338: IP20 according to EN 60529 7MB2355, 7MB2357 and 7MB2358: IP40 according to EN 60529
Electrical characteristics	
EMC interference immunity (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 or EN 61326-1
Safety extra-low voltage (SELV) with safe isolation	
Auxiliary power	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
Power consumption	Approx. 60 VA
Electrical inputs and outputs	
Analog output	Per component, 0/2/4 ... 20 mA, NAMUR, floating, max. load 750 Ω
Relay outputs	8, with changeover contacts, freely configurable, e.g. for measuring range identification; 24 V AC/DC/1 A load rating, floating, non-sparking
Digital inputs	3, dimensioned for 24 V, potential-free - Pump - AUTOCAL - Synchronization
Serial interface	RS 485
AUTOCAL function	Automatic device calibration with ambient air (depending on measured component); adjustable cycle time from 0 (1) ... 24 hours
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
Climatic conditions	
Permissible ambient temperature	
During operation	+5 ... 45 °C (IR detector, O₂) +5 ... 40 °C (H₂S sensor) +15 ... 35 °C (UV photometer)
During storage and transportation	-25 ... 60 °C (IR detector, O₂, UV photometer) -10 ... 60 °C (H₂S sensor)
Permissible ambient humidity	< 90% RH (relative humidity) during storage and transportation
Permissible pressure fluctuations	600 ... 1 200 hPa (IR detector, O₂, UV photometer) 750 ... 1 200 hPa (H₂S sensor)
Gas inlet conditions	
Sample gas pressure	
Without pump	Depressurized (< 1 200 hPa, absolute)

Technical specifications (Continued)

ULTRAMAT 23, 19" rack unit and portable version	
With pump	Depressurized suction mode, factory preset with 2 m hose at sample gas outlet; measuring range end value calibration necessary under different restrictor conditions (800 ... 1 050 hPa, absolute)
Sample gas flow	72 ... 120 l/h (1.2 ... 2 l/min)
Sample gas temperature	Min. 0 ... max. 50 °C, but above the dew point
Sample gas humidity	< 90% RH (relative humidity), non-condensing

ULTRAMAT 23, infrared channel ¹⁾	
Measuring ranges	See ordering data
Chopper purge	Primary pressure approximately 3 000 hPa; purging gas consumption approximately 100 ml/min
Time response	
Warm-up period	Approx. 30 min (at room temperature), (the technical specification will be met after 2 h)
Delayed display (T ₉₀ time)	Dependent on length of analyzer chamber, sample gas line and configurable damping
Damping (electrical time constant)	Configurable from 0 ... 99.9 s
Measuring response	
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 nameplate)
Detection limit	1% of the current measuring range
Linearity error	- In the largest possible measuring range: < ± 1% of the measuring range end value - In the smallest possible measuring range: < ± 2% of the measuring range end value
Repeatability	± 1% of the current measuring range
Drift	
Zero point	≤ 1% of the current measuring range/week
Full-scale value drift	≤ 1% of the current measuring range/week
Influencing variables	
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 nameplate per 10 K with an AUTOCAL cycle time of 6 h
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%

¹⁾ To ensure compliance with the technical specifications, 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 SO₂ measuring ranges (≤ 400 mg/m³) on German Technical Inspectorate/QAL-certified systems.

ULTRAMAT 23, 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 damping, not > 30 s at approximately 1.2 l/min sample gas flow
Measuring response	
Output signal fluctuation	Based on sample gas pressure 1 013 hPa absolute, 1.0 l/min sample gas flow and 25 °C ambient temperature < ± 0.5% of the current measuring range
Linearity error	< ± 0.2% of the current measuring range

Extractive continuous process gas analysis

ULTRAMAT 23

19" rack unit and portable version

Technical specifications (Continued)

ULTRAMAT 23, oxygen channel (electrochemical)	
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)

ULTRAMAT 23, ultraviolet photometer²⁾

Measuring ranges	The measuring ranges are calibrated with a certified calibration gas, whereby a concentration specification in ppm in accordance with EN 1343 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
Delayed display (T ₉₀ time)	Dependent on the external gas preparation, the length of the sample gas line and the configurable damping (see below) of the device. Note: SO ₂ is highly soluble in water! ≤ 30 s after sample gas inlet 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 measuring range end value
Detection limit	1% of set measuring range end 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 measuring range end value
• In the smallest measuring range	≤ 2% of set measuring range end value
Repeatability	≤ 1% of set measuring range end value
Influencing variables	
Temperature error	≤ 4% of smallest measuring range end value/10 K in ambient temperature range of 5 ... 45 °C
Atmospheric pressure	≤ 1% of set measuring range end value per 1% pressure variation
Auxiliary power	≤ 0.1% of set measuring range end value with a change of ±10%
Drift (zero point and full-scale value)	

Technical specifications (Continued)

ULTRAMAT 23, ultraviolet photometer ²⁾	
• 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 SO₂ - Halogen compounds - Chlorine - Acetone - Ozone

³⁾ 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.

ULTRAMAT 23, 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)
Operation mode	- Continuous measurement between 0 and 12.5 vpm - Discontinuous measurement between 12.5 and 50 vpm
Influencing variables	
Accompanying gases	The hydrogen sulfide sensor must not be used if the accompanying gas contains the following components: - Compounds containing chlorine - Compounds containing fluorine - Heavy metals - Aerosols - Alkaline components (e.g. NH₃ > 5 vpm)
Interference gases	1 360 vpm SO ₂ result in a cross-interference of < 20 vpm H ₂ S 180 vpm NO result in a cross-interference of < 150 vpm H ₂ S No cross-interference of CH ₄ , CO ₂ and H ₂ (1 000 vpm)
Temperature	< 3%/10 K referred to measuring range end value
Atmospheric pressure	< 0.2% of the measured value per 1% pressure variation
Measuring response	
Delayed display (T ₉₀ time)	< 40 s with sample gas flow of approx. 1 ... 1.2 l/min
Output signal noise	< 2% of smallest measuring range with a damping constant of 30 s
Display resolution	< 0.01 vpm H ₂ S

Extractive continuous process gas analysis

ULTRAMAT 23

19" rack unit and portable version

Technical specifications (Continued)

ULTRAMAT 23, H₂S channel for measuring ranges of 5 ... 50 vpm

Output signal resolution	< 1% of smallest measuring range with a damping constant of 30 s
Repeatability	< 4% of smallest measuring range
Drift	< 1% of the current measuring range per month

ULTRAMAT 23, paramagnetic oxygen cell

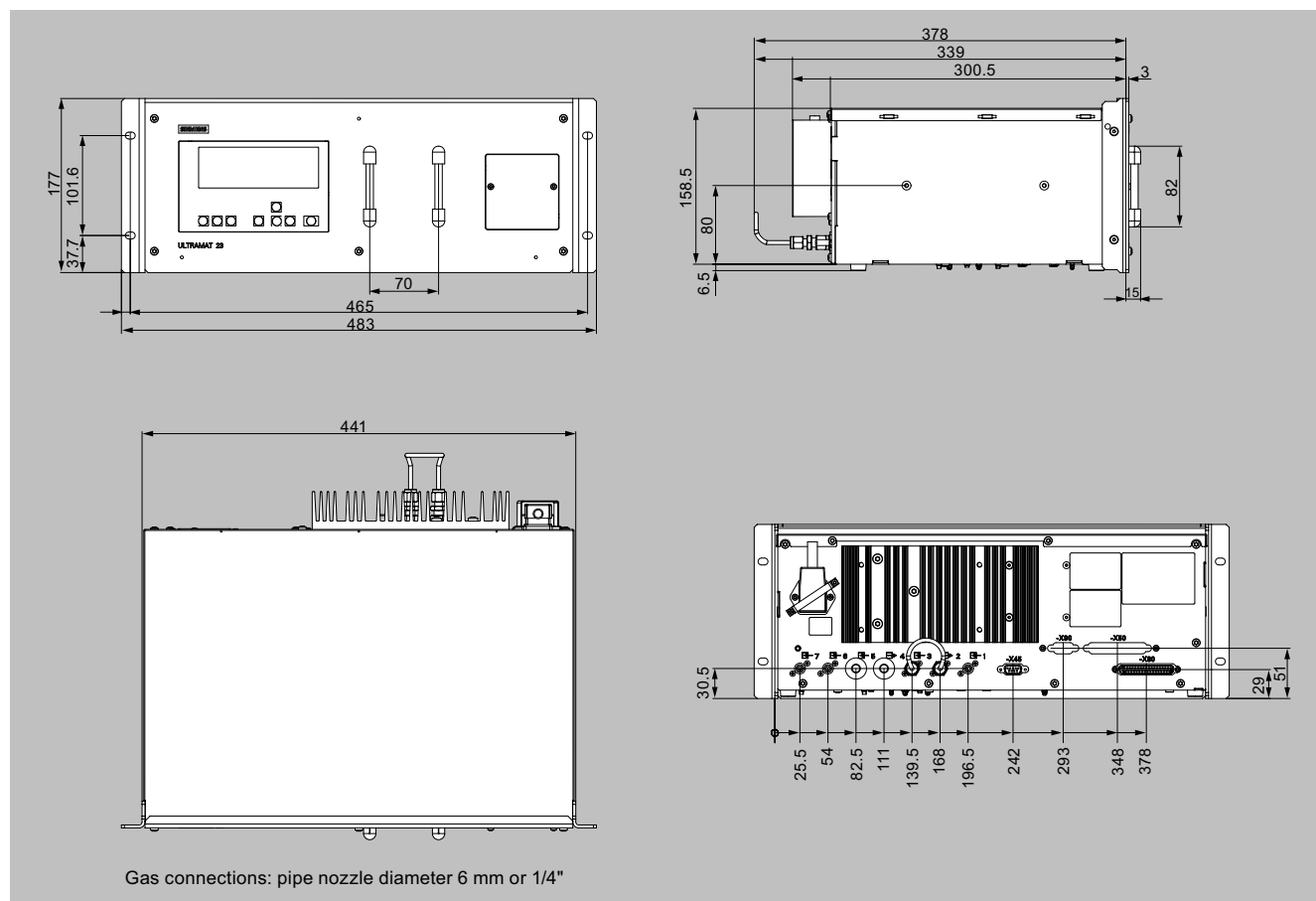
Measured components	Maximum of 4, comprising up to 3 infrared-sensitive gases and an oxygen component
Measuring ranges	2 per component • Min. 0 ... 2% vol O₂ • Max. 0 ... 100% vol O₂ • Suppressed measuring range possible; e.g. 95 ... 100%
Permissible operating temperature	5 ... 45 °C (41 ... 113 °F)
Interference gases	See "Paramagnetic oxygen cell cross-interference" table
Zero point drift	• Measuring range 2%: max. 0.1% with weekly zero-point calibration • Measuring range 5%: max. 0.1% with weekly zero-point calibration • Measuring range 25% or more: max. 0.5% with monthly zero-point calibration
Measured value drift	Negligible with AUTOCL
Temperature error	< 2%/10 K referred to measuring range 5% < 5%/10 K referred to measuring range 2%
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

Dimensional drawings



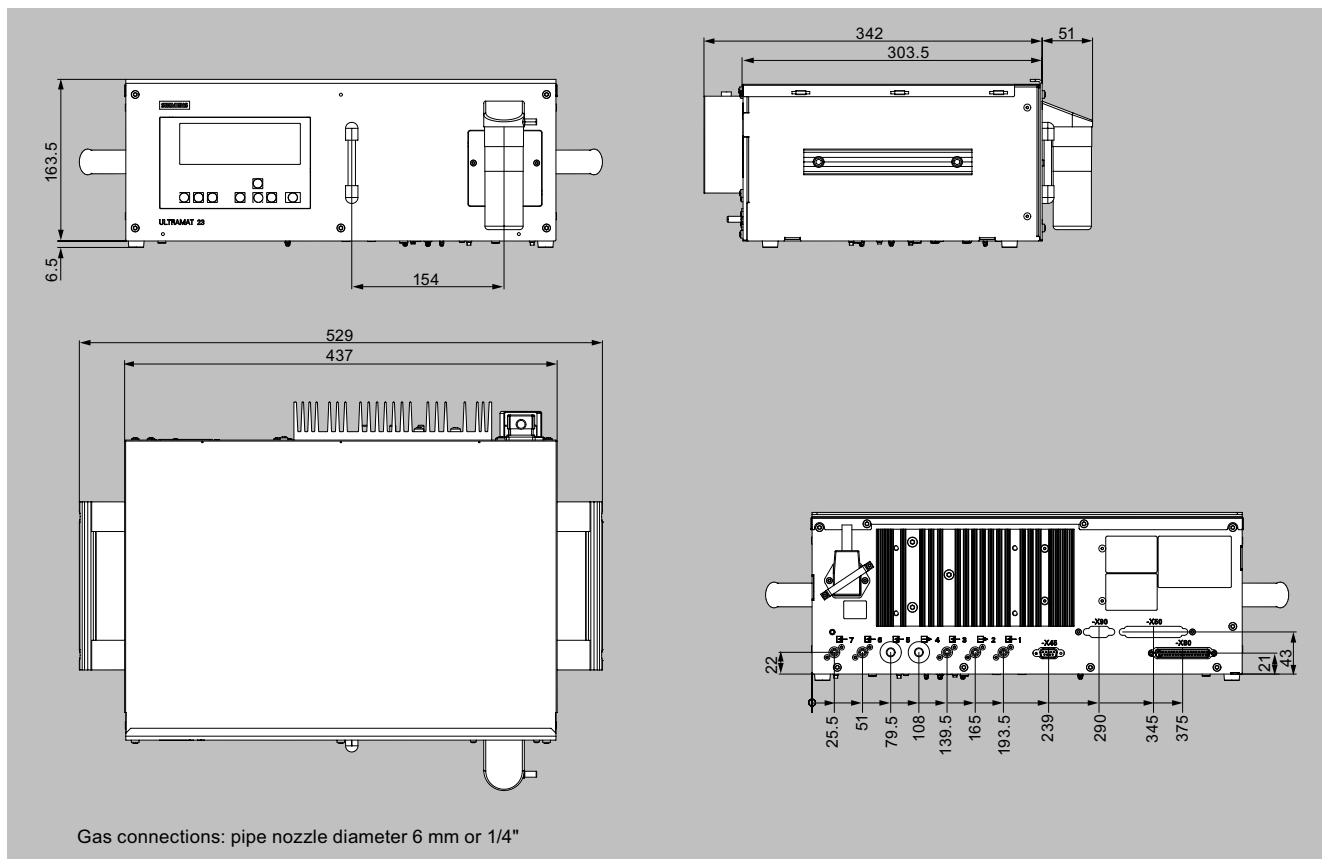
ULTRAMAT 23, 19" rack unit, dimensions in mm

Extractive continuous process gas analysis

ULTRAMAT 23

19" rack unit and portable version

Dimensional drawings (Continued)



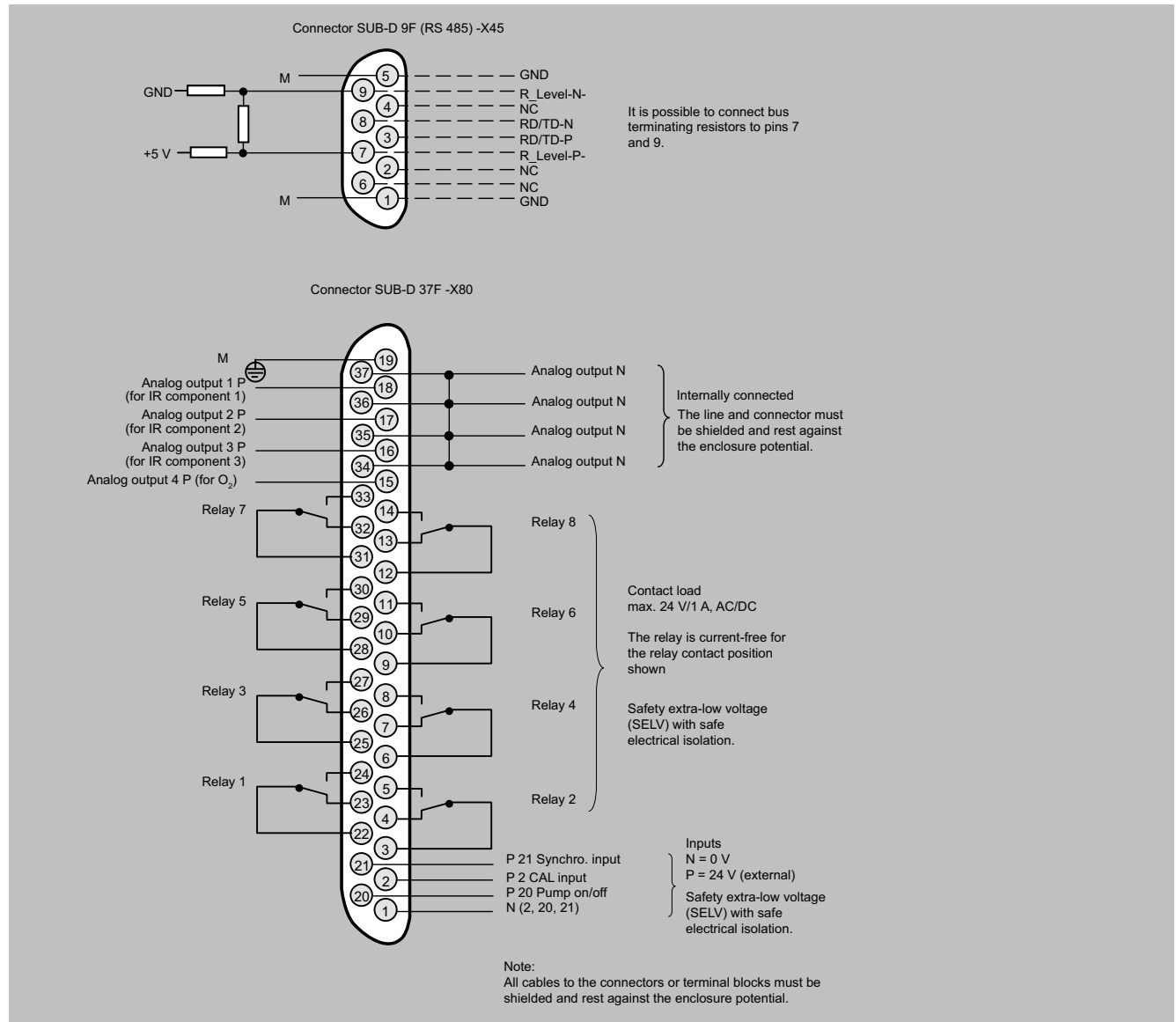
ULTRAMAT 23, bench-top unit, dimensions in mm

Extractive continuous process gas analysis

ULTRAMAT 23

19" rack unit and portable version

Circuit diagrams



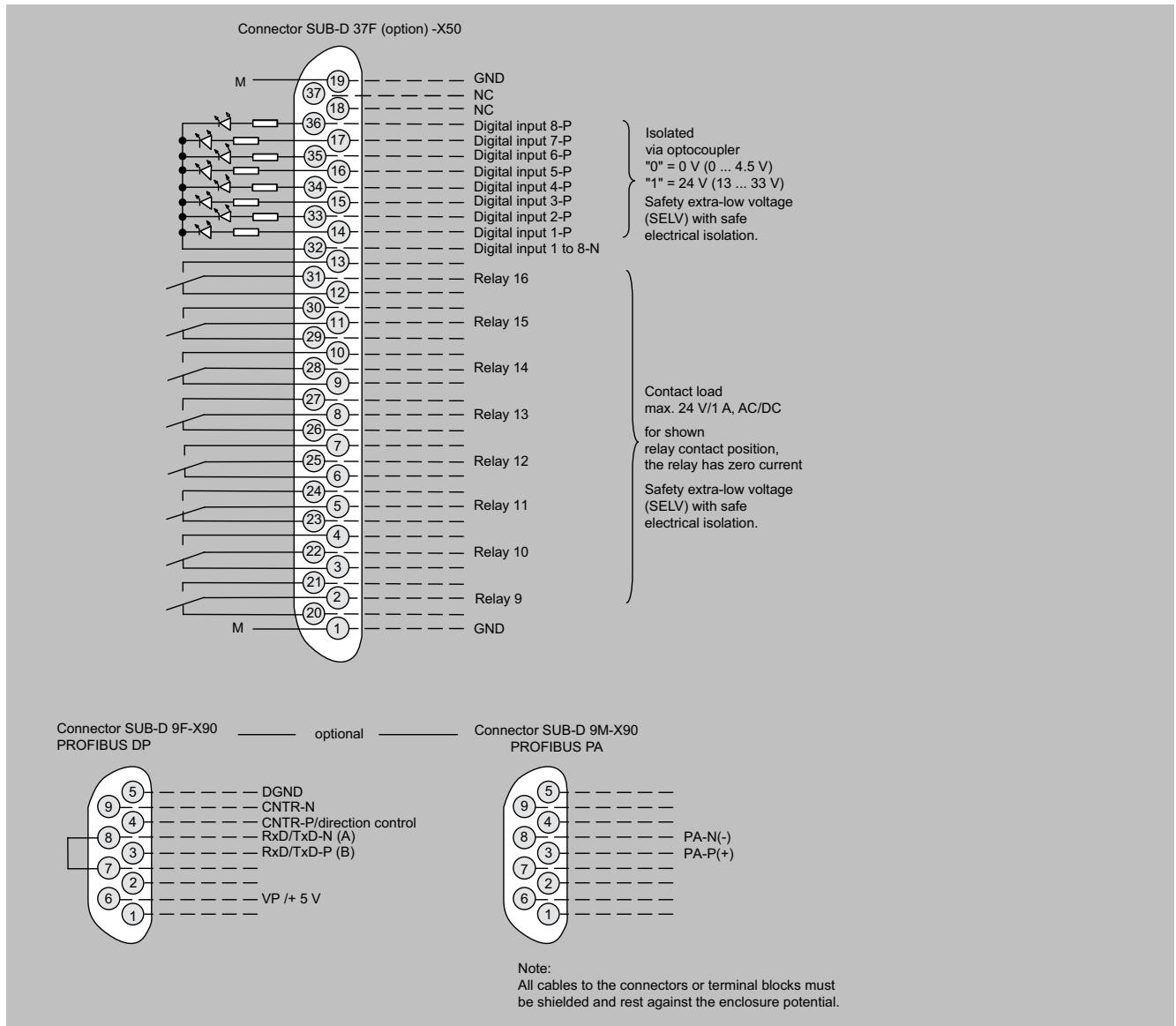
ULTRAMAT 23, pin assignment (standard)

Extractive continuous process gas analysis

ULTRAMAT 23

19" rack unit and portable version

Circuit diagrams (Continued)



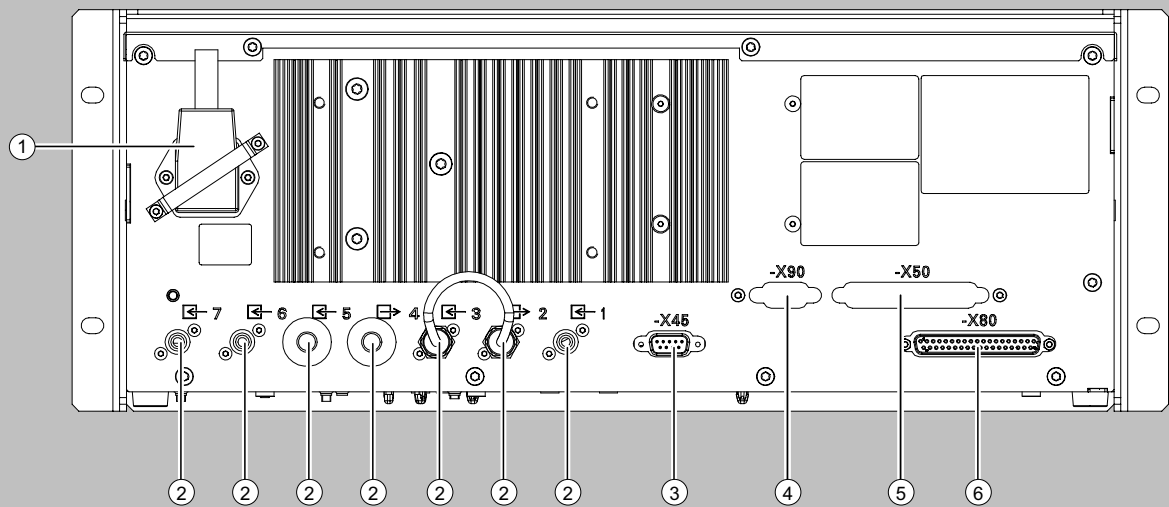
ULTRAMAT 23, pin assignment of optional PROFIBUS interface card

Extractive continuous process gas analysis

ULTRAMAT 23

19" rack unit and portable version

Circuit diagrams (Continued)



- 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; digital inputs/relay outputs
- ⑥ -X80: 37-pin connector: Analog and digital inputs and outputs

When installing in a cabinet: mount analyzer on support rails.

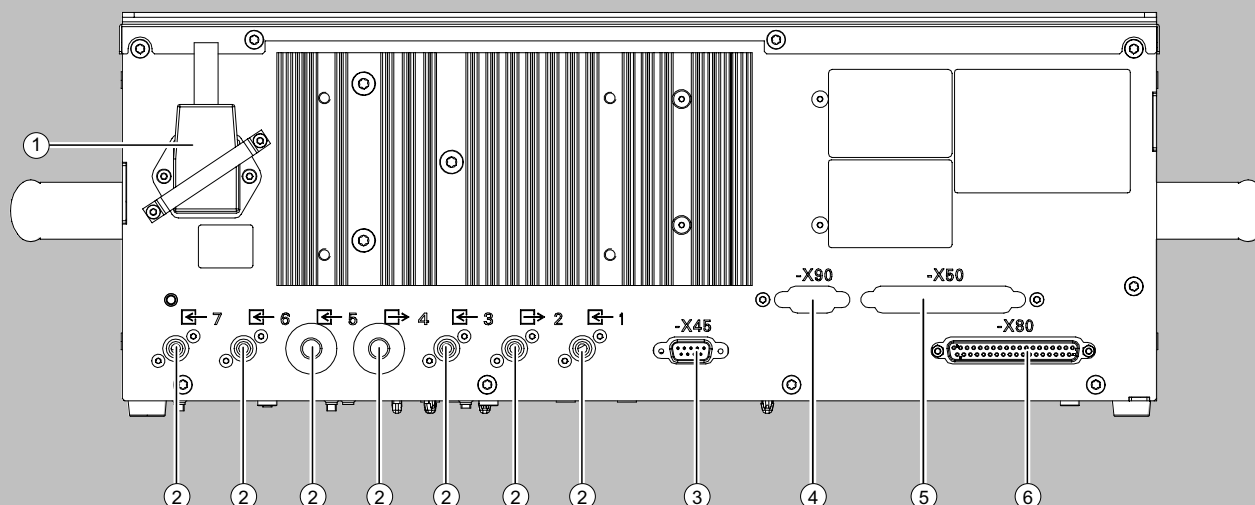
ULTRAMAT 23, 19" rack unit, e.g. an IR measured component with oxygen measurement

Extractive continuous process gas analysis

ULTRAMAT 23

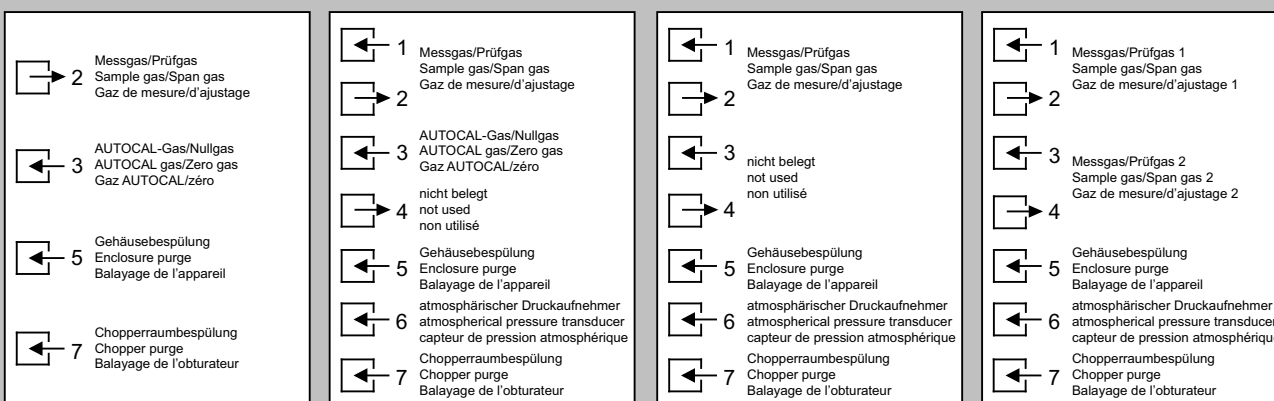
19" rack unit and portable version

Circuit diagrams (Continued)



- 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; digital 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



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

Extractive continuous process gas analysis

ULTRAMAT 23

19" rack unit and portable version

More information

German Technical Inspectorate (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 ...	Smallest measuring range from 0 to ...	Largest measuring range from 0 to ...
F	-	-	400 mg/m ³	2 000 mg/m ³	200 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	250 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 ...	Smallest 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, German Technical Inspectorate (TÜV)

IR component: CO

Measuring range: 0 to 200 / 1 250 mg/m³with electrochemical O₂ sensor

230 V AC; German

7MB2355-0AG16-3AA0-Z +T23**German Technical Inspectorate (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 ...	Smallest 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, German Technical Inspectorate (TÜV)

IR component: CO/NO + SO₂Measuring 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

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

Extractive continuous process gas analysis

ULTRAMAT 23

19" rack unit and portable version

More information (Continued)

7MB2337-*CP*6-*SY* or
 7MB2338-*DC*6-*SY* (incl. 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 ultra-pure gases

Calibration intervals, standard devices

	Calibration with calibration gas [weeks]		Comments (Comply with technical specifications)
	Zero point	Calibration point	
IR components	●	52	-
O ₂ - electrochemical sensor	52	●	-
O ₂ paramagnetic cell	1	●	At MB < 5%
	8	●	At MB > 5%
O ₂ paramagnetic cell	●	52	At MB < 5%
	●	52	At MB > 5%
H ₂ S sensor	●	4	-

● = with AUTOCAL, with ambient air or N₂, 3 ... 24h – depending on measuring range.

Extractive continuous process gas analysis

ULTRAMAT 23

Suggestion for spare parts

Selection and ordering data

Description	2 years (unit)	5 years (unit)	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
Plug-in 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 device, in sheet steel enclosure)	1	2	C79451-A3008-B43
Filter (for portable device, 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

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

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

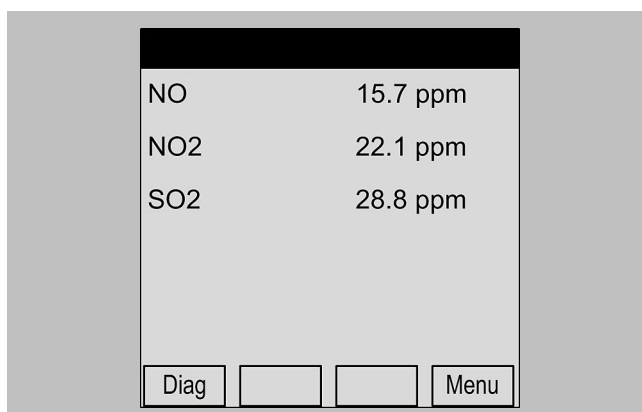
- In typical emission applications
- Taking account of possible cross-sensitivities (e.g. from mercaptan)

Design

- 19" rack unit with 4 U for installation
 - In hinged frame
 - In cabinets with or without telescopic rails
- Internal gas paths: hose made of FKM (VitonTM) 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 operator panel

- Large LCD panel for simultaneous display of measured value and device status
- Sensor buttons with context-based button functions
- Display protected by glass pane
- Contrast of the LCD 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

Communication

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

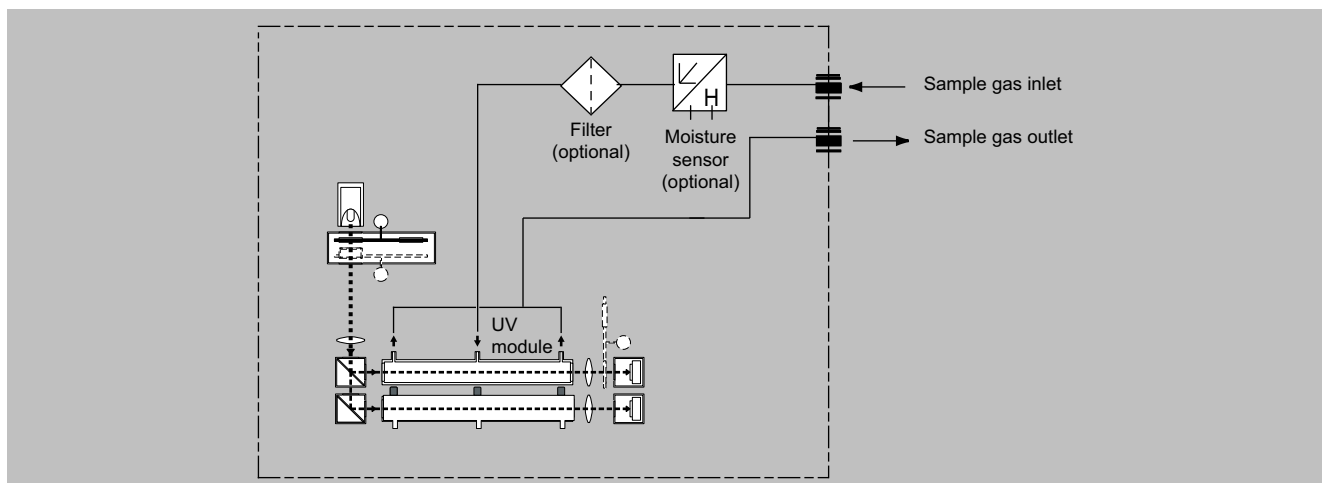
¹⁾ Depending on the version

Extractive continuous process gas analysis

SIPROCESS UV600

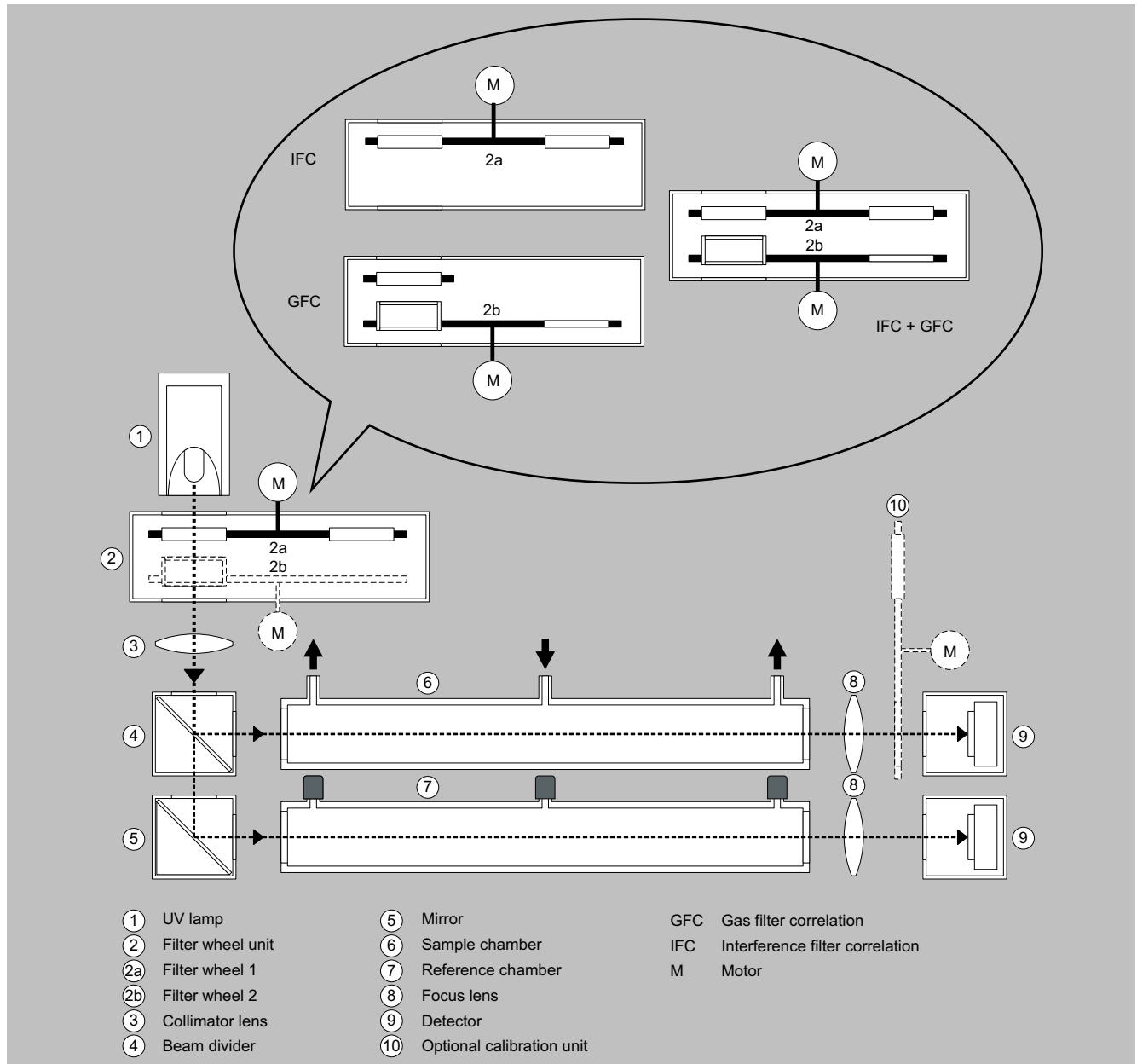
Design (Continued)

Gas flow chart



SIPROCESS UV600, gas flow chart

Mode of operation



SIPROCESS UV600, operating principle

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 electrode-less 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).

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Mode of operation (Continued)

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-shifted 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

Signal 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.

Inputs and outputs

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
- 1-pole changeover switch, three connections
- Maximum voltage ± 50 V
- Connect inductive loads (e.g. relays, solenoid valves etc.) via spark-quenching diodes only
- Maximum load rating (standard): Max. 30 V AC, max. 48 V DC, max. 500 mA.

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: 10 Ω
- Reference potential GND (see figure, analog inputs)
- Overcurrent protection: $\pm 1\,000$ mA

Function (Continued)

- Maximum 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 measuring range end value
- Maximum load 500 Ω
- 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.

Note

For all graphical representations of connections and pin assignments, see "Circuit diagrams".

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Selection and ordering data

SIPROCESS UV600 gas analyzer, incl. gas module and barometric pressure compensation			Article No. 7MB2621- ● ● ● ● ● - 0 ● ● ●									
Click on the Article No. for online configuration in the PIA Life Cycle Portal.												
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".												
Enclosure, version and gas paths, 19" rack unit for installation in cabinets												
<u>Gas connections:</u> <u>Diameter</u>	<u>Gas connections: Material</u>	<u>Gas paths: Material</u>										
6 mm pipe	PVDF	Hose / Viton	0									
6 mm pipe	Swagelok	PTFE	1									
6 mm pipe	Swagelok	Stainless steel, with pipes	2									
1/4" pipe	Swagelok	Stainless steel, with pipes	3									
1st UV measured component												
Measured component	Smallest/largest measuring range	Corresponds to										
NO	0 ... 10 / 0 ... 300 ppmv	0 ... 15 / 0 ... 450 mg/m ³	A	A								
	0 ... 20 / 0 ... 400 ppmv	0 ... 25 / 0 ... 500 mg/m ³	A	B								
	0 ... 25 / 0 ... 500 ppmv	0 ... 35 / 0 ... 700 mg/m ³	A	C								
	0 ... 50 / 0 ... 1 000 ppmv	0 ... 70 / 0 ... 1 250 mg/m ³	A	D								
NO ₂	0 ... 10 / 0 ... 300 ppmv ¹⁾	0 ... 20 / 0 ... 600 mg/m ³ ¹⁾	B	A								
	0 ... 20 / 0 ... 400 ppmv	0 ... 40 / 0 ... 800 mg/m ³	B	B								
	0 ... 25 / 0 ... 500 ppmv	0 ... 50 / 0 ... 1 000 mg/m ³	B	C								
	0 ... 50 / 0 ... 1 000 ppmv	0 ... 100 / 0 ... 2 000 mg/m ³	B	D								
SO ₂	0 ... 10 / 0 ... 300 ppmv ¹⁾	0 ... 25 / 0 ... 750 mg/m ³ ¹⁾	C	A								
	0 ... 20 / 0 ... 400 ppmv	0 ... 50 / 0 ... 1 000 mg/m ³	C	B								
	0 ... 25 / 0 ... 500 ppmv	0 ... 75 / 0 ... 1 500 mg/m ³	C	C								
	0 ... 50 / 0 ... 1 000 ppmv	0 ... 130 / 0 ... 2 600 mg/m ³	C	D								
H ₂ S	0 ... 25 / 0 ... 500 ppmv	0 ... 40 / 0 ... 800 mg/m ³	D	C								
	0 ... 50 / 0 ... 1 000 ppmv	0 ... 75 / 0 ... 1 500 mg/m ³	D	D								
2nd UV measured component												
Measured component	Smallest/largest measuring range	Corresponds to										
Without					0	0						
NO ₂	0 ... 10 / 0 ... 300 ppmv ¹⁾	0 ... 20 / 0 ... 600 mg/m ³ ¹⁾			2	1						
	0 ... 20 / 0 ... 400 ppmv	0 ... 40 / 0 ... 800 mg/m ³			2	2						
	0 ... 25 / 0 ... 500 ppmv	0 ... 50 / 0 ... 1 000 mg/m ³			2	3						
	0 ... 50 / 0 ... 1 000 ppmv	0 ... 100 / 0 ... 2 000 mg/m ³			2	4						
SO ₂	0 ... 10 / 0 ... 300 ppmv ¹⁾	0 ... 25 / 0 ... 750 mg/m ³ ¹⁾			3	1						
	0 ... 20 / 0 ... 400 ppmv	0 ... 50 / 0 ... 1 000 mg/m ³			3	2						
	0 ... 25 / 0 ... 500 ppmv	0 ... 75 / 0 ... 1 500 mg/m ³			3	3						
	0 ... 50 / 0 ... 1 000 ppmv	0 ... 130 / 0 ... 2 600 mg/m ³			3	4						
H ₂ S	0 ... 25 / 0 ... 500 ppmv	0 ... 40 / 0 ... 800 mg/m ³			4	3						
	0 ... 50 / 0 ... 1 000 ppmv	0 ... 75 / 0 ... 1 500 mg/m ³			4	4						
3rd UV measured component												
Measured component	Smallest/largest measuring range	Corresponds to										
Without									X	X		
SO ₂	0 ... 10 / 0 ... 300 ppmv ¹⁾	0 ... 25 / 0 ... 750 mg/m ³ ¹⁾							C	A		
	0 ... 20 / 0 ... 400 ppmv	0 ... 50 / 0 ... 1 000 mg/m ³							C	B		
	0 ... 25 / 0 ... 500 ppmv	0 ... 75 / 0 ... 1 500 mg/m ³							C	C		
	0 ... 50 / 0 ... 1 000 ppmv	0 ... 130 / 0 ... 2 600 mg/m ³							C	D		
H ₂ S	0 ... 25 / 0 ... 500 ppmv	0 ... 40 / 0 ... 800 mg/m ³							D	C		
	0 ... 50 / 0 ... 1 000 ppmv	0 ... 75 / 0 ... 1 500 mg/m ³							D	D		
Language of the operating software												
German											0	
English											1	
French											2	
Spanish											3	
Italian											4	

¹⁾ Smallest measuring range 0 ... 10 ppmv requires daily calibration and thermostatically controlled environment ($\pm 2^\circ\text{C}$) Use of an additional calibration unit (B11, B12 or B13) recommended. Two measured value outputs are required on the I/O module for this measuring 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 ppm - a second I/O module (option: A13) is required!

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Selection and ordering data (Continued)

Options	Order code
Add "-Z" to article number and then add order code.	
Second I/O module	A13
Calibration unit for 1st sample gas component	B11
Calibration unit for 1st and 2nd sample gas component	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

Recommended spare parts for preventive maintenance	2 years (unit)	5 years (unit)	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 ... 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

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Technical specifications

SIPROCESS UV600	
General information	
Measuring ranges	3, automatic measuring range switchover
Detection limit (2 σ)	< 1% of measuring span
Smallest possible measuring 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 measuring 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	
Type of protection	IP40
Weight	approx. 17 kg
Requirements of location of use	
Location of use	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 vibration/shock	
• 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 with 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	
Reference point drift	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Zero point drift	< ±1%/week of respective measuring span
• Standard measuring ranges	< ± 1%/week of respective measuring span

Technical specifications (Continued)

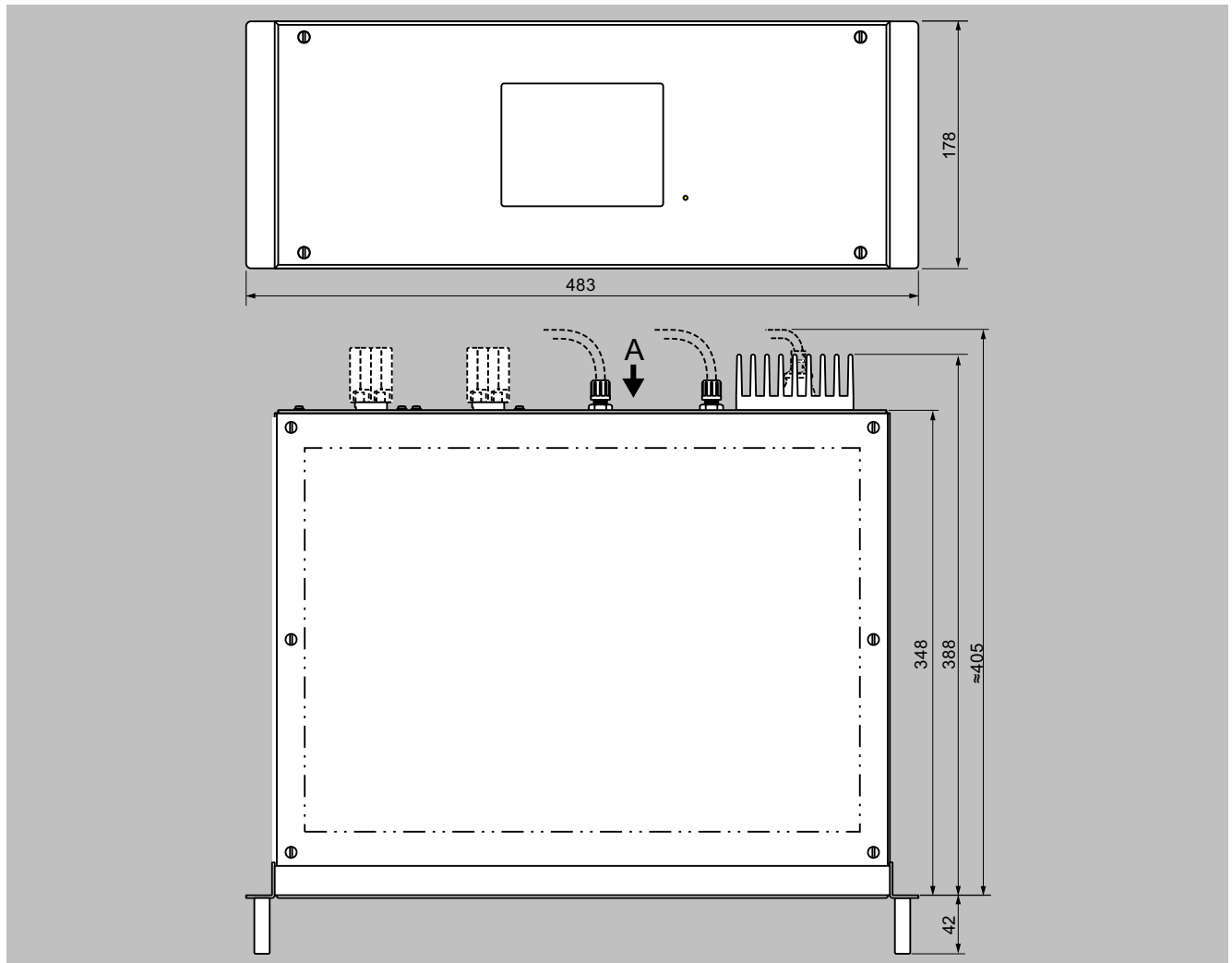
SIPROCESS UV600	
• Small measuring ranges (≤ 2x smallest measuring range)	< ± 2%/week of respective measuring span
• Measured components NO, NO ₂ , SO ₂	< ±1%/day of respective measuring span
Reproducibility	< ± 1% of respective measuring span
Linearity error	< ± 1% of respective measuring span
Electrical 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 load rating: 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	RS 485, Ethernet (LAN)

¹⁾ Only with daily recalibration and air-conditioned environment (+/- 2 °C)

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Dimensional drawings

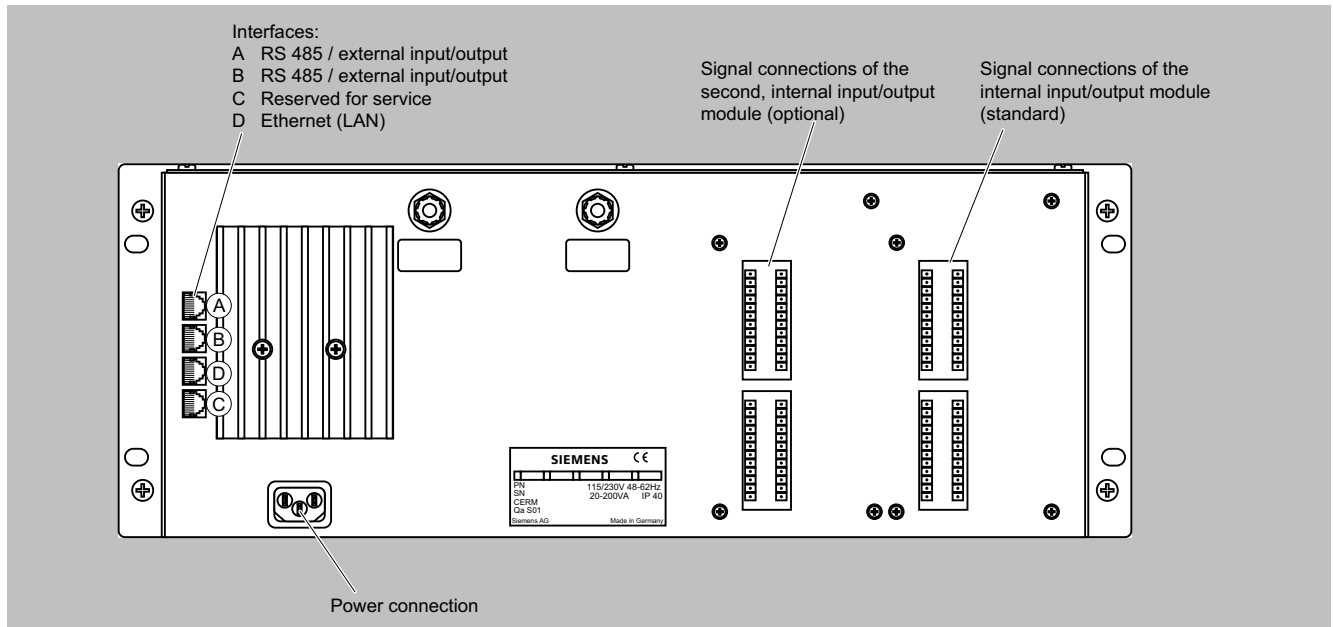


SIPROCESS UV600, 19" rack unit, dimensions in mm

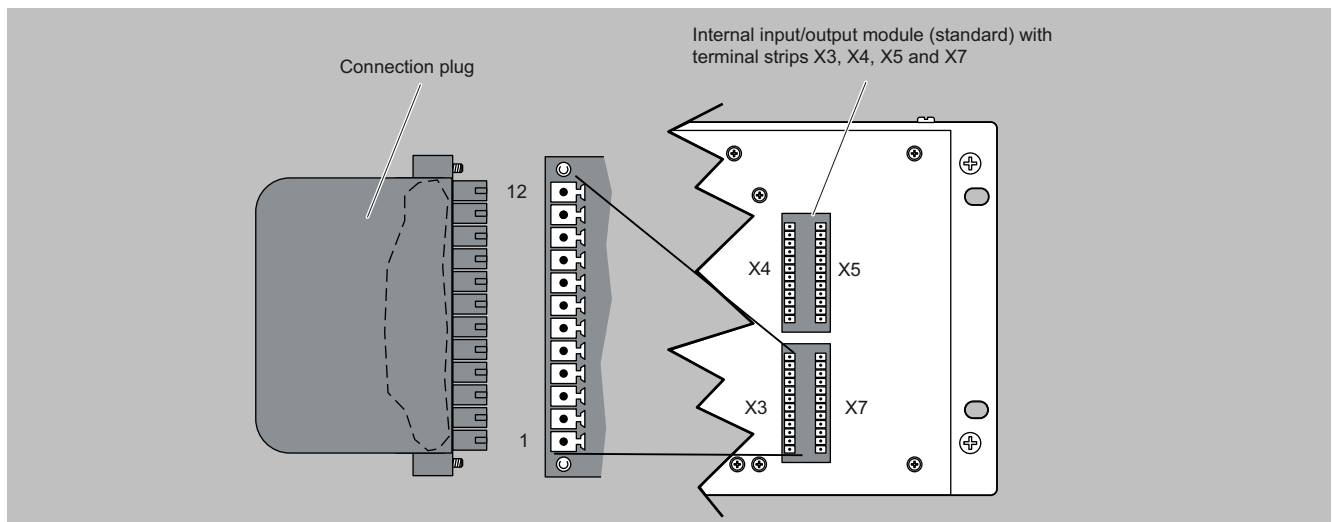
Extractive continuous process gas analysis

SIPROCESS UV600

Circuit diagrams



SIPROCESS UV600, gas connections and electrical connections

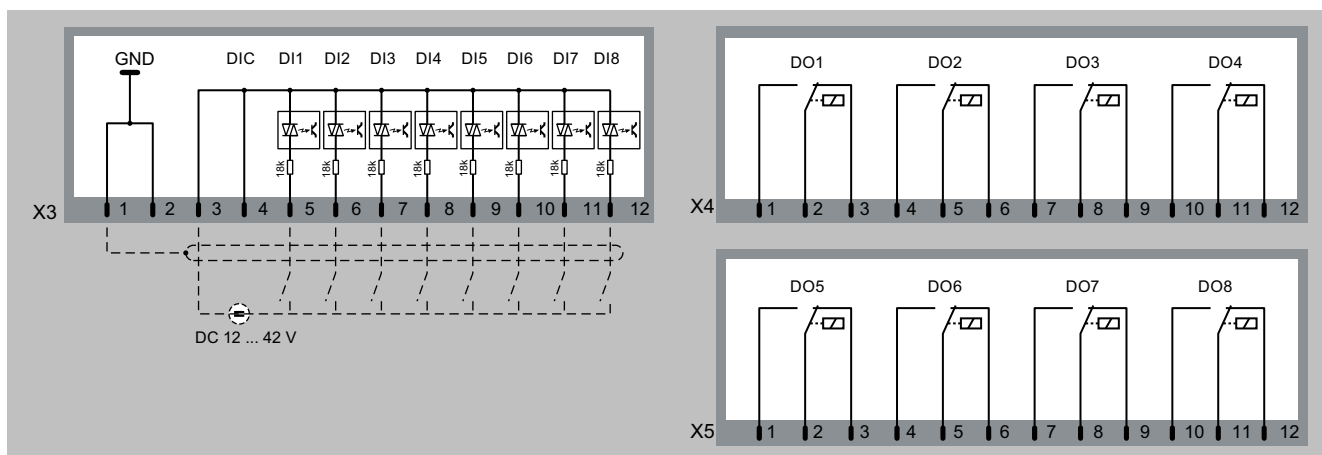


SIPROCESS UV600, signal connections and plug connectors

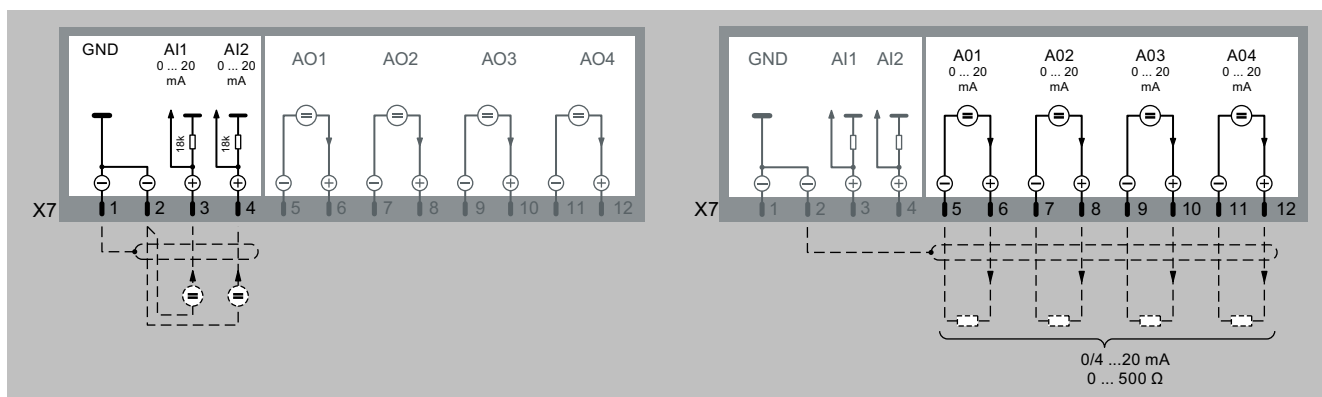
Extractive continuous process gas analysis

SIPROCESS UV600

Circuit diagrams (Continued)



SIPROCESS UV600, pin assignments of digital inputs X3 (DI1 to DI8) and digital outputs X4 (DO1 to DO4) and X5 (DO5 to DO8)



SIPROCESS UV600, pin assignment of the analog inputs X7 (AI1 and AI2) and analog outputs X7 (AO1 to AO4)