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Process Automation

Process Analytical Instruments

Catalog AP 01

Edition 2018

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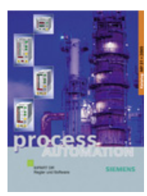

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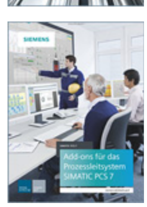

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Process Analytical Instruments

Process Automation

Catalog AP 01· 2018

Supersedes:
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Extractive continuous process gas analysis 1

In situ continuous process gas analysis 2

Process gas chromatography 3

Analytical Application Sets 4

Communication and software 5

General information 6

Appendix 7

The products and systems described in this catalog are manufactured/distributed under application of a certified quality management system in accordance with DIN EN ISO 9001 (Certified Registration No. 000656 QM08). The certificate is recognized by all IQNet countries.

For efficient gas composition analysis

Innovative analysis technology. Customized system design. Sound knowledge of customer applications. As a leading supplier of process analyzers and process analysis systems, we offer our global customers the optimum solutions for their gas analysis.


C: 38 F
D:545

Processes under control

From flue gas monitoring in refuse combustion plants and power plants up to gas analysis in the chemical industry or the monitoring of rotary kilns in cement works – our high-precision, reliable analyzers get the job done.

Our comprehensive range of process analytic products meets all your requirements for complete measuring instrument solutions. Device operation is menu-driven and designed in accordance with NAMUR guidelines.

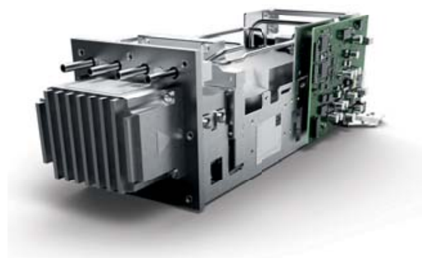
SIPROCESS GA700 – The new standard for flexibility in gas analytics. Depending on the measuring task, the SIPROCESS GA700 can be individually adapted to the respective requirements of the process by fitting selectable modules.

- The simple operating concept: Plug & Measure
- Reliable measurement, optimized for numerous applications with internal correction of cross-interference
- An analyzer consisting of a basic device and one or two analyzer modules is ready for measurement
- The basic device is available either as a 19" rack version with three height units or with housing for wall mounting
- The communication interfaces present in the basic units can be adapted to the respective process environment or process control system using optional interface adapters

The new SIPROCESS GA700 series for gas analysis lets you accommodate up to two modules in a single enclosure: either in a housing for wall mounting or in a 19” rack-mounted enclosure with three height units.

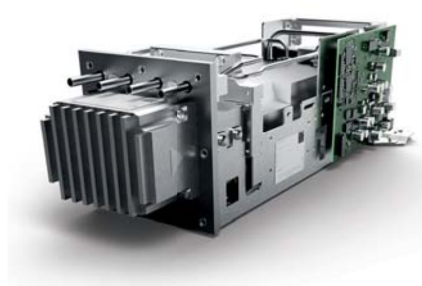
Overview of wall- and rack-mounted enclosure options:

- The wall and rack enclosure with IP65 degree of protection has ATEX and IEC Ex approval
- With its Ex p degree of protection, the pressurized wall unit can be operated in combination with an approved purging unit in Zone 1, with combustible or non-combustible sample gases
- With its Ex nR degree of protection, the gas-proof wall unit can be operated in Zone 2 with sample gases whose concentration is below the lower explosive limit (LEL)
- The 19” rack housing with Ex nA degree of protection can be operated with a suitable outer housing in Zone 2 with combustible or non-combustible gases



SIPROCESS GA700 – ULTRAMAT 7

- For boiler control measurements in incineration plants or process gas measurements in chemical plants
- High measurement accuracy with complex gas mixtures according to dual-beam NDIR method
- Integrated option for interfering gas correction
- Equipped with preventive maintenance function



SIPROCESS GA700 – OXYMAT 7

- For measurement of oxygen concentrations
- Measuring range 0–0.5% (smallest measuring range) or 0–100% (largest measuring range)
- Extremely high measuring accuracy with paramagnetic alternating pressure principle
- For ambient temperatures up to 50 °C

SIPROCESS GA700 – CALOMAT 7

- With thermal conductivity detector for quantitative determination of H_2 and He in binary or quasi-binary gas mixtures
- Wide range of applications with up to three applications per module
- Measuring range 0–0.5% (smallest measuring range) or 0–100% (largest measuring range)

CALOMAT 6

- Suitable for installation in Ex Zone 1 or 2
- For all areas of gas purity measurement up to use in processes for controlling production methods
- Easy integration into the automation network by means of various interfaces and PDM parameter assignment and operation

CALOMAT 62

- For measuring the concentration of gas components such as H_2, Cl_2, HCl or NH_3 in binary or quasi-binary mixtures
- Uses the principle of thermal conductivity (TCD) and is especially designed for measurements in corrosive gases, such as chlorine

FIDAMAT 6

- Measures total hydrocarbon concentration in the air or in gas mixtures with high boiling points
- Ideal solution for almost all measurement needs – from emission control to measurement of hydrocarbon traces in pure gas analyses up to measurement of high hydrocarbon concentrations even in the presence of corrosive gases

OXYMAT 61

- Oxygen analyzer for standard applications
- Can be operated with ambient air as the reference gas that is passed to the analyzer unit by the built-in pump

OXYMAT 64

- Gas analyzer for measurement of very low oxygen concentrations
- For air separation systems or technical gas production

Process gas analysis – Extractive

With extractive measuring procedures, the sample to be analyzed is extracted from the process line and supplied preconditioned to the analyzer via a sample line and a sample preparation system.

ULTRAMAT 23

- For a variety of standard applications, such as emission control, optimization of firing systems or room air monitoring
- Innovative multi-component gas analyzer
- For measuring up to three infrared-sensitive gases by means of the NDIR principle, as well as oxygen through the use of electrochemical or paramagnetic oxygen measuring cells
- Calibration using ambient air eliminates the need for expensive calibration gases
- Also available with installed H_2S sensor for biogas applications

ULTRAMAT 6

- Can be used from emissions monitoring to process control, even with highly corrosive gases
- Analyzer in 19” rack design or field housing
- Measurement of up to four infrared-sensitive components in a single unit

ULTRAMAT/OXYMAT 6

- Combines the features of the ULTRAMAT 6 and OXYMAT 6 in a 19” analyzer
- Extremely space-saving and compact design

Ex versions

- Possible with an additional monitoring unit for CALOMAT, OXYMAT and ULTRAMAT gas analyzers in field housings
- Measurement of non-flammable and flammable gases

SIPROCESS UV600

- Particularly suitable for measurement of very low concentrations of NO, NO_2, SO_2 or H_2S
- UV gas analyzer
- Measurement of up to three components simultaneously
- Simultaneous measurement of NO and NO_2 allows determination of the NO_x total concentration without need for additional devices such as NO_2 converters or CLD analyzers

Process gas analysis – In-situ (TDLS)

In-situ analytical procedures conduct physical measurements directly in the process gas line. In contrast to extractive gas analysis, a sample is not taken. Process data can be generated without contact and in real time.

SITRANS SL

- Reliable measurement of gas concentrations even with values in the zero range through patented technology
- Diode laser gas analyzer for measurement of flue and process gas concentrations in the chemical industry, including in hazardous areas
- Operation directly at sensor with built-in local user interface (LUI)
- Integrated reference cells facilitate "laser locking" completely independent of the process gas concentration, resulting in extremely stable operation, negligible drift and long maintenance intervals
- Ideal for single measurements in harsh environments

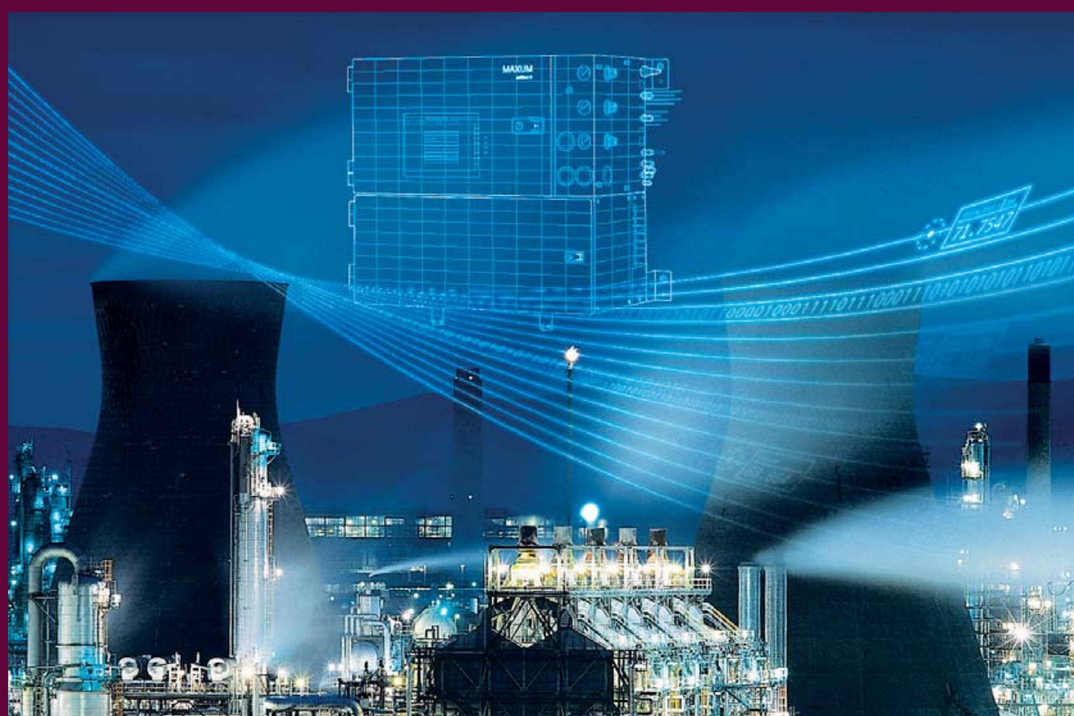
In-situ analytical procedures feature physical measurements within the flow of process gas directly in the actual process gas line. This means gases can also be measured under extreme conditions. Gas measurements with diode lasers are characterized by exceptional selectivity and flexibility. Neither high process temperatures nor high and varying concentrations of particles in the gas influence the quality of the results.

LDS 6

- Combines the compact, maintenance-friendly design, simple operation and network capability of the 6 series analyzers with the proven, exceptional performance of in-situ gas analysis using tunable diode laser spectrometers (TDLS) and fiber optics
- Precise, reliable measurement of gases even under extreme conditions, e.g. up to 1200 °C or with very high dust concentrations
- Measurement of O_2, NH_3, HCl, HF, H_2O, CO or CO_2 in flue gas, e.g. before and after gas purification
- Applications in the chemical and petrochemical industries, in steel and metal production, and in cement and paper plants

Innovative and powerful gas chromatographs

The application of Siemens' MAXUM gas chromatographs provides the user with a number of benefits resulting from our innovative technologies combined with years of experience in the field of process gas chromatography. The flexibility of our products enables us to custom engineer the perfect solution for any application. The powerful and efficient chromatographs solve a wide variety of measuring tasks in a number of sectors such as the chemical, petrochemical, oil and gas, and energy industries.



MAXUM edition II is the result of decades of experience and technological developments. It sets the standard in the industry when it comes to flexibility, versatility and reliability.

- Measures the chemical composition of gases and vaporized liquids
- Meets the requirements for reliable on-line measurement in harsh process environments

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MAXUM edition II

- Areas of application: chemical, oil & gas, water/wastewater, energy and automotive industries
- Extremely rugged with specially designed hardware and software, simultaneous applications, parallel chromatography and reduced analysis times
- With MAXUM modular ovens, parallel chromatography simplifies even the most complex analytical systems and significantly reduces measuring times
- The modular design enables fast maintenance and higher analyzer availability during measurement and process optimization
- Open network with TCP/IP and Ethernet for communication with PC workstations, other chromatographs or a process control system

Analytical application sets trend toward standardization

The same application is required time and again in different branches of industry. To minimize effort, we have developed standardized system solutions for industry-specific applications. These complement the range of individual system solutions. Ready-to-use systems also help minimize the technical risk for customers.

Set CEM CERT

- Reliable, continuous emission measurement of the components CO, NO, NO_2, SO_2, CO_2 and O_2
- Modular analysis system for cold-extractive measuring tasks
- Simple operation and calibration by means of an operator panel integrated in the cabinet door
- The innovative CEMS is tested and certified according to EN 15267 and EN 14181 and is suitable for IED 2010/75/EU applications
- Up to three analyzers possible, based on IR, UV, paramagnetic and electrochemical sensors

Set CEM 1

- Efficient emission measuring system for continuous measurement of CO, NO, NO_2, N_2O, SO_2, CO_2, O_2, HCl, HF, NH_3 and H_2O
- The proven ULTRAMAT 23 and LDS 6 analyzers are at the core of the system
- Attractive price-performance ratio
- High degree of flexibility through system integration of all ULTRAMAT 23 module versions

Set GGA

- The GGA Set is a complete solution for monitoring hydrogen-cooled turbo generators
- Easy handling based on two redundant analyzers
- Cost-efficient solution that is safe to operate and has low initial investment costs
- High-precision and reliable purity monitoring of hydrogen with the CALOMAT 6 analyzer
- Measurement of CO_2 and argon as an inert gas is possible

Set BGA

- The BGA Set is based on the four-component ULTRAMAT 23 gas analyzer with selectable equipment and I/O components
- Safe monitoring and measurement of the major biogas components CH_4 and CO_2 and critical associated components O_2 and H_2S
- TÜV-tested design with high safety standard
- Modular sample preparation for interfacing of multiple measuring points can be configured
- Very rugged and durable industrial design

How key industries benefit from single-source analyzers

Siemens offers a complete service package as well as all measuring instruments to assist you in engineering, designing, supplying, installing and commissioning measurement solutions for complete industrial plants. Our "one-stop shop" concept supports selection of all process instrumentation all the way up to integration with your process control system. Additional industrial components and systems are easily incorporated into the overall plant and ensure smooth process flows. In addition, user-friendly documentation of the plant ensures seamless after-sales service.

Individual solution concepts – Continuous planning from the sampling point, including sample preparation, up to the complete analysis system in a cabinet or large shelter

Overview of our services portfolio:

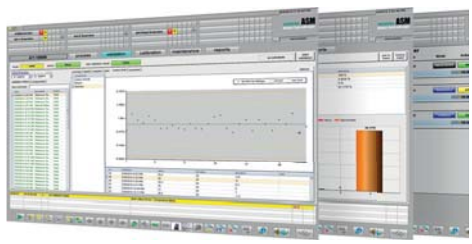
- Customized services and solutions from front-end engineering and design (FEED) all the way to the fully air-conditioned shelter
- Plant engineering and scheduling by an experienced project management team
- Specialists assist you in the selection and utilization of the field instruments
- Support during the approval phase
- Preliminary and detailed planning with state-of-the-art tools and complete documentation
- System assembly and testing in own system houses in the United States, Germany and Singapore
- Experience with all relevant national and international standards
- Commissioning in the field and start-up by specialists all around the world
- Remote maintenance, on-site service, spare parts supplies and goal-oriented training

Keeping a clear overview with the Analyzer System Manager (ASM)

Operators of industrial plants often wonder whether unusual measured values are the result of a plant problem or whether they have been generated by a faulty analyzer. The Analyzer System Manager (ASM) offers comprehensive data collection and validation functions that provide definite pointers to help with this situation.

Historical, current and statistical data indicate the maintenance required for the analyzers and the trustworthiness of the measurement at any time.

Scalable operator control and monitoring system for overseeing and evaluating analyzers, sample preparation systems and analyzer shelters



Operator control and monitoring system for optimizing the analyzer landscape in new and existing plants. PC-based system for monitoring, testing and management of gas analyzers in subsystems or complete plants.

Software
Analyzer System Manager (ASM)

- Collection of important analyzer performance data over a variety of traditional communication interfaces and storage in a central database
- Access to measured value trends, device status data and statistical evaluations, etc. as well as test routines to validate results
- Animated views of sample preparation systems and analysis shelters with status information/measured values of installed sensors
- Comprehensive reporting module is available for evaluation documentation
- State-of-the-art network solutions in a client-server architecture support even complex plant structures with distributed workstations

Extractive continuous process gas analysis

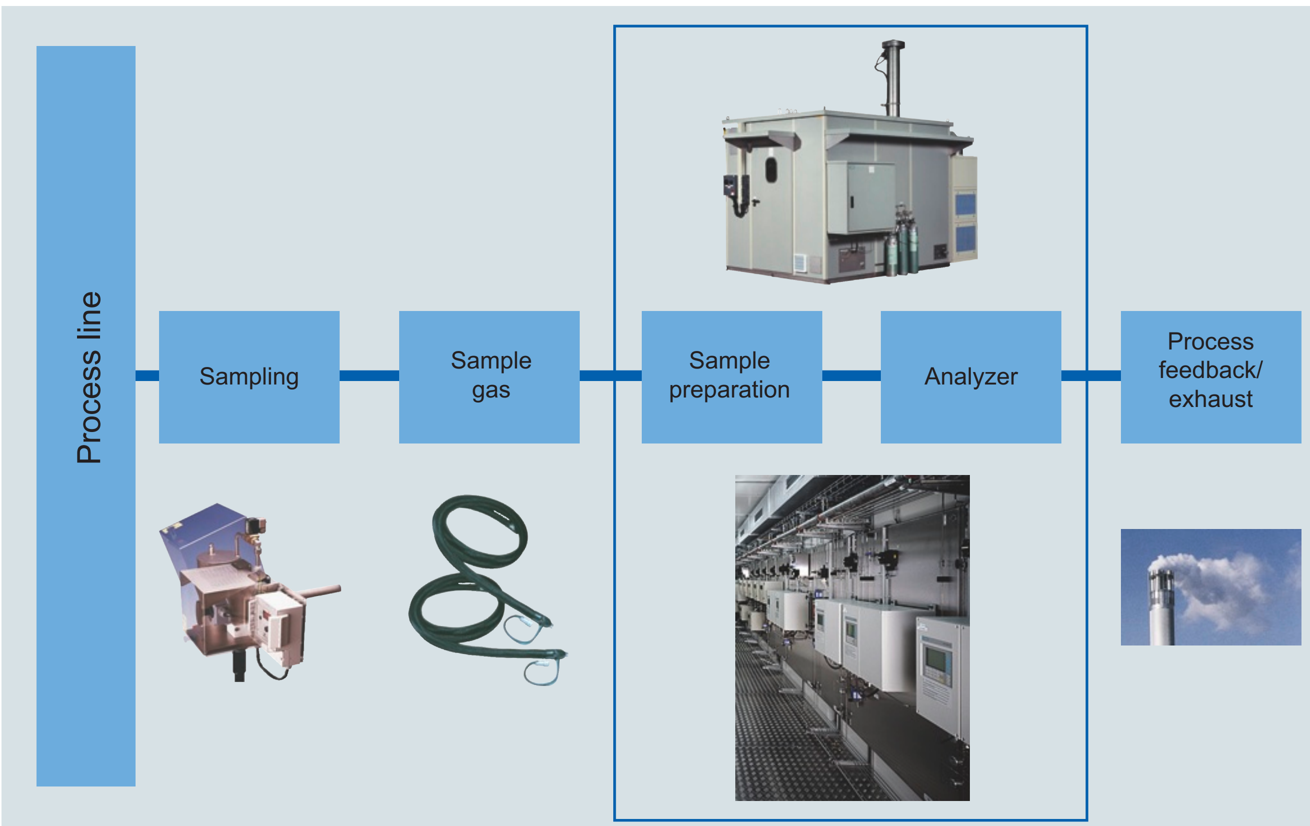
1/2	**Introduction**
1/5	**SIPROCESS GA700**
1/5	Base unit
1/13	ULTRAMAT 7 module
1/21	OXYMAT 7 module
1/31	CALOMAT 7 module
1/37	Parts for SIPROCESS GA700 modules wetted by sample gas
1/38	**Series 6**
	ULTRAMAT 6
1/38	General information
1/45	19" rack unit
1/59	Field device
1/70	Documentation, suggestions for spare parts
	ULTRAMAT/OXYMAT 6
1/71	General information
1/80	19" rack unit
1/93	Documentation
1/94	Suggestions for spare parts
	OXYMAT 6
1/95	General information
1/103	19" rack unit
1/109	Field device
1/117	Documentation
1/118	Suggestions for spare parts
	OXYMAT 61
1/119	General information
1/124	19" rack unit
1/130	Documentation, suggestions for spare parts
	OXYMAT 64
1/131	General information
1/138	19" rack unit
1/144	Documentation, suggestions for spare parts
	CALOMAT 6
1/145	General information
1/150	19" rack unit
1/157	Field device
1/164	Documentation, suggestions for spare parts
	CALOMAT 62
1/165	General information
1/170	19" rack unit
1/176	Field device
1/183	Documentation, suggestions for spare parts
	FIDAMAT 6
1/184	General information
1/190	19" rack unit
1/197	Documentation
1/198	Suggestions for spare parts
1/199	**ULTRAMAT 23**
1/199	General information
1/215	19" rack unit and portable version
1/237	Documentation, suggestions for spare parts
1/238	**SIPROCESS UV600**

Overview

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

Nowadays, the communications capability of analyzers is becoming increasingly important. Siemens process gas analyzers are an integral component of Siemens' "Totally Integrated 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 setup of extractive site installations

Extractive procedures for process gas analysis

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

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

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

SIPROCESS GA700

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

Base unit

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

Modules

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

Module	Measuring task
ULTRAMAT 7	The ULTRAMAT 7 module is used for highly-selective measurement of infrared-active components such as CO, CO_2, NO, CH_4 or SO_2. In general, the field of application ranges from all types of emission measurements to use in processes. These are used to control production processes and guarantee product quality, even in the presence of highly corrosive gases.
OXYMAT 7	The OXYMAT 7 module is used to measure oxygen between 0 to 0.5% (smallest measuring range) and 0 to 100% (largest measuring range). It is designed for use at ambient temperatures up to 50 °C and allows highly exact measurements through application of the paramagnetic alternating pressure principle. Thanks to the modular design, the OXYMAT 7 module can be combined with an additional module.
CALOMAT 7	For determining the concentration of hydrogen and inert gases in digital mixtures through measurement of thermal conductivity. The CALOMAT 7 module features a high dynamic measuring range (e.g. 0 ... 0.5% and 0 ... 100% H_2, configurable) and a short T_{90}time.

Field control unit

The field control unit with Ex-d explosion protection and 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 nonflammable 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, CO_2, NO, SO_2, NH_3, H_2O, CH_4 and other hydrocarbons. The ULTRAMAT 6 is a high-end analyzer in 19" format or in a sturdy field housing for use in harsh atmospheres. In general, the field of application ranges from all types of emission measurements to use in processes. These serve to control production processes and guarantee product quality, even in the presence of highly corrosive gases.

ULTRAMAT 23

The ULTRAMAT 23 is an innovative multi-component gas analyzer for measuring up to three infrared-sensitive gases using the NDIR principle. Use of a UV photometer enables you to measure even smaller concentrations of SO_2 and NO_2. Measurement of oxygen (O_2) is also possible through the use of electrochemical oxygen sensors or measuring cells operating according to the paramagnetic principle ("dumbbell"). The use of an additional electrochemical H_2S measuring cell permits use in biogas applications.

ULTRAMAT/OXYMAT 6

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

OXYMAT 6

For measurement of oxygen concentration according to the paramagnetic principle in complex applications. The OXYMAT 6 measures oxygen according to the paramagnetic alternating pressure principle. This guarantees absolute linearity and allows the use of very small measuring ranges from 0 to 0.5% (detection limit 50 vpm), up to 0 to 100%, and even 99.5 to 100% in one unit.
Suitable materials in the gas path even permit the analyzers to be used for measurement of corrosive gas mixtures. The detector unit does not come into contact with the sample gas, and therefore permits use in harsh atmospheres while simultaneously guaranteeing a long service life.

OXYMAT 61

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

OXYMAT 64

For measurement of oxygen concentrations in the trace range by means of ZrO_2 sensors. The OXYMAT 64 can be used to measure very small traces of oxygen, down to the smallest measuring range of 0 to 10 vpm. This is particularly interesting in systems for air separation. A catalytically inactive ZrO_2 sensor or a catalytically active ZrO_2 sensor can be selected, depending on the application.

CALOMAT 6

For determining the concentration of hydrogen and inert gases in digital mixtures through measurement of thermal conductivity. The CALOMAT 6 features a high dynamic measuring range (e.g. 0 … 1% and 0 … 100% H_2, configurable) and a short T_{90} 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 Cl_2, HCl and NH_3, as well as e.g. H_2 and N_2 in a corrosive atmosphere.

FIDAMAT 6

For measurement of total hydrocarbons according to the flame ionization principle.
The FIDAMAT versions feature a highly varied field of application. From monitoring for traces of hydrocarbons in ultra-pure gases - made possible by the high resolution and small differences in response factors - up to measurements of total hydrocarbons in the % range.
The widely adjustable operating temperature for the sample gas path and detector also allows measurement of high-boiling mixtures and of hydrocarbons at water vapor concentrations up to 100%.

SIPROCESS UV600

Gas analyzer based on UV resonance absorption spectrometry for measuring even very low NO, NO_2, SO_2, and H_2S concentrations.

General information

Introducing flammable gases

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

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

Cross-sensitivity

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

General installation guide and operating instructions

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

Calibration/adjustment

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

Standard	Zero gas N_2 (5.0)
Calibration gas	Sample gas with approx. 60 to 90% of measuring range in residual N_2 (5.0)

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

- Pre-purging of sample gas path via the sample gas inlet with nitrogen (N_2, quality 5.0), duration: min. 1 min, one further minute in addition for each 10 m of sample gas line.
- Calibration gases for zero-point calibration (ULTRAMAT 6, OXYMAT 6, CALOMAT 6, OXYMAT 7, OXYMAT 7, CALOMAT 7)
  Sufficient supply of inert gas via the sample gas inlet (free from measured component and free from gases with a cross-interference on the measured component), usually N_2, 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. N_2, quality 5.0)).
- Gases for calibration of the CALOMAT 62
  Since every residual gas (including nitrogen) has a specific thermal conductivity, the gases used for calibrating the zero point and full-scale values of the CALOMAT 62 must take this into account. When calibrating e.g. H_2 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 H_2 in HCl (or a substitute gas) as the span gas.

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

Explosion protection

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

Overview

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

Benefits

The base unit provides:

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

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

Application

Application areas

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

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

Design

19" rack unit

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

Wall-mounted device

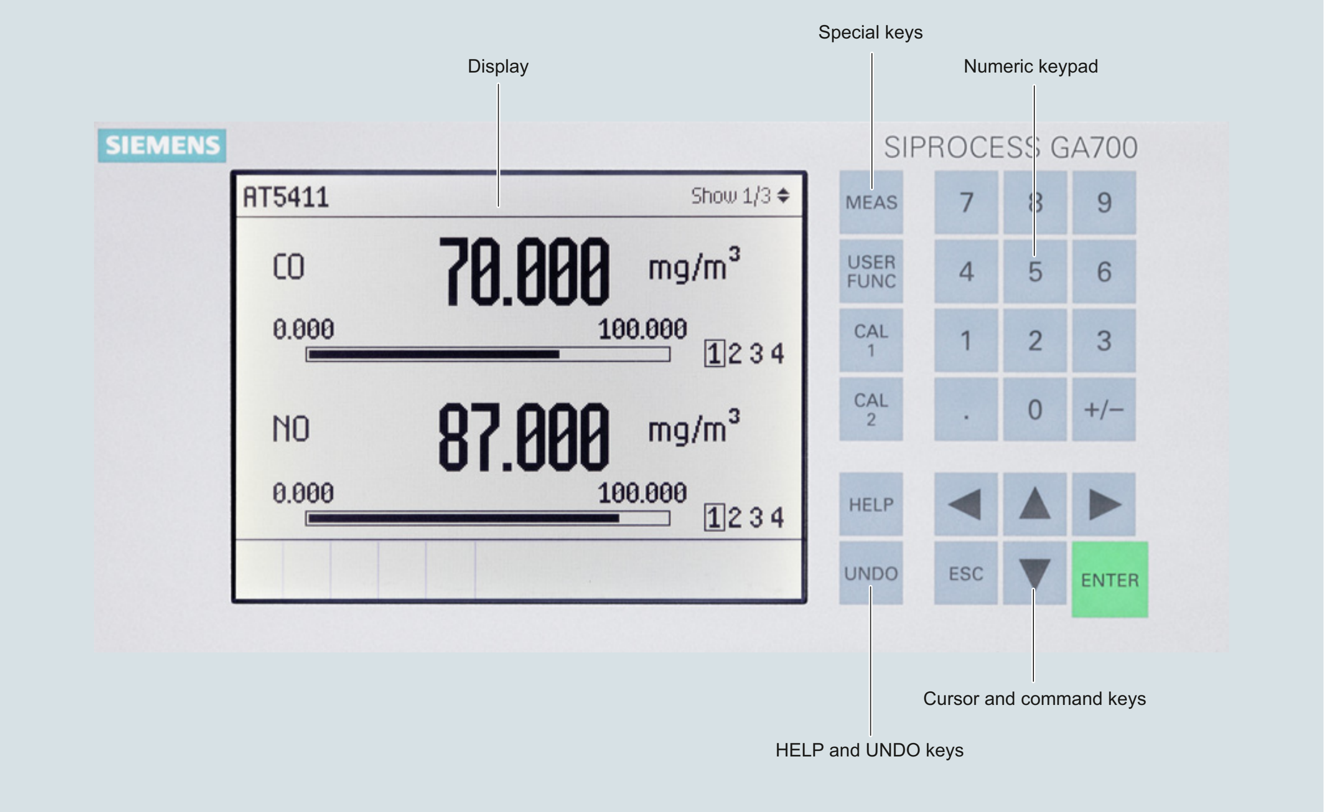
- Gas connections directly on the analyzer module for sample gas inlet and outlet: Pipe union for pipe diameter 6 mm
- Purging gas connections (optional): Pipe diameter 12 mm
- ATEX-/IECEx approval for Zones 1 and 2

Field device

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

Display and control panel

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



Display and operator panel of the SIPROCESS GA700 devices

Inputs and outputs

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

Interface modules

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

Function

Essential characteristics

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

Technical specifications

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

Base unit

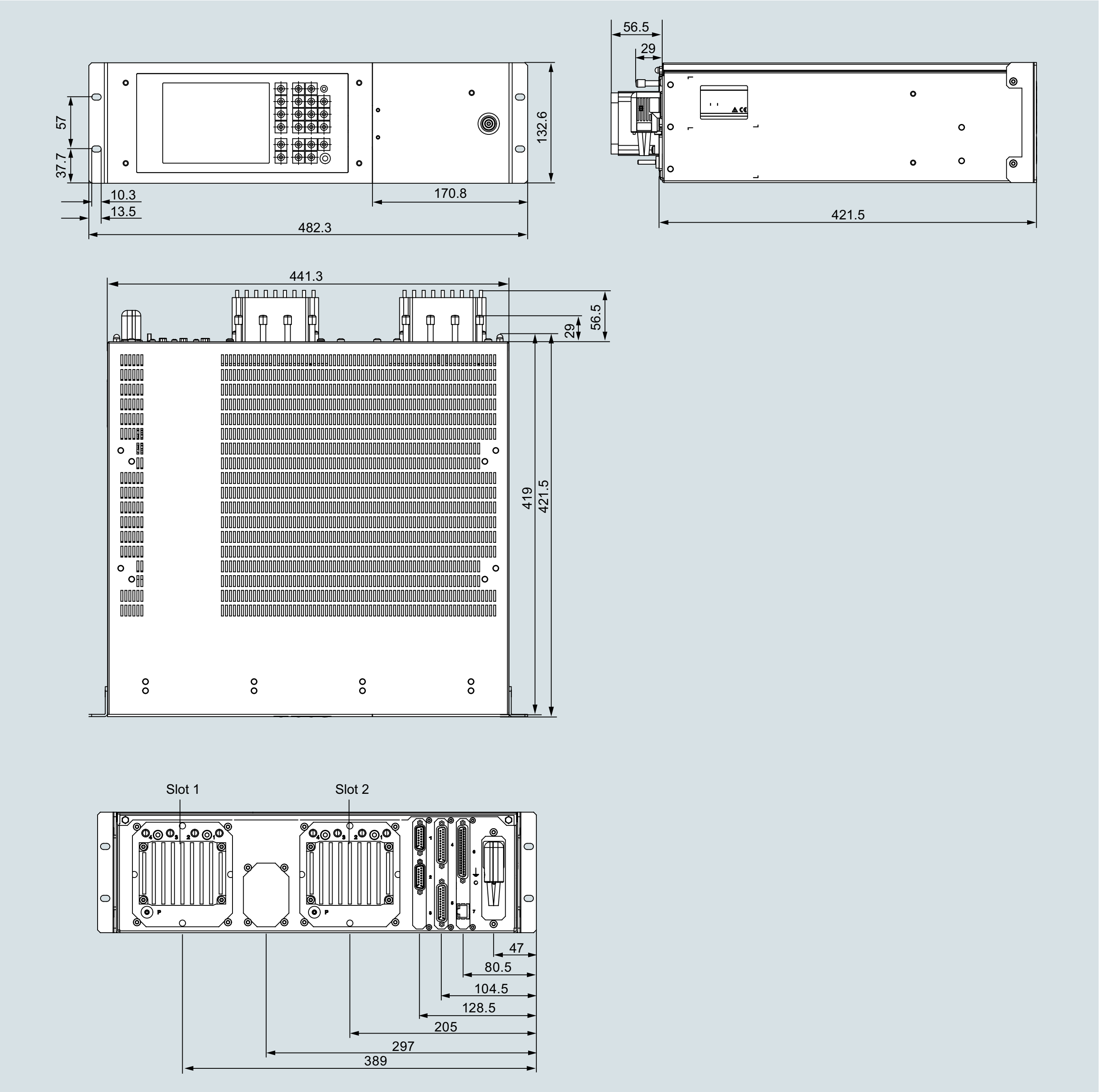
Selection and ordering data

Selection and ordering data		Article No.	Cannot be combined
SIPROCESS GA700		↗ **7MB3000- ■■■0■-■■■0**	
↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.			
Base unit versions			
19"-rack unit enclosure		**0**	**0**
Wall housing		**3**	**3**
Wall housing (bushing with support for shielding)		**4**	**4**
Field control unit, Ex d (including 1 analog output, 5 relay outputs and 5 digital inputs)		**6**	**6**
Module 1 (slot 1)			
Without		**X**	**X X X**
ULTRAMAT 7		**B**	
OXYMAT 7		**C**	
CALOMAT 7		**F**	
Module 2 (slot 2)			
Without		**X**	
ULTRAMAT 7		**B**	**B**
OXYMAT 7		**C**	**C**
CALOMAT 7		**F**	**F**
Interface module 1			
Without		**0**	
Interface module 1.1 (12 relay outputs + 8 digital inputs)		**1**	**1**
Interface module 2			
Without		**0**	
Interface module 2.1 (1 analog output for each component + 3 additional relay outputs for each module)		**1**	**1**
Interface module 2.2 (1 analog output for each component + 4 analog inputs + 4 additional digital inputs)		**2**	**2**
Interface module 2.2 for field control unit (4 analog outputs)		**6**	
Language of the Compact Operating Instructions / Explosion Protection Manuals			
Language of the Compact Operating Instructions	Language of the Ex 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**	**M**
	• Estonian, Latvian, Lithuanian	**N**	**N**
	• Czech, Polish, Slovak	**P**	**P**
	• Romanian, Bulgarian, Greek	**Q**	**Q**
	• Hungarian, Slovenian, Croatian	**R**	**R**
Ex-version			
Standard, operation in non-hazardous zone		**A**	**A A**
Standard, operation in non-hazardous zone with purging gas connection (wall housing only)		**B**	**B B B**
Operation in hazardous zone 2 (ATEX/IECEx approval), flammable or non-flammable gases Ex nA nC ic IIC T4 Gc (19" rack unit only)		**C**	**C C C**
Operation in hazardous zone 2 (ATEX/IECEx approval), non-flammable gases Ex nR ic IIC T4 Gc (wall housing only)		**D**	**D D D**
Operation in hazardous zone 1 and 2 (ATEX/IECEx approval), flammable or non-flammable gases Ex pxb ib IIC T4 Gb, Ex pzc ib IIC T4 Gc (wall housing only)		**E**	**E E E**
Operation in hazardous zone 1, 2, 22 (ATEX/IECEx approval), flammable or non-flammable gases Ex pxb ib IIC T4 Gb, Ex pzc ib IIC T4 Gc, Ex nR ib IIC T4 Gc, Ex pxb ib IIIC T65°C Dc, Ex pzc ib IIIC T65°C Dc, Ex tc ib IIIC T65°C Dc (wall housing only)		**G**	**G G G**
Setup in hazardous zone 1 and 2 (ATEX/IECEx approval) for flammable or non-flammable gases (for Ex d only)		**H**	

Selection and ordering data

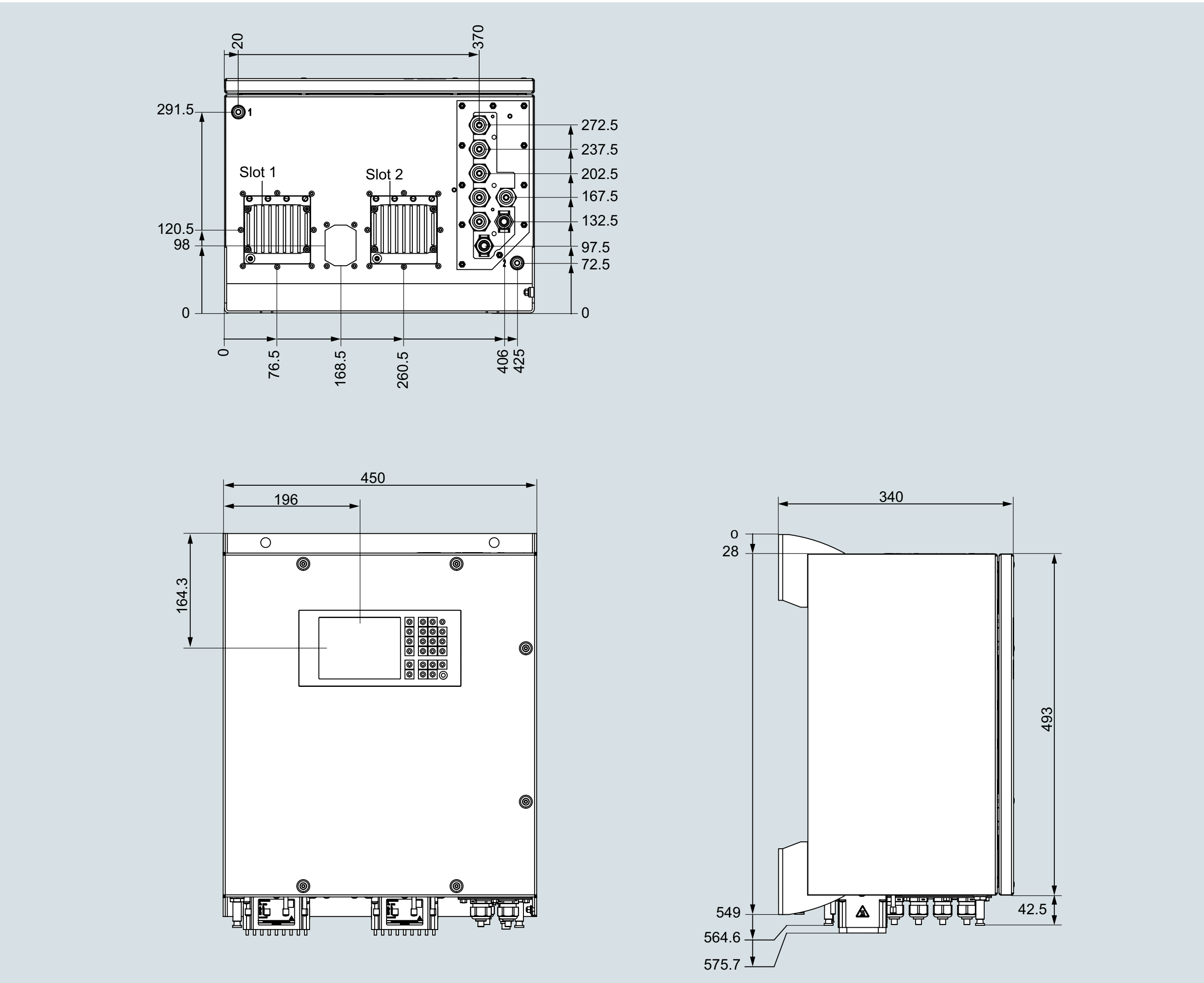
Additional versions	Order Code
Add "**-Z**" to Article No. and specify Order code	
TAG labels (specific inscription based on customer information)	**B03**
Base unit module assignment number	**D00 ... D99**

Dimensional drawings

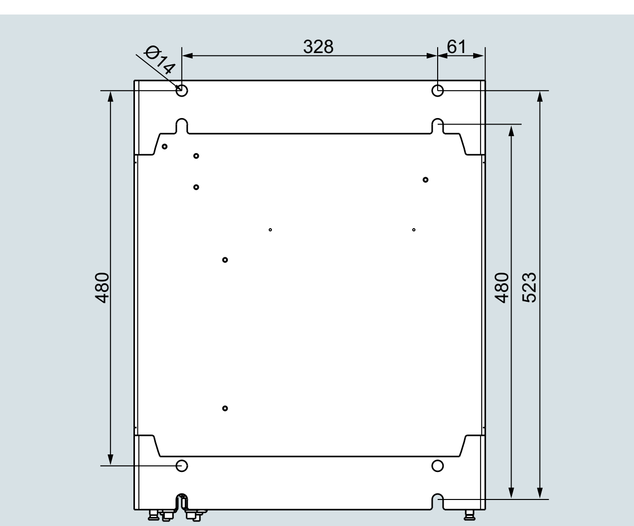


SIPROCESS GA700, rack unit, dimensions in mm

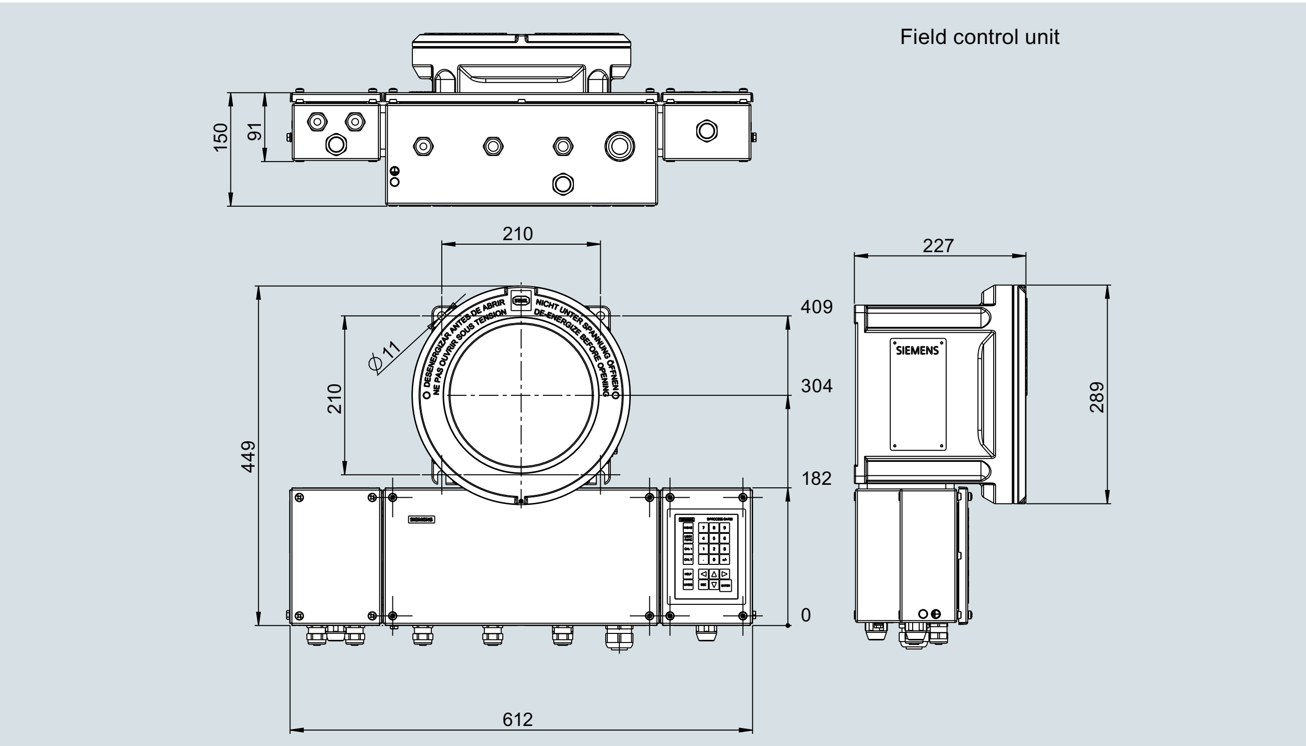
Base unit



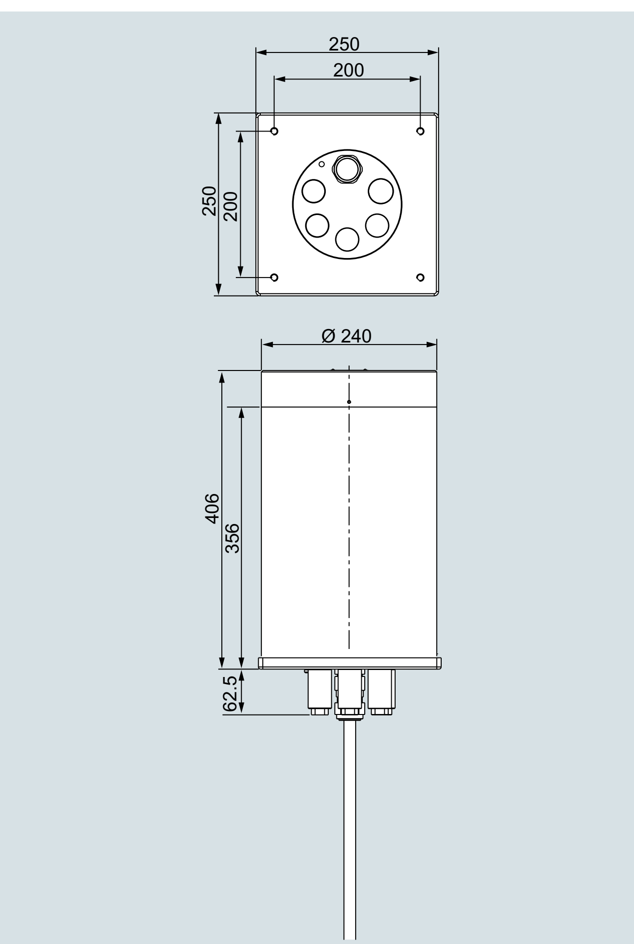
SIPROCESS GA700, wall enclosure, dimensions in mm



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



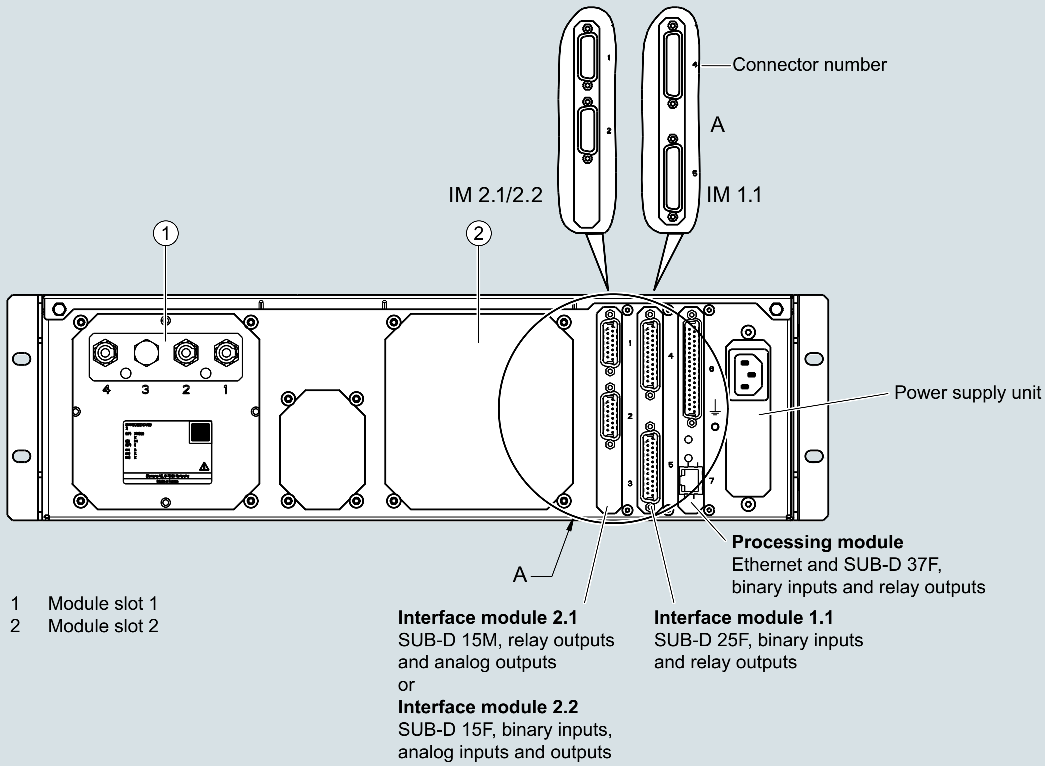
SIPROCESS GA700, field control unit, dimensions in mm



SIPROCESS GA700, field module, dimensions in mm

Circuit diagrams

Connection of the signal cables



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

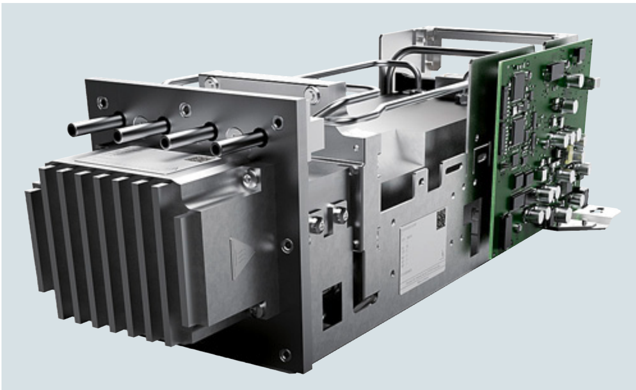
Possible combinations

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

The following restrictions must be observed:

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

Overview



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

Benefits

High selectivity due to double-layer detector
- Reliable measurements even in complex gas mixtures

Low detection limits
- Measurements with low concentrations

Analyzer cells can be cleaned as required on site
- Cost savings due to reuse after contamination

Corrosion-resistant materials in gas path (option)
- Measurement of highly corrosive gases possible

Application

Application areas

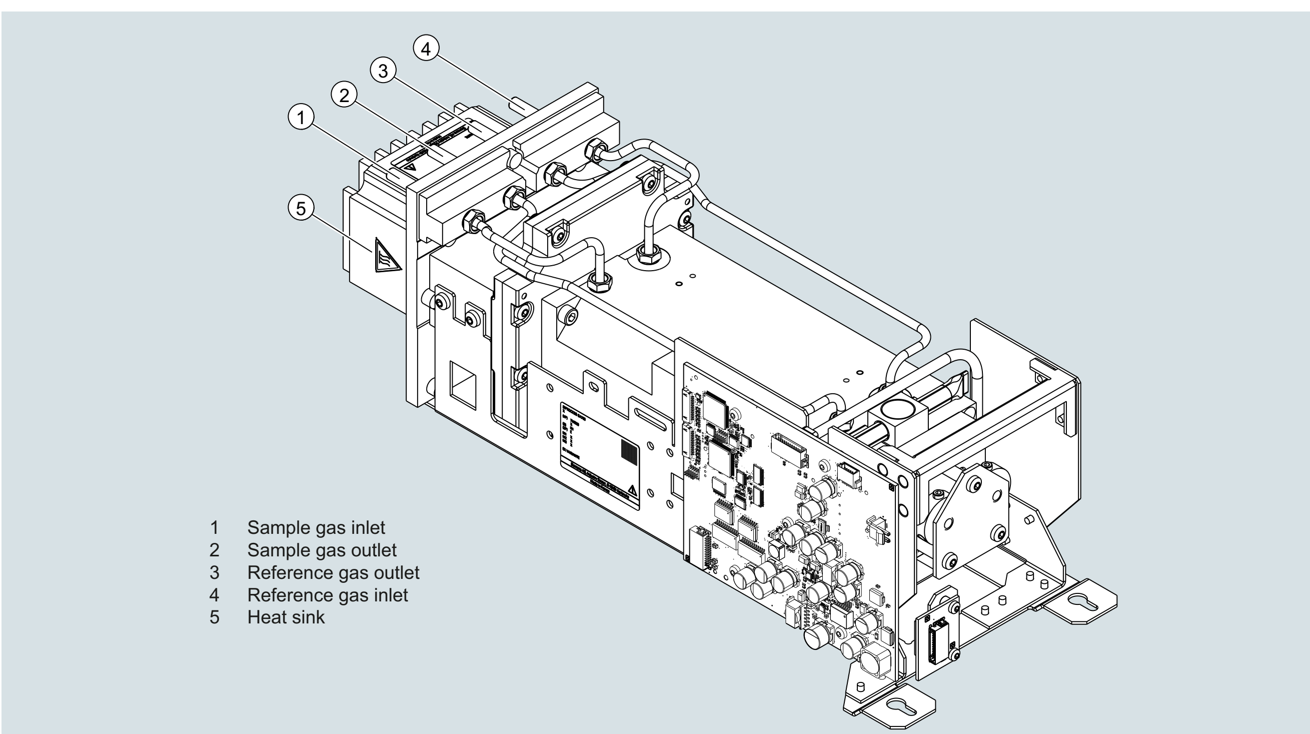
- Measurement for boiler control in incineration plants
- Process gas concentrations in chemical plants
- Trace measurements in pure gas processes
- Environmental protection
- TLV (Threshold Limit Value) monitoring at the workplace
- Quality monitoring
- introduction of flammable gases possible

Special versions

Flow-type reference compartment

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

Design



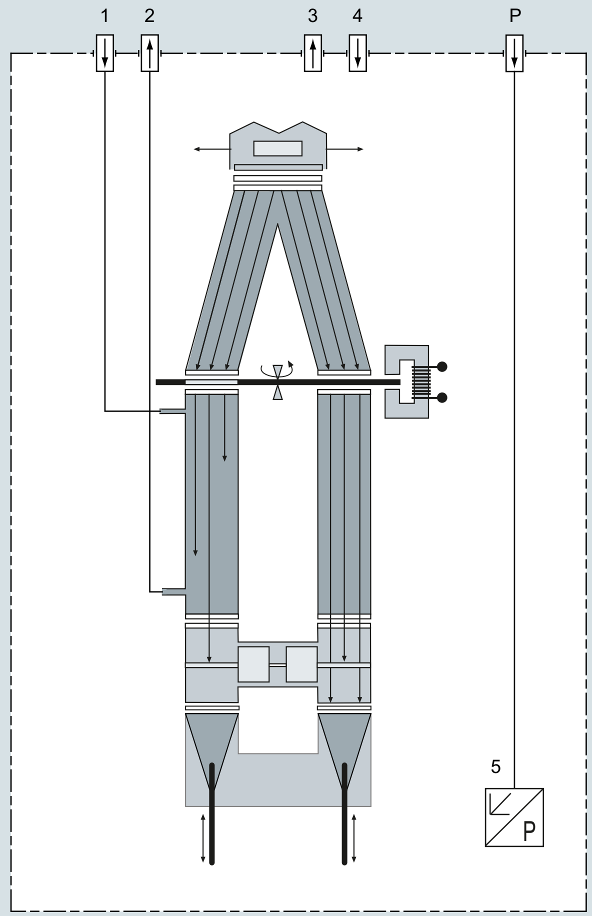
Structure of ULTRAMAT 7

Extractive continuous process gas analysis
SIPROCESS GA700

1

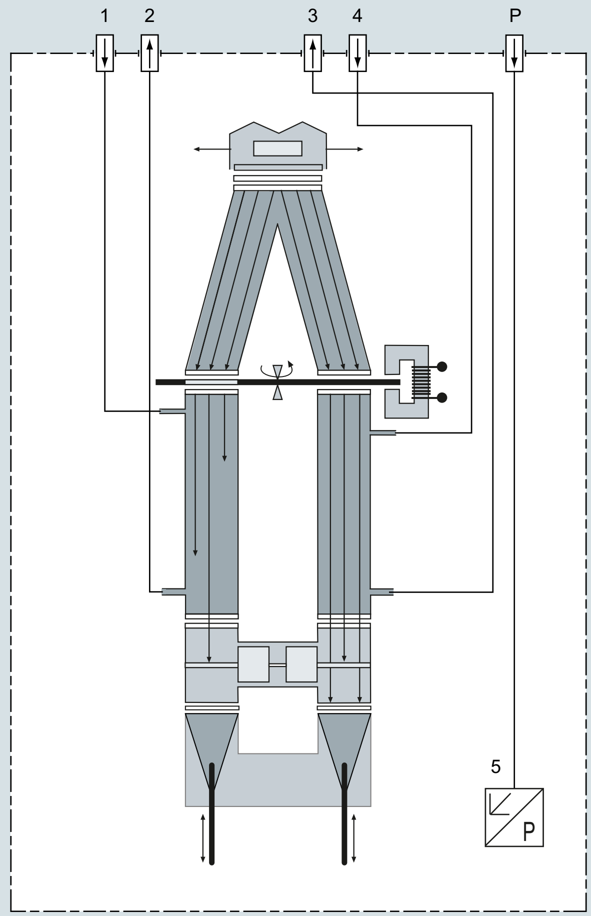
ULTRAMAT 7 module

Gas path



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

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



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

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

Mode of operation

Measuring principle

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

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

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

Principle of operation

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

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

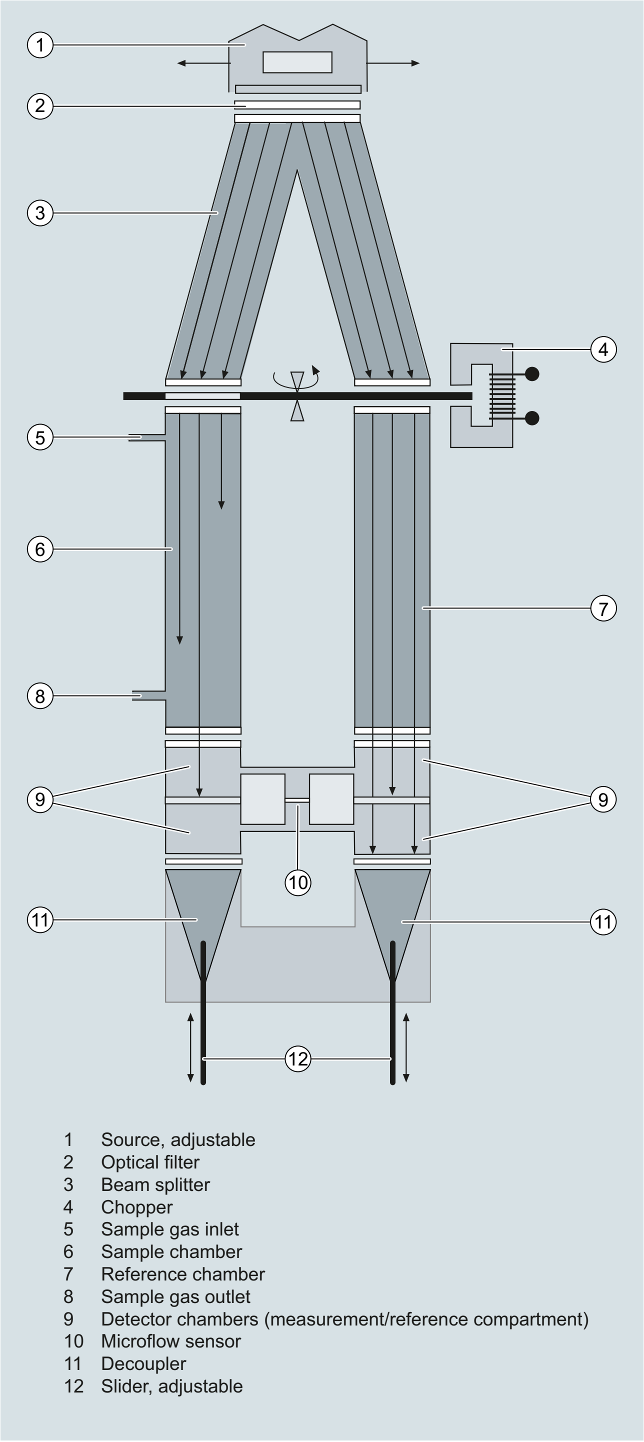
The chopper produces a periodic modulation of the infrared radiation, and thus enables relaxation of the detector.

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

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

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

The weighting between the first and second detector layer is preset at the factory depending on the application. 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.



ULTRAMAT 7, principle of operation of the infrared channel

Essential characteristics

- Dimension of measured value freely selectable (e.g. vpm, mg/m^3)
- Four freely-configurable measuring ranges per component
- Measuring ranges with suppressed zero point possible
- Measuring range identification
- Autoranging or manual measurement range switchover possible; remote switching is also possible
- Differential measuring ranges with flow-type reference cell
- Storage of measured values possible during adjustments
- Time constants selectable within wide limits (static/dynamic noise suppression); i.e. the response time of the analyzer or component can be matched to the respective measuring task
- Short response time
- Low long-term drift
- Measuring point switchover for up to 4 measuring points (programmable)
- Measuring point identification
- Internal pressure sensor for correction of atmospheric pressure fluctuations in the range 700 to 1 200 hPa absolute
- Automatic measuring range calibration can be configured
- Operation based on NAMUR recommendation
- Preventive maintenance / IR source monitoring
- Sample chamber for use in presence of highly corrosive sample gases, e.g. tantalum inlay sheet or Hastelloy C22 (special application)

Technical specifications

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

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

Ambient temperature	25 °C
Atmospheric pressure	Atmospheric (approx. 1 000 hPa)
Sample gas flow	0.6 l/min (or Nl/min)
Sample gas humidity	Dew point < -40 °C
Site of installation	Vibration- and impact-free
General information	
Weight	Max. 5.2 kg (standard version)
Measuring ranges	
Number of measuring ranges	Max. 4; parameters can be assigned freely
Parameters can be assigned in the measuring ranges	
• Smallest possible measuring span	CO: 0 ... 10 vpm
	CO_2: 0 ... 5 vpm
	CH_4: 0 ... 50 vpm
	C_2H_4: 0 ... 300 vpm
	SO_2: 0 ... 50 vpm
	NO: 0 ... 100 vpm
	N_2O: 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_2H_4: 0 ... 100%
	SO_2: 0 ... 100%
	NO: 0 ... 30 000 vpm
	N_2O: 0 ... 100%
	NH_3: 0 ... 100%
	CO/NO: 0 ... 10 000 vpm
	CO_2/CO: 0 ... 100%
Gas inlet conditions	
Sample gas pressure	
• Standard pressure (atmospheric pressure compensation)	500 to 1 500 hPa (absolute)
Pressure drop between sample gas inlet and sample gas outlet	< 10 hPa at 1.5 l/min
Sample gas flow	18 … 90 l/h (0.3 … 1.5 l/min)
Sample gas temperature	0 to 50 °C
Sample gas humidity (rel. humidity)	< 90% (condensation inside the gas path is to be avoided)
Dynamic response	
Warm-up period at room temperature	< 2 h
Response characteristics	
• Dead time (T_{10})	Application-specific (max. 3.6 s)
• Signal rise time (T_r) or fall time (T_f) with application-specific electronic damping of 10 s	Application specific < 14 s
• Time for device-internal signal processing T_v	Approx. 1 s
• Delayed display T_{90}	Rule: $T_{90} < T_{10} + T_{r/f} + T_v$

Measuring response	
Output signal fluctuation	≤ ± 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
Repeatability	≤ ± 1% of the current full-scale value
Linearity error	< ± 0.5% of the current full-scale 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 full-scale value/ 0.1 l/min change in flow
Supply voltage	≤ 0.1% of the current measuring range (with the nominal range of use)
Electrical outputs	
Analog and digital interfaces	See base unit
Climatic conditions	
Storage and transport	-30 ... 70 °C
Permissible ambient temperature (during operation in base unit)[1)]	5 ... 45 °C
Relative humidity (RH) during storage, transport or operation	< 90% (condensation from the installed components is to be avoided)
Gas connections	
Connection fittings	Pipe connection with 6 mm outer diameter
Materials of wetted parts	
Bushing	Stainless steel mat. no. 1.4571, Hastelloy C22
Pipe	Stainless steel mat. no. 1.4571, Hastelloy C22, O-ring: FKM (e.g. Viton) or FFKM (Kalrez 6375)
Sample chamber	
• Body	Aluminum
• Lining	Aluminum, tantalum
• Window	CaF_2, adhesive: E353, O-ring: FKM (e.g. Viton) or FFKM (Kalrez 6375)

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

1

ULTRAMAT 7 module

Selection and ordering data		Article No.	Cannot be combined
ULTRAMAT 7 module For measuring IR-absorbing gases		7MB3010- ■■■■■ - ■A■■	
↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.			
Module version			
Standard module for 19" rack unit and wall housing		0	
Measured components[1]	Possible with measuring range identification		
CO	B[2], C ... P	A	A
CO_2	A[2], B ... P	C	
CH_4	D[2], E ... P	D	D
C_2H_4	F[2], G... P	E	E
SO_2	D[2], E... P	F	F
NO	E[2], F ... P	G	G
N_2O	D[2], E ... P	H	H
NH_3 (dry)	E[2], F ... P	J	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	A A A A A A A
0 ... 10 vpm	0 ... 200 vpm	B	B B B B B B
0 ... 20 vpm	0 ... 400 vpm	C	C C C C C C
0 ... 50 vpm	0 ... 1 000 vpm	D	D D D
0 ... 100 vpm	0 ... 1 000 vpm	E	E
0 ... 300 vpm	0 ... 3 000 vpm	F	
0 ... 500 vpm	0 ... 5 000 vpm	G	
0 ... 1 000 vpm	0 ... 10 000 vpm	H	
0 ... 3 000 vpm	0 ... 30 000 vpm	J	
0 ... 5 000 vpm	0 ... 50 000 vpm	K	K
0 ... 1 %	0 ... 10 %	L	L
0 ... 3 %	0 ... 30 %	M	M
0 ... 5 %	0 ... 50 %	N	N
0 ... 10 %	0 ... 100 %	P	P
0 ... 100 vpm (CO), 0 ... 300 vpm (NO)	0 ... 1 000 vpm CO, NO	R	R
0 ... 300 vpm (CO), 0 ... 500 vpm (NO)	0 ... 3 000 vpm CO, NO	S	S
Gas path			
Material of gas path	Material of sample chamber		
Pipe made of stainless steel	with aluminum lining	1	
Pipe made of stainless steel	with tantalum lining[3]	2	
Pipe made of Hastelloy	with tantalum lining[3]	3	
Reference chamber			
Non-flow-type		0	
Flow-type		1	
Pressure compensation			
Atmospheric pressure compensation		0	
Module variant			
For rack-mounted enclosure		A	
For wall enclosure		B	
Version			
Standard		0	

1) C_2H_2, C_2H_6, C_3H_6, C_3H_8, C_4H_6, C_4H_{10}, C_6H_{14}, H_2O, possible as special application 7MB3017..
2) Not possible in combination with an OXYMAT 7 module.
3) Only for cell length 20 ... 180 mm.

Selection and ordering data

Additional versions	Order Code
Add "-**Z**" to Article No. and specify Order code	
Settings	
Kalrez (6375) seals in sample gas path	**B04**
Clean for O_2 service (specially cleaned gas path)	**B06**
Measuring range indication in plain text, if different from the default setting	**Y11**
Special setting (only together with an application no., e.g. extended measuring range)	**Y12**
Extended special setting (only together with an application no., e.g. determination of cross-interferences)	**Y13**
Base unit module assignment number	**D00 ... D99**

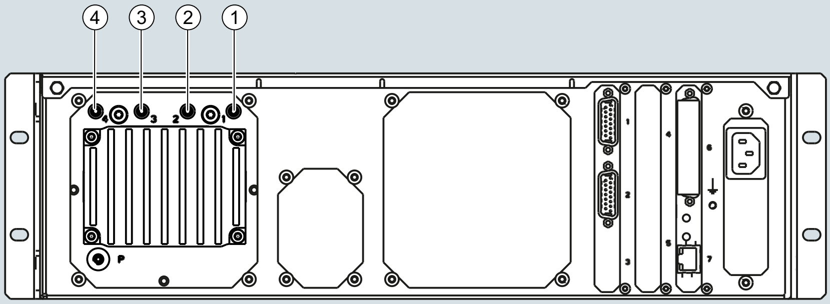
Ordering example

ULTRAMAT 7 module installed in rack unit enclosure
7MB3000-0BX00-1AA0-Z+D03
7MB3010-0AB10-0AA0-Z+D03

ULTRAMAT 7 module and rack unit enclosure supplied separately
7MB3000-0BX00-1AA0
7MB3010-0AB10-0AA0

Circuit diagrams

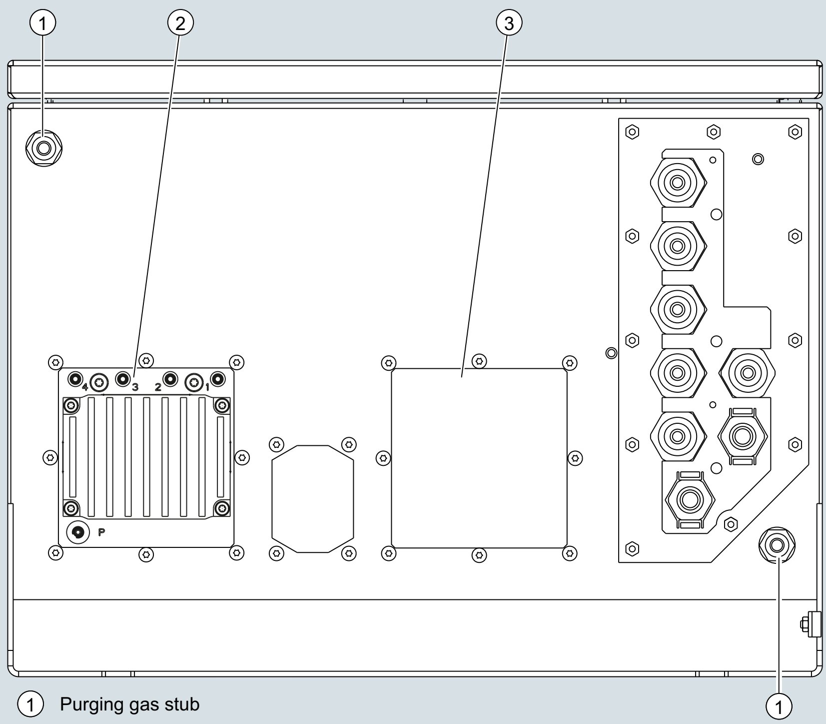
Gas connections



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

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

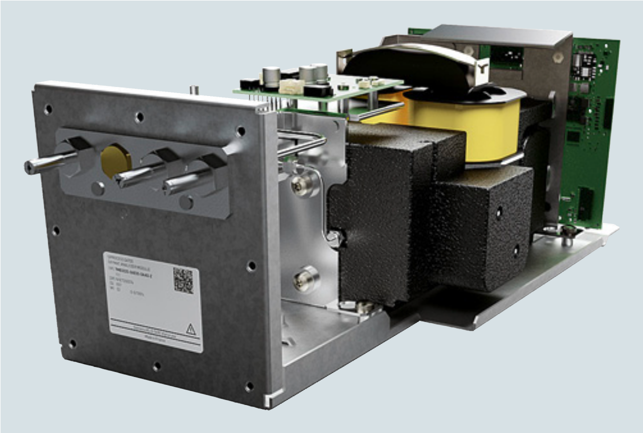
Wall-mounted device



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

Wall-mounted device, bottom

Overview



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

Benefits

Paramagnetic alternating pressure principle

- Small measuring ranges (0 to 0.5% or 99.5 to 100% O_2)
- Absolute linearity

Detector element has no contact with the sample gas

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

Physically suppressed zero point possible, e.g. in the measuring range 98% or 99.5% to 100% O_2

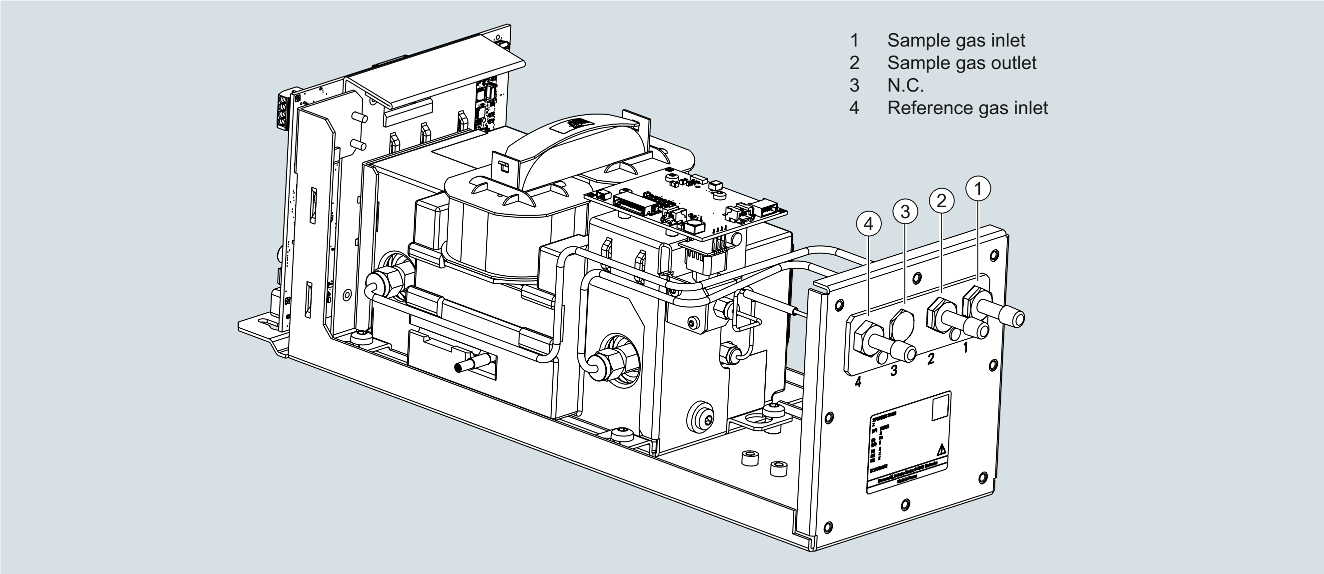
Ex (p) for Zones 1 and 2 according to ATEX-/IECEx approval, introduction of flammable gases possible

Application

Application areas

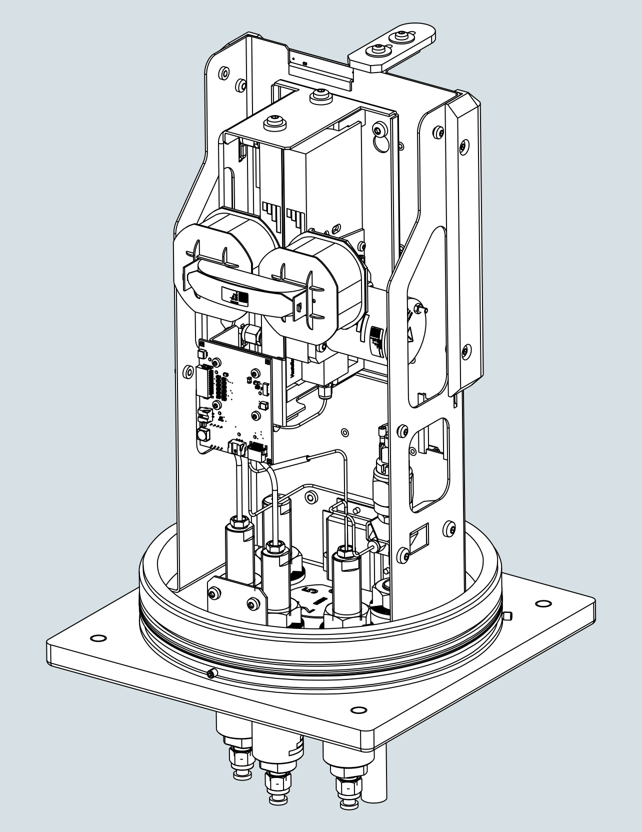
- For boiler control in incineration plants
- In chemical plants
- For ultra-pure gas quality monitoring
- In environmental protection
- For quality control
- Purity control/air separator
- Versions for analyzing flammable and non-flammable gases or vapors for use in hazardous areas

Design



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

OXYMAT 7 module

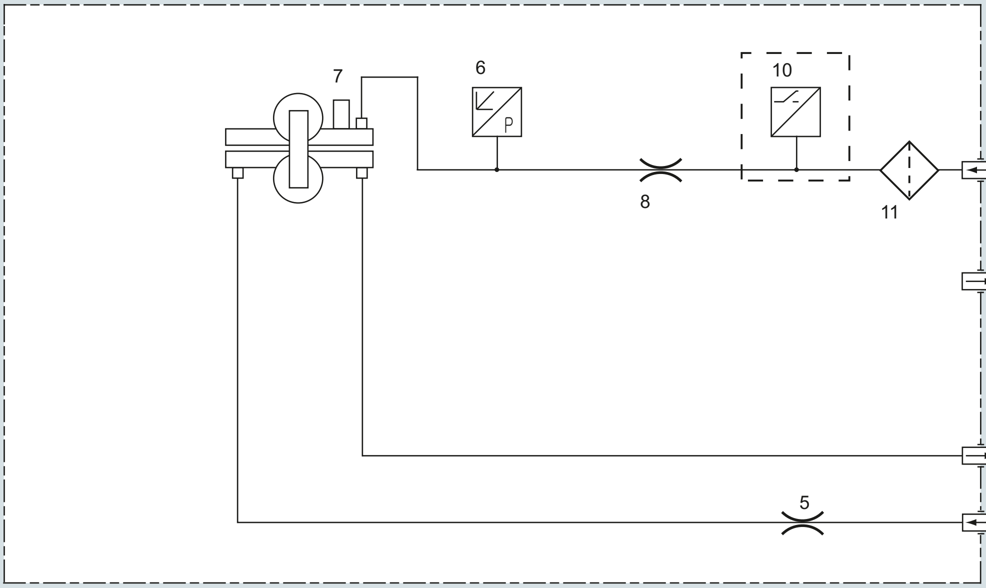


Structure of high-pressure version, field module, sample gas path with pipes

Gas path

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

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

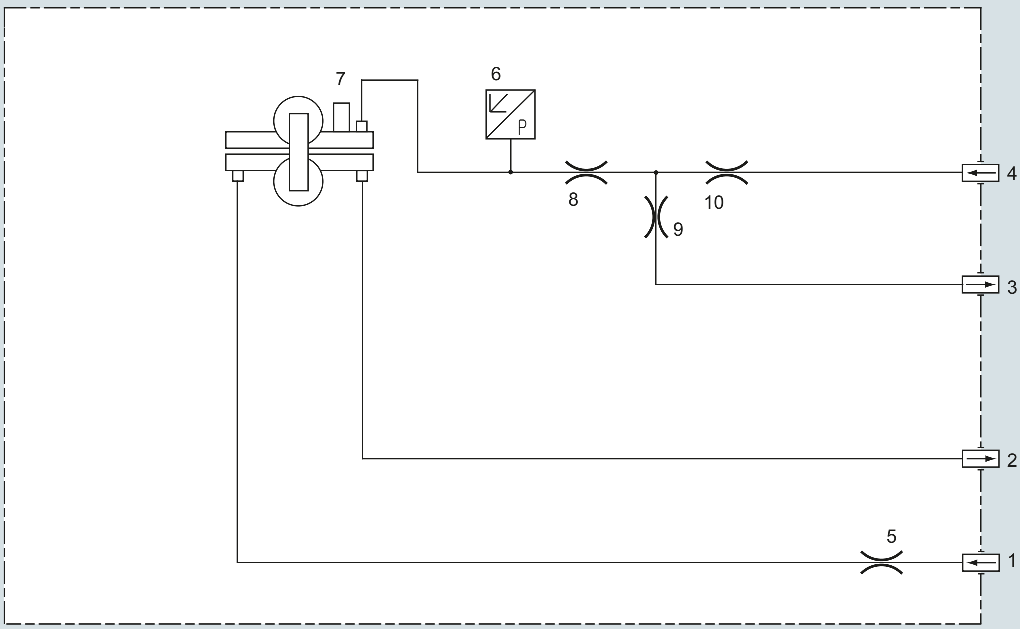


1 Sample gas inlet
2 Sample gas outlet
3 N. C.
4 Reference gas inlet
5 Sample gas restrictor
6 Pressure sensor p for sample gas pressure
7 Analyzer unit
8 Reference gas restrictor
10 Pressure switch for reference gas monitoring (optional)
11 Reference gas fine filter

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

Low-pressure version with external reference gas pump

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



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

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

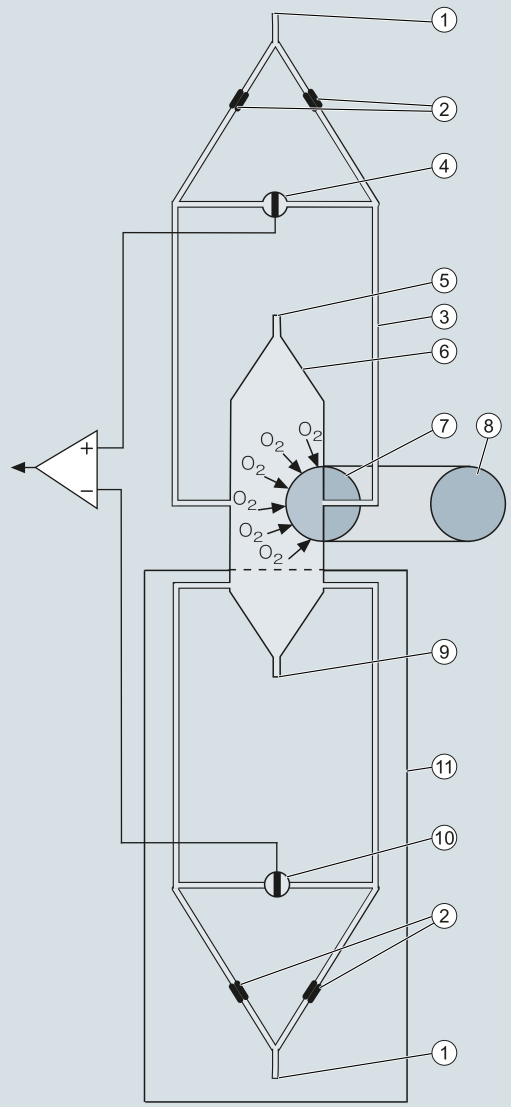
The oscillating magnetic field (8) means that the basic flow at the microflow sensor is not detected. The measurement is, thus, independent of the module's operating position or the position of the sample chamber.

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.



1 Reference gas inlet
2 Restrictors
3 Reference gas channels
4 Microflow sensor for measured signal
5 Sample gas inlet
6 Sample chamber
7 Source of the paramagnetic measuring effect
8 Electromagnet with alternating current strength
9 Sample gas and reference gas outlet
10 Microflow sensor in the vibration compensation system (order variant)
11 Compensation circuit (optional)

OXYMAT 7, principle of operation

Essential characteristics

Technical features

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

- Smallest measuring spans (up to 0.5% O_2) possible
- Measuring ranges with physically suppressed zero points possible (e.g. 99.5% to 100%)
- Short response time
- Low long-term drift
- Monitoring of reference gas pressure with reference gas connection 2 500 to 5 000 hPa (abs.) (option): reference gas pressure must be 2 000 ± 150 hPa higher than the sample gas pressure.

Features

- Internal pressure sensor for correction of pressure variations in sample gas in the range from 500 to 2 500 hPa (absolute)
- External pressure sensor - only with piping as the gas path - can be connected for correction of variations in the sample gas pressure up to 3 000 hPa absolute (option)
- Monitoring of reference gas (option)
- Analysis part with flow-type compensation circuit as an order variant for reducing the vibration impact at the installation site
- For sample gas path with hoses: Connection cable to the pressure sensor with hoses
- Hardware adapted to application
- Customer-specific analyzer options such as:
  - Clean for O_2 service (specially cleaned gas path)
  - Kalrez-6375 seals

Reference gases

Measuring range	Recommended reference gas	Reference gas connection pressure	Comments
0 to ... vol.% O_2	N_2	2 000 … 4 000 hPa above sample gas pressure (max. 5 000 hPa absolute)	The reference gas flow is set automatically to 5 … 10 ml/min (up to 20 ml/min with flow-type compensation branch)
... to 100 vol.% O_2 (suppressed zero point with full-scale value 100 vol.% O_2)	O_2		
Around 21 vol.% O_2 (suppressed zero point with 21 vol.% O_2 within the measuring span)	Air	100 hPa with respect to sample gas pressure, which may vary by max. 50 hPa around the atmospheric pressure	

Table 1: Reference gases for OXYMAT 7

Correction of zero-point error/cross-sensitivities

Accompanying gas (concentration 100 vol.%)	Zero point deviation in vol.% O_2 absolute
Organic gases	
Ethane C_2H_6	-0.49
Ethene (ethylene) C_2H_4	-0.22
Ethine (acetylene) C_2H_2	-0.29
1.2 butadiene C_4H_6	-0.65
1.3 butadiene C_4H_6	-0.49
n-butane C_4H_{10}	-1.26
iso-butane C_4H_{10}	-1.30
1-butene C_4H_8	-0.96
iso-butene C_4H_8	-1.06
Dichlorodifluoromethane (R12) CCl_2F_2	-1.32
Acetic acid CH_3COOH	-0.64
n-heptane C_7H_{16}	-2.40
n-hexane C_6H_{14}	-2.02
Cyclo-hexane C_6H_{12}	-1.84
Methane CH_4	-0.18
Methanol CH_3OH	-0.31
n-octane C_8H_{18}	-2.78
n-pentane C_5H_{12}	-1.68
iso-pentane C_5H_{12}	-1.49
Propane C_3H_8	-0.87
Propylene C_3H_6	-0.64
Trichlorofluoromethane (R11) CCl_3F	-1.63
Vinyl chloride C_2H_3Cl	-0.77
Vinyl fluoride C_2H_3F	-0.55
1.1 vinylidene chloride $C_2H_2Cl_2$	-1.22
Inert gases	
Helium He	+0.33
Neon Ne	+0.17
Argon Ar	-0.25
Krypton Kr	-0.55
Xenon Xe	-1.05
Inorganic gases	
Ammonia NH_3	-0.20
Hydrogen bromide HBr	-0.76
Chlorine Cl_2	-0.94
Hydrogen chloride HCl	-0.35
Dinitrogen monoxide N_2O	-0.23
Hydrogen fluoride HF	+0.10
Hydrogen iodide HI	-1.19
Carbon dioxide CO_2	-0.30
Carbon monoxide CO	+0.07
Nitrogen oxide NO	+42.94
Nitrogen N_2	0.00
Nitrogen dioxide NO_2	+20.00
Sulfur dioxide SO_2	-0.20
Sulfur hexafluoride SF_6	-1.05
Hydrogen sulfide H_2S	-0.44
Water H_2O	-0.03
Hydrogen H_2	+0.26

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

Conversion to other temperatures:

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

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

All diamagnetic gases have a negative deviation from zero point.

Technical specifications

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

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

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

General information	
Weight	Approx. 5.5 kg (standard version)
Measuring ranges	
Number of measuring ranges	Max. 4; parameters can be assigned freely
Parameters can be assigned in the measuring ranges	
• Smallest possible measuring spans	0.5%, 1%, 2% or 5% 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 … 3 000 hPa (abs.); briefly < 5 000 hPa (abs.)
• Field module	
- For non-combustible gases	500 … 2 500 hPa (abs.)
- For combustible gases up to gas mixtures which are occasionally explosive	800 … 1 100 hPa (abs.)
Reference gas pressure	
• High-pressure connection	2000 hPA above sample gas pressure (within permitted reference gas pressure range 2500 to 5000 hPa, abs.)
• Low-pressure connection with external reference gas pump	100 hPa above sample gas pressure
Pressure drop between sample gas inlet and sample gas outlet	< 100 hPa at 1 l/min
Sample gas flow	18 … 60 l/h (0.3 … 1 l/min)
Sample gas temperature	0 … 60 °C
Sample gas humidity (rel. humidity)	< 90% (condensation inside the gas path is to be avoided)
Sample chamber temperature	
Standard version	Approx. 72 °C
Time response	
Warm-up period at room temperature	< 2 h
Response characteristics	
• Display delay 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 suppression of 5% / 10 s	≤ ±0.5% of smallest measuring span (noise bandwidth corresponds to 1% = 6σ value or 0.333% = 2σ value), with vibration compensation activated: < 1.5 times the value
Detection limit	≤ 1% of smallest measuring span according to nameplate (with vibration compensation activated: < 1.5 times the value)

Measured-value drift	
• At the zero point	≤ ±0.5% of the smallest span/month or ≤ ±50 vpm O_2/month, whichever is greater
• For span gas	≤ ±0.5% of the current measuring span/month or ≤ ±50 vpm O_2/month, whichever is greater
Repeatability	
• At the zero point	≤ ±0.5% of the smallest measuring span/month or ≤ ±50 vpm O_2/month, whichever is greater
• For span gas	d≤ ±0.5% of the current measuring span/month or ≤ ±50 vpm O_2, whichever is greater
Linearity error with dry ambient air[1]	< 0.1%
Influencing variables	
Ambient temperature	
• Deviation at zero point	≤ 0.5% of the smallest measuring span / 10 K or ≤ 50 vpm O_2/10 K, whichever is greater
• Deviation of the span gas	≤ 0.5% of the current measuring span / 10 K or ≤ 50 vpm O_2/10 K, whichever is greater
Sample gas pressure	
• Deviation at zero point	≤ 0.2% of the smallest measuring span / 1% pressure variation or ≤ 50 vpm O_2/1% pressure variation, whichever is greater
• Deviation of the span gas	≤ 0.2% of the current measuring span / 1% pressure variation or ≤ 50 vpm O_2/1% pressure variation, whichever is greater
Sample gas flow	
• Deviation at zero point	≤ 1% of smallest measuring span per 0.1 l/min change in flow or ≤ 50 vpm O_2 per 0.1 l/min change in flow within the permissible flow range (0.3 to 1 l/min), whichever is greater
• Deviation of the span gas	≤ 1% of current measuring span per 0.1 l/min change in flow or ≤ 50 vpm O_2 per 0.1 l/min change in flow within the permissible flow range (0.3 to 1 l/min), whichever is greater
Accompanying gases	Zero point deviation (cross-sensitivity) in accordance with Table A.1 of EN 61207-3
Supply voltage	< 0.1% of the current measuring span (within the nominal range of use)
Electrical inputs and outputs	
Analog and digital interfaces	See base unit
Gas connections	
Connection fittings	Pipe connection with 6 mm outer diameter
Climatic conditions	
Storage and transport	-30 ...70 °C
Permissible ambient temperature[2]	0 ... 50 °C
Relative humidity (RH) during storage, transport or operation	< 90% (condensation from the installed components is to be avoided)

[1] Untreated ambient air contains less than 20.95% O_2 (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

OXYMAT 7 module

Selection and ordering data			Article No.	Cannot be combined
OXYMAT 7 module For measurement of oxygen			↗ **7MB3020-■■■■0-■AA■**	
↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.				
Module version				
Standard module (for rack mounted and wall enclosure)			**0**	
Standard module for hazardous zone (for rack mounted and wall enclosure)			**2**	**2 2**
Field module for field housing Ex d without purging gas connections			**4**	**4**
Reference gas pressure				
Low-pressure version 100 hPa (for the connection of an external pump; without pressure switch)			**A**	**A A 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**	**B**
1 %			**C**	**C**
2 %			**D**	
5 %			**E**	
Gas path				
Material of gas path	Material of sample chamber	Material of seal		
Hose made of FKM (Viton)	Stainless steel (1.4571)	FKM (Viton)	**0**	**0 0**
Pipe made of stainless steel (1.4404)	Stainless steel (1.4571)	FKM/Ex: Kalrez (6375)	**1**	**1**
Pipe made of Hastelloy C22	Hastelloy C22	Kalrez (6375)	**2**	**2**
Vibration compensation				
Without			**0**	**0**
With			**1**	
Version				
Standard			**0**	

Selection and ordering data	Order code
Additional versions	
Add "-**Z**" to Article No. and specify Order code	
Settings	
Kalrez (6375) seals in sample gas path	**B04**
Clean for O_2 service (specially cleaned gas path)	**B06**
Measuring range indication in plain text, if different from the default setting	**Y11**
Exclusively for measuring non-toxic sample gases	**Y16**
Base unit module assignment number	**D00 ... D99**

Ordering example

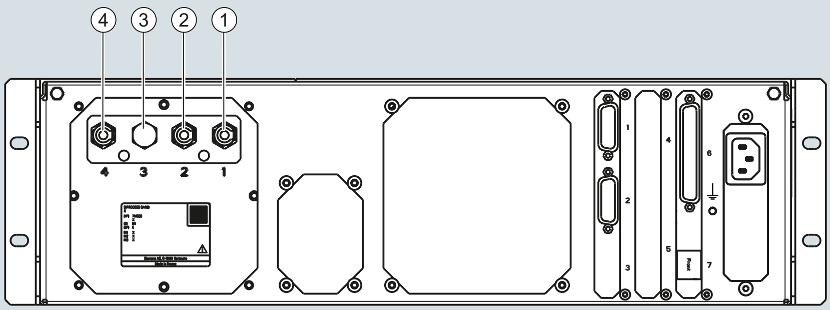
OXYMAT 7 module installed in wall enclosure
7MB3000-3CX00-1AA0-Z+D02
7MB3020-0CE00-0AA0-Z+D02

OXYMAT 7 module and ULTRAMAT 7 installed in rack unit enclosure
7MB3000-0CB00-1AA0-Z+D05
7MB3020-0CE00-0AA0-Z+D05
7MB3010-0CA10-0AA0-Z+D05

OXYMAT 7 module and wall enclosure supplied separately
7MB3000-3CX00-1AA0
7MB3020-0CE00-0AA0

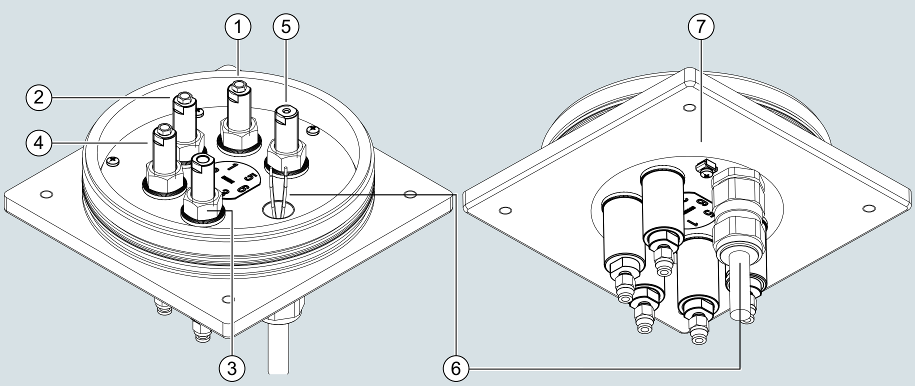
Circuit diagrams

Gas connections



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

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



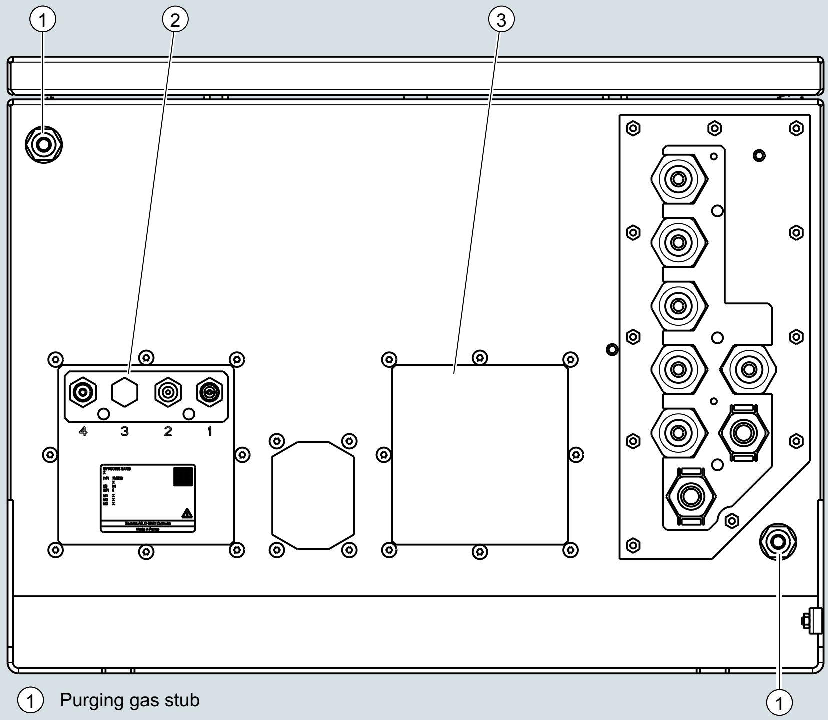
1 Sample gas inlet
2 Sample gas outlet
3 Blanking plug or purging gas connection
4 Reference gas inlet
5 Breathing apparatus (pressure compensation coupling)
6 Cable bushing
7 Ground connection

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

Gas connections of the field module

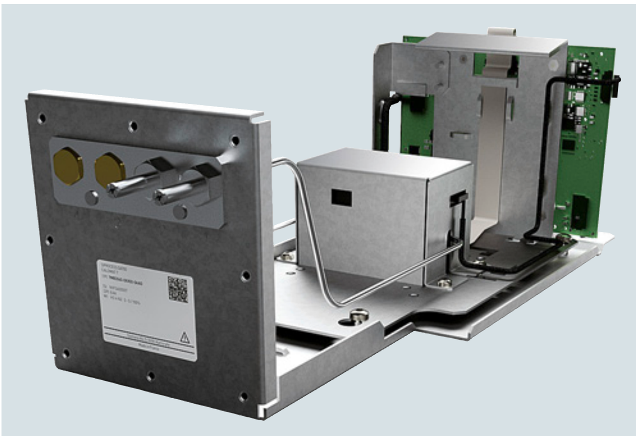
OXYMAT 7 module

Wall-mounted device



Wall-mounted device, bottom

Overview



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

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

Benefits

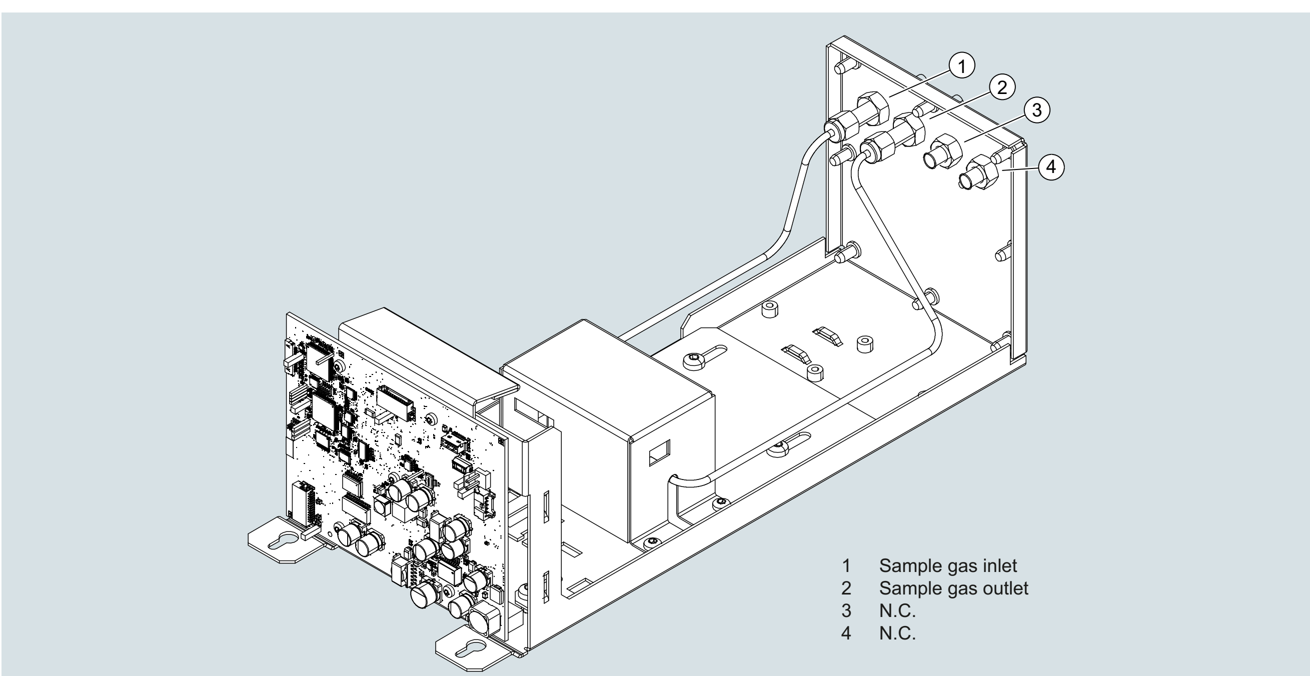
- Small T_{90} time due to micromechanical-produced Si sensor
- Universally applicable hardware basis, high measuring range dynamics (e.g. 0 to 0.5%, 0 to 100%, 95 to 100% H_2)
- Open interface architecture (analog, digital, Ethernet)
- SIMATIC PDM network for maintenance and servicing information (optional)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

Application

Application areas

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

Design

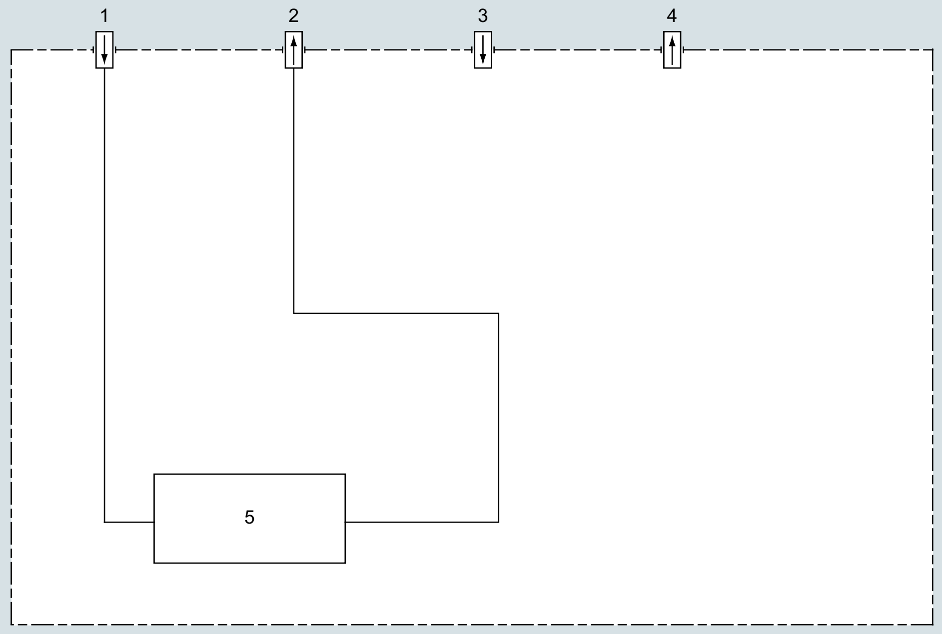


Structure of CALOMAT 7

1

CALOMAT 7 module

Gas path



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

CALOMAT 7, gas path

Mode of operation

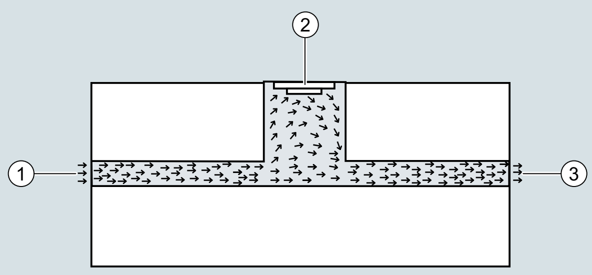
The measuring method is based on the different levels of thermal conductivity of gases. CALOMAT 7 modules work with a micromechanically produced Si chip, the measuring membrane of which is equipped with thin-film resistors.

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

Essential characteristics

- Four measuring ranges which can be freely configured, even with suppressed zero point, all measuring ranges are linear
- Smallest spans down to 0.5% H_2 (with suppressed zero: 95 to 100% H_2) possible
- Autoranging or manual measurement range switchover possible; remote switching is also possible
- Storage of measured values possible during adjustments
- Time constants can be selected within wide ranges (static/dynamic noise suppression); i.e. the response time of the device can be adapted to the respective measuring task.
- Short response time
- Low long-term drift
- Measuring point switchover for up to 6 measuring points (programmable)
- Measuring range identification
- Measuring point identification
- External pressure sensor can be connected – for correction of variations in sample gas pressure
- Automatic measuring range calibration can be configured
- Operation based on the NAMUR recommendation

Cross-interferences

To determine the cross-interferences of accompanying gases with several interfering gas components, you must know the sample gas composition. The following table contains the zero offsets for the carrier gas N_2 as H_2 equivalent values with 10% interference gas

Interference gas	H_2 equivalent values with 10% interference gas
CH_4	+1.77%
C_2H_6	+0.47%
C_3H_8	-0.28%
CO	-0.10%
CO_2	-0.84%
O_2	+0.19%
N_2O	-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_2O (3%)	+0.38%

Zero offset in the system H_2 in N_2

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 H_2 in He mixtures.

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

Technical specifications

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

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

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

General information	
Weight	Approx. 3 kg
Measuring ranges	
Number of measuring ranges	Max. 4; parameters can be assigned freely
Parameters can be assigned in the measuring ranges	
• Smallest possible span	0.5% H_2 in N_2
• Largest possible span	100% H_2 in N_2
• Smallest possible span with suppressed zero point	5% (e.g. 95% to 100%) H_2 in N_2
Gas inlet conditions	
Sample gas pressure	700 to 1200 hPa (abs.)
Pressure drop between sample gas inlet and sample gas outlet	< 50 hPa at 1.5 l/min
Sample gas flow	30 to 90 l/h (0.5 to 1.5 l/min)
Sample gas temperature	0 to 70 °C
Sample gas humidity (rel. humidity)	< 90% (condensation inside the gas path is to be avoided)
Sample chamber temperature	
Standard version	Approx. 72 °C
Time response	
Warm-up period at room temperature	< 30 min (max. accuracy after 2 h)
Response characteristics	
• Delay display T_{90} with device-internal signal damping (low pass filter) of 1 s	< 2.5 s
• Dead time (T_{10}) at 1 l/min	< 0.5 s
• Adjustable signal damping range	0 to 100 s
Measuring response	
Output signal fluctuation with device-internal signal damping of 1 s	≤ ± 0.5% of the smallest span acc. to nameplate (σ < ± 8.33 vpm H_2)
Detection limit	≤ 1% of the smallest measuring span according to nameplate
Measured-value drift	≤ ± 1%/week of smallest span according to nameplate or ≤ 50 vpm H_2 / week, whichever is greater
Repeatability	≤ ± 1% of the current measuring span or 100 vpm H_2
Linearity error	≤ ± 1% of the current measuring span or 100 vpm H_2

Influencing variables	
Ambient temperature	≤ ± 0.5%1)/10 K of the current measuring span or ≤ ± 50 vpm H_2 / 10 K
Sample gas pressure	≤ ± 0.5 %1) of the current measuring span/1% pressure variation or ≤ ± 50 vpm H_2 / 1% pressure change
Sample gas flow	≤ ± 0.2% of the smallest possible measuring span with a change in flow of 1 dl/min within the permissible flow range
Accompanying gases (interference gases)	The interference gas sensitivity depends on the application and must be determined in each case except for applications with blast furnace gas / converter gas / wood gasification (pre-adjusted).
Supply voltage	≤ ± 0.1% of full-scale value (within the nominal range of use)
Electrical inputs and outputs	
Analog and digital interfaces	See base unit
Climatic conditions	
Storage and transport	-30 ... 70 °C
Permissible ambient temperature (during operation in base unit)2)	0 ... 50 °C
Relative humidity (RH) during storage, transport or operation	< 90% (condensation from the installed components is to be avoided)
Gas connections	
Connection fittings	Pipe connection with 6 mm outer diameter
Materials of wetted parts	
Gas connection	Stainless steel material no. 1.4571
Clamping rings and union nut (set)	Stainless steel material no. 1.4401
Sample gas pipes	Stainless steel material no. 1.4404
Sensor mounting block	Stainless steel material no. 1.4571
Sensor	Si, SiO_xN_y, Au, epoxy resin, glass
Gasket, contained in the sensor module	Perfluorelastomere FFKM

1) Values less than the detection limit are not useful
2) Restriction for installing an ULTRAMAT 7 module: 5 ... 45 °C

Selection and ordering data		Article No.	Cannot be combined
CALOMAT 7 module For the measurement of gases in binary or quasi-binary gas mixtures		**7MB3040- ■■■■■ - 0 ■■■**	
↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.			
Module version			
Standard module for 19" rack unit and wall housing		**0**	
Measuring components, corrosive gas mixtures			
Only non-corrosive mixtures		**X**	
Measuring range, corrosive gas mixtures			
Only non-corrosive mixtures		**X**	
Material of gas path			
Stainless steel		**0**	
Reference chamber			
None		**0**	
Measuring components, non-corrosive mixtures			
H_2 in N_2		**A**	
H_2 in Ar		**B**	
He in N_2		**C**	C
He in Ar		**D**	D
He in H_2		**E**	E
Ar in N_2		**F**	F
Ar in O_2		**G**	G
CH_4 in N_2		**H**	H
CH_4 in Ar		**J**	J
CO_2 in N_2		**K**	K
Special version: H_2 in N_2 (for blast furnace gas, converter gas, wood gasification)		**Q**	Q
Smallest measuring range	Largest measuring range		
0 ... 0.5 %	0 ... 100 %	**A**	A A A
0 ... 1 %	0 ... 100 %	**B**	B B
0 ... 2 %	0 ... 100 %	**C**	C C
0 ... 5 %	0 ... 100 %	**D**	D
0 ... 10 %	0 ... 100 %	**E**	E
0 ... 10 %	0 ... 80 %	**F**	
Version			
Standard		**0**	

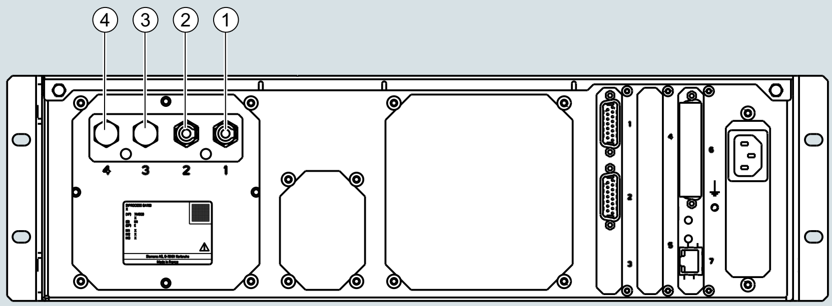
Selection and ordering data	Order code
Additional versions	
Add "-**Z**" to Article No. and specify Order code	
Settings	
Clean for O_2 service (specially cleaned gas path)	**B06**
Measuring range indication in plain text, if different from the default setting	**Y11**
Base unit module assignment number	**D00 ... D99**

Ordering example

CALOMAT 7 module installed in wall enclosure
7MB3000-3FX00-1AA0-Z+D12
7MB3040-0XX00-0BB0-Z+D12

Circuit diagrams

Gas connections

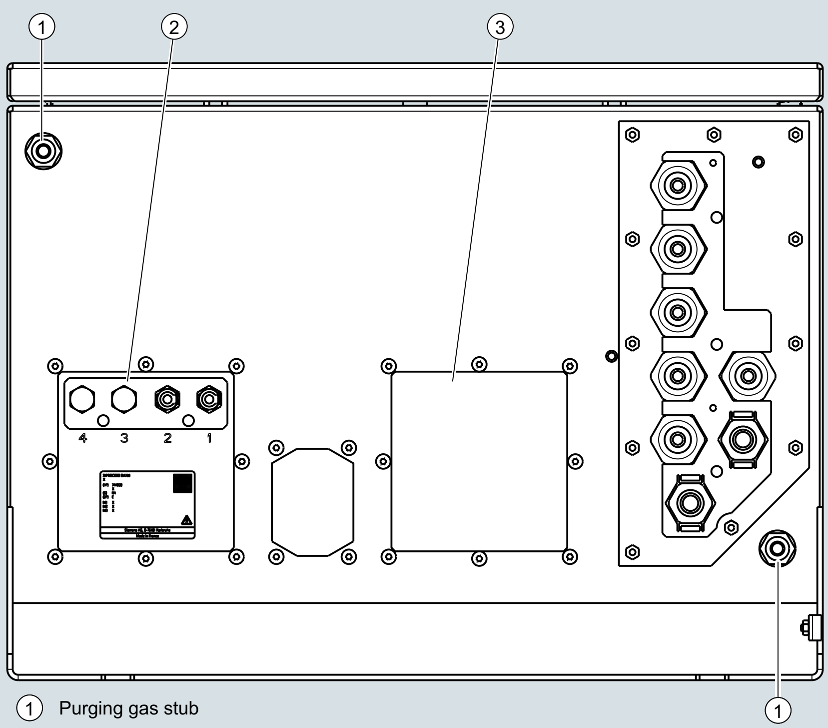


1 Sample gas inlet
2 Sample gas outlet
3 N.C.
4 N.C.

CALOMAT 7 gas connections

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

Wall-mounted device



1 Purging gas stub
2 Slot of module 1: CALOMAT 7
3 Slot of module 2

Wall-mounted device, bottom

Design

Gas path		ULTRAMAT 7	OXYMAT 7	CALOMAT 7
With hoses (Viton)	Bushing	–	PVDF	–
	Hose	–	FKM (Viton)	–
	Sample chamber	–	Stainless steel 1.4571	–
	Nozzle (sample chamber)	–	Stainless steel 1.4571	–
	Restrictor	–	PTFE (Teflon)	–
	O-ring	–	FKM (Viton)	–
With pipes (stainless steel)	Bushing	Stainless steel 1.4571	Stainless steel 1.4571	Stainless steel 1.4571
	Pipe	Stainless steel 1.4571	Stainless steel 1.4404	Stainless steel 1.4404
	Sample chamber			
	• Body	Aluminum	Stainless steel 1.4571	–
	• Lining	Aluminum or tantalum	–	–
	• Window	CaF2, adhesive: E353	–	–
	Sensor mounting block	–	–	Stainless steel 1.4571
	Sensor	–	–	Si, SiO_xN_y, AU, epoxy resin, glass
	Sample gas restrictor	–	Stainless steel 1.4571	–
	O-rings	FKM (Viton) or FFKM (Kalrez 6375)	FKM (Viton) or FFKM (Kalrez 6375)	FFKM (Kalrez 6375)
With pipes (Hastelloy)	Bushing	Hastelloy C22	Hastelloy C22	–
	Pipe	Hastelloy C22	Hastelloy C22	–
	Sample chamber			
	• Body	Aluminum	Hastelloy C22	–
	• Lining	Tantalum	–	–
	• Window	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 to ATEX 2G and ATEX 3G)

Application

Fields of application

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

Special versions

Special applications

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

Performance-tested version / QAL

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

- 1-component analyzer
  CO: 0 to 75 mg/m³; 0 to 10 000 mg/m³
  NO: 0 to 100 mg/m³; 0 to 10 000 mg/m³
  SO_2: 0 to 75 mg/m³; 0 to 1 500 mg/m³
- 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 QAL 1 according to EN 14181. The conformity of devices with both standards is accelerated by the TÜV.
The determination of the device drift according to EN 14181 (QAL 3) can be done manually as well as with the SIPROM GA maintenance and service software on the PLC. In addition, selected manufacturers of emission evaluation computers offer the possibility for downloading the drift data via the analyzer's serial interface and to automatically record and process it in the evaluation computer.

Flow-type reference compartment

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

Design

19" rack unit

- 19" rack unit with 4 HU for installation
  - In hinged frame
  - In cabinets with or without telescope rails
- Front plate can be swiveled downwards for service purposes (laptop connection)
- Internal gas paths: hose made of FKM (Viton) or pipe made of titanium or stainless steel
- Gas connections for sample gas inlet and outlet: pipe diameter 6 mm or 1/4"
- Flow indicator for sample gas on front plate (option)
- Pressure switch in sample gas path for flow monitoring (option)

Field device

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

Display and control panel

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

Inputs and outputs

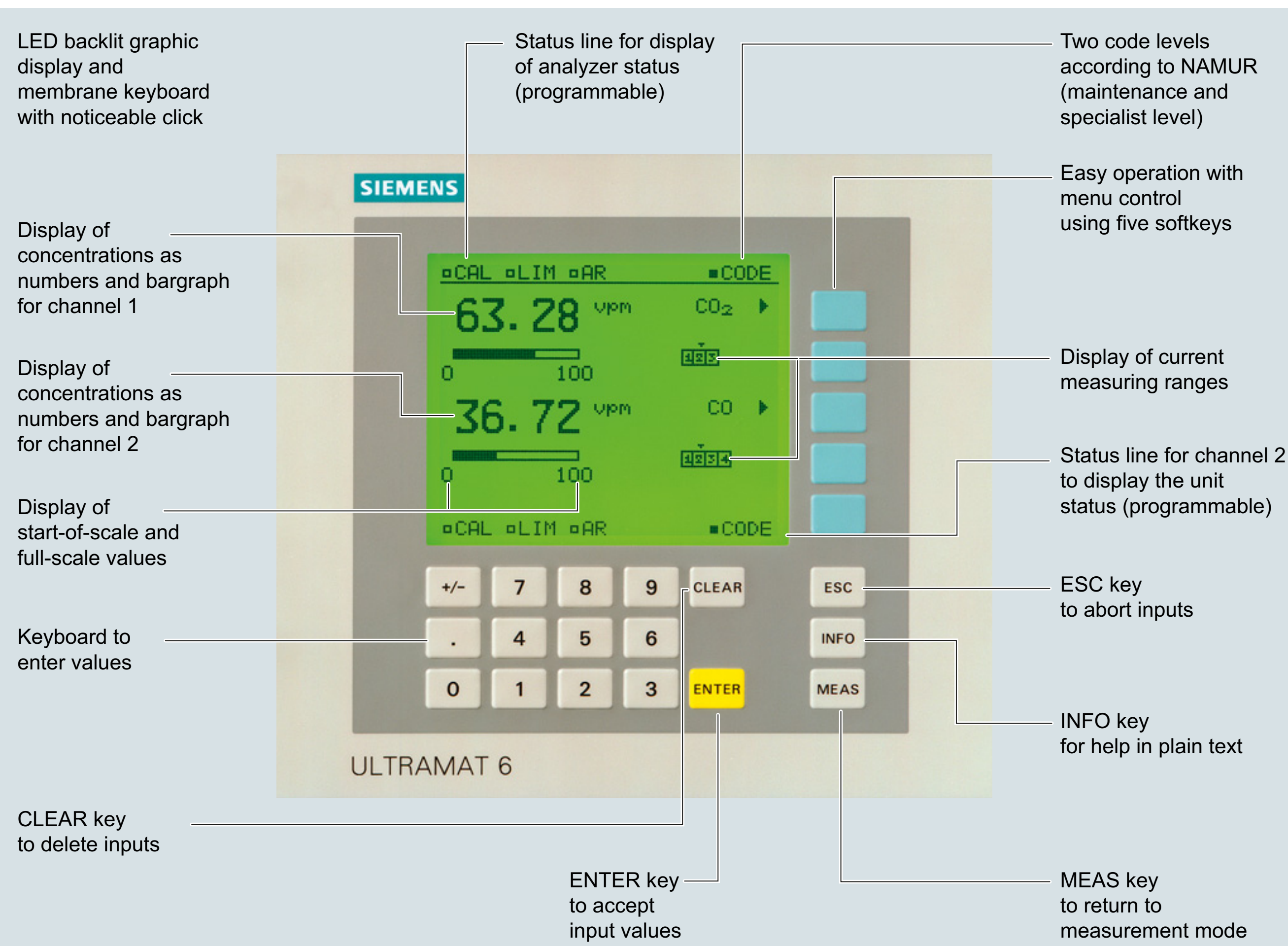
- One analog output per medium (from 0, 2, 4 to 20 mA; NAMUR configurable)
- Two analog inputs freely configurable (e.g. correction of cross-interferences or external pressure sensor)
- Six digital inputs freely configurable (e.g. for measurement range switchover, processing of external signals from sample preparation)
- Six relay outputs freely configurable e.g. for fault, maintenance request, limit alarm, external solenoid valves)
- Expansion by eight additional digital inputs and eight additional relay outputs e.g. for autocalibration with up to four calibration gases

Communication

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

Options

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



ULTRAMAT 6, membrane keyboard and graphic display

General information

Designs – Parts wetted by sample gas, standard

Gas path		19" rack unit	Field device	Field device Ex
With hoses	Bushing	Stainless steel, mat. no. 1.4571		-
	Hose	FKM (e.g. Viton)		
	Sample chamber:			
	• Body	Aluminum		
	• Lining	Aluminum		
	• Fitting	Stainless steel, mat. no. 1.4571, O-ring: FKM (e.g. Viton) or FFKM (Kalrez)		
	• Window	CaF_2, adhesive: E353, O-ring: FKM (e.g. Viton) or FFKM (Kalrez)		
With pipes	Bushing	Titanium		
	Pipe	Titanium, O-ring: FKM (e.g. Viton) or FFKM (Kalrez)		
	Sample chamber:			
	• Body	Aluminum		
	• Lining	Tantalum (only for cell length 20 mm to 180 mm)		
	• Window	CaF_2, adhesive: E353, O-ring: FKM (e.g. Viton) or FFKM (Kalrez)		
With pipes	Bushing	Stainless steel, mat. no. 1.4571		
	Pipe	Stainless steel, mat. no. 1.4571, O-ring: FKM (e.g. Viton) or FFKM (Kalrez)		
	Sample chamber:			
	• Body	Aluminum		
	• Lining	Aluminum or tantalum (tantalum only for cell length 20 mm to 180 mm)		
	• Window	CaF_2, adhesive: E353, O-ring: FKM (e.g. Viton) or FFKM (Kalrez)		

Options

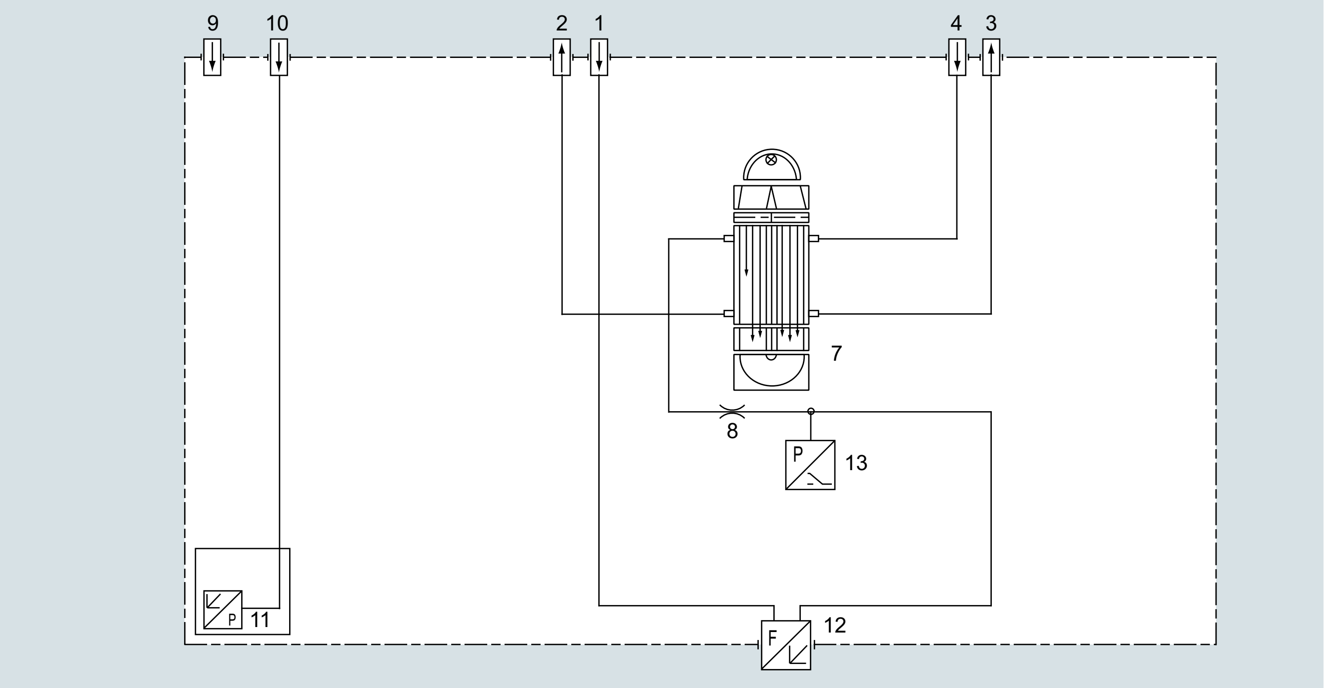
Gas path		19" rack unit	Field device	Field device Ex
Flow indicator	Measurement pipe	Duran glass	-	-
	Variable area	Duran glass		
	Suspension boundary	PTFE (Teflon)		
	Angle pieces	FKM (e.g. Viton)		
Pressure switch	Membrane	FKM (e.g. Viton)	-	-
	Enclosure	PA 6.3T		

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

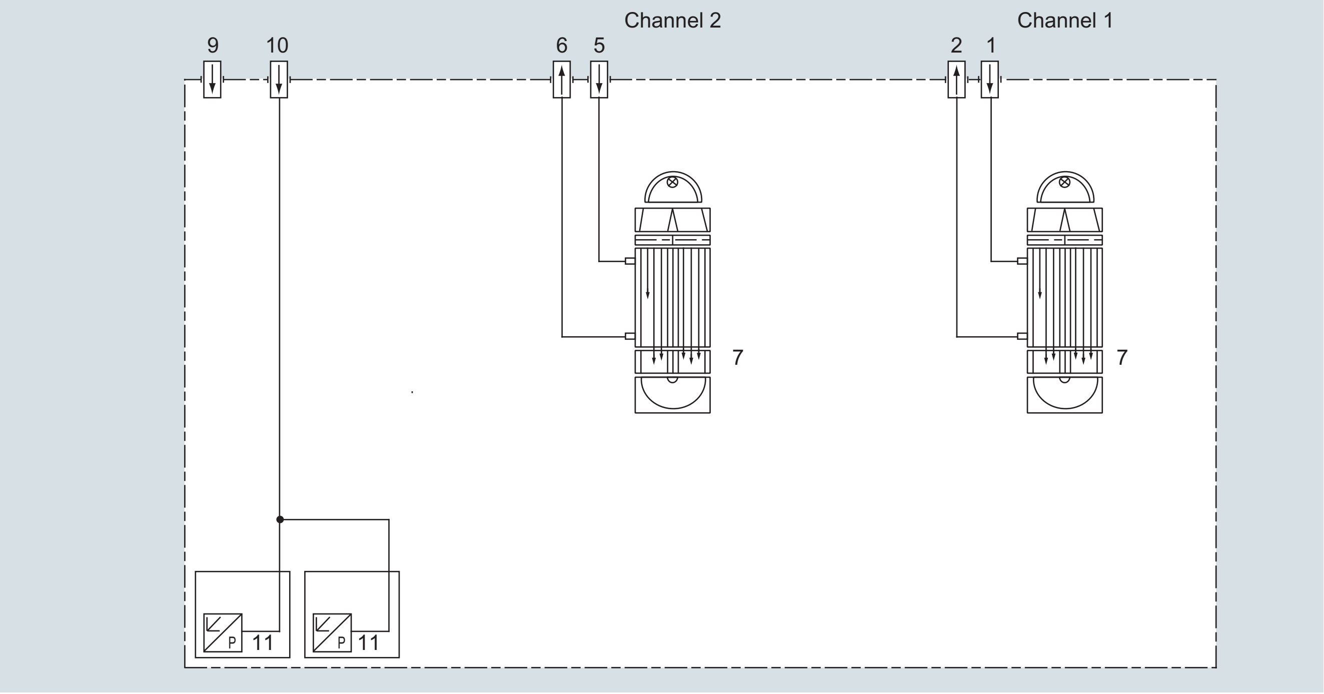
Gas path		19" rack unit	Field device	Field device Ex
With pipes	Bushing	e.g. Hastelloy C22		
	Pipe	e.g. Hastelloy C22, O-ring: FKM (e.g. Viton) or FFKM (Kalrez)		
	Sample chamber:			
	• Body	e.g. Hastelloy C22		
	• Window	CaF_2, without adhesive O-ring: FKM (e.g. Viton) or FFKM (Kalrez)		

Gas path (19" rack unit)

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



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

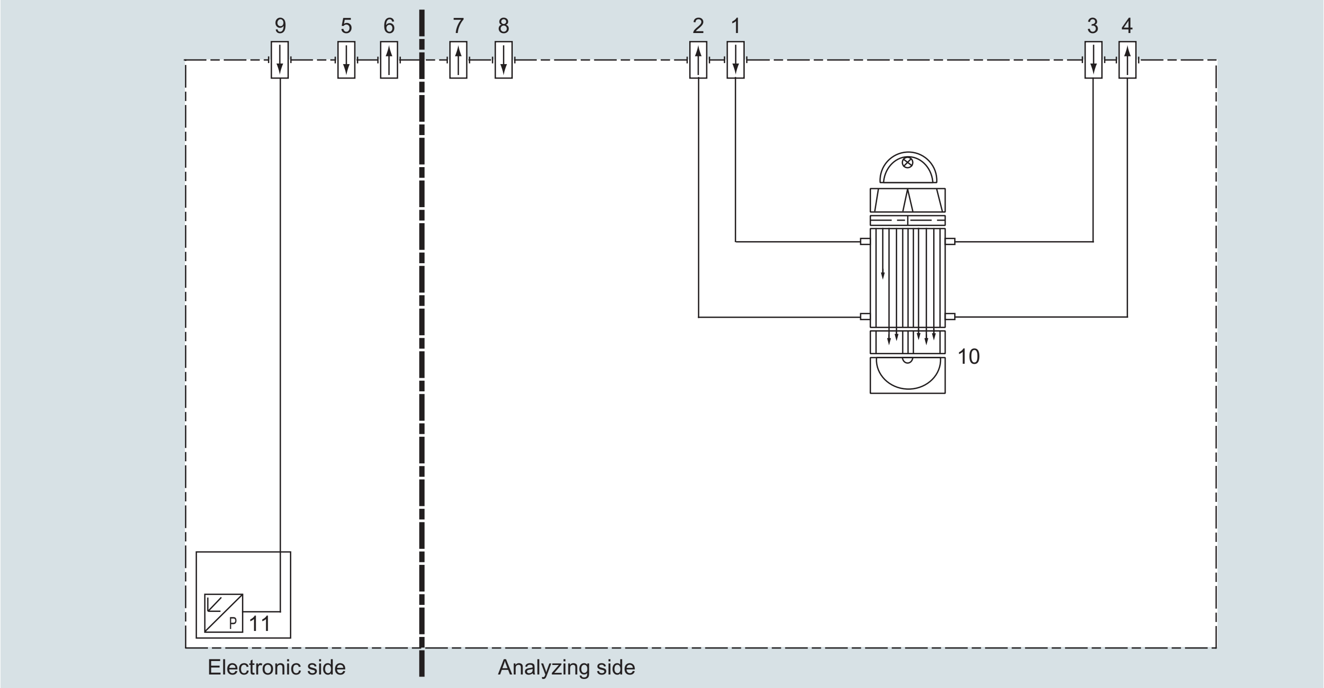


Gas path ULTRAMAT 6, dual-channel unit, 19" unit

General information

Gas path (field device)

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



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

Function

Principle of operation

The ULTRAMAT 6 gas analyzer operates according to the infrared two-beam alternating light principle with double-layer detector and optical coupler.

The measuring principle is based on the molecule-specific absorption of bands of infrared radiation. The absorbed wavelengths are characteristic to the individual gases, but may partially overlap. This results in cross-sensitivities which are reduced to a minimum in the ULTRAMAT 6 gas analyzers by the following measures:

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

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

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

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

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

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

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

Notes

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

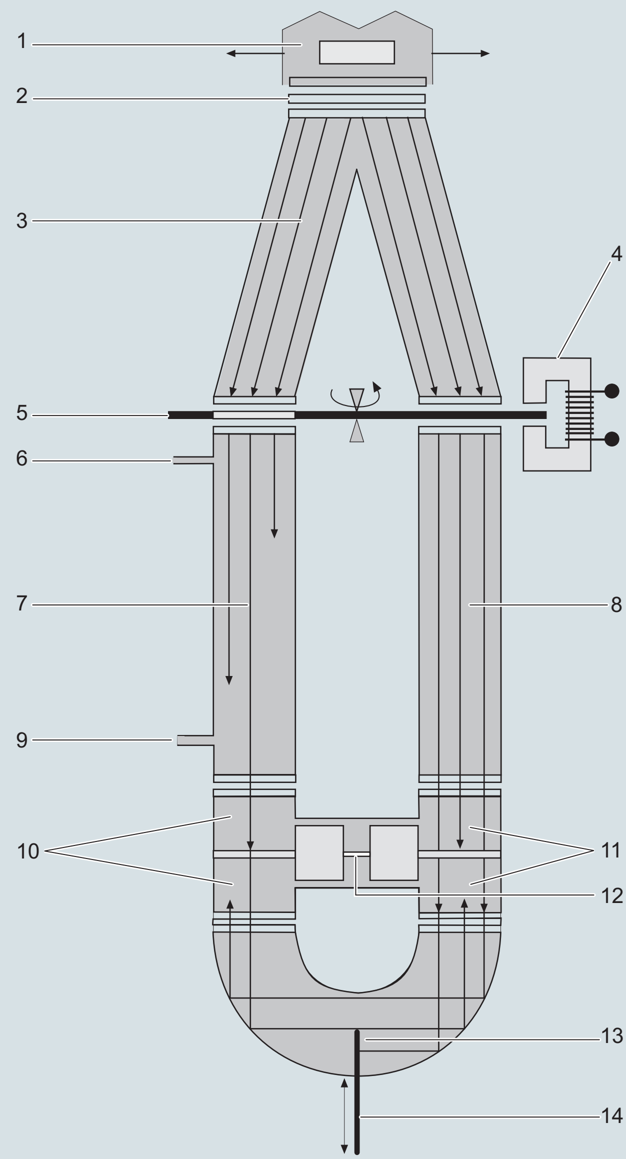
As far as possible, the ambient air of the analyzer should not have a large concentration of the gas components to be measured.

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

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

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

Physically suppressed zeros can be provided as a special application.



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

ULTRAMAT 6, principle of operation

General information

Essential characteristics

- Dimension of measured value freely selectable (e.g. vpm, mg/m^3)
- Four freely-configurable measuring ranges per component
- Measuring ranges with suppressed zero point possible
- Measuring range identification
- Galvanically isolated signal output 0/2/4 to 20 mA per component
- Automatic or manual measuring range switchover selectable; remote switching is also possible
- Differential measuring ranges with flow-type reference cell
- Storage of measured values possible during adjustments
- Time constants selectable within wide limits (static/dynamic noise suppression); i.e. the response time of the analyzer or component can be matched to the respective measuring task
- Short response time
- Low long-term drift
- Measuring point switchover for up to 6 measuring points (programmable)
- Measuring point identification
- Monitoring of sample gas flow (option)
- Internal pressure sensor for correction of variations in atmospheric pressure in the range 700 to 1 200 hPa absolute
- External pressure sensor can be connected for correction of variations in the process gas pressure in the range 700 to 1 500 hPa absolute (option)
- Two control levels with separate authorization codes to prevent unintentional and unauthorized inputs
- Automatic, configurable measuring range calibration
- Simple handling using a numerical membrane keyboard and operator prompting
- Operation based on NAMUR recommendation
- Customer-specific analyzer options such as:
  - Customer acceptance
  - TAG labels
  - Clean for O_2 service (specially cleaned gas path)
- Easy device replacement since electric connections can be simply disconnected from the device
- Sample chambers for use in presence of highly corrosive sample gases, e.g. tantalum layer or sample chamber made of Hastelloy C22 (special application)

Additional features, dual-channel version

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

Technical specifications

General information	
Measuring ranges	4, internally and externally switchable; autoranging is also possible
Smallest possible measuring range	Dependent on the application: e.g. CO: 0 … 10 vpm, CO_2: 0 … 5 vpm
Largest possible measuring 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 interfering 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 unit: Approx. 40 VA 2-channel unit: Approx. 70 VA
Fuse values	
• 100 ... 120 V	1 T/250 (7MB2121) 1.6 T/250 (7MB2123)
• 200 ... 240 V	0.63 T/250 (7MB2121) 1 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
Dynamic response	
Warm-up period	At room temperature < 30 min (the technical specification will be met after 2 hours)
Delayed display (T_{90}-time)	Dependent on length of analyzer chamber, sample gas line and configurable damping
Damping (electrical time constant)	0 … 100 s, configurable
Dead time (purging time of the gas path in the unit at 1 l/min)	Approximately 0.5 ... 5 s, depending on version
Time for device-internal signal processing	< 1 s
Pressure correction range	
Pressure sensor	
• Internal	700 … 1 200 hPa absolute
• External	700 … 1 500 hPa absolute

Measuring response	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation	< ± 1% of the smallest possible measuring range according to rating plate
Zero point drift	< ± 1% of the current measuring range/week
Measured-value drift	< ± 1% of the current measuring range/week
Repeatability	≤ 1% of the current measuring range
Detection limit	1% of the smallest possible measuring range
Linearity error	± 0.5 % of the full-scale value
Influencing variables	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Ambient temperature	< 1% of current measuring range/10 K (with constant receiver cell temperature)
Sample gas pressure	• With disabled pressure compensation: < 0.15% of the span/1% change in atmospheric pressure • With disabled pressure compensation: < 1.5% of the span/1% change in atmospheric pressure
Sample gas flow	Negligible
Auxiliary power	< 0.1% of the current measuring range with rated voltage ± 10%
Environmental conditions	Application-specific measuring influences possible if ambient air contains measured components or cross interference-sensitive gases
Electrical inputs and outputs	
Analog output	0/2/4 ... 20 mA, isolated; load ≤ 750 Ω
Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load: 24 V AC/DC/1 A, isolated, 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, isolated, freely configurable, e.g. for measuring range switchover
Serial interface	RS 485
Options	AUTOCAL function each with 8 additional digital inputs and relay outputs, also with PROFIBUS PA or PROFIBUS DP
Climatic conditions	
Permissible ambient temperature	-30 ... +70 °C during storage and transportation, 5 ... 45 °C during operation
Permissible humidity	< 90% RH (relative humidity) as annual average, during storage and transportation (dew point must not be undershot)

Selection and ordering data			Article No.	Cannot be combined
ULTRAMAT 6 gas analyzer Single-channel 19" rack unit for installation in cabinets			**7MB2121- ■■■■■- ■AA■**	
↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.				
Gas connections for sample gas and reference gas				
Pipe with 6 mm outer diameter			**0**	**0 → A21**
Pipe with ¼" outer diameter			**1**	**1 → A20**
Measured component		Possible with measuring range identification		
CO		11 ... 30	**A**	
CO highly selective (with optical filter)[2)]		12 ... 30	**B**	
CO[3)]			**X**	
CO_2		10 ... 30	**C**	
CH_4		13 ... 30	**D**	
C_2H_2		15 ... 30	**E**	
C_2H_4		15 ... 30	**F**	
C_2H_6		14 ... 30	**G**	
C_3H_6		14 ... 30	**H**	
C_3H_8		13 ... 30	**J**	
C_4H_6		15 ... 30	**K**	
C_4H_{10}		14 ... 30	**L**	
C_6H_{14}		14 ... 30	**M**	
SO_2 [4)]		13 ... 30	**N**	
NO [4)]		14 ... 20, 22	**P**	
NH_3 (dry)		14 ... 30	**Q**	**Q**
H_2O		17 ... 20, 22	**R**	**R**
N_2O		13 ... 30	**S**	
Smallest measuring range	Largest measuring range	Measuring range identification		
0 ... 5 vpm	0 ... 100 vpm	10	**A**	
0 ... 10 vpm	0 ... 200 vpm	11	**B**	
0 ... 20 vpm	0 ... 400 vpm	12	**C**	
0 ... 50 vpm	0 ... 1 000 vpm	13	**D**	
0 ... 100 vpm	0 ... 1 000 vpm	14	**E**	
0 ... 300 vpm	0 ... 3 000 vpm	15	**F**	
0 ... 500 vpm	0 ... 5 000 vpm	16	**G**	
0 ... 1 000 vpm	0 ... 10 000 vpm	17	**H**	
0 ... 3 000 vpm	0 ... 10 000 vpm	18	**J**	
0 ... 3 000 vpm	0 ... 30 000 vpm	19	**K**	
0 ... 5 000 vpm	0 ... 15 000 vpm	20	**L**	
0 ... 5 000 vpm	0 ... 50 000 vpm	21	**M**	
0 ... 1 %	0 ... 3 %	22	**N**	
0 ... 1 %	0 ... 10 %	23	**P**	
0 ... 3 %	0 ... 10 %	24	**Q**	
0 ... 3 %	0 ... 30 %	25	**R**	
0 ... 5 %	0 ... 15 %	26	**S**	
0 ... 5 %	0 ... 50 %	27	**T**	
0 ... 10 %	0 ... 30 %	28	**U**	
0 ... 10 %	0 ... 100 %	29	**V**	
0 ... 30 %	0 ... 100 %	30	**W**	
Internal gas paths	Sample chamber[1)] (lining)	Reference chamber (flow-type)		
Hose made of FKM (Viton)	Aluminum	Non-flow-type	**0**	**0** **0 → A20, A21**
	Aluminum	Flow-type	**1**	**1**
Pipe made of titanium	Tantalum	Non-flow-type	**4**	**4 → A20, A21, Y02**
	Tantalum	Flow-type	**5**	**5 → Y02**
Stainless steel pipe (mat. no. 1.4571)	Aluminum	Non-flow-type	**6**	**6 → A20, A21**
	Tantalum	Non-flow-type	**8**	**8 → A20, A21**
With sample gas monitoring				
Hose made of FKM (Viton)	Aluminum	Non-flow-type	**2**	**2** **2 → A20, A21**
	Aluminum	Flow-type	**3**	**3**

Footnotes: see next page

Selection and ordering data

Selection and ordering data	Article No.	Cannot be combined
ULTRAMAT 6 gas analyzer Single-channel 19" rack unit for installation in cabinets	**7MB2121- ■■■■■- ■AA■**	
Add-on electronics		
Without	0	0 → Y27
AUTOCAL function		
• With 8 additional digital inputs/outputs	1	
• With serial interface for the automotive industry (AK)	3	3 → E20
• With 8 digital inputs/outputs, PROFIBUS PA interface	6	
• With 8 digital inputs/outputs, PROFIBUS DP interface	7	
Power supply		
100 ... 120 V AC, 48 ... 63 Hz	0	
200 ... 240 V AC, 48 ... 63 Hz	1	
Operating software and documentation		
German	0	
English	1	
French	2	
Spanish	3	
Italian	4	

Additional versions	Order code
Add "-Z" to Article No. and specify Order code	
Flow-type reference cell with reduced flow, 6 mm	**A20**
Flow-type reference cell with reduced flow, ¼"	**A21**
Telescopic rails (2 units)	**A31**
TAG labels (specific lettering based on customer information)	**B03**
Kalrez gaskets in sample gas path	**B04**
SIL conformity declaration (SIL 2) Functional Safety according to IEC 61508 and IEC 61511	**C20**
FM/CSA certificate – Class I Div 2	**E20**
Clean for O_2 service (specially cleaned gas path)	**Y02**
Measuring range indication in plain text, if different from the standard setting	**Y11**
Special setting (only in conjunction with an application no., e.g. extended measuring range)	**Y12**
Extended special setting (only in conjunction with an application no., e.g. determination of cross-interferences)	**Y13**
QAL1 according to SIRA/MCERTS	**Y17**
Performance-tested according to EN 15267	**Y27**

Accessories	Article No.
RS 485/Ethernet converter	**A5E00852383**
RS 485/RS 232 converter	**C79451-Z1589-U1**
RS 485/USB converter	**A5E00852382**
AUTOCAL function with serial interface for the automotive industry (AK)	**C79451-A3480-D512**
AUTOCAL function with 8 digital inputs/outputs	**C79451-A3480-D511**
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS PA	**A5E00057307**
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS DP	**A5E00057312**
Set of Torx screwdrivers	**A5E34821625**

[1] Only for cell length 20 to 180 mm
[2] QAL1: see table "Performance tested according to EN 15267 (single component)", page 1/54
[3] QAL1: see table "Based on QAL1 according to SIRA/MCERTS (single component)", page 1/54
[4] QAL1: See table "Based on QAL1 according to SIRA/MCERTS (single component) and performance-tested according to EN 15267 (single component)", page 1/54

Selection and ordering data

Selection and ordering data			Article No.	Cannot be combined
ULTRAMAT 6 gas analyzer Two-channel 19" rack unit for installation in cabinets for measuring 2 IR components			↗ **7MB2123-** ■■■■■ - ■■■■	
↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.				
Gas connections for sample gas and reference gas				
Pipe with 6 mm outer diameter			**0**	**0** → **A21, A41**
Pipe with ¼" outer diameter			**1**	**1** → **A20, A40**
Channel 1 Measured component		Possible with measuring range identification		
CO		11 ... 30	**A**	
CO highly selective (with optical filter)[2]		12 ... 30	**B**	
CO[3]			**X**	
CO_2		10 ... 30	**C**	
CH_4		13 ... 30	**D**	
C_2H_2		15 ... 30	**E**	
C_2H_4		15 ... 30	**F**	
C_2H_6		14 ... 30	**G**	
C_3H_6		14 ... 30	**H**	
C_3H_8		13 ... 30	**J**	
C_4H_6		15 ... 30	**K**	
C_4H_{10}		14 ... 30	**L**	
C_6H_{14}		14 ... 30	**M**	
SO_2[4]		13 ... 30	**N**	
NO[4]		14 ... 20, 22	**P**	
NH_3 (dry)		14 ... 30	**Q**	**Q**
H_2O		17 ... 20, 22	**R**	**R**
N_2O		13 ... 30	**S**	
Smallest measuring range	Largest measuring range	Measuring range identification		
0 ... 5 vpm	0 ... 100 vpm	10	**A**	
0 ... 10 vpm	0 ... 200 vpm	11	**B**	
0 ... 20 vpm	0 ... 400 vpm	12	**C**	
0 ... 50 vpm	0 ... 1 000 vpm	13	**D**	
0 ... 100 vpm	0 ... 1 000 vpm	14	**E**	
0 ... 300 vpm	0 ... 3 000 vpm	15	**F**	
0 ... 500 vpm	0 ... 5 000 vpm	16	**G**	
0 ... 1 000 vpm	0 ... 10 000 vpm	17	**H**	
0 ... 3 000 vpm	0 ... 10 000 vpm	18	**J**	
0 ... 3 000 vpm	0 ... 30 000 vpm	19	**K**	
0 ... 5 000 vpm	0 ... 15 000 vpm	20	**L**	
0 ... 5 000 vpm	0 ... 50 000 vpm	21	**M**	
0 ... 1 %	0 ... 3 %	22	**N**	
0 ... 1 %	0 ... 10 %	23	**P**	
0 ... 3 %	0 ... 10 %	24	**Q**	
0 ... 3 %	0 ... 30 %	25	**R**	
0 ... 5 %	0 ... 15 %	26	**S**	
0 ... 5 %	0 ... 50 %	27	**T**	
0 ... 10 %	0 ... 30 %	28	**U**	
0 ... 10 %	0 ... 100 %	29	**V**	
0 ... 30 %	0 ... 100 %	30	**W**	
Internal gas paths	Sample chamber[1] (lining)	Reference chamber (flow-type)		
Hose made of FKM (Viton)	Aluminum	Non-flow-type	**0**	**0** **0** → **A20, A21, A40, A41**
	Aluminum	Flow-type	**1**	**1**
Pipe made of titanium	Tantalum	Non-flow-type	**4**	**4** → **A20, A21, A40, A41, Y02**
	Tantalum	Flow-type	**5**	**5** → **Y02**
Stainless steel pipe (mat. no. 1.4571)	Aluminum	Non-flow-type	**6**	**6** → **A20, A21, A40, A41**
	Tantalum	Non-flow-type	**8**	**8** → **A20, A21, A40, A41**
With sample gas monitoring				
Hose made of FKM (Viton)	Aluminum	Non-flow-type	**2**	**2** **2** → **A20, A21, A40, A41**
	Aluminum	Flow-type	**3**	**3**

[1] Only for cell length 20 to 180 mm

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

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

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

Selection and ordering data			Article No.	Cannot be combined
ULTRAMAT 6 gas analyzer Two-channel 19" rack unit for installation in cabinets for measuring 2 IR components			**7MB2123-** ■■■■■ **-** ■■■■	
Add-on electronics				
Without			**0**	0 → Y27, Y28
AUTOCAL function				
• With 8 additional digital inputs/outputs each for channel 1			**1**	
• With 8 additional digital inputs/outputs each for channel 2			**2**	
• With 8 additional digital inputs/outputs each for channel 1 and channel 2			**3**	
• With serial interface for the automotive industry (AK)			**5**	5 → E20
• With 8 additional digital inputs/outputs each for channel 1 and channel 2 and PROFIBUS PA interface			**6**	
• With 8 additional digital inputs/outputs each for channel 1 and channel 2 and PROFIBUS DP interface			**7**	
Power supply				
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)[1]		12 ... 30	**B**	
CO[2]			**X**	
CO_2		10 ... 30	**C**	
CH_4		13 ... 30	**D**	
C_2H_2		15 ... 30	**E**	
C_2H_4		15 ... 30	**F**	
C_2H_6		14 ... 30	**G**	
C_3H_6		14 ... 30	**H**	
C_3H_8		13 ... 30	**J**	
C_4H_6		15 ... 30	**K**	
C_4H_{10}		14 ... 30	**L**	
C_6H_{14}		14 ... 30	**M**	
SO_2[3]		13 ... 30	**N**	
NO[3]		14 ... 20, 22	**P**	
NH_3 (dry)		14 ... 30	**Q**	Q
H_2O		17 ... 20, 22	**R**	R
N_2O		13 ... 30	**S**	
Smallest measuring range	Largest measuring range	Measuring range identification		
0 ... 5 vpm	0 ... 100 vpm	10	**A**	
0 ... 10 vpm	0 ... 200 vpm	11	**B**	
0 ... 20 vpm	0 ... 400 vpm	12	**C**	
0 ... 50 vpm	0 ... 1 000 vpm	13	**D**	
0 ... 100 vpm	0 ... 1 000 vpm	14	**E**	
0 ... 300 vpm	0 ... 3 000 vpm	15	**F**	
0 ... 500 vpm	0 ... 5 000 vpm	16	**G**	
0 ... 1 000 vpm	0 ... 10 000 vpm	17	**H**	
0 ... 3 000 vpm	0 ... 10 000 vpm	18	**J**	
0 ... 3 000 vpm	0 ... 30 000 vpm	19	**K**	
0 ... 5 000 vpm	0 ... 15 000 vpm	20	**L**	
0 ... 5 000 vpm	0 ... 50 000 vpm	21	**M**	
0 ... 1 %	0 ... 3 %	22	**N**	
0 ... 1 %	0 ... 10 %	23	**P**	
0 ... 3 %	0 ... 10 %	24	**Q**	
0 ... 3 %	0 ... 30 %	25	**R**	
0 ... 5 %	0 ... 15 %	26	**S**	
0 ... 5 %	0 ... 50 %	27	**T**	
0 ... 10 %	0 ... 30 %	28	**U**	
0 ... 10 %	0 ... 100 %	29	**V**	
0 ... 30 %	0 ... 100 %	30	**W**	
Operating software and documentation				
German			**0**	
English			**1**	
French			**2**	
Spanish			**3**	
Italian			**4**	

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

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

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

Selection and ordering data

Additional versions	Order code	Cannot be combined
Add "-Z" to Article No. and specify Order codes.		
Flow-type reference cell with reduced flow, 6 mm (channel 1)	**A20**	
Flow-type reference cell with reduced flow, ¼" (channel 1)	**A21**	
Flow-type reference cell with reduced flow, 6 mm (channel 2)	**A40**	
Flow-type reference cell with reduced flow, ¼" (channel 2)	**A41**	
Connection pipe (can only be combined with the appropriate gas connection diameter and internal gas path materials)		
• Made of titanium, 6 mm, complete with screwed gland, for sample gas side	**A22**	
• Made of titanium, 6 mm, complete with screwed gland, for reference gas side	**A23**	
• Made of titanium, ¼", complete with screwed gland, for sample gas side	**A24**	
• Made of titanium, ¼", complete with screwed gland, for reference gas side	**A25**	
• Made of stainless steel (mat. no. 1.4571), 6 mm, complete with screwed gland, for sample gas side	**A27**	
• Made of stainless steel (mat. no. 1.4571), ¼", complete with screwed gland, for sample gas side	**A29**	
Telescopic rails (2 units)	**A31**	
TAG labels (specific lettering based on customer information)	**B03**	
Kalrez gaskets in sample gas path (channel 1)	**B04**	
Kalrez gaskets in sample gas path (channel 2)	**B05**	
SIL conformity declaration (SIL 2) Functional Safety according to IEC 61508 and IEC 61511	**C20**	
FM/CSA certificate – Class I Div 2	**E20**	
Clean for O_2 service (specially cleaned gas path; channels 1 + 2)	**Y02**	
Measuring range indication in plain text, if different from the standard setting	**Y11**	
Special setting (only in conjunction with an application no., e.g. extended measuring range)	**Y12**	
Extended special setting (only in conjunction with an application no., e.g. determination of cross-interferences)	**Y13**	
QAL1 according to SIRA/MCERTS (1st channel)	**Y17**	
QAL1 according to SIRA/MCERTS (2nd channel)	**Y18**	
Performance-tested according to EN 15267 (1st channel)	**Y27**	
Performance-tested according to EN 15267 (2nd channel)	**Y28**	

Accessories	Article No.	
RS 485/Ethernet converter	**A5E00852383**	
RS 485/RS 232 converter	**C79451-Z1589-U1**	
RS 485/USB converter	**A5E00852382**	
AUTOCAL function with serial interface for the automotive industry (AK)	**C79451-A3480-D33**	
AUTOCAL function with 8 digital inputs/outputs for channel 1 or channel 2	**C79451-A3480-D511**	
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS PA for channel 1 or channel 2	**A5E00057307**	
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS DP for channel 1 or channel 2	**A5E00057312**	
Set of Torx screwdrivers	**A5E34821625**	

Selection and ordering data			Article No.		Cannot be combined
ULTRAMAT 6 gas analyzer 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 the online configuration in the PIA Life Cycle Portal.					
Gas connections for sample gas and reference gas					
Pipe with 6 mm outer diameter			0		0 → A21, A41
Pipe with ¼" outer diameter			1		1 → A20, A40
Measured component	Smallest measuring range	Largest measuring range			
CO NO	0 ... 100 vpm 0 ... 100 vpm	0 ... 1 000 vpm 0 ... 1 000 vpm	A A		
CO NO	0 ... 300 vpm 0 ... 300 vpm	0 ... 3 000 vpm 0 ... 3 000 vpm	A B		
CO NO	0 ... 1 000 vpm 0 ... 1 000 vpm	0 ... 10 000 vpm 0 ... 10 000 vpm	A C		
For CO/NO (QAL1; see table "Based on QAL1 according to SIRA/MCERTS (2 components in series)", page 1/54)					
CO_2 CO	0 ... 100 vpm 0 ... 100 vpm	0 ... 1 000 vpm 0 ... 1 000 vpm	B A		
CO_2 CO	0 ... 300 vpm 0 ... 300 vpm	0 ... 3 000 vpm 0 ... 3 000 vpm	B B		
CO_2 CO	0 ... 1 000 vpm 0 ... 1 000 vpm	0 ... 10 000 vpm 0 ... 10 000 vpm	B C		
CO_2 CO	0 ... 3 000 vpm 0 ... 3 000 vpm	0 ... 30 000 vpm 0 ... 30 000 vpm	B D		
CO_2 CO	0 ... 1 % 0 ... 1 %	0 ... 10 % 0 ... 10 %	B E		
CO_2 CO	0 ... 3 % 0 ... 3 %	0 ... 30 % 0 ... 30 %	B F		
CO_2 CO	0 ... 10 % 0 ... 10 %	0 ... 100 % 0 ... 100 %	B G		
CO_2 CH_4	0 ... 10 % 0 ... 10 %	0 ... 100 % 0 ... 100 %	C G		
CO_2 NO	0 ... 300 vpm 0 ... 300 vpm	0 ... 3 000 vpm 0 ... 3 000 vpm	D B		
Internal gas paths	Sample chamber[1) (lining)	Reference chamber (flow-type)			
Hose made of FKM (Viton)	Aluminum	Non-flow-type	0		0 0 → A20, A21, A40, A41
	Aluminum	Flow-type	1		1
Pipe made of titanium	Tantalum	Non-flow-type	4		4 → A20, A21, A40, A41, Y02
	Tantalum	Flow-type	5		5 → Y02
Stainless steel pipe (mat. no. 1.4571)	Aluminum	Non-flow-type	6		6 → A20, A21, A40, A41
	Tantalum	Non-flow-type	8		8 → A20, A21, A40, A41
With sample gas monitoring					
Hose made of FKM (Viton)	Aluminum	Non-flow-type	2		2 2 → A20, A21, A40, A41
	Aluminum	Flow-type	3		3
Add-on electronics					
Without			0		
AUTOCAL function					
• With 8 additional digital inputs/outputs each for channel 1			1		
• With 8 additional digital inputs/outputs each for channel 1 and channel 2			2		2
• With serial interface for the automotive industry (AK), channel 1			3		3 → E20
• With serial interface for the automotive industry (AK), channel 1 and channel 2			4		4 → E20
• With 8 additional digital inputs/outputs for channel 1 and PROFIBUS PA interface			5		
• With 8 additional digital inputs/outputs each for channel 1 and channel 2 and PROFIBUS PA interface			6		6
• With 8 additional digital inputs/outputs for channel 1 and PROFIBUS DP interface			7		
• With 8 additional digital inputs/outputs each for channel 1 and channel 2 and PROFIBUS DP interface			8		8

1) Only for cell length 20 to 180 mm

Selection and ordering data

Selection and ordering data			Article No.	Cannot be combined
ULTRAMAT 6 gas analyzer Single-channel or dual-channel 19" rack unit for installation in cabinets for measuring 2 or 3 IR components			7MB2124- ■■■■■ - ■■■■	
Power supply				
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		
Without channel 2			W	W
CO		11 ... 30	A	
CO highly selective (with optical filter)		12 ... 30	B	
CO (QAL1; see table "Based on QAL1 according to SIRA/MCERTS (single component)", page 1/54)			X	
CO_2		10 ... 30	C	
CH_4		13 ... 30	D	
C_2H_2		15 ... 30	E	
C_2H_4		15 ... 30	F	
C_2H_6		14 ... 30	G	
C_3H_6		14 ... 30	H	
C_3H_8		13 ... 30	J	
C_4H_6		15 ... 30	K	
C_4H_{10}		14 ... 30	L	
C_6H_{14}		14 ... 30	M	
SO_2 (QAL1; see table "Based on QAL1 according to SIRA/MCERTS (single component)", page 1/54)		13 ... 30	N	
NO (QAL1; see table "Based on QAL1 according to SIRA/MCERTS (single component)", page 1/54)		14 ... 20, 22	P	
NH_3 (dry)		14 ... 30	Q	Q
H_2O		17 ... 20, 22	R	R
N_2O		13 ... 30	S	
Smallest measuring range	Largest measuring range	Measuring range identification		
Without channel 2			X	X → A40, A41, B05
0 ... 5 vpm	0 ... 100 vpm	10	A	
0 ... 10 vpm	0 ... 200 vpm	11	B	
0 ... 20 vpm	0 ... 400 vpm	12	C	
0 ... 50 vpm	0 ... 1 000 vpm	13	D	
0 ... 100 vpm	0 ... 1 000 vpm	14	E	
0 ... 300 vpm	0 ... 3 000 vpm	15	F	
0 ... 500 vpm	0 ... 5 000 vpm	16	G	
0 ... 1 000 vpm	0 ... 10 000 vpm	17	H	
0 ... 3 000 vpm	0 ... 10 000 vpm	18	J	
0 ... 3 000 vpm	0 ... 30 000 vpm	19	K	
0 ... 5 000 vpm	0 ... 15 000 vpm	20	L	
0 ... 5 000 vpm	0 ... 50 000 vpm	21	M	
0 ... 1 %	0 ... 3 %	22	N	
0 ... 1 %	0 ... 10 %	23	P	
0 ... 3 %	0 ... 10 %	24	Q	
0 ... 3 %	0 ... 30 %	25	R	
0 ... 5 %	0 ... 15 %	26	S	
0 ... 5 %	0 ... 50 %	27	T	
0 ... 10 %	0 ... 30 %	28	U	
0 ... 10 %	0 ... 100 %	29	V	
0 ... 30 %	0 ... 100 %	30	W	
Operating software and documentation				
German			0	
English			1	
French			2	
Spanish			3	
Italian			4	

Selection and ordering data

Additional versions	**Order code**	Cannot be combined
Add "-Z" to Article No. and specify Order codes.		
Flow-type reference cell with reduced flow, 6 mm (channel 1)	**A20**	
Flow-type reference cell with reduced flow, ¼" (channel 1)	**A21**	
Flow-type reference cell with reduced flow, 6 mm (channel 2)	**A40**	
Flow-type reference cell with reduced flow, ¼" (channel 2)	**A41**	
Connection pipe (can only be combined with the appropriate gas connection diameter and internal gas path materials)		
• Made of titanium, 6 mm, complete with screwed gland, for sample gas side	**A22**	
• Made of titanium, 6 mm, complete with screwed gland, for reference gas side	**A23**	
• Made of titanium, ¼", complete with screwed gland, for sample gas side	**A24**	
• Made of titanium, ¼", complete with screwed gland, for reference gas side	**A25**	
• Made of stainless steel (mat. no. 1.4571), 6 mm, complete with screwed gland, for sample gas side	**A27**	
• Made of stainless steel (mat. no. 1.4571), ¼", complete with screwed gland, for sample gas side	**A29**	
Telescopic rails (2 units)	**A31**	
TAG labels (specific lettering based on customer information)	**B03**	
Kalrez gaskets in sample gas path (channel 1)	**B04**	
Kalrez gaskets in sample gas path (channel 2)	**B05**	
SIL conformity declaration (SIL 2) Functional Safety according to IEC 61508 and IEC 61511	**C20**	
FM/CSA certificate – Class I Div 2	**E20**	
Clean for O_2 service (specially cleaned gas path; channels 1 + 2)	**Y02**	
Measuring range indication in plain text, if different from the standard setting	**Y11**	
Special setting (only in conjunction with an application no., e.g. extended measuring range)	**Y12**	
Extended special setting (only in conjunction with an application no., e.g. determination of cross-interferences)	**Y13**	
QAL1 according to SIRA/MCERTS (1st channel)	**Y17**	
QAL1 according to SIRA/MCERTS (2nd channel)	**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 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**	

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

Example for ordering

ULTRAMAT 6, QAL1
Component: CO
Measuring range: 0 to 50 / 1 000 mg/m^3
with hoses, non-flow-type reference compartment
without automatic adjustment (AUTOCAL)
230 V AC; German
7MB2121-0XD00-1AA0-Z +Y17

Performance-tested according to EN 15267 (single component)

Only in conjunction with order code Y27/Y28

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

Example for ordering

ULTRAMAT 6 2-channel, performance-tested according to EN 15267
Components: CO + SO_2
Measuring range: CO: 0 to 75 / 1 250 mg/m^3, SO_2: 0 to 75 / 1 500 mg/m^3
with hoses, non-flow-type reference compartment
with automatic adjustment (AUTOCAL)
230 V AC; German
7MB2123-0BD03-1NC0-Z +Y27+Y28

Based on QAL1 according to 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

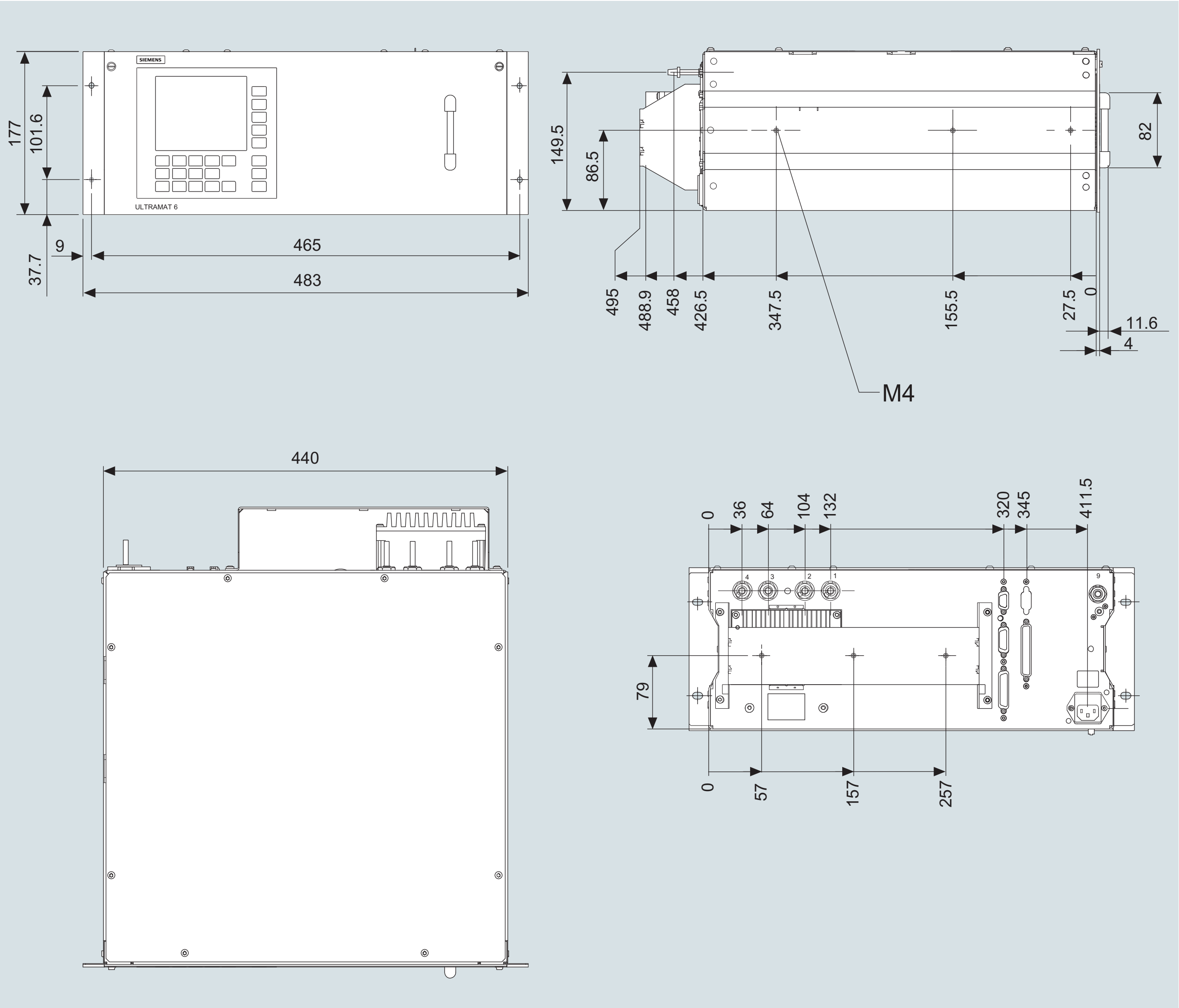
Example for ordering

ULTRAMAT 6 2-channel, QAL1
Components: CO/NO + SO_2
Measuring range: CO: 0 to 75 / 1 000 mg/m^3, NO: 0 to 200 / 2 000 mg/m^3, SO_2: 0 to 75 / 1 500 mg/m^3
with hoses, non-flow-type reference compartment
without automatic adjustment (AUTOCAL)
230 V AC; German
7MB2124-0AA00-1NC0-Z+Y17+Y18

Ordering information measured component N_2O

Certification in accordance with AM0028 and AM0034 (Kyoto Protocol) for measuring N_2O, measuring range 0 ... 300 vpm / 3 000 vpm.
Version: Standard device

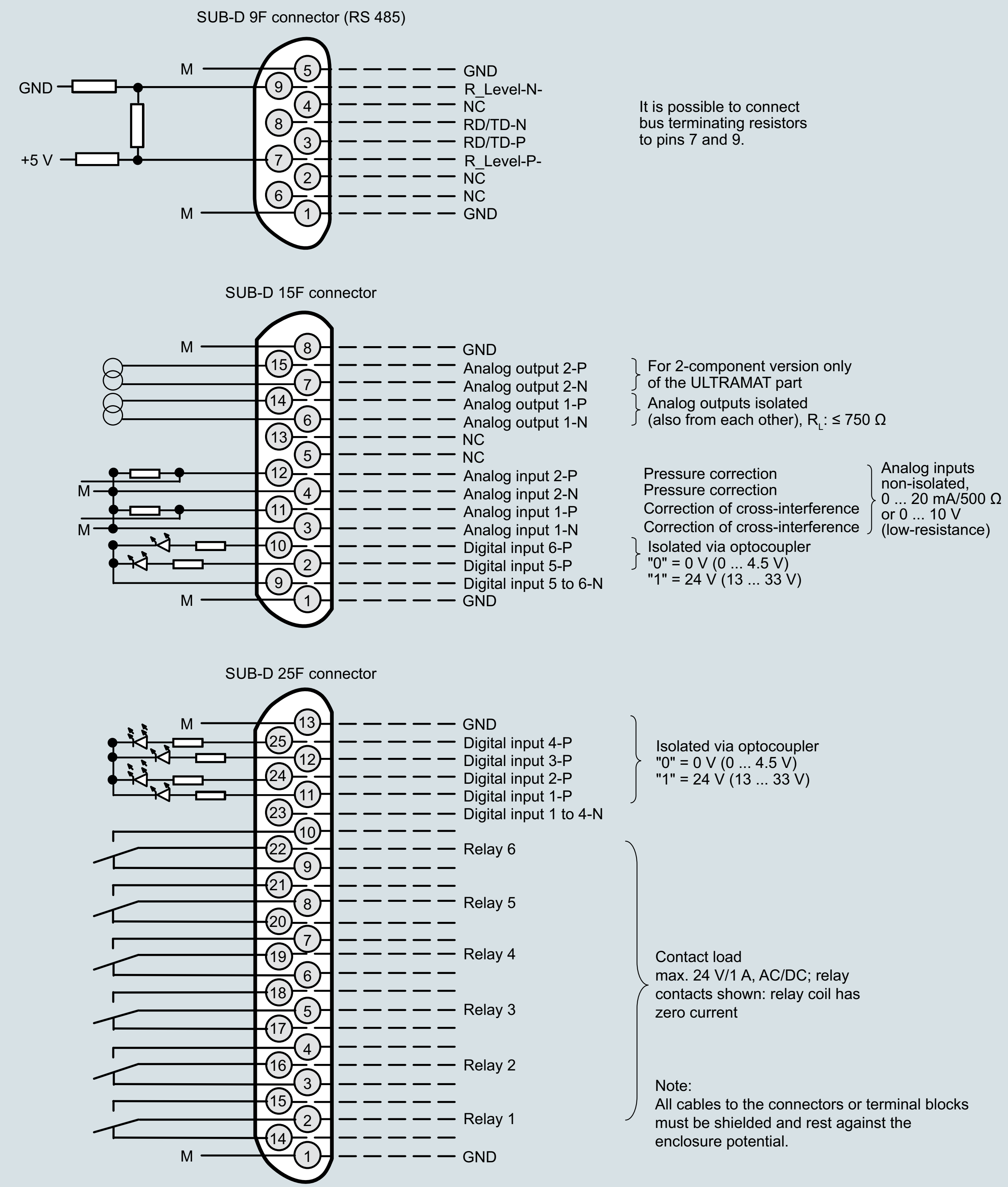
Dimensional drawings



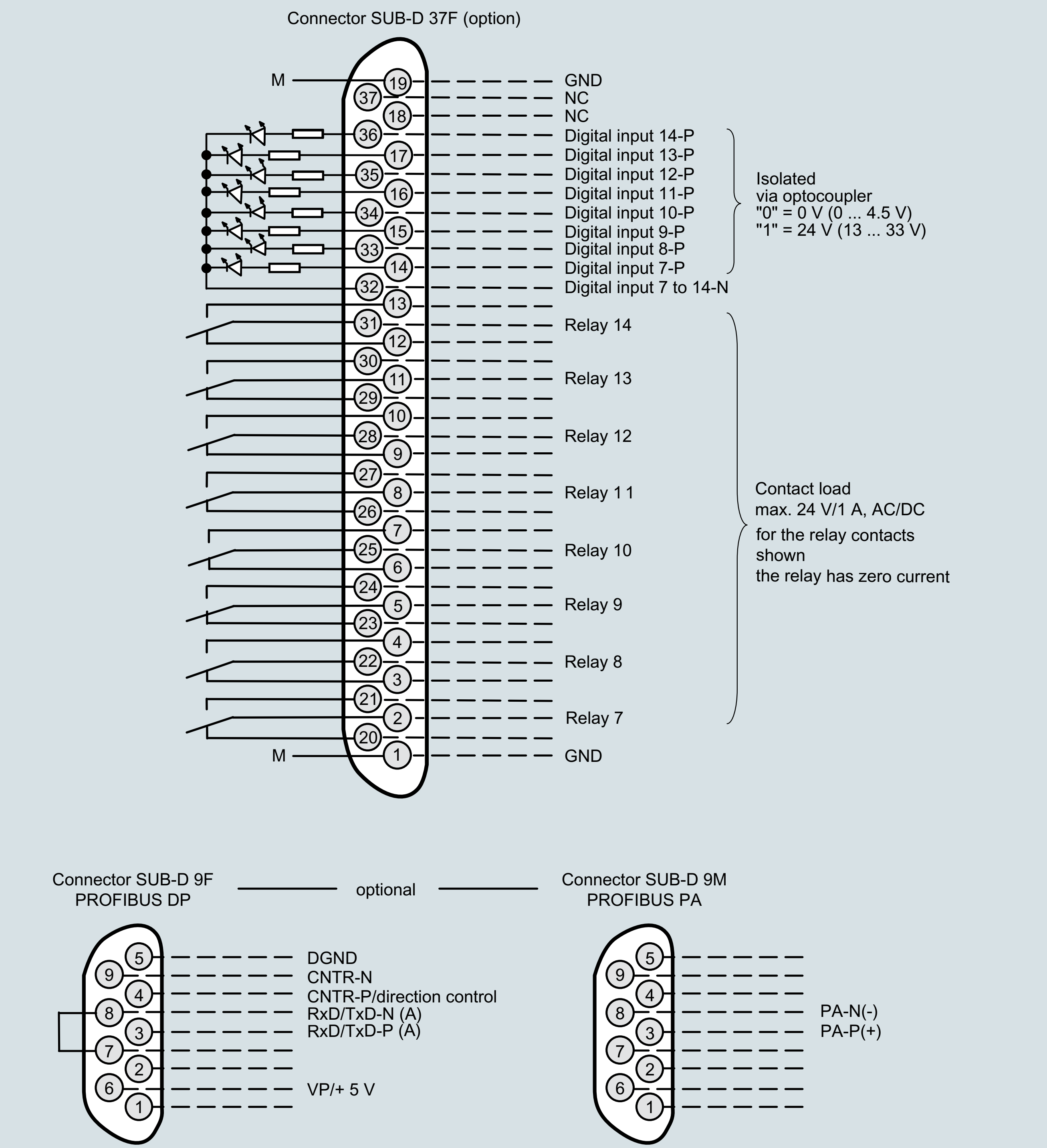
ULTRAMAT 6, 19" rack unit, dimensions in mm (example: 1-channel version)

Circuit diagrams

Pin assignment (electrical and gas connections)



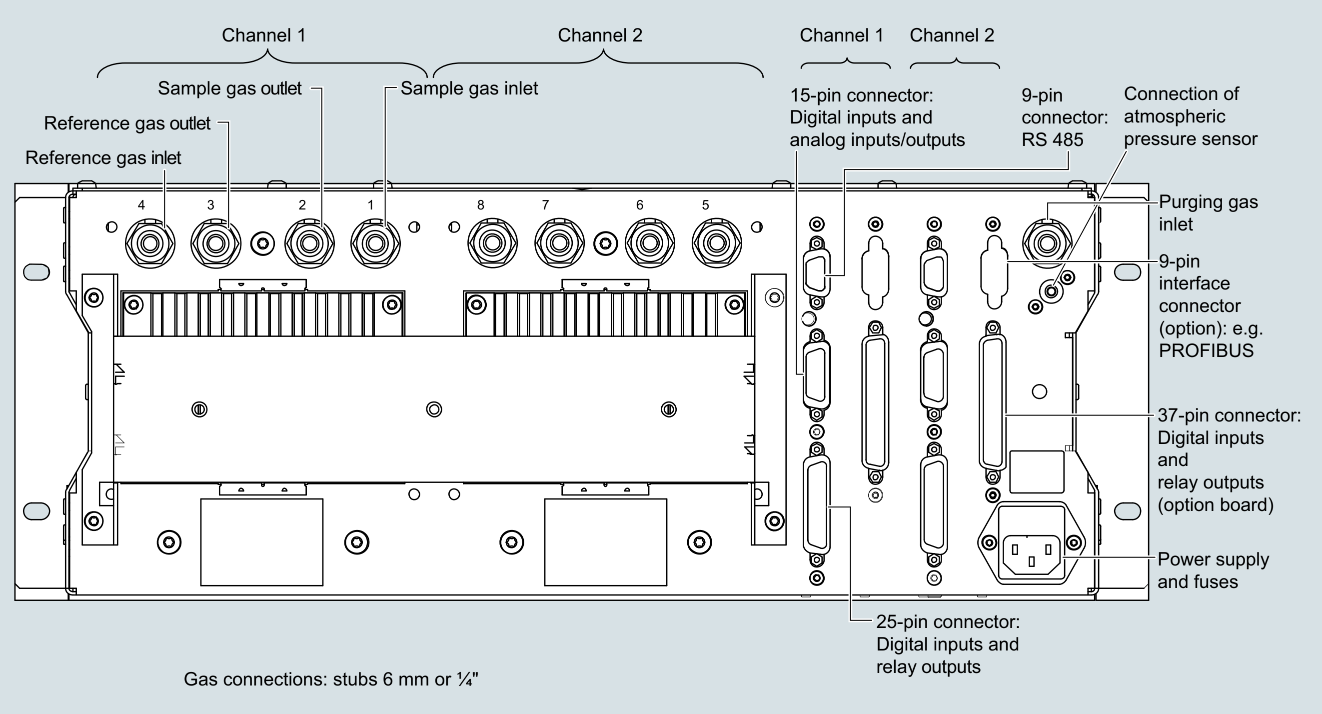
ULTRAMAT 6, 19" rack unit, pin assignment



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

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

19" rack unit



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

Technical specifications

General information	
Measuring ranges	4, internally and externally switchable; autoranging is also possible
Smallest possible measuring range	Dependent on the application, e.g. CO: 0 … 10 vpm, CO_2 : 0 … 5 vpm
Largest possible measuring range	Dependent on the application
Measuring 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 interfering gases must be considered separately	
Design, enclosure	
Weight	Approx. 32 kg
Degree of protection	IP65 in accordance with EN 60529, restricted breathing enclosure 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 units	Overvoltage category II
• Unheated units	Overvoltage category III
Fuse values (unheated unit)	
• 100 ... 120 V	F3: 1 T/250; F4: 1 T/250
• 200 ... 240 V	F3: 0.63 T/250; F4: 0.63 T/250
Fuse values (heated unit)	
• 100 ... 120 V	F1: 1 T/250; F2: 4 T/250 F3: 4 T/250; F4: 4 T/250
• 200 ... 240 V	F1: 0.63 T/250; F2: 2.5 T/250 F3: 2.5 T/250; F4: 2.5 T/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)
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
Dynamic response	
Warm-up period	At room temperature < 30 min (the technical specification will be met after 2 hours)
Delayed display (T_{90}-time)	Dependent on length of analyzer chamber, sample gas line and configurable damping

Damping (electrical time constant)	0 … 100 s, configurable
Dead time (purging time of the gas path in the unit at 1 l/min)	Approximately 0.5 ... 5 s, depending on version
Time for device-internal signal processing	< 1 s
Pressure correction range	
Pressure sensor	
• Internal	700 … 1 200 hPa absolute
• External	700 … 1 500 hPa absolute
Measuring response	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation	< ± 1% of the smallest possible measuring range according to rating plate
Zero point drift	< ± 1% of the current measuring range/week
Measured-value drift	< ± 1% of the current measuring range/week
Repeatability	≤ 1% of the current measuring range
Detection limit	1% of the smallest possible measuring range
Linearity error	± 0.5 % of the full-scale value
Influencing variables	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Ambient temperature	< 1% of current measuring range/10 K (with constant receiver cell temperature)
Sample gas pressure	With disabled pressure compensation: < 0.15% of the setpoint/1 % change in atmospheric pressure
Sample gas flow	Negligible
Auxiliary power	< 0.1% of the current measuring range with rated voltage ± 10%
Environmental conditions	Application-specific measuring influences possible if ambient air contains measured component or cross interference-sensitive gases
Electrical inputs and outputs	
Analog output	0/2/4 … 20 mA, isolated; load 750 Ω
Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load: 24 V AC/DC/1 A, isolated, 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, isolated, freely configurable, e.g. for measuring range switchover
Serial interface	RS 485
Options	AUTOCAL function each with 8 additional digital inputs and relay outputs, also with PROFIBUS PA or PROFIBUS DP
Climatic conditions	
Permissible ambient temperature	-30 … +70 °C during storage and transportation; 5 … 45 °C during operation
Permissible humidity	< 90% RH (RH: relative humidity) within average annual value, during storage and transportation (dew point must not be undershot)

Selection and ordering data			Article No.	Cannot be combined
ULTRAMAT 6 gas analyzer For installation in the field, single-channel, 1 component			↗ **7MB2111-** ■■■■■ - ■■ A ■	
↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.				
Gas connections				
Ferrule screw connection for pipe, outer diameter 6 mm			**0**	**0** → **A29**
Ferrule screw connection for pipe, outer diameter ¼"			**1**	**1** → **A28**
Measured component		Possible with measuring range identification		
CO		11 ... 30	**A**	
CO highly selective (with optical filter)		12 ... 30	**B**	
CO (QAL1; see table "Based on QAL1 according to SIRA/MCERTS (single component)", page 1/65)			**X**	
CO_2		10 ... 30	**C**	
CH_4		13 ... 30	**D**	
C_2H_2		15 ... 30	**E**	
C_2H_4		15 ... 30	**F**	
C_2H_6		14 ... 30	**G**	
C_3H_6		14 ... 30	**H**	
C_3H_8		13 ... 30	**J**	
C_4H_6		15 ... 30	**K**	
C_4H_{10}		14 ... 30	**L**	
C_6H_{14}		14 ... 30	**M**	
SO_2 (QAL1; see table "Based on QAL1 according to SIRA/MCERTS (single component)", page 1/65)		13 ... 30	**N**	
NO (QAL1; see table "Based on QAL1 according to SIRA/MCERTS (single component)", page 1/65)		14 ... 20, 22	**P**	
NH_3 (dry)		14 ... 30	**Q**	**Q**
H_2O		17 ... 20; 22 (17 to 24, 26; heated)	**R**	**R**
N_2O		13 ... 30	**S**	
Smallest measuring range	Largest measuring range	Measuring range identification		
0 ... 5 vpm	0 ... 100 vpm	10	**A**	
0 ... 10 vpm	0 ... 200 vpm	11	**B**	
0 ... 20 vpm	0 ... 400 vpm	12	**C**	
0 ... 50 vpm	0 ... 1 000 vpm	13	**D**	
0 ... 100 vpm	0 ... 1 000 vpm	14	**E**	
0 ... 300 vpm	0 ... 3 000 vpm	15	**F**	
0 ... 500 vpm	0 ... 5 000 vpm	16	**G**	
0 ... 1 000 vpm	0 ... 10 000 vpm	17	**H**	
0 ... 3 000 vpm	0 ... 10 000 vpm	19	**J**	
0 ... 3 000 vpm	0 ... 30 000 vpm	19	**K**	
0 ... 5 000 vpm	0 ... 15 000 vpm	20	**L**	
0 ... 5 000 vpm	0 ... 50 000 vpm	21	**M**	
0 ... 1 %	0 ... 3 %	22	**N**	
0 ... 1 %	0 ... 10 %	23	**P**	
0 ... 3 %	0 ... 10 %	24	**Q**	
0 ... 3 %	0 ... 30 %	25	**R**	
0 ... 5 %	0 ... 15 %	26	**S**	
0 ... 5 %	0 ... 50 %	27	**T**	
0 ... 10 %	0 ... 30 %	28	**U**	
0 ... 10 %	0 ... 100 %	29	**V**	
0 ... 30 %	0 ... 100 %	30	**W**	

Selection and ordering data

Selection and ordering data			Article No.	Cannot be combined
ULTRAMAT 6 gas analyzer For installation in the field, single-channel, 1 component			**7MB2111-** ■■■■■ **-** ■■**A**■	
Internal gas paths	Sample chamber (lining)	Reference chamber (flow-type)		
Hose made of FKM (Viton)	Aluminum	Non-flow-type	0	0 0 0 → A28, A29
	Aluminum	Flow-type	1	1 1
Pipe made of titanium	Tantalum[1]	Non-flow-type	2	2 → A28, A29, Y02
	Tantalum[1]	Flow-type	3	3 → Y02
Stainless steel pipe (mat. no. 1.4571)	Aluminum	Non-flow-type	6	6 → A28, A29
	Tantalum[1]	Non-flow-type	8	8 → A28, A29
Add-on electronics				
Without			0	
AUTOCAL function				
• With 8 additional digital inputs/outputs			1	
• With 8 digital inputs/outputs and PROFIBUS PA interface			6	6 → E12
• With 8 digital inputs/outputs and PROFIBUS DP interface			7	7 → E12
• With 8 digital inputs/outputs and PROFIBUS PA Ex i			8	8
Power supply				
Standard unit and acc. to ATEX II 3G version (Zone 2)				
• 100 ... 120 V AC, 48 ... 63 Hz			0	0
• 200 ... 240 V AC, 48 ... 63 Hz			1	1
ATEX II 2G versions (Zone 1), incl. certificate				
• 100 ... 120 V AC, 48 ... 63 Hz, according to ATEX II 2G[2] (operating mode: leakage compensation)			2	2 2
• 200 ... 240 V AC, 48 ... 63 Hz, according to ATEX II 2G[2] (operating mode: leakage compensation)			3	3 3
• 100 ... 120 V AC, 48 ... 63 Hz, according to ATEX II 2G[2] (operating mode: continuous purging)			6	6 6
• 200 ... 240 V AC, 48 ... 63 Hz, according to ATEX II 2G[2] (operating mode: continuous purging)			7	7 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 length 20 to 180 mm
[2] Only in connection with an approved purging unit

Selection and ordering data

Additional versions	Order code
Add "-Z" to Article No. and specify Order codes.	
Flow-type reference cell with reduced flow, 6 mm	**A28**
Flow-type reference cell with reduced flow, ¼"	**A29**
TAG labels (specific lettering based on customer information)	**B03**
Kalrez gaskets in sample gas path	**B04**
SIL conformity declaration (SIL 2) Functional Safety according to IEC 61508 and IEC 61511	**C20**
Ex versions Possible combinations: see table "Ex configurations – principle selection criteria (Series 6)", chapter "General information"	
ATEX II 3G certificate; restricted breathing enclosure, non-flammable gases	**E11**
ATEX II 3G certificate; flammable gases	**E12**
FM/CSA certificate – Class I Div 2	**E20**
ATEX II 3D certificate; potentially explosive dust atmospheres	
• In non-hazardous gas zone	**E40**
• In Ex zone acc. to ATEX II 3G, non-flammable gases	**E41**
• In Ex zone acc. to ATEX II 3G, flammable gases[1)]	**E42**
BARTEC Ex p purging unit "Leakage compensation"	**E71**
BARTEC Ex p purging unit "Continuous purging"	**E72**
Clean for O_2 service (specially cleaned gas path)	**Y02**
Measuring range indication in plain text, if different from the standard setting	**Y11**
Special setting (only in conjunction with an application no., e.g. extended measuring range)	**Y12**
Extended special setting (only in conjunction with an application no., e.g. determination of cross-interferences)	**Y13**
QAL1 according to SIRA/MCERTS	**Y17**

Additional units for Ex versions	Article No.
Category ATEX II 2G (zone 1)	
BARTEC Ex p purging unit, 230 V, "leakage compensation"	**7MB8000-2BA**
BARTEC Ex p purging unit, 115 V, "leakage compensation"	**7MB8000-2BB**
BARTEC Ex p purging unit, 230 V, "continuous purging"	**7MB8000-2CA**
BARTEC Ex p purging unit, 115 V, "continuous purging"	**7MB8000-2CB**
Ex i isolating transformer	**7MB8000-3AB**
Ex isolating relay, 230 V	**7MB8000-4AA**
Ex isolating relay, 110 V	**7MB8000-4AB**
Differential pressure switch for corrosive and non-corrosive gases	**7MB8000-5AA**
Stainless steel flame arrestor	**7MB8000-6BA**
Hastelloy flame arrestor	**7MB8000-6BB**
Category ATEX II 3G (Zone 2)	
BARTEC Ex p purging unit, 230 V, "continuous purging"	**7MB8000-2CA**
BARTEC Ex p purging unit, 115 V, "continuous purging"	**7MB8000-2CB**
FM/CSA (Class I Div. 2)	
Ex purging unit MiniPurge FM	**7MB8000-1AA**

Accessories	Article No.
RS 485/Ethernet converter	**A5E00852383**
RS 485/RS 232 converter	**C79451-Z1589-U1**
RS 485/USB converter	**A5E00852382**
AUTOCAL function with 8 digital inputs/outputs	**A5E00064223**
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS PA	**A5E00057315**
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS DP	**A5E00057318**
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS PA Ex i (firmware 4.1.10 required)	**A5E00057317**
Set of Torx screwdrivers	**A5E34821625**

1) Only in connection with an approved purging unit

Selection and ordering data			Article No.	Cannot be combined
ULTRAMAT 6 gas analyzer For installation in the field, single-channel, 2 components			↗ **7MB2112-** ■■■■■ - ■■A■	
↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.				
Gas connections				
Ferrule screw connection for pipe, outer diameter 6 mm			**0**	**0** → **A29**
Ferrule screw connection for pipe, outer diameter ¼"			**1**	**1** → **A28**
Measured component	Smallest measuring range	Largest measuring range		
CO NO	0 ... 100 vpm 0 ... 100 vpm	0 ... 1 000 vpm 0 ... 1 000 vpm	**A A**	
CO NO	0 ... 300 vpm 0 ... 300 vpm	0 ... 3 000 vpm 0 ... 3 000 vpm	**A B**	
CO NO	0 ... 1 000 vpm 0 ... 1 000 vpm	0 ... 10 000 vpm 0 ... 10 000 vpm	**A C**	
For CO/NO (QAL1; see table "Based on QAL1 according to SIRA/MCERTS (2 components in series)", page 1/65)				
CO_2 CO	0 ... 100 vpm 0 ... 100 vpm	0 ... 1 000 vpm 0 ... 1 000 vpm	**B A**	
CO_2 CO	0 ... 300 vpm 0 ... 300 vpm	0 ... 3 000 vpm 0 ... 3 000 vpm	**B B**	
CO_2 CO	0 ... 1 000 vpm 0 ... 1 000 vpm	0 ... 10 000 vpm 0 ... 10 000 vpm	**B C**	
CO_2 CO	0 ... 3 000 vpm 0 ... 3 000 vpm	0 ... 30 000 vpm 0 ... 30 000 vpm	**B D**	
CO_2 CO	0 ... 1 % 0 ... 1 %	0 ... 10 % 0 ... 10 %	**B E**	
CO_2 CO	0 ... 3 % 0 ... 3 %	0 ... 30 % 0 ... 30 %	**B F**	
CO_2 CO	0 ... 10 % 0 ... 10 %	0 ... 100 % 0 ... 100 %	**B G**	
CO_2 CH_4	0 ... 10 % 0 ... 10 %	0 ... 100 % 0 ... 100 %	**C G**	
CO_2 NO	0 ... 100 vpm 0 ... 100 vpm	0 ... 1 000 vpm 0 ... 1 000 vpm	**D A**	
CO_2 NO	0 ... 300 vpm 0 ... 300 vpm	0 ... 3 000 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**	**0** **0** → **A28, A29**
	Aluminum	Flow-type	**1**	**1**
Pipe made of titanium	Tantalum[1]	Non-flow-type	**2**	**2** → **A28, A29, Y02**
	Tantalum[1]	Flow-type	**3**	**3** → **Y02**
Stainless steel pipe (mat. no. 1.4571)	Aluminum	Non-flow-type	**6**	**6** → **A28, A29**
	Tantalum[1]	Non-flow-type	**8**	**8** → **A28, A29**
Add-on electronics				
Without			**0**	
AUTOCAL function				
• With 8 additional digital inputs/outputs			**1**	
• With 8 digital inputs/outputs and PROFIBUS PA interface			**6**	**6**
• With 8 digital inputs/outputs and PROFIBUS DP interface			**7**	**7**
• With 8 digital inputs/outputs and PROFIBUS PA Ex i			**8**	**8**
Power supply				
Standard unit and acc. to ATEX II 3G version (Zone 2)				
• 100 ... 120 V AC, 48 ... 63 Hz			**0**	**0**
• 200 ... 240 V AC, 48 ... 63 Hz			**1**	**1**
ATEX II 2G versions (Zone 1), incl. certificate				
• 100 ... 120 V AC, 48 ... 63 Hz, according to ATEX II 2G[2] (operating mode: leakage compensation)			**2**	**2** **2**
• 200 ... 240 V AC, 48 ... 63 Hz, according to ATEX II 2G[2] (operating mode: leakage compensation)			**3**	**3** **3**
• 100 ... 120 V AC, 48 ... 63 Hz, according to ATEX II 2G[2] (operating mode: continuous purging)			**6**	**6** **6**
• 200 ... 240 V AC, 48 ... 63 Hz, according to ATEX II 2G[2] (operating mode: continuous purging)			**7**	**7** **7**
Heating of internal gas paths and analyzer unit				
none			**A**	
With (max. 65 °C)			**B**	

Selection and ordering data	Article No.	Cannot be combined
ULTRAMAT 6 gas analyzer For installation in the field, single-channel, 2 components	**7MB2112- ■■■■■ - ■■A■**	
Language (supplied documentation, software)		
German	0	
English	1	
French	2	
Spanish	3	
Italian	4	

[1)] Only for cell length 20 to 180 mm.
[2)] See also "Additional units for Ex versions".

Additional versions	Order code
Add "-Z" to Article No. and specify Order codes.	
Flow-type reference cell with reduced flow, 6 mm	**A28**
Flow-type reference cell with reduced flow, ¼"	**A29**
TAG labels (specific lettering based on customer information)	**B03**
Kalrez gaskets in sample gas path	**B04**
SIL conformity declaration (SIL 2) Functional Safety according to IEC 61508 and IEC 61511	**C20**
Ex versions	
Possible combinations: see table "Ex configurations – principle selection criteria (Series 6), chapter "General information"	
ATEX II 3G certificate; restricted breathing enclosure, non-flammable gases	**E11**
ATEX II 3G certificate; flammable gases	**E12**
CSA certificate – Class I Div 2	**E20**
ATEX II 3D certificate; potentially explosive dust atmospheres	
• In non-hazardous gas zone	**E40**
• In Ex zone acc. to ATEX II 3G, non-flammable gases	**E41**
• In Ex zone acc. to ATEX II 3G, flammable gases	**E42**
BARTEC Ex p purging unit "Leakage compensation"	**E71**
BARTEC Ex p purging unit "Continuous purging"	**E72**
Clean for O_2 service (specially cleaned gas path)	**Y02**
Measuring range indication in plain text, if different from the standard setting	**Y11**
Special setting (only in conjunction with an application no., e.g. extended measuring range)	**Y12**
Extended special setting (only in conjunction with an application no., e.g. determination of cross-interferences)	**Y13**
QAL1 according to SIRA/MCERTS	**Y17**

Additional units for Ex versions	Article No.
Category ATEX II 2G (zone 1)	
BARTEC Ex p purging unit, 230 V, "leakage compensation"	**7MB8000-2BA**
BARTEC Ex p purging unit, 115 V, "leakage compensation"	**7MB8000-2BB**
BARTEC Ex p purging unit, 230 V, "continuous purging"	**7MB8000-2CA**
BARTEC Ex p purging unit, 115 V, "continuous purging"	**7MB8000-2CB**
Ex i isolating transformer	**7MB8000-3AB**
Ex isolating relay, 230 V	**7MB8000-4AA**
Ex isolating relay, 110 V	**7MB8000-4AB**
Differential pressure switch for corrosive and non-corrosive gases	**7MB8000-5AA**
Stainless steel flame arrestor	**7MB8000-6BA**
Hastelloy flame arrestor	**7MB8000-6BB**
Category ATEX II 3G (Zone 2)	
BARTEC Ex p purging unit, 230 V, "continuous purging"	**7MB8000-2CA**
BARTEC Ex p purging unit, 115 V, "continuous purging"	**7MB8000-2CB**
FM/CSA (Class I Div. 2)	
Ex purging unit MiniPurge FM	**7MB8000-1AA**

Accessories	Article No.
RS 485/Ethernet converter	**A5E00852383**
RS 485/RS 232 converter	**C79451-Z1589-U1**
RS 485/USB converter	**A5E00852382**
AUTOCAL function with 8 digital inputs/outputs	**A5E00064223**
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS PA	**A5E00057315**
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS DP	**A5E00057318**
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS PA Ex i (firmware 4.1.10 required)	**A5E00057317**
Set of Torx screwdrivers	**A5E34821625**

Based on QAL1 according to 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

Example for ordering

ULTRAMAT 6, QAL1 (1-component unit)
Component: CO
Measuring range: 0 to 50 / 1 000 mg/m^3
with hoses, non-flow-type reference compartment
without automatic adjustment (AUTOCAL)
230 V AC; without heating, German
7MB2111-0XD00-1AA0-Z +Y17

Based on QAL1 according to 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 ...**
AA	75 mg/m^3	1 000 mg/m^3	200 mg/m^3	2 000 mg/m^3
AB	300 mg/m^3	3 000 mg/m^3	300 mg/m^3	3 000 mg/m^3
AC	1 000 mg/m^3	10 000 mg/m^3	1 000 mg/m^3	10 000 mg/m^3

Example for ordering

ULTRAMAT 6, QAL1 (2 components in series)
Components: CO/NO
Measuring range CO: 0 to 75 / 1 000 mg/m^3, NO: 0 to 200 / 2 000 mg/m^3
with hoses, non-flow-type reference compartment
without automatic adjustment (AUTOCAL)
230 V AC; without heating, German
7MB2112-0AA00-1AA0-Z +Y17

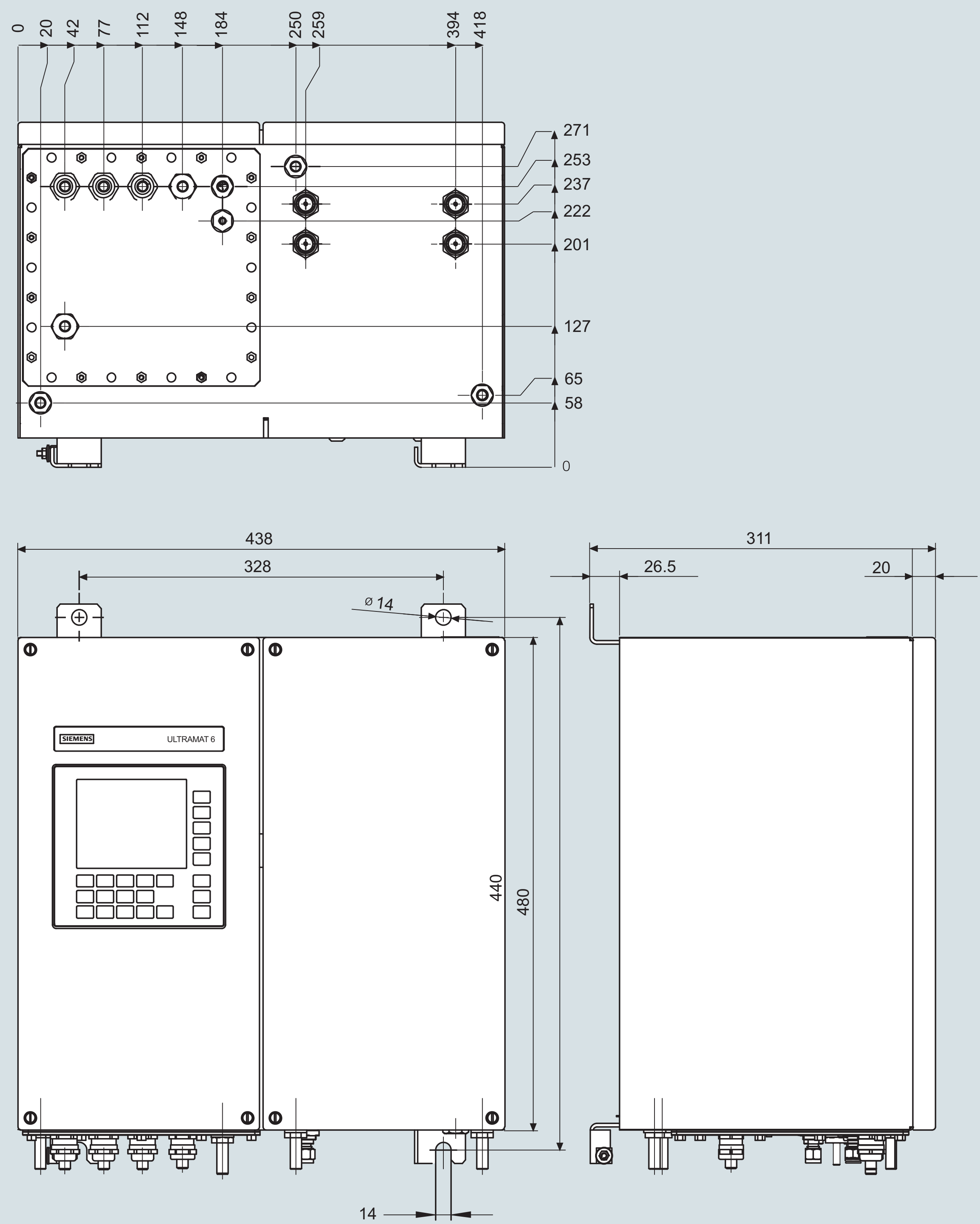
Note: for 3 components take both tables into consideration.

Ordering information measured component N_2O

Certification in accordance with AM0028 and AM0034 (Kyoto Protocol) for measuring N_2O, measuring range 0 to 300 vpm / 3 000 vpm.

Version: Standard device

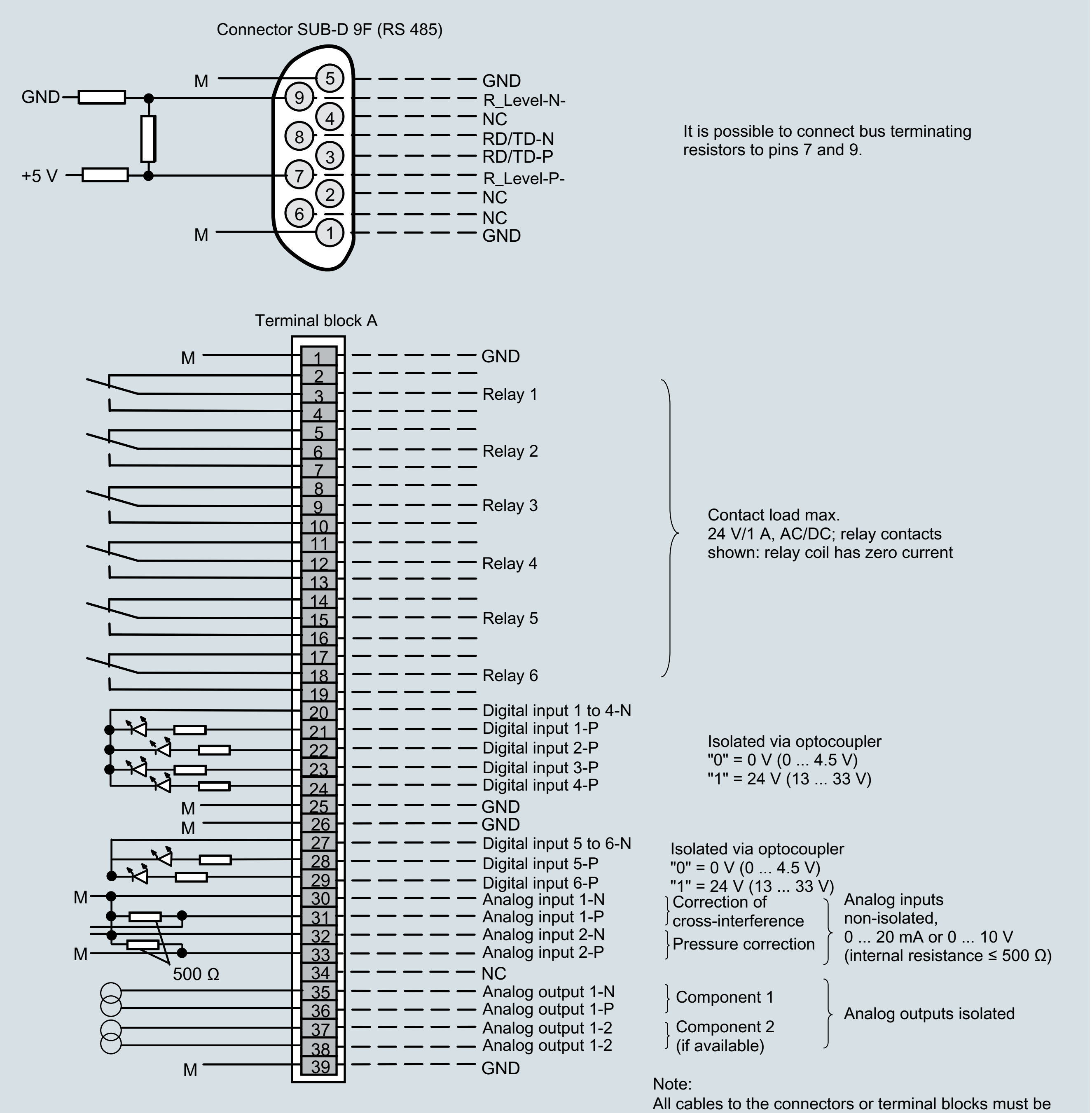
Dimensional drawings



ULTRAMAT 6, field unit, dimensions in mm

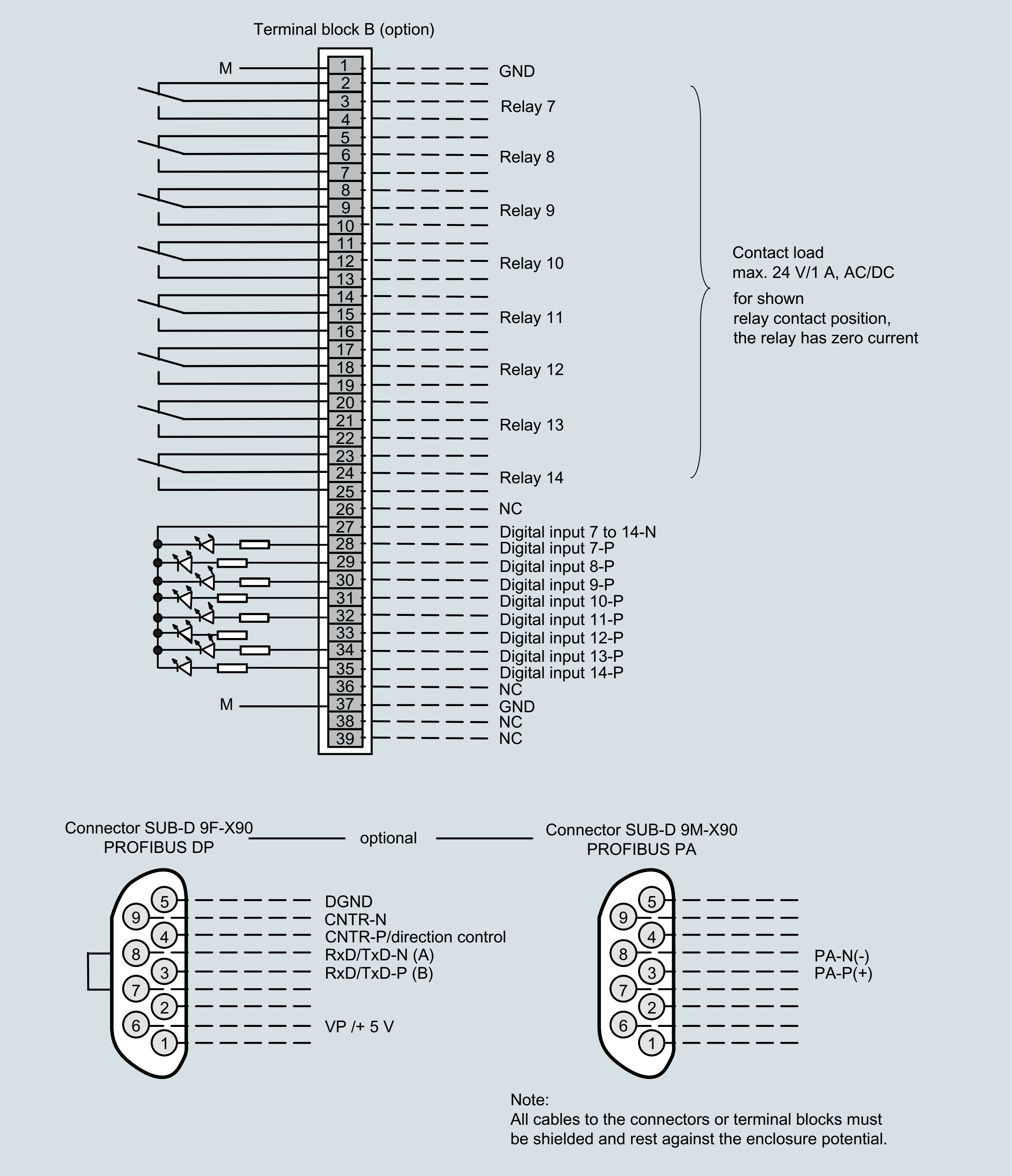
Circuit diagrams

Pin assignment (electrical and gas connections)

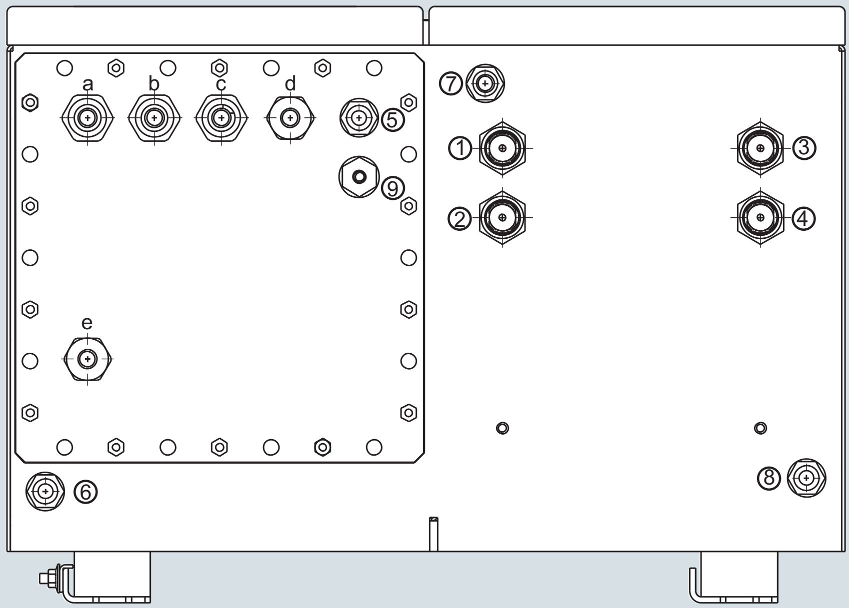


Note:
All cables to the connectors or terminal blocks must be shielded and rest against the enclosure potential.

ULTRAMAT 6, field device, pin and terminal assignment



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



Gas connections

①	Sample gas inlet	Clamping gland for pipe Ø 6 mm or ¼"
②	Sample gas outlet	
③	Reference gas inlet (option)	
④	Reference gas outlet (option)	

⑤-⑧ Purging gas inlets/outlets, stubs Ø 10 mm or 3/8"
⑨ Connection atmospheric pressure sensor, stubs Ø ¼"

Electrical connections

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

ULTRAMAT 6, field device, gas connections and electrical connections

Documentation, suggestions for spare parts

Selection and ordering data

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

More information

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

Selection and ordering data

Description	7MB-2121	7MB-2123	7MB-2124	7MB-2111	7MB-2112	7MB-2111/2 Ex	2 years (quantity)	5 years (quantity)	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-D501**
Sample gas path									
O-ring (hose clip)				x	x	x	2	4	**C71121-Z100-A159**
Pressure switch	x	x	x				1	2	**C79302-Z1210-A2**
Flow indicator	x	x	x				1	2	**C79402-Z560-T1**
Hose clip	x	x	x	x	x	x		1	**C79451-A3478-C9**
Heating cartridge (heated unit)				x	x	x		1	**W75083-A1004-F120**
Electronics									
Temperature fuse (heated unit)				x	x			1	**W75054-T1001-A150**
Fuse (device fuse)						x	1	2	**A5E00061505**
Temperature controller - electronics, 230 V AC				x	x	x		1	**A5E00118527**
Temperature controller - electronics, 115 V AC				x	x	x		1	**A5E00118530**
Fan, 24 V DC (heated unit)				x	x	x		1	**A5E00302916**
Front plate with keyboard	x	x	x				1	1	**C79165-A3042-B504**
Temperature sensor				x	x	x		1	**C79165-A3044-B176**
Adapter plate, LCD/keyboard	x	x	x	x	x		1	1	**C79451-A3474-B605**
Motherboard, with firmware: see spare parts list	x	x	x	x	x	x		1	
LC display	x	x	x	x	x		1	1	**A5E31474846**
Connector filter	x	x	x	x	x			1	**W75041-E5602-K2**
Fusible element, T 0.63 A/250 V	x		x	x	x	x	2	3	**W79054-L1010-T630**
Fusible element, T 1 A/250 V	x	x	x	x	x	x	2	3	**W79054-L1011-T100**
Fusible element, T 1.6 A/250 V		x	x				2	3	**W79054-L1011-T160**
Fusible element, T 2.5 A/250 V				x	x	x	2	3	**W79054-L1011-T250**

If the ULTRAMAT 6 is supplied with a specially cleaned gas path for high oxygen content ("Cleaned for O_2 service"), please ensure that you specify this when ordering spare parts. This is the only way to guarantee that the gas path will continue to comply with the special requirements for this version.

Overview

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

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

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

Benefits

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

ULTRAMAT channel

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

OXYMAT channel

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

Application

Fields of application

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

Special versions

Special applications

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

Performance-tested version / QAL

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

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

All larger measuring ranges are also approved.

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

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

Flow-type reference compartment

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

Design

19" rack unit

- 19" rack unit with 4 HU for installation
  - In hinged frame
  - In cabinets with or without telescope rails
- Front plate can be swung down for servicing purposes (laptop connection)
- Internal gas paths: hose made of FKM (Viton) or pipe made of titanium or stainless steel
- Gas connections for sample gas inlet and outlet: pipe diameter 6 mm or 1/4"
- Flow indicator for sample gas on front plate (option)
- Sample chamber (OXYMAT channel) – with or without flow-type compensation branch – made of stainless steel (mat. no. 1.4571) or of tantalum for highly corrosive sample gases (e.g. HCl, Cl_2, SO_2, SO_3, etc.)
- Monitoring (option) of sample gas and/or reference gas (both channels)

General information

Display and control panel

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

Inputs and outputs (per channel)

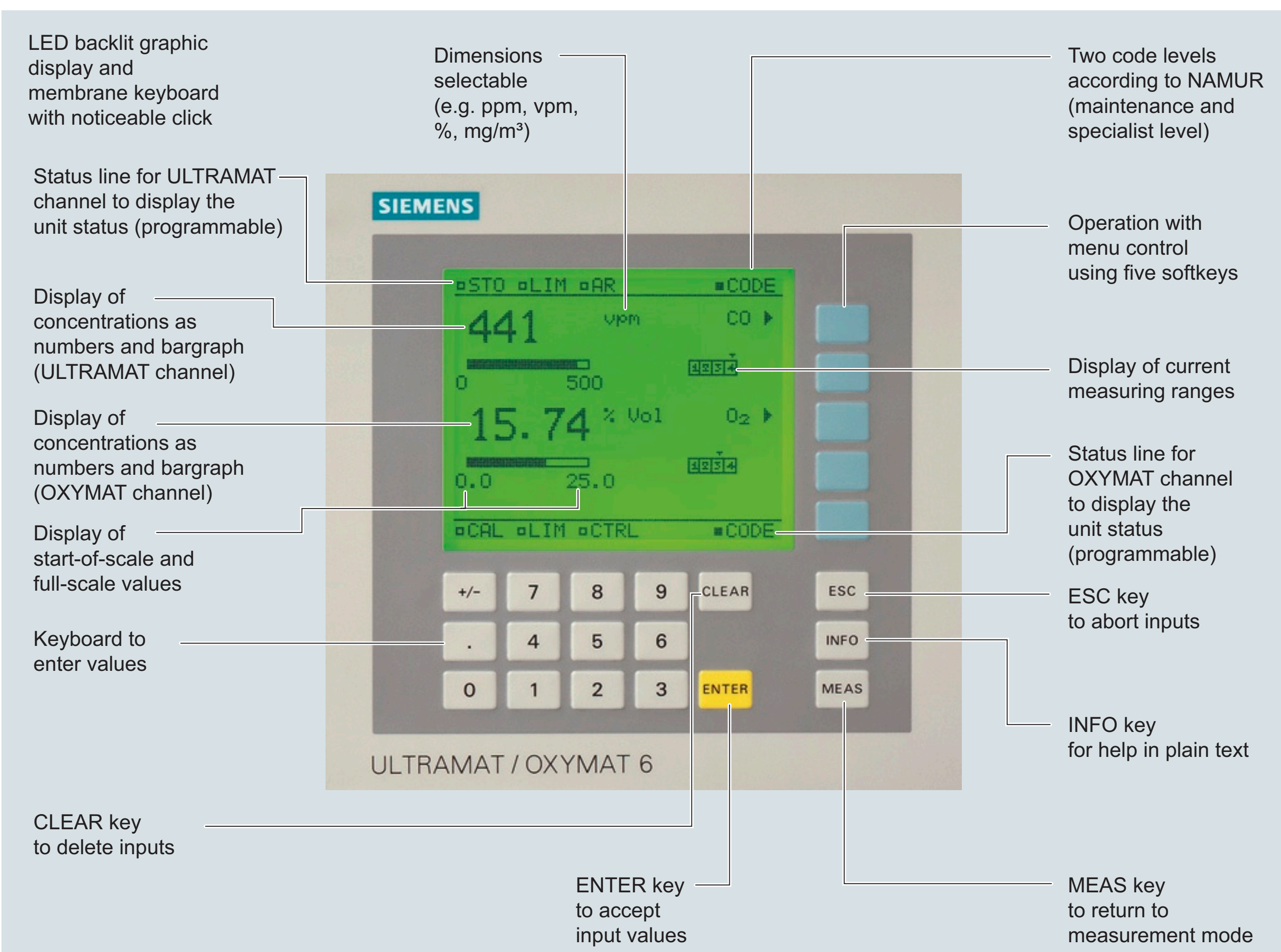
- One analog output for each measured component
- Two analog inputs freely configurable (e.g. correction of cross-interference or external pressure sensor)
- Six digital inputs freely configurable (e.g. for measurement range switchover, processing of external signals from sample preparation)
- Six relay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

Communication

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

Options

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



ULTRAMAT/OXYMAT 6, membrane keyboard and graphic display

Designs – Parts wetted by sample gas, standard

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

Options

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

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

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

General information

Designs – Parts wetted by sample gas, standard

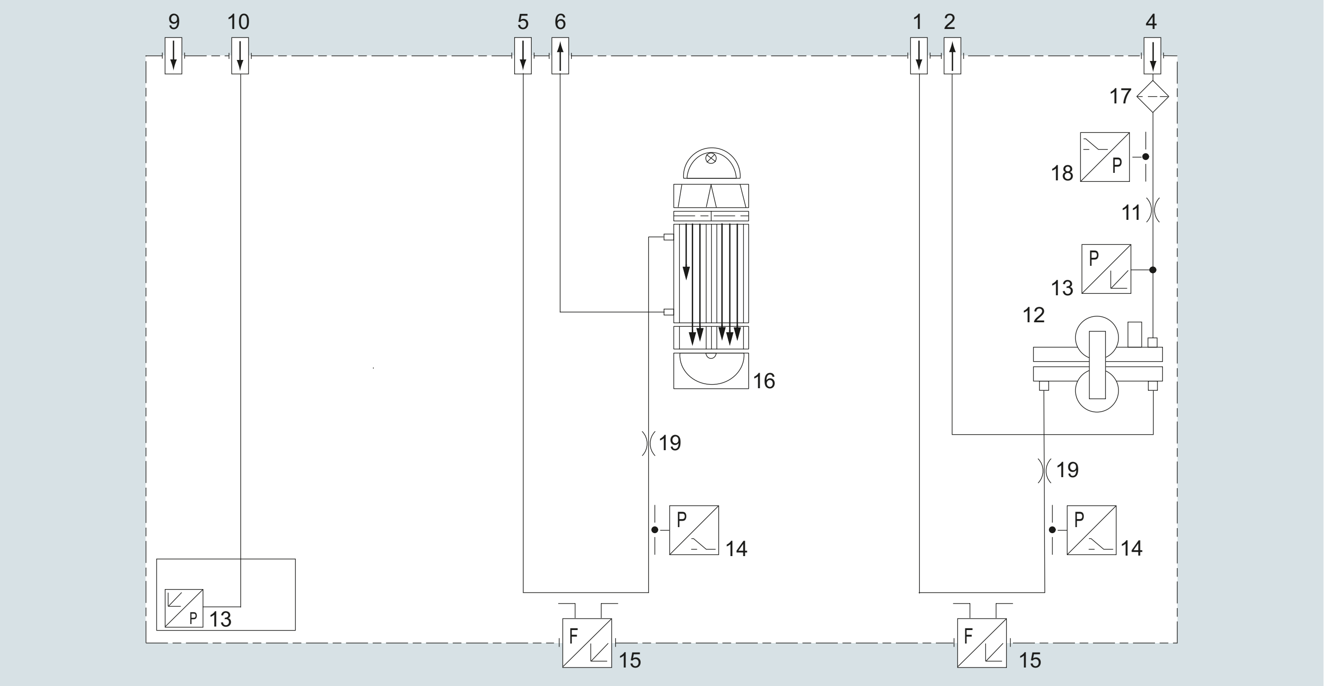
Gas path OXYMAT channel		19" rack unit
With hoses	Bushing	Stainless steel, mat. no. 1.4571
	Hose	FKM (e.g. Viton)
	Sample chamber	Stainless steel, mat. no. 1.4571 or tantalum
	Fittings for sample chamber	Stainless steel, mat. no. 1.4571
	Restrictor	PTFE (e.g. Teflon)
	O-rings	FKM (e.g. Viton)
With pipes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

Options

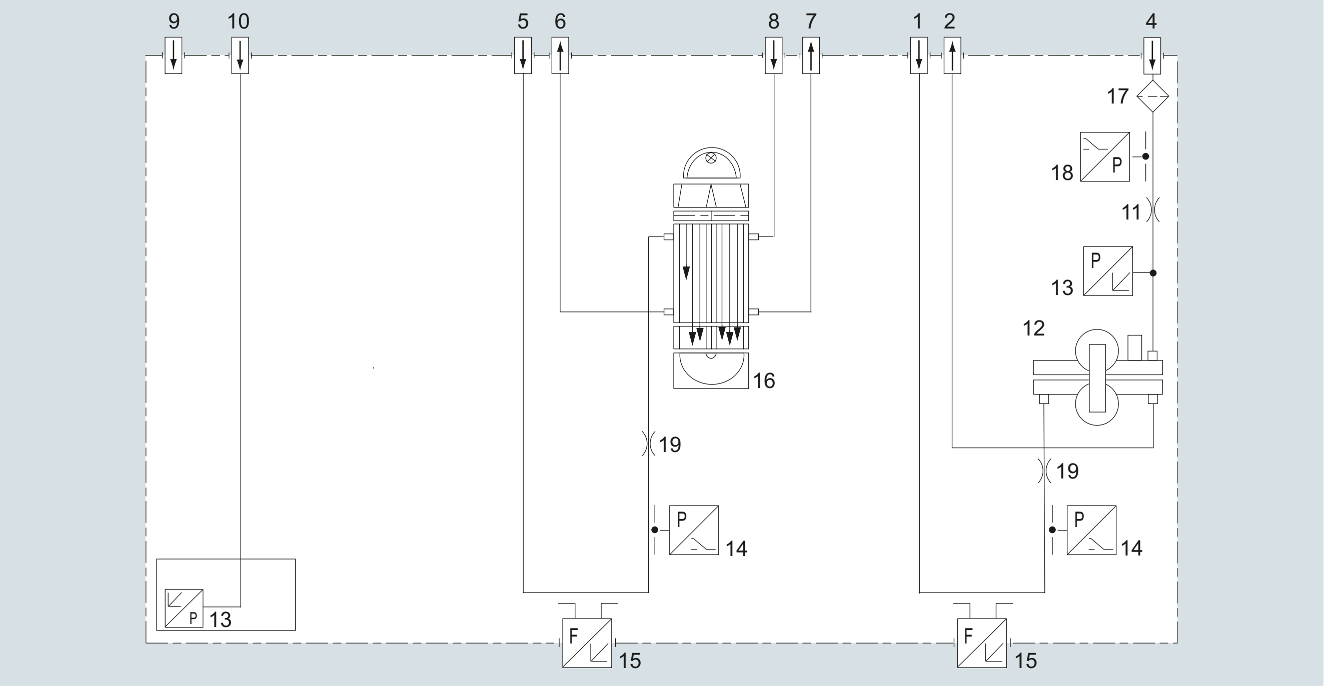
Gas path ULTRAMAT channel and OXYMAT channel		19" rack unit
Flow indicator	Measurement pipe	Duran glass
	Variable area	Duran glass
	Suspension boundary	PTFE (Teflon)
	Angle pieces	FKM (e.g. Viton)
Pressure switch	Diaphragm	FKM (e.g. Viton)
	Enclosure	PA 6.3T

Gas path

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



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



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

Function

Principle of operation, ULTRAMAT channel

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

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

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

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

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

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

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

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

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

Note

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

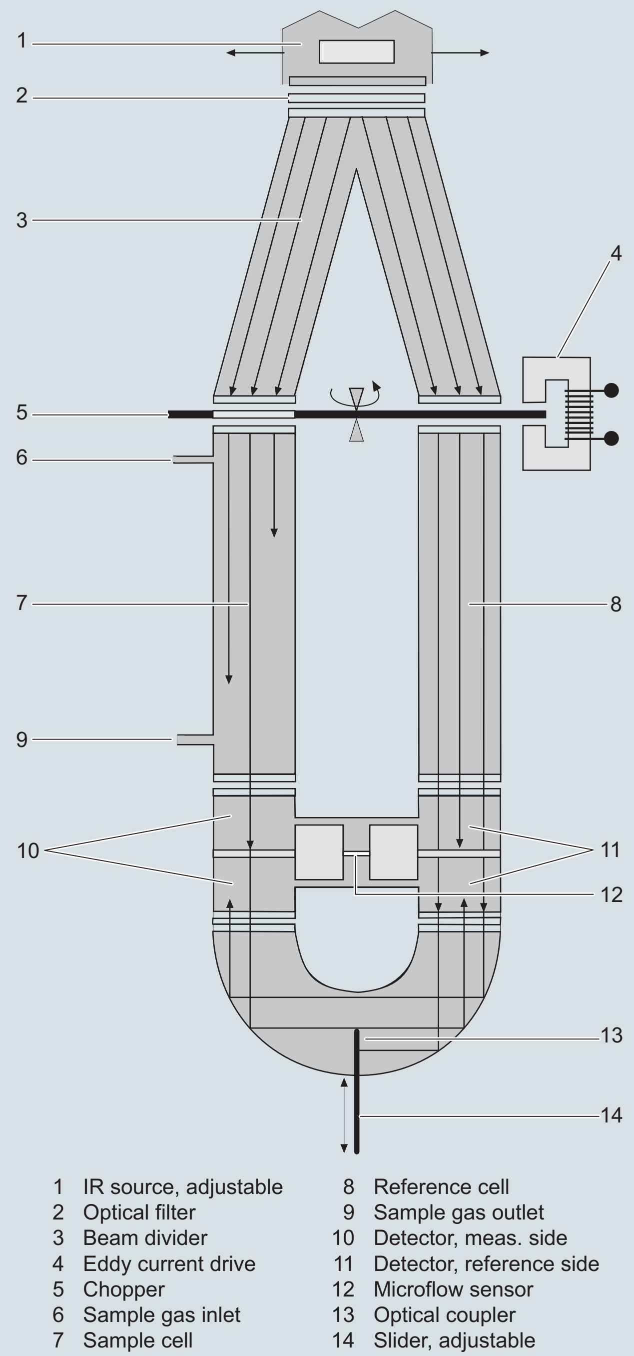
As far as possible, the ambient air of the analyzer should not have a large concentration of the gas components to be measured.

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

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

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

Physically suppressed zeros can be provided as a special application.



ULTRAMAT channel, principle of operation

Principle of operation, OXYMAT channel

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

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

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

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

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

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

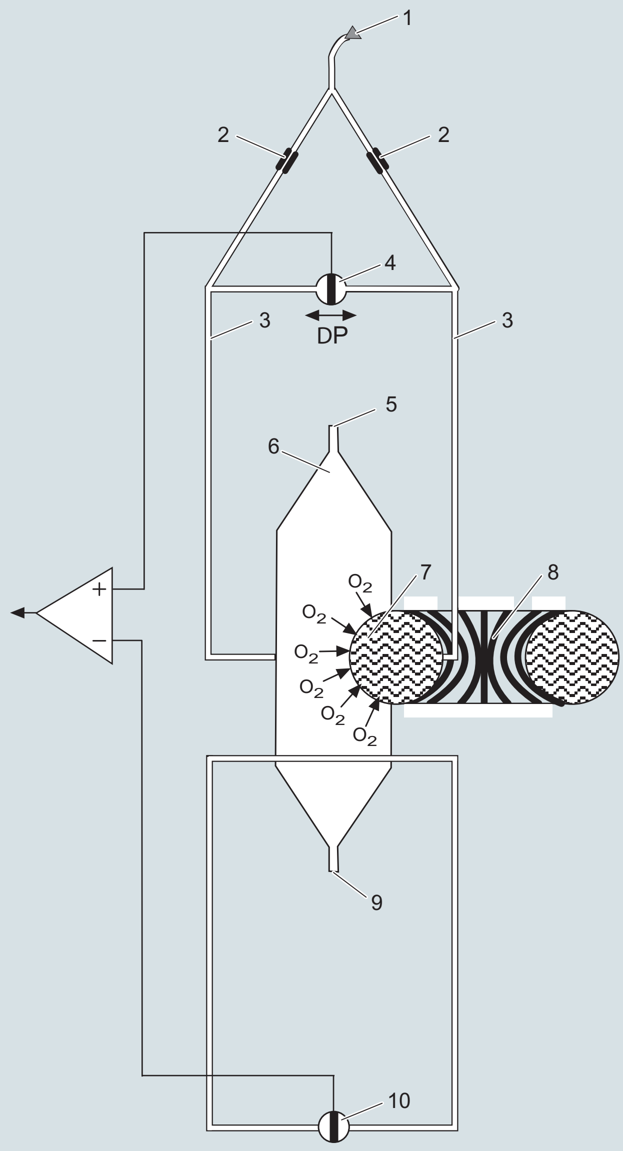
The sample chamber is directly in the sample path and has a small volume, and the microflow sensor is a low-lag sensor. This results in a very short response time.

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

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

Note

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



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

OXYMAT channel, principle of operation

General information

Essential characteristics

- Dimension of measured value freely selectable (e.g. vpm, mg/m^3)
- Four freely-configurable measuring ranges per component
- Measuring ranges with suppressed zero point possible
- Measuring range identification
- Galvanically isolated signal output 0/2/4 to 20 mA per component
- Automatic or manual measuring range switchover selectable; remote switching is also possible
- Storage of measured values possible during adjustments
- Time constants selectable within wide limits (static/dynamic noise suppression); i.e. the response time of the analyzer or component can be matched to the respective measuring task
- Short response time
- Low long-term drift
- Measuring point switchover for up to 6 measuring points (programmable)
- Measuring point identification
- Monitoring of sample gas flow (option)
- Two control levels with separate authorization codes to prevent unintentional and unauthorized inputs
- Automatic measuring range calibration can be configured
- Simple handling using a numerical membrane keyboard and operator prompting
- Operation based on NAMUR recommendation
- Customer-specific analyzer options such as:
  - Customer acceptance
  - TAG labels
  - Drift recording

ULTRAMAT channel

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

OXYMAT channel

- Monitoring of sample gas and/or reference gas (option)
- Different smallest measuring ranges (0.5%, 2.0% or 5.0% O_2)
- Analyzer unit with flow-type compensation circuit (option): a flow is passed through the compensation branch to reduce the vibration dependency in the case of highly different densities of the sample and reference gases
- Internal pressure sensor for correction of pressure variations in sample gas (range 500 to 2 000 hPa absolute)
- External pressure sensor - only with piping as the gas path - can be connected for correction of variations in the sample gas pressure up to 3 000 hPa absolute (option)
- Monitoring of reference gas with reference gas connection 3 000 to 5 000 hPa (option), absolute
- Sample chamber for use in presence of highly corrosive sample gases

Reference gases

Measuring range	Recommended reference gas	Reference gas connection pressure	Remarks
0 to ... vol.% O_2	N_2	2 000 … 4 000 hPa above sample gas pressure (max. 5 000 hPa absolute)	The reference gas flow is set automatically to 5 … 10 ml/min (up to 20 ml/min with flow-type compensation branch)
... to 100 vol.% O_2 (suppressed zero point with full-scale value 100 vol.% O_2)	O_2		
Around 21 vol.% O_2 (suppressed zero point with 21 vol.% O_2 within the measuring span)	Air	100 hPa with respect to sample gas pressure, which may vary by max. 50 hPa around the atmospheric pressure	

Table 1: Reference gases for OXYMAT channel

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

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

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

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

Conversion to other temperatures:

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

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

All diamagnetic gases have a negative deviation from zero point.

Technical specifications

19" rack unit

General information	
Operating position	Front wall, vertical
Conformity	CE mark in accordance with EN 50081-1 and EN 50082-2
Design, enclosure	
Weight	Approx. 21 kg
Degree of protection	IP20 according to EN 60529
Electrical characteristics	
EMC (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98)
Electrical safety	According to EN 61010-1, overvoltage category III
Auxiliary power	100 ... 120 V AC (nominal range of use 90 ... 132 V), 48 ... 63 Hz or 200 ... 240 V AC (nominal range of use 180 ... 264 V), 48 ... 63 Hz
Power consumption	Approx. 70 VA
Fuse values	120 ... 120 V: F1/F2 = T 1.6 A 200 ... 240 V: F1/F2 = T 1 A
Electrical inputs and outputs (per channel)	
Analog output	0/2/4 ... 20 mA, floating; max. load 750 Ω
Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load: 24 V AC/DC/1 A, floating, non-sparking
Analog inputs	2, dimensioned for 0/2/4 … 20 mA for external pressure sensor and correction of influence of accompanying gas (correction of cross-interference)
Digital inputs	6, designed for 24 V, floating, freely configurable, e.g. for measuring range switchover
Serial interface	RS 485
Options	AUTOCAL function each with 8 additional digital inputs and relay outputs; also with PROFIBUS PA or PROFIBUS DP
Climatic conditions	
Permissible ambient temperature	-30 ... +70 °C during storage and transportation, 5 ... 45 °C during operation
Permissible humidity	< 90% relative humidity, during storage and transportation (dew point must not be undershot)

ULTRAMAT channel

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

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

OXYMAT channel

Measuring ranges	4, internally and externally switchable; automatic measuring range switchover also possible
Smallest possible span (relating to sample gas pressure 1 000 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature)	0.5 vol.%, 2 vol.% or 5 vol.% O_2
Largest possible measuring range	100 vol.% O_2
Measuring ranges with suppressed zero point	Any zero point within 0 ... 100 vol.% can be implemented, provided that a suitable reference gas is used
Gas inlet conditions	
Permissible sample gas pressure	
• With pipes	500 ... 3 000 hPa absolute
• With hoses	
- Without pressure switch	500 ... 1 500 hPa absolute
- With pressure switch	500 ... 1 300 hPa absolute
Sample gas flow	18 ... 60 l/h (0.3 ... 1 l/min)
Sample gas temperature	0 ... 50 °C
Sample gas humidity	< 90% RH (relative humidity)
Reference gas pressure (high-pressure version)	2 000 ... 4 000 hPa above sample gas pressure, but max. 5 000 hPa
Reference gas pressure (low-pressure version)	Min. 100 hPa above sample gas pressure
Dynamic response	
Warm-up period	At room temperature < 30 min (the technical specification will be met after 2 hours)
Delayed display (T_{90}-time)	Min. 1.5 ... 3.5 s, depending on version
Damping (electrical time constant)	0 ... 100 s, configurable
Dead time (purging time of the gas path in the unit at 1 l/min)	Approx. 0.5 ... 2.5 s, depending on version
Time for device-internal signal processing	< 1 s
Pressure correction range	
Pressure sensor	
• Internal	500 ... 2 000 hPa absolute
• External	500 ... 3 000 hPa absolute

Measuring response	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation	< 0.75% of the smallest possible measuring range according to rating plate, with electronic damping constant of 1 s (corresponds to ± 0.25% at 2σ)
Zero point drift	< 0.5%/month of the smallest possible measuring span according to rating plate
Measured-value drift	≤ 0.5%/month of the current measuring range
Repeatability	≤ 1%/month of the current measuring range
Detection limit	1% of the current measuring range
Linearity error	1% of the current measuring range
Influencing variables	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Ambient temperature	• < 0.5%/10 K referred to smallest possible span according to rating plate • With measuring span 0.5%: 1%/10 K
Sample gas pressure (with air (100 hPa) as reference gas, correction of the atmospheric pressure fluctuations is only possible if the sample gas can vent to ambient air)	• With disabled pressure compensation: < 2% of the current measuring range /1 % change in atmospheric pressure • With disabled pressure compensation: < 0.2% of the current measuring range /1 % change in atmospheric pressure
Accompanying gases	Deviation from zero point corresponding to paramagnetic or diamagnetic deviation of accompanying gas
Sample gas flow	< 1% of the smallest possible span according to rating plate with a change in flow of 0.1 l/min within the permissible flow range
Auxiliary power	< 0.1% of the current measuring range with rated voltage ± 10%

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

Footnotes, see next page

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

[1] Only for cell length 20 to 180 mm

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

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

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

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

Selection and ordering data

Additional versions	**Order code**	Cannot be combined
Add "-Z" to Article No. and specify Order codes.		
Flow-type reference cell with reduced flow, 6 mm (ULTRAMAT channel)[1]	**A20**	
Flow-type reference cell with reduced flow, ¼" (ULTRAMAT channel)[1]	**A21**	
Reference gas monitoring (pressure switch ... 3 000 hPa), for OXYMAT channel only	**A26**	
Connection pipes (can only be combined with the appropriate gas connection diameter and internal gas path materials)		
• Titanium connection pipe, 6 mm, complete with screwed gland, for sample gas side	**A22**	
• Titanium connection pipe, ¼", complete with screwed gland, for sample gas side	**A24**	
• Stainless steel connection pipe (mat. no. 1.4571), 6 mm, complete with screwed gland, for sample gas side	**A27**	
• Stainless steel connection pipe (mat. no. 1.4571), ¼", complete with screwed gland, for sample gas side	**A29**	
Telescopic rails (2 units)	**A31**	
Kalrez gaskets in sample gas path (O_2 side)	**B01**	
TAG labels (specific lettering based on customer information)	**B03**	
Kalrez gaskets in sample gas path (IR side)	**B04**	
SIL conformity declaration (SIL 2) Functional Safety according to IEC 61508 and IEC 61511	**C20**	
FM/CSA certificate – Class I Div 2	**E20**	
Clean for O_2 service (specially cleaned gas path) (ULTRAMAT channel and OXYMAT channel)	**Y02**	
Measuring range indication in plain text[2], if different from the standard setting	**Y11**	
Special setting (only in conjunction with an application no., e.g. extended measuring range, only ULTRAMAT channel)	**Y12**	
Extended special setting (only in conjunction with an application no., e.g. determination of interference influences, only ULTRAMAT channel)	**Y13**	
QAL1 according to SIRA/MCERTS (ULTRAMAT channel only)	**Y17**	→ **E20**
Performance-tested according to EN 15267 (1st channel)	**Y27**	
Performance-tested according to EN 15267 (2nd channel)	**Y28**	
Accessories	**Article No.**	
RS 485/Ethernet converter	**A5E00852383**	
RS 485/RS 232 converter	**C79451-Z1589-U1**	
RS 485/USB converter	**A5E00852382**	
AUTOCAL function with serial interfaces for the automotive industry (AK)	**C79451-A3480-D33**	
AUTOCAL function with 8 digital inputs/outputs for ULTRAMAT channel or OXYMAT channel	**C79451-A3480-D511**	
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS PA for ULTRAMAT channel or OXYMAT channel	**A5E00057307**	
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS DP for ULTRAMAT channel or OXYMAT channel	**A5E00057312**	
Set of Torx screwdrivers	**A5E34821625**	

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

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

Selection and ordering data

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

Footnote, see next page

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

[1] Only for cell length 20 to 180 mm

Selection and ordering data

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

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

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

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

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

Only in conjunction with order code Y17

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

Performance-tested according to EN 15267 (single component)

Only in conjunction with order code Y27/Y28

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

Example for ordering

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

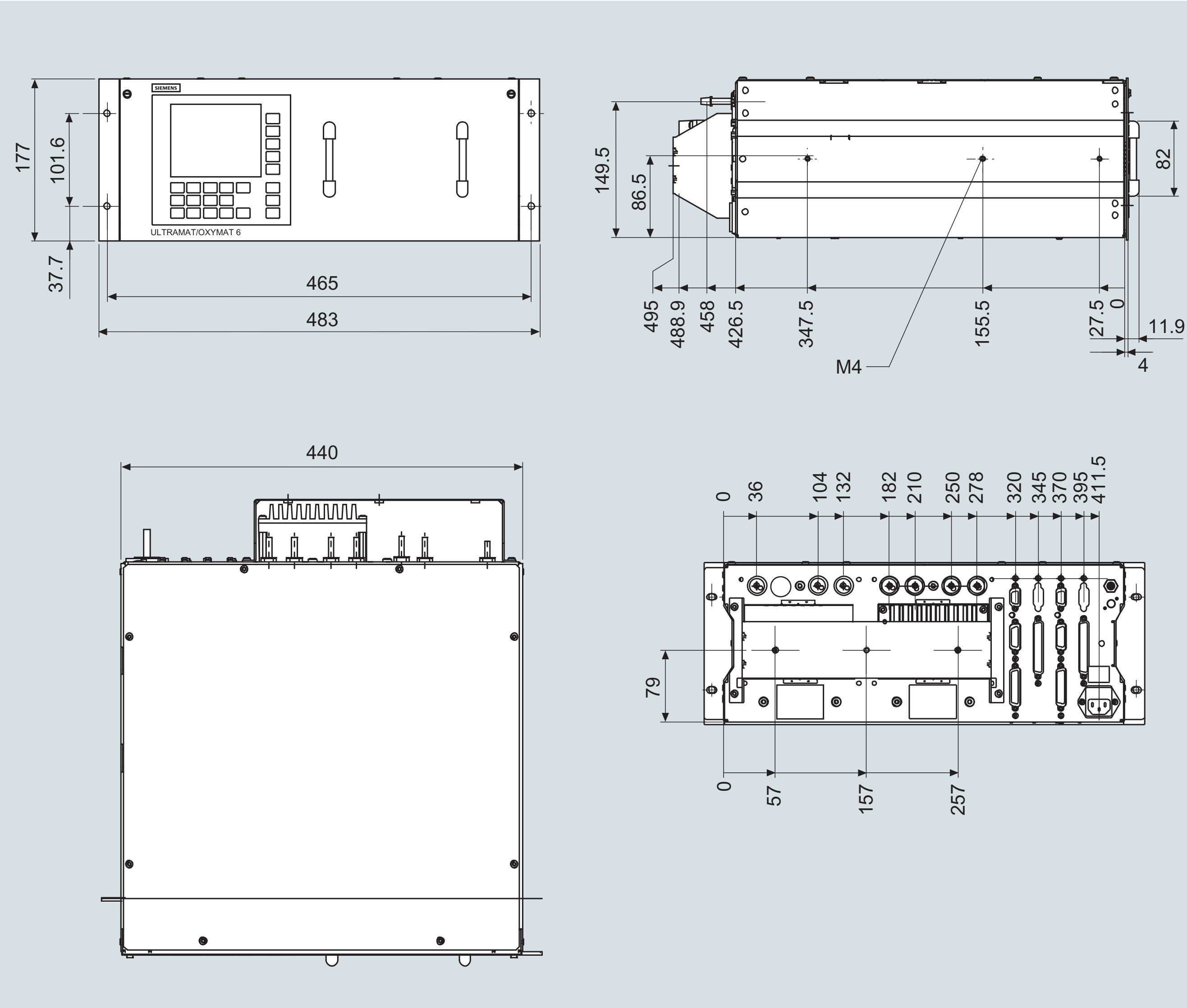
Based on QAL1 according to SIRA/MCERTS (2 components in series)

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

Example for ordering

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

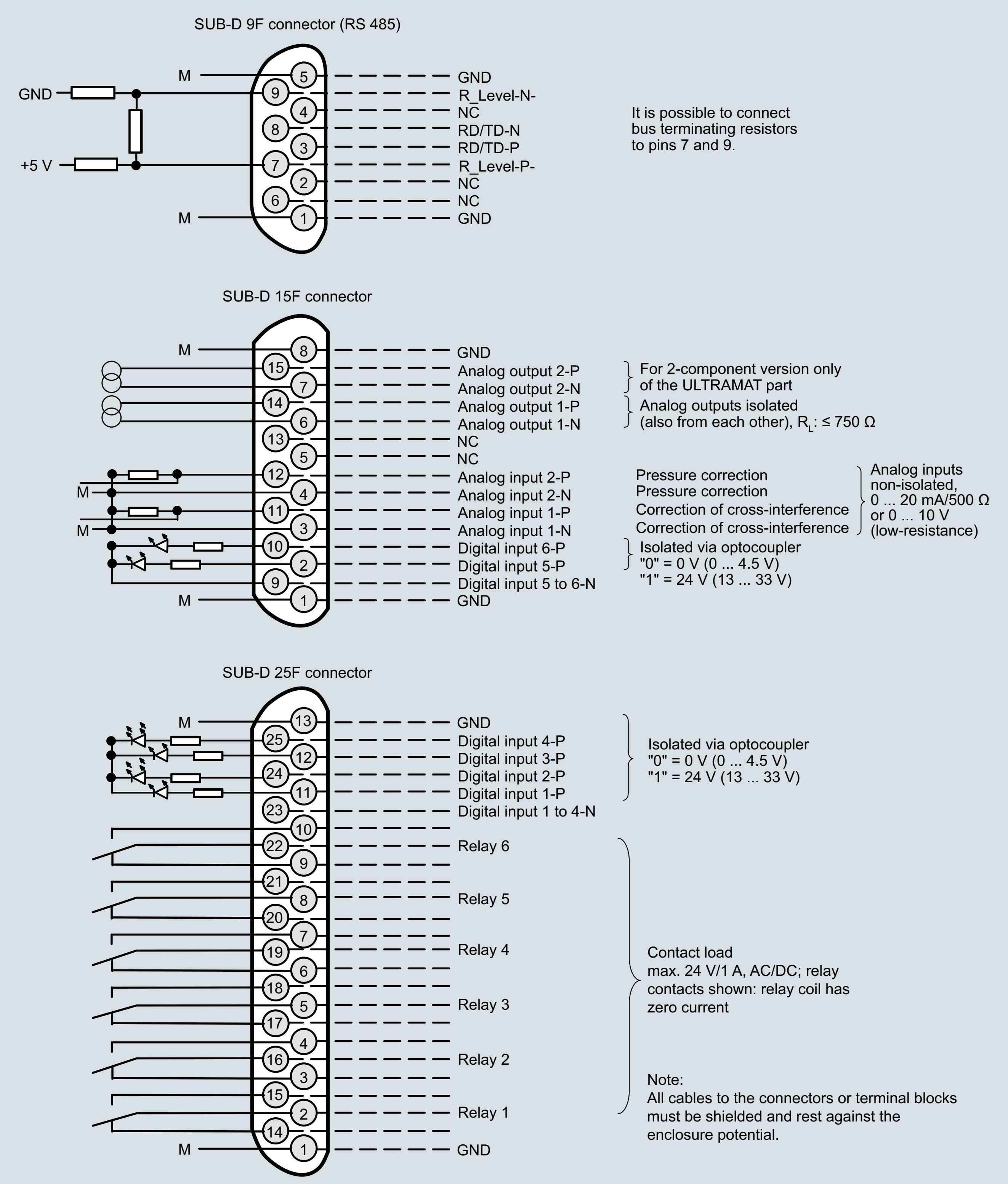
Dimensional drawings



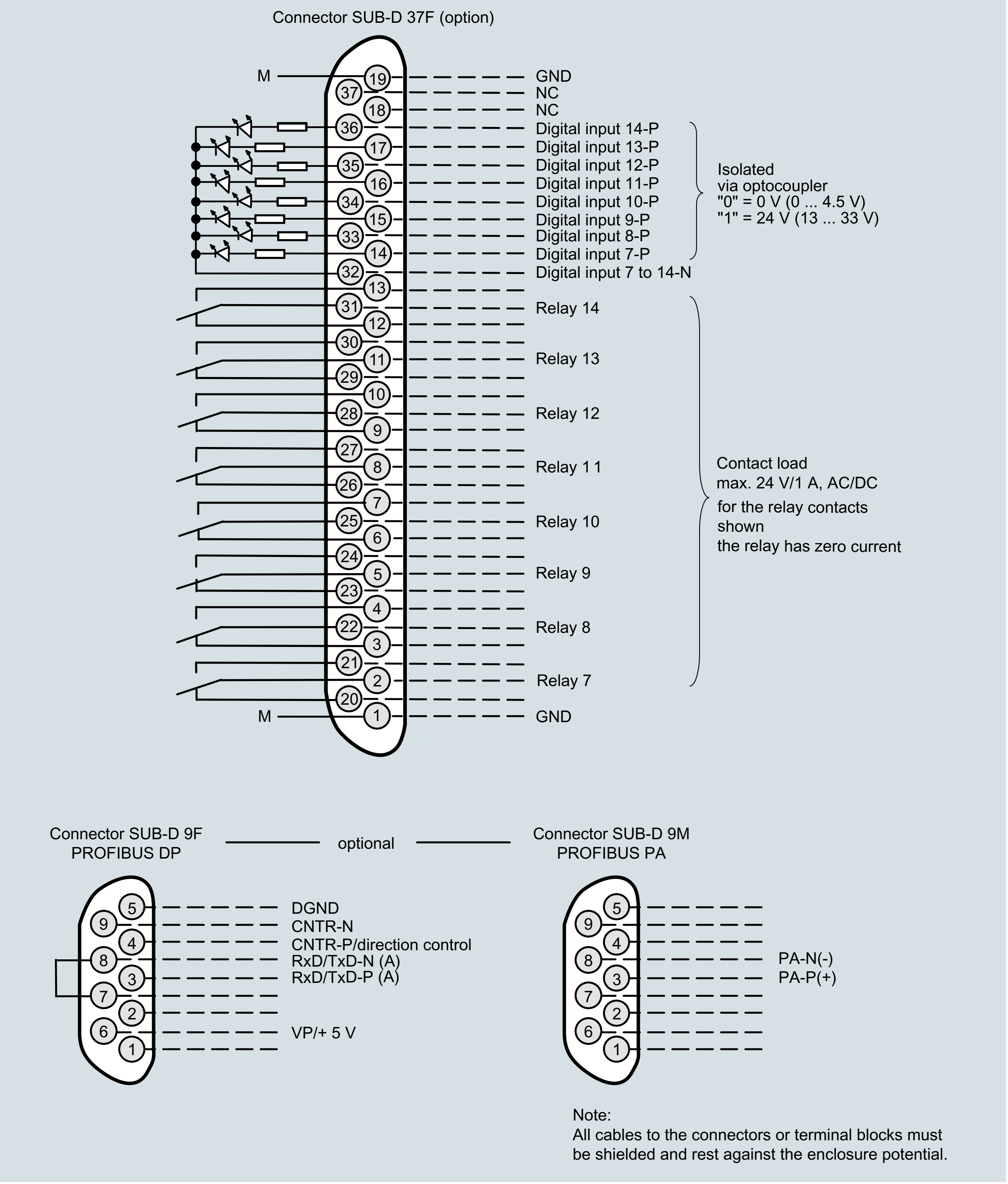
ULTRAMAT/OXYMAT 6, 19" unit, dimensions in mm

Circuit diagrams

Pin assignment (electrical and gas connections)

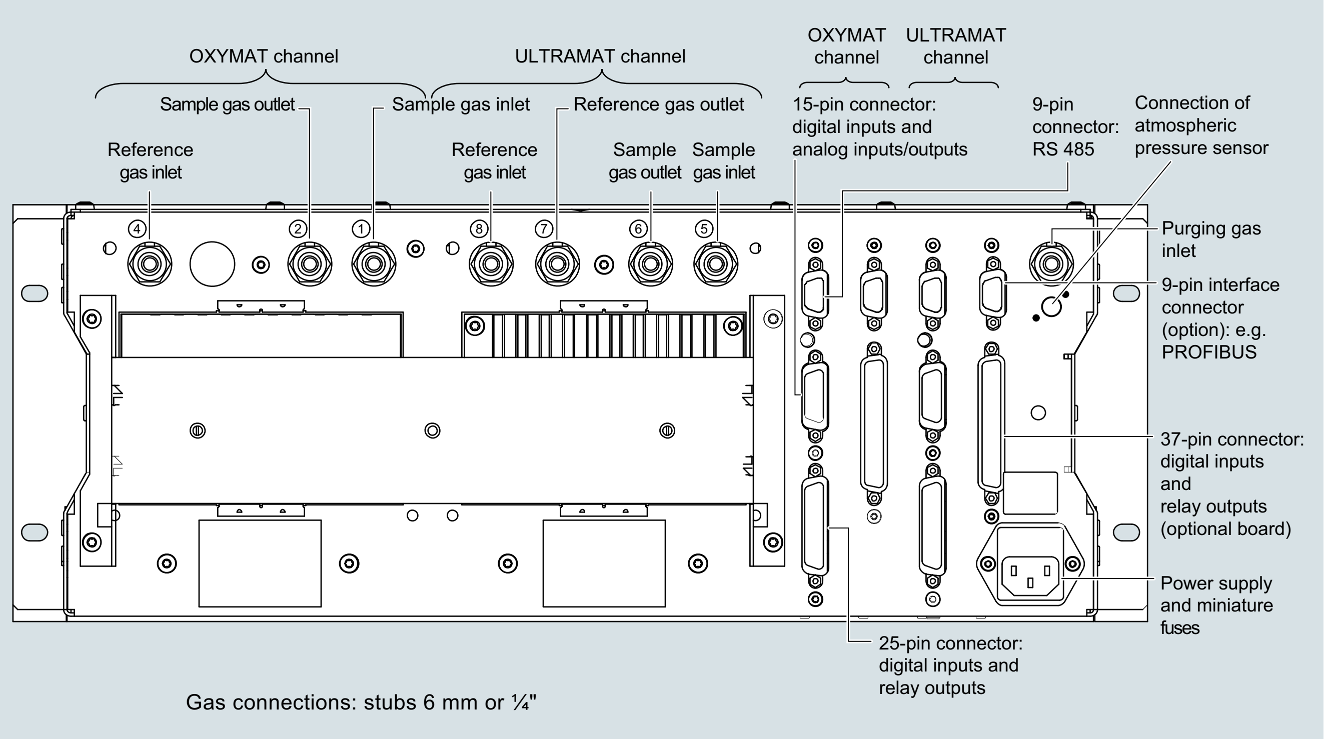


ULTRAMAT/OXYMAT 6, 19" unit, pin assignment



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

19" rack unit



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

Selection and ordering data

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

More information

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

Suggestions for spare parts

Selection and ordering data

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

If the device was supplied with a specially cleaned gas path for high oxygen context ("Clean for O_2 service"), please ensure that you specify this when ordering spare parts. This is the only way to guarantee that the gas path will continue to comply with the special requirements for this version.

Overview

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

Benefits

- Paramagnetic alternating pressure principle
  - Small measuring ranges (0 to 0.5% or 99.5 to 100% O_2)
  - 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 O_2), e.g. 98 to 100% O_2 for purity monitoring/air separation
- Open interface architecture (RS 485, RS 232, PROFIBUS)
- SIPROM GA network for maintenance and service information (option)
- Electronics and physics: gas-tight isolation, purging is possible, IP65, long service life even in harsh environments (field device only)
- Heated versions (option), use also in presence of gases condensing at low temperature (field device only)
- Ex(p) for zones 1 and 2 according to ATEX 2G and ATEX 3G (field device only)

Application

Fields of application

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

Special 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 TA-Luft, 13th and 27th BImSchV, federal emission law

Design

19" rack unit

- With 4 HU for installation
  - In hinged frame
  - In cabinets with or without telescope rails
- Front plate can be swung down for servicing purposes (laptop connection)
- Internal gas paths: hose made of FKM (Viton) or pipe made of titanium or stainless steel (mat. no. 1.4571)
- Gas connections for sample gas inlet and outlet and for reference gas: fittings, pipe diameter of 6 mm or ¼"
- Flow indicator for sample gas on front plate (option)
- Pressure switch in sample gas path for flow monitoring (option)

Field device

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

Display and control panel

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

General information

Input and outputs

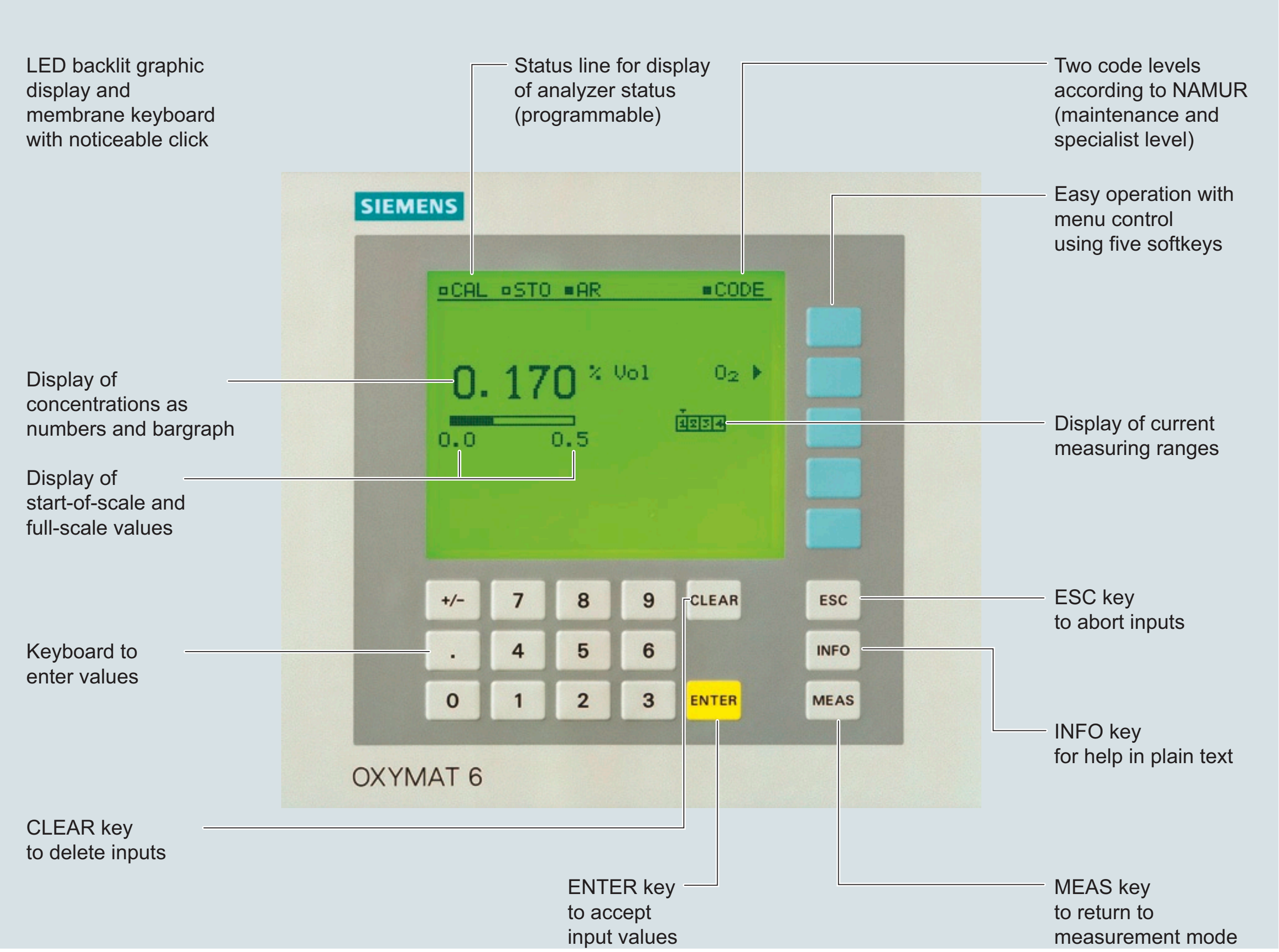
- One analog output per measured component (from 0, 2, 4 to 20 mA; NAMUR configurable)
- Two analog inputs configurable (e.g. correction of cross-interference, external pressure sensor)
- Six digital inputs freely configurable (e.g. for measurement range switchover, processing of external signals from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

Communication

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

Options

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



OXYMAT 6, membrane keyboard and graphic display

Designs – Parts wetted by sample gas, standard

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

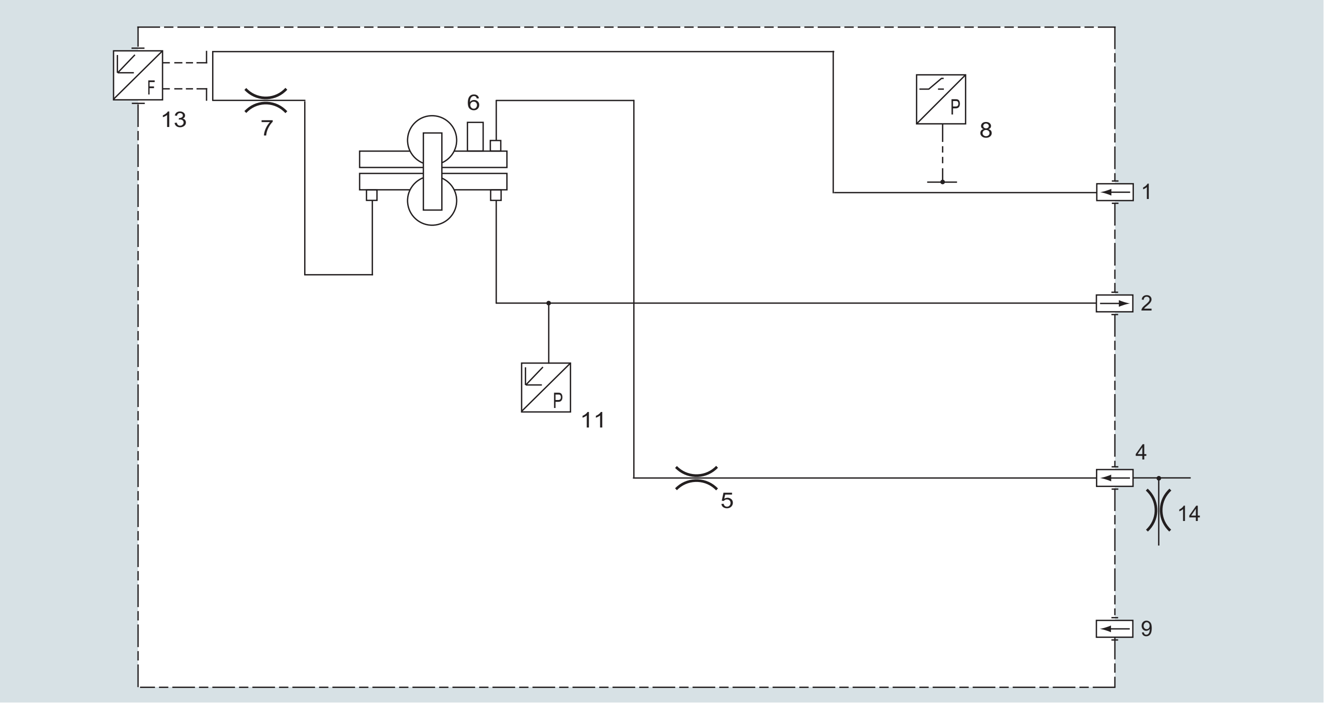
Options

Flow indicator	Measurement pipe	Duran glass	-	-
	Variable area	Duran glass, black		
	Suspension boundary	PTFE (Teflon)		
	Angle pieces	FKM (Viton)		
Pressure switch	Membrane	FKM (Viton)	-	-
	Enclosure	PA 6.3 T		

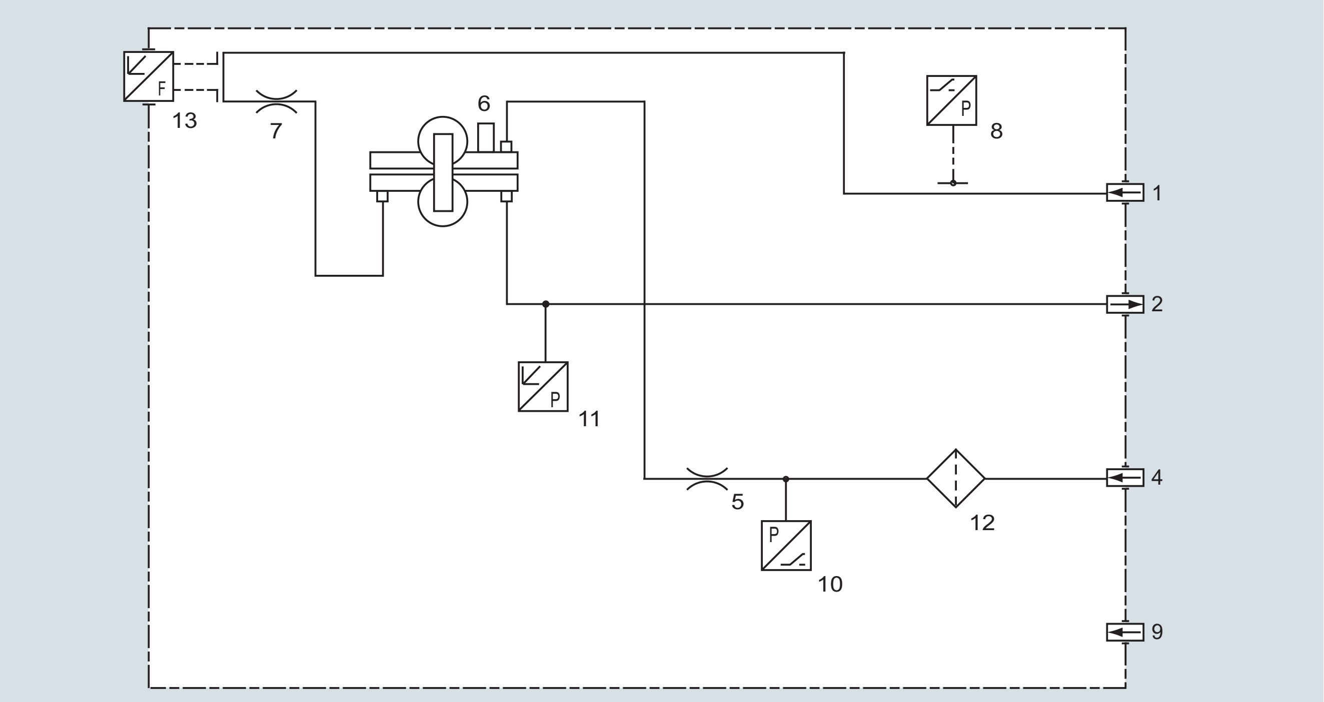
General information

Gas path (19" rack unit)

Legend for the gas path figures			
1	Sample gas inlet	8	Pressure switch in sample gas path (option)
2	Sample gas outlet	9	Purging gas
3	Not used	10	Pressure switch in reference gas path (option)
4	Reference gas inlet	11	Pressure sensor
5	Restrictor in reference gas inlet	12	Filter
6	O_2 physical system	13	Flow indicator in sample gas path (option)
7	Restrictor in sample gas path	14	Outlet restrictor



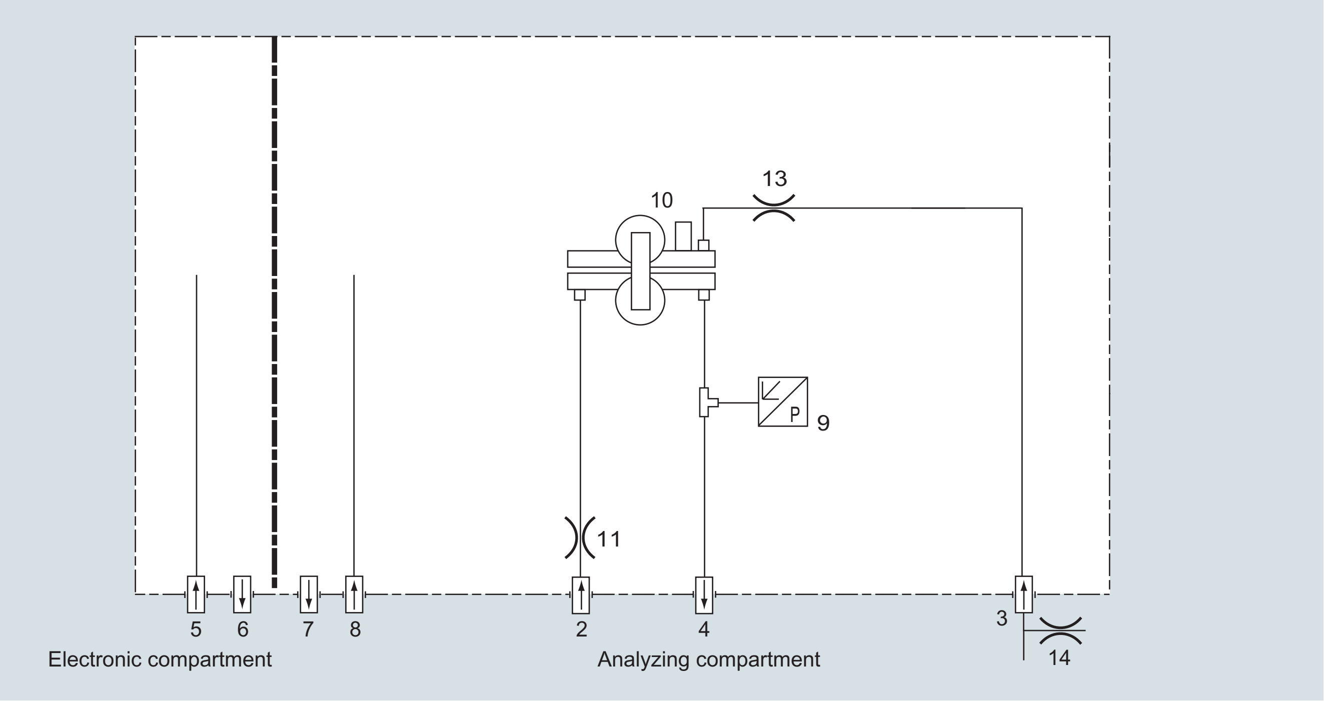
Gas path, reference gas connection 1 100 hPa, absolute



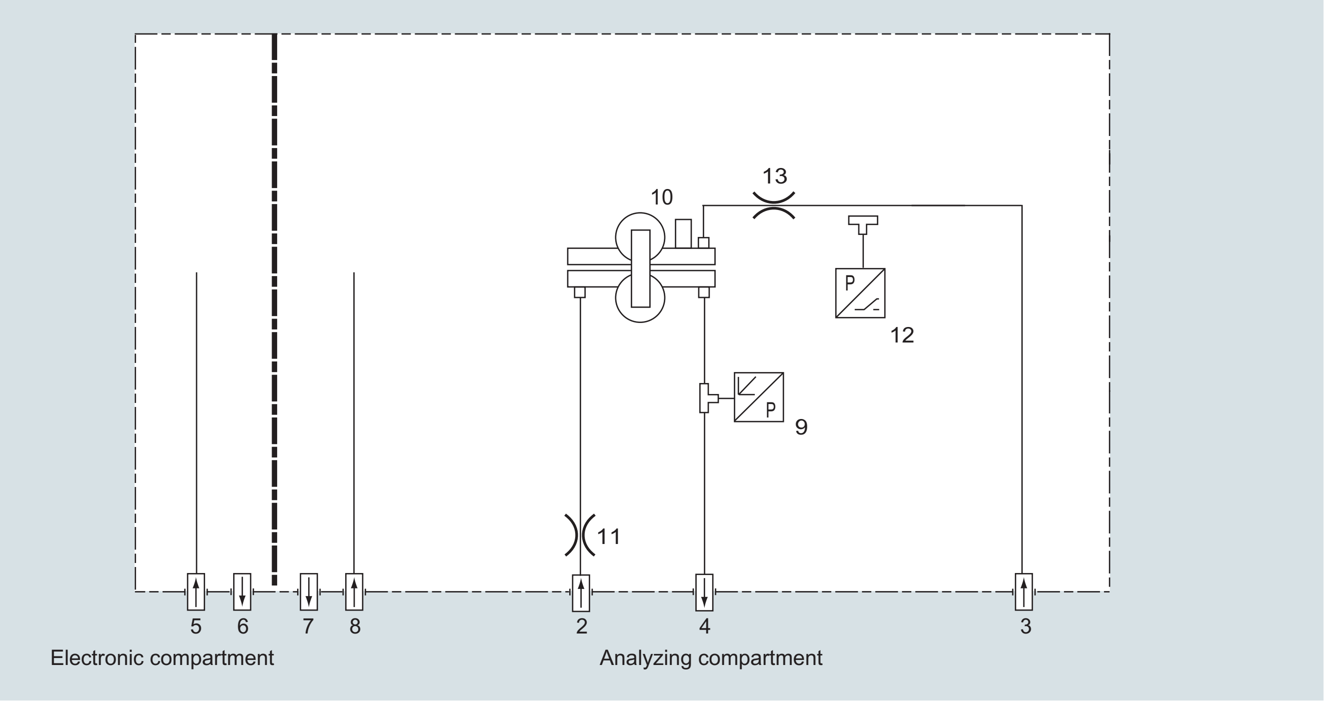
Gas path, reference gas connection 3 000 to 5 000 hPa, absolute

Gas path (field device)

Legend for the gas path figures			
1	Not used	8	Purging gas inlet (analyzer side)
2	Sample gas inlet	9	Pressure sensor
3	Reference gas inlet	10	O_2 physical system
4	Sample gas outlet	11	Restrictor in sample gas path
5	Purging gas inlet (electronics side)	12	Pressure sensor in reference gas path (option)
6	Purging gas outlet (electronics side)	13	Restrictor
7	Purging gas outlet (analyzer side)	14	Outlet restrictor



Gas path, reference gas connection 1 100 hPa, absolute



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

Function

Principle of operation

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

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

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

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

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

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

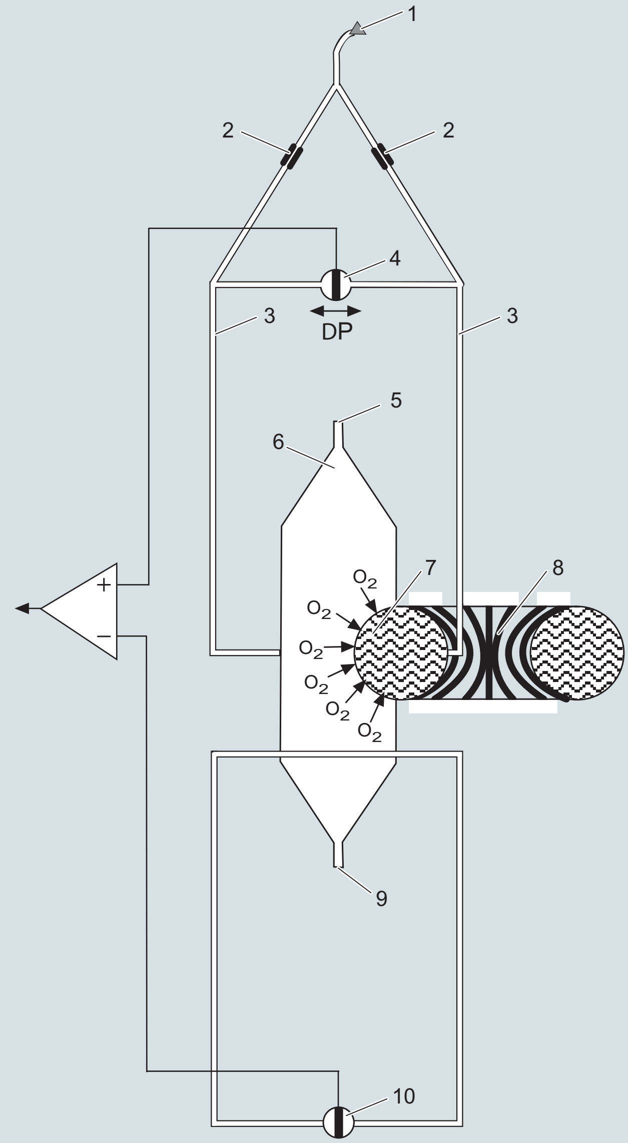
The sample chamber is directly in the sample path and has a small volume, and the microflow sensor is a low-lag sensor. This results in a very short response time for the OXYMAT 6.

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

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

Note

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



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

OXYMAT 6, principle of operation

Advantages of the function-based application of reference gas

- The zero point can be defined specific to the application. It is then also possible to set "physically" suppressed zero points. For example, it is possible when using pure oxygen as the zero gas to set a measuring range of 99.5 to 100% O_2 with a resolution of 50 vpm.
- The sensor (microflow sensor) is located outside the sample gas. Through use of an appropriate material in the gas path this also allows measurements in highly corrosive gases.
- Pressure variations in the sample gas can be compensated better since the reference gas is subjected to the same fluctuations.
- No influences on the thermal conductivity of the sample gas since the sensor is positioned on the reference gas side.
- The same gas is used for the serial gas calibration and as the reference gas. As a result of the low consumption of reference gas (3 to 10 ml/min), one calibration cylinder can be used for both gases.
- No measuring effect is generated in the absence of oxygen. The measured signal need not therefore be set electronically to zero, and is thus extremely stable with regard to temperature and electronic influences.

Essential characteristics

- Four measuring ranges which can be freely configured, even with suppressed zero point, all measuring ranges are linear
- Measuring ranges with physically suppressed zero point possible
- Measuring range identification
- Galvanically isolated measured-value output 0/2/4 to 20 mA (also inverted)
- Autoranging possible; remote switching is also possible
- Storage of measured values possible during adjustments
- Wide range of selectable time constants (static/dynamic noise suppression); i.e. the response time of the analyzer can be matched to the respective measuring task
- Short response time
- Low long-term drift
- Measuring point switchover for up to 6 measuring points (programmable)
- Measuring point identification
- Internal pressure sensor for correction of pressure variations in sample gas range 500 to 2 000 hPa (abs.)
- External pressure sensor - only with piping as the gas path - can be connected for correction of variations in the sample gas pressure up to 3 000 hPa absolute (option)
- Monitoring of sample gas flow (option for version with hoses)
- Monitoring of sample gas and/or reference gas (option)
- Monitoring of reference gas with reference gas connection 3 000 to 5 000 hPa (abs.) (option)
- Automatic measuring range calibration can be configured
- Operation based on the NAMUR recommendation
- Two control levels with their own authorization codes for the prevention of accidental and unauthorized operator interventions
- Simple handling using a numerical membrane keyboard and operator prompting
- Customer-specific analyzer options such as:
  - Customer acceptance
  - TAG labels
  - Drift recording
  - Clean for O_2 service
  - Kalrez gaskets
- Analyzer unit with flow-type compensation branch: a flow is passed through the compensation branch (option) to reduce the vibration dependency in the case of highly different densities of the sample and reference gases
- Sample chamber for use in presence of highly corrosive sample gases

General information

Reference gases

Measuring range	Recommended reference gas	Reference gas connection pressure	Remarks
0 to ... vol.% O_2	N_2	2 000 … 4 000 hPa above sample gas pressure (max. 5 000 hPa absolute)	The reference gas flow is set automatically to 5 … 10 ml/min (up to 20 ml/min with flow-type compensation branch)
... to 100 vol.% O_2 (suppressed zero point with full-scale value 100 vol.% O_2)	O_2		
Around 21 vol.% O_2 (suppressed zero point with 21 vol.% O_2 within the measuring span)	Air	100 hPa with respect to sample gas pressure, which may vary by max. 50 hPa around the atmospheric pressure	

Table 1: Reference gases for OXYMAT 6

Correction of zero point error / cross-sensitivities

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

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

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

Conversion to other temperatures

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

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

All diamagnetic gases have a negative deviation from zero point.

Technical specifications

General information	
Measuring ranges	4, internally and externally switchable; autoranging is also possible
Smallest possible span (relating to sample gas pressure 1 000 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature)	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 values	100 ... 120 V: 1.0 T/250
	200 ... 240 V: 0.63 T/250
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	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
Dynamic response	
Warm-up period	At room temperature < 30 min (the technical specification will be met after 2 hours)
Delayed display (T_{90}-time)	Min. 1.5 … 3.5 s, depending on version
Damping (electrical time constant)	0 … 100 s, configurable
Dead time (purging time of the gas path in the unit at 1 l/min)	Approximately 0.5 ... 2.5 s, depending on version
Time for device-internal signal processing	< 1 s

Pressure correction range	
Pressure sensor	
• Internal	500 … 2 000 hPa absolute
• External	500 … 3 000 hPa absolute
Measuring response	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation	< ± 0.75% of the smallest possible measuring range according to rating plate, with electronic damping constant of 1 s (corresponds to ±0.25% at 2 σ)
Zero point drift	< ± 0.5%/month of the smallest possible span according to rating plate
Measured-value drift	< ±0.5%/month of the current measuring range
Repeatability	< 1% of the current measuring range
Detection limit	1% of the current measuring range
Linearity error	< 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 rating plate, with measuring span 0.5%: 1%/10 K
Sample gas pressure (with air (100 hPa) as reference gas, correction of the atmospheric pressure fluctuations is only possible if the sample gas can vent to ambient air)	• With disabled pressure compensation: < 2% of the current measuring range /1% pressure change • With disabled pressure compensation: < 0.2% of the current measuring range /1% pressure change
Accompanying gases	Deviation from zero point corresponding to paramagnetic or diamagnetic deviation of carrier gas
Sample gas flow at zero point	< 1% of the current measuring range according to rating plate with a change in flow of 0.1 l/min within the permissible flow range
Auxiliary power	< 0.1% of the current measuring range with rated voltage ± 10%
Electrical inputs and outputs	
Analog output	0/2/4 … 20 mA, isolated; max. load 750 Ω
Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load: 24 V AC/DC/1 A, isolated
Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and residual gas influence correction (correction of cross-interference)
Digital inputs	6, designed for 24 V, isolated, freely configurable, e.g. for measuring range switchover
Serial interface	RS 485
Options	AUTOCAL function each with 8 additional digital inputs and relay outputs, also with PROFIBUS PA or PROFIBUS DP
Climatic conditions	
Permissible ambient temperature	-30 … +70 °C during storage and transportation, 5 … 45 °C during operation
Permissible humidity	< 90% RH (RH: relative humidity) within average annual value, during storage and transportation (dew point must not be undershot)

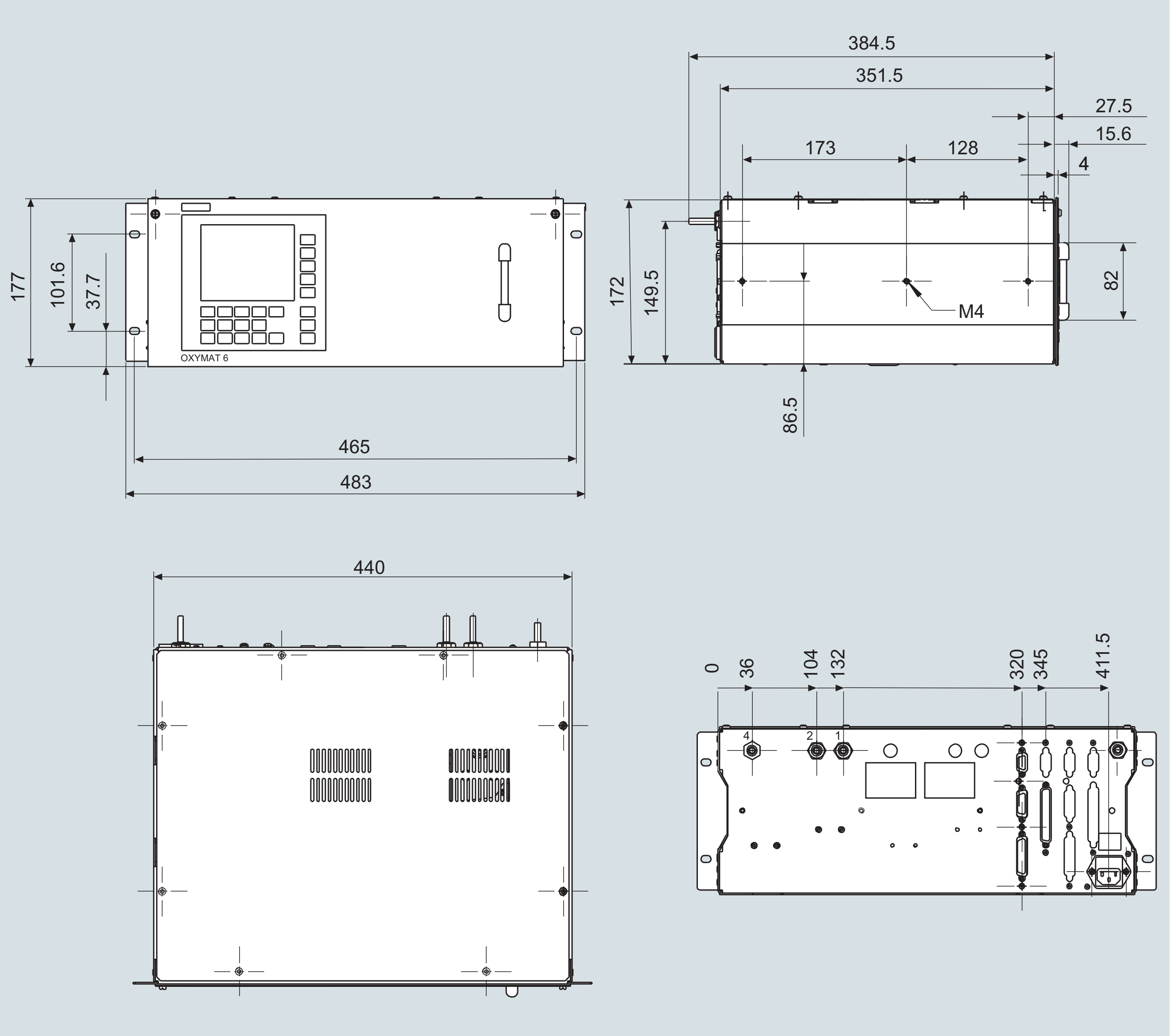
Selection and ordering data	Article No.	Cannot be combined
OXYMAT 6 gas analyzer ↗ 19" rack unit for installation in cabinets ↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.	**7MB2021- ■■■■0 - ■■■■**	
Gas connections		
Pipe with 6 mm outer diameter	**0**	
Pipe with ¼" outer diameter	**1**	
Smallest possible measuring span O_2		
0.5 % reference gas pressure 3 000 hPa	**A**	
0.5 % reference gas pressure 100 hPa (external pump)	**B**	**B B B → Y02**
2 % reference gas pressure 3 000 hPa	**C**	
2 % reference gas pressure 100 hPa (external pump)	**D**	**D D D → Y02**
5 % reference gas pressure 3 000 hPa	**E**	
5 % reference gas pressure 100 hPa (external pump)	**F**	**F F F → Y02**
Sample chamber		
Non-flow-type compensation branch		
• Made of stainless steel, mat. no. 1.4571	**A**	
• Made of tantalum	**B**	
Flow-type compensation branch		
• Made of stainless steel, mat. no. 1.4571	**C**	**C**
• Made of tantalum	**D**	**D**
Internal gas paths		
Hose made of FKM (Viton)	**0**	
Pipe made of titanium	**1**	**1 1 → Y02**
Pipe made of stainless steel, mat. no. 1.4571	**2**	**2**
Power supply		
100 ... 120 V AC, 48 ... 63 Hz	**0**	
200 ... 240 V AC, 48 ... 63 Hz	**1**	
Monitoring (reference gas, sample gas)		
Without	**A**	
Reference gas only	**B**	**B**
Reference gas and sample gas (with flow indicator and pressure switch for sample gas)	**C**	**C C**
Sample gas only	**D**	**D**
Add-on electronics		
Without	**A**	**A → Y27**
AUTOCAL function		
• With 8 additional digital inputs/outputs	**B**	
• With serial interface for the automotive industry (AK)	**D**	**D → E20**
• With 8 additional digital inputs/outputs and PROFIBUS PA interface	**E**	
• With 8 additional digital inputs/outputs and PROFIBUS DP interface	**F**	
Language		
German	**0**	
English	**1**	
French	**2**	
Spanish	**3**	
Italian	**4**	

Additional versions	**Order code**	Cannot be combined
Add "-Z" to Article No. and specify Order codes.		
Telescopic rails (2 units)	**A31**	
Kalrez gaskets in sample gas path	**B01**	
TAG labels (specific lettering based on customer information)	**B03**	
SIL conformity declaration (SIL 2) Functional Safety according to IEC 61508 and IEC 61511	**C20**	
FM/CSA certificate – Class I Div 2	**E20**	
Clean for O_2 service (specially cleaned gas path)	**Y02**	
Measuring range indication in plain text, if different from the standard setting	**Y11**	
Performance-tested according to EN 15267	**Y27**	

Selection and ordering data

Accessories	**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**

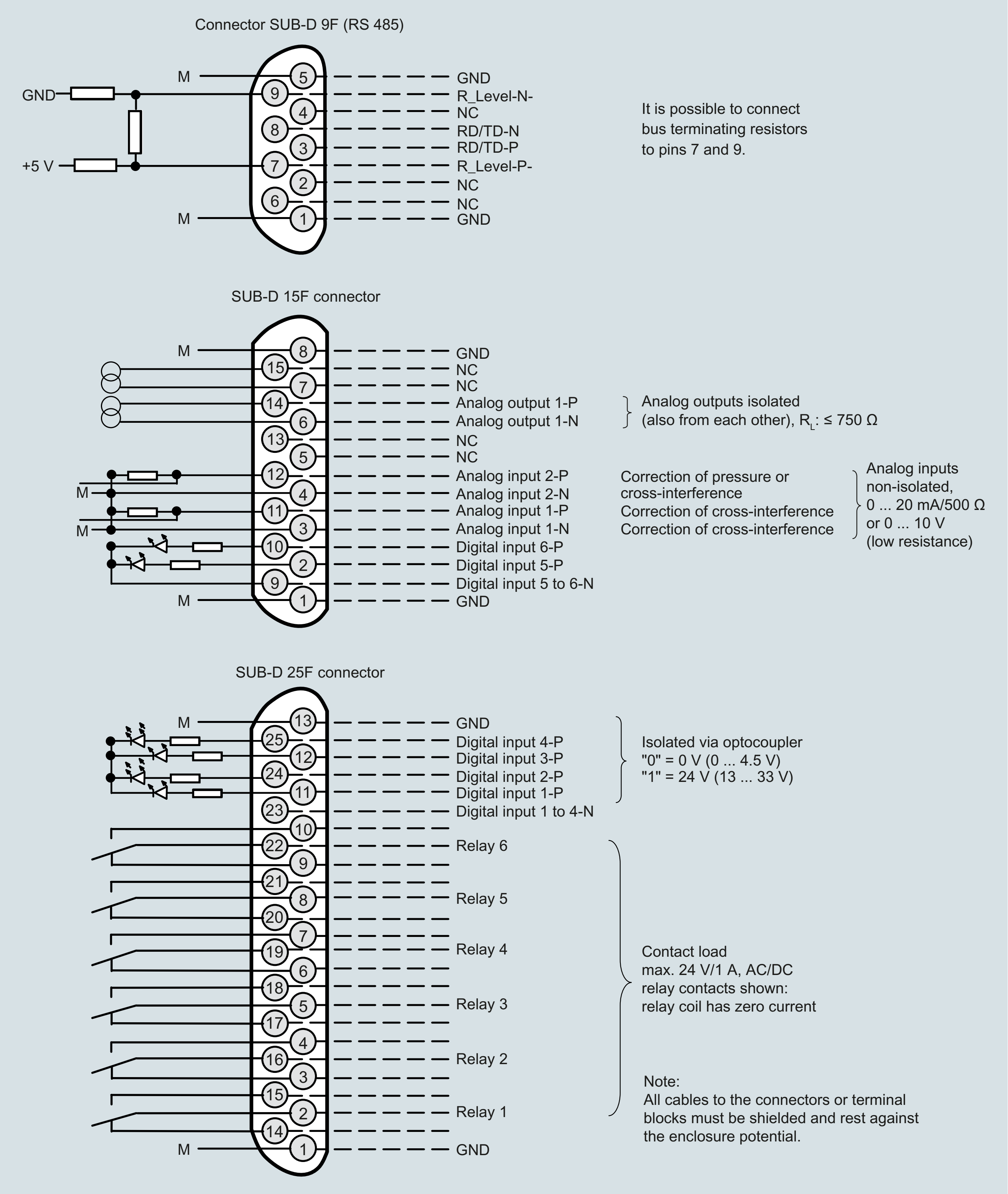
Dimensional drawings



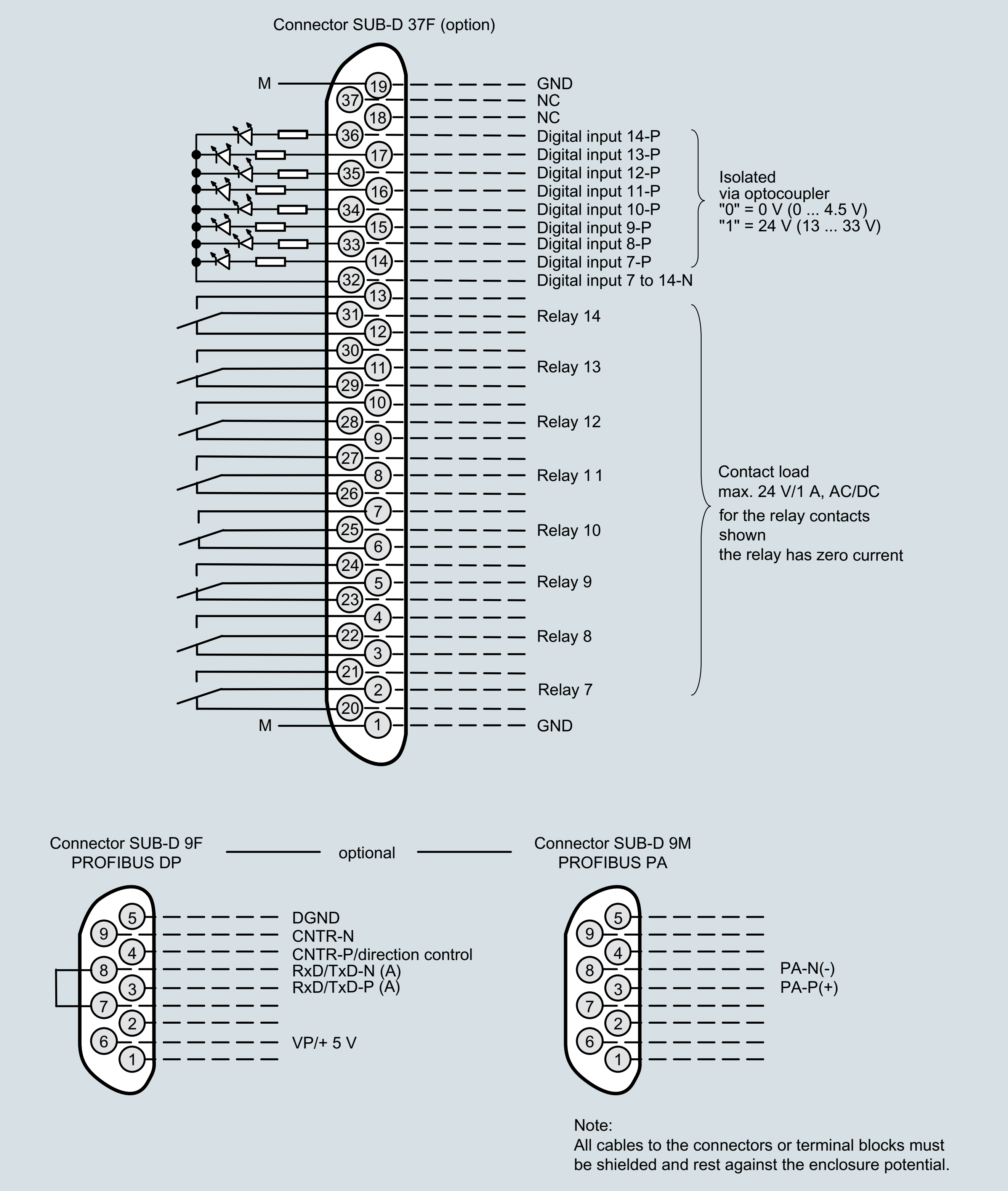
OXYMAT 6, 19" unit, dimensions in mm

Circuit diagrams

Pin assignment (electrical and gas connections)

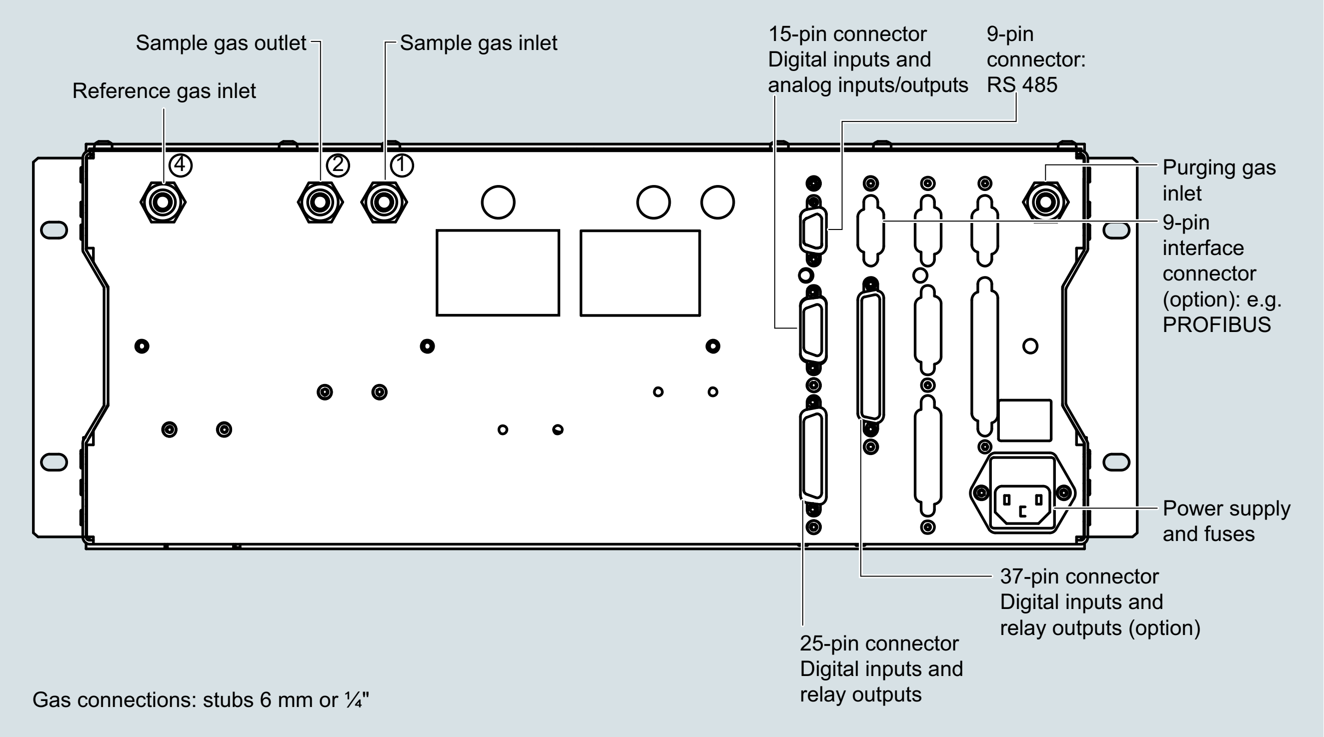


OXYMAT 6, 19" unit, pin assignment



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

19" rack unit



OXYMAT 6, 19" unit, gas and electrical connections

Technical specifications

General information	
Measuring ranges	4, internally and externally switchable; autoranging is also possible
Smallest possible span (relating to sample gas pressure 1 000 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature), smallest possible span with heated version: 0.5% (< 65 °C); 0.5 … 1% (65 … 90 °C); 1 … 2% (90 … 130 °C))	0.5 vol.%, 2 vol.% or 5 vol.% O_2
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 units	Overvoltage category II
• Unheated units	Overvoltage category III
Fuse values (unheated unit)	
• 100 ... 120 V	F3: 1 T/250; F4: 1 T/250
• 200 ... 240 V	F3: 0.63 T/250; F4: 0.63 T/250
Fuse values (heated unit)	
• 100 ... 120 V	F1: 1 T/250; F2: 4 T/250
	F3: 4 T/250; F4: 4 T/250
• 200 ... 240 V	F1: 0.63 T/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 to max. 50 °C, but above the dew point (unheated) • 15 °C above temperature analyzer unit (heated)
Sample gas humidity	< 90% relative humidity

Dynamic 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
Damping (electrical time constant)	0 … 100 s, configurable
Dead time (purging time of the gas path in the unit at 1 l/min)	Approx. 0.5 s
Time for device-internal signal processing	< 1 s
Pressure correction range	
Pressure sensor	
• Internal	500 … 2 000 hPa absolute
• External	500 … 3 000 hPa absolute
Measuring response	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation	< ± 0.75% of the smallest possible measuring range according to rating plate, with electronic damping constant of 1 s (corresponds to ± 0.25% at 2 σ)
Zero point drift	< ± 0.5%/month of the smallest possible span according to rating plate
Measured-value drift	< ±0.5%/month of the current measuring range
Repeatability	< 1% of the current measuring range
Detection limit	1% of the current measuring range
Linearity error	< 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 rating plate, with measuring span 0.5%: 1%/10 K
Sample gas pressure (with air (100 hPa) as reference gas, correction of the atmospheric pressure fluctuations is only possible if the sample gas can vent to ambient air)	• With disabled pressure compensation: < 2% of the current measuring range /1% pressure change • With disabled pressure compensation: < 0.2% of the current measuring range /1% pressure change
Accompanying gases	Deviation from zero point corresponding to paramagnetic or diamagnetic deviation of carrier gas
Sample gas flow at zero point	< 1% of the current measuring range according to rating plate with a change in flow of 0.1 l/min within the permissible flow range; heated version up to double error
Auxiliary power	< 0.1% of the current measuring range with rated voltage ± 10%

Field device

Electrical inputs and outputs	
Analog output	0/2/4 … 20 mA, isolated; max. load 750 Ω
Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load: 24 V AC/DC/1 A, isolated
Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and residual gas influence correction (correction of cross-interference)
Digital inputs	6, designed for 24 V, isolated, freely configurable, e.g. for measuring range switchover
Serial interface	RS 485
Options	AUTOCAL function each with 8 additional digital inputs and relay outputs, also with PROFIBUS PA or PROFIBUS DP
Climatic conditions	
Permissible ambient temperature	-30 … +70 °C during storage and transportation, 5 … 45 °C during operation
Permissible humidity	< 90% RH (relative humidity) as annual average (maximum accuracy achieved after 2 hours), during storage and transportation (dew point must not be undershot)

Selection and ordering data	Article No.	Cannot be combined
OXYMAT 6 gas analyzer For field installation	**7MB2011- ■■■0■-■■■■**	
↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.		
Gas connections for sample gas and reference gas		
Ferrule screw connection made of stainless steel (mat. no. 1.4571)		
• Pipe with 6 mm outer diameter	0	0 → D02
• Pipe with ¼" outer diameter	1	1 → D01
Ferrule screw connection made of titanium		
• Pipe with 6 mm outer diameter	2	2 → D01, D02, Y02
• Pipe with ¼" outer diameter	3	3 → D01, D02, Y02
Piping and gas connections made of Hastelloy C22: 7MB2011-0/1.... + order code D01 or D02		
Smallest possible measuring span O_2		
0.5 % reference gas pressure 3 000 hPa	A	
0.5 % reference gas pressure 100 hPa (external pump)	B	B B B B B → Y02
2 % reference gas pressure 3 000 hPa	C	
2 % reference gas pressure 100 hPa (external pump)	D	D D D D → Y02
5 % reference gas pressure 3 000 hPa	E	
5 % reference gas pressure 100 hPa (external pump)	F	F F F F → Y02
Sample chamber		
Non-flow-type compensation branch		
• Made of stainless steel, mat. no. 1.4571	A	
• Made of tantalum	B	
Flow-type compensation branch		
• Made of stainless steel, mat. no. 1.4571	C	C
• Made of tantalum	D	D
Heating of internal gas paths and analyzer unit		
None	0	
With (65 ... 130 °C)	1	1
Power supply		
Standard unit and acc. to ATEX II 3G version (Zone 2)		
• 100 ... 120 V AC, 48 ... 63 Hz	0	
• 200 ... 240 V AC, 48 ... 63 Hz	1	
ATEX II 2G versions (Zone 1), incl. certificate		
• 100 ... 120 V AC, 48 ... 63 Hz, according to ATEX II 2G[1)] (operating mode: leakage compensation)	2	2 2 2 → E11, E12
• 200 ... 240 V AC, 48 ... 63 Hz, according to ATEX II 2G[1)] (operating mode: leakage compensation)	3	3 3 3 → E11, E12
• 100 ... 120 V AC, 48 ... 63 Hz, according to ATEX II 2G[1)] (operating mode: continuous purging)	6	6 6 6 → E11, E12
• 200 ... 240 V AC, 48 ... 63 Hz, according to ATEX II 2G[1)] (operating mode: continuous purging)	7	7 7 7 → E11, E12
Reference gas monitoring		
Without	A	A
With	B	B
Add-on electronics		
Without	A	
AUTOCAL function		
• With 8 additional digital inputs and 8 additional relay outputs	B	
• With 8 additional digital inputs/outputs and PROFIBUS PA interface	E	E → E12
• With 8 additional digital inputs/outputs and PROFIBUS DP interface	F	F → E12
• With 8 additional digital inputs/outputs and PROFIBUS PA Ex-i	G	
Language		
German	0	
English	1	
French	2	
Spanish	3	
Italian	4	

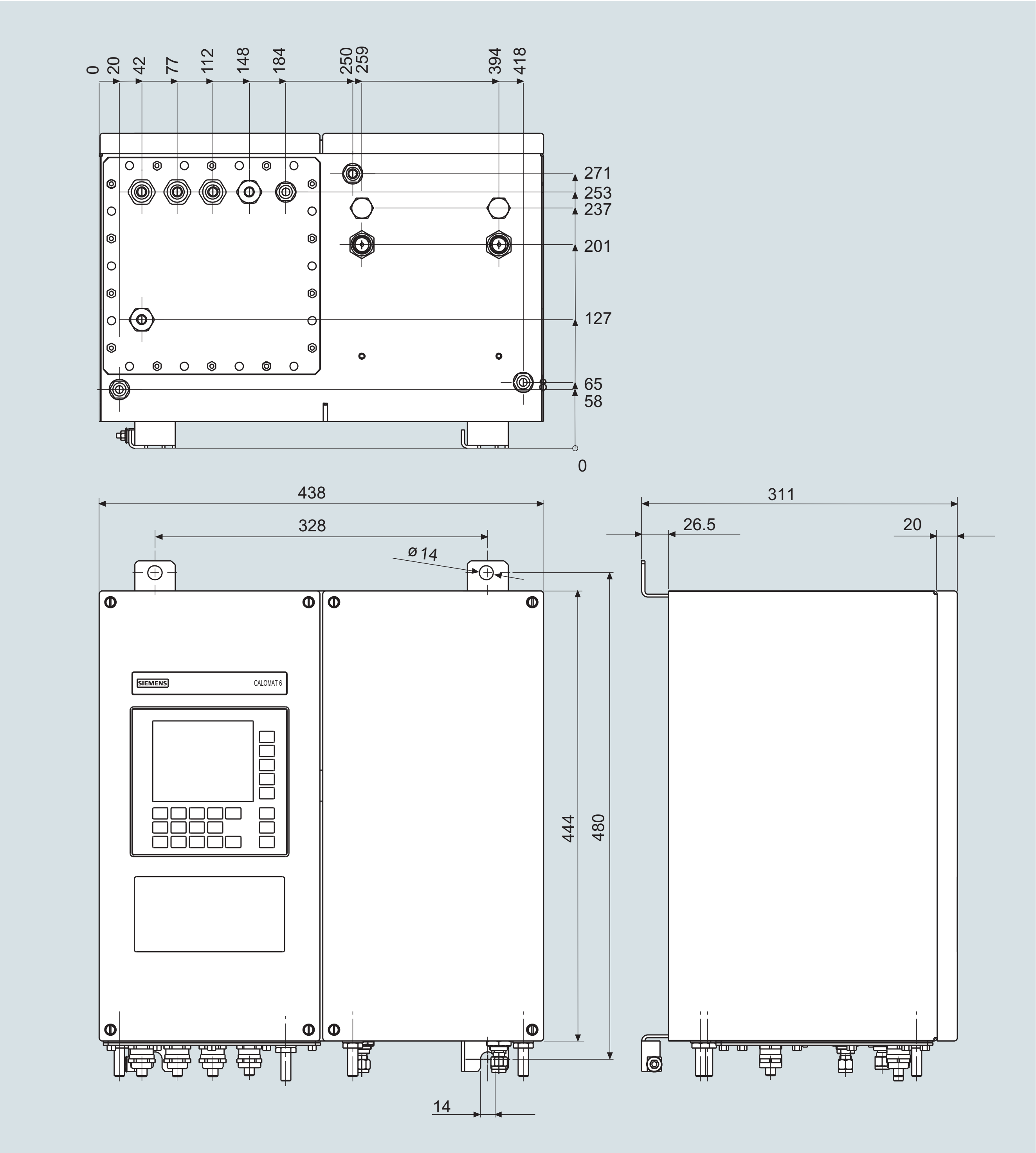
1) See also next page, "Additional units for Ex versions".

Selection and ordering data

Additional versions	Order code	Cannot be combined
Add "-Z" to Article No. and specify Order codes.		
Set of Torx screwdrivers	**A32**	
Kalrez gaskets in sample gas path	**B01**	
TAG labels (specific lettering based on customer information)	**B03**	
SIL conformity declaration (SIL 2) Functional Safety according to IEC 61508 and IEC 61511	**C20**	
Gas connections and piping made of Hastelloy C22		
• Outer diameter 6 mm	**D01**	→ **E20**
• Outer diameter ¼"	**D02**	→ **E20**
Ex versions Combination options see table "Ex configurations – principle selection criteria Series 6", chapter "General information"		
ATEX II 3G certificate; restricted breathing enclosure, non-flammable gases	**E11**	
ATEX II 3G certificate; flammable gases	**E12**	
FM/CSA certificate – Class I Div 2	**E20**	
ATEX II 3D certificate; potentially explosive dust atmospheres		
• In non-hazardous gas zone	**E40**	
• In Ex zone acc. to ATEX II 3G, non-flammable gases	**E41**	
• In Ex zone acc. to ATEX II 3G, flammable gases[1)]	**E42**	
BARTEC Ex p purging unit "Leakage compensation"	**E71**	
BARTEC Ex p purging unit "Continuous purging"	**E72**	
Clean for O_2 service (specially cleaned gas path)	**Y02**	
Measuring range indication in plain text, if different from the standard setting	**Y11**	
Additional units for Ex versions	**Article No.**	
Category ATEX II 2G (zone 1)		
BARTEC Ex p purging unit, 230 V, "leakage compensation"	**7MB8000-2BA**	
BARTEC Ex p purging unit, 115 V, "leakage compensation"	**7MB8000-2BB**	
BARTEC Ex p purging unit, 230 V, "continuous purging"	**7MB8000-2CA**	
BARTEC Ex p purging unit, 115 V, "continuous purging"	**7MB8000-2CB**	
Ex i isolating transformer	**7MB8000-3AB**	
Ex isolating relay, 230 V	**7MB8000-4AA**	
Ex isolating relay, 110 V	**7MB8000-4AB**	
Differential pressure switch for corrosive and non-corrosive gases	**7MB8000-5AA**	
Stainless steel flame arrestor	**7MB8000-6BA**	
Hastelloy flame arrestor	**7MB8000-6BB**	
Category ATEX II 3G (Zone 2)		
BARTEC Ex p purging unit, 230 V, "continuous purging"	**7MB8000-2CA**	
BARTEC Ex p purging unit, 115 V, "continuous purging"	**7MB8000-2CB**	
FM/CSA (Class I Div. 2)		
Ex purging unit MiniPurge FM	**7MB8000-1AA**	
Accessories		
RS 485/Ethernet converter	**A5E00852383**	
RS 485/RS 232 converter	**C79451-Z1589-U1**	
RS 485/USB converter	**A5E00852382**	
AUTOCAL function with 8 digital inputs/outputs	**A5E00064223**	
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS PA	**A5E00057315**	
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS DP	**A5E00057318**	
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS PA Ex i (firmware 4.1.10 required)	**A5E00057317**	
Set of Torx screwdrivers	**A5E34821625**	

1) Only in connection with an approved purging unit

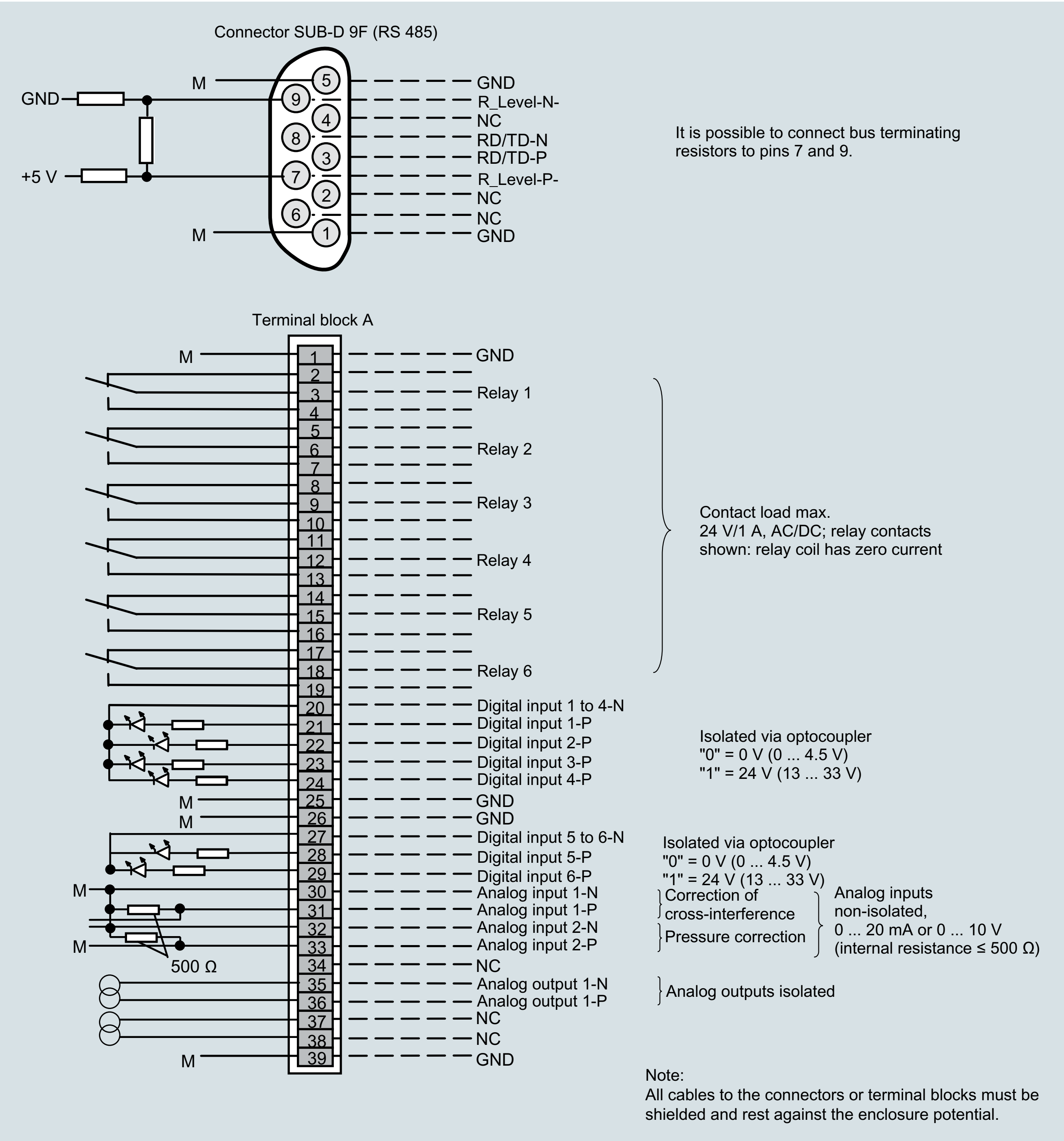
Dimensional drawings



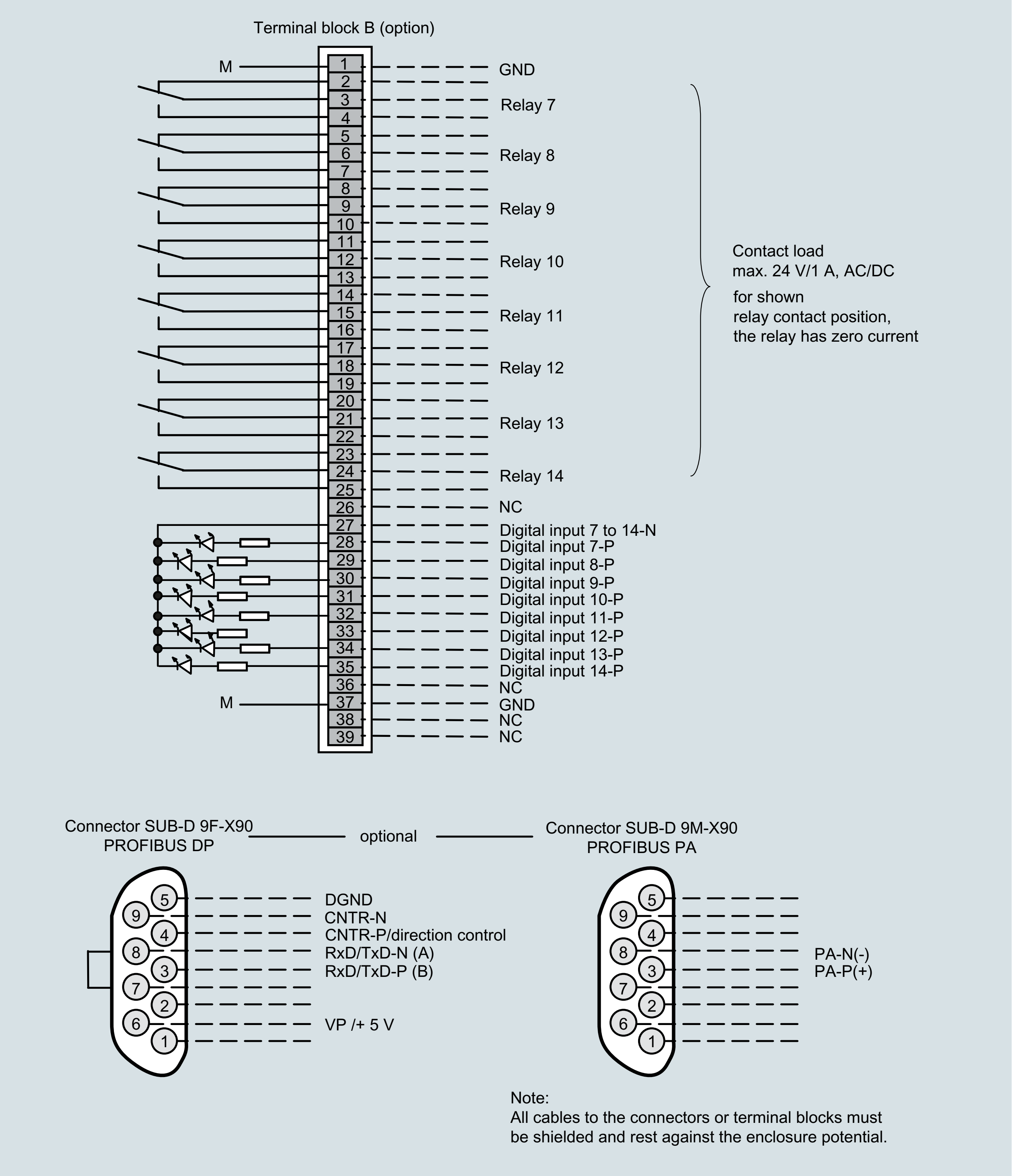
OXYMAT 6, field unit, dimensions in mm

Circuit diagrams

Pin assignment (electrical and gas connections)

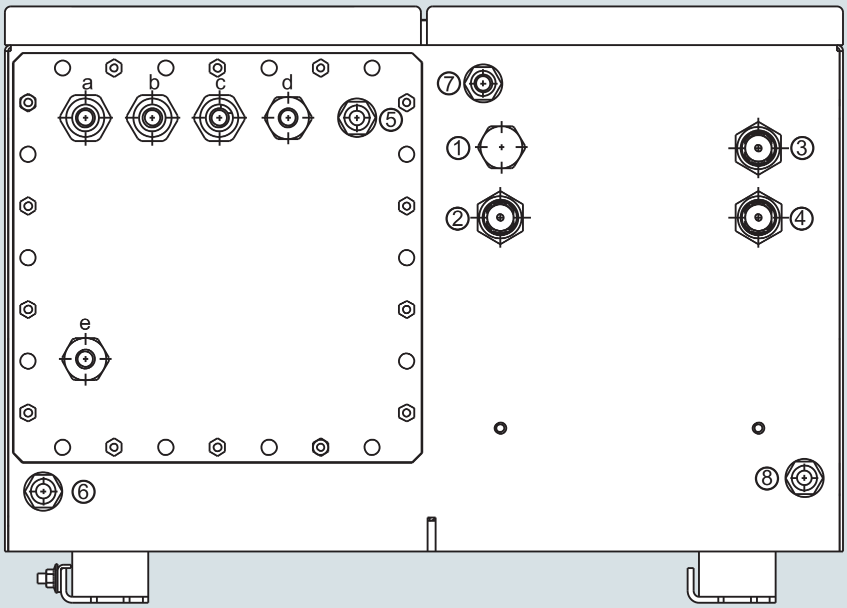


OXYMAT 6, field unit, connector and terminal assignment



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

Field device



Gas connections

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

Electrical connections

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

OXYMAT 6, field unit, gas and electrical connections

Selection and ordering data

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

More information

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

Suggestions for spare parts

Selection and ordering data

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

If the OXYMAT 6 was supplied with a specially cleaned gas path for high oxygen context ("Clean for O_2 service"), please ensure that you specify this when ordering spare parts. This is the only way to guarantee that the gas path will continue to comply with the special requirements for this version.

Overview

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

Benefits

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

Application

Application areas

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

Further applications

- Chemical plants
- Gas manufacturers
- Research and development

Design

- 19" slide-in module with 4 HU for installation
  - In hinged frame
  - In cabinets with or without telescope rails
- Front plate can be swung down for servicing purposes (laptop connection)
- Gas connections for sample gas inlet and outlet; pipe diameter 6 mm or ¼"
- Gas and electrical connections at the rear

Display and control panel

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

Input and outputs

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

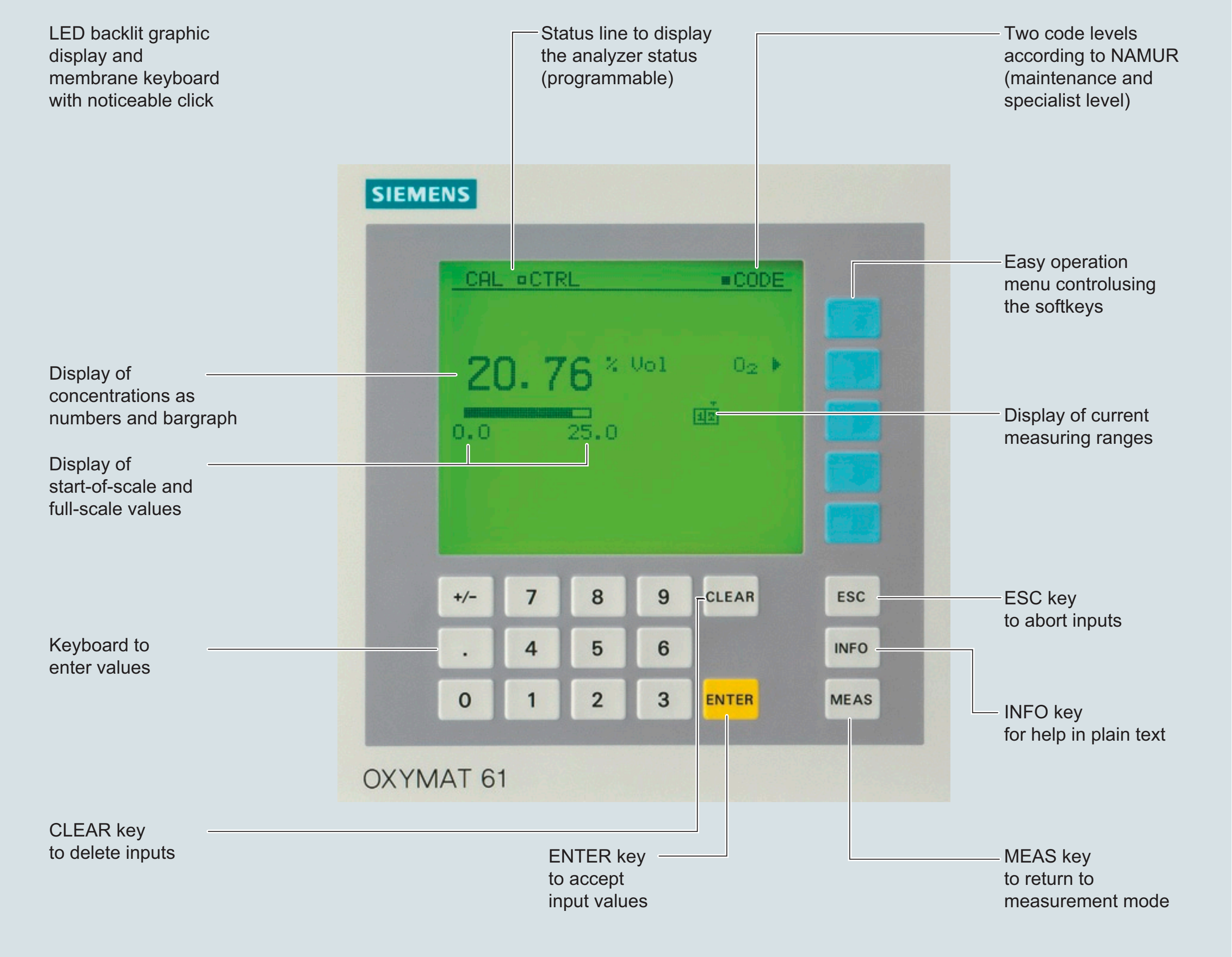
Communication

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

<u>Options</u>

- 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

General information



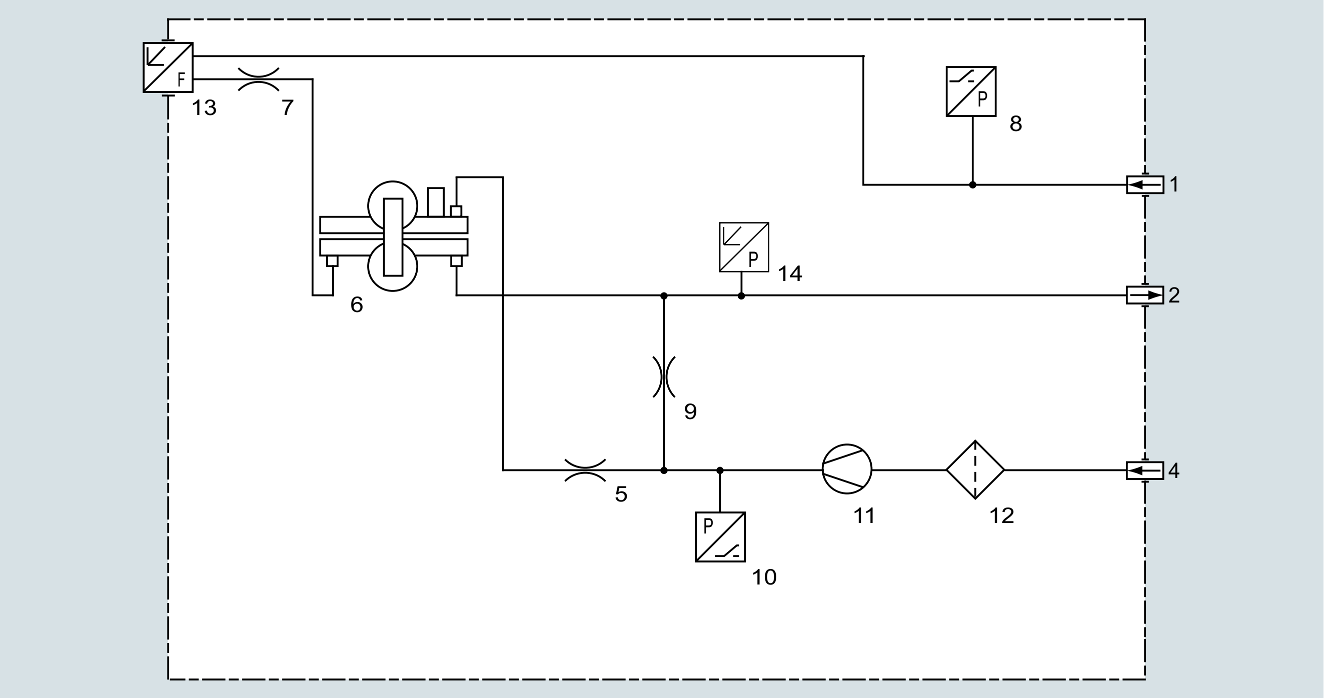
OXYMAT 61, membrane keyboard and graphic display

Designs – Parts wetted by sample gas, standard

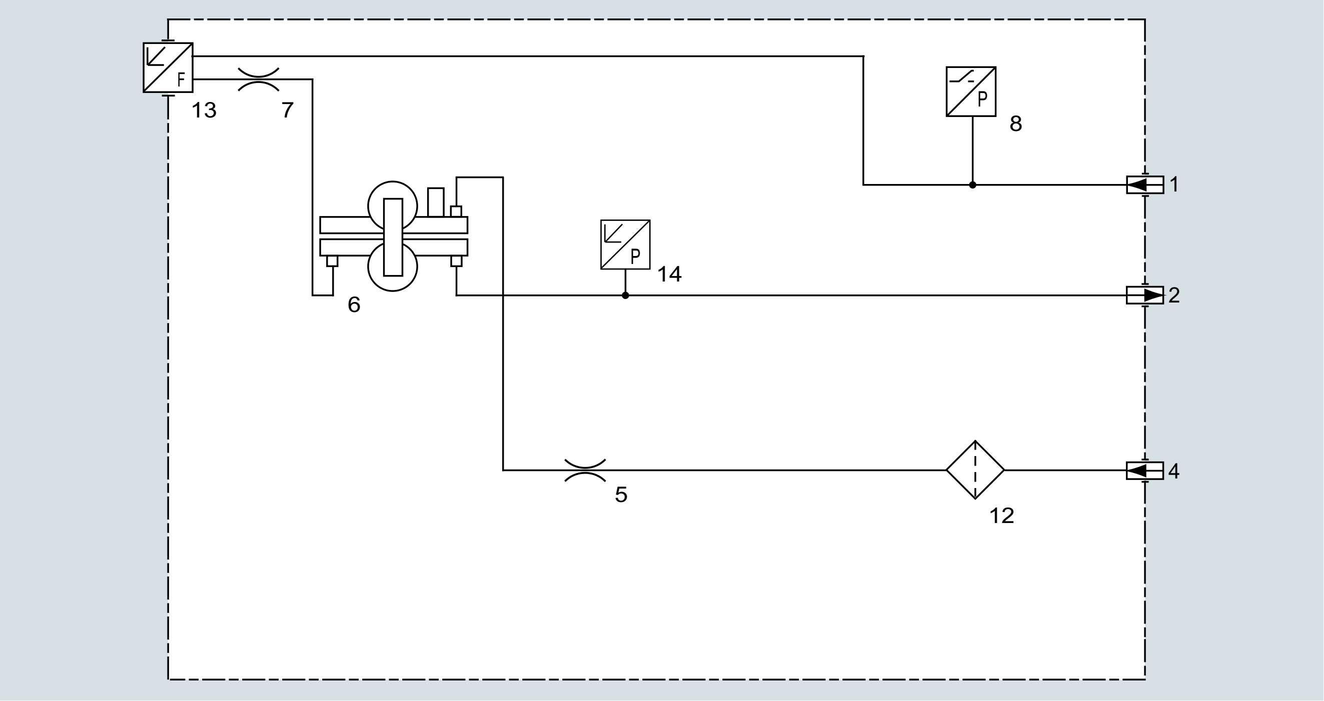
Gas path		19" rack unit
With hoses	Bushing	Stainless steel. Mat. no. 1.4571
	Hose	FKM (Viton)
	Sample chamber	Stainless steel. Mat. no. 1.4571
	Fittings for sample chamber	Stainless steel. Mat. no. 1.4571
	Restrictor	PTFE (Teflon)
	O-rings	FKM (Viton)
	Hose coupling	Polyamide 6
Options		
Flow indicator	Measurement pipe	Duran glass
	Variable area	Duran glass, black
	Suspension boundary	PTFE (Teflon)
	Angle pieces	FKM (Viton)
Pressure switch	Diaphragm	FKM (Viton)
	Enclosure	PA 6.3 T

Gas path

Legend for the gas path figures			
1	Sample gas inlet	8	Pressure switch in sample gas channel (option)
2	Sample gas outlet	9	Restrictor in reference gas path (outlet)
3	Not used	10	Pressure switch for reference gas monitoring
4	Reference gas inlet	11	Pump
5	Restrictor in reference gas path	12	Filter
6	O_2 physical system	13	Flow indicator in sample gas channel (optional)
7	Restrictor in sample gas path	14	Pressure sensor



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



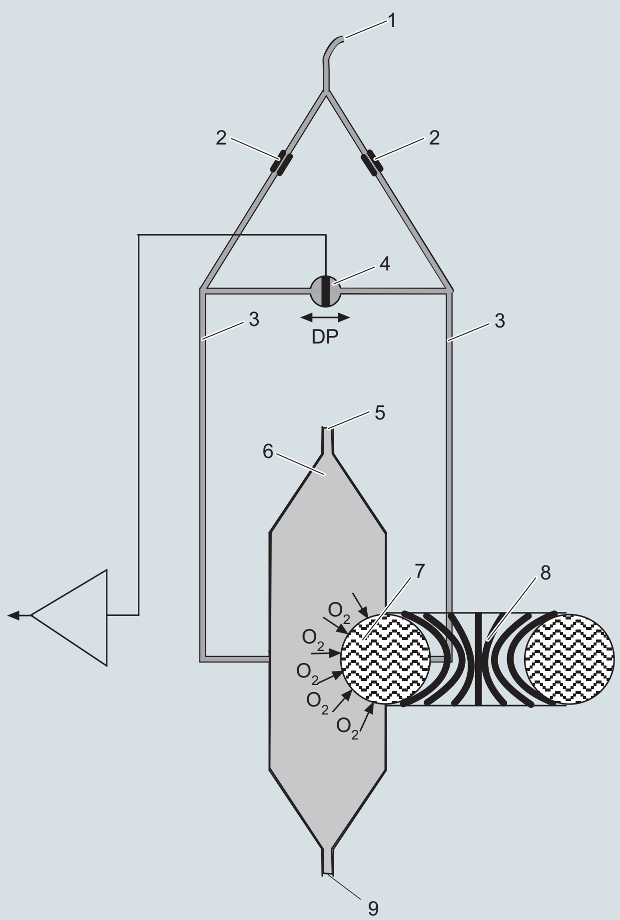
Gas path OXYMAT 61 with reference gas connection 3 000 to 5 000 hPa, absolute

Function

In contrast to almost all other gases, oxygen is paramagnetic. This property is utilized as the measuring principle by the OXYMAT 61 gas analyzers.

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

In the case of OXYMAT 61, one gas (1) is a reference gas (N_2, O_2 or air), the other is the sample gas (5). The reference gas is introduced into the sample chamber (6) through two channels (3). One of these reference gas streams meets the sample gas within the area of a magnetic field (7). Because the two channels are connected, the pressure, which is proportional to the oxygen content, causes a cross flow. This flow is converted into an electric signal by a microflow sensor (4).



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, principle of operation

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

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

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

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

Note

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

Essential characteristics

- Four measuring ranges which can be freely configured, even with suppressed zero point, all measuring ranges are linear
- Galvanically isolated measured-value output 0/2/4 to 20 mA (also inverted)
- Autoranging possible; remote switching is also possible
- Storage of measured values possible during adjustments
- Wide range of selectable time constants (static/dynamic noise suppression); i.e. the response time of the device can be adapted to the respective measuring task
- Easy handling thanks to menu-driven operation
- Low long-term drift
- Two control levels with their own authorization codes for the prevention of accidental and unauthorized operator interventions
- Automatic measuring range calibration can be configured
- Operation based on the NAMUR recommendation
- Monitoring of sample gas (option)
- Customer-specific analyzer options such as:
  - Customer acceptance
  - TAG labels
  - Drift recording
- Simple handling using a numerical membrane keyboard and operator prompting
- Short response time
- Reference gas supply either externally (N_2, O_2 or air, approx. 3 000 hPa) or via built-in reference gas pump (ambient air, approx. 1 100 hPa abs.)
- Monitoring of reference gas with reference gas connection; only on version with built-in reference gas pump
- Different smallest measuring ranges, depending on version 2.0% or 5.0% O_2
- Internal pressure sensor for correction of fluctuations in the sample gas pressure

Correction of zero error / cross-sensitivities

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

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

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

Conversion to other temperatures:

The deviations from the zero point listed in Table 1 must be multiplied by a correction factor (k):

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

All diamagnetic gases have a negative deviation from zero point.

Reference gases

Measuring range	Recommended reference gas	Reference gas connection pressure	Remarks
0 to … vol.% O_2	N_2	2 000 … 4 000 hPa above sample gas pressure (max. 5 000 hPa absolute)	The reference gas flow is set automatically to 5 … 10 ml/min.
... to 100 vol.% O_2 (suppressed zero point with full-scale value 100 vol.% O_2)	O_2		
Around 21 vol.% O_2 (suppressed zero point with 21 vol.% O_2 within the measuring span)	Air	Atm. pressure with internal reference gas pump	

Technical specifications

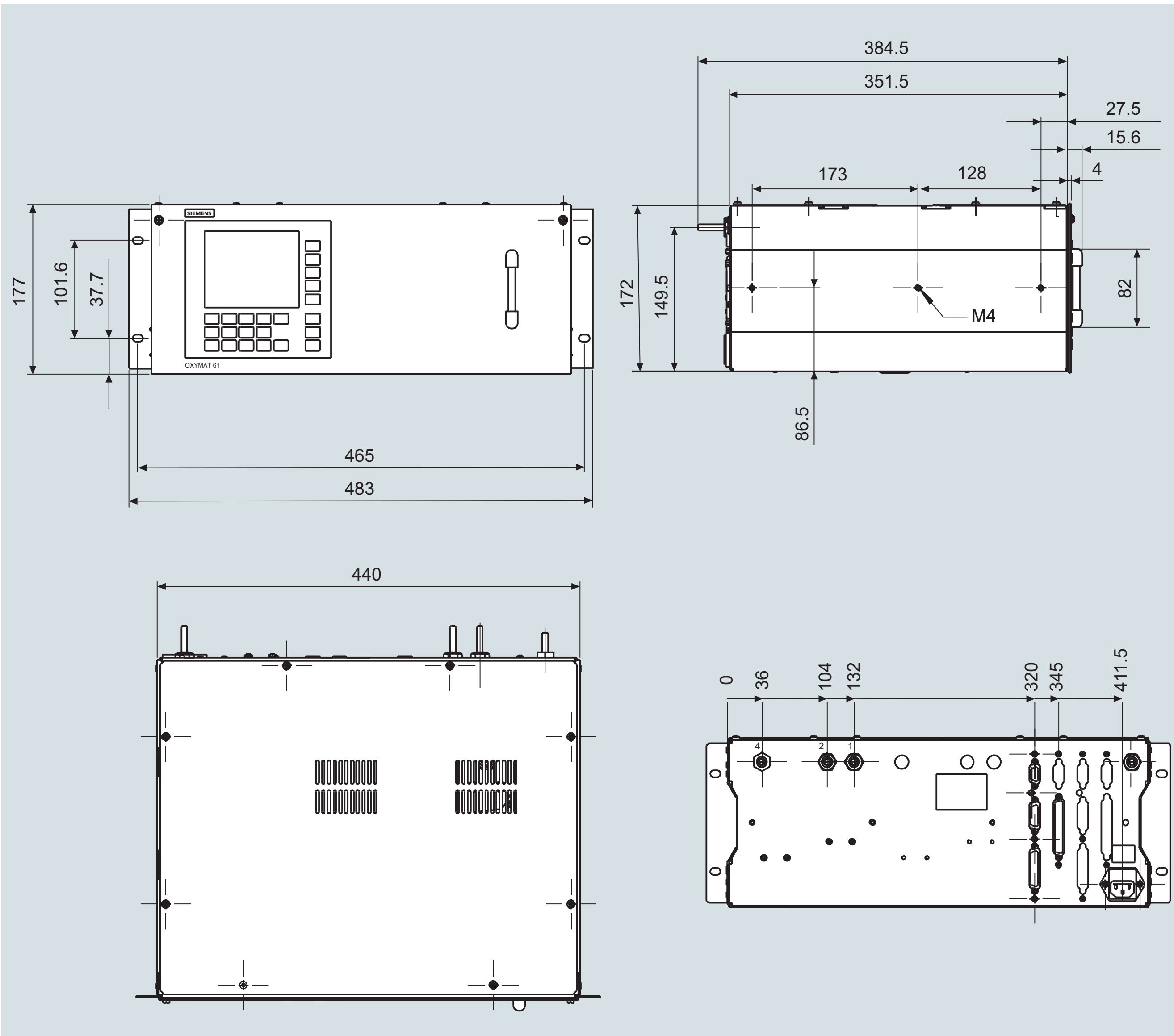
General information	
Measuring ranges	4, internally and externally switchable; autoranging is also possible
Smallest possible span (relating to sample gas pressure 1 000 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature)	2 vol.% or 5 vol.% O_2
Largest possible measuring span	100 vol.% O_2
Measuring ranges with suppressed zero point	Any zero point within 0 ... 100 vol.% can be implemented, provided that a suitable reference gas is used
Operating position	Front wall, vertical
Conformity	CE mark in accordance with EN 50081-1 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 values	100 ... 120 V: 1.0 T/250 200 ... 240 V: 0.63 T/250
Gas inlet conditions	
Permissible sample gas pressure	
• External reference gas supply	800 … 1 200 hPa absolute
• With integrated pump	Atmospheric pressure ±50 hPa
Sample gas flow	18 … 60 l/h (0.3 … 1 l/min)
Sample gas temperature	Min. 0 to max. 50 °C, but above the dew point
Sample gas humidity	< 90% relative humidity
Reference gas pressure (high-pressure version)	2 000 to 4 000 hPa above sample gas pressure, but max. 5 000 hPa absolute (version without reference gas pump)
Reference gas pressure (low-pressure version) with external pump	Min. 100 hPa above sample gas pressure
Dynamic response	
Warm-up period	At room temperature < 30 min (the technical specification will be met after 2 hours)
Delayed display (T_{90})	3.5 s
Damping (electrical time constant)	0 ... 100 s, configurable
Dead time (purging time of the gas path in the unit at 1 l/min)	Approximately 0.5 ... 2.5 s, depending on version
Time for device-internal signal processing	< 1 s
Pressure correction range	
Pressure sensor internal	500 … 2 000 hPa, absolute (see gas inlet conditions for permissible sample gas pressure)

Measuring response	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation	< ± 0.75% of the smallest possible measuring range according to rating plate, with electronic damping constant of 1 s (corresponds to ±0.25% at 2 σ)
Zero point drift	< ± 0.5%/month of the smallest possible span according to rating plate
Measured-value drift	< ±0.5%/month of the current measuring range
Repeatability	< 1% of the current measuring range
Detection limit	1% of the current measuring range
Linearity error	< 1% of the current measuring range
Influencing 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 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 change • With enabled pressure compensation: < 0.2% of the current measuring range /1% pressure change
Accompanying gases	Deviation from zero point corresponding to paramagnetic or diamagnetic deviation of accompanying gas (see table)
Sample gas flow at zero point	< 1% of the current measuring range according to rating plate with a change in flow of 0.1 l/min within the permissible flow range
Auxiliary power	< 0.1% of the current measuring range with rated 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: 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)

Selection and ordering data	Article No.	Cannot be combined
OXYMAT 61 gas analyzer 19" rack unit for installation in cabinets	7MB2001- ■■A00-■■■■	
↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.		
Gas connections for sample gas and reference gas		
Pipe with 6 mm outer diameter	0	
Pipe with ¼" outer diameter	1	
Smallest possible measuring span O_2		
2 % Reference gas pressure 3 000 hPa	C	
2 % reference gas supply with internal pump	D	D → Y02
5 % Reference gas pressure 3 000 hPa	E	
5 % reference gas supply with internal pump	F	F → Y02
Power supply		
100 ... 120 V AC, 48 ... 63 Hz	0	
200 ... 240 V AC, 48 ... 63 Hz	1	
Sample gas monitoring		
Without	A	
With (incl. flow indicator and pressure switch)	D	
Add-on electronics		
Without	A	
AUTOCAL function		
• With 8 additional digital inputs/outputs	B	
• With serial interface for the automotive industry (AK)	D	
• With 8 additional digital inputs/outputs and PROFIBUS PA interface	E	
• With 8 additional digital inputs/outputs and PROFIBUS DP interface	F	
Language		
German	0	
English	1	
French	2	
Spanish	3	
Italian	4	
Additional versions	**Order code**	
Add "-Z" to Article No. and specify Order code		
Telescopic rails (2 units)	A31	
TAG labels (specific lettering based on customer information)	B03	
Attenuation element for sample gas	B04	→ Y02
SIL conformity declaration (SIL 2) Functional Safety according to IEC 61508 and IEC 61511	C20	
Clean for O_2 service (specially cleaned gas path)	Y02	
Measuring range indication in plain text, if different from the standard setting[1]	Y11	
Accessories	**Article No.**	
RS 485/Ethernet converter	A5E00852383	
RS 485/RS 232 converter	C79451-Z1589-U1	
RS 485/USB converter	A5E00852382	
AUTOCAL function each with 8 digital inputs/outputs	C79451-A3480-D511	
AUTOCAL function 8 digital inputs/outputs each and PROFIBUS PA	A5E00057307	
AUTOCAL function 8 digital inputs/outputs each and PROFIBUS DP	A5E00057312	
Set of Torx screwdrivers	A5E34821625	

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

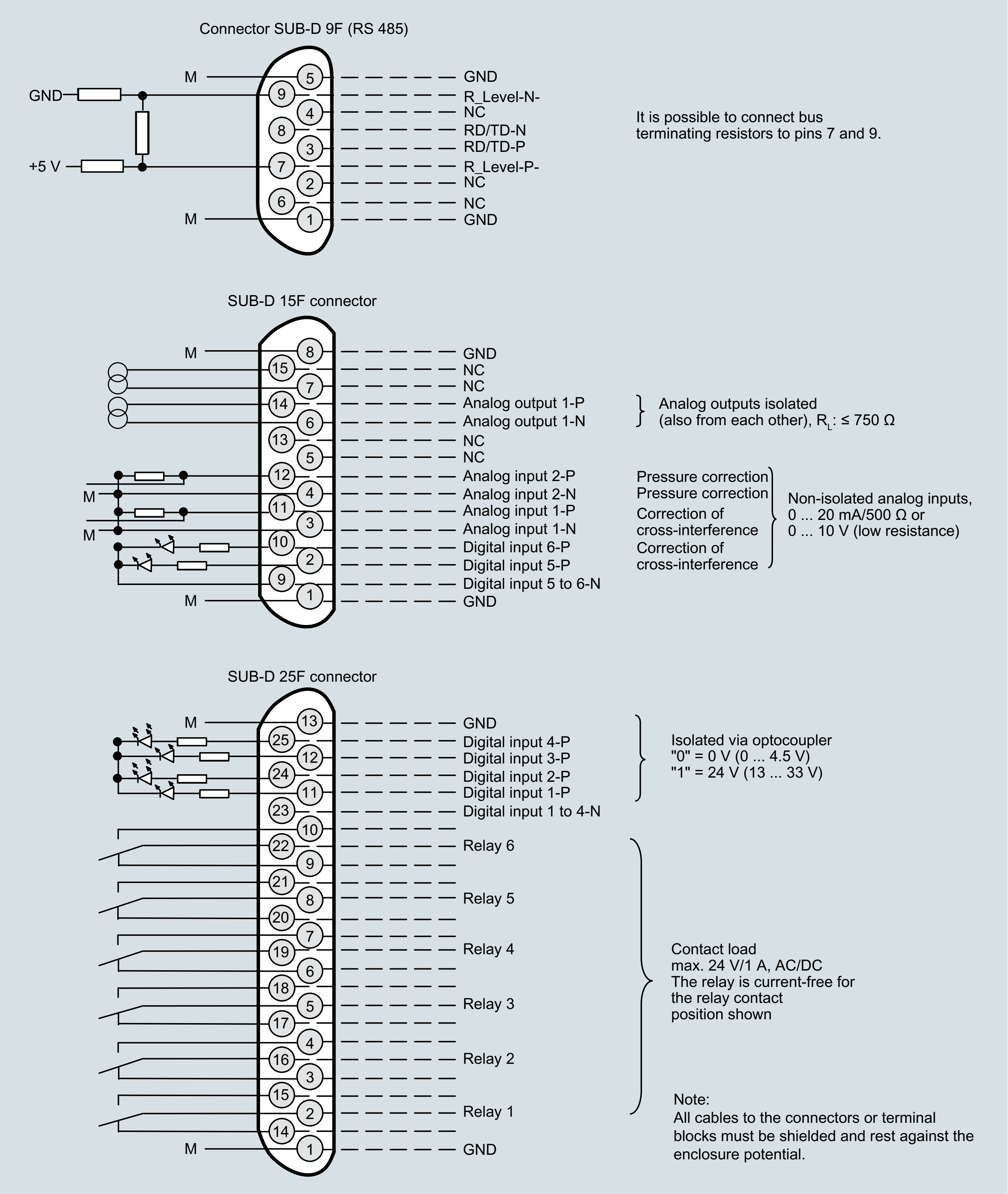
Dimensional drawings



OXYMAT 61, 19" unit, dimensions in mm

Circuit diagrams

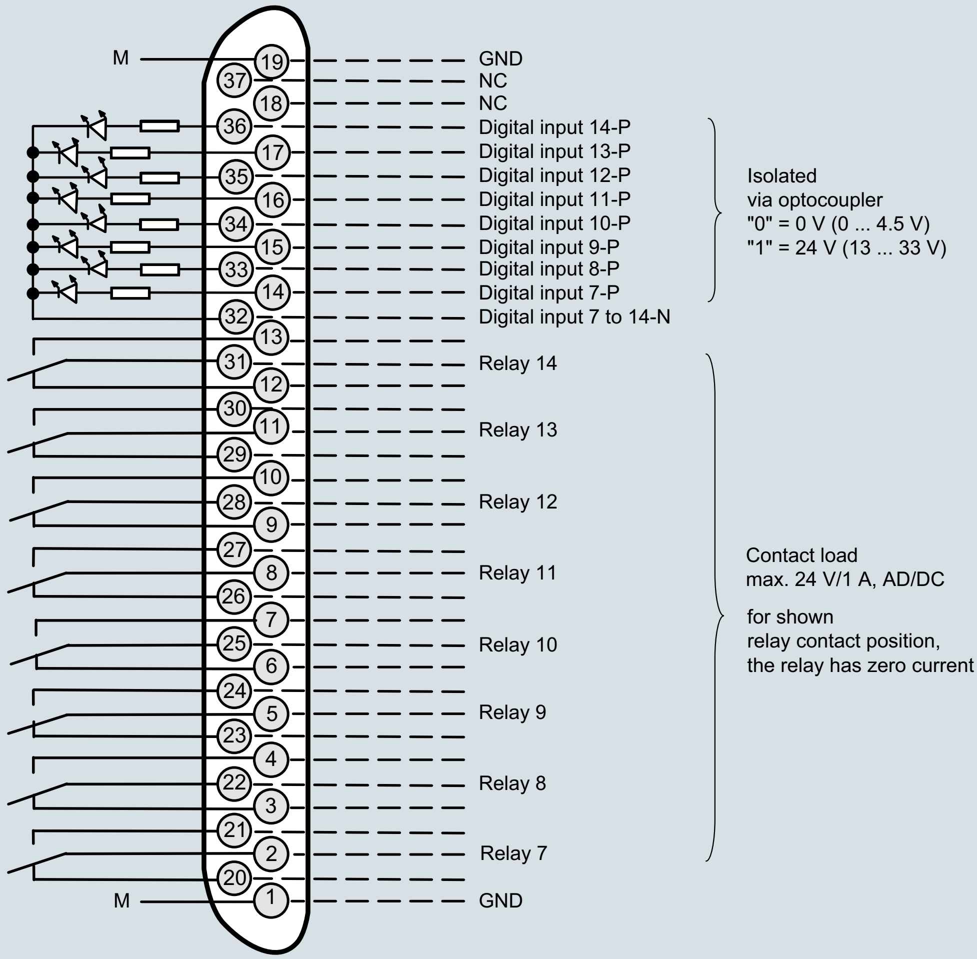
Pin assignment (electrical connections)



OXYMAT 61, 19" unit, pin assignment

Pin assignment (electrical connections)

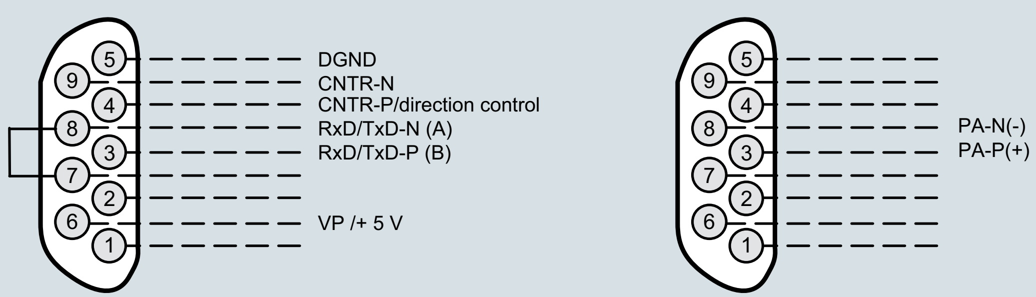
Connector SUB-D 37F (option)



Connector SUB-D 9F-X90
PROFIBUS DP

Optional

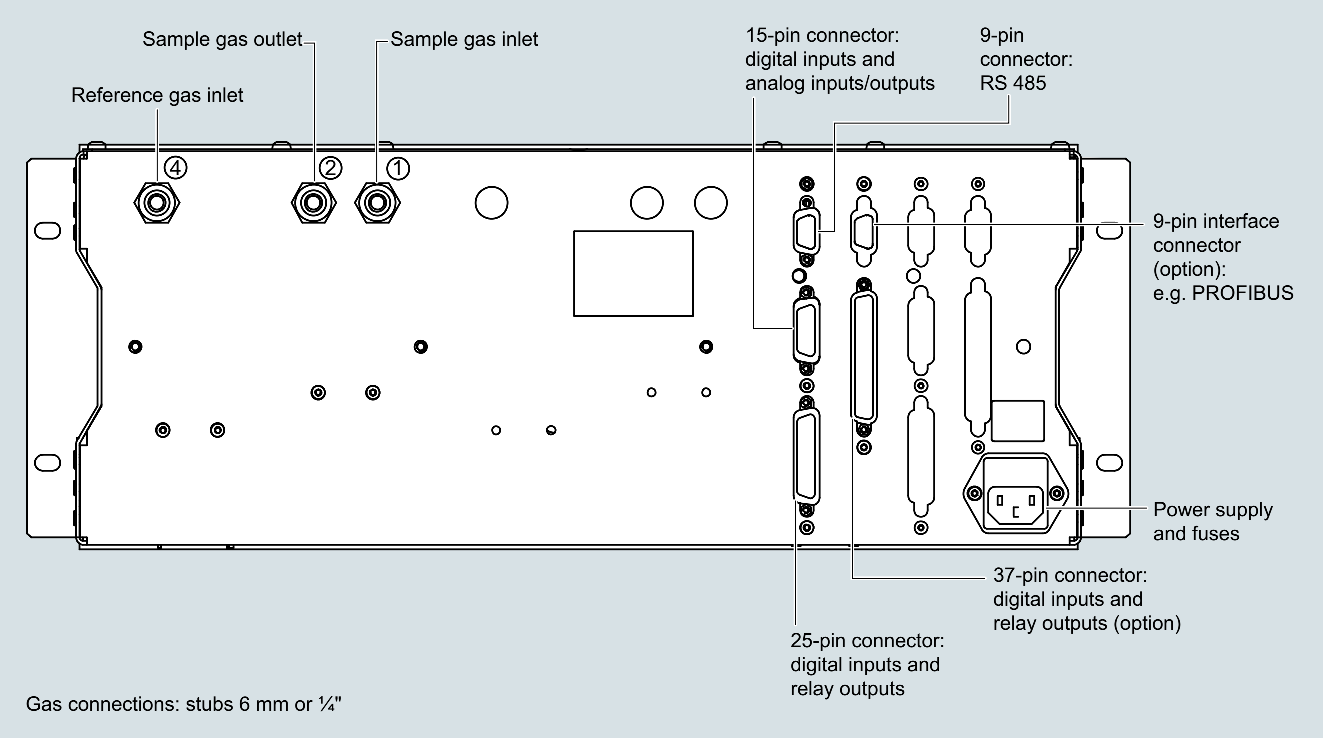
Connector SUB-D 9M-X90
PROFIBUS PA



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

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

Gas and electrical connections



OXYMAT 61, 19" unit, gas and electrical connections

Documentation, suggestions for spare parts

Selection and ordering data

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

More information

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

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

Selection and ordering data

Description	Quantity for 2 years	Quantity for 5 years	Article No.
Analyzer unit			
Reference gas supply (pump, restrictor, pressure switch, hose)	1	1	**A5E00114838**
Set of gaskets for sample gas pump	2	5	**A5E35875733**
O-ring	1	2	**C74121-Z100-A6**
Pressure switch (sample gas)	1	2	**C79302-Z1210-A2**
Flowmeter	1	2	**C79402-Z560-T1**
Sample chamber			
• Stainless steel, mat. no. 1.4571; non-flow-type compensation branch	-	1	**C79451-A3277-B535**
• O-ring (measuring head)	2	4	**C79121-Z100-A32**
• O ring (fitting)	2	4	**C71121-Z100-A159**
Measuring head (non-flow-type compensation branch)	1	1	**C79451-A3460-B525**
Restrictor for sample gas path, hose	2	2	**C79451-A3480-C10**
Reference gas path, 3000 hPa (set of parts)	1	1	**C79451-A3480-D518**
Electronics			
Front plate with keyboard	1	1	**A5E00259978**
Motherboard, with firmware: see spare parts list	-	1	
Adapter plate, LCD/keyboard	1	1	**C79451-A3474-B605**
Magnetic field connection plate	-	1	**C79451-A3474-B606**
LC display	1	1	**A5E31474846**
Connector filter	-	1	**W75041-E5602-K2**
Fuse			
• 0.63 A/250 V (230 V version)	2	3	**W79054-L1010-T630**
• 1.0 A/250 V (110 V version)	2	3	**W79054-L1011-T100**

If the OXYMAT 61 was supplied with a specially cleaned gas path for high oxygen context ("Clean for O_2 service"), please ensure that you specify this when ordering spare parts. This is the only way to guarantee that the gas path will continue to comply with the special requirements for this version.

Overview

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

Benefits

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

Application

Production of technical gases

- Measurements in 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 HU for installation
  - In hinged frame
  - In cabinets with or without telescope rails
- Front plate can be swung down for servicing purposes (laptop connection)
- Connections for sample gas
  - Input: Clamping ring connection for a pipe diameter of 6 mm or ¼"
  - Output: Pipe connection with diameter 6 mm or ¼"
- High-pressure and low-pressure versions
- Catalytically active and inactive cell

Display and control panel

- Large LCD field for simultaneous display of
  - Measured value
  - Status bar
  - Measuring ranges
- Contrast of the LCD field adjustable via the menu
- Permanent LED backlighting
- Washable membrane keyboard with five softkeys
- Five-digit measured-value display (decimal point counts as one digit)
- Menu-driven operation for parameterization, configuration, test functions, adjustment
- User help in plain text
- Graphic display of concentration trend; programmable time intervals
- Bilingual operating software German/English, English/Spanish, French/English, Spanish/English, Italian/English
- Switchover from ppm/vpm measuring range to % measuring range

Input and outputs

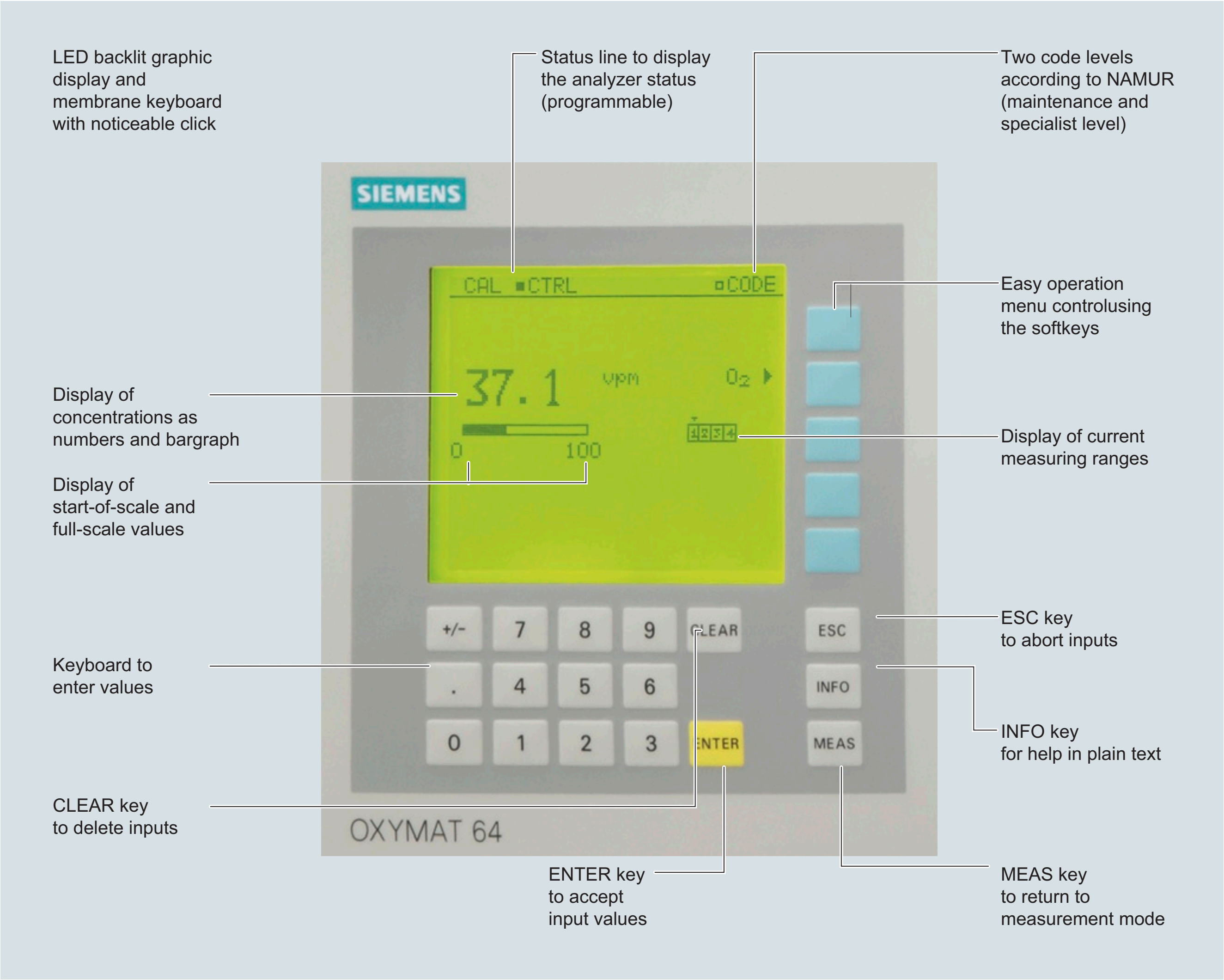
- One analog output per medium (from 0, 2, 4 to 20 mA; NAMUR parameterizable)
- Six digital inputs freely configurable (e.g. for measurement range switchover, processing of external signals from sample preparation)
- Six relay outputs freely configurable (failure, maintenance demanded, maintenance switch,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

Communication

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

<u>Options</u>

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



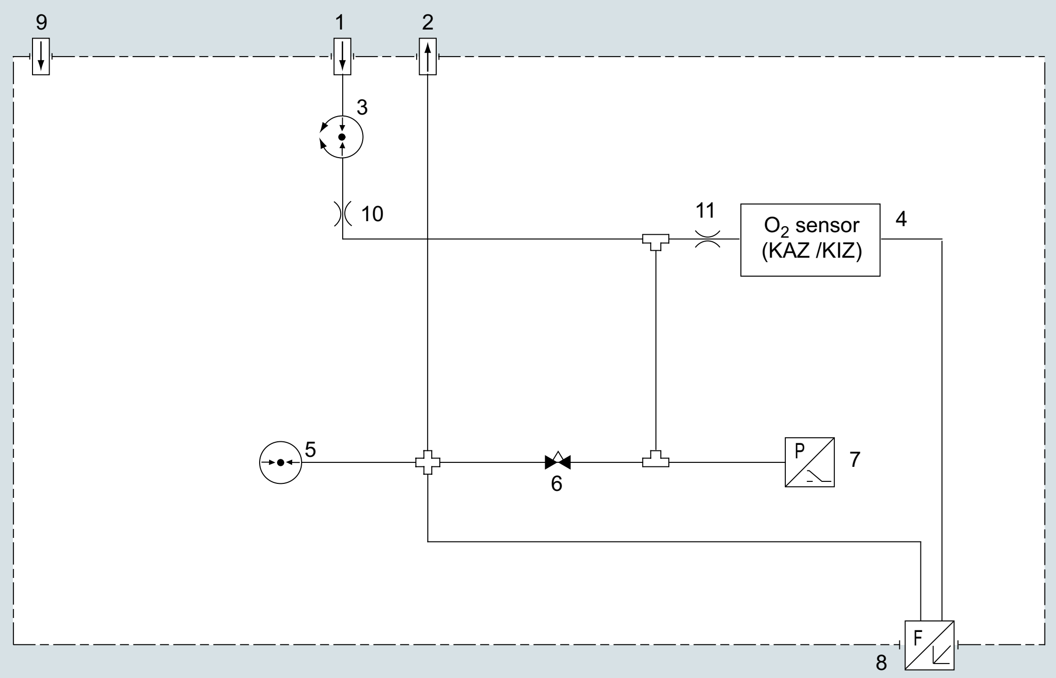
OXYMAT 64, membrane keyboard and graphic display

Designs – Parts wetted by sample gas, standard

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

Gas path (high-pressure version)

Legend for the gas path figure			
1	Sample gas inlet; inlet pressure	6	Bypass restrictor
	- Without internal pressure regulator: 2 000 hPa (abs.), regulated	7	Pressure switch
	- With internal pressure regulator: 2 000 ... 6 000 hPa (abs.)	8	Flow measuring tube
2	Sample gas outlet; sample gas flows off free of dynamic pressure	9	Purging gas connection
3	Pressure regulator (order version)	10	Restrictor
4	O_2 sensor	11	Sample gas restrictor
5	Pressure sensor		



Gas path OXYMAT 64, high-pressure version

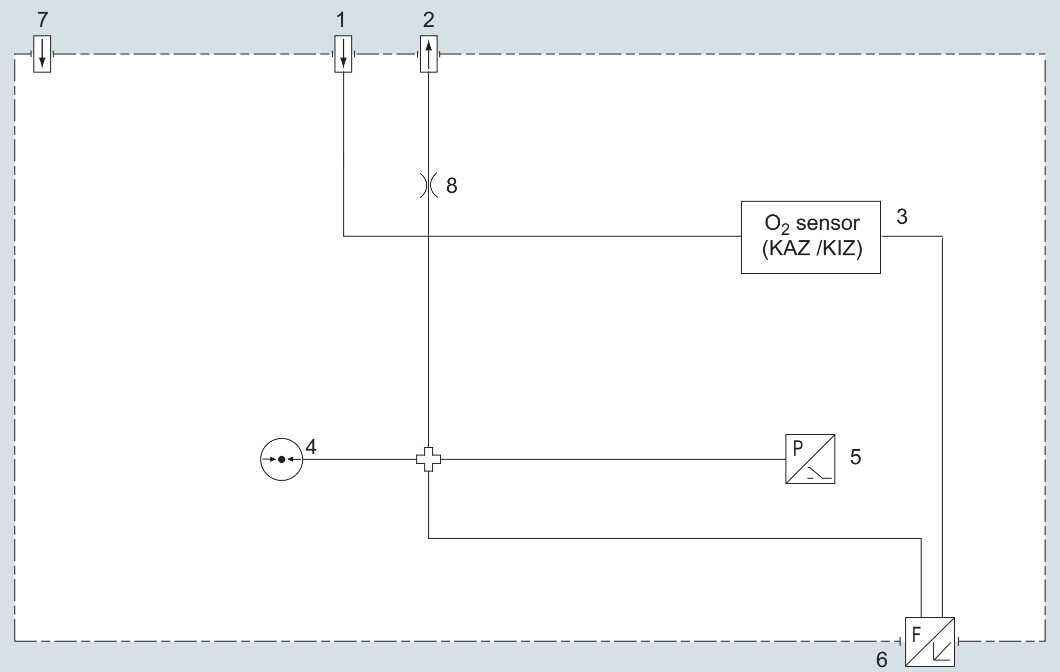
The sample gas pressure (2 000 to 6 000 hPa) is regulated by the pressure regulator (3) at approx. 2 000 hPa or is provided by the operator with 2 000 hPa. This pressure is applied at the restrictor (10). The restrictor (10) reduces the pressure such that a sample gas flow of 15 to 30 l/h is created. This flow is subdivided via the sample gas restrictor (11) and the adjustable bypass restrictor (6) such that there is a sample gas flow of 7.5 l/h through the sensor.

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

General information

Gas path (low pressure)

Legend for the gas path figure			
1	Sample gas inlet; flow 125 ml/min (7.5 l/h)	5	Pressure switch
2	Sample gas outlet; sample gas flows off free of dynamic pressure	6	Flow measuring tube
3	O_2 sensor	7	Purging gas connection
4	Pressure sensor	8	Restrictor

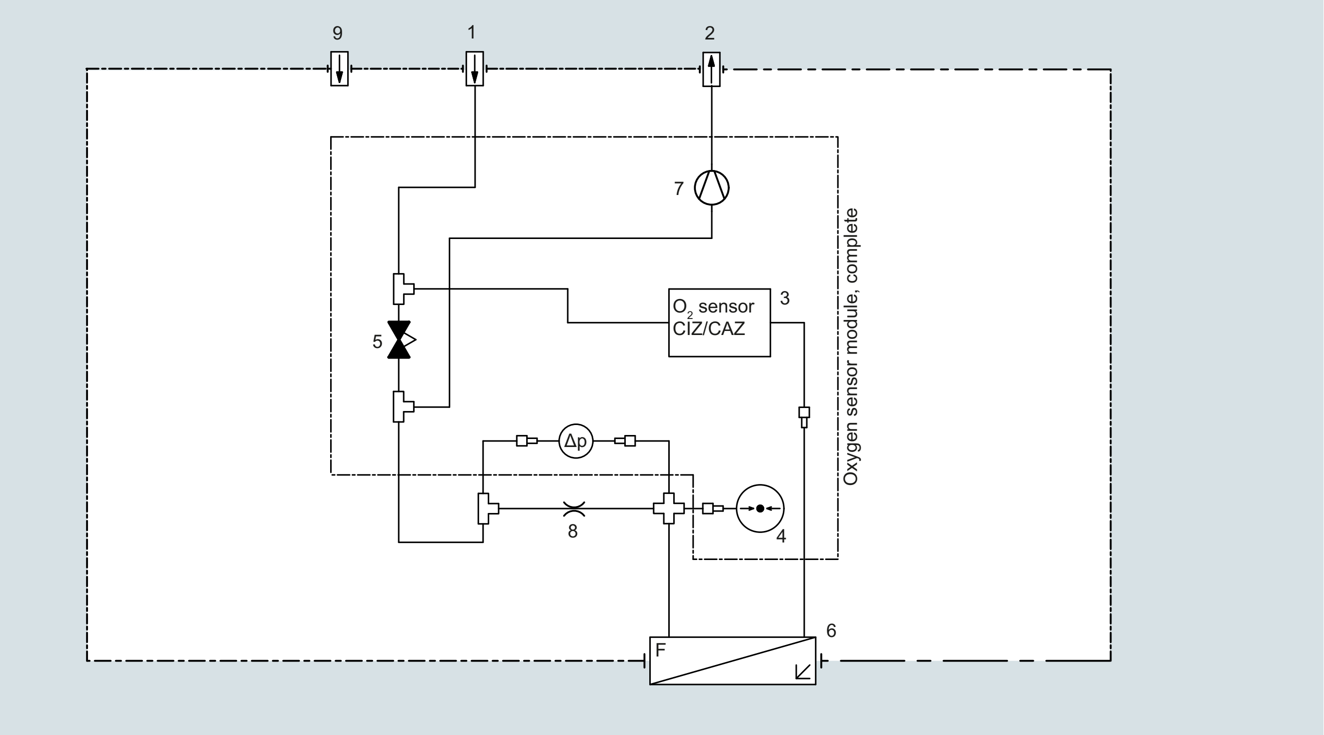


Gas path OXYMAT 64, low-pressure version

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

Gas path (low pressure with integrated sample gas pump)

Legend for the gas path figure			
1	Sample gas inlet	6	Flow measuring tube
2	Sample gas outlet; sample gas flows off free of dynamic pressure	7	Sample gas pump
3	O_2 sensor	8	Restrictor
4	Pressure sensor	9	Purging gas connection
5	Needle valve		



Low-pressure version with integral sample gas pump

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

Function

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

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

The differences in concentration at each side means that a differential partial pressure prevails. Since ZrO_2 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 membrane, which, according to equation (1), results in an electrical potential difference between the platinum electrodes.

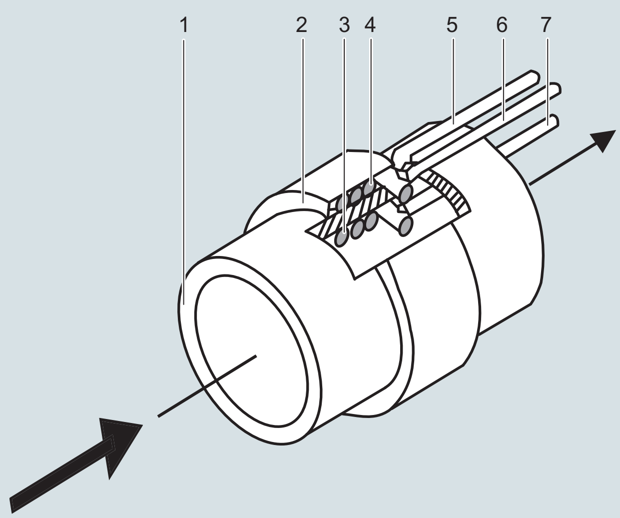
Defects in the crystal lattice, caused by contamination of the ZrO_2 material with Y_2O_3 and/or CaO (introduced originally to prevent cracks forming in ceramic material) make it easier for O_2 ions to diffuse in the ZrO_2 grid.

Catalytically active ZrO_2 sensor (CAZ)

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

Catalytically inactive ZrO_2 sensor (CIZ)

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



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

OXYMAT 64, principle of operation

Measuring effect

$U = U_A + RT/4F$ (ln $[O_2$,air] - ln $[O_2]$ (equation 1)
U measuring effect
U_A asymmetric voltage (voltage, at $[O_2] = [O_2$,air])
T ceramic temperature
$[O_2$,air] O_2 concentration in the air
$[O_2]$ O_2 concentration in sample gas

Note

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

Calibration

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

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

Essential characteristics

- Four measurement ranges freely parameterizable, all measurement ranges linear
- Galvanically isolated measurement value output 0/2/4 through 20 mA (also inverted) and as per NAMUR
- Autoranging selectable; possibility of remote switching
- Storage of measured values possible during adjustments
- Wide range of selectable time constants (static/dynamic noise suppression); i.e. the response time of the device can be adapted to the respective measuring task
- Easy handling thanks to menu-driven operation
- Low long-term drift
- Two control levels with their own authorization codes for the prevention of accidental and unauthorized operator interventions
- Automatic measuring range calibration can be configured
- Operation based on the NAMUR recommendation
- Monitoring of the sample gas (via pressure switch)
- Customer-specific analyzer options such as:
  - Customer acceptance
  - TAG labels
  - Drift recording
- Simple handling using a numerical membrane keyboard and operator prompting
- Smallest span 0 to 10 vpm O_2
- Largest span 0 to 100 % (testing with ambient air)
- Internal pressure sensor for correction of the influence of sample gas pressure fluctuations

Influence of interfering gas

Catalytically active sensor (CAZ)

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

Catalytically inactive sensor (CIZ)

There is only a slight cross-interference in the case of accompanying gases with a concentration in the range of the O_2 concentration. H_2, CO and CH_4 still have a noticeable effect in the case of flammable accompanying gas components.

Measured component / interfering gas	Diagonal gas offset
78 vpm O_2/140 vpm CO	-6.1 vpm
10 vpm O_2/10 vpm CO	-0.6 vpm
74 vpm O_2 / 25 vpm CH_4	-0.3 vpm
25 vpm O_2 / 357 vpm CH_4	-1.1 vpm
25 vpm O_2 / 70 vpm H_2	-3 vpm
5 vpm O_2 / 9.6 vpm H_2	-0.55 vpm
170 vpm O_2 / 930 vpm C_2H_4	-118 vpm

Examples of typical diagonal gas offsets on a catalytically inactive sensor

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

1

Technical specifications

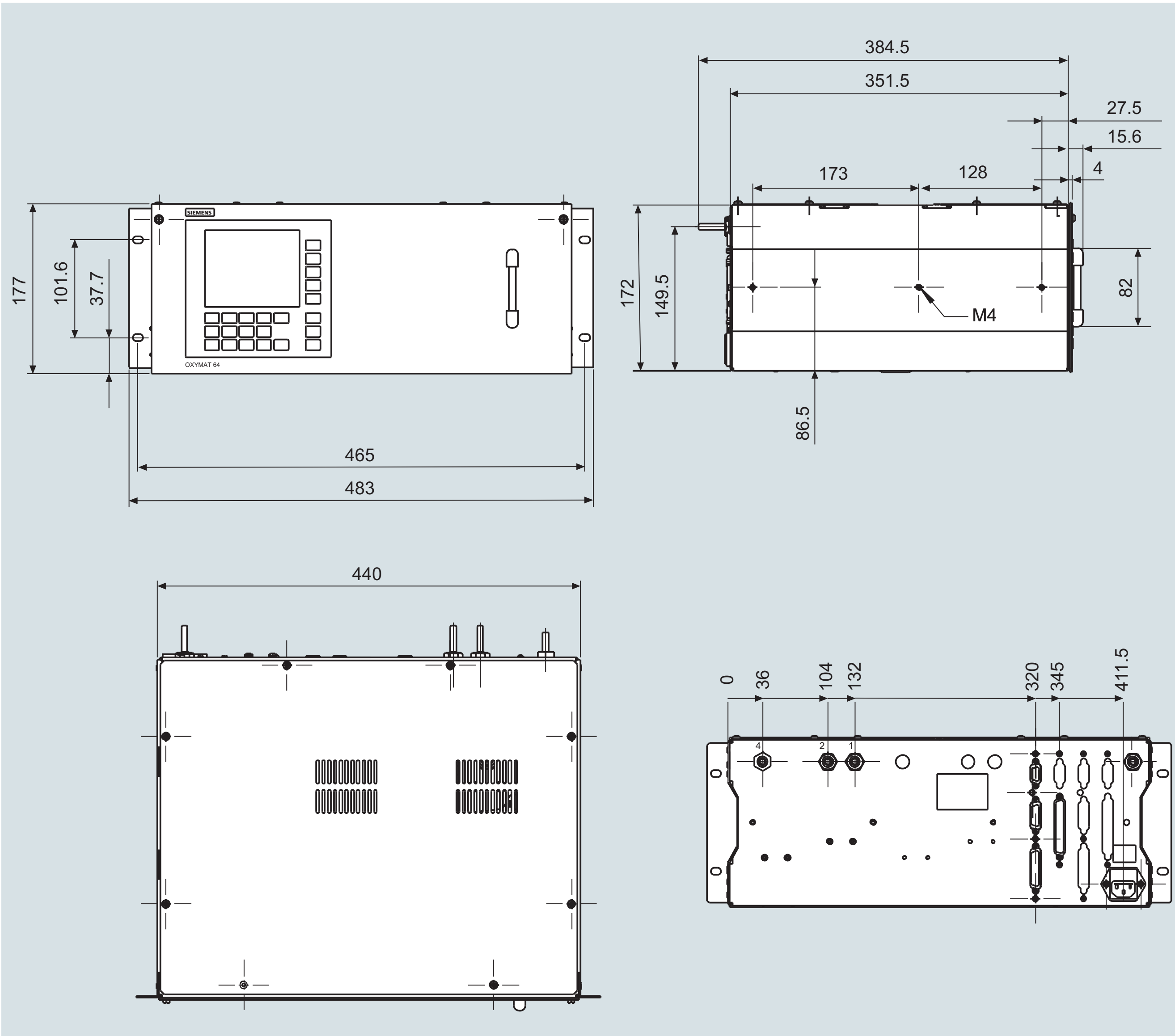
General	
Measurement ranges	4, internally and externally switchable; automatic measuring range switchover also possible
Smallest possible span (relating to sample gas pressure 1 000 hPa absolute, 0.5 l/min sample gas flow, and 25 °C ambient temperature)	0 ... 10 vpm O_2
Largest possible measuring span	0 ... 100%
Operating position	Front wall vertical
Conformity	CE mark in accordance with EN 50081-1, EN 50082-2 and RoHS
Design, enclosure	
Degree of protection	IP20 according to EN 60529
Weight	Approx. 11 kg
Electrical characteristics	
EMC interference immunity (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98) and EN 61326
Electrical safety	In accordance with EN 61010-1, overvoltage category II
Power supply	100 ... 120 V AC (nominal range of use 90 ... 132 V), 48 ... 63 Hz or 200 ... 240 V AC (nominal range of use 180 ... 264 V), 48 ... 63 Hz
Power consumption	Approx. 37 VA
Fuse values	100 ... 120 V: 1.0T/250 200 ... 240 V: 0.63T/250
Gas inlet conditions	
Sample gas flow	
• through the sensor	7.5 l/h
• Overall consumption	15 ... 30 l/h
Permissible sample gas pressure	
• Without internal pressure regulator	2 000 hPa (abs.)
• With internal pressure regulator	2 000 ... 6 000 hPa (abs.)
Sample gas temperature	Min. 0 ... max. 50 °C, but above the dew point
Sample gas humidity	< 1% relative humidity
Dynamic response	
Warm-up period	At room temperature < 30 min (the technical specification will be met after 2 hours)
Damping (electrical time constant)	0 ... 100 s, configurable
Dead time (high-pressure version) (purging time of the gas path in the unit at 125 ml/min)	10 ... 30 s
Dead time (low-pressure version without pump)	< 5 s
Dead time (low-pressure version with pump)	< 10 s
Time for device-internal signal processing	< 1 s
Pressure correction range	
Pressure sensor internal	800 ... 1 100 hPa (abs.)

Measuring response	Based on sample gas pressure 1 013 hPa absolute, 7.5 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation	< ± 1% of the smallest possible measuring range according to rating plate, with electronic damping constant of 1 s
Zero point drift	< ± 1% of the current span/month
Measured-value drift	< ± 1% of the current span/month
Repeatability	< 3% of the current measuring span
Detection limit	1% of current measuring range, < 0.1 vpm in measuring range 0 ... 10 vpm
Linearity error	< 2% of the current measuring span
Influencing variables	Based on sample gas pressure 1 013 hPa absolute, 7.5 l/min sample gas flow and 25 °C ambient temperature
Ambient temperature	< 2%/10 K referred to current measuring span
Sample gas pressure only possible if the sample gas can flow out into the ambient air	• With deactivated pressure compensation: < 1% of current span/1% pressure change • With activated pressure compensation: < 0.2% of current span / 1% pressure change
Residual gases, deviation from zero point	
• Catalytically active sensor (CAZ)	Only gases with non-combustible residual gas components can be introduced
• Catalytically inactive sensor (CIZ)	Residual gas concentration of 10 vpm H_2; CO and CH_4 have a lower cross-interference; higher HCs are negligible
Sample gas flow	< 2% of the smallest possible span with a change in flow of 10 ml/min
Power supply	< 0.1% of the current measuring range with rated voltage ± 10%
Electrical inputs and outputs	
Analog output	0/2/4 ... 20 mA, 4 … 20 mA (NAMUR), isolated; max. load 750 Ω
Relay outputs	6, with changeover contacts, freely parameterizable, e.g. for measuring range identification; load: 24 V AC/DC/1 A, isolated
Analog inputs	2, dimensioned for 0/2/4 … 20 mA for external pressure sensor and correction of influence of residual gas (correction of cross-interference)
Digital inputs	6, designed for 24 V, isolated, freely parameterizable, e.g. for measurement range switchover
Serial interface	RS 485
Options	AUTOCAL function each with 8 additional digital inputs and relay outputs, also with PROFIBUS PA or PROFIBUS DP
Climatic conditions	
Permissible ambient temperature	-40 ... +70 °C during storage and transportation, 5 ... 45 °C in operation
Permissible humidity	< 90% relative humidity as annual average, during storage and transportation (must not fall below dew point)

Selection and ordering data		Article No.	Cannot be combined
OXYMAT 64 gas analyzer 19" rack unit for installation in cabinets		↗ **7MB2041- ■■■1■-■A■■**	
↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.			
Sensor			
ZrO_2: Catalytically active cell (CAC)		**0**	0
ZrO_2: Catalytically inactive cell (CIC)		**1**	1
ZrO_2: Catalytically active cell (CAC); with differential pressure sensor		**2**	2
ZrO_2: Catalytically inactive cell (CIC); with differential pressure sensor		**3**	3
Sample gas pressure			
High pressure, without pressure regulator	2 000 hPa (abs.)	**A**	A
High pressure, with pressure regulator	2 000 ... 6 000 hPa (abs.)	**B**	B
Low pressure, with pump	Atmosphere	**C**	C
Low pressure, without suction pump	Atmosphere	**D**	D
Gas connection			
Input Output	Clamping ring connection 6 mm Fittings 6 mm	**A**	
Input Output	Clamping ring connection ¼" Fitting ¼"	**B**	
Add-on electronics			
Without		**0**	
AUTOCAL function			
• With 8 additional digital inputs/outputs		**1**	
• With 8 additional digital inputs/outputs and PROFIBUS PA interface		**6**	
• With 8 additional digital inputs/outputs and PROFIBUS DP interface		**7**	
Power supply			
100 to 120 V AC, 48 to 63 Hz		**0**	
200 to 240 V AC, 48 to 63 Hz		**1**	
Explosion protection			
Without		**A**	
Language			
German		**0**	
English		**1**	
French		**2**	
Spanish		**3**	
Italian		**4**	
Additional versions		**Order code**	
Add "-Z" to Article No. and specify Order code			
Telescopic rails (2 units)		**A31**	
TAG labels (specific lettering based on customer information)		**B03**	
Clean for O_2 service (specially cleaned gas path)		**Y02**	
Measuring range indication in plain text, if different from the standard setting		**Y11**	
Special setting (only in conjunction with an application no., e.g. extended measuring range)		**Y12**	
Extended special setting (only in conjunction with an application no., e.g. determination of cross-interferences)		**Y13**	
Accessories		**Article No.**	
RS 485/Ethernet converter		**A5E00852383**	
RS 485/RS 232 converter		**C79451-Z1589-U1**	
RS 485/USB converter		**A5E00852382**	
AUTOCAL function each with 8 digital inputs/outputs		**C79451-A3480-D511**	
AUTOCAL function 8 digital inputs/outputs each and PROFIBUS PA		**A5E00057307**	
AUTOCAL function 8 digital inputs/outputs each and PROFIBUS DP		**A5E00057312**	
Set of Torx screwdrivers		**A5E34821625**	

19" rack unit

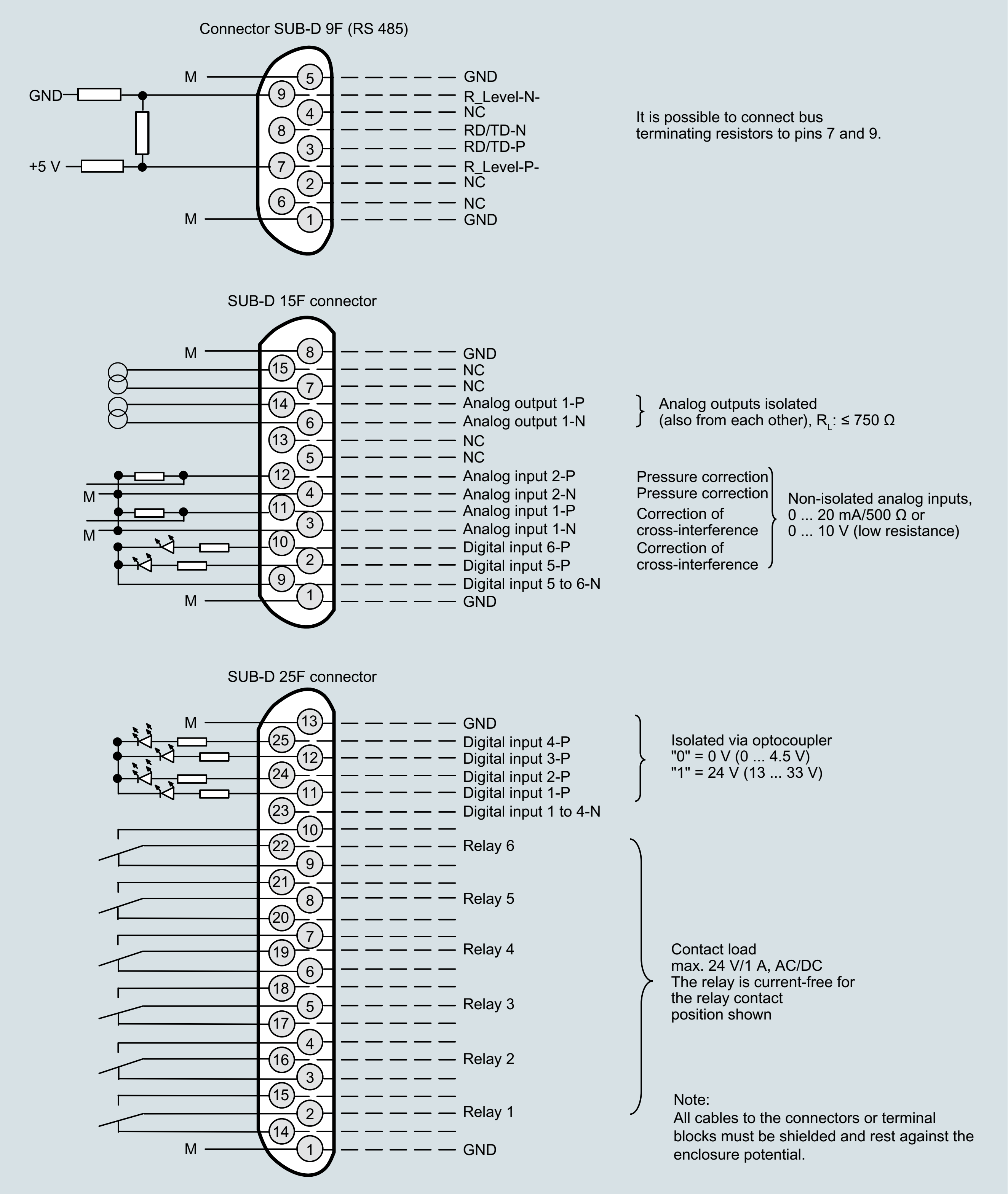
Dimensional drawings



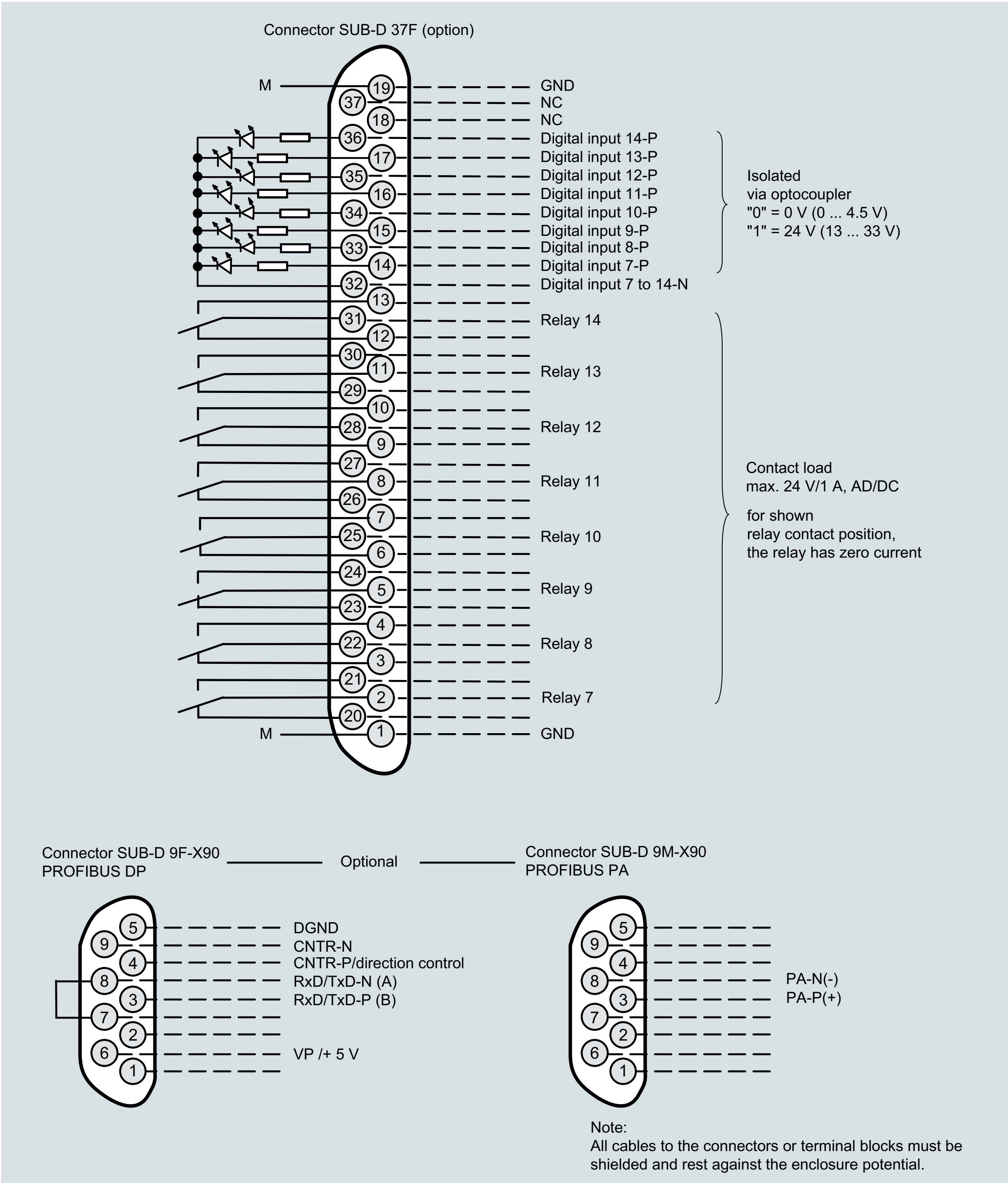
OXYMAT 64, 19" rack unit, size in mm

Circuit diagrams

Pin assignment (electrical connections)

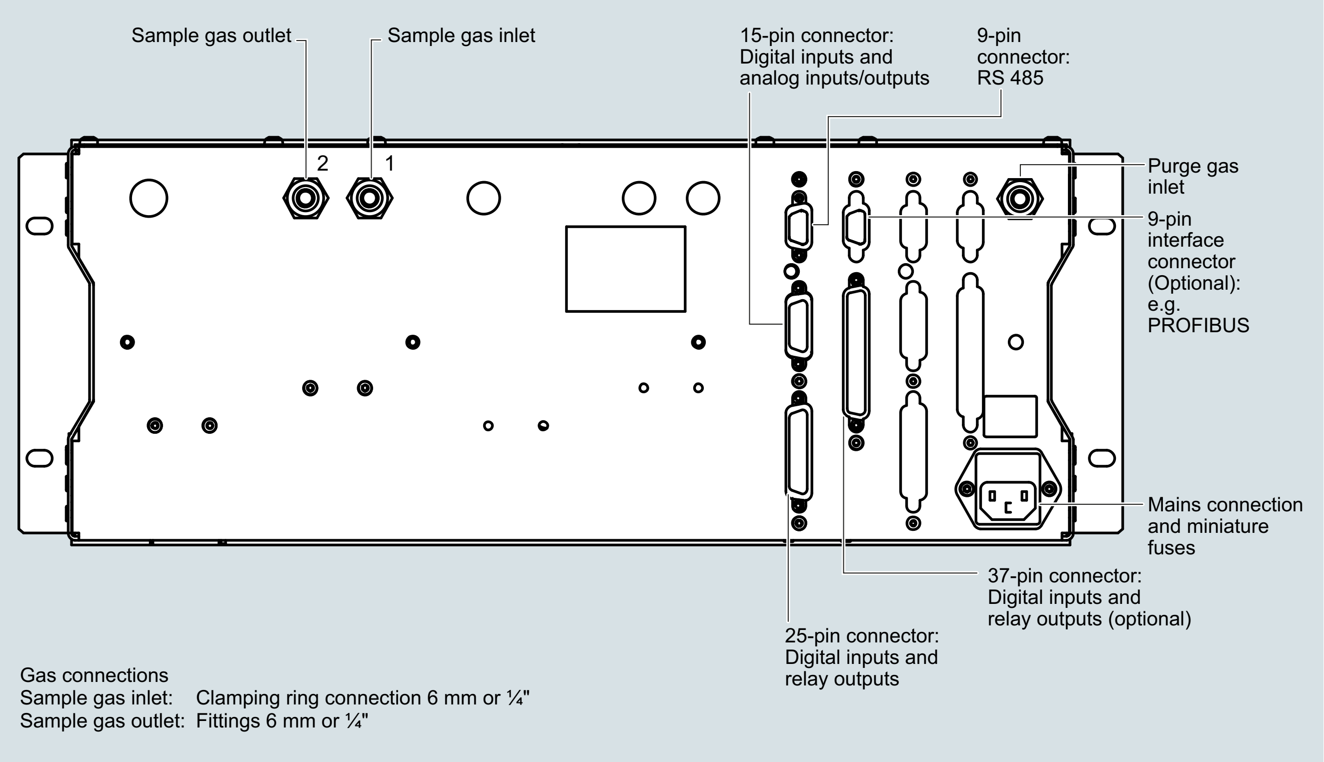


OXYMAT 64, 19" rack unit, pin assignment



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

Gas connections and pin assignment



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

Documentation, suggestions for spare parts

Selection and ordering data

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

More information

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

Selection and ordering data

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

Overview

The CALOMAT 6 gas analyzer is primarily used for quantitative determination of H_2 or He in digital or quasi-digital non-corrosive gas mixtures.

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

Fields of application

- 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 the analysis of flammable and non-flammable gases or vapors for use in hazardous areas (Zone 1 and Zone 2)

Special versions

Special applications

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

Design

19" rack unit

- With 4 HU for installation
  - In hinged frame
  - In cabinets with or without telescope rails
- Front plate can be swung down for servicing purposes (laptop connection)
- Internal gas paths: stainless steel pipe (mat. no. 1.4571)
- Gas connections for sample gas inlet and outlet and for purging gas: fittings, pipe diameter of 6 mm or ¼"

Field device

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

Display and control panel

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

Input and outputs

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

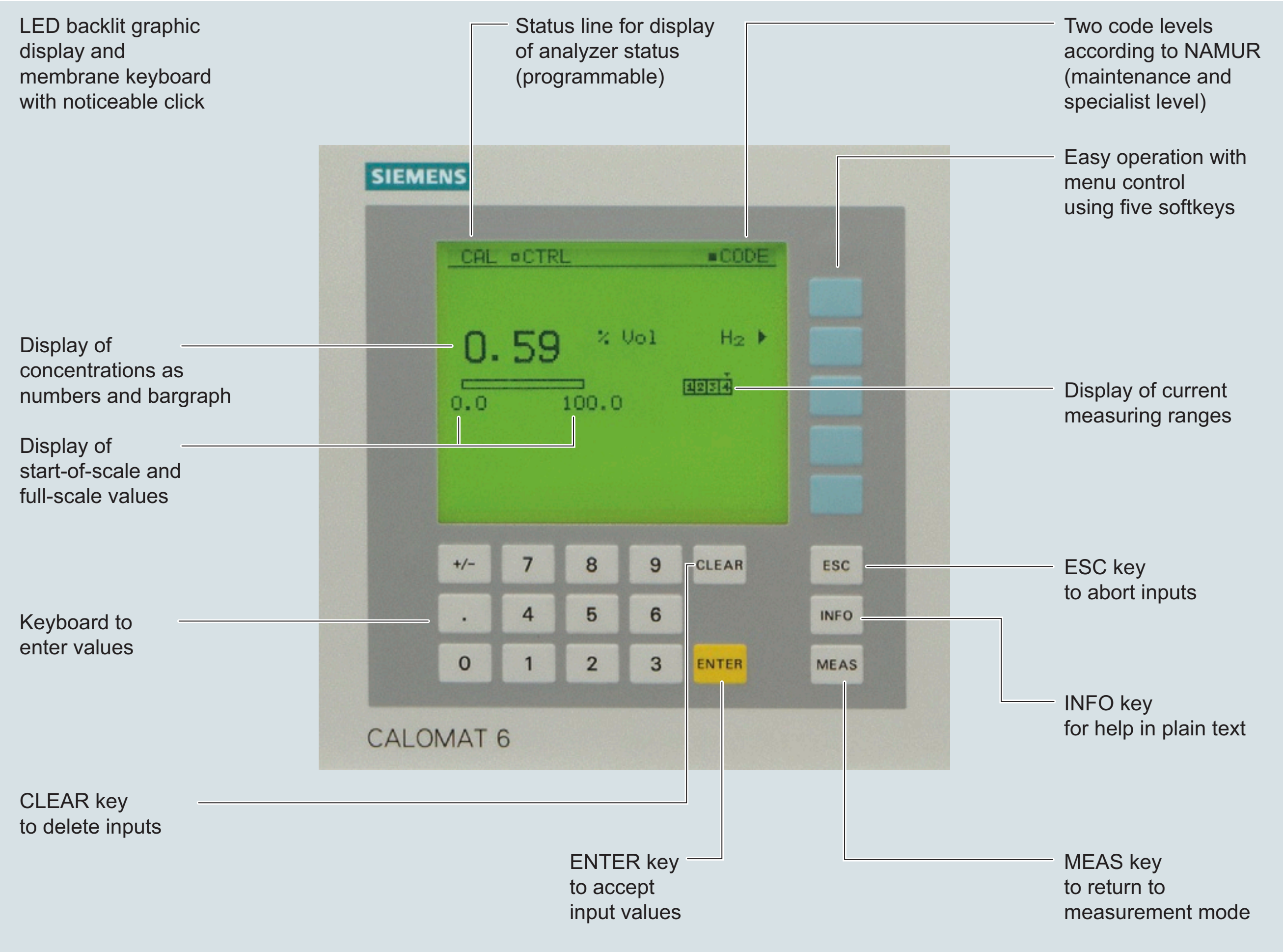
Communication

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

Options

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

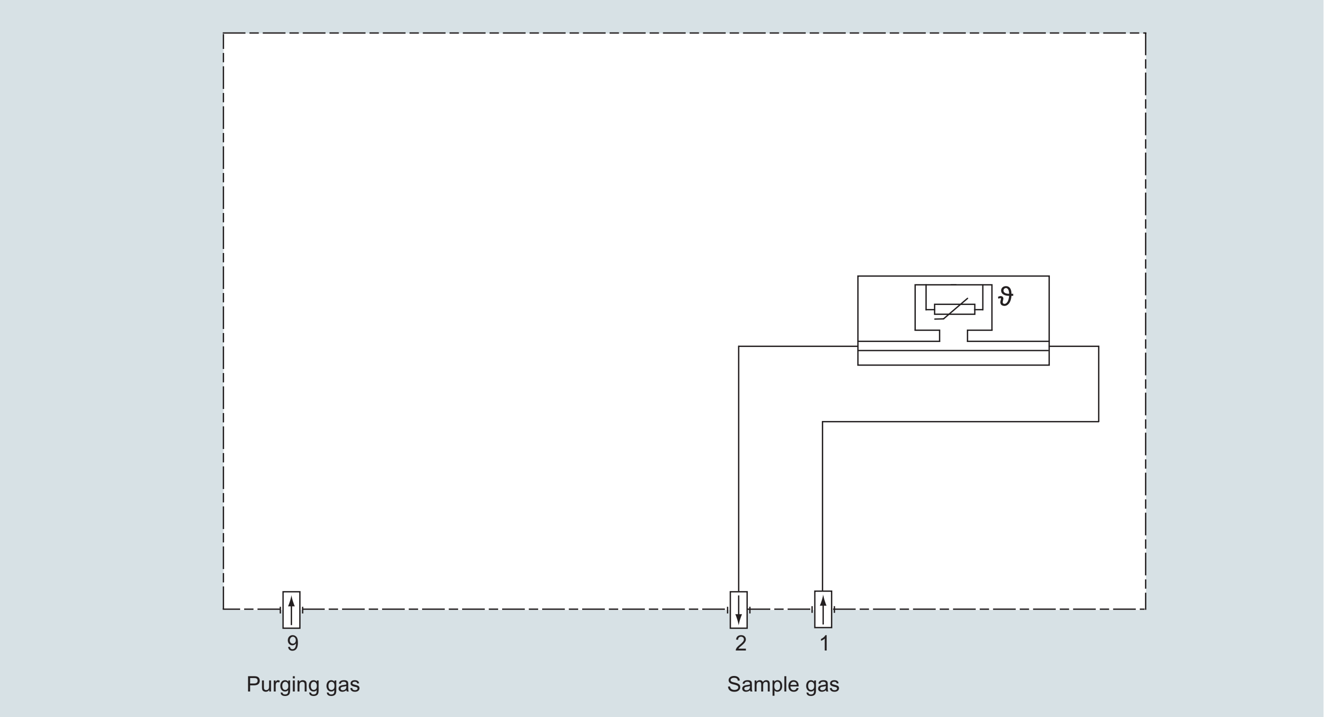
General information



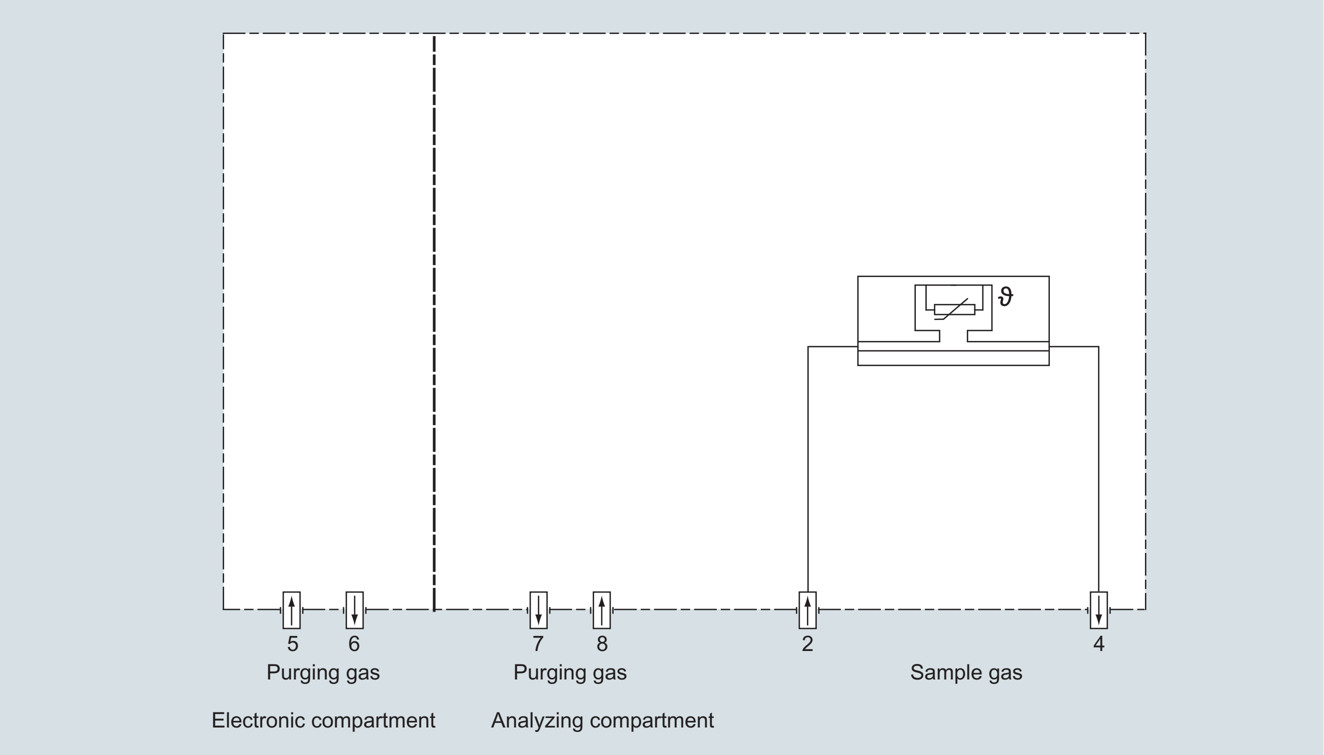
CALOMAT 6, membrane keyboard and graphic display

Designs – parts wetted by sample gas

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



CALOMAT 6, 19" rack unit, gas path



CALOMAT 6, field device, gas path

Function

Principle of operation

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

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

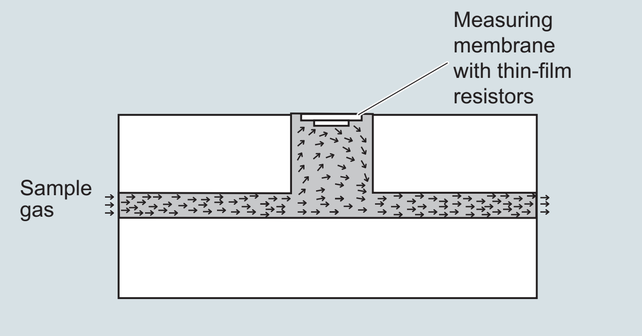
The resistors are kept at a constant temperature. This requires an current intensity depending on the thermal conductivity of the sample gas. This "raw value" is processed further electronically to calculate the gas concentration.

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

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

Note

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



CALOMAT, principle of operation

Essential characteristics

- Four freely parameterizable measuring ranges, also with suppressed zero point, all measuring ranges linear
- Smallest measuring spans up to 1 % H_2 (with disabled zero point: 95 to 100 % H_2) possible
- Measuring range identification
- Galvanically isolated measured-value output 0/2/4 to 20 mA (also inverted)
- Autoranging or manual measurement range switchover possible; remote switching is also possible
- Storage of measured values possible during adjustments
- Wide range of selectable time constants (static/dynamic noise suppression); i.e. the response time of the analyzer can be matched to the respective measuring task
- Short response time
- Low long-term drift
- Measuring point switchover for up to 6 measuring points (programmable)
- Measuring range identification
- Measuring point identification
- External pressure sensor can be connected – for the correction of sample gas fluctuations
- Automatic range calibration can be parameterized
- Operation based on the NAMUR recommendation
- Two control levels with their own authorization codes for the prevention of accidental and unauthorized operator interventions
- Simple handling using a numerical membrane keyboard and operator prompting
- Customer-specific analyzer options such as:
  - Customer acceptance
  - TAG labels
  - Drift recording
  - Clean for O_2 service

Measuring spans

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

The smallest possible spans listed below refer to N_2 as the residual gas. With other gases which have a larger/smaller thermal conductivity than N_2, the smallest possible span is also larger/ smaller.

Component	Smallest possible span
H_2	0 ... 1 % (95 ... 100 %)
He	0 ... 2 %
Ar	0 ... 10 %
CO_2	0 ... 20 %
CH_4	0 ... 15 %
H_2 in blast furnace gas	0 ... 10 %
H_2 in converter gas	0 ... 20 %
H_2 with wood gasification	0 ... 30 %

Influence of interfering gases

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

The following table lists the zero offsets expressed in % H_2 resulting from 10 % residual gas (interfering gas) in each case.

Component	Zero offset
Ar	-1.28 %
CH_4	+1.59 %
C_2H_6 (non-linear response)	+0.04 %
C_3H_8	-0.80 %
CO	-0.11 %
CO_2	-1.07 %
He	+6.51 %
H_2O (non-linear response)	+1.58 %
NH_3 (non-linear response)	+1.3 %
O_2	+0.18 %
SF_6	-2.47 %
SO_2	-1.34 %
100 % air (dry)	+0.27 %

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

The thermal conductivity of most gas mixtures has a non-linear response. Even ambiguous results, such as e.g. with NH_3/N_2 mixtures, can occur within a specific concentration range.

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

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

Example of correction of cross-interference

Specification for the interface cable

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

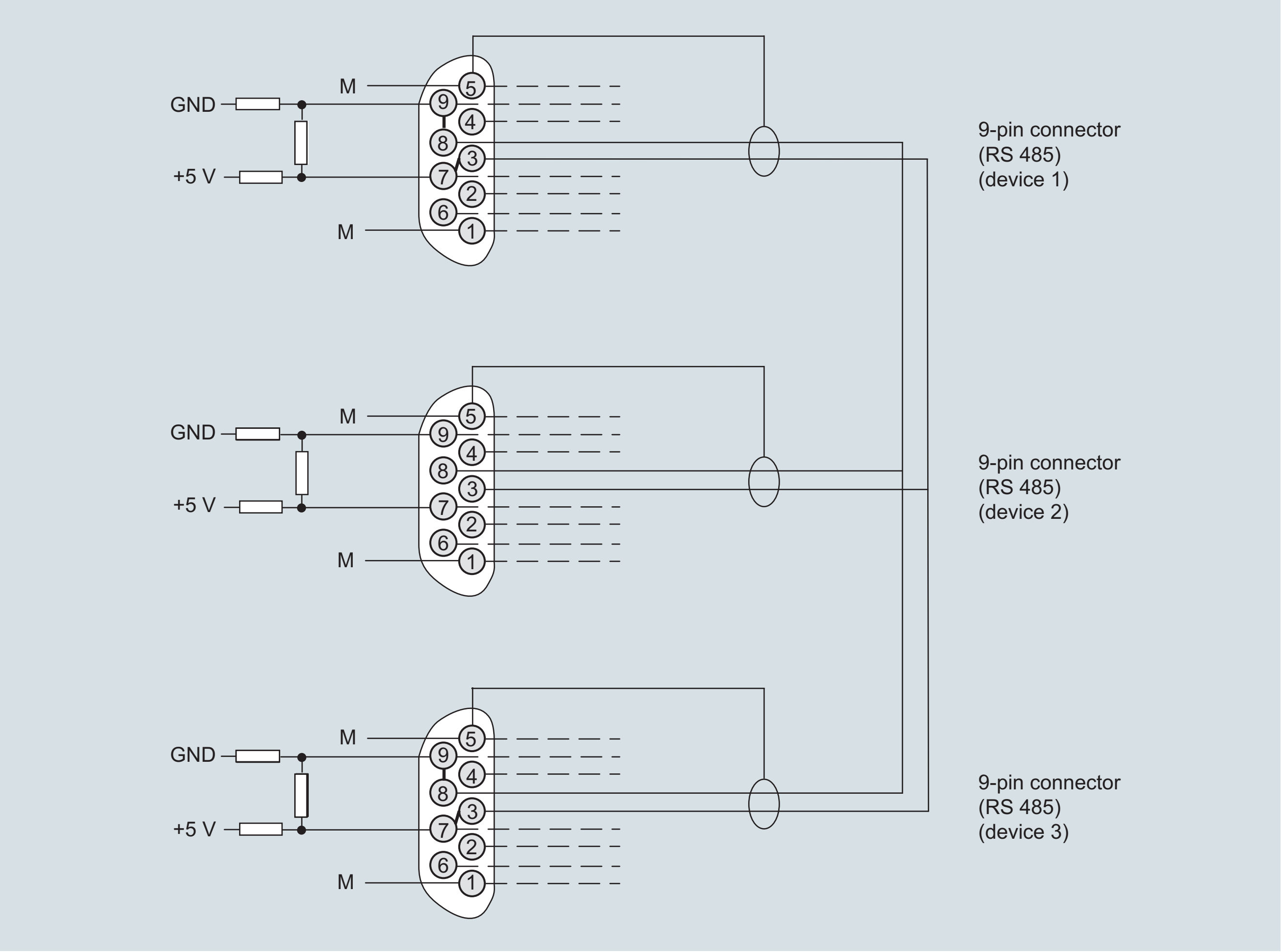
Bus terminating resistors

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

Note

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

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



Bus cable with plug connections, example

Technical specifications

General information	Based on DIN EN 61207 / IEC 1207. All data based on digital gas mixture H_2 in N_2
Measuring ranges	4, internally and externally switchable; automatic measuring range switchover also possible
Largest possible measuring span	100 vol.% H_2 (for smallest measuring span, see "Function")
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 -10% ... 120 V +10% AC, 48 ... 63 Hz or 200 V -10% ... 240 V +10% AC, 48 ... 63 Hz
Power consumption	Approx. 20 VA
Fuse values	100 to 120 V: 1.0T/250 200 ... 240 V: 0.63 T/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 to max. 50 °C, but above the dew point
Temperature of the measuring cell	Approx. 60 °C
Sample gas humidity	< 90% relative humidity
Dynamic response	
Warm-up period	< 30 min (the technical specification will be met after 2 hours)
Delayed display (T_{90})	< 5 s
Damping (electrical time constant)	0 ... 100 s, configurable
Dead time (purging time of the gas path in the unit at 1 l/min)	Approx. 0.5 s
Measuring response	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation	< ± 0.75% of the smallest possible measuring range according to rating plate, with electronic damping constant of 1 s (σ = 0.25%)
Zero point drift	< ± 1%/week of the smallest possible measuring span according to rating plate
Measured-value drift	< ± 1%/week of the smallest possible measuring span according to rating plate
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 rating plate
Accompanying gases	Deviation from zero point (for influence of interfering gas see paragraph titled "Interference influences")
Sample gas flow	< 0.2% of the smallest possible span according to rating plate with a change in flow of 0.1 l/min within the permissible flow range
Sample gas pressure	< 1% of the current measuring range with a pressure change of 100 hPa
Auxiliary power	< 0.1% of the current measuring range with rated 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 parameterizable, e.g. for measuring range identification; load: 24 V AC/DC/1 A, isolated
Analog inputs	2, dimensioned for 0/2/4 … 20 mA for external pressure sensor and correction of cross-interference
Digital inputs	6, designed for 24 V, isolated, freely parameterizable, e.g. for measurement range switchover
Serial interface	RS 485
Options	AUTOCAL function each with 8 additional digital inputs and relay outputs, also with PROFIBUS PA or PROFIBUS DP
Climatic conditions	
Permissible ambient temperature	-30 … +70 °C during storage and transportation, 5 … 45 °C during operation
Permissible humidity (dew point must not be fallen below)	< 90% relative humidity as annual average, during storage and transportation

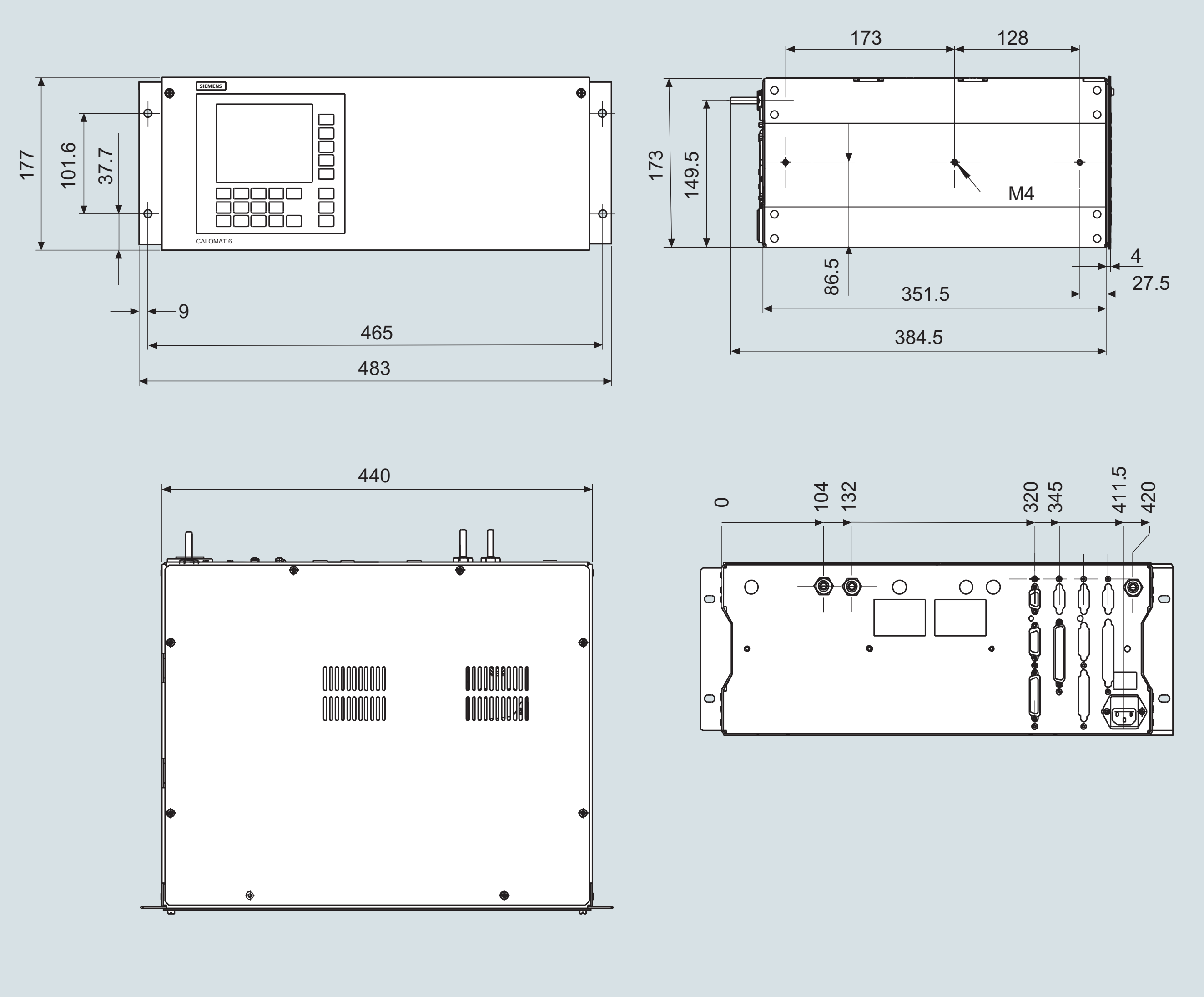
Selection and ordering data		Article No.	Cannot be combined
CALOMAT 6 gas analyzer 19" rack unit for installation in cabinets		↗ **7MB2521- ■ ■ ■ 0 ■ - ■ A ■ ■**	
↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.			
Connections for sample gas			
Pipe with 6 mm outer diameter		0	
Pipe with 1/4" outer diameter		1	
Measured component	Smallest/largest measuring range		
H_2 in N_2	0 ... 1/100 %	A A	
H_2 in N_2 (blast furnace gas measurement)[1]	0 ... 5/100 %	A W	
H_2 in N_2 (converter measurement)[1]	0 ... 5/100 %	A X	
H_2 in N_2 (wood gasification)[1]	0 ... 5/100 %	A Y	
H_2 in Ar	0 ... 1/100 %	A B	
H_2 in NH_3	0 ... 1/100 %	A C	
He in N_2	0 ... 2/100 %	B A	
He in Ar	0 ... 2/100 %	B B	
He in H_2	0 ... 10/80 %	B C	
Ar in N_2	0 ... 10/100 %	C A	
Ar in O_2	0 ... 10/100 %	C B	
CO_2 in N_2	0 ... 20/100 %	D A	
CH_4 in Ar	0 ... 15/100 %	E A	
NH_3 in N_2	0 ... 10/30 %	F A	
H_2 monitoring (turbo generators)		G A	GA
• CO_2 in air	0 ... 100 %		
• H_2 in CO_2	0 ... 100 %		
• H_2 in air	80 ... 100 %		
Add-on electronics			
Without		0	
AUTOCAL function			
• With 8 additional digital inputs and outputs		1	
• With 8 additional digital inputs/outputs and PROFIBUS PA interface		6	6
• With 8 additional digital inputs/outputs and PROFIBUS DP interface		7	7
Power supply			
100 ... 120 V AC, 48 ... 63 Hz		0	
200 ... 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 (supplied documentation, software)			
German		0	
English		1	
French		2	
Spanish		3	
Italian		4	

[1] Ready to enter external correction of cross-interferences for CO, CO_2 and CH_4 (CH_4 only for blast furnace gas and wood gasification).

Selection and ordering data

Additional versions	**Order code**
Add "-Z" to Article No. and specify Order codes.	
Telescopic rails (2 units)	**A31**
TAG labels (specific lettering based on customer information)	**B03**
Clean for O_2 service (specially cleaned gas path)	**Y02**
Measuring range indication in plain text, if different from the standard setting	**Y11**
Special setting (only in conjunction with an application no.)	**Y12**
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**

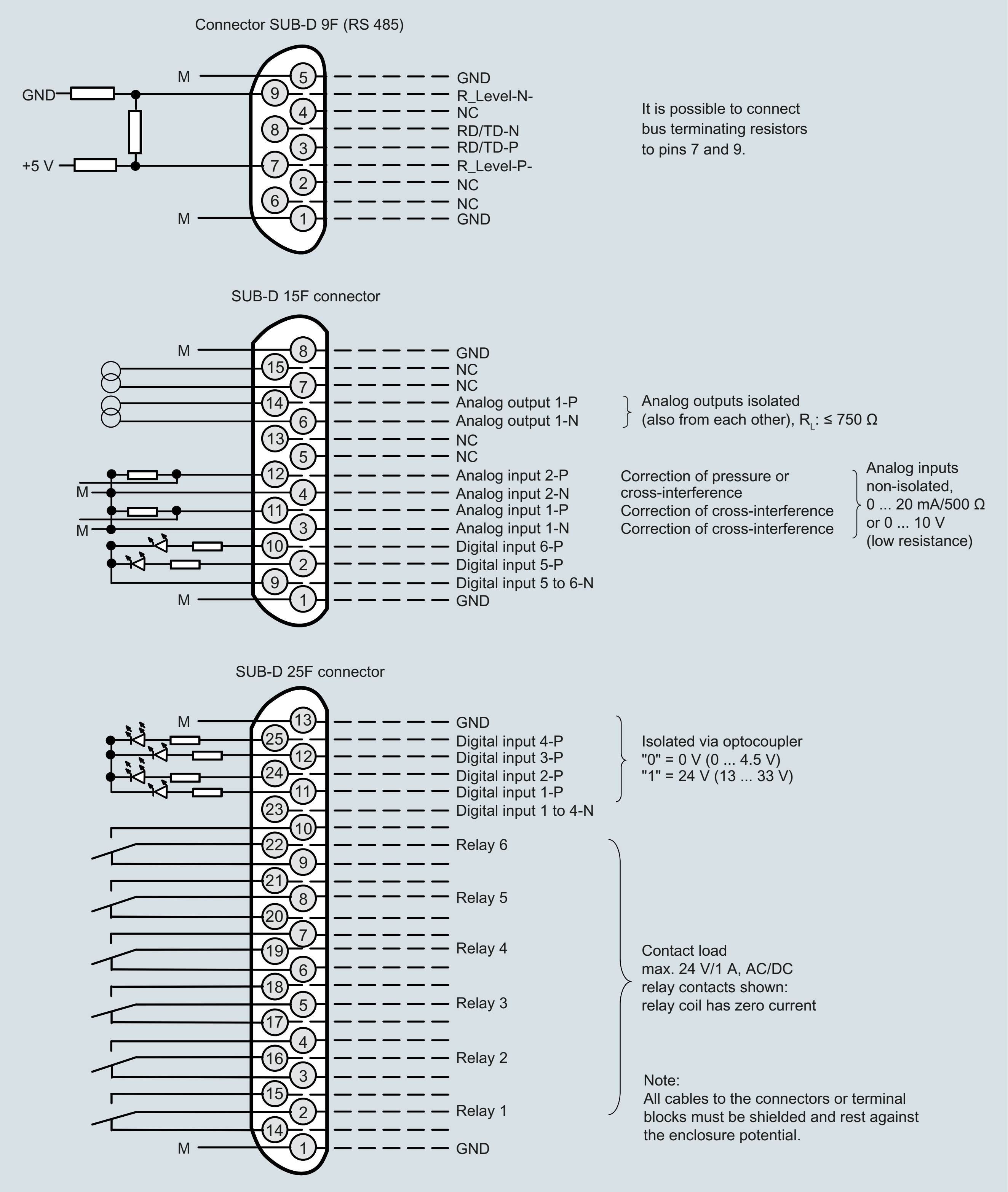
Dimensional drawings



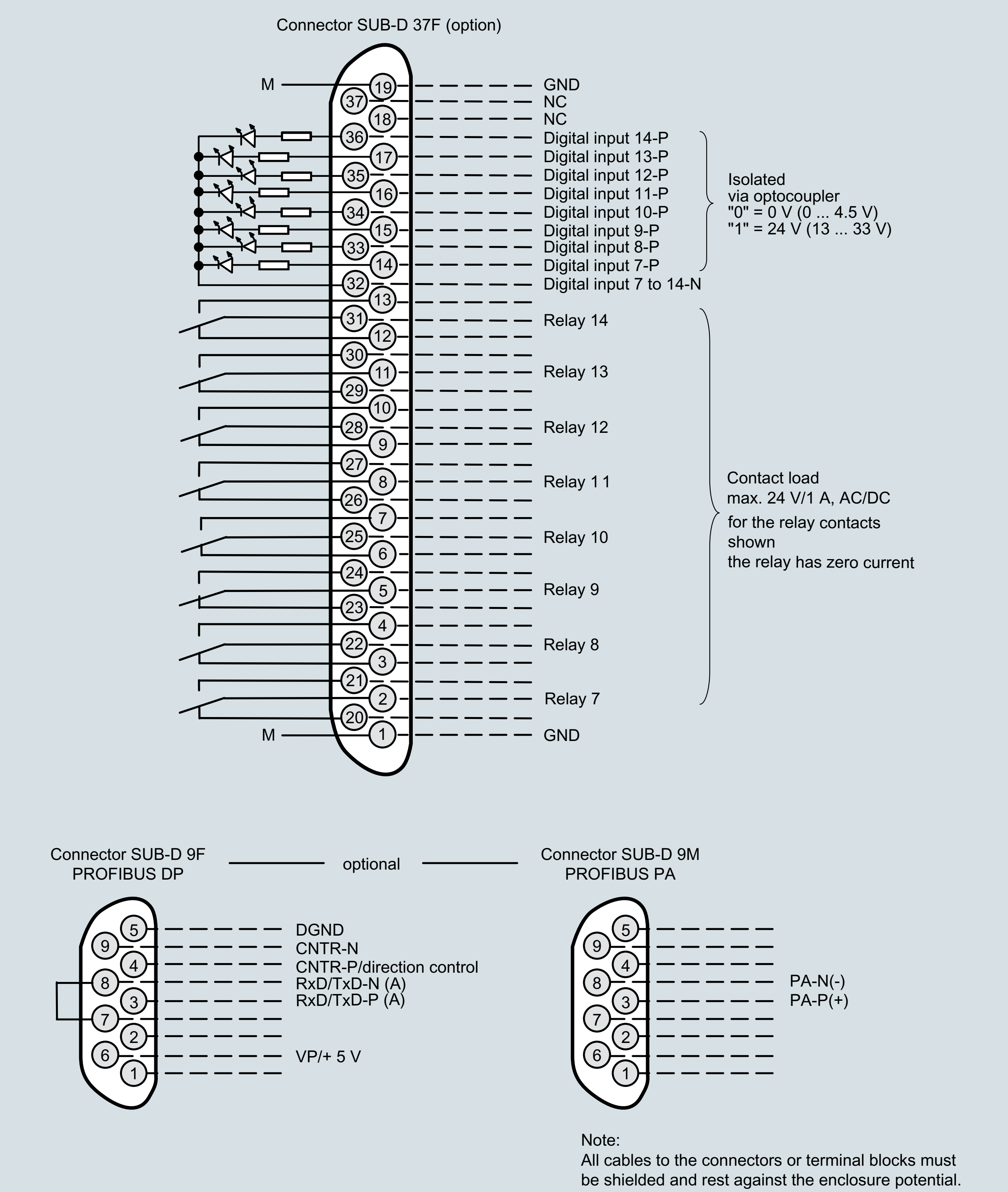
CALOMAT 6, 19" unit, dimensions in mm

Circuit diagrams

Pin assignment (electrical and gas connections)

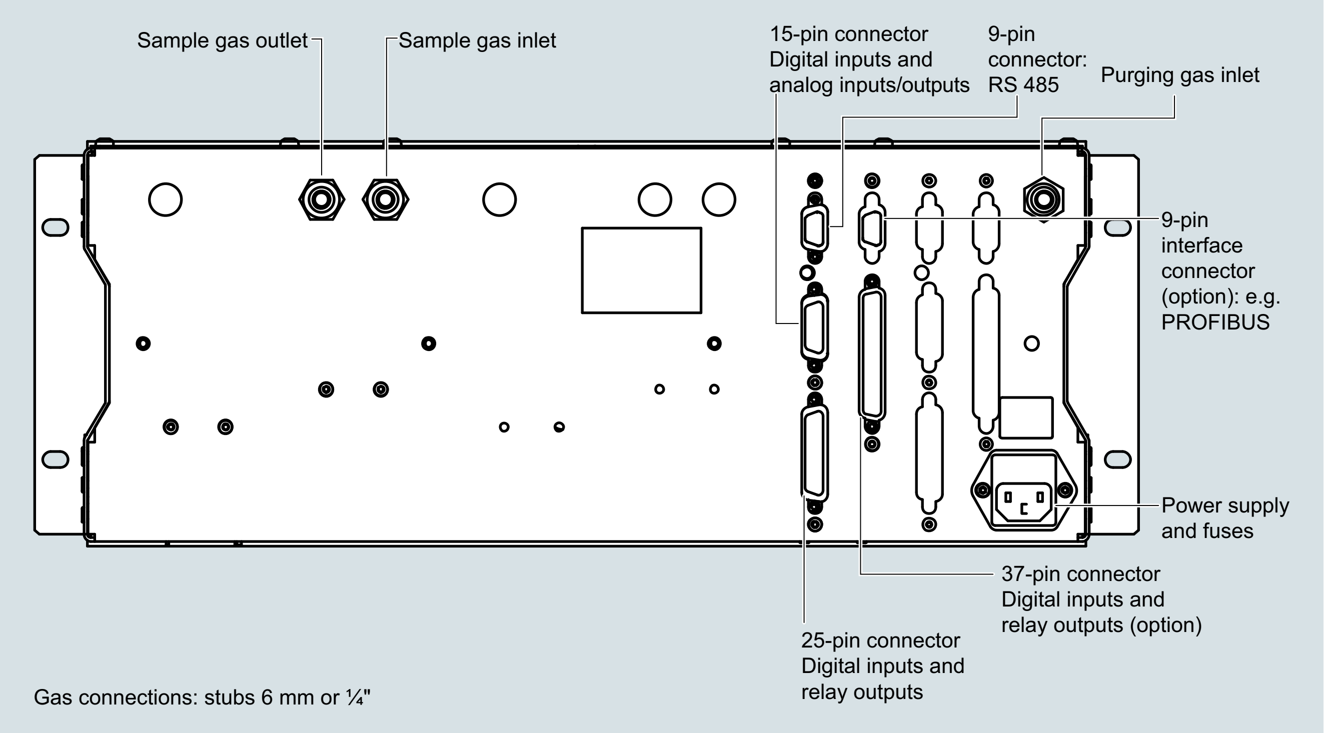


CALOMAT 6, 19" unit, pin assignment



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

19" rack unit



CALOMAT 6, 19" unit, gas and electrical connections

Technical specifications

General information	Based on DIN EN 61207/IEC 1207. All data based on digital gas mixture H_2 in N_2
Measuring ranges	4, internally and externally switchable; automatic measuring range change-over also possible
Largest possible measuring span	100 vol.% H_2 (for smallest measuring span, see "Function")
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)	In accordance with standard requirements of NAMUR NE21 (08/98)
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.	
Electrical safety	In accordance with EN 61010-1; overvoltage category II
Auxiliary power (see nameplate)	100 V -10% ... 120 V +10% AC, 48 ... 63 Hz or 200 V -10% ... 240 V +10% AC, 48 ... 63 Hz
Power consumption (unit)	Approx. 20 VA
Fuse values	100 to 120 V: 1.0T/250 200 ... 240 V: 0.63 T/250
Gas inlet conditions	
Sample gas pressure	800 to 1 100 hPa (absolute)
Sample gas flow	30 to 90 l/h (0.5 to 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 ambient pressure
• For short periods	Max. 250 hPa above ambient pressure
Time response	Based on sample gas pressure 1 000 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Warm-up period	< 30 min (the technical specification will be met after 2 hours)
Delayed display (T_{90})	< 5 s
Electrical damping	0 ... 100 s, configurable
Dead time (at 1 l/min)	Approx. 0.5 s

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 rating plate, with electronic damping constant of 1 s (σ = 0.25%)
Zero point drift	< ± 1%/week of the smallest possible measuring span according to rating plate
Measured-value drift	< ± 1%/week of the smallest possible measuring span according to rating plate
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 rating plate
Accompanying gases	Deviation from zero point (for influence of interfering gas, see section "Cross-interference")
Sample gas flow	< 0.2% of the smallest possible span according to rating plate with a change in flow of 0.1 l/min within the permissible flow range
Sample gas pressure	< 1% of the current measuring range with a pressure change of 100 hPa
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: 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 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 in operation
Permissible humidity (dew point must not be fallen below)	< 90% relative humidity as annual average, during storage and transportation

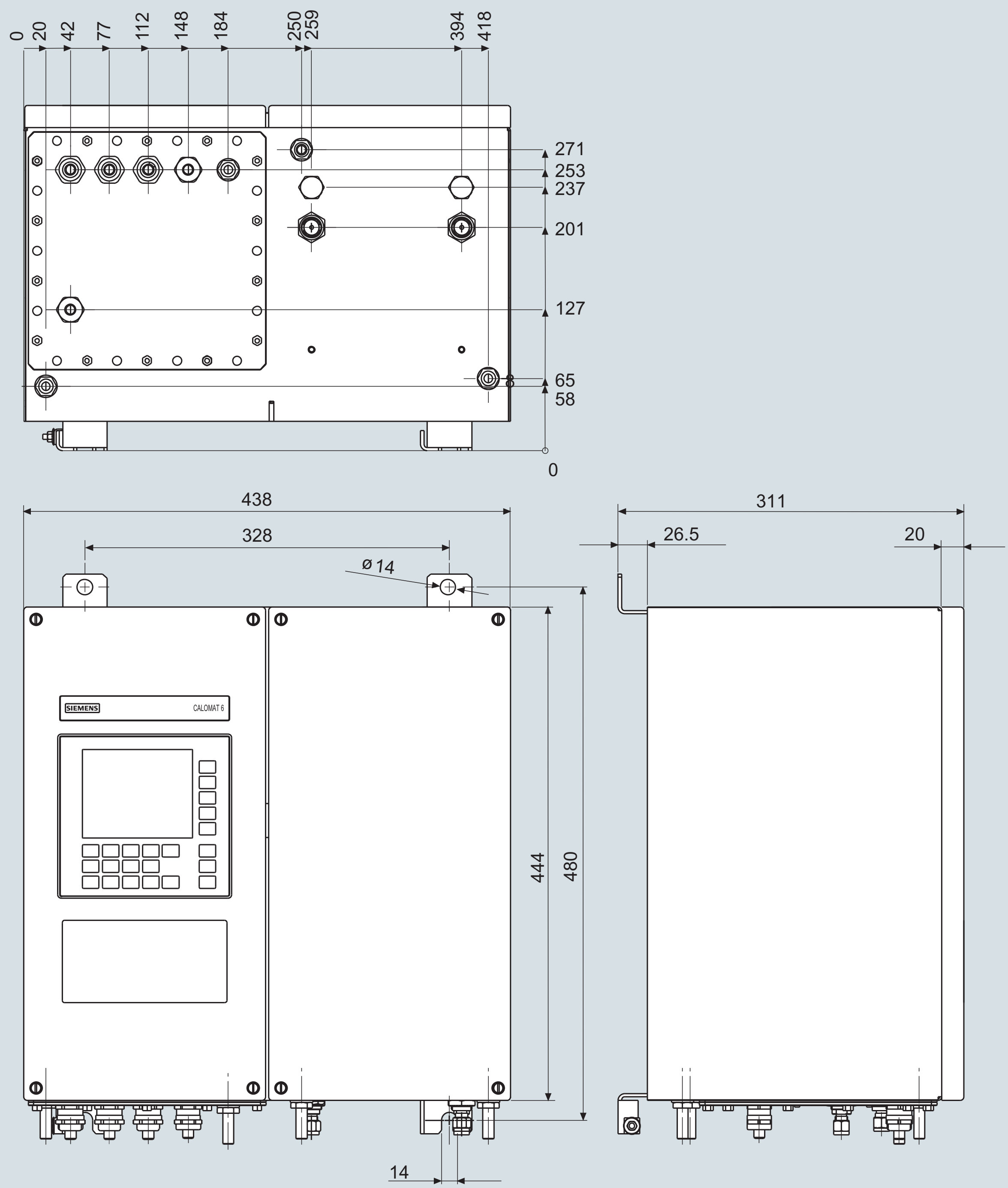
Selection and ordering data		Article No.	Cannot be combined			
CALOMAT 6 gas analyzer For field installation		↗ **7MB2511- ■■■0■-■A■■**				
↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.						
Connections for sample gas						
Ferrule screw connection for pipe, outer diameter 6 mm		0				
Ferrule screw connection for pipe, outer diameter 1/4"		1				
Measured component	Smallest/largest measuring range					
H_2 in N_2	0 ... 1/100 %	A A	A A			
H_2 in N_2 (blast furnace gas measurement)[1]	0 ... 5/100 %	A W	A W			
H_2 in N_2 (converter measurement)[1]	0 ... 5/100 %	A X	A X			
H_2 in N_2 (wood gasification)[1]	0 ... 5/100 %	A Y	A Y			
H_2 in Ar	0 ... 1/100 %	A B	A B			
H_2 in NH_3	0 ... 1/100 %	A C	A C			
He in N_2	0 ... 2/100 %	B A				
He in Ar	0 ... 2/100 %	B B				
He in H_2	0 ... 10/80 %	B C	B C			
Ar in N_2	0 ... 10/100 %	C A				
Ar in O_2	0 ... 10/100 %	C B				
CO_2 in N_2	0 ... 20/100 %	D A				
CH_4 in Ar	0 ... 15/100 %	E A	E A			
NH_3 in N_2	0 ... 10/30 %	F A	F A			
H_2 monitoring (turbo generators)		G A	G A			GA
• CO_2 in air	0 ... 100 %					
• H_2 in CO_2	0 ... 100 %					
• H_2 in air	80 ... 100 %					
Add-on electronics						
Without		0				
AUTOCAL function						
• With 8 additional digital inputs and outputs		1				
• With 8 additional digital inputs/outputs and PROFIBUS PA interface		6		6		6
• With 8 additional digital inputs/outputs and PROFIBUS DP interface		7		7		7
• With 8 additional digital inputs/outputs and PROFIBUS PA Ex-i interface		8			8	8
Power supply						
100 ... 120 V AC, 48 ... 63 Hz		0				
200 ... 240 V AC, 48 ... 63 Hz		1				
Explosion protection, incl. certificate						
Without		A				
Acc. to ATEX II 3G, non-flammable gases		B	B			
Acc. to ATEX II 3G; flammable gases[2]		C				
FM/CSA certificate – Class I Div 2		D			D	
According to ATEX II 2G, leakage compensation[2]		E		E		
According to ATEX II 2G, continuous purging[2]		F		F		
ATEX II 3D certificate; potentially explosive dust atmospheres						
• In non-hazardous gas zone		G				
• In Ex zone acc. to ATEX II 3G, non-flammable gases		H				
• In Ex zone acc. to ATEX II 3G, flammable gases[2]		J				
Language (supplied documentation, software)						
German		0				
English		1				
French		2				
Spanish		3				
Italian		4				

[1] Ready to enter external correction of cross-interferences for CO, CO_2 and CH_4 (CH_4 only for blast furnace gas and wood gasification).
[2] Only in connection with an approved purging unit.

Selection and ordering data

Additional versions	Order code
Add "-Z" to Article No. and specify Order codes.	
TAG labels (specific lettering based on customer information)	**B03**
BARTEC Ex p purging unit "Leakage compensation"	**E71**
BARTEC Ex p purging unit "Continuous purging"	**E72**
Clean for O_2 service (specially cleaned gas path)	**Y02**
Measuring range indication in plain text, if different from the standard setting	**Y11**
Additional units for Ex versions	**Article No.**
ATEX Category II 2G (zone 1)	
BARTEC Ex p purging unit, 230 V, "leakage compensation"	**7MB8000-2BA**
BARTEC Ex p purging unit, 115 V, "leakage compensation"	**7MB8000-2BB**
BARTEC Ex p purging unit, 230 V, "continuous purging"	**7MB8000-2CA**
BARTEC Ex p purging unit, 115 V, "continuous purging"	**7MB8000-2CB**
Ex i isolating transformer	**7MB8000-3AB**
Ex isolating relay, 230 V	**7MB8000-4AA**
Ex isolating relay, 110 V	**7MB8000-4AB**
Differential pressure switch for corrosive and non-corrosive gases	**7MB8000-5AA**
Stainless steel flame arrestor	**7MB8000-6BA**
Hastelloy flame arrestor	**7MB8000-6BB**
ATEX Category II 3G (zone 2)	
BARTEC Ex p purging unit, 230 V, "continuous purging"	**7MB8000-2CA**
BARTEC Ex p purging unit, 115 V, "continuous purging"	**7MB8000-2CB**
FM/CSA (Class I Div. 2)	
Ex purging unit Minipurge FM	**7MB8000-1AA**
Accessories	
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**

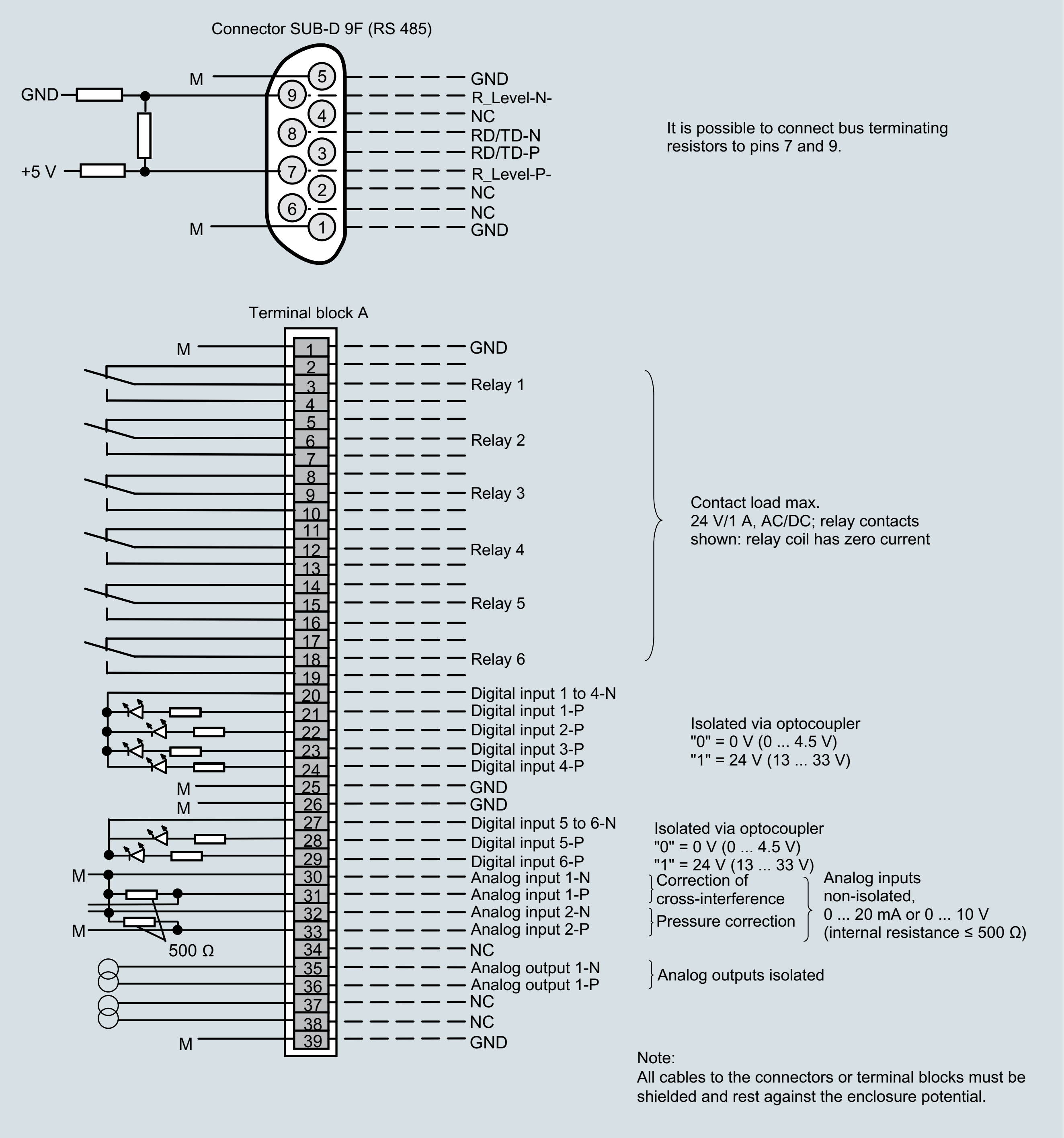
Dimensional drawings



CALOMAT 6, field unit, dimensions in mm

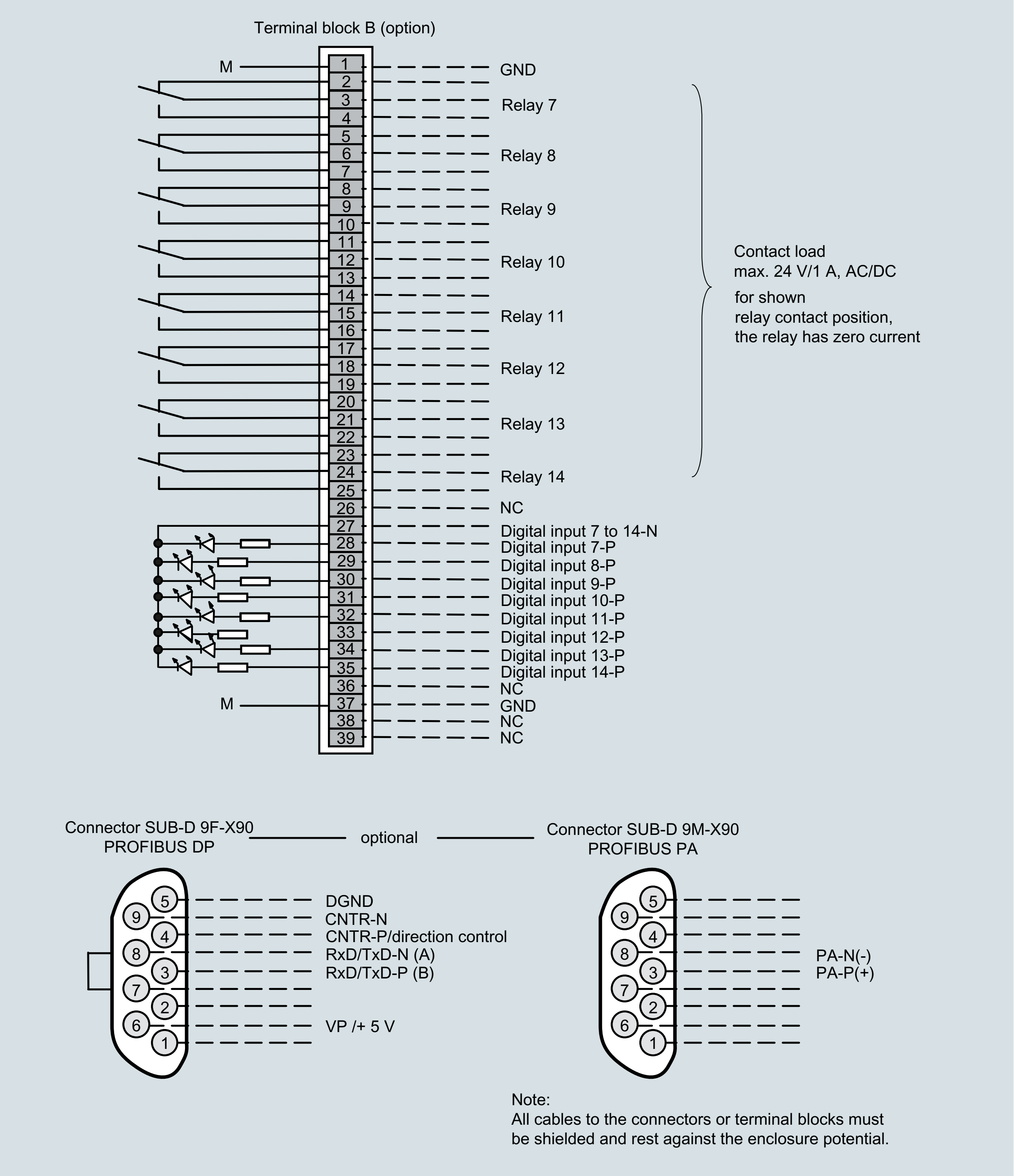
Circuit diagrams

Pin assignment (electrical and gas connections)

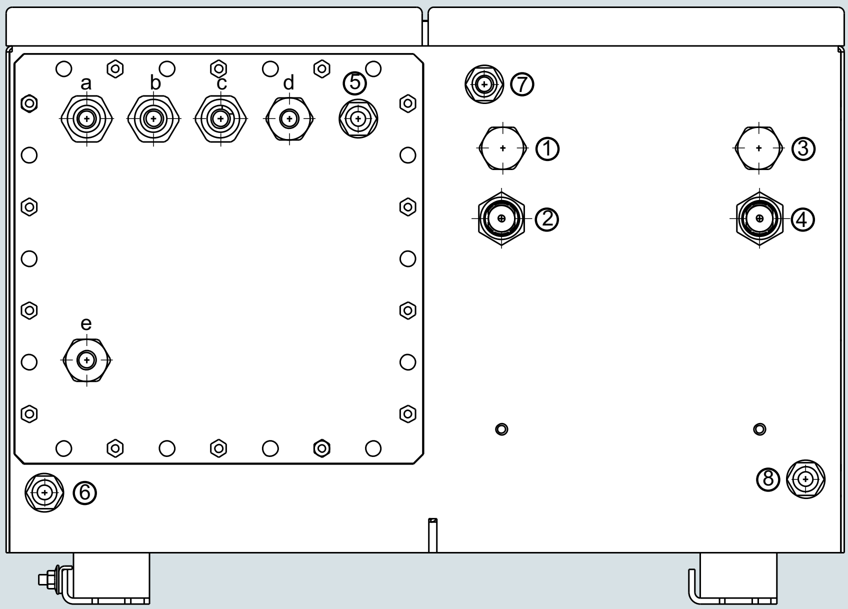


CALOMAT 6, field unit, connector and terminal assignment

Field device



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



Gas connections

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

Electrical connections

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

CALOMAT 6, field unit, gas and electrical connections

Documentation, suggestions for spare parts

Selection and ordering data

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

More information

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

Selection and ordering data

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

If the CALOMAT 6 is supplied with a specially cleaned gas path for high oxygen context ("Cleaned for O_2 service"), please ensure that you specify this when ordering spare parts. This is the only way to guarantee that the gas path will continue to comply with the special requirements for this version.

Overview

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

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

Benefits

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

Application

Fields of application

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

Special versions

Special applications

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

Design

19" rack unit

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

Field device

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

Display and control panel

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

Input and outputs

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

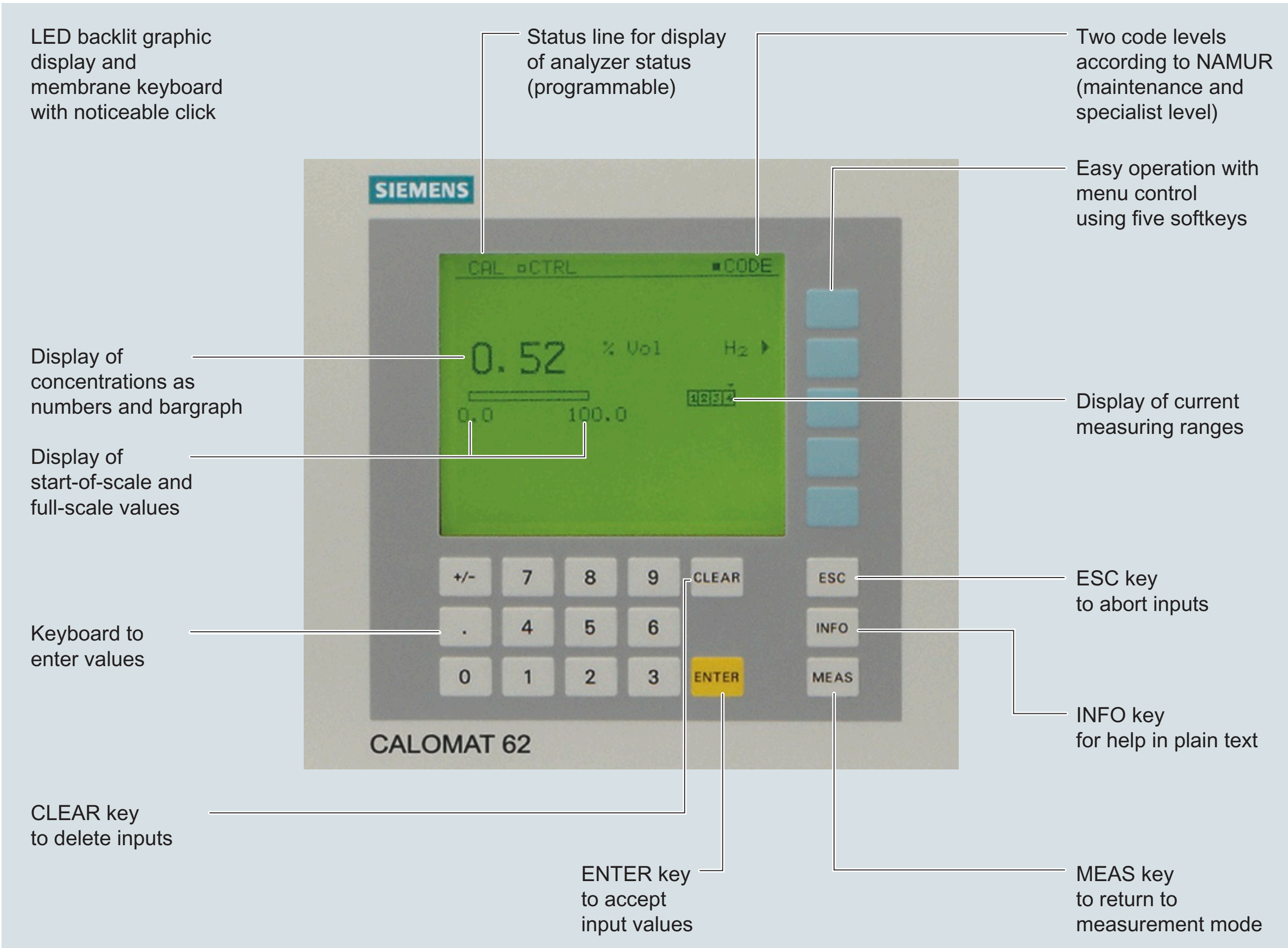
Communication

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

Options

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

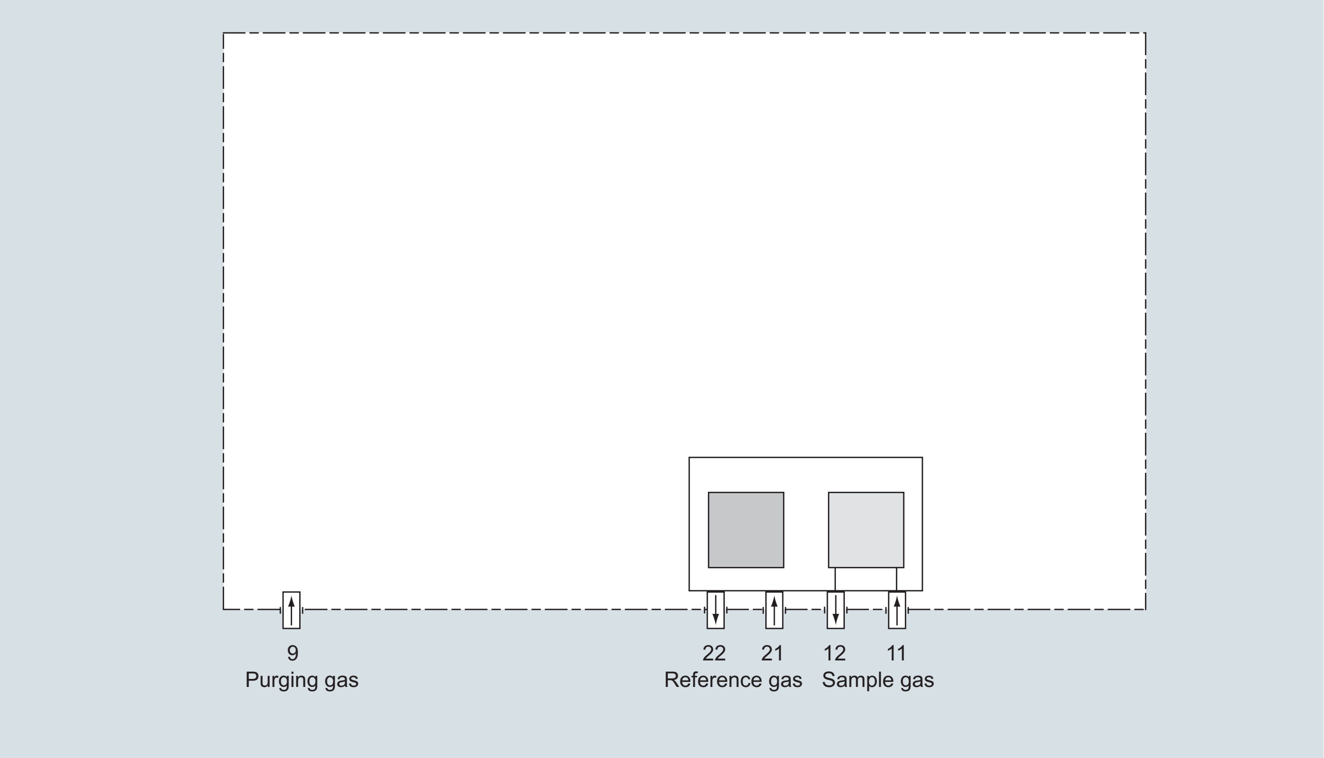
General information



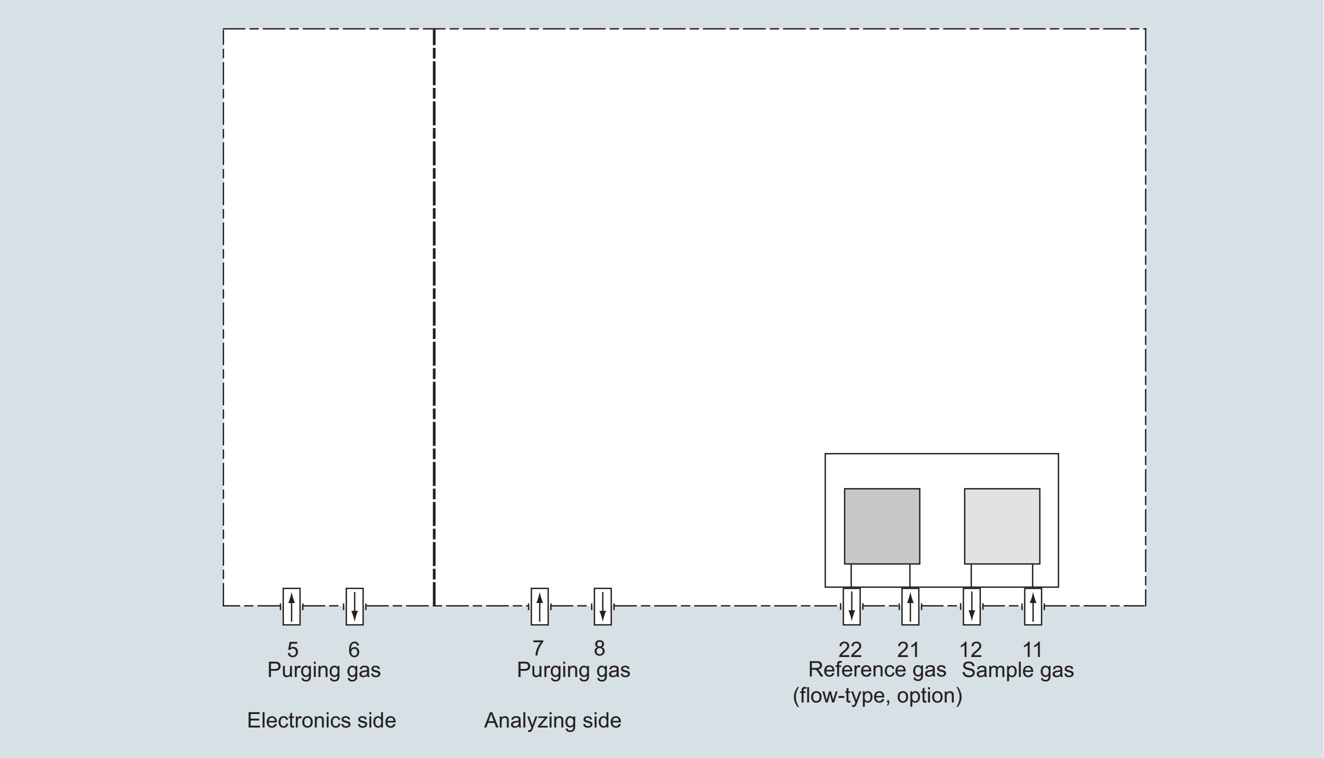
CALOMAT 62, membrane keyboard and graphic display

Designs – parts wetted by sample gas

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



CALOMAT 62, 19" rack unit, gas path



CALOMAT 62, field device, gas path

Function

Principle of operation

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

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

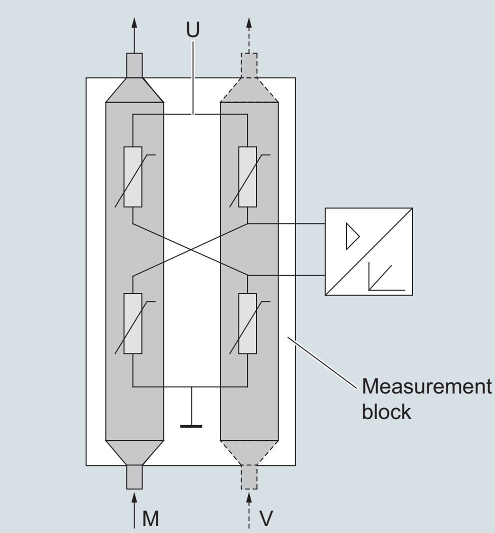
Sample gas flows around two of them, reference gas surrounds the other two. A constant DC voltage heats the resistors above the temperature of the measurement block.

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

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

Note

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



M Measurement chamber
V Reference gas chamber (optional: flow-type)

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

Important features

- Four freely-programmable measuring ranges, also with suppressed zero, all ranges linear
- Smallest spans down to 1 % H_2 (with suppressed zero: 99 to 100 % H_2) possible
- Measuring range identification
- Electrically isolated measured-value output 0/2/4 to 20 mA (also inverted)
- Automatic or manual measuring range switchover selectable; remote switching is also possible
- Measured value can be saved during adjustment
- Time constants are selectable within wide ranges (static/dynamic noise suppression); i.e. the response time of the analyzer can be adapted to the respective task
- Short response time
- Low long-term drift
- Measuring point switchover for up to 6 measuring points (parameterizable)
- Measuring point identification
- External pressure sensor can be connected – for correction of variations in sample gas pressure
- Possibility for correcting the influence of residual gases (correction of cross-interference)
- Automatic measuring range calibration can be programmed
- Operation based on the NAMUR recommendation
- Two operator input levels with their own authorization codes to prevent unintentional and unauthorized interventions
- Simple handling using a numerical membrane keyboard and operator prompting
- Customer-specific device versions, such as:
  - Customer acceptance
  - TAG labels
  - Drift recording
  - Clean for O_2 service

Spans

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

Cross-interferences

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

The zero offsets in % H_2 which result from 1 % residual gas (interfering gas) are listed in the following table; the specified values are approximate values.

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

Ar	Approx. - 0.15 %
O_2	Approx. + 0.02 %
CO_2	Approx. - 0.13 %
CH_4	Approx. + 0.17 %
SO_2	Approx. - 0.31 %
Air (dry)	Approx. + 0.25 %

Effect of 1 % gas component with nitrogen as the residual gas, expressed in % H_2

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

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

Specification for the interface cable

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

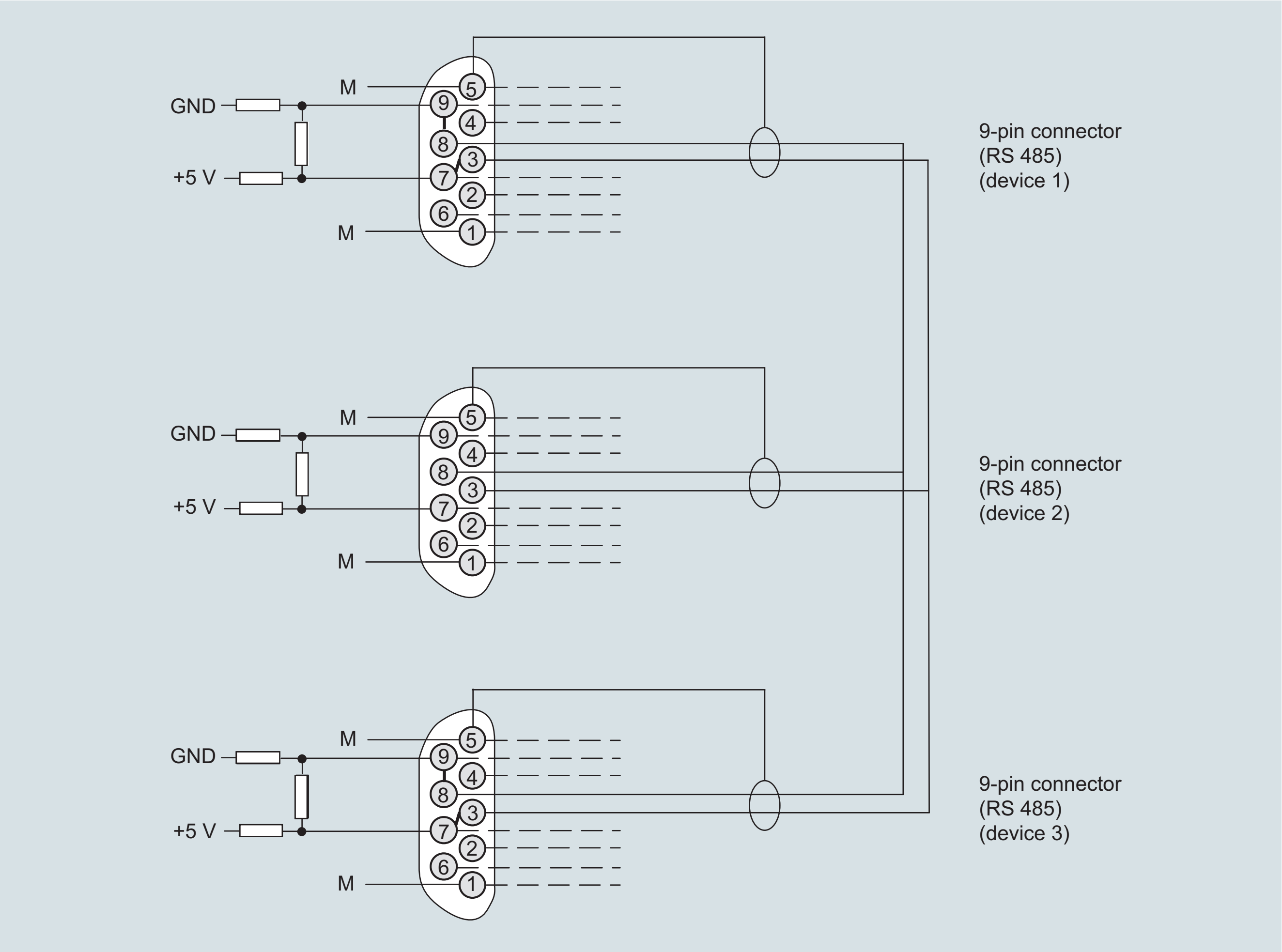
Bus terminating resistors

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

Note

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

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



Bus cable with plug connections, example

Technical specifications

General information	Based on DIN EN 61207/IEC 1207. All data based on digital gas mixture H_2 in N_2
Measuring ranges	4, internally and externally switch-able; automatic measuring range swi-tchover also possible
Span	Application-dependent (see ordering data)
Measuring ranges with suppressed zero point	Application-dependent (see ordering data)
Operating position	Front wall, vertical
Conformity	CE marking 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 (electro-magnetic compatibility)	In accordance with standard require-ments 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 V AC -10% ... 240 V AC +10%, 48 ... 63 Hz
Power consumption	Approx. 30 VA
Fuse values	100 to 120 V: 1.0 T/250
	200 ... 240 V: 0.63 T/250
Gas inlet conditions	
Sample gas pressure	800 ... 1 100 hPa (absolute)
Sample gas flow	30 ... 90 l/h
Sample gas temperature	Min. 0 to 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 span according to rating plate with elec-tronic damping constant of 1 s
Zero point drift	< ± 1% of the current span/week
Measured-value drift	< ± 1% of the smallest possible span (according to rating plate)/week
Repeatability	< ± 1% of the current span
Detection limit	1% of the smallest possible span according to rating plate
Linearity error	< ± 1% of the current span
Influencing variables	Based on sample gas pressure 1 000 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient tempera-ture
Ambient temperature	< 2%/10 K referred to smallest possi-ble span according to label
Accompanying gases	Deviation from zero point (for influ-ence of interfering gas, see section "Cross-interference")
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 span with a change in pressure of 100 hPa
Auxiliary power	< 0.1% of the current span with rated 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: 24 V AC/DC/1 A, isolated
Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and correc-tion of cross-interference
Digital inputs	6, designed for 24 V, isolated, freely configurable, e.g. for measuring range switchover
Serial interface	RS 485
Options	AUTOCAL function with 8 additional digital inputs and 8 additional 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 in operation
Permissible humidity (dew point must not be fallen below)	< 90% relative humidity as annual average, during storage and trans-portation

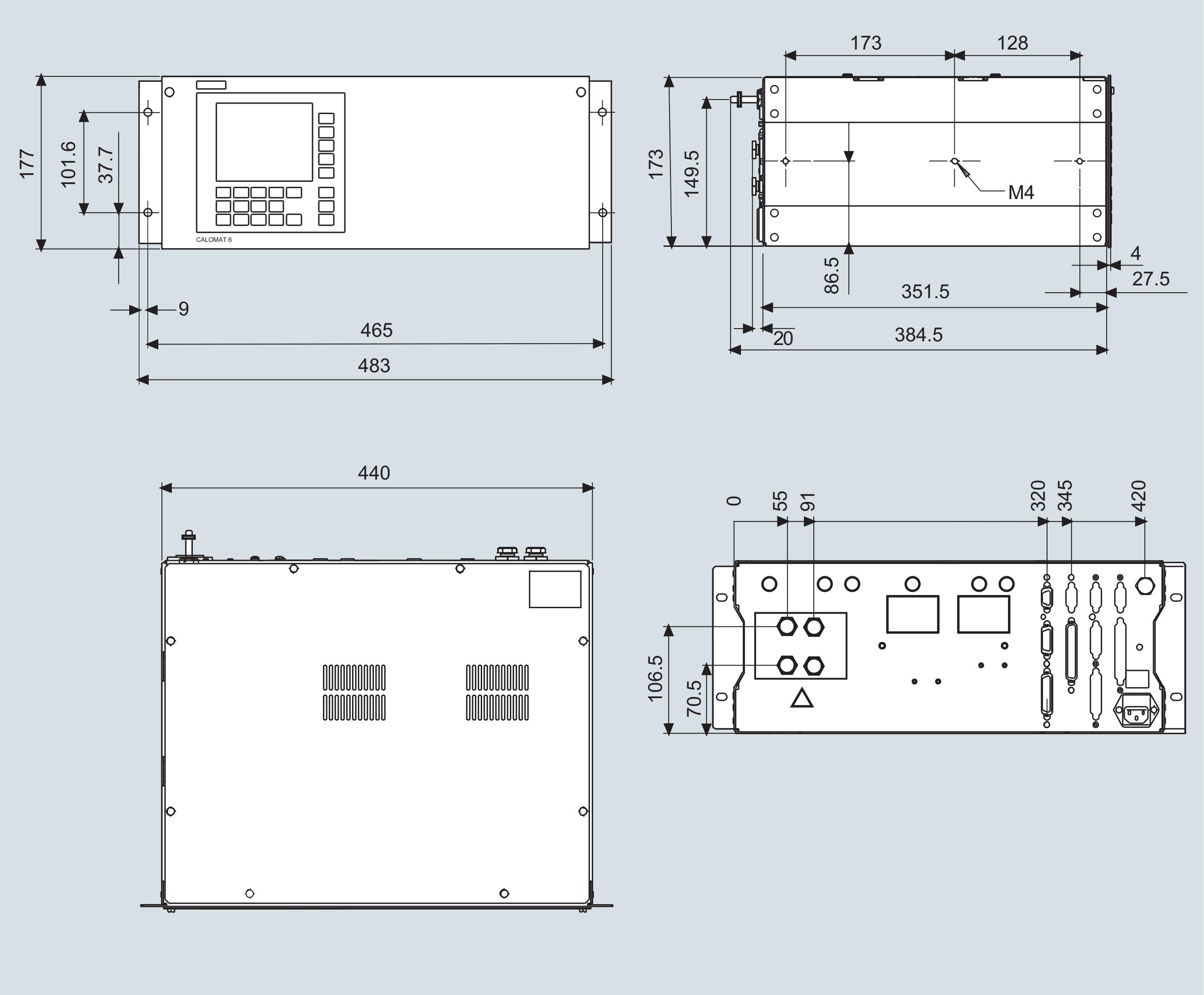
Selection and ordering data

Selection and ordering data			Article No.
CALOMAT 62 gas analyzer 19" rack unit for installation in cabinets			↗ **7MB2541- ■■■■■ - ■A■■**
↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.			
<u>Material of sample gas path</u>			
Stainless steel, mat. no. 1.4571; non-flow-type reference chamber, 1/8''-27 NPT		Purging gas stub 6 mm	**0**
Stainless steel, mat. no. 1.4571; non-flow-type reference chamber, 1/8''-27 NPT		Purging gas stub 1/4"	**4**
<u>Application</u>		<u>Possible with measuring range identification</u>	
H_2 in N_2		0, 5	**A N**
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**
<u>Smallest measuring range</u>	<u>Largest measuring range</u>	<u>Reference gas or filling gas</u>	
0 ... 1 %	0 ... 100 %	Accompanying gas component	**0**
0 ... 5 %	0 ... 100 %		**1**
100 ... 99 %	100 ... 0 %	Sample gas component	**5**
100 ... 95 %	100 ... 0 %		**6**
<u>Add-on electronics</u>			
Without			**0**
AUTOCAL function			
• With 8 additional digital inputs and outputs			**1**
• With 8 additional 8 digital inputs/outputs and PROFIBUS PA interface			**6**
• With 8 additional digital inputs/outputs and PROFIBUS DP interface			**7**
<u>Power supply</u>			
100 ... 120 V AC, 48 ... 63 Hz			**0**
200 ... 240 V AC, 48 ... 63 Hz			**1**
<u>Explosion protection</u>			
Without			**A**
<u>Language (supplied documentation, software)</u>			
German			**0**
English			**1**
French			**2**
Spanish			**3**
Italian			**4**

Additional versions	Order code
Add "-Z" to Article No. and specify Order codes.	
TAG labels (specific lettering based on customer information)	**B03**
Clean for O_2 service (specially cleaned gas path)	**Y02**
Measuring range indication in plain text, if different from the standard setting	**Y11**
Special setting (only in conjunction with an application no., e.g. extended measuring range)	**Y12**
Extended special setting (only in conjunction with an application no., e.g. determination of cross-interferences)	**Y13**

Accessories	Article No.
RS 485/Ethernet converter	**A5E00852383**
RS 485/RS 232 converter	**C79451-Z1589-U1**
RS 485/USB converter	**A5E00852382**
AUTOCAL function with 8 digital inputs/outputs	**C79451-A3480-D511**
AUTOCAL function 8 digital inputs/outputs each and PROFIBUS PA	**A5E00057307**
AUTOCAL function 8 digital inputs/outputs each and PROFIBUS DP	**A5E00057312**
Set of Torx screwdrivers	**A5E34821625**

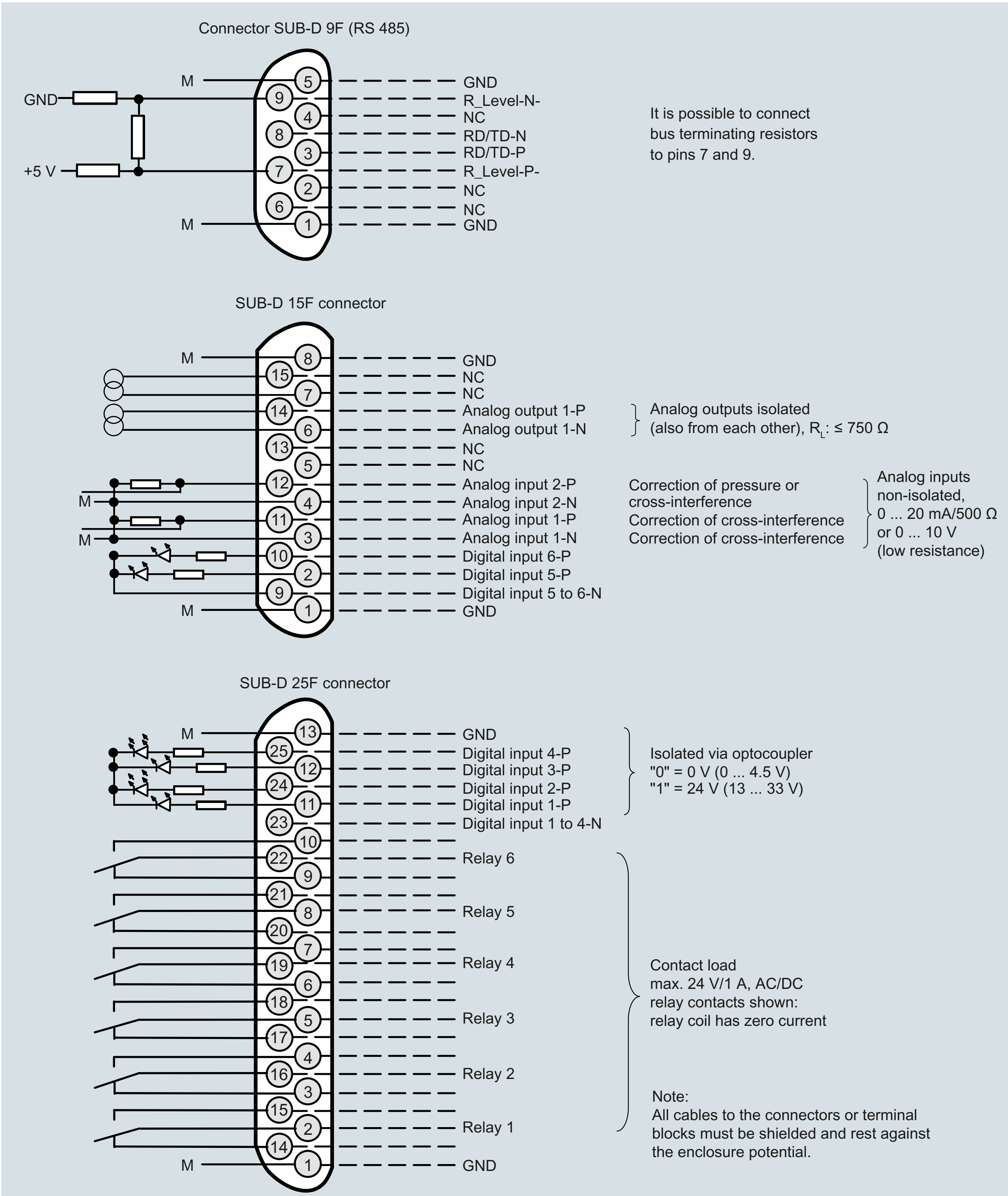
Dimensional drawings



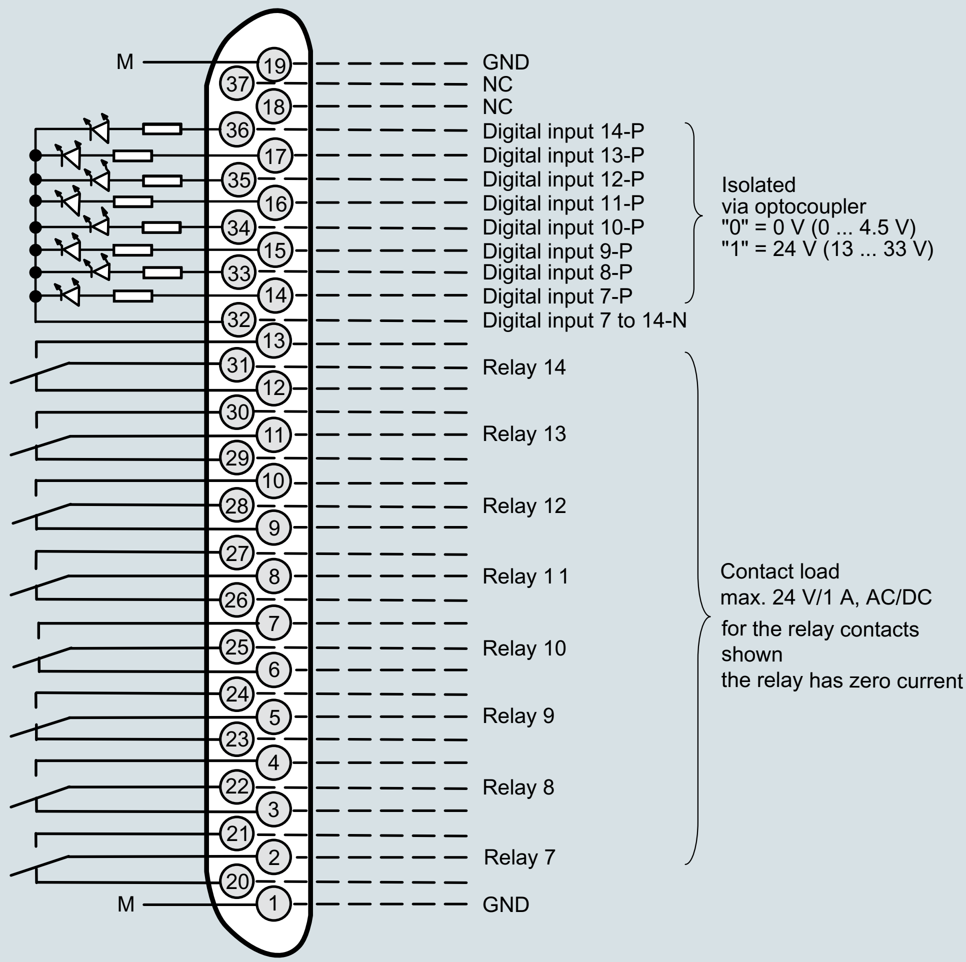
CALOMAT 62, 19" rack unit, dimensions in mm

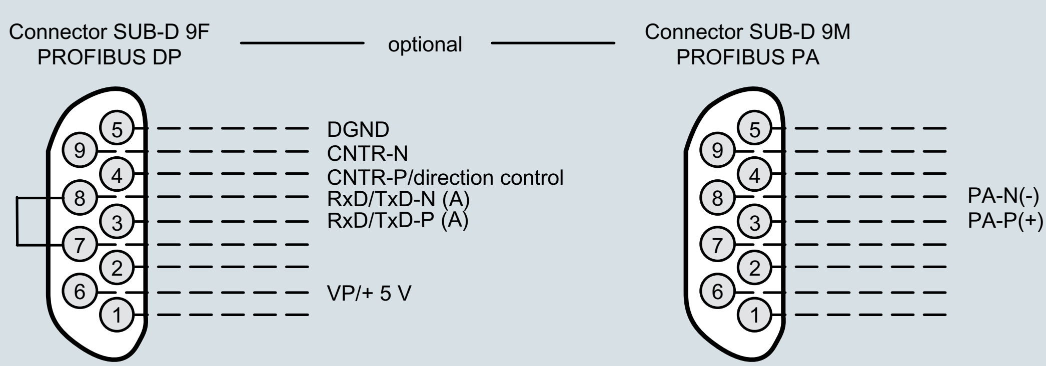
Circuit diagrams

Pin assignment (electrical and gas connections)



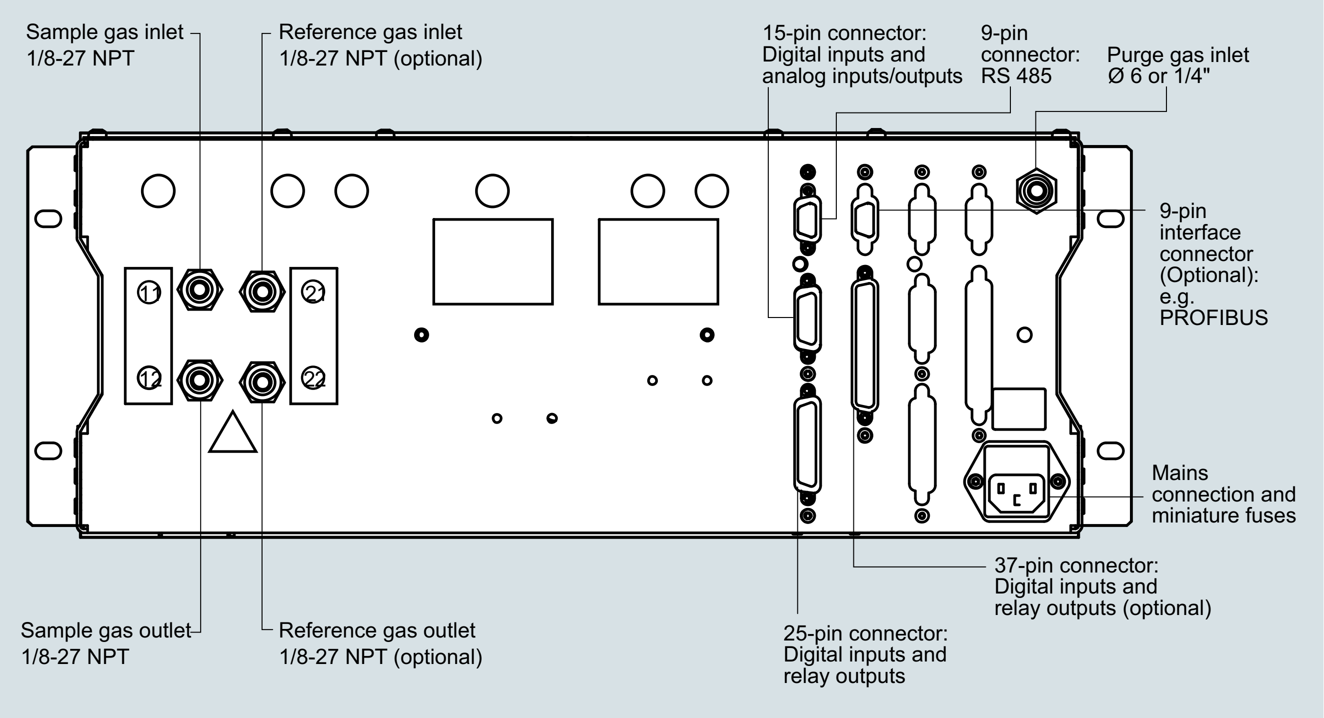
CALOMAT 62, 19" rack unit, pin assignment





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

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



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

Technical specifications

General information	Based on DIN EN 61207/IEC 1207. All data based on digital gas mixture H_2 in N_2
Measuring ranges	4, internally and externally switchable; automatic measuring range switchover also possible
Span	Application-dependent (see ordering data)
Measuring ranges with suppressed zero point	Application-dependent (see ordering data)
Operating position	Front wall, vertical
Conformity	CE marking 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-10% ... 120 V +10% AC, 48 ... 63 Hz or 200 V-10% ... 240 V +10% AC, 48 ... 63 Hz
Power consumption	• Approx. 25 VA (gas connection block unheated) • Approx. 330 VA (gas connection block heated)
Fuse values (gas connection unheated)	100 ... 120 V F3 1T/250 F4 1T/250 200 ... 240 V F3 0.63T/250 F4 0.63T/250
Fuse values (gas connection heated)	100 ... 120 V F1 1T/250 F2 4T/250 F3 4T/250 F4 4T/250 200 ... 240 V F1 0.63T/250 F2 2.5T/250 F3 2.5T/250 F4 2.5T/250
Gas inlet conditions	
Sample gas pressure	800 ... 1 100 hPa (absolute)
Sample gas flow	30 ... 90 l/h
Sample gas temperature	Min. 0 to 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 ambient 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 span according to rating plate with electronic damping constant of 1 s
Zero point drift	< ± 1% of the current span/week
Measured-value drift	< ± 1% of the smallest possible span (according to rating plate)/week
Repeatability	< ± 1% of the current span
Detection limit	1% of the smallest possible span according to rating plate
Linearity error	< ± 1% of the current 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 span according to rating plate
Accompanying gases	Deviation from zero point (for influence of interfering gas, see section "Cross-interference")
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 span with a change in pressure of 100 hPa
Auxiliary power	< 0.1% of the output signal span with rated 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: 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 8 additional 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 in operation
Permissible humidity (dew point must not be fallen below)	< 90% relative humidity as annual average, during storage and transportation

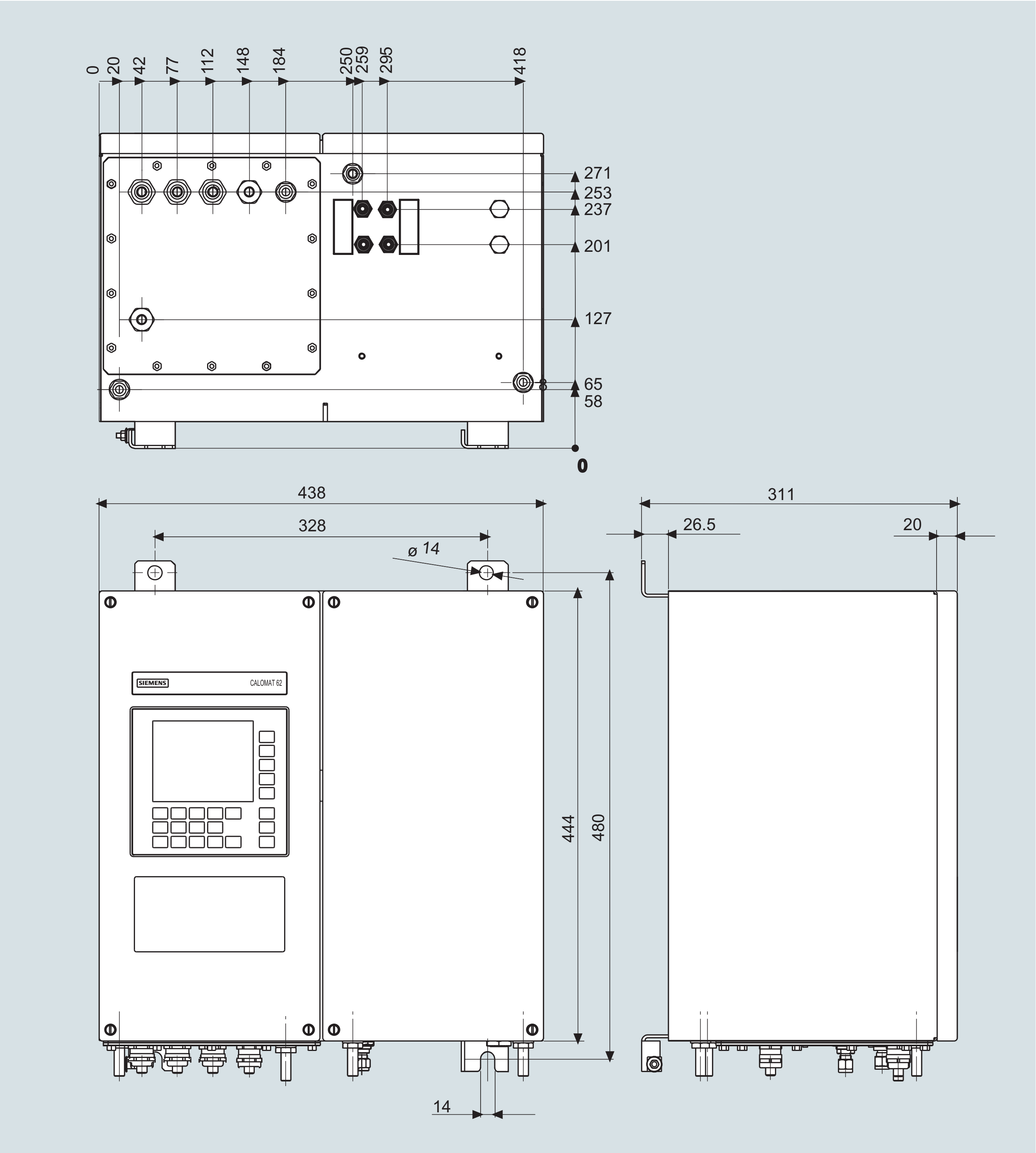
Selection and ordering data				Article No.	Cannot be combined
CALOMAT 62 gas analyzer For field installation			↗	**7MB2531-** ■■■■■ - ■■■■	
↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.					
Material of sample gas path					
Stainless steel, mat. no. 1.4571; non-flow-type reference chamber, Purging gas stub 10 mm 1/8''-27 NPT				0	0
Hastelloy C22; non-flow-type reference chamber, 1/8"-27 NPT				2	
Hastelloy C22; flow-type reference chamber, 1/8"-27 NPT				3	3
Stainless steel, mat. no. 1.4571; non-flow-type reference chamber, Purging gas stub $^3/_8$" 1/8''-27 NPT				4	4
Hastelloy C22; non-flow-type reference chamber, 1/8"-27 NPT				6	
Hastelloy C22; flow-type reference chamber, 1/8"-27 NPT				7	7
Application		Possible with measuring range identification			
H_2 in N_2		0; 5		A N	AN
H_2 in Cl_2		0; 5		A B	AB
Cl_2 in air		1; 6		B L	BL
HCl in air		1; 6		C L	CL
SO_2 in air		1; 6		E L	EL
CO_2 in H_2		0; 5		K A	KA
CO_2 in N_2		1; 6		K N	KN
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 %	Sample gas component		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 and outputs				1	
• With 8 additional 8 digital inputs/outputs and PROFIBUS PA interface				6	6
• With 8 additional digital inputs/outputs and PROFIBUS DP interface				7	7
Power supply					
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 2G, leakage compensation[1]				E	E
According to ATEX II 2G, continuous purging[1]				F	F
Language (supplied documentation, software)					
German				0	
English				1	
French				2	
Spanish				3	
Italian				4	

[1] Only in connection with an approved purging unit.

Selection and ordering data

Additional versions	Order code
Add "-Z" to Article No. and specify Order codes.	
TAG labels (specific lettering based on customer information)	**B03**
BARTEC Ex p purging unit "Leakage compensation"	**E71**
BARTEC Ex p purging unit "Continuous purging"	**E72**
Clean for O_2 service (specially cleaned gas path)	**Y02**
Measuring range indication in plain text, if different from the standard setting	**Y11**
Special setting (only in conjunction with an application no., e.g. extended measuring range)	**Y12**
Extended special setting (only in conjunction with an application no., e.g. determination of cross-interferences)	**Y13**
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 8 digital inputs/outputs each and PROFIBUS PA	**A5E00057315**
AUTOCAL function 8 digital inputs/outputs each and PROFIBUS DP	**A5E00057318**
Set of Torx screwdrivers	**A5E34821625**

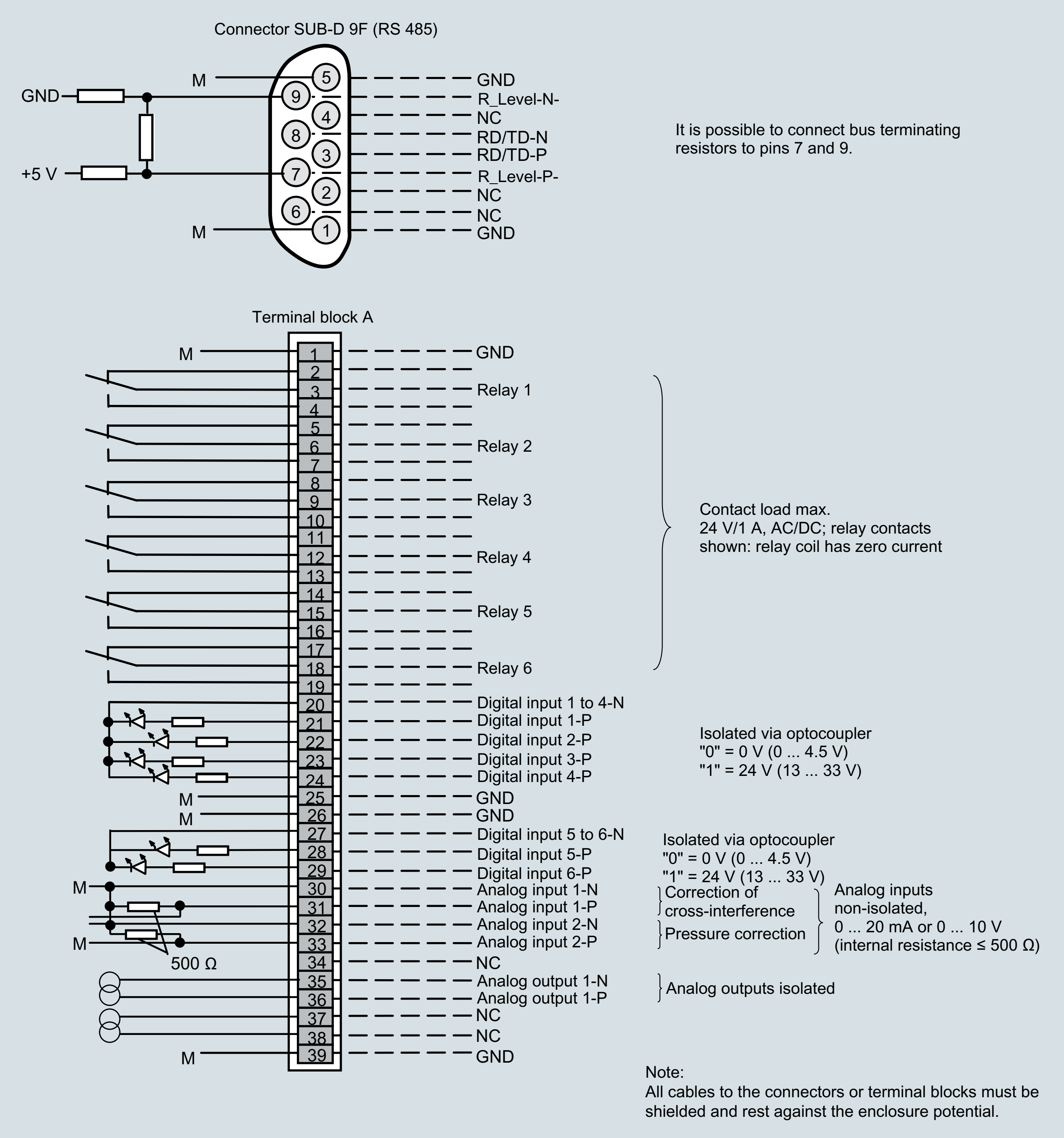
Dimensional drawings



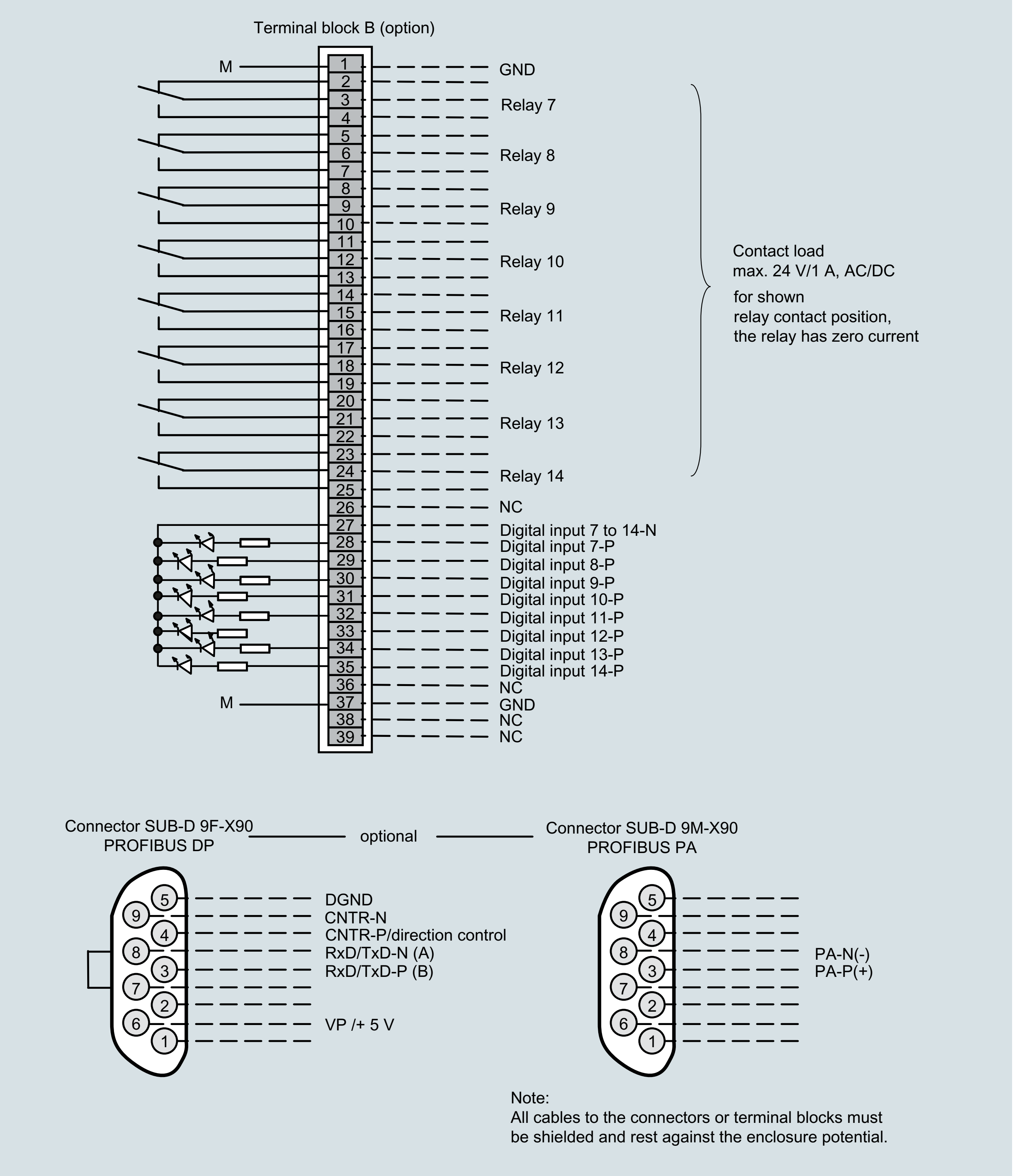
CALOMAT 62, field device, dimensions in mm

Circuit diagrams

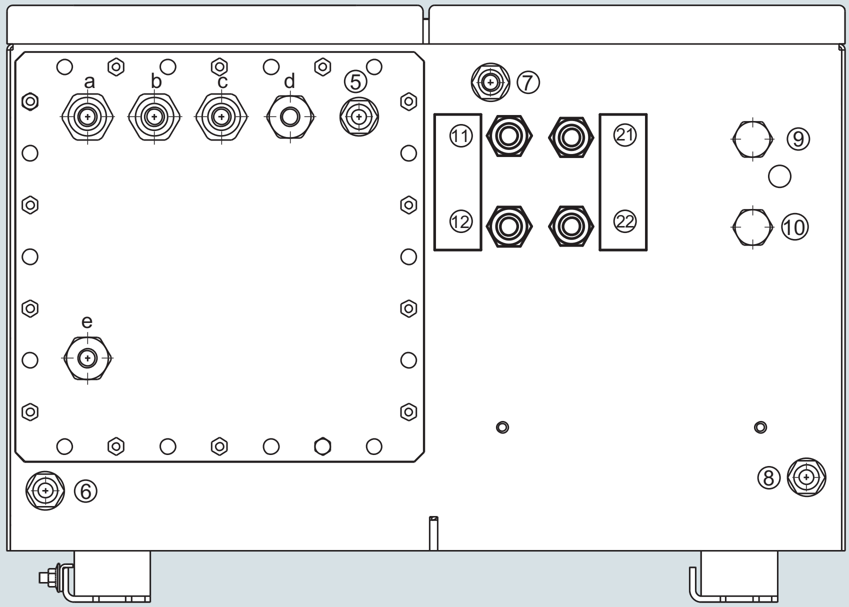
Pin assignment (electrical and gas connections)



CALOMAT 62, field device, pin and terminal assignment



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



Gas connections

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

Electrical connections

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

CALOMAT 62, field device, gas connections and electrical connections

Selection and ordering data

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

More information

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

Selection and ordering data

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

General information

Overview

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

Benefits

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

- In the presence of up to 100 % H_2O vapor
- In ultra-pure gas applications
- With high-boiling components (up to 200 °C)
- In the presence of corrosive gases (with preliminary filter)

The FIDAMAT 6 exhibits:

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

The analyzer is additionally equipped with warning and fault messages:

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

Application

Areas of application

- Environmental protection
- Wastewater (in conjunction with a stripping device, verification of the hydrocarbon content of liquids)
- TLV (Threshold Limit Value) monitoring at places of work
- Quality monitoring
- Process exhaust monitoring
- Ultra-pure gas measurements in media such as O_2, CO_2, inert gases and cold sample gases
- Measurement of corrosive and condensing gases
- Process optimization

Further applications

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

Special applications

Special applications

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

Performance-tested version

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

Design

- 19" slide-in module with 4 HU for installation
  - In hinged frame
  - In cabinets with or without telescopic rails
- Front plate can be swung down for servicing purposes (laptop connection)
- Gas connections for sample gas inlet and outlet as well as combustion gas and combustion air; pipe diameter 6 mm or ¼"
- Gas and electrical connections at the rear
- Internal gas paths: stainless steel (mat. no. 1.4571)

Display and control panel

- Large LCD field for simultaneous display of
  - Measured value
  - Status bar
  - Measuring ranges
- Contrast of LCD panel adjustable using menu
- Permanent LED backlighting
- Washable membrane keyboard with five softkeys
- Menu-driven operation for parameterization, test functions, adjustment
- User help in plain text
- Graphic display of concentration trend; programmable time intervals

Input and outputs

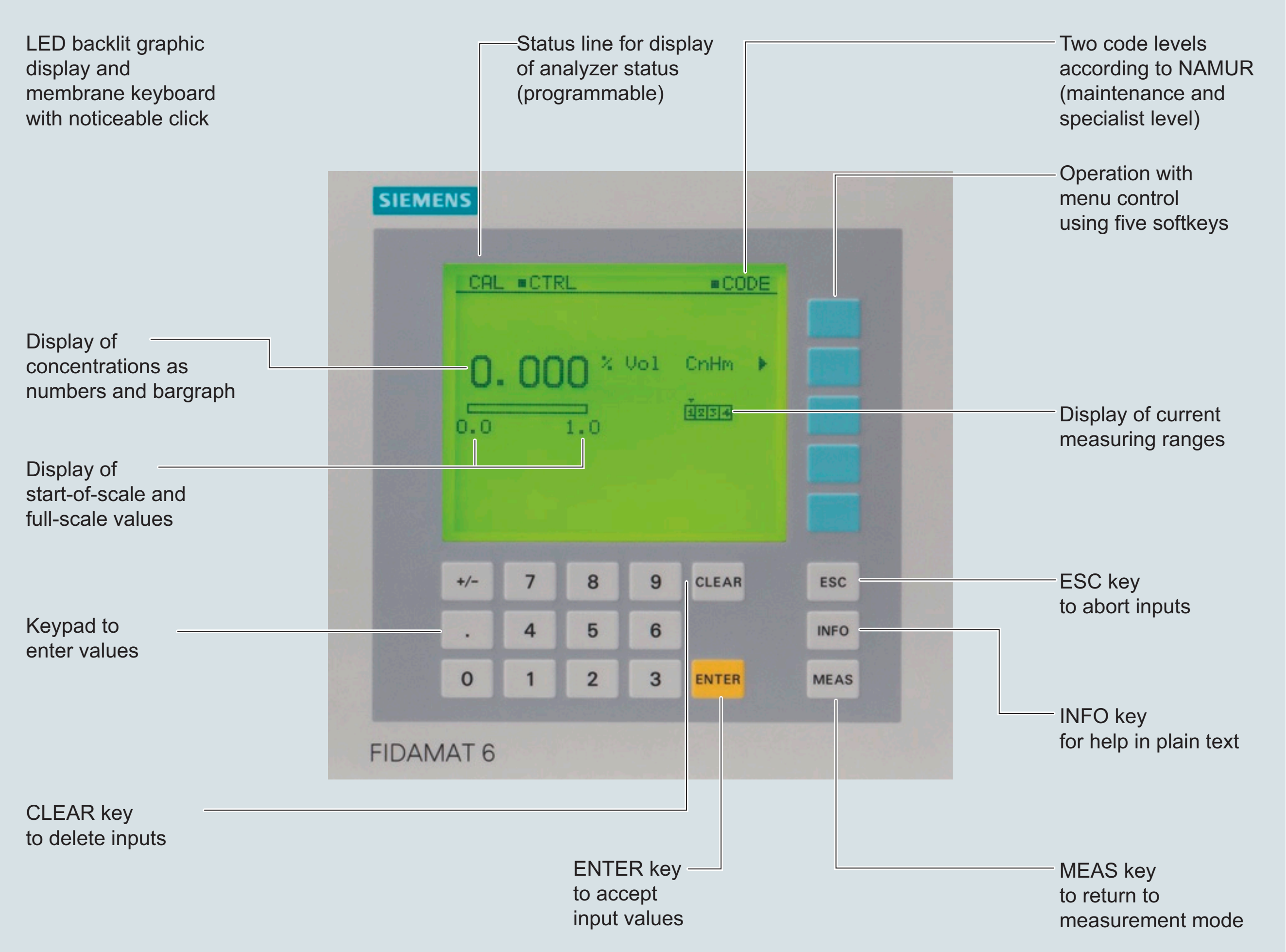
- One analog output for each measured component
- Two programmable analog inputs
- Six digital inputs freely configurable (e.g. for measurement range switchover, processing of external signals from sample preparation)
- Six relay outputs freely configurable (failure, maintenance demanded, maintenance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

Communication

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

Options

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



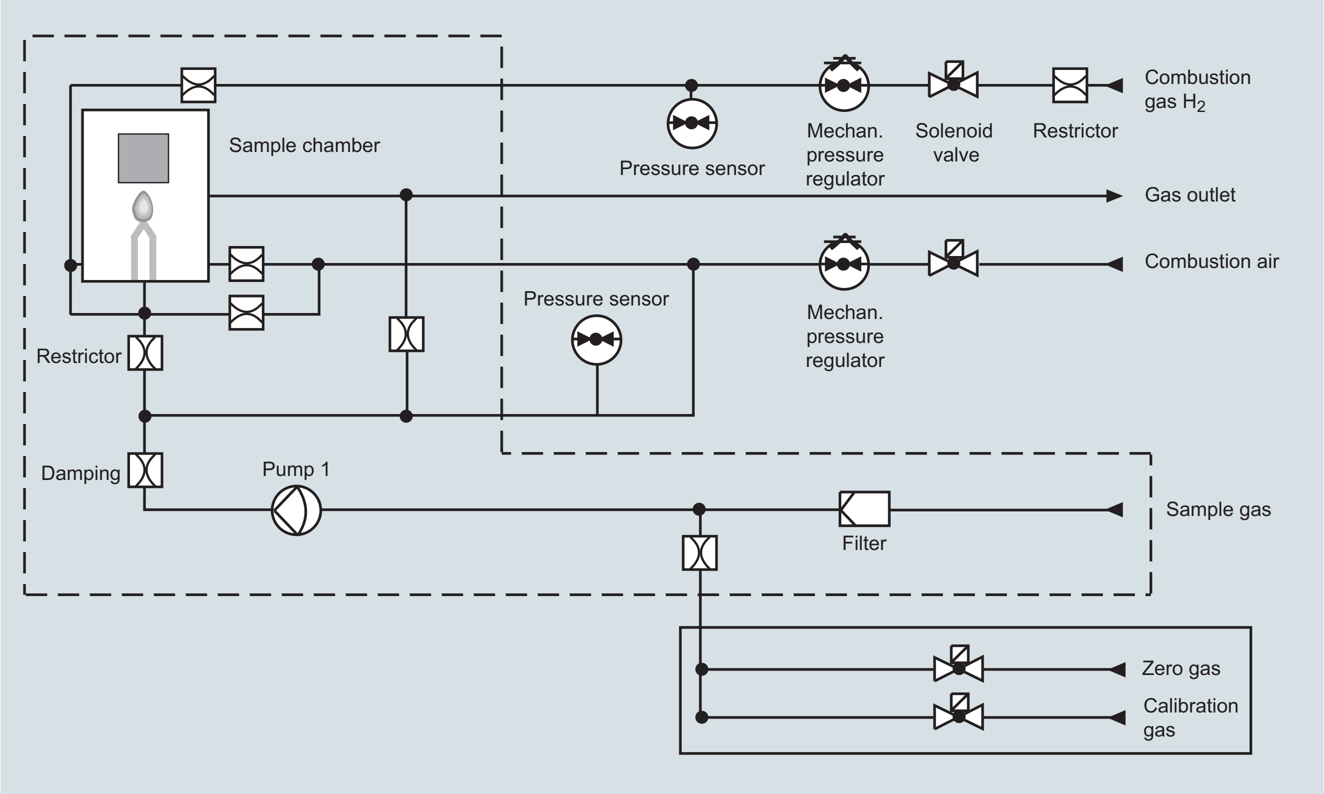
FIDAMAT 6, membrane keyboard and graphic display

General information

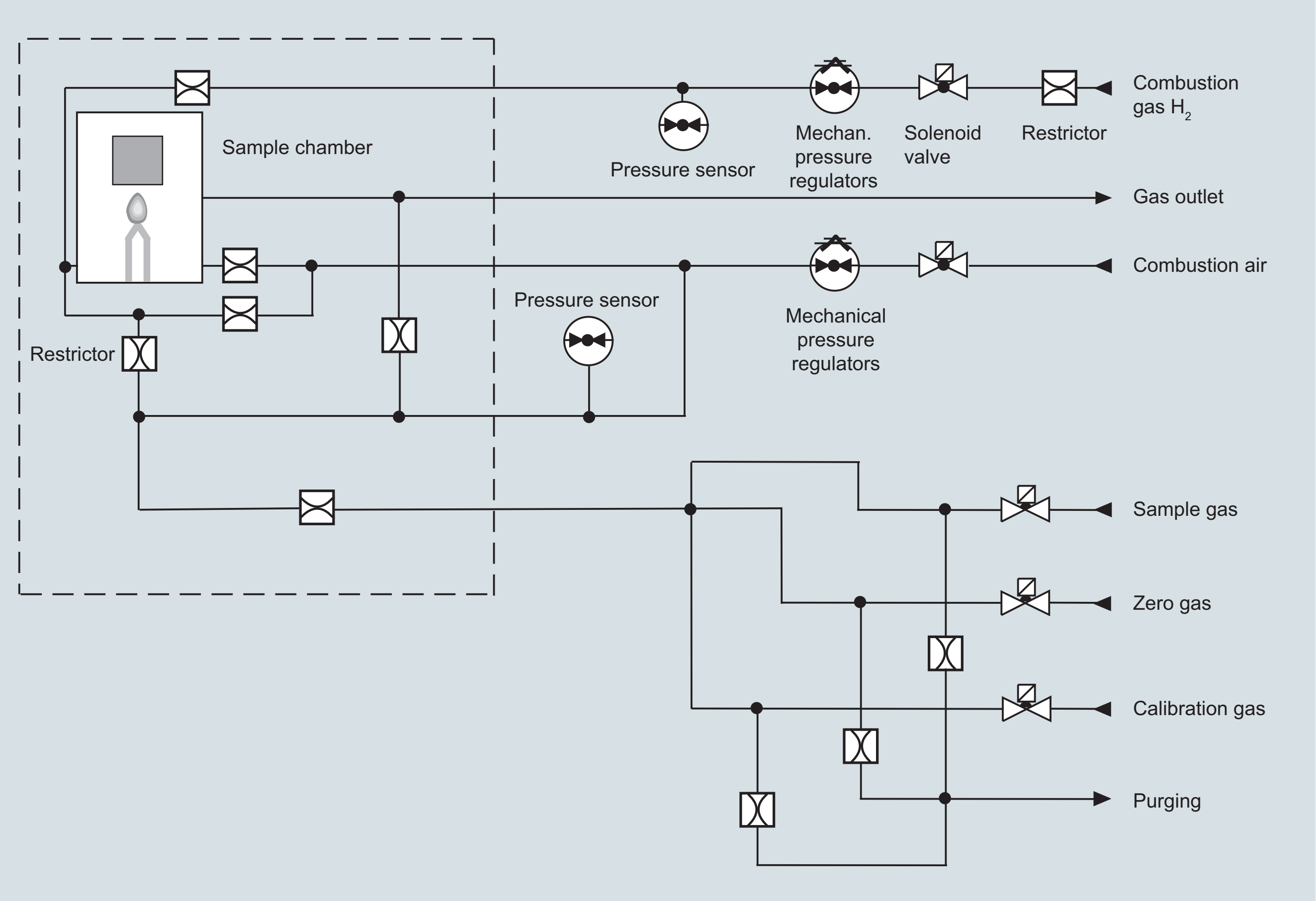
Designs – parts wetted by sample gas

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

Gas path



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



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

Function

Principle of operation

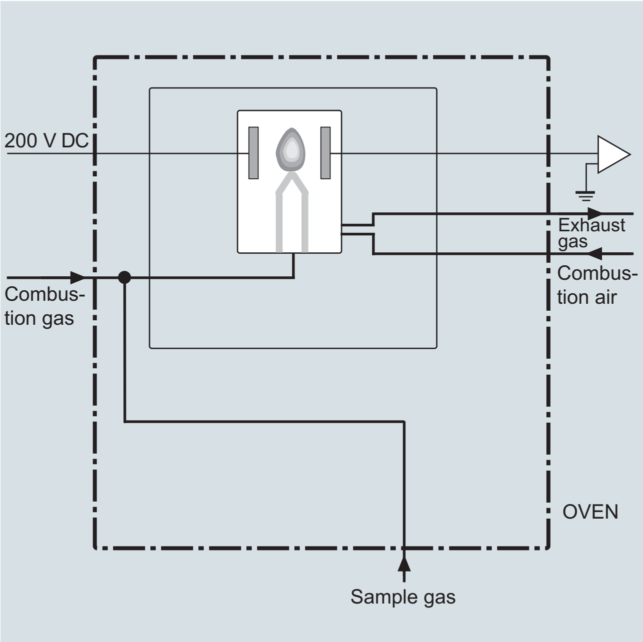
The FIDAMAT 6 carries out substance-specific measurements and not component-specific measurements. It measures the total of all hydrocarbons in a sample gas, but with different weighting of the hydrocarbon molecules. To a first approximation, the display is proportional to the number of C atoms in the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

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

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

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

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



FIDAMAT 6, principle of operation

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

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

Note

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

Calibration

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

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

For pure gas measurement, use suitable additional gases.

Example:

1. Emission measurement	
Measuring range	0 ... 50 mg C/m^3
Zero gas	N_2 (5.0 or better)
Calibration gas	21 vpm C_3H_8 in N_2 (corresponds to 31.43 mg C/m^3 at 20 °C)
2. Purity measurement in 100 % O_2	
Measuring range	0 ... 50 vpm C_1
Zero gas	N_2 (5.0 or better)
Calibration gas	At least 30 vpm CH_4 in O_2

Essential characteristics

- Four measuring ranges which can be freely configured, even with suppressed zero point, all measuring ranges are linear
- Galvanically isolated measured-value output 0/2/4 to 20 mA (also inverted)
- Autoranging possible; remote switching is also possible
- Storage of measured values possible during adjustments
- Measuring range identification
- Measuring point switchover for up to 6 measuring points
- Measuring point identification
- Wide range of selectable time constants (static/dynamic noise suppression); i.e. the response time of the device can be adapted to the respective measuring task
- Easy handling thanks to menu-driven operation
- Low long-term drift
- Two control levels with their own authorization codes for the prevention of accidental and unauthorized operator interventions
- Automatic measuring range calibration can be configured
- Operation based on the NAMUR recommendation
- Customer-specific analyzer options such as:
  - Customer acceptance
  - TAG labels
  - Drift recording
- Wear-free, corrosion-proof filter housing
- No blocking of the sample gas capillaries through the use of a quartz restrictor
- Purge function in the event of analyzer or power supply failure (avoids build-up of toxic and corrosive substances in the device)
- Low consumption of combustion air
- Response factors comply with the minimum requirements in accordance with German air purity guidelines and the Working Group of the German automotive Industry
- Simple handling using a numerical membrane keyboard and operator prompting

Response factors (examples, mean values)

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

Cross-interferences (examples)[1)]

Interfering component	Concentration of the interfering component	Induced cross-interference
O_2 in N_2	(21 vol. %)	< 0.3 mg/m^3
SO_2 in N_2	(258 mg/m^3)	< 0.15 mg/m^3
NO in N_2	(310 mg/m^3)	< 0.5 mg/m^3
NO_2 in synth. Air	(146 mg/m^3)	< 0.1 mg/m^3
CO in N_2	(461 mg/m^3)	< 0.15 mg/m^3
CO_2 in N_2	(18 vol. %)	< 0.1 mg/m^3
HCl in N_2	(78 mg/m^3)	< 0.3 mg/m^3

[1)] With measuring range 0 to 15 mg/m^3.

Technical specifications

General information	
Measuring ranges	4, internally and externally switchable; manual and autoranging 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 mgC/m^3
Autoranging	Hysteresis, selectable
Measured-value display	Digital concentration display (5 digits with floating point)
Resolution of digital display	0.1% of measured value
Operating position	Front wall, vertical
Conformity	CE mark in accordance with 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 values	• 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)
Dynamic response	
Warm-up period	At room temperature, approx. 2 ... 3 h
Delayed display (T_{90})	2 ... 3 s
Damping (electrical time constant)	0 ... 100 s, configurable
Dead time (purging time of the gas path in the unit at 1 l/min)	With filter, 2 ... 3 s
Time for device-internal signal processing	< 1 s

Measuring response	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation	< 0.75% of the smallest possible measuring range according to rating plate, with electronic damping constant of 1 s (corresponds to ± 0.25% at 2 σ)
Zero point drift	< 0.5%/month of the smallest possible measuring span according to rating plate
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 span according to rating plate
Atmospheric pressure	< 1%/50 hPa
Sample gas pressure	< 2% of the current measuring range/ 1% pressure change (within 600 ... 1 100 hPa)
Auxiliary power	< 1% of the current measuring range with rated voltage ± 10%
Position influence	< 1% with < 15° inclination
Electrical inputs and outputs	
Analog output	0/2/4 ... 20 mA, isolated; max. load 750 Ω
Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load: 24 V AC/ DC/1 A, potential-free
Analog inputs	2, dimensioned for 0/2/4 to 20 mA for external pressure sensor and correction of influence of accompanying gas (correction of cross-interference)
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	5 ... 45 °C in operation, -30 ... +70 °C during storage and transportation
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 Pump startup**		**Flow through FID**	**Flow through bypass**
		Without	**With**		
	hPa (abs.)	**hPa (abs.)**	**hPa (abs.)**	**ml/min**	**ml/min**
Combustion gas	3 000 ... 5 000	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
Calibration gas	3 500 ... 4 000	—	1 500 ± 2	~ 3	~ 1 000

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

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

Selection and ordering data	Article No.
FIDAMAT 6 gas analyzer 19" rack unit for installation in cabinets ↗	**7MB2421- ■■■■■- ■■A■**
↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.	
Gas connections	
Pipe with 6 mm outer diameter	0
Pipe with ¼" outer diameter	1
Version	
Without pump, for sample gas with overpressure[1]	B
With heated pump, for sample gas with atm. 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	1
• With 8 digital inputs/8 digital outputs, PROFIBUS PA interface	6
• With 8 digital inputs/8 digital outputs, PROFIBUS DP interface	7
Power supply	
100 ... 120 V AC, 48 ... 63 Hz	0
200 ... 240 V AC, 48 ... 63 Hz	1
Combustion gases	
H_2	A
Language (supplied documentation, software)	
German	0
English	1
French	2
Spanish	3
Italian	4

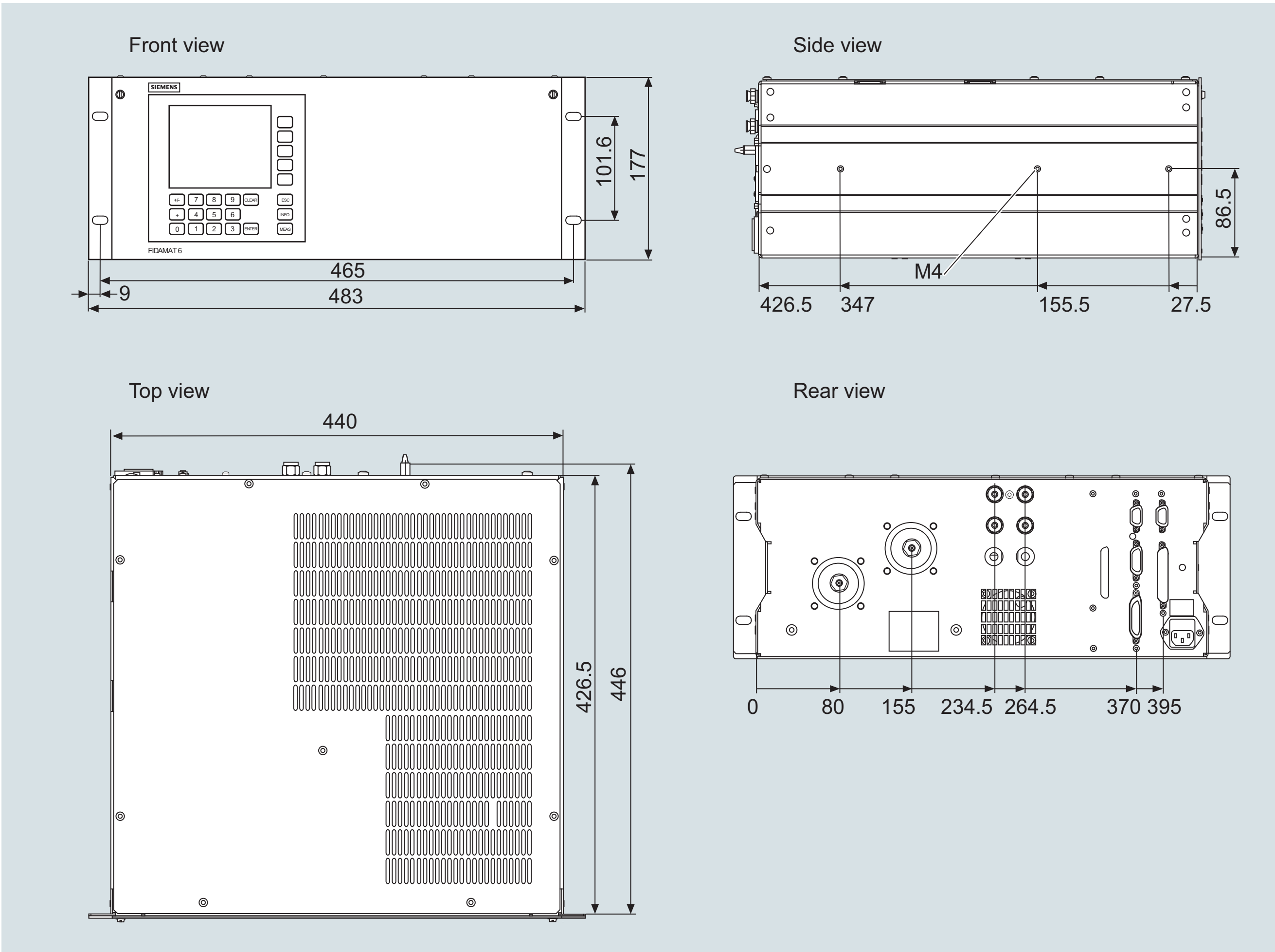
Additional versions	Order code
Add "-Z" to Article No. and specify Order code	
Telescopic rails (2 units)	**A31**
TAG labels (specific lettering based on customer information)	**B03**
Clean for O_2 service (specially cleaned gas path)	**Y02**
Measuring range indication in plain text, if different from the standard setting	**Y11**
Special setting (only in conjunction with an application No.)	**Y12**
Extended special setting (only in conjunction with an application No.)	**Y13**
Configuration according to EN 14181:2004	**Y17**
Prepared for EN 15267:2015[2]	**Y27**

Accessories	Article No.
RS 485/Ethernet converter	**A5E00852383**
RS 485/RS 232 converter	**C79451-Z1589-U1**
RS 485/USB converter	**A5E00852382**
AUTOCAL function each with 8 digital inputs/outputs	**C79451-A3480-D511**
AUTOCAL function 8 digital inputs/outputs each and PROFIBUS PA	**A5E00057307**
AUTOCAL function 8 digital inputs/outputs each and PROFIBUS DP	**A5E00057312**
Set of Torx screwdrivers	**A5E34821625**

1) No QAL1 certification according to EN 15267

2) For certified operation, compensation of the cross-interference caused by the oxygen is required. To do this, the device must be supplied with the current oxygen concentration value of the sample gas. The supply takes place over an external measuring instrument that must also meet the requirements of EN 15267-3 (e.g. ULTRAMAT 23 or OXYMAT 6). The FIDAMAT 6E –Y27 is preconfigured accordingly and expects an analog signal of 4 ... 20 mA corresponding to 0 ... 21 vol % O_2 at analog input AI2.

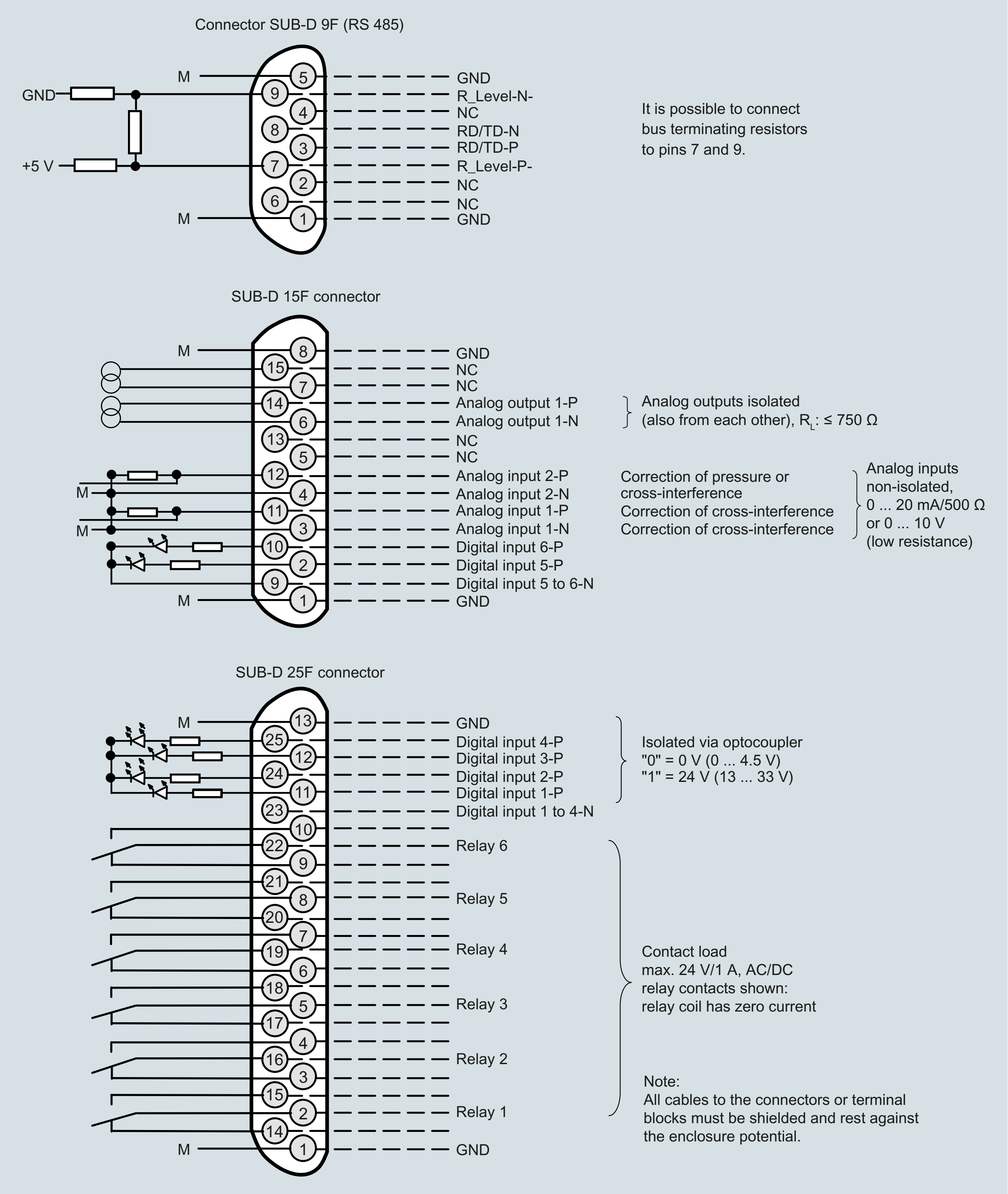
Dimensional drawings



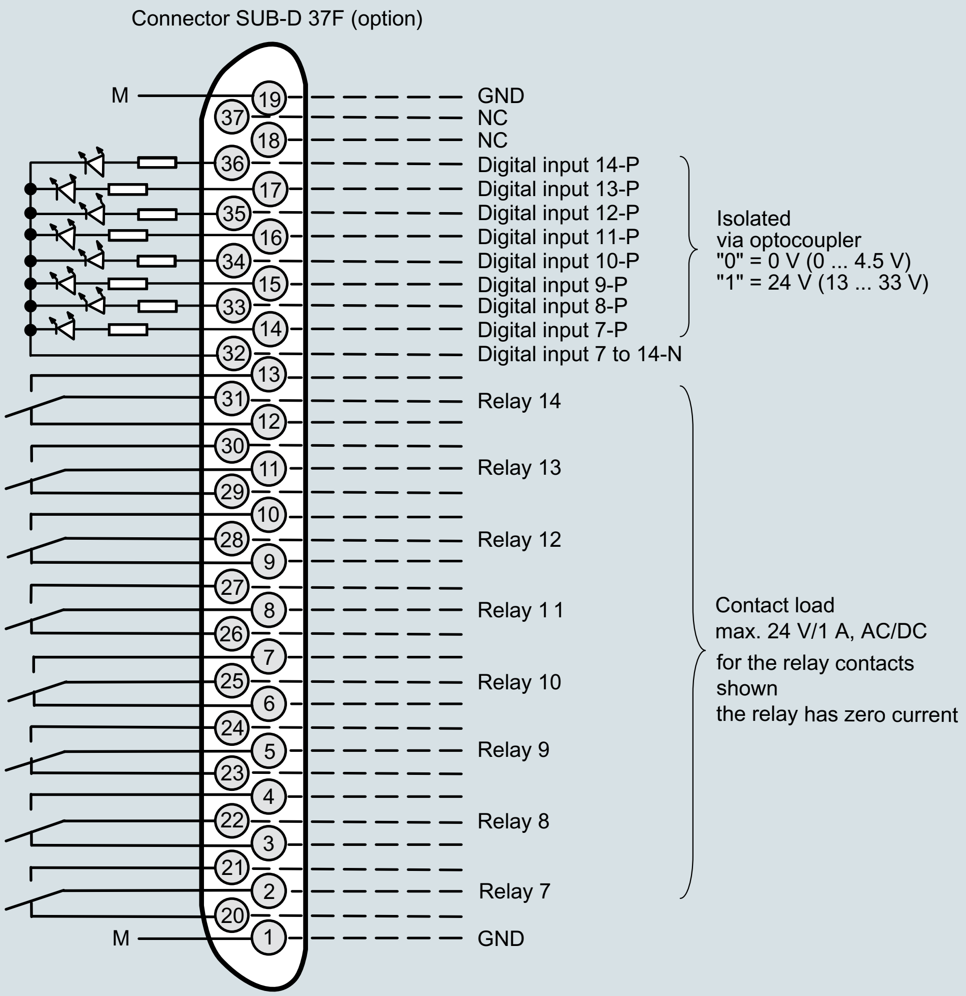
FIDAMAT 6, 19" unit, dimensions in mm

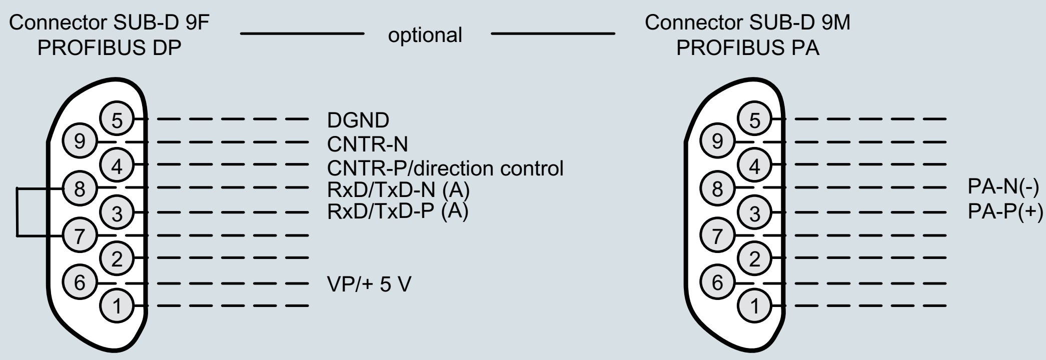
Circuit diagrams

Pin assignment (electrical and gas connections)



FIDAMAT 6, 19" rack unit, pin assignment



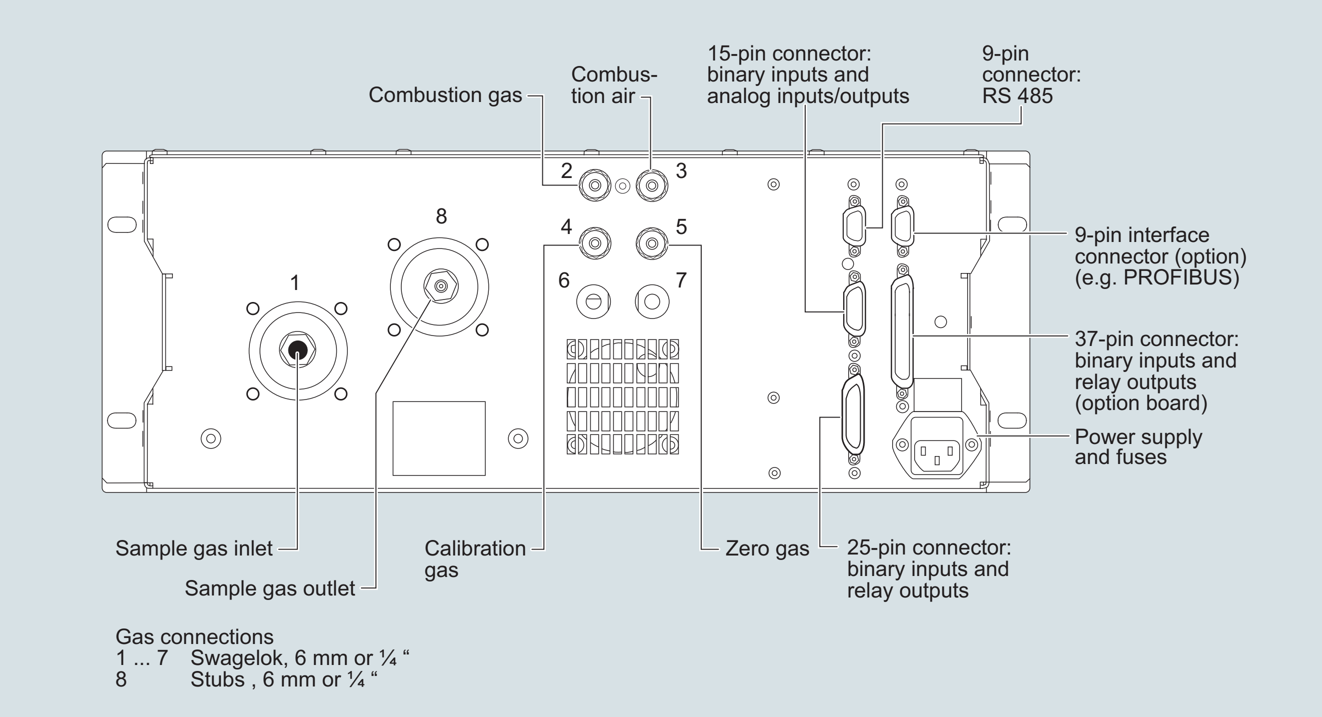


Note:
All cables to the connectors or terminal blocks must be shielded and rest against the enclosure potential.

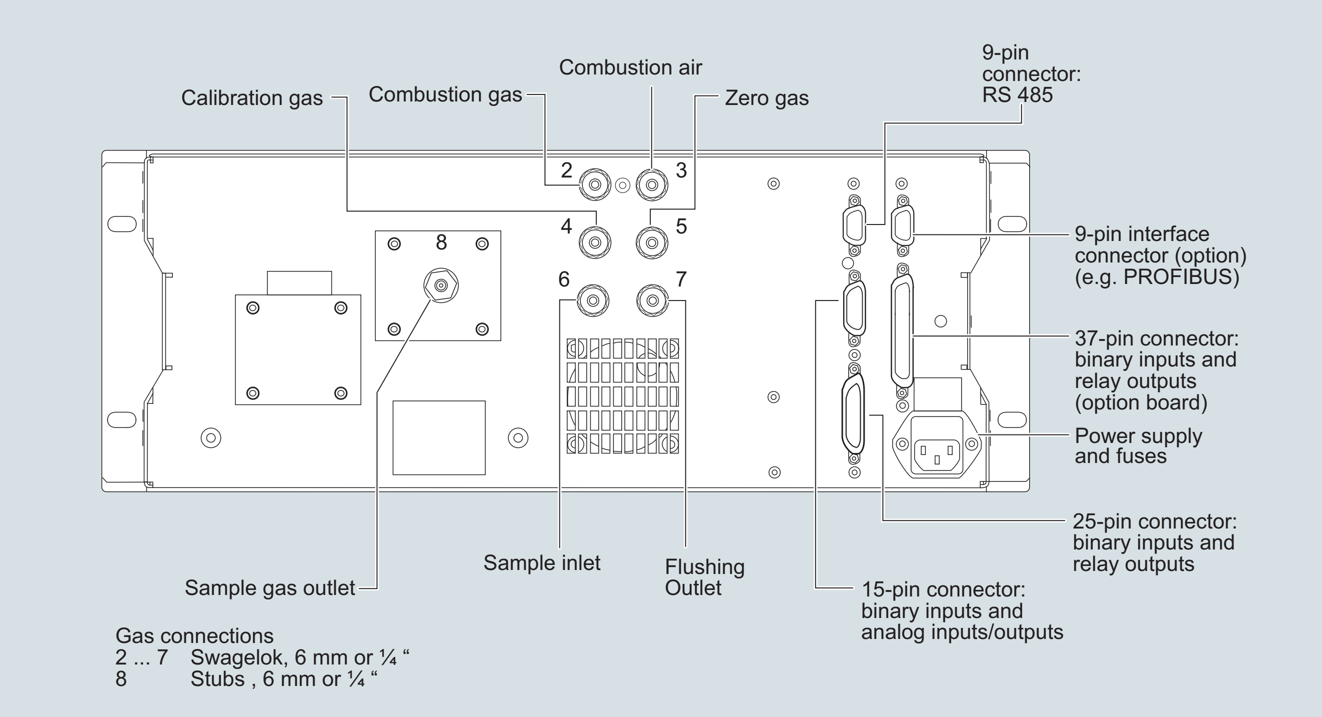
FIDAMAT 6, 19" rack unit, pin assignment of the AUTOCAL board and PROFIBUS connectors

1

19" rack unit



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



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

Selection and ordering data

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

More information

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

Suggestions for spare parts

Selection and ordering data

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

If the device was supplied with a specially cleaned gas path for high oxygen context ("Clean for O_2 service"), please ensure that you specify this when ordering spare parts. This is the only way to guarantee that the gas path will continue to comply with the special requirements for this version.

Overview

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

- IR detector for IR-active gases
- UV photometer for UV-active gases
- H_2S sensor (electrochemical)
- O_2 sensor (electrochemical)
- O_2 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 (CO_2 and CH_4), plus O_2 and H_2S 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 O_2 ("dumbbell" measuring cell).
- With the ULTRAMAT 23 gas analyzer with UV photometer, one infrared-sensitive gas, UV-active gases (SO_2, NO_2) as well as O_2 can be measured with an electrochemical sensor.

Benefits

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

Special benefits when used in biogas plants

- Continuous measurement of all four key components, including H_2S
- Long service life of the H_2S sensor even at increased concentrations; no diluting or backflushing necessary
- Introduction and measurement of flammable gases as occurring in biogas plants (e.g. 70% CH_4), is permissible (TÜV certification)

General information

Application

Areas of application

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

Application areas in biogas plants

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

Application area of paramagnetic oxygen sensor

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

Further applications

- Environmental protection
- Chemical plants
- Cement industry

Special versions

Separate gas paths

The ULTRAMAT 23 with 2 IR components without pump is also available with two separate gas paths. This allows the measurement of two measuring points as used e.g. for the NO_x measurement before and after the NO_x converter.
The ULTRAMAT 23 gas analyzer can be used in emission measuring systems and for process and safety monitoring.

Versions conforming to EN 14181 and EN 15267

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

For use in EN 14181 applications, the devices with the article numbers 7MB235X in the CEM CERT set (7MB1957) have undergone qualification testing according to German standards of EN 15267. These German Technical Inspectorate versions of the ULTRAMAT are suitable for measurement of CO, NO, SO_2 and O_2 according to 13th and 27th BImSchV as well as TA Luft. Smallest measuring range tested and approved by the German Technical Inspectorate:

1 and 2-component analyzer

- CO: 0 to 150 mg/m^3
- NO: 0 to 150 mg/m^3
- SO_2: 0 to 400 mg/m^3

3-component analyzer

- CO: 0 to 250 mg/m^3
- NO: 0 to 250 mg/m^3
- SO_2: 0 to 400 mg/m^3

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

- CO: 0 to 1 250 mg/m^3
- NO: 0 to 2 000 mg/m^3
- SO_2: 0 to 7 000 mg/m^3

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

Version with faster response time

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

Chopper compartment purging

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

Design

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

Display and control panel

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

Inputs/outputs

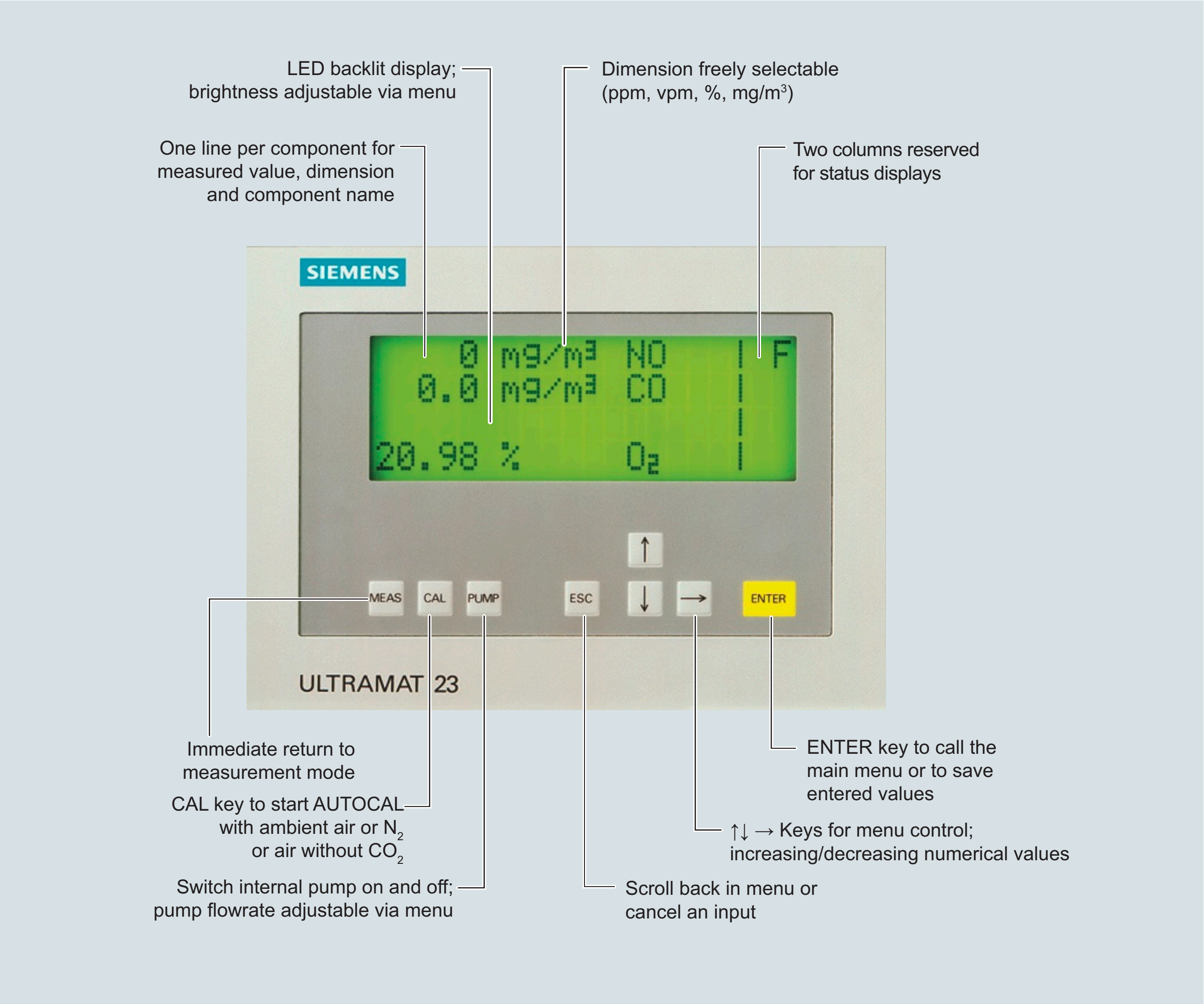
- Three digital inputs for sample gas pump On/Off, triggering of AUTOCAL and synchronization of several devices
- Eight relay outputs can be freely configured for fault, maintenance request, maintenance switch, limits, measuring range identification and external solenoid valves
- Eight additional digital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

Communication

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

Options

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

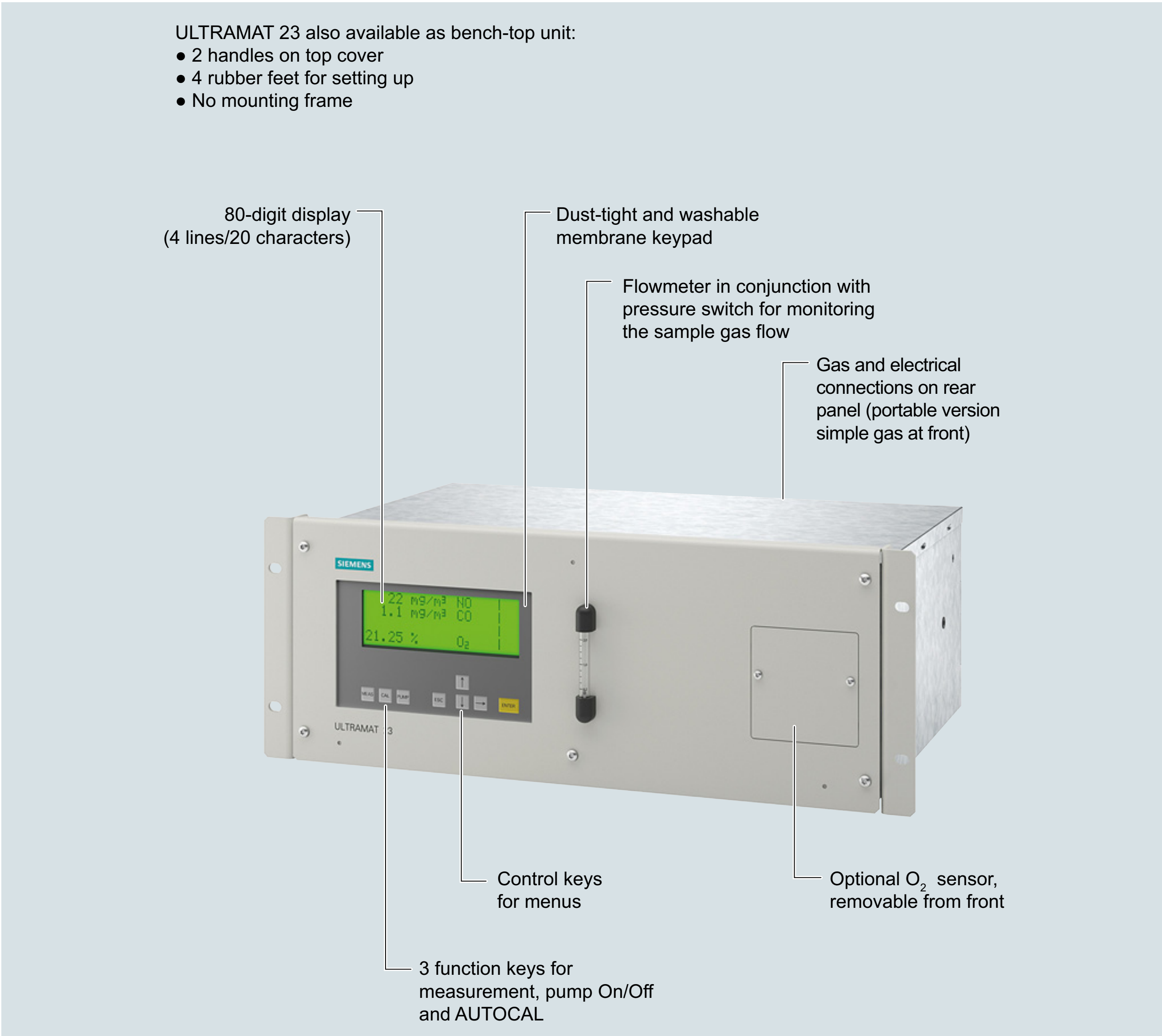


ULTRAMAT 23, membrane keyboard and graphic display

General information

Designs – parts wetted by sample gas

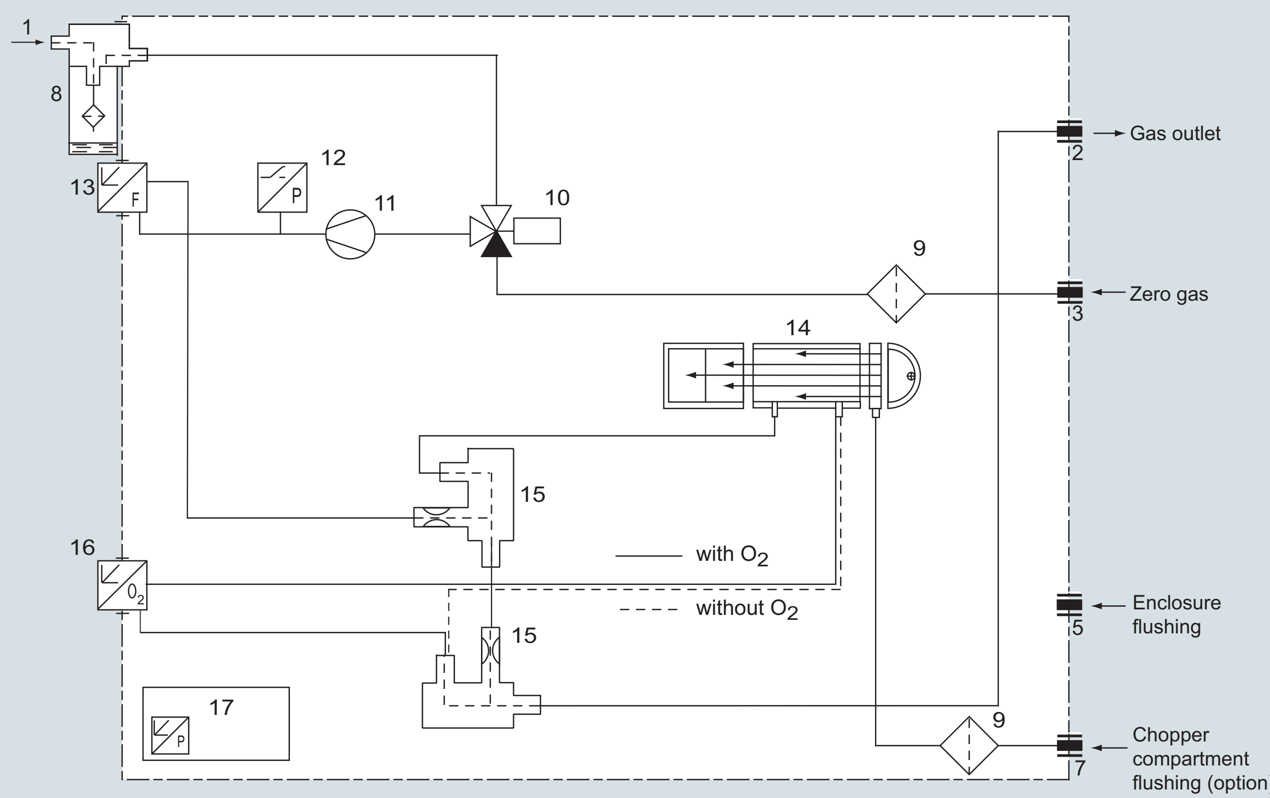
Gas path		19" rack unit	Desktop unit
With hoses	Condensation trap/gas inlet	-	PA (polyamide)
	Condensation trap	-	PE (polyethylene)
	Gas connections 6 mm	PA (polyamide)	PA (polyamide)
	Gas connections ¼"	Stainless steel, mat. no. 1.4571	Stainless steel, mat. no. 1.4571
	Hose	FPM (Viton)	FPM (Viton)
	Pressure switch	FPM (Viton) + PA6-3-T (Trogamide)	FPM (Viton) + PA6-3-T (Trogamide)
	Flowmeter	PDM/Duran glass/X10CrNiTi1810	PDM/Duran glass/X10CrNiTi1810
	Elbows/T-pieces	PA6	PA6
	Internal pump, option	PVDF/PTFE/EPDM/FPM/Trolene/ stainless steel, mat. no. 1.4571	PVDF/PTFE/EPDM/FPM/Trolene/ stainless steel, mat. no. 1.4571
	Solenoid valve	FPM70/Ultramide/ stainless steel, mat. no. 1.4310/1.4305	FPM70/Ultramide/ stainless steel, mat. no. 1.4310/1.4305
	Safety condensation trap	PA66/NBR/PA6	PA66/NBR/PA6
	Analyzer chamber		
	• 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
	• Adhesive	E353	E353
	• O-ring	FPM (Viton)	FPM (Viton)
With pipes, only available in version "without pump"	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)	



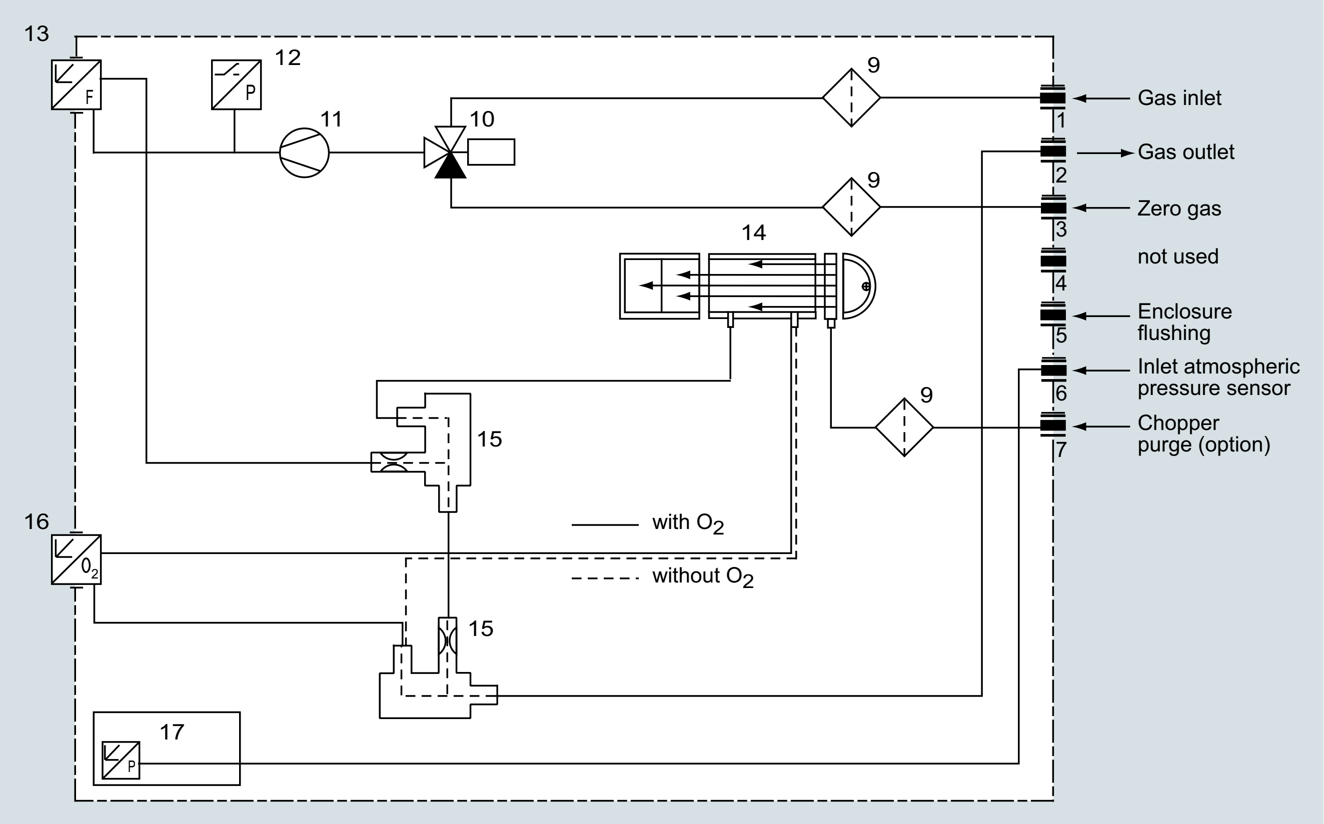
ULTRAMAT 23, design

Gas path

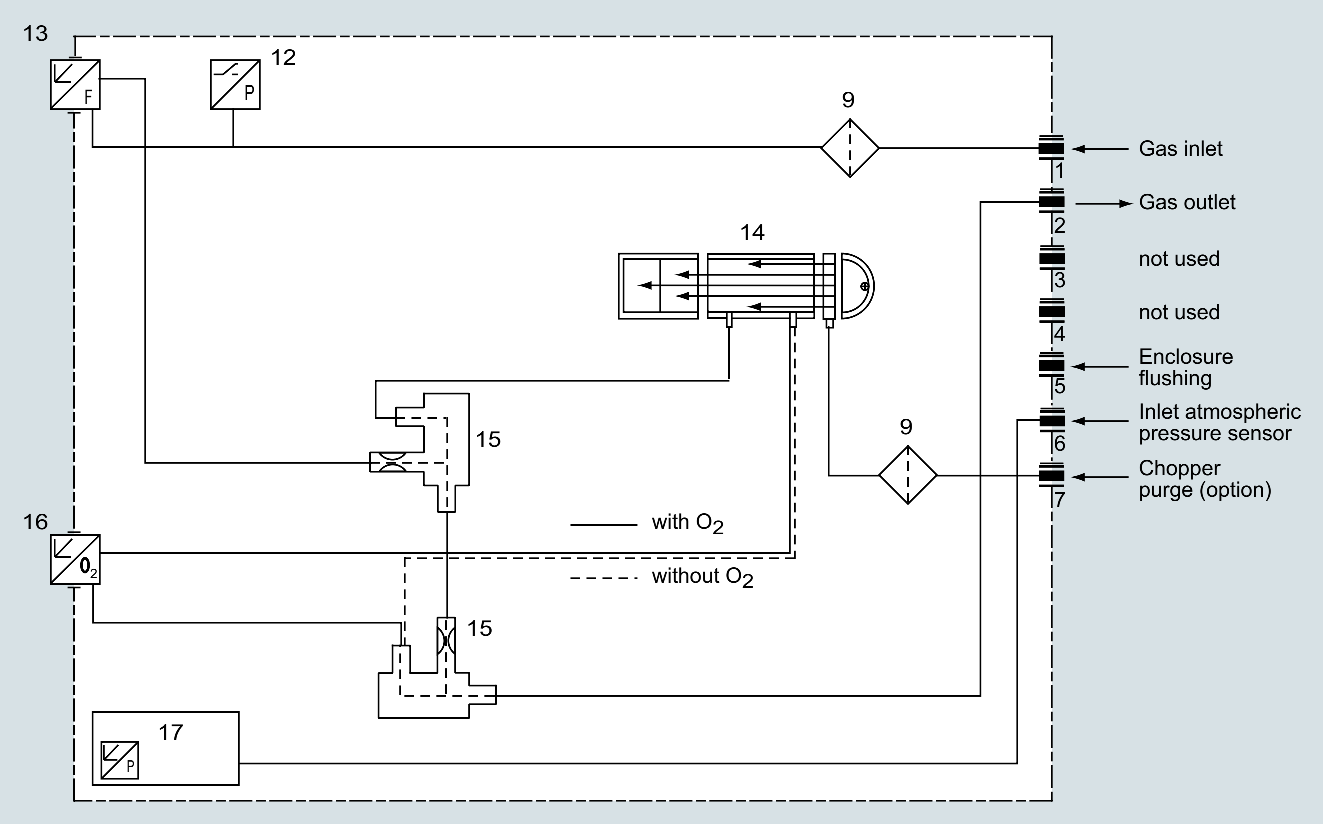
Legend for the gas path figures			
1	Inlet for sample gas/calibration gas	11	Sample gas pump
2	Gas outlet	12	Pressure switch
3	Inlet for AUTOCAL/zero gas or inlet for sample gas/calibration gas (channel 2)	13	Flow indicator
		14	Analyzer unit
4	Gas outlet (channel 2)	15	Safety condensation trap
5	Enclosure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



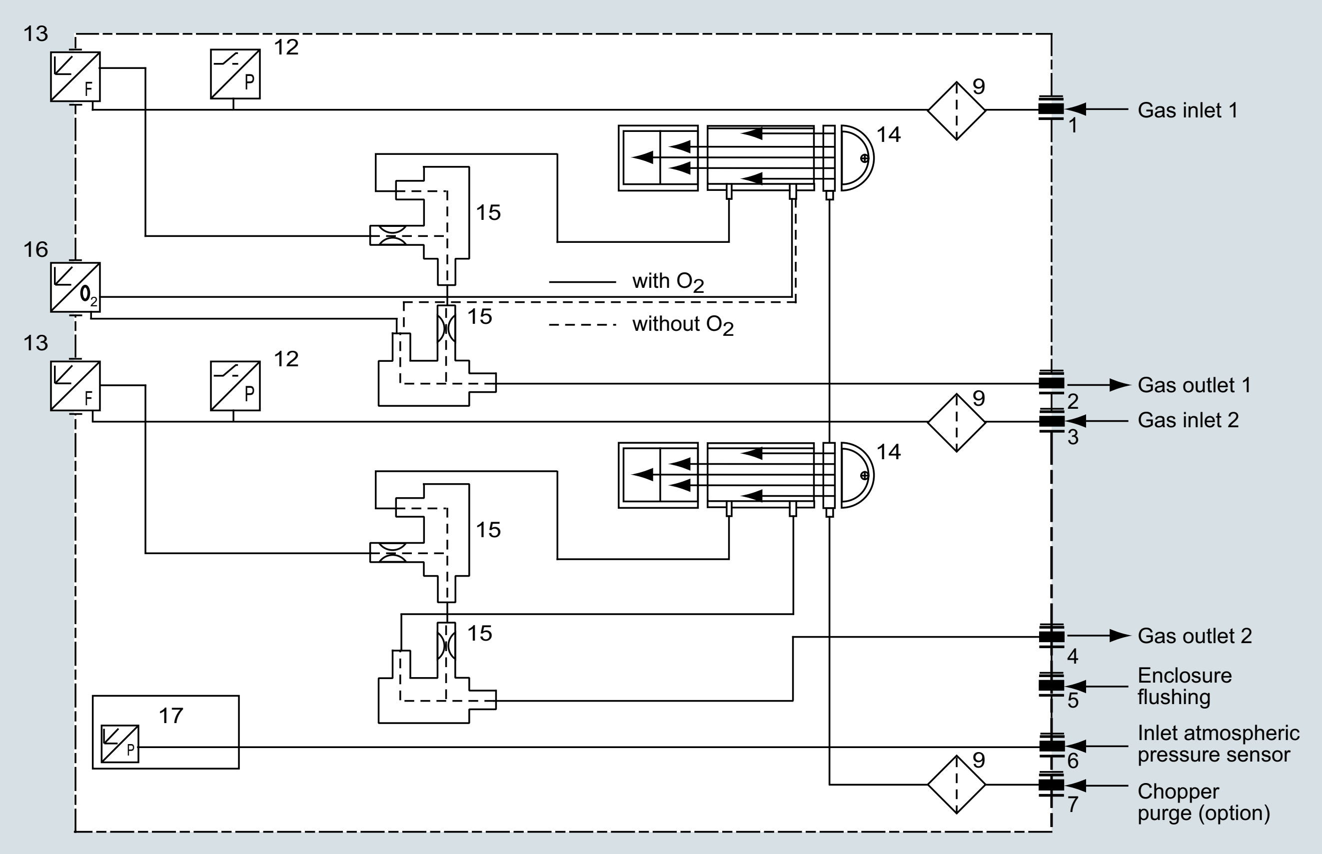
ULTRAMAT 23, portable, in sheet-steel housing with internal sample gas pump, condensation trap with safety filter on front plate, optional oxygen measurement



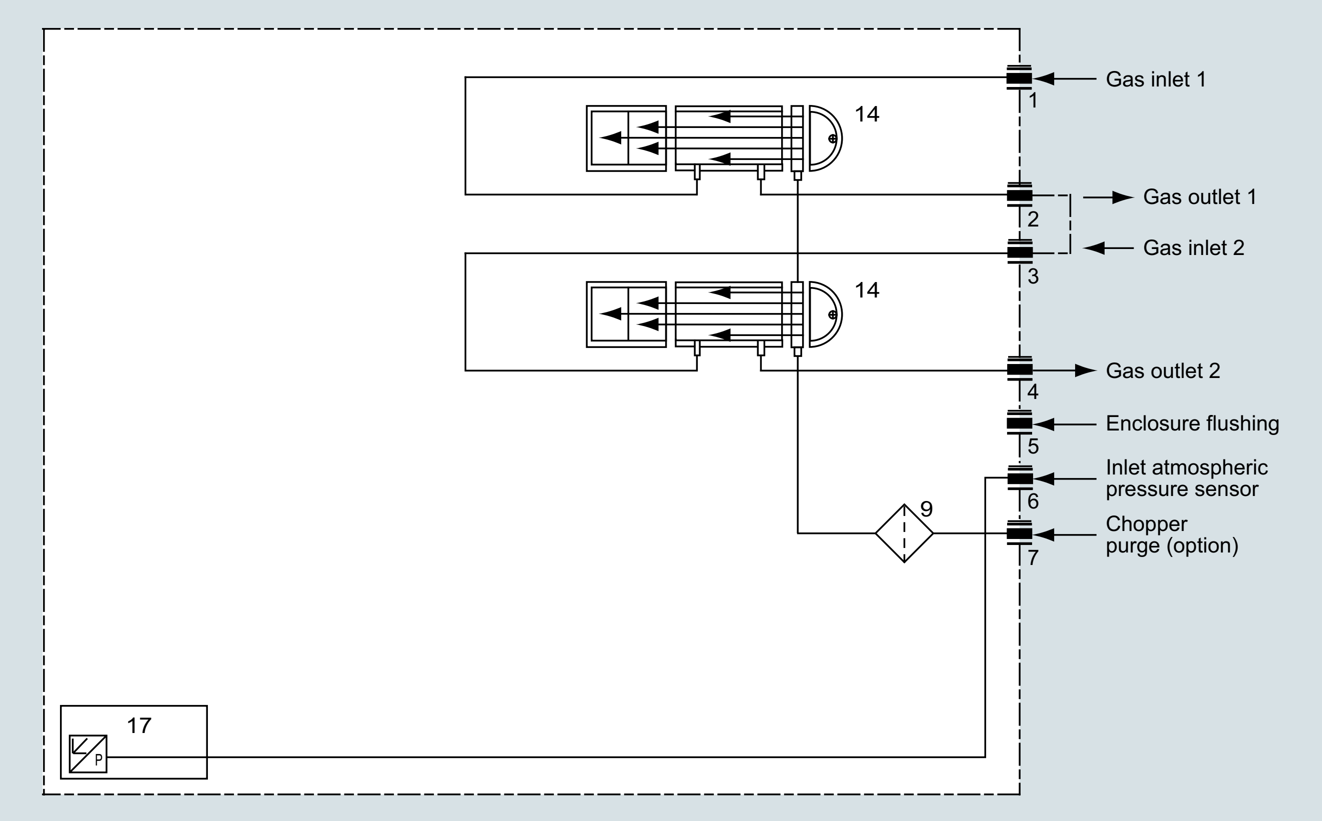
ULTRAMAT 23, 19" rack-mounted enclosure with internal sample gas pump; optional oxygen measurement



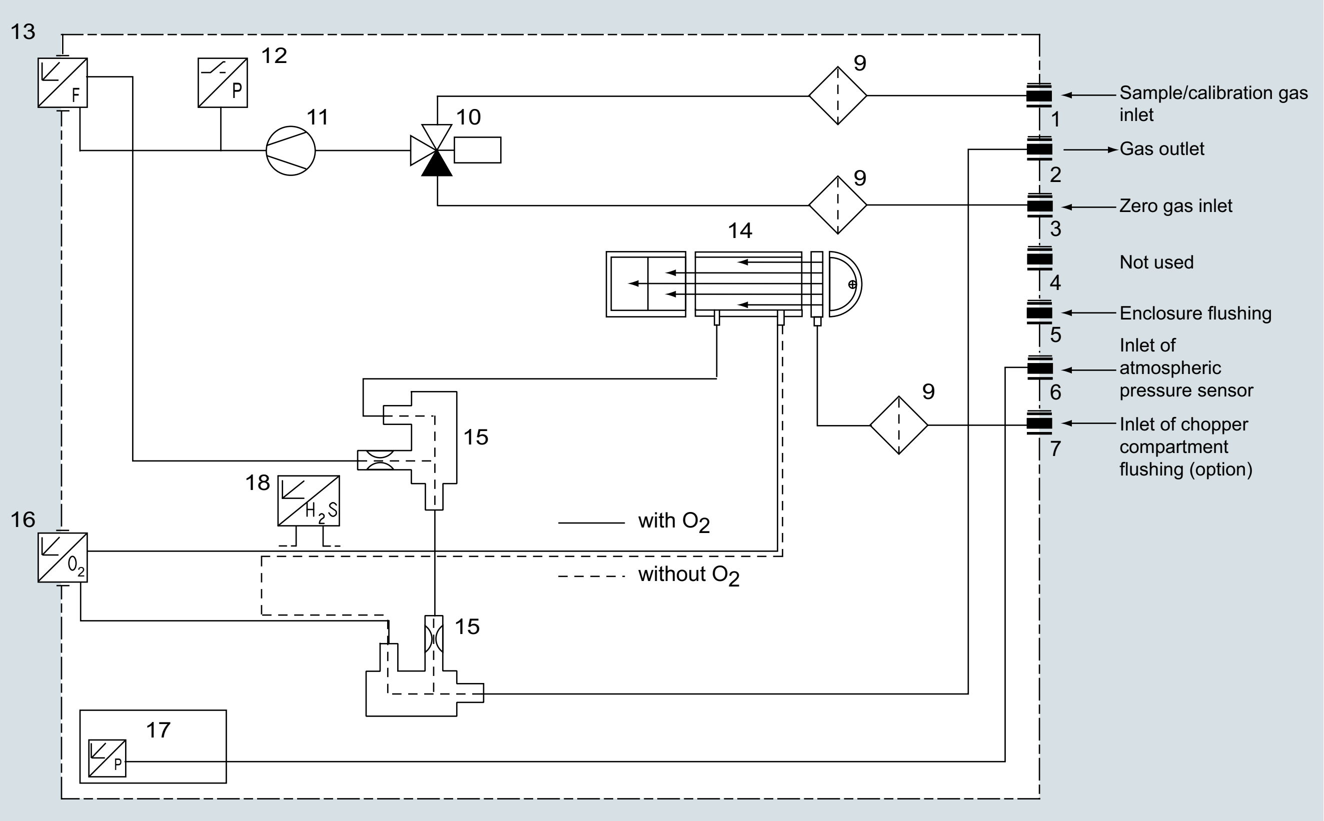
ULTRAMAT 23, 19" rack-mounted enclosure without internal sample gas pump; optional oxygen measurement



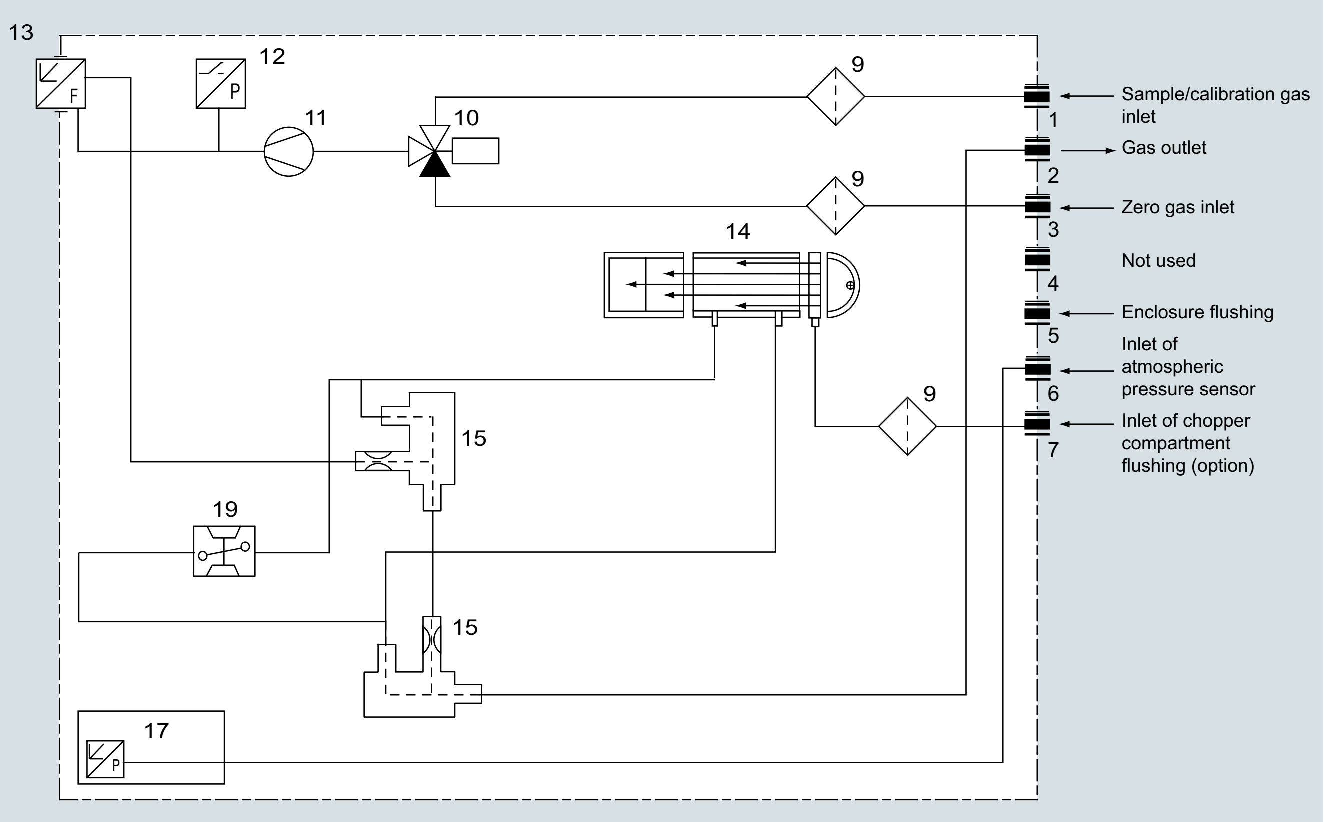
ULTRAMAT 23, 19" rack unit housing without internal sample gas pump, with separate gas path for the 2nd measured component or for the 2nd and 3rd measured component, optional oxygen measurement



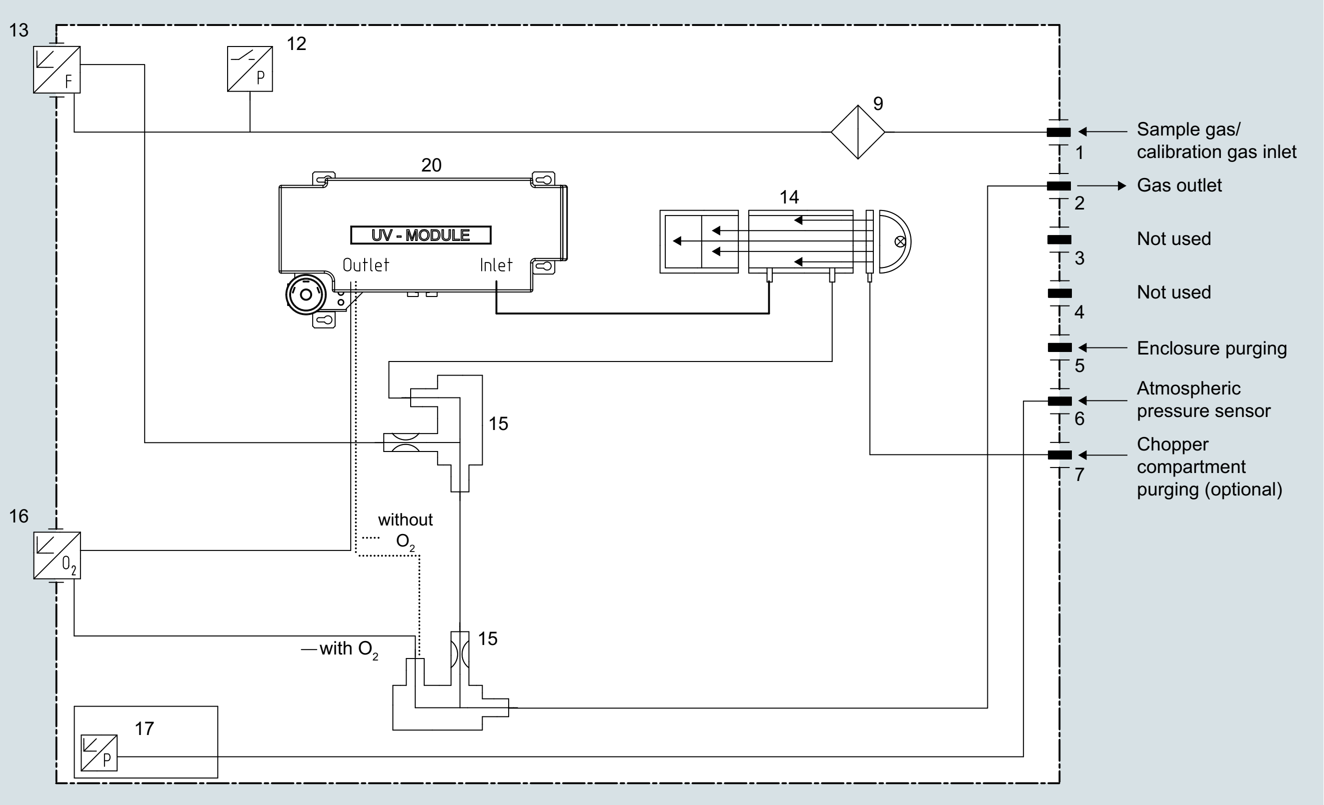
ULTRAMAT 23, 19" rack-mounted enclosure, sample gas path version in pipes, separate gas path, always without sample gas pump, without safety filter and without safety condensation trap



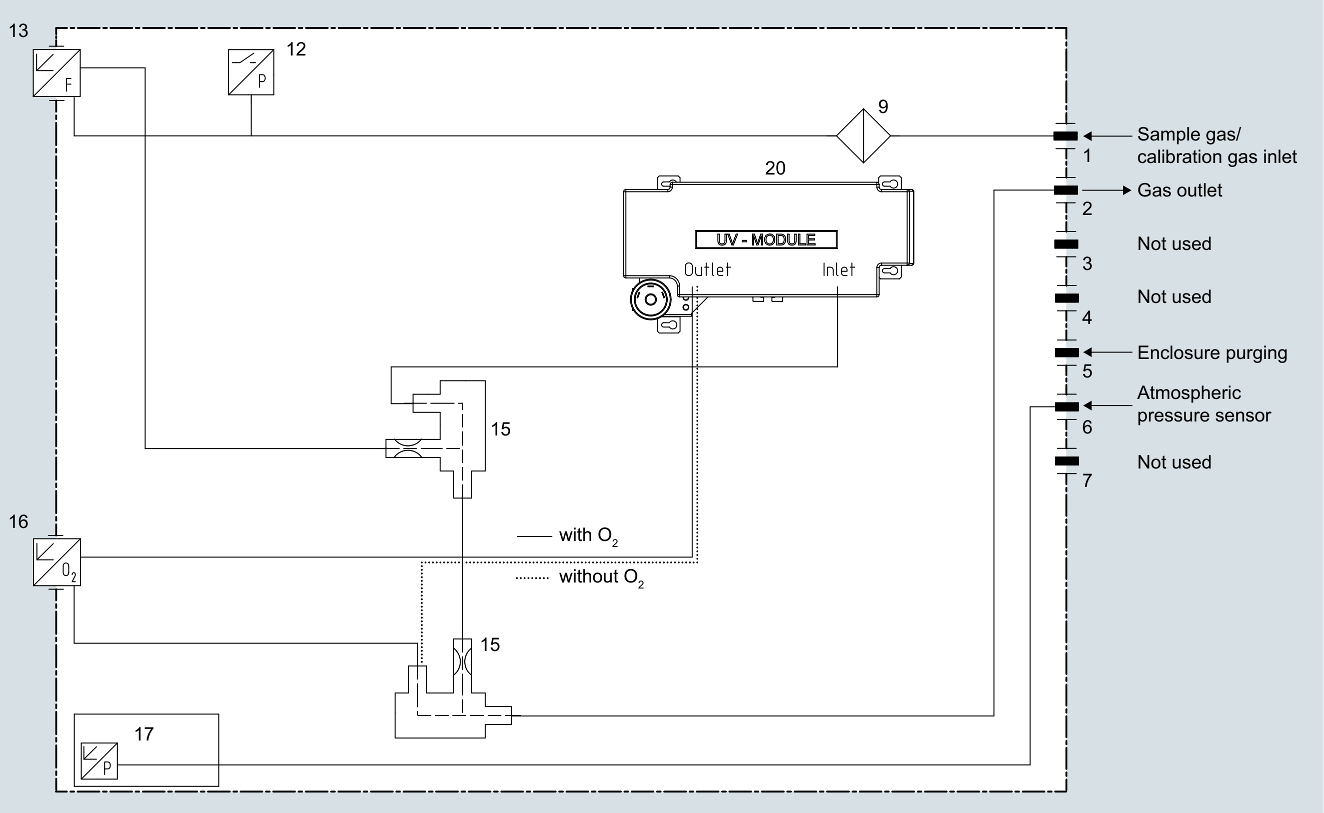
ULTRAMAT 23, 19" rack-mounted enclosure with internal sample gas pump and H_2S sensor



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



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



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

Function

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

Infrared measurement

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

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

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

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

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

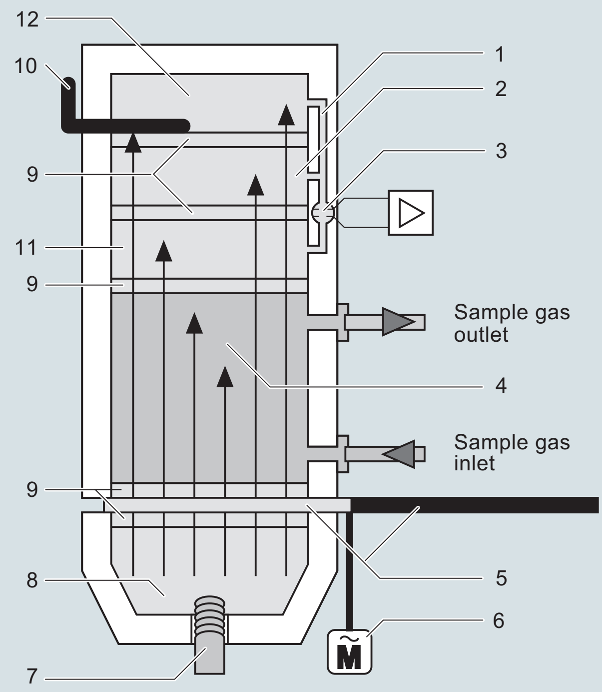
The rotating chopper (5) generates a pulsating flow in the receiver chamber that the microflow sensor (3) converts into an electrical signal.

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

Note

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

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



1 Capillary
2 Second detector layer
3 Microflow sensor
4 Sample cell
5 Chopper wheel
6 Chopper motor
7 IR source
8 Reflector
9 Window
10 Slide
11 First detector layer
12 Third detector layer

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

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

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

c Concentration
k Device-specific constant
U_0 Basic signal with zero gas (sample gas without measured component)
U Detector signal

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

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

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

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

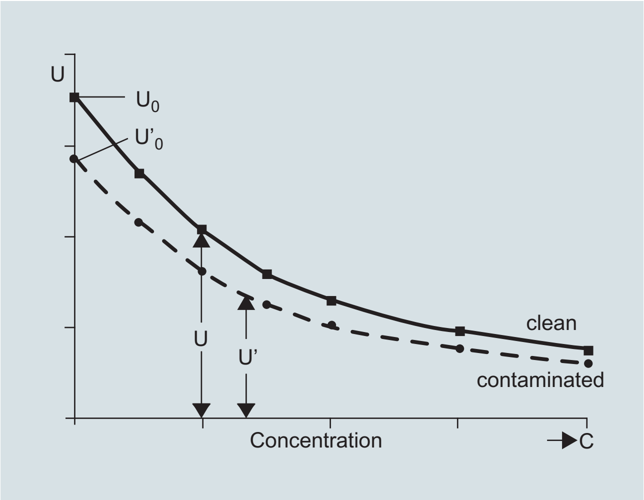
The influences of contamination and aging, as mentioned above, have a negligible influence on the measurement as long as U' remains in a certain tolerance range monitored by the unit.

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

Calibration

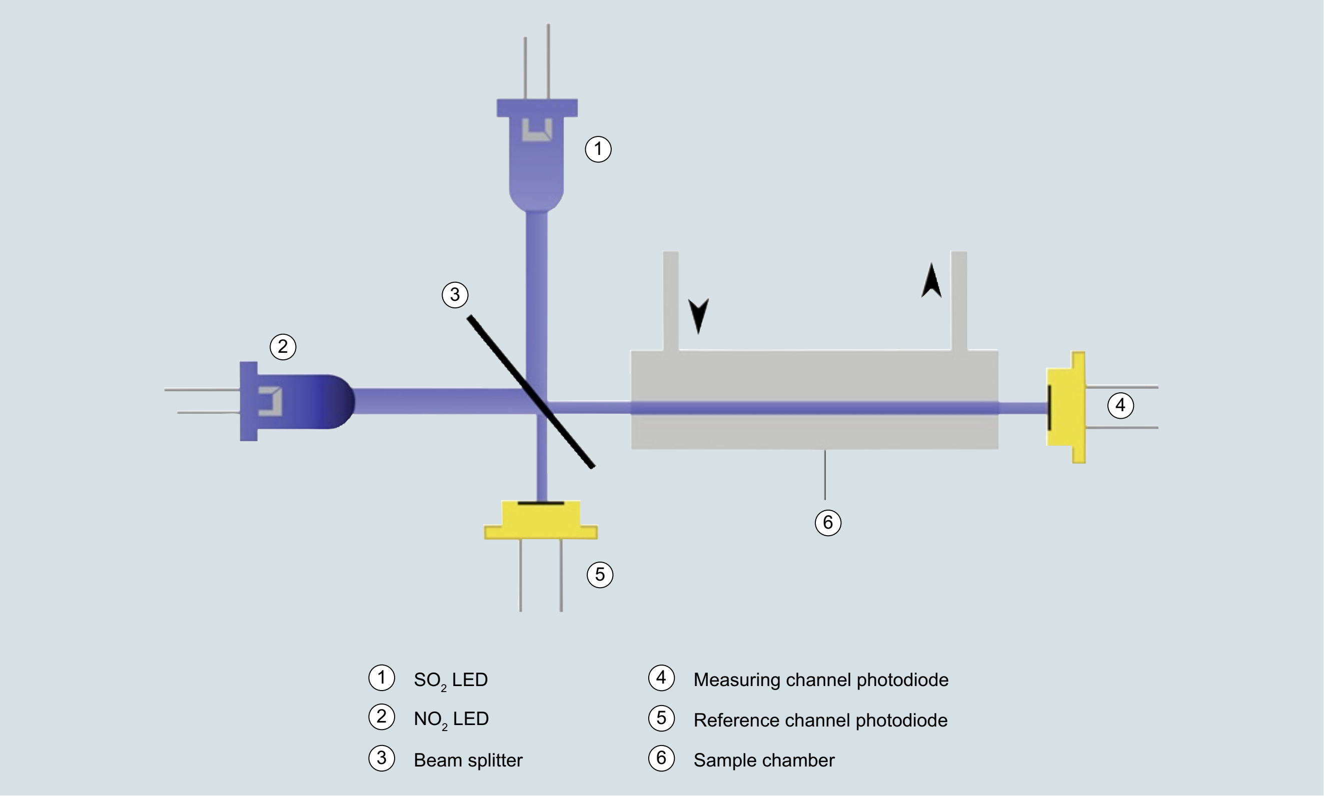
The units can be set to automatically calibrate the zero point every 1 to 24 hours, using ambient air or nitrogen. The calibration point for the IR-sensitive components is calculated mathematically from the newly determined U'_o and the device-specific parameters stored as default values. We recommend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

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



Calibration

Ultraviolet measurement



ULTRAMAT 23, ultraviolet measurement principle

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

The light source is a solid-state diode (LED) based on AlGaN or InGaN 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 (SO_2) and nitrogen dioxide (NO_2) 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.

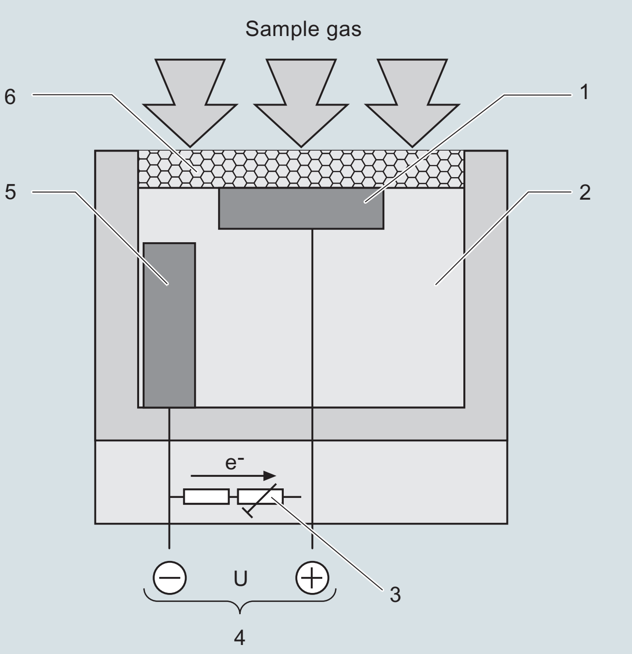
Oxygen measurement

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 resistor, where a measured voltage is present. This measured voltage is proportional to the concentration of oxygen in the sample gas.

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

Note

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



1 Gold cathode
2 Electrolyte (acetic acid)
3 Thermistor and load resistor for temperature compensation
4 Signal output
5 Lead anode
6 Oxygen diffusion membrane made of FEP

ULTRAMAT 23, operating principle of the oxygen sensor

Electrochemical sensor for H_2S determination

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

Calibration

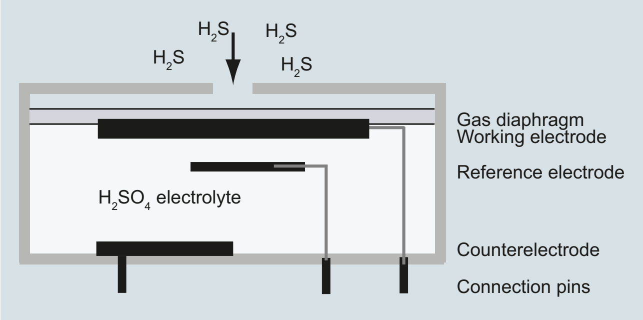
The zero point is automatically recalibrated by the AUTOCAL function when connecting e.g. nitrogen or air. It is recommendable to check the calibration point monthly using calibration gas (45 to 50 vpm).

The AUTOCAL (with ambient air, for example) must be performed every hour. In so doing, you must ensure that the ambient air is saturated in accordance with a dew point of 11 °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



Operating principle of the H_2S sensor

Paramagnetic oxygen cell

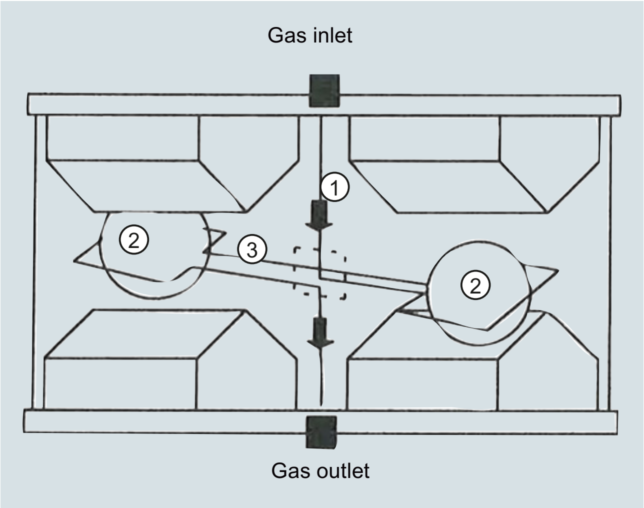
In contrast to other gases, oxygen is highly paramagnetic. This property is used as the basis for the method of measurement.

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

Calibration

The calibration point is calibrated with the AUTOCAL function when processing air (corresponding to calibration with the electrochemical O_2 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

General information

Cross-interferences, paramagnetic oxygen cells

Accompanying gas	Formula	Deviation at 20 °C	Deviation at 50 °C
Acetaldehyde	C_2H_4O	-0.31	-0.34
Acetone	C_3H_6O	-0.63	-0.69
Acetylene, ethyne	C_2H_2	-0.26	-0.28
Ammonia	NH_3	-0.17	-0.19
Argon	Ar	-0.23	-0.25
Benzene	C_6H_6	-1.24	-1.34
Bromine	Br_2	-1.78	-1.97
Butadiene	C_4H_6	-0.85	-0.93
n-butane	C_4H_{10}	-1.1	-1.22
Iso-butylene	C_4H_8	-0.94	-1.06
Chlorine	Cl_2	-0.83	-0.91
Diacetylene	C_4H_2	-1.09	-1.2
Dinitrogen monoxide	N_2O	-0.2	-0.22
Ethane	C_2H_6	-0.43	-0.47
Ethyl benzene	C_8H_{10}	-1.89	-2.08
Ethylene, ethene	C_2H_4	-0.2	-0.22
Ethylene glycol	$C_2H_6O_2$	-0.78	-0.88
Ethylene oxide	C_2H_4O	-0.54	-0.6
Furan	C_4H_4O	-0.9	-0.99
Helium	He	0.29	0.32
n-hexane	C_6H_{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_4O	-0.27	-0.31
Methylene chloride	CH_2Cl_2	-1	-1.1
Monosilane, silane	SiH_4	-0.24	-0.27
Neon	Ne	0.16	0.17
n-octane	C_8H_{18}	-2.45	-2.7
Phenol	C_6H_6O	-1.4	-1.54
Propane	C_3H_8	-0.77	-0.85
Propylene, propene	C_3H_6	-0.57	-0.62
Propylene chloride	C_3H_7Cl	-1.42	-1.44
Propylene oxide	C_3H_6O	-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_2S	-0.41	-0.43
Nitrogen	N_2	0	0
Nitrogen dioxide	NO_2	5	16
Nitrogen monoxide	NO	42.7	43

Accompanying gas	Formula	Deviation at 20 °C	Deviation at 50 °C
Styrene	C_8H_8	-1.63	-1.8
Toluene	C_7H_8	-1.57	-1.73
Vinyl chloride	C_2H_3Cl	-0.68	-0.74
Vinyl fluoride	C_2H_3F	-0.49	-0.54
Water (vapor)	H2O	-0.03	-0.03
Hydrogen	H_2	0.23	0.26
Xenon	Xe	-0.95	-1.02

Cross-sensitivities (with accompanying gas concentration 100%)

ULTRAMAT 23 essential characteristics

- Practically maintenance-free thanks to AUTOCAL with ambient air (or with N_2, only for units without an oxygen sensor); both the zero point and the sensitivity are calibrated in the process
- Calibration with calibration gas only required every twelve months, depending on the application
- Two measuring ranges per component can be set within specified limits; all measuring ranges linearized; autoranging with measuring range identification
- Automatic correction of variations in atmospheric pressure
- Sample gas flow monitoring;
  error message output if flow < 1 l/min
  (only with Viton sample gas path)
- Maintenance demanded
- Two freely configurable undershooting or overshooting limit values per measured component

Technical specifications

19" rack unit and portable version

General information	
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) Safety extra-low voltage (SELV) with safe isolation	In accordance with standard requirements of NAMUR NE21 or EN 61326-1
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, isolated, 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, potential-free, non-sparking
Digital inputs	3, dimensioned for 24 V, potential-free • Pump • AUTOCAL • Synchronization
Serial interface	RS 485
AUTOCAL function	Automatic unit 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, O_2) • +5 ... 40 °C (H_2S sensor) • +15 ... 35 °C (UV photometer)
• During storage and transportation	• -25 ... 60 °C (IR detector, O_2, UV photometer) • -10 ... 60 °C (H_2S sensor)
Permissible ambient humidity	< 90% RH (relative humidity) during storage and transportation
Permissible pressure fluctuations	• 600 … 1 200 hPa (IR detector, O_2, UV photometer) • 750 … 1 200 hPa (H_2S sensor)

Gas inlet conditions	
Sample gas pressure	
• Without pump	Unpressurized (< 1 200 hPa, absolute)
• With pump	Depressurized suction mode, factory preset with 2 m hose at sample gas outlet; full-scale value calibration necessary under different restrictor conditions (800 ... 1 050 hPa, absolute)
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

Infrared channel

So that the technical data can be complied with, a cycle time of ≤ 24 hours must be activated for the AUTOCAL. The cycle time of the AUTOCAL function must be ≤ 6 hours when measuring small NO and SO_2 measuring ranges (≤ 400 mg/m³) on TÜV/QAL-certified systems.

Measuring ranges	See ordering data
Chopper compartment flushing	Upstream 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 attenuation
Damping (electrical time constant)	Configurable from 0 … 99.9 s
Measuring response	Based on sample gas pressure 1 013 hPa absolute, 1.0 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation	< ± 1% of the current measuring range (see rating plate)
Detection limit	1% of the current measuring range
Linearity error	• In the largest possible measuring range: < ± 1% of the measuring range full scale value • In the smallest possible measuring range: < ± 2% of the measuring range full scale value
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	Based on sample gas pressure 1 013 hPa absolute, 1.0 l/min sample gas flow and 25 °C ambient temperature
Temperature	Max. 2% of the smallest possible measuring range according to rating plate 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%

Oxygen channel (electrochemical)

Measuring ranges	0 … 5 % to 0 … 25 % O_2, configurable
Service life	Approx. 2 years with 21% O_2
Detection limit	1% of the current measuring range
Time response	
Delayed display (T_{90} time)	Dependent on dead time and configurable attenuation, not > 30 s at approximately 1.2 l/min sample gas flow
Measuring response	Based on sample gas pressure 1 013 hPa absolute, 1.0 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation	< ± 0.5% of the current measuring range
Linearity error	< ± 0.2% of the current measuring range
Repeatability	≤ 0.05% O_2
Drift	
• With AUTOCAL	Negligible
Influencing variables	Based on sample gas pressure 1 013 hPa absolute, 1.0 l/min sample gas flow and 25 °C ambient temperature
Temperature	< ± 0.5% O_2 per 20 K, relating to a measured value at 20 °C
Atmospheric pressure	< 0.2% of the measured value per 1% pressure variation
Accompanying gases	The oxygen sensor must not be used if the accompanying gas contains the following components: Chlorine or fluorine compounds, heavy metals, aerosols, mercaptans, alkaline components (such as NH_3 in % range)
Typical combustion exhaust gases	Influence: < 0.05% O_2
Humidity	H_2O dew point ≥ 2 °C; the oxygen sensor must not be used with dry sample gases (however, no condensation either)

Ultraviolet photometer

To ensure compliance with the technical specifications, a cycle time of ≤ 24 hours must be activated for the AUTOCAL. The technical specifications are based on a sample gas pressure of 1 013 ±5 hPa absolute, a sample gas flow of 1.2 ±0.2 l/min and an ambient temperature of 25 ±2 °C. They apply to the SO_2 and NO_2 sample gas components.

Measuring ranges	The measuring ranges are calibrated with a certified calibration gas, whereby a concentration specification in ppm in accordance with EN1343 must be converted to the unit mg/m^3 at a reference temperature of 0 °C and a reference pressure of 1 013 hPa.
SO_2	
• Smallest measuring range	0 ... 50 mg/m^3
• Largest measuring range	0 ... 1 250 mg/m^3
NO_2	
• Smallest measuring range	0 ... 50 mg/m^3
• Largest measuring range	0 ... 1 250 mg/m^3

Time response	
Warm-up period	30 min The technical specification will be met after 2 h
Response time (T_{90}time)	Dependent on the external gas preparation, the length of the sample gas feed line and the configurable damping (see below) of the analyzer. **Note:** SO_2 is highly soluble in water! ≤ 30 s after sample gas input at a damping of ≤ 12 s
Damping (electronic time constant)	0 ... 99.9 s, can be set
Measuring response	
Output signal fluctuation	≤ 1% of set full-scale value
Detection limit	1% of set full-scale value or: • 1 mg/m^3 (SO_2) • 0.8 mg/m^3 (NO_2) This corresponds to 0.4 ppm for both components
Linearity error	
• In the largest measuring range	≤ 1% of set full-scale value
• In the smallest measuring range	≤ 2% of set full-scale value
Repeatability	≤ 1% of set full-scale value
Influencing variables	
Temperature error	≤ 4% of smallest full-scale value/10 K in ambient temperature range of 5 ... 45 °C
Air pressure	≤ 1% of set full-scale value per 1% pressure change
Auxiliary power supply	≤ 0.1% of set full-scale value with a change of ±10%
Drift (zero point and full-scale value)	
• AUTOCAL activated	Negligible depending on the cycle time setting
• AUTOCAL deactivated	
- NO_2	≤ 0.85 mg/m^3/day
- SO_2	≤ 1.25 mg/m^3/day
	Note It can take up to 12 hours after the device is put into operation before these values are reached.
Accompanying gases	
• Humidity up to 20 °C dew point	Negligible
• CO_2 ≤ 16% vol	Negligible
• Exclusions	• Sulfur compounds other than SO_2 • Halogen compounds • Chlorine • Acetone • Ozone

H_2S channel for measuring ranges of 5 ... 50 vpm

Measured components	Maximum of 4, comprising up to 2 infrared-sensitive gases, an oxygen component and a hydrogen sulfide component
Measuring ranges	
• Smallest measuring range	0 ... 5 vpm
• Largest measuring range	0 ... 50 vpm
Service life of the sensor	Approx. 12 months
Permissible atmospheric pressure	750 ... 1 200 hPa
Permissible operating temperature	5 ... 40 °C (41 ... 104 °F)
Operating mode	• 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. NH_3 > 5 vpm)
Cross-inferences (interfering gases)	1 360 vpm SO_2 result in a cross-interference of < 20 vpm H_2S 180 vpm NO result in a cross-interference of < 150 vpm H_2S No cross-interference of CH_4, CO_2 and H_2 (1 000 vpm)
Temperature	< 3% /10 K referred to full-scale value
Atmospheric pressure	< 0.2% of the measured value per 1% pressure variation
Measuring response	
Delayed display (T90 time)	< 40 s with sample gas flow of approx. 1 ... 1.2 l/min
Output signal noise	< 2% of smallest measuring range with an attenuation constant of 30 s
Display resolution	< 0.01 vpm H_2S
Output signal resolution	< 1% of smallest measuring range with an attenuation constant of 30 s
Repeatability	< 4% of smallest measuring range
Drift	< 1% of the current measuring range per month

Paramagnetic oxygen cell

Measured components	Maximum of 4, comprising up to 3 infrared-sensitive gases and an oxygen component
Measuring ranges	2 per component • Min. 0 ... 2% vol O_2 • Max. 0 ... 100% vol O_2 • Suppressed measuring range possible; e.g. 95 ... 100%
Permissible operating temperature	5 ... 45 °C (41 ... 113 °F)
Cross-inferences (interfering gases)	See "Paramagnetic oxygen cell cross-interference" table (page 1/214)
Zero point drift	• Measuring range 2%: max. 0.1% with weekly zero adjustment • Measuring range 5%: max. 0.1% with weekly zero adjustment • Measuring range 25% or greater: max. 0.5% with monthly zero adjustment
Measured-value drift	Negligible with AUTOCAL
Temperature error	< 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

Selection and ordering data

Selection and ordering data			Article No.	Cannot be combined
ULTRAMAT 23 gas analyzer For measuring 1 infrared component, UV components, oxygen and hydrogen sulfide			↗ **7MB2335- ■■■■■ - ■AA■**	
↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.				
Enclosure, version and gas paths 19" rack unit for installation in cabinets				
Gas connections	Gas path	Internal sample gas pump		
6 mm pipe	Viton	Without[2]	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	Without[2]	6	6 6 → E20
¼" pipe	Stainless steel, mat. no. 1.4571	Without[2]	7	7 7 → E20
Portable, in sheet steel enclosure, 6 mm gas connections, Viton gas path, with integrated sample gas pump, condensation trap with safety filter on the front plate			8	8 8 8 → E20
Measured component	Possible with measuring range identification			
CO	D, E, F, G ... R, U, X		A	A
CO_2[1]	D[6], G[6], H[6], J[6], K ... R		C	C
CH_4	E, H, L, N, P, R		D	D
C_2H_4	K		F	F
C_6H_{14}	K		M	M
SO_2[13]	B[10], F ... L, S[12], T[11], W		N	N
NO	E, G ... J, T, V, W		P	P P
N_2O[7]	E		S	S
SF_6	H		V	V
Smallest measuring range	Largest measuring range			
0 ... 200 mg/m³	0 ... 1 000 mg/m³		B	
0 ... 50 vpm	0 ... 250 vpm		D	
0 ... 100 vpm	0 ... 500 vpm		E	
0 ... 150 vpm	0 ... 750 vpm		F	
0 ... 200 vpm	0 ... 1 000 vpm		G	
0 ... 500 vpm	0 ... 2 500 vpm		H	
0 ... 1 000 vpm	0 ... 5 000 vpm		J	
0 ... 2 000 vpm	0 ... 10 000 vpm		K	
0 ... 0.5 %	0 ... 2.5 %		L	
0 ... 1 %	0 ... 5 %		M	
0 ... 2 %	0 ... 10 %		N	
0 ... 5 %	0 ... 25 %		P	
0 ... 10 %	0 ... 50 %		Q	
0 ... 20 %	0 ... 100 %		R	
0 ... 50 mg/m³	0 ... 1 250 mg/m³		S	S
0 ... 100 mg/m³	0 ... 750 mgm³		T	
0 ... 150 mg/m³	0 ... 750 mg/m³		U	
0 ... 250 mg/m³	0 ... 1 250 mg/m³		V	
0 ... 400 mg/m³	0 ... 2 000 mg/m³		W	
0 ... 50 vpm	0 ... 2 500 vpm		X	
Oxygen measurement[5]				
Without O_2 sensor			0	
With electrochemical O_2 sensor			1	1
With paramagnetic oxygen measuring cell			8	8 8 8
Hydrogen sulfide measurement				
Without			6	
With H_2S sensor 0 ... 5/50 vpm			7	7 7 7
Power supply				
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	
Operating software, documentation[3]				
German			0	
English			1	
French			2	
Spanish			3	
Italian			4	

Footnotes: See next page.

Selection and ordering data

Additional versions	**Order code**
Add "-**Z**" to Article No. and specify Order code	
Add-on electronics with 8 digital inputs/outputs, PROFIBUS PA interface	**A12**
Add-on electronics with 8 digital inputs/outputs, PROFIBUS DP interface	**A13**
IEC plug, 37-pin sub-D connector, 9-pin sub-D connector	**A33**
TAG labels (specific lettering based on customer information)	**B03**
Clean for O_2 service (specially cleaned gas path)	**B06**
Gas path for short response time[9)]	**C01**
Chopper compartment purging for 6 mm gas connection	**C02**
Chopper compartment purging for ¼" gas connection	**C03**
Presetting to reference temperature 0 °C for conversion into mg/m³, applies to all components	**D15**
IEC Ex: Ex ec ic nC IIC T4 Gc ATEX: II 3G Ex ec ic nC IIC T4 Gc CSA: • Class I, Div. 2, Gps ABCD, T4 • Class I, Zone 2 Ex nA ic nC II T4Gc Introduction of flammable gases is not permitted	**E20**
Measuring range indication in plain text[4)]	**Y11**
Measurement of CO_2 in forming gas[8)] (only in conjunction with measuring range 0 to 20/0 to 100 %)	**Y14**
Accessories	**Article No.**
CO_2 absorber cartridge	**7MB1933-8AA**
RS 485/Ethernet converter	**A5E00852383**
RS 485/RS 232 converter	**C79451-Z1589-U1**
RS 485/USB converter	**A5E00852382**
Add-on electronics with 8 digital inputs/outputs and PROFIBUS PA	**A5E00056834**
Add-on electronics with 8 digital inputs/outputs and PROFIBUS DP	**A5E00057159**
Set of Torx screwdrivers	**A5E34821625**

1) For measuring ranges below 1 %, a CO_2 absorber cartridge can be used for setting the zero point (see accessories)
2) Without separate zero gas input or solenoid valve
3) User language can be changed
4) Standard setting: smallest measuring range, largest measuring range
5) O_2 sensor/O_2 measuring cell in gas path of infrared measured component 1
6) With chopper compartment purging (N_2 approx. 3 000 hPa required for measuring ranges below 0.1 % CO_2), to be ordered separately (see order code C02 or C03)
7) Not suitable for use with emission measurements since the cross-sensitivity is too high
8) CO_2 measurement in accompanying gas Ar or Ar/He (3:1); forming gas
9) Only for version with Viton hose
10) Maximum possible AUTOCAL cycle ≤ 6 h, constant ambient conditions (max. deviation ±1 °C (1.8 °F)): see table "Calibration intervals, standard devices", page 1/230.
11) Maximum possible AUTOCAL cycle ≤ 3 h, constant ambient conditions (max. deviation ±1 °C (1.8 °F)): see table "Calibration intervals, standard devices", page 1/230.
12) Measured with UV technology
13) When measuring range identification "S" selected: parallel measurement of SO_2 and NO_2 with UV photometer

Selection and ordering data

Selection and ordering data			Article No.	Cannot be combined
ULTRAMAT 23 gas analyzer For measuring 2 infrared components, UV components, oxygen and hydrogen sulfide ↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.			↗ **7MB2337-** ■■■■■ - ■■■■	
Enclosure, version and gas paths 19" rack unit for installation in cabinets				
Gas connections	Gas paths	Internal sample gas pump		
6 mm pipe	Viton, not separate	Without[2]	**0**	
¼" pipe	Viton, not separate	Without[2]	**1**	
6 mm pipe	Viton, not separate	With	**2**	
¼" pipe	Viton, not separate	With	**3**	
6 mm pipe	Viton, separate	Without[2]	**4**	**4 → A27, A29**
¼" pipe	Viton, separate	Without[2]	**5**	**5 → A27, A29**
6 mm pipe	Stainless steel, mat. no. 1.4571, separate	Without[2]	**6**	**6 6**
¼" pipe	Stainless steel, mat. no. 1.4571, separate	Without[2]	**7**	**7 7**
Portable, in sheet steel enclosure, 6 mm gas connections, Viton gas path, with integrated sample gas pump, condensation trap with safety filter on the front plate			**8**	**8 8 8 → E20**
1st infrared measured component				
Measured component	Possible with measuring range identification			
CO	D, E, F, G ... R, U, X		**A**	
CO_2[1]	D[6], G[6], H[6], J[6], K ... R		**C**	
CH_4	E, H, L, N, P, R		**D**	
C_2H_4	K		**F**	
C_6H_{14}	K		**M**	
SO_2	B[11], F ... L, T[12], W		**N**	**N**
NO	E, G ... J, T, V, W		**P**	**P**
N_2O[7]	E		**S**	
SF_6	H		**V**	
Smallest measuring range	Largest measuring range			
0 ... 200 mg/m³	0 ... 1 000 mg/m³		**B**	
0 ... 50 vpm	0 ... 250 vpm		**D**	
0 ... 100 vpm	0 ... 500 vpm		**E**	
0 ... 150 vpm	0 ... 750 vpm		**F**	
0 ... 200 vpm	0 ... 1 000 vpm		**G**	
0 ... 500 vpm	0 ... 2 500 vpm		**H**	
0 ... 1 000 vpm	0 ... 5 000 vpm		**J**	
0 ... 2 000 vpm	0 ... 10 000 vpm		**K**	
0 ... 0.5 %	0 ... 2.5 %		**L**	
0 ... 1 %	0 ... 5 %		**M**	
0 ... 2 %	0 ... 10 %		**N**	
0 ... 5 %	0 ... 25 %		**P**	
0 ... 10 %	0 ... 50 %		**Q**	
0 ... 20 %	0 ... 100 %		**R**	
0 ... 100 mg/m³	0 ... 750 mg/m³		**T**	
0 ... 150 mg/m³	0 ... 750 mg/m³		**U**	
0 ... 250 mg/m³	0 ... 1 250 mg/m³		**V**	
0 ... 400 mg/m³	0 ... 2 000 mg/m³		**W**	
0 ... 50 vpm	0 ... 2 500 vpm		**X**	
Oxygen measurement[5]				
Without O_2 sensor			**0**	
With electrochemical O_2 sensor			**1**	**1**
With paramagnetic oxygen measuring cell			**8**	**8 8 8**
Hydrogen sulfide measurement				
Without			**6**	
With H_2S sensor 0 ... 5/50 vpm			**7**	**7 7 7**
Power supply				
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**	

Selection and ordering data

Selection and ordering data		Article No.	Cannot be combined
ULTRAMAT 23 gas analyzer For measuring 2 infrared components, UV components, oxygen and hydrogen sulfide		**7MB2337-** ■■■■■ **-** ■■■■	
2nd infrared measured component			
Measured component	Possible with measuring range identification		
CO	D, E, F, G ... R, U, X	A	A
CO_2[1)]	D[6)], G[6)], H[6)], J[6)], K ... R	C	C
CH_4	E, H, L, N, P, R	D	D
C_2H_4	K	F	F
C_6H_{14}	K	M	M
SO_2[14)]	B[11)], F ... L, S[13)], T[12)], W	N	
NO	E, G ... J, T, V, W	P	P
N_2O	E[7)], Y[10)]	S	S
SF_6	H	V	V
Smallest measuring range	Largest measuring range		
0 ... 200 mg/m³	0 ... 1 000 mg/m³	B	
0 ... 50 vpm	0 ... 250 vpm	D	
0 ... 100 vpm	0 ... 500 vpm	E	
0 ... 150 vpm	0 ... 750 vpm	F	
0 ... 200 vpm	0 ... 1 000 vpm	G	
0 ... 500 vpm	0 ... 2 500 vpm	H	
0 ... 1 000 vpm	0 ... 5 000 vpm	J	
0 ... 2 000 vpm	0 ... 10 000 vpm	K	
0 ... 0.5 %	0 ... 2.5 %	L	
0 ... 1 %	0 ... 5 %	M	
0 ... 2 %	0 ... 10 %	N	
0 ... 5 %	0 ... 25 %	P	
0 ... 10 %	0 ... 50 %	Q	
0 ... 20 %	0 ... 100 %	R	
0 ... 50 mg/m³	0 ... 1 250 mg/m³	S	S
0 ... 100 mg/m³	0 ... 750 mg/m³	T	
0 ... 150 mg/m³	0 ... 750 mg/m³	U	
0 ... 250 mg/m³	0 ... 1 250 mg/m³	V	
0 ... 400 mg/m³	0 ... 2 000 mg/m³	W	
0 ... 50 vpm	0 ... 2 500 vpm	X	
0 ... 500 vpm	0 ... 5 000 vpm	Y	
Operating software, documentation[3)]			
German		0	
English		1	
French		2	
Spanish		3	
Italian		4	

Footnotes: See next page.

Selection and ordering data

Additional versions	**Order code**
Add "-Z" to Article No. and specify Order code	
Add-on electronics with 8 digital inputs/outputs, PROFIBUS PA interface	**A12**
Add-on electronics with 8 digital inputs/outputs, PROFIBUS DP interface	**A13**
Stainless steel (mat. no. 1.4571) connection pipe, 6 mm, complete with screwed gland (cannot be combined with Viton hose)	**A27**
Stainless steel (mat. no. 1.4571) connection pipe, ¼", complete with screwed gland (cannot be combined with Viton hose)	**A29**
IEC plug, 37-pin sub-D connector, 9-pin sub-D connector	**A33**
TAG labels (specific lettering based on customer information)	**B03**
Clean for O_2 service (specially cleaned gas path)	**B06**
Gas path for short response time[9)]	**C01**
Chopper compartment purging for 6 mm gas connection	**C02**
Chopper compartment purging for ¼" gas connection	**C03**
Application with paramagnetic oxygen measuring cell and separate gas path	**C11**
Presetting to reference temperature 0 °C for conversion into mg/m³, applies to all components	**D15**
IEC Ex: Ex ec ic nC IIC T4 Gc ATEX: II 3G Ex ec ic nC IIC T4 Gc CSA: • Class I, Div. 2, Gps ABCD, T4 • Class I, Zone 2 Ex nA ic nC II T4Gc Introduction of flammable gases is not permitted	**E20**
Measuring range indication in plain text[4)]	**Y11**
Measurement of CO_2 in forming gas[8)] (only in conjunction with measuring range 0 to 20/0 to 100 %)	**Y14**
Accessories	**Article No.**
CO_2 absorber cartridge	**7MB1933-8AA**
RS 485/Ethernet converter RS 485/RS 232 converter RS 485/USB converter	**A5E00852383** **C79451-Z1589-U1** **A5E00852382**
Add-on electronics with 8 digital inputs/outputs and PROFIBUS PA	**A5E00056834**
Add-on electronics with 8 digital inputs/outputs and PROFIBUS DP	**A5E00057159**
Set of Torx screwdrivers	**A5E34821625**

1) For measuring ranges below 1 %, a CO_2 absorber cartridge can be used for setting the zero point (see accessories)
2) Without separate zero gas input or solenoid valve
3) User language can be changed
4) Standard setting: smallest measuring range, largest measuring range
5) O_2 sensor/O_2 measuring cell in gas path of infrared measured component 1
6) With chopper compartment purging (N_2 approx. 3 000 hPa required for measuring ranges below 0.1 % CO_2), to be ordered separately (see order code C02 or C03)
7) Not suitable for use with emission measurements since the cross-sensitivity is too high
8) CO_2 measurement in accompanying gas Ar or Ar/He (3:1); forming gas
9) Only for version with Viton hose
10) Only in conjunction with CO_2 measuring range 0 to 5 % to 0 to 25 % (CP)
11) Maximum possible AUTOCAL cycle ≤ 6 h, constant ambient conditions (max. deviation ±1 °C (1.8 °F): see table "Calibration intervals, standard devices", page 1/230.
12) Maximum possible AUTOCAL cycle ≤ 3 h, constant ambient conditions (max. deviation ±1 °C (1.8 °F)): see table "Calibration intervals, standard devices", page 1/230.
13) Measured with UV technology
14) When measuring range identification "S" selected: parallel measurement of SO_2 and NO_2 with UV photometer

Selection and ordering data			**Article No.**	
ULTRAMAT 23 gas analyzer For measuring 3 infrared components, UV components, oxygen or 2 infrared components and UV components			↗ **7MB2338-** ■■■■ **6 -** ■■■■	Cannot be combined
↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.				

Enclosure, version and gas paths
19" rack unit for installation in cabinets

Gas connections	Gas paths	Internal sample gas pump		Cannot be combined
6 mm pipe	Viton, not separate	Without[2)]	**0**	
¼" pipe	Viton, not separate	Without[2)]	**1**	
6 mm pipe	Viton, not separate	With	**2**	
¼" pipe	Viton, not separate	With	**3**	
6 mm pipe	Viton, separate	Without[2)]	**4**	**4 → A27, A29**
¼" pipe	Viton, separate	Without[2)]	**5**	**5 → A27, A29**
6 mm pipe	Stainless steel, mat. no. 1.4571, separate	Without[2)]	**6**	**6**
¼" pipe	Stainless steel, mat. no. 1.4571, separate	Without[2)]	**7**	**7**
Portable, in sheet steel enclosure, 6 mm gas connections, Viton gas path, with integrated sample gas pump, condensation trap with safety filter on the front plate			**8**	**8 → E20**

1st and 2nd infrared measured component

Measured component	Smallest measuring range	Largest measuring range		
CO NO	0 ... 500 vpm 0 ... 500 vpm	0 ... 2 500 vpm 0 ... 2 500 vpm	**A A**	
CO NO	0 ... 2 000 vpm 0 ... 1 000 vpm	0 ... 10 000 vpm 0 ... 5 000 vpm	**A B**	
CO NO	0 ... 1 000 vpm 0 ... 1 000 vpm	0 ... 5 000 vpm 0 ... 5 000 vpm	**A C**	
CO NO	0 ... 1 % 0 ... 1 000 vpm	0 ... 5 % 0 ... 5000 vpm	**A D**	
CO NO	0 ... 250 mg/m³ 0 ... 400 mg/m³	0 ... 1 250 mg/m³ 0 ... 2 000 mg/m³	**A K**	
CO CO_2	0 ... 10 % 0 ... 10 %	0 ... 50 % 0 ... 50 %	**B A**	
CO CO_2	0 ... 10 % 0 ... 0.5 %	0 ... 50 % 0 ... 2,5 %	**B B**	
CO CO_2	0 ... 20 % 0 ... 20 %	0 ... 100 % 0 ... 100 %	**B D**	
CO_2 CO	0 ... 5 % 0 ... 100 vpm	0 ... 25 % 0 ... 500 vpm	**B J**	
CO_2 CO	0 ... 10 % 0 ... 0.5 %	0 ... 50 % 0 ... 2.5 %	**B K**	
CO_2 CH_4	0 ... 5 % 0 ... 1 %	0 ... 25 % 0 ... 5 %	**C A**	
CO_2 CH_4	0 ... 5 % 0 ... 2 %	0 ... 25 % 0 ... 10 %	**C B**	
CO_2 NO	0 ... 5 % 0 ... 500 vpm	0 ... 25 % 0 ... 2 500 vpm	**D C**	

Oxygen measurement[5)]		Cannot be combined
Without O_2 sensor	**0**	
With electrochemical O_2 sensor	**1**	**1**
With paramagnetic oxygen measuring cell	**8**	**8 8**

Power supply	
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**

Footnotes: See page 1/225.

1

19" rack unit and portable version

Selection and ordering data

Selection and ordering data		Article No.	Cannot be combined
ULTRAMAT 23 gas analyzer For measuring 3 infrared components, UV components, oxygen or 2 infrared components and UV components		**7MB2338- ■■■■6 - ■■■■**	
3rd infrared measured component			
Measured component	Possible with measuring range identification		
CO	D, E, F, G ... R, U, X	A	
CO_2[1]	D[6], G[6], H[6], J[6], K ... R	C	
CH_4	E, H, L, N, P, R	D	
C_2H_4	K	F	
C_6H_{14}	K	M	
SO_2[13]	B[11], F ... L, T[12], W	N	
NO	E, G ... J, V, W	P	
N_2O	E[7], Y[10]	S	
SF_6	H	V	
Smallest measuring range	Largest measuring range		
0 ... 200 mg/m³	0 ... 1 000 mg/m³	B	
0 ... 50 vpm	0 ... 250 vpm	D	
0 ... 100 vpm	0 ... 500 vpm	E	
0 ... 150 vpm	0 ... 750 vpm	F	
0 ... 200 vpm	0 ... 1 000 vpm	G	
0 ... 500 vpm	0 ... 2 500 vpm	H	
0 ... 1 000 vpm	0 ... 5 000 vpm	J	
0 ... 2 000 vpm	0 ... 10 000 vpm	K	
0 ... 0.5 %	0 ... 2.5 %	L	
0 ... 1 %	0 ... 5 %	M	
0 ... 2 %	0 ... 10 %	N	
0 ... 5 %	0 ... 25 %	P	
0 ... 10 %	0 ... 50 %	Q	
0 ... 20 %	0 ... 100 %	R	
0 ... 50 mg/m³	0 ... 1 250 mg/m³	S	
0 ... 100 mg/m³	0 ... 750 mg/m³	T	
0 ... 150 mg/m³	0 ... 750 mg/m³	U	
0 ... 250 mg/m³	0 ... 1 250 mg/m³	V	
0 ... 400 mg/m³	0 ... 2 000 mg/m³	W	
0 ... 50 vpm	0 ... 2 500 vpm	X	
0 ... 500 vpm	0 ... 5 000 vpm	Y	
Operating software, documentation[3]			
German		0	
English		1	
French		2	
Spanish		3	
Italian		4	

Footnotes: See page 1/225.

Selection and ordering data

Additional versions	**Order code**
Add "**-Z**" to Article No. and specify Order code	
Add-on electronics with 8 digital inputs/outputs, PROFIBUS PA interface	**A12**
Add-on electronics with 8 digital inputs/outputs, PROFIBUS DP interface	**A13**
Stainless steel (mat. no. 1.4571) connection pipe, 6 mm, complete with screwed gland (cannot be combined with Viton hose)	**A27**
Stainless steel (mat. no. 1.4571) connection pipe, ¼", complete with screwed gland (cannot be combined with Viton hose)	**A29**
IEC plug, 37-pin sub-D connector, 9-pin sub-D connector	**A33**
TAG labels (specific lettering based on customer information)	**B03**
Clean for O_2 service (specially cleaned gas path)	**B06**
Gas path for short response time[9)]	**C01**
Chopper compartment purging for 6 mm gas connection	**C02**
Chopper compartment purging for ¼" gas connection	**C03**
Application with paramagnetic oxygen measuring cell and separate gas path	**C11**
Presetting to reference temperature 0 °C for conversion into mg/m³, applies to all components	**D15**
IEC Ex: Ex ec ic nC IIC T4 Gc ATEX: II 3G Ex ec ic nC IIC T4 Gc CSA: • Class I, Div. 2, Gps ABCD, T4 • Class I, Zone 2 Ex nA ic nC II T4Gc Introduction of flammable gases is not permitted	**E20**
Measuring range indication in plain text[4)]	**Y11**
Measurement of CO_2 in forming gas[8)] (only in conjunction with measuring range 0 to 20/0 to 100 %)	**Y14**
Accessories	**Article No.**
CO_2 absorber cartridge	**7MB1933-8AA**
RS 485/Ethernet converter	**A5E00852383**
RS 485/RS 232 converter	**C79451-Z1589-U1**
RS 485/USB converter	**A5E00852382**
Add-on electronics with 8 digital inputs/outputs and PROFIBUS PA	**A5E00056834**
Add-on electronics with 8 digital inputs/outputs and PROFIBUS DP	**A5E00057159**
Set of Torx screwdrivers	**A5E34821625**

1) For measuring ranges below 1 %, a CO_2 absorber cartridge can be used for setting the zero point (see accessories)
2) Without separate zero gas input or solenoid valve
3) User language can be changed
4) Standard setting: smallest measuring range, largest measuring range
5) O_2 sensor/O_2 measuring cell in gas path of infrared measured component 1
6) With chopper compartment purging (N_2 approx. 3 000 hPa required for measuring ranges below 0.1 % CO_2), to be ordered separately (see order code C02 or C03)
7) Not suitable for use with emission measurements since the cross-sensitivity is too high
8) CO_2 measurement in accompanying gas Ar or Ar/He (3:1); forming gas
9) Only for version with Viton hose
10) Only in combination with CO_2/NO, measuring range 0 to 5/25 %, 0 to 500/5 000 vpm [-DC-]
11) Maximum possible AUTOCAL cycle ≤ 6 h, constant ambient conditions (max. deviation ±1 °C (1.8 °F)): see table "Calibration intervals, standard devices", page 1/230.
12) Maximum possible AUTOCAL cycle ≤ 3 h, constant ambient conditions (max. deviation ±1 °C (1.8 °F)): see table "Calibration intervals, standard devices", page 1/230.
13) When measuring range identification "S" selected: parallel measurement of SO_2 and NO_2 with UV photometer

Selection and ordering data			**Article No.**	
Gas analyzer ULTRAMAT 23 - TÜV version For measuring 1 infrared component, UV components and oxygen			↗ **7MB2355- ■■■■6 - ■AA■**	Cannot be combined
↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.				
Enclosure, version and gas paths 19" rack unit for installation in cabinets				
Gas connections	Gas paths	Internal sample gas pump		
6 mm	FPM (Viton)	without	**0**	
Measured component	Possible with measuring range identification			
CO	G, J		**A**	
CO_2	P		**C**	
SO_2[1]	F, G, H, W		**N**	
NO	F, G, H, U, V, W		**P**	
Smallest measuring range	Largest measuring range			
0 ... 150 vpm	0 ... 750 vpm	TÜV: see table "TÜV, 1 and 2-component analyzer" page 1/229	**F**	
0 ... 200 vpm	0 ... 1 000 vpm		**G**	
0 ... 500 vpm	0 ... 2 500 vpm		**H**	
0 ... 1 000 vpm	0 ... 5 000 vpm		**J**	
0 ... 5 %	0 ... 25 %		**P**	
0 ... 50 mg/m³	0 ... 1 250 mg/m³	only in conjunction with order code T13/T23/T33	**S**	
0 ... 150 mg/m³	0 ... 750 mg/m³		**U**	
0 ... 250 mg/m³	0 ... 1 250 mg/m³		**V**	
0 ... 400 mg/m³	0 ... 2 000 mg/m³		**W**	
Oxygen measurement				
Without O_2 sensor			**0**	
With electrochemical O_2 sensor			**1**	
With paramagnetic oxygen measuring cell			**8**	
Power supply				
230 V AC, 50 Hz			**3**	
Operating software, documentation				
German			**0**	
English			**1**	
French			**2**	
Spanish			**3**	
Italian			**4**	

[1] When measuring range identification "S" selected: parallel measurement of SO_2 and NO_2 with UV photometer

Selection and ordering data	
Additional versions	**Order code**
Add "**-Z**" to Article No. and specify Order code	
Add-on electronics with 8 digital inputs/outputs, PROFIBUS PA interface	**A12**
Add-on electronics with 8 digital inputs/outputs, PROFIBUS DP interface	**A13**
IEC plug, 37-pin sub-D connector, 9-pin sub-D connector	**A33**
O_2 paramagnetic, suitability-tested EN 15267, IR measuring range in mg/m³	**T13**
O_2 paramagnetic, suitability-tested EN 15267, IR measuring range in mg/m³, greater measuring range	**T14**
O_2 electrochemical, suitability-tested EN 15267, IR measuring range in mg/m³	**T23**
O_2 paramagnetic, suitability-tested EN 15267, IR measuring range in mg/m³, greater measuring range	**T24**
Without O_2, suitability-tested EN 15267, IR measuring range in mg/m³	**T33**
Without O_2, suitability-tested EN 15267, IR measuring range in mg/m³, greater measuring range	**T34**
SO_2 with measuring range 0 … 400/7000 mg/m³	**Y15**

Selection and ordering data			**Article No.**	
Gas analyzer ULTRAMAT 23 - TÜV version For measuring 2 infrared components, UV components and oxygen			↗ **7MB2357- ■■■■6 - ■■■■**	Cannot be combined
↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.				
Enclosure, version and gas paths 19" rack unit for installation in cabinets				
Gas connections	Gas paths	Internal sample gas pump		
6 mm	FPM (Viton, not separate)	without	**0**	
1st infrared measured component				
Measured component	Possible with measuring range identification			
CO	G, J		**A**	**A**
CO_2	P		**C**	
SO_2	F, G, H, W		**N**	**N**
NO	F, G, H, U, V, W		**P**	**P**
Smallest measuring range	Largest measuring range			
0 ... 150 vpm	0 ... 750 vpm	TÜV: see table "TÜV, 1 and 2-component analyzer" page 1/229	**F**	
0 ... 200 vpm	0 ... 1 000 vpm		**G**	
0 ... 500 vpm	0 ... 2 500 vpm		**H**	
0 ... 1 000 vpm	0 ... 5 000 vpm		**J**	
0 ... 5 %	0 ... 25 %	only in conjunction with order code T13/T23/T33	**P**	
0 ... 150 mg/m³	0 ... 750 mg/m³		**U**	
0 ... 250 mg/m³	0 ... 1 250 mg/m³		**V**	
0 ... 400 mg/m³	0 ... 2 000 mg/m³		**W**	
Oxygen measurement				
Without O_2 sensor			**0**	
With electrochemical O_2 sensor			**1**	
With paramagnetic oxygen measuring cell			**8**	
Power supply				
230 V AC, 50 Hz			**3**	
2nd infrared measured component				
Measured component	Possible with measuring range identification			
CO	G, J		**A**	**A**
CO_2	P		**C**	
SO_2[1)]	F, G, H, W		**N**	**N**
NO	F, G, H, U, V, W		**P**	**P**
Smallest measuring range	Largest measuring range			
0 ... 150 vpm	0 ... 750 vpm	TÜV: see table "TÜV, 1 and 2-component analyzer" page 1/229	**F**	
0 ... 200 vpm	0 ... 1 000 vpm		**G**	
0 ... 500 vpm	0 ... 2 500 vpm		**H**	
0 ... 1 000 vpm	0 ... 5 000 vpm		**J**	
0 ... 5 %	0 ... 25 %	only in conjunction with order code T13/T23/T33	**P**	
0 ... 50 mg/m³	0 ... 1 250 mg/m³		**S**	
0 ... 150 mg/m³	0 ... 750 mg/m³		**U**	
0 ... 250 mg/m³	0 ... 1 250 mg/m³		**V**	
0 ... 400 mg/m³	0 ... 2 000 mg/m³		**W**	
Operating software, documentation				
German			**0**	
English			**1**	
French			**2**	
Spanish			**3**	
Italian			**4**	

1) When measuring range identification "S" selected: parallel measurement of SO_2 and NO_2 with UV photometer

Selection and ordering data	
Additional versions	**Order code**
Add "-**Z**" to Article No. and specify Order code	
Add-on electronics with 8 digital inputs/outputs, PROFIBUS PA interface	**A12**
Add-on electronics with 8 digital inputs/outputs, PROFIBUS DP interface	**A13**
IEC plug, 37-pin sub-D connector, 9-pin sub-D connector	**A33**
O_2 paramagnetic, suitability-tested EN 15267, IR measuring range in mg/m³	**T13**
O_2 paramagnetic, suitability-tested EN 15267, IR measuring range in mg/m³, greater measuring range	**T14**
O_2 electrochemical, suitability-tested EN 15267, IR measuring range in mg/m³	**T23**
O_2 paramagnetic, suitability-tested EN 15267, IR measuring range in mg/m³, greater measuring range	**T24**
Without O_2, suitability-tested EN 15267, IR measuring range in mg/m³	**T33**
Without O_2, suitability-tested EN 15267, IR measuring range in mg/m³, greater measuring range	**T34**
SO_2 with measuring range 0 … 400/7000 mg/m³	**Y15**

1

19" rack unit and portable version

Selection and ordering data			Article No.	Cannot be combined
Gas analyzer ULTRAMAT 23 - TÜV version For measuring 3 infrared components, UV components, oxygen or 2 infrared components and UV components			7MB2358- ■■■■ 6 - ■■■■	
Click on the Article No. for the online configuration in the PIA Life Cycle Portal.				
Enclosure, version and gas paths 19" rack unit for installation in cabinets				
Gas connections	Gas paths	Internal sample gas pump		
6 mm	FPM (Viton, not separate)	without	0	
1st and 2nd infrared measured component				
Measured component	Smallest measuring range	Largest measuring range		
CO	0 ... 250 mg/m^3	0 ... 1 250 mg/m^3	A	
NO	0 ... 400 mg/m^3	0 ... 2 000 mg/m^3	K	
Oxygen measurement				
Without O_2 sensor			0	
With electrochemical O_2 sensor			1	
With paramagnetic oxygen measuring cell			8	
Power supply				
230 V AC, 50 Hz			3	
3rd infrared measured component				
Measured component	Possible with measuring range identification			
SO_2 1)	F, G, H, W		N	
Smallest measuring range	Largest measuring range			
0 ... 150 vpm	0 ... 750 vpm	TÜV: see table "TÜV, 3-component analyzer" page 1/229	F	
0 ... 200 vpm	0 ... 1 000 vpm		G	
0 ... 500 vpm	0 ... 2 500 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	
Operating software, documentation				
German			0	
English			1	
French			2	
Spanish			3	
Italian			4	

1) When measuring range identification "S" selected: parallel measurement of SO_2 and NO_2 with UV photometer

Selection and ordering data	
Additional versions	**Order code**
Add "-**Z**" to Article No. and specify Order code	
Add-on electronics with 8 digital inputs/outputs, PROFIBUS PA interface	**A12**
Add-on electronics with 8 digital inputs/outputs, PROFIBUS DP interface	**A13**
IEC plug, 37-pin sub-D connector, 9-pin sub-D connector	**A33**
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**
SO_2 with measuring range 0 … 400/7000 mg/m^3	**Y15**

TÜV, 1 and 2-component analyzer

Only in conjunction with order code T13/T23/T33

Component	CO (TÜV)		SO_2 (TÜV)		NO (TÜV)	
Measuring range identification	**Smallest measuring range from 0 to ...**	**Largest measuring range from 0 to ...**	**Smallest measuring range from 0 to ...**	**Largest measuring range from 0 to ...**	**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, TÜV
IR component: CO
Measuring range: 0 to 200 / 1 250 mg/m^3
with electrochem. O_2 sensor
230 V AC; German
7MB2355-0AG16-3AA0-Z +T23

TÜV, 3-component analyzer

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

Component	CO (TÜV)		SO_2 (TÜV)		NO (TÜV)	
Measuring range identification	**Smallest measuring range from 0 to ...**	**Largest measuring range from 0 to ...**	**Smallest measuring range from 0 to ...**	**Largest measuring range from 0 to ...**	**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, TÜV
IR component: CO/NO + SO_2
Measuring range: CO: 0 to 250 / 1 250 mg/m^3, NO: 0 to 400 / 2 000 mg/m^3, SO_2: 0 to 400 / 2 000 mg/m^3
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 N_2O

7MB2335, 7MB2337 and 7MB2338
(application: Si chip production)

- Measuring range 0 to 100 / 500 vpm (MB designation "E")
- Can only be used to measure N_2O 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 CO_2 for correction of cross-interference

7MB2337-*CP*6-*SY* or
7MB2338-*DC*6-*SY* (including NO measurement)

7MB2337 and 7MB2338
(application with paramagnetic oxygen measuring cell and separate gas path)

7MB2337-4**86-**** - Z + C11
7MB2337-5**86-**** - Z + C11

7MB2338-4**86-**** - Z + C11
7MB2338-5**86-**** - Z + C11

Measured component SF_6

7MB2335, 7MB2337 and 7MB2338
(application: SI chip production)

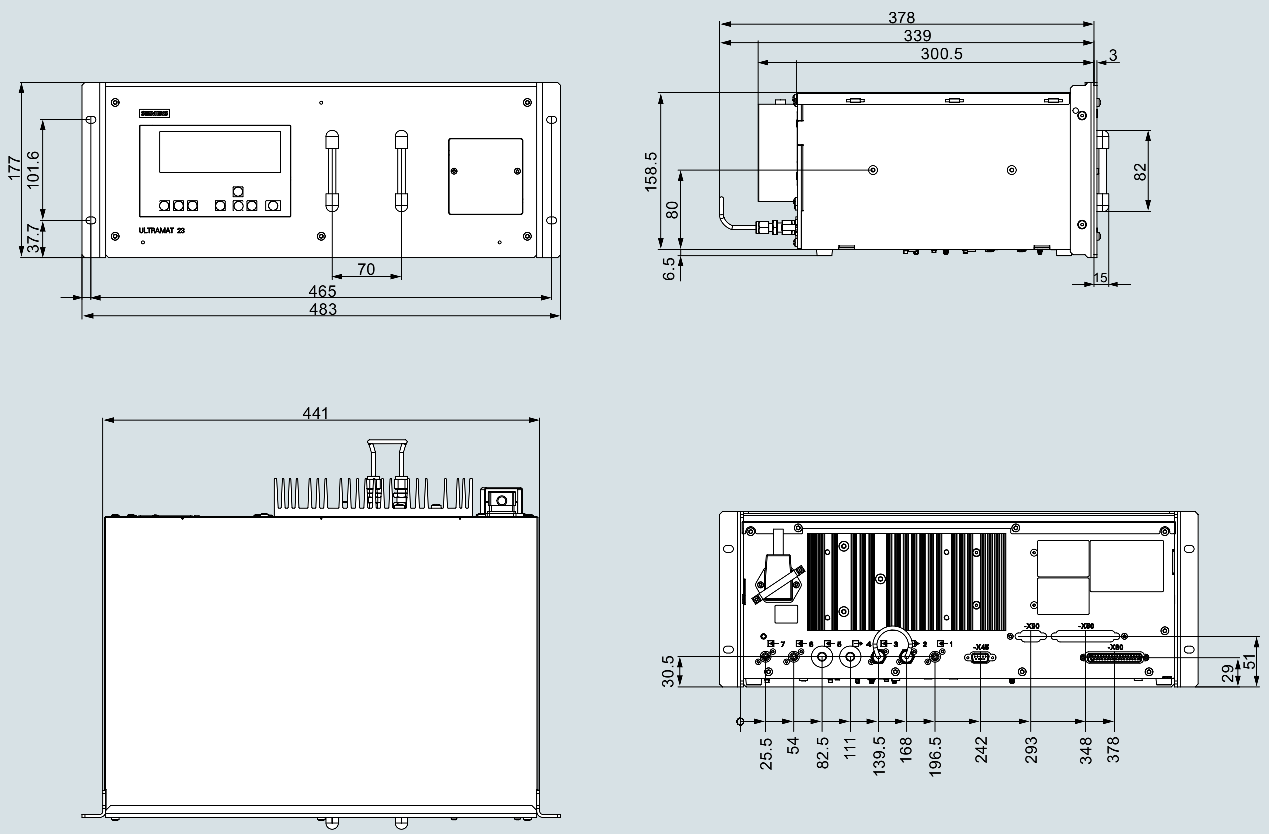
- Measuring range 0 to 500 / 2 500 vpm (MB designation "H")
- Can only be used to measure SF6 in inert gases

	Calibration with calibration gas		Comment
	Zero point	Calibration point	(keep to technical specs)
	Weeks		
IR components	o	52	
O_2 - electrical chemical sensor	52	o	
O_2 paramagnetic Cell	1	o	at MB < 5 %
	8	o	at MB > 5 %
O_2 paramagnetic Cell	o	52	at MB < 5 %
	o	52	at MB > 5 %
H_2S sensor	o	4	

o = with AutoCal, with ambient air or N_2, every 3 ... 24h - dependening on measuring range

Calibration intervals, standard devices

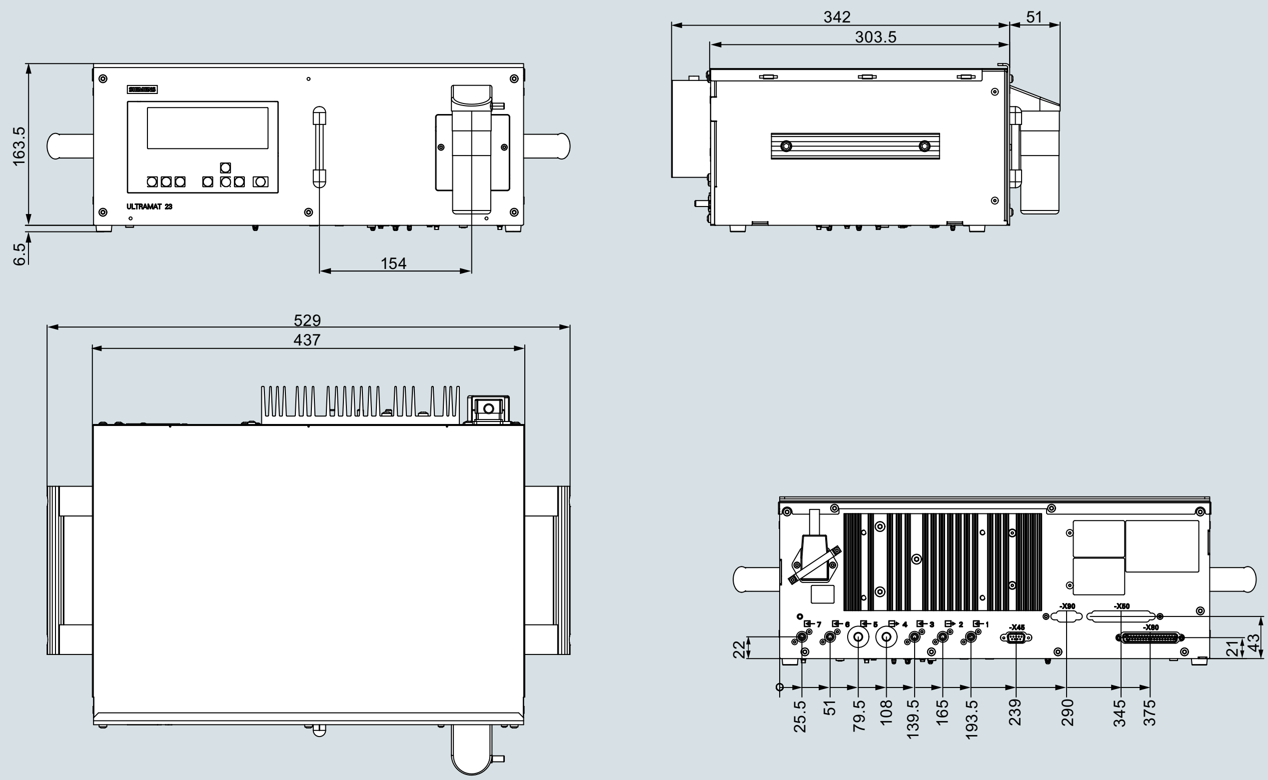
Dimensional drawings



Gas connections: pipe nozzle diameter 6 mm or 1/4"

ULTRAMAT 23, 19" rack unit, dimensions in mm

19" rack unit and portable version

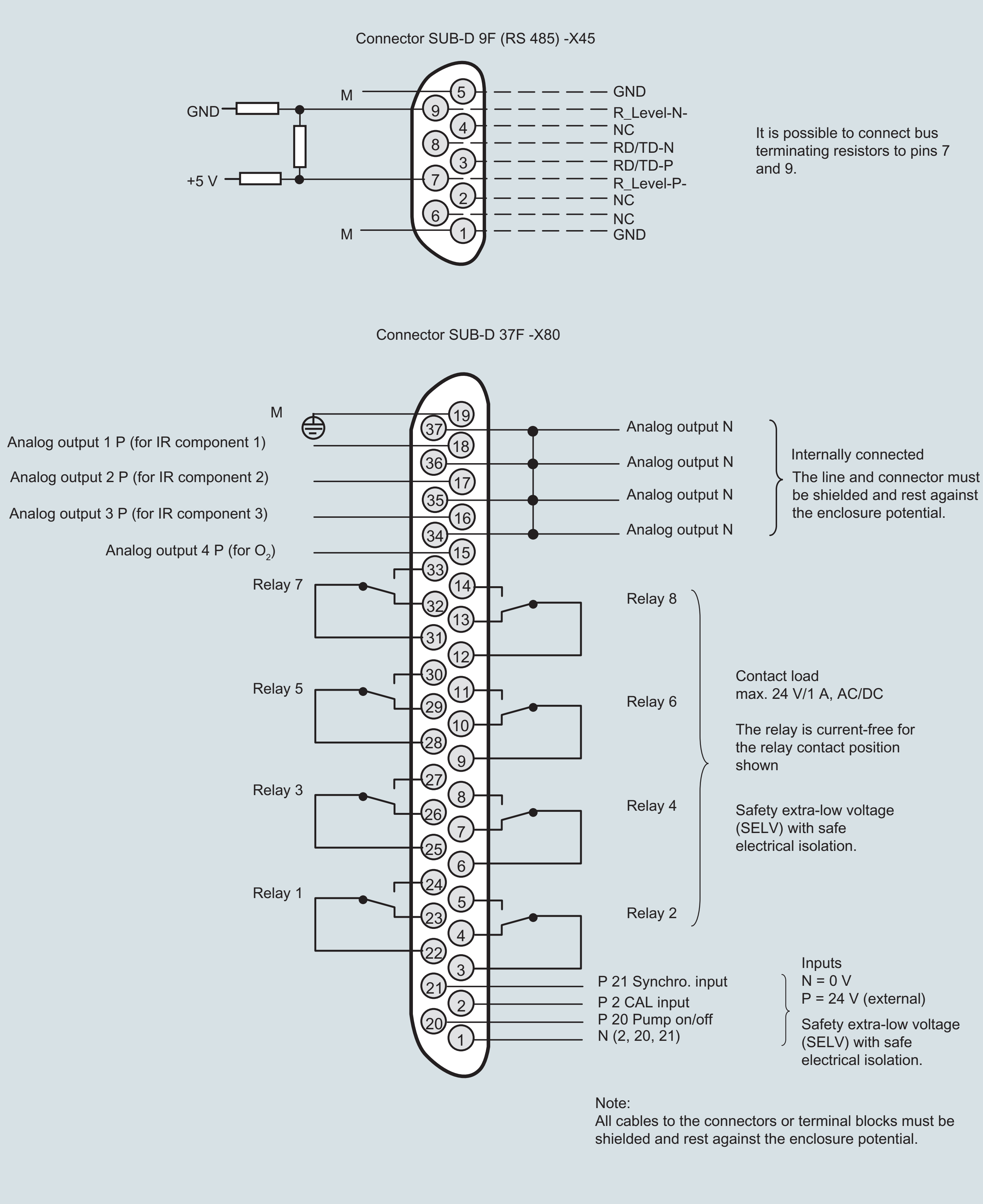


Gas connections: pipe nozzle diameter 6 mm or 1/4"

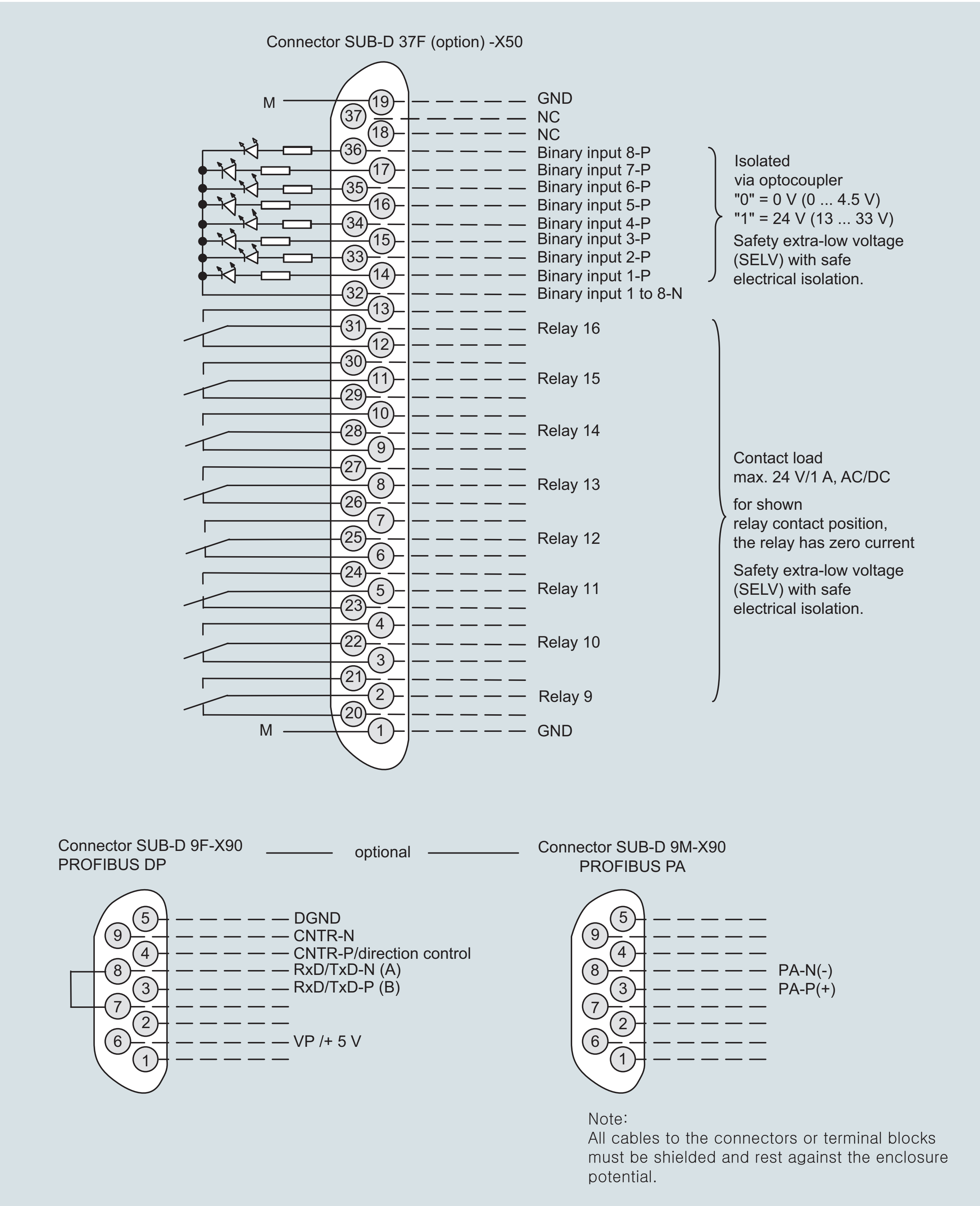
ULTRAMAT 23, bench-top unit, dimensions in mm

Circuit diagrams

Pin assignment (electrical and gas connections)

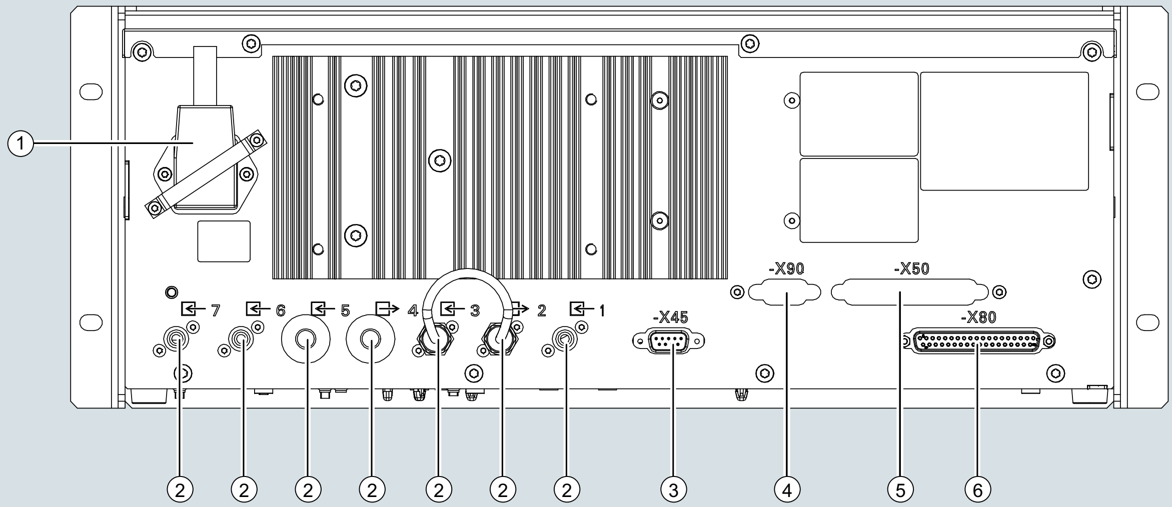


ULTRAMAT 23, pin assignment (standard)



ULTRAMAT 23, pin assignment of optional PROFIBUS interface card

19" rack unit

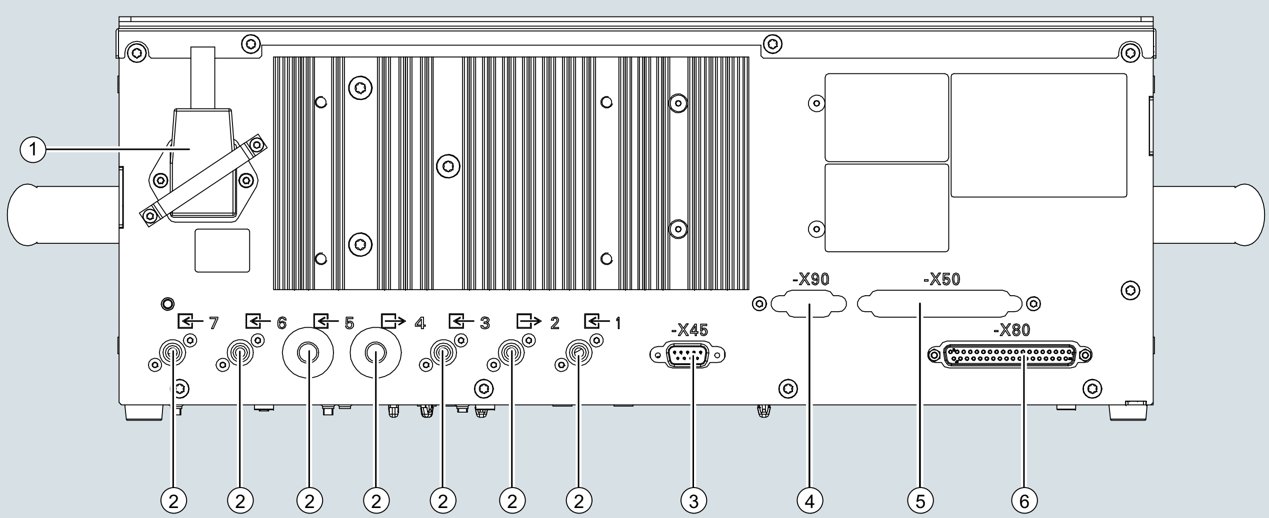


1 Auxiliary power and fine fuse
2 Gas connections: nozzles 6 mm or ¼"
3 -X45: ELAN (RS485) 9-pin connector
4 -X90: 9-pin interface connector (option board with PROFIBUS-DP/PA)
5 -X50: 37-pin connector: Option board; binary inputs/relay outputs
6 -X80: 37-pin connector: Analog and digital inputs and outputs

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

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

Portable unit

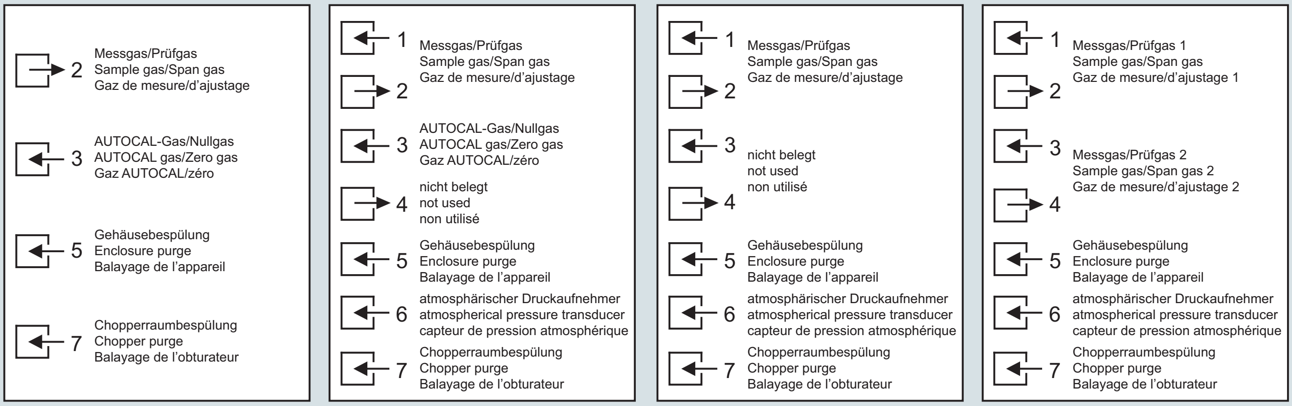


1 Power connector
2 Gas connections: nozzles 6 mm or ¼"
3 -X45: ELAN (RS485) 9-pin connector
4 -X90: 9-pin interface connector (option board with PROFIBUS-DP/PA)
5 -X50: 37-pin connector: Option board; binary inputs/relay outputs
6 -X80: 37-pin connector: Analog and digital inputs and outputs

ULTRAMAT 23 portable, in sheet-steel enclosure, gas connections and electrical connections

1

19" rack unit and portable version



Key to symbols ULTRAMAT 23 portable, in sheet-steel housing	Key to symbols ULTRAMAT 23 19” rack unit with sample gas pump	Key to symbols ULTRAMAT 23 19” rack unit without sample gas pump	Key to symbols ULTRAMAT 23 19” rack unit with two separate gas paths or pipe version

ULTRAMAT 23, designation of the different labels

More information

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

Selection and ordering data

Description	Quantity for 2 years	Quantity for 5 years	Article No.
Analyzer unit			
O-ring for analyzer chamber: 180, 90, 60, 20 mm	2	4	**C71121-Z100-A99**
Chopper			
• With motor, for 1 IR channel (7MB23X5-...)	1	1	**C79451-A3468-B515**
• With motor, for 2 IR channels (7MB23X7-..., 7MB23X8-...)	1	1	**C79451-A3468-B516**
Electronics			
Motherboard, with firmware	-	1	**C79451-A3494-D501**
Keypad	1	1	**C79451-A3492-B605**
LCD module	1	1	**C79451-A3494-B16**
Connector filter	-	1	**W75041-E5602-K2**
Line switch (portable analyzer)	-	1	**W75050-T1201-U101**
Fusible element 220 ... 240 V	2	4	**W79054-L1010-T630**
Fusible element 100 ... 120 V	2	4	**W79054-L1011-T125**
Other			
Safety filter (zero gas), internal	2	2	**C79127-Z400-A1**
Safety filter (sample gas), internal	2	3	**C79127-Z400-A1**
Pressure switch	1	2	**C79302-Z1210-A2**
Flowmeter	1	2	**C79402-Z560-T1**
Set of gaskets for sample gas pump	2	5	**C79402-Z666-E20**
Condensation trap (for portable unit, in sheet steel enclosure)	1	2	**C79451-A3008-B43**
Filter (for portable unit, in sheet steel enclosure)	1	2	**C79451-A3008-B60**
Oxygen sensor	1	1	**C79451-A3458-B55**
Sample gas pump 50 Hz	1	1	**C79451-A3494-B10**
Sample gas pump 60 Hz	1	1	**C79451-A3494-B11**
Solenoid valve	1	1	**C79451-A3494-B33**

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, NO_2, SO_2 or H_2S concentrations in gases.

Benefits

- For NO, NO_2, SO_2: Very low cross-sensitivity with other gases
- All modules are thermostatically-controlled, and thus independent of the ambient temperature
- Simultaneous measurement of NO and NO_2 with subsequent calculation of total. Therefore neither an NO_2 converter nor a CLD analyzer is required.
- Measurement in the UV range:
  - No cross-sensitivity with H_2O and CO_2
  - Very low SO_2 and NO measuring ranges possible
- UV resonance absorption spectrometry:
  - Measurement of very low NO concentrations
  - Very low cross-sensitivity possible
- Very long service life of UV lamp (usually 2 years)
- Low drifts and high stability thanks to four-channel measuring method with double generation of quotient
- True reference measurement for low-drift, stable results
- Interface for remote monitoring in networks and linking to process control systems
- Optional calibration unit
  - Filter wheel with calibration cells which can be automatically swung into the optical path
  - Low consumption of calibration gas
  - Manual or automatic calibration possible

Application

Fields of application

Emission measurements

- Measurement of low NO concentrations in power plants or gas turbines
- Monitoring of NOx in denitrification plants by direct measurement of NO and NO2, as well as summation to NOx in the analyzer
- Efficient measurement in desulfurization plants
- Monitoring of very small SO_2 and NO concentrations
- Emission measurements in the paper and cellulose industries

Process monitoring

- Measurement of SO_2 in process gases in the paper and petrochemical industries
- Optimization of NOx emissions in exhaust gas in the automotive industry

H_2S measurement

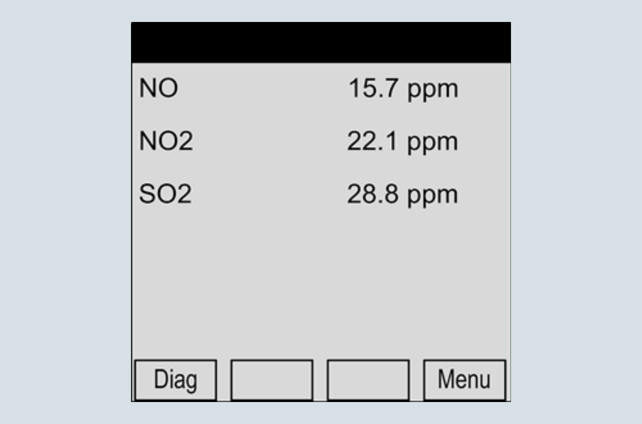
- In typical emission applications
- Taking account of possible cross-sensitivities (e.g. from mercaptan)"

Design

- 19" rack unit with 4 HU for installation
  - in hinged frame
  - in cabinets with or without telescopic rails
- Internal gas paths: hose made of FKM (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 control panel

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



SIPROCESS UV600, display and control panel

Inputs and outputs

- 2 configurable analog inputs
- 4 configurable analog outputs
- 8 digital inputs
- 8 digital outputs

Communications

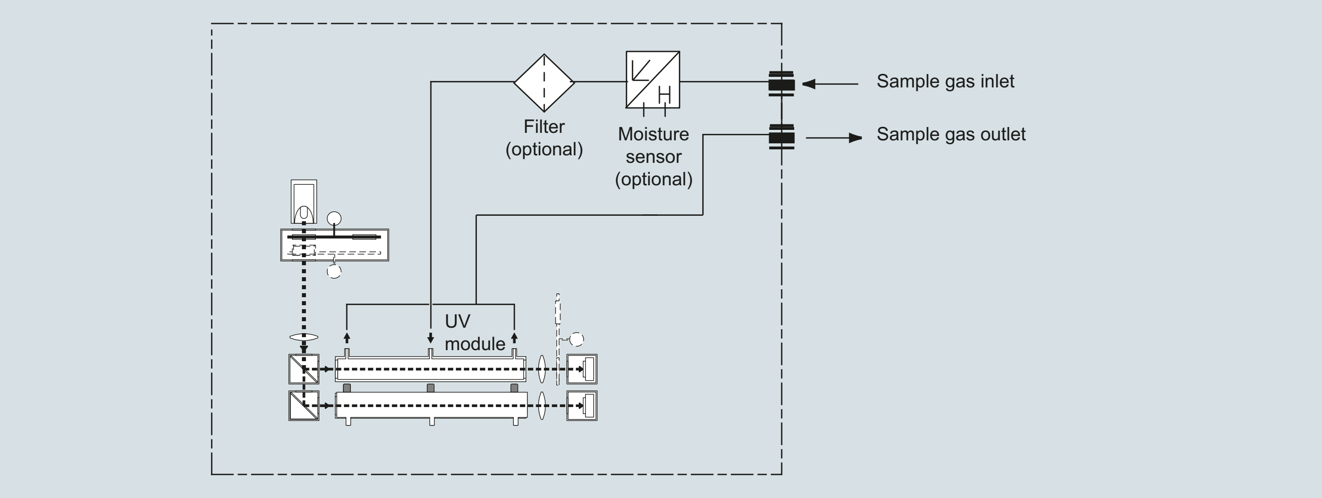
Connection via SIPROCESS-UV600-specific software tool

Materials wetted by sample gas

Component	Material
Analyzer unit (sample chamber)	Aluminum or stainless steel mat. no. 1.4404[1], epoxy resin
Optical window	CaF_2 or quartz[1], epoxy resin
Gas path, gaskets	FKM (Viton), PTFE, stainless steel mat. no. 1.4571[1]
Chamber	Aluminum or stainless steel[1]
Gas inlet/outlet	PVDF, stainless steel, mat. no. 1.4401[1]
Moisture sensor	Stainless steel mat. no. 1.4571, platinum, epoxy resin
Diaphragm pump	
• Central body	PVDF
• Diaphragm	FKM (Viton), EPDM

[1] Depending on the version

Gas flow chart



SIPROCESS UV600, gas flow chart

Mode of operation

The measuring principle of the SIPROCESS UV600 is based on the molecule-specific absorption of gases in the ultraviolet wavelength range. Radiation of a wavelength appropriate to the measurement is passed through the sample, and the selective absorption which is proportional to the concentration of the measured component is determined.

Measuring method

An electrodeless discharge lamp (1) emits broadband in the ultraviolet spectral range. A filter wheel unit (2) generates the ultraviolet radiation suitable for the respective measured component. Either interference filter correlation (IFC) or gas filter correlation (GFC), or a combination of the two methods, can be used for this purpose.

Interference filter correlation (IFC)

The sample and reference radiations are generated alternately with two different interference filters being swung into the beam path (filter wheel 2a).

Gas filter correlation (GFC)

Especially when NO is the measured component, the reference radiation is generated by swinging in a gas filter which is filled with the associated gas (filter wheel 2b).

IFC and GFC

The two filter wheels are combined in order to measure NO in combination with other measured components.

Design of the UV analyzer module

After passing through the filter unit, the beam is directed via a lens (3), a beam divider (4) and a mirror (4) into the sample chamber (6) and reference chamber (7).

The sample beam passes through the sample chamber (6), into which sample gas flows, and its intensity is weakened in line with the concentration of the measured component. The reference beam is directed via a mirror (5) into the reference chamber (7). This is filled with a neutral gas.

The detectors (9) receive the sample and reference beams in succession. These measured signals are amplified and evaluated using electronics.

The measuring system is temperature-controlled to minimize external temperature influences.

The physical state of the measuring system is recorded simultaneously through time-offset detection of the reference beam, and compensated if necessary.

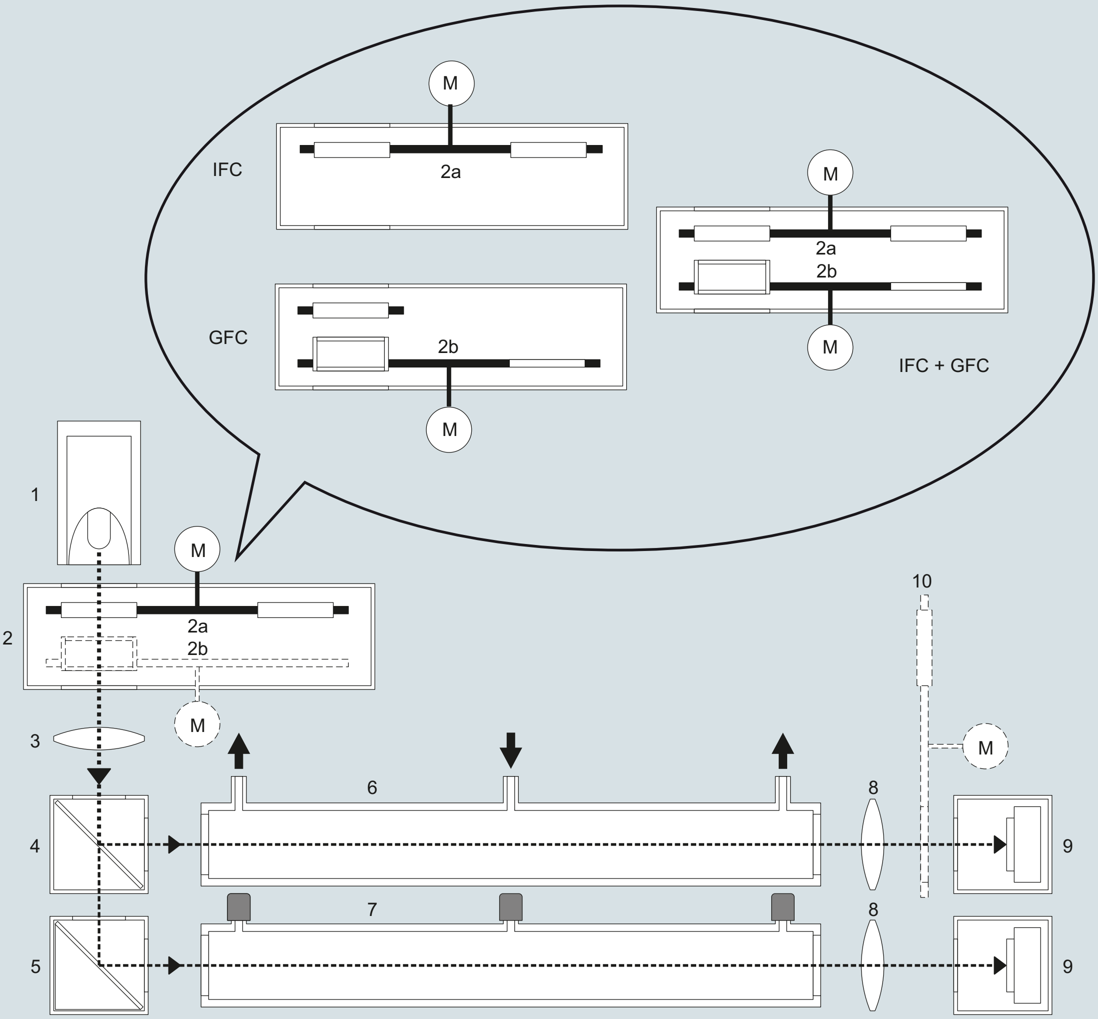
A quotient is generated for each detector from the determined signal values, and the ratio of these quotients determined. This double generation of quotients means that symmetrical signal drifts are compensated in the best possible manner in addition to proportional signal drifts.

Note

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

Additional measures depending on the application must be taken when introducing gases with flammable components at concentrations above the lower explosive limit (LEL). Please contact the technical department in such cases.

Function



1	UV lamp	5	Mirror	GFC	Gas filter correlation
2	Filter wheel unit	6	Sample chamber	IFC	Interference filter correlation
2a	Filter wheel 1	7	Reference chamber	M	Motor
2b	Filter wheel 2	8	Focus lens		
3	Collimator lens	9	Detector		
4	Beam divider	10	Optional calibration unit		

SIPROCESS UV600, operating principle

Technical specifications

General information	
Measuring ranges	3, automatic measuring range switching
Detection limit (2σ)	< 1% of span
Smallest possible span	Dependent on order configuration NO: 0 ... 10 / 0 … 20 / 0 … 25 / 0 … 50 vpm NO_2: 0 … 10[1] / 0 ... 20 / 0 … 25 / 0 … 50 vpm SO_2: 0 … 10[1] / 0 ... 20 / 0 … 25 / 0 … 50 vpm H_2S: 0 … 25 / 0 … 50 vpm
Largest possible span	Dependent on order configuration NO, NO_2, SO_2: 0 … 300 to 0 ... 1 000 vpm H_2S: 0 … 500 to 0 ... 1 000 vpm
UV lamp	
• Design	EDL, electrodeless discharge lamp
• Service life	≈ 2 years (17 500 h)
Conformity	CE mark
Design, enclosure	
Degree of protection	IP40
Weight	approx. 17 kg
Requirements of location of use	
Installation location	Within closed building
Atmospheric pressure in the environment	700 …1 200 hPa
Relative humidity	10 ... 95 %, non-condensing
Permissible contamination	Pollution degree 1
Maximum geographic altitude of location of use	2 500 m above sea level
Permissible ambient temperature	
• Operation	+5 ... +45 °C (41 ... 113 °F)
• Transport and storage	-10 ... +70 °C (14 ... 158 °F)
Operating position	Front wall, vertical , max. ± 15° angle for each spatial axis (maximum permissible inclination of the base surface during operation wtih constant operating position)
Permissible vibrations/ shocks	
• Vibration displacement	0.035 mm (in the range 5 ... 59 Hz)
• Amplitude of the starting acceleration	5 m/s^2 (in the range 59 … 160 Hz)
Electrical characteristics	
Line voltage (optional, see nameplate)	93 ... 132 V AC, 186 ... 264 V AC
Line frequency (AC)	47 ... 63 Hz
Permissible overvoltages (transient surges in the power supply network)	Up to overvoltage category II in accordance with IEC 60364-4-443
Power consumption	Approx. 50 VA, max. 300 VA
EMC interference immunity (electromagnetic compatibility)	In accordance with EN 61326-1, EN 61326-2-1, EN 61000-6-2, EN 61000-6-4 and EU Directive 2004/108/EC. In the case of electromagnetic radiation in the frequency range from 750 MHz ± 20 MHz, increased measuring errors can occur for small measuring ranges
Electrical safety	In accordance with EN 61010-1
Internal line fuses	
• primary	6.3 A, not replaceable
• secondary	8 A

Gas inlet conditions	
Permissible sample gas pressure	Relative to ambient/atmospheric air pressure: -200 ... +300 hPa (-0.2 … +0.3 bar)
Sample gas flow	20 ... 120 l/h (333 ... 2 000 ml/min)
Sample gas temperature	5 ... 55 °C
Measuring response	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Reference point drift	< ±1%/week of respective span
Zero point drift	
• Standard measuring ranges	< ± 1%/week of respective span
• Small measuring ranges (≤ 2x smallest measuring range)	< ± 2%/week of respective span
• Measured components NO, NO_2, SO_2	< ±1%/day of respective span
Repeatability (reproducibility)	< ± 1% of respective span
Linearity error	< ± 1% of respective span
Electric inputs and outputs	
Analog output	4, 0 ... 24 mA ; floating (electrically isolated), residual ripple 0.02 mA, resolution 0.1 % (20 µA), max. load 500 Ω, max. voltage ± 50 V
Relay outputs	8, with changeover contacts, max. voltage ± 50 V loading capacity: Max. 30 V AC / max. 48 V DC / max. 500 mA
Analog inputs	2, 0 ... 20 mA, reference potential GND, max. signal strength 30 mA, max. overcurrent protection ±1 A, max. voltage ± 50 V
Digital inputs	8, switching range 14 ... 42 V (external control voltage), max. voltage ± 50 V
Serial interface	RS485, Ethernet (LAN)

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

Selection and ordering data

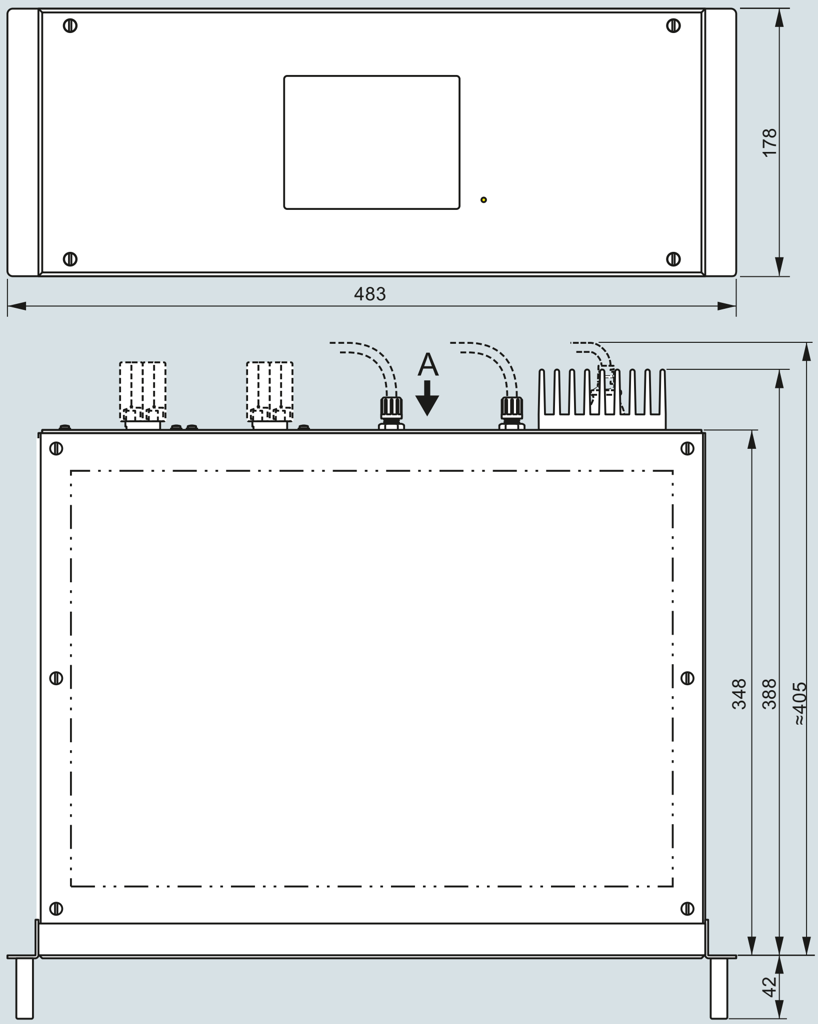
Product description			Article No.	Cannot be combined					
SIPROCESS UV600 gas analyzer, incl. gas module and barometric pressure compensation			↗ **7MB2621-** ■■■■■ - 0 ■■■						
↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.									
Enclosure, version and gas paths 19" rack unit for installation in cabinets									
Gas connections Diameter	Gas connections Material	Gas paths Material							
• 6 mm pipe	• PVDF	• Hose / Viton	0	0					
• 6 mm pipe	• Swagelok	• PTFE	1						1 → C15
• 6 mm pipe	• Swagelok	• Stainless steel, with pipes	2						2 → C15
• 1/4" pipe	• Swagelok	• Stainless steel, with pipes	3						3 → C15
1. UV measured component									
Measured component	Smallest/largest measuring range	corresponds to							
NO	0 ... 10 / 0 ... 300 ppmv	0 … 15 / 0 … 450 mg/m³	A A						A A → Y17
	0 ... 20 / 0 ... 400 ppmv	0 … 25 / 0 ... 500 mg/m³	A B						A B → Y17
	0 ... 25 / 0 ... 500 ppmv	0 … 35 / 0 … 700 mg/m³	A C						A C → Y17
	0 ... 50 / 0 ... 1 000 ppmv	0 … 70 / 0 ... 1 250 mg/m³	A D						
NO_2	0 ... 10 / 0 ... 300 ppmv[1]	0 … 20 / 0 … 600 mg/m³ [1]	B A	B A		B A			B A → Y17
	0 ... 20 / 0 ... 400 ppmv	0 … 40 / 0 … 800 mg/m³	B B	B B		B B			B B → Y17
	0 ... 25 / 0 ... 500 ppmv	0 … 50 / 0 … 1 000 mg/m³	B C	B C		B C			
	0 ... 50 / 0 ... 1 000 ppmv	0 … 100 / 0 ... 2 000 mg/m³	B D	B D		B D			
SO_2	0 ... 10 / 0 ... 300 ppmv[1]	0 … 25 / 0 … 750 mg/m³ [1]	C A				C A		C A → Y17
	0 ... 20 / 0 ... 400 ppmv	0 … 50 / 0 … 1 000 mg/m³	C B				C B		C B → Y17
	0 ... 25 / 0 ... 500 ppmv	0 … 75 / 0 … 1 500 mg/m³	C C				C C		
	0 ... 50 / 0 ... 1 000 ppmv	0 … 130 / 0 … 2 600 mg/m³	C D				C D		
H_2S	0 ... 25 / 0 ... 500 ppmv	0 … 40 / 0 … 800 mg/m³	D C	D C				D C	D C → Y17
	0 ... 50 / 0 ... 1 000 ppmv	0 … 75 / 0 ... 1 500 mg/m³	D D	D D				D D	D D → Y17
2. UV measured component									
Measured component	Smallest/largest measuring range								
None			0 0		0 0				0 0 → B12
NO_2	0 ... 10 / 0 ... 300 ppmv[1]	0 … 20 / 0 … 600 mg/m³ [1]	2 1	2 1		2 1			2 1 → B11, Y17
	0 ... 20 / 0 ... 400 ppmv	0 … 40 / 0 … 800 mg/m³	2 2	2 2		2 2			2 2 → B11, Y17
	0 ... 25 / 0 ... 500 ppmv	0 … 50 / 0 … 1 000 mg/m³	2 3	2 3		2 3			2 3 → B11
	0 ... 50 / 0 ... 1 000 ppmv	0 … 100 / 0 ... 2 000 mg/m³	2 4	2 4		2 4			2 4 → B11
SO_2	0 ... 10 / 0 ... 300 ppmv[1]	0 … 25 / 0 … 750 mg/m³ [1]	3 1				3 1		3 1 → B11, Y17
	0 ... 20 / 0 ... 400 ppmv	0 … 50 / 0 … 1 000 mg/m³	3 2				3 2		3 2 → B11, Y17
	0 ... 25 / 0 ... 500 ppmv	0 … 75 / 0 … 1 500 mg/m³	3 3				3 3		3 3 → B11
	0 ... 50 / 0 ... 1 000 ppmv	0 … 130 / 0 … 2 600 mg/m³	3 4				3 4		3 4 → B11
H_2S	0 ... 25 / 0 ... 500 ppmv	0 … 40 / 0 … 800 mg/m³	4 3	4 3				4 3	4 3 → B11, Y17
	0 ... 50 / 0 ... 1 000 ppmv	0 … 75 / 0... 1 500 mg/m³	4 4	4 4				4 4	4 4 → B11, Y17
3. UV measured component									
Measured component	Smallest/largest measuring range								
None			X X						X X → B13
SO_2	0 ... 10 / 0 ... 300 ppmv[1]	0 … 25 / 0 … 750 mg/m³ [1]	C A		C A		C A		C A → B11, B12, Y17
	0 ... 20 / 0 ... 400 ppmv	0 … 50 / 0 … 1 000 mg/m³	C B		C B		C B		C B → B11, B12, Y17
	0 ... 25 / 0 ... 500 ppmv	0 … 75 / 0 … 1 500 mg/m³	C C		C C		C C		C C → B11, B12
	0 ... 50 / 0 ... 1000 ppmv	0 … 130 / 0 … 2 600 mg/m³	C D		C D		C D		C D → B11, B12
H_2S	0 ... 25 / 0 ... 500 ppmv	0 … 40 / 0 … 800 mg/m³	D C	D C	D C			D C	D C → B11, B12, Y17
	0 ... 50 / 0 ... 1 000 ppmv	0 … 75 / 0 ... 1 500 mg/m³	D D	D D	D D			D D	D D → B11, B12, Y17
Language of software and documentation									
German			0						
English			1						
French			2						
Spanish			3						
Italian			4						

[1] Smallest measuring range 0...10 ppmv requires daily calibration and temperature-controlled environment (± 2 °C). Use of an additional calibration unit (B11, B12 or B13) recommended. 2 measured-value outputs are required on the I/O module for this measurement range switchover. A maximum of 4 measured-value outputs are available per I/O module. For versions with 3 sample gas components - including more than 1 component with measuring range 0...10/0...300 vpm - a second I/O module (option: A13) is required!

Product description	
Additional versions	**Order code**
Please add "-Z" to Article No. and specify Order code.	
Second IO module	**A13**
Calibration unit for 1st sample gas component	**B11**
Calibration unit for 1st and 2nd sample gas components	**B12**
Calibration unit for all 3 sample gas components	**B13**
Flow monitor	**C11**
Humidity monitor	**C12**
Pressure sensor (sample gas)	**C14**
Internal sample gas pump	**C15**
Special setting (only in conjunction with an application no., e.g. special measuring range)	**Y12**
Extended special setting (only in conjunction with an application no., e.g. determination of cross-interferences)	**Y13**
Prepared for QAL1, standard measured-value output in mg/m^3	**Y17**

Spare parts recommendation for preventative maintenance	**Quantity for 2 years**	**Quantity for 5 years**	**Article No.**
Article No.Safety filter FI64	1	2	**A5E03707235**
Power supply units, 24 V DC, 10 A		1	**A5E03707236**
Distribution board		1	**A5E03707240**
FKM hose d = 3/5, length = 1 m	2	5	**A5E03707757**
MEDL UV lamp with heater	1	1 ... 2	**A5E03707918**
Motor flange 3		1	**A5E03707919**
Motor flange 2		1	**A5E03707920**
Gas filter with holder, for measurement of NO	1	2	**A5E03707921**
SIPROCESS UV600 chamber H = 300 mm, aluminum		1	**A5E03707925**
Calibration chamber with holder for NO		1	**A5E03707941**
Calibration chamber with holder for SO_2 and H_2S		1	**A5E03707942**
Calibration chamber with holder for NO_2		1	**A5E03707943**
Heater with 380 mm long cable, for SIPROCESS UV600: MEDL, chamber, motor flange	1	2	**A5E03707968**
Moisture sensor	1	2	**A5E41110446**
Spare parts set - pressure sensor with gasket and O-ring		1	**A5E03707970**
Flow sensor with temperature sensor	1	2	**A5E03707971**
Diaphragm pump type 123, 24 V DC / 50 Hz		1	**A5E03707986**
Diaphragm assembly, EPDM for types 110-125	1	2	**A5E03707987**
O-ring for gas pump suspension	1	2	**A5E03707988**

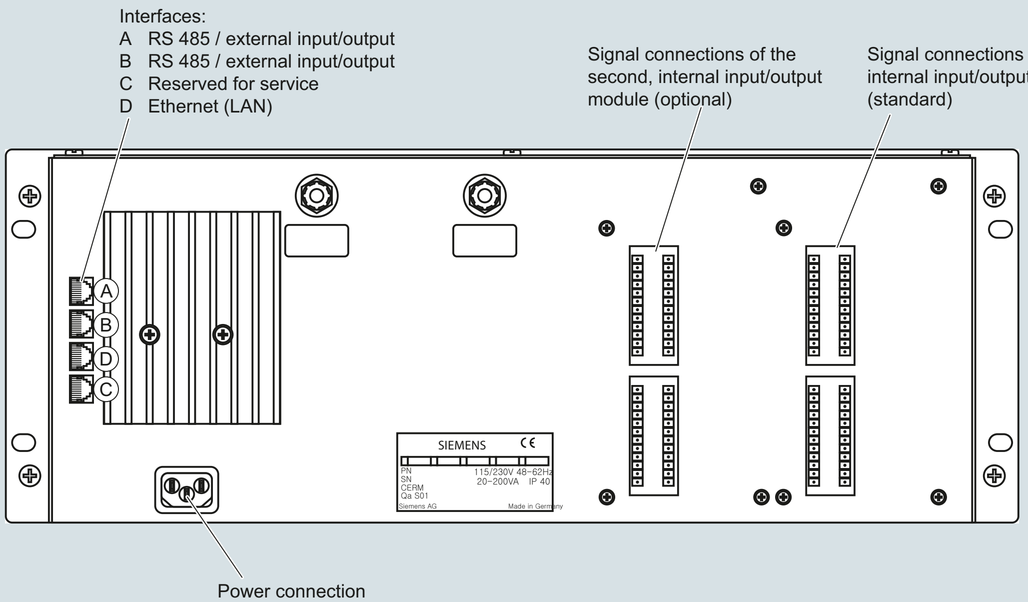
Dimensional drawings



SIPROCESS UV600, 19" rack unit, dimensions in mm

Circuit diagrams

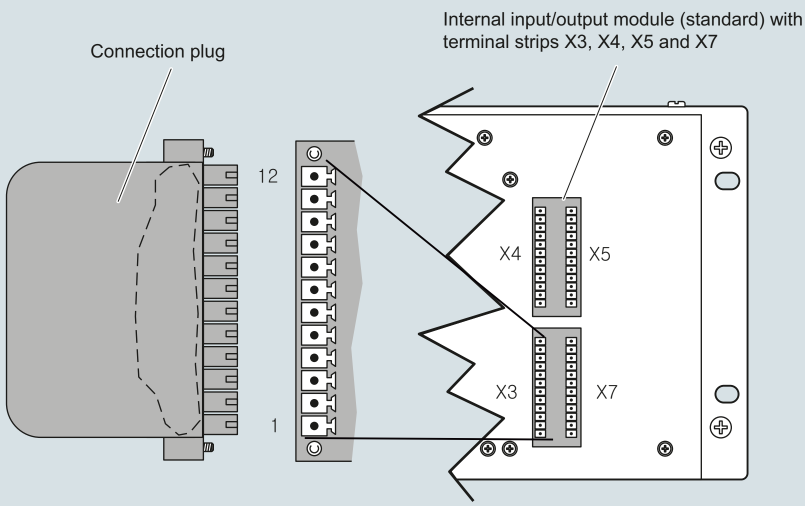
Electrical connections



SIPROCESS UV600, gas connections and electrical connections

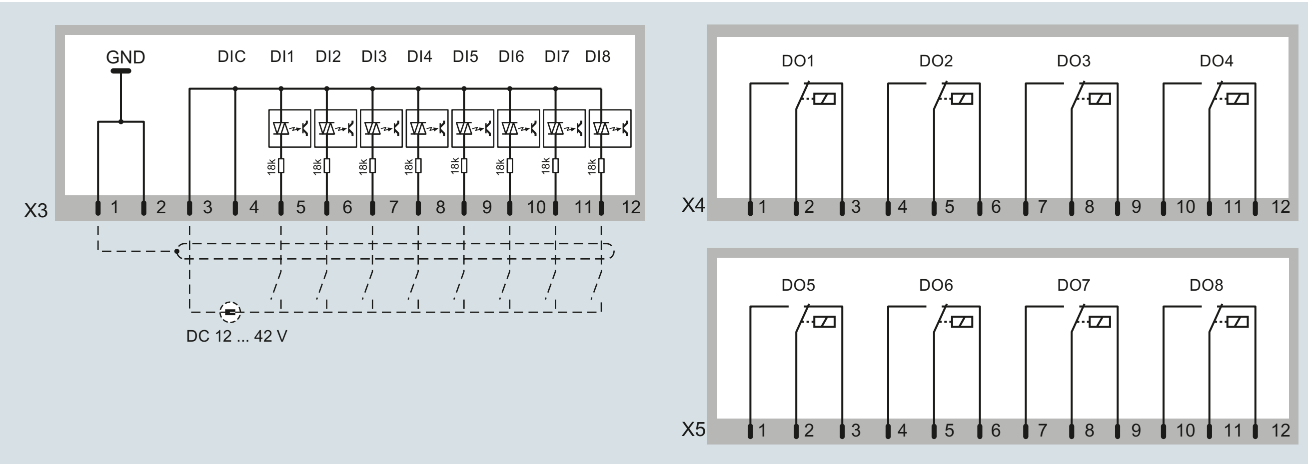
The SIPROCESS UV600 is supplied as standard with one or (optionally) two input/output modules. The logic function of the signal connections can be configured individually with the service and maintenance software specific to SIPROCESS UV600.

The signal connections are available at terminal strips X3, X4, X5 and X7 on the 12-pin plug connectors of the input/output modules. The scope of delivery includes the corresponding counterparts (plug connectors) with screw terminals.



SIPROCESS UV600, signal connections and plug connectors

Pin assignments



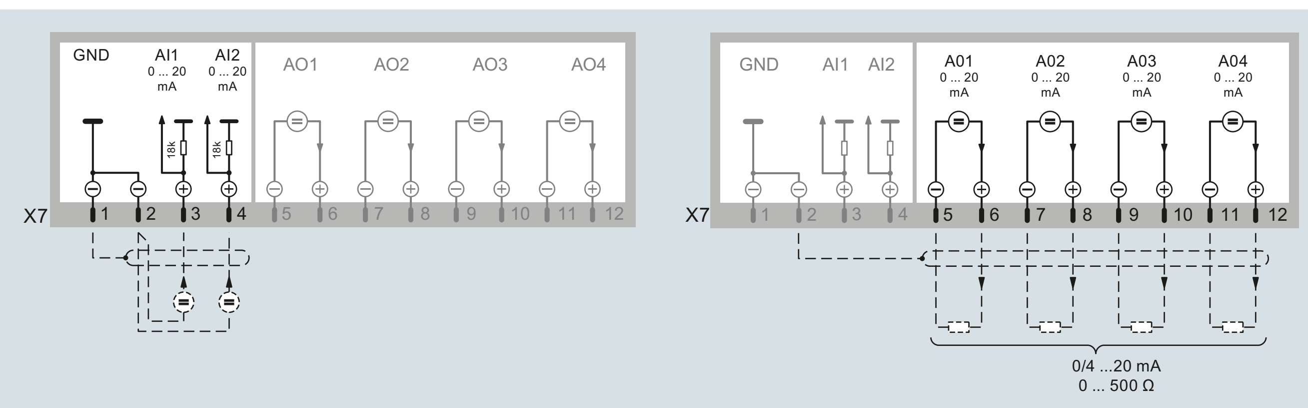
SIPROCESS UV600, pin assignments of digital inputs X3 (DI1 to DI8) and digital outputs X4 (DO1 to DO4) and X5 (DO5 to DO8)

Characteristics of the digital inputs:

- Floating optocouplers with common reference potential (DIC)
- Switching range 14 ... 42 V DC (external control voltage)
- The digital inputs can be operated either with positive or negative voltage
- With inverted switching logic, the logic function of the control input is active if no current is flowing through the control input
- Maximum voltage: ± 50 V

Characteristics of the digital outputs:

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



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

Characteristics of the analog inputs:

- The input signal is an analog current signal (standard 0 ... 20 mA, maximum 30 mA)
- The signal current must be provided by an external current source
- Load (internal resistance) of analog input: 10 Ω
- Reference potential GND (see figure, analog inputs)
- Overcurrent protection: ± 1 000 mA
- Max. voltage: ± 50 V

Characteristics of the analog outputs:

- Analog outputs are floating (electrically isolated) and provide a load-independent current signal
- Signal range 0 ... 24 mA
- Residual ripple 0.02 mA
- Resolution 0.1%
- Accuracy 0.25% of full-scale value
- Maximum load 500 Ω
- Maximum voltage ± 50 V
- Adjustable start or error state

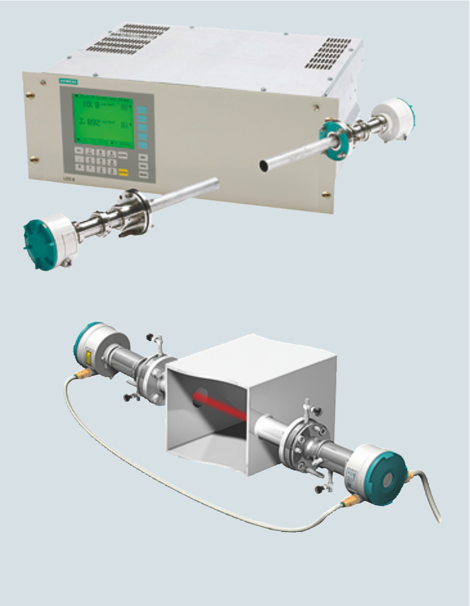
Note for electrical isolation:

The electrical isolation is canceled if the negative poles of the analog outputs are connected to GND.

Notes

In situ continuous process gas analysis

2



2/2	**Introduction**
2/3	**SITRANS SL**
2/3	In situ O_2 gas analyzer
2/22	Documentation
2/23	**LDS 6**
2/23	General information
2/30	19" central unit
2/42	Cross-duct sensor CD 6
2/52	Documentation
2/52	Suggestions for spare parts

Overview

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.

In-situ analytical procedures feature physical measurements in the flow of process gas directly in the actual process gas line. In contrast to extractive gas analysis, a sample is not taken and routed on to the analyzer via a sample line and sample preparation. Only in exceptional cases, the process conditions make it necessary to condition the sample gas stream in a bypass line with respect to process temperature, pressure and/or optical path length. Further conditioning of the process gas, such as drying or dust precipitation, is unnecessary. The analyzer carrying out in-situ measurements must always take into account changing process conditions (if these occur) and be able to automatically process them in the calibration model. Computed temperature and pressure compensation is frequently required for this. In addition, the analyzer must be extremely rugged since its sensors have direct contact with the process gas. The fast and non-contact measurement of gas concentrations directly in the process is the domain of in-situ diode laser gas analyzers.

The gas analyzer LDS 6 combines the compact and service-friendly design, simple operation and network capability of the Series 6 analyzers with the well-known exceptional performance data of in-situ gas analysis - namely high ruggedness and availability as well as low maintenance - by using diode laser technology and fiber-optics. Up to three CD 6 in-situ cross-duct sensors (which are also optionally available in an intrinsically-safe version for operation in hazardous areas) can be combined with an LDS 6 analyzer in the compact 19" rack unit enclosure. The distance between the analyzer's control unit - typically in an existing instrument room or the process plant's control room - and the max. three measuring points can be up to 700 m in each case.

The SITRANS SL gas analyzer for highly sensitive measurement of oxygen has a more integrated design without fiber-optic cables and with only one pair of cross-ducts sensors - a transmitter unit and a detector unit. In this case the receiver has a local user interface (LUI) which is controlled using IR remote control.

A maintenance-free reference gas cell integrated in both analyzers drastically reduces the need for recalibration (SITRANS SL) or even makes its superfluous (LDS 6). Remote scanning and diagnostics of the analyzers is possible using the Ethernet interface present as standard.

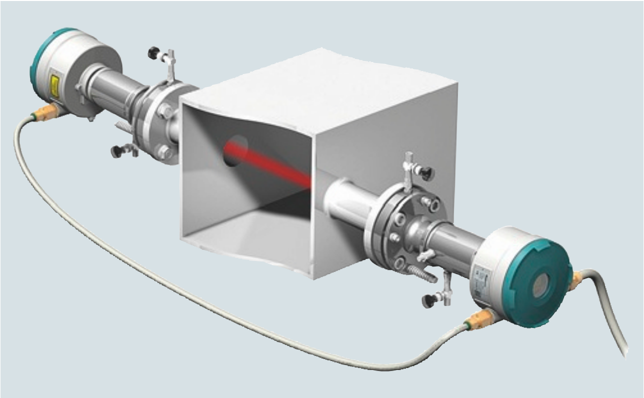
The list of gas components measurable using NIR diode laser technology already comprises:

- For the LDS 6 analyzer:
  - NH_3, HCl, HF, H_2O, CO, CO_2
  - More gas components on request
- For the SITRANS SL analyzer:
  - O_2

Gas measurements with diode lasers feature exceptional selectivity and flexibility. Neither high process temperatures nor high and varying concentrations of particles in the gas have an influence on the quality of the result within wide ranges. For example, it is possible with the LDS 6 to determine trace concentrations of NH_3, HCl or HF directly in moist process gases even before any gas purification stage.

These features together with fast measurements free of dead times mean that diode laser gas analysis with the LDS 6 or the SITRANS SL is an extremely interesting alternative to established extractive analyses.

Overview



SITRANS SL

SITRANS SL is a diode laser gas analyzer with a measuring principle based on the specific light absorption of different gas components. SITRANS SL is suitable for fast, non-contact measurement of gas concentrations in process or flue gases. An analyzer consisting of transmitter and receiver units (sensors) is used for each measuring point. The hardware for further processing of the measured signal into a concentration value, as well as the monitoring, control and communication functions, are integrated in these two main modules. The sensors are designed for operation under harsh environmental conditions.

Benefits

The in-situ SITRANS SL gas analyzer features high operational availability, unique analytical selectivity, and a wide range of possible applications. SITRANS SL permits measurement of a gas component directly in the process:

- With high dust load
- In hot, humid, corrosive, explosive, or toxic gases
- In applications showing strong varying gas compositions
- Under harsh environmental conditions at the measuring point
- Highly selective, i.e. mostly without cross-sensitivities

Special features of the SITRANS SL:

- Little installation effort
- Minimum maintenance requirements
- Extremely rugged design
- High long-term stability through built-in, maintenance-free reference gas cell
- Real-time measurements

Moreover, the analyzer provides warning and error messages:

- When maintenance is required
  - With large variations in the reference signal
  - With poor signal quality
- If the transmission violates an upper or lower limit

Application

Applications

- Control of combustion processes
- Process optimization
- Plant and operator safety
- Process measurements in all types of power and combustion plants
- Process control
- Explosion protection
- Measurements in corrosive and toxic gases
- Quality control

Sectors

- Chemical and petrochemical plants
- Power plants
- Waste incinerators
- Iron and steel industry

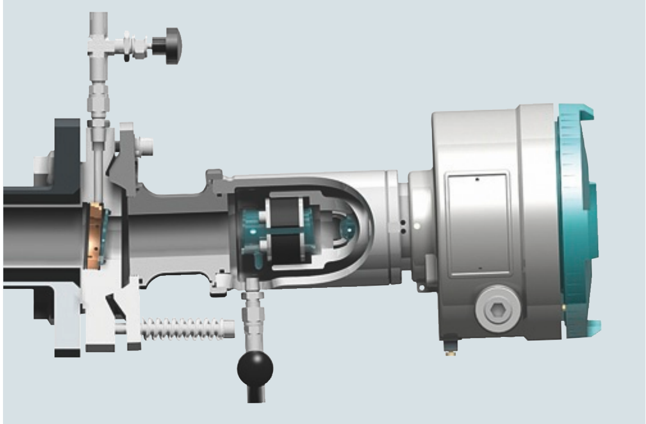
Design

The SITRANS SL gas analyzer consists of a pair of cross-duct sensors, a transmitter unit and a detector unit, both with the same dimensions. The complete analyzer is integrated in these two enclosures. The transmitter unit contains the laser source whose light is transmitted to the receiver through the measurement path. The detector unit contains a photodetector including electronics as well as a reference cell. The detector unit is connected to the transmitter unit by means of a sensor cable. A further cable on the receiver is used to connect the power supply and the communication interfaces. The receiver enclosure contains a local user interface (LUI) with an LC display which can be read through a window in the cover. The LUI is operated by remote-control.

Transmitter and detector units

Special features of the transmitter and detector units:

- In-situ cross-duct sensors, designed as transmitter and detector units, connected via sensor cable
- Powder-coated aluminium; stainless steel
- Degree of protection IP65
- Adjustable process connection plates
- Flange sizes (provided by customer): DN50/PN25, ANSI 4''/ 150 lbs
- Purging gas connections (see "Purging")
- Optional: Explosion-protected version in accordance with
  - Ex II 2G Ex de op is IIC T6
    Ex II 2D Ex tD A21 IP65 T85°C



SITRANS SL, detector unit

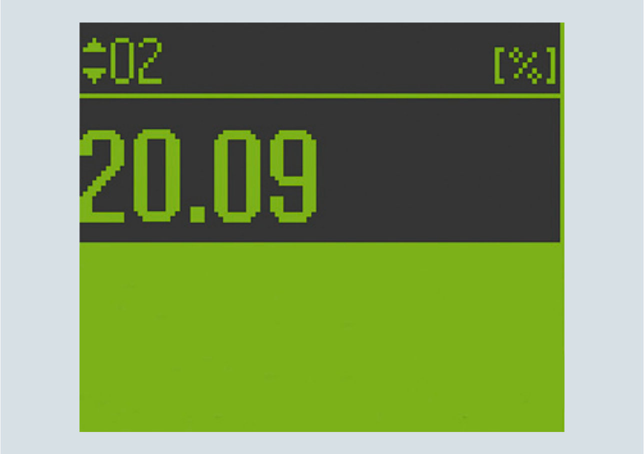
<u>Parts in contact with the process gas</u>

Only the stainless steel flange of the sensor with borosilicate window and FFKM seal comes in contact with the process gas. This has optional connections for purging the process gas side with an appropriate gaseous medium.

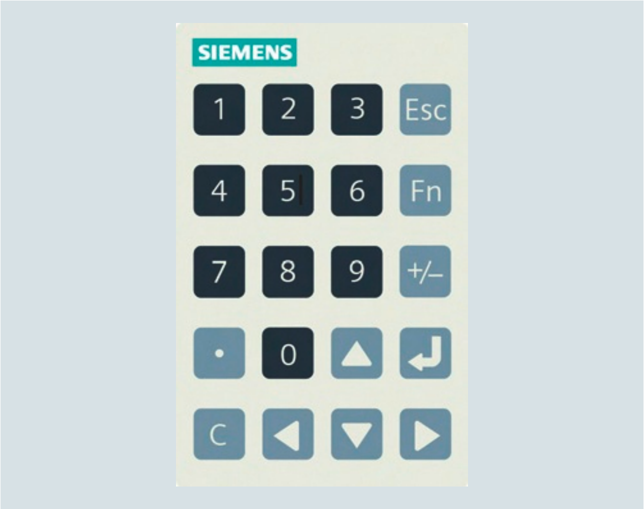
Display and control panel

Special features of the detector unit:

- Display for simultaneous output of result and device status
- LED backlighting of display
- Remote control with infrared interface for simplified configuration and operation for safe implementation in hazardous areas
- Menu-driven operation for parameterization and diagnostics



Local user interface (LUI) of SITRANS SL in the detector unit (display of measured value)



Remote control keypad for SITRANS SL

Connection cables

SITRANS SL is supplied as standard without connecting cables. These must be provided by the customer or are available as accessories. Exception: The standard ATEX version is supplied with pre-installed cabling.

The sensor cable connects together the transmitter and detector units of the analyzer.

The sensor connecting cable available as a cable set for the ATEX version as standard, and for non-Ex applications optionally, is offered in lengths of 5, 10 or 25 m. This (optional) cable set also enables permanent installation of an Ethernet cable used for service and maintenance purposes.

A rugged cable sleeve should be used as UV protection for installations in open cable ducts or channel systems.

The statutory directives must be observed in the event of installation in hazardous areas.

For the ATEX version of SITRANS SL, the sensor connecting cable must be connected between the two Ex-e terminal boxes secured on the transmitter and receiver units.

Inputs/outputs

- 2 analog inputs (4 to 20 mA) for process gas temperature and pressure
- 2 analog outputs (4 to 20 mA) for gas concentration or for concentration and transmission
- 1 configurable digital input
- 2 configurable digital outputs (display of faults, maintenance requirement, function monitoring, alarms for limit violations of measured value or transmission)
- 1 Ethernet 10Base-TX port, only for servicing and maintenance

Optional

- 1 Modbus interface with
  - Output of concentration as cyclic data
  - Alarm output, alarm classification
  - Input for temperature and/or pressure data for compensation
- 1 PROFIBUS DP interface with:
  - Output of concentration as cyclic data
  - Alarm output, alarm classification
  - Input for temperature and/or pressure data for compensation

The PROFIBUS DP protocol provides DPV0, cyclic data. Measured values are provided with additional quality data.

Note:

In contrast to the other interfaces, the Ethernet plug-in connector on standard non-Ex devices is only accessible following removal of the detector unit cover. With the help of the sensor cable set (optional with non-Ex devices), an Ethernet cable can be permanently installed via the terminal box of the sensor connecting cable. The Ethernet connection via the sensor cable can also only be used for temporary service and maintenance purposes.

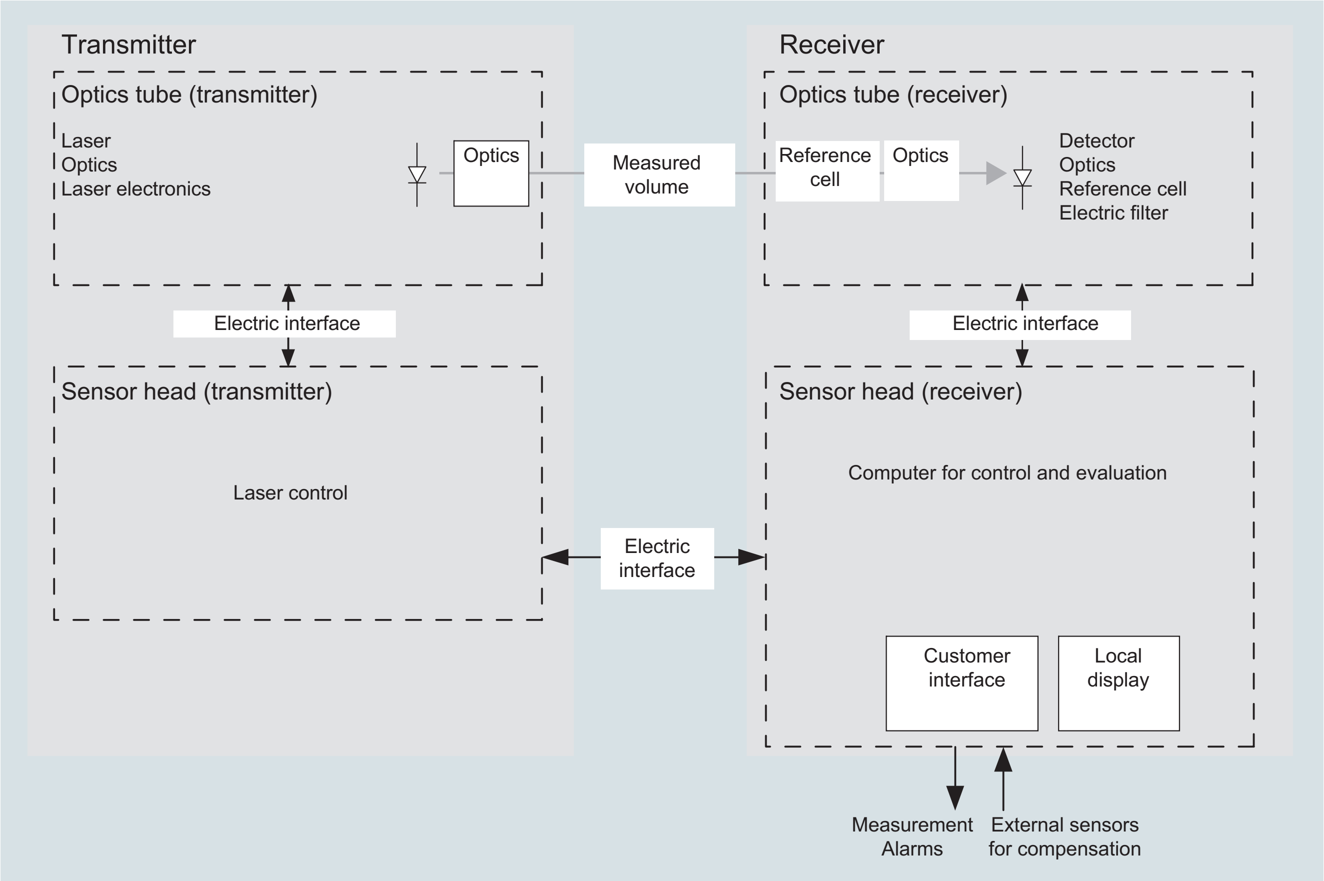
NOTICE:

In an Ex environment, Ethernet connections may only be made or removed with the permission of the plant operator!

Function

Operating principle

SITRANS SL is a gas analyzer employing single-line molecular absorption spectroscopy. A diode laser emits a beam of infrared light which passes through the process gas and is received by a detector unit. The wavelength of the laser diode output is tuned to a gas-specific absorption line. The laser continuously scans this single absorption line with a very high spectral resolution. The degree of absorption and the line shape are used for the evaluation.

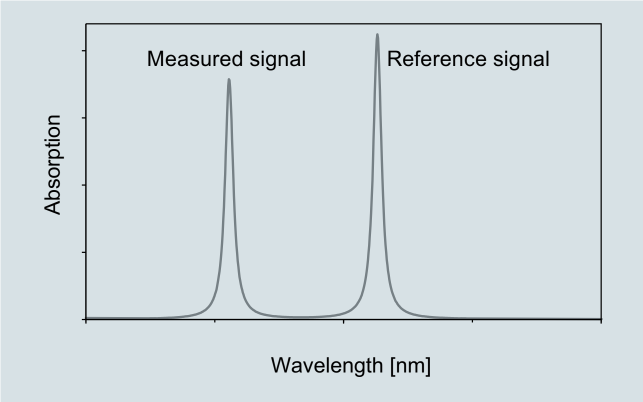


Basic design of the SITRANS SL

In situ O2 gas analyzer

The field design of the SITRANS SL in-situ gas analyzer consists of a transmitter unit and a detector unit. The light which is not absorbed by the sample is detected in the receiver. The concentration of the gas component is determined from the absorption.

The SITRANS SL analyzer measures a single gas component by means of the absorption capacity of a single fully resolved molecular absorption line.



Absorption spectrum of measured signal and reference signal with SITRANS SL

SITRANS SL is designed for measuring oxygen (O_2) with high sensitivity.

Typical application specifications:

Oxygen concentration	0 ... 100 vol %
Process pressure/temperature conditions (with O_2 application)	700 ... 5 000 hPa (absolute)/ 0 ... 200 °C
	900 ... 1 100 hPa (absolute)/ 0 ... 600 °C

The measuring performance of the SITRANS SL depends, among others, on the actual, individual process conditions with regard to concentration ranges, pressure and temperature.

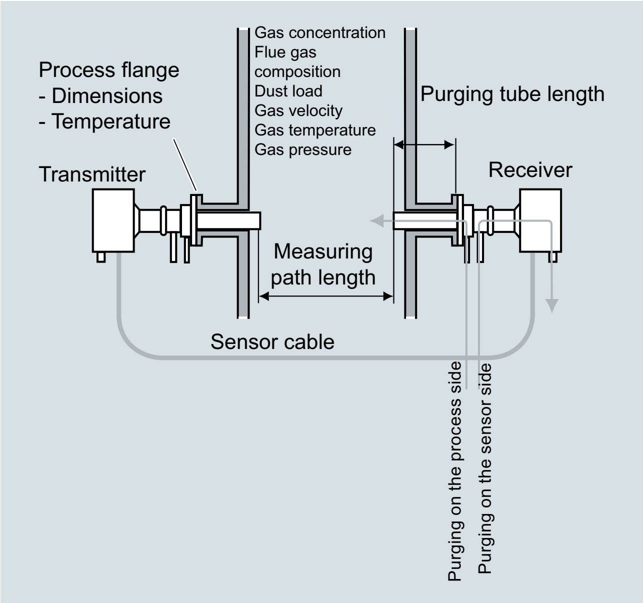
An internal reference cell is used to constantly check the stability of the spectrometer.

The self-calibration of the analyzer is therefore valid for one year without the need for external recalibration using calibration gases.

Configuration

A feature of the in-situ analytical procedure is that the physical measurement takes place directly in the stream of process gas and directly in the actual process gas line. All process parameters such as gas matrix, pressure, temperature, moisture, dust load, flow velocity and mounting orientation can influence the measuring properties of the SITRANS SL and must therefore be investigated for each new application.

The standard applications listed in the ordering data for the SITRANS SL are distinguished in that the typical process conditions are adequately well-known and documented. If you cannot find your application among the standard applications, please contact Siemens. We will be pleased to check your possible individual application of the SITRANS SL. You can find an application questionnaire on the website for the SITRANS SL:
http://www.siemens.com/insituquestionnaire



Typical cross-duct arrangement of the SITRANS SL

The SITRANS SL can be optionally purged on the process side using appropriate purging gases to prevent contamination of the sensor optics on the process side. Purging tubes on the sensor heads, which slightly extend into the process gas stream, define the effective measuring path length.

Influences on the measurement

Dust load

As long as the laser beam is able to generate a suitable detector signal, the dust load in the process gas does not influence the analytical result. By applying a dynamic background correction, measurements can be carried out without any negative impact. Under optimal conditions, the SITRANS SL can cope with dust loads up to 20 g/Nm^3 and up to a measured path length of 8 m. The influence of a high dust load is extremely complex, and depends on the optical path length and particle size. The optical attenuation increases exponentially at longer path lengths. Smaller particles also have a very large influence on the optical attenuation. With high dust load, long path length and small particle size, the technical support at Siemens should be consulted.

Temperature

The influence of temperature on the absorption line is compensated by a correction file. A temperature signal can be fed into the instrument from an external temperature sensor. The signal is then used for mathematical correction of the influence of the temperature on the concentration strength. If the process gas temperature remains constant, a static correction can be carried out as an alternative. Without temperature compensation, the relative error caused by changes in the gas temperature has an extensive effect on the measurement (e.g. up to 0.24 %/K with the O_2 application). An external temperature signal is therefore recommended in most cases.

Pressure

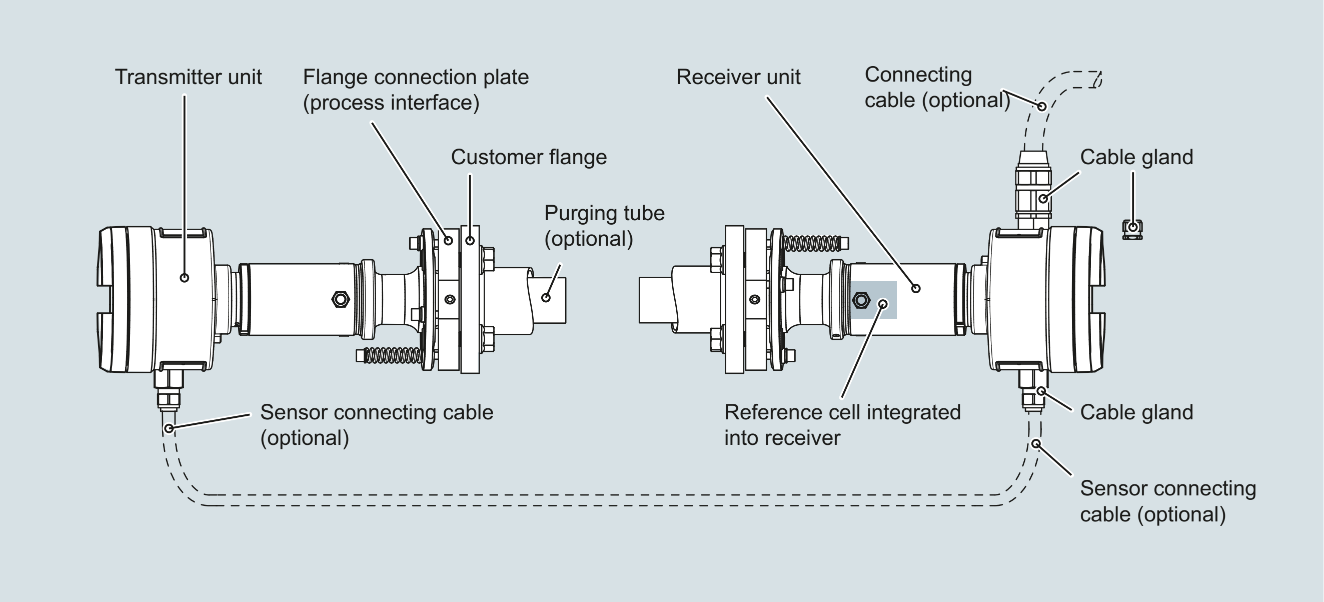
In addition to the temperature signal, an external pressure signal can be fed to the instrument to provide complete mathematical compensation for the pressure influence including the density effect. Without compensation, the relative error caused by changes in the process gas pressure is approx. 0.1 %/hPa. An external pressure signal is therefore recommended in most cases.

Effective optical path length

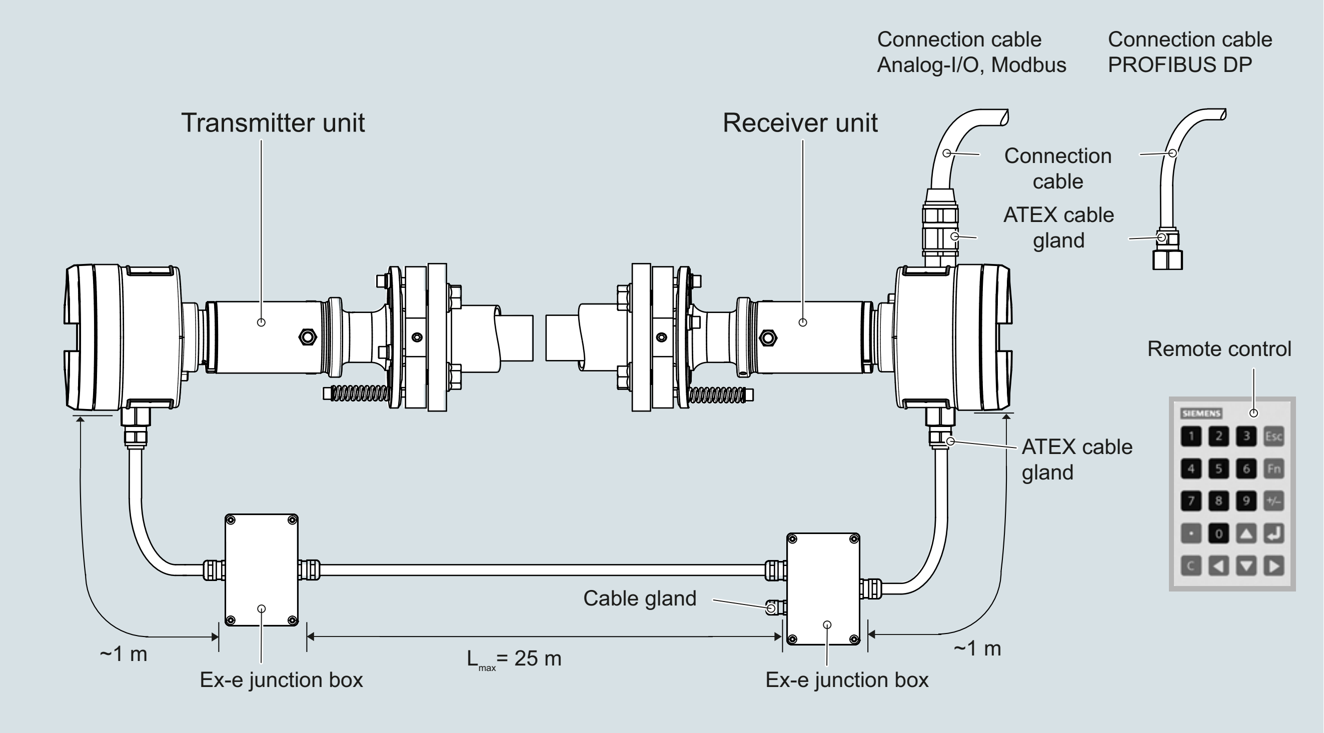
As a result of Beer-Lambert's law, the absorption of laser light depends on the optical path length within the sample gas. Therefore the precision of the effective optical path length measurement can have an effect on the precision of the total measurement.

Since the sensor optics on the process side usually has to be purged to keep it clean for a longer period, the extent of the mixed zone between the purging medium and the process gas as well as the latter's concentration distribution must be considered. In a typical in-situ installation with an optical path length of several meters, the influence of the purging gas on the effective path length can be ignored.

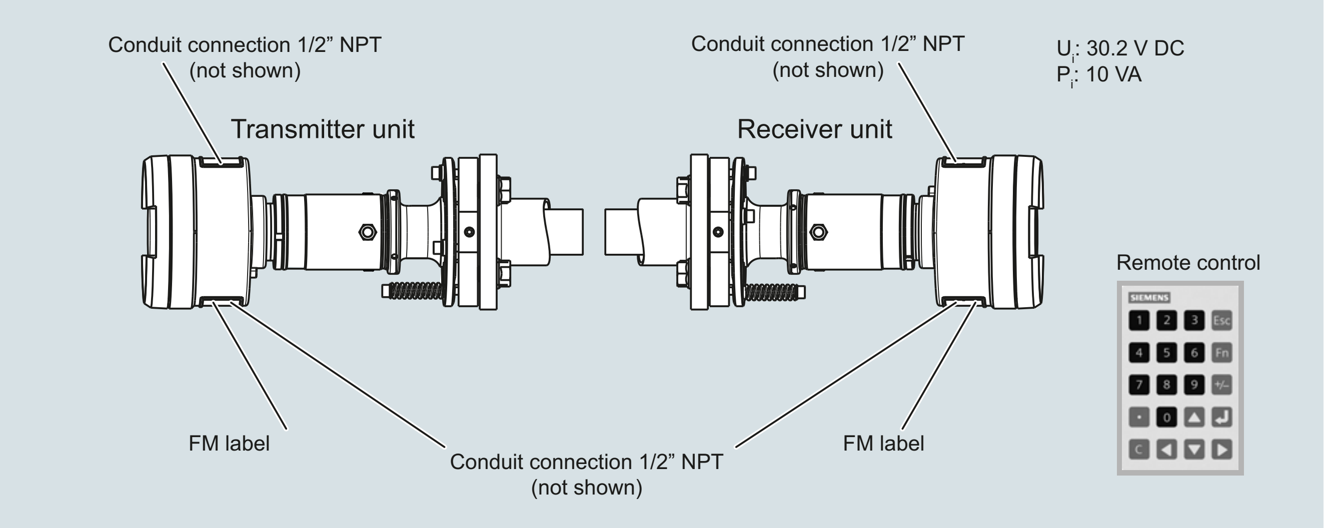
The maximum possible path length and dust load mutually affect each other: the higher the dust load in the process, the shorter the max. possible path length.



Design of the SITRANS SL system in non-Ex version



Design of the SITRANS SL system in ATEX version

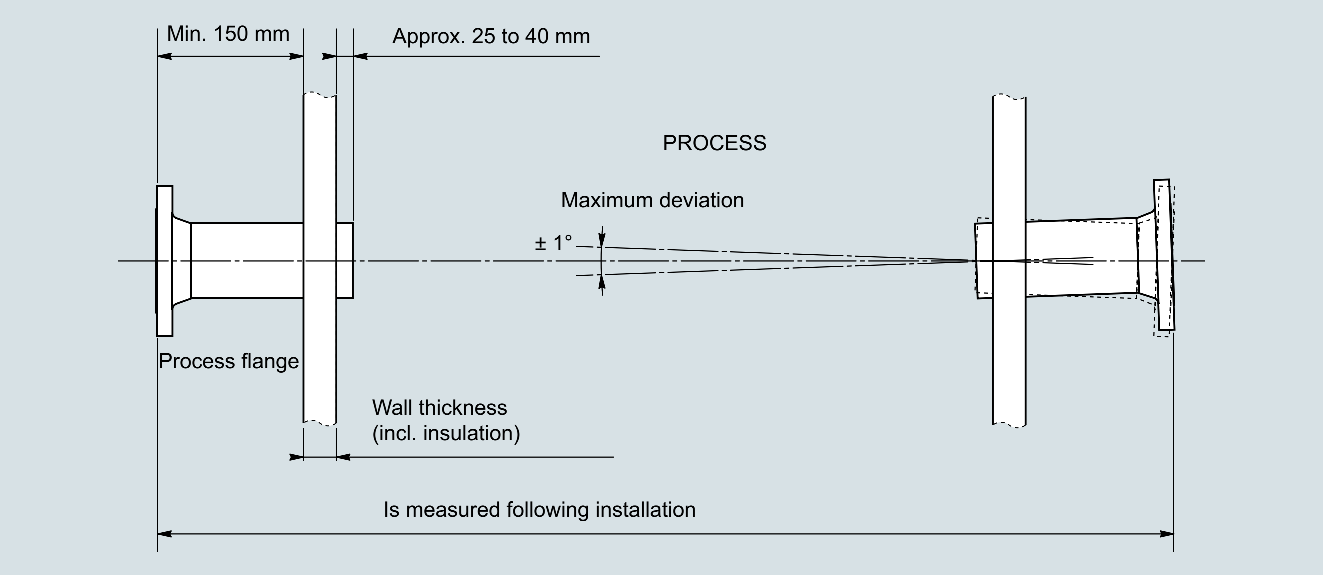


Design of the SITRANS SL system in FM version

The transmitter and detector units are mounted on process flanges provided by the customer. Correct alignment of these flanges must be guaranteed, e.g. by using the optional sensor alignment kit.

Adjustment of the pair of sensors

The flange connection plates (process interface) of the SITRANS SL to the process flanges on the customer side must be correctly aligned so that the laser beam generated by the transmitter hits the photodetector in the detector unit This is guaranteed in that the transmitter and detector units have a curved surface integrated in the connection plates. The adjustment is carried out by shifting the flanges on these surfaces, through which the symmetry axis is aligned. The axis can be offset by ± 1 degree, which means that the process flanges must be welded onto the process wall with at least this accuracy - see following figure.

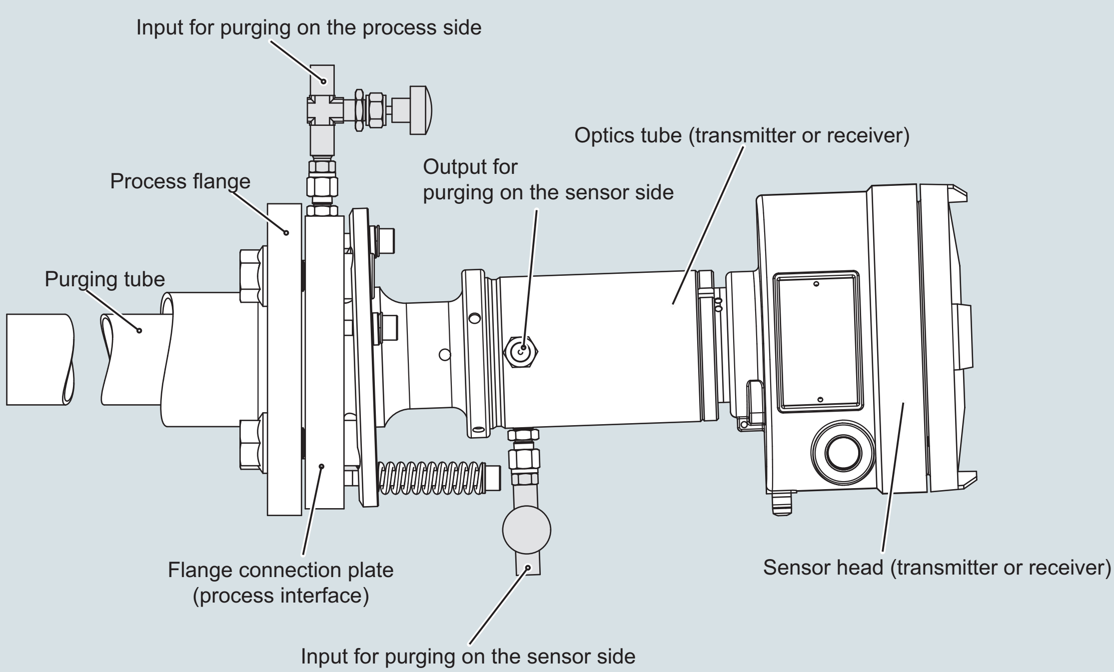


Installation/adjustment requirements for the pair of cross-duct sensors

Purging

The easiest way to avoid condensation and dust deposits on the sensor windows or excessively high thermal load of the windows and the sealing material as well as the sensor electronics is to purge them (with O_2 application: nitrogen). Purging must be selected depending on the application. The transmitted-light sensors can therefore be configured for the respective situation. The application reference table provides recommendations for suitable purging for the standard applications.

If oxygen is to be measured with the SITRANS SL - which is also present in measurable quantities in the ambient air - oxygen-free purging gases must be used, such as nitrogen. It is equally necessary to purge the inside of the sensor heads, since the ambient air must also be displaced here out of the laser beam path. A differentiation is therefore made between purging on the process side and purging on the sensor side.



Arrangement for purging on the sensor side of the SITRANS SL

Purging on process side

For purging on the process side, the flow of purging gas can be adjusted between 0 and approx. 50 l/min at each sensor head using a needle valve (included in delivery).

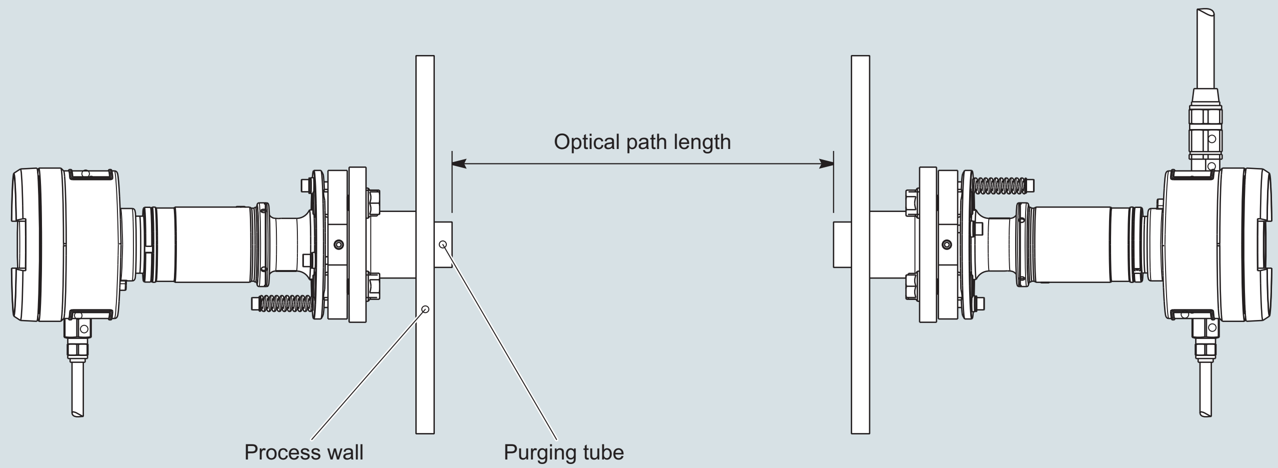
Purging on sensor side

This can be combined with the purging on the process side, if required. Purging with nitrogen on the sensor side is almost always necessary for O_2 applications to avoid an offset caused by the oxygen of the air present in the unit. The cells in the sensor head are then continuously purged with nitrogen. Particularly when (re)starting the SITRANS SL O_2, a sufficiently high flow of purging gas of approx. 3 to 5 l/min must be provided for several minutes to ensure that all residues of oxygen are removed. The flow of sensor purging gas can subsequently be set to a lower value using the needle valve (included in delivery).

Note:
With purging on the process side, it may be necessary to use non-return valves to ensure no process gas can enter the purging gas line in the event of failure of the purging gas supply. This applies especially in the case of cascaded process and sensor purging where there is otherwise the danger that, for example, corrosive process gases could enter the sensor enclosure.

Purging tubes

The purging media used on the process side flow through purging tubes into the process gas stream. The tubes extend into the process area by a few centimeters, usually perpendicular to the process gas stream. This means that an exactly defined optical path length is defined through the sample gas. The effective measuring path in the process gas is therefore defined as the distance between the ends of the two purging tubes. The standard length of the purging tubes is 340 mm. To achieve sufficient calibration of the transmitter and receiver, the process wall should be max. 150 mm thick.



Measurement of the optical path length between the ends of the purging gas tubes

Maintenance and fault messages

The SITRANS SL carries out continuous self-monitoring, and outputs alarms and warnings to indicate maintenance requirements or a system fault. The information is output as plain text on the LUI display, where symbols identify the category and the severity of the fault.

Alarm categories:

- Maintenance (system must be cleaned or repaired)
- Process value (problem with external sensor, or process conditions outside the permissible range for SITRANS SL)
- Configuration (SITRANS SL is not correctly configured)

Severity:

- Fault (measurements could not be carried out)
- Warning (measurements may be inaccurate, or the system will soon shut down measuring mode if an intervention is not made)
- Advanced warning/information (measurements are carried out)

The two binary (relay) outputs can be configured freely for the alarm output.

The response of the analog outputs in the event of an alarm is configurable; possible actions are:

- Off (current measured value is displayed)
- Last measured value (freezing of last value displayed)
- Standard level (setting to predefined value)
- 3 mA (NAMUR NE43 fault status)

In addition, the transmission is available as an output variable.

Note

Specific requirements for the measuring point can make the utilization of special sensor equipment necessary. The possibilities for adapting the sensors are:

- Special materials for purging tubes (on request)
- Various types/sizes of sensor flanges
- Explosion-protected sensor configurations

Essential characteristics

- Long-term stabilization by using an internal reference cell; for calibration interval of at least one year
- Dynamic background correction for varying dust loads
- Isolated signal outputs of 4 to 20 mA
- User-friendly, menu-driven operation
- Selectable time constants (response time)
- Password-protected user interface
- I/O operation in accordance with NAMUR recommendations
- Monitoring of overall optical transmission
- Sensor enclosure resistant to wear and corrosion
- Simple local operation using remote-control unit with numeric keypad and menu prompting

Standard applications

The following table lists the measuring conditions for standard applications. The listed values for the measuring range and detection limit are only approximate values. The exact values at the respective measuring point depend on the totality of all influencing variables and can be determined by Siemens for the specific case. Note that the values for the detection limit and the maximum measuring range are based on a path length of 1 m. Longer path lengths will improve the detection limit, but not linearly. This is due to limiting effects such as dust load. The maximum applicable measuring ranges can only be used if permitted by the process conditions such as dust load.

Standard application Effective optical path length: 0.3 … 8 m Dust load[2]: < 50 g/Nm^3			**Process gas temperature T_{min} … T_{max}**	**Process gas pressure p_{min} … p_{max}**	**Min. measuring range (with 1 m eff. opt. path length)**	**Max. measuring range (also dependent on eff. opt. path length: see following column)**	**Max. measuring range x path length**	**DL x path length (under standard conditions[1]) without cross-interference of other gases)**	**Repeatability[3]**	**Purging gas medium**
Sample gas component	**Gas code**	**Appl. code**								
O_2	A	B	0 … 600 °C	900 … 1 100 hPa	0 … 1 vol%	0 … 100 vol%	75 vol%*m	200 ppmv*m	2%	N_2
O_2	A	C	0 … 200 °C	700 … 5 000 hPa	0 … 1 vol%	0 … 100 vol%	75 vol%*m	200 ppmv*m	2%	N_2

Reference table: Standard applications. The specified pressures are absolute.

DL = detection limit

[1] The specification applies at 20 °C and 1013 hPa in a nitrogen atmosphere. In rare cases, a deviating process gas matrix or process conditions can have a negative effect on performance. Contact Siemens to determine the exact performance under your process conditions.

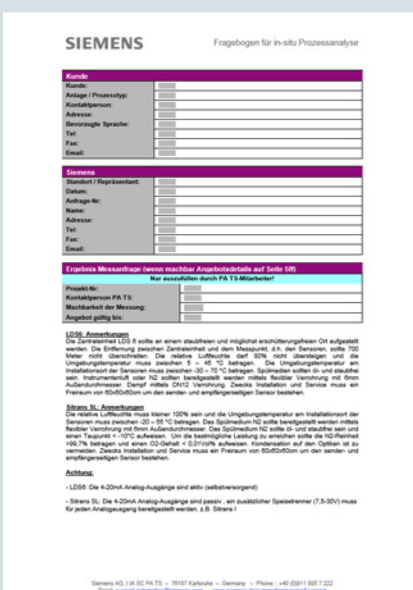
[2] With 0.3 m effective optical path length
Average diameter of the dust particles: 15 µm
Specific weight of the dust particles: 650 kg/m^3
The influence of dust load is extremely complex and depends on the path length and particle size. The optical attenuation increases exponentially at longer path lengths. Smaller particles also have a very large influence on the optical attenuation. With high dust load, long path length and small particle size, the technical support at Siemens should be consulted.

[3] Based on measuring range. With stable or externally measured and software-compensated process gas temperature and pressure conditions.

Special applications

In addition to the standard applications, special applications are available upon request. If the process conditions deviate from the specifications of the standard applications, special applications are also possible on request.

- Complete the application questionnaire which can be found on the Internet at http://www.siemens.com/insituquestionnaire:


SIEMENS Fragebogen für in-situ Prozessanalyse

Technical specifications

Analytical performance	
Measuring range	Internally adjustable
Detection limit at standardized conditions: 25 °C gas temperature, 1 000 hPa, 1 m effective optical path length, 3 s integration time and constant ambient conditions.	O_2: 200 ppmv
Linearity (under standard conditions)	Better than 1%
Repeatability (under standard conditions)	O_2: 1% of the measuring range
General information	
Design	Transmitter and detector units, connected by a sensor cable
Materials	• Sensor enclosure: Treated aluminum/stainless steel (1.4305/303) • Process interface: Acid-resistant stainless steel (1.4404/316L) • Window: hardened borosilicate glass • Compressible gaskets: FKM, FF, EPDM (holder for reference cell) • Flat gaskets: Graphite
Parts wetted by the process gases	• Purging tubes, flanges, window ring, process purging: acid-resistant stainless steel • Window: Borosilicate • Gasket in window: FFKM • Flat gasket between customer flange and process flange: Graphite
Installation	In-situ or bypass
Concentration units	ppm, vol.%, mg/Nm^3
Display	Digital concentration display (4 digits with floating decimal point)
Laser protection class	Class 1, safe to the eye
Explosion protection	Optionally, according to • ATEX II 2G Ex de op is IIC T6 ATEX II 2D Ex tD A21 IP65 T85 °C • FM Class I, II, III Div 1 Groups A, B, C, D, E, F, G T6 FM Class I, Zn 1, AEx d IIC T6 FM Class II, Zn 21, AEx td T85 °C • XP Class I, II, III Div 1 Groups C, D T6 Ta = 55 °C; DIP Class II,III Div 1 Groups E, F, G T6 Ta = 55 °C; Class I, Zn 1, Ex d IIC T6 Ta = 55 °C; Zn 21, Ex tD T85 °C Ta = 55 °C
Design, enclosure	
Degree of protection	IP65 according to EN 60529
Purging tube	• Length: 340 mm • Outer diameter: 48 mm • Inside diameter: 44 mm
Purging tube	Length, outer diameter, inner diameter: 340, 48, 44 mm
Weights	
• Detector unit	6.0 kg
• Transmitter unit	5.2 kg
• Process interface	
- for DN50/PN25	5.3 kg
- for ANSI4''/150 lbs	Approx. 12 kg
Connection dimension customer flange	DN 50/PN 25, DN 50/PN 40 or ANSI 4"/150 lbs

Electrical characteristics	
Auxiliary power	24 V DC nominal (18 ... 30.2 V DC)
Power consumption, maximum	10 VA
EMC	In accordance with EN 61326-1
Electrical safety	In accordance with EN 61010-1
Fuse specifications	T1.6L250V
Dynamic performance	
Warm-up time at 20 °C ambient temperature	Approx. 15 min
Response time (T90)	Approx. 2 s, depends on application
Integration time	0 ... 100 s, selectable
Influencing variables	
Variations in ambient temperature	< 0.5%/10 K of the measuring range
Process gas temperature	With compensation: < 1%/100 K of the measuring range
Variations in atmospheric pressure	Negligible
Process gas pressure	O_2: With compensation: < 1%/ 4 000 hPa of the measuring range
Variations in supply voltage	Negligible
Electrical inputs and outputs	
Number of measurement channels	1
Analog outputs	2 outputs, 4 ... 20 mA, floating, ohmic resistance max. 660 Ω. External isolating power supplies may have to be provided by the customer.
Analog inputs	2 inputs, designed for 4 ... 20 mA, 120 Ω
Digital outputs	2 outputs, with switchover contacts, configurable, 24 V/0.5 A, floating, single pole double throw (SPDT)
Digital input	1 input, designed for 24 V, floating, configurable
Service port	Ethernet 10BaseT (RJ-45)
RS 485 PROFIBUS DPV0 version	Two-wire interface, up to 3 Mbps, -7 … 12 V
RS 485 Modbus version	Two-wire interface, up to 115 200 bit/s, -7 … 12 V
Connection cable to customer interface	Not included in standard delivery, permanently installed for ATEX or optional for standard
Analog connection cable (only supplied cables may be used for ATEX configuration!)	10 x 2, with shielding in twisted-pair configuration (depending on type and number of I/Os used)
PROFIBUS DP connection cable (with ATEX configuration: only supplied cables may be used!)	1 x 2 + 4 (PROFIBUS DP hybrid cable)
Modbus connection cable (with ATEX configuration: only supplied cables may be used!)	1 x 2 + 3, with shielding in twisted-pair configuration
Cable length for ATEX configuration	3 m
Conductor cross-section	Min. 0.34 mm^2
Cable diameter	8 ... 12 mm or 13 ... 18 mm
Minimum bending radius ATEX-PROFIBUS	110 mm

In situ O2 gas analyzer

Sensor cable	Not included in standard delivery, permanently installed for ATEX or optional for standard
Sensor cable type configuration	4 x 2, with shielding, in twisted-pair configuration
Conductor cross-section	Min. 0.34 mm²
Cable sheath	PUR (polyurethane)
Dimensions	• Diameter: 11 mm • Length: up to 25 m
Minimum bending radius	ATEX: 85 mm
Climatic conditions	
Ambient temperature range	**Note** The display on the receiver side must not be exposed to direct solar radiation. • -20 ... +55 °C during operation (additional solar radiation not permissible!) • -40 ... +70 °C during transport and storage
Temperature range on the sensor side of the process interface (connection plate)	-20 ... +70 °C
Atmospheric pressure	800 ... 1100 hPa (for ATEX and FM version)
Humidity	< 100% rel. humidity
Measuring conditions	
Measurement path	0.3 ... 8 m (other lengths: please contact Siemens)
Process gas pressure, temperature	• O_2: 900 ... 1 100 hPa, 0 … 600 °C • O_2: 700 … 5 000 hPa, 0 … 200 °C
Dust load	The influence of a high dust load is complex, and depends on the optical path length and particle size distribution.
Purging	
Purging gas	Nitrogen (for O_2 applications)
• Quality	O_2 application: Purity better than 99.7% in order to achieve full performance. For oxygen measurements, an O_2 content < 0.01 vol.% in the purging gas is recommended.
• Dew point	< -10 °C, condensation on the optics must be avoided
Sensor purging	
• Max. overpressure in the sensor	500 hPa
• Purging gas temperature on sensor side	0 ... +55 °C
• Flow	O_2 application: When commissioning a sensor enclosure previously filled with air: 3 ... 5 l/min (for at least 15 min), subsequently: at least 0.25 l/min
Purging on the process side (optional)	
• Pressure at purging gas inlet	2 000 ... 8 000 hPa
• Flow	Dependent on process gas pressure, process gas velocity, dust load, moisture, etc. up to max. 50 l/min

Accessories

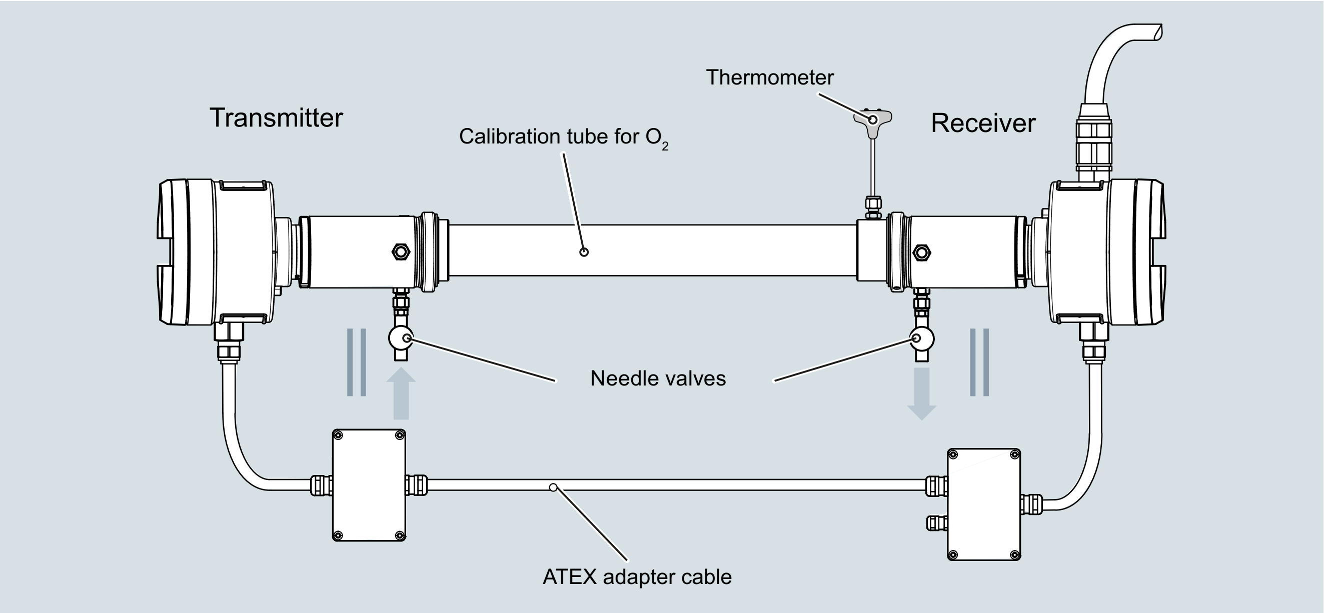
SITRANS SL sensor alignment kit

The SITRANS SL sensor alignment kit includes a battery-operated lamp, a centering aid with cross-hairs and two hook spanners for loosening the sensors from the flange connection plates.

Please note:
The SITRANS SL sensor alignment kit is not explosion-protected! Therefore it must never be used in a hazardous area without approval by the plant operator!

Calibration test kit

The SITRANS SL has already been factory-calibrated. If it is desirable or necessary to check the calibration, this can be performed using an external calibration test kit following removal of the transmitter and detector units. This procedure has no influence on the optical adjustment of the unit since the flange connection plates remain mounted on the customer flange. The calibration test kit for O_2 consists of a stainless steel calibration tube and a thermometer. To carry out the calibration, it is mounted between the transmitter and receiver. The calibration tube for O_2 can then be filled with air or a calibration gas.



Calibration validation setup of SITRANS SL O_2

Additional accessories

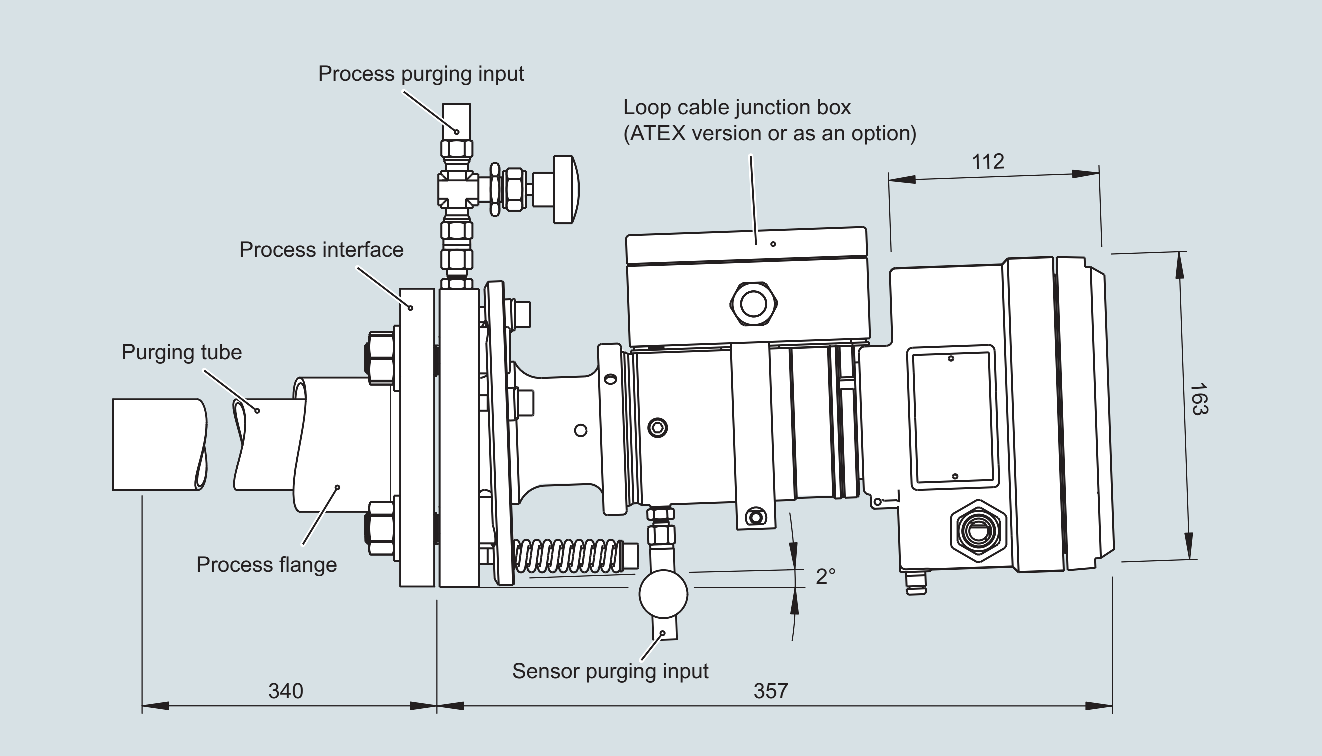
You can find more accessories and spare parts in our PIA Life Cycle Portal product selector:
http://www.pia-portal.automation.siemens.com

Dimensional drawings

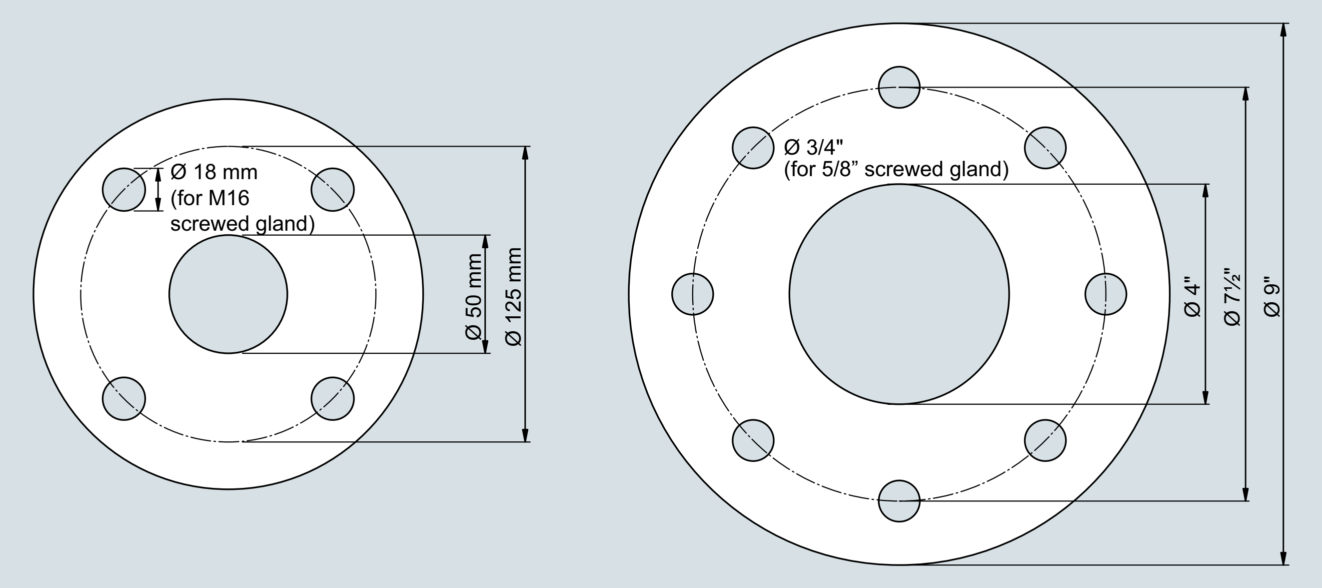
Note

The SITRANS SL sensors must be accessible from the side. A space of at least 60 cm must be provided next to the SITRANS SL transmitter and detector units in order to facilitate maintenance and servicing.

To fulfill the safety requirements, a clearance of at least 10 cm must be provided around the SITRANS SL to maintain cooling.



SITRANS SL, transmitter/detector unit (same housing for DN50/PN25 process interface version), dimensions in mm



Connection dimensions of process flanges provided by customer DN50/PN25 and ANSI 4''/150 lbs

Circuit diagrams

Electrical connections

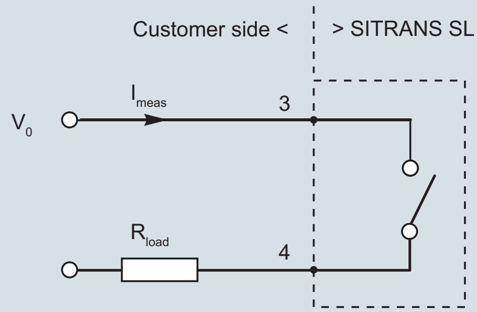
Non-hazardous area version connection cable - customer interface

Terminal block in the receiver enclosure			Function/voltage	Ethernet cable
1	+		Power supply 19 … 30.2 V, 10 VA[1]	
2	-			
3	Normally closed under power[4]		Digital output 0 (relay) 30 V, 0.5 A[3]	
4				
5	Normally closed under power[4]		Digital output 1 (relay) 30 V, 0.5 A[3]	
6				
7	+		Digital input 0 0 … 30 V[2]	
8	-			
9	+		Analog output 0 (measurement) 30 V, 24 mA[3]	
10	-			
11	+		Analog output 1 (measurement) 30 V, 24 mA[3]	
12	-			
13	PROFIBUS A line (RxD/TxD_N - data inverted)	Modbus D1 (RxD/TxD_N - data inverted)	RS 485 (PROFIBUS/Modbus)	
14	PROFIBUS B line (RxD/TxD_P - data not inverted)	Modbus D0 (RxD/TxD_P - data not inverted)	-7 ... +12 V DC	
15	PROFIBUS/Modbus shield			
16	T_x+		Ethernet[5]	White/orange
17	T_x-			Orange
18	R_x+			White/green
19	R_x-			Green
20	+		Analog input 0 (temperature) 0 … 30 mA[2], 120 Ω	
21	-			
22	+		Analog input 1 (pressure) 0 … 30 mA[2], 120 Ω	
23	-			
24			Grounding	
25			Grounding	
Ground			Grounding	
Ground			Grounding	Shielding

1) This is the maximum power consumption of the SITRANS SL
2) These are the maximum input values
3) These are the maximum output values
4) Note:
"Normal operation" stands for normal operation of the analyzer. The system is connected to the voltage source and is running without problems; no error message generated or displayed.
"Normal under power" refers to the status of the relay under the above-named normal operation. The relay contact of the alarm signal is closed.
5) We recommend that the Ethernet connection is not made via the cable to the Ethernet terminals in the detector unit. Instead, the Ethernet connection should be made via the sensor cable connection set which is optionally available for the detector unit.

Examples of digital output and analog output

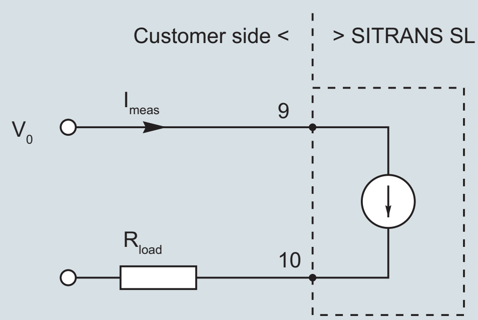
Caution
Please note that an external isolating power supply may be required!



V_0 can be up to 30 V

R_{load} must be at least 60 Ω
(max. 0.5 mA in relay)

Example of digital output 0



V_0 must be min 7.5 and max 30 V

R_{load} can be maximum $\frac{V_0 - 7.5}{0.025}$ Ω

Example of an analog output 0

Sensor cable terminal box on the receiver side (ATEX version)

Terminal strip in terminal box		Function	Color code
1	+	24 V DC voltage supply for transmitter unit	Red
2	-		Blue
3	Com +	Communication with transmitter	Pink
4	Com -		Gray
5	Sync +	Synchronization with transmitter	White
6	Sync -		Brown
7	NC	Not used	-
8	Tx+	Ethernet	Gray/pink
9	Tx-		Red/blue
10	Rx+		Black
11	Rx-		Violet
PE terminal	-	Grounding	Green
PE terminal		Grounding	Yellow
Gland		Grounding	Shielding

Selection and ordering data

Selection and ordering data		Article No.	Cannot be combined
SITRANS SL in-situ gas analyzer		↗ **7MB6221-** ■■■■■ - ■■■■	
↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.			
Explosion protection[1]			
Without		0	0
Ex II 2 G Ex de op is IIC T6 Ex II 2 D Ex tD A21 IP65 T85°C		1	
FM USA: XP Class I, II, III Div 1 Groups A, B, C, D T6 Ta = 55°C DIP Class II,III DIV 1 Group EFG Ta = 55°C Class I, Zn 1, AEx d IIC T6 Ta = 55°C Zn 21, AEx tD T85°C Ta = 55°C FM Canada: XP Class I, II, III Div 1 Groups C, D T6 Ta = 55°C DIP Class II,III DIV 1 Group EFG Class I, Zn 1, Ex d IIC T6 Ta =55°C Class II, III Zn 21, Ex t IIIC T85°C Ta = 55°C		2	2 2
Measured component			
O_2		A	A
Application examples[2]			
Control of combustion processes		B	B
Process control, safety monitoring in appropriate plant concepts		C	
Communication interface			
2x analog I/O, 1x DI, 2x DO		0	
PROFIBUS DP		1	
Modbus		2	
Purging tubes, material	**Length**		
No purging tubes		0	
Stainless steel	340 mm	1	
Purging: Process side	**Purging: Sensor side**		
No purging	No purging	0	0
No purging	3 ... 5 l/min	1	1
0 ... 50 l/min	No purging	2	2
0 ... 50 l/min	3 ... 5 l/min	3	
Process connection[3]			
Stainless steel flange (1.4404/316L), connection dimensions ANSI 4"/150 lbs, MAWP (PS) at 20 °C: 232 psi		B	
Stainless steel flange (1.4404/316L), connection dimensions DN50/PN25, MAWP (PS) at 20 °C: 2.5 MPa		C	
Stainless steel flange (1.4404/316L), connection dimensions DN50/PN40, MAWP (PS) at 20 °C: 4.0 MPa		E	E
Without process connection		X	
Sensor cable			
With brass bushing			
• 5 m		A	A A
• 10 m		B	B B
• 25 m		C	C C
With stainless steel gland			
• 5 m		D	D D
• 10 m		E	E E
• 25 m		F	F F
Without cable		X	
Documentation language			
German		0	
English		1	
French		2	
Spanish		3	
Italian		4	

[1] Complete and consistent implementation of the safety concept by the plant operator must be ensured during the commissioning and operation of the in-situ laser spectrometer SITRANS SL in hazardous atmospheres.

[2] The examples shown represent possible applications where appropriately configured SITRANS SL solutions can be used. The user is responsible for the prevailing conditions (plant concept (possibly redundant), application of appropriate components required in addition, compliance with possible directives, etc.).

[3] MAWP: Maximum Allowable Working Pressure.

In situ O2 gas analyzer

Selection and ordering data

Additional versions	Order code
Add "-Z" to Article No. and specify Order code	
Acceptance test certificate 3.1 (leak test) in accordance with EN 10204	**C12** [1)]
Acceptance test certificate 3.1 (material certificate) in accordance with EN 10204	**C13** [1)]
SIL 1 conformity declaration in accordance with standards IEC 61508/IEC 61511 (for the measured component oxygen in combination with analog interfaces)	**C20** [1)]
TAG label, customized inscription	**Y30**

[1)] Together with explosion protection as per FM, on request

Selection and ordering data

Additional units and spare parts	Article No.	Item no. (see graphic on page 2/21)
Additional units		
SITRANS SL, calibration test kit O_2,	**A5E01000694**	
SITRANS SL, sensor alignment kit	**A5E01000740**	
SITRANS SL, connection box Ex-e for 25-pin connecting cable	**A5E01267567**	
SITRANS SL, connecting cable set analog (for non-Ex)	**A5E03328474**	
SITRANS SL, connecting cable set PROFIBUS DP (for non-Ex)	**A5E03328473**	
SITRANS SL, UV protective hose for outdoor use, ND = 48 mm per 30 m length	**A5E01714061**	
SITRANS SL, sensor cable set (non-Ex) with cable glands of nickel-plated brass, length: 5 m	**A5E02509347**	**3+4+5**
SITRANS SL, sensor cable set (non-Ex) with cable glands of nickel-plated brass, length: 10 m	**A5E02528048**	**3+4+5**
SITRANS SL, sensor cable set (non-Ex) with cable glands of nickel-plated brass, length: 25 m	**A5E02528052**	**3+4+5**
Spare parts		
SITRANS SL, process connection plate (1 unit) for customer flange size: DN 50/PN 10 ... 40 including seal	**A5E01009881**	
SITRANS SL, gasket for DN 50/PN 10 ... 40	**A5E02522036**	
SITRANS SL, process connection plate (1 unit) for customer flange size: ANSI 4"/150 lbs including seal	**A5E01009883**	
SITRANS SL, gasket for ANSI 4''/150 lbs	**A5E02789535**	
SITRANS SL, purging tube 340 mm incl. seal for DN 50/PN 10 ... 40	**A5E01009892**	
SITRANS SL, window cover for detector unit	**A5E01009897**	
SITRANS SL, cover for transmitter unit	**A5E02568437**	
SITRANS SL, connecting cable for analog and Modbus (ATEX), cable gland of nickel-plated brass, for devices delivered after October 2009 (Version 1.1)	**A5E02608597**	**6**
SITRANS SL, connecting cable for analog and Modbus (ATEX), cable gland of stainless steel	**A5E34834297**	**6**
SITRANS SL, connecting cable for PROFIBUS DP (ATEX), cable gland of nickel-plated brass	**A5E02608594**	**6**
SITRANS SL, cable for transmitter (ATEX), cable gland of nickel-plated brass	**A5E44678580**	**2**
SITRANS SL, cable for detector (ATEX), cable gland of nickel-plated brass	**A5E44678567**	**4**
SITRANS SL, connecting cable for PROFIBUS DP (ATEX), cable gland of stainless steel	**A5E34834296**	**6**
SITRANS SL, connecting cable for transmitter (ATEX), cable gland of stainless steel	**A5E34830928**	**2**
SITRANS SL, connecting cable for detector (ATEX), cable gland of stainless steel	**A5E34831050**	**4**
SITRANS SL, terminal box and connecting cable for transmitter (ATEX), cable gland of stainless steel	**A5E34831075**	**1**
SITRANS SL, terminal box (ATEX), cable gland brass, nickel-plated	**A5E02091532**	**1**
SITRANS SL, terminal box and connecting cable for transmitter (ATEX), cable gland of nickel-plated brass	**A5E02568463**	**1+2**
SITRANS SL, sensor cable 5 m	**A5E02571180**	**5**
SITRANS SL, sensor cable 10 m	**A5E02571184**	**5**
SITRANS SL, sensor cable 25 m	**A5E02571186**	**5**
SITRANS SL, terminal box and connecting cable for detector (ATEX), cable gland of stainless steel	**A5E34831078**	**3**
SITRANS SL, terminal box and connecting cable for detector (ATEX), cable gland of nickel-plated brass	**A5E02568465**	**3+4**
SITRANS SL, cable gland for non-ex cables	**A5E02568457**	
SITRANS SL, screw cap	**A5E01010033**	
SITRANS SL, printed-circuit board for detector with LUI (Version 1.1)	**A5E31503119**	
SITRANS SL, remote control IS, CSA, FM, ATEX certifications	**A5E02091214**	
SITRANS SL, assembly kit for needle valve	**A5E02569944**	
SITRANS SL, assembly kit restrictor for sensor purging	**A5E02183375**	

Additional accessories

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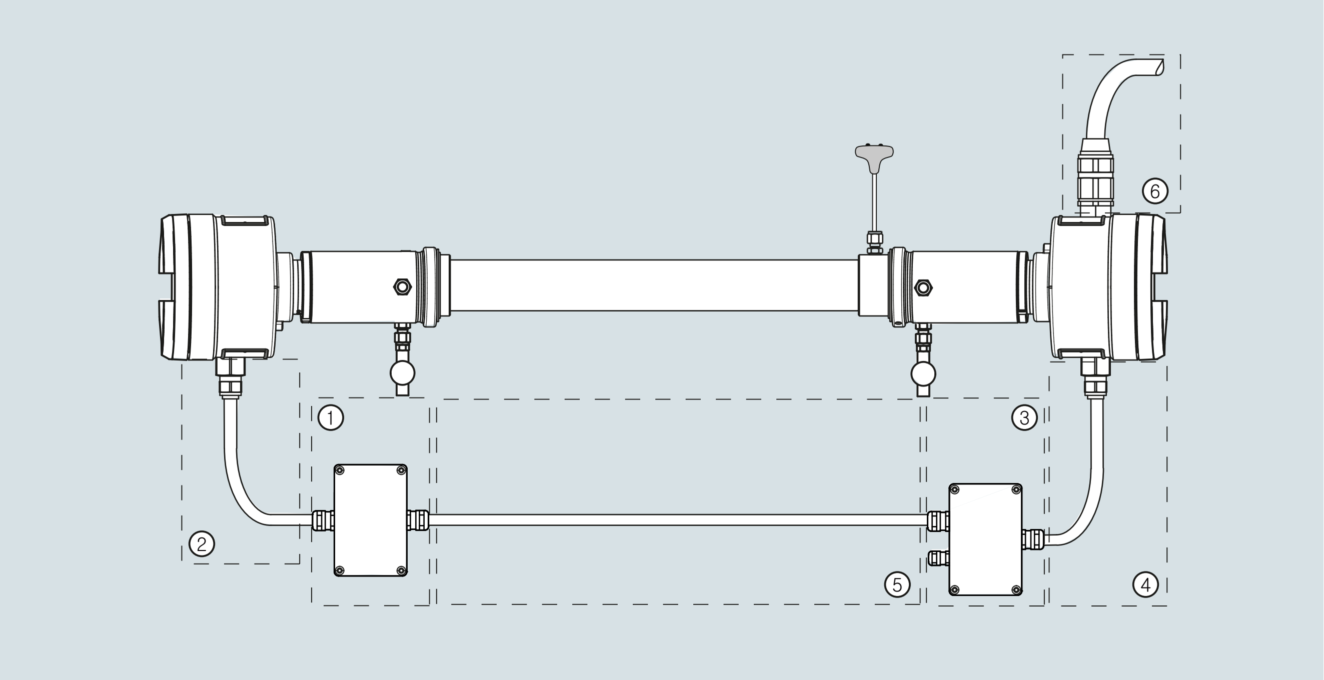
http://www.pia-portal.automation.siemens.com



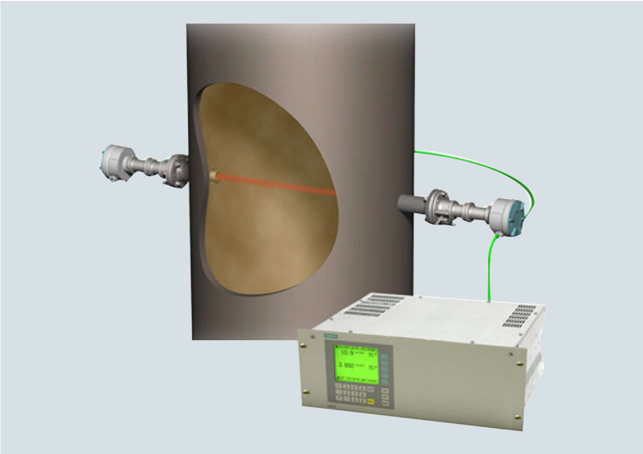
SITRANS SL spare parts, item numbers

Documentation

More information

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

Overview



LDS 6, typical installation with transmitted-light sensors

LDS 6 is a diode laser gas analyzer with a measuring principle based on the specific light absorption of different gas components. LDS 6 is suitable for fast and non-contact measurement of gas concentrations in process or flue gases. One or two signals from up to three measuring points are processed simultaneously by the central analyzer unit. The in-situ cross-duct sensors at each measuring point can be separated up to 700 m from the central unit by using fiber-optic cables. The sensors are designed for operation under harsh environmental conditions and contain a minimum of electrical components.

Benefits

The in-situ gas analyzer LDS 6 is characterized by a high availability and unique analytical selectivity, and is optimally suitable for numerous applications. LDS 6 enables the measurement of one or two gas components or - if desired - the gas temperature directly in the process:

- With high dust load
- In hot, humid, corrosive, explosive, or toxic gases
- In applications showing strong varying gas compositions
- Under harsh environmental conditions at the measuring point
- Highly selective, i.e. mostly without cross-sensitivities

LDS 6 properties:

- Little installation effort
- Minimum maintenance requirements
- Extremely rugged design
- High long-term stability through built-in, maintenance-free reference gas cell, field calibration is unnecessary
- Real-time measurements

Moreover, the instrument provides warning and failure messages upon:

- Need for maintenance
  - Erroneous reference function
  - Bad signal quality
- Violation of a lower or upper alarm level for the measured variable
- Transmitted amount of light violating an upper or lower limit

Application

Applications

- Process optimization
- Continuous emission monitoring for all kinds of fuels (oil, gas, coal, and others)
- Process measurements in power utilities and any kind of incinerator
- Process control
- Explosion protection
- Measurements in corrosive and toxic gases
- Quality control
- Environmental protection
- Plant and operator safety

Sectors

- Power plants
- Steel works
- Cement industry
- Chemical and petrochemical plants
- Automotive industry
- Waste incinerators
- Glass and ceramics production
- Research and development
- Semiconductor and computer chip production

Special applications

In addition to the standard applications, special applications are available upon request. These contain both an expansion of the temperature and pressure range, as well as an expansion of the concentration measuring range. Furthermore, other gas species can be measured using special application.

Design

The gas analyzer LDS 6 consists of a central unit and up to three in-situ sensors. The connection between the central unit and the sensors is established by a so-called hybrid cable, which contains optical fibers and copper wires. An additional cable connects the transmitter and receiver parts of the cross-duct sensor.

Central unit

The central unit is housed in a 19" rack unit housing with 4 fixing points for mounting

- in a hinged frame
- in racks with or without telescopic rails

Display and operator panel

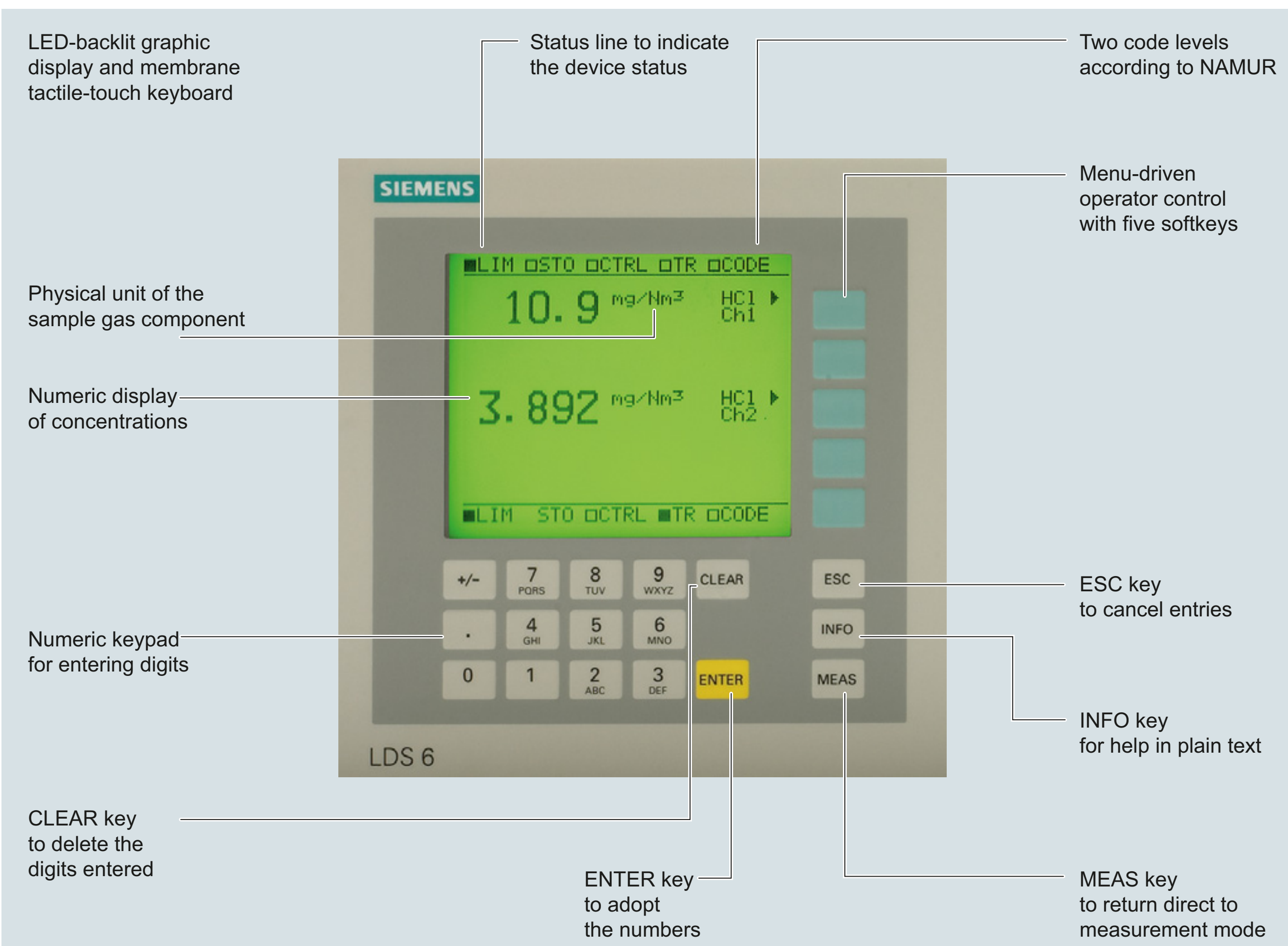
- Large LCD field for simultaneous display of measurement result and device status
- Contrast of the LCD field is adjustable via the menu
- LED background illumination of the display with energy-saving function
- Easy-to-clean membrane touch pad with softkeys
- Menu-driven operation for parameterization and diagnostics
- Operation support in plain text

Inputs and outputs

- One to three measurement channels with hybrid connections for the sensors at the measuring points
- 2 analog inputs per channel for process gas temperature and pressure
- 2 analog outputs per channel for gas concentration(s). For selected versions, the transmission can be read out as an alternative.
- 6 freely configurable digital inputs per channel for signaling faults or maintenance requests from external temperature or pressure transducers or sensor purging failure.
- 6 freely configurable digital outputs per channel (signaling of fault, maintenance requirements, function control, transmission limit alarm, concentration limit alarm, store analog output)

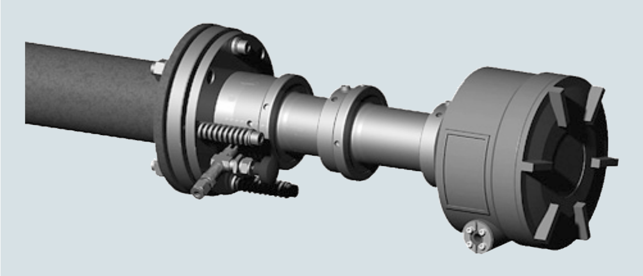
Communication

Network connection: Ethernet (T-Base-10) for remote diagnostics and maintenance.



LDS 6 central unit, membrane keyboard and graphic display

Cross-duct sensors



Sensor CD 6, transmitter or detector unit

- In-situ cross-duct sensors, configured as transmitter and detector unit, connected via sensor cable
- Connection to the LDS 6 central unit via a so-called hybrid cable of max. 700 m length (total hybrid and sensor connecting cable length: max. 250 m in Ex Zone 0 and Ex Zone 1)
- Stainless steel, some painted aluminum
- IP65 degree of protection for sensor
- Adjustable flanges with flange connection
- DN 65/PN 6, ANSI 4"/150 lbs
- Optional flameproof window flanges with dimensions: DN 65/ PN 6, DN 80/PN 16, ANSI 4"/150 lbs, other process interfaces available on request
- Purging facilities on the process and the sensor sides, configurable application with purging gas connections for:
  - Instrument air
  - Purging air blower
  - Steam
  - Nitrogen
  - Process gases to which the pressure equipment directive cat. 2 does not apply
- In combination with high-pressure window flanges, purging can be performed at the process end with instrument air or nitrogen
- Quick release fasteners for cleaning the measurement openings and the sensor window
- Optional: Version with explosion protection in accordance with ATEX / IEC Ex ia
- Sensor type CD 6 is compliant with the pressure equipment directive

Parts in contact with the process gas

The sensors normally do not come into contact with the process gas, since purging with a gaseous media is applied at the process side. Stainless steel purging gas tubes in front of the sensor windows are immersed slightly into the process gas and thus limit the purging volume. Special materials such as Hastelloy and plastics (PP) are available on request.

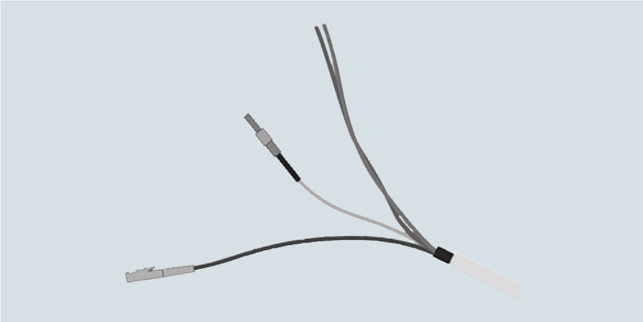
Hybrid and sensor cables

A combination of fiber-optic cables and twisted copper wires connects the sensors to the central unit. The hybrid cable connects the central unit with the detector unit of the sensor, the sensor cable connects the transmitter and receiver units of the sensor.

For installation in Ex-protected environments, the legislative regulations have to be complied with, such as the spatial separation of intrinsically-safe from non-intrinsically-safe cables.

In compliance with standard EN IEC 60079-14, systems with intrinsically-safe circuits must be installed such that their intrinsic safety is not impaired by electric or magnetic fields. Therefore the hybrid and sensor cables of the LDS 6 in an Ex application must be routed in such a way that they cannot generate electric or magnetic fields, e.g. by coiling them in more than one cable loop. To guarantee a good signal quality and to avoid impermissible inductance loops, the hybrid and sensor cables should be kept as short as possible.

- The distance between central unit and measuring point can be
  - up to 250 m for Ex units when used in Zone 0 and Zone 1 (total hybrid and sensor connecting cable length)
  - up to 700 m for Ex units used in Zone 2 and for non-Ex units
- Hybrid and sensor cables
  - Multimode fiber-optic cable, provided with SMA connections for transmission of the measured signal
  - Two-wire copper cable, in twisted pair version, for +24 V supply of the detector electronics (+12 V in the case of Ex-suitable instruments)
- Additionally for the hybrid cable:
  - Single-mode fiber-optic cable, configured double-sided with E2000 connectors for transmission of laser light
- Rugged cable sheath for laying in open cable ducts or ductworks
- Sheath material: oil-resistant polyurethane



Connections of the hybrid cable

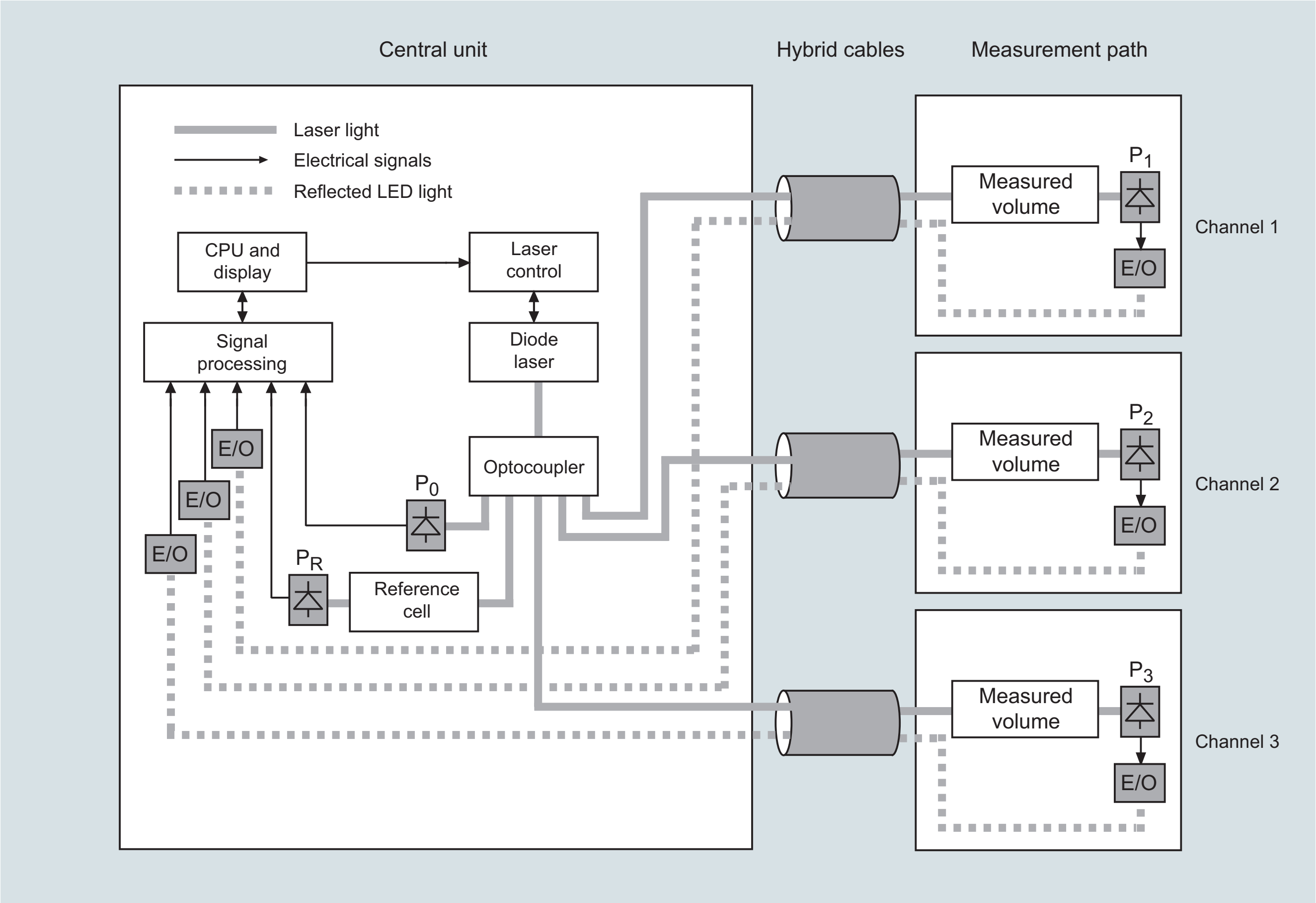
2

Function

Operating principle

LDS 6 is a gas analyzer employing single-line molecular absorption spectroscopy. A diode laser emits a beam of near-infrared light, which passes through the process gas and is detected by a receiver unit. The wavelength of the laser diode output is tuned to a gas-specific absorption line. The laser continuously scans this single absorption line with a very high spectral resolution.

The result is a fully resolved single molecular line which is analyzed in terms of absorption strength and line shape. The influence of cross-sensitivities on the measurement is negligible, since the quasi-monochromatic laser light is absorbed very selectively by only one specific molecular line in the scanned spectral range.

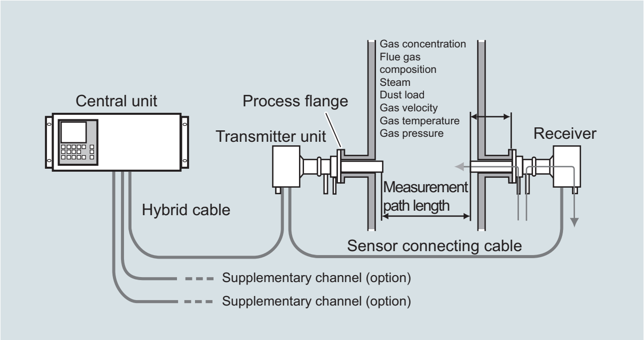


Basic design of the LDS 6

Configuration examples:

A feature of the in-situ analytical procedure is that the physical measurement takes place directly in the stream of process gas, and usually also directly in the actual process gas line. All process parameters such as gas matrix, pressure, temperature, moisture, dust load, flow velocity and mounting orientation can influence the measuring properties of the LDS 6 and must therefore be systematically investigated for each new application.

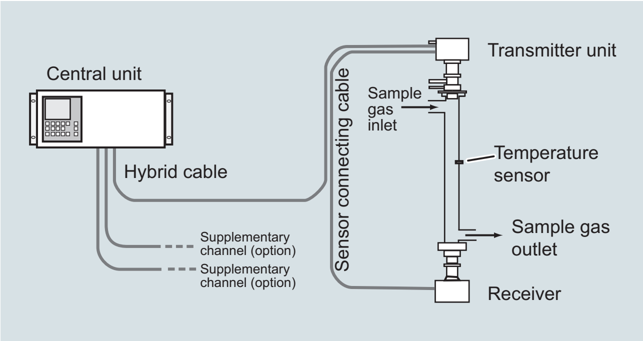
A feature of the standard applications defined in the ordering data of the LDS 6 is that the typical process conditions are well-known, documented, and the guaranteed measuring properties can be proven by reference installations. If you cannot find your application among the standard applications, please contact Siemens. We will be pleased to check your possible individual application of the LDS 6. You can find an application questionnaire on the LDS 6 product pages on the Internet:
www.siemens.com/insituquestionnaire



Typical transmitted light setup of LDS 6, in-situ

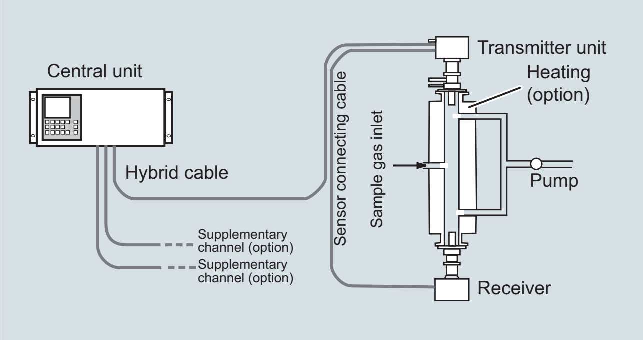
To avoid contamination of sensor optics on the process side, clean gaseous purging media such as instrument air, N_2 or steam are used. Purging air tubes on the sensor heads, which slightly penetrate into the process gas stream, define the effective measuring path length.

The LDS 6 can measure in both the transverse and longitudinal directions of the process gas flow. In certain cases, the process conditions make it necessary to condition the sample gas stream in a bypass line with respect to process temperature, pressure and/or optical path length. Further treatment of the process gas, such as drying or dust precipitation, is usually unnecessary.



Typical transmitted light setup of LDS 6, in bypass

A flow cell is available by special application for the LDS 6 which has been specially optimized for use with the LDS 6 and its transmitted-light sensors with respect to handling and measuring performance. It is designed to reduce surface effects, and is therefore also highly suitable for polar gases like ammonia. This flow cell is available in heated and non-heated versions. Wheel mounted and wall mounted versions are available.



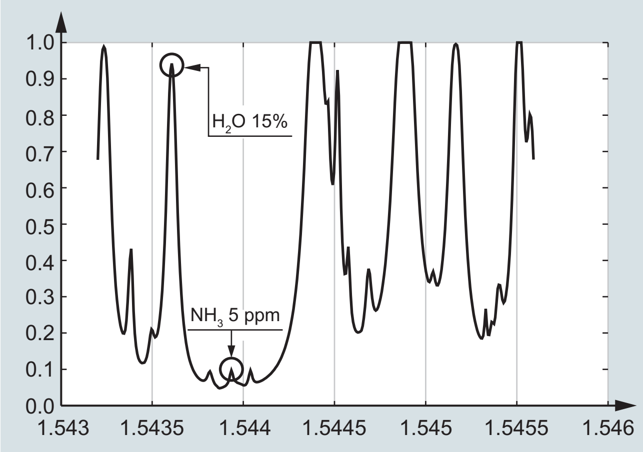
Measuring configuration of LDS 6 with heated flow cell

General information

LDS 6 is connected to the measuring points by fiber optics. The laser light is guided by a single-mode fiber from the central unit to the transmitter unit of the in-situ sensor. The sensor consists of a transmitter and a receiver; the distance between them defines the measurement path. In the receiver box, the light is focused onto a suitable detector. The detector signal is then converted into an optical signal and transmitted via a second optical fiber to the central unit, where the concentration of the gas component is determined from the detected absorption signal.

LDS 6 usually measures a single gas component by means of the absorption capacity of a single fully resolved molecular absorption line. The absorption results from conversion of the radiation energy of the laser light into the internal energy of the molecule.

In some specific cases, two components can be measured simultaneously if their absorption lines are so close to each other that they can be detected within the laser spectrum by one single scan (for example water (H_2O) and ammonia (NH_3)).



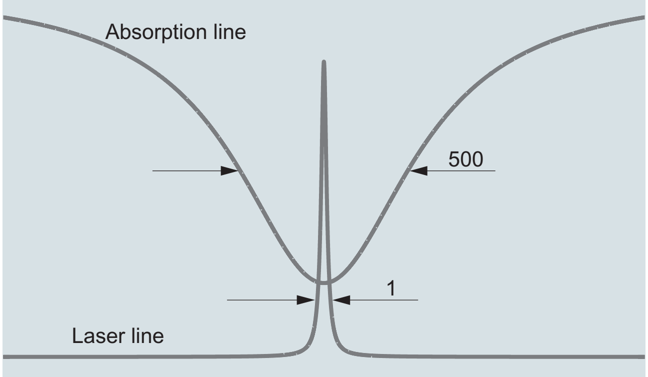
Absorption spectra of water and ammonia

Typical measurable gases for LDS 6 are:

- Oxygen (O_2) for low pressure range
- Hydrogen fluoride (HF) + water
- Hydrogen chloride (HCl) + water
- Ammonia (NH_3) + water
- Water vapor (H_2O)
- Carbon monoxide (CO)
- Carbon dioxide (CO_2)
- CO + CO_2

By using an internal reference cell normally filled with the gas measured, the stability of the spectrometer is permanently checked in a reference channel.

By doing so, the continuous validity of the calibration is ensured without the need to carry out external recalibration using bottled calibration gases or reference gas cells.



Typical spectral bandwidth of an absorption line compared to the bandwidth of the laser light.

2

Influences on the measurement

Dust load

As long as the laser beam is able to generate a suitable detector signal, the dust load of the process gases does not influence the analytical result. By applying a dynamic background correction, measurements can be carried out without any negative impact. Under good conditions, particle densities up to 100 g/Nm^3 (distance 1 m) can be handled by the LDS 6. Varying dust loads are compensated by scanning the laser over the gas absorption line and the current background.
The effect of a high dust load is complex and depends on the path length and particle size. The optical damping increases at longer path lengths. Smaller particles also have a very large influence on the optical attenuation. With a combination of high dust load, long path length and small particle size, the technical support at Siemens should be consulted.

Temperature

The effect of temperature on the absorption strength of the molecule line is compensated by a correction factor. A temperature signal can be fed into an analog instrument from an external temperature sensor. This signal is then used to correct the influence of the temperature on the observed line strength. If the temperature of the sample gas remains constant, it is alternatively possible to carry out a static correction using a preset value.
At high process gas temperatures, generally from approximately 1 000 °C, there may be noticeable broadband IR radiation of gas and dust, or flames may occasionally occur in the measurement path. An additional optical bandpass filter for an LDS 6 measuring O_2 can be set upstream of the detector to protect it and prevent saturation by the strong background radiation.

Pressure

The effect of pressure on the absorption line, and consequently on the measured concentration, is compensated with a correction factor. The gas pressure can affect the line shape of the molecular absorption line. An analog pressure signal can be sent to the device from an external pressure sensor to fully compensate for the effect of the pressure including the density effect.

Optical path length

The absorption values analyzed by the LDS 6 are typically small. According to the Lambert-Beer law, the absorption of laser light depends on the optical path length within the gas, among other factors. Therefore, the precision in determining the effective optical path length in the process might limit the overall precision of the measurement.
As the sensor optics on the process side normally need to be purged to keep them clean over a long period of time, the thickness of the mixing zone between the purging medium and the process gas and its concentration distribution need to be considered. In a typical in-situ installation directly in the line and with some meters of path, the influence of the purging gas on the effective path length can be neglected.
Path length and dust load are mutually influencing: the higher the dust load in the process, the shorter the max. possible path length. For short path lengths in the range ≤ 0.3 m, contact Siemens Technical Support.

Maintenance and fault messages

LDS 6 outputs different warnings via relays:

- Need for maintenance (measured value is not influenced)
- Operating error (measured value might be influenced)

Note

Individual requirements for the measuring point can make the utilization of special sensor equipment necessary. The possibilities for adapting the sensors are:

- Different purging media, such as instrument air, ambient air, nitrogen or steam
- Different purging modes on process and sensor sides
- Special materials of purging tubes and/or sensor flanges
- Cooling or heating of the sensors
- Explosion-protected sensor configurations

Essential characteristics

- Integrated calibration adjustment with an internal reference cell
- Negligible long-term drifts of zero and span
- Dynamic background correction for varying dust loads
- Isolated signal outputs, 4 to 20 mA
- User-friendly, menu-driven operation
- Selectable time constants (response time)
- Two user levels with individual access codes for prevention of unwanted and unauthorized operations
- Operation according to NAMUR recommendations
- Monitoring of overall optical transmission
- Remote preventive maintenance and servicing via Ethernet/modem
- Straightforward replacement of the central unit, since connections can easily be removed
- Sensor and central unit housing free of wear and corrosion
- Easy operation with a numerical keypad and menu prompting

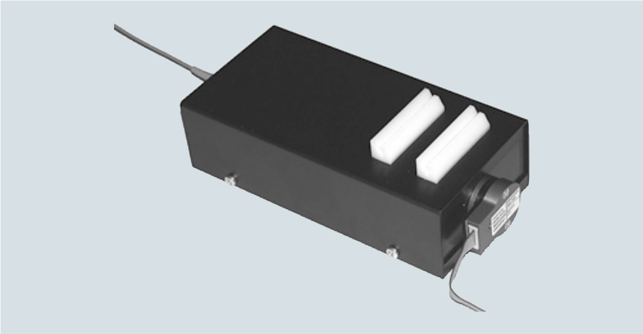
Certified versions for emission monitoring

The LDS 6 is available as certified instrument for emission monitoring of NH_3, NH_3/H_2O, H_2O, HCl, HCl/H_2O. The certificates are issued by TÜV for Germany and MCERTS for the United Kingdom. Test kits for ammonia, water and HCl should be used to conduct regular calibration and linearity checks on site. These kits can be ordered separately as instrument accessories. For new analyzer orders, the NH_3, NH_3/H_2O and H_2O kits named "Version 2" must be ordered. For analyzers already installed, contact Siemens Technical Support. for spotting the correct kit version, or consult the instrument manual.

Verification of calibration

Assembly with certified, maintenance-free calibration gas cell with connections for laser fiber-optic conductors and detector module of cross-duct sensor. These are used to rapidly verify the factory calibration in the field without compressed gas bottles or flow cell.

Calibration test kits are available for the following sample gases: O_2, NH_3, CO, CO_2, CO/CO_2. A "Zero gas test kit" is also available for individual applications (see Additional units).



Example of an assembly for verification of calibration

2

Technical specifications

Analytical performance	
Measuring range	Depending on sample gas component: See table for standard applications.
Detection limit (DL): Calculated in accordance with VDI 2449, measured on every supplied analyzer during the temperature test (between 5 ... 45 °C) in accordance with VDI 4203.	Depending on sample gas component: see table for standard applications. For application letter ET and FT: in accordance with the requirements of 17th and 27th BImSchV
Smallest recommended measuring range (with 1 m path length)	Depending on sample gas component: see table for standard applications.
The maximum applicable measuring ranges can be found in the table of standard combinations. These can only be applied if the individual process conditions allow it. Please contact the Technical Support from Siemens for checking the applicability.	
Accuracy[1]	2% / 5%, depending on sample gas component and application letter. At best: detection limit. See table for standard applications. For application letter ET and FT: in accordance with the requirements of 17th and 27th BImSchV
Linearity	Better than 1%
Repeatability	2% of the measured value or same amount as the detection limit (whichever is larger) For application letter ET and FT: in accordance with the requirements of 17th and 27th BImSchV
Calibration interval	No recalibration required thanks to internal reference cell
General information	
Concentration units	ppmv, Vol%, mg/Nm^3
Display	Digital concentration display (5 digits with floating decimal point)
Laser protection class	Class 1, safe to the eye
Certificates	CE marking, TÜV, MCERTS
Design, enclosure	
Degree of protection	IP20 according to EN 60529
Dimensions	177 x 440 x 380 mm
Weight	Approx. 13 kg
Mounting	Horizontal

Electrical characteristics	
Power supply	100 ... 240 V AC 50 ... 60 Hz, automatically adapted by the system; with a 3-channel central unit, an additional external power supply +24 V DC, 50 VA is included in the scope of delivery
Power consumption	50 W
EMC	According to EN 61326 and standard classification of NAMUR NE21
Electrical safety	According to EN 61010-1, overvoltage classification II
Fuse specifications	100 ... 240 V: T2.5L250V
Time response	
Warm-up time at 20 °C ambient temperature	Approx. 15 min
Response time	Min. of 1 s, depending on application
Integration time	1 … 100 s, adjustable
Influencing variables	
Ambient temperature	< 0.5%/10 K of the measured value
Atmospheric pressure	Negligible
Process gas pressure compensation	Recommended
Process gas temperature compensation	Recommended
Process gas pressure range	See table for standard applications
Power supply changes	< 1%/30 V
Electrical inputs and outputs	
Number of measurement channels	1 … 3, optional
Analog output	2 per channel, 4 ... 20 mA, floating, ohmic resistance max. 750 Ω
Analog inputs	2 per channel, designed for 4 ... 20 mA, 50 Ω
Digital outputs	6 per channel, with changeover contacts, configurable, 24 V AC/DC/1 A, floating
Digital inputs	6 per channel, designed for 24 V, floating, configurable
Communication interface	Ethernet 10BaseT (RJ-45)
Climatic conditions	
Temperature range	5 … 45 °C during operation, -40 … +70 °C during storage and transportation
Atmospheric pressure	800 … 1 200 hPa
Humidity	< 85% relative humidity, above dew point (in operation and storage)

1) The accuracy corresponds to intrinsic uncertainty according to IEC 61207 for 7MB6121-xKD00-0xxx.

Selection and ordering data		Article No.	Cannot be combined
LDS 6 in-situ gas analyzer 19" rack unit for installation in cabinets		7MB6121- ■■■0■ - 0■■■	
↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.			
Explosion protection[1]			
Without, not suitable for connection to Ex sensors		0	
Without, suitable for connection to Ex sensors in accordance with II 1 G Ex ia op is IIC T4 Ga, II 1 D Ex ia op is IIIC T135 °C Da		1	1 1 1
Measured component	**Possible with application code of the respective channel**		
O_2	B, C	A	
NH_3	A, E, F, L, T	C	
NH_3/H_2O	A, E, F, L, T	D	
HCl	A, H, T	E	
HCl/H_2O	A, H, T	F	
HF	A, H	G	
HF/H_2O	A, H	H	
CO	C	J	
CO/CO_2	D	K	
CO_2	A	L	
H_2O	A, T	M	
Application code of measured component channel 1	**Application examples channel 1**[1]		
A	Emission monitoring, non-certified	A	
B	Combustion optimization	B	
C	Safety monitoring with appropriate plant concept	C	
D	Process control	D	
E	SNCR-DeNOx	E	
F	SCR-DeNOx	F	
H	Filter optimization	H	
L	Automotive, for use according EU regulation No. 595/2009/EC from June 18, 2009 (EURO VI)	L	
T	Emission measurement, device design in accordance with QAL1 certification acc. to EN 14181 and EN 15267. Notice: Only in combination with measuring component version C, D, M, E and F (NH3, NH_3/H_2O, H_2O, HCl, HCl/H_2O).	T	T
CD 6, sensor alignment kit			
With		0	
Without		1	
Application code of measured component channel 2	**Application examples channel 2**[1]		
X	Channel 2 not used	X	
A	Emission monitoring, non-certified	A	
B	Combustion optimization	B	
C	Safety monitoring with appropriate plant concept	C	
D	Process control	D	
E	SNCR-DeNOx	E	
F	SCR-DeNOx	F	
H	Filter optimization	H	
L	Automotive, for use according EU regulation No. 595/2009/EC from June 18, 2009 (EURO VI)	L	
T	Emission measurement, device design in accordance with QAL1 certification acc. to EN 14181 and EN 15267. Notice: Only in combination with measuring component version C, D, M, E and F (NH3, NH_3/H_2O, H_2O, HCl, HCl/H_2O).	T	T

[1] Complete and consistent implementation of the safety concept by the plant operator must be ensured during the commissioning and operation of the in-situ laser spectrometer LDS6 or the sensor CD 6 in hazardous atmospheres.

[2] The examples shown represent possible applications where appropriately configured LDS 6 solutions can be used. The user is responsible for the prevailing conditions (plant concept (possibly redundant), application of appropriate components required in addition, compliance with possible directives, etc.). It is only possible to configure the same applications for multiple channels. If required, please contact Siemens for a special application (refer to page 2/41)

19" central unit

2

Selection and ordering data		Article No.	Cannot be combined
LDS 6 in-situ gas analyzer 19" rack unit for installation in cabinets		**7MB6121-** ■■■ **0** ■ **- 0** ■■■	
Application code of measured component channel 3	**Application examples channel 3**[1)] External 24 V DC power supply included in scope of delivery		
X	Channel 3 not used	**X**	
A	Emission monitoring, non-certified	**A**	
B	Combustion optimization	**B**	
C	Safety monitoring with appropriate plant concept	**C**	
D	Process control	**D**	
E	SNCR-DeNOx	**E**	
F	SCR-DeNOx	**F**	
H	Filter optimization	**H**	
L	Automotive, for use according EU regulation No. 595/2009/EC from June 18, 2009 (EURO VI)	**L**	
T	Emission measurement, device design in accordance with QAL1 certification acc. to EN 14181 and EN 15267. Notice: Only in combination with measuring component version C, D, M, E and F (NH3, NH_3/H_2O, H_2O, HCl, HCl/H_2O).	**T**	**T**
Language (supplied documentation, software)			
German		**0**	
English		**1**	
French		**2**	
Spanish		**3**	
Italian		**4**	

Selection and ordering data

Additional versions	Order code
Add "**-Z**" to Article No. and specify order codes.	
Telescopic rails (2 units)	**A31**
Set of Torx tools	**A32**
TAG label, customized inscription	**Y30**
Additional units	**Article No.**
LDS 6, optical bandpass filter for reducing infrarot background radiation (flame filter)	**A5E00534668**
LDS 6, external power supply unit for 3 channels	**A5E00854188**
LDS 6, linearity verification kit NH_3, Version 2	**A5E01075594**
LDS 6, TÜV/MCERT linearity verification kit NH_3, Version 2; 2 cells	**A5E00823339013**
LDS 6, TÜV/MCERT linearity verification kit NH_3/H_2O, Version 2; 3 cells	**A5E00823339014**
LDS 6, TÜV/MCERT linearity verification kit H_2O (for H_2O single component analyzer), Version 2; 2 cells	**A5E00823339015**
LDS 6, TÜV/MCERT linearity verification kit NH_3 (version 1); 2 cells	**A5E00534675**
LDS 6, TÜV/MCERT linearity verification kit NH_3/H_2O, Version 1; 3 cells	**A5E00823339003**
LDS 6, TÜV/MCERT linearity verification kit H_2O, Version 1; 2 cells	**A5E00823339004**
LDS 6, TÜV/MCERT linearity verification kit HCl; 2 cells	**A5E00823339005**
LDS 6, TÜV/MCERT linearity verification kit H_2O; 3 cells	**A5E00823339008**
LDS 6, TÜV/MCERT linearity verification kit H_2O, Version 1; 2 cells	**A5E00823339009**
LDS 6, TÜV/MCERT linearity verification kit HCl; 2 cells	**A5E00823339007**
LDS 6, TÜV/MCERT linearity verification kit H_2O; 3 cells	**A5E00823339002**
LDS 6, TÜV/MCERT linearity verification kit H_2O (only for HCl/H_2O analyzers); 5 cells	**A5E00823339012**
LDS 6, TÜV/MCERT linearity verification kit H_2O (only for NH_3/H_2O analyzers), Version 2; 5 cells	**A5E00823339006**
LDS 6, TÜV/MCERT linearity verification kit HCl; 5 cells	**A5E00823339001**
LDS 6, TÜV/MCERT linearity verification kit NH_3, Version 1; 5 cells	**A5E00823339011**
LDS 6, linearity verification kit NH_3, Version 2; 10 cells[2)]	**A5E03693426**
LDS 6, calibration test kit O_2, Version 1	**A5E01143755001**
LDS 6, calibration test kit CO Version 2	**A5E01143755003**
LDS 6, calibration test kit CO_2, Version 2	**A5E01143755004**
LDS 6, calibration test kit CO/CO_2, Version 2	**A5E01143755006**

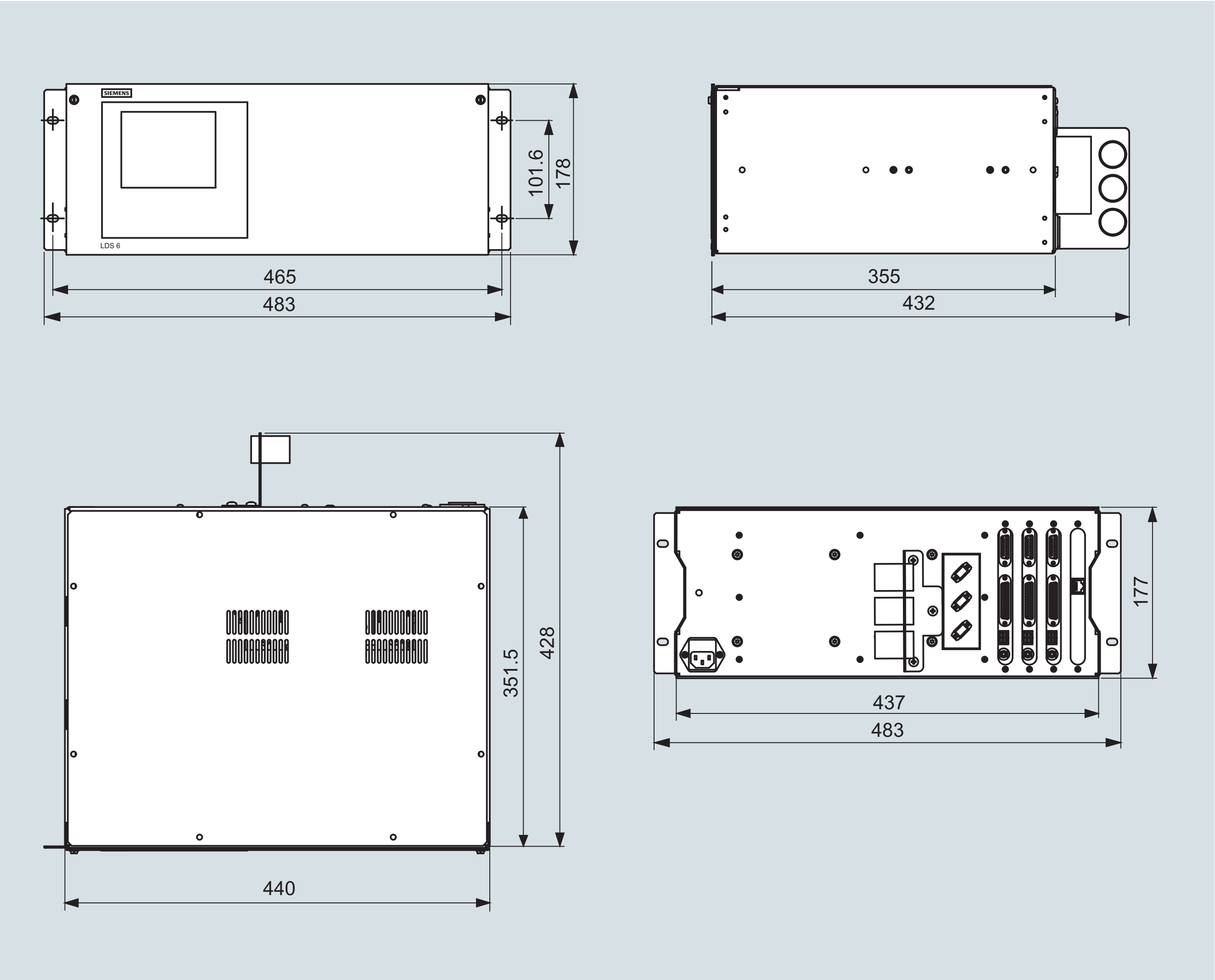
1) The examples shown represent possible applications where appropriately configured LDS 6 solutions can be used. The user is responsible for the prevailing conditions (plant design, possibly redundant, application of appropriate components required in addition, compliance with possible directives, etc.). It is only possible to configure the same applications for multiple channels. If needed, contact Siemens for a special application (refer to page 2/41).

2) In combination with the CL/DL LDS 6 application, suitable for use to measure NH_3 according to the requirements of regulation 595/2009/EC "Implementing regulations on type-approval of motor vehicles and engines with respect to emissions from heavy duty vehicles (EURO VI)" from June 18, 2009 and its regulation for implementation of number 582/2011/EC from May 25, 2011 of the Commission of the European Union.

Additional accessories

You can find more accessories and spare parts in our PIA Life Cycle Portal product selector:
http://www.pia-portal.automation.siemens.com

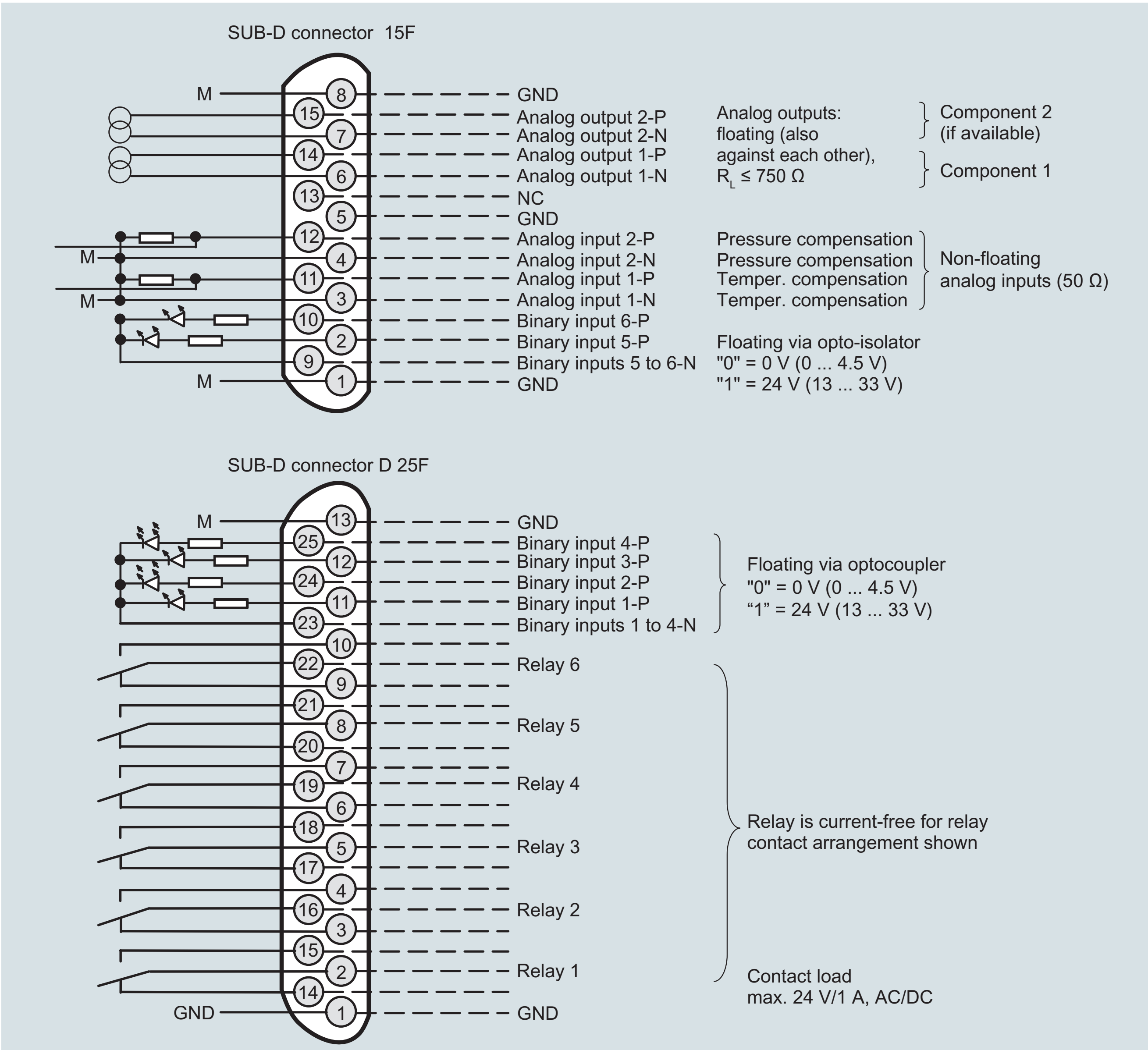
Dimensional drawings



LDS 6, 19" central unit, dimensions in mm

Circuit diagrams

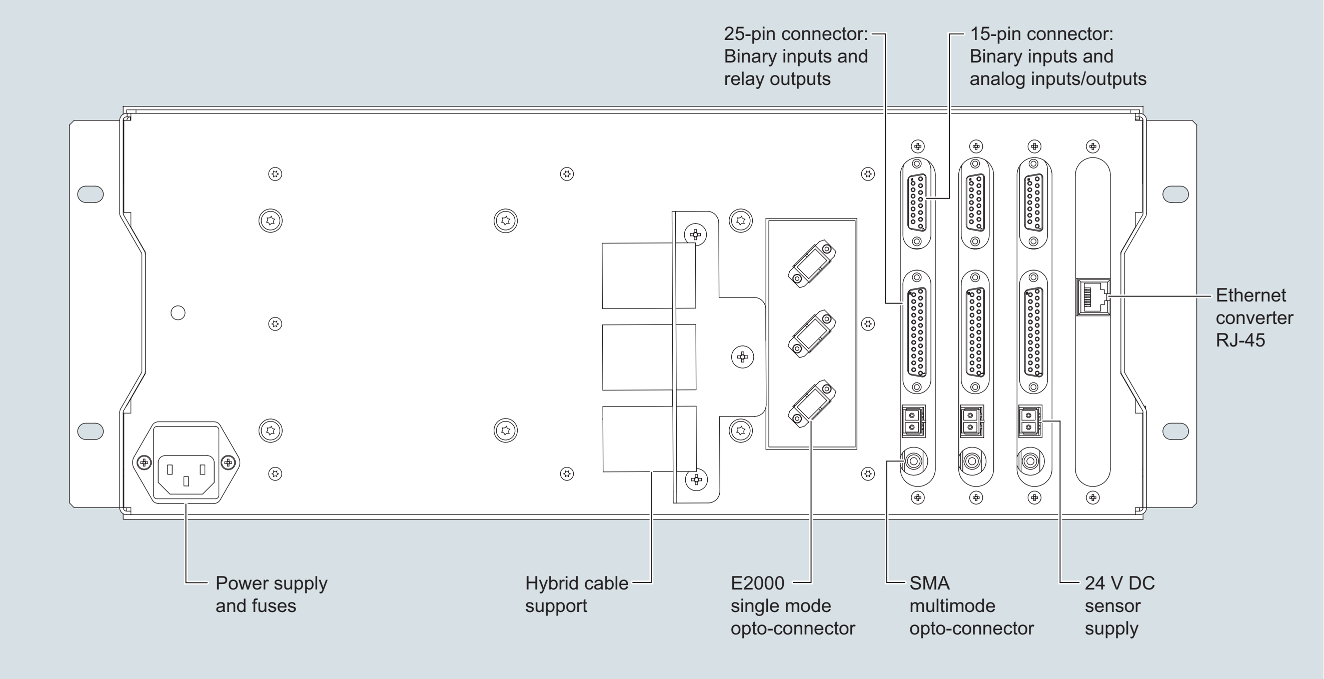
Pin assignments



LDS 6, 19" central unit, pin assignments

19" central unit

Optical and electrical connections



LDS 6, three-channel 19" central unit, optical and electrical connections

More information

The following table lists the measuring conditions for standard applications. The listed values for the measuring range and detection limit (DL) are only approximate values. The exact values at the respective measuring point depend on the totality of all influencing variables and can be determined by Siemens for the specific case. Note that the values for the detection limit and the maximum measuring range are based on a path length of 1 m. Longer path lengths will improve the detection limit, but not linearly. This is due to restrictive effects such as dust load. The maximum applicable measuring ranges can only be used if permitted by the process conditions such as dust load.

19" central unit

Standard application **Effective optical path length: 0.3 ... 12 m** **Dust load[2]: < 50 g/Nm³**				**Process gas temperature** $T_{min} \dots T_{max}$	**Process gas pressure** $p_{min} \dots p_{max}$	**Min. measuring range** (with 1 m eff. opt. path length)	**Max. measuring range** (also dependent on eff. opt. path length: see next column)	**Max. measuring range x path length**	**DL x path length** (under standard conditions[1] without cross-interference from other gases)	**DL x path length** (at 1 013 hPa with cross-interference from gas 2)	**Accuracy[3]**
Gas 1	**Gas 2**	**Gas code**	**Appl. code**			**Gas 1**	**Gas 1**	**Gas 1**	**Gas 1**	**Gas 1**	**Gas 1**
O_2		A	C	0 … 600 °C	950 …1 050 hPa	0 … 5 vol%	0 … 100 vol%	75 vol%*m	0.1 vol%*m		2%[4]
NH_3		C	A	0 … 150 °C	950 … 1 050 hPa	0 … 25 ppmv	0 … 500 ppmv	2 500 ppmv*m	0.5 ppmv*m	0.9 ppmv*m at 15 vol% H_2O, 55 °C	2%
			T	0 … 150 °C	950 … 1 050 hPa	0 … 25 ppmv	0 … 500 ppmv	2 500 ppmv*m	0.5 ppmv*m	0.9 ppmv*m at 15 vol% H_2O, 55 °C	2%
			E	250 … 350 °C	950 … 1 050 hPa	0 … 45 ppmv	0 … 500 ppmv	2 500 ppmv*m	0.9 ppmv*m at 250 °C	1.4 ppmv*m at 15 vol% H_2O, 250 °C	2%
			F	300 … 400 °C	950 … 1 050 hPa	0 … 50 ppmv	0 … 500 ppmv	2 500 ppmv*m	1 ppmv*m at 300 °C	1.5 ppmv*m at 15 vol% H_2O, 300 °C	2%
			L[6]	0 … 400 °C[7]	920 … 1 120 hPa	0 … 15 ppmv	0 … 500 ppmv	2 500 ppmv*m	0.5 ppmv*m	1.4 ppmv*m at 15 vol% H_2O, 250 °C	2%
NH_3	**H_2O**	D	A	0 … 150 °C	950 … 1 050 hPa	0 … 25 ppmv	0 … 100 ppmv	1 200 ppmv*m	0.5 ppmv*m	0.9 ppmv*m at 15 vol% H_2O, 55 °C	2%
			T	0 … 150 °C	950 … 1 050 hPa	0 … 25 ppmv	0 … 100 ppmv	1 200 ppmv*m	0.5 ppmv*m	0.9 ppmv*m at 15 vol% H_2O, 55 °C	2%
			E	250 … 350 °C	950 … 1 050 hPa	0 … 45 ppmv	0 … 100 ppmv	1 200 ppmv*m	0.9 ppmv*m at 250 °C	1.4 ppmv*m at 15 vol% H_2O, 250 °C	2%
			F	300 … 400 °C	950 … 1 050 hPa	0 … 50 ppmv	0 … 100 ppmv	1 200 ppmv*m	1 ppmv*m at 300 °C	1.5 ppmv*m at 15 vol% H_2O, 300 °C	2%
			L[6]	0 … 400 °C[7]	920 … 1 120 hPa	0 … 15 ppmv	0 … 100 ppmv	1 200 ppmv*m	0.5 ppmv*m	1.4 ppmv*m at 15 vol% H_2O, 250 °C	2%
HCl		E	A	0 … 150 °C	950 … 1 050 hPa	0 … 30 ppmv	0 … 6 000 ppmv	1 200 ppmv*m	0.6 ppmv*m	2.2 ppmv*m at 15 % H_2O, 55 °C	5%
			T	120 … 210 °C	950 … 1 050 hPa	0 … 10 ppmv	0 … 60 ppmv	720 ppmv*m			
			H	150 … 250 °C	950 … 1 050 hPa	0 … 50 ppmv	0 … 6 000 ppmv	1 200 ppmv*m	1.0 ppmv*m At 150 °C	3.1 ppmv*m at 15 vol% H_2O, 150 °C	5%
HCl	**H_2O**	F	A	0 … 150 °C	950 … 1 050 hPa	0 … 30 ppmv	0 … 100 ppmv	1 200 ppmv*m	0.6 ppmv*m	2.2 ppmv*m at 15 % H_2O, 55 °C	5%
			T	120 … 210 °C	950 … 1 050 hPa	0 … 10 ppmv	0 … 60 ppmv	720 ppmv*m			
			H	150 … 250 °C	950 … 1 050 hPa	0 … 50 ppmv	0 … 100 ppmv	1 200 ppmv*m	1.0 ppmv*m at 150 °C	3.1 ppmv*m at 15 vol% H_2O, 150 °C	5%

1) All technical specifications apply to an optical path distance of 1 m in a nitrogen atmosphere under standard conditions 25 °C (or T_{min}) and 1 013 hPa. The effective detection limit, the measuring range and the accuracy can be influenced by process parameters such as pressure, temperature and gas composition. Not all combinations of maximum pressure and temperature can be realized with the minimum measuring ranges. If the process conditions deviate from the specifications of the standard applications, special applications are also possible on request.
Complete the application questionnaire which can be found on the Internet at http://www.siemens.com/insituquestionnaire .

2) With 0.3 m effective optical path length, average diameter of dust particles: 15 µm, specific weight of dust particles: 650 kg/m³

3) At least: Detection limit

4) Up to 200 °C, 5% above this

5) Accuracy corresponds to intrinsic uncertainty acc. to IEC 61207: 2 % of MV (0 ... 200 °C); 2.5% of MV (0 ... 400 °C); at best 0.25 vol%*m.

6) Suitable for use to measure NH_3 according to requirements of Directive 595/2009/EC "Implementing regulations on type-approval of motor vehicles and engines with respect to emissions from heavy duty vehicles (EURO VI)" from 18 June 2009 and its regulation for implementation of number 582/2011/EC from 25 May 2011 of the Commission of the European Union.

7) Device also able to operate above 400 °C to 1 000 °C. Due to decomposition of NH_3 at higher temperatures, no specification can be given in these ranges.

Standard application Effective optical path length: 0.3 … 12 m Dust load[3]: < 50 g/Nm[3]				Min. measuring range (with 1 m eff. opt. path length)	Max. measuring range (usually also dependent on eff. opt. path length: see next column)	Max. measuring range x path length	DL x path length (under standard conditions[1) 2)])	DL x path length (at 1 013 hPa with cross-interference from gas 1)	Accuracy[4)]	Purging gas mode		Purging gas medium
Gas 1	Gas 2	Gas code	Appl. code	Gas 2	Gas 2	Gas 2	Gas 2	Gas 2	Gas 2	Standard	Optional	
O_2		A	C							D	B	N_2
NH_3		C	A							C	G	Air
			T							C	G	Air
			E							E	G	Air
			F							E	G	Air
			L							C	D	Air
NH_3	**H_2O**	D	A	0 … 5 vol%	0 … 30 vol%	240 vol%*m	0.1 vol%*m	0.1 vol%*m	5%	C	G	Air
			T	0 … 5 vol%	0 … 30 vol%	240 vol%*m	0.1 vol%*m	0.1 vol%*m	5%	C	G	Air
			E	0 … 5 vol%	0 … 30 vol%	240 vol%*m	0.1 vol%*m at 250 °C	0.1 vol%*m at 250 °C	5%	E	G	Air
			F	0 … 5 vol%	0 … 30 vol%	240 vol%*m	0.1 vol%*m at 300 °C	0.1 vol%*m at 300 °C	5%	E	G	Air
			L	0 … 5 vol%	0 … 30 vol%	250 vol%*m	0.1 vol%*m at 250 °C	0.1 vol%*m at 250 °C	5%	C	D	Air
HCl		E	A							C	G	Air
			T							C	G	Air
			H							E	G	Air
HCl	**H_2O**	F	A	0 … 5 vol%	0 … 30 vol%	360 vol%*m	0.1 vol%*m	0.1 vol%*m	5%	C	G	Air
			T	0 … 5 vol%	0 … 30 vol%	360 vol%*m				C	G	Air
			H	0 … 5 vol%	0 … 30 vol%	360 vol%*m	0.1 vol%*m at 150 °C	0.1 vol%*m at 150 °C	5%	E	G	Air

1) At 20 °C, 1 013 hPa

2) If the smallest permissible process gas temperature of application is T_{min} > 20 °C, the DL refers to T_{min} and standard pressure (1 013 hPa)

3) At 0.3 m optical path length, average diameter of dust particles: 15 µm, specific weight of dust particles: 650 kg/m³

4) At least: Detection limit

5) Accuracy corresponds to intrinsic uncertainty acc. to IEC 61207: 5% of MV; at best 0.5 vol%*m.

Standard application Effective optical path length: 0.3 … 12 m Dust load[2]: < 50 g/Nm^3				Process gas temperature T_{min} … T_{max}	Process gas pressure p_{min} … p_{max}	Min. measuring range (with 1 m eff. opt. path length)	Max. measuring range (also dependent on eff. opt. path length: see next column)	Max. measuring range x path length	DL x path length (under standard conditions[1] without cross-interference from other gases)	DL x path length (at 1 013 hPa with cross-interference from gas 2)	Accuracy[3]
Gas 1	Gas 2	Gas code	Appl. code			Gas 1	Gas 1	Gas 1	Gas 1	Gas 1	Gas 1
HF		G	A	0 … 150 °C	950 … 1 050 hPa	0 … 5 ppmv	0 … 1 500 ppmv	200 ppmv*m	0.1 ppmv*m	0.6 ppmv*m at 15 vol% H_2O, 55 °C	5%
			H	150 … 250 °C	950 … 1 050 hPa	0 … 5 ppmv	0 … 1 500 ppmv	200 ppmv*m	0.11 ppmv*m at 150 °C	0.6 ppmv*m at 15 vol% H_2O, 150 °C	5%
HF	**H_2O**	H	A	0 … 150 °C	950 … 1 050 hPa	0 … 5 ppmv	0 … 200 ppmv	200 ppmv*m	0.1 ppmv*m	0.6 ppmv*m at 15 vol% H_2O, 55 °C	5%
			H	150 … 250 °C	950 … 1 050 hPa	0 … 5 ppmv	0 … 200 ppmv	200 ppmv*m	0.11 ppmv*m at 150 °C	0.6 ppmv*m at 15 vol% H_2O, 150 °C	5%
CO		J	C	0 … 600 °C	950 … 1 050 hPa	0 … 1.5 vol%	0 … 100 vol%	40 vol%*m	300 ppmv*m	1 000 ppmv*m at 50 vol% CO_2, 20 °C	2%
CO	**CO_2**	K	D	0 … 400 °C	800 …1 400 hPa	0 … 5 vol%	0 … 100 vol%	0 ... 200 vol%*m	0.1 vol%*m	0.5 vol% at 50 vol% CO_2, 20 °C	2%[5]
CO_2		L	A	0 … 150 °C	950 … 1 050 hPa	0 … 7.5 vol%	0 … 100 vol%	40 vol%*m	300 ppmv*m		2%
H_2O		M	A	0 … 150 °C	950 … 1 050 hPa	0 … 5 vol%	0 … 30 vol%	240 vol%*m	0.1 vol%*m		5%
			T	0 … 150 °C	950 … 1 050 hPa	0 … 5 vol%	0 … 30 vol%	240 vol%*m	0.1 vol%*m		5%

1) All technical specifications apply to an optical path distance of 1 m in a nitrogen atmosphere under standard conditions 25 °C (or T_{min}) and 1 013 hPa. The effective detection limit, the measuring range and the accuracy can be influenced by process parameters such as pressure, temperature and gas composition. Not all combinations of maximum pressure and temperature can be realized with the minimum measuring ranges. If the process conditions deviate from the specifications of the standard applications, special applications are also possible on request.
Complete the application questionnaire which can be found on the Internet at http://www.siemens.com/insituquestionnaire .

2) With 0.3 m effective optical path length, average diameter of dust particles: 15 µm, specific weight of dust particles: 650 kg/m^3

3) At least: Detection limit

4) Up to 200 °C, 5% above this

5) Accuracy corresponds to intrinsic uncertainty acc. to IEC 61207: 2 % of MV (0 ... 200 °C); 2.5% of MV (0 ... 400 °C); at best 0.25 vol%*m.

6) Suitable for use to measure NH_3 according to requirements of Directive 595/2009/EC "Implementing regulations on type-approval of motor vehicles and engines with respect to emissions from heavy duty vehicles (EURO VI)" from 18 June 2009 and its regulation for implementation of number 582/2011/EC from 25 May 2011 of the Commission of the European Union.

7) Device also able to operate above 400 °C to 1 000 °C. Due to decomposition of NH_3 at higher temperatures, no specification can be given in these ranges.

Standard application **Effective optical path length: 0.3 … 12 m** **Dust load[3]: < 50 g/Nm³**				**Min. measuring range** (with 1 m eff. opt. path length)	**Max. measuring range** (usually also dependent on eff. opt. path length: see next column)	**Max. measuring range x path length**	**DL x path length** (under standard conditions[1) 2)])	**DL x path length** (at 1 013 hPa with cross-interference from gas 1)	**Accuracy[4)]**	**Purging gas mode**		**Purging gas medium**
Gas 1	**Gas 2**	**Gas code**	**Appl. code**	**Gas 2**	**Gas 2**	**Gas 2**	**Gas 2**	**Gas 2**	**Gas 2**	**Standard**	**Optional**	
HF		G	A							C	G	Air
			H							E	G	Air
HF	**H_2O**	H	A	0 … 5 vol%	0 … 30 vol%	360 vol%*m	0.1 vol%*m	0.1 vol%*m	5%	C	G	Air
			H	0 … 5 vol%	0 … 30 vol%	360 vol%*m	300 ppmv*m at 200 °C	300 ppmv*m at 200 °C	5%	E	G	Air
CO		J	C							E	G	Air, N_2
CO	**CO_2**	K	D	0 … 10 vol%	0 … 100 vol%	0 ... 200 vol%*m	0.2 vol%*m	1 vol% at 50 vol% CO, 20 °C	5%[5)]	C	G	Air
CO_2		L	A							C	G	Air
H_2O		M	A							C	G	Air
			T							C	G	Air

1) At 20 °C, 1 013 hPa

2) If the smallest permissible process gas temperature of application is T_{min} > 20 °C, the DL refers to T_{min} and standard pressure (1 013 hPa)

3) At 0.3 m optical path length, average diameter of dust particles: 15 µm, specific weight of dust particles: 650 kg/m³

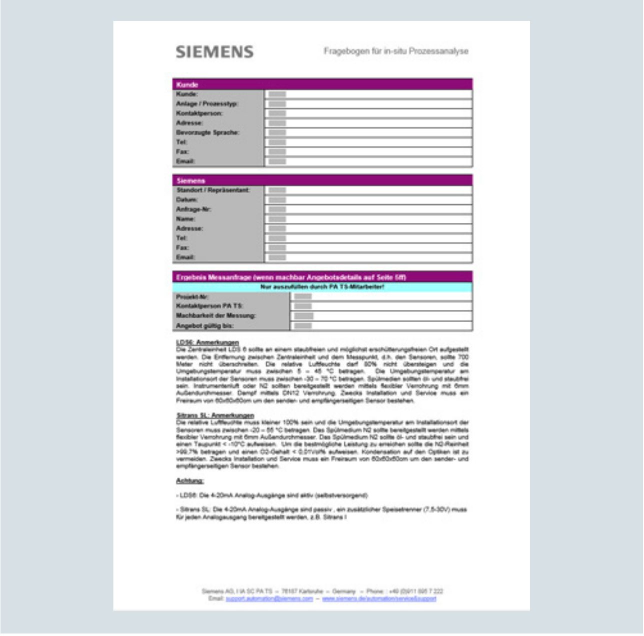
4) At least: Detection limit

5) Accuracy corresponds to intrinsic uncertainty acc. to IEC 61207: 5% of MV; at best 0.5 vol%*m.

Special applications

If the process conditions deviate from the specifications of the standard applications, special applications are also possible on request.

- Complete the application questionnaire which can be found on the Internet at http://www.siemens.com/insituquestionnaire:



Overview

Cross-duct sensors CD 6 and cables for non-Ex applications

The standard cross-duct sensor consists of a transmitter unit and a detector unit with the same dimensions. The transmitter unit provides a connector for the fiber-optic cable. The laser light is transmitted through this cable. The receiver unit contains a photodetector and an electronics PCB, and is connected to the detector unit by a sensor cable.

The sensors are mounted onto flanges. The easiest way to avoid condensation and dust deposits on the sensor windows is to use a purging gas, e.g. with instrument air. Purging must be selected depending on the application. The cross-duct sensors can therefore be configured for the respective situation. The application reference table provides recommendations for suitable purging with standard applications.

If a component is to be measured which is also present in measurable quantities in the purging medium - such as oxygen or moisture - it is necessary to use purging gases such as nitrogen, superheated process steam or similar. In such cases it is usually also necessary to purge the sensor heads, since the ambient air must also be displaced here out of the laser beam path. A differentiation is therefore made between purging on the process side and purging on the sensor side.

Note: For measurement of O_2 at gas temperatures above 600 °C, it may also be possible to tolerate air as the purging medium since its influence on the measurement can be compensated.

Applications with oxygen (high-pressure)

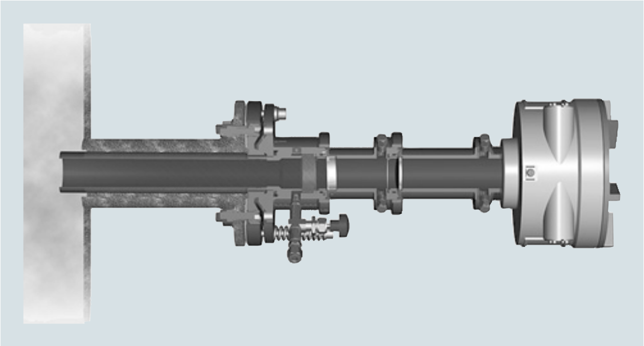
For oxygen measurements with a higher process gas pressure (1 to 5 bar), the sensor CD 6 can be used together with a high-pressure window flange as the process connection. This window flange is also available in the standard sizes DN 65/PN 6, DN 80/PN 16 or ANSI 4"/150 lbs. The optical surface to the process is made of borosilicate glass. High-pressure window flanges can be equipped with window purging, but without purging tubes. Possible purge modes for the window flanges are "A-C" (no purging or moderate purging on the process side). Window flanges are tested for leakage before delivery using overpressure, and show leakage rates of less than 10^{-5} mbar·l/s.

For ordering this application, the MLFB code of the central unit with the application code letter "P" must be selected. The process interface suitable for the sensors can be chosen by selection of the corresponding code in the 6th configurable position of the MLFB number.

The most important sensor purging configurations are presented below:

Purging on the process side with moderate flow

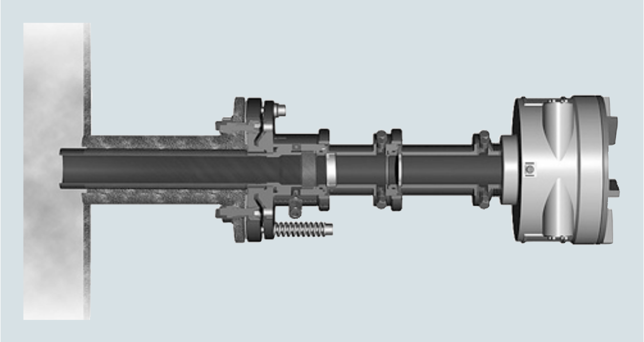
Selected for pure gas applications, emission monitoring, inertia monitoring, for example. The purging gas flow can be adjusted between 0 and approx. 120 l/min at each sensor head using a needle valve (included in delivery).



Moderate purging on the process side

Purging on the process side with increased flow

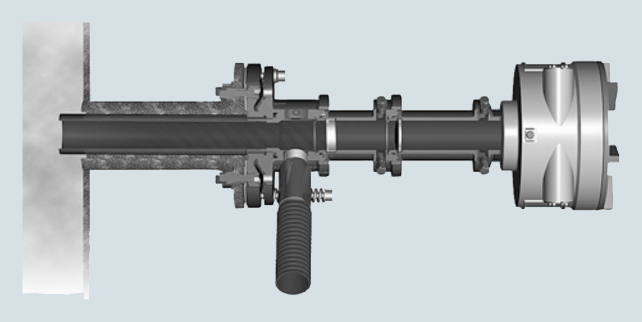
Through omission of needle valve. This type of purging is selected in crude gas applications with higher concentrations of particles and/or condensation as well as in non-purified flue gases in combustion plants. The purging gas flow is typically set between 200 and 500 l/min on each sensor head depending on the input pressure of the purging medium.



Increased purging on the process side

Purging on the process side with high flow

Through use of air blower or dry process steam. Connectors with hose adapters are included in the delivery. An additional Swagelok adapter must be ordered if a high flow of steam or instrument air purging is required (option A27). This type of purging is selected in crude gas applications with very high concentrations of particles and/or condensation such as in the furnaces of combustion plants. If instrument air is not available, an air blower is also an alternative for purging in applications with lower demands. On the process side, dry steam can be used as the inert purging gas instead of nitrogen (Tmax. 240 °C). The purging gas flow is automatically set between 500 and <1 000 l/min on each sensor head depending on the purging air blower or the steam pressure.



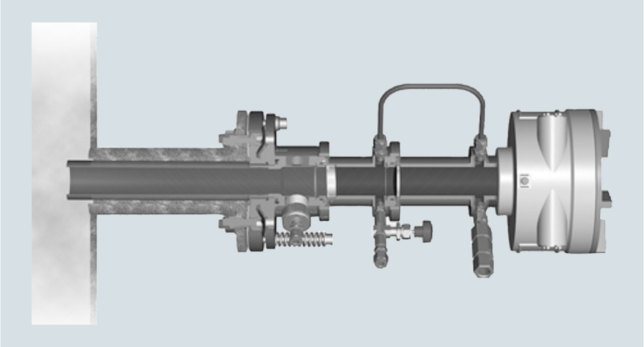
Increased purging on the process side, with hose connection adapter

Purging on sensor side

Can be combined with any purging mode on the process side, and is always selected if the ambient air must never have an influence on the measurement. The volumes within the sensor head are then continuously purged with an O_2-free gas (with H_2O-free gas in the case of moisture measurement).

Note

With purging on the process side, it may be necessary to use non-return valves to ensure no process gas can enter the purging gas line in the event of failure of the purging gas supply. This applies especially in the case of cascaded process and sensor purging where there is otherwise the danger that, for example, corrosive process gases could enter the sensor enclosure.



Sensor configuration with high purging on the process side, with 6 mm joint for use with steam, and with N_2 purging on the sensor side

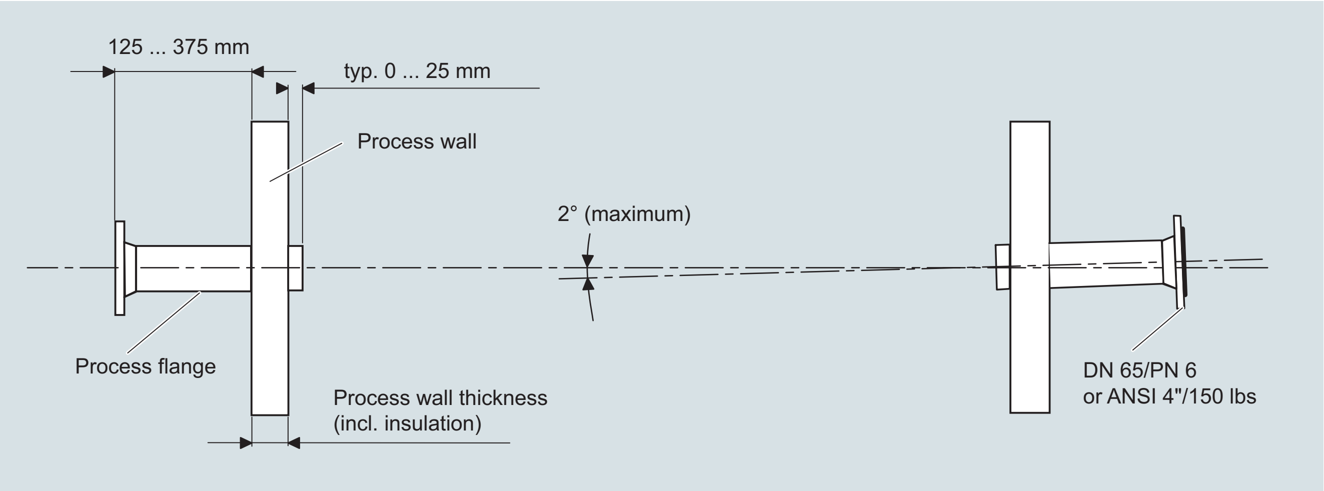
The purging media used on the process side flow through purging gas tubes into the process gas flow. The tubes extend a few centimeters into the process area, and usually receive a flow of process gas from the side. This results in a wedge being generated in the inlet zone of the purging gas. The effective measuring path in the process gas is therefore well-defined as the distance between the ends of the two purging gas inlet tubes.

Cross-duct sensor CD 6: Options and accessories

Sensor alignment kit

Includes a battery-operated visible light source, a centering aid with crosshair, and two hook spanners for opening the optics tube of the sensors.

Please note: the sensor alignment kit is not explosion protected.

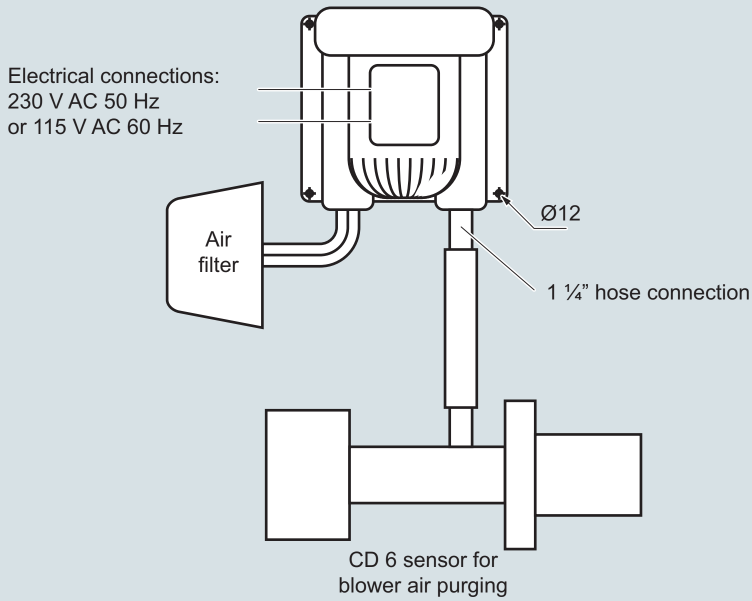


Installation requirements for the cross-duct sensors CD 6, dimensions in mm

Cross-duct sensor CD 6

Purging air blower

Two purging air blowers are required to purge the sensor heads. Both 230 V AC and 115 V AC versions can be ordered.



Sensor configuration with purging air blower

Flow cell (available on special application)

For implementation of measuring configurations with bypass mode. The cell consists of a stainless steel tube with electropolished internal surfaces to minimize surface effects.
With an effective measuring path of 1 m, the inner volume is only 1.2 l, and fast gas displacement times can therefore be achieved. The flow of sample gas can be from the ends or from the center of the tube, since appropriate 6 mm joints are present here. The flow cell can be ordered in four configurations:

- Unheated, including assembly for wall mounting
- Unheated, including assembly for wall mounting and a 19" housing with an air jet pump with a delivery rate of max. 30 l/min
- As above, but can be heated up to approx. 200 °C
- As above, but can be heated up to approx 200 °C and mounted on a rack with wheels and integrated 19" frame

Optical bandpass filter (only for O_2-CD 6)

Serves to protect the light-sensitive detector in the receiver unit of the sensor from saturation by IR background radiation. Used with measurements in very hot process gases (T > 1 000 °C) or with unavoidable appearances of flames in the measurement path.

Technical specifications

Cross-duct sensor CD 6

General information	
Design	Transmitter and detector units, connected by a sensor cable
Materials	Stainless steel (1.4305/303), aluminum
Installation	Vertical or parallel to the gas flow
Laser protection class	Class 1, safe to the eye
Explosion protection	II 1 G Ex ia op to IIC T4 Ga II 1 D Ex ia op to IIIC T135 °C Da
	A defined leak rate can only be guaranteed when using high-pressure window flanges. Otherwise, it may be necessary for the owner to carry out an evaluation in accordance with ATEX DEMKO 06 ATEX 139648X; IECEx UL 13.0029X
Design, enclosure	
Degree of protection	IP65
Dimensions	Diameter: 163, L: 450 mm
Purging gas tube in mm	400 (370 net) x 44 x 40 800 (770 net) x 54 x 40 1 200 (1 170 net) x 54 x 40
Weight	2 x approx. 11 kg
Mounting	DN 65/PN 6, DN 80/PN 16 or ANSI 4"/ 150 lbs

Please note:
- For purging tubes with a length of 800 and 1 200 mm, the wall thickness must not exceed 200 mm with DN 65/PN 6 connections. To carry out measurements with thicker walls, please contact Siemens.
- The optimum adjustment of the flanges can change with high differences in temperature between the process and environment depending on the type of assembly.

Electrical characteristics	
Power supply	24 V DC, supply from central unit via hybrid cable
Power consumption	< 2 W with non-Ex configuration, max. 0.6 W with Ex configuration
Climatic conditions	
Sensor temperature	
Non-Ex	-20 ... +70 °C in operation
	-30 ... +70 °C during transport and storage
Ex	-20 ... +60 °C in operation
	-30 ... +70 °C during transport and storage
Humidity	< 95 % RH, above dew point
Pressure	800 ... 1 100 hPa
Temperature range on the sensor side of the process interface (connection plate)	-20 ... +70 °C
Measuring conditions	
Measurement path	0.3 ... 12 m (other path lengths on request)
Dust load	The influence of dust is very complex and depends on the path length and particle size. The optical attenuation increases exponentially at longer path lengths. Smaller particles also have a very large influence on the optical attenuation. With high dust load, long path length and small particle size, the technical support at Siemens should be consulted.

Accessories

Purging	
Nitrogen is permissible as the purging gas for the sensor side. Nitrogen, steam, air and gases which are not subject to the pressure equipment directive Cat. 2 are permissible as purging gases for the process side.	
Purging with instrument air, N_2	
• Max. overpressure in the sensor	< 500 hPa
• Quality	
- Instrument air	According to ISO 8573-1:2010 [2:3:3]
	Note: It is sufficient if the pressure condensation point is min. 10 K below the minimum ambient temperature.
- Nitrogen	Purity better than 99.7 %. For oxygen measurements, an O_2 content < 0.01% in the purging gas. Optical path length ≥ 1 m, min. 5% oxygen in the process gas.
• Maximum flow rate (process purging)	500 l/min
• Dew point	Benchmark: < -10 °C, condensation on the optics must be avoided
Blower purging	
• Maximum counter pressure	40 hPa
• Maximum flow rate	850 l/min
• Power consumption	370 W
• Degree of protection (fan)	IP54, cover required to protect against rain
Steam purging	
• Steam conditioning	Overheated
• Maximum temperature	240 °C
• Minimum pressure	> 4 000 hPa
• Maximum pressure	16 000 hPa, refers to a volume flow of approx. 1 100 l/min

Cross-duct sensor CD 6

Hybrid and sensor cables

General information	
Configuration hybrid cable	Two optical fibers and two twisted copper wires in one cable for 24 V DC. Single-mode optical fiber fabricated at both ends with E2000 angle connectors. Multimode optical fiber configured at both ends with SMA connectors. Cable is flame-retardant, very good resistance to oil, gasoline, acids and alkalis, outer sheath UV-resistant
Cable sheath	Oil-resistant polyurethane
Dimensions	• An external power supply must be additionally ordered for > 500 m • For installation in hazardous zones, non-intrinsically-safe cables have to be spatially separated from intrinsically-safe lines
• Diameter	< 8.5 mm
• Length	• Use in non-hazardous and Ex Zone 2: Up to 700 m • Use in Ex Zone 0 and Zone 1: Up to 250 m
Weight	75 kg/km
Maximum tensile force	200 N
Maximum lateral pressure	1 000 N/cm
Impact resistance	200 N/cm
Maximum tensile strength	500 N
Minimum bending radius	12 cm
Climatic conditions	
Ambient temperature	-40 ... +70 °C during transport, storage and operation -5 ... +50 °C during cable installation
Humidity	< 95% rel. humidity, above dew point (in operation and storage)

2

Selection and ordering data

Selection and ordering data		Article No.	Cannot be combined
LDS 6 in-situ gas analyzer Pair of sensors (cross-duct sensor)		↗ 7MB6122- ■■■■■ - ■■■■	
↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.			
Explosion protection[1]			
Without		0	
II 1 G Ex ia op is IIC T4 Ga, II 1 D Ex ia op is IIIC T135 °C Da		1	
Sensor type	**Measured component**		
Standard cross-duct sensor	O_2	A	
	All gases except O_2	W	
Purging, process side	**Sensor side**		
Without purging	Without purging	A	
	Air or N_2, 1 to 2 l/min; incl. needle valve, 6 mm Swagelok	B	
Instrument air or N_2 Reduced flow: 0 ... 120 l/min incl. needle valve, 6 mm Swagelok	Without purging	C	
	Air or N_2, 1 to 2 l/min; incl. needle valve, 6 mm Swagelok	D	
Air or N_2 Increased flow: 200 ... 500 l/min incl. 6 mm Swagelok	Without purging	E	
	Air or N_2, 1 to 2 l/min; incl. needle valve, 6 mm Swagelok	F	
Air, fan or steam; high flow: > 500 l/min incl. 1¼" hose adapter	Without purging	G	G → 3, 4, 5
	Air or N_2, 1 to 2 l/min; incl. needle valve, 6 mm Swagelok	H	H → 3, 4, 5
Purging tubes, material			
No purging tubes		0	
Stainless steel, EN 1.4432/316L		1	1 → 3, 4, 5
Purging tubes, length			
No purging tubes		0	
400 mm		1	
800 mm		2	
1 200 mm		3	
75 mm, e.g. for engine test rigs		4	
Process connection			
Stainless steel flange (1.4404/316L), connection dimension DN 65/PN 6, MAWP (PS) at 20 °C: 0.05 MPa		0	0 → C12, C13
Stainless steel flange (1.4404/316L), connection dimension ANSI 4"/150 lbs, MAWP (PS) at 20 °C: 7.25 psi		1	1 → C12, C13
Stainless steel flange (1.4404/316L), connection dimension DN 65/PN 6, MAWP (PS) at 20 °C: 0.05 MPa, incl. enclosed welding flanges, e.g. for engine test rigs		2	2 → C12, C13
Pressure-resistant window flange (1.4404/316L, borosilicate glass), connection dimension DN 65/PN 6, MAWP (PS) at 20 °C: 0.6 MPa		3	3 3 3
Pressure-resistant window flange (1.4404/316L, borosilicate glass), connection dimension DN 80/PN 16, MAWP (PS) at 20 °C: 1.6 MPa		4	4 4 4
Pressure-resistant window flange (1.4404/316L, borosilicate glass), connection dimension ANSI 4"/150 lbs, MAWP (PS) at 20 °C: 232 psi		5	5 5 5
Hybrid cable			
No hybrid cable		X	
Standard length			
• 5 m		A	
• 10 m		B	
• 25 m		E	
• 40 m		G	
• 50 m		H	
Customized length (specified in complete meters)		Z	

[1] Complete and consistent implementation of the safety concept by the plant operator must be ensured during the commissioning and operation of the in-situ laser spectrometer LDS6 or the sensor CD 6 in hazardous atmospheres.

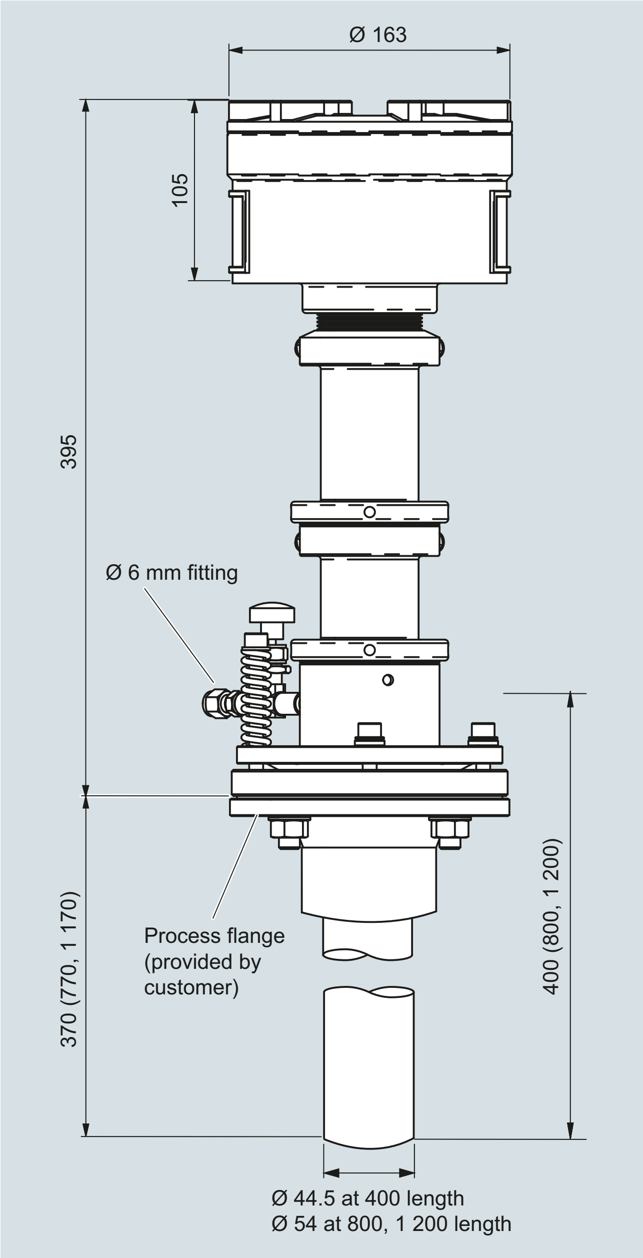
Cross-duct sensor CD 6

Selection and ordering data	Article No.		Cannot be combined
LDS 6 in-situ gas analyzer Pair of sensors (cross-duct sensor)	**7MB6122-** ■■■■■ - ■■■■		
Sensor connecting cable			
No sensor connecting cable	X		
Standard length			
• 5 m	A		
• 10 m	B		
• 25 m	E		
Customer-specific length (specified in complete meters)	Z		
Language (supplied documentation)			
German	0		
English	1		
French	2		
Spanish	3		
Italian	4		

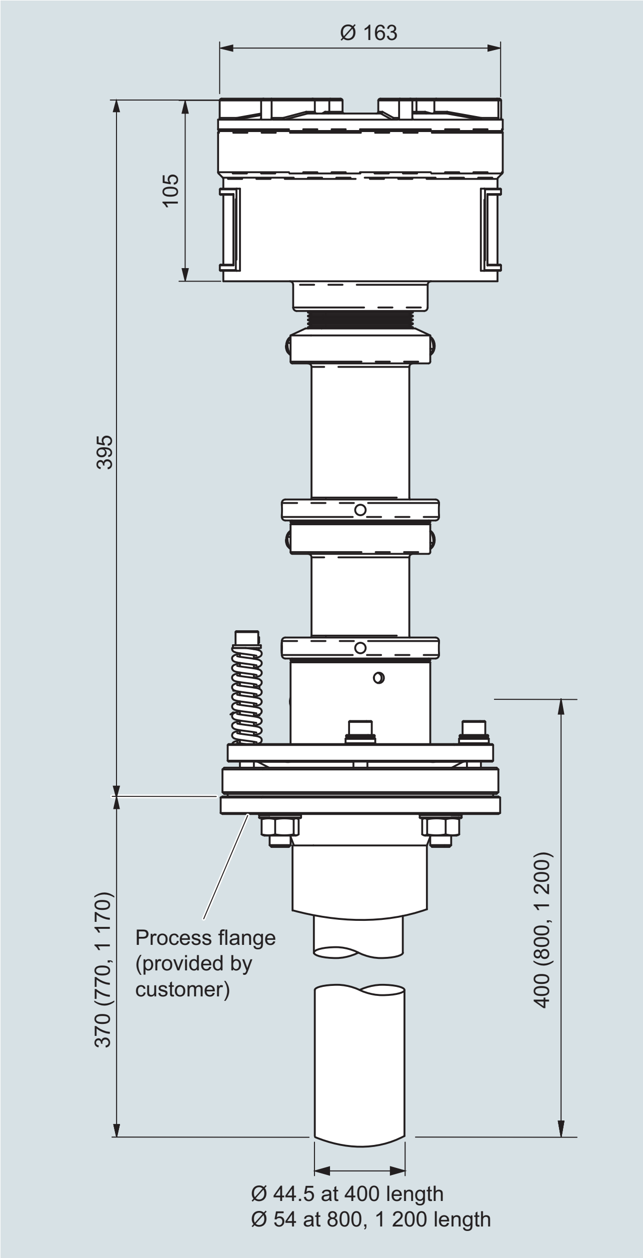
Additional versions	Order code
Add "-**Z**" to Article No. and specify order codes.	
6 mm Swagelok adapter for purging with steam, purging modes G and H	**A27**
Acceptance test certificate 3.1 (leak test) in accordance with EN 10204 (only in combination with flameproof window flanges)	**C12**
Acceptance test certificate 3.1 (material certificate) in accordance with EN 10204 (only in combination with flameproof window flanges)	**C13**
Hybrid cable, customized length	**P1Y**
Sensor cable, customized length	**Q1Y**
TAG label, customized inscription	**Y30**

Additional units	Article No.
CD 6, purging air blower 230 V / 50 Hz	**A5E00829151**
CD 6, purging air blower 115 V / 60 Hz	**A5E00829150**
CD 6, sensor alignment kit	**A5E00253142**
LDS 6, optical bandpass filter for reducing infrarot background radiation (flame filter), only for O_2	**A5E00534668**

Dimensional drawings



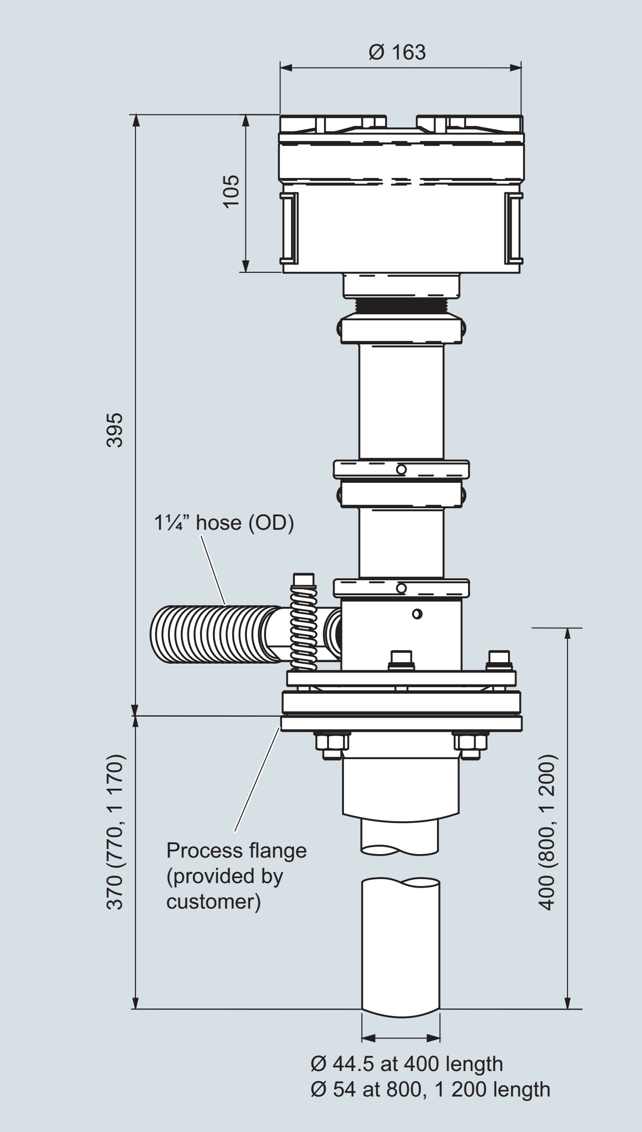
Cross-duct sensor CD 6, moderate purging (instrument air), version according to Order No. 7MB6122-**C1*-0***, dimensions in mm



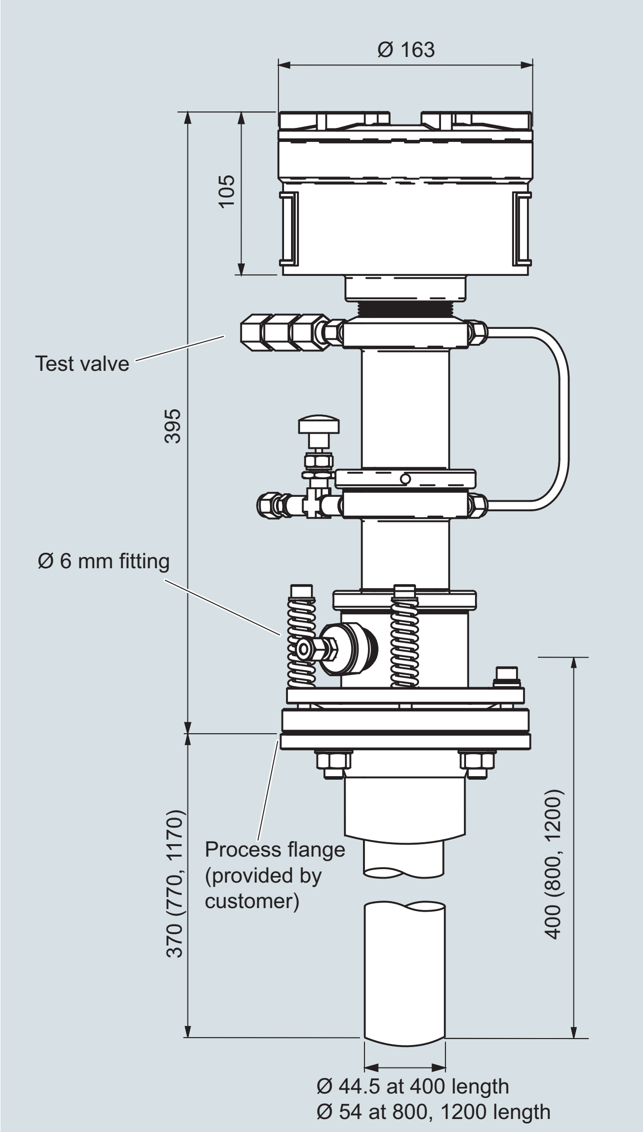
Cross-duct sensor CD 6, increased purging (instrument air), version according to Order No. 7MB6122-**E1*-0***, dimensions in mm

Cross-duct sensor CD 6

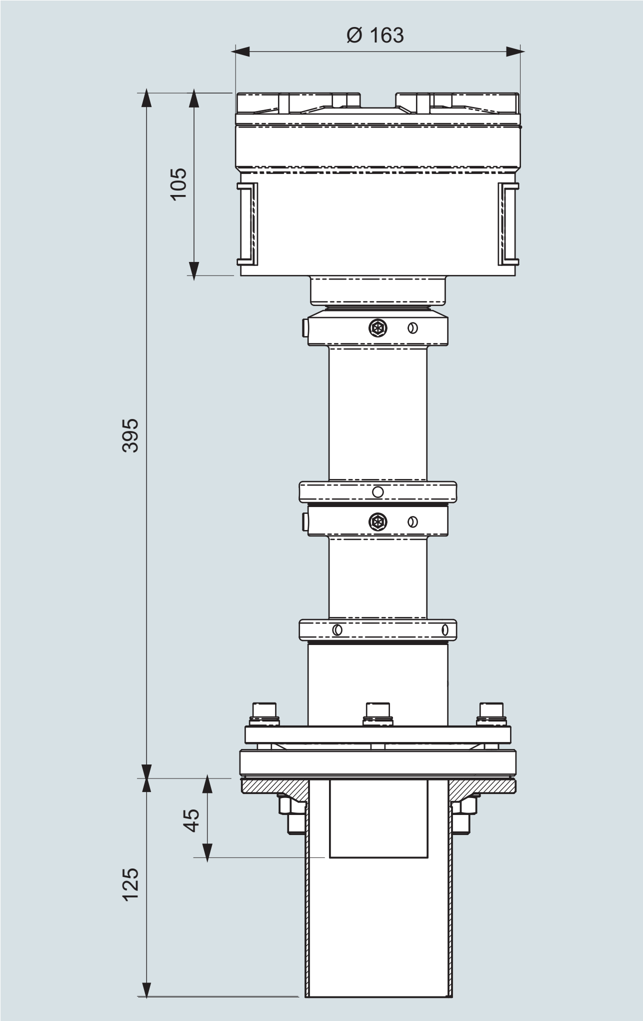
2



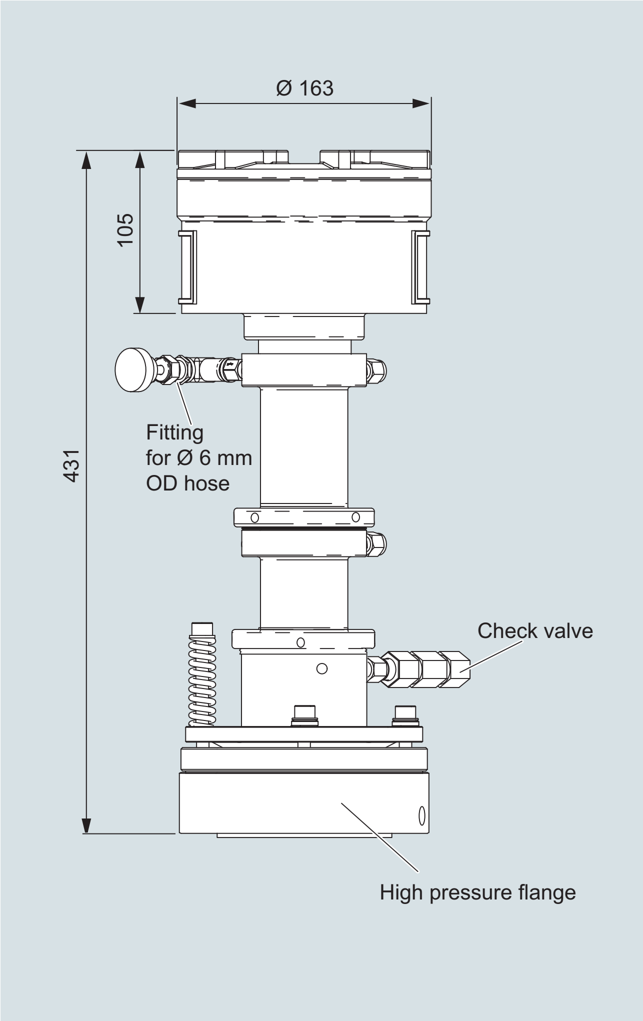
Cross-duct sensor CD 6, blower purging, version according to Order No. 7MB6122-**G1*-0***, dimensions in mm



Cross-duct sensor CD 6, sensor and process side purging, version according to Order No. 7MB6122-**H1*-0***-Z A27, dimensions in mm



Cross-duct sensor CD 6, purged version according to Order No. 7MB6122-*WC14-2***, dimensions in mm



CD 6 high-pressure sensor for oxygen, dimensions in mm

Documentation, suggestions for spare parts

Selection and ordering data

Manual	Article No.
LDS 6 manual	
• German	**A5E00295893**
• English	**A5E00295894**
• French	**A5E00295895**
• Italian	**A5E00295896**
• Spanish	**A5E00362720**

More information

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

Selection and ordering data

Description	Quantity for 2 years	Quantity for 5 years	Article No.
CD 6, window module, quartz	1	2	**A5E00338487**
CD 6, window module, engine test rig, no purging	1	2	**A5E00338490**
CD 6, high-pressure window flange (1.4404/316L), DN 65/PN 6	1	2	**A5E00534662**
CD 6, high-pressure window flange (1.4404/316L), DN 80/PN 16	1	2	**A5E00534663**
CD 6, high-pressure window flange (1.4404/316L), ANSI 4"/150 lbs	1	2	**A5E00534664**
Gasket for CD 6 hybrid cable	1	2	**A5E00853911**
CD 6, sensor electronics FO InGaAs (version 2)	1	1	**A5E01090409**
CD 6, sensor electronics FO Ge, only HCl (version 2)	1	1	**A5E01090413**
CD 6, sensor electronics SW, only O_2	1	1	**A5E00338533**
CD 6, sensor electronics ATEX SW, only O_2	1	1	**A5E00338563**
CD 6, sensor electronics ATEX HCl	1	1	**A5E00853896**
CD 6, sensor electronics ATEX NH_3, CO, CO_2, HF, H_2O, low gain	1	1	**A5E00338572**
CD 6, purging tube 400 mm 1.4432/316L	1	2	**A5E00253111**
CD 6, purging tube 800 mm 1.4432/316L	1	2	**A5E00253112**
CD 6, purging tube 1200 mm 1.4432/316L	1	2	**A5E00253113**

More information

For demanding applications it is recommended to keep purging tubes, window modules and detector electronics in stock (quantities stated per measuring point, i.e. per pair of sensors).

For the suitability of different parts (version 1 or version 2) please consult the instrument manual or contact Siemens directly. In general, all new analyzers are compatible with spare parts of version 2.

Process gas chromatography

3

3/2	**Introduction**
3/3	**MAXUM edition II**

Overview

Process gas chromatography is one of the most powerful measuring and analysis methods for process engineering. It is a procedure which is both discrete and extractive. This method is frequently used for online operation monitoring because the processes can be easily automated and a large number of components can be measured simultaneously.

Process gas chromatography can be used to separate and quantify the components of almost all homogenous gaseous or liquid mixtures. It must be possible to vaporize the liquid components without decomposition. The individual components of a discrete sample pass through the column system at different velocities, and are recorded in succession by a detector.

The time between sample introduction and registering of a substance at the detector (retention time) is characteristic of the substance and can also be used for the identification. The magnitude of the detector signal is a measure of the volume concentration of the component in the gas or liquid.

Overview

The MAXUM edition II is a universal process gas chromatograph for flexible process applications with a wide variety of analytical possibilities. The MAXUM edition II combines various functional modules with a flexible oven concept and can therefore also optimally solve complex applications.

The MAXUM edition II is used in all sectors of the chemical and petrochemicals industries and in refineries. It analyzes the chemical composition of gases and liquids in all production phases. The MAXUM edition II is suitable for installation in an analysis cabinet close to the process or in a nearby at-line laboratory. Thanks to the flexible application possibilities, it can be used to analyze the starting material, the end product and also by-products. The MAXUM edition II can also be used for many applications with environmental measurements.

The MAXUM edition II has extremely rugged and specially designed hardware and software. It automatically takes a sample from the process, and injects this onto the chromatographic columns.

With its high-performance software and hardware, it satisfies the highest demands for measurement repeatability, and can be operated for a long time without manual interventions. Using high-performance communication tools, the MAXUM edition II can send its measurement results to process control systems. The comprehensive networking options enable multiple MAXUM edition II chromatographs to operate together in large networks.

Benefits

The MAXUM edition II with its combination of different analytical components offers a wide range of analytical possibilities. This means it is possible to solve highly different measuring tasks with just one analyzer. This reduces the costs for investment, training and stocking of spare parts.

The MAXUM edition II platform offers:

- Numerous oven configurations permit an optimum solution for almost every application
- Numerous types of detector and valve for the optimum analytical solution
- Intelligent electronics based on plug & play principle
- Local operation and central workstation for fast, easy operator control, monitoring and maintenance
- Powerful device software enables best results
- Numerous I/Os and serial interfaces for internal and central interfacing
- Versatile networking possibilities for central maintenance and secure data transfer
- Many analytical possibilities as result of large application database
- Large, global, experienced support team

Hardware and software features

<u>Simultaneous applications</u>

Use one MAXUM edition II to provide the functionality of multiple GCs.

<u>Parallel chromatography</u>

Separate complex analytical tasks into simple parallel tasks and shorten analysis times.

<u>Low operating costs</u>

Flexible oven design enables low consumption of air and energy.

Application

Typical application examples

Chemical industry

- Monitoring of benzene in styrene in the ppb range
- Traces of residual gases in ultra-pure gases
- Determination of traces of hydrocarbons in air separation plants
- Fast analysis of CS_2 and H_2S in seconds
- Fast measurement of C6 to C8 aromatic compounds including the measurement of C9+ aromatics
- Monitoring of hydrogen in chlor-alkali plants
- Measurement of sulfurous components
- Measurement of C9 to C18 paraffins
- Determination of vinyl chloride in room air in a 60-second cycle
- Gas analysis during manufacture of vinyl chloride monomer (VCM)

Oil & gas

- Crack gas analysis
- Natural gas: Trace analysis for components such as mercaptans, H_2S or COS
- Fast determination of benzene in naphtha
- Determination of high boiling aromatics in a distillation fraction
- Fast measurement of acetylene in ethylene
- Total sulfur in petrol and diesel

Water/waste water

- Determination of halogenated hydrocarbons
- Simultaneous determination of chlorinated hydrocarbons, aromatics and alcohols in water
- Wastewater monitoring with PGC and stripper

Power engineering

- Power generation in coal-fired power plant

Automotive industry

- Fast analytical measurement of methane in car exhausts
- High-speed chromatography of small molecules in propellants

Design

A chromatographic measuring device consists of:

- Sampling matched to the application, sample preparation with switchover to various sample streams if necessary
- Gas chromatograph with analytical and electronic hardware as well as the measured value processing, operator control and communication software

The MAXUM edition II gas chromatograph is divided into three sections depending on the version:

- The upper section contains the electronics with the power supply, controllers and analog electronics
- The middle section contains the pneumatics and, in some cases, the detectors (not for MAXUM edition II modular oven version)
- The bottom section contains the oven and the complete analytical components responsible for the separation.

The MAXUM edition II is available in a version prepared for wall mounting and in a version for mounting on a free-standing rack.

Extension of functionality

Network Access Unit (NAU)

- A MAXUM edition II without analytical section
- Multiple slots for optional I/O plug-in cards
- Offers central MODBUS connection of several chromatographs to the control system

Function

Supply with carrier gas, combustion gas and auxiliary gases

A gas chromatograph must be supplied with carrier gas and, if applicable, combustion gas and other auxiliary gases depending on the analytical configuration. The carrier gas is used to transport the sample through the analytical system. Auxiliary gases are used to operate valves, as combustion gases for flame ionization detectors, and to purge the oven.

Injection system

The injection system is the link between the continuous process stream and the discrete analytical process. It is responsible for injecting an exactly defined portion of the sample in a reproducible and pulsed manner (as far as possible) into the carrier gas stream.

The injection can be carried out in the conventional manner using valves or by means of a live injection:

- Gaseous samples (0.1 to 5 ml)
- Completely vaporizable liquid samples (0.1 to 10 µl)

Gas injection valves

Model 50 10-port valve:

- Combined gas injection and backflushing valve
- Activation by pressure on the diaphragm without moving parts
- Can be used as gas injection valve or for column switching (6-port connection)
- > 3 million switching cycles without maintenance

Model 11 6-port valve:

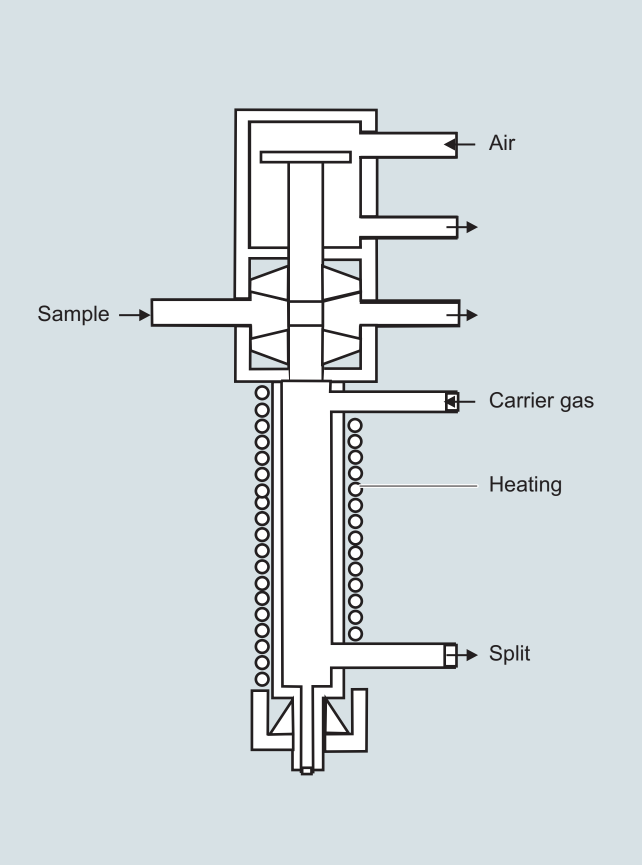
- Can be used as gas injection valve, liquid injection valve or for column switching
- Diaphragm controlled by tappet
- One million switching cycles without maintenance

Liquid injection valve FDV

With the liquid injection valve, a constant volume of a liquid sample can be automatically dosed and then quickly and completely vaporized. The valve can also be used to inject small volumes of gas.

The liquid injection valve consists of three sections:

- Thermostatically-controlled vaporization system
- Sample passage section with seal
- Pneumatic drive



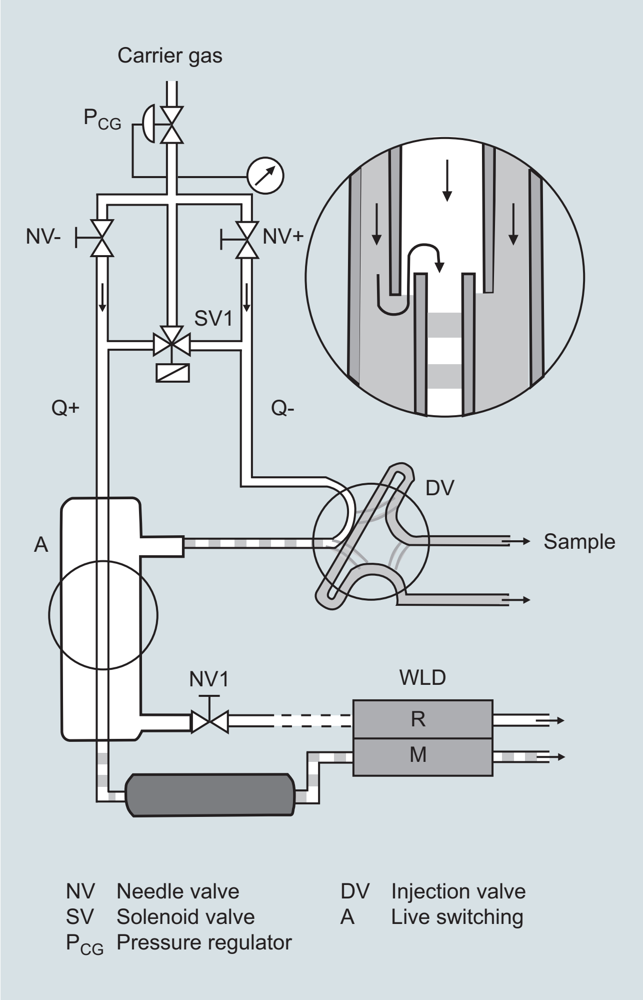
Liquid injection valve FDV

Features:

- Vaporization temperature 60 to 350 °C
- Injection volume 0.1 to 9.5 µl
- Sample temperature -20 to +150 °C
- Material of wetted parts: Stainless steel, mat. no. 1.4571, Hastelloy, Monel or special materials
- Control pressure 400 to 600 kPa
- Max. sample pressure 6 000 kPa, recommended 50 to 100 kPa
- Connections for pipe: 3.14 mm (1/8") outer diameter

Live injection add-on part

Flexible selection of the injection volume which is exactly matched to the analytical tasks and the requirements of the columns is possible with the live injection add-on part.



Live injection

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Oven

A further important factor for the separating performance is the temperature This has a very high influence on the vapor pressure of the individual components, and thus on the diffusion and the distribution equilibrium between the mobile and stationary phases in the column. This influences the retention times, and thus the performance capability of the MAXUM edition II. Therefore very high demands are placed on the temperature stability and repeatability of the oven and also on that of the injection equipment and the detectors.

Two different types of oven are available: Both types of oven are available as a single over or double ovens.

Airless oven**:**

- For extremely stable isothermal oven temperatures (0.02 °C control accuracy)
- Depending on the version, up to 80 °C (modular oven) or up to 280 °C.

Airbath oven**:**

- For isothermal (5 to 225 °C) operation
- For temperature-programmed operation

With the dual ovens, two separate heating circuits provide independent oven temperatures. It is then possible to use two different temperatures for the respectively installed columns for one application or to carry out two or more applications in one chromatograph with different temperatures for the separation.

In order to measure sample components with highly different volatilities, a temperature program is frequently used for the chromatographic separation. This program continuously increases the temperature of the separation columns at a configurable heating-up rate during the analytical process. This method (PTGC) is available with the MAXUM edition II.

The internal oven consists of a chamber with low thermal capacity located within the standard oven. The oven contains the capillary separating column used for the separation.

The ovens have separate, independent temperature control. The temperature of the internal oven is freely-programmable. The temperature changes according to the time-dependent profile assigned to the respective analysis. Up to three linear ramps and four constant periods can be configured.

Thus, it is possible to determine components with low and high boiling points in one analysis. Existing laboratory applications can be opened up by PTGC for use in the process industry.

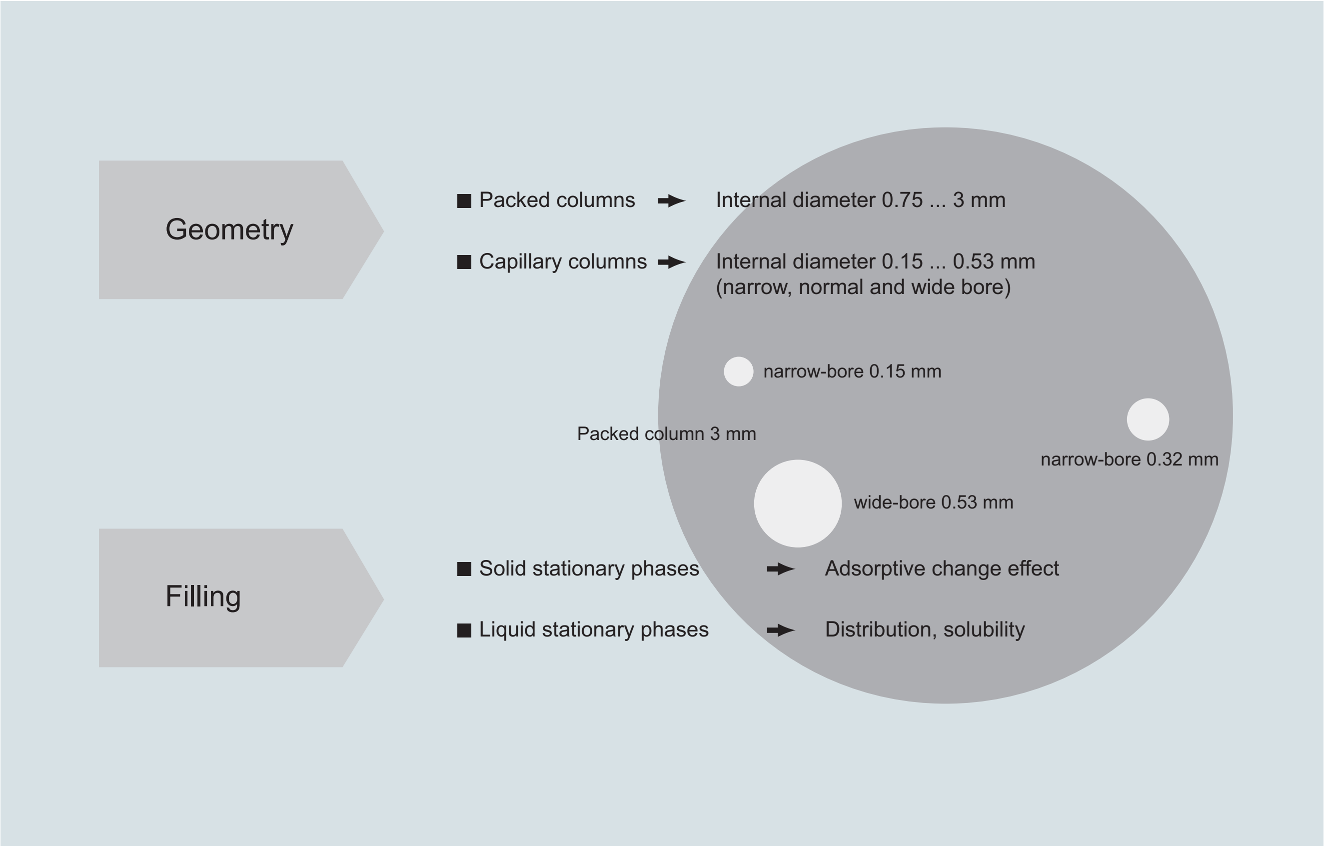
"Simulated distillation" is an important application of PTGC in refineries. The distillation range - a quality criterion for fuels - is chromatographically traced "online".

Columns

The columns are the central component of the chromatograph. They resolve the gas mixture or the vaporized liquid into its individual components. The following distinction is made:

- Packed/micropacked columns with inner diameter of 0.75 to 3 mm
- Capillary columns with inner diameter of 0.15 to 0.53 mm

Packed columns are mechanically stable and simple to handle. Capillary columns have a significantly higher separating performance, often with a shorter analysis period and lower analysis temperature.



Types of column

Column switching systems

Process chromatographs are almost always equipped with column switching functions. Column switching is understood to be the combination of several columns in the carrier gas path which are arranged in succession or parallel. These columns usually have different separating performances, and are interconnected by valves for switching over the gas path. A distinction is made between backflushing, cut and distribution.

A wide range of techniques is available for column switching.

The techniques comprise highly stable membrane gas valves, membrane piston valves, sliding vane rotary valves and also valveless switching techniques.

Valves

Model 50 10-port valve:

- Combined gas injection and backflushing valve
- Activation by pressure on the diaphragm without moving parts
- Switches gas samples at an overpressure of 0 to 500 kPa
- Can be used as gas injection valve or for column switching (6-port connection)
- > 3 million switching cycles without maintenance

Model 11 6-port valve:

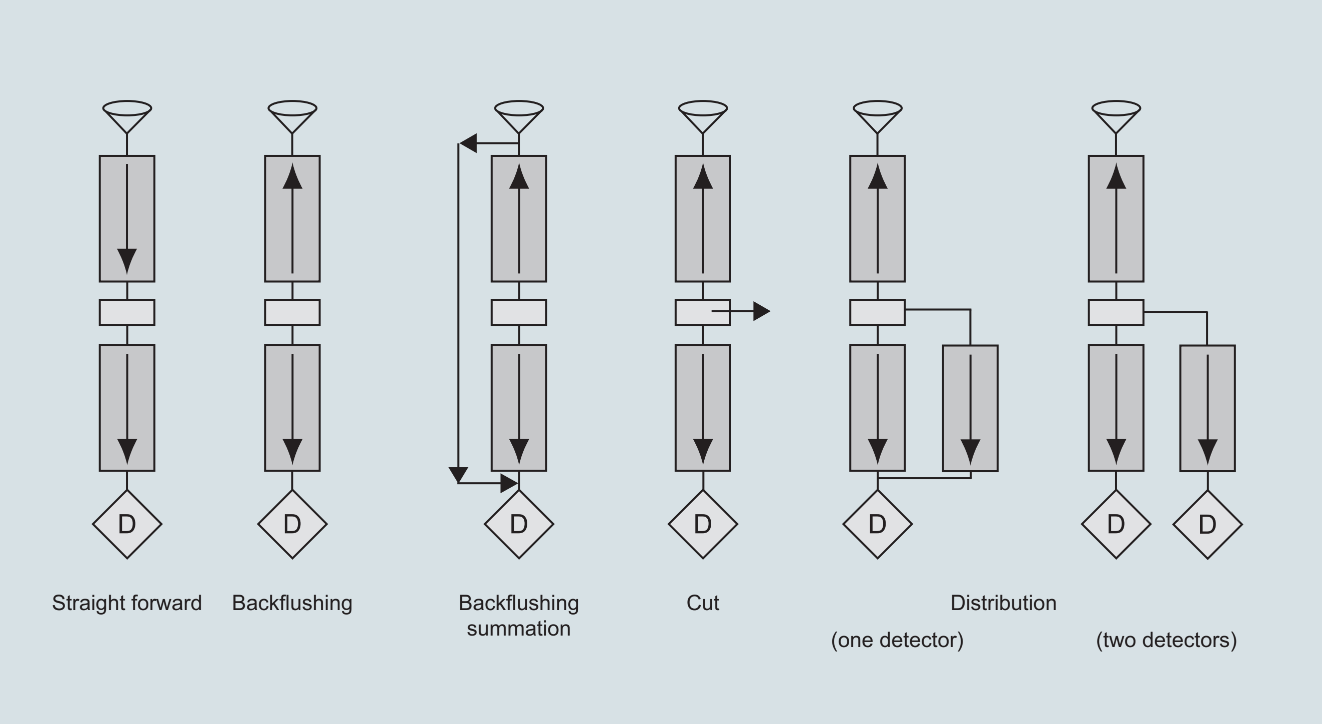
- Can be used as gas injection valve, liquid injection valve or for column switching
- Diaphragm controlled by tappet
- One million switching cycles without maintenance

Valveless switching technique

The valveless live column switching is exactly controlled by electronic pressure regulators, and prevents falsification of results since the sample does not come into contact with valves. A special pressure-controlled coupling element connects the capillary columns.

This technique is optimally suitable for capillary columns, and offers the best long-term stability and reliability. Live column switching is a technique where backflushing, cut or distribution is carried out on two different columns without any switching of valves or other moving components in the separation path.

This is achieved using a unique coupling unit, the live T-piece. Its function is based on pressure difference control regulated by the electronic precision pressure controllers of the MAXUM edition II. Because there is no dead volume whatsoever, it is ideally suitable for the low flow rates used with capillary columns. Maintenance of the column switching configuration is then superfluous, the separating performance is improved, and complicated separating procedures are simplified.



Column switching systems (examples)

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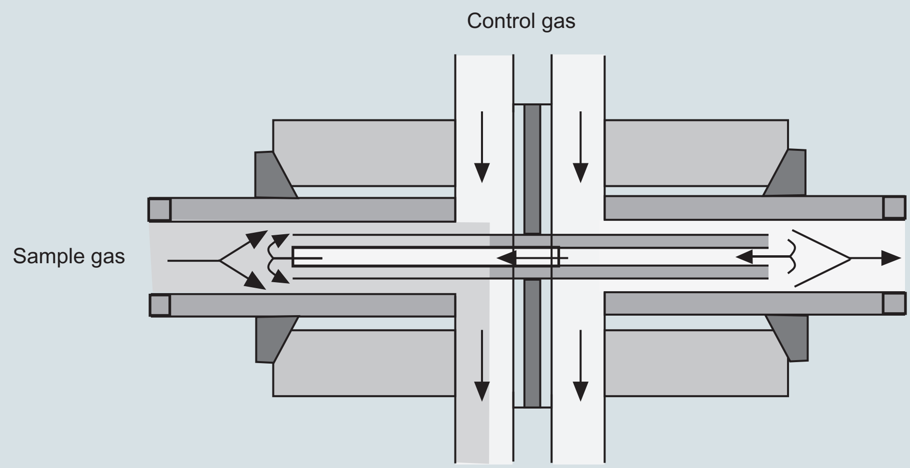


Live switching

Solenoid valve control module

- Contains all control elements in one module in order to reduce downtimes during repairs to a minimum
- Has 3-way and 4-way distributors for control of many different types of valve
- Uses separate, plug-on pipe connectors to permit implementation of variable gas supplies

Electronic pressure controller module (EPC)

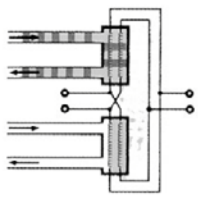
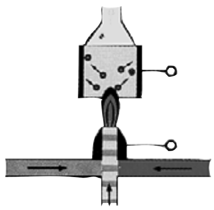
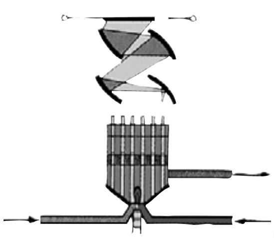
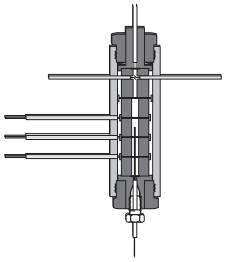
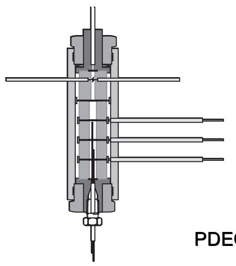
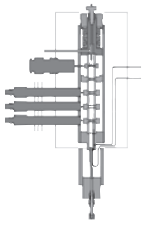
- Permits exact control of pressure without mechanical pressure regulator. Shortens the setup time since the pressure is set by an operator input.
- Permits programmable pressure changes for fast chromatography and modern applications.
- Controls the supply of carrier gas and combustion gas Avoids drift and deviations which can occur with mechanical pressure control.

Detectors

Thermal conductivity detectors (TCD) and flame ionization detectors (FID) are mainly used in process chromatography. Specific detectors such as flame photometer detector (FPD), electron capture detector (ECD), photo-ionization detector (PID), or helium ionization detector (HID) are used to a lesser extent.

The detector modules described above can be combined together in many different ways in the MAXUM edition II.

- A maximum of three detector modules can be used in the airbath oven.
- Up to three modules (depending on the type) can be used in the airless oven, the dual airless oven and the ovens with temperature programming.
- Thermal conductivity detectors (TCD) are used in the modular oven system.
- In the case of multiple modules such as the TCD, the measuring cells can be operated independent of one another in parallel at staggered times, for example, to increase the number of analyses per time unit.
- Multiple modules can each be used with a column system for one sample stream. This shortens the total cycle time with multi-stream applications.
- Parallel use of two identical column systems provides redundant measurements which can be compared with each other, thus reducing the necessity for calibration.

Detector	Measured value dependent on:	Selectivity	Application example
 WLD	Concentration	Universal	Main and subsidiary components
 FID	Mass flow	Thermally ionizable components at < 1 000 °C	Hydrocarbons
 FPD	Mass flow	Substances containing S or P	Traces of sulfur in HC matrices
 PDHID	Mass flow	Universal (except He and Ne)	Ultra-pure gas analysis
 PDECD	Mass flow	Molecules with electronegative groups	Traces of halogenated hydrocarbons
 PDPID	Mass flow	Selective, dependent on ionization potential	Traces of aromatic compounds, amines

Suitable detectors for process gas chromatography

Thermal conductivity detectors (TCD)

The measuring principle of the TCD is based on the difference between the thermal conductivity of a pure carrier gas stream and that of a gas mixture containing carrier gas and a component eluted from the column. Therefore all components whose thermal conductivity differs from that of the pure carrier gas can be detected by a TCD.

TCDs always consist of one to three measuring cells and one or two reference cells which are electrically heated and contain wire resistors or thermistors connected in a Wheatstone bridge.

The amount of heat transferred to the cells is the same as long as pure carrier gas flows through the measuring and reference cells. The resistances are therefore also very similar, and the bridge resistors are balanced. If a mixture of carrier gas and sample component flows through the sample chamber, the change in thermal conductivity of the gas mixture also changes the amount of heat transferred and thus the temperature and resistance of the heating wires or thermistors in the sample chamber.

The resulting offset in the bridge circuit is directly proportional to the current concentration of the sample component in the carrier gas stream.

Versions of TCDs:

- Thermistor detector
- Filament detector

Both detectors are available for universal use, and the filament detector can also be used at higher temperatures. The thermistor detector is available as a block with 6 measuring detectors and two reference detectors. The filament detector has a measuring cell and a reference cell.

Flame ionization detector (FID)

With the flame ionization detector (FID), the gas leaving the column is burnt in a constantly burning hydrogen flame. If this gas mixture contains thermally ionizable components, such as flammable organic compounds, ions are thermally generated during the combustion. These ions can transport a charge, the conductivity of the gas in the vicinity of the flame changes (increases). In order to measure the conductivity or the number of ions, these can be collected at an electrode.

For this purpose, an electrode voltage is applied between the nozzle from which the flame burns and the electron collector positioned above it.

The resulting current is amplified, and is the measured signal.

In contrast to the TCD (concentration-dependent signal), the signal with the FID is proportional to the mass flow of the components.

The FID features a linear range of 6 to 7 powers of ten, and permits detection limits of less than 0.1 ppm (referred e.g. to the concentration of the hydrocarbon in the sample). Non-flammable components or those that are very difficult to thermally ionize (e.g. inert gases and water), or components that do not thermally ionize at approx. 1 700°C, cannot be measured with the FID.

In addition to the carrier gas, hydrogen and air are required as the flame gases to operate this detector.

Flame photometer detector (FPD)

Further detector principles are used for determination of trace concentrations of specific components. For example, the flame photometer detector is used to determine traces of compounds containing sulfur or phosphor. The emission of light of characteristic wavelengths is measured when burning the substances in a reducing hydrogen flame.

Pulsed discharge detector (PDD)

The detector can be used in three different versions: HID (helium ionization detector), ECD (electron capture detector) and PID (photo ionization detector). Installation in the Maxum GC is possible without further modification, and the detector can only be used in non-hazardous areas. The PDD uses stable, pulsed DC discharges in helium as the ionization source. The detector's performance data is equal to or better than that of detectors which use radioactive ionization sources. Since a radioactive source is not used, the expensive requirements for radiation protection are not relevant for the customer.

- PDHID (helium ionization detector)
  The PDHID works almost destruction-free with an ionization rate of 0.01 to 0.1 %, and has a high sensitivity. The sensitivity for organic components is linear over five orders of magnitude, and the detection limit is in the low ppb range. The PDHID can be used universally for organic and inorganic components, with the exception of helium and neon.
- PDECD (electron capture detector)
  In electron capture mode, sample components with a high electron affinity can be selectively detected, such as halogenated hydrocarbons. It is necessary to use a supplementary gas in this mode (recommended: 3 % xenon in helium).
- PDPID (photo ionization detector)
  A supplementary gas must also be used in this mode. Addition of 1-3 vol.% of argon, krypton or xenon to the auxiliary gas leads to kinetic excitation of the added gas. The detector is used in this configuration for selective detection of aliphatic compounds, aromatic compounds and amines. The selectivity or the energy level can be determined through the choice of added gas. The sensitivity in this mode is limited to sample components whose ionization potential is below the kinetic emission energy of the added gas.

Accessories: Catalytic air purifier

Instrument air is usually contaminated by traces of hydrocarbons. If this air is used as combustion air for a flame ionization detector (FID), these impurities are evident as interference noise.

The catalytic air purifier eliminates interfering impurities of hydrocarbons in the combustion air for the FID detector. The products of the catalytic oxidation (H_2O, CO_2) have no influence on the detector. Use of the catalytic air purifier significantly reduces the noise. It has a flameproof housing and is therefore explosion-proof.

The air within the purifier is passed through a spiral lined with palladium. This metal spiral is heated up to approx. 600 °C. Palladium has a high activity at this temperature, and almost complete catalytic oxidation is achieved despite the short dwell time. The air subsequently passes through a cooling loop, and is output purified and cooled.

Parallel chromatography

Divides a complex application into several single sub-applications that are analyzed in parallel. This reduces the cycle times.

The hardware and software of the MAXUM edition II allows a complex chromatographic analysis to be divided into several single analyses. Each of these simple analyses can then be simultaneously executed in parallel. This not only simplifies the complete analysis, it can also be carried out faster and with greater reliability. In addition, maintenance of the simplified analyses is easier and faster.

State-of-the-art communication

TCP/IP communication and standard Ethernet hardware mean that MAXUM edition II is compatible with many networks.

Software

For simple operation and maintenance, the MAXUM edition II offers an online software system with local operation over an HMI and a flexible graphical user interface accessible via a computer workstation.

The online software system is installed in every MAXUM edition II or NAU and includes:

- Embedded EZChrom analysis
- Embedded MaxBasic in the runtime version
- Communications software, network software, I/O driver in order to operate the gas chromatograph

The Gas Chromatograph Portal PC workstation software comprises:

MAXUM edition II workstation tools:

- NetworkView to provide an overview of the network
- Method builder
- MMI maintenance panel emulator
- Data logger
- Modbus utility
- Backup and restore utilities
- Online system download utilities
- Online help and documentation

and optional packages for individual ordering, e.g.:

- MaxBasic editor
- Simulated distillation method
- OPC communications server

Application

Certain parameters must be adhered to during method development and subsequent operation of the MAXUM edition II. It can then be determined qualitatively whether the task is fulfilled. The basic prerequisite for this is that all components can be detected and clearly isolated from the interfering components. Important parameters are: Analysis period, measuring ranges, detection limits and repeatability of the results.

Technical specifications

MAXUM edition II classic oven

General information	
Smallest measuring ranges (depending on application)	• Thermal conductivity: 0 ... 20 ppm • Flame ionization: 0 ... 1 ppm
Temperature range in oven	Application-specific, temperature class-dependent 5 ... 330 °C depending on oven version and temperature class
Temperature control	± 0.02 °C
EMI/RFI design	• CE-compatible; certified according to 2014/30/EU (EMC directive) • CE-compatible; certified according to 2014/35/EU (low-voltage directive) • Tested according to EN 61010-1 / IEC 1010-1
Calibration	Comparative measurement with external standard
• Type	Manual or automatic
• Zero value	Automatic baseline correction
• Span	Standard sample cylinder (single or multipoint calibration possible)
Dimensions	
• Height	1 053.6 mm
• Width	752 mm
• Depth	417.4 mm
Weight	77 kg (application-dependent)
Degree of protection	IP54, Category 2
Danger class	Standard configurations: • Certified according to ATEX with air or nitrogen purging for Zones 1 and 2 (II2G Ex ... IIB + H_2 ... Gb) • Suitable for use in non-hazardous areas and with non-dangerous conditions • Certified according to CSA C/US for use in Class 1, Div. 1, Groups B, C, D with air or nitrogen purging. • Certified according to CSA C/US for use in Class 1, Div. 2, Groups B, C, D. **Important note!** Use in non-hazardous areas requires purging of the electronics area with air or nitrogen. PDD is not certified for hazardous areas.

Configuration	
Oven options	• Single isothermal oven or divided oven with two independent isothermal zones • Single oven or two independent airless ovens. The dual version has two separate oven areas with separate doors which operate completely independently. • Temperature-programmable oven (PTGC)
Detector modules	• Thermal conductivity • Flame ionization • Flame photometry • Helium ionization • Photo ionization and electron capture
Number of detector modules	• 1, 2 or 3 in any combination of types for airbath ovens (max. 2 FPDs) • 1 or 2 in any combination of types for airless ovens, up to 3 in special configurations
Sampling and column valves	• Diaphragm valves • Diaphragm piston valves • Sliding vane rotary valves, slider valves, or liquid injection valve
Valveless option	Live switching
Columns	Packed, micropacked or capillary columns
Regulation of gas supply	Up to 8 electronic pressure regulator channels and up to 6 mechanical pressure regulators
Electrical characteristics	
Auxiliary power	• Single-phase AC, 100 ... 130 V or 195 ... 260 V (selectable), 47 … 63 Hz • Single oven: max. 14 A • Dual oven: 2 circuits, max. 14 A each
Gas inlet conditions	
Sample flow	5 ... 100 ml/min (depending on application)
Sample filter size	0.1 ... 5 µm for gaseous samples depending on valve type
Minimum sample pressure	35 kPa, standard
Maximum sample pressure	200 kPa standard, higher pressure as option
Maximum sample temperature	121 °C standard; higher temperature as option
Materials wetted by sample	Stainless steel and Teflon; other materials as option
Liquid injection (valve)	
Vaporization temperature	60 ... 350 °C depending on application and temperature class
Injection volume	0.1 ... 9.5 µl
Sample temperature	-20 ... +150 °C
Material of wetted parts	Stainless steel, mat. no. 1.4571, Hastelloy, Monel or special materials
Control pressure	400 ... 600 kPa
Sample pressure	Max. 6 000 kPa, recommended 50 ... 100 kPa
Connections for pipe	3.14 mm (1/8") outer diameter

Measuring response	
Sensitivity (depending on application)	± 0.5 % of span
Linearity (depending on application)	± 2 % of span
Effects of vibrations	Negligible
Repeatability in % of full span	2 ... 100 %: ± 0.5 %; 0.05 ... 2 %: ± 1 %; 50 ... 500 ppm: ± 2 %; 5 ... 50 ppm: ± 3 %; 0.5 ... 5 ppm: ± 5 %
Detection limits	See "Detectors"
Influencing variables	
Effects of ambient temperature	None with electronic pressure control Different effects with mechanical pressure control (depending on application)
Electrical inputs and outputs	
Standard inputs and outputs	2 analog outputs 4 digital outputs • 1 digital output for indication of system faults • 3 digital outputs are user configurable 4 digital inputs
Card slots for optional inputs and outputs via internal I2C bus	2
Input and output cards	A IO 8 • 8 analog outputs • 8 analog inputs • 2 digital inputs D IO • 6 digital inputs and 8 digital outputs AD I/O • 4 digital inputs and 4 digital outputs • 4 analog inputs and 4 analog outputs
Digital inputs	Optocoupler with internal power supply (12 ... 24 V DC): • Mode 1: switchable by floating contacts • Mode 2: switchable by external power supply 12 … 24 V DC (only floating relay contacts) • Mode 3: external power supply, negative connection linked to ground, for a specific digital input
Digital outputs	Floating changeover contacts, max. contact rating: • 1 A for 30 V DC A freewheeling diode should be used for inductive loads.
Analog inputs	-20 ... +20 mA in 50 Ω or -10 ... +10 V R_{in} = 0.1 MΩ, mutually isolated up to 10 V
Analog outputs	0/4 ... 20 mA in max. 750 Ω, common negative pole, electrically isolated from ground; freely-connectable to ground
Termination	• Syscon-based I/O: Screw terminal for shielded or solid cable with a maximum area of 16 AWG or 1.5 mm^2 • Expansion board-based I/O: Screw terminal for shielded or solid cable with a maximum area of 18 AWG or 0.82 mm^2

Climatic conditions	
Ambient temperature	-18 ... 50 °C depending on application
Gas supply	
Instrument air	• At least 350 kPa for units with valves Model 11 or Valco • At least 825 kPa for units with valves Model 50 • At least 175 kPa for airbath ovens; 85 l/min per oven
Carrier gas	• Hydrogen, nitrogen, helium, argon or synthetic air in compressed gas cylinder, purity 99.999 %, or hydrogen with a purity of 99.999 % (depending on application). • Typical consumption quantity: 5 ... 100 l/month per detector module
Combustion gas	• Hydrogen with a purity of 99.999 % • Typical consumption quantity: 30 ... 50 ml/min/FID, approx. 100 ml/min/FPD
Combustion air	• Synthetic air: Hydrocarbon-free • Typical consumption quantity: 400 ml/min/FID, approx. 100 ml/min/FPD
Corrosion protection	• Purging with dry air to protect the electronics • Airbath oven with stainless steel lining • Airless oven made of aluminum • Steel lining painted on outside (epoxy powder coating)
Communication	
Serial output	RS 232, RS 485, e.g. Modbus
Ethernet	• Standard 10/100 BaseT Ethernet with 4 RJ45 connectors e.g. Modbus TCP IP or OPC • Optional ESBF board fiber-optic 100Base FX multimode with ST connection (3 x RJ 45 and 1 x optical)

3

MAXUM edition II modular oven

General information	
Smallest measuring ranges (depending on application)	• Only for gaseous sample • Thermal conductivity: 0 ... 200 ppm
Temperature range in oven	Application-specific, depending on temperature class, 60 ... 80 °C depending on application
Temperature control	± 0.02 °C
EMI/RFI design	• CE-compatible; certified according to 2014/30/EU (EMC directive) • CE-compatible; certified according to 2014/35/EU (low-voltage directive) • Tested according to EN 61010-1 / IEC 1010-1
Calibration	Comparative measurement with external standard
• Type	Manual or automatic
• Zero value	Automatic baseline correction
• Span	Standard sample cylinder (single or multipoint calibration possible)
Dimensions	
• Height	729.9 mm
• Width	752 mm
• Depth	415.9 mm
Weight	60 kg (application-dependent)
Degree of protection	IP54, Category 1
Danger class	Standard configurations: • Certified according to ATEX and IEC Ex with air or nitrogen purging for Zones 1 and 2 (II2G Ex ... IICT 4 Gb) • Suitable for use in non-hazardous areas and with non-dangerous conditions • Certified according to CSA C/US for use in Class 1, Div. 1, Groups B, C, D with air or nitrogen purging. • Certified according to CSA C/US for use in Class 1, Div. 2, Groups B, C, D. **Important note!** Use in non-hazardous areas requires purging of the electronics area with air or nitrogen.
Configuration	
Oven options	• Single oven or two independent airless ovens. • Optionally small oven for one small analytical module, large oven for two small analytical modules or one large analytical module. • Two small ovens, two large ovens or any combination of 2 ovens is possible. • Each dual oven version has two separate oven areas with separate doors which operate completely independently.
Detector module, type	Thermal conductivity
Detectors	One 4-cell TCD for small analytical modules and one or two 4-cell TCD for large analytical modules
Sampling and column valves	• 1 diaphragm valve model 50 (M50) in small analytical module • 1, 2 or 3 x M50 with 1 x M50 in large analytical module
Columns	Packed, micropacked or metal capillary columns
Regulation of gas supply	Up to 6 electronic pressure regulator channels and up to 4 mechanical pressure regulators

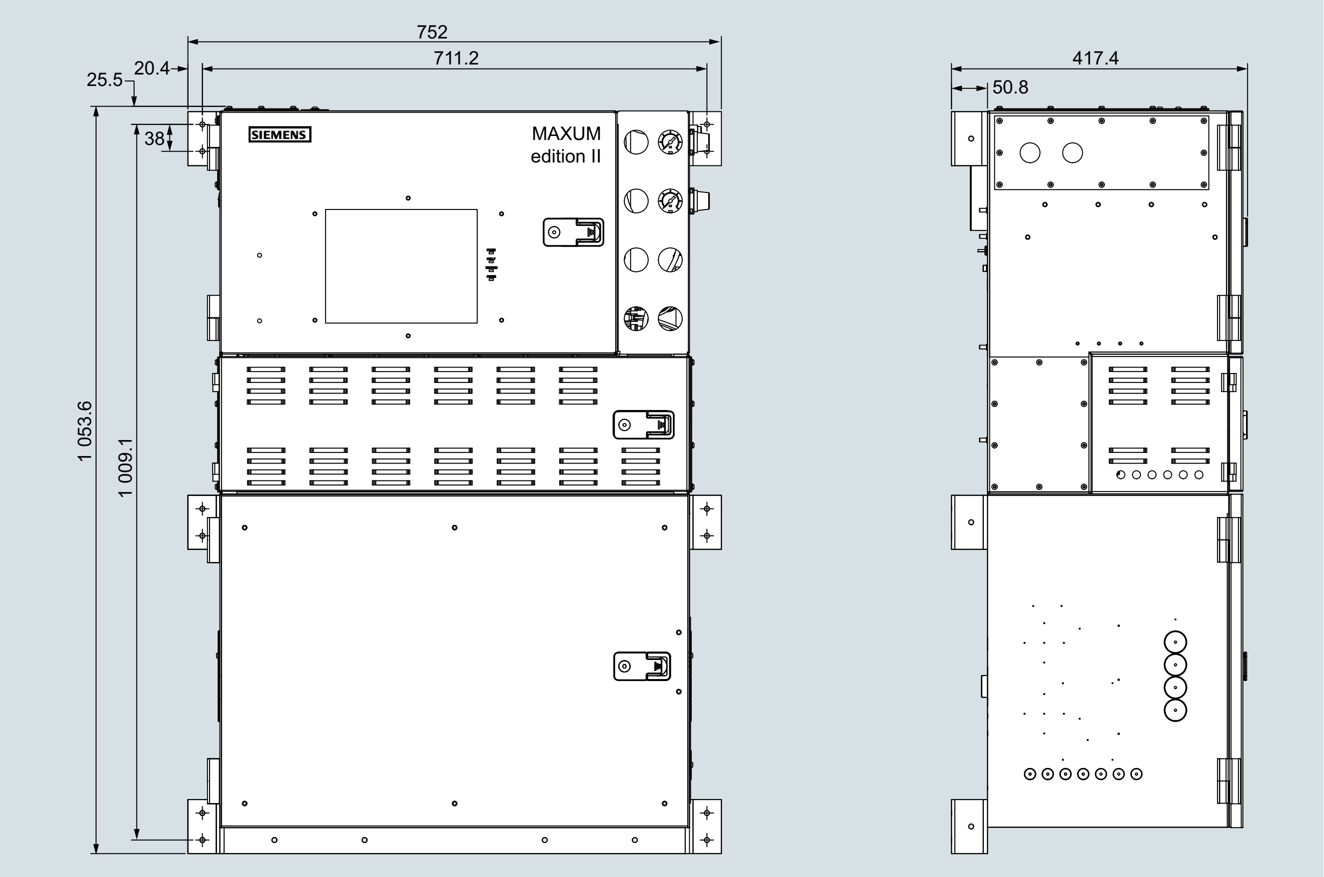
Electrical characteristics	
Auxiliary power	• Single-phase AC, 85 ... 264 V, 47 … 63 Hz • Max. 655 VA, nominal 280 VA Optional • 24 V DC ± 10 % 10 A with 32 V voltage limitation • Max. 100 mV residual ripple and interferences minimum to maximum at 20 MHz • Fuse protection with max. 20 A • External 24 V supply must accept minus to ground
Gas inlet conditions	
Sample flow	5 ... 100 ml/min (depending on application)
Sample filter size	0.1 µm for gaseous samples
Minimum sample pressure	35 kPa, standard
Maximum sample pressure	200 kPa standard, higher pressure as option
Maximum sample temperature	80 °C maximum; higher temperature as option
Materials wetted by sample	Stainless steel, aluminum, Viton, polyimide and Teflon
Measuring response	
Sensitivity (depending on application)	± 0.5 % of span
Linearity (depending on application)	± 2 % of span
Effects of vibrations	Negligible
Repeatability in % of full span	2 ... 100 %: ± 0.5 %; 0.05 ... 2 %: ± 1 %; 50 ... 500 ppm: ± 2 %; 5 ... 50 ppm: ± 3 %; 0.5 ... 5 ppm: ± 5 %
Detection limits	See "Detectors"
Influencing variables	
Effects of ambient temperature	None with electronic pressure control Different effects with mechanical pressure control (depending on application)
Electrical inputs and outputs	
Standard inputs and outputs	2 digital outputs • 1 digital output for indication of system faults • 1 digital output is user configurable 2 serial outputs • 1 x RS 232/RS 485 • 1 x RS 485
Card slots for optional inputs and outputs via internal I2C bus	2
Input and output cards	A IO 8 • 8 analog outputs • 8 analog inputs • 2 digital inputs D IO • 6 digital inputs and 8 digital outputs AD I/O • 4 digital inputs and 4 digital outputs • 4 analog inputs and 4 analog outputs
Digital inputs	Optocoupler with internal power supply (12 ... 24 V DC): • Mode 1: switchable by floating contacts • Mode 2: switchable by external power supply 12 … 24 V DC (only floating relay contacts) • Mode 3: external power supply, negative connection linked to ground, for a specific digital input

Digital outputs	Floating changeover contacts, max. contact rating: • 1 A for 30 V DC A freewheeling diode should be used for inductive loads.
Analog inputs	-20 ... +20 mA in 50 Ω or -10 ... +10 V R_{in} = 0.1 MΩ, mutually isolated up to 10 V
Analog outputs	0/4 ... 20 mA in max. 750 Ω, common negative pole, electrically isolated from ground; freely-connectable to ground
Termination	• Syscon-based I/O: Screw terminal for shielded or solid cable with a maximum area of 16 AWG or 1.5 mm^2 • Expansion board-based I/O: Screw terminal for shielded or solid cable with a maximum area of 18 AWG or 0.82 mm^2
Climatic conditions	
Ambient temperature	-18 ... 50 °C (depending on application)
Gas supply	
Instrument air	At least 825 kPa for units with Model 50-type valves
Carrier gas	• Hydrogen, nitrogen, helium, argon or synthetic air in compressed gas cylinder, purity 99.999 %, or hydrogen with a purity of 99.999 % (depending on application). • Typical consumption quantity: 5 ... 100 l/month per detector module
Corrosion protection	• Purging with dry air to protect the electronics • Airbath oven with stainless steel lining • Airless oven made of aluminum • Steel lining painted on outside (epoxy powder coating)
Communication	
Serial output	2 outputs • Port 1: RS 232/RS 485 can be selected • Port 2: Only RS 485 possible
Ethernet	• Standard 10/100 BaseT Ethernet with 4 RJ45 connectors e.g. Modbus TCP IP or OPC • Optional ESBF board fiber-optic 100Base FX multimode with ST connection (3 x RJ 45 and 1 x optical)

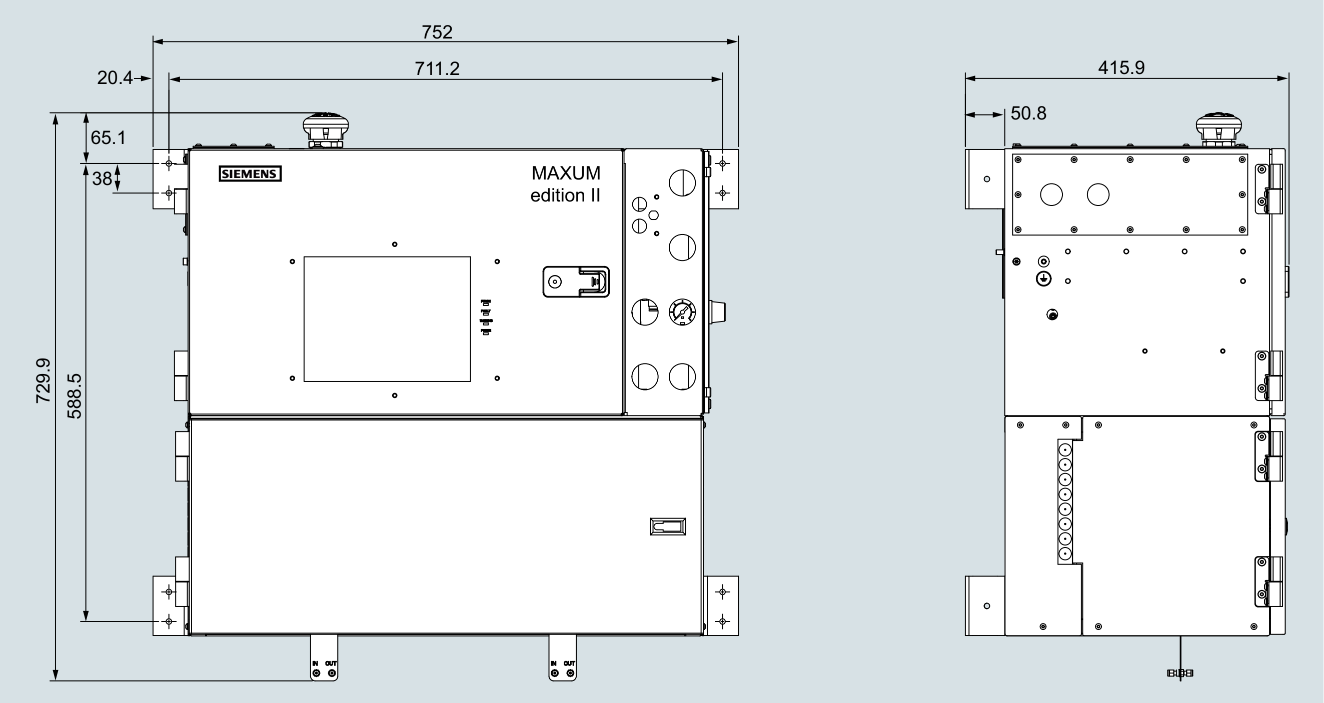
3

3

Dimensional drawings



MAXUM edition II airless/airbath oven, dimensions in mm



MAXUM edition II modular oven, dimensions in mm

More information

Please contact your Siemens sales partner to order a device.

Notes

Analytical Application Sets

4

4/2	**Introduction**
	Continuous emission monitoring
4/3	Introduction
4/4	Set CEM CERT
4/9	Set CEM 1
4/18	HM-1400 TRX Total mercury analyzer system
	Dust and opacity measurement
4/20	- D-R 220 dust and opacity measuring instrument
4/22	- D-R 290 dust and opacity measuring instrument
4/24	- D-R 320 dust measuring instrument
4/26	- D-R 808 dust measuring instrument
4/28	- D-RX 250 combination probe
	Volume flow measurement
4/30	- D-FL 100 volume flow measuring system
4/32	- D-FL 220 volume flow measuring system
4/34	D-ISC 100 display and control unit
	Environmental and process data management systems
4/36	- D-EMS 2000
4/38	- D-EMS 2000 CS
	Biogas analysis
4/39	Set BGA
	Continuous monitoring of hydrogen-cooled generators
4/43	Set GGA

Overview

Standardization and the supply of complete packages are two trends that are currently on the up. This can be attributed to the fact that the same application is frequently required in different industrial sectors and overhead can be minimized in this case. Furthermore, customers often want to purchase turnkey systems to minimize the risk of any technical problems.

With its Analytical Application Set initiative, Siemens is making use of its wealth of experience to offer standardized packages that are designed with a single application in mind. Its range of applications can cover a variety of industrial sectors.

It is now possible to simply configure and order complete applications straight from the catalog, thereby sharply reducing the amount of time taken between the request and order. All Analytical Application Sets are tested in advance and provide a high level of safety and reliability. The different versions cover a broad spectrum of potential applications and ensure that the sets can be configured for both minimum and maximum requirements.

The order structure makes it possible to choose from different versions and module components, as well as configure the system and order it directly.

Overview

The combustion of different fuels causes not only the development of carbon dioxide and water vapor but also other environmentally harmful exhaust gas substances (e.g. dust, nitrogen oxides and carbon monoxide, etc.) Emission limit values are determined for these substances according to the state of combustion engineering. The compliance with these limits does not only protect the environment from air pollutants but also ensures optimum combustion in the combustion plants. Emission measurements are a central element for complying with these limit values.

These measurements are required to document whether legal requirements relating to emission limits are complied with. Emission measurements still serve as warranty from plant constructors to operators that the plant runs in accordance with the specification and the law.

There are two reasons why the measuring and monitoring of flue gases for emission components is one of the key topics in continuous gas analysis. First, because of the necessity to comply with the legal regulations and directives. Second, because process plant operators draw conclusions regarding process efficiency from the gas analysis, for example, in boiler control.

So called Continuous Emission Monitoring Systems (CEMS) are used for the determination of the exhaust gas components. In Europe, they are usually called Automated Measurements Systems (AMS). DIN EN 15267 determines corresponding minimum requirements and testing procedures for automated monitoring systems for the measurement of gases and particulate substances in the exhaust gas of stationary sources as well as for the measurement of the volume flow of the exhaust gas. It provides detailed procedures for the realization of the requirements for the first quality assurance level (QAL1) of DIN EN 14181 and, if required, the access data for the third quality assurance level (QAL 3).

Siemens expertise in the area of products and solutions for process analysis helps you meet all requirements for continuous emission monitoring quickly and smoothly in accordance with regional law. This solution package even ensures a secure investment in case of regulatory adjustments.

According to individual requirements, Siemens offers cold-extractive, hot-extractive, and in-situ automated monitoring systems.

The portfolio is completed by emission evaluation systems for data storage, visualization, remote transmission - permitted according to TA-Luft, 13., 17., 27., 30. and 31. BImSchV

Siemens does not only offer standard solutions but also complete emission analysis systems, e.g. in turnkey analysis containers.

Set CEM CERT

Overview

Set CEM CERT is a standardized and certified continuous emission monitoring system. Set CEM CERT is suitable for use in many plants which need to comply with European legislation according to Directive 2010/75/EU, the Industrial Emissions Directive.

The modular CEMS meets the current quality standards of EU directives EN 15267 and EN 14181. The number of components that need to be measured depends on the type of plant as well as the fuel used. The measurement of gas components takes place according to the cold-extractive measuring procedure. A sample flow is constantly being extracted for measurement purposes in the exhaust gas stack by means of a gas sampling probe and transported to the analysis cabinet. The modular system cabinet can be equipped with up to three analyzers and different sample preparation components.

Benefits

- The tested measuring ranges can be selected for a variety of ranges to ensure use in different areas of application for the CEMS (checked for suitability according to EN 15267-3: TÜV and MCERTS).
- The complete modular package allows the certified use of system components from different manufacturers (checked for suitability according to EN 15267-3: TÜV and MCERTS).
- Simple and fast to configure
- Very low costs of procurement and operation

Modular design

- Up to 3 analyzers with different measuring ranges can be configured
- Selection of sample gas cooler and NO_X converter from leading manufacturers
- Electric heaters and air conditioners can be configured to extend the ambient temperature range
- Selection of versions with appropriate sampling probes, heated sample gas lines

Application

- Emission monitoring of power plants fueled with solid, gaseous or liquid fuels
- Emission monitoring of so-called TA air plants
- For plants in which corrosive aerosols (acid mist) may be encountered, suitable measures have to be taken to remove the corrosive aerosols from the gas matrix. To do this, a project-specific technical clarification is required in advance.

Design

Tested component design

The complete system consists of the following tested individual components:

- Sampling probe: M&C, type: SP2000; Bühler/Siemens, type: GAS222/7MB1943-2F
- Heated sample gas line: Winkler/Siemens, type: 7MB1943-2A
- Temperature controller: Siemens, type: SIRIUS
- Two-stage compressor gas cooler: M&C, type: CSS; Bühler, type: EGK 2-19
- Sample gas pump: Bühler/Siemens, type: P2.3/7MB1943-3C
- NO_X converter: M&C, type: CG-2

Design of measuring instruments checked for suitability

The modular measuring system Set CEM CERT can consist of one or up to three of the following analyzers in combination with a system cabinet.
The analyzer checked for suitability is selected separately from the system based on the specific article number.

Analyzer	Article number of the analyzer	Design
ULTRAMAT 23	7MB2358-.....-....	3 NDIR components on 2 optical benches
ULTRAMAT 23	7MB2357-.....-....	2 NDIR components on 2 optical benches
ULTRAMAT 23	7MB2355-.....-....	1 NDIR component on 1 optical bench
SIPROCESS UV600	7MB2621-.....-....	3 UV components on 1 optical bench
ULTRAMAT 6	7MB2121-.....-.... 7MB2011-.....-....	1 NDIR component on 1 optical bench
ULTRAMAT 6; two-channel 19" rack unit	7MB2123-.....-.... 7MB2124-.....-....	2 NDIR components on 2 optical benches
OXYMAT 6	7MB2021-.....-....	1 paramagnetic O_2 measuring cell
ULTRAMAT / OXYMAT 6	7MB2023-.....-.... 7MB2024-.....-....	1 NDIR component on 1 optical bench and 1 paramagnetic O_2 sample chamber

NDIR = Non-dispersive infrared sensor

Function

The modular measuring system consists of the following components:

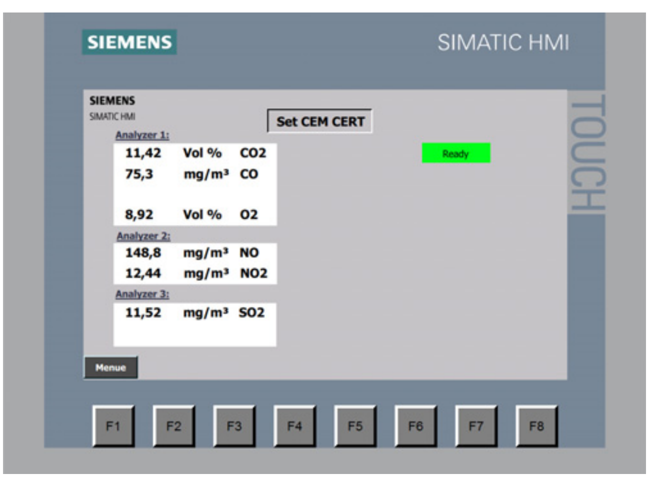
- 1 heated sampling probe
- 1 heated sample gas line (length of the heated sample gas line can be selected up to 50 m)
- 1 sample gas cooler
- 1 sample gas pump
- 1 to 3 differently configurable analyzers

Once it has passed through the heated cable, the sample gas flows into a two-stage compressor gas cooler. Between the 1st and 2nd cooler stage there is sample gas pump with integrated gas return for regulating the sample gas flows. Once it has passed through the sample gas cooler, the gas path splits into different partial lines to supply up to three analyzers simultaneously with sample gas. An additional partial flow lets the sample gas excess flow out over a bypass.

To protect the analyzers, a condensate blocker is located directly upstream from the analyzers; it closes off the gas path when condensate enters the path.

A three-way valve is installed upstream from the pump to supply the zero gas for automatic zero-point calibration.
A second three-way valve is installed downstream from the pump to supply zero gas and calibration gases from the pressurized gas cylinders. This three-way valve can offer calibration gases time-controlled from compressed gas cylinders for automatic calibration of zero point or reference point. Alternatively, calibration gases can be supplied manually by means of a three-way ball valve.

By default, the Set CEM CERT is operated by means of a touch screen panel (SIMATIC HMI, KTP700 BASIC) on the front of the measuring cabinet.
Alternatively, the measuring device can also be operated by means of the individual analyzers.



Start menu on the SIMATIC HMI touch screen panel

Technical specifications

Climatic conditions	
Ambient temperature	+5° ... +40 °C (standard)
• With heating	Min.-5 °C
Relative humidity	75% (annual average), non-condensing
Sample gas conditions	Sample gas must not be flammable or explosive.
Max. sample gas pressure at inlet to sample preparation system	500 hPa (mbar)
Max. moisture content in sample gas[1)2)]	• 17 vol % (cooler type: CSS), with PVDF heat exchanger • 25 vol % (cooler type: EGK 2-19), with glass heat exchanger.
Sample gas temperature	Max. 200 °C at cabinet entry
Sample gas flow	Approx. 60 l/h per analyzer
Sampling probe	• Dust load: < 2 g/m^3 • Mounting flange: DN 65, PN 6, form B • Including temperature controller with Pt100 • With internal sampling tube, stainless steel, length: 1 m (can be shortened) • With filter in probe, to 600 °C
Sample gas line, electrically heated	Max. 50 m
Power supply	
Supply 1	230 V AC, 50 … 60 Hz (-15%, +10%); on request
Supply 2	400 V AC, 50 … 60 Hz (-15%, +10%)
Power	Max. 4 000 VA; without heated sample gas line
System design	
Fusing of electronic consumers	1-pole or 2-pole (selectable)
Sample gas cooler	2-stage
Output signals	• 4 … 20 mA; corresponding to the analyzer information or via PROFIBUS DP • Additional digital inputs and outputs via PLC (SIMATIC S7-1200)
Color	RAL 7035
Weight	Approx. 160 kg
Sheet-steel cabinet/frame	Indoor installation
Explosion protection classification	Installation outside the Ex zone
Degree of protection	IP54
Calibration	Semi-automatic for fully automatic; AUTOCAL on ULTRAMAT 23 freely adjustable up to max. 24-hour interval
Dimensions	
Sheet-steel cabinet (with base) for indoor installation	2 100 x 800 x 800 mm (H x W x D)

500 mm spacing on the right or left must be provided for the cable inlet and connection of the heated sample gas line.

1) With NO and SO_2 concentration > 500 mg/m^3, the glass heat exchanger must be used.

2) When the SIPROCESS UV600 analyzer is selected, the cooler type EGK 2-19 must be used due to the greater cooling capacity.

Detailed information on the analyzers

You can find detailed information on the analyzers under "Extractive continuous process gas analysis".

Selection and ordering data

	Article number
Suitability-tested emission measuring system (EN 15267) for the continuous emission measurement ↗	**7MB1957- ■■■■■ - ■■■ 0**
↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.	
Rack	
System cabinet 1 (2 100 x 800 x 800 mm) with sample preparation, analyzers in swing frame, for design with up to three 19" analyzers, connections on the left, with cabinet light, including side panels and base	**0**
System cabinet 2 (2 100 x 800 x 800 mm) with sample preparation, analyzers in swing frame, for design with up to three 19" analyzers, connections on the right, with cabinet light, including side panels and base	**1**
Note: Must be approved by customer with individual acceptance test.	
GFK cabinet 1 (2 060 x 900 x 800 mm) with sample preparation, analyzers in swing frame, for design with up to three 19" analyzers, connections on the left, with cabinet light, base	**4**
Note: Must be approved by customer with individual acceptance test.	
GFK cabinet 2 (2 060 x 900 x 800 mm) with sample preparation, analyzers in swing frame, for design with up to three 19" analyzers, connections on the right, with cabinet light, base	**5**
Note: Must be approved by customer with individual acceptance test.	
Installation in custom cabinet; is ordered, delivered and invoiced as separate order item	**8**
Sampling probe	
For dust loads up to 2 g/m³, including sampling pipe, length 1 000 mm, for temperatures ≤ 600 degrees Celsius, without weather protection cover, material of filter enclosure: stainless steel	
Type: M&C; Version SP2000	**B**
Type: Bühler; GAS 222	**C**
Ventilation/cooling	
Cabinet fan installed in side panel, with adjustable thermostat	**B**
Note: Must be approved for ULTRAMAT 23 by customer with individual acceptance test.	
Energy-efficient cabinet air-conditioning unit installed in side panel, controlled via thermostat	**C**
Energy-efficient cabinet air-conditioning unit installed in side panel, controlled via thermostat, for outdoor installation in the GFK cabinet	**D**
Note: Must be approved by customer with individual acceptance test.	
Heater	
Without cabinet heating	**0**
Electrical frost protection heating installed in the cabinet for expansion of operating range of -5 °C (indoor installation) or -15 °C (outdoor installation)	**1**
Grounding of all electrical consumers	
1-pole	**0**
2-pole	**1**
Sample gas cooler	
Including two heat exchangers arranged in series connection.	
Type: M&C, Version CSS	**1**
Type: Bühler, Version EGK-2, for increased cooling capacity	**2**
NO_2/NO converter	
Without NO_2/NO converter	**A**
With NO_2/NO converter, type: M&C, Version CG, with converter cartridge for conversion of NO_2 into NO	**C**
Power supply	
50 Hz or 60 Hz, including main switch	
230 V AC, -15%, +10%	**B**
400 V AC, -15%, +10%, three-phase	**C**

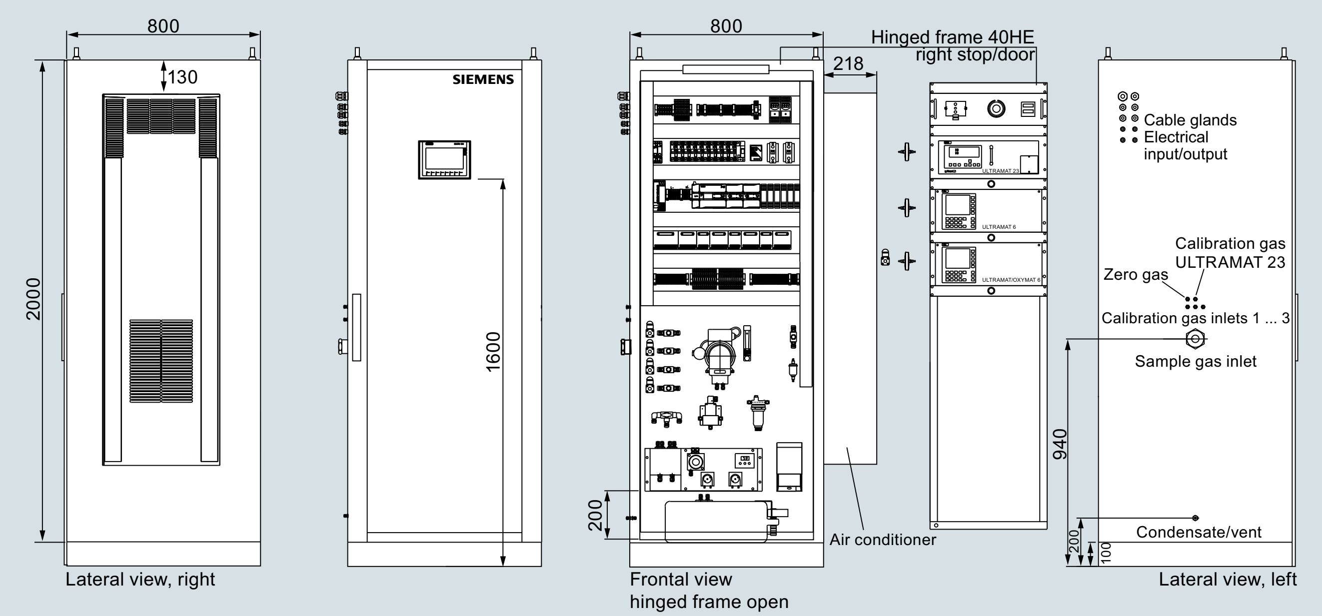
Additional versions	Order code
Add "-**Z**" to article number and then add order code	
Accessories	
Condensation trap made of plastic with level monitoring	**A03**
Acidification module for measuring of SO_2 concentrations < 100 mg/m³; to prevent wash-out effects by the condensate	**A04**
Note: Must be approved by customer with individual acceptance test.	
PROFIBUS DP interface for querying status and measured signals.	**A13**
Note: Must be approved by customer with individual acceptance test.	

Additional versions	Order code
Extractive process gas analyzers	
A total of up to 3 analyzers in combination can be selected.	
Each of the analyzers must be ordered separately.	
Analyzers mounting position 1	
• Preparation for the installation of ULTRAMAT 23 (7MB2358-.....-..../7MB2357-.....-..../7MB2355-.....-...)	**C10**
• Preparation for the installation of a SIPROCESS UV600 (7MB2621-.....-....)	**C11**
• Preparation for the installation of ULTRAMAT 6 (7MB2121-.....-....)	**C12**
• Preparation for the installation of ULTRAMAT 6/2 channels (7MB2123-.....-....)	**C13**
• Preparation for the installation of ULTRAMAT 6 (7MB2021-.....-....)	**C14**
• Preparation for the installation of ULTRAMAT/OXYMAT 6 (7MB2023-.....-....)	**C15**
Analyzers mounting position 2	
• Preparation for the installation of ULTRAMAT 23 (7MB2358-.....-..../7MB2357-.....-..../7MB2355-.....-...)	**C20**
• Preparation for the installation of a SIPROCESS UV600 (7MB2621-.....-....)	**C21**
• Preparation for the installation of ULTRAMAT 6 (7MB2121-.....-....)	**C22**
• Preparation for the installation of ULTRAMAT 6/2 channels (7MB2123-.....-....)	**C23**
• Preparation for the installation of ULTRAMAT 6 (7MB2021-.....-....)	**C24**
• Preparation for the installation of ULTRAMAT/OXYMAT 6 (7MB2023-.....-....)	**C25**
Analyzers mounting position 3	
• Preparation for the installation of ULTRAMAT 23 (7MB2358-.....-..../7MB2357-.....-..../7MB2355-.....-...)	**C30**
• Preparation for the installation of a SIPROCESS UV600 (7MB2621-.....-....)	**C31**
• Preparation for the installation of ULTRAMAT 6 (7MB2121-.....-....)	**C32**
• Preparation for the installation of ULTRAMAT 6/2 channels (7MB2123-.....-....)	**C33**
• Preparation for the installation of ULTRAMAT 6 (7MB2021-.....-....)	**C34**
• Preparation for the installation of ULTRAMAT/OXYMAT 6 (7MB2023-.....-....)	**C35**
Sample gas line, electrically heated	
Highly flexible, electrically heated sample gas line; can be regulated up to max. 200 °C, including temperature controller integrated in system cabinet	
Length: 5 m	**D01**
Length: 10 m	**D02**
Length: 15 m	**D03**
Length: 20 m	**D04**
Length: 25 m	**D05**
Length: 30 m	**D06**
Length: 35 m	**D07**
Length: 40 m	**D08**
Length: 45 m	**D09**
Length: 50 m	**D10**
Electronic overcurrent protection for heated sample gas line	
Grounding and temperature controller for heated sample gas line. The heated sample gas line must be ordered separately: see catalog AP 11 "Components for emission analysis".	
Length up to 5 m	**D21**
Length up to 10 m	**D22**
Length up to 15 m	**D23**
Length up to 20 m	**D24**
Length from 21 m to 30 m	**D25**
Length from 31 m to 40 m	**D26**

Set CEM CERT

Additional versions	Order code
Zero gas and span gas infeed	
Semi-automatic zero gas infeed for ULTRAMAT 23; max. number: 1	**F01**
Fully automatic zero gas infeed for a zero gas cylinder[1)]	**F02**
Fully automatic calibration gas infeed for the first calibration gas cylinder[1)]	**F03**
Fully automatic calibration gas infeed for the second calibration gas cylinder[1)]	**F04**
Fully automatic calibration gas infeed for the third calibration gas cylinder[1)]	**F05**
[1)] Applies to: • ULTRAMAT 6 • ULTRAMAT/OXYMAT 6 • OXYMAT 6 • SIPROCESS UV600	
Maximum number: 3; 1x/used calibration gas cylinder	
Option must be selected if the option C11 ... C15 was selected at least once.	
Signal processing	**M01**
Analog signal processing duplicated, electrically isolated, max. load 600 Ω, 1x/analog signal	
Documentation	
Technical documentation of the des Set CEM CERT and the configured analyzers	
German	**N01**
English	**N02**
French	**N03**

Dimensional drawings



Set CEM CERT, dimensions in mm

Overview

The Set CEM 1 is a standardized system specially for monitoring the emission components in flue gases.

Benefits

Standardized complete system

- Highly exact and reliable monitoring of emission components in flue gases.
- Modular complete package with gas sampling system, sample gas preparation system and gas analyzers from one source
- Simple and fast to configure
- Tried and tested, harmonized and reliable set
- Low purchase price and economic operation

Proven technologies

- Up to 3 extractive analyzers (ULTRAMAT 23, OXYMAT 6) can be used
- In-situ measurements without sampling and preparation, using LDS 6 laser diode spectrometer; central unit can be built into cabinet

Simple operation

- Intuitive operation
- Configuration on large displays using plain text, in several languages

Simple maintenance

- Maintenance-friendly cabinet design with hinged frame and uniform design
- Digital display of maintenance requests on LOGO modules

Application

The monitoring of emission components in flue gases is one of the most important topics for continuous gas analysis. This is a result of legislation for monitoring emissions, e.g. for large combustion plants, and also due to the requirements of companies operating process plants who can draw conclusions on the process efficiency from the gas analyses, e.g. with boiler control, DENOX and DESOX plants.

The market requires a reliable complete system which is specially designed for the application. The Set CEM 1 (Continuous Emission Monitoring) offered by Siemens is a system which reliably covers all requirements associated with sampling, sample preparation, and gas analysis.

It is possible to determine the concentrations of the gaseous components CO, CO_2, NO, NOx, SO_2, O_2, HCl, HF, NH_3 and H_2O.

The ULTRAMAT 23 and OXYMAT 6 are used for the extractive, continuous process gas analysis.

The standardized Set CEM 1 provides great clarity and simple configuration facilities. Different versions mean that it is possible to appropriately adapt the system to the requirements. Standardization also means that not all imaginable versions can be included, and that it may not be possible to implement special requirements such as armored cables, varying gas compositions, customer-specific documentation or specific conductor labeling without an extra charge.

Design

Starting with a mounting frame with sample preparation system, it is possible to add additional units as options. These include:

- Sampling probe with weather protection hood
- Heated sample gas line
- Analyzers
- Air-conditioning unit
- NO_2/NO converter
- Sample preparation extension for an additional ULTRAMAT 23 analyzer
- Single and dual (electrically isolated, not electrically isolated) analog signal processing
- Power supply modules (115 V, 230 V, 400 V)
- Outer panels with steel-plate door or with window
- Single-pole and double-pole fusing
- Condensation bottle
- Coalescence filter

Sampling probe

The standard probe is fitted with a DIN flange DN 65, PN 6. The probe is provided with a regulated heater, and has a power consumption of 400 VA. It is supplied with a weather protection hood and 2 µm filter. The maximum dust concentration at the sampling point should not exceed 2 g/m³. The sampling pipe is 1 000 mm long, made of stainless steel, and has dimensions of 20 x 1.5 mm. The sample gas temperature must not exceed 600 °C.

It is also possible to purchase the Set CEM 1 without sample probe.

Heated sample gas line

The temperature of the heated line is regulated at 200 °C by a temperature controller. The power consumption is 100 VA per meter. The internal core is made of PTFE 4/6. The heated line can be up to 35 m in length. Lengths greater than 35 m can be provided upon special request. If desired, the system can also be supplied without a heated sample gas line.

Mounting frame

The basis of each CEM 1 set is the mounting frame with hinged frame (40 HU) for installation of up to five 19" rack units. The mounting frame includes a standardized sample preparation system designed for an ULTRAMAT 23.

The sample preparation system includes a 3/2-way solenoid valve, 3-way switchover ball valve, regulating valve, corrosion-resistant sample gas pump (power consumption 60 VA), condensation trap, room air suction filter with filter element, LOGO for digital display of individual signals in the cabinet, 24 V DC power supply unit (power consumption 70 VA). Also included are a sample gas cooler (power consumption 200 VA) with integral heat exchanger, hose pump, moisture sensor with flow cell and Teflon filter. Teflon tubes connect the components.

The external dimensions without plinth are 2 000 x 800 x 800 mm (H x W x D). A cabinet depth of 600 mm is also optionally available (not suitable for LDS 6). Hoses and cables can be connected from the left or right. A distance of 500 mm must be provided on the left or right at the installation site for introduction of the hoses and cables.

In addition to the sheet-steel mounting frames for indoor installation, an FRP version is also available for outdoor use. The FRP cabinet is always provided complete with side panels and plinth. The external dimensions are 2 080 x 800 x 600 mm (H x W x D). The GRP cabinet cannot be combined with the LDS 6.

Preparation of sample preparation system for second ULTRAMAT 23

The standard system with sample preparation system and electronics is prepared for one ULTRAMAT 23. If a second ULTRAMAT 23 is to be fitted, this option must be selected so that the sample preparation system and electronics are extended accordingly.

Additional filter

In addition to the fine filter and moisture filter which are always present, a coalescence filter can be optionally fitted in the sample preparation system.

Side panels with doors

Optional outer panels can be selected for the sheet-steel mounting frames. This possibility allows use of the CEM 1 set in analysis cabinets as a rack design on one hand, or on the other as a cabinet design in halls requiring degree of protection IP54. Either a sheet-steel door without window or a glass door can be selected.

Base

Plinths with a height of 100 and 200 mm are additionally available.

Cabinet cooling and ventilation

Optionally available are a fan with outlet filter, an air-conditioning unit for indoor installation, and an air-conditioning unit for outdoor installation. The system can be ordered without a fan or air-conditioning unit if the side panels and the door with window are omitted.

The fan with outlet filter has a power consumption of 60 VA, and is fitted in the cabinet wall. The delivery also includes a thermostat with a power consumption of 25 VA.

The air-conditioning unit has a cooling power of 820 VA.

Frost protection heater

The power consumption of the optional cabinet heater is 500 VA. The delivery includes a thermostat with a power consumption of 25 VA for controlling the frost protection heater.

Fusing of the analog signals

In addition to single-pole fusing of the electronic consumers, it is possible to provide double-pole fusing.

The double-pole fuse is mainly required in Benelux countries.

Removal of condensation

A 19 liter condensation bottle can be provided as an option. It is also possible to order the system without a condensation bottle if the condensation can be removed on-site.

NO_2/NO converter

The mounting frame and cabinets can be optionally extended by a 19" rack unit with NO_2/NO converter with carbon cartridge. The power consumption is 520 VA. The flow is 90 l/h. An NO_2/NO converter is required if the share of NO_2 in the total NOx is greater than 5% and/or if total NOx is to be always determined.

Power supply

The system can be designed either for 115 V AC, 230 V AC or 400 V AC (-15 %, +10 %) with 50 or 60 Hz.

Three phases, neutral and ground must be provided by the customer at 400 V AC.

Analog signal processing

As standard, the analog signals are simply connected to isolating terminals. As an option, the analog signals can be processed twice without electrical isolation by a diode module, or twice with electrical isolation.

Analyzers

The standardized set is prepared for an ULTRAMAT 23. The system can be supplemented by a second ULTRAMAT 23, OXYMAT 6 and/or LDS 6. Different measured components and measuring ranges are available for selection. Other combinations of measured components and measuring ranges are available on request, but you must check that the desired certificates and approvals are available. The analyzers, measured components and measuring ranges used are described briefly below.

Details on the analyzers, alternative measuring components and ranges for process gas analysis can be found under the topics "Extractive continuous gas analyzers" and "In situ continuous gas analyzers".

ULTRAMAT 23: CO, NO

For measuring two infrared components.

Component	Smallest tested measuring range	Switchable to
CO	0 ... 150 mg/Nm³	0 ... 750 mg/Nm³
NO	0 ... 100 mg/Nm³	0 ... 500 mg/Nm³

One or two measuring ranges can be freely set within the limits. The ULTRAMAT 23 carries out automatic self-calibration with ambient air. The power consumption is 60 VA.

ULTRAMAT 23: CO, NO, SO_2

For measuring three infrared components.

Component	Smallest tested measuring range	Switchable to
CO	0 ... 250 mg/Nm³	0 ... 1 250 mg/Nm³
NO	0 ... 400 mg/Nm³	0 ... 2 000 mg/Nm³
SO_2	0 ... 400 mg/Nm³	0 ... 2 000 mg/Nm³

One or two measuring ranges can be freely set within the limits. The ULTRAMAT 23 carries out automatic self-calibration with ambient air. The power consumption is 60 VA.

ULTRAMAT 23: CO, NO, CO_2

For measuring three infrared components.

Component	Smallest tested measuring range	Switchable to
CO	0 ... 250 mg/Nm³	0 ... 1 250 mg/Nm³
NO	0 ... 400 mg/Nm³	0 ... 2 000 mg/Nm³
CO_2	0 ... 5 %	0 ... 25 %

One or two measuring ranges can be freely set within the limits. The ULTRAMAT 23 carries out automatic self-calibration with ambient air. The power consumption is 60 VA.

The component CO_2 has not been type approved by the TÜV.

ULTRAMAT 23: CO_2

For measuring one infrared component.

Component	Smallest measuring range	Largest measuring range
CO_2	0 ... 5 %	0 ... 25 %

One or two limits can be freely set within the limits. The ULTRAMAT 23 carries out automatic self-calibration with ambient air. The power consumption is 60 VA.

The component CO_2 has not been type approved by the TÜV.

The ULTRAMAT 23 analyzers can be optionally equipped with an electrochemical oxygen sensor.

O_2: Tested measuring ranges 0 to 10 / 25%

OXYMAT 6: O_2

For paramagnetic measurement of oxygen. Instead of ULTRAMAT 23 with electrochemical cell.

O_2: Tested measuring ranges 0 to 10 / 0 to 25 %

Sample chamber without flow-type compensation branch, made of stainless steel 1.4571.

LDS 6: HCl

Component	Smallest tested measuring range
HCl	0 ... 15 mg/Nm³

Application for channel 1: Emission monitoring

The power consumption is 50 VA. Suitable for connection of non-Ex sensors, including non-Ex-protected sensor electronics.

The delivery includes a pair of sensors for instrument air or N2 on the process side. The pair of sensors is designed for a moderate flow rate of 0 to 120 l/min. The 400 mm long purging tubes are made of stainless steel. The process connection is DN 65, PN 6. The power consumption is 2 VA.

Limitation:
Applies to measurement paths > 2 000 mm, applies to gases with a methane content < 15 mg/m³. Necessary gas temperature between 120 and 210 °C.

LDS 6: HCl / H_2O

Component	Smallest tested measuring range
HCl	0 ... 15 mg/Nm³
H_2O	0 ... 30 %

Application for channel 1: Emission monitoring

The power consumption is 50 VA. Suitable for connection of non-Ex sensors, including non-Ex-protected sensor electronics.

The delivery includes a pair of sensors for instrument air or N2 on the process side. The pair of sensors is designed for a moderate flow rate of 0 to 120 l/min. The 400 mm long purging tubes are made of stainless steel. The process connection is DN 65, PN 6. The power consumption is 2 VA.

Limitation:
Applies to measurement paths > 2 000 mm, applies to gases with a methane content < 15 mg/m³. Necessary gas temperature between 120 and 210 °C.

LDS 6: HF

HF: Smallest possible measuring range depends on the gas composition.

Application for channel 1: Emission monitoring

The power consumption is 50 VA. Suitable for connection of non-Ex sensors, including non-Ex-protected sensor electronics.

The delivery includes a pair of sensors for instrument air or N_2 on the process side. The pair of sensors is designed for a moderate flow rate of 0 to 120 l/min. The 400 mm long purging tubes are made of stainless steel. The process connection is DN 65, PN 6. The power consumption is 2 VA. The HF measurement has not been type approved by the TÜV.

Limitation:
Component has not been type approved by TÜV. Necessary gas temperature between 0 and 150 °C.

LDS 6: HF/H_2O

HF: Smallest possible measuring range depends on the gas composition.

H_2O: Smallest tested measuring range 0 to 30%

Application for channel 1: Emission monitoring

The power consumption is 50 VA. Suitable for connection of non-Ex sensors, including non-Ex-protected sensor electronics.

The delivery includes a pair of sensors for instrument air or N_2 on the process side. The pair of sensors is designed for a moderate flow rate of 0 to 120 l/min. The 400 mm long purging tubes are made of stainless steel. The process connection is DN 65, PN 6. The power consumption is 2 VA. The HF measurement has not been type approved by the TÜV.

Limitation:
Component has not been type approved by TÜV. Necessary gas temperature between 0 and 150 °C.

LDS 6: NH_3

Component	Smallest tested measuring range
NH_3	0 ... 20 mg/Nm³

Application for channel 1: Emission monitoring

The power consumption is 50 VA. Suitable for connection of non-Ex sensors, including non-Ex-protected sensor electronics.

The delivery includes a pair of sensors for instrument air or N_2 on the process side. The pair of sensors is designed for a moderate flow rate of 0 to 120 l/min. The 400 mm long purging tubes are made of stainless steel. The process connection is DN 65, PN 6. The power consumption is 2 VA.

Limitation:
Applies to measurement paths > 1 250 mm. Necessary gas temperature between 0 and 150 °C.

LDS 6: NH_3/ H_2O

Component	Smallest tested measuring range
NH_3	0 ... 20 mg/Nm³
H_2O	0 ... 15 %

Application for channel 1: Emission monitoring

The power consumption is 50 VA. Suitable for connection of non-Ex sensors, including non-Ex-protected sensor electronics.

The delivery includes a pair of sensors for instrument air or N_2 on the process side. The pair of sensors is designed for a moderate flow rate of 0 to 120 l/min. The 400 mm long purging tubes are made of stainless steel. The process connection is DN 65, PN 6. The power consumption is 2 VA.

Limitation:
Applies to measurement paths > 1 250 mm. Necessary gas temperature between 0 and 150 °C.

Hybrid cable

A hybrid cable is required to connect a central unit to one pair of sensors. Versions for 5, 10, 25, 40 and 50 m are available. Cable lengths cannot be combined. Lengths greater than 50 m can be ordered on request.

Sensor cable

A sensor cable is required to connect one pair of sensors. Versions for 5, 10 and 25 m are available. Cable lengths cannot be combined. Lengths greater than 25 m can be ordered on request.

Electrical preparation for dust measurement

Electrical preparation for connection of an external dust measurement to the system (contains a switch amplifier).

Electrical preparation for flow measurement

Electrical preparation for connection of an external flow measurement to the system (contains a switch amplifier).

Electrical preparation for pressure measurement

Electrical preparation for connection of an external pressure measurement to the system (contains a switch amplifier).

Electrical preparation for temperature measurement

Electrical preparation for connection of an external temperature measurement to the system (contains a switch amplifier).

Electrical preparation for emission data memory on rail module

On request.

Electrical preparation for emission data memory in 19" rack unit

On request.

Additional LOGO for four or more 19" rack units

Sets with more than three 19" rack units integrated require a LOGO extension module. The delivery also includes connection and programming.

Core end labeling

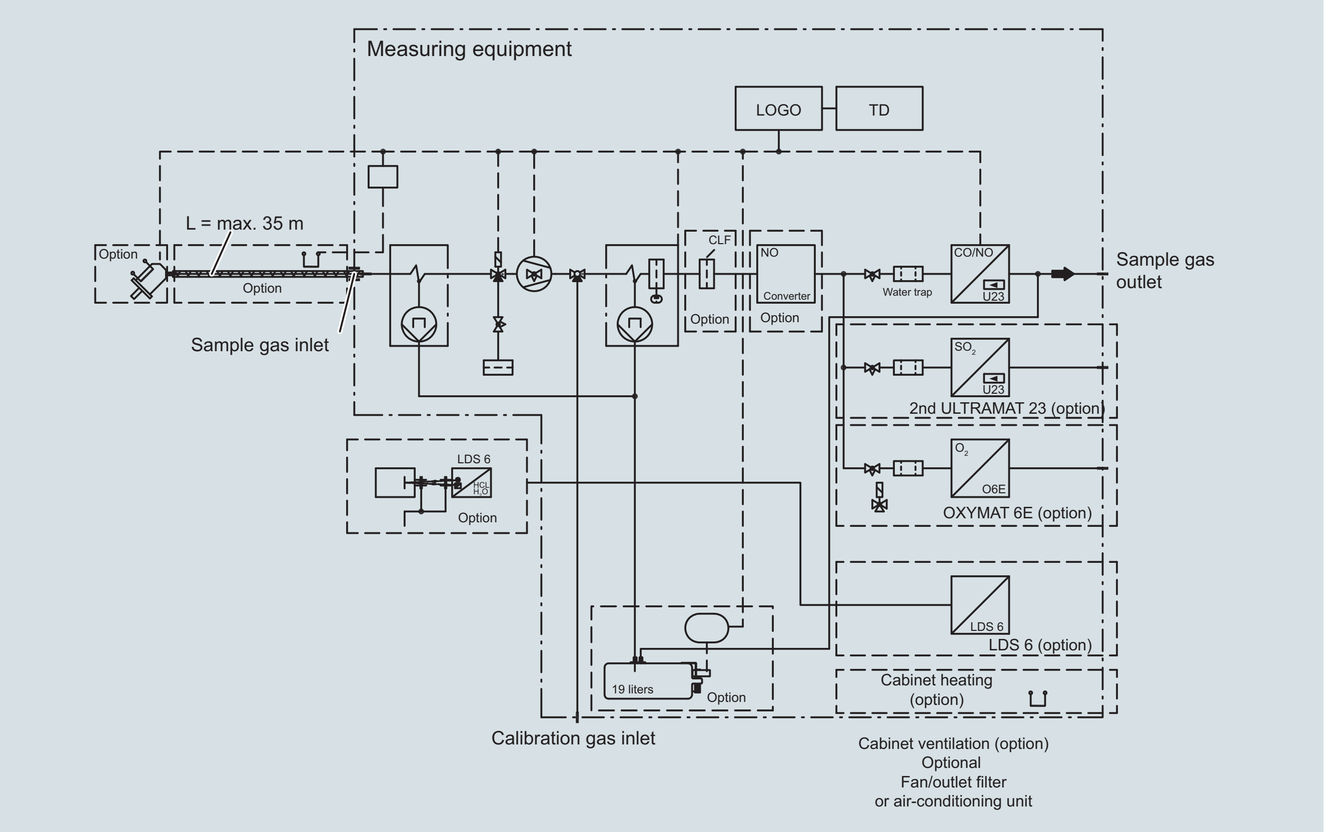
It is optionally possible to order core end labeling according to the Siemens standard (VDE 0100 Part 200).

Documentation

The Siemens standard documentation is available in German or English.

The documentation includes gas path diagram, circuit diagram, terminal diagram, installation diagram, consumable materials list, signal list, cable list, and parts list. Also included are technical data sheets and Operating Instructions for the components and devices used. The documentation language for parts provided by other suppliers may deviate. Plant description, LOGO program and test certificates are also included in the documentation.

The documentation contains no customer-specific/project-specific drawings, and consists of two folders and one CD per set.



Set CEM 1, gas flow chart including options

Set CEM 1

Function

A sample is extracted via the heated sample gas probe. The dust concentration may be up to 2 g/m³, the sample gas temperature up to 600 °C. The gas is transported to the analysis cabinet via a heated sample gas line. The heating prevents condensate. The gas cooler cools and dries the sample in the analysis cabinet. Condensate is drained. The level in the condensate trap is monitored. For safety purposes, a coalescence filter can be provided in addition to the fine filter and moisture filter which are always present. The sample gas is analyzed by analyzers such as the ULTRAMAT 23, OXYMAT 6 and LDS 6. The ULTRAMAT 23 operates on the basis of molecular-specific absorption of infrared radiation or with an electrochemical oxygen measuring cell. The OXYMAT 6 is an analyzer for paramagnetic oxygen measurements. The in-situ LDS 6 laser diode spectrometer operates according to the molecular-specific absorption of near-IR radiation. The delivery may also include an NO_2/NO converter which permits measurement of total nitrogen oxides. In order to qualify the set for low or high temperature ranges (-5, +45 °C), it is possible to use a cabinet heater or air-conditioning unit. Power supply versions are available for 115, 230 or 400 V AC. Electronic consumers can be provided with single-pole or double-pole fusing. The components of the sample preparation system and the analyzers are connected to LOGO modules via a digital signal, and transmit maintenance requirements. The analog signals can be processed either singly or twice. Electrical isolation is additionally possible for the double processing.

Technical specifications

Climatic conditions	
Ambient temperature • With heater in sheet-steel cabinet • With heating in GRP cabinet • With air-conditioning	0 ... 35 °C Min. -5 °C Min. -15 °C Max. 52 ?
Relative humidity	70%, non-condensing
Corrosive atmosphere	No
Gas inlet conditions	
Max. sample gas pressure at inlet to sample preparation system	500 hPa (mbar)
Max. moisture content in sample gas	17 vol.% [1)]
Max. water dew point	60 ?
Min. sample gas pressure at inlet to sample preparation system	180 °C
Dust content at inlet to sample preparation system	Dust-free
Sampling probe	Sampling tube 20 x 1.5, 1 000 mm long, stainless steel, flange: DN 65, PN 6
Max. sample gas pressure at sampling probe	500 hPa (mbar)
Max. sample gas temperature at sampling probe	600 °C
Max. dust content at sampling probe	2 g/Nm³
Sample gas must not be flammable or explosive.	
Power supply	
Supply 1	115 V AC (-15%, +10%)
Supply 2	230 V AC (-15%, +10%)
Supply 3	400 V AC (-15%, +10%)
Connections	
Hose material	Teflon
Cables	Not armored, not halogen-free
Electrical design	According to IEC
Cable ID	Individual core labeling as option
Fusing of electronic consumers	1-pole; 2-pole as option
Duplication of analog signals	• Not electrically isolated as option • Electrically isolated as option
Installation	
Site • In sheet-steel cabinet/frame • In GRP cabinet	 Indoor installation Outdoor installation
Ex zone	Non-Ex area
System design	
Version	Mounting frame or cabinet
Cabinet degree of protection	IP54
Automatic calibration	Yes, with ULTRAMAT 23
Dimensions (without plinth)	
Depth of sheet-steel frame • 800 mm (without plinth) • 600 mm (without plinth)	 2 000 x 800 x 800 mm (H x W x D) 2 000 x 800 x 600 mm (H x W x D)
GRP cabinet (with plinth)	2 080 x 900 x 600 mm (H x W x D)

It is necessary to provide a 500 mm gap to the right or left for the tube or cable inlet.
Use of the LDS 6 requires a cabinet with a depth of 800 mm.

1) Higher performance sample gas coolers can be offered upon request (not TÜV suitability-tested). A higher performance cooler is generally required for high sulfide content in fuels (e.g. heavy oil).

Detailed information on the analyzers

You can find detailed information on the analyzers in:

"Extractive continuous process gas analysis"

- ULTRAMAT 23
- OXYMAT 6

"In situ continuous process gas analysis"

- LDS 6

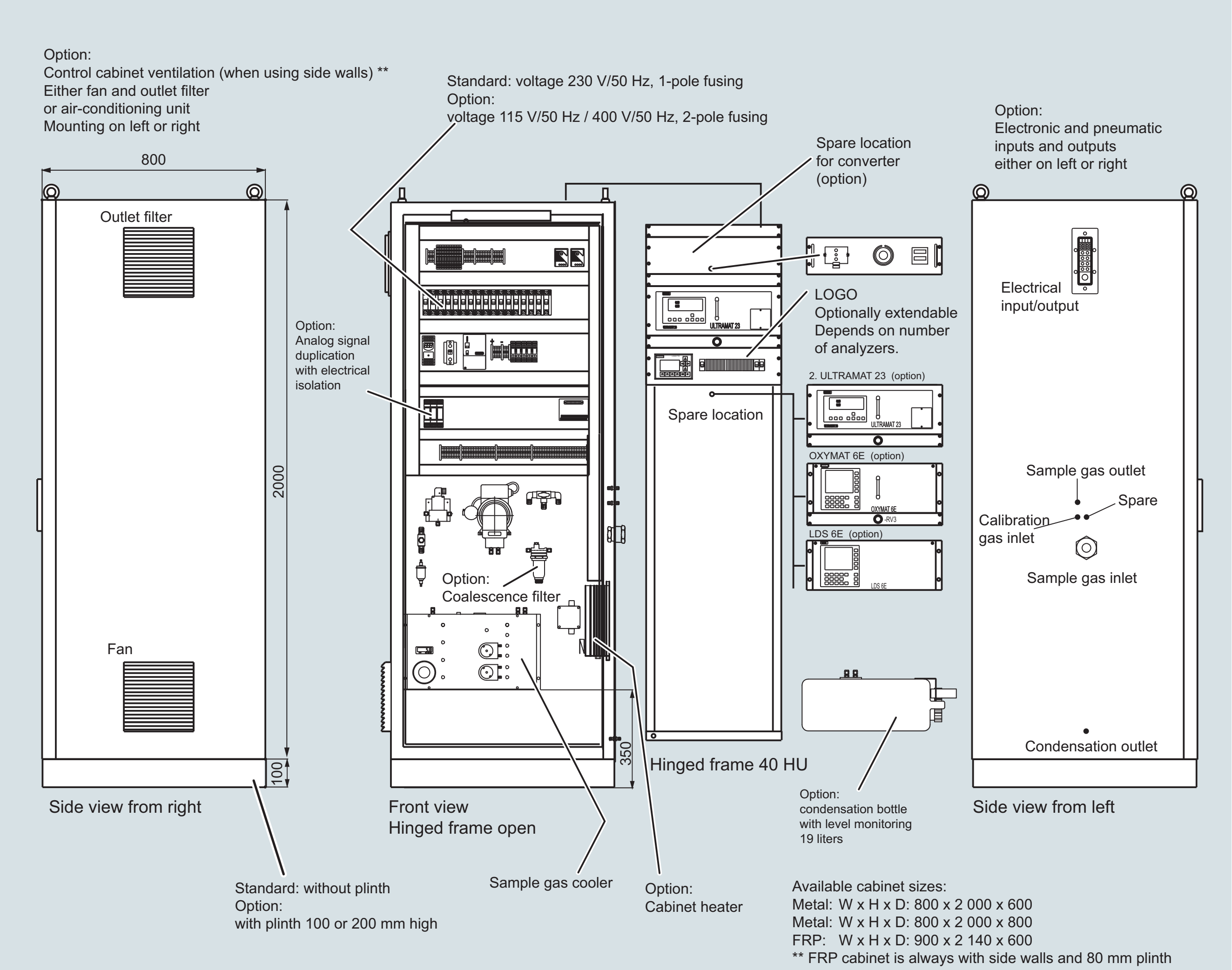
Selection and ordering data	Article No.	Cannot be combined
Set CEM 1 – Continuous Emission Monitoring	7MB1953- ■■■■■ - ■■■■	
↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.		
Rack		
Rack 1: 2 000 x 800 x 800 mm (H x W x D), with sample preparation device, with hinged frame 40 HU, hose/cable inlet on left side, with lighting, prepared for 1 x ULTRAMAT 23, max. five 19" rack units possible	0	**A03, A04, B02, B04**
Rack 2: 2 000 x 800 x 800 mm (H x W x D), with sample preparation device, with hinged frame 40 HU, hose/cable inlet on right side, with lighting, prepared for 1 x ULTRAMAT 23, max. five 19" rack units possible	1	**A03, A04, B02, B04**
Rack 3: 2 000 x 800 x 600 mm (H x W x D), with sample preparation device, with hinged frame 40 HU, hose/cable inlet on left side, with lighting, prepared for 1 x ULTRAMAT 23, max. five 19" rack units possible, not suitable for LDS 6	2	**A01, A02, B01, B03, E01 ... E06, F01 ... F06, G01 ... G04**
Rack 4: 2 000 x 800 x 600 mm (H x W x D), with sample preparation device, with hinged frame 40 HU, hose/cable inlet on right side, with lighting, prepared for 1 x ULTRAMAT 23, max. five 19" rack units possible, not suitable for LDS 6	3	**A01, A02, B01, B03, E01 ... E06, F01 ... F06, G01 ... G04**
Rack 5: 2 060 x 900 x 600 mm (H x W x D), GRP, base 80 mm, with sample preparation device, with hinged frame 40 HU, hose/cable inlet on left side, with lighting, prepared for 1 x ULTRAMAT 23, with side panels, incl. door with window, max. five 19" rack units possible, not suitable for LDS 6	4	**A01 ... A04, B01 ... B04, E01 ... E06, F01 ... F06, G01 ... G04**
Rack 6: 2 060 x 900 x 600 mm (H x W x D), GRP, base 80 mm, with sample preparation device, with hinged frame 40 HU, hose/cable inlet on right side, with lighting, prepared for 1 x ULTRAMAT 23, with side panels, incl. door with window, max. five 19" rack units possible, not suitable for LDS 6	5	**A01 ... A04, B01 ... B04, E01 ... E06, F01 ... F06, G01 ... G04**
Sampling probe		
Without	A	
Standard sampling probe	B	
Ventilation/cooling		
Without	A	
Fan with outlet filter	B	
Cabinet air-conditioning unit	C	
Cabinet air-conditioning unit for GRP rack	D	
Heating		
Without	0	
Cabinet heating	1	
Fuse protection		
1-pole	0	
2-pole	1	
Removal of condensation		
Without	0	
19 l container with level monitoring	1	
NO_2/NO converter		
Without	A	
NO_2/NO converter	B	
Power supply		
115 V AC, -15 %, +10 %, 50 or 60 Hz	A	
230 V AC, -15 %, +10 %, 50 or 60 Hz	B	
400 V AC, -15 %, +10 %, 50 or 60 Hz (3 phases, neutral, ground provided by customer)	C	
Connection set for heated line		
Without controller	0	
Standard controller (max. 35 m heated line can be connected)	1	
Note: The heated sample gas line must be ordered separately using Catalog AP 11.		

Set CEM 1

Additional versions	Order code
Add "-Z" to Article No. and specify Order code	
Bases	
Base for rack 1, 2, height 100 mm	**A01**
Base for rack 1, 2, height 200 mm	**A02**
Base for rack 3, 4, height 100 mm	**A03**
Base for rack 3, 4, height 200 mm	**A04**
Rack accessories	
Outer panel painted, for rack 1 and 2, viewing door	**B01**
Outer panel painted, for rack 3 and 4, viewing door	**B02**
Outer panel painted, for rack 1 and 2, sheet steel door	**B03**
Outer panel painted, for rack 3 and 4, sheet steel door	**B04**
ULTRAMAT 23, OXYMAT 6 extractive analyzers	
ULTRAMAT 23: CO, NO	**C01**
ULTRAMAT 23: CO, NO, SO_2	**C02**
ULTRAMAT 23: CO, NO, CO_2	**C03**
ULTRAMAT 23: CO_2	**C04**
ULTRAMAT 23: Electrochemical O_2 sensor for ULTRAMAT 23 expansion	**C05**
OXYMAT 6: OXYMAT paramagnetic O_2 analyzer	**C06**
Preperation for free choice ULTRAMAT 23 analyzer	**C07**
Additional sample preparation components	
Coalescence filter	**D02**
LDS 6 in-situ analyzers	
HCl including sensor pair	**E01**
HCl/H_2O including sensor pair	**E02**
HF including sensor pair, not suitability-tested	**E03**
HF/H_2O including sensor pair, not suitability-tested	**E04**
NH_3 including sensor pair	**E05**
NH_3/H_2O including sensor pair	**E06**
LDS 6 hybrid cable per LDS 6	
5 m	**F01**
10 m	**F02**
25 m	**F03**
40 m	**F04**
50 m	**F05**
Customer-specific > 50 m	**F06**
LDS 6 connecting cable per LDS 6	
5 m	**G01**
10 m	**G02**
25 m	**G03**
Customer-specific > 25 m	**G04**
Electrical preparation	
Preparation for dust measurement	**J01**
Preparation for flow measurement	**J02**
Preparation for pressure measurement	**J03**
Preparation for temperature measurement	**J04**
Preparation for emission data memory – DIN rail module (on request)	**J05**
Preparation for emission data memory – 19" rack unit (on request)	**J06**
Additional LOGO	
LOGO for a third and fourth 19" rack unit	**K01**

Additional versions	Order code
Core end labeling	
Single-core labeling Siemens standard	**L01**
Analog signal processing	
Double, galvanically connected, 1 x per analog signal	**M01**
Double, galvanically isolated, 1 x per analog signal	**M02**
Documentation	
German	**N01**
English	**N02**
French (on request)	**N03**

Dimensional drawings



Set CEM 1 configuration, figure contains options, dimensions in mm

HM-1400 TRX total mercury analyzer system

Overview

The HM-1400 TRX is a total mercury monitor for fully automatic and continuous measurement of emissions of mercury in flue gas ducts.

Benefits

- Continuous measurement
- Low maintenance dry reactor
- High operational reliability
- Easy maintenance, easy replacement of components
- Low cross sensitivities
- Integrated calibration gas generator for automatic reference point control
- Separate measurement of elemental and ionic mercury as an option

Application

The HM-1400 TRX monitors not only the performance of the mercury separators by measuring the total mercury concentration, but also reports and registers (also online) any violation of the high limits. As a result it is often possible to intervene directly in the process of the plant to be monitored and thus ensure reliable compliance with the specified limit values.

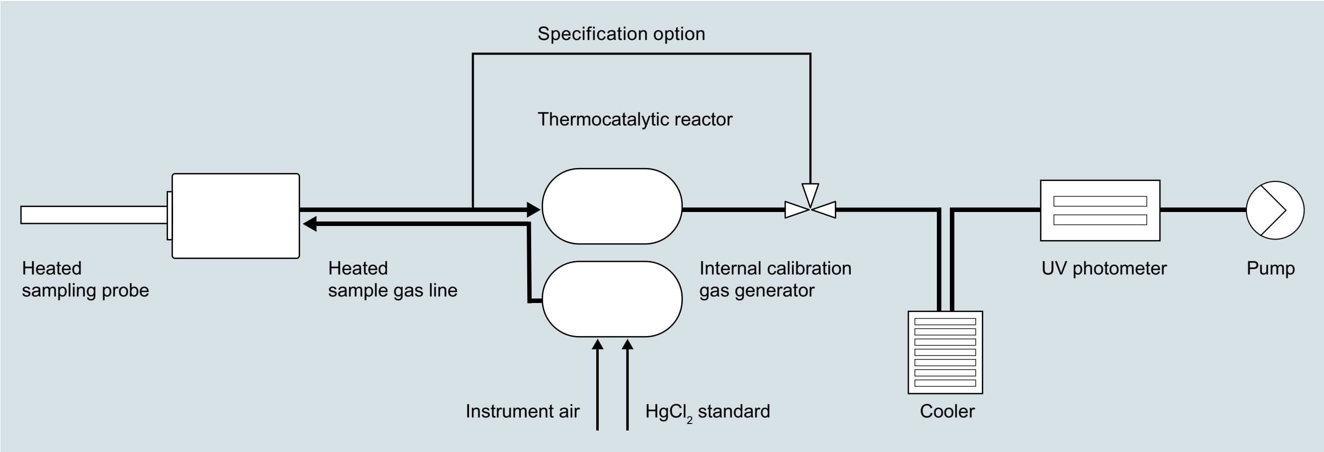
Application areas

- Waste incineration plants
- Sewage sludge and hazardous waste incineration
- Coal-fired power plants
- Steel plants with scrap metal preparation
- Contaminated soil burning plants (thermal cleanup of soil)
- Crematoria
- Mercury mines and refineries
- Fluorescent light bulb recycling

Certifications

- Suitability-tested by TÜV North,
  test report 109 GMT007/8000632287 from 30 June 2011
- Certified according to DIN EN 15267-3
- Itemized in the list of suitable measuring devices for continuous emission measuring
- MCERTS

Design



HM-1400 TRX system components

Sampling system

The sampling system consists of a sampling probe and a sampling line. Both components are heated to 180 °C. With flue gas temperatures < 200 °C, the sampling tube must also be in heated tube design to prevent faulty measurements (lower findings for the mercury concentration measurement due to the absorption properties of $HgCl_2$).

Gas patch switchover

The sample gas is extracted condensate-free from the exhaust stack with approx. 100 Nl/h and fed via a three-way ball valve to the thermocatalytic reactor. The path switchover is also heated and is operated as component of the measuring device by means of the device control. You can select between sample gas connection, reference connection or zero gas connection.

Thermocatalytic reactor

The total mercury analysis measures not only the elementary metallic mercury that is stored freely in the sample gas or deposited in the materials, but also measures the chemically bonded mercury that is found in the flue gas. The ionic mercury must also be converted into elementary, atomic mercury so that the detector can acquire and evaluate the total mercury. The thermocatalytic reactor carries out this function at a preset operating temperature.

Gas drying

Before the mercury content is determined, the now created sample gas containing Hg^0 is dried while flowing through a Peltier cooler. At the same time the system pressure and the measured gas temperature are continuously recorded.

2-beam UV photometer

The sample gas enters the measuring cuvette and is then routed over a selective filter in which the mercury is absorbed. The sample gas thus freed from the mercury then flows through the reference cuvette. The advantage of this cuvette switching is that the entire gas matrix flows through both the measuring cuvette and the reference cuvette and most of the mercury is selectively filtered out before it reaches the reference cuvette. This principle of differential measurement means that the measurement is less sensitive to spectrometric interference components than the single-beam photometer that has only one cuvette. The measured signal from the photometer is taken over by the internal PLC.

Gas volume flow generation

When the sample gas volume flow leaves the 2-beam UV photometer, it passes through the vacuum pump which generates the gas flow. The volume flow of approx. 100 Nl/h is set manually with the fine regulating valve. The system pressure and sample gas temperature parameters are measured after the gas drying at the photometer, where the mercury is also measured, and are used ultimately to convert the gas volume flow to standard conditions. The mercury concentration as result of a measurement is output as 4 to 20 mA current signal to match the set measuring range of 0 to X µg/Nm^3 (dry).

Integrated $HgCl_2$ calibration gas generator

A $HgCl_2$ calibration gas generator is integrated in the analyzer as a standard feature. The gas generator generates a defined mercury concentration and is used for regular zero point control. It can also be used to check the linearity of the device's characteristic curve. The zero point control can be integrated automatically into the measuring sequence or triggered manually. The reference concentration can be freely parameterized.

Optional

- Diluter
- Specification module for the separate measurement of elemental and ionic mercury
- Side-mounted cooling device
- Heated sample pipe 0.6 m, 1.0 m, 1.5 m

Function

In the HM 1400 TRX total mercury analyzer the sample gas is converted into mercury vapor by a combination of thermal and chemical treatment. It is then continuously measured in a photometer. The sample gas flow is measured after a sample game cooler at 2 °C. The concentration is calculated and displayed as "dry flue gas".

Technical specifications

Measured variable	Total mercury
Measuring ranges	0 ... 45, 0 ... 75 to 0 ... 400 µg/Nm^3
Measuring principle	UV absorption
Sample gas temperature	0 ... 250 °C
Sample gas pressure	-50 ... +50 hPa
Channel diameter	> 0.5 m
Ambient temperature (at the point of installation of the analyzer)	5 ... 40 °C
Degree of protection	IP54
Measured value outputs	2 x 0/4 ... 20 mA, 500 Ω
Digital outputs	9 relay outputs, load capacity 250 V, 100 VA
Digital inputs	8 status inputs
Power supply	230/400 VAC, 50 Hz, 3 x L, N, PE
• Measuring device	1 200 VA
• Sampling probe	650 VA
• Sampling line	100 VA/m
• Heated sample pipe 0.6 m, 1.0 m, 1.5 m	600 VA/800 VA/1200 VA
Dimensions (H x W x D) control cabinet	1 700 x 800 x 500 mm
Weight	220 kg
Purge air supply, compressed air	6 ... 8 bar (for calibration gas generator)

More information

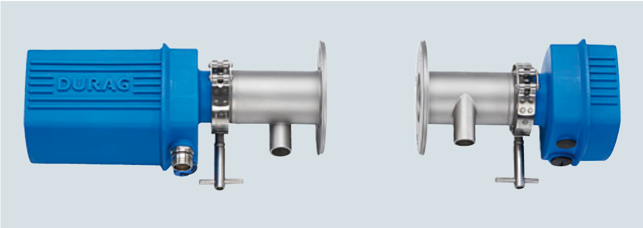
A HM-1400 TRX total mercury analyzer consists of, for example:

- 1 sampling pipe, heated and temperature-controlled, with connecting cable
- 1 sampling probe, heated and temperature-controlled, with connecting cable
- 1 sampling line, heated and temperature-controlled
- 1 analyzer
- Operating instructions

Please consult your Siemens sales partner for information on how to correctly configure and order a HM-1400 TRX Total Mercury Analysis System for a Siemens CEMS project.

D-R 220 dust and opacity measuring instrument

Overview



Compact and economical transmissiometer for monitoring the opacity and medium to high dust concentrations in dry exhaust gas and process gas.

Benefits

- In-situ measuring method
- Continuous measurement of opacity and dust concentration
- Automatic internal self-test, zero and reference point test
- Manual contamination control and manual linearity test
- Easy installation and commissioning due to universal control unit and calibration aid
- User-friendly operation with remote access option
- Economic, space-saving measuring system
- Operation with or without control unit possible

Application

The D-R 220 monitors not only the efficiency of the filter plants by registering the residual dust content, but also reports instantaneously when permissible levels of dust or flue gas emissions are exceeded. As a result, it is possible to intervene directly in the process of the plant being monitored, thus ensuring reliable compliance with the specified limits.

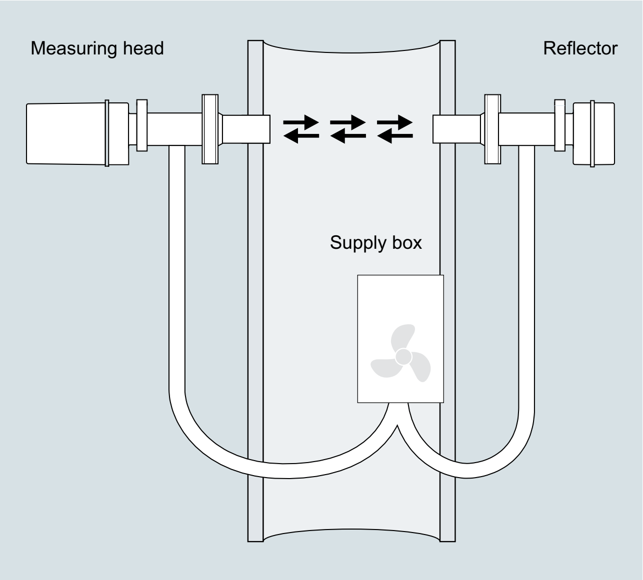
Application areas

- Measurements with changing exhaust gas velocities
- Power plants
- Biomass combustion
- Crematoria
- Waste incineration
- Boiler plants in industry, barracks, hospitals, schools
- Cement industry
- Monitoring of dust extraction and filter systems
- Process monitoring
- Emission monitoring on ships
- Measurement of dust load in halls or storage

Certifications

Product certified by TÜV Rheinland (German Technical Inspect orate): Tested AMS, regular monitoring, test mark number 0000051694.

Design



D-R 220 system components

Measuring head

The transmitter and receiver optics are integrated together with the electronics in a sturdy, compact polyamide housing. The measuring head is mounted on the weld-in flange.

Reflector

The reflector is installed in a sturdy polyamide housing. The reflector is mounted on the weld-in flange directly opposite the measuring head.

Supply unit D-TB 200 including purge air

A hose connects the measuring head and the reflector with the supply box. The filtered air is used to keep the scattered light interfaces of the measuring head and the reflector clean. A cable connects the measuring head to the supply box.

Software D-ESI 100

Parameterization software, visualization of the measured data and performance of maintenance functions.

The D-ESI 100 can be parameterized, maintained and, when faults occur, analyzed via the USB port with the help of a PC and the associated software.

Optional

Universal control unit D-ISC 100

The connected equipment is easy to configure and operate using the D-ISC 100 control unit. The display provides an immediate overview of the current measured values and the status of the measuring instruments.

Measured-value acquisition

In the simplest case the measured values and reference values are transferred to the plant's control system. The measured values and status signals that are output can also be fed into an emission calculator system for further processing. Either via discrete signals (4 to 20 mA and configurable relay contacts) or via Modbus according to VDI 4201-3.

Additional options

- Neutral density filters for linearity check
- Sighting scope for easy alignment

Function

The device operates using the double-pass method according to the auto-collimation principle. The light beam traverses the measuring distance twice. The attenuation of the light beam by the dust content in the measuring section is measured and evaluated.

The universal control unit D-ISC 100 can be connected for the measured value display and parameter assignment, which allows up to eight dust and flow-rate measurement instruments.

The connected equipment is easy to configure and operate using the D-ISC 100 control unit. The display provides an immediate overview of the current measured values and the status of the measuring instruments.

Technical specifications

Measured variables	• Opacity • Extinction
Measuring ranges	
• Opacity	0 ... 20 to 0 ... 100%
• Extinction	0 ... 0.1 to 0 ... 1.6
• Dust[1]	• 0 ... 160 mg/m^3 • 0 ... 5 000 mg/m^3
Measuring principle	Transmission
Sample gas temperature	Above dew point, ≤ 200 °C standard, others on request
Sample gas pressure	-50 ... +50 hPa
Channel diameter	0.4 ... 10 m
Ambient temperature	-20 ... +50 °C
Degree of protection	IP65
Measured value output	0/4 ... 20 mA. 400 Ω. RS 485 Modbus RTU
Digital outputs	2 x NO contact, Load capacity 60 V DC/30 V AC/0.5 A
Power supply	24 V DC, 0.4 A from the supply unit
Dimensions (H x W x D)	
• Measuring head	• 150 x 132 x 214 mm • 150 x 132 x 331 mm with purge flange
• Reflector	• 126 x 132 x 101 mm • 126 x 132 x 218 mm with purge flange
Weight	
• Measuring head	2.7 kg
• Reflector	1.6 kg
D-TB 200 supply unit	
Purge air supply	Integrated blower
Power supply	90 ... 264 V AC, 48 ... 62 Hz, 200 VA
Dimensions (H x W x D)	410 x 400 x 240 mm
Weight	10 kg
Degree of protection	IP65

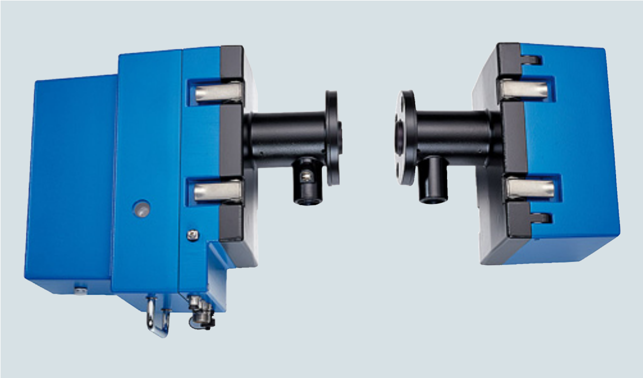
[1] With reference to 1 m of path length after gravimetric calibration

More information

Please consult your Siemens sales partner for information on how to correctly configure and order a D-R 220 measuring system for a Siemens CEMS project.

D-R 290 dust and opacity measuring instrument

Overview



The D-R 290 is a dust and opacity measuring instrument for plants with small to medium dust concentrations.

Benefits

- In-situ measuring procedure, continuous measurement
- Super-wide band diode (SWBD), provides more stable measuring results in comparison to devices with conventional LEDs
- Convenient operation, remote access option
- Automatic zero point and reference point control
- Automatic monitoring and correction of contamination
- Easy adjustment without additional equipment
- Data transmission via Modbus, in compliance with VDI 4201-3

Application

The D-R 290 monitors not only the efficiency of the filter plants by registering the residual dust content, but also instantaneously reports when permissible levels of dust emissions are exceeded. As a result, it is often possible to intervene directly in the process of the plant being monitored, thus ensuring reliable compliance with the specified limits.

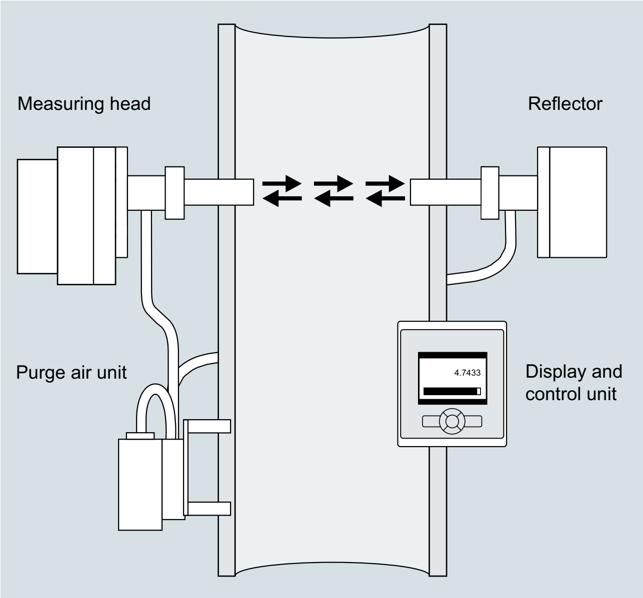
Application areas

- Furnace plants with semi-anthracite coal, brown coal, fuel oil and multi-fuel firing
- Converter plants, asphalt mixing plants
- Cement manufacturing plants
- Emission monitoring on ships

Certifications

- Suitability-tested by TÜV Cologne, test report 936/21226948/A
- Certified according to DIN EN 15267-3
- Itemized in the list of suitable measuring devices for continuous emission measuring
- MCERTS

Design



D-R 290 system components

Measuring head

The transmitter and receiver optics are integrated together with the electronics to form a compact unit housed within a rugged and robust aluminum enclosure. The measuring head is mounted on the weld-in flange.

Reflector

The reflector is installed in a rugged and robust aluminum housing. The reflector is mounted on the weld-in flange directly opposite the measuring head.

Software D-ESI 100

Parameterization software, visualization of the measured data and performance of maintenance functions.

The D-ESI 100 can be parameterized, maintained and, when faults occur, analyzed via the USB port with the help of a PC and the associated software.

Purge air unit

A hose connects the measuring head and the reflector with the purge air unit. The filtered air is used to keep the scattered light interfaces of the measuring head and the reflector clean.

Terminal box

Terminal box to output the data with connecting cable for the measuring head and customer terminal strip.

Optional

Universal control and display unit D-ISC 100

The connected equipment is easy to configure and operate using the D-ISC 100 universal control and display unit. The display provides an immediate overview of the current measured values and the status of the measuring instruments.

Quick-closing shutters

The quick-closing shutters are mounted on the measuring head and the reflector side between the weld-in flanges and the connected devices (measuring head, reflector). In the event of a fault (failure of the power supply or purge air), they automatically close the path between the exhaust gas duct and the measuring equipment.

Electronics for quick-closing shutter

A control electronics system is required for each quick-closing shutter.

Measured value acquisition

In the simplest case the measured values and reference values are transferred to the plant's control system. The measured values and status signals that are output can also be fed into an emission calculator system for further processing. Either via discrete signals (4 to 20 mA and configurable relay contacts) or via Modbus according to VDI 4201-3.

Weather protection covers

Weather protection covers are available to protect the measuring head, the reflector, the purge air unit and the terminal boxes when the measuring system is installed outdoors.

Additional options

- Explosion proof device version for Ex p, Zone 1 or Zone 2, 22
- Filter set for sensitivity and linearity control

Function

The device operates using the double-pass method according to the auto-collimation principle. The light beam traverses the measuring distance twice. The attenuation of the light beam by the dust content in the measuring section is measured and evaluated.

The universal control unit D-ISC 100 can be connected for the measured value display and parameter assignment, which allows up to eight dust and flow-rate measurement instruments.

The connected equipment is easy to configure and operate using the D-ISC 100. The display provides an immediate overview of the current measured values and the status of the measuring instruments.

Technical specifications

Measured variables	• Opacity • Extinction
Measuring ranges	
• Opacity	0 ... 20 to 0 ... 100%
• Extinction	0 ... 0.1 to 0 ... 2.0
• Dust[1)]	0 ... 80 mg/m^3 up to 0 ... 5 000 mg/m^3
Measuring principle	Transmission
Sample gas temperature	Above dew point up to 250 °C, optional up to 1,000 °C, depending on application
Sample gas pressure	-50 ... +20 hPa, optionally higher
Channel diameter	1 ... 18 m
Ambient temperature	-40 ... +60 °C
Degree of protection	IP65, Ex optional
Measured value outputs	0/4 ... 20 mA, 400 Ω RS 485 Modbus RTU
Digital outputs	2 x NC/NO contact, Load capacity 60 V DC/30 V AC/0.5 A
Power supply	24 V DC/0.5 A
Dimensions (H x W x D)	
• Measuring head	370 x 190 x 400 mm
• Reflector	370 x 190 x 270 mm
Weight	
• Measuring head	10 kg
• Reflector	7 kg
Purge air supply	
Purge air quantity	Approx. 80 m^3/h
Power supply	115/230 V AC, 50/60 Hz, 0.37/0.43 kW
Dimensions (H x W x D)	350 x 550 x 500 mm
Weight	12 kg
Degree of protection	IP55

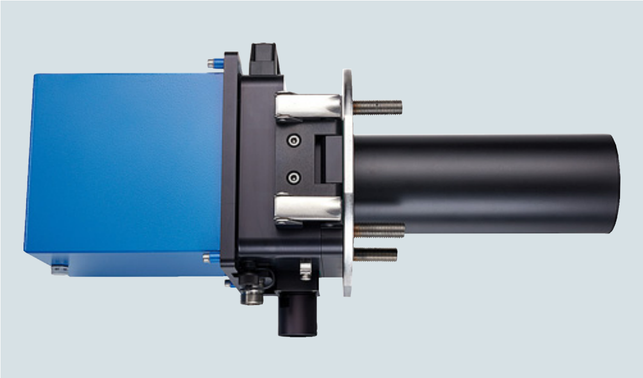
1) With reference to 1 m of path length after gravimetric calibration

More information

Please consult your Siemens sales partner for information on how to correctly configure and order a D-R 290 measuring system for a Siemens CEMS project.

D-R 320 dust measuring instrument

Overview



The D-R 320 is an optical dust measuring instrument for the smallest to medium dust concentrations in dry exhaust gas and process gas.

Benefits

- Continuous measurement of dust concentration
- Smallest certified measuring range 7.5 mg/m^3
- Easy installation on standard flanges
- Easy setup without manual adjustment
- Automatic background light compensation, no light trap
- Automatic zero point and reference point control
- Automatic monitoring and correction of contamination
- Integrated purge air regulation and purge air control
- Certified according to DIN EN 15267-3
- Data transmission via Modbus, in compliance with VDI 4201-3

Application

The D-R 320 monitors not only the efficiency of the filter plants by registering the residual dust content, but also reports instantaneously when permissible levels of dust or flue gas emissions are exceeded. As a result, it is often possible to intervene directly in the process of the plant being monitored, thus ensuring reliable compliance with the specified limits.

Application areas

Continuous emission measurements, e.g. in the following areas:

- Waste incineration
- Cement industry
- Power plant industry
- Woodworking industry
- Chemical industry
- Iron and steel industry

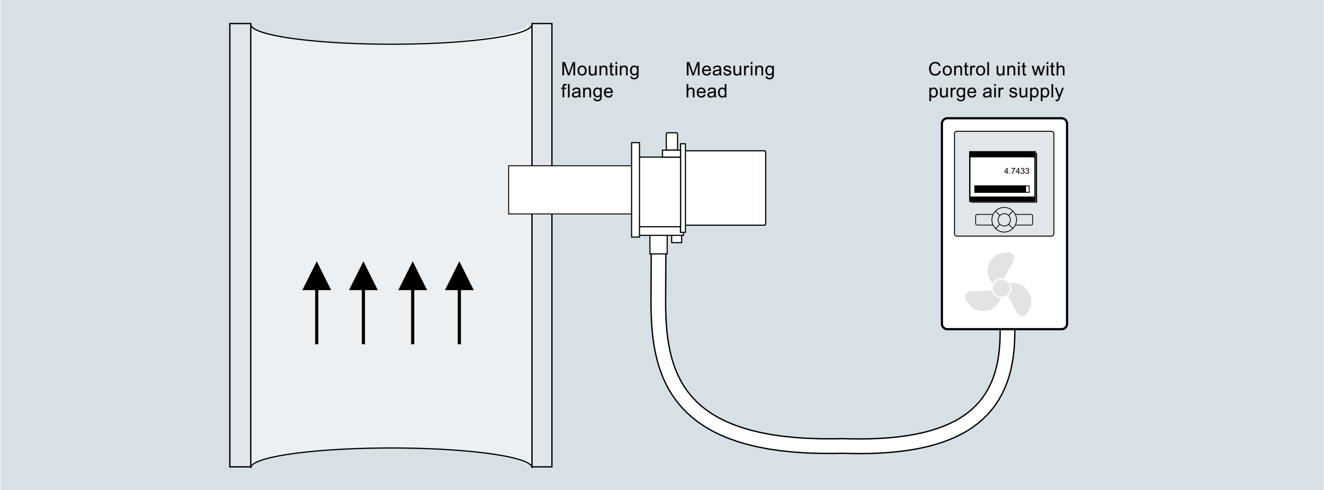
Process monitoring, e.g.**:**

- Monitoring of ventilation systems
- Monitoring of filter systems

Certifications

- Suitability-tested by TÜV Cologne, test report 936/21217455/A
- Certified according to DIN EN 15267-3
- MCERTS

Design



D-R 320 system components

Measuring head D-R 320 M

The measuring head is integrated together with the electronics in a compact unit in a rugged enclosure.
The measuring head consists of:

- Transceiver
- Swivel adapter
- Process connection
- Field diaphragm

This measuring unit is installed directly above the exhaust gas duct on a DIN 100 PN 6 or ANSI 4" 150 lb flange. No adjustment is required.

Supply unit D-TB 200 with purge air supply

The supply unit of the dust concentration measuring instrument D-R 320 is used to supply electricity and purge air and provides the connection for the transfer of the measured data. The regulated purge air is used to keep the optical interfaces of the transmission and reception optics of the D-R 320 clean. The device automatically reports any failure of the purging air.

Software D-ESI 100

Parameterization software, visualization of the measured data and performance of maintenance functions.

The D-ESI 100 can be parameterized, maintained and, when faults occur, analyzed via the USB port with the help of a PC and the associated software.

Optional

Universal control unit D-ISC 100

The connected equipment is easy to configure and operate using the D-ISC 100 control unit. The display provides an immediate overview of the current measured values and the status of the measuring instruments.

Measured value acquisition

In the simplest case the measured values and reference values are transferred to the plant's control system. The measured values and status signals that are output can also be fed into an emission calculator system for further processing. Either via discrete signals (4 to 20 mA and configurable relay contacts) or via Modbus according to VDI 4201-3.

Quick-closing shutter

The swivel adapter can be optionally replaced by an adapter with a fully integrated quick-closing shutter. By using this quick-closing shutter, the path between the measuring device and the exhaust gas is closed mechanically, but not airtight, in the event of a fault (failure of power supply or purge air). The measuring device is temporarily protected against overheating in the event of a fault. The measuring head takes over control of the quick-closing shutter.

Weather protection covers

A weather protection cover is available to protect the measuring system when it is installed outdoors.

Explosion-proof device version

An explosion-proof device version with pressurized enclosure according to Ex p, Zone 1 or Zone 2 is available for use in hazardous areas.

Function

The device operates according to the backscattering principle. This means the light of a laser diode illuminates the dust particles in the measuring volume of the exhaust gas duct. The light reflected by the particles is measured and evaluated.

The automatic background compensation via a patented optical system with integrated double detector is the unique feature. This enables quick and easy commissioning without adjustment. A light trap is not required.

The universal control unit D-ISC 100 can be connected for the measured value display and parameter assignment, which allows up to eight dust and flow-rate measurement instruments.

The connected equipment is easy to configure and operate using the D-ISC 100 control unit. The display provides an immediate overview of the current measured values and the status of the measuring instruments.

Control functions

The D-R 320 automatically performs zero and span check as well as contamination check at regular intervals and on demand. The device features an automatic contamination correction. Need for maintenance is immediately indicated by the electronics.

Technical specifications

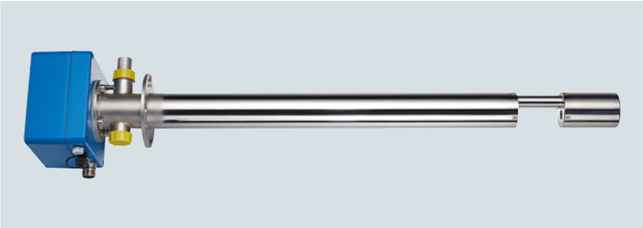
Measuring head	
Measured variable	Scattered light units, can be calibrated as dust concentration
Measuring ranges	0 ... 5 mg/m^3 to 0 ... 200 mg/m^3
Measuring principle	Backscattering
Sample gas temperature	0 ... 600 °C
Sample gas pressure	-50 ... +50 hPa
Channel diameter	> 0.7 m
Ambient temperature	-40 ... +60 °C
Degree of protection	IP65
Measured value outputs	0/4 ... 20 mA, 400 Ω Modbus RTU
Digital outputs	2 x NC/NO contact, Load capacity 60 V DC/30 V AC/0.5 A
Power supply	24 V DC/0.5 A
Dimensions (H x W x D)	200 x 190 x 260/410 mm
Weight	15 kg
Supply unit D-TB 200	
Purge air supply	Integrated blower
Power supply	90 ... 264 V AC, 48 ... 62 Hz, 0.37/0.43 kW, 400 VA
Dimensions (H x W x D)	410 x 400 x 240 mm
Weight	12 kg
Degree of protection	IP65

More information

Please consult your Siemens sales partner for information on how to correctly configure and order a D-R 320 measuring system for a Siemens CEMS project.

D-R 808 dust measuring instrument

Overview



The D-R 808 is an optical dust measuring instrument for the smallest to medium dust concentrations in dry exhaust gas and process gas.

Benefits

- In-situ measuring procedure with continuous measurement
- One-sided installation without optical alignment
- Automatic zero point and reference point control
- Automatic monitoring and correction of contamination
- Long service life due to integrated purge air monitoring
- Smallest certified measuring range 0 to 7.5 mg/m^3
- Remote access possible
- Data transmission via Modbus, in compliance with VDI 4201-3

Application

The D-R 808 not only monitors the efficiency of the filter systems by registering the residual dust content, but also reports instantaneously when permissible levels of dust or flue gas emissions are exceeded. As a result, it is often possible to intervene directly in the process of the plant to be monitored and thus ensure reliable compliance with the specified limits.

Areas of application

Continuous emission measurements, e.g. in the following areas:

- Waste incineration
- Cement industry
- Power plant industry
- Woodworking industry
- Chemical industry
- Iron and steel industry

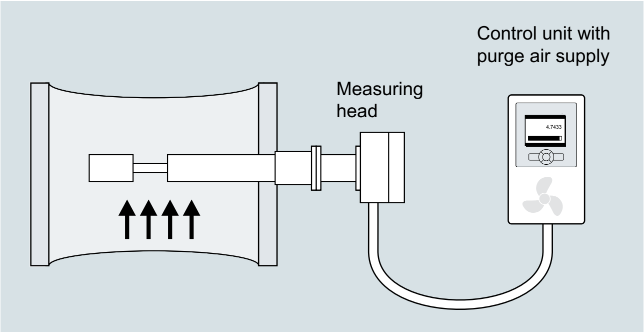
Process monitoring, e.g.:

- Monitoring of ventilation systems
- Monitoring of filter systems

Certifications

- Suitability-tested by TÜV Cologne, test report 936/21232768/B
- Certified according to DIN EN 15267-3
- MCERTS

Design



D-R 808 system components

Measuring device

The transmitter and receiver optics are integrated together with the electronics in a compact unit in a rugged housing. The measuring probe made of stainless steel 1.4404 can be supplied in two lengths of approx. 400 and 800 mm (from mounting flange).

Supply unit D-TB 200 with purge air supply

The supply unit of the dust concentration measuring instrument D-R 808 is used to supply electricity and purge air and provides the connection for the transfer of the measured data. The purge air is used to keep the optical interfaces of the D-R 808 clean. The device automatically reports any failure of the purging air.

Mounting flange 130/240/500 mm

The connection flange made of carbon steel or stainless steel 1.4571 should protrude approximately 30 mm into the channel.

Software D-ESI 100

Parameterization software, visualization of the measured data and performance of maintenance functions.

The D-ESI 100 can be parameterized, maintained and, when faults occur, analyzed via the USB port with the help of a PC and the associated software.

Optional

Universal control unit D-ISC 100

The connected equipment is easy to configure and operate using the D-ISC 100 control unit. The display provides an immediate overview of the current measured values and the status of the measuring instruments.

Measured value acquisition

In the simplest case the measured values and reference values are transferred to the plant's control system. The measured values and status signals that are output can also be fed into an emission calculator system for further processing. Either via discrete signals (4 to 20 mA and configurable relay contacts) or via Modbus according to VDI 4201-3.

Weather protection covers

Weather protection covers are available to protect the measuring system for outdoor installation.

Function

The D-R 808 device operates according to the forward-scattering principle. The concentrated and modulated light from a laser diode penetrates the measuring volume. The light scattered by the dust particles in the forward direction is measured and evaluated.

Technical specifications

Measured variable	Dust concentration
Measuring ranges	0 ... 5 mg/m^3 to 0 ... 200 mg/m^3 [1)]
Measuring principle	Forward scattering
Sample gas temperature	Above dew point up to 350 °C
Sample gas pressure	-50 ... +50 hPa
Channel diameter	> 0.3 m
Probe length	400/800 mm
Ambient temperature	-40 ... +60 °C
Degree of protection	IP65
Measured value outputs	1 x 0/4 ... 20 mA, 400 Ω, RS 485 Modbus RTU
Digital outputs	2 x NC/NO contact, Load capacity 60 V DC/30 V AC/0.5 A
Power supply	24 V DC/0.5 A
Dimensions (H x W x D)	160 x 160 x 600/1 000 mm
Weight	approx. 3 kg/7 kg
Supply unit D-TB 200	
Purge air supply	Integrated blower
Power supply	90 ... 264 V AC, 48 ... 62 Hz, 200 VA
Dimensions (H x W x D)	410 x 400 x 240 mm
Weight	10 kg
Degree of protection	IP65

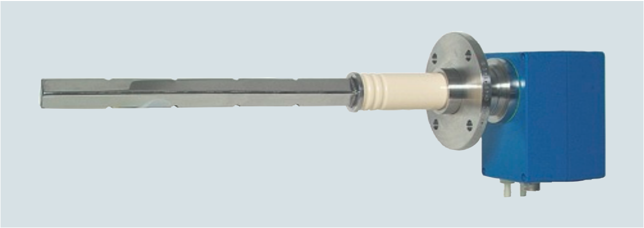
1) After gravimetric calibration

More information

Please consult your Siemens sales partner for information on how to correctly configure and order a D-R 808 measuring system for a Siemens CEMS project.

D-RX 250 combination probe

Overview



MCERTS-certified dust measuring instrument, combined with a flow, temperature and absolute pressure measurement for monitoring small to medium dust concentrations in dry exhaust gas and process gas.

Benefits

- Only one probe/installation opening in the exhaust gas duct
- Compact design, no moving parts, no consumable parts
- Continuous conversion to normalized dust concentration in mg/Nm^3 and to normalized volume flow in Nm^3/h
- LCD display in mg/Nm^3, Nm^3/h, °C and hPa, one analog output for each measured variable
- Parameterization at the control unit without the need of a PC or other tools

Application

By combining four selected measuring functions in a single device it is possible to automatically calculate the pollutant mass flow for the preparation of the emission declaration in addition to monitoring the pollutant dust.

Application areas

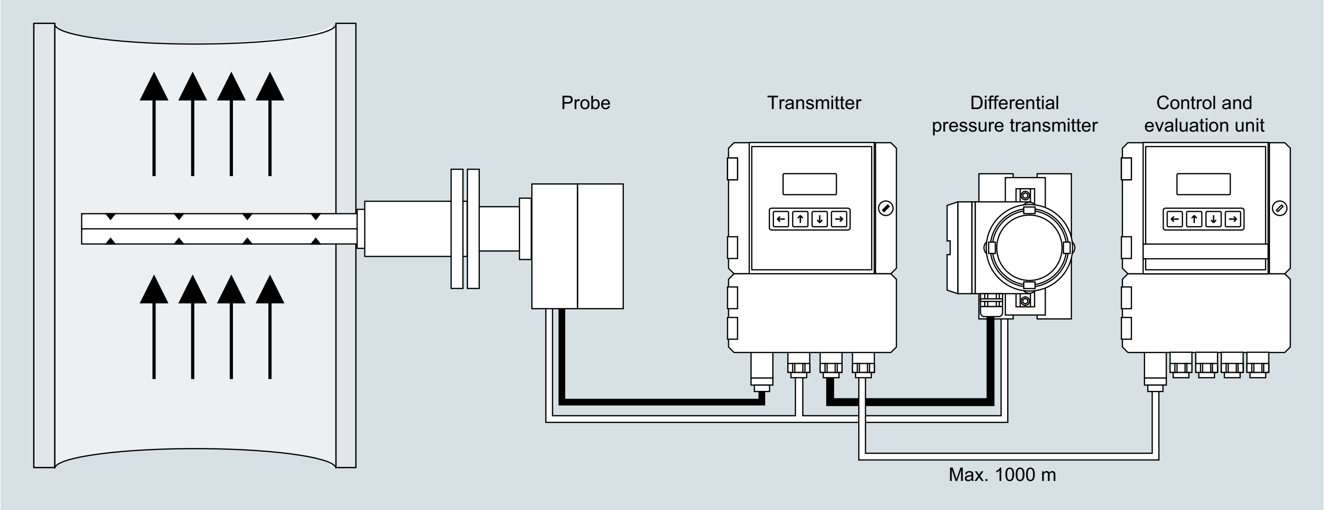
- Power plants
- Biomass combustion
- Crematoria
- Waste incineration
- Cement industry
- Monitoring of dust extraction and filter systems

Not suitable for use behind electrostatic filters.

Certifications

- Suitability-tested by TÜV Cologne, test report 936/800006/A
- Itemized in the list of suitable measuring devices for continuous emission measuring
- MCERTS incl. testing according to DIN EN 15267-3

Design



D-RX 250 system components

Probe

The probe consists of the probe measuring rod and the measured value processing by the electronics in the measuring head. The probe measuring rod is a probe section that protrudes into the dust duct and is fastened with a flange in the duct. It is insulated in design because of the triboelectric measurement and has two chambers for differential pressure measurement. The two chambers for pressure measurement are connected to a differential pressure transmitter. One of the two chambers is also connected to the absolute pressure transmitter in the transmitter. The gas temperature is measured via a measurement resistance in a third chamber in the center of the probe section. The electronic measured value processing is performed in the probe housing. The temperature of the measurement resistance and the triboelectric raw value are determined here. The two raw values of temperature and tribo signal are transferred digitally to the transmitter.

Differential pressure transducer

The differential pressure transmitter converts the differential pressure, created by the gas flowing in the probe measuring rod, into a gas velocity variable.

Transmitter

The transmitter supplies the voltages for the probe and the measuring transmitter for absolute pressure and differential pressure, reads in the raw measured values of these modules and transfer the measured values to the evaluation unit via the RS 485 interface. The transmitter reads the probe values of the triboelectric measured signal and the temperature through the RS 485 interface.

The differential pressure transmitter is connected to the transmitter by a two-wire cable. The absolute pressure transmitter is located inside the transmitter housing. It receives the pressure from a chamber of the probe rod.

Control and evaluation unit

The control and evaluation unit reads out the raw measured values from the transmitter. The measured values for normalized dust concentration and normalized volume flow are calculated in the unit.

It is possible to output all analog values via Modbus or 4/20-mA signals and all status signals via floating contacts.

Measured value acquisition

In the simplest case a recorder is used to record the measured values and the reference values. The measured values and status signals that are output can also be fed into an emission calculator system for further processing.

Optional

- Weather protection cover
- Change-over cock for back purging/zero point control
- Automatic cyclical probe backflush for high dust concentrations
- Hastelloy probes for corrosive gases
- Purge air connection at flange

Function

Dust concentration

The dust concentration is calculated according to the triboelectric measuring principle. The tribo probe measures the electrical charge of the incident particles.

Volume flow

The measurement of the volume flow is based on the mechanical action principle. The probe has two separate chambers, between which a differential pressure builds up under flow.

Absolute pressure

The absolute pressure in the flue gas is measured by a pressure transmitter in one chamber of the probe.

Temperature

The temperature is measured directly in the center of the flue gas in a separate chamber within the probe with a temperature sensor.

Technical specifications

Measured variables	• Dust concentration • Volume flow • Pressure • Temperature
Measuring ranges	• 0 ... 10 to 0 ... 500 mg/Nm³ • 0 ... 9,999,999 Nm³/h[1)] • 800 ... 1300 hPa • 0 ... 200 °C, optional 0 ... 350 °C
Measuring principle	
• Dust	Tribo electric
• Volume	Differential pressure
Sample gas temperature	Above dew point up to 200 °C, optional up to 350 °C
Sample gas humidity	< 80 %
Sample gas pressure	-200 ... +200 hPa
Channel diameter	0.3 ... 5 m
Ambient temperature	-20 ... +50 °C
Degree of protection	IP65
Measured value outputs	4 x 0/4 ... 20 mA, 500 Ω Modbus RTU (RS-485)
Digital outputs	7 relay outputs, load rating 48 V/0.5 A
Digital inputs	6 floating inputs
Power supply	115/230 VAC, 50/60 Hz, 50 VA
Dimensions	
• Probes	180 x 180 x (340 + probe length) mm
• Probe length	250/400/700/1000 mm
Weight	
• Probe	9.5 kg
• Electronics	22 kg
Options	
Probe backflush, purge air supply	3 bar
Isolator purging, continuous purge air supply	Approx. 2 m³/h

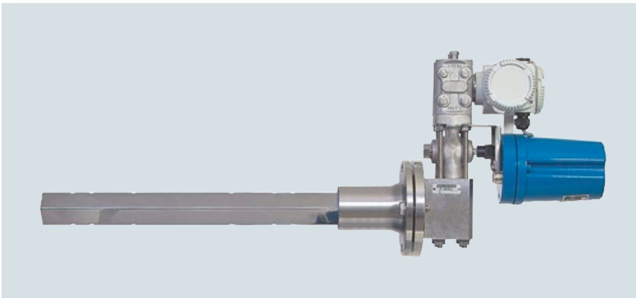
1) Flue gas velocity > 5 m/s concentration after gravimetric calibration

More information

Please consult your Siemens sales partner for information on how to correctly configure and order a D-RX 250 combined probe sensor for a Siemens CEMS project.

D-FL 100 volume flow measuring system

Overview



Suitability-tested and certified dynamic pressure probe measuring system. For measuring the velocity and volume flow of exhaust gas, air or process gas in ducts, pipes or chimneys.

Benefits

- Reliable measurement of exhaust gas velocity, even at high temperatures
- Calculation of the volume flow with standard conditions
- Certified, economic measuring system
- Versions with or without counter-support and for point measurement
- Easy operation via remote access using web interface

Application

As an in-situ measuring system, the measuring equipment determines the measured values without sampling directly in the duct through which gas is flowing.

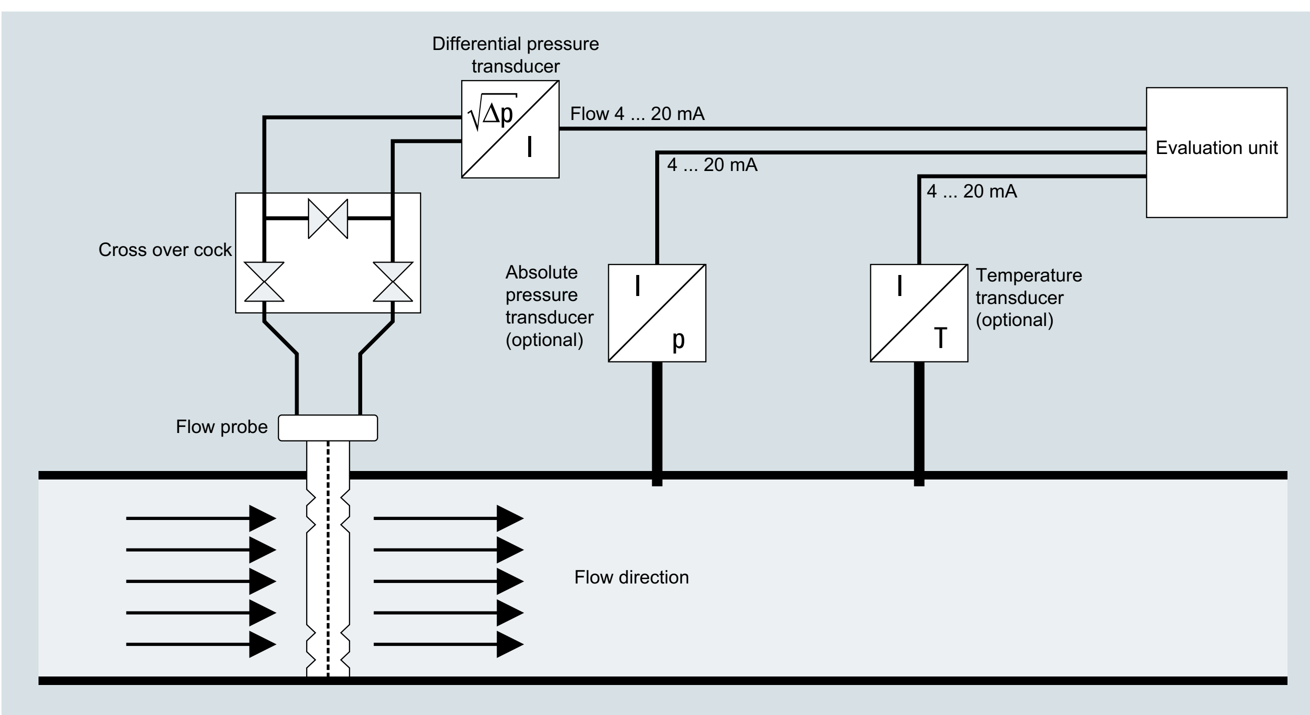
Application areas

- Volume flow measurement at high temperatures and high pressure
- Power plants
- Biomass combustion
- Crematoria
- Waste incineration
- Cement industry
- Process monitoring
- ATEX applications

Certifications

- Suitability-tested by TÜV Cologne, test report 936/21218492/A
- Itemized in the list of suitable measuring devices for continuous emission measuring
- Certified according to DIN EN 15267-3
- MCERTS

Design



D-FL 100 system components

Measuring probes

Each D-FL 100 measuring probe is a customized product for the respective measuring location. Three different sizes are available depending on the length of the planned measurement path:

- Probe 1: 0.4 to 2 m
- Probe 2: 2 to 4 m
- Probe 3: 4 to 8 m

Types

- D-FL 100 probe mounting, with mounting of the transmitter on the measuring probe
- D-FL 100 hose mounting, with connection of the transmitter via hose line.

Cross-over cock

Cross-over device for the backflush of the dynamic pressure probe

Differential pressure transducer

The transducer is delivered with factory set defaults for the order-specific configuration. The zero point should be calibrated after the installation.

Counter-support

A counter-support is required for a probe mounted on two sides. The counter-support supports the probe not only mechanically, but also enables the compensation of the temperature-dependent longitudinal expansion of the probe.

Mounting tubes with flange

Mounting tubes made of stainless steel 1.4571, adapted to the plant conditions, are available in various lengths. A single flange is required for a one-sided probe; otherwise two flanges are always required.

Evaluation unit

The evaluation unit D-FL 100-20 evaluates the measured signal from the differential pressure transducer. A 4 to 20 mA current signal is available as measured value output. A Modbus interface according to VDI 4201 for the connection of an emission evaluation calculator with digital interface is available in addition to the 4 to 40 mA current signal output. The front panel contains five LEDs and one USB port. The LEDs signal the system's current status/operating state.

The various parameters, such as standard density, substitute values for pressure and temperature in the exhaust gas duct, k-factor and measuring ranges are input via the USB port with the help of a PC or the associated software D-ESI 100.

Optional

Software D-ESI 100

Parameterization software, visualization of the measured data and performance of maintenance functions for D-FL 100-20.

The D-ESI 100 can be parameterized, maintained and, when faults occur, analyzed via the USB port with the help of a PC and the associated software.

Universal control unit D-ISC 100 with evaluation unit D-FL 100-20

The connected equipment is easy to configure and operate using the D-ISC 100 control unit. The display provides an immediate overview of the current measured values and the status of the measuring instruments.

Automatic back purging unit

An automatic backflush device to keep the measuring openings clean is available for applications with high dust loads.

Weather protection covers

A weather protection cover is available to protect the probe head and the back purging control when the measuring system is installed outdoors.

Transmitters

- Absolute pressure transducer
- Temperature transmitter

Options

- Special designs in other materials for applications with particularly aggressive exhaust gases or higher gas temperatures:
- Differential pressure transmitter in Ex-version

Function

The D-FL 100 measuring system operates according to the mechanical action principle dynamic/differential pressure measurement with two-chamber probe. The measuring probe has two separate chambers between which the flow builds up a differential pressure. The evaluation unit determines the gas velocity and the volume flow (standardized or under operating conditions), taking into account the measuring section, sample gas temperature and gas pressure.

Technical specifications

Measured variables	• Flue gas velocity • Volume flow[1)]
Measuring ranges	• 3 ... 50 m/s • 0 ... 3 000 000 m^3/h
Measuring principle	Differential pressure
Sample gas temperature	Above dew point up to 450 °C standard, others on request
Sample gas pressure	-50 ... +50 hPa Standard, others on request
Channel diameter	> 0.5 m
Ambient temperature	-20 ... +50 °C Standard, others on request
Degree of protection	IP65
Measured value output	0/4 ... 20 mA, 500 Ω
Digital outputs	2 relay outputs, load rating 48 V/0.5 A
Power supply	
• Standard	24 V DC, 0.5 A
• Option	90 ... 264 V AC, 48 … 62 Hz
Dimensions	
• Evaluation units	
- A/P	231 x 160 x 105 mm
- M	62 x 90 x 54 mm
• Probes	
- Measuring probe 1	24 x 22 x 400 ... 2 000 mm
- Measuring probe 2	54 x 50 x 2 000 ... 4 000 mm
- Measuring probe 3	100 x 90 x 4 000 ... 8 000 mm
Weight	32 kg + 6.8 kg/m probe length Evaluation unit: 1 kg
Purge-air supply (optional)	6 ... 8 bar for backflush

1) Optional pressure and temperature correction

More information

Please consult your Siemens sales partner for information on how to correctly configure and order a D-FL 100 measuring system for a Siemens CEMS project.

D-FL 220 volume flow measuring system

Overview

Suitability-tested and certified ultrasonic measuring system for measuring the velocity and volume flow of exhaust gas, air or process gas in pipes or chimneys, in particular in wet and aggressive flue gases.

Benefits

- In-situ measuring method
- Measurement possible below dew point and for high dust concentrations
- Continuous measurement of normal volume flow and gas velocity
- Automatic zero point and reference point control
- Easy operation via remote access using web interface

Application

As an in-situ measuring system, the measuring equipment determines the measured values without sampling directly in the duct through which gas is flowing.

Application areas

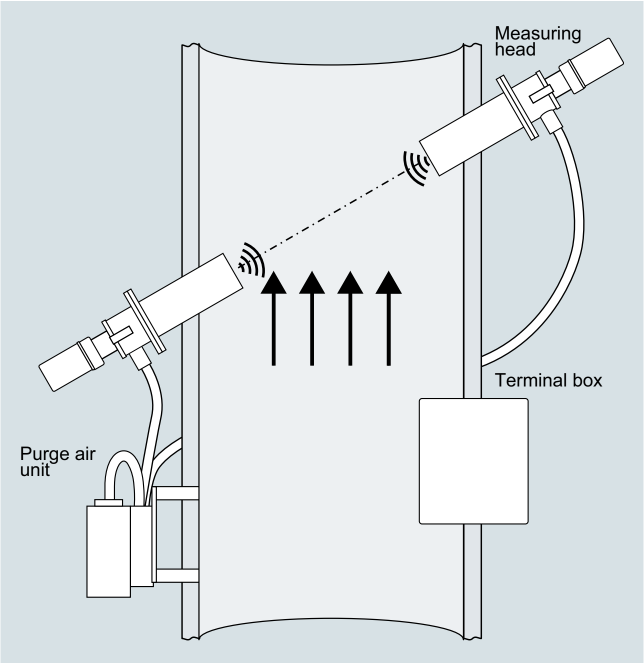
- Volume flow measuring at low speeds
- Plants with damp and/or aggressive exhaust gas
- Volume flow measurement at high dust content
- Power plants
- Biomass combustion
- Crematoria
- Waste incineration
- Cement industry
- Process monitoring

Certifications

- Suitability-tested by TÜV Cologne, test report 936/21218490/A
- Certified according to DIN EN 15267-3
- Itemized in the list of suitable measuring devices for continuous emission measuring
- MCERTS

4

Design



D-FL 220 system components

Measuring heads

Two identically designed measuring heads are used. Depending on the application data, different depth-of-penetration lengths are required, for example, from 100 to 1 100 mm.

A 4-to-20-mA current signal is available as measured value output which measures the velocity and/or the volume flow and can be connected, for example, to a emission evaluation calculator. Two relay contacts are available for signaling. Also available is a Modbus interface according to VDI 4201-3 for the connection of an emission evaluation calculator with digital interface. The various parameters are entered during the installation on site. The USB port is on the rear.

Purge flanges

The purge air is supplied to each of the two measuring heads via a purge flange for cooling and cleaning the ultrasonic transducers. A toggle-type fastener connects the purge flange to the measuring head.

Mounting tubes with flange

Mounting tubes made of stainless steel 1.4571 or of glass-fiber reinforced plastic, adapted to the plant conditions, are available.

Purge air unit

A hose connects the two measuring heads to the purge air unit. The filtered air is used to cool the measuring heads and to keep the transducers clean.

Terminal box

Terminal box to output the data with connecting cable for the two sensors and customer terminal strip.

Software D-ESI 100

Parameterization software, visualization of the measured data and performance of maintenance functions.

The D-ESI 100 can be parameterized, maintained and, when faults occur, analyzed via the USB port with the help of a PC and the associated software.

Optional

Universal control unit D-ISC 100

The connected equipment is easy to configure and operate using the D-ISC 100 control unit. The display provides an immediate overview of the current measured values and the status of the measuring instruments.

Measured value acquisition

In the simplest case the measured values and reference values are transferred to the plant's control system. The measured values and status signals that are output can also be fed into an emission calculator system for further processing. Either via discrete signals (4 to 20 mA and configurable relay contacts) or via Modbus according to VDI 4201-3.

Weather protection covers

Weather protection covers are available to protect the measuring heads when the measuring system is installed outdoors.

Additional options

- Absolute pressure transducer
- Temperature transmitter

Function

The D-FL 220 measuring system operates according to the acoustic transit time differential method.

Two identical sensors transmit and receive ultra-sonic pulses reciprocally. The system calculates precisely the gas velocity and the gas temperature from the transit time difference dependent on the direction. The volume flow is calculated taking into consideration the cross-section, the sample gas temperature and the absolute pressure. The D-FL 220 performs internal self-monitoring routines and is very low maintenance.

Technical specifications

Measured variables	• Flue gas velocity • Volume flow[1)] • Temperature
Measuring ranges	• 0 ... 40 m/s • 0 ... 5 000 000 m^3/h • 0 ... 400 °C
Measuring principle	Ultrasonic transit-time differential
Sample gas temperature	Above dew point, up to 300 °C standard, others on request
Sample gas pressure	-50 ... +20 hPa
Channel diameter	0.5 ... 13 m, temperature-dependent
Ambient temperature	-20 ... +50 °C, measuring head -40 ... +70 °C
Degree of protection	IP65
Measured value output	0/4 ... 20 mA, 400 Ω RS 485 Modbus RTU
Digital outputs	2 x NC/NO contact, Load capacity 60 V DC/30 V AC, 0.5 A
Power supply	24 V DC/0.5 A
Dimensions (H x W x D)	
• Measuring head housing	• 113 x 84 x 188 mm • 190 x 190 x 330 mm with purge flange
• Measuring probe (DxL)	110 x 230 … 2 270 mm, others on request
Weight	6.5 kg (sensor head 610 mm with purge flange, weight depending on version)
Purge air supply	
Purge air quantity	40 m^3/h (50 hPa)/60 m^3/h (25 hPa)
Power supply	115/230 V, 50/60 Hz, 0.37/0.43 kW
Dimensions (H x W x D)	480 x 450 x 320 mm
Weight	12 kg
Degree of protection	IP55

1) Optional pressure and temperature correction

More information

Please consult your Siemens sales partner for information on how to correctly configure and order a D-FL 220 measuring system for a Siemens CEMS project.

D-ISC 100 display and control unit

Overview

The D-ISC 100 universal control unit permits the connection of up to 8 sensors combining dust and volume flow measurements on one display.

Benefits

- Operation, parameterization and data transmission of connected sensors
- Connection of up to 8 sensors to a control unit
- Large liquid crystal display (LCD) for display of the measured values
- Automatic detection of connected sensors
- Modular design, expandable with expansion modules
- Integrated purge air supply for one sensor optional
- Installation in the vicinity of the measuring device or in the control room

Application

The control unit can supply a single sensor or a system consisting of two sensors with power. Several sensors that are connected via a network can also be connected to the D-ISC 100. In this case, each of the sensors must be supplied with power by means of a separate terminal box, supply unit or evaluation unit. The interconnection and the connection to the operating unit is made via Modbus. A version of the control unit with an integrated purge air blower is available for D-R 220, D-R 320 and D-R 808.

The display provides an immediate overview of the status of the connected devices. The current measured values can be displayed without the necessity of direct access to the sensors. It is also possible to visualize the measured values with bar chart display.

The connected sensors can be queried, controlled and parameterized with the control unit. Operation takes place directly via the membrane keyboard of the control unit. Alternatively, you can connect a PC via the integrated USB port. In conjunction with the Web server technology software D-ESI 100, remote support is possible via the Internet.

The control unit can be extended with expansion modules. They are available either as software modules (e.g. Modbus RTU, Modbus TCP) or DIN rail modules (e.g. analog input/output, digital input/output).

Certifications

Type-tested according to European directive EN 15267 for continuous emission measurements in connection with the test reports no. 936/21217455, 936/21218492, 936/21218490 and 936/21232768/B of the Technical Inspectorate of the Rhineland region (TÜV Rheinland)

Design

The universal control unit D-ISC 100 is available in four different versions:

- D-ISC 100 C
  - Control unit in compact field housing
  - Can be expanded with software modules
- D-ISC 100 M
  - Control unit in field housing
  - Can be expanded with software modules
  - Expandable with up to 4 standard mounting rail modules.
- D-ISC 100 P
  - Control unit in field housing with integrated purge air blower (for D-R 220, D-R 320, D-R 808)
  - Can be expanded with software modules
  - Expandable with up to 2 standard mounting rail modules
- D-ISC 100 R
  - Control unit for 19" rack
  - Can be expanded with software modules
  - Expandable with 4 DIN rail modules

Optional

<u>Software modules</u>

- Modbus RTU module
- Modbus TCP module

<u>Standard mounting rail modules</u>

- Analog input module with 4 analog inputs:
  0 to 20 mA with 2/4 mA live zero, load 50 Ω
- Analog output module with 4 analog outputs:
  0 to 20 mA with 4 mA live zero, max. load 400 Ω
- Digital input module with 8 digital inputs
- Digital output module with 8 digital outputs

Technical specifications

Base unit

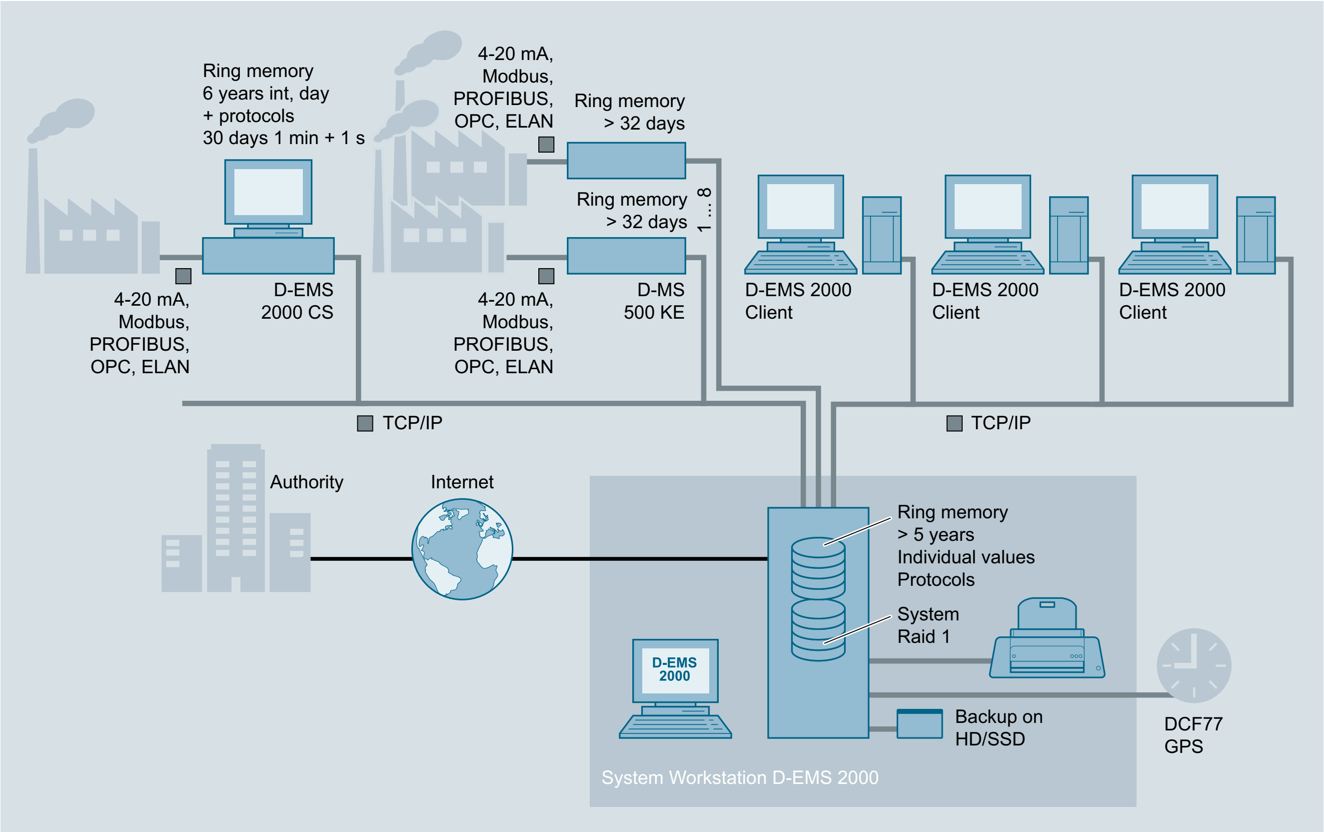
	D-ISC 100 C	D-ISC 100 M	D-ISC 100 P	D-ISC 100 R
Ambient temperature	-20 … +50 °C, -40 … +60 °C optional			-20 … +50 °C
Degree of protection	IP65			IP20
Measured value output	0/4 ... 20 mA, 400 Ω			
Digital outputs	2 relay outputs, load capacity 60 V DC / 30 V AC/0.5 A floating			
Digital inputs	None			
Power supply	90 ... 264 V AC, 48 … 62 Hz			
Power consumption	200 VA	200 VA	360 VA	200 VA
Dimensions	230 x 200 x 111 mm	278 x 415 x 174 mm	410 x 400 x 240 mm	267 x 483 x 255 mm
Weight	5 kg	10 kg	20 kg	10 kg
Purge air supply	-	-	Integrated blower for D-R 220/D-R 320/D-R 808	-

More information

Please consult your Siemens sales partner for information on how to correctly configure and order a D-ISC 100 control unit for a Siemens CEMS project.

D-EMS 2000

Overview



The D-EMS 2000 environmental and process data management system is a modular system for the continuous acquisition, long-term storage, calculation and visualization of environmental and process data.

Benefits

- Instrument for monitoring legally prescribed limit values and recording their observance
- Emission monitoring and remote data transmission to the authorities
- Corresponds to EU guidelines 2010/75/EU and EN 14181
- Adjustable to any plant size through to complete assessment of complex industrial sites
- Continuous monitoring of 1 to 320 components per system workstation
- Interconnection of any number of components via data networks
- Visualization available in 19 languages

Application

The D-EMS 2000 standard system is designed for small to medium sized industrial sites whose emission data, immission data or process data must be recorded in line with government regulations for measured data logging.

Approvals

- Suitability-tested by TÜV in accordance with German TA-Luft 1., 2., 13., 17., 27., 30. and 31. BImSchV
- Itemized in the list of suitable systems for evaluation of continuous emission measuring
- Certified according to DIN EN 15267-2
- MCERTS certified

Design

Measured data acquisition:

Analog/digital inputs as:

- 19" rack with ring memory
- Local DIN rail modules

Data communication via bus systems, Modbus RTU/ TCP, PROFIBUS, Elan, OPC UA (Modbus and PROFIBUS according to VDI 4201).

Function

Data sources

- Emission data
- Immission data
- Meteorological data
- Water data
- Process data

Data export

- Data interface to MS-Excel with option of further measured data evaluation, e.g. for fulfillment of environmental protection officer's reporting duties
- Measured data can be transferred to authorities via standard remote communication or via Internet
- Merging of measured data e.g. for greenhouse emission trading
- Remote service interface for fast and cost effective service

Data security

- Industrial type evaluation PC with vibration-proof hard disks in RAID 1 array and special air cooling with filter system
- Paperless data storage to replace recorders and printers is possible through integrated data security, which is guaranteed on several levels in the system
- Intermediate storage of the raw input values at minute intervals in data communication unit D-MS 500 KE
- Storage of raw input values in one-second intervals
- Data backup on external redundant drive

Internet/intranet connection

- Data transmission to an Internet server with HTML standard masks via standard software (MS Internet Explorer)
- Password protected control of daily emission values including the classification records

Visualization

- Measured data logging according to official regulations
- Classification tables, daily, monthly and annual records
- Representation of current, prognostic and historic measured data in bar/linear form
- Pollutant compensation, characteristics curve and correlation
- Automatic alarm and information system

Annual emission declaration

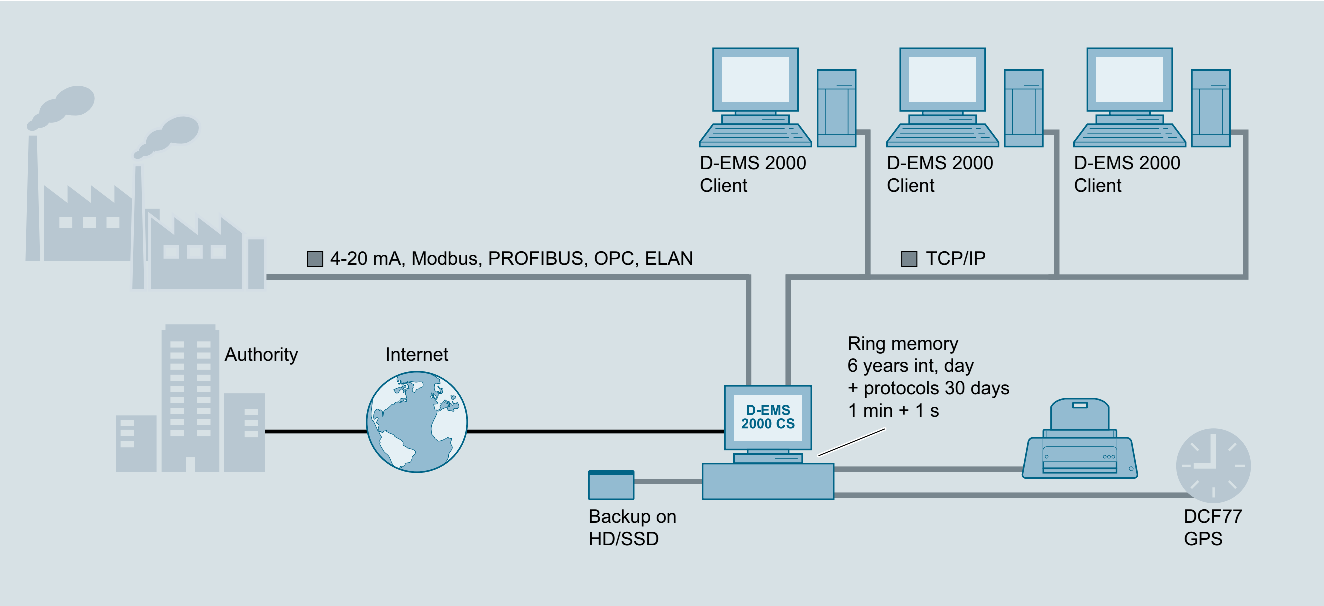
- Automatic preparation of annual emission declaration, from the individual values stored in the system, according to 11. BImSchV
- Compatible with official software, import/export module
- Automatic filling in of forms
- Reading in of historical emission declarations

More information

Please consult your Siemens sales partner for information on how to correctly configure and order a D-EMS 2000 environmental and process data management system for a Siemens CEMS project.

D-EMS 2000 CS

Overview



The D-EMS 2000 CS environmental and process data management system is an affordable compact system for small to medium plants.

Benefits

- Independently operating module for the acquisition, long-term storage, calculation and visualization of environmental and process data
- Instrument for monitoring legally prescribed limit values with automatic recording
- Continuous monitoring of 1 to 12 components, connected via bus communication or hard-wired
- Compact system, no additional evaluation PC required
- Windows-based and certified D-EMS 2000 software
- All modules of the D-EMS 2000 system can be used
- Visualization available in 19 languages

Application

The D-EMS 2000 CS compact system is designed for small to medium sized industrial plants whose emission data, immission data or process data must be recorded in line with public authority regulations for measured data logging.

Approvals

- Suitability-tested by TÜV in accordance with German TA-Luft 1., 2., 13., 17., 27., 30. and 31. BImSchV
- Itemized in the list of suitable systems for evaluation of continuous emission measuring
- Certified according to DIN EN 15267-2
- MCERTS certified

Design

Three available device types:

- Compact system in 19", 3HM rack
- Desktop version with monitor / keyboard / mouse
- 19", 1HM slide-in unit with extendable keyboard and hinged monitor

Technical specifications

Device versions	• Compact system in 19" 3HM rack • Desktop version with monitor / keyboard / mouse • 19" slide-in assembly
Computer	Intel based dual-core PC with Windows 10, 2 GB RAM and 120 GB SDD
Inputs/outputs	Max. 3 cards: • Combination card 4 AI, 8 DI, 2 AO, 4 DO • Input card 8 AI, 15 DI • Output card 8 AO • Output card 16 DO
Connection of bus systems	• Modbus RTU / TCP, PROFIBUS, Elan, OPC UA (Modbus and PROFIBUS according to VDI 4201) • Analog / digital inputs: 12/24 • Analog / digital outputs: 12/24
Interfaces	• 1 x VGA • 2 x USB • 1 x RJ 45 • 3 x serial (RS 232 or RS 485) • BNC for DCF77 - radio clock
Ambient temperature	5 ... 40 °C
Degree of protection	IP20
Operating voltage	115/230 V AC, 50/60 Hz, 100 VA

More information

Please consult your Siemens sales partner for information on how to correctly configure and order a D-EMS 2000 CS compact system for a Siemens CEMS project.

Overview

The Set BGA (**bio**g**as** **a**nalyzer) is a standardized system for stationary, continuous operation for the analysis of landfill gas, sewage gas or biogas.

Benefits

Standardized complete system

The standardized complete system has a modular configuration and can thus be used at various measuring locations for different measuring tasks.

- Simple and fast to configure
- Field-tested and matched Set in rugged industrial design
- Extremely high long-term stability
- The Set BGA is based on the proven ULTRAMAT 23

Field-proven, reliable technologies

- Autocalibration function with ambient air reduces the maintenance requirements
- Detonation protection in accordance with EN 12874
- Modular system design based on long-term tested components
- LEL sensor for cabinet monitoring (optional)

Simple operation

- Intuitive menu guidance
- Configuration on large displays with plain text
- Two freely-configurable limits per measured component

Application

The efficiency of biogenic production processes and optimum operation of the plant largely depends on continuous monitoring of the biogas composition. The basic version of the Set BGA analyzes CH_4 and CO_2 using the proven ULTRAMAT 23 IR analyzer. The concentrations of O_2 und H_2S are optionally measured using electrochemical sensors and also converted into output signals of 4 to 20 mA. In this manner, the Set BGA contributes to operational safety and explosion protection in addition to process optimization.

The modular design of the system takes into account the physical conditions of the gas with regard to temperature and moisture in that various gas preparation components for heating or drying the sample gas can be configured as required.

The gas mixture can be explosive at critical concentration ratios between methane and oxygen. Even if such critical gas compositions occur extremely rarely, the danger of ignition must nevertheless be avoided. For this reason, the Set BGA is designed with a high safety standard and even the basic version is equipped with flow monitoring and detonation protection in accordance with EN 12874 in the sample gas path. To increase safety even further, a gas sensor for monitoring the ambient air can be connected as an option.

It is also possible to monitor up to six measuring points using an optional sample switching cabinet. In this case the sample flows are sucked in continuously using a powerful pump in order to achieve fast measuring times.

Set BGA

Design

The Set BGA consists of the following components:

- ULTRAMAT 23 analyzer with four measured components max.
- Analyzer cabinet with modularly configurable gas preparation components
- Cabinet for measuring point switchover (option)
- Heated line (option)

The ULTRAMAT 23 is selectable with two IR components (CO_2 and CH_4). Furthermore, the configuration can be equipped with an electrochemical oxygen sensor and/or an electrochemical hydrogen sulfide sensor. The corresponding measuring ranges are listed in the table below.

Measured component	Smallest measuring range	Largest measuring range
CO_2	0 … 20 %	0 … 100 %
CH_4	0 … 20 %	0 … 100 %
O_2	0 … 5 %	0 … 25 %
H_2S (low)	0 … 5 ppm	0 … 50 ppm

The ULTRAMAT 23 calibrates the IR components and the electromechanical oxygen sensor automatically with ambient air. Calibration with calibration gas is recommended once a year or after oxygen sensor replacement. In order to comply with the technical specification data, the hydrogen sulfide sensor must be calibrated every three months. An appropriate calibration gas is therefore required. It is supplied to the analyzer through a manually switchable ball valve.

Set BGA measuring system

2-stream sample preparation

Technical specifications

Installation	
Ambient temperature	5 … 38 °C, with cabinet heating ± 0 °C
Site	Indoor/outdoor installation (configurable)
Gas inlet conditions	
Sample gas pressure	• With pump, depressurized suction mode, selectable with internal or external pump • Provision must be made for a pressure reduction for pressures greater than 1 200 mbar absolute
Pump performance	Adjustable to 60 … 80 Nl/h
Sample gas temperature	Max. 45 °C, with moisture saturation
Power supply	
Supply 1	200 … 240 V AC, 47 … 63 Hz
Supply 2	100 … 120 V AC, 47 … 63 Hz
Power consumption	Approx. 180 VA (without cooler and sample preparation)
Connection systems	
Teflon hose	With PVDF screwed glands
Connection systems	Metric (6 mm) or imperial (1/4") selectable
Dimensions	
Set BGA measuring system (W x H x D)	600 x 781 x 600 mm
Sample preparation (W x H x D)	600 x 600 x 220 mm
Weight	
Set BGA measuring system	Approx. 50 kg
Sample preparation	Approx. 22 kg
System design	
System housing	3-part sheet-steel housing with window
Degree of protection	IP54
Cabinet conditioning	Fan
Cooling system	Peltier cyclone cooler (optional)
Sample preparation	Max. six sample streams can be controlled using Logo module with fast loop pump in separate housing
Analog outputs	Per component 0/2/4 … 20 mA; NAMUR, floating, max. load 750 Ω
Measured components / measuring ranges	
CH_4	0 … 100 vol.% to 0 … 20 vol.% (NDIR)
CO_2	0 … 100 vol.% to 0 … 20 vol.% (NDIR)
O_2	0 … 25 vol.% to 0 … 5 vol.% (electrochemical or paramagnetic optionally selectable)
H_2S	0 … 5 ppm to 0 … 50 ppm (electrochemical); optional
Safety assemblies	
Assembly 1	Detonation protection F501
Assembly 2	Flow measurement with limit monitoring at the output
Assembly 3	LEL monitoring (optional)
Comment	• The system concept of the Set BGA is based on the preconfigured ULTRAMAT 23 solutions (7MB2335-…, 7MB2337-…) • The technical performance data concerning the measuring response correspond to the catalog data of the ULTRAMAT 23. The preconfigured version does not contain any ULTRAMAT 23 add-ons or retrofitting sets.

Selection and ordering data

Selection and ordering data	Article No.	Cannot be combined
Set BGA basic configuration, including flame arrestor ↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.	↗ **7MB1955-** ■ ■ ■ ■ ■ - ■ ■ ■ ■	
Gas connections, external		
6 mm	**0**	
¼ inch	**1**	
Sample conditioning		
Without gas cooling	**A**	
Passive cooling (supplied separately)	**B**	
Peltier cooler, integrated in Set BGA enclosure	**C**	
Enclosure design		
Not heated	**A**	
Electrically heated	**B**	
Pump design		
Internal pump in analyzer	**1**	
External pump, fitted in Set BGA enclosure	**2**	
Power supply		
AC 120 V, 60 Hz	**0**	
AC 230 V, 50 Hz	**1**	
AC 110 V, 50 Hz	**2**	
AC 220 V, 60 Hz	**3**	
Infrared measured components		
Version with one measured component Highly selective ULTRAMAT 23 single-beam infrared gas analyzer for measuring methane; mounted in 19-inch rack unit for installation in wall cabinet Specification: • Measured component CH_4 - Smallest measuring range: 0 ... 20 % - Largest measuring range: 0 … 100 %	**0**	
Version for two measured components Highly selective ULTRAMAT 23 single-beam infrared gas analyzer for measuring carbon dioxide and methane; mounted in 19-inch rack unit for installation in wall cabinet Specification: • 1. Measured component CO_2 - Smallest measuring range: 0 ... 20 % - Largest measuring range: 0 … 100 % • 2. Measured component CH_4 - Smallest measuring range: 0 ... 20 % - Largest measuring range: 0 … 100 %	**1**	
Version with one measured component Highly selective ULTRAMAT 23 single-beam infrared gas analyzer for measuring carbon dioxide; mounted in 19-inch rack unit for installation in wall cabinet. Specification: • Measured component CO_2 - Smallest measuring range: 0 ... 0.5 % - Largest measuring range: 0 … 2.5 %	**2**	
Oxygen measurement		
Gas analyzer without oxygen sensor	**A**	
Electrochemical oxygen sensor; sensitive to CO_2 Specification: • Smallest measuring range: 0 ... 5 % • Largest measuring range: 0 ... 25 % • Repeatability: approx. 0.05 % O_2	**B**	
Paramagnetic oxygen measuring cell; no sensor wear Specification: • Smallest measuring range: 0 ... 2 % • Largest measuring range: 0 ... 100 % • Repeatability: < 1 % of smallest measuring range	**C**	**C**

Set BGA

Set BGA basic configuration, including flame arrestor	7MB1955- ■ ■ ■ ■ ■ - ■ ■ ■ ■	Cannot be combined
H_2S measurement		
Without H_2S sensor	A	
With H_2S sensor, 0 … 5 ppm to 0 … 50 ppm	D	D
Documentation		
German, 1 set (paper and CD)	0	
English, 1 set (paper and CD)	1	
French, 1 set (paper and CD)	2	

Further versions (add-ons)	
Add "-Z" to Article No. and specify Order code	
Heated sample gas line, self-regulating, Ex-proof	
• Length: 5 m, supplied separately	**A01**
• Length: 10 m, supplied separately	**A02**
• Length: 15 m, supplied separately	**A03**
• Length: 20 m, supplied separately	**A04**
• Length: 25 m, supplied separately	**A05**
• Length: 30 m, supplied separately	**A06**
• Length: 35 m, supplied separately	**A07**
Communication	
• PROFIBUS PA interface	**A12**
• PROFIBUS DP interface	**A13**
Fast loop design and sample switching	
• 2-stream sample switching with Logo and external pump	**B02**
• 3-stream sample switching with Logo and external pump	**B03**
• 4-stream sample switching with Logo and external pump	**B04**
• 5-stream sample switching with Logo and external pump	**B05**
• 6-stream sample switching with Logo and external pump	**B06**
Gas sensor for leak monitoring of the Set BGA system	
• Alarm monitoring: 20 % LEL methane	**C01**

Overview

The standardized Set GGA (Generator Gas Analyzer) has been specially designed for monitoring hydrogen-cooled turbo generators.

Benefits

Standardized complete system

- Simple and fast to configure
- Field-proven, harmonized and reliable set
- Low purchase price and economic operation
- Suitable for optimizing the efficiency of H_2-cooled turbo generators

Field-proven, reliable technologies

- High-precision and reliable purity monitoring of hydrogen
- Microchip-based thermal conductivity measurement
- Redundant measuring system
- SIL 1 certificate for the analysis hardware

Simple operation

- Intuitive menu prompting
- Configuration on large displays with plaintext
- Use of CO_2 and AR as inert gas possible

Application

This set is used in power generation applications.

Turbo generators in power plants are cooled with gas in order to increase their efficiency. In spite of the strict safety requirements hydrogen is used as a cooling gas. This offers huge advantages over air. These include considerably better cooling properties, lower friction loss on rotating parts, and a higher electrical breakdown strength. These features enable hydrogen to satisfy the requirements for the turbo generator to reach an optimum level of efficiency.

However, mixtures of hydrogen and air with a hydrogen content of anything from 4 to 77 % are explosive. For safety reasons, it is imperative that this is prevented during operation filling and emptying of the turbo generators. International standards (EN 60034-3 and IEC 842) state that redundant safety monitoring with two independent operating systems must be used for this.

In addition, contamination of the hydrogen cooling gas reduces the efficiency of the turbo generator, as it leads to considerably higher friction loss. For a 970 MW generator, a difference of 4% is equivalent to a 0.8 MW difference in power. There are also good reasons related to cost-effectiveness why the cooling gas should be continuously monitored for contamination.

The Set GGA is a complete solution for monitoring hydrogen-cooled turbo generators, with the dual benefit of being simple to handle and having low initial investment costs.

Design

The Set GGA is available in the following versions:

- Generator Gas Analyzer (GGA)
- GGA with test gas skid
- GGA with test gas skid and installation frame

Analyzers

The GGA contains two CALOMAT 6E analyzers (19" rack unit versions). From the gas sampling system right through to the gas outlet, these are completely separate from one another, thereby ensuring full redundancy.

The CALOMAT 6E is a continuous gas analyzer for determining H_2 and He in binary or quasi-binary gas mixtures.

To measure the hydrogen and inert gases continuously, the exact thermal conductivity of the sample gas mixture is measured and the concentration calculated from this. Only binary gas mixtures can be directly measured.

The CALOMAT 6E is used to measure 0 to 100 % CO_2/Ar in air, 0 to 100 % H_2 in CO_2/Ar or 80 to 100 % H_2 in air, in the context of monitoring hydrogen-cooled turbo generators, on account of its high measuring range dynamics.

The units are approved for use in ATEX Zone 2. Gas mixtures may also be fed in according to the definition of Zone 1. In terms of tightness and compressive strength, the measuring cell and entire physical structure of the gas path, from inlet to outlet, are certified up to 55 000 hPa . This is much higher than the pressure that arises when oxyhydrogen gas is ignited.

A flame arrestor at the sample gas inlet provides additional safety.

The integrated LCD display shows the measured values, status bar and measuring ranges simultaneously.

The T90 time is less than 5 s. This means that the delay between the measurement and displaying the result is very short.

Tests carried out under harsh field conditions have indicated that the 3-week drift of the measurement results is less than 0.1 %. Combined with a repeatability value of 0.1 %, this ensures that the measurement results gathered will be both accurate and precise.

Analyzer cabinet

Another feature of the GGA is a protective cabinet for the analyzers. This provides a compact location where the system can be easily installed, and offers protection against dust and water. The system is approved in accordance with IP54 degree of protection.

The cabinet measures 616 x 615 x 600 mm (H x D x W) and is made from painted sheet steel.

A key advantage of this type of construction is that it eliminates the need for a restricted breathing enclosure, allowing maintenance to be carried out without any difficulty. If a restricted breathing enclosure is required, it must be ensured that the system is operated in an airtight room. Restoring the restricted breathing enclosure once maintenance procedures have been performed is a costly and time-consuming process.

To keep operating and maintenance costs low, the GGA set supports natural cabinet ventilation and a filter element provides protection against particles of dirt. Purging with instrument air is not necessary.

Test gas skid

The analyzers and analyzer cabinet are supplied as part of the basic configuration of the set. As an option, however, it is also possible to obtain a suitable test gas skid on a mounting plate.

The test gas skid is responsible for preparing the extracted sample ready for analysis. This ensures that the sample, calibration and inert gases are fed into the analyzers at the right pressure and flow rate, and without having been mixed with other gases.

The skid is fully equipped with a flame arrestor, stopcock ball valve, stainless steel overflow regulator, single-stage pressure reducer, stainless steel 5-way transfer ball valve, all-metal flow meter for air, 1-channel isolating switch amplifier and installation material. The flowmeters are designed to transmit a limit monitoring signal. The connection is made on-site.

The test gas skid guarantees that all the requirements in terms of safety, quality and simplicity are satisfied when connecting sample, calibration and inert gases.

Installation frame

The installation frame is a supplementary feature of the set. It enables free-standing installation of the analyzer cabinet and test gas skid.

The installation frame is supplied in a fully assembled state (including feet). Its overall height is 2 000 mm.

Function

There are three distinct processes in monitoring hydrogen-cooled turbo generators: normal operation, filling and emptying. The measuring task entails preventing a gas mixture of hydrogen and air outside the specified limits, or detecting the risk of this happening in good time, as well as monitoring the hydrogen purity.

During normal operation, the purity of the generator cooling gas is monitored. If the purity falls below a specific limit (e.g. < 95 % H_2), a message is output. The monitored range is 80 to 100 % H_2 in air.

Filling the generator is a two-stage procedure: first, the air in the generator is replaced by inert gas (argon or CO_2), and then this is replaced by hydrogen. During this, the concentration trends of the gases are measured and the replacement processes monitored. To prevent explosive mixtures from being formed, it is necessary to monitor the measuring range of 0 to 100 % inert gas in air in the first step and 0 to 100 % H_2 in inert gas in the second step.

The procedure is performed in reverse when emptying the generator: The hydrogen is first replaced with inert gas and the generator is then filled with air. The measuring tasks remain unchanged in this case. Here it is necessary to monitor the measuring ranges of 0 to 100 % H_2 in inert gas first, and then 0 to 100 % inert gas in air.

Technical specifications

Climatic conditions	
Ambient temperature	5 ... 50 °C
Relative humidity	70%, non-condensing
Corrosive atmosphere	No
Gas inlet conditions	
Calomat 6E	
• Sample gas pressure	800 ... 1 100 hPa (absolute)
• Sample gas flow	30 ... 90 l/h (0.5 … 1.5 l/min)
Test gas skid	
• Sample gas pressure	55 000 hPa (absolute)
• Sample gas flow	30 … 90 l/h (0.5 … 1.5 l/min)
Power supply	
Supply 1	200 ... 240 V AC, 48 ... 63 Hz
Supply 2	100 ... 120 V AC, 48 ... 63 Hz
Supply 3	24 V DC for switch amplifiers
Type of connections	
Pipe material	Stainless steel
Connections/components	• Metric (6 mm) • Imperial (¼")
Cabling	
Electrical design	According to IEC
Type of cables	Non-armored cables
Cable ID	No single core labeling
Installation	
Site	Interior
Ex-zone analyzer	ATEX II, 3G

System design	
Version	Cabinet
Degree of protection	IP54
Automatic calibration	No
Signal outputs	4 ... 20 mA/floating contact max. 24 V AC/DC 1 A
With sample gas return flow	On request
Measuring response	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation	< ± 0.75% of the smallest possible measuring range according to rating plate, with electronic damping constant of 1 s (σ = 0.25%)
Zero point drift	< 1%/week of the smallest possible span according to rating plate
Measured-value drift	< 0.5%/of the smallest possible span according to rating plate
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 span according to label
Accompanying gases	Deviation from zero point
Sample gas flow	< 0.1% of the smallest possible span according to rating plate with a change in flow of 0.1 l/h within the permissible flow range
Sample gas pressure	< 1% of the current measuring range with a pressure change of 100 hPa
Auxiliary power	< 0.1% of the current measuring range with rated voltage ± 10%

Generator gas analyzer

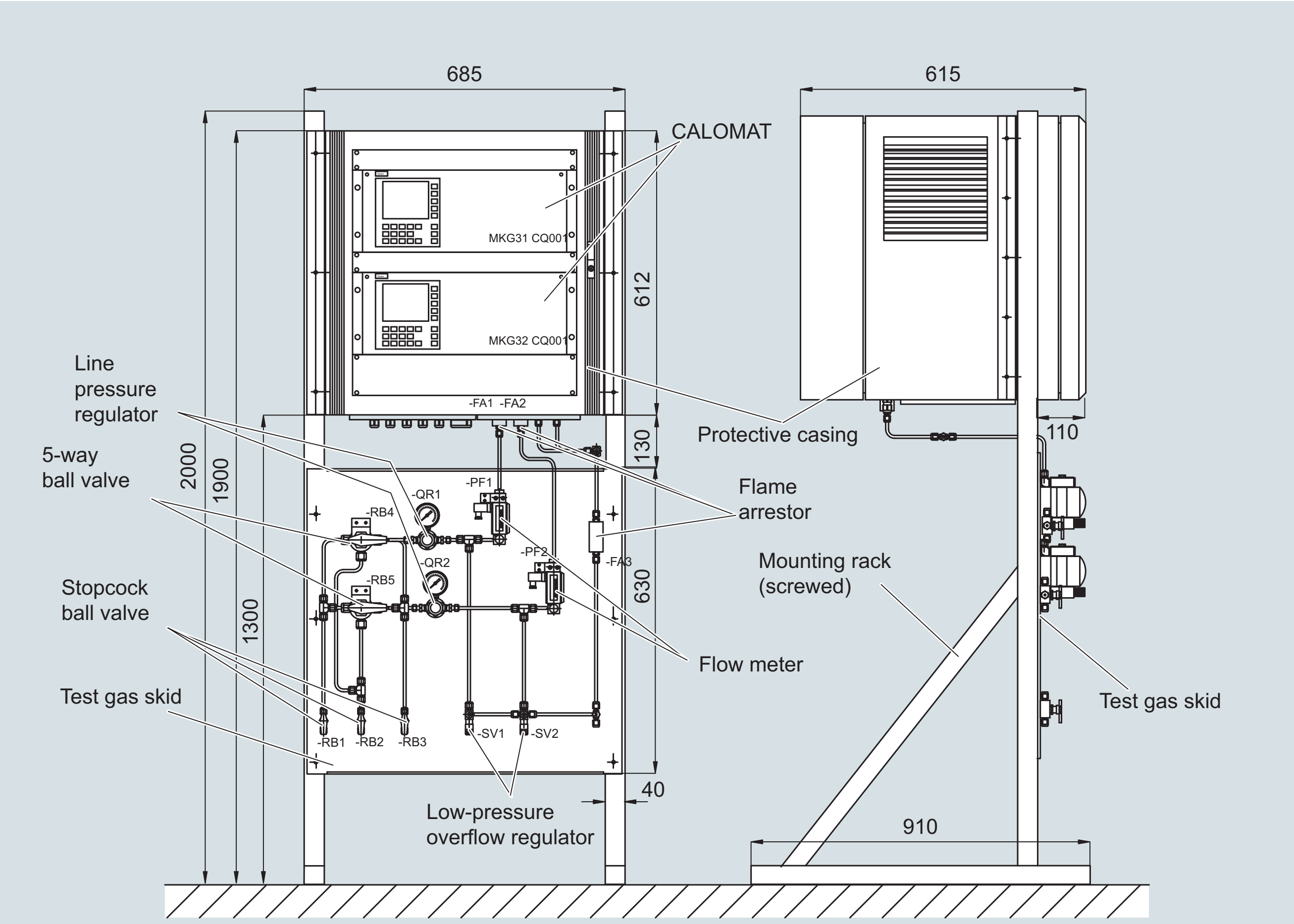
Analysis	**Measuring point designation**			**Generator gas analyzer**			
	Concentration			**Unit**	**Measured component**	**Measuring range**	
Component	**Min.**	**Typical**	**Max.**			**Small**	**Large**
Ar/CO_2 in air	0		100	vol. %	Yes	0	100
H_2 in Ar/CO_2	0		100	vol. %	Yes	0	100
H_2 in air	80		100	vol. %	Yes	80	100
Sample temperature		50		°C			
Dust content		0		mg/m^3			
H_2O dew point		-50		°C			
Aggregate state, sample[1)]	Gaseous						

1) Standard state at 20 °C, 101.3 kPa

Set GGA

Selection and ordering data	Article No.	Cannot be combined
Set GGA ↗	**7MB1950- ■■■0■ - ■■■■**	
↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.		
Gas connections		
6 mm pipe	0	
1/4" pipe	1	
Version		
H_2 monitoring (turbo generators)	G A	
Add-on electronics		
Without	0	
Auxiliary power		
100 ... 120 V AC, 47 ... 63 Hz	0	
200 ... 240 V AC, 47 ... 63 Hz	1	
Variants		
Set GGA, cable glands M20x1.5 power supply with cable diameter of 6 ... 12 mm	A	
Set GGA, with test gas skid, cable glands M20x1.5 power supply with cable diameter of 6 ... 12 mm (sampling unit on stainless steel plate), delivery batch in 2 parts	B	
Set GGA, cable glands M25x1.5 power supply with cable diameter of 14 ... 18 mm	C	
Set GGA, with test gas skid factory-assembled on mounting frame, cable glands M20x1.5 power supply with test gas skid (PA on stainless steel plate), ready mounted on frame, delivery batch 1 part	E	
Explosion protection		
Certificate: ATEX II 3G, flammable and non-flammable gases	B	
Documentation		
German	0	
English	1	
French	2	
Spanish	3	

Dimensional drawings



Set GGA, dimensions in mm, figure corresponds to 7MB1950-0GA00-1EB0

Notes

Communication and software

5

5/2 Analyzer System Manager ASM

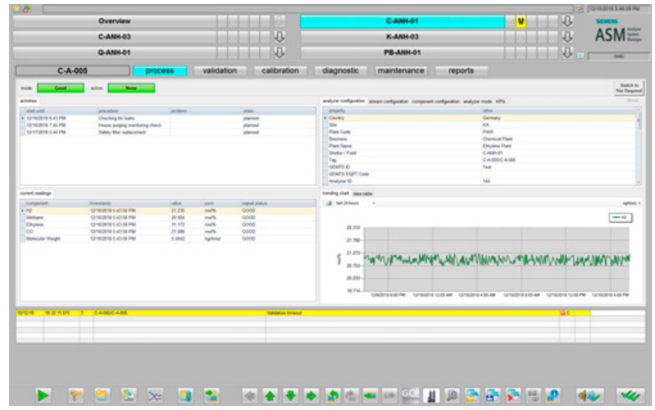
Overview

The ASM is a PC-based HMI system for monitoring, testing and management of analyzers in subsystems or in the complete plant. The relevant information from different analyzers is collected via various communications protocols and saved in a central database. Using the PC's user-friendly operator interface, it is possible to access measured value trends, device states and statistical evaluations, for example, or to start test routines for validation of the results. A comprehensive reporting module with predefined reports is available to document the evaluations. Device-specific maintenance tasks can be planned, monitored and documented using the maintenance module.

Benefits

Core functions as added value

- Just one system monitors, tests and administers the most disparate analyzers
- Visualization and operation from simple single-user or distributed multi-user systems
- Assessment of the measured value reliability by checking analyzers with a variety of validation routines, for example, reference sample method, line sample method
- Logging and statistical evaluation of validation results based on the industry standard ASTM D 3764
- Automatic calculation of operating conditions using key performance indicators (KPIs) such as availability, error rate and frequency of maintenance
- Reduction in maintenance costs through device-specific planning, implementation and checking of maintenance work
- Reporting module with predefined reports



View of the process module

Application

The ASM is ideally suited for all systems and plants where analyzer performance documentation and high reliability of the measured values are required. Distributed analyzers can be monitored from a central workstation through a modular and scalable communication network, based on standard SIMATIC components. The ASM is especially suitable for implementation in the oil and gas, petrochemical and chemical, as well as the steel industry for the optimization of analyzer landscapes in greenfield and brownfield plants.

The ASM has a flexible structure and a wide scope of functionalities and can therefore easily be adapted to individual customer requirements.

Design

System design

- PC-based HMI system
- Visualization and operation from simple single-user or distributed multi-user systems
- Logging and archiving of process and system data in a central database
- Integration of different analyzers in a uniform communications network

System software

- The ASM is based on standard SIMATIC products
- Microsoft SQL Server for archiving and data collection
- Microsoft Windows / Windows Server as the operating system

Communication

- The Ethernet protocol serves as the communication basis for the ASM
- Integration of analyzers using PROFINET, ModbusTCP or OPC data exchange
- Analyzers without a communication interface can be integrated by connecting the signals to Siemens SIMATIC components
- Data exchange with other systems possible using OPC

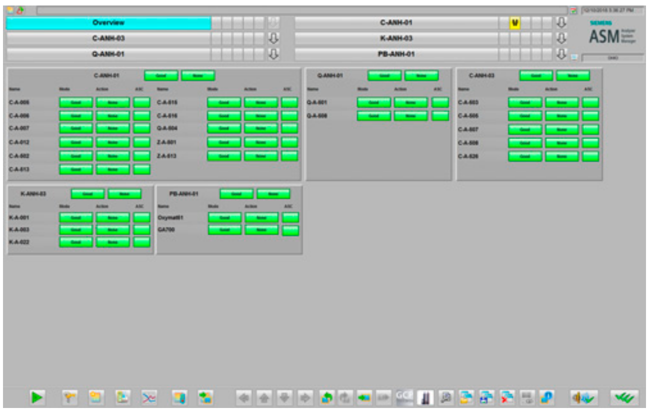
Networking

- Siemens Scalance Ethernet switches for designing electrical and optical Industrial Ethernet in line and star structures. Ring structures are also possible to increase the fail-safety of the network
- The ASM can be integrated into an existing Ethernet network

Function

General information

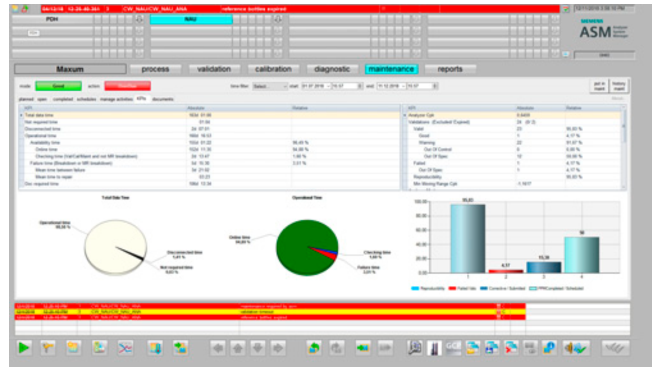
Information from the analyzers is collected over the communications network and saved in the central ASM database for further analysis. The ASM is operated from a PCS 7 environment, making it possible to navigate between overview screens, device-specific displays and general functions.



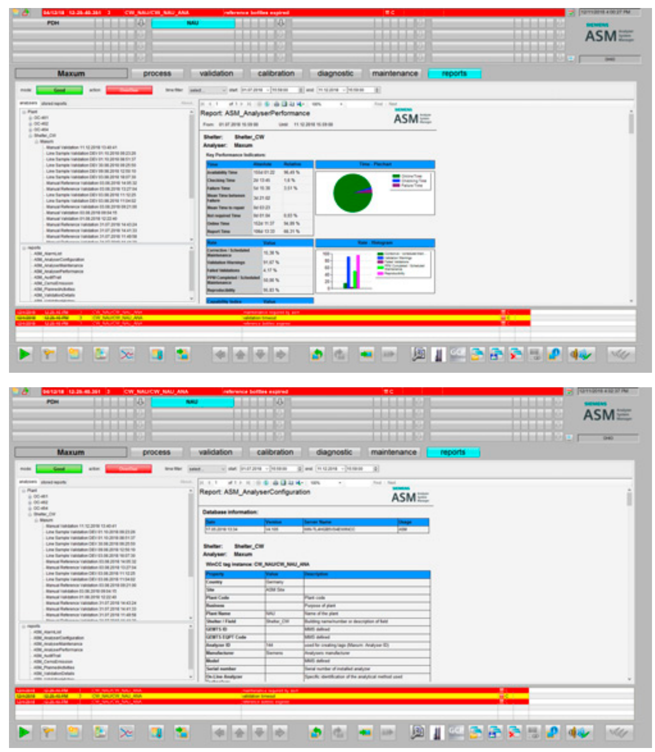
Overview of analyzers in a plant

The ASM has the following function modules for each analyzer for performing operator control and monitoring tasks:

View	Task
Process	Provides a detailed overview of the selected analyzer. The current analyzer status, planned maintenance work, and configuration data are displayed. The current measured values are displayed in a table, historical values can be analyzed with the trend display using selectable time windows.
Validation	Checking the reliability of the measured values of analyzers using various routines and methods. This test can be started automatically at specific intervals or manually by the ASM.
Calibration	Carries out a calibration on the analyzer and monitors the results (this module is only available for analyzers which support remote calibration, e.g. Siemens MAXUM Ed. II, …).
Diagnostics	The ASM is capable of monitoring additional values from sample systems and analyzer houses. These are displayed as diagnostic values of the analyzer system. The operator can define different limits for each diagnostic value and the reaction of the system if one of these limits is exceeded, such as an alarm or warning. Diagnostic values are parameters which directly affect the analyzer performance, e.g. response factor, sample temperature, sample pressure, sample flow,…
Maintenance	Device-specific maintenance tasks can be specified here, their timing defined, and checked. Documentation such as maintenance procedures or manuals can be opened to support the maintenance work. The key performance indicators (KPI) view provides a fast overview of the analyzer's performance features, such as availability, error rate and maintenance frequency.
Report	This is a comprehensive function for producing customized reports. The module permits analysis of current and historical data in selectable time periods for documentation of the performance of individual analyzers up to the complete plant using the reporting module. The reports can be saved in the ASM or exported for further use.



View of the maintenance module



Examples of generated reports

Further functions are:

View	Task
SCADA	The ASM provides all typical SCADA functions, for example: • Password protection and different access privileges • User administration • Signaling, acknowledgment and archiving of alarms and events
Reference bottle management	Management and assignment of reference gas cylinders. This information provides reference values for validation using the reference sample method.
ASM Manager	For configuring the analyzers. Among other things, the analyzer-specific data is entered here, the type of validation is defined, and the number of measured values and units is entered.
MAXUM edition II operating software	Direct calling of the comprehensive Siemens configuration and operating software for Siemens MAXUM edition II. It is then possible to access the connected analyzers for maintenance, configuration, or viewing of chromatograms.
Optional views	• *Analyzer house* with locations of all elements • *Sample handling system* with locations of all elements • *Mimic panel* for visualizing alarms which influence the modes of the analyzer house. The analyzer house status will change to 'Breakdown' mode and generate an alarm message. • *Status display of the network devices.* This overview displays the statuses of the Ethernet switches (online/uncertain/fault). The analyzer alarms are integrated in the ASM signaling system. • …

Validation

One of the core functions of the ASM is checking the analyzers for reliability of the measured values. Two measuring procedures are available for recording the values, namely the reference sample method and the line sample method. The resulting values can be checked using different evaluation methods (based on ASTM D3764 or deviation). The objective of the validation is to recognize fluctuations and deviations with respect to a comparison value, and to thus permit a statement to be made on the reliability and drift of the measurement.

Measuring procedure: Reference sample method

The analyzer is disconnected from the process gas, and a reference gas connected for measurement. The composition of this reference gas was previously specified in the "Reference bottle management" of the ASM. The ASM uses these values to determine the deviation between the measurement and the reference.

Measuring procedure: Line sample method

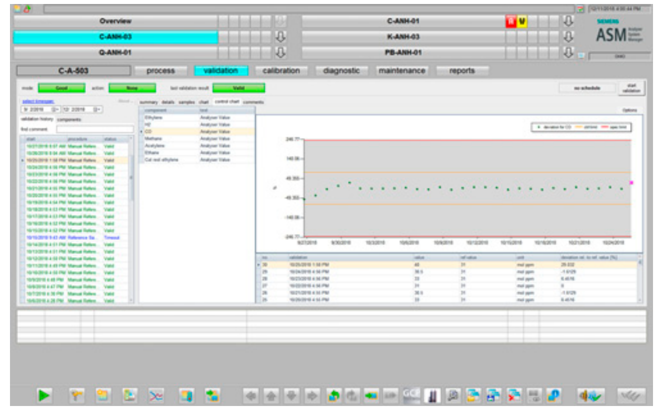
With this method, a gas sample is extracted from the stream of sample gas to the analyzer, and analyzed in the laboratory. The resulting measured values are passed on to the ASM and compared with the analyzer's measured values. With this method, the analyzer does not need to be disconnected from the process gas, and remains permanently available for the process measurement.

Evaluation based on ASTM D3764 and ASTM D6299

Based on the ASTM D3764 and ASTM D6299 international standards, the results are checked using various statistical methods, including standard deviation, Dixon outlier test, and systematic error.

Evaluation using deviation method

Limit values are defined for this evaluation: the warning limit and the control limit. Simple rules are used to define how the reliability of the measurement is to be assessed when these limits are violated. For example, it can be specified that a single violation of the limit can be tolerated, but that repeated violation is an impermissible condition.



View of the validation module

Technical specifications

Operating system	
Server	Windows Server 2016
Client(s)	Windows 10
PC hardware requirements	
Server	Standard Industrial Workstation[1]
Client(s)	Standard Industrial Workstation[1]

[1] The HW configuration depends on the size of the device network supported.

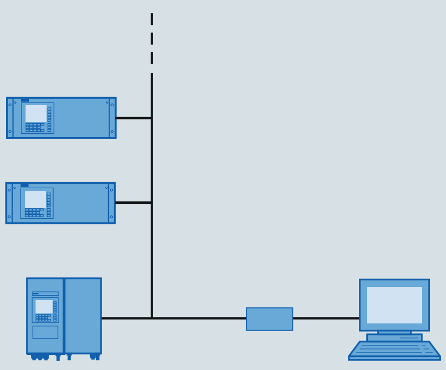
Selection and ordering data

Please contact your Siemens sales partner for further information and ordering.

5

General information

6



6/2	**Communication**
6/2	Continuous process gas analysis
6/9	Gas analysis library for SIMATIC PCS 7
6/10	Process gas chromatography
6/12	**Operator functions of Series 6**
6/13	**FAT & factory certificates**
6/14	**Ex versions**
	Extractive continuous process gas analysis
	Series 6
6/25	- Purging unit ATEX II 2G
6/26	- Purging unit ATEX II 2G, leakage compensation
6/28	- Purging unit ATEX II 2G/3G, continuous purging
6/31	- Purging unit FM (Class I Div 2)
6/32	- Additional units
	In situ continuous gas analysis, in-situ
6/34	- LDS 6
6/36	- LDS 6, Ex barrier
6/37	- SITRANS SL
6/38	Process gas chromatography
6/39	**Tables**
6/39	Conversion tables
6/40	Dew point/saturation table
6/42	International standards
6/44	**Definitions**

Continuous process gas analysis

Overview

Reliable functioning of analyzers is of decisive importance for process control. It is necessary to record, correct and transmit measured values, to set and modify parameters, to check functions, to update calibrations, and to scan status signals e.g. for preventive maintenance. Communication between the operator and device is therefore an important part of process analysis, and the offered facilities have become a decisive performance feature of analyzers.

Extractive continuous process gas analysis

The gas analyzers of Series 6 (ULTRAMAT 6, ULTRAMAT/OXYMAT 6, OXYMAT 6, OXYMAT 61, OXYMAT 64, FIDAMAT 6, CALOMAT 6, CALOMAT 62) as well as the ULTRAMAT 23 offer the following communication options in addition to data transmission with analog and digital outputs:

- RS 485 interface
- SIPROM GA
- PROFIBUS DP/PA
- Generic communications interface (only OXYMAT 6, ULTRAMAT 6 and ULTRAMAT/OXYMAT 6).

The modular SIPROCESS GA700 gas analyzer with the ULTRAMAT 7, OXYMAT 7 and CALOMAT 7 modules offers the following communication options in addition to data transmission with analog and digital outputs:

- MODBUS TCP
- Remote transmission via UMTS router
- Modbus TCP/PROFINET communication

RS 485 interface

The serial interface integrated as standard permits communication between several analyzers over the internal bus (ELAN). Parameterization is carried out using the analyzer's menu.

Networking over ELAN

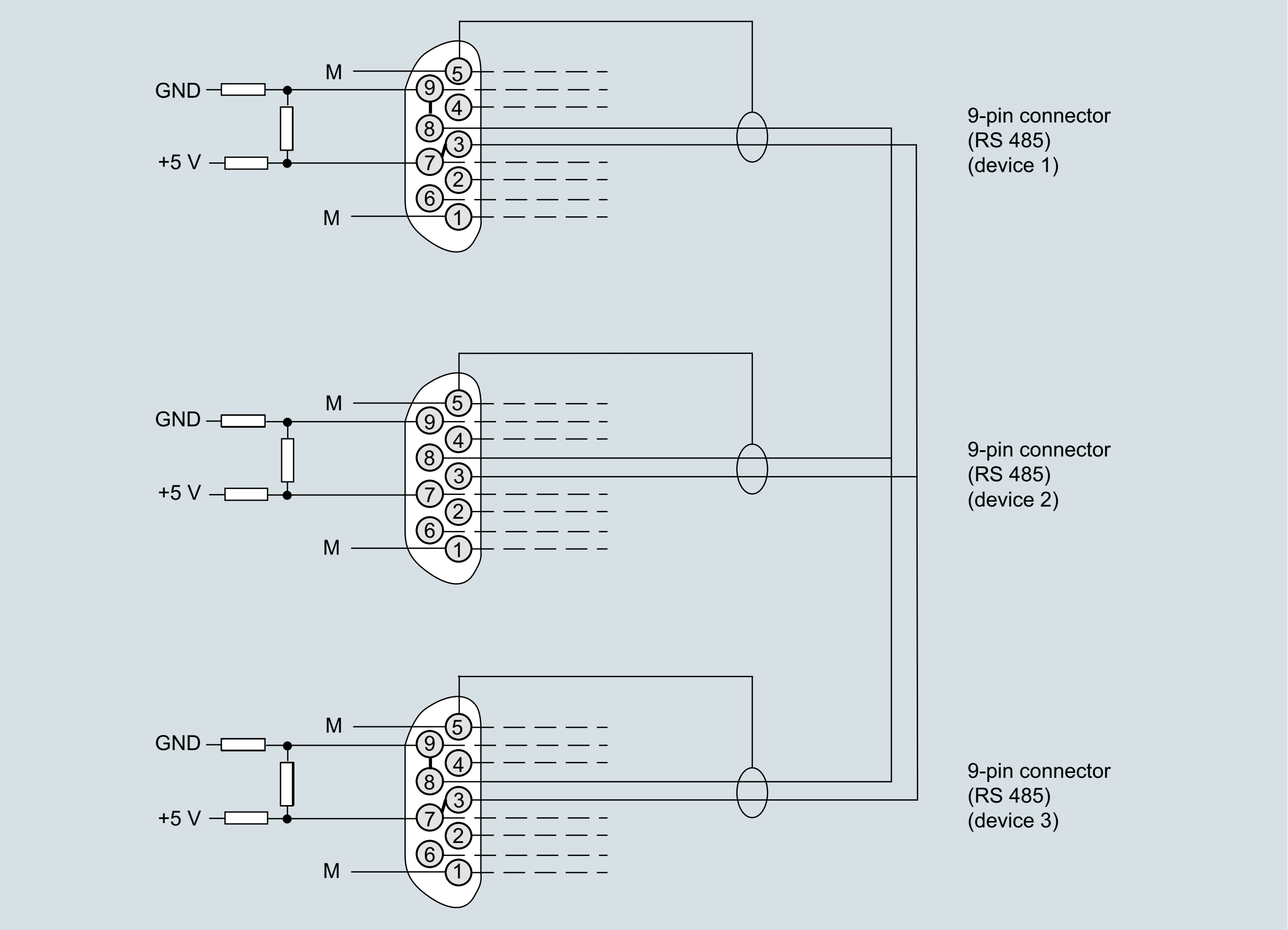
ELAN communication is used e.g. for the interference gas correction of interfering gases. Direct connection is only possible between Siemens gas analyzers.

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 mm², 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 connector of a bus cable must be bridged (ELAN networking).

Note

If the cable is longer than 500 m or high interference effects are present, it is advisable to install a repeater on the device side.



Bus cable with plug connections, ELAN networking

Networking with SIPROM GA

When used externally, the RS-485 interface requires software matched to the analyzers, e.g. SIPROM GA.

SIPROM GA is a software program for communication between a PC or laptop and analyzers. A maximum of 12 devices (electronics modules) with up to four channels/measured components of the following type can be connected, displayed and remote-controlled per COM interface:

- OXYMAT 6/61
- OXYMAT 64
- ULTRAMAT 6
- CALOMAT 6
- CALOMAT 62
- FIDAMAT 6
- ULTRAMAT 23

SIPROM GA allows access to device parameters all the way to the device configuration. All analyzer functions (except factory default functions) can be remote-controlled and monitored in this manner. SIPROM GA is therefore an ideal service and maintenance tool for Siemens gas analyzers.

In addition to remote control of all operator functions, SIPROM GA offers full access to all diagnostic data. SIPROM GA therefore permits preventive maintenance as well as fast responses when maintenance becomes necessary or when the production process is changed.

SIPROM GA guarantees:

- High operational reliability
- High availability
- Central, comprehensive information
- Fast response time
- Flexibility
- Economical system integration

In addition to the display of analyzers with TAG No., components, current measured values, comprehensive diagnostics information (status) and parameter assignment, SIPROM GA also offers the following possibilities:

- Bargraph display
- Recorder display of one or more measured values with printer output
- Calibration functions (adjustment of all setpoints for calibration, remote calibration)
- Saving of all device data
- Remote control of all device functions
- Remote calibration
- Online help
- Downloading of new device firmware
- Cyclic saving of measured values on hard disk
- Writing user data to the device's EEPROM, or downloading data from it.

Analyzers are accessed using SIPROM GA in one of the following two ways:

- Directly from the PC with an RS 485 interface
- Via an Ethernet gateway

Hardware requirements

In order to use SIPROM GA, the following hardware and system requirements for the PC/laptop equipment must be met:

- Windows computer with Pentium 133 MHz and 32 MB RAM: Recommendation: Pentium II 266 MHz and 64 MB RAM
- CD-ROM drive (for installation)
- Free hard disk capacity of at least 10 MB
- VGA graphics card (Windows-supported); resolution: 1024 x 768
- Printer (Windows-supported)
- MS Windows XP, Windows 7 and Windows 10 operating system
- Vacant COM port (COM 1, 2 ...)
  - The RS 485 / RS 232 interface converter is required for the connection to the RS 485 ELAN network
  - A standard 10-Mbit or 100-Mbit network (RJ45 connection) with TCP/ IP is required for connection of the Ethernet / RS 485 interface converter

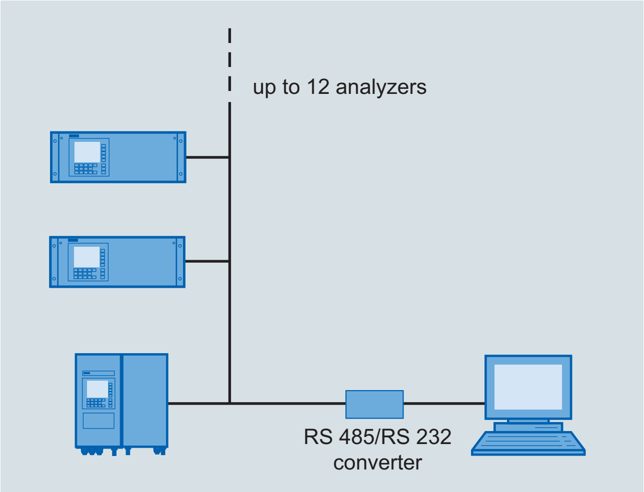
Accessories for the network

For cables, connectors, repeaters etc., see Catalog IK PI or in the Mall in CA 01 under SIMATIC NET communications systems / PROFIBUS / Network components.

Networking with SIPROM GA via converter

A maximum of 12 analyzers with up to four components each can be networked.

The functional principle is shown in the following illustration.



Typical structure of an RS 485 Ethernet network via SIPROM GA

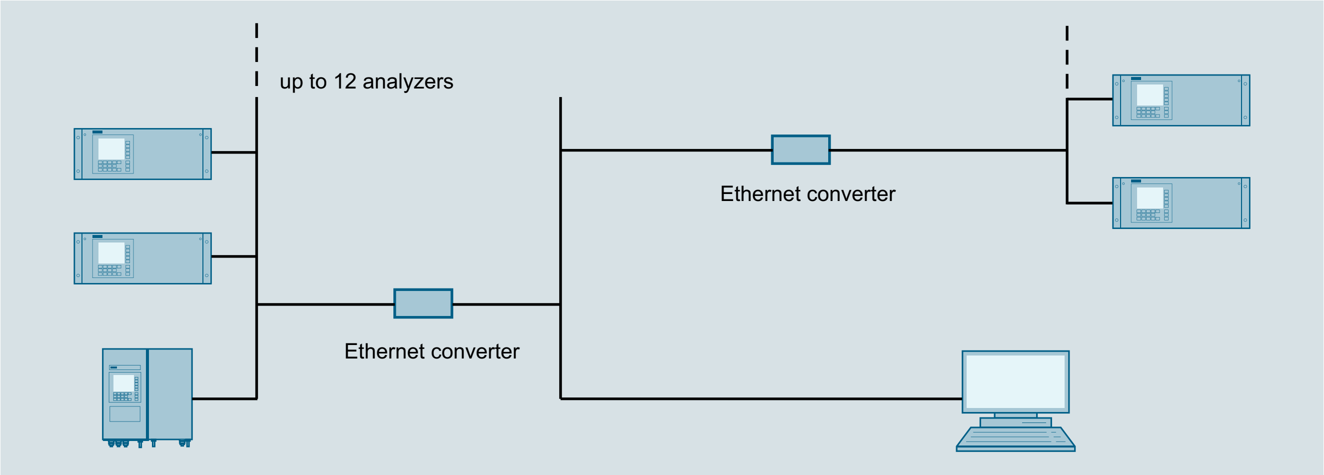
The gas analyzers can be installed at distances up to 500 m. One network can be connected to each COM port.

6

Continuous process gas analysis

Networking with SIPROM GA via Ethernet

For access via Ethernet, there are no limitations on the distance between PC and gateway. In addition, communication via Ethernet enables the installation of multiple gateways on one COM port. As a result, the possibility exists for operator control and monitoring of multiple analyzers or analyzer systems located far away and far apart from one station.



Typical structure of an RS 485 Ethernet network via SIPROM GA

PROFIBUS

The commonly used practice of transmitting measured values and fault messages via analog and digital outputs requires complex cabling. By contrast, with PROFIBUS DP and PROFIBUS PA, a single 2-wire cable is possible for digital transmission of, for example, all measured values (including from several channels), status information and diagnostics functions for preventive maintenance.

The PROFIBUS DP version is widely used in production automation because of its high transmission rate for relatively small data quantities per device. PROFIBUS PA makes allowance, in particular, for the properties required in process industry, e.g. large data quantities and use in hazardous areas.

The limited dynamic performance of 4 to 20 mA mA signals can be replaced, the laborious configuring of measuring ranges can be omitted. By using simulated measured values without media, increased safety can be provided for the plant configuration, and configuration errors can be avoided. Parameter sets can be generated offline (from your desk) and subsequently downloaded and saved in the device. Local operations can thus be reduced to a minimum.

With an optional plug-in card, which can also be retrofitted, the following Siemens gas analyzers are PROFIBUS-compatible and comply with the mandatory "Device profile for analyzers" of the PI (PROFIBUS International).

- OXYMAT 6/61
- OXYMAT 64
- ULTRAMAT 23
- ULTRAMAT 6
- CALOMAT 6
- CALOMAT 62
- FIDAMAT 6

Customer benefits include enormous savings potential in all plant areas, covering configuration and commissioning, operation and maintenance, up to subsequent plant expansions.

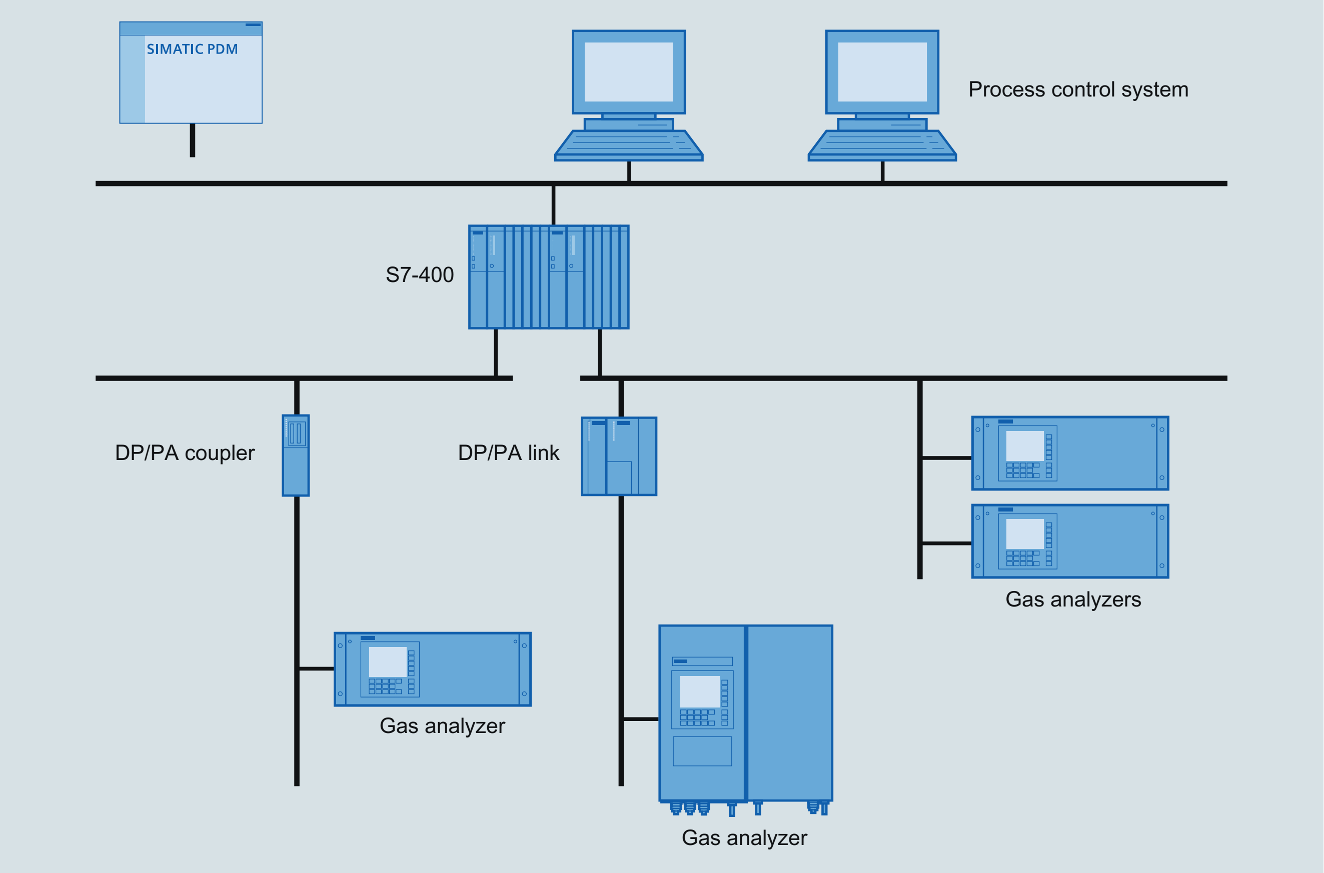
Operation of the gas analyzers from a control system or a separate PC is possible with the SIMATIC PDM tool (Process Device Manager). The SIMATIC PDM software runs on Windows and can be integrated in the SIMATIC PCS 7 process control system. This permits a clear presentation for integration of the analyzers in the system as well as for the complex parameter structure of the analyzers.

Direct connection of the analyzers to a control system without PDM, e.g. using STEP 7, is also possible but this requires additional programming and is less convenient for the operator. In most cases, this direct connection is therefore only applicable if acyclic (device operation) data are not used.

A differentiation is made between cyclic and acyclic services. Cyclic services are used to transmit time-critical data such as measured values and statuses. The acyclic services allow device parameters to be queried or changed during operation.

Both graphic displays and values can be output on a PC. Signaling of maintenance, fault and diagnostics information is also cyclic. These data are displayed in plain text when using SIMATIC PDM.

The digital outputs can also be switched using cyclic services, thus also permitting triggering of relays over PROFIBUS (e.g. for measuring point switchover, calibration etc.).



Schematic structure of a PROFIBUS system

The following acyclic device parameters and device configurations can be used in PROFIBUS DP and PROFIBUS PA with SIMATIC PDM:

- Factory data
- Diagnostics values
- Logbook
- Display measuring ranges
- Zero calibration
- Sensitivity calibration
- Zero point/sensitivity setpoints
- Total/single calibration and AUTOCAL
- Select measuring ranges
- Define measuring ranges
- Electrical time constants
- On/off functions
- Chopper frequency
- Magnetic field frequency
- Date/time
- Measuring point switchover
- Logbook settings
- Relay assignment
- Digital inputs
- Reset
- Save/load data
- Suppression of short noise signals
- Calibration tolerances
- Switch valves
- PROFIBUS configuration

Use of PROFIBUS offers the following customer benefits:

- Cost reductions for planning, installation and operation
- Use of (distributed) device intelligence
- Replaceability of devices
- Only one cable for everything, no complex cabling
- No limited 4 to 20 mA resolution
- No laborious parameterization of measuring ranges
- Simulation of measured values
- Simplification of commissioning
- Testing of network/AS
- Avoidance of errors during startup
- Online diagnostics
- Offline parameterization

<u>Generic communications interface</u>
<u>(only OXYMAT 6, ULTRAMAT 6 and ULTRAMAT/OXYMAT 6)</u>

Users benefit from numerous functions that are mainly needed in the automotive industry, for example, to carry out repeated linearization. In contrast to PROFIBUS and ELAN, communication is only possible between one device and one PC, and takes place according to the master/slave principle. The device only transmits data when requested by a command telegram, where only one command can be processed and replied to at a time.

Function88 can be used to open the generic communications menu and set the parameters.

SIPROCESS GA700: connection via Modbus TCP

Der SIPROCESS GA700 uses Modbus TCP for interference gas corrections and for external pressures for measured value processing. Measured values such as process value, pressure and temperature can also be imported from other SIPROCESS-GA700-devices and shown on the display.

The SIPROCESS GA700 can simultaneously accept up to seven connections via Modbus TCP.
Modbus TCP function codes 3, 16 and 43 are currently supported:

- Current measured values such as process value, pressure, temperature and device status can be determined with function code 3.
- Device identification data are made available using function code 43.
- The eight virtual Modbus digital inputs can be written with function code 16.

The virtual digital inputs can be freely configured just like the physical inputs. As a result for example, it is possible to start an AutoCAL, set external errors and switch between various measuring ranges via Modbus TCP.

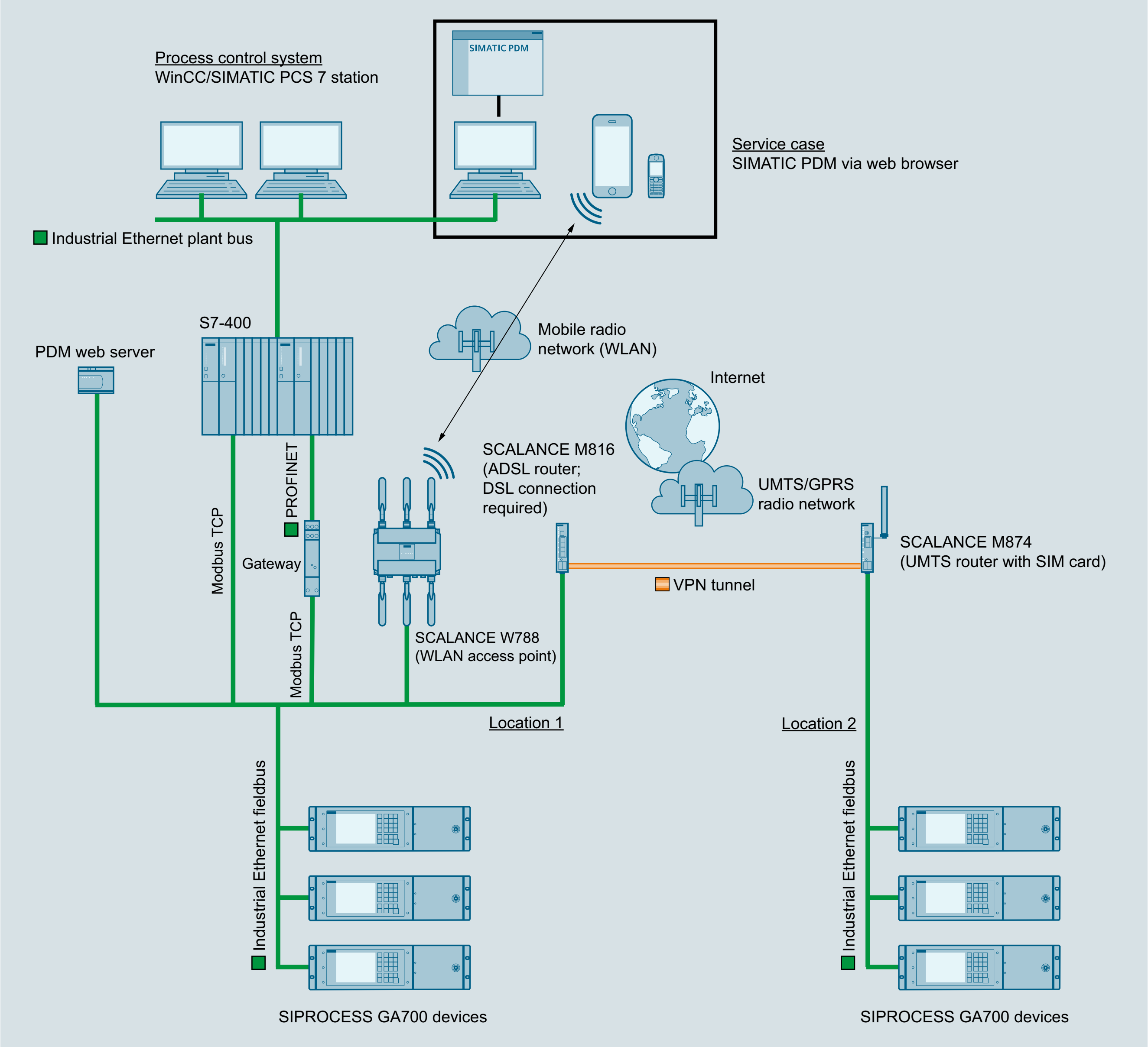
SIPROCESS GA700: Possible communication paths

The SIPROCESS GA700 has two Ethernet interfaces: one process interface and one service interface.
While the device is connected to the plant bus, device parameters can be assigned in parallel via the service interface.

- The process and service interfaces are interconnected (switch functionality).
- There is no limit on the number of SIPROCESS GA700 devices in an Ethernet network.
- The device parameters are assigned using SIMATIC PDM (Ethernet).
- The SIPROCESS GA700 can be connected to a controller via Modbus TCP.
  An additional Modbus library is needed for SIMATIC PCS 7 (SIMATIC S7-400).
  A standard block (SIMATIC PCS 7 SIMATIC S7-400: MonAna/MonAnl) is used to acquire and display the values. As a result, the data is also available in WinCC.

The parameter assignment using SIMATIC PDM is also possible via a point-to-point connection with the SIPROCESS GA700.

Close-distance and long-distance remote access to the SIPROCESS GA700 can also be set up using standard network components (WLAN access point / UMTS router / DSL router). The following figure shows a selection of possible communication paths and network components that the SIPROCESS GA700 can use for communication.



SIPROCESS GA700: Communication paths and network components

With a Modbus TCP/PROFINET gateway, the SIPROCESS GA700 can also be connected to a controller via PROFINET.

Connection of two separate networks (e.g. multiple locations) via the Internet.

A VPN tunnel is set up over the Internet between a UMTS router (plant environment) and an ADSL router (office environment). All SIPROCESS GA700 devices can now be addressed from any node using, for example, SIMATIC PDM/controller/Modbus client in one of the two networks via Modbus TCP and S7-400 (PDM).

Remote access

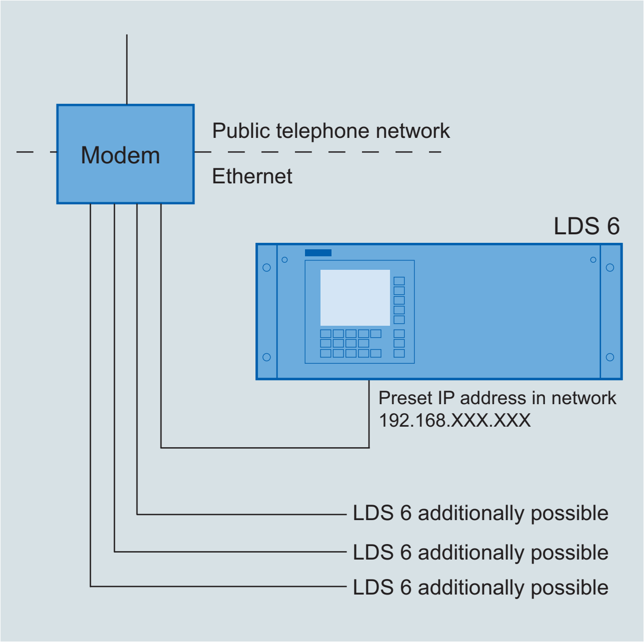
The WLAN access point enables mobile access to devices via a laptop, for example. If a PDM web server was installed and set up, you can access the SIPROCESS GA700 devices from handheld devices (mobile phone, tablet) via a web browser. The PDM web server is a computer on which SIMATIC PDM with additional web server functionalities is installed.

Continuous process gas analysis

In situ continuous process gas analysis

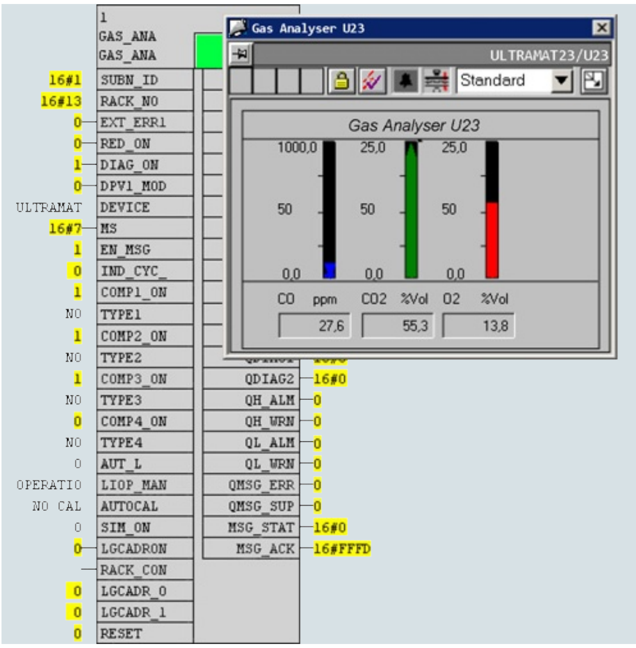
LDS 6 can send and receive data over an Ethernet connection with the help of the LDScom software. This installation and service tool is able to check and adapt device status and calibration parameters from a remote location. If necessary, even a complete system check can be carried out over the remote connection. If servicing is necessary, the required information can be sent to the Siemens service engineer by router, and he can then carry out the appropriate measures from the remote location.

This facility for remote maintenance and diagnostics is implemented using a standard LAN modem.



External connection of LDS 6 via a modem for implementing remote maintenance measures

Overview



The driver blocks from the gas analysis library permit integration of the following gas analyzers into the SIMATIC PCS 7 process control system over PROFIBUS DP:

- ULTRAMAT 6 and ULTRAMAT 23
- CALOMAT
- OXYMAT

The driver blocks permit access to the measured values and to the calibration functions of these devices. Their diagnostic information can be analyzed and displayed, and alarm indications can be optionally triggered with their help.

Note:

The gas analysis library can be used together with SIMATIC PCS 7 V7.1, V8.0, V8.1 and V8.2.

Function

Driver blocks

The gas analyzers are integrated into the hardware configuration of the SIMATIC PCS 7 process control system using their GSD files. Parameterization of the driver blocks is subsequently carried out corresponding to the device configuration. The driver blocks provide the following functions:

- Reading of analyzer values
- Starting of autocalibration
- Evaluation of device-specific diagnostics
- Standard diagnostics
- Alarms for analyzer values (alarm limits adjustable on the block)
- Simulation

Symbols and faceplates

The symbols are automatically created and interlinked by the wizard "Generate block symbols". The faceplates can be displayed in various views:

- Standard
- Maintenance
- Configuration
- Limits
- Trend and alarm

More information

Siemens AG
Digital Factory Division
Customer Services DF&PD
Service for PA

Tel.: +49 721 595-7522

E-mail: function.blocks.industry@siemens.com

Overview

The MAXUM edition II gas chromatograph can transfer measured results and status information to process control systems, operator panels or printers during operation.

Interfaces

Chromatograph, operator panel, printer and control system use special electronic interfaces:

- Electrical connection
  The device interfaces are connected by electric cables. The electrical properties of the interfaces are standardized.
- Control of communication and language
  Rules must be observed to control the communication. It must be clearly defined in networks who is the "sender" and who is the "receiver" of the data. Both communication partners must use the same protocol.

MODBUS

MODBUS is a rule for controlling data transfer between two computer systems - a transmission protocol. MODBUS is an industry standard for connecting measuring and control devices to process control systems (PCS). Most process control systems can be equipped with serial interfaces and MODBUS.

Using the MODBUS coupling, information can be sent interference-proof via just one data line. Information can be read from process gas chromatographs (PGC), and certain functions of the PGC can also be parameterized.

Advantages:

- Information on the PGC status during operation
- Supply of protected data in numerical form without falsification by interfering pulses
- Reduced cabling overhead

The MODBUS coupling can:

- Transmit measured values
- Transmit status information
- Output information on the current analysis
- Trigger control functions

The MODBUS uses a master/slave transmission procedure. The control system is always the master, the process gas chromatograph is the slave.

The representation of data in the message frames is based on the compact RTU format.

Memory division

To ensure that the meaning of the registers is known to each network station, this must be defined in the configuration. The results of each component in each sample must be written into defined positions in the PCS memory. These address declarations depend on the number of chromatographs, samples and components. The same applies to status, sample sequence and sample release. Standard addresses are also defined in these cases.

OPC server (OLE for Process Control)

OPC is a vendor-independent software interface. It allows standardized access from Windows applications to chromatograph data. OPC corresponds to a typical client/server architecture.

OPC allows a universal connection between any Windows application which supports an OPC client interface and Maxum edition II.

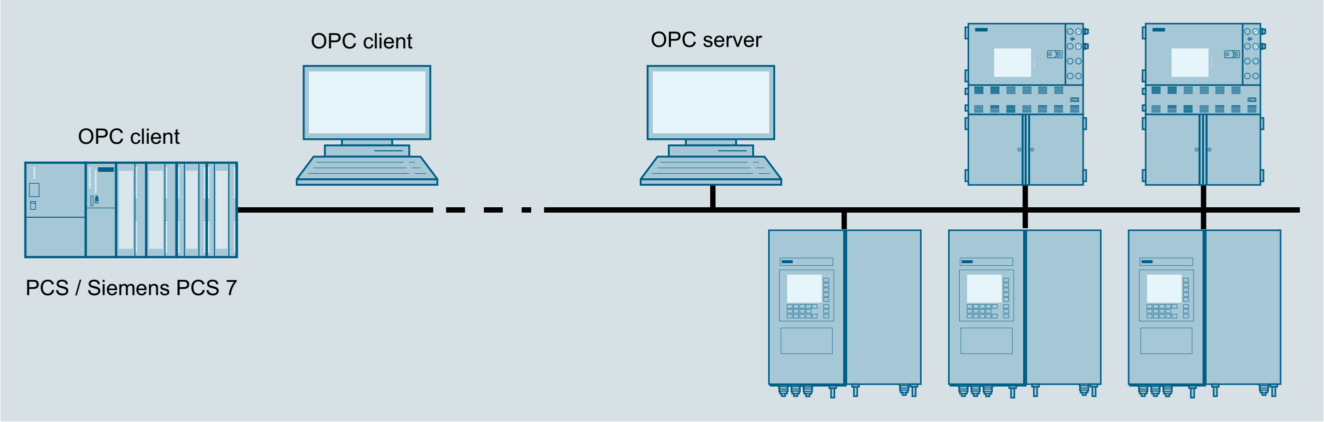
The OPC server is usually installed on a separate PC.

OPC is a modern alternative to MODBUS. MAXUM edition II does not require an additional interface since it uses the existing Ethernet connection (TCP/IP).

OPC standardizes the access to measured values, status functions, control functions and analytical data in a manner similar to MODBUS.

Advantages with OPC applications:

- Reduced maintenance costs
- Simple GUI for configuration
- Reduced system integration costs
- Reduced test costs
- Reduced maintenance costs



OPC server

Hardware components

NAU - Network Access Unit

An NAU expands and supplements a GC network, and has three fundamental functions:

- Enclosure for 7 additional I/O plug-in cards
- Connection of serial ASCII printers and external host PCs (control system)
- Central operation of a GC network from one point

The Network Access Unit (NAU) is an input/output station for the Siemens process chromatographs. It can be used to centrally call, process and pass on data. It is used if it is not possible to connect the electronics close to the analyzer or if installation in a central control room is required. This significantly reduces the required wiring to the control room.

The NAU is connected to the Ethernet or DataNet and has a total of 7 slots to accommodate a wide range of electronics cards. These comprise cards for analog and digital signal processing as well as interfaces for host computers and process control systems.

Various electronics cards are available:

• Input/output module	A IO 8 • 8 analog outputs • 8 analog inputs • 2 digital inputs
• Input/output module	D IO • 6 digital inputs and 8 digital outputs
• Input/output module	AD I/O • 4 digital inputs and 4 digital outputs • 4 analog inputs and 4 analog outputs
• Communication module	10 Base FO Ethernet (fiber-optic coupling)
• Communication module	DataNET Copper (redundant system bus)
• Communication module	DataNET Fiber Optic
• Communication module	Advanced Data Highway (OptiCHROMe Advance coupling)

Software

Modern chromatographs are controlled by microprocessors. We differentiate between software in the device and software on a PC operator panel.

Software in the chromatograph

The chromatograph can carry out analyses independently, without an operator panel being connected. It then requires its own control software and local operating software (HMI).

Software in the operator panel (PC)

Siemens gas chromatographs can be operated over Ethernet and a PC, by using the built-in control panel (HMI), or with a Network Extension Unit (NAU).

Workstation software

The user-friendly Gas Chromatograph Portal software enables optimum operation of MAXUM edition II.

There is a distinctive graphical interface for analyzing results, chromatograms, application methods and analyzer settings. The following optional programs are also available:

MaxBasic

For modification of MaxBasic programs in the gas chromatographs or the NAU.

MAXUM OPC server

For coupling the MAXUM to control systems, for example.

Simulated Distillation

For import/export of methods for simulated distillation.

MAXUM System Tools

For data recording (logging) and firmware updates.

MMI emulation: Operator control and monitoring

This is identical to operation on the built-in control panel of a MAXUM or an NAU. It is used for operator control and monitoring. For example, it is possible to display results, switch valves or modify temperatures. However, there are only minimum possibilities for editing the configuration and tables. The MMI is always a dynamic display.

Overview

Main menu	No.	Function designation	Manual	SIPROM GA	PA/DP V1.6.0	PA/DP V2.0.0
Diagnostics	1	Factory data	X	X	X	X
	2	Diagnostics values	X	X	—	X
	3	Logbook	X	X	—	X
	4	Display measuring ranges	X	X	—	X
Calibration	20	Zero calibration	X	X	—	X
	21	Sensitivity calibration	X	X	—	X
	22	Zero point/sensitivity setpoints	X	X	—	X
	23	Total/individual calibration	X	X	—	X
	24	AUTOCAL	X	X	X	X
	25	Drift values	X	X	—	—
	26	Calibration with air (**OXYMAT 64** only)	X	—	—	—
Measuring ranges (Code 1)	40	Select measuring ranges	X	X	—	X
	41	Define measuring ranges	X	X	—	X
Parameter (Code 1)	50	Electrical time constants	X	X	—	X
	51	Limit values	X	X	—	—
	52	On/off functions	X	—	—	X
	53	Status messages	X	X	—	—
	54	Graphical measured value representation	X	X	—	—
	55	Measured-value display	X	X	—	—
	56	LCD contrast	X	—	—	—
	57	Chopper frequency (**ULTRAMAT 6** only) Magnetic field frequency (**OXYMAT 6** only) Flame ignition (**FIDAMAT 6** only)	X	X	—	X
	58	Date/time	X	X	—	X
	59	Measuring point switchover	X	X	—	—
	60	Logbook settings	X	—	—	X
	61	Vibration compensation (**OXYMAT 6** only) Switch internal valves (**FIDAMAT 6** only)	X	X	—	X
	62	Set external pressure (**FIDAMAT 6 "without pump"** only)	X	X	—	X
Configuration (Code 2)	70	Analog output	X	X	—	—
	71	Relay assignment	X	X	—	X
	72	Digital inputs	X	X	—	X
	73	ELAN configuration	X	X	—	—
	74	Reset	X	X	—	X
	75	Save/load data	X	X	—	X
	76	Suppression of short noise signals	X	X	—	X
	77	Measured value memory (analog output)	X	X	—	—
	78	Calibration tolerances	X	X	—	X
	79	Change codes	X	X	—	—
	80	Unit test	X	X	—	—
	81	Language selection	X	X	—	—
	82	Pressure correction (**ULTRAMAT 6, OXYMAT 6, OXYMAT 64 and CALOMAT 62** only)	X	X	—	—
	83	Correction of cross-interference	X	X	—	—
	84	Phase calibration (**ULTRAMAT 6** and **OXYMAT 6** only)	X	—	—	—
	85	Switch valves	X	—	—	—
	86	Linear temperature compensation	X	X	—	—
	87	Fault on/off	X	—	—	—
	88	AK configuration (**ULTRAMAT 6 and OXYMAT 6** only)	X	—	—	—
	89	Sample chamber heating (**ULTRAMAT 6, OXYMAT 6 and CALOMAT 62** only)	X	X	—	—
	90	PROFIBUS configuration	X	X	X	X
	91	Startup state (**FIDAMAT 6** only)	X	X	—	—
	92	Pressure values (**FIDAMAT 6** only)	X	X	—	—
	93	Units (**FIDAMAT 6** only)	X	—	—	—
	—	Control of external valves	—	—	—	X
	—	Software download	—	X	—	—

6

Selection and ordering data	Article No.	
FAT & factory certificates for extractive gas analyzers of Series 6 and ULTRAMAT 23	**7MB8100-** ■■■■■ - ■■■■	not applicable for
Click on the Article No. for the online configuration in the PIA Life Cycle Portal.		
Factory acceptance (FAT) with customer		
Visual inspection and basic settings		
• None	0	
• Visual acceptance, 1 to 8 devices, incl. function test and calibration	1	
• Visual acceptance, 9 devices and more, incl. function test and calibration	2	
Measured signal response		
• None	A	
• Noise, drift	B	
• Noise, drift, linearity, T_{90} time	C	
Compensation, cross-interference		
• None	A	
• Pressure compensation	B	FIDAMAT
• 1 interfering gas[3]	C	
• 2 ... 3 interfering gases[3]	D	
• Pressure compensation and 1 interfering gas[3]	E	FIDAMAT
• Pressure compensation and 2 or 3 interfering gases[3]	F	FIDAMAT
Factory acceptance, explosion protection		
• None	0	
• Pressurized enclosure for explosion-proof units (functionality)	1	19" rack units
• Relay test	2	
• Pressurized enclosure for explosion-proof units and relay test	3	19" rack units
Number of test channels		
• None	0	
• 1 ... 3	2	
• 4 ... 6	3	
• 7+	4	
Certificates		
General certificates		
• Factory certificate DIN EN 10204 2.1 (quality test certificate)[1]	0	
• Test report according to DIN EN 10204 2.2[1]	1	
• Certificate of origin[1]	2	
• Certificate of origin[1] and test report according to DIN EN 10204 2.2	3	
• Certificate of origin[1] and factory certificate DIN EN 10204 2.1	4	
• Certificate of origin, factory certificate 2.1 and test report 2.2 according to DIN EN 10204	5	
• Factory certificate 2.1 and test report 2.2 according to DIN EN 10204	6	
• Factory certificate EN 10204 2.1 following repair	7	
• Parameter sheets (only with suffix Y22)	8	
Acceptance test certificate according to DIN EN 10204 3.1 with suffix Y22		
• None	A	
• Measured values, noise, drift, linearity	B	
• Measured values, noise, drift, linearity, pressure compensation	C	FIDAMAT
• Measured values, noise, drift, linearity, pressure and temperature compensation	D	FIDAMAT
Acceptance test certificate according to DIN EN 10204 3.1 extended		
• None	A	
• Cross-interference of residual gases (H_2O and 2 other gases)	B	
• T_{90} time	C	
• Influence of atmosphere containing CO_2	D	
• Cross-interference of residual gases[2] and T_{90} time	E	
• Cross-interference of residual gases[2] and influence of atmosphere containing CO_2	F	
• T_{90} time and influence of atmosphere containing CO_2	G	
• Cross-interference of residual gases[2], T_{90} time and influence of atmosphere containing CO_2	H	
Factory inspection certificate DIN EN 10204, language		
• German	0	
• English	1	
• French	2	
Required analyzer information	**Order code**	
Add "-Z" to Article No. and specify Order codes.		
Information on product/order with order item and contact partner (Sales Region, region or distributor)	**Y22**	

[1] Can also be ordered following delivery

[2] H_2O and 2 other gases

[3] Special gases are invoiced with a surcharge as required. Orders for factory acceptance (FAT) with customer should be ordered with quantity 1. Orders for certificates can be ordered with quantity ≥ 1.

6

Overview

Use of Series 6 in hazardous areas

Dependent on the application, the measuring equipment can include the following parts:

- Analyzer with Ex approval
- Ex p safety equipment (purging unit)
- Flame arrestors with Ex approval
- Ex i isolating transformer
- Isolating relay with Ex approval

Gas analyzers

Suitability-tested field analyzers of Series 6 must be used to measure gases in hazardous areas.

The Series 6 analyzers are approved in accordance with Ex type of protection "Flameproof enclosure Ex p" for Zone 1 and Zone 2. In addition, these analyzers must be connected to monitoring equipment which must also be suitability-tested.

Following pre-purging of 5 minutes, the monitoring equipment ensures that no gas fumes can enter the enclosure, and accumulation of the sample gas in the enclosure is prevented. The volume flow during the pre-purging phase is > 50 l/min. The protective gas is usually fed into the analyzer enclosure from a supply network via the monitoring equipment.

Exception: A flameproof enclosure is not required in zone 2 for the measurement of gases whose composition always remains below the lower explosive limit (25% of LEL); in this case, it is sufficient for the field housing to have the gas-fume-proof type of protection (type of protection Ex n R).

Category ATEX II 2G (Ex zone 1)

Two versions of flameproof enclosure Ex p complying with the directive 2014/34//EU (94/9/EC) are available for use in zone 1:

- *Flameproof enclosure with compensation of losses resulting from leaks*
  The principle of this type of protection is based on prevention of ingress of the surrounding atmosphere or of the sample gas into the enclosure of the electrical equipment through overpressure in the device.
  Only the volume of protective gas that is required to maintain an overpressure of at least 50 Pa (recommended 5 hPa) above the sample gas pressure and at least 50 Pa (recommended 5 hPa) above the atmospheric pressure is fed into the enclosure. The maximum purging gas pressure is 165 hPa; this results in a maximum permissible sample gas pressure of 164 hPa or 160 hPa.
  If the sample gas is combustible or occasionally flammable, the analyzer enclosure must be additionally purged with inert gas (e.g. nitrogen). In these cases, you must additionally ensure that the internal enclosure pressure is at least 50 Pa (recommended 5 hPa) higher than the fail-safe-regulated sample gas pressure.
  If the pressure control of the sample gas is not fail-safe (= "double fault safety"), but only operationally safe (="single fault safety"), a differential pressure switch of the Ex p safety equipment must be used to signal if the sample gas pressure exceeds the purging gas pressure. This measure initiates a safety shutdown.
  With occasionally flammable sample gas mixtures, flame arrestors must be additionally mounted externally at the sample gas inlet and outlet of the analyzer (for OXYMAT and CALOMAT).
  Both the differential pressure switch and the flame arrestors come into contact with the sample gas and must therefore be made of corrosion-proof material, if applicable.
  Design examination certificate: PTB 00 ATEX 2022 X
  Device identification: II 2 G Ex px [ia] IIC T4
- *Flameproof enclosure with continuous purging*
  The principle of this type of protection is based on having continuous purging of the Ex p enclosure after the pre-purge. It prevents ingress of the surrounding atmosphere and ensures that, for example, sample gas released through leaks is thinned to the extent that a combustible mixture cannot be created. The volume flow of the protective gas is fixed at 1 l/min and exceeds the maximum release volume by a factor of more than 100.
  Protective gas flows continuously through the enclosure with a volume flow of at least 1 l/min; in addition, the flow ensures that the enclosure pressure is increased to at least 50 Pa (recommended 5 hPa) higher than the surrounding pressure.
  The max. permissible purging gas pressure is 165 hPa. The max. permissible sample gas pressure is equivalent to the permissible analyzer sample gas pressure.
  Type examination certificate: TÜV 01 ATEX 1708 X
  Device identification: II 2 G Ex px ia [ia] IIC T6 or T4 or T3 Gb.

The purging gas is monitored using Ex p monitoring equipment: This is a stand-alone unit which is connected electrically and pneumatically to the analyzer. Explosion protection is only provided when both devices are combined (analyzer and purging unit, and possibly further measures) (see below).

Category ATEX II 3G (Ex zone 2)

The principle of the type of protection "Flameproof enclosure for devices of Category 3" is based on preventing the ingress of any hazardous atmosphere into the gas analyzer.

Two versions complying with Directive 2014/34/EU (94/9/EC) are available for use in Zone 2.

- *Explosion protection due to gas-fume-proof enclosure*
  The enclosure is sealed sufficiently to prevent the ingress of gas fumes. With this type of protection, only sample gases may be fed in which are below the LEL (25% of the LEL).
  Design examination certificate: TÜV 01 ATEX 1686 X
  Device identification: II 3 G Ex nR IIC T6 or T4 Gc
  It is not necessary to install a purging unit here.
- *Flameproof enclosure with continuous purging*
  Protective gas continuously flows through the enclosure with a volume flow of at least 1 l/min; furthermore, the flow results in an overpressure in the enclosure of at least 50 Pa (recommended 5 hPa) compared to atmospheric pressure.
  The max. permissible purging gas pressure is 165 hPa. The max. permissible sample gas pressure is equivalent to the permissible analyzer sample gas pressure.
  Type examination certificate: TÜV 01 ATEX 1697 X
  Device identification: II 2/3 G Ex pz [ia Ga] IIC T6 or T4 or T3 Gb/Gc
  The purging gas is monitored using Ex p monitoring equipment. This is a stand-alone unit which is connected electrically and pneumatically to the analyzer. Explosion protection is only provided when these two units (analyzer and purging unit) are combined. (See Purge unit below)
  The electronics of the analyzer may be exempt from the simplified flameproof enclosure. Multiple simplified flameproof enclosures may be pneumatically installed in series if required.

Category ATEX II 3D (Ex zone 22)

Zone 22 concerns the so-called dust protection. This is the European successor to the previous German zone 11. Zone 22 concerns the area in which, during normal operation, it is *not* expected that potentially explosive atmospheres occur in the form of a cloud of flammable dust in the air. Should such a cloud occur, however, *then only briefly*.

Type examination certificate TÜV 03 ATEX 2278 X.
They receive the Ex marking II 3D IP65 T60°C or T65°C or T82°C or T130°C.

With this type of protection, only sample gases may be fed in which are below the LEL (25 % of the LEL).

Purging requirements for the USA and Canada

The continuous analyzers from Siemens with approvals for Class I, Div. 2 never require purging in a hazardous area in accordance with Class I, Div. 2 / Zone 2 under the aspect of area classification. All electronic and mechanical components are classified as "non-explosive" and can be used in environments in accordance with Class I, Div. 2 / Zone 2. However, purging may be necessary for a specific application, depending on the type of sample gas and the respective analyzer model in order to comply with the NEC and NFPA standards and to guarantee maximum possible safety as well as protection of the system. Additional measures are required in this case in coordination with the supervising authority:

NFPA 496 requirements for continuous gas analyzers and systems from Siemens

The NFPA 496 "Standard for Purged and Flameproof Enclosures for Electrical Equipment" describes in great detail and clarity the requirements for purging and for the flameproof enclosure for electric systems depending on 1) the external hazardous area classification, 2) the classification/grading of the system, 3) the type of gas in the gas path, and 4) the expected discharge of gas (none/limited/unlimited).

It is assumed for the internal gas path of a continuous gas analyzer that it exhibits only low losses under normal conditions and uncontrolled losses in the case of a mechanical failure (abnormal conditions).

When connecting gases with flammable components (> LEL) to the gas path of an analyzer with a hermetically sealed enclosure, the flammable component can become enriched in the inside of the analyzer enclosure – even under normal conditions – beyond a limit for continuous explosiveness and change the area classification (inside the analyzer enclosure) from "General Purpose" (Universal) or Class I, Div. 2 / Zone 2 to Class I, Div. 1 / Zone 0. This can also occur under abnormal conditions in any type of analyzer enclosure (including NEMA 1).

Analyzers for installation in the field – O6F, U6F and C6F – have a sealed enclosure (IP65 / NEMA 4 equivalent in accordance with IEC/EN 60529 and NEMA Standards Publication 250). Only a small natural exchange of air takes place with the environment. In accordance with NFPA 496, a limited discharge of gas is to be expected under normal conditions, and an unlimited discharge under abnormal conditions.

Analyzers for 19" rack mounting – O6E, U6E, U/O6, C6E, U23, O61, O64 and FID6 – have an "open" enclosure (IP20 in accordance with IEC/EN 60529, no exact NEMA equivalent for IP20 available). A high natural exchange of air takes place with the environment unless the exchange is restricted. In accordance with NFPA 496, no discharge of gas is to be expected under normal conditions, but an unlimited discharge under abnormal conditions.

In the case of analyzers designed for general applications, it is assumed that they can ignite an explosive gas mixture at any time, and therefore no type of explosive atmosphere whatsoever may be present in the vicinity of these analyzers or within the enclosure at any time.

It is assumed that devices designed for Class I, Div. 2 / Zone 2 devices cannot ignite an explosive gas mixture under normal conditions (single fault safety), and these analyzers can therefore be used in an occasionally explosive atmosphere in the environment or within the enclosure in accordance with the definition of Class I, Div. 2 / Zone 2. However, a frequent or permanent explosive atmosphere must be avoided since a simultaneous fault occurring on the electrical components of the analyzer could constitute an ignition source.

When purging a continuous gas analyzer or when purging/venting a continuous gas analyzer system suitable for Class I, Div. 2 / Zone 2 with instrument air or ambient air, and if failure of the safety vessel is not obvious, a leak detector (measurement in % of LEL) or similar equipment should be used in order to detect unlimited discharges under abnormal conditions and to avoid a frequent or permanent explosive atmosphere inside the analyzer or in its environment. The leak detector must be fitted at a location where the escaping sample gas can be measured before becoming too greatly diluted. The alarm limit of the leak detector must be set to a level which enables detection of a dangerous state with consideration of the fact that the discharged sample gas has most probably already been diluted before it reaches the sensor.

Use of SIPROCESS GA700 in hazardous areas

Dependent on the application, the measuring equipment can include the following parts:

- Oxygen analyzer with Ex approval
- Ex p monitoring equipment (purging unit)
- Flame arrestors with Ex approval

Gas analyzers

Performance-tested SIPROCESS GA700 analyzers can be chosen for measuring oxygen in hazardous areas.

The SIPROCESS GA700 analyzers are approved in the 19" rack unit enclosure version designed according to Ex type of protection Non-sparking "Ex nA". The analyzer must be installed in an enclosure that meets the requirements of type of protection "Ex nA" according to EN/IEC 60079-0 and EN/IEC 60079-15.

The OXYMAT 7 is approved in the "wall enclosure" version in accordance with Ex type of protection flameproof enclosure "Ex p" for Zone 1 and Zone 2.

In addition, these analyzers must be connected to monitoring equipment which must also be suitability-tested.

Following pre-purging of 10 minutes, the monitoring equipment ensures that no gas fumes can enter the enclosure, and accumulation of the sample gas in the enclosure is prevented. The volume flow during the pre-purging phase is > 60 Nl/min. The protective gas is usually fed into the analyzer enclosure from a supply network via the monitoring equipment.

A flameproof enclosure is not required in type of protection gas-fume-proof enclosure "Ex n R" for Zone 2 for the measurement of gases whose composition always remains below the lower explosive limit (25 % of LEL).

With the Ex-d field device, Siemens presents an ATEX-approved and IECEx-approved analyzer for Zone 1. The field device comprises a field control unit and a field module.

The field control unit is approved in type of protection Flameproof Enclosure "Ex d" with integrated electronics, a connection enclosure in type of protection Increased safety "Ex e" and a keyboard with type of protection Intrinsic safety "Ex i". The field module with the module is certified for the explosion protection type Flameproof Enclosure "Ex d".

Category ATEX II 2G and IECEx (Ex Zone 1)

Two enclosure variants complying with Directive 2014/34/EU (94/9/EC) are available for use in Zone 1.

- *Flameproof enclosure with continuous purging with px monitoring system*
  The principle of this type of protection is based on having continuous purging of the Ex p enclosure after the pre-purge. It prevents ingress of the surrounding atmosphere and ensures that, for example, sample gas released through leaks is thinned to the extent that a combustible mixture cannot be created. The volume flow of the protective gas is fixed at 1 l/min and exceeds the maximum release volume by a factor of more than 100.
  Protective gas flows continuously through the enclosure with a volume flow of at least 1 Nl/min; in addition, the flow ensures that the enclosure pressure is increased to at least 50 Pa (recommended 5 hPa) higher than the surrounding pressure. The maximum permissible purging gas pressure is 110 hPa. The maximum permissible sample gas pressure for non-combustible gases is 3 000 hPa (abs.), but for occasionally explosive gases (Zone 1 gases) only 1 100 hPa (abs.).
  - Type examination certificate: BVS 14 ATEX E 153
  - IECEx Declaration of Conformity: IECEx BVS 14.0104X
  - Analyzer ID: II 2G Ex pxb ib IIC T4 Gb (in conjunction with a px monitoring system)
    The purging gas is monitored using Ex p monitoring equipment: This is a stand-alone unit which is connected electrically and pneumatically to the analyzer. Explosion protection is only provided when both devices are combined (analyzer and purging unit, and possibly further measures).
- *Ex-d field device*
  The gas analyzer is provided for the analysis of non-combustible and combustible gases.
  Ignitable parts are located in an enclosure which is designed such that, in the event of an ignition, flashover of the explosion into the environment is prevented.
  The maximum permissible sample gas pressure for non-combustible gases is 3 000 hPa (abs.), but for combustible and occasionally explosive gases (Zone 1 gases) only 1 100 hPa (abs.).
  - EC type test certificate: BVS 15 ATEX E 038 X
  - IECEx Declaration of Conformity: IECEx BVS 15.0030X
  - Analyzer ID: II 2G Ex db e ib IIC T4 Gb

Category ATEX II 3G and IECEx (Ex Zone 2)

The principle of the type of protection "Flameproof enclosure for devices of Category 3" is based on preventing the ingress of any hazardous atmosphere into the gas analyzer, or for the rack unit, avoiding any potential ignition sources in the device.

Three enclosure variants complying with Directive 2014/34/EU (94/9/EC) are available for use in Zone 2.

- *19" rack unit, type of protection Non-sparking "Ex nA"*
  The analyzer does not generate any sparks during normal operation. It must be installed in an enclosure that meets the requirements of type of protection "Ex nA" according to EN/IEC 60079-0 and EN/IEC 60079-15. Enclosure und analyzer must comply with at least IP54 when assembled.
  - Type examination certificate: BVS 15 ATEX E 007 X
  - IECEx Declaration of Conformity: IECEx BVS 15.0007X
  - Analyzer ID: II 3G Ex nA nC ic IIC T4 Gc
- *Explosion protection through gas-fume-proof enclosure "Ex nR"*
  The wall enclosure is sealed sufficiently to prevent the ingress of gas fumes. With this type of protection, only sample gases may be fed in which are below the LEL (25 % of the LEL). It is not necessary to install a purging unit here.
  - Type examination certificate: BVS 14 ATEX E 153X
  - IECEx Declaration of Conformity: IECEx BVS 14.0104X
  - Analyzer ID: II 3G Ex nR ib IIC T4 Gc
- *Flameproof enclosure with continuous purging with pz monitoring system*
  Protective gas continuously flows through the wall enclosure with a volume flow of at least 1 Nl/min; furthermore, the flow results in an overpressure in the enclosure of at least 50 Pa (recommended 5 hPa) compared to atmospheric pressure. The maximum permissible purging gas pressure is 110 hPa. The maximum permissible sample gas pressure for non-combustible gases is 3 000 hPa (abs.), but for combustible and occasionally explosive gases (Zone 1 gases) only 1 100 hPa (abs.).
  - Type examination certificate: BVS 14 ATEX E 153 X
  - IECEx Declaration of Conformity: IECEx BVS 14.0104X
  - Analyzer ID: II 3G Ex pzc ib IIC T4 Gc (in conjunction with a pz monitoring system)
    The purging gas is monitored using Ex p monitoring equipment. This is a stand-alone unit which is connected electrically and pneumatically to the analyzer. Explosion protection is only provided when both devices are combined (analyzer and purging unit, and possibly further measures). In the case of combustible sample gases or sample gases above the LEL (25 % of the LEL), a px purge must be used.

Category ATEX II 3D (Ex Zone 22)

Zone 22 concerns the area in which, during normal operation, it is *not* expected that potentially explosive atmospheres occur in the form of a cloud of flammable dust in the air. Should such a cloud occur, however, *then only briefly*.

- Type examination certificate: BVS 14 ATEX E 153 X
- IECEx Declaration of Conformity: IECEx BVS 14.0104X

Analyzer ID:

- II 3D Ex pxb ib IIIC T65°C Dc (in conjunction with a px monitoring system)
  Only combustible and occasionally explosive gases may be fed in.
- II 3D Ex pzc ib IIIC T65°C Dc (in conjunction with a pz monitoring system)
- II 3D Ex tc ib IIIC T65°C Dc
  With these two types of protection, only sample gases may be fed in which are below the LEL (25 % of the LEL).

Additional safety mechanisms for continuous gas analyzers for measuring explosive gases (internal explosion protection)

Although the IEC and EN directives IEC 60079-10, EN 60079-10 (gas) do not specifically define the terms seldom, occasional, frequent, and permanent, the following interpretation is customary:

- Frequent or continuous: > 1 000 hours per year
  → a frequent explosive atmosphere corresponds to Zone 0 or Class I, Div. 1
- Occasional: 10 to 1 000 hours per year
  → an occasional explosive atmosphere corresponds to Zone 1 or Class I, Div. 1
- Seldom: < 10 hours per year
  → a rarely explosive atmosphere corresponds to Zone 2 or Class I, Div. 2

The following additional safety mechanisms are recommended for continuous gas analyzers for measuring explosive gases (internal explosion protection). These requirements are based on the European ATEX approvals for analyzers.

Categories of explosive gases	Analyzer		
	ULTRAMAT 6F	**OXYMAT 6F**	**CALOMAT 6/62F** **CALOMAT 6E**
Seldom explosive (Zone 2 Gas): < 10 hours per year	No action	Flame arrestors	Flame arrestors
Occasionally explosive (Zone 1 Gas): 10 … 1 000 hours per year	No action	Flame arrestors	Flame arrestors
Frequently or permanently explosive (Zone 0 Gas): > 1 000 hours per year	Not permitted	Not permitted	Not permitted

Categories of explosive gases	Analyzer		
	OXYMAT 7 (19" rack unit)	**OXYMAT 7 (19" wall-mounted device)**	**OXYMAT 7 (19" field unit)**
Seldom explosive (Zone 2 Gas): < 10 hours per year	Installation in a suitable enclosure (IP54)	Flame arrestors	Flame arrestors (integrated)
Occasionally explosive (Zone 1 Gas): 10 … 1 000 hours per year	Not permitted	Flame arrestors	Flame arrestors (integrated)
Frequently or permanently explosive (Zone 0 Gas): > 1 000 hours per year	Not permitted	Not permitted	Not permitted

Further important information

Material of gas paths

It is strongly recommended that you use gas paths made of metal for applications with flammable gases since such gas paths offer the greatest safety. This particularly applies to analyzers or systems which are purged with instrument air or ambient air since an explosive atmosphere can be produced under abnormal conditions.

Additional reasons for purging analyzers

- Corrosive sample gases: Purging with air or inert gas is necessary to prevent the enrichment of corrosive gas inside the analyzer, whereby operators or servicing personnel could be injured or the analyzer unit could be damaged. The discharged purging gas should be released at a non-critical point (collective vent etc.)
- Toxic gases: Purging with air or inert gas is necessary to prevent the enrichment of toxic gas inside the analyzer, whereby operators or servicing personnel could be injured. The discharged purging gas should be released at a non-critical point (collective vent etc.) Further information can be found in the OSHA directives for handling toxic materials.

Application

Differentiation of cases: Ex zones/danger through flammable sample gas (Series 6)

Zone		Gas type: Sample gas non-flammable below the lower explosive limit LEL (25% of LEL)	Gas type: Sample gas is flammable and/ or is rarely, and then only briefly, above the LEL (25% of LEL)	Gas type: Sample gas is flammable and/ or is occasionally above the LEL (25% of LEL)
Category ATEX II 1G (Zone 0)		Not permitted	Not permitted	Not permitted
Category ATEX II 2G (Zone 1)	Analyzer	Ex analyzer Ex p (certificate ATEX 2022X)	Ex analyzer Ex p (certificate ATEX 2022X)	Ex analyzer Ex p (certificate ATEX 2022X)
	Gas path	Pipe gas path	Pipe gas path	Pipe gas path
	Flame arrestor	—	Flame arrestor in sample gas inlet and outlet	Flame arrestor in sample gas inlet and outlet
	Monitoring	Ex p purging unit (certificate ATEX E 082)	Ex p purging unit sample gas pressure < 165 hPa, fail-safe (certificate ATEX E 082)	Ex p purging unit sample gas pressure < 165 hPa, fail-safe (certificate ATEX E 082)
	Pressure switch	—	Differential pressure switch (when sample gas pressure is not controlled fail-safely)	Differential pressure switch (when sample gas pressure is not controlled fail-safely)
Category ATEX II 2G (zone 1)	Analyzer	Ex analyzer Ex p (certificate ATEX 1708X)	Ex analyzer Ex p (certificate ATEX 1708X)	Ex analyzer Ex p (certificate ATEX 1708X)
Operating mode "Continu-ous purging"	Gas path	Pipe gas path	Pipe gas path	Pipe gas path
	Flame arrestor	—	Flame arrestor in sample gas inlet and outlet	Flame arrestor in sample gas inlet and outlet
	Monitoring	Ex p purging unit (certificate DMT 99 ATEX E 082)	Ex p purging unit (certificate DMT 99 ATEX E 082)	Ex p purging unit (certificate DMT 99 ATEX E 082)
	Pressure switch	—	—	—
Category ATEX II 3G (zone 2)	Analyzer	Standard analyzer in field hous-ing (addition E11: certificate ATEX 1686X)	Standard analyzer in field hous-ing (addition E12: certificate ATEX 1697X)	Standard analyzer in field hous-ing (addition E12: certificate ATEX 1697X)
	Gas path	Pipe or hose gas path	Pipe gas path	Pipe gas path
	Flame arrestor	—	Flame arrestor in sample gas inlet and outlet	Flame arrestor in sample gas inlet and outlet
	Monitoring	—	Ex p control device (certificate DMT 99 ATEX E 082)	Ex p control device (certificate DMT 99 ATEX E 082)
Non-hazardous zone	Analyzer	Analyzer as rack unit or in field housing	Analyzer as rack unit or in field housing	Analyzer as rack unit or in field housing
	Gas path	Pipe or hose gas path	Pipe gas path, recommended Enclosure purging with inert gas (N_2) recommended	Pipe gas path, recommended Enclosure purging with inert gas (N_2) recommended
	Flame arrestor	—	Flame arrestor in sample gas inlet and outlet	Flame arrestor in sample gas inlet and outlet
	Monitoring	—	—	Simplified monitoring of purging recommended

Ex configurations – principle selection criteria (Series 6)

	Signal line routing: Within zone 1	Signal line routing: From zone 1 to zone 2	Signal line routing: From zone 1 to non-hazardous zone
Ex i isolating transformer	Required	Required under certain conditions (when energy feedback cannot be excluded)	Required under certain conditions (when energy feedback cannot be excluded)
Isolating relay	Required	Required under certain conditions (when energy feedback cannot be excluded)	Required under certain conditions (when energy feedback cannot be excluded)

Additional units, selection criteria (ATEX 2G)

Differentiation of cases: Ex zones/danger through flammable sample gas (OXYMAT 7)

Wall-mounted device

Zone		Gas type: Sample gas non-flammable below the lower explosive limit LEL (25% of LEL)	Sample gas is flammable and/or is rarely, and then only briefly, above the LEL (25% of LEL)	Sample gas is flammable and/or is occasionally above the LEL (25% of LEL)
Category ATEX II 1G (Zone 0)		Not permitted	Not permitted	Not permitted
Category ATEX II 2G (Zone 1) Operating mode "continuous purging"	Analyzer	Ex analyzer Ex p (Certificate BVS 14 ATEX E 153 X and IECEx BVS 14.0104X)	Ex analyzer Ex p (Certificate BVS 14 ATEX E 153 X and IECEx BVS 14.0104X)	Ex analyzer Ex p (Certificate BVS 14 ATEX E 153 X and IECEx BVS 14.0104X)
	Flame arrestor	Not required	Flame arrester in sample gas and reference gas paths:	Flame arrester in sample gas and reference gas paths:
	Monitoring	Permitted px monitoring system	Permitted px monitoring system	Permitted px monitoring system
Category ATEX II 3G (Zone 2) Operating mode "continuous purging"	Analyzer	Ex analyzer Ex p (Certificate BVS 14 ATEX E 153 X and IECEx BVS 14.0104X)	Corresponds to ATEX II 2G (zone 1)	Corresponds to ATEX II 2G (zone 1)
	Flame arrestor	Not required		
	Monitoring	Permitted pz monitoring system		
Category ATEX II 3G (Zone 2) Operating mode "gas-fume-proof"	Analyzer	Ex analyzer Ex nR (Certificate BVS 14 ATEX E 153/154 X and IECEx BVS 14.0104X)	Not permitted	Not permitted
	Flame arrestor	Not required	Not required	Not required

Ex configurations – principle selection criteria

Field device

Zone		Gas type: Sample gas non-flammable below the lower explosive limit LEL (25% of LEL)	Sample gas is flammable and/or is rarely, and then only briefly, above the LEL (25% of LEL)	Sample gas is flammable and/or is occasionally above the LEL (25% of LEL)
Category ATEX II 1G (Zone 0)		Not permitted	Not permitted	Not permitted
Category ATEX II 2G (Zone 1) Operating mode "pressurized enclosure"	Analyzer	Ex analyzer Ex d (Certificate BVS 15 ATEX E 038 X and IECEx BVS 15.0030X)	Ex analyzer Ex d (Certificate BVS 15 ATEX E 038 X and IECEx BVS 15.0030X)	Ex analyzer Ex d (Certificate BVS 15 ATEX E 038 X and IECEx BVS 15.0030X)
	Flame arrestor	Integrated	Integrated	Integrated

Ex configurations – principle selection criteria

Rack-mounted device

Zone		Gas type: Sample gas non-flammable below the lower explosive limit LEL (25% of LEL)	Sample gas is flammable and/or is rarely, and then only briefly, above the LEL (25% of LEL)	Sample gas is flammable and/or is occasionally above the LEL (25% of LEL)
Category ATEX II 1G (Zone 0)		Not permitted	Not permitted	Not permitted
Category ATEX II 2G (Zone 1)		Not permitted	Not permitted	Not permitted
Category ATEX II 3G (Zone 2) Type of protection "nA"	Analyzer (Installation in a suitable enclosure IP54)	Ex analyzer Ex nA (Certificate BVS 15 ATEX E 007 X and IECEx BVS 15.0007X)	Ex analyzer Ex nA (Certificate BVS 15 ATEX E 007 X and IECEx BVS 15.0007X)	Not permitted
	Flame arrestor	Not required	Required	Not permitted

Ex configurations – principle selection criteria

6

Use of OXYMAT 6 in hazardous area and/or for measurement of flammable gases

		Article No.	Certification (short codes)		Additional unit				
			Gas	Dust	Purging unit	Flame arrestor	Pressure switch	Ex i isolating transformer	Ex i isolating relay
Category	**Operating mode**		**Ex zone**	**Ex zone**	**7MB8000-**	**7MB8000-**	**7MB8000-**	**7MB8000-**	**7MB8000-**
ATEX II 2G (Zone 1)	Leakage compensation	7MB2011-***0*-2***	X	—	2BB	6BA/6BB[1]	5AA[1]	3AB[1]	4AB[1]
		7MB2011-***0*-3***	X	—	2BA	6BA/6BB[1]	5AA[1]	3AB[1]	4AA[1]
	Continuous purging	7MB2011-***0*-6***	X	—	2CB	6BA/6BB[1]	o	3AB[1]	4AB[1]
		7MB2011-***0*-7***	X	—	2CA	6BA/6BB[1]	o	3AB[1]	4AA[1]
ATEX II 3G (Zone 2)	Flammable gases	7MB2011-***0*-0***	E12	—	2CB	6BA/6BB[1]	o	o	o
		7MB2011-***0*-1***	E12	—	2CA	6BA/6BB[1]	o	o	o
		7MB2011-***0*-0***	E42[3]		—	6BA/6BB[1]	o	o	o
		7MB2011-***0*-1***	E42[3]		—	6BA/6BB[1]	o	o	o
	Non-flammable gases	7MB2011-***0*-0***	E11	—	o	o	o	o	o
		7MB2011-***0*-1***	E11	—	o	o	o	o	o
		7MB2011-***0*-0***	E41		—	o	o	o	o
		7MB2011-***0*-1***	E41		—	o	o	o	o
Non-hazardous zone	Non-hazardous gas zone	7MB2011-***0*-0***	E40		—	o	o	o	o
		7MB2011-***0*-1***	E40		—	o	o	o	o
		7MB2011-***0*-0***	—	—	o	o	o	o	o
		7MB2011-***0*-1***	—	—	o	o	o	o	o
		7MB2021-****0-****	X	—	o	o	o	o	o
CLASS 1 Div 2	Flammable and non-flammable gases	7MB2011-***0*-0***	E20	—	1AA	6BA/6BB	o	o	o
		7MB2011-***0*-1***	E20	—	1AA	6BA/6BB	o	o	o
		7MB2021-*****-****[2]	E20	—	1AA	6BA/6BB	o	o	o

— Combination not allowed

X Possible combination, no additional data required

o Not required

Ex configurations, possible combinations

[1] Required under certain conditions: see table of Ex configurations, selection criteria
[2] Installation in additional housing required
[3] It is prohibited to purge the analyzer when it is used in Ex zone 22

6

Use of ULTRAMAT 6 in hazardous area and/or for measurement of flammable gases

		Article No.	Certification and short codes		Additional unit				
			Gas	Dust	Purging unit	Flame arrestor	Pressure switch	Ex i isolating transformer	Ex i isolating relay
Category	**Operating mode**	**7MB2111- 7MB2112-**	**Ex zone**	**Ex zone**	**7MB8000-**	**7MB8000-**	**7MB8000-**	**7MB8000-**	**7MB8000-**
ATEX II 2G (Zone 1)	Leakage compensation	*****-2*A*	X	—	2BB	—	5AA[1]	3AB[1]	4AB[1]
		*****-3*A*	X	—	2BA	—	5AA[1]	3AB[1]	4AA[1]
	Continuous purging	*****-6*A*	X	—	2CB	—	o	3AB[1]	4AB[1]
		*****-7*A*	X	—	2CA	—	o	3AB[1]	4AA[1]
ATEX II 3G (Zone 2)	Flammable gases	*****-0*A*	E42[4]		—	—	o	o	o
		*****-1*A*	E42[4]		—	—	o	o	o
		*****-0*A*	E12	—	2CB	o	o	o	o
		*****-1*A*	E12	—	2CA	o	o	o	o
	Non-flammable gases	*****-0*A*	E41		—	o	o	o	o
		*****-1*A*	E41		—	o	o	o	o
		*****-0*A*	E11	—	o	o	o	o	o
		*****-1*A*	E11	—	o	o	o	o	o
Non-hazardous zone	Non-hazardous gas zone	*****-0*A*	X	E40	—	o	o	o	o
		*****-1*A*	X	E40	—	o	o	o	o
CLASS 1 Div 2	Flammable and non-flammable gases	7MB2111- *****-0*A*	E20	—	1AA[3]	6BA/6BB[3]	o	o	o
		7MB2111- *****-1*A*	E20	—	1AA[3]	6BA/6BB[3]	o	o	o
		7MB212*- *****-****[2]	E20	—	1AA[3]	6BA/6BB[3]	o	o	o

— Combination not allowed

X Possible combination, no additional data required

o Not required

1) Required under certain conditions; see table of Ex configurations, selection criteria.
2) Installation in additional housing required
3) When using flammable gases, only in coordination with relevant authority
4) It is prohibited to purge the analyzer when it is used in Ex zone 22

6

Use of CALOMAT 6 in hazardous area and/or for measurement of flammable gases

		Article No.	Certification		Additional unit				
			Gas	Dust	Purging unit	Flame arrestor	Pressure switch	Ex i isolating transformer	Ex i isolating relay
Category	**Operating mode**				**7MB8000-**	**7MB8000-**	**7MB8000-**	**7MB8000-**	**7MB8000-**
ATEX II 2G (Zone 1)	Leakage compensation	7MB2511-***0*-0AE*	X	—	2BB	6BA/6BB[1]	5AA[1]	3AB[1]	4AB[1]
		7MB2511-***0*-1AE*	X	—	2BA	6BA/6BB[1]	5AA[1]	3AB[1]	4AA[1]
	Continuous purging	7MB2511-***0*-0AF*	X	—	2CB	6BA/6BB[1]	o	3AB[1]	4AB[1]
		7MB2511-***0*-1AF*	X	—	2CA	6BA/6BB[1]	o	3AB[1]	4AA[1]
ATEX II 3G (Zone 2)	Flammable gases	7MB2511-***0*-*AJ*	X	X[4]	—	6BA/6BB[1]	o	o	o
		7MB2511-***0*-*AC*	X	—	2CA/2CB	6BA/6BB[1]	o	o	o
		7MB2521-***0*-*AB*[2]	X	—	In accord. w/ certificate	6BA/6BB[1]	o	o	o
	Non-flammable gases	7MB2511-***0*-*AH*	X	X[4]	—	o	o	o	o
		7MB2511-***0*-*AB*	X	—	o	o	o	o	o
		7MB2521-***0*-*AB*	X	—	o	o	o	o	o
Non-hazardous zone	Non-hazardous gas zone	7MB2511-***0*-*AG*	—	X[4]	—	o	o	o	o
CLASS 1 Div 2	Flammable and non-flammable gases	7MB2511-***0*-*AD*	X	—	1AA[3]	6BA/6BB[3]	o	o	o
		7MB2521-***0*-*AD*[2]	X	—	1AA[3]	6BA/6BB[3]	o	o	o

X Possible combination, no additional data required

— Combination not allowed

o Not required

Ex configurations, possible combinations

1) Required under certain conditions; see table of Ex configurations, selection criteria
2) Installation in additional housing required
3) When using flammable gases, only in coordination with relevant authority
4) It is prohibited to purge the analyzer when it is used in Ex zone 22

6

Use of ULTRAMAT 23 in hazardous area and/or for measurement of flammable gases

		Article No.	Certification and short codes		Additional unit				
			Gas		Dust	Purging unit	Flame arrestor	Pressure switch	Ex i isolating transformer
Category	**Operating mode**	**7MB233*-**	**Ex zone**	**Ex zone**	**7MB8000-**	**7MB8000-**	**7MB8000-**	**7MB8000-**	**7MB8000-**
ATEX II 3G (zone 2)	Non-flammable gases [2]	*****-****	E20	—	o	o	o	o	o
CLASS 1 Div 2	Non-flammable gases [2]	*****-****	E20	—	o	o[1]	o	o	o

— Combination not allowed

o Not required/not defined

[1] Required under certain conditions
[2] Installation in additional housing required

Use of OXYMAT 7 in hazardous area and/or for measurement of flammable gases

			Certification		Additional unit	
			Gas	Dust	Purging unit	Flame arrestor
Category	**Operating mode**	**Article No.**	**Ex zone**	**Ex zone**		**7MB8000-**
Zone 1	Wall-mounted device Ex p Flammable gases	7MB3000-(3/4)C*0*-**(E/G)0 7MB3020-2**10-*AA0	X	X[1]	px monitoring system	6BA/6BB
	Field device Ex d Flammable gases	7MB3000-6CX00-(0/6)*H0 7MB3020-(4/5)(C/D)*10-1AA0	X	—	o	Integrated
Zone 2	Wall-mounted device Ex p Non-flammable gases	7MB3000-(3/4)C*0*-**(E/G)0 7MB3020-2(C/D)*10-*AA0	X	X[1]	pz monitoring system	o
	Wall-mounted device Ex nR Non-flammable gases	7MB3000-(3/4)C*0*-**(D/G)0 7MB3020-2(C/D)*10-*AA0	X	X[1]	o	o
	19" rack unit Ex nA [2] Flammable gases	7MB3000-0C*0*-**C0 7MB3020-2(C/D)*10-*AA0	X	—	—	o

— Combination not allowed

X Possible combination, no additional data required

o Not required/not defined

[1] Variant "G" only
[2] Installation in an IP54 enclosure in accordance with EN/IEC 60079-0 and EN/IEC 60079-15

6

Overview of the Ex certificates (Series 6)

		Ex approval						
		ATEX				**CLASS I Div 2**		**ATEX**
		2G-LC	**2G - CP**	**3G burn.**	**3G nbrn.**	**FM**	**CSA**	**3D (dust)**
		See base article number		**Z + E12**	**Z + E11**	**Z + E20**	**Z + E20**	**Z + E4X**
				except CALOMAT				**except CALOMAT**
Field device								
	U6F	ATEX 2022 X	ATEX 1708 X	ATEX 1697 X	ATEX 1686 X	3016050	1526657	ATEX 2278 X
	U6F-S	ATEX 2022 X	ATEX 1708 X	ATEX 1697 X	ATEX 1686 X	3016050	1526657	—
	O6F	ATEX 2022 X	ATEX 1708 X	ATEX 1697 X	ATEX 1686 X	3016050	1526657	ATEX 2278 X
	O6F-S	ATEX 2022 X	ATEX 1708 X	ATEX 1697 X	ATEX 1686 X	3016050	1526657	—
	C6F	ATEX 2022 X	ATEX 1708 X	ATEX 1697 X	ATEX 1697 X	3018862	1526660	ATEX 2278 X
	C6F-S	ATEX 2022 X	ATEX 1708 X	ATEX 1697 X	ATEX 1697 X	301162	1526660	—
	C62F	ATEX 2022 X	ATEX 1708 X	—	—	—	—	—
	C62F-S	ATEX 2022 X	ATEX 1708 X	—	—	—	—	—
19" rack unit								
	U6E	—	—	—		3016050	1526657	—
	U6E-S	—	—	—		3016050	1526657	—
	O6E	—	—	—		3016050	1526657	—
	O6E-S	—	—	—		3016050	1526657	—
	OU6E	—	—	—		3016050	1526657	—
	OU6E-S	—	—	—		3016050	1526657	—
	C6E	—	—	ATEX 1873 X		3018862	1526660	—
	C6E-S	—	—	ATEX 1873 X		3018862	1526660	—
	C62E	—	—	—		—	—	—
	C62E-S	—	—	—		—	—	—
	O61	—	—	—		—	—	—
	O64	—	—	—		—	—	—
	F6	—	—	—	(SET)	—	—	—
	U23	—	—	BVS 16 ATEX E 061 X		—	70059958	—
	U23 O2p	—	—	BVS 16 ATEX E 061 X		—	70059958	—
	U23 H2S	—	—	BVS 16 ATEX E 061 X		—	70059958	—

CP = Continuous Purging
LC = Leakage compensation
… -S = Special application
burn. = Flammable gases
nbrn. = Non-flammable gases
o = In progress

Possible combinations of PROFIBUS with Ex applications				
ATEX 2022 X	PROFIBUS PA Ex-i	FM/CSA	PROFIBUS PA or DP	
ATEX 1708 X	PROFIBUS PA Ex-i			
ATEX 1697 X	PROFIBUS PA Ex-i	ATEX 2278 X	PROFIBUS DP - Non-hazardous gas installation	(Z + E40)
ATEX 1686 X	PROFIBUS DP	ATEX 2278 X	PROFIBUS DP in combination ATEX 1686 X	(Z + E41)
ATEX 1873 X	PROFIBUS DP	ATEX 2278 X	PROFIBUS PA Ex-i in combination with ATEX 1697 X	(Z + E42)

More information

The certificates are available for download free-of-charge in various languages at:
http://www.siemens.com/processanalytics/documentation

Overview

Ex p safety equipment (purging unit)

The Ex p safety equipment to be connected to the analyzer must have at least the following features:

- Adjustable pre-purging phase; purging gas flow must be approximately 50 l/min
- Limitation of purging gas pressure during the pre-purging phase: < 165 hPa
- "Leakage compensation" or "Continuous purging"
- Connection for purging gas lines with Ø 10 mm or Ø 3/8" from and to the analyzer
- Pressure after pressure reducer
  - 0.2 to 0.4 MPa (leakage compensation)
  - 0.2 to 0.3 MPa (continuous purging)
- Max. permissible input pressure 0.6 MPa
- Relay contacts for all-pole isolation of the analyzer supply voltage
- Connection option for a key-operated switch and a pressure switch (intrinsically-safe circuits)
- Device version "Leakage compensation": Connection option for a pressure switch with intrinsically-safe scan

The Bartec control unit APEX 2003.SI meets the requirements for "Pressured enclosure with leakage compensation or continuous purging" in accordance with EN 60079 or ATEX guidelines, and can be used as explosion-proof equipment in Zones 1 and 2.

The purging unit ensures that in a closed enclosure, any explosive gases will be purged and then a pressure higher than the surrounding atmosphere will be generated and maintained.

A non-hazardous area is thus created in the enclosure in which electrical devices can be installed that are not themselves explosion-proof. After commissioning, a distinction is made between the pre-purging phase and the operating phase:

The pre-purging phase is necessary to ensure that any explosive atmposphere entering during the standstill time does not become a hazard; the enclosure must therefore be purged with protective gas (air from a non-hazardous area or inert gas) before commissioning.

Additional function

By connecting additional pressure sensors, the internal pressure of the enclosure is maintained at a pressure higher than that of the sample gas by means of a proportional valve. During the pre-purging phase the purging gas flow is max. 4 100 Nl/h with an internal enclosure pressure of 50 hPa.

4 programmable relay inputs (8 relay contacts) are available to separate the data lines.

During the operating phase, the pressure inside the enclosure must be maintained at a level at least 50 Pa higher than that of the surrounding atmosphere. If the internal pressure drops below the defined minimum value, safety equipment must shut down the entire electrical supply to the Ex-p enclosure autonomously (including the possible data lines).

Enclosures frequently contain accessories to which flammable gases or sometimes also flammable gas mixtures are fed via a separate gas path. This is the case with gas analyzers, for example. In this case, it must be ensured that the pressure of the protective gas is always more than 50 Pa higher than the pressure of the sample gas.

After mounting the control device APEX 2003.SI on the Ex-p enclosure, and after connecting the mains power and the protective gas, the control module regulates and monitors the flow of purging gas automatically during the pre-purging phase, and the internal enclosure pressure during the operating phase.

If the minimum operating pressure of the enclosure is exceeded and if flow through the pressure monitoring module is sufficient, the pressure sensors forward the sensor module signals to the control module.

Purging unit ATEX II 2G, leakage compensation

Overview

BARTEC Ex p purging unit "leakage compensation"

The APEX 2003.SI purging unit controls and monitors the pre-purging and operating phases of analyzers with containment systems in Ex zone 1.

Technical specifications

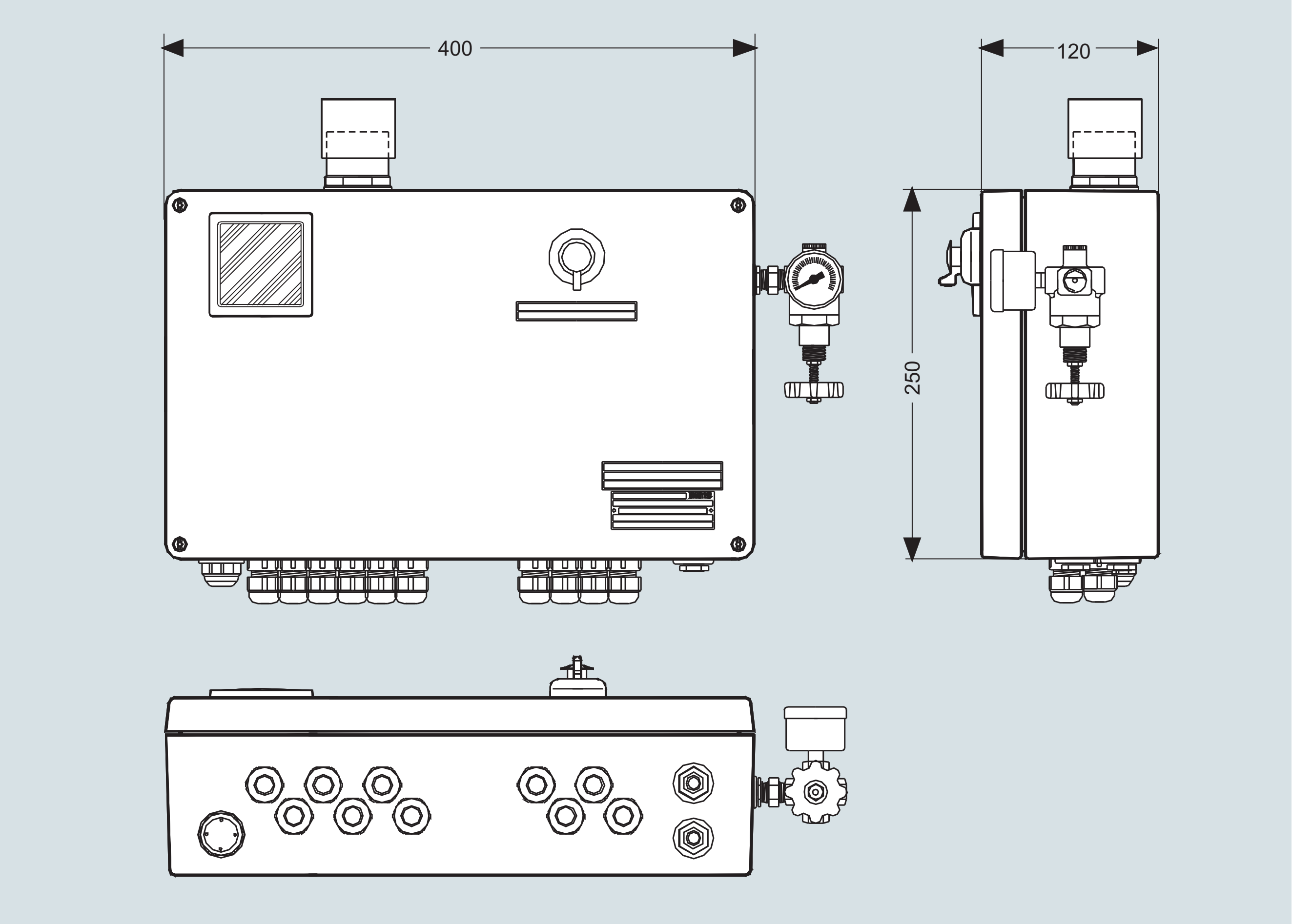
Guidelines	• EU EMC Guideline 89/336/EEC • EC low voltage, RL 73/23/EEC • ATEX directive 94/9/EC
Design	Explosion-protected enclosure (Ex e) with viewing window in the cover
Enclosure material	Glass fiber-reinforced polyester
Degree of protection	IP65
Terminals	2.5 mm, finely stranded
Pressure sensors	• MIN A = 0 … 300 hPa • MIN B = 0 … 300 hPa • MAX = 0 … 300 hPa • MAX 1 = 0 … 300 hPa • DIFF A = 0 … 25 hPa • DIFF B = 0 … 25 hPa
Prepurging time	0 … 99 min; 5 sec dropout delayed
Weight	14.5 kg

Electrical data	
Supply voltage	230 V AC (115 V AC) ± 10 %, 48 … 62 Hz
Power consumption	21 W /230 V
Relay contacts	K2/3; max. 250 V, 5 A with cos ϕ = 1, K4/K5; supply voltage or floating, max. 250 V, 5 A with cos ϕ = 1
Communication (for service only)	RS 485 interface
Temperature switching value (option)	0 … +40 °C
Explosion protection	
Marking	II 2(1)G Ex e d ib [ia Ga px] IIC T4 Gb
Design examination certificate	DMT 99 ATEX E 082
Ambient temperature	-20 … +40 °C

Selection and ordering data

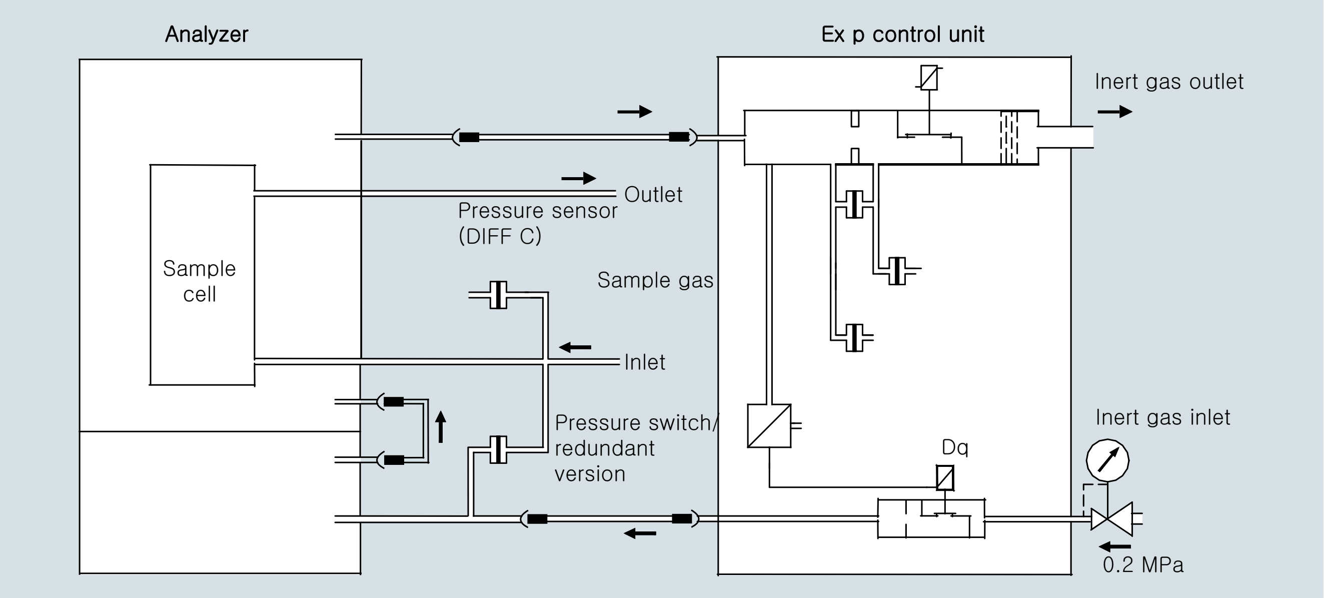
	Article No.
ATEX Category II 2G (zone 1)	
BARTEC Ex p purging unit, 230 V, "leakage compensation"	**7MB8000-2BA**
BARTEC Ex p purging unit, 115 V, "leakage compensation"	**7MB8000-2BB**

Dimensional drawings

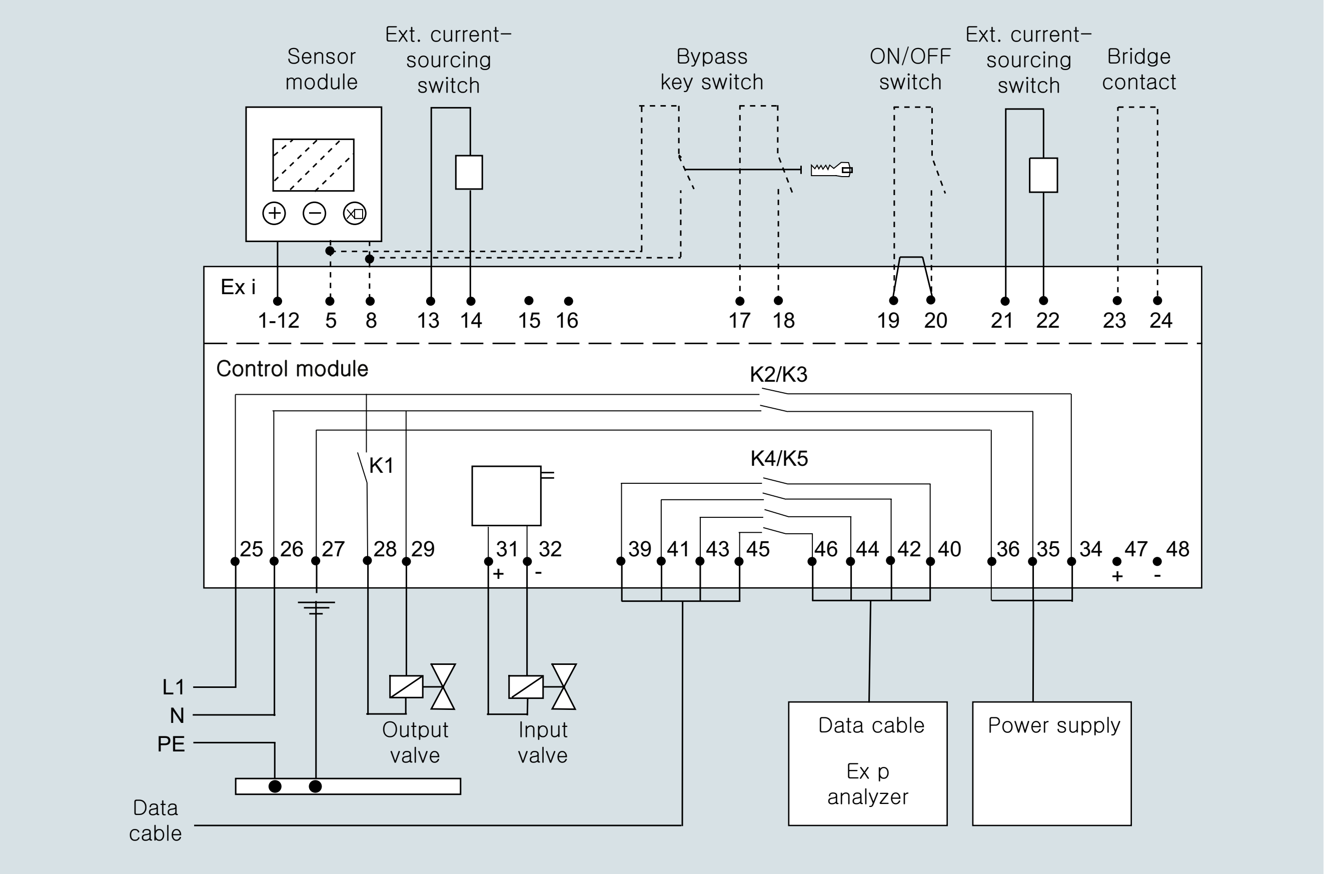


BARTEC purging unit, dimensions in mm

Circuit diagrams



BARTEC purging unit, leakage compensation, gas connection diagram



BARTEC purging unit, leakage compensation, electric connection diagram

Purging unit ATEX II 2G/3G, continuous purging

Overview

BARTEC Ex p purging unit "continuous purging"

The APEX 2003.SI purging unit controls and monitors the pre-purging and operating phases of analyzers with containment systems in Ex zone 1 and 2.

The purging unit redundantly monitors the continuous flow of protective gas through the connected analyzer and thereby dilutes any escaping sample gas to below the lower explosive limit (max. purging gas pressure 25 hPa).

At the same time, a higher pressure is maintained inside the Ex-p enclosure than in the surrounding atmosphere. If the flow of purging gas or the internal pressure falls below a determined minimum value, the supply voltage to the equipment in the flameproof enclosure is shut down.

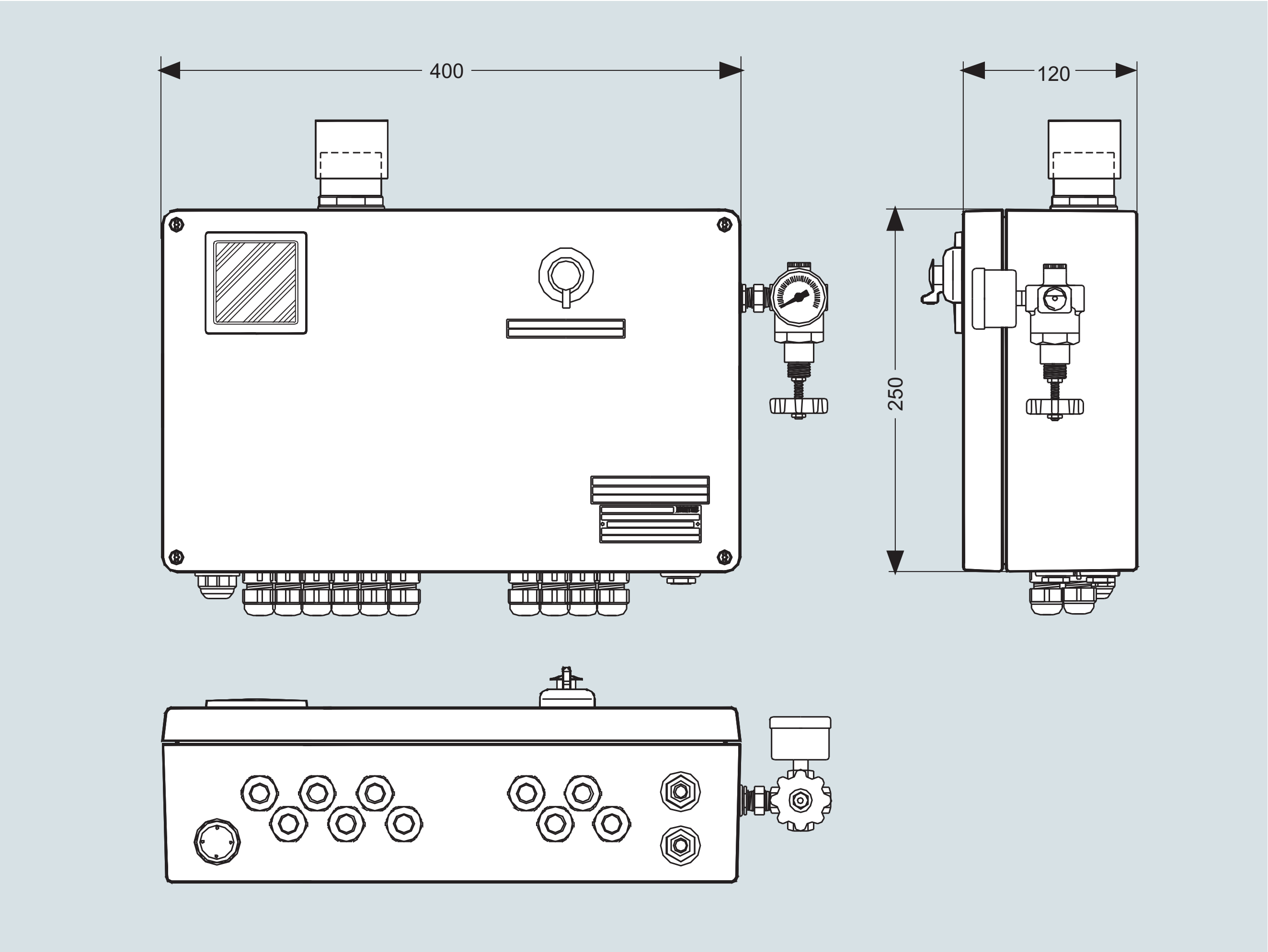
Technical specifications

Guidelines	• EU EMC Guideline 89/336/EEC • EC low voltage, RL 73/23/EEC • ATEX directive 94/9/EC
Design	Explosion-protected enclosure (Ex e) with viewing window in the cover
Degree of protection	IP65
Terminals	2.5 mm, finely stranded
Pressure sensors	• MIN A = 0 … 25 hPa • MIN B = 0 … 25 hPa • MAX = 0 … 25 hPa • MAX 1 = 0 … 25 hPa • DIFF A = 0 … 25 hPa • DIFF B = 0 … 25 hPa
Prepurging time	0 … 99 min; 5 sec dropout delayed
Weight	10.6 kg
Electrical data	
Supply voltage	230 V AC (115 V AC) ± 10 %, 48 … 62 Hz
Power consumption	15 W /230 V
Relay contacts	K2/3; max. 250 V, 5 A with cos ϕ = 1, K4/K5; supply voltage or floating, max. 250 V, 5 A with cos ϕ = 1
Communication (for service only)	RS 485 interface
Temperature switching value (option)	0 … +40 °C
Explosion protection	
Marking	II 2(1)G Ex de ib [ia Ga px] IIC T4 Gb
Design examination certificate	DMT 99 ATEX E 082
Ambient temperature	-20 … +40 °C

Selection and ordering data

	Article No.
ATEX Category II 2G (zone 1)/ Category II 3G (zone 2)	
BARTEC Ex p purging unit, 230 V, "continuous purging"	**7MB8000-2CA**
BARTEC Ex p purging unit, 115 V, "continuous purging"	**7MB8000-2CB**

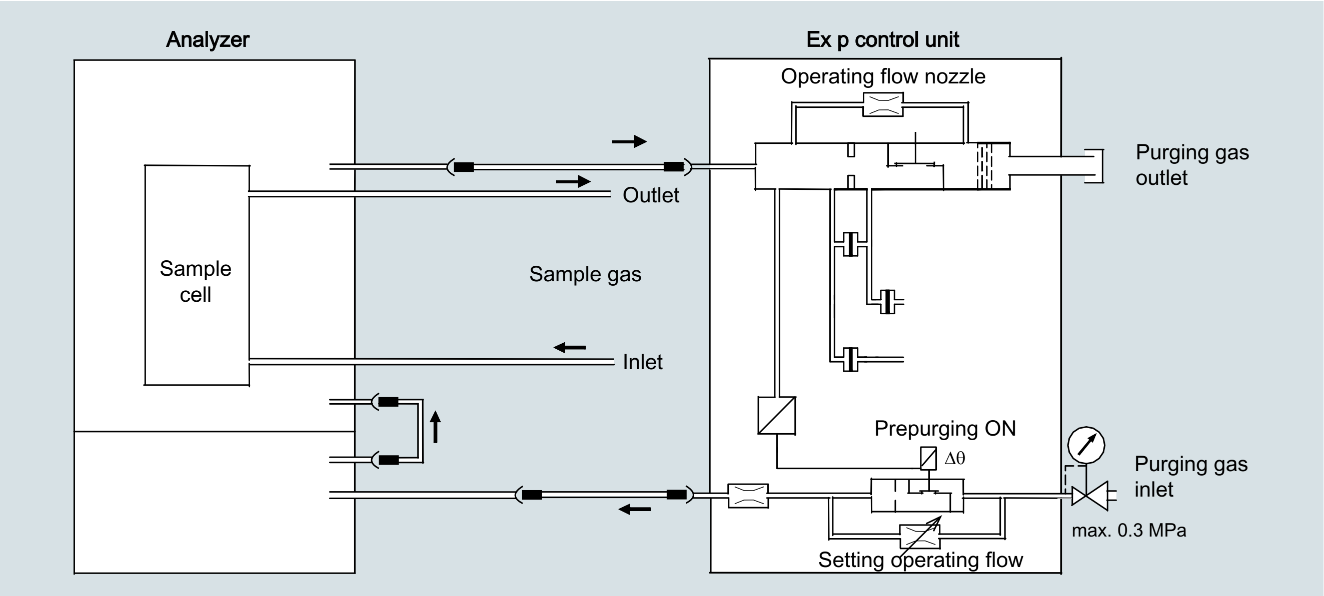
Dimensional drawings



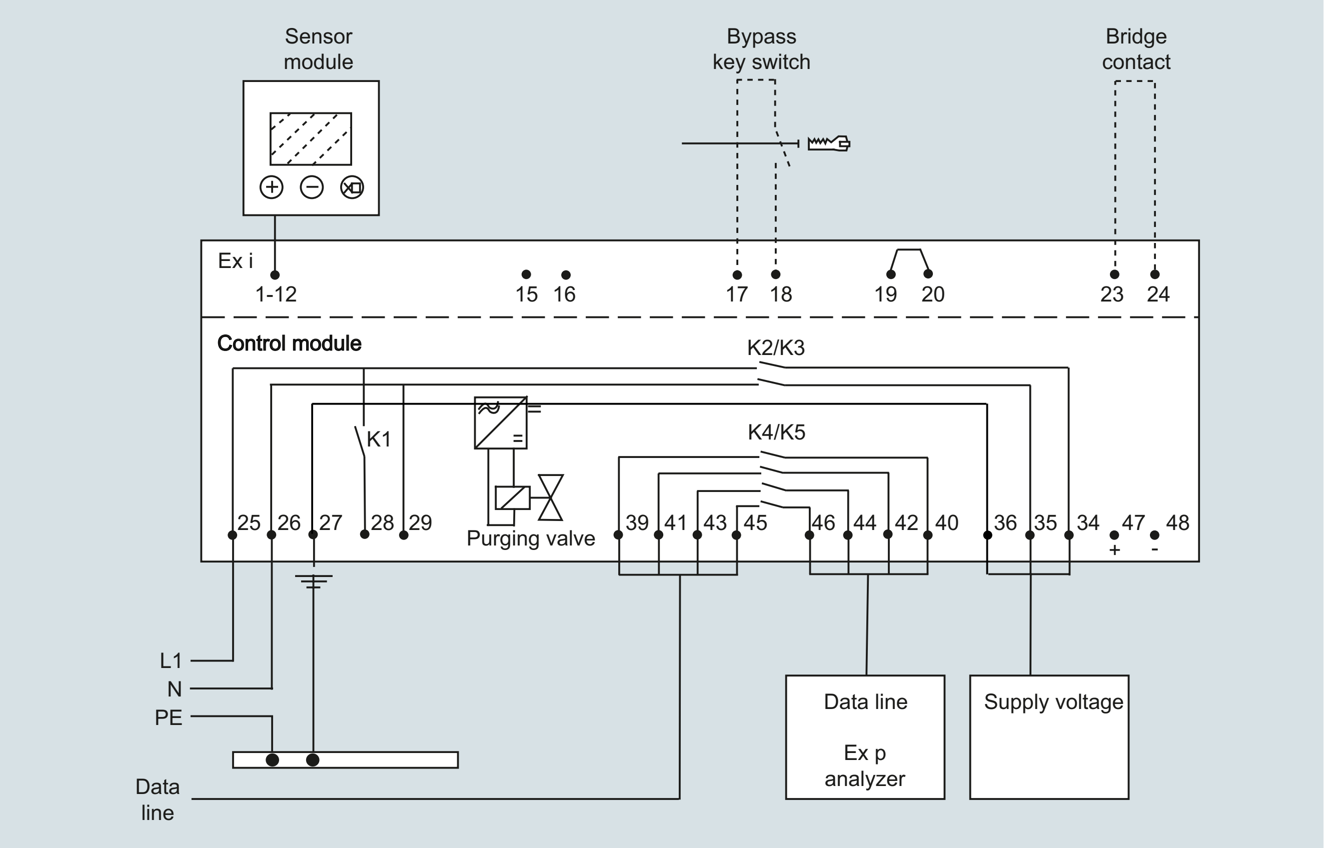
BARTEC purging unit, dimensions in mm

Purging unit ATEX II 2G/3G, continuous purging

Circuit diagrams



BARTEC purging unit, continuous purging, gas connection diagram



BARTEC purging unit, continuous purging, electric connection diagram

Overview

The Ex purging unit, MiniPurge FM, is used for pressure monitoring during continuous purging of an analyzer with purging or inert gas. If the pressure falls below the set value, an optical display is triggered and the relay is activated. This monitoring unit is driven by the purging gas pressure and therefore does not require an additional power supply.

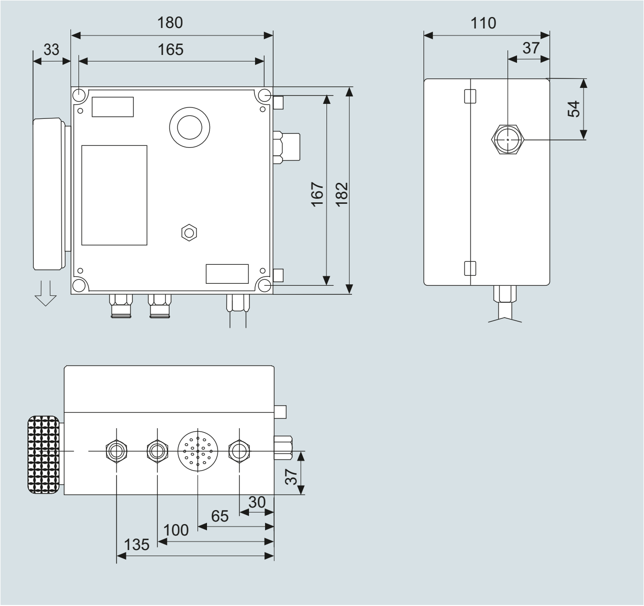
Technical specifications

Classification	Class I Division 2
FM certificate	Certificate of compliance 1X8A4.AE / 0B3A3.AE
Reaction upon failure of pressure	Opening of switching contact, and alarm via signal indicator (red display)
System type	MiniPurge complete system
Operating mode	Continuous purging
Type of enclosure	Reinforced polycarbonate
Enclosure surface	RAL 7035 gray with transparent cover
Pressure supply	Dry, oil-free air or inert gas with regulated pressure of approx. 2000 hPa (30 psi) at inlet of MiniPurge
Supply connections	Pressure via ¼ BSPP connection, pressure hose at least ½" or 12 mm
Display (signal indicator)	Pneumatically driven color signal: green/red
Switching contact	Via SPCO switch approved for Class I Division 2
Settings	Lower response limit 0.5 hPa set relative to purging gas flow of 1 to 2 l/min
Prepurging time	Is defined by operator, and controlled manually
Enclosure pressure limitation	Made of stainless steel with integrated flame arrestor; opens at 10 hPa ± 10 %

Selection and ordering data

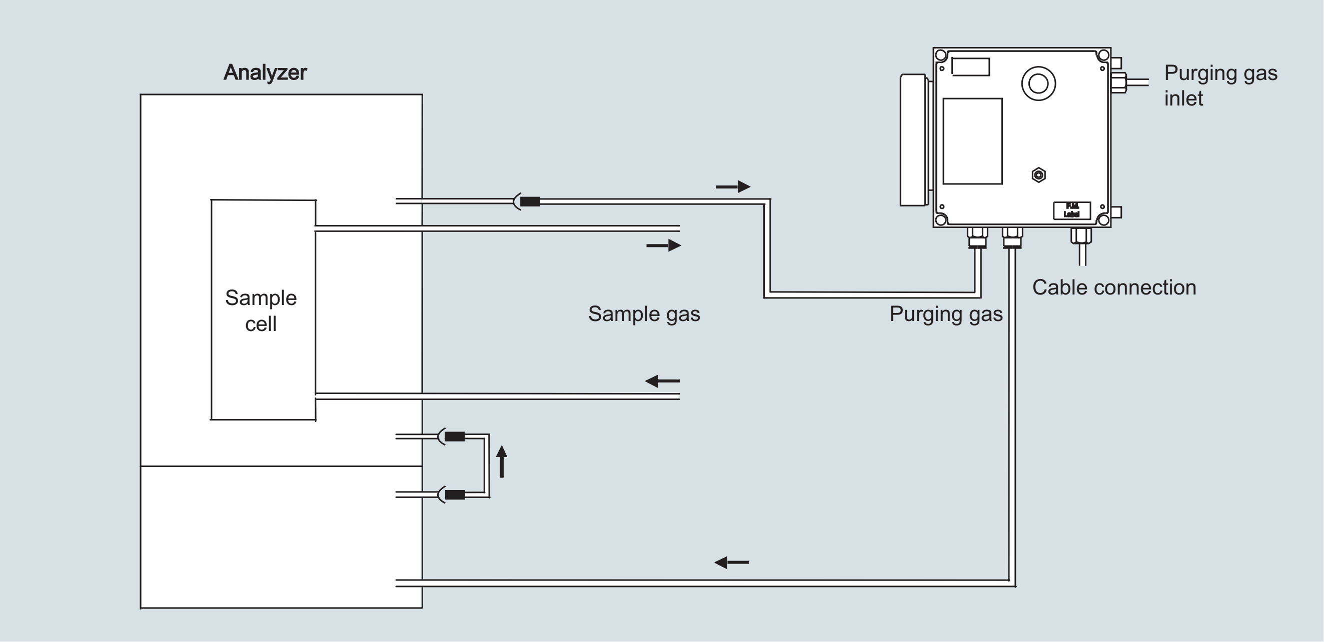
	Article No.
FM/CSA (Class I Div. 2)	
Ex purging unit Minipurge FM	**7MB8000-1AA**

Dimensional drawings



MiniPurge, dimensions in mm

Circuit diagrams



MiniPurge, purging unit, Class I, Div 2, gas connection diagram

Additional units

Overview

Installation of Ex isolation modules / Ex i isolation amplifiers

The mounting rail in the analyzer has a length of approximately 250 mm, with the number of installable components being limited.

The maximum installation height including mounting rail is 115 mm; however, it is less in the area of the display (88 mm). The width must not exceed 100 mm.

The add-on devices must be approved for an ambient temperature of up to 60 °C; this temperature can be reached under extreme marginal conditions.

Installation must always be discussed with the competent experts.

Slots in the analyzer

	Ex i isolating transformer	Ex isolating relay 8S	Comment
Analyzers	2	0	Max. 2

Ex i isolating transformer, 7MB8000-3AB

The analog inputs and outputs of the analyzers are **not intrinsically safe** in the basic version.

The analog output can be supplemented later with an intrinsically-safe analog output (explosion protection type Ex ib II C or EE ia II C). For this purpose, a suitable commercially available isolating transformer can be mounted on a rail in the device.

Technical specifications

- Intrinsically-safe analog output
- mA isolating transformer without power supply
- For installing in the analyzer

Ex i isolating transformer, rail mounting

- Intrinsically-safe output Ex ia IIC
- Galvanic isolation

Technical specifications

Input voltage U_{in}	≤ 31.2 V
Auxiliary power	Without
Weight	160 g
Ambient temperature	-20 °C … +70 °C
Relative humidity	< 95%, no condensation

Explosion protection

Type of protection	II 3 (1) G Ex nA [ia] IIC T4 and E II (1) D [Ex iaD]
EC type-examination certificate	BVS 04 ATEX E 082 X
Safety limits	U_0 ≤ 18.8 V I_0 ≤ 107 mA P_0 ≤ 503 mW

Isolating relay (signal outputs with external voltage supply) 7MB8000-4AA (230 V AC)/7MB8000-4AB (115 V AC)

If the device has to be opened, it must be isolated at all poles from the mains cable, the digital inputs, relay outputs, analog inputs/ outputs, RS485 interface cable, and the PROFIBUS PA cables (not Ex i). For this purpose, isolating relays must be inserted. Intrinsically-safe circuits are excepted from this.

An isolating relay must be explosion-proof if it is to be set up in an area subject to explosion hazard. The isolating relays must be installed in an additional Ex-protected enclosure.

Protective gas

- The fed-in gases are not flammable. Air from an area not subject to explosion hazard can be used as the protective gas (purging gas).
- Flammable gases or gas mixtures that are rarely or only briefly ignitable are fed in. The enclosure must be flooded with inert gas.
- Gas mixtures that are occasionally ignitable are introduced. As with b), the enclosure must be flooded with inert gas; in addition, the sample gas inlet and outlet must be equipped with flame arrestors.
- Explosive gas mixtures that are present in the long term or permanently must not be connected!

Flame arrestors

If the gas mixture to be measured sometimes has an explosive composition, flame arrestors must be installed in the sample gas inlet and, in certain circumstances, also in the sample gas outlet, in addition to the application already described with flammable sample gases.

The material of the flame arrestors must be resistant to the flow-type sample gas mixture. For this reason, they are available in two different versions:

- The detonation protection (Ex designation Ex IIG IIC) is used to prevent flashover in the case of unstable detonations and deflagrations of explosive gas or vapor/air mixtures of explosion group IIC.
- The flame arrestor consists essentially of a detonation-proof enclosure with gas connections and a ceramic sinter cartridge built into the housing (max. pore width: 80 µm) to prevent flashover.

It may be heated up to 150 °C and subjected to a pressure up to 3 bar (abs.).

Technical specifications

Length	83.5 mm
Diameter	32 mm
External thread	M 30 x 1.5; 30 mm long
Gas connections	G 1/4"
Material	Stainless steel or Hastelloy C
Max. gas operating pressure	3 bar (abs.)
Max. operating temperature	150 °C (200 °C on request)
Explosion group	IIC

Differential pressure switch: 7MB8000-5AA

There must be a fail-safe guarantee that the sample gas pressure will never exceed 5 hPa under the purging gas pressure.

If this cannot be guaranteed on the plant side, a differential pressure switch must be mounted between the sample gas line and the purging gas line and connected electrically with the purging unit.

The differential pressure switch always has contact with the sample gas.

Technical specifications

- Differential pressure switches type 732.51 with magnetic spring contact type 821
- Materials coming into contact with the sample gas: 1.4571
- Measuring range: -20 ... +20 hPa
- Trigger point: Adjustable

Selection and ordering data

	Article No.
ATEX Category II 2G (zone 1)	
Ex i isolating transformer	**7MB8000-3AB**
Ex isolating relay, 230 V	**7MB8000-4AA**
Ex isolating relay, 115 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**

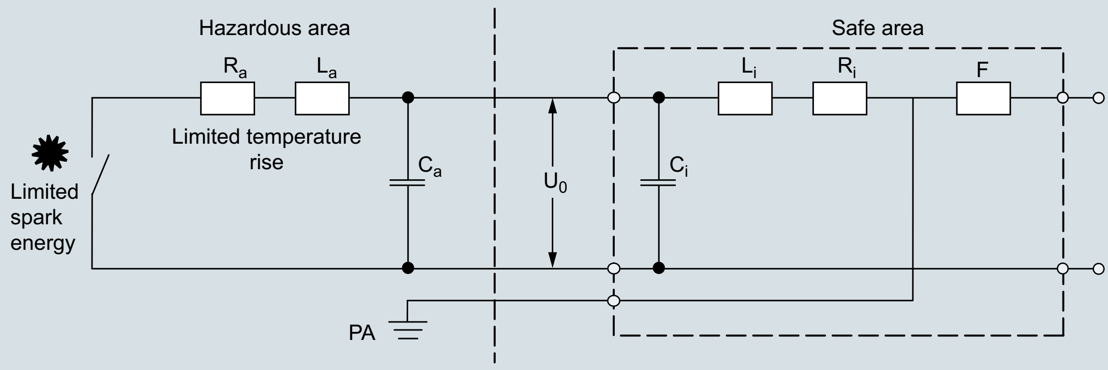
Overview

Sensors and cables for applications of the LDS 6 in hazardous areas

Intrinsic safety and intrinsically-safe circuit

Principles

The physical principle for the degree of protection "Intrinsic safety" is that a certain minimum ignition energy is required to ignite an explosive atmosphere. In an intrinsically-safe circuit, this minimum ignition energy is not present in the hazardous area, neither during normal operation nor in the event of an incident. The intrinsic safety of a circuit is achieved by limiting the current, voltage, power and temperature. Therefore the type of protection "Intrinsic safety" is limited to circuits with relatively small capacity. To prevent sparks during closing or opening of an electrical circuit, the capacitance and inductance of an intrinsically-safe circuit are also limited depending on the maximum current and voltage values. No sparks or thermal effects which could lead to ignition of an explosive atmosphere occur either in normal operation or in the process upset. Therefore intrinsically-safe circuits may also be connected or disconnected during operation when live, since the safety is also guaranteed in the event of a short-circuit or interruption. The following figure shows the block diagram for the type of protection "Intrinsic safety".



U_0	Max. output voltage	PA	Potential compensation
R_i	Internal resistor	R_a	External resistor
L_i	Internal inductivity	L_a	External inductivity
C_i	Internal capacitance	C_a	External capacitance
F	Fuse		

Block diagram for voltage/current limiting with type of protection "Intrinsic safety"

Intrinsically-safe electrical equipment and intrinsically-safe components of associated equipment are divided into two categories ("Protection levels"). A differentiation is made between the protection levels "ia" and "ib". Protection level "ib" also provides protection should one protective measure fail (fault redundancy 1). Protection level "ia" provides protection even if two protective measures should fail (fault redundancy 2). The standard refers to so-called "countable faults" instead of protective measures. These refer to protective measures, such as current limiting resistors, Zener diodes for voltage limiting, fuses, safe distances etc., i.e. all components or measures which implement an exactly defined safety function for the associated equipment.

Protection level	Description according to EN 50020	Installation
ia	The intrinsically-safe electrical equipment must not cause an ignition: • During normal operation or with the existence of non-countable safety-related faults which result in the most unfavorable condition. • During normal operation or with the existence of countable faults plus non-countable faults which result in the most unfavorable condition. • During normal operation or with the existence of two countable faults plus non-countable faults which result in the most unfavorable condition.	Up to zone 0
ib	The intrinsically-safe electrical equipment must not cause an ignition: • During normal operation or with the existence of non-countable faults which result in the most unfavorable condition. • During normal operation or with the existence of countable faults plus non-countable faults which result in the most unfavorable condition.	Zone 2 Zone 1

Protection levels of electrical equipment and intrinsically-safe components

Minimum ignition curves

The "minimum ignition curves" are used to evaluate an intrinsically- safe circuit and to determine the maximum capacitance and inductance values. They are included in the valid intrinsically-safe standards (EN 50020 or DIN EN 50020 and IEC 60079-11 or EN 60079-11). Minimum ignition curves exist for resistive, capacitive and inductive circuits. Different minimum ignition curves are applied depending on the gas group for which an intrinsically-safe circuit is to be designed, and take into account the minimum ignition energies of the gas groups.

Associated electrical equipment

Associated electrical equipment is a reference to equipment which contains one or more intrinsically-safe circuits, but in which not all circuits are intrinsically-safe. Associated electrical equipment usually has an isolating function, i.e. separating intrinsically-safe equipment from non-intrinsically-safe equipment within a signal circuit. Such devices include, for example: safety barriers, switch amplifiers, power supply units etc.

Associated electrical equipment is not explosion-proof and must therefore not be installed in hazardous areas. It only contains intrinsically-safe circuits which may be routed into the hazardous area. Associated electrical equipment is identified by a square bracket enclosing "Ex" and the symbol for the type of protection, as well as absence of the temperature class (e.g. [Ex ia] IIC).

Cables

DIN/EN 60079-14 (VDE 165, Part 1) must be observed when selecting and routing the cables. Particular attention must be paid to the characteristic values, such as electric strength and minimum cross-section. In the case of intrinsically-safe circuits, the cable capacitance and inductance must be observed in addition, and must not exceed the values specified for the intrinsically-safe or associated equipment used (Co, Lo). The connection points and cables of intrinsically-safe circuits must be identified, e.g. in light blue, and be separated from the other connection points and cables of non-intrinsically-safe circuits.

Typical setup of an LDS 6 system in hazardous areas

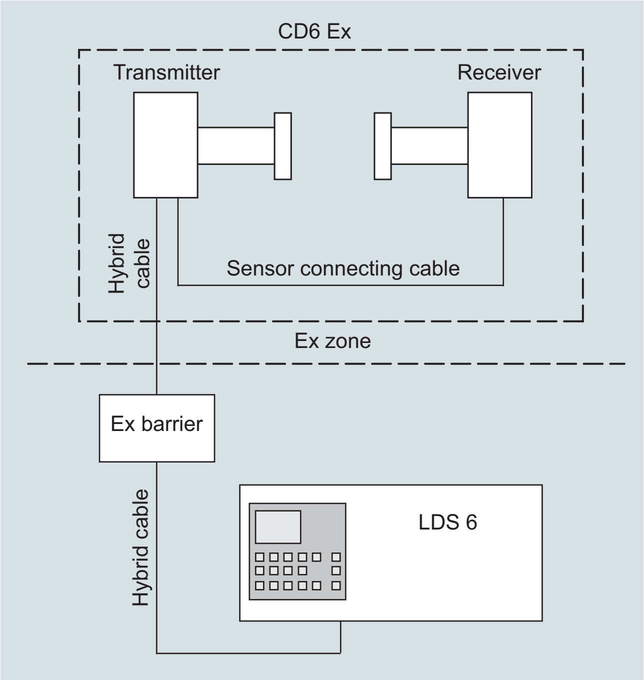
LDS 6 is capable of measuring gases in Ex environments, provided all safety-relevant points are particularly observed. The central unit of LDS 6 must always be located outside of hazardous areas.

Special Ex-type sensors (see explosion protection tag), certified according to

- ATEX II 1G Ex ia IIC T4 and
- ATEX II 1 D Ex iaD 20 IP65 T135 °C

allow operation inside almost any Ex-classified area.

For the intrinsically-safe version, an Ex barrier must be provided between the sensors and central unit. A typical version is shown in the following figure for intrinsically safe (Ex ia) sensors.



Typical setup of LDS 6 in a hazardous area

6

LDS 6 / Ex barrier

Overview

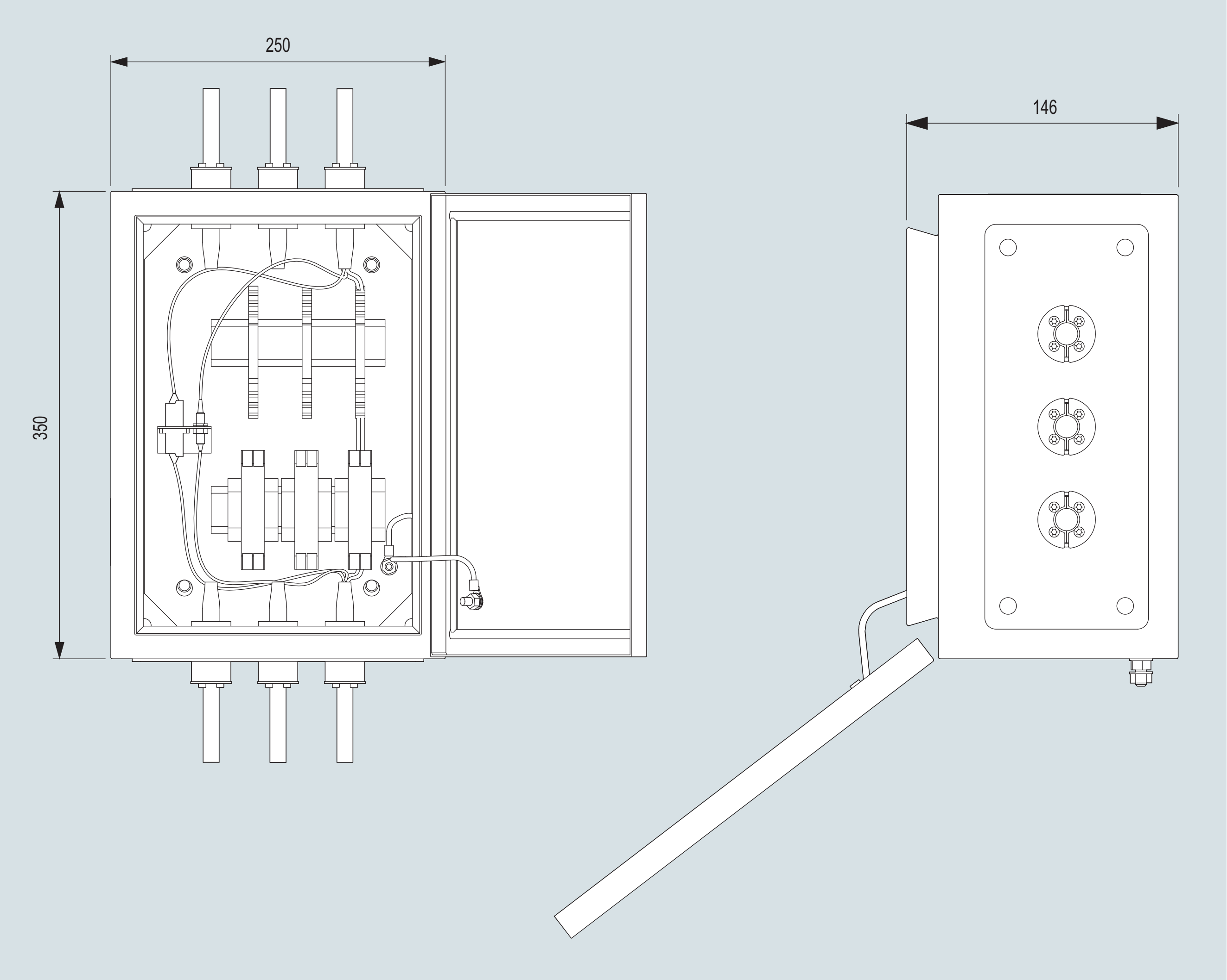
The Ex barrier is included in the scope of delivery of the CD 6 sensors in Ex ia version. It is meant for wall mounting close to the location of the LDS 6 central unit within an Ex-safe environment.

The Ex barrier defines the interface between the analyzer central unit and the intrinsically-safe sensor heads and ensures under all circumstances that the total electrical energy transferred via the hybrid cable to the sensors is always less than that needed to ignite combustible gas mixtures.

Technical specifications

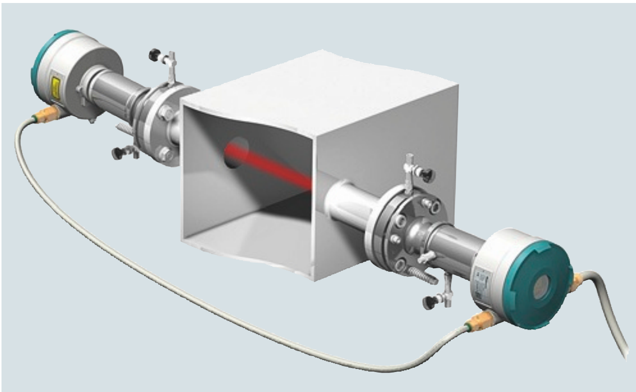
Hazardous area output	
• Minimum output voltage	12.5 V at 45 mA
• Maximum output voltage	24 V at 170 Ω
• Current limitation	45 mA
Max. power consumption (45 mA output)	90 mA at 24 V, 110 mA at 20 ... 35 V DC
Safety description	25 V, 170 Ω, 147 mA, U_m = 250 V_{rms} or DC

Dimensional drawings



Ex barrier, dimensions in mm

Overview



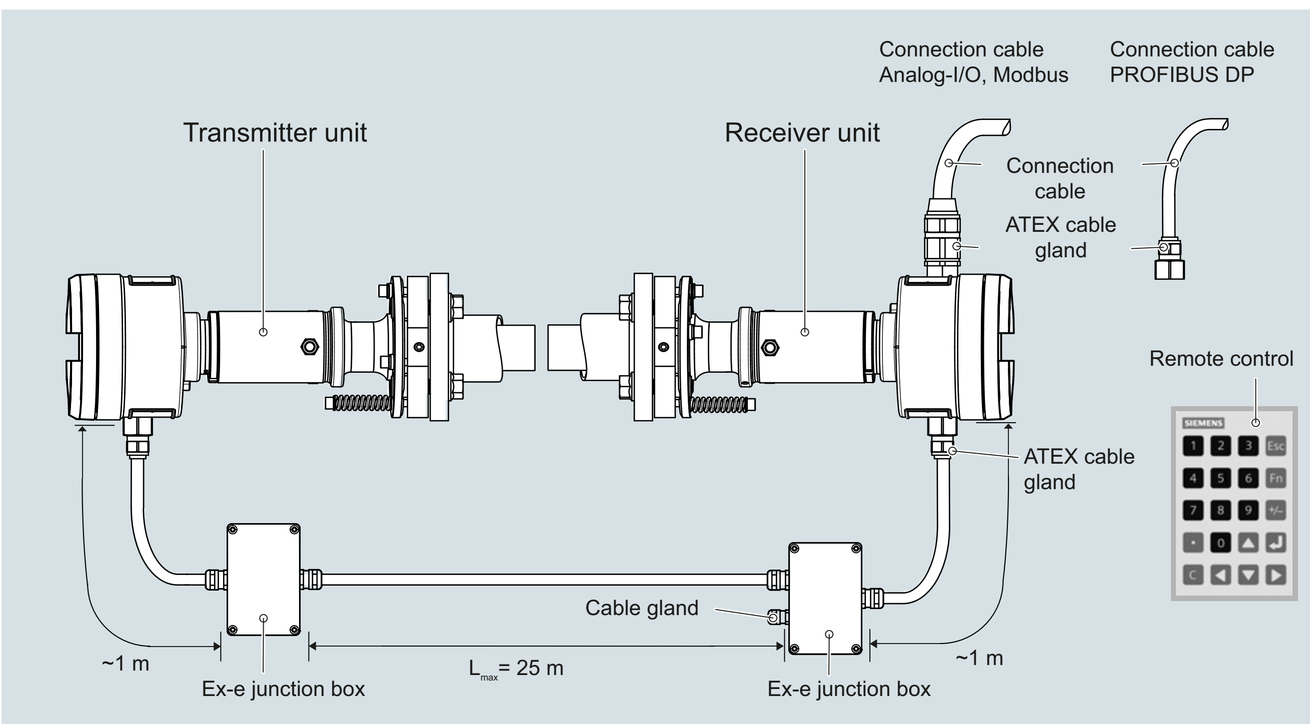
An Ex concept with type of explosion protection "Flameproof enclosure d" is used for the SITRANS SL. The enclosure used resists an explosion caused by an explosive gas mixture in the analyzer. Ignition of an explosive atmosphere produced outside the enclosure is therefore reliably prevented.

The SITRANS SL consists of a flameproof transmitter, a flameproof receiver, and optionally a specially certified junction box with increased safety. The complete analytical system is accommodated in the two flameproof enclosures which are connected together by a cable. An additional cable is connected to the receiver, and serves as the power supply and customer interface. Both cables have a fixed connection to the flameproof enclosure ex factory. They must be connected in a suitable junction box if applicable. The receiver also has a local display (LUI).

SITRANS SL can be operated by Ex-certified infrared remote control without having to open the enclosure.

The laser has a radiated power of 0.8 mW. The irradiance is approx. 10.9 $\mu W/mm^2$. This is below the values permitted in EN 60079-28.

The SITRANS SL is available with ATEX or FM certificates.



Special conditions

Repairing of the flameproof gaps must only be carried out in accordance with the manufacturer's design directives.

Connection conditions

- Unused openings must be closed in accordance with EN 60079-1 Section 11.9.
- A fixed cable must be used for the SITRANS SL gas analyzer, and routed such that it is sufficiently protected against damage.
- If the temperature on the entry components is higher than 70 °C, appropriate temperature-resistant cables must be used.
- The SITRANS SL gas analyzer must be included in the local equipotential bonding.
- The end of the SITRANS SL gas analyzer cable must be connected in an enclosure which complies with the requirements of a recognized type of explosion protection in accordance with EN 60079-0, Section 1, if the connection is made in the hazardous area.

Overview

Safety is extremely important during the storage, manufacture, processing and transportation of flammable materials, especially in the chemical and petrochemical industries, and in oil and gas production.

Gas chromatographs and the sample preparation carried out in these plants must be designed such that no explosive mixtures can be ignited when applied. National directives and guidelines as well as international standards regulate the equipment prerequisites.

The MAXUM edition II chromatograph can be used in hazardous areas according to ATEX II 2G (zone 1) and ATEX II 3G (zone 2).

The following individual protective measures apply:

Type of protection: pressurized enclosure "p"

The ignition source is enclosed by a protective gas with overpressure (at least 0.5 hPa). Air is used in most cases. The surrounding explosive atmosphere cannot penetrate.

The strength of the enclosure is at least 1.5 times the resistance to operating pressure.

An alarm is generated in the event of failure of the purging gas or the overpressure.

The electronics area must be purged prior to starting up the equipment.

This purging also provides additional protection in corrosive environments.

Type of protection: flameproof enclosure "d"

This type of protection is used for most of our detectors. The detector is fitted in an enclosure which is resistant to the explosion of an explosive atmosphere within it. This means that the mechanical stability of the enclosure must withstand this internal explosion pressure.

Joints must also be so tight that hot gas escaping between two parts of the enclosure is not explosive.

Ignition of an explosive atmosphere produced outside the enclosure is therefore reliably prevented. This is known as resistance to transmission of internal ignition.

The FID, TCD and FPD detectors are available with this degree of protection. The maximum demands with regard to the joint parameters (width/length) are made on enclosures of explosion group II C.

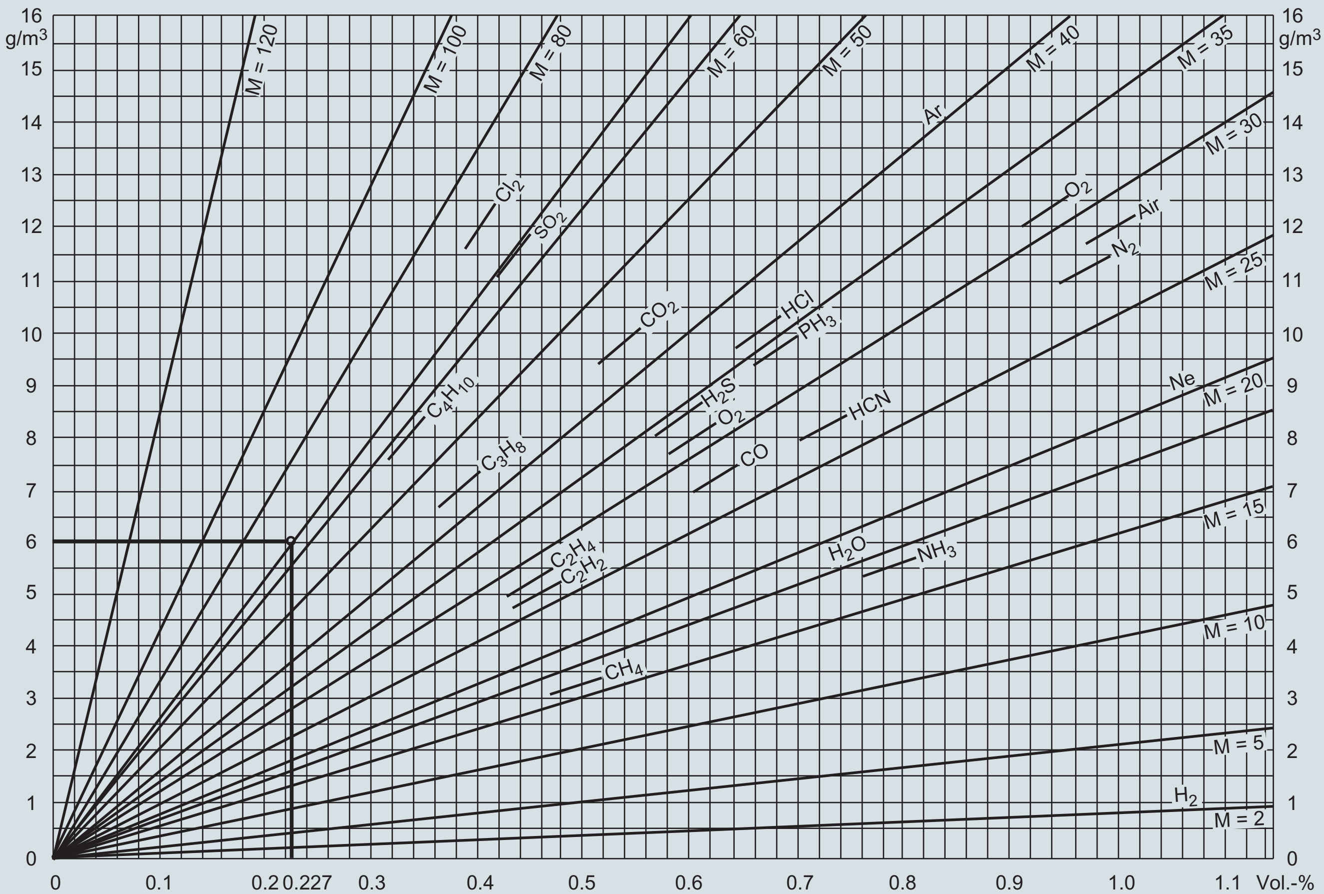
Basic design with MAXUM edition II

The electronic components are accommodated in a pressurized area. If the overpressure falls below a certain value, a control device switches off the power supply when a defined threshold is reached (available as an option).

MAXUM edition II is available with certificates according to CSA/US, ATEX and IEC Ex.

MAXUM edition II

Overview



M Molecular weight
Example for SO_2: 6 g/m³ corresponds to 0.227 Vol.-%

Conversion from g/m³ to vol. % (at 293 K and 1013 hPa)

Conversion tables

Component	Molecular mass	1 ppm in mg/m³	1 mg/m³ in ppm
CO	28	1.250	0.800
NO	30	1.339	0.747
SO_2	64	2.857	0.350
CO_2	44	1.964	0.509
CH_4	16	0.714	1.400
C_2H_4	28	1.250	0.800
C_2H_6	30	1.339	0.747
C_4H_{10}	58	2.589	0.386
C_3H_8	44	1.964	0.509
C_3H_6	42	1.875	0.533

Conversion ppm ↔ mg/m³ (1 atm; 0 °C), examples

	atm	bar	hPa	psia
atm		1.01325	1013.25	14.69595
bar	0.9869		1000	14.50377
hPa	0.0009869	0.001		0.0145038
psia	0.0680	0.06894	68.94	

Conversion of pressure units

hPa	psia
420	6.091
500	7.251
600	8.202
800	11.603
1 000	14.503
1 160	16.824
1 200	17.404
1 300	18.854
1 485	21.538
1 500	21.755
2 000	29.007
3 000	43.511
3 500	50.763
4 000	58.015

Conversion hPa ↔ psia

Dew point/saturation table

Dew point/saturation table

Dew point °C	Dew point °F	Water content ppm (vol.)	Water content g/m³ [1)]
-100	-148.0	0.014	0.0000103
-90	-130.0	0.008	0.000119
-80	-112.0	0.54	0.000565
-70	-94.0	2.57	0.00269
-60	-78.0	10.7	0.011
-55	-67.0	20.8	0.021
-50	-58.0	38.4	0.038
-48	-54.4	49.6	0.049
-46	-50.8	63.0	0.061
-45	-49.0	68.5	0.067
-44	-47.2	80.1	0.076
-42	-43.6	101.5	0.097
-40	-40.0	126.9	0.11
-39	-38.2	137.0	0.12
-38	-36.4	158.0	0.14
-37	-34.6	174.1	0.16
-36	-32.8	197.8	0.17
-35	-31.0	224.0	0.19
-34	-29.2	245.0	0.22
-33	-27.4	274.0	0.24
-32	-25.6	303.4	0.26
-31	-23.8	336.0	0.30
-30	-22.0	374	0.33
-29	-20.2	411	0.37
-28	-18.4	461	0.40
-27	-16.8	511	0.45
-26	-14.3	563	0.49
-25	-13.0	623	0.55
-24	-11.2	689	0.59
-23	-9.4	759	0.66
-22	-7.3	840	0.72
-21	-5.8	922	0.80
-20	-4.0	1 015	0.88
-19	-2.2	1 118	0.96
-18	-0.4	1 231	1.05
-17	+1.4	1 358	1.15
-16	+3.2	1 480	1.26
-15	+5.0	1 630	1.38
-14	+6.8	1 779	1.51
-13	+8.8	1 953	1.65
-12	+10.4	2 140	1.79
-11	+12.2	2 338	1.96
-10	+14.0	2 562	2.14
-9	+15.8	2 798	2.33
-8	+17.6	3 047	2.54
-7	+19.4	3 333	2.76
-6	+21.2	3 632	2.99
-5	+23.0	3 955	3.20
-4	+24.8	4 303	3.51
-3	+26.6	4 690	3.81
-2	+28.4	5 100	4.13
-1	+30.2	5 547	4.47
0	+32.0	6 020	4.84
+1	+33.8	6 480	5.2
+2	+36.8	6 850	5.6
+3	+37.4	7 487	6.0
+4	+39.2	8 022	6.4
+5	+41	8 595	6.8
+6	+42.8	9 216	7.3
+7	+44.6	9 875	7.8
+8	+46.4	10 584	8.3
+9	+48.2	11 318	8.8
+10	+50	12 114	9.4
+11	+51.8	12 935	10.0
+12	+53.6	13 806	10.7
+13	+55.4	14 800	11.4
+14	+57.2	15 796	12.1
+15	+59	16 791	12.8
+16	+60.8	17 885	13.6
+17	+62.6	19 030	14.5
+18	+64.4	20 396	15.4
+19	+66.2	21 641	16.3
+20	+68	23 020	17.3
+21	+69.8	24 502	18.3
+22	+71.6	26 120	19.4
+23	+73.4	27 736	20.6
+24	+75.2	29 477	21.8
+25	+77	31 219	23.0
+26	+78.8	33 209	24.4
+27	+80.6	35 200	25.8
+28	+82.4	37 312	27.2
+29	+84.2	39 551	28.7
+30	+86	41 791	30.3
+31	+87.8	44 322	32.0
+32	+89.6	46 936	33.5
+33	+91.4	49 675	35.6
+34	+93.2	52 539	37.2
+35	+95	55 472	39.6
+36	+96.8	58 639	41.3
+37	+98.6	62 001	43.8
+38	+100.4	65 487	45.8
+39	+102.2	68 973	48.4
+40	+104	71 761	50.7
+42	+107.6	81 049	56.5
+44	+111.2	89 889	62.3
+45	+113	94 527	65.3
+46	+114.8	99 600	68.7
+48	+118.4	110 681	75.5
+50	+122	120 398	82.3
+55	+131	155 472	104.0
+60	+140	196 517	129.5
+70	+158	307 212	196.5
+80	+176	467 662	290.5
+90	+194	691 542	418.0
+100	+212	1 000 980	558.0

[1)] Reference temperature = dew point temperature.

Guide values for dead time (sec) per meter of sample gas line

d / Q	4 mm	6 mm	8 mm	10 mm	12 mm	14 mm	16 mm	18 mm	20 mm
30 l/h	1.5	3.4	6	9.4	13.5	18.4	24	30.5	37.6
60 l/h	0.8	1.7	3	4.7	6.8	9.2	12	15.3	18.8
90 l/h	0.5	1.1	2	3.1	4.5	6.1	8	10.2	12.5
120 l/h	0.4	0.9	1.5	2.4	3.4	4.6	6	7.6	9.4
150 l/h	0.3	0.7	1.2	1.9	2.7	3.7	4.8	6.1	7.5
180 l/h	0.3	0.6	1	1.6	2.3	3.1	4	5.1	6.3
210 l/h	0.2	0.5	0.9	1.3	1.9	2.6	3.4	4.3	5.4
240 l/h	0.2	0.5	0.8	1.2	1.7	2.3	3	3.8	4.7
270 l/h	0.2	0.4	0.7	1	1.5	2	2.7	3.4	4.2
300 l/h	0.15	0.34	0.6	0.9	1.4	1.8	2.4	3.1	3.8

d = Inner diameter of sample gas lines
Q = Flow rate

6

International standards

National standards also exist in most EU member states, and may be used in these countries in addition to the valid EN standards. In the Federal Republic of Germany, these are the DIN standards and the VDE regulations.

However, extensive harmonization has already been carried out in the explosion protection sector, and most standards now also exist as "DIN EN ...." versions, which have also been incorporated into the VDE regulations. DIN EN standards are identical to the corresponding EN standards, were special national features, e.g. concerning areas of validity etc., are formulated in a national foreword.

Topic	International		Europe/Germany		USA		Canada	
			FM	UL	ANSI/ISA	Ex zone model	Ex Class Div. model	Miscella-neous
Ex: General regulations	IEC 60079-0	EN 50014/ VDE 0170/0171 Part 1	FM 3600		ANSI/ISA-S12.0.01	CSA 79-0-95		
Oil immersion "o"	IEC 60079-6	EN 50015/ DIN EN 50015, VDE 0170/0171 Part 2		UL2279, Pt.6	ANSI/ISA-S12.26. 01	CSA-E79-6		
Pressurized enclosure "p"	IEC 60079-2	EN 50016/ DIN EN 50016, VDE 0170/0171 Part 3	FM 3620	(NFPA4 96)		CSA-E79-2	CSA TIL. E 13 A	
Powder filling "q"	IEC 60079-5	EN 50017/ DIN EN 50017, VDE 0170/0171 Part 4		UL2279, Pt.5	ANSI/ISA-S12.25. 01	CSA-E79-5		
Flameproof enclosure "d"	IEC 60079-1	EN 50018/ DIN EN 50018, VDE 0170/0171 Part 5	FM 3615	UL2279, Pt.1 UL1203	ANSI/ISA-S12.22. 01	CSA-E79-1	CSA C22.2 No. 30	
Increased safety "e"	IEC 60079-7	EN 50019/ DIN EN 50019, VDE 0170/0171 Part 6		UL2279, Pt.7	ANSI/ISA-S12.16. 01	CSA-E79-7		
Intrinsic safety "i"	IEC 60079-11	EN 50020/ DIN EN 50020, VDE 0170/0171 Part 7	FM 3610	UL2279, Pt.11 UL 913	pr ANSI/ ISA-S12.02. 01	CSA-E79-11	CSA C22.2 No. 157	
Degree of protection "n"	IEC 60079-15	EN 50021/ DIN EN 50021, VDE 0170/0171 Part 8	FM 3611	UL2279, Pt.15	pr ANSI/ISA S12.12. 01	CSA-E79-15	CSA C22.2 No. 213	
Encapsulation "m"	IEC 60079-18	EN 50028/ DIN EN 50028, VDE 0170/0171 Part 9		UL2279, Pt.18	ANSI/ISA-S12.23. 01	CSA-E79-18		
Zone 0	IEC 60079-26	EN 50284/ DIN EN 50284, VDE 0170/0171 Part 12						
Electrical safety	IEC 61010	EN 61010-1/ DIN EN 61010-1, VDE 0411 Part 1			ANSI/ISA-82. 02.01			CAN/CSA-C22.2 No. 1010.1

Comparison of international and European standards

European standard	German standard	German title
EN 1127	DIN EN 1127-1	Explosive atmospheres - Explosion protection - Part 1: Fundamentals and method
EN 50039	DIN EN 50039, VDE 0170/0171 Part 10	Electrical equipment for hazardous areas; intrinsically-safe electrical systems "i"
EN 13463-1	DIN EN 13 463-1	Non-electrical equipment for use in hazardous areas, Part 1: Fundamental method and requirements
EN 50281-1-1	DIN EN 50281-1-1, VDE 0170/0171 Part 15-1-1	Electrical equipment for use in areas with combustible dust, Part 1-1: Electrical equipment with protection by enclosure
EN 60079-10	DIN EN 60079-10, VDE 165 Part 101	Electrical equipment for potentially explosive gas atmospheres, Part 10: Division of potentially explosive areas
EN 60079-14	DIN EN 60079-14, VDE 165 Part 1	Electrical equipment for hazardous areas, Part 14: Electrical installations in potentially explosive areas (except underground excavation)
EN 60079-17	DIN EN 60079-17, VDE 0165 Part 10	Electrical equipment for potentially explosive gas atmospheres, Part 17: Testing and maintenance of electrical installations in hazardous areas (except underground excavation)
EN 60950	DIN EN 60950, VDE 0805	Safety of information technology equipment, including electrical office machines

Harmonized European standards for explosion protection

	T 1 > 450 °C	T 2 > 300 °C	T 3 > 200 °C	T 4 > 135 °C	T 5 > 100 °C	T 6 > 85 °C
I	Methane					
II A	Acetone Ethane Ethyl acetate Ammonia Benzene (pure) Acetic acid Carbon monox-ide Methane Methanol Propane Toluene	Ethyl alcohol i-amyl acetate n-butane n-butyl alcohol	Petrol Diesel fuel Aviation gasoline Fuel oil n-hexane	Acetyl aldehyde Ethyl ether		
II B	Town gas (Illuminating gas)	Ethylene				
II C	Hydrogen	Acetylene				Carbon disulfide

Classification of gases and vapors into explosion groups and temperature classes

Overview

Definitions

Calibration gas

Gas used for adjusting the sensitivity (deflection) of the detected gas. It is a gas mixture of known composition (measured component and suitable residual gas).

Sensitivity

Ratio between a change in output variable observed on the measuring instrument and the change in input variable required for this.

Linearity error of devices with linear characteristics

Deviation of measured characteristic from a linear reference characteristic.

The linearity is an important variable particularly for instruments which use a measuring effect with nonlinear characteristic and where the measured characteristic is linearized electronically.

Cross-sensitivity

Measure for the selectivity of a gas analyzer with regard to interfering components.

It is the ratio between the displayed value of the interfering component and the displayed value of the measured component; both have the same concentration.

In the case of analyzers where the total concentration of different materials is measured (e.g. total hydrocarbon concentration) and where the individual components are weighted differently in the measuring result, these factors are specified in equivalents of a master component (e.g. CH_4 equivalents for the total hydrocarbon measurement) and not as cross-sensitivity.

Time response

The dynamic response of an analyzer is characterized by its response time and dead time. The response time is the time which passes until the output variable remains constantly within defined limits following an abrupt change in the input variable. The response time is usually understood as the time required to reach 90 (T_{90}) or 95% of the expected display.

Units of measurement

Vol%

Volume proportion in % of measured component, based on the sample gas.

ppm (vpm)

Parts per million, i.e. one proportion of the measured component per 10^6 proportions of the sample gas (corresponds to 10^{-4} %).

In gas analysis technology, ppm is usually understood as volume concentrations. The dimension unit vpm is frequently used for unequivocal identification:

1 vpm = 1 cm^3 / m^3

Example: 1 000 vpm = 0.1 vol.% = 1 dm^3 / m^3

mg/m^3

Mass of measured component in mg referred to 1 m^3 of sample gas at 1 013 hPa and 20 °C.

Example: 1 vpm = 1 cm^3 / m^3 corresponds to:

(molecular weight of component / molecular volume of component) · (mg / m^3)

Weight concentration

Specification of measured values in weight concentrations is not common with gas analysis. Weight concentrations can only be determined in exceptional cases. The dimension unit mg/m^3 does not mean weight concentration.

Appendix

7

7/2	**SITRAIN - Training for Industry**
7/3	Course offer for Process Analytics
	PIA Life Cycle Portal
7/4	Engineering, Ordering, Installation and Operation tool
7/5	**Partner · Industry Mall and Interactive Catalog CA 01**
7/6	**Information and Download Center**
	Partner at Siemens
7/7	Siemens Partner Program
	Industry Services
7/9	Industry Services – Portfolio overview
7/11	Online Support
7/12	**Software Licenses**
7/14	**Conditions of sale and delivery**

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SITRAIN – Training for Industry – provides you with comprehensive support in solving your tasks.

Training directly from the manufacturer enables you to make correct decisions with confidence.

Increased profits and lower costs:

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- Optimized production operations
- Reliable configuration and commissioning
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- Exclude expensive faulty planning right from the start.
- Flexible plant adaptation to market requirements
- Compliance with quality standards in production
- Increased employee satisfaction and motivation
- Shorter familiarization times following changes in technology and staff

Contact

Visit our site on the Internet at:
www.siemens.com/sitrain

or let us advise you personally:

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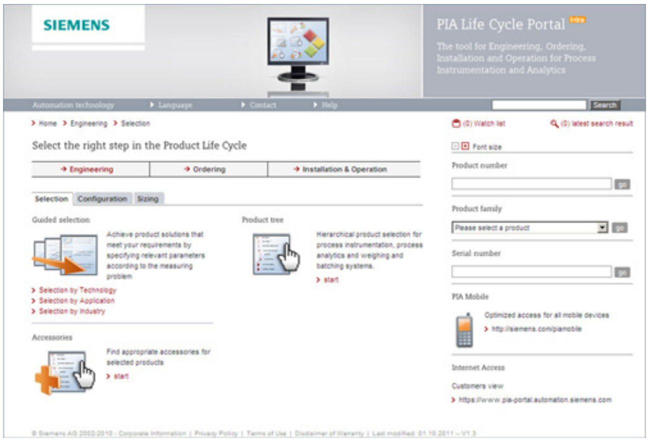
Course offer

Title	Course suitable for: Plan-ning	Realiza-tion	Opera-tion	Duration/ Medium	Course code
Analyzer System Manager Operator, basics and operation	✔	✔	✔	2 days	SC-I-ASMO
Continuous Process Gas Analysis					
CGA, SIPROCESS GA700, OXYMAT 7 Operation and maintenance		✔	✔	2 days	SC-G-GA700
OXYMAT 6, ULTRAMAT 6 and 23, Industrial gases, paramagnetism and infrared absorption		✔	✔	3 days	SC-G-OXYUL
CALOMAT 6 Intensive, thermo conductivity of gases		✔	✔	1 day	SC-G-CAL (on request)
FIDAMAT Intensive continuous measurement of total hydrocarbon content in the gas phase		✔	✔	2 days	SC-G-FID
CGA, SIPROCESS UV 600		✔	✔	2 days	SC-G-UV600
ULTRAMAT 23 Intensive, industrial gases, infrared absorption, oxygen measurement		✔	✔	2 days	SC-G-ULT23
ULTRAMAT 6 Intensive, industrial gases, infrared absorption		✔	✔	2 days	SC-G-ULT6
In situ Laser Gas Analyzer LDS 6 and SITRANS SL	✔	✔	✔	3 days	SC-G-LDS
Process Gas Chromatography					
Process Gas Chromatograph MAXUM edition II Operation and maintenance	✔	✔	✔	4.5 days	SC-C-MAX1
Process Gas Chromatograph MAXUM edition II Advanced User		✔	✔	3 days	SC-C-MAX2
Process Gas Chromatograph MAXUM edition II MaxBasic		✔	✔	3 days	SC-C-MPGM
Process Gas Chromatograph MAXUM edition II Modular Oven, Basics	✔	✔	✔	3 days	SC-C-MMO1
Process Gas Chromatograph MicroSAM Operation and maintenance	✔	✔	✔	2.5 days	SC-C-SAM
Process Gas Chromatograph Sitrans CV Calorific Value, Operation and maintenance	✔	✔	✔	2.5 days	SC-C-CV

Engineering, Ordering, Installation and Operation Tool

Overview



The PIA Life Cycle Portal provides the appropriate functionality in all stages of the Product Life Cycle for products of Process Instrumentation, Process Analytics and Weighing Technology.

The application guides you through Engineering & Selection, supports you at the Order and provides tools and information for Installation and Operation.

- **Phase 1:** Selection & Planning
- **Phase 2:** Ordering
- **Phase 3:** Installation & Operation
- **Additional features:** e. g. PIA Mobile

Phase 1: Selection & Planning

Selection

Achieve product solutions that meet your requirements by specifying relevant parameters according to the measuring point by using the *guided selection* or select the product directly in the *product and accessories tree*.

Configuration

Configure a selected product step by step and use the integrated configuration knowledge to avoid errors.

Sizing & calculation

Sizing & calculation tools for Gas Analyzers, Weighing and Batching Systems and Flow measurement instruments.

Phase 2: Ordering

Bulk upload

Verify several part numbers in one step by uploading a simple text file.

Watchlist & projects

Collect products in a *watch list* and save it as a *project* for later use.

Interface to the Industry Mall

Order the selected products with the ordering system for Siemens' automation and drive solutions.

Phase 3: Installation & Operation

Spare parts

Find appropriate *spare parts* for selected products or corresponding product families.

After sales support

Go to the *Service and Support Portal* to access manuals, certificates and further information concerning service & support.

Device information and history

Serial number specific product information for installed devices

Additional features

Personalize

Register in order to customize the application to your personal needs.

PIA Mobile

Use the product *selection, configuration and device information and history* with the version optimized for mobile devices.
www.siemens.com/piamobile

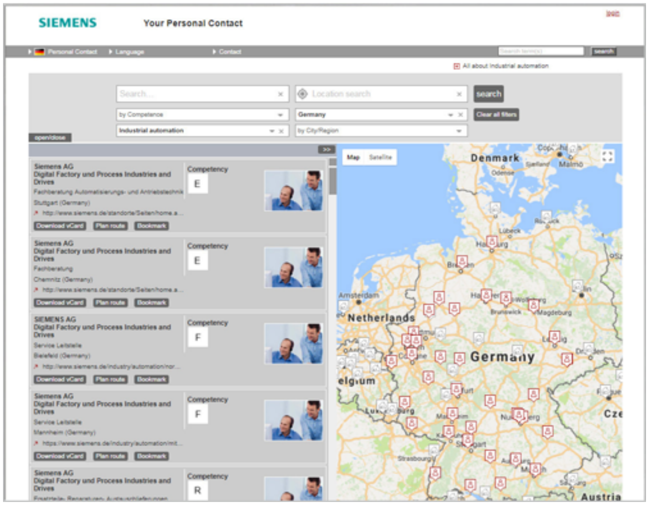
Product details

Find all relevant product information at a single glance: commercial and technical data, certificates, images and documents, etc.

More information

PIA Life Cycle Portal
Ostliche Rheinbrückenstraße 50
76187 Karlsruhe, Germany
Tel.: +49 (721) 595 2114
E-Mail: support.pia-portal@siemens.com
www.siemens.com/pia-portal

Partner at Siemens



At your service locally, around the globe for consulting, sales, training, service, support, spare parts on the entire portfolio of Digital Factory and Process Industries and Drives.

Your partner can be found in our Personal Contacts Database at:
www.siemens.com/automation-contact

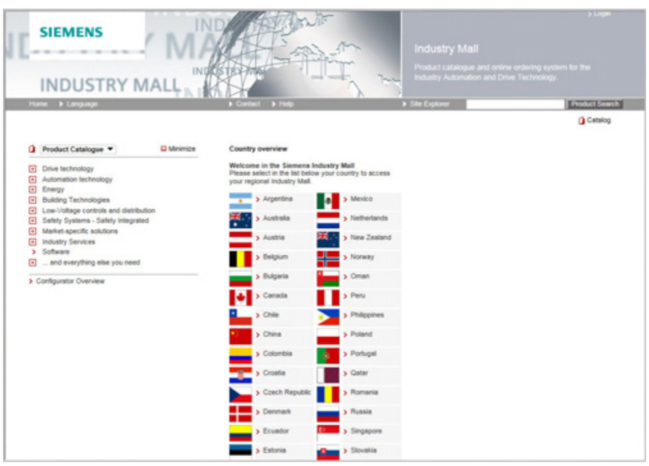
You start by selecting

- the required competence,
- products and branches,
- a country and a city

or by a

- location search or free text search.

Easy product selection and ordering in the Industry Mall and with the Interactive Catalog CA 01



Industry Mall

The Industry Mall is a Siemens Internet ordering platform. Here you have a clear and informative online access to a huge range of products.

Powerful search functions make it easy to select the required products. Configurators enable you to configure complex product and system components quickly and easily. CAx data types are also provided here.

Data transfer allows the whole procedure, from selection through ordering to tracking and tracing, to be carried out online. Availability checks, customer-specific discounts and bid creation are also possible.

www.siemens.com/industrymall

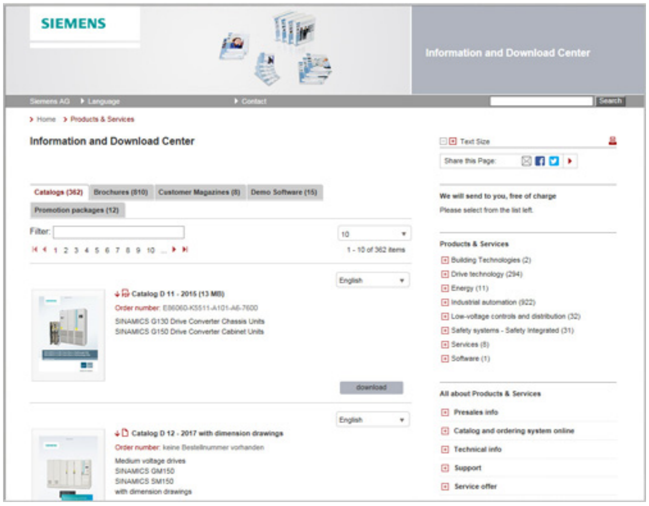
Interactive Catalog CA 01 - Products for Automation and Drives

The Interactive Catalog CA 01 combined with the Siemens Industry Mall unites the benefits of offline and online media in one application – the performance of an offline catalog with the availability of manifold and up-to-date information on the Internet.

Select products and assemble orders with the CA 01, determine the availability of the selected products and track & trace via the Industry Mall.

More information and download:
www.siemens.com/automation/ca01

Downloading catalogs



In the Information and Download Center you can download catalogs and brochures in PDF format without having to register.

The filter dialog makes it possible to carry out targeted searches.

www.siemens.com/industry/infocenter

Overview

Siemens Solution und Approved Partners

<u>Highest competence in automation and drive technology as well as power distribution</u>

Siemens works closely together with selected partner companies around the world in order to ensure that customer requirements for all aspects of automation and drives, as well as power distribution, are fulfilled as best as possible – wherever you are, and whatever the time.

We place great value on our customers acting in accordance with the same ideals which characterize Siemens as a whole: Competence, professionalism and quality. That is why continuous development through qualification and certification measures in line with global standards is a central aspect of our Partner Program. This means that with our partners, you benefit from the same high quality standards all over the world.
The partner emblem is the symbol for tried and tested quality.

<u>Solution Partners and Approved Partners</u>

Our global network of partners includes both Solution Partners and Approved Partners. The latter can be further differentiated into "Value Added Reseller" and "Industry Services".

At present we are working with more than 1,500 Solution Partners worldwide. They are characterized by extensive application, system and sector knowledge, as well as proven project experience, and are able to implement future-proof tailored solutions of the highest quality, based on our product and system portfolio.

With their detailed technical knowledge, Siemens Approved Partners – Value Added Resellers offer a combination of products and services that range from specialist technologies and customized modifications to the provision of high-quality system and product packages. They also provide qualified technical support and assistance.

Approved Partners – Industry Services put their unique expertise entirely at the service of enhancing your productivity and can be instrumental in ensuring the availability of your plants.

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In the Siemens global Solution Partner program, customers are certain to find the optimum partner for their specific requirements - with no great effort. The Partner Finder is basically a comprehensive database that showcases the profiles of all our solution partners.

Easy selection:
Set filters in the search screen form according to the criteria that are relevant to you. You can also directly enter the name of an existing partner.

Skills at a glance:
Gain a quick insight into the specific competencies of any particular partner with the reference reports.

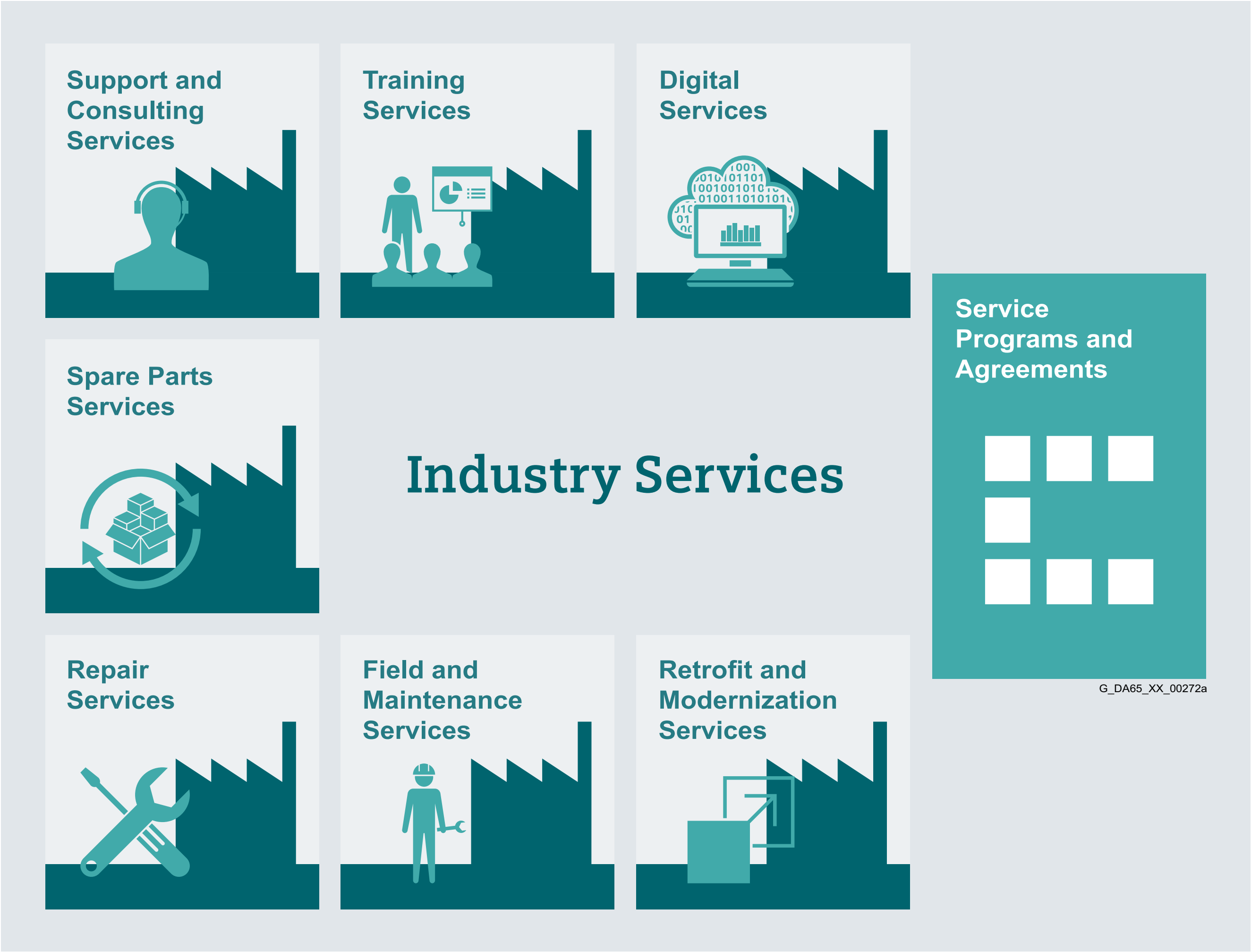
Direct contact option:
Use our electronic query form:

www.siemens.com/partnerfinder

Additional information on the Siemens Solution Partner Program is available online at:

www.siemens.com/partner-program

Overview



Keep your business running and shaping your digital future – with Industry Services

Optimizing the productivity of your equipment and operations can be a challenge, especially with constantly changing market conditions. Working with our service experts makes it easier. We understand your industry's unique processes and provide the services needed so that you can better achieve your business goals.

You can count on us to maximize your uptime and minimize your downtime, increasing your operations' productivity and reliability. When your operations have to be changed quickly to meet a new demand or business opportunity, our services give you the flexibility to adapt. Of course, we take care that your production is protected against cyber threats. We assist in keeping your operations as energy and resource efficient as possible and reducing your total cost of ownership. As a trendsetter, we ensure that you can capitalize on the opportunities of digitalization and by applying data analytics to enhance decision making: You can be sure that your plant reaches its full potential and retains this over the longer lifespan.

You can rely on our highly dedicated team of engineers, technicians and specialists to deliver the services you need – safely, professionally and in compliance with all regulations. We are there for you, where you need us, when you need us.

https://www.siemens.com/global/en/home/products/services/industry.html

Overview

Digital Services make your industrial processes transparent to gain improvements in productivity, asset availability, and energy efficiency.

Production data is generated, filtered and translated with intelligent analytics to enhance decision-making.

This is done whilst taking data security into consideration and with continuous protection against cyber-attack threats.

https://www.siemens.com/global/en/home/products/services/industry/digital-services.html

Industry Online Support site for comprehensive information, application examples, FAQs and support requests.

Technical and Engineering Support for advice and answers for all inquiries about functionality, handling, and fault clearance. The Service Card as prepaid support for value added services such as Priority Call Back or Extended Support offers the clear advantage of quick and easy purchasing.

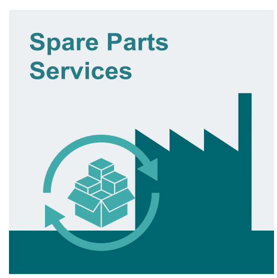
Information & Consulting Services, e.g. SIMATIC System Audit; clarity about the state and service capability of your automation system or Lifecycle Information Services; transparency on the lifecycle of the products in your plants.

https://support.industry.siemens.com/cs/ww/en/sc/2235

From the basics and advanced to specialist skills, SITRAIN courses provide expertise right from the manufacturer – and encompass the entire spectrum of Siemens products and systems for the industry.

Worldwide, SITRAIN courses are available wherever you need a training course in more than 170 locations in over 60 countries.

https://support.industry.siemens.com/cs/ww/en/sc/2226



Spare Parts Services are available worldwide for smooth and fast supply of spare parts – and thus optimal plant availability. Genuine spare parts are available for up to ten years. Logistic experts take care of procurement, transport, custom clearance, storage and order management. Reliable logistics processes ensure that components reach their destination as needed.

Since not all spare parts can be kept in stock at all times, Siemens offers a preventive measure for spare parts provisioning on the customer's premises with optimized **Spare Parts Packages** for individual products, custom-assembled drive components and entire integrated drive trains – including risk consulting.

Asset Optimization Services help you design a strategy for parts supply where your investment and carrying costs are reduced and the risk of obsolescence is avoided.

https://support.industry.siemens.com/cs/ww/en/sc/2110

Industry Services – Portfolio overview

Overview (continued)

Repair Services are offered on-site and in regional repair centers for fast restoration of faulty devices' functionality.

Also available are extended repair services, which include additional diagnostic and repair measures, as well as emergency services.

https://support.industry.siemens.com/cs/ww/en/sc/2154

Siemens specialists are available globally to provide expert field and maintenance services, including commissioning, functional testing, preventive maintenance and fault clearance.
All services can be included in customized service agreements with defined reaction times or fixed maintenance intervals.

https://support.industry.siemens.com/cs/ww/en/sc/2265

Provide a cost-effective solution for the expansion of entire plants, optimization of systems or upgrading existing products to the latest technology and software, e.g. migration services for automation systems.

Service experts support projects from planning through commissioning and, if desired over the entire extended lifespan, e.g. Retrofit for Integrated Drive Systems for an extended lifetime of your machines and plants.

https://support.industry.siemens.com/cs/ww/en/sc/2286

A technical Service Program or Agreement enables you to easily bundle a wide range of services into a single annual or multi-year agreement.

You pick the services you need to match your unique requirements or fill gaps in your organization's maintenance capabilities.

Programs and agreements can be customized as KPI-based and/or performance-based contracts.

https://support.industry.siemens.com/cs/ww/en/sc/2275

Overview

Siemens Industry and Online Support with some 1.7 million visitors per month is one of the most popular web services provided by Siemens. It is the central access point for comprehensive technical know-how about products, systems and services for automation and drives applications as well as for process industries.

In connection with the challenges and opportunities related to digitalization you can look forward to continued support with innovative offerings.

Overview

Software types

Software requiring a license is categorized into types.
The following software types have been defined:

- Engineering software
- Runtime software

Engineering software

This includes all software products for creating (engineering) user software, e.g. for configuring, programming, parameterizing, testing, commissioning or servicing.

Data generated with engineering software and executable programs can be duplicated for your own use or for use by third-parties free-of-charge.

Runtime software

This includes all software products required for plant/machine operation, e.g. operating system, basic system, system expansions, drivers, etc.

The duplication of the runtime software and executable programs created with the runtime software for your own use or for use by third-parties is subject to a charge.

You can find information about license fees according to use in the ordering data (e.g. in the catalog). Examples of categories of use include per CPU, per installation, per channel, per instance, per axis, per control loop, per variable, etc.

Information about extended rights of use for parameterization/configuration tools supplied as integral components of the scope of delivery can be found in the readme file supplied with the relevant product(s).

License types

Siemens Industry Automation & Drive Technologies offers various types of software license:

- Floating license
- Single license
- Rental license
- Rental floating license
- Trial license
- Demo license
- Demo floating license

Floating license

The software may be installed for internal use on any number of devices by the licensee. Only the concurrent user is licensed. The concurrent user is the person using the program. Use begins when the software is started.
A license is required for each concurrent user.

Single license

Unlike the floating license, a single license permits only one installation of the software per license.

The type of use licensed is specified in the ordering data and in the Certificate of License (CoL). Types of use include for example per instance, per axis, per channel, etc.

One single license is required for each type of use defined.

Rental license

A rental license supports the "sporadic use" of engineering software. Once the license key has been installed, the software can be used for a specific period of time (the operating hours do not have to be consecutive).
One license is required for each installation of the software.

Rental floating license

The rental floating license corresponds to the rental license, except that a license is not required for each installation of the software. Rather, one license is required per object (for example, user or device).

Trial license

A trial license supports "short-term use" of the software in a non-productive context, e.g. for testing and evaluation purposes.
It can be transferred to another license.

Demo license

The demo license support the "sporadic use" of engineering software in a non-productive context, for example, use for testing and evaluation purposes. It can be transferred to another license. After the installation of the license key, the software can be operated for a specific period of time, whereby usage can be interrupted as often as required.

One license is required per installation of the software.

Demo floating license

The demo floating license corresponds to the demo license, except that a license is not required for each installation of the software. Rather, one license is required per object (for example, user or device).

Certificate of License (CoL)

The CoL is the licensee's proof that the use of the software has been licensed by Siemens. A CoL is required for every type of use and must be kept in a safe place.

Downgrading

The licensee is permitted to use the software or an earlier version/release of the software, provided that the licensee owns such a version/release and its use is technically feasible.

Delivery versions

Software is constantly being updated.
The following delivery versions

- PowerPack
- Upgrade

can be used to access updates.

Existing bug fixes are supplied with the ServicePack version.

PowerPack

PowerPacks can be used to upgrade to more powerful software. The licensee receives a new license agreement and CoL (Certificate of License) with the PowerPack. This CoL, together with the CoL for the original product, proves that the new software is licensed.
A separate PowerPack must be purchased for each original license of the software to be replaced.

Upgrade

An upgrade permits the use of a new version of the software on the condition that a license for a previous version of the product is already held.
The licensee receives a new license agreement and CoL with the upgrade. This CoL, together with the CoL for the previous product, proves that the new version is licensed.
A separate upgrade must be purchased for each original license of the software to be upgraded.

Overview

ServicePack

ServicePacks are used to debug existing products. ServicePacks may be duplicated for use as prescribed according to the number of existing original licenses.

License key

Siemens Industry Automation & Drive Technologies supplies software products with and without license keys.

The license key serves as an electronic license stamp and is also the "switch" for activating the software (floating license, rental license, etc.).

The complete installation of software products requiring license keys includes the program to be licensed (the software) and the license key (which represents the license).

Software Update Service (SUS)

As part of the SUS contract, all software updates for the respective product are made available to you free of charge for a period of one year from the invoice date. The contract will automatically be extended for one year if it is not canceled three months before it expires.

The possession of the current version of the respective software is a basic condition for entering into an SUS contract.

You can download explanations concerning license conditions from www.siemens.com/automation/salesmaterial-as/catalog/en/terms_of_trade_en.pdf

1. General Provisions

By using this catalog you can acquire hardware and software products described therein from Siemens AG subject to the following Terms and Conditions of Sale and Delivery (hereinafter referred to as "T&C"). Please note that the scope, the quality and the conditions for supplies and services, including software products, by any Siemens entity having a registered office outside Germany, shall be subject exclusively to the General Terms and Conditions of the respective Siemens entity. The following T&C apply exclusively for orders placed with Siemens Aktiengesellschaft, Germany.

1.1 For customers with a seat or registered office in Germany

For customers with a seat or registered office in Germany, the following applies subordinate to the T&C:

- for installation work the "General Conditions for Erection Works – Germany"1) ("Allgemeine Montagebedingungen – Deutschland" (only available in German at the moment)) and/or
- for Plant Analytics Services the "Standard Terms and Conditions for Plant Analytics Services – for Customer in Germany"1) ("Allgemeine Geschäftsbedingungen für das Plant Analytics Services – für Kunden in Deutschland" (only available in German at the moment)) and/or
- for stand-alone software products and software products forming a part of a product or project, the "General License Conditions for Software Products for Automation and Drives for Customers with a Seat or registered Office in Germany"1) and/or
- for other supplies and/or services the "General Conditions for the Supply of Products and Services of the Electrical and Electronics Industry"1).
  In case such supplies and/or services should contain Open Source Software, the conditions of which shall prevail over the " General Conditions for the Supply of Products and Services of the Electrical and Electronics Industry "1). A notice will be contained in the scope of delivery in which the applicable conditions for Open Source Software are specified. This shall apply mutatis mutandis for notices referring to other third party software components.

1.2 For customers with a seat or registered office outside Germany

For customers with a seat or registered office outside Germany, the following applies subordinate to the T&C:

- for Plant Analytics Services the "Standard Terms and Conditions for Plant Analytics Services"1) and/or
- for services the "International Terms & Conditions for Services"1) supplemented by "Software Licensing Conditions"1) and/or
- for other supplies of hard- and/or software the "International Terms & Conditions for Products"1) supplemented by "Software Licensing Conditions" 1)

1.3 For customers with master or framework agreement

To the extent our supplies and/or services offered are covered by an existing master or framework agreement, the terms and conditions of that agreement shall apply instead of T&C.

2. Prices

The prices are in € (Euro) ex point of delivery, exclusive of packaging.

The sales tax (value added tax) is not included in the prices. It shall be charged separately at the respective rate according to the applicable statutory legal regulations.

Prices are subject to change without prior notice. We will charget the prices valid at the time of delivery.

To compensate for variations in the price of raw materials (e.g. silver, copper, aluminum, lead, gold, dysprosium and neodym), surcharges are calculated on a daily basis using the so-called metal factor for products containing these raw materials. A surcharge for the respective raw material is calculated as a supplement to the price of a product if the basic official price of the raw material in question is exceeded.

The metal factor of a product indicates the basic official price (for those raw materials concerned) as of which the surcharges on the price of the product are applied, and with what method of calculation.

An exact explanation of the metal factor can be downloaded at:

www.siemens.com/automation/salesmaterial-as/catalog/en/terms_of_trade_en.pdf

To calculate the surcharge (except in the cases of dysprosium and neodym), the official price from the day prior to that on which the order was received or the release order was effected is used.

To calculate the surcharge applicable to dysprosium and neodym ("rare earths"), the corresponding three-month basic average price in the quarter prior to that in which the order was received or the release order was effected is used with a one-month buffer (details on the calculation can be found in the explanation of the metal factor).

3. Additional Terms and Conditions

The dimensions are in mm. In Germany, according to the German law on units in measuring technology, data in inches apply only to devices for export.

Illustrations are not binding.

Insofar as there are no remarks on the individual pages of this catalog - especially with regard to data, dimensions and weights given - these are subject to change without prior notice.

1) The text of the Terms and Conditions of Siemens AG can be downloaded at
www.siemens.com/automation/salesmaterial-as/catalog/en/terms_of_trade_en.pdf

4. Export regulations

We shall not be obligated to fulfill any agreement if such fulfillment is prevented by any impediments arising out of national or international foreign trade or customs requirements or any embargoes and/or other sanctions.

Export may be subject to license. We shall indicate in the delivery details whether licenses are required under German, European and US export lists.

Our products are controlled by the U.S. Government (when labeled with "ECCN" unequal "N") and authorized for export only to the country of ultimate destination for use by the ultimate consignee or end-user(s) herein identified. They may not be resold, transferred, or otherwise disposed of, to any other country or to any person other than the authorized ultimate consignee or end-user(s), either in their original form or after being incorporated into other items, without first obtaining approval from the U.S. Government or as otherwise authorized by U.S. law and regulations.

The export indications can be viewed in advance in the description of the respective goods on the Industry Mall, our online catalog system. Only the export labels "AL" and "ECCN" indicated on order confirmations, delivery notes and invoices are authoritative.

Products labeled with "AL" unequal "N" are subject to European / national export authorization. Products without label, with label "AL:N" / "ECCN:N", or label "AL:9X9999" / "ECCN: 9X9999" may require authorization from responsible authorities depending on the final end-use, or the destination.

If you transfer goods (hardware and/or software and/or technology as well as corresponding documentation, regardless of the mode of provision) delivered by us or works and services (including all kinds of technical support) performed by us to a third party worldwide, you must comply with all applicable national and international (re-)export control regulations.

If required for the purpose of conducting export control checks, you (upon request by us) shall promptly provide us with all information pertaining to the particular end customer, final disposition and intended use of goods delivered by us respectively works and services provided by us, as well as to any export control restrictions existing in this relation.

The products listed in this catalog may be subject to European/German and/or US export regulations. Any export requiring approval is therefore subject to authorization by the relevant authorities.

Errors excepted and subject to change without prior notice.

Catalogs

Digital Factory, Process Industries and Drives and Energy Management

Further information can be obtained from our branch offices listed at www.siemens.com/automation-contact

Interactive Catalog on DVD	*Catalog*
Products for Automation and Drives	**CA 01**

Building Control	
GAMMA Building Control	ET G1

Drive Systems	
SINAMICS G130 Drive Converter Chassis Units SINAMICS G150 Drive Converter Cabinet Units	D 11
SINAMICS GM150, SINAMICS SM150 Medium-Voltage Converters	D 12
Digital: SINAMICS PERFECT HARMONY GH180 Medium-Voltage Air-Cooled Drives (Germany Edition)	*D 15.1*
SINAMICS G180 Converters – Compact Units, Cabinet Systems, Cabinet Units Air-Cooled and Liquid-Cooled	D 18.1
SINAMICS S120 Chassis Format Converter Units SINAMICS S120 Cabinet Modules SINAMICS S150 Converter Cabinet Units	D 21.3
SINAMICS S120 and SIMOTICS	D 21.4
SINAMICS DCM DC Converter, Control Module	D 23.1
SINAMICS Inverters for Single-Axis Drives · Built-In Units	D 31.1
SINAMICS Inverters for Single-Axis Drives · Distributed Inverters	D 31.2
Digital: SINAMICS S210 Servo Drive System	*D 32*
Digital: SINAMICS V90 Basic Servo Drive System	*D 33*
SINAMICS G120P and SINAMICS G120P Cabinet pump, fan, compressor converters	D 35
LOHER VARIO High Voltage Motors Flameproof, Type Series 1PS4, 1PS5, 1MV4 and 1MV5 Frame Size 355 to 1000, Power Range 80 to 7100 kW	D 83.2
Digital: Three-Phase Induction Motors SIMOTICS HV, SIMOTICS TN	*D 84.1*
Digital: Three-Phase Induction Motors SIMOTICS HV	*D 84.3*
High Voltage Three-phase Induction Motors SIMOTICS HV Series A-compact PLUS	D 84.9
Digital: Modular Industrial Generators SIGENTICS M	*D 85.1*
Three-Phase Induction Motors SIMOTICS HV, Series H-compact	D 86.1
Synchronous Motors with Permanent-Magnet Technology, HT-direct	D 86.2
DC Motors	DA 12
SIMOVERT PM Modular Converter Systems	DA 45
MICROMASTER 420/430/440 Inverters	DA 51.2
MICROMASTER 411/COMBIMASTER 411	DA 51.3
Low-Voltage Three-Phase-Motors	
SIMOTOCS S-1FG1 Servo geared motors	D 41
SIMOTICS Low-Voltage Motors	D 81.1
SIMOTICS FD Low-Voltage Motors	D 81.8
LOHER Low-Voltage Motors	D 83.1
Digital: MOTOX Geared Motors	*D 87.1*
SIMOGEAR Geared Motors	MD 50.1
SIMOGEAR Electric-monorail geared motors Light-load and heavy-load applications	MD 50.8
SIMOGEAR Gearboxes with adapter	MD 50.11
Mechanical Driving Machines	
FLENDER Standard Couplings	MD 10.1
FLENDER High Performance Couplings	MD 10.2
FLENDER Backlash-free Couplings	MD 10.3
FLENDER SIP Standard industrial planetary gear units	MD 31.1

Digital: These catalogs are only available as a PDF.

Process Instrumentation and Analytics	*Catalog*
Digital: Field Instruments for Process Automation	*FI 01*
Digital: Display Recorders SIREC D	*MP 20*
Digital: SIPART Controllers and Software	*MP 31*
Products for Weighing Technology	WT 10
Digital: Process Analytical Instruments	*AP 01*
Digital: Process Analytics, Components for Continuous Emission Monitoring	*AP 11*

Low-Voltage Power Distribution and Electrical Installation Technology	
SENTRON · SIVACON · ALPHA Protection, Switching, Measuring and Monitoring Devices, Switchboards and Distribution Systems	LV 10
Standards-Compliant Components for Photovoltaic Plants	LV 11
Electrical Components for the Railway Industry	LV 12
Power Monitoring Made Simple	LV 14
Components for Industrial Control Panels according to UL Standards	LV 16
3WT Air Circuit Breakers up to 4000 A	LV 35
3VT Molded Case Circuit Breakers up to 1600 A	LV 36
Digital: SIVACON System Cubicles, System Lighting and System Air-Conditioning	*LV 50*
Digital: ALPHA Distribution Systems	*LV 51*
ALPHA FIX Terminal Blocks	LV 52
SIVACON S4 Power Distribution Boards	LV 56
SIVACON 8PS Busbar Trunking Systems	LV 70
Digital: DELTA Switches and Socket Outlets	*ET D1*
Vacuum Switching Technology and Components for Medium Voltage	HG 11.01

Motion Control	
SINUMERIK 840 Equipment for Machine Tools	NC 62
SINUMERIK 808 Equipment for Machine Tools	NC 81.1
SINUMERIK 828 Equipment for Machine Tools	NC 82
SIMOTION Equipment for Production Machines	PM 21
Digital: Drive and Control Components for Cranes	*CR 1*

Power Supply	
SITOP Power supply	KT 10.1

Safety Integrated	
Safety Technology for Factory Automation	SI 10

SIMATIC HMI / PC-based Automation	
Human Machine Interface Systems/ PC-based Automation	ST 80/ ST PC

SIMATIC Ident	
Industrial Identification Systems	ID 10

SIMATIC Industrial Automation Systems	
Products for Totally Integrated Automation	ST 70
SIMATIC PCS 7 Process Control System System components	ST PCS 7
SIMATIC PCS 7 Process Control System Technology components	ST PCS 7 T
Add-ons for the SIMATIC PCS 7 Process Control System	ST PCS 7 AO
SIMATIC S7-400 advanced controller	ST 400

SIMATIC NET	
Industrial Communication	IK PI

SIRIUS Industrial Controls	
Digital: SIRIUS Industrial Controls	*IC 10*

Information and Download Center

Digital versions of the catalogs are available on the Internet at:
www.siemens.com/industry/infocenter
There you'll find additional catalogs in other languages.

Please note the section "Downloading catalogs" on page "Online services" in the appendix of this catalog.

Get more information

All the latest information on process analytical instruments can be found on the internet at:
www.siemens.com/processanalytics

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Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial security measures that may be implemented, please visit
https://www.siemens.com/industrialsecurity

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed under
https://www.siemens.com/industrialsecurity