SIEMENS

Catalog
AP 01

Edition
2022

PROCESS AUTOMATION

Process Analytical Instruments

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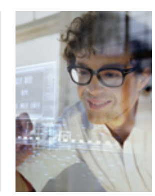

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Process Analytical Instruments

Process Automation

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Catalog AP 01 · 2022

Supersedes:
Catalog AP 01 · 2018

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and as PDF at the following address:
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For comfortable, fast and error free product selection you will get support in our PIA Life Cycle Portal:
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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.

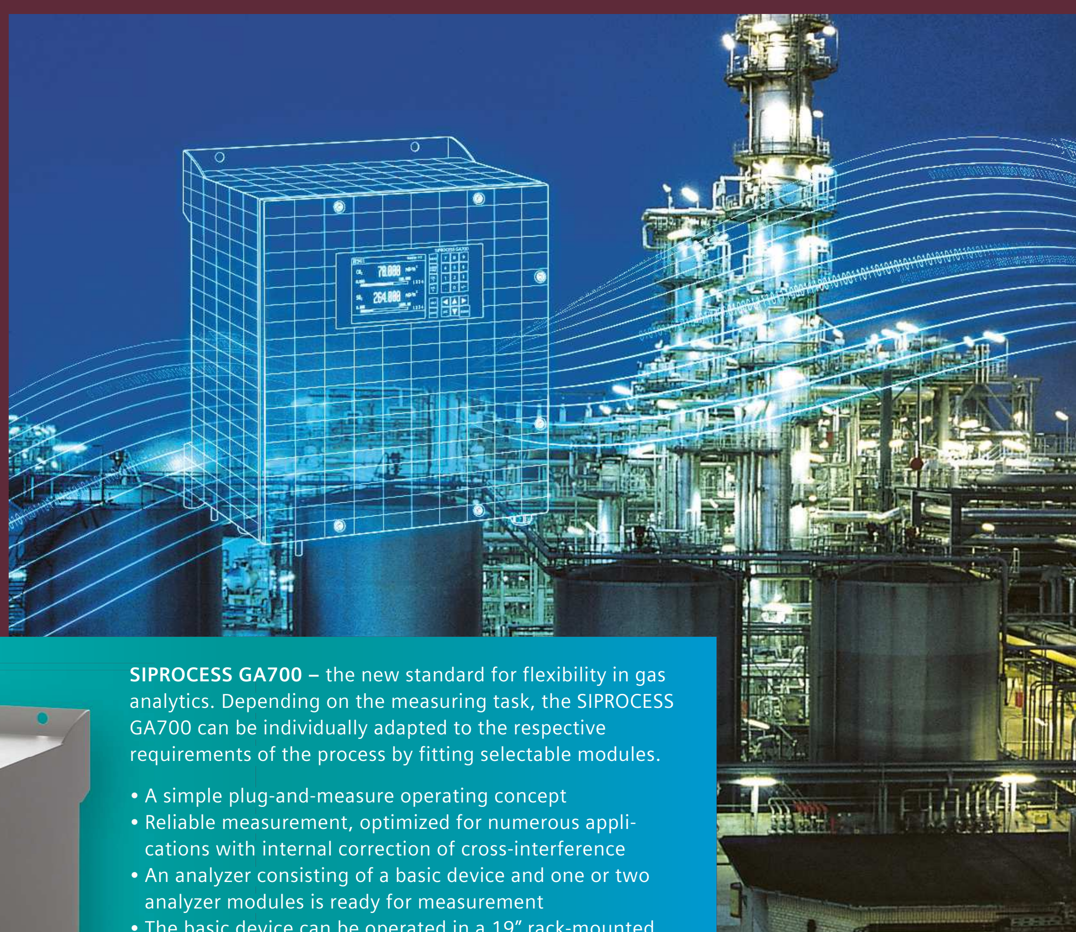
For efficient gas composition analysis

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.

Processes under control

From flue gas monitoring in waste incineration and power plants 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.

- A simple plug-and-measure operating concept
- 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 can be operated in a 19" rack-mounted enclosure that is three units high or in a wall-mounted version
- The communication interfaces present in the basic units can be adapted to the respective process environment or process control system using optional interface adapters

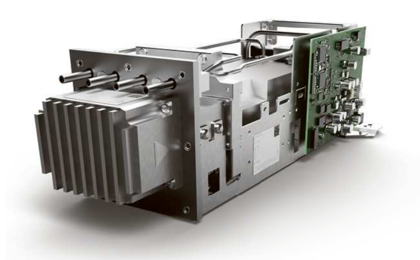
The new SIPROCESS GA700 series for gas analysis lets you accommodate up to two modules in a single enclosure: either in a housing for wall mounting or in a 19” rack-mounted enclosure that is three units high.

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 and Zone 2, with combustible and occasionally explosive samples or non-combustible sample gases
- With its Ex eC degree of protection, the wall unit can be operated in Zone 2 with sample gases whose concentration is below the lower explosive limit (LEL)
- The 19” rack-mounted enclosure with Ex eC degree of protection can be operated with a suitable outer housing in Zone 2 with combustible or non-combustible gases

SIPROCESS GA700

- Ex-field device for Zone 1 and Zone 2 applications (only OXYMAT 7)



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 based on a 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 based on a 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
- Measuring range 0–0.5% (smallest measuring range) or 0–100% (largest measuring range)

Process gas analysis – Extractive
Continuously, samples are extracted from the process line, prepared and supplied to the analyzer for close and precise monitoring of the process. This way, deviations are managed within seconds.

CALOMAT 6

- Suitable for installation in Ex Zone 1 or Ex Zone 2
- For all areas of gas purity measurement up to use in processes for controlling production methods
- Approved to Safety Integrity Level 1 (SIL 1)
- For measuring the concentration of gas components such as H_2, Cl_2, HCl, or NH_3 in binary or quasi-binary mixtures

CALOMAT 62

- Specifically designed to measure hydrogen and noble gases in corrosive environments, such as chlorine
- Uses the principle of thermal conductivity (TCD) and is designed specifically 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 analysis to measurement of high hydrocarbon concentrations even in the presence of corrosive gases

OXYMAT 6/61

- 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
- Approved to Safety Integrity Level 2 (SIL 2)

OXYMAT 64

- Special analyzer for measurement of trace oxygen in the ppm range
- For air-separation systems or technical gas production

ULTRAMAT 23

- For standard applications in various industries
- Benchmark for emission monitoring tasks
- Innovative multi-component gas analyzer with unique combination of UV and IR in one device
- For measuring UV-active and/or infrared-sensitive gases by means of the NDIR, as well as oxygen through the use of electrochemical or paramagnetic oxygen measuring cells
- Calibration with ambient air – no extra calibration gases needed
- Minimal maintenance efforts guarantee high availability

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
- Approved to Safety Integrity Level 2 (SIL 2)

ULTRAMAT/OXYMAT 6

- Combines the features of the ULTRAMAT 6 and OXYMAT 6 in a 19" analyzer
- Extremely space-saving and compact design
- Approved to Safety Integrity Level 2 (SIL 2)

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, 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 oxygen measurements in harsh environments
- Suitable for use in SIL 1 safety systems according to IEC 61508/IEC 61511

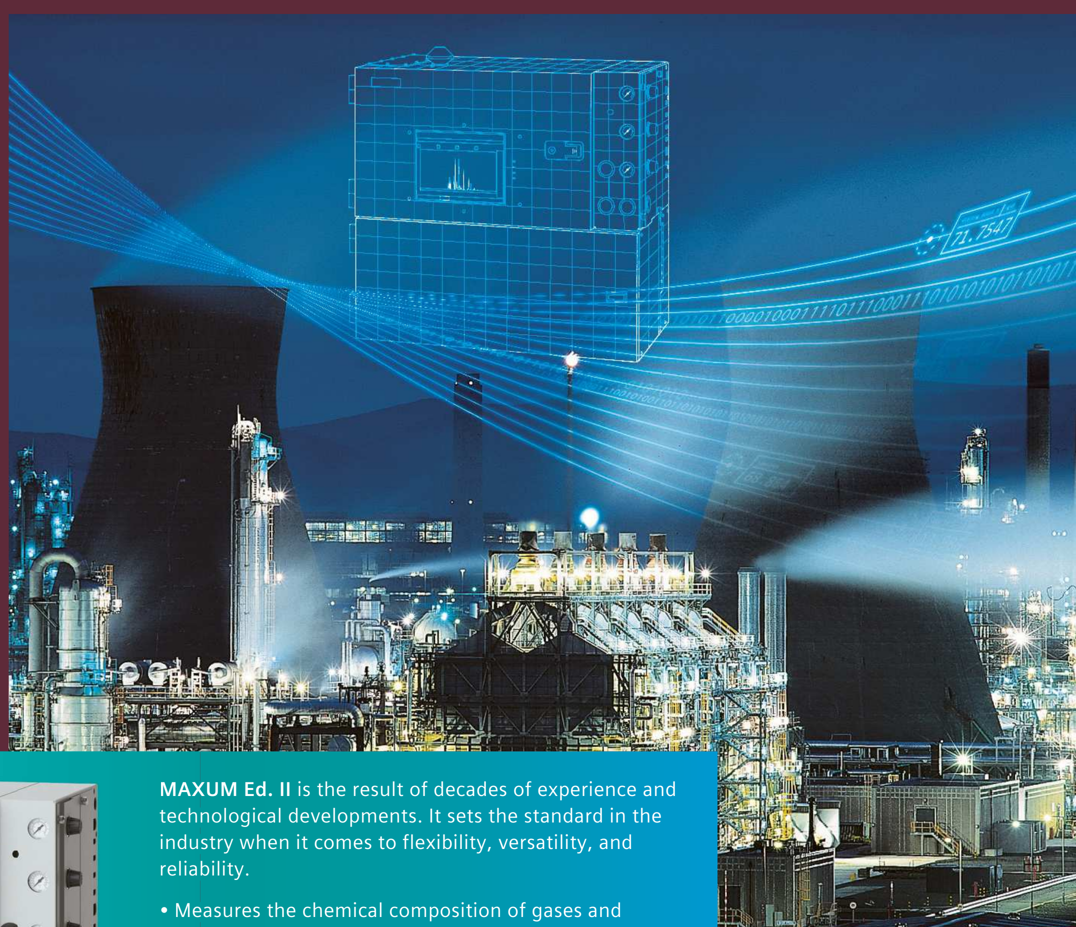
In situ analytical procedures feature physical measurements within the flow of process gas directly in the actual process gas line. This means gases can also be measured under extreme conditions. Gas measurements with diode lasers are characterized by exceptional selectivity and flexibility. Neither 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 six 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 600 °C or with very high dust concentrations
- Measurement of NH_3, HCl, HF, H_2O, CO, or CO_2 in flue gas, e.g. before and after gas purification
- Applications in cement and paper plants

Efficiency meets unsurpassed performance

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 various sectors including the chemicals, petrochemicals, refining, natural gas, gas processing, and LNG industries.



MAXUM Ed. 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

MAXUM Ed. II

Our highly adaptable MAXUM Ed. II process gas chromatographs are the perfect match for a wide variety of process analytics applications, even with varying user requirements for each analyzer.

- Extremely rugged with specially designed hardware and software, simultaneous applications, parallel chromatography, and reduced analysis times
- Valveless column switching
- Smart Sampling System Interface (SSSI)
- New thermal conductivity detector for MAXUM airbath/airless GC
- With MAXUM Ed. II 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 in accordance with 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 and analytics all the way 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

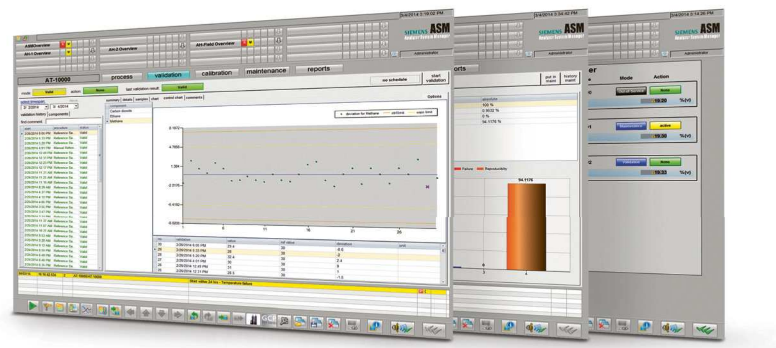
- Service experts consult you during the entire lifecycle, starting with the selection of the right analyzer to emerging operational challenges
- Commissioning and start-up in the field by contracts specialists all around the world
- Service contracts tailored to your individual needs
- Comprehensive training courses in our worldwide training centers or on site
- Provison services of rental equipment
- On-call services to ensure fast support through experts in case of need
- Siemens AP offers customers extended warranties services for up to 5 years
- Remote services with pro-active checks and rapid reactive assistance through remote access
- Fast, dependable, worldwide supply of spare parts ensures optimal availability

Increasing performance with Analyzer System Manager (ASM)

In the present time, it is more and more important to have accurate data and use them for further optimization of the plant. The Analyzer System Manager (ASM) offers comprehensive data collection, validation functions, maintenance planning and reporting functions, which enables enhanced data analytics.

Benefit from the Analyzer System Manager through an optimized performance, reduced maintenance costs and higher data quality.

Harvest the fruits of digitalization with Analyzer System Manager and open the door for a new performance level of your analyzer measurement systems.



Data Acquisition and Handling System for monitoring and optimization of analyzer measurement systems supporting maintenance management and providing reporting of performance and service KPI and other relevant analyzer information

Key features

- Collection of important analyzer performance data over a variety of communication interfaces and storage in a central database
- Validation/Calibration of analyzers through centralized system
- Monitoring of analyzer measurement system data including sample preparation according to ASTM rules and deviations
- Maintenance Planning and Documentation
- Gas Bottle Management
- Comprehensive reporting module is available for evaluation documentation and further analysis
- State-of-the-art network solutions in a client-server architecture support even complex plant structures with distributed workstations
- Broad range of analyzers including 3rd party devices are supported through ASM

1

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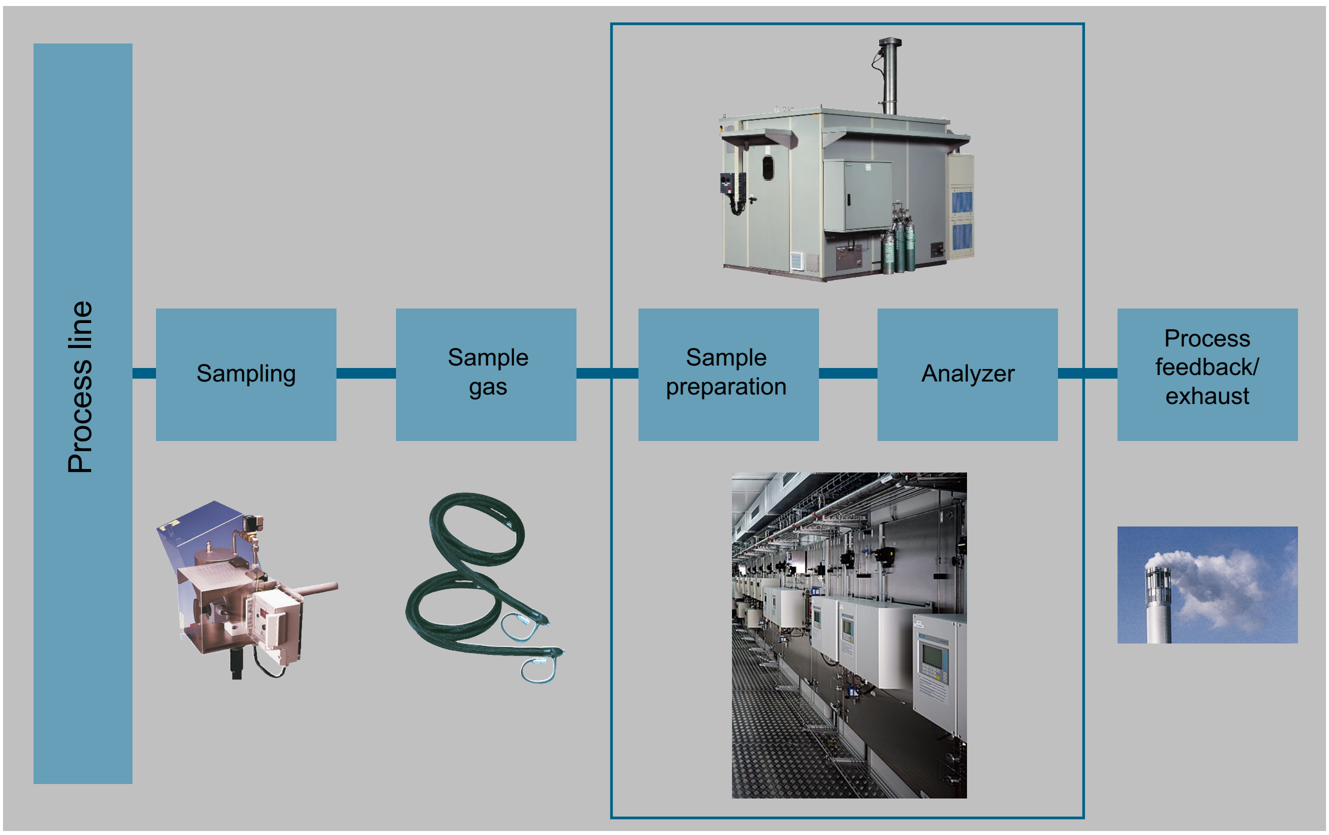
Overview

Siemens process gas analyzers have been used in the process industry for more than 40 years, and are renowned for their quality, reliability and measuring accuracy. The flexibility provided by the continuous process gas analyzers with respect to enclosure design, explosion protection, corrosion resistance and communications capability means that optimum solutions can be found for all applications.
Nowadays, the communications capability of analyzers is becoming increasingly important. Siemens process gas analyzers are an integral component of Siemens' "Totally Integrated Automation" concept which is globally unique. This concept permits design of uniform process communication from the operations management level down to the field level. The simple integration of analyzers into the host control systems is the basis for a uniform automation and analysis solution.
Many years of experience in the development and production of analyzers as well as in the planning and installation of analyzer systems distinguishes Siemens as a solution provider - reliable, innovative and with global presence.



Schematic representation of the measuring procedure of extractive site installations

Extractive procedures for process gas analysis

Extractive process gas analyzers are used for continuous determination of the concentrations of one or more gases in a gas mixture. Determination of the concentration of gases in a process is used to control and monitor process flows, and is therefore decisive for the automation and optimization of processes and ensuring product quality. In addition, process gas analyzers are used to check emissions, thus making an important contribution to environmental protection, as well as for ensuring compliance with statutory directives.
With extractive measuring procedures, the sample to be analyzed is extracted from the process line and applied preconditioned to the analyzer via a sample line and a sample preparation system. This system, for example, adjusts the pressure, temperature and flow of the sample preparation, and frees the sample gas of dust and moisture if necessary. This guarantees that the measurement can be carried out under defined conditions. Furthermore, the analyzer is protected from damaging influences.
Various measuring procedures with different physical and electrochemical methods are used depending on the type of components to be measured and the measuring point. Siemens offers a range of measuring procedures for extractive gas analysis in two device families, SIPROCESS GA700 and series 6 / ULTRAMAT 23. Each device family provides peak analytical performances for its class.

SIPROCESS GA700

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

Basic unit

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

Overview (Continued)

Modules

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

Module	Measuring task
ULTRAMAT 7	The ULTRAMAT 7 module is used for highly-selective measurement of infrared-active components such as CO, CO_2, NO, CH_4 or SO_2. In general, the application area covers many areas, e.g. the use in processes. These are used to control production processes and ensure product quality, even in the presence of highly corrosive gases.
OXYMAT 7	The OXYMAT 7 module is used to measure oxygen between 0 to 0.5% (smallest measuring range) and 0 to 100% (largest measuring range). It is designed for use as a field device at ambient temperatures up to 60 °C and allows highly exact measurements through application of the paramagnetic alternating pressure principle. Thanks to the modular design, the OXYMAT 7 module can be combined with an additional module.
CALOMAT 7	For determining the concentration of hydrogen and inert gases in binary mixtures by measuring the thermal conductivity. The CALOMAT 7 module features a high dynamic measuring range (e.g. 0 ... 0.5% and 0 ... 100% H_2, configurable) and a short T_{90} time.

Field control unit

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

Series 6 / ULTRAMAT 23

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

ULTRAMAT 6

For highly-selective measurement of infrared-active components such as CO, 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 enclosure for use in harsh atmospheres. In general, the application area ranges from all types of emission measurements to use in processes. These serve to control production processes and guarantee product quality, even in the presence of highly corrosive gases.

ULTRAMAT 23

The ULTRAMAT 23 is an innovative multi-component gas analyzer for measuring up to three infrared-sensitive gases using the NDIR principle. Use of a UV photometer enables you to measure even smaller concentrations of 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 measuring 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 parameterization of very small measuring ranges from 0 to 0.5% (detection limit 50 vpm), up to 0 to 100%, and even 99.5 to 100% in one device.
Suitable materials in the gas path even permit the analyzers to be used for measurement of corrosive gas mixtures. The detector unit does not come into contact with the sample gas, and therefore permits use in harsh conditions while simultaneously guaranteeing a long service life.

OXYMAT 61

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

OXYMAT 64

For measurement of oxygen concentrations in the trace range by means of ZrO_2 sensor technology. The OXYMAT 64 can be used to measure very small traces in the oxygen concentration, down to the smallest measuring range of 0 to 10 vpm. This is particularly interesting in systems for air separation. A catalytically inactive 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 binary mixtures by measuring the 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.

Overview (Continued)

FIDAMAT 6

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

SIPROCESS UV600

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

General information

Introducing flammable gases

Introducing frequently or permanently explosive gas mixtures to the gas analyzers mentioned in this section is not permitted.
The introduction of gases with flammable components at concentrations above the lower explosive limit (LEL) should only be carried out with devices fitted with piping. Purging of the enclosure as well as further measures must be carried out depending on the application. You can find more on this in the section "Extractive continuous process gas analytics" under "Ex-versions". When using SIPROCESS UV600, please contact the technical department. An inert gas must be used for purging (see manual for further information).

Cross-sensitivity

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

General installation guide and operating conditions

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

Calibration/adjustment

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

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

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

- Pre-purging of sample gas path via the sample gas inlet with nitrogen (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, ULTRAMAT 7, OXYMAT 7, CALOMAT 7)
  Sufficient supply of inert gas via the sample gas inlet (free from measured component and free from gases with a cross-interference on the measured component), usually 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 measuring range end 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 sections describing the respective device.

Overview (Continued)

Explosion protection

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

More information

Supplied product documentation on DVD and safety notes

The scope of delivery of the Siemens products for process analytics includes a multilingual instruction sheet with **safety notes** as well as a uniform **DVD - "Analytical products"**.
This DVD contains the most important manuals and certificates for the Siemens process analytics portfolio. The delivery may also contain product-specific or order-specific printed materials. For more information, see section 7 "Appendix".

Download catalogs

The entire documentation is available for download free of charge in various languages at:
http://www.siemens.com/processanalytics/documentation

Certificates

All available certificates are listed on the internet at:
http://www.siemens.com/processanalytics/certificate

Overview

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

Benefits

The basic unit provides:

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

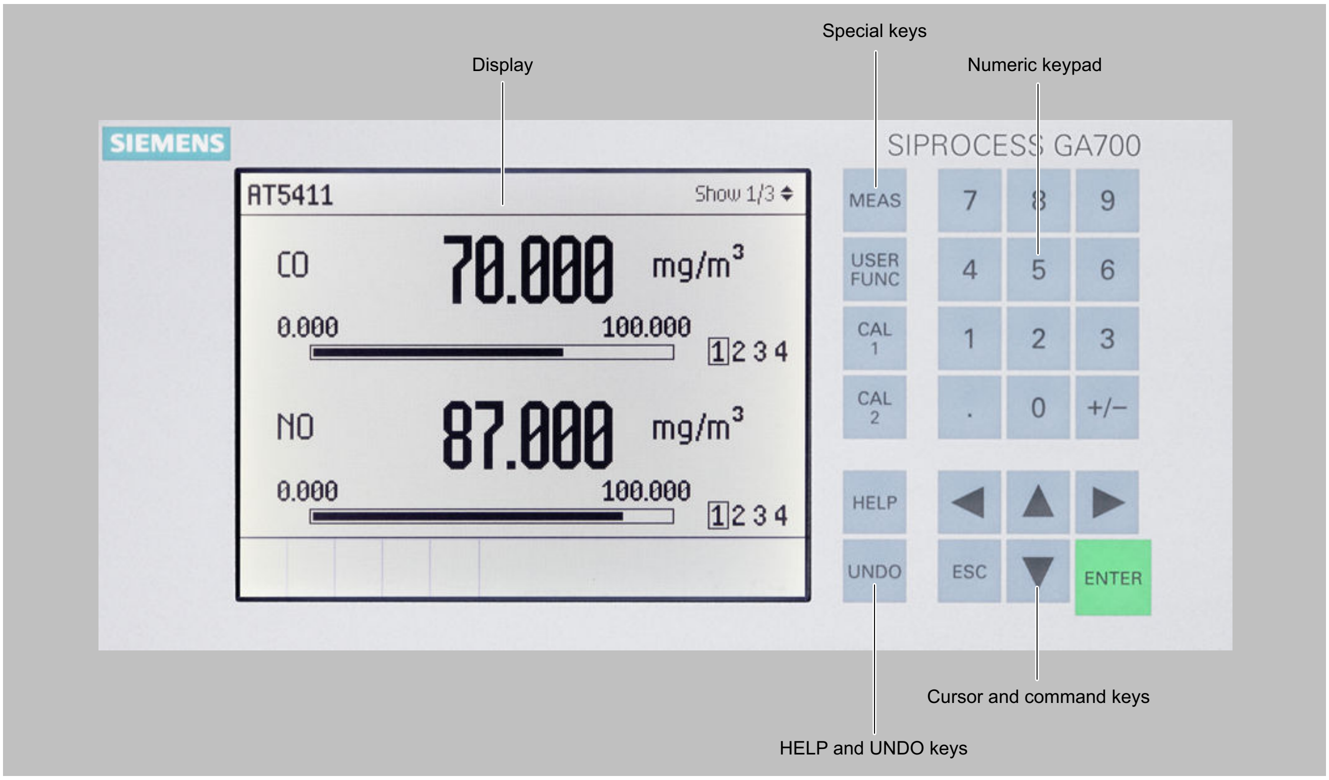
In addition to the modules, the basic unit contains the interfaces for the peripherals.

Application

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

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

Design



Display and operator panel of the SIPROCESS GA700 devices

19" rack unit

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

Wall-mounted device

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

Field device

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

Display and operator panel

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

Design (Continued)

Inputs and outputs

- 19" rack unit and wall-mounted unit
  - 8 digital inputs, designed for 24 V, floating, freely configurable (e.g. for measuring range switchover, processing of external signals from sample preparation)
  - 8 relay outputs, with changeover contacts, freely configurable (e.g. for faults, maintenance demanded, limit alarms, external solenoid valves)
  - Ethernet connection contained in the basic unit (connection on the rear side, Ethernet RJ45, 100 Mbit)
  - Service interface (front side); Ethernet RJ45, 100 Mbit.
- Field control unit
  - 1 analog output for each component 0/4 to 20 mA
  - 5 relay outputs, with changeover contacts, freely configurable, e.g. for faults or measuring range identification
  - 5 digital inputs, designed for 24 V, floating, freely configurable, e.g. for measuring range switchover

Interface modules

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

Function

Essential characteristics

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

Selection and ordering data

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

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

Selection and ordering data (Continued)

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

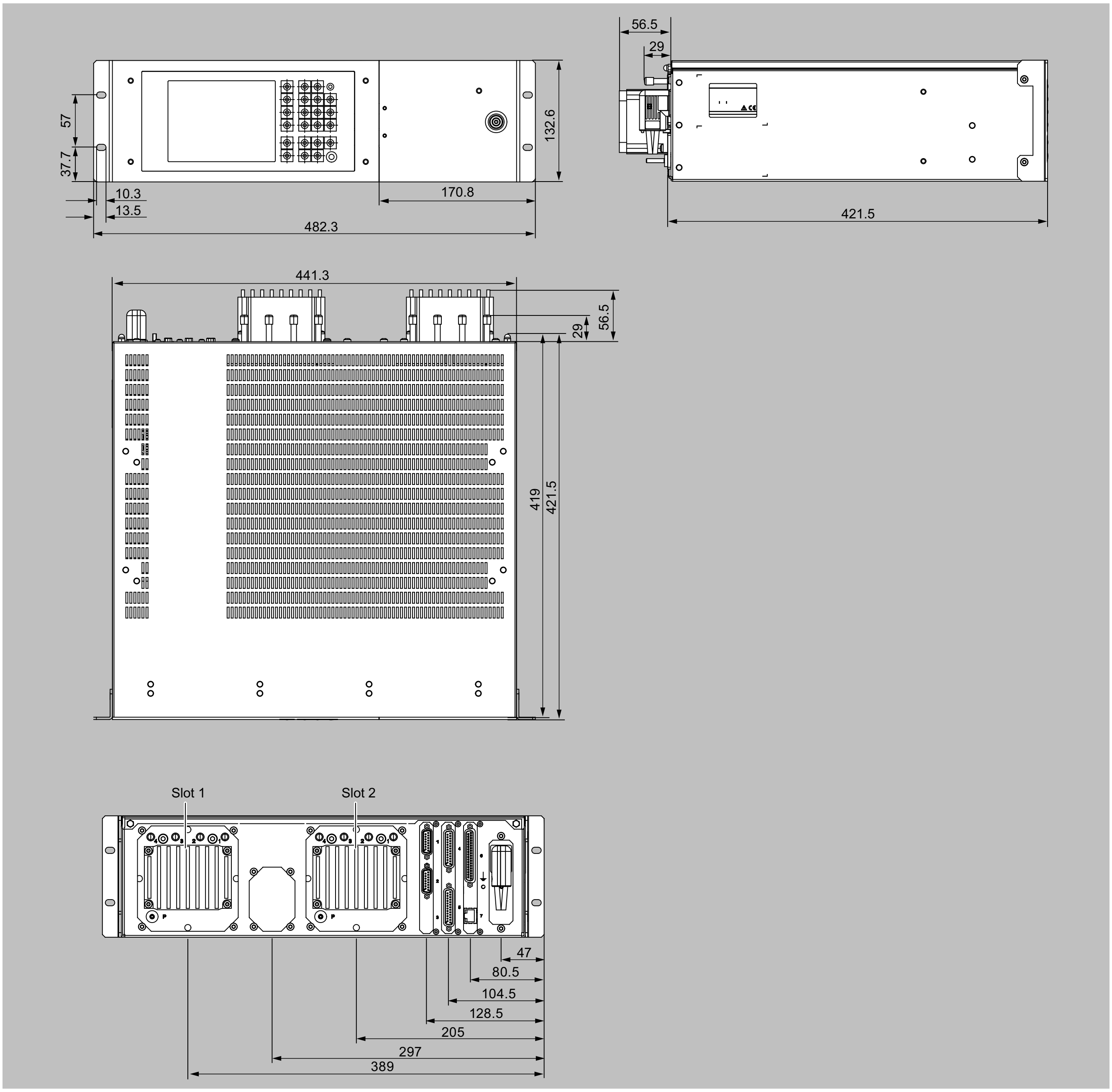
Technical specifications

	19" rack unit enclosure	Wall box	Field control unit
General information			
Operating position	Horizontal	Vertical	Horizontal
Design, enclosure			
Weight without module	8.6 kg	23 kg	27 kg
Degree of protection	IP20 according to EN 60529	IP65 according to EN 60529	IP55 according to EN 60529
Electrical characteristics			
Auxiliary power	100 … 240 V AC (nominal range of use 85 … 264 V), 50 … 60 Hz (nominal range of use 47 … 63 Hz)	100 … 240 V AC (nominal range of use 85 … 264 V), 50 … 60 Hz (nominal range of use 47 … 63 Hz)	100 … 240 V AC (nominal range of use 85 … 264 V), 50 … 60 Hz (nominal range of use 47 … 63 Hz)
Power consumption	Max. 280 VA	Max. 280 VA	Max. 280 VA
EMC interference immunity (electromagnetic compatibility)	In accordance with the standard requirements of NAMUR NE21 (05/2006) and EN 61326-1	In accordance with the standard requirements of NAMUR NE21 (05/2006) and EN 61326-1	In accordance with the standard requirements of NAMUR NE21 (05/2006) and EN 61326-1
Electrical safety	In accordance with EN 61010-1, overvoltage category II	In accordance with EN 61010-1, overvoltage category II	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 configured, e.g. for measuring range identification; max. load rating: 24 V AC/DC/1.7 A (total load for all 8 relay outputs in continuous operation max. 160 W), floating, non-sparking	8, with changeover contacts, can be freely configured, e.g. for measuring range identification; max. load rating: 24 V AC/DC/1.7 A (total load for all 8 relay outputs in continuous operation max. 160 W), floating, non-sparking	5, with changeover contacts, can be freely configured, e.g. for measuring range identification; load rating: 24 V AC/DC/1.7 A, floating, non-sparking
Digital inputs	8, designed for 24 V, floating, freely configurable, e.g. for measuring range switchover	8, designed for 24 V, floating, freely configurable, e.g. for measuring range switchover	5, designed for 24 V, floating, can be freely configured, e.g. for measuring range switchover
Ethernet interface Ethernet RJ45, 100 Mbit	Rear	Underside	Underside
Service port Ethernet RJ45, 100 Mbit	Front (behind door)	Inside on the processing unit	Inside on the processing unit
Interface module 1.1	12 relay outputs, with changeover contacts, load rating: 24 V AC/DC/1.7 A (total load for all 12 relay outputs in continuous operation max. 244 W), floating, non-sparking 8 digital inputs, designed for 24 V, floating, freely configurable	12 relay outputs, with changeover contacts, load rating: 24 V AC/DC/1.7 A (total load for all 12 relay outputs in continuous operation max. 244 W), floating, non-sparking 8 digital inputs, designed for 24 V, floating, freely configurable	-

Technical specifications (Continued)

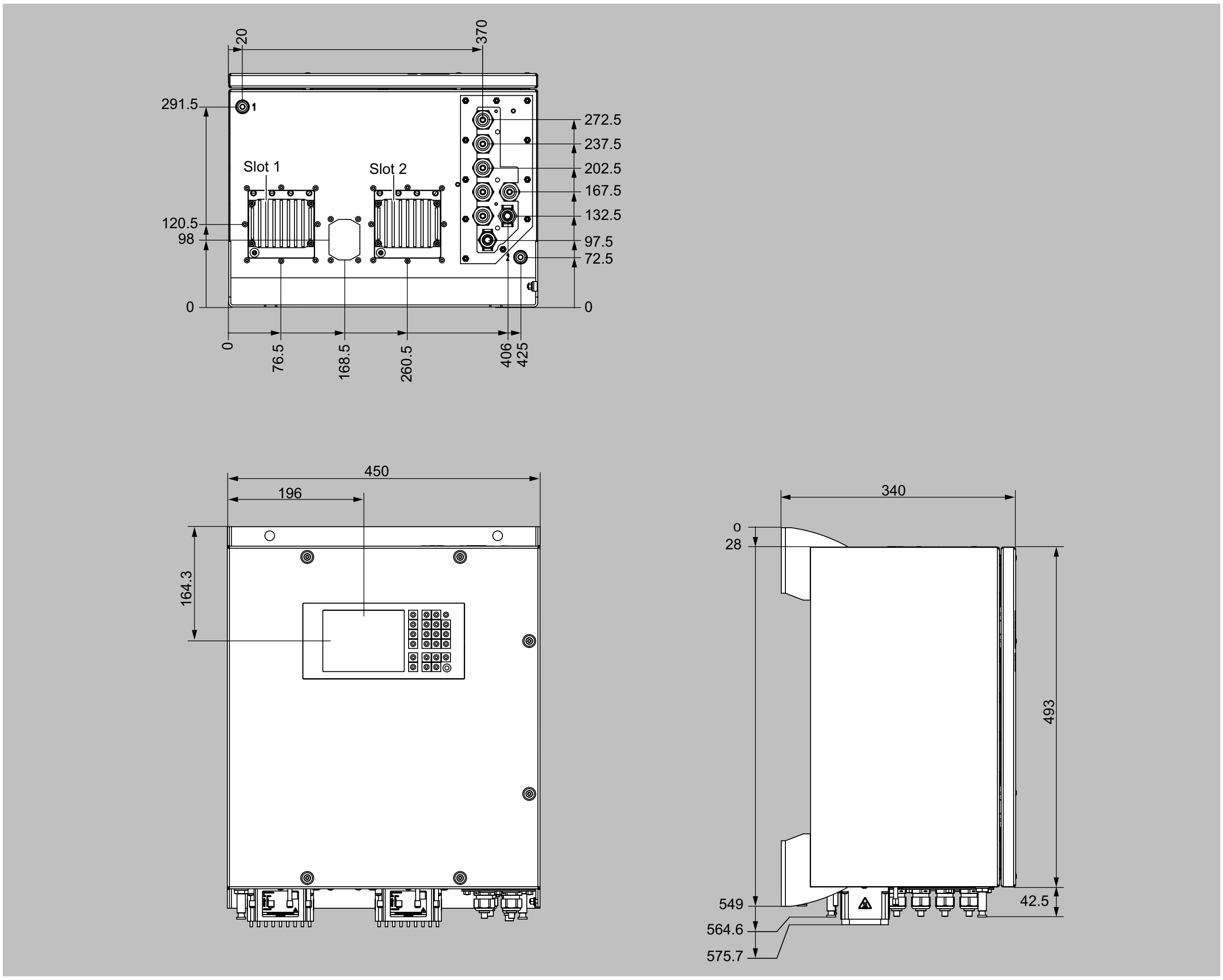
	19" rack unit enclosure	Wall box	Field control unit
Interface module 2.1	1 analog output for each component 0/4 ... 20 mA, floating; load 100 Ω ≤ R_L ≤ 750 Ω; 3 relay outputs per module, load rating: 24 V AC/DC/1.7 A (total load for all 6 relay outputs in continuous operation max. 122 W), floating, non-sparking	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	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-isolated, internal resistance ≤ 100 W
Climatic conditions			
Permissible operating altitude	3 000 m above sea level	3 000 m above sea level	2 000 m above sea level
Permissible ambient temperature (with one module; application-dependent with two modules)	Depends on application, See technical specifications of the modules Ventilation slots must not be covered (recommended minimum clearance upward from the next device when installing 2 modules and at maximum ambient temperature: min. 1 U)	Depends on application, See technical specifications of the modules	-30 ... + 70 °C during storage and transportation 5 ... 55 °C for regular operation with OXYMAT 7 5 ... 60 °C for operation with OXYMAT 7 and with limited measuring accuracy
Permissible humidity	< 90% RH (RH: relative humidity), during storage, transportation and operation (must not fall below dew point)	< 90% RH (RH: relative humidity), during storage, transportation and operation (must not fall below dew point)	< 90% RH (RH: relative humidity), during storage, transportation and operation (must not fall below dew point)

Dimensional drawings



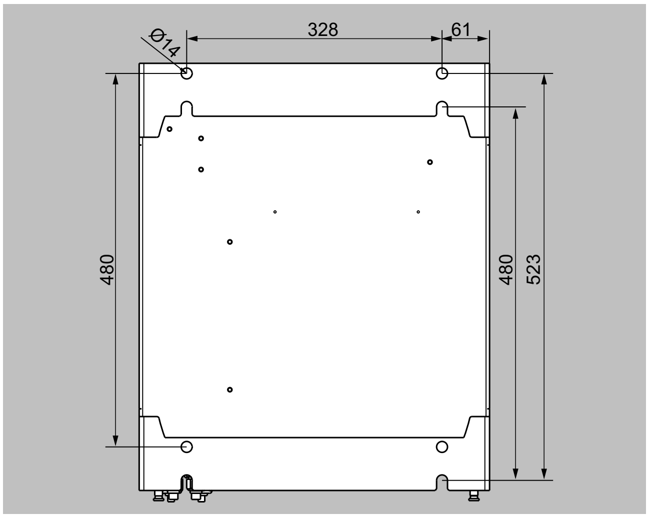
SIPROCESS GA700, rack unit, dimensions in mm

Dimensional drawings (Continued)

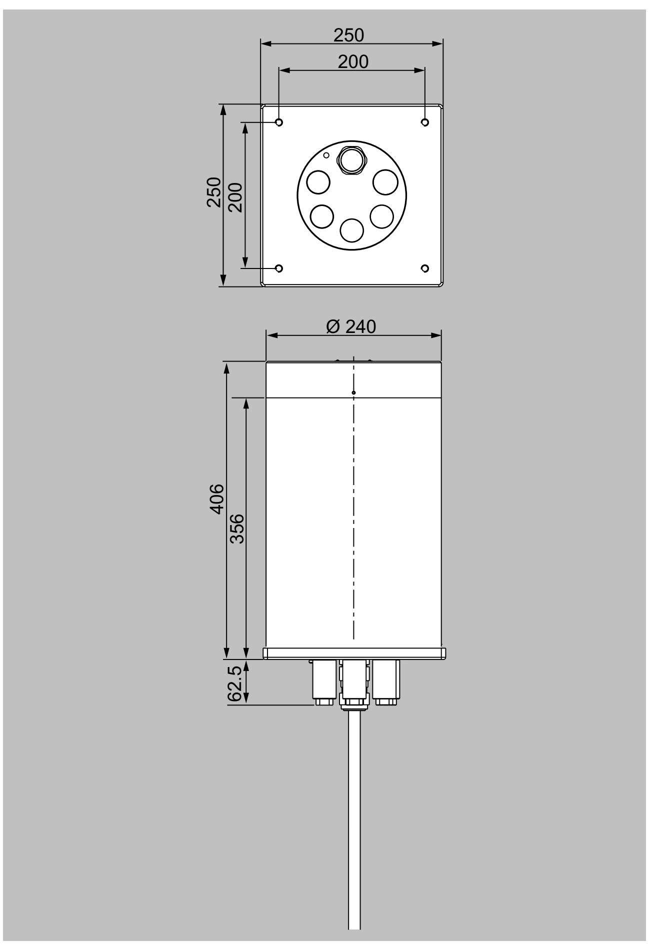


SIPROCESS GA700, wall enclosure, dimensions in mm

Dimensional drawings (Continued)

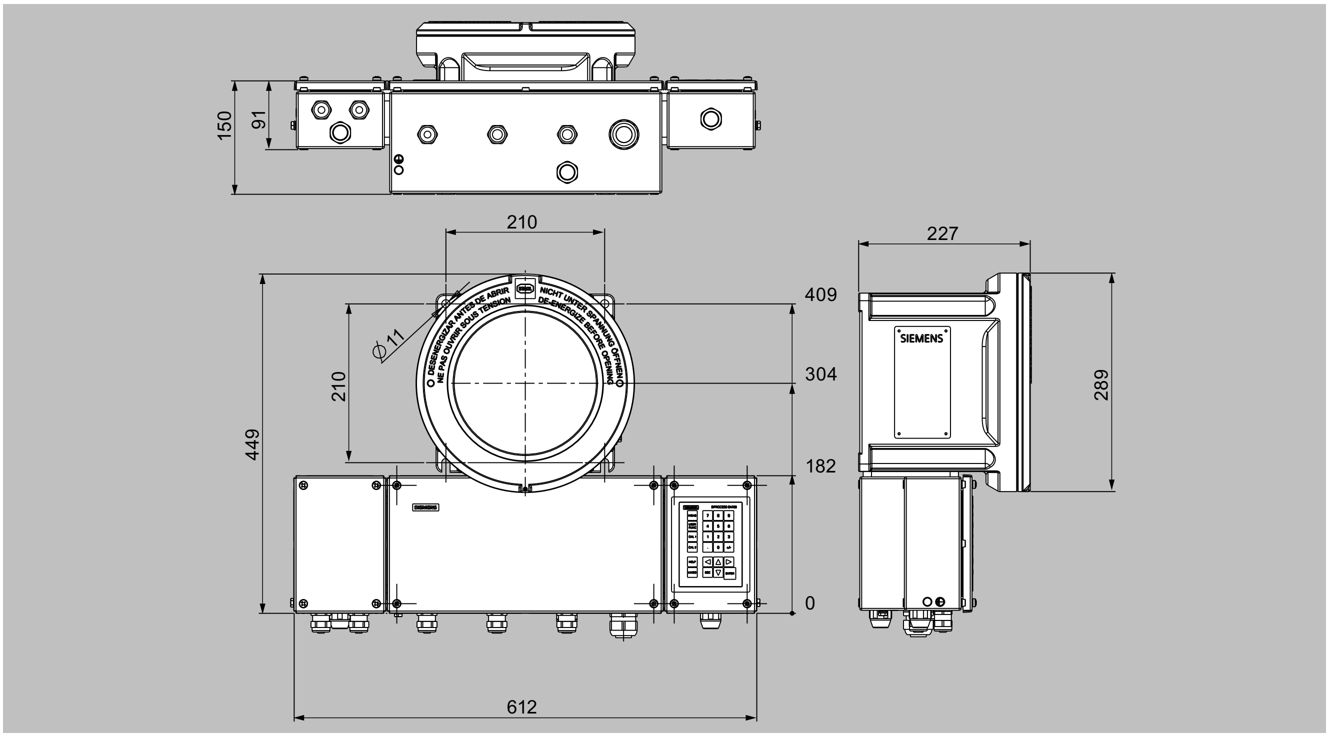


SIPROCESS GA700, wall enclosure, drilling pattern, dimensions in mm



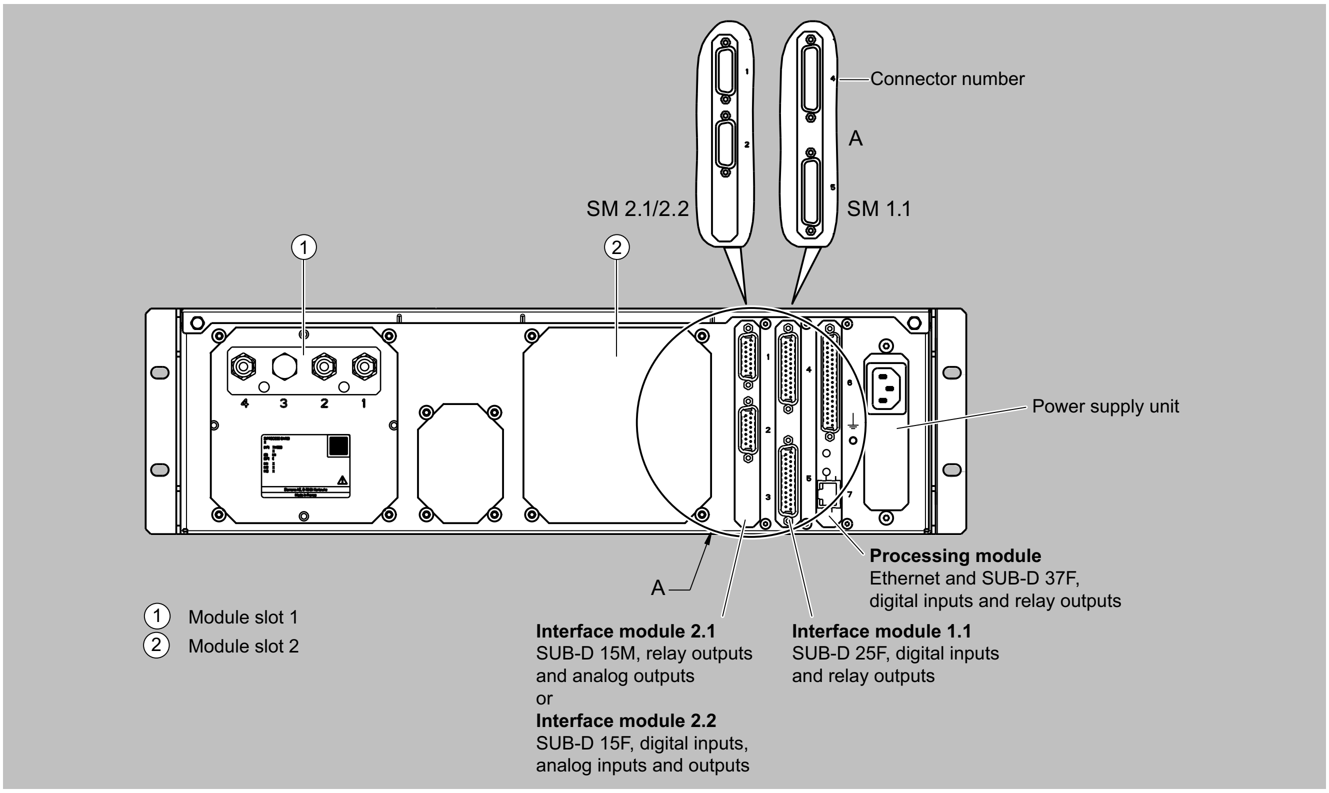
SIPROCESS GA700, field module, dimensions in mm

Dimensional drawings (Continued)



SIPROCESS GA700, field control unit, dimensions in mm

Circuit diagrams



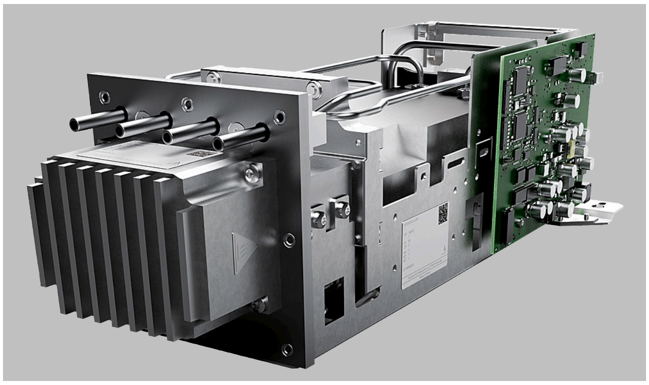
Connection of the signal cables: Expansion options for interface modules; example of rear wall of rack unit

Possible combinations

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

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

Overview



The ULTRAMAT 7 module functions according to the NDIR dual-beam differential mode process and measures gases whose absorption bands in the infrared wavelength range are between 2 and 9 µm, such as CO, 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 sample gases possible
- Heating possible

Application

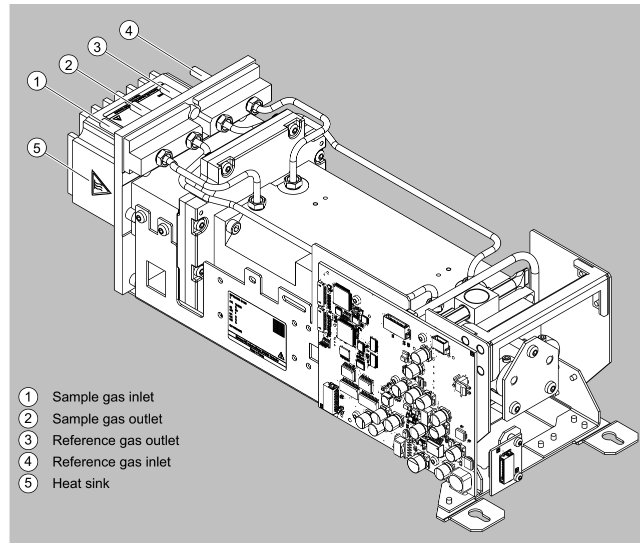
- Measurement for boiler control in combustion plants
- Process gas concentrations in chemical plants
- Trace measurements in pure gas processes
- Environmental protection
- TLV (Threshold Limit Value) monitoring at the workplace
- Quality monitoring
- introduction of flammable gases possible

Special versions

Flow-type reference cell

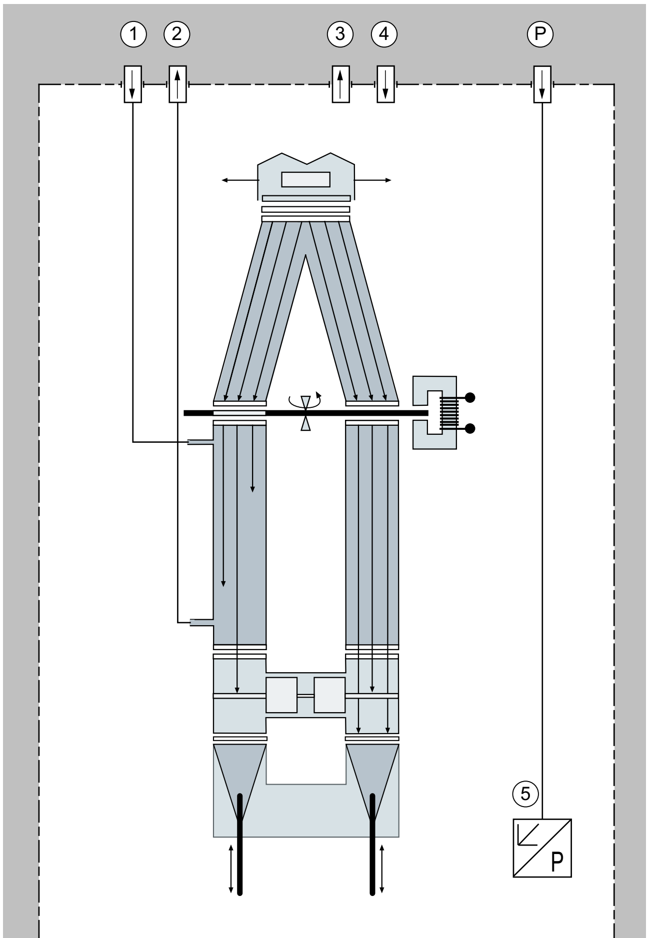
The flow through the reference cell should be adapted to the sample gas flow.

Design



ULTRAMAT 7 design

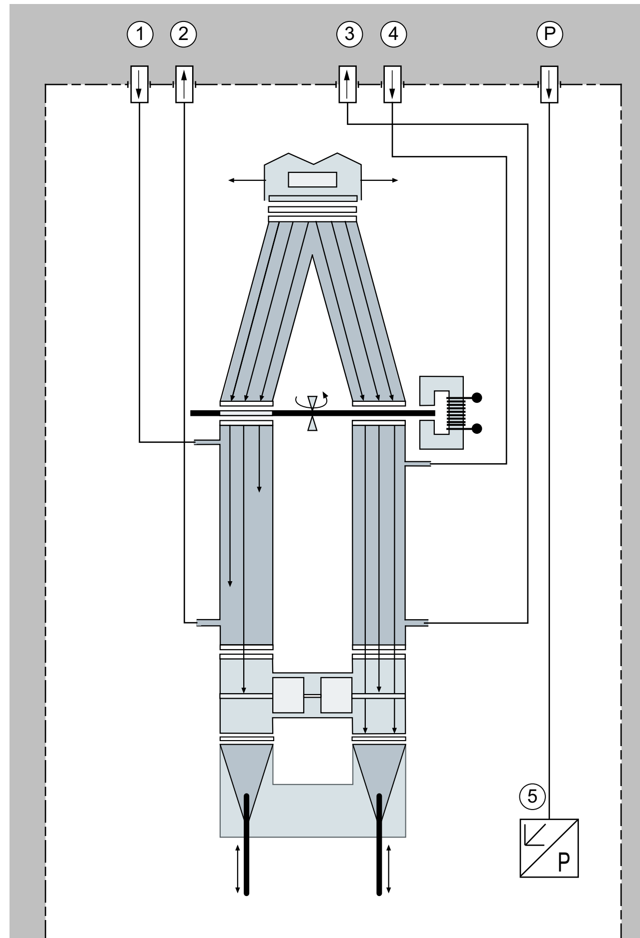
Design (Continued)



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 cell

Design (Continued)



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 cell

Mode of operation

Measuring principle

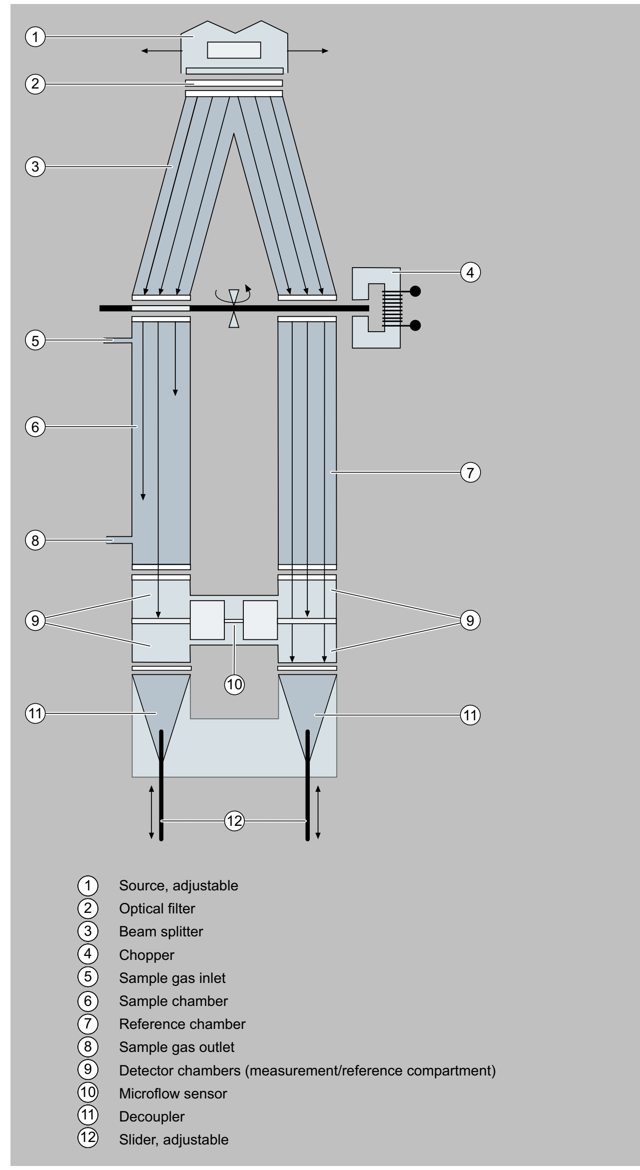
The measurements are based on the molecular-specific absorption of infrared radiation bands (absorption bands).
ULTRAMAT 7 modules use a spectral range which includes wavelengths of 2 to 9 µm. Although the absorbing wavelengths are characteristic of individual gases, they may partially overlap. This results in cross-sensitivities which are reduced to a minimum by the following measures:

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

Principle of operation

ULTRAMAT 7 modules operate according to the infrared push-pull chopped radiation principle and are equipped with a double-layer detector.
A source with a temperature of approx. 600 °C generates infrared radiation which is emitted in the beam splitter. The beam splitter acts as a filter chamber and divides the beam equally between the sample gas and reference gas compartments.
The chopper produces a periodic modulation of the infrared radiation, and thus enables relaxation of the detector.
The reference beam passes through the reference chamber and enters the detector chamber virtually unattenuated. The detector chamber is filled with a precisely defined concentration of the gas component to be measured. The sample beam, in contrast, passes through the sample chamber filled with sample gas and enters the detector chamber attenuated to various degrees. The degree of attenuation depends on the respective sample gas concentration.
The detector is designed as a double-layer detector. The detector layer at the source end serves primarily to absorb the middle of the band. The band edges, however, are absorbed equally by both of the layers.
The detector layers at both compartments of the detector are pneumatically connected to each other via a microflow sensor. This sensor element converts the pressure difference in the detector into an electrical signal.
The weighting between the first and second detector layer is preset at the factory depending on the application. The influence of interfering components is minimized as a result. To ensure the long-term stability of the measured value, the ULTRAMAT 7 module supports the predictive self-diagnostics of the analyzer. This function enables you to plan maintenance measures in a timely manner.

Mode of operation (Continued)



ULTRAMAT 7, principle of operation of the infrared channel

Function

Main features

- Dimension of measured value freely selectable (e.g. vpm, mg/m³)
- Four freely parameterizable measuring ranges per component
- Measuring ranges with suppressed zero point possible
- Measuring range identification
- Automatic or manual measuring range switchover selectable; remote switching is also possible
- Differential measuring ranges with flow-type reference cell
- Storage of measured values possible during calibration
- Time constants selectable within wide limits (static/dynamic noise damping); i.e. the response time of the device or component can be adapted to the respective measuring task
- Short response time
- Low long-term drift
- Measuring point switchover for up to 4 measuring points (parameterizable)
- Measuring point identification
- Internal pressure sensor for correction of variations in atmospheric pressure in the range 700 to 1 200 hPa absolute
- Automatic measuring range calibration parameterizable
- Operation based on NAMUR recommendation
- Preventive maintenance - IR source monitoring
- Sample chamber for use in presence of highly corrosive sample gases, e.g. tantalum inlay sheet or Hastelloy C22 (special application)

Selection and ordering data

ULTRAMAT 7 module For measuring IR-absorbing gases		**Article No.** 7MB3010-	●	●	●	●	●	-	●	A	●	●
Click on the Article No. for online configuration in the PIA Life Cycle Portal. ***Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".***												
Module version												
Standard module for 19 inch rack unit enclosure and wall box			0									
Heated module 65 °C for wall box			1									
Standard module for hazardous zone 19 inch rack unit enclosure and wall box			2									
Heated Ex module 65 °C for wall box			3									
Measured components[1]	**Possible with measuring range identification**											
CO	B[2], C ... P			A								
CO (selective)	C, D ... P			B								
CO_2	A[2], B ... P			C								
CH_4	D[2], E ... P			D								
C_2H_4	F[2], G ... P			E								
SO_2	D[2], E ... P			F								
NO	E[2], F ... J			G								
N_2O	D[2], E ... P			H								
NH_3 (dry)	E[2], F ... P			J								
CO, NO	E[2], F, H, R, S			Q								
CO_2, CO	E, F, H, J, L, M, P			R								
Smallest measuring range	**Largest measuring range**											
0 ... 5 vpm	0 ... 100 vpm				A							
0 ... 10 vpm	0 ... 200 vpm				B							
0 ... 20 vpm	0 ... 400 vpm				C							
0 ... 50 vpm	0 ... 1 000 vpm				D							
0 ... 100 vpm	0 ... 1 000 vpm				E							
0 ... 300 vpm	0 ... 3 000 vpm				F							
0 ... 500 vpm	0 ... 5 000 vpm				G							

Selection and ordering data (Continued)

ULTRAMAT 7 module For measuring IR-absorbing gases		Article No. 7MB3010-	●	●	●	●	●	-	●	A	●	●
0 ... 1 000 vpm	0 ... 10 000 vpm				H							
0 ... 3 000 vpm	0 ... 30 000 vpm				J							
0 ... 5 000 vpm	0 ... 50 000 vpm				K							
0 ... 1%	0 ... 10%				L							
0 ... 3%	0 ... 30%				M							
0 ... 5%	0 ... 50%				N							
0 ... 10%	0 ... 100%				P							
0 ... 30%	0 ... 300%				Q							
0 ... 100 vpm (CO), 0 ... 300 vpm (NO)	0 ... 1 000 vpm CO, NO				R							
0 ... 300 vpm (CO), 0 ... 500 vpm (NO)	0 ... 3 000 vpm CO, NO				S							
Material: Gas paths, sample chambers												
Gas path	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 gas chamber												
Non-flow-type							0					
Flow-type							1					
Pressure compensation												
Atmospheric pressure compensation									0			
Module version												
For 19 inch rack enclosure											A	
For wall box											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 and additional measured components possible as 7MB3017.. special application.
[2] Not possible in combination with an OXYMAT 7 module.
[3] Only for chamber length 20 ... 180 mm.

Options	Order code
Add "**-Z**" to article number and then add order code	
Settings	
Kalrez (6375) gaskets in sample gas path	***B04***
Clean for O2 service (specially cleaned gas path)	***B06***
Measuring range indication in plain text, if different from default setting	***Y11***
Special setting (only together with an application no., e.g. extended measuring range)	***Y12***
Extended special setting (only in conjunction with an application no., e.g. determination of cross-interferences)	***Y13***
Basic unit module assignment number	***D00 ... D99***

Note

See order example under "More information".

Technical specifications

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

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

ULTRAMAT 7 module	
General information	
Weight	Max. 5.2 kg (standard version)
Measuring ranges	
Number of measuring ranges	Max. 4; parameters can be assigned freely
Parameters can be assigned in the measuring ranges	
• Smallest possible measuring span	CO: 0 ... 10 vpm CO_2: 0 ... 5 vpm CH_4: 0 ... 50 vpm C_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 ... 50 °C
Sample gas humidity (rel. humidity)	< 90% (condensation inside the gas path is to be avoided)
Time response	
Warm-up period at room temperature	< 2 h
Response characteristics	
• Dead time (T_{10})	Application-specific (max. 3.6 s)
• Signal rise time (T_r) or fall time (T_f) with application-specific electronic damping of 10 s	Application specific < 14 s
• Time for device-internal signal processing T_v	Approx. 1 s
• Delayed display T_{90}	$T_{90} < T_{10} + T_{r/f} + T_v$ applies
Measuring response	
Output signal fluctuation	≤ ± 1% of smallest measuring range acc. to nameplate
Zero point drift	< ± 1%/week of smallest measuring range acc. to nameplate
Measured value drift	≤ 1% of the current measuring range per week

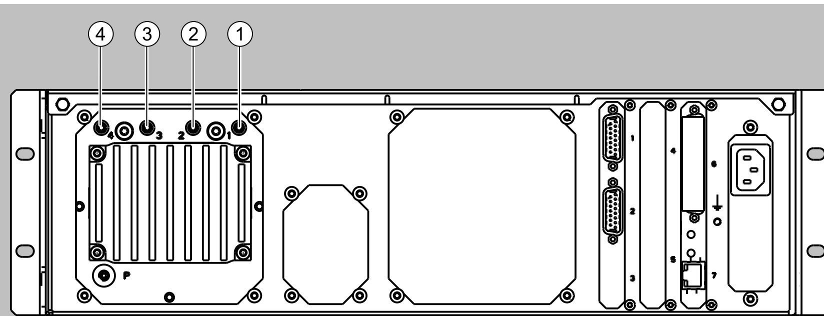
Technical specifications (Continued)

ULTRAMAT 7 module	
Repeatability	≤ ± 1% of the current measuring range end value
Linearity error	< ± 0.5% of the current measuring range end value
Influencing variables	
Ambient temperature	
• Measured value	≤ 1% of the current measuring range/10 K (at constant receiver cell temperature)
Sample gas pressure	
• Without pressure compensation	≤ 1.5% of the current measuring range/1% pressure variation
• With pressure compensation switched on	≤ 0.15% of the current measuring range/1% pressure variation
Sample gas flow	≤ 1% of the current measuring range end value/0.1 l/min change in flow
Supply voltage	≤ 0.1% of the current measuring range (within the nominal range of use)
Electrical outputs	
Analog and digital interfaces	See basic unit
Climatic conditions	
Storage and transport	-30 ... 70 °C
Permissible ambient temperature (during operation in basic unit)[1]	5 ... 45 °C
Relative humidity (RH) during storage, transport or operation	< 90% (condensation on the installed components is to be avoided)
Gas connections	
Connection fittings	Pipe connection with 6 mm outer diameter
Materials of wetted parts	
Bushing	Stainless steel mat. no. 1.4571, Hastelloy C22
Pipe	Stainless steel mat. no. 1.4571, Hastelloy C22, O-ring: FKM (e.g. Viton) or FFKM (Kalrez 6375)
Sample chamber	
• Body	Aluminum
• Lining	Aluminum, tantalum
• Window	CaF_2, adhesive: E353, O-ring: FKM (e.g. Viton) or FFKM (Kalrez 6375)

[1] Applies also in combination with OXYMAT 7 or CALOMAT 7 modules

Circuit diagrams

Gas connections

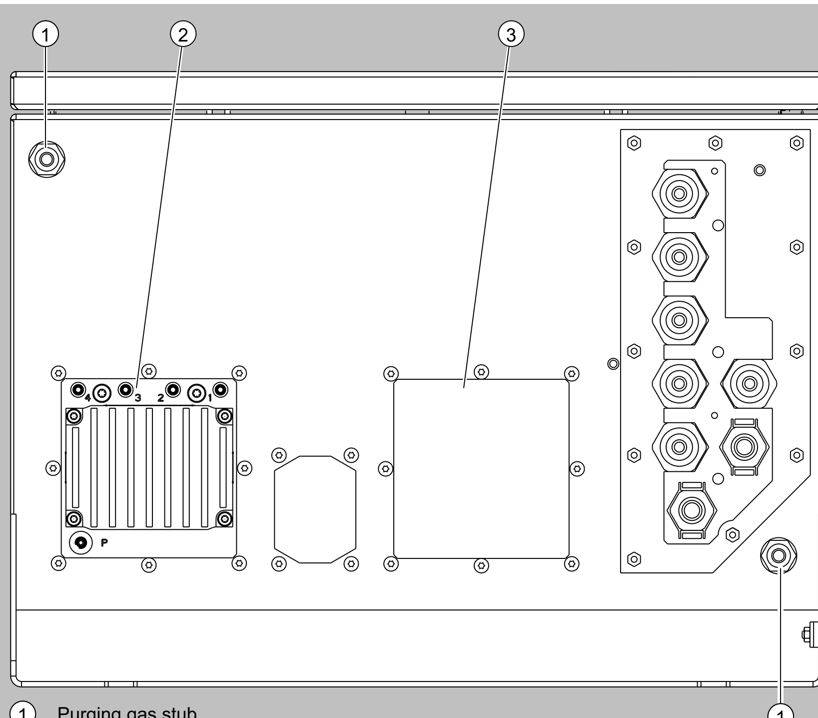


1. Sample gas inlet
2. Sample gas outlet
3. Reference gas outlet
4. Reference gas inlet

(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

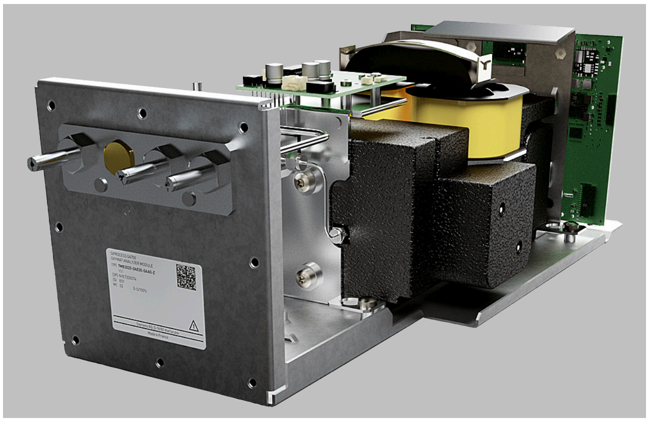
Wall-mounted device, bottom

More information

Ordering example

ULTRAMAT 7 module installed in rack-mounted enclosure
7MB3000-0BX00-1AA0-Z+D03
7MB3010-0AB10-0AA0-Z+D03
ULTRAMAT 7 module and rack-mounted enclosure supplied unassembled
7MB3000-0BX00-1AA0
7MB3010-0AB10-0AA0

Overview



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

Benefits

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

Detector element has no contact with the sample gas
- Applicable in the absence of corrosive sample gases
- Long service life
- High-heated variant

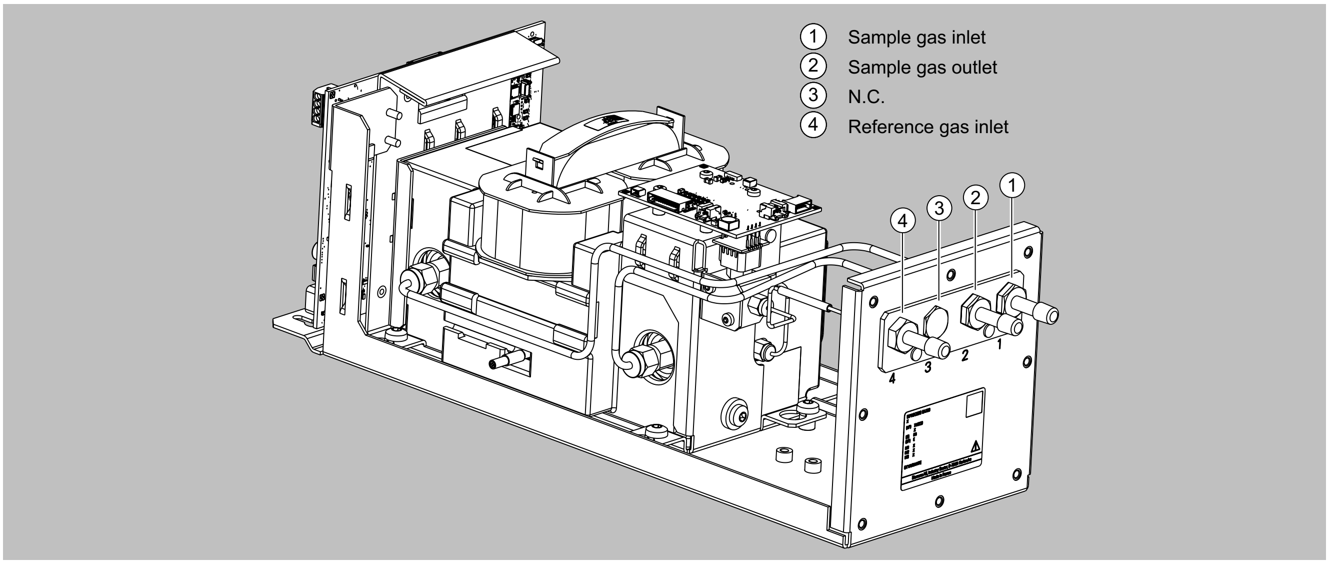
Physically suppressed zero point possible, e.g. in the measuring range 98% or 99.5% to 100% O_2

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

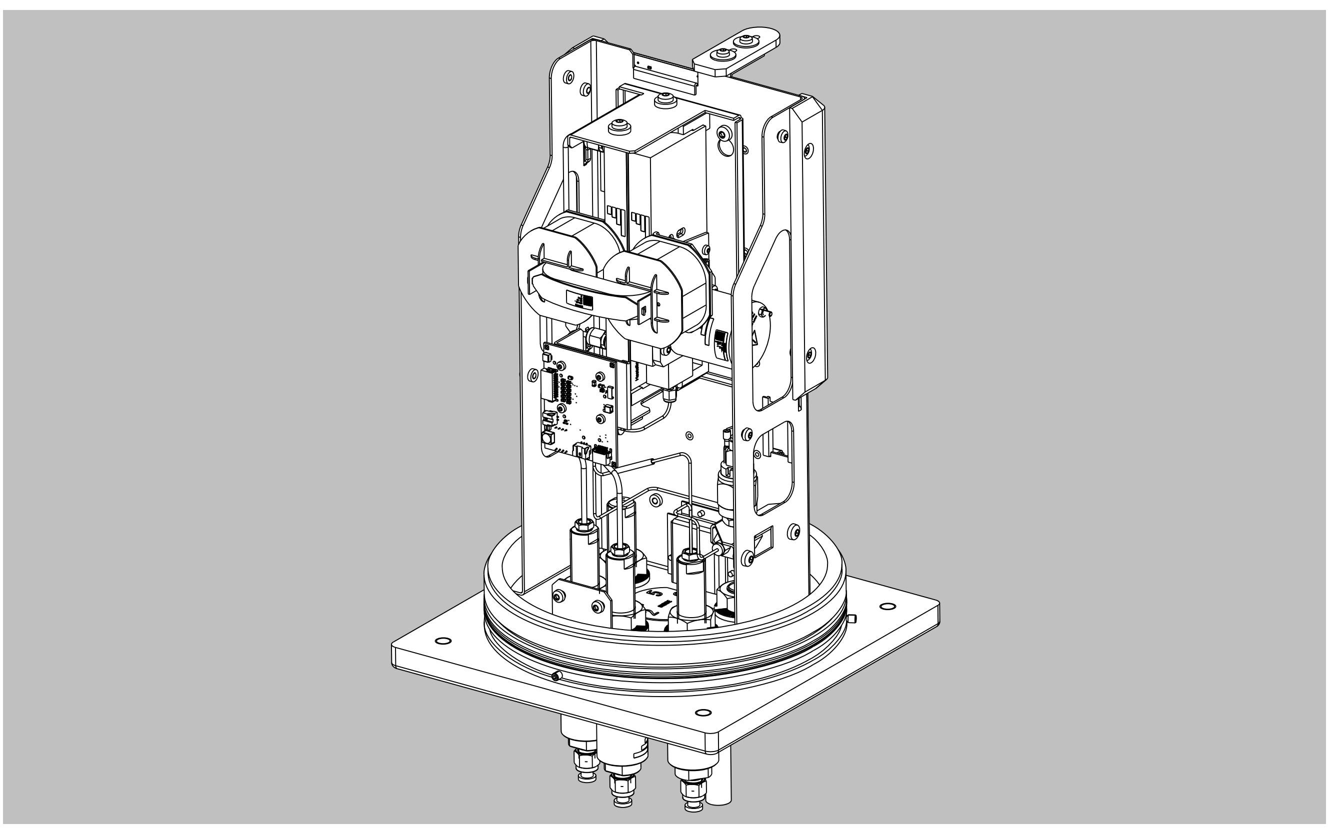
Application

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

Design



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

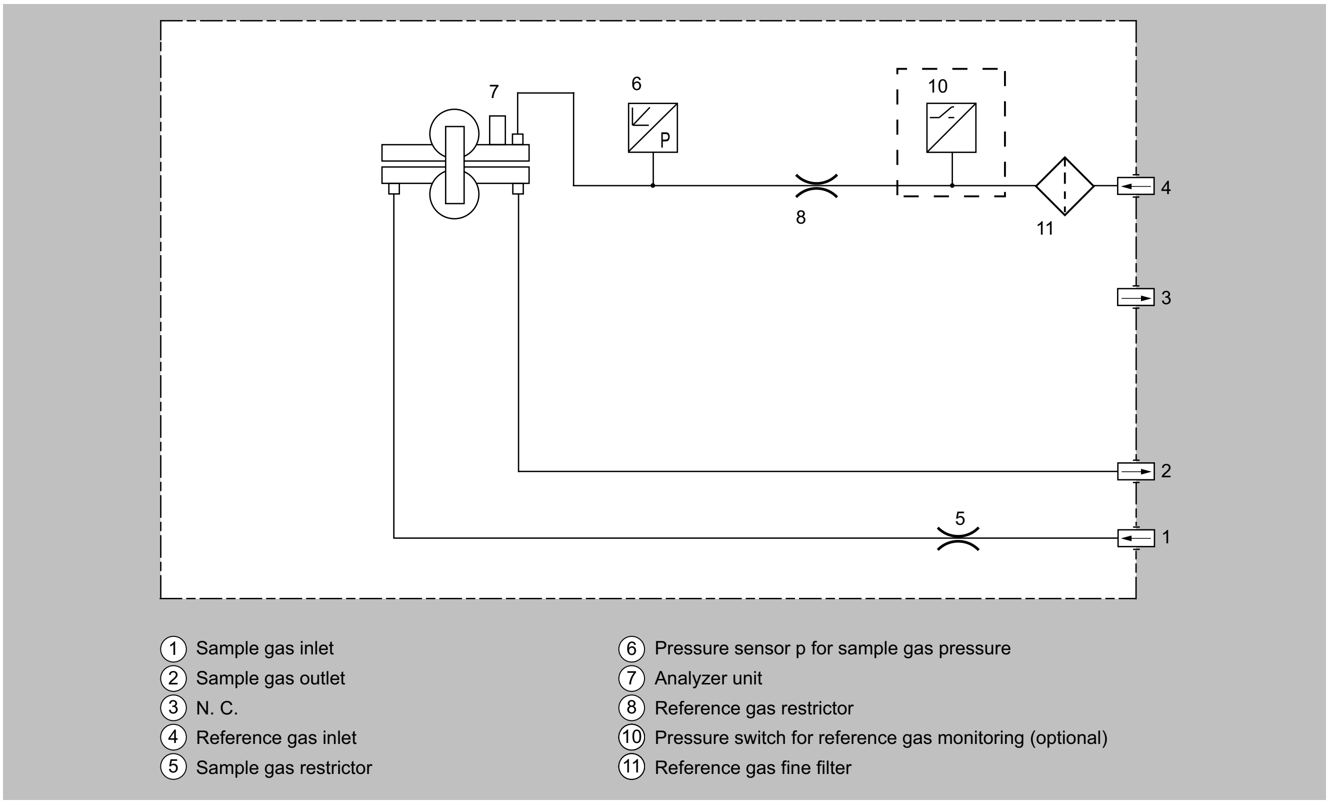


Design of high-pressure version, field module, sample gas path with pipes

Design (Continued)

Gas path

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

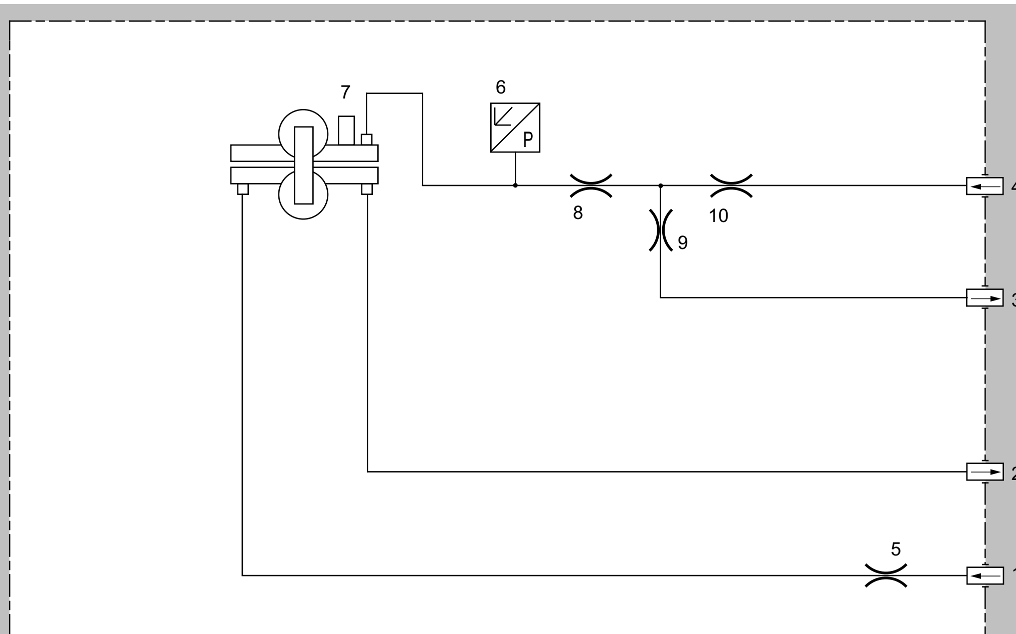


Gas path plan, high-pressure version with optional pressure switch for monitoring reference gas pressure

High-pressure version with optional pressure switch for monitoring reference gas pressure	
Reference gas pressure	2 000 ... 4 000 hPa above sample gas pressure, but max. 5 000 hPa
Sample gas pressure	
• With hoses	500 ... 1 500 hPa (abs.)
• With pipes	500 ... 2 500 hPa (abs.) with internal pressure sensor 500 ... 3 000 hPa (abs.) with external pressure sensor
Sample gas path	With hoses or with pipes

Design (Continued)

Low-pressure version with external reference gas pump



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

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

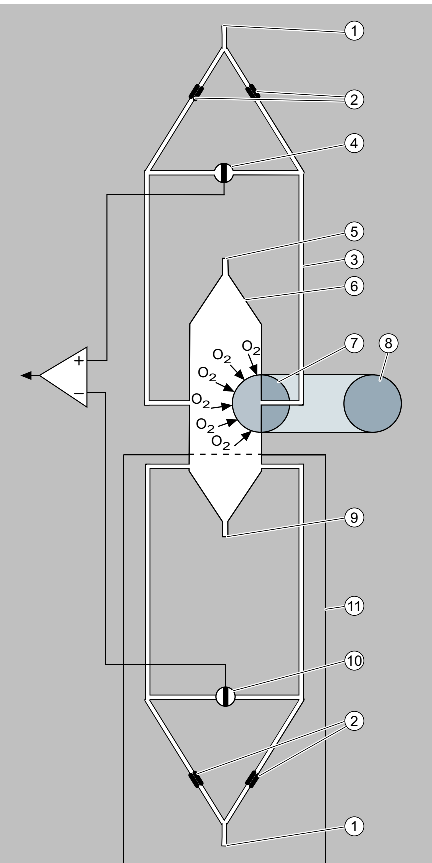
Mode of operation

Oxygen is highly paramagnetic. This outstanding property of paramagnetism is used as a physical measuring effect for oxygen analysis.
Oxygen molecules in an inhomogeneous magnetic field always move toward the higher field strength. This results in a higher oxygen concentration where the field strength is higher (higher oxygen partial pressure). If two gases with differing oxygen content are combined in a magnetic field, a (O_2 partial) pressure difference arises between them.
Since the measuring effect is always based on the difference of the oxygen content of the two gases, one refers to the sample and reference gases.
For measuring oxygen in the OXYMAT 7, the reference gas (N_2, O_2 or air) flows through two channels into the sample chamber (6). One of these partial flows enters the measuring chamber (7) in the area of the magnetic field. If the sample gas is O_2-free, the reference gas can flow out freely. If the sample gas does contain O_2, however, the oxygen molecules concentrate in the area of the magnetic field. The reference gas can then no longer flow off freely. An alternating pressure results between the two reference gas inlets. This pulsates in step with the magnetic field and depends on the oxygen concentration. This causes an alternating flow in the microflow sensor (4).
The microflow sensor consists of two nickel-plated grids heated to approximately 120°C, which, along with two supplementary resistors, form a Wheatstone bridge. The alternating flow results in a change in the resistance of the nickel-plated grids. The resulting offset in the bridge is a measure of the concentration of oxygen in the sample gas.
Because the microflow sensor is located in the reference gas flow, the measurement is not influenced by the thermal conductivity, the specific heat or the internal friction of the sample gas. Additionally, the microflow sensor is protected through this arrangement from corrosion caused by the sample gas.

Further information

The oscillating magnetic field (8) means that the basic flow at the microflow sensor is not detected. The measurement is, thus, independent of the module's operating position or the position of the sample chamber.
The sample chamber is directly in the sample path and has a small volume, and the microflow sensor is a low-lag sensor. As a result, extremely short response times are realized.
Vibrations at the installation site can interfere with the measured signal (e.g. large fluctuations in the output signal). This behavior can be compensated for by a second (optional) microflow sensor (10), which functions as a vibration sensor. Since large differences in density between the sample and reference gases further amplify the undesired influence of vibration, reference gas is channeled to both the compensation microflow sensor (10) and the sample microflow sensor (4).
The sample gases must be fed into the analyzers free of dust. Condensation in the sample chambers must be prevented. Therefore, the use of gas modified for the measuring task is necessary in most application cases.
Flowing reference gas prevents the microflow sensor from being damaged and maintains the measurement capability of the module.

Mode of operation (Continued)



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

Function

Main features

Technical features

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

- Smallest measuring spans (down to 0.5% 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 device designs, such as:
  - Clean for O_2 service (specially cleaned gas path)
  - Kalrez-6375 gaskets

Reference gases for OXYMAT 7

Measuring range	Recommended reference gas	Reference gas connection pressure	Comments
0 to ... vol.% O_2	N_2	2 000 ... 4 000 hPa above sample gas pressure (max. 5 000 hPa absolute)	The reference gas flow is set automatically to 5 ... 10 ml/min (up to 20 ml/min with flow-type compensation branch)
... to 100 vol.% O_2[1]	O_2	2 000 ... 4 000 hPa above sample gas pressure (max. 5 000 hPa absolute)	
Approx. 21 vol.% O_2[2]	Air	100 hPa with respect to sample gas pressure, which may vary by max. 50 hPa around the air pressure	

[1] Suppressed zero point with measuring range end value 100 vol.% O_2.
[2] Suppressed zero point with 21 vol.% O_2 within the measuring span.

Correction of zero-point error/cross-sensitivities

Accompanying gas (concentration 100 vol.%)	Zero point deviation in vol.% O_2 absolute
Organic gases	
Ethane C_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
Isobutane C_4H_{10}	-1.30
1-butene C_4H_8	-0.96
Isobutene 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

Function (Continued)

Accompanying gas (concentration 100 vol.%)	Zero point deviation in vol.% O_2 absolute
N-octane C_8H_{18}	-2.78
N-pentane C_5H_{12}	-1.68
Isopentane 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

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)

<u>Conversion to other temperatures:</u>

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

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

All diamagnetic gases have a negative deviation from zero point.

Selection and ordering data

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

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

Note

See order example under "More information".

Technical specifications

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

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

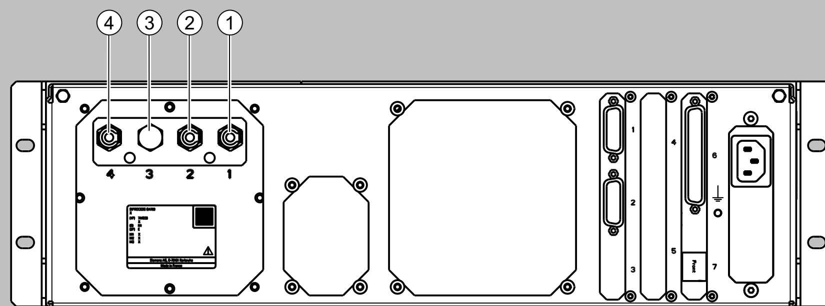
OXYMAT 7 module	
General information	
Weight	Approx. 5.5 kg (standard version)
Measuring ranges	
Number of measuring ranges	Max. 4; parameters can be assigned freely
Parameters can be assigned in the measuring ranges	
• Smallest possible measuring spans	0.5%, 1%, 2% or 5% O_2
• Largest possible measuring span	100% O_2
Gas inlet conditions	
Sample gas pressure	
• Standard devices with hoses	500 ... 1 500 hPa (abs.)
• Standard devices with hoses and ext. RG pump	Atmospheric pressure ± 50 hPa
• Standard devices with pipes	500 to 3 000 hPa (abs.); short-term max. 5 000 hPa (abs.)
• Field module	
- For non-flammable gases	500 ... 2 500 hPa (abs.)
- For flammable gases up to gas mixtures which are occasionally explosive	800 ... 1 100 hPa (abs.)
Reference gas pressure	
• High-pressure connection	2 000 hPa above sample gas pressure (within the permissible reference gas pressure range 2 500 ... 5 000 hPa, abs.)
• Low-pressure connection with external reference gas pump	100 hPa above sample gas pressure
Pressure drop between sample gas inlet and sample gas outlet	< 100 hPa at 1 l/min
Sample gas flow	18 ... 60 l/h (0.3 ... 1 l/min)
Sample gas temperature	0 ... 60 °C
Sample gas humidity (rel. humidity)	< 90% (condensation inside the gas path is to be avoided)
Sample chamber temperature	
Standard version	Approx. 72 °C
Time response	
Warm-up period at room temperature	< 2 h
Response characteristics	
• Delayed display T_{90} with an electronic damping setting of 0 s and a sample gas flow of 1 Nl/min.	≤ 1.9 s; ≤ 2.4 s (field module including flame arrestor)
• Dead time T_{10}	≤ 1.1 s; < 1.6 s (field module)
Measuring response	
Output signal fluctuation with static damping constant of 0 s and dynamic noise damping of 5% / 10 s	≤ ±0.5% of smallest measuring span (noise bandwidth corresponds to 1% = 6σ value or 0.333% = 2σ value), with vibration compensation activated: < 1.5 times the value
Detection limit	≤ 1% of smallest measuring span according to nameplate (with vibration compensation activated: < 1.5 times the value)
Measured value drift	

Technical specifications (Continued)

OXYMAT 7 module	
• At the zero point	≤ ±0.5% of the smallest measuring span/month or ≤ ± 50 vpm O_2/month, whichever is greater
• For span gas	≤ ±0.5% of the current measuring span/month or ≤ ± 50 vpm O_2/month, whichever is greater
Repeatability	
• At the zero point	≤ ±0.5% of the smallest measuring span or ≤ ± 50 vpm O_2, whichever is greater
• For span gas	≤ ±0.5% of the current measuring span/month or ≤ ± 50 vpm O_2, whichever is greater
Linearity error with dry ambient air[1)]	< 0.1%
Influencing variables	
Ambient temperature	
• Deviation at zero point	≤ 0.5% of the smallest measuring span/ 10 K or ≤ 50 vpm O_2/10 K, whichever is greater
• Deviation of the span gas	≤ 0.5% of the current measuring span/ 10 K or ≤ 50 vpm O_2/10 K, whichever is greater
Sample gas pressure	
• Deviation at zero point	≤ 0.2% of the smallest measuring span/1% pressure variation or ≤ 50 vpm O_2/1% pressure variation, whichever is greater
• Deviation of the span gas	≤ 0.2% of the current measuring span/1% pressure variation or ≤ 50 vpm O_2/1% pressure variation, whichever is greater
Sample gas flow	
• Deviation at zero point	≤ 1% of smallest measuring span per 0.1 l/min change in flow or ≤ 50 vpm O_2 per 0.1 l/min change in flow within the permissible flow range (0.3 to 1 l/min), whichever is greater
• Deviation of the span gas	≤ 1% of current measuring span per 0.1 l/min change in flow or ≤ 50 vpm O_2 per 0.1 l/min change in flow within the permissible flow range (0.3 to 1 l/min), whichever is greater
Accompanying gases	Zero point deviation (cross-sensitivity) in accordance with Table A.1 of EN 61207-3
Supply voltage	< 0.1% of the current measuring span (within the nominal range of use)
Electrical inputs and outputs	
Analog and digital interfaces	See basic unit
Gas connections	
Connection fittings	Pipe connection with 6 mm outer diameter
Climatic conditions	
Storage and transport	-30 ... 70 °C
Permissible ambient temperature[2)]	0 ... 50 °C
Relative humidity (RH) during storage, transport or operation	< 90% (condensation on the installed components is to be avoided)

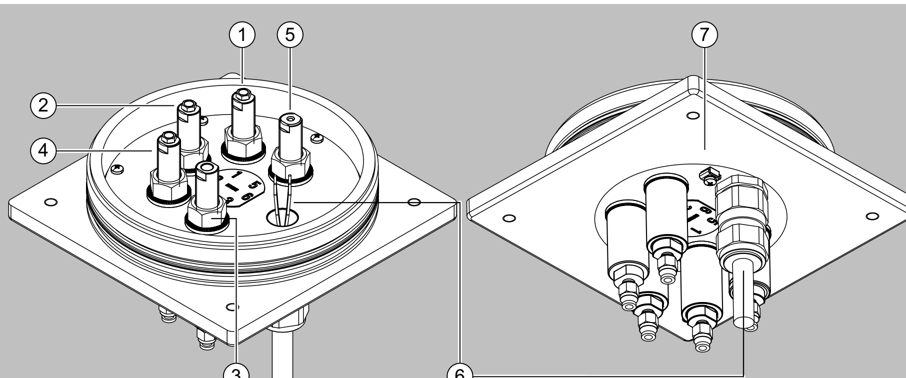
[1)] Untreated ambient air contains less than 20.95% O_2 (literature value) since existing humidity of the oxygen content is decreased relatively.
[2)] Restriction for installing together with an ULTRAMAT 7 module: 5 ... 45 °C.

Circuit diagrams



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

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

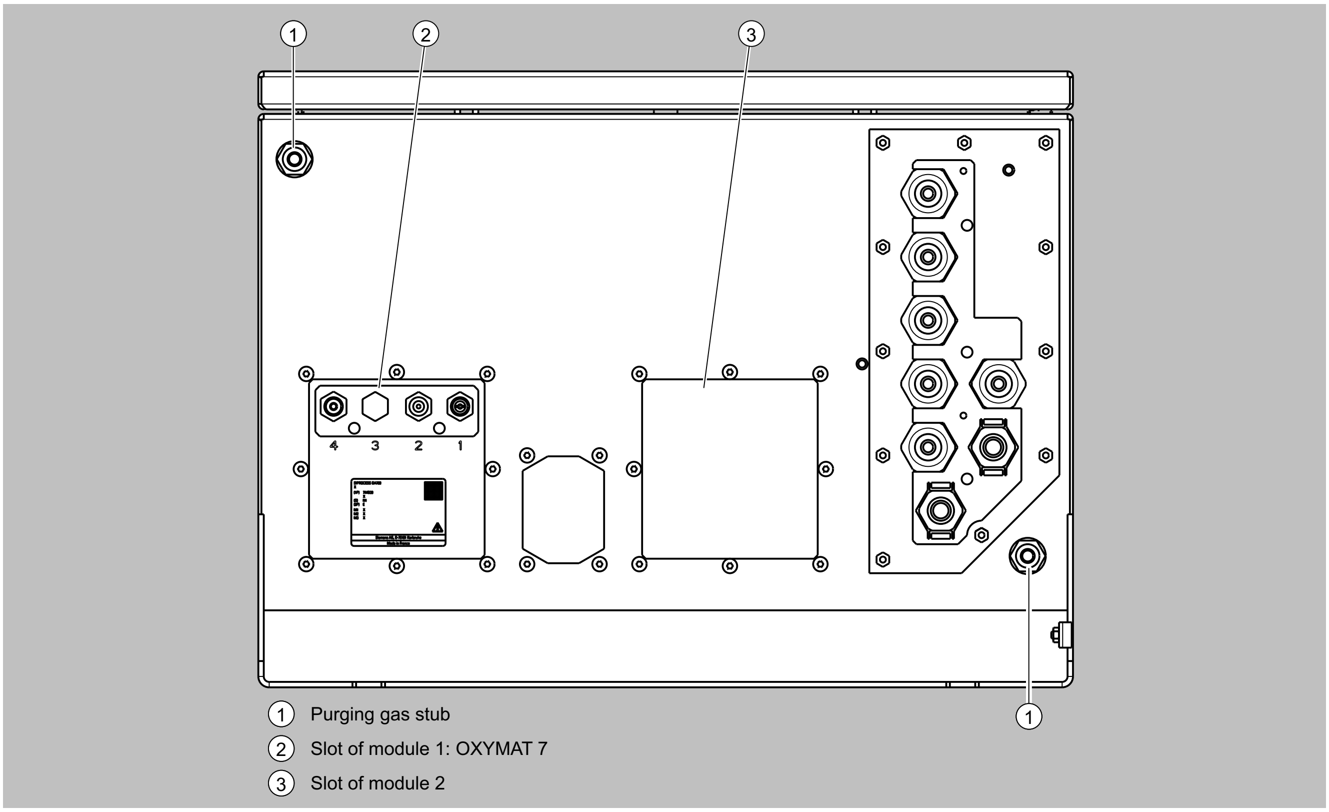


1. Sample gas inlet
2. Sample gas outlet
3. Blanking plug or purging gas connection
4. Reference gas inlet
5. Breathing apparatus (pressure compensation coupling)
6. Cable bushing
7. Ground connection

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

Gas connections of the field module

Circuit diagrams (Continued)



Wall-mounted device, bottom

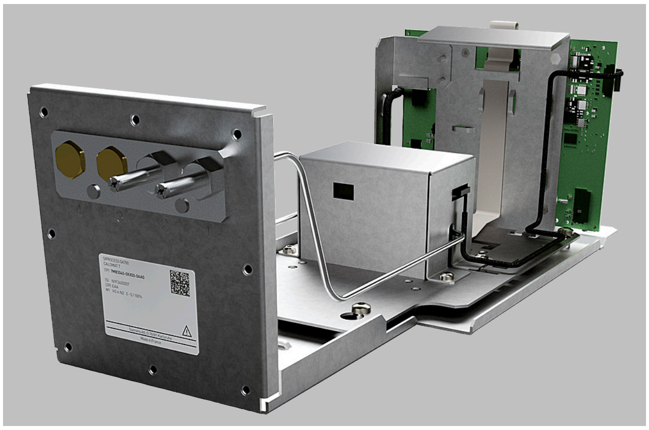
More information

Ordering example

OXYMAT 7 module installed in wall box
7MB3000-3AX00-1AA0-Z+D02
7MB3020-0CE00-0AA0-Z+D02
OXYMAT 7 module and ULTRAMAT 7 module built into rack-mounted enclosure
7MB3000-0AA00-1AA0-Z+D05
7MB3020-0CE00-0AA0-Z+D05
7MB3010-0CA10-0AA0-Z+D05
OXYMAT 7 module and wall box supplied unassembled
7MB3000-3CX00-1AA0
7MB3020-0CE00-0AA0

CALOMAT 7 module

Overview



The CALOMAT 7 module is primarily used for quantitative determination of H_2 or He in digital or quasi-digital non-corrosive gas mixtures.
Concentrations of other gases can also be measured if their thermal conductivity differs significantly from their accompanying gases, such as Ar, CO_2, CH_4.

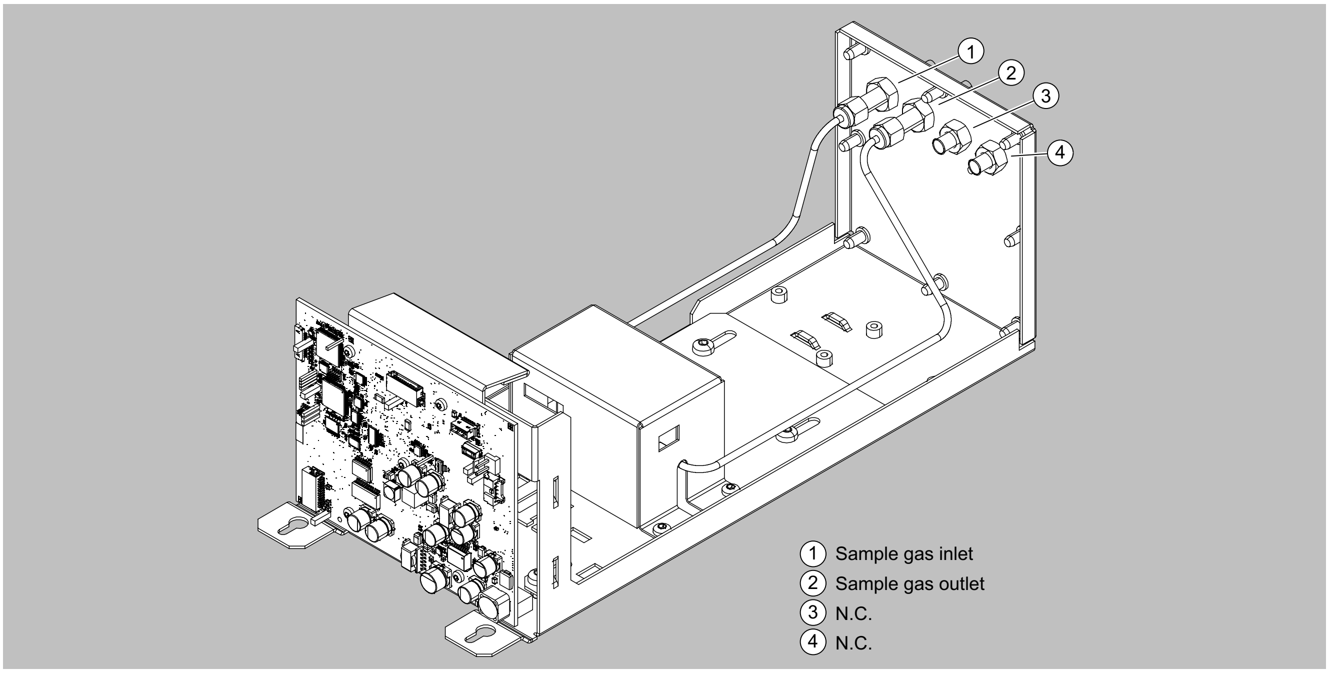
Benefits

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

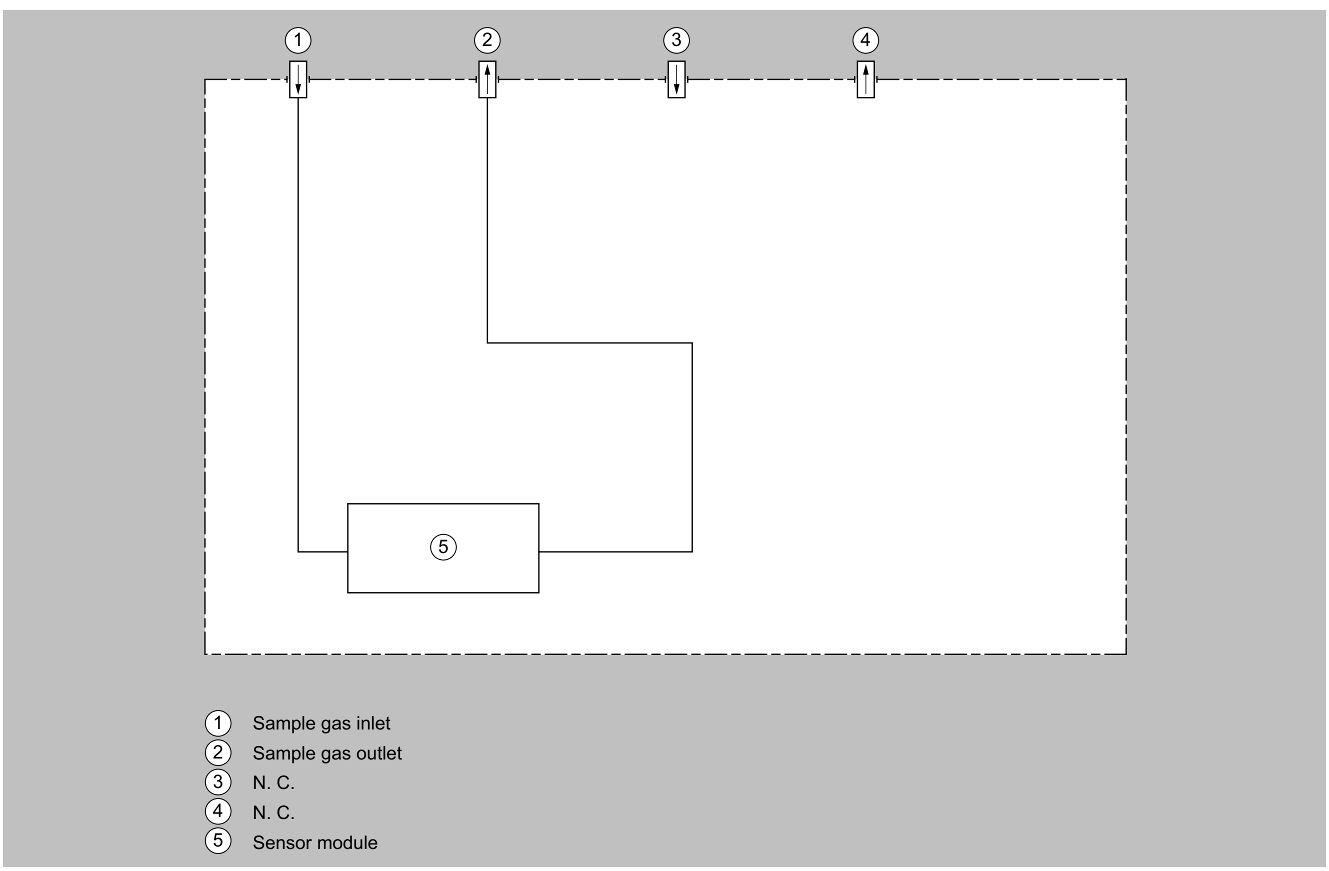
Application

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

Design



Structure of CALOMAT 7



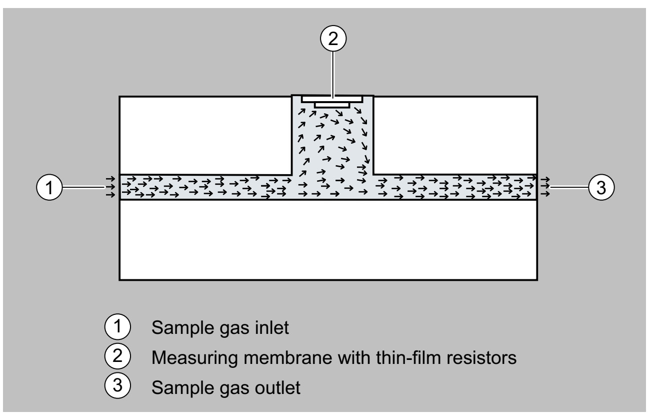
CALOMAT 7, gas path

Mode of operation

The measuring method is based on the different levels of thermal conductivity of gases. CALOMAT 7 modules work with a micromechanically produced Si chip, the measuring membrane of which is equipped with thin-film resistors.
The resistors contained in the diaphragm are regulated for constant temperature. The amperage required fluctuates in accordance with the thermal conductivity of the sample gas. This raw value determined in this way is processed further electronically to calculate the gas concentration.
The sensor is in a thermostatically controlled stainless steel enclosure in order to suppress the effect of the ambient temperature. To rule out flow influences, the sensor is mounted in a bore hole next to the flow channel.

Note

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



CALOMAT 7, mode of operation

Function

Main features

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

Function (Continued)

Cross-interferences

To determine the cross-interferences of accompanying gases with several interfering gas components, you must know the sample gas composition. The following table contains the zero offsets for the carrier gas 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 can also affect the characteristic curve. For most gases, however, the effect on the characteristic curve is negligible.

Selection and ordering data

CALOMAT 7 module For the measurement of gases in binary or quasi-binary gas mixtures		Article No. 7MB3040-	●	●	●	●	●	-	0	●	●	●
Click on the Article No. for online configuration in the PIA Life Cycle Portal. ***Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".***												
Module version												
Standard module for 19 inch rack unit enclosure and wall box			0									
Standard module for hazardous zone for 19 inch rack unit enclosure and wall box			2									
Measured components, corrosive gas mixtures												
Non-corrosive gas mixtures only				X								
Measuring range, corrosive mixtures												
Non-corrosive gas mixtures only					X							
Material of gas path												
Stainless steel 1.4571						0						
Reference gas chamber												
None (for non-corrosives gas mixtures)							0					
Measured components, non-corrosive mixtures												
H_2 in N_2										A		
H_2 in Ar										B		
He in N_2										C		
He in Ar										D		
He in H_2										E		
Ar in N_2										F		
Ar in O_2										G		
CH_4 in N_2										H		
CH_4 in Ar										J		
CO_2 in N_2										K		
Special version: H_2 in N_2 (for blast furnace gas, converter gas, wood gasification)										Q		
Smallest measuring range	**Largest measuring range**											
0 ... 0.5%	0 ... 100%										A	
0 ... 1%	0 ... 100%										B	
0 ... 2%	0 ... 100%										C	
0 ... 5%	0 ... 100%										D	
0 ... 10%	0 ... 100%										E	
0 ... 10%	0 ... 80%										F	
Version												
Standard												0

The following mixtures are available as a special application (7MB3047):	
H_2 in He	N_2 in O2
H_2 in CO_2	N_2 in H2
H_2 in synthetic air	Synthetic air in Ar
H_2 in CH_4	Synthetic air in CO_2
He in synthetic air	Synthetic air in H_2
Ar in He	Synthetic air in He
Ar in CO_2	CO_2 in Ar
Ar in synthetic air	CO_2 in synthetic air
Ar in H_2	CO_2 in H_2
N_2 in Ar	CH_4 in synthetic air
N_2 in He	CH_4 in H_2
N_2 in CH_4	O_2 in N_2

Options	Order code
Add "-**Z**" to article number and then add order code	
Settings	
Clean for O2 service (specially cleaned gas path)	***B06***
Measuring range indication in plain text, if different from default setting	***Y11***

Selection and ordering data (Continued)

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

Note

See order example under "More information".

Technical specifications

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

Measuring conditions	
Ambient temperature	25 °C
Atmospheric pressure	Atmospheric (approx. 1 000 hPa)
Sample gas flow	0.6 l/min (or Nl/min)
Reference application	H_2 in N_2*
Site of installation	Vibration- and impact-free

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

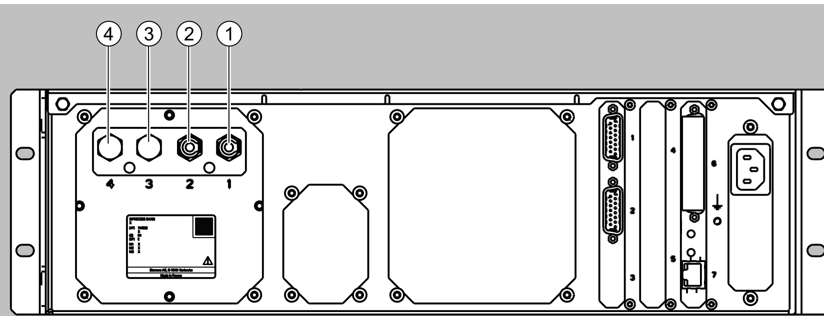
CALOMAT module	
General information	
Weight	Approx. 3 kg
Measuring ranges	
Number of measuring ranges	Max. 4; parameters can be assigned freely
Parameters can be assigned in the measuring ranges	
• Smallest possible measuring span	0.5% H_2 in N_2
• Largest possible measuring span	100% H_2 in N_2
• Smallest possible measuring span with suppressed zero point	5% (e.g. 95% ... 100%) H_2 in N_2
Gas inlet conditions	
Sample gas pressure	700 ... 1 200 hPa (abs.)
Pressure drop between sample gas inlet and sample gas outlet	< 50 hPa at 1.5 l/min
Sample gas flow	30 ... 90 l/h (0.5 ... 1.5 l/min)
Sample gas temperature	0 ... 70 °C
Sample gas humidity (rel. humidity)	< 90% (condensation inside the gas path is to be avoided)
Sample chamber temperature	
Standard version	Approx. 72 °C
Time response	
Warm-up period at room temperature	< 30 min (max. accuracy after 2 h)
Response characteristics	
• Delayed display T_{90} with device-internal signal damping (low pass filter) of 1 s	< 2.5 s
• Dead time (T_{10}) at 1 l/min	< 0.5 s
• Adjustable signal damping range	0 to 100 s
Measuring response	
Output signal fluctuation with device-internal signal damping of 1 s	≤ ± 0.5% of the smallest measuring span acc. to nameplate (σ < ± 8.33 vpm H_2)

Technical specifications (Continued)

CALOMAT module	
Detection limit	≤ 1% of the smallest measuring span according to nameplate
Measured value drift	≤ ± 1%/week of smallest measuring span according to nameplate or ≤ 50 vpm H_2/week, whichever is greater
Repeatability	≤ ± 1% of the current measuring span or 100 vpm H_2
Linearity error	≤ ± 1% of the current measuring span or 100 vpm H_2
Influencing variables	
Ambient temperature	≤ ± 0.5%[1)]/10 K of the current measuring span or ≤ ± 50 vpm H_2/10 K
Sample gas pressure	≤ ± 0.5%[1)] of the current measuring span/1% pressure variation or ≤ ± 50 vpm H_2/1% pressure variation
Sample gas flow	≤ ± 0.2% of the smallest possible measuring span with a change in flow of 1 dl/min within the permissible flow range
Accompanying gases (interference gases)	The interference gas sensitivity depends on the application and must be determined in each case except for applications with blast furnace gas / converter gas / wood gasification (pre-adjusted).
Supply voltage	≤ ± 0.1% of characteristic curve end value (within the nominal range of use)
Electrical inputs and outputs	
Analog and digital interfaces	See basic unit
Climatic conditions	
Storage and transport	-30 ... 70 °C
Permissible ambient temperature (during operation in basic unit)[2)]	0 ... 50 °C
Relative humidity (RH) during storage, transport or operation	< 90% (condensation on the installed components is to be avoided)
Gas connections	
Connection fittings	Pipe connection with 6 mm outer diameter
Materials of wetted parts	
Gas connection	Stainless steel material no. 1.4571
Clamping rings and union nut (set)	Stainless steel material no. 1.4401
Sample gas pipes	Stainless steel material no. 1.4404
Sensor mounting block	Stainless steel material no. 1.4571
Sensor	Si, SiO_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.

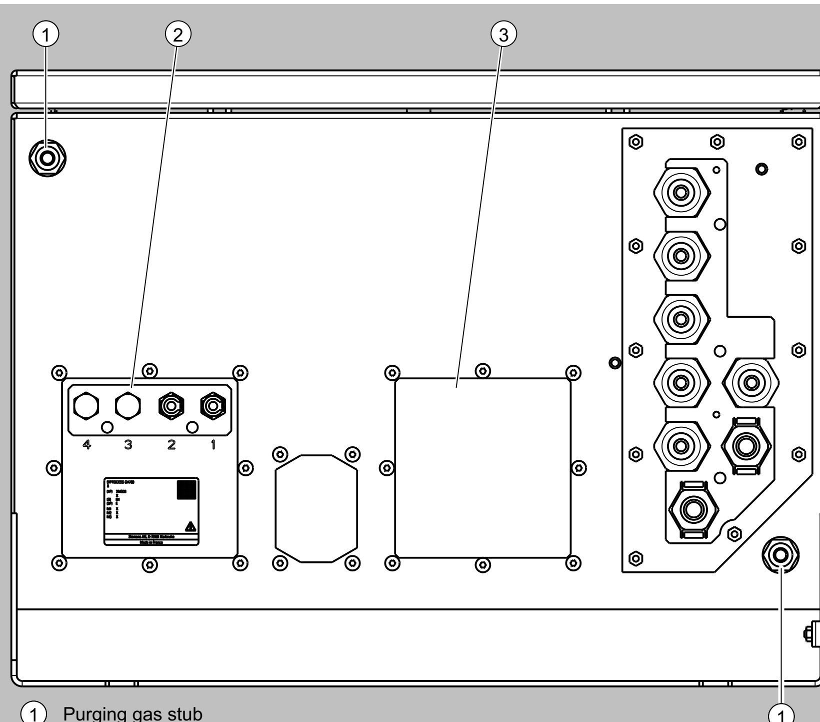
Circuit diagrams



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 connection fittings with a pipe diameter of 6 mm.



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

Wall-mounted device, bottom

More information

Ordering example

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

Parts for the SIPROCESS GA700 modules wetted by sample gas

Overview

Gas path		ULTRAMAT 7	OXYMAT 7	CALOMAT 7
With hoses (Viton)	Bushing	–	PVDF	–
	Hose	–	FKM (Viton)	–
	Sample chamber	–	Stainless steel 1.4571	–
	Nozzle (sample chamber)	–	Stainless steel 1.4571	–
	Restrictor	–	PTFE (Teflon)	–
	O-ring	–	FKM (Viton)	–
With pipes (stainless steel)	Bushing	Stainless steel 1.4571	Stainless steel 1.4571	Stainless steel 1.4571
	Pipe	Stainless steel 1.4571	Stainless steel 1.4404	Stainless steel 1.4404
	Sample chamber			
	• Body	Aluminum	Stainless steel 1.4571	–
	• Lining	Aluminum or tantalum	–	–
	• Window	CaF2, adhesive: E353	–	–
	Sensor mounting block	–	–	Stainless steel 1.4571
	Sensor	–	–	Si, SiO_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

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

Special versions

Special applications

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

Application (Continued)

Performance-tested version / QAL

For measurements of CO, NO, SO_2 and O_2 according to sections 13 and 27 of the German Federal Immission Protection Regulations and TA Luft, performance-tested versions according to EN 15267 are available.
Certified measuring range:
- 1-component analyzer
  CO: 0 to 75 mg/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 QAL1 according to EN 14181. Conformity of the analyzers with both standards is TÜV-certified.
Determination of the analyzer drift according to EN 14181 (QAL3) can be carried out manually or also with a PC using the SIPROM GA maintenance and servicing software. In addition, selected manufacturers of emission evaluation computers offer the possibility for downloading the drift data via the analyzer's serial interface and to automatically record and process it in the evaluation computer.

Flow-type reference cell

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

Design

19" rack unit

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

Field device

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

Display and operator panel

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

Inputs and outputs

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

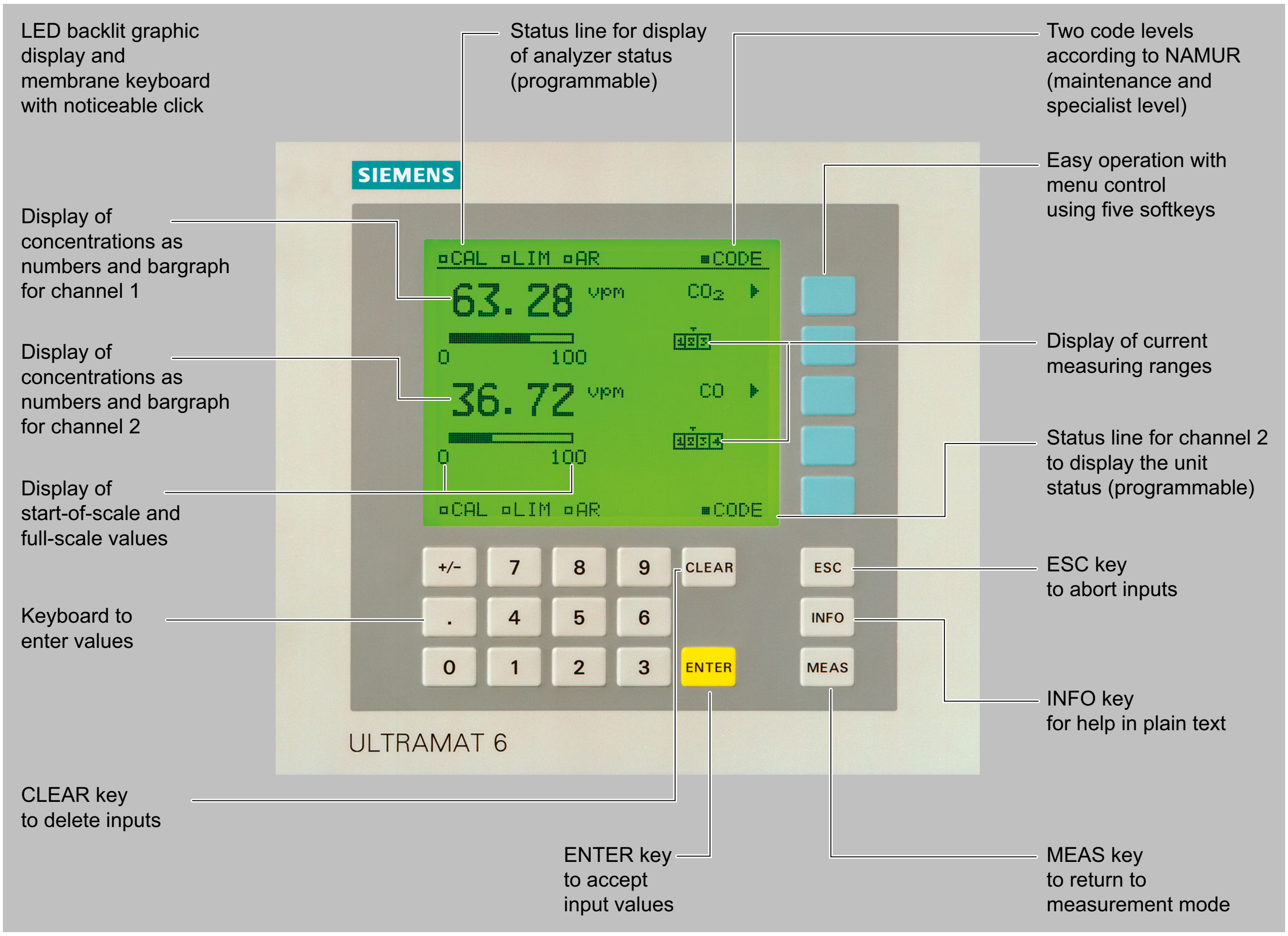
Communication

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

Options

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

Design (Continued)



ULTRAMAT 6, membrane keyboard and graphic display

Designs – Parts wetted by sample gas, standard

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

Design (Continued)

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

Options

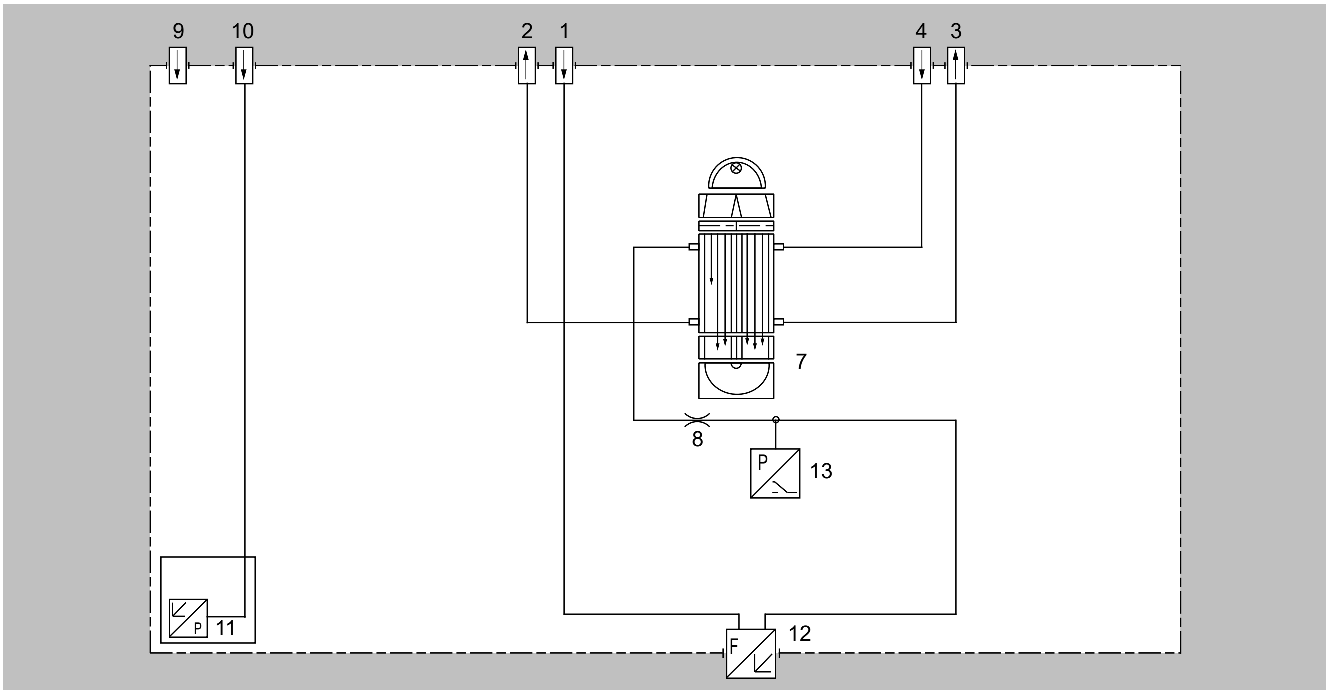
Gas path		19" rack unit	Field device	Field device Ex
Flow indicator	Measuring tube	Duran glass	-	-
	Variable area	Duran glass	-	-
	Suspension boundary	PTFE (Teflon)	-	-
	Angle units	FKM (e.g. Viton)	-	-
Pressure switch	Diaphragm	FKM (e.g. Viton)	-	-
	Enclosure	PA 6.3T	-	-

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

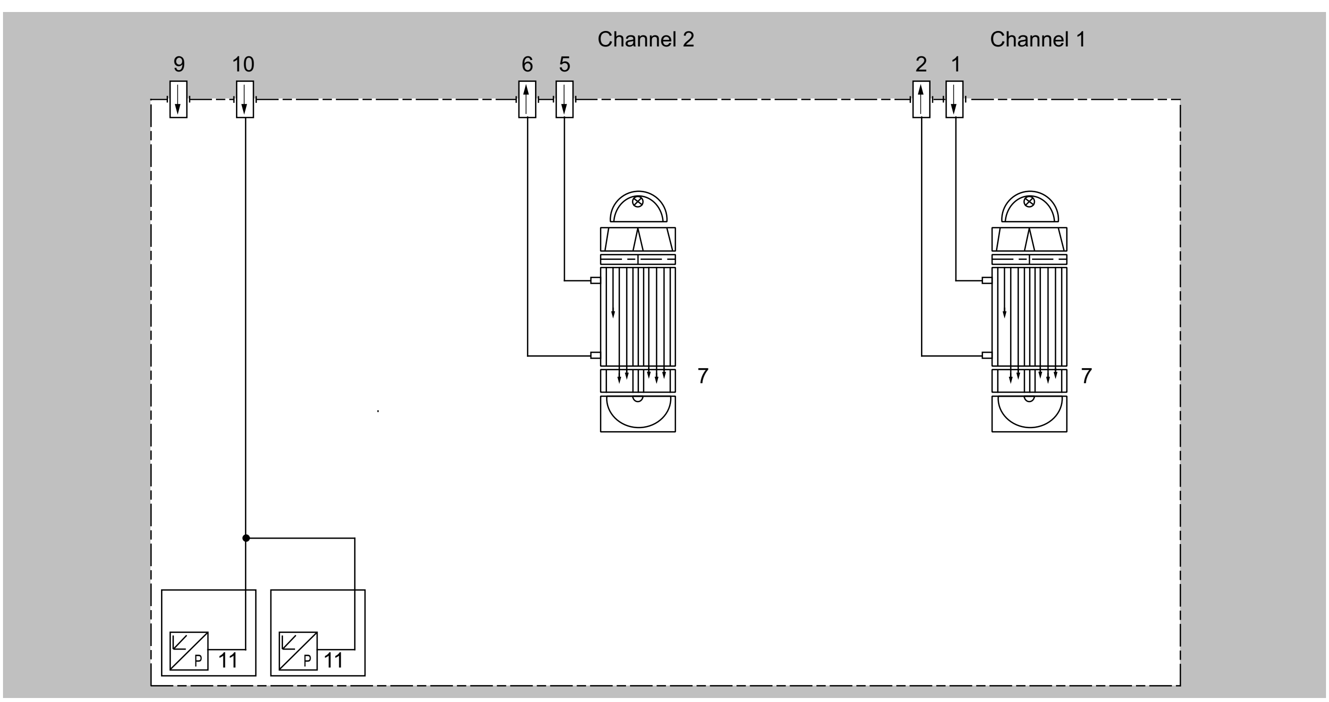
Gas path		19" rack unit	Field device	Field device Ex
With pipes	Bushing	e.g. Hastelloy C22	e.g. Hastelloy C22	e.g. Hastelloy C22
	Pipe	e.g. Hastelloy C22 O-ring: FKM (e.g. Viton) or FFKM (Kalrez)	e.g. Hastelloy C22 O-ring: FKM (e.g. Viton) or FFKM (Kalrez)	e.g. Hastelloy C22 O-ring: FKM (e.g. Viton)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

Design (Continued)

Gas path (19" rack unit)



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

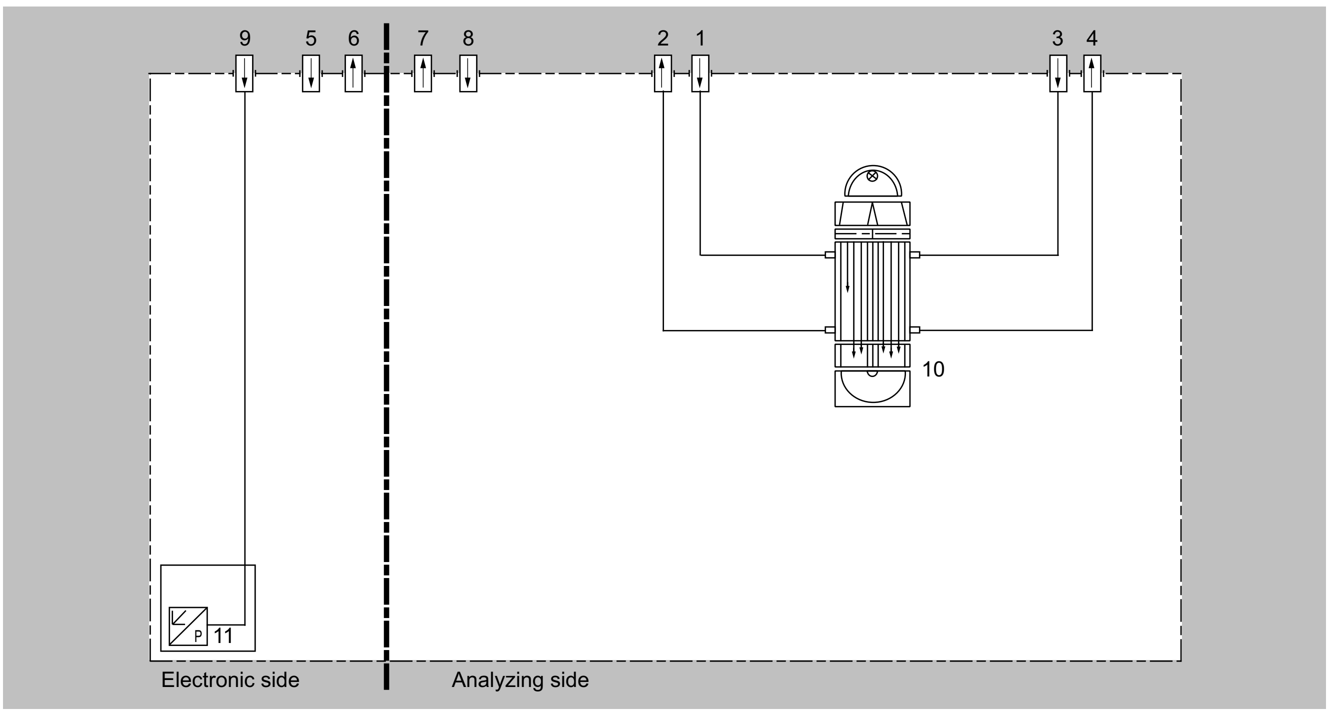


Gas path ULTRAMAT 6, dual-channel unit, 19" rack unit

Design (Continued)

Legend for the figures "Gas path (19" rack unit)"			
1	Sample gas inlet channel 1	8	Restrictor
2	Sample gas outlet channel 1	9	Purging gas inlet
3	Reference gas outlet (option)	10	Connection of atmospheric pressure sensor
4	Reference gas inlet (option)	11	Atmospheric pressure sensor
5	Sample gas inlet channel 2	12	Flow indicator in sample gas path (option)
6	Sample gas outlet channel 2	13	Pressure switch in sample gas path (option)
7	IR physical system		

Gas path (field device)



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

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

Mode of operation

The ULTRAMAT 6 gas analyzer operates according to the infrared two-beam modulated light principle with double-layer detector and optical coupler.
The measuring principle is based on the molecule-specific absorption of bands of infrared radiation. The absorbed wavelengths are characteristic to the individual gases, but may partially overlap. This results in cross-sensitivities which are reduced to a minimum in the ULTRAMAT 6 gas analyzers by the following measures:

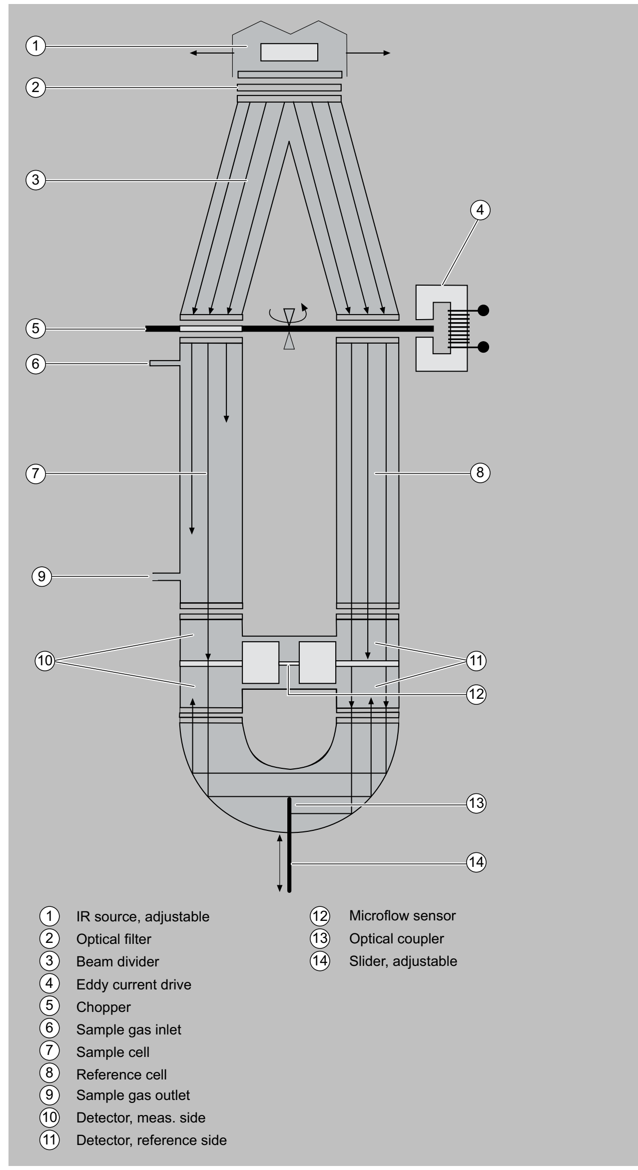
- Gas-filled filter cell (beam divider)
- Double-layer detector with optical coupler
- Optical filters if necessary

The figure shows the measuring principle. An IR source (1) which is heated to approx. 700 °C and which can be shifted to balance the system is divided by the beam divider (3) into two equal beams (sample and reference beams). The beam divider also acts as a filter cell.
The reference beam passes through a reference cell (8) filled with N_2 (a non-infrared-active gas) and reaches the right-hand side of the detector chamber (11) practically unattenuated. The sample beam passes through the sample chamber (7) through which the sample gas flows and reaches the left-hand side of the detector (10) attenuated to a lesser or greater extent depending on the concentration of the sample gas. The detector chamber is filled with a defined concentration of the gas component to be measured.
The detector is designed as a double-layer detector. The center of the absorption band is preferentially absorbed in the upper detector layer, the edges of the band are absorbed to approximately the same extent in the upper and lower layers. The upper and lower detector layers are connected together via the microflow sensor (12). This coupling means that the spectral sensitivity has a very narrow band.
The optical coupler (13) lengthens the lower detector chamber layer optically. The infrared absorption in the second detector chamber layer is varied by changing the slider position (14). It is thus possible to individually minimize the influence of interfering components.
A chopper (5) rotates between the beam divider and the sample chamber and interrupts the two beams alternately and periodically. If absorption takes place in the sample chamber, a pulsating flow is generated between the two detector levels which is converted by the microflow sensor (12) into an electric signal.
The microflow sensor consists of two nickel-plated grids heated to approximately 120 °C, which, along with two supplementary resistors, form a Wheatstone bridge. The pulsating flow together with the dense arrangement of the Ni grids causes a change in resistance. This leads to an offset in the bridge, which is dependent on the concentration of the sample gas.

Notes

The sample gases must be fed into the analyzers free of dust. Condensation in the sample chambers must be prevented. Therefore, the use of gas modified for the measuring task is necessary in most application cases.
As far as possible, the ambient air of the analyzer unit should not have a large concentration of the gas components to be measured.
Flow-type reference cells with reduced flow must not be operated with flammable or toxic gases.
Flow-type reference cells with reduced flow and an 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.

Mode of operation (Continued)



ULTRAMAT 6, principle of operation

Function

Main features

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

Additional features, dual-channel version

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

Selection and ordering data

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

Selection and ordering data (Continued)

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

1) Only for cell lengths 20 to 180 mm.
2) QAL1: See table "Performance tested according to EN 15267 (single component)".
3) QAL1: See table "Based on QAL1 according to SIRA/MCERTS (single component)".
4) QAL1: See tables "Based on QAL1 according to SIRA/MCERTS (single component)" and "Performance-tested according to EN 15267 (single component)".

Options	Order code
Add "**-Z**" to article number and then add order code	
Settings	
Flow-type reference cell with reduced flow, 6 mm	***A20***
Flow-type reference cell with reduced flow, ¼"	***A21***
Telescopic rails (2 units)	***A31***
Set of Torx screwdrivers	***A32***
Tag plates (customized inscription)	***B03***
Kalrez gaskets in sample gas path	***B04***
SIL Declaration of Conformity (SIL 2) Functional Safety according to IEC 61508 and IEC 61511	***C20***
FM/CSA certificate – Class I Div 2	***E20***
Clean for O_2 service (specially cleaned gas path)	***Y02***
Measuring range indication in plain text, if different from default setting	***Y11***
Special setting (only in conjunction with an application no., e.g. extended measuring range)	***Y12***
Extended special setting (only in conjunction with an application no., e.g. determination of cross-interferences)	***Y13***
Hardware/software configuration conforming to QAL1 suitability test according to EN 14181:2004	***Y17***
Performance-tested according to EN 15267	***Y27***

Accessories	Article No.
RS 485/Ethernet converter	A5E00852383

Selection and ordering data (Continued)

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

ULTRAMAT 6 gas analyzer Two-channel 19" rack unit for installation in cabinets for measuring 2 IR components			**Article No.** 7MB2123-	●	●	●	●	●	-	●	●	●	●
Click on the Article No. for online configuration in the PIA Life Cycle Portal. ***Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".***													
Gas connections for sample gas and reference gas													
Pipe with 6 mm outer diameter				0									
Pipe with ¼" outer diameter				1									
Channel 1 Measured component		**Possible with measuring range identification**											
CO		11 ... 30			A								
CO highly selective (with optical filter)[2)]		12 ... 30			B								
CO_2		10 ... 30			C								
CH_4		13 ... 30			D								
C_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)]		12 ... 30			N								
NO[4)]		14 ... 30			P								
NH_3 (dry)		14 ... 30			Q								
H_2O		17 ... 22			R								
N_2O		13 ... 30			S								
CO[3)]		13, 15 ... 17, 19, 23, 25, 29			X								
Smallest measuring range	**Largest measuring range**	**Measuring range identification**											
0 ... 5 vpm	0 ... 100 vpm	10				A							
0 ... 10 vpm	0 ... 200 vpm	11				B							
0 ... 20 vpm	0 ... 400 vpm	12				C							
0 ... 50 vpm	0 ... 1 000 vpm	13				D							
0 ... 100 vpm	0 ... 1 000 vpm	14				E							
0 ... 300 vpm	0 ... 3 000 vpm	15				F							
0 ... 500 vpm	0 ... 5 000 vpm	16				G							
0 ... 1 000 vpm	0 ... 10 000 vpm	17				H							
0 ... 3 000 vpm	0 ... 10 000 vpm	18				J							
0 ... 3 000 vpm	0 ... 30 000 vpm	19				K							
0 ... 5 000 vpm	0 ... 15 000 vpm	20				L							
0 ... 5 000 vpm	0 ... 50 000 vpm	21				M							
0 ... 1%	0 ... 3%	22				N							
0 ... 1%	0 ... 10%	23				P							
0 ... 3%	0 ... 10%	24				Q							
0 ... 3%	0 ... 30%	25				R							
0 ... 5%	0 ... 15%	26				S							

Selection and ordering data (Continued)

ULTRAMAT 6 gas analyzer Two-channel 19" rack unit for installation in cabinets for measuring 2 IR components		**Article No.** 7MB2123-	●	●	●	●	●	●	●	●	●
0 ... 5%	0 ... 50%	27			T						
0 ... 10%	0 ... 30%	28			U						
0 ... 10%	0 ... 100%	29			V						
0 ... 30%	0 ... 100%	30			W						
Internal gas paths	**Sample chamber[1] (lining)**	**Reference chamber (flow-type)**									
Hose made of FKM (Viton)	Aluminum	Non-flow-type				0					
Hose made of FKM (Viton)	Aluminum	Flow-type				1					
Hose made of FKM (Viton) with sample gas monitoring	Aluminum	Non-flow-type				2					
Hose made of FKM (Viton) with sample gas monitoring	Aluminum	Flow-type				3					
Pipe made of titanium	Tantalum	Non-flow-type				4					
Pipe made of titanium	Tantalum	Flow-type				5					
Stainless steel pipe (mat. no. 1.4571)	Aluminum	Non-flow-type				6					
Stainless steel pipe (mat. no. 1.4571)	Tantalum	Non-flow-type				8					
Add-on electronics											
Without							0				
AUTOCAL function with 8 additional digital inputs/outputs each for channel 1							1				
AUTOCAL function with 8 additional digital inputs/outputs each for channel 2							2				
AUTOCAL function with 8 additional digital inputs/outputs for channel 1 and channel 2							3				
AUTOCAL function with serial interface for the automotive industry (AK)							5				
AUTOCAL function with 8 additional digital inputs/outputs each for channel 1 and channel 2 and PROFIBUS PA interface							6				
AUTOCAL function with 8 additional digital inputs/outputs each for channel 1 and channel 2 and PROFIBUS DP interface							7				
Auxiliary power											
100 ... 120 V AC, 48 ... 63 Hz								0			
200 ... 240 V AC, 48 ... 63 Hz								1			
Channel 2 Measured component		**Possible with measuring range identification**									
CO		11 ... 30							A		
CO highly selective (with optical filter)[2]		12 ... 30							B		
CO_2		10 ... 30							C		
CH_4		13 ... 30							D		
C_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]		12 ... 30							N		
NO[4]		14 ... 30							P		
NH_3 (dry)		14 ... 30							Q		
H_2O		17 ... 22							R		
N_2O		13 ... 30							S		
CO[3]		13, 15 ... 17, 19, 23, 25, 29							X		
Smallest measuring range	**Largest measuring range**	**Measuring range identification**									
0 ... 5 vpm	0 ... 100 vpm	10								A	
0 ... 10 vpm	0 ... 200 vpm	11								B	
0 ... 20 vpm	0 ... 400 vpm	12								C	
0 ... 50 vpm	0 ... 1 000 vpm	13								D	
0 ... 100 vpm	0 ... 1 000 vpm	14								E	
0 ... 300 vpm	0 ... 3 000 vpm	15								F	
0 ... 500 vpm	0 ... 5 000 vpm	16								G	
0 ... 1 000 vpm	0 ... 10 000 vpm	17								H	
0 ... 3 000 vpm	0 ... 10 000 vpm	18								J	
0 ... 3 000 vpm	0 ... 30 000 vpm	19								K	
0 ... 5 000 vpm	0 ... 15 000 vpm	20								L	
0 ... 5 000 vpm	0 ... 50 000 vpm	21								M	

Selection and ordering data (Continued)

ULTRAMAT 6 gas analyzer Two-channel 19" rack unit for installation in cabinets for measuring 2 IR components			Article No. 7MB2123- ● ● ● ● ● - ● ● ● ●
0 ... 1%	0 ... 3%	22	N
0 ... 1%	0 ... 10%	23	P
0 ... 3%	0 ... 10%	24	Q
0 ... 3%	0 ... 30%	25	R
0 ... 5%	0 ... 15%	26	S
0 ... 5%	0 ... 50%	27	T
0 ... 10%	0 ... 30%	28	U
0 ... 10%	0 ... 100%	29	V
0 ... 30%	0 ... 100%	30	W
Language of the operating software			
German			0
English			1
French			2
Spanish			3
Italian			4

1) Only for cell lengths 20 to 180 mm.
2) QAL1: See table "Performance tested according to EN 15267 (single component)".
3) QAL1: See table "Based on QAL1 according to SIRA/MCERTS (single component)".
4) QAL1: See tables "Based on QAL1 according to SIRA/MCERTS (single component)" and "Performance-tested according to EN 15267 (single component)".

Options	Order code
Add "-**Z**" to article number and then add order code	
Settings	
Flow-type reference cell with reduced flow, 6 mm (channel 1)	**A20**
Flow-type reference cell with reduced flow, 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 pipes(can only be combined with the appropriate gas connection diameter and internal gas path materials)	
• Made of titanium, 6 mm, complete with screwed gland, for sample gas side	**A22**
• Made of titanium, 6 mm, complete with screwed gland, for reference gas side	**A23**
• Made of titanium, 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**
Set of Torx screwdrivers	**A32**
Without Siemens logo	**B02**
Tag plates (customized inscription)	**B03**
Kalrez gaskets in sample gas path (channel 1)	**B04**
Kalrez gaskets in sample gas path (channel 2)	**B05**

Selection and ordering data (Continued)

Options	Order code
SIL Declaration of Conformity (SIL 2) Functional Safety according to IEC 61508 and IEC 61511	**C20**
FM/CSA certificate – Class I Div 2	**E20**
Clean for O_2 service (specially cleaned gas path, channel 1+2)	**Y02**
Measuring range indication in plain text, if different from default setting	**Y11**
Special setting (only in conjunction with an application no., e.g. extended measuring range)	**Y12**
Extended special setting (only in conjunction with an application no., e.g. determination of cross-interferences)	**Y13**
Hardware/software configuration conforming to QAL1 suitability test according to EN 14181:2004 (Channel 1)	**Y17**
German Technical Inspectorate version according to 13th and 17th German Federal Immission Protection Regulations (channel 2)	**Y18**
Performance-tested according to EN 15267 (channel 1)	**Y27**
Performance-tested according to EN 15267 (channel 2)	**Y28**

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

ULTRAMAT 6 gas analyzer Single-channel or dual-channel 19" rack unit for installation in cabinets for measuring 2 or 3 IR components			**Article No.** **7MB2124-**	●	●	●	●	●	-	●	●	●	●
Click on the Article No. for online configuration in the PIA Life Cycle Portal. ***Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".***													
Gas connections for sample gas and reference gas													
Pipe with 6 mm outer diameter				0									
Pipe with ¼" outer diameter				1									
Measured component	**Smallest measuring range**	**Largest measuring range**											
CO and NO[1)]	0 ... 100 vpm	0 ... 1 000 vpm			A	A							
CO and NO[1)]	0 ... 300 vpm	0 ... 3 000 vpm			A	B							
CO and NO[1)]	0 ... 1 000 vpm	0 ... 10 000 vpm			A	C							
CO_2 and CO	0 ... 100 vpm	0 ... 1 000 vpm			B	A							
CO_2 and CO	0 ... 300 vpm	0 ... 3 000 vpm			B	B							
CO_2 and CO	0 ... 1 000 vpm	0 ... 10 000 vpm			B	C							
CO_2 and CO	0 ... 3 000 vpm	0 ... 30 000 vpm			B	D							

Selection and ordering data (Continued)

ULTRAMAT 6 gas analyzer Single-channel or dual-channel 19" rack unit for installation in cabinets for measuring 2 or 3 IR components			Article No. 7MB2124-	●	●	●	●	●	-	●	●	●	●
CO_2 and CO	0 ... 1%	0 ... 10%			B	E							
CO_2 and CO	0 ... 3%	0 ... 30%			B	F							
CO_2 and CO	0 ... 10%	0 ... 100%			B	G							
CO_2 and CH_4	0 ... 10%	0 ... 100%			C	G							
CO_2 and NO	0 ... 300 vpm	0 ... 3 000 vpm			D	B							
Internal gas paths	**Sample chamber[2] (lining)**	**Reference chamber (flow-type)**											
Hose made of FKM (Viton)	Aluminum	Non-flow-type					0						
Hose made of FKM (Viton)	Aluminum	Flow-type					1						
Hose made of FKM (Viton) with sample gas monitoring	Aluminum	Non-flow-type					2						
Hose made of FKM (Viton) with sample gas monitoring	Aluminum	Flow-type					3						
Pipe made of titanium	Tantalum	Non-flow-type					4						
Pipe made of titanium	Tantalum	Non-flow-type					5						
Stainless steel pipe (mat. no. 1.4571)	Aluminum	Non-flow-type					6						
Stainless steel pipe (mat. no. 1.4571)	Aluminum	Non-flow-type					8						
Add-on electronics													
Without								0					
AUTOCAL function with 8 additional digital inputs/outputs each for channel 1								1					
AUTOCAL function with 8 additional digital inputs/outputs for channel 1 and channel 2								2					
AUTOCAL function with serial interface for the automotive industry (AK), channel 1								3					
AUTOCAL function with serial interface for the automotive industry (AK), channel 1 and channel 2								4					
AUTOCAL function with 8 additional digital inputs/outputs each for channel 1 and PROFIBUS PA interface								5					
AUTOCAL function with 8 additional digital inputs/outputs each for channel 1 and channel 2 and PROFIBUS PA interface								6					
AUTOCAL function with 8 additional digital inputs/outputs each for channel 1 and PROFIBUS DP interface								7					
AUTOCAL function with 8 additional digital inputs/outputs each for channel 1 and channel 2 and PROFIBUS DP interface								8					
Auxiliary power													
100 ... 120 V AC, 48 ... 63 Hz										0			
200 ... 240 V AC, 48 ... 63 Hz										1			
Channel 2 Measured component		**Possible with measuring range identification**											
CO		11 ... 30									A		
CO highly selective (with optical filter)		12 ... 30									B		
CO_2		10 ... 30									C		
CH_4		13 ... 30									D		
C_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]		12 ... 30									N		
NO[3]		14 ... 23, 25, 29									P		
NH_3 (dry)		14 ... 30									Q		
H_2O		17 ... 30									R		
N_2O		13 ... 30									S		
Without channel 2											W		
CO[3]											X		
Smallest measuring range	**Largest measuring range**	**Measuring range identification**											
0 ... 5 vpm	0 ... 100 vpm	10										A	
0 ... 10 vpm	0 ... 200 vpm	11										B	
0 ... 20 vpm	0 ... 400 vpm	12										C	
0 ... 50 vpm	0 ... 1 000 vpm	13										D	
0 ... 100 vpm	0 ... 1 000 vpm	14										E	
0 ... 300 vpm	0 ... 3 000 vpm	15										F	
0 ... 500 vpm	0 ... 5 000 vpm	16										G	
0 ... 1 000 vpm	0 ... 10 000 vpm	17										H	

Selection and ordering data (Continued)

ULTRAMAT 6 gas analyzer Single-channel or dual-channel 19" rack unit for installation in cabinets for measuring 2 or 3 IR components			**Article No.** 7MB2124-	●	●	●	●	●	-	●	●	●	●
0 ... 3 000 vpm	0 ... 10 000 vpm	18										J	
0 ... 3 000 vpm	0 ... 30 000 vpm	19										K	
0 ... 5 000 vpm	0 ... 15 000 vpm	20										L	
0 ... 5 000 vpm	0 ... 50 000 vpm	21										M	
0 ... 1%	0 ... 3%	22										N	
0 ... 1%	0 ... 10%	23										P	
0 ... 3%	0 ... 10%	24										Q	
0 ... 3%	0 ... 30%	25										R	
0 ... 5%	0 ... 15%	26										S	
0 ... 5%	0 ... 50%	27										T	
0 ... 10%	0 ... 30%	28										U	
0 ... 10%	0 ... 100%	29										V	
0 ... 30%	0 ... 100%	30										W	
Without channel 2												X	
Language of the operating software													
German													0
English													1
French													2
Spanish													3
Italian													4

[1)] QAL1: See table "Based on QAL1 according to SIRA/MCERTS (2 components in series)".
[2)] Only for cell lengths 20 to 180 mm.
[3)] QAL1: See table "Based on QAL1 according to SIRA/MCERTS (single component)".

Options	Order code
Add "**-Z**" to article number and then add order code	
Settings	
Flow-type reference cell with reduced flow, 6 mm (channel 1)	**A20**
Flow-type reference cell with reduced flow, 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 pipes(can only be combined with the appropriate gas connection diameter and internal gas path materials)	
• Made of titanium, 6 mm, complete with screwed gland, for sample gas side	**A22**
• Made of titanium, 6 mm, complete with screwed gland, for reference gas side	**A23**
• Made of titanium, 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 plates (customized inscription)	**B03**
Kalrez gaskets in sample gas path (channel 1)	**B04**
Kalrez gaskets in sample gas path (channel 2)	**B05**

Selection and ordering data (Continued)

Options	Order code
SIL Declaration of Conformity (SIL 2) Functional Safety according to IEC 61508 and IEC 61511	**C20**
FM/CSA certificate – Class I Div 2	**E20**
Clean for O_2 service (specially cleaned gas path, channel 1+2)	**Y02**
Measuring range indication in plain text, if different from default setting	**Y11**
Special setting (only in conjunction with an application no., e.g. extended measuring range)	**Y12**
Extended special setting (only in conjunction with an application no., e.g. determination of cross-interferences)	**Y13**
Hardware/software configuration conforming to QAL1 suitability test according to EN 14181:2004 (Channel 1)	**Y17**
Hardware/software configuration conforming to QAL1 suitability test according to EN 14181:2004 (Channel 2)	**Y18**

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

Note

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

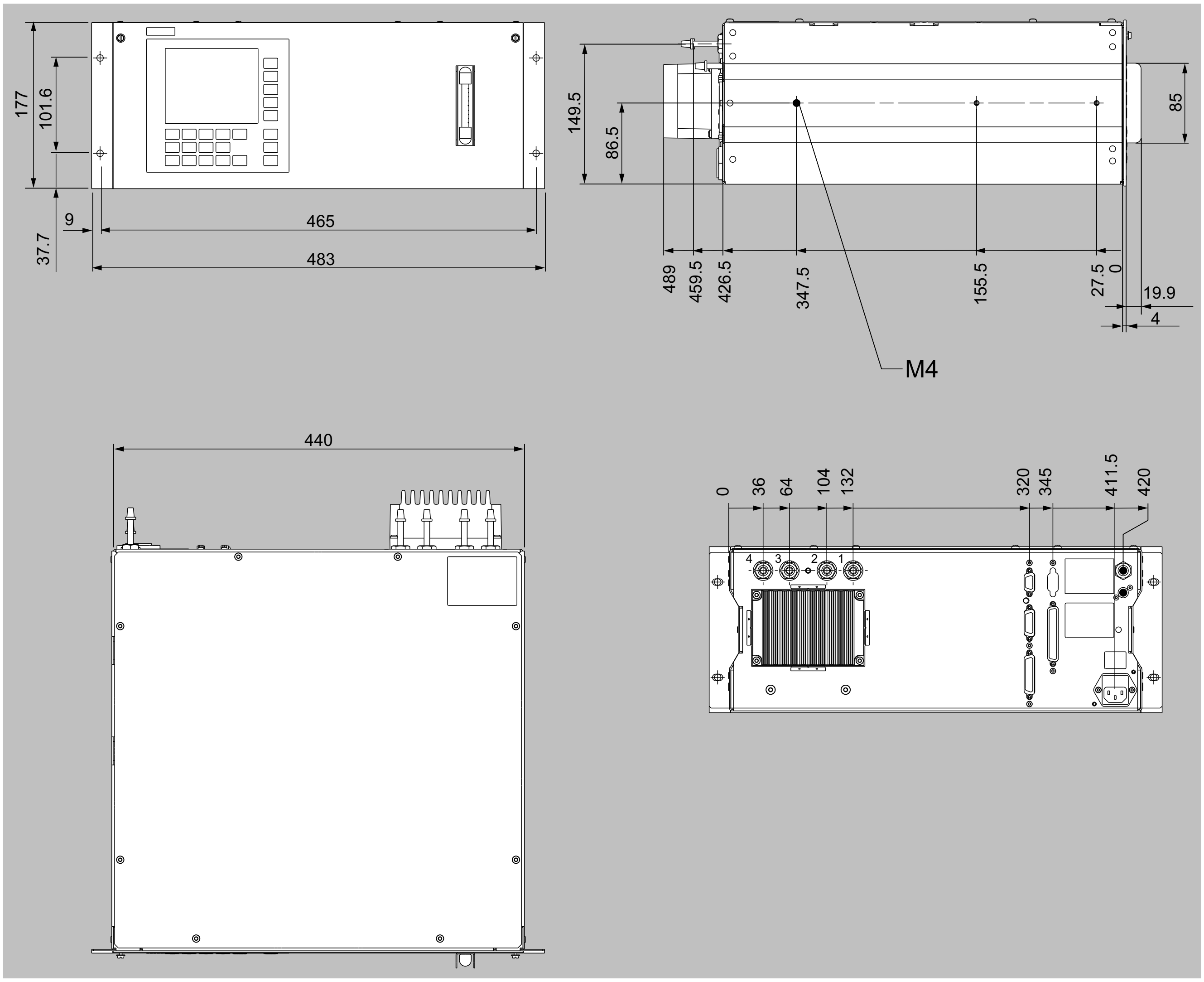
Technical specifications

ULTRAMAT 6, 19" rack unit	
General information	
Measuring ranges	4, internally and externally switchable; automatic measuring range switchover is also possible
Smallest possible measuring range	Dependent on the application: e.g. CO: 0 ... 10 vpm, CO_2: 0 ... 5 vpm
Largest possible measuring span	Dependent on the application
Measuring range with suppressed zero point	Any zero point within 0 ... 100 vol.% can be implemented; smallest possible span 20%
Operating position	Front wall, vertical
Conformity	CE mark in accordance with EN 50081-1, EN 50082-2
Influence of interference gases must be considered separately	
Design, enclosure	
Weight	Approx. 15 kg (with one IR channel) Approx. 21 kg (with two IR channels)
Degree of protection	IP20 according to EN 60529
Electrical characteristics	
EMC (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98)
Electrical safety	According to EN 61010-1, overvoltage category III
Auxiliary power	100 ... 120 V AC (nominal range of use 90 ... 132 V), 48 ... 63 Hz or 200 ... 240 V AC (nominal range of use 180 ... 264 V), 48 ... 63 Hz
Power consumption	1-channel device: approx. 40 VA 2-channel device: approx. 70 VA
Fuse ratings	100 ... 120 V: 1T/250 (7MB2121); 1.6T/250 (7MB2123) 200 ... 240 V: 0.63T/250 (7MB2121); T/250 (7MB2123)
Gas inlet conditions	
Permissible sample gas pressure	
• With hoses	
- Without pressure switch	600 ... 1 500 hPa (absolute)
- With pressure switch	700 ... 1 300 hPa (absolute)
• With pipes (without pressure switch)	600 ... 1 500 hPa (absolute)
Sample gas flow	18 ... 90 l/h (0.3 ... 1.5 l/min)
Sample gas temperature	Min. 0 ... max. 50 °C, but above the dew point
Sample gas humidity	< 90% RH (relative humidity), or dependent on measuring task, non-condensing
Time response	
Warm-up period	At room temperature < 30 min (the technical specification will be met after 2 hours)
Delayed display (T_{90} time)	Dependent on length of analyzer chamber, sample gas line and configurable damping
Damping (electrical time constant)	0 ... 100 s, configurable
Dead time (purging time of the gas path in the device at 1 l/min)	Approx. 0.5 ... 5 s, depending on the version
Time for device-internal signal processing	< 1 s
Pressure correction range	
Pressure sensor	
• Internal	700 ... 1 200 hPa absolute
• External	700 ... 1 500 hPa absolute
Measuring response	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation	< ± 1% of the smallest possible measuring range according to nameplate
Zero point drift	< ± 1% of the current measuring range/week
Measured value drift	< ± 1% of the current measuring range/week
Repeatability	≤ 1% of the current measuring range
Detection limit	1% of the smallest possible measuring range
Linearity error	± 0.5% of the measuring range end value

Technical specifications (Continued)

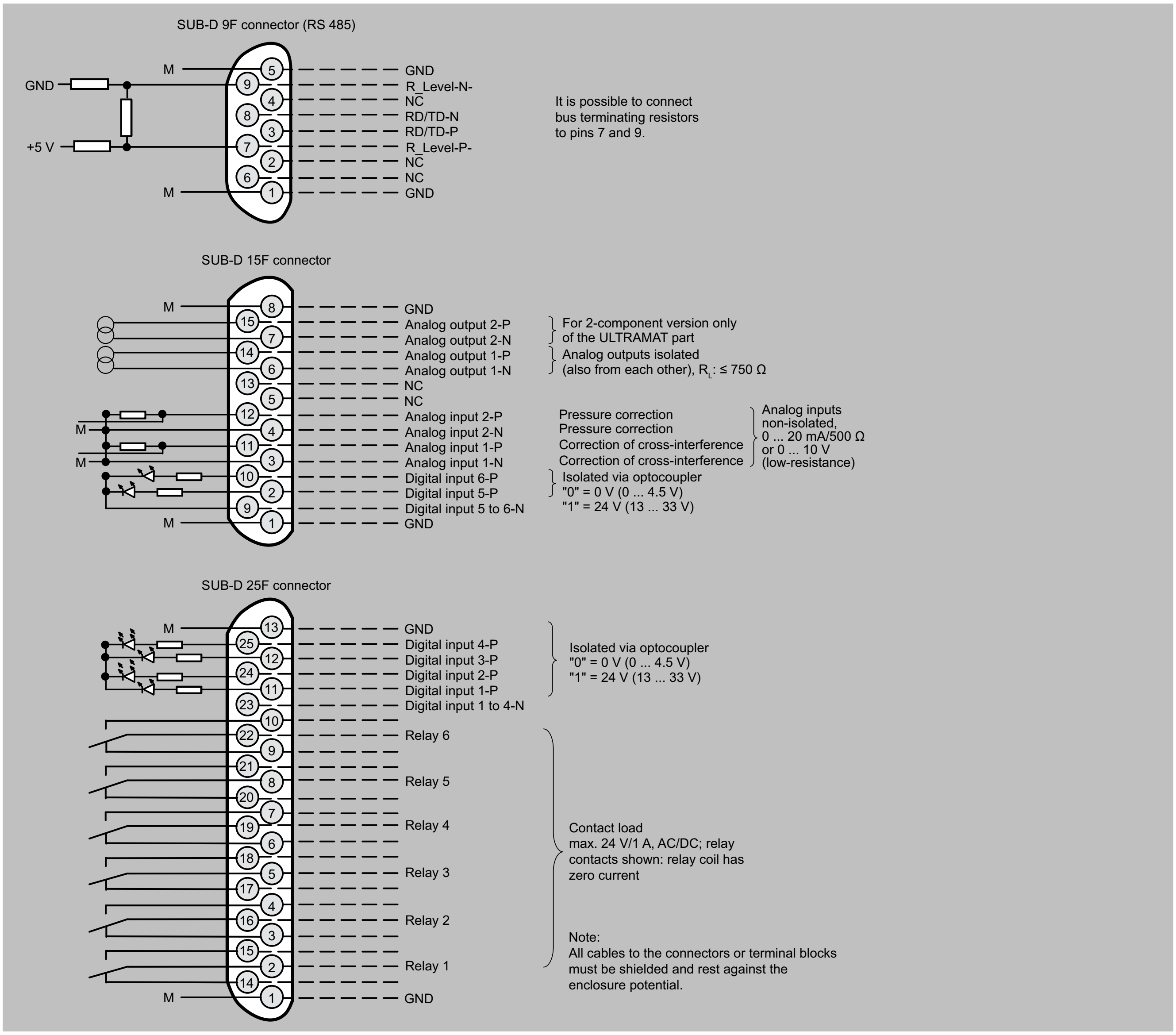
ULTRAMAT 6, 19" rack unit	
Influencing variables	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Ambient temperature	< 1% of current measuring range/10 K (with constant receiver cell temperature)
Sample gas pressure	• With enabled pressure compensation: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

Dimensional drawings



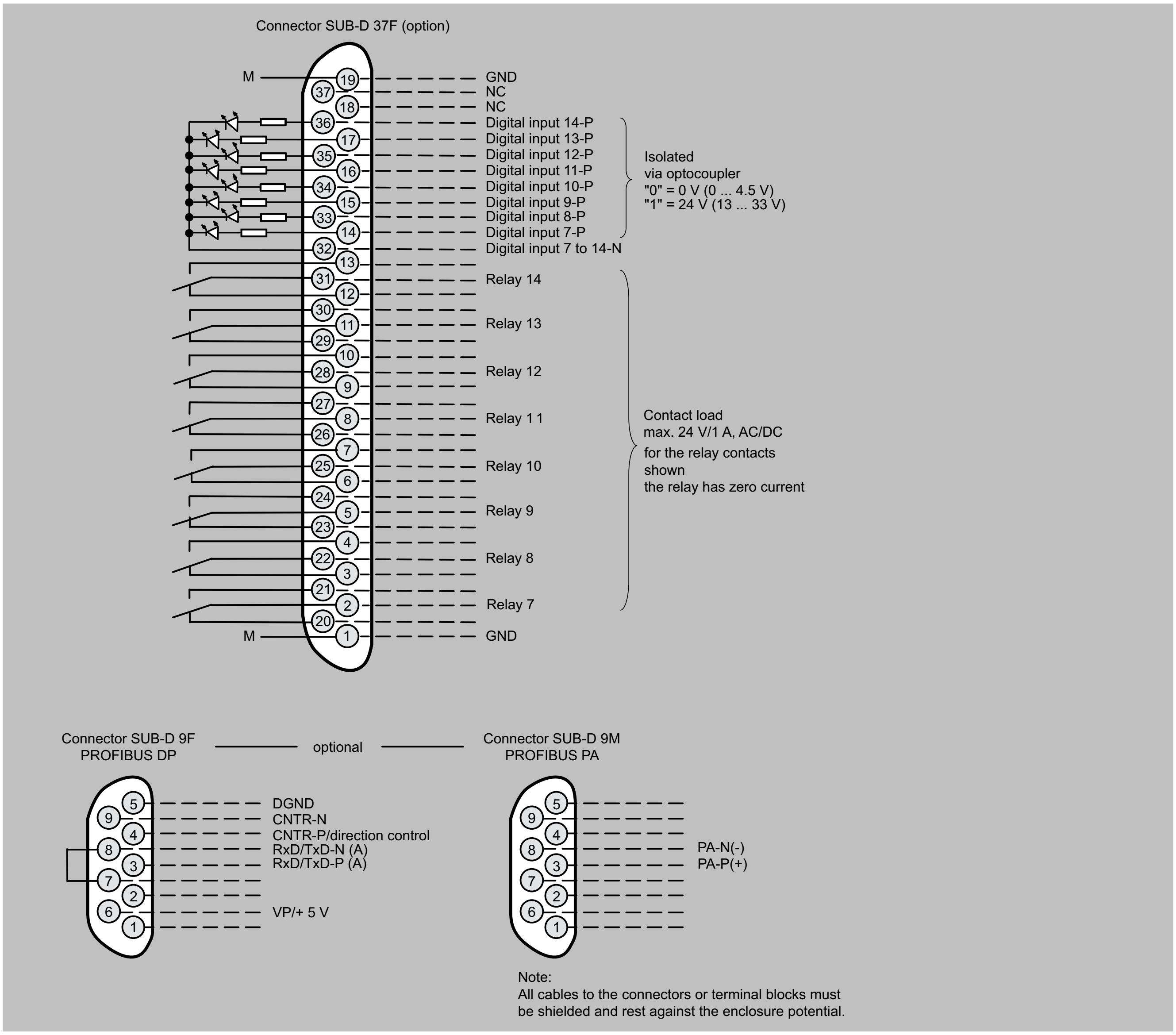
ULTRAMAT 6, 19" rack unit, dimensions in mm (example: 1-channel version)

Circuit diagrams



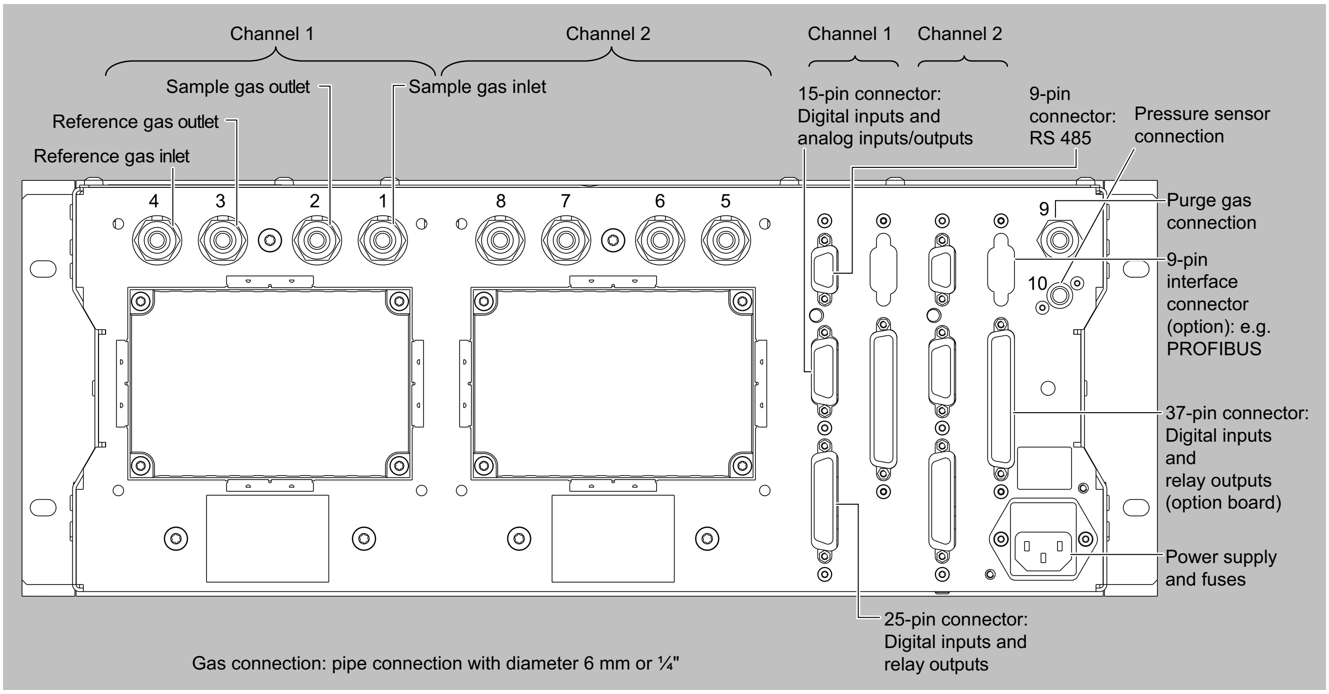
ULTRAMAT 6, 19" rack unit, pin assignment

Circuit diagrams (Continued)



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

Circuit diagrams (Continued)



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

More information

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

Only in conjunction with order code Y17/Y18

Component	CO (QAL1)		SO_2 (QAL1)		NO (QAL1)	
Measuring range identification	**Smallest measuring range from 0 to ...**	**Largest measuring range from 0 to ...**	**Smallest measuring range from 0 to ...**	**Largest measuring range from 0 to ...**	**Smallest measuring range from 0 to ...**	**Largest measuring range from 0 to ...**
C	-	-	75 mg/m³	1 500 mg/m³	-	-
D	50 mg/m³	1 000 mg/m³	300 mg/m³	3 000 mg/m³	-	-
E	-	-	500 mg/m³	5 000 mg/m³	100 mg/m³	2 000 mg/m³
F	300 mg/m³	3 000 mg/m³	1 000 mg/m³	10 000 mg/m³	300 mg/m³	3 000 mg/m³
G	500 mg/m³	5 000 mg/m³	-	-	500 mg/m³	5 000 mg/m³
H	1 000 mg/m³	10 000 mg/m³	3 000 mg/m³	30 000 mg/m³	1 000 mg/m³	10 000 mg/m³
K	3 000 mg/m³	30 000 mg/m³	10 g/m³	100 g/m³	3 000 mg/m³	30 000 mg/m³

Ordering example

ULTRAMAT 6, QAL1
Component: CO
Measuring range: 0 to 50 / 1 000 mg/m³
With hoses, non-flow-type reference cell
Without automatic adjustment (AUTOCAL)
230 V AC; German
7MB2121-0XD00-1AA0-Z +Y17

More information (Continued)

Performance-tested according to EN 15267 (single component)

Only in conjunction with order code Y27/Y28

Component	CO (QAL1)		SO_2 (QAL1)		NO (QAL1)	
Measuring range identification	**Smallest measuring range from 0 to ...**	**Largest measuring range from 0 to ...**	**Smallest measuring range from 0 to ...**	**Largest measuring range from 0 to ...**	**Smallest measuring range from 0 to ...**	**Largest measuring range from 0 to ...**
C	-	-	75 mg/m³	1 500 mg/m³	-	-
D	75 mg/m³	1 250 mg/m³	-	-	-	-
E	125 g/m³	1 250 mg/m³	-	-	100 mg/m³	2 000 mg/m³
F	300 mg/m³	3 000 mg/m³	-	-	300 mg/m³	3 000 mg/m³
G	500 mg/m³	5 000 mg/m³	-	-	500 mg/m³	5 000 mg/m³
H	1 000 mg/m³	10 000 mg/m³	-	-	1 000 mg/m³	10 000 mg/m³
J	3 000 mg/m³	10 000 mg/m³	-	-	3 000 mg/m³	10 000 mg/m³

Ordering example

ULTRAMAT 6 2-channel, performance-tested according to EN 15267
Components: CO + SO_2
Measuring range: CO: 0 to 75 / 1 250 mg/m³, SO_2: 0 to 75 / 1 500 mg/m³
With hoses, non-flow-type reference cell
With automatic calibration (AUTOCAL)
230 V AC; German
7MB2123-0BD03-1NC0-Z +Y27+Y28

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

Only in conjunction with order code Y17

Component	CO (QAL1)		NO (QAL1)	
Measuring range identification	**Smallest measuring range from 0 to ...**	**Largest measuring range from 0 to ...**	**Smallest measuring range from 0 to ...**	**Largest measuring range from 0 to ...**
AA	75 mg/m³	1 000 mg/m³	200 mg/m³	2 000 mg/m³
AB	300 mg/m³	3 000 mg/m³	300 mg/m³	3 000 mg/m³
AC	1 000 mg/m³	10 000 mg/m³	1 000 mg/m³	10 000 mg/m³

Ordering example

ULTRAMAT 6 2-channel, QAL1
Components: CO/NO + SO_2
Measuring range: CO: 0 to 75 / 1 000 mg/m³, NO: 0 to 200 / 2 000 mg/m³,SO_2: 0 to 75 / 1 500 mg/m³
With hoses, non-flow-type reference cell
Without automatic adjustment (AUTOCAL)
230 V AC; German
7MB2124-0AA00-1NC0-Z+Y17+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

Selection and ordering data

ULTRAMAT 6 gas analyzer For installation in the field, single-channel, 1 component			**Article No.** 7MB2111-	●	●	●	●	●	-	●	●	A	●
Click on the Article No. for online configuration in the PIA Life Cycle Portal. ***Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".***													
Gas connections													
Cutting ring fitting for pipe, outer diameter 6 mm				0									
Cutting ring fitting for pipe, outer diameter ¼"				1									
Measured component		**Possible with measuring range identification**											
CO		11 ... 30			A								
CO highly selective (with optical filter)		12 ... 30			B								
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[1]		12 ... 30			N								
NO[1]		14 ... 30			P								
NH_3 (dry)		14 ... 30			Q								
H_2O		17 ... 24, 26			R								
N_2O		13 ... 30			S								
CO[1]					X								
Smallest measuring range	**Largest measuring range**	**Measuring range identification**											
0 ... 5 vpm	0 ... 100 vpm	10				A							
0 ... 10 vpm	0 ... 200 vpm	11				B							
0 ... 20 vpm	0 ... 400 vpm	12				C							
0 ... 50 vpm	0 ... 1 000 vpm	13				D							
0 ... 100 vpm	0 ... 1 000 vpm	14				E							
0 ... 300 vpm	0 ... 3 000 vpm	15				F							
0 ... 500 vpm	0 ... 5 000 vpm	16				G							
0 ... 1 000 vpm	0 ... 10 000 vpm	17				H							
0 ... 3 000 vpm	0 ... 10 000 vpm	18				J							
0 ... 3 000 vpm	0 ... 30 000 vpm	19				K							
0 ... 5 000 vpm	0 ... 15 000 vpm	20				L							
0 ... 5 000 vpm	0 ... 50 000 vpm	21				M							
0 ... 1%	0 ... 3%	22				N							
0 ... 1%	0 ... 10%	23				P							
0 ... 3%	0 ... 10%	24				Q							
0 ... 3%	0 ... 30%	25				R							
0 ... 5%	0 ... 15%	26				S							
0 ... 5%	0 ... 50%	27				T							
0 ... 10%	0 ... 30%	28				U							
0 ... 10%	0 ... 100%	29				V							
0 ... 30%	0 ... 100%	30				W							
Internal gas paths	**Sample chamber (lining)**	**Reference chamber (flow-type)**											
Hose made of FKM (Viton)	Aluminum	Non-flow-type					0						
Hose made of FKM (Viton)	Aluminum	Flow-type					1						
Pipe made of titanium	Tantalum[2]	Non-flow-type					2						
Pipe made of titanium	Tantalum[2]	Flow-type					3						
Stainless steel pipe (mat. no. 1.4571)	Aluminum	Non-flow-type					6						
Stainless steel pipe (mat. no. 1.4571)	Tantalum[2]	Non-flow-type					8						
Add-on electronics													
Without								0					
AUTOCAL function with 8 additional digital inputs/outputs each								1					
AUTOCAL function 8 additional digital inputs/outputs and PROFIBUS PA interface								6					

Selection and ordering data (Continued)

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

[1)] QAL1: See table "Based on QAL1 according to SIRA/MCERTS (single component)" under "More information".
[1)] Only for cell lengths 20 to 180 mm
[2)] See also "Additional units for Ex versions".

ULTRAMAT 6 gas analyzer For installation in the field, single-channel, 2 components			**Article No.** 7MB2112-	●	●	●	●	●	-	●	●	A	●
Click on the Article No. for online configuration in the PIA Life Cycle Portal.													
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".													
Gas connections													
Cutting ring fitting for pipe, outer diameter 6 mm				0									
Cutting ring fitting for pipe, outer diameter ¼"				1									
Measured component	**Smallest measuring range**	**Largest measuring range**											
CO and NO[3]	0 ... 100 vpm	0 ... 1 000 vpm			A	A							
CO and NO[3]	0 ... 300 vpm	0 ... 3 000 vpm			A	B							
CO and NO[3]	0 ... 1 000 vpm	0 ... 10 000 vpm			A	C							
CO_2 and CO	0 ... 100 vpm	0 ... 1 000 vpm			B	A							
CO_2 and CO	0 ... 300 vpm	0 ... 3 000 vpm			B	B							
CO_2 and CO	0 ... 1 000 vpm	0 ... 10 000 vpm			B	C							
CO_2 and CO	0 ... 3 000 vpm	0 ... 30 000 vpm			B	D							
CO_2 and CO	0 ... 1%	0 ... 10%			B	E							
CO_2 and CO	0 ... 3%	0 ... 30%			B	F							
CO_2 and CO	0 ... 10%	0 ... 100%			B	G							
CO_2 and CH_4	0 ... 10%	0 ... 100%			C	G							
CO_2 and NO	0 ... 100 vpm	0 ... 1 000 vpm			D	A							
CO_2 and NO	0 ... 300 vpm	0 ... 3 000 vpm			D	B							
Internal gas paths	**Sample chamber (lining)**	**Reference chamber (flow-type)**											
Hose made of FKM (Viton)	Aluminum	Non-flow-type					0						
Hose made of FKM (Viton)	Aluminum	Flow-type					1						
Pipe made of titanium	Tantalum[1]	Non-flow-type					2						
Pipe made of titanium	Tantalum[1]	Flow-type					3						
Stainless steel pipe (mat. no. 1.4571)	Aluminum	Non-flow-type					6						
Stainless steel pipe (mat. no. 1.4571)	Tantalum[1]	Non-flow-type					8						
Add-on electronics													
Without								0					

Selection and ordering data (Continued)

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

1) Only for cell lengths 20 to 180 mm
2) See also "Additional units for Ex versions".
3) QAL1: See table "Based on QAL1 according to SIRA/MCERTS (2 components in series)" under "More information".

Options	Order code
Add "**-Z**" to article number and then add order code	
Settings	
Flow-type reference cell with reduced flow, 6 mm	**A28**
Flow-type reference cell with reduced flow, ¼"	**A29**
Set of Torx screwdrivers	**A32**
Tag plates (customized inscription)	**B03**
Kalrez gaskets in sample gas path	**B04**
SIL Declaration of Conformity (SIL 2) Functional Safety according to IEC 61508 and IEC 61511	**C20**
Ex versions	
For combination options see "Ex configurations – principle selection criteria series 6" table, "General information" section	
ATEX II 3G certificate; restricted breathing enclosure, non-flammable gases	**E11**
ATEX II 3G certificate; flammable gases	**E12**
FM/CSA certificate – Class I Div 2	**E20**
ATEX II 3D certificate; potentially explosive dust atmospheres	
• In non-hazardous gas zone	**E40**
• In hazardous zone acc. to ATEX II 3G, non-flammable gases[1)]	**E41**
• In hazardous zone acc. to ATEX II 3G, flammable gases	**E42**

Selection and ordering data (Continued)

Options	Order code
BARTEC Ex p purging unit for use in ATEX or IECEx Zone 1 • BARTEC Ex p control unit for continuous flow • BARTEC Ex e control station with bypass key switch	**E74**
BARTEC Ex purging unit for use in ATEX or IECEx Zone 1 • BARTEC Ex p control unit for continuous flow • BARTEC Ex control station with bypass key switch • Operator display for visualization of system states	**E75**
Clean for O_2 service (specially cleaned gas path)	**Y02**
Measuring range indication in plain text, if different from default setting	**Y11**
Special setting (only in conjunction with an application no., e.g. extended measuring range)	**Y12**
Extended special setting (only in conjunction with an application no., e.g. determination of cross-interferences)	**Y13**
Hardware/software configuration conforming to QAL1 suitability test according to EN 14181:2004	**Y17**

[1] Only in connection with an approved purging unit

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

Selection and ordering data (Continued)

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

Note

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

Technical specifications

ULTRAMAT 6, field device	
General information	
Measuring ranges	4, internally and externally switchable; automatic measuring range switchover is also possible
Smallest possible measuring range	Dependent on the application, e.g. CO: 0 ... 10 vpm, CO_2 : 0 ... 5 vpm
Largest possible measuring range	Dependent on the application
Measuring range with suppressed zero point	Any zero point within 0 ... 100 vol.% can be implemented; smallest possible span 20%
Heated version	65 °C
Operating position	Front wall, vertical
Conformity	CE mark in accordance with EN 50081-1, EN 50082-2
Influence of interference gases must be considered separately	
Design, enclosure	
Weight	Approx. 32 kg
Degree of protection	IP65 in accordance with EN 60529, restricted breathing enclosure according to EN 50021
Electrical characteristics	
Auxiliary power	100 ... 120 V AC (nominal range of use 90 ... 132 V), 48 ... 63 Hz or 200 ... 240 V AC (nominal range of use 180 ... 264 V), 48 ... 63 Hz
Power consumption	Approx. 35 VA; approx. 330 VA with heated version
EMC (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98)
Electrical safety	In accordance with EN 61010-1
• Heated devices	Overvoltage category II
• Unheated devices	Overvoltage category III
Fuse ratings (unheated device)	100 ... 120 V: F3 1T/250; F4 1T/250 200 ... 240 V: F3 0.63T/250; F4 0.63T/250
Fuse ratings (heated device)	100 ... 120 V: F1 1T/250; F2 4T/250, F3 4T/250; F4 4T/250 200 ... 240 V: F1 0.63T/250; F2 2.5T/250; F3 2.5T/250; F4 2.5T/250
Gas inlet conditions	
Permissible sample gas pressure	
• With hoses (without pressure switch)	600 ... 1 500 hPa (absolute)
• With pipes (without pressure switch)	600 ... 1 500 hPa (absolute)
- Ex (leakage compensation)	600 ... 1 160 hPa (absolute)
- Ex (continuous purging)	600 ... 1 500 hPa (absolute)

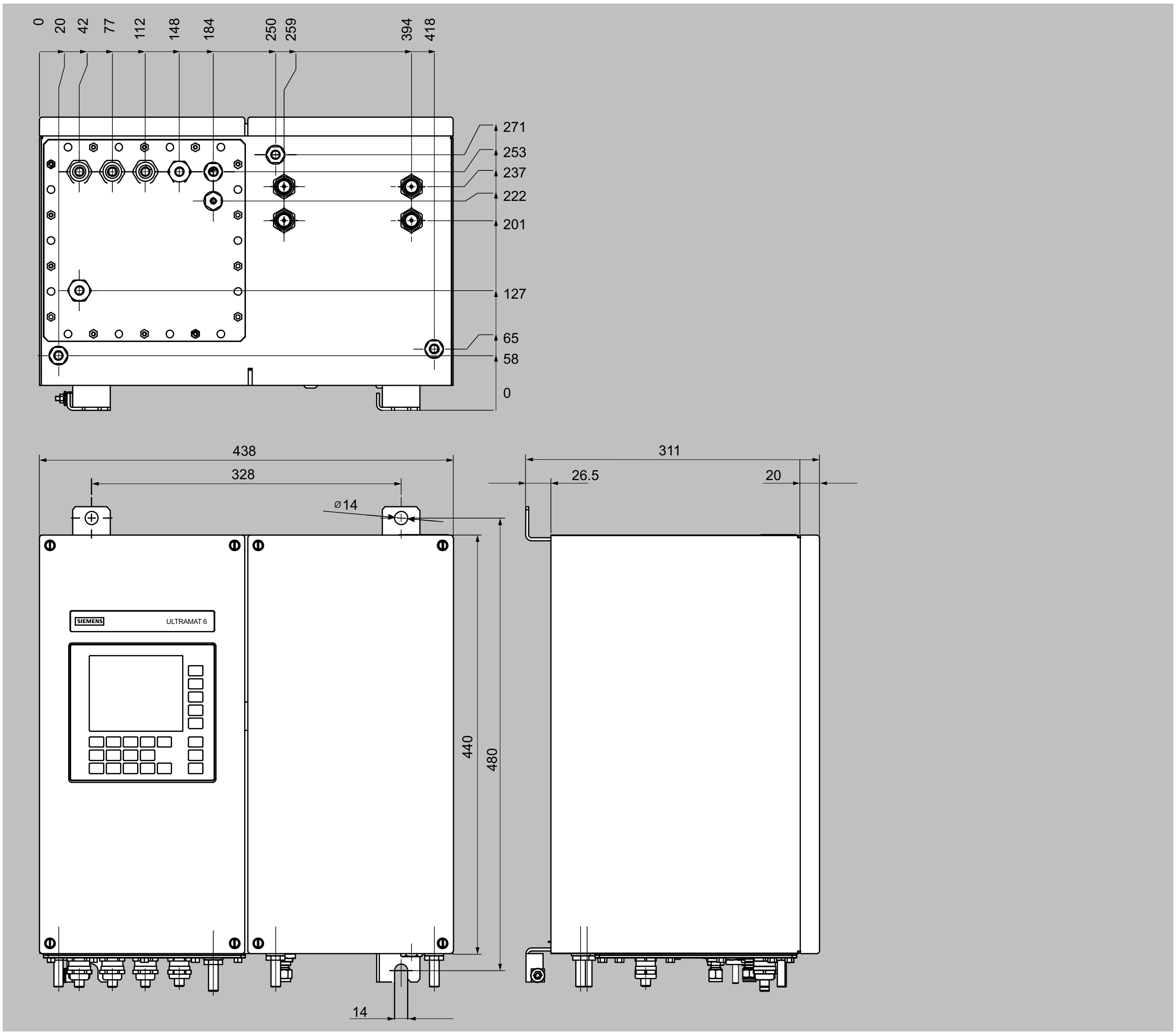
Technical specifications (Continued)

ULTRAMAT 6, field device	
Purging gas pressure	
• Permanent	< 165 hPa above ambient pressure
• For short periods	250 hPa above ambient pressure
Sample gas flow	18 ... 90 l/h (0.3 ... 1.5 l/min)
Sample gas temperature	Min. 0 ... max. 50 °C, but above the dew point, for heated version min. 0 ... max. 80 °C
Sample gas humidity	< 90% RH (RH: relative humidity) or dependent on measuring task
Time response	
Warm-up period	At room temperature < 30 min (the technical specification will be met after 2 hours)
Delayed display (T_{90} time)	Dependent on length of analyzer chamber, sample gas line and configurable damping
Damping (electrical time constant)	0 ... 100 s, configurable
Dead time (purging time of the gas path in the device at 1 l/min)	Approx. 0.5 ... 5 s, depending on the version
Time for device-internal signal processing	< 1 s
Pressure correction range	
Pressure sensor	
• Internal	700 ... 1 200 hPa absolute
• External	700 ... 1 500 hPa absolute
Measuring response	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation	< ± 1% of the smallest possible measuring range according to nameplate
Zero point drift	< ± 1% of the current measuring range/week
Measured value drift	< ± 1% of the current measuring range/week
Repeatability	≤ 1% of the current measuring range
Detection limit	1% of the smallest possible measuring range
Linearity error	± 0.5% of the measuring range end value
Influencing variables	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Ambient temperature	< 1% of current measuring range/10 K (with constant receiver cell temperature)
Sample gas pressure	With enabled pressure compensation: < 0.15% of the setpoint/1% change in atmospheric pressure
Sample gas flow	Negligible
Auxiliary power	< 0.1% of the current measuring range with nominal voltage ± 10%

Technical specifications (Continued)

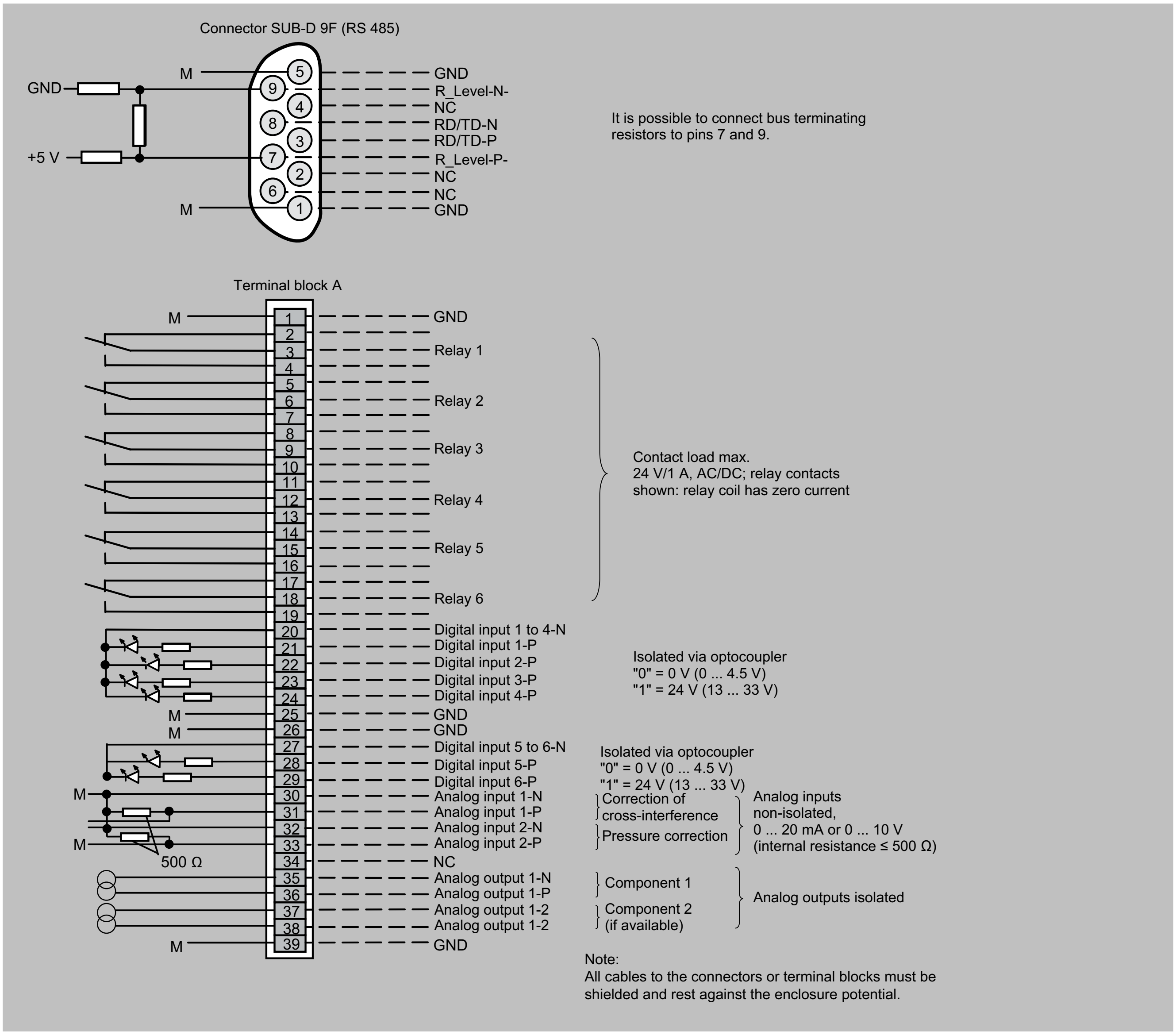
ULTRAMAT 6, field device	
Environmental conditions	Application-specific measuring influences possible if ambient air contains measured component or cross interference-sensitive gases
Electrical inputs and outputs	
Analog output	0/2/4 ... 20 mA, floating; load 750 Ω
Relay outputs	6, with changeover contacts,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

Dimensional drawings



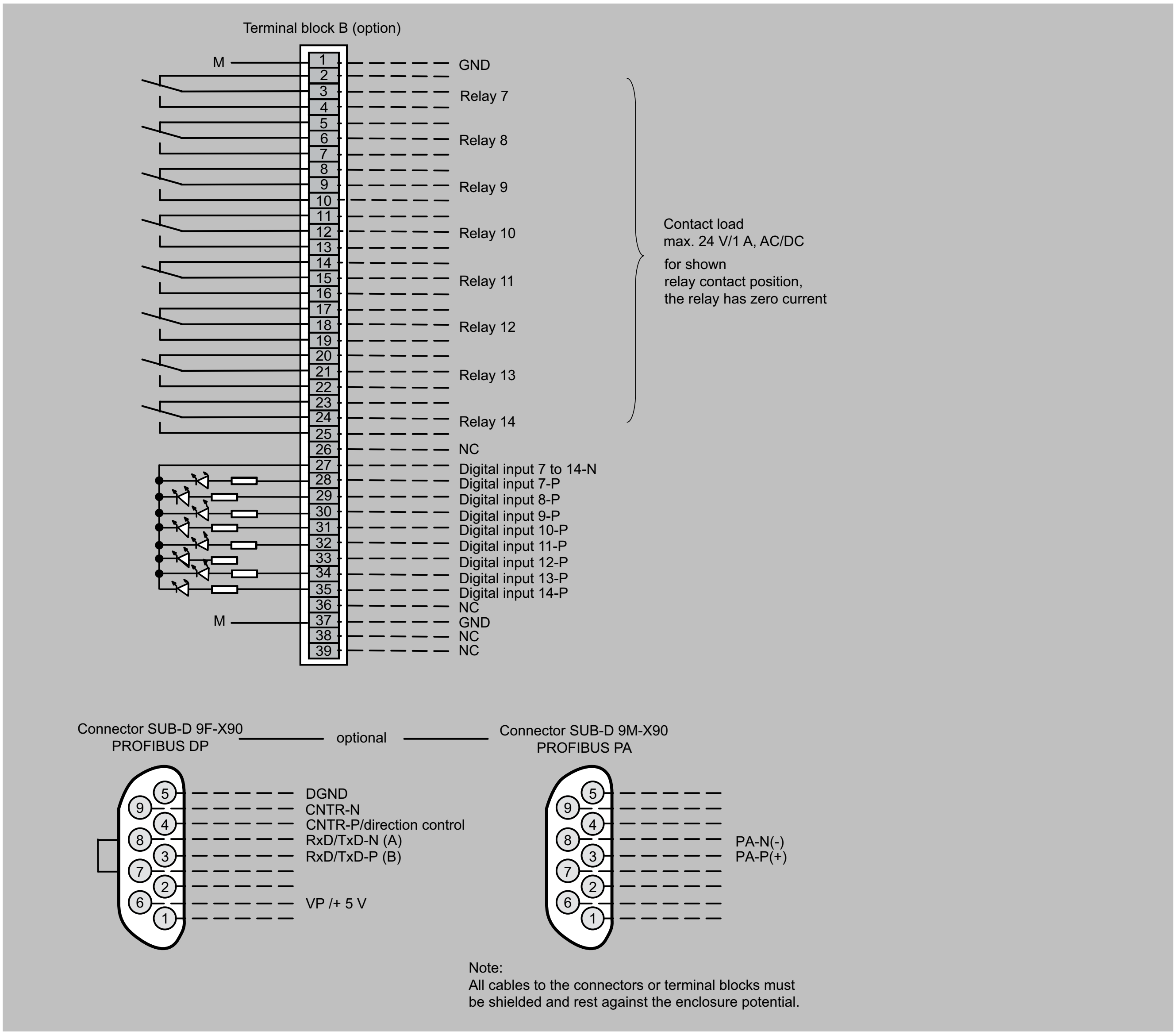
ULTRAMAT 6, field unit, dimensions in mm

Circuit diagrams



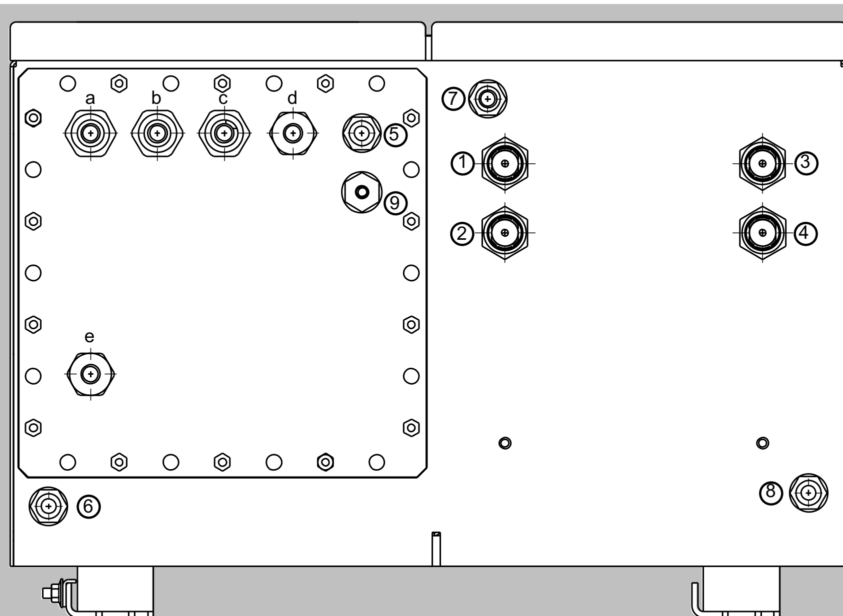
ULTRAMAT 6, field device, pin and terminal assignment

Circuit diagrams (Continued)



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

Circuit diagrams (Continued)



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

More information

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

Only with additional suffix Z (Y17, Y18)

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

Ordering example
ULTRAMAT 6, QAL1 (1-component unit)
Component: CO
Measuring range: 0 to 50 / 1 000 mg/m^3
With hoses, non-flow-type reference cell

More information (Continued)

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

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

Component	CO (QAL1)		NO (QAL1)	
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/m³	1 000 mg/m³	200 mg/m³	2 000 mg/m³
AB	300 mg/m³	3 000 mg/m³	300 mg/m³	3 000 mg/m³
AC	1 000 mg/m³	10 000 mg/m³	1 000 mg/m³	10 000 mg/m³

Ordering example

ULTRAMAT 6, QAL1 (2 components in series)
Components: CO/NO
Measuring range CO: 0 to 75 / 1 000 mg/m³, NO: 0 to 200 / 2 000 mg/m³
With hoses, non-flow-type reference cell
Without automatic adjustment (AUTOCAL)
230 V AC; Without heating, German
7MB2112-0AA00-1AA0-Z +Y17
Note: for 3 components take both tables into consideration.

Ordering information measured component 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.

Selection and ordering data

Description	7MB2121	7MB2123	7MB2124	7MB2111	7MB2112	7MB2111/-2 Ex	2 years (unit)	5 years (unit)	Article No.
Analyzer unit									
O-ring for cover (window)	x	x	x	x	x	x	2	4	C79121-Z100-A24
Cover (cell length 20 ... 180 mm)	x	x	x	x	x	x	2	2	C79451-A3462-B151
Cover (cell length 0.2 ... 6 mm)	x	x	x	x	x	x	2	2	C79451-A3462-B152
O-rings, set	x	x	x	x	x	x		1	C79451-A3462-D50-1
Sample gas path									
O-ring (hose gland)				x	x	x	2	4	C71121-Z100-A159
Pressure switch	x	x	x				1	2	C79302-Z1210-A2
Flow indicator	x	x	x				1	2	C79402-Z560-T1
Hose gland	x	x	x	x	x	x		1	C79451-A3478-C9
Heating cartridge (heated device)				x	x	x		1	W75083-A1004-F12-0
Electronics									
Temperature fuse (heated device)				x	x			1	W75054-T1001-A15-0
Fuse (device fuse)						x	1	2	A5E00061505
Temperature controller - electronics, 230 V AC				x	x	x		1	A5E00118527
Temperature controller - electronics, 115 V AC				x	x	x		1	A5E00118530
Fan, 24 V DC (heated device)				x	x	x		1	A5E00302916
Front plate with keyboard	x	x	x				1	1	C79165-A3042-B504
Temperature sensor				x	x	x		1	C79165-A3044-B176
Adapter plate, LCD/keyboard	x	x	x	x	x		1	1	C79451-A3474-B605
Motherboard, with firmware: see spare parts list	x	x	x	x	x	x		1	
LC display	x	x	x	x	x		1	1	A5E31474846
Plug-in filter	x	x	x	x	x			1	W75041-E5602-K2
Fusible element, T 0.63 A/250 V	x		x	x	x	x	2	3	W79054-L1010-T63-0
Fusible element, T 1 A/250 V	x	x	x	x	x	x	2	3	W79054-L1011-T10-0
Fusible element, T 1.6 A/250 V		x	x				2	3	W79054-L1011-T16-0
Fusible element, T 2.5 A/250 V				x	x	x	2	3	W79054-L1011-T25-0

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

More information

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

Overview

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

Benefits

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

ULTRAMAT channel

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

OXYMAT channel

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

Application

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

Special versions

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

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

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

All larger measuring ranges are also approved.
In addition, performance-tested versions of the ULTRAMAT/OXYMAT 6 meet the requirements set forth in EN 14956 and QAL1 according to EN 14181. Conformity of the analyzers with both standards is TÜV-certified.
Determination of the analyzer drift according to EN 14181 (QAL3) can be carried out manually or also with a PC using the SIPROM GA maintenance and servicing software. In addition, selected manufacturers of emission evaluation computers offer the possibility for downloading the drift data via the analyzer's serial interface and to automatically record and process it in the evaluation computer.

Flow-type reference cell

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

Design

19" rack unit

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

Display and operator panel

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

Inputs and outputs (per channel)

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

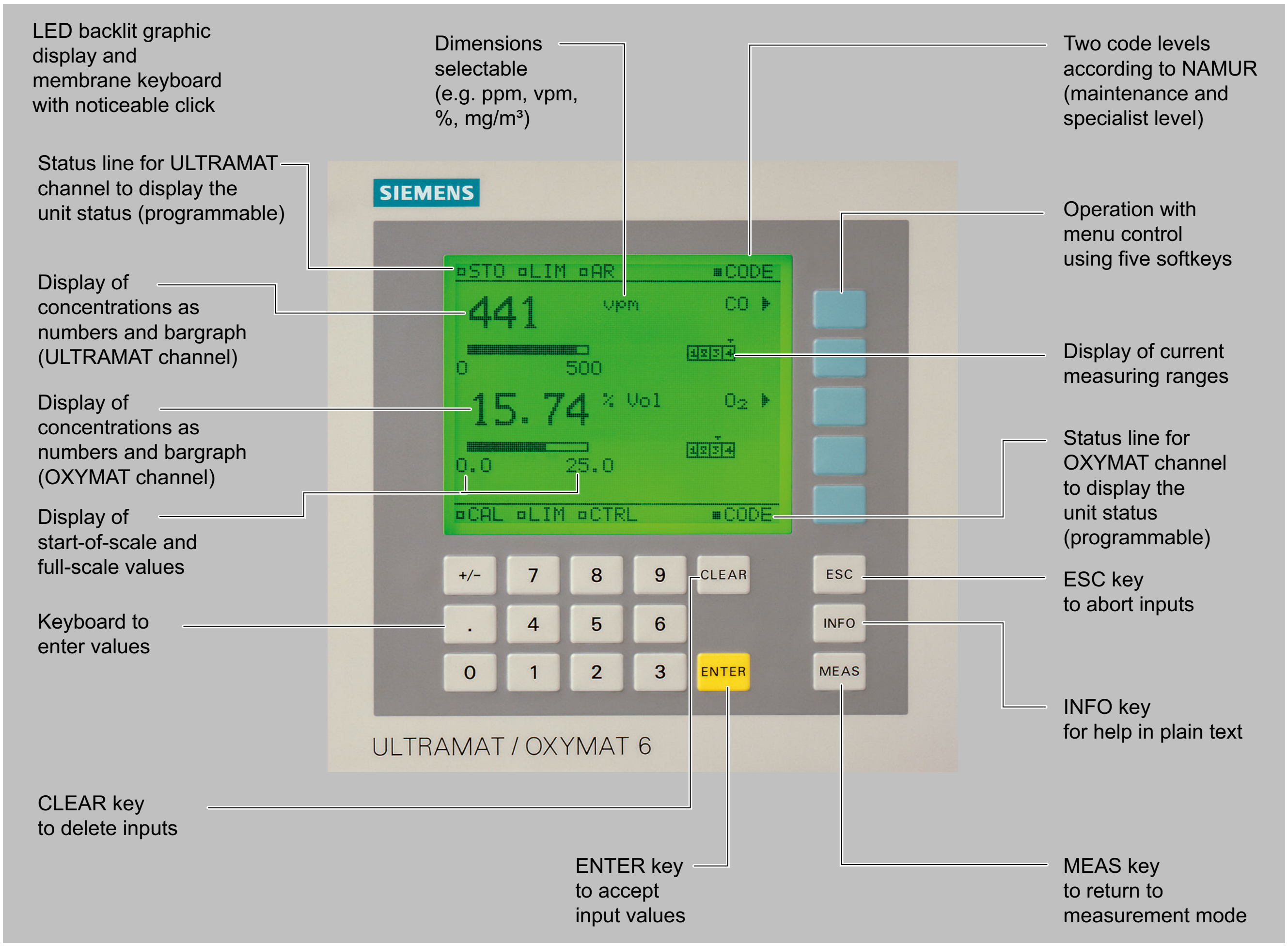
Communication

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

<u>Options</u>

- 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

Design (Continued)



ULTRAMAT/OXYMAT 6, membrane keyboard and graphic display

Designs – Parts wetted by sample gas, standard

Gas path ULTRAMAT channel		19" rack unit
With hoses	Bushing	Stainless steel, mat. no. 1.4571
	Hose	FKM (e.g. Viton)
	Sample chamber:	
	• Body	Aluminum
	• Lining	Aluminum
	• 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)

Design (Continued)

Gas path ULTRAMAT channel		19" rack unit
With pipes	• Window	CaF_2, adhesive: E353 O-Ring: FKM (e.g. Viton) or FFKM (Kalrez)
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	Measuring tube	Duran glass
	Variable area	Duran glass
	Suspension boundary	PTFE (Teflon)
	Angle units	FKM (e.g. Viton)
Pressure switch	Diaphragm	FKM (e.g. Viton)
	Enclosure	PA 6.3T

Options

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

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

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

Designs – Parts wetted by sample gas, standard

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

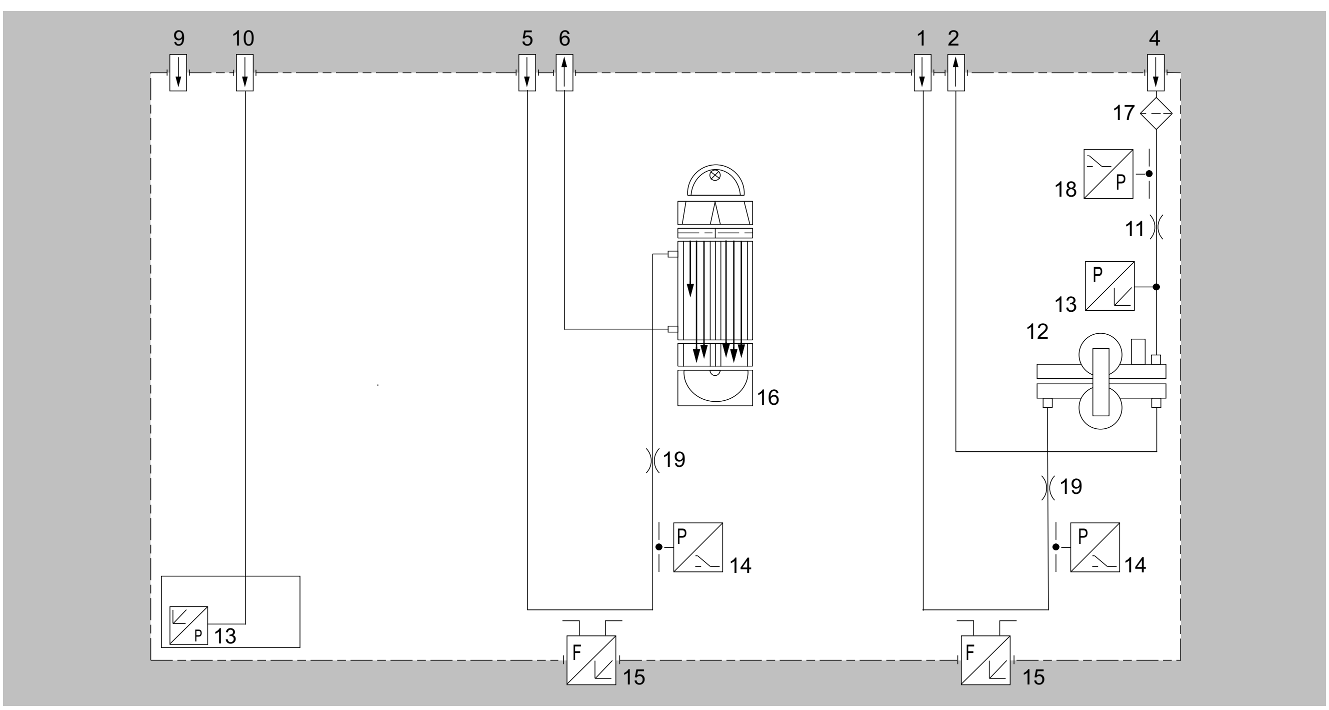
Design (Continued)

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

Options

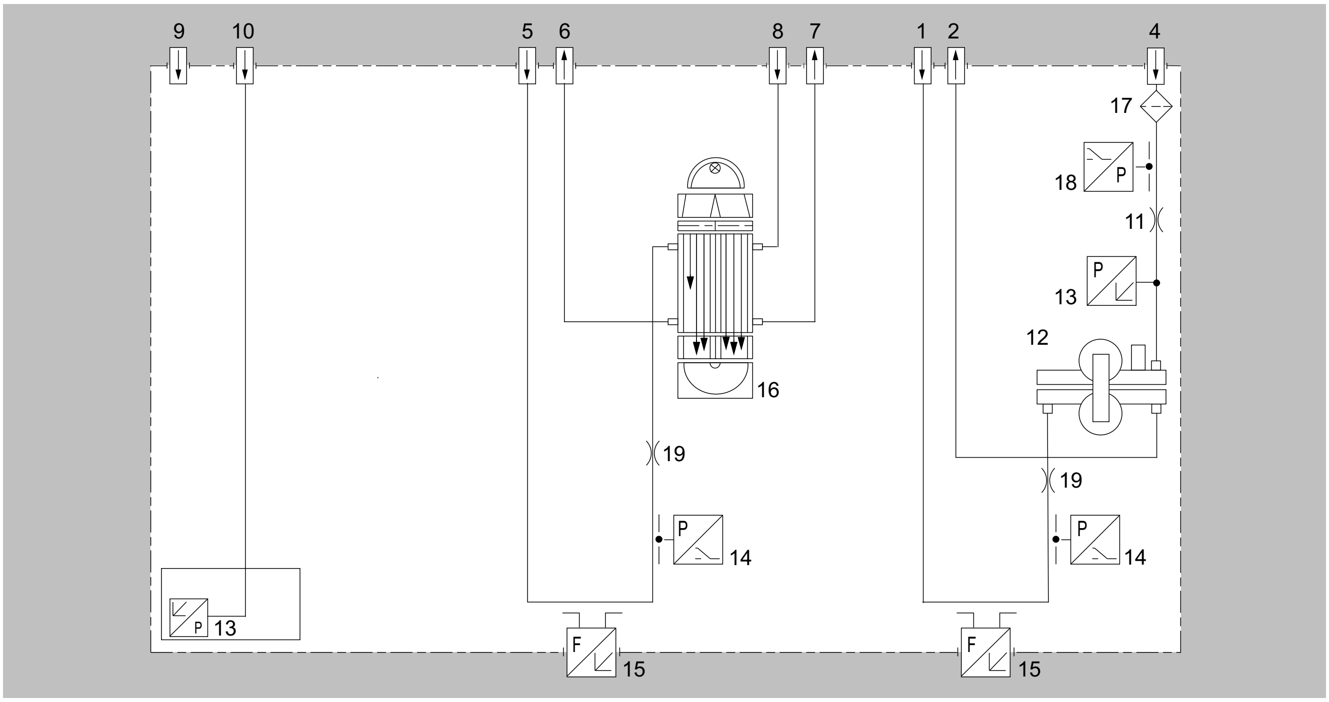
Gas path ULTRAMAT channel and OXYMAT channel		19" rack unit
Flow indicator	Measuring tube	Duran glass
	Variable area	Duran glass
	Suspension boundary	PTFE (Teflon)
	Angle units	FKM (e.g. Viton)
Pressure switch	Diaphragm	FKM (e.g. Viton)
	Enclosure	PA 6.3T

Gas path



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

Design (Continued)



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

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

Mode of operation

ULTRAMAT channel

The ULTRAMAT channel operates according to the infrared two-beam modulated light principle with double-layer detector and optical coupler.
The measuring principle is based on the molecule-specific absorption of bands of infrared radiation. The absorbed wavelengths are characteristic to the individual gases, but may partially overlap. This results in cross-sensitivities which are reduced to a minimum by the following measures:

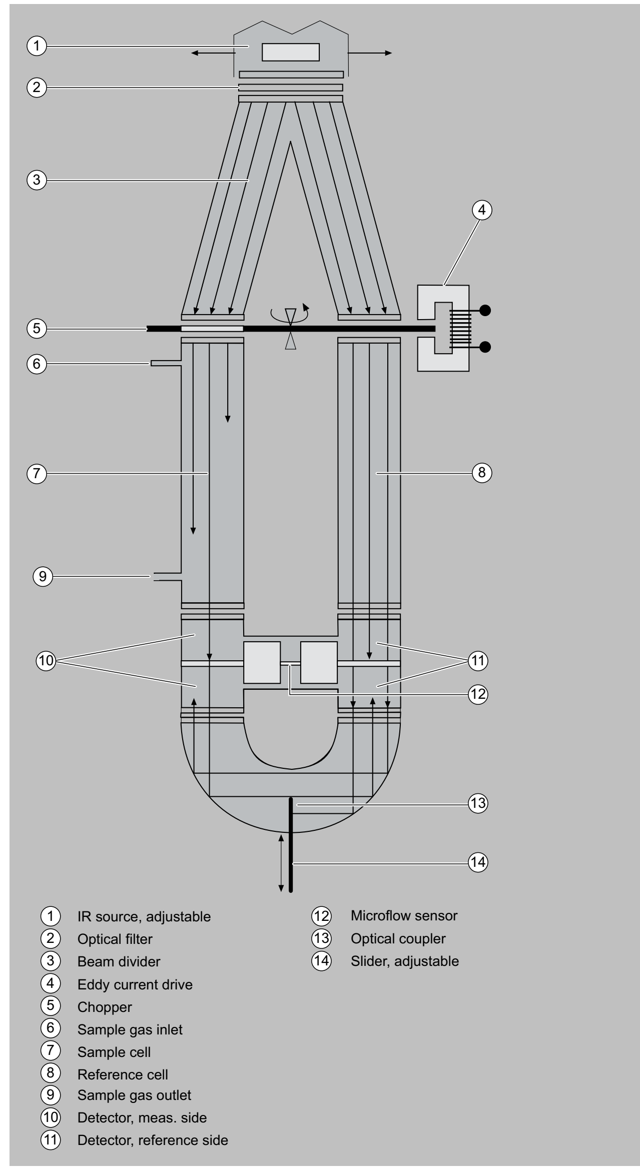
- Gas-filled filter cell (beam divider)
- Double-layer detector with optical coupler
- Optical filters if necessary

The figure shows the measuring principle. An IR source (1) which is heated to approx. 700 °C and which can be shifted to balance the system is divided by the beam divider (3) into two equal beams (sample and reference beams). The beam divider also acts as a filter cell.
The reference beam passes through a reference cell (8) filled with N_2 (a non-infrared-active gas) and reaches the right-hand side of the detector chamber (11) practically unattenuated. The sample beam passes through the sample chamber (7) through which the sample gas flows and reaches the left-hand side of the detector (10) attenuated to a lesser or greater extent depending on the concentration of the sample gas. The detector chamber is filled with a defined concentration of the gas component to be measured.
The detector is designed as a double-layer detector. The center of the absorption band is preferentially absorbed in the upper detector layer, the edges of the band are absorbed to approximately the same extent in the upper and lower layers. The upper and lower detector layers are connected together via the microflow sensor (12). This coupling means that the spectral sensitivity has a very narrow band.
The optical coupler (13) lengthens the lower detector chamber layer optically. The infrared absorption in the second detector chamber layer is varied by changing the slider position (14). It is thus possible to individually minimize the influence of interfering components.
A chopper (5) rotates between the beam divider and the sample chamber and interrupts the two beams alternately and periodically. If absorption takes place in the sample chamber, a pulsating flow is generated between the two detector levels which is converted by the microflow sensor (12) into an electric signal.
The microflow sensor consists of two nickel-plated grids heated to approximately 120 °C, which, along with two supplementary resistors, form a Wheatstone bridge. The pulsating flow together with the dense arrangement of the Ni grids causes a change in resistance. This leads to an offset in the bridge, which is dependent on the concentration of the sample gas.

Note

The sample gases must be fed into the analyzers free of dust. Condensation in the sample chambers must be prevented. Therefore, the use of gas modified for the measuring task is necessary in most application cases.
As far as possible, the ambient air of the analyzer unit should not have a large concentration of the gas components to be measured.
Flow-type reference cells with reduced flow must not be operated with flammable or toxic gases.
Flow-type reference cells with reduced flow and an 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.

Mode of operation (Continued)



ULTRAMAT channel, principle of operation

OXYMAT channel

In contrast to almost all other gases, oxygen is paramagnetic. This property is utilized as the measuring principle by the OXYMAT channel.
Oxygen molecules in an inhomogeneous magnetic field are drawn in the direction of increased field strength due to their paramagnetism. When two gases with different oxygen contents meet in a magnetic field, a pressure difference is produced between them.
One gas (1) is a reference gas (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 resist-

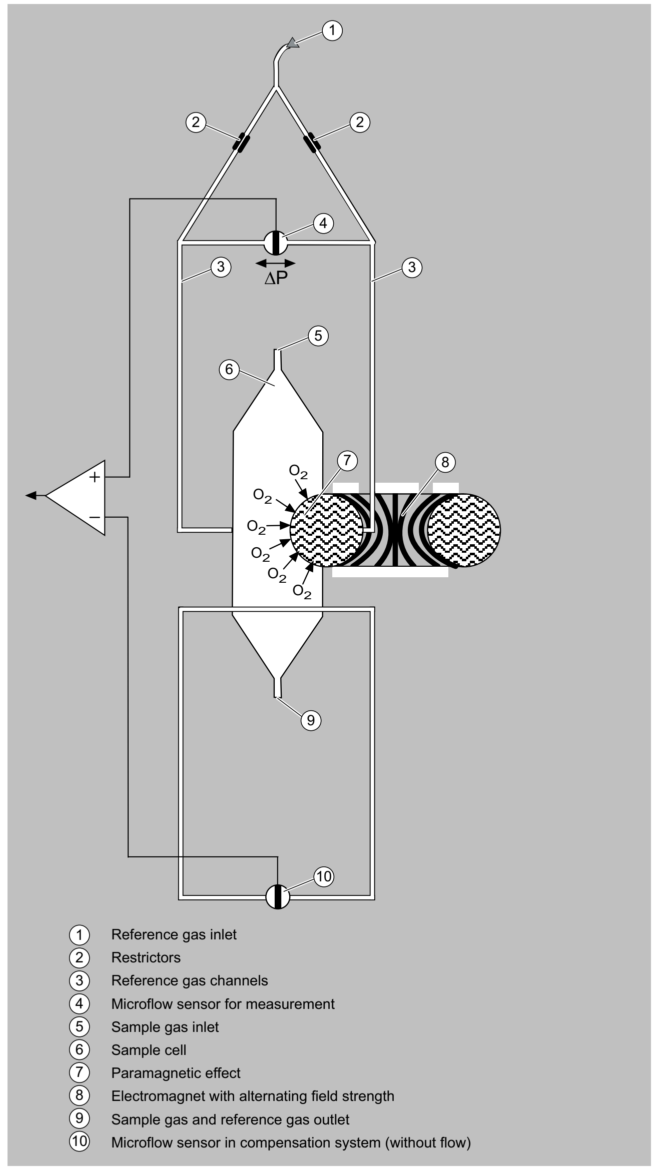
Mode of operation (Continued)

ors, form a Wheatstone bridge. The pulsating flow results in a change in the resistance of the Ni grids. This leads to an offset in the bridge which is dependent on the oxygen concentration of the sample gas.
Because the microflow sensor is located in the reference gas stream, the measurement is not influenced by the thermal conductivity, the specific heat or the internal friction of the sample gas. This also provides a high degree of corrosion resistance because the microflow sensor is not exposed to the direct influence of the sample gas.
By using a magnetic field with alternating strength (8), the effect of the background flow in the microflow sensor is not detected, and the measurement is thus independent of the sample chamber position as well as the gas analyzer's operating position.
The sample chamber is directly in the sample path and has a small volume, and the microflow sensor is a low-lag sensor. This results in a very short response time.
Vibrations frequently occur at the place of installation and may falsify the measured signal (noise). A further microflow sensor (10) through which no gas passes acts as a vibration sensor. Its signal is applied to the measured signal as compensation.
If the density of the sample gas deviates by more than 50% from that of the reference gas, the compensation microflow sensor (10) is flushed with reference gas just like the measuring sensor (4) (option).

Note

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

Mode of operation (Continued)



OXYMAT channel, principle of operation

Function

Main features

- Dimension of measured value freely selectable (e.g. vpm, mg/m^3)
- Four freely parameterizable measuring ranges per component
- Measuring ranges with suppressed zero point possible
- Measuring range identification
- Electrically isolated measured value output 0/2/4 up to 20 mA per component
- Automatic or manual measuring range switchover selectable; remote switching is also possible
- Storage of measured values possible during calibration
- Wide range of selectable time constants (static/dynamic noise damping); i.e. the response time of the device or component can be adapted to the respective measuring task
- Short response time
- Low long-term drift
- Measuring point switchover for up to 6 measuring points (parameterizable)
- Measuring point identification
- Monitoring of sample gas flow (option)
- Two input levels with separate authorization codes to prevent unintentional and unauthorized operator intervention
- Automatic measuring range calibration parameterizable
- Simple handling using a numerical membrane keyboard and operator prompting
- Operation based on NAMUR recommendation
- Custom-made device designs, such as:
  - Customer acceptance
  - TAG plates
  - Drift recording

ULTRAMAT channel

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

OXYMAT channel

- Monitoring of sample gas and/or reference gas (option)
- Different smallest measuring spans (0.5%, 2.0% or 5.0% 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 sample and reference gases with significantly different densities
- Internal pressure sensor for correction of pressure variations in sample gas (range 500 to 2 000 hPa absolute)
- External pressure sensor - only with piping as the gas path - can be connected for correction of variations in the sample gas pressure up to 3 000 hPa absolute (option)
- Monitoring of reference gas with reference gas connection 3 000 to 5 000 hPa (option), absolute
- Sample chamber for use in presence of highly corrosive sample gases

Reference gases for OXYMAT channel

Measuring range	Recommended reference gas	Reference gas connection pressure	Comments
0 to ... vol.% O_2	N_2	2 000 ... 4 000 hPa above sample gas pressure (max. 5 000 hPa absolute)	The reference gas flow is set automatically to 5 ... 10 ml/min (up to 20 ml/min with flow-type compensation branch)
... to 100 vol.% O_2 [1]	O_2	2 000 ... 4 000 hPa above sample gas pressure (max. 5 000 hPa absolute)	
Approx. 21 vol.% O_2 [2]	Air	100 hPa with respect to sample gas pressure, which may vary by max. 50 hPa around the air pressure	

[1] Suppressed zero point with measuring range end value 100 vol.% O_2.
[2] Suppressed zero point with 21 vol.% O_2 within the measuring span.

Function (Continued)

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

Accompanying gas (concentration 100 vol.%)	Zero point deviation in vol.% O_2 absolute	Accompanying gas (concentration 100 vol.%)	Zero point deviation in vol.% O_2 absolute
Organic gases		**Inert gases**	
Ethane C_2H_6	-0.49	Helium He	+0.33
Ethene (ethylene) C_2H_4	-0.22	Neon Ne	+0.17
Ethine (acetylene) C_2H_2	-0.29	Argon Ar	-0.25
1,2-butadiene C_4H_6	-0.65	Krypton Kr	-0.55
1,3-butadiene C_4H_6	-0.49	Xenon Xe	-1.05
N-butane C_4H_{10}	-1.26	**Inorganic gases**	
Isobutane C_4H_{10}	-1.30	Ammonia NH_3	-0.20
1-butene C_4H_8	-0.96	Hydrogen bromide HBr	-0.76
Isobutene C_4H_8	-1.06	Chlorine Cl_2	-0.94
Dichlorodifluoromethane (R12) CCl_2F_2	-1.32	Hydrogen chloride HCl	-0.35
Acetic acid CH_3COOH	-0.64	Dinitrogen monoxide N_2O	-0.23
N-heptane C_7H_{16}	-2.40	Hydrogen fluoride HF	+0.10
N-hexane C_6H_{14}	-2.02	Hydrogen iodide HI	-1.19
Cyclo-hexane C_6H_{12}	-1.84	Carbon dioxide CO_2	-0.30
Methane CH_4	-0.18	Carbon monoxide CO	+0.07
Methanol CH_3OH	-0.31	Nitrogen oxide NO	+42.94
N-octane C_8H_{18}	-2.78	Nitrogen N_2	0.00
N-pentane C_5H_{12}	-1.68	Nitrogen dioxide NO_2	+20.00
Isopentane C_5H_{12}	-1.49	Sulfur dioxide SO_2	-0.20
Propane C_3H_8	-0.87	Sulfur hexafluoride SF_6	-1.05
Propylene C_3H_6	-0.64	Hydrogen sulfide H_2S	-0.44
Trichlorofluoromethane (R11) CCl_3F	-1.63	Water H_2O	-0.03
Vinyl chloride C_2H_3Cl	-0.77	Hydrogen H_2	+0.26
Vinyl fluoride C_2H_3F	-0.55		
1,1 vinylidene chloride $C_2H_2Cl_2$	-1.22		

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

<u>Conversion to other temperatures:</u>

The zero point deviations listed in the table must be multiplied by an adjustment factor (k):
- with diamagnetic gases: k = 333 K / (ϑ [°C] + 273 K)
- with paramagnetic gases: k = [333 K / (ϑ [°C] + 273 K)]^2

All diamagnetic gases have a negative zero point deviation.

Selection and ordering data

ULTRAMAT/OXYMAT 6 gas analyzer 19" rack unit for installation in cabinets Combined measurement of IR-absorbing gas and O_2			Article No. 7MB2023-	●	●	●	●	●	-	●	●	●	●
Click on the Article No. for online configuration in the PIA Life Cycle Portal. ***Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".***													
Gas connections for sample gas and reference gas													
Pipe with 6 mm outer diameter				0									
Pipe with 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								
2% reference gas pressure 3 000 hPa					C								
2% reference gas pressure 100 hPa (external pump)					D								
5% reference gas pressure 3 000 hPa					E								
5% reference gas pressure 100 hPa (external pump)					F								
Sample chamber (OXYMAT channel)													
Non-flow-type compensation branch													
• Made of stainless steel, mat. no. 1.4571						A							
• Made of tantalum						B							
Flow-type compensation branch													
• Made of stainless steel, mat. no. 1.4571						C							
• Made of tantalum						D							
Internal gas paths (both channels)	**Sample chamber[1)] (lining) (ULTRAMAT channel)**	**Reference chamber (flow-type) (ULTRAMAT channel)**											
Hose made of FKM (Viton)	Aluminum	Non-flow-type					0						
Hose made of FKM (Viton)	Aluminum	Flow-type					1						
Hose made of FKM (Viton) with sample gas monitoring (both channels)	Aluminum	Non-flow-type					2						
Hose made of FKM (Viton) with sample gas monitoring (both channels)	Aluminum	Flow-type					3						
Pipe made of titanium	Tantalum	Non-flow-type					4						
Pipe made of titanium	Tantalum	Flow-type					5						
Stainless steel pipe (mat. no. 1.4571)	Aluminum	Non-flow-type					6						
Stainless steel pipe (mat. no. 1.4571)	Tantalum	Non-flow-type					8						
Add-on electronics													
Without								0					
AUTOCAL function with 8 additional digital inputs and outputs for OXYMAT channel								1					
AUTOCAL function with 8 additional digital inputs and outputs for ULTRAMAT channel								2					
AUTOCAL function with 8 additional digital inputs/outputs each for ULTRAMAT channel and OXYMAT channel								3					
AUTOCAL function with serial interface for the automotive industry (AK)								5					
AUTOCAL function with 8 additional digital inputs/outputs and PROFIBUS PA interface for ULTRAMAT channel and OXYMAT channel								6					
AUTOCAL function with 8 additional digital inputs/outputs and PROFIBUS DP interface for ULTRAMAT channel and OXYMAT channel								7					
Auxiliary power													
100 ... 120 V AC, 48 ... 63 Hz										0			
200 ... 240 V AC, 48 ... 63 Hz										1			
Footnotes, see next page													
ULTRAMAT channel measured component		**Possible with measuring range identification**											
CO		11[2)], 12 ... 30									A		
CO highly selective (with optical filter)[3)]		12[2)], 13 ... 30									B		
CO_2		10[2)], 11 ... 30									C		
CH_4		13[2)], 14 ... 30									D		
C_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		

Selection and ordering data (Continued)

ULTRAMAT/OXYMAT 6 gas analyzer 19" rack unit for installation in cabinets Combined measurement of IR-absorbing gas and O_2			**Article No.** 7MB2023-	●	●	●	●	●	-	●	●	●	●
C_6H_{14}		14[2], 15 ... 30									M		
SO_2[5]		12[2], 14 ... 30									N		
NO[5]		14[2], 15 ... 30									P		
NH_3 (dry)		14[2], 15 ... 30									Q		
H_2O		17[2], 18 ... 22									R		
N_2O		13[2], 14 ... 30									S		
CO[4]											X		
Smallest measuring range	**Largest measuring range**	**Measuring range identification**											
0 ... 5 vpm	0 ... 100 vpm	10										A	
0 ... 10 vpm	0 ... 200 vpm	11										B	
0 ... 20 vpm	0 ... 400 vpm	12										C	
0 ... 50 vpm	0 ... 1 000 vpm	13										D	
0 ... 100 vpm	0 ... 1 000 vpm	14										E	
0 ... 300 vpm	0 ... 3 000 vpm	15										F	
0 ... 500 vpm	0 ... 5 000 vpm	16										G	
0 ... 1 000 vpm	0 ... 10 000 vpm	17										H	
0 ... 3 000 vpm	0 ... 10 000 vpm	18										J	
0 ... 3 000 vpm	0 ... 30 000 vpm	19										K	
0 ... 5 000 vpm	0 ... 15 000 vpm	20										L	
0 ... 5 000 vpm	0 ... 50 000 vpm	21										M	
0 ... 1%	0 ... 3%	22										N	
0 ... 1%	0 ... 10%	23										P	
0 ... 3%	0 ... 10%	24										Q	
0 ... 3%	0 ... 30%	25										R	
0 ... 5%	0 ... 15%	26										S	
0 ... 5%	0 ... 50%	27										T	
0 ... 10%	0 ... 30%	28										U	
0 ... 10%	0 ... 100%	29										V	
0 ... 30%	0 ... 100%	30										W	
Language of the operating software													
German													0
English													1
French													2
Spanish													3
Italian													4

1) Only for cell lengths 20 to 180 mm
2) Can be ordered as special application (no. 3100 with order code Y12).
3) QAL1: See table "Performance tested according to EN 15267 (single component)" under "More information".
4) QAL1: See table "Based on QAL1 according to SIRA/MCERTS (single component)" under "More information".
5) QAL1: See tables "Based on QAL1 according to SIRA/MCERTS (single component)" and "Performance-tested according to EN 15267 (single component)" under "More information".

Options	Order code
Add "-**Z**" to article number and then add order code	
Settings	
Flow-type reference cell with reduced flow, 6 mm (ULTRAMAT channel)[1]	**A20**
Flow-type reference cell with reduced flow, 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)	

Selection and ordering data (Continued)

Options	Order code
• Titanium connection pipe, 6 mm, complete with screwed gland, for sample gas side	**A22**
• Titanium connection pipe, 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**
Set of Torx screwdrivers	**A32**
Kalrez gaskets in sample gas path (O_2 side)	**B01**
Tag plates (customized inscription)	**B03**
Kalrez gaskets in sample gas path (IR side)	**B04**
SIL Declaration of Conformity (SIL 2) Functional Safety according to IEC 61508 and IEC 61511	**C20**
FM/CSA certificate – Class I Div 2	**E20**
Clean for O_2 service (specially cleaned gas path) (ULTRAMAT channel and OXYMAT channel)	**Y02**
Measuring range indication in plain text[2] if different from default setting	**Y11**
Special setting (only in conjunction with an application no., e.g. extended measuring range, ULTRAMAT channel only)	**Y12**
Extended special setting (only in conjunction with an application no., e.g. determination of cross-interference, only ULTRAMAT channel)	**Y13**
QAL1 according to SIRA/MCERTS (ULTRAMAT channel only)	***Y17 (cannot be combined with E20)***
Performance-tested according to EN 15267 (channel 1)	**Y27**
Performance-tested according to EN 15267 (channel 2)	**Y28**

[1] Cannot be combined with non-flow-type reference cell.
[2] Standard setting, in % or ppm (vpm): Smallest measuring range, 25% of largest measuring range, 50% of largest measuring range, largest measuring range

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

Selection and ordering data (Continued)

ULTRAMAT/OXYMAT 6 gas analyzer 19" rack unit for installation in cabinets Combined measurement of IR-absorbing gas and O_2			**Article No.** **7MB2024-**	●	●	●	●	●	-	●	●	●	●
Click on the Article No. for online configuration in the PIA Life Cycle Portal.													
Gas connections for sample gas and reference gas													
Pipe with 6 mm outer diameter				0									
Pipe with 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								
2% reference gas pressure 3 000 hPa					C								
2% reference gas pressure 100 hPa (external pump)					D								
5% reference gas pressure 3 000 hPa					E								
5% reference gas pressure 100 hPa (external pump)					F								
Sample chamber (OXYMAT channel)													
Non-flow-type compensation branch													
• Made of stainless steel, mat. no. 1.4571						A							
• Made of tantalum						B							
• Made of Hastelloy						E							
Flow-type compensation branch													
• Made of stainless steel, mat. no. 1.4571						C							
• Made of tantalum						D							
• Made of Hastelloy						F							
Internal gas paths (both channels)	**Sample chamber[1] (lining) (ULTRAMAT channel)**	**Reference chamber (flow-type) (ULTRAMAT channel)**											
Hose made of FKM (Viton)	Aluminum	Non-flow-type					0						
Hose made of FKM (Viton)	Aluminum	Flow-type					1						
Hose made of FKM (Viton) with sample gas monitoring (both channels)	Aluminum	Non-flow-type					2						
Hose made of FKM (Viton) with sample gas monitoring (both channels)	Aluminum	Flow-type					3						
Pipe made of titanium	Tantalum	Non-flow-type					4						
Pipe made of titanium	Tantalum	Flow-type					5						
Stainless steel pipe (mat. no. 1.4571)	Aluminum	Non-flow-type					6						
Stainless steel pipe (mat. no. 1.4571)	Tantalum	Non-flow-type					8						
Add-on electronics													
Without								0					
AUTOCAL function													
AUTOCAL function with 8 additional digital inputs/outputs each for ULTRAMAT channel and OXYMAT channel								1					
AUTOCAL function with serial interface for the automotive industry (AK)								5					
AUTOCAL function with 8 additional digital inputs/outputs and PROFIBUS PA interface for ULTRAMAT channel and OXYMAT channel								6					
AUTOCAL function with 8 additional digital inputs/outputs and PROFIBUS DP interface for ULTRAMAT channel and OXYMAT channel								7					
Auxiliary power													
100 ... 120 V AC, 48 ... 63 Hz										0			
200 ... 240 V AC, 48 ... 63 Hz										1			
ULTRAMAT channel measured component	**Smallest measuring range**	**Largest measuring range**											
CO and NO[2]	0 ... 1 000 vpm	0 ... 10 000 vpm									A	C	
CO and NO[2]	0 ... 100 vpm (CO) 0 ... 300 vpm (NO)	0 ... 1 000 vpm									A	H	
CO and NO[2]	0 ... 300 vpm (CO) 0 ... 500 vpm (NO)	0 ... 3 000 vpm									A	J	
CO and NO[2]	0 ... 1 000 vpm	0 ... 10 000 vpm									A	C	
CO_2 and CO	0 ... 100 vpm	0 ... 1 000 vpm									B	A	
CO_2 and CO	0 ... 300 vpm	0 ... 3 000 vpm									B	B	
CO_2 and CO	0 ... 1 000 vpm	0 ... 10 000 vpm									B	C	
CO_2 and CO	0 ... 3 000 vpm	0 ... 30 000 vpm									B	D	
CO_2 and CO	0 ... 1%	0 ... 10%									B	E	
CO_2 and CO	0 ... 3%	0 ... 30%									B	F	
CO_2 and CO	0 ... 10%	0 ... 100%									B	G	

Selection and ordering data (Continued)

ULTRAMAT/OXYMAT 6 gas analyzer 19" rack unit for installation in cabinets Combined measurement of IR-absorbing gas and O_2			**Article No.** 7MB2024-	●	●	●	●	●	-	●	●	●	●
CO_2 and CO	0 ... 100 vpm (CO_2) 0 ... 300 vpm (CO)	0 ... 1 000 vpm									B	H	
CO_2 and CO	0 ... 300 vpm (CO_2) 0 ... 500 vpm (CO)	0 ... 3 000 vpm									B	J	
CO_2 and CH_4	0 ... 10%	0 ... 100%									C	G	
CO_2 and CH_4	0 ... 300 vpm (CO_2) 0 ... 500 vpm (CH_4)	0 ... 3 000 vpm									C	J	
CO_2 and NO	0 ... 300 vpm (CO_2) 0 ... 500 vpm (NO)	0 ... 3 000 vpm									D	J	
Language of the operating software													
German													0
English													1
French													2
Spanish													3
Italian													4

[1] Only for cell lengths 20 to 180 mm
[2] QAL1; see table "Based on QAL1 according to SIRA/MCERTS (2 components in series)" under "More information".

Options	Order code
Add "-**Z**" to article number and then add order code	
Settings	
Flow-type reference cell with reduced flow, 6 mm (ULTRAMAT channel)[1]	**A20**
Flow-type reference cell with reduced flow, 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**
Set of Torx screwdrivers	**A32**
Kalrez gaskets in sample gas path (O_2 side)	**B01**
Tag plates (customized inscription)	**B03**
Kalrez gaskets in sample gas path (IR side)	**B04**
SIL Declaration of Conformity (SIL 2) Functional Safety according to IEC 61508 and IEC 61511	**C20**
FM/CSA certificate – Class I Div 2	**E20**
Clean for O_2 service (specially cleaned gas path) (ULTRAMAT channel and OXYMAT channel)	**Y02**
Measuring range indication in plain text[2] if different from default setting	**Y11**

Selection and ordering data (Continued)

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

1) Cannot be combined with non-flow-type reference cell.
2) Standard setting, in % or ppm (vpm): Smallest measuring range, 25% of largest measuring range, 50% of largest measuring range, largest measuring range

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

Note

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

Technical specifications

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

Technical specifications (Continued)

ULTRAMAT/OXYMAT 6, 19" rack unit	
Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and accompanying gas influence correction (correction of cross-interference)
Digital inputs	6, designed for 24 V, floating, freely configurable, e.g. for measurement range switchover
Serial interface	RS 485
Options	AUTOCAL function each with 8 additional digital inputs and relay outputs; also with PROFIBUS PA or PROFIBUS DP
Climatic conditions	
Permissible ambient temperature	-30 ... +70 °C during storage and transportation, 5 ... 45 °C during operation
Permissible humidity	< 90% relative humidity during storage and transportation (must not fall below dew point)

ULTRAMAT channel	
Measuring ranges	4, internally and externally switchable; automatic measuring range switchover is also possible
Smallest possible measuring range	Dependent on the application, e.g. CO: 0 ... 10 vpm CO_2: 0 ... 5 vpm

Technical specifications (Continued)

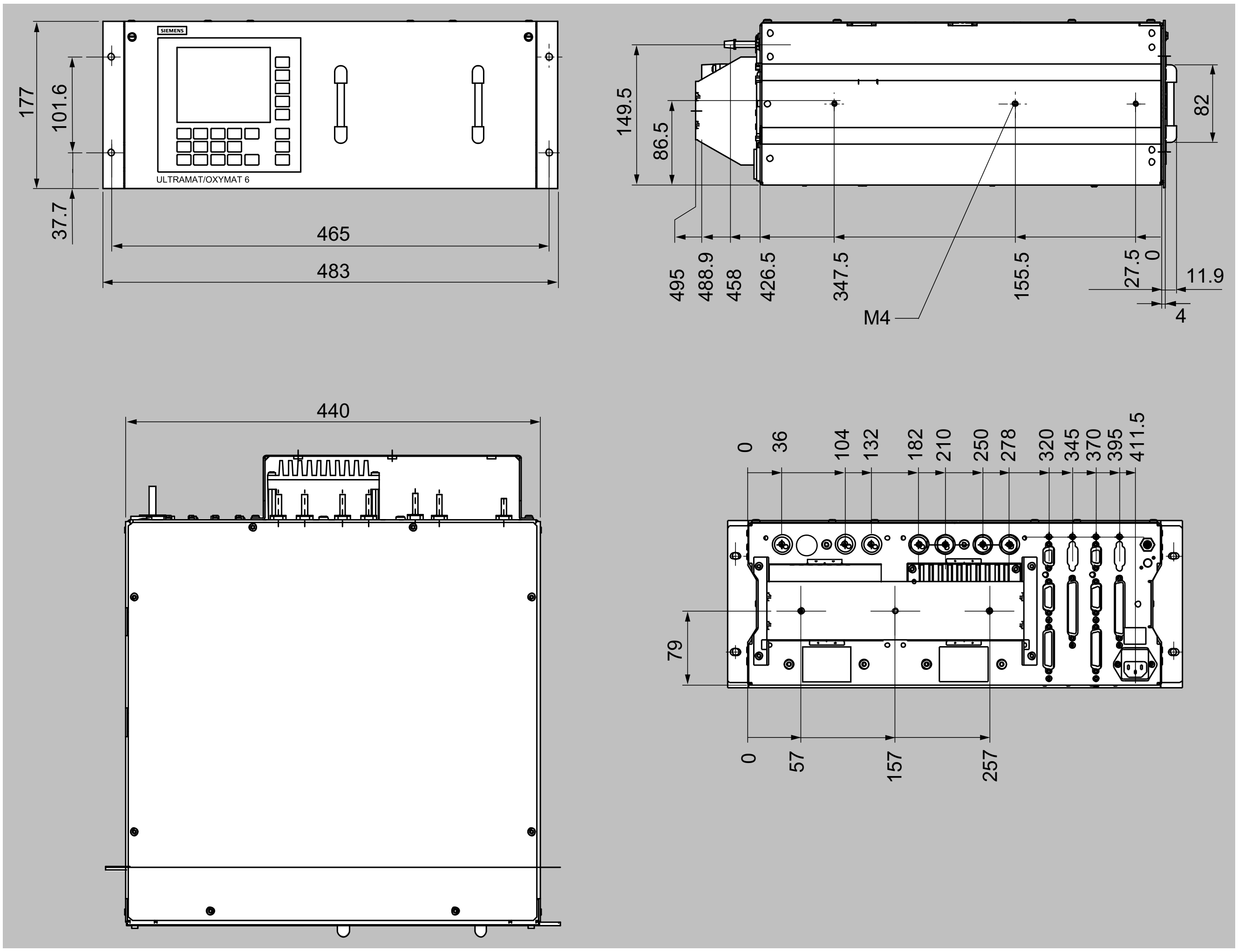
ULTRAMAT channel	
Largest possible measuring range	Dependent on the application
Measuring ranges with suppressed zero point	Any zero point within 0 ... 100 vol.% can be implemented; smallest possible span 20%
Characteristic curve	Linearized
Influence of interference gases must be considered separately	
Gas inlet conditions	
Permissible sample gas pressure	
• Without pressure switch	700 ... 1 500 hPa (absolute)
• With integrated pressure switch	700 ... 1 300 hPa (absolute)
Sample gas flow	18 ... 90 l/h (0.3 ... 1.5 l/min)
Sample gas temperature	Min. 0 ... max. 50 °C, but above the dew point
Sample gas humidity	< 90% (relative humidity), or dependent on measuring task, non-condensing
Time response	
Warm-up period	At room temperature < 30 min (the technical specification will be met after 2 hours)
Delayed display (T_{90} time)	Dependent on length of analyzer chamber, sample gas line and configurable damping
Damping (electrical time constant)	0 ... 100 s, configurable
Dead time (purging time of the gas path in the device at 1 l/min)	Approx. 0.5 ... 5 s, depending on the version
Time for device-internal signal processing	< 1 s
Pressure correction range	
Pressure sensor	
• Internal	700 ... 1 200 hPa absolute
• External	700 ... 1 500 hPa absolute
Measuring response	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation	< ± 1% of the smallest possible measuring range according to nameplate
Zero point drift	< ± 1% of the current measuring range/week
Measured value drift	< ± 1% of the current measuring range/week
Repeatability	≤ 1% of the current measuring range
Detection limit	1% of the smallest possible measuring range
Linearity error	< 0.5% of the measuring range end value
Influencing variables	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Ambient temperature	< 1% of current measuring range/10 K (with constant receiver cell temperature)
Sample gas pressure	• With enabled pressure compensation: < 0.15% of the measuring span/1% change in atmospheric pressure • With disabled pressure compensation: < 1.5% of the measuring span/1% change in atmospheric pressure
Sample gas flow	Negligible
Auxiliary power	< 0.1% of the current measuring range with nominal voltage ± 10%
Environmental conditions	Application-specific measuring influences possible if ambient air contains measured component or cross interference-sensitive gases

OXYMAT channel	
Measuring ranges	4, internally and externally switchable; automatic measuring range switchover also possible
Smallest possible measuring span (relating to sample gas pressure 1 000 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature)	0.5 vol.%, 2 vol.% or 5 vol.% O_2
Largest possible measuring range	100 vol.% O_2

Technical specifications (Continued)

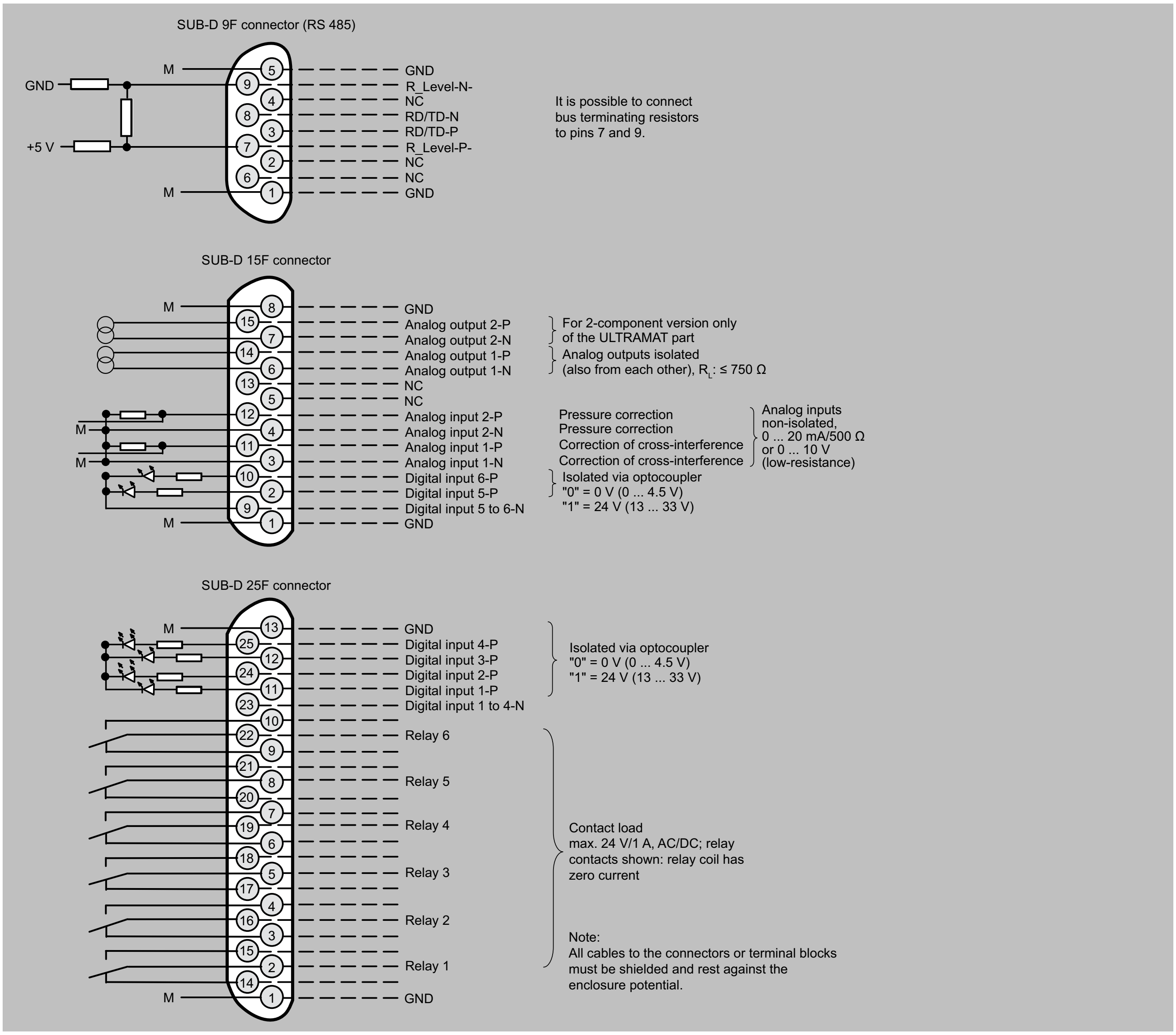
OXYMAT channel	
Measuring ranges with suppressed zero point	Any zero point within 0 ... 100 vol.% can be implemented, provided that a suitable reference gas is used
Gas inlet conditions	
Permissible sample gas pressure	
• With pipes	500 ... 3 000 hPa absolute
• With hoses	
- Without pressure switch	500 ... 1 500 hPa absolute
- With pressure switch	500 ... 1 300 hPa absolute
Sample gas flow	18 ... 60 l/h (0.3 ... 1 l/min)
Sample gas temperature	0 ... 50 °C
Sample gas humidity	< 90% RH (relative humidity)
Reference gas pressure (high-pressure version)	2 000 ... 4 000 hPa above sample gas pressure, but max. 5 000 hPa
Reference gas pressure (low-pressure version)	Min. 100 hPa above sample gas pressure
Time response	
Warm-up period	At room temperature < 30 min (the technical specification will be met after 2 hours)
Delayed display (t_{90} time)	Min. 1.5 ... 3.5 s, depending on the version
Damping (electrical time constant)	0 ... 100 s, configurable
Dead time (purging time of the gas path in the device at 1 l/min)	Approx. 0.5 ... 2.5 s, depending on the version
Time for device-internal signal processing	< 1 s
Pressure correction range	
Pressure sensor	
• Internal	500 ... 2 000 hPa absolute
• External	500 ... 3 000 hPa absolute
Measuring response	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation	< 0.75% of the smallest possible measuring range according to nameplate, with electronic damping constant of 1 s (corresponds to ± 0.25% at 2σ)
Zero point drift	< 0.5%/month of the smallest possible measuring span according to nameplate
Measured value drift	≤ 0.5%/month of the current measuring range
Repeatability	≤ 1%/month of the current measuring range
Detection limit	1% of the current measuring range
Linearity error	1% of the current measuring range
Influencing variables	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Ambient temperature	• < 0.5%/10 K referred to smallest possible measuring span according to nameplate • With measuring span 0.5%: 1%/10 K
Sample gas pressure (with air (100 hPa) as reference gas, correction of the atmospheric pressure fluctuations is only possible if the sample gas can vent to ambient air)	• With disabled pressure compensation: < 2% of the current measuring range/1% change in atmospheric pressure • With enabled pressure compensation: < 0.2% of the current measuring range/1% change in atmospheric pressure
Accompanying gases	Zero point deviation corresponding to paramagnetic or diamagnetic deviation of accompanying gas
Sample gas flow	< 1% of the smallest possible measuring span according to nameplate with a change in flow of 0.1 l/min within the permissible flow range
Auxiliary power	< 0.1% of the current measuring range with nominal voltage ± 10%

Dimensional drawings



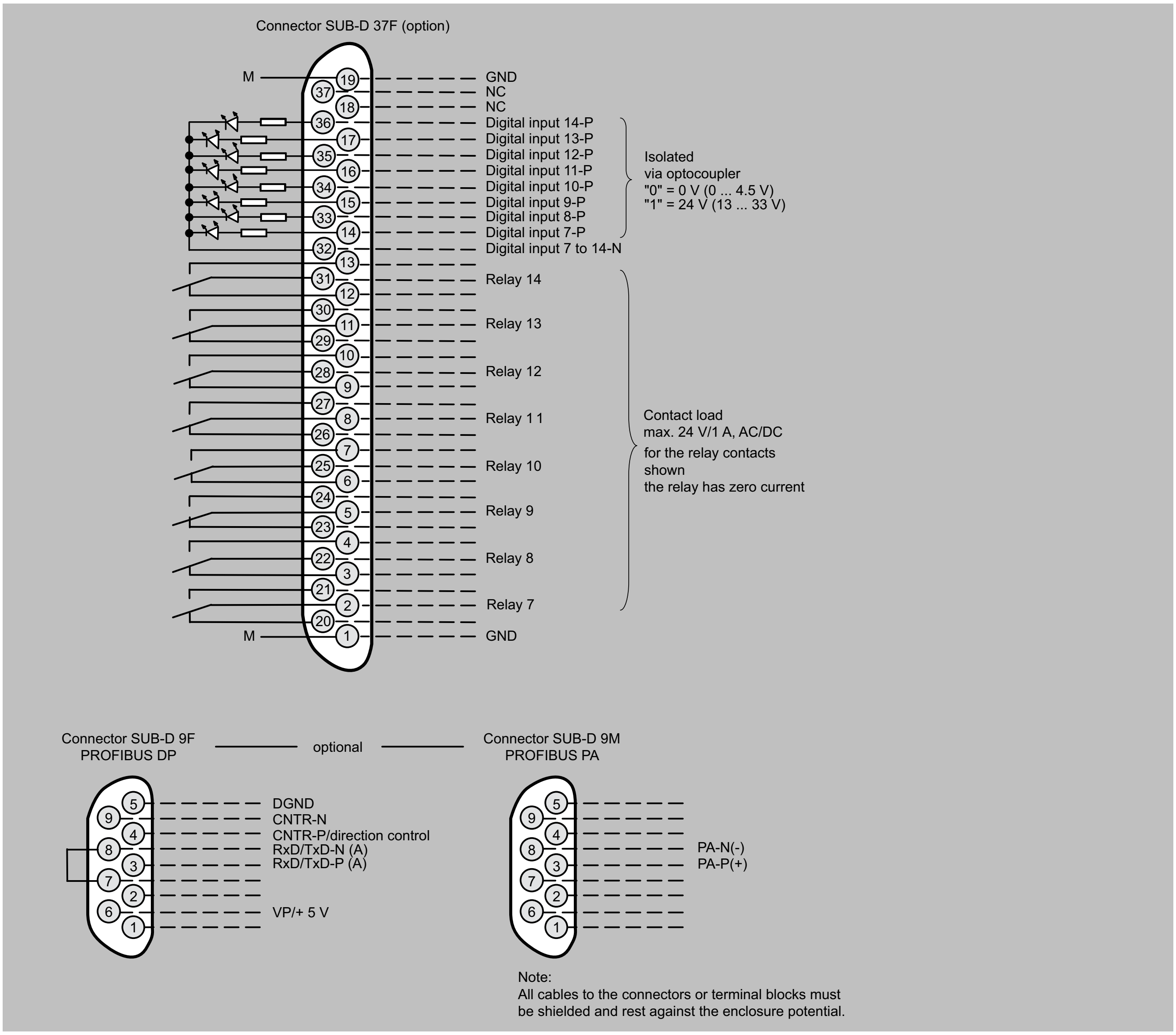
ULTRAMAT/OXYMAT 6, 19" rack unit, dimensions in mm

Circuit diagrams



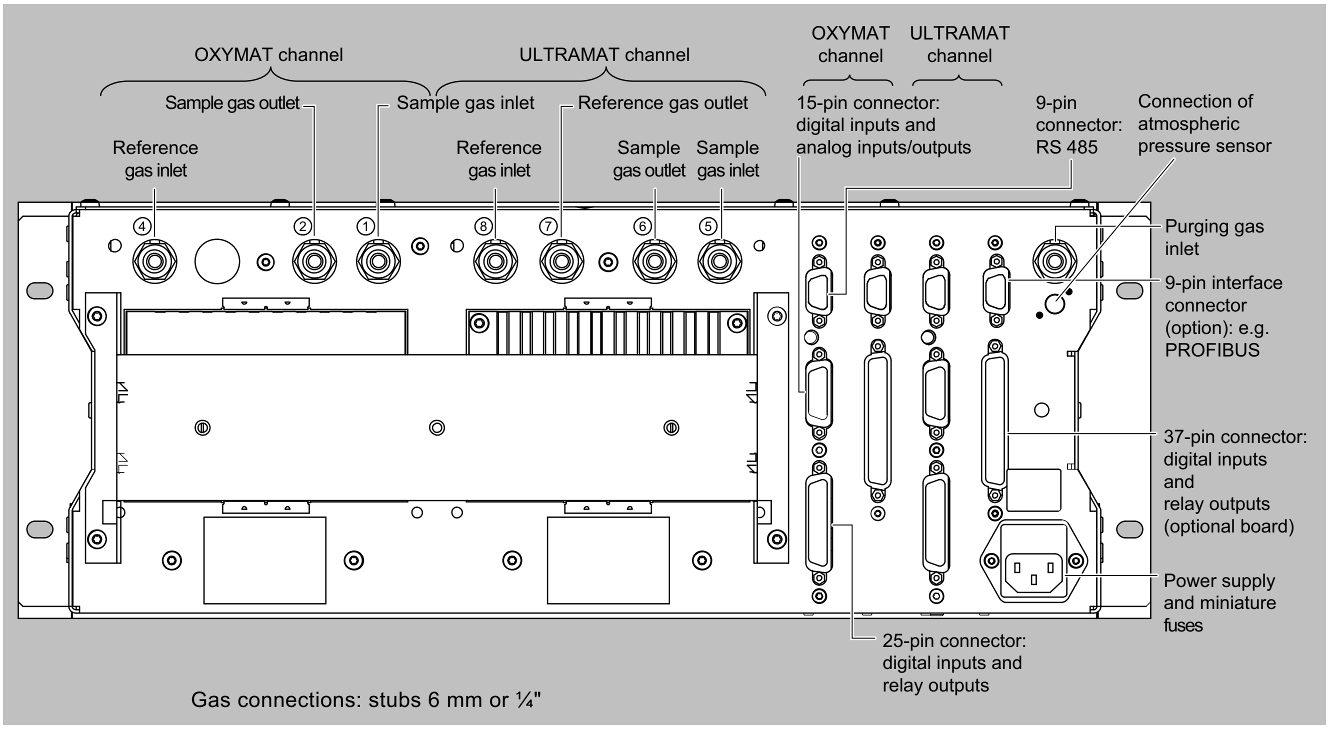
ULTRAMAT/OXYMAT 6, 19" rack unit, pin assignment

Circuit diagrams (Continued)



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

Circuit diagrams (Continued)



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

More information

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

Only in conjunction with order code Y17

Component	CO (QAL1)		SO_2 (QAL1)		NO (QAL1)	
Measuring range identification	Smallest measuring range from 0 to ...	Largest measuring range from 0 to ...	Smallest measuring range from 0 to ...	Largest measuring range from 0 to ...	Smallest measuring range from 0 to ...	Largest measuring range from 0 to ...
C	-	-	75 mg/m³	1 500 mg/m³	-	-
D	50 mg/m³	1 000 mg/m³	300 mg/m³	3 000 mg/m³	-	-
E	-	-	500 mg/m³	5 000 mg/m³	100 mg/m³	2 000 mg/m³
F	300 mg/m³	3 000 mg/m³	1 000 mg/m³	10 000 mg/m³	300 mg/m³	3 000 mg/m³
G	500 mg/m³	5 000 mg/m³	-	-	500 mg/m³	5 000 mg/m³
H	1 000 mg/m³	10 000 mg/m³	3 000 mg/m³	30 000 mg/m³	1 000 mg/m³	10 000 mg/m³
K	3 000 mg/m³	30 000 mg/m³	10 g/m³	100 g/m³	3 000 mg/m³	30 000 mg/m³

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/m³	1 500 mg/m³	-	-
D	75 mg/m³	1 250 mg/m³	-	-	-	-
E	125 g/m³	1 250 mg/m³	-	-	100 mg/m³	2 000 mg/m³
F	300 mg/m³	3 000 mg/m³	-	-	300 mg/m³	3 000 mg/m³

More information (Continued)

Component	CO (QAL1)		SO_2 (QAL1)		NO (QAL1)	
G	500 mg/m³	5 000 mg/m³	-	-	500 mg/m³	5 000 mg/m³
H	1 000 mg/m³	10 000 mg/m³	-	-	1 000 mg/m³	10 000 mg/m³
J	3 000 mg/m³	10 000 mg/m³	-	-	3 000 mg/m³	10 000 mg/m³

Ordering example

ULTRAMAT/OXYMAT 6, performance-tested according to EN 15267
IR channel
Component: CO
Measuring range: 0 to 75 / 1 250 mg/m³
With hoses, non-flow-type reference cell
With automatic calibration (AUTOCAL)
230 V AC; German
7MB2023-0EA03-1BD0-Z Y27+Y28

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

Component	CO (QAL1)		NO (QAL1)	
Measuring range identification	**Smallest measuring range from 0 to ...**	**Largest measuring range from 0 to ...**	**Smallest measuring range from 0 to ...**	**Largest measuring range from 0 to ...**
AH	75 mg/m³	1 000 mg/m³	200 mg/m³	2 000 mg/m³
AJ	300 mg/m³	3 000 mg/m³	500 mg/m³	3 000 mg/m³
AC	1 000 mg/m³	10 000 mg/m³	1 000 mg/m³	10 000 mg/m³

Ordering example

ULTRAMAT/OXYMAT 6, QAL1
IR channel
Components: CO/NO
Measuring range CO: 0 to 75 / 1 000 mg/m³, NO: 0 to 200 / 2 000 mg/m³
With hoses, non-flow-type reference cell
Without automatic adjustment (AUTOCAL)
230 V AC; German
7MB2024-0EA00-1AH0-Z +Y17

Selection and ordering data

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

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

More information

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

Overview

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

Benefits

- Paramagnetic alternating pressure principle
  - Small measuring ranges (0 to 0.5% or 99.5 to 100% 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

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

Special versions

Special applications

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

Performance-tested version / QAL

As a reference value for emission measurements according to German Technical Instructions on Air Quality Control (TA Luft), 13th and 27th BlmSchV, federal emission law

Design

19" rack unit

- With 4 U for installation
  - In hinged frame
  - In cabinets with or without telescopic rails
- Front plate can be swung down for servicing purposes (laptop connection)
- Internal gas paths: hose made of FKM (Viton) or pipe made of titanium or stainless steel (mat. no. 1.4571)
- Gas connections for sample gas inlet and outlet and for reference gas: Fittings, pipe diameter of 6 mm or 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 operator panel

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

Inputs and outputs

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

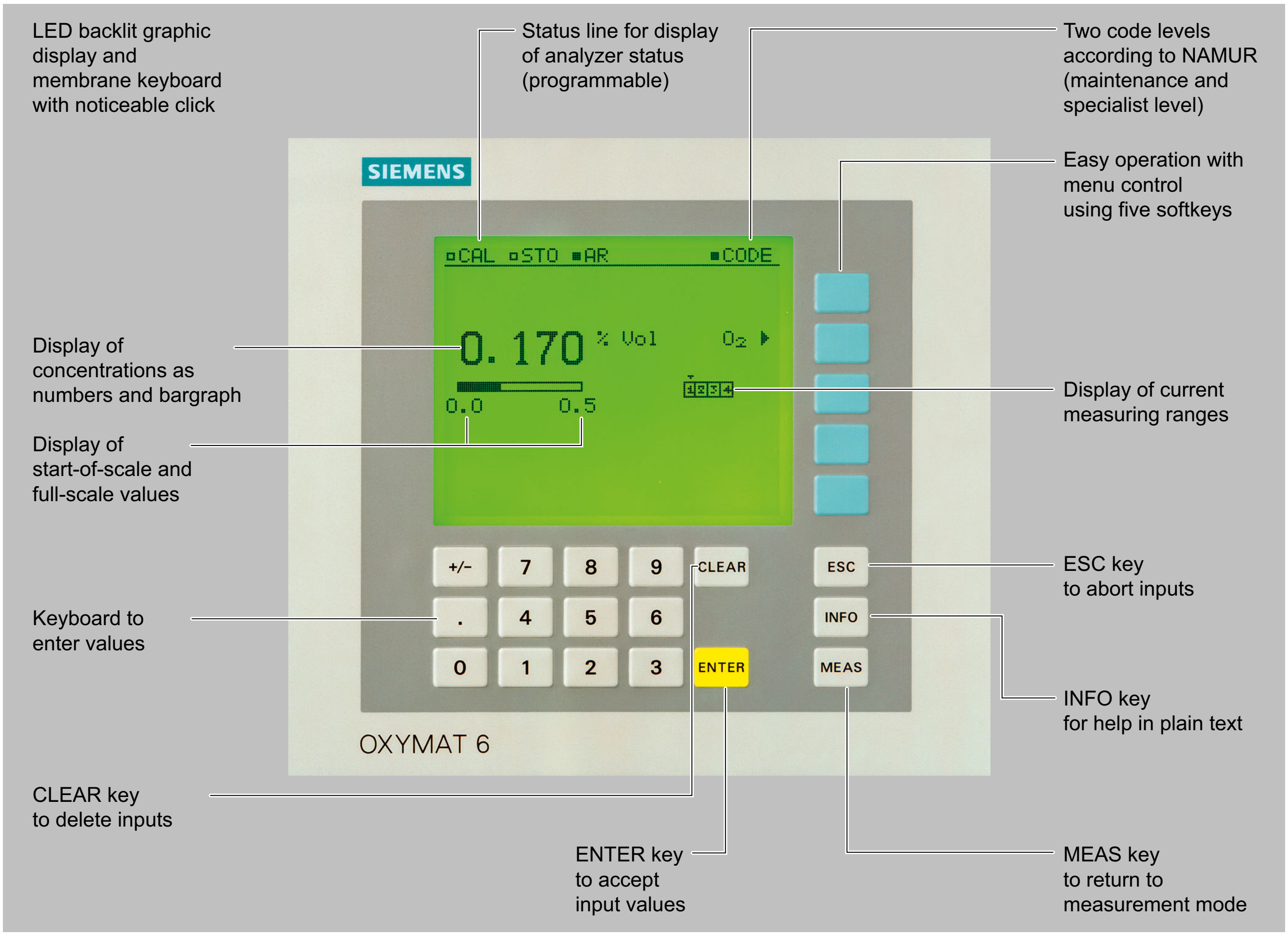
Communication

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

Options

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

Design (Continued)



OXYMAT 6, membrane keyboard and graphic display

Designs – Parts wetted by sample gas, standard

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

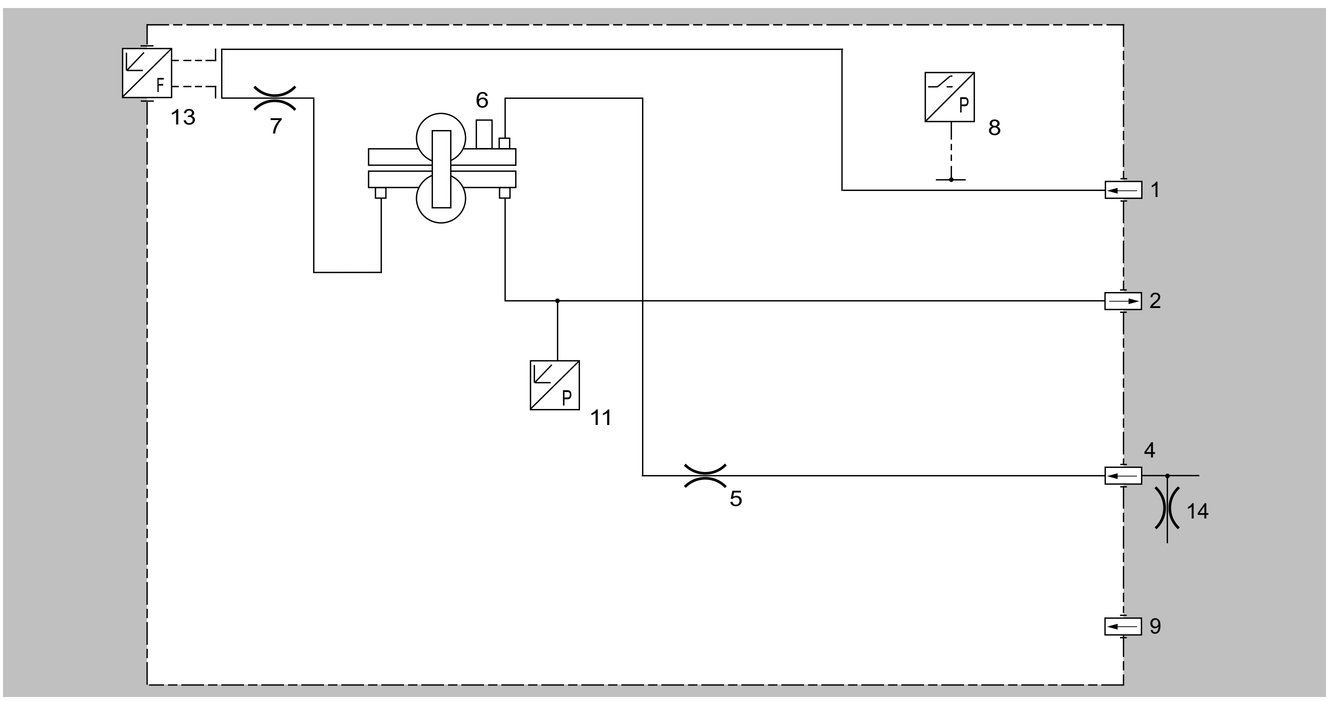
Design (Continued)

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

Options

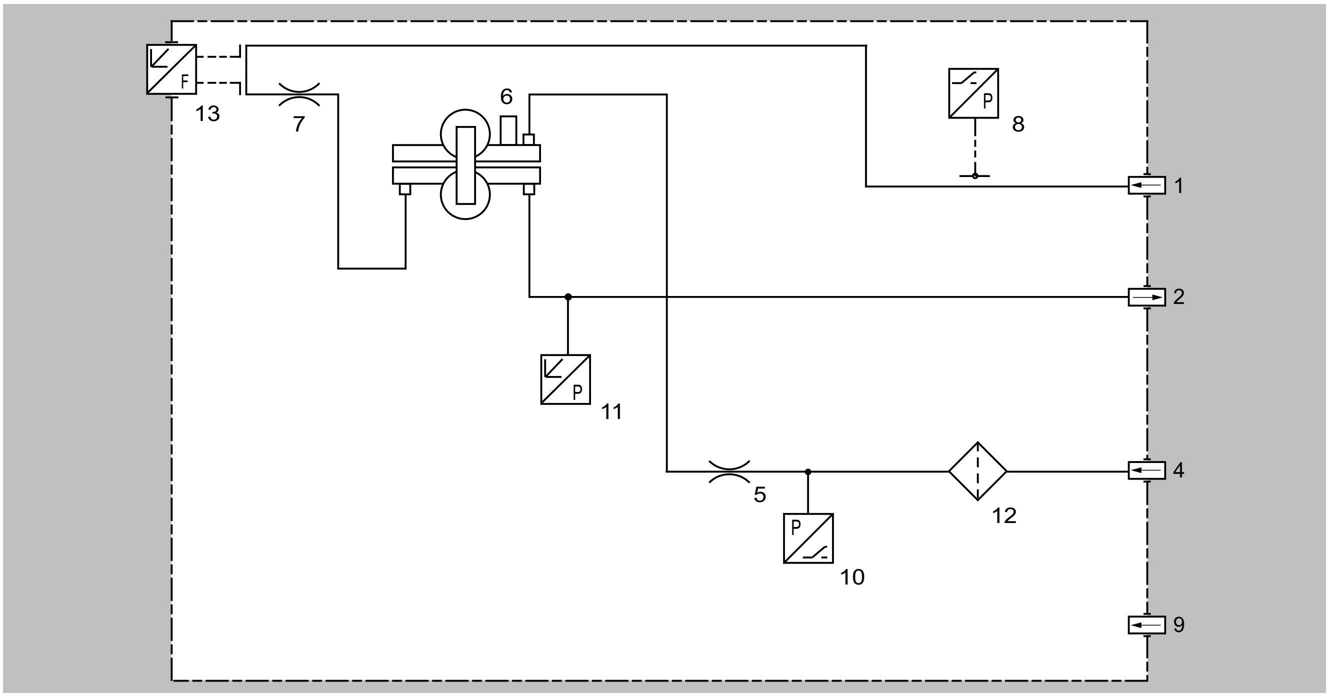
Flow indicator	Measuring tube Variable area Suspension boundary Angle units	Duran glass Duran glass, black PTFE (Teflon) FKM (Viton)	-	-
Pressure switch	Diaphragm Enclosure	FKM (Viton) PA 6.3 T	-	-

Gas path (19" rack unit)



Gas path, reference gas connection 1 100 hPa, absolute

Design (Continued)

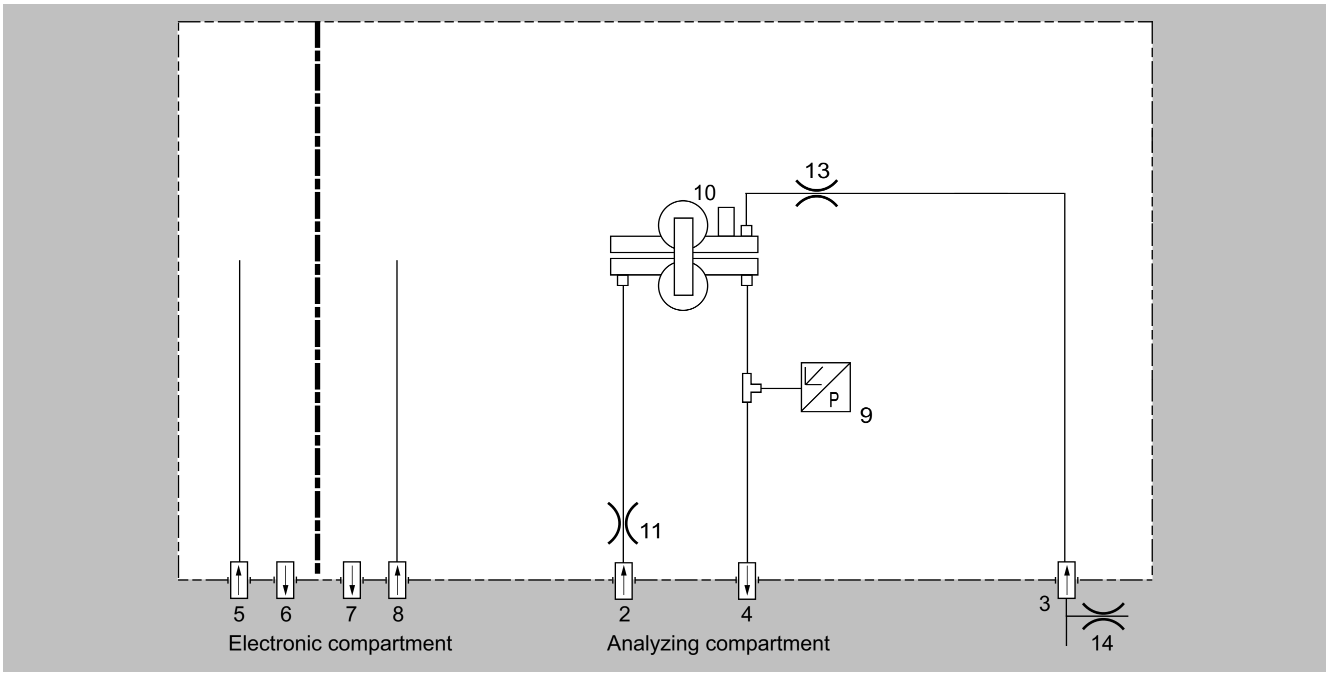


Gas path, reference gas connection 3 000 to 5 000 hPa, absolute

Legend for the gas path 19" rack unit figures			
1	Sample gas inlet	8	Pressure switch in sample gas path (option)
2	Sample gas outlet	9	Purging gas
3	Not used	10	Pressure switch in reference gas path (option)
4	Reference gas inlet	11	Pressure sensor
5	Restrictor in reference gas inlet	12	Filter
6	O_2 physical system	13	Flow indicator in sample gas path (option)
7	Restrictor in sample gas path	14	Outlet restrictor

Design (Continued)

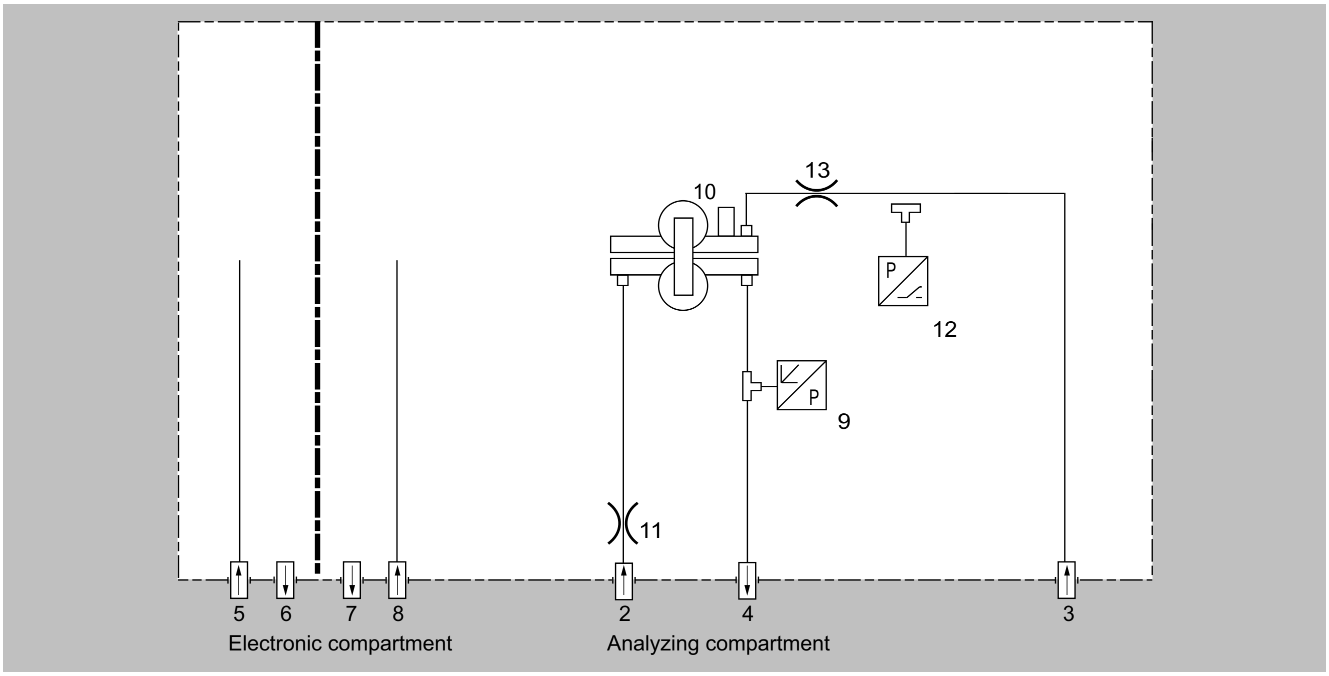
Gas path (field device)



Gas path, reference gas connection 1 100 hPa, absolute

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

Design (Continued)



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

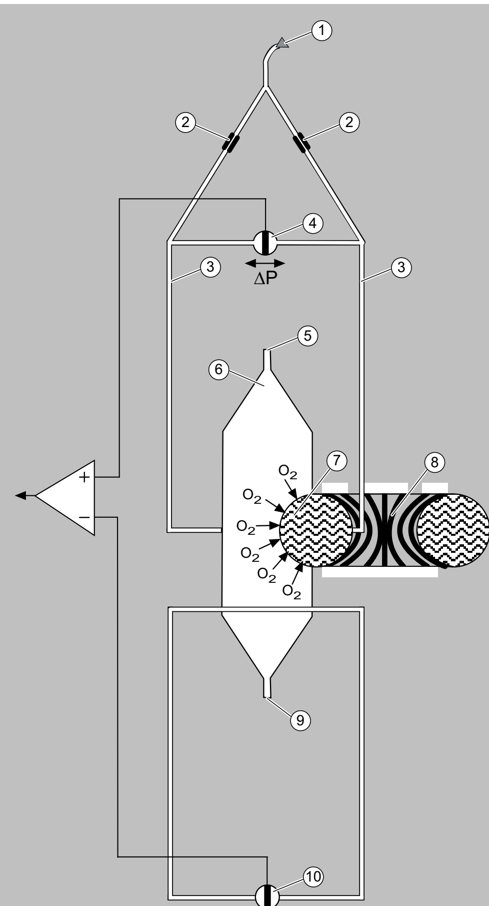
Mode of operation

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 sample chamber position as well as the gas analyzer's operating position.
The sample chamber is directly in the sample path and has a small volume, and the microflow sensor is a low-lag sensor. This results in a very short response time for the OXYMAT 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.

Mode of operation (Continued)



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, mode of operation

Function

Advantages of the function-based application of reference gas

- The zero point can be defined specific to the application. It is then also possible to set "physically" suppressed zero points. For example, it is possible when using pure oxygen as the zero gas to set a measuring range of 99.5 to 100% 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 zero gas calibration and as the reference gas. As a result of the low reference gas consumption (3 to 10 ml/min), one calibration gas cylinder can be used for both gases.
- No measuring effect is generated in the absence of oxygen. The measured signal need not therefore be set electronically to zero, and is thus extremely stable with regard to temperature and electronic influences.

Main features

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

Reference gases for OXYMAT 6

Measuring range	Recommended reference gas	Reference gas connection pressure	Comments
0 to ... vol.% O_2	N_2	2 000 ... 4 000 hPa above sample gas pressure (max. 5 000 hPa absolute)	The reference gas flow is set automatically to 5 ... 10 ml/min (up to 20 ml/min with flow-type compensation branch)
... to 100 vol.% O_2 [1)]	O_2	2 000 ... 4 000 hPa above sample gas pressure (max. 5 000 hPa absolute)	
Approx. 21 vol.% O_2 [2)]	Air	100 hPa with respect to sample gas pressure, which may vary by max. 50 hPa around the air pressure	

Function (Continued)

[1] Suppressed zero point with measuring range end value 100 vol.% O_2.
[2] Suppressed zero point with 21 vol.% O_2 within the measuring span.

Correction of zero-point error/cross-sensitivities

Accompanying gas (concentration 100 vol.%)	Zero point deviation in vol.% O_2 absolute	Accompanying gas (concentration 100 vol.%)	Zero point deviation in vol.% O_2 absolute
Organic gases		**Inert gases**	
Ethane C_2H_6	-0.49	Helium He	+0.33
Ethene (ethylene) C_2H_4	-0.22	Neon Ne	+0.17
Ethine (acetylene) C_2H_2	-0.29	Argon Ar	-0.25
1,2-butadiene C_4H_6	-0.65	Krypton Kr	-0.55
1,3-butadiene C_4H_6	-0.49	Xenon Xe	-1.05
N-butane C_4H_{10}	-1.26	**Inorganic gases**	
Isobutane C_4H_{10}	-1.30	Ammonia NH_3	-0.20
1-butene C_4H_8	-0.96	Hydrogen bromide HBr	-0.76
Isobutene C_4H_8	-1.06	Chlorine Cl_2	-0.94
Dichlorodifluoromethane (R12) CCl_2F_2	-1.32	Hydrogen chloride HCl	-0.35
Acetic acid CH_3COOH	-0.64	Dinitrogen monoxide N_2O	-0.23
N-heptane C_7H_{16}	-2.40	Hydrogen fluoride HF	+0.10
N-hexane C_6H_{14}	-2.02	Hydrogen iodide HI	-1.19
Cyclo-hexane C_6H_{12}	-1.84	Carbon dioxide CO_2	-0.30
Methane CH_4	-0.18	Carbon monoxide CO	+0.07
Methanol CH_3OH	-0.31	Nitrogen oxide NO	+42.94
N-octane C_8H_{18}	-2.78	Nitrogen N_2	0.00
N-pentane C_5H_{12}	-1.68	Nitrogen dioxide NO_2	+20.00
Isopentane C_5H_{12}	-1.49	Sulfur dioxide SO_2	-0.20
Propane C_3H_8	-0.87	Sulfur hexafluoride SF_6	-1.05
Propylene C_3H_6	-0.64	Hydrogen sulfide H_2S	-0.44
Trichlorofluoromethane (R11) CCl_3F	-1.63	Water H_2O	-0.03
Vinyl chloride C_2H_3Cl	-0.77	Hydrogen H_2	+0.26
Vinyl fluoride C_2H_3F	-0.55		
1,1 vinylidene chloride $C_2H_2Cl_2$	-1.22		

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

Conversion to other temperatures

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

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

All diamagnetic gases have a negative zero point deviation.

Selection and ordering data

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

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

Selection and ordering data (Continued)

Options	Order code
Tag plates (specific inscription based on customer information)	**B03**
SIL Declaration of Conformity (SIL 2) Functional Safety according to IEC 61508 and IEC 61511	**C20**
FM/CSA certificate – Class I Div 2	**E20**
Clean for O_2 service (specially cleaned gas path)	**Y02**
Measuring range indication in plain text, if different from default setting	**Y11**
Performance-tested according to EN 15267	**Y27**

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

Technical specifications

OXYMAT 6, 19" rack unit	
General information	
Measuring ranges	4, internally and externally switchable; automatic measuring range switchover is also possible
Smallest possible measuring span (relating to sample gas pressure 1 000 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature)	0.5 vol.%, 2 vol.% or 5 vol.% O_2
Largest possible measuring span	100 vol.% O_2 (for a pressure above 2 000 hPa: 25 vol.% O_2)
Measuring ranges with suppressed zero point	Any zero point can be implemented within 0 ... 100 vol.%, provided that a suitable reference gas is used (see Table 1 in "Function")
Operating position	Front wall, vertical
Conformity	CE mark in accordance with EN 50081-1, EN 50082-2
Design, enclosure	
Degree of protection	IP20 according to EN 60529
Weight	Approx. 13 kg
Electrical characteristics	
Auxiliary power	100 ... 120 V AC (nominal range of use 90 ... 132 V), 48 ... 63 Hz or 200 ... 240 V AC (nominal range of use 180 ... 264 V), 48 ... 63 Hz
Power consumption	Approx. 35 VA
EMC (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98), EN 61326
Electrical safety	According to EN 61010-1, overvoltage category III
Fuse ratings	100 ... 120 V: 1.0T/250 200 ... 240 V: 0.63T/250
Gas inlet conditions	
Permissible sample gas pressure	
• With pipes	500 ... 3 000 hPa absolute

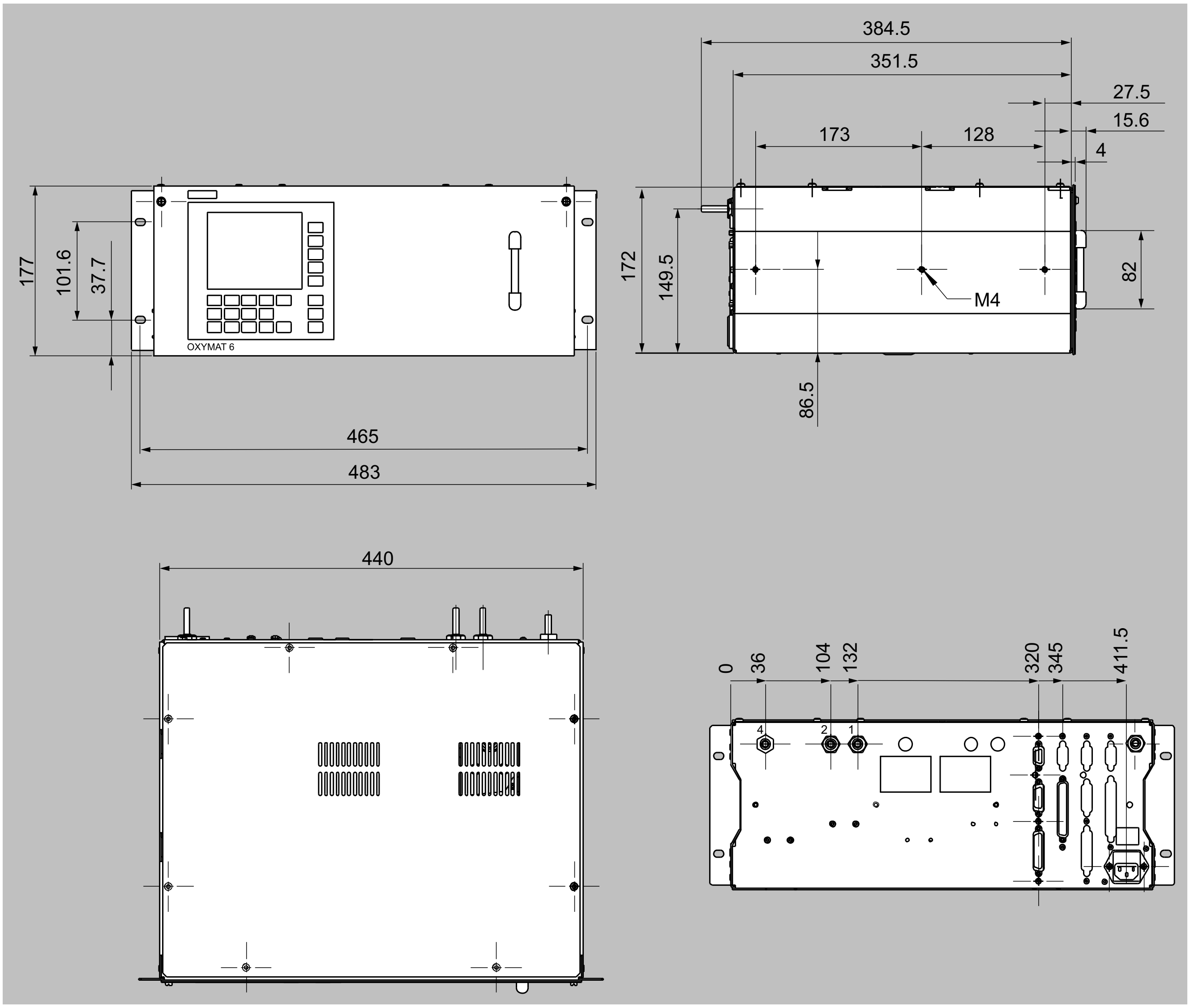
Technical specifications (Continued)

OXYMAT 6, 19" rack unit	
• With hoses	
- Without pressure switch	500 ... 1 500 hPa absolute
- With pressure switch	500 ... 1 300 hPa absolute
Sample gas flow	18 ... 60 l/h (0.3 ... 1 l/min)
Sample gas temperature	Min. 0 ... max. 50 °C, but above the dew point
Sample gas humidity	< 90% RH (RH: relative humidity)
Reference gas pressure (high-pressure version)	2 000 ... 4 000 hPa above sample gas pressure, but max. 5 000 hPa
Reference gas pressure (low-pressure version)	Min. 100 hPa above sample gas pressure
Time response	
Warm-up period	At room temperature < 30 min (the technical specification will be met after 2 hours)
Delayed display (T_{90} time)	Min. 1.5 ... 3.5 s depending on the version
Damping (electrical time constant)	0 ... 100 s, configurable
Dead time (purging time of the gas path in the device at 1 l/min)	Approx. 0.5 ... 2.5 s, depending on the version
Time for device-internal signal processing	< 1 s
Pressure correction range	
Pressure sensor	
• Internal	500 ... 2 000 hPa absolute
• External	500 ... 3 000 hPa absolute
Measuring response	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation	< ± 0.75% of the smallest possible measuring range according to nameplate, with electronic damping constant of 1 s (corresponds to ±0.25% at 2 σ)
Zero point drift	< ± 0.5%/month of the smallest possible measuring span according to nameplate

Technical specifications (Continued)

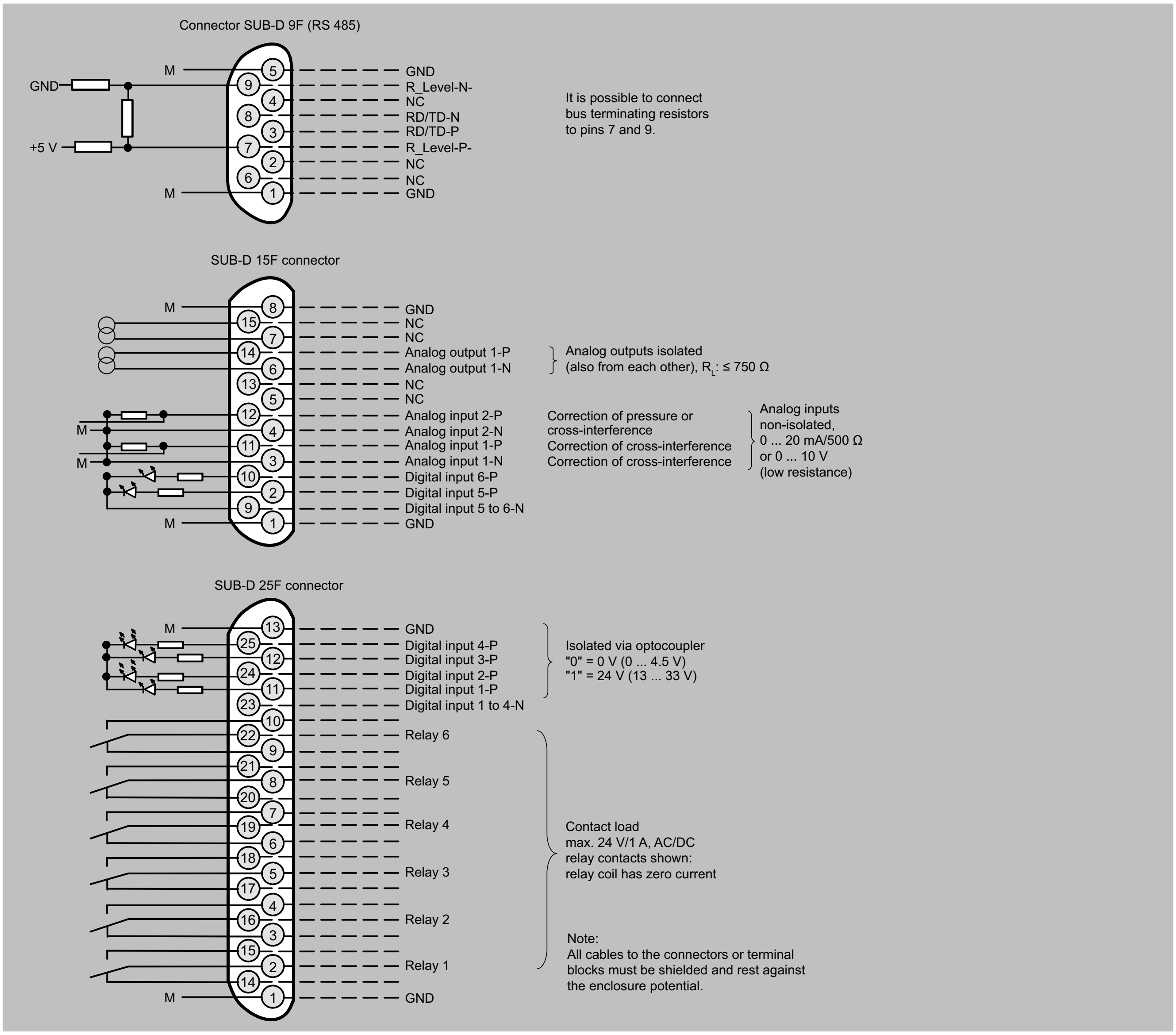
OXYMAT 6, 19" rack unit	
Measured value drift	< ± 0.5%/month of the current measuring range
Repeatability	< 1% of the current measuring range
Detection limit	1% of the current measuring range
Linearity error	< 0.1% of the current measuring range
Influencing variables	Based on sample gas pressure 1 013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

Dimensional drawings



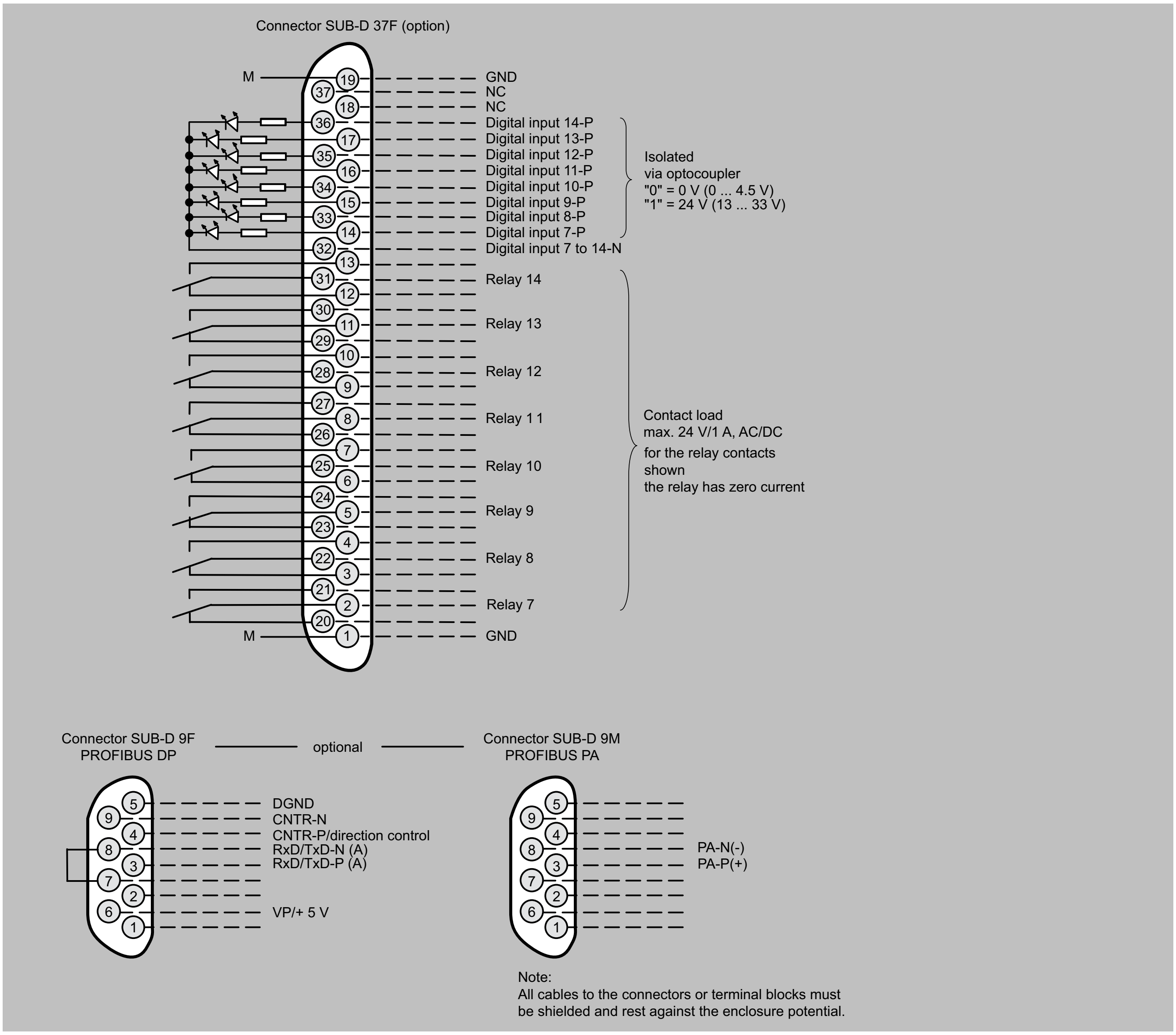
OXYMAT 6, 19" rack unit, dimensions in mm

Circuit diagrams



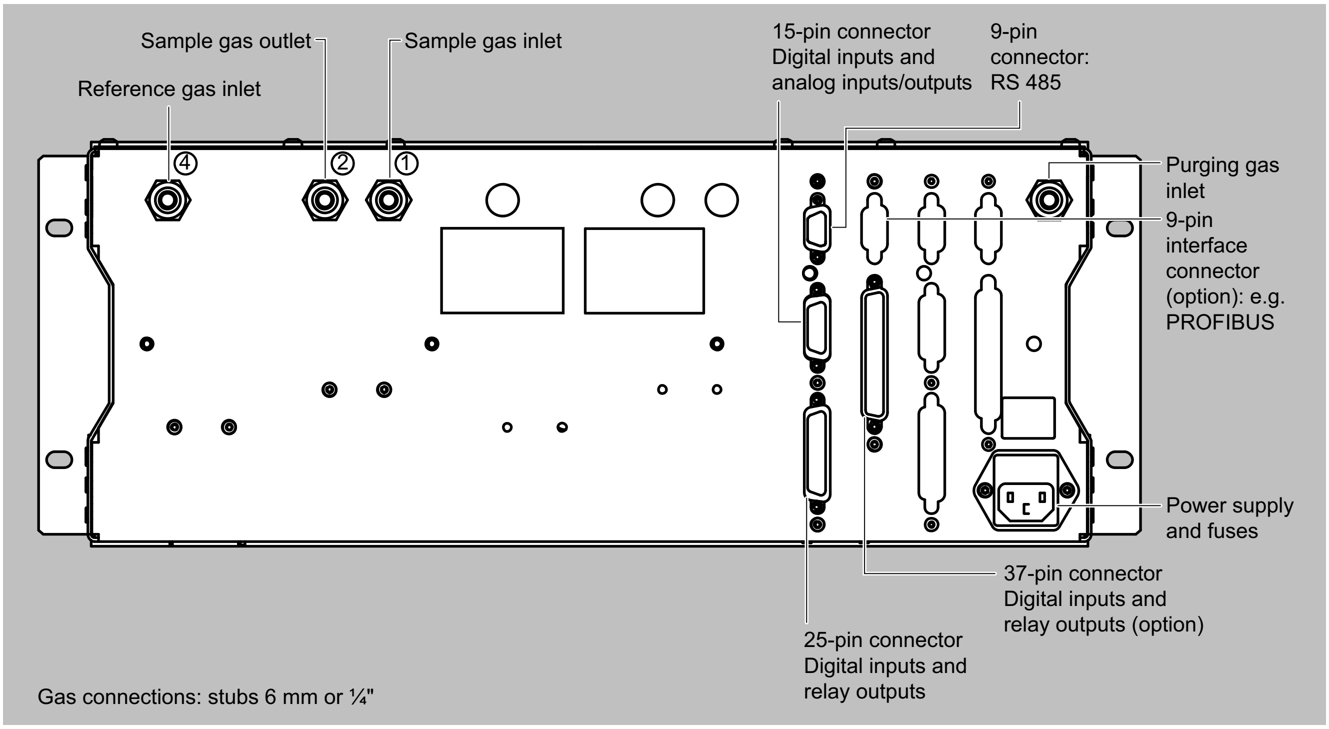
OXYMAT 6, 19" rack unit, pin assignment

Circuit diagrams (Continued)



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

Circuit diagrams (Continued)



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

Selection and ordering data

OXYMAT 6 gas analyzer For installation in the field	**Article No.** **7MB2011-**	●	●	●	0	●	-	●	●	●	●
Click on the Article No. for online configuration in the PIA Life Cycle Portal. ***Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".***											
Gas connections for sample gas and reference gas											
Cutting ring fitting made of stainless steel (mat. no. 1.4571)											
• Pipe with 6 mm outer diameter		0									
• Pipe with ¼" outer diameter		1									
Cutting ring fitting made of titanium											
• Pipe with 6 mm outer diameter		2									
• Pipe with ¼" outer diameter		3									
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								
2% reference gas pressure 3 000 hPa			C								
2% reference gas pressure 100 hPa (external pump)			D								
5% reference gas pressure 3 000 hPa			E								
5% reference gas pressure 100 hPa (external pump)			F								
Sample chamber											
Non-flow-type compensation branch											
• Made of stainless steel, mat. no. 1.4571				A							
• Made of tantalum				B							
• Made of Hastelloy				E							
Flow-type compensation branch											
• Made of stainless steel, mat. no. 1.4571				C							
• Made of tantalum				D							
• Made of Hastelloy				F							
Heating of internal gas paths and analyzer unit											
Without						0					
With (65 ... 130 °C)						1					
Auxiliary power											
Standard device and versions acc. to ATEX II 3G (Zone 2)											
• 100 ... 120 V AC, 48 ... 63 Hz								0			
• 200 ... 240 V AC, 48 ... 63 Hz								1			
ATEX II 2G versions (Zone 1), including certificate											
• 100 ... 120 V AC, 48 ... 63 Hz, according to ATEX II 2G[1] Operation mode: continuous purging)								6			
• 200 ... 240 V AC, 48 ... 63 Hz, according to ATEX II 2G[1] (operation mode: continuous purging)								7			
Reference gas monitoring											
Without									A		
With									B		
Add-on electronics											
Without										A	
AUTOCAL function with 8 additional digital inputs and 8 additional relay outputs										B	
AUTOCAL function 8 additional digital inputs/outputs and PROFIBUS PA interface										E	
AUTOCAL function with 8 additional digital inputs/outputs and PROFIBUS DP interface										F	
AUTOCAL function with 8 additional digital inputs/outputs and PROFIBUS PA Ex i										G	
Language of the operating software											
German											0
English											1
French											2
Spanish											3
Italian											4

[1] See also "Additional units for Ex versions".

Selection and ordering data (Continued)

Options	Order code
Add "-**Z**" to article number and then add order code	
Settings	
Set of Torx screwdrivers	**A32**
Kalrez gaskets in sample gas path	**B01**
Tag plates (customized inscription)	**B03**
SIL Declaration of Conformity (SIL 2) Functional Safety according to IEC 61508 and IEC 61511	**C20**
Gas connections and piping made of Hastelloy C22	
• Outer diameter 6 mm	D01 (cannot be combined with E20)
• Outer diameter ¼"	D02 (cannot be combined with E20)
Ex versions	
For combination options, see table "Ex configurations – Main selection criteria series 6", page 5/17	
ATEX II 3G certificate; restrictive breathing enclosure, non-flammable gases	**E11**
ATEX II 3G certificate; flammable gases	**E12**
FM/CSA certificate – Class I Div 2	**E20**
Approval ATEX IIG safety-related measurements	
• In non-hazardous gas zone	**E30**
• In hazardous zone acc. to ATEX II 2G, leakage compensation	**E31**
• In hazardous zone acc. to ATEX II 2G, continuous purging	**E32**
• In hazardous zone acc. to ATEX II 3G, flammable and non-flammable gases	**E33**
• Add-on for heated devices 110 V/120 V	**E38**
• Add-on for heated devices 220 V/240 V	**E39**
ATEX II 3D certificate; potentially explosive dust atmospheres	
• In non-hazardous gas zone	**E40**
• In hazardous zone acc. to ATEX II 3G, non-flammable gases	**E41**
• In hazardous zone acc. to ATEX II 3G, flammable gases[1)]	**E42**
BARTEC Ex p purging unit for use in ATEX or IECEx Zone 1 • BARTEC Ex p control unit for continuous flow • BARTEC Ex control station with bypass key switch	**E74**
BARTEC Ex purging unit for use in ATEX or IECEx Zone 1 • BARTEC Ex p control unit for continuous flow • BARTEC Ex control station with bypass key switch • Operator display for visualization of system states	**E75**
Clean for O_2 service (specially cleaned gas path)	**Y02**
Defined firmware version 4.2.1 for use in safety-related systems	**Y05**
Measuring range indication in plain text, if different from default setting	**Y11**

1) Only in connection with an approved purging unit.

Selection and ordering data (Continued)

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

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

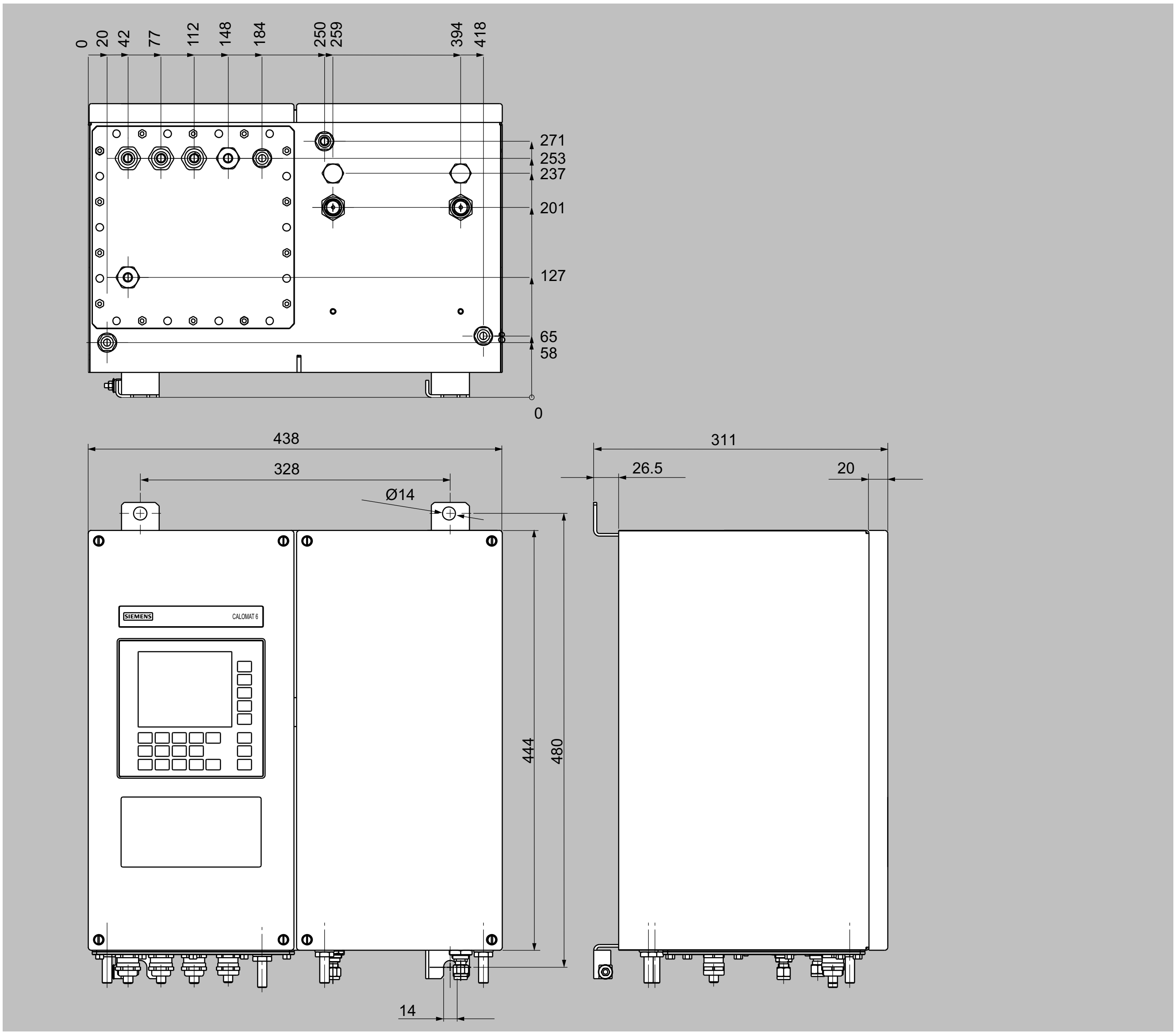
Technical specifications

OXYMAT 6, field device	
General information	
Measuring ranges	4, internally and externally switchable; automatic measuring range switchover is also possible
Smallest possible measuring span (relating to sample gas pressure 1 000 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature, smallest possible measuring span with heated version: 0.5% (< 65 °C); 0.5 ... 1% (65 ... 90 °C); 1 ... 2% (90 ... 130 °C))	0.5 vol.%, 2 vol.% or 5 vol.% O_2
Largest possible measuring span	100 vol.% O_2 (for a pressure above 2 000 hPa: 25 vol.% O_2)
Measuring ranges with suppressed zero point	Any zero point can be implemented within 0 ... 100 vol.%, provided that a suitable reference gas is used (see Table 1 in "Function")
Operating position	Front wall, vertical
Conformity	CE mark in accordance with EN 50081-1, EN 50082-2
Design, enclosure	
Degree of protection	IP65 in accordance with EN 60529, restricted breathing enclosure to EN 50021
Weight	Approx. 28 kg
Electrical characteristics	
Auxiliary power	100 ... 120 V AC (nominal range of use 90 ... 132 V), 48 ... 63 Hz or 200 ... 240 V AC (nominal range of use 180 ... 264 V), 48 ... 63 Hz
Power consumption	Approx. 35 VA, approx. 330 VA with heated version
EMC (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98), EN 61326
Electrical safety	In accordance with EN 61010-1
• Heated devices	Overvoltage category II
• Unheated devices	Overvoltage category III
Fuse ratings (unheated device)	
• 100 ... 120 V	F3: 1 T/250; F4: 1 T/250
• 200 ... 240 V	F3: 0.63T/250; F4: 0.63T/250
Fuse ratings (heated device)	
• 100 ... 120 V	F1: 1 T/250; F2: 4 T/250 F3: 4 T/250; F4: 4 T/250
• 200 ... 240 V	F1: 0.63T/250; F2: 2.5 T/250 F3: 2.5 T/250; F4: 2.5 T/250
Gas inlet conditions	
Permissible sample gas pressure	
• With pipes	500 ... 3 000 hPa absolute
• With pipes, Ex version	
- Leakage compensation	500 ... 1 160 hPa absolute
- Continuous purging	500 ... 3 000 hPa absolute
Reference gas pressure (high-pressure version)	2 000 ... 4 000 hPa above sample gas pressure, but max. 5 000 hPa
Reference gas pressure (low-pressure version)	Min. 100 hPa above sample gas pressure
Purging gas pressure	
• Permanent	< 165 hPa above ambient pressure
• For short periods	Max. 250 hPa above ambient pressure
Sample gas flow	18 ... 60 l/h (0.3 ... 1 l/min)
Sample gas temperature	• Min. 0 ... max. 50 °C, but above the dew point (unheated) • 15 °C above temperature analyzer unit (heated)
Sample gas humidity	< 90% relative humidity
Time response	
Warm-up period	At room temperature < 30 min (the technical specification will be met after 2 hours)
Delayed display (t_{90} time)	< 1.5 s

Technical specifications (Continued)

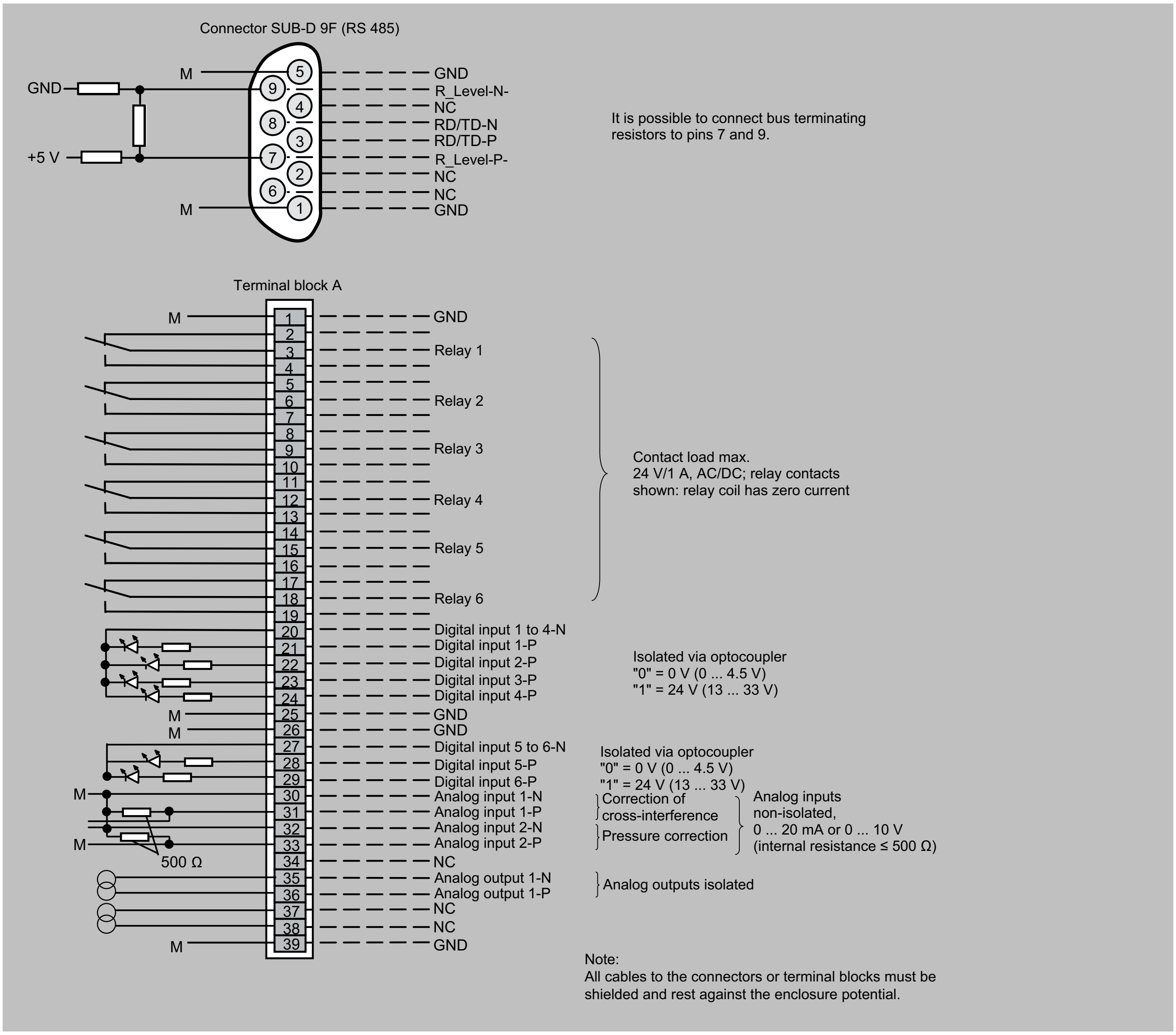
OXYMAT 6, field device	
Damping (electrical time constant)	0 ... 100 s, configurable
Dead time (purging time of the gas path in the device at 1 l/min)	Approx. 0.5 s
Time for device-internal signal processing	< 1 s
Pressure correction range	
Pressure sensor	
• Internal	500 ... 2 000 hPa absolute
• External	500 ... 3 000 hPa absolute
Measuring response	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation	< ± 0.75% of the smallest possible measuring range according to nameplate, with electronic damping constant of 1 s (corresponds to ± 0.25% at 2 σ)
Zero point drift	< ± 0.5%/month of the smallest possible measuring span according to nameplate
Measured value drift	< ± 0.5%/month of the current measuring range
Repeatability	< 1% of the current measuring range
Detection limit	1% of the current measuring range
Linearity error	< 0.1% of the current measuring range
Influencing variables	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Ambient temperature	< 0.5%/10 K relating to the smallest possible measuring range according to nameplate, with measuring span 0.5%: 1%/10 K
Sample gas pressure (with air (100 hPa) as reference gas, correction of the atmospheric pressure fluctuations is only possible if the sample gas can vent to ambient air)	• With disabled pressure compensation: < 2% of the current measuring range /1% pressure variation • With enabled pressure compensation: < 0.2% of the current measuring range /1% pressure variation
Accompanying gases	Zero point deviation corresponding to paramagnetic or diamagnetic deviation of accompanying gas
Sample gas flow at zero point	< 1% of the current measuring range according to nameplate with a change in flow of 0.1 l/min within the permissible flow range; heated version up to double error
Auxiliary power	< 0.1% of the current measuring range with nominal voltage ± 10%
Electrical inputs and outputs	
Analog output	0/2/4 ... 20 mA, floating; max. load 750 Ω
Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load rating: 24 V AC/DC/1 A, floating
Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and accompanying gas influence correction (correction of cross-interference)
Digital inputs	6, designed for 24 V, floating, freely configurable, e.g. for measuring range switchover
Serial interface	RS 485
Options	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 (maximum accuracy achieved after 2 hours), during storage and transportation (must not fall below dew point)

Dimensional drawings



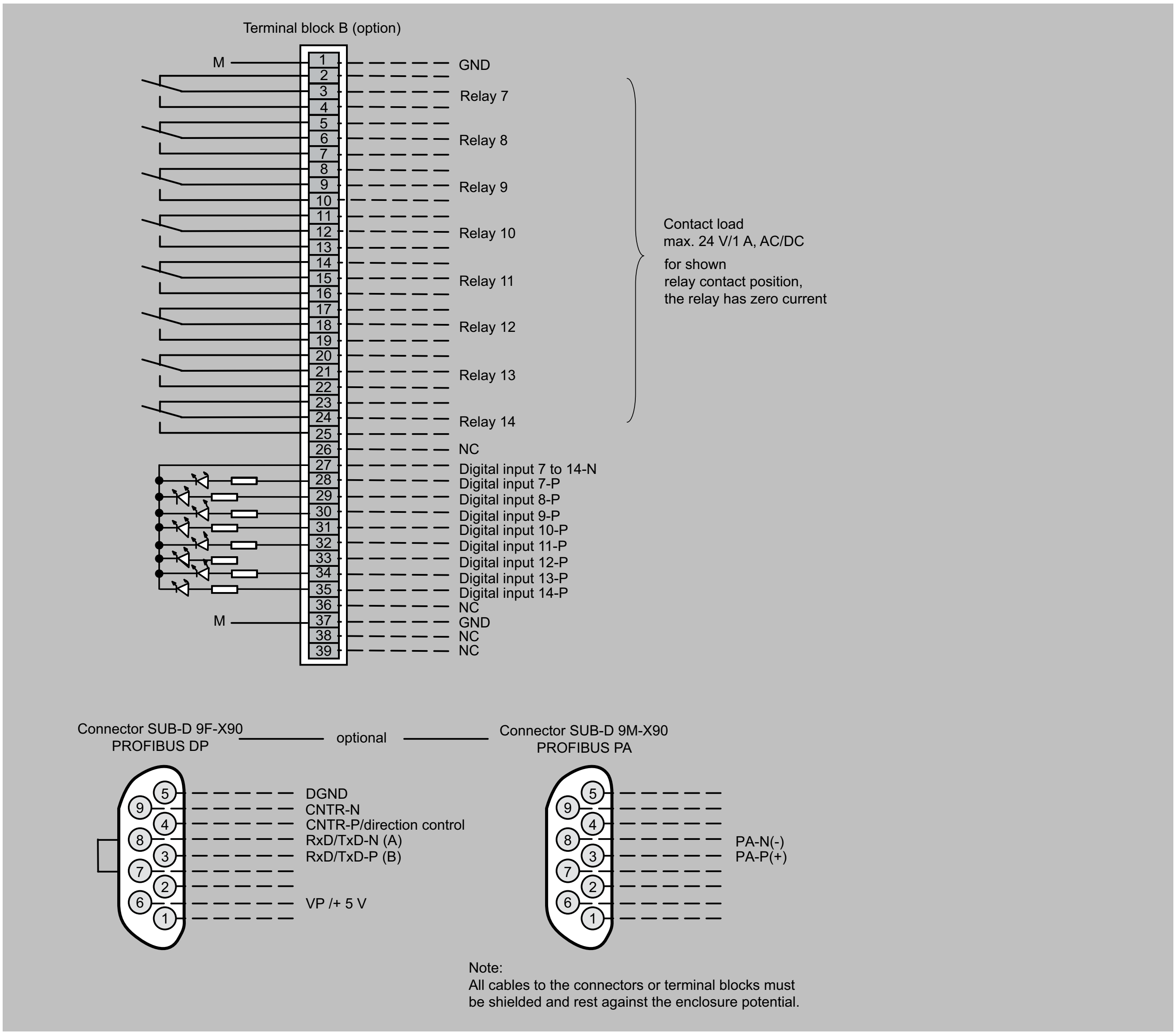
OXYMAT 6, field unit, dimensions in mm

Circuit diagrams



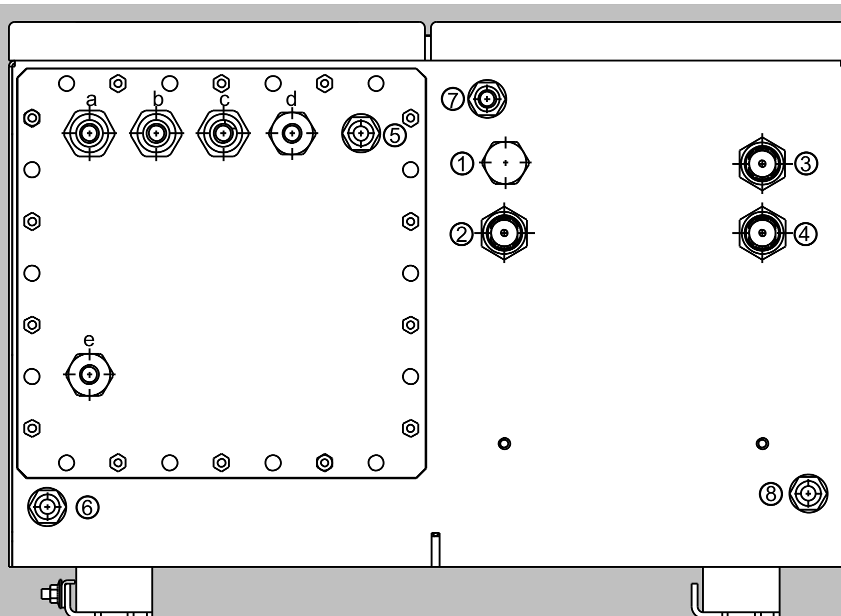
OXYMAT 6, field device, pin and terminal assignment

Circuit diagrams (Continued)



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

Circuit diagrams (Continued)



Gas connections

1	not used	Clamping gland for pipe Ø 6 mm or 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

OXYMAT 6, field device, gas connections and electrical connections

Selection and ordering data

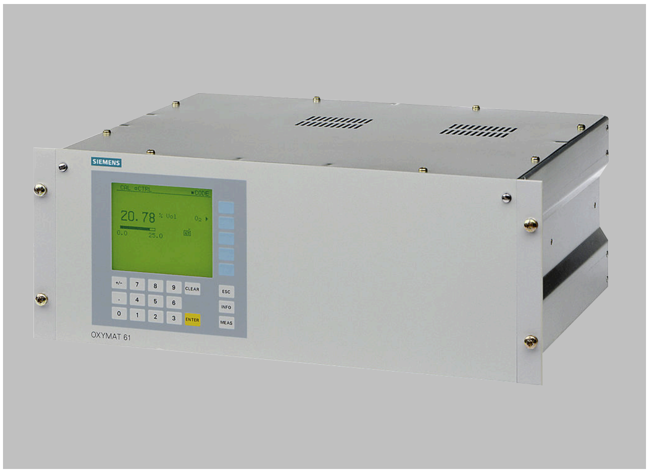
Description	7MB2021	7MB2011	7MB2011 Ex	2 years (unit)	5 years (unit)	Article No.
Analyzer unit						
O-ring (sample chamber)	x	x	x	2	4	C71121-Z100-A159
O-ring (fitting)	x	x	x	1	2	C74121-Z100-A6
O-ring (measuring head)	x	x	x	2	4	C79121-Z100-A32
Spacer		x	x	-	1	C79451-A3277-B22
Sample chamber, stainless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

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

More information

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

Overview



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

Benefits

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

Application

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

Further applications

- Chemical plants
- Gas manufacturers
- Research and development

Design

- 19" rack unit with 4 U for installation
  - In hinged frame
  - In cabinets with or without telescopic rails
- Front plate can be swung down for servicing purposes (laptop connection)
- Gas connections for sample gas inlet and outlet; pipe diameter 6 mm or ¼"
- Gas and electrical connections at the rear of the device

Display and operator panel

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

Inputs and outputs

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

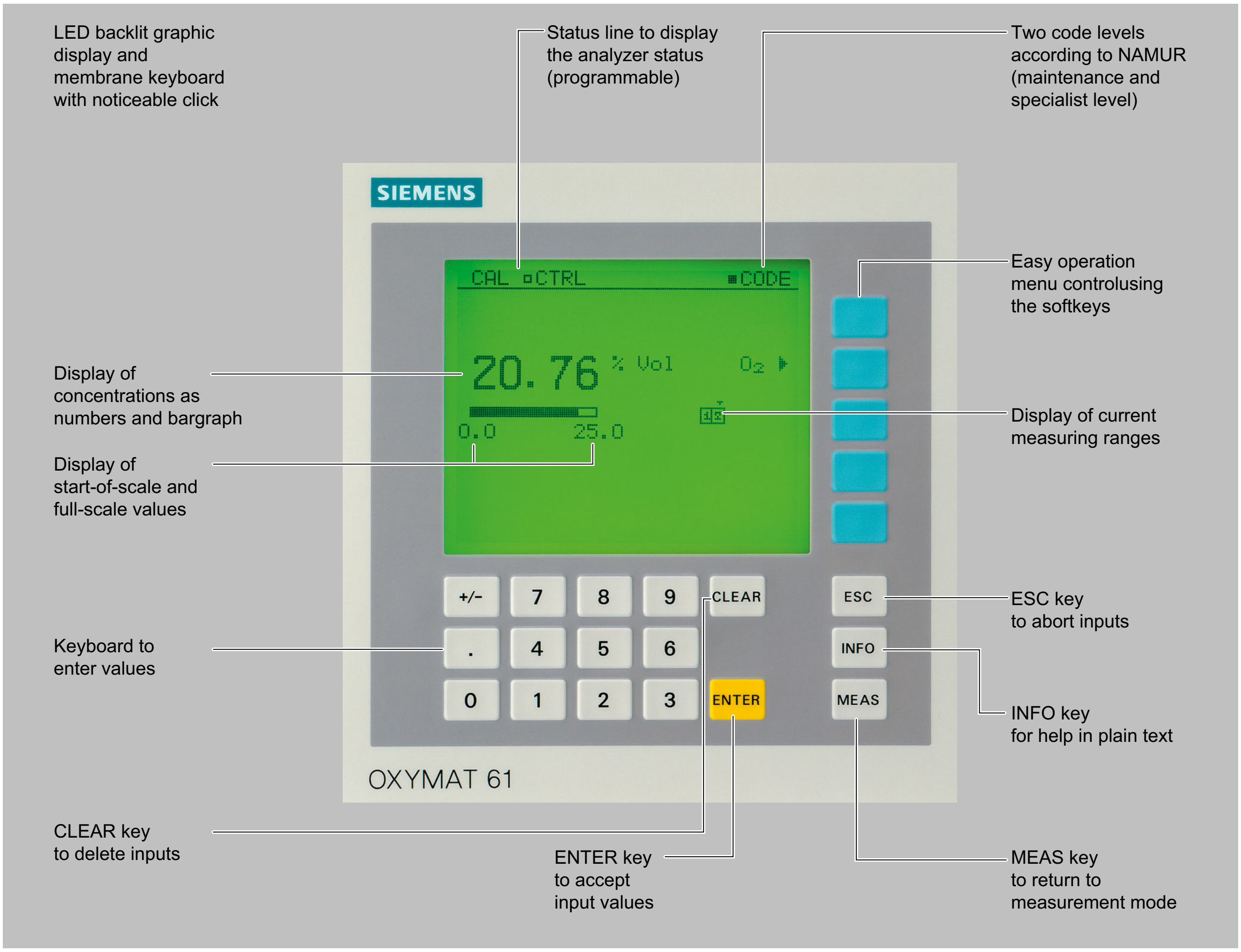
Communication

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

Options

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

Design (Continued)



OXYMAT 61, membrane keyboard and graphic display

Designs – Parts wetted by sample gas, standard

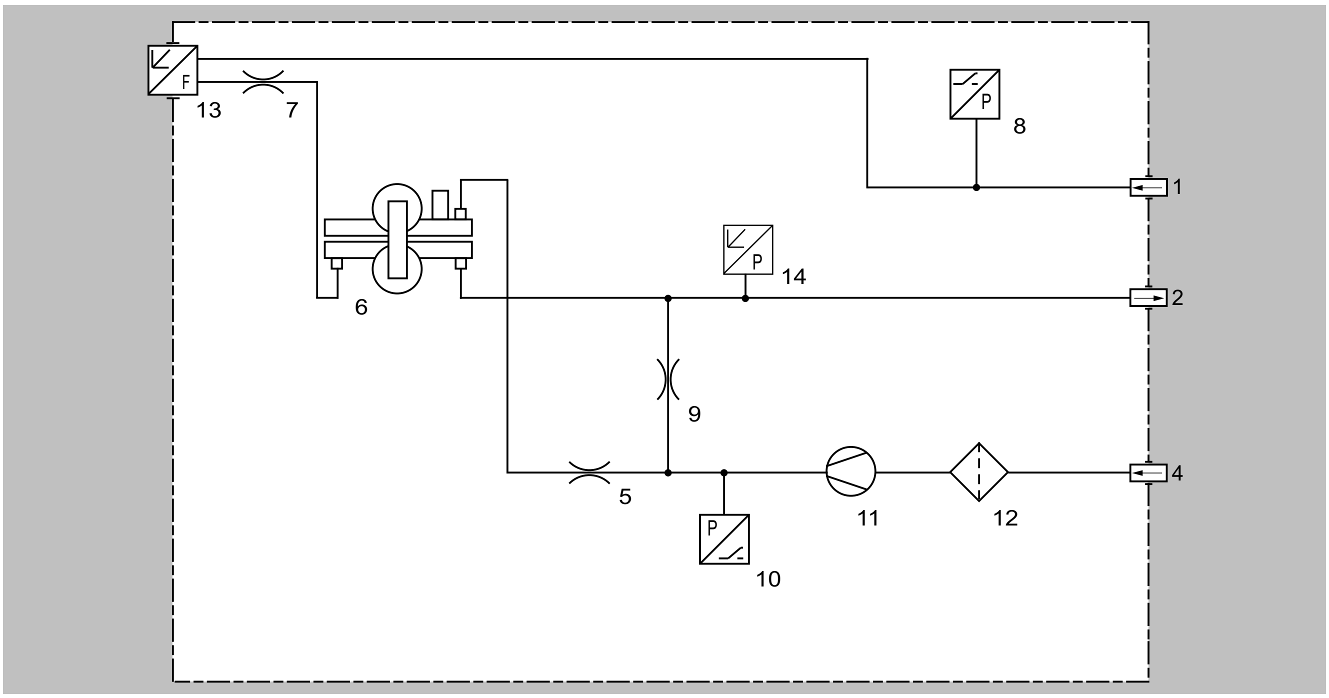
Gas path		19" rack unit
With hoses	Bushing	Stainless steel. Mat. no. 1.4571
	Hose	FKM (Viton)
	Sample chamber	Stainless steel. Mat. no. 1.4571
	Fittings for sample chamber	Stainless steel. Mat. no. 1.4571
	Restrictor	PTFE (Teflon)
	O-rings	FKM (Viton)
	Hose coupling	Polyamide 6

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

Design (Continued)

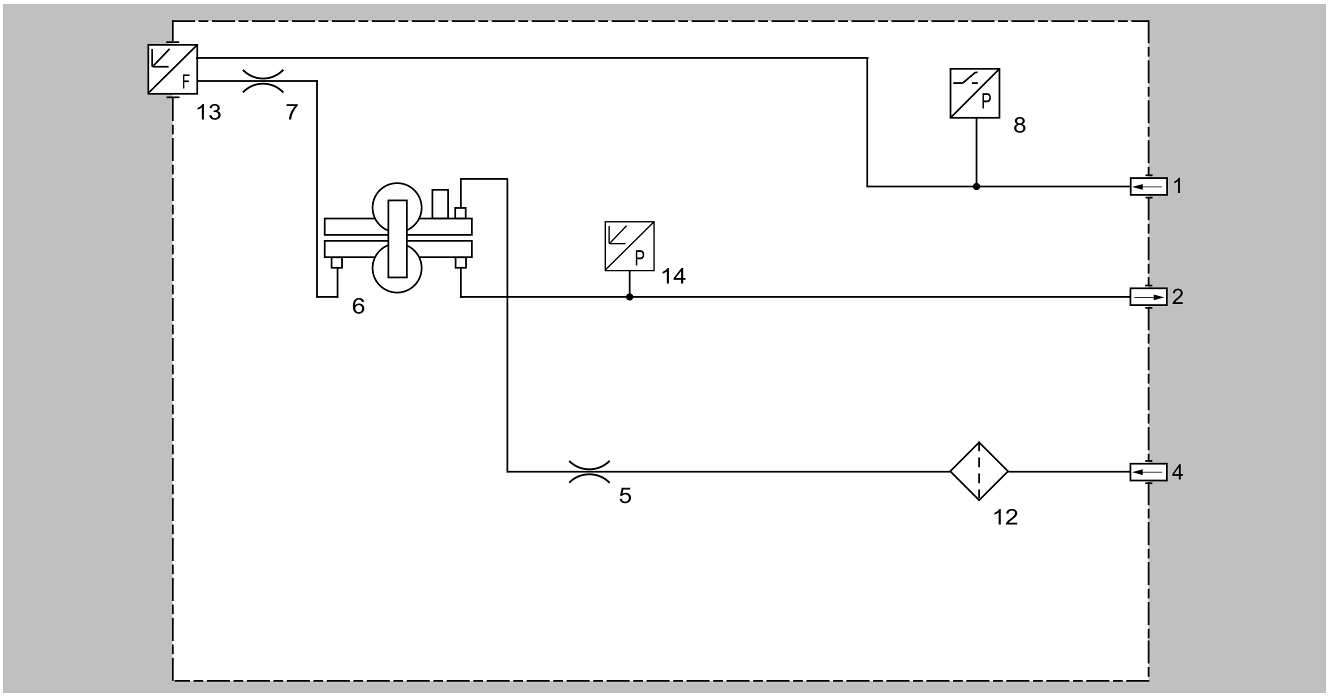
Options		
Pressure switch	Diaphragm Enclosure	FKM (Viton) PA 6.3 T

Gas path



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

Design (Continued)



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

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

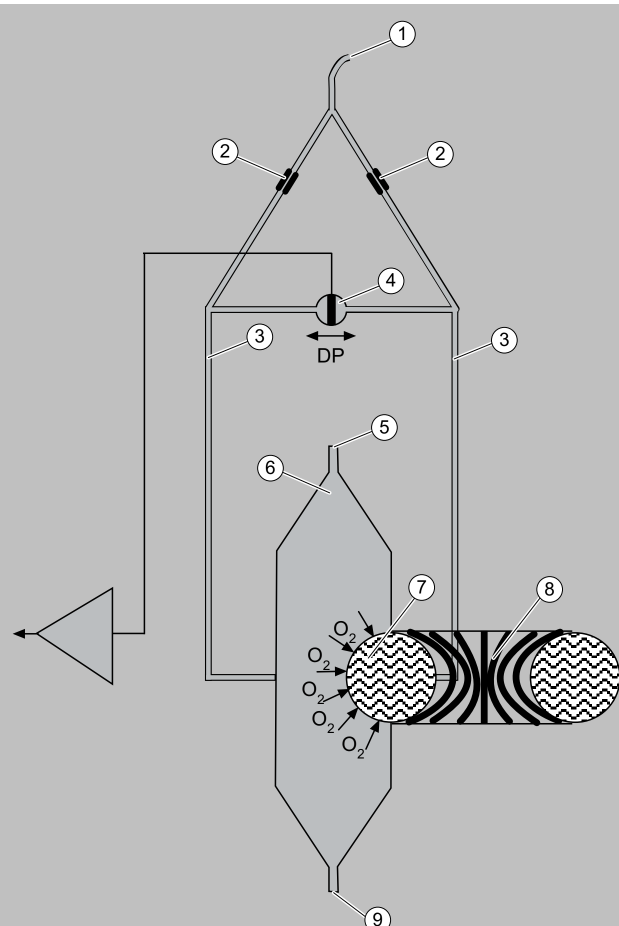
Mode of operation

In contrast to almost all other gases, oxygen is paramagnetic. This property is utilized as the measuring principle by the OXYMAT 61 gas analyzers.
Oxygen molecules in an inhomogeneous magnetic field are drawn in the direction of increased field strength due to their paramagnetism. When two gases with different oxygen contents meet in a magnetic field, a pressure difference is produced between them.
In the case of OXYMAT 61, one gas (1) is a reference gas (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 sample chamber position as well as the gas analyzer's operating position.
The sample chamber is directly in the sample path and has a small volume, and the microflow sensor is a low-lag sensor. This results in a very short response time for the OXYMAT 61.

Mode of operation (Continued)

Note

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



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

OXYMAT 61, mode of operation

Function

Main features

- Four measuring ranges which can be freely configured, even with suppressed zero point; all measuring ranges are linear
- Electrically isolated measured value output 0/2/4 through to 20 mA (including inverted)
- Choice of automatic or manual measuring range switchover; remote switching is also possible
- Storage of measured values possible during calibration
- Wide range of selectable time constants (static/dynamic noise damping); i.e. the response time of the device can be adapted to the respect-ive measuring task
- Easy handling thanks to menu-driven operation
- Low long-term drift
- Two control levels with separate authorization codes for the prevention of accidental and unauthorized operator interventions
- Automatic measuring range calibration parameterizable
- Operation based on NAMUR recommendation
- Monitoring of sample gas (option)
- Custom-made device designs, such as:
  - Customer acceptance
  - TAG plates
  - Drift recording
- Simple handling using a numerical membrane keyboard and operator prompting
- Short response time
- Reference gas supply either externally (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 for version with built-in reference gas pump
- Different smallest measuring spans, depending on version 2.0% or 5.0% O_2
- Internal pressure sensor for correction of fluctuations in the sample gas pressure

Reference gases for OXYMAT 61

Measuring range	Recommended reference gas	Reference gas connection pressure	Comments
0 to ... vol.% O_2	N_2	2 000 ... 4 000 hPa above sample gas pressure (max. 5 000 hPa absolute)	The reference gas flow is set automatically to 5 ... 10 ml/min.
... to 100 vol.% O_2	O_2	2 000 ... 4 000 hPa above sample gas pressure (max. 5 000 hPa absolute)	
Approx. 21 vol.% O_2	Air	Atm. air pressure with internal reference gas pump	

[1] Suppressed zero point with measuring range end value 100 vol.% O_2.
[2] Suppressed zero point with 21 vol.% O_2 within the measuring span.

Correction of zero-point error/cross-sensitivities

Accompanying gas (concentration 100 vol.%)	Zero point deviation in vol.% O_2 absolute
Organic gases	
Ethane C_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
Isobutane C_4H_{10}	-1.30
1-butene C_4H_8	-0.96
Isobutene 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

Function (Continued)

Accompanying gas (concentration 100 vol.%)	Zero point deviation in vol.% O_2 absolute
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
Isopentane 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

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

Conversion to other temperatures:

The zero point deviations listed in Table 1 must be multiplied by an adjustment factor (k):
- with diamagnetic gases: $k = 333\ K / (\vartheta\ [°C] + 273\ K)$
- with paramagnetic gases: $k = [333\ K / (\vartheta\ [°C] + 273\ K)]^2$

All diamagnetic gases have a negative zero point deviation.

Selection and ordering data

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

Options	Order code
Add "-**Z**" to article number and then add order code.	
Settings	
Telescopic rails (2 units)	**A31**
Set of Torx screwdrivers, ball Allen screwdrivers	**A32**
Tag plates (specific inscription based on customer information)	**B03**
Damping element for sample gas	**B04 (cannot be combined with Y02)**
SIL Declaration of Conformity (SIL 2) Functional Safety according to IEC 61508 and IEC 61511	**C20**
Clean for O_2 service (specially cleaned gas path)	**Y02**
Measuring range indication in plain text, if different from default setting[1)]	**Y11**

Accessories	Article No.
RS 485/Ethernet converter	A5E00852383
RS 485/RS 232 converter	C79451-Z1589-U1
RS 485/USB converter	A5E00852382
AUTOCAL function with 8 digital inputs/outputs each	C79451-A3480-D511
AUTOCAL function with 8 digital inputs/outputs each and PROFIBUS PA	A5E00057307

Selection and ordering data (Continued)

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

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

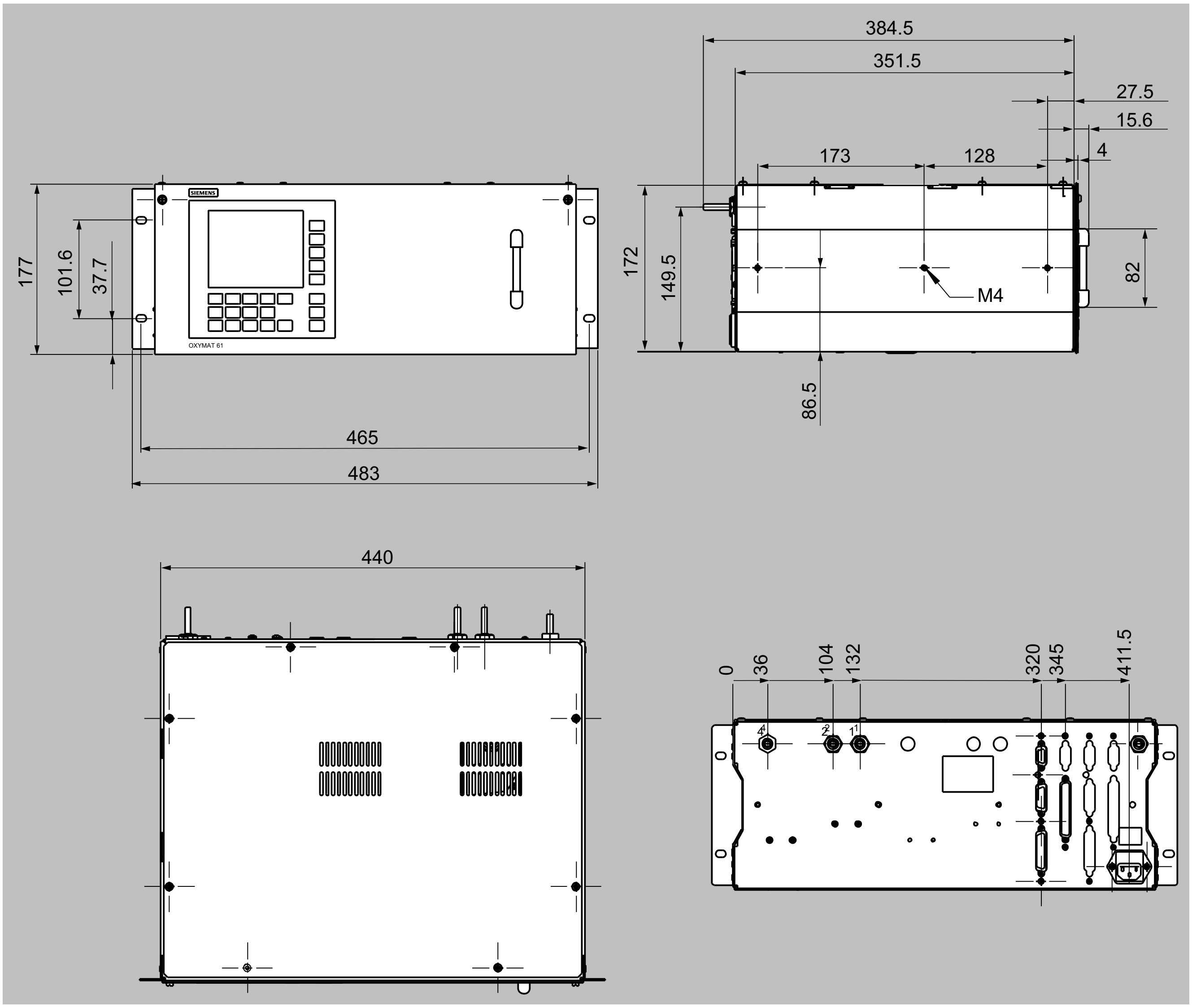
Technical specifications

OXYMAT 61, 19" rack unit	
General information	
Measuring ranges	4, internally and externally switchable; automatic measuring range switchover is also possible
Smallest possible measuring span (relating to sample gas pressure 1 000 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature)	2 vol.% or 5 vol.% O_2
Largest possible measuring span	100 vol.% O_2
Measuring ranges with suppressed zero point	Any zero point within 0 ... 100 vol.% can be implemented, provided that a suitable reference gas is used
Operating position	Front wall, vertical
Conformity	CE mark in accordance with EN 50081-1 and EN 50082-2
Design, enclosure	
Degree of protection	IP20 according to EN 60529
Weight	Approx. 13 kg
Electrical characteristics	
Auxiliary power	100 ... 120 V AC (nominal range of use 90 ... 132 V), 48 ... 63 Hz or 200 ... 240 V AC (nominal range of use 180 ... 264 V), 48 ... 63 Hz
Power consumption	Approx. 45 VA
EMC (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98)
Electrical safety	According to EN 61010-1, overvoltage category III
Fuse ratings	100 ... 120 V: 1.0T/250 200 ... 240 V: 0.63T/250
Gas inlet conditions	
Permissible sample gas pressure	
• External reference gas supply	800 ... 1 200 hPa, absolute
• With integrated pump	Atmospheric pressure ± 50 hPa
Sample gas flow	18 ... 60 l/h (0.3 ... 1 l/min)
Sample gas temperature	Min. 0 ... max. 50 °C, but above the dew point
Sample gas humidity	< 90% relative humidity
Reference gas pressure (high-pressure version)	2 000 ... 4 000 hPa above sample gas pressure, but max. 5 000 hPa, absolute (version without reference gas pump)
Reference gas pressure (low-pressure version) with external pump	Min. 100 hPa above sample gas pressure
Time response	
Warm-up period	At room temperature < 30 min (the technical specification will be met after 2 hours)
Delayed display (T_{90})	3.5 s
Damping (electrical time constant)	0 ... 100 s, configurable
Dead time (purging time of the gas path in the device at 1 l/min)	Approx. 0.5 ... 2.5 s, depending on the version
Time for device-internal signal processing	< 1 s
Pressure correction range	
Pressure sensor internal	500 ... 2 000 hPa, absolute (see gas inlet conditions for permissible sample gas pressure)

Technical specifications (Continued)

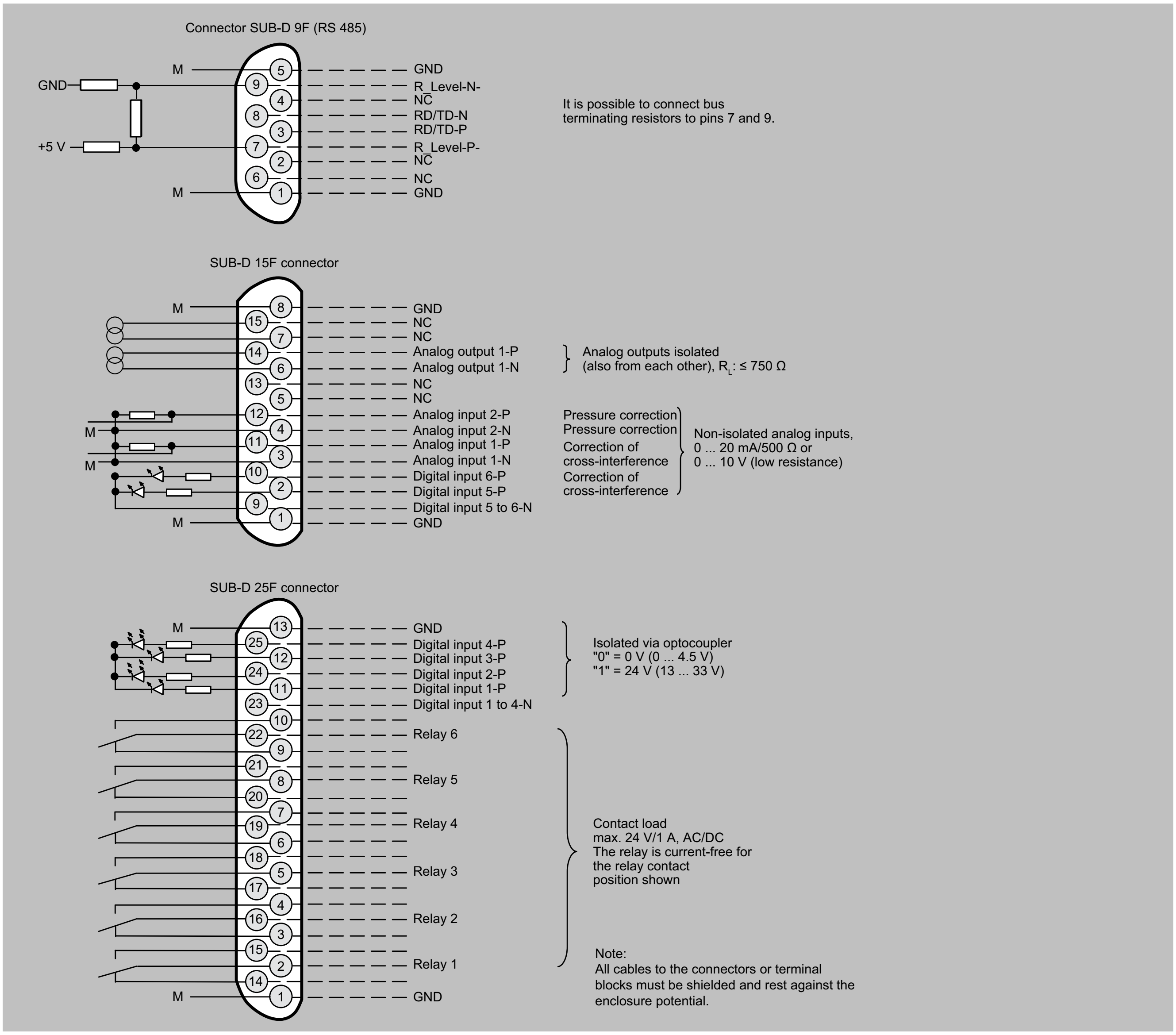
OXYMAT 61, 19" rack unit	
Measuring response	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation	< ± 0.75% of the smallest possible measuring range according to nameplate, with electronic damping constant of 1 s (corresponds to ± 0.25% at 2 σ)
Zero point drift	< ± 0.5%/month of the smallest possible measuring span according to nameplate
Measured value drift	< ± 0.5%/month of the current measuring range
Repeatability	< 1% of the current measuring range
Detection limit	1% of the current measuring range
Linearity error	< 1% of the current measuring range
Influencing variables	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 variation • With enabled pressure compensation: < 0.2% of the current measuring range/1% pressure variation
Accompanying gases	Zero point deviation corresponding to paramagnetic or diamagnetic deviation of accompanying gas (see table)
Sample gas flow at zero point	< 1% of the current measuring range according to nameplate with a change in flow of 0.1 l/min within the permissible flow range
Auxiliary power	< 0.1% of the current measuring range with nominal voltage ± 10%
Electrical inputs and outputs	
Analog output	0/2/4 ... 20 mA, floating; max. load 750 Ω
Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load rating: 24 V AC/DC/1 A, floating
Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and accompanying gas influence correction (correction of cross-interference)
Digital inputs	6, designed for 24 V, floating, freely configurable, e.g. for measuring range switchover
Serial interface	RS 485
Options	AUTOCAL function each with 8 additional digital inputs and relay outputs, also with PROFIBUS PA or PROFIBUS DP
Climatic conditions	
Permissible ambient temperature	-30 ... +70 °C during storage and transportation, 5 ... 45 °C during operation
Permissible humidity	< 90% relative humidity as annual average during storage and transportation (must not fall below dew point)

Dimensional drawings



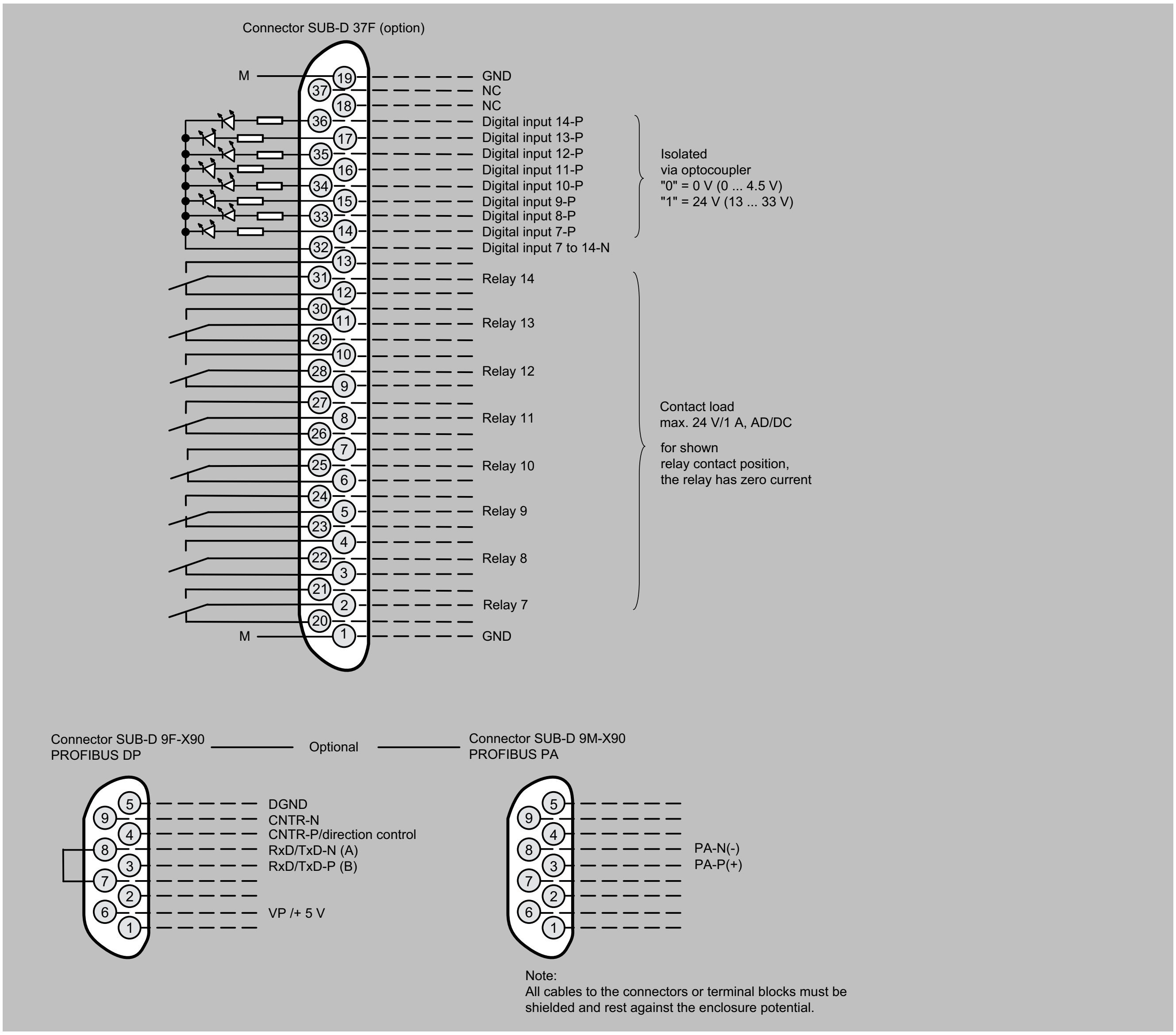
OXYMAT 61, 19" rack unit, dimensions in mm

Circuit diagrams



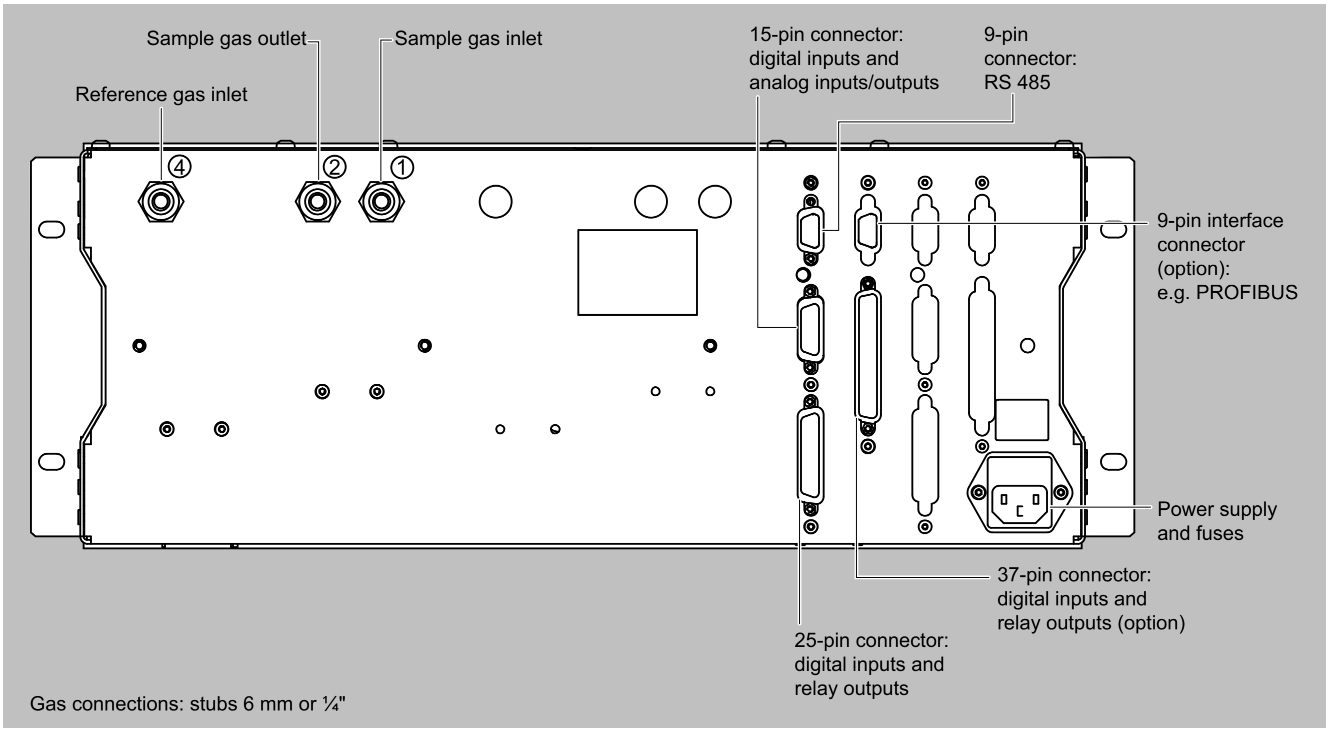
OXYMAT 61, 19" rack unit, pin assignment

Circuit diagrams (Continued)



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

Circuit diagrams (Continued)



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

Selection and ordering data

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

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

More information

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

OXYMAT 64

Overview

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

Benefits

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

Application

Production of technical gases
- Measurements in N_2 and CO_2

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

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

Food production
- Measurement in CO_2 (e.g. breweries)

Electronics industry
- Low-pressure version with pump

Flow soldering systems

Design

- 19" rack unit with 4 U for installation
  - In hinged frame
  - In cabinets with or without telescopic rails
- Front plate can be swung down for servicing purposes (laptop connection)
- Connections for sample gas
  - Input: Clamping ring connection for a pipe diameter of 6 mm or ¼"
  - Output: Pipe connection with diameter 6 mm or ¼"
- High-pressure and low-pressure versions
- Catalytically active and inactive cell

Display and operator panel

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

Design (Continued)

- Menu-driven operation for parameterization, configuration, test functions, adjustment
- User help in plain text
- Graphic display of concentration trend; programmable time intervals
- Bilingual operating software German/English, English/Spanish, French/English, Spanish/English, Italian/English
- Switchover from ppm/vpm measuring range to % measuring range

Inputs and outputs

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

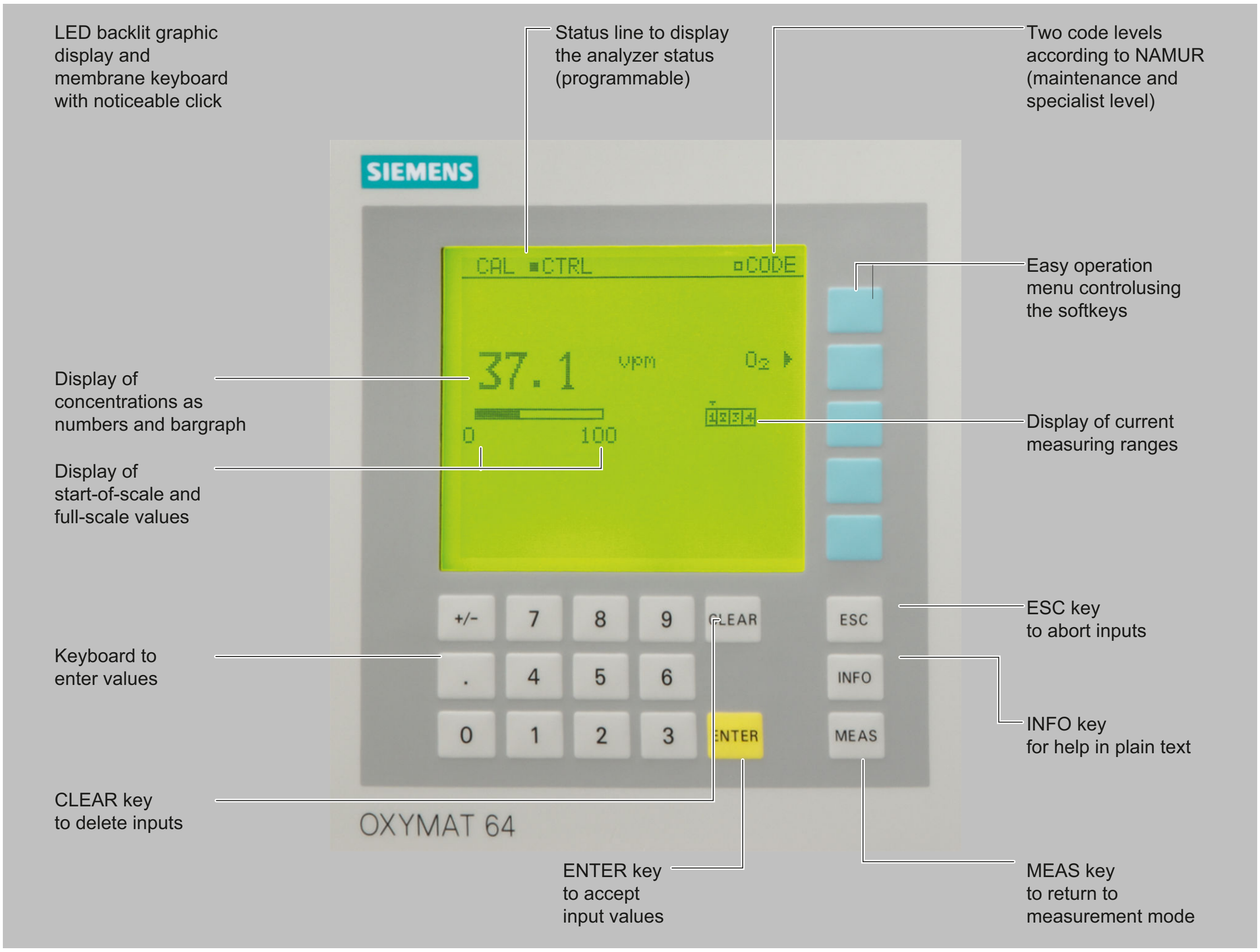
Communication

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

Options

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

Design (Continued)



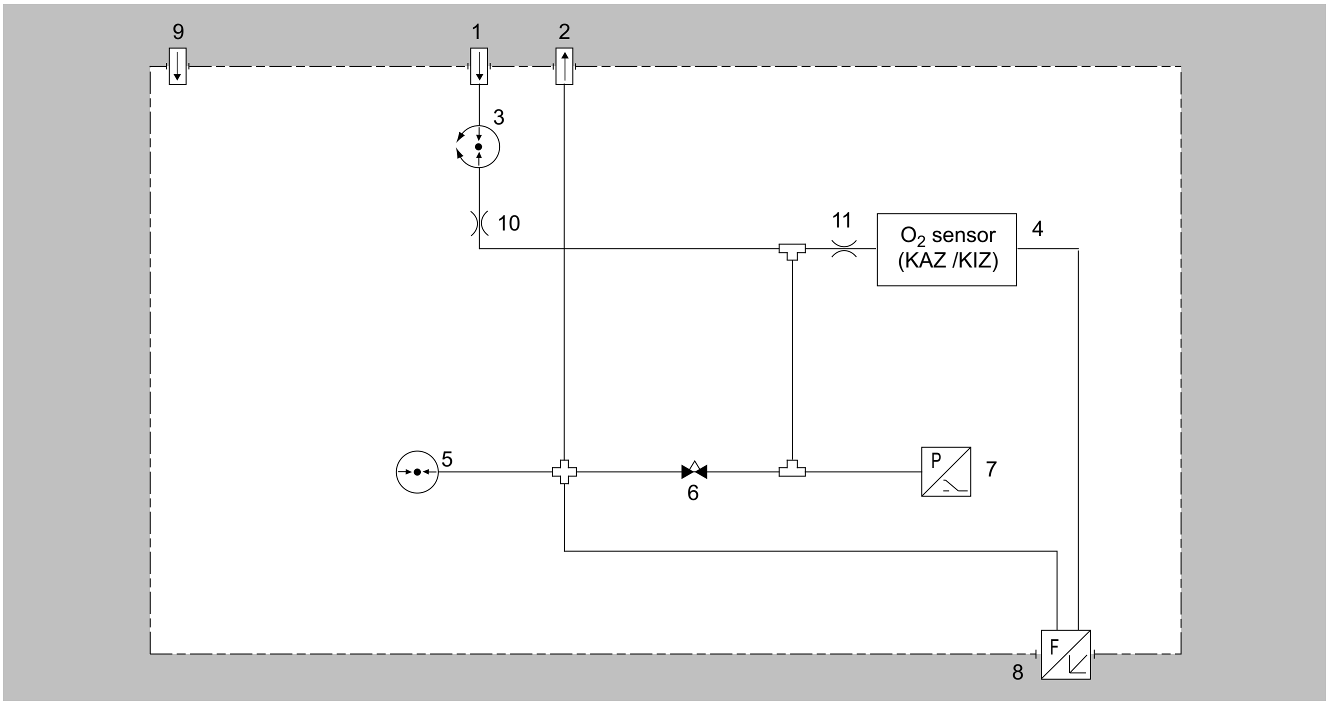
OXYMAT 64, membrane keyboard and graphic display

Designs – Parts wetted by sample gas, standard

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

Design (Continued)

Gas path (high-pressure version)



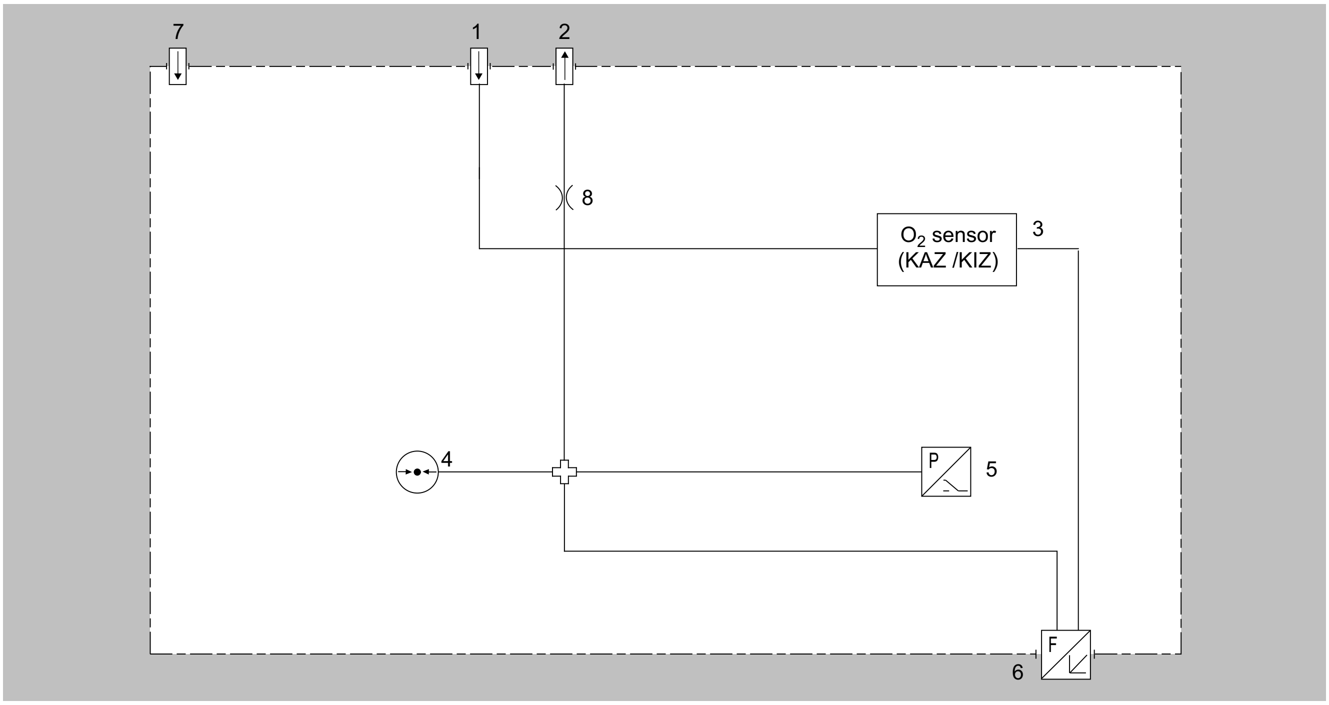
Gas path OXYMAT 64, high-pressure version

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

The sample gas pressure (2 000 to 6 000 hPa) is regulated by the pressure regulator (3) at approx. 2 000 hPa or is provided by the operator with 2 000 hPa. This pressure is applied at the restrictor (10). The restrictor (10) reduces the pressure such that a sample gas flow of 15 to 30 l/h is created. This flow is subdivided via the sample gas restrictor (11) and the adjustable bypass restrictor (6) such that there is a sample gas flow of 7.5 l/h through the sensor.
If the sample gas can flow off into the atmosphere unhampered, the sample gas pressure corresponds to the atmospheric pressure. If the sample gas flows off via an exhaust gas line, it works like a flow resistance. If the resulting dynamic pressure exceeds 100 hPa (rel.), a maintenance demanded is output.

Design (Continued)

Gas path (low pressure)



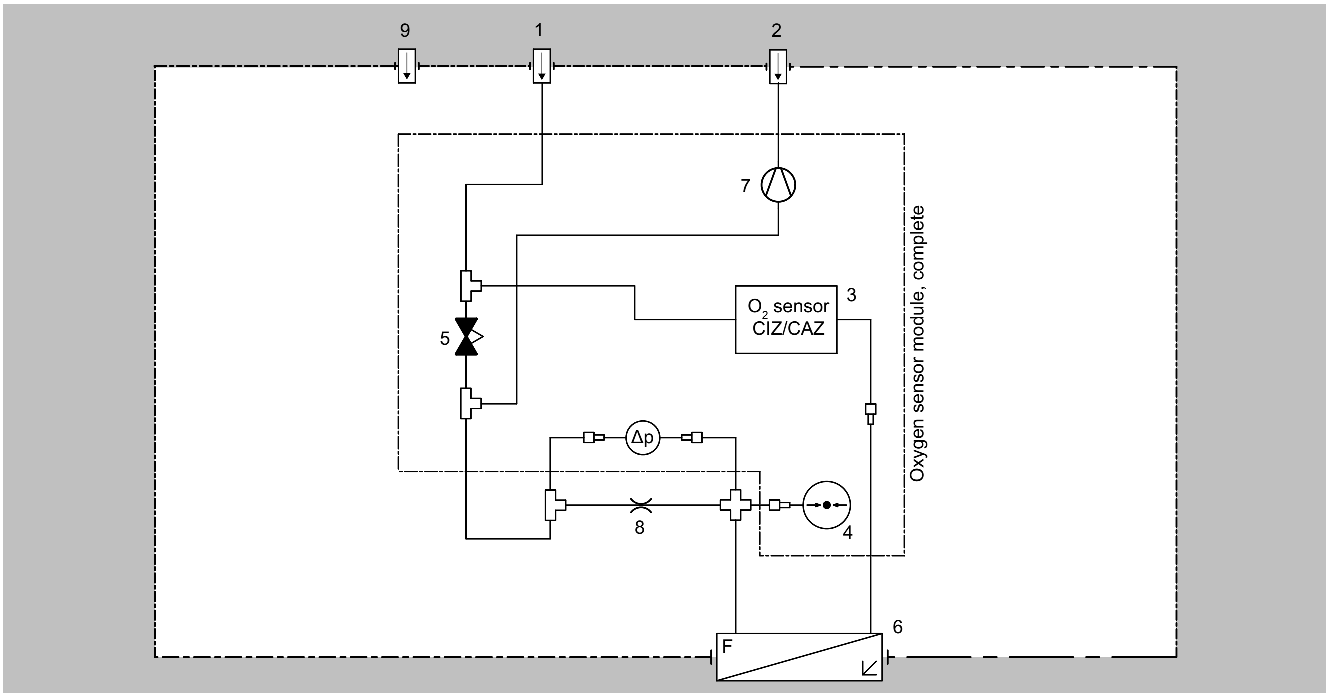
Gas path OXYMAT 64, low-pressure version

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

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

Design (Continued)

Gas path (low pressure with integrated sample gas pump)



Low-pressure version with integrated sample gas pump

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

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

Mode of operation

The measuring cell consists of a cylindrical (pipe-shaped) ZrO_2 diaphragm. The sample gas (low O_2 content) flows at a constant rate through the inside of the diaphragm, which is regulated at 650 °C. The exterior of the sensor is exposed to the ambient air (approx. 21% O_2).
Both sides of the ZrO_2 diaphragm are coated with thin platinum films that act as electrodes. This forms a solid, electrochemical cell. The amount of oxygen atoms ionized depends on the oxygen concentration at the electrodes.
The differences in concentration at each side means that a differential partial pressure prevails. Since ZrO_2 conducts ions at 650 °C, ionic migration takes place in the direction of the lower partial pressure.
An oxygen gradient arises across the width of the ZrO_2 diaphragm, which, according to equation (1), results in an electrical potential difference between the platinum electrodes.
Defects in the crystal lattice, caused by contamination of the ZrO_2 material with Y_2O_3 and/or CaO (introduced originally to prevent cracks forming in ceramic material) make it easier for O_2 ions to diffuse in the ZrO_2 grid.

Catalytically active ZrO_2 sensor (CAC)

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

Catalytically inactive ZrO_2 sensor (CIC)

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

Measuring effect

$U = U_A + RT/4F$ (In [O_2, air] - In [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

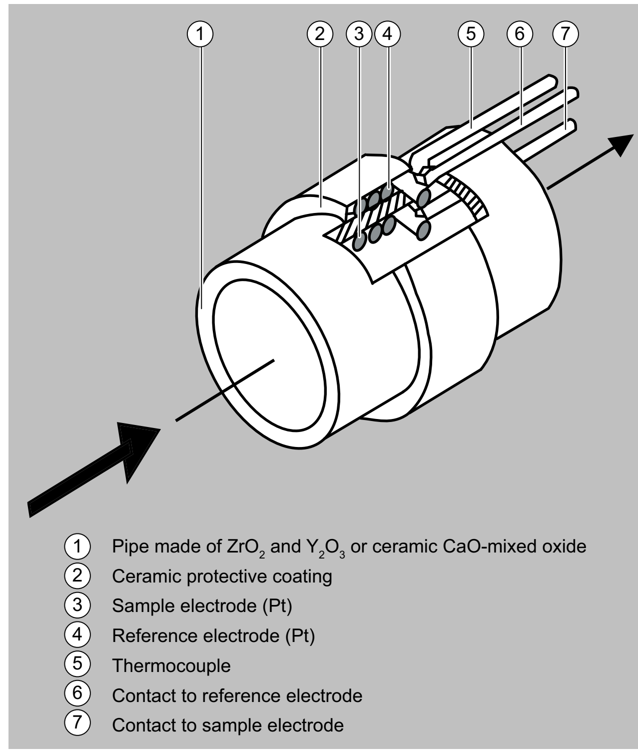
Note

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

Mode of operation (Continued)



OXYMAT 64, principle of operation

Function

Main features

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

Function (Continued)

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

Cross-interference

Catalytically active sensor (CAC)

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

Catalytically inactive sensor (CIC)

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

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

Examples of typical interference gas offsets on a catalytically inactive sensor

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

OXYMAT 64 / 19" rack unit

Selection and ordering data

OXYMAT 64 gas analyzer 19" rack unit for installation in cabinets	**Article No.** 7MB2041-	●	●	●	1	●	-	●	A	●	●
Click on the Article No. for online configuration in the PIA Life Cycle Portal. ***Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".***											
Sensor											
ZrO_2: catalytically active cell (CAC)		0									
ZrO_2: catalytically inactive cell (CIC)		1									
ZrO_2: catalytically active cell (CAC); with differential pressure sensor		2									
ZrO_2: catalytically inactive cell (CIC); with differential pressure sensor		3									
Sample gas pressure											
High pressure, without pressure regulator; 2 000 hPa (abs.)			A								
High pressure, with pressure regulator; 2 000 ... 6 000 hPa (abs.)			B								
Low pressure, with pump, atmosphere			C								
Low pressure, without suction pump, atmosphere			D								
Gas connection											
Input: Clamping ring connection 6 mm / outlet: Fittings 6 mm				A							
Input: Clamping ring connection ¼" / outlet: Fittings ¼"				B							
Add-on electronics											
Without						0					
AUTOCAL function with 8 additional digital inputs and outputs						1					
AUTOCAL function 8 additional digital inputs/outputs and PROFIBUS PA interface						6					
AUTOCAL function with 8 additional digital inputs/outputs and PROFIBUS DP interface						7					
Auxiliary power											
100 V ... 120 V AC, 48 ... 63 Hz								0			
200 V ... 240 V AC, 48 ... 63 Hz								1			
Explosion protection											
Without										A	
Language of the operating software											
German											0
English											1
French											2
Spanish											3
Italian											4

Options	Order code
Add "**-Z**" to article number and then add order code.	
Settings	
Telescopic rails (2 units)	**A31**
Tag plates (specific inscription based on customer information)	**B03**
Clean for O_2 service (specially cleaned gas path)	**Y02**
Measuring range indication in plain text, if different from default setting	**Y11**
Special setting (only together with an application no., e.g. extended measuring range)	**Y12**
Extended special setting (only in conjunction with an application no., e.g. determination of cross-interferences)	**Y13**

Accessories	Article No.
RS 485/Ethernet converter	A5E00852383
RS 485/RS 232 converter	C79451-Z1589-U1
RS 485/USB converter	A5E00852382
AUTOCAL function with 8 digital inputs/outputs each	C79451-A3480-D511

Selection and ordering data (Continued)

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

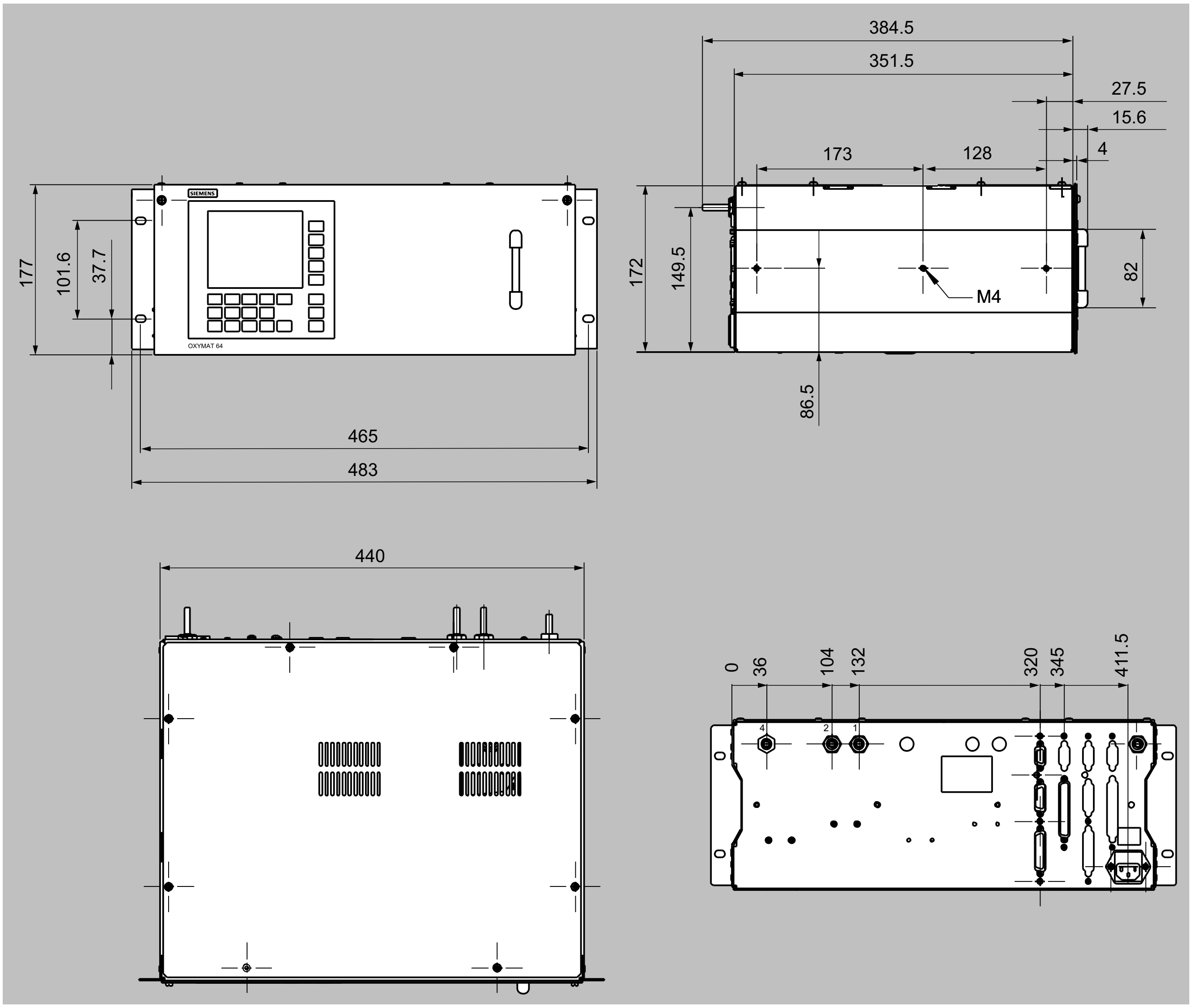
Technical specifications

OXYMAT 64, 19" rack unit	
General information	
Measuring ranges	4, internally and externally switchable; automatic measuring range switchover also possible
Smallest possible measuring span (relating to sample gas pressure 1 000 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature)	0 ... 10 vpm O_2
Largest possible measuring span	0 ... 100%
Operating position	Front wall, vertical
Conformity	CE mark in accordance with EN 50081-1, EN 50082-2 and RoHS
Design, enclosure	
Degree of protection	IP20 according to EN 60529
Weight	Approx. 11 kg
Electrical characteristics	
EMC interference immunity (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98) and EN 61326
Electrical safety	In accordance with EN 61010-1, overvoltage category II
Auxiliary power	100 ... 120 V AC (nominal range of use 90 ... 132 V), 48 ... 63 Hz or 200 ... 240 V AC (nominal range of use 180 ... 264 V), 48 ... 63 Hz
Power consumption	Approx. 37 VA
Fuse ratings	100 ... 120 V: 1.0T/250 200 ... 240 V: 0.63T/250
Gas inlet conditions	
Sample gas flow	
• Through the sensor	7.5 l/h
• Total consumption	15 ... 30 l/h
Permissible sample gas pressure	
• Without internal pressure regulator	2 000 hPa (abs.)
• With internal pressure regulator	2 000 ... 6 000 hPa (abs.)
Sample gas temperature	Min. 0 ... max. 50 °C, but above the dew point
Sample gas humidity	< 1% relative humidity
Time response	
Warm-up period	At room temperature < 30 min (the technical specification will be met after 2 hours)
Damping (electrical time constant)	0 ... 100 s, configurable
Dead time (high-pressure version) (purging time of the gas path in the device at 125 ml/min)	10 ... 30 s
Dead time (low-pressure version without pump)	< 5 s
Dead time (low-pressure version with pump)	< 10 s
Time for device-internal signal processing	< 1 s
Pressure correction range	
Pressure sensor internal	800 ... 1 100 hPa (abs.)

Technical specifications (Continued)

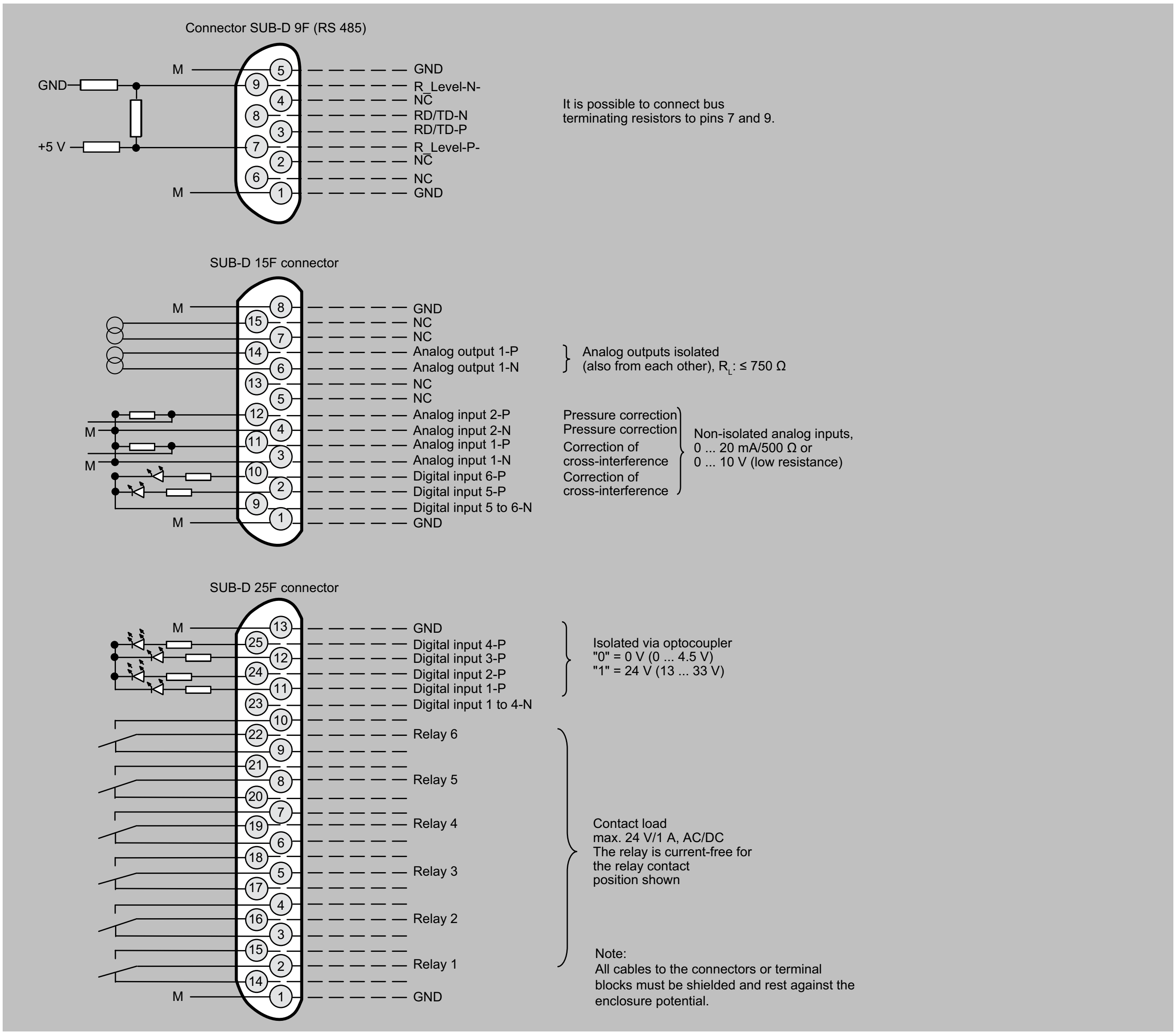
OXYMAT 64, 19" rack unit	
Measuring response	Based on sample gas pressure 1 013 hPa absolute, 7.5 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation	< ± 1% of the smallest possible measuring range according to nameplate, with electronic damping constant of 1 s
Zero point drift	< ± 1% of the current measuring span/month
Measured value drift	< ± 1% of the current measuring span/month
Repeatability	< 3% of the current measuring span
Detection limit	1% of current measuring range, < 0.1 vpm in measuring range 0 ... 10 vpm
Linearity error	< 2% of the current measuring span
Influencing variables	Based on sample gas pressure 1 013 hPa absolute, 7.5 l/min sample gas flow and 25 °C ambient temperature
Ambient temperature	< 2%/10 K referred to current measuring span
Sample gas pressure only possible if the sample gas can flow out into the ambient air	• With disabled pressure compensation: < 1% of current measuring span/1% pressure variation • With enabled pressure compensation: < 0.2% of current measuring span/1% pressure variation
Accompanying gases, deviation from zero point	
• Catalytically active cell (CAC)	Only gases with non-flammable accompanying gas components can be introduced
• Catalytically inactive cell (CIC)	Accompanying 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 measuring span with a change in flow of 10 ml/min
Auxiliary power	< 0.1% of the current measuring range with nominal voltage ± 10%
Electrical inputs and outputs	
Analog output	0/2/4 ... 20 mA, 4 ... 20 mA (NAMUR), floating; max. load 750 Ω
Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load rating: 24 V AC/DC/1 A, floating
Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and accompanying gas influence correction (correction of cross-interference)
Digital inputs	6, designed for 24 V, floating, freely configurable, e.g. for measuring range switchover
Serial interface	RS 485
Options	AUTOCAL function each with 8 additional digital inputs and relay outputs; also with PROFIBUS PA or PROFIBUS DP
Climatic conditions	
Permissible ambient temperature	-40 ... +70 °C during storage and transportation, 5 ... 45 °C during operation
Permissible humidity	< 90% relative humidity as annual average during storage and transportation (must not fall below dew point)

Dimensional drawings



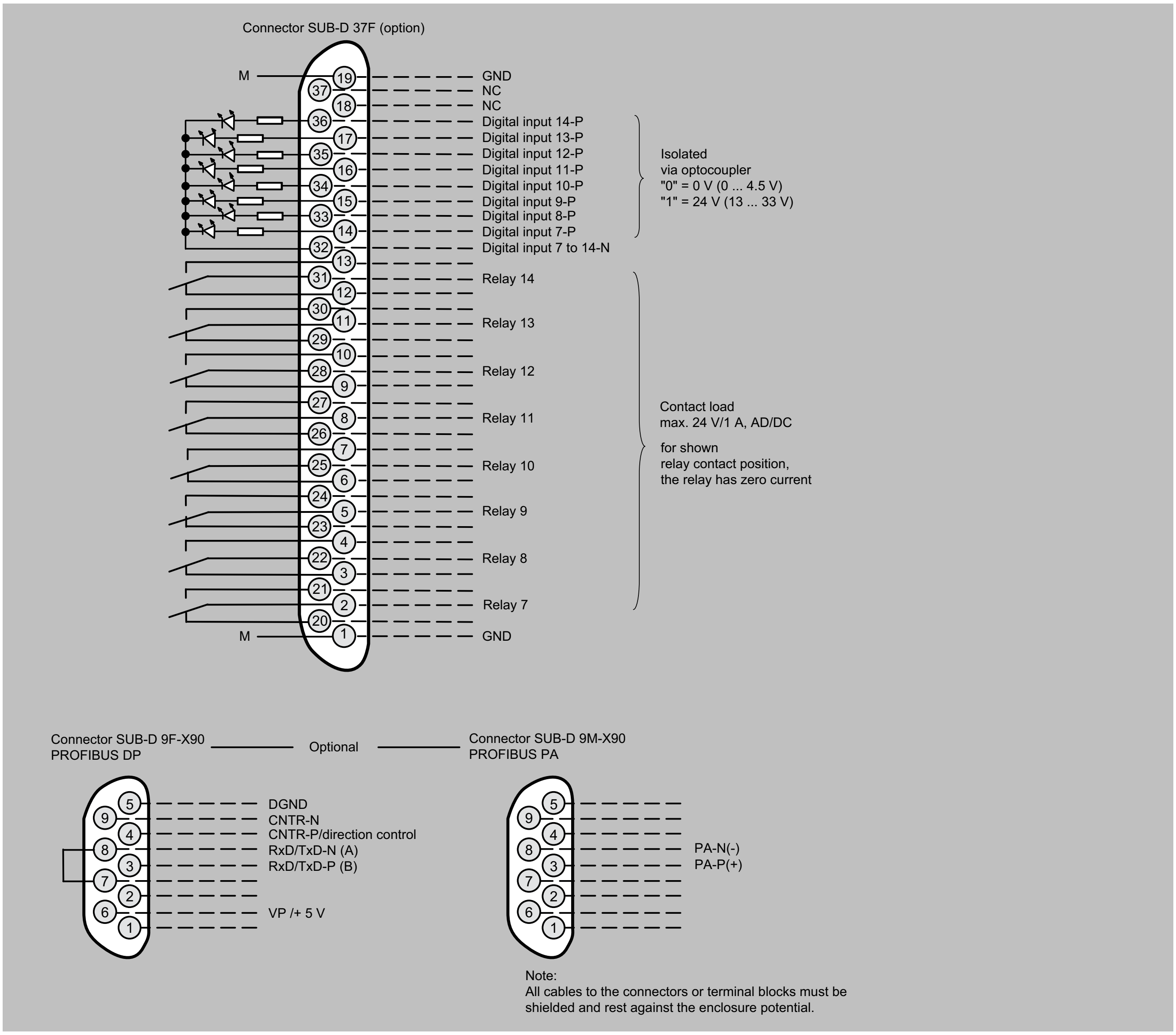
OXYMAT 64, 19" rack unit, dimensions in mm

Circuit diagrams



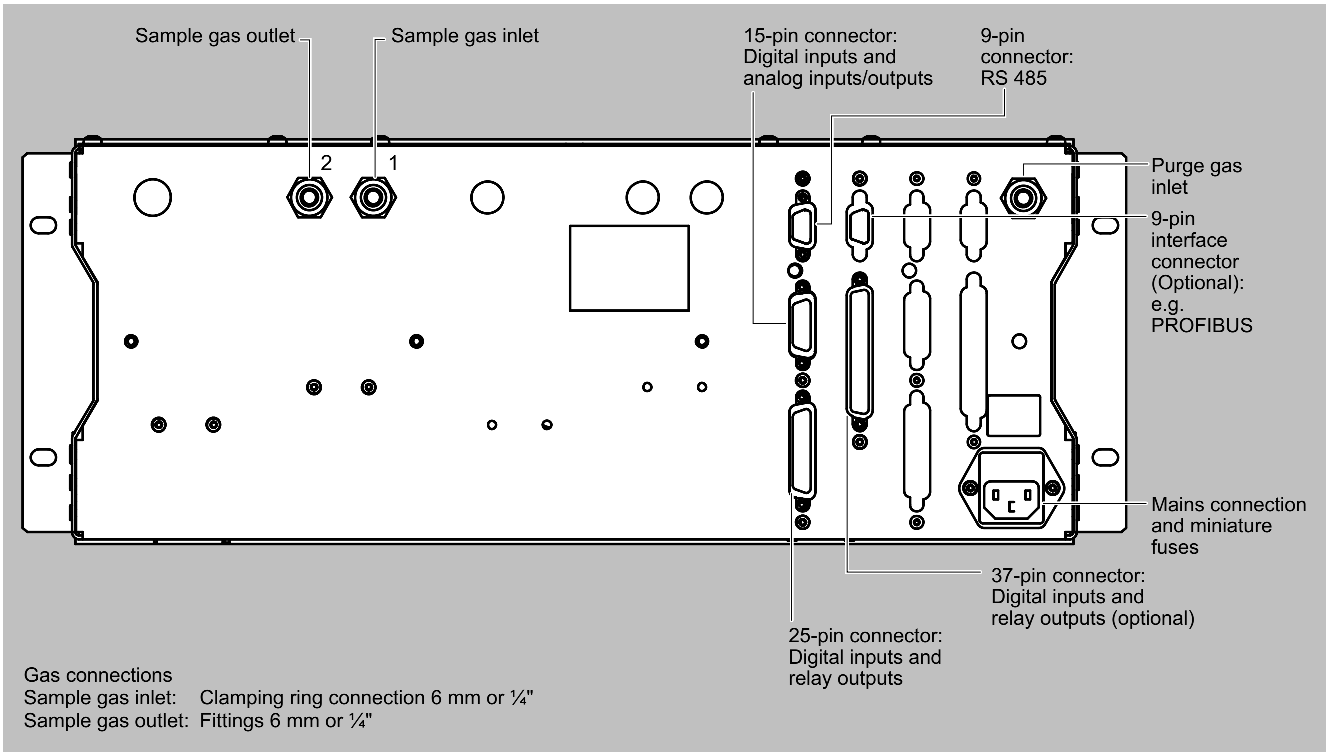
OXYMAT 64, 19" rack unit, pin assignment

Circuit diagrams (Continued)



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

Circuit diagrams (Continued)



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

Selection and ordering data

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

Overview

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

Benefits

- Small T_{90} time due to micromechanical-produced Si sensor
- Universally applicable hardware basis, high measuring range dynamics (e.g. 0 to 1%, 0 to 100%, 95 to 100% H_2)
- Integrated correction of cross-interference, no external calculation required
- Open interface architecture (RS 485, RS 232, PROFIBUS)
- SIPROM GA network for maintenance and service information (option)
- Electronics and physics: gas-tight separation, purgeable, IP65, long service life even in harsh environments
- Ex(p) for Zones 1 and 2 (in accordance with 94/9/EC (ATEX 2G and ATEX 3G), and Class I Div 2 (CSA) Ex(n)

Application

Application areas

- Pure gas monitoring (0 to 1% H_2 in Ar)
- Protective gas monitoring (0 to 2% He in N_2)
- Hydroargon gas monitoring (0 to 25% H_2 in Ar)
- Forming gas monitoring (0 to 25% H_2 in N_2)
- Gas production:
  - 0 to 2% He in N_2
  - 0 to 10% Ar in O_2
- Chemical applications:
  - 0 to 2% H_2 in NH_3
  - 50 to 70% H_2 in N_2
- Wood gasification (0 to 30% H_2 in $CO/CO_2/CH_4$)
- Blast furnace gas (0 to 5% H_2 in $CO/CO_2/CH_4/N_2$)
- Bessemer converter gas (0 to 20% H_2 in CO/CO_2)
- Monitoring equipment for hydrogen-cooled turbo-alternators:
  - 0 to 100% CO_2/Ar in air
  - 0 to 100% H_2 in CO_2/Ar
  - 80 to 100% H_2 in air
- Versions for analyzing flammable and non-flammable gases or vapors for use in hazardous areas (Zone 1 and Zone 2)

Application (Continued)

Special versions

Special applications

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

Design

19" rack unit

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

Field device

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

Display and operator panel

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

Inputs and outputs

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

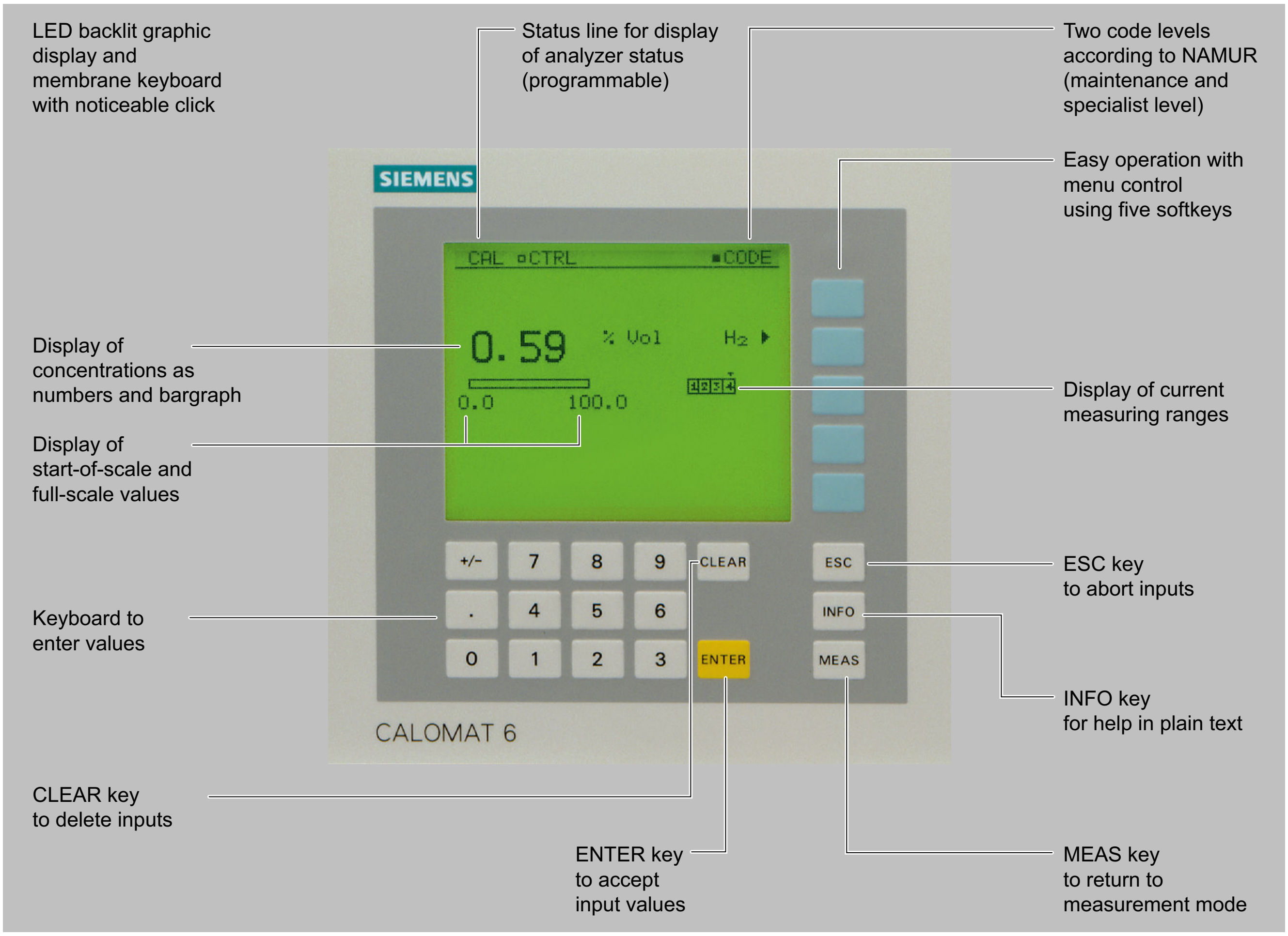
Communication

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

<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

Design (Continued)

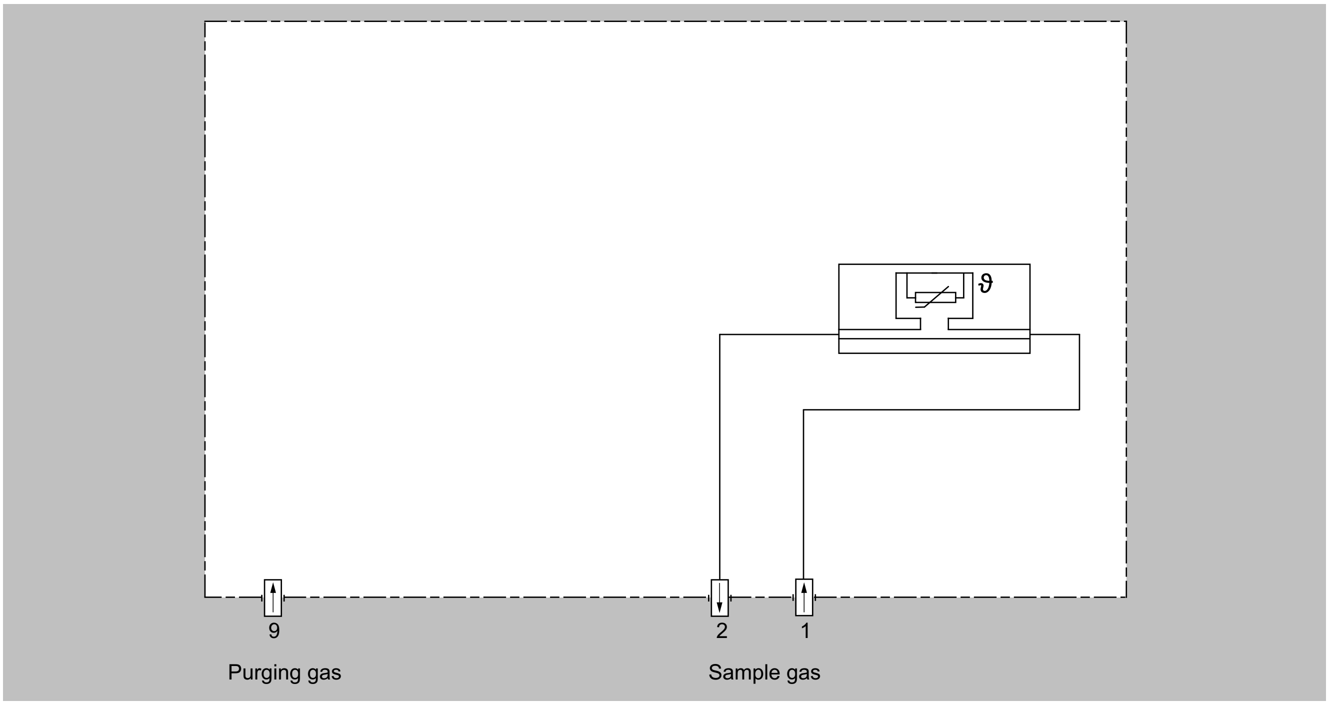


CALOMAT 6, membrane keyboard and graphic display

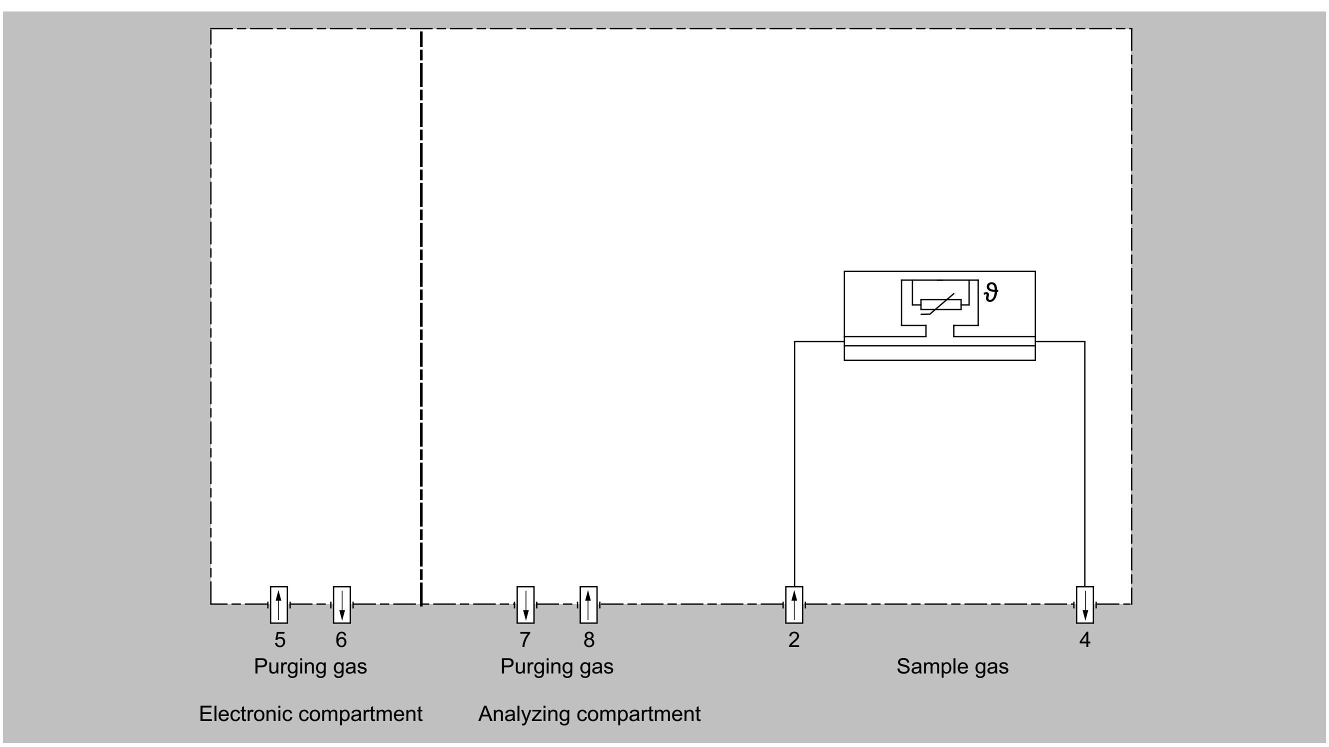
Designs – parts wetted by sample gas

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

Design (Continued)



CALOMAT 6, 19" rack unit, gas path



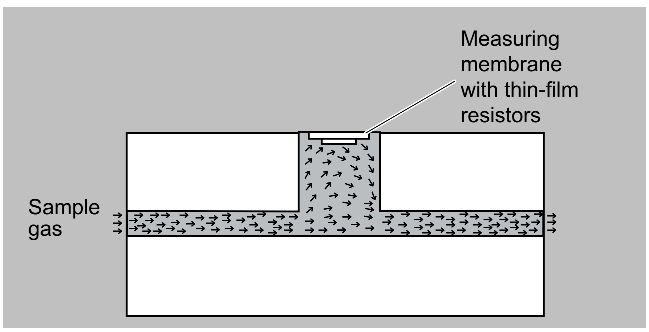
CALOMAT 6, field device, gas path

Mode of operation

The measuring principle is based on the different thermal conductivity of gases.
The CALOMAT 6 works with a micromechanically produced Si chip whose measuring diaphragm is equipped with thin-film resistors.
The resistors are kept at a constant temperature. This requires a current intensity that takes on a specific value depending on the thermal conductivity of the sample gas. This "raw value" is electronically further processed to calculate the gas concentration.
The sensor is located in a thermostatically-controlled stainless steel enclosure in order to prevent the influence of changes in ambient temperature.
To prevent the influence of changes in flow, the sensor is positioned in a bore hole located to the side of the main flow.

Note

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



CALOMAT, principle of operation

Function

Main features

- Four measuring ranges which can be freely configured, even with suppressed zero point; all measuring ranges are linear
- Smallest measuring spans down to 1% H_2 (with suppressed zero point: 95 to 100% H_2) possible
- Measuring range identification
- Electrically isolated measured value output 0/2/4 through to 20 mA (including inverted)
- Automatic or manual measuring range switchover selectable; remote switching is also possible
- Storage of measured values possible during calibration
- Wide range of selectable time constants (static/dynamic noise damping); i.e. the response time of the device can be adapted to the respective measuring task
- Short response time
- Low long-term drift
- Measuring point switchover for up to 6 measuring points (parameterizable)
- Measuring range identification
- Measuring point identification
- External pressure sensor can be connected – for correction of variations in sample gas pressure
- Automatic measuring range calibration parameterizable
- Operation based on NAMUR recommendation

Function (Continued)

- Two control levels with separate authorization codes for the prevention of accidental and unauthorized operator interventions
- Simple handling using a numerical membrane keyboard and operator prompting
- Custom-made device designs, such as:
  - Customer acceptance
  - TAG plates
  - Drift recording
  - Clean for O_2 service

Measuring spans

The smallest and largest possible measuring spans depend on both the measured component (gas type) and the respective application. The smallest possible measuring spans listed below refer to N_2 as the accompanying gas. With other gases which have a larger/smaller thermal conductivity than N_2, the smallest possible measuring span is also larger/smaller.

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

Cross-interferences

Knowledge of the sample gas composition is necessary to determine the cross-interference of accompanying gases with multiple interference gas components.
The following table lists the zero offsets expressed in % H_2 resulting from 10% accompanying gas (interference 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 accompanying gas concentrations differing from 10%, the corresponding multiple of the associated value in the table provides an acceptable approximation. This is valid for accompanying gas concentrations up to 25% (dependent on gas type).
The thermal conductivity of most gas mixtures has a non-linear response. Even ambiguous measurement results, such as e.g. with 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 curve is influenced by the accompanying gas. However, this effect is negligible for most gases.

Function (Continued)

When correcting cross-interferences with additional analyzers (ULTRAMAT 6/ULTRAMAT 23), the resulting measuring error can – depending on the application – amount to up to 5% of the smallest measuring range of the respective application.

Example of correction of cross-interference

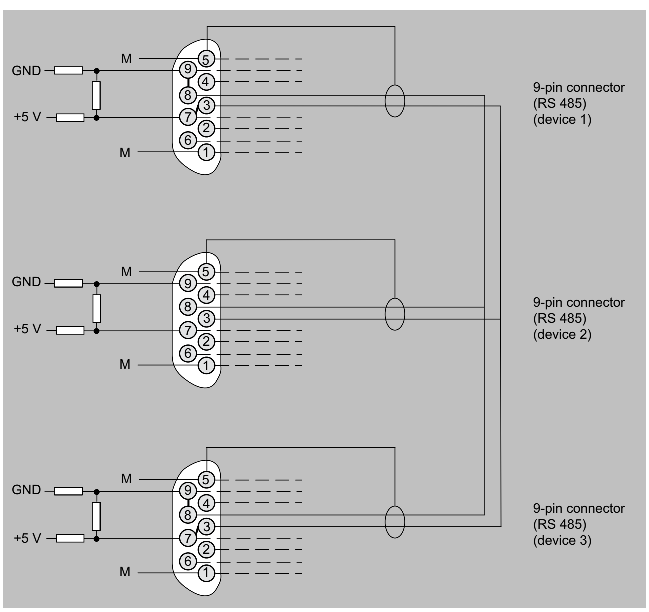
Specification for the interface cable	
Surge impedance	100 ... 300 Ω, with a measuring frequency of > 100 kHz
Cable capacitance	Typ. < 60 pF/m
Core cross-section	> 0.22 mm², corresponds to AWG 23
Cable type	Twisted pair, 1 x 2 conductors of cable section
Signal attenuation	Max. 9 dB over the whole length
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 and last plugs of bus cables must be bridged (see Graphic "Bus line with plug connection, example").

<u>Note</u>

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

Selection and ordering data

CALOMAT 6 gas analyzer 19" rack unit for installation in cabinets			**Article No.** 7MB2521-	●	●	●	0	●	-	●	A	●	●
Click on the Article No. for online configuration in the PIA Life Cycle Portal. ***Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".***													
Connections for sample gas													
Pipe with 6 mm outer diameter				0									
Pipe with ¼" outer diameter				1									
Measured component	**Smallest measuring range**	**Largest measuring range**											
H_2 in N_2	0 ... 1%	0 ... 100%			A	A							
H_2 in N_2 (blast furnace gas measurement)[1]	0 ... 5%	0 ... 100%			A	W							
H_2 in N_2 (converter measurement)[1]	0 ... 5%	0 ... 100%			A	X							
H_2 in N_2 (wood gasification)[1]	0 ... 5%	0 ... 100%			A	Y							
H_2 in Ar	0 ... 1%	0 ... 100%			A	B							
H_2 in NH_2	0 ... 1%	0 ... 100%			A	C							
He in N_2	0 ... 2%	0 ... 100%			B	A							
He in Ar	0 ... 2%	0 ... 100%			B	B							
He in H_2	0 ... 10%	0 ... 80%			B	C							
Ar in N_2	0 ... 10%	0 ... 100%			C	A							
Ar in O_2	0 ... 10%	0 ... 100%			C	B							
CO_2 in N_2	0 ... 20%	0 ... 100%			D	A							
CH_4 in Ar	0 ... 15%	0 ... 100%			E	A							
NH_3 in N_2	0 ... 10%	0 ... 30%			F	A							
H_2 monitoring (turbo generators)													
• CO_2 in air	0 ... 100%				G	A							
• H_2 in CO_2	0 ... 100%				G	A							
• H_2 in air	80 ... 100%				G	A							
Add-on electronics													
Without								0					
AUTOCAL function with 8 additional digital inputs and outputs								1					
AUTOCAL function 8 additional digital inputs/outputs and PROFIBUS PA interface								6					
AUTOCAL function with 8 additional digital inputs/outputs and PROFIBUS DP interface								7					
Auxiliary power													
100 V ... 120 V AC, 48 ... 63 Hz										0			
200 V ... 240 V AC, 48 ... 63 Hz										1			
Explosion protection													
Without												A	
Certificate: ATEX II 3G, flammable and non-flammable gases												B	
FM/CSA certificate – Class I Div 2												D	
Language of the operating software													
German													0
English													1
French													2
Spanish													3
Italian													4

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

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

Selection and ordering data (Continued)

Options	Order code
Clean for O_2 service (specially cleaned gas path)	**Y02**
Measuring range indication in plain text, if different from default setting	**Y11**
Special setting (only in conjunction with an application no.)	**Y12**

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

Technical specifications

CALOMAT 6, 19" rack unit	
General information	Based on EN 61207/IEC 1207. All data based on H_2 in N_2 binary mixture
Measuring ranges	4, internally and externally switchable; automatic measuring range switchover also possible
Largest possible measuring span	100 vol.% H_2 (see "Function" for smallest measuring span)
Measuring ranges with suppressed zero point	Any zero point within 0 ... 100 vol.% can be implemented, smallest possible measuring span: 5% H_2
Operating position	Front wall, vertical
Conformity	CE mark in accordance with EN 61326/A1 and EN 61010/1
Design, enclosure	
Degree of protection	IP20 according to EN 60529
Weight	Approx. 10 kg
Electrical characteristics	
EMC interference immunity (electromagnetic compatibility) All signal lines must be shielded. Measured value deviations of up to 4% of the smallest measuring range may occur in ranges with strong electromagnetic interference.	In accordance with standard requirements of NAMUR NE21 (08/98)
Electrical safety	In accordance with EN 61010-1; overvoltage category II
Auxiliary power (see nameplate)	100 V AC -10% ... 120 V AC +10%, 48 ... 63 Hz or 200 AC -10% ... 240 V AC +10%, 48 ... 63 Hz
Power consumption	Approx. 20 VA
Fuse ratings	100 ... 120 V: 1.0T/250 200 ... 240 V: 0.63T/250
Gas inlet conditions	
Sample gas pressure	800 ... 1 100 hPa (absolute)
Sample gas flow	30 ... 90 l/h (0.5 ... 1.5 l/min)
Sample gas temperature	Min. 0 ... max. 50 °C, but above the dew point
Temperature of the measuring cell	Approx. 60 °C
Sample gas humidity	< 90% relative humidity
Time response	
Warm-up period	< 30 min (the technical specification will be met after 2 hours)

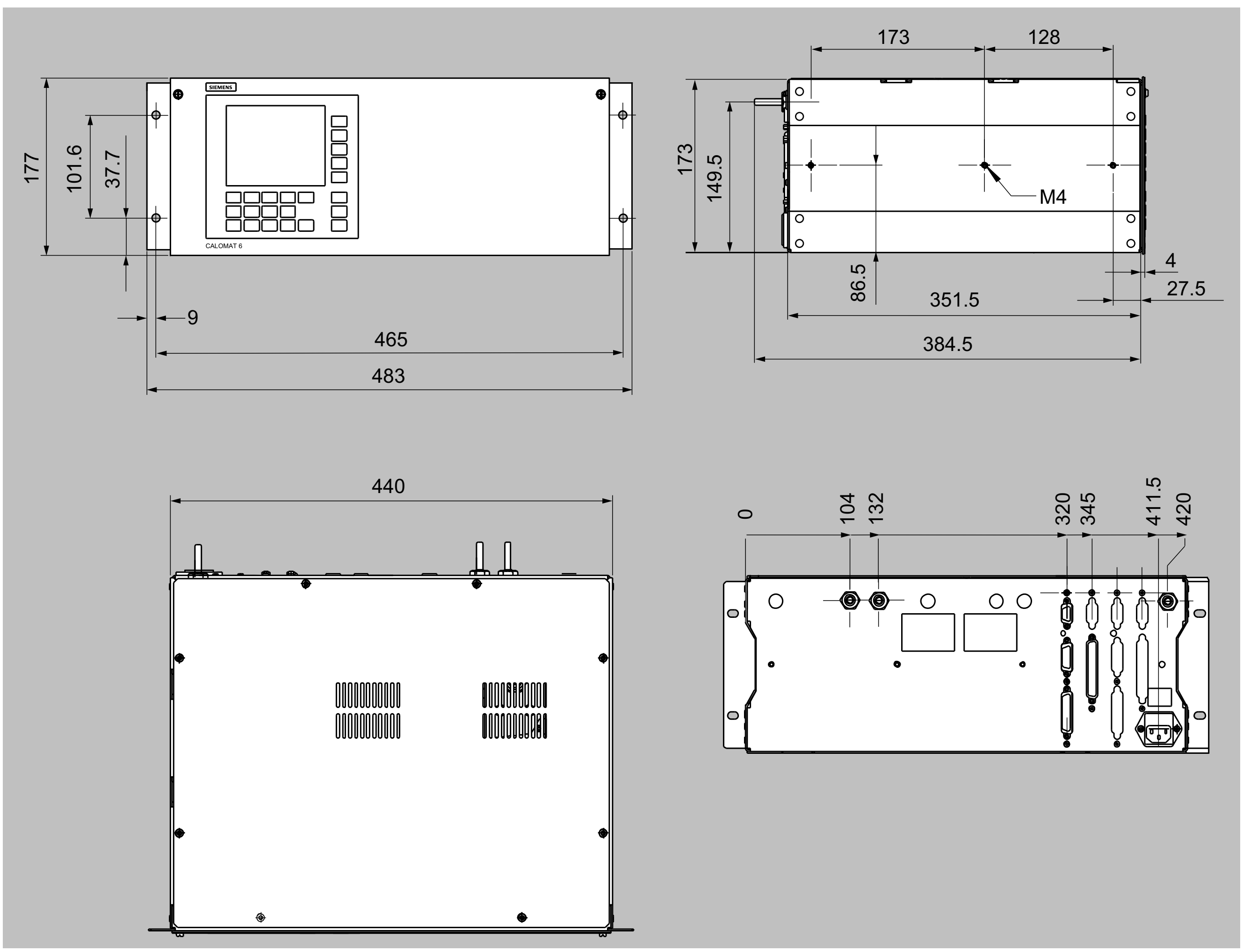
Technical specifications (Continued)

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

Technical specifications (Continued)

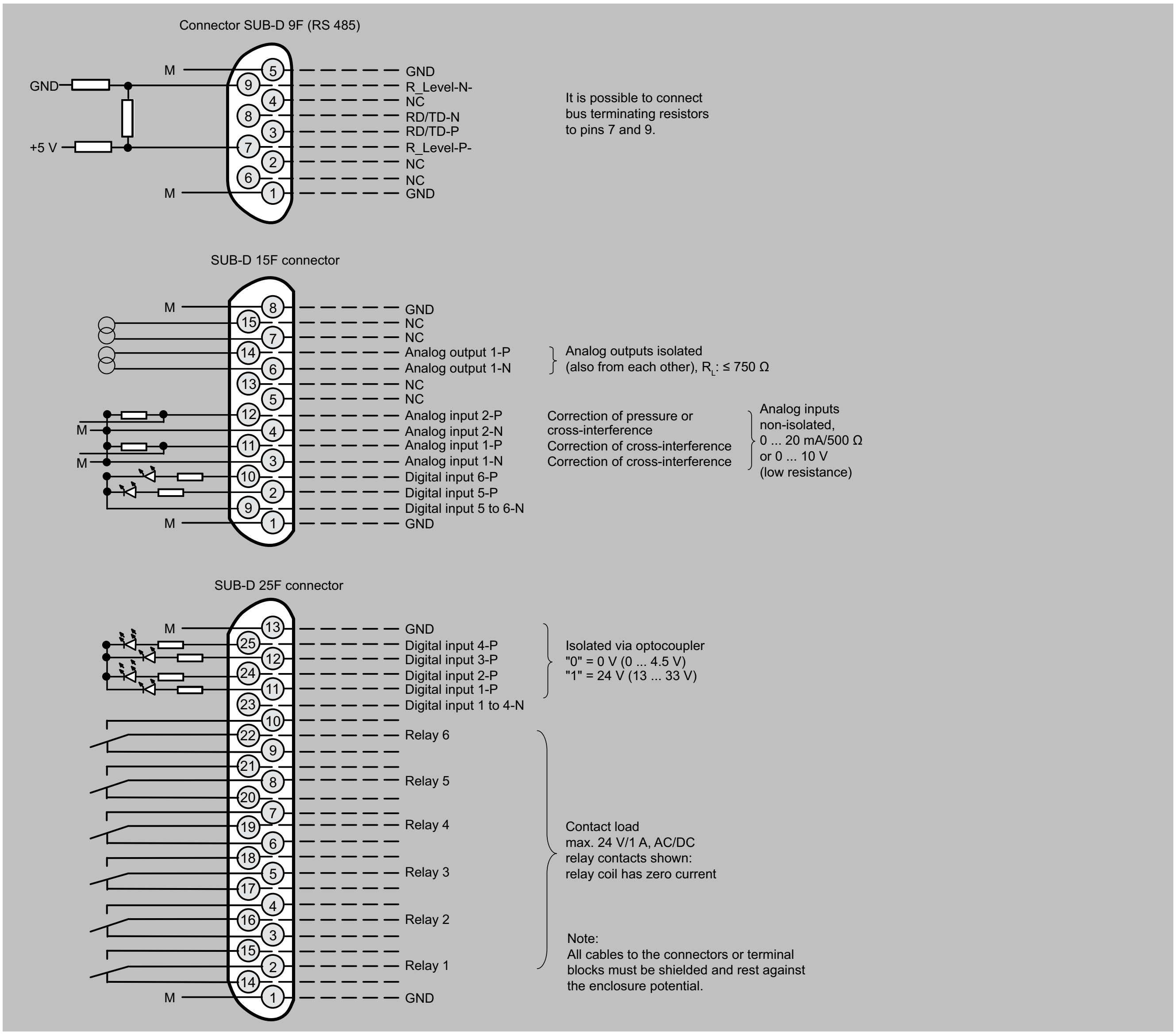
CALOMAT 6, 19" rack unit	
Digital inputs	6, designed for 24 V, floating, freely configurable, e.g. for measuring range switchover
Serial interface	RS 485
Options	AUTOCAL function each with 8 additional digital inputs and relay outputs, also with PROFIBUS PA or PROFIBUS DP
Climatic conditions	
Permissible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

Dimensional drawings



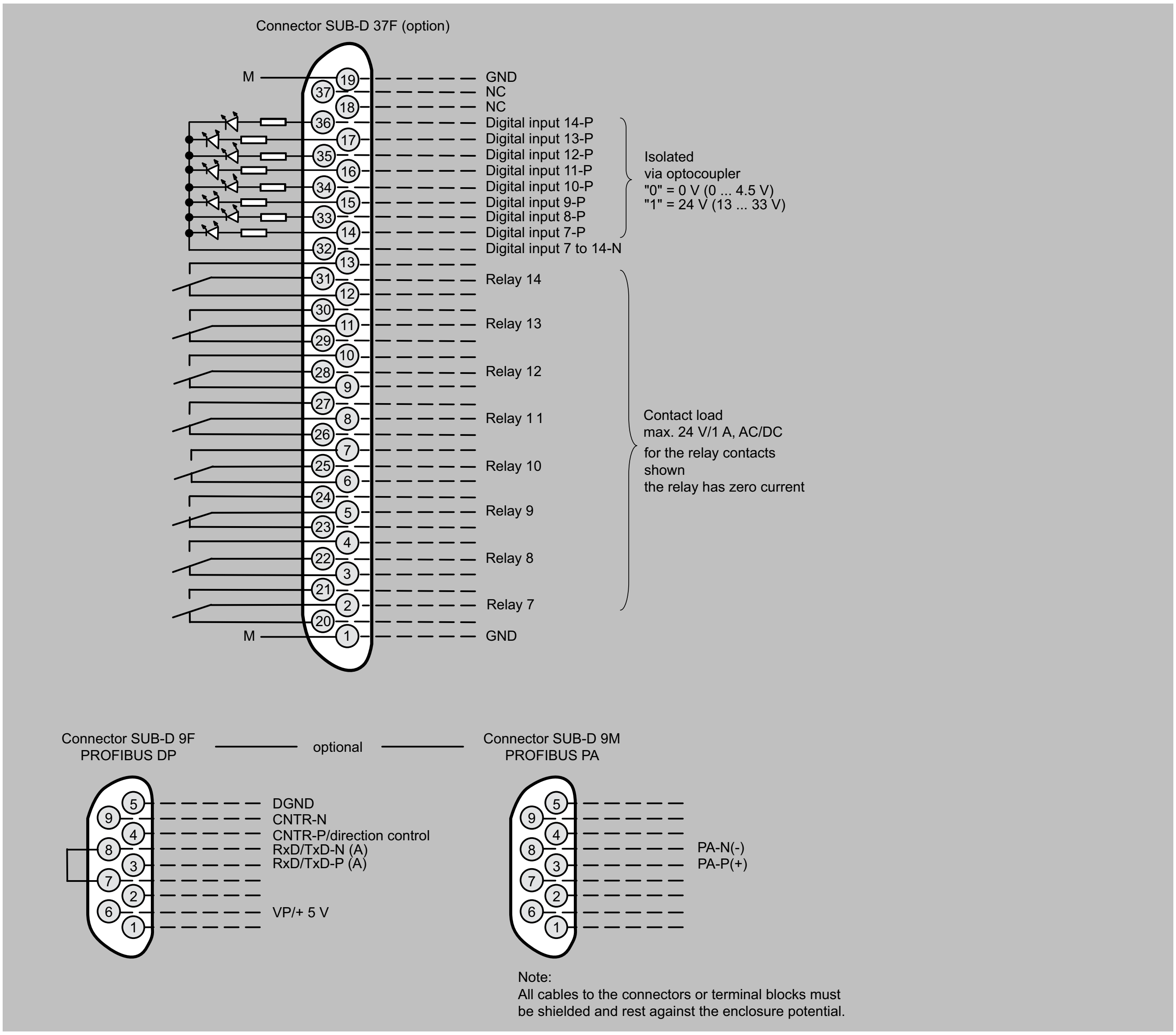
CALOMAT 6, 19" rack unit, dimensions in mm

Circuit diagrams



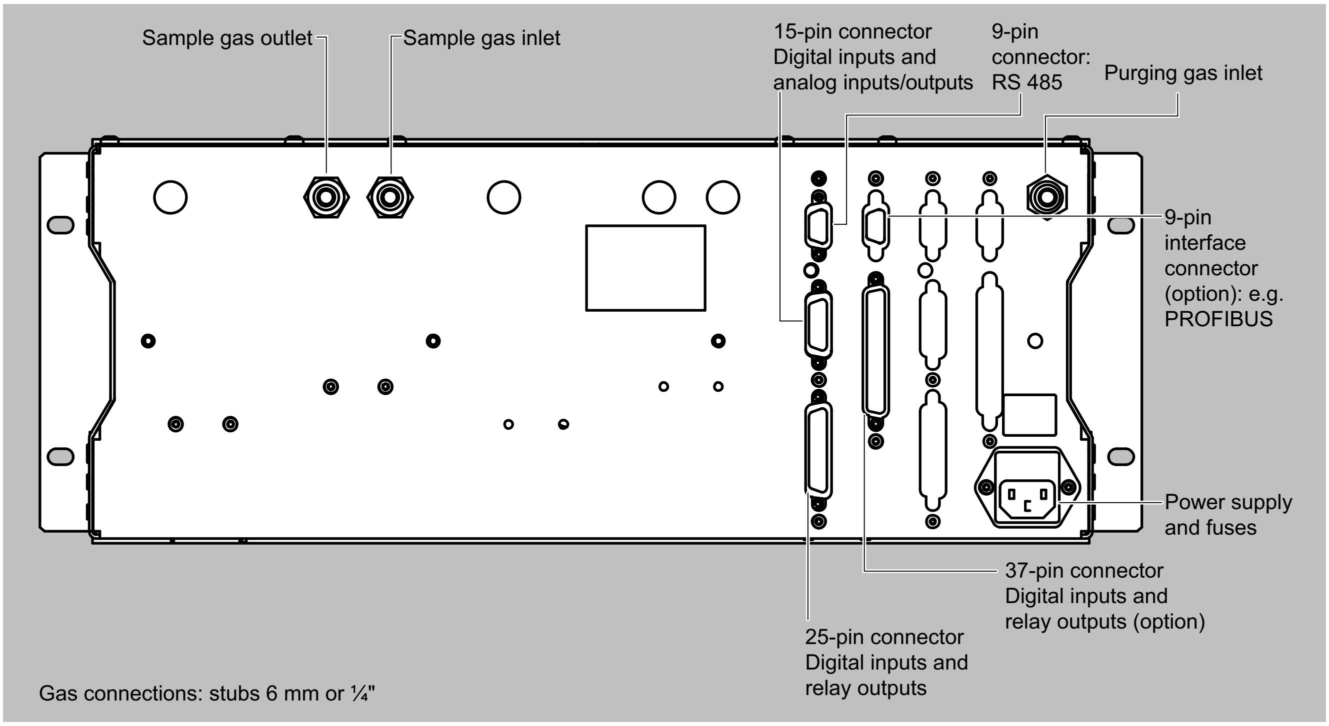
CALOMAT 6, 19" rack unit, pin assignment

Circuit diagrams (Continued)



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

Circuit diagrams (Continued)



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

Selection and ordering data

CALOMAT 6 gas analyzer For installation in the field			**Article No.** 7MB2511-	●	●	●	0	●	-	●	A	●	●
Click on the Article No. for online configuration in the PIA Life Cycle Portal.													
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".													
Connections for sample gas													
Cutting ring fitting for pipe, outer diameter 6 mm				0									
Cutting ring fitting for pipe, outer diameter ¼"				1									
Measured component	**Smallest measuring range**	**Largest measuring range**											
H_2 in N_2	0 ... 1%	0 ... 100%			A	A							
H_2 in N_2 (blast furnace gas measurement)[1]	0 ... 5%	0 ... 100%			A	W							
H_2 in N_2 (converter measurement)[1]	0 ... 5%	0 ... 100%			A	X							
H_2 in N_2 (wood gasification)[1]	0 ... 5%	0 ... 100%			A	Y							
H_2 in Ar	0 ... 1%	0 ... 100%			A	B							
H_2 in NH_3	0 ... 1%	0 ... 100%			A	C							
He in N_2	0 ... 2%	0 ... 100%			B	A							
He in Ar	0 ... 2%	0 ... 100%			B	B							
He in H_2	0 ... 10%	0 ... 80%			B	C							
Ar in N_2	0 ... 10%	0 ... 100%			C	A							
Ar in O_2	0 ... 10%	0 ... 100%			C	B							
CO_2 in N_2	0 ... 20%	0 ... 100%			D	A							
CH_4 in Ar	0 ... 15%	0 ... 100%			E	A							
NH_3 in N_2	0 ... 10%	0 ... 30%			F	A							
H_2 monitoring (turbo generators)													
• CO_2 in air	0 ... 100%				G	A							
• H_2 in CO_2	0 ... 100%				G	A							
• H_2 in air	80 ... 100%				G	A							
Add-on electronics													
Without								0					
AUTOCAL function with 8 additional digital inputs and outputs								1					
AUTOCAL function 8 additional digital inputs/outputs and PROFIBUS PA interface								6					
AUTOCAL function with 8 additional digital inputs/outputs and PROFIBUS DP interface								7					
AUTOCAL function with 8 additional digital inputs/outputs and PROFIBUS PA Ex i interface								8					
Auxiliary power													
100 V ... 120 V AC, 48 ... 63 Hz										0			
200 V ... 240 V AC, 48 ... 63 Hz										1			
Explosion protection, including certificates													
Without												A	
According to ATEX II 3G, non-flammable gases												B	
According to ATEX II 3G, flammable gases[2]												C	
FM/CSA certificate – Class I Div 2												D	
According to ATEX II 2G, continuous purging[2]												F	
ATEX II 3D certificate; potentially explosive dust atmospheres													
• In non-hazardous gas zone												G	
• In hazardous zone according to ATEX II 3G; non-flammable gases												H	
• In hazardous zone according to ATEX II 3G; flammable gases[2]												J	
Language of the operating software													
German													0
English													1
French													2
Spanish													3
Italian													4

[1] Ready to enter external correction of cross-interference for CO, 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 (Continued)

Options	Order code
Add "-**Z**" to article number and then add order code.	
Settings	
Set of Torx screwdrivers, ball Allen screwdrivers	**A32**
Tag plates (specific inscription based on customer information)	**B03**
BARTEC Ex p control station	
• "Leakage compensation"	**E71**
• "Continuous purging"	**E72**
BARTEC Ex p purging unit for use in ATEX or IECEx Zone 1 • BARTEC Ex p control unit for continuous flow • BARTEC Ex control station with bypass key switch	**E74**
BARTEC Ex purging unit for use in ATEX or IECEx Zone 1 • BARTEC Ex p control unit for continuous flow • BARTEC Ex control station with bypass key switch • Operator display for visualization of system states	**E75**
Clean for O_2 service (specially cleaned gas path)	**Y02**
Measuring range indication in plain text, if different from default setting	**Y11**
Special setting (only in conjunction with an application no., e.g. additional components, measuring range)	**Y12**

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

Selection and ordering data (Continued)

Additional units for Ex versions	Article No.
FM/CSA (Class I Div 2)	
Ex purging unit MiniPurge FM	7MB8000-1AA

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

Technical specifications

CALOMAT 6, field device	
General information	Based on EN 61207/IEC 1207. All data based on H_2 in N_2 binary mixture
Measuring ranges	4, internally and externally switchable; automatic measuring range switchover also possible
Largest possible measuring span	100 vol.% H_2 (see "Function" for smallest measuring span)
Measuring ranges with suppressed zero point	Any zero point within 0 ... 100 vol.% can be implemented; smallest possible measuring span: 5% H_2
Operating position	Front wall, vertical
Conformity	CE mark in accordance with EN 61326/A1 and EN 61010/1
Design, enclosure	
Degree of protection	IP65 according to EN 60529
Weight	Approx. 25 kg
Electrical characteristics	
EMC interference immunity (electromagnetic compatibility) All signal lines must be shielded. Measured value deviations of up to 4% of the smallest measuring range may occur in ranges with strong electromagnetic interference.	In accordance with standard requirements of NAMUR NE21 (08/98)
Electrical safety	In accordance with EN 61010-1; overvoltage category II
Auxiliary power (see nameplate)	100 V AC -10% ... 120 V AC +10%, 48 ... 63 Hz or 200 AC -10% ... 240 V AC +10%, 48 ... 63 Hz
Power consumption (device)	Approx. 20 VA
Fuse ratings	100 ... 120 V: 1.0T/250 200 ... 240 V: 0.63T/250
Gas inlet conditions	
Sample gas pressure	800 to 1 100 hPa (absolute)
Sample gas flow	30 ... 90 l/h (0.5 ... 1.5 l/min)
Sample gas temperature	Min. 0 to max. 50 °C, but above the dew point
Temperature of the measuring cell	Approx. 60 °C
Sample gas humidity	< 90% relative humidity
Purging gas pressure	
• Permanent	165 hPa above atmospheric pressure
• For short periods	Max. 250 hPa above ambient pressure

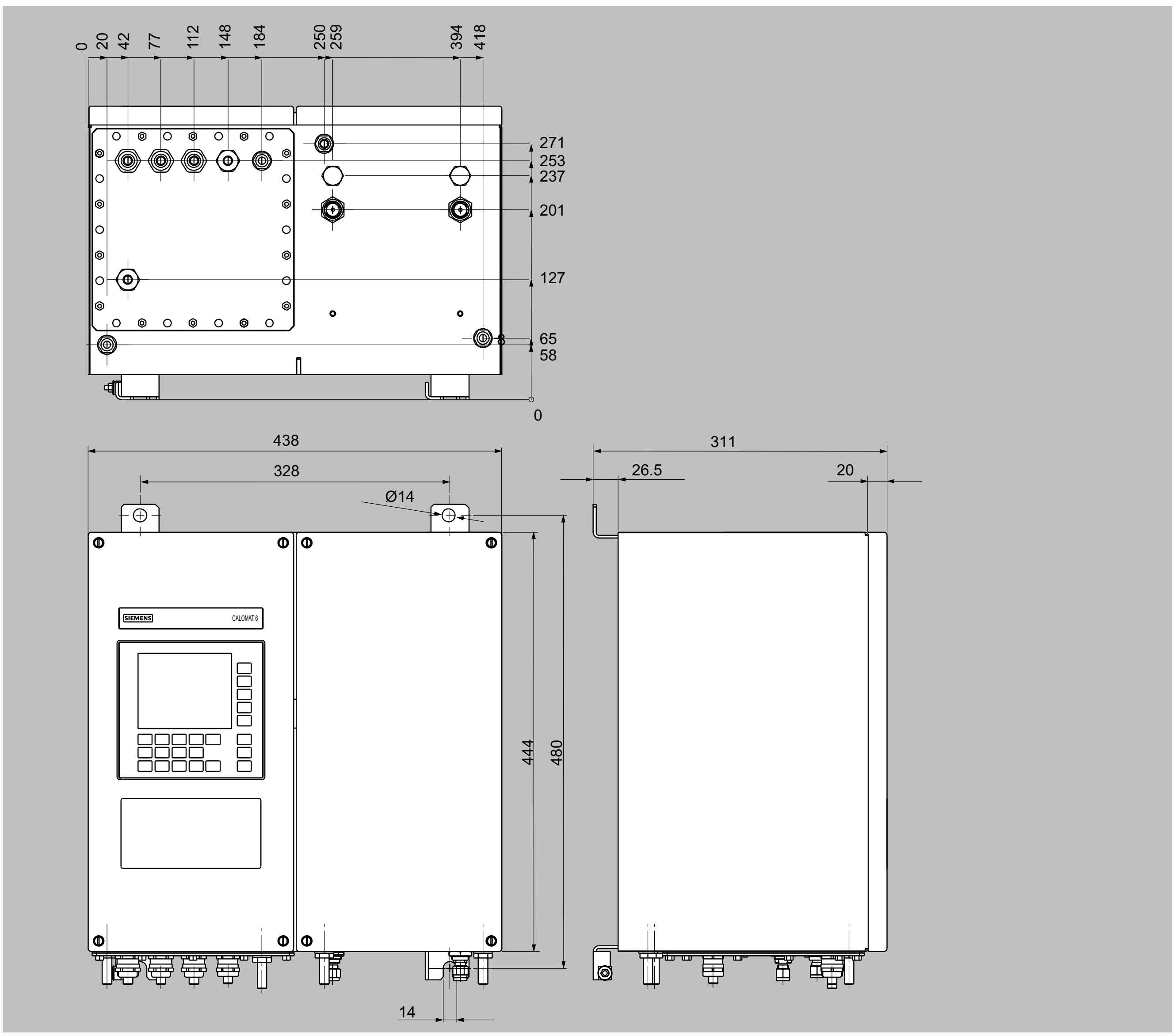
Technical specifications (Continued)

CALOMAT 6, field device	
Time response	Based on sample gas pressure 1 000 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Warm-up period	< 30 min (the technical specification will be met after 2 hours)
Delayed display (T_{90})	< 5 s
Electrical damping	0 ... 100 s, configurable
Dead time (at 1 l/min)	Approx. 0.5 s
Measuring response	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation (maximum accuracy achieved after 2 hours)	< ± 0.75% of the smallest possible measuring range according to nameplate, with electronic damping constant of 1 s (σ = 0.25%)
Zero point drift	< ± 1%/week of the smallest possible measuring span according to nameplate
Measured value drift	< ± 1%/week of the smallest possible measuring span according to nameplate
Repeatability	< 1% of the current measuring range
Detection limit	1% of the current measuring range
Linearity error	< ± 1% of the current measuring range
Influencing variables	Based on sample gas pressure 1013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Ambient temperature	< 1%/10 K referred to smallest possible measuring span according to nameplate
Accompanying gases	Zero point deviation (for influence of interference gas, see "Cross-interferences")
Sample gas flow	< 0.2% of the smallest possible measuring span according to nameplate with a change in flow of 0.1 l/min within the permissible flow range
Sample gas pressure	< 1% of the current measuring range with a pressure variation of 100 hPa
Electrical inputs and outputs	
Analog output	0/2/4 ... 20 mA, floating; max. load 750 Ω
Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load rating: 24 V AC/DC/1 A, floating
Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and correction of cross-interference

Technical specifications (Continued)

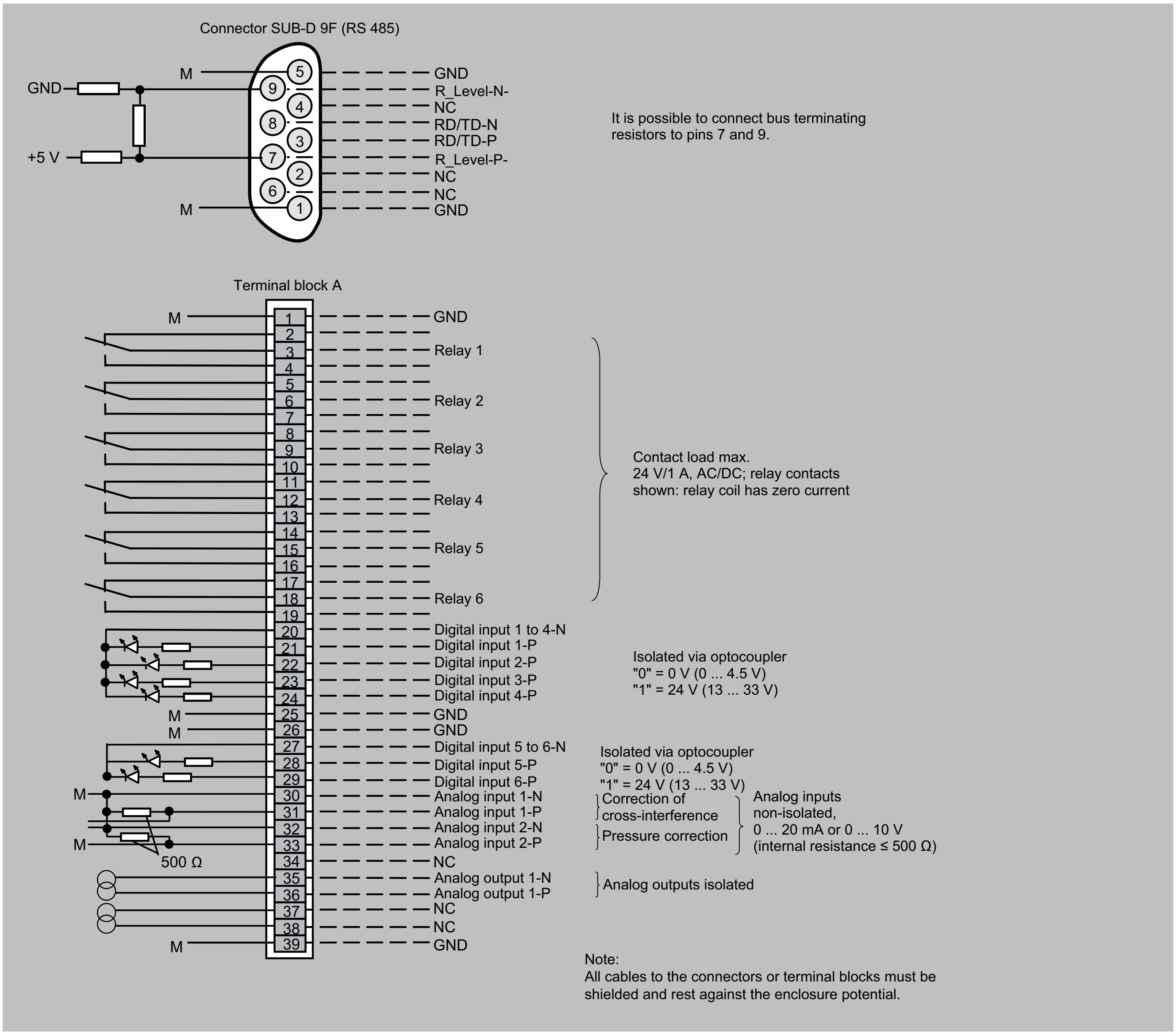
CALOMAT 6, field device	
Digital inputs	6, designed for 24 V, floating, freely configurable, e.g. for measuring range switchover
Serial interface	RS 485
Options	AUTOCAL function each with 8 additional digital inputs and relay outputs, also with PROFIBUS PA or PROFIBUS DP
Climatic conditions	
Permissible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

Dimensional drawings



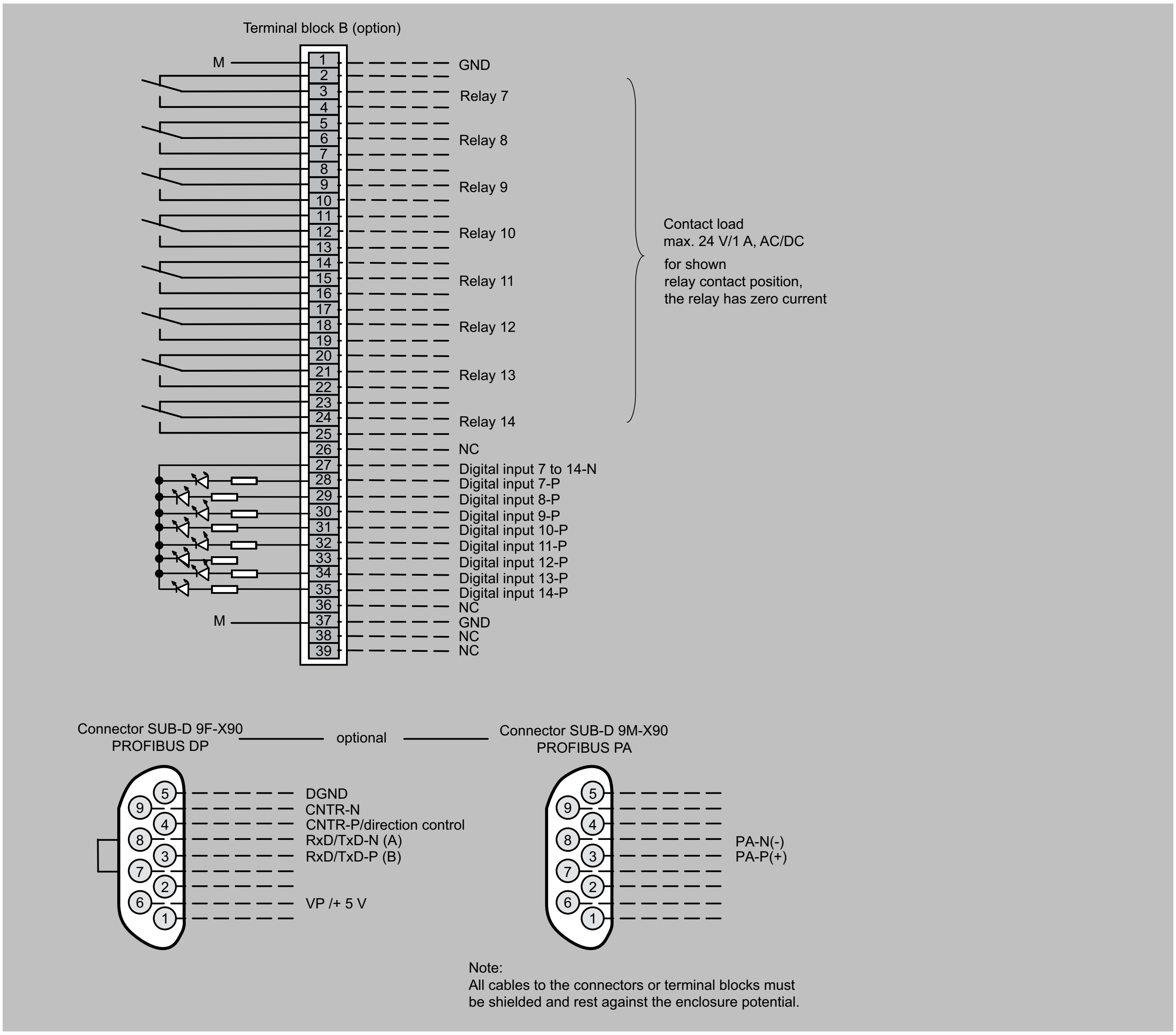
CALOMAT 6, field unit, dimensions in mm

Circuit diagrams



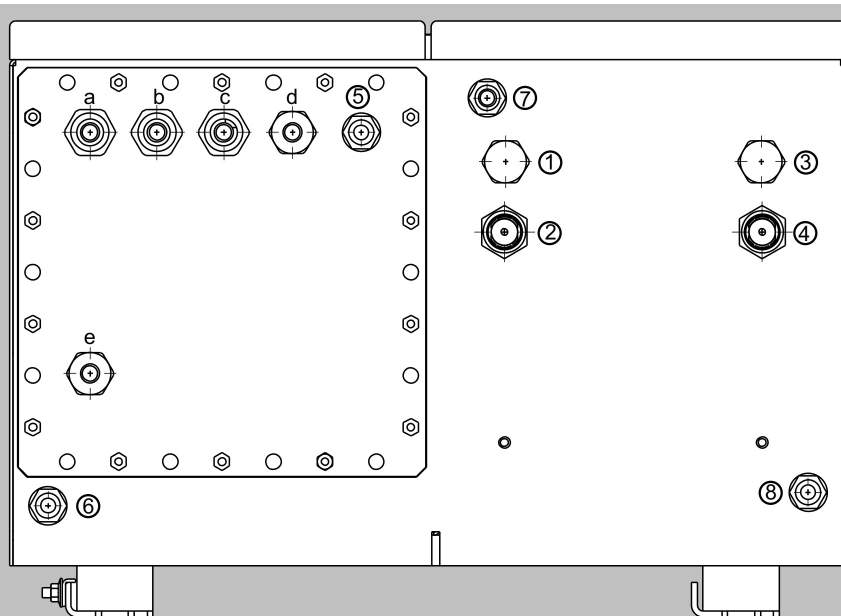
CALOMAT 6, field device, pin and terminal assignment

Circuit diagrams (Continued)



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

Circuit diagrams (Continued)



Gas connections

1	not used	Clamping gland for pipe Ø 6 mm or 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 device, gas connections and electrical connections

Selection and ordering data

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

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

More information

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

Overview

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

Benefits

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

Application

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

Special versions

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

Design

19" rack unit

- With 4 U for installation
  - In hinged frame
  - In cabinets with or without telescopic rails
  - With closed or flow-type reference chambers
- Front plate can be swung down for servicing purposes (laptop connection)
- IP20 degree of protection, with purging gas connection
- Internal gas paths: Stainless steel pipe (mat. no. 1.4571)
- Gas connections for sample gas inlet and outlet and for reference gas: Female thread 1/8"-27 NPT
- Purging gas connections: Pipe diameter 6 mm or ¼"
- With closed or flow-type reference chambers

Field device

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

Display and operator panel

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

Inputs and outputs

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

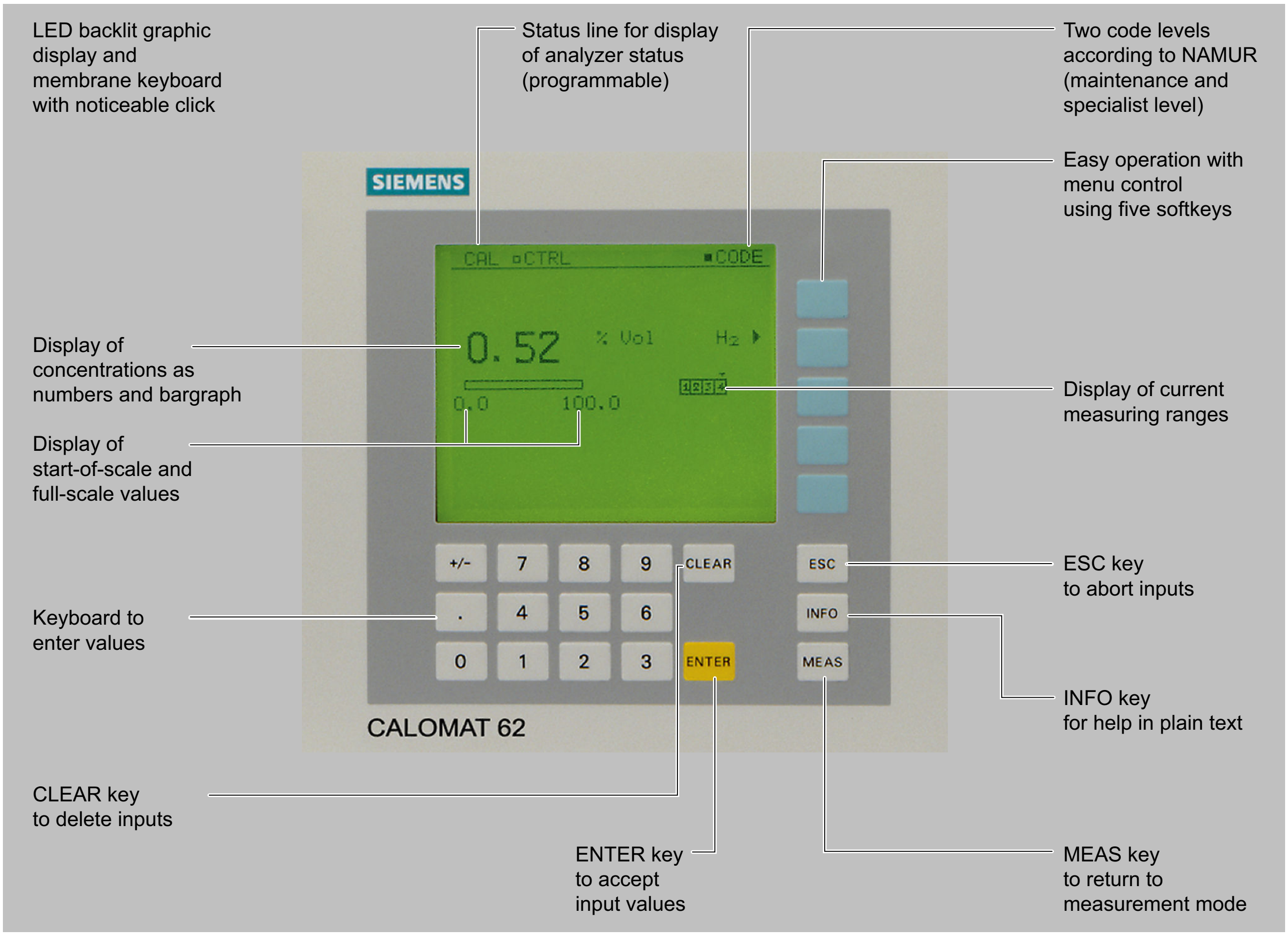
Communication

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

<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

Design (Continued)

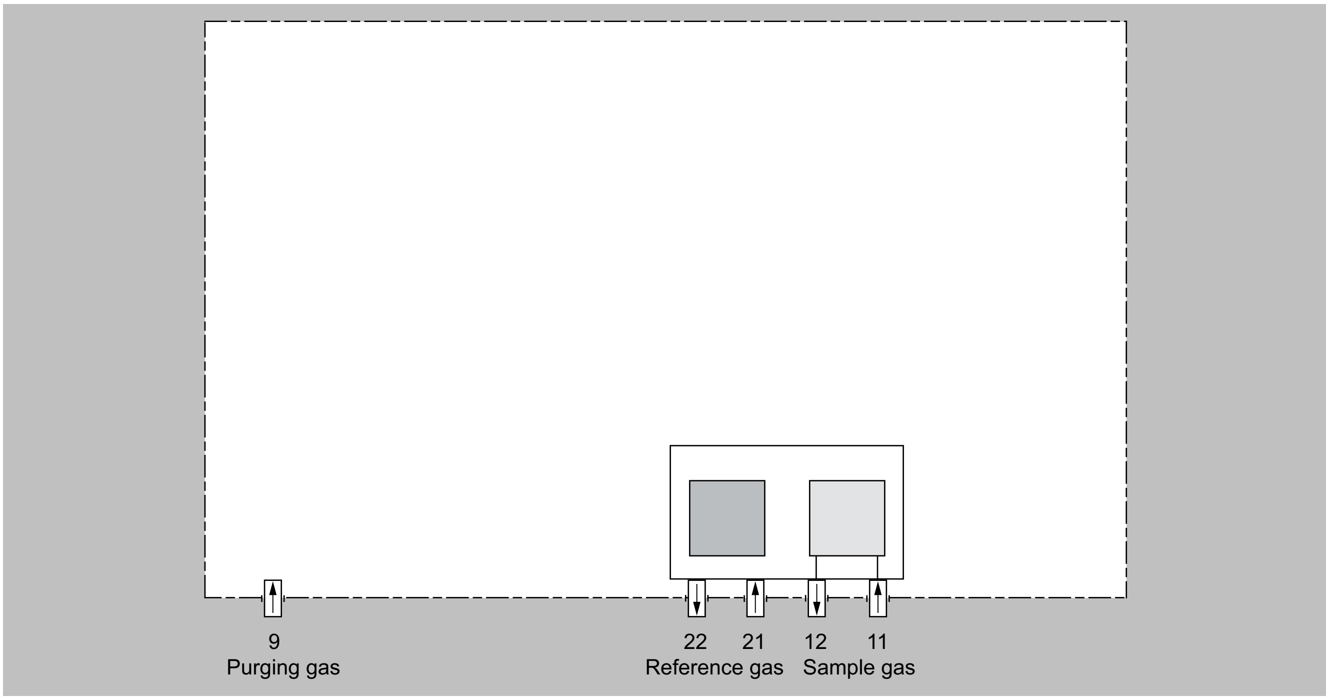


CALOMAT 62, membrane keyboard and graphic display

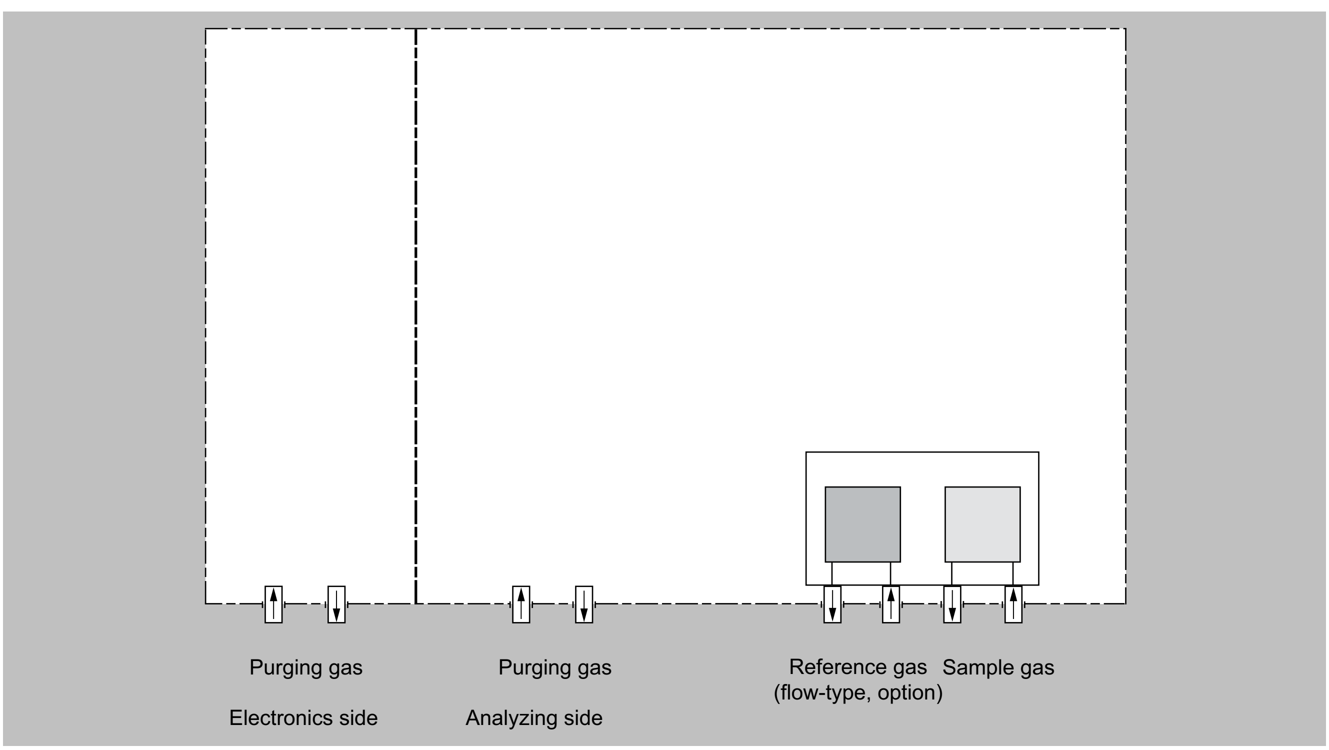
Designs – parts wetted by sample gas

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

Design (Continued)



CALOMAT 62, 19" rack unit, gas path



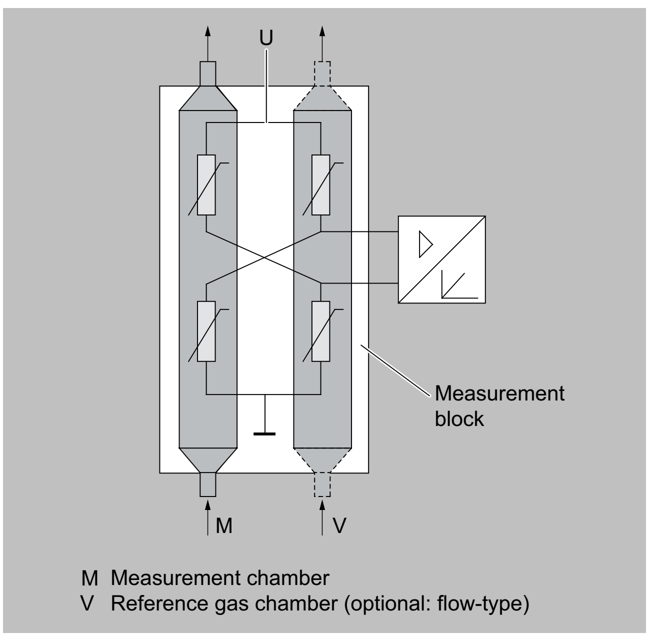
CALOMAT 62, field device, gas path

Mode of operation

The measuring principle is based on the different thermal conductivity of gases.
The temperature rise of a heated resistor surrounded by gas is determined by the thermal conductivity of the gas. Four such resistors are connected as a bridge.
Sample gas flows around two of them, reference gas surrounds the other two. A constant DC voltage heats the resistances above the temperature of the transducer block.
The different thermal conductivity of the sample and reference gases result in different temperatures of the resistances. A change in the composition of the sample gas thus also causes a change in the resistance values.
The electrical equilibrium of the measuring bridge is disrupted, and a voltage is generated in the bridge diagonal. This is a measure of the concentration of the measured component.

Note

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



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

Function

Main features

- Four measuring ranges which can be freely configured, even with suppressed zero point; all measuring ranges are linear
- Smallest measuring spans down to 1% H_2 (with suppressed zero point: 99 to 100% H_2) possible
- Measuring range identification
- Electrically isolated measured value output 0/2/4 through to 20 mA (including inverted)
- Automatic or manual measuring range switchover selectable; remote switching is also possible
- Storage of measured values possible during calibration
- Wide range of selectable time constants (static/dynamic noise damping); i.e. the response time of the device can be adapted to the respective measuring task
- Short response time
- Low long-term drift
- Measuring point switchover for up to 6 measuring points (parameterizable)
- Measuring point identification
- External pressure sensor can be connected – for correction of variations in sample gas pressure
- Possibility for correcting the influence of accompanying gases (correction of cross-interference)
- Automatic measuring range calibration parameterizable
- Operation based on NAMUR recommendation
- Two control levels with separate authorization codes for the prevention of accidental and unauthorized operator interventions
- Simple handling using a numerical membrane keyboard and operator prompting
- Custom-made device designs, such as:
  - Customer acceptance
  - TAG plates
  - Drift recording
  - Clean for O_2 service

Measuring spans

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

Cross-interferences

Knowledge of the sample gas composition is necessary to determine the cross-interference of accompanying gases with multiple interference gas components.
The zero offsets in % H_2 which result from 1% accompanying gas (interference gas) are listed in the following table; the specified values are approximate values.
It should be noted that the cross-interference is not linear to their concentration. Knowledge of the sample gas composition is necessary to determine the cross-interference of accompanying gases with multiple interference gas components.

Effect of 1% accompanying gas component with nitrogen as the residual gas, expressed in % H_2	
Ar	Approx. - 0.15%
O_2	Approx. + 0.02%
CO_2	Approx. -0.13%
CH_4	Approx. + 0.17%
SO_2	Approx. - 0.31%

Function (Continued)

Effect of 1% accompanying gas component with nitrogen as the residual gas, expressed in % H_2	
Air (dry)	Approx. + 0.25%

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

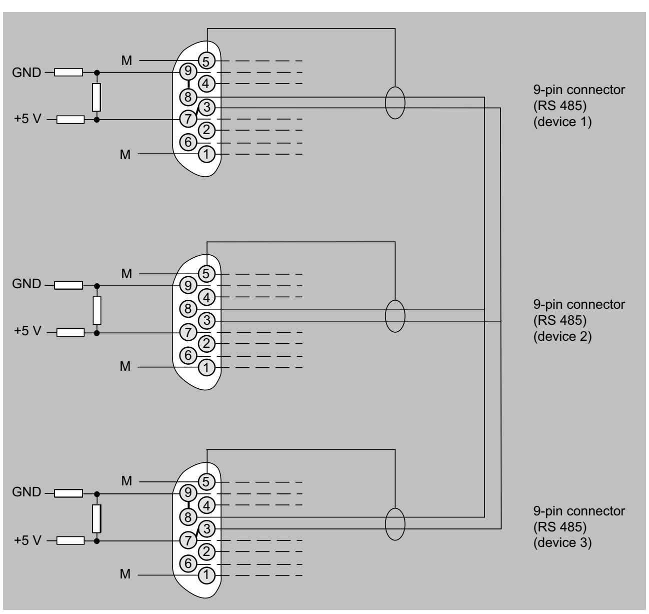
Specification for the interface cable	
Surge impedance	100 ... 300 Ω, with a measuring frequency of > 100 kHz
Cable capacitance	Typ. < 60 pF/m
Core cross-section	> 0.22 mm², corresponds to AWG 23
Cable type	Twisted pair, 1 x 2 conductors of cable section
Signal attenuation	Max. 9 dB over the whole length
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 and last plugs of bus cables must be bridged (see Graphic "Bus line with plug connection, example").

Note

It is advisable to install a repeater on the device side in the case of a cable length of more than 500 m or with high interferences.
Up to four components can be corrected via the ELAN bus, correction of cross-interference can be carried out for one or two components via the analog input.



Bus cable with plug connections, example

Selection and ordering data

CALOMAT 62 gas analyzer 19" rack unit for installation in cabinets			Article No. 7MB2541-	●	●	●	●	●	-	●	A	●	●
Click on the Article No. for online configuration in the PIA Life Cycle Portal. ***Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".***													
Material of sample gas path													
Purging gas stub 6 mm													
• Stainless steel, mat. no. 1.4571; non-flow-type reference chamber, 1/8"-27 NPT				0									
Purging gas stub ¼"													
• Stainless steel, mat. no. 1.4571; non-flow-type reference chamber, 1/8"-27 NPT				4									
Application		**Possible with measuring range identification**											
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							
Smallest measuring range	**Largest measuring range**	**Reference gas or filling gas**											
0 ... 1%	0 ... 100%	Accompanying gas component					0						
0 ... 5%	0 ... 100%						1						
100 ... 99%	100 ... 0%						5						
100 ... 95%	100 ... 0%						6						
Add-on electronics													
Without								0					
AUTOCAL function with 8 additional digital inputs/outputs each								1					
AUTOCAL function with 8 additional digital inputs/outputs each and PROFIBUS PA interface								6					
AUTOCAL function with 8 additional digital inputs/outputs each and PROFIBUS DP interface								7					
Auxiliary power													
100 ... 120 V AC, 48 ... 63 Hz										0			
200 ... 240 V AC, 48 ... 63 Hz										1			
Explosion protection													
Without												A	
Language of the operating software													
German													0
English													1
French													2
Spanish													3
Italian													4

Options	Order code
Add "**-Z**" to article number and then add order code.	
Settings	
Tag plates (specific inscription based on customer information)	**B03**
Clean for O_2 service (specially cleaned gas path)	**Y02**
Measuring range indication in plain text, if different from default setting	**Y11**
Special setting (only together with an application no., e.g. extended measuring range)	**Y12**
Extended special setting (only in conjunction with an application no., e.g. determination of cross-interferences)	**Y13**

Accessories	Article No.
RS 485/Ethernet converter	**A5E00852383**
RS 485/RS 232 converter	**C79451-Z1589-U1**
RS 485/USB converter	**A5E00852382**

Selection and ordering data (Continued)

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

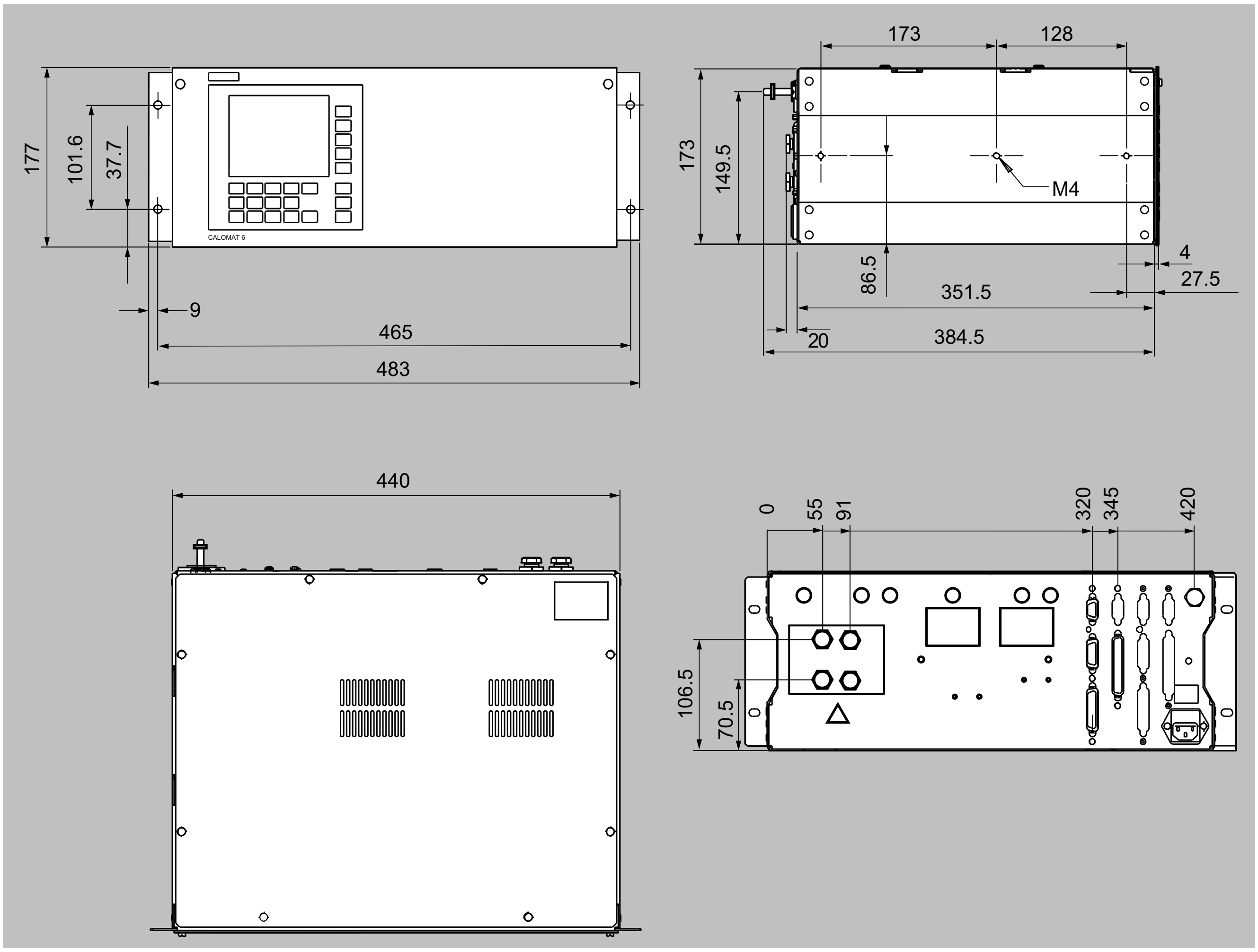
Technical specifications

CALOMAT 62, 19" rack unit	
General information	Based on EN 61207/IEC 1207. All data based on H_2 in N_2 binary mixture
Measuring ranges	4, internally and externally switchable; automatic measuring range switchover also possible
Measuring span	Application-dependent (see ordering data)
Measuring ranges with suppressed zero point	Application-dependent (see ordering data)
Operating position	Front wall, vertical
Conformity	CE mark in accordance with EN 50081-1/EN 50081-2 and RoHS
Design, enclosure	
Degree of protection	IP20 according to EN 60529
Weight	Approx. 13 kg
Electrical characteristics	
EMC interference immunity (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98) and EN 61326
Electrical safety	In accordance with EN 61010-1; overvoltage category II
Auxiliary power (see nameplate)	100 V AC -10% ... 120 V AC +10%, 48 ... 63 Hz or 200 AC -10% ... 240 V AC +10%, 48 ... 63 Hz
Power consumption	Approx. 30 VA
Fuse ratings	100 ... 120 V: 1.0T/250 200 ... 240 V: 0.63T/250
Gas inlet conditions	
Sample gas pressure	800 ... 1 100 hPa (absolute)
Sample gas flow	30 ... 90 l/h
Sample gas temperature	Min. 0 ... max. 50 °C, but above the dew point
Temperature of the measuring cell	70 °C
Time response	The time and measuring response refers to the measurement of H_2 in N_2
Warm-up period	< 30 min at room temperature (the technical specification will be met after 2 hours)
Delayed display (T_{90})	Approx. 35 s (including dead time)
Damping (electrical time constant)	0 ... 100 s, configurable
Dead time (the diffusion to the probes is the determining variable)	Approx. 34 s
Measuring response	The time and measuring response refers to the measurement of H_2 in N_2 (based on the sample gas pressure 1 000 hPa absolute, sample gas flow 0.5 l/min, and ambient temperature 25 °C)
Output signal fluctuation (3σ value)	< ± 1% of the smallest possible measuring span according to nameplate with electronic damping constant of 1 s
Zero point drift	< ± 1% of the current measuring span/week
Measured value drift	< ± 1% of the smallest possible measuring span (according to nameplate)/week
Repeatability	< ± 1% of the current measuring span
Detection limit	1% of the smallest possible measuring span according to nameplate
Linearity error	< ± 1% of the current measuring span

Technical specifications (Continued)

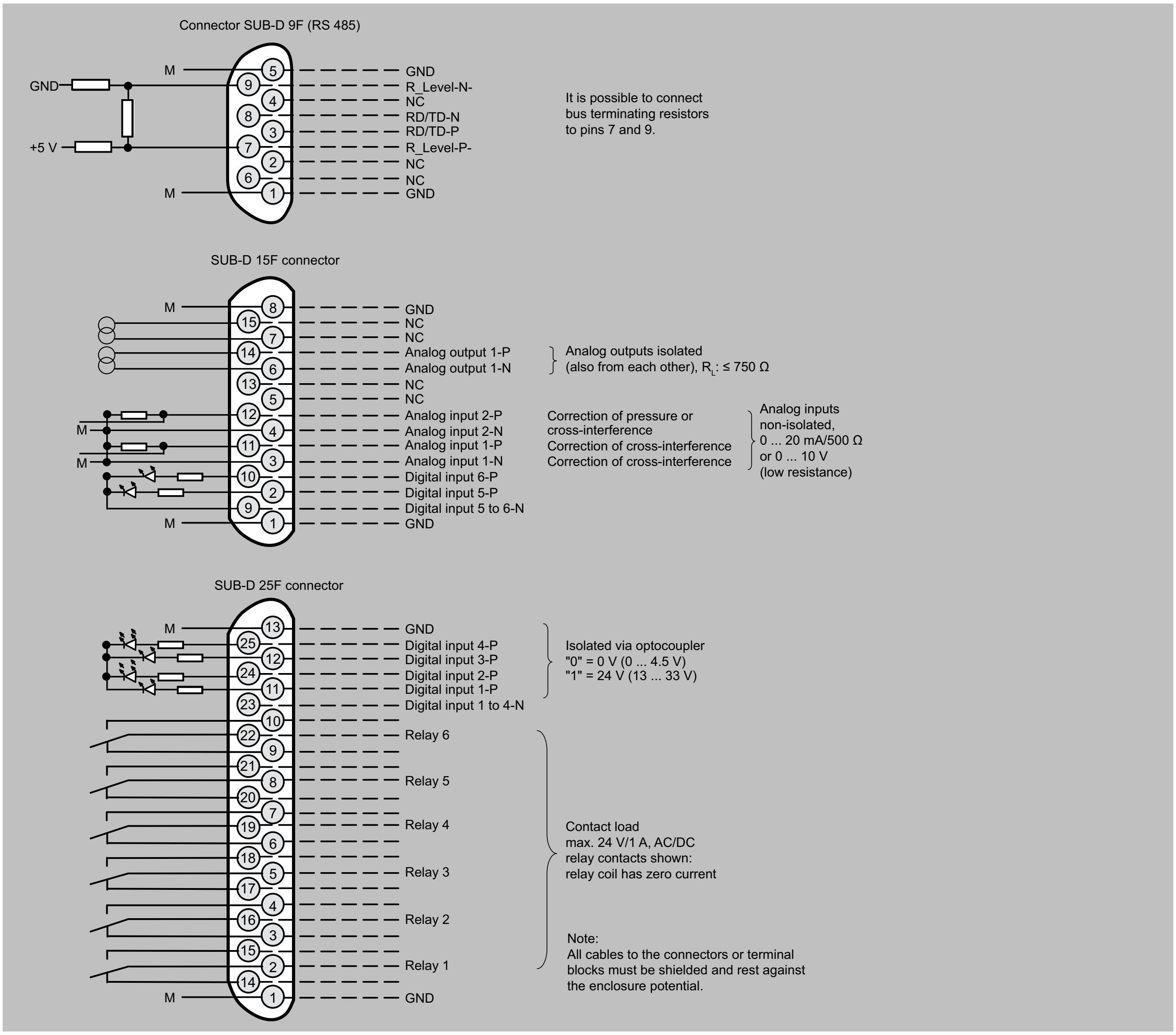
CALOMAT 62, 19" rack unit	
Influencing variables	Based on sample gas pressure 1 000 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Ambient temperature	< 2%/10 K referred to smallest possible measuring span according to nameplate
Accompanying gases	Zero point deviation (for influence of interference gas, see "Cross-interferences")
Sample gas flow	0.2% of the current measuring span with a change in flow of 0.1 l/min within the permissible flow range
Sample gas pressure	< 1% of the current measuring span with a pressure variation of 100 hPa
Auxiliary power	< 0.1% of the current measuring span with nominal voltage ± 10%
Electrical inputs and outputs	
Analog output	0/2/4 ... 20 mA, floating; max. load 750 Ω
Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load rating: 24 V AC/DC/1 A, floating
Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and correction of cross-interference
Digital inputs	6, designed for 24 V, floating, freely configurable, e.g. for measuring range switchover
Serial interface	RS 485
Options	AUTOCAL function with 8 additional digital inputs and relay outputs, also with PROFIBUS PA (on request) or PROFIBUS DP (on request)
Climatic conditions	
Permissible ambient temperature	-40 ... +70 °C during storage and transportation, 5 ... 45 °C during operation
Permissible humidity (must not fall below dew point)	< 90% relative humidity as annual average during storage and transportation

Dimensional drawings



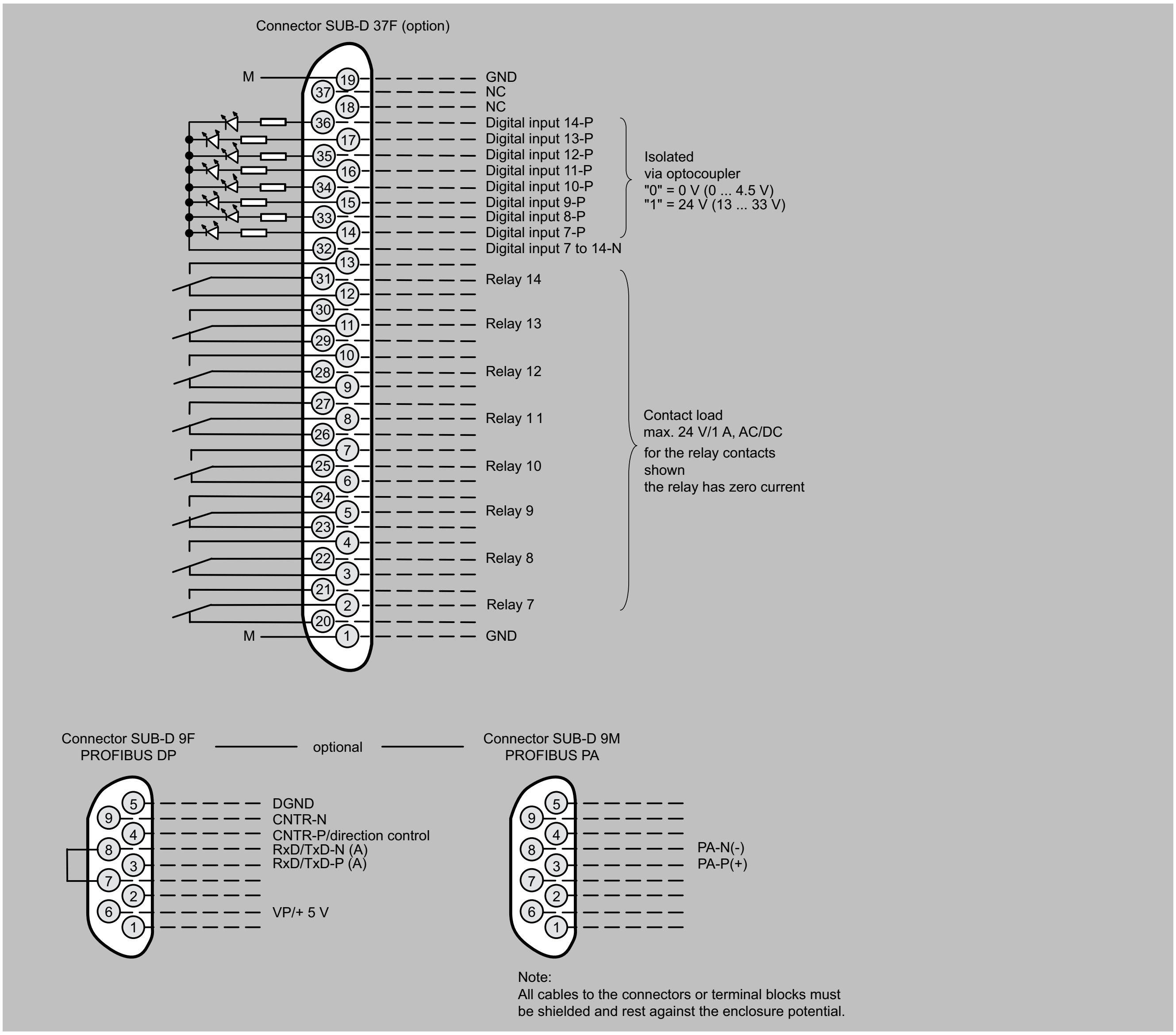
CALOMAT 62, 19" rack unit, dimensions in mm

Circuit diagrams



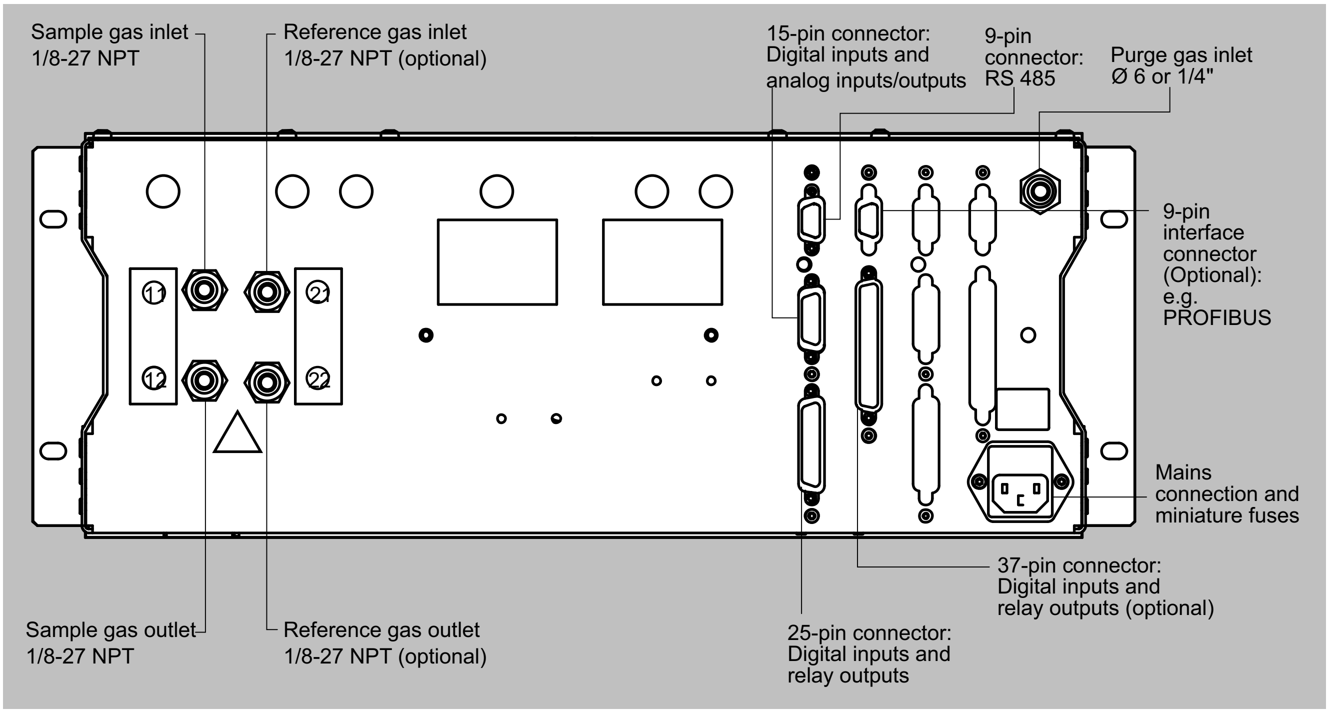
CALOMAT 62, 19" rack unit, pin assignment

Circuit diagrams (Continued)



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

Circuit diagrams (Continued)



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

Selection and ordering data

CALOMAT 62 gas analyzer For installation in the field			**Article No.** **7MB2531-**	●	●	●	●	●	-	●	●	●	●
Click on the Article No. for online configuration in the PIA Life Cycle Portal. ***Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".***													
Material of sample gas path													
Purging gas stub 10 mm													
• Stainless steel, mat. no. 1.4571; non-flow-type reference chamber, 1/8"-27 NPT				0									
• Hastelloy C22; non-flow-type reference chamber, 1/8"-27 NPT				2									
• Hastelloy C22; flow-type reference chamber, 1/8"-27 NPT				3									
Purging gas stub 3/8"													
• Stainless steel, mat. no. 1.4571; non-flow-type reference chamber, 1/8"-27 NPT				4									
• Hastelloy C22; non-flow-type reference chamber, 1/8"-27 NPT				6									
• Hastelloy C22; flow-type reference chamber, 1/8"-27 NPT				7									
Application		**Possible with measuring range identification**											
H_2 in N_2		0; 5			A	N							
H_2 in Cl_2		0; 5			A	B							
Cl_2 in air		1; 6			B	L							
HCl in air		1; 6			C	L							
SO_2 in air		1; 6			E	L							
CO_2 in H_2		0; 5			K	A							
CO_2 in N_2		1; 6			K	N							
Smallest measuring range	**Largest measuring range**	**Reference gas or filling gas**											
0 ... 1%	0 ... 100%	Accompanying gas component					0						
0 ... 5%	0 ... 100%						1						
0 ... 5%	0 ... 60%						2						
0 ... 10%	0 ... 100%						3						
0 ... 20%	0 ... 40%						4						
100 ... 99%	100 ... 0%						5						
100 ... 95%	100 ... 0%						6						
100 ... 90%	100 ... 0%						7						
100 ... 80%	100 ... 60%						8						
Add-on electronics													
Without								0					
AUTOCAL function with 8 additional digital inputs/outputs each								1					
AUTOCAL function with 8 additional digital inputs/outputs each and PROFIBUS PA interface								6					
AUTOCAL function with 8 additional digital inputs/outputs each and PROFIBUS DP interface								7					
Auxiliary power													
100 ... 120 V AC, 48 ... 63 Hz										0			
200 ... 240 V AC, 48 ... 63 Hz										1			
Heating of internal gas paths and analyzer unit													
Without											A		
With (max. 80 °C)											B		
Explosion protection													
Without												A	
According to ATEX II 3G													
• Restrictive breathing for Zone 2												B	
• Simplified pressurized enclosure (pz) for Zone 2												C	
According to ATEX II 2G													
• Continuous purging[1]												F	
According to ATEX II 3D													
• Dust Ex enclosure for Zone 22												G	
According to ATEX II 3D or 3G													
• Zone 22 or restrictive breathing for Zone 2												H	
• Zone 22 or simplified pressurized enclosure for Zone 2												J	
Language of the operating software													
German													0

Selection and ordering data (Continued)

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

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

Options	Order code
Add "-**Z**" to article number and then add order code.	
Settings	
Tag plates (specific inscription based on customer information)	**B03**
BARTEC Ex p purging unit for use in ATEX or IECEx Zone 1 • BARTEC Ex p control unit for continuous flow • BARTEC Ex control station with bypass key switch	**E74**
BARTEC Ex purging unit for use in ATEX or IECEx Zone 1 • BARTEC Ex p control unit for continuous flow • BARTEC Ex control station with bypass key switch • Operator display for visualization of system states	**E75**
Clean for O_2 service (specially cleaned gas path)	**Y02**
Measuring range indication in plain text, if different from default setting	**Y11**
Special setting (only together with an application no., e.g. extended measuring range)	**Y12**
Extended special setting (only in conjunction with an application no., e.g. determination of cross-interferences)	**Y13**

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

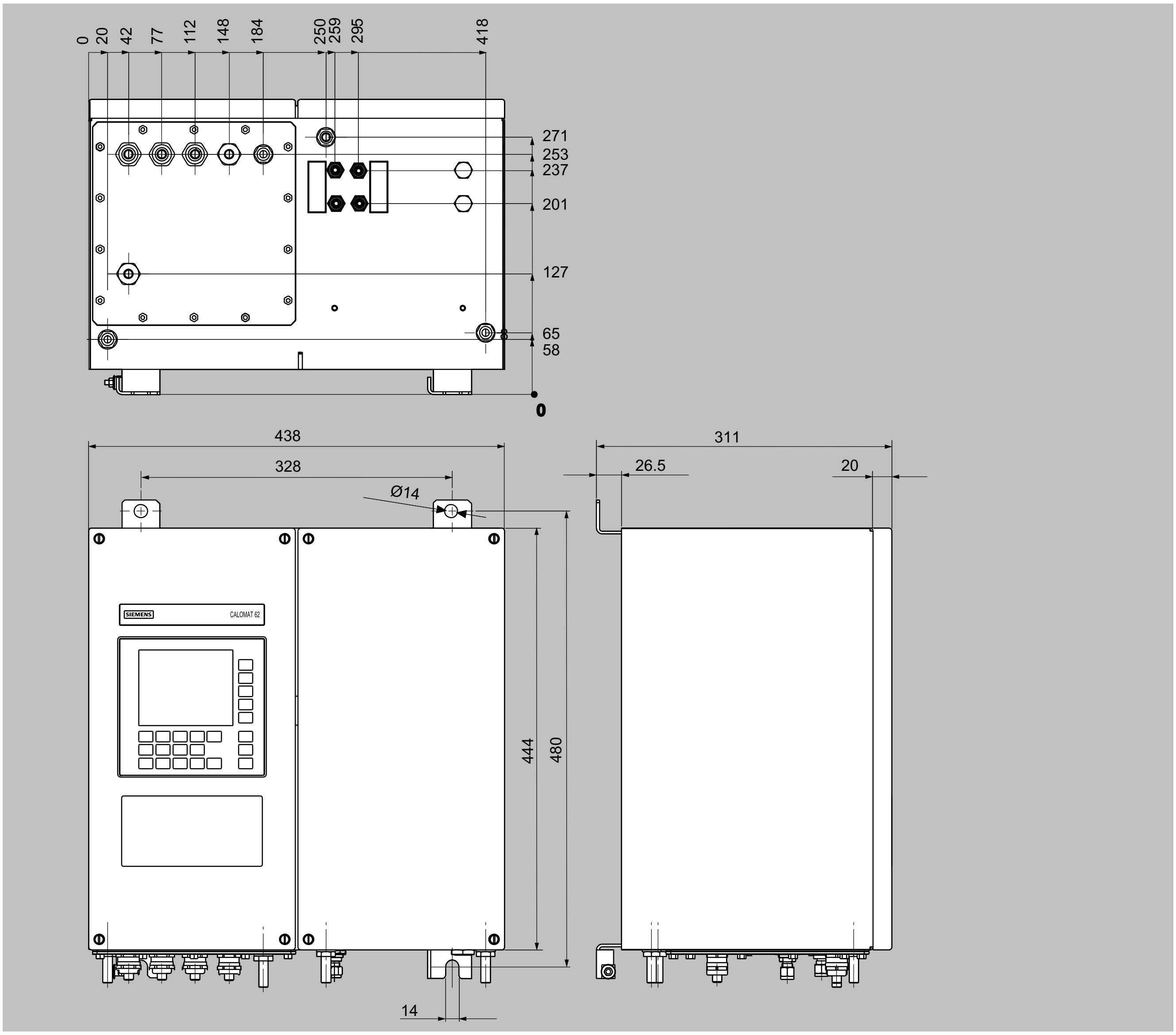
Technical specifications

CALOMAT 62, field device	
General information	Based on EN 61207/IEC 1207. All data based on H_2 in N_2 binary mixture
Measuring ranges	4, internally and externally switchable; automatic measuring range switchover also possible
Measuring span	Application-dependent (see ordering data)
Measuring ranges with suppressed zero point	Application-dependent (see ordering data)
Operating position	Front wall, vertical
Conformity	CE mark in accordance with EN 50081-1/EN 50081-2 and RoHS
Design, enclosure	
Degree of protection	IP65 according to EN 60529
Weight	Approx. 25 kg
Electrical characteristics	
EMC interference immunity (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98) and EN 61326
Electrical safety	In accordance with EN 61010-1; overvoltage category II
Auxiliary power (see nameplate)	100 V AC -10% ... 120 V AC +10%, 48 ... 63 Hz or 200 AC -10% ... 240 V AC +10%, 48 ... 63 Hz
Power consumption	• Approx. 25 VA (gas connection block unheated) • Approx. 330 VA (gas connection block heated)
Fuse ratings (gas connection unheated)	100 ... 120 V: F3 1T/250, F4 1T/250 200 ... 240 V: F3 0.63T/250, F4 0.63T/250
Fuse ratings (gas connection heated)	100 ... 120 V: F1 1T/250, F2 4T/250, F3 4T/250, F4 4T/250 200 ... 240 V: F1 0.63T/250, F2 2.5T/250, F3 2.5T/250, F4 2.5T/250
Gas inlet conditions	
Sample gas pressure	800 ... 1 100 hPa (absolute)
Sample gas flow	30 ... 90 l/h
Sample gas temperature	Min. 0 ... max. 50 °C, but above the dew point
Temperature	
• of the measuring cell (sensor)	70 °C
• of the measurement cell block (base)	80 °C (heated)
Sample gas humidity	< 90% relative humidity
Purging gas pressure	
• Permanent	165 hPa above atmospheric pressure
• For short periods	Max. 250 hPa above ambient pressure
Time response	The dynamic and measuring response refers to the measurement of H_2 in N_2 (based on the sample gas pressure 1 000 hPa absolute, sample gas flow 0.5 l/min, and ambient temperature 25 °C
Warm-up period	< 30 min at room temperature (the technical specification will be met after 2 hours)
Delayed display (T_{90})	Approx. 35 s (including dead time)
Electrical damping	0 ... 100 s, configurable
Dead time (the diffusion to the probes is the determining variable)	Approx. 34 s
Measuring response	The dynamic and measuring response refers to the measurement of H_2 in N_2 (based on the sample gas pressure 1 000 hPa absolute, sample gas flow 0.5 l/min, and ambient temperature 25 °C
Output signal fluctuation (3σ value)	< ± 1% of the smallest possible measuring span according to nameplate with electronic damping constant of 1 s
Zero point drift	< ± 1% of the current measuring span/week
Measured value drift	< ± 1% of the smallest possible measuring span (according to nameplate)/week
Repeatability	< ± 1% of the current measuring span

Technical specifications (Continued)

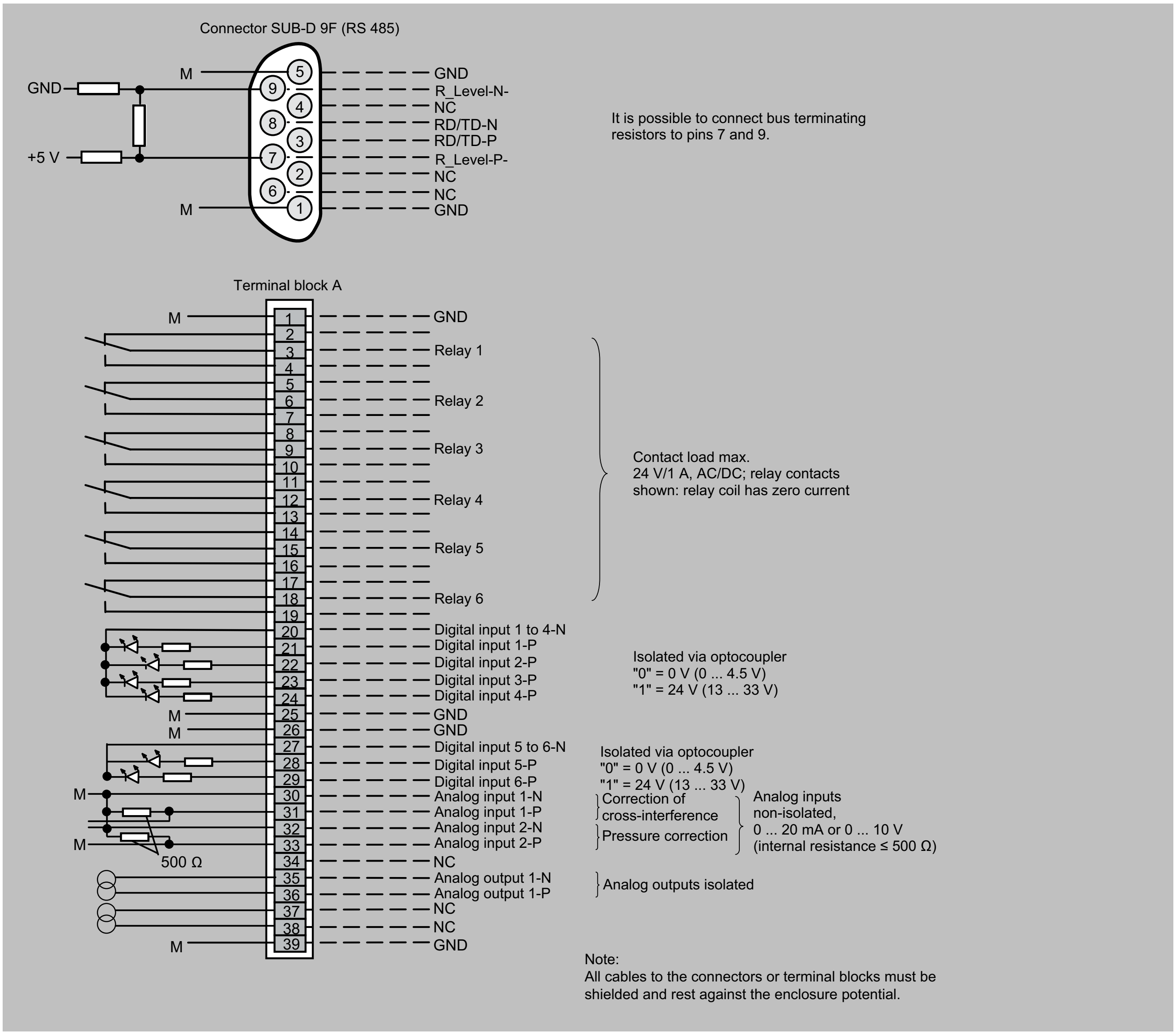
CALOMAT 62, field device	
Detection limit	1% of the smallest possible measuring span according to nameplate
Linearity error	< ± 1% of the current measuring span
Influencing variables	Based on sample gas pressure 1 000 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Ambient temperature	< 2%/10 K referred to smallest possible measuring span according to nameplate
Accompanying gases	Zero point deviation (for influence of interference gas, see "Cross-interferences")
Sample gas flow	0.2% of the current measuring span with a change in flow of 0.1 l/min within the permissible flow range
Sample gas pressure	< 1% of the measuring span with a pressure variation of 100 hPa
Auxiliary power	< 0.1% of the output signal span with nominal voltage ± 10%
Electrical inputs and outputs	
Analog output	0/2/4 ... 20 mA, floating; load max. 750 Ω
Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load rating: 24 V AC/DC/1 A, floating
Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and correction of cross-interference
Digital inputs	6, designed for 24 V, floating, freely configurable, e.g. for measuring range switchover
Serial interface	RS 485
Options	AUTOCAL function with 8 additional digital inputs and relay outputs, also with PROFIBUS PA (on request) or PROFIBUS DP (on request)
Climatic conditions	
Permissible ambient temperature	-40 ... +70 °C during storage and transportation, 5 ... 45 °C during operation
Permissible humidity (must not fall below dew point)	< 90% relative humidity as annual average during storage and transportation

Dimensional drawings



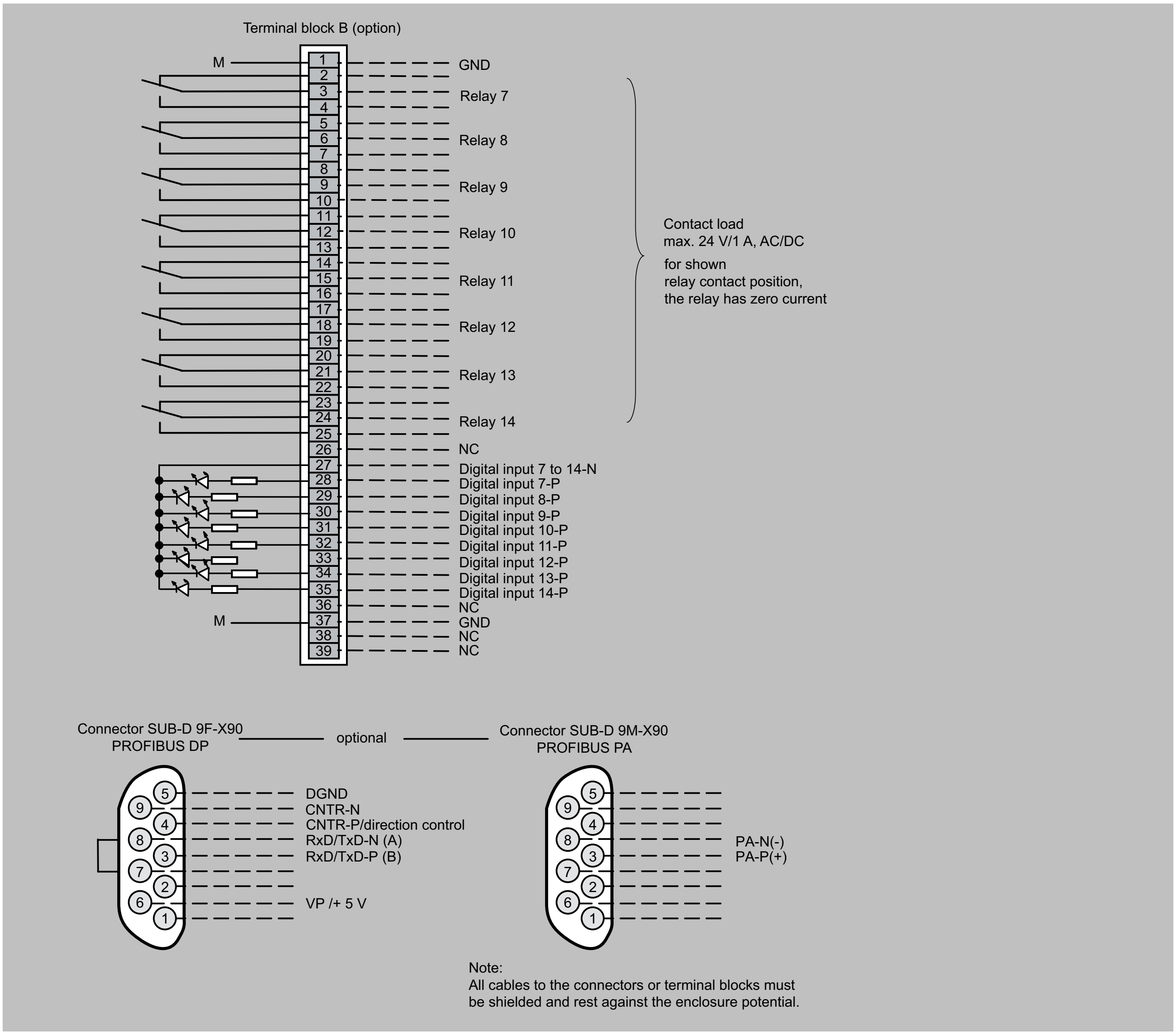
CALOMAT 62, field device, dimensions in mm

Circuit diagrams



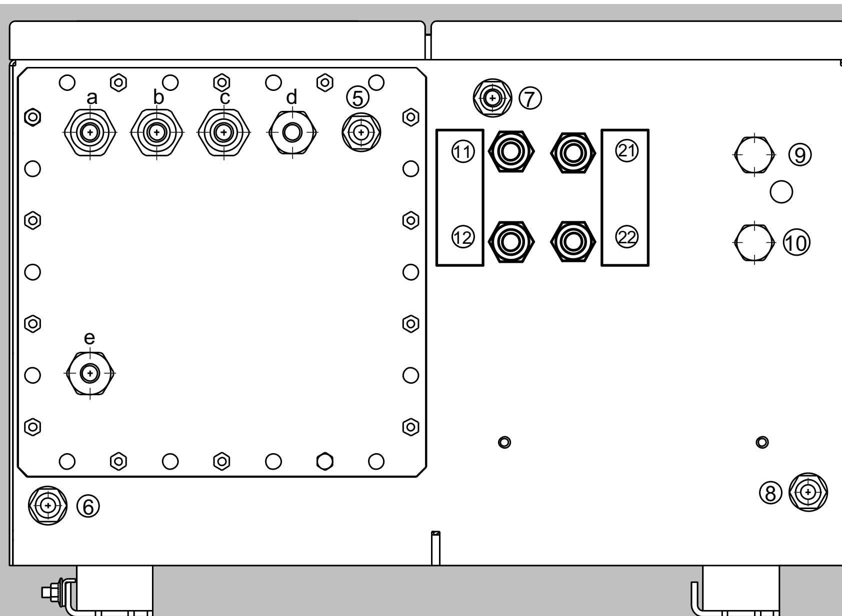
CALOMAT 62, field device, pin and terminal assignment

Circuit diagrams (Continued)



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

Circuit diagrams (Continued)



Gas connections

11	Sample gas inlet	Internal thread 1/8" - 27 NPT
12	Sample gas outlet	
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

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

Overview

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

Benefits

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

- In the presence of up to 100% 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 interference gases
- Low consumption of combustion air
- Low influence of oxygen on measured value

Moreover, the device provides warning and error messages:

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

Application

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

Application (Continued)

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

Specific applications

<u>Special applications</u>

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

<u>Performance-tested version</u>

Configuration prepared based on QAL1 according to EN 15267 for systems - sections 13 and 27 of the German Federal Immission Protection Regulations and German Technical Instructions on Air Quality Control (TA Luft).

Design

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

Display and operator panel

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

Inputs and outputs

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

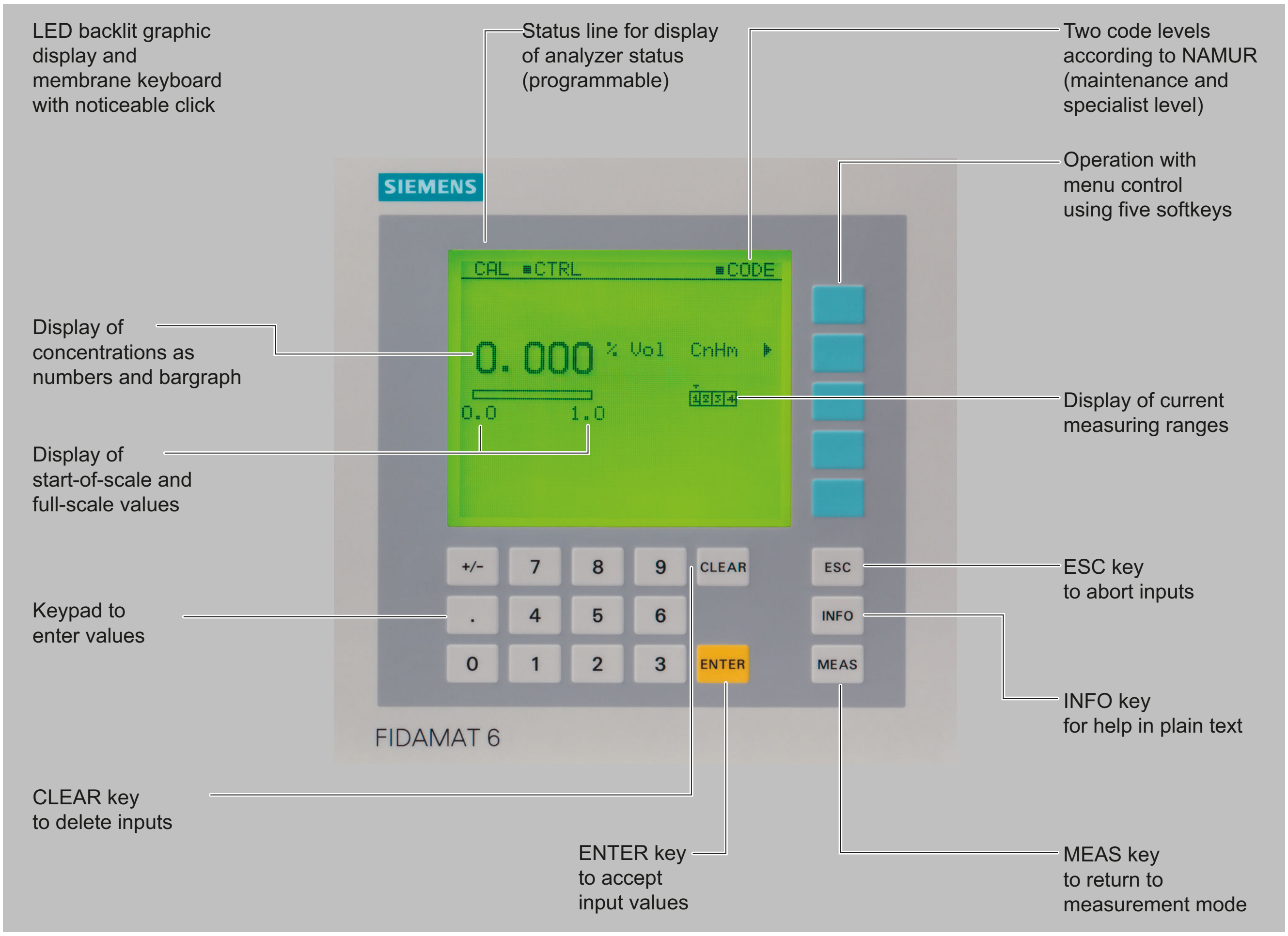
Communication

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

Options

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

Design (Continued)

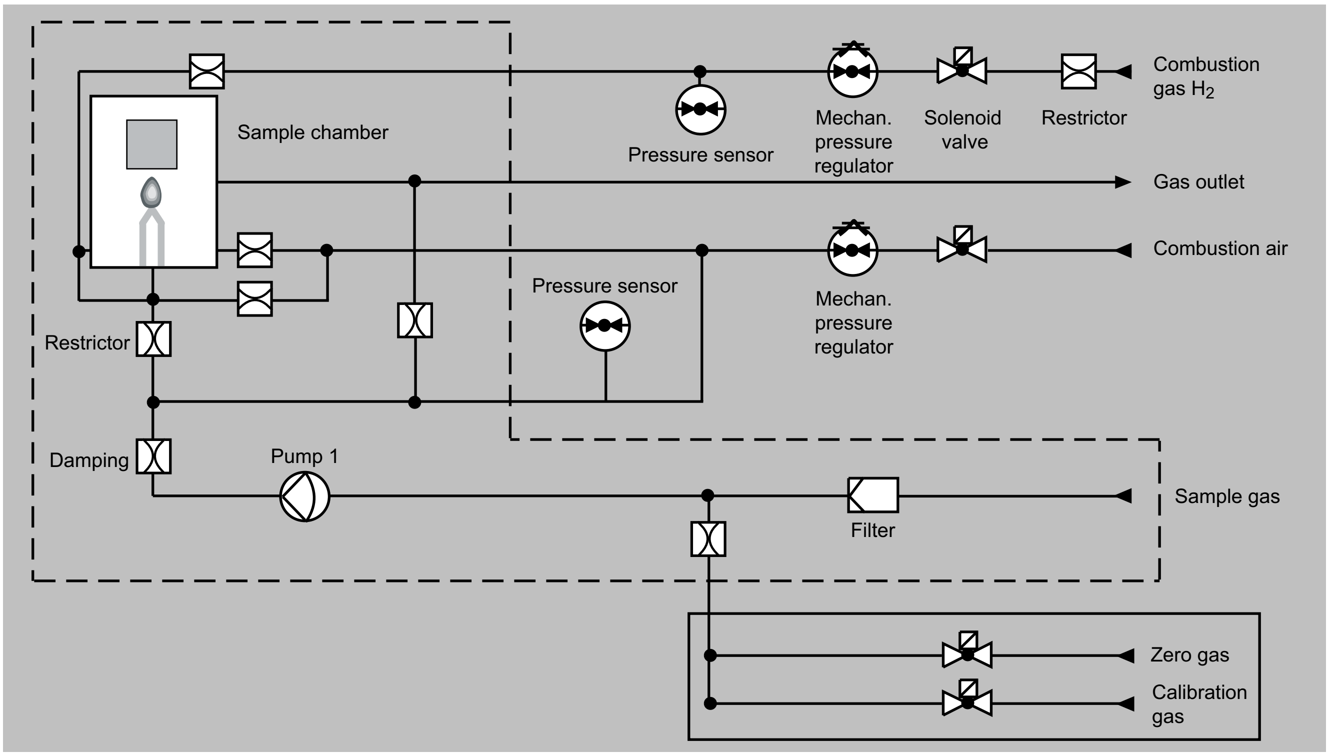


FIDAMAT 6, membrane keyboard and graphic display

Designs – parts wetted by sample gas	
Gas path	**Material**
Piping	Stainless steel, mat. no. 1.4571
Gas inlet	Stainless steel, mat. no. 1.4571
Gaskets	Graphite
Sample gas restrictor	Quartz
Auxiliary gas restrictors	Stainless steel, mat. no. 1.4571
Pump diaphragm	PTFE
Pump head	Stainless steel, mat. no. 1.4571
Detector	
• Nozzle	Quartz
• FID enclosure	Stainless steel, mat. no. 1.4571

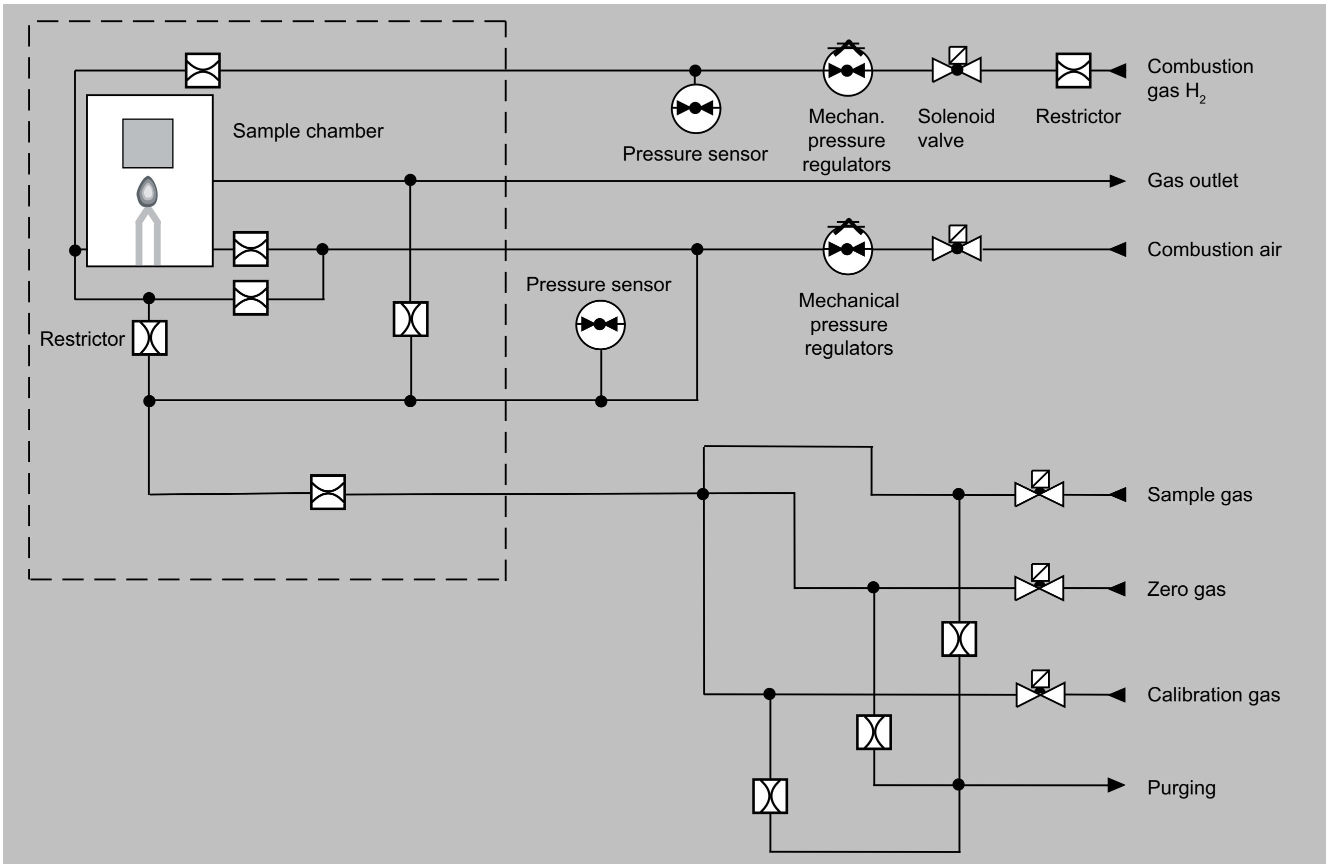
Design (Continued)

Gas path



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

Design (Continued)



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

Mode of operation

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

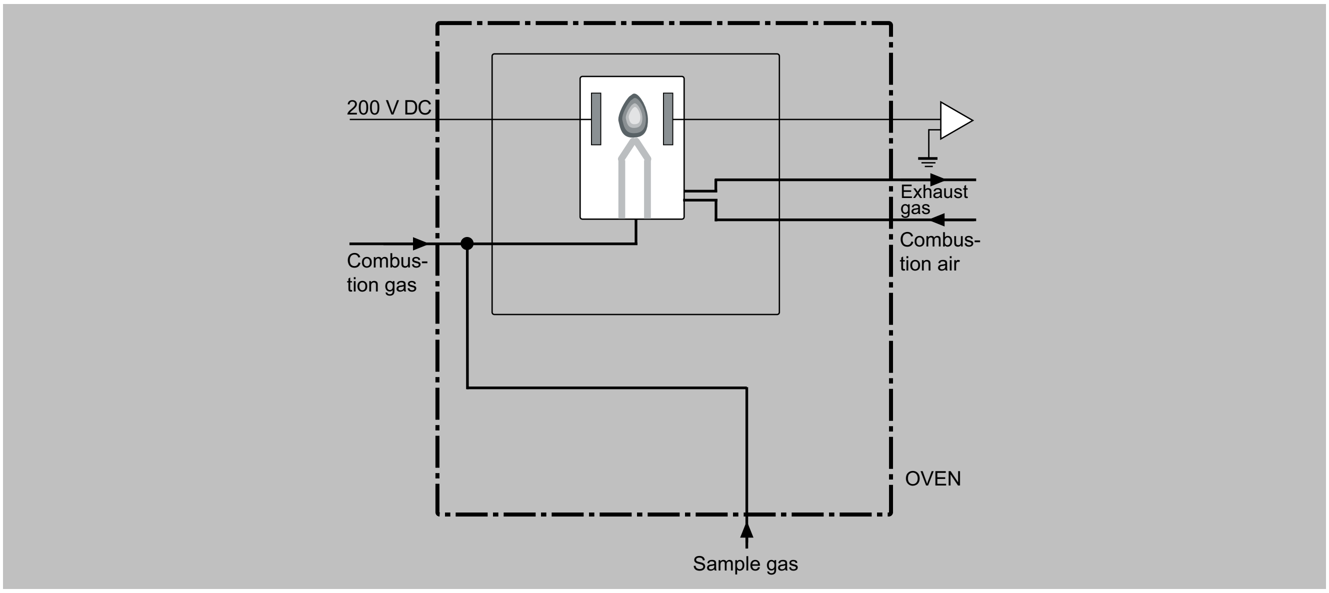
The sample gas is supplied to the FIDAMAT 6 through overpressure or drawn in by the built-in diaphragm pump (optionally via a heated line and an additional filter) and passed on to the flame ionization detector via an obstruction-proof fused-silica restrictor.

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

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

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

Mode of operation (Continued)



FIDAMAT 6, mode of operation

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

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

Note

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

Calibration

The calibrating interval should be adapted to the respective measuring task. We recommend N_2 as zero gas (at least 5.0; for measuring of hydrocarbons < 1 vpm: at least 6.0).
The calibration gas should have a concentration of at least 60% of the leading measuring range. The concentration of residual hydrocarbons must not exceed 0.1 vpm.
For pure gas measurement, use suitable accompanying gases.

Calibration (example)	
1. Emission measurement	
Measuring range	0 ... 50 mg C/m^3
Zero gas	N_2 (5.0 or better)
Span gas	21 vpm C_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)
Span gas	At least 30 vpm CH_4 in O_2

Function

Main features

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

Response factors (examples, mean values)

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

Function (Continued)

Cross-interferences (examples)[1)]

Interfering component	Concentration of the interfering component	Induced cross-interference
O_2 in N_2	(21 vol.%)	< 0.3 mg/m³
SO_2 in N_2	(258 mg/m³)	< 0.15 mg/m³
NO contact in N_2	(310 mg/m³)	< 0.5 mg/m³
NO contact₂ in synth. Air	(146 mg/m³)	< 0.1 mg/m³
CO in N_2	(461 mg/m³)	< 0.15 mg/m³
CO_2 in N_2	(18 vol.%)	< 0.1 mg/m³
HCl in N_2	(78 mg/m³)	< 0.3 mg/m³

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

Selection and ordering data

FIDAMAT 6 gas analyzer 19" rack unit for installation in cabinets	Article No. 7MB2421-	●	●	●	●	●	-	●	●	A	●
Click on the Article No. for online configuration in the PIA Life Cycle Portal. ***Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".***											
Gas connections											
Pipe with 6 mm outer diameter		0									
Pipe with ¼" outer diameter		1									
Version											
Without pump, for sample gas with overpressure[1]			B								
With heated pump, for sample gas with atmospheric pressure			D								
Combustion air feed											
With connection for combustion air				A							
Number of channels											
1-channel version					1						
Add-on electronics											
Without						0					
AUTOCAL function with 8 additional digital inputs/outputs each						1					
AUTOCAL function with 8 digital inputs/outputs each and PROFIBUS PA interface						6					
AUTOCAL function with 8 digital inputs/outputs each and PROFIBUS DP interface						7					
Auxiliary power											
100 ... 120 V AC, 48 ... 63 Hz								0			
200 ... 240 V AC, 48 ... 63 Hz								1			
Combustion gases											
H_2									A		
Language of the operating software											
German											0
English											1
French											2
Spanish											3
Italian											4

[1] No QAL1 approval according to EN 15267.

Options	Order code
Add "-**Z**" to article number and then add order code.	
Settings	
Telescopic rails (2 units)	**A31**
Tag plates (specific inscription based on customer information)	**B03**
Clean for O_2 service (specially cleaned gas path)	**Y02**
Measuring range indication in plain text, if different from default setting	**Y11**
Special setting (only in conjunction with an application no.)	**Y12**
Extended special setting (only in conjunction with an application no.)	**Y13**
Configuration according to certificate (QAL1)[1]	**Y37**

[1] For certified operation, compensation of the influence of interference gas caused by the oxygen is required. To do this, the device must be supplied with the current oxygen concentration value of the sample gas. The supply takes place over an external measuring instrument that must also meet the requirements of EN 15267-3 (e.g. ULTRAMAT 23 or OXYMAT 6). The FIDAMAT 6E -Y37 is pre-parameterized accordingly and expects an analog signal of 4 ... 20 mA corresponding to 0 ... 21 vol.% O_2 at analog input AI2.

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

Selection and ordering data (Continued)

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

Technical specifications

FIDAMAT 6, 19" rack unit	
General information	
Measuring ranges	4, internally and externally switchable; manual and automatic measuring range switchover possible
Smallest possible measuring span	0 ... 10 vpm
Largest possible measuring span	99.999 vpm*)
Concentration units	vpm, C_1, C_3, C_6 or mgC/m^3
Automatic measuring range switchover	Hysteresis, selectable
Measured value display	Digital concentration indicator (5 digits with floating point)
Resolution of digital display	0.1% of measured value
Operating position	Front wall, vertical
Conformity	CE mark EN 50081-1, EN 50082-2
Oven temperature	Adjustable 100 ... 200 °C
Design, enclosure	
Degree of protection	IP20 according to EN 60529
Weight	Approx. 23 kg
Electrical characteristics	
Auxiliary power	100 ... 120 V AC (nominal range of use 90 ... 132 V), 48 ... 63 Hz or 200 ... 240 V AC (nominal range of use 180 ... 264 V), 48 ... 63 Hz
Power consumption	• Approx. 150 VA during operation,
	• Approx. 350 VA during warm-up phase
EMC interference immunity (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98)
Electrical safety	In accordance with EN 61010-1, overvoltage category II
Fuse ratings	100 ... 120 V: 4.0T/250 200 ... 240 V: 2.5 T/250
Gas inlet conditions	
Permissible sample gas pressure	
• Without pump	< 2 000 hPa abs.
• With integrated pump	600 ... 1 100 hPa
Sample gas temperature	0 ... 200 °C
Sample gas humidity	< 90% RH (RH: relative humidity)
Time response	
Warm-up period	At room temperature, approx. 2 ... 3 h
Delayed display (T_{90})	2 ... 3 s
Damping (electrical time constant)	0 ... 100 s, configurable
Dead time (purging time of the gas path in the device at 1 l/min)	With filter 2 ... 3 s
Time for device-internal signal processing	< 1 s
Measuring response	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation	< 0.75% of the smallest possible measuring range according to nameplate, with electronic damping constant of 1 s (corresponds to ± 0.25% at 2 σ)

Technical specifications (Continued)

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

*) 100% as special application

FIDAMAT 6 with pump and heated oven, with combustion air connection					
Gases		Operating pressure			
	Inlet 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	2 000 ± 20	~ 25	—
Combustion air	3 000 ... 5 000	1 420 ± 20	1 500	~ 320	~ 500
Sample gas	~ 1000	—	1 500 ± 2	~ 3	~ 1 000
Zero gas	3 500 ... 4 000	—	1 500 ± 2	~ 3	~ 1 000
Span gas	3 500 ... 4 000	—	1 500 ± 2	~ 3	~ 1 000

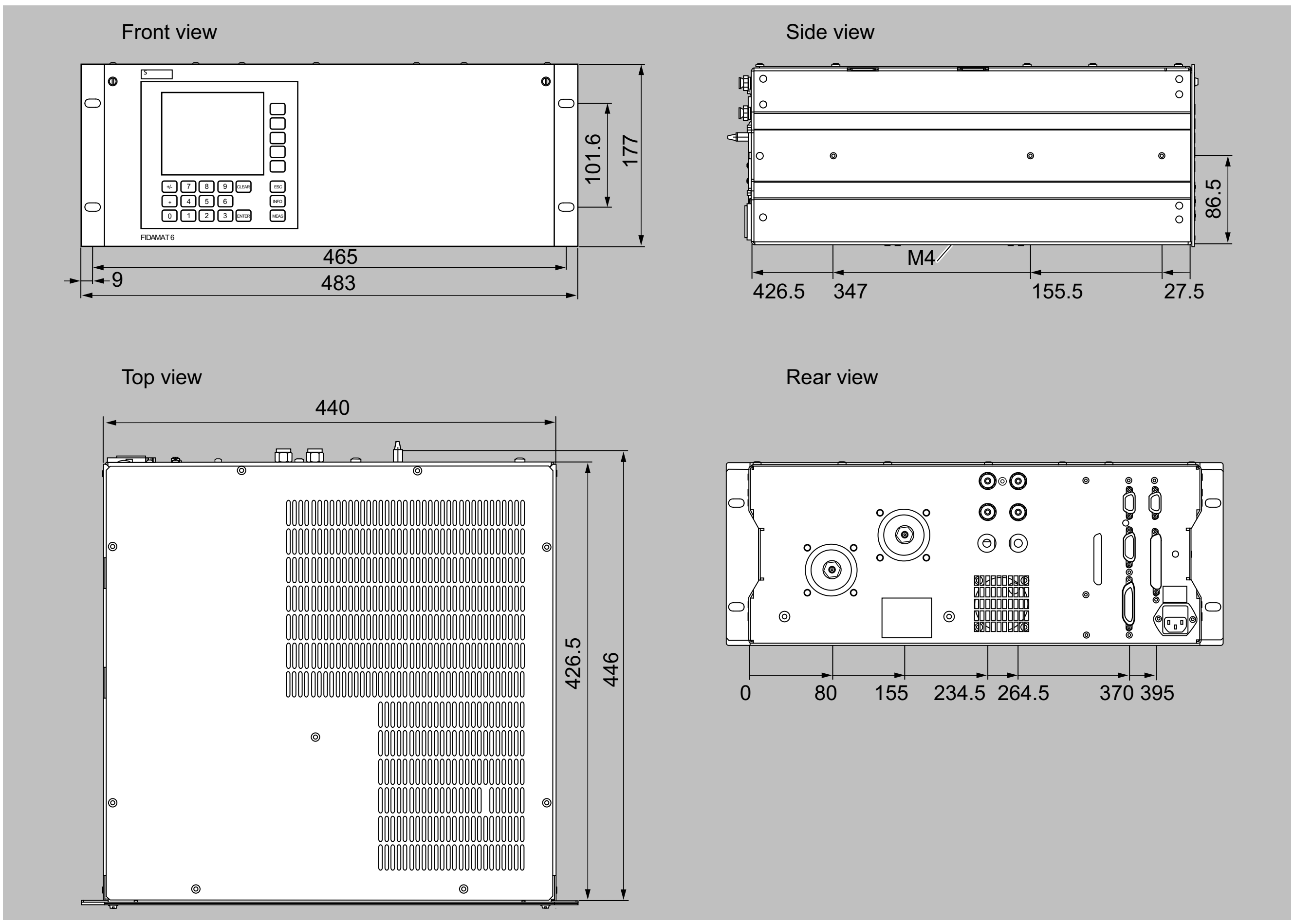
FIDAMAT 6 without pump, with heated oven, with combustion air connection					
Gases		Operating pressure			
	Inlet pressure	Sample/calibration gas		Flow through FID	Flow through bypass
		Without	With		
	hPa (abs.)	hPa (abs.)	hPa (abs.)	ml/min	ml/min
Combustion gas	3 000 ... 5 000	2 000 ± 20	2 000 ± 20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

Technical specifications (Continued)

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

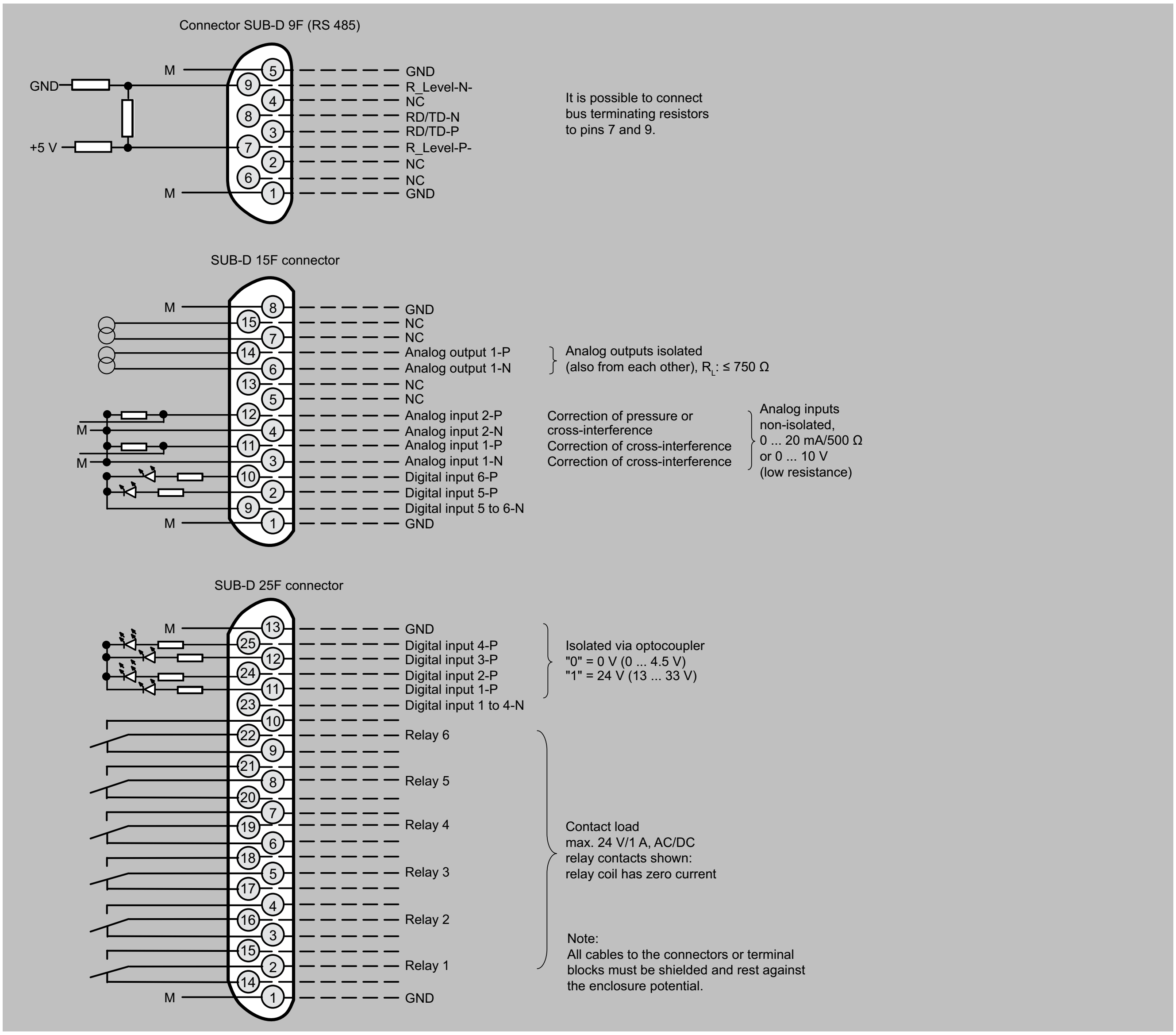
The supply gases (combustion gas, combustion air) must have a degree of purity of 5.0 in order to guarantee correct measurements. The degree of purity must be increased in the case of very small hydrocarbon concentrations (< 1 vpm).

Dimensional drawings



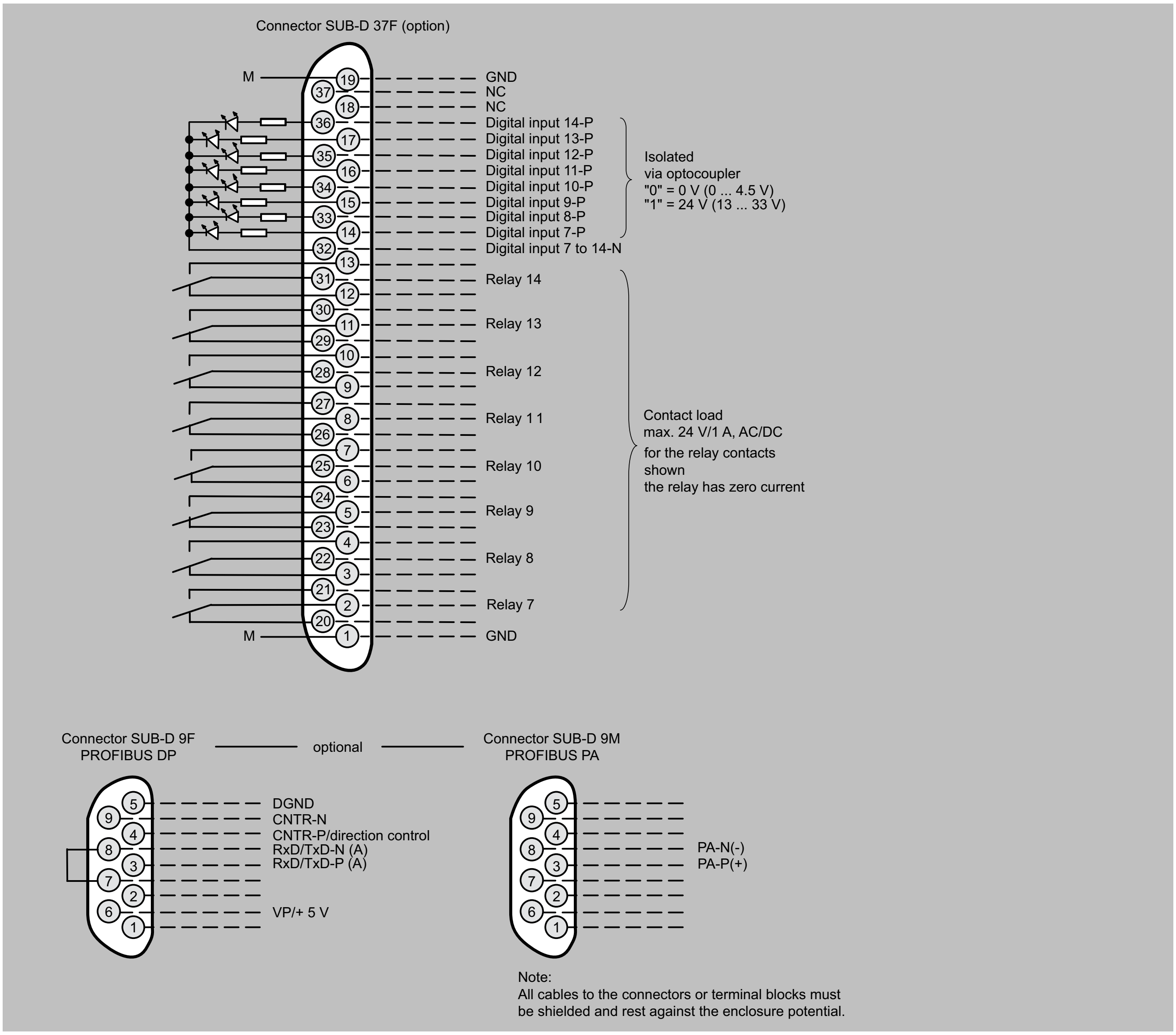
FIDAMAT 6, 19" rack unit, dimensions in mm

Circuit diagrams



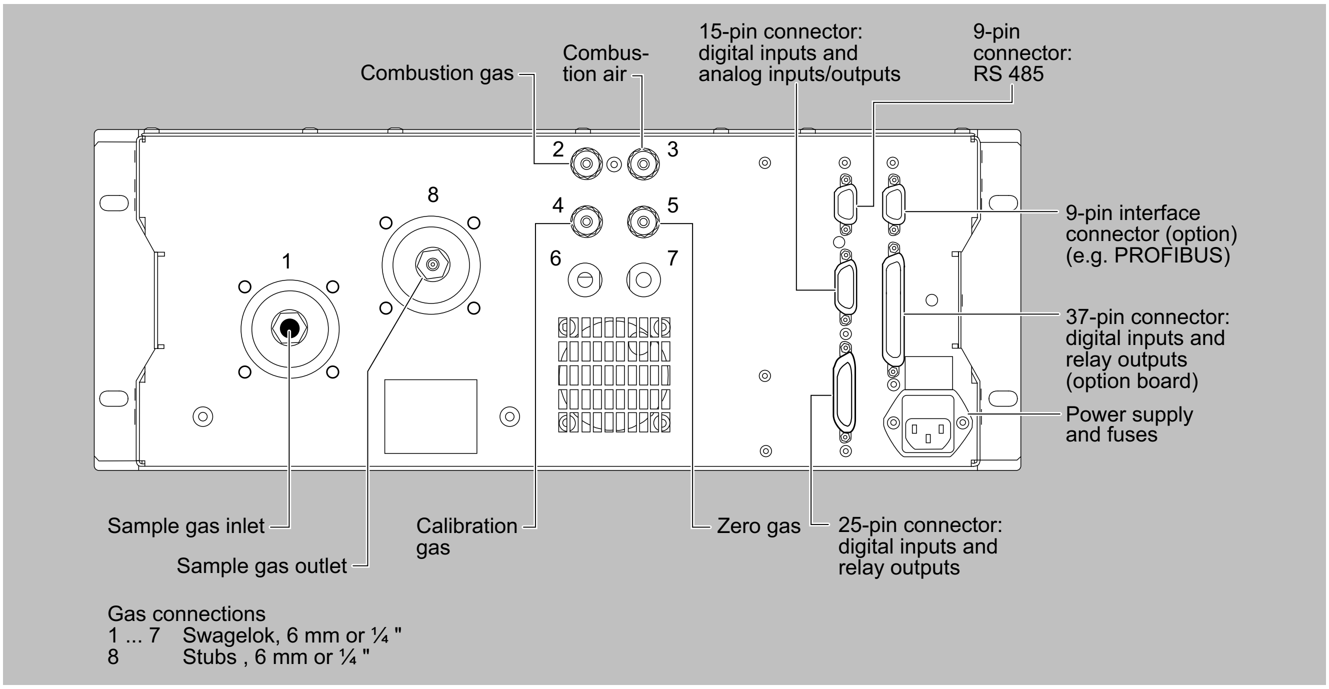
FIDAMAT 6, 19" rack unit, pin assignment

Circuit diagrams (Continued)

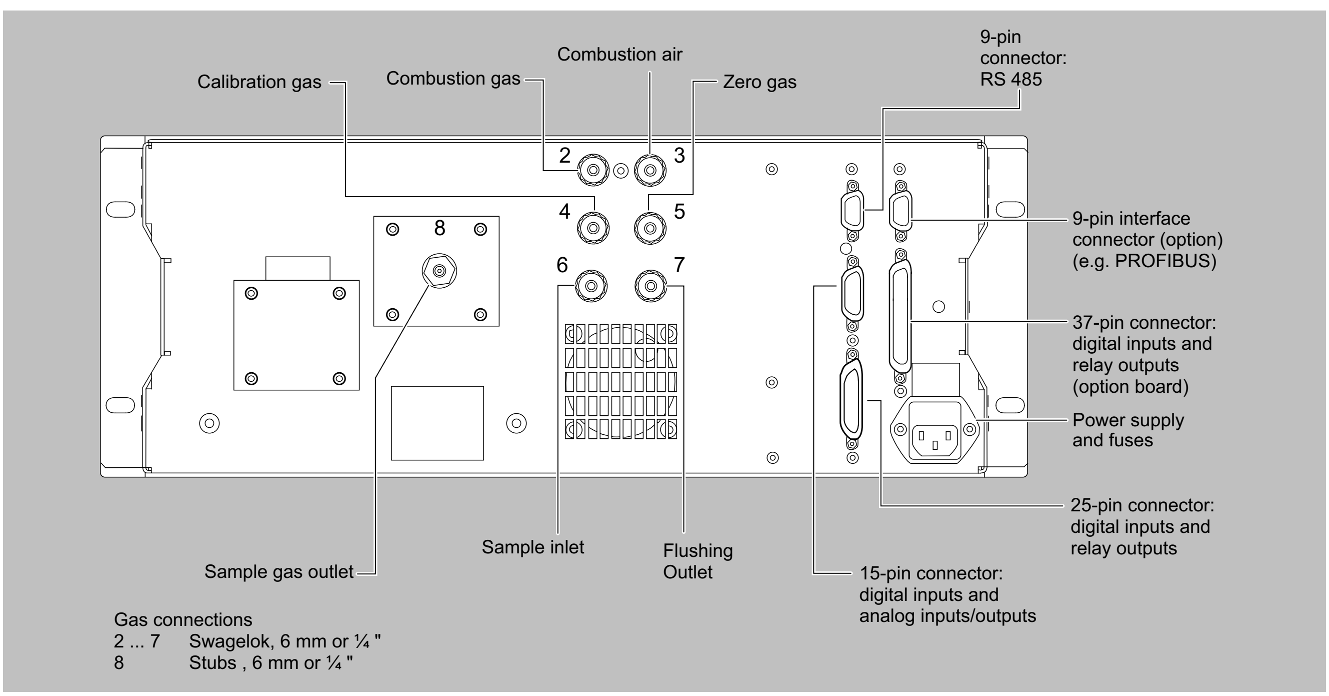


FIDAMAT 6, 19" rack unit, pin assignment of AUTOCAL board and PROFIBUS plugs

Circuit diagrams (Continued)



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



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

Selection and ordering data

Description	2 years (unit)	5 years (unit)	Article No. FIDAMAT 6 with pump	FIDAMAT 6 without pump
Analyzer unit				
FI detector, complete		1	A5E00295816	A5E00295816
Sample gas path				
Pump (KNF)	1	1	A5E00882121	
Set of gaskets for pump (KNF)	4	10	A5E03792459	
Filter, with gasket for sample gas	1	3	A5E00248845	
Pressure regulators	1	1	A5E00248851	A5E00248851
Gasket for pressure regulator	1	2	A5E00295107	A5E00295107
Filter, complete (sample gas inlet, 6 mm)		1	A5E00295928	
Filter, complete (sample gas inlet, 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 (retrofit kit)	1	2	A5E01040317	A5E01040317
Fusible element, 230 V AC	2	3	A5E00248819	A5E00248819
Fusible element, 110 V AC	2	3	A5E00248822	A5E00248822
LC display	1	1	A5E00248920	A5E00248920
Cable, temperature sensor for oven		1	A5E00283770	A5E00283770
Cable, temperature sensor for analyzer part		1	A5E00283780	A5E00283780
Cable, magnetic distributor		1	A5E00283800	A5E00283800
Cable, heater for oven, 230 V AC		1	A5E00283817	A5E00283817
Cable, heater for oven, 110 V AC		1	A5E00295469	A5E00295469
Cable, electrode voltage, complete		1	A5E00284092	A5E00284092
Cable, signal cable		1	A5E00284094	A5E00284094
Cable, connecting cable (4-pole)	1	1	A5E00284095	A5E00284095
Cable, connecting cable (5-pole)	1	1	A5E00284096	A5E00284096
Axial-flow fan, 24 V DC		1	A5E00313839	A5E00313839

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

More information

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

Overview

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

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

Benefits (Continued)

Special benefits when used in biogas plants

- Continuous measurement of all four key components, including 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 (German Technical Inspectorate/TÜV certificate)

Application

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

Application areas in biogas plants

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

Application area of paramagnetic oxygen sensor

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

Further applications

- Environmental protection
- Chemical plants
- Cement industry

Special 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 devices and for process and safety monitoring.

Versions conforming to EN 14181 and EN 15267

According to EN 14181, which is standardized in the EU and required in many European countries, a QAL1 qualification test, i.e. certification of the complete measuring device including gas paths and conditioning, is required for continuous emission monitoring systems (CEMS). In accordance with EN 15267, this must be performed by an independent accredited authority. In Germany, for example, the test is performed by the German Technical Inspectorate (TÜV) and the test report is submitted to the Federal/State Workgroup for Emission Control (Bund/Länder-Arbeitsgemeinschaft für Immissionsschutz - LAI) for examination/approval. Notification is then issued by the German Federal Environment Agency (Umweltbundesamt - UBA) in the Federal Gazette (Bundesanzeiger) as well

Application (Continued)

as by the German Technical Inspectorate (TÜV) here:
https://www.qal1.en.
In the UK, the QAL1 test reports are prepared by Sira Environmental of the Environmental Agency in accordance with the MCERTS scheme and submitted for approval and publication on the SIRA Environmental websites. The other European countries rely either on the German or English certification scheme.
For use in EN 14181 applications, the devices with the article numbers 7MB235X in the Set CEM CERT (7MB1957) have undergone qualification testing according to German standards of EN 15267.
These German Technical Inspectorate (TÜV) versions of the ULTRAMAT are suitable for measurement of CO, NO, SO_2 and O_2 according to sections 13 and 27 of the BlmSchV (Federal Emission Law of Germany) and TA Luft. Smallest measuring range tested and approved by the German Technical Inspectorate:
1 and 2-component analyzer

- CO: 0 to 150 mg/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 (QAL3) can be carried out manually or also with a PC using the SIPROM GA maintenance and servicing software. In addition, selected manufacturers of emission evaluation computers offer the possibility to read the drift data via the analyzer's serial interface and automatically record and process it in the evaluation computer.

Version with faster response time

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

Chopper purge

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

Design

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

Display and operator panel

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

Inputs/outputs

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

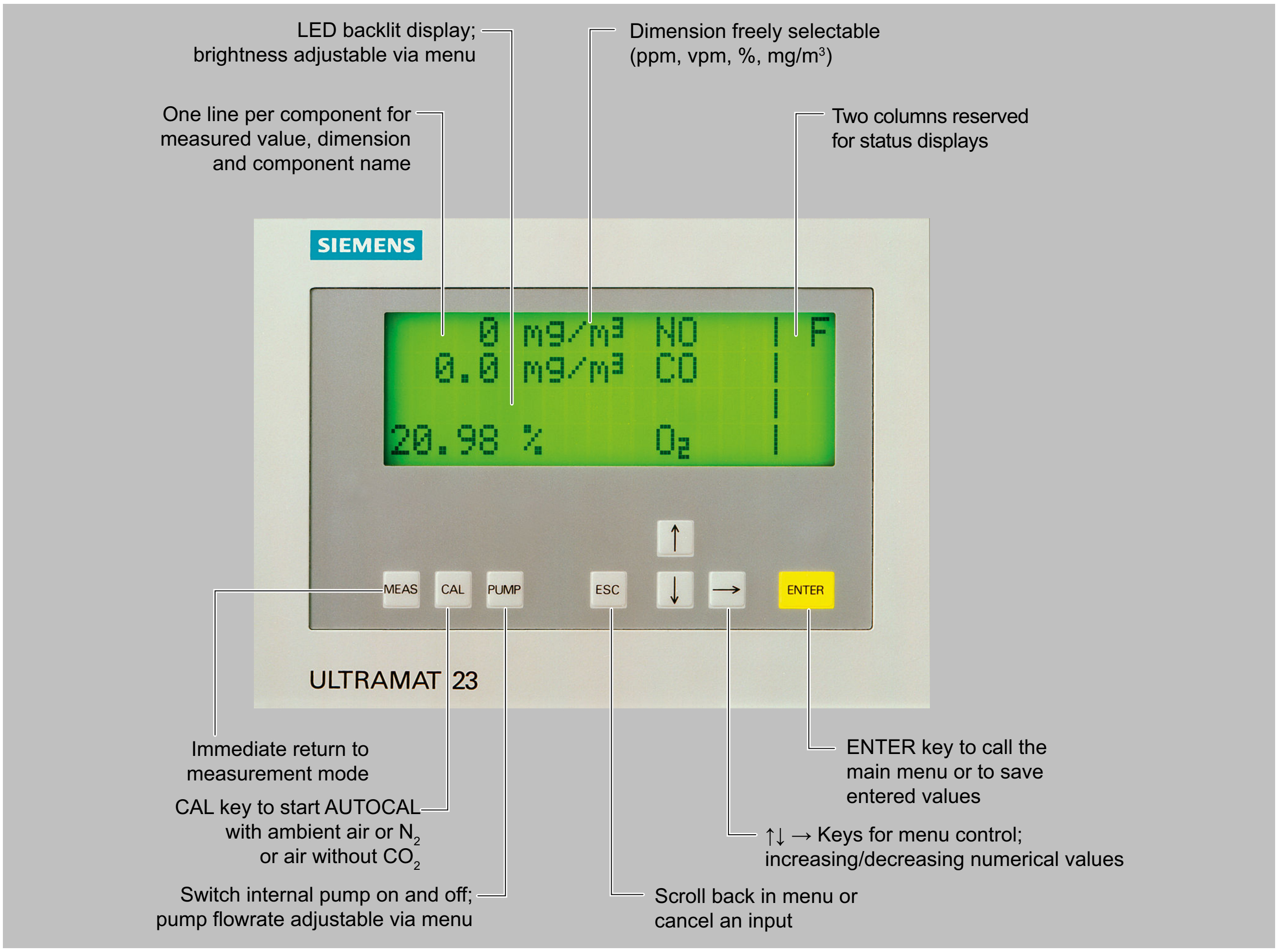
Communication

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

Options

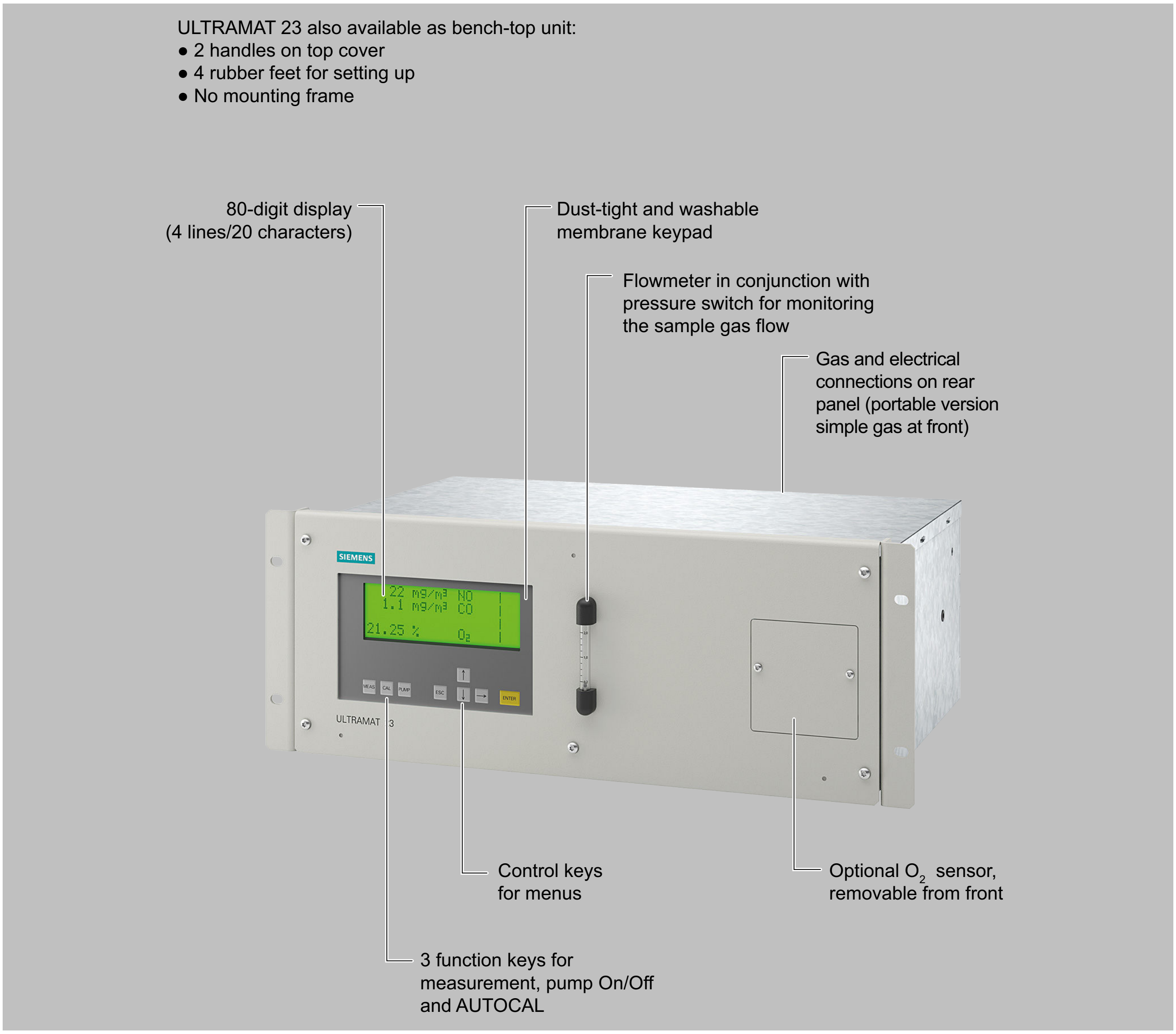
- RS 485/RS 232 converter
- RS 485/Ethernet converter
- RS 485/USB converter
- Incorporation in networks via PROFIBUS DP/PA interface
- SIPROM GA software as service and maintenance tool

Design (Continued)



ULTRAMAT 23, membrane keyboard and graphic display

Design (Continued)



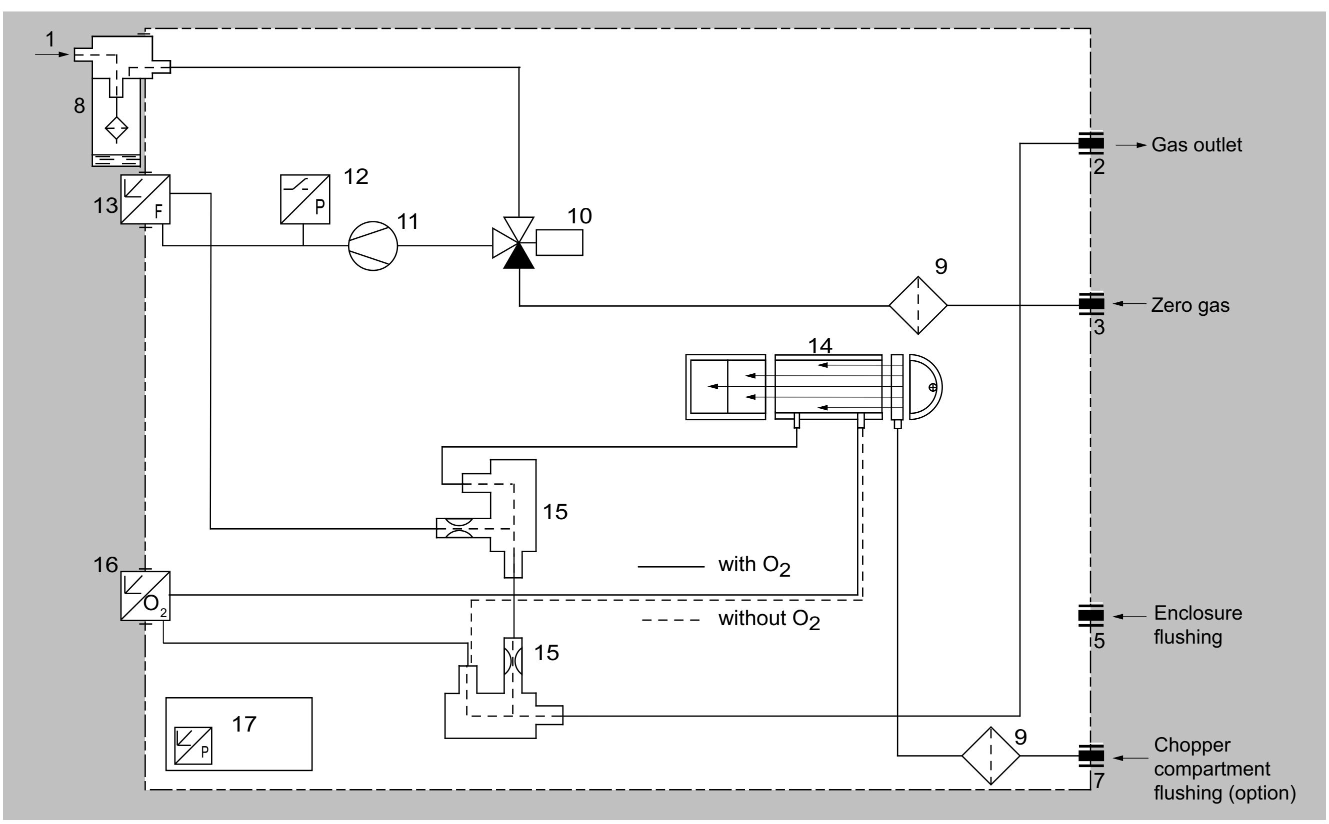
ULTRAMAT 23, design

Designs – parts wetted by sample gas			
Gas path		19" rack unit	Desktop unit
With hoses	Condensation trap/gas inlet	-	PA (polyamide)
	Condensation trap	-	PE (polyethylene)
	Gas connections 6 mm	PA (polyamide)	PA (polyamide)
	Gas connections 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
	Angle units/T-pieces	PA6	PA6
	Internal pump, option	PVDF/PTFE/EPDM/FPM/Trolene/stainless steel, mat. no. 1.4571	PVDF/PTFE/EPDM/FPM/Trolene/stainless steel, mat. no. 1.4571

Design (Continued)

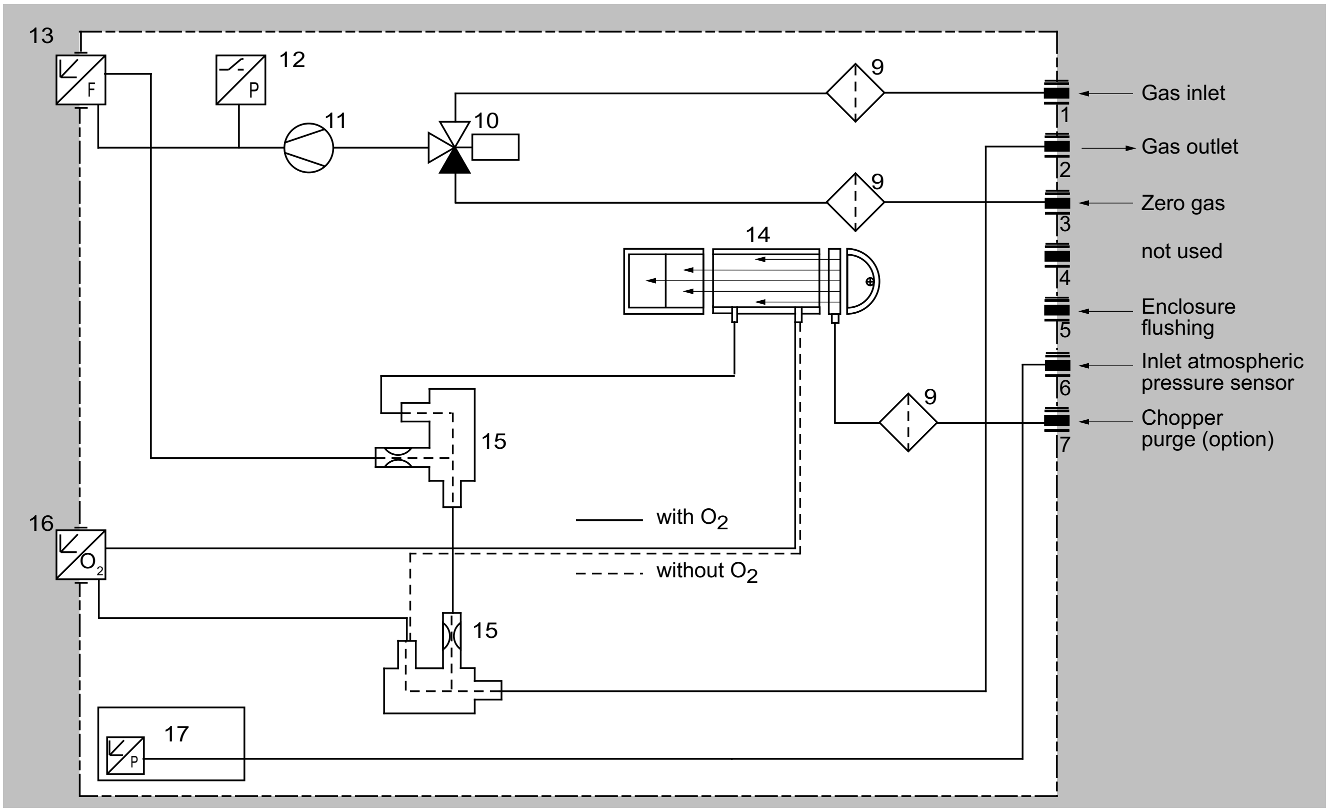
Designs – parts wetted by sample gas Gas path		19" rack unit	Desktop unit
With hoses	Solenoid valve	FPM70/Ultramide/stainless steel, mat. no. 1.4310/1.4305	FPM70/Ultramide/stainless steel, mat. no. 1.4310/1.4305
	Safety condensation trap	PA66/NBR/PA6	PA66/NBR/PA6
	Analyzer chamber		
	• Body	Aluminum	Aluminum
	• Lining	Aluminum	Aluminum, black anodized
	• Fitting	Stainless steel, black anodized, mat. no. 1.4571	Stainless steel, mat. no. 1.4571
	• Window	CaF_2, quartz	CaF_2
	• 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)	-

Gas path



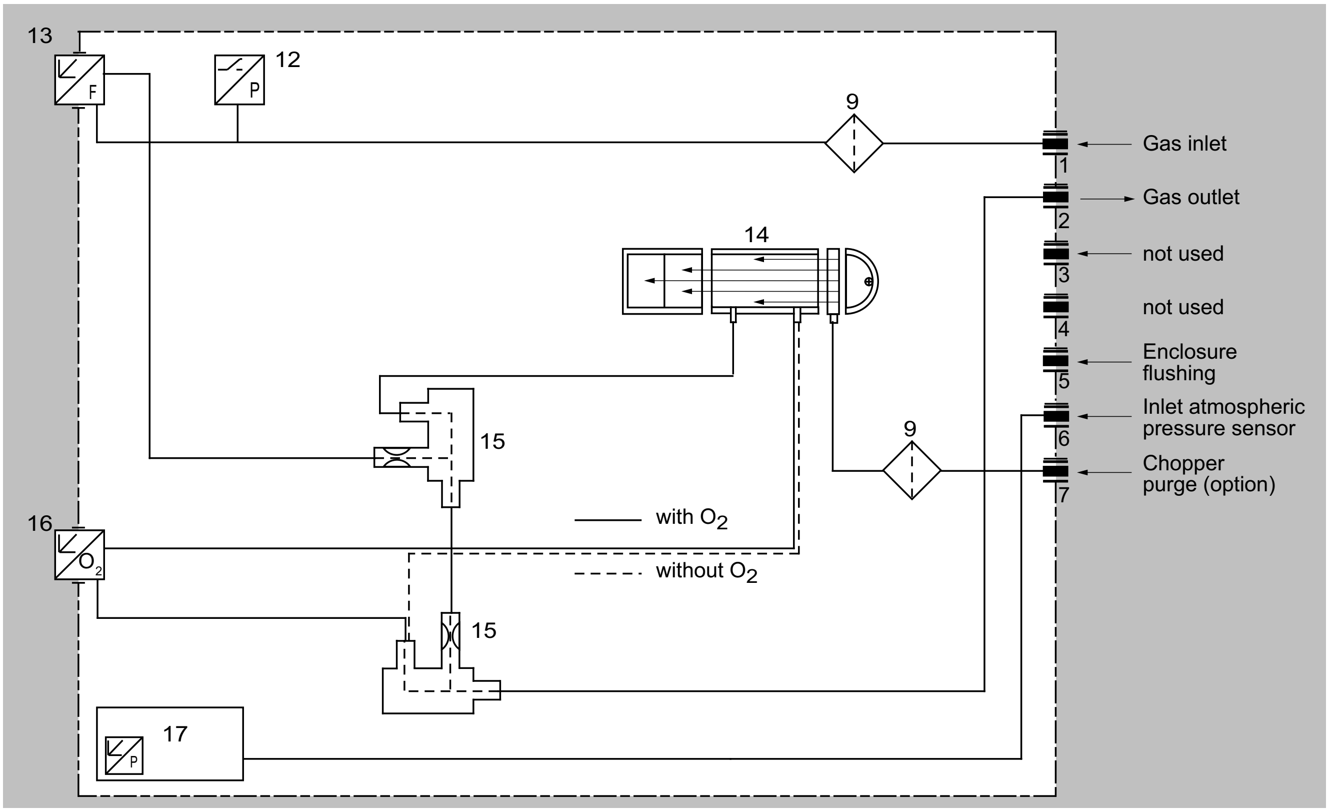
ULTRAMAT 23, portable, in sheet-steel housing with internal sample gas pump, condensation trap with safety filter on front plate, optional oxygen measurement

Design (Continued)



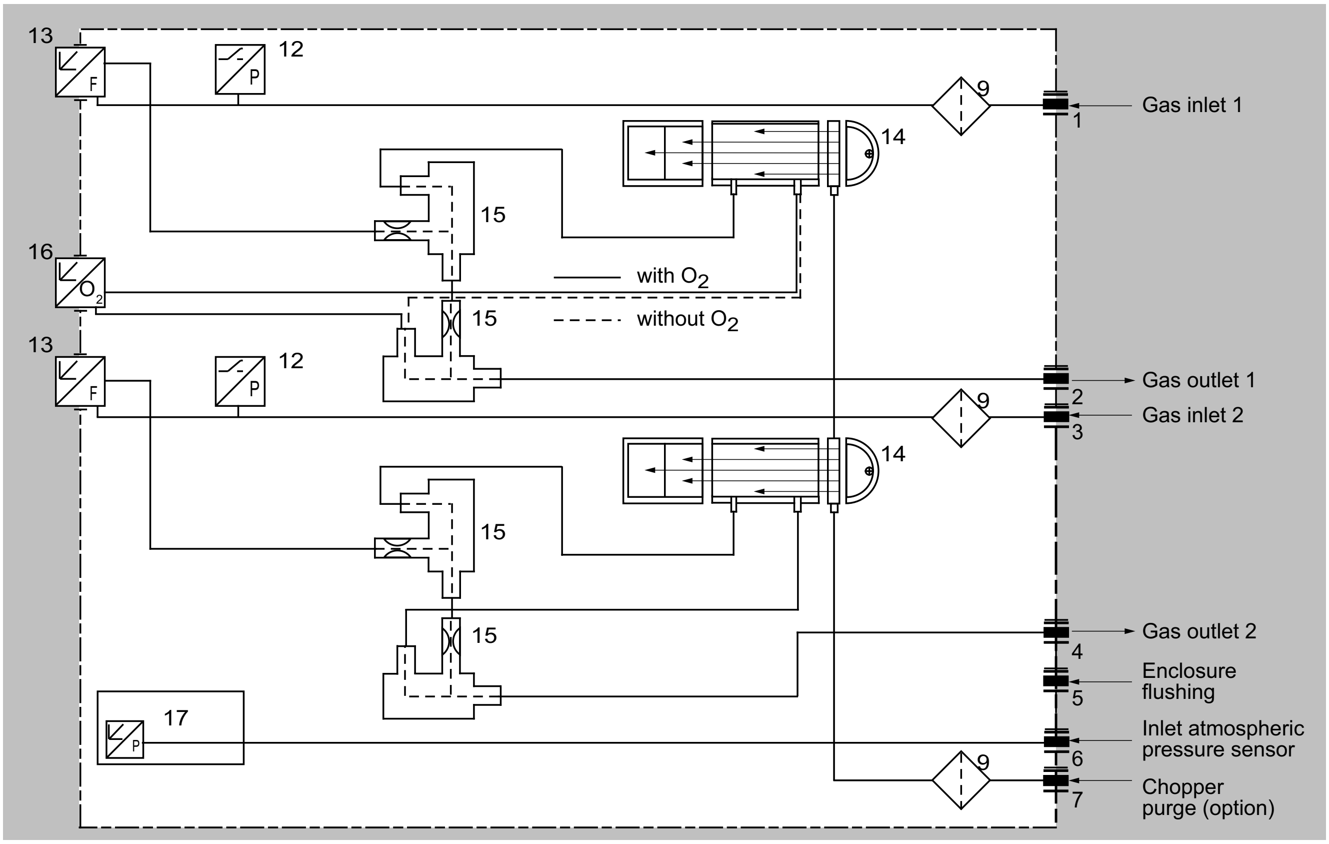
ULTRAMAT 23, 19" rack-mounted enclosure with internal sample gas pump; optional oxygen measurement

Design (Continued)



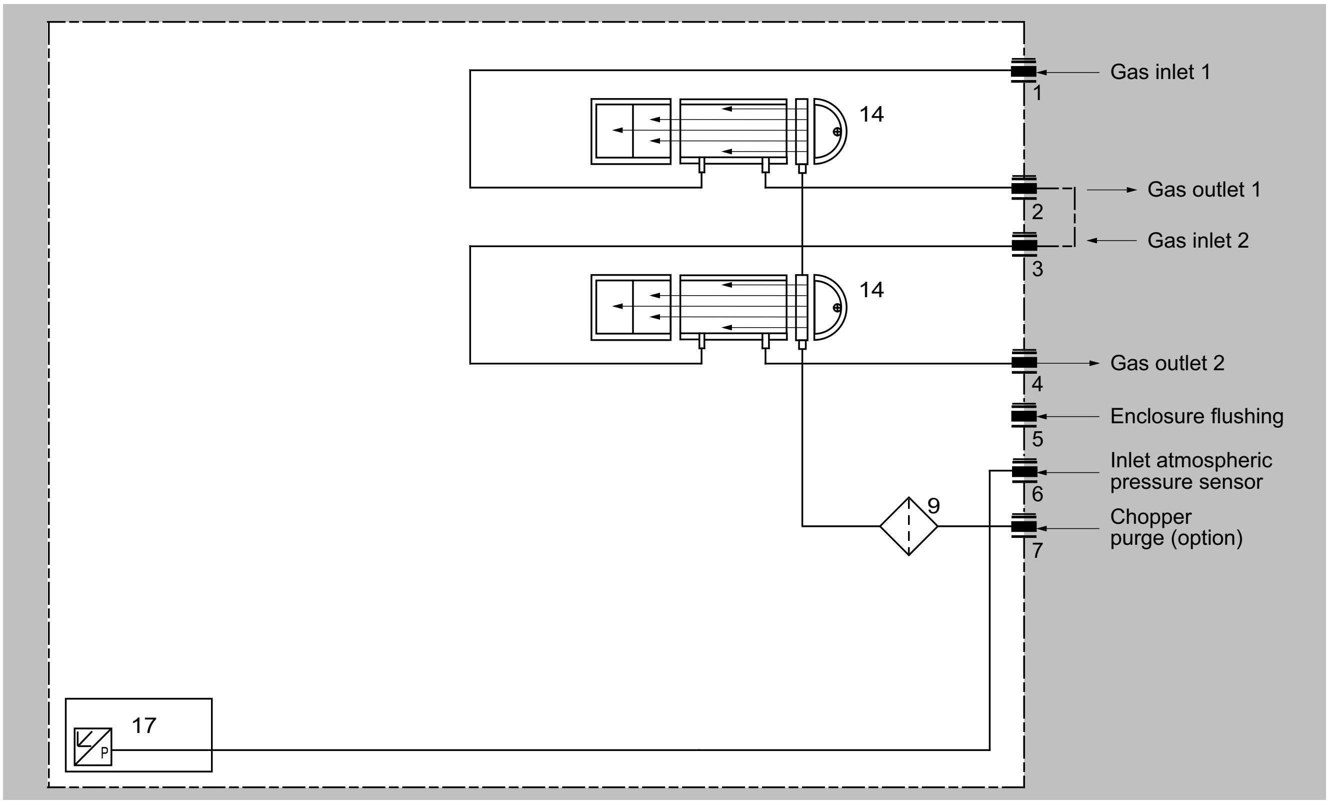
ULTRAMAT 23, 19" rack-mounted enclosure without internal sample gas pump; optional oxygen measurement

Design (Continued)



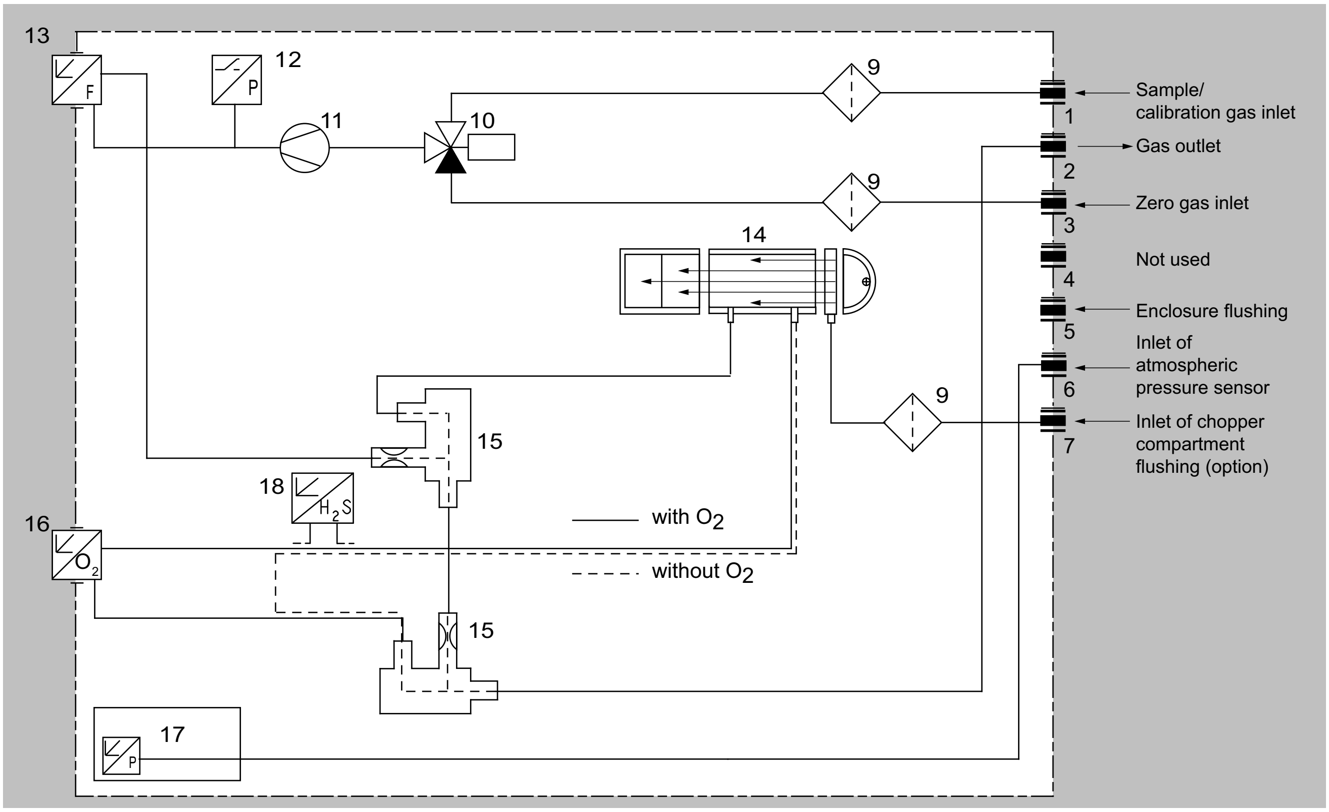
ULTRAMAT 23, 19" rack unit housing without internal sample gas pump, with separate gas path for the 2nd measured component or for the 2nd and 3rd measured component, optional oxygen measurement

Design (Continued)



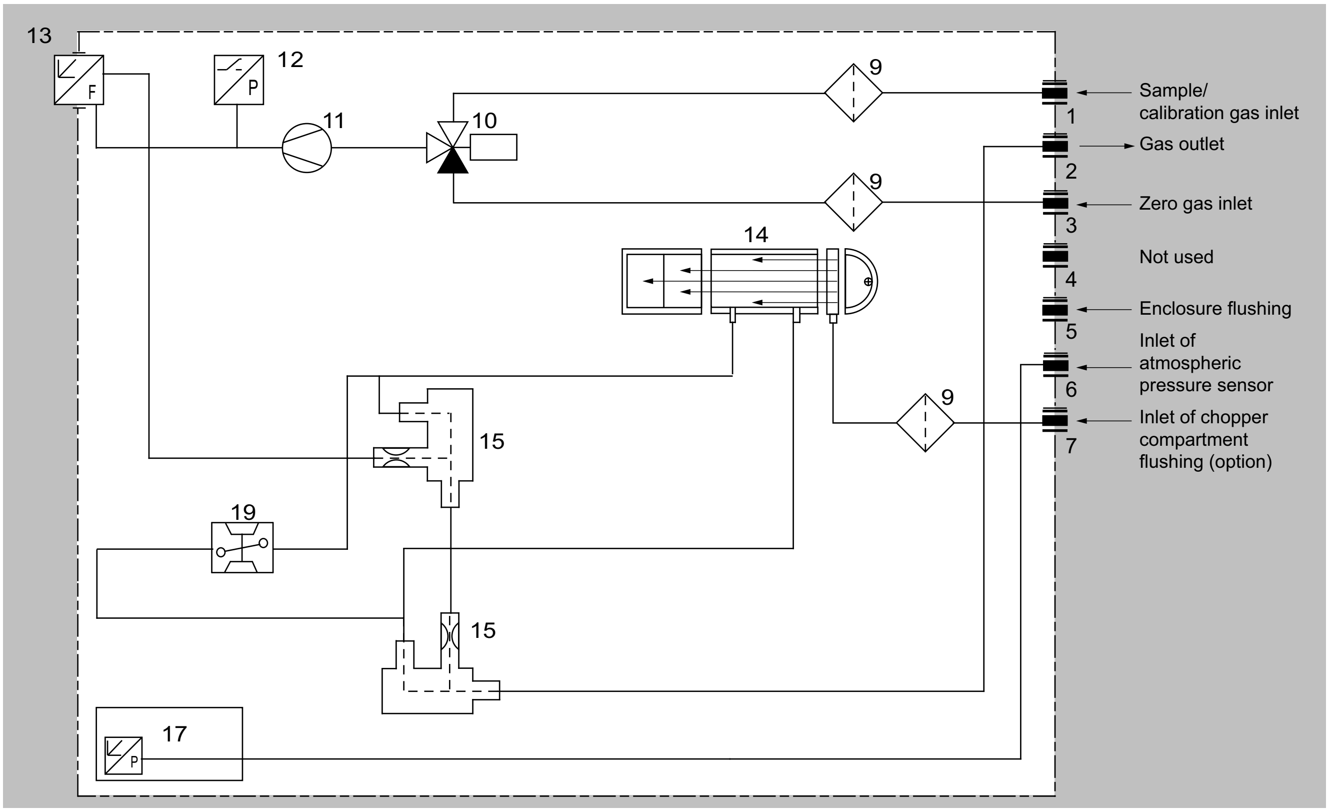
ULTRAMAT 23, 19" rack-mounted enclosure, sample gas path version in pipes, separate gas path, always without sample gas pump, without safety filter and without safety condensation trap

Design (Continued)



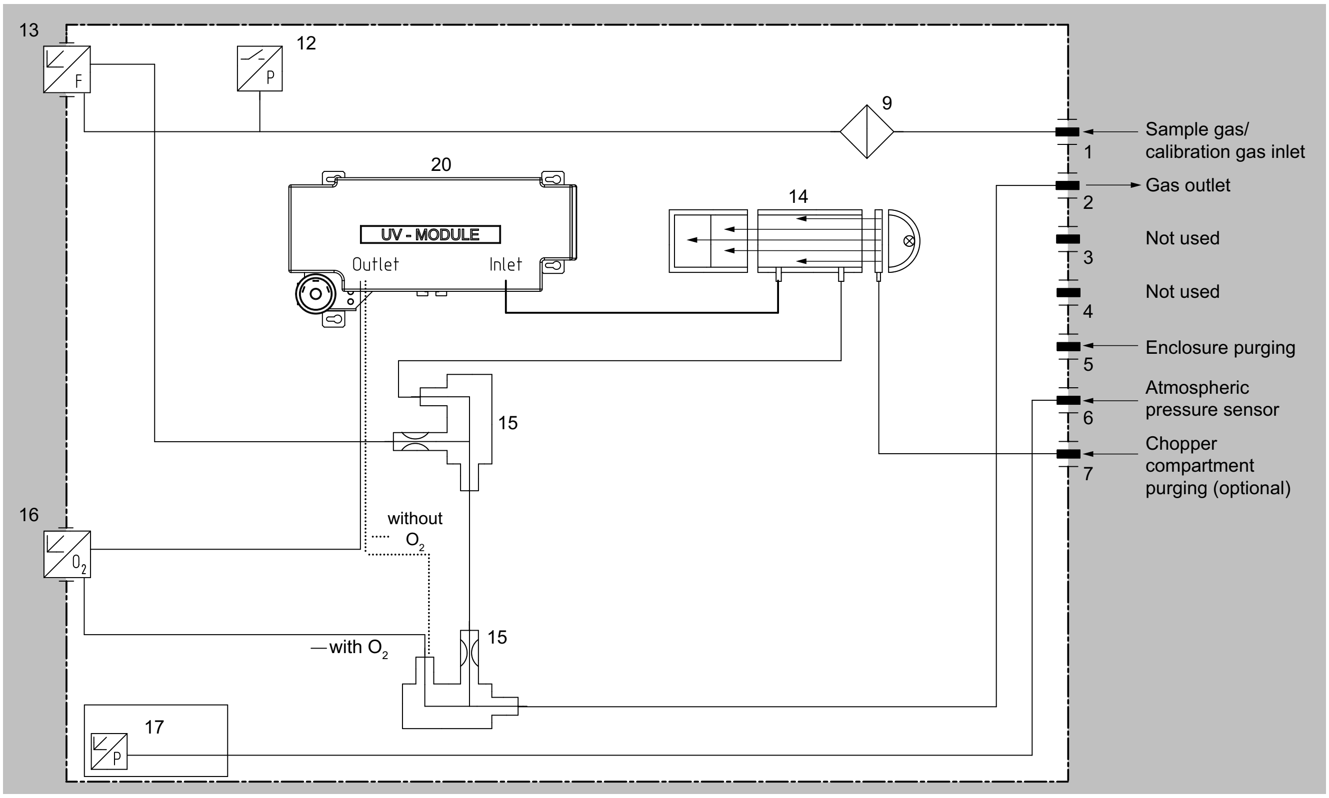
ULTRAMAT 23, 19" rack-mounted enclosure with internal sample gas pump and H_2S sensor

Design (Continued)



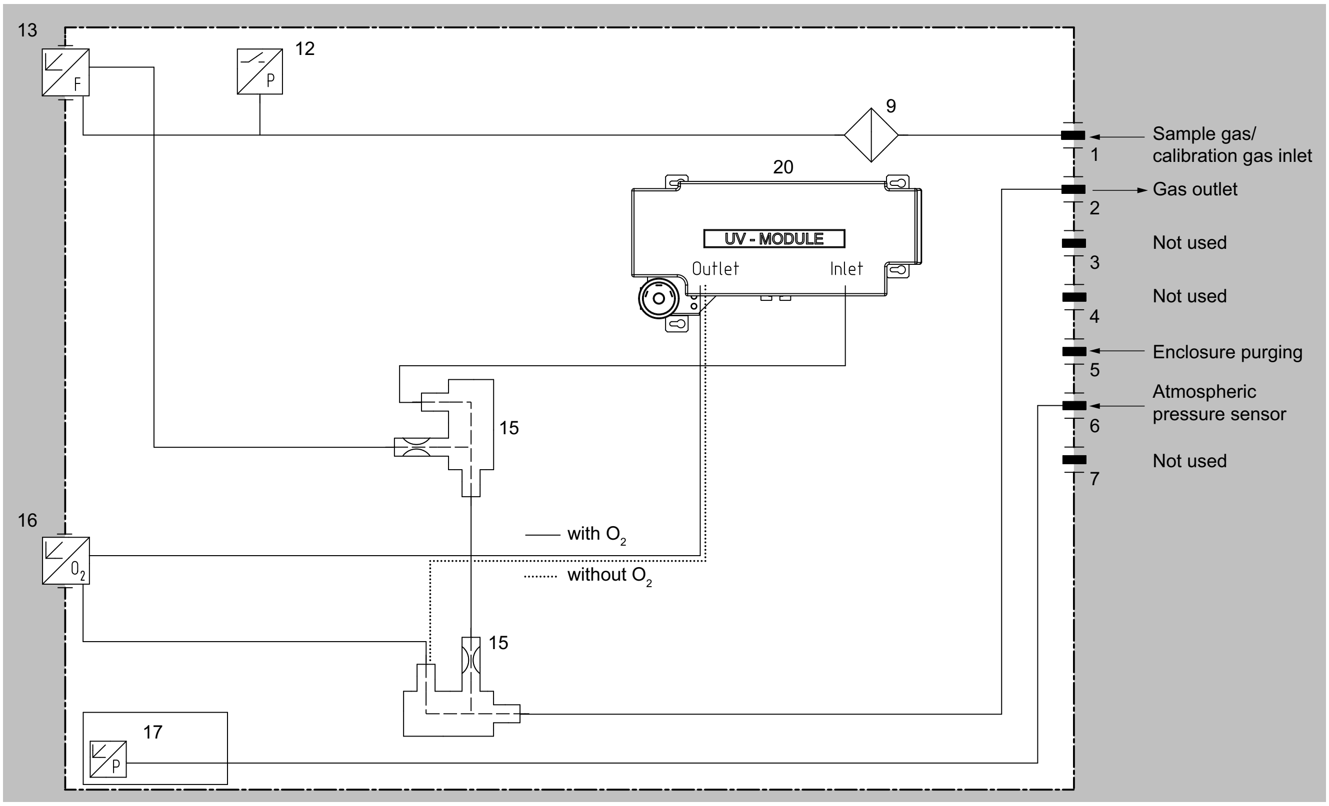
ULTRAMAT 23, 19" rack-mounted enclosure with internal sample gas pump and paramagnetic oxygen measurement

Design (Continued)



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

Design (Continued)



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

Legend for the gas path figures			
1	Inlet for sample gas/calibration gas	11	Sample gas pump
2	Gas outlet	12	Pressure switch
3	Inlet for AUTOCAL/zero gas or inlet for sample gas/calibration gas (channel 2)	13	Flow indicator
		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/chopper purge	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		

Mode of operation

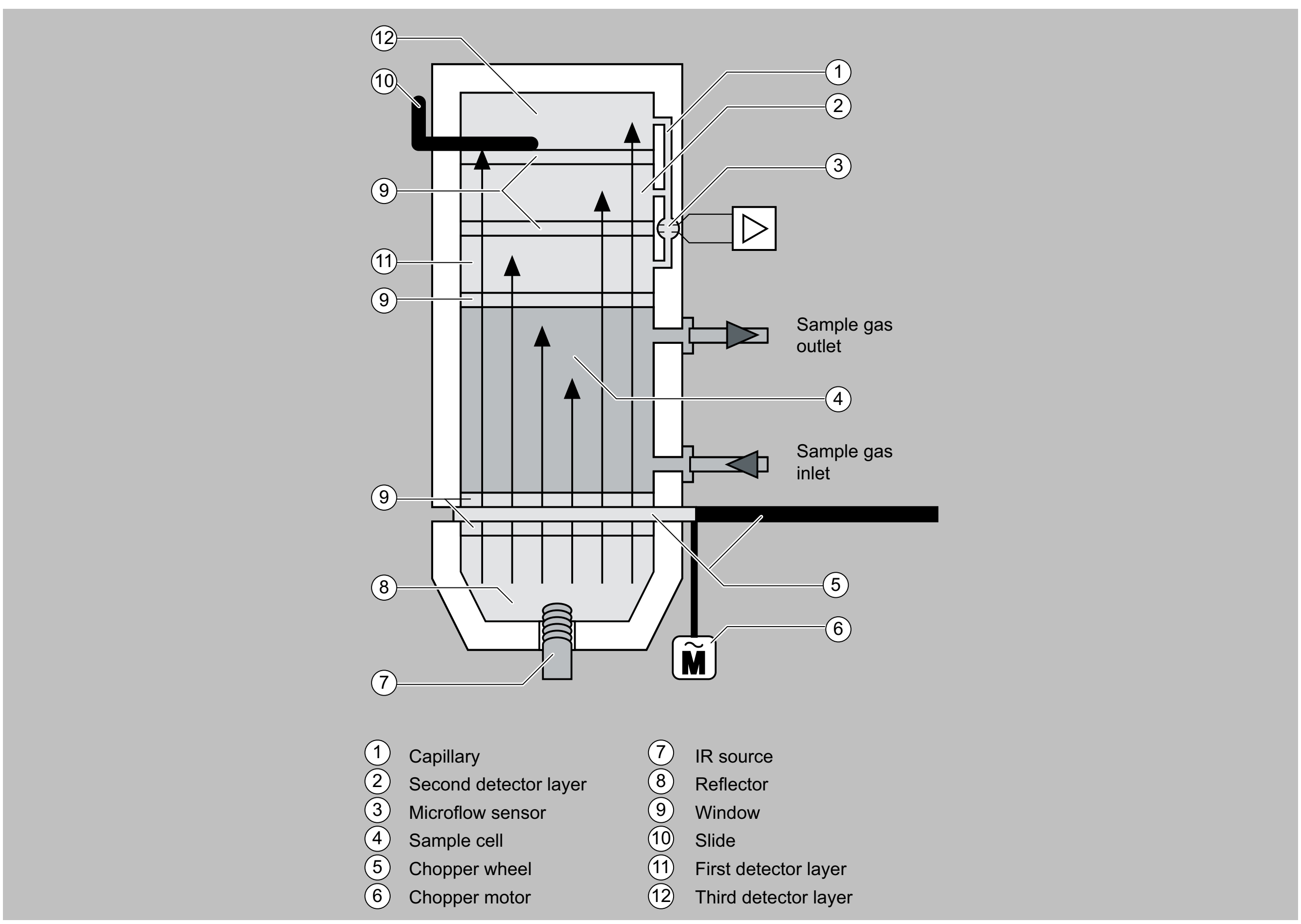
The ULTRAMAT 23 uses multiple independent measuring principles which work selectively.

Infrared measurement

The measuring principle of the ULTRAMAT 23 is based on the molecule-specific absorption of bands of infrared radiation, which in turn is based on the "single-beam procedure". A radiation source (7) operating at 600 °C emits infrared radiation, which is then modulated by a chopper (5) at 8 1/3 Hz.
The IR radiation passes through the sample chamber (4), into which sample gas is flowing, and its intensity is weakened as a function of the concentration of the measured component.
The detector chamber - set up as a two- or three-layer detector chamber - is filled with the component to be measured.
The first detector layer (11) primarily absorbs energy from the central sections of the sample gas IR bands. Energy from the peripheral sections of the bands is absorbed by the second (2) and third (12) detector layers.
The microflow sensor generates a pneumatic connection between the upper layer and the lower layers. Negative feedback from the upper and lower layers leads to an overall narrowing of the spectral sensitivity band. The volume of the third layer and, therefore, the absorption of the bands, can be varied using a "slide switch" (10), thereby increasing the selectivity of each individual measurement.
The rotating chopper (5) generates a pulsating flow in the detector chamber that the microflow sensor (3) converts into an electrical signal. The microflow sensor consists of two nickel-plated grids heated to approximately 120 °C, which, along with two supplementary resistors, form a Wheatstone bridge. The pulsating flow together with the dense arrangement of the Ni grids causes a change in resistance. This leads to an offset in the bridge, which is dependent on the concentration of the sample gas.

Note

The sample gases must be fed into the analyzers free of dust. Condensation in the sample chambers must be prevented. Therefore, the use of gas modified for the measuring task is necessary in most application cases.
As far as possible, the ambient air of the analyzer unit should also not have a large concentration of the gas components to be measured.



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

Automatic calibration with air (AUTOCAL)

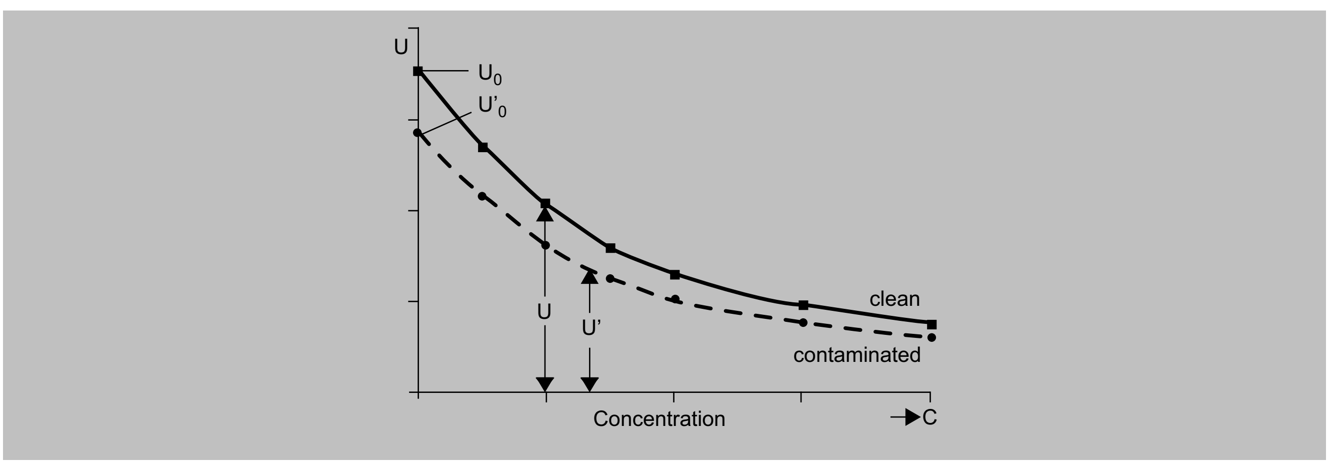
The ULTRAMAT 23 can be calibrated using, for example, ambient air. During this process (adjustable between 1 and 24 hours, 0 = no AUTOCAL), the chamber is purged with air. The detector then generates the largest signal U_0 (no pre-absorption in the sample chamber).

Mode of operation (Continued)

This signal is used as the reference signal for zero point calibration, and also serves as the initial value for calculating the full-scale value in the manner described below.
As the concentration of the measured component increases, so too does absorption in the sample chamber. As a result of this pre-absorption, the detectable radiation energy in the detector decreases, and thus also the signal voltage. For the single-beam procedure of the ULTRAMAT 23, the mathematical relationship between the concentration of the measured component and the measured voltage can be approximately expressed as the following exponential function:
$U = U_0 \cdot e^{-kc}$
c Concentration
k Device-specific constant
U_0 Basic signal with zero gas (sample gas without measured component)
U Detector signal
Changes in the radiation power, contamination of the sample chamber, or aging of the detector components have the same effect on both U_0 and U, and result in the following:
$U' = U'_0 \cdot e^{-kc}$
Apart from being dependent on concentration c, the measured voltage thus changes continuously as the IR source ages, or with persistent contamination.
Each AUTOCAL thus tracks the total characteristic curve according to the currently valid value. Temperature and pressure influences are also compensated in this way.
The influences of contamination and aging, as mentioned above, have a negligible influence on the measurement as long as U' remains in a certain tolerance range monitored by the device.
The tolerance range between two or more AUTOCALs can be individually configured on the ULTRAMAT 23 and an alarm message output. An alarm message is output when the value falls below the original factory setting of U_0 < 50% U. In most cases, this is due to the sample chamber being contaminated.

Calibration

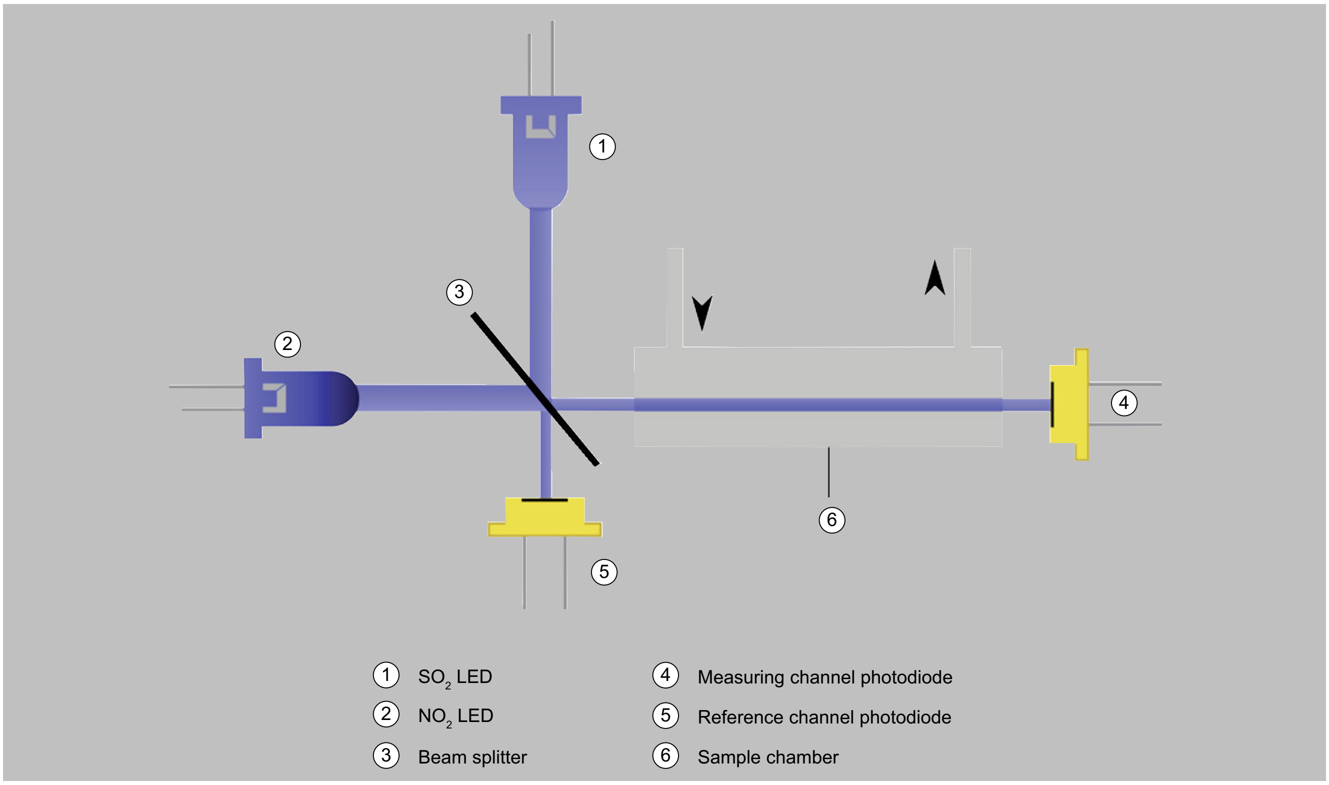
The devices can be set to automatically calibrate the zero point every 1 to 24 hours, using ambient air or nitrogen. The calibration point for the IR-sensitive components is calculated mathematically from the newly determined U'_o and the device-specific parameters stored as default values. We recommend checking the calibration point once a year using a calibration gas. (For details on German Technical Inspectorate/TÜV measurements, see Table "Calibration intervals (TÜV versions)" under Selection and ordering data).
If an electrochemical sensor is installed, it is recommendable to use air for the AUTOCAL. In addition to calibration of the zero point of the IR-sensitive components, it is then also possible to simultaneously calibrate the calibration point of the electrochemical O_2 sensor automatically. The characteristic curve of the O_2 sensor is sufficiently stable following the single-point calibration. The zero point of the electrochemical sensor only needs be checked once a year by connecting nitrogen.



Calibration

Mode of operation (Continued)

Ultraviolet measurement



ULTRAMAT 23, ultraviolet measurement mode of operation

This measuring principle is also based on the molecule-specific absorption of bands of ultraviolet radiation using a double-beam photometer. The light source is a solid-state diode (LED) based on 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.

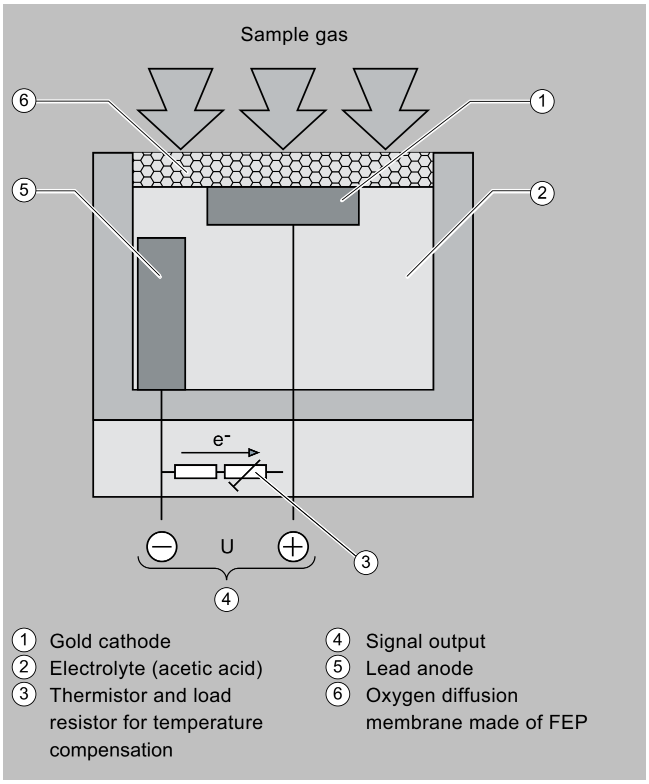
Oxygen measurement

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 resistance, where a measured voltage is present. This measured voltage is proportional to the concentration of oxygen in the sample gas.
The oxygen electrolyte used is less influenced by interference influences (particularly CO_2, CO, H_2 and CH_4) than other sensor types.

<u>Note</u>

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 purging times are to be set.

Mode of operation (Continued)



ULTRAMAT 23, oxygen sensor mode of operation

Electrochemical sensor for H_2S determination

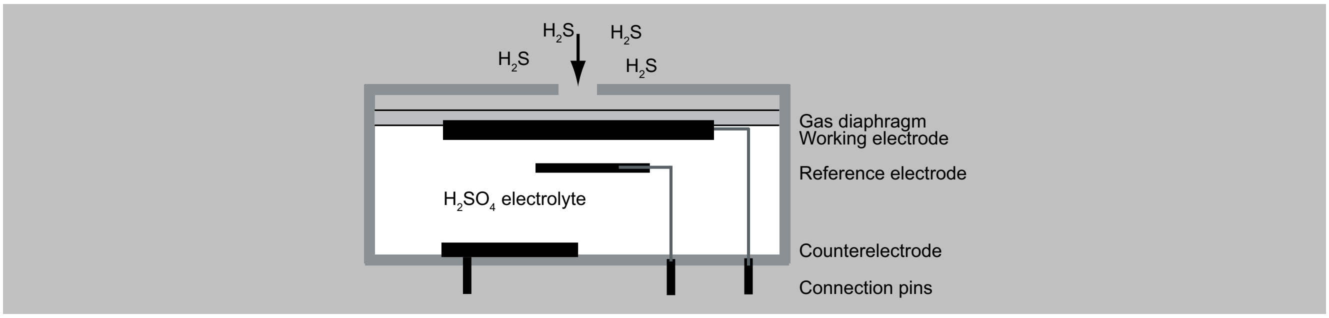
The hydrogen sulfide enters through the diffusion barrier (gas diaphragm) into the sensor and is oxidized at the working electrode. A reaction in the form of a reduction of atmospheric oxygen takes place on the counter electrode. The transfer of electrons can be tapped on the connector pins as a current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

Calibration

The zero point is automatically recalibrated by the AUTOCAL function when connecting e.g. nitrogen or air. It is recommendable to check the calibration point monthly using calibration gas (45 to 50 vpm).
The AUTOCAL (with ambient air, for example) must be performed every hour. In so doing, you must ensure that the ambient air is saturated in accordance with a dew point of 11 °C.
If this cannot be constantly ensured with dry ambient air, the adjustment gas must be fed through a humidifier and subsequently through a cooler (dew point 11 °C).
If the accompanying gas contains the following components, the hydrogen sulfide sensor must not be used:

- Compounds containing chlorine
- Compounds containing fluorine
- Heavy metals
- Aerosols
- Alkaline components
- NH_3 > 5 vpm

Mode of operation (Continued)



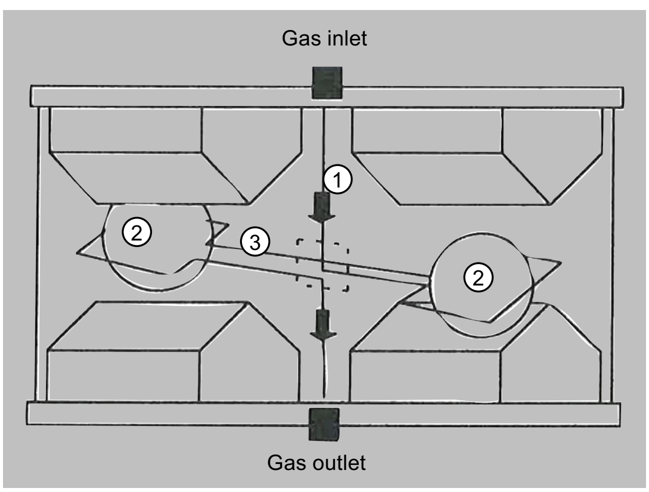
Operating principle of the H_2S sensor

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

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

Mode of operation (Continued)

Accompanying gas	Formula	Deviation at 20 °C	Deviation at 50 °C
Butadiene	C_4H_6	-0.85	-0.93
n-butane	C_4H_{10}	-1.1	-1.22
Isobutylene	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
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%)

Function

Main features

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

Selection and ordering data

ULTRAMAT 23 gas analyzer For measuring 1 infrared component, UV components, oxygen and hydrogen sulfide		Article No. 7MB2335-	●	●	●	●	●	-	●	A	A	●
Click on the Article No. for online configuration in the PIA Life Cycle Portal. ***Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".***												
Enclosure, version and gas paths 19" rack unit for installation in cabinets												
Gas connections	Gas paths	Internal sample gas pump										
6 mm pipe	Viton	Without[2]	0									
¼" pipe	Viton	Without[2]	1									
6 mm pipe	Viton	With	2									
¼" pipe	Viton	With	3									
6 mm pipe	Stainless steel, mat. no. 1.4571, separate	Without[2]	6									
¼" pipe	Stainless steel, mat. no. 1.4571, separate	Without[2]	7									
Portable, in sheet steel enclosure, 6 mm gas connections, Viton gas path, with integrated sample gas pump, condensation trap with safety filter on the front plate.			8									
Infrared measured component												
Measured component	**Possible with measuring range identification**											
CO	C, D, E, F, G ... R, T, U, X			A								
CO_2[1]	D[5], G[5], H[5], J[5], K ... R			C								
CH_4	E, H, L, N, P, R			D								
C_2H_4	K			F								
C_6H_{14}	K			M								
SO_2[10]	B[7], F ... L, S[9], T[8], W			N								
NO	C, E, G ... J, T, U, V, W			P								
N_2O[6]	E			S								
SF_6	H			V								
Smallest measuring range	**Largest measuring range**											
0 ... 200 mg/m³	0 ... 1 000 mg/m³				B							
0 ... 100 mg/m³	0 ... 1 000 mg/m³				C							
0 ... 50 vpm	0 ... 250 vpm				D							
0 ... 100 vpm	0 ... 500 vpm				E							
0 ... 150 vpm	0 ... 750 vpm				F							
0 ... 200 vpm	0 ... 1 000 vpm				G							
0 ... 500 vpm	0 ... 2 500 vpm				H							
0 ... 1 000 vpm	0 ... 5 000 vpm				J							
0 ... 2 000 vpm	0 ... 10 000 vpm				K							
0 ... 0.5%	0 ... 2.5%				L							
0 ... 1%	0 ... 5%				M							
0 ... 2%	0 ... 10%				N							
0 ... 5%	0 ... 25%				P							
0 ... 10%	0 ... 50%				Q							
0 ... 20%	0 ... 100%				R							
0 ... 50 mg/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							
Oxygen measurement[4]												
Without O_2 sensor						0						
With electrochemical O_2 sensor						1						
With paramagnetic oxygen measuring cell						8						
Hydrogen sulfide measurement												
Without							6					
With H_2S sensor 0 ... 5 / 50 vpm							7					
Auxiliary power												
100 V AC, 50 Hz									0			
120 V AC, 50 Hz									1			
200 V AC, 50 Hz									2			

Selection and ordering data (Continued)

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

[1] For measuring ranges below 1%, a CO_2 absorber cartridge can be used for zero point adjustment (see Accessories).
[2] Without separate zero gas input or solenoid valve.
[3] Language for operation can be changed.
[4] O_2 sensor/O_2 measuring cell in gas path of infrared measured component 1.
[5] 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).
[6] Not suitable for use with emission measurements since cross-sensitivity too high.
[7] Maximum possible AUTOCAL cycle ≤ 6 h, constant ambient conditions (max. deviation ±1 °C (1.8 °F)): see table "Calibration intervals, standard devices" under "More information".
[8] Maximum possible AUTOCAL cycle ≤ 3 h, constant ambient conditions (max. deviation ±1 °C (1.8 °F)): see table "Calibration intervals, standard devices" under "More information".
[9] Measured with UV technology
[10] When measuring range identification "S" selected: Parallel measurement of SO_2 and NO_2 with UV photometer.

Options	Order code
Add "-**Z**" to article number and then add order code	
Settings	
Add-on electronics with 8 digital inputs/outputs, PROFIBUS PA interface	**A12**
Add-on electronics with 8 digital inputs/outputs, PROFIBUS DP interface	**A13**
IEC plug, 37-pin D-sub connector, 9-pin D-sub connector	**A33**
Tag plates (customized inscription)	**B03**
Clean for O_2 service (specially cleaned gas path)	**B06**
Gas path for short response time[3]	**C01**
Chopper compartment purging for 6 mm gas connection	**C02**
Chopper compartment purging for ¼" gas connection	**C03**
Selection of the conversion mg/m³ in ppm at 293K or 273K	**D15**
Certificate FM/CSA Class I Div 2, ATEX II 3G	**E20**
Calibration interval 5 months (TÜV, QAL) measuring ranges: CO 0 - 150/750 mg/m³; NO 0 - 100/750 mg/m³	**E50**
Measuring range indication in plain text[1]	**Y11**
Measurement of CO_2 in forming gas[2] (only in conjunction with measuring range 0 ... 20 / 0 ... 100%)	**Y14**

[1] Default setting: smallest measuring range, largest measuring range.
[2] CO_2 measurement in accompanying gas Ar or Ar/He (3:1); forming gas.
[3] Only for version with Viton hose.

Accessories	Article No.
CO_2absorber cartridge	7MB1933-8AA

Selection and ordering data (Continued)

Accessories	Article No.
RS 485/Ethernet converter	A5E00852383
RS 485/RS 232 converter	C79451-Z1589-U1
RS 485/USB converter	A5E00852382
Add-on electronics with 8 digital inputs/outputs and PROFIBUS PA	A5E00056834
Add-on electronics with 8 digital inputs/outputs and PROFIBUS DP	A5E00057159
Set of Torx screwdrivers	A5E34821625

ULTRAMAT 23 gas analyzer For measuring 2 infrared components, UV components, oxygen and hydrogen sulfide			Article No. 7MB2337-	●	●	●	●	●	-	●	●	●	●
Click on the Article No. for online configuration in the PIA Life Cycle Portal. ***Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".***													
Enclosure, version and gas paths													
19" rack unit for installation in cabinets													
Gas connections	Gas paths	Internal sample gas pump											
6 mm pipe	Viton, not separate	Without[2)]		0									
¼" pipe	Viton, not separate	Without[2)]		1									
6 mm pipe	Viton, not separate	With		2									
¼" pipe	Viton, not separate	With		3									
6 mm pipe	Viton, separate	Without[2)]		4									
¼" pipe	Viton, separate	Without[2)]		5									
6 mm pipe	Stainless steel, mat. no. 1.4571, separate	Without[2)]		6									
¼" pipe	Stainless steel, mat. no. 1.4571, separate	Without[2)]		7									
Portable, in sheet steel enclosure, 6 mm gas connections, Viton gas path, with integrated sample gas pump, condensation trap with safety filter on the front plate.				8									
1st infrared measured component													
Measured component	**Possible with measuring range identification**												
CO	C, D, E, F, G ... R, T, U, X				A								
CO_2[1)]	D[5)], G[5)], H[5)], J[5)], K ... R				C								
CH_4	E, H, L, N, P, R				D								
C_2H_4	K				F								
C_6H_{14}	K				M								
SO_2	B[8)], F ... L, T[9)], W				N								
NO	C, E, G ... J, T, U, V, W				P								
N_2O[6)]	E				S								
SF_6	H				V								
Smallest measuring range	**Largest measuring range**												
0 ... 200 mg/m³	0 ... 1 000 mg/m³					B							
0 ... 100 mg/m³	0 ... 1 000 mg/m³					C							
0 ... 50 vpm	0 ... 250 vpm					D							
0 ... 100 vpm	0 ... 500 vpm					E							
0 ... 150 vpm	0 ... 750 vpm					F							
0 ... 200 vpm	0 ... 1 000 vpm					G							
0 ... 500 vpm	0 ... 2 500 vpm					H							
0 ... 1 000 vpm	0 ... 5 000 vpm					J							
0 ... 2 000 vpm	0 ... 10 000 vpm					K							
0 ... 0.5%	0 ... 2.5%					L							
0 ... 1%	0 ... 5%					M							
0 ... 2%	0 ... 10%					N							
0 ... 5%	0 ... 25%					P							
0 ... 10%	0 ... 50%					Q							
0 ... 20%	0 ... 100%					R							
0 ... 100 mg/m³	0 ... 750 mg/m³					T							
0 ... 150 mg/m³	0 ... 750 mg/m³					U							

Selection and ordering data (Continued)

ULTRAMAT 23 gas analyzer For measuring 2 infrared components, UV components, oxygen and hydrogen sulfide		Article No. 7MB2337-	●	●	●	●	●	-	●	●	●	●
0 ... 250 mg/m^3	0 ... 1 250 mg/m^3				V							
0 ... 400 mg/m^3	0 ... 2 000 mg/m^3				W							
0 ... 50 vpm	0 ... 2 500 vpm				X							
Oxygen measurement[4]												
Without O_2 sensor						0						
With electrochemical O_2 sensor						1						
With paramagnetic oxygen measuring cell						8						
Hydrogen sulfide measurement												
Without							6					
With H_2S sensor 0 ... 5 / 50 vpm							7					
Auxiliary power												
100 V AC, 50 Hz									0			
120 V AC, 50 Hz									1			
200 V AC, 50 Hz									2			
230 V AC, 50 Hz									3			
100 V AC, 60 Hz									4			
120 V AC, 60 Hz									5			
230 V AC, 60 Hz									6			
2nd infrared measured component												
Measured component	**Possible with measuring range identification**											
CO	C, D, E, F, G ... R, T, U, X									A		
CO_2[1]	D[5], G[5], H[5], J[5], K ... R									C		
CH_4	E, H, L, N, P, R									D		
C_2H_4	K									F		
C_6H_{14}	K									M		
SO_2[11]	B[8], F ... L, S[10], T[9], W									N		
NO	C, E, G ... J, T, U, V, W									P		
N_2O	E[6], Y[7]									S		
SF_6	H									V		
Smallest measuring range	**Largest measuring range**											
0 ... 200 mg/m^3	0 ... 1 000 mg/m^3										B	
0 ... 100 mg/m^3	0 ... 1 000 mg/m^3										C	
0 ... 50 vpm	0 ... 250 vpm										D	
0 ... 100 vpm	0 ... 500 vpm										E	
0 ... 150 vpm	0 ... 750 vpm										F	
0 ... 200 vpm	0 ... 1 000 vpm										G	
0 ... 500 vpm	0 ... 2 500 vpm										H	
0 ... 1 000 vpm	0 ... 5 000 vpm										J	
0 ... 2 000 vpm	0 ... 10 000 vpm										K	
0 ... 0.5%	0 ... 2.5%										L	
0 ... 1%	0 ... 5%										M	
0 ... 2%	0 ... 10%										N	
0 ... 5%	0 ... 25%										P	
0 ... 10%	0 ... 50%										Q	
0 ... 20%	0 ... 100%										R	
0 ... 50 mg/m^3	0 ... 1 250 mg/m^3										S	
0 ... 100 mg/m^3	0 ... 750 mg/m^3										T	
0 ... 150 mg/m^3	0 ... 750 mg/m^3										U	
0 ... 250 mg/m^3	0 ... 1 250 mg/m^3										V	
0 ... 400 mg/m^3	0 ... 2 000 mg/m^3										W	
0 ... 50 vpm	0 ... 2 500 vpm										X	
0 ... 500 vpm	0 ... 5 000 vpm										Y	
Language of the operating software[3]												
German												0
English												1
French												2
Spanish												3
Italian												4

Selection and ordering data (Continued)

1) For measuring ranges below 1%, a CO_2 absorber cartridge can be used for zero point adjustment (see Accessories).
2) Without separate zero gas input or solenoid valve.
3) Language for operation can be changed.
4) O_2 sensor/O_2 measuring cell in gas path of infrared measured component 1.
5) 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).
6) Not suitable for use with emission measurements since cross-sensitivity too high.
7) Only in conjunction with CO_2 measuring range 0 to 5% to 0 to 25% (CP).
8) Maximum possible AUTOCAL cycle ≤ 6 h, constant ambient conditions (max. deviation ±1 °C (1.8 °F)): see table "Calibration intervals, standard devices" under "More information".
9) Maximum possible AUTOCAL cycle ≤ 3 h, constant ambient conditions (max. deviation ±1 °C (1.8 °F)): see table "Calibration intervals, standard devices" under "More information".
10) Measured with UV technology
11) When measuring range identification "S" selected: Parallel measurement of SO_2 and NO_2 with UV photometer.

Options	Order code
Add "**-Z**" to article number and then add order code	
Settings	
Add-on electronics with 8 digital inputs/outputs, PROFIBUS PA interface	**A12**
Add-on electronics with 8 digital inputs/outputs, PROFIBUS DP interface	**A13**
Stainless steel connection pipe (mat. no. 1.4571), 6 mm, complete with screwed gland (cannot be combined with Viton hose)	**A27**
Stainless steel connection pipe (mat. no. 1.4571), ¼", complete with screwed gland (cannot be combined with Viton hose)	**A29**
IEC plug, 37-pin D-sub connector, 9-pin D-sub connector	**A33**
Tag plates (customized inscription)	**B03**
Clean for O_2 service (specially cleaned gas path)	**B06**
Gas path for short response time[3)]	**C01**
Chopper compartment purging for 6 mm gas connection	**C02**
Chopper compartment purging for ¼" gas connection	**C03**
Application with paramagnetic oxygen measuring cell and separate gas path	**C11**
Selection of the conversion mg/m^3 in ppm at 293K or 273K	**D15**
Certificate FM/CSA Class I Div 2, ATEX II 3G	**E20**
Calibration interval 5 months (TÜV, QAL) measuring ranges: CO 0 - 150/750 mg/m^3; NO 0 - 100/750 mg/m^3[3)]	**E50**
DNV-GL statement of conformity for use in marine CEMS according to MEPC.259(68)	**E60**
Measuring range indication in plain text[1)]	**Y11**
Measurement of CO_2 in forming gas[2)] (only in conjunction with measuring range 0 ... 20 / 0 ... 100%)	**Y14**

1) Default setting: smallest measuring range, largest measuring range.
2) CO_2 measurement in accompanying gas Ar or Ar/He (3:1); forming gas.
3) Only for version with Viton hose.

Accessories	Article No.
CO_2absorber cartridge	7MB1933-8AA
RS 485/Ethernet converter	A5E00852383
RS 485/RS 232 converter	C79451-Z1589-U1
RS 485/USB converter	A5E00852382

Selection and ordering data (Continued)

Accessories	Article No.
Add-on electronics with 8 digital inputs/outputs and PROFIBUS PA	**A5E00056834**
Add-on electronics with 8 digital inputs/outputs and PROFIBUS DP	**A5E00057159**
Set of Torx screwdrivers	**A5E34821625**

ULTRAMAT 23 gas analyzer For measuring 3 infrared components, UV components, oxygen or 2 infrared components and UV components			**Article No.** **7MB2338-**	●	●	●	●	6	-	●	●	●	●
Click on the Article No. for online configuration in the PIA Life Cycle Portal.													
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".													
Enclosure, version and gas paths 19" rack unit for installation in cabinets													
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									
¼" pipe	Viton, separate	Without[2)]		5									
6 mm pipe	Stainless steel, mat. no. 1.4571, separate	Without[2)]		6									
¼" pipe	Stainless steel, mat. no. 1.4571, separate	Without[2)]		7									
Portable, in sheet steel enclosure, 6 mm gas connections, Viton gas path, with integrated sample gas pump, condensation trap with safety filter on the front plate.				8									
1st and 2nd Infrared measured component													
Measured component	**Smallest measuring range**	**Largest measuring range**											
CO and NO	0 ... 500 vpm	0 ... 2 500 vpm			A	A							
CO and NO	0 ... 2 000 vpm (CO) 0 ... 1000 vpm (NO)	0 ... 10 000 vpm (CO) 0 ... 5000 vpm (NO)			A	B							
CO and NO	0 ... 1 000 vpm	0 ... 5 000 vpm			A	C							
CO and NO	0 ... 1% (CO) 0 ... 1000 vpm (NO)	0 ... 5% (CO) 0 ... 5000 vpm (NO)			A	D							
CO and NO	0 ... 250 mg/m^3 (CO) 0 ... 400 mg/m^3 (NO)	0 ... 1 250 mg/m^3 (CO) 0 ... 2 000 mg/m^3 (NO)			A	K							
CO and NO	0 ... 50 vpm (CO) 0 ... 100 vpm (NO)	0 ... 250 vpm (CO) 0 ... 500 vpm (NO)			A	P							
CO and NO	0 ... 100 vpm	0 ... 500 vpm			A	R							
CO and CO_2	0 ... 10%	0 ... 50%			B	A							
CO and CO_2	0 ... 10% (CO) 0 ... 0.5% (CO_2)	0 ... 50% (CO) 0 ... 2.5% (CO_2)			B	B							
CO and CO_2	0 ... 20%	0 ... 100%			B	D							
CO and CO_2	0 ... 100 vpm (CO) 0 ... 5% (CO_2)	0 ... 500 vpm (CO) 0 ... 25% (CO_2)			B	J							
CO and CO_2	0 ... 0.5% (CO) 0 ... 10% (CO_2)	0 ... 2.5% (CO) 0 ... 50% (CO_2)			B	K							
CO and CO_2	0 ... 75 mg/m^3 (CO) 0 ... 5% (CO_2)	0 ... 750 mg/m^3 (C0) 0 ... 25% (CO_2)			B	L							
CO_2 and CH_4	0 ... 5% (CO_2) 0 ... 1% (CH_4)	0 ... 25% (CO_2) 0 ... 5% (CH_4)			C	A							
CO_2 and CH_4	0 ... 5% (CO_2) 0 ... 2% (CH_4)	0 ... 25% (CO_2) 0 ... 10% (CH_4)			C	B							
CO_2 and NO	0 ... 5% (CO_2) 0 ... 500 vpm (NO)	0 ... 25% (CO_2) 0 ... 2500 vpm (NO)			D	C							
Oxygen measurement[4)]													
Without O_2 sensor							0						
With electrochemical O_2 sensor							1						
With paramagnetic oxygen measuring cell							8						
Auxiliary power													
100 V AC, 50 Hz										0			
120 V AC, 50 Hz										1			

Selection and ordering data (Continued)

ULTRAMAT 23 gas analyzer For measuring 3 infrared components, UV components, oxygen or 2 infrared components and UV components		**Article No.** 7MB2338- ● ● ● ● 6 -	●	●	●	●
200 V AC, 50 Hz			2			
230 V AC, 50 Hz			3			
100 V AC, 60 Hz			4			
120 V AC, 60 Hz			5			
230 V AC, 60 Hz			6			
3rd infrared measured component						
Measured component	**Possible with measuring range identification**					
CO	C, D, E, F, G ... R, U, X			A		
CO_2[1]	D[5], G[5], H[5], J[5], K ... R			C		
CH_4	E, H, L, N, P, R			D		
C_2H_4	K			F		
C_6H_{14}	K			M		
SO_2[10]	PIA B[8], F ... L, S, T[9], W			N		
NO	C, E, G ... J, T, U, V, W			P		
N_2O	E[6], Y[7]			S		
SF_6	H			V		
Smallest measuring range	**Largest measuring range**					
0 ... 200 mg/m³	0 ... 1 000 mg/m³				B	
0 ... 100 mg/m³	0 ... 1 000 mg/m³				C	
0 ... 50 vpm	0 ... 250 vpm				D	
0 ... 100 vpm	0 ... 500 vpm				E	
0 ... 150 vpm	0 ... 750 vpm				F	
0 ... 200 vpm	0 ... 1 000 vpm				G	
0 ... 500 vpm	0 ... 2 500 vpm				H	
0 ... 1 000 vpm	0 ... 5 000 vpm				J	
0 ... 2 000 vpm	0 ... 10 000 vpm				K	
0 ... 0.5%	0 ... 2.5%				L	
0 ... 1%	0 ... 5%				M	
0 ... 2%	0 ... 10%				N	
0 ... 5%	0 ... 25%				P	
0 ... 10%	0 ... 50%				Q	
0 ... 20%	0 ... 100%				R	
0 ... 50 mg/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	
Language of the operating software[3]						
German						0
English						1
French						2
Spanish						3
Italian						4

[1] For measuring ranges below 1%, a CO_2 absorber cartridge can be used for zero point adjustment (see Accessories).
[2] Without separate zero gas input or solenoid valve.
[3] Language for operation can be changed.
[4] O_2 sensor/O_2 measuring cell in gas path of infrared measured component 1.
[5] 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).
[6] Not suitable for use with emission measurements since cross-sensitivity too high.
[7] Only in conjunction with CO_2/NO, measuring range 0 to 5/25%, 0 to 500/5 000 vpm [-DC-].
[8] Maximum possible AUTOCAL cycle ≤ 6 h, constant ambient conditions (max. deviation ±1 °C (1.8 °F)): see table "Calibration intervals, standard devices" under "More information".
[9] Maximum possible AUTOCAL cycle ≤ 3 h, constant ambient conditions (max. deviation ±1 °C (1.8 °F)): see table "Calibration intervals, standard devices" under "More information".
[10] When measuring range identification "S" selected: Parallel measurement of SO_2 and NO_2 with UV photometer.

Selection and ordering data (Continued)

Options	Order code
Add "-**Z**" to article number and then add order code	
Settings	
Add-on electronics with 8 digital inputs/outputs, PROFIBUS PA interface	**A12**
Add-on electronics with 8 digital inputs/outputs, PROFIBUS DP interface	**A13**
Stainless steel connection pipe (mat. no. 1.4571), 6 mm, complete with screwed gland (cannot be combined with Viton hose)	**A27**
Stainless steel connection pipe (mat. no. 1.4571), ¼", complete with screwed gland (cannot be combined with Viton hose)	**A29**
IEC plug, 37-pin D-sub connector, 9-pin D-sub connector	**A33**
Tag plates (customized inscription)	**B03**
Clean for O_2 service (specially cleaned gas path)	**B06**
Gas path for short response time[3]	**C01**
Chopper compartment purging for 6 mm gas connection	**C02**
Chopper compartment purging for ¼" gas connection	**C03**
Application with paramagnetic oxygen measuring cell and separate gas path	**C11**
Selection of the conversion mg/m^3 in ppm at 293K or 273K	**D15**
Certificate FM/CSA Class I Div 2, ATEX II 3G	**E20**
Measuring range indication in plain text[1]	**Y11**
Measurement of CO_2 in forming gas[2] (only in conjunction with measuring range 0 ... 20 / 0 ... 100%)	**Y14**

[1] Default setting: smallest measuring range, largest measuring range.
[2] CO_2 measurement in accompanying gas Ar or Ar/He (3:1); forming gas.
[3] Only for version with Viton hose.

Accessories	Article No.
CO_2absorber cartridge	7MB1933-8AA
RS 485/Ethernet converter	A5E00852383
RS 485/RS 232 converter	C79451-Z1589-U1
RS 485/USB converter	A5E00852382
Add-on electronics with 8 digital inputs/outputs and PROFIBUS PA	A5E00056834
Add-on electronics with 8 digital inputs/outputs and PROFIBUS DP	A5E00057159
Set of Torx screwdrivers	A5E34821625

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

Selection and ordering data (Continued)

ULTRAMAT 23 gas analyzer - German Technical Inspectorate version For measuring 1 infrared component, UV components and oxygen		**Article No.** 7MB2355-	●	●	●	●	6	-	●	A	A	●
CO_2	P			C								
SO_2[1)]	F, G, H, S, W			N								
NO	F, G, H, U, V, W			P								
Smallest measuring range[3)]	**Largest measuring range**[3)]											
SO_2: 0 ... 400 mg/m³ NO: 0 ... 200 mg/m³	SO_2: 0 ... 2 000 mg/m³ NO: 0 ... 1 000 mg/m³				F							
CO: 0 ... 200 mg/m³ SO_2: 0 ... 500 mg/m³ NO: 0 ... 250 mg/m³	CO: 0 ... 1 250 mg/m³ SO_2: 0 ... 2 500 mg/m³ NO: 0 ... 1 250 mg/m³				G							
NO: 0 ... 600 mg/m³ SO_2: 0 ... 1 400 mg/m³	NO: 0 ... 3 000 mg/m³ SO_2: 0 ... 7 000 mg/m³				H							
0 ... 1 250 vpm	0 ... 6 000 vpm				J							
0 ... 5%[2)]	0 ... 25% [2)]				P							
0 ... 50 mg/m³ [2)]	0 ... 1 250 mg/m³ [2)]				S							
0 ... 150 mg/m³ [2)]	0 ... 750 mg/m³ [2)]				U							
0 ... 250 mg/m³ [2)]	0 ... 1 250 mg/m³ [2)]				V							
0 ... 400 mg/m³ [2)]	0 ... 2 000 mg/m³ [2)]				W							
Oxygen measurement												
Without O_2 sensor						0						
With electrochemical O_2 sensor						1						
With paramagnetic oxygen measuring cell						8						
Auxiliary power												
230 V AC, 50 Hz									3			
Language of the operating software												
German												0
English												1
French												2
Spanish												3
Italian												4

1) When measuring range identification "S" selected: Parallel measurement of SO_2 and NO_2 with UV photometer.
2) Only in conjunction with order code T13/T23/T33
3) German Technical Inspectorate: see table "TÜV/German Technical Inspectorate, 1 and 2-component analyzer" under "More information".

Options	Order code
Add "-**Z**" to article number and then add order code.	
Settings	
Add-on electronics with 8 digital inputs/outputs, PROFIBUS PA interface	**A12**
Add-on electronics with 8 digital inputs/outputs, PROFIBUS DP interface	**A13**
IEC plug, 37-pin D-sub connector, 9-pin D-sub connector	**A33**
O_2 paramagnetic, suitability-tested EN 15267, IR measuring range in mg/m³	**T13**
O_2 paramagnetic, suitability-tested EN 15267, IR measuring range in mg/m³, wide measuring range	**T14**
O_2 electrochemical, suitability-tested EN 15267, IR measuring range in mg/m³	**T23**
O_2 electrochemical, suitability-tested EN 15267, IR measuring range in mg/m³, wide measuring range	**T24**
O_2 electrochemical cell	**T25**
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, wide measuring range	**T34**
No O_2 cell integrated	**T35**

Selection and ordering data (Continued)

Options	Order code
Measuring range indication in plain text	**Y11**
SO_2 with measuring range 0 ... 400/7 000 mg/m³	**Y15**

ULTRAMAT 23 gas analyzer - German Technical Inspectorate version For measuring 2 infrared components, UV components and oxygen			**Article No.** 7MB2357-	●	●	●	●	0	-	●	●	●	●
Click on the Article No. for online configuration in the PIA Life Cycle Portal. ***Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".***													
Enclosure, version and gas paths 19" rack unit for installation in cabinets													
Gas connections	Gas path	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								
CO_2	P				C								
SO_2	F, G, H, W				N								
NO	F, G, H, U, V, W				P								
Smallest measuring range[3]	**Largest measuring range**[3]												
SO_2: 0 ... 400 mg/m³ NO: 0 ... 200 mg/m³	SO_2: 0 ... 2 000 mg/m³ NO: 0 ... 1 000 mg/m³					F							
CO: 0 ... 200 mg/m³ SO_2: 0 ... 500 mg/m³ NO: 0 ... 250 mg/m³	CO: 0 ... 1 250 mg/m³ SO_2: 0 ... 2 500 mg/m³ NO: 0 ... 1 250 mg/m³					G							
NO: 0 ... 600 mg/m³ SO_2: 0 ... 1 400 mg/m³	NO: 0 ... 3 000 mg/m³ SO_2: 0 ... 7 000 mg/m³					H							
0 ... 1 250 vpm	0 ... 6 000 vpm					J							
0 ... 5% [2]	0 ... 25% [2]					P							
0 ... 150 mg/m³ [2]	0 ... 750 mg/m³ [2]					U							
0 ... 250 mg/m³ [2]	0 ... 1 250 mg/m³ [2]					V							
0 ... 400 mg/m³ [2]	0 ... 2 000 mg/m³ [2]					W							
Oxygen measurement													
Without O_2 sensor							0						
With electrochemical O_2 sensor							1						
With paramagnetic oxygen measuring cell							8						
Auxiliary power													
230 V AC, 50 Hz										3			
2nd infrared measured component													
Measured component	**Possible with measuring range identification**												
CO	G, J										A		
CO_2	P										C		
SO_2[1]	F, G, H, S, W										N		
NO	F, G, H, U, V, W										P		
Smallest measuring range[3]	**Largest measuring range**[3]												
SO_2: 0 ... 400 mg/m³ NO: 0 ... 200 mg/m³	SO_2: 0 ... 2 000 mg/m³ NO: 0 ... 1 000 mg/m³											F	
CO: 0 ... 200 mg/m³ SO_2: 0 ... 500 mg/m³ NO: 0 ... 250 mg/m³	CO: 0 ... 1 250 mg/m³ SO_2: 0 ... 2 500 mg/m³ NO: 0 ... 1 250 mg/m³											G	
NO: 0 ... 600 mg/m³ SO_2: 0 ... 1 400 mg/m³	NO: 0 ... 3 000 mg/m³ SO_2: 0 ... 7 000 mg/m³											H	
0 ... 1 250 vpm	0 ... 6 000 vpm											J	
0 ... 5% [2]	0 ... 25% [2]											P	
0 ... 50 mg/m³ [2]	0 ... 1 250 mg/m³ [2]											S	
0 ... 150 mg/m³ [2]	0 ... 750 mg/m³ [2]											U	
0 ... 250 mg/m³ [2]	0 ... 1 250 mg/m³ [2]											V	
0 ... 400 mg/m³ [2]	0 ... 2 000 mg/m³ [2]											W	
Language of the operating software													
German													0

Selection and ordering data (Continued)

ULTRAMAT 23 gas analyzer - German Technical Inspectorate version For measuring 2 infrared components, UV components and oxygen	**Article No.** 7MB2357-	●	●	●	●	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.
[2] Only in conjunction with order code T13/T23/T33
[3] German Technical Inspectorate: see table "TÜV/German Technical Inspectorate, 1 and 2-component analyzer" under "More information".

Options	Order code
Add "**-Z**" to article number and then add order code.	
Settings	
Add-on electronics with 8 digital inputs/outputs, PROFIBUS PA interface	**A12**
Add-on electronics with 8 digital inputs/outputs, PROFIBUS DP interface	**A13**
IEC plug, 37-pin D-sub connector, 9-pin D-sub connector	**A33**
O_2 paramagnetic, suitability-tested EN 15267, IR measuring range in mg/m^3	**T13**
O_2 paramagnetic, suitability-tested EN 15267, IR measuring range in mg/m^3, wide measuring range	**T14**
O_2 electrochemical, suitability-tested EN 15267, IR measuring range in mg/m^3	**T23**
O_2 electrochemical, suitability-tested EN 15267, IR measuring range in mg/m^3, wide measuring range	**T24**
O_2 electrochemical, suitability-tested EN 15267, measuring range in mg/m^3 with UV photometer	**T25**
Without O_2, suitability-tested EN 15267, IR measuring range in mg/m^3	**T33**
Without O_2, suitability-tested EN 15267, IR measuring range in mg/m^3, wide measuring range	**T34**
Suitability-tested EN 15267, measuring range in mg/m^3 with UV photometer	**T35**
Measuring range indication in plain text	**Y11**
SO_2 with measuring range 0 ... 400/7 000 mg/m^3	**Y15**

ULTRAMAT 23 gas analyzer - German Technical Inspectorate version For measuring 3 infrared components, UV components, oxygen <u>or</u> 2 infrared components and UV components			**Article No.** 7MB2358-	●	●	●	●	6	-	●	●	●	●
Click on the Article No. for online configuration in the PIA Life Cycle Portal. ***Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".***													
Enclosure, version and gas paths 19" rack unit for installation in cabinets													
<u>Gas connections</u>	<u>Gas path</u>	<u>Internal sample gas pump</u>											
6 mm	FPM (Viton, not separate)	Without		0									
<u>**1st and 2nd Infrared measured component**</u>													
Measured component	**Smallest measuring range**	**Largest measuring range**											
CO and NO	0 ... 250 vpm (CO) 0 ... 400 vpm (NO)	0 ... 1 250 vpm (CO) 0 ... 2000 vpm (NO)			A	K							
CO and NO	0 ... 200 vpm (CO) 0 ... 150 vpm (NO)	0 ... 1 250 vpm (CO) 0 ... 750 vpm (NO)			A	S							
Oxygen measurement													
Without O_2 sensor							0						

Selection and ordering data (Continued)

ULTRAMAT 23 gas analyzer - German Technical Inspectorate version For measuring 3 infrared components, UV components, oxygen or 2 infrared components and UV components		Article No. 7MB2358-	●	●	●	●	6	-	●	●	●	●
With electrochemical O_2 sensor						1						
With paramagnetic oxygen measuring cell						8						
Auxiliary power												
230 V AC, 50 Hz									3			
3rd infrared measured component												
Measured component	**Possible with measuring range identification**											
SO_2 [1)]	F, G, H, S, W									N		
Smallest measuring range [2)]	**Largest measuring range** [2)]											
0 ... 400 vpm	0 ... 2 000 vpm										F	
0 ... 500 vpm	0 ... 2 500 vpm										G	
0 ... 1 400 vpm	0 ... 7 000 vpm										H	
0 ... 50 mg/m³	0 ... 1 250 mg/m³										S	
0 ... 400 mg/m³	0 ... 2 000 mg/m³										W	
Language of the operating software												
German												0
English												1
French												2
Spanish												3
Italian												4

[1)] When measuring range identification "S" selected: Parallel measurement of SO_2 and NO_2 with UV photometer.
[2)] German Technical Inspectorate: see table "TÜV/German Technical Inspectorate, 3-component analyzer" under "More information".

Options	Order code
Add "**-Z**" to article number and then add order code.	
Settings	
Add-on electronics with 8 digital inputs/outputs, PROFIBUS PA interface	**A12**
Add-on electronics with 8 digital inputs/outputs, PROFIBUS DP interface	**A13**
IEC plug, 37-pin D-sub connector, 9-pin D-sub connector	**A33**
O_2 paramagnetic, suitability-tested EN 15267, IR measuring range in mg/m³	**T13**
O_2 electrochemical, suitability-tested EN 15267, IR measuring range in mg/m³	**T23**
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, with UV photometer	**T35**
Measuring range indication in plain text	**Y11**
SO_2 with measuring range 0 ... 400/7 000 mg/m³	**Y15**

Note

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

Technical specifications

ULTRAMAT 23, 19" rack unit and portable version	
General information	
Measured components	Maximum of 4
Measuring ranges	2 per measured component
Display	LCD with LED backlighting and contrast control; function keys; 80 characters (4 lines/20 characters)
Operating position	Front wall, vertical
Conformity	CE marking EN 61000-6-2, EN 61000-6-4
Design, enclosure	
Weight	Approximately 10 kg
Degree of protection, 19" rack unit and desktop model	• 7MB2335, 7MB2337 and 7MB2338: IP20 according to EN 60529 • 7MB2355, 7MB2357 and 7MB2358: IP40 according to EN 60529
Electrical characteristics	
EMC interference immunity (electromagnetic compatibility) 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, floating, max. load 750 Ω
Relay outputs	8, with changeover contacts, freely configurable, e.g. for measuring range identification; 24 V AC/DC/1 A load rating, floating, non-sparking
Digital inputs	3, dimensioned for 24 V, potential-free • Pump • AUTOCAL • Synchronization
Serial interface	RS 485
AUTOCAL function	Automatic device calibration with ambient air (depending on measured component); adjustable cycle time from 0 (1) ... 24 hours
Options	Add-on electronics, each with 8 additional digital inputs and relay outputs, e.g. for triggering of automatic calibration and for PROFIBUS PA or PROFIBUS DP
Climatic conditions	
Permissible ambient temperature	
• During operation	• +5 ... 45 °C (IR detector, 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	Depressurized (< 1 200 hPa, absolute)

Technical specifications (Continued)

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

ULTRAMAT 23, infrared channel[1]	
Measuring ranges	See ordering data
Chopper purge	Primary pressure approximately 3 000 hPa; purging gas consumption approximately 100 ml/min
Time response	
Warm-up period	Approx. 30 min (at room temperature), (the technical specification will be met after 2 h)
Delayed display (T_{90} time)	Dependent on length of analyzer chamber, sample gas line and configurable damping
Damping (electrical time constant)	Configurable from 0 ... 99.9 s
Measuring response	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 nameplate)
Detection limit	1% of the current measuring range
Linearity error	• In the largest possible measuring range: < ± 1% of the measuring range end value • In the smallest possible measuring range: < ± 2% of the measuring range end value
Repeatability	≤ ± 1% of the current measuring range
Drift	
Zero point	≤ 1% of the current measuring range/week
Full-scale value drift	≤ 1% of the current measuring range/week
Influencing variables	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 nameplate per 10 K with an AUTOCAL cycle time of 6 h
Atmospheric pressure	< 0.2% of the current measuring range per 1% pressure variation
Auxiliary power	< 0.1% of the current measuring range with a change of ± 10%

[1] To ensure compliance with the technical specifications, a cycle time of ≤ 24 hours must be activated for the AUTOCAL. The cycle time of the AUTOCAL function must be ≤ 6 hours when measuring small NO and SO_2 measuring ranges (≤ 400 mg/m³) on German Technical Inspectorate/QAL-certified systems.

ULTRAMAT 23, oxygen channel (electrochemical)	
Measuring ranges	0 ... 5% to 0 ... 25% O_2, configurable
Service life	Approx. 2 years with 21% O_2
Detection limit	1% of the current measuring range
Time response	
Delayed display (T_{90} time)	Dependent on dead time and configurable damping, not > 30 s at approximately 1.2 l/min sample gas flow
Measuring response	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

Technical specifications (Continued)

ULTRAMAT 23, oxygen channel (electrochemical)	
Repeatability	≤ 0.05% O_2
Drift	
• With AUTOCAL	Negligible
Influencing variables	Based on sample gas pressure 1 013 hPa absolute, 1.0 l/min sample gas flow and 25 °C ambient temperature
Temperature	< ± 0.5% O_2 per 20 K, relating to a measured value at 20 °C
Atmospheric pressure	< 0.2% of the measured value per 1% pressure variation
Accompanying gases	The oxygen sensor must not be used if the accompanying gas contains the following components: Chlorine or fluorine compounds, heavy metals, aerosols, mercaptans, alkaline components (such as NH_3 in % range)
Typical combustion exhaust gases	Influence: < 0.05% O_2
Humidity	H_2O dew point ≥ 2 °C; the oxygen sensor must not be used with dry sample gases (however, no condensation either)

ULTRAMAT 23, ultraviolet photometer[2)]	
Measuring ranges	The measuring ranges are calibrated with a certified calibration gas, whereby a concentration specification in ppm in accordance with EN 1343 must be converted to the unit mg/m³ at a reference temperature of 0 °C and a reference pressure of 1 013 hPa.
SO_2	
• Smallest measuring range	0 ... 50 mg/m³
• Largest measuring range	0 ... 1 250 mg/m³
NO_2	
• Smallest measuring range	0 ... 50 mg/m³
• Largest measuring range	0 ... 1 250 mg/m³
Time response	
Warm-up period	30 min The technical specification will be met after 2 h
Delayed display (T_{90} time)	Dependent on the external gas preparation, the length of the sample gas line and the configurable damping (see below) of the device. **Note:** SO_2 is highly soluble in water! ≤ 30 s after sample gas inlet at a damping of ≤ 12 s
Damping (electronic time constant)	0 ... 99.9 s, can be set
Measuring response	
Output signal fluctuation	≤ 1% of set measuring range end value
Detection limit	1% of set measuring range end value or: • 1 mg/m³ (SO_2) • 0.8 mg/m³ (NO_2) This corresponds to 0.4 ppm for both components
Linearity error	
• In the largest measuring range	≤ 1% of set measuring range end value
• In the smallest measuring range	≤ 2% of set measuring range end value
Repeatability	≤ 1% of set measuring range end value
Influencing variables	
Temperature error	≤ 4% of smallest measuring range end value/10 K in ambient temperature range of 5 ... 45 °C
Atmospheric pressure	≤ 1% of set measuring range end value per 1% pressure variation
Auxiliary power	≤ 0.1% of set measuring range end value with a change of ±10%
Drift (zero point and full-scale value)	

Technical specifications (Continued)

ULTRAMAT 23, ultraviolet photometer[2)]	
• AUTOCAL activated	Negligible depending on the cycle time setting
• AUTOCAL deactivated	
- NO_2	≤ 0.85 mg/m³/day
- SO_2	≤ 1.25 mg/m³/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

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

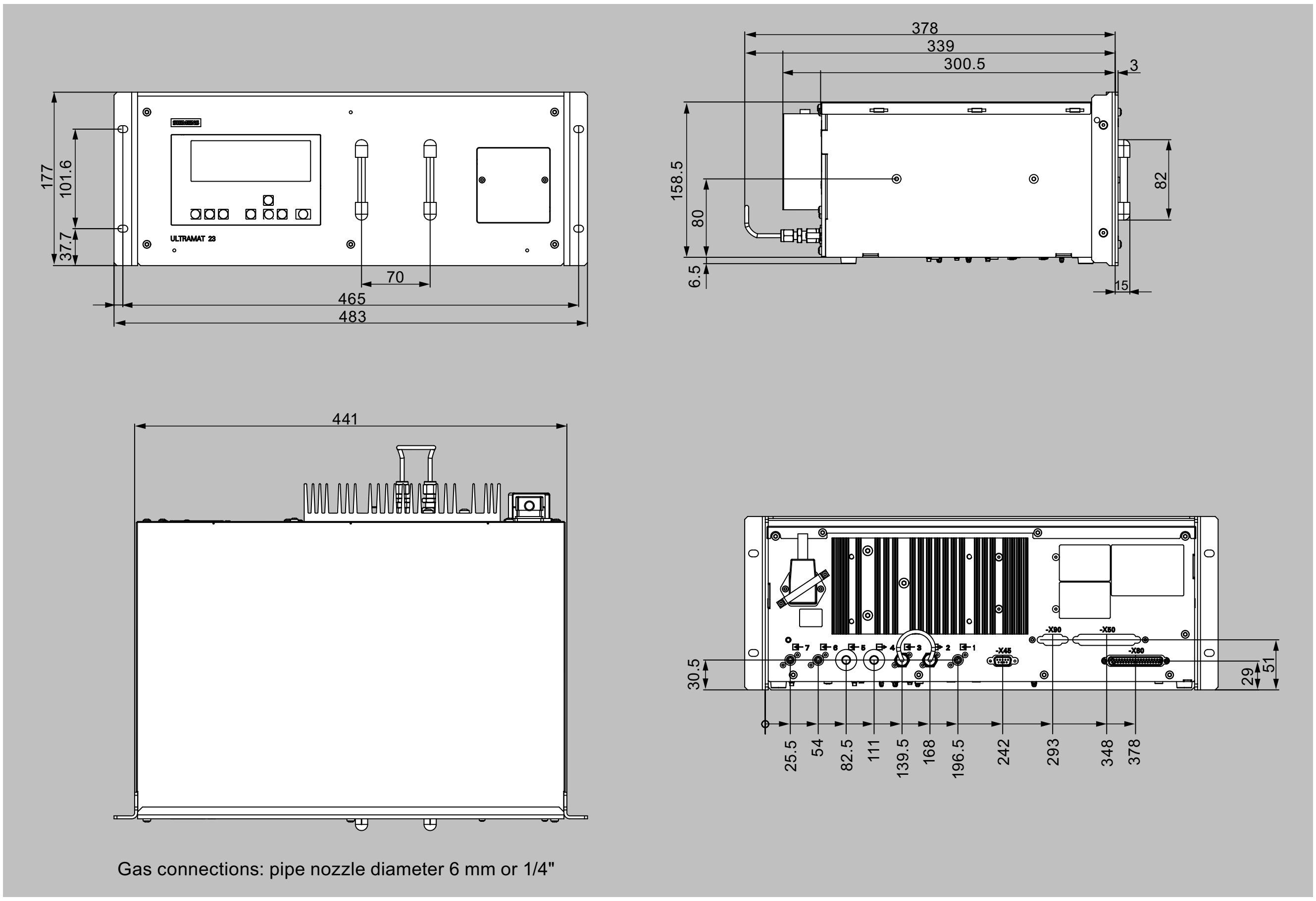
ULTRAMAT 23, H_2S channel for measuring ranges of 5 ... 50 vpm	
Measured components	Maximum of 4, comprising up to 2 infrared-sensitive gases, an oxygen component and a hydrogen sulfide component
Measuring ranges	
• Smallest measuring range	0 ... 5 vpm
• Largest measuring range	0 ... 50 vpm
Service life of the sensor	Approx. 12 months
Permissible atmospheric pressure	750 ... 1 200 hPa
Permissible operating temperature	5 ... 40 °C (41 ... 104 °F)
Operation mode	• Continuous measurement between 0 and 12.5 vpm • Discontinuous measurement between 12.5 and 50 vpm
Influencing variables	
Accompanying gases	The hydrogen sulfide sensor must not be used if the accompanying gas contains the following components: • Compounds containing chlorine • Compounds containing fluorine • Heavy metals • Aerosols • Alkaline components (e.g. NH_3 > 5 vpm)
Interference 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 measuring range end 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 a damping constant of 30 s
Display resolution	< 0.01 vpm H_2S

Technical specifications (Continued)

ULTRAMAT 23, H_2S channel for measuring ranges of 5 ... 50 vpm	
Output signal resolution	< 1% of smallest measuring range with a damping constant of 30 s
Repeatability	< 4% of smallest measuring range
Drift	< 1% of the current measuring range per month

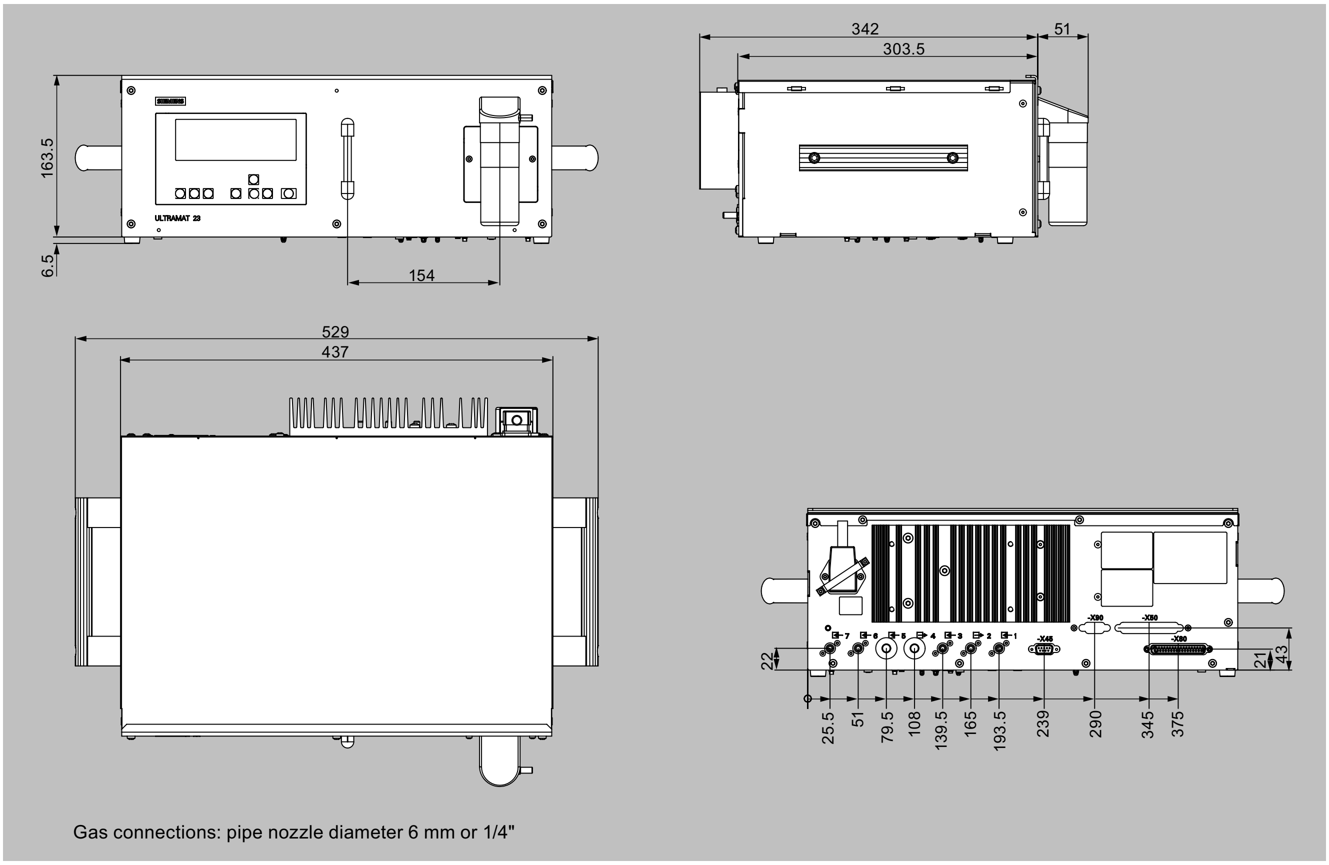
ULTRAMAT 23, paramagnetic oxygen cell	
Measured components	Maximum of 4, comprising up to 3 infrared-sensitive gases and an oxygen component
Measuring ranges	2 per component • Min. 0 ... 2% vol O_2 • Max. 0 ... 100% vol O_2 • Suppressed measuring range possible; e.g. 95 ... 100%
Permissible operating temperature	5 ... 45 °C (41 ... 113 °F)
Interference gases	See "Paramagnetic oxygen cell cross-interference" table
Zero point drift	• Measuring range 2%: max. 0.1% with weekly zero-point calibration • Measuring range 5%: max. 0.1% with weekly zero-point calibration • Measuring range 25% or more: max. 0.5% with monthly zero-point calibration
Measured value drift	Negligible with 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

Dimensional drawings



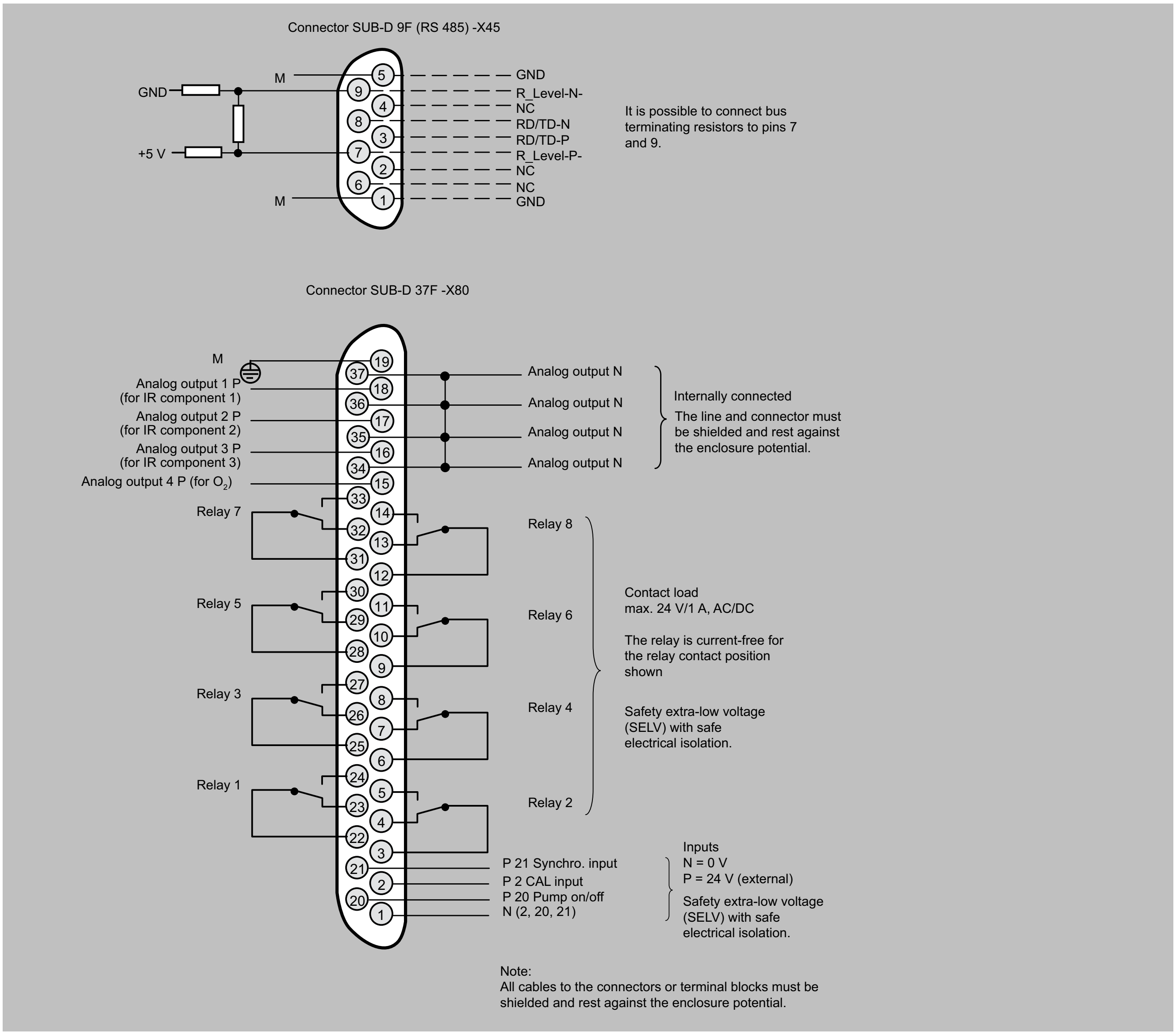
ULTRAMAT 23, 19" rack unit, dimensions in mm

Dimensional drawings (Continued)



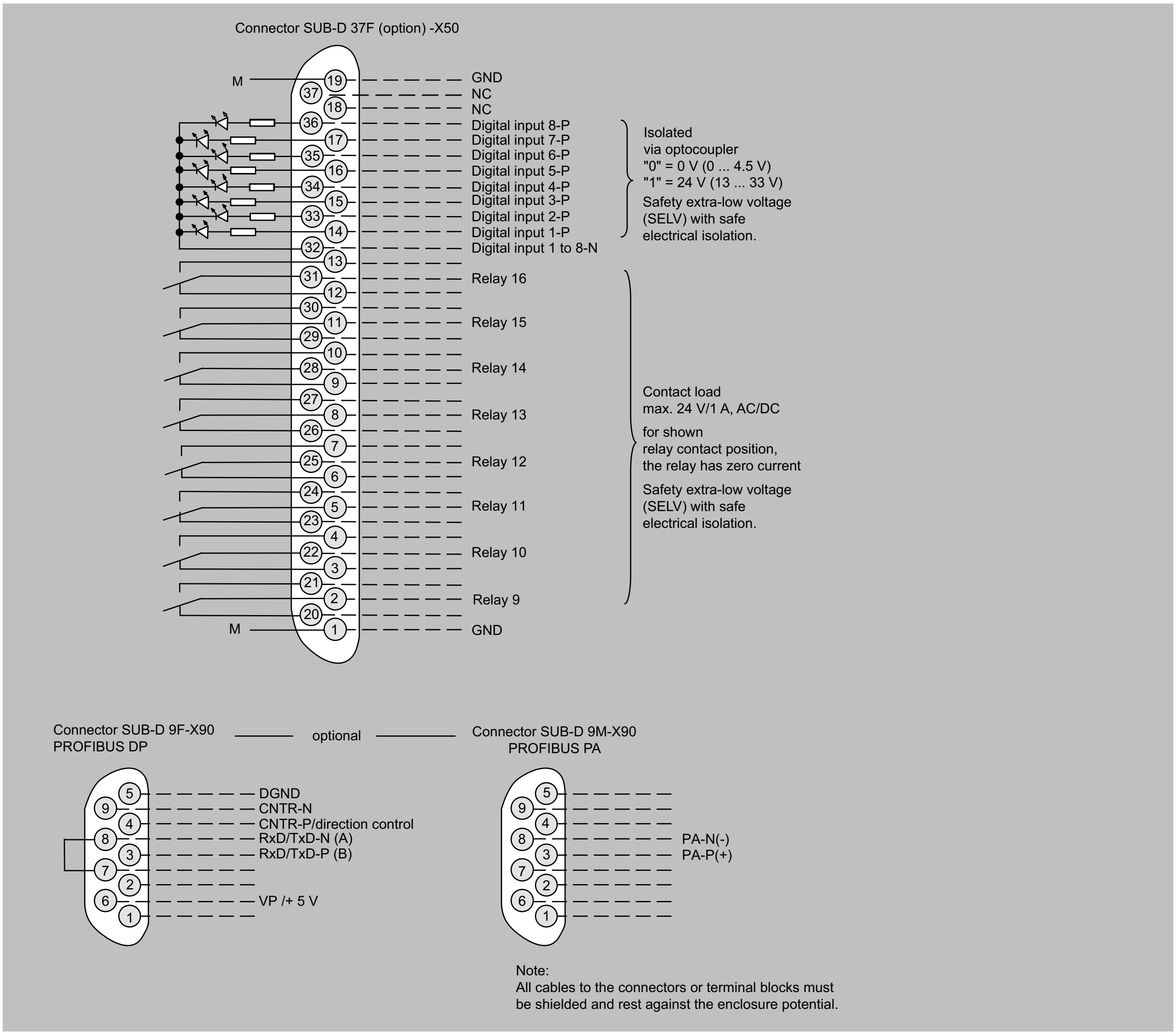
ULTRAMAT 23, bench-top unit, dimensions in mm

Circuit diagrams



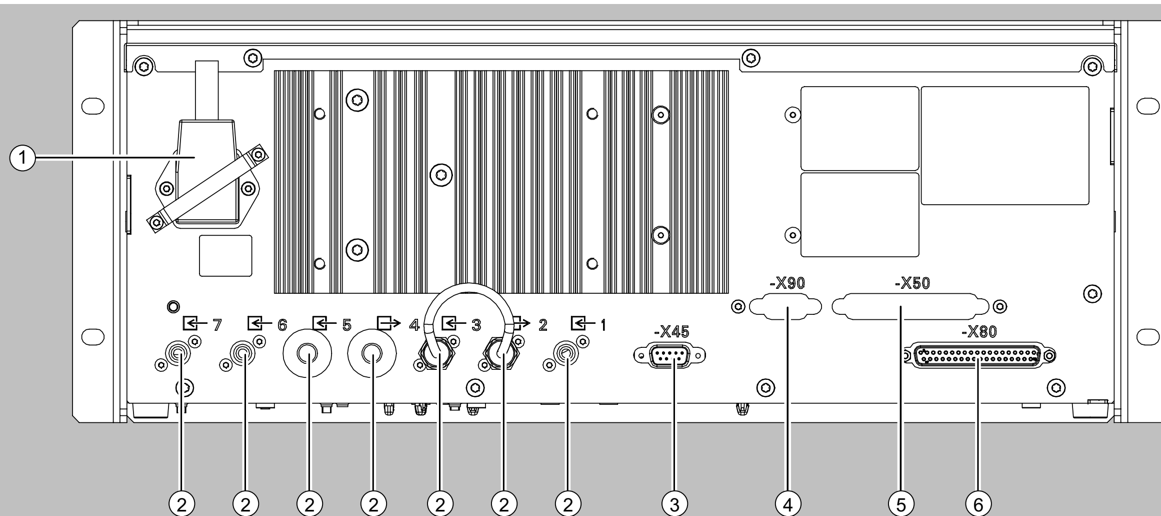
ULTRAMAT 23, pin assignment (standard)

Circuit diagrams (Continued)



ULTRAMAT 23, pin assignment of optional PROFIBUS interface card

Circuit diagrams (Continued)

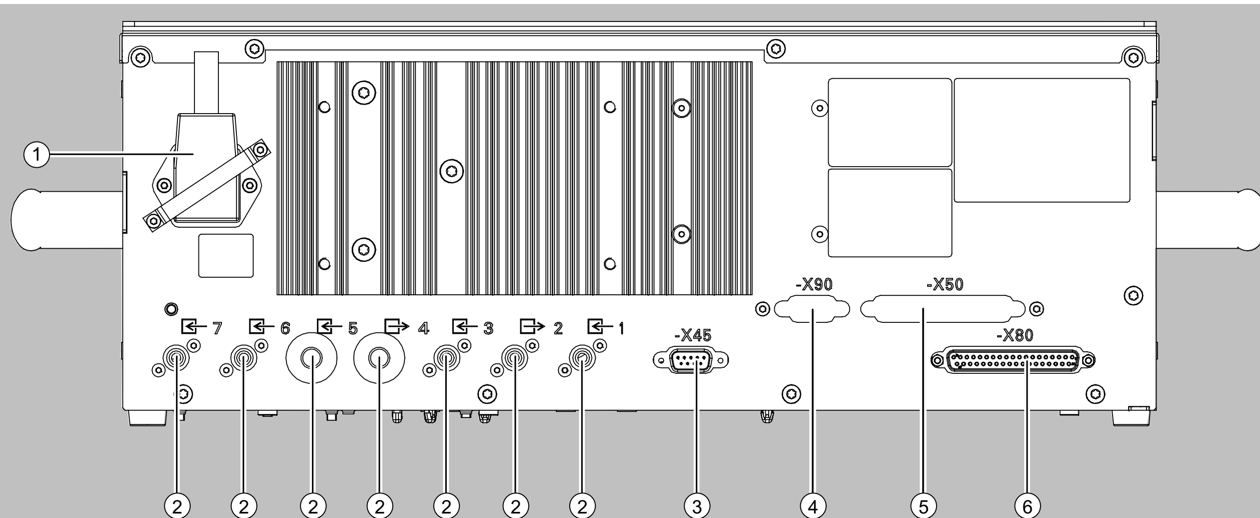


1. Auxiliary power and fine fuse
2. Gas connections: nozzles 6 mm or ¼"
3. -X45: ELAN (RS485) 9-pin connector
4. -X90: 9-pin interface connector (option board with PROFIBUS-DP/PA)
5. -X50: 37-pin connector: Option board; digital inputs/relay outputs
6. -X80: 37-pin connector: Analog and digital inputs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

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

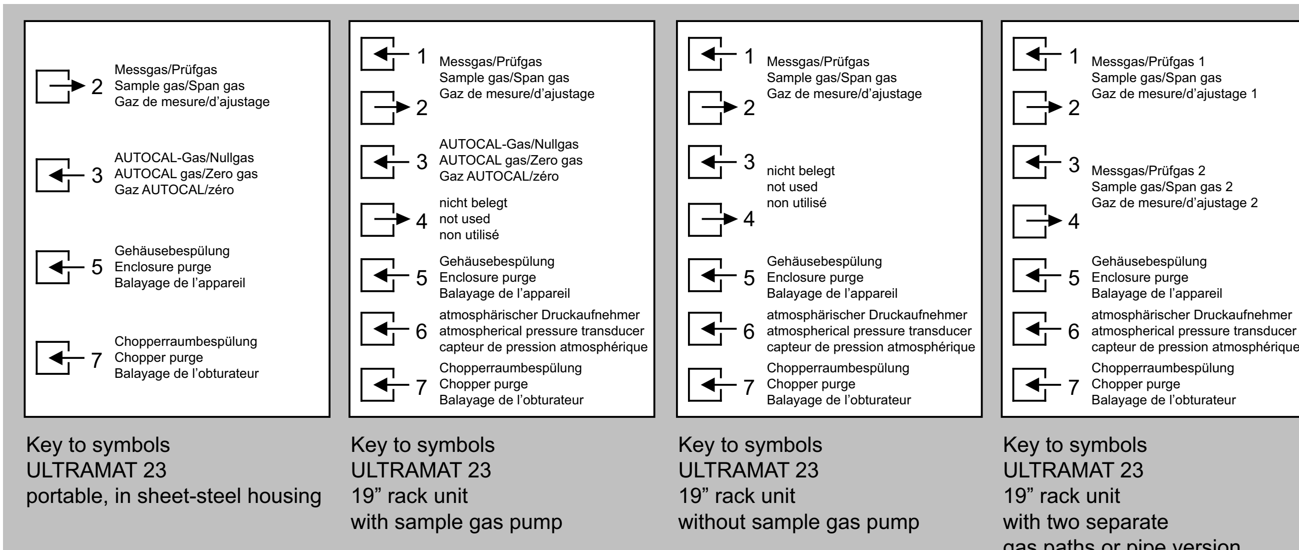
ULTRAMAT 23, 19" rack unit, e.g. an IR measured component with oxygen measurement

Circuit diagrams (Continued)



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

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



ULTRAMAT 23, designation of the different labels

More information

German Technical Inspectorate (TÜV), 1 and 2-component analyzer

Only in conjunction with order code T13/T23/T33

Component	CO (TÜV)		SO_2 (TÜV)		NO (TÜV)	
Measuring range identification	**Smallest measuring range from 0 to ...**	**Largest measuring range from 0 to ...**	**Smallest measuring range from 0 to ...**	**Largest measuring range from 0 to ...**	**Smallest measuring range from 0 to ...**	**Largest measuring range from 0 to ...**
F	-	-	400 mg/m³	2 000 mg/m³	200 mg/m³	1 000 mg/m³
G	200 mg/m³	1 250 mg/m³	500 mg/m³	2 500 mg/m³	250 mg/m³	1 250 mg/m³
H	-	-	1 400 mg/m³	7 000 mg/m³	-	-
S	-	-	75 mg/m³	1 250 mg/m³	-	-

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/m³	3 000 mg/m³
J	1 250 mg/m³	6 000 mg/m³	-	-	-	-

Ordering example

ULTRAMAT 23, German Technical Inspectorate (TÜV)
IR component: CO
Measuring range: 0 to 200 / 1 250 mg/m³
with electrochemical O_2 sensor
230 V AC; German
7MB2355-0AG16-3AA0-Z +T23

German Technical Inspectorate (TÜV), 3-component analyzer

Only in conjunction with order code T13/T23/T33

Component	CO (TÜV)		SO_2 (TÜV)		NO (TÜV)	
Measuring range identification	**Smallest measuring range from 0 to ...**	**Largest measuring range from 0 to ...**	**Smallest measuring range from 0 to ...**	**Largest measuring range from 0 to ...**	**Smallest measuring range from 0 to ...**	**Largest measuring range from 0 to ...**
F	-	-	400 mg/m³	2 000 mg/m³	-	-
G	-	-	500 mg/m³	2 500 mg/m³	-	-
H	-	-	1 400 mg/m³	7 000 mg/m³	-	-

Ordering example

ULTRAMAT 23, German Technical Inspectorate (TÜV)
IR component: CO/NO + SO_2
Measuring range: CO: 0 to 250 / 1 250 mg/m³, NO: 0 to 400 / 2 000 mg/m³, SO_2: 0 to 400 / 2 000 mg/m³
with paramagnetic oxygen measuring cell
230 V AC; German
7MB2358-0AK86-3NF0-Z +T13

Ordering notes

Special selection rules must be observed when measuring some components.

Measured component 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

More information (Continued)

7MB2337-*CP*6-*SY* or
7MB2338-*DC*6-*SY* (incl. NO measurement)
7MB2337 and 7MB2338 (application with paramagnetic oxygen measuring cell and separate gas path)
7MB2337-4**86-**** - Z + C11
7MB2337-5**86-**** - Z + C11
7MB2338-4**86-**** - Z + C11
7MB2338-5**86-**** - Z + C11

Measured component 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 SF_6 in ultra-pure gases

Calibration intervals, standard devices

	Calibration with calibration gas [weeks]		Comments
	Zero point	**Calibration point**	**(Comply with technical specifications)**
IR components	●	52	-
O_2 - electrochemical sensor	52	●	-
O_2 paramagnetic cell	1	●	At MB < 5%
	8	●	At MB > 5%
O_2 paramagnetic cell	●	52	At MB < 5%
	●	52	At MB > 5%
H_2S sensor	●	4	-

● = with AUTOCAL, with ambient air or N_2, 3 ... 24h – depending on measuring range.

Selection and ordering data

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

Overview

The function of the SIPROCESS UV600 gas analyzer is based on UV resonance absorption spectrometry. It also is used to measure very low NO, NO2,SO2$_{\text{or H2}}$S 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

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 NO_2 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

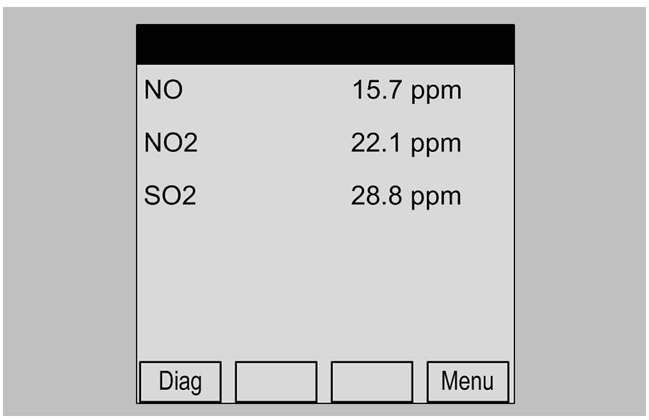
H_2S measurement
- In typical emission applications
- Taking account of possible cross-sensitivities (e.g. from mercaptan)

Design

- 19" rack unit with 4 U for installation
  - In hinged frame
  - In cabinets with or without telescopic rails
- Internal gas paths: hose made of FKM (VitonTM) or pipe made of PTFE or stainless steel
- Gas connections for sample gas inlet and outlet and for reference gas: Fittings, pipe diameter of 6 mm or ¼"

Display and operator panel

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



SIPROCESS UV600, display and control panel

Inputs and outputs

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

Communication

Connection via SIPROCESS UV600-specific software tool

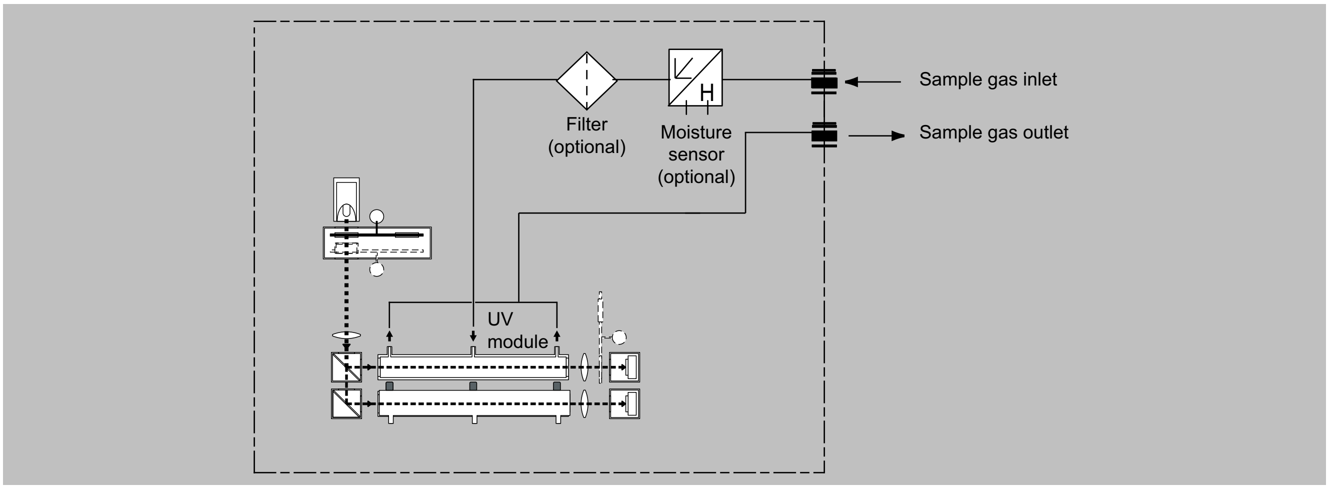
Materials wetted by sample gas

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

[1)] Depending on the version

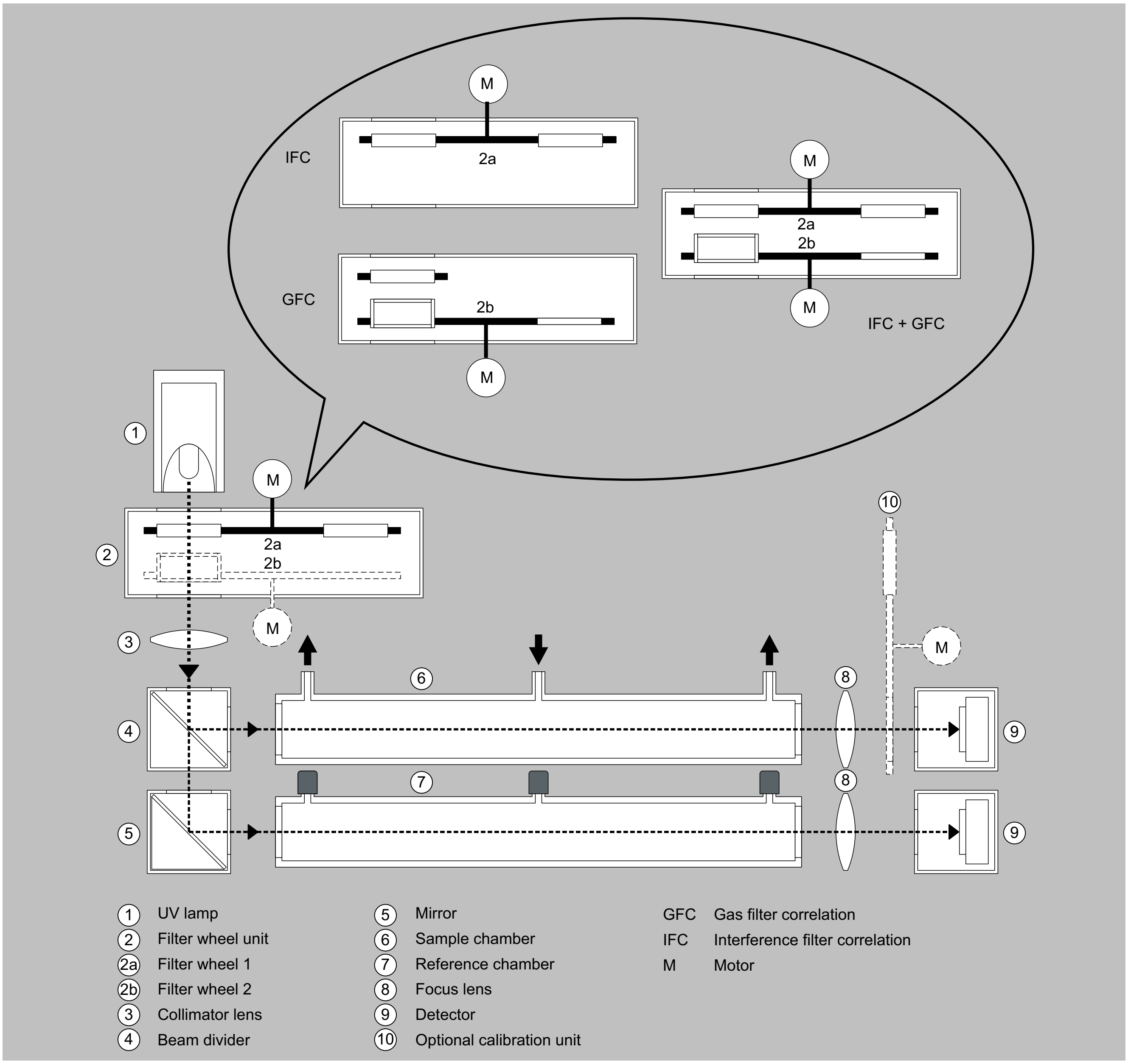
Design (Continued)

Gas flow chart



SIPROCESS UV600, gas flow chart

Mode of operation



SIPROCESS UV600, operating principle

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

Measuring method

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

Interference filter correlation (IFC)

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

Mode of operation (Continued)

Gas filter correlation (GFC)

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

IFC and GFC

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

Design of the UV analyzer module

After passing through the filter unit, the beam is directed via a lens (3), a beam divider (4) and a mirror (4) into the sample chamber (6) and reference chamber (7).
The sample beam passes through the sample chamber (6), into which sample gas flows, and its intensity is weakened in line with the concentration of the measured component. The reference beam is directed via a mirror (5) into the reference chamber (7). This is filled with a neutral gas.
The detectors (9) receive the sample and reference beams in succession. These measured signals are amplified and evaluated using electronics.
The measuring system is temperature-controlled to minimize external temperature influences.
The physical state of the measuring system is recorded simultaneously through time-shifted detection of the reference beam, and compensated if necessary.
A quotient is generated for each detector from the determined signal values, and the ratio of these quotients determined. This double generation of quotients means that symmetrical signal drifts are compensated in the best possible manner in addition to proportional signal drifts.

Note

The sample gases must be fed into the analyzers free of dust. Condensation in the sample chambers must be prevented. Therefore, the use of gas modified for the measuring task is necessary in most application cases.
Additional measures depending on the application must be taken when introducing gases with flammable components at concentrations above the lower explosive limit (LEL). Please contact the technical department in such cases.

Function

Signal connections

The SIPROCESS UV600 is supplied as standard with one or (optionally) two input/output modules. The logic function of the signal connections can be configured individually with the service and maintenance software specific to SIPROCESS UV600.
The signal connections are available at terminal strips X3, X4, X5 and X7 on the 12-pin plug connectors of the input/output modules. The scope of delivery includes the corresponding counterparts (plug connectors) with screw terminals.

Inputs and outputs

Characteristics of the digital inputs:
- Floating optocouplers with common reference potential (DIC)
- Switching range 14 ... 42 V DC (external control voltage)
- The digital inputs can be operated either with positive or negative voltage
- With inverted switching logic, the logic function of the control input is active if no current is flowing through the control input
- Maximum voltage ± 50 V

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

Characteristics of the analog inputs:
- The input signal is an analog current signal (standard 0 ... 20 mA, maximum 30 mA)
- The signal current must be provided by an external current source
- Load (internal resistance) of analog input: 10 Ω
- Reference potential GND (see figure, analog inputs)
- Overcurrent protection: ± 1 000 mA

Function (Continued)

- Maximum voltage: ± 50 V

Characteristics of the analog outputs:
- Analog outputs are floating (electrically isolated) and provide a load-independent current signal
- Signal range 0 ... 24 mA
- Residual ripple 0.02 mA
- Resolution 0.1%
- Accuracy 0.25% of measuring range end value
- Maximum load 500 Ω
- Maximum voltage ± 50 V
- Adjustable start or error state

Note for electrical isolation:

The electrical isolation is canceled if the negative poles of the analog outputs are connected to GND.

Note

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

Selection and ordering data

SIPROCESS UV600 gas analyzer, incl. gas module and barometric pressure compensation			Article No. 7MB2621- ●	●	●	●	●	-	0	●	●	●
Click on the Article No. for online configuration in the PIA Life Cycle Portal.												
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".												
Enclosure, version and gas paths, 19" rack unit for installation in cabinets												
Gas connections: Diameter	Gas connections: Material	Gas paths: Material										
6 mm pipe	PVDF	Hose / Viton	0									
6 mm pipe	Swagelok	PTFE	1									
6 mm pipe	Swagelok	Stainless steel, with pipes	2									
¼" pipe	Swagelok	Stainless steel, with pipes	3									
1st UV measured component												
Measured component	**Smallest/largest measuring range**	**Corresponds to**										
NO	0 ... 10 / 0 ... 300 ppmv	0 ... 15 / 0 ... 450 mg/m^3		A	A							
	0 ... 20 / 0 ... 400 ppmv	0 ... 25 / 0 ... 500 mg/m^3		A	B							
	0 ... 25 / 0 ... 500 ppmv	0 ... 35 / 0 ... 700 mg/m^3		A	C							
	0 ... 50 / 0 ... 1 000 ppmv	0 ... 70 / 0 ... 1 250 mg/m^3		A	D							
NO_2	0 ... 10 / 0 ... 300 ppmv[1)]	0 ... 20 / 0 ... 600 mg/m^3 [1)]		B	A							
	0 ... 20 / 0 ... 400 ppmv	0 ... 40 / 0 ... 800 mg/m^3		B	B							
	0 ... 25 / 0 ... 500 ppmv	0 ... 50 / 0 ... 1 000 mg/m^3		B	C							
	0 ... 50 / 0 ... 1 000 ppmv	0 ... 100 / 0 ... 2 000 mg/m^3		B	D							
SO_2	0 ... 10 / 0 ... 300 ppmv[1)]	0 ... 25 / 0 ... 750 mg/m^3 [1)]		C	A							
	0 ... 20 / 0 ... 400 ppmv	0 ... 50 / 0 ... 1 000 mg/m^3		C	B							
	0 ... 25 / 0 ... 500 ppmv	0 ... 75 / 0 ... 1 500 mg/m^3		C	C							
	0 ... 50 / 0 ... 1 000 ppmv	0 ... 130 / 0 ... 2 600 mg/m^3		C	D							
H_2S	0 ... 25 / 0 ... 500 ppmv	0 ... 40 / 0 ... 800 mg/m^3		D	C							
	0 ... 50 / 0 ... 1 000 ppmv	0 ... 75 / 0 ... 1 500 mg/m^3		D	D							
2nd UV measured component												
Measured component	**Smallest/largest measuring range**	**Corresponds to**										
Without						0	0					
NO_2	0 ... 10 / 0 ... 300 ppmv[1)]	0 ... 20 / 0 ... 600 mg/m^3 [1)]				2	1					
	0 ... 20 / 0 ... 400 ppmv	0 ... 40 / 0 ... 800 mg/m^3				2	2					
	0 ... 25 / 0 ... 500 ppmv	0 ... 50 / 0 ... 1 000 mg/m^3				2	3					
	0 ... 50 / 0 ... 1 000 ppmv	0 ... 100 / 0 ... 2 000 mg/m^3				2	4					
SO_2	0 ... 10 / 0 ... 300 ppmv[1)]	0 ... 25 / 0 ... 750 mg/m^3 [1)]				3	1					
	0 ... 20 / 0 ... 400 ppmv	0 ... 50 / 0 ... 1 000 mg/m^3				3	2					
	0 ... 25 / 0 ... 500 ppmv	0 ... 75 / 0 ... 1 500 mg/m^3				3	3					
	0 ... 50 / 0 ... 1 000 ppmv	0 ... 130 / 0 ... 2 600 mg/m^3				3	4					
H_2S	0 ... 25 / 0 ... 500 ppmv	0 ... 40 / 0 ... 800 mg/m^3				4	3					
	0 ... 50 / 0 ... 1 000 ppmv	0 ... 75 / 0 ... 1 500 mg/m^3				4	4					
3rd UV measured component												
Measured component	**Smallest/largest measuring range**	**Corresponds to**										
Without										X	X	
SO_2	0 ... 10 / 0 ... 300 ppmv[1)]	0 ... 25 / 0 ... 750 mg/m^3 [1)]								C	A	
	0 ... 20 / 0 ... 400 ppmv	0 ... 50 / 0 ... 1 000 mg/m^3								C	B	
	0 ... 25 / 0 ... 500 ppmv	0 ... 75 / 0 ... 1 500 mg/m^3								C	C	
	0 ... 50 / 0 ... 1000 ppmv	0 ... 130 / 0 ... 2 600 mg/m^3								C	D	
H_2S	0 ... 25 / 0 ... 500 ppmv	0 ... 40 / 0 ... 800 mg/m^3								D	C	
	0 ... 50 / 0 ... 1 000 ppmv	0 ... 75 / 0 ... 1 500 mg/m^3								D	D	
Language of the operating software												
German												0
English												1
French												2
Spanish												3
Italian												4

1) Smallest measuring range 0 ... 10 ppmv requires daily calibration and thermostatically controlled environment (± 2 °C) Use of an additional calibration unit (B11, B12 or B13) recommended. Two measured value outputs are required on the I/O module for this measuring range switchover. A maximum of 4 measured value outputs are available per I/O module. For versions with 3 sample gas components - including more than 1 component with measuring range 0 ... 10/0 ... 300 vpm - a second I/O module (option: A13) is required!

Selection and ordering data (Continued)

Options	Order code
Add "**-Z**" to article number and then add order code.	
Second I/O module	**A13**
Calibration unit for 1st sample gas component	**B11**
Calibration unit for 1st and 2nd sample gas component	**B12**
Calibration unit for all 3 sample gas components	**B13**
Flow monitor	**C11**
Humidity monitor	**C12**
Pressure sensor (sample gas)	**C14**
Internal sample gas pump	**C15**
Special setting (only in conjunction with an application no., e.g. special measuring range)	**Y12**
Extended special setting (only in conjunction with an application no., e.g. determination of cross-interferences)	**Y13**
Prepared for QAL1, standard measured-value output in mg/m^3	**Y17**

Spare parts

Recommended spare parts for preventive maintenance	2 years (unit)	5 years (unit)	Article No.
Safety filter FI64	1	2	A5E03707235
Power supply units, 24 V DC, 10 A		1	A5E03707236
Distribution board		1	A5E03707240
FKM hose d = 3/5, length = 1 m	2	5	A5E03707757
MEDL UV lamp with heater		1 ... 2	A5E03707918
Motor flange 3		1	A5E03707919
Motor flange 2		1	A5E03707920
Gas filter with holder, for measurement of NO	1	2	A5E03707921
SIPROCESS UV600 chamber H = 300 mm, aluminum		1	A5E03707925
Calibration chamber with holder for NO		1	A5E03707941
Calibration chamber with holder for SO_2 and H_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

Technical specifications

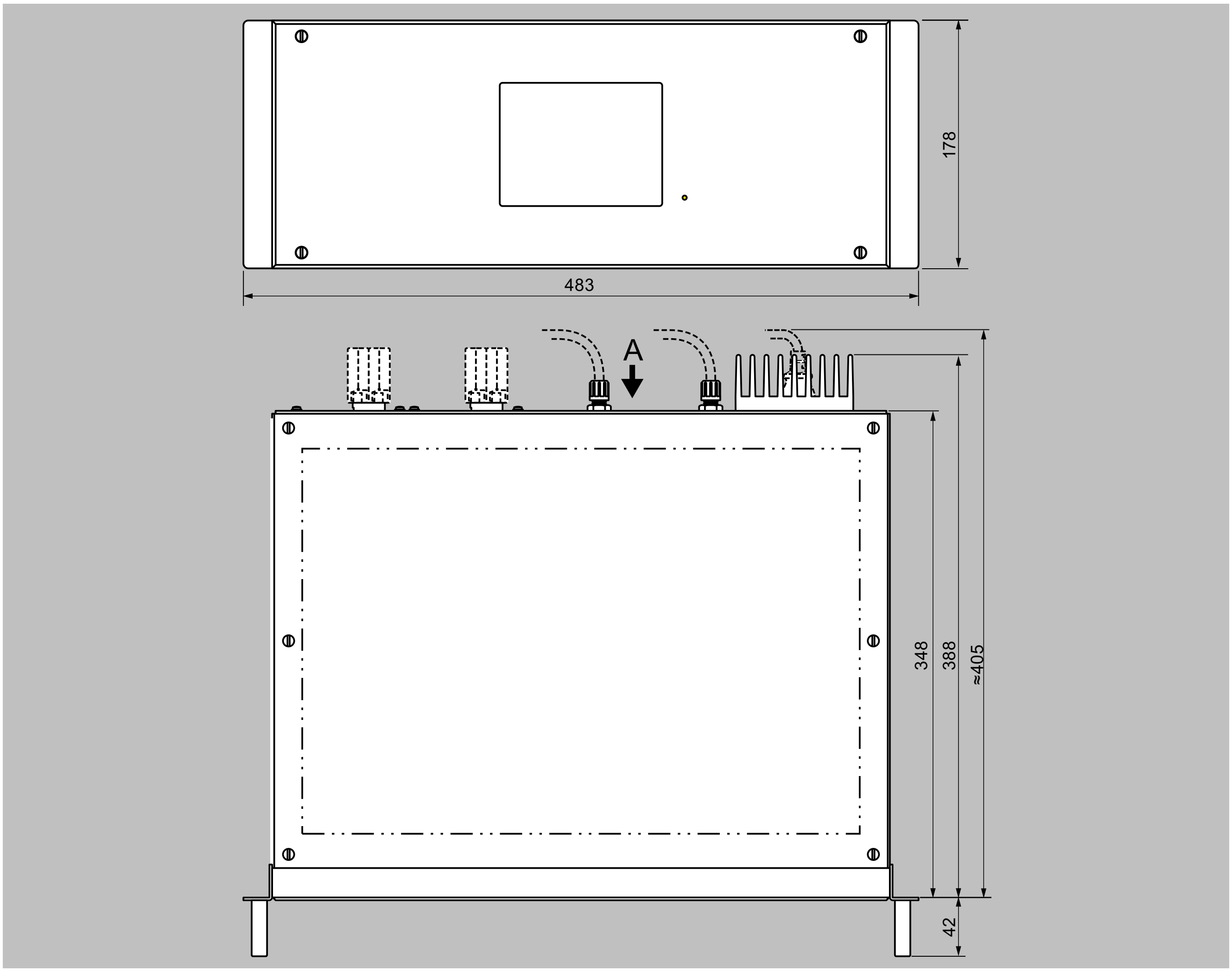
SIPROCESS UV600	
General information	
Measuring ranges	3, automatic measuring range switchover
Detection limit (2σ)	< 1% of measuring span
Smallest possible measuring span	Dependent on order configuration NO: 0 ... 10 / 0 ... 20 / 0 ... 25 / 0 ... 50 vpm NO_2: 0 ... 10[1] / 0 ... 20 / 0 ... 25 / 0 ... 50 vpm SO_2: 0 ... 10[1] / 0 ... 20 / 0 ... 25 / 0 ... 50 vpm H_2S: 0 ... 25 / 0 ... 50 vpm
Largest possible measuring span	Dependent on order configuration NO, NO_2, SO_2: 0 ... 300 to 0 ... 1 000 vpm H_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	
Type of protection	IP40
Weight	approx. 17 kg
Requirements of location of use	
Location of use	Within closed building
Atmospheric pressure in the environment	700 ... 1 200 hPa
Relative humidity	10 ... 95%, non-condensing
Permissible contamination	Pollution degree 1
Maximum geographic altitude of location of use	2 500 m above sea level
Permissible ambient temperature	
• Operation	+5 ... +45 °C (41 ... 113 °F)
• Transport and storage	-10 ... +70 °C (14 ... 158 °F)
Operating position	Front wall, vertical, max. ± 15° angle for each spatial axis (maximum permissible inclination of the base surface during operation with constant operating position)
Permissible vibration/shock	
• Vibration displacement	0.035 mm (in the range 5 ... 59 Hz)
• Amplitude of the starting acceleration	5 m/s^2 (in the range 59 ... 160 Hz)
Electrical characteristics	
Line voltage (optional, see nameplate)	93 ... 132 V AC, 186 ... 264 V AC
Line frequency (AC)	47 ... 63 Hz
Permissible overvoltages (transient surges in the power supply network)	Up to overvoltage category II in accordance with IEC 60364-4-443
Power consumption	Approx. 50 VA, max. 300 VA
EMC interference immunity (electromagnetic compatibility)	In accordance with EN 61326-1, EN 61326-2-1, EN 61000-6-2, EN 61000-6-4 and EU Directive 2004/108/EC. In the case of electromagnetic radiation in the frequency range from 750 MHz ± 20 MHz, increased measuring errors can occur with small measuring ranges
Electrical safety	In accordance with EN 61010-1
Internal line fuses	
• primary	6.3 A, not replaceable
• secondary	8 A
Gas inlet conditions	
Permissible sample gas pressure	Relative to ambient/atmospheric air pressure: -200 ... +300 hPa (-0.2 ... +0.3 bar)
Sample gas flow	20 ... 120 l/h (333 ... 2 000 ml/min)
Sample gas temperature	5 ... 55 °C
Measuring response	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 measuring span
Zero point drift	
• Standard measuring ranges	< ± 1%/week of respective measuring span

Technical specifications (Continued)

SIPROCESS UV600	
• Small measuring ranges (≤ 2x smallest measuring range)	< ± 2%/week of respective measuring span
• Measured components NO, NO_2, SO_2	< ±1%/day of respective measuring span
Reproducibility	< ± 1% of respective measuring span
Linearity error	< ± 1% of respective measuring span
Electrical inputs and outputs	
Analog output	4, 0 ... 24 mA; floating (electrically isolated), residual ripple 0.02 mA, resolution 0.1% (20 µA), max. load 500 Ω, max. voltage ± 50 V
Relay outputs	8, with changeover contacts, max. voltage ± 50 V load rating: Max. 30 V AC / max. 48 V DC / max. 500 mA
Analog inputs	2, 0 ... 20 mA, reference potential GND, max. signal strength 30 mA, max. overcurrent protection ±1 A, max. voltage ± 50 V
Digital inputs	8, switching range 14 ... 42 V (external control voltage), max. voltage ± 50 V
Serial interface	RS 485, Ethernet (LAN)

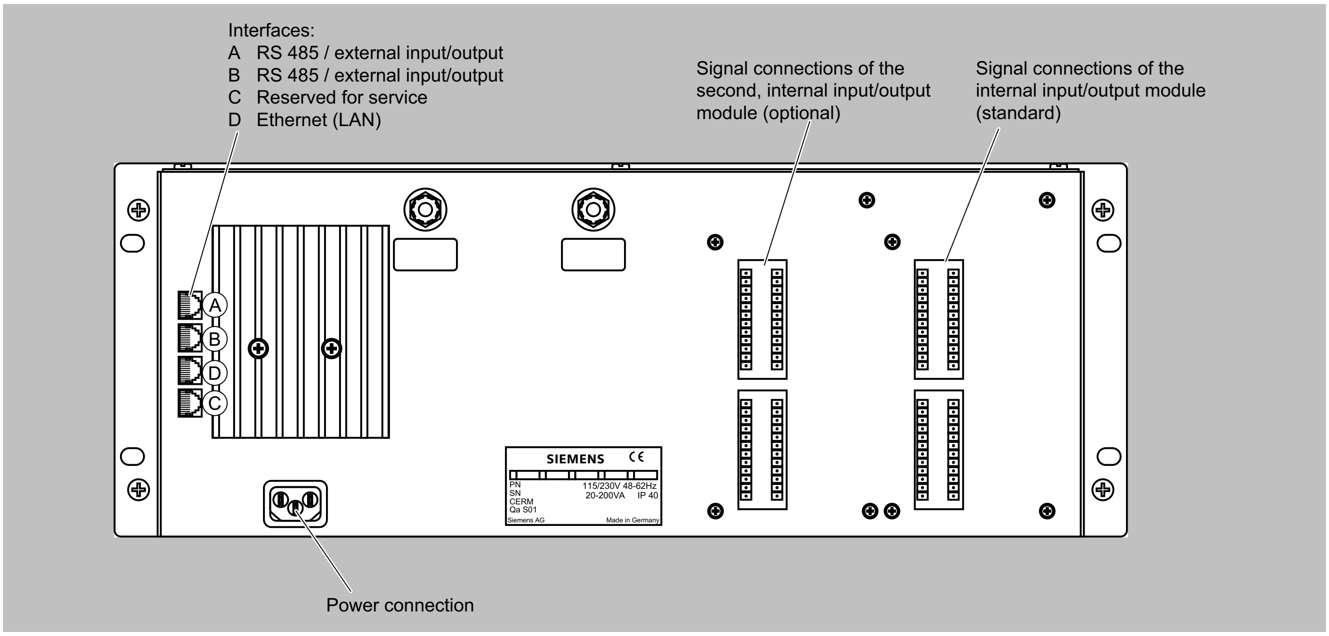
[1] Only with daily recalibration and air-conditioned environment (+/- 2 °C)

Dimensional drawings

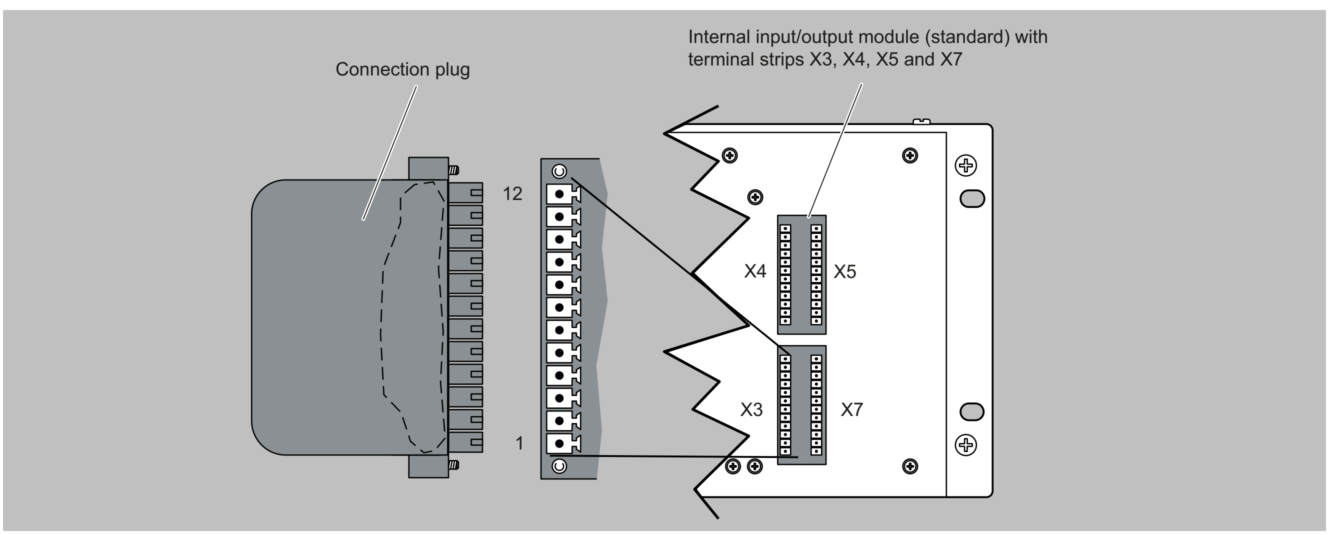


SIPROCESS UV600, 19" rack unit, dimensions in mm

Circuit diagrams

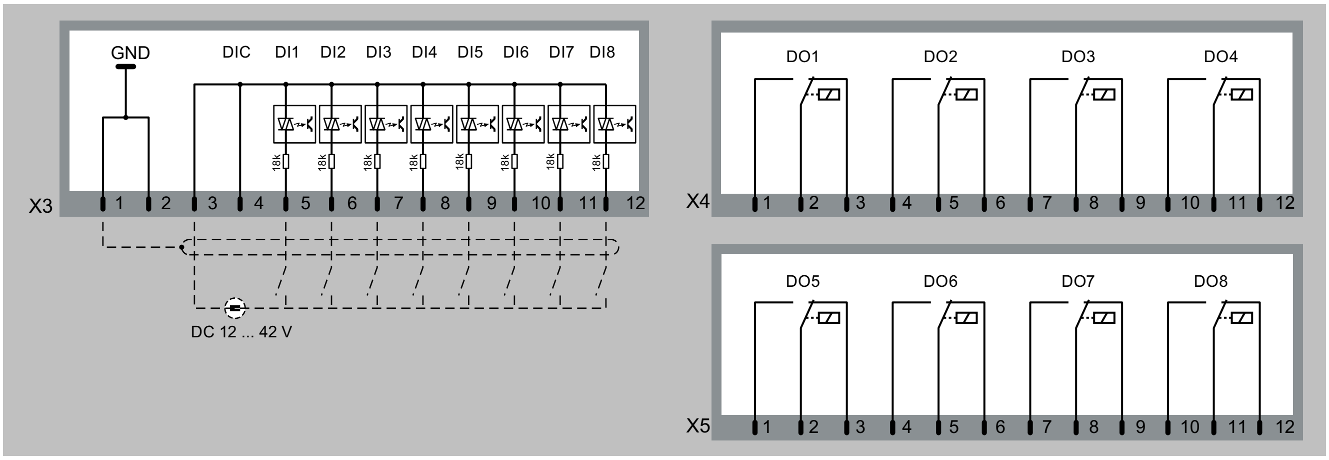


SIPROCESS UV600, gas connections and electrical connections

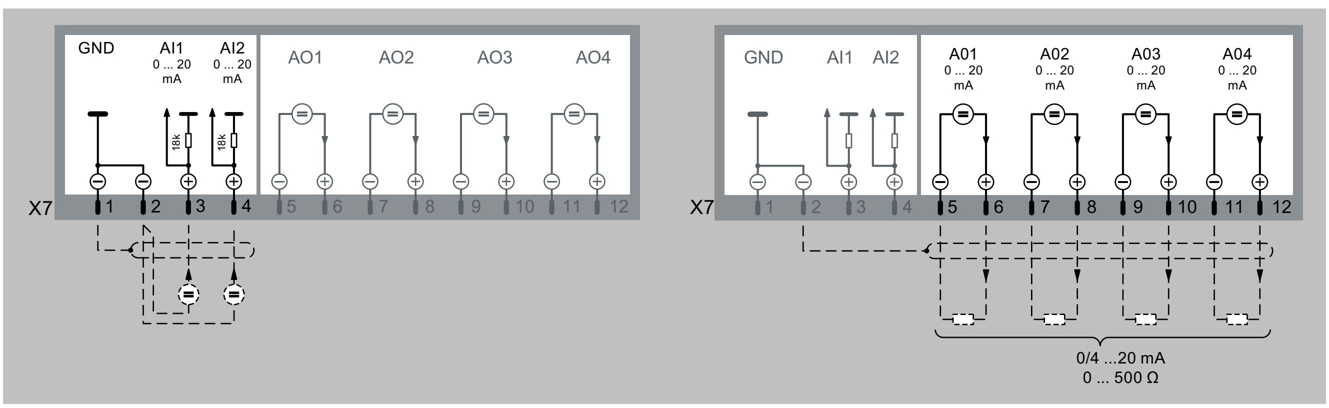


SIPROCESS UV600, signal connections and plug connectors

Circuit diagrams (Continued)

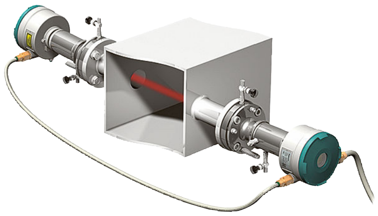


SIPROCESS UV600, pin assignments of digital inputs X3 (DI1 to DI8) and digital outputs X4 (DO1 to DO4) and X5 (DO5 to DO8)



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

2



2/2	**Introduction**
2/3	**SITRANS SL (in-situ O2 gas analyzer)**
2/21	**LDS 6**
2/30	19" central unit
2/40	Optics enclosure CD 6
2/51	Suggestion 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 optics enclosures (which are also optionally available in an intrinsically safe version for operation in hazardous zones) 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 detector 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 devices is possible using the Ethernet interface present as standard.

The list of gas components measurable using NIR diode laser technology already comprises:

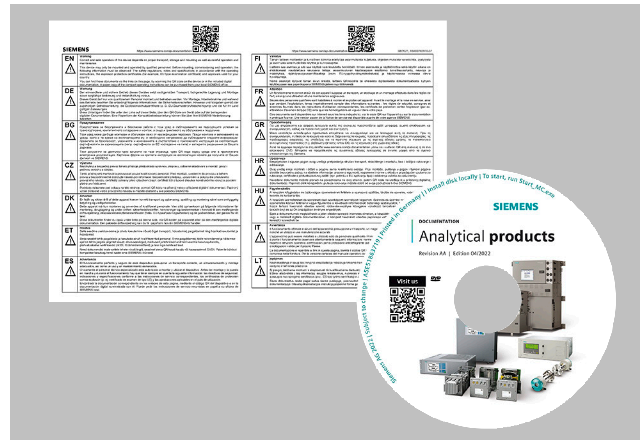
- For the LDS 6 analyzer:
  - NH_3, HCl, HF, H_2O, CO, CO_2
  - More gas components on request
- For the SITRANS SL analyzer:
  - O_2

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.

More information

Supplied product documentation on DVD and safety notes



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

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

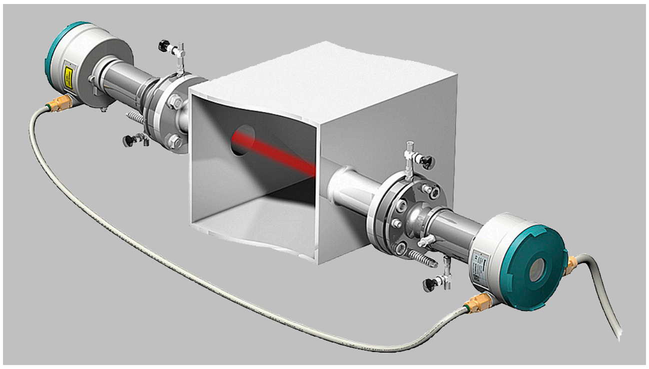
Download catalogs

The entire documentation is available for download free of charge in various languages at:
http://www.siemens.com/processanalytics/documentation

Certificates

All available certificates are listed on the internet at:
http://www.siemens.com/processanalytics/certificate

Overview



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 detector 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 strongly varying gas compositions
- Under harsh ambient conditions at the measuring point
- Highly selective, i.e. mostly without cross-sensitivities

Special features of the SITRANS SL:

- Low installation workload
- Minimum maintenance requirements
- Extremely rugged design
- High long-term stability through built-in, maintenance-free reference gas cell
- Real-time measurements

Moreover, the device provides warning and error messages in the following situations:

- When maintenance is required
  - With large variations in the reference signal
  - With poor signal quality
- If the transmission violates a min. or max. value

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

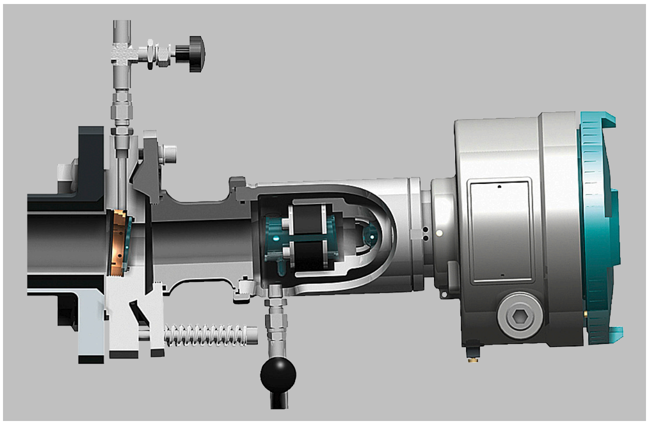
The SITRANS SL gas analyzer consists of a pair of cross-duct sensors, a transmitter unit and a detector unit, both with identical mechanical dimensions. The complete analyzer is integrated in these two enclosures. The transmitter unit contains the laser source whose light is transmitted to the detector through the measurement path. The detector unit contains a photodetector including detector electronics as well as a reference cell. The detector unit is connected to the transmitter unit by means of a sensor connecting cable. A further connecting cable on the detector is used to connect the power supply and the communications interfaces. The detector enclosure contains a local user interface (LUI) with an LC display which can be read through a window in the enclosure cover. The local user interface 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 connecting cable
- Powder-coated aluminum; stainless steel
- Type of protection IP65
- Adjustable process connection plates
- Flange sizes (provided by customer): DN50/PN25, DN50/PN40, 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
  - 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

Design (Continued)



SITRANS SL, detector unit

Parts in contact with the process gas

Only the stainless steel flange of the sensor with borosilicate window and FFKM gasket comes in contact with the process gas. This has optional purging gas connections for purging the process gas side with an appropriate gaseous medium.

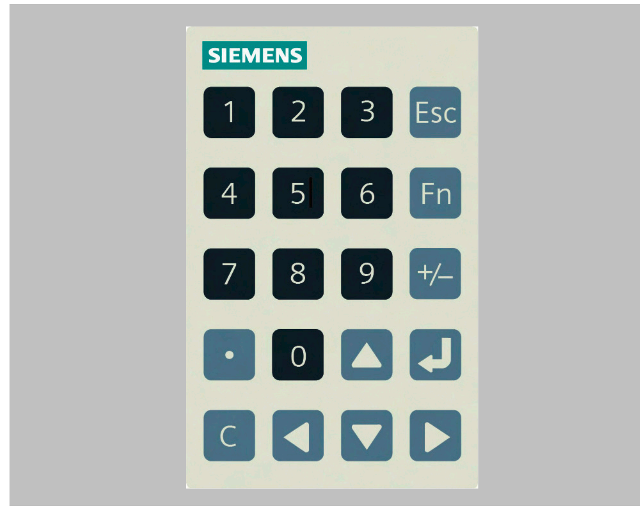
Display and operator panel

Special features of the detector unit:

- Display for simultaneous output of measurement result and device status
- LED backlighting of display
- Remote control with infrared interface for simplified parameterization and operation for safe implementation in hazardous zones
- Menu-driven operation for parameterization and diagnostics

Local user interface (LUI) of SITRANS SL in the detector unit (display of measured value)

Design (Continued)



Remote control keypad for SITRANS SL

Connection cables

SITRANS SL is supplied as standard without connection 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 connecting cable connects the transmitter and detector units of the analyzer.
The sensor connecting cable is offered as a cable set for the ATEX version as standard, and for non-Ex applications as an option, in lengths of 5, 10 and 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 junction boxes secured on the transmitter and detector 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 errors, maintenance required, function monitoring, alarms for upper 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

Design (Continued)

The PROFIBUS DP protocol provides DPV0, cyclic data. Measured values are provided with additional quality data.

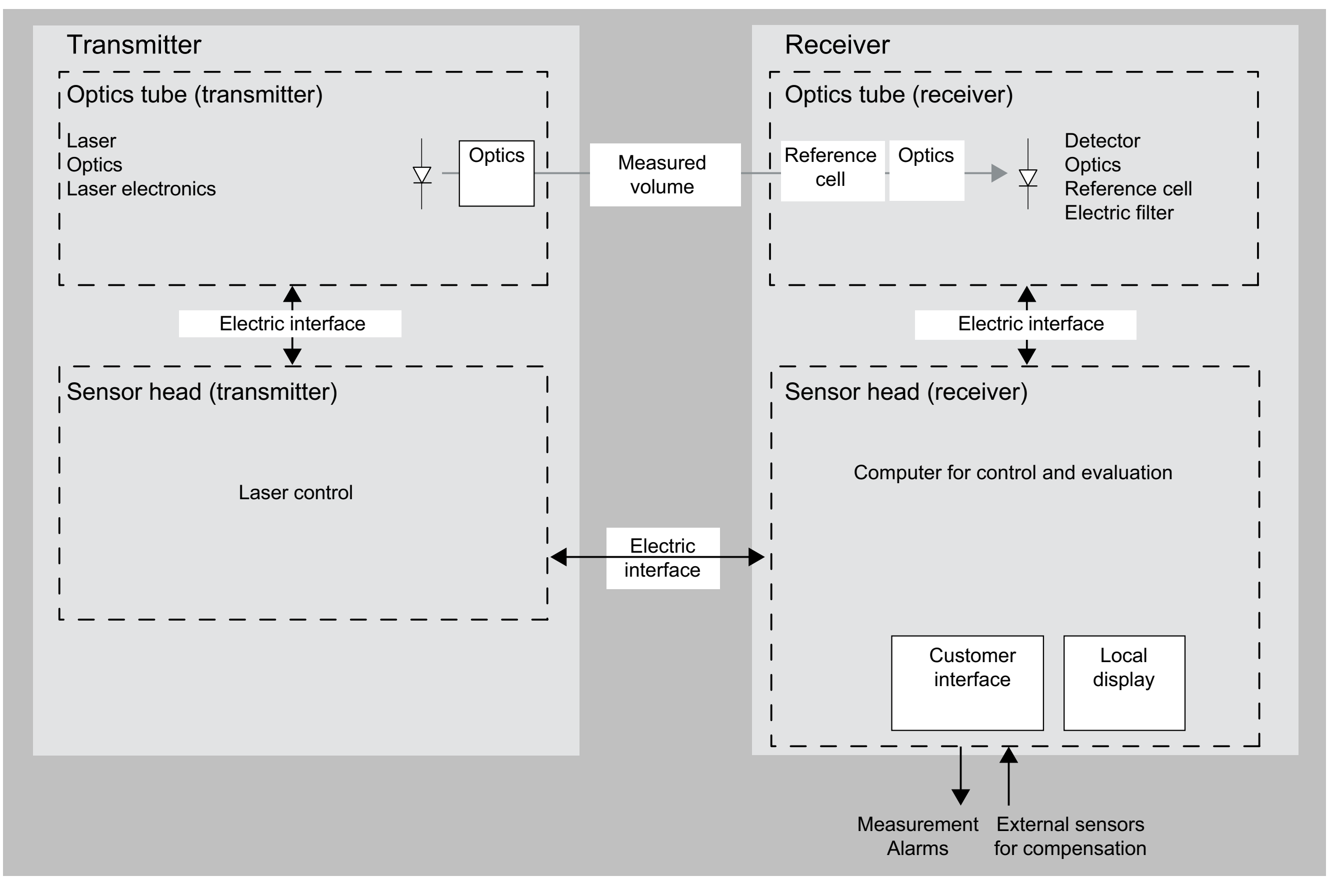
Note:
In contrast to the other interfaces, the Ethernet plug-in connector on standard non-Ex devices is only accessible following removal of the enclosure cover of the detector unit. With the help of the sensor cable set (optional with non-Ex devices), an Ethernet cable can be permanently installed via the junction box of the sensor connecting cable. The Ethernet connection via the sensor connecting cable can also only be used for temporary service and maintenance purposes.

CAUTION:
In an Ex environment, Ethernet connections may only be made or removed with the permission of the plant operator!

Function

Operating principle

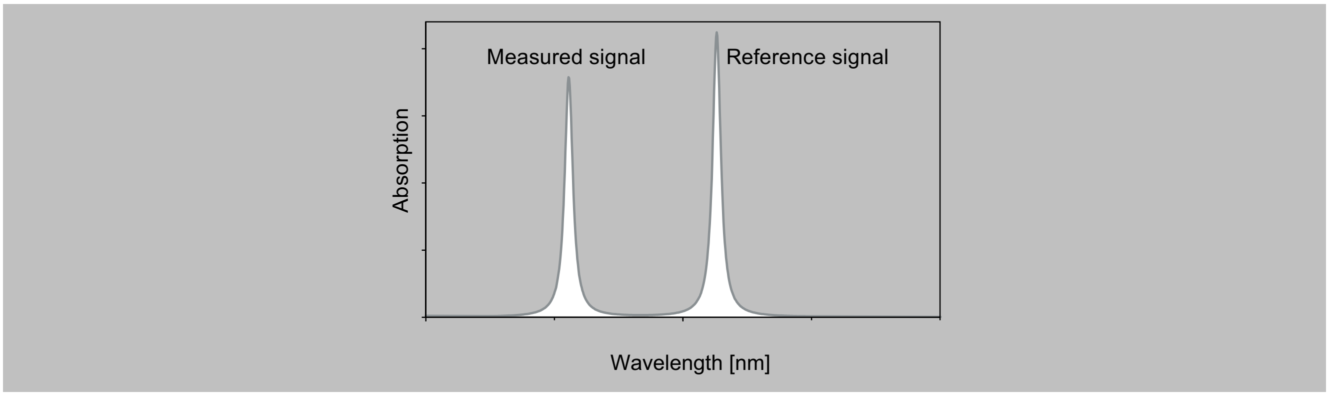
SITRANS SL is a gas analyzer employing single-line molecular absorption spectroscopy. A diode laser emits a beam of infrared light which passes through the process gas and is received by a detector unit. The wavelength of the laser diode output is tuned to a gas-specific absorption line. The laser continuously 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

The field device 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 measured in the detector unit. 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.

Function (Continued)



Absorption spectrum of measured signal and reference signal with SITRANS SL

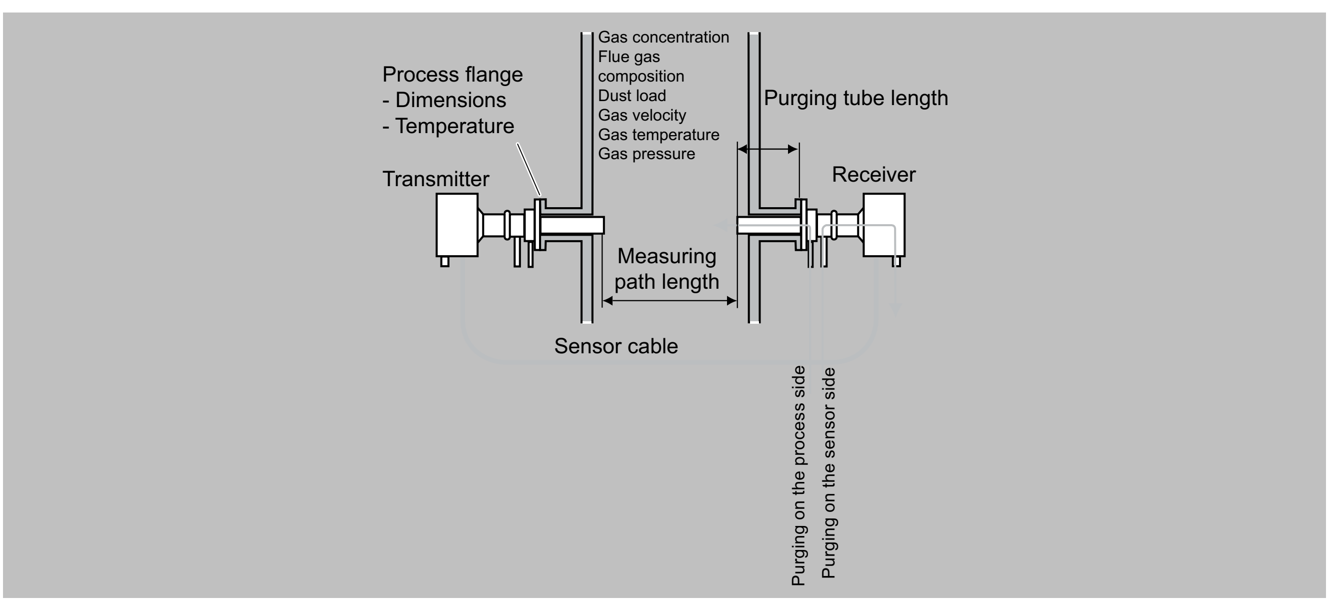
SITRANS SL is designed for measuring oxygen (O_2) with high sensitivity.

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, for example, 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 re-calibration 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 SITRANS SL product page on the internet:
http://www.siemens.com/insituquestionnaire



Typical cross-duct arrangement of the SITRANS SL

Function (Continued)

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/Nm³ 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 damping increases exponentially at longer path lengths. Smaller particles also have a very large influence on the optical damping. With high dust load, long path length and small particle size, the technical support at Siemens should be consulted.

Temperature

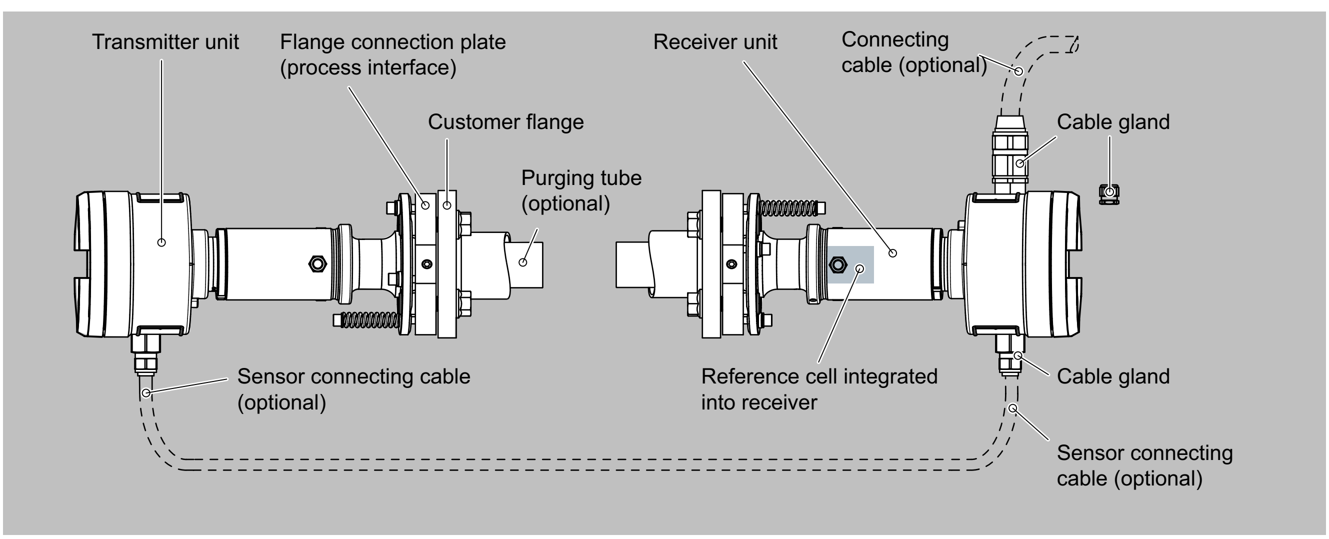
The influence of temperature on the absorption line is compensated by a correction file. A temperature signal can be fed into the device from an external temperature sensor. The signal is then used for mathematical correction of the influence of the temperature on the concentration strength. If the process 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 device to provide complete mathematical compensation for the pressure influence including the density effect. Without compensation, the relative measuring error caused by changes in the process gas pressure is approx. 0.1%/hPa. An external pressure signal is therefore recommended in most cases.

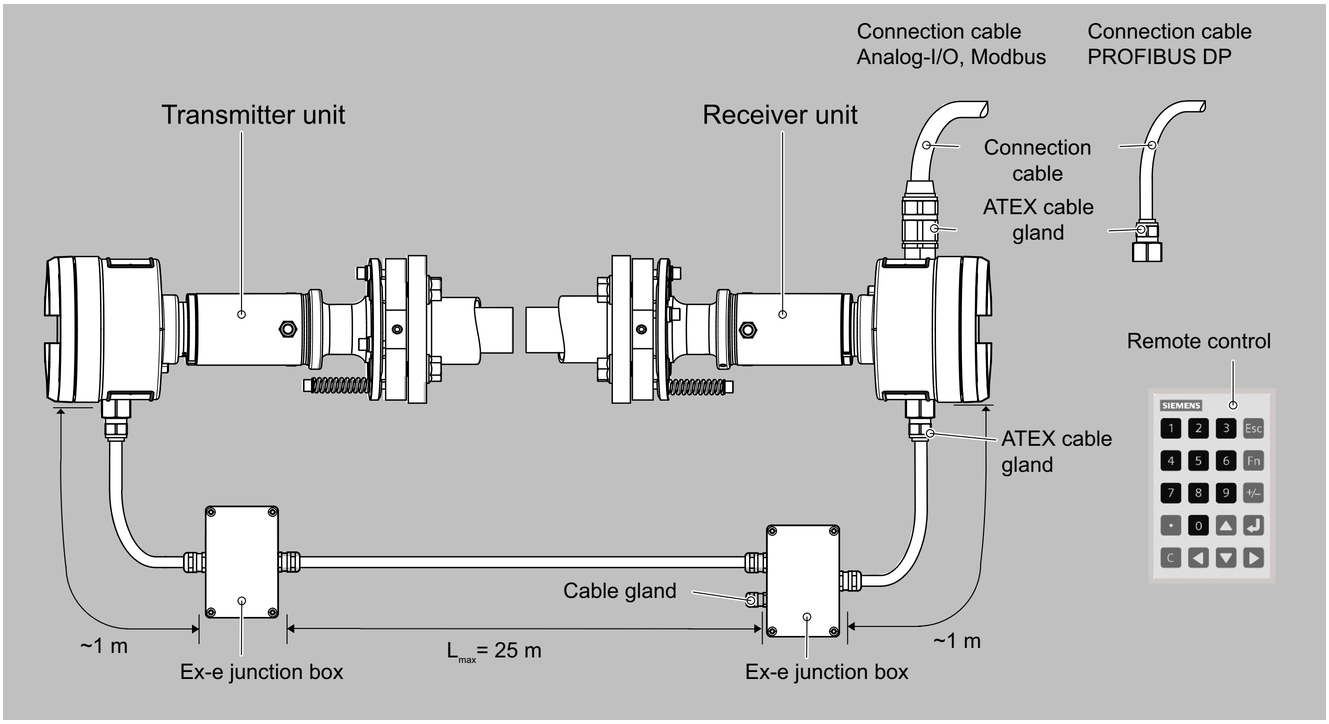
Effective optical path length

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 have to be purged to keep them clean for a longer period, the expansion 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.

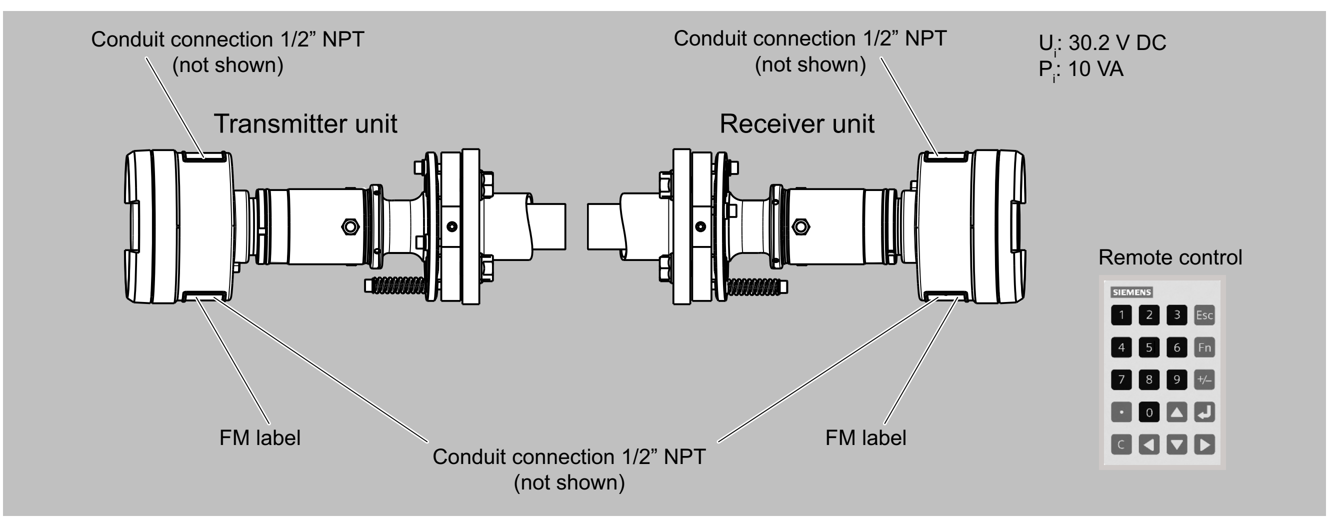


Design of the SITRANS SL system in non-Ex version

Function (Continued)



Design of the SITRANS SL system in ATEX version



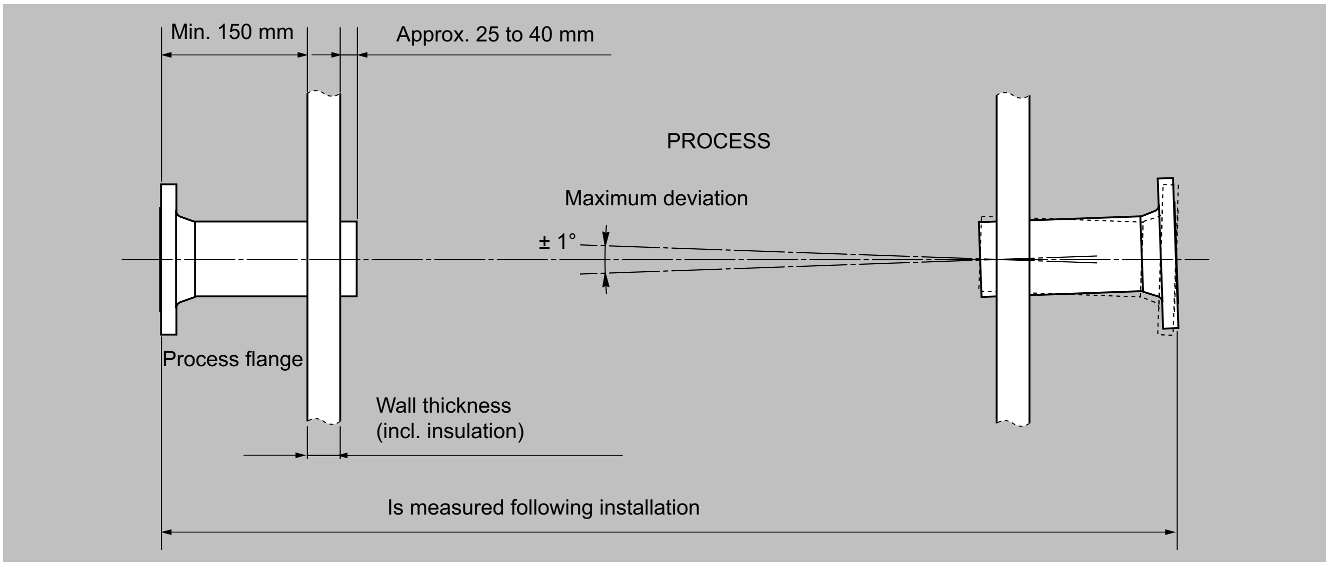
Design of the SITRANS SL system in FM version

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 photo detector in the detector unit This is ensured by the transmitter and detector units having 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.

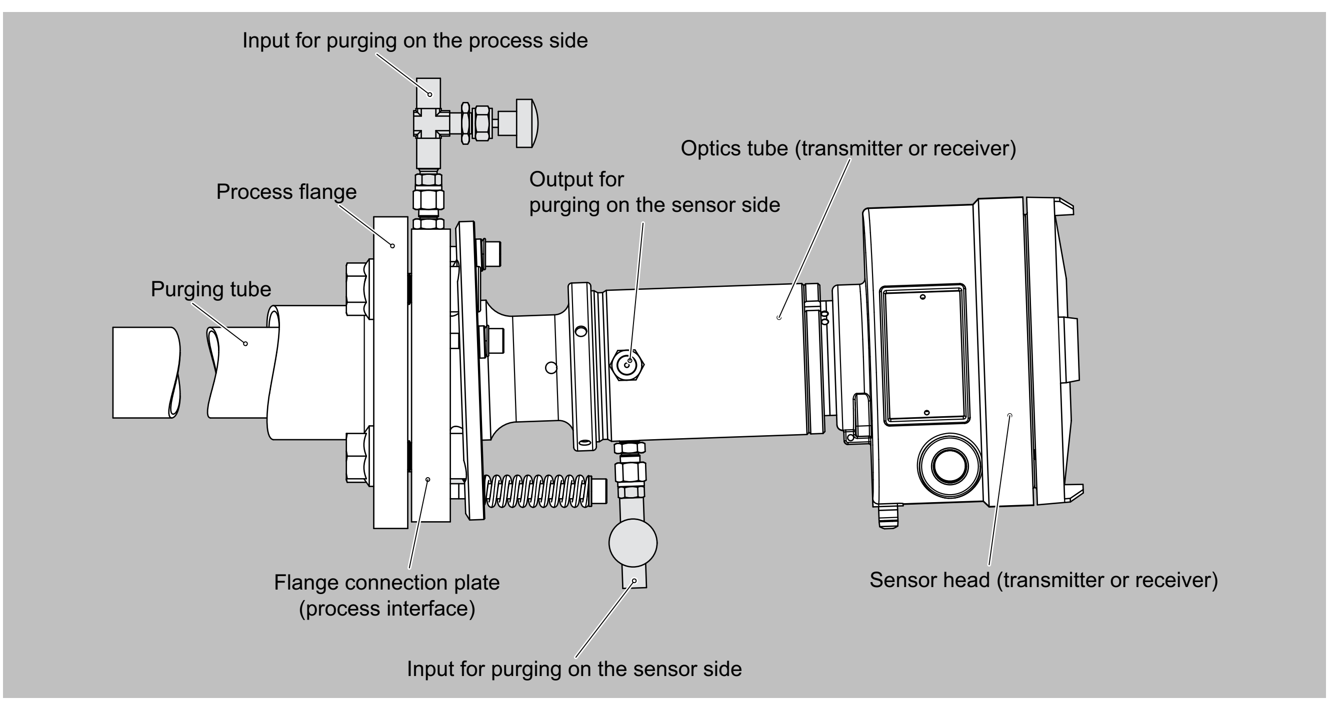
Function (Continued)



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 stress of the windows and the gasket material as well as the sensor electronics is to purge them with a purging gas (with O_2 application: nitrogen). 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 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

Function (Continued)

Purging on process side

For purging on the process side, the purging gas flow can be adjusted between 0 and approx. 50 l/min at each sensor head using a needle valve (included in scope of delivery).

Purging on sensor side

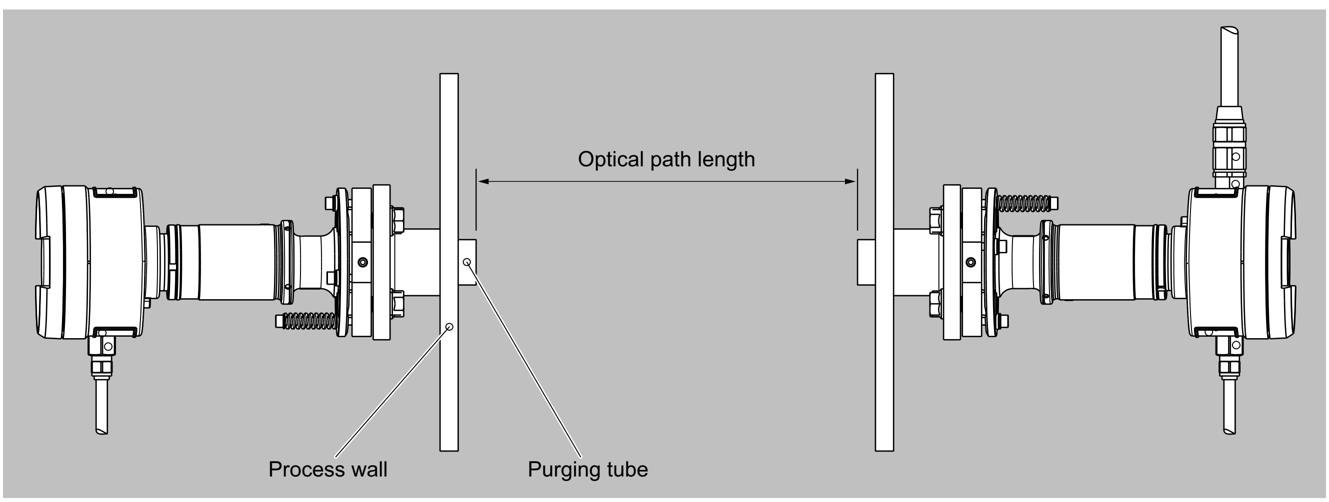
This can be combined with the purging on the process side, if required. Purging with nitrogen on the sensor side is almost always necessary for O_2 applications to avoid an offset caused by the oxygen of the air present in the device. The cells in the sensor head are then continuously purged with nitrogen. Particularly when (re)starting the SITRANS SL O_2, a sufficiently high flow of sensor 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 scope of delivery).

Note

No process gas may flow into the purging gas line!
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 a danger that corrosive process gases could enter the sensor enclosure, for example.

Purging tubes

The purging media used on the process side flow through purging tubes into the process gas stream. The pipes 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 detector, 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 required 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:

- Error (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 error status)

In addition, the transmission is available as an output variable.

Function (Continued)

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 signal 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 parameters 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 (e.g. dust load).

Standard application Effective optical path length: 0.3 ... 8 m Dust load[2]: < 50 g/Nm³			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 below)
Sample gas component	Gas code	Appl. code				
O_2	A	B	0 ... 600 °C	900 ... 1 100 hPa	0 ... 1 vol%	0 ... 100 vol%
O_2	A	C	0 ... 200 °C	700 ... 5 000 hPa	0 ... 1 vol%	0 ... 100 vol%

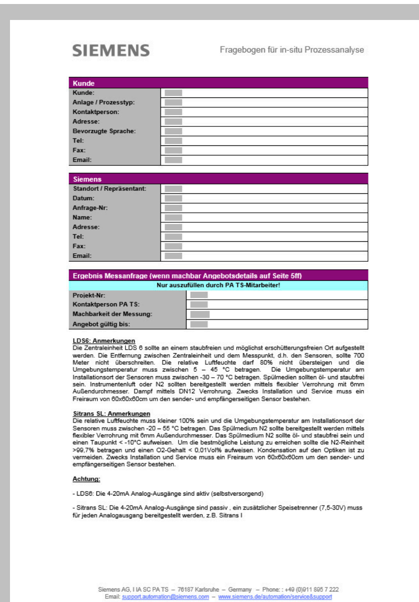
Standard application Effective optical path length: 0.3 ... 8 m Dust load[2]: < 50 g/Nm³			Max. measuring range x path length	DL x path length (under standard conditions[1] without cross-interference of other gases)	Repeatability[3]	Purging gas medium
Sample gas component	Gas code	Appl. code				
O_2	A	B	75 vol%*m	200 ppmv*m	2% [4]	N_2
O_2	A	C	75 vol%*m	200 ppmv*m	2% [4]	N_2

Reference table: Standard applications. The specified pressures are absolute.
DL = detection limit
[1] The specification provided 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/m³
The influence of dust load is extremely complex and depends on the path length and particle size. The optical damping increases exponentially at longer path lengths. Smaller particles also have a very large influence on the optical damping. 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.
[4] 2% of measured value or DL (whichever is greater)

Function (Continued)

Special applications

In addition to the standard applications, special applications are available on 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

Kunde	
Kunde:	
Anlage / Prozesstyp:	
Kontaktperson:	
Adresse:	
Bevorzugte Sprache:	
Tel:	
Fax:	
Email:	

Siemens	
Standort / Repräsentant:	
Datum:	
Anfrage-Nr:	
Name:	
Adresse:	
Tel:	
Fax:	
Email:	

Ergebnis Messanfrage (wenn machbar Angebotsdetails auf Seite 5ff)	
Nur auszufüllen durch PA TS-Mitarbeiter!	
Projekt-Nr:	
Kontaktperson PA TS:	
Machbarkeit der Messung:	
Angebot gültig bis:	

LDS6: Anmerkungen
Die Zentraleinheit LDS 6 sollte an einem staubfreien und möglichst erschütterungsfreien Ort aufgestellt werden. Die Entfernung zwischen Zentraleinheit und dem Messpunkt, d.h. den Sensoren, sollte 700 Meter nicht überschreiten. Die relative Luftfeuchte darf 80% nicht übersteigen und die Umgebungstemperatur muss zwischen 5 – 45 °C betragen. Die Umgebungstemperatur am Installationsort der Sensoren muss zwischen -30 – 70 °C betragen. Spülmedien sollten öl- und staubfrei sein. Instrumentenluft oder N2 sollten bereitgestellt werden mittels flexibler Verrohrung mit 6mm Außendurchmesser. Dampf mittels DN12 Verrohrung. Zwecks Installation und Service muss ein Freiraum von 60x60x60cm um den sender- und empfängerseitigen Sensor bestehen.

Sitrans SL: Anmerkungen
Die relative Luftfeuchte muss kleiner 100% sein und die Umgebungstemperatur am Installationsort der Sensoren muss zwischen -20 – 55 °C betragen. Das Spülmedium N2 sollte bereitgestellt werden mittels flexibler Verrohrung mit 6mm Außendurchmesser. Das Spülmedium N2 sollte öl- und staubfrei sein und einen Taupunkt < -10°C aufweisen. Um die bestmögliche Leistung zu erreichen sollte die N2-Reinheit >99,7% betragen und einen O2-Gehalt < 0,01Vol% aufweisen. Kondensation auf den Optiken ist zu vermeiden. Zwecks Installation und Service muss ein Freiraum von 60x60x60cm um den sender- und empfängerseitigen Sensor bestehen.

Achtung:

- LDS6: Die 4-20mA Analog-Ausgänge sind aktiv (selbstversorgend)

- Sitrans SL: Die 4-20mA Analog-Ausgänge sind passiv , ein zusätzlicher Speisetrenner (7,5-30V) muss für jeden Analogausgang bereitgestellt werden, z.B. Sitrans I

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Email: support.automation@siemens.com – www.siemens.de/automation/service&support

Selection and ordering data

SITRANS SL in-situ gas analyzer		Article No. 7MB6221-	●	●	●	●	●	-	●	●	●	●
Click on the Article No. for online configuration in the PIA Life Cycle Portal. ***Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".***												
Explosion protection[1)]												
Without			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									
Measured component												
O_2				A								
Application examples[2)]												
Control of combustion processes					B							
Process control, safety monitoring in appropriate plant concepts					C							
Communications 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			

Selection and ordering data (Continued)

SITRANS SL in-situ gas analyzer		Article No. 7MB6221-	●	●	●	●	●	-	●	●	●	●
No purging	3 … 5 l/min								1			
0 … 50 l/min	No purging								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 dimension DN50/PN25, MAWP (PS) at 20 °C: 2.5 MPa										C		
Stainless steel flange (1.4404/316L), connection dimension DN50/PN40, MAWP (PS) at 20 °C: 4.0 MPa										E		
Without process connection										X		
Sensor cable												
With brass bushing												
• 5 m											A	
• 10 m											B	
• 25 m											C	
With stainless steel gland												
• 5 m											D	
• 10 m											E	
• 25 m											F	
Without cable											X	
Language of the operating software (preset)												
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 SITRANS SL laser spectrometer 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.

Options	Order code
Add "-**Z**" to article number and then add order code.	
Settings	
Inspection certificate 3.1 (leak test) in accordance with EN 10204	***C12*** [1]
Inspection certificate 3.1 (material certificate) in accordance with EN 10204	***C13*** [1]
SIL 1 Declaration of Conformity in accordance with standards IEC 61508 / IEC 61511 (for the measured component oxygen in combination with analog interfaces)	***C20*** [1]
Surface free of copper and silicone	***R01***
For temperatures up to 1 500 °C	
• For path lengths from 0.2 … 8 m	***R02***
• For path lengths from 8 … 16 m	***R03***
Special application	***R10 … R39***
Tag plate, customized inscription	***Y30***
Additional label Special application	***Y31***
Hardware change	***Y33***

1) In combination with explosion protection according to FM on request

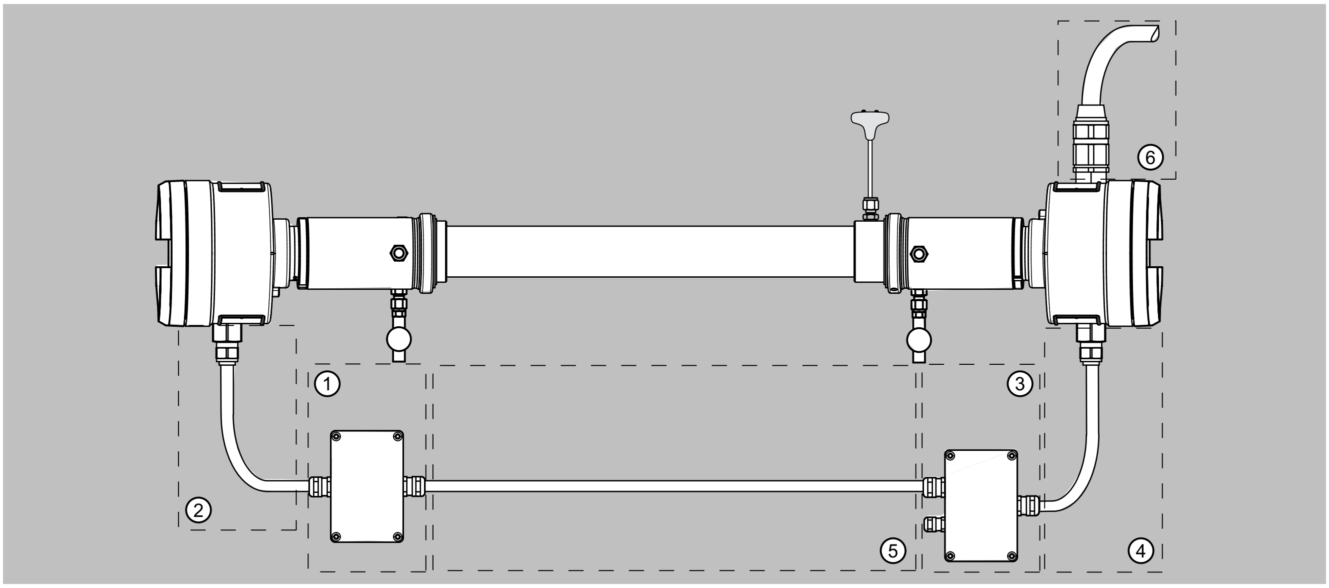
Selection and ordering data (Continued)

Additional units and spare parts	Article No.	Item No. (see graphic below)
Additional units		
SITRANS SL, calibration verification set O_2	A5E01000694	
SITRANS SL, sensor alignment kit	A5E50918922	
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 installation, 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 gasket	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 gasket	A5E01009883	
SITRANS SL, gasket for ANSI 4"/150 lbs	A5E02789535	
SITRANS SL, purging tube 340 mm incl. gasket 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 connecting cable 5 m	A5E02571180	5
SITRANS SL, sensor connecting cable 10 m	A5E02571184	5
SITRANS SL, sensor connecting 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, union nut	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	
SITRANS SL, flashlight with adapter	A5E33259745	

Other accessories

You can find more accessories and spare parts in our PIA Life Cycle Portal product selector: www.pia-portal.automation.siemens.com

Selection and ordering data (Continued)



SITRANS SL replacement parts, item numbers

Technical specifications

In-situ O2 gas analyzer	
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: 2% of measured value or DL (whichever is greater)
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 in contact with the process gas	• Purging tubes, flanges, window ring, process purging: Acid-resistant stainless steel (1.4404/316L) • Window: hardened borosilicate glass • 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

Technical specifications (Continued)

In-situ O2 gas analyzer	
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
Dimensions	For each unit (transmitter, detector) • Diameter: 165 mm • Length: 357 mm
Purging tube	• Length: 340 mm • Outer diameter: 48 mm • Inside diameter: 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

Technical specifications (Continued)

In-situ O2 gas analyzer	
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 changeover contacts, configurable, 24 V/0.5 A, floating, single-pole single throw (SPST)
Digital input	1 input, designed for 24 V, floating, configurable
Service port	Ethernet 10BaseT (RJ45)
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 bps, -7 ... 12 V
Connecting cable to customer interface	Not included in standard delivery, permanently installed for ATEX or optional for standard
Analog connecting 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 connecting cable (only supplied cables may be used for ATEX configuration!)	1 × 2 + 4 (PROFIBUS DP hybrid cable)
Modbus connecting cable (only supplied cables may be used for ATEX configuration!)	1 × 2 + 3, with shielding in twisted-pair configuration
Cable length for ATEX configuration	3 m
Cable cross-section	Min. 0.34 mm²
Cable diameter	8 ... 12 mm or 13 ... 18 mm
Minimum bending radius ATEX-PROFIBUS	110 mm
Sensor cable	Not included in standard delivery, permanently installed for ATEX or optional for standard
Sensor cable type configuration	4 × 2, with shielding in twisted-pair configuration
Cable cross-section	Min. 0.34 mm²
Cable jacket	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 detector 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)

Technical specifications (Continued)

In-situ O2 gas analyzer	
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

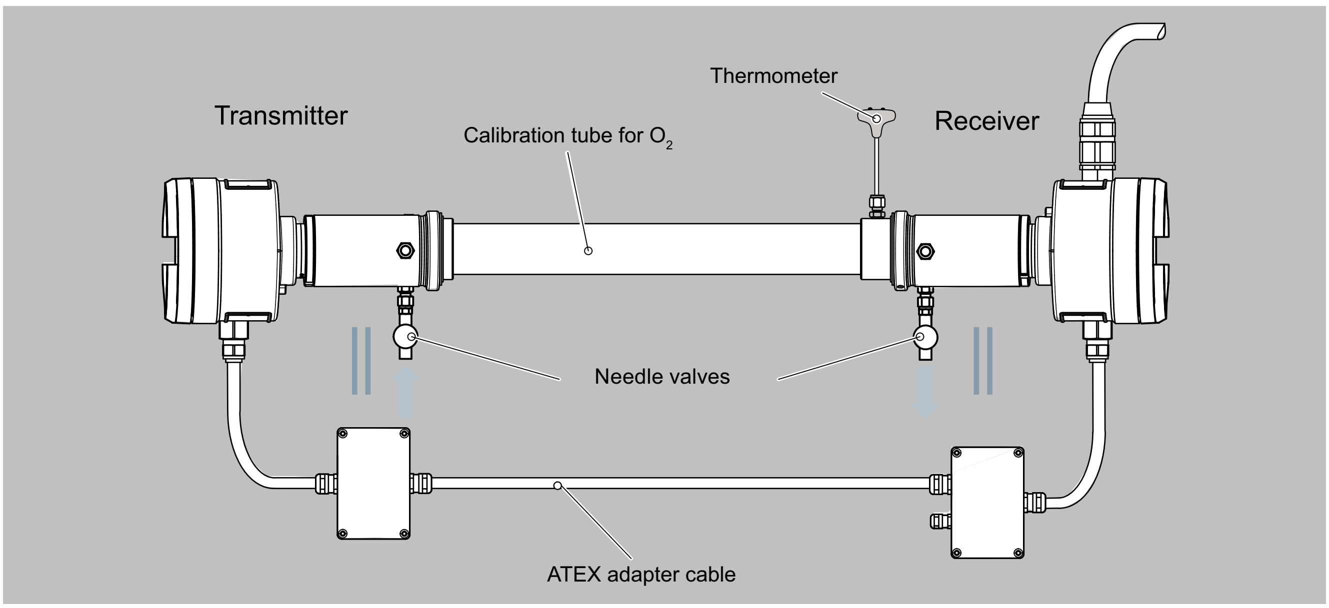
Accessories

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 verification 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 device since the flange connection plates remain mounted on the customer flange. The calibration verification 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 detector. The calibration tube for O_2 can then be filled with air or a calibration gas.

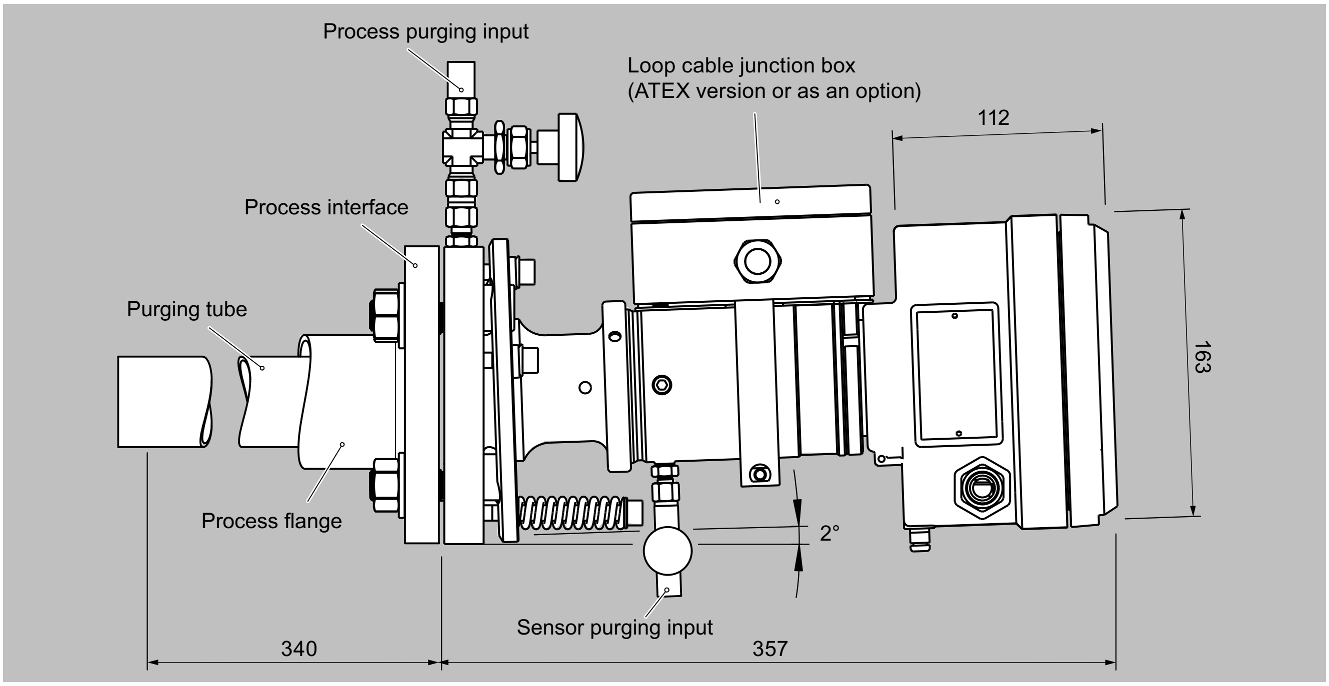


Calibration validation setup of SITRANS SL O_2

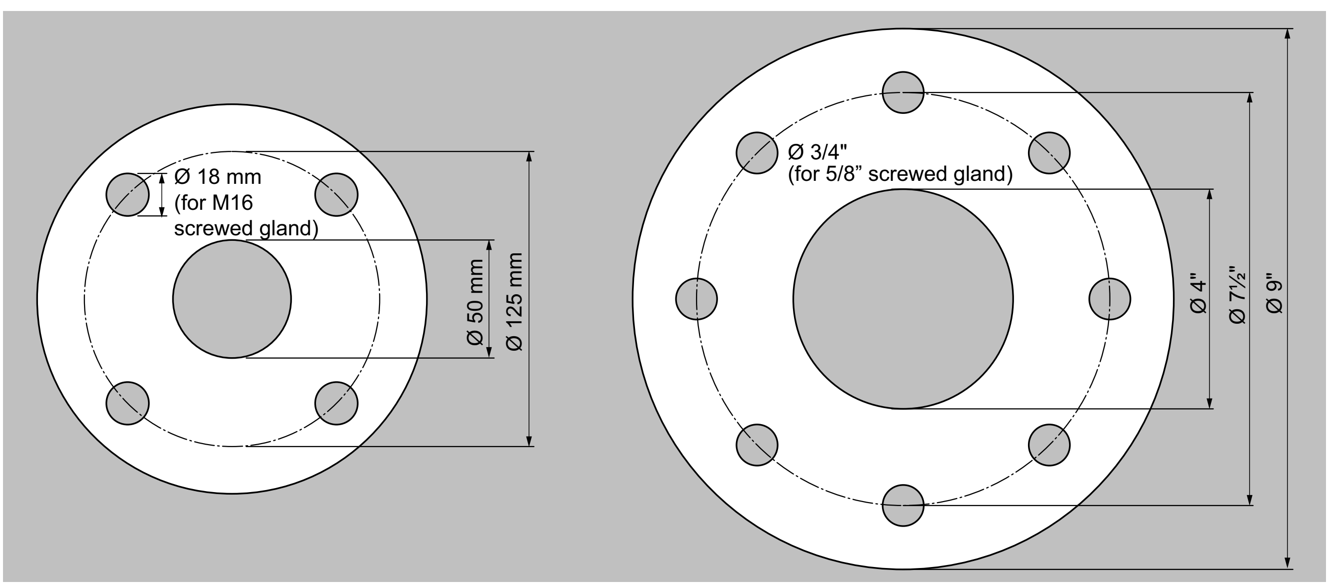
Other accessories

You can find more accessories and spare parts in our PIA Life Cycle Portal product selector: www.pia-portal.automation.siemens.com

Dimensional drawings



SITRANS SL, transmitter/detector unit (same enclosure for DN50/PN25 process interface version), dimensions in mm



Connection dimensions of process flanges provided by customer DN50/PN25 and ANSI 4"/150 lbs

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.

Circuit diagrams

Electrical connections

Non-Ex 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) -7 ... +12 V DC	
14	PROFIBUS B line (RxD/TxD_P - data not inverted)	Modbus D0 (RxD/TxD_P - data not inverted)		
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	
Mass			Grounding	
Mass			Grounding	Shielding

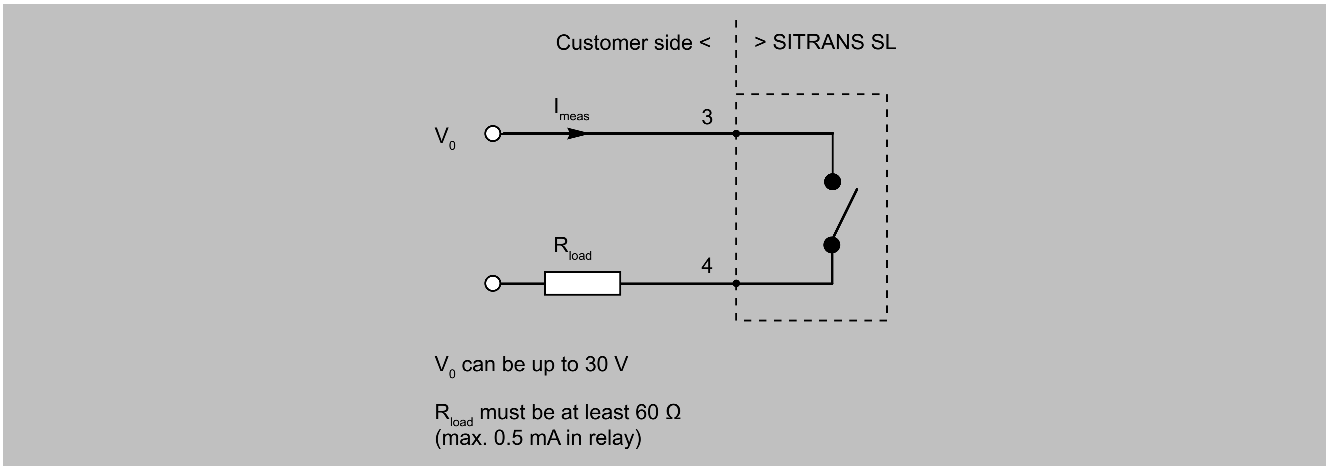
1) Maximum power consumption of SITRANS SL.
2) Maximum input values.
3) Maximum output values.
4) Note: "Normal operation" stands for normal operation of the analyzer. The system is connected to the voltage source and is running without problems; no error message generated or displayed. "Normally under 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 connecting 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 side.

Examples of digital output and analog output

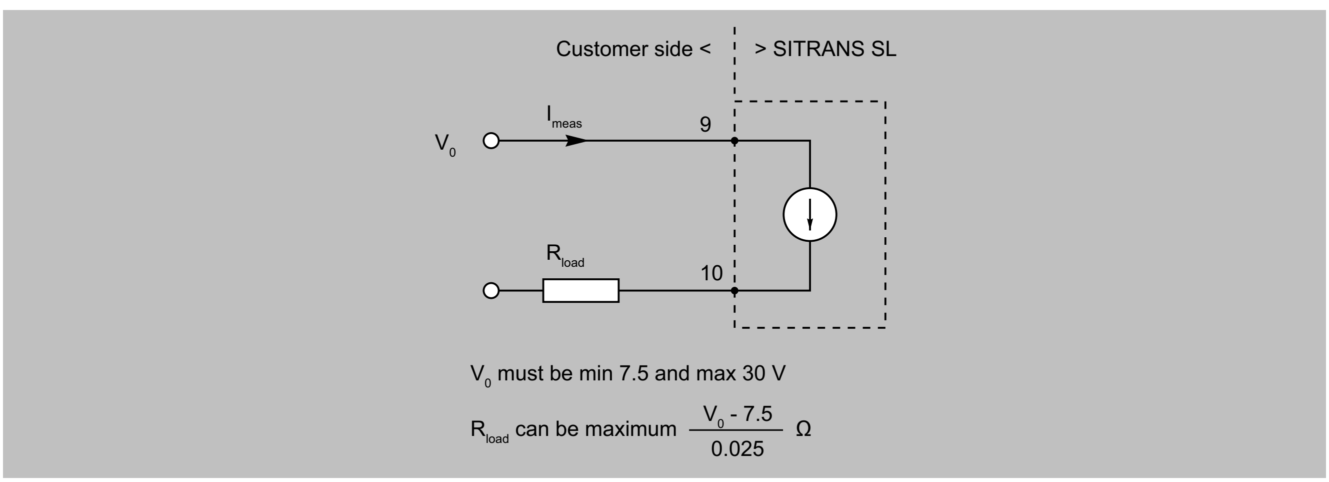
Caution

Please note that an external isolating power supply may be required!

Circuit diagrams (Continued)



Example of digital output 0

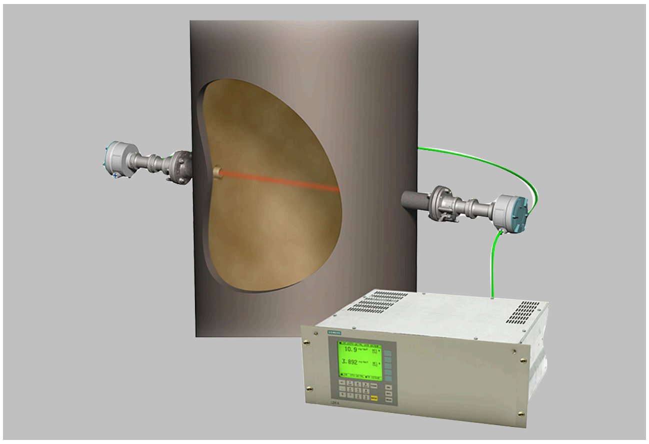


Example of analog output 0

Sensor cable junction box on the detector side (ATEX version)

Terminal strip in junction box		Function	Color code
1	+	24 V DC power 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

Overview



LDS 6, typical installation with central analyzer unit and optics enclosures

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 optics enclosures at the individual measuring points are connected to the central unit via fiber optic cables, so that the distance between the installation site of the central unit and the measuring points can be up to 700 m. The optics enclosures 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. It 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 strongly varying gas compositions
- Under harsh ambient conditions at the measuring point
- Highly selective, i.e. mostly without cross-sensitivities

LDS 6 properties:

- Low installation workload
- 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 device provides warning and error messages in the following situations:

- Maintenance required with
  - Erroneous reference function
  - Bad signal quality
- Violation of a high or low threshold value for the measured variable
- Transmitted amount of light violating a min. or max. value

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 combustion plant
- 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 on 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 applications.

Design

The gas analyzer LDS 6 consists of a central unit and up to three in-situ optics enclosure. The connection between the central unit and the optics enclosures is established by a so-called hybrid cable, which contains fiber-optic cables and copper wires. An additional sensor cable connects the transmitter and receiver parts of the optics enclosure.

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 display is adjustable via the menu
- LED backlight 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

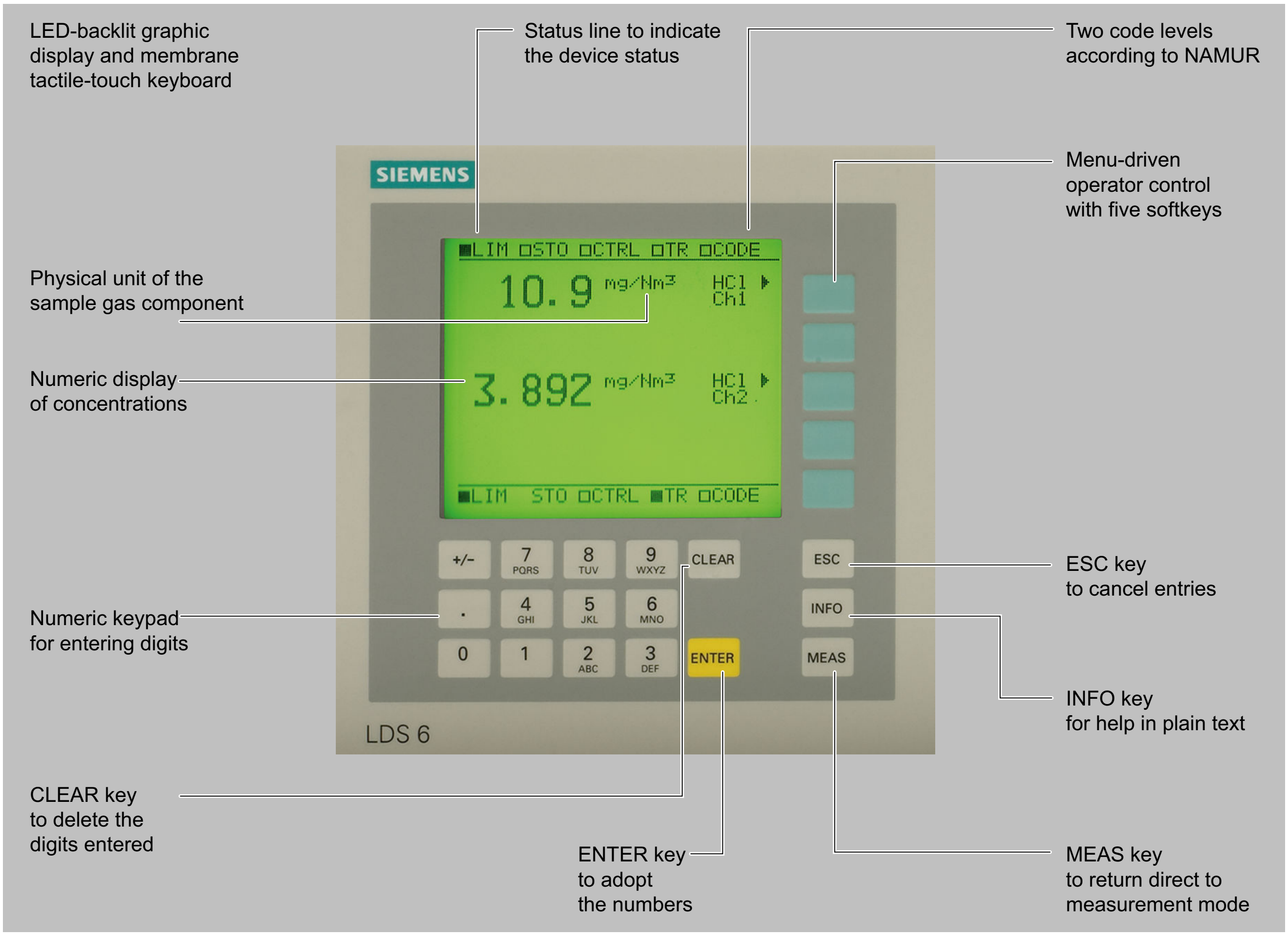
Inputs and outputs

- One to three measurement channels with hybrid cable connections for the optics enclosure 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 demanded from external temperature or pressure transducers or insufficient purging of the optics enclosure.
- 6 freely configurable digital outputs per channel (signaling of errors, maintenance required, function control, transmission limit alarm, concentration limit alarm, store analog output)

Communication

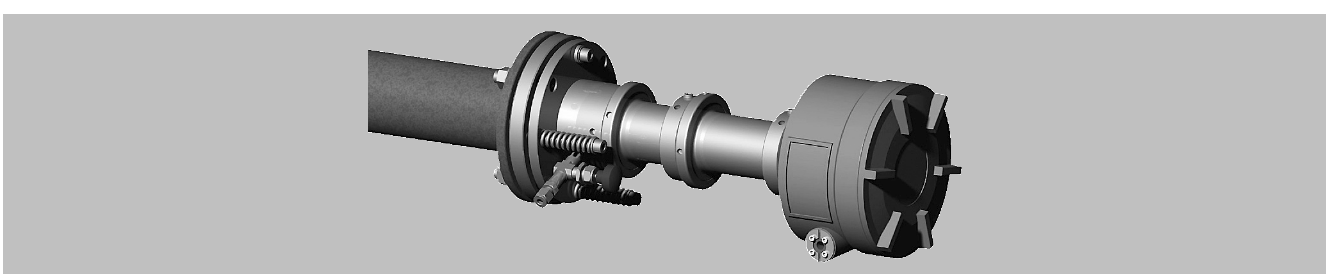
Network connection: Ethernet (T-Base-10) for remote diagnostics and maintenance.

Design (Continued)



LDS 6 central unit, membrane keyboard and graphic display

Optics enclosure



Optics enclosure CD 6, transmitter or detector unit

- In-situ optics enclosure, 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 hazardous zone 0 and hazardous zone 1)
- Stainless steel, some painted aluminum
- Optics enclosure according to IP65 degree of protection
- Adjustable flanges with flange connection
- DN 65/PN 6, ANSI 4"/150 lbs

Design (Continued)

- 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 optics enclosure window
- Optional: Version with explosion protection in accordance with ATEX / IEC Ex ia
- Optics enclosure CD 6 is compliant with the pressure equipment directive

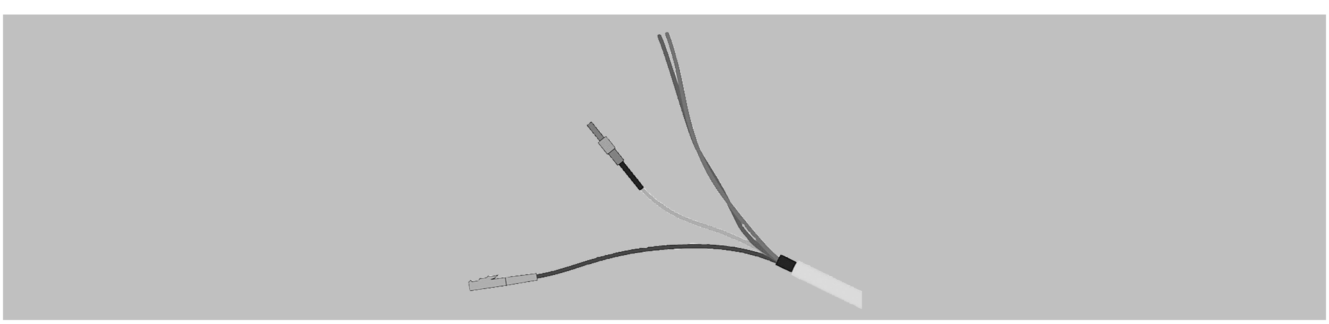
Parts in contact with the process gas

The optics enclosure normally does 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 optics enclosure to the central unit. The hybrid cable connects the central unit with the detector unit of the optics enclosure, the sensor cable connects the transmitter and detector unit of the optics enclosure.
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 devices when used in Zone 0 and Zone 1 (total hybrid and sensor connecting cable length)
  - up to 700 m for Ex devices used in Zone 2 and for non-Ex devices
- 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) power 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 jacket for laying in open cable ducts or ductworks
- Sheath material: oil-resistant polyurethane

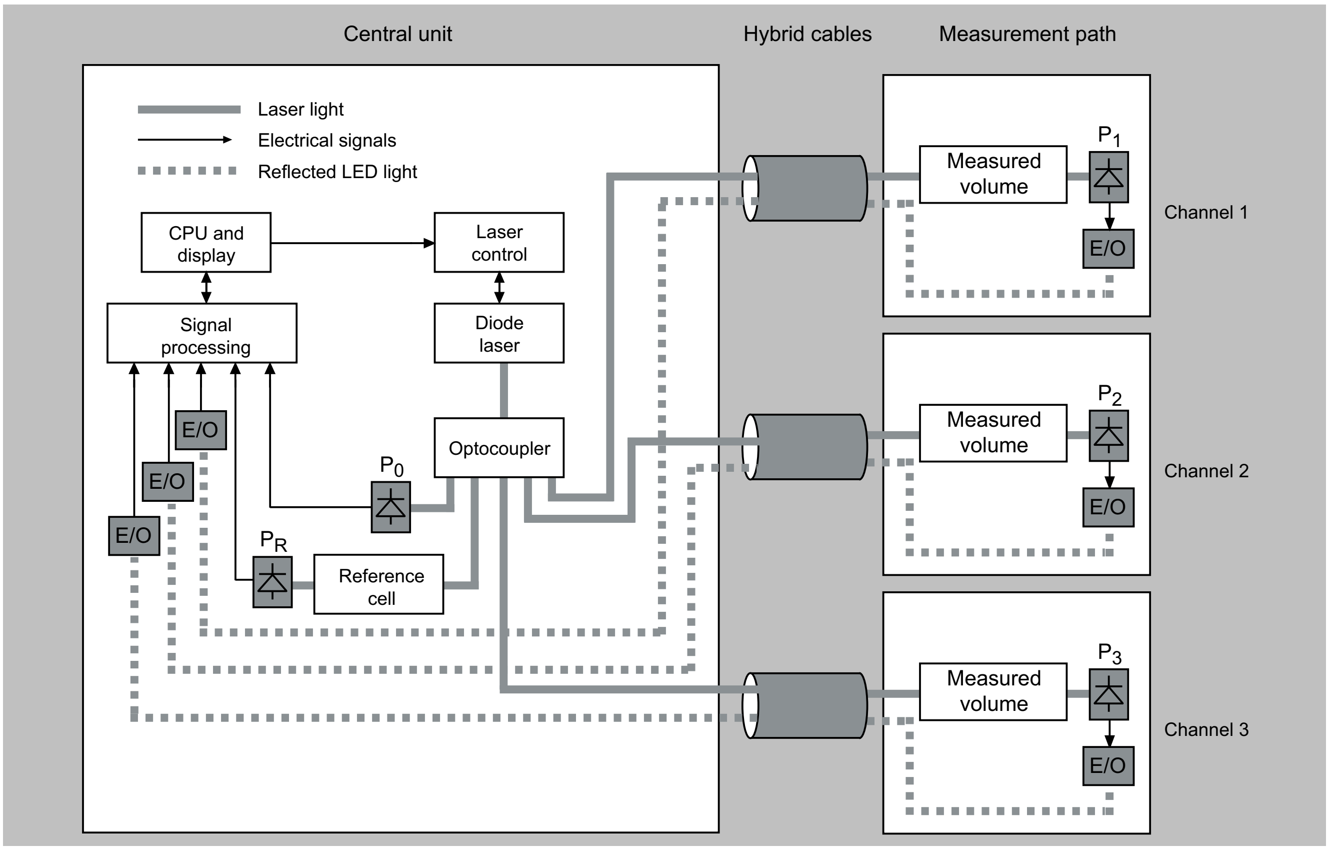


Connections of the hybrid cable

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 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 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.



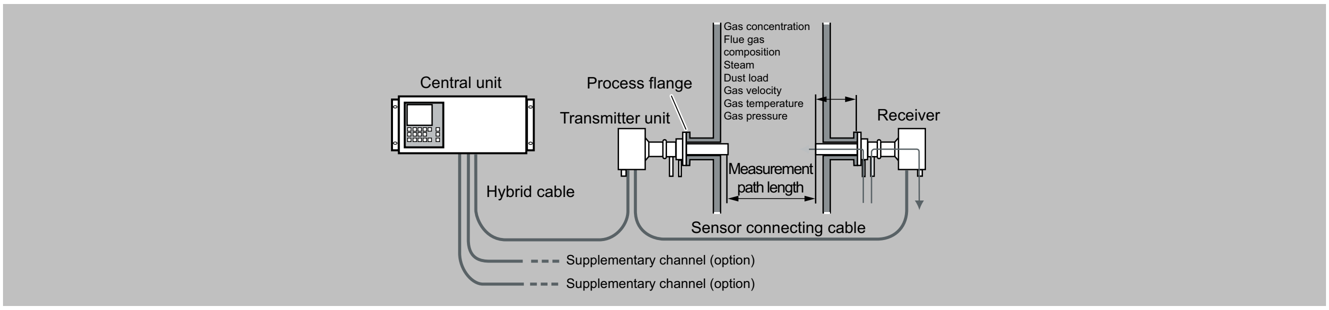
Basic design of the LDS 6

<u>Configuration examples:</u>

A feature of the in-situ analytical procedure is that the physical measurement takes place directly in the process gas stream, 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.

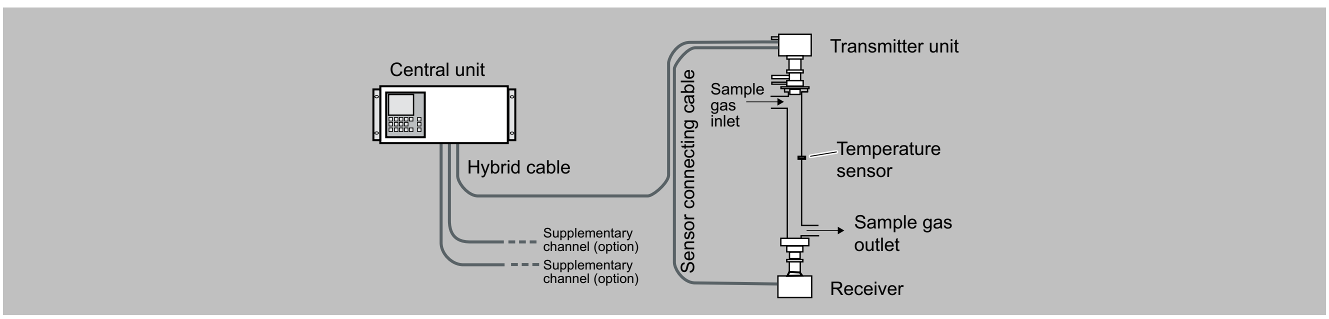
A feature of the standard applications defined in the ordering data of the LDS 6 is that the typical process conditions are well-known, documented, and the guaranteed measuring properties can be proven by reference installations. If you cannot find your application among the standard applications, please 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

Function (Continued)



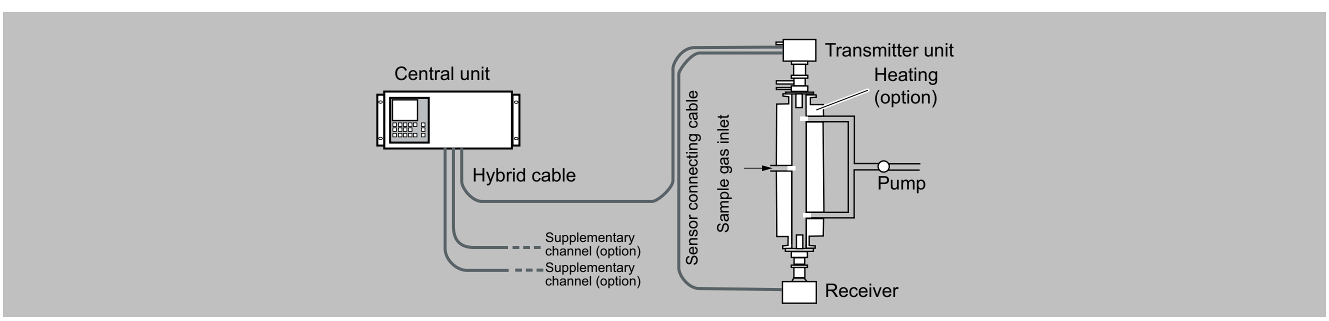
Typical transmitted light setup of LDS 6, in-situ

To avoid contamination of optics on the process side, clean gaseous purging media such as instrument air, N_2 or steam are used. Purging air tubes on the optics enclosures, 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 optics enclosures 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.

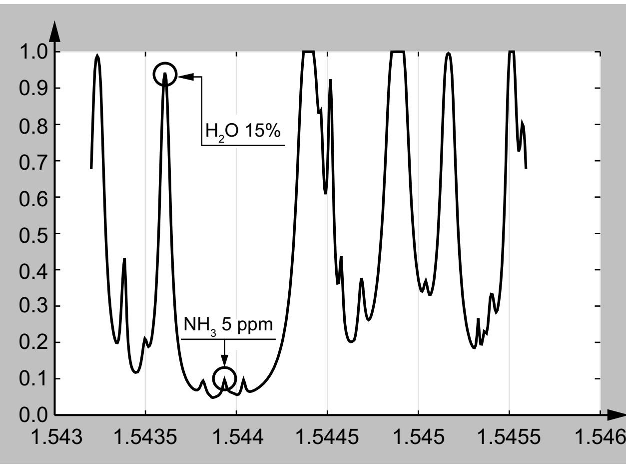


Measuring configuration of LDS 6 with heated flow cell

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 optics enclosure. The optics enclosure consists of a transmitter and a detector. The distance between them defines the measurement path. In the detector, 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)).

Function (Continued)

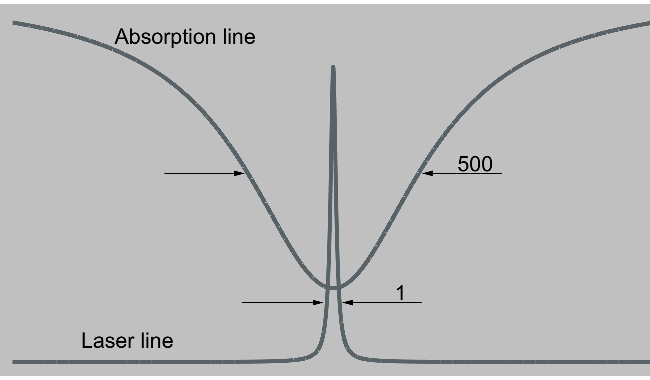


Absorption spectra of water and ammonia

Typical measurable gases for LDS 6 are:

- 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 continuously checked in a reference channel.
In this way, the continuous validity of the calibration is ensured without the need to carry out external re-calibration using bottled calibration gases or reference gas cells.



Typical spectral bandwidth of an absorption line compared to the bandwidth of the laser light.

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 reliably and 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 damping. 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 molecular line is compensated by an adjustment factor. An analog temperature signal can be transferred to the device from an external temperature sensor. This signal is then used to correct the influence of the temperat-

Function (Continued)

ure 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 an adjustment 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 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 ignored.
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 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 optics enclosure sides
- Special materials of purging tubes and/or flanges
- Cooling or heating of the optics enclosure
- Explosion-protected optics enclosure configurations

Essential characteristics

- Integrated calibration adjustment with a built-in reference cell
- Negligible long-term drifts of zero point 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 signal transmission
- Remote preventive maintenance and servicing via Ethernet/modem
- Straightforward replacement of the central unit, since connections can easily be removed
- Optics enclosure and enclosure of central unit free of wear and corrosion
- Easy operation with a numerical keypad and menu prompting

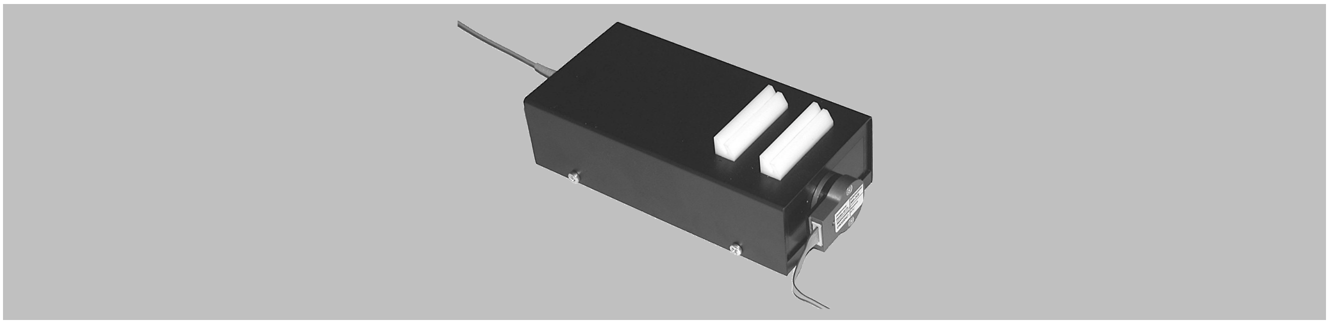
Certified versions for emission monitoring

The LDS 6 is available as certified device for emission monitoring of NH_3, NH_3/H_2O, H_2O, HCl, HCl/H_2O. The certificates are issued by German Technical Inspectorate 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 device 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 to determine the correct kit version for your device. Alternatively, this information can be found in the device manual.

Verification of calibration

Assembly with certified, maintenance-free calibration gas cell with connections for laser fiber-optic conductors and detector module of the optics enclosure. These are used to rapidly verify the factory calibration in the field without compressed gas bottles or flow cell.
Calibration verification kits are available for the following sample gases: O_2, NH_3, CO, CO_2, CO/CO_2.

Function (Continued)



Example of an assembly for verification of calibration

Selection and ordering data

LDS 6 in-situ gas analyzer 19" rack unit for installation in analysis cabinets		Article No. 7MB6121-	●	●	●	0	●	-	0	●	●	●
Click on the Article No. for online configuration in the PIA Life Cycle Portal. ***Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".***												
Explosion protection 1)												
Without, not suitable for connection to Ex optics enclosure			0									
Without, suitable for connection to Ex optics enclosure 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									
Measured component	**Possible with application letter of the respective channel**											
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, D			J								
CO/CO_2	D			K								
CO_2	A			L								
H_2O	A, T			M								
Application letter of measured component channel 1	**Application examples channel 1 2)**											
A	Emission monitoring, non-certified				A							
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, suitable for operation in accordance with regulation 595/2009/EC dated 18 June 2009 (EURO VI)				L							
T	Emission measurement, device design in accordance with QAL1 certification according to EN 14181 and EN 15267. Caution: only in combination with measured component versions C, D, M, E and F (NH_3, NH_3/H_2O, H_2O, HCl, HCl/H_2O).				T							
CD 6 optics enclosure alignment kit												
With							0					
Without							1					
Application letter of measured component channel 2	**Application examples channel 2 2)**											
A	Emission monitoring, non-certified									A		
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, suitable for operation in accordance with regulation 595/2009/EC dated 18 June 2009 (EURO VI)									L		
T	Emission measurement, device design in accordance with QAL1 certification according to EN 14181 and EN 15267. Caution: only in combination with measured component versions C, D, M, E and F (NH_3, NH_3/H_2O, H_2O, HCl, HCl/H_2O).									T		
X	Channel 2 not used									X		
Application letter of measured component channel 3	**Application examples channel 3 1)** External 24 V DC power supply included in the scope of delivery											
A	Emission monitoring, non-certified										A	
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, suitable for operation in accordance with regulation 595/2009/EC dated 18 June 2009 (EURO VI)										L	

Selection and ordering data (Continued)

LDS 6 in-situ gas analyzer 19" rack unit for installation in analysis cabinets		Article No. 7MB6121-	●	●	●	0	●	-	0	●	●	●
T	Emission measurement, device design in accordance with QAL1 certification according to EN 14181 and EN 15267. Caution: only in combination with measured component versions C, D, M, E and F (NH_3, NH_3/H_2O, H_2O, HCl, HCl/H_2O).										T	
X	Channel 3 not used										X	
Language of the operating software (preset)												
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 LDS 6 or the optics enclosure 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 needed, contact Siemens for a special application (refer to "Selection and ordering data" under "SITRANS SL (in-situ O2 gas analyzer)").

Options	Order code
Add "-**Z**" to article number and then add order code.	
Settings	
Telescopic rails (2 units)	***A31***
Set of Torx tools	***A32***
Special applications	***R10 … R39***
Tag plate, customized inscription	***Y30***
Additional label special application	***Y31***
Hardware change	***Y33***

Additional units	Article No.
Optical bandpass filter for reducing infrared background radiation (flame filter)	A5E00534668
External power supply for hybrid cable length > 500 m	A5E00854188
Calibration verification kit NH_3 (Version 2)	A5E01075594
German Technical Inspectorate/MCERT calibration verification kit NH_3 (Version 2), 2 cells	A5E00823339013
German Technical Inspectorate/MCERT calibration verification kit NH_3/H_2O (Version 2), 3 cells	A5E00823339014
German Technical Inspectorate/MCERT calibration verification kit H_2O (Version 2), 2 cells	A5E00823339015
Calibration verification kit for NH_3 (Version 1)	A5E00534675
German Technical Inspectorate/MCERT calibration verification kit NH_3 (Version 1), 2 cells	A5E00823339003
German Technical Inspectorate/MCERT calibration verification kit NH_3/H_2O (Version 1), 3 cells	A5E00823339004

Selection and ordering data (Continued)

Additional units	Article No.
German Technical Inspectorate/MCERT calibration verification kit H_2O (Version 1), 2 cells	**A5E00823339005**
German Technical Inspectorate/MCERTS calibration verification kit HCl, 2 cells	**A5E00823339008**
German Technical Inspectorate/MCERT calibration verification kit HCl/H_2O, 3 cells	**A5E00823339009**
German Technical Inspectorate/MCERT linearity verification kit H_2O (only for HCl/H_2O analyzers), 5 cells	**A5E00823339007**
German Technical Inspectorate/MCERT linearity verification kit H_2O (only for NH_3/H_2O analyzers), (Version 1), 5 cells	**A5E00823339002**
German Technical Inspectorate/MCERT linearity verification kit H_2O (only for NH_3/H_2O analyzers), (Version 2), 5 cells	**A5E00823339012**
German Technical Inspectorate/MCERT linearity verification kit HCl, 5 cells	**A5E00823339006**
German Technical Inspectorate/MCERT linearity verification kit NH_3, (Version 1), 5 cells	**A5E00823339001**
German Technical Inspectorate/MCERT linearity verification kit NH_3, (Version 2), 5 cells	**A5E00823339011**
Linearity verification kit NH_3 (Version 2), 10 cells[2)]	**A5E03693426**
Calibration verification kit for O_2 (only for application letters AA, AC and AD)	**A5E01143755001**
Calibration verification kit for CO	**A5E01143755003**
Calibration verification kit CO_2	**A5E01143755004**
Calibration verification kit for CO/CO_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 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 needed, contact Siemens for a special application (refer to "Selection and ordering data" under "SITRANS SL (in-situ O2 gas analyzer)").
[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)" dated 18 June 2009 and its regulation for implementation of number 582/2011/EC dated 25 May 2011 of the Commission of the European Union.

Other accessories

You can find more accessories and spare parts in our PIA Life Cycle Portal product selector: www.pia-portal.automation.siemens.com

Technical specifications

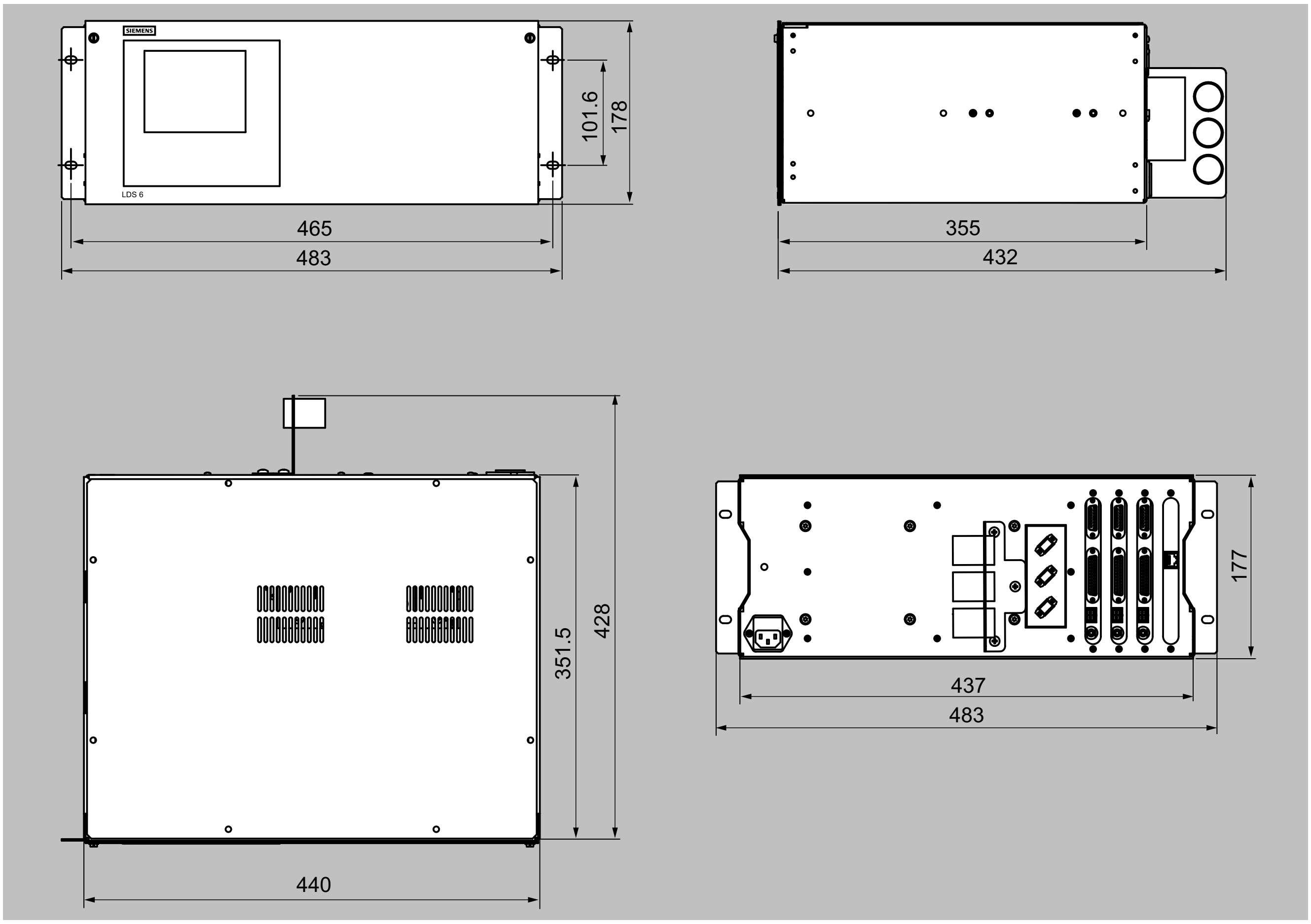
LDS 6, 19" central unit	
Analytical performance	
Measuring range	Depending on sample gas component: see table for standard applications.
Detection limit (DL): Calculated in accordance with VDI 2449, measured on every supplied analyzer during the temperature test (between 5 ... 45 °C) in accordance with 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 German Federal Immission Protection Regulations
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 measuring ranges 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 German Federal Immission Protection Regulations
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 German Federal Immission Protection Regulations
Calibration interval	No recalibration required thanks to internal reference cell
General information	
Concentration units	ppmv, Vol%, mg/Nm³
Display	Digital concentration display (5 digits with floating decimal point)
Laser protection class	Class 1, safe to the eye
Certificates	CE marking, German Technical Inspectorate, MCERTS
Design, enclosure	
Degree of protection	IP20 according to EN 60529
Dimensions	177 × 440 × 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 unit +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

Technical specifications (Continued)

LDS 6, 19" central unit	
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
Communications interface	Ethernet 10BaseT (RJ45)
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)

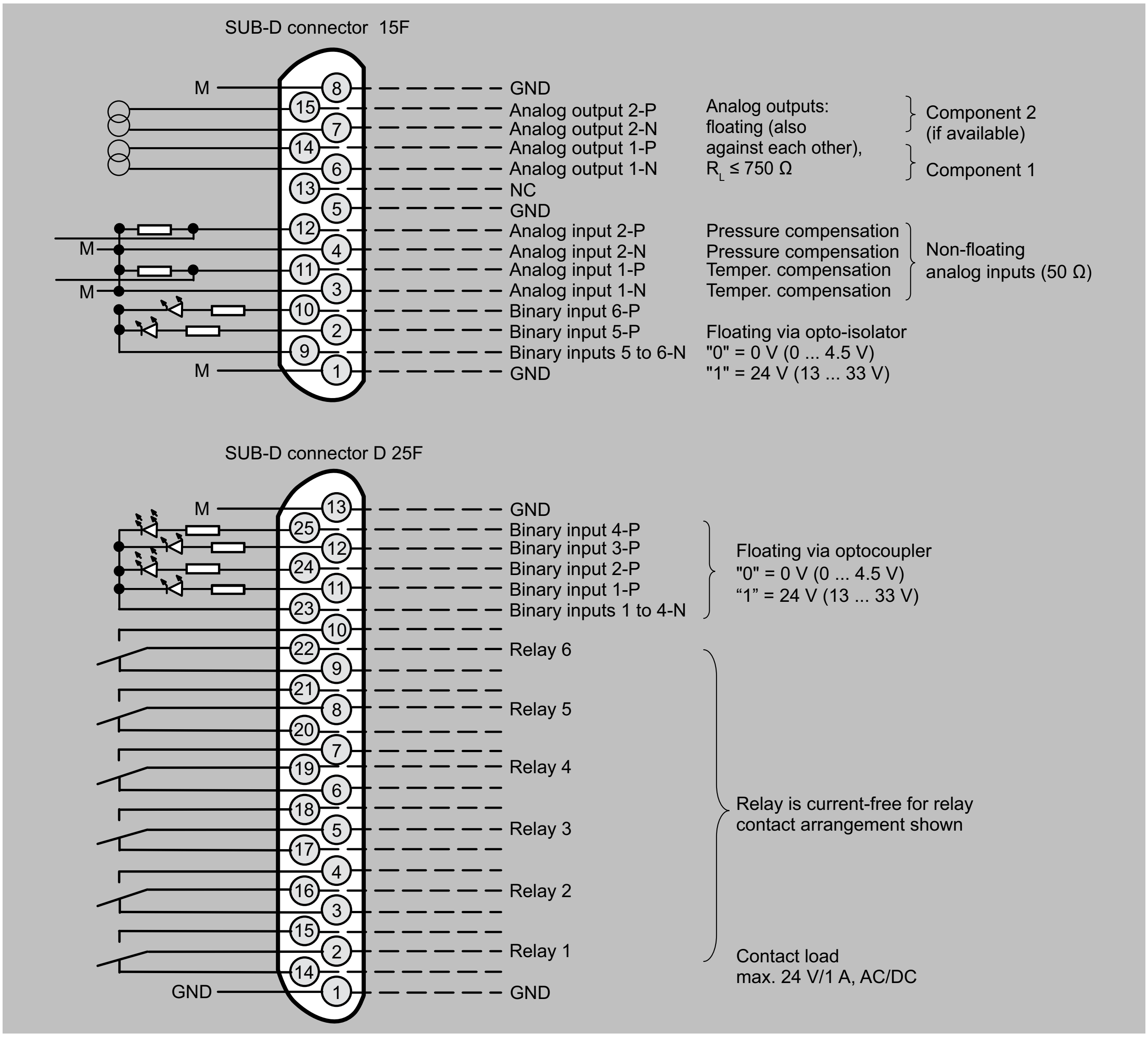
[1] The accuracy corresponds to intrinsic uncertainty according to IEC 61207 for 7MB6121-xKD00-0xxx

Dimensional drawings



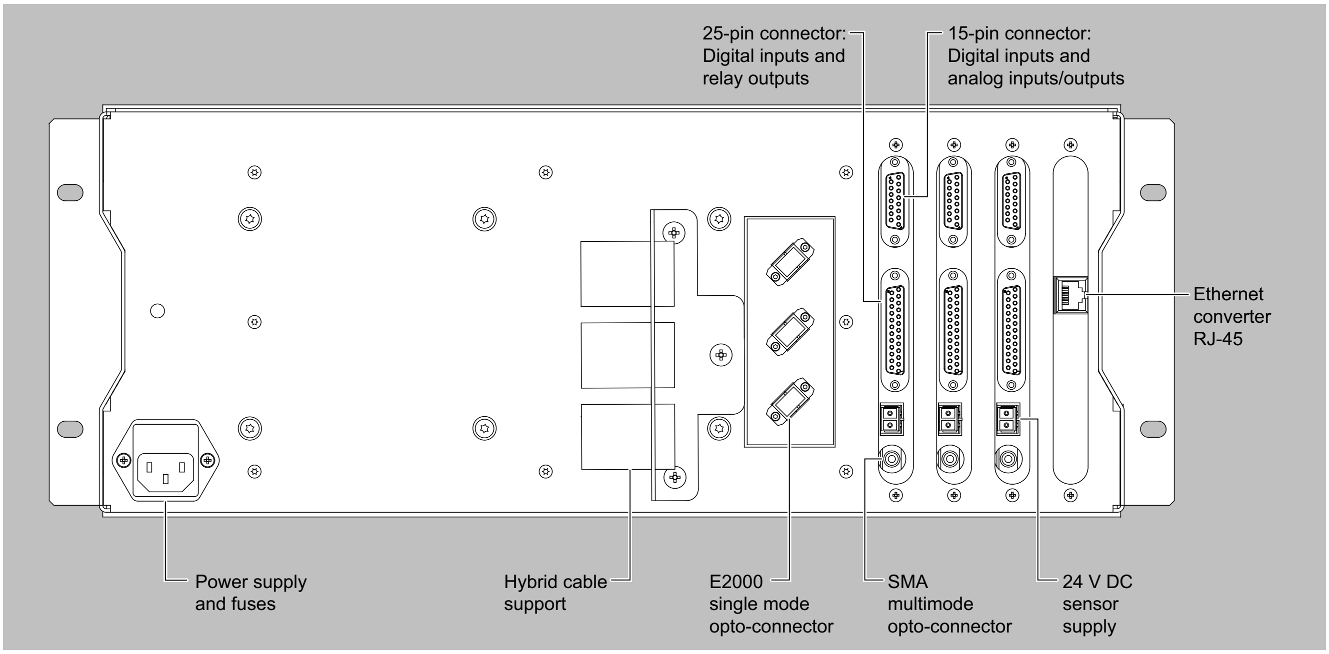
LDS 6, 19" central unit, dimensions in mm

Circuit diagrams



LDS 6, 19" central unit, pin assignments

Circuit diagrams (Continued)



LDS 6, three-channel 19" central unit, optical and electrical connections

More information

The following tables list 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 parameters 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 (e.g. dust load).

Standard application Effective optical path length: 0.3 ... 12 m Dust load²⁾: < 50 g/Nm³				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 effective optical 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
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[6]	0 ... 200 °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[4]	0 ... 400 °C[5]	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%

More information (Continued)

Standard application Effective optical path length: 0.3 ... 12 m Dust load[2]: < 50 g/Nm³				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 effective optical 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
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[6]	0 ... 200 °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[4]	0 ... 400 °C[5]	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 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] 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.
[5] 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.
[6] In the temperature range 150 to 200 °C, only the specified requirements according to EN 15267 QAL1 are fulfilled.

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 effective optical 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	
NH_3		C	A							C	G	Air
			T							C	G	Air
			E							E	G	Air
			F							E	G	Air
			L							C	D	Air

More information (Continued)

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 effective optical 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	
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 the 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/m^3.
4) At least: detection limit.

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 effective optical 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%[4)]
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[5)]	0 ... 200 °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 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.

More information (Continued)

[3] At least: detection limit.
[4] 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.
[5] In the temperature range 150 to 200 °C, only the specified requirements according to EN 15267 QAL1 are fulfilled.

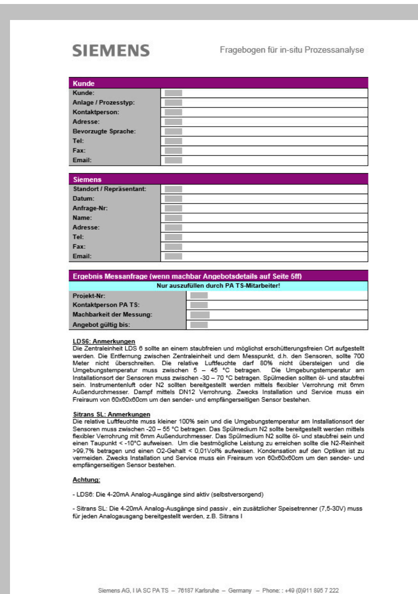
Standard application Effective optical path length: 0.3 ... 12 m Dust load[3]: < 50 g/Nm³				Min. measuring range (with 1 m eff. opt. path length)	Max. measuring range (usually also dependent on effective optical path length: see next column)	Max. measuring range x path length	DL x path length (under 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 the 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:



SIEMENS — Fragebogen für in-situ Prozessanalyse

Kunde	
Kunde:	
Anlage / Prozesstyp:	
Kontaktperson:	
Adresse:	
Bevorzugte Sprache:	
Tel:	
Fax:	
Email:	

Siemens	
Standort / Repräsentant:	
Datum:	
Anfrage-Nr:	
Name:	
Adresse:	
Tel:	
Fax:	
Email:	

Ergebnis Messanfrage (wenn machbar Angebotsdetails auf Seite 5ff)	
Nur auszufüllen durch PA TS-Mitarbeiter!	
Projekt-Nr:	
Kontaktperson PA TS:	
Machbarkeit der Messung:	
Angebot gültig bis:	

LDS6: Anmerkungen
Die Zentraleinheit LDS 6 sollte an einem staubfreien und möglichst erschütterungsfreien Ort aufgestellt werden. Die Entfernung zwischen Zentraleinheit und dem Messpunkt, d.h. den Sensoren, sollte 700 Meter nicht überschreiten. Die relative Luftfeuchte darf 80% nicht übersteigen und die Umgebungstemperatur muss zwischen 5 – 45 °C betragen. Die Umgebungstemperatur am Installationsort der Sensoren muss zwischen -30 – 70 °C betragen. Spülmedien sollten öl- und staubfrei sein. Instrumentenluft oder N2 sollten bereitgestellt werden mittels flexibler Verrohrung mit 6mm Außendurchmesser. Dampf mittels DN12 Verrohrung. Zwecks Installation und Service muss ein Freiraum von 60x60x60cm um den sender- und empfängerseitigen Sensor bestehen.

Sitrans SL: Anmerkungen
Die relative Luftfeuchte muss kleiner 100% sein und die Umgebungstemperatur am Installationsort der Sensoren muss zwischen -20 – 55 °C betragen. Das Spülmedium N2 sollte bereitgestellt werden mittels flexibler Verrohrung mit 6mm Außendurchmesser. Das Spülmedium N2 sollte öl- und staubfrei sein und einen Taupunkt < -10°C aufweisen. Um die bestmögliche Leistung zu erreichen sollte die N2-Reinheit >99,7% betragen und einen O2-Gehalt < 0,01Vol% aufweisen. Kondensation auf den Optiken ist zu vermeiden. Zwecks Installation und Service muss ein Freiraum von 60x60x60cm um den sender- und empfängerseitigen Sensor bestehen.

Achtung:

- LDS6: Die 4-20mA Analog-Ausgänge sind aktiv (selbstversorgend)

- Sitrans SL: Die 4-20mA Analog-Ausgänge sind passiv , ein zusätzlicher Speisetrenner (7,5-30V) muss für jeden Analogausgang bereitgestellt werden, z.B. Sitrans I

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Email: support.automation@siemens.com – www.siemens.de/automation/service&support

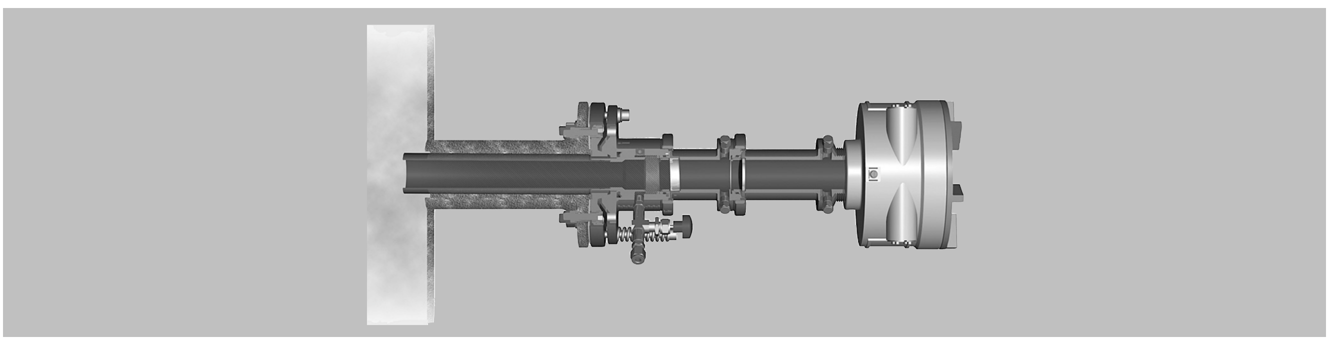
Overview

Optics enclosure CD 6 and cables for non-Ex applications

The standard optics enclosure consists of a transmitter unit and a detector unit with the same dimensions. The transmitter unit provides a connection for the fiber-optic cable. The laser light is transmitted through this fiber-optic cable. The detector unit contains a photo detector and an electronic PCB, and is connected to the transmitter unit by a connection cable.
The optics enclosures are mounted onto flanges. The easiest way to avoid condensation and dust deposits on the windows of the optics enclosure is to use a purging gas, e.g. with instrument air. Purging must be selected depending on the application. The optics enclosures 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 optics enclosures, 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 of the optics enclosure.
The most important optics enclosure purging configurations are presented below:

<u>Purging on the process side with moderate flow</u>

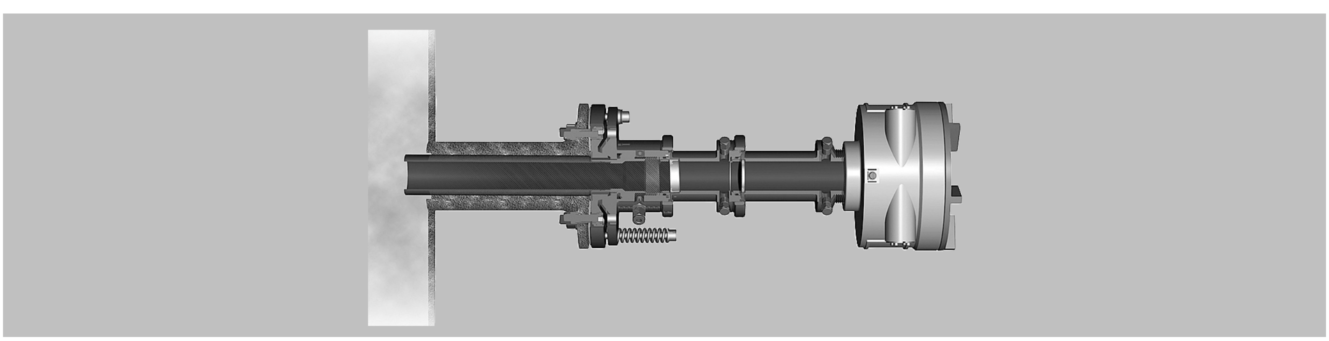
Selected for pure gas applications, emission monitoring, inertia monitoring, for example. The purging gas flow can be adjusted between 0 and approx. 120 l/min at each optics enclosure using a needle valve (included in scope of delivery).



Moderate purging on the process side

<u>Purging on the process side with increased flow</u>

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 optics enclosure depending on the primary pressure of the purging medium.

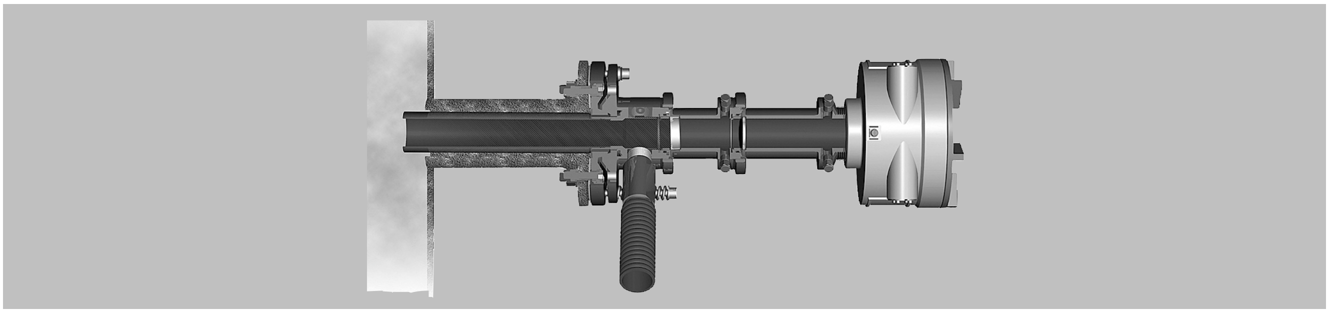


Increased purging on the process side

<u>Purging on the process side with high flow</u>

Through use of purging air blower or dry process steam. Connectors with hose adapters are included in the scope of 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 optics enclosure depending on the purging air blower or the steam pressure.

Overview (Continued)



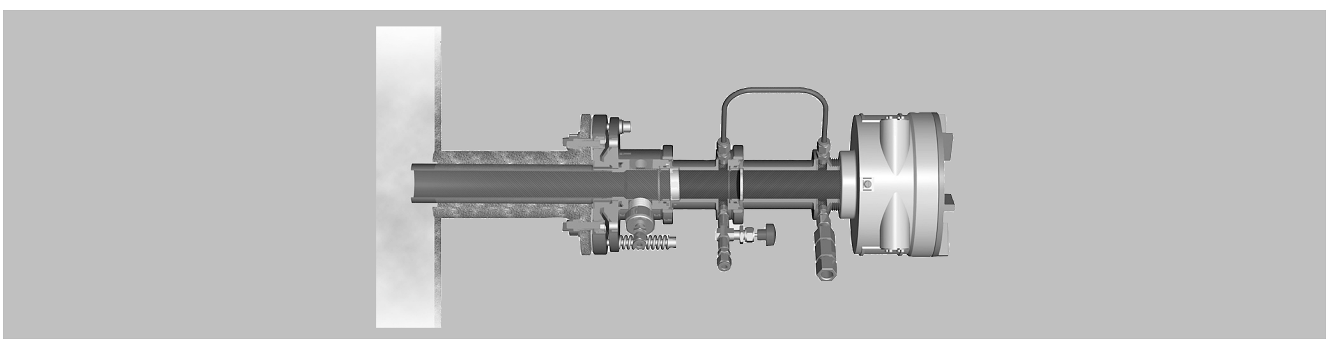
Increased purging on the process side, with hose connection adapter

Purging of the optics enclosure

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 optics enclosure 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 that 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 optics enclosure.



Sensor configuration with high purging on the process side, with 6 mm connector for use with steam, and with N_2 purging of the optics enclosure

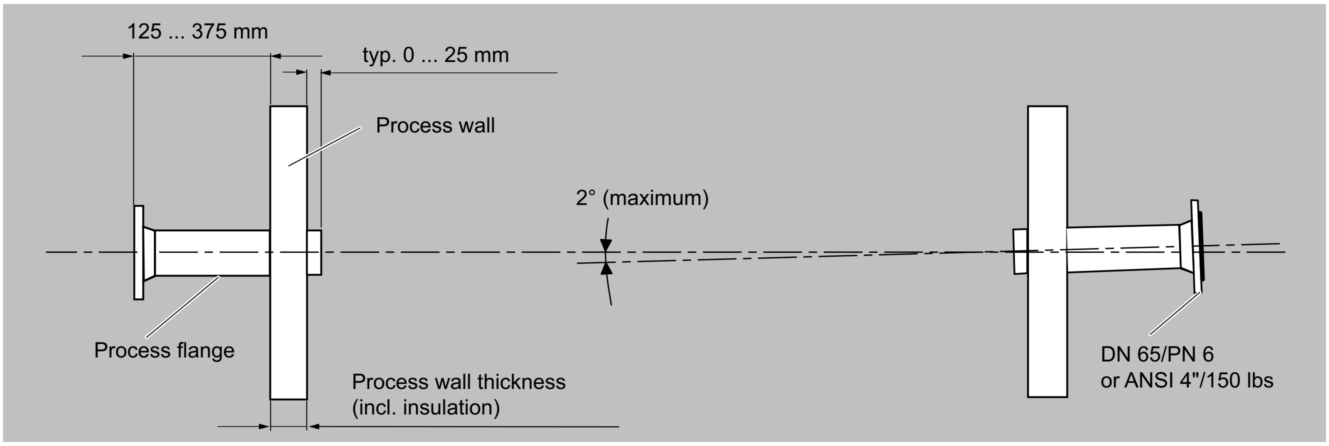
The purging media used on the process side flow through purging gas tubes into the process gas flow. The pipes extend a few centimeters into the process area, and typically receive a flow of process gas from the side. This results in a wedge being generated in the inlet zone of the purging gas. The effective measuring path in the process gas is therefore well-defined as the distance between the ends of the two purging gas inlet tubes.

Optics enclosure CD 6: Options and accessories

Sensor alignment kit

Includes a battery-operated visible light source, a centering aid with crosshairs, and two hook spanners for opening the optics tube of the sensors.
Please note: The sensor alignment kit is not explosion-protected.

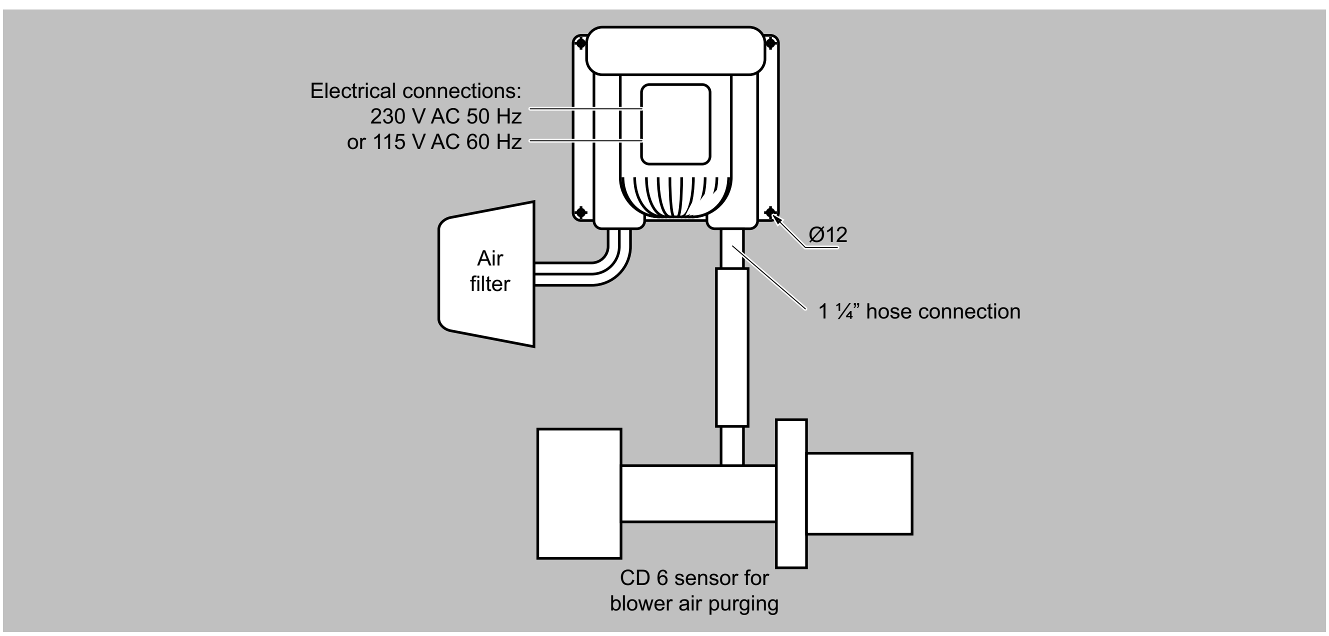
Overview (Continued)



Installation requirements for the optics enclosure CD 6, dimensions in mm

Purging air blower

Two purging air blowers are required to purge the optics enclosure. Both 230 V AC and 115 V AC versions can be ordered.



Optics enclosure 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 pipe, since appropriate 6 mm screwed 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" enclosure with an air jet pump with a flow 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

Complete the application questionnaire which can be found on the internet at www.siemens.com/insituquestionnaire .

Selection and ordering data

LDS 6 in-situ gas analyzer Optics enclosure pair		**Article No.** 7MB6122-	●	●	●	●	●	-	●	●	●	●
Click on the Article No. for online configuration in the PIA Life Cycle Portal. ***Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".***												
Explosion protection[1)]												
Without			0									
Explosion protection: acc. to ATEX II 1 GD IP65 T135 °Cel. IECEx Ex ia IIC T4 for hazardous zone 0 and 1, the maximum hybrid cable length is 250 m for Ex reasons. In hazardous zone 2 and non-Ex scenarios, longer cables (up to 700 m) are also permitted.			1									
Measured component												
All gases except O_2				W								
Purging: Process side	**Purging: Optics enclosure**											
Without purging	Without purging				A							
Without purging	Air or N_2, 1 ... 2 l/min incl. Needle valve, 6 mm Swagelok				B							
Instrument air or N_2 according to flow: 0 ... 120 l/min including Needle valve, 6 mm Swagelok	Without purging				C							
Instrument air or N_2 according to flow: 0 ... 120 l/min including Needle valve, 6 mm Swagelok	Air or N_2, 1 ... 2 l/min incl. Needle valve, 6 mm Swagelok				D							
Air or N_2 increased flow: 200 ... 500 l/min including 6 mm Swagelok	Without purging				E							
Air or N_2 increased flow: 200 ... 500 l/min including 6 mm Swagelok	Air or N_2, 1 ... 2 l/min incl. Needle valve, 6 mm Swagelok				F							
Air, fan or steam; high flow: > 500 l/min including 1 ¼" hose adapter	Without purging				G							
Air, fan or steam; high flow: > 500 l/min including 1 ¼" hose adapter	Air or N_2, 1 ... 2 l/min incl. Needle valve, 6 mm Swagelok				H							
Material of purging tubes												
Without purging tubes						0						
Stainless steel, EN 1.4432/316L						1						
Length of purging tubes												
Without 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 dimensions DN 65/PN 6, MAWP (PS) at 20 °C: 0.05 MPa									0			
Stainless steel flange (1.4404/316L), connection dimensions ANSI 4"/150 lbs, MAWP (PS) at 20 °C: 7.25 psi									1			
Stainless steel flange (1.4404/316L), connection dimensions DN 65/PN 6, MAWP (PS) at 20 °C: 0.05 MPa, including enclosed welding flanges, e.g. for engine test rigs									2			
Flameproof window flange (1.4404/316L, borosilicate glass), connection dimensions DN 65/PN 6, MAWP (PS) at 20 °C: 0.6 MPa									3			
Flameproof window flange (1.4404/316L, borosilicate glass), connection dimensions DN 80/PN 16, MAWP (PS) at 20 °C: 1.6 MPa									4			
Flameproof window flange (1.4404/316L, borosilicate glass), connection dimensions ANSI 4"/150 lbs, MAWP (PS) at 20 °C: 232 psi									5			
Hybrid cable												
No hybrid cable										X		
Standard lengths												
• 5 m										A		
• 10 m										B		
• 25 m										E		
• 40 m										G		
• 50 m										H		
• 75 m										L		

Selection and ordering data (Continued)

LDS 6 in-situ gas analyzer Optics enclosure pair	**Article No.** 7MB6122-	●	●	●	●	●	-	●	●	●	●
• 100 m									P		
• 150 m									R		
• 200 m									U		
Customized length: Specified in full meters									Z		
Sensor cable											
No sensor connecting cable										X	
Standard lengths											
• 5 m										A	
• 10 m										B	
• 25 m										E	
Customized length: Specified in full meters										Z	
Operating software											
Digital documentation											9

[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 LDS 6 or the optics enclosure CD 6 in hazardous atmospheres.

Options	**Order code**
Add "**-Z**" to article number and then add order code.	
Settings	
6 mm Swagelok adapter for purging with steam, purging modes G and H	***A27***
Inspection certificate 3.1 (leak test) in accordance with EN 10204 (only in combination with flameproof window flanges)	***C12***
Inspection certificate 3.1 (material certificate) in accordance with EN 10204 (only in combination with flameproof window flanges)	***C13***
Purging tubes: Special material	***L1Y***
Purging tubes: Special length	***M1Y***
Customer-specific process connection	***N1Y***
Hybrid cable, customized length	***P1Y***
Sensor connecting cable, customized length	***Q1Y***
Special applications	***R10 ... R39***
Tag plate, customized inscription	***Y30***
Additional plate	***Y31***
Special application number	***Y33***

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 infrared background radiation (flame filter), only for O_2	A5E00534668
SITRANS SL, flashlight with adapter	A5E33259745

Technical specifications

LDS 6, optics enclosure 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 is IIC T4 Ga II 1 D Ex ia op is 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) × 44 × 40 800 (770 net) × 54 × 40 1 200 (1 170 net) × 54 × 40
Weight	2 × approx. 11 kg
Mounting	DN 65/PN 6, DN 80/PN 16 or ANSI 4"/150 lbs
Please note: • For purging gas 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 mounting type.	
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	
Optics enclosure 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 optics enclosure of the process interface (terminal 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 damping increases exponentially at longer path lengths. Smaller particles also have a very large influence on the optical damping. With high dust load, long path length and small particle size, the technical support at Siemens should be consulted.

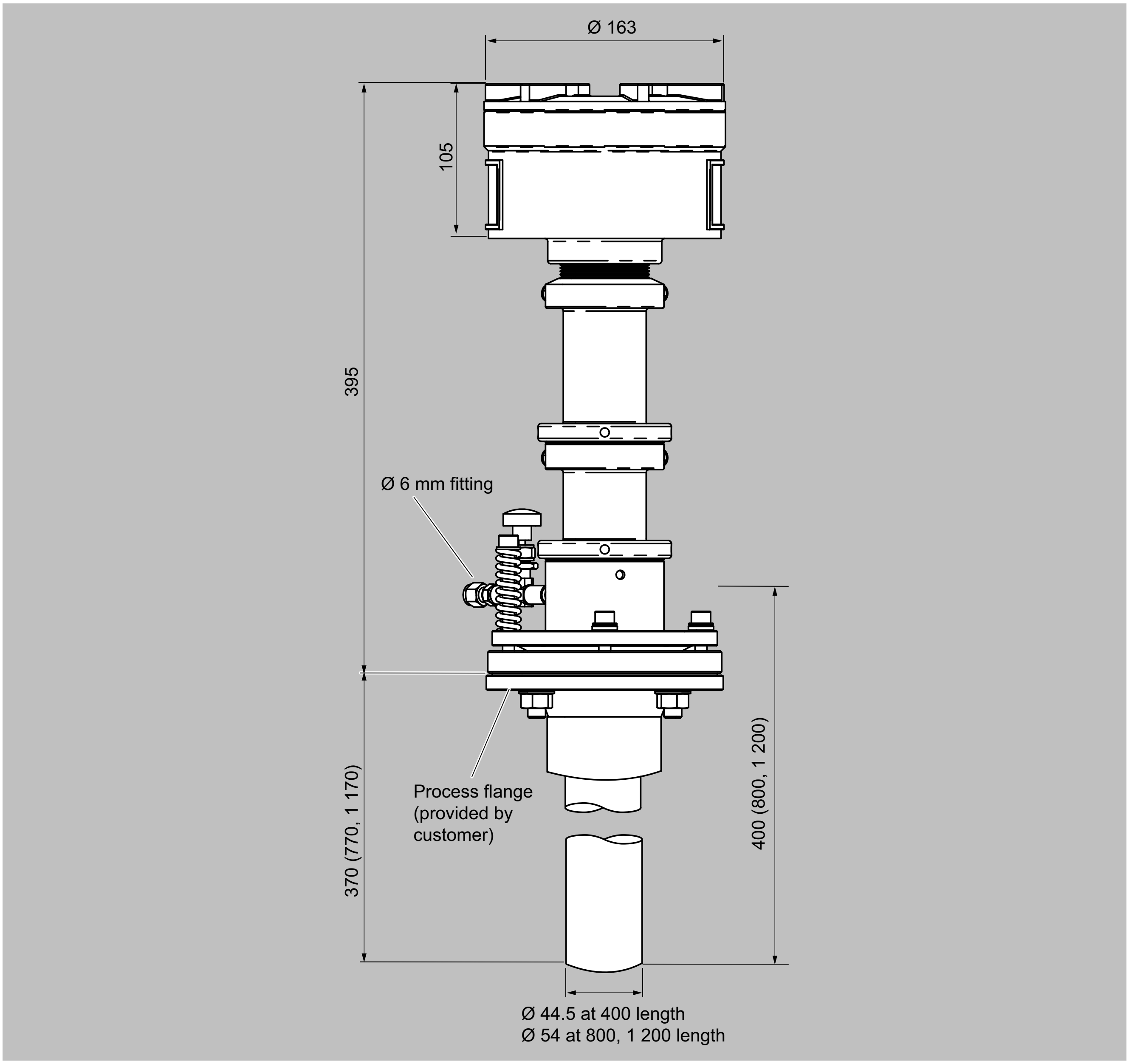
LDS 6, accessories	
Purging	
Nitrogen is permissible as the purging gas for the optics enclosure. Nitrogen, steam, air and gases which are not subject to the pressure equipment directive Cat. 2 are permissible as purging gases for the process side.	
Purging with instrument air, N_2	
• Max. overpressure in the sensor	< 500 hPa
• Quality	

Technical specifications (Continued)

LDS 6, accessories	
- Instrument air	According to ISO 8573-1:2010 [2:3:3] Note: It is sufficient if the pressure dew point is min. 10 K below the minimum ambient temperature.
- Nitrogen	Purity > 99.7%
• 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, protective barrier required for rain
Steam purging	
• Steam conditioning	Superheated
• 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

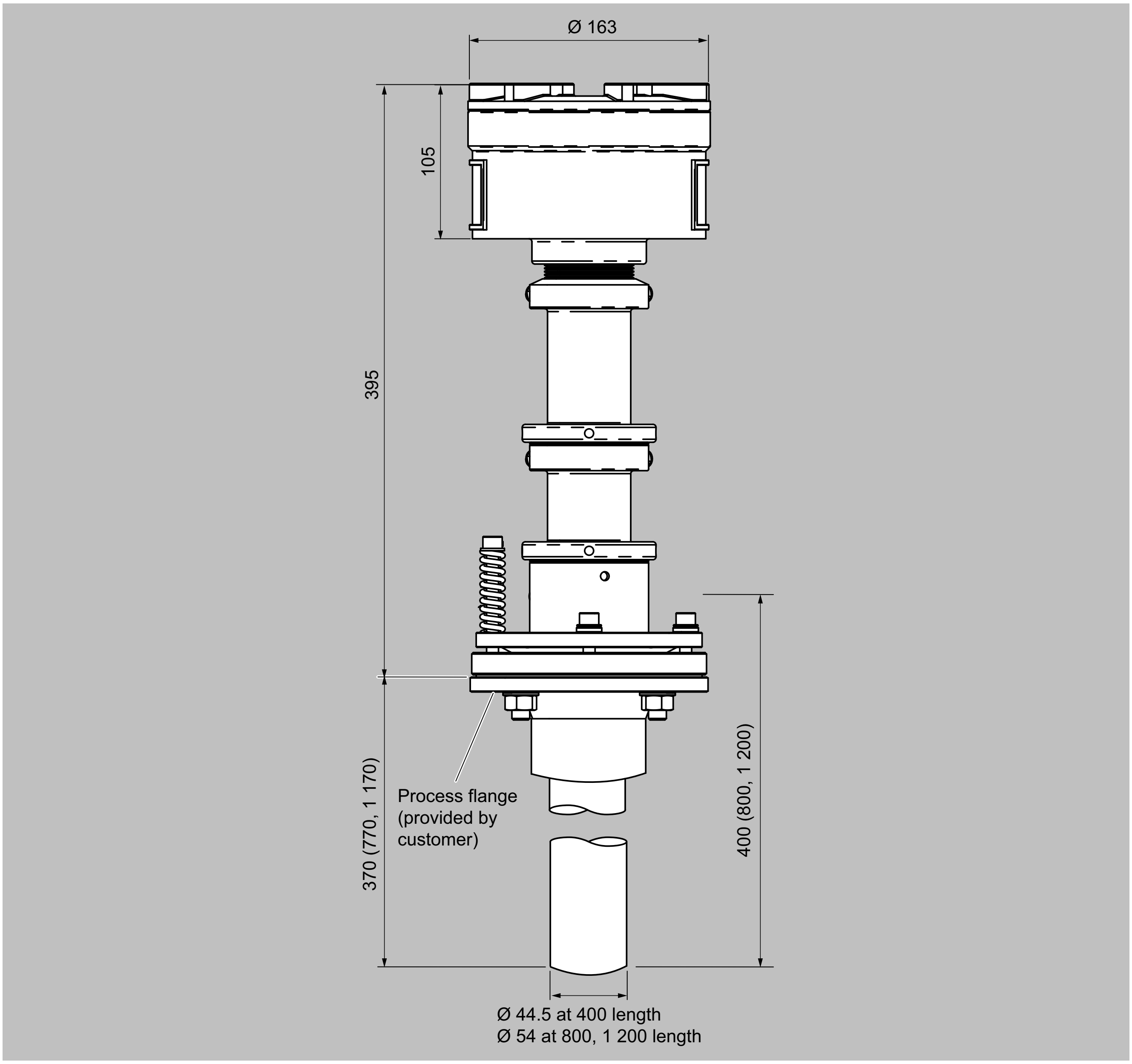
LDS 6, hybrid and sensor cables	
General information	
Configuration hybrid cable	Two optical fibers and two twisted copper wires in one cable for 24 V DC. Single-mode fiber-optic cable prefabricated at both ends with E2000 angle plugs. Multimode fiber-optic cable prefabricated at both ends with SMA connectors. Cable is flame-retardant, very good resistance to oil, gasoline, acids and alkalis, protective jacket UV-resistant
Cable jacket	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 installed spatially separated from intrinsically safe lines
• Diameter	< 8.5 mm
• Length	• Use in non-Ex and hazardous zone 2: Up to 700 m • Use in hazardous 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
Shock 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)

Dimensional drawings



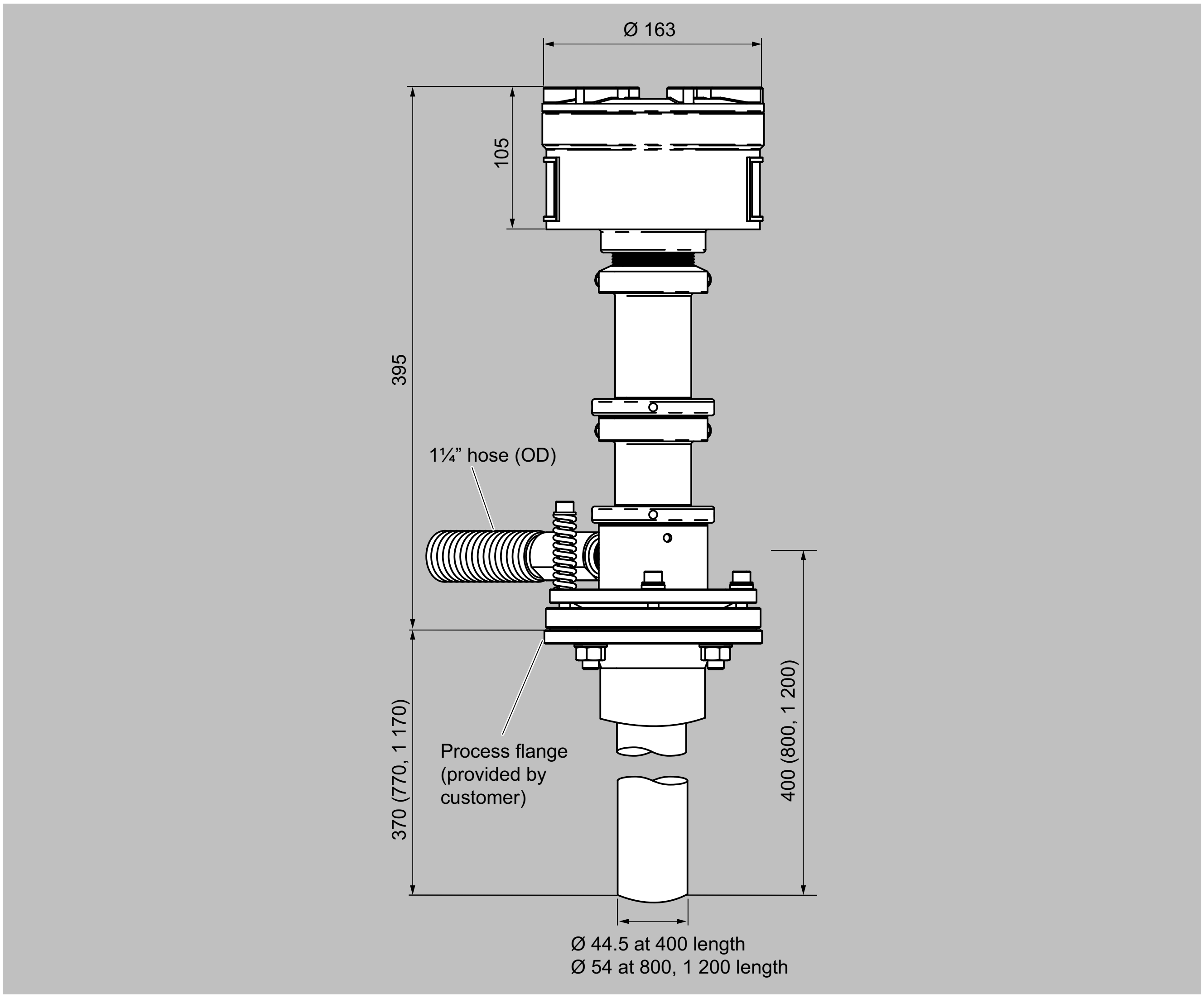
Optics enclosure CD 6, moderate purging (instrument air), version according to Article No. 7MB6122-**C1*-0***, dimensions in mm

Dimensional drawings (Continued)



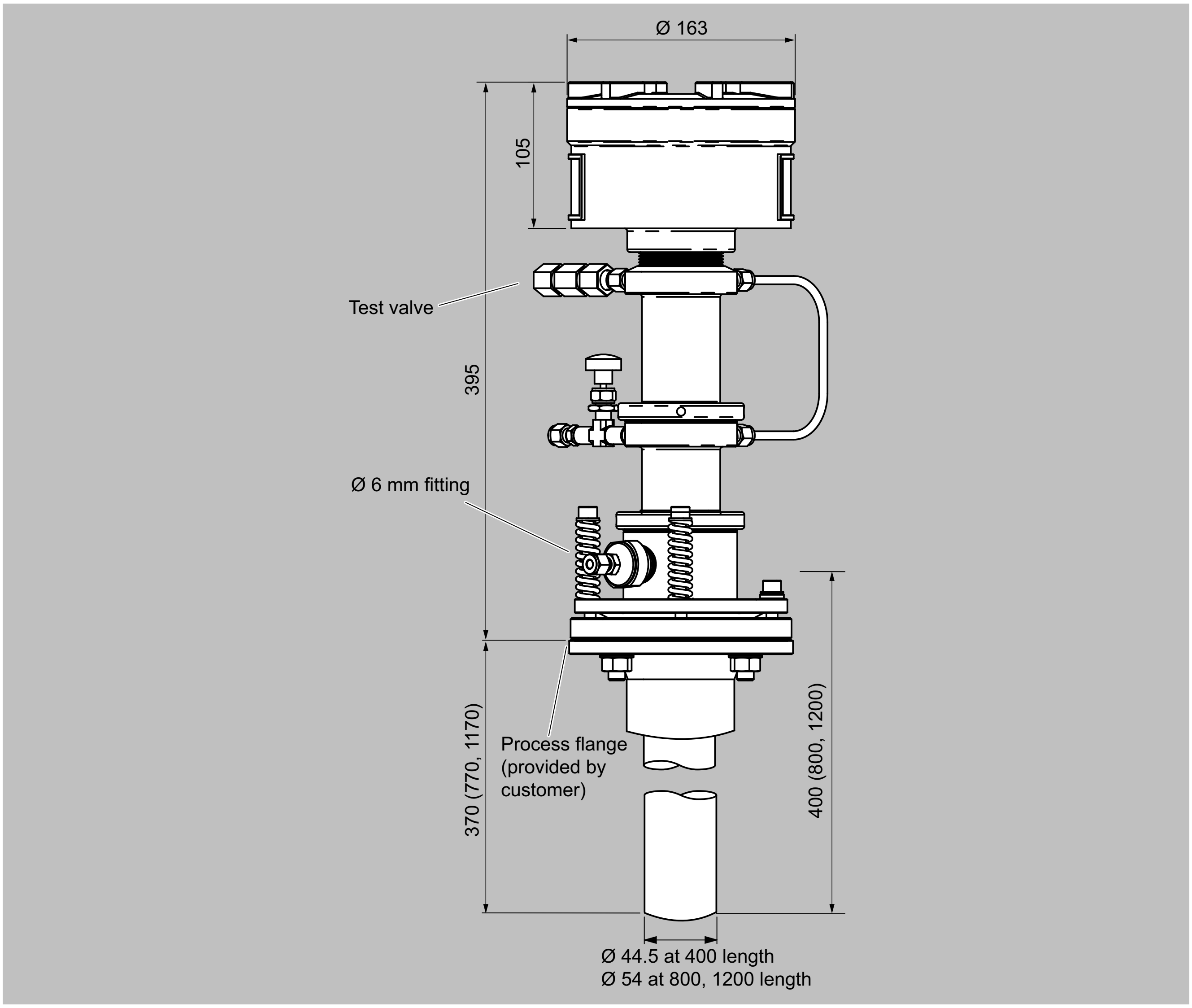
Optics enclosure CD 6, increased purging (instrument air), version according to Article No. 7MB6122-**E1*-0***, dimensions in mm

Dimensional drawings (Continued)



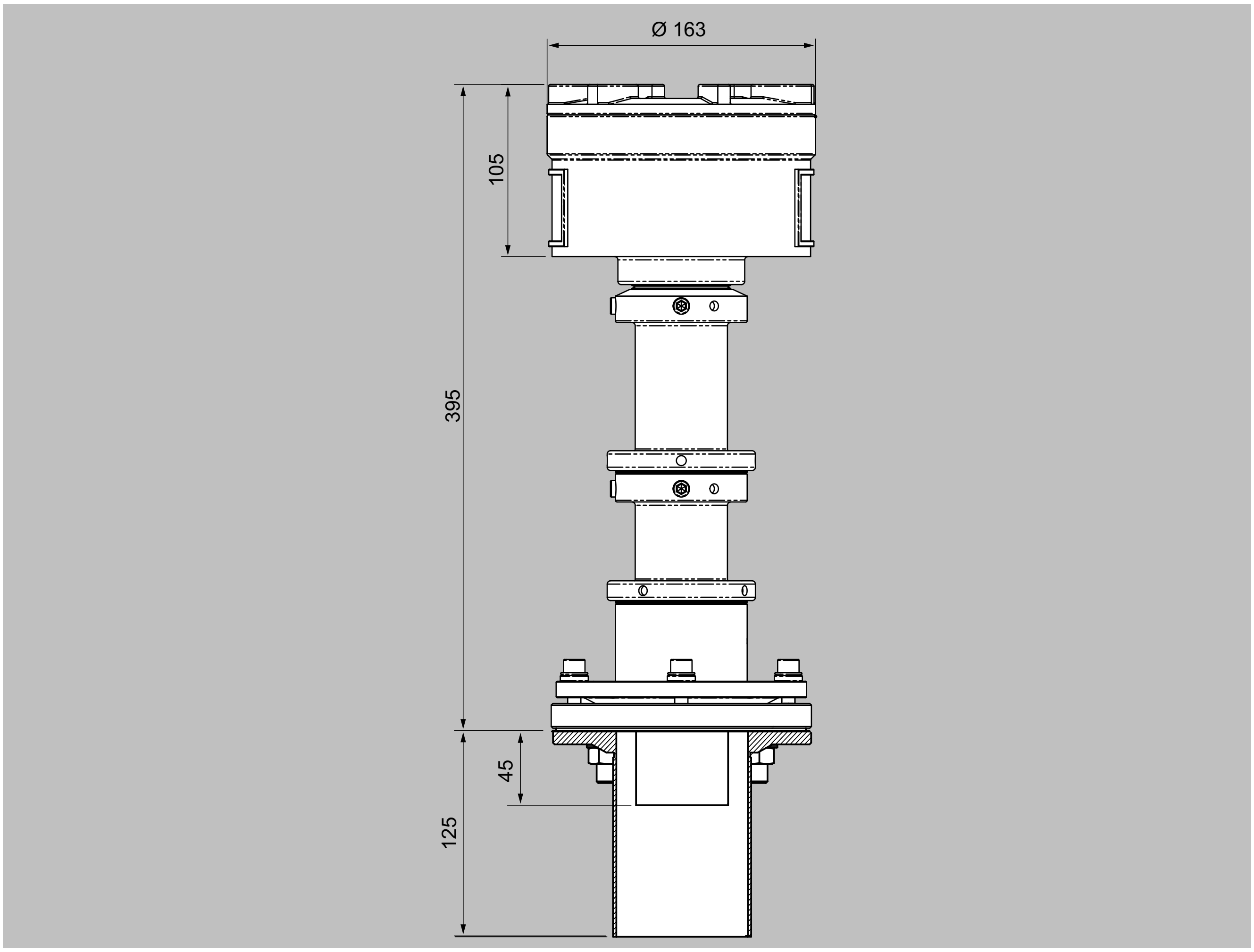
Optics enclosure CD 6, blower purging, version according to Article No. 7MB6122-**G1*-0***, dimensions in mm

Dimensional drawings (Continued)



Optics enclosure CD 6, optics enclosure and process side purging, version according to Article No. 7MB6122-**H1*-0***-Z A27, dimensions in mm

Dimensional drawings (Continued)



Optics enclosure CD 6, purged version according to Article No. 7MB6122-*WC14-2***, dimensions in mm

Selection and ordering data

Description	2 years (unit)	5 years (unit)	Article No.
CD 6, window module, quartz	1	2	A5E00338487
CD 6, window module, engine test rig, no purging	1	2	A5E00338490
CD 6, flameproof window flange (1.4404/316L), DN 65/PN 6	1	2	A5E00534662
CD 6, flameproof window flange (1.4404/316L), DN 80/PN 16	1	2	A5E00534663
CD 6, flameproof 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 information on which parts are suitable for which devices (version 1 or version 2), please consult the Equipment Manual or the PIA Life Cycle Portal product selector www.pia-portal.automation.siemens.com or contact Siemens directly. In general, all new devices are compatible with spare parts of version 2.

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.

More information

Supplied product documentation on DVD and safety notes

The scope of delivery of the Siemens products for process analytics includes a multilingual instruction sheet with **safety notes** as well as a uniform **DVD - "Analytical products"**.
This DVD contains the most important manuals and certificates for the Siemens process analytics portfolio. The delivery may also contain product-specific or order-specific printed materials. For more information, see section 7 "Appendix".

Download catalogs

The entire documentation is available for download free of charge in various languages at:
http://www.siemens.com/processanalytics/documentation

Certificates

All available certificates are listed on the internet at:
http://www.siemens.com/processanalytics/certificate

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

Benefits (Continued)

Hardware and software features

Simultaneous applications
Use one MAXUM edition II to provide the functionality of multiple GCs.

Parallel chromatography
Separate complex analytical tasks into simple parallel tasks and shorten analysis times.

Low operating costs
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

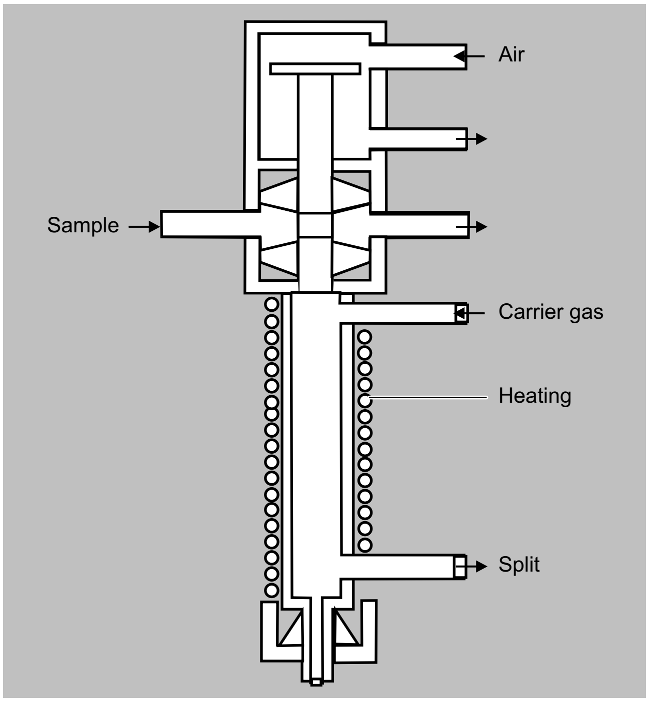
Model 50 10-port valve:
- Combined gas injection and backflushing valve
- Activation by pressure on the diaphragm without moving parts
- Can be used as gas injection valve or for column switching (6-port connection)
- > 3 million switching cycles without maintenance

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 (LIV)

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 dose small volumes of gas.
The liquid injection valve consists of three sections:
- Thermostatically-controlled vaporization system
- Sample passage section with seal
- Pneumatic drive

Function (Continued)



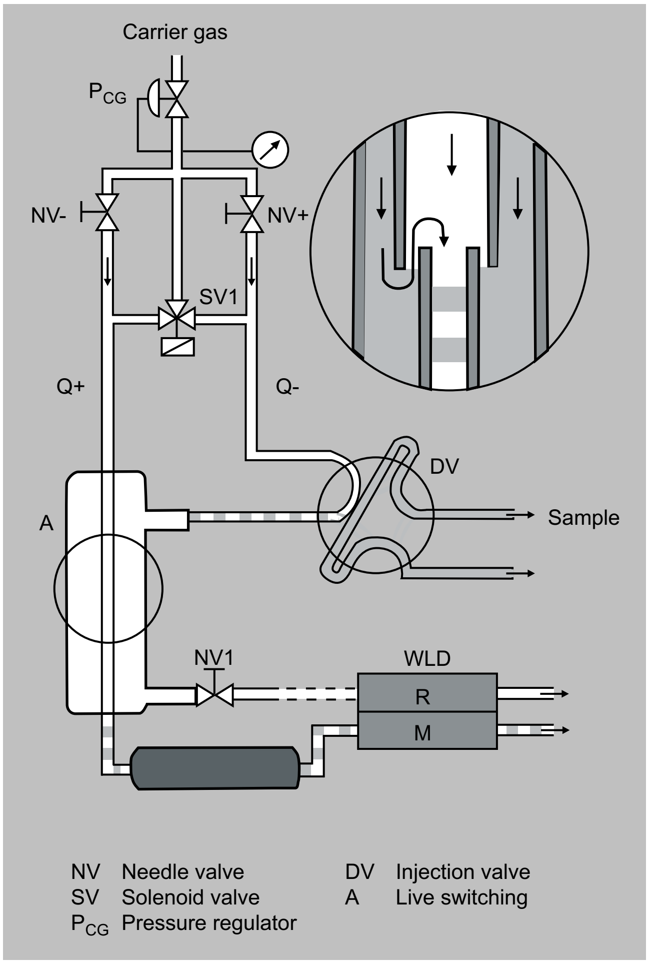
Liquid injection valve (LIV)
Features:

- 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 separation columns is possible with the live injection add-on part.

Function (Continued)



Live injection

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 separation 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 reproducibility 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 oven or dual ovens.
Airless oven**:**

- For extremely stable isothermal oven temperatures (0.02 °C control precision)
- 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 separation 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 separation 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 input.

Function (Continued)

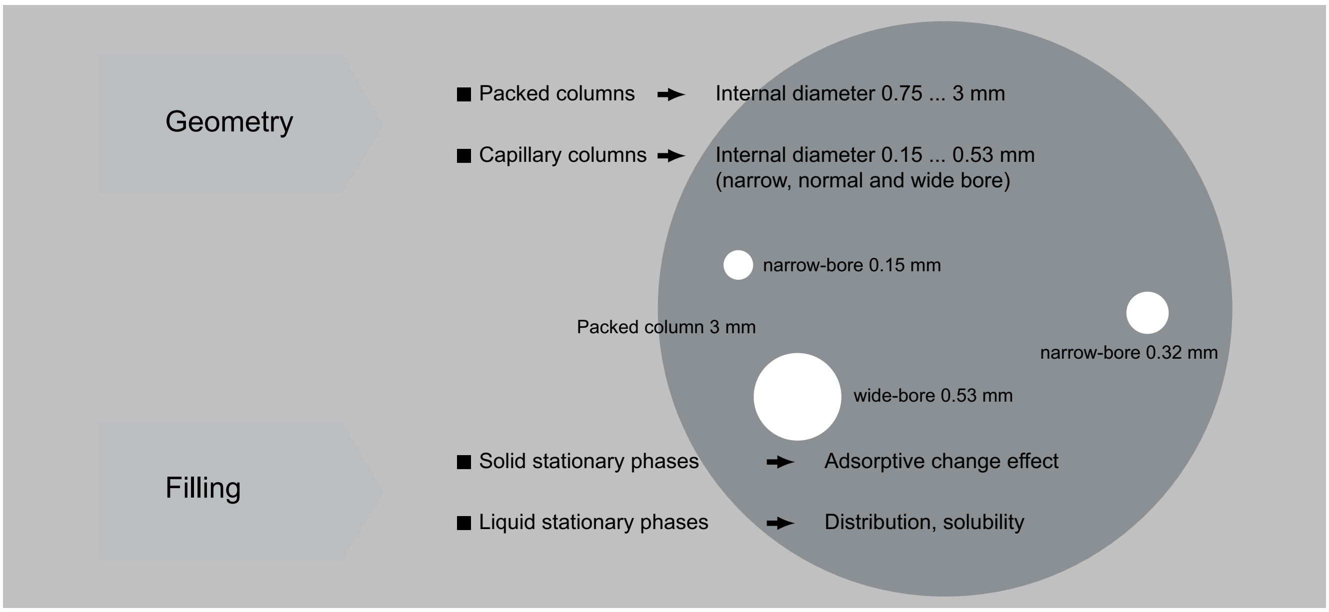
"Simulated distillation" is an important application of PTGC in refineries. The distillation range - a quality criterion for fuels - is chromatographically traced "online".

Separation columns

The separation 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 separation 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 separation column

Column switching systems

Process chromatographs are almost always equipped with column switching functions. Separation column switching is understood to be the combination of several separation columns in the carrier gas path which are arranged in succession or parallel. These separation 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:

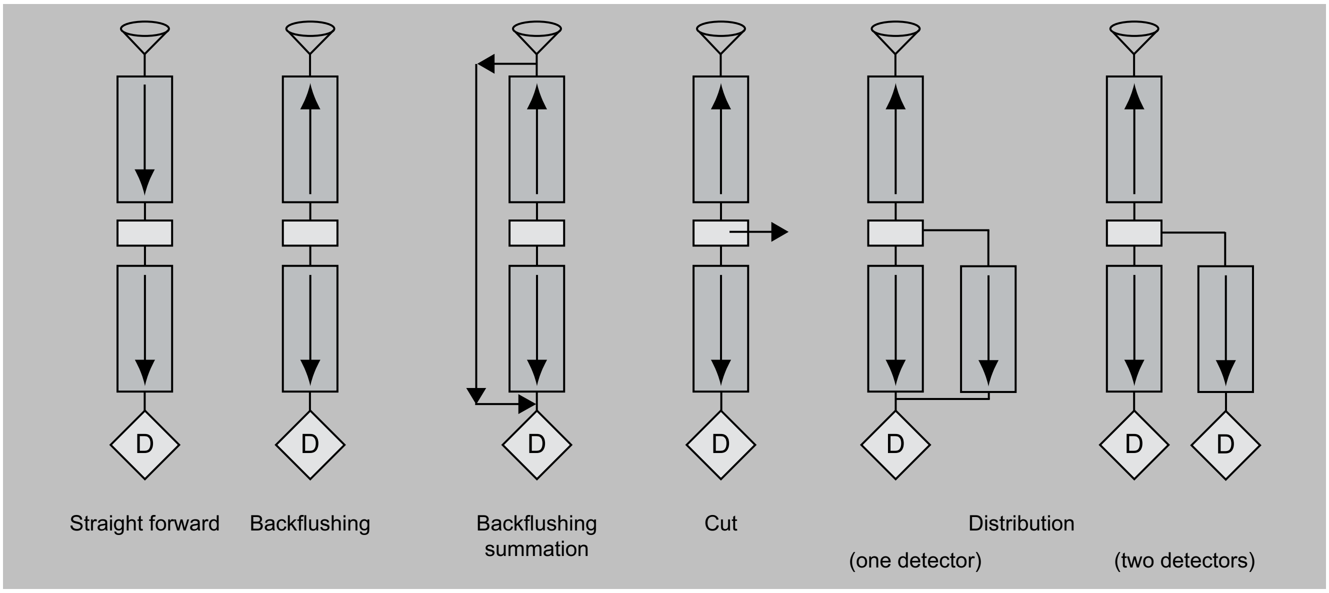
- Can be used as gas injection valve, liquid injection valve or for column switching
- Diaphragm controlled by tappet
- One million switching cycles without maintenance

Valveless switching technique

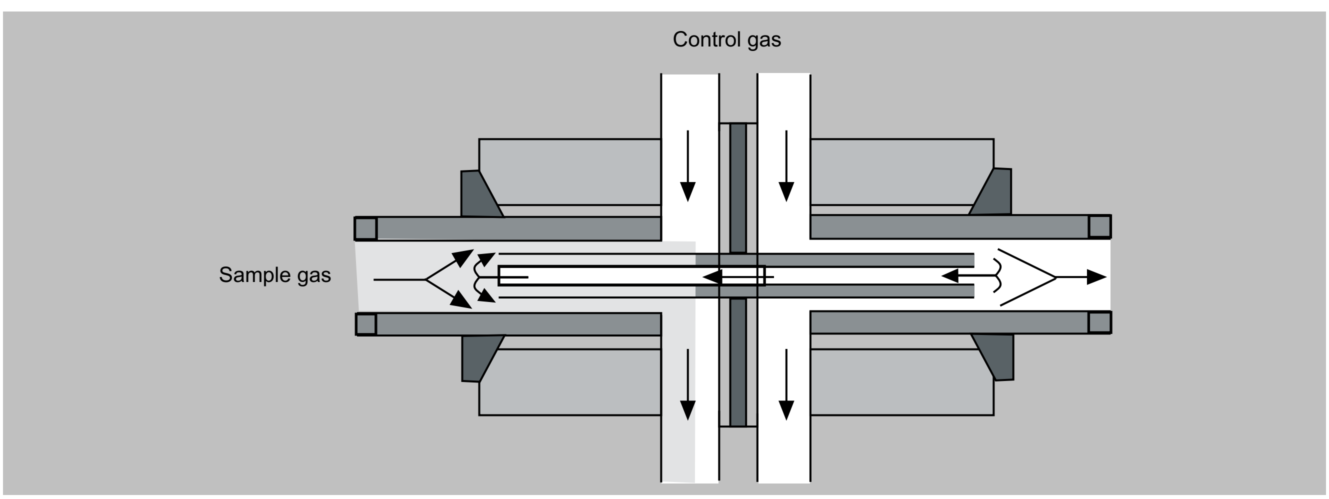
The valveless live column switching is exactly controlled by electronic pressure regulators, and prevents falsification of measurement results since the sample does not come into contact with valves. A special pressure-controlled coupling element connects the capillary columns. This technique is optimally 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.

Function (Continued)

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)



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)

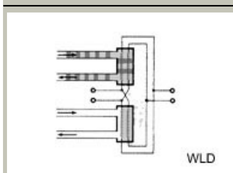
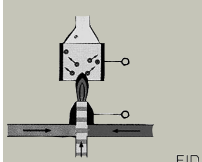
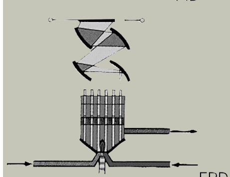
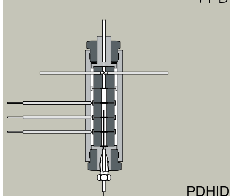
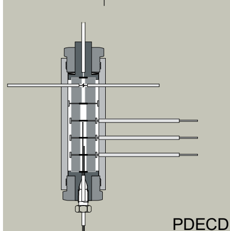
- Permits exact pressure control without mechanical pressure regulator. Shortens the setup time since the pressure is set by an operator input.
- Permits programmable pressure changes for fast chromatography and modern applications.
- Controls the supply of carrier gas and combustion gas Avoids drift and deviations which can occur with mechanical pressure control.

Function (Continued)

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 flow. 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
	Concentration	Universal	Main and subsidiary components
	Mass flow	Thermally ionizable components at < 1 000 °C	Hydrocarbons
	Mass flow	Substances containing S or P	Traces of sulfur in HC matrices
	Mass flow	Universal (except He and Ne)	Ultra-pure gas analysis
	Mass flow	Molecules with electronegative groups	Traces of halogenated hydrocarbons
	Mass flow	Selective, dependent on ionization potential	Traces of aromatic compounds, amines

Function (Continued)

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 separation 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 measured 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-Ex 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 with a heating element 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 at the gas outlet.

Function (Continued)

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 multi-point 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 IECEx with air or nitrogen purging for Zones 1 and 2 (Ex ... IIB+H2 ... Gb Gc) • Certified according to ATEX with air or nitrogen purging for Zones 1 and 2 (II2G Ex ... IIB + H_2 ... Gb) (II3G Ex ... IIB+H2 ... Gc) • 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.

Technical specifications (Continued)

MAXUM edition II classic oven	
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 measuring range
Linearity (depending on application)	± 2% of measuring range
Effects of vibrations	Negligible
Repeatability in % of full measuring range	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)

Technical specifications (Continued)

MAXUM edition II classic oven	
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 of the type Model 11 or Valco • At least 825 kPa for units with Model 50-type valves • 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

Technical specifications (Continued)

MAXUM edition II classic oven	
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 485, e.g. Modbus
Ethernet	• Standard ESBF board fiber-optic 100Base FX multimode with ST connection (3 x RJ 45 and 1 x optical), e.g. Modbus TCP IP or OPC

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 multi-point 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 IECEx with air or nitrogen purging for Zones 1 and 2 (Ex ... IIB+H2 ... Gb Gc) • Certified according to ATEX and IEC Ex with air or nitrogen purging for Zones 1 and 2 (II2G Ex ... IIC T4 Gb) (II3G Ex ... IIC T4 Gc) • 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.

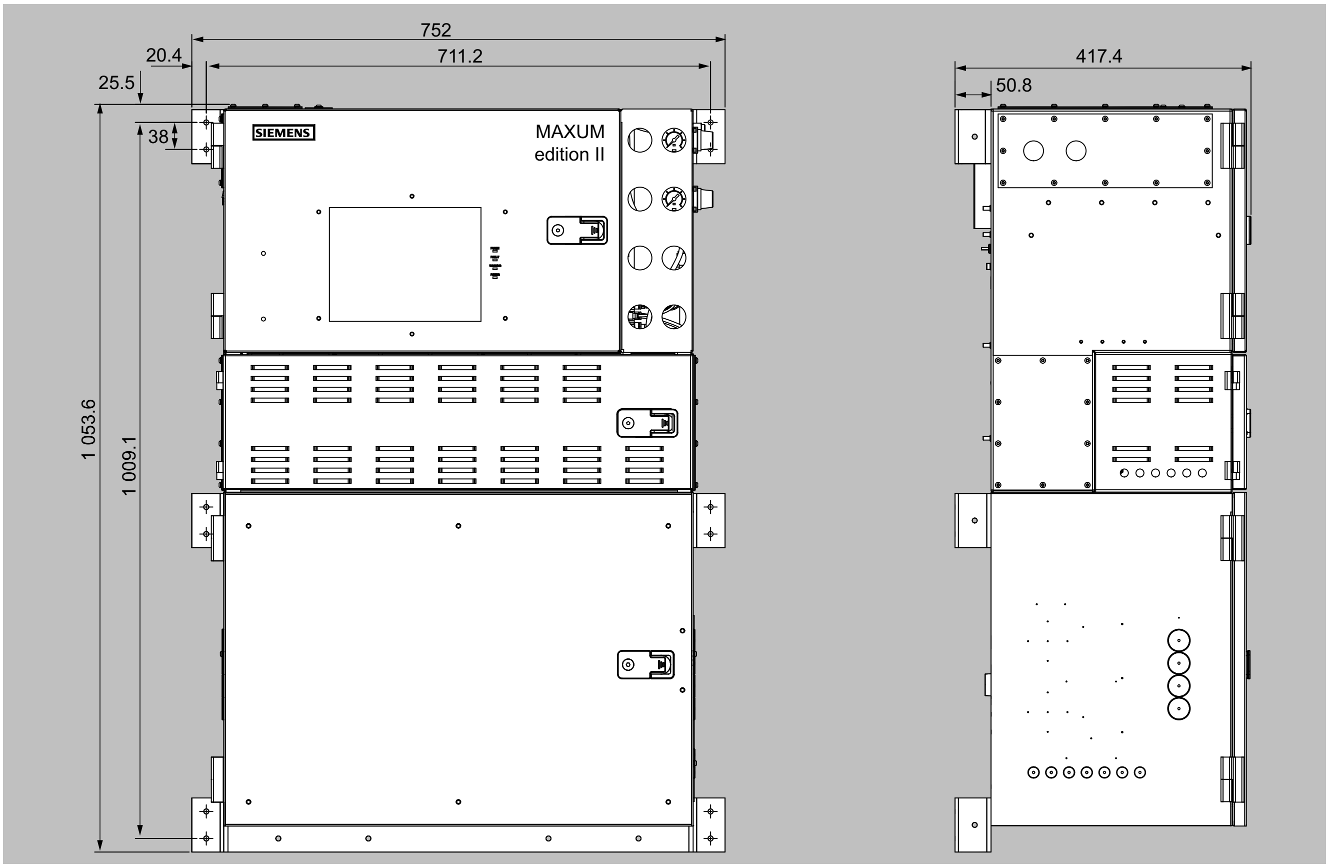
Technical specifications (Continued)

MAXUM edition II modular oven	
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 × M50 with 1 × M50 in large analytical module
Columns	Packed, micropacked or metal capillary separation 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 • DC 24 V ± 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, polymide and Teflon
Measuring response	
Sensitivity (depending on application)	± 0.5% of measuring range
Linearity (depending on application)	± 2% of measuring range
Effects of vibrations	Negligible
Repeatability in % of full measuring range	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 × RS 485 • 1 × RS 485
Card slots for optional inputs and outputs via internal I2C bus	2

Technical specifications (Continued)

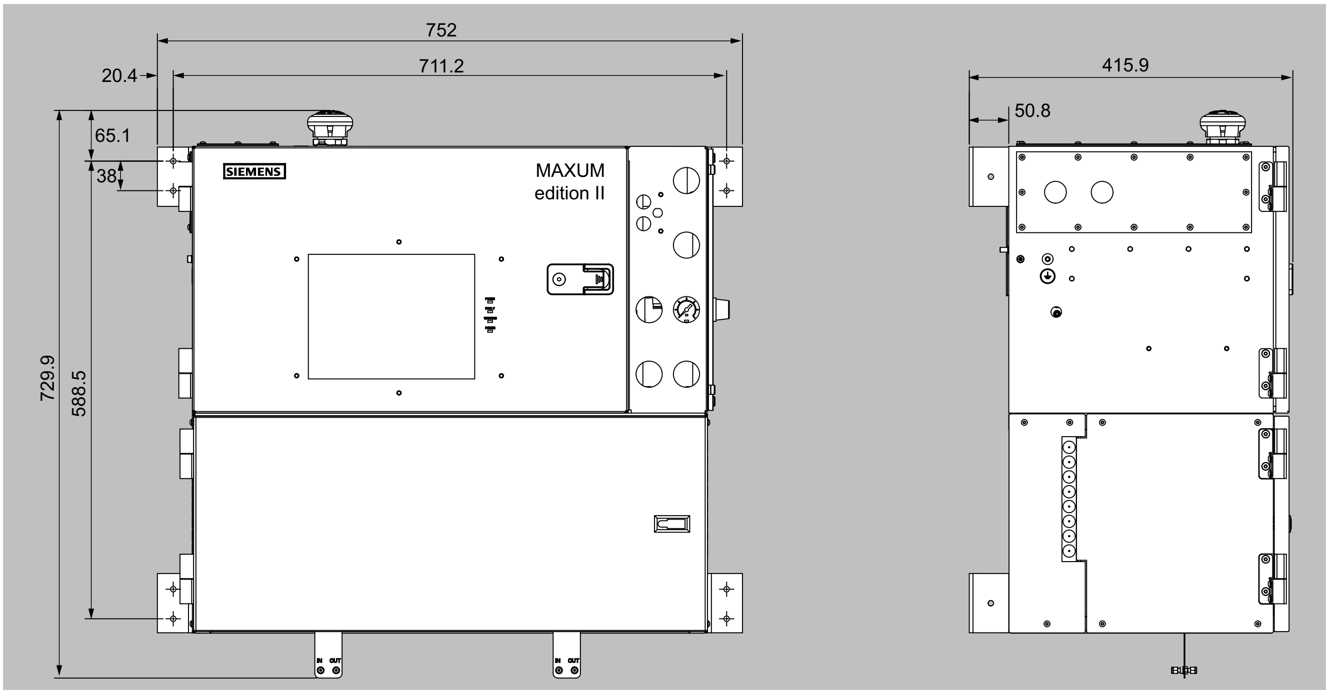
MAXUM edition II modular oven	
Input and output cards	A IO 8 • 8 analog outputs • 8 analog inputs • 2 digital inputs D IO • 6 digital inputs and 8 digital outputs AD I/O • 4 digital inputs and 4 digital outputs • 4 analog inputs and 4 analog outputs
Digital inputs	Optocoupler with internal power supply (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	-20 ... 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 485 • Port 2: RS 485
Ethernet	• Standard ESBF board fiber-optic 100Base FX multimode with ST connection (3 × RJ 45 and 1 × optical), e.g. Modbus TCP IP or OPC

Dimensional drawings



MAXUM edition II airless/airbath oven, dimensions in mm

Dimensional drawings (Continued)



MAXUM edition II modular oven, dimensions in mm

More information

Please contact your Siemens sales partner to order a device.

4/2	**Introduction**
4/3	**Continuous emission monitoring**
4/4	Set CEM CERT
4/11	Set CEM 1
4/21	HM-1400 TRX total mercury analyzer system
4/24	D-R 220 dust and opacity measuring instrument
4/26	D-R 290 dust and opacity measuring instrument
4/28	D-R 320 dust measuring instrument
4/30	D-R 808 dust measuring instrument
4/32	D-FL 100 volume flow measuring system
4/36	D-FL 220 volume flow measuring system
4/38	D-ISC 100 display and control unit
4/40	D-EMS 2000
4/42	D-EMS 2000 CS
4/43	**Biogas analysis**
4/43	Set BGA
4/48	**Continuous monitoring of hydrogen-cooled generators**
4/48	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.

More information

Supplied product documentation on DVD and safety notes

The scope of delivery of the Siemens products for process analytics includes a multilingual instruction sheet with **safety notes** as well as a uniform **DVD - "Analytical products"**.
This DVD contains the most important manuals and certificates for the Siemens process analytics portfolio. The delivery may also contain product-specific or order-specific printed materials. For more information, see section 7 "Appendix".

Download catalogs

The entire documentation is available for download free of charge in various languages at:
http://www.siemens.com/processanalytics/documentation

Certificates

All available certificates are listed on the internet at:
http://www.siemens.com/processanalytics/certificate

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 not only protects the environment from air pollutants but also ensures optimum combustion in the furnaces. 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 guarantee from plant constructors to operators that the plant runs in accordance with specifications 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 Measuring Systems (AMS). The standard EN 15267 determines corresponding minimum requirements and testing procedures for automated measuring systems (AMS) 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 the standard EN 14181 and, if required, the access data for the third quality assurance level (QAL3).

Siemens expertise in the area of products and solutions for process analytics helps you meet all requirements for continuous emission monitoring quickly and smoothly in accordance with regional law. This solution package ensures a secure investment even in the event of regulatory adjustments.

According to individual requirements, Siemens offers cold-extractive, hot-extractive, and in-situ automated measuring systems.

The portfolio is completed by emission evaluation systems for data storage, visualization, remote transmission - permitted according to German Technical Instructions on Air Quality Control (TA Luft), 13th, 17th, 27th, 30th and 31st German Federal Immission Protection Regulations.

Siemens offers not only 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	Design
ULTRAMAT 23 Art. No. 7MB2358-.....-....	3 NDIR components on 2 optical benches
ULTRAMAT 23 Art. No. 7MB2357-.....-....	2 NDIR components on 2 optical benches
ULTRAMAT 23 Art. No. 7MB2355-.....-....	1 NDIR component on 1 optical bench
SIPROCESS UV600 Art. No. 7MB2621-.....-....	3 UV components on 1 optical bench
ULTRAMAT 6 Art. No. 7MB2121-.....-.... and 7MB2011-.....-....	1 NDIR component on 1 optical bench
ULTRAMAT 6; two-channel 19" rack unit Art. No. 7MB2123-.....-.... and 7MB2124-.....-....	2 NDIR components on 2 optical benches
OXYMAT 6 Art. No. 7MB2021-.....-....	1 paramagnetic O_2 measuring cell
ULTRAMAT / OXYMAT 6 Art. No. 7MB2023-.....-.... and 7MB2024-.....-....	1 NDIR component on 1 optical bench and 1 paramagnetic O_2 sample chamber

NDIR = Non-dispersive infrared sensor

Function

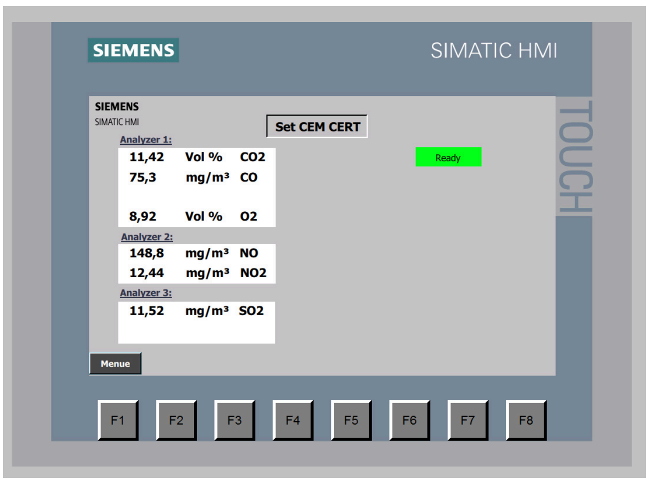
The modular measuring system consists of the following components:

- 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.

Function (Continued)

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

Selection and ordering data

Set CEM CERT Suitability-tested emission measurement system (EN 15267) for continuous emission measurements	**Article No.** 7MB1957-	●	●	●	●	●	-	●	●	●	0
Click on the Article No. for online configuration in the PIA Life Cycle Portal. ***Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".***											
Rack											
Set CEM CERT, cabinet design (2 100 x 800 x 800 mm), sheet steel, sample gas connection left, with sample preparation, cable inlet above, device design in swing frame, for installation of max. 3 units 19" analyzers, analyzers, with cabinet light, including side panels, front panel and base, door stop on the right		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, sample gas connections on the right, cable inlet above, with cabinet light, including side panels and base **Note:** Must be approved by customer with individual acceptance test		1									
GRP cabinet 1 (2 060 x 900 x 800 mm) with sample preparation, analyzers in swing frame, for design with up to three 19" analyzers, sample gas connections on the left, cable inlet above, with cabinet light, base **Note:** Must be approved by customer with individual acceptance test		4									
GRP cabinet 2 (2 060 x 900 x 800 mm) with sample preparation, analyzers in swing frame, for design with up to three 19" analyzers, sample gas connections on the right, cable inlet above, with cabinet light, base **Note:** Must be approved by customer with individual acceptance test		5									
FIDAMAT 6 emission measurement system, sheet-steel cabinet (800 x 700 x 600) with preparation for 1 FIDAMAT 6 analyzer unit. **Note:** FIDAMAT 6 analyzer must be ordered separately		6									
Installation in custom cabinet; is ordered, delivered and invoiced as separate order item		8									
Sampling probe For dust loads up to 2 g/m^3, including sampling pipe, length 1 000 mm, for temperatures ≤ 600 °C, with weather protection cover[1)], material of filter enclosure: stainless steel											
Without			A								
Type: M&C; Version SP2000			B								
Type: Bühler; GAS 222			C								
Type: M&C; Version SP2000, with connections for 2 heated sample gas lines, without weather protection cover			F								
Type: Bühler; GAS 222, with connections for 2 heated sample gas lines			G								

Selection and ordering data (Continued)

Set CEM CERT Suitability-tested emission measurement system (EN 15267) for continuous emission measurements	**Article No.** 7MB1957-	●	●	●	●	●	-	●	●	●	0
Ventilation/cooling											
Cabinet fan installed in side panel, with adjustable thermostat **Note:** Must be approved for ULTRAMAT 23 by customer with individual acceptance test.				B							
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 GRP cabinet **Note:** Must be approved by customer with individual acceptance test.				D							
Cabinet fan for FIDAMAT 6 emission measurement system installed in side panel, with adjustable thermostat				E							
Energy-efficient cabinet air-conditioning unit for FIDAMAT 6 emission measurement system installed in side panel, controlled via thermostat				F							
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 loads											
1-pole						0					
2-pole						1					
Sample gas cooler Including two heat exchangers arranged in series connection.											
Without								0			
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: Bühler, BÜNO$_x$									B		
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%, 3-phase										C	

[1)] Exception: Option F is without weather protection cover.

Options	Order code
Add "**-Z**" to article number and specify order code	
Accessories	
Condensation trap made of plastic with level monitoring	**A03**
Acidification module for measuring SO_2 concentrations < 50 mg/m³; to prevent wash-out effects by the condensate. **Note:** Must be approved by customer with individual acceptance test.	**A04**
PROFIBUS DP interface for querying status and measured signals. **Note:** Must be approved by customer with individual acceptance test.	**A13**
Air Treater for FIDAMAT 6, for removing residual traces of hydrocarbons in the combustion gas of the FID; supplied unassembled, for wall mounting, incl. 2 m hose line	**A14**
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	

Selection and ordering data (Continued)

Options	Order code
• Preparation for the installation of ULTRAMAT 23 (7MB2358-.....-..../7MB2357-.....-..../7MB2355-.....-...)	**C10**
• Preparation for the installation of ULTRAMAT 6 (7MB2121-.....-....)	**C12**
• Preparation for the installation of OXYMAT 6 (7MB2021-.....-....)	**C14**
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 OXYMAT 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 OXYMAT 6 (7MB2021-.....-....)	**C34**
• Preparation for the installation of ULTRAMAT/OXYMAT 6 (7MB2023-.....-....)	**C35**
Analyzers mounting position 4	
• Preparation for installation of an additional LDS6 central unit (7MB6121-...0.-0...). The LDS 6 central unit must be ordered separately with a CD6 sensor pair	**C40**
Heated line must be ordered as option D27 and 7MB1943-2AA31	
Fuse protection (25A) and regulator for heated sample gas line up to 50 m, the heated line must be ordered or provided under MLFB 7MB1943-2AA31	**D27**
Zero gas and calibration 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**

Selection and ordering data (Continued)

Options	Order code
Signal processing	
Analog signal processing 1 duplicated, electrically isolated, max. load 600 Ω, 1x/analog signal	**M01**
Analog signal processing 2 duplicated, electrically isolated, max. load 600 Ω, 1x/analog signal	**M02**
Analog signal processing 3 duplicated, electrically isolated, max. load 600 Ω, 1x/analog signal	**M03**
Analog signal processing 4 duplicated, electrically isolated, max. load 600 Ω, 1x/analog signal	**M04**
Analog signal processing 5 duplicated, electrically isolated, max. load 600 Ω, 1x/analog signal	**M05**
Analog signal processing 6 duplicated, electrically isolated, max. load 600 Ω, 1x/analog signal	**M06**
Documentation Technical documentation of the Set CEM CERT and the configured analyzers	
German	**N01**
English	**N02**
French	**N03**
Hardware and software configurations corresponding to QAL1 according to EN 15267	**Y27**

[1)] Applies to ULTRAMAT 6, ULTRAMAT/OXYMAT 6, OXYMAT 6, SIPROCESS UV600. Max. quantity 3; 1x/used calibration gas cylinder. Option must be selected if the option C11 ... C15 was selected at least once.

Technical specifications

Set CEM SERT	
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/m³ • 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

Technical specifications (Continued)

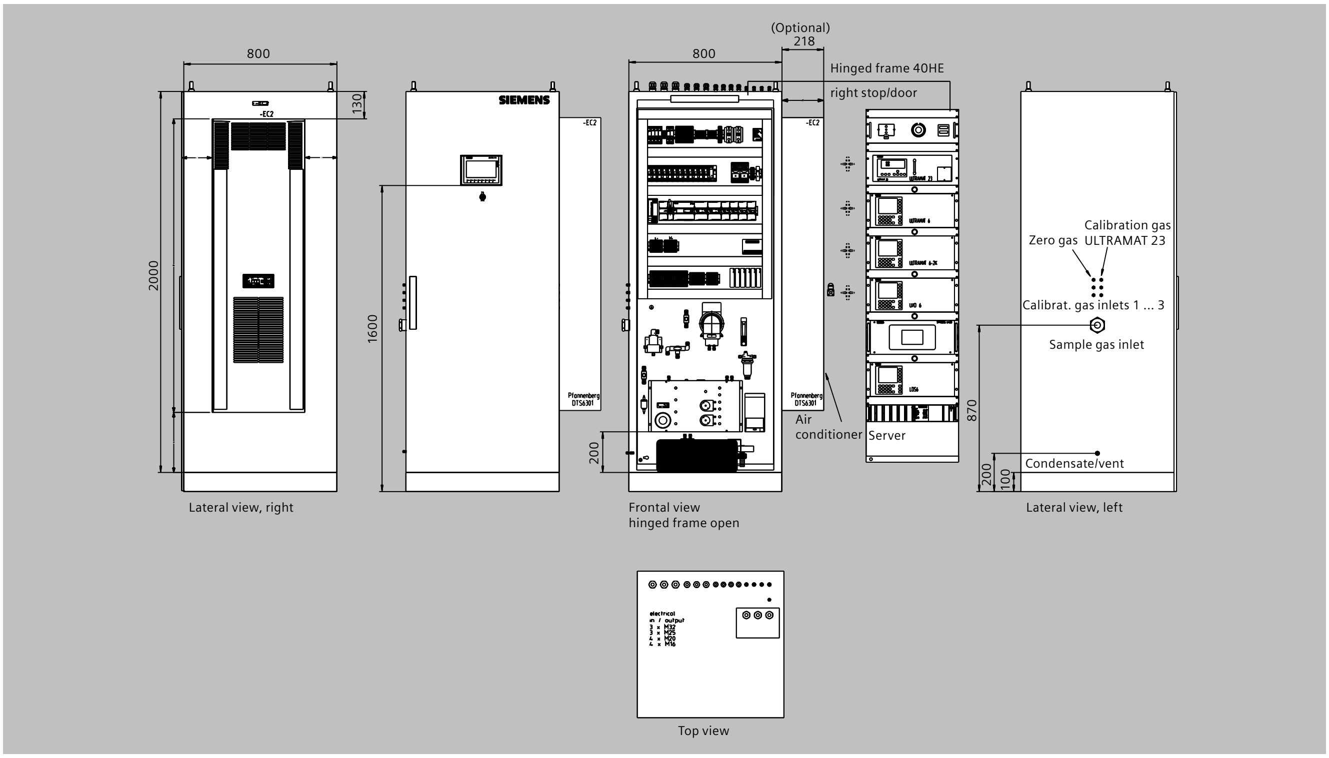
Set CEM SERT	
Output signals	• 4 ... 20 mA; corresponding to the analyzer information or via PROFIBUS DP • Additional digital inputs and outputs via PLC (SIMATIC S7-1200)
Color	RAL 7035
Weight	Approx. 160 kg
Sheet-steel cabinet/frame	Indoor installation
Explosion protection classification	Installation outside the hazardous zone
Degree of protection	IP54
Calibration	Semi-automatic or 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 × 800 × 800 mm (H × B × T)

* 500 mm spacing on the right or left must be provided for the cable entry and connection of the heated sample gas line.
[1)] With NO and SO_2 concentration > 500 mg/m³, 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

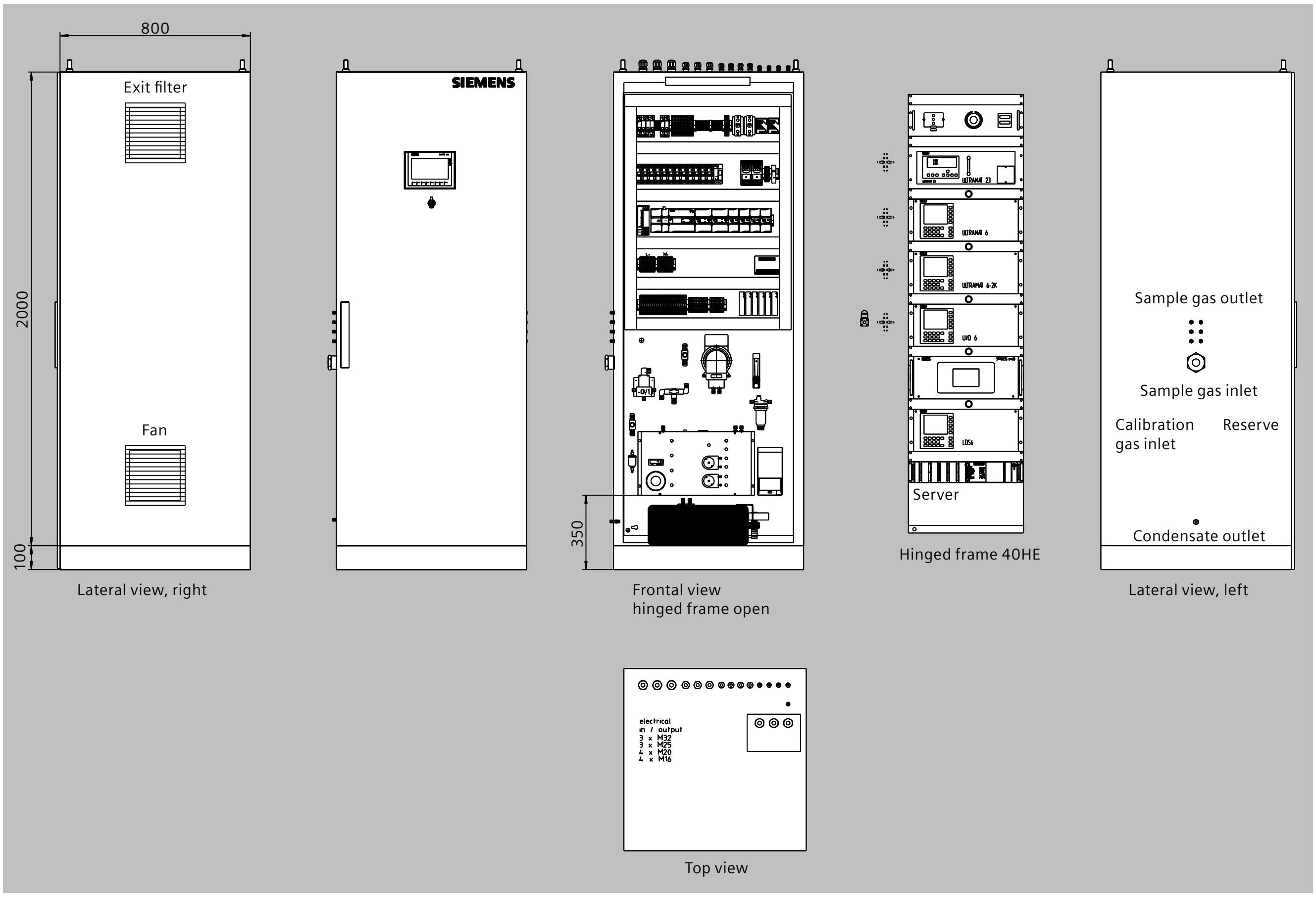
You can find detailed information on the analyzers under "Extractive continuous process gas analytics".

Dimensional drawings



Set CEM CERT, version with refrigerator, dimensions in millimeter

Dimensional drawings (Continued)



Set CEM CERT, version with fan, dimensions in millimeter

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 requirement 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 two-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 Set CEM 1 is the mounting frame with hinged frame (40 U) 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). Hose and cable entry can take place from the left or right. A distance of 500 mm must be provided on the left or right at the installation site for hose and cable entry.
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.

<u>Preparation of sample preparation system for second ULTRAMAT 23</u>

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.

<u>Additional filter</u>

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 Set CEM 1 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.

Design (Continued)

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 two-pole fusing.
The two-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 measuring 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%

Design (Continued)

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 (German Technical Inspectorate).

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 (German Technical Inspectorate).
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 (German Technical Inspectorate).
Limitation:
Component has not been type approved by TÜV (German Technical Inspectorate). 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.

Design (Continued)

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 (German Technical Inspectorate).
Limitation:
Component has not been type approved by TÜV (German Technical Inspectorate). 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 connecting 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 DIN rail module

On request.

Electrical preparation for emission data memory in 19" rack unit

On request.

Additional LOGO! module for four or more 19" rack units

Sets with more than three 19" rack units integrated require a LOGO! expansion module. The delivery also includes connection and programming.

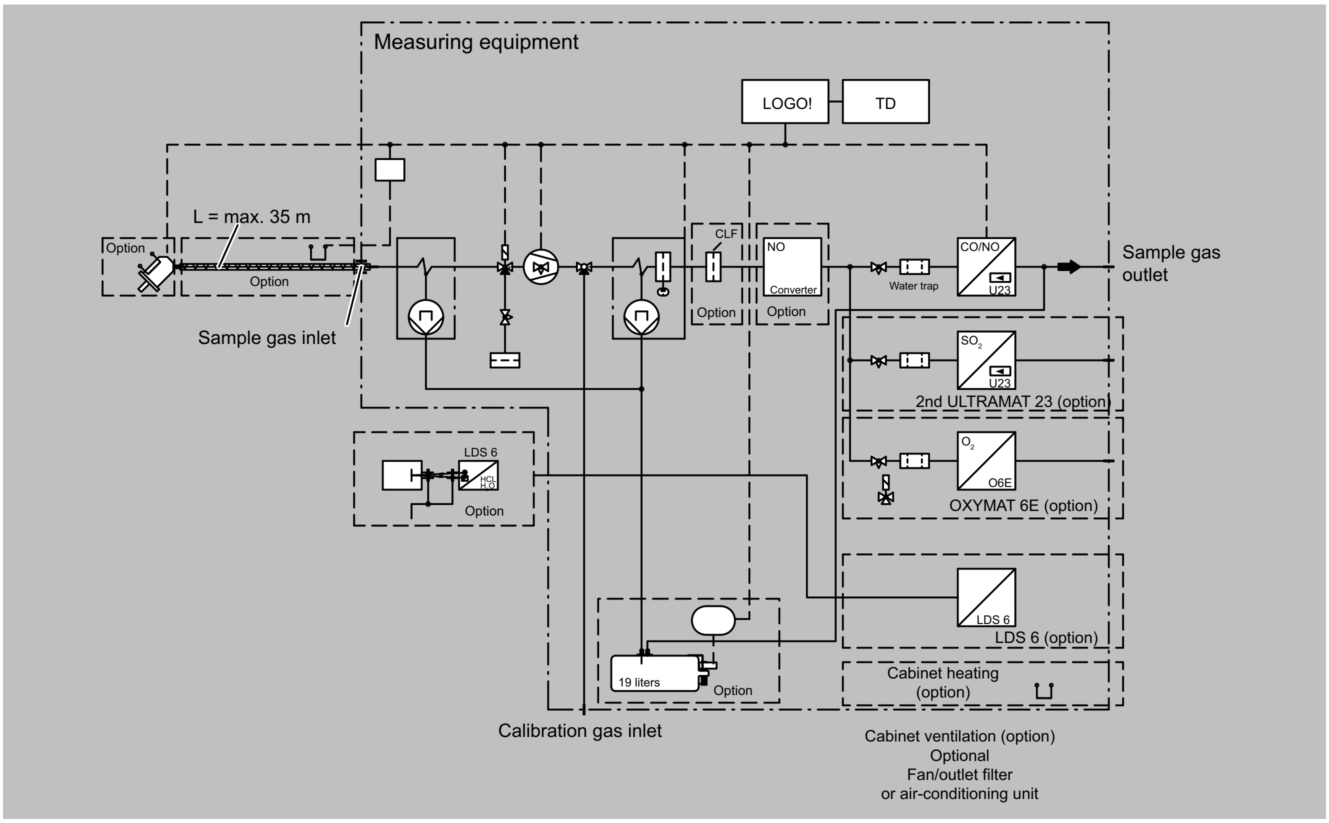
Design (Continued)

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 specification sheets and Operating Instructions for the components and devices used.
The documentation language for parts provided by other suppliers may deviate. System description, LOGO! program and test certificates are also included in the documentation.
The documentation contains no customer-specific/project-specific markings, and consists of two folders and one CD per set.



Set CEM 1, gas flow chart including options

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 demanded.
- The analog signals can be processed either singly or twice.
  - Galvanic isolation is additionally possible for the double processing.

Selection and ordering data

Set CEM 1 – Continuous Emission Monitoring	Article No. 7MB1953-	●	●	●	●	●	-	●	●	●	●
Click on the Article No. for online configuration in the PIA Life Cycle Portal. ***Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".***											
Rack											
Rack 1: 2 000 × 800 × 800 mm (H x W x D), with sample preparation device, with hinged frame 40 U, hose/cable entry on left side, with lighting, prepared for 1 × ULTRAMAT 23, max. five 19" rack units possible		0									
Rack 2: 2 000 × 800 × 800 mm (H x W x D), with sample preparation device, with hinged frame 40 U, hose/cable entry on right side, with lighting, prepared for 1 × ULTRAMAT 23, max. five 19" rack units possible		1									
Rack 3: 2 000 × 800 × 600 mm (H x W x D), with sample preparation device, with hinged frame 40 U, hose/cable entry on left side, with lighting, prepared for 1 × ULTRAMAT 23, max. five 19" rack units possible, not suitable for LDS 6		2									
Rack 4: 2 000 × 800 × 600 mm (H x W x D), with sample preparation device, with hinged frame 40 U, hose/cable entry on right side, with lighting, prepared for 1 × ULTRAMAT 23, max. five 19" rack units possible, not suitable for LDS 6		3									
Rack 5: 2 060 × 900 × 600 mm (H × W × D) GFK, base 80 mm, with sample preparation device, with hinged frame 40 U, hose/cable entry on left side, with lighting, prepared for 1 × ULTRAMAT 23, with side panels, incl. door with window, max. five 19" rack units possible, not suitable for LDS 6		4									
Rack 6: 2 060 × 900 × 600 mm (H × W × D) GFK, base 80 mm, with sample preparation device, with hinged frame 40 U, hose/cable entry on right side, with lighting, prepared for 1 × ULTRAMAT 23, with side panels, incl. door with window, max. five 19" rack units possible, not suitable for LDS 6		5									
Sampling probe											
Without			A								
Standard sampling probe			B								
Ventilation/cooling											
Without				A							
Fan with outlet filter				B							
Cabinet air-conditioning unit				C							

Selection and ordering data (Continued)

Set CEM 1 – Continuous Emission Monitoring	Article No. 7MB1953-	●	●	●	●	●	-	●	●	●	●
Cabinet air-conditioning unit for GRP rack				D							
Heater											
Without					0						
Cabinet heating					1						
Fuse protection											
1-pole						0					
2-pole						1					
Removal of condensation											
Without								0			
19 l vessel 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.											

Options	Order code
Add "**-Z**" to article number and then add order code	
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: Paramagnetic O_2 OXYMAT analyzer	**C06**
Prepared for integration of any ULTRAMAT 23 of your choice	**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 for each LDS 6	
5 m	**F01**
10 m	**F02**
25 m	**F03**
40 m	**F04**
50 m	**F05**

Selection and ordering data (Continued)

Options	Order code
LDS 6 connection cable for each LDS 6	
5 m	**G01**
10 m	**G02**
25 m	**G03**
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**
Electrical preparation for emission data memory – 19" rack unit (on request)	**J06**
Additional LOGO! module	
LOGO! module for a 3rd and 4th 19" rack unit	**K01**
Core end labeling	
Single-core labeling Siemens standard	**L01**
Single-core labeling, customized	**L02**
Analog signal processing	
Double, electrically connected, 1 x per analog signal	**M01**
Double, electrically isolated, 1 x per analog signal	**M02**
Documentation	
German	**N01**
English	**N02**
French (on request)	**N03**

Technical specifications

Set CEM 1	
Climatic conditions	
Ambient temperature	0 ... 35 °C
• With heater in sheet-steel cabinet	Min. -5 °C
• With heating in GRP cabinet	Min. -15 °C
• With air-conditioning	Max. 52 °C
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 °C
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 × 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%)

Technical specifications (Continued)

Set CEM 1	
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	
Place of installation	
• In sheet-steel cabinet/frame	Indoor installation
• In GRP cabinet	Outdoor installation
Hazardous zone	Non-hazardous 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)	2 000 × 800 × 800 mm (H × W × T)
• 600 mm (without plinth)	2 000 × 800 × 600 mm (H × W × D)

Technical specifications (Continued)

Set CEM 1	
GRP cabinet (with plinth)	2 080 × 900 × 600 mm (H × W × T)

It is necessary to allow 500 mm of clearance on the left or right for the hose/cable entry. The use of LDS 6 requires a cabinet with a depth of 800 mm.

Detailed information on the analyzers

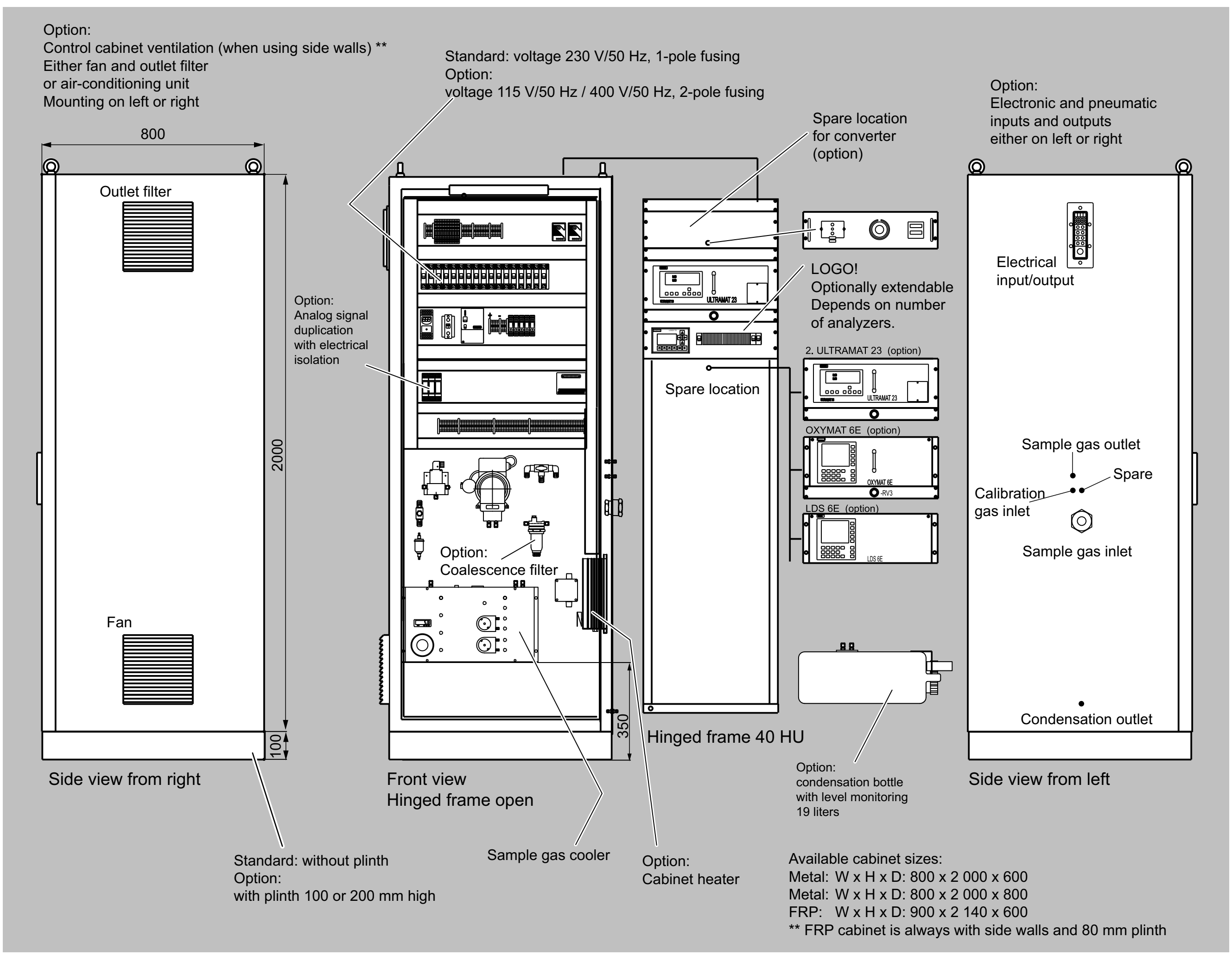
You can find detailed information on the analyzers in:
"Extractive continuous process gas analytics"

- ULTRAMAT 23
- OXYMAT 6

"In-situ continuous process gas analytics"

- LDS 6

Dimensional drawings



Set CEM 1 configuration, figure contains options, dimensions in mm

Overview

Total mercury analyzer for continuous process and emission monitoring with option for separate determination of elemental and oxidized mercury.

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 not only monitors 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.

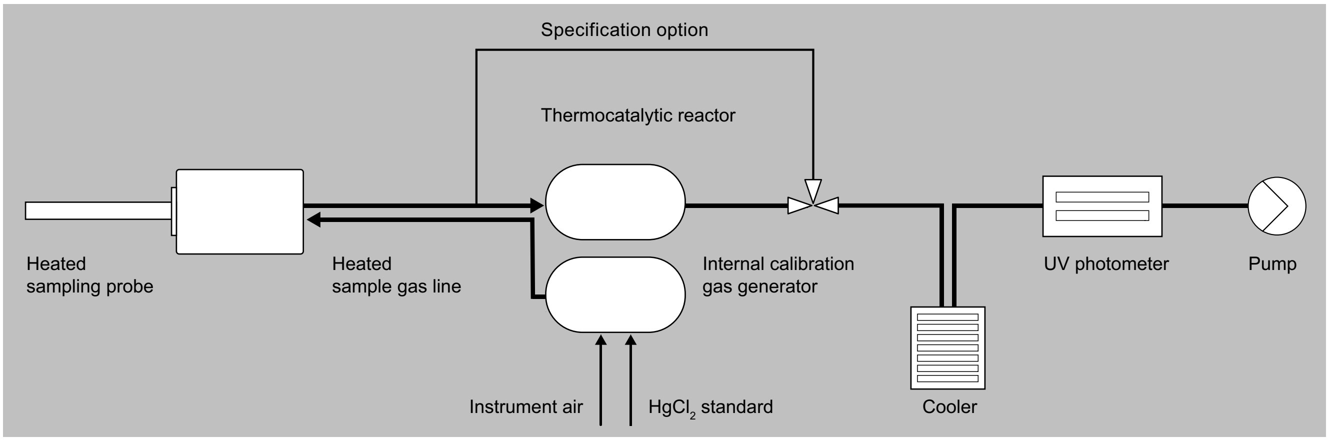
Application areas

- Combustion plants
- Metal and steel industry
- Power plant industry
- Waste incineration
- Crematoria
- Scrap metal recycling

Approvals

- TÜV Rheinland (German Technical Inspectorate), test report 936/21245908/A from 6 May 2019
- EN 15267-1, EN 15267-2, EN 15267-3 and EN 14181
- MCERTS

Design



HM-1400 TRX 2 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 pipe design to prevent faulty measurements (lower findings for the mercury concentration measurement due to the absorption properties of $HgCl_2$).

Thermocatalytic reactor

The total mercury analysis measures not only the elemental metallic mercury that is stored freely in the sample gas or deposited in the materials, but also measures the oxidized mercury that is found in the flue gas. The oxidized mercury must also be converted into elemental, 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

After thermocatalytic conversion, the Hg^0-containing sample gas is dried in a sample gas cooler and any condensate is removed. The system pressure and the sample gas temperature are continuously recorded.

2-beam UV photometer

The dried sample gas enters the measuring cuvette, is measured there and then passed through selective filters for mercury, which completely absorbs the elemental mercury. The mercury-free sample gas then flows through the reference cuvette and is measured again. This principle of differential measurement between the two cuvettes means that, compared to the single-beam photometer with only one measuring cuvette, the measurement is less sensitive to spectrometric interference components. The measured signal from the photometer is received and processed by the internal PLC. The mercury concentration is output as 4 to 20 mA current signal to match the set measuring range of 0 to X µg/Nm³ (dry).

Sample gas flow

When the sample gas volume flow leaves the 2-beam UV photometer, it passes through the sample gas pump. The volume flow of approx. 100 Nl/h is set manually with the fine regulating valve. Sharp changes in the volume flow indicate leaks or blockages in the overall system.

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 configured using a variety of concentrated reference solutions.

Optional

- Dilution device for aggressive and heavily dust-laden process gases
- Specification module for the separate measurement of elemental and oxidized mercury
- Side-mounted cooling device and/or cabinet heater for the extended temperature range of 0 ... 50 °C
- Heated sample pipe 0.6 m, 1.0 m, 1.5 m

Mode of operation

In the HM 1400 TRX 2 total mercury analysis system, the sample gas is processed by a combination of thermal and chemical treatment. The total mercury concentration is then continuously measured in a photometer. The concentration is calculated in µg/m³ (dry in the standard condition), displayed and output via an analog output.

Technical specifications

HM-1400 TRX total mercury analyzer system	
General information	
Measured variable	Total mercury concentration in µg/m³
Measuring ranges	0 ... 15/45/75 µg/m³ (QAL1) and 0 ... 400 µg/m³, 0 ... 3 000 µg/m³(depending on device version)
Measuring principle/measuring method	Extractive total mercury measurement by thermocatalytic conversion and atomic absorption spectroscopy
Dimensions (W × H × D)	1 700 × 800 × 500 mm
Weight	220 kg
Operating conditions in the channel	• Temperature: Max. 300 °C • Relative humidity: 0 ... 100% • Gauge pressure: -50 ... +20 hPa
Dimensions of the channel	Inside diameter: Min. 0.5 m
Ambient conditions	Temperature: • -20 ... +50 °C (sampling) • 0 ... +50 °C (analyzer)
Degree of protection	IP54 according to EN 60529
Interface	Analog output: 3 × 4 ... 20 mA, max. 500 ohm, configurable parameters Digital input: 8 × status input, configurable parameters Digital output: 9 × relay contact NO (normally open), configurable parameters
Operating voltage (electrical data)	• 230/400 V 3 × 25 A, N, PE, 50 Hz, max. 10 kVA • Measuring device 1 200 VA • Sampling probe 650 A • Sampling line 100 VA/m, max. 40 m without external support • Heated sample pipe 0.6 m/1.0 m/1.5 m, 600 VA/800 VA/1 200 VA
Instrument air supply	Only for operation with dilution or for internal drift check with reference gas (HgCl2): • Dilution: 3 ... 13 bar, max. 100 l/h • Internal drift check: 3 ... 8 bar, max. 500 l/h (corresponds to 680 l/week)

More information

A HM-1400 TRX 2 total mercury analyzer system consists of, among other items:

- 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 2 Total Mercury Analysis System for a Siemens CEMS project.

HM-1400 TRX total mercury analyzer system / D-R 220 dust and opacity measuring instrument

Overview

The affordable solution for continuous, non-contacting dust and opacity measurement at medium to high concentrations in dry flue and process gases.

Benefits

- Easy installation for opacity monitoring and reliable emission monitoring
- Reliable measurement of medium to high dust concentrations
- Space-saving and simple installation
- Transmission measurement principle opens up a wide range of applications
- Use even under extreme sample gas conditions

Application

The D-R 220 allows emission measurement of dry flue and process gases even with a complex gas matrix directly at the flue. In addition, the device enables the timely detection of exceedance of impermissibly large dust emissions. 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.

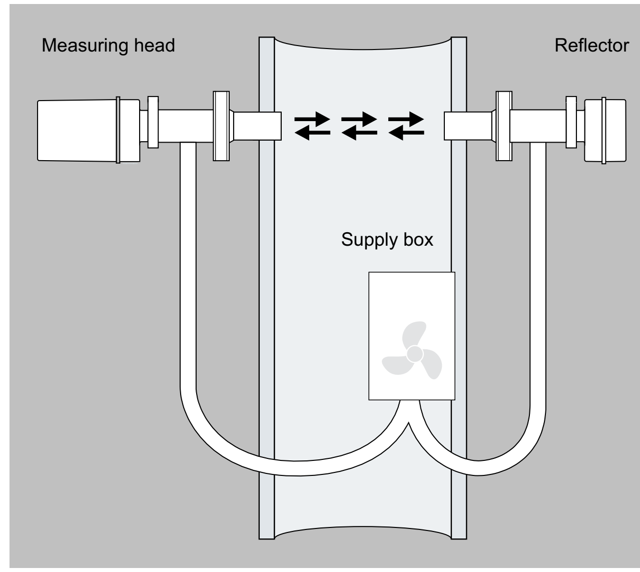
Application areas

- Power generation, metal and steel industry, oil and gas, petrochemical industry
- Refinery
- Chemical industries, pulp and paper, cement industry
- Plaster
- Clinker, waste incineration, power plant industry, scrap metal recycling, sinter plant

Approvals

- Product certified by TÜV Rheinland (German Technical Inspectorate): Tested AMS, regular monitoring, test mark number 0000051694_01

Design



D-R 220 system components

Measuring device

The transmitter and receiver optics are integrated together with the electronics in a sturdy, compact polyamide housing. The measuring device 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 device.

Supply unit D-TB 200 including purge air

A hose connects the measuring device and the reflector with the supply unit. The filtered air is used to keep the scattered light interfaces of the measuring device and the reflector clean. A cable connects the measuring device to the supply unit.

Software D-ESI 100

Parameterization software, visualization of the measured data and performance of maintenance functions.
The device can be parameterized, maintained and, in the event of a fault, analyzed via the USB port with the help of a Windows PC and the associated software D-ESI 100.

Optional

Universal control unit D-ISC 100

Up to eight connected devices can be easily configured and operated 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

Design (Continued)

- 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.
By means of a gravimetric reference calibration, a calibration curve can be stored on the integrated electronics and the measured signal can be converted into a dust concentration in mg/m³.

Technical specifications

D-R 220 dust and opacity measuring instrument	
General information	
Measured variable	Extinction, opacity can be calibrated as dust concentration in mg/m³
Measuring range	• Opacity: 0 ... 100% • Extinction: 0 ... 1.6 • Dust concentration: 0 ... 5 000 mg/m³
Measuring principle	Transmission, non-contacting and in situ measurement
Dimensions (W × H × D)	• Measuring device: - 150 × 132 × 214 mm - 150 × 132 × 331 mm (with purge flange) • Reflector: - 126 × 132 × 101 mm - 126 × 132 × 218 mm (with purge flange)
Weight	• Measuring device: 2.7 kg • Reflector: 1.6 kg
Operating conditions in the channel	• Temperature: Max. 200 °C, optional: 500 °C • Relative humidity: 0 ... 95%, no condensation • Gauge pressure: - -50 ... +10 hPa standard - -50 ... +50 hPa option
Dimensions of the channel	Inside diameter: 0.4 ... 10 m
Ambient conditions	• Installation location: indoor or outdoor installation¹⁾ • Temperature: -20 ... +50 °C
Degree of protection	IP65 according to EN 60529
Interface²⁾	• Analog output: 1 × 4 ... 20 mA, max. 400 ohm, floating (various parameters adjustable) • Digital output: 2 × NC/NO, max. 60 V DC, 30 V AC, 0.5 A (various parameters adjustable) • RS 485 Modbus RTU, USB • Status display: LED
Operating voltage	24 V DC, 0.4 A
Supply unit D-TB 200	
Purge air supply	Integrated side channel condenser
Operating voltage	90 ... 264 V AC, 48 ... 62 Hz, 200 VA
Dimensions (W × H × D)	Stainless steel enclosure: 410 (528) × 400 (454) × 240 mm
Weight	17.9 kg
Material	Stainless steel
Degree of protection	IP65

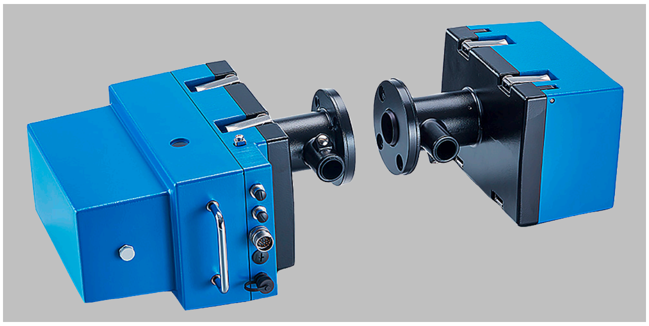
1) Weather protection cover required for outdoor installation.
2) Additional interfaces with control unit D-ISC 100.

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.

HM-1400 TRX total mercury analyzer system / D-R 290 dust and opacity measuring instrument

Overview



For continuous, non-contacting dust and opacity measurement at medium to high concentrations in dry flue and process gases. Also suitable for difficult plant conditions.

Benefits

- Suitable for regulatory emission monitoring
- Reliable measurement of medium to high dust concentrations
- Space-saving and simple installation
- Long service life and high availability under extreme plant conditions

Application

The D-R 290 allows emission measurement of dry flue and process gases even in corrosive flue gases directly at the flue. In addition, the device enables the timely detection of exceedance of impermissibly large dust emissions. 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. The D-R 290 is approved for regulatory emission monitoring and can therefore also be used for transmitting data to the authorities.

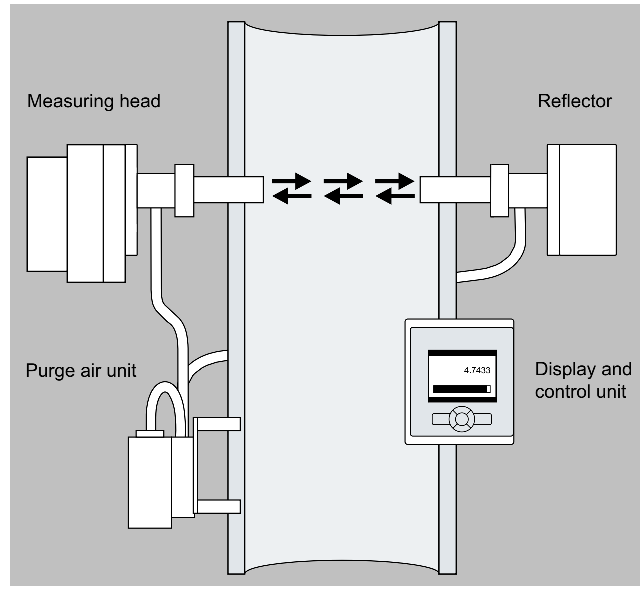
Application areas

- Power generation, metal and steel industry, oil and gas, petrochemical industry
- Refinery
- Chemical industries, pulp and paper, cement industry
- Plaster
- Clinker, waste incineration, power plant industry, scrap metal recycling, sinter plant

Approvals

- Suitability-tested by TÜV Cologne (German Technical Inspectorate), test report 936/21226948/A
- Certified according to EN 15267-1, EN 15267-2, EN 15267-3 and EN 14181
- MCERTS
- Conforming to US EPA 40 CFR 60 PS11

Design



D-R 290 system components

Measuring device

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 device 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 device.

Software D-ESI 100

Parameterization software, visualization of the measured data and performance of maintenance functions.
The device can be parameterized, maintained and, in the event of a fault, analyzed via the USB port with the help of a Windows PC and the associated software D-ESI 100.

Purge air unit

A hose connects the measuring device and the reflector with the purge air unit. The filtered air is used to keep the scattered light interfaces of the measuring device and the reflector clean.

Terminal box

Terminal box to output the data with connecting cable for the measuring device and customer terminal strips.

Optional

Universal control unit D-ISC 100

Up to eight connected devices can be easily configured and operated 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.

Quick-closing shutters

The quick-closing shutters are mounted on the measuring device and the reflector side between the weld-in flanges and the connected devices (measuring device, reflector). In the event of a fault (failure of the power supply or purge air), they automatically close

Design (Continued)

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 device, the reflector, the purge air unit and the junction boxes when the measuring system is installed outdoors.

Additional options

- Explosion-proof device design 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.
By means of a gravimetric reference calibration, a calibration curve can be stored on the integrated electronics and the measured signal can be converted into a dust concentration in mg/m³.

Technical specifications

D-R 290 dust and opacity measuring instrument	
General information	
Measured variable	Extinction, opacity can be calibrated as dust concentration in mg/m³
Measuring range	• Opacity: min. 0 ... 20%, max. 0 ... 100% • Extinction: min. 0 ... 01, max. 0 ... 2.0 • Dust concentration: min. 0 ... 80 mg/m³, max. 0 ... 4 000 mg/m³
Measuring principle	Transmission, non-contacting and in situ measurement
Dimensions (W × H × D)	• Measuring device: 370 × 190 × 400 mm • Reflector: 370 × 190 × 270 m
Weight	• Measuring device: 10 kg • Reflector: 7 kg
Operating conditions in the channel	• Temperature: Max. 250 °C, optional: 1 000 °C • Relative humidity: 0 ... 95%, no condensation • Gauge pressure: - -50 ... +50 hPa - -50 ... 0 hPa (ATEX/IECEx)
Dimensions of the channel	Inside diameter: 0.5 ... 18 m[1)]
Ambient conditions	• Installation location: Indoor or outdoor installation[2)] • Temperature: - -40 ... +60 °C - -30 ... +60 °C (ATEX) - -20 ... +60 °C (IECEx)
Degree of protection	IP65 according to EN 60529

Technical specifications (Continued)

D-R 290 dust and opacity measuring instrument	
Interface[3)]	• Analog output: 1 × 4 ... 20 mA, max. 400 ohm, floating (various parameters adjustable) • Digital output: 2 × NC/NO, max. 60 V DC, 30 V AC, 0.5 A (various parameters adjustable) • RS 485 Modbus RTU, USB • Status display: LED
Operating voltage	24 V DC/0.5 A
Purge air supply D-BL	
Purge air consumption	Approx. 60 m³/h @ 25 hPa
Operating voltage	115/230 V 50/60 Hz, LNPE
Dimensions	415 × 460 mm (base plate)
Weight	20 kg

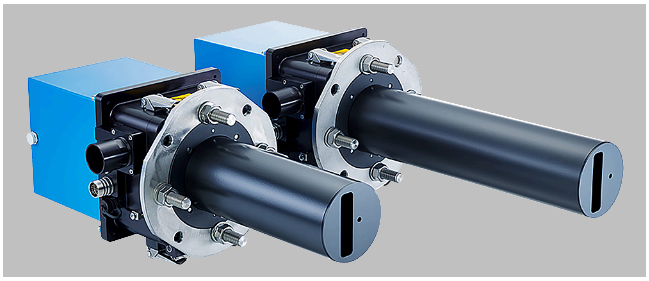
1) Measuring section > 1 m.
2) Weather protection cover required for outdoor installation.
3) Additional interfaces with control unit D-ISC 100.

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.

HM-1400 TRX total mercury analyzer system / D-R 320 dust measuring instrument

Overview



For continuous, non-contacting measurement of low to medium dust concentrations in dry flue and process gases. Also suitable for corrosive gases and hazardous areas.

Benefits

- Suitable for regulatory emission monitoring
- Reliable measurement of low dust concentrations
- Space-saving and simple installation
- Long service life and high availability under extreme plant conditions
- Low maintenance costs

Application

The D-R 320 allows emission measurement of dry flue and process gases even with a complex gas matrix directly at the flue. In addition, the device enables the timely detection of exceedance of impermissibly large dust emissions. 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. The D-R 320 is approved for regulatory emission monitoring and can therefore also be used to transmit data to the authorities.

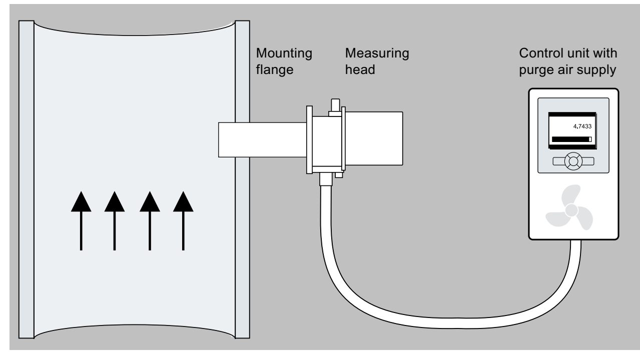
Application areas

- Building materials industry, power generation, metal and steel industry, oil and gas, petrochemical industry
- Refinery
- Chemical industries, pulp and paper, combustion plants, cement industry
- Plaster
- Clinker, recycling industry, waste incineration, waste incineration, combined heat and power plant, wood industry, power plant industry, scrap metal recycling, sinter plant

Approvals

- Suitability tested by TÜV Rheinland (German Technical Inspectorate), test report 936/21225028/B dated 1 March 2015
- Certified according to EN 15267-1, EN 15267-2, EN 15267-3 and EN 14181
- MCERTS
- Conforming to US EPA 40 CFR60 PS11

Design



D-R 320 system components

Measuring device D-R 320 M

The measuring device is integrated together with the electronics in a compact unit in a rugged enclosure.
The measuring device consists of:

- Transceiver
- Swivel adapter
- Process connection
- Field diaphragm

This measuring unit is installed directly above the exhaust gas duct on a DN 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 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 device can be parameterized, maintained and, in the event of a fault, analyzed via the USB port with the help of a PC and the associated software D-ESI 100.

Optional

<u>Universal control unit D-ISC 100</u>

Up to eight connected devices can be easily configured and operated 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.

<u>Measured value acquisition</u>

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.

<u>Quick-closing shutter</u>

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 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

Design (Continued)

protected against overheating in the event of a fault. The measuring device takes over control of the quick-closing shutter.

Weather protection covers

Weather protection covers are available to protect the measuring system for outdoor installation.

Explosion-proof device design

An explosion-proof device design with pressurized enclosure according to Ex p, Zone 1, Zone 2 or Zone 22, as well as IECEx 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.
By means of a gravimetric reference calibration, a calibration curve can be stored on the integrated electronics and the measured signal can be converted into a dust concentration in mg/m³.

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 automatic contamination correction. Any maintenance required is immediately indicated by the electronics.

Technical specifications

D-R 320 dust measuring instrument	
General information	
Measured variable	Scattered light units, can be calibrated as dust concentration in mg/m³
Measuring range	• Min. 0 ... 5 mg/m³ • Max. 0 ... 200 mg/m³
Measuring principle	Backscatter, single-sided installation, non-contacting and in situ measurement
Dimensions (W × H × D)	200 × 190 × 260/410 mm
Weight	15 kg
Operating conditions in the channel	• Temperature: Max. 600 °C • Relative humidity: 0 ... 95%, no condensation • Gauge pressure: - -50 ... +50 hPa - -50 ... 0 hPa (ATEX/IECEx)
Dimensions of the channel	• Min. inner diameter: 0.7 m • Max. wall thickness: 0.56 m
Ambient conditions	• Installation location: indoor or outdoor installation[1)] • Temperature: - -40 ... +60 °C - -30 ... +60 °C (ATEX) - -20 ... +60 °C (IECEx)
Degree of protection	IP65 according to EN 60529

Technical specifications (Continued)

D-R 320 dust measuring instrument	
Interface[2)]	• Analog output: 1 × 4 ... 20 mA, max. 400 ohm, floating (various parameters adjustable) • Digital output: 2 × NC/NO, max. 60 V DC, 30 V AC), 0.5 A (various parameters adjustable) • RS 485 Modbus RTU, USB • Status display: LED
Operating voltage	24 V DC/0.5 A
Supply unit D-TB 200	
Purge air supply	Integrated side channel condenser
Operating voltage	90 ... 264 V AC, 48 ... 62 Hz, 200 VA
Dimensions (W × H × D)	Stainless steel enclosure: 410 (528) × 400 (454) × 240 mm
Weight	17.9 kg
Material	Stainless steel
Degree of protection	IP65

1) Weather protection cover required for outdoor installation.
2) Additional interfaces with control unit D-ISC 100.

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.

HM-1400 TRX total mercury analyzer system / D-R 808 dust measuring instrument

Overview

For continuous measurement of low to medium dust concentration in dry flue and process gases. Single-sided installation for difficult plant conditions.

Benefits

- Suitable for regulatory emission monitoring
- Reliable measurement of low dust concentrations
- Space-saving and simple installation
- Reliable emission monitoring
- Long service life

Application

The D-R 808 allows emission measurement of dry flue and process gases directly at the flue. In addition, the device enables the timely detection of exceedance of impermissibly large dust emissions. 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. The D-R 808 is approved for regulatory emission monitoring and can therefore also be used to transmit data to the authorities.

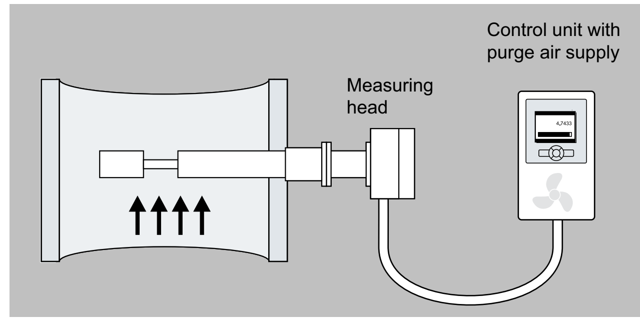
Application areas

- Building materials industry, power generation, oil and gas, petrochemical industry
- Refinery
- Chemical industries, pulp and paper, combustion plants, recycling industry, waste incineration, combined heat and power plant, wood industry, power plant industry

Approvals

- Suitability-tested by TÜV Cologne (German Technical Inspectorate), test report 936/21232768/C
- Certified according to EN 15267-1, EN 15267-2, EN 15267-3 and EN 14181
- MCERTS
- Conforming to US EPA 40 CFR60 PS11

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 enclosure. 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.

Connecting 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 device can be parameterized, maintained and, in the event of a fault, analyzed via the USB port with the help of a Windows PC and the associated software D-ESI 100.

Optional

Universal control unit D-ISC 100

The connected devices can be easily configured and operated 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.
By means of a gravimetric reference calibration, a calibration curve can be stored on the integrated electronics and the measured signal can be converted into a dust concentration in mg/m³.

Technical specifications

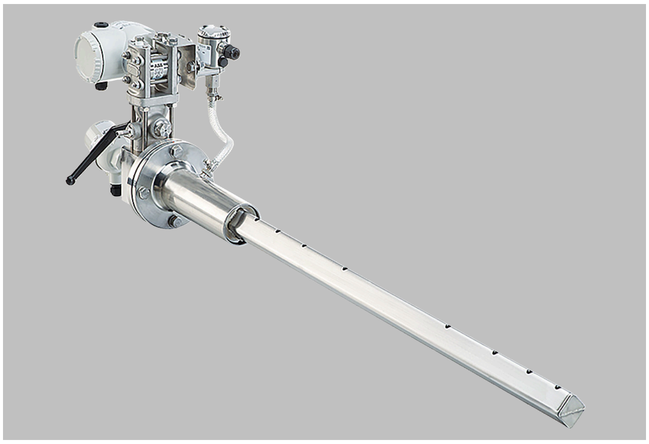
D-R 808 dust measuring instrument	
General information	
Measured variable	Scattered light units, can be calibrated as dust concentration in mg/m³
Measuring range	• Min. 0 ... 5 mg/m³ • Max. 0 ... 200 mg/m³
Measuring principle	Forward scattering, in situ measurement, single-sided installation
Dimensions (W × H × D)	160 × 160 × 600/1 000 mm
Weight	Approx. 3/7 kg
Operating conditions in the channel	• Temperature: Max. 350 °C, optional 500 °C • Relative humidity: 0 ... 95%, no condensation • Gauge pressure: -50 ... +50 hPa
Dimensions of the channel	• Min. inner diameter: 0.3 m • Max. wall thickness: 0.47 m
Probe	Length: 400/800 mm
Ambient conditions	• Installation location: indoor or outdoor installation[1)] • Temperature: -40 ... +60 °C
Degree of protection	IP65 according to EN 60529
Interface[2)]	• Analog output: 1 × 4 ... 20 mA, max. 400 ohm, floating (various parameters adjustable) • Digital output: 2 × NC/NO, max. 60 V DC, 30 V AC, 0.5 A (various parameters adjustable) • RS 485 Modbus RTU, USB • Status display: LED
Operating voltage	24 V DC/0.5 A
Supply unit D-TB 200	
Purge air supply	Integrated side channel condenser
Operating voltage	90 ... 264 V AC, 48 ... 62 Hz, 200 VA
Dimensions (W × H × D)	Stainless steel enclosure: 410 (528) × 400 (454) × 240 mm
Weight	17.9 kg
Material	Stainless steel
Degree of protection	IP65

[1)] Weather protection cover required for outdoor installation.
[2)] Additional interfaces with control unit D-ISC 100.

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.

Overview



System for continuous volume flow measurement in dry gases. Reliable, even under extreme operating conditions.

Benefits

- Certified for regulatory emission monitoring
- Accurate measurement of speed and volume flow even under demanding operating conditions
- Space-saving and simple single-sided installation (optional)
- Suitable for operation in hazardous areas (optional)
- Suitable for use in hot gases

Application

The D-FL 100 continuously determines the sample gas speed for reliable emission monitoring, even in hot or aggressive gases, and in small to large flues. The D-FL 100 can be used for reliable emission monitoring even in hazardous areas. The measuring system is therefore ideal for process control and process optimization.

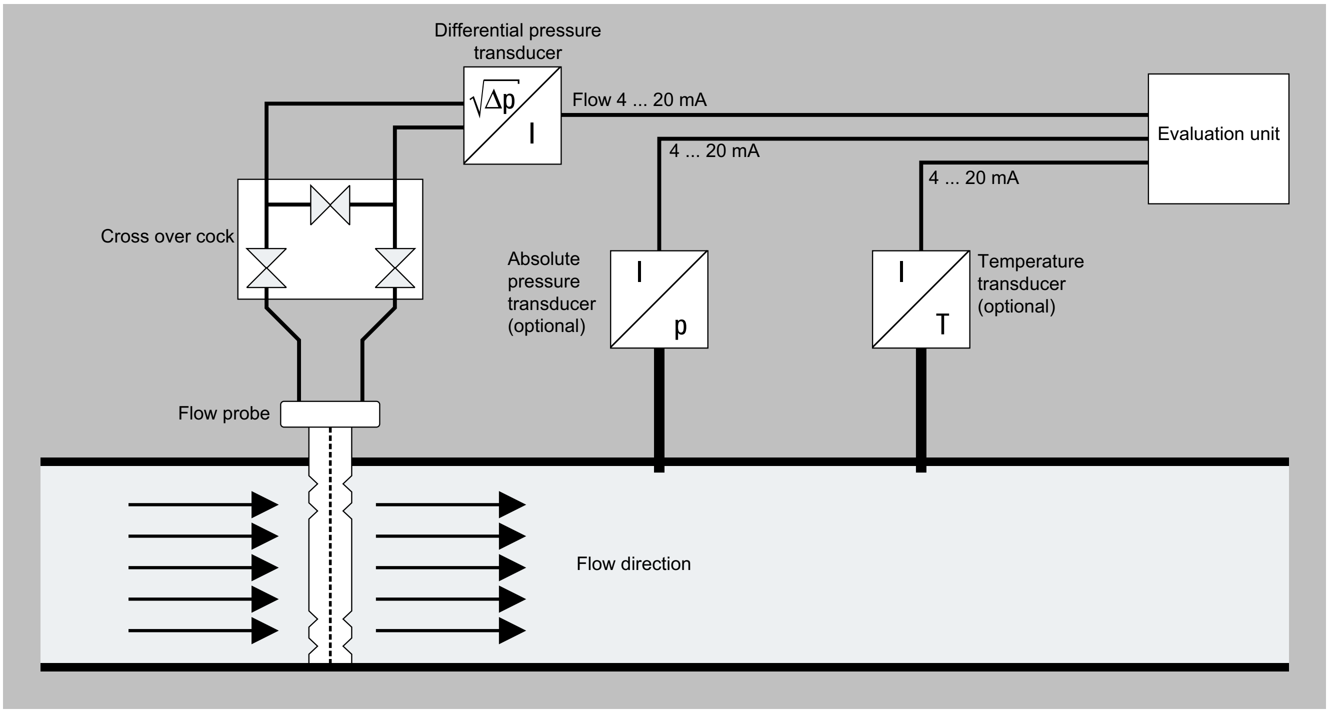
Application areas

- Building materials industry, power generation, metal and steel industry, oil and gas, petrochemical industry
- Refinery, combustion plants, cement industry
- Plaster
- Clinker, power plant industry, waste incineration, crematories, process monitoring

Approvals

- Suitability-tested by TÜV Rheinland (German Technical Inspectorate), test report 936/21218492/C
- Certified according to EN 15267-1, EN 15267-2, EN 15267-3 and EN 14181
- MCERTS

Design



D-FL 100 system components

Measuring probes

Each probe is custom manufactured to meet the requirements of the application. Different sizes are available depending on the flue diameter and dust load:

- Probe type 1: 300 ... 2 000 mm
- Probe type 2: ≤ 4 000 mm
- Probe type 3: > 4 000 mm

Placement of the transmitter

- 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

Multiway cock

Cross-over device for the backflush of the averaging pitot tube

Differential pressure transmitter

The transmitter is delivered with factory set defaults for the order-specific configuration. The zero point should be calibrated after the installation.

Counter bearing

A counter bearing is required for a probe mounted on two sides. The counter bearing not only supports the probe 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 transmitter. 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.

Design (Continued)

Software D-ESI 100

Parameterization software, visualization of the measured data and performance of maintenance functions for D-FL 100-20.
The device can be parameterized, maintained and, in the event of a fault, analyzed via the USB port with the help of a PC and the associated software D-ESI 100.

Optional

Universal control unit D-ISC 100

The connected devices can be easily configured and operated 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

Weather protection covers are available to protect the probe head and the back purging control when the measuring system is installed outdoors.

Transmitters

- Absolute pressure transmitter
- Temperature transmitter

Additional options

Probe material

Different materials are available for the probes for applications with high temperatures and/ or aggressive exhaust gases.

Ex version

The transmitters and the automatic backflush are also available in explosion-proof 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

D-FL 100 volume flow measuring system	
General information	
Measured variable	Differential pressure, speed, volume flow, volume flow (normalized), temperature, pressure
Measuring range	• Speed: 3 ... 50 m/s • Volume flow: 0 ... 3 000 000 m^3/h
Measuring principle	Differential pressure measuring principle, in situ measurement, continuous measurement, single-sided or two-sided installation
Dimensions (W × H × D)	• Evaluation unit A/P: 231 × 160 × 105 mm • Evaluation unit M: 62 × 90 × 54 mm • Measuring probe 1: 24 × 22 × 400 ... 2 000 mm • Measuring probe 2: 54 × 50 × 2 000 ... 4 000 mm • Measuring probe 3: 100 × 90 × 4 000 ... 8 000 mm

Technical specifications (Continued)

D-FL 100 volume flow measuring system	
Weight	• Measuring system with probe type 1: 19 kg + 1 kg/m probe length • Measuring system with probe type 2: 27 kg + 3.6 kg/m probe length • Measuring system with probe type 3: 28 kg + 6.8 kg/m probe length • Evaluation unit: 1 kg
Operating conditions in the channel	• Temperature: Max. 850 °C[1)] • Relative humidity: 0 ... 95%, no condensation • Gauge pressure: -50 ... +50 hPa • Dust concentration: Max. 30/100/150 mg/m^3, depending on the probe version
Dimensions of the channel	• Inside diameter: 0.4 ... 9 m • Wall thickness: Max. 300/800/1 300 mm, depending on the probe version
Ambient conditions	• Ambient temperature: - -20 ... +50 °C (certified) - -40 ... +60 °C (optional) • Air humidity: 30 ... 60% relative humidity, non-condensing
Degree of protection	• Evaluation unit: - IP65 (implemented in enclosure) - IP20 (implemented in DIN rail module) • Differential pressure sensor: IP67
Interfaces	• Analog output: 1 × 4 ... 20 mA, maximal 400 ohm, floating • Digital output: 2 × NC/NO, max. 60 V DC, 30 V AC, 0.5 A • Modbus RS 485 RTU, USB

Technical specifications (Continued)

D-FL 100 volume flow measuring system	
Operating voltage	• 24 V DC, 0.5 A (standard) • 90 ... 264 V AC, 48 ... 62 Hz (option)
Purge-air supply (optional)	6 ... 8 bar for backflush

[1)] Higher temperature on request.

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.

HM-1400 TRX total mercury analyzer system / D-FL 220 volume flow measuring system

Overview

For continuous, non-contacting volume flow measurement in dry and damp gases. Reliable, even under demanding operating conditions.

Benefits

- Certified for regulatory emission monitoring
- Precise measurement of the gas speed and volume flow
- Suitable for measurement in damp and aggressive gases
- Long service life and high availability even under extreme plant conditions
- Low maintenance costs

Application

The D-FL 220 continuously determines the sample gas speed for reliable emission monitoring, even in damp and aggressive gases, and in small to very large flues. Even at very low speeds (< 3 m/s), the D-FL 220 can be used for reliable emission monitoring. The measuring system is therefore ideal for process control and process optimization.

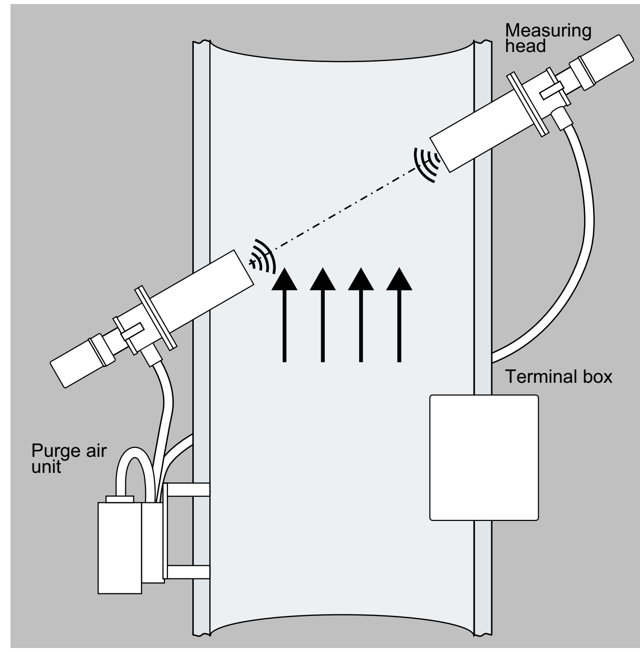
Application areas

- Volume flow measurement at low speeds
- Plants with damp and/or aggressive exhaust gas
- Building materials industry, power generation, metal and steel industry, oil and gas, petrochemical industry
- Refinery, combustion plants, cement industry
- Plaster
- Clinker, power plant industry, waste incineration, crematories, process monitoring

Approvals

- Suitability-tested by TÜV Rheinland (German Technical Inspectorate), test report 936/21218490/C
- Certified according to EN 15267-1, EN 15267-2, EN 15267-3 and EN 14181
- MCERTS
- Conforming to US EPA 40 CFR60 PS6

Design



D-FL 220 system components

Measuring devices

Two identically designed measuring devices 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 is proportional to the speed 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 air flange

The purge air is supplied to each of the two measuring heads via a purge air flange for cooling and cleaning the ultrasonic transducers. A toggle-type fastener connects the purge air flange to the measuring device.

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 devices to the purge air unit. The filtered air is used to cool the measuring devices and to keep the transmitters 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 device can be parameterized, maintained and, in the event of a fault, analyzed via the USB port with the help of a PC and the associated software D-ESI 100.

Design (Continued)

Optional

Universal control unit D-ISC 100

The connected devices can be easily configured and operated 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 transmitter
- 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

D-FL 220 volume flow measuring system	
General information	
Measured variable	Volume flow (operation), volume flow (normalized), speed, temperature
Measuring range	• Speed: 0 ... 40 m/s • Volume flow: 0 ... 5 000 000 m³/h
Measuring principle	Ultrasonic transit time difference method, in situ measurement, continuous measurement, double-sided installation, non-contacting measurement
Dimensions	• Enclosure dimensions (W × H × D) - 113 x 84 x 188 mm - 190 x 190 x 330 mm (with purge flange) • Measuring probe (D × L): 110 × 230 ... 2,270 mm, others on request
Weight	6.5 kg (sensor head 610 mm with purge flange, weight depending on version)
Operating conditions in the channel	• Temperature: Max. 300 °C • Relative humidity: 0 ... 95%, no condensation • Gauge pressure: -50 ... +20 hPa
Dimensions of the channel	• Inside diameter: 0.5 ... 14 m, depending on operating conditions in the channel • Wall thickness: Max. 800 mm

Technical specifications (Continued)

D-FL 220 volume flow measuring system	
Ambient conditions	• Temperature: - -40 ... +70 °C (measuring device) - -40 ... +60 °C (certified) • Air humidity: 30 ... 60% relative humidity, non-condensing
Degree of protection	IP65 according to EN 60529
Interfaces	• Analog output: 1 × 4 ... 20 mA, maximal 400 ohm, floating • Digital output: 2 × NC/NO, max. 60 V DC, 30 V AC, 0.5 A • Modbus RS 485 RTU, USB
Operating voltage	24 V DC/0.5 A
Purge air supply D-BL	
Purge air consumption	Approx. 60 m³/h @ 25 hPa
Operating voltage	115|230 V 50/60 Hz, LNPE
Dimensions (H × W)	415 × 460 mm
Weight	Approx. 20 kg

[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

Control unit including power supply and optional purge air supply

Benefits

- Space-saving and simple installation
- Simple and efficient system installation
- Operation at any time and from anywhere
- Suitable for use in extreme ambient conditions and in hazardous zones
- Reliable operation at various distances from the sensor installation site

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 control unit is made via Modbus. A version of the control unit with an integrated purging 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 interface. 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 DIN rail modules. Thus, for example, analog inputs/outputs or digital inputs/outputs can be adapted to the system requirements.

Approvals

Type-tested according to European directives EN 15267 and EN 14181 for continuous emission measurements in connection with the test reports no. 936/21225028/B (D-R 320), 936/21218492/C (D-FL 100), 936/21218490/C (D-FL 220) and 936/21232768/C (D-R 808) of TÜV Rheinland (German Technical Inspectorate).

Design

The universal control unit D-ISC 100 is available in four different versions:

- D-ISC 100 C
  - Control unit in compact field enclosure
- D-ISC 100 M
  - Control unit in field enclosure
  - Expandable with up to 4 standard DIN rail modules
- D-ISC 100 P
  - Control unit in field enclosure with integrated purging air blower (for D-R 220, D-R 320, D-R 808)
  - Expandable with up to 2 DIN rail modules
- D-ISC 100 R
  - Control unit for 19" rack
  - Expandable with up to 4 standard DIN rail modules

Optional

<u>Software modules</u>
The software modules will be standard as of 1 Jan. 2022.

<u>DIN rail modules</u>

- Analog input module with 4 analog inputs:
  0 to 20 mA with 2/4 mA live zero, load 50 ohm
- Analog output module with 4 analog outputs:
  0 to 20 mA with 4 mA live zero, max. load 400 ohm
- Digital input module with 8 digital inputs
- Digital output module with 8 digital outputs

Technical specifications

Basic unit

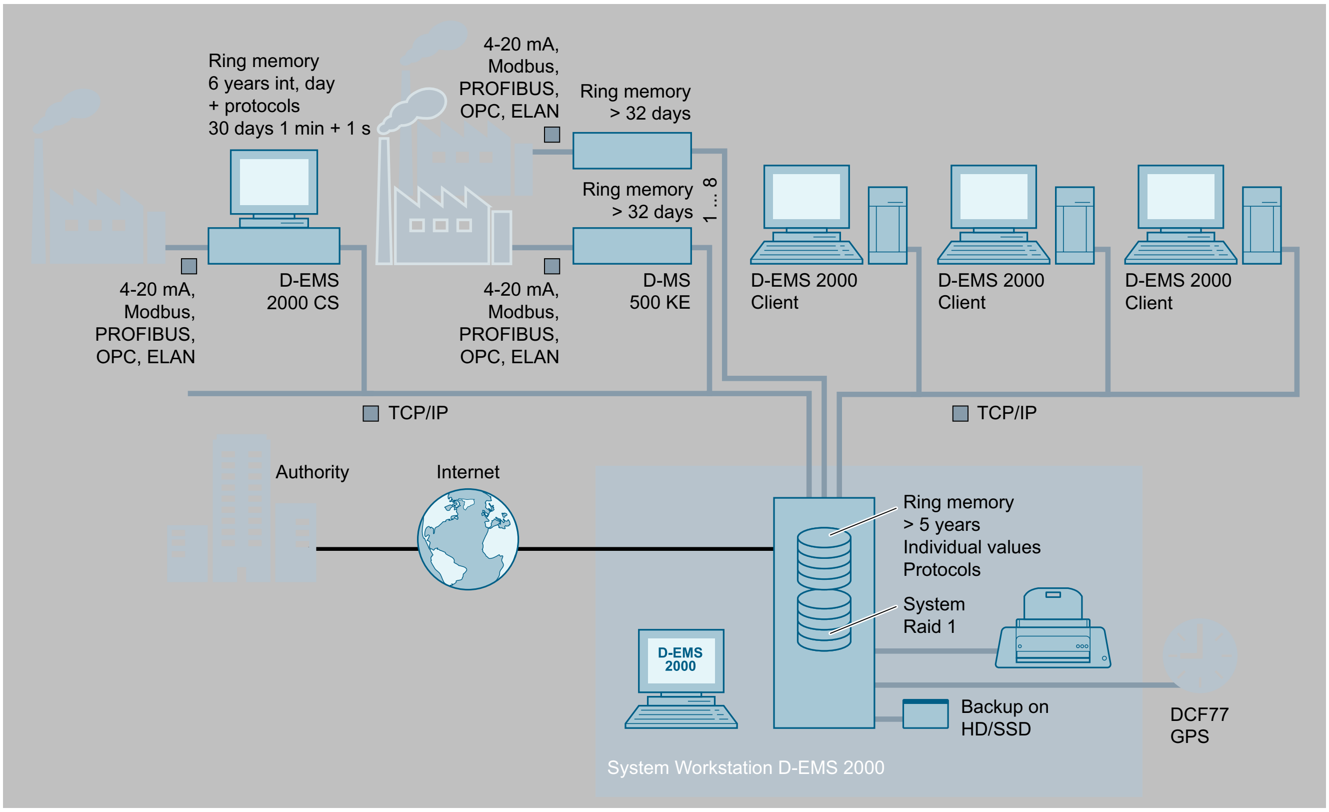
	D-ISC 100 C	D-ISC 100 M	D-ISC 100 P	D-ISC 100 R
General information				
Dimensions	270 × 266 × 120 mm	319 × 439 × 175 mm	529 × 454 × 241 mm	267 × 483 × 258 mm
Weight	5 kg	10 kg	20 kg	10 kg
Degree of protection	IP65	IP65	IP65	IP20
Ambient conditions				
Temperature	-20 ... +50 °C, -40 ... +60 °C optional	-20 ... +50 °C, -40 ... +60 °C optional	-20 ... +50 °C, -40 ... +60 °C optional	-20 ... +50 °C
Purge air supply	-	-	Integrated blower for D-R 220/D-R 320/D-R 808	-
Inputs and outputs				
Measured value output	0/4 ... 20 mA, 400 ohm	0/4 ... 20 mA, 400 ohm	0/4 ... 20 mA, 400 ohm	0/4 ... 20 mA, 400 ohm
• Analog output	1 × 4 ... 20 mA, max. 400 ohm, floating (various parameters adjustable)	1 × 4 ... 20 mA, max. 400 ohm, floating (various parameters adjustable)	1 × 4 ... 20 mA, max. 400 ohm, floating (various parameters adjustable)	1 × 4 ... 20 mA, max. 400 ohm, floating (various parameters adjustable)
• Digital output	2 × NC/NO, max. 60 V DC, 30 V AC, 0.5 A, floating (various parameters adjustable)	2 × NC/NO, max. 60 V DC, 30 V AC, 0.5 A, floating (various parameters adjustable)	2 × NC/NO, max. 60 V DC, 30 V AC, 0.5 A, floating (various parameters adjustable)	2 × NC/NO, max. 60 V DC, 30 V AC, 0.5 A, floating (various parameters adjustable)
Expansion modules (optional)				
• Analog output	4 × 4 ... 20 mA	4 × 4 ... 20 mA	4 × 4 ... 20 mA	4 × 4 ... 20 mA
• Analog input	4 × 4 ... 20 mA	4 × 4 ... 20 mA	4 × 4 ... 20 mA	4 × 4 ... 20 mA
• Digital output	8 × NC/NO	8 × NC/NO	8 × NC/NO	8 × NC/NO
• Digital input	8 × NC/NO	8 × NC/NO	8 × NC/NO	8 × NC/NO
Auxiliary power				
Operating voltage	90 ... 264 V AC, 48 ... 62 Hz	90 ... 264 V AC, 48 ... 62 Hz	90 ... 264 V AC, 48 ... 62 Hz	90 ... 264 V AC, 48 ... 62 Hz
Power consumption	200 VA	200 VA	450 VA	200 VA

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-ISC 100 display and control unit / 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 German Technical Inspectorate (TÜV) for systems in accordance with German Technical Instructions on Air Quality Control (TA Luft), 1st, 2nd, 13th, 17th, 27th, 30th and 31st German Federal Immission Protection Regulations
- Itemized in the list of suitable systems for evaluation of continuous emission measuring
- Certified according to 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

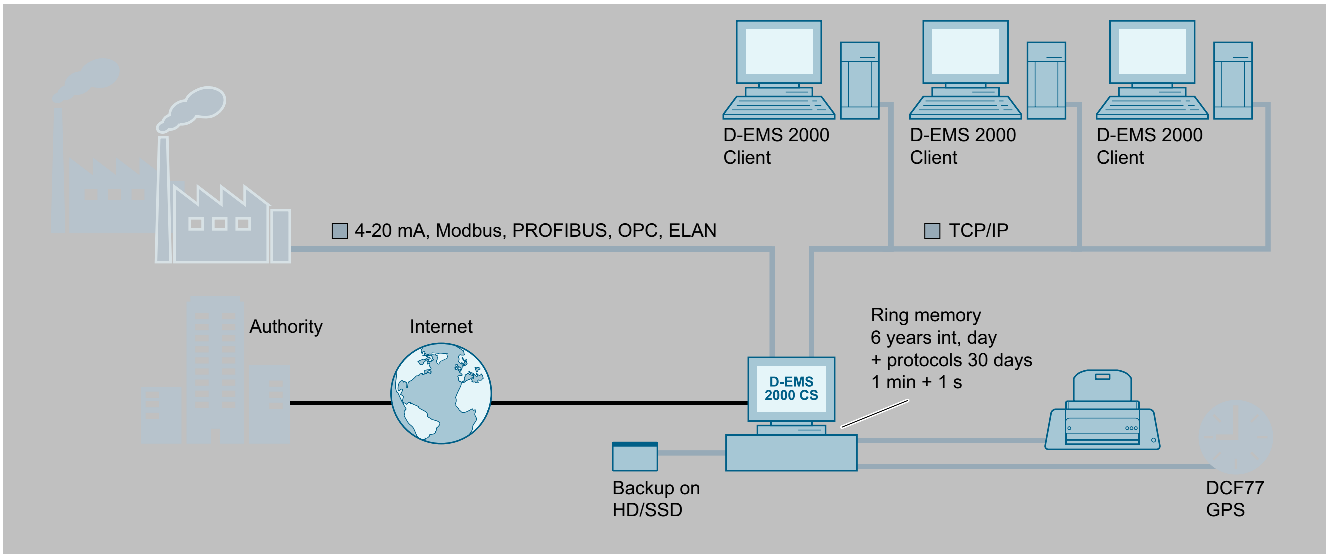
- Automatic preparation of annual emission declaration, from the individual values stored in the system, according to 11. BImSchV
- Compatible with official software, import/export module
- Automatic filling in of forms
- Reading in of historical emission declarations

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-ISC 100 display and control unit / 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 German Technical Inspectorate (TÜV) for systems in accordance with German Technical Instructions on Air Quality Control (TA Luft), 1st, 2nd, 13th, 17th, 27th, 30th and 31st German Federal Immission Protection Regulations
- Itemized in the list of suitable systems for evaluation of continuous emission measuring
- Certified according to 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

D-EMS 2000 CS	
Device designs	• Compact system in 19" 3 U 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 × VGA • 2 × USB • 1 × RJ 45 • 3 × 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**gas **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.

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

Selection and ordering data

Set BGA basic configuration, including flame arrestor	Article No. 7MB1955-	●	●	●	●	●	-	●	●	●	●
Click on the Article No. for online configuration in the PIA Life Cycle Portal. ***Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".***											
Gas connections, 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						
Auxiliary power											
120 V AC, 60 Hz						0					
230 V AC, 50 Hz						1					
110 V AC, 50 Hz						2					
220 V AC, 60 Hz						3					
Infrared measured components											
Version with one measured component (CH_4) 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 adjustable measuring range: 0 ... 20% • largest adjustable measuring range: 0 ... 100%								0			
Version for 2 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: 1st measured component CO_2 • smallest adjustable measuring range: 0 ... 20% • largest adjustable measuring range: 0 ... 100% 2nd measured component CH_4 • smallest adjustable measuring range: 0 ... 20% • largest adjustable measuring range: 0 ... 100%								1			
Version with one measured component (CO_2) 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 adjustable measuring range: 0 ... 0.5% • largest adjustable measuring range: 0 ... 2.5%								2			
Oxygen measurement											
Gas analyzer without oxygen sensor									A		
Electrochemical oxygen sensor; resistant to CO_2 Specification: • smallest adjustable measuring range: 0 ... 5% • largest adjustable measuring range: 0 ... 25% • repeatability: approx. 0.05% O_2									B		
Paramagnetic oxygen measuring cell; no sensor wear Specification: • smallest adjustable measuring range: 0 ... 2% • largest adjustable measuring range: 0 ... 100% • repeatability: < 1% of smallest measuring range									C		
H_2S measurement											
Without H_2S sensor										A	
With H_2S sensor, 0 ... 5 ppm to 0 ... 50 ppm										D	
Documentation											
German, 1 set (paper and CD)											0
English, 1 set (paper and CD)											1

Selection and ordering data (Continued)

Set BGA basic configuration, including flame arrestor	Article No. 7MB1955- ● ● ● ● ● - ● ● ● ●
French, 1 set (paper and CD)	2

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

Technical specifications

Set BGA	
Installation	
Ambient temperature	5 ... 38 °C, with cabinet heating ± 0 °C
Place of installation	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

Technical specifications (Continued)

Set BGA	
Connection systems	Metric (6 mm) or imperial (1/4") selectable
Dimensions	
Set BGA measuring system (W × H × D)	600 × 781 × 600 mm
Sample preparation (W × H × D)	600 × 600 × 220 mm
Weight	
Set BGA measuring system	Approx. 50 kg
Sample preparation	Approx. 22 kg
System design	
System housing	3-part sheet-steel enclosure with inspection 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 enclosure
Analog outputs	Per component 0/2/4 ... 20 mA; NAMUR, floating, max. load 750 Ω

Technical specifications (Continued)

Set BGA	
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 pre-configured ULTRAMAT 23 solutions (7MB2335-..., 7MB2337-...) • The technical performance data concerning the measuring response corresponds to the catalog data of the ULTRAMAT 23. The pre-configured version does not contain any ULTRAMAT 23 add-ons or retrofitting sets.

Set GGA

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.

Application (Continued)

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

Design (Continued)

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 involved 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 thresholds, or detecting the risk of this happening in good time.
- Monitoring the hydrogen purity.

Normal operation

During normal operation, the purity of the generator cooling gas is monitored. If the purity falls below a specific threshold (e.g. < 95 % H_2), a message is output. The monitored range is 80 to 100 % H_2 in air.

Filling the generator

Filling the generator is a two-step procedure: first, the air in the generator is replaced by inert gas (argon or CO_2). The inert gas is then replaced by hydrogen. During this procedure, the concentration trends of the gases are measured, and the replacement processes monitored.
To ensure that no potentially explosive mixtures arise:

- In the first step, the measuring range of 0 to 100% inert gas in the air must be monitored.
- In the second step, the measuring range of 0 to 100% H_2 in the inert gas must be monitored.

Emptying the generator

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 the inert gas first, and then 0 to 100% inert gas in the air.

Selection and ordering data

Set GGA	7MB1950-	●	●	●	0	●	-	●	●	●	●
Click on the Article No. for online configuration in the PIA Life Cycle Portal. *Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".*											
Gas connection											
6 mm pipe		0									
¼" pipe		1									
Version											
H_2 monitoring (turbo generators)			G	A							
Add-on electronics											
Without						0					
Auxiliary power											
100 ... 120 V AC, 48 ... 63 Hz								0			
200 ... 240 V AC, 48 ... 63 Hz								1			
Device design											
Set GGA, cable glands M20 x 1.5, power supply with cable diameter of 6 ... 12 mm									A		
Set GGA, with calibration gas skid, cable glands M20 x 1.5, power supply with cable diameter of 6 ... 12 mm (sample preparation on stainless steel plate), delivery batch in 2 shipments									B		
Set GGA, cable glands M25 x 1.5, power supply with cable diameter of 14 ... 18 mm									C		
Set GGA, with calibration gas skid pre-mounted on frame, cable glands M20 x 1.5, power supply with calibration gas kit (PA on stainless steel plate), pre-mounted on frame, delivery batch in 1 shipment									E		
Explosion protection											
Certificate: ATEX II 3G, flammable and non-flammable gases										B	
Documentation											
German											0
English											1
French											2
Spanish											3

Technical specifications

Set GGA	
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)
Calibration 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 isolation 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	
Place of installation	Interior
Hazardous zone analyzer	ATEX II, 3G

Technical specifications (Continued)

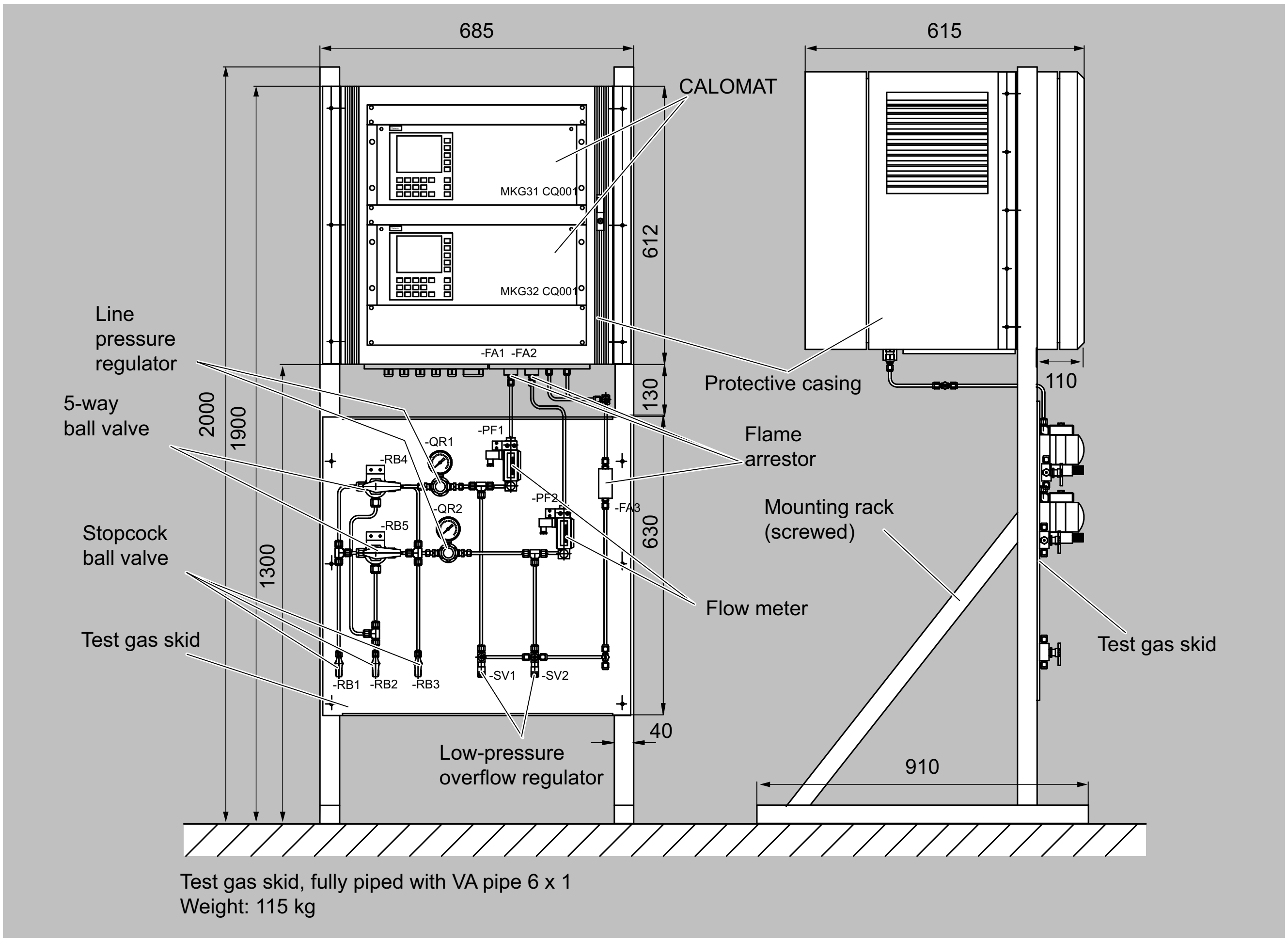
Set GGA	
System design	
Version	Cabinet
Degree of protection	IP54
Automatic calibration	No
Signal outputs	4 ... 20 mA/floating contact; max. 24 V AC/DC 1 A
With sample gas return flow	On request
Measuring response	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation	< ± 0.75% of the smallest possible measuring range according to nameplate, with electronic damping constant of 1 s (s = 0.25%)
Zero point drift	< 1%/week of the smallest possible measuring span according to nameplate
Measured value drift	< 0.5%/of the smallest possible measuring span according to nameplate
Repeatability	< 1% of the current measuring range
Detection limit	1% of the current measuring range
Linearity error	< ± 1% of the current measuring range
Influencing variables	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Ambient temperature	< 1%/10 K referred to smallest possible measuring span according to nameplate
Accompanying gases	Deviation from zero point
Sample gas flow	< 0.1% of the smallest possible measuring span according to nameplate 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 variation of 100 hPa
Auxiliary power	< 0.1% of the current measuring range with nominal 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.

Dimensional drawings



Set GGA, dimensions in mm, figure corresponds to 7MB1950-0GA00-1EB0

5

5/2	**Analyzer System Manager**
5/5	**SITRANS Analyzer Intelligence Director (SITRANS AID IQ)**

Overview

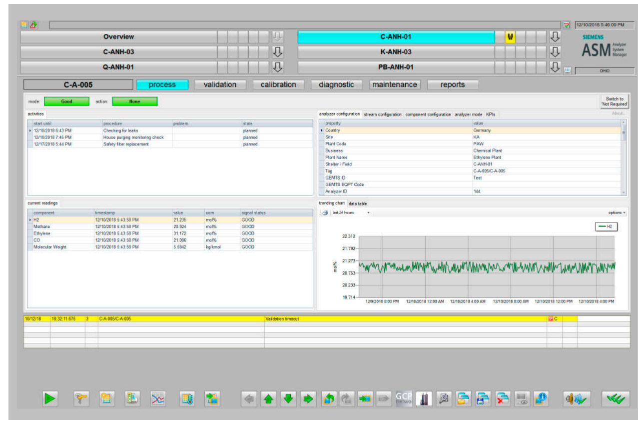
The Analyzer System Manager (ASM) is a PC-based operator control and monitoring system for monitoring, controlling and optimizing analyzers in subsystems or in the complete plant. The relevant information from different analyzers is collected via various communications protocols in software. Using the PC's user-friendly operator interface, it is possible to access measured value trends, device statuses and statistical evaluations, for example, or to start test routines for validation of the results. The software analyzes the collected data for possible problems and provides the user additional information. 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

- A single system monitors and controls all analyzers in the field and helps optimize their performance
- Increased stability of the process value through continuous analysis of the process value
- Optimization of the measured value precision and 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 or statistical deviations
- Increased availability by performing diagnostics on the internal device data
- Device-specific planning, implementation and checking of maintenance work The prediction of future analyzer behavior enables predictive maintenance planning. Transparency on the performance of the plant and the individual assets is provided by KPI reports (e.g. availability, mean time to repair, error frequency, process capability index)

Benefits (Continued)



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 suitable for use in all industries such as oil and gas, petrochemical and chemical, as well as in the area of emissions 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 operator control and monitoring 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 the analyzers via PROFIBUS, PROFINET, Modbus TCP or OPC data exchange – all analyzers and all communications interfaces are supported
- Analyzers without a communications 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 are available for designing electrical and optical Industrial Ethernet networks in the scope of an ASM project

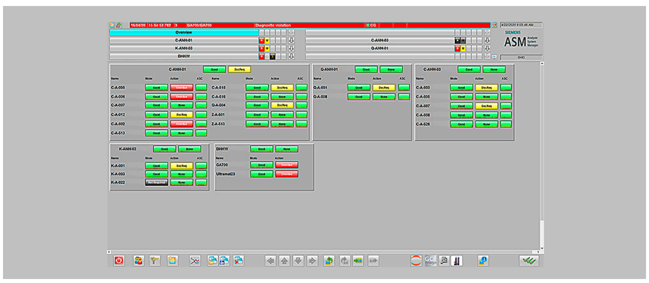
Design (Continued)

- The ASM can be integrated into an existing plant network

Function

General information

Information from the analyzers is collected over the communications network and saved in the central ASM database for further analysis. Operation is performed on suitable workstations. making it possible to navigate between overview screens, device-specific displays and general functions.

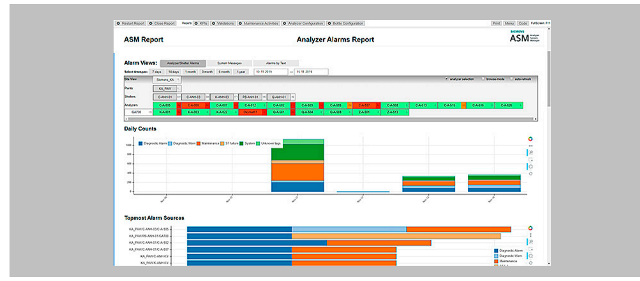


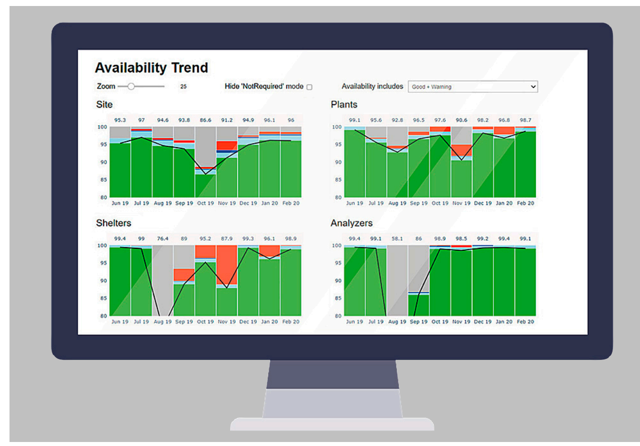
Overview of analyzers in a plant

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 device 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. The validation results can be visualized in various control charts.
Calibration	Carries out a calibration on the analyzer and monitors the results (this module is only available for devices which support remote calibration, e.g. Siemens MAXUM edition 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.

Function (Continued)





Examples of generated reports

Further functions are:

View	Task
Access Management	ASM offers all the Access Management features such as: • Password protection and different access privileges • User administration with a variety of views • 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.
Analyzer operating software	Direct access to extensive and individual analyzer software such as MAXUM GC Portal via a central system. It is then possible to access the connected devices for maintenance, configuration, or viewing of chromatograms.
Optional views	• Plant overview with locations of all analyzers • 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. • ...

Detailed overview: Reliability Management, Validation

One of the core functions of the ASM is checking the analyzers for reliability of the measured values. For this, the analyzers are regularly validated and, if required, calibration is initiated. Two measur-

Function (Continued)

ing 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

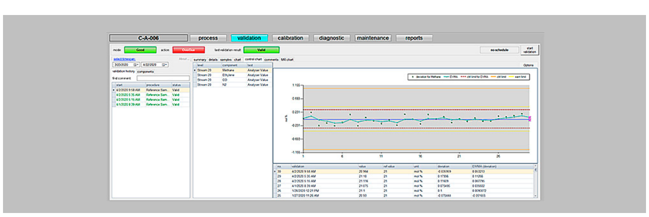
With this method, a gas sample is extracted from the stream of sample gas to the analyzer, and analyzed in the laboratory. The resulting measured values are passed on to the ASM and compared with the analyzer's measured values. With this method, the analyzer does not need to be disconnected from the process gas, and remains permanently available for the process measurement.
Laboratory measurements can be automatically read and visualized in ASM via a laboratory information management system (LIMS).
The recorded validation results can be checked using different evaluation methods (based on ASTM D3764 or deviation):

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.
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. A detailed analysis can be performed using appropriate quality control charts that visualize the validation results.



View of the validation module

Technical specifications

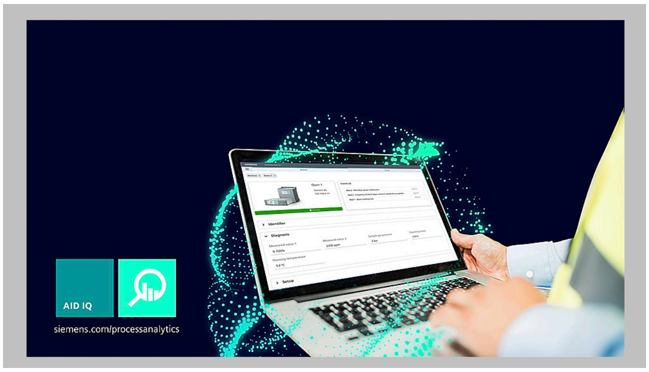
Analyzer System Manager	
Operating system	
Server	Windows Server 2016
Client(s)	Windows 10
PC hardware requirements	
Server	Standard Industrial Workstation[1)]
Client(s)	Standard Industrial Workstation[1)]

[1)] The HW configuration depends on the size of the device network supported.

More information

Please contact your Siemens sales partner for further information and for ordering.

Overview

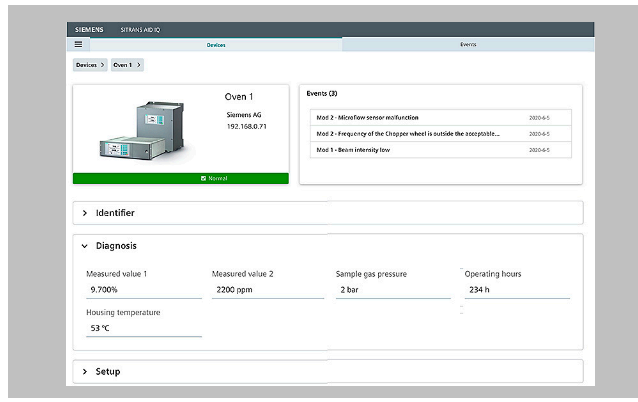


SITRANS Analyzer Intelligence Director IQ is a controller-based operator control and monitoring system for the health status of Siemens analyzers. The relevant, internal diagnostics data from different Siemens analyzers is collected via various communications protocols.
The data is additionally monitored using statistical rules defined by analyzer experts to make a prediction about upcoming problems (e.g. due to physical component failure). The user is correspondingly informed by the software.
A user-friendly user interface can be used from any customer PC or via a SIMATIC HMI to access, for example, identification data, measured values, diagnostics parameters and statistical evaluations. The system displays the cause of the error and, if needed, a suggestion on how to correct it. If a problem occurs, the user can contact Siemens Service or perform the service independently.
Predictive analysis of the device status leaves enough time for maintenance planning or ordering spare parts so that measurements can continue and remain available. In this way, the availability of the analyzers can be significantly improved, unnecessary and preventive maintenance activities can be minimized. This reduces the stress on local service staff by lowering unexpected errors.

Benefits

Core functions as added value

- Provision of device information for quick identification
- Display of the relevant diagnostics data of the respective device for evaluating the state of health, e.g. NOA data for the GA700
- Increased availability through predictive analysis of diagnostics data using statistical expert rules
- Faster error analysis by identifying the cause of the problem using software
- Faster troubleshooting by providing service recommendations



Detailed overview of the device status

Application

SITRANS AID IQ is the ideal partner for all analyzers and helps ensure maximum asset availability. After all, the best measurement is useless if it is not available. Deploying SITRANS AID IQ is therefore suitable in all industries in which Siemens analyzers are used – whether brownfield or greenfield. Especially where the availability of the analyzer is important for the process or, for example, for the fulfillment of legal requirements.
Distributed analyzers can be monitored from a central workstation through a modular and scalable communication network, based on standard SIMATIC components.

Design

System design

- Controller-based operator control and monitoring systems
- Visualization and operation via a browser (use of existing customer hardware) or via a SIMATIC HMI 400 or 700 Comfort Panel
- Integration of different analyzers via a central controller

System software

- SITRANS AID IQ uses the visualization options of standard SIMATIC products
- No software installation required on a PC.

Communication

- SITRANS AID IQ only supports Siemens analyzers
- The following Siemens analyzers are currently supported: GA700, ULTRAMAT 6, OXYMAT 6/61/64, ULTRAMAT/OXYMAT 6, CALOMAT 6/62, ULTRAMAT 23
- Connection of Siemens analyzers via Modbus TCP or ELAN

Networking

- SITRANS AID IQ can be integrated into an existing plant network

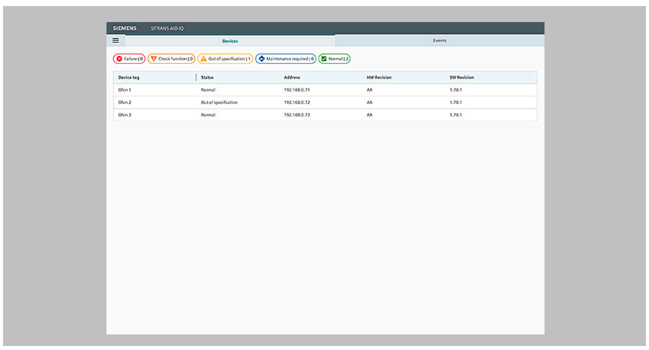
Design (Continued)

- Optional provision of a plant network using Siemens SCALANCE Ethernet switches

Function

General information

Information from the analyzers is collected over the communications network and saved in the central controller. The software can be accessed via a web browser on a connected laptop or an HMI.



Overview of connected analyzers in SITRANS AID IQ

SITRANS AID IQ provides the following function modules for operator control and monitoring tasks:

View	Task
Devices Overview	Provides an overview of all connected devices with the tag name, the health status and the most important data. The status of the device is displayed based on the NE107 (Failure, Check Function, Out of Specification, Maintenance required, Normal).
Devices Details	Detailed overview of a device with the following information: Identification data, diagnostics data, setup data, open events
Events Overview	Lists the open events for all devices with the event text, the priority, the event and the device tag. The events can be filtered accordingly
Event Details	Shows the detailed event text and the service recommendation

Selection and ordering data

SITRANS Analyzer Intelligence Director IQ /SITRANS AID IQ)	Article No. 7KU0001-	●	●	●	●	●	-	●	●	●	●
Click on the Article No. for online configuration in the PIA Life Cycle Portal.											
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".											
Selection of the software											
Delivery of the SITRANS AID IQ software		0									
Number of supported analyzers on a controller											
Max. 6 analyzers are supported by SITRAINS AID IQ			A								
Max. 10 analyzers are supported by SITRANS AID IQ			B								
Communications interface of the devices											
Communications interface of the devices to be connected: Modbus TCP				A							
Communications interface of the devices to be connected: ELAN				B							
Communications interfaces of the devices to be connected: Modbus TCP and ELAN				D							
Number of supported SHS on a controller											
No SHS components are connected to SITRANS AID IQ					0						
Selection of the controller											
SITRANS AID IQ is supplied with a configured S7-1500 controller						0					

Selection and ordering data (Continued)

SITRANS Analyzer Intelligence Director IQ /SITRANS AID IQ)	Article No. 7KU0001-	●	●	●	●	●	-	●	●	●	●
User interface											
SITRANS AID IQ User Interface: Access to software via web application								0			
SITRANS AID IQ User Interface: Access to software via web application & HMI (SIMATIC KTP400 Comfort Panel)								2			
SITRANS AID IQ User Interface: Access to software via web application & HMI (SIMATIC KTP700 Comfort Panel)								3			
Software and documentation language											
English									A		
German									B		
Not used										A	
Not used											A

Options	Order code
Add "-**Z**" or "Y" to article number and then add order code	
Additional items	
SIMATIC PM 1507 24 V/3 A power supply	A01
SITOP PSU100S 24V/2.5 A power supply	A02
DIN rail S7-1500 (245 mm)	A03
Communications network is defined by Siemens and the corresponding hardware is made available.	A04
Additional analyzer information	
Analyzer serial number & MLFB	Y06
Analyzer serial number & MLFB	Y10

Technical specifications

SITRANS Analyzer Intelligence Director (SITRANS AID IQ)	
Software	
Controller software	SITRANS AID IQ software project in controller
Client software	No software required for browser, HMI project is loaded
Hardware used	
Controller	SIMATIC S7-1500 Controller
HMI	SIMATIC HMI 400 or 700 Comfort Panel

More information

Please contact your Siemens sales partner for more information and ordering.

6/2	**Communication**
6/2	Continuous process gas analysis
6/10	Gas analysis library for SIMATIC PCS 7
6/11	Process gas chromatography
6/14	**Operator functions of Series 6**
6/16	**FAT & factory certificates**
6/18	**Ex versions**
6/18	Extractive continuous process gas analysis
6/32	BARTEC Ex p purging unit
6/36	Purging unit FM (Class I Div 2)
6/38	Additional units
6/40	Purging unit ATEX II 2G / II 2D, continuous purging
6/42	In situ continuous process gas analysis, LDS 6
6/44	Ex barrier
6/45	In situ continuous process gas analysis, SITRANS SL
6/47	Process gas chromatography
6/48	**Tables**
6/48	Conversion tables
6/50	Dew point/saturation table
6/53	International standards
6/55	**Definitions**

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 analytics

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 transfer 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 transfer with analog and digital outputs:

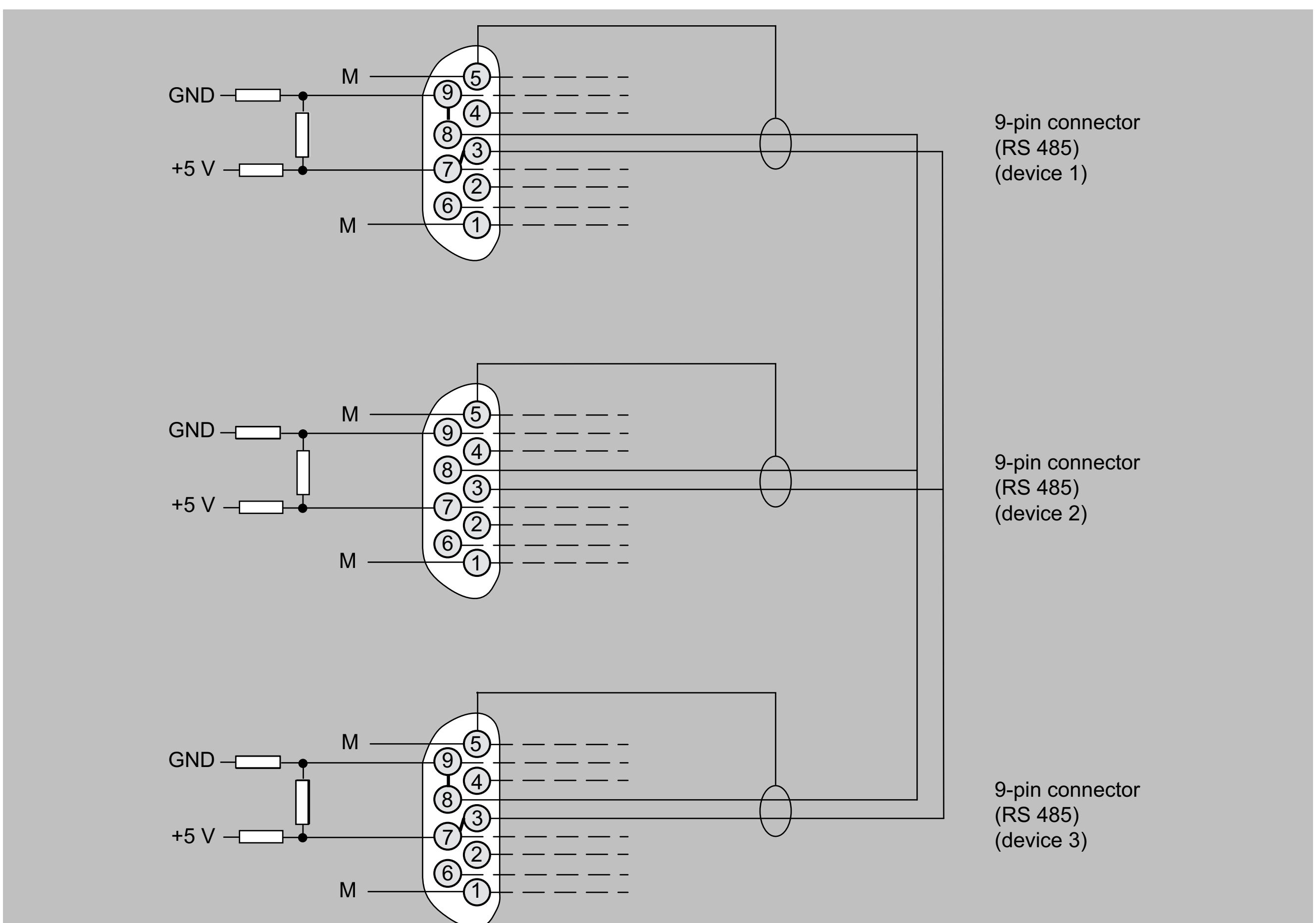
- Modbus TCP
- Remote transmission via UMTS router
- Modbus TCP/PROFINET communication

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 correction of cross-interference. Direct connection is only possible between Siemens gas analyzers.



Bus cable with plug connections, ELAN networking

Overview (Continued)

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 × 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 plug of a bus cable must be bridged (ELAN networking).

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.

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 twelve 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 diagnostics 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:

- Bar graph 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

Overview (Continued)

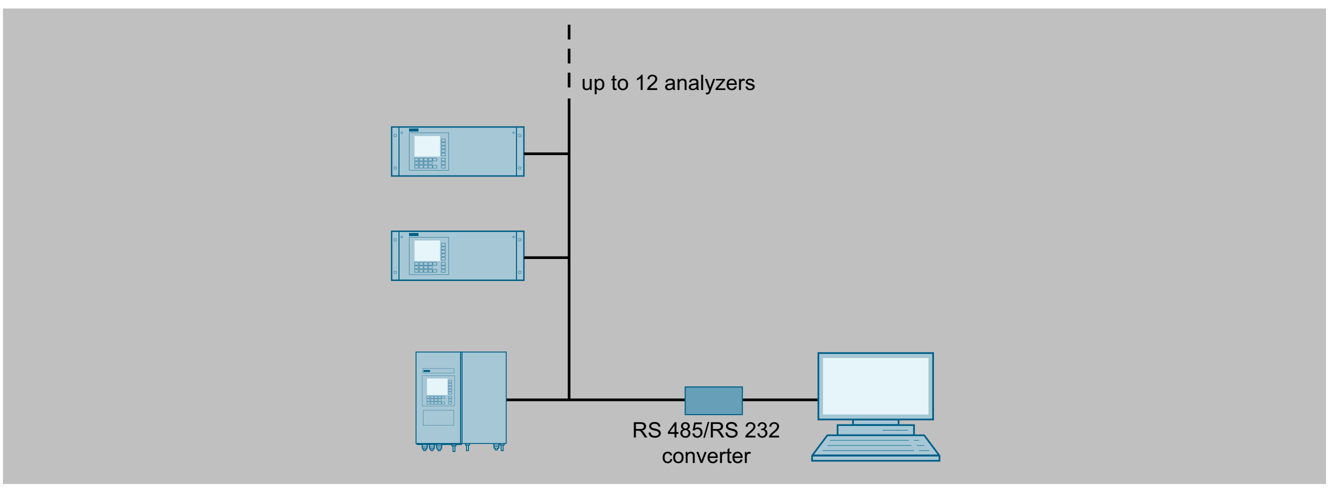
- VGA graphics card (Windows-supported); resolution: 1024 x 768
- Printer (Windows-supported)
- MS Windows XP, Windows 7 and Windows 10 operating system
- Vacant COM interface (COM 1, 2 ...)
  - The RS 485 / RS 232 interface converter is required for the connection to the RS 485 ELAN network
  - A standard 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, plugs, 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 4 components each can be networked.
The functional principle is shown in the following illustration.

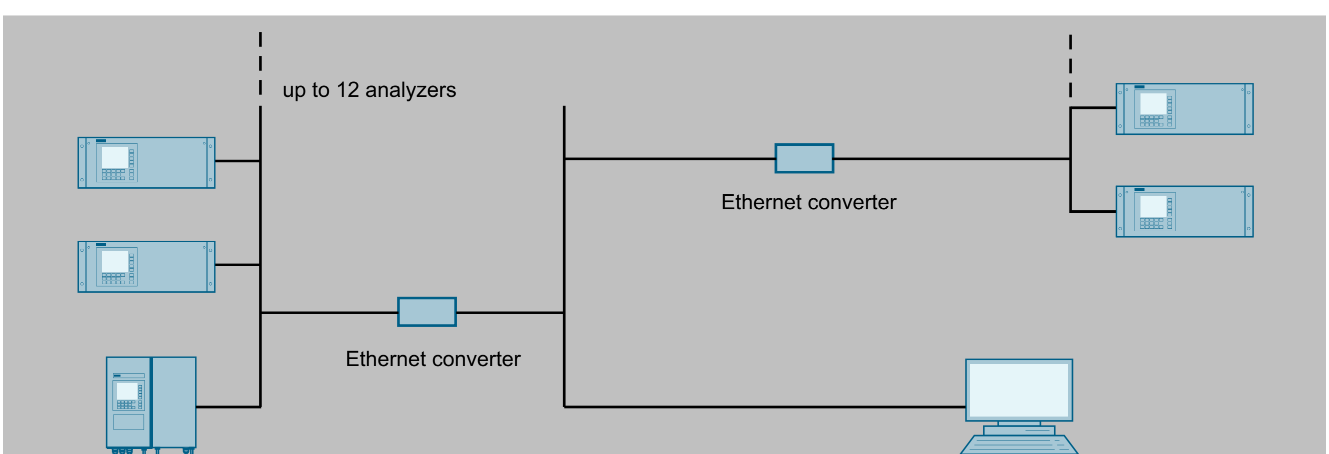


Typical structure of an RS 485 network via SIPROM GA

The gas analyzers can be installed at distances up to 500 m. One network can be connected to each COM interface.

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 interface. 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

Overview (Continued)

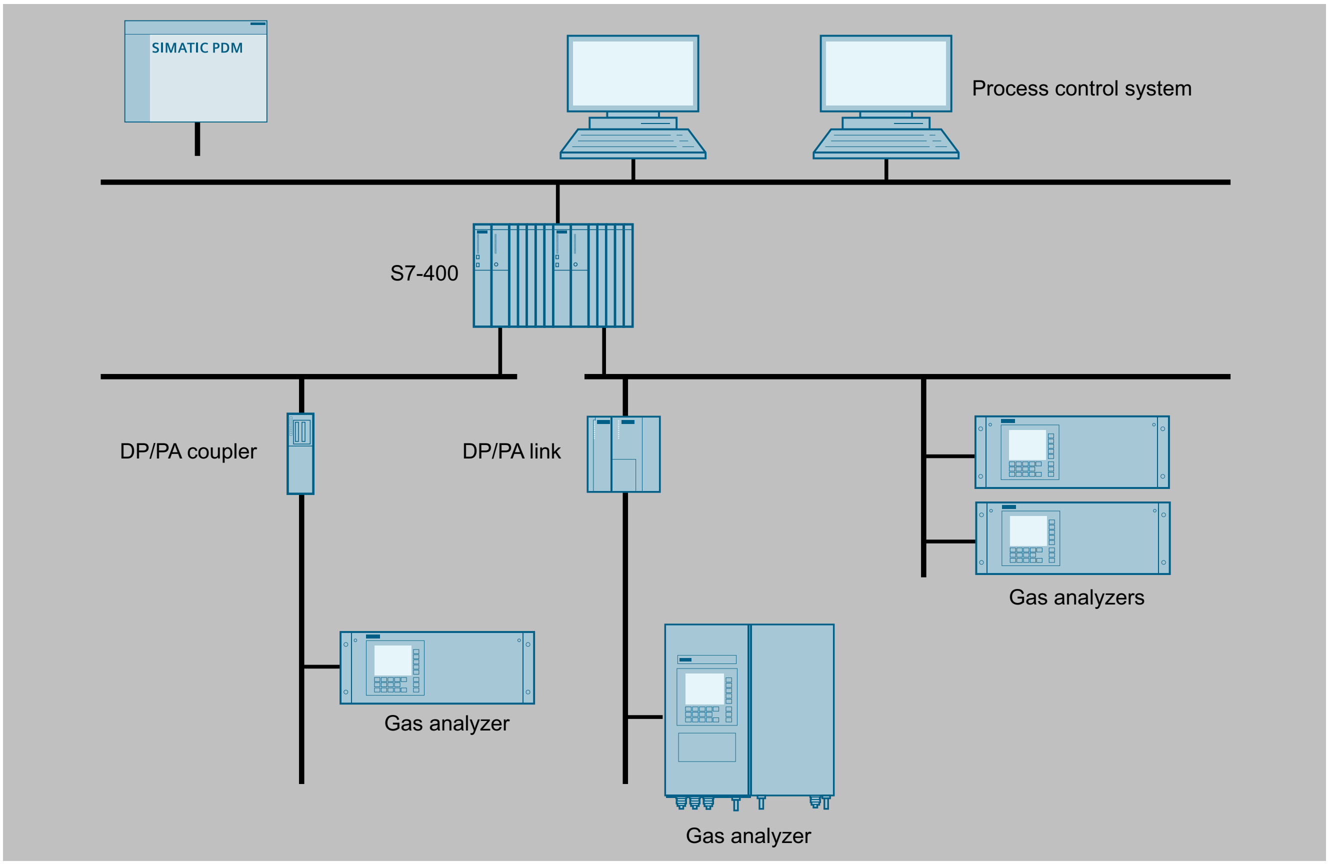
PROFIBUS

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 factory 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 status. 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.).

Overview (Continued)



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
- Diagnostic 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 of day
- Measuring point switchover
- Logbook settings
- Relay assignment
- Digital inputs
- Reset
- Save/load data
- Suppression of short noise signals
- Calibration tolerances

Overview (Continued)

- 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

Generic communications interface
(only OXYMAT 6, ULTRAMAT 6 and ULTRAMAT/OXYMAT 6)

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

The SIPROCESS GA700 uses Modbus TCP for correction of cross-interference 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.

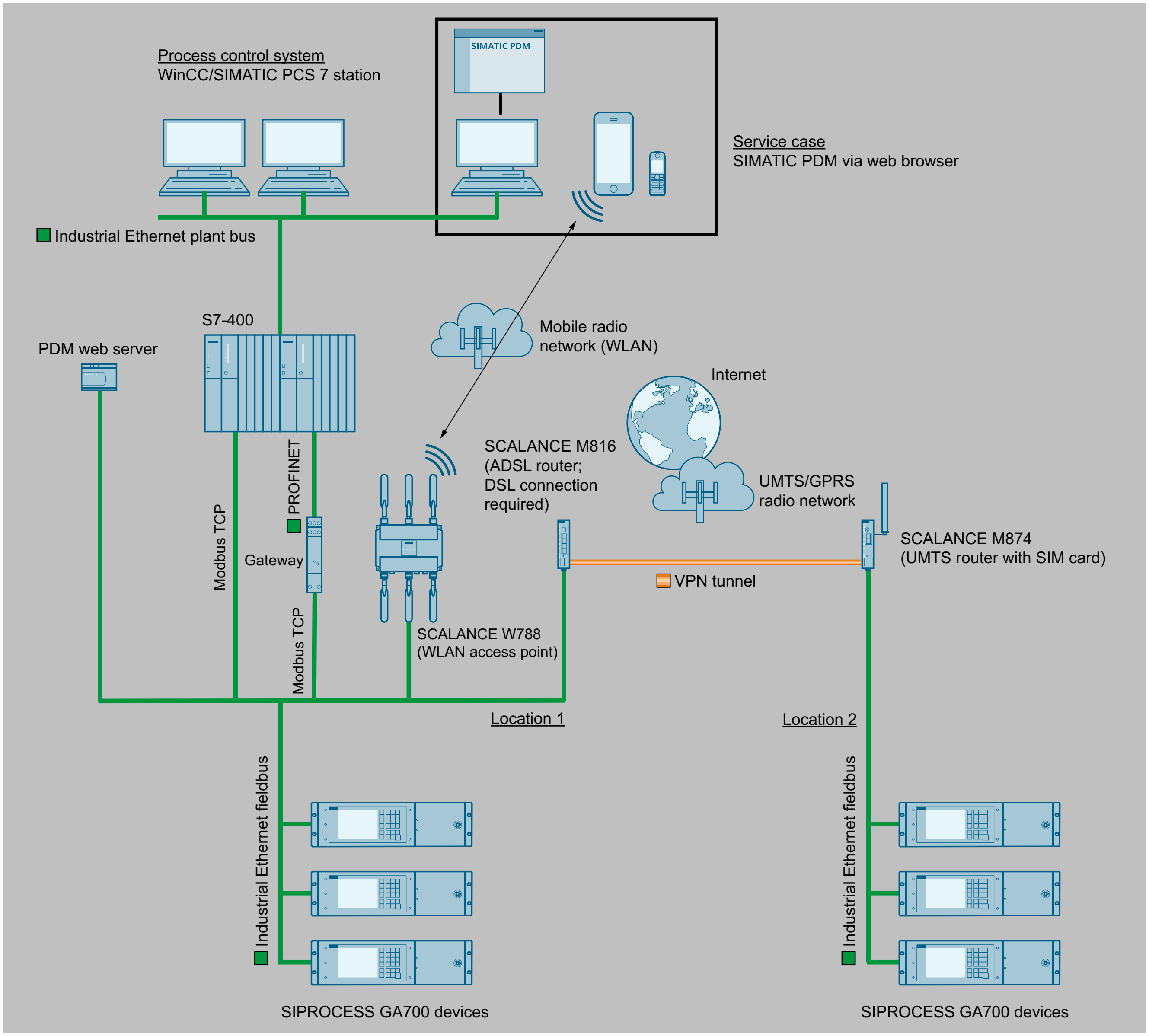
SIPROCESS GA700: Possible communication paths

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.

Overview (Continued)



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

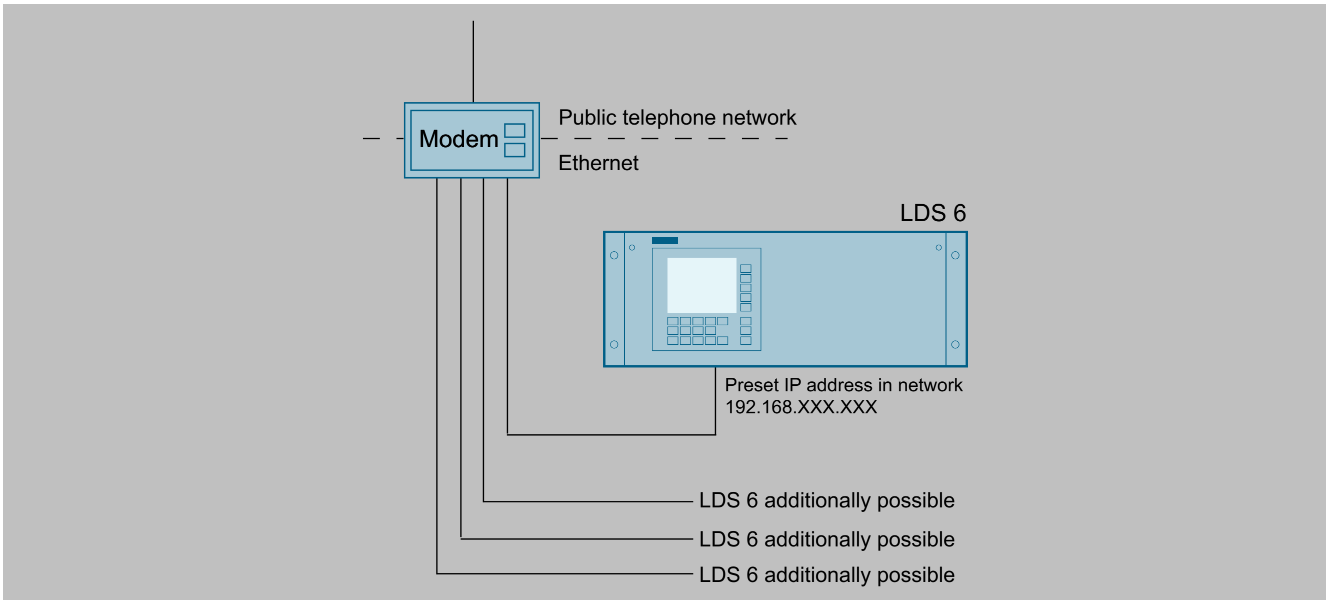
The WLAN access point enables mobile access to devices via a laptop, for example. If a PDM web server was installed and set up, you can access the SIPROCESS GA700 devices from hand-held devices (mobile phone, tablet) via a web browser. The PDM web server is a computer on which SIMATIC PDM with additional web server functionalities is installed.

In-situ continuous process gas analytics

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.

Overview (Continued)

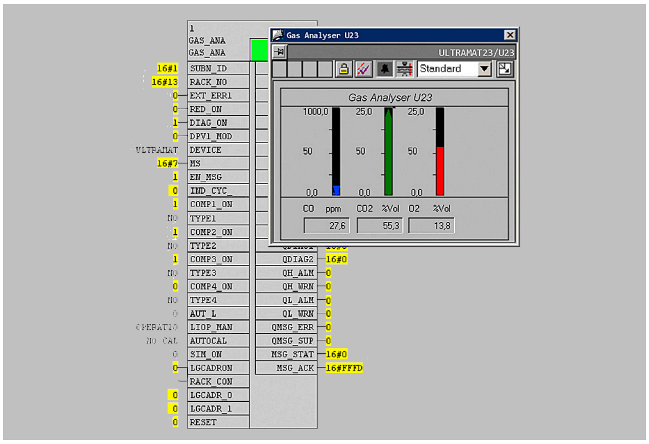
This facility for remote maintenance and diagnostics is implemented using a standard LAN modem.



External connection of LDS 6 via a modem for implementing remote maintenance measures

Gas analysis library for SIMATIC PCS 7

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

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E-mail:

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 method. 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

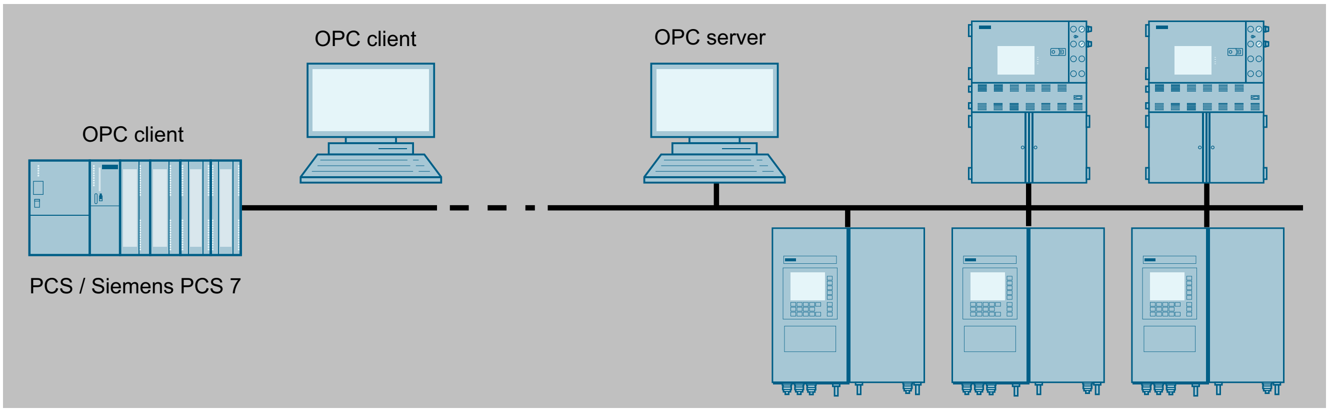
To ensure that the meaning of the registers is known to each network station, this must be defined in the configuration. The results of each component in each sample must be written into defined positions in the PCS memory. These address declarations depend on the number of chromatographs, samples and 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 user interface for configuration
- Reduced system integration costs
- Reduced test costs
- Reduced maintenance costs

Overview (Continued)



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:

Electronics types	
A IO 8	8 × analog outputs 8 × analog inputs 2 × digital inputs
D IO	6 × digital inputs 8 × digital outputs
AD I/O	4 × digital inputs 4 × digital outputs 4 × analog inputs 4 × analog outputs
Communication module	10 Base FO Ethernet (fiber-optic coupling) DataNET Copper (redundant system bus) DataNET Fiber Optic 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 operator 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:

Overview (Continued)

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 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	Diagnostic 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	Limits	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 of day	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	Device 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	Error 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	—	—	—

Overview (Continued)

Main menu	No.	Function designation	Manual	SIPROM GA	PA/DP V1.6.0	PA/DP V2.0.0
Other	—	Control of external valves	—	—	—	X
	—	Software download	—	X	—	—

Selection and ordering data

FAT & factory certificates **For series 6 and ULTRAMAT 23 extractive gas analyzers**	**Article No.** **7MB8100-**	●	●	●	●	●	-	●	●	●	●
Click on the Article No. for online configuration in the PIA Life Cycle Portal. ***Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".***											
Factory acceptance (FAT) with customer											
Visual acceptance (optical inspection und basic settings)											
None		0									
1 ... 8 devices, including function check and calibration		1									
9 devices or more, including function check and calibration		2									
Measured signal response											
None			A								
Noise, drift			B								
Noise, drift, linearity, T_{90} time			C								
Compensation, cross-interference											
Without[4]				A							
Pressure compensation				B							
1 interference gas[3]				C							
2 ... 3 interference gas[3]				D							
Pressure compensation and 1 interference gas[3][4]				E							
Pressure compensation and 2 or 3 interference gases[3][4]				F							
Explosion protection and relay test											
Without Ex protection					0						
Pressurized enclosure for Ex devices (functionality)[5]					1						
Relay test					2						
Pressurized enclosure for Ex devices and relay test[5]					3						
Number of test channels											
None						0					
1 ... 3						2					
4 ... 6						3					
≥ 7						4					
Certificates											
General certificates											
Declaration of compliance with the order EN 10204 2.1 (quality test certificate)[1]								0			
Factory certificate according to EN 10204 2.2[1]								1			
Certificate of origin[1]								2			
Certificate of origin[1] and factory certificate according to EN 10204 2.2								3			
Certificate of origin[1] and declaration of compliance with the order according to EN 10204 2.1								4			
Certificate of origin, declaration of compliance with the order 2.1 and factory certificate 2.2 according to EN 10204								5			
Declaration of compliance with the order 2.1 and factory certificate 2.2 according to EN 10204								6			
Parameter sheets (only with suffix Y22)								8			
Inspection certificate, extended, according to EN 10204 3.1 with suffix Y22											
None									A		
Measured values, noise, drift, linearity									B		
Measured values, noise, drift, linearity, pressure compensation[4]									C		
Measured values, noise, drift, linearity, pressure and temperature compensation[4]									D		
Inspection certificate, extended, according to EN 10204 3.1											
None										A	
Cross-interference accompanying gas (H_2O and 2 other gases)										B	
T_{90} time										C	
Effect CO_2 atmosphere										D	
Cross-interference accompanying gas[2] and T_{90} time										E	
Cross-interference accompanying gas[2] and effect CO_2 atmosphere										F	
T_{90} time and effect CO_2 atmosphere										G	
Cross-interference accompanying gas[2], T_{90} time and CO_2 atmosphere										H	
Language factory certificate EN 10204 2.3											
German											0
English											1
French											2

[1] Can also be ordered following delivery.

Selection and ordering data (Continued)

[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.
[4] Not applicable for FIDAMAT.
[5] Not applicable for 19" rack unit devices.

Options	Order code
Add "-**Z**" to article number and then add order code	
Required device information	
Information on product/order with order item and contact person (sales region, region or distributor)	**Y22**
Product equipment data	**Q70**

Overview

Use of series 6 in hazardous areas

Depending on the application, the measuring device 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

<u>Gas analyzers</u>

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 "Pressurized 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 purging of 5 minutes, the checking 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 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 pressurized 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 restrictive breathing enclosure type of protection (type of protection Ex n R).

<u>Category ATEX II 2G (Hazardous Zone 1)</u>

Two variants of the Ex p pressurized enclosure are available for use in Zone 1:
- **Pressurized enclosure with leakage loss**
  (Bartec Ex p purging unit for compensation of losses from leaks is no longer available for order as of July 2021)
  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 flammable or occasionally combustible, 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 externally 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 input and output 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-resistant material, if applicable.
  Prototype test certificate: PTB 00 ATEX 2022 X
  Device marking: II 2 G Ex px [ia] IIC T4
- **Pressurized enclosure with continuous purging**
  The principle of this type of protection is based on having continuous purging of the Ex p enclosure after the 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 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.
  Prototype test certificate: German Technical Inspectorate 01 ATEX 1708 X
  Device marking: II 2G 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 device 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).

<u>Category ATEX II 3G (Hazardous Zone 2)</u>

Two variants complying with Directive 2014/34/EU (94/9/EC) are available for use in Zone 2.
- **Explosion protection through restrictive breathing enclosure**
  The enclosure is sealed sufficiently to prevent the ingress of gas fumes. With this degree of protection, only sample gases may be fed in which are below the LEL (25% of the LEL).
  Prototype test certificate: German Technical Inspectorate 01 ATEX 1686 X
  Device marking: II 3 G Ex nR IIC T6 or T4 Gc
  It is not necessary to install a purging unit here.
- **Pressurized enclosure with continuous purging**
  The principle of the type of protection "Pressurized enclosure for category 3 equipment" is based on the measure that the penetration of potentially explosive atmosphere into the gas analyzer is prevented.

Overview (Continued)

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.
Prototype test certificate: German Technical Inspectorate 01 ATEX 1697 X
Device marking: II 2/3G 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 device which is connected electrically and pneumatically to the analyzer. Explosion protection is only provided when these two devices (analyzer and purging unit) are combined. (See Purging unit below)
The electronics of the analyzer may be exempt from the simplified pressurized enclosure. Multiple simplified pressurized enclosures may be pneumatically installed in series if required.

Category ATEX II 3D (Hazardous 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.
Prototype test certificate German Technical Inspectorate 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 degree 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 Pressurized Enclosures for Electrical Equipment" describes in great detail and clarity the requirements for purging and for the pressurized enclosure for electrical installations 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 accumulate 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 devices designed for general applications, it is assumed that they can ignite a potentially explosive gas mixture at any time, and therefore no type of hazardous 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 cannot ignite a potentially 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 error 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.

Overview (Continued)

Use of SIPROCESS GA700 in hazardous areas

SIPROCESS GA700, family

Depending on the application, the measuring device can include the following parts:
- OXYMAT 7, ULTRAMAT 7, CALOMAT 7 with Ex approval
- Ex p monitoring equipment (purging unit)
- Flame arrestors with Ex approval
- Ex ec enclosure for Ex-19" rack units (cannot be ordered from catalog)

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 variant designed according to Ex type of protection "Increased Safety Ex ec". The analyzer must be installed in an enclosure that meets the requirements of type of protection "Ex ec" according to EN/IEC 60079-0 and EN/IEC 60079-7
The OXYMAT 7 is approved in the "wall box" version in accordance with Ex type of protection pressurized 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 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 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 pressurized enclosure is not required for variants in type of protection "Increased Safety Ex ec" 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 intrinsically safe protection type "Ex i". The field module with the module is certified for the type of protection Flameproof Enclosure "Ex d".

Category ATEX II 2G and IECEx (Hazardous Zone 1)

Two enclosure variants complying with Directive 2014/34/EU are available for use in Zone 1.
- **Pressurized 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 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 atmospheric pressure.
  The maximum permissible purging gas pressure is 110 hPa. The maximum permissible sample gas pressure for non-flammable gases is 3 000 hPa (abs.), but for occasionally explosive gases (Zone 1 gases) only 1 100 hPa (abs.).
  - Prototype test certificate: BVS 14 ATEX E 153
  - IECEx Declaration of Conformity: IECEx BVS 14.0104X

Overview (Continued)

- Device marking: II 2G Ex pyb 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 device 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-flammable and flammable 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-flammable gases is 3 000 hPa (abs.), but for flammable and occasionally explosive gases (Zone 1 gases) only 1 100 hPa (abs.).
  - EC type-examination certificate BVS 15 ATEX E 038 X
  - IECEx Declaration of Conformity: IECEx BVS 15.0030X
  - Example of device marking: II 2G Ex db e ib IIC T4 Gb

Category ATEX II 3G and IECEx (Hazardous Zone 2)

Three enclosure variants complying with Directive 2014/34/EU are available for use in Zone 2.

- **19" rack unit type of protection "Increased Safety Ex ec"**
  The analyzer does not contain an ignition source. It must be installed in an enclosure that meets the requirements of type of protection "Ex ec" according to EN/IEC 60079-0 and EN/IEC 60079-7 Enclosure und analyzer must comply with at least IP54 and pollution degree 2 when assembled.
  - Prototype test certificate: BVS 18 ATEX E084 X and BVS 15 ATEX E 007 X
  - IECEx Declaration of Conformity: IECEx BVS 15.0007X
  - Example of device marking: II 3G Ex nA nC ic IIC T4 Gc
- **Wall box, Ex protection through degree of protection "Increased Safety Ex ec"**
  The analyzer does not contain an ignition source. With this degree 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.
  - Prototype test certificate: BVS 14 ATEX E 153X, BVS 14 ATEX E154 X
  - IECEx Declaration of Conformity: IECEx BVS 14.0104X
  - Example of device marking: II 3G Ex ec ib nC IIC T4 Gc
- **Pressurized enclosure with continuous purging with py or px monitoring system**
  Protective gas continuously flows through the wall box 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. This means that flammable and potentially explosive gases can also be measured. The max. permissible purging gas pressure is 110 hPa.
  - Prototype test certificate: BVS 14 ATEX E 153 X
  - IECEx Declaration of Conformity: IECEx BVS 14.0104X
  - Example of device marking: II 2G Ex pyb ib IIC T4 Gb (in conjunction with a py or px monitoring system)
    The purging gas is monitored using Ex p checking equipment. This is a stand-alone device 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 flammable sample gases or sample gases above the LEL (25% of the LEL), a py[1)] or px purge must be used.

Category ATEX II 3D (Hazardous 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.

- Prototype test certificate: BVS 14 ATEX E 153 X
- IECEx Declaration of Conformity: IECEx BVS 14.0104X

Example of device marking:

- II 2G/3D Ex pyb ib IIIC/IIC T65°C Dc/Gb (in conjunction with a py[1)] or px monitoring system).
  Flammable and potentially explosive gases can be introduced.
- II 3D Ex tc ib IIIC T65°C Dc
  With these degrees 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) for series 6

Although the IEC and EN regulations 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

Overview (Continued)

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 potentially 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 CALOMAT 6E: Installation in a suitable enclosure (IP54)
Occasionally explosive (Zone 1 Gas) 10 ... 1 000 hours per year	No action	Flame arrestors	Flame arrestors CALOMAT 6E: Installation in a suitable enclosure (IP54)
Frequently or permanently explosive (Zone 0 Gas) > 1 000 hours per year	Not permissible	Not permissible	Not permissible

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 a potentially 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 accumulation of corrosive gas inside the analyzer, whereby operators or service engineers 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 accumulation of toxic gas inside the analyzer, whereby operators or service engineers could be injured. The discharged purging gas should be released at a non-critical point (collective vent etc.) More information can be found in the OSHA regulations for handling toxic materials.

Application

Differentiation of cases: Hazardous zones/danger through flammable sample gas (series 6)

Place of installation / 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)
ATEX II 1G (Zone 0)	Not permissible	Not permissible	Not permissible
ATEX II 2G (Zone 1) "Leakage compensation" operation mode			
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	Ex p purging unit Sample gas pressure < 165 hPa, fail-safe	Ex p purging unit Sample gas pressure < 165 hPa, fail-safe
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)
ATEX II 2G (Zone 1) "Continuous purging" operation mode			
Analyzer	Ex analyzer Ex p (Certificate ATEX 1708X)	Ex analyzer Ex p (Certificate ATEX 1708X)	Ex analyzer Ex p (Certificate ATEX 1708X)
Gas path	Pipe gas path	Pipe gas path	Pipe gas path

Application (Continued)

Place of installation / 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)
Flame arrestor	-	Flame arrestor in sample gas inlet and outlet	Flame arrestor in sample gas inlet and outlet
Monitoring	Ex px purging unit Available for order with option -Z (E74/E75)	Ex p purging unit Available for order with option -Z (E74/E75)	Ex px purging unit Available for order with option -Z (E74/E75)
Pressure switch	-	-	-
ATEX II 3G (Zone 2)			
Analyzer	Ex analyzer Ex nR In the field enclosure Available for order with option E11: Certificate ATEX 1686X	Ex analyzer Ex pz In the field enclosure Available for order with option E12: Certificate ATEX 1697X	Analyzer Ex pz In the field enclosure Available for order with option 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 px control unit Available for order with option -Z (E74/E75)	Ex px control unit Available for order with option -Z (E74/E75)
Non-hazardous zone			
Analyzer	Analyzer as rack unit or in field enclosure	Analyzer as rack unit or in field enclosure	Analyzer as rack unit or in field enclosure
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	-	Enclosure purging with inert gas or air; purge monitoring	Enclosure purging with inert gas or air; purge monitoring

Ex configurations – Main selection criteria (series 6)

	Signal line routing		
	Within Zone 1	**From zone 1 to zone 2**	**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: Hazardous zones/danger through flammable and potentially explosive sample gas (SIPROCESS GA700, OXYMAT 7, ULTRAMAT 7 and CALOMAT 7)

Wall-mounted device

Place of installation / zone	Sample gas non-flammable below the lower explosive limit LEL (25% of LEL)	Sample gas is flammable and/or is occasionally above the LEL (25% of LEL)
ATEX II 1G (Zone 0)		
Device protection level	Not permissible (EPL) Ga – not approved	Not permissible (EPL) Ga – not approved
ATEX II 2G (Zone 1)		
Analyzer/type of protection	Ex analyzer Ex p Overpressure encapsulation type of protection, "Continuous purging" operation mode (Certificate BVS 14 ATEX E 153 X and IECEx BVS 14.0104X)	Ex analyzer Ex p Overpressure encapsulation type of protection, "Continuous purging" operation mode (Certificate BVS 14 ATEX E 153 X and IECEx BVS 14.0104X)
Flame arrestor	Not required	For OXYMAT 7: Flame arrestor in sample gas and reference gas paths:

Application (Continued)

Place of installation / zone	Sample gas non-flammable below the lower explosive limit LEL (25% of LEL)	Sample gas is flammable and/or is occasionally above the LEL (25% of LEL)
Monitoring	Approved px or py[1] monitoring system For OXYMAT 7 HT: Approved px monitoring system (option E72)	Approved px or py[1] monitoring system; px recommended: Option E72 For OXYMAT 7 high-temperature version: Approved px monitoring system
Device protection level	(EPL) Gb	(EPL) Gb
ATEX II 3G (Zone 2)		
Analyzer/type of protection	Ex analyzer Ex p Overpressure encapsulation type of protection, "Continuous purging" operation mode (Certificate BVS 14 ATEX E 153 X and IECEx BVS 14.0104X) or Ex analyzer Ex ec type of protection "Increased Safety" (Certificate BVS 14 ATEX E 154 X, BVS 14 ATEX E 153 X and IECEx BVS 14.0104X)	Ex analyzer Ex p Overpressure encapsulation type of protection, "Continuous purging" operation mode (Certificate BVS 14 ATEX E 153 X and IECEx BVS 14.0104X)
Flame arrestor	Not required	For OXYMAT 7: Flame arrestor in sample gas and reference gas paths:
Monitoring	Approved px, py or pz monitoring system or without monitoring system for Ex ec	Approved px or py1 monitoring system; px recommended: Option E72 For OXYMAT 7 high-temperature version: Approved px monitoring system
Device protection level	(EPL) Gb	(EPL) Gb
ATEX II 3D (Zone 22)		
Analyzer/type of protection	Ex analyzer Ex p or tc (Variant G) Overpressure encapsulation type of protection, "Continuous purging" operation mode or type of protection dust protection by enclosure (Certificate BVS 14 ATEX E 153 X and IECEx BVS 14.0104X)	Ex analyzer Ex p (Variant G) Overpressure encapsulation type of protection, "Continuous purging" operation mode (Certificate BVS 14 ATEX E 153 X and IECEx BVS 14.0104X)
Flame arrestor	Not required	For OXYMAT 7: Flame arrestor in sample gas and reference gas paths:
Monitoring	Approved px, py or pz monitoring system or no monitoring system for Ex tc	Approved px or py[1] monitoring system; px recommended: Option E72 For OXYMAT 7 high-temperature version: Approved px monitoring system
Device protection level	(EPL) Dc	(EPL) Dc/Gb
Non-hazardous zone		
Analyzer	Standard analyzer	Standard analyzer
Gas path	Pipe or hose gas path	• Pipe gas path • Seals FFKM (option B04 for ULTRAMAT 7 and OXYMAT 7) Enclosure purging with air or inert gas (N2):1 Nl/min
Flame arrestor	Not required	For OXYMAT 7 and CALOMAT 7: Flame arrestor recommended for sample gas inlet and outlet; For OXYMAT 7 monitoring of the reference gas or flame arrestors in the reference gas path • For ULTRAMAT 7, the flame arrestors can be omitted when using a technically unmodified analyzer module
Monitoring	Not required	• Enclosure purging monitored[2] Regular leak test as described in the manual

[1] The above-mentioned purging monitoring in py mode is permissible according to the certificate, but is explicitly not recommended by SIEMENS. As a manufacturer, we generally recommend the use of a purge monitor in px operation. The py operation requires immediate intervention by the operator in the event of failure or insufficient purging, since the Ex p system only provides an alarm and no automatic shutdown.
[2] For the measurement of flammable gases, a px monitoring system (option E72) is recommended, since with py purge monitoring it must be ensured that remedial action is taken immediately in the event of malfunction.

The evaluation regarding possible zone displacement must be performed by the operator on site in all cases.

Field device OXYMAT 7

Place of installation / zone	Sample gas non-flammable below the lower explosive limit LEL (25% of LEL)	Sample gas is flammable and/or is occasionally above the LEL (25% of LEL)
ATEX II 1G (Zone 0)		
Device protection level	Not permissible (EPL) Ga – not approved	Not permissible (EPL) Ga – not approved

Application (Continued)

Place of installation / zone	Sample gas non-flammable below the lower explosive limit LEL (25% of LEL)	Sample gas is flammable and/or is occasionally above the LEL (25% of LEL)
ATEX II 2G (Zone 1)		
Analyzer	Ex analyzer Ex d "Flameproof enclosure" type of protection (Certificate BVS 15 ATEX E 038 X and IECEx BVS 15.0030X)	Ex analyzer Ex d "Flameproof enclosure" type of protection (Certificate BVS 15 ATEX E 038 X and IECEx BVS 15.0030X)
Flame arrestor	Integrated	Integrated
Device protection level	(EPL) Gb	(EPL) Gb

Rack unit

Place of installation / zone	Sample gas non-flammable below the lower explosive limit LEL (25% of LEL)	Flammable sample gas	Sample gas is flammable and/or is occasionally above the LEL (25% of LEL)
ATEX II 1G (Zone 0)			
Device protection level	Not permissible (EPL) Ga – not approved	Not permissible (EPL) Ga – not approved	Not permissible (EPL) Ga – not approved
ATEX II 2G (Zone 1)			
Device protection level	Not permissible (EPL) Gb – not approved	Not permissible (EPL) Gb – not approved	Not permissible (EPL) Gb – not approved
ATEX II 3G (Zone 2)			
Analyzer	Ex analyzer Ex ec (Certificate BVS 18 ATEX E 084 X, BVS 15 ATEX E 007 X and IECEx BVS 15.0007X) (installation in suitable enclosure with type of protection ec, IP54 according to EN/IEC 60079-0 and EN/IEC 60079-7); pollution degree 2	Ex analyzer Ex ec (Certificate BVS 18 ATEX E 084 X, BVS 15 ATEX E 007 X and IECEx BVS 15.0007X) (installation in suitable enclosure with type of protection ec, IP54 according to EN/IEC 60079-0 and EN/IEC 60079-7); pollution degree 2 • OXYMAT 7, ULTRAMAT 7 and CALOMAT 7 can be used • Reference gas OXYMAT 7 only N2 with min. 2.2 bar rel. • Reference gas OXYMAT 7 must be monitored	Ex analyzer Ex ec (Certificate BVS 18 ATEX E 084 X and IECEx BVS 15.0007X) (installation in suitable enclosure with type of protection ec, IP54 according to EN/IEC 60079-0 and EN/IEC 60079-7); pollution degree 2 • CALOMAT 7 and ULTRAMAT 7 can be used
Flame arrestor	Not required	Not required Recommended for OXYMAT 7	Not required
Purging	Not required	Required: Air exchange of at least 5 times the enclosure volume per hour, but at least 164 l/h must be ensured	Required: Air exchange of at least 5 times the enclosure volume per hour, but at least 164 l/h must be ensured
Device protection level	(EPL) Gc	(EPL) Gc	(EPL) Gb/Gc
Non-hazardous zone			
Analyzer	Non-Ex analyzer	Non-Ex analyzer	Non-Ex analyzer
Gas path	Gas path with hoses or pipes	• Pipe gas path • Seals FFKM (option B04 for ULTRAMAT 7 and OXYMAT 7) • Regular leak test as described in the manual • Evaluation regarding possible zone displacement must be performed by the operator on site	• Pipe gas path • Seals FFKM (option B04 for ULTRAMAT 7 and OXYMAT 7) • Regular leak test as described in the manual • Evaluation regarding possible zone displacement must be performed by the operator on site
Flame arrestor	Not required	Recommended	Recommended
Purging	Not required	Required: Air exchange of at least 5 times the enclosure volume per hour, but at least 164 l/h must be ensured	Required: Air exchange of at least 5 times the enclosure volume per hour, but at least 164 l/h must be ensured

Application (Continued)

Use of OXYMAT 6 in hazardous area and/or for measurement of flammable gases

Category / operation mode	Article No. 7MB2011-	Certification (order codes) Gas Hazardous zone	Dust Hazardous zone	Additional unit Purging unit 7MB8000-	Flame arrestor 7MB8000-	Pressure switch 7MB8000-	Ex i isolating transformer 7MB8000-	Ex i isolating relay 7MB8000-
ATEX II 2G (Zone 1)								
Continuous purging	***0*-6***	X	-	7CA, 7CB	6BA/6BB[1)]	o	3AB[1)]	4AB[1)]
	0*-7	X	-	7CA, 7CB	6BA/6BB[1)]	o	3AB[1)]	4AA[1)]
ATEX II 3G (Zone 2) / ATEX II 3D (Zone 22)								
Flammable gases with px purging	***0*-0***	E12	-	7CA, 7CB	6BA/6BB[1)]	o	o	o
	0*-1	E12	-	7CA, 7CB	6BA/6BB[1)]	o	o	o
	0*-0	E42	E42[4)]	7CA, 7CB[4)]	6BA/6BB[1)]	o	o	o
	0*-1	E42	E42[4)]	7CA, 7CB[4)]	6BA/6BB[1)]	o	o	o
Non-flammable gases with "Ex nR" restrictive breathing enclosure	***0*-0***	E11	-	o	o	o	o	o
	0*-1	E11	-	o	o	o	o	o
	0*-0	E41	E41	-	o	o	o	o
	0*-1	E41	E41	-	o	o	o	o
ATEX II 3D (Zone 22)								
Dust protection Ex tc	***0*-0***	-	E40	-	o	o	o	o
	0*-1	-	E40	-	o	o	o	o
Class 1 Div 2								
Flammable and non-flammable gases[3)]	***0*-0***	E20	-	1AA[3)]	6BA/6BB[3)]	o	o	o
	0*-1	E20	-	1AA[3)]	6BA/6BB[3)]	o	o	o
	*****-****[2)]	E20	-	1AA[3)]	6BA/6BB[3)]	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 enclosure required
3) When using flammable gases and only in coordination with relevant authority
4) When used in hazardous zone 22, it is prohibited to purge the analyzer and no flammable gases may be introduced

Use of ULTRAMAT 6 in hazardous area and/or for measurement of flammable gases

Category / operation mode	Article No. 7MB2111- 7MB2112-	Certification and order codes Gas Hazardous zone	Dust Hazardous zone	Additional unit Purging unit 7MB8000-	Flame arrestor 7MB8000-	Pressure switch 7MB8000-	Ex i isolating transformer 7MB8000-	Ex i isolating relay 7MB8000-
ATEX II 2G (Zone 1)								
Continuous purging	*****-6*A*	X	-	7CA, 7CB	o	o	3AB[1)]	4AB[1)]
	*****-7*A*	X	-	7CA, 7CB	o	o	3AB[1)]	4AA[1)]
ATEX II 3G (Zone 2) / ATEX II 3D (Zone 22)								
Flammable gases with px purging	*****-0*A*	E42	E42[4)]	7CA, 7CB[4)]	o	o	o	o
	*****-1*A*	E42	E42[4)]	7CA, 7CB[4)]	o	o	o	o
	*****-0*A*	E12	-	7CA, 7CB	o	o	o	o
	*****-1*A*	E12	-	7CA, 7CB	o	o	o	o
Non-flammable gases with "Ex nR" restrictive breathing enclosure	*****-0*A*	E41	E41	-	o	o	o	o
	*****-1*A*	E41	E41	-	o	o	o	o
	*****-0*A*	E11	-	o	o	o	o	o
	*****-1*A*	E11	-	o	o	o	o	o
ATEX II 3D (Zone 22)								
Dust protection Ex tc	*****-0*A*	-	E40	o	o	o	o	o
	*****-1*A*	-	E40	o	o	o	o	o

Application (Continued)

Category / operation mode	Article No. 7MB2111- 7MB2112-	Certification and order codes Gas Hazardous zone	Dust Hazardous zone	Additional unit Purging unit 7MB8000-	Flame arrestor 7MB8000-	Pressure switch 7MB8000-	Ex i isolating transformer 7MB8000-	Ex i isolating relay 7MB8000-
Class 1 Div 2								
Flammable and non-flammable gases$^{3)}$	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 enclosure required
$^{3)}$ When using flammable gases, only in coordination with relevant authority
$^{4)}$ When used in hazardous zone 22, it is prohibited to purge the analyzer and no flammable gases may be introduced

Use of CALOMAT 6 in hazardous area and/or for measurement of flammable gases

Category / operation mode	Article No.	Certification Gas	Dust	Additional unit Purging unit 7MB8000-	Flame arrestor 7MB8000-	Pressure switch 7MB8000-	Ex i isolating transformer 7MB8000-	Ex i isolating relay 7MB8000-
ATEX II 2G (Zone 1)								
Continuous purging	7MB2511-***0*-0AF*	X	-	7CA, 7CB	6BA/6BB$^{1)}$	o	3AB$^{1)}$	4AB$^{1)}$
	7MB2511-***0*-1AF*	X	-	7CA, 7CB	6BA/6BB$^{1)}$	o	3AB$^{1)}$	4AA$^{1)}$
ATEX II 3G (Zone 2) / ATEX II 3D (Zone 22)								
Flammable gases with px purging	7MB2511-***0*-*AJ*	X	X$^{4)}$	7CA, 7CB$^{4)}$	6BA/6BB$^{1)}$	o	o	o
	7MB2511-***0*-*AC*	X	-	7CA, 7CB	6BA/6BB$^{1)}$	o	o	o
	7MB2521-***0*-*AB*$^{2)}$	X	-	In accord. w/certificate	6BA/6BB$^{1)}$	o	o	o
Non-flammable gases with "Ex nR" restrictive breathing enclosure	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
ATEX II 3D (Zone 22)								
Dust protection Ex tc	7MB2511-***0*-*AG*	-	X$^{4)}$	-	o	o	o	o
Class 1 Div 2								
Flammable and non-flammable gases$^{3)}$	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 enclosure required
$^{3)}$ When using flammable gases, only in coordination with relevant authority
$^{4)}$ When used in hazardous zone 22, it is prohibited to purge the analyzer and no flammable gases may be introduced

Application (Continued)

Use of ULTRAMAT 23 in hazardous area and/or for measurement of flammable gases

Category / operation mode	Article No. 7MB233*-	Certification and order codes Gas Hazardous zone	Dust Hazardous zone	Additional unit Purging unit 7MB8000-	Flame arrestor 7MB8000-	Pressure switch 7MB8000-	Ex i isolating transformer 7MB8000-	Ex i isolating relay 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 enclosure required

Use of OXYMATT 7 in hazardous area and/or for measurement of flammable gases or potentially explosive gases

Place of installation / operation mode	Article No.	Certification Gas Hazardous zone	Dust Hazardous zone	Additional unit Purging unit (Available for order via option E72 for 7MB3000)	Flame arrestor 7MB8000-
Zone 1					
Wall-mounted device Ex p Non-flammable, flammable and occasionally explosive gases	7MB3000-(3/4)(C/K)*0*-**(E/G)0	X	X[1]	E72[3] py or px monitoring system (only px for O7 high-temperature version)	6BA/6BB (in sample gas path and reference gas path); only with flammable sample gases
	7MB3020-(2/3)(C/D)*(1/2/4/5)0-*AA0	X	X[1]		
	7MB3027-(2/3)(C/D)*(1/2/4/5)0-*AA0	X	X[1]		
Field device Ex d Flammable gases	7MB3000-6CX00-(0/6)*H0	X	-	o	Integrated
	7MB3020-(4/5)(C/D)*(1/2)0-1AA0	X	-	o	Integrated
	7MB3027-(4/5)(C/D)*(1/2)0-1AA0	X	-	o	Integrated
Zone 2 / Zone 22					
Wall-mounted device Ex p Flammable and potentially explosive gases	7MB3000-(3/4)(C/K)*0*-**(E/G)0	X	X[1]	E72[3] py or px monitoring system (only px for O7 high-temperature version)	6BA/6BB (in sample gas path and reference gas path)
	7MB3020-(2/3)(C/D)*(1/2/4/5)0-*AA0	X	X[1]		
	7MB3027-(2/3)(C/D)*(1/2/4/5)0-*AA0	X	X[1]	o	6BA/6BB (in sample gas path and reference gas path)
Wall-mounted device Ex ec / Ex tc Non-flammable gases	7MB3000-(3/4)(C/K)*0*-**(D/G)0	X	X[1]	o	o
	7MB3020-2(C/D)*(1/2/4/5)0-*AA0	X	X[1]	o	o
	7MB3027-2(C/D)*(1/2/4/5)0-*AA0	X	X[1]	o	o
19" rack unit Ex ec[2] Flammable and potentially explosive gases	7MB3000-0C*0*-**C0	X	-	-	o
	7MB3020-2(C/D)*(1/2)0-*AA0	X	-	-	o
	7MB3027-2(C/D)*(1/2)0-*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 according to EN/IEC 60079-0 and EN/IEC 60079-7 with defined air exchange rate according to BVS 15 ATEX E 007 X and IECEx BVS 15.0007X

Application (Continued)

3) Gönnheimer Ex p purge monitoring (px)

Use of ULTRAMAT 7 in hazardous area and/or for measurement of flammable gases or potentially explosive gases

Place of installation	Article No.	Certification Gas Hazardous zone	Dust Hazardous zone	Additional unit Purging unit (Available for order via option E72 for 7MB3000)	Flame arrestor 7MB8000-
Zone 1					
Wall-mounted device Ex p Flammable gases and potentially explosive gases	7MB3000-(3/4)B*0*-**(E/G)0	X	X[1]	E72[3] py or px monitoring system	o
	7MB3010-2**(1/2/3) (0/1)-0AB0	X	X[1]		o
	7MB3017-2**(1/2/3) (0/1)-0AB0	X	X[1]		o
Zone 2 / Zone 22					
Wall-mounted device Ex p Flammable and potentially explosive gases	7MB3000-(3/4)B*0*-**(E/G)0	X	X[1]	E72[3] py or px monitoring system	o
	7MB3010-2**(1/2/3) (0/1)-0AB0	X	X[1]		o
	7MB3017-2**(1/2/3) (0/1)-0AB0	X	X[1]	E72[3] py or px monitoring system	o
Wall-mounted device Ex ec / Ex tc non-flammable gases	7MB3000-(3/4)B*0*-**(D/G)0	X	X[1]	o	o
	7MB3010-2**(1/2/3) (0/1)-0AB0	X	X[1]	o	o
	7MB3017-2**(1/2/3) (0/1)-0AB0	X	X[1]	o	o
19" rack unit Ex ec[2] Flammable and potentially explosive gases	7MB3000-0B*0*-**C0	X	-	-	o
	7MB3010-2**(1/2/3) (0/1)-0AA0	X	-	-	o
	7MB3017-2**(1/2/3) (0/1)-0AA0	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 according to EN/IEC 60079-0 and EN/IEC 60079-7 with defined air exchange rate according to BVS 18 ATEX E 084 X; BVS 15 ATEX E 007 X and IECEx BVS 15.0007X
3) Gönnheimer Ex p purge monitoring (px)

Use of CALOMAT 7 in hazardous area and/or for measurement of flammable gases or potentially explosive gases

Place of installation / operation mode	Article No.	Certification Gas Hazardous zone	Dust Hazardous zone	Additional unit Purging unit (Available for order via option E72 for 7MB3000)	Flame arrestor 7MB8000-
Zone 1					
Wall-mounted device Ex p Flammable gases and potentially explosive gases	7MB3000-(3/4)F*0*-**(E/G)0	X	X	E72[3] py or px monitoring system	Integrated
	7MB3040-2XX00-0**0	X	X		Integrated
	7MB3047-2XX00-0**0	X	X		Integrated
Zone 2 / Zone 22					
Wall-mounted device Ex p Flammable and potentially explosive gases	7MB3000-(3/4)F*0*-**(E/G)0	X	X[1]	E72[3] py or px monitoring system	Integrated
	7MB3040-2XX00-0**0	X	X[1]		Integrated
	7MB3047-2XX00-0**0	X	X[1]		Integrated

Application (Continued)

Place of installation / operation mode	Article No.	Certification Gas Hazardous zone	Dust Hazardous zone	Additional unit Purging unit (Available for order via option E72 for 7MB3000)	Flame arrestor 7MB8000-
Wall-mounted device Ex ec / Ex tc Non-flammable gases	7MB3000-(3/4)F*0*-**(D/G)0	X	X[1)	o	Integrated
	7MB3040-2XX00-0**0	X	X[1)	o	Integrated
	7MB3047-2XX00-0**0	X	X[1)	o	Integrated
19" rack unit Ex ec[2) Flammable and potentially explosive gases	7MB3000-0F*0*-**C0	X	-	-	Integrated
	7MB3040-2XX00-0**0	X	-	-	Integrated
	7MB3047-2XX00-0**0	X	-	-	Integrated

- 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 according to EN/IEC 60079-0 and EN/IEC 60079-7 with defined air exchange rate according to BVS 18 ATEX E 084 X; BVS 15 ATEX E 007 X and IECEx BVS 15.0007X
3) Gönnheimer Ex p purge monitoring (px)

Overview of the Ex certificates (series 6)

	Ex approval ATEX 2G - LC See base article number	2G - CP	3G burn. Z + E12 except CALOMAT	3G nbrn. Z + E11	CLASS I Div 2 FM Z + E20	CSA Z + E20	ATEX 3D (dust) Z + E4X except CALO-MAT
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	3018862	1526660	-
C62F	ATEX 2022 X	ATEX 1708 X	ATEX 1697 X	ATEX 1697 X	3018862	1526660	ATEX 2278 X
C62F-S	ATEX 2022 X	ATEX 1708 X	ATEX 1697 X	ATEX 1697 X	3018862	1526660	-
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	ATEX 1873 X	3018862	1526660	-
C6E-S	-	-	ATEX 1873 X	ATEX 1873 X	3018862	1526660	-
C62E	-	-	-	-	-	-	-
C62E-S	-	-	-	-	-	-	-
O61	-	-	-	-	-	-	-
O64	-	-	-	-	-	-	-
F6	-	-	-	(SET)	-	-	-
U23	-	-	BVS 16 ATEX E 061 X	BVS 16 ATEX E 061 X	-	70059958	-
U23 O2p	-	-	BVS 16 ATEX E 061 X	BVS 16 ATEX E 061 X	-	70059958	-
U23 H2S	-	-	BVS 16 ATEX E 061 X	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

Application (Continued)

Possible PROFIBUS combinations 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

Requirements for the Ex p safety equipment to be connected (BARTEC Ex p purging unit)

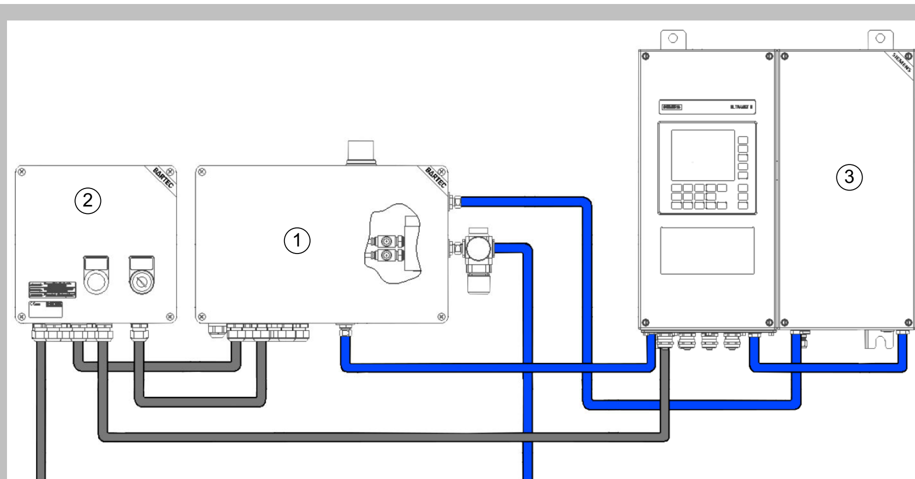
The Ex p safety equipment to be connected to the analyzer must have at least the following features:

- 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 primary pressure 0.6 MPa
- Relay contacts for all-pole isolation of the analyzer supply voltage
- Connection option for a keyswitch and a pressure switch (intrinsically safe circuits)
- Device version "Leakage compensation": Connection option for a pressure switch with intrinsically safe scan.

Design

The following diagram shows the typical installation of the BARTEC Ex p control unit in connection with series 6 field devices.

- Blue lines are purging gas connections
- Gray lines are electrical connections



1 Ex p control device BARTEC
2 Ex control station BARTEC
3 Siemens analyzing system: here Series 6 field device

BARTEC Ex p control unit: Installation in conjunction with series 6 field devices

- The enclosure of the BARTEC Ex p control unit is made of glass-fiber reinforced polyester, in which the pressure measuring board as well as purging gas control and purging gas outlet are integrated.
- The BARTEC Ex control station is used for voltage and signal distribution as well as activation of the bypass operation.
- The BARTEC Ex control station has a bypass keyswitch as well as an indicator light which shows the activated bypass operation. A MODEX comb relay can be integrated internally if required.

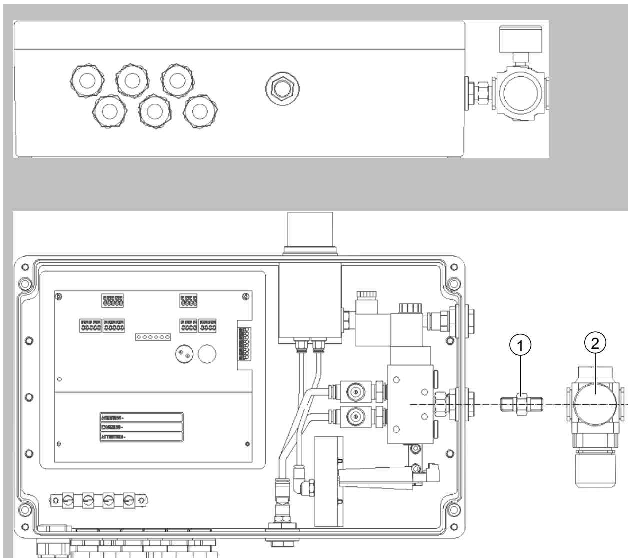
Mode of operation

BARTEC Ex p control unit

The BARTEC Ex p control unit serves as a control and monitoring device for pressurized enclosures. The control unit is intended for use in Explosion Group II, Category 2G (Zone 1) and temperature class T4 and can also be used in Zone 2.
In addition, the safety function of the BARTEC Ex p control unit meets the requirements of SIL 2 according to IEC 61508 and performance level "d" according to EN ISO 13849-1.
The BARTEC Ex p control unit is specially designed for Ex p systems according to the principle of "continuous operating flow". For this, the BARTEC Ex p control unit operates according to the procedure described in EN 60079-2, section 13.3.

- In this process, the BARTEC Ex p control unit purges the protected volume and then reliably prevents the occurrence of a dangerous concentration of explosive gas mixtures using a continuous operating flow.
  - Due to the higher pressure inside the protected volume compared to the atmosphere, potentially explosive gases cannot enter the pressurized enclosure from the outside at any time.
- After installing the BARTEC Ex p control unit and connecting the purging gas connections to the protected volume, and after connecting the mains voltage and purging gas, the Ex p system starts automatically.
  - The Ex p PLC with the BARTEC Ex p control unit regulates the purging gas flow and internal enclosure pressure during the purging phase and the internal enclosure pressure and operating flow during the operating phase.

The purging phase is required to prevent any explosive atmosphere that may have penetrated during the downtime from becoming a hazard. The enclosure must therefore be purged with protective gas (air from a non-hazardous area or inert gas) before commissioning.



1 Double nipple G¼ inch

2 Pressure reducer

BARTEC Ex p control unit: Purging gas supply assembly

The maximum pressure for the BARTEC Ex p control unit is 2.5 bar. A pressure reducer must be connected upstream for higher pressures of the supplied purging gas. The pressure reducer for reducing the supplied purging gas pressure is mounted on the outside of the BARTEC Ex p control unit. For this, a threaded joint with a G¼ inch female thread is attached to the enclosure.

Mode of operation (Continued)

Only inert gas (e.g. nitrogen) or purified and dry instrument air may be used as purging gas. A filter must be connected upstream if the quality with regard to foreign particles is not guaranteed.
During the operating phase, the pressure inside the enclosure is maintained at a level at least 50 Pa higher than that of the surrounding atmosphere.
The BARTEC Ex p control unit automatically regulates and monitors the purging gas flow during the purging phase and the internal enclosure pressure during the operating phase. If the purging gas flow or the internal pressure drops below a specified minimum value, the supply voltage of the pressurized equipment is immediately switched off.
Attention must be paid to functional safety when connecting external sensors to the Ex p control unit. The external sensor technology must meet SIL 2 requirements. Up to 2 [Ex ia] pressure or gas sensors with 4 to 20 mA output can be connected. The signal is processed according to the setting of the functions. The function is set by an integrated web interface via a LAN interface. The web interface is operated via a PC or laptop and has password protection. By default, the Ex p control unit has a permanently set IP address. In addition, up to 3 temperature sensors (PT 100 or 1000) can be connected. 2 or 3-wire sensors can be used.

Selection and ordering data

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

Technical specifications

Series 6, BARTEC Ex-p purging unit	
Electrical characteristics	
Mains voltage AC (variants)	100 ... 230 V AC ±10%
Max. power consumption	35 W (incl. flush valve)
Electrical inputs and outputs	
• Enable relay K1 (SIL)	2 potential-referenced NO contacts: • 230 V AC at 5 A (AC1) or • 24 V DC at 5 A (DC1)
• Enable relay K2 (SIL)	Floating, 4 x NO • 230 V AC at 3 A • 24 V DC at 3 A
• Signal relays K3 and K4	Floating, 1x changeover contact • 230 V AC at 1 A • 24 V DC at 1 A
Purging gas supply	
Purging gas supply primary pressure:	Max. 3.5 bar
Trip value p1	≥ 50 Pa (0.5 mbar)
Purging phase	
• Duration	• Preset to 5 minutes • Adjustable purge time: 1 ... 120 minutes

Technical specifications (Continued)

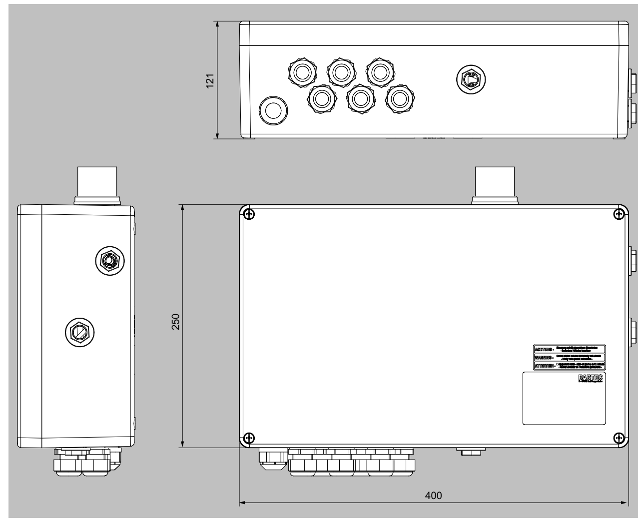
Series 6, BARTEC Ex-p purging unit	
• Flow	• Preset to 50 l/minute (3 000 l/h) • Adjustable: ≤ 65 l/minute (3 900 l/h)
Purge volume	250 l
Operating flow rate	• Preset to 3.5 l/minute (trip value 3 l/minute) • Adjustable: ≤ 30 l/minute
Purging gas valve	Switchover valve
Design, enclosure	
Enclosure material	Polyester, glass-fiber reinforced
Dimensions in mm (W × H × D)	250 × 300 × 130
Weight	10.7 kg
Operating conditions	
Operating temperature range	-25 ... +50 °C
Storage and transport temperature	-25 ... +60 °C
IP degree of protection	• IP64 according to IEC/EN 60079-0 • IP66 according to IEC/EN 60529
Certificates and approvals	
EC prototype test certificate	BVS 19 ATEX E 015 X
IEC ex certification	IECEx BVS 19.0038X
ATEX marking	II 2(1)G Ex eb mb ib [ib pxb] [ia Ga] IIC T4 Gb
IEC Ex marking	Ex eb mb ib [ib pxb] [ia Ga] IIC Gb

Accessories

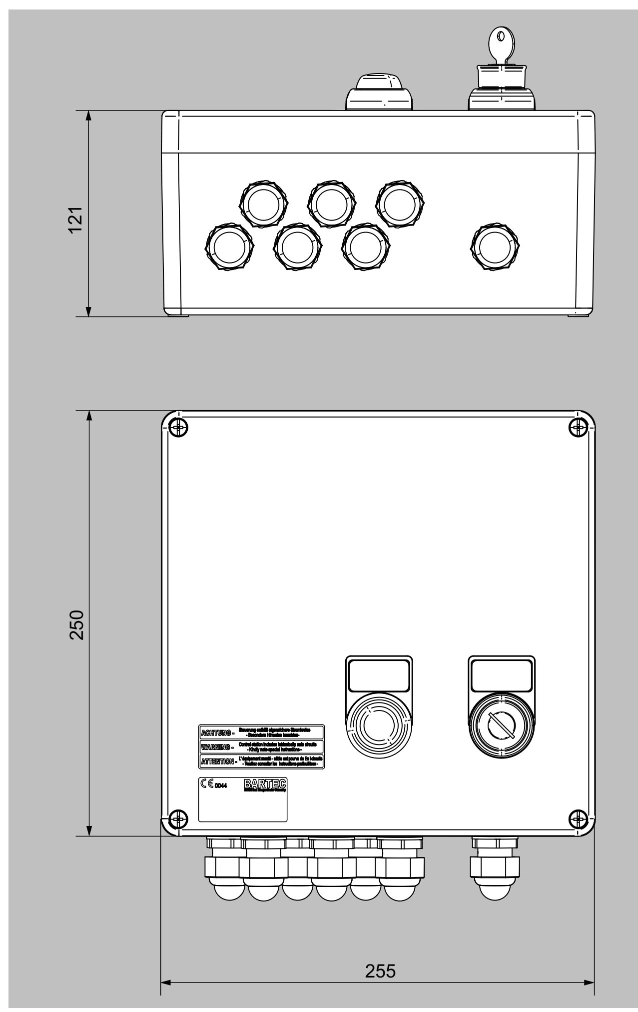
Accessories (optional)

In addition, a display (p operator panel) can be connected to the BARTEC Ex p control unit as a visualization unit. This enables the display of system states and parameter assignment of the control unit. Mounting brackets enable the display to be used either angle-mounted or flush-mounted. The display can be connected or disconnected during operation. There is no need for the display to be permanently connected to the control unit.

Dimensional drawings



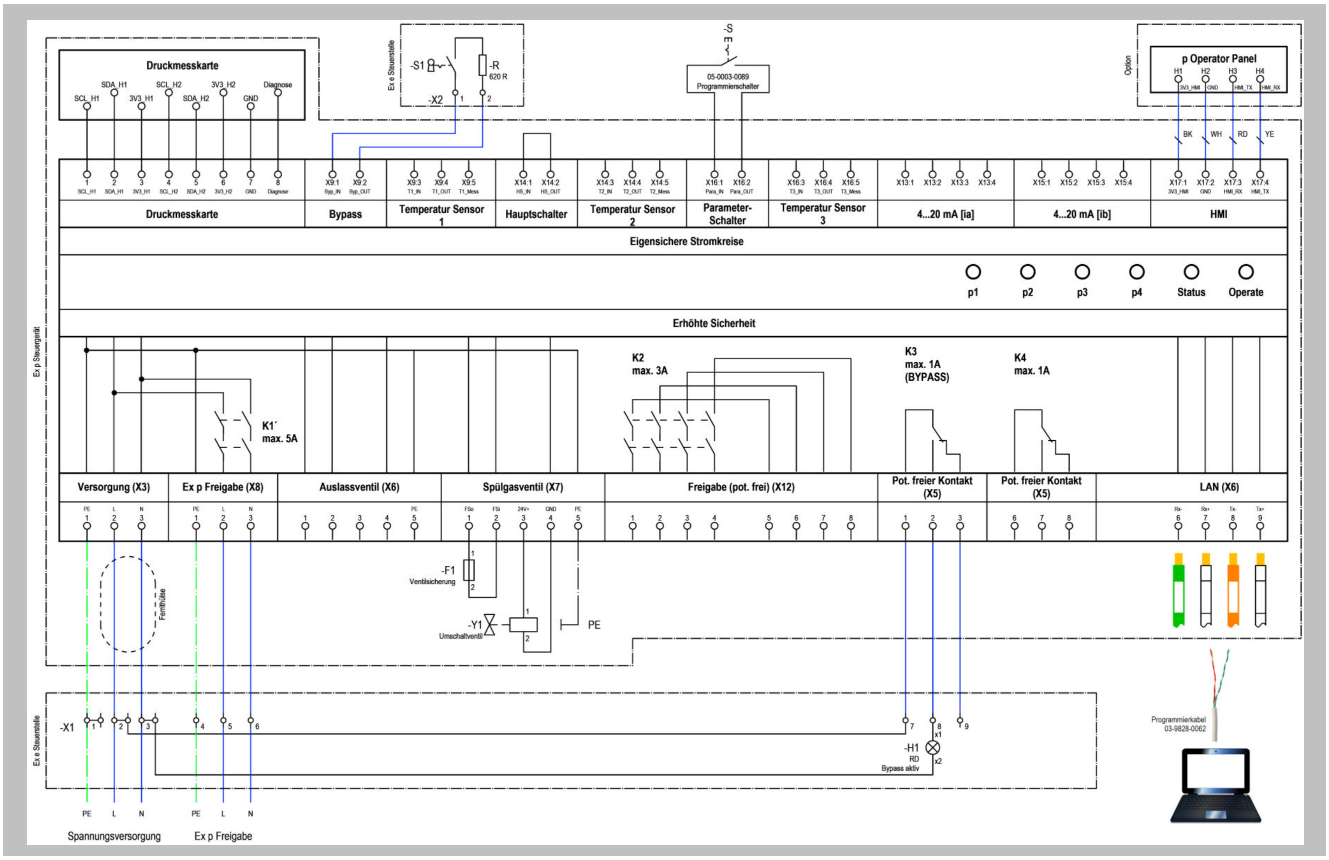
BARTEC Ex p control unit, dimensions in mm



BARTEC Ex control station, dimensions in mm

Circuit diagrams

Electrical wiring diagram of the BARTEC Ex p control unit



BARTEC Ex p control unit: electrical 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.

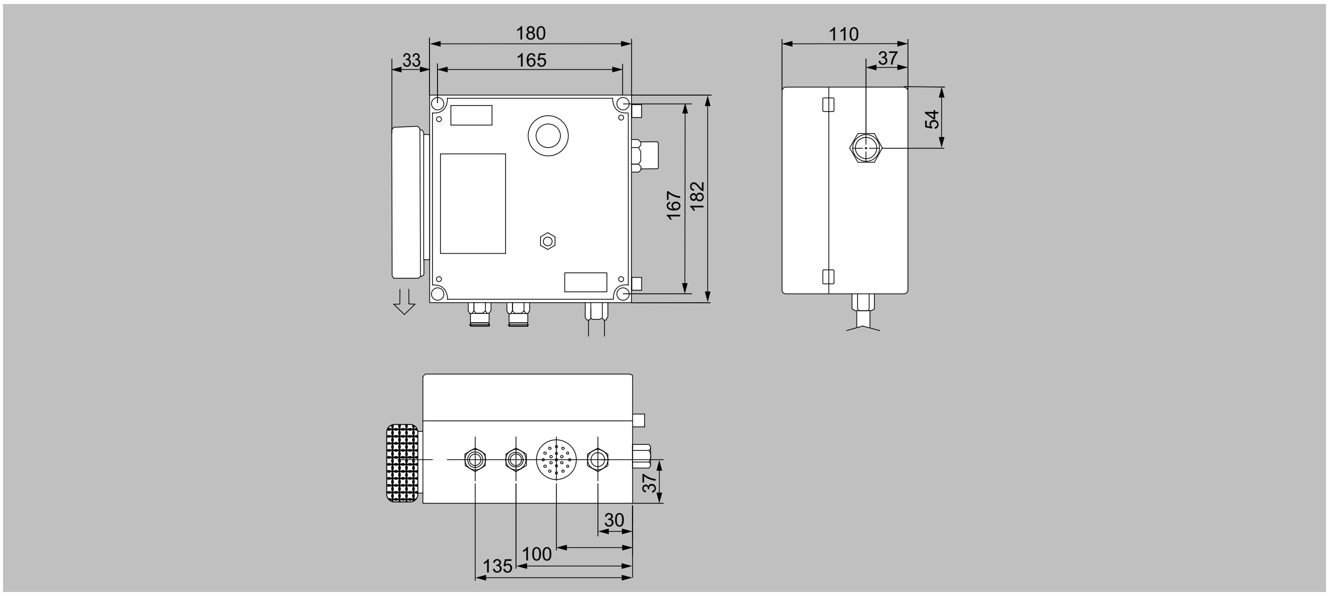
Selection and ordering data

	Article No.
FM/CSA (Class I Div 2)	
Ex purging unit MiniPurge FM	**7MB8000-1AA**

Technical specifications

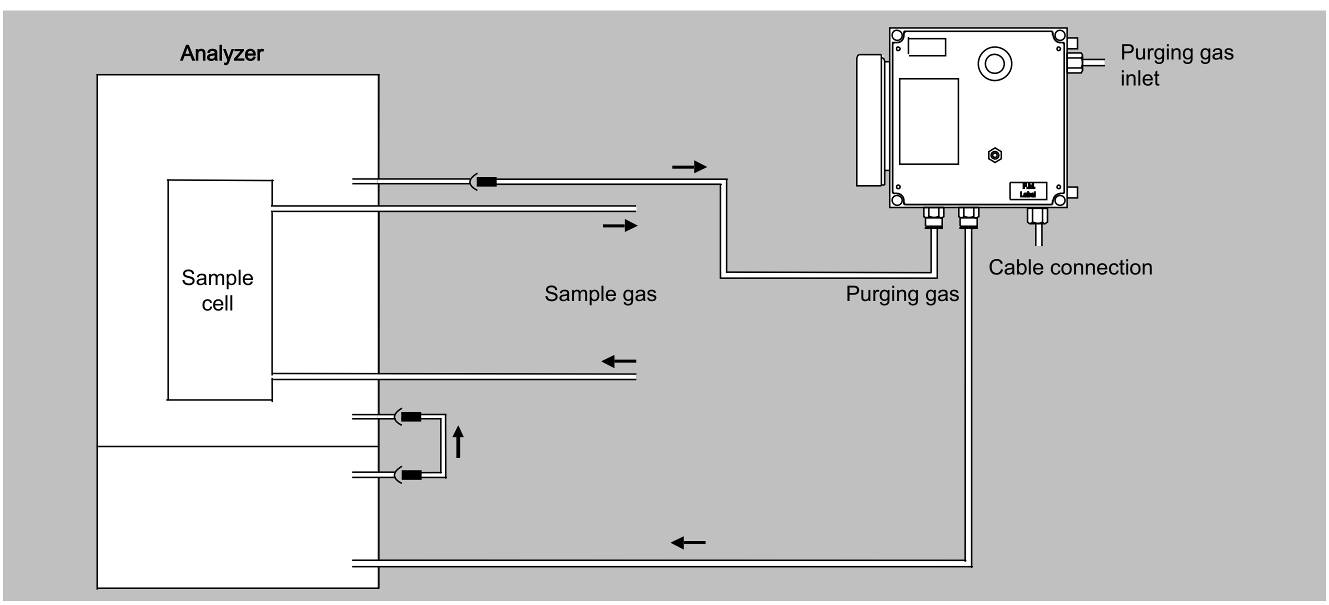
Series 6, purging unit FM (Class I Div 2)	
Classification	Class I Division 2
FM certificate	Certificate of compliance 1X8A4.AE / 0B3A3.AE
Reaction upon failure of pressure	Opening of switching contact, and alarm via signal indicator (red display)
System type	MiniPurge complete system
Operation mode	Continuous 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	Low response limit 0.5 hPa set relative to purging gas flow of 1 to 2 l/min
Prepurging time	Defined by operator, and controlled manually
Enclosure pressure limitation	Made of stainless steel with integrated flame arrestor; opens at 10 hPa ± 10%

Dimensional drawings



MiniPurge, dimensions in mm

Circuit diagrams



MiniPurge, purging unit, Class I, Div 2, gas connection diagram

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 max. mounting height incl. mounting rail is 115 mm, but is less in the vicinity of the display (approx. 88 mm). The width may not exceed 100 mm.
The additional units 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.

Mounting positions in the analyzer

Analyzer	Analyzers[1]
Ex i isolating transformer	2
Ex isolating relay 8S	0

[1] Max. 2 analyzers.

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 type of protection Ex ib II C or EE ia II C). For this purpose, a suitable commercially available isolating transformer can be mounted on a DIN rail in the device.

Technical specifications

- Intrinsically safe analog output
- mA isolating transformer without supply voltage
- For installing in the analyzer

Ex i isolating transformer, DIN 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 ... +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-related limits	$U_0 \leq$ 18.8 V $I_0 \leq$ 107 mA $P_0 \leq$ 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, RS 485 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 a non-hazardous area.

Overview (Continued)

Isolating relays must be installed in special explosion-protected enclosures.

Protective gas

- The fed-in gases are not flammable. Air from a non-hazardous area may be used as the protection 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 potentially 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
Male 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

The Gönnheimer Ex px purging unit "Continuous purging", model FS870S, controls and monitors the pre-purging and operating phases of analyzers with "Containment systems" in Ex zone 1 and Ex zone 2.
The purging unit redundantly monitors a continuous protective gas flow through the connected analyzer. Any escaping sample gas is then diluted to below the explosive limit (max. purging gas pressure 100 hPa). At the same time, a higher pressure is maintained inside the Ex-p enclosure than in the surrounding atmosphere.
If the purging gas flow or the internal pressure drops below a specified minimum value, the supply voltage of the pressurized equipment is switched off.

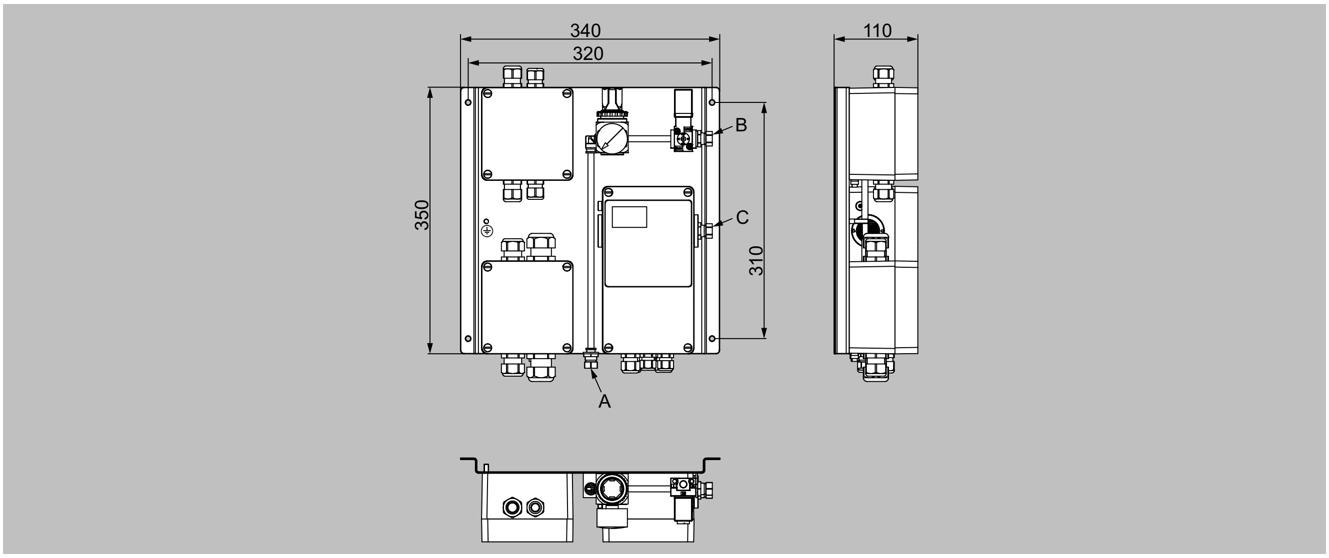
Technical specifications

Purging unit consisting of FS870S with SVP2, SR852, SR853, pressure regulators	
Electrical data	
Voltage	110 ... 230 V AC ± 10%
Frequency	48 ... 62 Hz
Power consumption	20 W
Component SR852	
8 floating switching contacts	Max. 250 V AC / 3 A (23 ... 15 AWG)
	Max. 30 V DC / 3 A
Cable cross-section	
• With end sleeve	0.25 ... 1.5 mm² (23 ... 15 AWG)
• Without end sleeve	0.2 ... 2.5 mm2 (24 ... 13 AWG)
Component SR853	
4 floating switching contacts	Max. 420 V AC / 16 A, 30 A / 4 s, 80 A / 20 ms
	Max. DC 28 V DC / 16 A
Cable cross-section	
• With end sleeve	0.25 ... 4 mm² (23 ... 11 AWG)
• Without end sleeve	0.2 ... 6 mm² (24 ... 10 AWG)
Climatic conditions	
Ambient temperature	0 ... +60 °C (32 ... 140 °C)
Humidity	5 ... 95%, no condensation
Pneumatic data	
Primary pressure	2.5 ... 10 bar Min. 3 l/s at the connection point
Pressure measuring range	5 ... 200 mbar
Flow measuring range	0.01 ... 1.5 l/s
Enclosure	
Degree of protection	IP65
Dimensions in mm (inch)	340 × 350 × 110 (13.4 × 13.8 × 4.3)
Explosion protection	
Device group	II 2G / II 2D
FS870S	
• Explosion protection	• II 2 G Ex e db mb ib [pxb] IIC T4 Gb • II 2 D Ex tb IIIC T100 °C [ib] [pxb] Db
• Prototype test certificate	• ATEX: BVS 10 ATEX E 112 • IECEx: IECEx BVS 10.0095
SR852	
• Explosion protection	• II 2 G Ex eb mb IIC T4 Gb • II 2 D Ex tb IIIC T130 °C Db
• Prototype test certificate	• ATEX: BVS 17 ATEX E 016X • IECEx: IECEx BVS 17.0006X
SR853	
• Explosion protection	• II 2 G eb qb IIC T4 II • 2 D Ex tb IIIC T108 °C

Technical specifications (Continued)

Purging unit consisting of FS870S with SVP2, SR852, SR853, pressure regulators	
• Prototype test certificate	• ATEX: TÜV 02 ATEX 1824 • IECEx: IECEx TUN 14.0029
Mounting	Within hazardous area Zone 1/21

Dimensional drawings



Gönnheimer purging unit, dimensions in mm

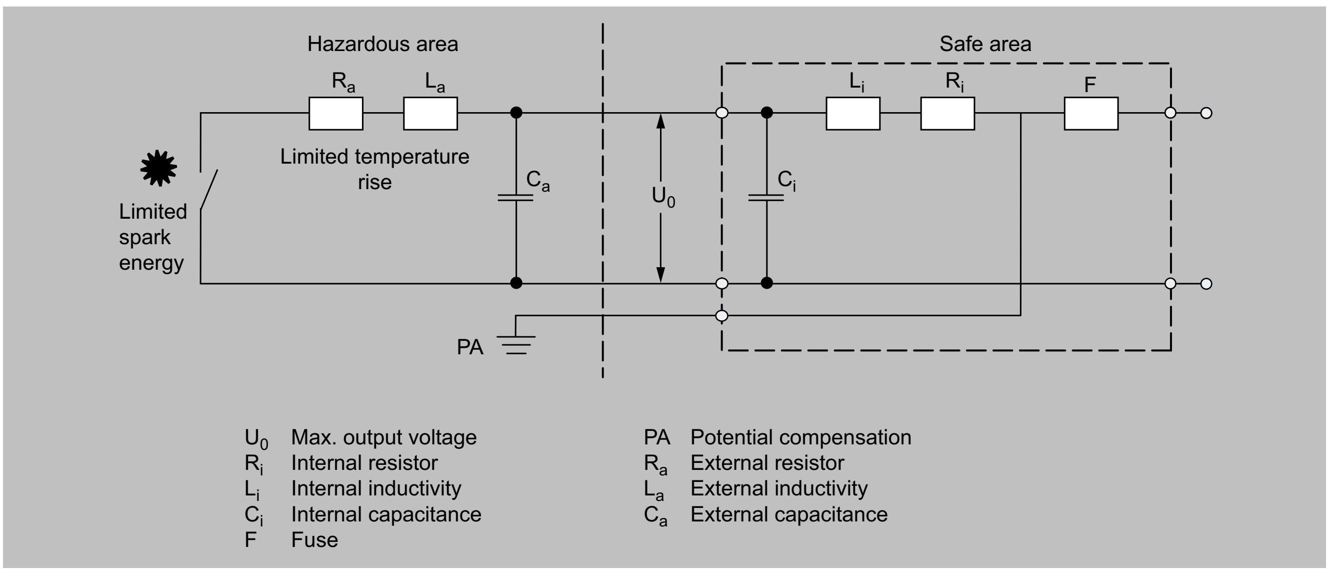
Overview

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".



Block diagram for voltage/current limitation 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 intrinsic safety standards (EN 50020 or EN 50020 and IEC 60079-11 or EN 60079-11). Minimum igni-

Overview (Continued)

tion 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

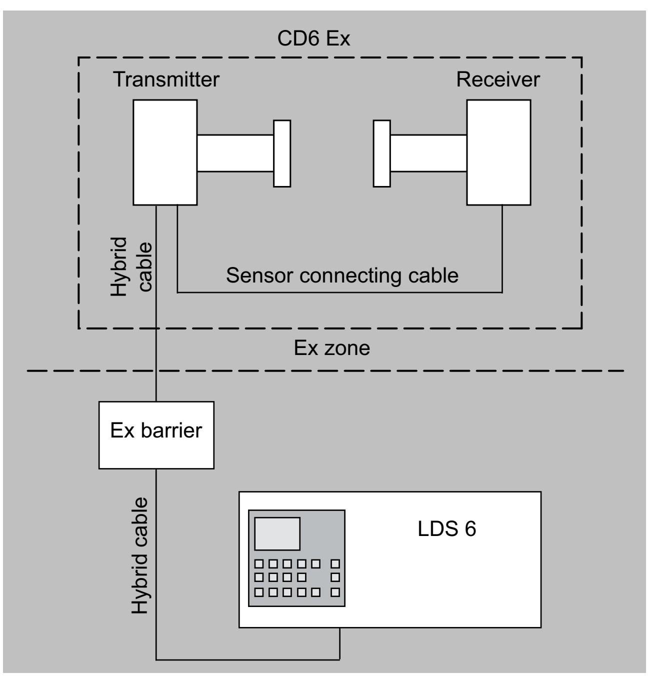
EN 60079-14 (VDE 165, Part 1) must be observed when selecting and routing the cables. Particular attention must be paid to the characteristic values, such as electric strength and minimum conductor cross-section. In the case of intrinsically-safe circuits, the cable capacitance and inductance must be 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

In situ continuous process gas analysis, LDS 6 / Ex barrier

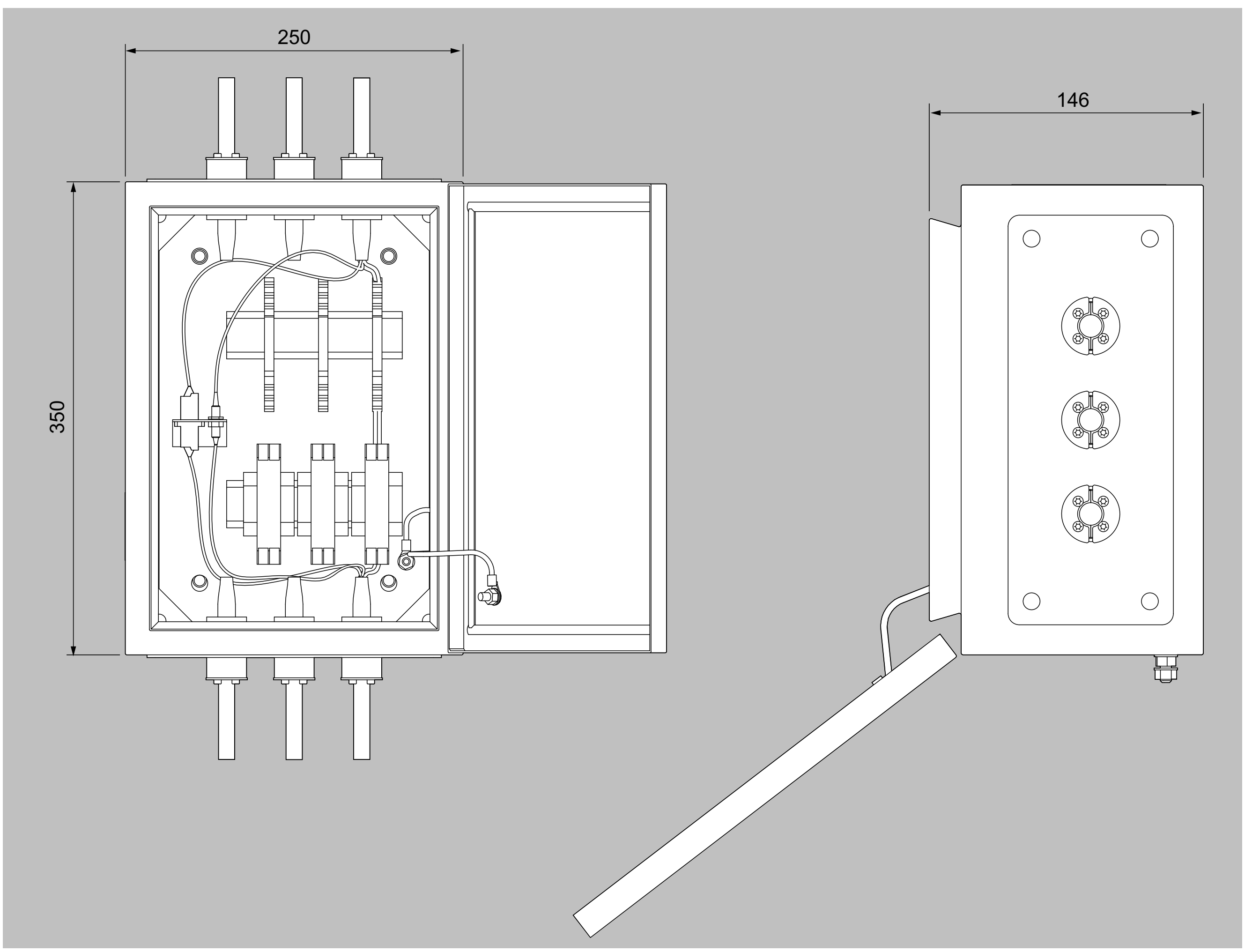
Overview

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

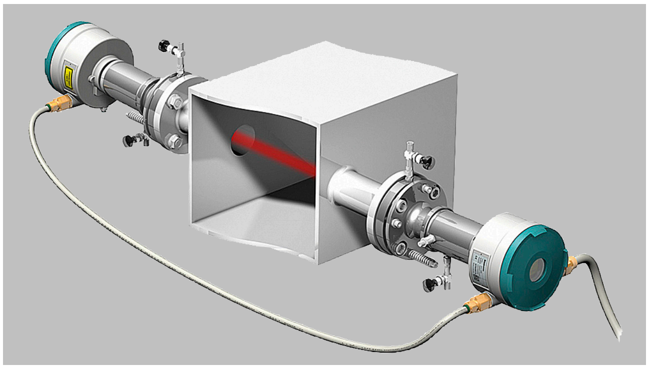
In-situ continuous process gas analytics, LDS 6 / ex-barrier	
Hazardous area output	
• Minimum output voltage	12.5 V at 45 mA
• Maximum output voltage	24 V at 170 Ω
• Current limitation	45 mA
Max. power consumption (45 mA output)	90 mA at 24 V, 110 mA at 20 ... 35 V DC
Safety description	25 V, 170 Ω, 147 mA, U_m = 250 V_{rms} or DC

Dimensional drawings



Ex barrier, dimensions in mm

Overview



An Ex concept with type of protection "Flameproof enclosure d" is used for the SITRANS SL. The enclosure used resists an explosion caused by a potentially explosive gas mixture in the analyzer. Ignition of a potentially 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 µW/mm^2. This is below the values permitted in EN 60079-28.
The SITRANS SL is available with ATEX or FM certificates.

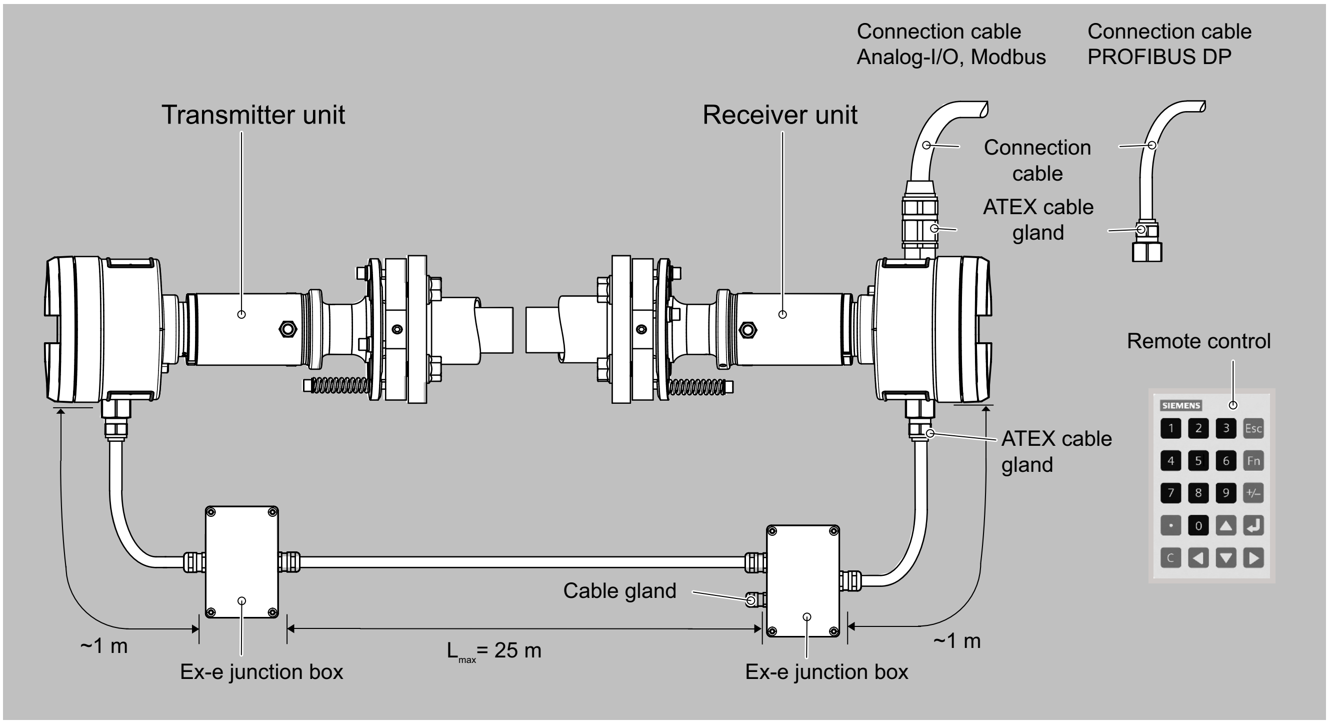
Special conditions

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 protection in accordance with EN 60079-0, Section 1, if the connection is made in the hazardous area.

Design


Connection cable
Analog-I/O, Modbus
Connection cable
PROFIBUS DP
Transmitter unit
Receiver unit
Connection
cable
ATEX cable
gland
Remote control
SIEMENS
1
2
3
Esc
4
5
6
Fn
7
8
9
+/–
0
C
ATEX cable
gland
Cable gland
~1 m
L_{max}= 25 m
~1 m
Ex-e junction box
Ex-e junction box

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.

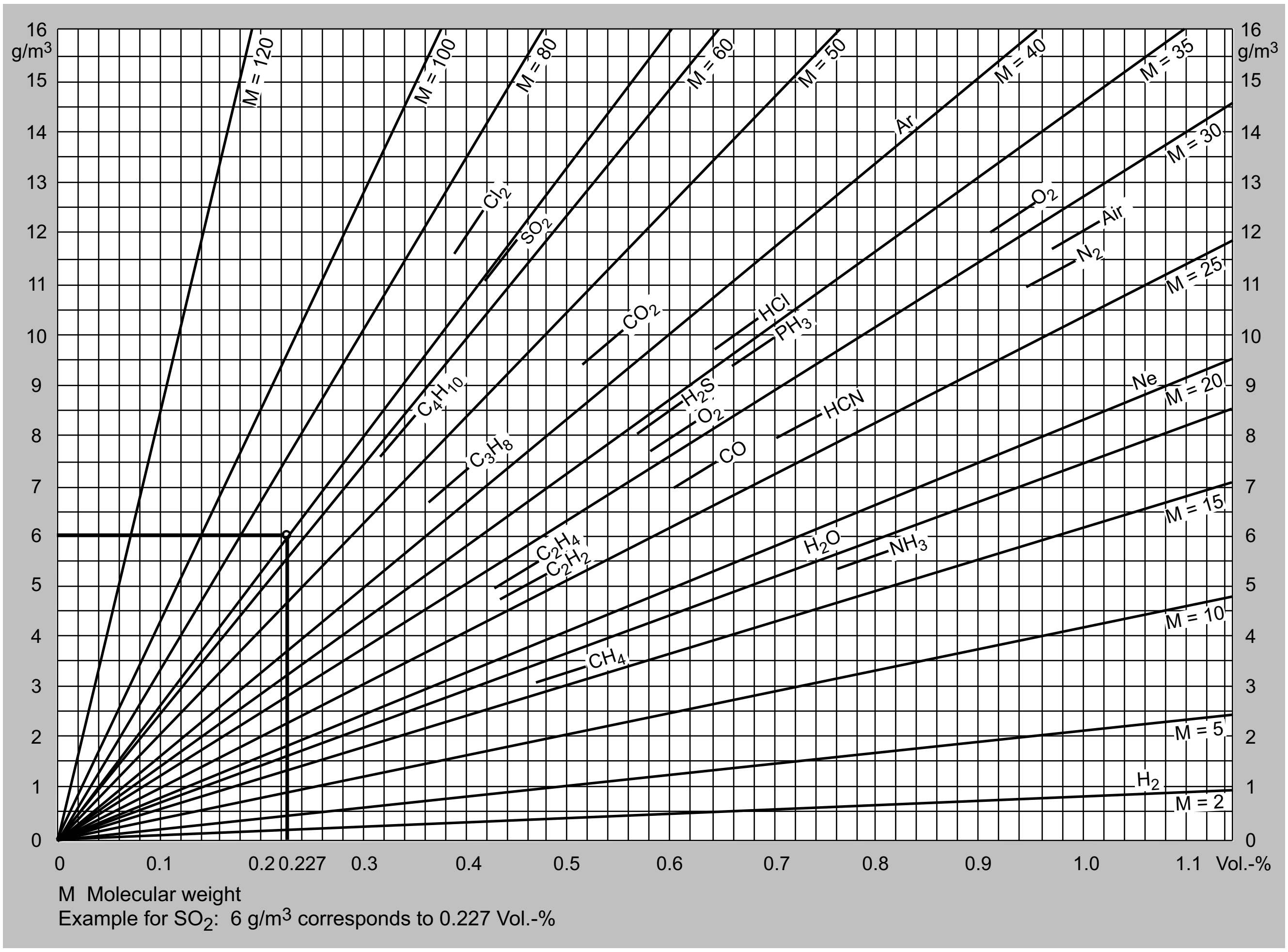
Basic design with MAXUM edition II

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

Conversion tables

Overview



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

	atm	bar	hPa	psia
atm	1	1.01325	1013.25	14.69595
bar	0.9869	1	1000	14.50377

Overview (Continued)

	atm	bar	hPa	psia
hPa	0.0009869	0.001	1	0.0145038
psia	0.0680	0.06894	68.94	1

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

Dew point/saturation table

Overview

Dew point/saturation table

Dew point °C	°F	Water content ppm (vol.)	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

Overview (Continued)

Dew point		Water content	
°C	°F	ppm (vol.)	g/m³ 1)
-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

Dew point/saturation table

Overview (Continued)

Dew point		Water content	
°C	°F	ppm (vol.)	g/m³ [1]
+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	4 mm	6 mm	8 mm	10 mm	12 mm	14 mm	16 mm	18 mm	20 mm
Q									
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

Overview

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 "EN ...." versions, which have also been incorporated into the VDE regulations. EN standards are identical to the corresponding EN standards, were special national features, e.g. concerning ranges 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	Miscellaneous
Ex: General regulations	IEC 60079-0	EN 50014/ VDE 0170/0171 - 1	FM 3600		ANSI/ISA-S12.0.01	CSA 79-0-95		
Oil immersion "o"	IEC 60079-6	EN 50015/ EN 50015, VDE 0170/0171 - 2		UL2279, Pt.6	ANSI/ISA-S12.26. 01	CSA-E79-6		
Pressurized enclosure "p"	IEC 60079-2	EN 50016/ EN 50016, VDE 0170/0171 - 3	FM 3620	(NFPA4 96)		CSA-E79-2	CSA TIL. E 13 A	
Powder filling "q"	IEC 60079-5	EN 50017/ EN 50017, VDE 0170/0171 - 4		UL2279, Pt.5	ANSI/ISA-S12.25. 01	CSA-E79-5		
Flameproof enclosure "d"	IEC 60079-1	EN 50018/ EN 50018, VDE 0170/0171 - 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/ EN 50019, VDE 0170/0171 - 6		UL2279, Pt.7	ANSI/ISA-S12.16. 01	CSA-E79-7		
Intrinsic safety "i"	IEC 60079-11	EN 50020/ EN 50020, VDE 0170/0171 - 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/ EN 50021, VDE 0170/0171 - 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/ EN 50028, VDE 0170/0171 - 9		UL2279, Pt.18	ANSI/ISA-S12.23. 01	CSA-E79-18		
Zone 0	IEC 60079-26	EN 50284/ EN 50284, VDE 0170/0171 - 12						
Electrical safety	IEC 61010	EN 61010-1/ EN 61010-1, VDE 0411 - 1			ANSI/ISA-82. 02.01			CAN/CSA-C22.2 No. 1010.1

European standard	German standard	Title
EN 1127	EN 1127-1	Explosive atmospheres - Explosion protection - Part 1: Fundamentals and method
EN 50039	EN 50039, VDE 0170/0171 - 10	Electrical equipment for hazardous areas; intrinsically safe electrical systems "i"
EN 13463-1	EN 13 463-1	Non-electrical equipment for use in hazardous areas, Part 1: Fundamental method and requirements
EN 50281-1-1	EN 50281-1-1, VDE 0170/0171 - 15-1-1	Electrical equipment for use in areas with combustible dust, Part 1-1: Electrical equipment with protection by enclosure
EN 60079-10	EN 60079-10, VDE 165 Part 101	Electrical equipment for potentially explosive gas atmospheres, Part 10: Classification of the hazardous areas
EN 60079-14	EN 60079-14, VDE 165 Part 1	Electrical equipment for hazardous areas, Part 14: Electrical installations in hazardous areas (except underground excavation)
EN 60079-17	EN 60079-17, VDE 0165 - 10	Electrical equipment for potentially explosive gas atmospheres, Part 17: Testing and maintenance of electrical installations in hazardous areas (except underground excavation)
EN 60950	EN 60950, VDE 0805	Safety of information technology equipment, including electrical office machines

	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 monoxide Methane Methanol Propane Toluene	Ethyl alcohol i-amyl acetate n-butane n-butyl alcohol	Petrol Diesel fuel Aviation gasoline Fuel oil n-hexane	Acetaldehyde Ethyl ether		
II B	Town gas (Illuminating gas)	Ethylene				

Overview (Continued)

	T 1 > 450 °C	T 2 > 300 °C	T 3 > 200 °C	T 4 > 135 °C	T 5 > 100 °C	T 6 > 85 °C
II C	Hydrogen	Acetylene				Carbon disulfide

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/m³

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/m³ does not mean weight concentration.

Appendix

7

7/2	**PIA Life Cycle Portal**
7/2	Engineering, Ordering, Installation and Operation Tool
7/3	**Partners at Siemens**
7/4	Siemens Partner Program
7/5	**Product documentation**
7/5	Supplied product documentation, QR code, SIOS
7/6	**Industry Services**
7/7	Industry Services – Portfolio overview
7/9	Online Support
7/10	**Siemens Automation Cooperates with Education (SCE)**
7/10	Teaching made easy - Comprehensive support on the way to Industry 4.0
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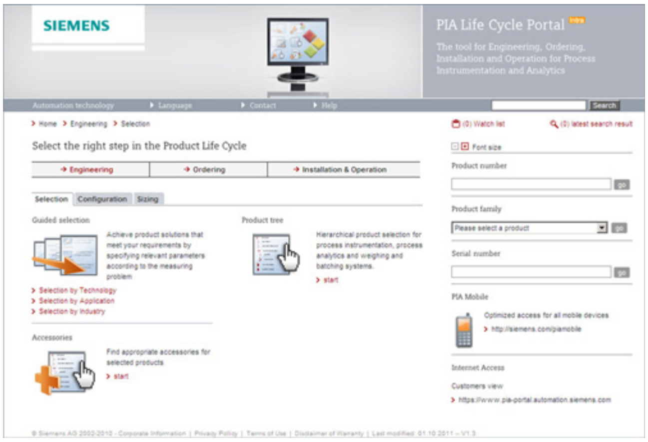
Engineering, Ordering, Installation and Operation Tool

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.
Product configurations which cannot be ordered are blocked.

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

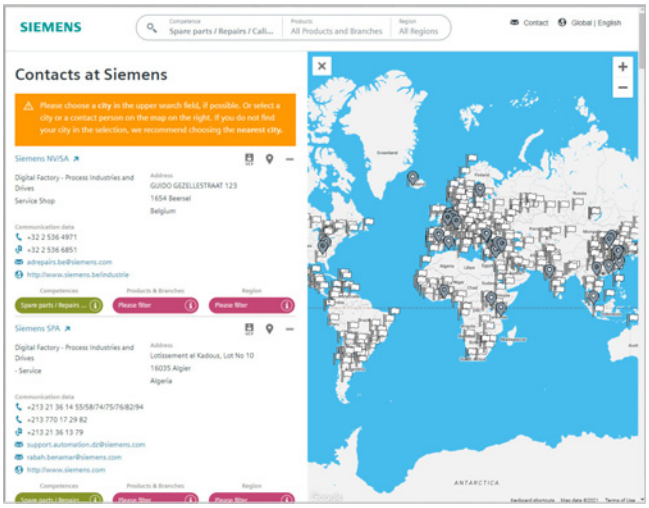
Find all relevant product information at a single glance: commercial and technical data, certificates, images and documents etc.

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

Overview

Partners at Siemens



At your service locally, around the globe for consulting, sales, training, service, support, spare parts on the entire portfolio of Siemens.

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.

Siemens Partner Program

Overview

Siemens Solution and Approved Partner – Partners for your success

Highest competence in automation and drive technology

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 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.

The partner network for industry

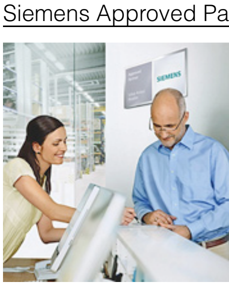
The Siemens Partner Program offers you expertise and experience close at hand.

Within our global network, we distinguish between Solution Partners and Approved Partners. We currently work with more than 1,500 Solution Partners around the world. Our network of over 150 Approved Partners continues to grow. In more than 80 countries worldwide.

Siemens Solution Partner – Automation Drives

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.

Siemens Approved Partner – Value Added Reseller



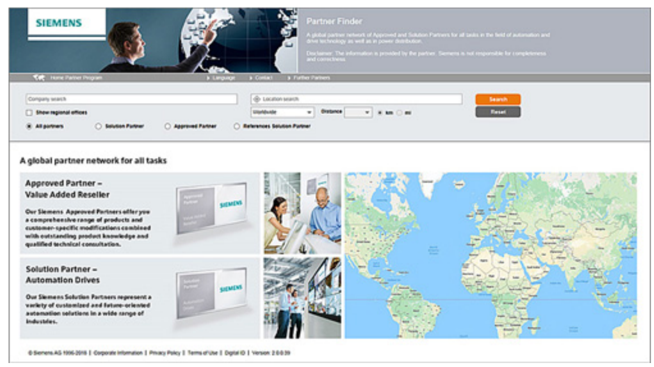
With their detailed technical knowledge, Siemens Approved Partners – Value Added Resellers offer a combination of products and services that range from specialist technologies and customized modifications to the provision of high-quality system and product packages. They also provide qualified technical support and assistance.

Siemens Approved Partner – Industry Services

Siemens Approved Partner – 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.

Partner Finder

The ideal partner for your task is just a mouse click away!



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 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 of the Siemens Parners for industry is available online at:

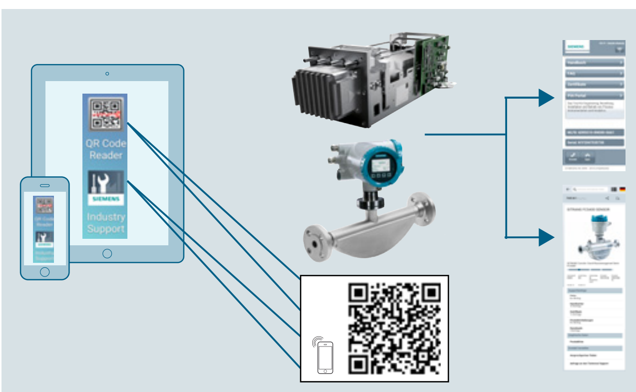
www.siemens.com/partnerprogram

Supplied product documentation on DVD and safety instructions

Siemens products for process analytics will be delivered with a multi-language **Safety note** and a **DVD „Analytical products“**.

On the DVD, customers can find many important operating instructions and certificates of our Siemens portfolio for process analytics. As well, product or order-specific print material may be part of the delivery.

QR code – Easy access to product information

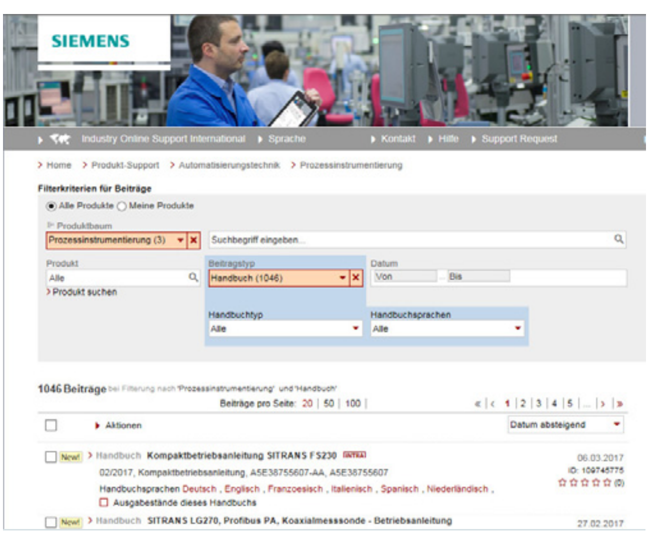


For easy identification, our devices are fitted with a QR code which can be read with the Siemens Industry Support App or any other QR code reader.

This not only enables simple access to article and serial numbers, it also provides you with a direct link to the product documentation, certificates, FAQs and videos.

You can find the Siemens Industry Support App or other QR code reader in your App Store for iOs, Android or Windows mobile.

Siemens Industry Online Support Portal (SIOS)

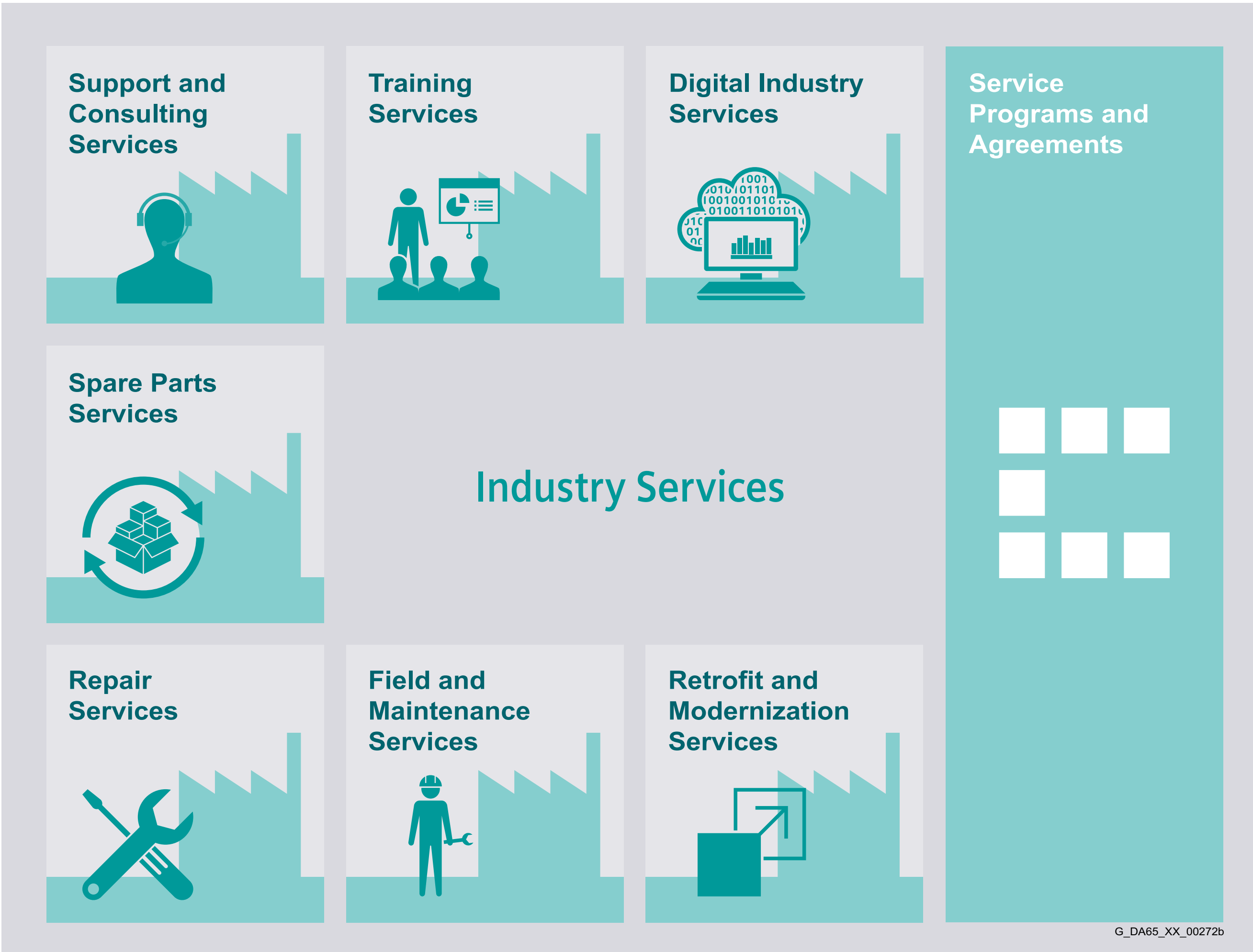


For the complete portfolio, customers can download product documentation for free using the following links to our **Siemens Industry Online Support Portal (SIOS)**:

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

By entering the product names as Search term and selecting the field Entry type, you can find all operating instructions, current catalogs and brochures, certificates, product software (EDDs, calculation tools), product notes and other useful information.

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.

www.siemens.com/industryservices

Overview

Digital Industry 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.

www.siemens.com/global/en/products/services/industry/digital-industry-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.

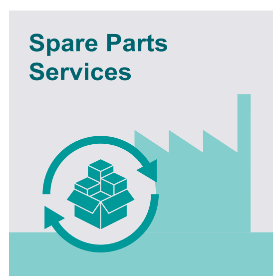
Information & Consulting Services, e.g. SIMATIC System Audit; clarity about the state and service capability of your automation system or Lifecycle Information Services; transparency on the lifecycle of the products in your plants.

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

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

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

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.

Appendix
Siemens Automation Cooperates with Education (SCE)

Teaching made easy - Comprehensive support on the way to Industry 4.0

Knowledge & technology – the keystones to success in digitalization

Digitalization is quickly and radically changing our world. What does this mean for education?

In the world of Industry 4.0, companies can expect a host of new opportunities and challenges. New systems are verified on the spot through simulations. Automated mass production processes can make every product on the conveyor belt a unique product.

New products are now market-ready much faster. Siemens is shaping this transformation as a technology leader in the field of automation and process lifecycle management (PLM).

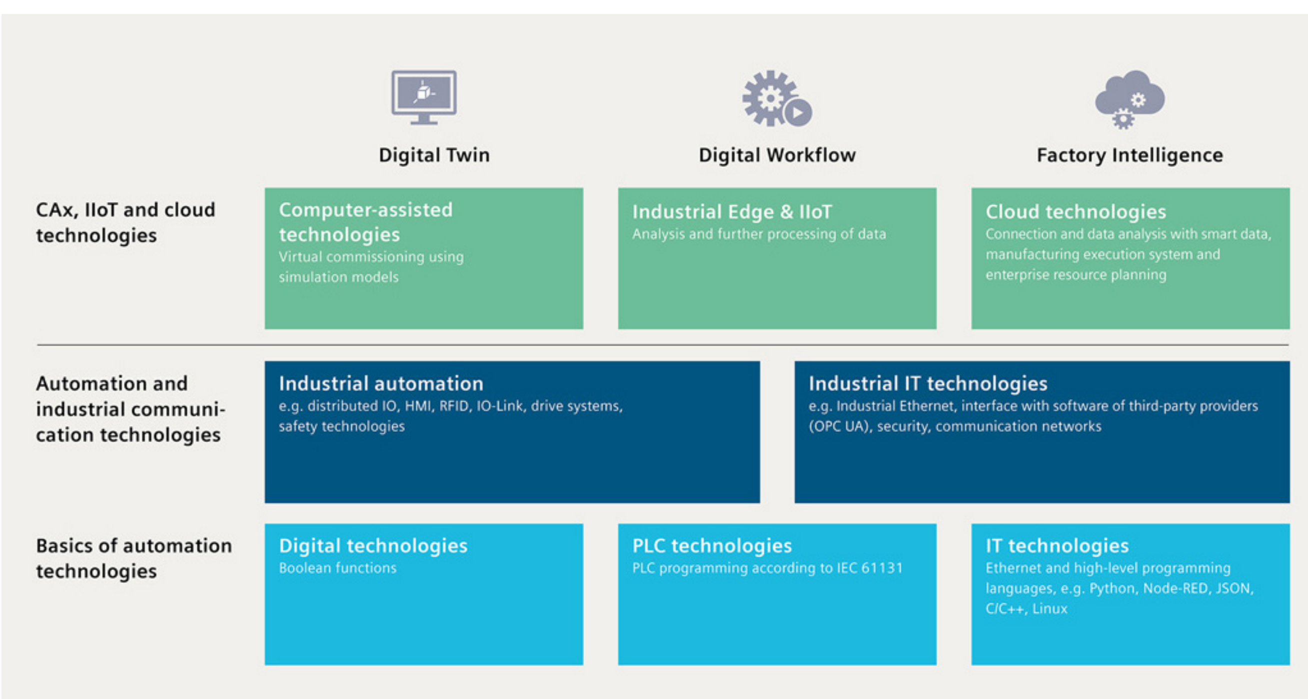
These new digitalization processes are changing the know-how requirements for employees. Many educational institutions are facing the challenge of conveying Industry 4.0 know-how as part of their teaching and training. The Siemens Automation Cooperates with Education (SCE) program is supporting educators on the way to Industry 4.0.

The SCE digitalization concept for educators

The SCE digitalization concept presented here shows how digitalization can be implemented in educational institutions – from vocational schools to universities.

Digitalization (or Industry 4.0) know-how is now introduced through computer aided technology, Industrial Edge and IIoT as well as Cloud technologies. It is founded on the basics of automation, such as digital technologies, PLC and information technologies, and on advanced automation and industrial communication technologies.

The level of digitalization knowledge can be weighted, depending on the vocational field or branch of study –
e.g. mechanical engineering, automation engineering or computer science.



The SCE digitalization concept for educators (continued)

As part of their project work, students at Vocational School 2 in Wolfsburg, Germany, have implemented the three levels of the SCE Industry 4.0 concept. A virtual twin created with the Siemens NX Mechatronics Designer (MCD) CAD software was used for the design and virtual commissioning. This enables fast and efficient assembly of the real automation system, e.g. with SIMATIC S7-1500/ET 200SP/RFID, for use in classes. Production data, such as the number of bottles filled, production date and system parameters, are uploaded to a cloud using SIMATIC IOT2000.

siemens.com/sce/iot2000

siemens.com/nx

The SCE offers

Learning and training documents

More than 100 didactically prepared learning and training documents are available through SCE and incorporate the digitalization concept. They are designed for use in classes, but can also be customized or used for individual study. These documents are available for free download, most of them in 7 languages.

siemens.com/sce/documents

Educator courses

Excellent teaching content is needed to introduce students to digitalization. For this purpose, SCE holds educator courses in certain regions. Based on our learning and training documents and through practical exercises, educators acquire the latest Industry 4.0 know-how.

siemens.com/sce/courses

Trainer packages

The 90 SCE trainer packages help educators teaching and implementing the SCE digitalization concept. Trainer packages comprise specially compiled, genuine Siemens hardware and software products. The trainer packages are based on the learning and training documents and are offered to schools, colleges and universities at special terms.

siemens.com/sce/tp

Support for your projects / textbooks

We support you on selected projects with advice and assistance from SCE contact partners.

As a special service, we support textbook authors. We maintain a list of textbooks on the SCE website.

siemens.com/sce/contact

siemens.com/sce/books

Teaching made easy - Comprehensive support on the way to Industry 4.0

Partnerships for proliferation of Industry 4.0 in education

Partnership with WorldSkills

As a technology powerhouse, we support vocational training of students around the world. Since 2010, we have partnered with WorldSkills as a Global Industry Partner in order to amplify this cause.

WorldSkills is an international organization whose mission is to raise the profile and recognition of skilled people, and show how important vocational skills are in achieving economic growth and personal success. Every two years, WorldSkills hosts the world championships of skills.

Siemens provides the competitors with automation products, such as SIMATIC S7-1500 and LOGO!, for the disciplines: industrial control, electrical installations, Polymechanics/Automation and manufacturing technology.

Additionally, we support selected continental and regional competitions.

siemens.com/worldskills

Partnerships with educators

We provide support to educators and educational organizations in the form of one-on-one advice through SCE contact partners and Siemens experts as well as long-term cooperation.

siemens.com/sce/contact

Partnerships with producers of learning systems

For practical training in classrooms and labs, numerous producers of learning systems offer a wide range of complete didactic solutions based on SCE trainer packages.

siemens.com/sce/learningsystems

Information portal

To facilitate your teaching assignment and/or for selfstudy, we offer educators and students a comprehensive SCE information portal. At this portal you have quick access to all SCE offers, e.g. learning and training documents including projects, Getting Started information, videos, manuals, trial software and newsletters.

siemens.com/sce

Global Industry Partner

worldskills

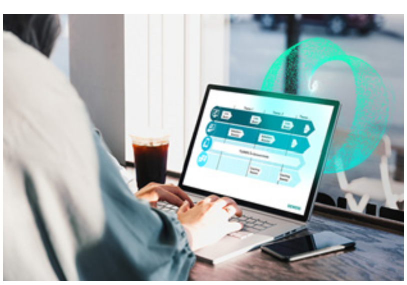
Introduction

The Future of Learning starts now

Globalization, digitalization, new work, Internet of Things, new business models – our way of working, living and learning is changing rapidly. With SITRAIN, the future of learning begins today: SITRAIN stands for a modern learning culture that focuses on the needs of learners and the demands of innovative companies.
With SITRAIN – Digital Industry Academy, the future of learning is yours.

Face-to-face training or digital training, location-independent, 24/7, on-demand or learning at fixed dates and course times? With a personal learning consultant, in a team, or on your own responsibility? Everything is possible. SITRAIN offers a wide range of different learning options with the "Learning Journey", "Learning Membership" and "Learning Event".

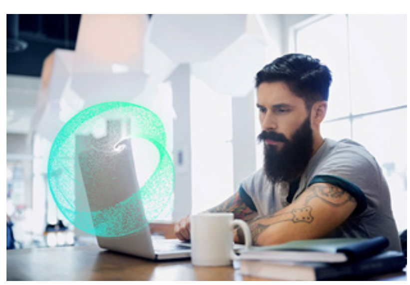
The three learning formats of SITRAIN – Digital Industry Academy



Learning Journey

The combination for sustainable learning success

- The optimal mix of self-study units and guided live modules
- Includes a Learning Membership to work through the self-study modules and access on-demand content
- The SITRAIN learning consultant is available for questions and one-on-one consultations
- Ideal integration into the daily work routine and adaptation to one's own learning pace.



Learning Membership

Securing knowledge through continuous learning on your own responsibility

- With access to the comprehensive and constantly growing range of self-study units on SITRAIN access, the digital learning platform
- Search and find specific learning content or simply have a look around – anytime and anywhere
- A modern learning culture through continuous learning on your own responsibility and transparency about your learning success in the team or company.

Learning Event

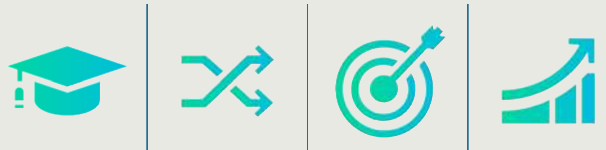
Acquire theoretical and practical knowledge in a compact and guided format

- You achieve a defined learning goal in the shortest possible time
- The learning consultant guides you through the practical exercises and is also exclusively available to you during the theoretical sessions for the entire duration
- Focused learning, outside of the daily work routine, in a protected learning environment – virtually, in the training center, or at your company.

Introduction

Expand your knowledge, apply what you have learned, develop future skills

The SITRAIN Digital Industry Academy combines didactically effective methods and modular options.



Effective | Flexible | Relevant | Continuous

The four building blocks of SITRAIN – Digital Industry Academy

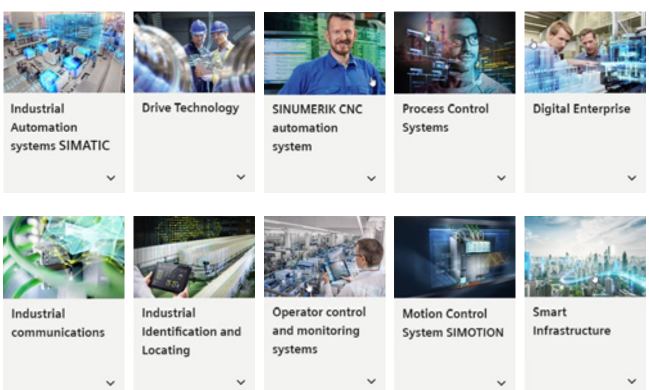
Different methods for maximum learning success:

- Live
- On your own responsibility
- On demand
- Individual

Learn the way you want to learn. For learning success that takes you further.

Education and training directly from the manufacturer

For individual knowledge building, the following topics concerning the industrial product and solution portfolio of Siemens are available. Experience the new learning culture with SITRAIN.



Training cases catalog

https://www.siemens.com/sitrain-catalog-training-cases

Find your local offer here

SITRAIN – Digital Industry Academy worldwide

You will find the regional knowledge offer in the country selection. One click will take you to the corresponding website.

SITRAIN – Digital Industry Academy

www.siemens.com/sitrain

- SITRAIN Learning Journey: www.siemens.com/sitrain-learning-journey
- SITRAIN Learning Membership: www.siemens.com/sitrain-learning-membership
- SITRAIN Learning Event: www.siemens.com/sitrain-learning-event

Course offer

Title	Course suitable for: Plan-ning	Course suitable for: Realiza-tion	Course suitable for: Opera-tion	Duration/ Medium	Course code
Analyzer System Manager Operator, basics and operation	✔	✔	✔	2 days	SC-I-ASMO
Continuous Process Gas Analysis					
SIPROCESS GA700, OXYMAT 7, ULTRAMAT 7, CALOMAT 7, modular system, operation and maintenance	✔	✔	✔	2 days	SC-G-GA700
OXYMAT 6, ULTRAMAT 6+23 gases, paramagnetism and infrared absorption		✔	✔	3 days	SC-G-OXYU
CALOMAT 6 intensive, thermo conductivity of gases		✔	✔	2 days	SC-G-CAL (a. A.)
FIDAMAT 6, continuous measurement of total hydrocarbon content in the gas phase		✔	✔	2 days	SC-G-FID
SIPROCESS UV 600 operation and maintenance	✔	✔	✔	2 days	SC-G-UV600
ULTRAMAT 23 intensive, industrial gases, infrared absorption, oxygen measurement		✔	✔	2 days	SC-G-UL23
ULTRAMAT 6 intensive, industrial gases, infrared absorption		✔	✔	2 days	SC-G-UL6
In situ Laser Gas Analyzer LDS 6 and SITRANS SL	✔	✔	✔	3 days	SC-G-LDS
Refresher In situ Laser Gas Analyzer LDS 6 and SITRANS SL		✔	✔	1 day	SC-G-LASR
Refresher ULTRAMAT 6		✔	✔	1 day	SC-G-UL6R
Refresher ULTRAMAT 23		✔	✔	1 day	SC-G-U23R
Refresher OXYMAT 6, 61, 64		✔	✔	1 day	SC-G-OXYR
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 programming		✔	✔	3 days	SC-C-MPGM
Process Gas Chromatograph MAXUM edition II Modular Oven, operation and maintenance	✔	✔	✔	3 days	SC-C-MMO1
Process Gas Chromatograph MicroSAM, operation and maintenance	✔	✔	✔	2.5 days	SC-C-SAM
Process Gas Chromatograph SITRANS CV, operation and maintenance	✔	✔	✔	2.5 days	SC-C-CV
Process Gas Chromatograph MAXUM edition II valveless column switching		✔	✔	3 days	SC-C-LIVE
Refresher Process Gas Chromatograph MAXUM edition II operation and maintenance		✔	✔	2.5 days	SC-C-MA1R
Refresher Process Gas Chromatograph MAXUM edition II Advanced User		✔	✔	2.5 days	SC-C-MA2R

Software licenses

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 supply 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 https://mall.industry.siemens.com/legal/ww/en/terms_of_trade_en.pdf

1. General Provisions

By using this catalog you can purchase products (hardware, software and services) described therein from Siemens Aktiengesellschaft 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 European Union

For customers with a seat or registered office in European Union, the following terms and conditions apply subordinate to T&C:

- for products, which include specific terms and conditions in the description text, these specific terms and conditions shall apply and subordinate thereto,
- 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 consulting services the “Allgemeine Geschäftsbedingungen für Beratungsleistungen der Division DF – Deutschland” (available only in German) and/or
- for other services, the „Supplementary Terms and Conditions for Services (“BL”)[1)] and/or
- for other supplies the "General Conditions for the Supply of Products and Services of the Electrical and Electronics Industry"[1)].
  In case such supplies 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 European Union

For customers with a seat or registered office outside European Union, the following terms and conditions apply subordinate to T&C:

- for products, which include specific terms and conditions in the description text, these specific terms and conditions shall apply and subordinate thereto,
- for consulting services the "Standard Terms and Conditions for Consulting Services of the Division DF for Customers with a Seat or Registered Office Outside of Germany"[1)] and/or
- for other services the "International Terms & Conditions for Services"[1)] supplemented by "Software Licensing Conditions"[1)] and/or
- for other supplies of hard- and 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 charge 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:

https://mall.industry.siemens.com/legal/ww/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
https://mall.industry.siemens.com/legal/ww/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. Products labeled with "AL" unequal "N" are subject to European / national export authorization.

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 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 shall comply with all applicable national and international (re-)export control regulations. In any event of such transfer of goods, works and services you shall comply with the (re-) export control regulations of the Federal Republic of Germany, of the European Union and of the United States of America.

Prior to any transfer of goods, works and services provided by us to a third party you shall in particular check and guarantee by appropriate measures that

- there will be no infringement of an embargo imposed by the European Union, by the United States of America and/ or by the United Nations by such transfer, by brokering of contracts concerning those goods, works and services or by provision of other economic resources in connection with those goods, works and services, also considering the limitations of domestic business and prohibitions of by-passing those embargos;
- such goods, works and services are not intended for use in connection with armaments, nuclear technology or weapons, if and to the extent such use is subject to prohibition or authorization, unless required authorization is provided;
- the regulations of all applicable Sanctioned Party Lists of the European Union and the United States of America concerning the trading with entities, persons and organizations listed therein are considered.

If required to enable authorities or us to conduct export control checks, you, upon request by us, shall promptly provide us with all information pertaining to the particular end customer, the particular destination and the particular intended use of goods, works and services provided by us, as well as any export control restrictions existing.

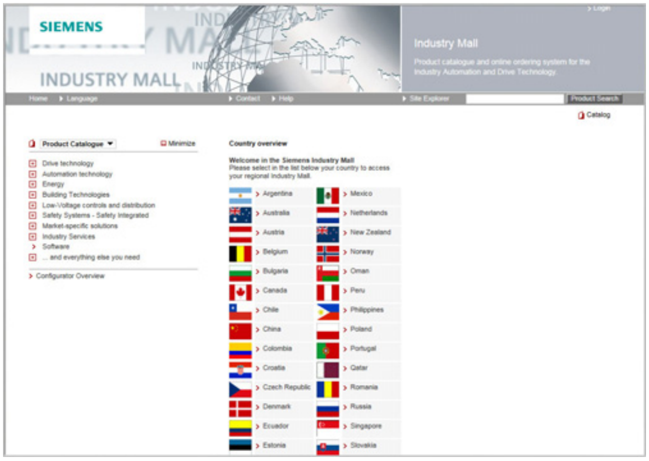
You acknowledge that under the EU embargo regulations against Iran, Syria and Russia respectively the sale of certain listed goods and related services is subject to authorization by the competent export control authorities of the European Union. If (i) the goods or services ordered by you are destined for Iran, Syria or Russia, and (ii) the contract for our supplies and/or services is subject to prior authorization of the competent export control authorities of the European Union, the contract between you and us shall come into force in this respect only upon granting of such authorization.

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.

Notes

Easy product selection and ordering: Industry Mall



Industry Mall

The Industry Mall is a Siemens AG Internet ordering platform. It provides you with online access to a comprehensive product spectrum that is presented in an informative, well-organized way.

Powerful search functions help you select the required products, while configurators enable you to configure complex product and system components quickly and easily. CAx data are also available for you to use.

Data transfer allows the entire procedure, from selection through ordering to tracking and tracing, to be carried out online. Availability checks, individual customer discounting, and quotation preparation are also possible.

www.siemens.com/industrymall

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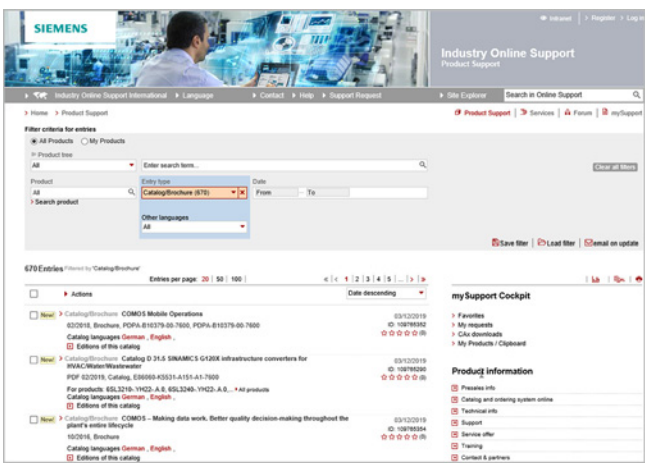

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Security information

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
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