

OXYMAT 64

Gas analyzer for measurements of trace oxygen
7MB2041

Operating Instructions • June 2008



Continuous gas analysis

SIEMENS

Continuous gas analysis

Gas analyzer for measurement of trace oxygen OXYMAT 64

Operating Instructions

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Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

 DANGER
indicates that death or severe personal injury will result if proper precautions are not taken.
 WARNING
indicates that death or severe personal injury may result if proper precautions are not taken.
 CAUTION
with a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken.
CAUTION
without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.
NOTICE
indicates that an unintended result or situation can occur if the corresponding information is not taken into account.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The device/system may only be set up and used in conjunction with this documentation. Commissioning and operation of a device/system may only be performed by **qualified personnel**. Within the context of the safety notes in this documentation qualified persons are defined as persons who are authorized to commission, ground and label devices, systems and circuits in accordance with established safety practices and standards.

Prescribed Usage

Note the following:

 WARNING
This device may only be used for the applications described in the catalog or the technical description and only in connection with devices or components from other manufacturers which have been approved or recommended by Siemens. Correct, reliable operation of the product requires proper transport, storage, positioning and assembly as well as careful operation and maintenance.

Trademarks

All names identified by ® are registered trademarks of the Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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General information

1.1 Information for our customers

Before beginning work with this device, please read this manual! It contains important information and data whose observation ensures proper device function and saves you servicing costs. The manual will help you to operate the device more easily and efficiently, allowing you to achieve reliable results.

1.2 General information

The product described in this manual has left the factory in a perfectly safe and tested condition. In order to preserve this condition and to operate this product correctly and safely, it may only be used in the manner described by the manufacturer. Furthermore, proper transportation, storage, installation, operation and maintenance of the device are vital for ensuring correct and safe operation.

This manual contains the information required for the intended use of the described product.

It is addressed to technically qualified personnel who are specially trained or who have the relevant knowledge of automation technology (measuring and control systems).

Knowledge and technically correct implementation of the safety notes and warnings contained in this manual are required for safe installation and commissioning, as well as for safety during the operation and maintenance of the described product. Only qualified personnel have the required professional knowledge for correctly interpreting the generally valid safety notes and warnings in this manual in each specific case and to act accordingly.

This manual is an inherent part of the scope of delivery, despite the fact that it can be ordered separately for logistic reasons.

Due to the variety of technical details, it is not possible to consider every single detail for all versions of the described product and for every conceivable case in the set-up, operation, maintenance and use in systems. For further information, or in the case of problems which are not covered in enough detail in this document, please request the required information from your local or responsible Siemens regional office.

Note

In particular, before using the device for new research and development applications, we recommend that you first contact us to discuss the application in question.

1.3 Special information and warnings

This manual provides you with information on using, installing, operating, and maintaining the device.

Pay particular attention to all special information and warnings. Information of this type is set apart from the rest of the text and is marked with the corresponding pictograms. This information provides you with useful tips and helps avoid maloperations.

1.4 Warranty conditions

We expressly point out that the product quality is exclusively and conclusively described in the sales contract. The content of this product documentation is neither a part of a previous or existing agreement, promise or legal relationship, nor is it intended to modify these. All obligations on the part of Siemens AG are contained in the respective sales contract, which also contains the complete and solely applicable liability provisions. The provisions defined in the sales contract for the responsibility for defects are neither extended nor limited by the remarks in this document.

1.5 Standards and regulations

As far as possible, the harmonized European standards were the basis for the specification and production of this device. If no harmonized European standards have been applied, the standards and regulations for the Federal Republic of Germany are valid.

When this product is used beyond the scope of these standards and regulations, the valid standards and regulations of the country of the operating company apply.

1.6 Delivery information

The respective scope of delivery is listed on the shipping documents – enclosed with the delivery – in accordance with the valid sales contract.

When opening the packaging, please observe the corresponding information on the packaging material. Check the delivery for completeness and undamaged condition. In particular, you should compare the Order No. on the rating plates with the ordering data, if available.

If possible, please retain the packaging material, since you can use it again in case of return deliveries.

Description

2.1 Fields of application and features

 WARNING
Explosion hazard Gases with flammable components at concentrations above the lower explosive limit must not be supplied to the analyzer.

The OXYMAT 64 gas analyzer is used to measure traces of oxygen in pure gases.

Fields of application

- Manufacture of technical gases:
measurements in N₂ and CO₂
- Welding:
measurements in protective gases when welding high-alloy steels, titanium etc.
- Systems for air separation:
measurements in N₂ and in inert gases (e.g. Ar, Ne), measurements in CO₂ and H₂.
- Breweries, food and beverages industry:
measurements in CO₂

Main features

- 2x four measuring ranges freely-parameterizable (four each for vpm and %)
- Electrically-isolated measured value output 0/2/4 to 20 mA (also inverted) as well as according to NAMUR
- Autoranging can be configured; remote switching possible
- Measured values can be stored during calibration
- Time constants can be selected within wide ranges (static/dynamic noise suppression), i.e. the response time can be adapted to the respective measuring task
- Simple handling by means of menu-controlled operation
- Two operation levels with separate authorization codes to prevent unintentional and unauthorized operator interventions
- Internal pressure sensor for correction of influence caused by variations in the sample gas pressure
- Automatic measuring range calibration can be parameterized
- Operation based on NAMUR recommendation
- Fieldbus connection (option)

- Monitoring of sample gas using pressure switch (option)
- Smallest span: 10 vpm O₂
- Customized analyzer versions such as:
 - customer acceptance
 - tag labels
 - drift recording
- Easy device replacement since electric connections can be simply disconnected from the device
- 19" rack unit with 4 HU for installation in hinged bays or cabinets (with or without telescopic rails)
- Front panel can be swung down for servicing purposes (laptop connection)
- Internal gas paths: stainless steel capillary; FPM (FKM) hose
- Connections for sample gas:
 - Inlet: clamping ring gland for pipe diameter 6 mm or 1/4"
 - Outlet: pipe coupling with diameter 6 mm or 1/4"
- Sensor made of ZrO₂ ceramic

2.2 Design

Display and control panel

- Large LCD field for simultaneous display of measured value (digital and analog), analyzer state and measuring range
- Contrast of the LCD field is adjustable via menu
- Constant LED backlighting
- 5-digit measured value display (decimal point counts as digit)
- Washable membrane keyboard with five softkeys
- Menu-prompted operation for parameterization, configuration, test functions, calibration
- Graphical display of the concentration curve; time intervals can be parameterized

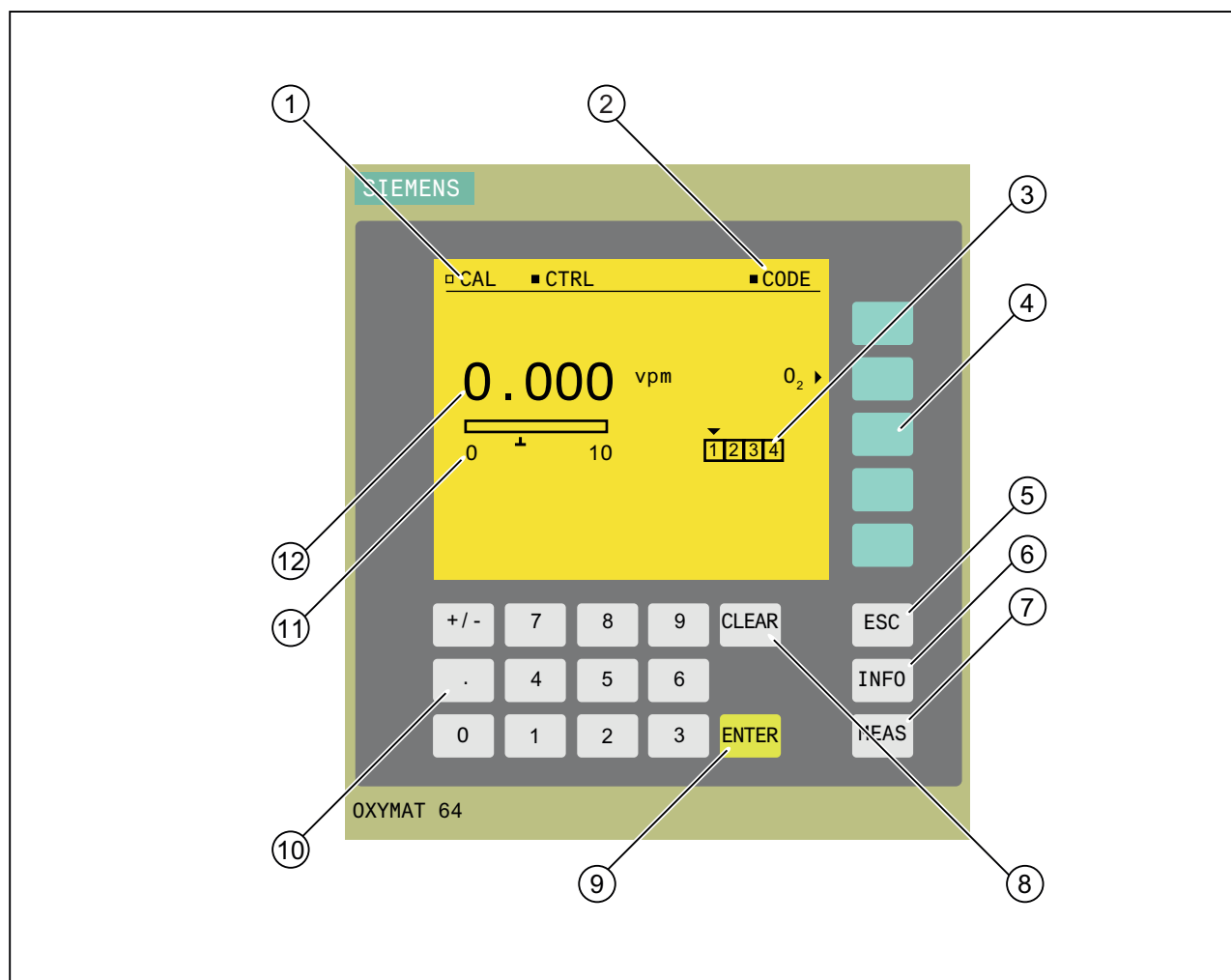


Figure 2-1 Membrane keyboard and graphic display

- 1 Status line for display of analyzer state (configurable)
- 2 Two code levels according to NAMUR (maintenance and specialist levels)
- 3 Display of activated measuring ranges
- 4 Five softkeys for menu control
- 5 ESC key for returning to previous input step, with acceptance of any changes
- 6 INFO key for help functions for the current menu
- 7 MEAS key for returning to measuring mode
- 8 CLEAR key to delete numerical inputs
- 9 ENTER key to accept numerical values
- 10 Numerical keypad for entering numerical values
- 11 Display of start-of-scale and full-scale values
- 12 Display of concentrations as digits and bars

Inputs and outputs

- Six freely-configurable binary inputs (e.g. range switching, processing of external signals from sample preparation)
- Six freely-configurable relay outputs (failure, maintenance request, maintenance switch, limit alarm, external solenoid valves)
- Two configurable analog inputs (e.g. external pressure sensor and correction of cross-interference)
- Can be extended by eight additional binary inputs and eight additional relay outputs for automatic calibration with max. four calibration gases

Communication

- RS 485 included in the standard analyzer (connection at rear)

Options

- RS 485/RS 232 converter
- RS 485/Ethernet converter
- RS 485/USB converter
- Linked in networks via PROFIBUS-DP/PA interface
- SIPROM GA software as servicing and maintenance tool (SIPROM GA Version 1.9.14 and higher)

2.3 Principle of operation

Principle of operation

The measuring cell consists of a ZrO_2 membrane arranged as a cylinder (tubular). The sample gas (with a low O_2 content) flows at a constant rate through the inside of the sensor regulated at 650°C . The exterior of the sensor is exposed to the ambient air (approx. 21% O_2). The two sides of the ZrO_2 membrane are coated with thin platinum films which serve as electrodes. This produces a stable electrochemical cell. The exterior of this sensor is exposed to the ambient air (approx. 21% O_2). The different O_2 concentrations also cause a different diffusion of the oxygen into the ceramic sensor material. A quantity of oxygen atoms is ionized equivalent to the oxygen concentration at the electrodes.

A different partial pressure exists due to the differences in concentration on the two sides. Since ZrO_2 is electrically conductive at 650°C , there is a migration of ions in the direction of the lower partial pressure.

A gradient in the oxygen ions is produced across the thickness of the ZrO_2 membrane which leads to a potential difference between the two platinum electrodes in accordance with equation (1).

The inclusion of crystal lattice faults by doping the ZrO_2 material with Y_2O_3 and/or CaO - originally to prevent the formation of cracks in the ceramic material - increases the diffusion ability of the O_2 ions in the ZrO_2 lattice.

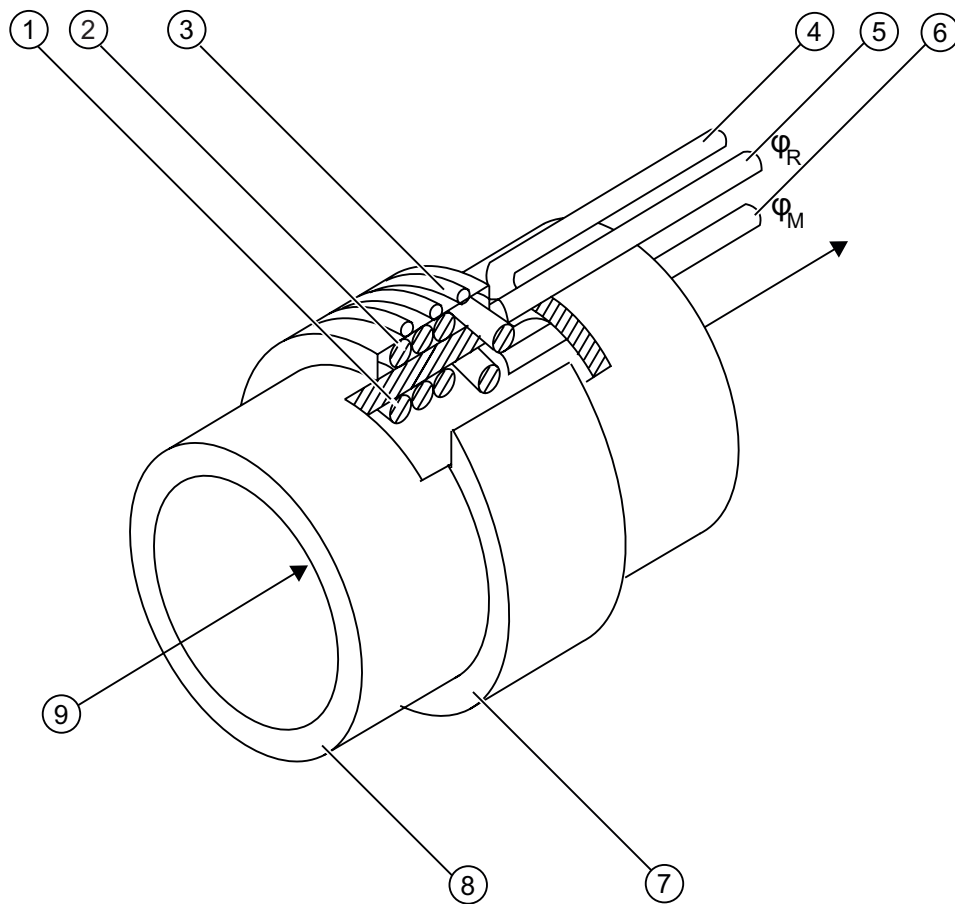
Catalytically active ZrO_2 sensor (CAZ)

The electrode material is made of platinum (Pt). This type of sensor therefore has a large cross-sensitivity in the presence of flammable components in the residual gas.

Catalytically inactive ZrO_2 sensor (CIZ)

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

Sensor design



- 1 Measuring electrode
- 2 Reference electrode
- 3 Heating
- 4 Thermocouple
- 5 Contact to reference electrode
- 6 Contact to measuring electrode
- 7 Ceramic protective layer
- 8 Tube made of ZrO_2 and Y_2O_3 or CaO mixed oxide ceramic
- 9 Sample gas input

Figure 2-2 Sensor design

Measuring effect

$$U = \varphi_R - \varphi_M$$

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

U Measuring effect

U_A Asymmetry voltage (voltage if $[O_2] = [O_2, \text{air}]$)

R Gas constant

T Temperature of ceramic in Kelvin

F Faraday constant

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

$[O_2]$ O_2 concentration

Note

Gas inlet conditions

The sample gas must be fed into the analyzer free of dust. The production of condensation must also be avoided. Therefore, gas modified for the measurement tasks is necessary in most application cases.

2.4 Influence of interfering gas

Table 2- 1 Examples of typical offsets caused by interfering flammable gases on a catalytically inactive sensor

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

2.5 Materials used in the sample gas path

Table 2- 2 Examples of a few non-flammable gases

Measured component / interfering gas	Offset caused by interfering gas
8.9 vpm O ₂ / residual gas Ne	-0.3 vpm O ₂
8.4 vpm O ₂ / residual gas He	-0.26 vpm O ₂
8.1 vpm O ₂ / residual gas Ar	+0.06 vpm O ₂

The listed deviations are only exemplary, and can vary by up to ± 0.2 vpm. The actual deviation must be determined in individual cases, and the error can be eliminated by appropriate correction of cross-interference (see operating function 83).

See also

Correction of cross-interference (function 83) (Page 95)

2.5 Materials used in the sample gas path

Table 2- 3 Materials wetted by sample gas

O ₂ sensor	ZrO ₂ ; steel 1.4571
Sample gas inlet and outlet	Steel 1.4571
Bypass restrictor (only high-pressure version)	Steel 1.4571
Gaskets	PTFE
Tube connectors	Polyamide 6
Tube	FKM / FPM (Viton)
Flow metering tube	Glass
Outlet restrictor	Glass

2.6 Communication

2.6.1 General information

All gas analyzers of Series 6 such as ULTRAMAT 6, OXYMAT 6/61/64, CALOMAT 6/62, FIDAMAT 6 as well as ULTRAMAT 23 offer the following communication possibilities:

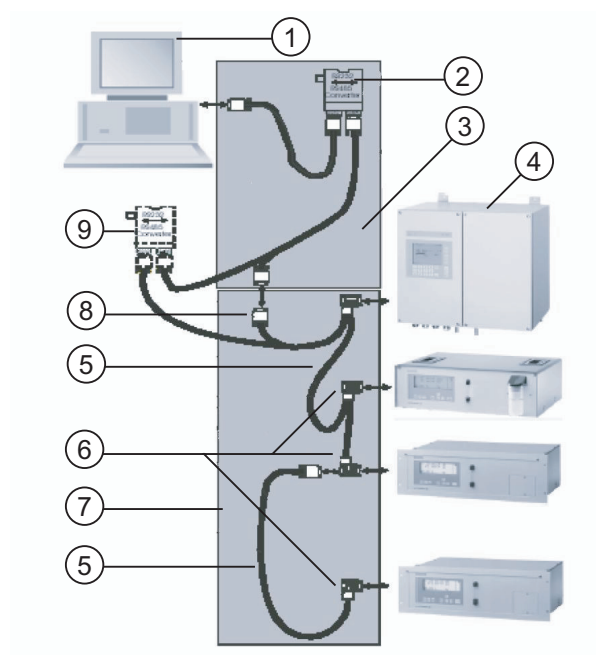
- ELAN interface
- SIPROM GA (Version 1.9.14 and higher)
- PROFIBUS DP/PA
- Generic communications interface (only ULTRAMAT 6E, OXYMAT/ULTRAMAT 6E, OXYMAT 61, OXYMAT 6).

2.6.2 ELAN interface

ELAN interface

ELAN is a standard integrated serial interface (RS 485) which allows communication between several analyzers. You can link a maximum of 12 analyzers with up to four components. This connection is also possible without a PC.

The functional principle is shown in the following figure:



- 1 Computer
- 2 RS-485/RS-232 converter with RS 485 and RS 232 cables
- 3 RS 485 bus connector with bridge
- 4 Analyzer
- 5 RS 485 cable
- 6 RS 485 bus connector
- 7 RS 485 network
- 8 9-pin SUB-D connector
- 9 Optional: RS-485 repeater

Figure 2-3 Typical structure of an ELAN network (RS 232)

Interface parameters

Parameter	Value
Level	RS 485
Baud rate	9600
Data bit	8
Stop bit	1
Start bit	1
Parity	None
No information feedback	

Ordering information	Order No.
Interface description	C79000-B5200-C176
RS-485/RS-232 converter	C79451-Z1589-U1
SIMATIC cable / bus line	6XV1 830-OEH10
SIMATIC bus connector	6ES7 972-OBB11-OXAO
9-pin SUB-D connector	6ES7 972-OBB11-OXAO
Repeater	6ES7 972-OAA01-OXAO

Further information can be found in the ELAN interface description:

Order Nos.:

- C79000-B5200-C176 German
- C79000-B5274-C176 English

2.6.3 SIPROM GA functions

SIPROM GA is a software tool especially for service and maintenance tasks. All analyzer functions, whether as a single device or several linked together, can be remotely operated and monitored this way.

Functions:

- Display and storage of all device data
- Remote operation of all device functions
- Parameter and configuration settings
- Comprehensive diagnostics information
- Remote calibration
- Online help
- Cyclic storage of measured values
- Status on hard disk and export to commercially available user programs
- Download of new software
- Drift values according to QAL 3, DIN EN 14181

Hardware requirements:

- PC/laptop Pentium 133 MHz, RAM 32 MB, CD-ROM drive
- Vacant disk capacity min. 10 MB
- VGA graphics card supported by Windows
- Printer supported by Windows
- Vacant COM port: RS 232 for direct coupling to ELAN RS 485 network
- For connection of the Ethernet/485 interface converter, a standard network of 10 Mbit or 100 Mbit (RJ 45 connection) with TCP/IP is necessary. In the case of an RS 485 network, the distance must not be more than 500 m. If this is exceeded, a repeater must be used.

Software requirements:

- Windows 95
- Windows 98
- Windows NT 4.0
- Windows 2000
- Windows XP

Ordering information	Order No.
SIPROM GA software, German/English selectable during installation, consists of 1 CD with installation instructions, software, product certificate and registration form	S79610-B4014-A1

2.6.4 PROFIBUS DP/PA

PROFIBUS DP/PA is the leading fieldbus on the market. All Siemens gas analyzers with an optional – also retrofitable – plug-in card are Profibus-compatible and comply with the binding "Device profile for analyzers" defined by the PNO (PROFIBUS International). Central access to the system analyzers is possible with the SIMATIC PDM software tool.

"Fieldbus" is the name of a digital communication system with which distributed field devices of a system are linked to each other over a single cable and are simultaneously connected to programmable controllers or a process control system.

The PROFIBUS-DP version is widespread in production automation due to its high transmission speed per device, while PROFIBUS-PA takes the required properties of process engineering into account, such as use in Ex areas.

The benefit is the considerable savings potential in all areas of the system, covering project planning and commissioning, operation and maintenance, up to subsequent system extensions.

Operation of the gas analyzers from a control system or a separate PC is possible with the SIMATIC PDM tool (Process Device Manager). This software executes under Windows XP/Windows 2000 and can also be integrated in the SIMATIC PCS 7 process control system. With this, the integration of the devices in the system as well as the complex parameter structure of the analyzers can be clearly illustrated. Operating becomes simply a matter of "clicking".

PROFIBUS International (PNO) is an independent institution and represents the interests of many manufacturers and users. Besides services such as consulting, training and device certification, its primary job is to further develop, standardize and promote PROFIBUS technology. The binding functionality definition for a device class in the form of a profile is the condition for standardized device behavior from various manufacturers, the so-called interoperability. The binding profile for analyzers was defined at the end of 1999. With this, the interaction of all PROFIBUS-compatible devices of a system is guaranteed.

In this profile, the functionalities of the analyzers are defined in a block model: for example, the physical block describes the measuring procedure, analyzer and manufacturer name, serial number and the operating state (operation, maintenance). Different functional blocks contain the execution of certain functions, such as measured value and alarm processing. The transducer blocks describe the function of the actual measuring process, as well as its control, e.g. the pre-processing of a measured value, correction of cross-interferences, characteristics, measuring ranges, as well as switching and control processes. The data transmission between the bus participants is defined in protocols.

A distinction is made between cyclic and acyclic services. Time-critical data, such as measured values and status, are transmitted with cyclic services. The acyclic services allow device parameters to be queried or changed during operation.

All gas analyzers of Series 6 (ULTRAMAT 6, OXYMAT 6/61/64, CALOMAT 6/62 and FIDAMAT 6 as well as ULTRAMAT 23) are Profibus-compatible with an optional plug-in card, which can also be retrofitted.

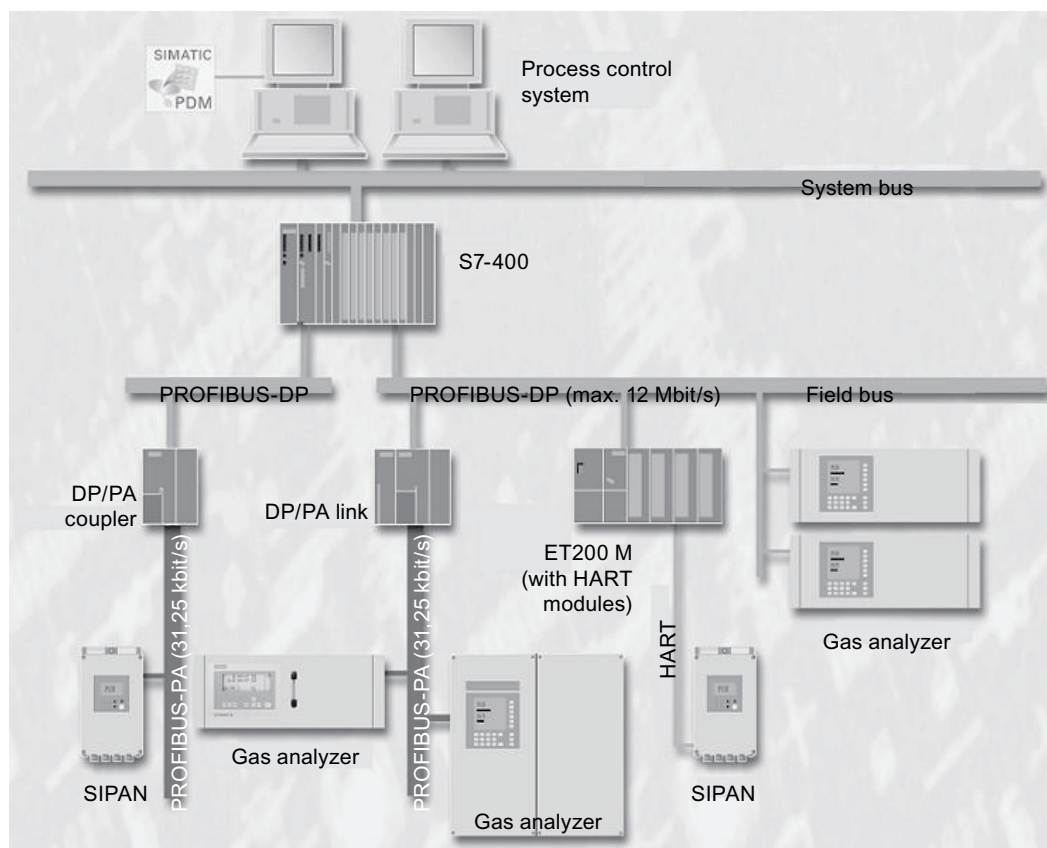


Figure 2-4 Typical structure of a PROFIBUS system

Installing and connecting

3.1 Safety information

WARNING

Danger of explosion through operation in hazardous areas

When using the analyzer in hazardous areas, it may ignite explosive gases.

The result could be death, severe physical injury and/or damage to property.

Do not use the standard version of the analyzer in hazardous areas! Clarify the supply of gases with flammable components at concentrations above the lower explosive limit (LEL) with the responsible expert for explosion hazards. The plant owner is finally responsible for the supply.

CAUTION

Danger of burns

The O₂ sensor can be up to 300 °C hot, especially at its tube and wire connections.

Since the sensor is exposed when the housing is open, touching can result in skin burns.

Before opening the housing, always wait for at least one hour to allow the device to cool down.

3.2 Installation requirements

Select an installation location which is as vibration-free as possible.

If the **OXYMAT 64** is installed in a cabinet or desktop housing, it must be supported on rails. It is not sufficient to only secure the front side, since the weight of the device loads the chassis too greatly.

When installing in control cabinets, ensure sufficient ventilation between the devices. Protect the device from direct sunlight. During operation, make sure that the permissible ambient temperature of 5 °C to 45 °C is observed.

Do not install an **OXYMAT 6** or **61** in the direct vicinity of the **OXYMAT 64**. Due to their functional principle, the **OXYMAT 6** and **OXYMAT 61** emit magnetic stray fields. Distances of up to 50 cm are therefore necessary between the devices.

3.3 Gas connections and internal gas routing

3.3.1 Sample gas line

3.3.1.1 Gas connections

Sample gas inlet: clamping ring gland for pipe diameter 6 mm or 1/4".

Sample gas outlet: pipe couplings with pipe diameter 6 mm or 1/4".

A material suitable for the sampling gas must be selected for the inlet and outlet pipes.

3.3.1.2 Sample gas inlet pipe

The quality of the sample gas inlet pipe depends on the measuring task.

The smaller the O₂ concentration to be measured (below approx. 100 vpm O₂), the higher the requirements on the surface quality of the inlet pipe. Recommended is an inlet pipe made of stainless steel with an internal electrolytically polished surface.

In addition, the number of pipe glands and other connecting elements should be kept as low as possible. Glands are potential sources of leaks and possess cavities which only release O₂ slowly, resulting in a slower rise in signal.

It should also be noted that steam has an influence on the quality of the measurement. It adheres through adsorption on the surfaces of the parts wetted by the sample gas, and in turn binds O₂, which can also result in a slow rise in signal.

It is therefore recommendable to heat long inlet pipes to above 110 °C and to select a small cross-section (internal diameter ≤ 2 mm).

3.3.1.3 Sample gas outlet pipe

If the sample gas is to flow into an exhaust line, use as short a line as possible or a transition to a larger diameter to make sure that no flow resistance is produced in the exhaust line.

3.3.2 Sample gas quality

NOTICE
Danger of defects resulting from insufficiently prepared sample gas
The sample gas connected to the device must be free of oil and dust, and must not contain any corrosive components. Moisture must never penetrate the sample gas path, the sensor would otherwise be damaged!
Therefore make sure that the sample gas is prepared appropriately!

No flammable gases above the lower explosive limit may be connected either, since these could be released and produce an explosive atmosphere within the analyzer.

3.3.3 Pressure sensors

The OXYMAT 64 has an internal pressure sensor for correcting the influence of pressure on the measured value. The pressure sensor is present on the sensor electronics, and measures the sample gas pressure via the sample gas outlet pipe. The pressure sensor need not be considered further in the device installation.

3.3.4 Gas flow

High-pressure version

The sample gas pressure (3000 to 6000 hPA) is regulated by the pressure regulator (4) at approx. 2000 hPA, or is offered in the version without a pressure regulator by the operator at 2000 hPA. This pressure is applied at the restrictor (5). The restrictor (5) reduces the pressure such that a sample gas flow of 15 to 30 l/h is created. This flow is divided via the sample gas restrictor (6) and the adjustable bypass restrictor (10) 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 ambient pressure. If the sample gas flows off via an exhaust gas line, it works like a flow resistance.

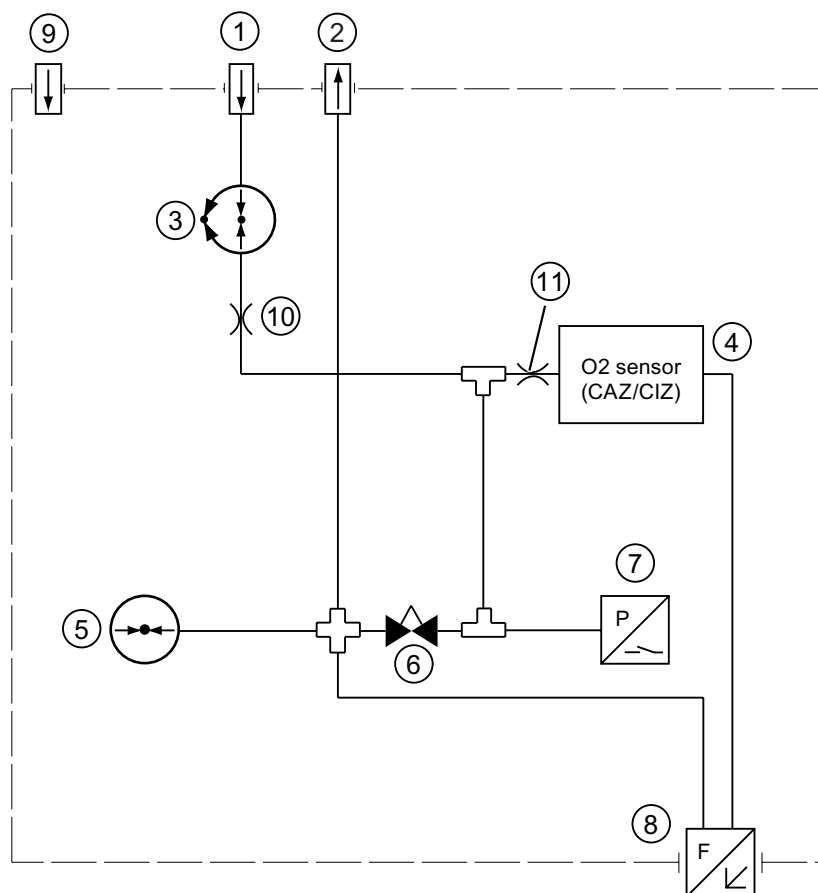


Figure 3-1 Gas path for high-pressure version

- 1 Sample gas inlet; inlet pressure:
 - Without internal pressure regulator: 2000 hPa, regulated
 - With internal pressure regulator: 3000 to 6000 hPa
- 2 Sample gas outlet; sample gas must flow off free of dynamic pressure
- 3 Pressure regulator (ordered version)
- 4 O₂ sensor
- 5 Pressure sensor
- 6 Bypass restrictor
- 7 Pressure switch
- 8 Flow metering tube
- 9 Purging gas connection
- 10 Restrictor
- 11 Restrictor

Low-pressure version

With the low-pressure version, the sample gas flow must be set externally to 125 ml/min. With a built-in pressure switch, the sample gas pressure is approx. 30 hPa above the current atmospheric pressure since the sample gas flows off via a restrictor. If the resulting dynamic pressure exceeds 100 hPa (rel.), a maintenance request 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.

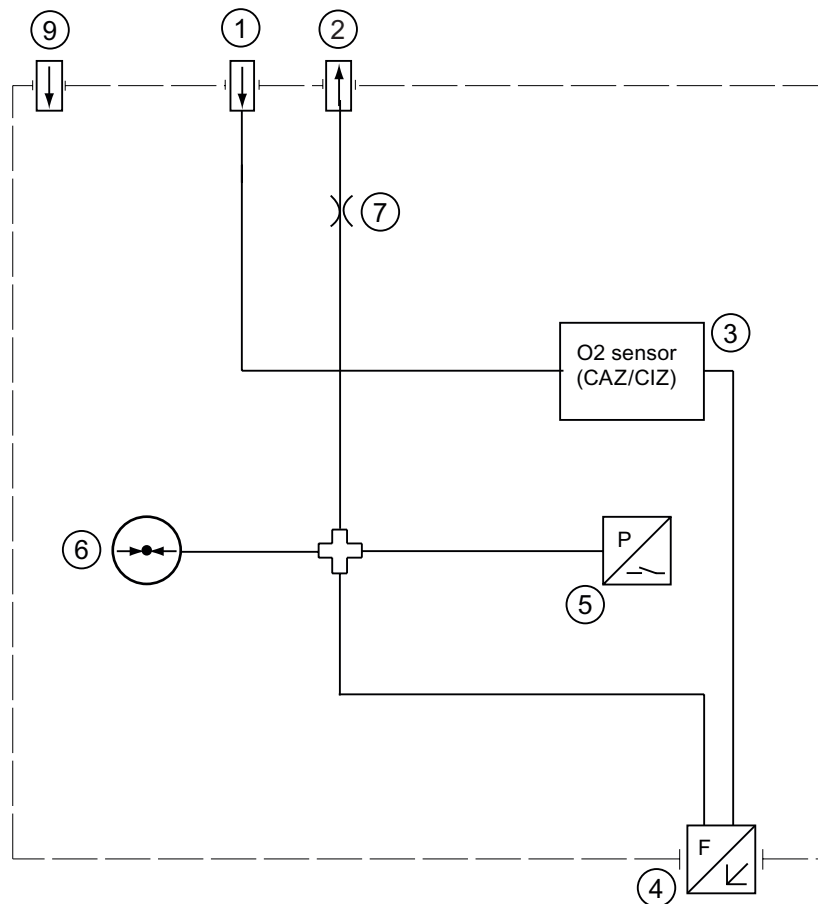


Figure 3-2 Gas path for low-pressure version

- 1 Sample gas inlet; flow 125 ml/min (7.5 l/h)
- 2 Sample gas outlet; sample gas flows off free of dynamic pressure
- 3 O₂ sensor
- 4 Flow metering tube
- 5 Pressure switch
- 6 Pressure sensor
- 7 Outlet restrictor

3.4 Electric connection

3.4.1 Electric connection



WARNING

For the electrical installation, observe VDE 0100 or an equivalent international standard for setting up high-voltage systems having nominal voltages under 1000 V.

Failure to comply with these regulations can result in death, personal injury and/or damage to property.

3.4.2 Mains connection

- The device comes with an appliance plug which may only be connected to the mains supply line by qualified personnel. The mains supply line must comply with the valid regulations and conditions for the place of installation and be provided with a protective conductor which lies at the potential of the enclosure. The cross-section of each wire must be $\geq 1 \text{ mm}^2$. Connect the phase conductor to the marked position in the plug.
- Install the mains line separately from the signal lines.
- Provide a mains disconnection device in the direct vicinity of the device (for load rating, see rating plate). It must be readily accessible and marked.
- Check whether the existing mains voltage agrees with the mains voltage specified on the rating plate.

3.4.3 Connection of the signal lines



WARNING

Only connect the signal lines to devices which have reliable electric isolation from their power supply.

- Connect the signal lines to the SUB-D plug connectors on the rear of the device.
- As a measure to suppress sparking across the relay contacts (e.g. limit relays), RC elements must be connected as shown in the following figure. Note that the RC element results in a drop-out delay for an inductive component (e.g. solenoid valve).

- The RC element should therefore be dimensioned according to the following rule of thumb:
 $R [\Omega] \approx 0.2 \times R_L [\Omega]$
 $C [\mu F] \approx I_L [A]$.
 Also make sure that a non-polarized capacitor C is used.
 In the case of operation with direct current, a spark-quenching diode can be fitted instead of the RC element.
- The connection lines must be shielded to the relay outputs, the binary inputs, the analog inputs and the analog output. Connect these to the corresponding trapezoidal plugs (SUB-D plug connectors) in accordance with the routing assignments.

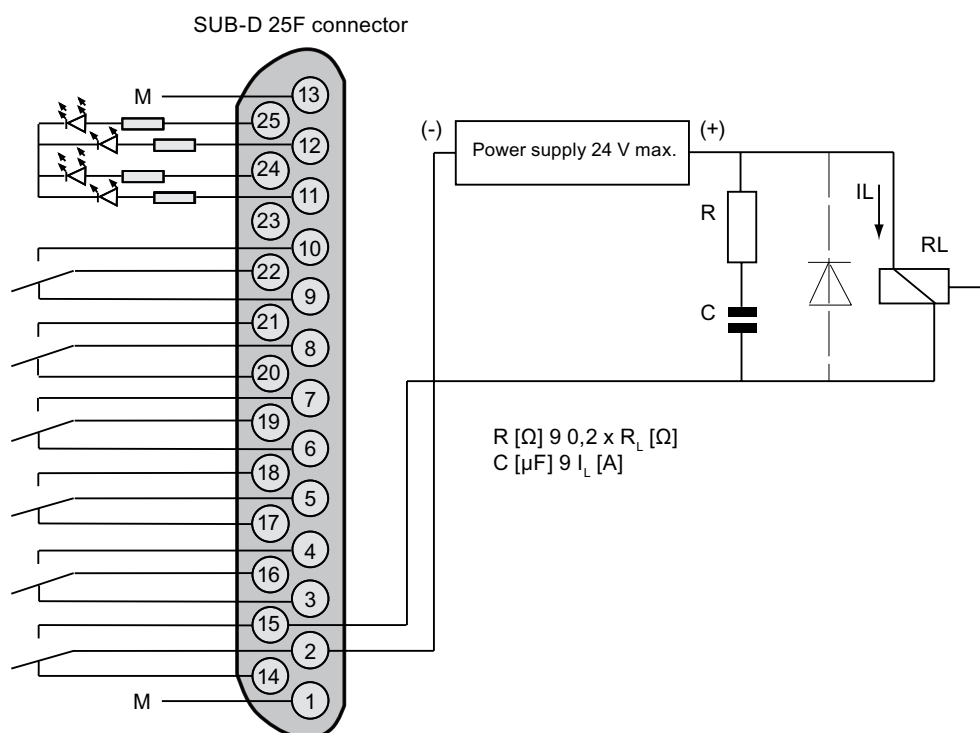


Figure 3-3 Example of spark suppression on a relay contact

- The reference ground of the analog inputs is the potential of the housing.
- The analog output is floating.
- The shielding of the interface line must be at the potential of the housing. Connect the shield of the line to the shield of the SUB-D plug connector with a high contact area. The core cross-section must be $\geq 0.5 \text{ mm}^2$. The interface line may be at most 500 m long.

Note

All connection lines (except for the mains connection line) must be shielded. The shielding of the connected lines must have a large-area and continuous contact at the respective screw couplings. The core cross-section must be $\geq 0.5 \text{ mm}^2$. We recommend cables of type JE-LiYCY...BD. The cable length of the analog output depends on the load.

3.4.4 Motherboard pin assignments

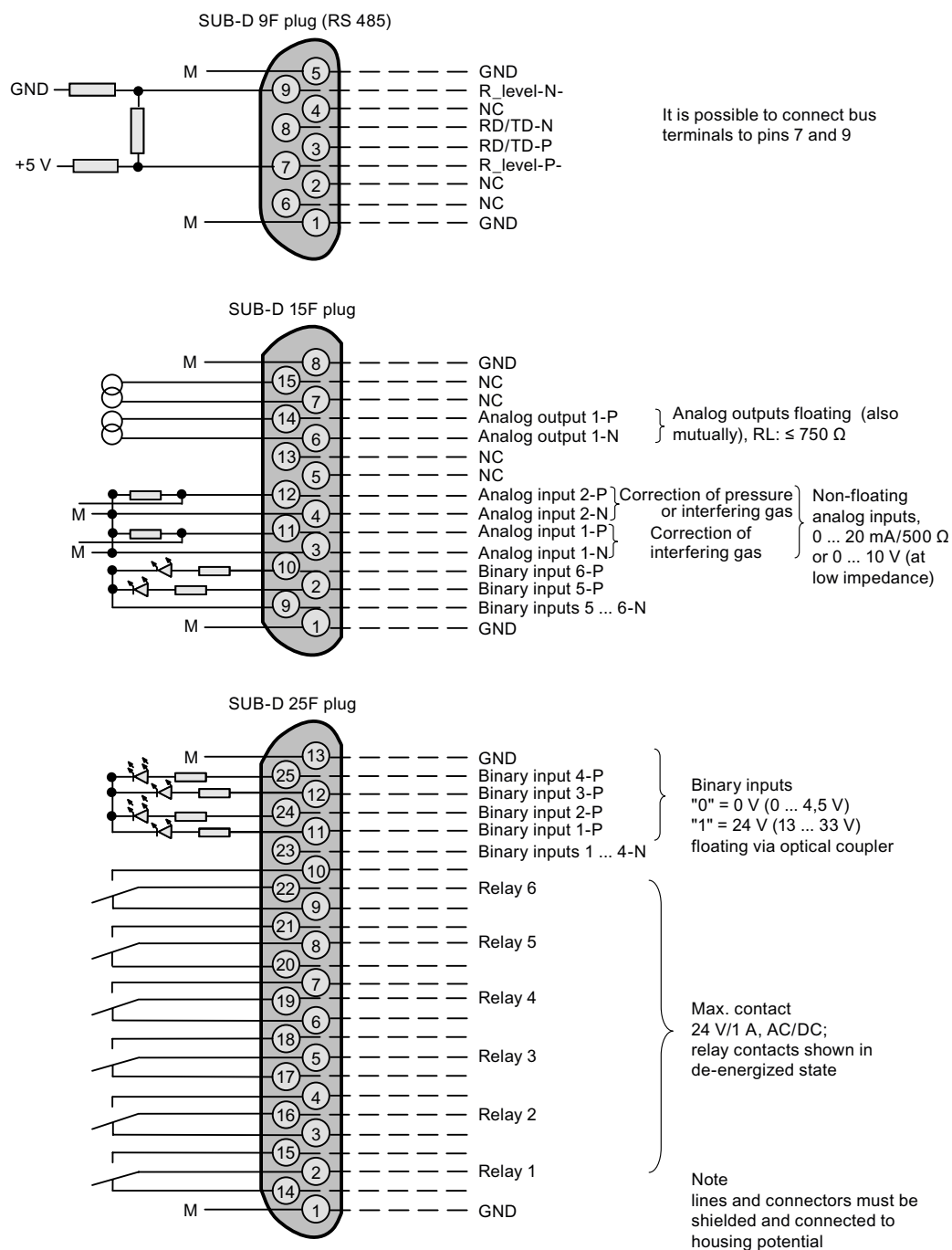


Figure 3-4 OXYMAT 64, 19" rack unit, motherboard pin assignments

3.4.5 Plug connector assignment of the optional board and PROFIBUS

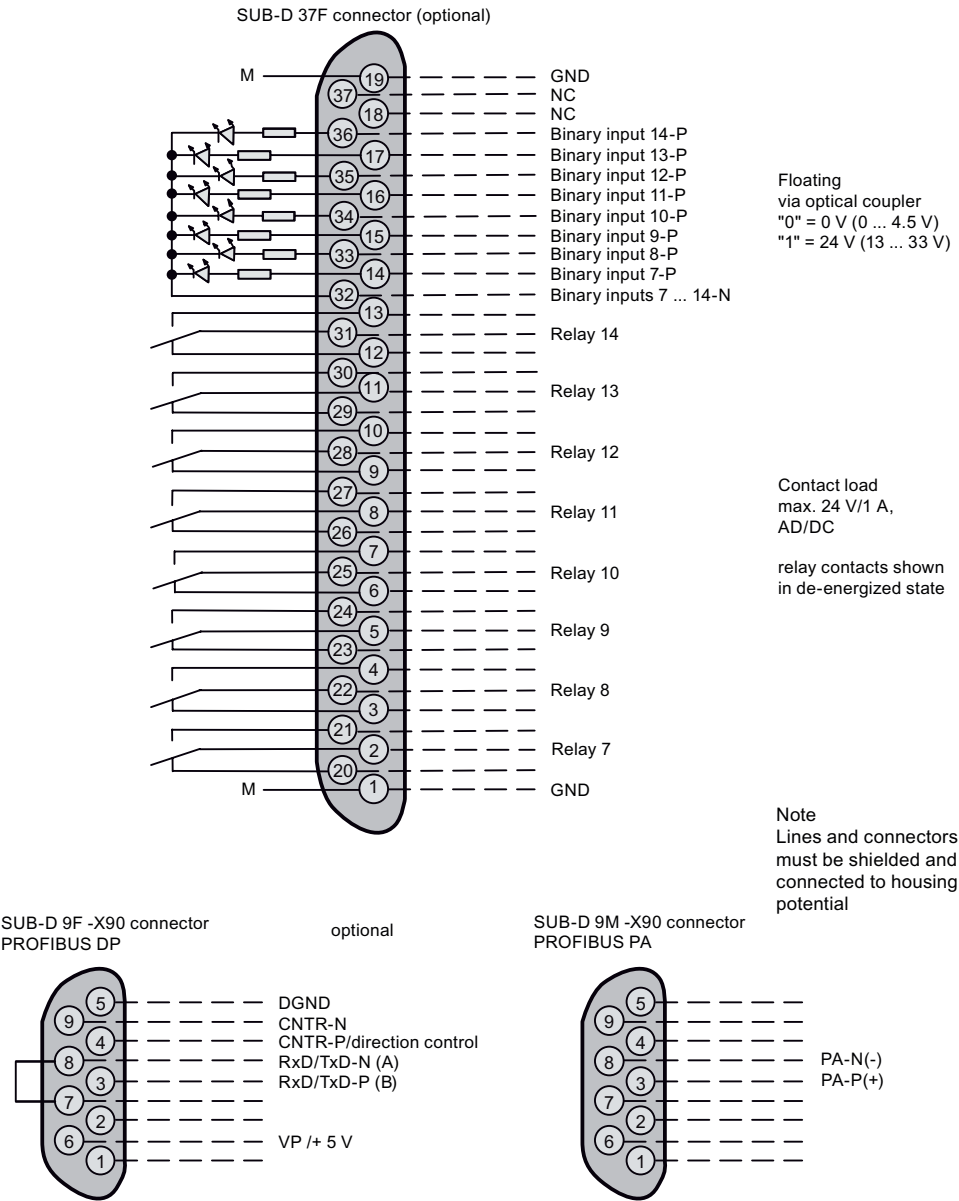


Figure 3-5 OXYMAT 64, 19" rack unit, pin assignments on the optional board and PROFIBUS plug connector

3.4.6 Example of Autocal connection

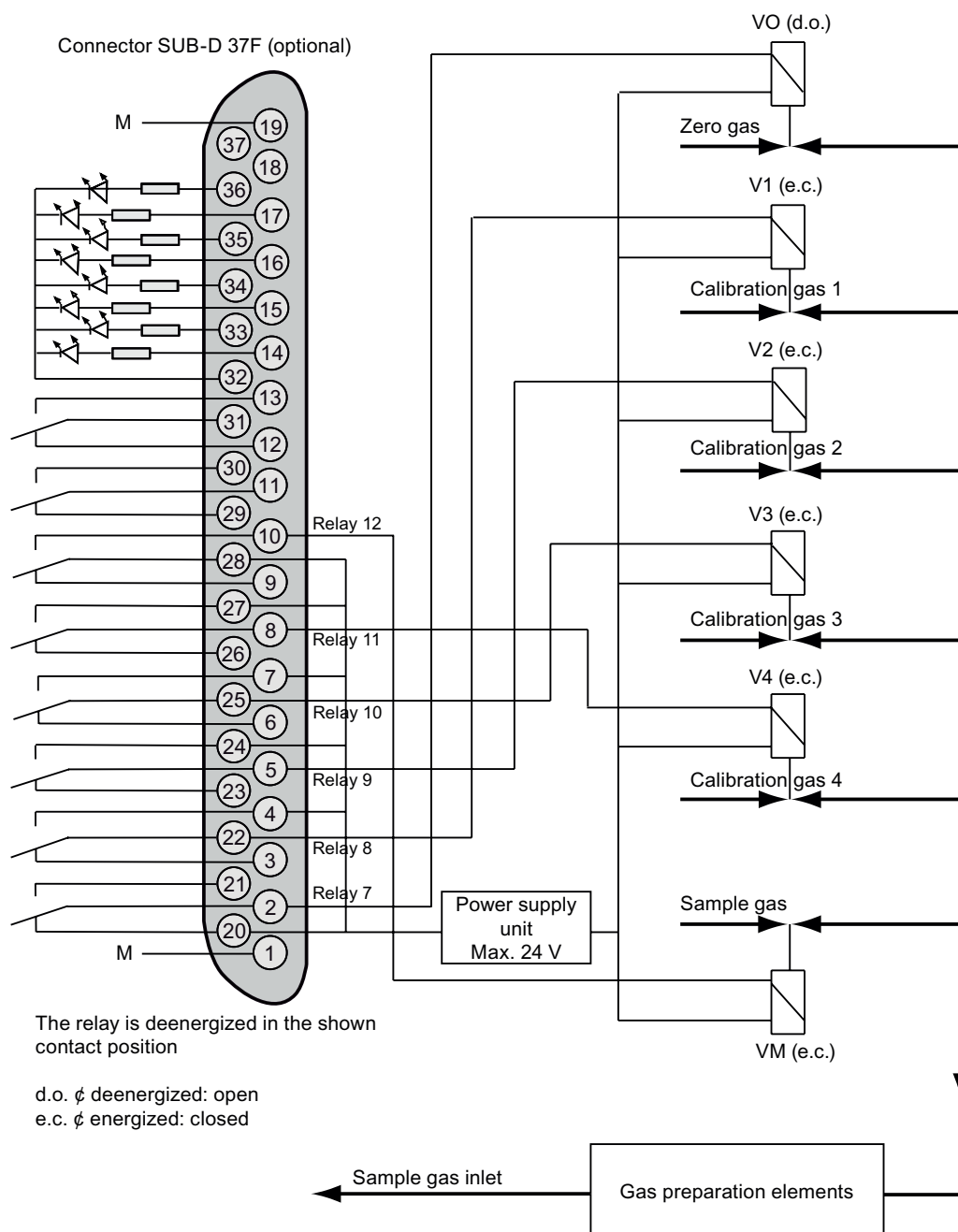


Figure 3-6 Connections and valve plan "Autocal"

3.5 Dimensions for preparing installation

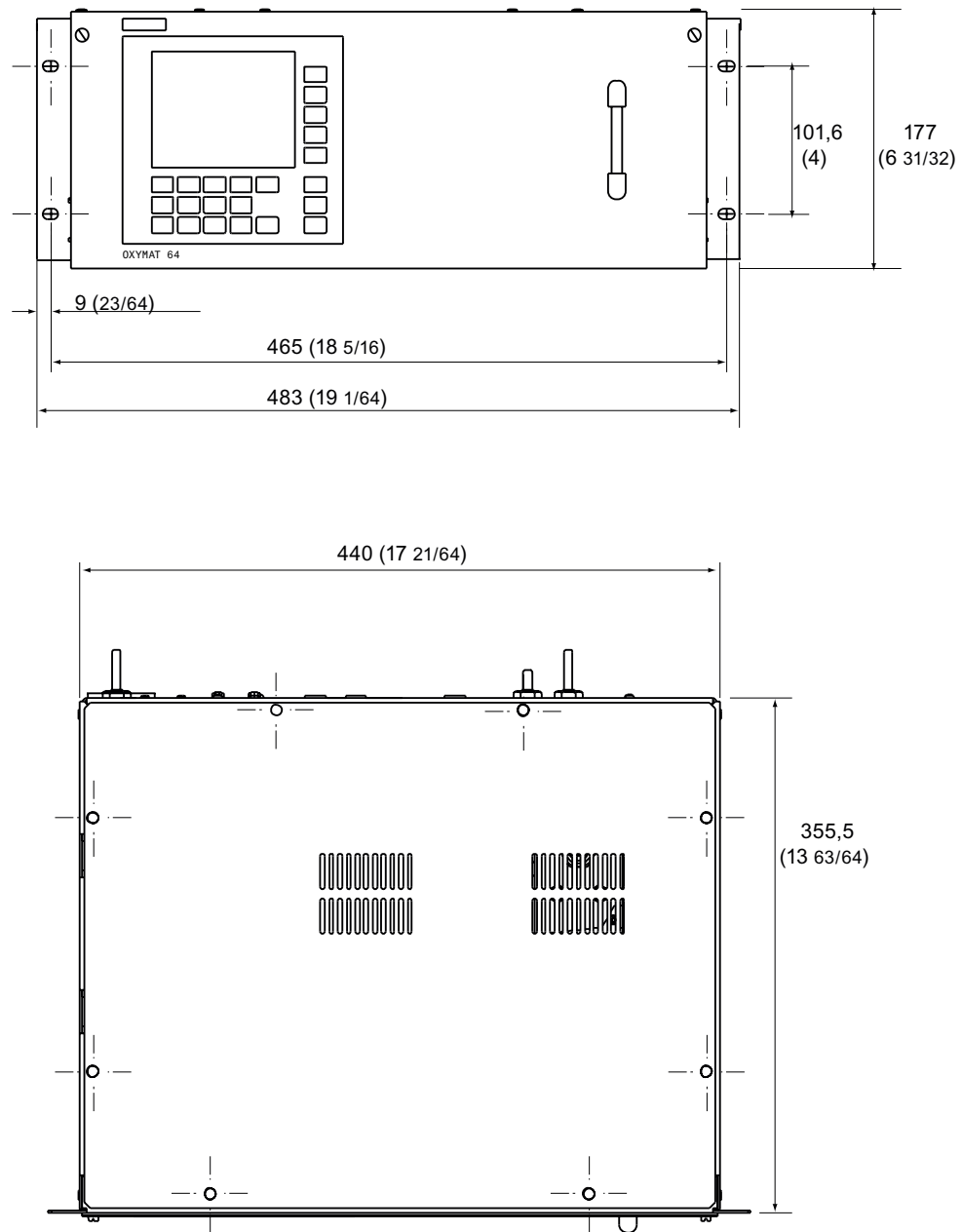


Figure 3-7 Dimensions for preparing installation (front view and plan view)

3.5 Dimensions for preparing installation

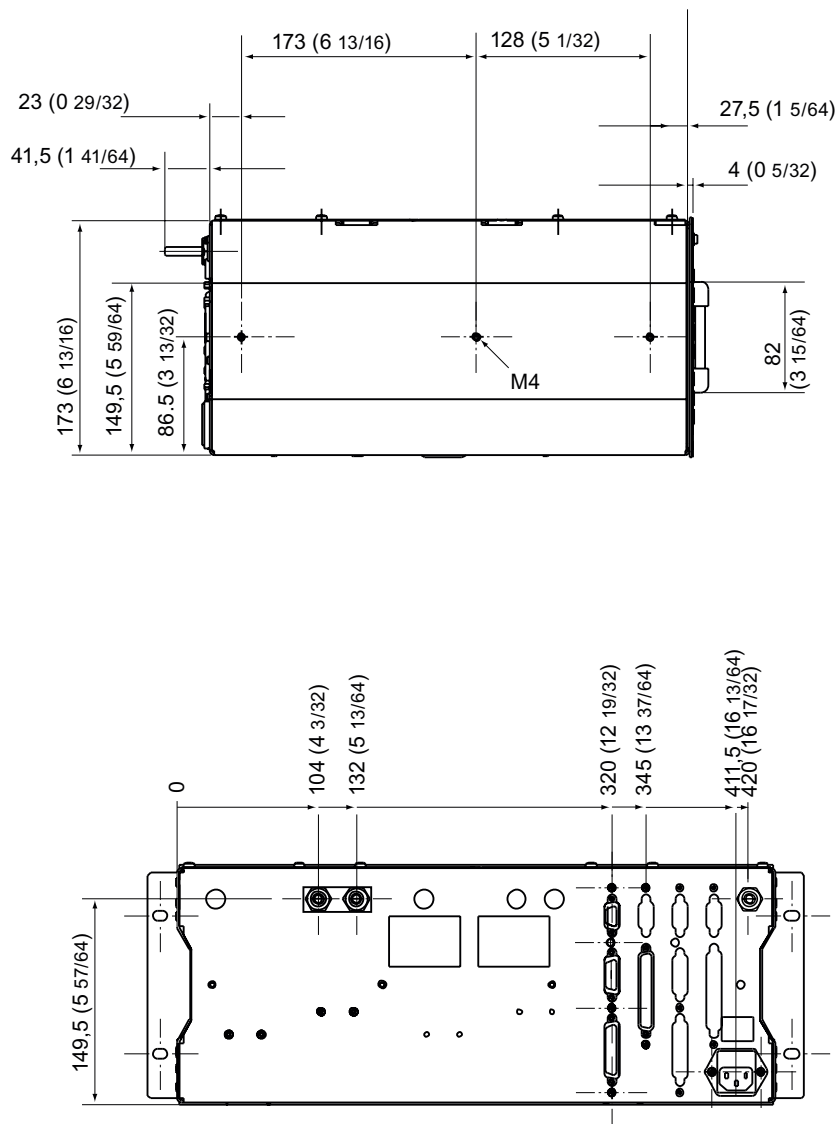


Figure 3-8 Dimensions for preparing installation (view from left and rear view)

Commissioning

4.1 Safety information

4.1.1 Safety information

WARNING
It is essential to observe the following statements and information!

4.1.2 Explosion hazard

DANGER
Explosion hazard The OXYMAT 64 gas analyzer must not be used to measure mixtures which are ignitable in normal operation.

WARNING
Explosion hazard The analyzer must not be operated in potentially explosive atmospheres. Gases with flammable components at concentrations above the lower explosive limit must not be supplied to the analyzer.

4.1.3 Electrical safety

DANGER

Electrical safety

Certain parts of this device are under dangerous voltage. Before switching on the device, the housing must be closed and grounded.

Failure to do so may result in death, personal injury and/or damage to property. Please also observe the section "Electric connection".

4.1.4 Toxic gases

WARNING

Toxic gases

When measuring toxic gases, it could occur that sample gas accumulates in the analyzer because of leaks in the gas path.

To prevent the danger of poisoning, the analyzer or the system must be purged with air. The gas displaced by purging must be collected using appropriate equipment and routed for environmentally-friendly disposal via an exhaust line.

4.1.5 Danger of burns

CAUTION

Danger of burns

Temperatures of up to 300 °C can occur in the analyzer when switched on.

The plant owner is finally responsible for switching-on.

4.2 Commissioning preparations

4.2.1 General information for commissioning

Operation

Before connecting and switching on the device, the operator must have made himself familiar with the device operation.

Interfaces

Before use, the interfaces must be correctly allocated and parameterized.

Sample gas requirements

The sample gas must be free of dust, oil and condensation. Corrosive gases (e.g. HCl, Cl₂, SO₂, ...) or catalyzer poisons (e.g. H₂S, HCN, CS₂, ...) must not be connected, not even in low concentrations.

Noise suppression

Noise in the measured signal can be reduced using function 50.

Pressure correction

The influence of the sample gas pressure is already corrected by the sensor electronics. A special adjustment is not necessary. The pressure can be read using function 2.

Influence of interfering gases

Flammable gases influence the O₂ measurement in that they reduce the O₂ content of the sample gas. The sensor temperature, the concentration of flammable components, as well as the O₂ concentration and sample gas flow all have an effect.

The relationship between interfering gas concentration and O₂ offset is frequently non-linear.

Correction of cross-interference is only meaningful if the effect of the interfering gas is lower than the expected O₂ concentration.

For examples of interfering gas offsets, refer to the chapter "Influence of interfering gas".

See also

Sample gas quality (Page 25)

Influence of interfering gas (Page 15)

4.2.2 Adjusting the sample gas flow

High-pressure version

The sample gas must be connected to the sample gas inlet. Make sure that the input pressure for the analyzer version without internal pressure regulator is approx. 2000 hPa. With a built-in pressure regulator, the pressure must be between 3000 hPa and 6000 hPa.

The total flow is factory-set to 24 l/h. It is specifically recommended that this is not changed. However, if a change is necessary, the total flow can be varied from 15 l/h to 30 l/h using the internal pressure regulator. The total flow can be measured using a flowmeter at the sample outlet. Following a change in the total flow, it is essential to check the sample gas flow through the sensor and to readjust this if necessary.

The sample gas flow can be read on the flowmeter at the front. It must be 7.5 l/h. If different, set the desired flow by adjusting the bypass capillary inside the analyzer. A leak test should subsequently be carried out to check for leaks in the supply line.

Low-pressure version

The sample gas flow must be set externally to 125 ml/min (7.5 l/h). The flow can be read on the flowmeter at the front. Depending on the application, it may be meaningful to install a bypass upstream of the gas inlet in order to keep the 90% time as short as possible.

See also

Leak test (Page 39)

4.3 Commissioning and operation

4.3.1 General information

After a short period, the measured value display appears on the LC display. The status display is present above this in the top line. A footer is present at the bottom. The current operating state is displayed in the footer.

Switch on the power supply

For the first approx. 30 minutes, the O₂ sensor is in the warmup phase. During this period, the message 'WARMUP' is displayed in the bottom line.

Achievement of the full measuring accuracy of the device depends on the ambient temperature. At room temperature, this is approx. 3 hours following switching on.

4.3.2 Leak test

Sample gas must be passed through the sample gas path (including inlet pipe to analyzer, see adjustment of sample gas flow). A meaningful measurement can only be carried out if the sensor temperature has already been at its setpoint of $650\text{ }^{\circ}\text{C} \pm 0.1\text{ K}$ for more than 5 min.

The check is carried out as follows:

- Pass nitrogen at 7.5 l/h into the analyzer (flow over the sensor), and record the displayed O_2 value after 5 minutes.
- Then reduce the flow to 6.9 l/h. Record the value again after 5 minutes. With this reduction in flow, a leak would result in a larger O_2 value. There is a leak in the sample gas path if the O_2 value deviates by more than +2% from the initial value.
- The opposite effect should occur if the sample gas flow is increased by a corresponding amount.
- If the leak test indicates a fault, it must be repeated directly on the analyzer. This will then indicate whether the leak is in the inlet pipe or in the analyzer itself.

See also

Adjusting the sample gas flow (Page 38)

4.3.3 Calibrate measuring ranges

Measuring ranges / spans

The desired spans (start-of-scale and full-scale values of measuring range) can be defined using function 41. The start-of-scale / full-scale values are allocated to the analog current values 0/2/4 mA to 20 mA.

If you enter the same values for the start-of-scale and full-scale of a measuring range, this range is considered as non-existent. Allocate the smallest span (MS) to measuring range 1 and the respectively larger ones to ranges 2 – 4. In general, the following is true for the allocation: $\text{MS1} < \text{MS2} < \text{MS3} < \text{MS4}$ or $\text{MS1} > \text{MS2} > \text{MS3} > \text{MS4}$.

The start-of-scale value must always be the same in all measuring ranges.

Technical zero

Since a zero point cannot be achieved because of the logarithmic measuring effect, the zero adjustment is therefore carried out close to the start-of-scale value. This is defined as the "Technical zero". An appropriate calibration gas must be selected as the "Zero gas" for this purpose. Its O_2 concentration should always be $< 30\%$ of the smallest span to be adjusted. Enter the zero setpoint using function 22.

Span adjustment

The setpoint should be as close as possible to the full-scale value (at least 70% of the respective span). Connect the corresponding calibration gas for the span adjustment. The setpoint is also entered using function 22.

4.3.4 General information on calibration

Note

Calibration is only possible when the device is in the "Measure" operating state.

Zero point

The zero point is calibrated using function 20. The device displays both the setpoint and actual value.

Note

Note that this function can only be activated if AUTOCAL (function 24) is deactivated.

Single / total calibration

A single or total calibration is selected using function 23.

Single calibration means that each measuring range is calibrated using a separate calibration gas.

During a total calibration, the measuring ranges defined using function 41 are calibrated together.

Sensitivity

Select function 21 and carry out the desired calibration. Note that this function can only be activated if AUTOCAL (function 24) is deactivated. If the total calibration was activated previously, all measuring ranges are then calibrated.

If you have selected single calibration (total calibration deactivated), repeat the calibration procedure for each measuring range individually with the corresponding calibration gases. (In function 22, a calibration gas must be entered for every measuring range!)

4.3.5 Calibration examples

Detection of oxygen in nitrogen

Oxygen in nitrogen is to be measured. Measuring range in which the calibration is to be carried out:

Measuring range: 0 – 50 vpm O₂

Calibration gas for zero point (zero gas): 5.8 vpm O₂

Calibration gas for span: 43.3 vpm O₂

Step	Procedure	Function No.	Input	Remark
1	Select start-of-scale and full-scale values of measuring range	41	0 – 50 vpm	0 vpm -> 0/2/4 mA (assignment to analog output) 50 vpm -> 20 mA (assignment to analog output)
2	Enter setpoints for zero and span	22	5.8 vpm	Zero setpoint
			43.3 vpm	Span setpoint
3	Calibrate zero	20		Calibrate using calibration gas for zero point (zero gas)
4	Calibrate span	21		Calibrate using calibration gas for span

Measurements in the percentage range

Oxygen in nitrogen is to be measured. Measuring range in which the calibration is to be carried out:

Measuring range: 20 – 80% O₂

Calibration gas for zero point (zero gas = air): 20.64% O₂

Calibration gas for span: 62% O₂

Step	Procedure	Function No.	Input	Remark
1	Select start-of-scale and full-scale values of measuring range	41	20 – 80 %	20% -> 0/2/4 mA (assignment to analog output) 80% -> 20 mA (assignment to analog output)
2	Enter setpoints for zero and span	22	20,64 %	Zero setpoint
			62,00 %	Span setpoint
3	Calibrate zero	20		Calibrate using calibration gas for zero point (zero gas)
4	Calibrate span	21		Calibrate using calibration gas for span

Note

The operation and input options of the named functions are described in detail in the chapter "Operation".

Operation

5.1 General information about operation

5.1.1 Measured value display and control panel

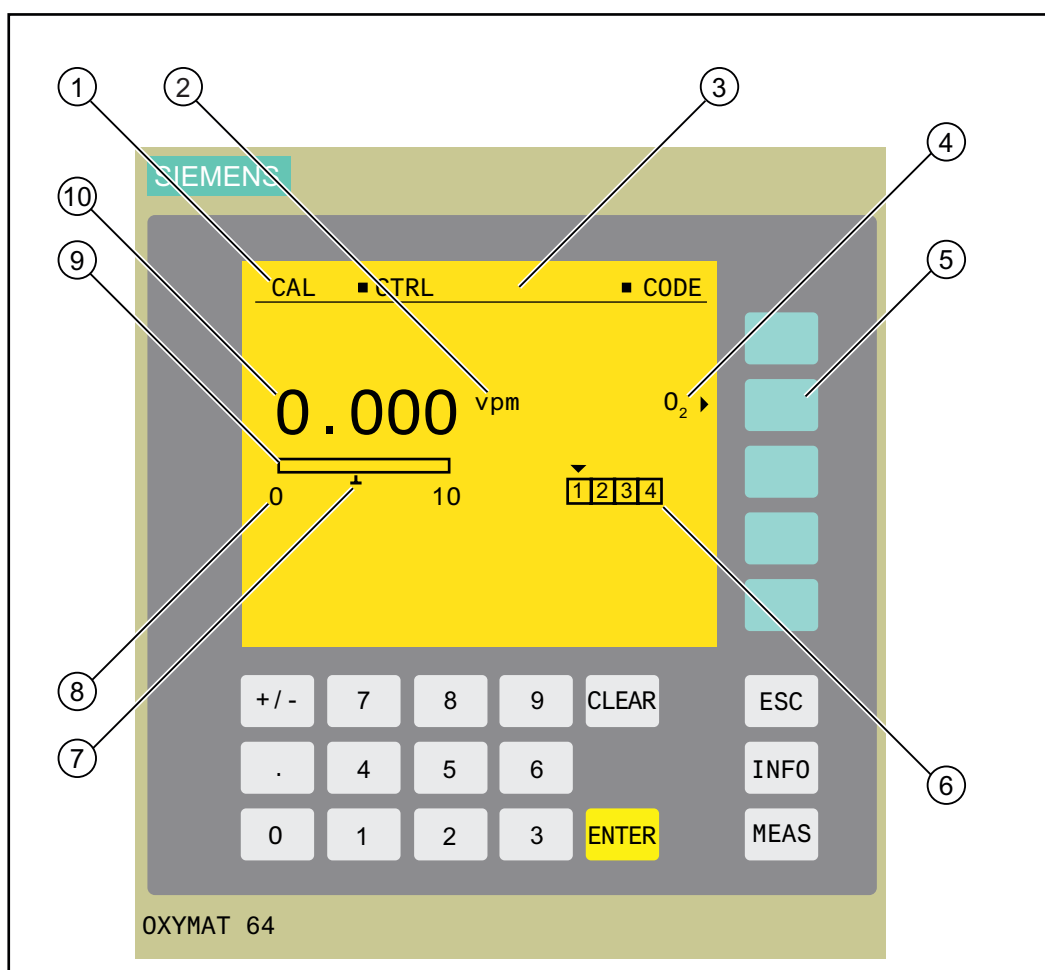


Figure 5-1 Measured value display and control panel

- | | |
|--|---|
| 1 Status display | 6 Display of activated measuring ranges with the current range marked |
| 2 Display of dimension | 7 Limit marker on bargraph |
| 3 Status line | 8 Measuring range start-of-scale and full-scale values |
| 4 Display of measured component | 9 Analog display of measured value |
| 5 Buttons with varying function (softkeys) | 10 Measured value |

5.1.2 Button meanings

Table 5- 1 Button meanings

Button	Meaning/function
CLEAR	Clears the begun number input
ENTER	Every number entered (except fast activation of a function) must be confirmed with [ENTER].
ESC	Jumps back one step in the operating structure. Changes are accepted without need for confirmation.
INFO	Information about current menu / current function
MEAS	Jump back from every position in the operating structure to the "Decoded display mode" (you may be asked to confirm the entered data). Pressing the [MEAS] button again changes to "Coded display mode", i.e. another change in the "Operator control mode" requires the entry of the corresponding code.
Softkey	Varying function; possible here are: • Submenu selection / function selection • Selection of a subfunction

5.1.3 Editing inputs

The values in the menus shown in this chapter are meant as examples.

An active input field is shown with colons (e.g.: 10:) as a limiter. The cursor blinks under the number to be entered.

By pressing the [ENTER] button, you finish your input and the value is stored. If there are several input fields on one function screen, the cursor positions itself at the next input field at the same time.

Note

Confirm every entered value, even the last of several values in a function, before exiting the function with [ENTER]!

With the [CLEAR] button, you can clear a number which you have begun to enter. The cursor then jumps back to the first position of the input field.

Graphic symbols

- = activated (ON state; also in status message in the status line)
- = deactivated (OFF state; also in status message in the status line)
- = access a submenu/subfunction
- = trigger a function/subfunction (e.g. Start calibration...)

5.1.4 Device operating modes

Table 5- 2 Operating modes

Mode	Properties	Remarks
Coded display mode	- Measured value display is shown - Protected submenus can only be reached by entering a code - The current operating state of the device (except for "Measure") is displayed in the bottom line - Functional check not active	The device only supplies reliable measured values in this mode, as far as it's in the "Measure" operating state. From the operator control mode, you can reach this mode by pressing the [MEAS] button twice.
Decoded display mode	- Measured value display is shown - The submenus protected by the entered code are accessible - The current operating state of the device (except for "Measure") is displayed in the bottom line - Functional check active - Measured value can be influenced	From the operator control mode, you can reach this mode by pressing the [MEAS] button once and confirming or discarding the made entries.
Operator control mode	- Menu or function is displayed - Settings and inputs can be made - Functional check active - Measured value can be influenced	From "Coded display mode" you can reach this mode by entering the code of the corresponding operation level. In this mode, you can parameterize/calibrate the device.

Schematic diagram of the operating sequence with operating modes

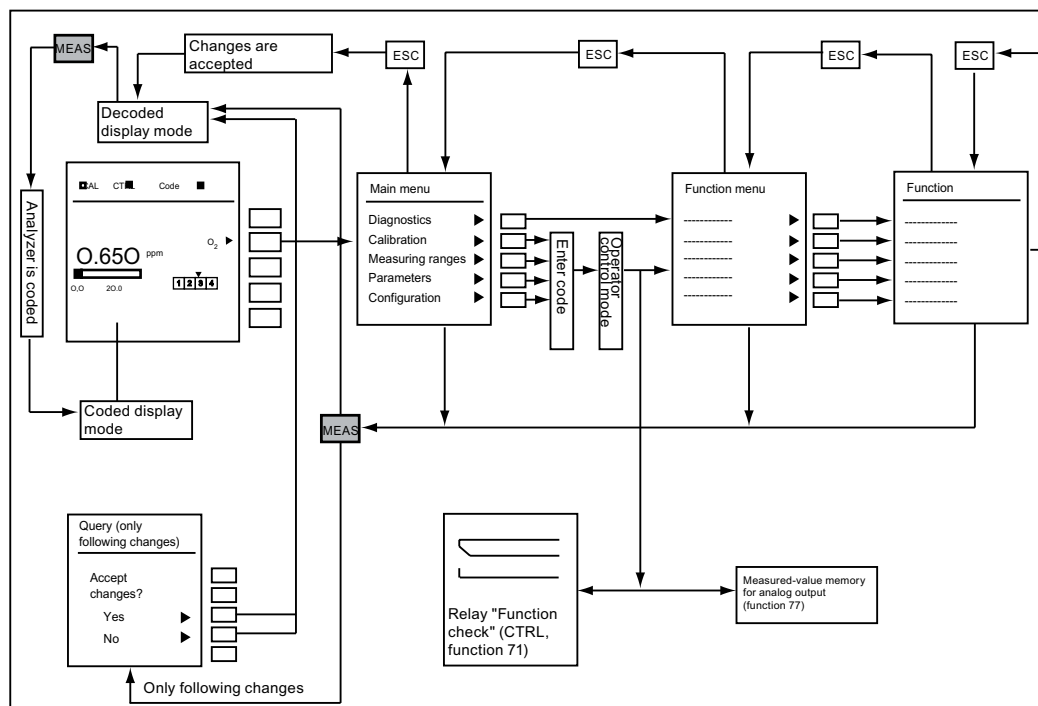


Figure 5-2 Operating sequence O64 with operating modes

5.2 Measured value display

In the following, the displays below are referred to as the "Measured value display" which appear in the display in the two operating states "Coded display mode" and "Decoded display mode".

Note

Device operating state

In the "Measured value display", the current operating state of the device can be read in the bottom line. The "Measured value display" is not an operating state and not an operating mode, but is simply displayed. It must not be confused with the "Measure" operating state (also "Measuring state") of the device!

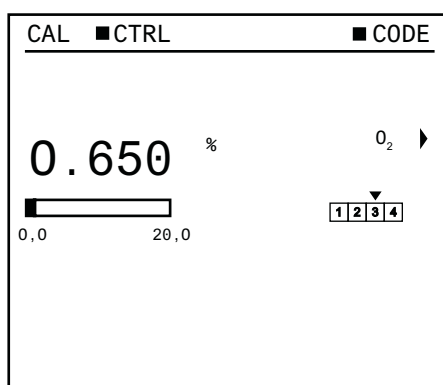


Figure 5-3 Measured value display

5.3 Menu control

5.3.1 Entering the main menu

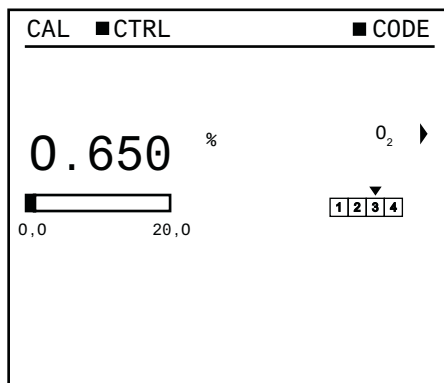


Figure 5-4 Measured value display

On the right side of the measured value display is the measured component with an arrow pointing to the right (►). A softkey is assigned to this component.

Press this softkey to call the main menu.

5.3.2 Entering a submenu

The main menu consists of five submenus.

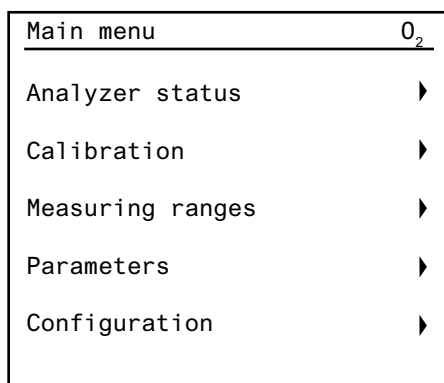


Figure 5-5 Main menu

Some of these are protected against unauthorized access by various level codes.

Menu	Code level
Analyzer status	Not coded
Calibration	Code level 1
Measuring ranges	Code level 1
Parameter	Code level 1
Configuration	Code level 2

The code of level 1 is preset to "111" in the factory, and the code of level 2 is preset to "222".

Entering a submenu

If you select a submenu by pressing the associated softkey, the code of the corresponding operation level is queried once (exception: the submenu "Analyzer status" is freely accessible; selecting this does not change the operating mode).

Decoding level 2 also decodes level 1.

By entering a corresponding code, the device switches to the operator control mode, whereby the functional check is activated.

The functional check "CTRL" (shown in the status line of the measured value display) is always activated by the device when an intervention endangers correct measurement, e.g. when the code is entered. If you have configured a corresponding relay using function 71 with "Functional check", an extra signal is sent out via the relay contact together with the decoding. This relay contact then signals every functional check activation, e.g. even the warm-up phases and calibration states of the device.

Decoding also activates the measured value memory, providing you have parameterized it using function 77. The coding status of the device can be read in the status line of the measured value display as a symbol "■ CODE" for "coded" or "□ CODE" for "decoded".

5.3.3 Jump back to coded/decoded display mode

With the [MEAS] key, you can jump from "Operator control mode" back to "Decoded display mode". Any input started is aborted.

Before jumping back, the following query appears:

Return to measuring	O ₂
Accept modifications?	
YES	•
NO	•

Figure 5-6 Query before jumping back

- Press "YES" to accept changes permanently into the working memory of the parameter memory or "NO" to discard the changes. The device then changes to "Decoded display mode".
- Press [ESC] to return to the last function screen. Changes are accepted here without a further query.

Coding the device

After jumping back to "Decoded display mode" with [ESC] or [MEAS], if you press [MEAS] again you put the device back into "Coded display mode". Only now is the functional check deactivated again.

5.3.4 Fast function selection

In order to directly access the desired function when operating frequently from the "Coded display mode", a "Power user operation" was created. This allows you to directly access the desired function by entering the function number. This allows you to skip menu levels. However, the functions can only be directly called from the measured value display. For fast function selection, proceed as follows:

1. Enter the number of the desired function using the number keys.
2. Press the softkey of the component with the arrow ►. If the desired function is protected by a code, you will be asked to enter the code.

See also

Overview of operating functions (Page 51)

5.4 Operating functions

5.4.1 Overview of operating functions

The following overview is a list of the device functions. This list corresponds to software version 0.1.5.

Main menu item	Function number	Name of function
Analyzer status	1	Factory data
	2	Diagnostics values
	3	Logbook
	4	Display measuring ranges
Calibration (code 1)	20	Calibrate zero
	21	Calibrate span
	22	Zero/span setpoints
	23	Total/single calibration
	24	Autocal
	25	Drift values
Measuring ranges (code 1)	26	Sensor calibration
	40	Select measuring ranges
Parameters (code 2)	41	Define measuring ranges
	50	Electric time constant
	51	Limits
	52	On/off functions
	53	Status signals
	54	Graphic measured-value display
	55	Measured-value display
	56	LCD contrast
	58	Date/time
Configuration (code 2)	59	Measuring-point switchover
	60	Logbook settings
	70	Analog output
	71	Relay assignment
	72	Binary inputs
	73	ELAN configuration
	74	Reset
	75	Save, load data
	76	Suppress short noise signals and negative measured values
	77	Save analog output (measured value)
	78	Calibration tolerance
	79	Change codes
	80	Analyzer test
	81	Select language
	82	Pressure correction
	83	Correction of cross-interference
	85	Switch valves
	86	Linear temperature compensation
	87	Faults on/off
	90	PROFIBUS configuration
	91	Change dimension
	99	Factory settings

Overview of operating functions

See also

Fast function selection (Page 50)

5.4.2 Analyzer status**5.4.2.1 Analyzer status submenu**

Analyzer status	0 ₂
1 Analyzer configuration	▶
2 Diagnostic values	▶
3 Logbook	▶
4 Display meas. ranges	▶

Figure 5-7 Analyzer status submenu

The analyzer status functions are freely accessible. For this reason, there is no code query and no change in the operating mode.

The analyzer status submenu offers you various functions for displaying device parameters and stored data.

5.4.2.2 Analyzer configuration (function 1)

After this function is selected, the following device manufacturing data appear:

Motherboard:

- Firmware No.:
Order No. of the software in the EPROM for the motherboard
- Order No.:
Information on device ordering data
- Production No.:
Indication of date of manufacture and device serial number
- Object version:
Indication of the hardware design of the device
- Software version/date:
Version of the motherboard software; date, version of boot software of motherboard

Adapter board:

- Order No.:
Order No. of the software in the EPROM for the adapter board
- Software status:
Version of the adapter board software
- HW version:
Version of the adapter board hardware

5.4.2.3 Diagnostic values (function 2)

The most important diagnostic values may be called using function 2. They may allow conclusions to be drawn for evaluation of errors or setting work.

5.4.2.4 Logbook (function 3)

In the logbook, all errors which led to a maintenance request (W) or a fault (S) are listed. The limit alarm (LIM) and functional check (CTRL) are also registered. However, these do not trigger a maintenance request or fault message.

The logbook contains a max. of eight pages, with four messages per page. It works according to the rotating buffer principle, i.e. when all eight pages (all 32 locations) are occupied, the oldest message is overwritten.

You can delete or block logbook entries (function 60), but you can also switch them off individually (function 87).

Note

If an error occurs whose error message is switched off with function 87, there is no reaction at any configured interface. This applies both to the ELAN interface and to the analog output and the relay output.

See also

Alarms and messages (Page 109)
Logbook settings (function 60) (Page 80)
Error on/off (function 87) (Page 99)

5.4.2.5 Display measuring ranges (function 4)

The measuring ranges defined using function 41 are listed here. However, you cannot carry out any changes in this function.

5.4.3 Calibration

Note

The calibration tolerance (function 78) is permanently active in order to monitor for an incorrect calibration or leaks in the system during the calibration procedures.

5.4.3.1 Calibration submenu

Calibration	0 ₂
20 Zero calibration	▶
21 Span calibration	▶
22 Setpoints for zero/ span	▶
23 Calibration settings	▶
...continue	▶

Figure 5-8 Calibration submenu

You can calibrate the device using the functions available in this menu. Press the fifth softkey "...continue" to access further functions.

This menu is protected by the code of code level 1.

The OXYMAT 64 offers the option of a manual or automatic calibration (Autocal: function 24). The latter is only possible with an optional board which contains an additional eight binary outputs and eight relay outputs.

The setpoints for the zero and span calibrations are entered using function 22.

Note

If the analyzer has been equipped with an optional board with Autocal function, it automatically enters Autocal mode when switched on. In order to carry out a manual adjustment or via binary inputs, the Autocal mode must first be switched off (function 24).

5.4.3.2 Zero calibration (function 20)

20 Zero calib.		O ₂
Setpoint :	5.4	vpm
Act.val. :	0.00	vpm
Start calibration		●
CANCEL		

Figure 5-9 Zero calibration

In order to be able to calibrate the zero, the device must be in the "Measure" operating state. If this is not the case, calibration is not possible. The display will show the message *"Analyzer is not measuring"*.

The zero is calibrated simultaneously for all measuring ranges, even when the span of the measuring ranges is calibrated individually.

Only initiate calibration when the measured value (actual value) has stabilized after applying the zero gas. Otherwise, the calibration may be imprecise.

If there is a lot of noise, increase the time constant before calibrating (function 50).

See also

Electric time constants (function 50) (Page 71)

5.4.3.3 Span calibration (function 21)

Single calibration ("Measure" operating state required)

21 Sp.cal. all MRs		O ₂
Calibration MR 1	▶	
Calibration MR 2	▶	
Calibration MR 3	▶	
Calibration MR 4	▶	

Figure 5-10 Carry out single calibration

Single calibration is only possible if the *"Total calibration"* subfunction has been deactivated in function 23.

All measuring ranges defined using function 41 appear in the display. The above function screen is an example of the single calibration of four measuring ranges.

If you would like to calibrate range 3, press the corresponding softkey.

The setpoint and current actual value of the selected range then appear in the display:

21 Sp.cal. MR 3	O ₂
Setpoint : 9999.00	vpm
Act.val. : 9901.00	vpm
Start calibration	●
CANCEL	

Figure 5-11 Calibrate measuring range

When the actual value has stabilized, you can initiate the calibration process by pressing the fourth softkey. The actual value is now made to agree with the setpoint.

If a calibration is carried out incorrectly (e.g. using the wrong calibration gas) repeat the complete calibration procedure.

If the calibration is aborted because the calibration tolerance is too large, check your calibration gas as well as for leaks in the analyzer (chapter 4.3.2). If the calibration gas is OK, and if there are no leaks, try to carry out a basic calibration using function 26 (adjust sensor). If the calibration tolerance is still too high, the sensor may be faulty.

Total calibration ("Measure" operating state required)

Total calibration is only possible if the *"Total calibration"* subfunction has been activated using function 23.

With a total calibration, you calibrate all measuring ranges together. Define the "leading" measuring range in function 22. We recommend that you use the largest measuring range for this.

The setpoint and current actual value of the "leading" measuring range appear in the display.

When the actual value has stabilized, you can initiate the calibration process by pressing the fourth softkey. The actual value is now made to agree with the setpoint.

If a calibration is carried out incorrectly (e.g. using the wrong calibration gas) repeat the complete calibration procedure.

See also

Setting the setpoints (function 22) (Page 57)

Total / single calibration (function 23) (Page 57)

Define measuring ranges (function 41) (Page 70)

5.4.3.4 Setting the setpoints (function 22)

22 Setpoints total	0 ₂
Setpoint for zero. : 5.40: vpm	
Setpoint for MR 1 8.50 vpm	☐
Setpoint for MR 2 12.50 vpm	☐
Setpoint for MR 3 600.50 vpm	☒
Setpoint for MR 4 8245.50 vpm	☐

Figure 5-12 Setting the setpoints

The function screen shows the setpoint input with total calibration. The third measuring range is chosen here as the leading measuring range.

With single calibration, there is no choice for the leading measuring range.

The definition of the leading measuring range does not apply to Autocal mode.

5.4.3.5 Total / single calibration (function 23)

23 Calibr. settings	0 ₂
Total range calibration	☒

Figure 5-13 Select calibration method

With this function, select between the total and single calibration of the measuring ranges.

Total calibration means that you adjust one "leading measuring range" and all other measuring ranges are calibrated using the switching ratio.

If this function is not activated, each measuring range is calibrated separately.

5.4.3.6 Autocal (function 24)**Note**

You can only make use of automatic calibration (Autocal) if your device contains additional electronics (optional board). If this isn't the case, a corresponding message will appear on the display when the Autocal function is called.

Automatic calibration can only be started if the device is in the "Measure" operating state!

Autocal / -check	0 ₂
Autocal / -check mode	▶
Autocal / -check sequence	▶
Autocal / -check cyclic parameter	▶
Autocal check	▶

Figure 5-14 Autocal function

Note

The settings for "Autocal/Check..." (subfunctions 1 to 3) are valid both for Autocal (automatic calibration) and for Autocal Check (automatic check that the set calibration tolerances are complied with, without calibration).

The settings for "Autocal Check" (4th subfunction) only refer to the check of the calibration tolerances without calibration.

AUTO CAL/Check operating mode

Autocal / -check mode	0 ₂
Autocal / -check on/off	☐
Start autocal / -check cyclically	☐
Start autocal / -check via binary input	☐
Trigger autocal once	
Abort autocal	

Figure 5-15 AUTO CAL/Check operating mode

With this subfunction, you parameterize various Autocal operating modes.

"Autocal/Check on/off":

During the state *"Autocal off"* (shown as: "□"), the settings on the switch *"Autocal start cyclically (parameter)"* and *"Autocal start via binary input"* do not have an effect on the device. *"Trigger Autocal once"* cannot be selected. The cycle time continues to run. No automatic calibration is initiated, however.

"Autocal/Check start cyclically":

You can activate Autocal to be a regularly repeated cycle if you first set *"Time from Autocal to Autocal (cycle time)"* using subfunction *"Autocal/Check cycle parameter"*.

The Autocal Check is only for checking the calibrations. As with Autocal, the device executes the sequence parameterized in subfunction *"Autocal/Check sequence"*. As opposed to Autocal, no new calibrations are carried out, but only the deviations are checked with respect to selectable calibration tolerances.

"Autocal/Check start via binary input":

If you previously configured a binary input using function 72, you can initiate Autocal via a binary input.

"Trigger Autocal once":

In the state *"Autocal on"*, you can start an Autocal sequence at any time using the softkey *"Trigger Autocal once"* providing the device is in the "Measure" operating state. A sequence initiated this way has no influence on the time cycle of an Autocal, i.e. the cycle time continues to run independently of this.

After initiating, the dot disappears until the process is finished.

"Abort Autocal":

A running automatic calibration process can be exited at any time using the softkey *"Abort Autocal"*. With this, all calibration data determined up to that point are discarded and the calibration data used before Autocal was started are used further (zero and span).

Canceling has no influence on the time cycle. All valid calibration processes are retained.

AUTOCAL sequence

Acal / -check sequence	O ₂
1. Zero gas 1 :1.0: min	●
2. Cal. gas 1 1.1 min	●
3. Cal. gas 2 1.2 min	●
4. Cal. gas 3 1.3 min	●
...continue ▶	

Figure 5-16 AUTOCAL/Check sequence

With this subfunction, you can combine several calibration phases to form one Autocal sequence.

You can parameterize the automatic calibration as you wish. It is possible to "compose" a sequence of up to twelve different phases.

Besides the supply of one zero gas and up to four calibration gases per component, you can also program flushing with sample gas, sample gas intermediate operation, as well as a signaling contact. The signaling contact is available if you previously allocated it to a relay output using function 71.

Sample gas intermediate operation

Sample gas intermediate operation can be necessary if the system may only leave measuring mode for a certain time. If the necessary flushing times are greater in total than the permissible downtime, measuring mode must be returned to between calibrations.

Signaling contact

Use the signaling contact to initiate an automatic calibration process of a second device, for example, or to signal the beginning or end of an Autocal.

Relay outputs

If you have defined relay outputs for the sample gas, zero gas, calibration gases and/or measuring/calibration (function 71), these are used to activate the corresponding external solenoid valves. The same applies to the signaling contact "Autocal". This is closed for 1 s when the command is executed.

Example:

You want to program the following sequence:

1. Zero gas calibration, after 15 minutes of flushing with zero gas
2. Calibration with calibration gas 1, after 10 minutes of flushing with calibration gas
3. Flushing with sample gas: 8 minutes
4. Sample gas intermediate operation: 30 minutes
5. Calibration with calibration gas 3, after 1.4 minutes of flushing

The specified Autocal sequence is shown in the following function screens.

Acal / -check sequence			0 ₂
1. Zero gas 1	:15.0: min	●	
2. Cal. gas 1	10.0 min	●	
3. Purge SG	8.0 min	●	
4. SG i/m.op.	30.0 min	●	
...continue ▶			

Figure 5-17 Example of Autocal sequence

Acal / -Check sequence		0 ₂
5.	Cal.gas 3: 1.4:min.	●
6.	**** min.	●
7.	**** min.	●
8.	**** min.	●
...continue		▶

Figure 5-18 Example of Autocal sequence

Acal / -Check sequence		0 ₂
9.	**** min.	●
10.	**** min.	●
11.	**** min.	●
12.	**** min.	●
...continue		▶

Figure 5-19 Example of Autocal sequence

List for the Autocal sequence:

Autocal sequence
Zero gas 1
Zero gas 2 (air with function 26)
Calibration gas 1
Calibration gas 2
Calibration gas 3
Calibration gas 4
Flush sample gas
Sample gas intermediate operation
Signaling contact

AUTOCAL/Check cycle parameters

Acal/-check cycle	0 ₂
Time from autocal to auto-cal (cycle time):	0: [h]
Time up to next autocal cycle	15 [min]
Carry out span calibration for each :	1 : cycle
Total range calibration	
Calibration gas	4

Figure 5-20 Autocal/Check cycle parameters

With this subfunction, you can parameterize various time constants for activating a cyclically repeated Autocal sequence.

"Time from Autocal to Autocal (cycle time)":

Any setting between 0 and 500 (hours) is accepted by the device. "0" corresponds to no Autocal cycle.

"Time to first Autocal" (after the time of setting):

If you enter "0" here and Autocal is activated with *"Autocal on/off"*, the device begins immediately with the Autocal sequence.

If Autocal is switched off, the device only starts an Autocal sequence if Autocal is switched on within one minute after entering "0". If not, the total time between two Autocal cycles passes by, starting with the input of "0".

Note

The clock inside the device also runs when Autocal is deactivated! It restarts when the device is switched on and must be set to the current time using function 58.

"Carry out span calibration for each xth cycle":

Here you set the number of cycles after which a calibration with the calibration gas is to be carried out.

If you would like to save on calibration gas, for example, and not calibrate the span along with every zero calibration, enter in the line *"Calibrate with calibration gas at every : : cycle"* an integer > 1.

Note

As long as Autocal is activated (Autocal ■), access to functions 20 and 21 is blocked. If you activate these functions anyway, a corresponding message appears on the display.

Settings for AUTOCAL Check

Autocal / -check	O ₂
Calib. tolerance at zero in % of smallest MR: : 6:	
Calib. tolerance of sens. in % of current MR 6	
Start only autocal check cyclically	☐
Trigger acal check once	
Abort autocal check	

Figure 5-21 Autocal Check

In the subfunction *"Autocal Check"*, enter the desired calibration tolerances which should be checked by Autocal Check. Using functions 71 and 72, you can also select the relay output or binary input for "Autocal Check".

When a calibration limit is exceeded, the maintenance request W10 is set, and also, if parameterized, the relay "Acal Chk Dif".

Both will be reset again after an error-free Autocal. W10 is retained in the logbook.

"When starting via cycle, initiate Autocal Check":

If this function is activated, the device executes an Autocal Check when Autocal is started via a cycle. In other words, it only checks that the calibration tolerances are observed, but does not carry out a calibration.

Sequence:

1. Start the Autocal Check:
 - By means of the softkey *"Trigger Autocal Check once"* in the subfunction *"Acal/Check sequence"*
 - Via binary input
 - Via cycle
2. The device executes the sequence as parameterized in the subfunction *"Autocal/Check sequence"*.

See also

Relay outputs (function 71) (Page 82)

Binary inputs (function 72) (Page 84)

5.4.3.7 Drift values (function 25)

25 Drift values			O ₂
Zeropoint:	0.00	vpm	
Span MR4:	-36.00	vpm	
Drift values reset			●

Figure 5-22 Drift values

This function displays the drift values of all measuring ranges as a total. Every deviation is added to the existing drift value. This value is deleted when the device is switched off, i.e. all measuring ranges have 0 as the drift value following a restart.

5.4.3.8 Sensor calibration (function 26)

Note

As soon as a calibration process is triggered by this function, all existing span and zero settings are deleted. We therefore recommend that you save your current settings using function 75 'Save user data' **before** you call function 26.

You can recalibrate the sensor characteristic using this function. This function guarantees that the displayed O₂ concentration agrees with that of the ambient air.

We recommend that you carry out this function if the calibration tolerance is too large when calibrating with one of the functions 20 or 21.

Note

Prior to this step you must first check the analyzer for leaks since these can also result in an excessively large calibration tolerance.

The sensor calibration must then be carried out **before** calibrating the zero and span (functions 20 and 21).

The setpoint of the ambient air is 20.64 %; this is an annual average. This takes into account the fact that moisture displaces O₂.

The calibration takes place in two steps.

1. The sensor zero is first adjusted using ambient air.
2. The span of the sensor signal is then calibrated using a previously defined calibration gas.

Preparatory steps

- Select the function 23 'Single/total calibration' and activate the parameter 'Total calibration' there.
- A calibration gas is required for the second step, namely calibration of the sensor signal span. We recommend a calibration gas with a concentration between 10 and 100 ppm O₂ in N₂.
Enter the value of this calibration gas in function 22 under 'Setpoint for MR', and activate the corresponding measuring range. The calibration gas valve of the calibration gas activated in function 22 is opened.

Procedure

1. Select function 23.
2. Activate the 'Total range calibration' parameter.
3. Select function 22.
4. Enter the O₂ concentration of the calibration gas under 'Setpoint of leading MR'.
5. Select function 26. The following display is output:

26 Adjust sensor	O ₂
Setpoint : 20.64	% vol
Act.value: 20.16	% vol
T Sensor : 650.0	°C
Please connect air	
...cont. with Span cal.	▶
Start calibration	●
CANCEL	

Figure 5-23 Calibration of sensor zero

Note

The relay for zero gas 2 is set (if it has been previously appropriately parameterized).

6. Connect ambient air to the sample gas inlet.
You can use air from a compressed air system, or suck in ambient air using a pump.
Provide and input pressure of
 - 2000 hPa for high-pressure devices without a built-in pressure regulator and
 - 3000 to 6000 hPa for high-pressure devices with a built-in pressure regulator.
 - With low-pressure devices you must guarantee that the flow is 7.5 l/h.

Note

Connection to a compressed air system

When connecting to a compressed air system, ensure that the air is free of oil and grease. Measurements will otherwise be permanently falsified.

7. Check the flow on the front panel rotameter. The flow must be constant at 125 ml/min.
8. Observe the display and wait until the measured value has stabilized and the sensor temperature is within the permissible tolerance of ± 0.1 °C.
9. Press the softkey 'Trigger calibration procedure' and follow the input steps shown on the display.
10. Press the softkey 'Continue to span calibration'. The following display is output:

26 Adjust sensor	O ₂
Setpoint : 15.00	vpm
Act. value: 206400.00	vpm
T Sensor : 650.0	°C
Please connect span gas	
Start calibration	●
CANCEL	

Figure 5-24 Span calibration

Note

The activated calibration gas relay is then switched.

11. To calibrate the span of the sensor signal, connect the calibration gas to the sample gas inlet. Ensure that the input pressure is correct. It must correspond to the pressure values in step 3.
12. Check the flow on the front panel rotameter. The flow must be constant at 125 ml/min.
13. Press the softkey 'Trigger calibration procedure' and follow the input steps shown on the display.

If the message 'Calibration successful' is displayed, the calibration has been completed.

If an error occurs during the calibration, you can use function 75 (save/load data / load user data) to reload the old calibration data.

5.4.4 Measuring ranges

5.4.4.1 Measuring ranges submenu

Meas. ranges	0 ₂
40 Range selection	▶
41 Define meas. ranges	▶

Figure 5-25 Measuring ranges submenu

The measuring ranges menu contains all functions you need for selecting and setting the measuring ranges.

This menu is protected by the code of code level 1.

5.4.4.2 Select measuring ranges (function 40)

40 Select ranges	0 ₂
MR1 0.0 - 10.0 vpm	☐
MR2 0.0 - 100.0 vpm	☐
MR3 0.0 - 1000.0 vpm	☐
MR3 0.0 - 10000.0 vpm	☐
Auto range	☒

Figure 5-26 Select measuring ranges

You can select a fixed measuring range or switch to automatic measuring range switching. All selection options are subject to mutual interlocking.

Automatic measuring range switching is only possible under the following conditions:

- At least two measuring ranges must be available. One measuring range is said to be present when the following is true: Measuring range start-of-scale value ≠ full-scale value
- The spans must become greater or smaller
- The measuring ranges must "border on" each other or overlap

Measuring range types

The permissible measuring range constellations result which are shown in the figure below:

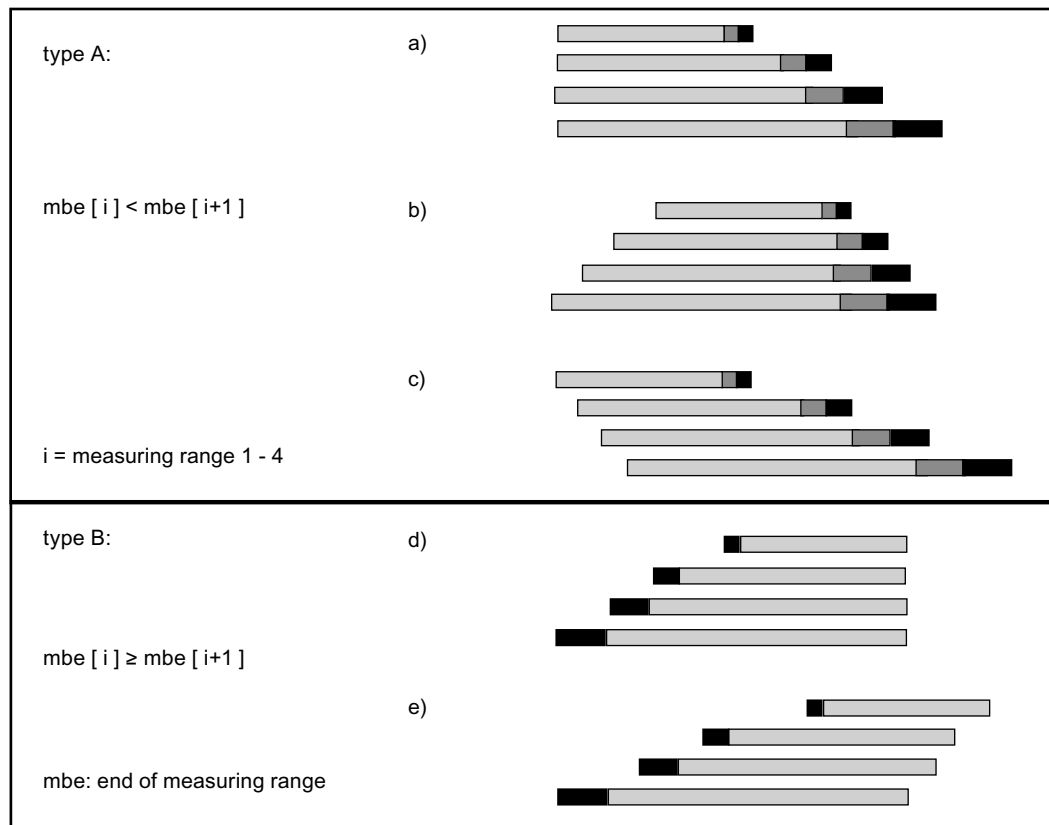
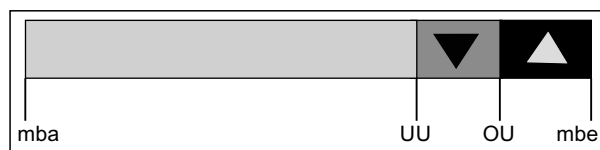


Figure 5-27 Measuring range types

Two measuring range types are distinguished:

Type A:

The full-scale value must be less than the full-scale value which follows it. The top measuring range limit therefore becomes higher with every measuring range.



- mba Start of measuring range
- mbe End of measuring range
- UU Lower switchover point: select the smaller measuring range
- OU Upper switchover point: select the larger measuring range

Figure 5-28 Measuring range type A

The following applies to measuring range switching:

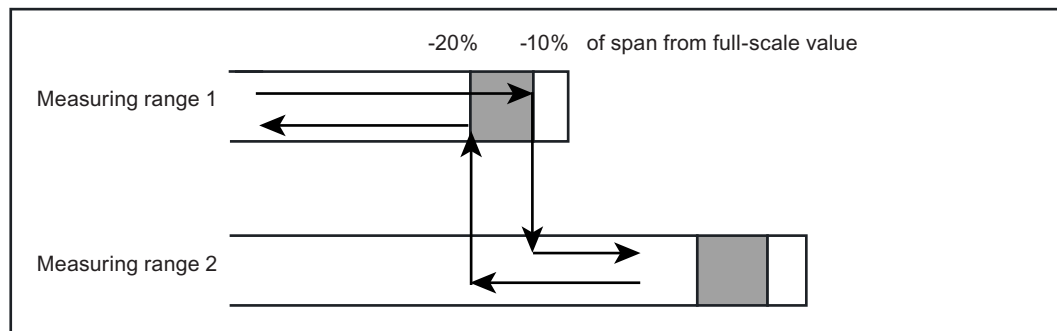
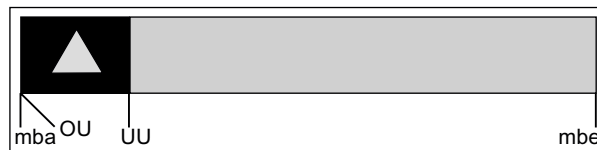


Figure 5-29 Measuring range switching, type A

When the upper switchover point (OU) is exceeded, the next larger available measuring range is selected. If the lower switchover point (UU) of the next smaller available measuring range is fallen below, this is selected. The UU lies at 80 % (HystA) of the measuring range. The OU lies at 90 % (HystE) of the measuring range.

Type B:

The full-scale value must be greater than or equal to the full-scale value following it. Since the spans must simultaneously become larger, the start-of-scale values of the following measuring ranges become continuously smaller.



- mba Start of measuring range
- mbe End of measuring range
- UU Lower switchover point: select the smaller measuring range
- OU Upper switchover point: select the larger measuring range

Figure 5-30 Measuring range type B

The following applies to measuring range switching:

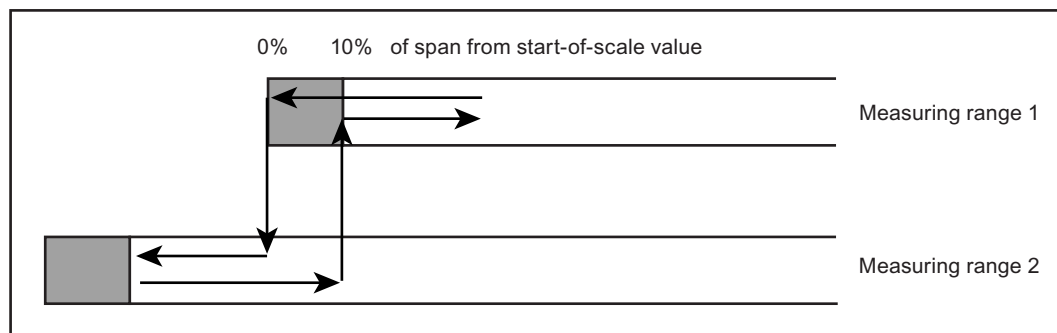


Figure 5-31 Measuring range switch, type B

When the upper switchover point (OU) has been fallen below, the next larger available measuring range is selected. If the lower switchover point (UU) of the next smaller available measuring range is exceeded, this is selected.

The UU lies at 10 % (100 % - HystE) of the measuring range. The OU lies at the start of the measuring range (mba).

5.4.4.3 Define measuring ranges (function 41)

41 Define ranges			0 ₂
MR start No.	end value		
1:	0.000:	10.0 vpm	
2	0.000	100.0 vpm	
3	0.000	1000.0 vpm	
4	0.000	10000.0 vpm	

Figure 5-32 Define measuring ranges

You can define a maximum of four measuring ranges whose start-of-scale values are allocated to the bottom value (0/ 2/ 4 mA) and whose full-scale values are allocated to the top value (20 mA) of the analog output.

If the message "Measuring ranges not plausible!" appears, this means that autoranging is not possible.

If the start-of-scale and full-scale values are "0", the measuring range is deactivated.

5.4.5 Parameters

5.4.5.1 Parameters submenu

Parameters		0 ₂
50 El. time constants		▶
51 Limits		▶
52 On/off configuration		▶
53 Status messages		▶
...	...continue	▶

Figure 5-33 Parameters submenu

The parameters menu contains all functions which are required for parameterizing the device.

You can branch to further parameter functions by pressing the fifth softkey, "...continue".

This menu is protected by the code of code level 1.

5.4.5.2 Electric time constants (function 50)

50 Electr. time con	0 ₂
Effective bandwidth in % of smallest MR: : 6.0: %	
Time constant within bandwidth ti: 10.0 s	
Time constant outside bandwidth ta: 1.0 s	
Actual measured value: 0.00 vpm	

Figure 5-34 Electric time constants

With this function, you set various time constants in order to reduce noise. The noise reduction is approximately equivalent to a low-pass filter with the corresponding time constant. The display delay is given as the 90% time.

The time constant "ti" acts within an parameterizable effective interval which is defined in % of the smallest span. It attenuates small changes in the measurement (e.g. noise) on the one hand, but becomes ineffective immediately when the measured value exceeds the effective interval. In this case, the outer time constant "ta" attenuates the measured value.

You can parameterize values up to 100% for the effective interval, and values up to 100 s for the time constants "ti" and "ta". By cleverly combining these three parameters, you can achieve a low display delay (90% time) despite high noise suppression.

The effect on the set attenuation parameters can be observed in the bottom line. The "live" measured value is displayed here.

5.4.5.3 Limits (function 51)

51 Limits		O ₂
Limit 1 :	0.00:vpm	
on relay -		
alarms at decrease	●	
Signal		
Applies to MR	1234	●
Limit alarm on/off	☐	
Limit 2	▶	

Figure 5-35 Limits

The device monitors up to four limits for every component, and these limits can be allocated to any measuring range. Each limit can be allocated to any relay using function 71.

You can only set positive limits. These must be within the measuring ranges.

"Alarms at decrease signal":

Here you select whether a limit alarm is to be switched if the entered limit is exceeded or fallen short of.

"Applies to measuring range...":

Here, you allocate the limit to the desired measuring range(s) by pressing the third softkey several times. When you do so, the pointers move over the measuring range numbers and indicate the ranges in which the limit monitor is to be active. In the above example, this is measuring range 3.

"Limit alarm":

The limit monitoring of every single limit can be switched off individually using function 52.

The response of a limit relay is registered in the logbook (function 3). As soon as the cause of the limit alarm has been eliminated, the limit relay is reset automatically.

You can change to the next limit using the fifth softkey (*"Limit..."*).

See also

Logbook (function 3) (Page 53)

On/off functions (function 52) (Page 73)

Relay outputs (function 71) (Page 82)

5.4.5.4 On/off functions (function 52)

52 On/off config.	O ₂
Auto range (Fct.40)	■
Store function (Fct.77)	□
...continue ▶	

Figure 5-36 On/off functions

With this function, you can easily switch other functions on/off, such as the ones listed in the above function screen.

Thanks to this simplified operation, these functions do not have the longer paths through various menus. For better orientation, the function numbers have also been specified.

Activated functions are marked by "■", deactivated ones by "□". Using the fifth softkey ("...continue"), jump to the next function screen with further functions.

Function 52 is used to switch the following functions on and off:

Table 5- 3 Functions switched on/off by function 52

Description	Fct. No.	Remarks
Automatic measuring range switching	40	
Measured-value memory	77	
Temperature recompensation of zero point	86	
Temperature recompensation of span	86	
Signal tolerance violation	78	
Limit monitoring 1	51	
Limit monitoring 2	51	
Limit monitoring 3	51	
Limit monitoring 4	51	
Suppress negative measured values	70	
Automatic calibration	24	Only with supplementary electronics
Total calibration	23	
Block logbook	60	
Fault / WA / CTRL MAMUR	72	
Suppress negative measured values for display	55	

Besides the functions listed in the table "Functions switched on/off by function 52", function 52 can also be used to address other service functions. These are restricted to service engineers and are only visible when the service code is entered (code level 3).

5.4.5.5 Status messages (function 53)

53 Status messages	0 ₂
Display automat. calibration [CAL]	■
Display stored value [STO]	□
Display limits [LIM]	□
Display autorange [AR]	□
Display control function [CTRL]	■

Figure 5-37 Status messages

With this function, you can parameterize the status message display in the status line of the measured value display. You can display a maximum of four different status messages. The message CODE ■/□ provides information on the current operating mode ("Coded"/"Decoded") and is therefore always displayed.

The device activates the functional check (softkey 5 on the function screen) when it determines that the measured value was influenced.

This is the case:

- During the warm-up phase
- After entry of the code (i.e. change to "Operator control mode")
- During automatic calibration (Autocal) or remote calibration

Note

Functional check ("CTRL")

If the functional check is active, the measured value might be falsified! The measured value must therefore be checked when the functional check is no longer active.

As long as you are in code level 1 or 2, in "Operator control mode" in other words, the functional check is active. If you parameterized the analog output with "Memory on" using function 77, this remains in the fault current until you leave the corresponding code level, and therefore "Operator control mode", and return to "Coded display mode" (press [MEAS] twice).

Table 5- 4 Status messages

Status	What appears in the display depends on functions 52 and 53			
	Fct. 53 "□"	Fct. 52 "□" Fct. 53 "■"	Fct. 52 "■" Fct 53 "■"	
Calibration: CAL	None	CAL	□ CAL	■ CAL; calibration running (also in Autocal)
Measured value memory: STO	None	STO	□ STO	■ STO; analog output applied to memory (see function 77)
Limit: LIM	None	LIM	□ LIM	■ LIM; limit has been violated (see function 51)
Automatic measuring range switching: AR	None	AR	□ AR	■ AR; measuring range switching (actively possible), see function 40
Functional check: CTRL	None	□ CTRL or ■ CTRL (functional check cannot be switched off using function 52)	□ CTRL	■ CTRL; device is in the "Warm-up phase" or in "Operator control mode" or calibration is in progress

If an error occurs during operation, the message "Maintenance request", "Fault" or "Measuring protection" appears in the status line, depending on the severity of the error. This message is alternately displayed with the status messages.

In addition, when communication is over the ELAN interface, the message "Remote" is displayed – also alternating – with display of the device status.

See also

Select measuring ranges (function 40) (Page 67)

Limits (function 51) (Page 72)

Analog output memory (function 77) (Page 91)

5.4.5.6 Graphical representation of measured values (function 54)

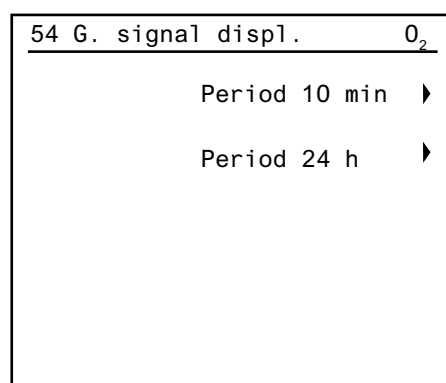


Figure 5-38 Graphical representation of measured values

With this function, you can follow the trend of the measured values for the last ten minutes or 24 hours on the display.

Select the desired time period with softkey 1 or 2.

The device now graphs the measured value vs. time:

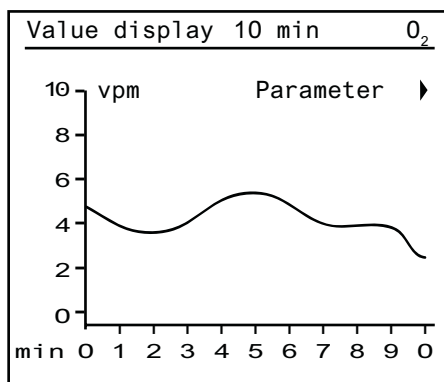


Figure 5-39 Measured value trend

The most recent measured value is on the time axis at the left at $t = 0$.

Select softkey 1 "Parameters".

Here, assign a certain measuring range to the measured value axis:

Val. display 24h		0 ₂
Optimum meas. val. dis.		☒
Range 1		☐
Range 2		☐
Range 3		☐
Range 4		☐

Figure 5-40 Parameters for measured value representation

Activate "*Optimum measured value display*" in order to have the measured value axis automatically scaled. The device adapts the scale to the measured value dispersion.

5.4.5.7 Measured value display (function 55)

55 Select digits		O ₂
Suppress negative measured values		☐
automatic		☐
Total Digits	5	☒
Digits after decimal point	3	☒
The decimal point counts as a digit		

Figure 5-41 Parameterizing the measured value display

With this function, you can parameterize the display of measured values.

With softkey 1, you suppress the display of negative measured values.

With softkey 2 "Automatic", you can activate the automatic display of the measured value with 5 digits. The number of decimal places depends on the size of the measured value.

With the softkeys 3 and 4, you can choose the total number of digits and the maximum number of decimal places.

Note that a maximum of five digits can be displayed (decimal point also counts as one digit).

5.4.5.8 LCD contrast (function 56)

56 LCD-contrast		O ₂
brighter		☒
darker		☒
Basic setting		☒
Test		☒

Figure 5-42 Setting the LCD contrast

With this function, you can make the display contrast brighter or darker.

If the contrast is misadjusted, you can reestablish the factory settings using the third softkey "*Basic settings*".

With the fourth softkey "*Test*", you can carry out an LCD test. Various test screens are then displayed in succession.

From "Coded/decoded display mode", you can reestablish the basic setting by entering [8][8][8][8] [ENTER].

5.4.5.9 Date/time (function 58)

58 Date/Time	0 ₂
New Date (dd.mm.yy;24h/day)	
New Time: 14 : 55	
Set clock ●	
Actual Date Actual Time	
26.03.2007 14:55	

Figure 5-43 Setting the date/time

With this function, you can set the date and time.

The cursor is already located at the first place of the date display. Enter the new settings in the order: day, month, year. By pressing [ENTER], jump to the next input field. Set the time in the same way (hours, minutes).

The system clock of the device is not buffered against mains failures (not a real-time clock).

NOTICE

When the device is switched off, the clock stops and is not updated.
--

The settings are especially important for troubleshooting. Errors which are always stored in the logbook (function 60) can be allocated more easily with the help of the date and time.

Press the third softkey "*Set clock*" in order to accept the set data. These then appear at the bottom edge of the display.

See also

Logbook (function 3) (Page 53)

Logbook settings (function 60) (Page 80)

5.4.5.10 Measuring point switching (function 59)

Sample selection		O ₂
M.pt. 1	Rel. 2 :	45: min
M.pt. 2	Rel. 1	20 min
M.pt. 3	Rel. 4	12 min
M.pt. 4	Rel. 3	8 min
M.pt. 5	Rel. 6	23 min
M.pt. 6	Rel. 5	6 min
M.p. switching on/off ☐		

Figure 5-44 Measuring point switching

With this function, you can allocate a maximum of six measuring points and switch them cyclically and automatically.

The condition is that you parameterized the measuring point relay beforehand using function 71 "Relay outputs", which then actuates the corresponding solenoid valves.

Every measuring point relay is also allocated a time period, which you can enter in the respective input field. Values between 0 and 60,000 (minutes) are possible for this input.

Press the fifth softkey to activate/deactivate the measuring point switching.

You can allocate a signal relay to each measuring point relay. This allows measuring point identification separate from the measuring point relay. Configure the signal relay, also using function 71.

See also

Relay outputs (function 71) (Page 82)

5.4.5.11 Logbook settings (function 60)

60 Setup logbook	0 ₂
clear logbook ●	
lock logbook □	

Figure 5-45 Parameterizing the logbook

With this function, you delete or block logbook entries.

From the "Coded/decoded display mode", you can also delete logbook entries with the button sequence [5][5][5][5] [ENTER].

Status messages such as maintenance requests or faults cannot be suppressed by "blocking". This only prevents an entry into the logbook.

See also

Logbook (function 3) (Page 53)

5.4.6 Configuring

5.4.6.1 Configuration submenu

Configuration	0 ₂
70 Analog outputs	▶
71 Relay outputs	▶
72 Binary inputs	▶
73 ELAN - Configuration	▶
...continue	▶

Figure 5-46 Configuration submenu

All functions of this menu are only accessible via the code of level 2.

This menu contains all functions required for configuring the device.

Press the fifth softkey ("...continue") to branch to further configuration functions.

5.4.6.2 Analog output (function 70)

70 Analog output	0 ₂
4 - 20 mA	●
output inverted	☐
Suppress negative measured values	☐

Figure 5-47 Configuring the analog output

With this function, you can configure the analog output.

With softkey 1, define the start-of-scale value of the analog current range. The following settings (see also table "Configurations of the analog output") are possible:

- 0 – 20 mA
- 2 – 20 mA
- 4 – 20 mA
- NAMUR/4 – 20 mA (with limit at 3.8 mA).

You can invert the analog output with softkey 2: e.g. 0 - 10 vpm $O_2 \equiv 0 - 20 \text{ mA} \equiv 0 - 10 \text{ vmp}$
 $O_2 \equiv 20 - 0 \text{ mA}$.

With softkey 3, you can suppress the negative measured values. If a negative value has an unfavorable effect on further processing, the negative measured values at the analog output can be limited to 0 (or 2/4/3.8 (NAMUR) mA) when this function is activated. The display continues to show the actual measured value.

Table 5- 5 Configurations of the analog output

Defined analog output / mA	Measuring range limit in normal operation		Measuring range limit in case of fault / CTRL	
	Start-of-scale value / mA	Full-scale value / mA	Start-of-scale value / mA	Full-scale value / mA
0 – 20	-1	21	0	21
2 – 20	1	21	2	21
4 – 20	2	21	4	21
4 – 20 (NAMUR)	3,8	20,5	3	21,5

Note

If the electronics is defective, it is possible that the analog output may get stuck at approx. -1 mA or approx. +24 mA.

5.4.6.3 Relay outputs (function 71)

71 Relay outputs		O_2
R 1	Fault	●
R 2	Main. req.	●
R 3	Funct. cont.	●
R 4	Vacant	●
...cont.		▶

Figure 5-48 Assigning the relays

There are six freely configurable relays included in the standard equipment whose switchable output contacts (max. 24 V/1 A) can be used for signaling, actuating valves, etc.

If these six relays are insufficient, you can retrofit additional electronics with eight further relays (optional board).

With this function, you can assign each relay functions listed in the table "Relay outputs", whereby you may only assign each function once. In other words, for example, "Fault" may not be assigned to two relays at the same time.

The connection assignments for the individual relays in the zero-current state can be found in the routing assignments "Motherboard pin assignments". The relays are preset at delivery. Press the fifth softkey ("...continue"), to access the next function screen, thus branching to further relays.

Table 5- 6 Relay outputs (possible functions)

Function	Relay is passive when	Relay conducts current	Remark
Not assigned			Relay is permanently passive (zero current)
Fault	Fault		Also shown in the status line of the measured value display
Maintenance request	Maintenance request		
Calibration		Calibration running	For identification purposes
Measuring range 1 to 4		Measuring range 1 to 4 on	Measuring range identification
Limit 1 to 4	Limit 1 (to 4) triggered		Limit monitoring
Functional check (CTRL)	Functional check active (e.g.: when changing to "Operator control mode", in the warm-up phase, when Autocal is running, when calibration is running)	Functional check deactivated	Signal when: device is decoded, warm-up phase (max. 2 h), calibration running (Autocal)
Sample gas*		Supply of sample gas	Valve actuation
Zero gas 1 to 2*		Supply of zero gas	
Calibration gas 1 to 4*		Supply of calibration gas	
Measuring point 1 to 6		Measuring point 1 to 6 selected	For taking a gas sample via solenoid valves at various measuring points
Measuring point signal 1 to 6		Measuring point 1 to 6 selected	For identifying the measuring point (runs parallel to measuring point)
Signaling contact*		When there's a signal, the relay conducts current for a short time	e.g. in the case of AUTOCAL: actuation of a second device
Autocal check		Autocal difference too large (function 24)	
Dimension % v/v	vpm	%	For identification purposes

* This function is only available if the analyzer is fitted with an optional Autocal board

See also

Motherboard pin assignments (Page 30)

Removing faults (Page 109)

5.4.6.4 Binary inputs (function 72)

Binary input functions

72 Binary inputs	0 ₂
Fault/Maint.r/CTRL NAMUR	□
Binary inputs define	►

Figure 5-49 Binary input function

Six floating binary inputs are included in the standard equipment ("0" = 0 V [0 to 4.5 V]; "1" = 24 V [13 to 33 V]).

If these six inputs are insufficient, you can retrofit additional electronics with eight further binary inputs (optional board).

If you activate the "NAMUR" ("■") operating mode with softkey 1, the binary inputs behave as in table "Binary input activation functions" marked with "N".

If you deactivate the "NAMUR" ("□") operating mode, the binary inputs behave compatibly with the software outputs of the older version V 4.3.0 (in the table "Binary input activation functions" marked with "X").

Press softkey 2. The following function screen appears on the display.

72 Binary inputs	0 ₂
B 1 Vacant	●
B 2 Vacant	●
B 3 Vacant	●
B 4 Vacant	●
...cont.	►

Figure 5-50 Define binary inputs

Assign one of the activation functions listed below to each input as you like, whereby every function may only be assigned once.

The connection assignments for the individual inputs can be found in the section "Electric connection".

No binary input has been preassigned in the factory.

Press the fifth softkey ("...continue"), to access the next function screen, thus branching to further binary inputs.

NOTICE
Save changes Make sure you save every change in the configuration of the binary inputs in the user data memory using function 75! If you neglect to do this, there is a danger that a previous (unwanted) configuration will be loaded by "Load user data" (function 75).

Table 5- 7 Binary input activation functions

Function	Necessary activation voltage			Remark / effect
	0 V	24 V	24 V (min. 1 s)	
Not assigned				No effect when activated
Fault 1 to 7	N	X		e.g. due to: - Signal from a gas preparation system: - Condensate overflow - Gas cooler defective - Fault message from interfering gas analyzer
Maintenance request 1 to 7	N	X		
Acknowledge			N, X	Activation deletes all logbook entries. However, if the cause of a fault or maintenance request has not been eliminated, the corresponding message reappears in the logbook.
Functional check 1 to 4	N	X		Relay must be configured for functional check using function 71 if, for example, the function is to be checked by a second device.
Autocal			N, X	Note: Effective activation only possible in "Measure" operating state! Autocal must be parameterized (function 24)
Measuring range 1 to 4			N, X	Activation switches to the corresponding measuring range.
Zero gas			N, X	Note: Effective activation only possible in "Measure" operating state! Relay must be configured for zero gas. After activation, the device changes from "Measure" to "Calibration" operating state. See also "Example - binary inputs"

Function	Necessary activation voltage			Remark / effect
	0 V	24 V	24 V (min. 1 s)	
Calibration gas			N, X	Note: Effective activation only possible in "Measure" operating state! Relay must be configured for calibration gas. After activation, the device changes from "Measure" to "Calibration" operating state. See also "Example - binary inputs"
Sample gas			N, X	Note: Effective activation only possible in "Measure" and "Calibration" operating states! Relay must be configured for sample gas. Before the sample gas valve opens, the other valves are closed. The device then switches to the "Measure" operating state, and all other states (e.g. "Calibration") are left.
Zero calibration			N, X	Activation initiates calibration. See also "Example - binary inputs"
Span calibration				
Autorange			N, X	Activate "Automatic measuring range switching"
Autocal check			N, X	Note: Effective activation only possible in "Measure" operating state! Start Autocal check (function 24)
Measuring protection		N, X		It is possible to define a binary input "Measuring protection" which has the following effect: If the device is in the "Measure" operating state (functional check deactivated), it remains in this state, i.e.: • The device can no longer be decoded. • The device can no longer be set to "Remote". The message "Measuring protection activated" appears in the status line of the measured value display.

5.4.6.5 ELAN configuration (function 73)

73 ELAN Config.	0 ₂
Channel address:	01 ●
Measured value telegram :	off ●
ELAN-TAG : OXY64	

Figure 5-51 Configuring ELAN

With this function, you set the parameters for an ELAN network.

Channel address:

Set the channel address here. Addresses from 1 to 12 can be set. In an ELAN network, each address may only be used once.

Measured value telegrams on/off:

Here you can switch the cyclic, independent sending of measured values every 500 ms on or off.

ELAN tag:

Display of the tag assigned to the analyzer in the ELAN network. It has a maximum of 10 alphanumeric characters.

Note

Independent sending of measured values

When you have set up your own communication control system, this option offers a simple way of checking an ELAN telegram. In order to avoid unnecessarily loading the device and the ELAN network, however, the function should only be switched on as needed!

Further ELAN details can be found in the ELAN interface description:

- (C79000-B5200-C176 German)
- (C79000-B5276-C176 English).

5.4.6.6 Reset (function 74)

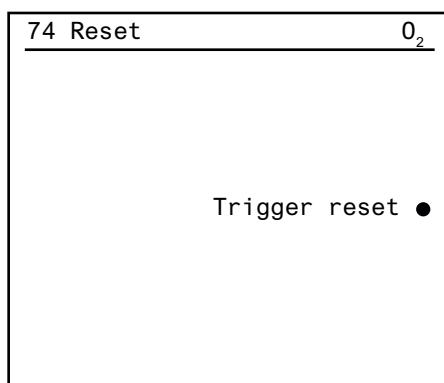


Figure 5-52 Carrying out a reset

With this function, you can carry out a warm restart.

After calling this function, the device switches to the "Warm-up phase", which activates the functional check at the same time. The device is only completely ready for operation again after successfully running through this phase.

5.4.6.7 Save, load data (function 75)

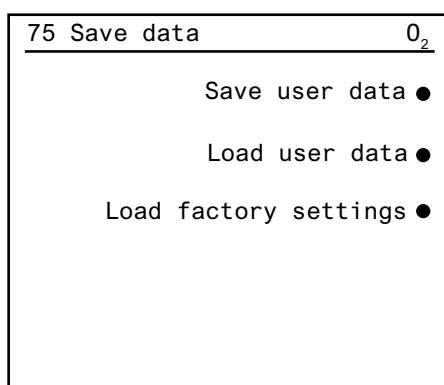


Figure 5-53 User data memory

You can configure the user data memory with this function:

Press the softkey 1 *"Save user data"* e.g. after the system has been successfully commissioned. All individual settings are then saved.

Press the softkey 2 *"Load user data"*, to load the last user data saved.

These functions are important when the device is undergoing repairs or maintenance work, or, for example, if new parameter settings are to be tried out.

Press softkey 3 to re-establish the factory settings.

A confirmation query is set up in this function. In order to actually load the respective data in the memory, you must confirm with "yes". If you select "no", this is cancelled.

NOTICE

Make sure you save every change in the configuration of the relay outputs in the user data memory using function 75!

If you neglect to do this, there is a danger that a previous (unwanted) configuration will be loaded by "Load user data" (function 75).

The following figure contains an overview of the interaction between the various memory modules.

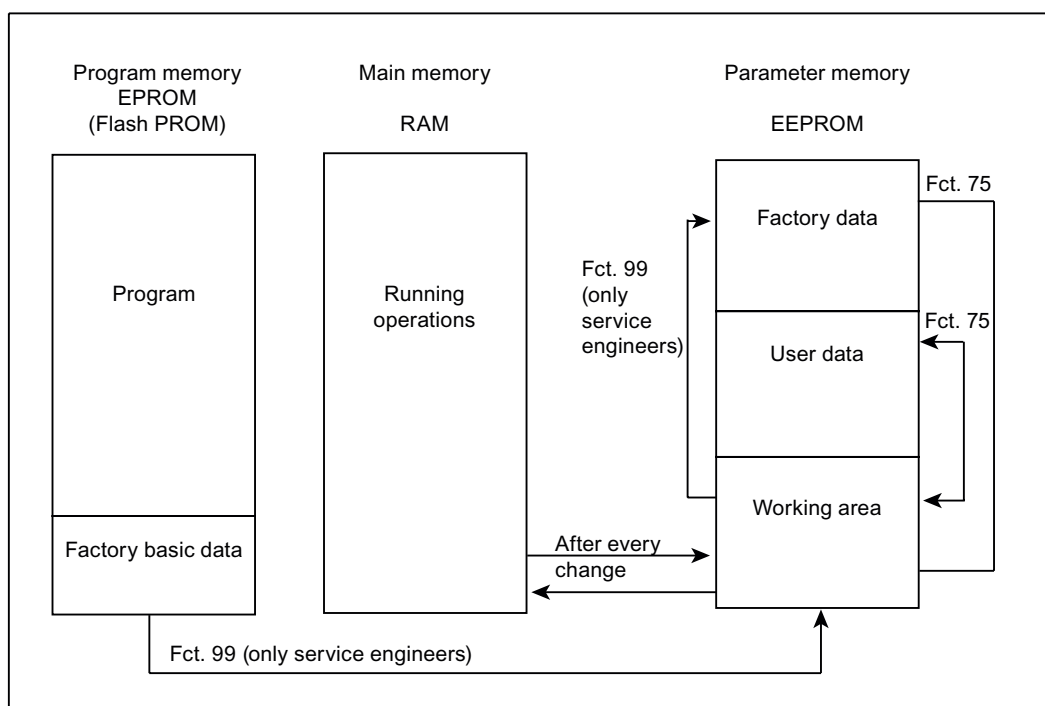


Figure 5-54 Interaction between the memory modules

5.4.6.8 Suppression of short-term noise signals (function 76)

76 Suppress fault..	0 ₂
Suppress noise signals with a duration of up to : 0.0: s	
Level in % of smallest MR: 12.0 %	

Figure 5-55 Suppression of noise signals

With function 76, you can eliminate undesired spikes which exceed a settable threshold.

Spikes are caused by electromagnetic interferences or occasional mechanical shocks.

These faults can be suppressed by entering a "blanking time" of 0 to 5 s. The entered time has the effect that the last measured value before the spike occurred is displayed so that the measured result is not influenced.

Times can be entered in steps of 0.1 s.

Under "*Level in % of smallest MR*", enter the threshold value in % of the smallest measuring range above which the noise signals are to be suppressed.

Note

If a change in concentration directly follows a fault, this may be displayed after a delay.

When this function is activated, the settings of function 50 ("Electric time constants") must be taken into account, since these are executed first.

See also

Electric time constants (function 50) (Page 71)

5.4.6.9 Analog output memory (function 77)

77 Store	0 ₂
analog out.to meas.value	☒
analog out.to 0/2/4 mA	☐
analog out.to 21 mA	☐
store on/off	☐

Figure 5-56 Setting the analog output

You can use this function is used to define the response of the analog output for specific states when measuring mode has been left (e.g. fault).

With softkey 5, you can activate (■) or deactivate (□) the entire function.

Switch softkey 1 to active (■) in order to output the last measured value at the analog output.

Switch softkey 2 to active (■) in order to output 0/2 or 4 mA.

Switch softkey 3 to active (■) in order to output 21 mA.

5.4.6.10 Calibration tolerances (function 78)

Setting the calibration tolerances

78 Calib. tolerance	0 ₂
Calib. tolerance at zero in % of smallest MR:	:6:
Calib. tolerance of sens. in % of current MR:	10
Signal tolerance violation.	☐

Figure 5-57 Setting the calibration tolerances

With this function, you define the calibration tolerances.

With softkey 3 "Signal tolerance violation", you activate or deactivate the tolerance monitoring.

If you previously configured a relay output to "Maintenance request" using function 71, the device outputs the changes in the zero point or the span with respect to the last calibration as "Maintenance request".

Note

In order to be able to use this function, "Total calibration" (function 23) must be activated.

With "*Calibration tolerance at zero point ...*", you define the max. deviation proportional to the smallest span in %.

With "*Calibration tolerance at span ...*", you define the max. deviation proportional to the current span in %.

The calibration tolerance, which can be set from 0 to 99 %, refers to the measuring range with the smallest span in the case of the zero point, and to the measuring range where the total adjustment is carried out (marked with "■" in function 22) in the case of the span.

Example

Measuring range 1	0 to 100 vpm O ₂
Measuring range 2	0 to 1000 vpm O ₂
Leading measuring range in which calibration takes place	Measuring range 2
Selected calibration tolerances	6% (zero); 10% (span)
Response threshold for zero point	100 vpm O ₂ x 0.06 = 6 vpm O ₂
Response threshold for span	1000 vpm O ₂ x 0.1 = 100 vpm O ₂

If the zero / span deviates by more than the parameterized value compared to the last calibration, and if "Signal tolerance violation" is activated, the corresponding relay signalizes a maintenance request.

See also

Total / single calibration (function 23) (Page 57)

5.4.6.11 Change codes (function 79)

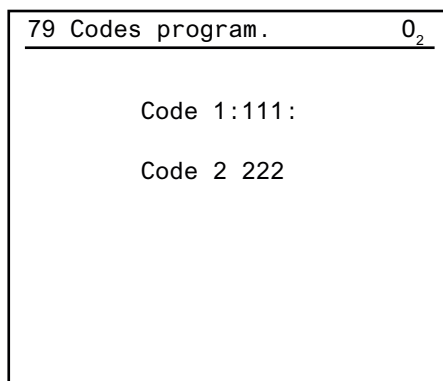


Figure 5-58 Change codes

With this function, you replace the factory-set codes ("111" for level 1, "222" for level 2) by your own.

If you enter the value "000" for a code, code blocking is canceled and you have immediate access to the corresponding operation level.

5.4.6.12 Device test (function 80)

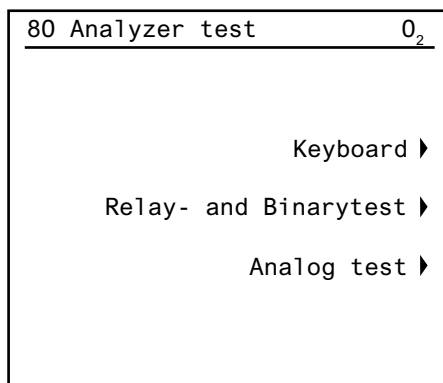


Figure 5-59 Testing the device

With this function, you can test the interfaces of the device.

Keyboard test

You can test all keys on the control panel by means of the keyboard test. The five softkeys on the right edge can be used to make the associated item appear/disappear. If a number key or the sign key is pressed, this is displayed in the bottom line of the display.

After pressing the [INFO] key, a message is displayed in plain text. The [MEAS] and [ESC] keys retain their "jump back" function.

Relay and binary test

Relay and Binary			0 ₂
No	Relay	Binary	
1	:1:	0	
2	1	0	
3	0	0	
4	0	0	
5	1	0	
6	0	0	
			...continue ▶

Figure 5-60 Test relay outputs and binary inputs

NOTICE

The data connector must be removed before calling this function!

The first function screen shows the state of the six relay and binary inputs of the standard device. With an optional board, there are another eight relay/binary inputs on a second page.

With the relay test, individual relays can be activated. This is done via the input field. With "1", the relay is on, with "0", it returns to its release condition. Numbers other than "0" and "1" are not accepted by the input field.

After leaving function 80, the relays are back in the state they had before calling the relay and binary test.

The current state of the binary inputs is displayed in the "Binary" column.

Analog test

With the analog test, the analog output is set to a constant current of 0 to 24000 µA for testing purposes.

The analog input displays the input currents in µA.

5.4.6.13 Language selection (function 81)

81 Select language	O ₂
other ☐	
English ☒	

Figure 5-61 Selecting a language

With this function, you set the device to a second dialog language.

The device is always delivered in the ordered language. Usually, English is included as a second language (if English is the first language, Spanish is set as the second language).

5.4.6.14 Correction of cross-interference (function 83)

83 Interf. correct.	O ₂
Interference correct. 1	●
Interference correct. 2	●
Interference correct. 3	●
Interference correct. 4	●

Figure 5-62 Carrying out correction of cross-interference

Flammable gases influence the O₂ measurement in that they reduce the O₂ content of the sample gas. The sensor temperature, the concentration of flammable components, as well as the O₂ concentration and sample gas flow all have an effect.

The relationship between interfering gas concentration and O₂ offset is usually non-linear (see also Table "Examples of typical interfering gas offsets on a catalytically inactive sensor").

Note

A differentiation must always be made with the correction of cross-interference as to whether the interfering gas has a constant or variable concentration.

Correction of cross-interference is only meaningful if the effect of the interfering gas is lower than the expected O₂ concentration.

Correction of cross-interference is not effective during a calibration procedure. It is active again when calibration has been completed and the device has returned to measuring mode.

Press the first softkey. The following function screen appears on the display.

By pressing the first softkey you now select the type of influence of an interfering gas. The following distinctions are possible:

- No correction of cross-interference
- Correction of cross-interference with constant influence of interfering gas
- Correction of cross-interference with variable influence of interfering gas via analog input
- Correction of cross-interference with variable influence of interfering gas via ELAN

Correction of cross-interference with constant influence of interfering gas

Interf. correct. 1		O ₂
with const. interference correction		●
valid for range	1 2 3 4	●
Interference:	:	0.50:
Meas. val.::	0.00	vpm

Figure 5-63 Correction of cross-interference with constant influence of interfering gas

With softkey 2, you can set whether the correction of cross-interference should only apply to certain measuring ranges.

Under "*Interference*", enter the value of the zero offset.

Correction of cross-interference with variable influence of interfering gas

Interf. correct. 1	0 ₂
with var. interference influence on an. input 1	●
valid for range	1 2 3 4 ●
Interferencing gas: 1.00: causes an interference :	0.01
Analoginp. 1: 0 - 20 mA	●
for range :	
0.00 - 10.00	
Meas. val.:	1.00 vpm

Figure 5-64 Correction of cross-interference with variable influence via analog input

Here, a variable influence of interfering gas is active which must be measured using a suitable separate gas analyzer and then applied to the device for correction of cross-interference as an analog current or digital signal (via ELAN).

Correction of cross-interference via ELAN

Press softkey 1 again to carry out the correction of cross-interference via the RS 485 serial interface (ELAN).

Interf. correct. 1	0 ₂
with var. interference influence via ELAN	●
valid for range	1 2 3 4 ●
Interferencing gas: 1.00: causes an interference :	0.05
Channel :03: Comp.: :1:	●
for range :	
0.00 - 10.00	
Meas. val.:	1.00 vpm

Figure 5-65 Correction of cross-interference with variable influence via ELAN

Here, the same inputs are to be made as for the correction of cross-interference "...via analog input".

Also enter the channel number and component number of the interfering gas analyzer. The type of gas allocated to the channel and component as well as the device status appear in the display.

With softkey 2, you can set whether this correction of cross-interference should only apply to certain measuring ranges.

Note

On the device supplying the correction data, the parameter *"Measured value telegrams"* (function 73) must be set to *"On"*.

In addition, the two devices must have different channel addresses.

See also

ELAN configuration (function 73) (Page 87)

5.4.6.15 Switch valves (function 85)

85 Switch valves			0 ₂
01	Meas. point 1	Rel. 1	☐
02	Zero gas	Rel. 3	☐

Figure 5-66 Switching valves

With this function, you can manually switch up to six valves. This is done via the relays which are allocated to the individual valves and are available on the motherboard and optional board. The precondition is that the corresponding relays have been previously configured with function 71 ("Relay outputs")

The "Switch valves" function only applies to the relay functions "Zero gas", "Calibration gas 1 to 4" and "Sample gas".

Only one valve can be switched at a time, since the valves are mutually interlocked.

See also

Relay outputs (function 71) (Page 82)

5.4.6.16 Error on/off (function 87)

87 Error on/off		O ₂
S1	Parameter memory	■
S2		■
S3		■
S4	External fault	■
...continue ▶		

Figure 5-67 Switching errors on and off

With this function, you switch the message for maintenance requests and faults (see Tables "Causes of maintenance requests" and "Causes of fault messages") off individually so that there is no entry in the logbook, no message in the status line of the measured value display and no external signal sent.

Fault messages which do not apply to this analyzer are identified by the absence of text following the fault number.

See also

Removing faults (Page 109)

5.4.6.17 PROFIBUS configuration (function 90)

90 Profibus Config.		O ₂
Address	:126:	
TAG	: OXYMATSIXTYFOUR	
Ident number	: 1:	●
Relay by PB	:off:	●
Software version: 2.0.0		
Boot software : 0.2.0		

Figure 5-68 Configuring PROFIBUS

This function can only be called if the device contains additional PROFIBUS electronics (optional board).

With this function, you can set the PROFIBUS station address. The address can be set from 0 to 126.

Under TAG you can display the tag assigned to a device in the ELAN network (or the 16 characters thereof).

The configuration behavior of the device is configured with the *"Ident number"* (softkey 2). Parameters 0, 1 and 3 can be selected and have the following meaning:

Table 5- 8 PROFIBUS parameters

Parameter	Meaning
0	Only the PROFILE ID number is positively acknowledged
1	Only the device-specific ID number is positively acknowledged
3	Only the PROFILE ID number for multivariable devices (complex analyzers) is positively acknowledged.

Note

In order to work with the provided GSD and DD, the value 1 must be entered for 'Ident number'.

Relay by PB. The 8 relays of the additional electronics (optional board) can be controlled over PROFIBUS using this. To allow activation, none of these relays must be occupied by a device-internal function.

Note

The parameter 'Relay by PB' is only available with software version 2.0.0 and higher of the PROFIBUS additional electronics (optional board).

5.4.6.18 Changing the dimension (function 91)

With this function you can switch over the measured value display between "vpm" and "% v/v".

91 Dimension		0 ₂
Dimension :	vpm	●
CTRL at change :		□

Figure 5-69 Changing the dimension

With function 91 you can choose vpm range, automatic switchover, or % range. A relay function can be selected to signal the currently used display, and is active with % v/v.

A distinction is made between joint and separate parameters. Joint parameters apply to both dimensions, separate parameters are different for the vpm and % v/v ranges. The following are listed separately:

- Measuring range start-of-scale and full-scale values
- Number of valid measuring ranges
- Selected measuring range with autoranging
- Calibration gases for measuring ranges and zero
- Selected MR calibration gas
- Limits; switching direction of limits
- Measuring range validity of limits
- Limit monitoring on/off
- Format of measured-value display
- Start and end values of characteristic

The following are listed jointly for both dimensions:

- Total deviation of zero point and measuring range calibration

When switching over, the following parameters are recalculated to the new end values of the characteristic:

- Measuring range calibration factors
- Post-compensation factors at the zero point below and above the reference temperature
- Start value of post-compensation at the zero point
- Interfering gas deflection value with correction of cross-interference

0-99999 is set in the vpm range and 0-100 in the percentage range as the end values of the characteristic. Several calibrations, compensations and linearizations are influenced by these values. Therefore all calibrations, compensations and linearizations must be redetermined following a change.

The change in dimension takes place in less than 1 second. The analog current output is instable during the change, and the measuring range limit relays etc. are also influenced. This is usually irrelevant since the measured value changes strongly when an automatic change is carried out, and the measuring range also probably changes. Furthermore, this effect can be reduced further by appropriate selection of the measuring ranges.

Changing the dimension via a binary input is not possible. These values are switched to active depending on the current dimension.

Automatic changing of the dimension with a defined hysteresis can also be selected. It switches over when the following values are reached:

- From vpm to % v/v when the measured value exceeds 50000 vpm
- From % v/v to vpm when the measured value drops below 2%

The automatic changeover is prevented during a calibration.

As an option, you can activate the functional check during changing of the dimension. This is then active for approx. 10 seconds. This guarantees that the measured value is only enabled again when all limit relays have been correctly set again. Since these are parameterized independent of one another, they can briefly output incorrect values if the functional check is not activated.

In order to keep the analog current output at a defined value during the changeover procedure, you can also use function 77 (store analog output). An active functional check then keeps the analog current output at the selected value.

See also

Analog output memory (function 77) (Page 91)

5.4.6.19 Factory settings (function 99)

Factory settings	0 ₂
The following functions are exclusively for MAINTENANCE PERSONNEL Caution: Manipulations in this level may permanently in- terfere with the analyzer. :....: -Press ESC to return-	

Figure 5-70 Default settings

With this function, the operator can access the factory functions level. These settings are intended only for maintenance personnel and are therefore protected by an additional code.

After activating this function, a message appears which prompts you to enter the corresponding code.

Repair, maintenance and servicing

6.1 Important maintenance information

WARNING
--

Maintaining the device

Disconnect the gas and power supply before opening the device.
--

Only carry out setting work with appropriate tools in order to prevent short circuits on the electronic boards.

Incorrect installation or adjustment could result in the release of gas, which in turn could result in damage to the analyzer (e.g. danger of explosion) or to the health of persons (e.g. poisoning).
--

Maintenance

The analyzer must be subject to annual maintenance in order to check the electrical safety and correct working. It is up to the owner to decide on extension of the maintenance interval in individual cases.

If standards or directives apply to the gases/components used, these must also be observed.

To allow maintenance work, the top cover can be removed and the front panel swung forwards. If maintenance work is interrupted for more than two hours, the analyzer must be closed again.

Service

All modules within the housing can be replaced in the event of a defect. Repairs to these modules are not envisaged.

The following modules can be replaced:

- Complete analyzer section (metal bracket with sensor electronics and measuring cell)
- Pressure controller
- Mains transformer
- Fuses
- Complete motherboard
- Optional board
- Complete analyzer front panel
- Analyzer front panel without display

Removal of these modules - with the exception of the measuring cell - is self-explanatory.

6.2 Sensor module

6.2.1 Design

The sensor module consists of the following function units: O₂ sensor, sensor electronics, supporting plate (metal bracket), and the gas path components mounted on the bracket.

6.2.2 Installation and removal of the sensor module

The sensor module is not particularly susceptible to faults. If a component of the sensor module is faulty as a result of a material fault or incorrect operation, the complete sensor module must be replaced. It is then replaced by an equivalent module. Individual components cannot be replaced.

1. Release the internal capillary link at the sample gas inlet.
2. Release the internal hose connection at the sample gas outlet.
3. Release the hose connections on the flowmeter.
4. Loosen the four socket screws (M6) of the metal bracket, and then slide this to the side until the screw heads are free.
5. Remove the ribbon cable from the motherboard.
6. Remove the RS232 communication cable from the sensor electronics.
7. Remove the metal bracket.
8. To install, carry out the above steps in reverse order.

Leak test

Following all maintenance or servicing measures which affect the gas path of the sensor module, a leak test must be carried out according to Section "Commissioning and operation".

If the leak check indicates the presence of a leak, check all screwed glands and hose connections.

Sample gas flow

Subsequently check that the sample gas flow is correct; it must be 125 ml/min (7.5 l/h). To do this, connect an inert gas which has a density similar to N₂ (e.g. oil-free compressed air) to the sample gas inlet. Then set a relative pressure of approx. 2000 hPa at the sample gas inlet (for the high-pressure version without internal pressure regulator). If a pressure regulator is fitted, a relative pressure of 3000 - 6000 hPa can be connected.

If the displayed flow deviates from the setpoint of 7.5 l/min, set the setpoint by adjusting the bypass capillary.

With the low-pressure version, the flow must be set externally to 125 ml/min (7.5 l/h).

Calibration

Following replacement or readjustment of the sensor module, the analyzer must be recalibrated according to Section "Calibration".

See also

Leak test (Page 39)

General information on calibration (Page 40)

Calibration examples (Page 41)

6.2.3 Installation/retrofitting of pressure regulator

If a pressure regulator has to be replaced or retrofitted, proceed as follows:

1. Remove sensor module
2. Mount the pressure regulator onto the sloping upright plate of the metal bracket using two M5 screws.
3. Reinstall the sensor module.
4. Fit the supplied capillary tube (without restrictor) between the sample gas inlet coupling and the gas inlet of the pressure regulator.
5. Fit the supplied capillary tube with restrictor between the input of the T-piece present on the O₂ sensor and the output of the pressure controller.
6. Carry out a leak test as described in Section 'Commissioning and operation'.
7. Apply a sample gas pressure (> 0.2 MPa) and turn the screw of the pressure controller until the cone floats in the flowmeter tube. Then adjust the setpoint flow (125 ml/min) using the bypass restrictor.

Note

Make sure that none of the small parts (gasket cone, sleeve, pressure piece, union nut) are lost when fitting the capillary tube. In addition, do not overtighten the union nut, otherwise the gasket (PTFE) will be permanently deformed and lose its sealing function.

See also

Leak test (Page 39)

6.3 Replacement of motherboard and optional board

The motherboard, optional board and adapter board can be easily replaced/retrofitted.

Removing/installing the motherboard

To remove, proceed as follows:

1. Disconnect the device from the mains.
2. Loosen the screws on the housing cover and remove it.
3. Remove the data plug from the rear of the housing.
4. Loosen the three screws which are between the SUB-D plug connectors on the rear of the device.
5. Disconnect the plug connectors of the ribbon cables from the motherboard.
6. Carefully remove the motherboard.

To install the boards, carry out the same steps in the opposite order.

Removing the optional/adapter boards

The procedure is the same as for the motherboard. Unlike the motherboard, both the optional and adapter boards are only fixed to the rear of the housing with two screws.

6.4 Replacement of fuses

WARNING

Make sure you disconnect the device from the mains before exchanging fuses!

Apart from this, the described requirements applicable to operator and maintenance personnel apply.

The device is protected by two fuses against various influences (e.g. mains voltage, heat). The fuses depend on various conditions (e.g. analyzer version, mains voltage).

The appropriate fuse ratings can be taken from the spare parts list.

Table 6- 1 Fuse ratings in Ampere

Voltage	Fuse rating:
200 to 240 V	0.63 T/250
100 to 120 V	1 T/250

Replacement of mains fuses

Even if only one mains fuse is defective, always replace both mains fuses! To replace, proceed as follows:

1. Disconnect the device from the mains.
2. Open the fuse insert at the mains connection socket of the device and remove this.
3. Check the fuses for damage.
4. In case of damage, replace both fuses by fuses which have the required rating.
5. Insert the fuse insert again.

6.5 Cleaning the device

Cleaning the surface

CAUTION
Make absolutely sure that no water penetrates the device during cleaning.

The front panels and doors are washable. Use a sponge or cloth dampened by water containing washing-up liquid. In particular, the surface in the display area must only be cleaned with a gentle pressure to prevent damage to the thin foil. Make sure that no water penetrates the device during cleaning.

NOTICE
In the case of devices used in hazardous areas, the control panel (keyboard and window) must only be cleaned with a damp cloth.

Cleaning the interior

After opening the device, you can blow out the interior carefully with a compressed air gun, if necessary.

6.6 Removing faults

6.6.1 Alarms and messages

The device is able to detect functional irregularities. These appear as "Maintenance request" or "Fault" in the status line of the measured value display. At the same time, they are recorded in the logbook (function 3) and can be called up there. Logbook entries which have to be acknowledged are identified by a dot. You acknowledge a message by pressing the softkey next to the corresponding logbook entry. If you do not eliminate the cause, the message will appear again.

Latching

Certain logbook messages are latching (e.g. "Sensor temperature outside tolerance limits"). They must be acknowledged manually or via binary input in order to reset them, but they appear again immediately if the cause of the message has not been eliminated.

Note: acknowledgment via a binary input should be carried out only with brief setting (approx. 1 s) since latching of the associated fault message otherwise remains ineffective.

If a new message appears, the record stored in the logbook is shifted back one place in the memory. There are a total of 32 memory locations available. If all 32 memory locations are already occupied when another record arrives (no. 33), the oldest one (no. 1) is overwritten. A power failure deletes all records.

It cannot be excluded that all pages of the logbook are rapidly used up in the case of a high message rate (logbook "overflows"). It can occur that unacknowledged messages are no longer visible in the logbook, but are nevertheless still saved. These entries will continue to result in fault messages. Deletion is only possible if the logbook is deleted completely using function 60.

Logbook entries which have to be acknowledged are identified in the following tables by "Q" in the column "No.".

You can block the logbook or even delete the messages in it with function 60. This might be especially helpful during test operation.

All messages can be shut off individually with function 87. In normal operation, we recommend that this option is not used.

6.6.2 Maintenance requests

If there are indications of changes in internal device parameters, "Maintenance request" appears in the status line. Such changes do not significantly affect the measuring quality at the time they occur. In order to still guarantee the measuring quality, it may be necessary to carry out remedial measures.

The following fault messages entail a maintenance request (output in the display) and are signaled externally if a corresponding relay has been configured using function 71.

Table 6- 2 Causes of maintenance requests

No.	Signal	Possible cause	Remedy
W1 Q	Calibration tolerance exceeded	Calibration gas was changed	Repeat calibration
		Incorrect setpoint entered	
W4 Q	Set clock	The device was switched off	New input of date and time
W6 Q	Temperature of LC display too high or too low	Ambient temperature above 45 °C or below 5 °C	Make sure that the ambient temperature is in the range from 5 °C to 45 °C.
W9	External maintenance request	External signal	Check (function 72 must be configured accordingly)
W10	Autocal check deviation	Violation of the tolerance was determined during an "Autocal check"	

6.6.3 Fault messages

Defects in the hardware or changes in the device parameters which would result in the device being unable to make reliable measurements lead to a fault message. "Fault" then appears in the status line if the device is in measuring mode.

The faults listed below result in a fault message (output in the display) and are signaled externally if a corresponding relay has been configured using function 71. Immediate remedial measures should always be carried out here by qualified maintenance personnel.

Function 87 can be used to switch off (deactivate) each fault individually.

Table 6- 3 Possible fault messages

No.	Fault message	Possible cause	Remedy
S1 Q	Parameter memory test failed	EPROM contains incorrect or incomplete data in the working area	Carry out RESET; if the fault message S1 is still displayed: 1. Load user data (function 75); if the fault message S1 is still displayed: 2. Inform Service Important: leave analyzer in operation in order to facilitate fault diagnostics by the servicing personnel!
S4	External fault message	External signal	Check; function 72 must be configured accordingly
S5 Q	Temperature of O ₂ sensor too high or too low	Temperature control of sensor faulty Sample gas flow is too high (>> 125 ml/min)	Set flow to 125 ml/min
S8 Q	Signal of pressure sensor outside tolerance	Flow resistance too large in the sample gas outlet line	Reduce flow resistance until sample gas pressure is below 100 hPa (rel.)
S10 Q	24 h RAM/Flash check	RAM or Flash-PROM	Replace motherboard; inform service department
S12 Q	Mains power supply	Line voltage outside tolerance	Line voltage must be within the specified limits according to the type nameplate
S13 Q	Hardware / line frequency	Crystal or ext. ADC faulty	Replace motherboard
		Line frequency outside tolerance	Connect power supply stabilizer
S14	Measured value greater than full-scale value (+ 5%)	O ₂ content in sample gas too high as result of leak in sample gas path	Carry out leak test
		Sample gas pressure too high	Check sample gas pressure and reduce if necessary
S15 Q	Calibration aborted	Fault during calibration via binary input Fault if the analyzer is in Autocal mode	Eliminate the cause of the fault message
S16	Sample gas flow too low	Pressure in sample gas supply line too low	Provide sufficient pressure (> 2000 hPa)

6.6.4 Other faults

In addition to the fault messages which can be shown in the logbook, the following influences could lead to an unsteady display:

Table 6- 4 Additional fault causes

Cause	Remedy
Pressure surges or variations in the sample gas outlet	Route the sample gas outlet separate from the outlets from other analyzers, and/or install a damping unit in the sample gas outlet. The flow resistance must be kept as small as possible. Dimension the flow resistance such that the sample gas pressure does not exceed 100 hPa (rel.).
Occurrence of sporadic spikes	See also function 76; inform service department if necessary
Green LED on the rear of the analyzer flashes in a certain sequence (not regular flashing)	Inform Service

Technical data

Table 7- 1 Technical data – general technical data

General technical data	
Measuring ranges	4, internally and externally switchable; manual and automatic range switching is possible
Smallest possible span ³⁾	0 – 10 vpm
Largest possible span	0 – 99999 vpm (corresponds to 10%); 0 – 100% v/v
EMC– interference immunity (electromagnetic compatibility)	According to EN 61326 and NAMUR recommendation NE 21
Degree of protection	IP 20 according to EN 60529
Electrical safety	According to EN 61010-1, overvoltage category II
Position of use (analyzer)	Front panel vertical
Dimensions (analyzer)	See Section "Dimensional drawing"
Weight (analyzer)	Approx. 11 kg

Table 7- 2 Technical data – power supply

Power supply	
Power supply (see rating plate)	100 to 120 V AC (rated range of use 90 V to 132 V), 48 to 63 Hz or 200 to 240 V AC (rated range of use 180 V to 264 V), 48 to 63 Hz
Power consumption (analyzer)	Approx. 37 VA
Fuse ratings	100 ... 120 V 1T/250 200 ... 240 V 0.63T/250

Table 7- 3 Technical data – gas inlet conditions

Gas inlet conditions	
Permissible sample gas pressure	
High-pressure version	
Without built-in pressure regulator	2000 hPa rel.
With built-in pressure regulator	3000 - 6000 hPa rel.
Low-pressure version	
20 - 30 hPa rel.	
Total sample gas flow	
High-pressure version	
250 – 500 ml/min (15 – 30 l/h)	
Low-pressure version	
125 ml/min (7.5 l/h)	
Sample gas flow through the O ₂ sensor	125 ml/min (7.5 l/h)
Sample gas temperature	0 to 50 °C
Sample gas moisture content	< 1 % RH ¹⁾

Table 7- 4 Technical data – time response

Time response	
Warmup time	At room temperature: < 30 min ²⁾
Delayed display (t ₉₀)	
When changing from N ₂ to air	
High-pressure version	< 5 min
Low-pressure version	< 10 sec
Damping (electronic delay)	0 to 100 s, can be parameterized
Dead time (time for gas path in the device to be purged at 125 ml/min)	Approx. 10 to 30 s, depending on version
Time for signal processing in the device	< 1 s

Table 7- 5 Technical data – pressure correction range

Pressure correction range	
Pressure sensor	800 to 1100 hPa (abs.)

Table 7- 6 Technical data – measuring behavior

Measuring behavior	
Output signal variation	< 1% of smallest possible measuring range according to rating plate with an electronic delay of 1 s
Measured value drift	< $\pm 2\%$ /month of respective span
Repeatability	< $\pm 3\%$ of respective span
Linearity deviation	< $\pm 2\%$ of respective span
Accuracy ⁵⁾	The accuracy is the geometric total of the output signal variation, drift, repeatability and linearity deviation with constant influencing variables.

Table 7- 7 Technical data – influencing variables

Influencing variables ³⁾	
Ambient temperature	< 2%/10 K referred to the respective span
Sample gas pressure	With pressure compensation switched on: < 0.2% of respective span /1% change in pressure
Auxiliary gases	<i>Catalytically inactive sensor:</i> approx. 1 vpm O ₂ with an auxiliary gas concentration of 10 vpm H ₂ ; CO and CH ₄ exhibit a smaller cross-interference; higher hydrocarbons are negligible <i>Catalytically active sensor:</i> only gases with non-flammable auxiliary gas components may be sampled!
Sample gas flow	< 2% of smallest possible span according to rating plate with 10 ml/min change in flow within the permissible flow range

Table 7- 8 Technical data – electric inputs and outputs

Electric inputs and outputs	
Analog output	0/2/4 – 20 mA ; 4 – 20 mA (NAMUR)
Relay outputs	6, with changeover contacts, can be freely parameterized, e.g. for identification of a measuring range; max. load: 24 V AC/DC / 1 A floating
Analog inputs	2, designed for 0/2/4 to 20 mA for external pressure sensor and/or correction of auxiliary gas influence
Binary inputs	6, designed for 24 V, floating, can be freely parameterized, e.g. for measuring range switching
Serial interface	RS 485
Options	Supplementary electronics with 8 additional binary inputs and 8 additional relay outputs, e.g. for triggering automatic calibration; supplementary electronics for PROFIBUS-PA and PROFIBUS-DP

Table 7- 9 Technical data – climatic conditions

Climatic conditions	
Permissible ambient temperature	Storage and transport: -40 to +70 °C, operation: +5 to +45 °C
Permissible humidity	< 90 % RH ¹⁾ as annual mean, during storage and transport ⁴⁾

¹⁾ RH: relative humidity

²⁾ Maximum accuracy is achieved after approx. 3 hours

³⁾ Referred to sample gas pressure 1000 hPa (abs.), sample gas flow 125 ml/min and ambient temperature 25 °C

⁴⁾ Dew point must not be fallen below!

⁵⁾ The error of the calibration gas must be considered in addition

* Based on DIN EN 61207 / IEC 1207

Dimension drawings and charts

8.1 Dimension drawings

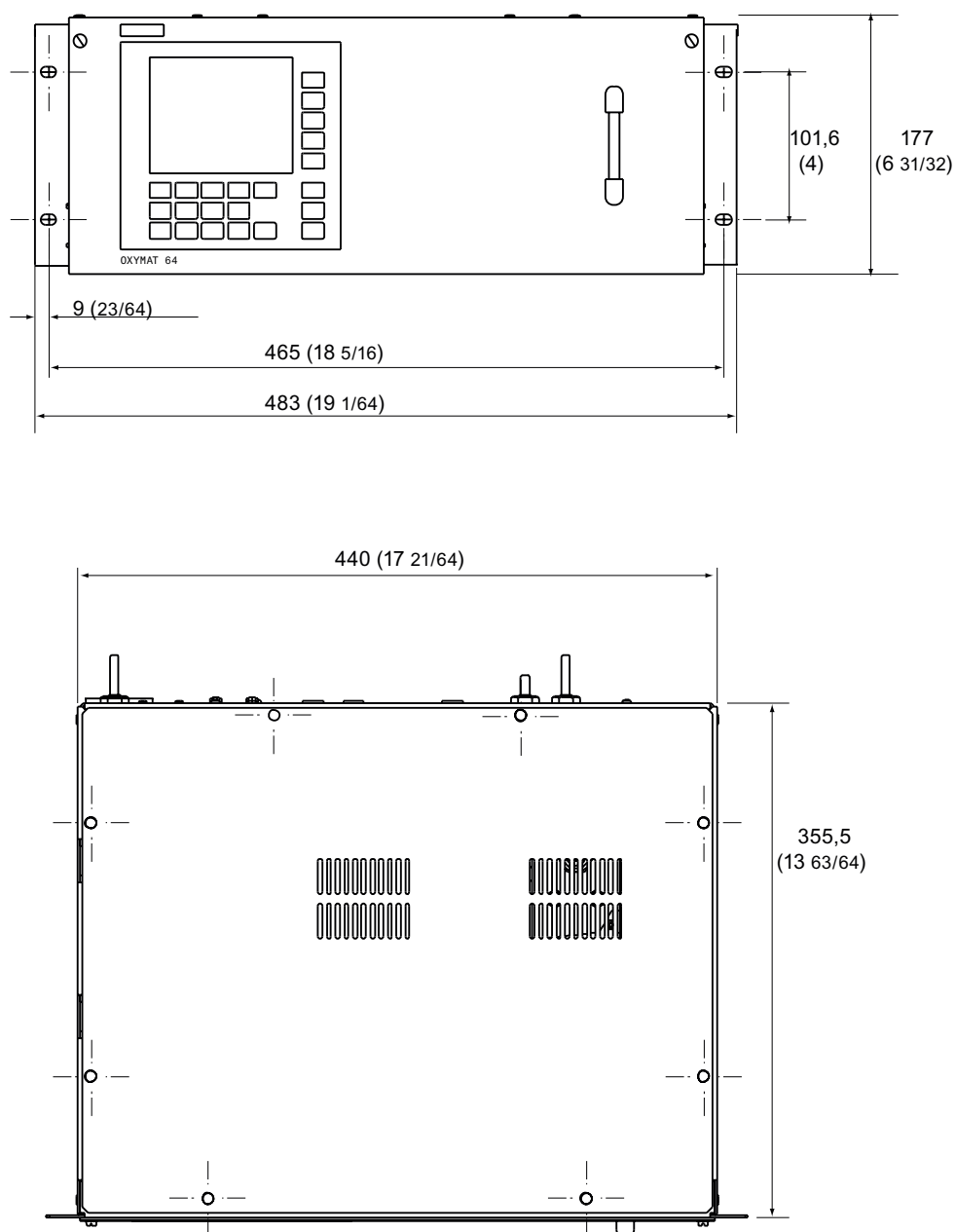


Figure 8-1 Dimensions for preparing installation (front view and plan view)

8.1 Dimension drawings

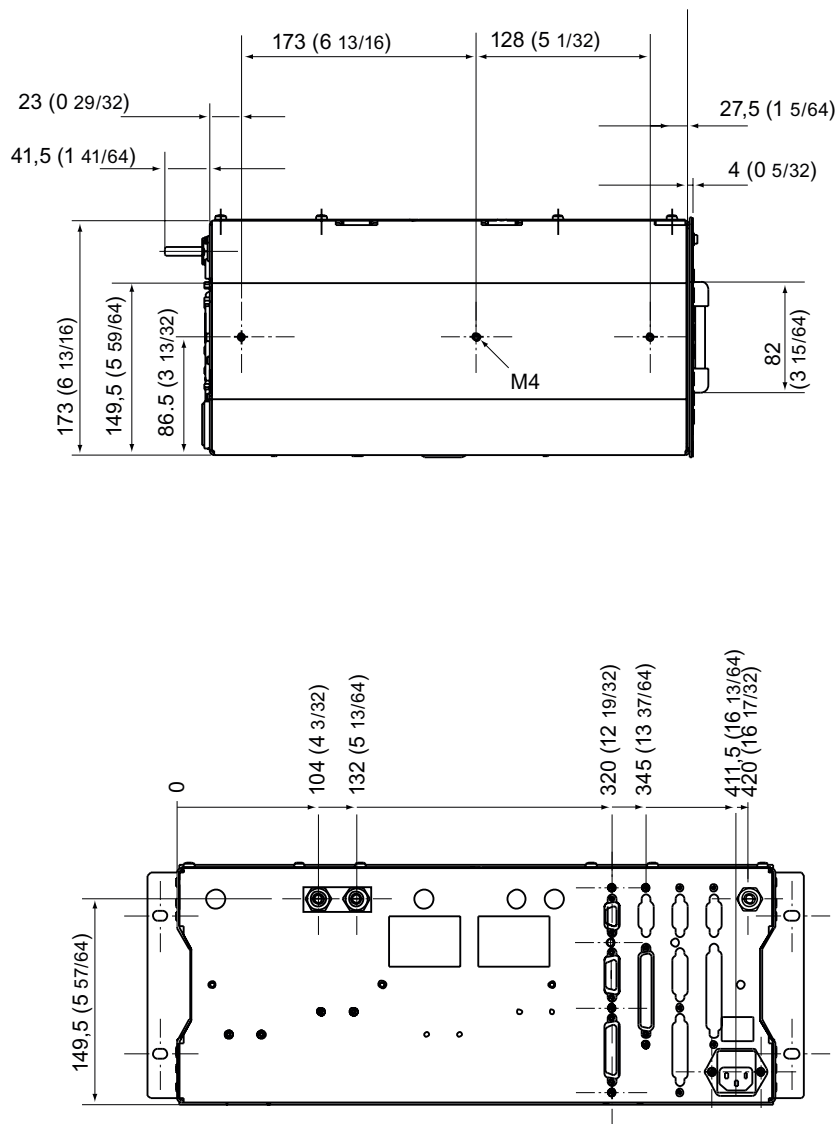


Figure 8-2 Dimensions for preparing installation (view from left and rear view)

8.2 Gas flow chart

High-pressure version

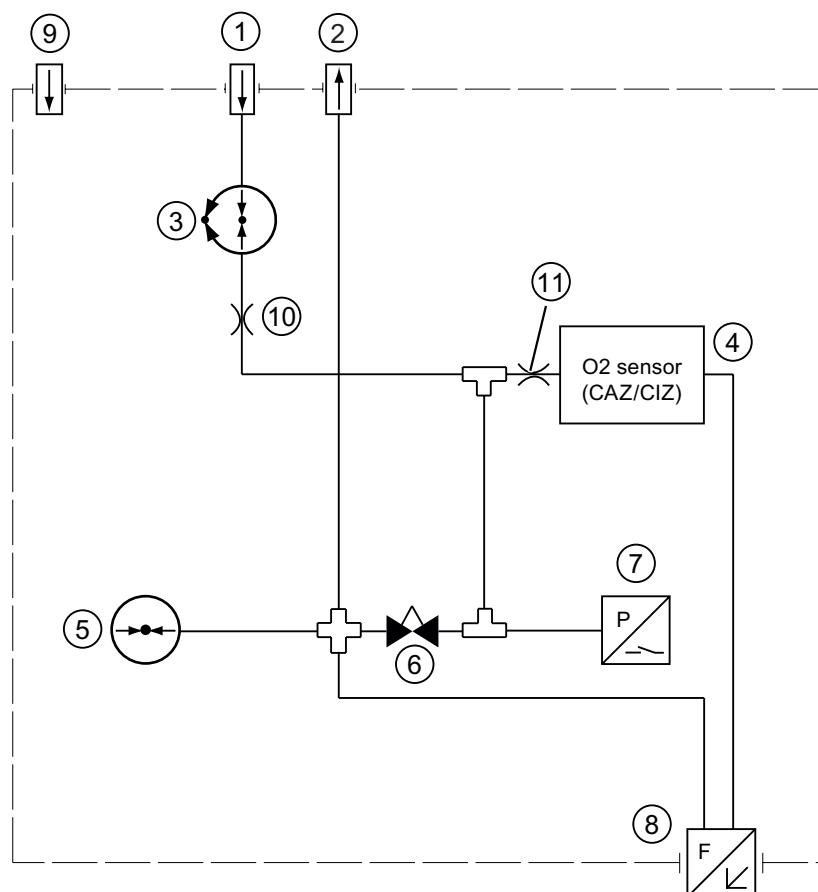


Figure 8-3 Gas path for high-pressure version

- 1 Sample gas inlet; inlet pressure:
 - Without internal pressure regulator: 2000 hPa, regulated
 - With internal pressure regulator: 3000 to 6000 hPa
- 2 Sample gas outlet; sample gas must flow off free of dynamic pressure
- 3 Pressure regulator (ordered version)
- 4 O₂ sensor
- 5 Pressure sensor
- 6 Bypass restrictor
- 7 Pressure switch
- 8 Flow metering tube
- 9 Purging gas connection
- 10 Restrictor
- 11 Restrictor

1) The OXYMAT 64 must only be purged with air, otherwise the measured value will be falsified.

Low-pressure version

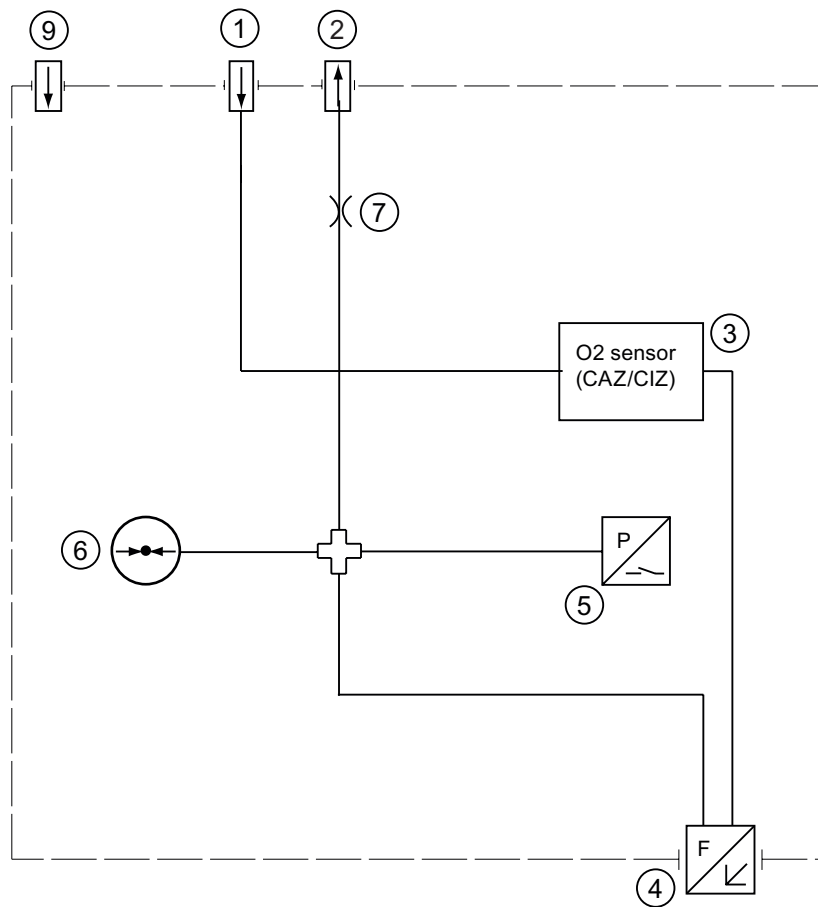


Figure 8-4 Gas path for low-pressure version

- 1 Sample gas inlet; flow 125 ml/min (7.5 l/h)
- 2 Sample gas outlet; sample gas flows off free of dynamic pressure
- 3 O₂ sensor
- 4 Flow metering tube
- 5 Pressure switch
- 6 Pressure sensor
- 7 Outlet restrictor

Spare parts and accessories

9.1 Ordering information

The type nameplate contains important data such as Order No. of the device, product version, serial number, electrical connection data, and measuring range. The spare parts list corresponds to the technical status of April 2007.

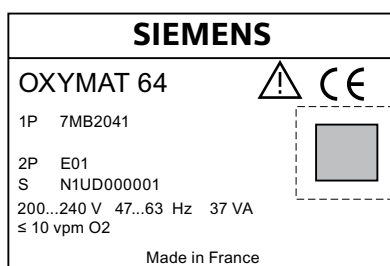


Figure 9-1 Example of type nameplate for OXYMAT 64

Ordering example

The order for spare parts must contain:

Table 9- 1 Information for ordering of spare part

Device name	OXYMAT 64
Order no. of the device	7MB2041-1BA10-1AA0
Serial number	N1UD00001
Quantity	1
Designation of the spare part	Front panel
Order No. of the spare part	A5E01061562

9.2 Sensor module

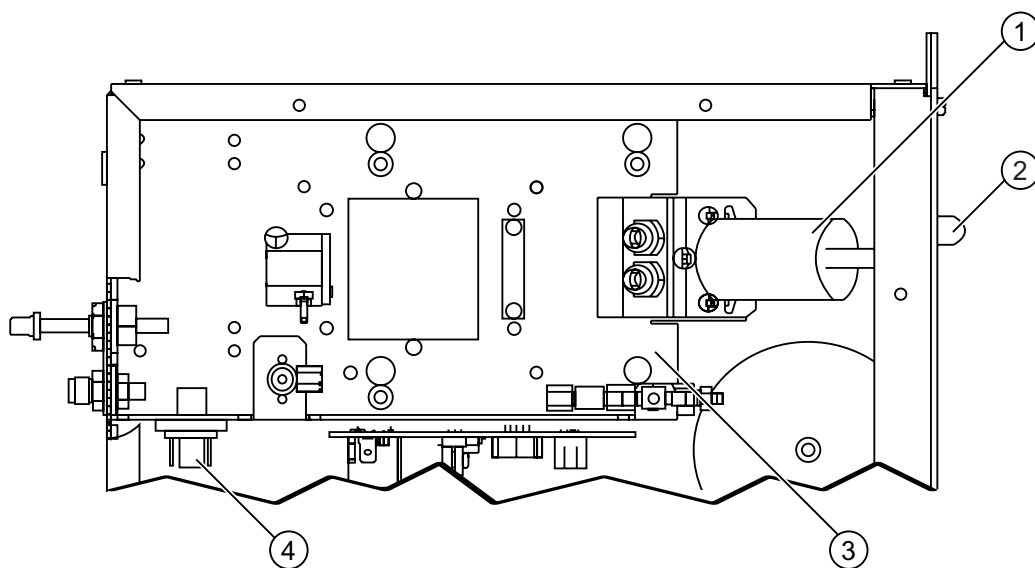


Figure 9-2 Spare parts of the sensor module

Table 9- 2 Spare parts list for sensor module

No.	Description	Order no.	Remarks
1	Pressure regulator as retrofitting set	A5E01008972	Incl. capillary tube + screwed glands
2	Flow metering tube	A5E01061561	Incl. brackets
3	Sensor module / with catalytically active cell	A5E01058837	Complete with sensor and sensor electronics; pre-calibrated
	With catalytically inactive cell	A5E01058838	
4	Pressure switch as spare part	A5E01007406	

9.3 Electronics

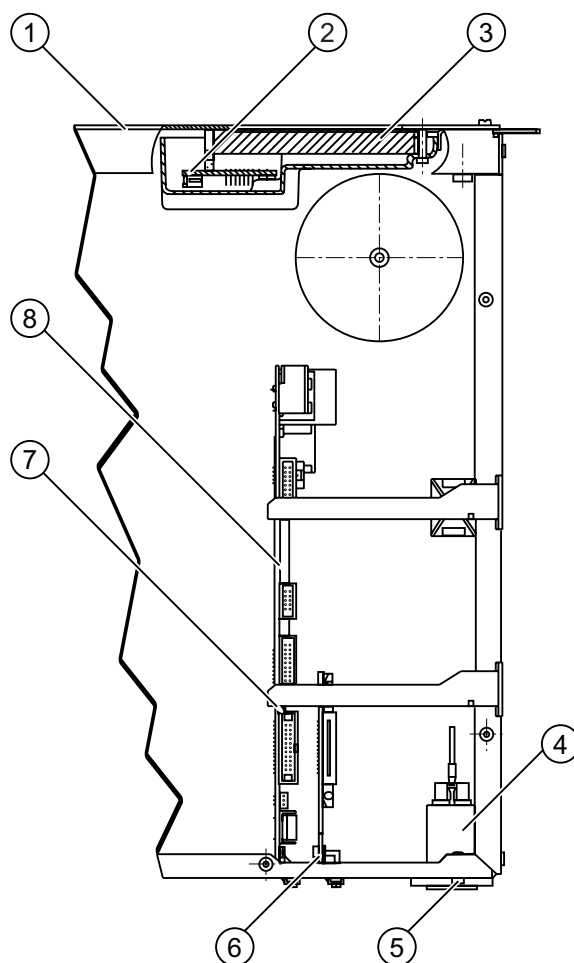


Figure 9-3 Spare parts for the electronics

Table 9-3 Spare parts list for the electronics

No.	Description	Order no.	Comment
1	Front panel	A5E00280516	Complete
	Front panel	A5E01061562	Without LC display
2	Adapter board, LCD/keyboard	C79451-A3474-B605	
3	LC display	W75025-B5001-B1	
4	Plug-in filter	W75041-E5602-K2	
5	G-type fuse T630L250V	W79054-L1010-T630	200 V - 240 V, 0.63 A
	G-type fuse T1L250	W79054-L1011-T100	100 V - 120 V, 1 A
6	Optional board	C79451-A3480-D511	Relay
		A5E00057307	PROFIBUS PA
		A5E00057312	PROFIBUS DP
		A5E00057164	Firmware update for Profibus

No.	Description	Order no.	Comment
7	Firmware (Flash-PROM)	A5E00789705	German
		A5E00789706	English
		A5E00789707	French
		A5E00789708	Spanish
		A5E00789709	Italian
8	Motherboard	A5E01061563	Motherboard and firmware; German
		A5E01061564	Motherboard and firmware; English
		A5E01061565	Motherboard and firmware; French
		A5E01061566	Motherboard and firmware; Spanish
		A5E01061567	Motherboard and firmware; Italian

9.4 Service

9.4.1 General information

If servicing is necessary, you can obtain the required information such as contact person and address from your responsible partner or from the following Internet address.

See also

Contacts (<http://www.siemens.com/processinstrumentation/contacts>)

Partner (<http://www.automation.siemens.com/partner>)

9.4.2 Repairs

Note

Return delivery of contaminated device components

Device components which have come into contact with radioactive or highly toxic gases or substances, or have been exposed to radioactive or high-energy radiation, may not be returned.

The owner of the device must ensure in such cases that the contaminated device components are disposed of correctly in accordance with the local directives at the location of use.

If possible, the original packaging should be used to return the complete device or its components. Please enclose components such as the analyzer section or motherboard in a conductive ESD bag.

If the original packaging is no longer available, wrap the device in plastic foil. The device or the returned parts can then be packed in a sufficiently large box packed with shock-absorbing material (wood shavings, sponge rubber or similar). If you use wood shavings, the stuffed layer on each side should be at least 15 cm thick.

For overseas shipping, shrinkwrap the devices in an additional PE foil which is at least 0.2 mm thick, with a desiccant (e.g. silica gel) enclosed! For this type of shipping, also line the inside of the transport container with a double layer of tar paper.

If you return your device for repair, it is essential to enclose the filled-in decontamination declaration as well as the filled-in fault description.

The return delivery address applicable to you can be obtained from the following address.

See also

Services & Support (<http://www.siemens.com/automation/service&support>)

9.4.3 Spare parts

Your regional contact partner will be pleased to receive your order. In addition, there is a central phone number for every country at which you can contact us. Delivery is according to the usual delivery times in the country.

If you are asked to return the faulty spare part, the filled-in decontamination declaration and the filled-in fault description must be enclosed.

See also

Services & Support (<http://www.siemens.com/automation/service&support>)

9.4.4 Error Description

Customer name	
Administrator	
Delivery address:	
Phone/ Fax/ E-mail:	
Return delivery address (if not the same address as above)	
Device name	
MLFB No.	
Serial number	
Description of returned part	
Fault indication	
Process data at measuring point	
Operating temperature	
Operating pressure	
Composition of sample gas	
Operating duration/ operating date	
Confirmation	It is confirmed that the returned part has not come into contact with highly toxic or radioactive gases or substances, or been exposed to radioactive or high-energy radiation.
Location:	<i>Company, department, name, first name</i>
Date:	Signature:

Software update () yes () no

9.4.5 Decontamination declaration

To protect our employees and equipment, it must be guaranteed that all residues of a medium have been removed from the returned device.

Therefore we check whether a decontamination declaration is present before unpacking the device.

Please securely apply a clear plastic envelope with the completely filled-in and signed decontamination declaration including the shipping papers outside on the packaging.

Customer name	
Administrator	
Delivery address:	
Phone/ Fax/ E-mail:	
Device name	
MLFB No.	
Serial number	
Description of returned part	
Medium	
Concentration	
Cleaned using	
Operating duration/ operating date	
Confirmation	It is herewith confirmed that all residues of the medium have been removed. The device is therefore free of all dangerous and toxic materials.
Location:	<i>Company, department, name, first name</i>
Date:	Signature:

Appendix

A.1 Declaration of conformity



EC Declaration of Conformity
EG-Konformitätserklärung

No. A5E-01

Manufacturer: <i>Hersteller.</i>	SIEMENS AG Automation & Drives
Address: <i>Anschrift.</i>	Östliche Rheinbrückenstr. 50, 76187 Karlsruhe Bundesrepublik Deutschland
Product description: <i>Produktbezeichnung:</i>	Gas analyzer/ <i>Gasanalysegerät</i> OXYMAT 64E Type / <i>Typ</i> 7MB 2041-xxxx-xAAx

The product described above in the form as delivered is in conformity with the provisions of the following European Directives:

Das bezeichnete Produkt stimmt in der von uns in Verkehr gebrachten Ausführung mit den Vorschriften folgender Europäischer Richtlinien überein:

2004/108/EC EMC	Council Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC <i>Richtlinie des Rates zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über die elektromagnetische Verträglichkeit und zur Aufhebung der Richtlinie 89/336/EWG</i>
73/23/EEC LVD	Council Directive on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits. (amended by 93/68/EEC). <i>Richtlinie des Rates zur Angleichung der Rechtsvorschriften der Mitgliedstaaten betreffend elektrische Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen. (geändert durch 93/68/EWG).</i>

Annex A is integral part of this declaration.

Anhang A ist integraler Bestandteil dieser Erklärung.

This declaration certifies the conformity to the specified directives but contains no assurance of properties.

The safety documentation accompanying the product shall be considered in detail.

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, ist jedoch keine Zusicherung von Eigenschaften.

Die Sicherheitshinweise der mitgelieferten Produktdokumentation sind zu beachten.

Annex A to the EC Declaration of Conformity

Anhang A zur EG-Konformitätserklärung

No. A5E-01

Product description: <i>Produktbezeichnung:</i>	Gas analyzer/ <i>Gasanalysegerät</i> OXYMAT 64E Type / <i>Typ</i> 7MB 2041-xxxx-xAAx
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Conformity to the Directives indicated on page 1 is assured through the application of the following standards (depending on versions):

Die Konformität mit den auf Blatt 1 angeführten Richtlinien wird nachgewiesen durch die Einhaltung folgender Normen (variantenabhängig):

Directive <i>Richtlinie</i>	Standard / Reference number <i>Norm / Referenznummer</i>	Edition <i>Ausgabedatum</i>
2004/108/EC	EN 61326/A3 App. A	2003
73/23/EEC	EN 61010-1 (2 nd ed.)	2001

A.2 Overview of operating functions

The following overview is a list of the device functions. This list corresponds to software version 0.1.5.

Main menu item	Function number	Name of function
Analyzer status	1	Factory data
	2	Diagnostics values
	3	Logbook
	4	Display measuring ranges
Calibration (code 1)	20	Calibrate zero
	21	Calibrate span
	22	Zero/span setpoints
	23	Total/single calibration
	24	Autocal
	25	Drift values
	26	Sensor calibration
Measuring ranges (code 1)	40	Select measuring ranges
	41	Define measuring ranges
Parameters (code 2)	50	Electric time constant
	51	Limits
	52	On/off functions
	53	Status signals
	54	Graphic measured-value display
	55	Measured-value display
	56	LCD contrast
	58	Date/time
	59	Measuring-point switchover
Configuration (code 2)	60	Logbook settings
	70	Analog output
	71	Relay assignment
	72	Binary inputs
	73	ELAN configuration
	74	Reset
	75	Save, load data
	76	Suppress short noise signals and negative measured values
	77	Save analog output (measured value)
	78	Calibration tolerance
	79	Change codes
	80	Analyzer test
	81	Select language
	82	Pressure correction
	83	Correction of cross-interference
	85	Switch valves
	86	Linear temperature compensation
	87	Faults on/off
	90	PROFIBUS configuration
	91	Change dimension
	99	Factory settings

Overview of operating functions

A.3 ESD guidelines

Definition of ESD

All electronic modules are equipped with large-scale integrated ICs or components. Due to their design, these electronic elements are highly sensitive to overvoltage, and thus to any electrostatic discharge.

The electrostatic sensitive components/modules are commonly referred to as ESD devices. This is also the international abbreviation for such devices.

ESD modules are identified by the following symbol:



CAUTION
ESD devices can be destroyed by voltages well below the threshold of human perception. These static voltages develop when you touch a component or electrical connection of a device without having drained the static charges present on your body. The electrostatic discharge current may lead to latent failure of a module, that is, this damage may not be significant immediately, but in operation may cause malfunction.

Electrostatic charging

Anyone who is not connected to the electrical potential of their surroundings can be electrostatically charged.

The figure below shows the maximum electrostatic voltage which may build up on a person coming into contact with the materials indicated. These values correspond to IEC 801-2 specifications.

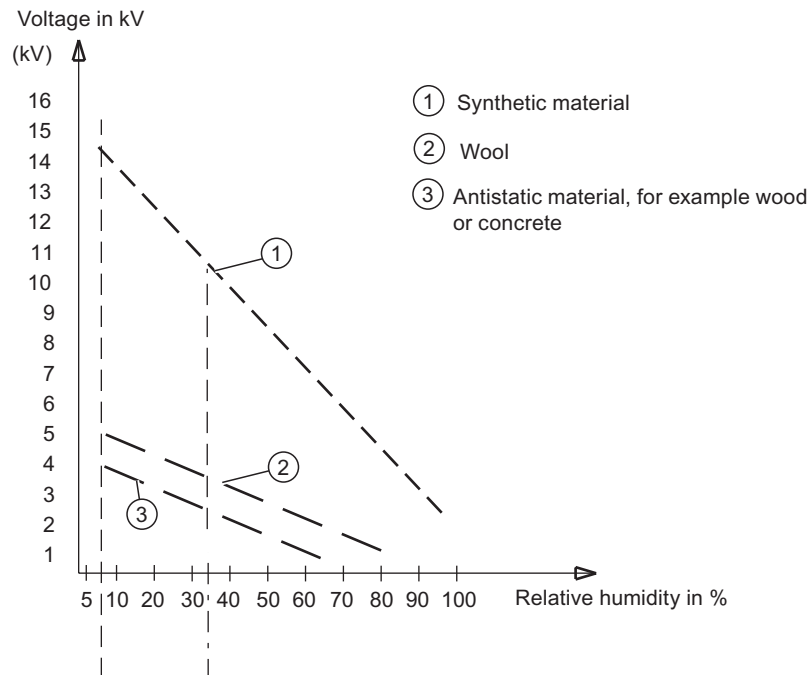


Figure A-1 Electrostatic voltages on an operator

Basic protective measures against electrostatic discharge

- Ensure good equipotential bonding:
When handling electrostatic sensitive devices, ensure that your body, the workplace and packaging are grounded. This prevents electrostatic charge.
- Avoid direct contact:
As a general rule, only touch electrostatic sensitive devices when this is unavoidable (e.g. during maintenance work). Handle the modules without touching any chip pins or PCB traces. In this way, the discharged energy can not affect the sensitive devices.

Discharge your body before you start taking any measurements on a module. Do so by touching grounded metallic parts. Always use grounded measuring instruments.

List of abbreviations/acronyms

B.1 List of abbreviations

Abbreviation / symbol	Explanation
"	Inch 1" $\triangleq$ 25.4 mm
<	Less than
>	Greater than
$\leq$	Less than or equal to
$\geq$	Greater than or equal to
°	Degrees
°C	Degrees Celsius
AC	Alternating current
Ar	Argon, an inert gas
C ₂ H ₄	Ethene, formally ethylene
CaO	Calcium oxide, quicklime
CH ₄	Methane
Cl ₂	Chlorine
cm ²	Square centimeters
CO	Carbon monoxide
CO ₂	Carbon dioxide
COM port	Communications connection, serial port of a computer
CS ₂	Carbon bisulfide
DC	Direct current
DP	Distributed I/O (in association with PROFIBUS)
EEPROM	Electrically-erasable programmable read-only memory
ELAN	Economic local area network
EPROM	Erasable programmable read-only memory
EMC	Electromagnetic compatibility
FKM	Fluorocaoutchouc, a plastic (ASTM name), commercial name e.g. Viton
FPM	Fluorocaoutchouc, a plastic (DIN/ISO name), commercial name e.g. Viton
GA	Gas analysis
GND	Ground
Possibly	Possibly
H ₂	Hydrogen
H ₂ S	Hydrogen sulfide
HC	Hydrocarbon

List of abbreviations/acronyms

B.1 List of abbreviations

Abbreviation / symbol	Explanation
HCl	Hydrogen chloride, hydrochloric acid
HCN	Hydrogen cyanide, prussic acid
He	Helium, an inert gas
HU	Height unit for computer housings, 1 HU $\triangleq$ 1 3/4" $\triangleq$ 44.45 mm
hPa	Hectopascal
Hyst	Hysteresis
K	Kelvin
CAZ	Catalytically active zirconium dioxide sensor
kHz	Kilohertz
ClZ	Catalytically inactive zirconium dioxide sensor
kPa	Kilopascal
k Ω	Kiloohms
l	Liters
LCD	Liquid crystal display
LED	Light emitting diode
mA	Milliamperes
TLV	Threshold limit value (maximum workplace concentration)
max.	Maximum
MB	Megabyte
mba, MBA	Start of measuring range
mbar	Millibars
mbe, MBE	End of measuring range
mg	Milligrams
min	Minute
ml	Milliliters
MLFB	Machine-readable product code
mm	Millimeters
mm ²	Square millimeters
MPa	Megapascal
m Ω	Milliohms
M Ω	Megaohms
n. B.	As required
NAMUR	Standards working committee for measuring and control technology in the chemical industry
Ne	Neon, an inert gas
NH ₃	Ammonia
No.	Number
O ₂	Oxygen
o. Ä.	Or similar
PA	Process automation
PC	Personal computer

Abbreviation / symbol	Explanation
PCS	Process control system
PDM	Process Device Manager
pF	Picofarad (10^{-12} Farad)
PROFIBUS	Process Field Bus
Pt	Platinum
PTFE	Polytetrafluoroethylene (plastic, commercial name, e.g. Teflon)
QAL	Quality assurance level
RAM	Random access memory
ROM	Read only memory
s	Seconds
SO ₂	Sulfur dioxide
SUB-D	Subminiature D-shaped connector
TCP/IP	Transmission Control Protocol/Internet Protocol; a reference model for communication on the Internet
USB	Universal Serial Bus; serial bus system for connecting external devices to a computer
V	Volts
VGA	Video Graphics Array, a graphics card standard
Y ₂ O ₃	Yttric oxide
vpm	Volume parts per million
e.g.	For example
ZrO ₂	Zirconium dioxide
Δ	Difference (delta)
Ω	Ohms

Glossary

Adapter board

Board contained in the standard configuration of the OXYMAT 64. It is used to preprocess sensor signals and the measured signal.

Additional electronics

Generic term for all optional boards.

Back wall of housing

Part for sealing the rear housing opening of the device.

Calibration

Setting or adjustment of an analyzer to eliminate systematic deviations in measurements as far as necessary for the required application.

Calibration gas

Gas used to carry out a calibration.

Code

String for enabling protected system areas or device functions.

Code level

Area of protected functions or states which are enabled after entering a certain code.

Coded display mode

Operating mode in which the measured value is displayed and the device is protected against unauthorized access by codes.

Commissioning

Totality of measures and actions required to make a machine or system capable of running.

Control panel

Panel with operating elements used to make inputs on the device.

Correction of cross-interference

Computed correction of the measured value falsification caused by the interfering gas.

Cross-interference deflection

The falsification of a measurement caused by an interfering gas.

Cursor

Tool (insertion mark, writing mark, input mark) for identifying the current processing position of a program.

Decoded display mode

Operating mode in which the measured value is displayed, the device is partially or completely decoded, and the functional check is active.

Dialog language

Language in which communication between the user and device takes place.

Display

Visible information on states and values.

Display unit

Device component which outputs/shows device information and visualizes the communication via the control panel.

Factory functions

Function for device maintenance. This function is protected by the highest code level and is only accessible to maintenance personnel.

Factory setting

The factory setting is the value of a parameter when an analyzer is delivered from the factory.

Front panel

Front part of a device, usually with clear identification features (e.g. device name, manufacturer logo, etc.).

Function

Numbered software function of a device. Functions are listed in submenus.

Function display

Screen display depending on the called function.

Functional check

Identification activated by the device if it determines that the measured value was influenced (e.g. when changing to operator control mode by decoding the device).

Gas analyzer

Device for quantitative analysis of gases and gas mixtures.

Gas inlet

Defined point for connecting a gas to the analyzer.

Gas outlet

Defined point for directing a gas out of a gas analyzer.

Hysteresis

(from Greek: hysteros = behind) Identifies the continuation of an effect following the disappearance of its cause. Hysteresis occurs in many control processes, also in our gas analyzers during the (delayed) switching over from one measuring range to another.

Input field

One or multiple line area in which the user can enter alphanumeric content or edit, delete or replace existing text contained therein.

Interfering gas

Residual gases present in the sample gas whose presence can falsify the measured value.

Leak-tightness

Reliability of piping system against escaping of gases.

Limit alarm

Signaling of upward/downward violation of a limit.

Limit monitoring

Function which monitors the observation of adjustable limits, and signals if these are violated.

Limit relay

Relay to which a certain limit is assigned and which is switched when there is a limit alarm.

Main menu

Menu of the highest hierarchical level. It contains the submenus.

Measured signal

Representation of measured variables in the signal path by an allocated physical quantity of the same or different type. Depending on the position of the measured signal at the input or output of the considered element, one distinguishes between an input signal and an output signal.

Measured value

Output value for a determined variable.

Measured value display

Totality of the displayed information in "Coded display mode" and "Decoded display mode". The following are displayed, for example: measured value, status line with status messages, footer, measuring ranges, components, etc.

Measuring point

Location where a measured value is recorded.

Measuring point relay

Relay to which a measuring point is allocated.

Measuring range

The measuring range is the range of values for a measured variable. The limits of the measuring range are the start-of-scale and full-scale values. This means that the start-of-scale and full-scale values are known for the measuring range.

Measuring range switching

Automatic switching over of measuring ranges. Also referred to as "autorange" in the software.

Membrane keyboard

Keyboard whose keys are protected jet-proof against atmospheric influences by a membrane (IP 65 according to EN 60529).

Motherboard

Board which contains the basic data and firmware for the device. Here, data are processed and stored, and interfaces and device I/Os are controlled and managed.

Noise

Totality of all phenomena which could disturb the transmission and/or recording of information.

Operating mode

Various modes into which the device can be put by intervening from the outside. Three modes are distinguished:

- Coded display mode
- Decoded display mode
- Operator control mode

Operating state

Common term for all states in which the device can be found during operation (e.g. measure, fault, calibration, ...).

Operation level

Certain operating area (menus and functions) which is either freely accessible or protected by a code.

Operator control mode

Operating mode in which the device is partially or entirely decoded and the functional check is activated. The device is parameterized in this mode.

RC element

An RC element in electronics is a circuit comprising an ohmic resistor (R) and a capacitor (C).

Sample gas

A gas which has been extracted from a process and is to be analyzed.

Signaling contact

Usually a floating contact contained in electronic components (e.g. relay) which signals the occurrence of an event to a control unit.

Span

The span is the difference between the start-of-scale and full-scale values of the measuring range. Example: Measuring range: -1 bar to 15 bar; start-of-scale value: -1 bar, full-scale value: 15 bar, span: 16 bar

Span calibration

Adjustment of the span using a suitable means (in this case: calibration gas).

Spike

Engl.: Spike: Undesired, briefly occurring peaked interference of a measured signal.

Standard configuration

Totality of standard features contained in the device at the time of delivery without optional extensions.

Status message

Selectable output of various messages in the status line of the measured value display.

Subfunction

Independent functional unit within a function.

Submenu

Menu which is listed under a higher-order menu item.

Time constant

System parameter which determines the way a system-relevant variable changes with time.

Warm restart

Restarting the device from its "warm" state with the last set parameters.

Warm-up phase

Time which the analyzer needs to reach operating temperature. It counts as one of the operating states.

Zero calibration

Calibration of the zero point with a suitable zero gas.

Zero gas

Gas used to adjust the zero point of analyzers; it does not cause a measured value which differs from the zero value.

Zero point

Smallest possible point of a measuring range (usually the start-of-scale value).

Zirconium dioxide, ZrO_2

Zirconium dioxide (ZrO_2) as the sensor material is a high-performance ceramic belonging to the group of oxide ceramics, and is therefore a non-metallic, inorganic material. It is non-magnetic, extremely resistant to acids and alkalis, and exhibits a high resistance to chemical, thermal and mechanical influences.

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