OXYMAT 61

Oxygen analyzer for standard applications

7MB2001

Operating instructions

Continuous gas analysis

SIEMENS

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Continuous gas analysis

Oxygen analyzer for standard applications OXYMAT 61

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 relevant 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 product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

⚠ WARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

Trademarks

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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

1.1 Device model and validity

You have purchased the OXYMAT 61, a device that that undergoes continuous development and therefore can vary in functionality and software release in comparison to other devices of the same type.

This manual describes the OXYMAT 61 gas analyzer with the software release 4.8.3.

1.2 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.

1.3 General information

This device left the factory in a safe and proper condition and has been tested. In order to maintain this condition and to ensure safe operation of this product, it should 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.

1.4 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.

1.5 Proper use

Proper use within the context of this manual, means that the product may be used only for the applications described in the catalog or the technical description, and only in combination with the equipment, components and devices of other manufacturers recommended or permitted by Siemens.

The product described in this manual has been developed manufactured, tested and documented in compliance with relevant safety standards. When the handling rules described for the configuration, installation, proper operation and maintenance, as well at the safety guidelines are adhered to, therefore, there is normally no risk to the health of persons or in respect to damage to property.

This device was designed to ensure safe isolation of the primary and secondary circuits. Low voltages that are connected must therefore also be generated with safe isolation.

⚠ WARNING

Dangerous contact voltage

After removing the housing or protection against direct contact or after opening the system cabinet, certain parts of of this device/system will be exposed that can carry hazardous voltage. Therefore, only appropriately qualified persons are permitted to perform work within this device. These persons must be thoroughly familiar with all sources of danger and service activities in accordance with these operating instructions.

1.6 Qualified Personnel

Qualified personnel are people who are familiar with the installation, mounting, commissioning, and operation of the product. These people have the following qualifications:

- They are authorized, trained or instructed in operating and maintaining devices and systems according to the safety regulations for electrical circuits, high pressures and aggressive as well as hazardous media.
- For explosion-proof devices: they are authorized, trained, or instructed in carrying out work on electrical circuits for hazardous systems.
- They are trained or instructed in maintenance and use of appropriate safety equipment according to the safety regulations.

1.7 Notes on warranty

The contents of this manual shall not become part of or modify any prior or existing agreement, commitment or legal relationship. The sales contract contains all obligations on the part of Siemens as well as the complete and solely applicable warranty conditions. Any statements regarding device versions described in the manual do not create new warranties or modify the existing warranty.

The content reflects the technical status at the time of publishing. Siemens reserves the right to make technical changes in the course of further development.

1.8 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.

1.9 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.

Description 2

2.1 Area of application

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

NOTICE
The OXYMAT 61 is not suited for measuring flammable, toxic and corrosive gases.

Application examples

Measurement of oxygen

- For boiler control in incineration plants
- For quality monitoring in ultra-pure gas
- For environmental protection
- For monitoring of process exhaust gas
- For process optimization

Important features

- Four freely configurable measuring ranges, also with suppressed zero point, all measuring ranges are linear
- Electrically isolated measured value output 0/2/4 to 20 mA
- Selectable automatic or manual measuring range switching; remote switching is also possible
- Measured values can be stored during calibration
- Wide range of selectable time constants (static/dynamic noise suppression); i.e. the response time of the device can be adapted to the respective measuring task
- Simple handling through menu-guided operation according to NAMUR recommendation
- Fast response time
- Low long-term drift
- Reference gas supply either externally (N_2, O_2 or air, approx. 2000 to 4000 hPa via sample gas pressure) or via built-in reference gas pump (ambient air)
- Two control levels with separate authorization codes to prevent unintentional and unauthorized operator intervention
- External pressure sensor can be connected for correction of variations in the process gas pressure in the range 800 to 1200 hPa (absolute)
- Automatic measuring range calibration can be configured
- Fieldbus connection (optional)
- Monitoring of sample gas (optional)
- Monitoring of reference gas (only with version with internal reference gas pump)
- Variety of narrow measuring ranges, depending on version 2.0 % or 5.0 % O_2
- Easy device replacement since electric connections can be simply disconnected from the device
- 19" rack unit with 4 height units (U) for installation in swivel frame
- 19" rack unit with 4 U for installation in cabinets, with or without telescopic rails
- Front plate can be swung down for servicing purposes (laptop connection)
- Internal gas channels: Hose made of FKM (Viton)
- Connections for sample gas: Pipe diameter 6 mm or 1/4"
- Sample chamber of stainless steel (mat. no. 1.4571)

2.2 Design

Display and control panel

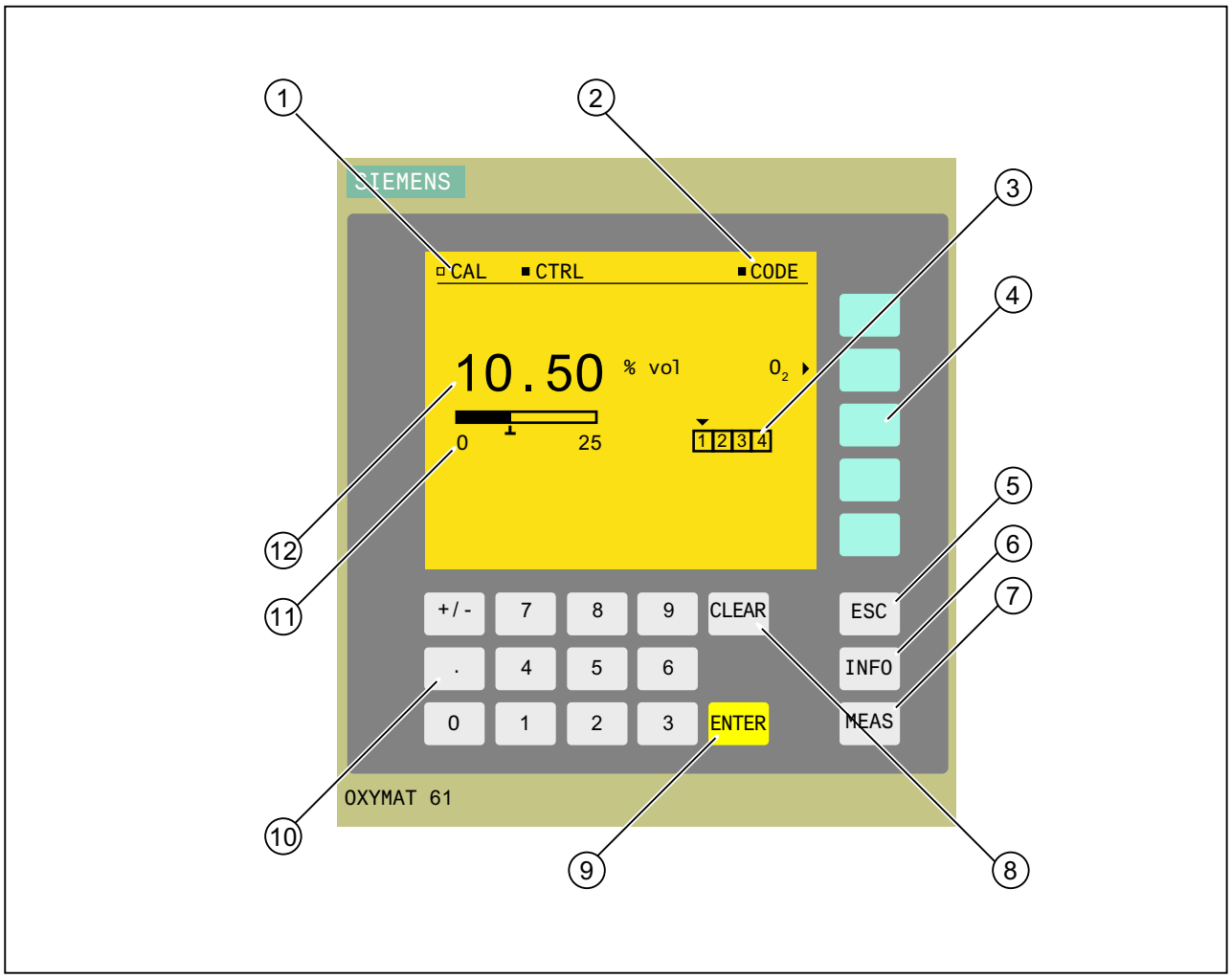
- Large LCD for simultaneous display of:
  - Measured value (digital and analog displays)
  - Status line
  - Measuring ranges
- Contrast of the LCD adjustable via the menu
- Permanent backlighting with LED
- 5-digit measured value display (decimal point counts as digit)
- Washable membrane keyboard/front panel
- Menu-guided operation for parameter assignment, configuration and calibration
- Operating help in plain text
- Graphic display of concentration trend; programmable time intervals

Inputs and outputs

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

Communication

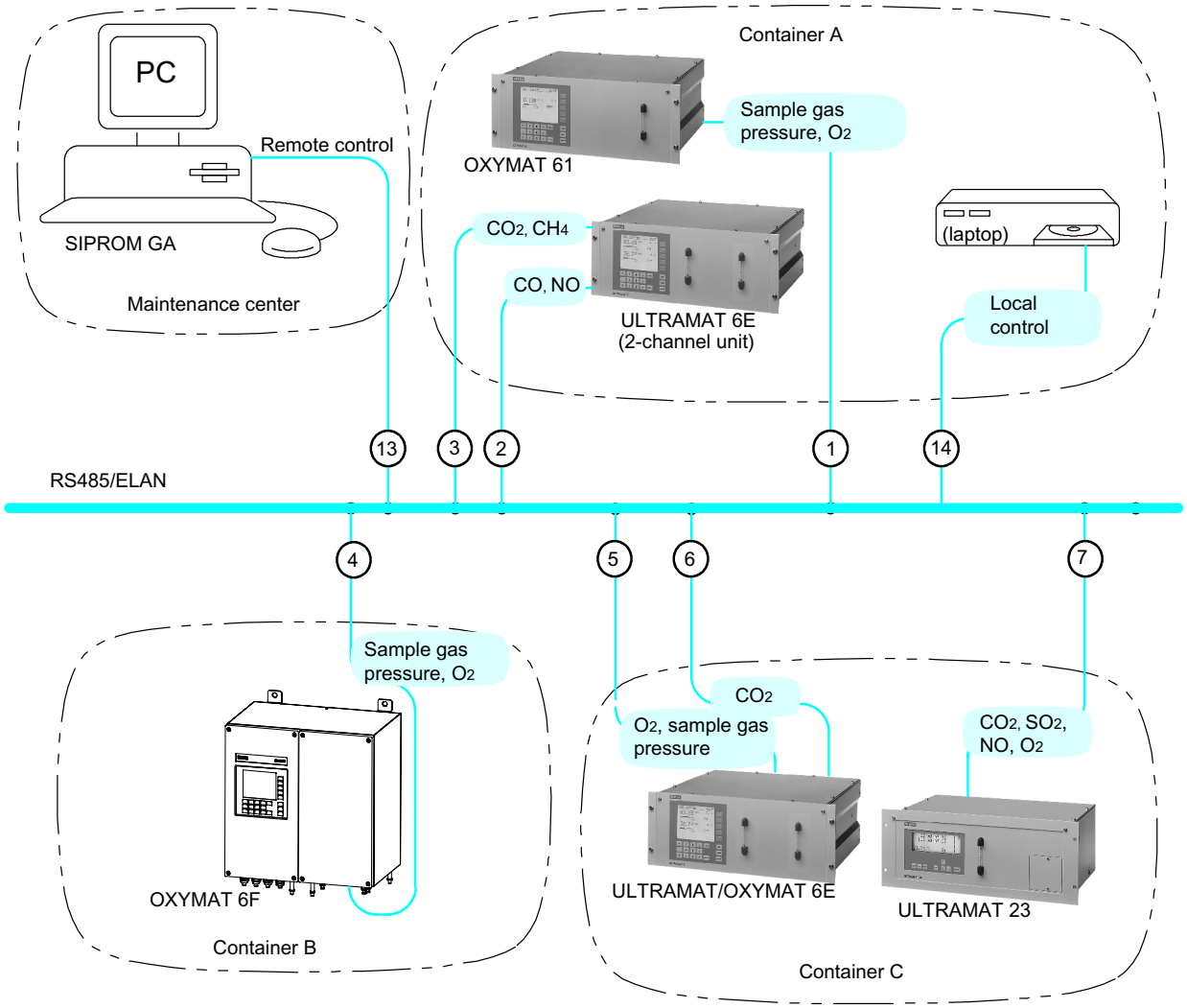
- RS485 (standard)
- Optionally available:
  - AK interface for the automotive industry with extended functions
  - Converter for RS232, USB and Ethernet
  - Integration in networks via PROFIBUS DP/PA interface
  - SIPROM GA software as the service and maintenance tool



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 application of any changes made
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

Figure 2-1 Membrane keyboard and graphic display

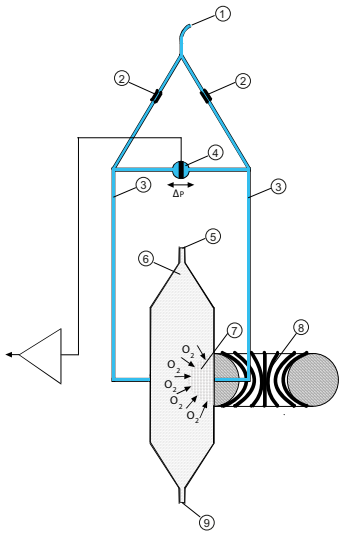
2.3 Communication interface



- ELAN®: Economical Local Area Network
- Networking of various analyzers ULTRAMAT 6, OXYMAT 6, OXYMAT 61, ULTRAMAT 23
- Centralized maintenance by coupling to higher-level computer
- Measurement data available in ASCII format for fast processing
- Remote control and download of records via PC
- Remote transmission via modem
- Up to 12 channel addresses (interfaces) can be used for measured variables (concentrations, pressures, temperatures, etc.)
- SIPROM GA
- PROFIBUS
- Technology: RS485 - 9600 baud - repetition rate 0.5 s - range up to 500m
- (1) ..... (12) Channel addresses
  (13) and (14) Control addresses (e.g. for PC, etc.)

Figure 2-2 Various analyzers, networked with 485

2.4 Principle of operation



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

OXYMAT 61, principle of operation

In contrast to almost all other gases, oxygen is paramagnetic. This property is utilized as a measuring effect by the OXYMAT 61 channel.

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

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

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

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

A magnetic field with alternating strength (8) prevents detection of the background flow in the microflow sensor, enabling measurement to be performed independent of the sample chamber position and thus also independent of the location where the gas analyzer is used.

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

Mounting and connecting 3

3.1 Safety instructions

⚠ DANGER

Explosion hazard

The analyzer must not be operated in potentially explosive atmospheres. The supply of gases with combustible components in concentrations above the lower explosive limit (LEL) must be clarified in consultation with the relevant hazard experts and is ultimately the responsibility of the operator.

⚠ WARNING

Dangerous contact voltage

Certain parts of this device are under dangerous voltage. In order to avoid contact with live parts, the housing must be closed and grounded upon completion of all assembly and installation work.

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

⚠ WARNING

Release of hazardous gases

Gases may be released if there are leaks in the sample gas channel. For this reason, toxic and corrosive gases are not allowed to be be measured with this device.

Failure to comply with this can result in death, personal injury as well as damage to property and the environment.

CAUTION

Incorrect mounting

The device can be damaged, destroyed or its functionality impaired through improper mounting.

- Before installing ensure there is no visible damage present on the device.
- Make sure that process connectors are clean, and suitable gaskets and glands are used.
- Mount the device using suitable tools. Refer to the information in "Technical data" , for example installation torques requirements.

3.2 Installation requirements

Vibration

Select an installation location which is as vibration-free as possible. If you install the device in a cabinet or in desktop housing, you must hang it on support rails. It is not sufficient to only secure the front side, since the intrinsic weight of the device creates too much load on the chassis.

Temperature

Ensure sufficient ventilation between the devices if you install them in control cabinets.

If the device is installed outdoors, it must be protected from direct sunlight.

Ensure that the permissible ambient temperature range of 5 to 45 °C is maintained during operation (see Technical Specification section).

Magnetic fields

Magnetically sensitive devices should not be installed in close proximity of OXYMAT 61 since it is inherently emits stray magnetic fields. Depending on the sensitivity, distances up to 50 cm are required (see also Function 57).

3.3 Connections

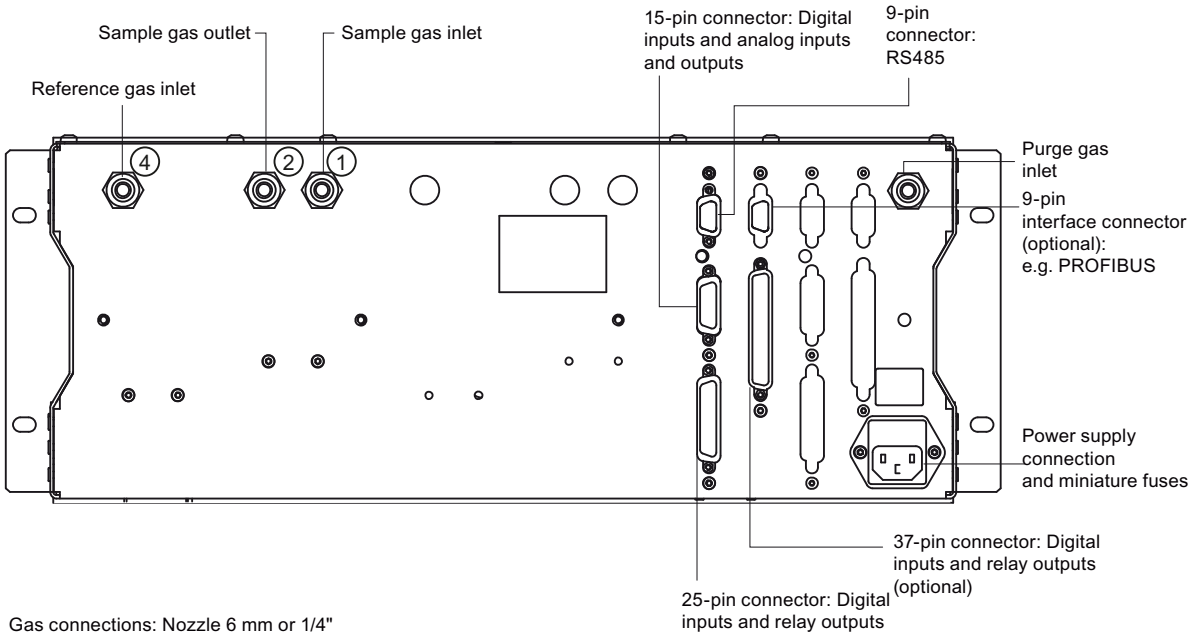


Figure 3-1 Back side with gas and electrical connections

3.3.1 Gas connections and internal gas flow diagram

3.3.1.1 Sample gas line

Connector stems with a pipe diameter of 6 mm or 1/4" are provided for gas connections. For the gas supply and discharge from the device, you need to select a suitable material for the sample gas.

CAUTION
Dynamic pressure in the sample gas channel The device must be operated in such a way that the sample gas pressure in the analyzer does not accumulate. When several devices are connected in series, you must ensure that there are no restrictions in the gas channels of the downstream devices (free exhaust gas flow). You must remove any sample gas restrictors installed in the device. The only restrictor that can be retained is one between the sample gas line and the first gas analyzer unit. After removing the sample gas restrictors, the sample gas monitoring (pressure switches) of the downstream analyzers will be inoperable. To avoid error messages, you must have disable the corresponding error messages ("Gas flow rate is too low") in the configuration function of the software (section 5.6.18, Function 87 (Page 101), Error S16). You should also note in this case that the assignment of a relay to the "Sample gas flow" error message has no function. If the sample gas flows to an exhaust gas line, you must note the following: • The flow resistance in the exhaust gas line should be kept as low as possible with a line as short as possible or with a large diameter junction. • The exhaust gas line must be free of rapid pressure fluctuations. If this is not the case, either a special exhaust gas line must be installed, or a damping vessel (> 1 l) with restrictor must be installed between the device and exhaust gas line (pneumatic low pass).

3.3.1.2 Reference gas line

The connection stems for the reference gas has a pipe diameter of 6 mm or 1/4".

The reference gas line must be as short as possible and have a small cross-section.

If you use N_2 or O_2 as a reference gas, you must use a metal pipe as the supply line. If air is used as the reference gas, it is recommended to install a dryer attachment in the intake to avoid volume errors in comparison to the gas side that can be caused by air humidity.

If you subsequently convert the device to a different reference gas supply, ensure that only trained service personnel perform the replacement work for the connector stems and the reference gas restrictor.

3.3.1.3 Pressure sensor

The device has an internal pressure sensor for correcting the effect of pressure on the measured value.

It is firmly mounted in the analyzer unit and directly measures sample gas pressure through the reference gas supply. The pressure sensor is therefore not involved in the installation.

3.3.1.4 Gas preparation

To prevent contamination of parts from contact with the sample gas, which can thus influence the measurement, the sample gas must be sufficiently prepared before it is introduced in the device.

The following components are usually located upstream from the sample gas inlet of the device:

- Gas sampling device
- Sample gas cooler
- Filter
- A gas suction pump

Depending on the composition of the sample gas, you may need additional equipment such as a wash bottle, additional filters and pressure reducers.

Also provide for the removal of corrosive components or components that interfere with the measurement process by using appropriate absorption filters.

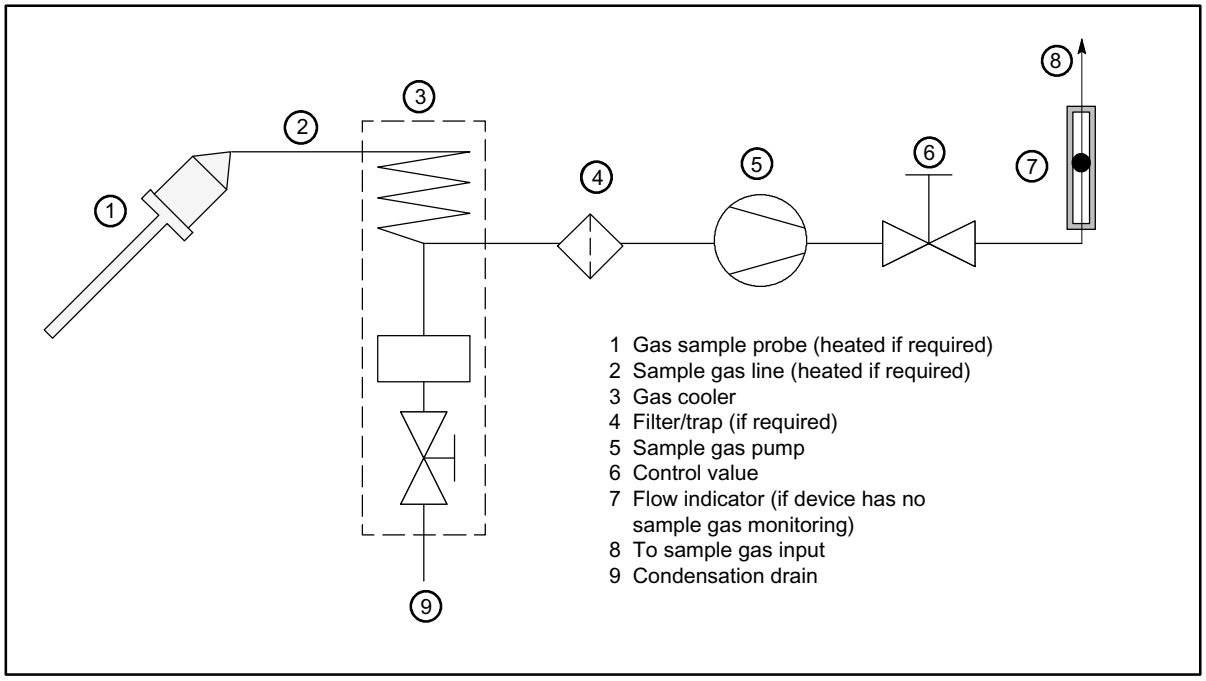


Figure 3-2 Example of gas preparation

3.3.1.5 Gas flow diagram

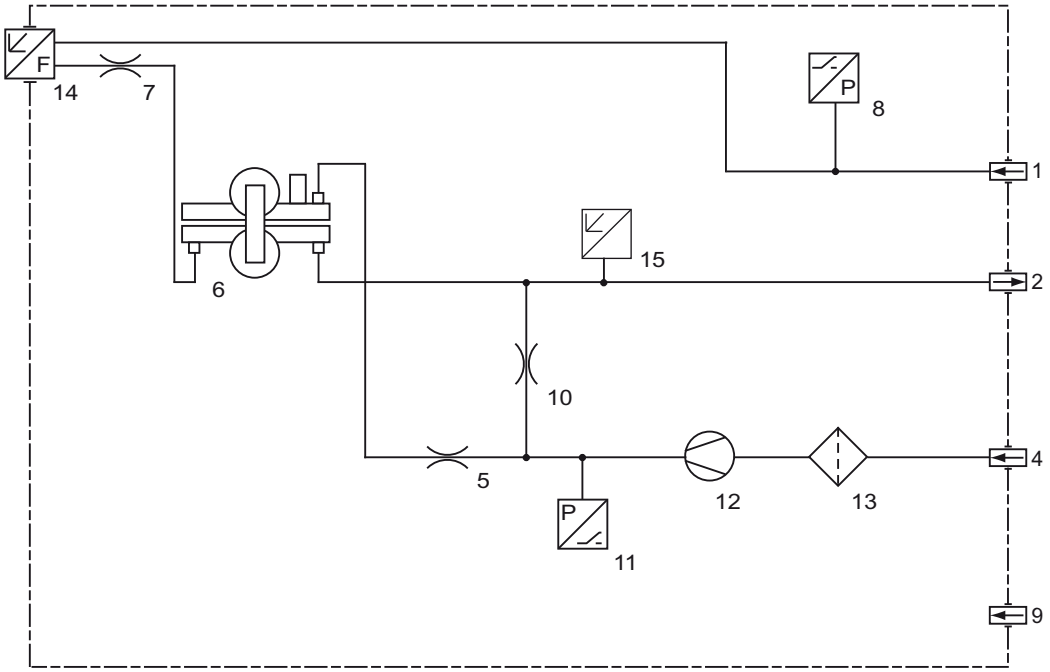


Figure 3-3 Gas path OXYMAT 61 with installed reference gas pump

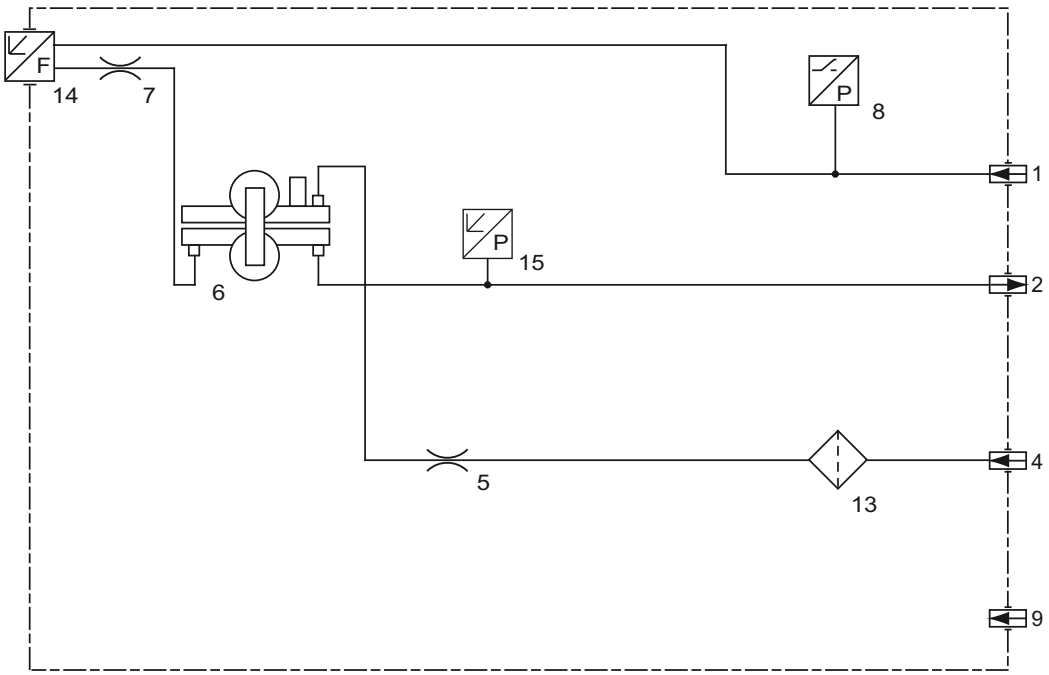


Figure 3-4 OXYMAT 61 gas channel, with reference gas connection 3 000 to 5 000 hPa absolute

Key for gas flow diagrams			
1	Sample gas inlet	9	Purging gas
2	Sample gas outlet	10	Restrictor in reference gas channel (outlet)
3	n.c.	11	Pressure switch for reference gas monitoring
4	Reference gas inlet	12	Pump
5	Restrictor in reference gas channel	13	Filter
6	Analyzer section	14	Flow indicator in sample gas channel (optional)
7	Restrictor in sample gas channel	15	Pressure sensor
8	Pressure switch in sample gas channel (option)		

3.3.2 Electrical connections

3.3.2.1 Mains connection

⚠ WARNING

Dangerous contact voltage

Danger of electric shock in case of incorrect connection.

- For the electrical connection specifications, refer to the information in Chapter "Technical specifications (Page 123)".
- At the mounting location of the device observe the applicable directives and laws for installation of electrical power installations with rated voltages below 1000 V.

- 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 ≥ 1 mm². 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.

3.3.2.2 Connection of the signal cables

⚠ WARNING

Inadequate signal lines

If signals (e.g. 4 to 20 mA analog output) are to be introduced into a hazardous area of zone 1, they must be intrinsically-safe. Additional upgrading or retrofitting of the device with energy-limiting modules is also required in this case.

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

The Ex marking of these energy-limiting modules must be clearly visibly on the device.

⚠ WARNING

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

- The connection lines to the relay outputs, the digital inputs, the analog inputs and the analog outputs must be shielded.
- The reference ground of the analog inputs is the potential of the housing.
- The analog output is floating.

- 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 be sized according to the following rule of thumb:
  $R\ [\Omega] \approx 0.2 \times R_L\ [\Omega]$; $C[\mu F] \approx I_L\ [A]$
  You must also use a non-polarized capacitor for the RC element.

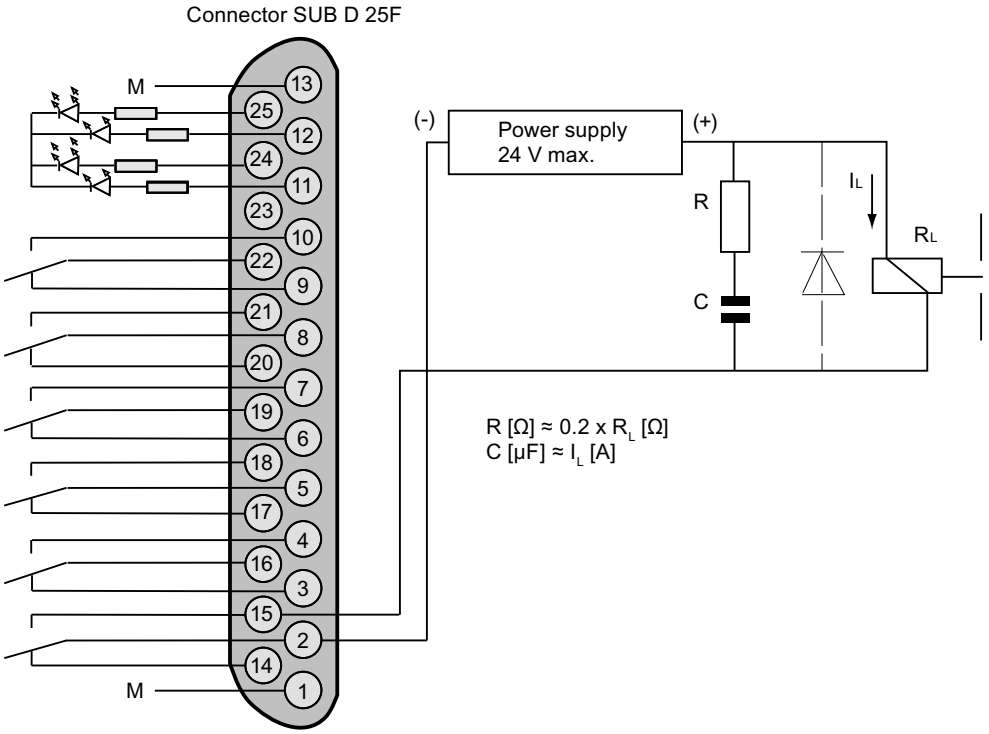


Figure 3-5 Example of spark suppression on a relay contact

When operated with direct current, a spark suppression diode can be installed instead of the RC element.

- Connect the signal lines to the SUB-D plug connectors at the rear of the device.
- Refer to the ELAN interface description (Order No. C79000-B5200-C176 German, C79000-B5276-C176 English) for details on the interface cable.

3.3.2.3 Pin assignments

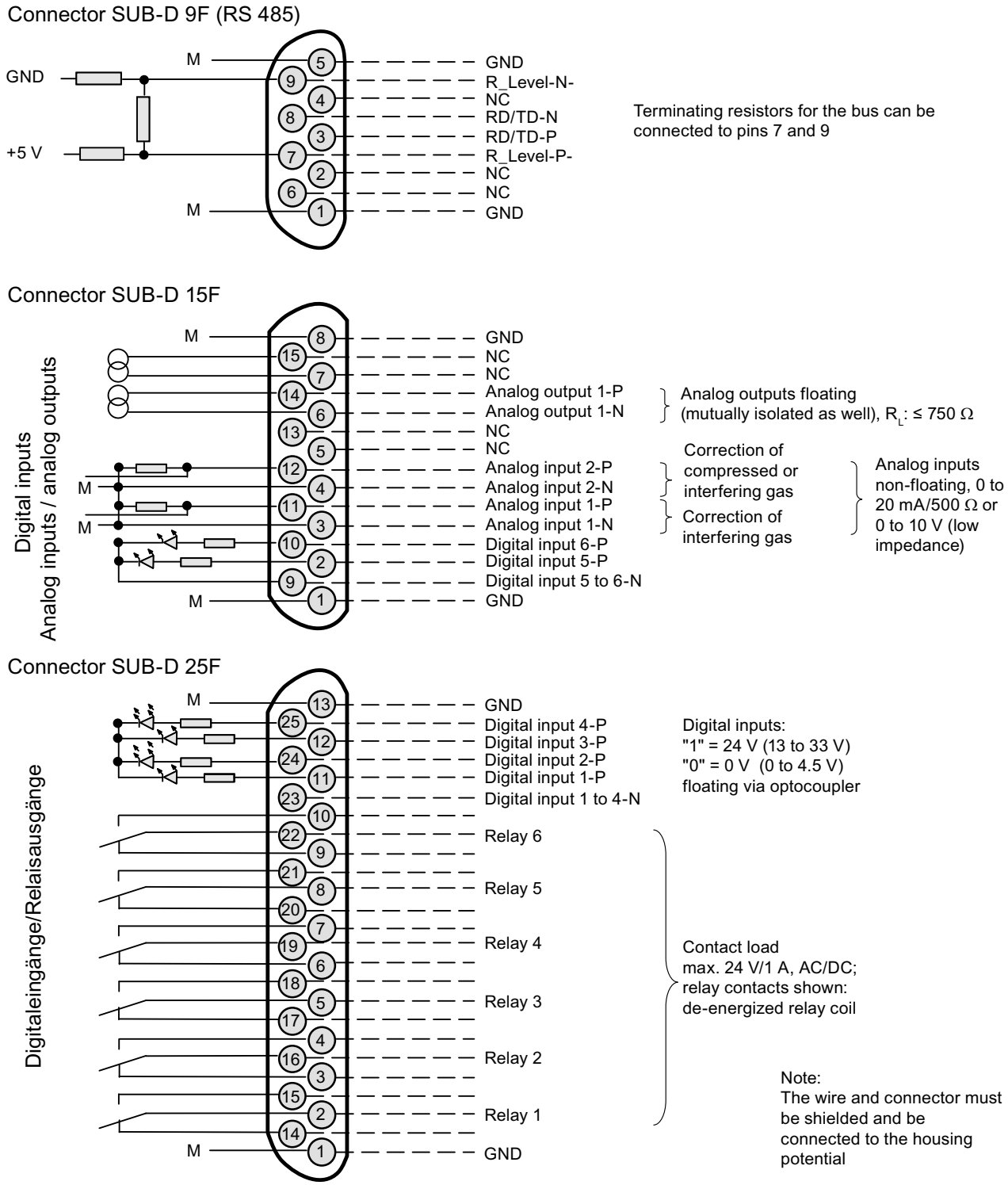


Figure 3-6 Motherboard pin assignments

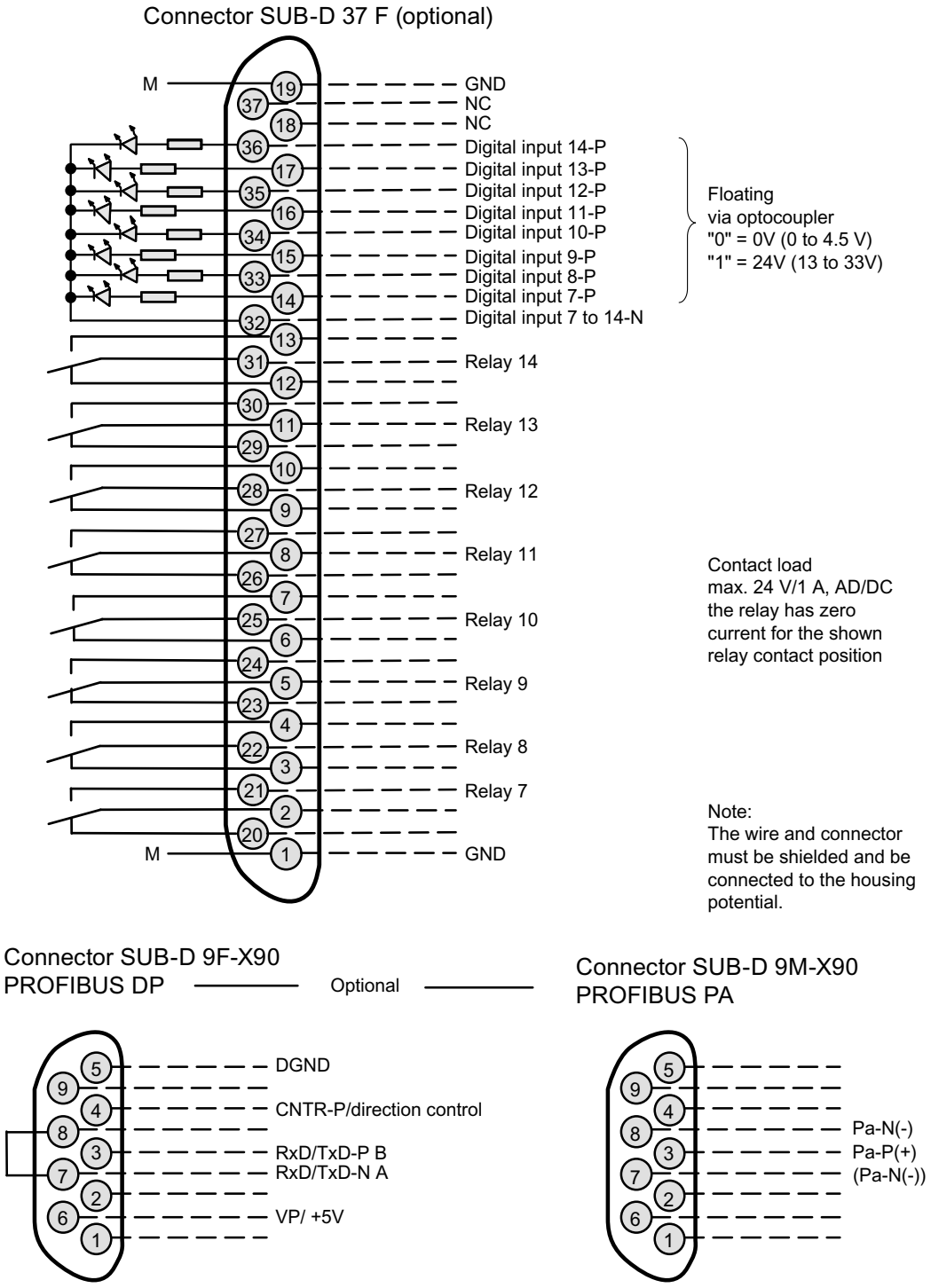


Figure 3-7 Pin assignments of the add-on board

3.4 Example of AUTOCAL connection

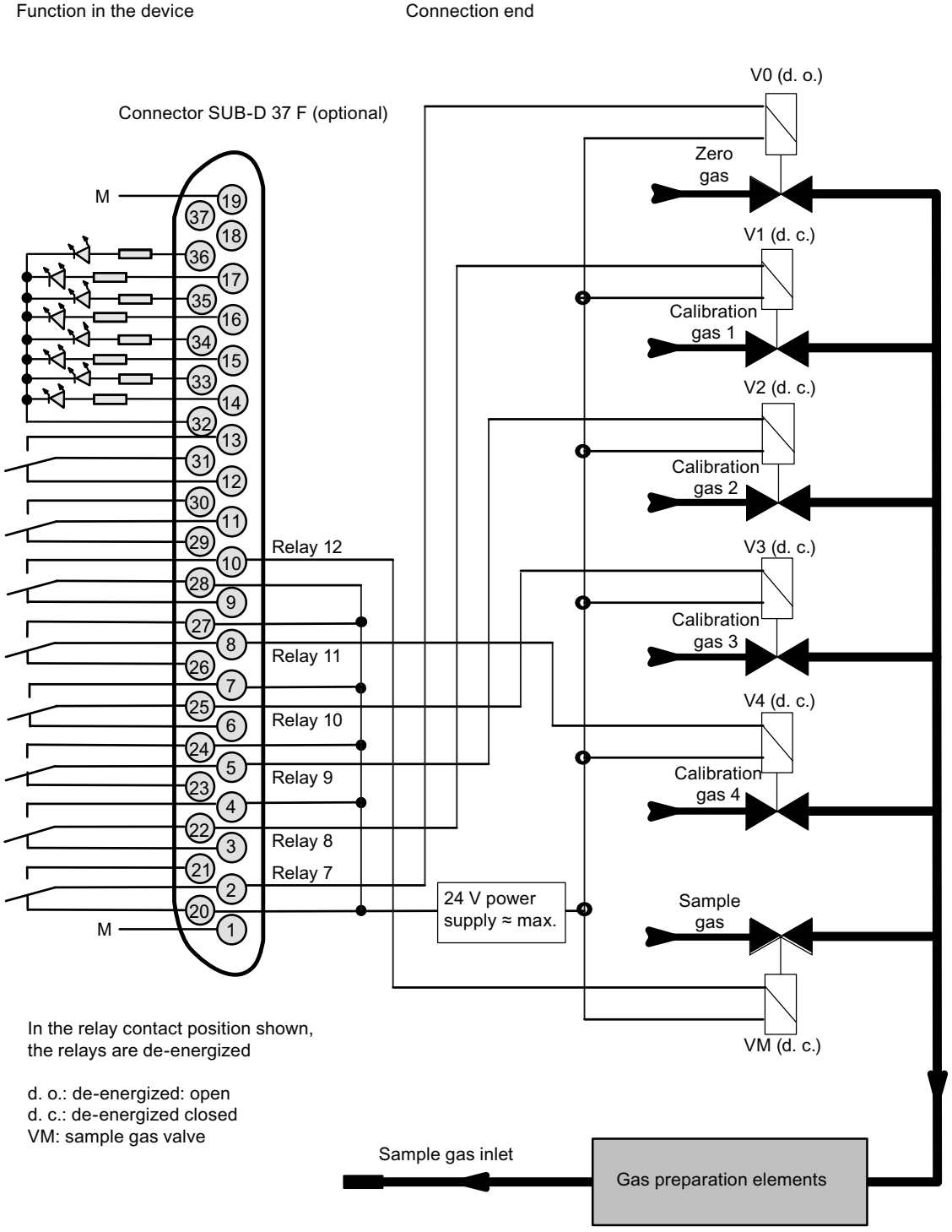


Figure 3-8 Connector pin assignment and valve diagram of an AUTOCAL connection

Commissioning

4

4.1 Safety instructions

⚠ DANGER

Explosion hazard

The analyzer must not be operated in potentially explosive atmospheres. The supply of gases with combustible components in concentrations above the lower explosive limit (LEL) must be clarified in consultation with the relevant hazard experts and is ultimately the responsibility of the operator.

⚠ WARNING

Dangerous contact voltage

Certain parts of this device are under dangerous voltage. In order to avoid contact with live parts, the housing must be closed and grounded upon completion of all assembly and installation work.

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

⚠ WARNING

Release of hazardous gases

Gases may be released if there are leaks in the sample gas channel. For this reason, toxic and corrosive gases are not allowed to be be measured with this device.

Failure to comply with this can result in death, personal injury as well as damage to property and the environment.

4.2 Preparation for commissioning

4.2.1 General information

Gas preparation

Make all devices in the gas channel upstream from the analyzer ready for operation (e.g.: gas sampling devices, gas cooling device, condensate vessels, filters and any connected controllers, recorders or indicators.

Read carefully the instructions and information in the operation manuals of the devices!

Operation

Before switching on the device, familiarize yourself with its operation (see section 5 of this manual)!

Interfaces

Make sure that all interfaces are properly assigned and configured.

Electrical connections

Make sure that all electrical connections have been correctly made. Read also the information in the "Electric connection" section.

4.2.2 Selection of the reference gas

When you select the reference gas, you must ensure that the various measurement spans have at least one common point. This point is then defined as 'physical zero point'. This applies to all measuring ranges. Once this point is known, the reference gas can be selected.

This is explained by the following example:

There are four measuring ranges:

- 17 - 22 % O_2
- 15 - 25 % O_2
- 0 - 25 % O_2
- 0 -100 % O_2

These four measurement ranged have the spans from 17 to 22 % O_2 in common. The physical zero point should lie within this range. Air (20.95 % O_2%) is suitable as the reference gas in this case.

An exception to this principle is possible if the smallest measuring span ≥5 % O_2 and the distance to the reference gas is not more than 20 % O_2. Then, the physical zero point may be located outside the measuring range. In this case, however, the pressure correction (see Function 82 in section 5) must be activated, since there a pressure relationship due to the large zero point offset.

The purity of the reference gas has to be appropriate for the measuring task.

Installing the reference gas connection

The reference gas connection is made depending on the order:

- Air (low pressure variant)
  Air as the reference gas is sucked in with the internal pump. When the analyzer is mounted in a cabinet, you must therefore ensure that the air sucked in is supplied from outside the cabinet.
- Nitrogen, oxygen, air (high pressure variant)
  Pay attention to the purity of the gas (4.6)!
  The supply is here comes from a compressed gas cylinder with a pressure setting of 2000 to 4000 hPa over the sample gas pressure. A sintered metal frit (porous filter) is in the coupling to prevent entry of dirt particles into the analyzer.

Introducing reference gas

Always introduce the reference gas before beginning the measurements. Reference gas should always continue to flow even if the measurements are temporarily interrupted. The increased consumption caused by this is negligible when compared to reference gas line is sealed.

Compressed gas cylinder

If the reference gas is taken from a compressed gas cylinder, the reference gas line must be purged prior to commissioning. You must then check the line for leaks, because leakage losses are often greater than the reference gas consumption. To do this, close the valve at the compressed gas cylinder. If the pressure indicator at the reducer value of the gas cylinder does not drop by more than 1000 hPa/min, the gas connection is sufficiently sealed. The reference gas pressure must always be 2000 hPa or more above the sample gas pressure.

Checking the reference gas flow

To do this, proceed as follows:

1. Close the sample gas inlet couplings.
2. Lay a hose with an internal diameter of 4 mm from the sample gas outlet nozzle into a beaker filled with water.
3. Observe the glass.
   The reference gas must be slow with 1 to 2 bubbles per second coming through the water.

Checking for leaks in the sample gas channel with hosed devices

To do this, proceed as follows:

1. Close the reference gas connection.
2. Establish a pressure of approx. 100 hPa in the sample gas channel.
3. Wait about 1 minute.
   During this time, the inflowing sample gas will adapt to the ambient temperature.
4. Note the pressure.
5. Wait another 15 minutes.
6. Note the pressure again.
   The sample gas channel is sufficiently tight when the pressure has changed by no more than 1 hPa (1 mbar) within these 15 minutes.

4.2.3 Initial commissioning

Switch on the power supply

After you have ensured that all connections have been made and there are no leaks, switch on the device. After a short period, the measured value display appears on the operator display. The status display is located above this in the top row (for details on the operator display see section 5.1).

The measuring head is in the warm-up phase during the first five minutes. During this time, the display signals CTRL (function check).

Setting the measuring span

Specify the desired spans (measuring range full-scale value - measuring range start-of-scale value) with function 41. The start-of-scale or full-scale values are assigned to the 0(2/4) or 20 mA of the analog output.

If you define multiple measurement ranges; we recommend that you set measurement range 1 for the smallest measuring span (MS)etc. In general, the following applies then:
MS1 < MS2 < MS3 < MS4

Setting the physical zero point

If the composition of test and reference gas are identical, their O_2 difference is therefore zero and there is no measuring signal. We refer to this as the physical zero point. Depending on the reference gas, the physical zero point may therefore have any value between 0 and 100 % O_2. The setpoint of the physical zero point is specified under function 22.

Setting the setpoint of the sensitivity

The setpoints of the sensitivity must be as far from the physical zero point as possible (at least 60 % of the respective measuring span). The setpoint or setpoints are entered with function 22. The calibration gases required for this must be made available for the adjustment.

Selecting the calibration method

Set the calibration mode to total or single calibration using either function 23 or 52.

- Single calibration means that each measuring range is calibrated using its own calibration gas.
- Total calibration means that you adjust one "leading measuring range" and all other measuring ranges are "tracked" to this using the switching ratio.

When performing the calibration, ensure that the gas flows between 0.3 l/min and 1 l/min.

Calibrating the zero point

The physical zero point is calibrated with function 20. It is applied to all configured measuring ranges.

Calibrating sensitivity

The sensitivity is calibrated with function 21.

Compensating the effect of temperature

The compensation of the temperature effect is stored permanently in the software (firmware) for the OXYMAT 61. No further actions are required for this.

Noise suppression

Noise in the measured signal can be suppressed using function 50. This function allows you to configure a low pass filter, which is assigned a time constant of maximum 100 s.

4.2.4 Calibration examples

The following examples reflect typical applications for the OXYMAT 61.

O_2 monitoring in gases

Measurement task: Measurement of oxygen in N_2.
Measuring range: 0 to 5 % O_2; Reference gas: N_2; Calibration gas: 4.7 % O_2

Procedure	Function no.	Input	Remarks
Selection of measuring range start-of-scale value	41	0	0 ⇒ 0(2/4) mA
Selection of measuring range full-scale value	41	5	5 ⇒ 20 mA
Specification of the setpoint for the physical zero point	22	0	Setpoint for physical zero point
Specification of the setpoint for the sensitivity	22	4.7	Setpoint for sensitivity
Start zero point calibration	20		Introduce N_2
Start sensitivity calibration	21		Introduce calibration gas

Room air monitoring

Measuring range: 15 to 21 % O_2; Reference gas: Air (20.95 % O_2); Calibration gas:15.3 % O_2

Procedure	Function no.	Input	Remarks
Selection of measuring range start-of-scale value	41	15	15 ⇒ 0(2/4) mA
Selection of measuring range full-scale value	41	21	21 ⇒ 20 mA
Specification of the setpoint for the physical zero point	22	20.95	Setpoint for physical zero point
Specification of the setpoint for the sensitivity	22	15.3	Setpoint for sensitivity
Start zero point calibration	20		Introduce air
Start sensitivity calibration	21		Introduce calibration gas

O_2 measurement in flue gas

Measuring range: 0 to 10 % O_2; Reference gas: Air; Calibration gas: N_2

NOTICE
Reference gas out of range In this example, the O_2 content of the reference gas is not within the measuring range of up to 10 % O_2. Since the measuring span is greater than 5 %, however, an exception can be made in the selection of the reference gas. In this case, the pressure correction must be necessarily activated (see also Function 82 in section 5)!

Procedure	Function no.	Input	Remarks
Selection of measuring range start-of-scale value	41	0	0 ⇒ 0(2/4) mA
Selection of measuring range full-scale value	41	10	10 ⇒ 20 mA
Specification of the setpoint for the physical zero point	22	20.95	Setpoint for physical zero point
Specification of the setpoint for the sensitivity	22	0	Setpoint for sensitivity
Start zero point calibration	20		Introduce air
Start sensitivity calibration	21		Introduce N_2

Purity monitoring of oxygen

Measuring range: 95 to 100 % O_2; Reference gas: Pure O_2; Calibration gas: 95.6 % O_2

Procedure	Function no.	Input	Remarks
Selection of measuring range start-of-scale value	41	95	95 ⇒ 0(2/4) mA
Selection of measuring range full-scale value	41	100	100 ⇒ 20 mA
Specification of the setpoint for the physical zero point	22	100	Setpoint for physical zero point
Specification of the setpoint for the sensitivity	22	95.6	Setpoint for sensitivity
Start zero point calibration	20		Introduce pure O_2 (100 %)
Start sensitivity calibration	21		Introduce calibration gas

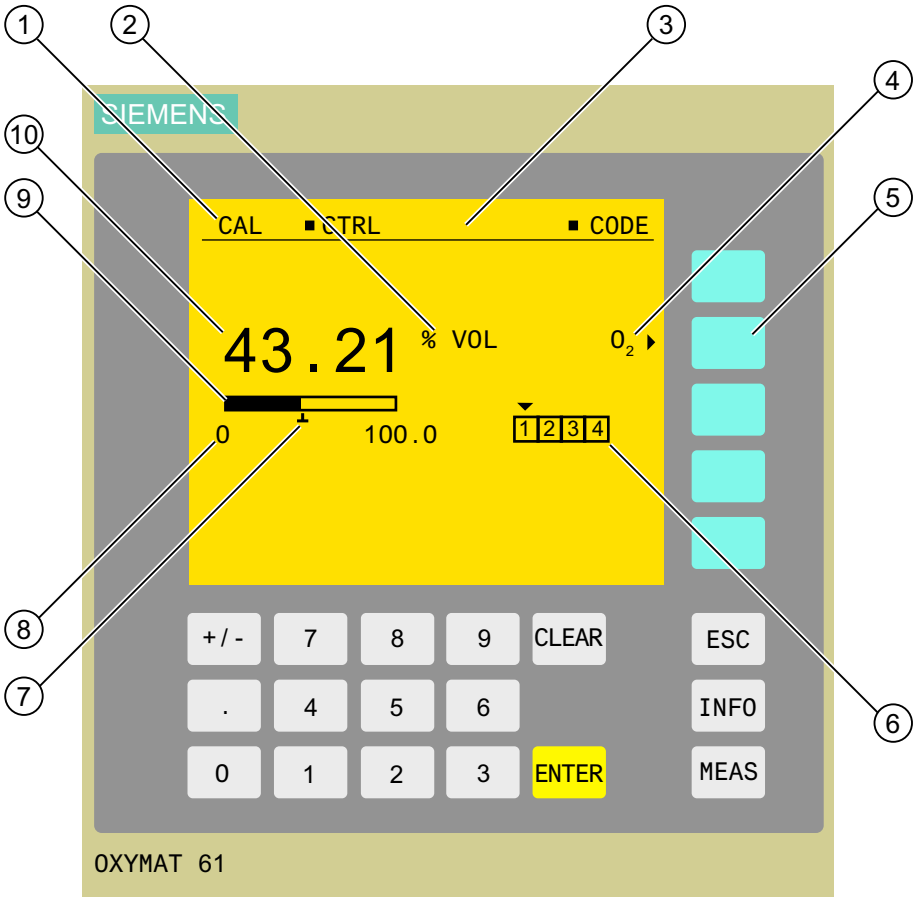
Detailed operating instructions for performing all the required testing functions are provided in section 5 (Operation).

Operation

5

5.1 General information

5.1.1 Measured value display and control panel



1 Status display
2 Display of dimension
3 Status line (can be programmed under function 53)
4 Display of measured component
5 Buttons with varying function (softkeys)
6 Display of activated measuring ranges with the current range marked
7 Limit marker on bargraph
8 Start-of-scale and full-scale values
9 Analog measured value display (bar chart, graph of the measured value with the start-of-scale and full-scale value of the current measuring range)
10 Measured value

Figure 5-1 Measured value display and control panel

Table 5- 1 Button meanings

Button	Meaning/function
CLEAR	Clears the commenced 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 • ON/OFF switch function

5.1.2 Device operating modes

Table 5- 2 Device 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 mode 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 mode. 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 mode 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 configure/calibrate the device.

Schematic diagram of the operating sequence with operating modes

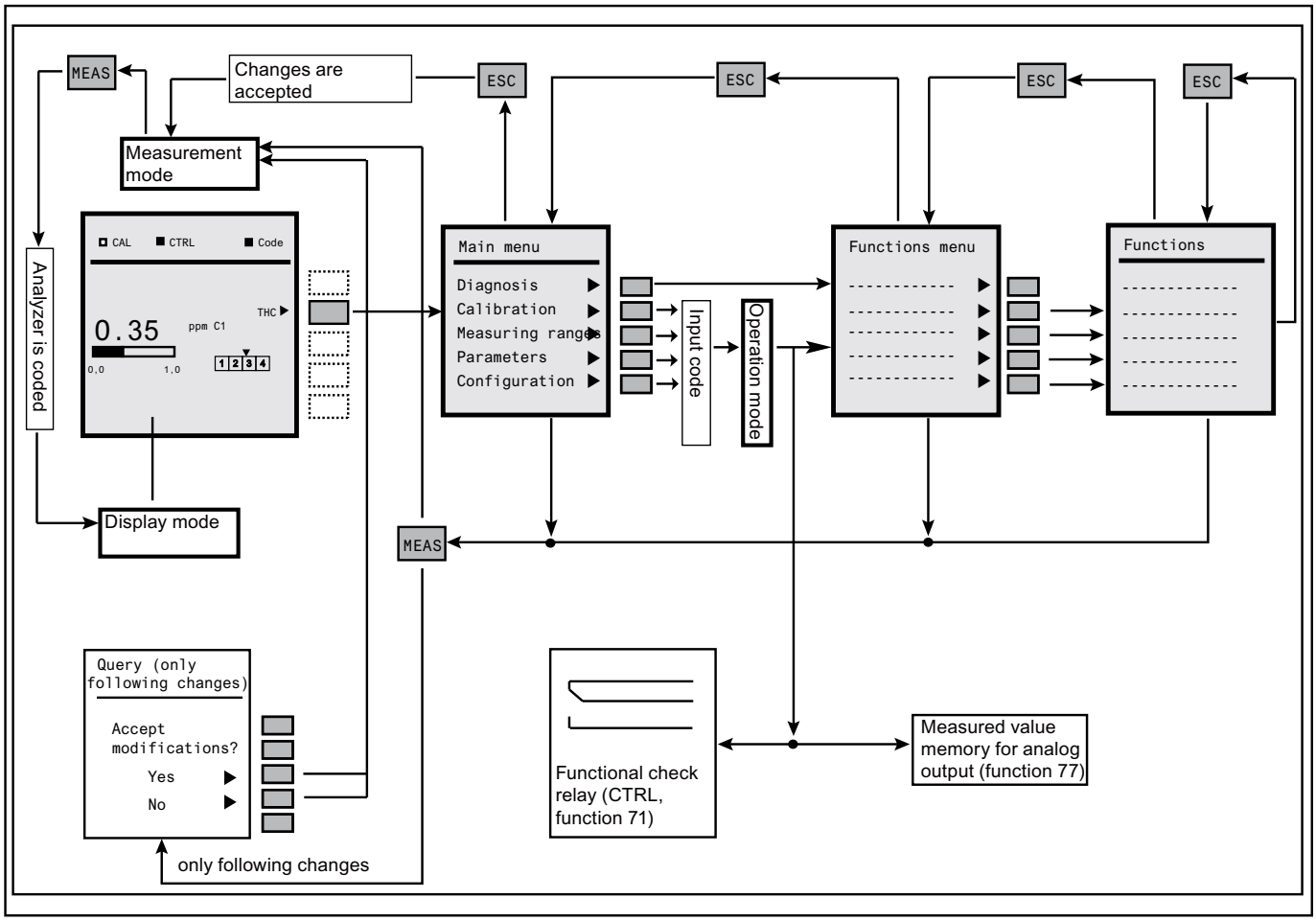


Figure 5-2 Operating sequence with operating modes

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 Operating sequence

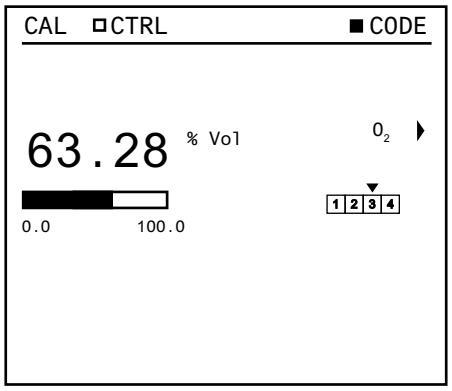


Figure 5-3 Measured value display

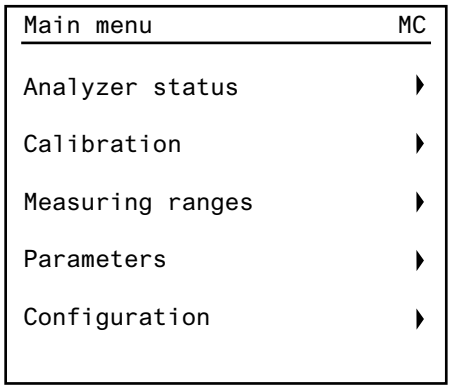
5.1.4.1 Introduction to the main menu

The device must be in measuring mode. The right side of the display field shows the measured component, which is indicated with "MC" in the following illustrations of the display. A right arrow [►] appears for it. This arrow indicates a softkey. The main menu can be opened by pressing this softkey.

The main menu consists of the following commands (with the associated code level on the right):

Function group	Code level
Analyzer status	Not coded
Calibration	Code of code level 1
Measuring ranges	Code of code level 1
Parameter	Code of code level 1
Configuration	Code of code level 2

The code of level 1 is factory set to "111", that of level 2 is factory set to "222".



5.1.4.2 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 configured this 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".

5.1.4.3 Returning to display mode

You can use the [MEAS] key to jump back to "Decoded display mode" from any location in "Operator control mode". Any input started is aborted.

Before jumping back, the following query appears:

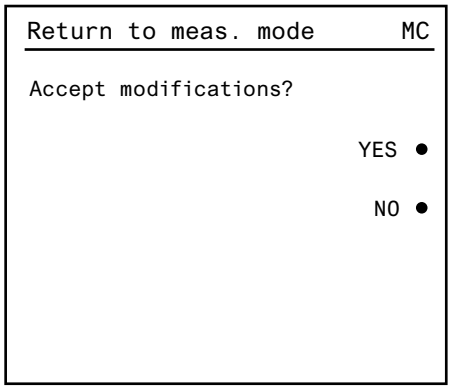


Figure 5-4 Query before jumping back

- 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".

By pressing the [ESC] brings you back to the most recent 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 function check once again deactivated and all states invoked by the decoding are released again.

5.1.4.4 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.

5.1.5 Overview of operating functions

The following overview is a list of the device functions.

This list corresponds to software version 4.

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	Calibration settings (Total, Single)
	24	AUTOCAL
	25	Drift values
Measuring ranges (code 1)	40	Select measuring ranges
	41	Define measuring ranges
Parameters (code 1)	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
	57	Magnetic field frequency
	58	Date/time
	59	Measuring-point switchover
	60	Logbook settings
Configuration (code 2)	70	Analog output
	71	Relay assignment
	72	Digital inputs
	73	ELAN configuration
	74	Reset
	75	Save, load data
	76	Suppress short noise signals
	77	Measured value memory (analog output)
	78	Calibration tolerance
	79	Change codes
	80	Analyzer test
	81	Select language
	82	Pressure correction
	83	Correction of cross-interference
	84	Phase adjust
	85	Switch valves
	86	Linear temperature compensation
	87	Faults on/off
	90	PROFIBUS configuration

Overview of operating functions

5.2 Analyzer status

After selecting the diagnostic functions in the main menu by pressing the first (top) softkey ('Analyzer status'), the following menu screen appears with additional choices.

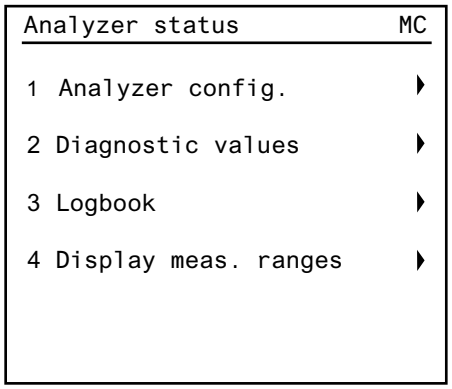


Figure 5-5 Analyzer status submenu

The analyzer status functions are freely accessible. There is therefore 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.

5.2.1 Analyzer configuration (function 1)

When this function is selected, important device manufacturing data can be viewed:

- Firmware No.

  Order No. of the software in the EPROM
- 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 and date

  Indication of the functional scope of the device

5.2.2 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.

5.2.3 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 cyclic 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 to the ELAN interface, the analog output and the relay output.

5.2.4 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.

5.3 Calibration

After selecting the calibration functions in the main menu by pressing the second softkey ('Calibration'), the following menu screen appears with additional choices.

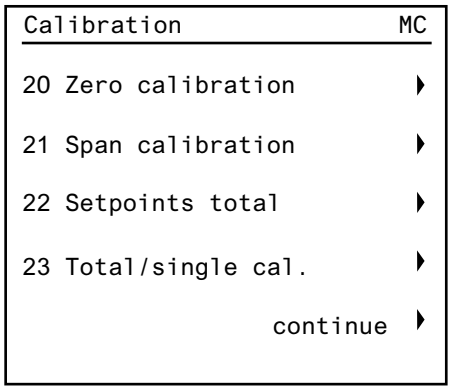


Figure 5-6 Calibration submenu

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

You can calibrate the device using the functions available in this menu. If the function you are looking for is not included in this overview, press the fifth softkey "...Continue" to go to other functions.

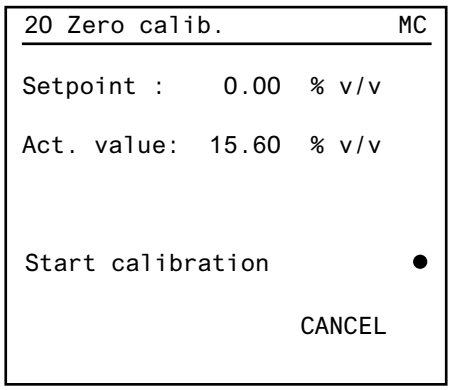
The device allows you to perform calibration manually or automatically (function 24). The latter is only possible with an add-on board, which contains eight additional digital inputs and eight relay outputs.

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

The drift values are set with function 25, the single or total calibration with function 23.

Following the selection of functions 20 and 21, the required gases must be introduced manually.

5.3.1 Calibration of the zero point (function 20)



Zero calibration

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

The zero point 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 or the measured value is unstable over time, increase the time constant before calibrating (function 50).

5.3.2 Span calibration (function 21)

A single or total calibration is carried out depending on the setting made with function 23. This function is specific for the component.

Single calibration ("Measure" operating mode required)

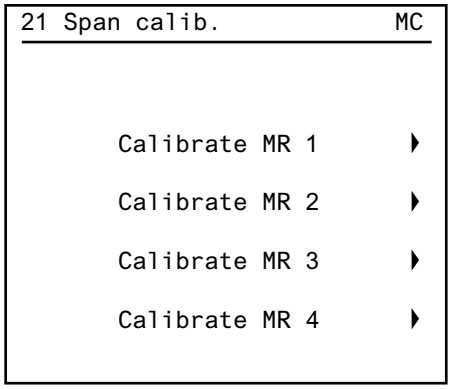


Figure 5-7 Carry out single calibration

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

The display will show then number of measuring ranges that were set using function 41. The function screen above is therefore an example of the single calibration of four measuring ranges.

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

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

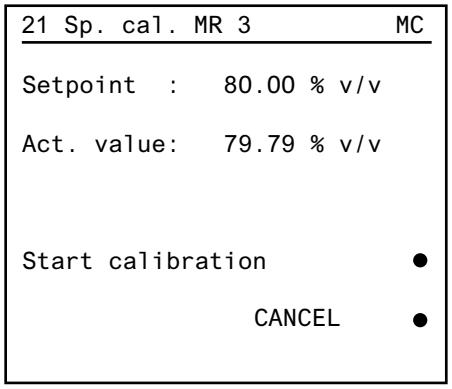


Figure 5-8 Calibrating the measuring range (single calibration)

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 you make a mistake during the calibration (e.g. wrong calibration gas), reload the original calibration by pressing the "Cancel calibration" softkey.

Total calibration ("Measure" operating mode 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.

After selecting this function, the display shows the setpoint and the current value of the "leading" measuring range.

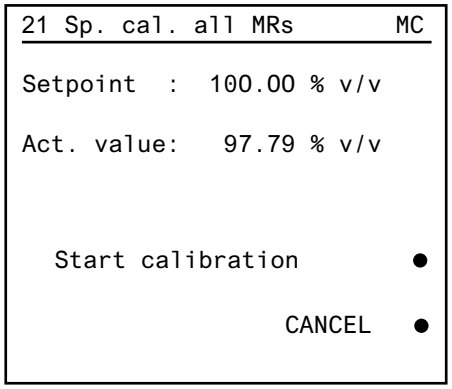


Figure 5-9 Calibrating the measuring range (total calibration)

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 you make a mistake during the calibration (e.g. wrong calibration gas), reload the original calibration by pressing the "CANCEL" softkey.

Note

Measuring accuracy

With a switching ratio of the spans of more than 1:10, an individual calibration should be carried out for each range to achieve a higher measuring accuracy.

5.3.3 Zero/span setpoints (function 22)

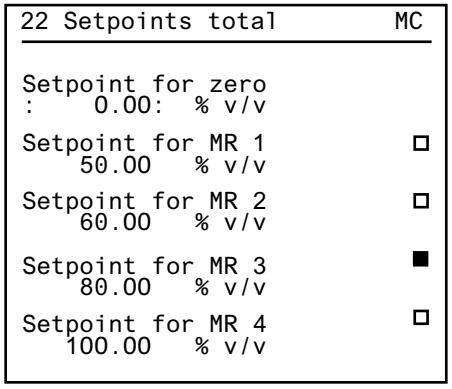


Figure 5-10 Setting the setpoints

The function display 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.

5.3.4 Calibration setting (function 23)

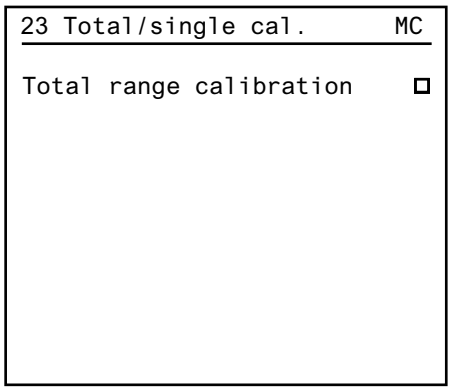


Figure 5-11 Select calibration method

With this function, select between 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 the total calibration is not activated, as shown here on the function display, you must calibrate every measuring range individually.

5.3.5 AUTOCAL (function 24)

Note

You can only make use of automatic calibration (AUTOCAL) if your device contains additional electronics (add-on board). If it does not, 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 mode!

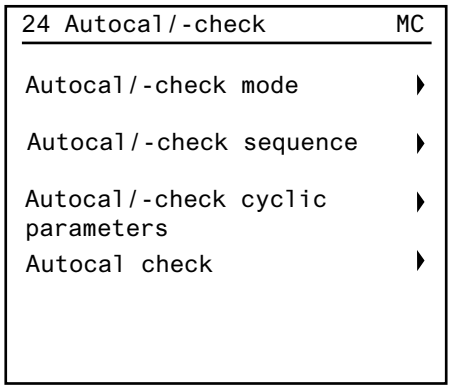


Figure 5-12 AUTOCAL function

Note

The settings for "Acal/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.

AUTOCAL/Check operating mode

With this AUTOCAL function, you configure various AUTOCAL operating modes.

The AUTOCAL Check is only for checking the calibrations. As with AUTOCAL, the device executes the sequence configured in subfunction *"AUTOCAL/Check sequence"*. In contrast to AUTOCAL, no new calibrations are performed; only the deviations are checked with respect to selectable calibration tolerances.

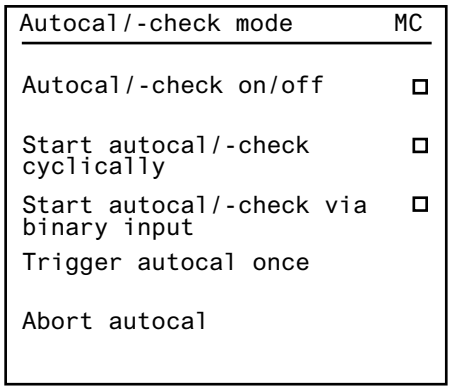


Figure 5-13 AUTOCAL/Check operating modes

"AUTOCAL/Check on/off":

During the state *"AUTOCAL off"* (shown as: "□"), the settings on the switch *"AUTOCAL start cyclically (parameter)"* and *"AUTOCAL start via digital input"* do not have an effect on the device. *"Trigger AUTOCAL once"* cannot be selected. A previously set cycle time continues to run, but without triggering automatic calibration.

"AUTOCAL/Check start cyclically":

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

"AUTOCAL/Check start via digital input":

If you previously configured a digital input using function 72, you can initiate AUTOCAL via a digital input.

The *"AUTOCAL start via cycle parameter"* and "*AUTOCAL start via digital input*" operating modes can be activated simultaneously in order e.g. to verify a weekly calibration and control this check via a digital input.

"Trigger AUTOCAL once"

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

After the initial trigger, 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

The AUTOCAL sequence is configured in this submenu.

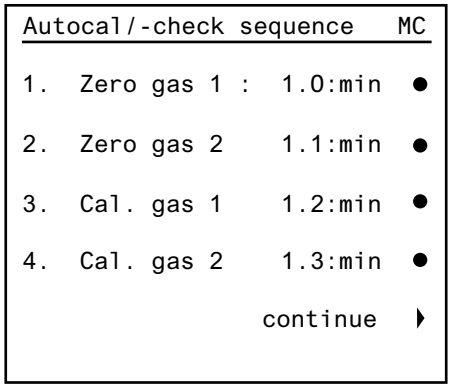


Figure 5-14 AUTOCAL/Check sequence

A AUTOCAL can be composed of up to 12 individual steps.

Besides the supply of one zero gas and up to four calibration gases per component, you can also program purging with sample gas, sample gas intermediate operation, as well as a signaling contact. The signaling contact is only available if you have previously assigned 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 sum of the required purge times are greater than the permissible downtime, you must return to the measuring mode between the individual 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: 15 minutes
2. Calibration with calibration gas 1: 10 minutes
3. Purging with sample gas: 8 minutes
4. Sample gas intermediate operation: 30 minutes
5. Calibration with calibration gas 2: 5 minutes
6. Calibration with calibration gas 3: 8 minutes
7. Calibration with calibration gas 4: 11 minutes
8. Purging with sample gas: 8 minutes
9. Short-term signaling contact in order to be able to start AUTOCAL on another device.

The specified AUTOCAL sequence is shown in the following function displays.

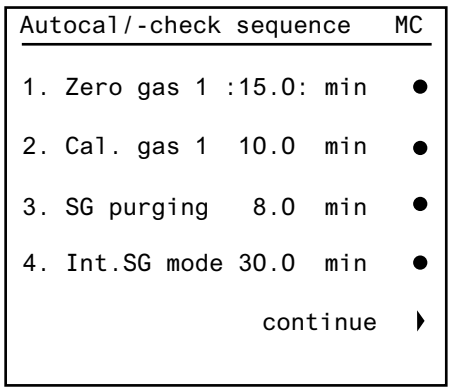


Figure 5-15 Example of AUTOCAL sequence

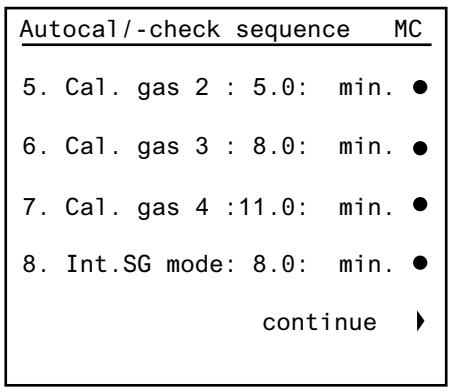


Figure 5-16 Example of AUTOCAL sequence

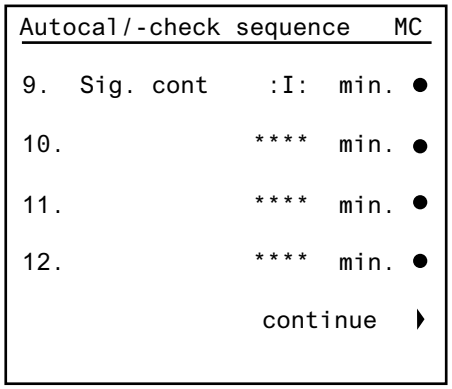


Figure 5-17 Example of AUTOCAL sequence

List for the AUTOCAL sequence:

Step	AUTOCAL sequence
Zero gas 1	Function code 1
Zero gas 2	Function code 2
Calibration gas 1	Function code 3
Calibration gas 2	Function code 4
Calibration gas 3	Function code 5
Calibration gas 4	Function code 6
Flush sample gas	Function code 7
Sample gas intermediate operation	Function code 8
Signaling contact	Function code 9

AUTOCAL/Check cycle parameters

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

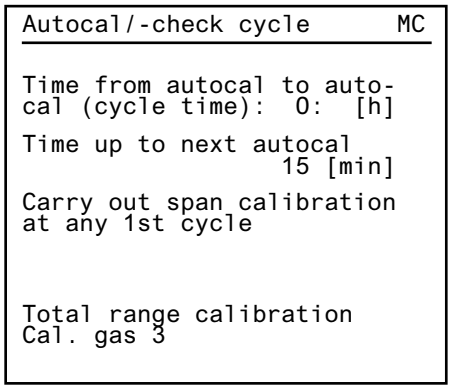


Figure 5-18 AUTOCAL/Check cycle parameters

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

Any setting between 0 and 1 000 (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"* subfunction, 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 starts the first time the device is switched on with the factory-set start time 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.

Information in the last two lines

The information in the last (bottom) lines indicates that specified parameters relate to total calibration with calibration gas for measuring range 3. This measuring range was selected beforehand with function 22.

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

The "AUTOCAL Check" subfunction is only used for checking the calibrations.

Similar to "AUTOCAL", sequence set in the "AUTOCAL Sequence" menu is performed. In contrast to "AUTOCAL", no new calibrations are performed; only the deviations are checked with respect to selectable calibration tolerances.

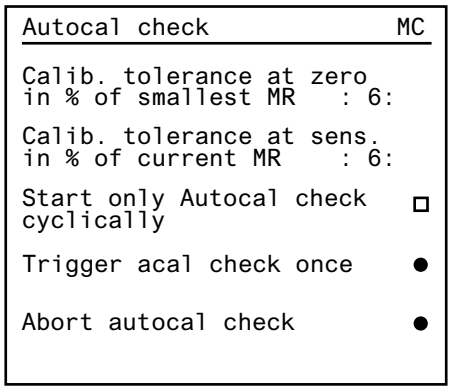


Figure 5-19 AUTOCAL Check

Functions of the AUTOCAL Check

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

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

Both will be reset again after an error-free AUTOCAL Check. 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 digital input
   - Via cycle
2. The device executes the sequence as configured in the subfunction *"Autocal/Check sequence"*.

5.3.6 Drift values (function 25)

This function shows deviations occurring for the calibrations (and AUTOCAL as well) (actual value - setpoint) as a sum parameter. All rated zero point and sensitivity calibrations of each range are calculated here for the selected measured component. Every new deviation is added to the existing drift value.

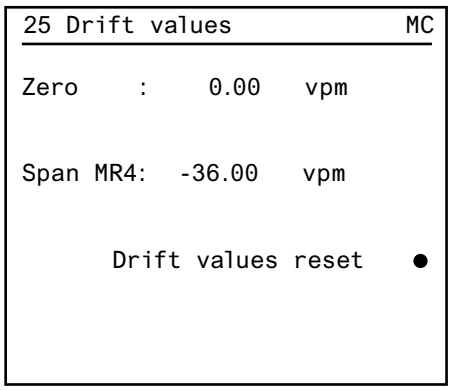


Figure 5-20 Drift values

The display of the drift values for the sensitivity calibration depends on the setting of the calibration method. If total calibration is selected here, only the selected measuring range for the sensitivity calibration is displayed. For single calibration, all measuring ranges can be individually adjusted and can therefore have different drift values, which are shown separately.

The drift values can reset to 0.0 with the 'Reset drift values' instruction. When you reboot the device all measuring ranges have 0.0 as the drift value.

5.4 Measuring ranges

After selecting the measuring range functions in the main menu, the following screen appears when the third softkey ("Measuring ranges") is pressed.

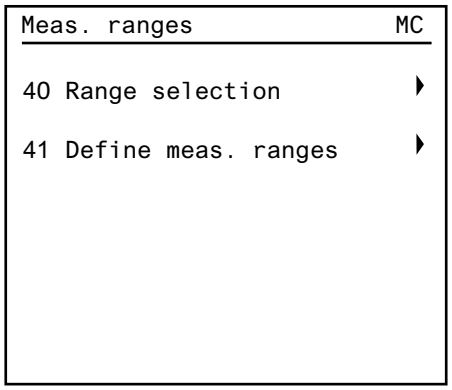


Figure 5-21 Measuring ranges submenu

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.

5.4.1 Select measuring ranges (function 40)

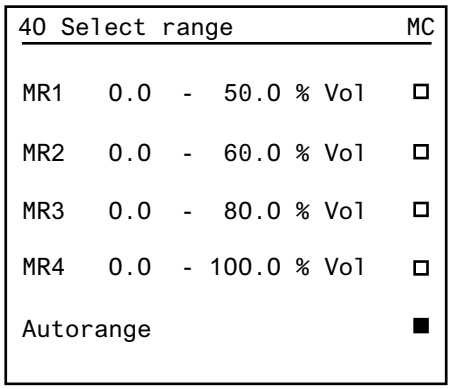


Figure 5-22 Select measuring ranges

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. A measuring range is said to be present when the following is true: Start-of-scale value ≠ full-scale value
- The measuring 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:

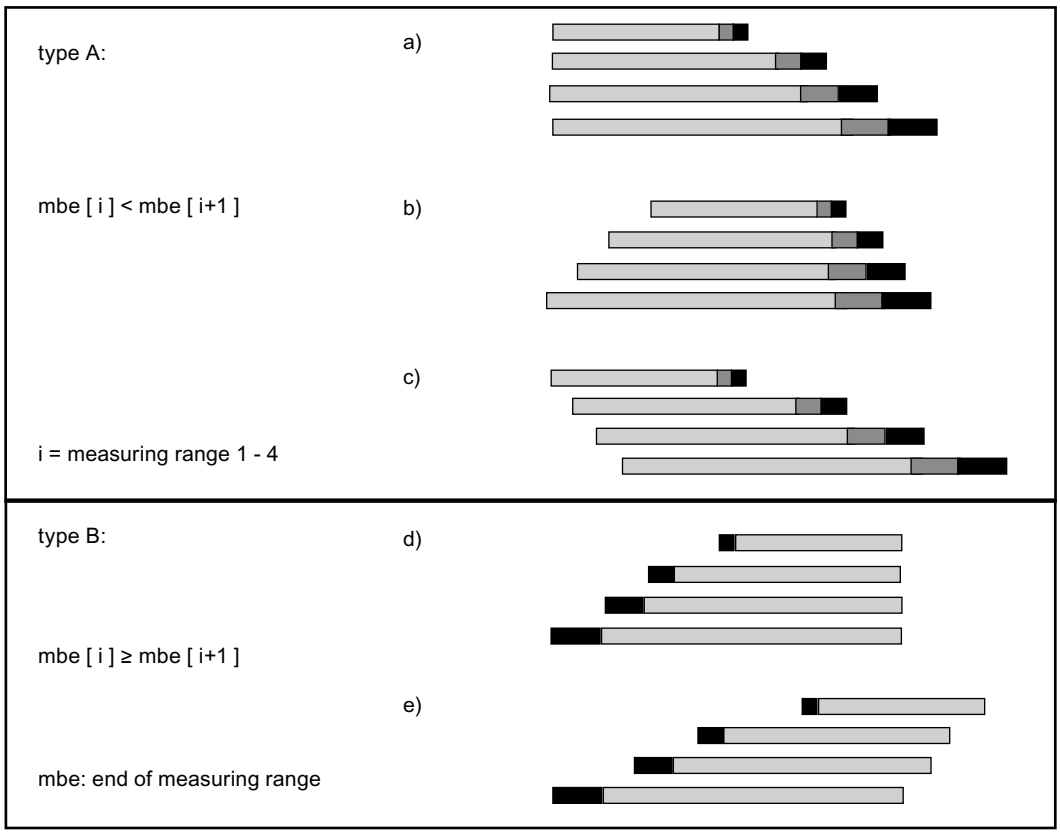
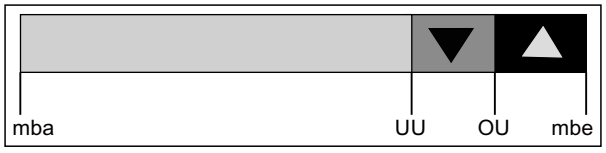


Figure 5-23 Measuring range types

Two measuring range types are distinguished:

Type A:

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



SSV Start-of-scale value
FSV Full-of-scale value
LS Low switchover point: select smaller measuring range
HS High switchover point: select larger measuring range

Figure 5-24 Measuring range type A

The following applies to measuring range switching:

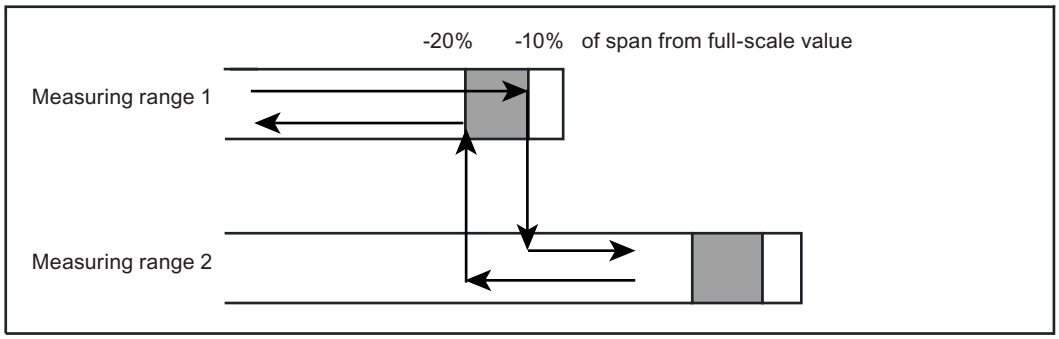
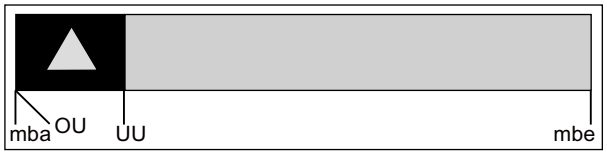


Figure 5-25 Measuring range switching, type A

When the upper switchover point (OU) is exceeded, the next larger measuring range available is selected. If the lower switchover point (UU) of the next smaller measuring range available is fallen below, this is selected. The UU lies at 80 % (HystS) 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 measuring spans must simultaneously become larger, the start-of-scale values of the following measuring ranges become continuously smaller.



SSV Start-of-scale value
FSV Full-of-scale value
LS Low switchover point: select smaller measuring range
HS High switchover point: select larger measuring range

Figure 5-26 Measuring range type B

The following applies to measuring range switching:

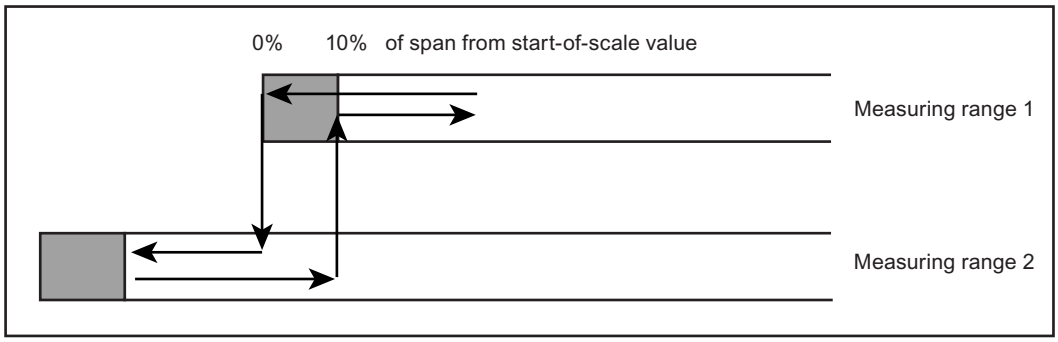


Figure 5-27 Measuring range switching, type B

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

5.4.2 Define measuring ranges (function 41)

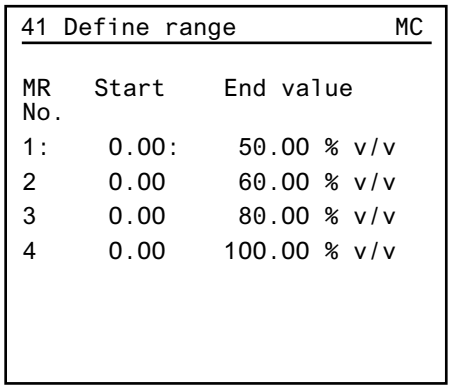


Figure 5-28 Define measuring ranges

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.

Note

If a start-of-scale value other than "0" is defined, you must read the section "Preparations for start-up - temperature influence".

5.5 Parameters

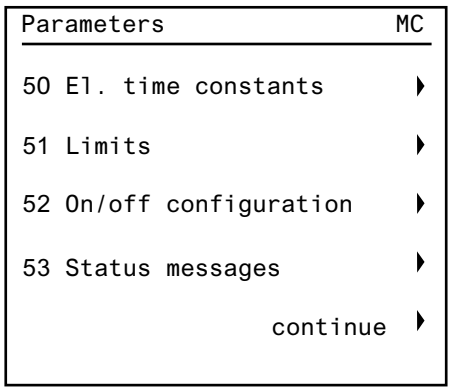


Figure 5-29 Parameters submenu

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

After selecting the parameter functions in the main menu by pressing the fourth softkey ("Parameters"), the menu screen for the selection of parameter functions 50 to 53 appears. Pressing the fifth softkey "...Continue" brings you to additional parameter functions.

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

5.5.1 Electric time constants (function 50)

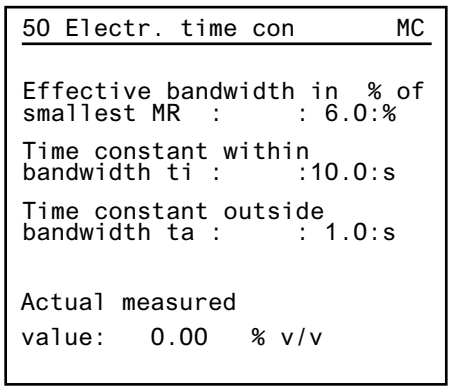


Figure 5-30 Electric time constants

With this function, you set various time constants, which reduce the underlying noise in an message value signal. 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 "t_i" acts within an configurable 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 "t_a" attenuates the measured value.

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

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

5.5.2 Limits (function 51)

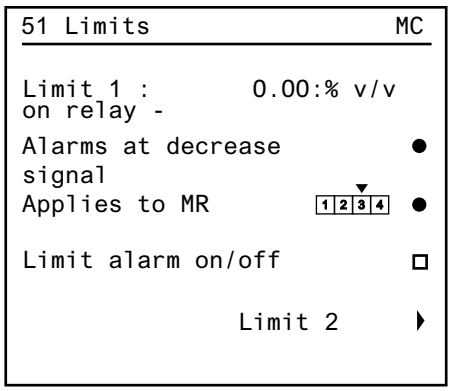


Figure 5-31 Limits

The device monitors up to four limits, and these limits can be allocated to any measuring range. Each limit can be allocated to any relay using function 71. If this was not configured, the "--" indicator appears in the limit screen.

You can only configure positive limits up to 100%.

"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. The menu screen shown here is for measuring range 3.

"Limit alarm":

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

Resetting the limit alarm

If the limit relay is triggered, this state is obtained even when the measured value goes back to the permissible range. 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..."*).

5.5.3 On/off functions (function 52)

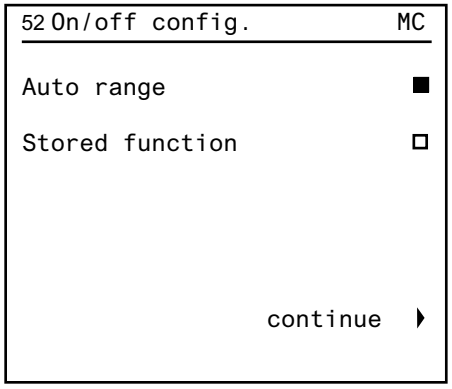


Figure 5-32 On/off functions

With this function, you can easily switch other functions on/off, for example, the ones listed in this function screen.

Thanks to this simplified operation, these functions do not have the longer paths through various menus and submenus. 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
Total calibration	23	
AUTOCAL	24	Only with supplementary electronics
Automatic measuring range switching	40	
Limit monitoring 1	51	
Limit monitoring 2	51	
Limit monitoring 3	51	
Limit monitoring 4	51	
Suppression the display of negative measured values	55	
Blocking of the logbook	60	
Suppression the display of negative measured values	70	
Fault / WA / FCTRL acc. to NAMUR	72	
Measured-value memory	77	
Signal tolerance violation	78	
Temperature recompensation of zero point	86	
Temperature recompensation of span	86	

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).

5.5.4 Status messages (function 53)

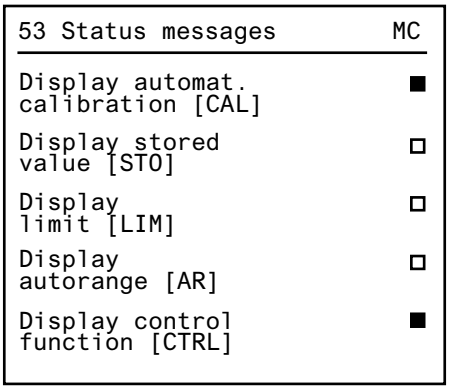


Figure 5-33 Status messages

With this function, you can configure 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 display mode"/"Decoded display mode") and is therefore always displayed.

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

This is the case:

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

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.

5.5.5 Graphical representation of measured values (function 54)

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

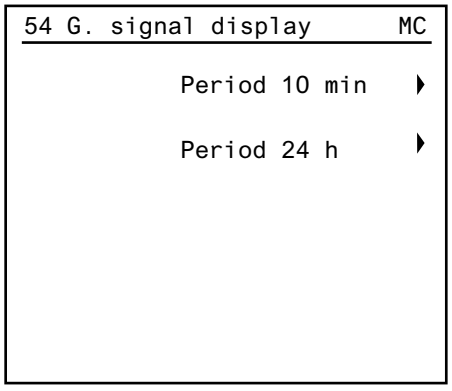


Figure 5-34 Graphical measured value representation

Select the desired time period with softkey 1 or 2.

The device now graphs the measured value vs. time:

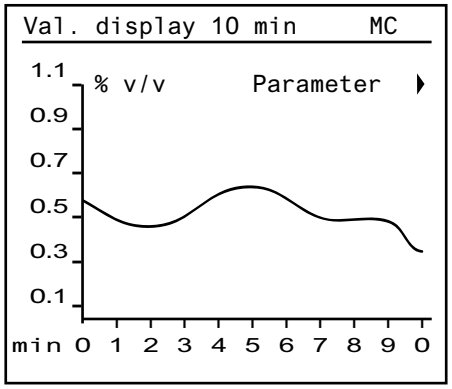


Figure 5-35 Measured value trend

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:

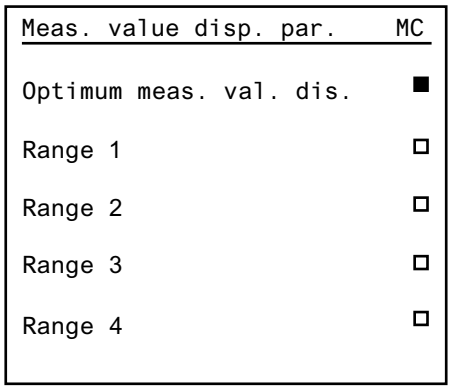


Figure 5-36 Parameters for measured value representation

If you select *"Optimum measured-value display"*, the software automatically scales the measured value axis. The device adapts the scale to the measured value scatter.

5.5.6 Measured value display (function 55)

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

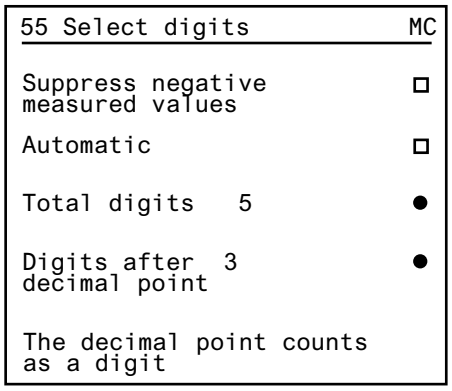


Figure 5-37 Configuring the measured value display

You have the following options for this:

- 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).

5.5.7 LCD contrast (function 56)

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

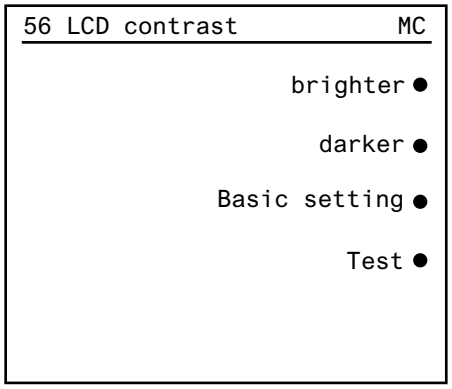


Figure 5-38 Setting the LCD contrast

If the contrast is misadjusted, you can restore 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 restore the basic setting by entering [8] [8] [8] [8] [ENTER].

5.5.8 Magnetic field frequency (function 57)

You can use this function, for example, to minimize vibration-dependent frequencies superimposed on the analog output (beat) or even eliminate them in the ideal case.

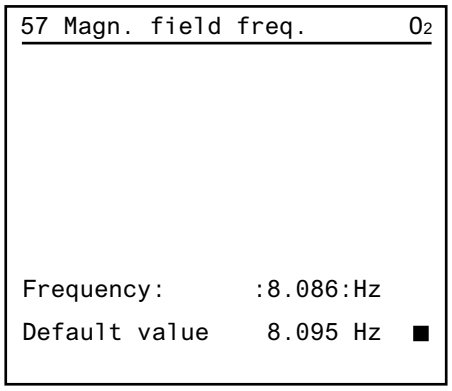


Figure 5-39 Magnetic field frequency

To do this, enter the desired frequency value in the "Frequency" input field by calling function 57. The permitted values for this are between 7 to 11 Hz.

If the change to a specific frequency does not have the desired effect, enter different frequency values.

Pressing the fifth softkey resets clock frequency back to the factory default of 8.095 Hz.

NOTICE
Calibration of zero point and sensitivity
After each frequency change, the zero point and sensitivity must be calibrated again.

5.5.9 Date/time (function 58)

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

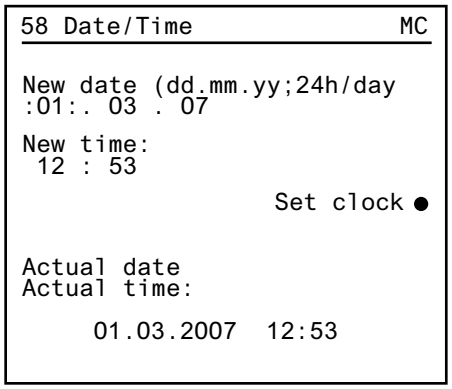


Figure 5-40 Setting the date/time

The device features a system clock that is not buffered against mains failure (no a real-time clock). When starting the device, the clock starts with the date 1.1.1995.

When the function is called, the cursor is placed 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. With a 24-hour based system (hours, minutes), set the time in the same way.

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.

5.5.10 Measuring point switching (function 59)

With this function, you can assign the device up to six measuring points, which are switched automatically at the expiration of a configured period.

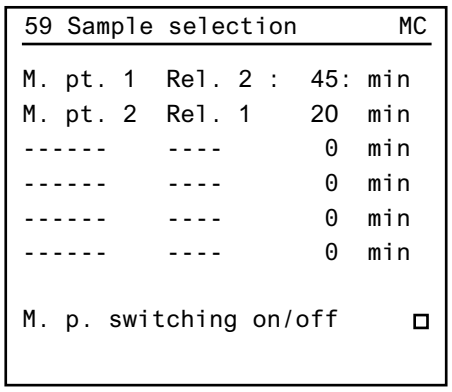


Figure 5-41 Measuring point switching

The condition is that you configured 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 (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. You also use function 71 to configure the signal relay.

5.5.11 Logbook settings (function 60)

With this function, you delete or block logbook entries.

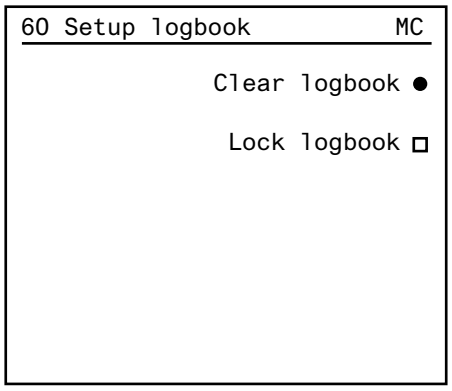


Figure 5-42 Configuring the logbook

Status messages such as maintenance requests or faults cannot be suppressed by "blocking". They still appear, despite the blocked logbook.

5.6 Configuration

This menu contains all functions required for configuring the device.

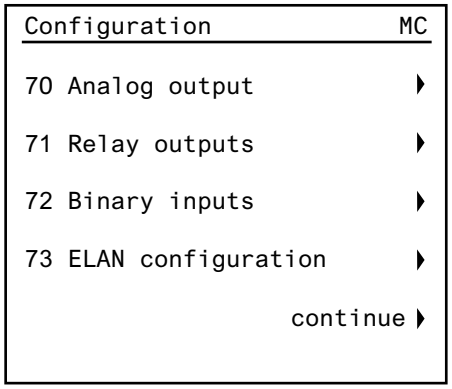


Figure 5-43 Configuration submenu

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

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

5.6.1 Analog output (function 70)

With this function, you can configure the analog output.

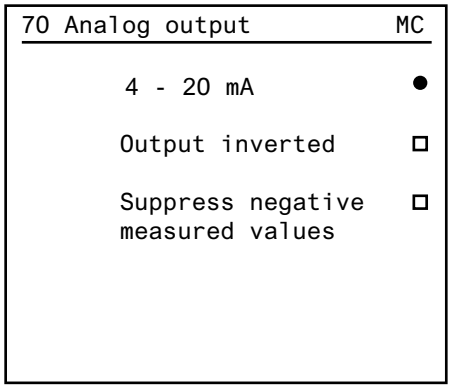


Figure 5-44 Configuring the analog output

With softkey 1, define the start-of-scale value of the measuring 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 ... 20 % O_2 ≡ 0 ... 20 mA → 0 ... 20 % O_2 ≡ 20 ... 0 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	2	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.

5.6.2 Relay outputs (function 71)

With this function, you can assign each relay functions listed in the table "Relay outputs (possible functions)", 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.

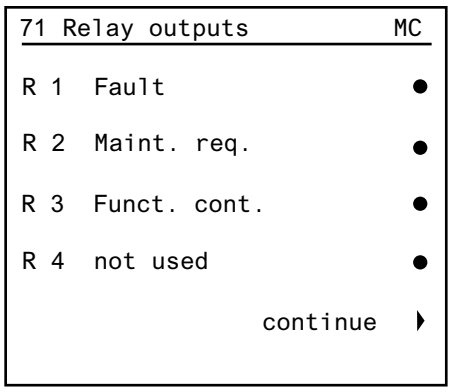


Figure 5-45 Assigning the relays

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 (add-on board).

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.

NOTICE
Changing the configuration Every change to the configuration of the relay assignments should always be saved in the user data memory by means of 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- 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)	Decoding, warm-up phase, Autocal running	Signal when: • Device is decoded, • Warm-up phase (approx. 30 min), • Calibration running (Autocal) • Remote
Sample gas		Supply of sample gas	Valve actuation for Autocal
Zero gas 1		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
Sample gas flow		Sample gas flow too low	For identification purposes
Reference gas pressure		Reference gas pressure too low	For identification purposes
AUTOCAL Check	Autocal difference too large (function 24)		

5.6.3 Binary inputs (function 72)

Digital input functions

Six floating digital 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 digital inputs (add-on board).

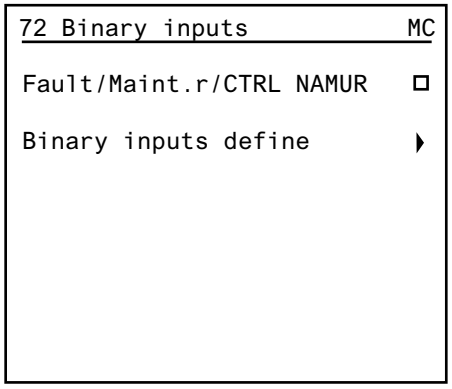


Figure 5-46 Digital input function

The operation of the digital inputs are defined with softkey 1. If you activate the "NAMUR" ("■") operating mode, the digital inputs behave as in table "Digital input activation functions" marked with "N".

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

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

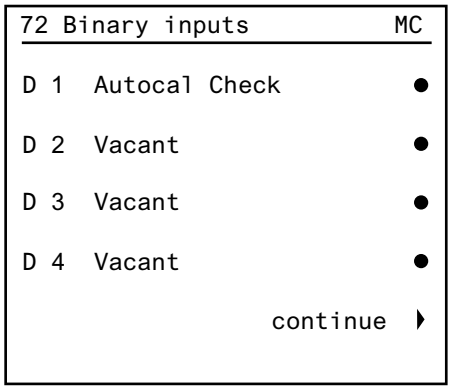


Figure 5-47 Define digital inputs

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 "Electrical connection".

No digital input has been preassigned in the factory.

Up to four digital inputs can be configured in a menu screen. Press the fifth softkey ("...continue"), to access the next function screen, thus branching to further digital inputs.

NOTICE
Save changes Make sure you save every change in the configuration of the digital 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 Digital input activation functions

Function	Necessary activation voltage			Remark / effect
	0 V	24 V	24 V pulse (min. 1 s)	
Not assigned				No effect when activated
External fault 1 to 7	N	X		e.g. due to: • Signal from a gas preparation system: – Condensate overflow – Gas cooler fault see also section 'Maintenance requests and fault messages"
External maintenance request 1 to 7	N	X		
Deleting the logbook entries			N, X	After deletion, the device is restored to the initial state. If the cause of a fault or maintenance request is not eliminated, the corresponding message reappears in the logbook.
Function check (CTRL) 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.
Start AUTOCAL			N, X	Note: Effective activation only possible in "Measure" operating mode! AUTOCAL must be configured (functions 23, 24 and 25).
Measuring range 1 to 4 on			N, X	For measuring range switching Note: Automatic measuring range switching (function 52) must be turned off

Function	Necessary activation voltage			Remark / effect
	0 V	24 V	24 V pulse (min. 1 s)	
Zero gas on			N, X	Note: Effective activation only possible in "Measure" operating mode! Relay function under 71 must be set to zero gas (calibration gas, sample gas) and the corresponding valves to be connected. Applies only to total calibration, since only one calibration gas can be used (function 22)
Calibration gas on				
Sample gas on				
Zero calibration			N, X	Activation initiates calibration. See also "Example - digital inputs"
Span calibration				
Autorange			N, X	Activate "Automatic measuring range switching"
Autocal check			N, X	Note: Effective activation only possible in "Measure" operating mode! Start Autocal check (function 24)
Measuring protection		N, X		It is possible to define a digital input "Measuring protection" which has the following effect: If the device is in the "Measure" operating mode (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.

5.6.4 ELAN configuration (function 73)

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

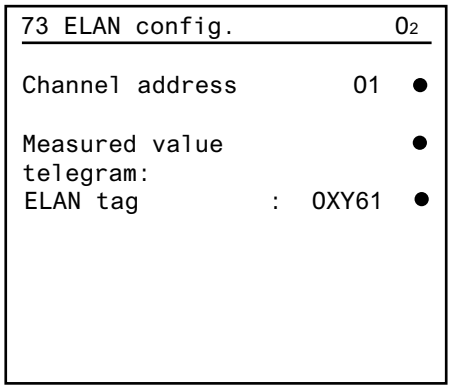


Figure 5-48 Configuring ELAN

Channel address:

Set the channel address for the device here. Addresses from 1 to 12 can be set. In an ELAN network, each address may only be used once. Addresses of devices that are used to correct the pressure or the influence of interfering gas may not be entered at this location.

Measured value telegrams on/off:

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

Note

Independent sending of measured values

If 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!

ELAN tag:

Display of the tag assigned to the device in the ELAN network.

For more details, refer to the ELAN interface description (Order no.. C79000-B5200-C176 German, C79000-B5276-C176 English).

5.6.5 Reset (function 74)

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

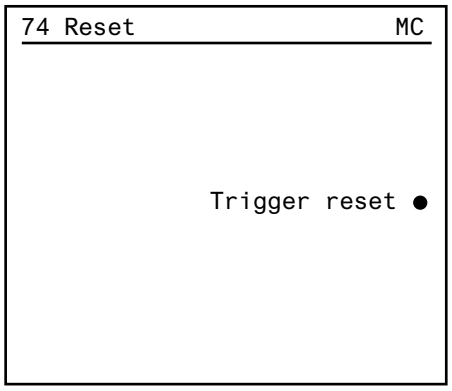


Figure 5-49 Carrying out a reset

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.

5.6.6 Save, load data (function 75)

You can configure the user data memory with this function:

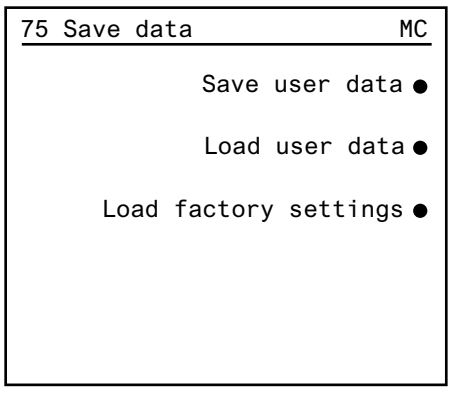


Figure 5-50 User data memory

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 tested.

Press softkey 3 to restore 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 shows an overview of the interaction between the various memory modules.

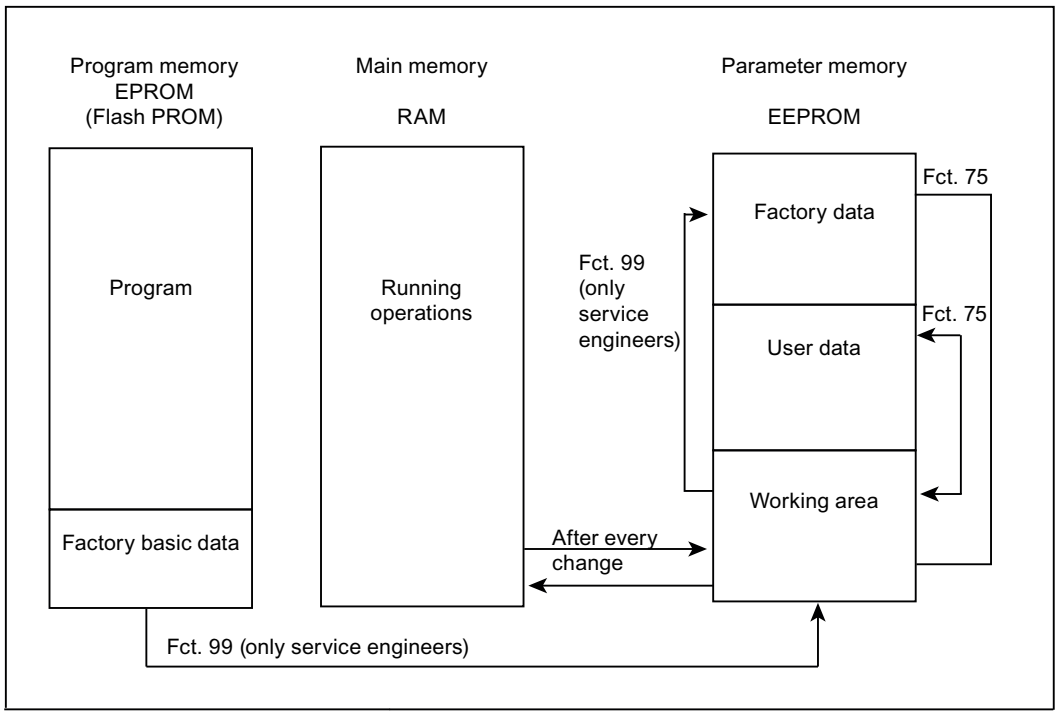


Figure 5-51 Memory modules

5.6.7 Suppression of short noise signals (function 76)

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

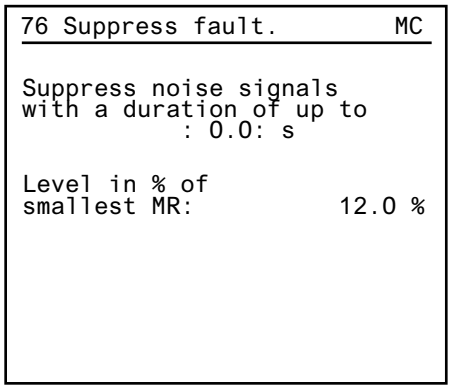


Figure 5-52 Suppressing noise

Spikes are created by electromagnetic interferences or sometimes by 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.

5.6.8 Measured value memory (function 77)

This function is used to define the response of the analog output or the digital interface when the device assumes a specific state.

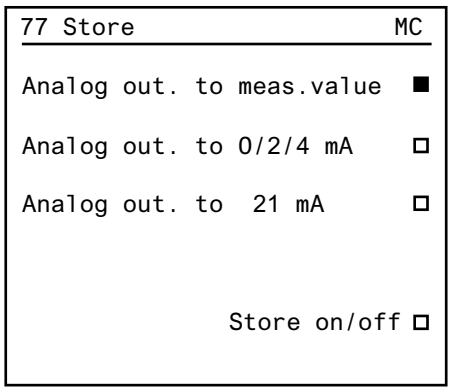


Figure 5-53 Setting the analog output

In case of a fault (S) or CTRL (decoding, calibration, warm-up phase), one of these values is sent to the analog output:

- The last registered measured value
  or
- 0 (2/4) mA
  or
- 21 mA

'Memory on' (■) activates the respective setting.

5.6.9 Calibration tolerances (function 78)

Setting the calibration tolerances

With this function, you define the calibration tolerances.

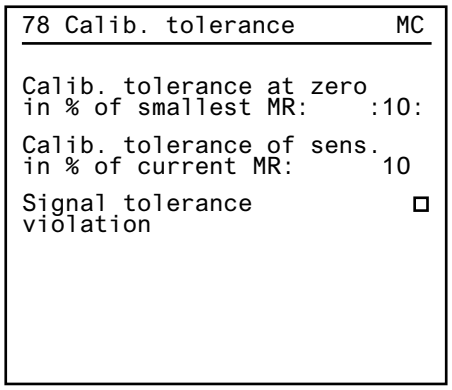


Figure 5-54 Setting the calibration tolerances

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 measuring span in %.

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

The calibration tolerance, which can be set from 0 to 99 %, refers to the measuring range with the smallest measuring 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	95 to 100 % O_2
Measuring range 2	90 to 100 % O_2
Smallest span	(100 - 95 %) O_2 = 5 % O_2
Measuring range in which calibration takes place	Measuring range 2
Selected calibration tolerance	6 %
Response threshold for zero point	5 % O_2 x 0.06 = 0.3 % O_2
Response threshold for span	10 % O_2 x 0.06= 0.6 % O_2

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

5.6.10 Change codes (function 79)

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

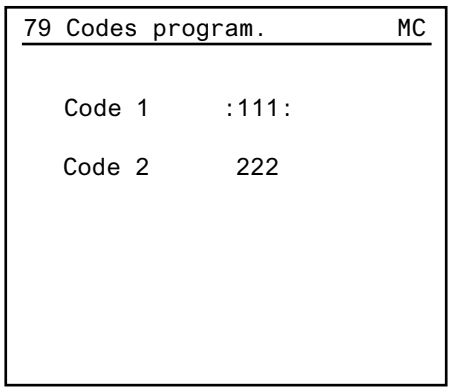


Figure 5-55 Change codes

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

5.6.11 Device test (function 80)

You can check the functionality of the device by performing the following three tests.

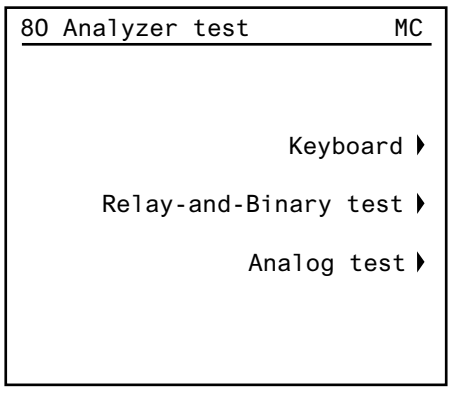


Figure 5-56 Testing the device

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

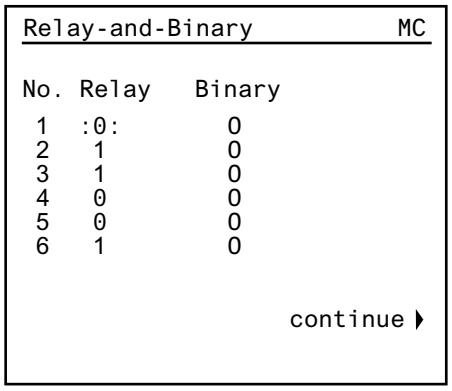


Figure 5-57 Test relay outputs and digital inputs

The first function screen shows the state of the six relay and digital inputs of the standard device. With an add-on board, there are another eight relay/digital 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 digital 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 24 000 µA for testing purposes.

The analog input displays the input currents in µA.

5.6.12 Language selection (function 81)

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

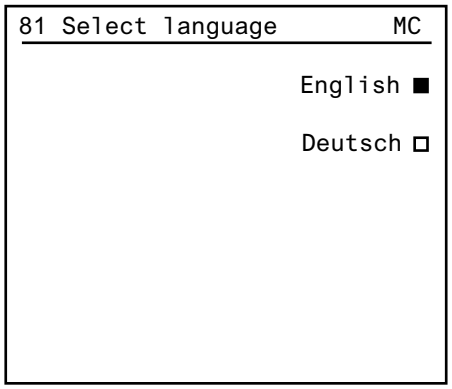


Figure 5-58 Selecting a language

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).

5.6.13 Pressure correction (function 82)

Variations in the sample gas pressure can be corrected within the range from 800 to 1200 hPa (absolute) with the OXYMAT 61.

This function offers the possibility for pressure correction using one of the following options:

- Pressure correction using an internal pressure sensor
- Pressure correction using an external pressure sensor via analog input 2*) (example as shown)
- Pressure correction using an external pressure sensor via ELAN (RS485).

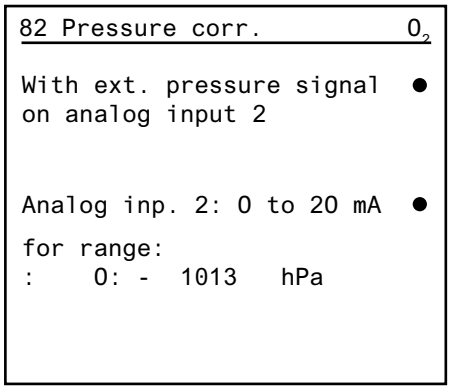


Figure 5-59 Pressure correction via analog output 2

The pressure correction can also be switched off using function 52 ("On/off functions").

Pressure correction using an external pressure sensor via ELAN

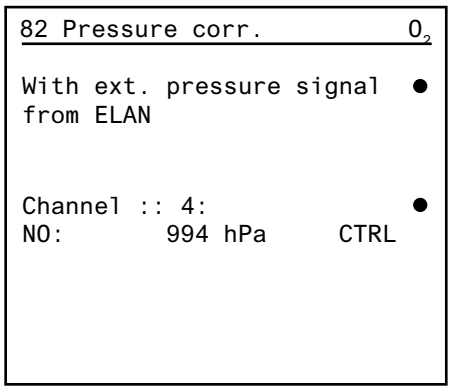


Figure 5-60 Pressure correction via ELAN

Note

Measured value "Pressure"

The measured value "Pressure" is an internal value in the OXYMAT 61 gas analyzer which can be supplied to another gas analyzer via ELAN. It is basically possible to use other pressure measuring instruments or analyzers with pressure measuring function and ELAN capability for the pressure measurement.

On the device supplying the pressure data, the parameter "Measured value telegrams" must be set to "On" using the function 73.

5.6.14 Correction of cross-interference (function 83)

Associated gases contained in the sample gas (interfering gases) can affect the measurement. This function is used to reduce such interference or eliminate it altogether in the ideal case.

Note

A correction for interfering gas is usually only useful if the corrected O_2 equivalent is not greater than the smallest span.

When the reference gas and residual gas have different compositions (= sample gas without O_2 content), a zero point offset (interfering gas swing) occurs triggered by the paramagnetic or diamagnetic difference of the two gases. The value of this zero point offset can be specified to compensate for this offset.

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.

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

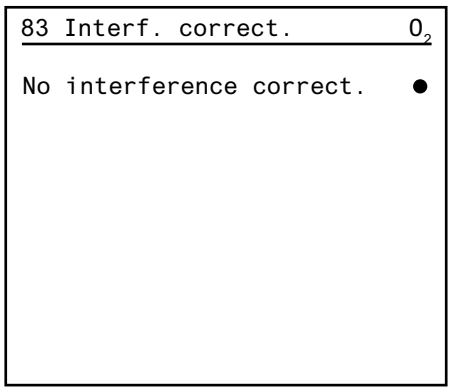


Figure 5-61 Carrying out correction of cross-interference

By pressing the first softkey you now select the type of cross-interference correction. 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

Note

The correction of cross-interference is deactivated for the duration of a calibration process (zero or span). It is active again when calibration has been completed and the device has returned to the "Measure" operating mode.

Correction of cross-interference with constant influence of interfering gas

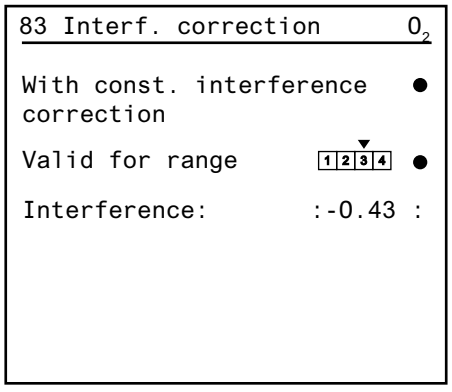


Figure 5-62 Constant influence of interfering gas

With constant residual gas composition and low concentration of O_2, a residual gas effect occurs, which varies only by fluctuations in O_2 content and can therefore be regarded as approximately constant.

The device must be informed of the value of the zero point offset (interfering gas swing) (see Example 1).

Example 1:

The residual gas (sample gas without O_2; zero gas) is 50 % propane, remainder is N_2. N_2 is used as a reference gas.

1. Determine the influence of interfering gas:
   The diamagnetic zero point offset (O_2 equivalent) of the propane is --0.86 % O_2. With content of 50 %, the interfering gas swing would be --0.43 % O_2.
2. Enter the interfering gas swing (her --0.43 % O_2).

Correction of cross-interference with variable influence of interfering gas

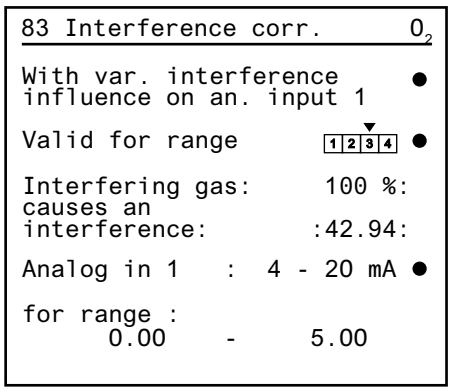


Figure 5-63 Variable influence of interfering gas

Example of a variable cross-interference correction:
The concentration of the interfering component must be measured with a suitable analyzer and the corresponding analog signal must be transmitted to the OXYMAT 61 for inclusion in calculations.

A pure residual gas should be specified as the interfering gas swing (O_2 equivalent).

By specifying the measuring range of the residual gas analyzer as a % as well as its electricity output, an internal calculation of the actual O_2 offset can be made.

Example 2:

A sample gas is composed of 4% NO and 96% N_2. It should be monitored for O_2.

The O_2 equivalent of 100% NO amounts to 42.94% O_2.

The NO analyzer has a measuring range of 5 % NO and an analog output from 4 to 20 mA.

Correction of cross-interference via ELAN

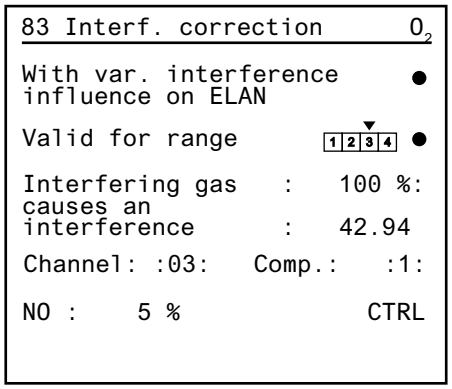


Figure 5-64 Correction of cross-interference with variable influence via ELAN

If the cross-interference correction is performed via the serial RS485 interface (ELAN), the same specification must be made as for the *cross-interference correction with a variable interfering gas influence*.

Also enter the channel number and component number of the interfering gas analyzer. The type of gas allocated to the channel and component, the measuring range and possibly the device status appear in the display (see also function 82 "Pressure compensation").

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"*.

5.6.15 Phase adjustment (function 84)

The physical principle of the measurement procedure and the mechanical design of the detector result in a delayed reaction (phase offset) of the analog measured value signal compared to the clock signal of the magnet controller. This phase shift can be adjusted if necessary with the help of this function.

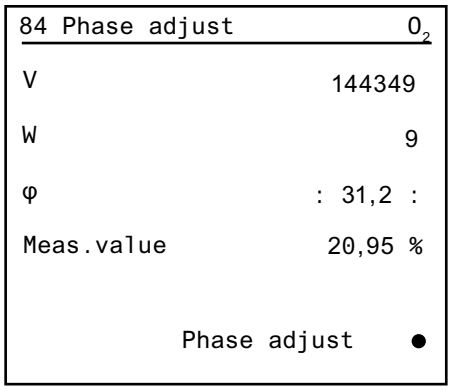


Figure 5-65 Phase adjustment

With the maximum possible signal (sample gas: e.g. air) the gain is automatically adjusted so that V assumes a value of approximately 500,000. The phase angle φ is then calculated using this signal value and saved, whereby V is maximized and W minimized.

This angle was determined at the factory and should only be readjusted when the magnetic field frequency is changed.

5.6.16 Switch valves (function 85)

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 add-on board. The precondition is that the corresponding relays have been previously configured with function 71 ("Relay outputs")

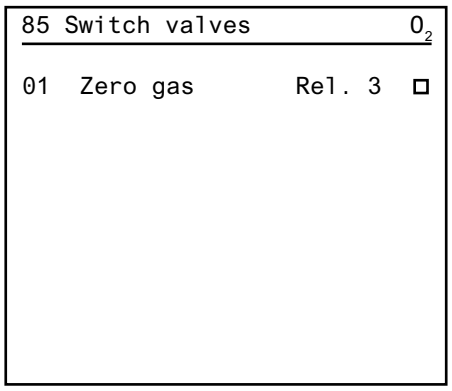


Figure 5-66 Switching valves

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

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

5.6.17 Linear temperature compensation (function 86)

The OXYMAT 61 is temperature-compensated for sensitivity. If an additional temperature error occurs during operation, for instance, due to light contamination of the sample chamber, it can be compensated with this function.

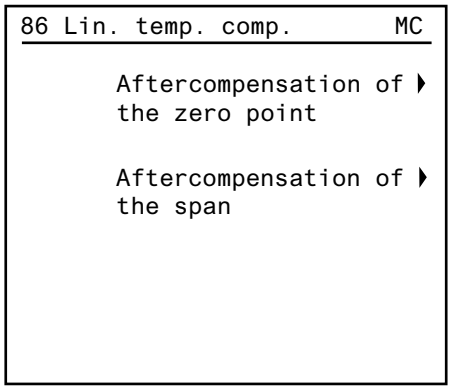


Figure 5-67 Linear temperature compensation

Temperature compensation at the zero point

Assuming an average temperature T_M, two different correction values can be specified for ranges of increased temperature and decreased temperature.

Example:

If the zero point changes by +0.3 % (relative) in relation to the difference between 100 % O_2 and the start value of the smallest span due to a temperature increase in the sample chamber changes from T_M to T_M', the value determined by the following formula should be entered under "Δ" for a temperature increase:

$$\Delta = -\frac{(+0.3)}{[T_M - T_M']} \times 10 \quad [\%/10\ °C]$$

A factor can be determined for a temperature decrease in the same manner.

If only a correction factor is determined, the first value of opposite sign is entered for the second correction value.

Temperature compensation in the measured value:

The procedure is the same as for the zero point, however, the percentage change refers to the measured value itself.

Example:

If the measured value changes from 70 % to 69 % with a temperature increase of 4 °C, the percentage change is

$$\frac{(70 - 69)}{70} \times 100 = 1.42 \quad [\%/4\ °C]$$

and therefore
Δ = 3.55 [%/10°C].

Note

If the zero point changes to negative with temperature change, Δ has a positive sign and vice versa. The same applies to a measured value which becomes smaller.

5.6.18 Error on/off (function 87)

With this function, you switch the message for maintenance requests and faults (see Tables "Causes of maintenance requests" and "Causes of error 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.

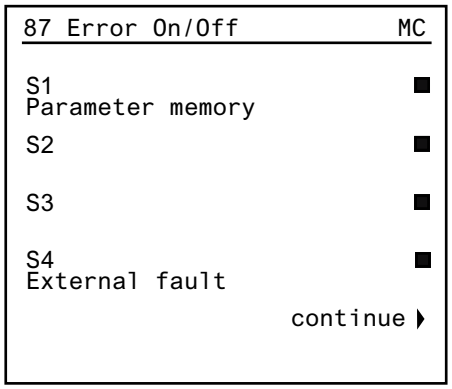


Figure 5-68 Switching errors on and off

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

5.6.19 PROFIBUS configuration (function 90)

This function can only be called if the device contains additional PROFIBUS electronics (add-on board). This function is used to set the PROFIBUS parameters.

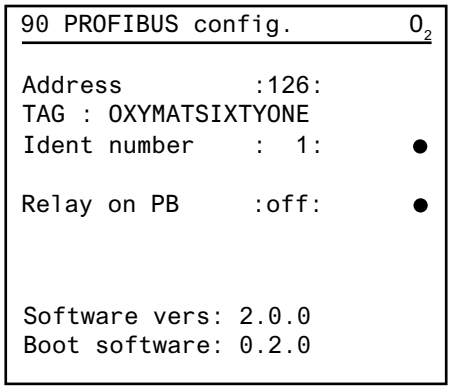


Figure 5-69 Configuring PROFIBUS

You can set the following specific PROFIBUS parameters:

- Address (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 first 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:

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 (add-on 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 (add-on board).

Maintenance and servicing 6

6.1 Safety instructions

⚠ WARNING

Work on an open device

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

Only carry out adjustments using appropriate tools, for example, to avoid short-circuits on the electronic PCBs.

Leaks in the gas channel caused by incorrect installation or calibration may result in the release of gas, which in turn could result in injury to personnel (e.g. poisoning symptoms) as well as damage to the equipment itself (e.g. danger of corrosion).

Maintenance

The device must be subjected to annual maintenance to verify its electrical safety and correct operation, in particular the tightness of the sample gas channel (containment system).

The operator can extend the maintenance interval in individual cases if no negative effects are expected with respect to chemical corrosion to the seals that come in contact with the sample gas.

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

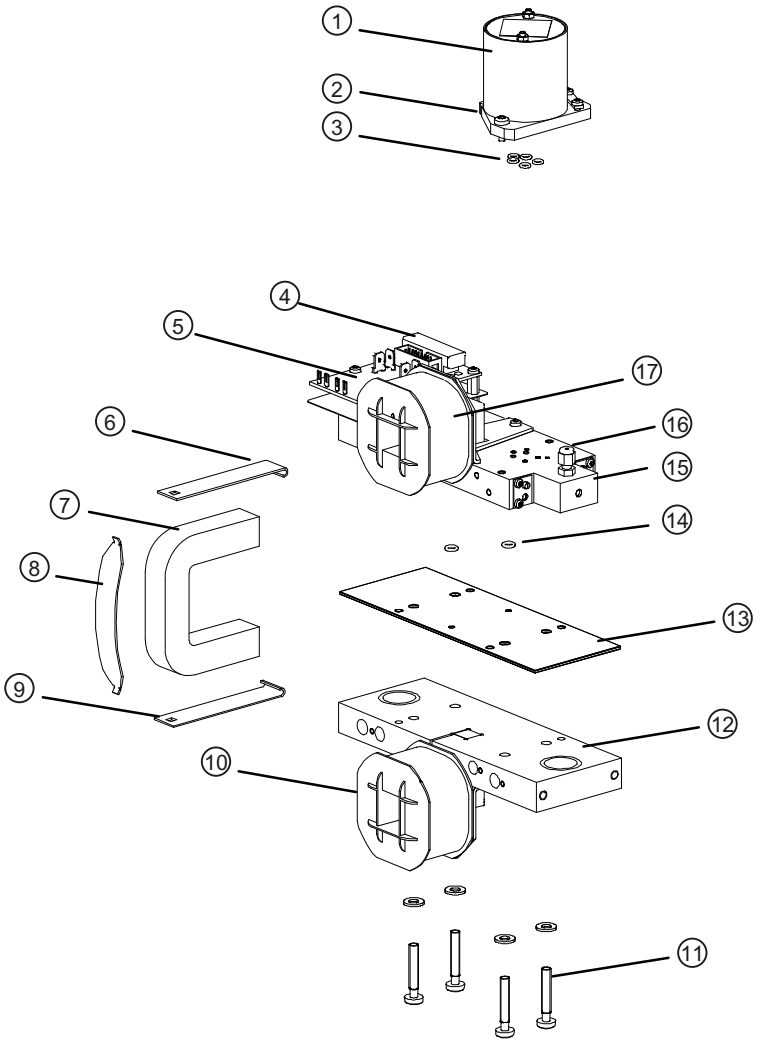
All modules within the housing can be replaced in the event of a defect. Repairs to these modules are not envisaged.

6.2 Analyzer section

6.2.1 Design of the analyzer section

Analyzer section

The analyzer section consists of the functional parts magnetic circuit, sample chamber and the measuring head.



① Measuring head
② Restrictor plate
③ O-ring measuring head
④ Pressure sensor
⑤ Electrical terminal board
⑥, ⑨ Retaining plate
⑦ Cut strip-wound core
⑧ Tension spring
⑩, ⑰ Coil
⑪ Mounting screws
⑫ Bottom part of casing
⑬ Sample chamber
⑭ O-ring sample chamber
⑮ Top part of casing
⑯ Reference gas connection

Magnet circuit

A magnetic pole shoe is glued into each casing section. The cut strip-wound core placed upon it is held down by a tension spring. This method deflects the forces of the magnetostriction away from the sample chamber.

Sample chamber

The sample chamber consists of a 1-mm thick center plate in which the sample gas channel is punched, and two 0.3-mm thick cover plates, which contain the openings for the supply of the sample gas and the reference gas. Since the sample gas only comes into contact with the chamber plates, the OXYMAT 61 can be used for numerous combinations of sample gas. The other channels of the measuring system are purged by the reference gas. In the fully-assembled analyzer section, the sample chamber is installed between the two casing sections.

Measuring head

The microflow sensor of the measuring circuit is located in the measuring head. This is installed in a thermostated aluminum block. The strong magnetic field required to produce a sufficient measurement effect causes interference in the microflow sensor. The aluminum block with the preamp electronics are therefore shielded to eliminate this effect.

This screen is composed of

- Screen cup
  and
- Restrictor plate This includes restrictors, the function of which is described in section 2.5.

Both parts are made of a material with high permeability.

Reference gas channel

The reference gas line is a restrictor, which decreases the incoming reference gas pressure to allow a continuous flow of 5 to 10 ml/min.

The reference gas line is installed and removed as follows:

1. Loosen the reference gas line at the nozzle and on the analyzer section.
2. Remove the reference gas line.

To install, carry out the above steps in reverse order.

CAUTION
Clogged reference gas channel It is important to ensure that no liquid or dust can enter the connection nozzles or the reference gas line! The measurement function may deteriorate or the device may even fail as a result!

See also

Principle of operation (Page 16)

6.2.2 Disassembling the analyzer section

Removing the measuring head

Proceed as follows for this:

1. Pull out the measuring head connector cable out of its socket.
2. Loosen socket screws.
   Now you can remove the measuring head.

To install, carry out the above steps in reverse order. It is important here to ensure that all O-rings are re-inserted! In additional, the screen cup should never be removed from the measuring head!

Cleaning the sample chamber

The sample chamber is not particularly susceptible to faults. If condensation passes through the analyzer as a result of a fault in the gas conditioning, although there is a temporary fault in the measurement (highly oscillating values are displayed), the device is ready for measurements again once the sample chamber has dried out. However, one of the inlets for the reference gas may become clogged and measurement may fail if there is extremely high contamination. This will be apparent from extremely strong fluctuations in the display of measured values. If such situations, you need to clean the sample chamber as follows:

1. Remove the measuring head (as described in the section ”Removing the measuring head”.
2. Blow compressed gas into the sample chamber to clean it. The compressed air passes through the sample gas outlet and through the reference gas channels in the upper part of the casing.

   You can also flush the sample chamber with trichloroethylene or alcohol.. In such situations, you need to dry it afterwards with a stream of dry air.
3. Install the measuring head again.

If the cleaning procedure described above does not produce the desired result, the sample chamber must be completely removed and cleaned in an ultrasonic bath. If this measure does not succeed, you may need to replace the sample chamber.

Removing the analyzer section

Proceed as follows for this:

1. Pull out the measuring head connector cable out of its socket on the magnetic field terminal board.
2. Remove the reference gas inlet hose from the analyzer section.
3. Disconnect the hose at a suitable location.
4. Remove the analyzer section together with the retaining plate and lift both out of the analyzer.
5. Remove the analyzer section from the retaining plate.
6. Remove the sample gas lines from the analyzer section.

Removing the sample chamber

Proceed as follows for this:

1. Remove the measuring head (as described in the section ”Removing the measuring head”.
2. Insert a suitable tool (e.g. screwdriver) between the retaining plate and the cut strip-wound core (U core) and pry out the retaining plate until the tension spring is released.
3. Remove cut strip-wound core and retaining plate.
4. Loosen the four mounting screws and pull the two parts of the casing apart.

The sample chamber is now accessible and can be removed. To install, carry out the above steps in reverse order. It is important to note the following in this regard:

- Check all O-rings to ensure they are OK, and replace them if they are damaged.
- Tighten the mounting screws diagonally opposed with a torque of 6 Nm.

Calibration

Each time a measuring head is replaced or the analyzer section reassembled, you need to recalibrate the device. This procedure is described in section Calibration (Page 50).

Leak test

A leak test must be carried out following every maintenance measure that affects the analyzer section or the gas channel. This procedure is described in section Sealing (Page 35). If the device fails the leak test, you must replace all seals and hoses or pipes.

6.2.3 Removing the sample gas restrictor

If the sample gas restrictor is clogged from condensate and therefore needs to be cleaned, or if it a hindrance to the measurement task for other reasons (e.g. due to the use of OXYMAT 61 with gas analyzers of the type ULTRAMAT 6 in certain measuring configuration), you must remove the restrictor.

If there is no a flow indicator (optional) in the device, the sample gas restrictor is located in the sample gas hose between the pipe inlet nozzle and the analyzer section.

If there is a flow indicator, the sample gas restrictor is located between it and the analyzer section. The restrictor is secured with a hose clamp.

Remove the restrictor as follows:

1. Loosen the hose section in which the restrictor is located.
2. Remove the hose clamp over the restrictor.
3. Use a suitable object (stick, etc.) to push the restrictor out of the hose.

6.3 Replacement of motherboard and add-on board

⚠ WARNING

Dangerous contact voltage

You need to open the enclosure to do this work. This makes live parts are accessible, which may cause death or injury due to electric shock when touched.

For this reason, you must always disconnect the device from the mains before replacing the board!

Replacing the motherboard

To do this, proceed as follows:

1. Disconnect the device from the mains.
2. Loosen the screws on the cover of the housing and remove it.
3. Remove the data plug from the rear of the device.
4. Unscrew the three M3 screws located between the plugs.
5. Pullout the plugs of the ribbon cables from the motherboard.
6. Remove the motherboard from the device.

Removing the add-on board

The procedure is the same as for the motherboard. In contrast to the motherboard, the add-on board is only attached to the back of the housing with two screws.

Mounting

Proceed in reverse order to install the both board.

6.4 Replacing fuses

⚠ WARNING

Dangerous contact voltage

You need to open the enclosure to do this work. This makes live parts are accessible, which may cause death or injury due to electric shock when touched.

For this reason, you must always disconnect the device from the mains before replacing the board!

Improper handling

The fuses may be only be replaced by trained or instructed personnel! You may only use fuses of the same type!

The device is protected by multiple fuses, the values of which depend on the device model (e.g. supply voltage, heating, etc.):

Power	Fuse ratings
200 to 240 V	0.63 T/250
100 to 120 V	1 T/250

Fuse ratings in Ampere

Fuses F3, F4

These fuses are located in a drawer of the mains connection box. To replace the fuses, use a suitable tool (e.g. a screwdriver) to pry them out and removed them.

6.5 Cleaning the device

User Interface

The front panel is washable. We recommend using a damp sponge or cloth containing a mild detergent for this. Yu should only apply slight pressure when cleaning, especially in the display area, to avoid damaging the thin membrane. In addition, ensure no water penetrates the interior of the device during cleaning.

Interior

If necessary, you can gently remove dust and dirt from the interior using a compressed air gun.

6.6 Maintenance requests and fault messages

The device is able to detect functional irregularities. These appear, depending on the severity, as either 'Maintenance request' or 'Fault' in the status line of the display. At the same time, they are recorded in the logbook (function 3) and can also be called up there. Pressing the button next to the corresponding log entry acknowledges it. It will appear again, however, if you do not eliminate the cause.

Each new message is written to the next free space in the logbook. A total of 32 storage spaces are available, which means that the oldest of 32 log entries is overwritten by a new entry. A power failure deletes all log entries.

You can disable the log or delete the messages contained in it using function 60.

The display of messages is especially distracting during testing. They can be disabled under the function 87. You should not do this during normal operation, since you need to be able to detect any faults that may occur.

Maintenance requests

If there are indications of changes in internal device parameters, "Maintenance request" appears in the status line of the display. Changes of this type do not affect the measurement capability of the device or affect it only minimally the first time they appear. In order to continue to guarantee the measuring capability, however, it may be necessary to carry out remedial measures.

If the relay output of the device was configured accordingly (see also section 5, Function 71), external signaling may also be performed.

6.6.1 Maintenance requests

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

Function 87 can be used to switch off (disable) each maintenance request individually.

Each maintenance requests labeled with "Q" in the left column of the following table must be acknowledged.

No.	Message	Possible causes	Remedy	Remarks
W1 Q	Calibration tolerance exceeded	Calibration gas was changed	Repeat calibration	Calibration tolerance, see also function 78; Drift of device according to technical specifications: Zero point: 1% of FSV/week, Span: >1% of FSV/week
		Drift characteristics	Check that drift is normal	
W2 Q	Signal span to high with zero point adjustment	Reference gas contains too much oxygen	Check reference gas	Zero gas and reference gas should be identical
		Zero gas contains too much oxygen	Check zero gas	
W3 Q	Signal voltage too low with span adjustment	Zero gas contains too little oxygen	Check calibration gas	
		Reference gas flow is too low	Check reference gas flow and correct if necessary	
		An incorrect measuring range has been selected for the calibration	Select the correct measuring range	
W4 Q	Set clock	The device was switched off	Reenter the date and time	See function 58
W6 Q	Temperature of LCD is too high or too low	Ambient temperature outside tolerances specified in the technical specifications (5 to 45 °C)	Make sure that the ambient temperature is in the range from 5 to 45 °C	
W7 Q	Temperature of analyzer section	Ambient temperature too high (≥45 °C)	Check ambient temperature (max. 45 °C), especially with built-in analyzers	
		Measuring head temperature too high (≥78 °C) (only applies to non-heated model)	Contact service department	
		With a heated sample chamber: selected setpoint temperature is too low or heating is switched off. Message W7 appears until the new setpoint temperature has been reached	**No error!** Wait until the analyzer section has cooled down to the new setpoint temperature	

No.	Message	Possible causes	Remedy	Remarks
W8 Q	Temperature of measuring head outside tolerance	More than ±3 °C deviation from the setpoint temperature (see also S7)	If temperature remains constant: no need for action; otherwise: contact service department	
W9	External maintenance request	Signal from external source	Check	Function 72 must be configured accordingly
W10	AUTOCAL/Check error	Tolerances that are exceeded in AUTOCAL/Check or false sample gas (assignment to the measuring range is wrong)	Perform AUTOCAL again	This message disappears only when the AUTOCAL has been successfully completed.

Causes of maintenance requests

6.6.2 Faults

The following faults result in a fault message (output in the display) and are signaled externally if a corresponding relay has been configured using function 71. The measurement capability of the device is restricted if these messages appear. Immediate remedial measures should always be carried out here by qualified maintenance personnel.

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

Each maintenance requests labeled with "Q" in the left column of the following table must be acknowledged.

No.	Message	Possible causes	Remedy
S1 Q	Parameter memory test failed	EEPROM contains incorrect or incomplete data in the working range	1. Execute RESET or switch the device off and on again. If the error message S1 appears again: 2. Load user data (function 75) 3. contact service department, Make sure you leave the device in operation in order to assist the fault diagnostics of the service staff!
S2 Q	Magnetic field supply faulty	Ribbon cable connection interrupted	Check connection
		Motherboard faulty	contact service department
S3 Q	Microflow sensor faulty	One half of the grid has been destroyed	Replace measuring head or contact service department
S4	External fault message	Signal from external source	Check: Function 72 must be configured accordingly
S5 Q	Temperature of analyzer section is too high or too low	Ambient temperature outside tolerances specified in the technical specifications (5 to 45 °C)	Make sure that the ambient temperature is in the permissible range from 5 to 45 °C
		Measuring head temperature too high (>80 °C) or too low (<10 °C)	Perform restart (RESET); if this is not successful: contact service department
		Temperature sensor faulty: ⇒ Temperature rises above setpoint temperature	
S7 Q	Temperature of measuring head outside tolerance	More than ±5 °C deviation from the setpoint temperature (75 °C)	Replace measuring head or contact service department

No.	Message	Possible causes	Remedy
S8 Q	Signal of selected pressure sensor outside tolerance	Sample gas blocked at outlet (> 2 000 hPa with internal pressure sensor or > 3 000 hPa with external) or system pressure too high	**Caution** The internal pressure sensor may be destroyed if the system pressure exceeds 4 000 hPa! 1. Perform a suitable action to reduce the flow resistance at the device inlet until the sample gas is back within the tolerance limits 2. Regulate the system pressure accordingly 3 Check for leaks (see section 4.2 - Preparation for commissioning), If leak is found: contact service department
		Sample gas pressure too low (< 500 hPa)	Set system pressure > 500 hPa
S9 Q	Signal too high	Sample gas pressure > 3 000 hPa or O_2 concentration in range 2 000 to 3 000 hPa too high	Reduce pressure or O_2 concentration or contact service department
S10 Q	RAM check	RAM PROM	Replace motherboard or contact service department
S11	Reference gas supply failed	Reference gas line leaks, is interrupted or blocked	Check reference gas flow (see section 4.2 Preparation for commissioning)
		Reference gas source is empty	Connect new reference gas source
S12 Q	Mains power supply	Mains voltage outside tolerance limits	Line voltage must be within the specified limits specified by the rating plate
S13 Q	Hardware / line frequency	Mains frequency outside tolerance limits	Connect power supply stabilizer
		Crystal or external ADC defective	Replace motherboard
S14	Measured value greater than operating full-scale value (+ 5 %)	Sample gas pressure exceeds the pressure correction range of 2 000 or 3 000 hPa	Check the sample gas pressure and possibly reduce it or switch to an external pressure sensor with an appropriate measuring range
		Incorrect calibration of the measuring range	Repeat calibration and possibly check the sample test
S 15 Q	Calibration aborted	Fault if the device is in AUTOCAL mode	Remedy the cause
		Fault in calibration via digital input	
S16	Sample gas flow is too low		Ensure sufficient flow

Causes of fault messages

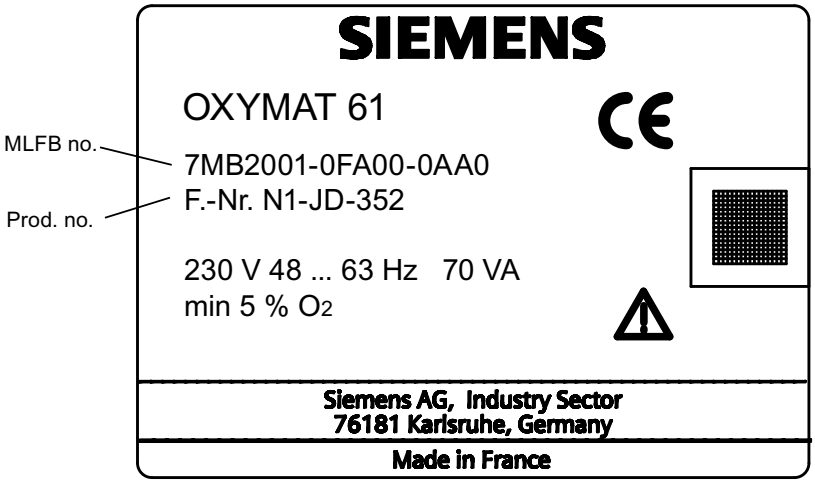
Spare parts list

7

7.1 General information

This spare parts list corresponds to the technical status of February 2011.

The rating plate shows the year of construction of the gas analyzer (coded in the production no.).



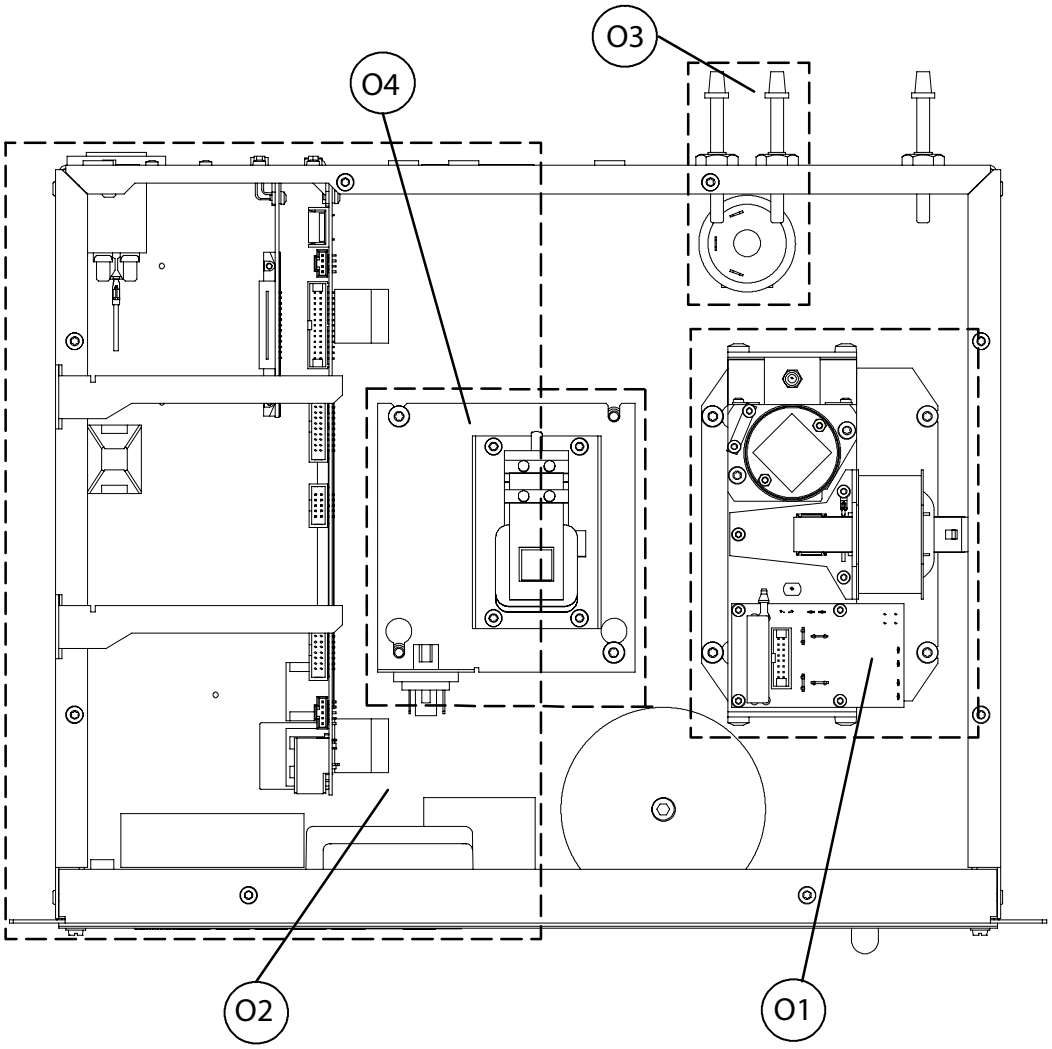
An order for spare parts must contain the following information:

- Quantity
- Designation of the spare part
- Order no. of the spare part
- Device name, order number, and production no. of the gas analyzer for which the spare part is intended

Example for ordering

2 measuring heads
C79000-A3460-B525
for OXYMAT 61, MLFB 7MB2001-0FA00-0AA0, Prod. no. N1-JD-352

Overview of the modules



O1 Analyzer section
O2 Electronics
O3 Sample gas channel
O4 Reference gas channel

Figure 7-1 OXYMAT 61 modules

7.2 Analyzer section

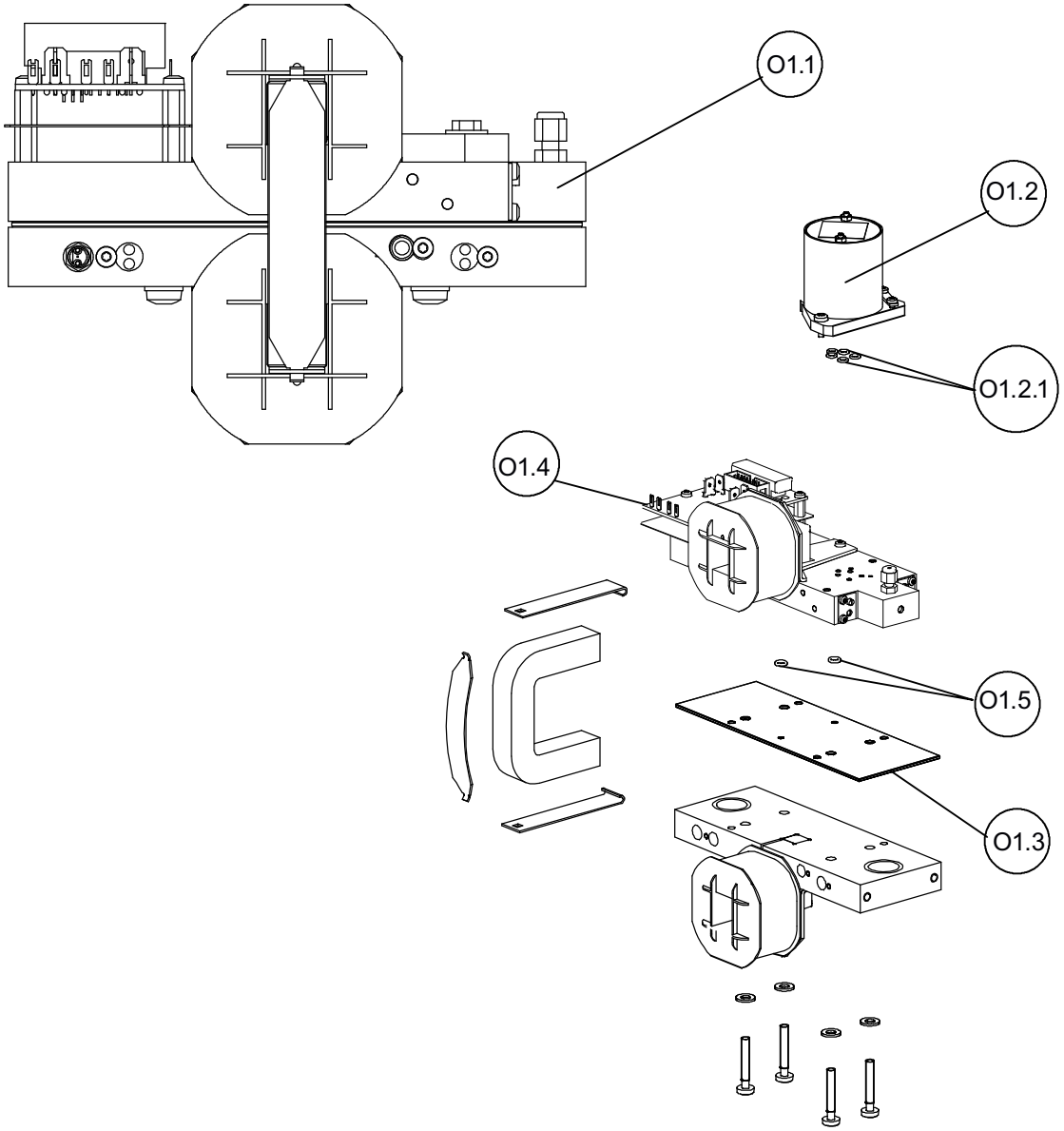


Table 7- 1

Part no.	Designation	Order no.	Remarks
O1.1	Analyzer section complete, material no. 1.4571	C79451-A3460-B31	
O1.2	Measuring head	C79451-A3460-B525	
O1.2.1	O-ring	C79121 -Z100-A32	1 item
O1.3	Sample chamber, material no. 1.4571	C79451- A3277-B535	
O1.4	Magnet terminal board	C79451-A3474-B606	
O1.5	O-ring, FPM (Viton)	C71121-Z100-A159	1 item

OXYMAT 61, analyzer section

7.3 Electronics

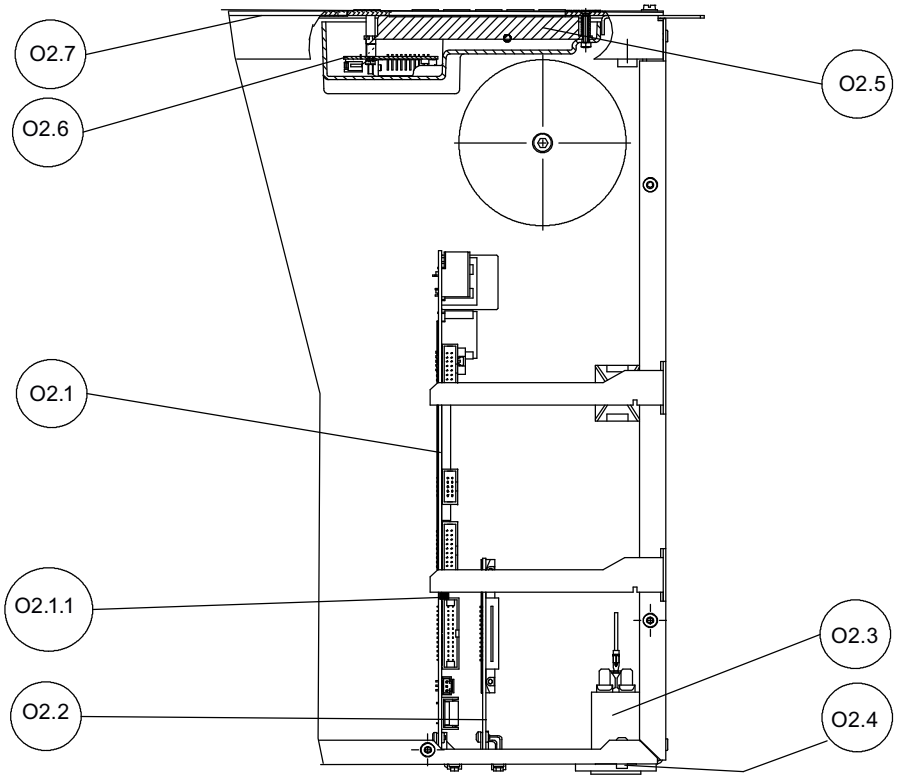


Table 7- 2

Part no.	Designation	Order no.	Remarks
O2.1	Motherboard	C79451-A3480-D501 C79451-A3480-D502 C79451-A3480-D503 C79451-A3480-D504 C79451-A3480-D505	Motherboard and firmware German, Motherboard and firmware English Motherboard and firmware French Motherboard and firmware Spanish v Italian
O2.1.1	Firmware (FlashPROM)	C79451-A3460-S501 C79451-A3460-S502 C79451-A3460-S503 C79451-A3460-S504 C79451-A3460-S505	German English French Spanish Italian
O2.2	Add-on board	C79451-A3480-D511 A5E00057307 A5E00057312 A5E00057164	Relay PROFIBUS PA PROFIBUS DP Firmware update PROFIBUS
O2.3	Plug-in filter	W75041-E5602-K2	
O2.4	G--type fuse	W79054-L1010-T630 W79054-L1011-T100	200 V to 240 V, T 0.63 A/250 V 100 V to 120 V, T 1 A/250 V
O2.5	LC display	W75025-B5001-B1	
O2.6	Adapter board, LCD/keyboard	C79451-A3474-B605	
O2.7	Front panel	A5E00259978	With membrane keyboard

OXYMAT 61, Electronics

7.4 Gas channel

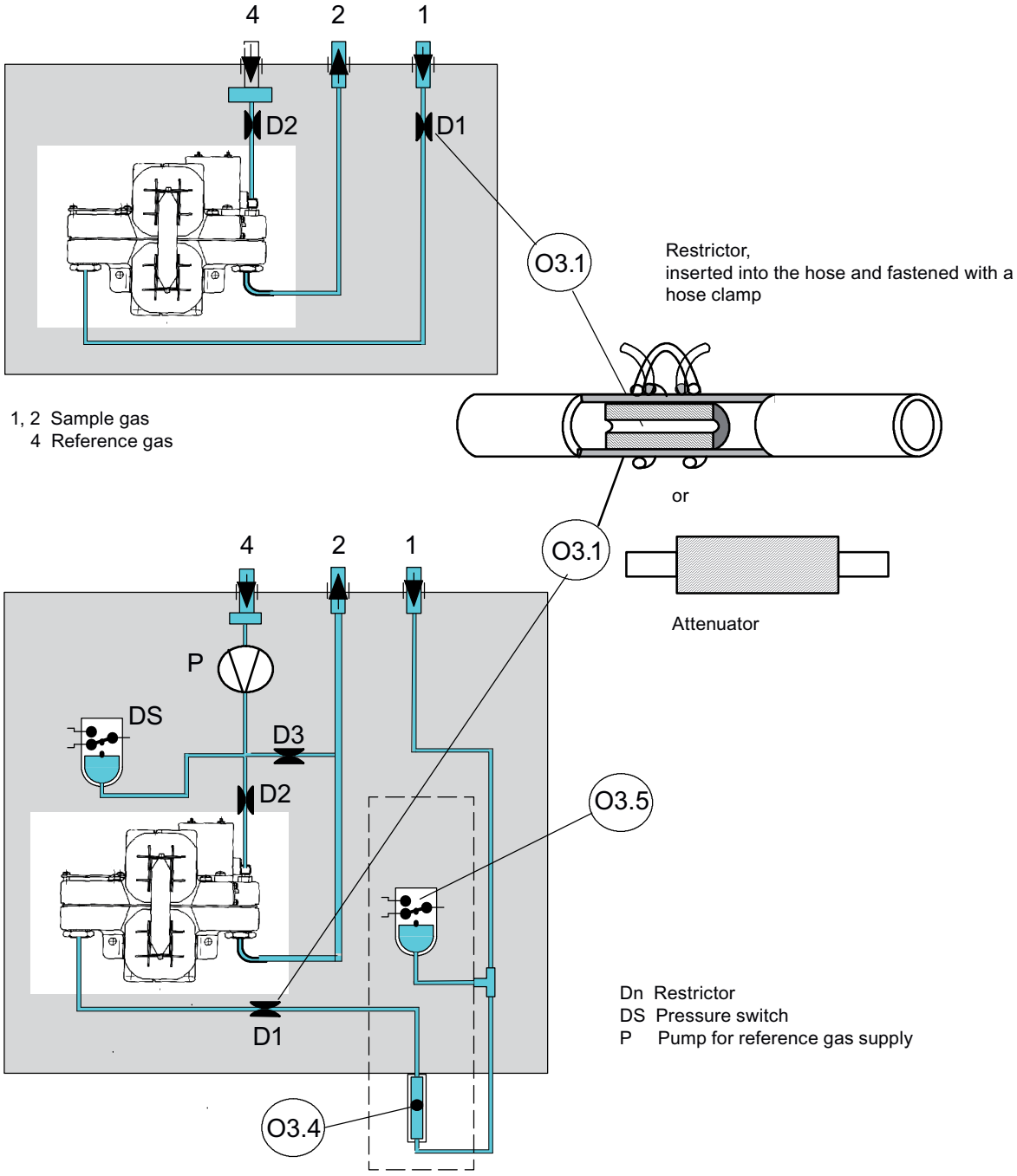


Figure 7-2 Sample gas channel, with hoses

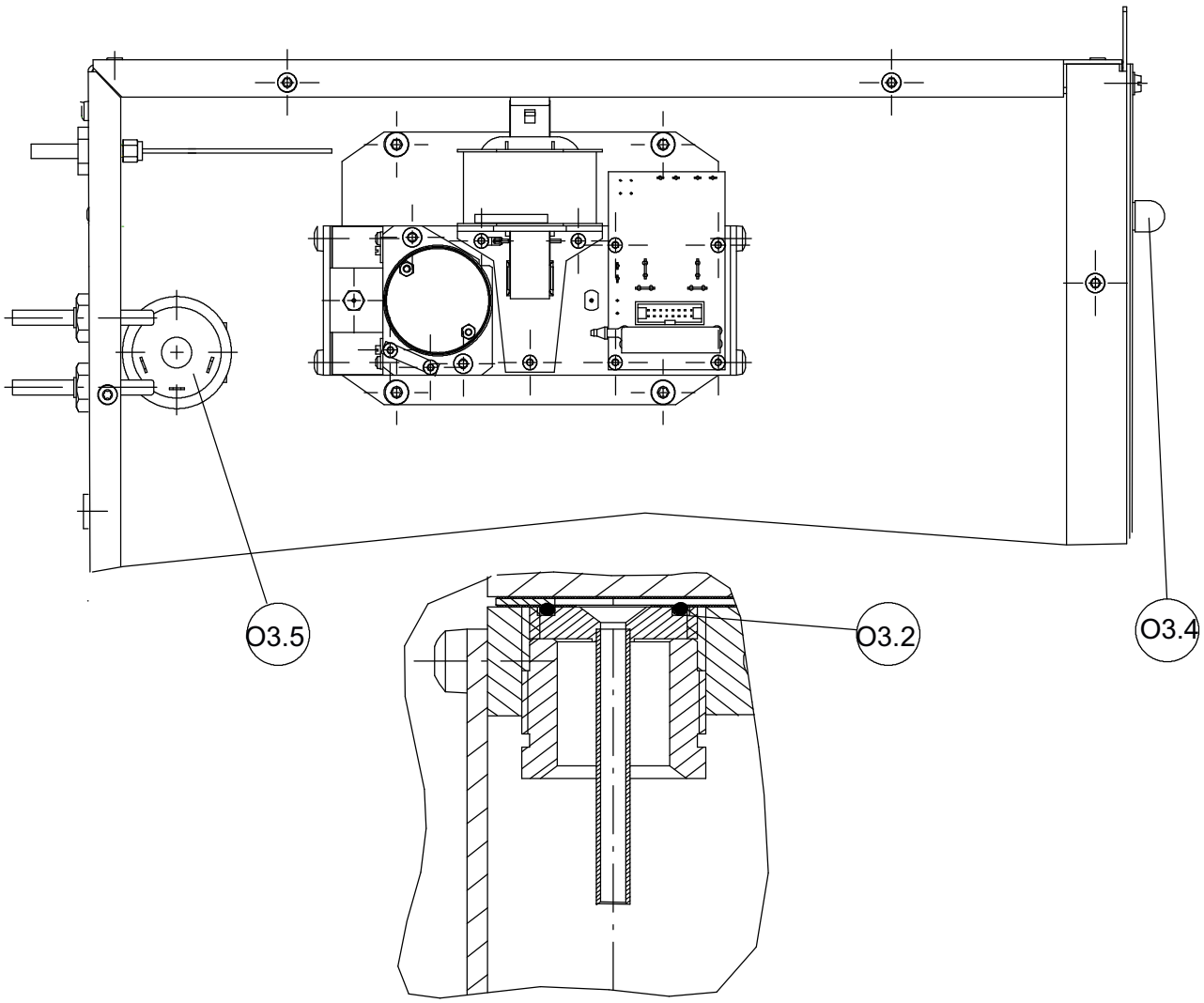


Figure 7-3 Gas connections

Table 7- 3

Part no.	Designation	Order no.	Remarks
O3.1	Restrictor	C79451-A3480-C10	Gas channel hose
O3.1	Attenuator	A5E00118236	Attenuator with hose
O3.2	O-ring, FPM (Viton)	C74121-Z100-A6	1 item
O3.4	Flow meter	C79402-Z560-T1	
O3.5	Pressure switch	C79302-Z1210-A2	

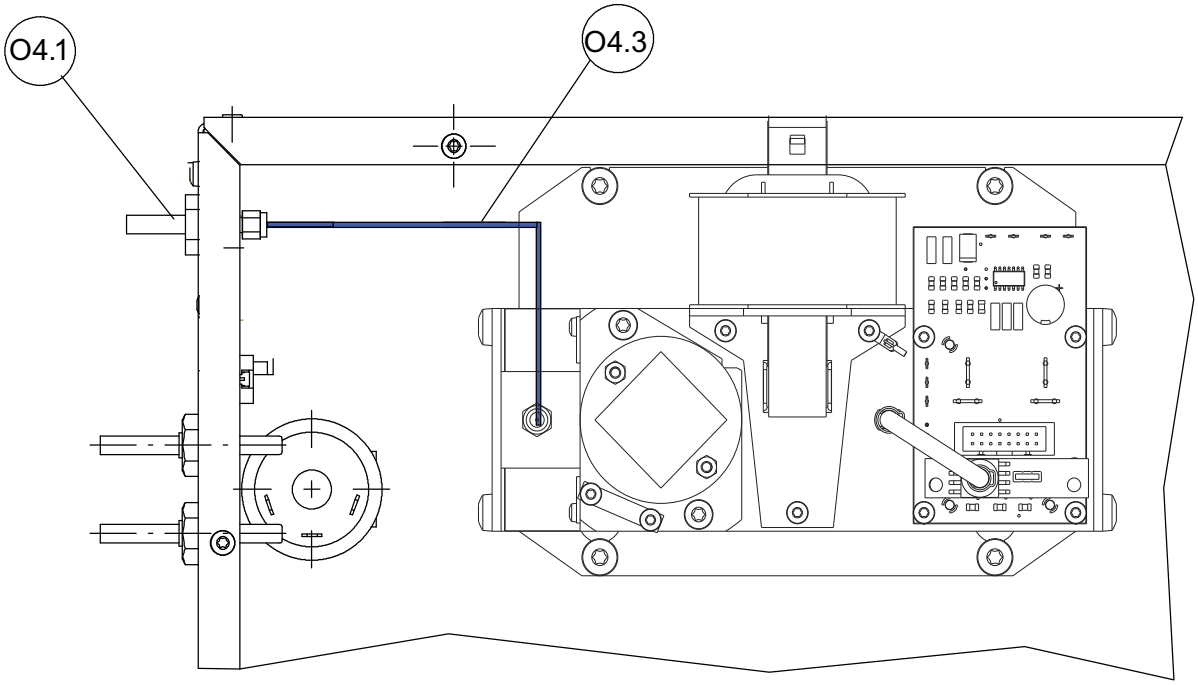


Figure 7-4 Reference gas channel for external reference gas supply with 2000 to 4000 hPa

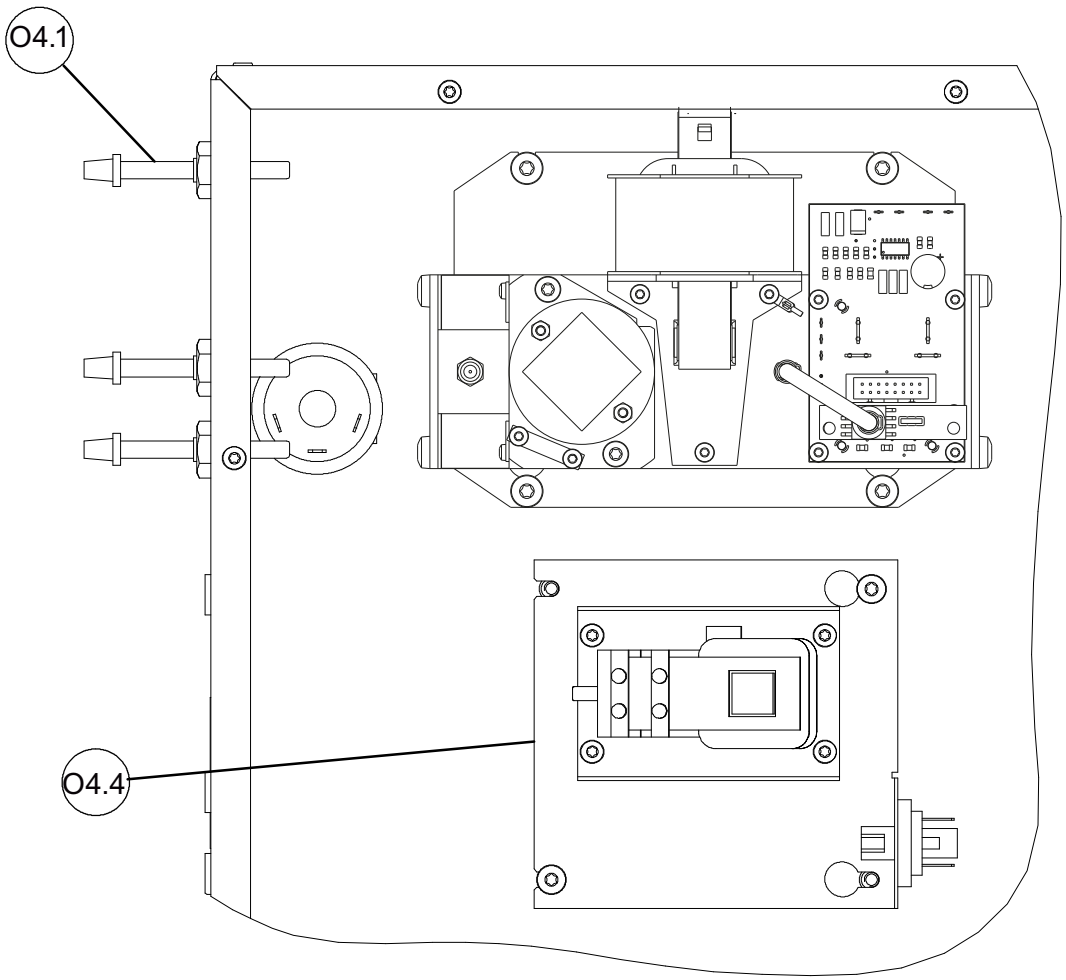


Figure 7-5 Reference gas channel for internal reference gas supply with ambient pressure +/- 50 hPa

Table 7- 4

Part no.	Designation	Order no.	Remarks
O4.1	Nozzle, complete	C79451-A3480-B1	Ø 6 mm, 3 000 hPa
	Nozzle, complete	C79451-A3480-B2	1/4", 3 000 hPa
O4.3	Capillary	C79451-A3480-D518	3 000 hPa
O4.4	Reference gas supply	A5E00114838	Pump module complete

Technical specifications

8

8.1 General technical specifications

Table 8- 1 Technical specifications – general technical specifications

General technical specifications	
Measuring ranges	4, internally and externally switchable; manual and automatic range switching is possible
Smallest possible measuring span [3)]	2 vol. % or 5 vol. % O_2
Largest possible span	0 to 100% vol. O_2
Measuring ranges with suppressed zero point	Any zero point can be implemented within 0 … 100 vol.% O_2 provided that a suitable reference gas is used (see also Reference gases (Page 126))
EMC– interference immunity (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98), EN 50081-1, EN 50082-1
Degree of protection	IP 20 according to EN 60529
Electrical safety	According to EN 61010-1, overvoltage category III
Position of use (analyzer)	Front panel vertical
Dimensions (analyzer)	See Section "Dimensional drawing"
Weight (analyzer)	Approx. 13 kg

Table 8- 2 Technical specifications – power supply

Power supply	
Auxiliary power (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 8- 3 Technical specifications – gas inlet conditions

Gas inlet conditions	
Permissible sample gas pressure	800 to 1 200 hPa absolute (with external reference gas supply), atm. pressure range (with built-in pump)
Sample gas flow	18 to 60 l/h (0.3 to 1 l/min)
Sample gas temperature	0 to 50 °C
Sample gas moisture content	< 90 % RH [1)]

Table 8- 4 Technical specifications – time response

Time response	
Warmup time	At room temperature: < 30 min [2)]
Display response time (t_{90})	3.5 s
Damping (electronic time constant)	0 to 100 s, can be configured
Dead time (purging time of the gas channel in the device at 1 l/min)	Approx. 0.5 to 2.5 s, depending on model
Time for signal processing in the device	< 1 s

Table 8- 5 Technical specifications – pressure correction range

Pressure correction range	
Pressure sensor	500 to 2 000 hPa (abs.)

Table 8- 6 Technical specifications – measuring characteristics

Measuring characteristics	
Output signal variation	< ± 0.75 % of the smallest possible measuring range according to rating plate, with electronic time constant of 1 s (corresponds to ± 0.25% at 2 σ)
Zero point drift	< ± 0.5 %/month of respective span
Measured value drift	< ± 0.5 %/month of respective span
Repeatability	< ±1% of respective span
Linearity deviation	< ±1% of respective span

Table 8- 7 Technical specifications – influencing variables

Influencing variables [3)]	
Ambient temperature	< 0.5 %/10 K relative to smallest possible span according to rating plate
Sample gas pressure	With disabled pressure compensation: < 2 % of the current measuring range / 1 % pressure change With enabled pressure compensation: < 0.2 % of the current measuring range / 1 % pressure change
Associated gases	Deviation from zero point corresponding to paramagnetic or diamagnetic deviation of accompanying gas (see table 3.2)
Sample gas flow	< 1 % of smallest possible span according to rating plate with 0.1 l change in flow within the permissible flow range
Power supply	< 0.1 % of the current measuring range with rated voltage ± 10%

Table 8- 8 Technical specifications – electric inputs and outputs

Electric inputs and outputs	
Analog output	0/2/4 to 20 mA, isolated; Max. load 750 Ω
Relay outputs	6, with changeover contacts, can be freely configured, e.g. for measuring range identification; 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 associated gas influence (cross-interference correction)
Digital inputs	6, designed for 24 V, isolated, freely configurable, e.g. for measuring range switchover
Serial interface	RS485
Options	Supplementary electronics with 8 additional digital inputs and 8 additional relay outputs, e.g. for triggering automatic calibration; supplementary electronics for PROFIBUS-PA and PROFIBUS-DP

Table 8- 9 Technical specifications – 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 approximately 3 hours
[3] Relative to sample gas pressure 1 000 hPa (absolute), sample gas flow 0.5 l and ambient temperature 25°
[4] Dew point low limit may not be violated!
[5] The error of the calibration gas must also be taken into account
* Based on DIN EN 61207 / IEC 1207

8.2 Reference gases

Table 8- 10 Reference gases for OXYMAT 61

Measuring range	Recommended reference gas	Reference gas connection pressure	Remarks
0 to 100 vol. % O_2	N_2, 4.6	2 000 to 4 000 hPa above sample gas pressure (max. 5 000 hPa absolute)	The reference gas flow is set automatically to 5 to 10 ml/min
to 100 vol. % O_2 (suppressed zero point with measuring range full-scale value 100 vol. % O_2)	O_2		
Around 21 % O_2 (suppressed zero with 21 vol. % O_2 within the span)	Air	Atmospheric pressure with internal reference gas pump	

8.3 Zero point error

Table 8- 11 Zero point errors of different accompanying gases

Associated gas (concentration 100 vol. %)		Zero point deviation in vol. % absolute		Associated gas (concentration 100 vol. %)		Zero point deviation in vol. % absolute
Organic gases				**Inert gases**		
Ethyne (acetylene)	C_2H_2	- 0.29		Argon	Ar	- 0.25
1.2 butadiene	C_4H_6	- 0.65		Helium	He	+ 0.33
1.3 butadiene	C_4H_6	- 0.49		Krypton	Kr	- 0.55
n-butane	C_4H_{10}	- 1.26		Neon	Ne	+ 0.17
Isobutane	C_4H_{10}	- 1.30		Xenon	Xe	- 1.05
1-butene	C_4H_8	- 0.96		**Inorganic gases**		
Isobutene	C_4H_8	- 1.06		Ammonia	NH_3	-0.20
Dichlorodifluoromethane (R12)	CCl_2F_2	-1.32		Hydrogen bromide	HBr	-0.76
Ethanoic acid	CH_3COOH	- 0.64		Chlorine	Cl_2	- 0.94
n-heptane	C_7H_{16}	- 2.40		Hydrogen chloride	HCl	- 0.35
n-hexane	C_6H_{14}	- 2.02		Dinitrogen monoxide	N_2O	- 0.23
Cyclo-hexane	C_6H_{12}	- 1.84		Hydrogen fluoride	HF	+ 0.10
Methane	CH_4	- 0.18		Hydrogen iodide	HI	- 1.19
Methanol	CH_3OH	- 0.31		Carbon dioxide	CO_2	- 0.30
n-octane	C_8H_{18}	- 2.78		Carbon monoxide	CO	+ 0.07
n-pentane	C_5H_{12}	- 1.68		Oxygen	O_2	+100
Isopentane	C_5H_{12}	- 1.49		Nitric oxide	NO	+42.94
Propane	C_3H_8	- 0,87		Nitrogen	N_2	0.00
Propylene	C_3H_6	- 0.64		Nitrogen dioxide	NO_2	+20.00
Trichlorofluoromethane (R11)	CCl_3F	-1.63		Sulfur dioxide	SO_2	- 0.20
Vinyl chloride	C_2H_3Cl	- 0.77		Sulfur hexafluoride	SF_6	- 1.05
Vinyl fluoride	C_2H_3F	- 0.55		Hydrogen sulfide	H_2S	- 0.44
1.1 vinylidene chloride	$C_2H_2Cl_2$	- 1.22		Water	H_2O	- 0.03
				Hydrogen	H_2	+ 0.26

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

Conversion to other temperatures

For this, multiply the deviations from the zero point listed in Table 3.2 by a correction factor (k):

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

* All diamagnetic gases have a negative deviation from zero point

8.4 Materials used in the sample gas channel

Standard		
Gas channel		19" rack unit
With hoses	Procedure	1.4571
	Hose	FPM (Viton)
	Sample chamber	1.4571
	Nozzles for sample chamber	1.4571
	Restrictor	PTFE (Teflon)
	O-rings	FPM (Viton)
	Hose coupling	Polyamide 6

Options		
Flow indicator	Measuring tube	Duran glass
	Float-type meters	Duran glass
	Suspension boundary	PTFE (Teflon)
	Angle pieces	FPM (Viton)
Sample gas pressure switch	Membrane	FPM (Viton)
	Enclosure	PA 6.3 T

9 Dimension drawings

9.1 Dimension drawings

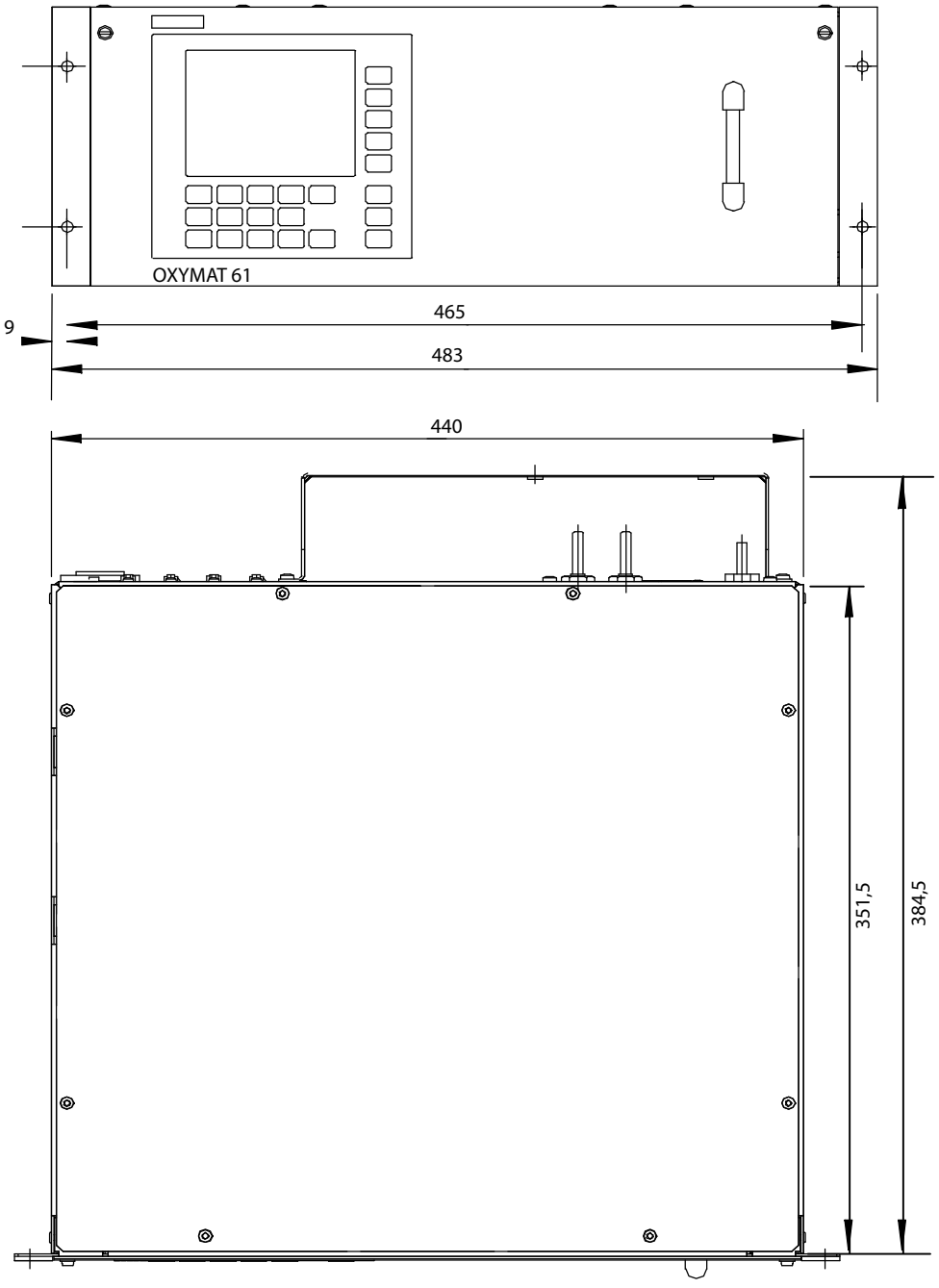


Figure 9-1 Dimensions for preparing installation (in mm) (front view and plan view)

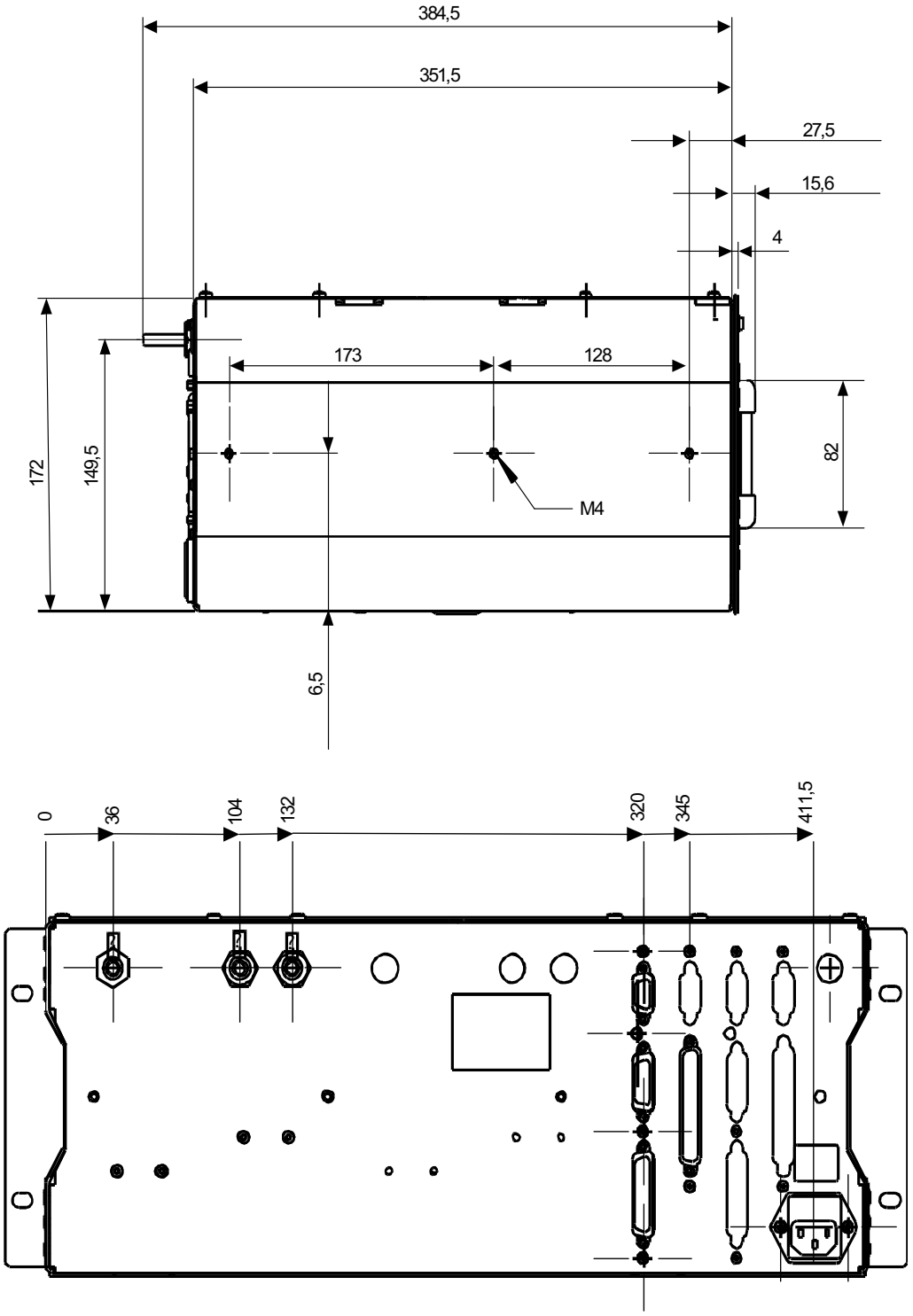


Figure 9-2 Dimensions for preparing installation (in mm) (front view and plan view)

Appendix

A

A.1 EC Declaration of Conformity

SIEMENS

Industry

EC Declaration of Conformity
EG-Konformitätserklärung

CE

No. A5E00484554 - 03

Manufacturer: *Hersteller:*	Siemens AG Industry Sector Industry Automation Division
Address: *Anschrift:*	76181 Karlsruhe, Germany
Product description: *Produktbezeichnung*	Gas analyzer / Gasanalysator OXYMAT 61, OXYMAT 6 E / F, OXYMAT 64 E Type / Typ 7MB2001-xxA00-xxxx-Z+xxx 7MB2011-xax0x-bcdx-Z+e+f+xxx 7MB2017-xax0c-bcdx-Z+e+f+xxx 7MB2021-xxxx0-xxxx-Z+g+xxx 7MB2027-xxxx0-bxxx-Z+g+xxx 7MB2041-xxxxx-xxxx-Z+xxx a, b, c, d, e, f, g, x: see tables page 2 / siehe Tabellen Blatt 2

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	Directive of the European Parliament and of the Council on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC. *Richtlinie des Europäischen Parlaments und des Rates zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über die elektromagnetische Verträglichkeit und zur Aufhebung der Richtlinie 89/336/EWG.*
2006/95/EC LVD	Directive of the European Parliament and of the Council on the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits. *Richtlinie des Europäischen Parlaments und des Rates zur Angleichung der Rechtsvorschriften der Mitgliedstaaten betreffend elektrische Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen.*
94/9/EC ATEX	Directive of the European Parliament and the Council on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres. *Richtlinie des Europäischen Parlaments und des Rates zur Angleichung der Rechtsvorschriften der Mitgliedstaaten für Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen.*

Karlsruhe, 22.06.2009
Siemens AG

Markus Nicklas,
Research & Development / Entwicklung
(Name, function / Funktion)

Wilhelm Eckhard
Quality / Qualität
(Name, function / Funktion)

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 Beschaffenheits- oder Haltbarkeitsgarantie nach §443 BGB. Die Sicherheitshinweise der mitgelieferten Produktdokumentation sind zu beachten.

Siemens Aktiengesellschaft: Chairman of the Supervisory Board: Gerhard Cromme
Managing Board: Peter Loescher, Chairman, President and Chief Executive Officer; Wolfgang Dehen, Heinrich Hiesinger, Joe Kaeser, Jim Reid-Anderson, Hermann Requardt, Siegfried Russwurm, Peter Y. Solmssen
Registered offices: Berlin and Munich; Commercial registries: Berlin Charlottenburg, HRB 12300, Munich, HRB 6684
WEEE-Reg.-Nr. DE 23691322

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SIEMENS

Annex A to the EC Declaration of Conformity
Anhang A zur EG-Konformitätserklärung

No. A5E00484554 - 03

Product description: Gas analyzer / Gasanalysator
Produktbezeichnung OXYMAT 61, OXYMAT 6 E / F, OXYMAT 64 E
Type / Typ
7MB2001-xxA00-xxxx-Z+xxx
7MB2011-xax0x-bcdx-Z+e+f+xxx 7MB2017-xax0c-bcdx-Z+e+f+xxx
7MB2021-xxxx0-xxxx-Z+g+xxx 7MB2027-xxxx0-bxxx-Z+g+xxx
7MB2041-xxxxx-xxxx-Z+xxx
a, b, c, d, e, f, g, x: see tables page 2 / siehe Tabellen Blatt 2

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 *Richtlinie*	Standard / Reference number *Norm / Referenznummer*	Edition *Ausgabedatum*	a,b,c,d,e, x = 0..9 or/ oder A..Z	f=E31, E32,E33, E38,E39 g=E30	a=A,C,E b=0,1 c=B d=A,B,G e=E40	a=A,C,E b=0,1 c=B d=A,B,G e=E11	a=A,C,E b=0,1 c=B d=A,B,G e=E12	a=A,C,E b=6,7 c=B d=A,B,G	a=A,C,E b=2,3 c=B d=A,B,G
2004/108/EC	EN 61326-1 *	2006	X	X	X	X	X	X	X
2006/95/EC	EN 61010-1	2001	X	X	X	X	X	X	X
94/9/EC	EN 50014	1997						X	X
94/9/EC	EN 60079-0	2006							X
94/9/EC	EN 50016	1995						X	X
94/9/EC	EN 60079-2	2004							X
94/9/EC	EN 50020	1994						X	X
94/9/EC	EN 60079-11	2007							X
94/9/EC	EN 50021	1999				X	X		
94/9/EC	EN 50281-1-1+A1	1998			X				
94/9/EC	EN 60079-14,sec.13	1997					X		
94/9/EC	EN 954	1996							X
94/9/EC	EN ISO 13849-1	2006							X
94/9/EC	ZH 1/10, sec. 1.3.4.2, 2.3.1	1987					X	X	
94/9/EC	DIN EN 50104	2002		X					
94/9/EC	DIN EN 50271	2002		X					

* all enviroments included

Certificates / *Zertifikate*

Certificates *Zertifikate*	f=E31, E32, E33, E38,E39 g=30	a=A,C,E b=0,1 c=B d=A,B,G e=E40	a=A,C,E b=0,1 c=B d=A,B,G e=E11	a=A,C,E b=0,1 c=B d=A,B,G e=E12	a=A,C,E b=6,7 c=B d=A,B,G	a=A,C,E b=2,3 c=B d=A,B,G
BVS 03 ATEX G013 X	X					
TÜV 03 ATEX 2278 X		X				
TÜV 01 ATEX 1686 X			X			
TÜV 01 ATEX 1697 X				X		
TÜV 01 ATEX 1708 X					X	
PTB 00 ATEX 2022 X						X

Inspection / Surveillance:
Kontrolle / Überwachung:

Directive *Richtlinie*		Notified Body Product Quality Assurance *Benannte Stelle Qualitätssicherung Produktion*	No.:
94/9/EC	ATEX	TÜV NORD CERT GmbH, Am TÜV 1 D-30516 Hannover	0044

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A.2 Return delivery

The analyzer or replacement parts should be returned in their original packaging material. If the original packing material is no longer available, wrap the analyzer in plastic foil and pack in a sufficiently large box lined with additional padding material (wood shavings, foam rubber, etc.). If you use wood shavings, the padding should be at least 15 cm thick on all sides.

When shipping overseas, the analyzer must be additionally sealed air-tight in polyethylene foil at least 0.2 mm thick and a drying agent (e.g. silica gel) should be added. In addition, the transport container should be lined with a layer of kraft paper.

Photocopy the return delivery form, fill it in and enclose it with the returned device.

In case of guarantee claim, please enclose your guarantee card.

Return delivery addresses

Spare parts service

Send your orders for spare parts to the following address:

SIEMENS SPA
CSC
Tel.: (00333)69066677
Fax: (00333)69066688
1, chemin de la Sandlach
F-67506 Haguenau, France

- DP order form recipient: 0011E

Repairs

To enable us to quickly identify and correct faults, return the analyzers to the following address (applicable until further notice):

SIEMENS SPA
CSC
Tel.: (00333)69066677
Fax: (00333)69066688
1, chemin de la Sandlach
F-67506 Haguenau, France

- DP order form recipient: 0011E

Returned deliveries form

( ) Repair ( ) Guarantee

Customer name	
Person responsible	
Delivery address	
Phone	
Fax	
E-mail	
Return address (if different from address above)	
Customer (original) Order number	
Device name	
MLFB no.	
Production no.	
Description of returned part	
Fault description	
Process data at location of use	
Operating temperature	
Operating pressure	
Sample gas composition	
Operating hours/ operating date	

Service report	
RH no.:	Date received: Date returned: Technician:

ESD Directives

B

B.1 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.

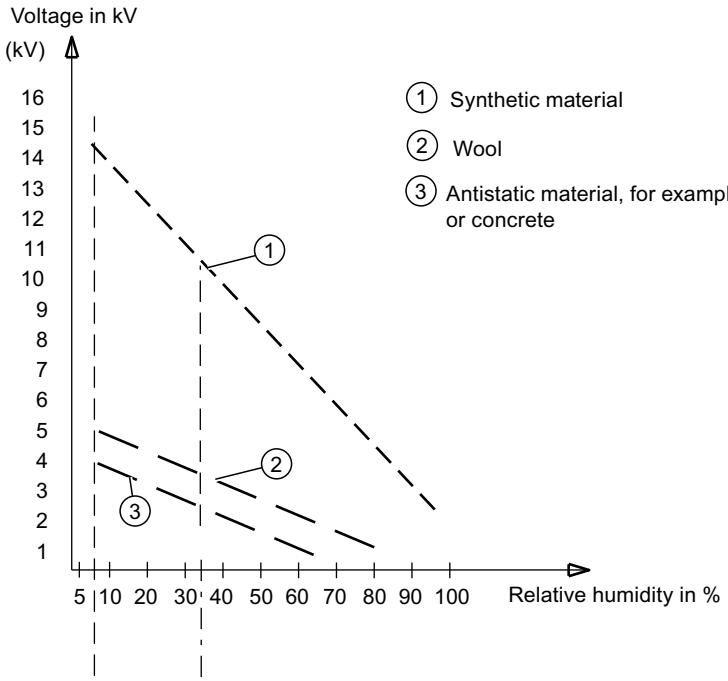

Figure B-1 Electrostatic voltages on an operator

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

C

C.1 List of abbreviations

Abbreviation	Meaning
>	Greater than
<	Smaller than
≥	Greater than or equal to
≤	Smaller than or equal to
=	Equal to
≠	Not equal to
≡	Congruent
±	Plus/minus
≈	Approximately equal
"	Inch (1 inch corresponds to 25.4 mm)
%	Percent (1 percent corresponds to the hundredth part of the whole)
vol. %	Volume percent
°	Degrees (angular)
°C	Degrees Celsius
°F	Degrees Fahrenheit
A	Amperes
AC	Alternating current
AC	Automobile channel
Approx.	Approximately
ASCII	American Standard Code for Information Interchange
AUTOCAL	Automatic calibration
CH_4	Methane
cm	Centimeter
CO	Carbon monoxide
CO_2	Carbon dioxide
D	Slow-blow (fuse values)
DB	Data bits
DC	Direct current
DD	Device Description
DIN	Deutsche Industrie Norm (German industrial standard)
DP	Decentralized periphery, a PROFIBUS version
DS	Pressure switch

Abbreviation	Meaning
e.g.	For example
EEPROM	Electrically erasable programmable read-only memory
ESD	Electrostatic sensitive device
ELAN	Economical Local Area Network
EN	European standard
EP	Even parity
EPROM	Erasable Programmable Read-only Memory
ETX	End of text
Fct.	Function
FCTRL	Function check
FKM	Fluoroelastomer (name according to DIN ISO 1629)
FSV	Full-of-scale value
GA	Gas analyzers
GND	Ground
GSD	Device master data
h	Hour (from lat. 'hora')
hPa	Hectopascal (1 hPa corresponds to one millibar (mbar))
HS	High switchover point
HU	Height unit (1 HU correspondence to 1 3/4 inch, i.e. 44.45 millimeter)
HystS	Start point of the hysteresis
HystE	End point of the hysteresis
Hz	Hertz
i.e.	In other words
IEC	International Electrotechnical Commission
IP	Ingress Protection Degree of protection
K	Kelvin
kg	Kilogram
NP	No parity
l	Liter
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LEL	Lower explosion limit
LS	Low switchover point

Abbreviation	Meaning
m	Meter
mA	Milliampere
Mat. no.	Material number
max.	Maximum
min	Minute
min.	Minimum
MC	Measured component
MLFB	Machine-readable product designation
mm	Millimeter
MR	Measuring range
MR	Maintenance request
MS	Span
N_2	Nitrogen
NAMUR	Standards working committee for measuring and control technology in the chemical industry
NC	No connection
NO	Nitrogen oxide
No.	Number
O_2	Oxygen
OP	Odd parity
PA	Process Automation
PA	Polyamide, a plastic, commercial name, e.g. nylon
PC	Personal computer
PROFIBUS	Process fieldbus
PTFE	Polytetrafluoroethylene, a plastic, commercial name, e.g. Teflon
Q	Acknowledgment required
RAM	Random access memory (memory with random (direct) access)
RC	R = resistor, C = capacitor
RD	Received data
R.H., RH	Relative humidity
RS232	Serial interface for data communication
RS485	Serial interface for high-speed data transfer
s	Second
SB	Stop bit(s)
SG	Sample gas
SO_2	Sulfur dioxide
SSV	Start-of-scale value
STX	Start of text
SUB-D	Subminiature-D, form a plug system for data connections
SW	Software

Abbreviation	Meaning
t	Time (from lat. 'tempus')
TD	Transmitted data
USB	Universal Serial Bus
V	Volts
V.	Version
VA	Volt-ampere
Δ	Difference
µA	Microampere
µF	Microfarad
φ	Phase angle
Ω	Ohm

Glossary

Additional electronics

Generic term for all add-on boards.

Back wall of housing

Part for sealing the rear housing opening of the device.

Calibration

Elimination of deviations between the setpoint and actual value of certain measured variables.

Calibration gas

Gas used for calibration procedures.

Code

A selectable sequence of characters for enabling a protected submenu.

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.

Containment system

Gas channel within the gas analyzer.

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 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

Standard settings of the device at the time of delivery.

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 the gas analyzer.

Input field

Single or multi-line area for entering data.

Interfering gas

A gas which interferes with the measurement, and which may be contained in the sample gas.

Limit alarm

Signaling of violation of a high or low limit.

Limit monitoring

Function which monitors adherence to adjustable limits, and signals if high or low limit is 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

The measured value is an output value which reflects 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

Range within which the result of a measurement moves. The measuring range has a reference number, e.g. 1. It is characterized by a start-of-scale value and a full-scale value.

Measuring range switching

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

Membrane keyboard

Keyboard whose keys are protected against atmospheric influences by a membrane.

Motherboard

Board which contains the basic data and firmware for the device.

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

Generic term for a number of independent states which the device can assume during operation (e.g. measure, standby, pause, etc.).

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

Generic term for a number of independent states which the device can assume during operation (e.g. measure, standby, pause, etc.).

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 configured in this mode.

Sample gas

A gas which has been extracted from a process for analysis.

Sealing

Protection of the materials against escaping of gases.

Signaling contact

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

Span

Difference between defined start-of-scale value and defined full-scale value.

Span calibration

Adjustment of the span using a suitable calibration gas.

Spike

English.: Thorn, pin, prong: 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.

Start-up state

Settable operating mode to which the device changes after the warm-up phase has been successfully run through.

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. The warm-up phase counts as one of the operating modes.

Weighting

Evaluation of single factors of a solution approach with regard to their importance. It has the effect that more relevant factors have a greater influence on the result.

Zero calibration

Calibration of the zero point with a suitable zero gas.

Zero gas

Gas used to calibrate the zero point.

Zero point

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

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