SIEMENS

Continuous gas analysis

SIPROCESS GA700
Rack-mounted device

Operating Instructions

7MB3000-.....-....
7MB3010-.....-....
7MB3017-.....-....
7MB3020-.....-....
7MB3040-.....-....

A5E31874006-12

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

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

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

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

Disclaimer of Liability

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

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Table of contents

Introduction

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1.1 Purpose of this document

These operating instructions include all the necessary information on the operating principle and the safe usage of the device. These are instructions on the mounting, commissioning, operation, servicing, decommissioning and dismantling of the device.

These operating instructions are intended for qualified personnel who have been instructed in all work on a device in non-hazardous areas and in possible dangers arising from improper conduct and who have been trained.

It is your responsibility to read the operating instructions thoroughly and understand them before beginning work. To ensure correct handling, become acquainted with the principle of operation of the device.

The operating instructions belong to the device. Keep them in the direct vicinity of the device

1.2 History

The following table includes information on the different editions of this document.

Table 1-1 History

Edition	Comment
01/2013	First edition
05/2014	Expansion option modules OM 1.1 and OM 2.2 (analog inputs, digital inputs, digital outputs), corrections
05/2015	Extension for analyzer modules CALOMAT 7 and ULTRAMAT 7
03/2016	Additional module combinations for CALOMAT 7 and ULTRAMAT 7 Extended ULTRAMAT 7 area of application: measurement of components NO, N_2O, SO_2, CH_4, C_2H_4, NH_3
06/2017	ULTRAMAT 7: Measurement of two components simultaneously. Corrosion resistant versions of ULTRAMAT 7 and OXYMAT 7 Cleaned for O_2: Variants with specially cleaned gas path for sample gases with high oxygen content
05/2018	Expansion and updating of the document Wall-mounted device: Analyzer modules OXYMAT 7 and ULTRAMAT 7, high-temperature version
11/2019	Expansion and updating of the document Wall-mounted device: Revision of the sections OXYMAT 7 and ULTRAMAT 7 in high-temperature version
01/2022	General expansion and updating of the document

1.3 Purpose

The device is designed for the concentration analysis of gases in gas mixtures. Depending on the installed analyzer module, different gases can be examined.

Use the device only for measuring/analysis of gas concentrations in gas mixtures according to the information in section "Technical specifications (Page 117)".

Note

Aggregate state of examined substances

The system can only be used for gaseous samples.

Note

This device meets the requirements of NAMUR Recommendation 53.

Note

Use in home environment

This equipment of Class A Group 1 is intended solely for use in industrial areas.

If used in homes, the device may cause radio interference.

Note

For more information on the compatibility of the hardware and firmware, refer to:
Siemens Industry Online Support (https://support.industry.siemens.com/cs/de/en/ps/17731).

You will find more information in the operating instructions, see "References (Page 135)".

1.4 Field of application

These operating instructions only describe **non** explosion-proof SIPROCESS GA700 rack-mounted devices. You can find information on explosion-proof SIPROCESS GA700 devices in the compact operating instructions "Devices in explosion-proof version", see Table A-6 References 5 - Compact Operating Instructions Ex (Page 136).

A SIPROCESS GA700 rack-mounted device comprises a housing into which up to two exchangeable analyzer modules can be inserted. The rack-mounted device is suitable for installing in a control cabinet or in a frame. The analyzer modules are selected according to the measuring task and local conditions.

The standard analyzer modules OXYMAT 7, ULTRAMAT 7 and CALOMAT 7 are available for rack-mounted devices.

The following table provides an overview of the device variants.

Table 1-2 SIPROCESS GA700 devices with analyzer modules

Device variants	**MLFB number**[1)]
Basic device:	
Rack-mounted device	7MB3000-0****-****
Analyzer modules, standard version:	
OXYMAT 7	7MB302*-0***0-*AA*
ULTRAMAT 7	7MB301*-0****-0A**
CALOMAT 7	7MB304*-0****-0***

1) Machine-readable product designation

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 approved by Siemens.

1.6 Qualified personnel

Persons who install, connect, commission, operate, service, maintain and disassemble the device must have the following specific qualifications:

- They are authorized and trained or instructed in operating and maintaining devices and systems according to the safety regulations for electrical circuits, high pressures and corrosive as well as hazardous media.
- They are trained or instructed in the maintenance and use of appropriate safety equipment according to the pertinent safety regulations.

1.7 Checking delivery

1. Check the packaging and the device for visible damage caused by inappropriate handling during shipping.
2. Report any claims for damages immediately to the shipping company.
3. Retain the damaged parts until clarification.

4. Check the scope of delivery for correctness and completeness on the basis of the delivery note. Compare the serial numbers on the delivery note with the serial numbers on the basic device or on the analyzer modules.
5. Check whether the package includes the following items:
   – CD-ROM "Manual Collection" CD-ROM "Manual Collection"
   – This printed copy of the Compact Operating Instructions (not with loose delivery).

Note

Installation of analyzer modules

The analyzer module is only installed in the basic device at the factory if you select the options "D00 to D99" when ordering an analyzer module.

If you do not specify the module assignment/installation location during the ordering process, the analyzer module is delivered separately from the basic device ("separate delivery").

If the analyzer module is delivered separately, you must install it in the basic device yourself. Information on this point is only available in the Operating Instructions of the unit, see "References (Page 135)".

See also

Installing/removing and connecting analyzer and option modules (Page 55)

1.8 Transportation and storage

To ensure sufficient protection during transport and storage, observe the following:

- Keep the original packaging for subsequent transportation.
- Devices/replacement parts should be returned in their original packaging.
- If the original packaging is no longer available, please ensure that all shipments are sufficiently protected during transport by the replacement packaging. The manufacturer accepts no liability for additional costs resulting from damage during transportation.
- Store the device in a dry place, vibration-free and horizontal.

Note

Insufficient protection during storage

The packaging only provides limited protection against moisture and infiltration.

- Provide additional packaging as necessary.

Special conditions for storage and transportation of the device are listed in section "Technical specifications (Page 117)".

1.9 Warranty conditions

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

Safety instructions

2

2.1 Requirements for safe use

In terms of safety, this device left the factory in perfect condition. In order to maintain this status and to ensure safe operation of the device, observe these operating instructions and all the information relevant to safety.

Observe the information and symbols on the device. Do not remove any information or symbols from the device. Always keep the information and symbols in a completely legible state and renew it, if necessary.

Symbol	Description
	Consult operating instructions
	Hot surface
	Dangerous electrical voltage

2.1.1 Laws and directives

Observe the test certification, provisions and laws applicable in your country during connection, assembly and operation in the respectively valid version. These include, for example:

- National Electrical Code (NEC - NFPA 70) (USA)
- Canadian Electrical Code (CEC) (Canada)

Additional information is available at:
Certificate (Page 134)

2.1.2 Conformity with European directives

The CE marking on the device shows conformity with the regulations of the following European guidelines:

Electromagnetic compatibility EMC 2014/30/EU	Directive of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to electromagnetic compatibility (new version)
Low voltage directive LVD 2014/35/EU	Directive of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits (new version)
Atmosphère explosible ATEX 2014/34/EU	Directive of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres (new version)
Restriction of certain Hazardous Substances RoHS 2011/65/EU	Directive of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (new version)

The standards applied can be found in the EU Declaration of Conformity for the associated device.

2.2 Basic safety instructions

Industrial security

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the Internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

You can find more possible protective measures in the area of industrial security at Industrial security (https://www.siemens.com/industrialsecurity).

Siemens' products and solutions undergo continuous development to make them more secure. Siemens expressly recommends that product updates be applied as soon as they become available and that only the latest product versions be used. Use of product versions that are no longer supported, and failure to apply latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed under: Industrial security (https://www.siemens.com/industrialsecurity)

⚠ WARNING

Introduction of combustible gases

Explosion hazard

Devices in standard version are not designed for use in hazardous areas.

- Do not use a standard version of the analyzer in hazardous areas.
- Supply gases with flammable components at concentrations above the lower explosion limit (LEL) only in devices with pipes.

⚠ WARNING

Device modifications

Danger to personnel, system and the environment can result from modifications and repairs to the device.

- Only carry out modifications or repairs that are described in the operating instructions for the device.
- Failure to observe this requirement cancels the manufacturer's warranty and the product approvals.

⚠ WARNING

Faults in the process resulting from incorrectly displayed measured values

An incorrectly displayed measured value can result in misinterpretations or faults in the process.

Take appropriate measures to guarantee a fault-free process.

General information

3

3.1 KC Safety note - Information for Korea only

Class A Equipment (Industrial Broadcasting & Communication Equipment)

This equipment is Industrial (Class A) electromagnetic wave suitability equipment and seller or user should take notice of it, and this equipment is to be used in the places except for home.

MSIP 요구사항 - For Korea only

A급 기기(업무용 방송통신기자재)

이 기기는 업무용(A급) 전자파 적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정 외의 지역에서 사용하는것을 목적으로 합니다.

3.2 Requirements for special applications

Due to the number or possible applications, this document does not include all detailed information on the described device versions. This means not every possible scenario for commissioning, operating, maintenance or operation in plants is taken into consideration.

Should you require additional information which is not included in these instructions, please contact your local SIEMENS office or your SIEMENS partner.

Note

Operation under special ambient conditions

If you want to use the device under special ambient conditions, for example, in nuclear power plants or for research and development purposes,
we recommend:

First contact your local SIEMENS partner or our application department. Explain the specific application and clarify the operating conditions.

3.3 Automatic reset

All SIPROCESS GA700 devices feature internal monitoring. When this monitoring is activated, the standard digital outputs switch after about 4 seconds for a period of approx. 60 seconds to "inactive", i.e. to a recognized safe operating mode. These times are valid for devices manufactured as of 09/2017. You can find this information on the nameplate. It can take up to 10 seconds for older devices to switch over, and up to 100 seconds to switch to safe operating mode.

If you are using SIPROCESS GA700 devices in critical processes, observe the following information:

- Monitor the limits externally via the control system.
- If an option module 2.1 is installed, read out the device status via the digital outputs of the option module.
- Use an available manual measuring range switchover instead of the autoranging.
- Only use the "Total" parameter with the "Off" setting for the measuring range switchover.
- If you use the "Correction of cross-interference" and "External pressure compensation" functions, store suitable substitute values.
- Only access the measured value via an analog output.

3.4 Measuring high oxygen concentrations

Note

Measuring high oxygen concentrations

For the measurement of high O_2 concentrations in excess of 25%, it is absolutely necessary that all parts that come in contact with the sample gas are free of oil and grease and do not contain any particles that could react with O_2.

We highly recommend you use specially cleaned analyzer modules with the "Cleaned for O2" option for such measurements.

Description

4

4.1 Overview

Rack-mounted devices have a modular structure. A rack-mounted device comprises a rack-mounted housing and at least one analyzer module. Optionally, rack-mounted devices can be fitted with option modules.

Definition of rack-mounted device and rack-mounted housing

The following terms are used in the operating instructions:

- Basic device, rack-mounted housing
  This includes the metal housing for installation in a 19" rack with local user interface, built-in processing unit (PU) and a power supply unit. A rack-mounted housing (basic device) is prepared for installation of the analyzer and option modules.
- Rack-mounted device
  This includes a rack-mounted housing (basic unit) with at least one analyzer module (AM) installed.

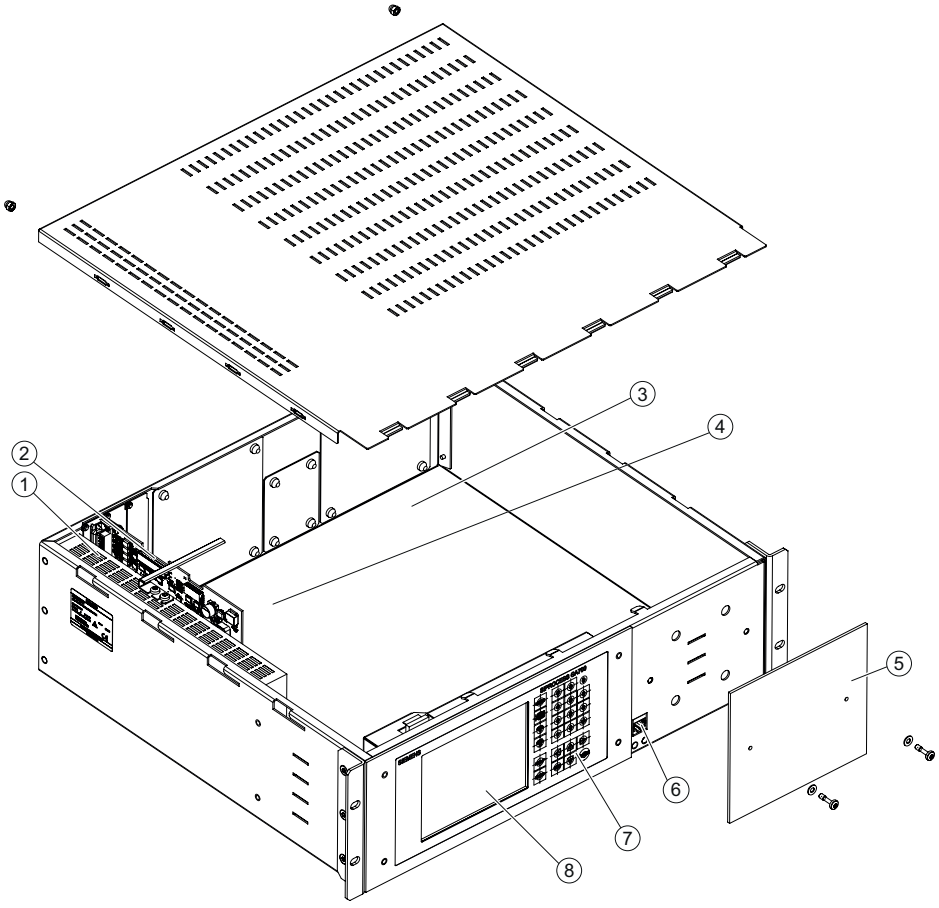
Overview of analyzer modules

The analyzer modules are matched with specific sample gas components and measuring ranges. Various types of measuring methods are implemented.
The following table provides an overview of the features of the measuring tasks of the analyzer modules.

Table 4-1 Measuring task of the analyzer modules

Analyzer modules	Sample gas in gas mixtures	Measuring principle
OXYMAT 7	O_2	Paramagnetic alternating pressure method
ULTRAMAT 7	CO, CO_2, CH_4, C_2H_4, SO_2, NO, N_2O, NH_3	Infrared push-pull chopped radiation method
CALOMAT 7	H_2 and additional gases in binary or quasi-binary gas mixtures	Difference in thermal conductivity of gases

4.2 Design of rack-mounted housing



① Power supply unit
② Processing unit
③ Mounting location AM1
④ Mounting location AM2
⑤ Door
⑥ Ethernet service interface
⑦ Keyboard
⑧ Display

Figure 4-1 Design of rack-mounted housing

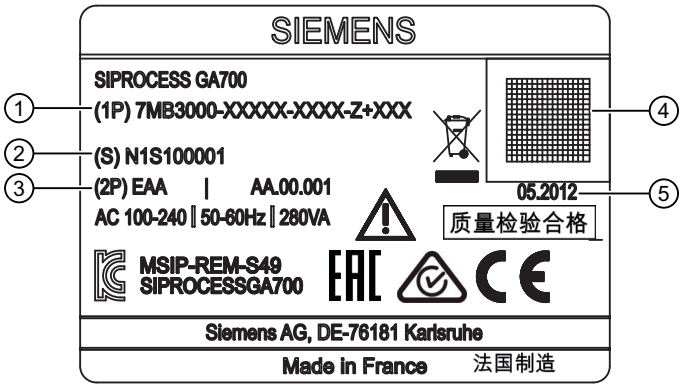
The device is secured with four screws, for example in a cabinet or frame, see section "Installing the rack-mounted device (Page 53)".

The front panel is equipped with a display ⑧, a keypad ⑦, and a removable door ⑤. The door is locked with screws and may only be opened for maintenance purposes by loosening the screws, see section "Rack-mounted housing tool (Page 56)".

The device provides space for the installation of two option modules and two analyzer modules AM1 ③ and AM2 ④. The power supply ① and the processing unit ② are located on the left. More information on the mounting locations of the option modules can be found in section Mounting locations of option modules (Page 63).

4.3 Device/module identification

4.3.1 Nameplate layout

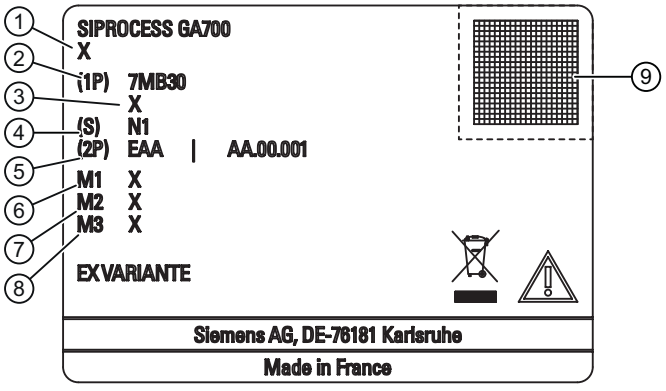


① Article number
② Serial number
③ Revision status
④ DataMatrix Code ECC 200
⑤ Date of manufacture

Figure 4-2 Nameplate

The nameplate with the article number and other important information is located on the left of the enclosure exterior.

4.3.2 Design of module nameplate



① Module version
② Article number
③ Article number suffix
④ Serial number
⑤ Revision status
⑥ Measured component 1
⑦ Measured component 2 optional (ULTRAMAT only)
⑧ Measured component 3 optional
⑨ DataMatrix Code ECC 200

Figure 4-3 Module nameplate

The module nameplate with the article number and other important information is located below the gas connections on the module exterior.

Measured component examples		
M1 CO_2 0-500/5000 vpm	M1 CO_2 0-500/5000 vpm M2 CO_2 0-500/5000 vpm	M1 CO_2 0-500/5000 vpm M2 - - - M3 - - -

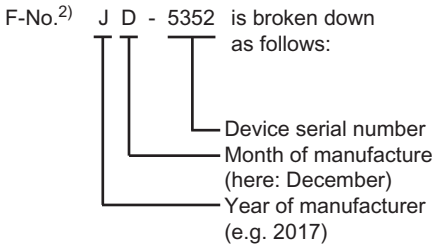
4.3.3 Date of manufacture

Year of manufacture

The date of manufacture is included as coded information in the serial number (see rating plate). Details on the coding can be found in the following table.

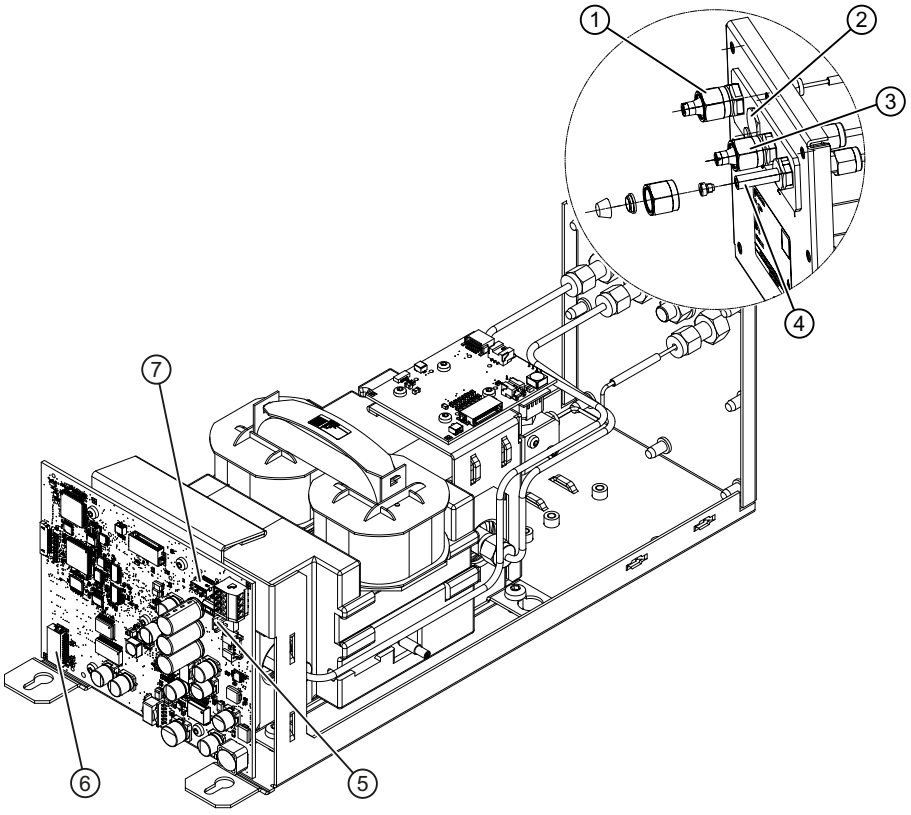
Production year	Code [1]	Month	Code [1]
1950, 1970, 1990, 2010	A	January	1
1951, 1971, 1991, 2011	B	February	2
1952, 1972, 1992, 2012	C	March	3
1953, 1973, 1993, 2013	D	April	4
1954, 1974, 1994, 2014	E	May	5
1955, 1975, 1995, 2015	F	June	6
1956, 1976, 1996, 2016	H	July	7
1957, 1977, 1997, 2017	J	August	8
1958, 1978, 1998, 2018	K	September	9
1958, 1979, 1999, 2019	L	October	O
1960, 1980, 2000, 2020	M	November	N
1961, 1981, 2001, 2021	N	December	D
1962, 1982, 2002, 2022	P		
1963, 1983, 2003, 2023	R		
1964, 1984, 2004, 2024	S		
1965, 1985, 2005, 2025	T		
1966, 1986, 2006, 2026	U		
1967, 1987, 2007, 2027	V		
1968, 1988, 2008, 2028	W		
1969, 1989, 2009, 2029	X		

Example:



[1] In conformance with DIN EN 60062
[2] The identifier of the manufacturing location (e.g. N1) is added as a prefix to the actual serial number

4.4 OXYMAT 7

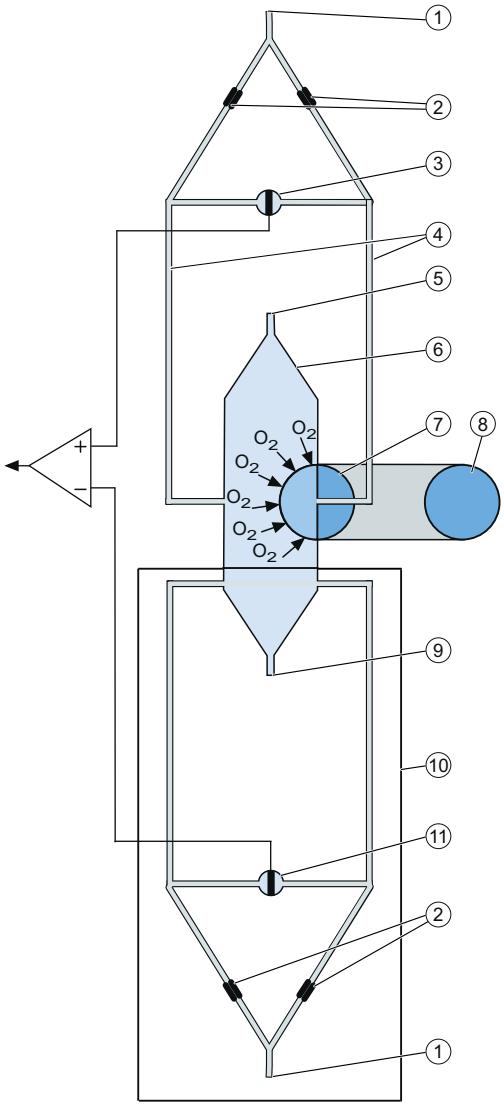


①	Reference gas inlet	⑤	Power supply connection
②	Not assigned	⑥	Connection for optional module 2.x (OM2.x)
③	Sample gas outlet	⑦	Connection for internal bus communication (CAN)
④	Sample gas inlet		

Figure 4-4 Design OXYMAT 7, high-pressure version, measurement gas path with pipes

4.4.1 Principle of operation of OXYMAT 7

Overview



①	Reference gas inlet	⑦	Paramagnetic measurement effect
②	Restrictors	⑧	Electromagnet with alternating current strength
③	Microflow sensor	⑨	Sample gas and reference gas outlet
④	Reference gas channels	⑩	Vibration compensation system (optional)
⑤	Sample gas inlet	⑪	Microflow sensor in the vibration compensation system (flow-type)
⑥	Measuring chamber		

Figure 4-5 Principle of operation of OXYMAT 7

Measuring principle

In contrast to other gases, oxygen is highly paramagnetic. OXYMAT 7 analyzer modules use this physical property to determine the oxygen concentration in gases.

Oxygen molecules in an inhomogeneous magnetic field always move toward the higher field strength. This results in a higher oxygen concentration where the field strength is higher (higher oxygen partial pressure). If two gases with differing oxygen content come together in a magnetic field, a partial pressure difference arises between them. The measuring effect is therefore always based on the difference in the oxygen content of the two gases. The two gases are referred to as the sample gas and the reference gas.

How it works

To measure oxygen in the OXYMAT 7, the reference gas (nitrogen, air or oxygen) flows through two reference gas channels ④ into the measuring chamber ⑥. One of these partial flows enters the measuring chamber in the area of the magnetic field ⑦. If the sample gas contains no oxygen, the reference gas flows freely into the sample chamber. However, if the sample gas contains oxygen, the oxygen molecules concentrate in the area of the magnetic field. The reference gas can then no longer flow freely into the sample chamber. There is a slight build-up of dynamic pressure, which depends on the concentration of oxygen in the sample gas. In an oscillating magnetic field, oscillating pressure is also generated and this results in alternating flow. This alternating flow is converted into an alternating current signal by two microflow sensors ③ located between the reference gas channels ④.

The microflow sensors ③ consist of two nickel-plated grids each, which are arranged together with two further nickel-plated grids to form a measuring bridge. The alternating flow results in a change in the resistance of the nickel-plated grids. The resulting offset in the bridge is a measure of the concentration of oxygen in the sample gas.

The microflow sensors ③ are surrounded by reference gas. This arrangement protects them from corrosion by the sample gas.

Vibrations at the installation site can interfere with the measured signal, for example, large fluctuations in the output signal. Two additional optional microflow sensors ⑪ serve as vibration sensors and thus compensate for the undesirable behavior.

4.4.2 Reference gas monitoring

NOTICE

Damage to the microflow sensor

The microflow sensors can be damaged by aggressive sample gas components. As long as the reference gas is flowing, the sample gas is prevented from diffusing to the microflow sensors and destroying them.

- Ensure that the microflow sensors have no contact to the sample gas. To do this, monitor the reference gas pressure using an internal (optional) or external pressure switch.
- Ensure that there is a continuous supply of reference gas during operation.
- Interrupt the sample gas supply if the reference gas pressure is too low, and flush the sample gas path with inert gas.

Note

Sample gas pressure increase influences the sample gas pressure switch

At the time of delivery of an OXYMAT 7 analyzer module, the internal pressure switch for reference gas monitoring is preset to approx. 2000 hPa (3000 hPa abs.). Changes in the sample gas pressure in the analyzer module by more than 150 hPa require a change in the pressure switch switching point by the same amount. The monitoring functionality of the reference gas pressure switch is modified as a result.

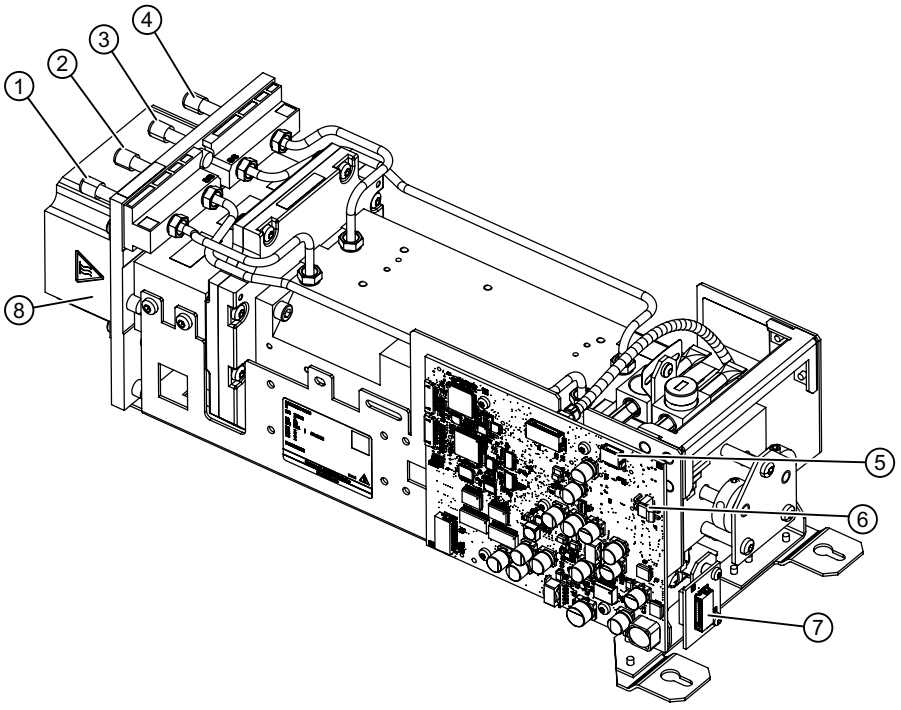
- For changes to the sample gas pressure, contact the Service (Page 149).
- Have the pressure switching point of the reference gas pressure switch adjusted by a Siemens technician or someone trained for this case.

See also

Reference gas monitoring with pressure switch (Page 93)

4.5 ULTRAMAT 7

4.5.1 Module design

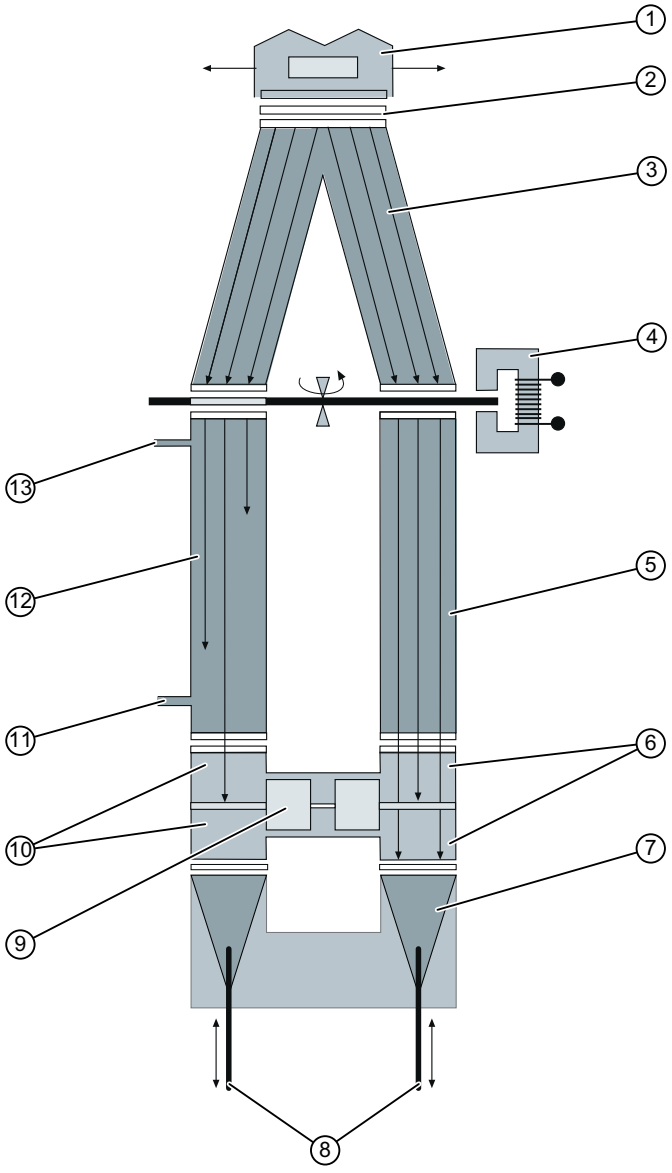


①	Sample gas inlet (1)	⑤	Connection for internal bus communication (CAN)
②	Sample gas outlet (2)	⑥	Power supply connection
③	Reference gas outlet (3)	⑦	Connection for optional module 2.x (OM2.x)
④	Reference gas inlet (4)	⑧	Heat sink

Figure 4-6 Design of ULTRAMAT 7, measurement and reference gas path with pipes

4.5.2 How the ULTRAMAT 7 works

Overview



① Source, adjustable
② Optical filter
③ Beam splitter/Y cell
④ Chopper
⑤ Reference chamber
⑥ Receiver chamber comparison side
⑦ Decoupler
⑧ Slider, adjustable
⑨ Microflow sensor
⑩ Receiver chamber measuring side
⑪ Sample gas outlet
⑫ Sample chamber
⑬ Sample gas inlet

Figure 4-7 Principle of operation of ULTRAMAT 7

Measuring principle

The ULTRAMAT 7 can simultaneously measure up to 4 infrared-active measuring components.

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

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

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

An IR source ① with a temperature of approximately 600 °C generates infrared radiation which is emitted in the beam splitter ③ . The beam splitter ③ acts as a filter chamber and divides the beam equally between the sample gas and reference gas compartments.

The chopper ④ produces a periodic modulation of the infrared radiation, and thus enables relaxation of the receiver.

The reference beam passes through the reference chamber ⑤ and enters the detector chamber ⑥ virtually unattenuated. The detector chamber ⑥ is filled with a precisely defined concentration of the gas component to be measured.

The sample beam, by contrast, passes through the sample chamber ⑫ filled with sample gas and enters the detector chamber ⑩ attenuated to various degrees. The degree of attenuation depends on the respective sample gas concentration.

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

The detector layers at both compartments of the detector are pneumatically connected to each other via a microflow sensor ⑨ . This sensor element converts the pressure difference in the detector into an electrical signal.

The weighting between the first and second detector layer is preset to a dew point of 4°C by default at the factory using the decoupler. This minimizes the effect of interfering components.

To ensure the long-term stability of the measured value, the ULTRAMAT 7 analyzer module supports the predictive self-diagnostics of the analyzer. This function enables you to plan maintenance measures in a timely manner.

4.5.3 Reference gas monitoring

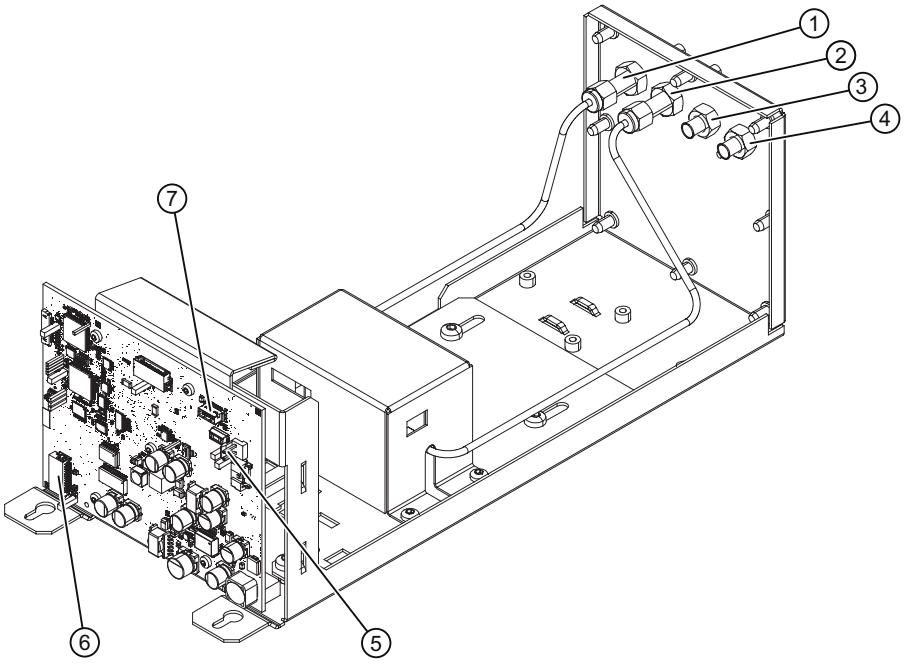
Only the device versions of the ULTRAMAT 7 with a flow-type reference end are equipped with reference gas connections. The reference gas connections are implemented as nozzles with an outer diameter of 6 mm.

To connect the reference gas supply and return lines use only such gas-contacted connecting parts that are suitable for the connection and the reference gas.

The flow rate of the reference gas can range from 0.1 l/min to 1.5 l/min. We recommend a flow rate of approx. 0.5 l/min.

For devices without flow-type reference compartment, the reference cuvette is filled with nitrogen and hermitically sealed.

4.6 CALOMAT 7

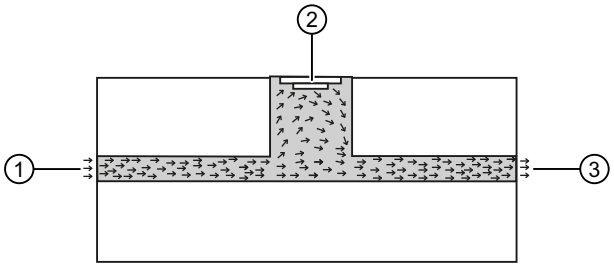


① Sample gas inlet
② Sample gas outlet
③ Not assigned
④ Not assigned
⑤ Power supply connection
⑥ Connection for optional module 2.x (OM2.x)
⑦ Connection for internal bus communication (CAN)

Figure 4-8 Design of CALOMAT 7, sample gas path with pipes

4.6.1 How the CALOMAT 7 works

Overview



① Sample gas inlet
② Measuring membrane with thin-film resistors
③ Sample gas outlet

Figure 4-9 Principle of operation of CALOMAT 7

How it works/measuring principle

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

The resistors contained in the membrane are regulated for constant temperature. The amperage required fluctuates according to the thermal conductivity of the sample gas. This raw value determined in this way is processed further electronically to calculate the gas concentration.

The sensor is in a thermostatically controlled stainless steel enclosure in order to suppress the effect of the ambient temperature. To rule out flow influences, the sensor is mounted in a bore hole next to the flow channel.

4.7 Option modules

Option module 1.1

Option module 1.1 (OM1.1) provides eight additional digital inputs and twelve additional digital outputs. Because the module is a "passive" module, the processing unit is in charge of controlling the OM.

Option module 2.1

The option module 2.1 (OM2.1) is a "passive" module whose control is handled by the relevant analyzer module. For every component measured by the analyzer module, the OM2.1 makes an analog output available. This option module also provides three digital outputs per analyzer module with a fixed function assignment.

If the device is retrofitted with an option module 2.1, this must be activated via LUI or PDM.

Option module 2.2

Option module 2.2 (OM2.2) is a system module connected directly via the CAN bus. Just like the analyzer modules, this module is an "intelligent" module with the following core properties:

- Independent identification in the menu of the LUI
- Plug & measure capability
- Parameter assignment including parameter block transfer (save and restore)
- Diagnostics and test functions
- Inclusion in the logbook
- Download of firmware and parameter blocks

Compared to option module 2.1, the option module 2.2 provides four analog inputs and four digital inputs. The additional analog inputs can be used as measured value source for the correction of cross-interference and/or pressure compensation. You can also output the analog input measured values in the display of the additional process values (main view).

Test mode can be activated for analog as well as digital inputs.

Inputs/outputs of option modules OM2.1 and OM2.2

Table 4-2 Inputs/outputs at a glance

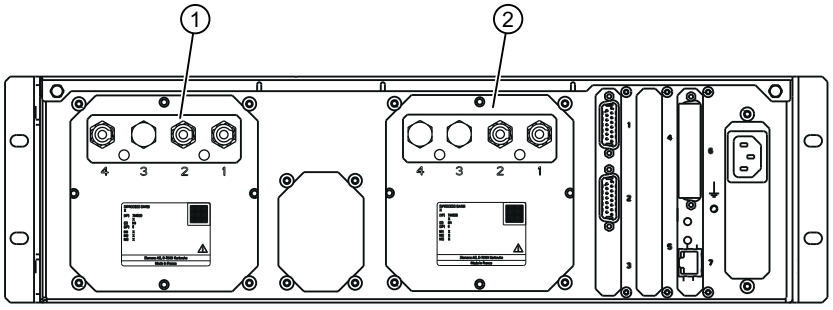
Option module 2.1	**Option module 2.2**
The option module 2.1 has the following inputs/ outputs: • 6 digital outputs (3 digital outputs per analyzer module): These digital outputs are assigned fixed to a function • 6 analog outputs	The option module 2.2 has the following inputs/ outputs: • 4 analog inputs • 4 digital inputs • 6 analog outputs

Combined operation

5

5.1 Slots for analyzer modules

The following figure shows the rear of the rack-mounted device with two slots for the analyzer modules.



① Slot 1 (AM1), example OXYMAT 7

② Slot 2 (AM2), example CALOMAT 7

Figure 5-1 Slots for analyzer modules, rack-mounted device rear

5.2 Operating modes

5.2.1 Setting note

Note

Operating mode-specific parameter assignment of the gas path in serial/parallel operation

Analyzer modules can be operated in series or in parallel.

- If you are only using one analyzer module or want to operate two analyzer modules in series, set the value "Shared" in the "Gas path" parameter field.
- If you are operating two analyzer modules in parallel, however, select the setting "Separate".

You can find the corresponding setting options in the menu → [2.12].

5.2.2 Serial/parallel operation

If you are using two analyzer modules in one basic device, the analyzer modules can be operated in series or in parallel:

- Serial operation: The sample gas flows through the analyzer modules consecutively.
  To do this, connect the sample gas outlet of the analyzer module filled first to the sample gas inlet of the second analyzer module.
- Parallel operation: The sample gas flows separately through the analyzer modules.
  To do this, connect each sample gas inlet individually to the sample gas in such a way that the analyzer modules are supplied separately with sample gas.

5.2.3 Pressure operation/Suction operation

The analyzer modules can be operated in pressure operation and in suction operation:

- Pressure operation: The sample gas is fed into the analyzer module with overpressure from the gas line or gas bottle.
- Suction operation: The sample gas is sucked out of the analyzer module by a downstream pump.

5.2.4 Changing the operating mode

Please observe the following points when switching between the operating modes:

- Check the mounting positions of sample gas restrictors or clamping screws at the sample gas connections. If required, change them in accordance with the selected operating mode.
  For additional information, refer to the section "Structure of the gas connections (Page 34)".
- In the menu, adapt the parameter field of the gas path.
  Additional information is available in the operating manuals: References (Page 135).
- If necessary, adjust the signal frequency of the module combination.
  Additional information is available in the operating manuals: References (Page 135).

5.3 Structure of the gas connections

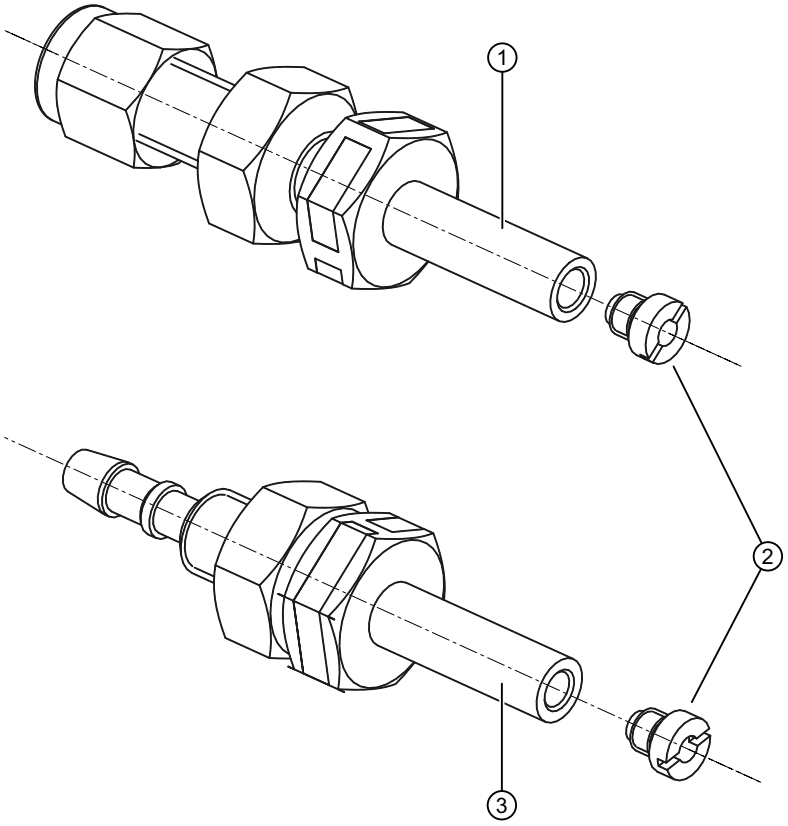
Note

Equipping analyzer modules with sample gas restrictors and/or clamping screws

In the delivery state, the analyzer modules are equipped as follows at the factory:

- OXYMAT 7: With a sample gas restrictor at the sample gas inlet, otherwise clamping screws everywhere.
- ULTRAMAT 7: Does not require clamping screws/sample gas restrictors. Subsequent upgrading or retrofitting is not possible and not required.
- CALOMAT 7: With clamping screws only.

Overview



① Version with pipes:
Sample gas bushing with 6 mm nozzles

② Sample gas restrictors

③ Version with hoses:
Sample gas bushing with 6 mm nozzles

Figure 5-2 Sample gas connections with sample gas restrictors

The sample gas connections of the analyzer modules are 6 mm nozzles. Depending on the analyzer module, either clamping screws or sample gas restrictors are mounted onto these nozzles that are then connected tightly to the incoming gas lines and outgoing gas lines. Sample gas restrictors as well as clamping screws ensure a gas-tight connection between the gas connection and the gas line.

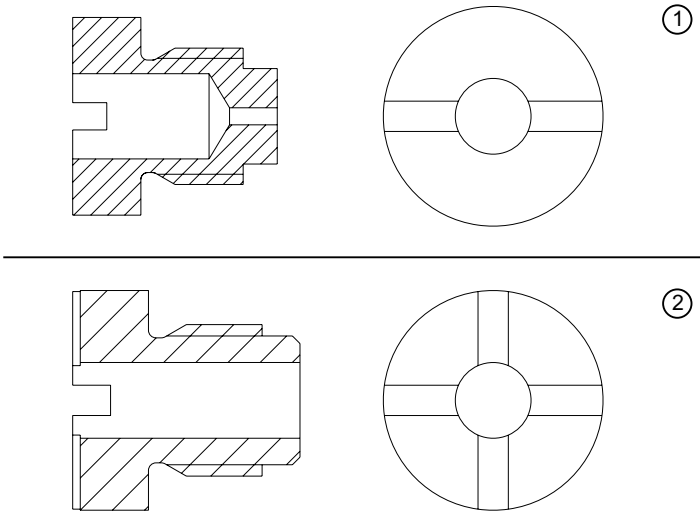
Depending on the application, however, you may also need to remove the sample gas restrictor or move it to another module. The sample gas restrictor is screwed (grub screw) onto the bushing of the gas path.

If no sample gas restrictors are installed, the clamping screws take on the role of length compensation for the gas connections.

Distinction between sample gas restrictors and clamping screws

The sample gas restrictor and clamping screw differ in the bolt head and at the outlet diameter at the bottom end.

- Sample gas restrictor: Slotted screw, outlet diameter 0.5 mm
- Clamping screw: Cross-tip screw, outlet diameter 2 mm

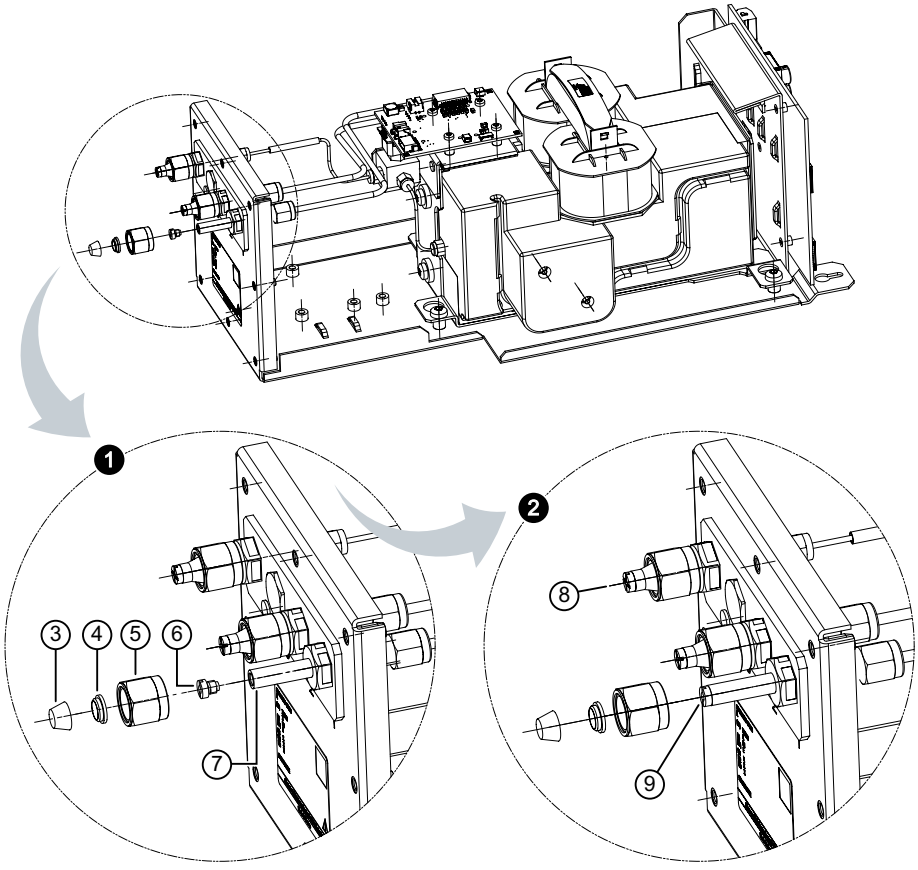


① Sample gas restrictor

② Clamping screw

Figure 5-3 Sample gas restrictor and clamping screw, sectional drawing and view from above

Overview of mounting position



① Gas connection before installation of sample gas restrictor or clamping screw
② Gas connection after installation of sample gas restrictor or clamping screw
③ Front clamp ring
④ Rear clamp ring
⑤ Union nut
⑥ Sample gas restrictor or clamping screw
⑦ Gas connection
⑧ Correctly installed gas connection
⑨ Gas connection nozzle with sample gas restrictor or clamping screw

Figure 5-4 Mounting position sample gas restrictor or clamping screw using an OXYMAT 7 as an example

5.4 Application planning

5.4.1 General safety instructions

WARNING

Introduction of combustible gases

Explosion hazard

Devices in standard version are not designed for use in hazardous areas.

- Do not use a standard version of the analyzer in hazardous areas.
- Supply gases with flammable components at concentrations above the lower explosion limit (LEL) only in devices with pipes.

WARNING

Introduction of toxic, corrosive or flammable gases

The limited release of toxic or corrosive gases during their introduction cannot be avoided with absolute certainty.

- Before toxic, corrosive or flammable gases are introduced, carry out a leak test for the pipe connections.
- Flush the device with oil-free and dry purge air or inert gas.
- Collect the emerging purging gas for environmentally-friendly disposal with a suitable device.

WARNING

Parts in contact with sample gases unsuitable for sample gas

Danger of injury or poisoning, device damage

Hot, poisonous and corrosive sample gases can be released at the connections if the device parts and accessories coming into contact with sample gas are unsuitable for the sample gas.

- Use only sample gas-contacting connecting parts (pipes, unions and sealing material) that are suitable for the connection and for the sample gases. Refer to the information in the section "Technical specifications (Page 117)".

5.4.2 Notes on applications planning

Note

Usability of the device

Before you use the device, use the technical specifications to check that your device is suitable for the measuring task.

Note

Vibrations at the installation site disturb the measured signal

When you use OXYMAT 7 and/or ULTRAMAT 7 analyzer modules, vibrations, especially in the frequency range from 6 Hz to 15 Hz, can influence the measured signal.

- Select an installation location which is vibration-free.
- If necessary, change the measuring frequency settings:
  - Make sure that the measuring frequencies do not correspond to the fundamental of the installation site nor one of its harmonic multiples.
  - You must also ensure that the measuring frequency differs from half the basic frequency of the vibration.

Note

Magnetic radiance of the OXYMAT 7

Due to its functional principles, the OXYMAT 7 emits magnetic stray fields. Therefore, do not operate magnetically sensitive devices in the immediate vicinity of the analyzer module. Depending on the sensitivity, a distance of up to 50 cm from the analyzer module is required.

5.4.3 Operation with at least one OXYMAT 7

Note

Additional clamping screws

Additionally required clamping screws are not included in the scope of delivery. Order the clamping screws separately.

Table 5-1 Mounting position of the sample gas restrictor: OXYMAT 7

Operating mode	**Sample gas restrictor/clamping screw**		
	Operation with one OXYMAT 7	**Operation with two OXYMAT 7 in series**	**Operation with two OXYMAT 7 in parallel**
Pressure operation	Install a sample gas restrictor in front of the sample gas inlet.	Install a sample gas restrictor in front of the sample gas inlet into which the sample gas is introduced first. In addition replace the sample gas restrictor in the inlet of the rear, second module with a clamping screw.	Install a sample gas restrictor in front of each sample gas inlet.
Suction operation	Install a sample gas restrictor in the sample gas outlet	Install a sample gas restrictor in the sample gas outlet from which the sample gas is first sucked out: In addition replace the sample gas restrictor in the inlet of the rear, second module with a clamping screw.	Install a sample gas restrictor at each sample gas outlet

5.4.4 Operation with at least one ULTRAMAT 7

Table 5-2 Mounting position for the sample gas restrictor: ULTRAMAT 7

Operating mode	**Sample gas restrictor/clamping screw**
	Operation with one or two ULTRAMAT 7
Pressure operation/Suction operation	No sample gas restrictor/clamping screw required Subsequent upgrading or retrofitting is not possible and not required. There are no particular mounting restrictions.

5.4.5 Operation with at least one CALOMAT 7

Table 5-3 Mounting position for the sample gas restrictor: CALOMAT 7

Operating mode	**Clamping screw**
	Operation with one or two CALOMAT 7
Pressure operation/Suction operation	Pre-assembled clamping screws. No retrofitting or dismantling required.

5.4.6 Operation with different analyzer modules

OXYMAT 7/ ULTRAMAT 7/ CALOMAT 7

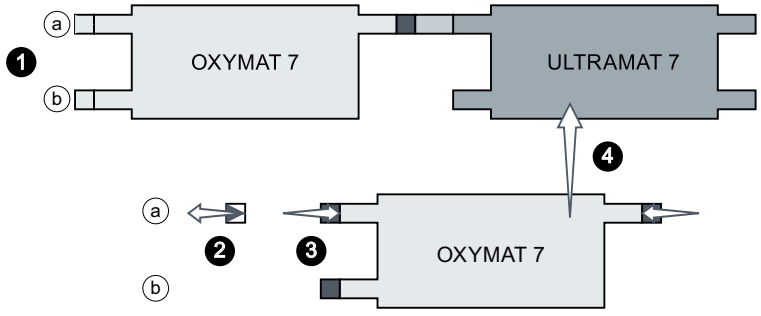
Table 5-4 Mounting conditions and positions for the sample gas restrictor

Operating mode	**Sample gas restrictor/clamping screw**		
	OXYMAT 7/ ULTRAMAT 7	**ULTRAMAT 7/ CALOMAT 7**	**OXYMAT 7/ CALOMAT 7**
Pressure operation	OXYMAT 7 must always be flowed first. Install a sample gas restrictor in front of the sample gas inlet of the OXYMAT 7.	We recommend flowing the CALOMAT 7 as the first module	No restrictions
Suction operation	ULTRAMAT 7 must always be flowed first. Install a sample gas restrictor in the sample gas outlet of the OXYMAT 7. Replace a sample gas restrictor in the sample gas inlet of the OXYMAT 7 with a clamping screw.		

5.4.7 Retrofitting sample gas restrictors

Retrofitting example: "Pressure operation, serial" for OXYMAT 7/ULTRAMAT 7

When you are replacing the ULTRAMAT 7 with an OXYMAT 7 analyzer module, you must replace the sample gas restrictor in the sample gas inlet with a clamping screw.

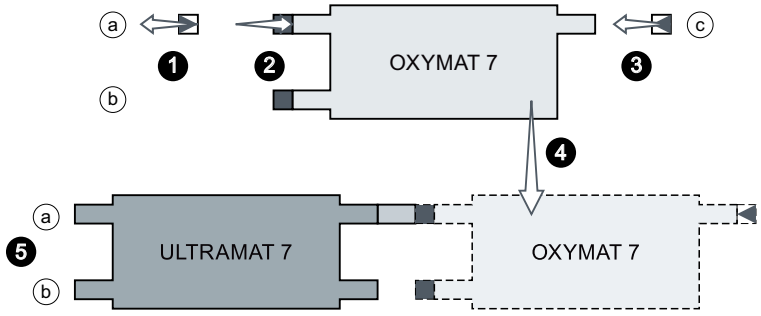


a Sample gas inlet
b Reference gas inlet
① Initial situation, serial pressure operation of OXYMAT 7 (AM1) and ULTRAMAT 7 (AM2)
② Remove sample gas restrictor in the sample gas inlet of the replacement module
③ Install clamping screw in the sample gas inlet of the replacement module
④ Replace ULTRAMAT 7 with OXYMAT 7

Figure 5-5 Retrofitting of the sample gas restrictors: Example "Pressure operation, serial"

Retrofitting example "Suction operation, serial" operating mode for OXYMAT 7/ULTRAMAT 7

When you are using the ULTRAMAT 7 and the OXYMAT 7 analyzer module in serial suction operation, you must convert the sample gas restrictor of the OXYMAT 7 analyzer module: Sample gas inlet → Sample gas outlet.



a Sample gas inlet
b Reference gas inlet
c Sample gas outlet/reference gas outlet
① Remove sample gas restrictor from the sample gas inlet of the additional OXYMAT 7 analyzer module
② Install the clamping screw into the sample gas inlet of the additional OXYMAT 7 analyzer module
③ Install the sample gas restrictor into the sample gas outlet of the additional OXYMAT 7 analyzer module
④ Install additional OXYMAT 7 analyzer module
⑤ Target configuration: ULTRAMAT 7 and OXYMAT 7 in serial suction operation

Figure 5-6 Retrofitting of the sample gas restrictors: Example "Pressure operation, serial"

5.4.8 Sample gas disposal

Thin long lines cause flow resistances in the gas paths. Therefore:

- Install the exhaust line as short as possible
- Use an exhaust gas line with a larger diameter

Install the exhaust line as vertical as possible to avoid water vapor condensation in the exhaust gas line.

5.5 Plug & measure permitted activities

5.5.1 General information

Term

"Plug & Measure" is the ability to recognize any analyzer modules and/or option modules added at a later time and to integrate them. This ability makes it easier to replace modules for maintenance purposes as well as installing devices at a later time, for example, option modules.

When you replace or retrofit a module, the processing module recognizes the change in the device configuration during a restart. The type of module as well as its parameter assignment are recognized. You can either apply the parameter assignments of the replacement/retrofit module or use those of the previous module.

Requirement

For successful module retrofitting or module replacement, the firmware of the module to be replaced must be compatible with the firmware of the processing module.

Prior to the installation of the module you have to update the firmware of the processing module:

- When installing a new module into an existing device.
- When replacing a module: When the error message 'Download firmware/configuration' appears in the display.

If an analyzer module is already present, you must update its firmware. To this purpose, please contact our Service department.

5.5.2 Notes on configuration change

NOTICE
Damage caused by inadmissible procedure/faulty operations Inadmissible procedure and/or faulty operations can result in damage to the device or its modules/electronic equipment in connection with Plug & Measure. Therefore: • Observe the specifications regarding installation/removal of the device hardware. • Carefully read the following information on different Plug & Measure cases.

NOTICE

Deletion of the analyzer module parameter assignment due to faulty operation during commissioning

During commissioning after replacement of the AM electronics, a faulty operation can prevent transfer of the parameters and render the AM electronics unusable. When you commission the device once again after replacing the AM electronics, the following applies:

- First, confirm the message regarding the change of the configuration.
- Make sure to confirm the transfer of the parameters by pressing <ENTER>.
- Always carry out a normalization. To do this calibrate the analyzer module in the service menu as follows:
  "Main menu" > "2. Settings" > "20. Service" > "03. Factory calibrations" > "03. Normalization".

Note

Authorization level

To execute the actions described below, you must be logged on with at least the "Expert" authorization level. You may have to log on again with the requested PIN.

Message panel for configuration change

When you change the hardware equipment of the device by replacing or adding modules or components, the LUI alarm window "Device configuration changed" is displayed during re-commissioning.

To start the data synchronization, confirm the alarm by pressing <ENTER>.

Depending on the concrete application adapt the required parameter sets in the message panel "Transfer parameters". Information on the further procedure is available in the tables below.

5.5.3 Case differentiations

Table 5-5 Plug & Measure - Commissioning

Case		Description	Data synchronization/Action
PM	AMx		
New	New	Commissioning, PM without serial number	Automatic data synchronization [1].
New	New	Commissioning, each module has a serial number stored at the factory. None of the modules has been connected to another module before	Automatic data synchronization [1].

[1] Data synchronization: PM parameters are transferred to the AMx (x=1 or 2), parameters of the AMx are transferred to the PM

Table 5-6 Plug & Measure installation of an AM into an existing (configured) device / replacement of an AM in an existing (configured) device

Case		Description	Data synchronization/Action
PM	**AMx**		
Unchanged	Replaced	The AM is to be replaced by a module of the same type. The replacement AM has a different serial number than the AM connected previously.	User action. Confirm <ENTER> or reject <ESC>. The AM data is transmitted from the PM to the AM after confirmation, except the identification data and the calibration parameters.
		Replacement of the AM electronics, only permitted without own serial number stored in the AM electronics	User action. Always confirm <ENTER>. The AM data is transmitted from the PM to the AM after confirmation, including the identification data and the calibration parameters.
Unchanged	Replaced	AM electronics installed as "assigned spare part".	Normal startup without message. The default data of the AM set in the factory is applied.
Unchanged	Replaced	An AM is replaced by an AM of a different type.	Automatic data synchronization [1], no action required by user.
Unchanged	New	An additional AM of the same type is to be installed. An additional AM of a previously installed type is installed again.	User action. Confirm <ENTER> or reject <ESC>. The data is transmitted after confirmation, except the identification data and the calibration parameters.
Unchanged	New	An additional AM of a type that has not been connected before is to be installed.	Automatic data synchronization [1], no action required by user.

[1] Data synchronization: PM parameters are transferred to the AMx (x=1 or 2), parameters of the AMx are transferred to the PM

Table 5-7 Plug & Measure installation of a PM into an existing (configured) device / replacement of a PM in an existing (configured) device

Case		Description	Data synchronization/Action
PU	**AMx**		
New	Unchanged	The PM electronics is replaced. "-" is displayed instead of the serial number. At least one AM remains in the device.	Automatic data synchronization [1], no action required by user. When there are two AMs in the device, the new PM always synchronizes with AM1. The PM receives the data of the previously used PM, including its serial number [2]
New	Unchanged	PM electronics with new serial number is installed.	Automatic data synchronization [1], no action required by user. In this scenario, the replacement of the PM electronics results in a loss of data of the previously installed PM. In addition, the serial number is overwritten.

1) Data synchronization: PM parameters are transferred to the AMx (x=1 or 2), parameters of the AMx are transferred to the PM

2) Serial number stored in the PM is also the serial number of the device

Table 5-8 Plug & Measure - Replacement of a PM/Installation of a used AM

Case		Description	Data synchronization/Action
PM	**AMx**		
Replaced	Replaced	Assembly from inventory: Each module has a serial number and has been connected to another module before. AM of the same type is replaced.	User action. Confirm with <ENTER> or reject with <ESC>. When the process is confirmed, stored AM data is transmitted to the replaced AM.
Replaced	Replaced	Assembly from inventory: Each module has a serial number and has been connected to another module before. AM of a different type is replaced.	Automatic data synchronization [1], no action required by user. Each module retains its data.

1) Data synchronization: PM parameters are transferred to the AMx (x=1 or 2), parameters of the AMx are transferred to the PM

Table 5-9 Plug & Measure - AM slot change

Case		Description	Data synchronization/Action
PM	**AMx**		
Unchanged	AM1 → AM2 AM2 → AM1	Internal swapping of modules between slots is not permitted! Install the modules once again in their previous slot and restart the device.	None
Unchanged	AM1 = 0 AM2 → AM1	An AM is removed. Retrofitting: Remaining AM is inserted in the slot that has opened up	Automatic data synchronization, no action required by user.

Installing

6

6.1 General safety instructions for installation

⚠ CAUTION

Lifting and carrying the device

Risk of injury from falling loads

Unsecured or inadequately secured parts can fall during transport or installation and cause injuries.

- Use suitable tools such as hand pallet trucks or trolleys to transport the device. Secure the device against slipping and tipping over during transport.
- Use suitable lifting tools or a second person to assist you when lifting and installing the device. Observe the appropriate safety regulations.
- When lifting, make sure that you have a secure grip and are standing steady.
- Keep transport routes free of trip hazards, uneven surfaces and slippage risks.
- Wear safety footwear during transport and installation of the device.

⚠ WARNING

Parts in contact with sample gases unsuitable for sample gas

Danger of injury or poisoning, device damage

Hot, poisonous and corrosive sample gases can be released at the connections if the device parts and accessories coming into contact with sample gas are unsuitable for the sample gas.

- Use only sample gas-contacting connecting parts (pipes, unions and sealing material) that are suitable for the connection and for the sample gases. Refer to the information in the section "Technical specifications (Page 117)".

Note

Material compatibility

Siemens can provide you with support concerning selection of analyzer components wetted by the process medium. However, the device operator is responsible for the selection of components. Siemens accepts no liability for faults or failures resulting from incompatible materials.

⚠ WARNING

Violation of the maximum permissible operating pressure

Danger of injury or poisoning

The maximum permissible operating pressure depends on the device version. The device can be damaged if the maximum permissible operating pressure is exceeded. Hot, toxic and corrosive process media can be released.

- Make sure that the device is suitable for the maximum permissible operating pressure of your system. Refer to the information on the nameplate and/or in section "Technical specifications (Page 117)".

⚠ WARNING

Insufficient ventilation

Risk of fire

The device may overheat or start burning in the case of insufficient ventilation.

- Make sure that the room is sufficiently ventilated.
  Refer to the information in section "Technical specifications (Page 117)".

NOTICE

Improper installation

The device can be damaged or destroyed or its functionality impaired through an incorrect installation.

- Make sure before installing the device that there is no visible damage.
- Ensure that the process connections are clean and that the seals and cable glands are suitable.
- Mount the device using a suitable tool.

NOTICE

Insufficient air circulation around the device

Device damage

The device may overheat in case of heat accumulation.

- Make sure that sufficient air circulates around the rack-mounted device.
- Do not cover the ventilation slit.
- If you install more than one rack-mounted device, maintain a clearance of one height unit (4.5 cm) to the next device.

Note

Installation in control cabinets

- Make sure there is adequate ventilation between the devices when installing in control cabinets.
- Make sure that the permitted ambient temperature listed in the technical specifications is not exceeded.

NOTICE

Aggressive atmospheres

Damage to device through penetration of corrosive vapors

- Make sure that the device is suitable for the area of use.

NOTICE

Direct sunlight

Device damage

The device can overheat or materials become brittle through the influence of UV radiation.

- Protect the device from direct sunlight.
- Make sure that the maximum permissible ambient temperature is not exceeded. For more information on this, see section "Technical specifications (Page 117)".

NOTICE

Damage to the membrane keyboard and the display

- Make sure when installing the device that the membrane keyboard and display are not damaged.

6.2 Installation instructions

Note

Layout of the installation location

The installation location should be:

- Easily accessible
- Shock-free and vibration-free
- Within the ambient temperature limits

Note

Weatherproof installation

Install the device at a location where it is protected against:

- Direct heat and solar radiation
- Mechanical damage
- Vibrations
- Contamination
- Intrusion of dust
- Corrosive media
- Moisture
- Significant and rapid temperature fluctuations
- Strong air flow

Note

Loss of degree of protection in case of open enclosure

Damage to device if the enclosure is permanently open or not properly closed.

The degree of protection stipulated on the rating plate or in the technical specifications is no longer guaranteed if the device is open or not completely closed.

- Install the device in accordance with the mounting instructions in order to ensure the degree of protection.
- Close the enclosure after finishing the mounting or maintenance work.

Note

Measuring high oxygen concentrations

For the measurement of high O_2 concentrations in excess of 25%, it is absolutely necessary that all parts that come in contact with the sample gas are free of oil and grease and do not contain any particles that could react with O_2.

We highly recommend you use specially cleaned analyzer modules with the "Cleaned for O2" option for such measurements.

6.3 Installing the rack-mounted device

Dimension drawing

The following figure shows the dimensions of the rack-mounted device and the distance of the fastening holes at the mounting brackets. The dimensions are specified in millimeters.

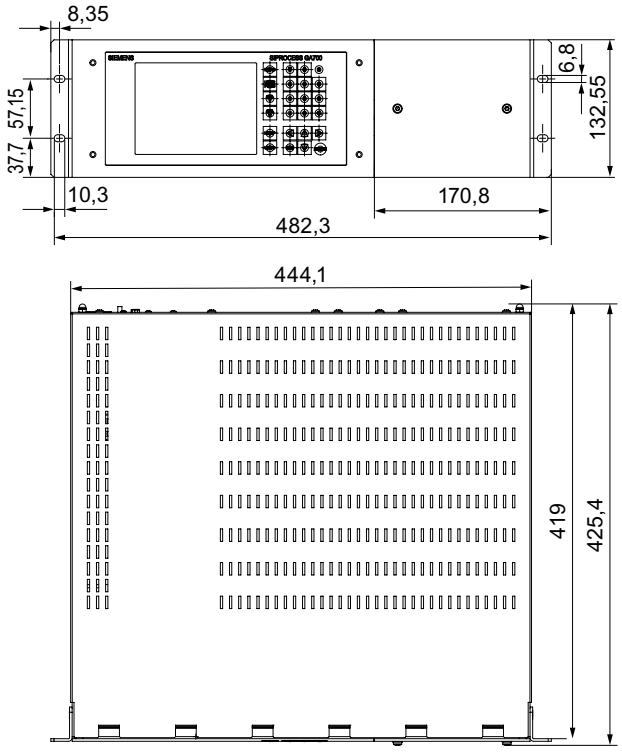


Figure 6-1 Dimension drawing

Procedure

1. Place the rack unit in the control cabinet or the enclosure.
2. Fasten the rack-mounted device in the control cabinet or enclosure with four screws at its mounting brackets.
   The dimensions for the drill holes are specified in the dimension drawing.

Note

As an option, you can place the rack-mounted device on a guide bracket or floor panel in a rack or cabinet.

Installing/removing and connecting analyzer and option modules

7

7.1 General safety instructions for configuration change

⚠ WARNING

Dangerous voltage at open device

Danger of electrocution when the enclosure is opened or enclosure parts are removed

- Keep the device closed during operation
- Open the enclosure exclusively for installation or maintenance. Close the enclosure after the completion of this work.
- Disconnect the device before you open the enclosure or remove enclosure parts.
- Observe the special precautionary measures if maintenance is required while the device is live. Have maintenance work carried out by qualified personnel.

⚠ CAUTION

Hot surfaces resulting from hot sample gases and high-temperature devices

After being switched off, the analyzer module or heated device is still very hot and the temperature only drops very slowly. Contact with skin may result in burns.

- Do not remove the analyzer module until after the analyzer module or device has cooled down.
- Take appropriate protective measures, for example contact protection.

NOTICE

Damage to the membrane keyboard and the display

Make sure when installing the device that the membrane keyboard and display are not damaged.

NOTICE

Incorrect installation

Improper installation or modification can damage the device and thus invalidate the approval.

7.2 Rack-mounted housing tool

The following tools are required for the mounting/removal of the analyzer modules in the rack-mounted housing:

Table 7-1 Rack-mounted housing tool

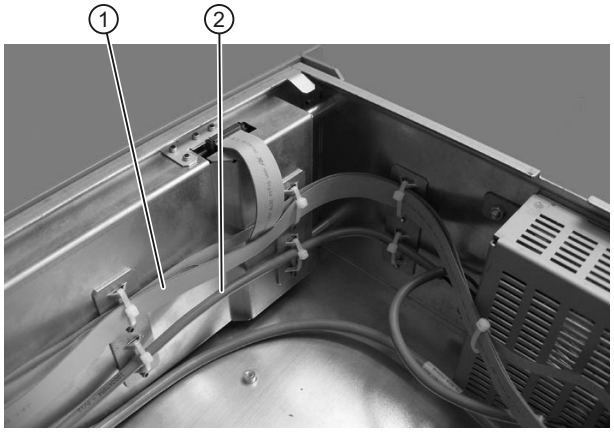
Name		Quantity
Screwdriver		
	Torx T20	1
	Torx T10	1
Hexagon socket wrench		
	SW7	1
	SW5	1
Torque wrench 0.2 to 2.5 Nm		1

7.3 Cables

Overview

Each analyzer module has a cable set. The CAN BUS cable which interconnects all components always has the full range of connections.

The enclosure contains plastic retainers that are used to fasten the cables. The flat cables and ribbon cables are laid separate from each other in the enclosure and fastened with cable ties to plastic retainers.



① Ribbon cable
② Power cable

Figure 7-1 Wiring and cabling

NOTICE

Cable damage

Cables can be damaged by friction or other mechanical influences.

- Lay the cables carefully again after installation or when you replace an analyzer module and secure them in the housing at the plastic holders.

Note

Order spare parts separately

When you install option modules into the basic device later, order the associated sets of cables separately.

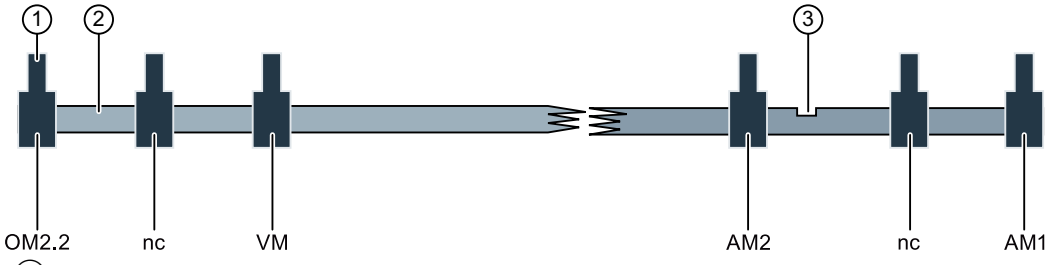
CAN bus cable

NOTICE

Confusing the connectors when connecting the modules

When connecting the modules to the CAN bus, confusing the connectors can lead to error messages to the device.

- For this reason, note the assignment shown in the following figure.
- Orient yourself in particular on the alignment of the CAN bus coding mark as of which the connectors are coded differently.

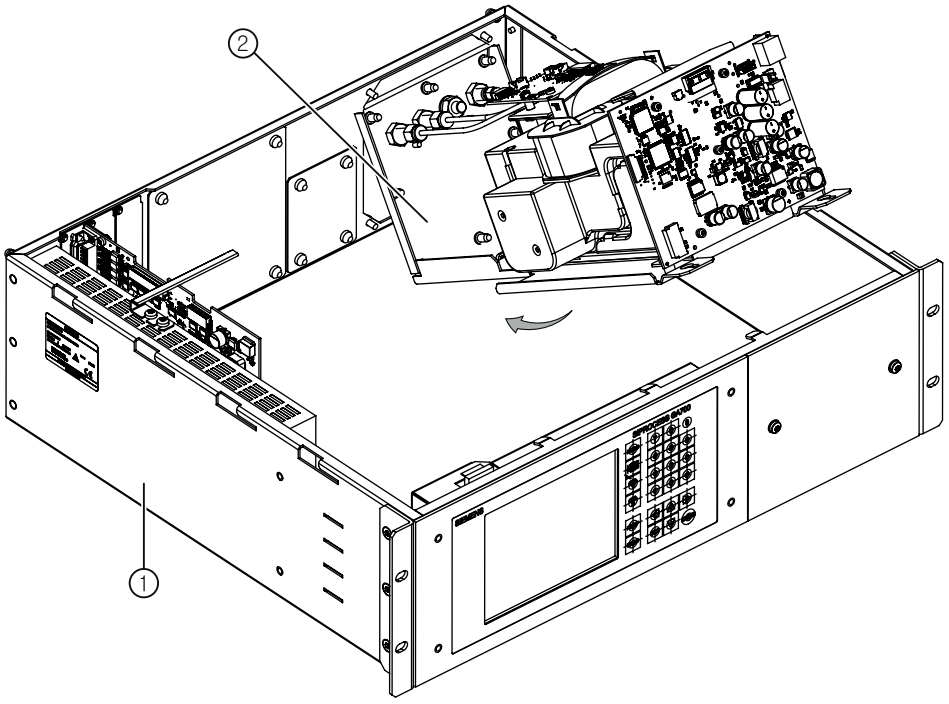


①	CAN bus connectors
②	CAN bus cable
③	Coding mark
OM2.2	Connectors of option module 2.2
PU	Connectors of the processing unit
AM1/AM2	Connectors for the analyzer modules 1 and 2
nc	Not assigned, without function

Figure 7-2 Schematic representation of the CAN bus cable

7.4 Installation of analyzer modules

Overview



① Rack-mounted housing
② OXYMAT 7 analyzer module

Figure 7-3 Installing an analyzer module, example OXYMAT 7

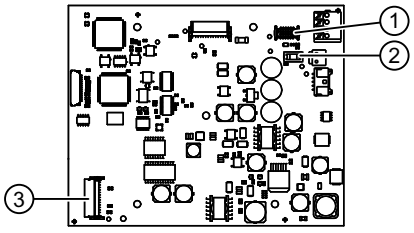
Procedure

1. Isolate the device from power.
2. Remove the housing cover. To do so, unscrew the two cap nuts on the rear panel and push the housing cover to the back.
3. Remove the blank plate at the rear of the housing at the corresponding slot. To do so, loosen the four screws and remove the blank plate.
4. Place the analyzer module ② in the rack-mounted housing ①.
5. Fasten the analyzer module ② with four screws to the rear panel and two screws to the base of the housing.
   Tighten the screws on the rear panel and the base of the housing with a torque of 2.5 Nm.

7.5 Connecting analyzer modules

7.5.1 Wiring OXYMAT 7

Overview



① CAN interface, 12-pin ribbon cable

② Connector for cable from power supply unit

③ Interface, 26-pin ribbon cable to option module OM 2.1/2.2

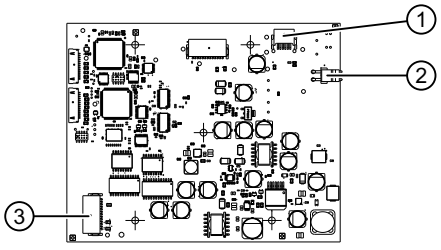
Figure 7-4 Analyzer module printed circuit board, interfaces OXYMAT 7

Procedure

1. When an option module OM 2.1 or OM 2.2 is installed:
   Connect the option module to the interface ③ of the analyzer module printed circuit board (AM FBG) using the existing 26-pin ribbon cable.
2. Connect the processing unit (PU) to the CAN interface on the AM-FBG ① using the existing 12-pin ribbon cable.
3. Establish power supply to the AM PCB from the power supply unit ② via the power cable, see "Connecting the power supply (Page 78)".
4. Attach the housing cover.
   Tighten the cap nuts with a torque of 2.5 Nm.
5. Connect the gas connections, see "OXYMAT 7 (Page 71)".
6. Check the sample gas path for leaks, see "Checking gas paths for leaks (Page 97)".

7.5.2 Connecting the ULTRAMAT 7

Overview



① CAN interface, 12-pin ribbon cable
② Connector for cable from power supply unit
③ Interface, 26-pin ribbon cable to adapter card

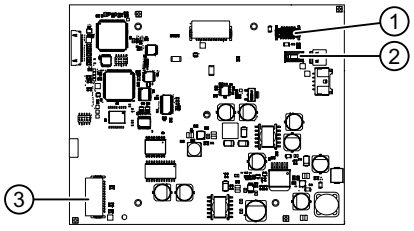
Figure 7-5 Analyzer module printed circuit board, interfaces ULTRAMAT 7

Procedure

1. When an option module OM 2.1 or OM 2.2 is installed:
   Connect the option module to the interface ③ of the analyzer module printed circuit board (AM PCB) using the existing 26-pin ribbon cable.
2. Connect the processing unit (PU) to the CAN interface on the AM-FBG ① using the existing 12-pin ribbon cable.
3. Establish power supply to the analyzer from the power supply unit ② via the power cable, see "Connecting the power supply (Page 78)".
4. Attach the housing cover.
   Tighten the cap nuts with a torque of 2.5 Nm.
5. Connect the gas connections, see "ULTRAMAT 7 (Page 72)".
6. Check the sample gas path for leaks, see "Checking gas paths for leaks (Page 97)".

7.5.3 Connecting CALOMAT 7

Overview



① CAN interface, 12-pin ribbon cable

② Connector for cable from power supply unit

③ Interface, 26-pin ribbon cable to option module OM 2.1/2.2

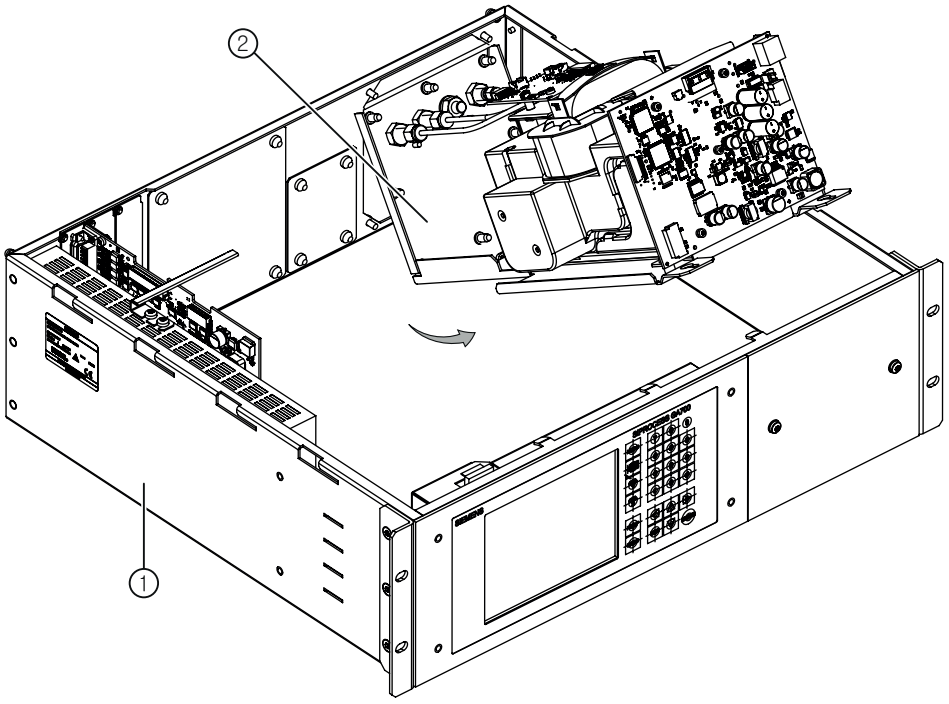
Figure 7-6 AM PCB interfaces CALOMAT 7

Procedure

1. When an option module OM 2.1 or OM 2.2 is installed:
   Connect the option module to the analog interface ③ of the analyzer module printed circuit board (AM-FBG) using the existing 26-pin ribbon cable.
2. Connect the processing unit (PU) to the CAN interface on the AM-FBG ① using the existing 12-pin ribbon cable.
3. Establish power supply to the analyzer from the power supply unit ② via the power cable, see "Connecting the power supply (Page 78)".
4. Attach the housing cover.
   Tighten the cap nuts with a torque of 2.5 Nm.
5. Connect the gas connections, see "CALOMAT 7 (Page 73)".
6. Check the sample gas path for leaks, see "Checking gas paths for leaks (Page 97)".

7.6 Removing analyzer modules

Overview



① Rack-mounted housing ② OXYMAT 7 analyzer module

Figure 7-7 Removing an analyzer module based on the example of an OXYMAT 7

Procedure

1. Isolate the device from power.
2. Remove the housing cover. To do so, unscrew the two cap nuts on the rear panel and push the housing cover to the back.
3. Remove the following cables:
   - Power cable to the analyzer module printed circuit board (AM-FBG) and power supply unit
   - 12-pin ribbon cable (CAN) to the AM-FBG and the processing unit
   - If applicable, 26-pin ribbon cable to the AM-FBG or the analog output adapter card and the option module OM 2.1 or OM 2.2
4. Remove the mounting for the analyzer module.
   Loosen the four screws on the rear panel and the two screws at the base of the housing.
5. Remove the analyzer module ② from the rack-mounted housing ①.
6. If you are not installing and connecting a new analyzer module, attach the blank plate over the respective slot using the four screws to a torque of 2.5 Nm.
7. Attach the housing cover.
   Tighten the cap nuts to a torque of 2.5 Nm.

7.7 Installing option modules

Note

Enable analog and digital outputs

If you subsequently install an option module 2.1, you must enable the analog and digital outputs using SIMATIC PDM after restarting:

1. Establish a connection between SIMATIC PDM and the analyzer.
   You may have to log on at the Expert level.
2. Navigate to: Parameter group overview > Properties > Device
3. For the "Option module 2.1" parameter, set the value "Yes".
4. Transfer the modified parameter assignment to the device.

7.7.1 Mounting locations of option modules

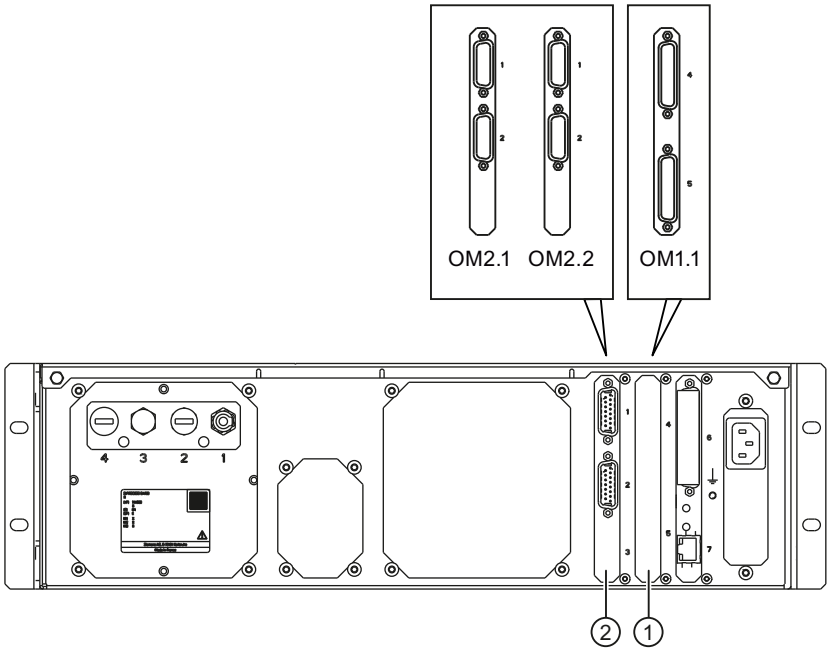
Features

Information on option module features with inputs and outputs is available in the section Technical specifications (Page 117).

Slots

The rack-mounted housing has been prepared for the installation of up two option modules. If option modules are not installed at the intended mounting locations, the openings on the rear are closed off with blank plates.

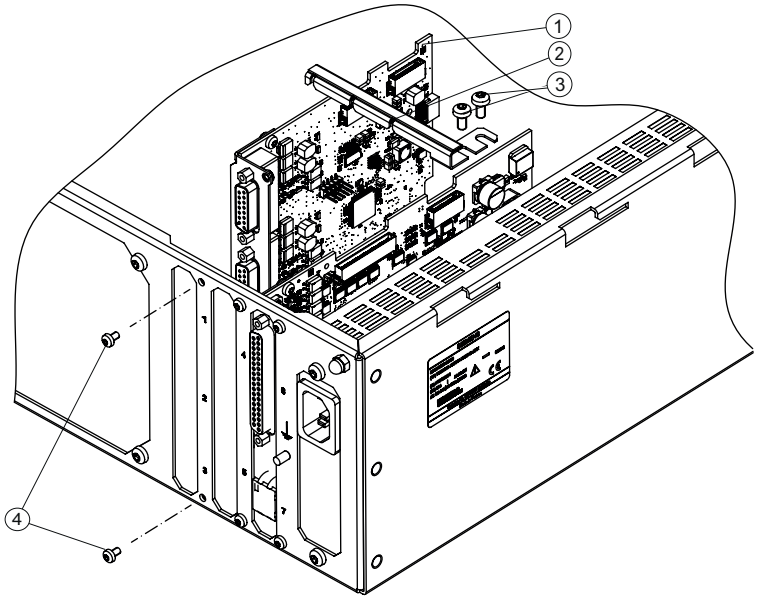
Install option module OM 1.1 at mounting location ①, and option module OM 2.1 or OM 2.2 at mounting location ②.



① Mounting location OM 1.1 ② Mounting location OM 2.1 or OM 2.2

Figure 7-8 Mounting locations of option modules

7.7.2 Installing option modules



① Option module ③ Screws

② Printed circuit board holder ④ Screws

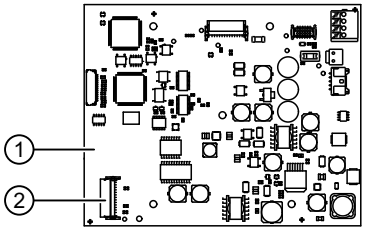
Figure 7-9 Installing option module using example of OM 2.2

Procedure

1. Isolate the device from power.
2. Remove the housing cover. To do so, unscrew the two nuts on the rear panel of the device and push the housing cover to the back.
3. If applicable, remove the option module blank plate from the rear panel.
4. Loosen the two screws ③ and remove the printed circuit board holder ②.
5. Insert the option module ① at the appropriate mounting location into the device.
6. Fasten the option module ① with both screws ④ to the rear panel.
   Tighten the screws with a torque of 1.3 Nm.
7. Insert the printed circuit board holder ② again.
   Tighten the screws with a torque of 2.5 Nm.

7.8 Wiring option modules

Overview



① Analyzer module printed circuit board
② Interface

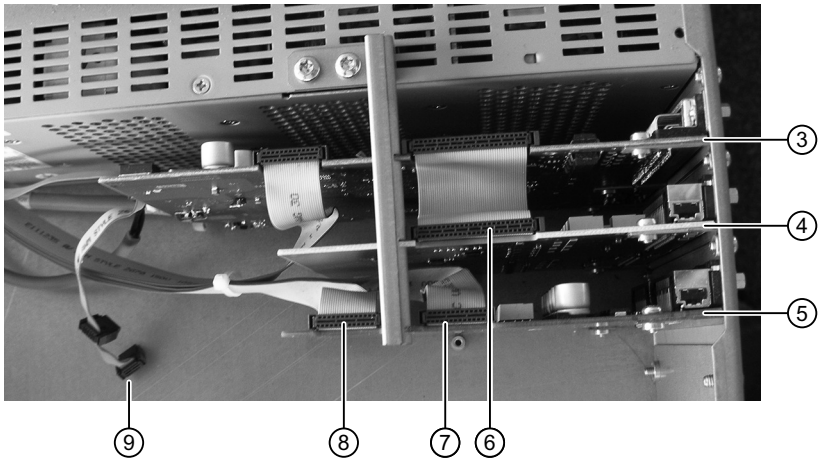
Figure 7-10 Connecting option modules based on the example of an OXYMAT 7

Note

ULTRAMAT 7: Deviating position of the OM2.x connections

With ULTRAMAT 7 analyzer modules, the connector of the option module is not on the printed circuit board but is on an additional circuit board. This is mounted horizontally at the upper end of the analyzer module.

Procedure



③ Processing unit
④ Option module OM 1.1
⑤ Option module OM 2.1
⑥ Connection PU - OM 1.1
⑦ Plug contact AM1
⑧ Plug contact AM2
⑨ Plug contact CAN for OM 2.2

Figure 7-11 Cabling using OM 1.1 and OM 2.1 as an example

1. Connect the option modules as follows after installation:
   - OM 1.1 to the processing unit using the 50-pin ribbon cable
   - OM 2.1 to the analyzer module FBG ① using the 26-pin ribbon cable
   - OM 2.2 to the analyzer module PCB ① using the 26-pin ribbon cable and to the processing unit using the 12-pin CAN ribbon cable.
2. Attach the housing cover.
   Tighten the cap nuts with a torque of 2.5 Nm.

Connecting

8

8.1 Gas connections

8.1.1 General safety instructions on gas connection

⚠ WARNING

Introduction of toxic, corrosive or flammable gases

The limited release of toxic or corrosive gases during their introduction cannot be avoided with absolute certainty.

- Before toxic, corrosive or flammable gases are introduced, carry out a leak test for the pipe connections.
- Flush the device with oil-free and dry purge air or inert gas.
- Collect the emerging purging gas for environmentally-friendly disposal with a suitable device.

⚠ WARNING

Parts in contact with sample gases unsuitable for sample gas

Danger of injury or poisoning, device damage

Hot, poisonous and corrosive sample gases can be released at the connections if the device parts and accessories coming into contact with sample gas are unsuitable for the sample gas.

- Use only sample gas-contacting connecting parts (pipes, unions and sealing material) that are suitable for the connection and for the sample gases. Refer to the information in the section "Technical specifications (Page 117)".

⚠ WARNING

Possible leakages of gas path

Danger of poisoning

Leaky gas paths lead to accumulation of the sample gas in the device.

- Tighten the clamping screws in accordance with the mounting specifications of the manufacturer using a suitable open-ended wrench.
  In the process, make sure that you counter properly.

8.1.2 Connection information

Note

Identifier of the gas connections

The identifiers of the gas connections are imprinted as numbers 1 to 4 on the module plate.

Note

Pipes

Connect the pipes with the gas connections using suitable clamping screws.

Use only such connecting parts (pipes, threaded joints, etc.) coming into contact with sample gas that are resistant to the sample gas.

Note

Leaky gas connections

A gas-tight connection cannot be achieved if you install the clamping ring connections before a sample gas restrictor or clamping screw was screwed onto the connecting socket. The gas connection is then irreversibly leaky. Leaky gas paths lead to accumulation of the sample gas in the device.

- Observe the information provided by the manufacturer of the clamping screws. Observe the installation guidelines.
- Before you install the clamping ring connections, make sure that the connecting socket is either equipped with a sample gas restrictor or with a clamping screw.
- Tighten the clamping screws in accordance with the mounting specifications of the manufacturer using a suitable open-ended wrench. In the process, make sure that you counter properly.

Note

Reference gas connection

Connection for an external reference gas pump (low pressure connection):

- The gas connections (4 and 3) are stainless steel pipes with a diameter of 6 mm. Connection 4 (inlet) is connected to an external pump with a discharge pressure of 100 hPa to 150 hPa. Excessive reference gas flows from a module-internal bypass restrictor out of connection 3 (outlet) into the ambient air. If the analyzer module is installed in a tight control cabinet, connection 3 must be connected to the ambient air.
  For more on this, refer to the nameplate of the analyzer module 7MB3020-xAxxx-xxxx; the letter A is the 10th digit of the article no.

Reference gas connection (high-pressure connection)

- The reference gas connection (connection 4) is a stainless steel pipe with a diameter of 6 mm. It is suitable for pressure up to 5000 hPa (abs.).
  Refer to the nameplate of the analyzer module 7MB3020-xCxxx-xxxx; the letter C or D is the 10th digit of the article no.

Note

Shutting off the sample gas inlet and outlet

If you shut off the sample gas inlet and outlet, make sure that the reference gas can escape, for example, by a 2-way valve at the sample gas outlet. Alternatively, the connection of an overpressure valve is possible. The trigger pressure must then lie approx. 0.1 MPa above the selected sample gas pressure.

Otherwise, excessive reference gas pressure can build up in the analyzer unit. The result could be destruction of the internal pressure sensor or its connection to the analyzer unit.

Do not switch off the reference gas! Corrosive sample gases can destroy the microflow sensor.

Ensure that the reference gas flowing via the sample gas outlet is discharged in an environmentally friendly manner.

Note

Avoiding pressure fluctuations in the sample gas outlet

When the sample gas is conducted into a collective exhaust gas line, the exhaust gas line must be free of "rapid" pressure fluctuations. If such pressure fluctuations are present, implement the following remedial measures:

- Install a special exhaust line.
- Alternatively: Install a damping vessel (> 1 l) with a downstream restrictor between the device and the exhaust line (pneumatic low pass).
- To avoid steam condensation in the exhaust gas line, lay the exhaust gas line as vertically as possible.

Note

Unstable measured value display due to pressure surges

Pressure surges can result in unstable measured value displays when the sample gas flow is superimposed by fast pressure fluctuations or a sample gas pump delivers sample gas into the device. To protect the device from pressure surges, we recommend that:

- Install the supplied sample gas restrictors into the gas path.
- Use a pneumatic low-pass filter (restrictor and damping vessel), if necessary.

8.1.3 Installing/removing the sample gas restrictor

Requirements

Before you install/remove the sample gas restrictor, ensure that

- the sample gas line is disconnected from the device,
- you have read the section "Combination operation (Page 33)",
- a suitable slot screwdriver is at hand.
  The difference between a sample gas restrictor and a clamping screw is:
  - Sample gas restrictor: slotted screw; outlet diameter 0.5 mm
  - Clamping screw: Cross-tip screw; outlet diameter 2 mm. For additional information, refer to the section "Structure of the gas connections (Page 34)".

Procedure

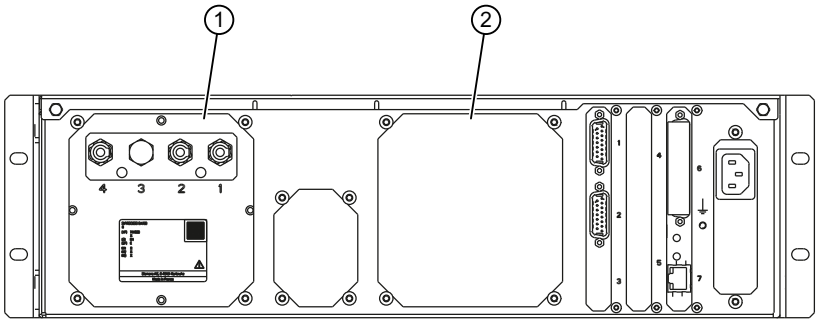
The installation, removal and retrofitting of clamping screws or sample gas restrictors is limited to only a few module types. You will find more detailed information on the mounting position and the mounting conditions in the section "Structure of the gas connections (Page 34)".

1. Install the sample gas restrictor or clamping screw:
   Screw the sample gas restrictor or the clamping screw into the outlet. The tightening torque is 1 Nm.
2. Connect the sample gas line again.
3. Remove the sample gas restrictor or clamping screw:
   Proceed in reverse order.

8.1.4 Gas connections on the device

8.1.4.1 OXYMAT 7

OXYMAT 7: Arrangement of the gas connections in the rack-mounted device



① Slot of analyzer module 1: OXYMAT 7

1 Sample gas inlet
2 Sample gas outlet
3 Not assigned, bypass outlet for version with external reference gas pump
4 Reference gas inlet

② Slot of analyzer module 2

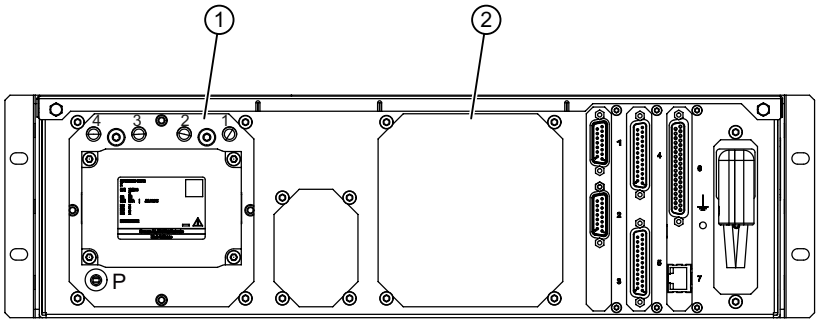
Figure 8-1 OXYMAT 7 gas connections in the rack-mounted device, rear

Design of the gas connections in OXYMAT 7

Gas connection	Material	External nozzle diameter
Version with pipes		
Sample gas	Stainless steel material no. 1.4571 or Hastelloy material no. 2.4819	6 mm
Reference gas	Stainless steel material no. 1.4404	6 mm
Version with hoses		
Sample gas	Stainless steel material no. 1.4571	6 mm
Reference gas	Stainless steel material no. 1.4404	6 mm

8.1.4.2 ULTRAMAT 7

ULTRAMAT 7: Arrangement of the gas connections in the rack-mounted device



① Slot of analyzer module 1: ULTRAMAT 7

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

② Slot of analyzer module 2

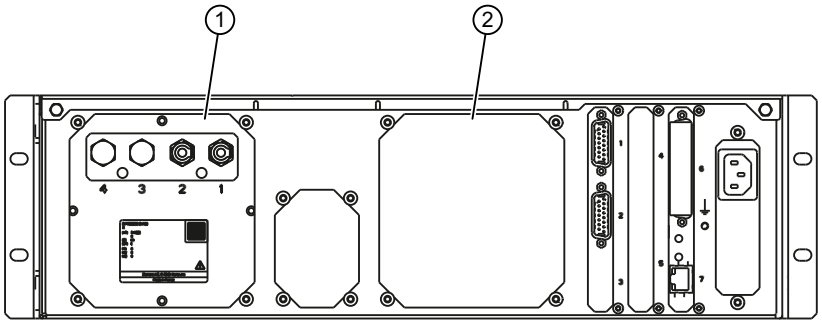
Figure 8-2 ULTRAMAT 7 gas connections in the rack-mounted device, rear

Design of the gas connections in ULTRAMAT 7

Gas connection	Material	External nozzle diameter
Sample gas	Stainless steel material no. 1.4404 or Hastelloy material no. 2.4819	6 mm
Reference gas	Stainless steel material no. 1.4404	6 mm

8.1.4.3 CALOMAT 7

CALOMAT 7: Arrangement of the gas connections in the rack-mounted device



① Slot of analyzer module 1: CALOMAT 7

1 Sample gas inlet

2 Sample gas outlet

3 Not assigned

4 Not assigned

② Slot of analyzer module 2

Figure 8-3 CALOMAT 7 gas connections in the rack-mounted device, rear

Design of the gas connections in CALOMAT 7

Gas connection	Material	External nozzle diameter
Sample gas	Stainless steel material no. 1.4571	6 mm

8.1.5 Connecting gas

Procedure

1. Connect the gas lines by means of suitable clamping ring screwed connections to the associated gas inlets and outlets.
   When tightening the union nuts at the screwed connections make sure that you counter properly.
2. Check the clamping ring screwed connections for a tight fit and the pipe connections for leaks.

8.2 Electrical connections

8.2.1 General safety instructions for electrical connections

⚠ WARNING

Incorrect electrical connection

Danger of electrocution

- Connect the device to the power supply in accordance with the technical specifications. The information about proper electrical connection is available in section "Technical specifications (Page 117)".
- 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.

⚠ WARNING

Danger due to electrical current

The power cable to be connected at the customer location could be damaged by improper connection to the device.

- Check whether the existing line voltage corresponds to the line voltage specified on the nameplate of the device or in the technical specifications.
  You can also find the required line voltage in the test certificate valid for your country.
- Before starting up the device, you should carry out a visual inspection and PE conductor test of the cable. To do this, proceed in accordance with the country-specific safety standards, regulations or other applicable directives.
- Because part of the cable runs in the device, always adhere to the product safety standard IEC/EN 61010-1 or its national equivalent.

⚠ WARNING

Missing PE/ground terminal

Danger of electrocution

If there is no ground terminal, there is a risk of electrocution.

Depending on the device version, connect the power supply as follows:

- Power plug: Ensure that the used socket has a PE/ground terminal. Check that the PE/ground terminal of the socket and power plug match.
- Connecting terminals: Connect the terminals according to the terminal assignment table. Connect the PE/ground conductor first.

⚠ CAUTION

Equipotential bonding

Operating the device without connection of the equipotential bonding can result in injury and/or material damage and harm to the environment.

- Connect the device to equipotential bonding.

8.2.2 Connection information

Note

Insulation of external connections

The insulation of the external connections against the power inlet for proper operation of the device with a rated voltage up to 300 V is designed for 3000 V AC.

Note

Connection requirements

The power cable must comply with the valid regulations and conditions for the place of installation and be provided with a protective conductor at the potential of the enclosure. The cross-section of each wire must be ≥ 1 mm^2.

Note

Electromagnetic compatibility (EMC)

You can use this device in industrial environments and small businesses. Metal housings show increased electromagnetic compatibility compared to high-frequency radiation. The protection from high-frequency radiation can be increased by grounding the housing.

Note

Improvement of interference immunity

- Lay signal cables separately from cables with voltages > 60 V.
- Use cables with twisted wires.
- Install the device and lay its cables at a distance to strong electromagnetic fields.
- Use shielded lines to guarantee the full specification according to Ethernet/PROFIBUS.

Note

Securing plug-in connections

Plug-in connections without interlock can loosen and fall out.

- Secure plug-in connections without interlock mechanically, for example, with a cable tie.

8.2.3 Requirements for electrical connection

- You have ensured that a power disconnection unit belonging to the device is located in the direct vicinity of the device.
  This power disconnection device must be labelled so that it is linked exclusively with this device.
- You have checked that the existing power supply corresponds to that specified on the rating plate of the device.

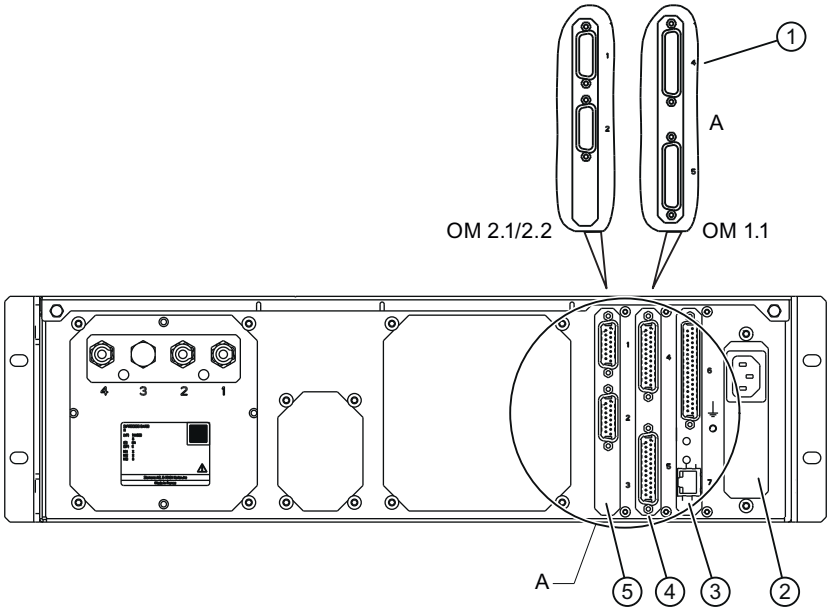
8.2.4 Connecting signal and Ethernet cables

Note

Separate laying of signal lines

Install the signal lines separately from the power lines.

Overview



A Detail view of option module connections
① OM1.1 and OM2.1/2.2 with embossed connector numbers on the housing's rear panel
② Power supply unit
③ Processing unit, Ethernet (MODBUS TCP), and 37-pin sub-D (female), digital inputs and outputs
④ Optional module 1.1 25-pin sub-D (female), digital inputs and outputs
⑤ Optional module 2.1, 15-pin sub-D (male), digital outputs and analog outputs or
Optional module 2.2, 15-pin sub-D (female), digital inputs, analog inputs and analog outputs

Figure 8-4 Backplane of a rack-mounted device, connecting signal/Ethernet cables

Procedure

1. Plug the signal cables into the associated sockets on the device rear in accordance with the connection assignment.
2. Screw the signal cables tight to prevent them from falling out.
3. Plug the Ethernet cable into the socket ③.

You can find additional information on the setting of optional modules or MODBUS TCP using the list of references in the following documentation:

- Operating manual LUI (Page 135)
- Operating manual PDM (Page 135)

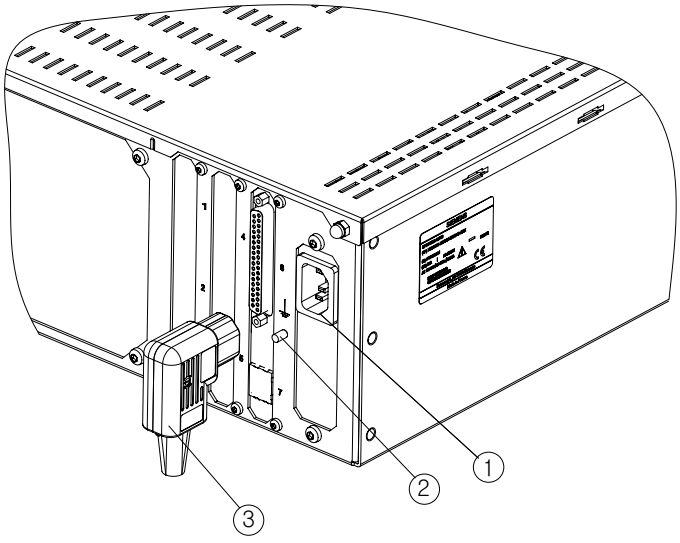
8.2.5 Connecting the power supply

Note

Appliance plug

You can use any appliance plug that fulfills the conditions of DIN EN 60320-1, ≥ 6 A to connect the device.

Overview



① Power supply unit ③ Appliance plug
② Equipotential bonding

Figure 8-5 Backplane of the rack-mounted device, connecting the power supply

Procedure

1. Connect the wires of the connecting cable to the appliance plug ③ at the marked spot. Make sure that the mains conductor, the neutral conductor (N) and the protective conductor (PE) are connected correctly!
   If you are using the power plug that is available as an option, tighten the screws in the appliance plug with the following torques:
   - 0.5 Nm at the terminals
   - 0.3 Nm at the cable terminals (strain relief) and the connector enclosure
2. Connect the appliance plug ③ to the power supply unit ①.
3. Connect the device to the equipotential bonding ②. To do this screw the ring cable lug with spring washer to the threaded bolt M4.

8.2.6 Electrical connections and terminal assignment

Note

Number of inputs and outputs

The number of inputs/outputs that are actually available in the device depends on the installed optional modules. The paragraph below includes an overview of all inputs/outputs.

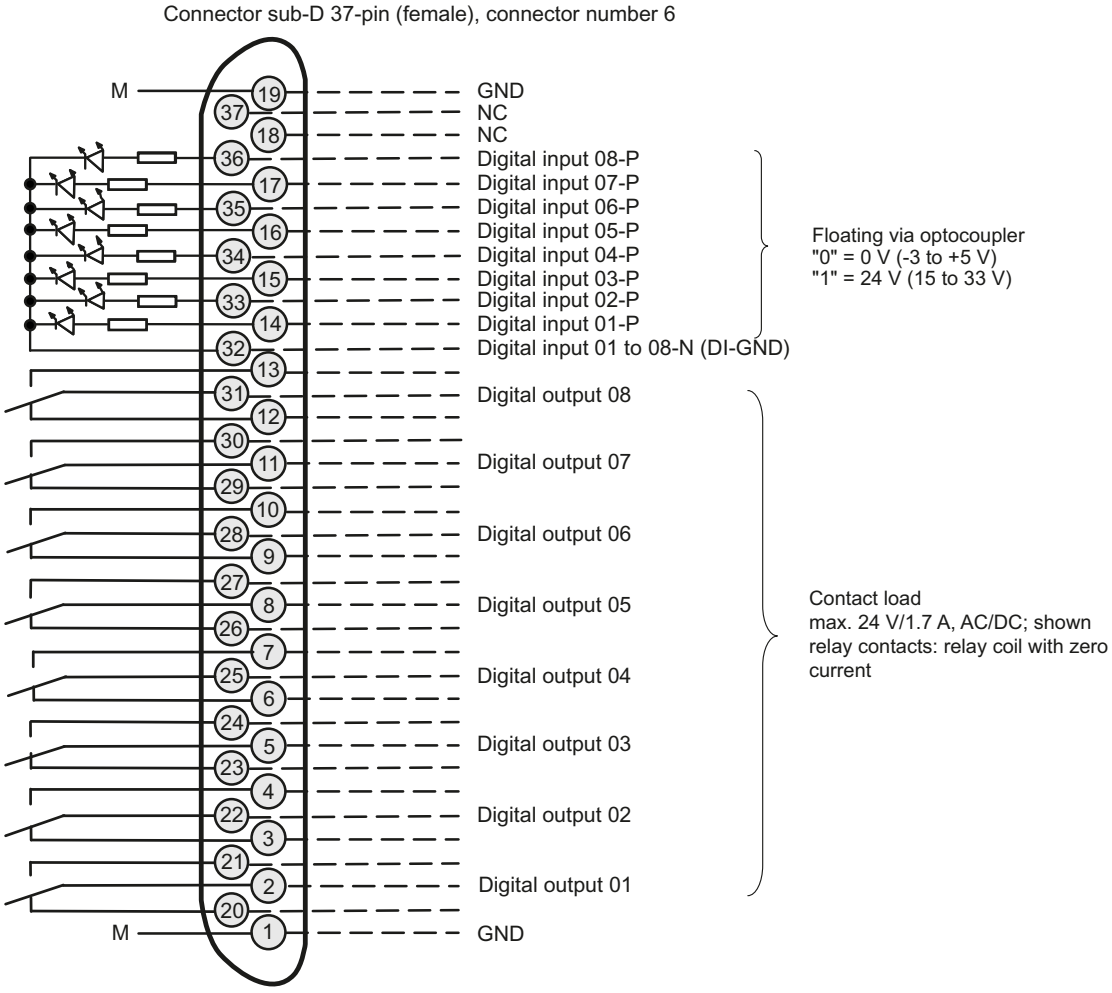
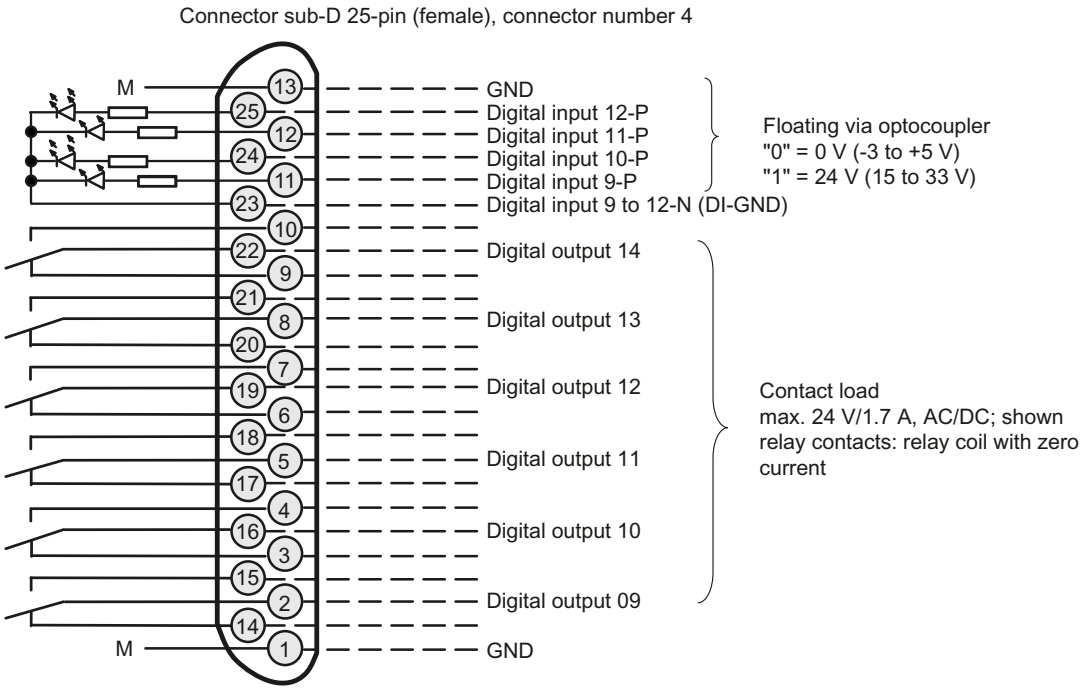


Figure 8-6 Pin assignment of processing unit



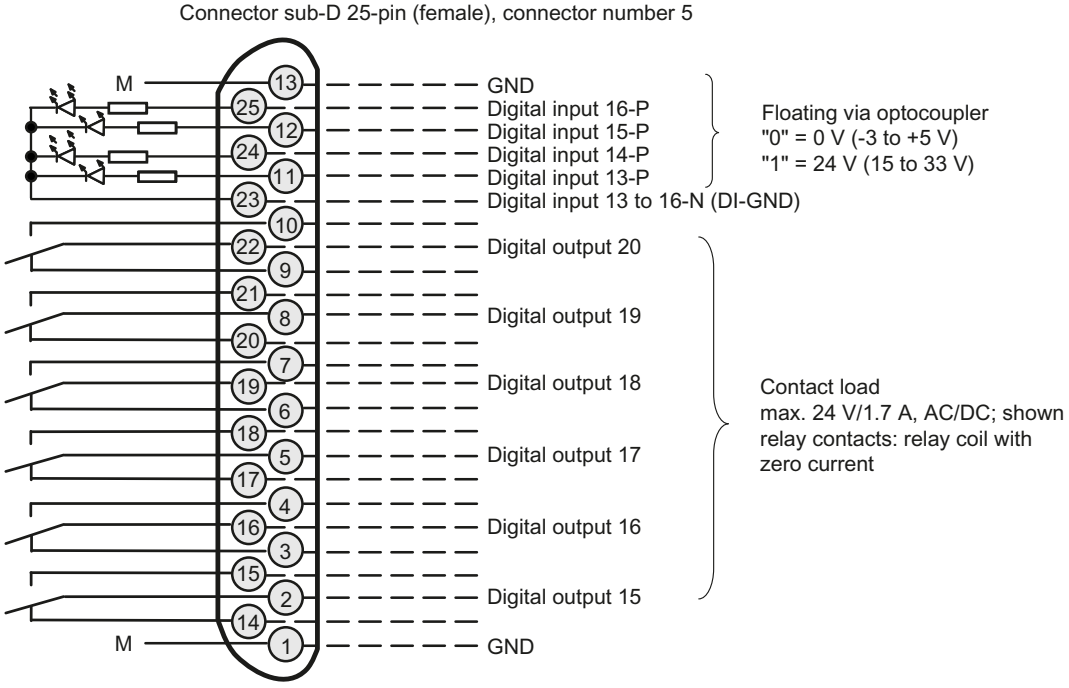


Figure 8-7 Pin assignment of optional module 1.1

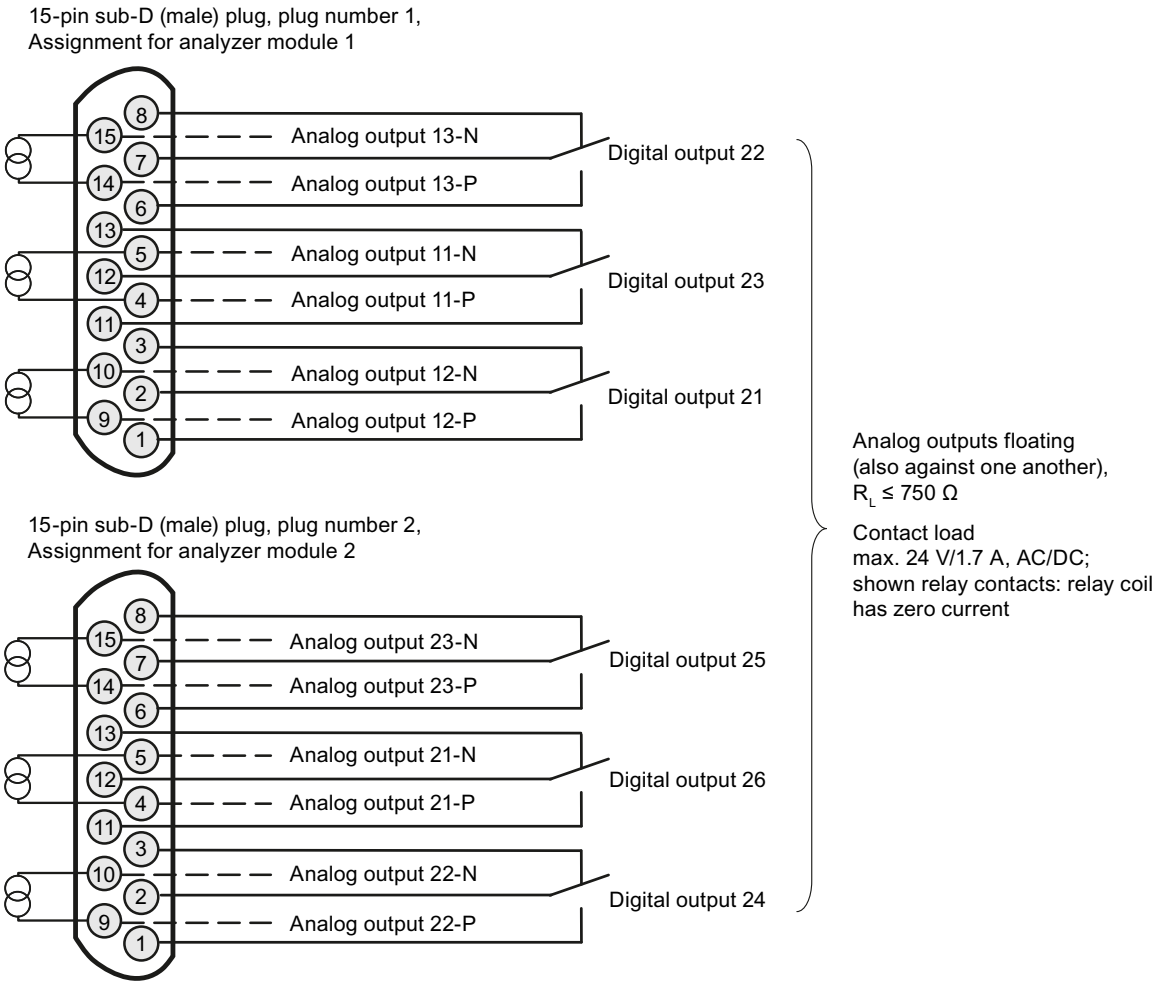


Figure 8-8 Pin assignment of optional module 2.1

Note

Limited number of analog outputs

Because of the functional principle, only a limited number of analog outputs is available.

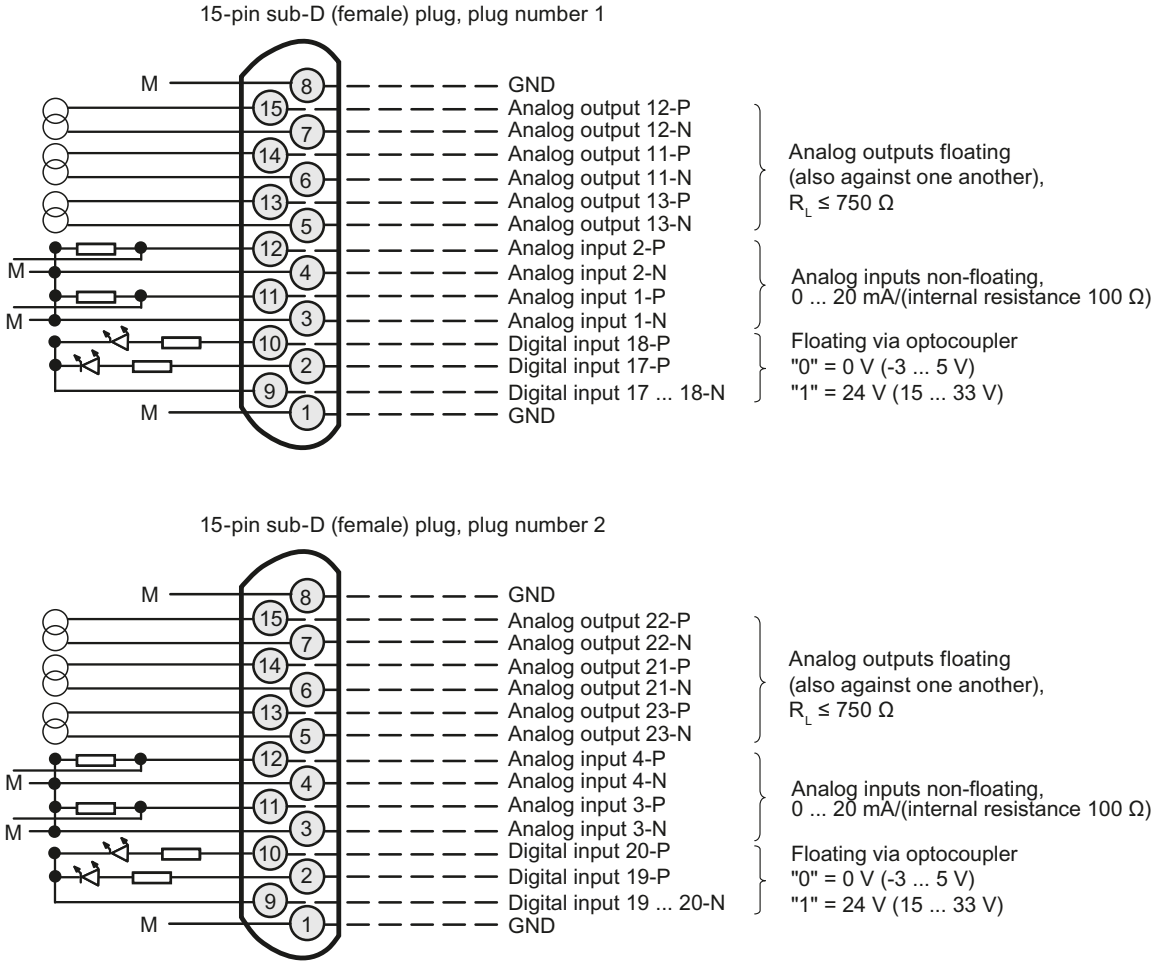
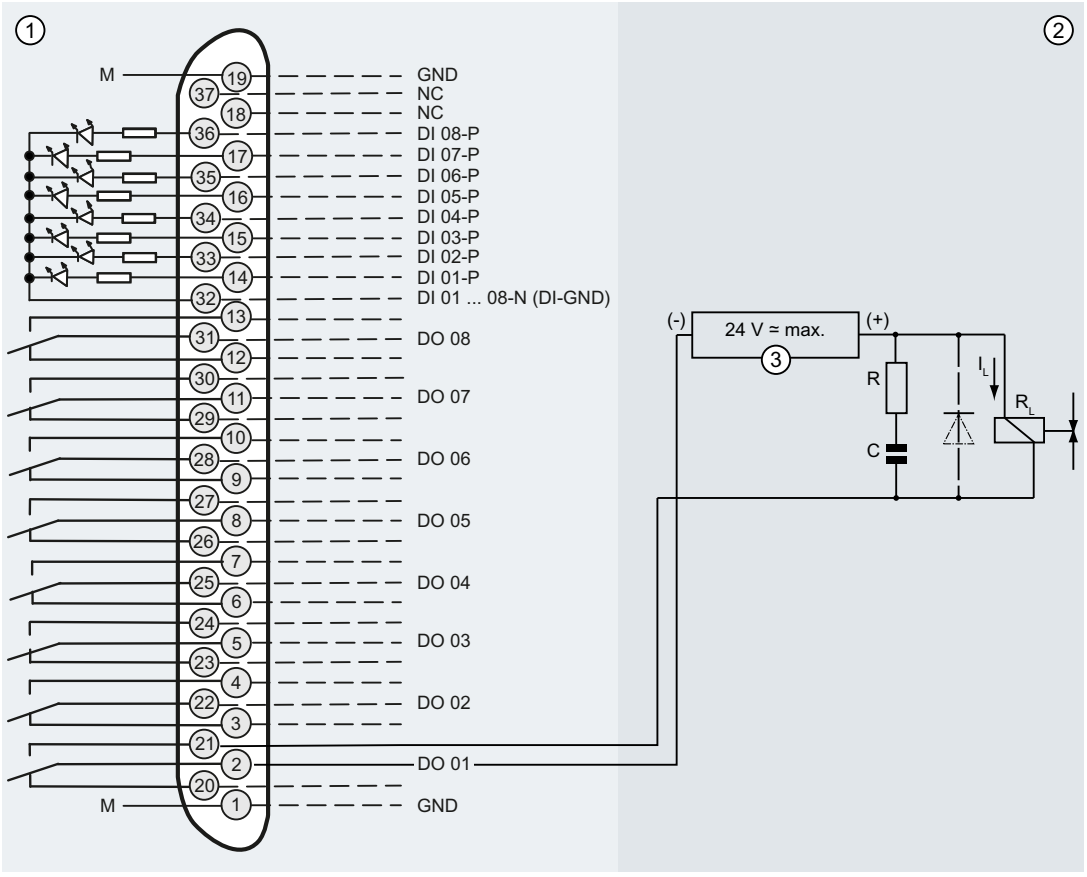


Figure 8-9 Pin assignment of optional module 2.2

8.2.7 Spark suppression: Example

NOTICE
Damage to the digital outputs due to missing external protective circuit Arcs can result when switching inductances without external protective circuit; these can damage the digital outputs/relays. • Install an adequate external protective circuit with inductive or ohmic-inductive loading of the digital outputs/relays. • Refer to the following paragraphs as an example.



① Sub-D connector, 37-pin: Pin number 6: Function in the analyzer

② Terminal end/spark suppression

③ Power supply unit

DI ...-P	Digital input. Floating via optocoupler:	" 0 "	0 V (-3 ... +5 V)
		" 1 "	24 V (15 ... 33 V)

DO Digital outputs: Contact load max. 24 V/1.7 A, AC/DC. Shown relay contacts: relay coil has zero current

Figure 8-10 Rack-mounted device: Example of spark suppression on a relay contact

Observe the following information on spark suppression:

- To suppress sparks via relay contacts, you can use RC elements. In direct current operation, you can also use a spark killer diode instead of the RC element.
- The RC element results in a drop-out delay for an inductive component, for example, a solenoid valve. To rate the RC element accordingly, use the following rule of thumb:
  - $R\ [\Omega] \approx 0.2 \times R_L\ [\Omega]$
  - $C\ [\mu F] \approx I_L\ [A]$

- You must use a non-polarized capacitor "C".
- When connecting the RC element, refer to the previous figure/figures.

Commissioning

9

9.1 General safety instructions for commissioning

⚠ WARNING

Introduction of toxic and harmful gases into the device

Danger of poisoning

Various gases with compositions known only to the operator can occur in introduced gas mixtures. The introduction of toxic gas mixtures can result in poisoning.

- Only introduce gas mixtures into the device whose composition is known to you and that are suitable for analysis in the respective device. Observe the safety information in these operating instructions. If in doubt, contact your local SIEMENS partner.
- In the case of toxic, aggressive and/or combustible gases, ensure that the components are suitable for use.

⚠ WARNING

Commissioning and operation with error message

If an error message is displayed, correct operation in the process is no longer guaranteed.

- Check to see which error is pending.
- Correct the error.
- If the error continues to exist:
  - Take the device out of operation.
  - Prevent a new commissioning.

⚠ WARNING

Introduction of combustible gases

Explosion hazard

Devices in standard version are not designed for use in hazardous areas.

- Do not use a standard version of the analyzer in hazardous areas.
- Supply gases with flammable components at concentrations above the lower explosion limit (LEL) only in devices with pipes.

WARNING

Leaking of toxic gases when the device is vented

Danger of poisoning

Toxic sample gases and liquids can be released when the device is vented.

- Before venting, ensure that there are no toxic gases or liquids in the device.

WARNING

Danger of poisoning by escaping gas

Leaky gas paths lead to accumulation of the sample gas in the device.

- Check whether the threaded joints at the gas connections are secure. Tighten the threaded joints with a suitable open-ended wrench, if necessary. In the process, make sure that you counter properly.
- Check the gas paths for leaks. See section "Checking gas paths for leaks (Page 97)".

CAUTION

Hot surfaces resulting from hot sample gases and heated devices

Danger of burns resulting from surface temperatures above 70 °C (155 °F).

- Take appropriate protective measures, for example contact protection.
- Make sure that the maximum ambient temperature is not exceeded by implementing protective measures. Refer to the information in the section "Technical specifications (Page 117)".

WARNING

Ignition hazard

Because of the danger of ignition, all parts coming into contact with oxygen must be clean. This means they must be free of loose parts or parts which could become loose during operation and of foreign particles, especially oil, grease and solvents.

Observe the following when working on analyzers with specially cleaned gas path:

- No clothing which is contaminated by oil or grease may be worn.
- The installation site must be clean and dust-free.
- Only parts which are packed and marked accordingly may be assembled.
- Always wash your hands before commencing work.
- The cleaned parts must only be handled on the surfaces which do not come into contact with the sample gas.
- New filters, new connecting hoses, and oil-free mixing equipment must **always** be used to check the analyzer function.

Note

Device variant Cleaned for O_2

In the device version with the order suffix -B06 (Cleaned for O_2), all parts wetted by the sample gas are cleaned and absolutely grease-free.

NOTICE
Formation of condensation in the device Condensation can be caused by a high difference in temperature between transportation and storage and the installation location. • Before taking the device into operation let the device adapt for several hours in the new environment.

9.2 Information on commissioning

Note

Ambient temperature

Ensure that the ambient temperature is within the permissible range during operation. The corresponding information is available in the section "Technical specifications".

The technical specifications of the device can deviate outside these temperature limits. Operability of the device is no longer ensured at deviations of more than 5 K.

Note

Vibrations at the installation site disturb the measured signal

When you use OXYMAT 7 and/or ULTRAMAT 7 analyzer modules, vibrations, especially in the frequency range from 6 Hz to 15 Hz, can influence the measured signal.

- Select an installation location which is vibration-free.
- If necessary, change the measuring frequency settings:
  - Make sure that the measuring frequencies do not correspond to the fundamental of the installation site nor one of its harmonic multiples.
  - You must also ensure that the measuring frequency differs from half the basic frequency of the vibration.

Note

Signal frequencies with two OXYMAT 7 analyzer modules

If you install a second OXYMAT 7 analyzer module, the operating and signal frequencies of the two OXYMAT 7 analyzer modules have to differ from each other.

- Check the set frequencies of both OXYMAT 7 analyzer modules.
- If necessary, adjust the frequencies of the modules again. We recommend:
  - A frequency of 8.33 Hz for Module 1
  - A frequency of 10.00 Hz for Module 2.

You can find additional information in the bibliography in:

- Table References 1 - Operating Manuals LUI (Page 135)
- Table References 2 - Operating Manuals PDM (Page 135)

Note

Combined operation with ULTRAMAT 7: Signal frequency of the OXYMAT 7

If you use an OXYMAT 7 and an ULTRAMAT 7 analyzer module in combined operation, the default OXYMAT 7 signal frequency can have a negative influence on the ULTRAMAT 7 analyzer module.

- Check the set signal frequency of the OXYMAT 7 analyzer module.
- If the nominal frequency 8.33 Hz is still set, change the signal frequency to 10 Hz.

You can find additional information in the bibliography in:

- Table References 1 - Operating Manuals LUI (Page 135)
- Table References 2 - Operating Manuals PDM (Page 135)

Note

Flow-type reference path ULTRAMAT 7

When you flush the reference chamber, make sure that it is supplied with gas. Otherwise, the error message "Intensity outside tolerance" may occur. If the error continues, take the following measures:

- Check the IR source. Replace it if necessary.
- Clean the cuvette.

Note

OXYMAT 7 pressure correction

The OXYMAT 7 analyzer modules have an internal pressure sensor for correcting the effect of pressure on the measured value.

In the case of OXYMAT 7 the pressure sensor is connected with the sample gas path and therefore always measures the current sample gas pressure.

Note

ULTRAMAT 7 pressure correction

If you are using the internal atmospheric pressure sensor, make sure that the pressure drop caused by the piping system at the sample gas outlet does not exceed 10 hPa (large line diameter, short line length). In analyzer cabinets and analyzer enclosure, you can connect the pressure transducer to the atmosphere in order to record only the atmospheric pressure change.

Note

CALOMAT 7 pressure correction

With CALOMAT 7, you can implement required pressure correction using an external pressure sensor.

Note

Using an external pressure sensor

An external pressure sensor can process ambient or sample gas pressure values up to 3 bar (abs.), regardless of the application.

You can obtain additional information on the use of external pressure sensors from your service partner: → Technical support (Page 149).

Note

Enable analog and digital outputs

If you subsequently install an option module 2.1, you must enable the analog and digital outputs using SIMATIC PDM after restarting:

1. Establish a connection between SIMATIC PDM and the analyzer.
   You may have to log on at the Expert level.
2. Navigate to: Parameter group overview > Properties > Device
3. For the "Option module 2.1" parameter, set the value "Yes".
4. Transfer the modified parameter assignment to the device.

9.3 Gas preparation

Sample gas and reference gas quality

Note

Gas preparation

The condensation of the sample gas in the gas path and the soiling of the parts through which the sample gas flows can result in a measured value error or even failure of the analyzer. To prevent this, the sample gas has to be prepared in accordance with the measuring task.

In order to keep the sample gas/reference gas free of dusts and condensate, observe the following information:

- Position the suitable absorption filter before the device in order to filter out corrosive components or components which interfere with measuring.
- Make sure that the sample gas does not condense in the gas preparation unit and in the analyzer itself.
  Prevent condensation of the sample gas with suitable measures, for example: Connect a cooler or condensate separator upstream of the device. Heat the device.

We recommend installing the following devices upstream of the sample gas inlet for gas preparation:

- Gas sampling device with filter
- Sample gas cooler
- Analyzer filter, medium pore size <10 µm
- 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.

Ensure that gas sampling devices, gas cooling devices, condensate vessels, filters and any connected controllers, recorders or indicators are ready to operate (see the associated operating instructions).

In the case of toxic, corrosive and/or combustible gases, ensure the suitability for use of the components. They must be approved for the respective application.

Note

Introduction of corrosive gases into heated devices

The device operator is responsible for the temperature control of moist corrosive gases. The heating of the gases starts at the sample gas inlet into the analyzer module.

Heated devices must always be purged during operation with corrosive gases.

9.4 OXYMAT 7 / ULTRAMAT 7: Introduction of reference gas

9.4.1 Selection of the reference gas

9.4.1.1 OXYMAT 7

Note

Composition of the reference gas

Using an unsuitable reference gas can cause the reference gas throttle (capillary tube) to be closed. The device is then no longer capable of measuring.

Therefore, use dust-free reference gas or a standard dust filter with a mean pore width of <5 µm in the reference gas inlet.

Overview

Table 9-1 Overview of the reference gases

Measuring range	Recommended reference gas	Reference gas connection pressure range	Comment
0 to vol. % O_2	N_2	2 000 to 4 000 hPa above sample gas pressure (max. 5 000 hPa absolute)	The reference gas flow is set automatically to between 5 and 12 ml/min.
to 100 Vol. % O_2 (suppressed zero point with full-scale value 100 Vol. % O_2)	O_2		
0 ≤ 21 ≤ 100% O_2 (suppressed zero with 21 Vol. % O_2 within the span)	Air	100 - 150 hPa with respect to sample gas pressure	The sample gas pressure may fluctuate by max. 50 hPa around the ambient pressure

Reference gas "Air"

Air only has a constant O_2 share if the humidity is constant. Therefore use dry air.

For measurements with measuring ranges of 2 %, the exact O_2 share of the reference gas "Air" must be known. Use this value as the setpoint for a zero point calibration.

Selection of the reference gas

The various measuring spans must have at least one common value. This value is then defined as the "physical zero point" and applies to all the measuring ranges. The reference gas can be selected on the basis of the "physical zero point".

The following example with four measuring ranges illustrates this:

Table 9-2 Selection of the reference gas

Measuring range	Criterion for selection of the reference gas
17 to 22% O_2	The span of 17 to 22% O_2 is part of all measuring ranges. The physical zero point may lie within this range. Air (20.95 % O_2%) is suitable as the reference gas.
15 to 25% O_2	
0 to 25% O_2	
0 to 100 % O_2	

Exception: If the smallest measuring span is ≥ 5% O_2 and the distance to the reference gas amounts to no more than 16 % O_2, the physical zero point can also lie outside the measuring range. The purity of the reference gas has to be appropriate for the measuring task.

9.4.1.2 ULTRAMAT 7

In an analyzer module without physically suppressed zero point, meaning with characteristic initial value of zero, use nitrogen as the reference gas (purity 4.6).

In an analyzer module with a physically suppressed zero point, use an appropriate reference gas. The concentration of the reference gas generally corresponds to the characteristic initial value or, in special cases, the full-scale value or intermediate values.

In order to compensate for interference, the reference gas compartment can be subjected to the purified sample gas of the measured component (absorber mode) or gas out of the cylinder, which corresponds to the average interference gas composition.

9.4.2 Requirements for reference gas from the gas cylinder

The reference gas pressure must be 2 000 hPa above the sample gas pressure for sufficient measuring ability.

1. Use a reference gas line with the following characteristics at measuring spans of < 2% oxygen:
   - Small cross-section, e.g. pipe diameter 2 mm
   - Made of metal, e.g., stainless steel
2. Flush the reference gas line thoroughly with reference gas before commissioning.

9.4.3 Introducing reference gas

- Set the flow of sample gas and reference gas to the same level.
- Always introduce the reference gas **before** introducing the sample gas.

Note

Introduction of the reference gas during measurement interruptions

In the case of temporary interruption of the measurements, keep introducing the reference gas into the analyzer module. In this way, the sample gas remaining in the sample chamber is prevented from diffusing to the microflow sensors and possibly destroying them.

9.4.4 Check the reference gas flow

Procedure

1. Close the sample gas inlet.
2. Lay a hose with an internal diameter of 4 mm from the sample gas outlet into a beaker filled with water.
3. Apply reference gas to the analyzer module.

The reference gas must exit slowly with 1 to 2 bubbles per second through the water filling (at versions with flow-type compensation circuit, 2 to 4 bubbles per second). The reference gas flow rate is then sufficient.

9.4.5 Reference gas monitoring with pressure switch

Note

No monitoring of measuring ability

The reference gas pressure switch only has a protective function for microflow sensors and is not intended to monitor the measuring ability.

It only monitors that the reference gas pressure is at least 1 000 hPa above the sample gas pressure.

Note

Excessive sample gas pressure

At the time of delivery, the pressure switch for reference gas monitoring is set to approx. 2000 hPa (rel.). If you need to change the sample gas pressure by more than ±150 hPa due to process-specific requirements, you should also change the reference gas pressure by the same amount. Only then is sufficient monitoring functionality of the pressure switch ensured.

To reset the pressure switching point of the reference gas pressure switch

- Contact the Service (Page 149).
- Have the pressure switching point of the reference gas pressure switch adjusted by a Siemens technician or someone trained for this scenario.

Checking pressure switch for function

1. Increase the reference gas pressure until the pressure switch is triggered, meaning that the switch contact opens.
2. Please ensure that the reference gas pressure is not more than 2 000 hPa above the sample gas pressure.

The value when pressure is increasing (response pressure) is always higher than the value when pressure is decreasing (release pressure). This so-called switching hysteresis of the pressure switch is approx. 200 hPa.

9.5 Zero point error

Note

Zero point error because of surrounding gases

Keep the ambient air of the analyzer section free from the measured gas component; otherwise, measurement results will be affected. Gases which exhibit cross-sensitivity to the measured gas component must also not be present in the ambient air.

9.5.1 OXYMAT 7

Accompanying gases (interfering gases) cause a zero point deviation that is positive with paramagnetic gases and negative with diamagnetic gases. The extent of this offset per 100 vol. % accompanying gas, expressed in vol. % O_2 absolute, is listed in the following table. The values in the tables refer to nitrogen at 60 °C and 1 000 hPa absolute to IEC 1207/3.

Table 9-3 Zero point error of organic gases

Accompanying gas (concentration 100 vol. %)		**Zero point deviation in vol. % O_2 absolute**
Ethane	C_2H_6	-0.49
Ethene (ethylene)	C_2H_4	-0.22
Ethine (acetylene)	C_2H_2	-0.29
1.2 butadiene	C_4H_6	-0.65
1.3 butadiene	C_4H_6	-0.49
n-butane	C_4H_{10}	-1.26
Isobutane	C_4H_{10}	-1.30
1-butene	C_4H_8	-0.96
Isobutene	C_4H_8	-1.06
Dichlorodifluoromethane (R12)	CCl_2F_2	-1.32
Ethanoic acid	CH_3COOH	-0.64
n-heptane	C_7H_{16}	-2.40
n-hexane	C_6H_{14}	-2.02
Cyclo-hexane	C_6H_{12}	-1.84

Accompanying gas (concentration 100 vol. %)		**Zero point deviation in vol. % O_2 absolute**
Methane	CH_4	-0.18
Methanol	CH_3OH	-0.31
n-octane	C_8H_{18}	-2.78
n-pentane	C_5H_{12}	-1.68
Isopentane	C_5H_{12}	-1.49
Propane	C_3H_8	-0.87
Propylene	C_3H_6	-0.64
Trichlorofluoromethane (R11)	CCl_3F	-1.63
Vinyl chloride	C_2H_3Cl	-0.77
Vinyl fluoride	C_2H_3F	-0.55
1.1 vinylidene chloride	$C_2H_2Cl_2$	-1.22

Table 9-4 Zero point error of noble gases

Accompanying gas (concentration 100 vol. %)		**Zero point deviation in vol. % O_2 absolute**
Helium	He	+0.33
Neon	Ne	+0.17
Argon	Ar	-0.25
Krypton	Kr	-0.55
Xenon	Xe	-1.05

Table 9-5 Zero point error of inorganic gases

Accompanying gas (concentration 100 vol. %)		**Zero point deviation in vol. % O_2 absolute**
Ammonia	NH_3	-0.20
Hydrogen bromide	HBr	-0.76
Chlorine	Cl_2	-0.94
Hydrogen chloride	HCl	-0.35
Dinitrogen monoxide	N_2O	-0.23
Hydrogen fluoride	HF	+0.10
Hydrogen iodide	HI	-1.19
Carbon dioxide	CO_2	-0.30
Carbon monoxide	CO	+0.07
Oxygen	O_2	+100
Nitric oxide	NO	+42.94
Nitrogen	N_2	0.00
Nitrogen dioxide	NO_2	+20.00
Sulfur dioxide	SO_2	-0.20
Sulfur hexafluoride	SF_6	-1.05
Hydrogen sulfide	H_2S	-0.44

Accompanying gas (concentration 100 vol. %)		Zero point deviation in vol. % O_2 absolute
Water	H_2O	-0.03
Hydrogen	H_2	+0.26

Since the zero point deviations are linear, it is easy to convert to lower interfering gas concentrations.

In the case of interfering gases with a constant concentration, an interfering gas correction with constant zero point offset can be carried out in the gas to be measured. If the concentration of the accompanying gases changes during the oxygen measurement, a variable interfering gas correction has to be carried out. An external concentration must be determined for each interfering gas with a considerable zero point deviation. Its result is fed as interfering gas concentration into the OXYMAT 7 analyzer module and the correction value is calculated constantly.

Information on interference gas correction is available in the following operating manuals:

- Operating with the Local User Interface Table A-2 References 1 - Operating Manuals LUI (Page 135)
- Operation with SIMATIC PDM Table A-3 References 2 - Operating Manuals PDM (Page 135)

9.5.2 CALOMAT 7

Overview

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

Table 9-6 Zero offset in the system H_2 in N_2

Interference gas	H_2 equivalent values with 10% inference gas
CH_4	1.77%
C_2H_6	0.47%
C_3H_8	-0.28%
CO	-0.10%
CO_2	-0.84%
O_2	0.19%
N_2O	-0.83%
NH_3	1.45%
Ar	-1.22%
He	6.32%
SF_6	-2.15%
SO_2	-1.47%
Synthetic air	0.40%
H_2O (3%)	0.38%

If you are using accompanying gas concentrations ≠ 10%, you can use the corresponding multiples of the respective table value as a good approximation. This procedure applies depending on the type of gas for an accompanying gas concentration range up to approx. 25%.

The thermal conductivity of most gas mixtures has a non-linear response. Even ambiguous results can occur in specific concentration ranges, e.g. with H_2 in He mixtures.

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

More information on correction of cross-interference is available in the following operating manuals:

- Operating with the Local User Interface Table A-2 References 1 - Operating Manuals LUI (Page 135)
- Operation with SIMATIC PDM Table A-3 References 2 - Operating Manuals PDM (Page 135)

9.6 Checking gas paths for leaks

9.6.1 General information on leaks

The analyzers may only be used if all the required gas inlet and outlet lines have been connected prior to startup and tested with an overpressure for leaks and tightness.

The device operator is responsible for the required gas inlet and outlet lines.

Checking for leaks

1. Perform a leak test with air or nitrogen (test gas) at the operating temperature.
2. Determine the leak rate in accordance with the pressure drop method. To do this monitor the pressure of the gas (air or nitrogen) enclosed in the gas line for a defined period. The size of the pressure drop is a measure of the tightness of the gas line.

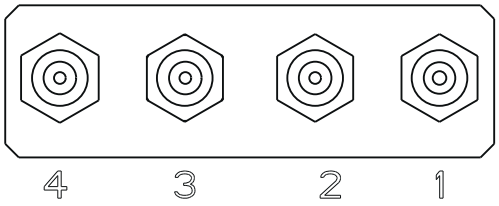
For the exact procedure, refer to the sections:

- OXYMAT 7 (Page 99)
- ULTRAMAT 7 (Page 100)
- CALOMAT 7 (Page 100)

9.6.2 Recommended test setup for analyzer modules in standard version

Arrangement of the gas connections in analyzer modules in standard version

The figure below is a schematic view of the gas connections:

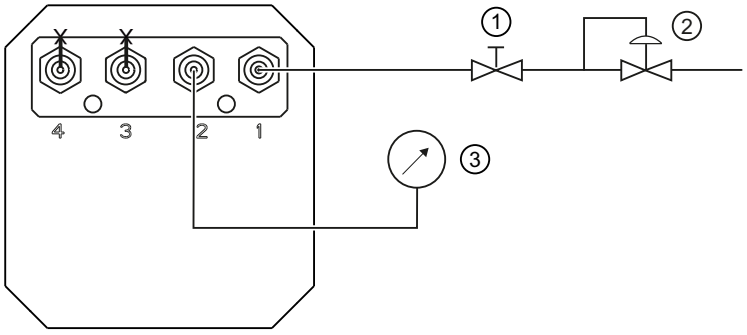


1 Sample gas inlet
2 Sample gas outlet
3 ULTRAMAT 7: Reference gas outlet
OXYMAT 7 (high-pressure version) / CALOMAT 7: Not assigned, dummy plug
OXYMAT 7 (low-pressure version): Bypass outlet
4 OXYMAT 7 / ULTRAMAT 7: Reference gas inlet
CALOMAT 7: Not assigned, dummy plug

Figure 9-1 Arrangement of the gas connections

Test setup for leakage test of analyzer modules in standard version

To check for leaks, we recommend the test setup shown below:



① Shut-off valve
② Pressure regulator
③ Manometer (gauge pressure)
1 Sample gas inlet
2 Sample gas outlet
3 OXYMAT 7 / ULTRAMAT 7: Unscrewing blanking plugs
4 OXYMAT 7 / ULTRAMAT 7: Unscrewing blanking plugs

Figure 9-2 Recommended test setup to check for leaks

9.6.3 Checking OXYMAT 7 for leaks

Procedure: Devices with pipes

1. Close the reference gas inlet.
2. Connect a pressure measuring instrument (manometer) to the sample gas outlet.
3. Carefully apply pressure of approximately 3 000 hPa (absolute pressure) to the measuring inlet.
4. Then shut off the measuring inlet.
5. Wait for approximately 5 minutes until the test gas that flowed in has reached the ambient temperature and the pressure remains stable.
   Note the pressure.
6. Wait an additional 5 minutes and note the pressure again.

If the pressure change is less than 5 hPa, the sample gas path is adequately tight.
This value is based on the tare volume of the measuring module 7 ml and the volume of the pressure measuring device of 23 ml.

Procedure: Devices with hoses

1. Close the reference gas inlet and, for versions with an external reference gas pump, also the bypass outlet.
2. Connect a pressure measuring instrument (manometer) to the sample gas outlet.
3. Carefully apply pressure of approximately 1 500 hPa (absolute pressure) to the sample gas inlet.
4. Then close the sample gas inlet.
5. Wait for approximately 51 minutes until the test gas that flowed in has reached the ambient temperature and the pressure remains stable.
   Note the pressure.
6. Wait an additional 5 minutes and note the pressure again.

If the pressure change is less than 28 hPa, or for variants with external reference gas pump under 34 hPa, the sample gas path is adequately tight.
This value is based on the tare volume of the measuring module 7 ml and the volume of the pressure measuring device of 23 ml.

9.6.4 Checking ULTRAMAT 7 for leaks

NOTICE
Maximum permissible reference gas pressure Ensure that the pressure of the introduced sample and reference gas does not exceed 2600 hPa (absolute) for a piped configuration.

Note

Test values

The test values have been defined under the assumption that the total volume of the gas path in the analyzer module and in the connection line of the pressure measuring device amounts to 80 ml.

Procedure

1. Close the sample gas/reference gas outlet.
2. Connect the sample gas/reference gas outlet to a pressure measuring instrument (manometer).
3. Pressurize the sample gas/reference gas path with overpressure of 100 hPa.
4. Wait for approximately 1 minute until the sample gas/reference gas reaches the ambient temperature.
5. Note the pressure.
6. Wait approximately 5 minutes. Note the pressure again.

If the pressure change lies under 1 hPa, the sample gas/reference gas path is adequately tight. This value is based on the tare volume of the measuring module 7 ml and the volume of the pressure measuring device of 25 ml.

9.6.5 Checking CALOMAT 7 for leaks

Procedure

1. Connect a pressure measuring instrument (manometer) to the sample gas outlet.
   Measuring range approx. 200 hPa rel. to 1000 hPa rel. with appropriate measured value resolution (0.1 hPa).
   Absolute pressure gauges with correspondingly good resolution are also suitable.
2. Connect the sample gas inlet to a compressed air source via a shutoff mechanism. The shutoff mechanism must demonstrate a leakage rate < 10^{-5} hPa*l/s.
3. Pressurize the analyzer module step-by-step with an overpressure of approx. 200 hPa.

4. Close the shutoff mechanism and wait for approximately 5 minutes until the sample gas that flowed in has reached the ambient temperature.
5. Note the pressure.
6. Wait approximately 5 minutes. Note the pressure again.

If the pressure change lies under 5 hPa, the sample gas path is adequately tight.
This value is based on the tare volume of the measuring module 7 ml and the volume of the pressure measuring device of 23 ml.

9.7 Requirements for startup

You have ensured that

- The device has at least one analyzer module,
- All required gas lines and facilities are connected to the device and are checked for leaks and tightness with an overpressure,
- No gas has been introduced into the device yet.

Information on how to connect the gas lines correctly is available

- in section "Gas connections (Page 67)" and
- in the device-specific operating instructions (Page 135).

9.8 Commissioning the device

You can find information on commissioning the device in the following operating manuals:

- Operating with the Local User Interface, see Table A-2 References 1 - Operating Manuals LUI (Page 135)
- Operation with SIMATIC PDM, see Table A-3 References 2 - Operating Manuals PDM (Page 135)

Operation

10

Information on operation of the rack-mounted device is included in the operating manuals:

- Operating with the Local User Interface, see Table A-2 References 1 - Operating Manuals LUI (Page 135)
- Operation with SIMATIC PDM, see Table A-3 References 2 - Operating Manuals PDM (Page 135)

Maintenance and service 11

11.1 General safety instructions on service and maintenance

⚠ WARNING

Dangerous voltage at open device

Danger of electrocution

Danger of electrocution exists when the enclosure is opened or enclosure parts are removed.

- Before you open the enclosure or remove enclosure parts, deenergize the device and wait another 10 minutes. Ensure that the device cannot be switched back on inadvertently.
- Observe the special precautionary measures if maintenance is required while the device is live. Have the maintenance work carried out by certified personnel with special training for live-line working.
- Open the enclosure only for installation or maintenance. Close the enclosure after completing this work.

⚠ WARNING

Faulty adjustment and reassembly

Faulty mounting or calibration can lead to dangerous gas leaks. This can lead to intoxications or burns as well as corrosion damage at the device.

- Only carry out adjustments using appropriate tools in order to avoid short-circuits on the electronic PCBs.

⚠ WARNING

Danger of poisoning by escaping gas

The device is designed for operation with toxic, lightly corrosive gases. Therefore, dangerous substances may exit from the gas lines when they are opened.

- Prevent gases from exiting prior to opening or removing the device, for example:
  - Shut off the gas inlets and gas outlets.
  - Disconnect the gas lines from the device.

⚠ WARNING

Danger from gas lines under pressure

Danger of injury during maintenance work

Hot, toxic or corrosive sample gases can be released when the gas lines are opened. Prevent gases from exiting prior to opening or removing the device.

- Do not loosen process connections and do not remove any pressurized parts while the device is under pressure.
- Depressurize the device. Shut off the gas inlets and gas outlets. Disconnect the gas lines from the device.
- Before opening or removing the device, ensure that process media cannot be released.

⚠ WARNING

Danger of suffocation by inert gas

Inert gas in the housing can cause suffocation. The housing also contains a flammable substance which may be within the flammable range when it comes into contact with air.

- Ensure sufficient ventilation in the room. When opening the device, avoid breathing in directly beside the housing.

⚠ CAUTION

Hot surfaces resulting from hot sample gases and heated devices

Danger of burns resulting from surface temperatures above 70 °C (155 °F)

After being switched off, the device and its parts are still very hot. Touching can result in skin burns.

- Begin the maintenance / shutting down once the device has cooled off.
- Take appropriate protective measures, for example contact protection.

⚠ CAUTION

Faults at the device

For faults which you are unable to eliminate, place the device out of service and protect it against inadvertent commissioning.

NOTICE

Penetration of moisture into the device

Device damage.

- Make sure when carrying out cleaning and maintenance work that no moisture penetrates the inside of the device.

11.2 General information on maintenance

Depending on the use of the device and certain empirical values, determine a maintenance interval for the tests to be carried out repeatedly.

The maintenance intervals will vary from site to site depending on corrosion resistance.

11.3 Cleaning the device

Cleaning the surface

The front panels and sides are washable. Use a sponge or cloth soaked in water containing dishwashing liquid. Use only solvent-free, commercial detergents.

Clean the display and the membrane keyboard with care and without pressure using a damp cloth. Water must not enter the interior of the device.

Cleaning the interior

If necessary, you can blow out the interior carefully with a compressed air gun.

11.4 Maintaining analyzers

Check the device annually:

- For electrical safety and function
- For leakage of the gas path within the device

Check the device for leakage after every interference in the gas path. See section "Checking gas paths for leaks (Page 97)" for information.

The owner can extend maintenance intervals in individual cases if no negative effects can be expected on wetted parts materials (gaskets in particular).

Further information on maintenance of the analyzers can be found in the associated Operating Instructions, see "References (Page 135)".

11.5 Replacing the basic device

Requirement

You have ensured that

- the basic device is fully configured,
- the serial number and factory data are saved,
- all user-specific parameters are saved externally, for example with SIMATIC PDM.

Removing the device

1. Shut off all gas lines to the device.
2. Ensure that no hazardous gases escape when removing the gas lines to the device.
3. Remove the analyzer module, as described in the section "Removing analyzer modules (Page 62)".
4. Remove the option modules, see section "Installing option modules (Page 63)", reverse order
5. Remove the fastening screws and remove the basic device

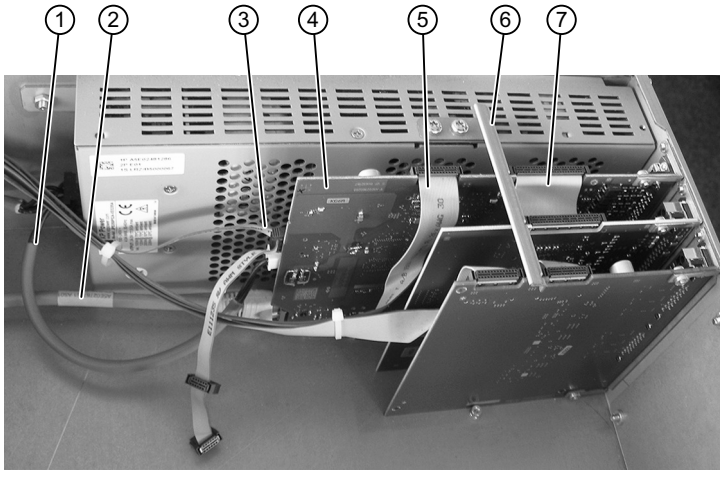
Mounting the device

1. Mount the new basic device.
2. Install the previously used analyzer modules (AM) into the new basic device and connect these.
   Proceed as described in sections "Installation of analyzer modules (Page 58)" and "Connecting analyzer modules (Page 59)".
   - Subsequent to switching on the device, the AM is recognized as new.
   - Each AM retains its parameter assignment.
     Also observe the information in the section "Plug & measure permitted activities (Page 44)".
3. Install the option modules again, follow the procedure described in the sections "Installing option modules (Page 64)" and "Wiring option modules (Page 65)"
4. Start the device.
   To commission the analyzer modules, follow the procedure described in the section "Commissioning (Page 85)".
5. Enter the user-specific parameters of the basic device again.
   If the parameters have been saved on a PC using SIMATIC PDM, download the parameters to the device.

11.6 Replacing the processing unit

Procedure

1. Isolate the device from power.
2. Remove the housing cover. To do so, unscrew the two nuts on the rear panel of the device and push the housing cover to the back.



① Power cable
② Ethernet cable
③ 12-pin ribbon cable (CAN bus)
④ PU and screws
⑤ 26-pin ribbon cable (display)
⑥ Printed circuit board holder and screws
⑦ 50-pin ribbon cable

Figure 11-1 Connection cables for processing unit

3. Loosen the two screws and remove the printed circuit board holder ⑥.
4. Disconnect the following cables depending on the installation situation:
   - Power cable ①
   - 26-pin ribbon cable to display ⑤
   - Ethernet cable ②
   - 12-pin ribbon cable to analyzer modules (AM) and option module OM 2.2 ③
   - 50-pin ribbon cable to option module 1.1 ⑦
5. Loosen the screws (outer, rear) and remove the processing unit (PU) ④.
6. Install the new PU in the reverse order.
   Tighten the screws on the rear panel with a torque of 1.3 Nm.
   Tighten the screws of the FBG holder on the power supply, and the cap nuts on the housing cover with a torque of 2.5 Nm.

Recommissioning the device

Note

Recommissioning the device

Recommission the device with the analyzer modules installed **last**. This guarantees that all required data is restored on the new processing unit.

- No operating, user or factory data is saved on the basic device. The new PU is provided with the most recent firmware.
- Restart the device with the analyzer modules installed **last**.
- Subsequent to switching on the device, the AM is recognized as new. Each AM retains its parameter settings.
- The configuration of the basic device (operating data) is restored from the memory of analyzer module AM1.
  You can find additional information in section "Combined operation (Page 33)".
- The procedural descriptions in the operating manuals at "References (Page 135)" apply to recommissioning.
- For further steps, please contact the Service (Page 149) department.

Note

Different IP address when replacing the processing module

Having different IP addresses after replacing the processing module can prevent network communication with the device.

If you install a new processing module in the SIPROCESS GA700 device, the following IP address is set as default in the factory: 192.168.0.2. Before you set up a network connection to the device, follow the steps below:

- Check the IP address
- Set the IP address again prior to module replacement

You will find information on setting the IP address in the operating manuals (→ References (Page 135)).

11.7 Replacing option modules

You can find information on replacing option modules in the section "Installing option modules (Page 63)".

11.8 Eliminating faults and errors

Table 11-1 Error messages

Fault message	Description	Measures
Invalid device configuration	No analyzer module was detected. At least one analyzer module is required to use the device.	Install at least one analyzer module.
Firmware versions incompatible	The firmware of the basic device and the analyzer modules must be compatible with one another.	Please contact the service department.
Unknown module type detected	An analyzer module has been detected which is not supported in the firmware version.	Please contact the service department.
Memory error detected	A hardware fault, faulty firmware or no firmware at all has been detected in the following analyzer modules, e.g., AM1. Possible causes: • No firmware is present on the analyzer module. • The existing firmware is invalid. • The program memory is faulty. In this case, the analyzer module starts in bootloader mode and is ready to perform a firmware update. If the error still exists despite the firmware update, the analyzer module FBG must be replaced.	Please contact the service department.
Cable fault detected	The installed analyzer modules could not be recognized correctly. Possible causes: Faulty or incorrectly connected CAN bus cable.	Check the CAN bus connections.

See also

Technical support (Page 149)

Decommissioning, dismantling and disposal 12

12.1 Safety instructions for decommissioning

⚠ WARNING

Incorrect disassembly

The following dangers may result through incorrect disassembly:

- Injury through electric shock

- Danger through emerging media when connected to the process

- Danger of explosion in hazardous area

Observe the following for correct disassembly:

- Before starting work, ensure that the power supply and pressure supply are disconnected and hot device surfaces have cooled off.
- If the device contains dangerous process media, empty the device prior to disassembly. Make sure that no media are released which are environmentally hazardous.
- Secure the remaining connections so that no damage can result if the process is started unintentionally.

⚠ WARNING

Dangerous voltage at open device

Danger of electrocution

Danger of electrocution when the enclosure is opened or enclosure parts are removed.

- Disconnect the device and wait another 10 minutes before you open the enclosure or remove enclosure parts. Ensure that the device cannot be switched back on unintentionally.

⚠ WARNING

Danger of poisoning by escaping gas

The device is designed for operation with toxic, lightly corrosive gases. Therefore, dangerous substances may exit from the gas lines when they are opened.

- Prevent gases from exiting prior to opening or removing the device, for example:
  - Shut off the gas inlets and gas outlets.
  - Disconnect the gas lines from the device.

WARNING

Danger from gas lines under pressure

Danger of injury during maintenance work

Hot, toxic or corrosive sample gases can be released when the gas lines are opened. Prevent gases from exiting prior to opening or removing the device.

- Do not loosen process connections and do not remove any pressurized parts while the device is under pressure.
- Depressurize the device. Shut off the gas inlets and gas outlets. Disconnect the gas lines from the device.
- Before opening or removing the device, ensure that process media cannot be released.

CAUTION

Hot surfaces resulting from hot sample gases and heated devices

Danger of burns resulting from surface temperatures above 70 °C (155 °F)

After being switched off, the device and its parts are still very hot. Touching can result in skin burns.

- Begin the maintenance / shutting down once the device has cooled off.
- Take appropriate protective measures, for example contact protection.

12.2 Decommissioning the device

Procedure

1. Ensure that gas is no longer flowing through the device. Shut off all gas lines to the device. Ensure that no hazardous gases escape when removing the gas lines to the device.
2. If external pumps are present, switch all of them off.
3. Purge the sample gas path with air.
4. Isolate the device from power. Disconnect the connection to the power supply.
5. Unscrew all the gas connections.
6. Remove the analyzer module, as described in the section "Removing analyzer modules (Page 62)".
7. Remove the option modules, see section "Installing option modules (Page 63)", reverse order
8. Ensure that the device cannot be started up again unintentionally.

12.3 Uninstalling the device

Requirement

The device has been decommissioned.

Procedure

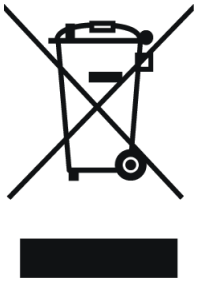
1. Remove the rack-mounted device from the control cabinet or housing. To do this, loosen the fixing screws.
2. Remove the rack-mounted device.

12.4 Disposing of the device

The device has to be fully emptied before the disposal. When disposing of the device observe the statutory regulations applying in the respective country of use (for example guidelines on the disposal of electronic waste).

Have the device fetched by a certified waste disposal company and disposed of in accordance with the national regulations of the country of use.

12.5 Information on recycling



This product is from a environmentally-friendly manufacturer and complies with the directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE).

This product may contain substances that are potentially harmful to the environment if disposed of improperly (landfills, incineration plants). It must therefore not be disposed of in this way.

Therefore, please be environmentally conscious:

- Ensure that this product is recycled at the end of its life cycle through the relevant local facilities!
- Observe the relevant regulations in your country.

Technical specifications

13

13.1 Determining the technical specifications

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

Technical specifications	OXYMAT 7	ULTRAMAT 7	CALOMAT 7
Ambient temperature		25 °C (77 °F)	
Ambient pressure		Atmospheric (approx. 1 000 hPa)	
Sample gas flow		0.6 Nl/min; Nl = Standard liter	
Sample gas humidity		Dew point < -40 °C (-40 °F)	
Site of installation		Free of vibration, shock and impact	
Reference gas	Nitrogen (N_2)	Standard: Nitrogen (N_2) Option: freely selectable [1]	-
Reference application	-	-	Hydrogen in nitrogen (H_2 in N_2) [2]

[1] For devices with filled reference gas side

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

13.2 Technical specifications of rack-mounted housing

Table 13-1 Rack-mounted housing: General technical specifications

General	
Installation position	Horizontal
Weight	Approx. 8.5 kg
Degree of protection	IP20 according to EN 60529

Electrical characteristics		
Auxiliary power supply		100 to 240 V AC (nominal range of use 85 to 264 V) 50 to 60 Hz (nominal range of use 47 to 63 Hz)
Power consumption		Max. 280 VA
EMC interference immunity (electromagnetic compatibility) during operation:	with one and/or two OXYMAT 7 / ULTRAMAT 7 units	in accordance with the standard requirements of NAMUR NE21 (05/2006) and EN 61326-1 (2013)
	with one or two CALOMAT 7 units	in accordance with standard requirements EN 61326-1 (2013)
Electrical safety		in accordance with EN 61010-1, overvoltage category II

Electrical characteristics	
Transient protection	It has to be ensured that the transient protection is set to a value that does not exceed 140% of the measured peak voltage value at the device power supply connectors.
Power unit cable	• Cable diameter: max. Ø 10 mm (3/0 AWG) • Core cross-section: max. 3 x 2.1 mm^2 (14 AWG)

Electrical inputs and outputs	
Digital outputs (DO)	8, with changeover contacts, parameters can be freely assigned, e.g. for measuring range identification; max. load: 24 V AC/DC/1.7 A (total load for all 8 relay outputs in continuous operation max. 160 W), isolated, non-sparking
Digital inputs (DI)	8, designed for 24 V, isolated, freely parameterizable, e.g. for autoranging
Service interface (rear)	Ethernet RJ 45, 100 Mbps
Service interface (front)	Ethernet RJ 45, 100 Mbps

Table 13-2 Rack-mounted housing: Option modules

Option modules	
Option module 1.1	• 12 digital outputs, with changeover contacts, max. load: 24 V AC/DC / 1.7 A (total load for all 12 relay outputs in continuous operation max. 244 W), isolated, non-sparking • 8 digital inputs, designed for 24 V, isolated, freely configurable
Option module 2.1	• 6 analog outputs 0/4 ... 20 mA, designed for 24 V, isolated; load: $R_L \leq 750\ \Omega$ • 6 digital outputs, load rating: 24 V AC/DC/1.7 A (total load for all 6 relay outputs in continuous operation max. 122 W), isolated, non-sparking
Option module 2.2	• 6 analog outputs 0/4 ... 20 mA, designed for 24 V, isolated; load: $R_L \leq 750\ \Omega$ • 4 analog inputs 0/4 ... 20 mA, designed for 24 V, non-isolated, internal resistance 100 Ω • 4 digital inputs, designed for 24 V, isolated

Table 13-3 Rack-mounted housing: Climatic conditions

Climatic conditions	
Permissible operating altitude	3 000 m above sea level sea level
Permissible ambient temperature and humidity	Technical specifications of analyzer modules (Page 119)

13.3 Technical specifications of analyzer modules

13.3.1 OXYMAT 7 technical specifications

Table 13-4 OXYMAT 7: General technical specifications

General		**OXYMAT 7**	**OXYMAT 7 high-temperature [1)]**
Information on the smallest span		See module nameplate or device certificate	
Max. power consumption	Warm-up phase	≤ 60 W	≤ 120 W
Weight (only module)		< 5.5 kg	< 7.5 kg
Electrical safety		In accordance with DIN EN 61010-1	
Max. EMC error during operation with one and/or two OXYMAT 7 / ULTRAMAT 7 units			1.0% according to EN 61326-1 (2013)

[1)] The high-temperature version of the analyzer module is **not** intended for installation in the rack-mounted device.

Table 13-5 OXYMAT 7: Measuring ranges

Measuring ranges		**OXYMAT 7**	**OXYMAT 7 high-temperature [1)]**
Number of measuring ranges		Max. 4; parameters can be assigned freely	Max. 4; parameters can be assigned freely
Parameters can be assigned in the measuring ranges	Smallest possible measuring span	0.5% O_2	2% O_2
	Largest possible span	100% O_2	100% O_2

[1)] The high-temperature version of the analyzer module is **not** intended for installation in the rack-mounted device.

Note

Temperature change for high-temperature OXYMAT 7

If you change the temperature range, the device has to be re-calibrated. Detailed information can be found in the operating manuals, see "Bibliography".

Table 13-6 OXYMAT 7: Gas inlet conditions

Gas inlet conditions	
Sample gas pressure	
Standard devices with hoses	500 to 1 500 hPa (absolute)
Tolerance within the valid pressure range	± 150 hPa
Standard devices with hoses with external reference gas pump	700 to 1 200 hPa (absolute)
Tolerance within the valid pressure range	± 150 hPa
Standard devices with pipes	500 to 3 000 hPa (absolute); short-term < 5000 hPa (abs.)

Gas inlet conditions	
Tolerance within the valid pressure range	± 150 hPa
Reference gas pressure	
High-pressure connection	2 000 hPa above sample gas pressure (within permitted reference gas pressure range 2500 to 5000 hPa, abs.)
Low-pressure version with external reference gas pump	
Without vibration compensation	100 hPa above sample gas pressure
With vibration compensation	150 hPa above sample gas pressure
Pressure loss between sample gas inlet and sample gas outlet	< 100 hPa at 1 l/min
Sample gas flow	18 to 60 l/h (0.3 to 1 l/min)
Sample gas temperature and humidity	
OXYMAT 7 standard version	0 ... 60 °C (0 ... 140 °F) with relative humidity < 90%, avoid condensation in the gas path (moisture content results in measurement errors)
OXYMAT 7 high-temperature	0 to 130 °C (0 ... 266 °F), avoid condensation in the gas path (moisture content results in measurement errors)

Table 13-7 OXYMAT 7: Temperature of sample chamber and gas path

Temperature of sample chamber and gas path	**OXYMAT 7**	**OXYMAT 7 high-temperature** [1]
Gas path	5 K above ambient temperature	72 ... 130 °C (162 ... 266 °F), adjustable
Sample chamber	72 °C (162 °F)	72 ... 130 °C (162 ... 266 °F), adjustable

[1] The high-temperature version of the analyzer module is **not** intended for installation in the rack-mounted device.

Table 13-8 OXYMAT 7: Time response

Time response		
Warm-up period at room temperature		< 2 h
Response characteristics	Delayed display T_{90} with an electronic damping setting of 0 s and a sample gas flow of 1 Nl/min - analyzer module in rack or wall-mounted device	≤ 1.9 s
	Dead time T_{10} Analyzer module in rack-mounted device or wall-mounted device	≤ 1.1 s

Table 13-9 OXYMAT 7: Measuring response

Measuring response		
Output signal variation with static damping constant of 0 s and dynamic noise suppression of 5% / 10 s		≤ ±0.5% of smallest measuring span (noise bandwidth corresponds to 1% = 6σ value or 0.333% = 2σ value), with vibration compensation activated: < 1.5 times value
Detection limit		≤ 1% of smallest measuring span according to nameplate (with vibration compensation activated: < 1.5 times value)
Measured value drift	At the zero point	≤ ±0.5% of the smallest measuring span/month or ≤ ± 50 vpm O_2/month; Whichever is greater
	For span gas	≤ ±0.5% of the current measuring span/month or ≤ ± 50 vpm O_2/month; whichever is greater
Repeatability	At the zero point	≤ ±0.5% of the smallest measuring span/month or ≤ ± 50 vpm O_2; whichever is greater
	For span gas	≤ ±0.5% of the current measuring span/month or ≤ ± 50 vpm O_2; whichever is greater
Linearity deviation with dry ambient air*		< 0.1%

* Untreated ambient air contains less than 20.95% O_2 (literature value) since existing humidity of the oxygen content is decreased relatively.

Table 13-10 OXYMAT 7: Influence variables

Influence variables		
Ambient temperature	Deviation at zero point	≤ 0.5% of the smallest measuring span/10 K or ≤ 50 vpm O_2/10 K; whichever is greater
	Deviation of the span gas	≤ 0.5% of the current measuring span/10 K or ≤ 50 vpm O_2/10 K; whichever is greater
Sample gas pressure	Deviation at zero point	≤ 0.2% of the smallest measuring span/1% pressure change or ≤ 50 vpm O_2/1% pressure change; whichever is greater
	Deviation of the span gas	Deviation ≤ 0.2% of current measuring span/1% pressure change or 50 vpm O_2/1% pressure change; whichever is greater
Sample gas flow	Deviation at zero point	≤ 1% of smallest measuring span per 0.1 l/min. change in flow or 50 vpm O_2 per 0.1 l/min. change in flow within the permissible flow range (0.3 to 1 l/min); whichever is greater
	Deviation of the span gas	≤ 1% of current measuring span per 0.1 l/min. change in flow or 50 vpm O_2 per 0.1 l/min. change in flow within the permissible flow range (0.3 to 1 l/min.); whichever is greater

Influence variables		
Accompanying gases		Zero point deviation (cross-sensitivity) in accordance with Table A.1 of EN 61207-3
Supply voltage	Analyzer module 24 V DC (-5%/+10%)	< 0.1% of the current span
	Basic device 85 V AC to 264 V AC / 47 Hz to 63 Hz	< 0.1% of the current span

Table 13-11 OXYMAT 7: Climatic conditions

Climatic conditions	
Storage and transport	- 30 ... +70 °C (-22 ... 158 °F)
Max. permissible ambient temperature surrounding the basic device during operation [1]	0 ... 50 °C (0 ... 122 °F)
Ambient humidity (relative humidity) during storage, transport or operation [2]	< 90%

[1] Restriction for installing an ULTRAMAT 7 analyzer module (combined operation): 5 ... 45 °C (41 ... 113 °F)

[2] Avoid condensation on the installed components!

Table 13-12 OXYMAT 7: Gas connections

Gas connections	
With hoses	Connecting socket for 6 mm hose
With pipes	Connecting socket for 6 mm pipe

Table 13-13 OXYMAT 7: Parts in contact with sample gases

Materials of wetted parts		**OXYMAT 7**	**OXYMAT 7 high-temperature** [1]
Sample chamber		Stainless steel: • Plates: Material No. 1.4571 • Screw-in glands: Material No. 1.4571 Hastelloy: • Plates: Material No. 2.4602 • Screw-in glands: Material No. 2.4819	Stainless steel: • Plates: Material No. 1.4571 Hastelloy: • Plates: Material No. 2.4602
Gas path	With hoses	FPM	-
	With pipes	Stainless steel: • Pipes: Material No. 1.4404 • Gas connections: Material No. 1.4571 Hastelloy: • Pipes: Material No. 2.4602 • Gas connections: Material No. 2.4602	Stainless steel: • Gas connections: Material No. 1.4571 Hastelloy: • Gas connections: Material No. 2.4602
Sealing material		FKM (e. g. Viton) or FFKM (Kalrez 6375)	

[1] The high-temperature version of the analyzer module is **not** intended for installation in the rack-mounted device.

13.3.2 Technical data ULTRAMAT 7

Table 13-14 ULTRAMAT 7: General technical specifications

General	**ULTRAMAT 7**	**ULTRAMAT 7 high-temperature**[1]
Information on the smallest span	See module nameplate	
Max. power consumption	≤ 30 W	≤ 120 W
Weight (only module)	Max. 5.2 kg	Max. 7.2 kg
Electrical safety	In accordance with DIN EN 61010-1	
Max. EMC error during operation with one and/or two OXYMAT 7/ ULTRAMAT 7 units	1.0% according to EN 61326-1 (2013)	

[1] The high-temperature version of the analyzer module is **not** intended for installation in the rack-mounted device.

Table 13-15 ULTRAMAT 7: Measuring ranges

Measuring ranges			
Number of measuring ranges	Max. 4; parameters can be assigned freely		
	Component	Smallest possible measuring span	Largest possible measuring span
	CO	0 ... 10 ppm	0 ... 100%
	CO_2	0 ... 5 ppm	0 ... 100%
	CH_4	0 ... 50 ppm	0 ... 100%
	C_2H_4	0 ... 300 ppm	0 ... 100%
	SO_2	0 ... 50 ppm	0 ... 100%
	NO	0 ... 100 ppm	0 ... 3%
	N_2O	0 ... 50 ppm	0 ... 100%
	NH_3	0 ... 100 ppm	0 ... 100%
	CO/NO	0 ... 100 ppm	0 ... 10000 ppm
	CO/NO (combination with O7)	CO 0 ... 100/NO 0 ... 300 ppm	CO 0 ... 3000 ppm/NO 0 ... 3000 ppm
	CO_2/CO	0 ... 100 ppm	0 ... 100%

Table 13-16 ULTRAMAT 7: Gas inlet conditions

Gas inlet conditions	
Sample gas pressure Normal pressure (atmospheric pressure compensation)	500 to 1 500 hPa (absolute)
Pressure loss between sample gas inlet and sample gas outlet	< 10 hPa at 1.5 l/min
Sample gas flow	
ULTRAMAT 7 standard version	18 ... 90 l/h (0.3 ... 1.5 l/min) [1, 2)]
ULTRAMAT 7 high-temperature	36 .. 90 l/h (0.6 ... 1.5 l/min) [1, 2)]
Sample gas temperature and humidity	
ULTRAMAT 7 standard version	0 to 50 °C (32 ... 122 °F) at relative humidity < 90%, in reference to the respective ambient temperature; avoid condensation in gas path (moisture content results in measurement errors)
ULTRAMAT 7 high-temperature	0 to 90 °C (32 ... 194 °F), avoid condensation in the gas path (moisture content results in measurement errors)

[1)] Nominal values in the section "Determining the technical specifications"
[2)] Wall-mounted device only

Table 13-17 ULTRAMAT 7: Temperature of sample chamber and gas path

Temperature of sample chamber and gas path	**ULTRAMAT 7**	**ULTRAMAT 7 high-temperature [1]**
Gas path	5 K above ambient temperature	Stainless steel pipe: ≥ 60 °C (140 °F) with ambient temperature T_a = 5 °C (41 °F) ≥ 65 °C (149 °F) with ambient temperature T_a = 20 °C (68 °F) Hastelloy pipe: ≥ 55 °C (131 °F) with ambient temperature T_a = 5 °C (41 °F) ≥ 65 °C (149 °F) with ambient temperature T_a ≥ 25 °C (77 °F)
Sample chamber	5 K above ambient temperature	65 °C (149 °F)

[1] The high-temperature version of the analyzer module is **not** intended for installation in the rack-mounted device.

Table 13-18 ULTRAMAT 7: Time response

Time response		
Warm-up period at room temperature		< 2 h
Response characteristics	Dead time (T_{10})	Application-specific (max. 5 s)
	Signal rise time T_r [1] or signal fall time T_f [2] with application-specific electronic damping of 10 s	Application specific < 14 s
	Time for device-internal signal processing T_v	Approx. 1 s
	Delayed display T_{90}	$T_{90} < T_{10} + T_{r/f} + T_v$

[1] "Rise time"

[2] "Fall time"

Table 13-19 ULTRAMAT 7: Measuring response

Measuring response	
Output signal fluctuation	≤ ± 1% of smallest measuring range acc. to nameplate
Zero point drift	≤ 2%/week of smallest measuring range acc. to nameplate
Measured value drift	≤ 1% of the biggest measuring range per week
Repeatability	≤ ± 1% of the current full-scale value
Linearity deviation	≤ 1% of the current full-scale value

Table 13-20 ULTRAMAT 7: Influence variables

Influence variables		
Ambient temperature	Zero point	≤ 1% of smallest measuring range / 2 K
	Measured value	≤ 1% of the current measuring range/10 K
Sample gas pressure	Without pressure compensation	≤ 1.5% of the current measuring range/1% pressure change
	with switched-on pressure compensation	≤ 0.15% of the current measuring range/1% pressure change
Sample gas flow		≤ 1% of the current full-scale value/ 0.1 l/min. change in flow
Supply voltage 24 V DC (-5%/+10%)		≤ 0.1% of the current measuring range

Table 13-21 ULTRAMAT 7: Electrical outputs

Electrical outputs	
Analog current output 0 - 20 mA	Max. 2 (depending on component)

Table 13-22 ULTRAMAT 7: Climatic conditions

Climatic conditions	
Storage and transport	-30 ... +70 °C (-22 ... 158 °F)
Max. permissible ambient temperature surrounding the basic device during operation [1)]	5 ... 45 °C (41 ... 113 °F)
Ambient humidity (relative humidity) during storage, transport or operation	< 90% (dew point must not be undershot)

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

Table 13-23 ULTRAMAT 7: Gas connections

Gas connections	
Implementation	Connecting socket for 6 mm pipe

Table 13-24 ULTRAMAT 7: Parts in contact with sample gases

Materials of wetted parts	
Gas connections, pipes:	Stainless steel (Material No. 1.4571) Hastelloy C-22 (Material No. 2.4602)
Measuring cell:	Aluminum, tantalum (inlay sheet)
Gaskets (O-rings)	FPM (e.g. Viton), FFPM (Kalrez 6375)

See also

Determining the technical specifications (Page 117)

13.3.3 CALOMAT 7 technical specifications

Table 13-25 CALOMAT 7: General technical specifications

General	
Information on the smallest span	See module nameplate
Power consumption	< 20 W
Weight	Approx. 3 kg
Electrical safety	In accordance with DIN EN 61010-1
Max. EMC error during operation of one and/or two CALOMAT 7 units	2.0% according to EN 61326-1 (2013)

Table 13-26 CALOMAT 7: Measuring ranges

Measuring ranges	
Number of measuring ranges	Max. 4; parameters can be assigned freely
Note The following metrological data apply to the gas pair H_2 in N_2. With other gas pairs, these data may differ from the possible measuring spans, the time behavior and the measurement behavior as well as the influencing variables.	
Parameters can be assigned in the measuring ranges	
Smallest possible measuring span	0.5% H_2 in N_2
Largest possible span	100% H_2 in N_2
Smallest possible span with suppressed zero point	5% (e.g. 95 to 100%) H_2 in N_2

Table 13-27 CALOMAT 7: Gas inlet conditions

Gas inlet conditions	
Sample gas pressure	700 to 1 400 hPa (absolute)
Pressure drop between sample gas inlet and outlet	< 50 hPa at 1.5 l/min
Sample gas flow	30 to 90 l/h (0.5 to 1.5 l/min)
Sample gas temperature and humidity	0 ... 70 °C (32 ... 158 °F) with relative humidity < 90%, avoid condensation in the gas path (moisture content results in measurement errors)

Table 13-28 CALOMAT 7: Temperature of sample chamber and gas path

Temperature of sample chamber and gas path	
Gas path	5 K above ambient temperature
Standard version	72 °C (162°F)

Table 13-29 CALOMAT 7: Time response

Time response		
Warm-up period at room temperature		< 30 min (max. accuracy after 2 h)
Response characteristics		
Delayed display T_{90}	Standard module	< 2.5 s
	Module with integrated flame arrester	< 3.5 s
Dead time (T_{10}) at 1 l/min		< 0.5 s
Adjustable signal damping range		0 to 100 s

Table 13-30 CALOMAT 7: Measuring response

Measuring response	
Output signal fluctuation with device-internal signal damping of 1 s	≤ ±0.5% of smallest measuring span according to module nameplate (noise bandwidth corresponds to 1% = 6σ value or 0.333% = 2σ value)
Detection limit	≤ 1% of the smallest span according to nameplate
Measured value drift	≤ ± 1%/week of smallest measuring span according to nameplate or 50 vpm H_2/week Whichever is greater
Repeatability	≤ ± 1% of the current span or 100 vpm H_2
Linearity deviation	≤ ± 1% of the current span or 100 vpm H_2

Table 13-31 CALOMAT 7: Influence variables

Influence variables	
Ambient temperature	≤ 0.5% of smallest measuring span/10 K or ≤ 50 vpm H_2/10 K Whichever is greater
Sample gas pressure	≤ ± 0.5%[1] of smallest measuring span/1% change in pressure or ≤ ± 50 vpm H_2/1% change in pressure Whichever is greater
Sample gas flow	≤ 0.2% of smallest measuring span/ dl/min change in flow or ≤ 50 vpm O_2 /dl/min change in flow within the permissible flow range (0.3 to 1 l/min) Whichever is greater
Accompanying gases (interference gases)	The interference gas sensitivity depends on the application and must be determined in each case except for applications with blast furnace gas / converter gas / wood gasification (pre-adjusted).
Supply voltage (fluctuations of the power supply of the basic device[2] in the range of 85 to 264 V AC / 47 to 63 Hz)	≤ ± 0.1% of full-scale value

[1] Values less than the detection limit are not useful

[2] Basic device: 7MB3000-0xxx0-1xx0 rack-/wall-mounted housing

Table 13-32 CALOMAT 7: Climatic conditions

Climatic conditions	
Storage and transport	- 30 ... +70 °C (-22 ... 158 °F)
Max. permissible ambient temperature surrounding the basic device during operation [1]	0 ... 50 °C (32 ... 122 °F)
Ambient humidity (relative humidity) during storage, transport or operation [2]	< 90%

[1] Restriction for installing an ULTRAMAT 7 analyzer module (combined operation): 5 ... 45 °C (41 ... 113 °F)

[2] Avoid condensation on the installed components

Table 13-33 CALOMAT 7: Gas connections

Gas connections	
Connection fittings	Pipe diameter 6 mm (outer diameter)

Table 13-34 CALOMAT 7: Parts in contact with sample gases

Materials of wetted parts	
Gas connection	Stainless steel (Material No. 1.4571)
Clamping rings and union nut (set)	Stainless steel (Material No. 1.4401)
Sample gas pipes	Stainless steel (Material No. 1.4404)
Sensor mounting block	Stainless steel (Material No. 1.4571)
Sensor	Si, SiO_xN_y, Au, epoxy resin, glass
Gasket, contained in the sensor module	Perfluorelastomere FFPM

Dimension drawings

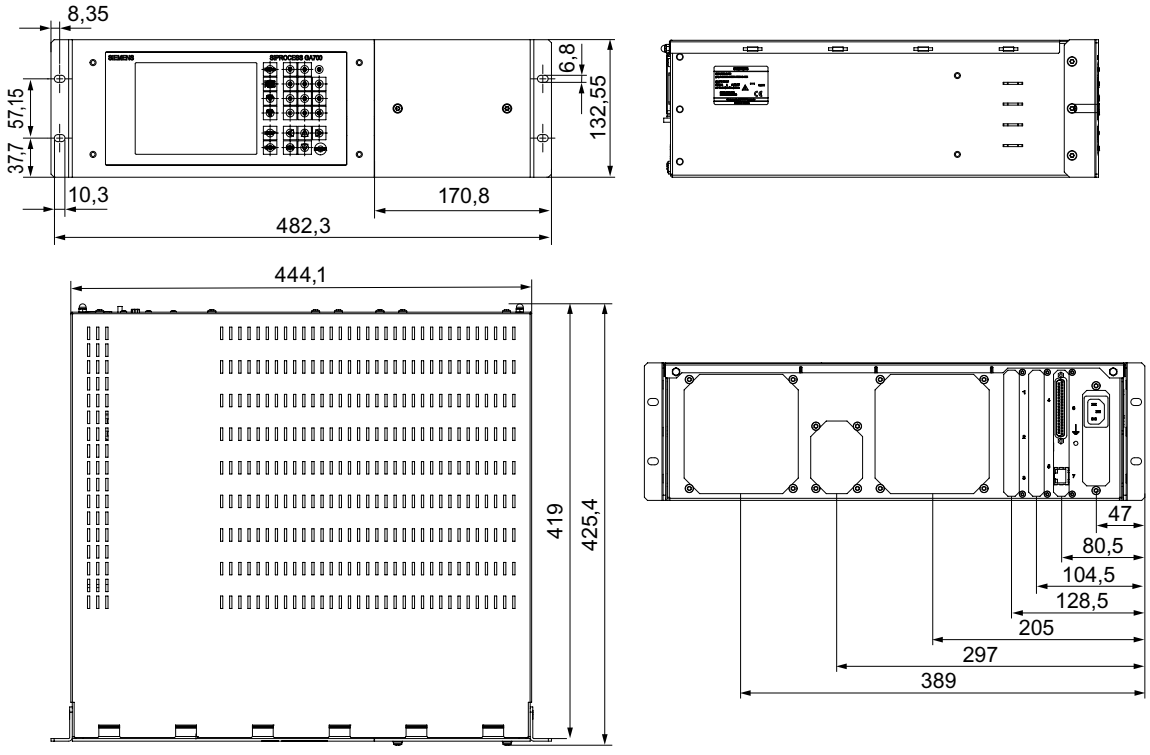


Figure 14-1 Dimension drawing rack-mounted housing

The dimensions are specified in millimeters.

Appendix

A

A.1 Conformity with European directives

The manufacturer of the gas analyzers listed below is authorized to provide the respective labels with a CE marking:

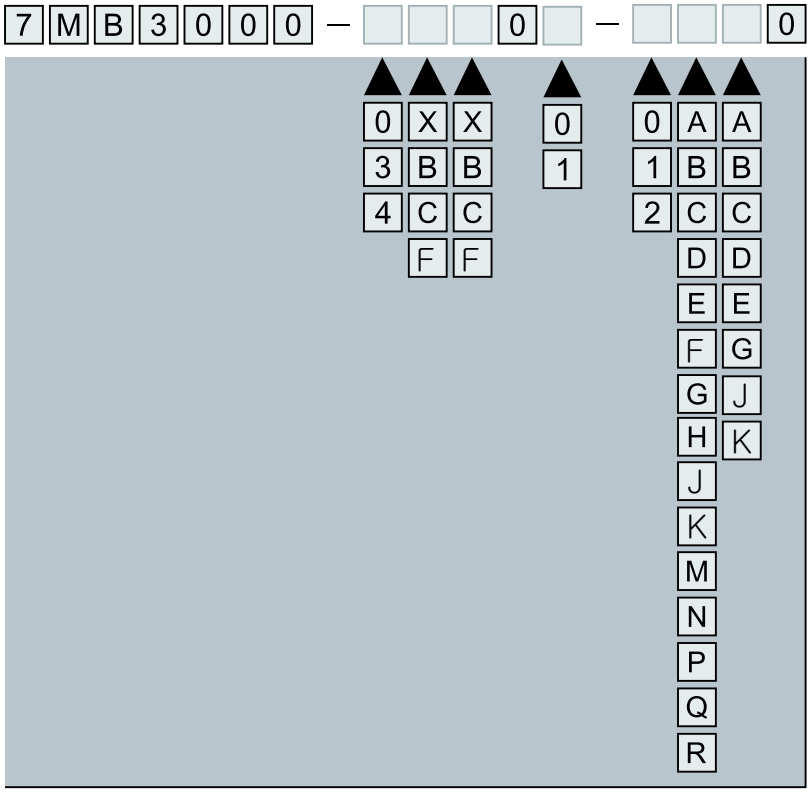


Figure A-1 SIPROCESS GA700 gas analyzers with CE marking

The version of the identified product sold by the manufacturer conforms with the directives of the following European guidelines:

2014/30/EU EMC	Directive of the European Parliament and of the Council on the harmonization of the laws of the Member States relating to electromagnetic compatibility
2014/35/EU LVD	Directive of the European Parliament and of the Council on the harmonization of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits

SIPROCESS GA700 without / ohne / sans ULTRAMAT:

2011/65/EU RoHS	Directive of the European Parliament and of the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment

Conformity with the specified directives is proven through adherence to the following standards (depending on the version):

Directive	Standard	Edition
2014/30/EU	EN 61326-1*	2013
2014/35/EU	EN 61010-1	2010

* Applies to all surrounding areas

A.2 Certificate

The certificates are available on the Internet at:

Certificates (https://support.industry.siemens.com/cs/ww/en/ps/17702/cert).

A.3 Abbreviations

List of abbreviations

Table A-1 List of abbreviations

Abbreviation	In full	Description
A	Amperes	Current unit
AC	Alternating Current	Alternating current
AM	Analyzer module	
°C	Degrees Celsius	Temperature unit
CAN	Controller Area Network	Asynchronous serial bus system
cm	Centimeter	Unit of length
DC	Direct Current	Direct current
PCB	Printed circuit board	
FFKM/FFPM	Perfluoroelastomer	
FPM/FKM	Fluorinated rubber, Fluorocarbon	Chemically resistant plastic
h	Hour	Time unit
HU	Height unit	44.45 mm
Hz	Hertz	Frequency unit
K	Kelvin	Temperature unit
l	Liter	Volume unit
LUI	Local User Interface	Local user interface
m	Meter	Unit of length
MG	Sample gas	
min	Minute	Time unit
mm^2	Square millimeter	Unit of area
MFS	Microflow sensor	Micromechanical component for converting a pneumatic signal into an electrical one. The microflow sensor is used as a transducer in the ULTRAMAT detector unit.

Abbreviation	In full	Description
SL	Standard liters	Standardized volume unit; based on standard conditions (temp = 273.15K and pressure = 1013.25 hPa)
Nm	Newton meter	Torque unit
OM	Option module	
Pa	Pascal	Pressure unit
PDM	Process Device Manager	
ppm	Parts per million	Parts per million: 10^{-6}
PTFE	Polytetrafluoroethylene	Chemically resistant plastic
PVDF	Polyvinylidene fluoride	Chemically resistant plastic
s	Second	Time unit
SW	Width across flats	
THHN	Thermoplastic High Heat-resistant Nylon-coated	English for "hoch-hitzebeständiger und mit Nylon ummantelter Thermoplast", condition of a cable insulation material
THWN	Thermoplastic Heat and Water-resistant Nylon-coated	English for "hitzebeständiger und wasserfester Thermoplast", condition of a cable insulation material
LEL	Lower explosion limit	
V	Volt	Unit of electrical voltage
RG	Reference gas	
PU	Processing unit	
vpm	Volume parts per million	Volume parts per million: 10^{-6}
W	Watt	Unit of electrical power

A.4 References

Table A-2 References 1 - Operating Manuals LUI

Title	Languages	Article numbers
SIPROCESS GA700 Operating with the local user interface Operating manual	German (de-DE)	A5E31930441
	English (en-US)	A5E31930478

Table A-3 References 2 - Operating Manuals PDM

Title	Languages	Article numbers
SIPROCESS GA700 Operation with SIMATIC PDM Operating Manual	German (de-DE)	A5E31930523
	English (en-US)	A5E31930531

Table A-4 References 3 - Operating Instructions

Title	Languages	Article numbers
SIPROCESS GA700 Rack-mounted device Operating Instructions	German (de-DE)	A5E31873438
	English (en-US)	A5E31874006

Title	Languages	Article numbers
SIPROCESS GA700 Wall-mounted device Operating Instructions	German (de-DE)	A5E31930383
	English (en-US)	A5E31930403

Table A-5 References 4 - Compact Operating Instructions

Title	Languages	Article numbers
SIPROCESS GA700 Quick Start Compact Operating Instructions	German (de-DE)	A5E31805153
	English (en-US)	A5E31805656
	French (fr-FR)	A5E31809624
	Italian (it-IT)	A5E31809652
	Spanish (es-ES)	A5E31809707
	Portuguese (pt-BR)	A5E31809812

Table A-6 References 5 - Compact Operating Instructions Ex

Title	Languages	Article numbers
SIPROCESS GA700 Devices with explosion-proof models Quick Start Compact Operating Instructions	German (de-DE)	A5E35134047
	English (en-US)	
	Danish (da-DK)	A5E35134119
	Swedish (sv-SE)	
	Finnish (fi-FI)	
	Estonian (et-ET)	A5E35134150
	Latvian (lt-LT)	
	Lithuanian (lv-LV)	
	Spanish (es-EM)	A5E35134177
	Italian (it-IT)	
	Portuguese (pt-PT)	
	Czech (cs-CZ)	A5E35134191
	Polish (pl-PL)	
	Slovak (sk-SK)	
	Romanian (ro-RO)	A5E35134200
	Bulgarian (bg-BG)	
	Greek (el-GR)	
	Hungarian (hu-HU)	A5E35134219
	Slovenian (sl-SI)	
	Croatian (hr-HR)	
	French (fr-FR)	A5E35134270
	Dutch (nl-NL)	

Table A-7 References 6 - Operating Instructions Field device "Ex d"

Title	Languages	Article numbers
SIPROCESS GA700 field device Operating Instructions	German (de-DE)	A5E35640463
	English (en-US)	
	Danish (da-DK)	A5E35640359
	Swedish (sv-SE)	
	Finnish (fi-FI)	
	Estonian (et-ET)	A5E35640371
	Latvian (lt-LT)	
	Lithuanian (lv-LV)	
	Spanish (es-EM)	A5E35640420
	Italian (it-IT)	
	Portuguese (pt-PT)	
	Czech (cs-CZ)	A5E35640437
	Polish (pl-PL)	
	Slovak (sk-SK)	
	Romanian (ro-RO)	A5E35640444
	Bulgarian (bg-BG)	
	Greek (el-GR)	
	Hungarian (hu-HU)	A5E35640455
	Slovenian (sl-SI)	
	Croatian (hr-HR)	
	French (fr-FR)	A5E35640457
	Dutch (nl-NL)	

Table A-8 References 6 - Catalogs

Title / address	Address
SIPROCESS GA700 → Catalog AP 01	→ Information and Download Center (https://w3app.siemens.com/mcms/infocenter/content/en/Pages/order_form.aspx)

A.5 Spare parts/accessories

A.5.1 Notes

WARNING

Danger for operating personnel/device failure

All spare parts in the spare parts lists are listed with the classifications "1", "2" or "*" and are available for order. This classification indicates a permission for use. You must therefore note the following:

- The use of Class 2 spare parts is allowed only after appropriate training provided by Siemens AG.
  The use of Class 2 spare parts without prior training has the following consequences:
  - The device can fail completely and can thus become a danger for the operating personnel.
  - The device can lose its measuring capability.
  - Each of these cases voids the manufacturer warranty of the device/module.
- The general information contained in this document apply to qualification for Class 1 spare parts. Additional training by Siemens AG is not required.
- For the spare parts marked with *) we do **not** recommend repair on site. Instead, you should send in the device for repair to our Repair Center as repair on site may void the technical specifications.

You can obtain additional information about this from your Siemens contact

Siemens contact (https://www.automation.siemens.com/partner)

Note

Completeness/timeliness of spare parts lists

The following spare parts lists were correct at the time this documentation was issued. Interim changes or updates are not included. You can find information about the latest spare parts in the catalogs and on the Internet. If necessary contact your Siemens contact at:

Siemens contact (https://www.automation.siemens.com/partner)

See also

Contact partner (https://w3.siemens.com/aspa_app/)

A.5.2 Spare parts slide-in device

Table A-9 Spare parts list rack-mounted device - standard version

Article number	Name	Description	Classification
A5E03862265	19" bracket	2x brackets with mounting screws and sleeve nuts	1
A5E48170402	19" bracket	2x bracket with 3 fastening screws (from year of manufacture October 2019, serial numbers N1-LO*****)	1
A5E03862280	Front	Front cover complete with keyboard and securing components, without display and LUI FBG	1
A5E03862297	Door	Complete, with fixing screws	1
A5E48170862	Door	Complete, with 2 fastening screws (from year of manufacture October 2019, serial numbers N1-LO*****)	1
A5E03862411	Blank plate analyzer module	With fixing screws	1
A5E03862437	Blank plate gas management	With fixing screws	1
A5E03862587	Cover	Cover behind door with fastening nuts	1
A5E03862602	Housing cover	With fastening cap nuts	1
A5E48171220	Housing cover	With mounting cap nuts (from year of manufacture October 2019, serial numbers N1-LO*****)	1
A5E03862608	Power connector with securing bracket	Appliance plug with guard bracket	1
A5E03862614	Blank plate FBG	With fixing screws	1
A5E03862617	FBG holder	FBG holder with fixing screws	1
A5E03862623	Cable ties	High-temperature cable ties for cable fastening	1
A5E03860170	Display	With spacers	1
A5E03860142	LUI FBG	Operating unit FBG without expanding rivet	1
A5E03860127	Processing unit	With fixing screws	1
A5E03860137	Option module 1.1 (also DI/DO)	With fixing screws	1
A5E03860138	Option module 2.1 (6xAO + 6DO)	With fixing screws	1
A5E03860130	Option module 2.2	With fixing screws	1
A5E03860938	CAN cable	CAN bus cable	1
A5E03862634	Service interface cable	For service interface	1
A5E03860941	Supply cable PU	For processing unit	1
A5E03862649	Analyzer module supply cable AM 1	For analyzer module 1	1
A5E03860948	Supply cable GM / AM	for gas management (rack-mounted device) / analyzer module (wall-mounted device)	1
A5E03862650	Analyzer module supply cable AM 2	For analyzer module 2	1
A5E03862657	Connecting cable PU - LUI	For processing unit - front panel	1

Article number	Name	Description	Classification
A5E03862665	Connecting cable AM 1 - OM 2.x	For analyzer module 1 - option module 2.x	1
A5E03862669	Connecting cable AM 2 - OM 2.x	For analyzer module 2 - option module 2.x	1
A5E03860997	Data cable PU - OM 1	For processing unit - option module 1	1
A5E03862674	Power supply unit	Power supply unit with fixing screws, -nuts and ground cable	1
A5E45446380	Rack-mounted device packaging	Empty shipping packaging for the rack-mounted device	1
A5E46153581	Connector set PU and OMs	D-sub connector set for external connection of the processing unit and the optional interface cards	1

Table A-10 Conversion sets rack-mounted unit

Article number	Name	Description	Classification
A5E31271086	Conversion set 1 EG; OM 11	Retrofit/conversion set rack-mounted device option module 1.1	1
A5E31271189	Conversion set 2 EG; OM21	Retrofit/conversion set rack-mounted device option module 2.1	1
A5E31271203	Conversion set 3 EG; OM 22	Retrofit/conversion set rack-mounted device option module 2.2	1

A.5.3 Spare parts OXYMAT 7

Table A-11 Spare parts list OXYMAT 7 - standard version

Article number	Name	Description	Classification
A5E03790045	Measuring head	Without vibration compensation	1
A5E03790046	Measuring head	With vibration compensation	1
A5E03790047	O-ring set	FKM / FPM	1
A5E41571138	O-ring set	FKM / FPM for analyzer module in standard version, cleaned for O_2	2
A5E41534683	O-ring set	FFKM / FKM for Hastelloy and Ex, for flange, screwed gland, and top bin section	1
A5E41581325	O-ring set	FFKM / FKM for Hastelloy and Ex, for flange, screwed gland, and top bin section, cleaned for O_2	2
A5E03790048	Insulation set	For analyzer modules in standard version	1
A5E03790049	Sample chamber	Without vibration compensation, stainless steel	1
A5E41572735	Sample chamber	Without vibration compensation, stainless steel, cleaned for O_2	2
A5E03790052	Sample chamber	Without vibration compensation, Hastelloy	1
A5E41578916	Sample chamber	Without vibration compensation, Hastelloy, cleaned for O_2	2

Article number	Name	Description	Classification
A5E03790050	Sample chamber	With vibration compensation, stainless steel	1
A5E41574271	Sample chamber	With vibration compensation, stainless steel, cleaned for O_2	2
A5E03790053	Sample chamber	With vibration compensation, Hastelloy	1
A5E41579777	Sample chamber	With vibration compensation, Hastelloy, cleaned for O_2	2
A5E03790055	O-ring set	For sample chamber, Kalrez	1
A5E41580069	O-ring set	For sample chamber, Kalrez, cleaned for O_2	2
A5E03790056	Set of screws	For analyzer modules in standard version	1
A5E03790058	Analyzer unit	Without vibration compensation, stainless steel	1
A5E41582613	Analyzer unit	Without vibration compensation, stainless steel, cleaned for O_2	2
A5E35685210	Analyzer unit	Without vibration compensation, Hastelloy (Kalrez)	1
A5E41586678	Analyzer unit	Without vibration compensation, Hastelloy (Kalrez), cleaned for O_2	2
A5E03790059	Analyzer unit	With vibration compensation, stainless steel	1
A5E41583723	Analyzer unit	With vibration compensation, stainless steel cleaned for O_2	2
A5E35685444	Analyzer unit	With vibration compensation, Hastelloy (Kalrez)	1
A5E41586684	Analyzer unit	With vibration compensation, Hastelloy, cleaned for O_2	2
A5E03790063	Pressure switch	For high pressure variant 3000 hPa - 5000 hPa (abs.)	1
A5E03790211	Set of tubes	For reference gas, low pressure version, external pump	1
A5E03790213	Set of pipes	For reference gas, high-pressure version	1
A5E35891987	Set of pipes	For reference gas, low pressure version	1
A5E03790214	Pressure sensor	1.5 bar with pipe	1
A5E03790215	Pressure sensor	2.5 bar with pipe	1
A5E03790216	Restrictor	For sample gas with hoses	1
A5E03790218	Restrictor	For sample gas path with pipes, stainless steel	1
A5E41589699	Restrictor	For sample gas with pipes, stainless steel, cleaned for O_2	2
A5E03790219	Restrictor	For sample gas with pipes, Hastelloy	1
A5E41589698	Restrictor	For sample gas with pipes, Hastelloy, cleaned for O_2	2
A5E35898391	Clamping screw	For sample gas path with pipes, stainless steel	1
A5E41588359	Clamping screw	For sample gas with pipes, stainless steel, cleaned for O_2	2
A5E35898424	Clamping screw	For sample gas with pipes, Hastelloy	1
A5E41588366	Clamping screw	For sample gas with pipes, Hastelloy, cleaned for O_2	2
A5E03790221	Set for sample gas path	FKM / FPM hose	1
A5E41590922	Set for sample gas path	Hose, FKM / FPM, cleaned for O_2:	2
A5E03790222	Set for sample gas path	Stainless steel	1
A5E41590925	Set for sample gas path	Stainless steel, cleaned for O_2	2
A5E03790223	Set for sample gas path	Hastelloy, for analyzer modules in standard version	1
A5E41590929	Set for sample gas path	Hastelloy, cleaned for O_2	2
A5E03790238	Set of screwed glands	For reference gas, 1/16", stainless steel	1
A5E03790226	Set of screwed glands	For sample gas and reference gas, FKM / FPM hose	1
A5E41591747	Set of screwed glands	For sample gas and reference gas, FKM / FPM hose, cleaned for O_2	2
A5E03790227	Set of screwed glands	For sample gas, 1/8"; stainless steel	1

Article number	Name	Description	Classification
A5E41591764	Set of screwed glands	For sample gas, 1/8"; stainless steel, cleaned for O_2	2
A5E03790228	Set of screwed glands	For sample gas with restrictor, 1/8", Hastelloy	1
A5E41591760	Set of screwed glands	For sample gas with restrictor, 1/8", Hastelloy, cleaned for O_2	2
A5E03790229	Set of stubs with flange	For sample gas with hoses	1
A5E41592351	Set of stubs with flange	For sample gas with hoses, cleaned for O_2	2
A5E03790230	Set of screwed glands with flange	For sample gas path with pipes, stainless steel	1
A5E41592353	Set of screwed glands with flange	For sample gas with pipes, stainless steel, cleaned for O_2	2
A5E03790231	Set of screwed glands with flange	For sample gas with pipes, Hastelloy	1
A5E41592354	Screw gland with flange	For sample gas with pipes, Hastelloy, cleaned for O_2	2
A5E35686677	Set of screwed glands with flange	For sample gas with pipes, stainless steel with FFKM O-ring	1
A5E42004884	Set of screwed glands with flange	For sample gas with pipes, stainless steel with FFKM O-ring, cleaned for O_2	2
A5E03790504	Set of dummy plugs	For mounting on the panel of the module	1
A5E03790505	Set of seals	For screwed glands; with pipes / with hoses	1
A5E03790512	Control module FBG		1
A5E03790513	Heater module set	For analyzer modules in standard version	1
A5E41890604	Thermal paste	For analyzer modules in standard version	1
A5E03790515	Set of self-locking screws		1
A5E43896751	Module packaging	C7-O7-U7	1
A5E03878052	Set of cables		1
A5E03790507	Analyzer module FBG	For analyzer modules in standard version	1
A5E35686750	Retaining plate with small parts set	For mounting the FBG A5E03790512 or the pressure sensor A5E03790214 / A5E03790215	1
A5E35681466	Union nut for customer connection (set)	Swagelok nut clamping ring set for 6 mm pipe, stainless steel	1
A5E35687155	Union nut for customer connection (set)	Swagelok nut clamping ring set for 6 mm pipe, Hastelloy	1
A5E35681883	Set of 4A fuses	AM-FBG, set of 6x 4A fuses	1

A.5.4 Spare parts ULTRAMAT 7

Table A-12 Spare parts list ULTRAMAT 7 - IR source standard version

Article number	Name	Description	Classification
A5E35255648	IR source	For standard module, 2 gas connections, stainless steel, non-flow type, sealed	2
A5E41793434	IR source	For standard module, 2 gas connections, stainless steel, cleaned for O_2, non-flow type, sealed	2

Article number	Name	Description	Classification
A5E41004050	IR source	For standard module, 2 gas connections, Hastelloy, non-flow type, sealed	2
A5E41793555	IR source	For standard module, 2 gas connections, Hastelloy, cleaned for O_2, non-flow type, sealed	2
A5E35255650	IR source	For standard module, 4 gas connections, stainless steel, flow-type, sealed	2
A5E41795139	IR source	For standard module, 4 gas connections, stainless steel, cleaned for O_2, flow-type, sealed	2
A5E41004110	IR source	For standard module, 4 gas connections, Hastelloy, flow-type, sealed	2
A5E41799637	IR source	For standard module, 4 gas connections, Hastelloy, cleaned for O_2, flow-type, sealed	2
A5E35255669	IR source	For standard module, without 2 gas connections, non-flow type, sealed	2
A5E35255673	IR source	For standard module, without 4 gas connections, flow-type, sealed	2
A5E35255656	Terminal block	For sample gas, stainless steel	1
A5E41801808	Terminal block	For sample gas, stainless steel, cleaned for O_2	2
A5E35255660	Terminal block	For reference gas, stainless steel	1
A5E41801973	Terminal block	For reference gas, stainless steel, cleaned for O_2	2
A5E41758733	Terminal block	For sample gas, Hastelloy	1
A5E41801829	Terminal block	For sample gas, Hastelloy, cleaned for O_2	2
A5E43471974	Terminal block	For reference gas, Hastelloy	1
A5E43471983	Terminal block	For reference gas, Hastelloy, cleaned for O_2	2

Table A-13 Spare parts list ULTRAMAT 7 - Y cells

Article number	Name	Description	Classification
A5E35255663	Y cell	For measured components: CO, CO (TÜV), NO, NH_3	2
A5E35255664	Y cell	For measured component: CO_2	2
A5E36527931	Y cell	For measured components: N_2O, CH_4, C_2H_4	2
A5E36527933	Y cell	For measured component: SO_2	2
A5E43469844	Y cell	For measured component: CO highly selective	2

Table A-14 Spare parts list ULTRAMAT 7 - analyzer chamber

Article number	Name	Description	Classification
A5E35263520	Analyzer chamber	0.2 mm Al, non-flow-type	2
A5E35255676	Analyzer chamber	0.2 mm Al, flow-type	2
A5E35263521	Analyzer chamber	0.6 mm Al, non-flow-type	2
A5E35255677	Analyzer chamber	0.6 mm Al, flow-type	2

Article number	Name	Description	Classification
A5E35263523	Analyzer chamber	2 mm Al, non-flow-type	2
A5E35255678	Analyzer chamber	2 mm Al, flow-type	2
A5E35263524	Analyzer chamber	6 mm Al, non-flow-type	2
A5E35255679	Analyzer chamber	6 mm Al, flow-type	2
A5E35263525	Analyzer chamber	20 mm Al, non-flow-type	2
A5E35255680	Analyzer chamber	20 mm Al, flow-type	2
A5E35263526	Analyzer chamber	60 mm Al, non-flow-type	2
A5E35255681	Analyzer chamber	60 mm Al, flow-type	2
A5E35263527	Analyzer chamber	90 mm Al, non-flow-type	2
A5E35255683	Analyzer chamber	90 mm Al, flow-type	2
A5E35263528	Analyzer chamber	180 mm Al, non-flow-type	2
A5E35255685	Analyzer chamber	180 mm Al, flow-type	2
A5E41093568	Analyzer chamber	0.2 mm Al FFKM, non-flow-type	2
A5E41093542	Analyzer chamber	0.2 mm Al FFKM, flow-type	2
A5E41093507	Analyzer chamber	0.6 mm Al FFKM, non-flow-type	2
A5E41093456	Analyzer chamber	0.6 mm Al FFKM, flow-type	2
A5E41093164	Analyzer chamber	2 mm Al FFKM, non-flow-type	2
A5E35255678	Analyzer chamber	2 mm Al FFKM, flow-type	2
A5E41092910	Analyzer chamber	6 mm Al FFKM, non-flow-type	2
A5E41092881	Analyzer chamber	6 mm Al FFKM, flow-type	2
A5E35263530	Analyzer chamber	20 mm Al+Ta FFKM, non-flow-type	2
A5E35255686	Analyzer chamber	20mm Al+Ta FFKM, flow-type	2
A5E35263531	Analyzer chamber	60 mm Al+Ta FFKM, non-flow-type	2
A5E35255687	Analyzer chamber	60 mm Al+Ta FFKM, flow-type	2
A5E35263532	Analyzer chamber	90 mm Al+Ta FFK, non-flow-type	2
A5E35255689	Analyzer chamber	90 mm Al+Ta FFKM, flow-type	2
A5E35263533	Analyzer chamber	180 mm Al+Ta FFKM, non-flow-type	2
A5E35255691	Analyzer chamber	180 mm Al+Ta FFKM, flow-type	2
A5E41265903	Analyzer chamber	0.2 mm Al, non-flow-type, cleaned for O_2	2
A5E41266188	Analyzer chamber	0.2 mm Al FFKM, non-flow-type, cleaned for O_2	2
A5E41266818	Analyzer chamber	0.2 mm Al, flow-type, cleaned for O_2	2
A5E41267538	Analyzer chamber	0.2 mm Al FFKM, flow-type, cleaned for O_2	2
A5E41267703	Analyzer chamber	0.6 mm Al, non-flow-type	2
A5E41268308	Analyzer chamber	0.6 mm Al FFKM, non-flow-type	2
A5E41269556	Analyzer chamber	0.6 mm Al, flow-type, cleaned for O_2	2
A5E41269904	Analyzer chamber	0.6 mm Al FFKM, flow-type, cleaned for O_2	2
A5E41276328	Analyzer chamber	2 mm Al, non-flow-type, cleaned for O_2	2
A5E41276420	Analyzer chamber	2 mm Al FFKM, non flow-type, cleaned for O_2	2
A5E41276583	Analyzer chamber	2 mm Al, flow-type, cleaned for O_2	2
A5E41276721	Analyzer chamber	2 mm Al FFKM, flow-type, cleaned for O_2	2
A5E41276788	Analyzer chamber	6 mm Al, non-flow-type, cleaned for O_2	2
A5E41276823	Analyzer chamber	6 mm Al FFKM, non-flow-type, cleaned for O_2	2

Article number	Name	Description	Classification
A5E41276808	Analyzer chamber	6 mm Al, flow-type, cleaned for O_2	2
A5E41276884	Analyzer chamber	6 mm Al FFKM, flow-type, cleaned for O_2	2
A5E41276950	Analyzer chamber	20 mm Al, non-flow-type, cleaned for O_2	2
A5E41276984	Analyzer chamber	20 mm Al+Ta FFKM, non-flow-type, cleaned for O_2	2
A5E41277059	Analyzer chamber	20 mm Al, flow-type, cleaned for O_2	2
A5E41277092	Analyzer chamber	20 mm Al+Ta FFKM, flow-type, cleaned for O_2	2
A5E41277169	Analyzer chamber	60 mm Al, non-flow-type, cleaned for O_2	2
A5E41277263	Analyzer chamber	60 mm Al+Ta FFKM, non-flow-type, cleaned for O_2	2
A5E41277536	Analyzer chamber	60 mm Al, flow-type, cleaned for O_2	2
A5E41277563	Analyzer chamber	60 mm Al+Ta FFKM, flow-type, cleaned for O_2	2
A5E41277800	Analyzer chamber	90 mm Al, non-flow-type, cleaned for O_2	2
A5E41277982	Analyzer chamber	90 mm Al+Ta FFKM, non-flow-type, cleaned for O_2	2
A5E41277992	Analyzer chamber	90 mm Al, flow-type, cleaned for O_2	2
A5E41278138	Analyzer chamber	90 mm Al+Ta FFKM, flow-type, cleaned for O_2	2
A5E41278169	Analyzer chamber	180 mm Al, non-flow-type, cleaned for O_2	2
A5E41278180	Analyzer chamber	180 mm Al+Ta FFKM, non-flow-type, cleaned for O_2	2
A5E41278203	Analyzer chamber	180 mm Al, flow-type, cleaned for O_2	2
A5E41278401	Analyzer chamber	180 mm Al+Ta FFKM, flow-type, cleaned for O_2	2
A5E35263887	Cover	For analyzer chamber lengths 0.2 mm - 6 mm	2
A5E35263542	Cover	For analyzer chamber lengths 20 mm - 180 mm	2
A5E41946985	Cover	For analyzer chamber lengths 0.2 mm - 6 mm, cleaned for O_2	2
A5E41946993	Cover	For analyzer chamber lengths 20 mm - 180 mm, cleaned for O_2	2
A5E35263362	Socket	Mounting for analyzer chamber	1

Table A-15 Spare parts list ULTRAMAT 7 - receiver chambers

Article number	Name	Description	Classification
A5E35263502	Receiver chamber	CO	2
A5E35263503	Receiver chamber	CO_2	2
A5E36528448	Receiver chamber	CH_4	2
A5E36528449	Receiver chamber	C_2H_4	2
A5E36528452	Receiver chamber	SO_2, C_4H_{10}	2
A5E36528454	Receiver chamber	NO	2
A5E36528456	Receiver chamber	N_2O	2
A5E36528458	Receiver chamber	NH_3	2
A5E43470307	Receiver chamber	CO highly selective	2
A5E48644456	Receiver chamber	CO_2 with vibration compensation	2
A5E48644474	Receiver chamber	CO_2 with vibration compensation	2

Table A-16 Spare parts list ULTRAMAT 7 - pipes

Article number	Name	Description	Classification
A5E35263351	Pipe	0.2 - 6 mm sample gas Recommendation: Include O-rings in order; Viton or FFKM	1
A5E41252601	Pipe	0.2 - 6 mm sample gas, cleaned for O_2 Recommendation: Include O-rings in order; Viton or FFKM	2
A5E35263535	Pipe	0.2 - 6 mm reference gas, Recommendation: Include O-rings in order; Viton or FFKM	1
A5E41947240	Pipe	0.2 - 6 mm reference gas, cleaned for O_2 Recommendation: Include O-rings in order; Viton or FFKM	2
A5E35263352	Pipe	20 mm sample gas Recommendation: Include O-rings in order; Viton or FFKM	1
A5E41254338	Pipe	20 mm sample gas, cleaned for O_2 Recommendation: Include O-rings in order; Viton or FFKM	2
A5E35263536	Pipe	20 mm reference gas Recommendation: Include O-rings in order; Viton or FFKM	1
A5E41947381	Pipe	20 mm reference gas, cleaned for O_2 Recommendation: Include O-rings in order; Viton or FFKM	2
A5E35263353	Pipe	60 mm sample gas Recommendation: Include O-rings in order; Viton or FFKM	1
A5E41254600	Pipe	60 mm sample gas, cleaned for O_2 Recommendation: Include O-rings in order; Viton or FFKM	2
A5E35263538	Pipe	60 mm reference gas, Recommendation: Include O-rings in order; Viton or FFKM	1
A5E41947390	Pipe	60 mm reference gas, cleaned for O_2 Recommendation: Include O-rings in order; Viton or FFKM	2
A5E35263354	Pipe	90 mm sample gas, Recommendation: Include O-rings in order; Viton or FFKM	1
A5E41254800	Pipe	90 mm sample gas, cleaned for O_2 Recommendation: Include O-rings in order; Viton or FFKM	2
A5E35263539	Pipe	90 mm reference gas, Recommendation: Include O-rings in order; Viton or FFKM	1
A5E41947402	Pipe	90 mm reference gas, cleaned for O_2 Recommendation: Include O-rings in order; Viton or FFKM	2
A5E35263358	Pipe	180 mm sample gas, Recommendation: Include O-rings in order; Viton or FFKM	1
A5E41254875	Pipe	180 mm sample gas, cleaned for O_2 Recommendation: Include O-rings in order; Viton or FFKM	2
A5E35263540	Pipe	180 mm reference gas, Recommendation: Include O-rings in order; Viton or FFKM	1
A5E41947457	Pipe	180 mm reference gas, cleaned for O_2 Recommendation: Include O-rings in order; Viton or FFKM	2
A5E41050303	Pipe	0.2 - 6 mm sample gas Hastelloy	1
A5E41255166	Pipe	0.2 - 6 mm sample gas Hastelloy, cleaned for O_2	2
A5E43472792	Pipe	0.2 - 6 mm reference gas, Hastelloy	1
A5E43472864	Pipe	0.2 - 6 mm reference gas, Hastelloy; cleaned for O_2	2
A5E41042188	Pipe	20 mm sample gas Hastelloy	1

Article number	Name	Description	Classification
A5E41261523	Pipe	20 mm sample gas Hastelloy, cleaned for O_2	2
A5E43472867	Pipe	20 mm reference gas Hastelloy	1
A5E43472873	Pipe	20 mm reference gas Hastelloy, cleaned for O_2	2
A5E41042699	Pipe	60 mm sample gas	1
A5E41262055	Pipe	60 mm sample gas, cleaned for O_2	2
A5E43472881	Pipe	60 mm reference gas Hastelloy	1
A5E43472887	Pipe	60 mm reference gas Hastelloy, cleaned for O_2	2
A5E41042857	Pipe	90 mm sample gas Hastelloy	1
A5E41263077	Pipe	90 mm sample gas Hastelloy, cleaned for O_2	2
A5E43472891	Pipe	90 mm reference gas Hastelloy	1
A5E43472897	Pipe	90 mm reference gas, Hastelloy, cleaned for O_2	2
A5E41042944	Pipe	180 mm sample gas Hastelloy	1
A5E41264463	Pipe	180 mm sample gas Hastelloy, cleaned for O_2	2
A5E43472904	Pipe	180 mm reference gas, Hastelloy	1
A5E43472912	Pipe	180 mm reference gas, Hastelloy, cleaned for O_2Recommendation:	2

Table A-17 Spare parts list ULTRAMAT 7 - other spare parts standard version

Article number	Name	Description	Classification
A5E35255652	Heat sink		1
A5E35380097	IR radiation source	Without setting system	2
A5E35255666	Chopper	Complete	2
A5E35255667	Chopper	complete sealed	2
A5E35263882	Intermediate plate	For measured component CO_2	2
A5E35263883	Optical decoupler		2
A5E35263884	FBG analyzer module	Printed circuit board analyzer module Recommendation: Order pressure sensor hose, cable set and cable tie set as well	1
A5E35263885	FBG connector adapter	Connector adapter printed circuit board analyzer module Recommendation: Order pressure sensor hose, cable set and cable tie set as well	1
A5E35255654	Hose pressure sensor and clamps	Recommendation: Include Oetiker pliers in order	1
A5E34820355	O-rings	For FKM pipes, for sample gas path	1
A5E41050801	O-rings	For KALREZ-6375 pipes, for sample gas path	1
A5E35332928	O-rings	For analyzer chamber FKM, for sample gas path	2
A5E41050939	O-rings	For analyzer chamber Kalrez-6375, for sample gas path	2
A5E35255695	O-rings	FKM, for unsealed version, for all measured components except CO_2 O-rings for sample gas path not included.	2
	O-rings	FKM, for sealed version, for measured component CO_2 O-rings for sample gas path not included	2

Article number	Name	Description	Classification
A5E35255693	Cable set	For chopper, sensor module, adapter, cable tie	2
A5E35255699	Screw set	M3x6	1
A5E35255700	Screw set	M4x10	1
A5E35263268	Screw set	M4x16	1
A5E35263315	Screw set	M4x20	1
A5E35263334	Screw set	M5x16	1
A5E35263344	Screw set	M5x45	1
A5E40871415	Screw set	M5x40	1
A5E39981720	Zero point adjuster	For 2R channel	1
A5E43896751	Module packaging	C7-O7-U7	1

Table A-18 Spare parts list ULTRAMAT 7 - optical filter IR source

Article number	Name	Description	Classification
A5E35255662	Optical filter IR source	For sample gas CO_2	2
A5E36528536	Optical filter IR source	For sample gas C_2H_4	2
A5E36528537	Optical filter IR source	For sample gas SO_2	2
A5E36528538	Optical filter IR source	For sample gas NO	2
A5E36528540	Optical filter IR source	For sample gas N_2O	2
A5E36528539	Optical filter IR source	For sample gas NH_3	2
A5E41402503	Optical filter IR source	For CO/NO	2
A5E43470125	Optical filter IR source	For CO highly-selective	2

A.5.5 Spare parts CALOMAT 7

Table A-19 Spare parts list CALOMAT 7

Article number	Name	Description	Classification
A5E35235529	Set of screws	For mounting the sensor module	1
A5E35362241	Sensor module	Complete	1
A5E42057578	Sensor module	Complete, cleaned for O_2	2
A5E35362256	FBG analyzer module	For module in standard version	1
A5E42057622	Screwed gland	For sample gas; 1/8"; stainless steel, cleaned for O_2	2
A5E03790504	Set of dummy plugs	Complete	1
A5E35638683	Cable tie set		1
A5E43896751	Module packaging	For analyzer modules C7-O7-U7, empty shipping packaging	1

A.6 Technical support

Technical Support

If you have any technical questions, contact Technical Support (https://support.industry.siemens.com/cs/ww/en/sc/2090).

Use our online request form Support Request (https://support.industry.siemens.com/My/ww/en/requests#createRequest).

Service & Support on the Internet

In addition to our documentation, we offer further information online on the Internet:

Industry Online Support (https://support.industry.siemens.com/cs/ww/en/sc)

There you will find:

- The latest product information, FAQs, downloads, tips and tricks.
- A newsletter that provides you with up-to-date information about the products.
- The Knowledge Manager that finds the right documents for you.
- Your local contact partner for automation technology in our contacts database.
- Information about on-site services, repairs, spare parts and much more is available on our "Services" pages.

Our bulletin board, where users and specialists share their knowledge worldwide.

Additional Support

Contact your local Siemens partner if you have any questions about the use of products described in this manual and cannot find the answers here.

Find your contact partner at:

Partner (https://www.automation.siemens.com/partner)

A signpost to the documentation of the various products and systems is available at:

Instructions and Manuals (https://support.industry.siemens.com/cs/ww/en/ps/17731/man)

A.7 Return procedure

The device has to be returned in its original packaging. If the original packaging is no longer available, return the device in appropriate packaging. Empty packaging for devices and modules is also available as spare part.

Include the delivery note, the goods document with the returned goods process mark and decontamination certificate in a firmly attached clear plastic pouch on the outside of the packaging.

With this decontamination declaration you warrant that the device/replacement part has been carefully cleaned and is free of residues. The device/replacement part does not pose a hazard for

humans and the environment. If the returned device/replacement part has come into contact with poisonous, corrosive, flammable or water-polluting substances, you must thoroughly clean the device/replacement part before returning it, in order to ensure that all hollow areas are free of hazardous substances. Check the item after it has been cleaned. Devices/replacement parts without decontamination certificate will be returned to you at your expense.

The forms are available on the supplied CD.

For more detailed information, refer to Return procedure (https://support.industry.siemens.com/cs/ww/en/sc/4529)

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