

19" rack units

Continuous gas analysis Series 6 and ULTRAMAT 23

Compact Operating Instructions

Introduction

1

Safety instructions

2

Assembly/installation

3

Connecting

4

Commissioning

5

Service and maintenance

6

Technical specifications

7

Taking out of operation
and disposal

8

Appendix

A

7MB2001, 7MB2021, 7MB2023, 7MB2024,
7MB2026, 7MB2041, 7MB2047, 7MB2121,
7MB2123, 7MB2124, 7MB2126, 7MB2335,
7MB2337, 7MB2338, 7MB2355, 7MB2357,
7MB2358, 7MB2421, 7MB2427, 7MB2521,
7MB2527, 7MB2541, 7MB2547

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 Aktiengesellschaft. 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.

Table of contents

1	Introduction	7
1.1	Purpose of this documentation	7
1.2	Product versions	7
1.3	General information	10
1.4	Special information and warnings	11
1.5	Proper use	11
1.6	Qualified personnel	12
1.7	Warranty conditions	13
1.8	Delivery information	13
1.9	Standards and regulations	13
1.10	Conformity with European directives	13
2	Safety instructions	15
2.1	Cybersecurity information	15
2.2	Prerequisites for safe use	15
2.3	Analyzers in biogas plants outside the hazardous area	20
2.4	Analyzers in hazardous areas	21
2.4.1	ULTRAMAT 23 IEC, ATEX, CSA, with option E20	21
2.4.2	ULTRAMAT 23 CSA general	21
2.4.3	ULTRAMAT 23 CSA with option E21	22
2.4.4	CALOMAT 6E	22
2.5	Safety instructions for the introduction of flammable gases	23
2.5.1	Introduction of flammable gases in Series 6 devices (ULTRAMAT 6, OXYMAT 6, OXYMAT 61, OXYMAT 64, CALOMAT 6, CALOMAT 62, FIDAMAT 6)	23
2.5.2	Introduction of flammable gases into the OXYMAT 6	23
2.5.3	Introduction of flammable gases into the ULTRAMAT 23	24
2.5.4	Flammable components in sample gas	24
2.6	Measurement of oxygen in hydrogen with OXYMAT 6E	24
2.7	Measurement of hydrogen in oxygen with CALOMAT 6E	26
2.7.1	Calibration	27
2.7.2	Limit	28
3	Assembly/installation	29
3.1	Safety information	29
3.2	Installation location requirements	30
3.2.1	Installation location requirements when flammable gases are introduced	30
3.3	Analyzers in hazardous areas	31

3.4	Gas mixtures with oxygen concentration >21%	31
3.4.1	Measuring high oxygen concentrations in hazardous areas	32
3.5	Gas analyzers OXYMAT 6 and OXYMAT 61	32
4	Connecting	33
4.1	Safety instructions	33
4.1.1	General	33
4.1.2	Analyzers in hazardous areas.....	33
4.2	Electrical connection.....	35
4.2.1	Power connection	35
4.2.2	Connection of the signal lines	37
4.2.3	PROFIBUS DP.....	38
4.2.4	Pin assignments.....	39
4.3	Gas connections	43
4.3.1	Gas preparation	43
4.3.2	FIDAMAT 6 gas connection.....	43
4.3.3	Toxic and corrosive gases	44
4.4	Connection diagrams	45
4.4.1	Connection diagrams for ULTRAMAT 23	45
4.4.2	Connection diagrams for CALOMAT 6E	47
5	Commissioning	49
5.1	Safety instructions	49
5.2	General information on commissioning	50
5.3	Checking for leaks.....	52
5.4	OXYMAT 6 gas analyzer.....	52
6	Service and maintenance	53
6.1	Safety instructions	53
6.1.1	General safety instructions.....	53
6.1.2	ULTRAMAT 23	55
6.1.3	Analyzers in hazardous areas.....	55
6.2	Replacing fuses.....	57
7	Technical specifications	59
7.1	Technical specifications ULTRAMAT 23	59
7.2	General technical data series 6	62
7.3	Technical specifications ULTRAMAT 6E and ULTRAMAT channel in ULTRAMAT/OXYMAT 6E.....	63
7.4	Technical specifications OXYMAT 6E, OXYMAT channel in OXYMAT/ULTRAMAT 6E and OXYMAT 61	64
7.5	Technical specifications OXYMAT 64	65
7.6	Technical specifications CALOMAT 6E	66
7.7	Technical specifications CALOMAT 62E	67
7.8	Technical specifications FIDAMAT 6.....	68

8	Taking out of operation and disposal	71
8.1	Repair or changing of location.....	71
8.2	Product disposal.....	71
A	Appendix.....	73
A.1	Technical support.....	73
A.2	ESD directives	73
A.3	List of abbreviations.....	74
	Index.....	77

Introduction

1.1 Purpose of this documentation

These instructions are a brief summary of important features, functions and safety information, and contain all necessary information required for safe use of the respective devices. Read the manual carefully prior to assembly and startup! To ensure correct handling, become acquainted with the principle of operation of the respective device.

The instructions are aimed at persons who mechanically assemble the devices, connect them electrically, and commission them.

To achieve optimum usage of the respective device read the detailed version of the respective operating instructions.

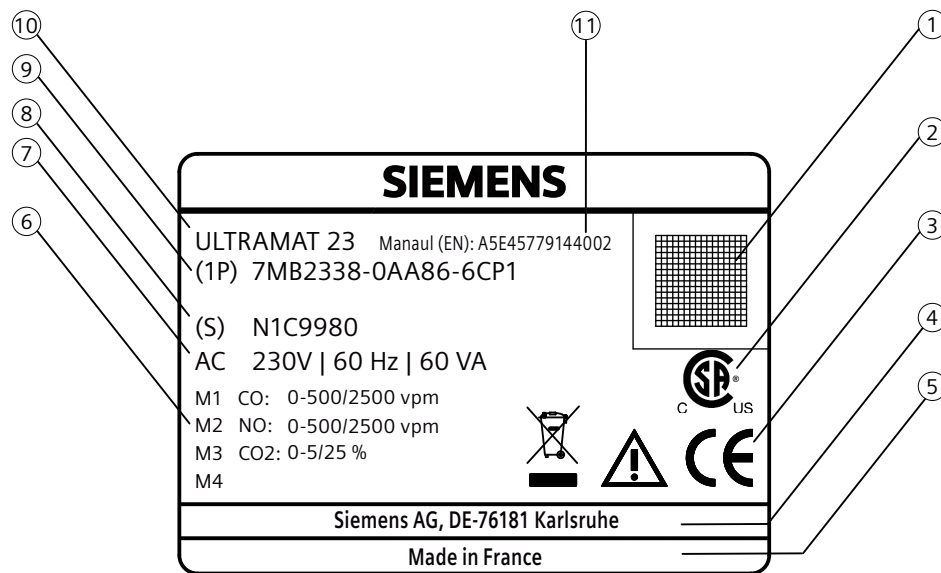
1.2 Product versions

These instructions are valid for the 19" rack units of Series 6 and the ULTRAMAT 23 gas analyzers which are available as 19" rack unit as well as bench-top unit. This includes the devices listed below:

- ULTRAMAT 23
- ULTRAMAT 6E
- ULTRAMAT/OXYMAT 6E
- OXYMAT 6E
- OXYMAT 61
- OXYMAT 64
- CALOMAT 6E
- CALOMAT 62E
- FIDAMAT 6

These gas analyzers are suitable for a wide variety of measurements and are also available in different versions. The data on the label, among others, indicates which device version you have.

We are using the label of an ULTRAMAT 23 as an example.



- 1 Data matrix code
- 2 CSA conformity mark (only for 120 V/60 Hz and 230 V/60 Hz)
- 3 CE conformity symbol
- 4 Name and address of manufacturer
- 5 Designation of origin
- 6 Measuring range(s)
- 7 Auxiliary power supply
- 8 Serial number
- 9 Order No. (MLFB number) of the device
- 10 Device name
- 11 Compact operating instructions (safety information)

Figure 1-1 ULTRAMAT 23 label (example)

These Operating Instructions also cover the rack-mounted versions of Series 6 (CALOMAT 6E and ULTRAMAT 23) approved for operation in hazardous areas.

It is essential that you also observe the respective "Special conditions" of the certificates referred to in the table.

These describe

- The fields of application
- The requirements for operation in hazardous areas
- Other precautionary measures which are important for operation.

The technical specifications in these Operating Instructions may be different to those in the associated Operating Instructions for the analyzers and additional equipment under some circumstances. The technical specifications listed in these Operating Instructions are valid in such cases.

The following table provides an overview of the associated analyzers:

Table 1-1 ULTRAMAT 23 devices permitted for operation in hazardous areas

Certificate	Ex type of protection	Device	MLFB no.
BVS 16 ATEX E061 X IECEX BVS 16.0041 X	 II 3G Ex ec ic nC IIC T4 Gc	ULTRAMAT 23	MB233x-xxxxx-xxxx-Z E20+xxx
CSA16. 70059958	Class I, DIV 2, Groups ABCD, T4, Ta=45°C Class I, Zone 2 A/Ex ec ic nC IIC T4 Gc	ULTRAMAT 23	MB233x-xxxxx-xxxx-Z E20+xxx
CSA16. 70059958	Class I, DIV 2, Groups ABCD, T4, Ta=45°C Class I, Zone 2 A/Ex ec ic nC IIC T4 Gb/Gc	ULTRAMAT 23	MB233x-xxxxx-xxxx-Z E21+xxx

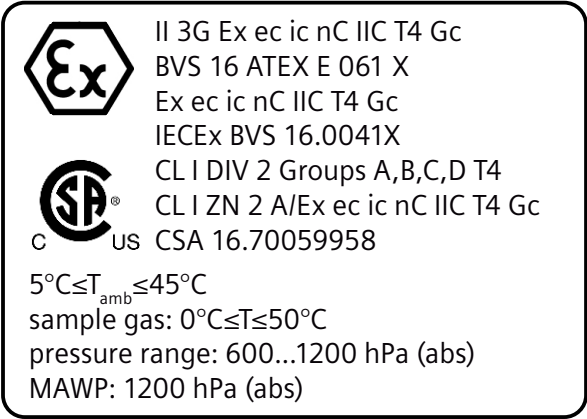


Figure 1-2 Nameplate Ex E20

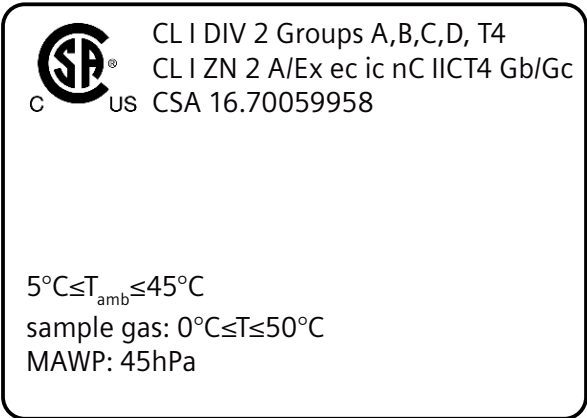


Figure 1-3 Nameplate Ex CSA E21

1.3 General information

Table 1-2 Rack-mounted analyzers of Series 6 approved for operation in hazardous areas

Certificate	Ex type of protection	Device	MLFB no.
TÜV 02 ATEX 1873 X	II 2/3 G Ex ec nC IIC T4 Gb/Gc	CALOMAT 6E	7MB252x-xxx0x-xABx-Z xxx
FM 3018862 FM16US0375X	NI/ CL I / DIV2 / ABCD / T4, Ta= 45°C IP20 Class I / Zone 2/IIC/T4, Ta=45°C IP20	CALOMAT 6E	7MB252x-xxx0x-xADx-Z xxx
CSA 1526660 (CAN/US)	Class I, DIV 2, ABCD, T4, Ta= 45°C IP20 Class I, Zone 2 Ex nA IIC T4, Ta=45°C IP20	CALOMAT 6E	7MB252x-xxx0x-xADx-Z xxx
FM3016050 FM16US0376X	NI/ CL I / DIV2 / ABCD / T4, Ta= 45°C IP20 Class I / Zone 2/IIC/T4, Ta=45°C IP20	ULTRAMAT 6E OXYMAT 6E	7MB212x-xxxx0-xxxx-Z E20 7MB202x-xxxx0-xxxx-Z E20
CSA 1526657 (CAN/US)	Class I, DIV 2, ABCD, T4, Ta= 45°C IP20 Class I, Zone 2 Ex nA IIC T4, Ta=45°C IP20	ULTRAMAT 6E OXYMAT 6E	7MB212x-xxxx0-xxxx-Z E20 7MB202x-xxxx0-xxxx-Z E20

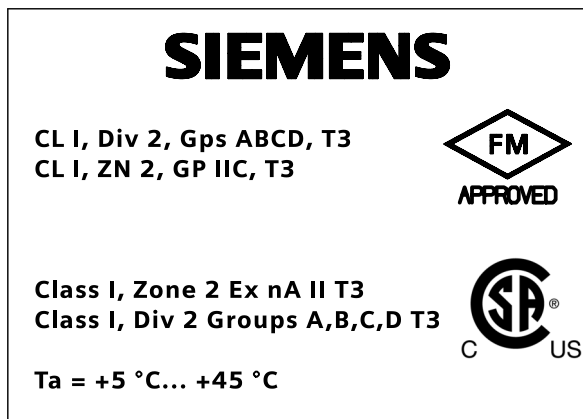


Figure 1-4 Example of additional label FM/CSA series 6

1.3 General information

This device left the factory in a safe and proper condition and has been tested. In order to maintain this condition and to ensure safe operation, it should only be used in the manner described by the manufacturer. Furthermore, proper transportation, storage, installation, operation and maintenance of the device are vital for ensuring correct and safe operation.

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

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

Knowledge and technically correct implementation of the safety notes and warnings contained in this manual are required for safe installation and commissioning, as well as for safety during the operation and maintenance of the described product. Only qualified

personnel have the required professional knowledge for correctly interpreting the generally valid safety notes and warnings in this manual in each specific case and to act accordingly.

This manual is not included in the scope of delivery for the device. It can be downloaded under: Process analytics manuals (<https://support.industry.siemens.com/cs/products?dtp=Manual&mfn=ps&pnid=17702&lc=en-WW>)

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

Note

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

1.4 Special information and warnings

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

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

1.5 Proper use

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

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

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



WARNING

Dangerous contact voltage

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

Note

Observe the environmental conditions for the rack unit and bench-top unit

Ensure compliance with the environmental conditions listed in the technical specifications.

- During operation
- In the event of maintenance

Note

Environmental conditions for bench-top unit in accordance with IEC 61010-1-2010

According to IEC 61010-1-2010, the bench-top unit may only be used indoors.

1.6 Qualified personnel

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

- Because of their training they are capable of commissioning, operating and maintaining devices and systems in accordance with requirements on safety (such as electrical dangers, high pressures, aggressive and dangerous substances).
- For explosion-proof devices: They are authorized, trained, or instructed in carrying out work on devices which are intended for use in hazardous environments (Ex zones).
- They are trained or instructed in the maintenance and usage of appropriate personal protection equipment according to the safety engineering standards.

1.7 Warranty conditions

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

1.8 Delivery information

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

When opening the packaging, please observe the corresponding information on the packaging material. Check the delivery for completeness and undamaged condition. In particular, the Order No. on the labels, if present, must be compared with the ordering data.

If possible, please keep the packaging material since you can reuse it for return deliveries if necessary.

1.9 Standards and regulations

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

When this product is used beyond the scope of these standards and regulations, the standards and regulations applicable in the operating company's country must be observed.

As per CSA, the ULTRAMAT 23 is classified as C225206 and C225286 and certified according to CSA accreditation to ISO/IEC 17065 by the "Standards Council of Canada (SCC)". The certificate is valid for the versions with 120V/60Hz and 230V/60Hz.

1.10 Conformity with European directives

The product described in this document complies with the relevant harmonisation laws and its amendments of the European Union.

Electromagnetic compatibility EMC 2014/30/EU	Directive of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to electromagnetic compatibility
Explosion protection directive ATEX 2014/34/EU	Directive of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres

1.10 Conformity with European directives

Low voltage directive LVD 2014/35/EU	Directive of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to electrical equipment designed for use within certain voltage limits on the market
Restriction of hazardous substances directive RoHS 2011/65/EU	Directive of the European Parliament and of the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment

The applicable directives can be found in the EU declaration of conformity of the specific device.

See also

Certificates (<https://www.siemens.com/analytics/certificates>)

Safety instructions

2.1 Cybersecurity information

Siemens provides products and solutions with industrial cybersecurity 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 cybersecurity concept. Siemens' products and solutions constitute one element of such a concept.

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

For additional information on industrial cybersecurity measures that may be implemented, please visit

<https://www.siemens.com/global/en/products/automation/topic-areas/industrial-cybersecurity.html>.

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

To stay informed about product updates, subscribe to the Siemens Industrial Cybersecurity RSS Feed under

<https://new.siemens.com/global/en/products/services/cert.html>.

2.2 Prerequisites for safe use

This device left the factory in good working condition. In order to maintain this status and to ensure safe operation of the device, observe these instructions and all the specifications 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.

Symbol	Explanation of the symbols on the device
	General warning of dangers, observe operating instructions
	Warning of hot surface
	Warning of dangerous voltage

Note

Operation under special ambient conditions

The device must only be used in accordance with the ambient conditions foreseen by the manufacturer. Should you deviate from this, for example in nuclear power plants or when the device is used for research and development purposes, we recommend that you first contact your Siemens representative or our application department in order to discuss the type of operation.

NOTICE

Manipulation of the device

Physical access to the device enables undesired manipulations of the device. As a result of this, the device can lose its measuring properties and become unusable.

- Ensure that the device is located in a protected area to which only authorized persons have access.
- If no settings need be carried out, lock the device.

WARNING

Improper device modifications

Danger to personnel, system and the environment can result from modifications to the device, especially in hazardous areas.

- Only carry out modifications that are described in the instructions for the device. If this information is ignored, the manufacturer's warranty becomes invalid. If the modification is significant with regard to product conformity (for example safety, EMC), the corresponding product approval becomes ineffective. Operation of the device is no longer permissible after unauthorized modifications.

 WARNING**Harmful gases**

Danger to personnel, system and the environment can result from introducing harmful (corrosive, flammable and/or poisonous) gases into the device. If this should be required for the measuring task of the device, you must take the following measures:

- Take into account the safety measures according to the German Occupational Safety Act (Arbeitsschutzgesetz - ArbSchG) or similar national laws. These safety measures must be coordinated with a local specialist. In particular, this includes measures to prevent any potential release of gases from the internal gas path (containment system) as well as their monitoring and disposal.
- Ensure that the discharged gas is treated according to the applicable local laws.
- Purge the device or the plant with a purging gas. The gas displaced by purging must be collected using appropriate equipment and disposed of environmentally-friendly via an exhaust line.

 WARNING**Harmful substances in the condensate**

The condensate at the sample gas cooler or condensation trap can be corrosive, depending on the composition of the sample gas (e.g.: through SO₂, NO, H₂S, HCl, etc.). When you dip litmus paper into the condensate it will turn red.

- Wear protective clothing, protective goggles and protective gloves when handling the condensate!
- Prior to its disposal, dilute the condensate with tap water until it turns neutral and the litmus paper does not change color. Alternatively, you can also neutralize the condensate with a weak sodium carbonate solution (Na₂CO₃).

 WARNING**Risk of explosion due to improper use**

A device which is not intended for use in an explosive atmosphere (can be identified by the absence of an Ex label on the nameplate) must never be used in hazardous areas.

Observe the safety regulations, provisions and laws applicable in your country for the connection, assembly and operation.

 WARNING

Toxic and/or corrosive gases

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

To prevent the danger of poisoning or damage to parts of the analyzer, the analyzer must be purged. The gas displaced by purging must be collected using appropriate equipment and disposed of environmentally-friendly via an exhaust line.

 WARNING

Wetted parts unsuitable for the process media

Risk of injury or damage to device.

Hot, toxic and corrosive media could be released if the wetted parts are unsuitable for the process medium.

- Ensure that the material of the device parts wetted by the process medium is suitable for the medium. Refer to the information in Technical specifications (Page 59).

NOTICE

Electromagnetic compatibility

The product is intended for operation in the EMC environment class Industry. Ensure EMC-compliant setup of your device as described in the documentation.

When the device is used in a residential environment, it may cause radio interference.

 WARNING

Insufficient protection during storage

The packaging only provides limited protection against moisture and infiltration by dust and foreign bodies.

- Provide additional packaging as necessary.

 WARNING

Incorrect disassembly

The following risks may result from incorrect disassembly:

- Injury through electric shock
- Risk through emerging media when connected to the process
- Risk of explosion in hazardous area

In order to disassemble correctly, observe the following:

- Before starting work, make sure that you have switched off all physical variables such as pressure, temperature, electricity etc. or that they have a harmless value.
- If the device contains hazardous media, it must be emptied prior to disassembly. Make sure that no environmentally hazardous media are released.
- Secure the remaining connections so that no damage can result if the process is started unintentionally.

 WARNING

Violation of the maximum permissible operating pressure

Danger of injury or poisoning.

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

- Ensure that the maximum allowable operating pressure of the device is not exceeded.
- Take note of the information on the nameplate and/or in the technical specifications of the manual/operating instructions of the respective device!

2.3 Analyzers in biogas plants outside the hazardous area

DANGER

Danger of poisoning

The ULTRAMAT 23 is used, among other things, for the measurement of hydrogen sulfide (hydrogen sulfide, dihydrogen sulfide, H_2S).

Hydrogen sulfide is highly toxic even in small concentrations! The odor threshold for hydrogen sulfide is very low at 0.02 vpm (20 vpb), but higher concentrations result in numbing of the olfactory receptors in the nose so that the odor is no longer perceived. Persons exposed to this gas in concentrations up to 100 vpm for several hours exhibit symptoms of poisoning such as fatigue, headaches, lack of appetite, lack of concentration, irritation of the mucous membranes of eyes and respiratory tract, and throat irritations.

Inhalation of H_2S concentrations of 500 vpm longer than 30 minutes can cause fatal poisoning. Concentrations above 1 000 vpm cause death within a few minutes, concentrations above 5 000 vpm cause death within a few seconds.

When using this device in plant where there may be high concentrations of H_2S and you therefore need to take following continual precautions to prevent the effects of poisoning:

- Connect the gas outlet of the analyzer to a gas exhaust unit so that no gas can escape into the environment.
- Before you begin maintenance on the analyzer, make sure that the H_2S concentration in the analyzer is close to 0 vpm. Before beginning work, always flush the gas path of the analyzer and the gas sampler with ambient air or nitrogen for a duration of about 10 minutes .
- Check for leaks in the analyzer at regular intervals.

DANGER

Explosion hazard

When the device is used in biogas plants, you should expect that the sample gas will contain methane (CH_4), which forms explosive mixtures with oxygen or air in certain concentrations. These conditions might occur under certain operating states of the plant. These operating states are to be avoided in the plant.

2.4 Analyzers in hazardous areas

WARNING

Use in hazardous area

Risk of explosion.

- Only use equipment that is approved for use in the intended hazardous area and labeled accordingly.
- Do not use devices that have been operated outside the conditions specified for hazardous areas. If you have used the device outside the conditions for hazardous areas, make all Ex markings unrecognizable on the nameplate.

Safety instructions for explosion protection (ATEX, IECEx, FM, CSA)

The gas analyzer designed as a 19" rack unit must be installed in a separate enclosure having IP54 degree of protection that meets the requirements in accordance with EN/IEC/CSA/UL 60079-0 and EN/IEC/CSA/UL 60079-7, if it is used in Zone 2 or Class I Division 2.

The device may only be used in an area with pollution degree 2 or better according to IEC 60664-1. Overvoltage protection must be available which is set to a value that does not exceed 140% of the maximum nominal voltage value at the power supply terminals of the device.

Connecting and disconnecting the plug-in connectors from live circuits is only permissible for installation, maintenance or repair purposes if a potentially explosive gaseous atmosphere can be ruled out.

Operation of the keyboard is only permitted when a potentially explosive atmosphere can be excluded.

You must only connect devices which do not generate sparks during normal operation to non-intrinsically-safe circuits in Zone 2, and these must be suitable for operation in hazardous areas of Zone 2 under the conditions prevailing at the place of operation.

The measuring function for the explosion protection is not part of the ex test report.

2.4.1 ULTRAMAT 23 IEC, ATEX, CSA, with option E20

The introduction of flammable gases is not permitted for an ULTRAMAT 23 with order option E20.

2.4.2 ULTRAMAT 23 CSA general

The device is suitable for installation in devices which are permitted by CSA.

2.4.3 ULTRAMAT 23 CSA with option E21

The sample gas exhaust lines must terminate **outside** the hazardous area at a harmless location. The sample gas exhaust line can also be returned to the sampling point.

Ensure that the device is operated without pressure at the sample gas outlet.

For the introduction of flammable gases, purging with inert gas or comparable measures to avoid an explosive atmosphere are recommended, because devices with seals are considered devices with limited release according to international standards.



WARNING

Risk of explosion due to accumulation of flammable gases

When the device is installed in an enclosure, an air exchange rate of at least once per hour must be ensured.



WARNING

Flammable components in sample gas

If the sample gas could contain flammable components, we recommend that you only use devices with option - E21.

2.4.4 CALOMAT 6E



DANGER

Explosion hazard

Frequently or permanently explosive gas mixtures must not be connected.

Rarely or occasionally explosive gas mixtures may be connected in accordance with the special conditions specified in the corresponding certificates.

Ensure that no absolute sample gas pressures higher than 1.1 bar (110 kPa) can occur.

During installation in a control cabinet, an air exchange ratio of at least 1/h has to be ensured through corresponding ventilation measures.

If the sample gases may occasionally be explosive, suitable flame arrestors have to be installed in the sample gas inlet and outlet lines of the CALOMAT 6E gas analyzer. A flame arrestor can be omitted at the outlet of the device if the sample gas is routed into a non-hazardous area. When discharging the exhaust gas into an explosion-free area, a flame arrestor at the device outlet can be dispensed with.

2.5 Safety instructions for the introduction of flammable gases

WARNING

Explosion hazard

When flammable gases are introduced into the device, it cannot be excluded that flammable gases are released. Suitable measures must be taken to ensure that this cannot result in an explosive atmosphere. Possible measures may include:

- The purging of the device and/or the environment with a suitable purging gas.
- Ensuring sufficient natural convection that sufficiently dilutes the emitted gas.

The maximum permissible sample gas pressure in the analyzer depends on the device version and is described in the section Technical specifications (Page 59) under the item "Gas inlet conditions".

You must perform a leak test following all installation and maintenance work affecting the containment system.

This leak test must be performed at regular intervals.

2.5.1 Introduction of flammable gases in Series 6 devices (ULTRAMAT 6, OXYMAT 6, OXYMAT 61, OXYMAT 64, CALOMAT 6, CALOMAT 62, FIDAMAT 6)

DANGER

Explosion hazard

When introducing flammable gases above the lower explosion limit, the inlets and outlets of the sample gas must be equipped with flame arrestors. The flame arrestors must meet the safety requirements for the flammable medium.

If it is ensured that the concentration of the sample gas cannot exceed the lower explosion limit, even in the case of a fault, a flame arrestor is not required.

2.5.2 Introduction of flammable gases into the OXYMAT 6

DANGER

Explosion hazard

If flammable gases are introduced into the OXYMAT 6, even if only rarely or occasionally, an inert reference gas must be used continuously. Supply with an inert reference gas must be monitored.

! DANGER

Explosion hazard

If flammable gases are introduced into the OXYMAT 6, even if only rarely or occasionally, the reference gas inlet must be equipped with a flame arrestor. The flame arrestors must meet the safety requirements for the flammable medium.

A flame arrestor is not required at the reference gas inlet if it is guaranteed that the reference gas is introduced before the analyzer is switched on and that the reference gas pressure is monitored continuously.

2.5.3 Introduction of flammable gases into the ULTRAMAT 23

2.5.4 Flammable components in sample gas

Note

Flammable components in sample gas

If the sample gas could contain flammable components, we recommend that you only use devices with option - E21.

If it can definitely be excluded that the LEL can never be exceeded, the E21 option is not required.

2.6 Measurement of oxygen in hydrogen with OXYMAT 6E

NOTICE

Explosive gas mixtures

Gas mixtures of hydrogen H_2 in oxygen O_2 are explosive in a wide range. At an atmospheric pressure of 1000 hPa and 20 °C ambient temperature, the lower explosive limit (LEL) lies at 4 % H_2 in O_2 , the upper explosive limit (UEL) at 95.2 % H_2 in O_2 . At an ambient temperature of 80 °C the LEL lies at 3.8 % H_2 in O_2 , the UEL lies at 95.4 % H_2 in O_2 .

In general, a distinction is made between the following cases at the occurrence of explosive gas mixtures:

- Frequently or constantly explosive - more than 1000 hours/year
- Occasionally explosive - 10 to 1000 hours/year
- Rarely explosive - less than 10 hours/year

**DANGER****Danger of explosion!****Measuring explosive gas mixtures with OXYMAT 6**

Non-explosive sample gases and gas mixtures below the LEL may be introduced into the OXYMAT 6. Flame arrestors are not required. However, it must be guaranteed that the sample gas in the gas path (containment system, CS) always remains below the lower explosive limit!

Rarely or occasionally explosive gas mixtures must only be introduced into the gas analyzer if the inputs and outputs for sample gas have been each provided with a **flame arrestor**. The **flame arrestors** must meet the safety requirements for the combustible medium. A flame arrestor can be omitted at the reference gas inlet if it is guaranteed that the reference gas is introduced before the analyzer is switched on and that the reference gas pressure is monitored continuously.

Frequently or continuously explosive gas mixtures must not be connected to the gas analyzer.

Gas mixtures above the upper explosive limit: The introduction must be individually assessed in accordance with a separate certificate based on on-site acceptance testing.

NOTICE**Checking leak tightness of the gas path**

In case of leakages of the gas path (containment system, CS), hydrogen (H₂) and oxygen (O₂) can concentrate in the gas analyzer to form an explosive mixture. Only after checking for a suitable leak tightness of the gas path, may these gases be fed into the gas analyzer.

OXYMAT 6E (rack unit)

The enclosure of the gas analyzer has to be equipped with sufficient openings so that a gas exchange with the environment takes place and an explosive mixture cannot build up in the device.

The device must be set up in a well ventilated place so that an explosive mixture cannot build up in the device environment.

If the device is installed into a cabinet, it must be insured through suitable measures that the ventilation rate in this cabinet amounts to at least 1/h (exhaust air at cabinet cover, supply air at cabinet bottom).

2.7 Measurement of hydrogen in oxygen with CALOMAT 6E

NOTICE

Explosive gas mixtures

Gas mixtures of hydrogen H_2 in oxygen O_2 are explosive in a wide range. At an atmospheric pressure of 1000 hPa and 20 °C ambient temperature, the lower explosive limit (LEL) lies at 4 % H_2 in O_2 , the upper explosive limit (UEL) at 95.2 % H_2 in O_2 . At an ambient temperature of 80 °C the LEL lies at 3.8 % H_2 in O_2 , the UEL lies at 95.4 % H_2 in O_2 .

In general, a distinction is made between the following cases at the occurrence of explosive gas mixtures:

- Frequently or constantly explosive - more than 1000 hours/year
- Occasionally explosive - 10 to 1000 hours/year
- Rarely explosive - less than 10 hours/year



DANGER

Danger of explosion

Measuring explosive gas mixtures with CALOMAT 6E and CALOMAT 6F

- **Non-explosive sample gases and gas mixtures below the LEL** may be inserted into the CALOMAT 6. Flame arrestors can be omitted. However, it must be guaranteed that the sample gas in the gas path (containment system, CS) always remains below the lower explosive limit!
- **Rarely or occasionally explosive gas mixtures** must only be introduced into the gas analyzer if the inputs and outputs for sample gas have each been provided with a **flame arrestor**. The **flame arrestors** must meet the safety requirements for the combustible medium.
- **Frequently or continuously explosive gas mixtures** must not be introduced into the gas analyzer.
- **Gas mixtures above the upper explosive limit:** Assess the introduction individually in accordance with a separate certificate based on on-site acceptance testing.

NOTICE

Checking leak tightness of the gas path

In case of leakages of the gas path (containment system, CS), hydrogen (H_2) and oxygen (O_2) can concentrate in the gas analyzer to form an explosive mixture. Only after checking for a suitable leak tightness of the gas path, may these gases be fed into the gas analyzer.

CALOMAT 6E rack unit

The enclosure of the gas analyzer has to be equipped with sufficient openings so that a gas exchange with the environment takes place and an explosive mixture cannot build up in the device.

The device must be set up in a well ventilated place so that an explosive mixture cannot build up in the device environment.

If the device is installed in a cabinet, it must be insured through suitable measures that the ventilation rate in this cabinet amounts to at least 1/h (exhaust air at cabinet cover, supply air at cabinet bottom).

2.7.1 Calibration

Calibration

The CALOMAT 6 must be adjusted or calibrated at 2 points: At the zero point for 0 % H₂ and at the impact point (sensitivity) for 100 % H₂. To operate the CALOMAT 6, see the operating instructions CALOMAT 6 (A5E00116454) section 5.2.2.

Required gas concentrations:

- 100 % nitrogen (N₂) – inert purging gas
- 100 % oxygen (O₂) (purity 99.999 % O₂ or better) – zero-point calibration
- 100 % hydrogen (H₂) (purity 99.999 % H₂ or better) – sensitivity calibration

Proceed as follows:

1. Check the calibration setting in **Function 23**. The overall calibration must be activated. All measuring ranges are calibrated in their entirety.
2. Check the setting of the setpoint values in **Function 22**. The value 0.000 must be entered as the setpoint value for the zero point. Measuring range 3 must be selected as the leading measuring range. The final value concentration must be entered with 100% vol.
3. **Zero-point calibration:** Select **Function 20**. First flush the gas path with the inert gas nitrogen to flush any hydrogen concentration in the gas path. The measured value does not change to 0 % H₂ but to about -1.4 % H₂ because N₂ has a different thermal conductivity than O₂.
4. Apply 100 % O₂ concentration to the device. Wait long enough until the measured value is stable. This can take 5 minutes. The measured value should lie close to the value 0 % vol. H₂.
5. Trigger the calibration in **Function 20**.
6. **Sensitivity calibration:** Select **Function 21**. Flush the gas path with inert gas N₂.
7. Apply the 100 % H₂ concentration to the device. Wait again until the measured value is stable.
8. Trigger the sensitivity calibration in **Function 21**.
9. Then flush again with inert gas N₂.
10. Apply and acknowledge the calibration by pressing the "MEAS" key.

2.7.2 Limit

Limit

A limit that lies at 1 % O₂ is set to ensure that the measuring values lie below the lower explosive limit (LEL) during measuring operation. This corresponds to approx. 25 % of the LEL. Exceeding of the limit is signaled at Relay 4.

Function 51:

Limit 1:	1 % H ₂
At relay:	4
Switches when exceeded	On
Applies for all measuring ranges	All
Limit alarm:	On

Assembly/installation

3.1 Safety information



WARNING

Wetted parts unsuitable for the process media

Danger of injury or damage to device.

Hot, toxic and corrosive media could be released if the process medium is unsuitable for the wetted parts.

- Ensure that the material of the device parts wetted by the process medium is suitable for the medium. Refer to the information in "Technical data".

NOTICE

Incorrect mounting

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

- Before installing ensure there is no visible damage to the device.
- Make sure that process connectors are clean, and suitable gaskets and glands are used.
- Mount the device using suitable tools. Refer to the information in Technical specifications (Page 59).

NOTICE

Condensation in the device

Damage to device through formation of condensation if the temperature difference between transportation or storage and the mounting location exceeds 20 °C (36 °F).

- Before taking the device into operation, let the device adapt for several hours in the new environment.

3.2 Installation location requirements

NOTICE**Direct sunlight**

Damage to device.

The device can overheat or materials become brittle due to UV exposure.

- Protect the device from direct sunlight.
- Make sure that the maximum permissible ambient temperature is not exceeded. Refer to the information in Technical specifications (Page 59).

**WARNING****Insufficient ventilation**

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

- Ensure sufficient ventilation between the devices when installing in control cabinets. The heat sinks at the rear must remain free for air circulation.
- Make sure during operation that the permissible ambient temperature range is always observed (see Technical specifications (Page 59)).

**CAUTION****Strong vibrations**

Strong vibrations could loosen connections or damage sensors, resulting in free passage of the sample gas into the environment.

Even weaker vibrations influence the result!

The analyzer must therefore only be used at a location which is free of vibration.

Please observe the data in the Technical specifications.

3.2.1 Installation location requirements when flammable gases are introduced

Note**Installation location requirements when flammable gases are introduced**

When flammable gases are introduced, it can never be excluded that they could be partially or fully released in the event of a fault. Suitable measures must be taken to ensure that explosive gas mixtures can never result. A possible safety measure is the sufficient purging of the installation location with inert gas or air. These safety measures must be coordinated with a local specialist.

3.3 Analyzers in hazardous areas

DANGER

Explosion hazard

If a flammable or ignitable atmosphere exists, plugs must never be disconnected or lamps/fuses replaced when the analyzer is supplied with power.

DANGER

Explosion hazard

The gas analyzers for use in Ex zone 2 must be installed in a lockable enclosure. This enclosure must comply with the requirements of EN/IEC/UL/CSA 60079-0/60079-7 and must be designed for all ambient conditions which can occur during operation. This enclosure only be opened using a tool (e.g. a key).

The ambient air temperatures can be found in the section Technical specifications (Page 59).

Suitable measures must additionally be applied to ensure that

- The generation of potentially explosive gas mixtures inside the analyzer does not exceed the specifications of Zone 2.
- Interferences cannot lead to a deviation of more than 40 % from the rated voltage.
- You only set up the devices in areas with pollution degree 2 or better according to IEC 60664-1.

3.4 Gas mixtures with oxygen concentration >21%

NOTICE

Measuring gas mixtures with high oxygen concentration

Oxygen promotes fire. It cannot be fully excluded that sample gases are released and therefore gas mixtures with increased oxygen concentration accumulate in the device or its environment. Take suitable measures to ensure that this does not result in a hazard. Possible measures may include:

- The purging of the device and/or the environment with a suitable purging gas.
- Ensuring sufficient natural convection that sufficiently dilutes the emitted gas.

Note

Measuring high oxygen concentrations

For the measurement of high O₂ concentrations in excess of 25%, it is 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 O₂. We offer specially cleaned analyzer modules with the "Cleaned for O₂" option for such measurements.

3.4.1 Measuring high oxygen concentrations in hazardous areas

Note

Measuring high oxygen concentration in hazardous areas

The analysis of gas mixtures with an oxygen concentration of above 21% is not within the scope of a prototype test certificate. Therefore, analysis of such gas mixtures is not permitted without further examination.

3.5 Gas analyzers OXYMAT 6 and OXYMAT 61

NOTICE
Magnetism Devices of the type OXYMAT 6 and OXYMAT 61 emit magnetic stray fields as a matter of principle. Magnetically sensitive devices should therefore not be installed in the immediate vicinity of these devices. • Keep a distance in such cases. This distance can be up to 50 cm depending on the sensitivity of the respective device.

Connecting

4.1 Safety instructions

4.1.1 General

WARNING

Hazardous contact voltage

Risk of electric shock in case of incorrect connection.

- For the electrical connection specifications, refer to the information in Electrical connection (Page 35).
- 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

Missing PE/ground connection

Risk of electric shock.

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

- **Power plug:** Ensure that the used socket has a PE/ground conductor connection. Check that the PE/ground conductor connection of the socket and power plug match each other.
- **Connecting terminals:** Connect the terminals according to the terminal connection diagram. First connect the PE/ground conductor.

4.1.2 Analyzers in hazardous areas

DANGER

Explosion hazard

If a flammable or ignitable atmosphere exists, plugs must never be disconnected or lamps/fuses replaced when the analyzer is supplied with power.

** DANGER****Potentially explosive atmosphere**

The analyzer keys must not be pressed if a potentially explosive atmosphere may be present. If operation using the keyboard is necessary, a hot work permit is absolutely essential.

** WARNING****Improper laying of shielded cables**

Risk of explosion through compensating currents between hazardous area and the non-hazardous area.

- Shielded cables that cross into hazardous areas should be grounded only at one end.
- If grounding is required at both ends, use an equipotential bonding conductor.

** WARNING****Lack of equipotential bonding**

Risk of explosion through compensating currents or ignition currents through lack of equipotential bonding.

- Ensure that the device is potentially equalized
- The cable cross-section of the equipotential bonding cable must be greater than or equal to the connecting cable of the electronics

** CAUTION****Incorrect connection**

Devices may only be connected and disconnected when in a deenergized state. This also applies to the SUB-D connections.

Particular reference is made here to the PROFIBUS DP connection. The bus must be switched off when the plug on the analyzer is connected or disconnected. Please observe the information in Section PROFIBUS DP (Page 38) with regard to the bus connection of PROFIBUS DP.

The plug connectors must be mechanically locked.

4.2 Electrical connection

4.2.1 Power connection

NOTICE
Incorrect power supply Check before connecting that the existing supply voltage corresponds to that specified on the label of the device. Install the power line separately from the signal lines.

A power supply cable or an appliance plug is enclosed with the device, and must only be connected by qualified personnel (see AUTOHOTSPOT). The cable is connected to the appliance socket at the rear of the device. At the power supply end, the cable is inserted into a mains socket.

19" rack unit

A flexible cable suitable for power supply cords must be connected to the appliance plug. The cross-section of each conductor must be at least 1 mm² (AWG 17). The cross-section of the PE conductor must not be smaller than that of the L and N conductors. The cable must be suitable for a temperature of at least 70 °C (158 °F) and must be approved for the country of use or the location.

A readily accessible facility for mains disconnection must be provided in the immediate vicinity of the analyzer.

Bench-top unit

A power supply cable must be used which is approved for the country of use or the location. The minimum cross-section of each conductor must be at least 0.75 mm² (AWG 18) as long as the maximum length of the cable does not exceed 2 m (6 1/2 ft). Longer cables require larger conductor cross-sections than 0.75 mm² (AWG 18). The cable must at least be suitable for a temperature of 70 °C (158 °F).

When positioning the analyzer, make sure that the power connector at the rear is accessible at all times.

Note**Disconnecting means**

The power supply cable also serves as the disconnecting means.

Make sure that the cable is

- clearly recognizable
- easy to reach.

The cable length must not exceed 3 m.

Electrical circuit breaker in accordance with IEC 60947-1 and IEC 60947-3

In accordance with IEC 60947-1 "Standard for low-voltage switchgear and controlgear" and IEC 60947-3 "Switches, disconnectors, fuses" you require an electrical circuit breaker for the device.

We recommend commercially available automatic circuit breakers.

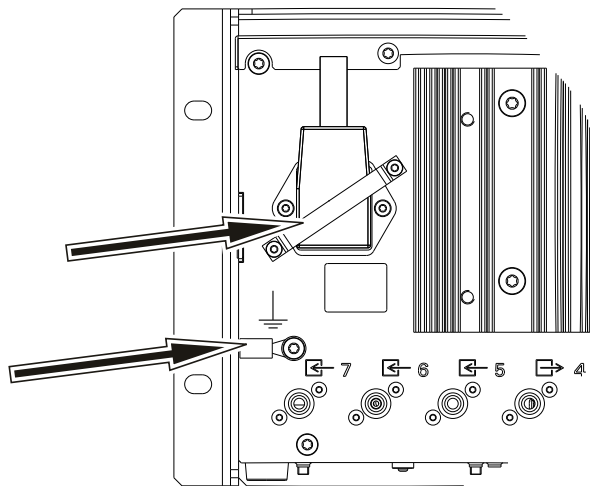
Ex analyzers

The following applies to all devices in the hazardous area:

Connect the device to the equipotential bonding (see image below, lower arrow). To connect the equipotential bonding there is a M4 screw with spring washer at the back of the device to which a ring cable lug has to be connected.

Ex devices may only be connected and disconnected when in a de-energized state. This also applies to connections via D-sub plugs. Particular reference is made here to the PROFIBUS DP connection:

The bus must be switched off when the plug on the analyzer is connected or disconnected. The plug-in connectors must be mechanically locked. This applies in particular to the power plug which has to be secured with the safety bracket.



Analyzers envisaged for use in hazardous areas must be provided with a safety bracket which protects the power connector from being unintentionally disconnected (see upper arrow in image above). This bracket is enclosed loose with the analyzer and must be attached before switching on.

4.2.2 Connection of the signal lines

NOTICE

Incorrect power supply

The 24 V/1 A power supply must be a power-limited safety extra-low voltage with safe electrical isolation (SELV).

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

- The connection lines to the relay outputs, binary inputs, and analog outputs must be shielded.
- The analog outputs are floating, but have a common negative pole.
- As a measure to suppress sparking across the relay contacts (e.g. limit relays), RC elements must be connected as shown in the following figure. Note that the RC element results in a drop-out delay for an inductive component (e.g. solenoid valve). The RC element should be sized according to the following rule of thumb:
 - $R = R_L/2$; $C = 4L/R_L^2$,
where $R = 100\ \Omega$ and $C = 200\ \text{nF}$ are sufficient.
 - You must use a non-polarized capacitor for the RC element.

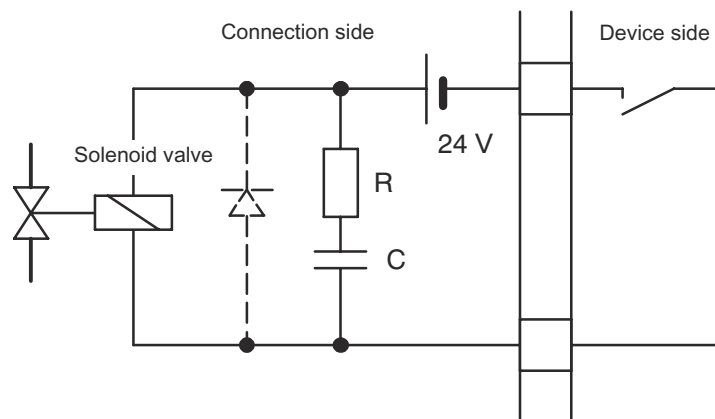


Figure 4-1 Measure to suppress sparks on a relay contact

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

Please also observe the following for correct operation:

- Connect the analyzer's enclosure to the equipotential bonding.
- Connect the signal lines to the Sub-D plugs at the rear of the device.

Refer to the ELAN interface description (Order No. C79000-B5200-C176 German, C79000-B5276-C176 English) for details on the interface cable.

4.2.3 PROFIBUS DP

SUB-D 9F -X90 connector
PROFIBUS-DP

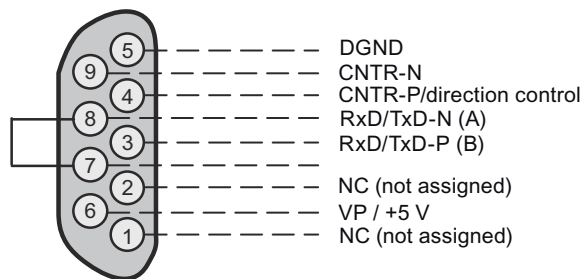


Figure 4-2 PROFIBUS DP connection



CAUTION

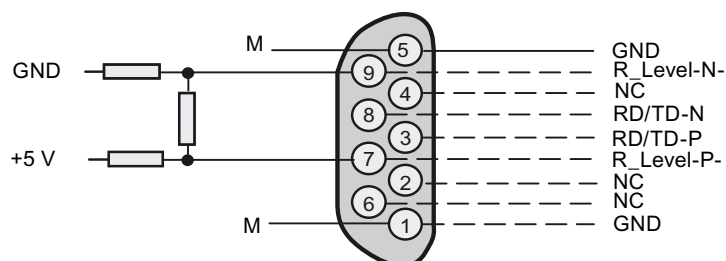
Pin 7 is connected to the data line. No consumers must be connected.
The cable shield must be connected over a larger surface in the plug housing.
Failure to comply with this can result in personal injury or damage to property.

4.2.4 Pin assignments

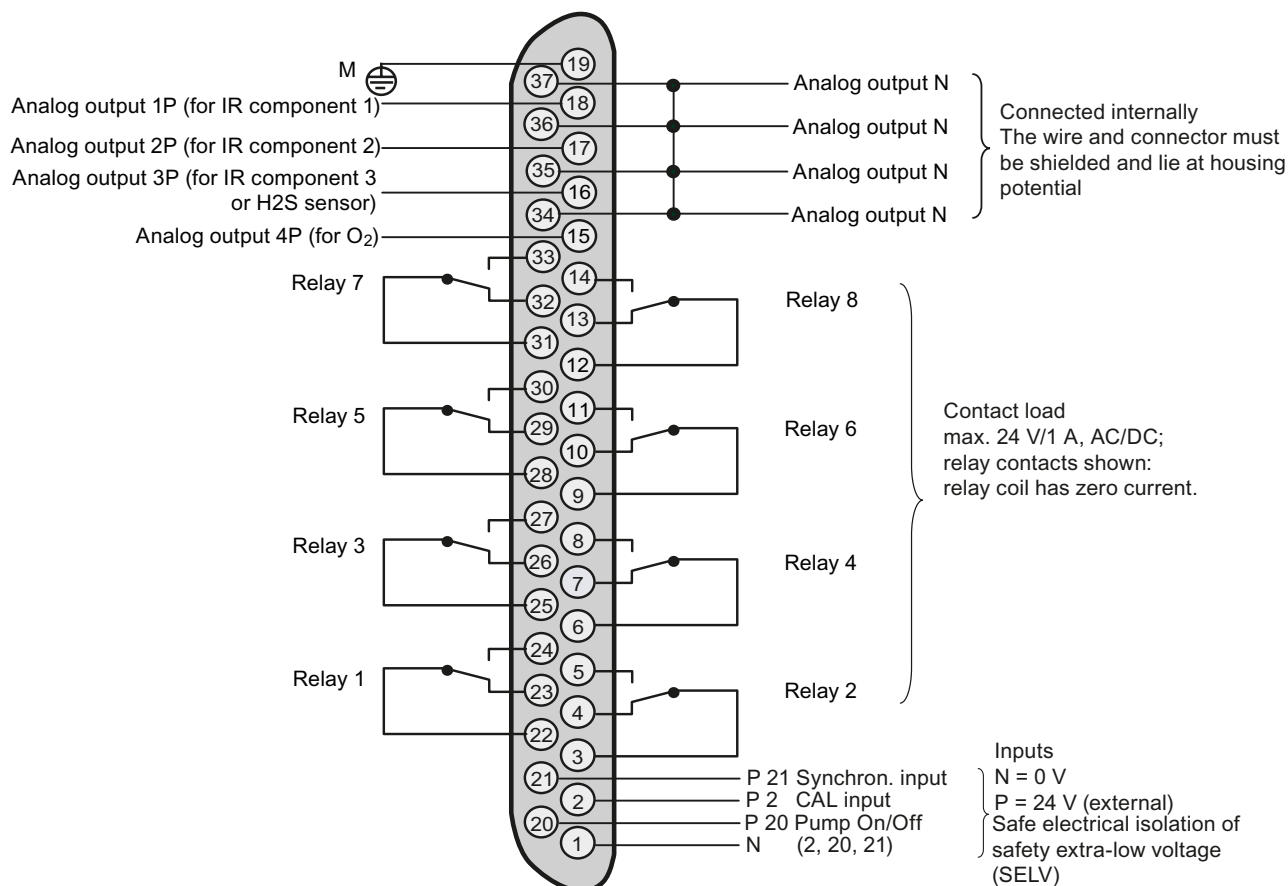
ULTRAMAT 23

Motherboard

Connector SUB-D 9F (RS 485)

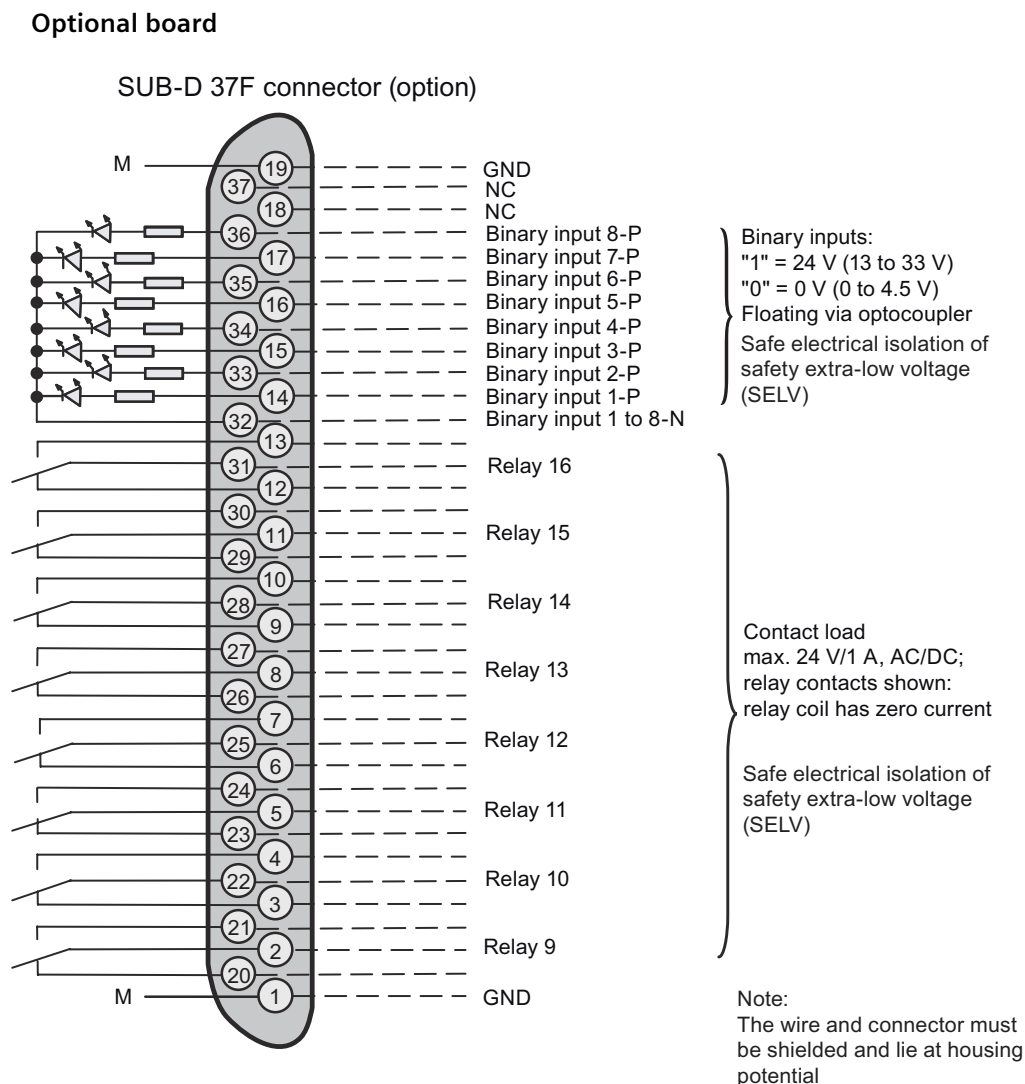


SUB-D 37F connector



Note:
The wire and connector must be shielded and lie at housing potential

Figure 4-3 ULTRAMAT 23 motherboard

SUB-D 9F connector -X90
PROFIBUS-DP

Optional

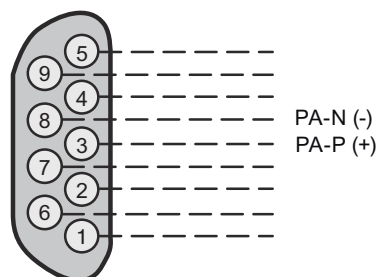
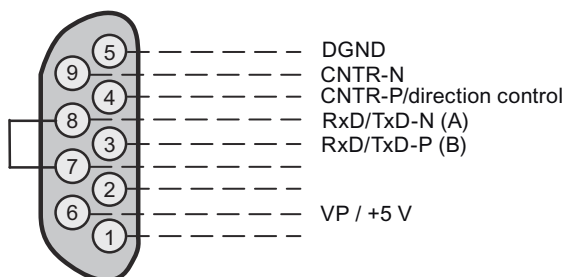
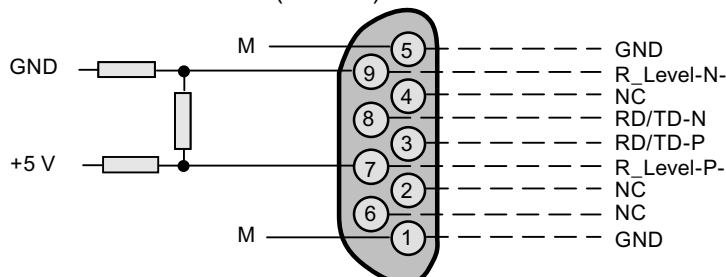
SUB-D 9M connector -X90
PROFIBUS-PA

Figure 4-4 ULTRAMAT 23 optional board

CALOMAT 6E

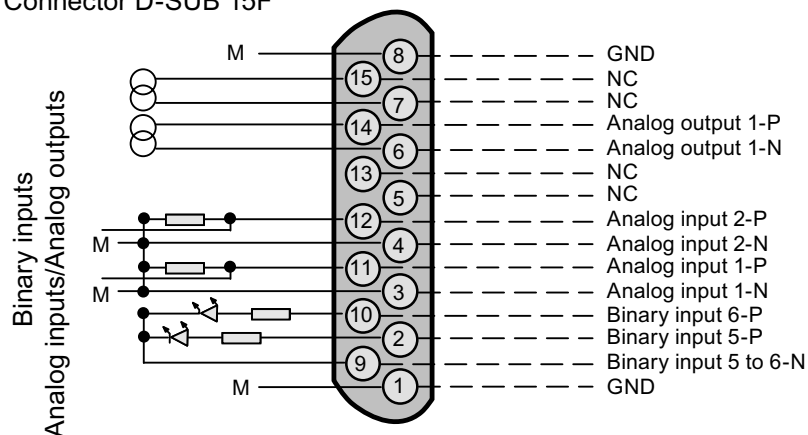
Motherboard

Connector D-SUB 9F (RS 485)



Bus termination resistors can be connected to pins 7 and 9

Connector D-SUB 15F

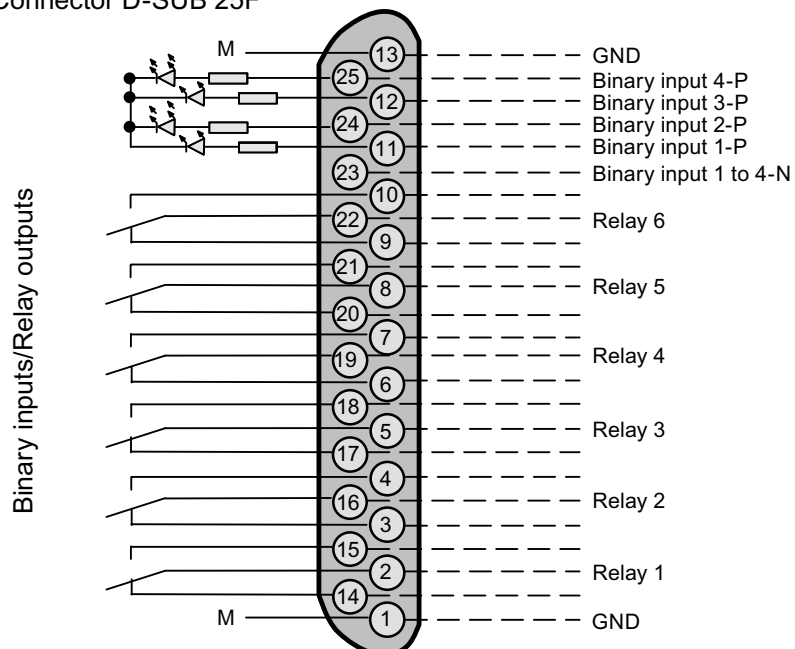


Analog outputs floating (also from each other), $R_L \leq 750 \Omega$

Pressure or cross-interference correction
Cross-interference correction

Analog inputs non-floating, 0 to 20 mA/ 500 Ω or 0 to 10 V (low-resistance)

Connector D-SUB 25F



Binary inputs
"1" = 24 V (13 to 33 V)
"0" = 0 V (0 to 4.5 V)
Floating via optocoupler

Contact load
max. 24 V AC/DC / 1 A;
shown relay contacts:
de-energized relay coil

Note:
Cable and connector must be shielded and at housing potential

Figure 4-5 Pin assignments of CALOMAT 6E motherboard

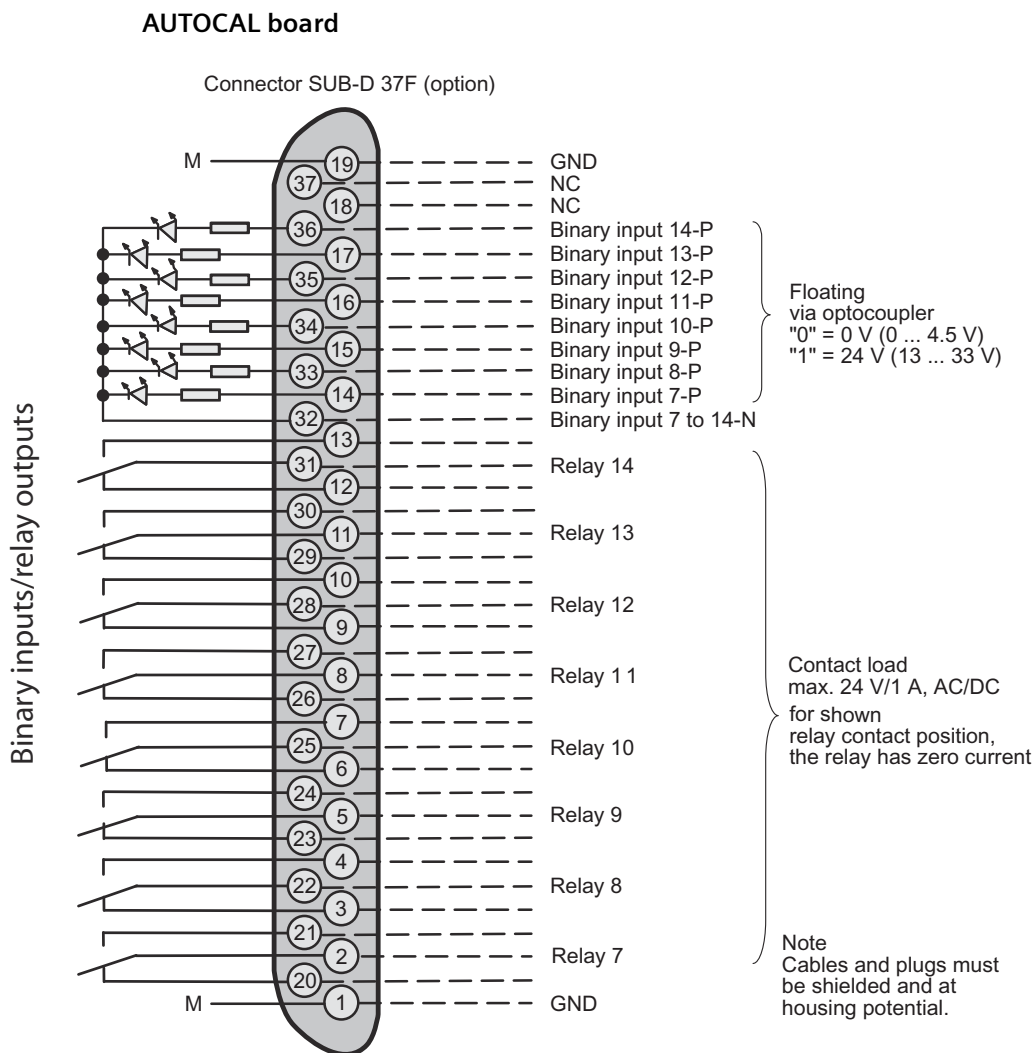


Figure 4-6 AUTOCAL module of CALOMAT 6E

4.3 Gas connections

WARNING

Unsuitable connecting parts

Risk of injury or poisoning.

In case of improper mounting, hot, toxic, and corrosive process media could be released at the connections.

- Ensure that connecting parts (such as flange gaskets and bolts) are suitable for connection and process media.

4.3.1 Gas preparation

To prevent contamination of parts through which the sample gas flows, the sample gas must be prepared appropriate to the measurement. We recommend the following minimum configuration:

- Gas sampling unit with filter
- Analyzer filter (approx. 1-2 µm)

Depending on the characteristics of the sample gas it may be necessary to provide additional equipment such as an external gas suction pump, sample gas cooler, wash bottle or pressure reducer.

4.3.2 FIDAMAT 6 gas connection

The **FIDAMAT 6** analyzer needs combustion air and combustion gas (hydrogen) as additional supply gases for operation.

WARNING

Dangerous concentration of hydrogen

Danger of explosion

Hydrogen (H₂), among others, serves as a supply gas for operation of the FIDAMAT. Hydrogen combines with the oxygen in ambient air to form an explosive gas mixture. Because hydrogen is usually supplied from high-pressure gas cylinders, you must ensure that the quantity of hydrogen needed is limited.

- Ensure limiting of the hydrogen quantity, e.g. by using a suitable reducing valve.

4.3.3 Toxic and corrosive gases

Appropriate components must be used for toxic and/or flammable gases. These components must be approved for the respective application.

We recommend that you consult our technical department before connecting toxic or corrosive gases.

Please note in particular that the control cabinet housing the analyzer must have a protection rating of at least IP54 and be purged with a suitable purging gas.



WARNING

Toxic and/or corrosive gases

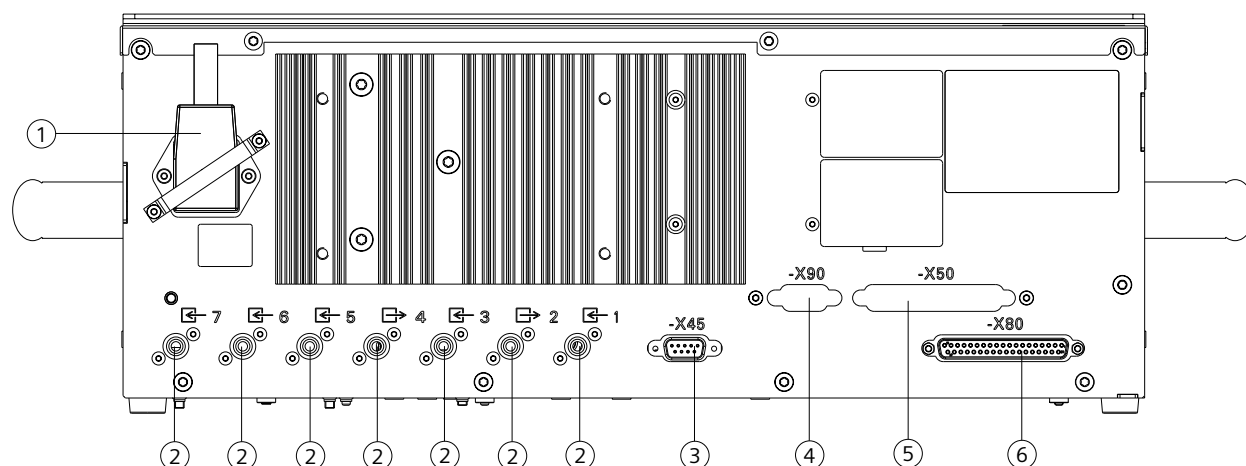
When measuring toxic or corrosive gases, it could occur that sample gas accumulates in the analyzer because of leaks in the gas path.

To prevent the danger of poisoning or damage to parts of the analyzer, the analyzer must be purged. The gas displaced by purging must be collected using appropriate equipment and disposed of environmentally-friendly via an exhaust line.

4.4 Connection diagrams

4.4.1 Connection diagrams for ULTRAMAT 23

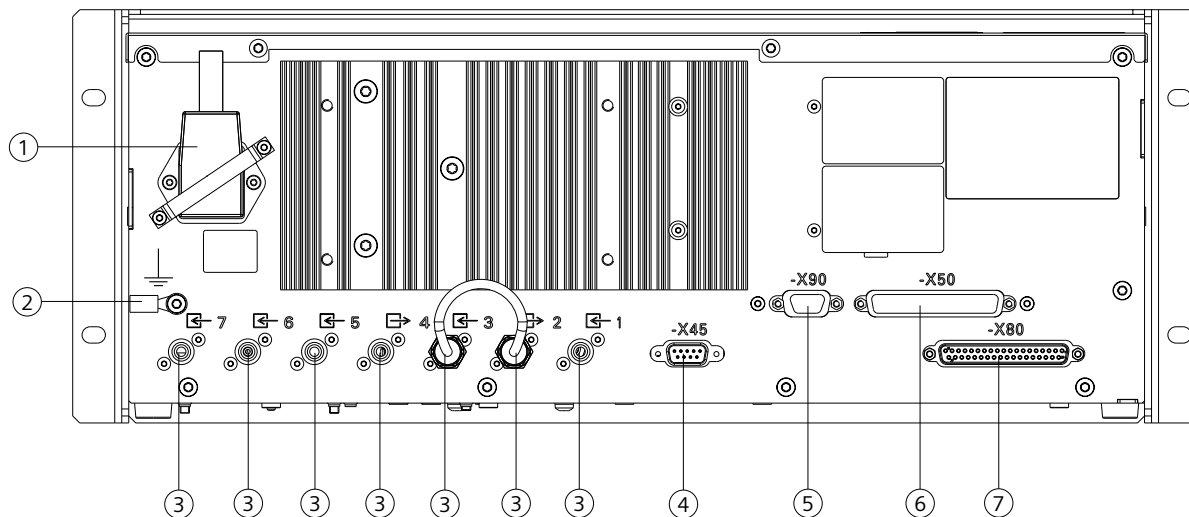
Bench-top unit



- ① Power connector
- ② Gas connections: 6 mm supports; see section Gas connections (Page 43)
- ③ -X45: ELAN (RS485) 9-pin connector
- ④ -X90: 9-pin interface connector (option board with PROFIBUS-DP/PA)
- ⑤ -X50: 37-pin connector: Option board; binary inputs/relay outputs
- ⑥ -X80: 37-pin connector: Analog and digital inputs and outputs

Figure 4-7 Connections of bench-top unit

19" rack unit



- ① Auxiliary power and fine fuse
- ② Potential connection
- ③ Gas connections: 6 mm or 1/4" nozzle; see section Gas connections (Page 43)
- ④ Gas connections: 6 mm or 1/4" nozzle; see section
- ⑤ -X90: 9-pin interface connector (option board with PROFIBUS-DP/PA)
- ⑥ -X50: 37-pin connector: Option board; binary inputs/relay outputs
- ⑦ -X80: 37-pin connector: Analog and digital inputs and outputs

Note: When installing in a cabinet, mount analyzer on support rails

Figure 4-8 Connections of rack device

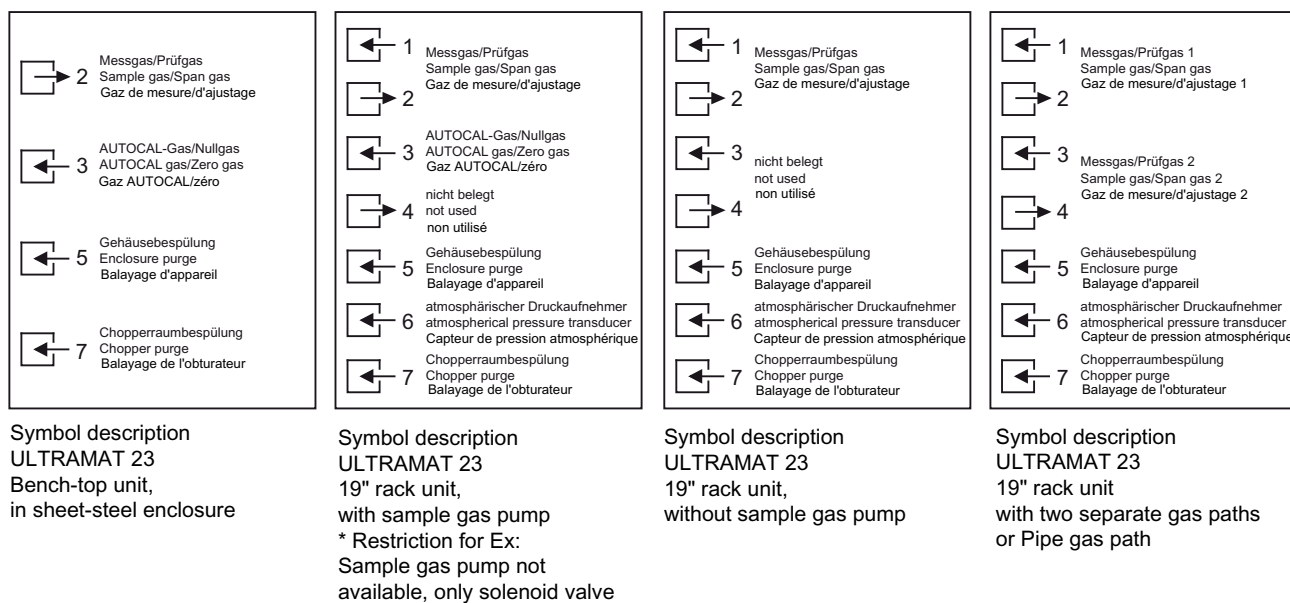
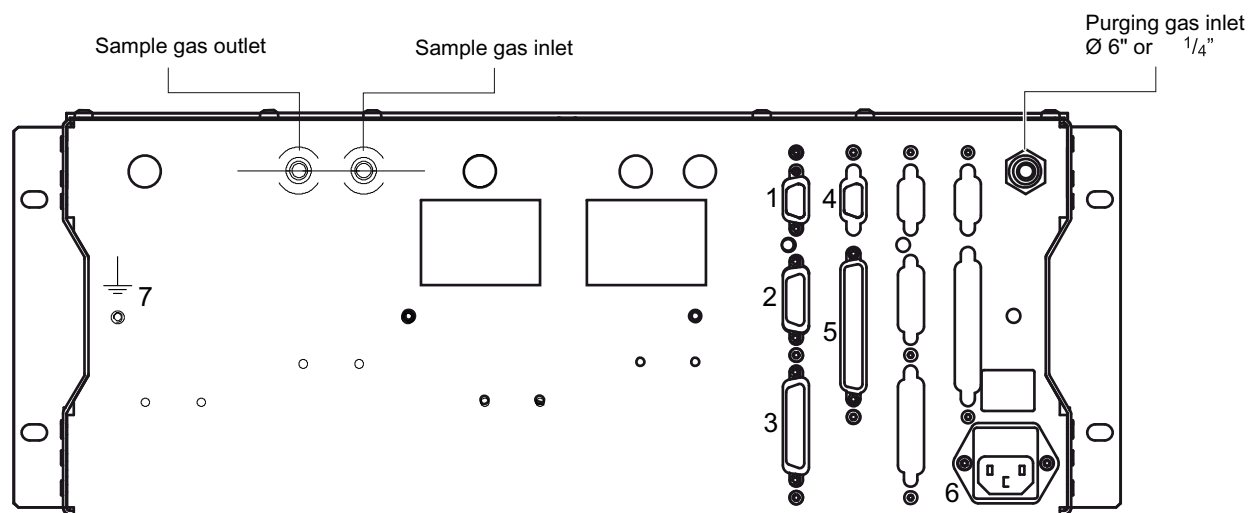


Figure 4-9 Gas connections of ULTRAMAT 23 versions

4.4.2 Connection diagrams for CALOMAT 6E



When installing in a cabinet, mount analyzer on support rails or telescopic rails

- ① 9-pin connector RS485
- ② 15-pin connector, relay outputs and binary inputs
- ③ 25-pin connector, analog inputs and outputs
- ④ 9-pin interface connector for PROFIBUS (option)
- ⑤ 37-pin connector, relay outputs and binary inputs (option)
- ⑥ Power connection and fine fuses
- ⑦ Potential connection

Figure 4-10 CALOMAT 6E, gas connections and electrical connections

See also

Gas connections (Page 43)

Commissioning

5.1 Safety instructions



WARNING

Hazardous contact voltage

Risk of injury through hazardous contact voltage when the device is open or not completely closed.

The degree of protection specified on the nameplate or in Technical specifications (Page 59) is no longer guaranteed if the device is open or not properly closed.

- Make sure that the device is securely closed.



WARNING

Use of flammable and toxic gases

If flammable gases including occasionally explosive gases (Ex Zone 1) are discharged from ULTRAMAT 23 equipment, a solenoid valve is part of the containment system and the zero-point calibration (AUTOCAL) is not performed with air instead of inert gas, a daily AUTOCAL has to be performed. In this way, a possible leakage at the solenoid valve gasket can be detected through zero point deviation during calibration.

If a zero point deviation occurs for this configuration, the device must be taken out of operation immediately and a leak test must be performed, in particular of the solenoid valve.

In hazardous areas (Zone 2), measuring of flammable gases is only permissible with the option -E21.



CAUTION

Loss of degree of protection

Damage to device if the enclosure is open or not properly closed. The degree of protection specified on the nameplate or in Chapter "Technical specifications (Page 59)" is no longer guaranteed.

- Make sure that the device is securely closed.

** WARNING****Commissioning and operation with pending error**

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

- Check the gravity of the error.
- Correct the error.
- If the error still exists:
 - Take the device out of operation.
 - Prevent renewed commissioning.

NOTICE**Danger for persons and material**

If sample gas occurs uncontrolled due to leakage, this may put personnel and material in the environment of the analyzer at risk.

- You should therefore always check the sample gas path for leaks before each commissioning.
- Only commission analyzers with a perfect sample gas path.

** WARNING****Humid environment**

Danger of electrocution.

- Avoid working on the device if it is under voltage.
- If working under voltage is required, ensure a dry environment.
- Make sure when performing cleaning and maintenance work that no moisture penetrates the inside of the device.

5.2 General information on commissioning

Commissioning can only be performed properly when the person doing the commissioning is familiar with the contents of the respective manuals and operating instructions. The safety and warning information included there must be observed in particular.

 WARNING**Wetted parts unsuitable for the process media**

Risk of injury or damage to device.

Hot, toxic and corrosive media could be released if the wetted parts are unsuitable for the process medium.

- Ensure that the material of the device parts wetted by the process medium is suitable for the medium. Refer to the information in Technical specifications (Page 59).

 WARNING**Hazardous contact voltage**

Risk of electric shock in case of incorrect connection.

- For the electrical connection specifications, refer to the information in Technical specifications (Page 59).
- 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**Missing PE/ground connection**

Risk of electric shock.

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

- **Power plug:** Ensure that the used socket has a PE/ground conductor connection. Check that the PE/ground conductor connection of the socket and power plug match each other.
- **Connecting terminals:** Connect the terminals according to the terminal connection diagram. First connect the PE/ground conductor.

 WARNING**Unsuitable cables, cable glands and / plug-in connectors**

Risk of electric shock and material damage

- Only use cable glands/plug connectors that meet the requirements for electrical safety.
- Tighten the cable glands according to the instructions in the respective manuals / operating instructions.
- Close unused cable openings for electrical connections.
- When replacing cable glands, only use ones of the same type.
- Make sure the cables are tight after installation.

5.3 Checking for leaks

Checking the sample gas path for leaks

Carry out a leak test prior to commissioning or following each maintenance measure which affects the sensor or the gas path. This is carried out as follows:

1. Connect the sample gas outlet to a relative pressure manometer (e.g. U-tube manometer with measuring range 0 to 150 hPa, resolution 0.1 hPa).
2. Apply air to the sample gas inlet.
As soon as an overpressure of approx. 100 hPa has been reached (measure using manometer at sample gas outlet), block the sample gas inlet.
3. Wait approx. one minute until the enclosed air has become adapted to its environmental conditions. Then record the pressure.
4. Wait for a while and read the pressure once again. The gas path is sufficiently tight when the pressure drop does not exceed a maximum value.

Different criteria are in effect for the parameters (wait time and pressure drop) listed in item 4 due to the different designs of the analyzers. You can find the relevant values for each analyzer in the operating instructions of the respective unit.

Note

It must be guaranteed during this measurement that the temperature of the gas path and sensor remains constant.

5.4 OXYMAT 6 gas analyzer

**CAUTION****Excessive sample gas pressure**

Device damage

At the time of delivery, the pressure switch for reference gas monitoring is set to approx. 2 000 hPa (rel.). If the sample gas pressure has to be changed by more than ± 150 hPa due to process-specific requirements, the reference gas pressure also has to be changed 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.
- Have the pressure switching point of the reference gas pressure switch adjusted by a Siemens technician or someone trained for this scenario.

Service and maintenance

When restarting, make sure that the device has sufficient protection from impact energy of over 2 Joules in the area of the windows.

Annual maintenance of the analyzer must be carried out to check the electrical safety and reliable operation, in particular the tightness of the sample gas path within the analyzer. Furthermore, a leak test must be carried out following each intervention in the gas path (containment system). The leak test is described in the section Commissioning (page 20)

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 analyzer can be found in the associated Operating Instructions.

6.1 Safety instructions

6.1.1 General safety instructions

WARNING

Hot, toxic or corrosive process media

Danger of injury during maintenance work.

When working on the process connection, hot, toxic or corrosive process media could be released.

- As long as the device is under pressure, do not loosen process connections and do not remove any parts that are pressurized.
- Before opening or removing the device ensure that process media cannot be released.

WARNING

Impermissible repair and maintenance of the device

- Repair and maintenance must be carried out by Siemens authorized personnel only.

 CAUTION

Dangerous voltage at open device

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

- Before you open the enclosure or remove enclosure parts, de-energize the device.
- If maintenance measures in an energized state are necessary, observe the particular precautionary measures. Have maintenance work carried out by qualified personnel.

 CAUTION

Electrostatic discharges

The electronic components and modules fitted in this device can be destroyed by electrostatic discharging.

Comprehensive measures (such as the wearing of protective clothing by the maintenance personnel) must therefore be made to prevent electrostatic discharging wherever they are manufactured, tested, transported and installed.

 WARNING

Danger of burns resulting from hot surfaces

This symbol indicates a risk of burns from hot surfaces.

- Take appropriate protective measures, for example, wear protective gloves.
- Wait at least 60 minutes after switching off the heat source before starting work on hot parts of the device!

 CAUTION

Penetration of moisture into the device

Device damage.

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

6.1.2 ULTRAMAT 23

** WARNING****Danger of chemical burns for ULTRAMAT 23**

The O₂ sensor contains acetic acid, which leads to burns on unprotected skin. Therefore, do not use any tools when replacing the sensor module which could damage the sensor through sharp edges or squeezing.

If contact with the acid occurs nevertheless, rinse the affected skin immediately with plenty of water!

** WARNING****Danger of chemical burns**

The H₂S sensor contains sulfuric acid, which leads to burns on unprotected skin. Therefore do not use any tools when replacing the sensor module which could damage the sensor due to sharp edges or squeezing.

If contact with the acid occurs nevertheless, rinse the affected skin immediately with plenty of water!

** CAUTION****Danger to eyesight when disassembling the UV module in the device enclosure.**

This device emits UV radiation.

- Never look directly into the light beam, otherwise there is a risk of injury to the eye, especially when using focusing devices (e.g. lenses or magnifying glasses).
- Use protective goggles when working on the open device.

6.1.3 Analyzers in hazardous areas

Following maintenance or the retrofitting of parts associated with explosion protection, the analyzer may only be put into operation when an Ex specialist has ensured that the analyzer has the essential features and meets the requirements for explosion protection and issues a certificate to this effect and/or has attached a test symbol to the equipment.

** DANGER****Explosion hazard**

Never open, service or repair the analyzer in an area in which a potentially explosive atmosphere may be present.

 DANGER

Potentially explosive atmosphere

The analyzer keys must not be pressed if a potentially explosive atmosphere may be present. If operation using the keyboard is necessary, a hot work permit is absolutely essential.

 WARNING

Electrostatic charge

Danger of explosion in hazardous areas if electrostatic charges develop, for example, when cleaning plastic surfaces with a dry cloth.

- Prevent electrostatic charging in hazardous areas.

 WARNING

Maintenance during continued operation in a hazardous area

There is a danger of explosion when carrying out repairs and maintenance on the device in a hazardous area.

- Isolate the device from power.
- or -
- Ensure that the atmosphere is explosion-free (hot work permit).

 WARNING

Impermissible accessories and spare parts

Danger of explosion in areas subject to explosion hazard.

- Only use original accessories or original spare parts.
- Observe all relevant installation and safety instructions described in the instructions for the device or enclosed with the accessory or spare part.

 WARNING

Improper connection after maintenance

Danger of explosion in areas subject to explosion hazard.

- Connect the device correctly after maintenance.
- Close the device after maintenance work.

Refer to Connecting (Page 33).

6.2 Replacing fuses

To replace the fuses, proceed as follows:

1. Remove the fuse holder above the appliance plug.
Use a small screwdriver to do this.
2. Remove the blown fuse from the holder.
3. Insert a new fuse.
4. Insert the fuse holder into the compartment again.

Note

Only fuses of the type printed on the rear of the analyzer may be used (see also section Technical specifications (Page 59)).

Technical specifications

7.1 Technical specifications ULTRAMAT 23

General information	
Measured components	Maximum of 4
Measuring ranges	2 per component, freely adjustable between smallest and largest measuring range
Characteristics	Linearized
Operator panel	LCD with LED backlighting and contrast control, 80 characters (4 lines à 20 characters); function keys
Operating position	Front panel vertical
Vibrations	
• During operation	No vibrations
• During transport	Maximum vibration 5 m/s ²
Warm-up phase (function check activated)	30 minutes if no UV module is installed 60 minutes if UV module is installed
Enclosure	
Weight	Approx. 10 kg (22 lbs.) The weight varies according to the ordered variant.
Degree of protection	IP40 in accordance with EN / IEC 60529 for the versions 7MB235x (TÜV) IP20 in accordance with EN / IEC 60529 for the versions 7MB233x
Electrical characteristics	
Electrical safety	In accordance with EN / IEC 61010-1, overvoltage category II
EMC interference immunity (with safety extra-low voltage (SELV) with safe isolation)	In accordance with standard requirements of NAMUR NE21 or EN IEC 61326-1
Auxiliary power supply	100 V AC, +10%/-15%, 50 Hz, 120 V AC, +10%/-15%, 50 Hz, 200 V AC, +10%/-15%, 50 Hz, 230 V AC, +10%/-15%, 50 Hz, 100 V AC, +10%/-15%, 60 Hz, 120 V AC, +10%/-15%, 60 Hz, 230 V AC, +10%/-15%, 60 Hz
Power consumption	Max. 60 VA depending on ordered version
Fuse values	200 V/230 V AC; T 630 mA/L 250 V see inscription on rear of device 100 V/120 V AC; T 1.25 A/L 250 V see inscription on rear of device
Electrical inputs and outputs	

7.1 Technical specifications ULTRAMAT 23

Electrical characteristics	
Analog outputs	1 analog current output per component, 0/2/4/NAMUR ... 20 mA, floating, max. load 750 Ω
Relay outputs	8, with changeover contacts, freely selectable, e.g. for fault, loading capacity 24 V AC/DC/1 A, floating, non-sparking
Binary inputs	3, dimensioned for 24 V, floating • Pump • AUTOCAL • Synchronization
Serial interface	ELAN (RS485), PROFIBUS-PA/DP as option
AUTOCAL function	Automatic calibration (adjustment) of all channels with ambient air (in case oxygen is present as measured component) or nitrogen (depending on measured component), adjustable cycle time from 1 ... 24 hours. If 0 hours is entered, the cycle is deactivated. AUTOCAL cycle must be activated for certified emission measurements
Options	Add-on electronics, with 8 additional digital inputs and 8 additional relay outputs, for e.g. triggering of automatic calibration, PROFIBUS PA/DP
Climatic conditions	
Permissible ambient temperature	
• During operation	+5 ... +45 °C (+41 ... +113 °F) +5 ... +40 °C (+41 ... +104 °F) with H2S sensor
• During transportation and storage	-20 °C ... + 60 °C (-4 ... +140 °F) -10 ... +55 °C (+14 ... +131 °F) with H2S sensor
Permissible ambient humidity	< 90% RH (relative humidity) during transportation and storage (Assembly/ installation (Page 29))
Permissible ambient pressure	600 ... 1200 hPa (absolute)
Maximum operating altitude	2000 m above sea level
Pollution degree	2 according to IEC 60664-1
Gas inlet conditions	
Sample gas pressure	
• Without pump	before device: On the inlet side, the overpressure of the gas with respect to ambient pressure must not exceed 45 hPa. after device: On the outlet side, the gas outlet must be depressurized against ambient pressure.
• With pump	before device: Depressurized suction mode after device: On the outlet side, the gas outlet must be depressurized against ambient pressure.
Sample gas flow	72 ... 120 l/h (1.2 .. 2 l/min)
Sample gas temperature	0 ... +50 °C (+32 ... +122 °F)
Sample gas humidity	< 90% RH (relative humidity), non-condensing

		19" rack unit with hoses incl. with optional order option E20	19" rack unit with hoses ONLY for order option E21 *	19" rack unit with pipes	Bench-top unit with hoses (not for Ex applications)
Gas feedthroughs 6 mm	PA6 (polyamide)	x			x
Gas feedthrough 6 mm	Stainless steel 1.4571			x	
Gas feedthroughs ¼"	Stainless steel 1.4571	x	x	x	x
Fine safety filter	Enclosure material: PA6 (polyamide 6) filter material: Cellulose or enclosure material: PA12 (polyamide 12) filter pipe: Borosilicate micro-glass fibers with kynar binder	x	x		x
Hose	FKM	x	x		x
Pipe	Stainless steel 1.4571			x	
Pressure switch	PTFE + PA6 (polyamide)	x			x
Flowmeter	Borosilicate glass/ steel 1.4878	x			x
Elbows/T-pieces	PA6 (polyamide)	x			x
Internal pump (optional)	PVDF/PTFE/EPDM/HD-PE/ stainless steel 1.4571	x			x
Solenoid valve (optional)	FKM/PA6/stainless steel 1.4310/1.4305	x	x		x
Safety condensation trap	PA66/NBR/PA6	x			x
Analyzer chamber body IR	Aluminum	x	x	x	x
Analyzer chamber body UV	Aluminum	x			
Analyzer chamber inner coating	Pure aluminum (not with UV module)	x		x	x
Analyzer chamber nozzles	Stainless steel 1.4571	x	x	x	x
Analyzer chamber window IR	CaF2	x	x	x	x
Analyzer chamber window UV	Synthetic quartz glass	x			
Analyzer chamber adhesive	Epoxy resin-based adhesive	x	x	x	x

7.2 General technical data series 6

		19" rack unit with hoses incl. with optional order option E20	19" rack unit with hoses ONLY for order option E21 *	19" rack unit with pipes	Bench-top unit with hoses (not for Ex applications)
Analyzer chamber O-ring	FKM	x		x	x
Condensation trap at gas inlet	PA6 (polyamide) PE (polyethylene)				x

* Wall strengths of the components used for E21 all ≥ 1 mm

7.2 General technical data series 6

The general technical specifications apply to all analyzer versions unless they are not defined otherwise in the technical specifications of the analyzer versions.

The technical specifications listed in this document are an excerpt that includes all safety-related data. The complete technical specifications can be found in the respective operating instructions of your analyzer.

Enclosure	
Position of use of the analyzer	Front panel vertical
Degree of protection	IP20 according to EN / IEC 60529
Electrical characteristics	
EMC interference immunity (with safety extra-low voltage (SELV) with safe isolation)	In accordance with standard requirements of NAMUR NE21 or EN / IEC 61326
Electrical safety	In accordance with EN / IEC 61010-1, overvoltage category III
Auxiliary power supply	100 V AC to 120 V AC, 50/60 Hz or 200 V AC to 240 V AC, 50/60 Hz
Climatic conditions	
Permissible ambient temperature	
- During operation - CALOMAT 6E (ATEX), Article No. 7MB252x-xGAXx-xABx +5 to +55 °C +5 to +45 °C - All other analyzers -20 °C to + 60 °C (-4 °F to +140 °F) - During transportation and storage 2 according to IEC 60664-1 - Pollution degree	
Vibrations	
- During operation None - During transportation and storage Maximum vibration 5 m/s²	
Permissible ambient pressure	700 to 1200 hPa absolute

7.3 Technical specifications ULTRAMAT 6E and ULTRAMAT channel in ULTRAMAT/OXYMAT 6E

Enclosure		
Weight	Approx. 15 kg with one IR channel approx. 21 kg with two IR channels	
Dimensions	483 mm x 385 mm x 177 mm (W x D x H)	
Electrical characteristics		
Power consumption		
• 1-channel unit	Approx. 40 VA	
• 2-channel unit	approx. 70 VA	
Fuse values		
• 1-channel unit (7MB2121, 7MB2127, 7MB2124, 7MB2126)		
– 100 to 120 V	1T/250	
– 200 to 240 V	0.63T/250	
• 2-channel unit (7MB2123, 7MB2128, 7MB2124, 7MB2126)		
– 100 to 120 V	1.6 T/250	
– 200 to 240 V	1T/250	
Gas inlet conditions		
Permissible sample gas pressure	600 to 1500 hPa absolute, 700 to 1300 hPa absolute with installed pressure switch	
Sample gas flow	18 to 90 l/h (0.3 to 1.5 l/min)	
Sample gas temperature	0 to 50 °C	
Sample gas humidity	< 90% RH (relative humidity), non-condensing or dependent on measuring task	
Parts in gas path wetted by sample gas		
Standard devices		
Gas path with tubes	Gas feedthrough	Stainless steel 1.4571
	Hose	FKM
	Hose coupling	PA 6
	Sample chamber	
	• Body	Alu
	• Lining	Alu
	• Gaskets (O-rings)	FKM or FFKM
	• Window	CaF ₂ , adhesive E353
Pipe gas path	Gas feedthrough	Ti or stainless steel 1.4571
	Pipe	Ti or stainless steel 1.4571

7.4 Technical specifications OXYMAT 6E, OXYMAT channel in OXYMAT/ULTRAMAT 6E and OXYMAT 61

Parts in gas path wetted by sample gas		
	Sample chamber	
	• Body	Alu
	• Lining	Alu or Ta
	• Gaskets (O-rings)	FKM or FFKM
	• Window	CaF ₂ , adhesive E353
Special applications		
Pipe gas path	Gas feedthrough	Ti or stainless steel 1.4571 or Hastelloy C22
	Pipe	Ti or stainless steel 1.4571 or Hastelloy C22
	Sample chamber	
	• Body	Ti or stainless steel 1.4571 or Hastelloy C22
	• Lining	Ta or Alu
	• Gaskets (O-rings)	Material according to specification
	• Window	CaF ₂ ; without adhesive
Further designs upon request		
Options		
Flowmeter	Measurement pipe	Duran glass
	Variable area	Duran glass
	Suspension boundary	PTFE
	Angle pieces	FKM
Pressure switch sample gas	Diaphragm	FKM
	Enclosure	PA 6.3 T

7.4 Technical specifications OXYMAT 6E, OXYMAT channel in OXYMAT/ULTRAMAT 6E and OXYMAT 61

Enclosure	
Weight	Approx. 13 kg
Dimensions	483 mm x 385 mm x 172 mm (W x D x H)
Electrical characteristics	
Power consumption (analyzer)	Approx. 45 VA
Fuse ratings	
• 100 ... 120 V	1T/250
• 200 ... 240 V	0.63T/250
Gas inlet conditions	
Permissible sample gas pressure	800 to 1200 hPa absolute (with external reference gas supply), atmospheric pressure (with built-in pump)
Sample gas flow	18 to 60 l/h (0.3 to 1 l/min)

Gas inlet conditions		
Sample gas temperature	0 to 50 °C	
Sample gas moisture content	< 90% RH	
Parts in gas path wetted by sample gas		
Standard devices		
Gas path with tubes	Gas feedthrough	Stainless steel 1.4571
	Hose	FKM
	Hose coupling	PA 6
	Restrictor	PTFE
	Measuring chamber	Stainless steel 1.4571 or Ta (OXYMAT 6)
Pipe gas path (OXYMAT 6)	Gas feedthrough	Hastelloy C22 or Ti or stainless steel 1.4571
	Pipe	Hastelloy C22 or Ti or stainless steel 1.4571
	Measuring chamber	Stainless steel 1.4571 or Ta (OXYMAT 6)
Special applications		
Pipe gas path (OXYMAT 6)	Gas feedthrough	Hastelloy C22
	Pipe/nozzle	Hastelloy C22
	Measuring chamber	Hastelloy C22
	Gaskets (O-rings)	Material according to specification
Further designs upon request		
Options		
Flowmeter	Measurement pipe	Duran glass
	Variable area	Duran glass
	Suspension boundary	PTFE
	Angle pieces	FKM
Pressure switch sample gas	Diaphragm	FKM
	Enclosure	PA 6.3 T

7.5 Technical specifications OXYMAT 64

Enclosure	
Weight	Approx. 11 kg
Dimensions	483 mm x 356 mm x 173 mm (W x D x H)
Parts in gas path wetted by sample gas	
Gas connections	Stainless steel 1.4571
Gaskets (O-rings)	PTFE
Sensor	ZrO ₂ ; stainless steel 1.4571
Internal gas path (gas lines)	FKM; hose connector: PA6

7.6 Technical specifications CALOMAT 6E

Parts in gas path wetted by sample gas	
Flowmeter	Glass
Bypass restrictor (high-pressure version)	Stainless steel 1.4571
Outlet restrictor	Glass
Electrical characteristics	
Power consumption (unit)	Approx. 37 VA
Fuse values	100 ... 120 V 1T/250 200 ... 240 V 0.63T/250
Gas inlet conditions	
Permissible sample gas pressure	
- High-pressure version - Without built-in pressure regulator 2000 hPa rel. - With built-in pressure regulator 3000 – 6000 hPa rel. - Low-pressure version 20 – 30 hPa rel.	
Total sample gas flow	
- High-pressure version 250 to 500 ml/min (15 to 30 l/h) - Low-pressure version 125 ml/min (7.5 l/h)	
Sample gas flow through the O ₂ sensor	125 ml/min (7.5 l/h)
Sample gas temperature	0 to 50 °C
Sample gas humidity	< 1% RH

7.6 Technical specifications CALOMAT 6E

Enclosure	
Weight	Approx. 10 kg
Dimensions	483 mm x 378 mm x 172 mm (W x D x H)
Electrical characteristics	
Power consumption	Approx. 30 VA
Fuse values	
100 to 120 V 200 to 240 V	1T/250 0.63T/250
Parts in gas path wetted by sample gas	
Gas connections	Stainless steel 1.4571, pipe diameter 1/4" or 6 mm
Gaskets (O-rings)	FFKM (e.g. Chemraz)

Parts in gas path wetted by sample gas	
Sensor	Silicon, SiO _x N _y , gold, epoxy resin, glass
Measuring cell body	Stainless steel 1.4571
Internal gas path (gas lines)	Stainless steel 1.4571
Leak-tightness	Loss through leaks < 0.5 µl/s
Gas inlet conditions	
Permissible sample gas pressure	800 to 1100 hPa absolute
Sample gas flow	30 to 90 l/h (0.5 to 1.5 l/min)
Sample gas temperature	0 to 50 °C
Sample gas humidity	< 90% RH (relative humidity), non-condensing

7.7 Technical specifications CALOMAT 62E

Enclosure	
Weight	Approx. 13 kg
Dimensions	383 x 177 x 390 mm
Electrical characteristics	
Power consumption (unit)	Approx. 30 VA
Fuse values	
• 100 ... 120 V	T1L250V
• 200 ... 240 V	T630L250V
Gas path	
Gas connections	Female thread 1/8"-27 NPT (according to ANSI B 1.20.1)
Gaskets (O-rings)	FKM (e.g. Viton) or FFKM (e.g. Kalrez)
Sensor	Glass
Internal gas path (gas lines)	Stainless steel 1.4571
Leak-tightness	Loss through leaks < 0.5 µl/s
Gas inlet conditions	
Sample gas pressure	800...1100 hPa (absolute)
Sample gas flow	30...90 l/h (0.5...1.5 l/min)
Sample gas temperature	0 to 50 °C
Sample gas moisture content	< 90% RH

7.8 Technical specifications FIDAMAT 6

Time response	
Warm-up time	< 30 min, maximum accuracy is achieved after about 2 hours
Delayed display T ₉₀ (incl. dead time)	Approx. 35 s
Damping (electronic time constant)	0 to 100 s, adjustable
Dead time (at 1 l/min)	Approx. 34 s (because of diffusion to sensor)

7.8 Technical specifications FIDAMAT 6

Enclosure	
Weight	Approx. 23 kg
Dimensions (W x D x H)	483 mm x 457 mm x 160 mm

Electrical characteristics	
Power consumption	Approx. 150 VA during operation Approx. 350 VA in the warm-up phase
Fuse values	
• 100 to 120 V	4.0 T/250
• 200 to 240 V	2.5 T/250

Gas inlet conditions	
Sample gas pressure	
With integrated pump	• 600 ... 1100 hPa
Without pump	• < 2000 hPa
Sample gas temperature	0 ... 200 °C
Sample gas humidity	< 90% relative humidity

Pressures and flow (FIDAMAT 6 with pump)					
Gases	Inlet pressure hPa (rel.)	Operating pressure hPa (rel.)		Flow across FID ml/min	Flow through by-pass ml/min
		Without pump start-up	With pump start-up		
Combustion gas	2000 ... 4000		1000 ± 20	~ 12	-
Combustion air	2000 ... 4000	420 ± 20	500	~ 320	~ 500
Sample gas	atmospheric	-	500 ± 2	~ 3	~ 1000
Zero gas	2500 ... 3000	-	1500 ± 2	~ 3	~ 1000
Calibration gas	2500 ... 3000	-	1500 ± 2	~ 3	~ 1000

Pressures and flow (FIDAMAT 6 without pump)						
Gases	Inlet pressure hPa (rel.)		Operating pressure hPa (rel.)		Flow across FID ml/min	Flow through by-pass ml/min
		Without sample gas, calibration gas	With sample gas, calibration gas			
Combustion gas	3000 ... 5000		2000 ± 20		~ 25	-
Combustion air	3000 ... 5000	1480 ± 5	--		~ 320	~ 300
Sample gas	1500 ... 2000	-	1500 ± 2		~ 3	~ 500
Zero gas	1500 ... 2000	-	1500 ± 2		~ 3	~ 500
Calibration gas	1500 ... 2000	-	1500 ± 2		~ 3	~ 500

Taking out of operation and disposal

8.1 Repair or changing of location

If the analyzer is shut down for repair or for changing the location of use, proceed as follows:

DANGER

When the device is used in hazardous areas

A hot work permit is required for hazardous areas.

1. Make sure that gas is no longer flowing through the analyzer. If external pumps are present, switch all of them off.
2. Purge the sample gas path with air or nitrogen.
3. Switch the analyzer off.
4. Disconnect the power plug.
5. Disconnect all hose connections from the rear of the analyzer.
With pipe versions, unscrew all pipes.

8.2 Product disposal



The analyzer to be disposed of as electronic waste with the code number 160213 is a 'product containing dangerous components'. It must therefore be disposed of correctly and in an environmentally-friendly manner by a local waste disposal company.



It must never be disposed of with household waste!

WARNING

Danger of chemical burns for ULTRAMAT 23

The O₂ sensor contains acetic acid, which leads to burns on unprotected skin. Therefore, do not use any tools when replacing the sensor module which could damage the sensor through sharp edges or squeezing.

If contact with the acid occurs nevertheless, rinse the affected skin immediately with plenty of water!

8.2 Product disposal

WARNING
--

Danger of chemical burns

The H₂S sensor contains sulfuric acid, which leads to burns on unprotected skin. Therefore do not use any tools when replacing the sensor module which could damage the sensor due to sharp edges or squeezing.

If contact with the acid occurs nevertheless, rinse the affected skin immediately with plenty of water!
--

Appendix

A.1 Technical support

Technical support

If this documentation does not completely answer your technical questions, you can enter a Support Request (<http://www.siemens.com/automation/support-request>).

For help creating a support request, view this video here (www.siemens.com/opensr).

Additional information on our technical support can be found at Technical Support (<http://www.siemens.com/automation/csi/service>).

Service & support on the Internet

In addition to our technical support, Siemens offers comprehensive online services at Service & Support (<http://www.siemens.com/automation/serviceandsupport>).

Contact

If you have further questions about the device, contact your local Siemens representative at Personal Contact (<http://www.automation.siemens.com/partner>).

To find the contact for your product, go to "all products and branches" and select "Products & Services > Industrial automation > Process instrumentation".

Contact address for business unit:

Siemens AG
Digital Industries
Process Automation
Östliche Rheinbrückenstr. 50
76187 Karlsruhe, Germany

A.2 ESD directives

NOTICE
Electrostatic sensitive devices can be destroyed by voltages which are far below the human perception limit. These voltages already occur if you touch a component or the electric connections of a module without being electrostatically discharged. The damage caused on a module by an overvoltage is not usually recognized immediately, but only becomes evident after a longer period of operation.

Fundamental measures to protect against static discharge

- Provide good grounding:
When handling electrostatic sensitive devices, provide good grounding for persons, workstation and packaging. In this manner you avoid static discharge.
- Avoid direct touching:
Only touch electrostatic sensitive devices when this is absolutely unavoidable (e.g. during maintenance). Hold the modules so that you touch neither pins nor printed conductors. In this manner, the discharge energy cannot reach or damage sensitive devices.
If you have to carry out measurements on a module, discharge yourself before carrying out any actions. To do this, touch grounded metal objects. Only use grounded measuring instruments.

A.3 List of abbreviations

Table A-1

Abbreviation/ symbol	Description
ATEX	A tmosphère e xplosible (French for explosive atmosphere)
C 6	C ALOMAT 6
C 62	C ALOMAT 62
CE	Communauté Européenne (French for European Community)
CSA	C anadian S tandards A ssociation, a technical testing organization
D-Sub	D -shaped sub -miniature (connector)
DIN	D eutsches I nstitut für N ormung e. V. (German standards association)
ELAN	E conomic L ocal A rea N etwork
EMC	E lectro M agnetic C ompatibility
EN	E uropäische N orm (European standard)
ESD	E lectrostatic D ischarge
EU	E uropean U nion
FKM	Fluoroelastomer, a plastic
FFKM	Perfluoroelastomer, a plastic
IEC	I nternational E lectrotechnical C ommission
IEEE	I nstitute of E lectrical and E lectronics E ngineers
ISO	International Standards Organization (from Greek: " isos "; in English "equal")
MLFB	Machine-readable Order No. (German M aschinenlesbare F abrikate B ezeichnung)
NAMUR	N ormen a rbeitsgemeinschaft für M ess- und R egeltechnik in der chemischen Industrie (standardization body for instrumentation and control technology in the chemical industry)
NFPA	N ational F ire P rotection A ssociation, a non-profit fire protection organization in the USA
LVD	L ow V oltage D irective
O 6	O XYMAT 6
PROFIBUS	P rocess F ield B us
QAL	Q uality A ssurance L evel

Abbreviation/ symbol	Description
RC element	Resistor, Capacitor; switch which consists of an ohmic resistor and a capacitor.
SELV	Safety Extra Low Voltage
SIPROM GA	Siemens Process Maintenance for Gas Analyzers
TÜV	Technischer Überwachungsverein, German Technical Inspectorate
U 6	ULTRAMAT 6
LEL	Lower Explosion Limit
UL	Underwriters Laboratories, certification service provider
VDE	Verband der Elektrotechnik, Elektronik und Informationstechnik (German Association for Electrical, Electronic and Information Technologies)
vpb	Parts per billion by volume
vpm	Parts per million by volume

Index

B

- Bench-top unit
 - Power connection, 35
- Biogas measurement
 - Safety instructions, 20

C

- CSA, 36
- Customer Support, (Refer to Technical support)

D

- Delivery, 13
- Disassembly, 19

E

- Electrical connections
 - Power connection, 35
 - Signal connections, 37
- Ex area
 - CSA Class I Div. 2, (Safety bracket)

H

- H₂S measurement
 - Safety instructions, 20
- Hotline, (Refer to Support request)
- Hydrogen sulfide measurement
 - Safety instructions, 20

I

- Inputs
 - Technical specifications, 59

L

- Label, 7
- List of abbreviations, 74

O

- Outputs
 - Technical specifications, 59

P

- Power connection, 35
- Proper use, 11

R

- Repair, 71

S

- Safety bracket, 36
- Safety extra-low voltage, 37
- Safety instructions
 - Analyzers in biogas plants, 20
 - General information, 17
 - Maintenance and servicing, 54
 - Signal connections, 37
- Service, 73
- Service and support
 - Internet, 73
- Support, 73
- Support request, 73

T

- Technical specifications, 59
 - General information, 59
- Technical support, 73
 - partner, 73
 - personal contact, 73

W

- Warranty, 13

