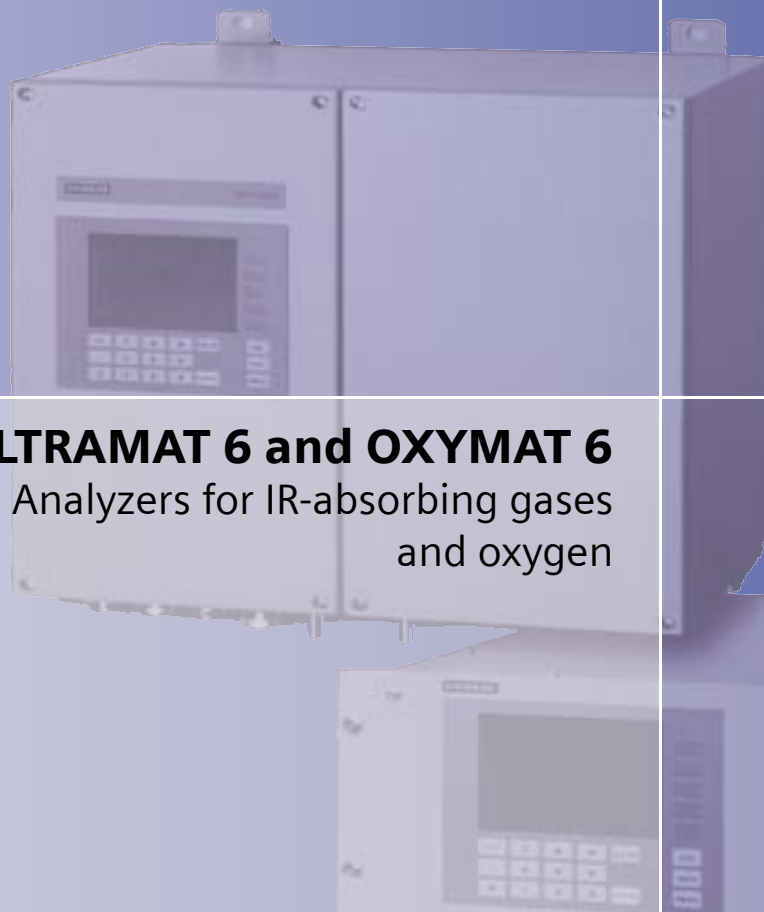


Manual Edition 05/2006



ULTRAMAT 6 and OXYMAT 6
Analyzers for IR-absorbing gases
and oxygen

gas analysis

SIEMENS

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ULTRAMAT 6 and OXYMAT 6

Analyzers for IR-absorbing gases and oxygen

**7MB2011, 7MB2021, 7MB2023, 7MB2024, 7MB2111, 7MB2112,
7MB2121, 7MB2123, 7MB2124
7MB2017, 7MB2027, 7MB2028, 7MB2026, 7MB2117, 7MB2118,
7MB2127, 7MB2128, 7MB2126**

Manual

**Order No. C79000-G5276-C143
Release 05/2006**

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While we have verified the contents of this manual for agreement with the hardware and software described, variations remain possible. Thus we cannot guarantee full agreement. The contents of this manual are regularly reviewed and corrections are included in subsequent editions. We welcome all suggestions for improvement.

Contents

| | |
|---|------------|
| Information for the User | 1-1 |
| 1.1 Information for our Customers | 1-2 |
| 1.2 General Information | 1-4 |
| 1.3 Notes on Using this Manual | 1-5 |
| 1.4 Danger Information | 1-5 |
| 1.5 Approved Use | 1-6 |
| 1.6 Qualified Personnel | 1-6 |
| 1.7 Warranty Information | 1-7 |
| 1.8 Standards and Regulations | 1-7 |
| 1.9 Supply and Delivery | 1-8 |
| 1.10 Conformity to European Guidelines | 1-9 |
| 1.11 Certificates | 1-10 |
| 1.11.1 TÜV Test Certificate Containment System in rack units BB-EG1-KAR Gr02X | 1-10 |
| 1.11.2 Statement of Conformity 94/9/EG TÜV 01 ATEX 1686 X (Gas-proof Analyzer - Zone 2) | 1-11 |
| 1.11.3 EC type Examination Certificate TÜV 01 ATEX 1697 X (Simplified Pressurized Analyzers - Zone 2) | 1-13 |
| 1.11.4 Statement of Conformity TÜV 03 ATEX 2278 X (Dust Ex Zone 22) | 1-15 |
| 1.11.5 FM Certificate of Compliance (Class 1, Div. 2) | 1-16 |
| 1.11.6 CSA Certificate of Compliance (Class 1, Zone 2) | 1-18 |
| 1.11.7 EC type Examination Certificate BVS 03 ATEX G 013 X (Gas Warning Equipment) | 1-20 |
| Installation Guidelines | 2-1 |
| 2.1 Safety Information | 2-2 |
| 2.2 Installation Requirements | 2-3 |
| 2.2.1 General | 2-3 |
| 2.2.2 Gas-proof Analyzers for Measurement of Non-flammable Gases or Gas/air Mixtures Below the LEL in Potentially Explosive Atmospheres of Zone 2 | 2-4 |
| 2.2.3 Simplified Pressurized Analyzers for Measurement of Flammable Gases or Gas/air Mixtures Occasionally Above the LEL in Potentially Explosive Atmospheres of Zone 2 | 2-5 |
| 2.2.4 Dust-protected Analyzers for Analysis of Gases in Zone 22 | 2-9 |
| 2.2.5 OXYMAT 6 Gas Warning Equipment for Monitoring of Inertisation Processes | 2-10 |

| | | |
|---------|---|------|
| 2.2.6 | Use of Gas Analyzers with CSA and FM Certificates | 2-11 |
| 2.2.6.1 | Field Devices | 2-11 |
| 2.2.6.2 | Rack-mounted Devices | 2-12 |
| 2.3 | Gas Connections and Internal Gas Paths | 2-14 |
| 2.3.1 | Sample Gas Line | 2-14 |
| 2.3.2 | Reference Gas Line | 2-17 |
| 2.3.3 | Purging Gas Connection | 2-18 |
| 2.3.4 | Pressure Sensor | 2-18 |
| 2.3.5 | Gas Path | 2-19 |
| 2.4 | Gas Conditioning | 2-24 |
| 2.5 | Electric Connection | 2-25 |
| 2.5.1 | Power Supply Connection | 2-25 |
| 2.5.2 | Connection of Signal Cables | 2-26 |
| 2.5.3 | Pin Assignments of ULTRAMAT 6E and OXYMAT 6E | 2-29 |
| 2.5.4 | Pin Assignments of Autocal Module ULTRAMAT 6E and OXYMAT 6E .. | 2-30 |
| 2.5.5 | Example of Autocal Circuit ULTRAMAT 6E and OXYMAT 6E | 2-31 |
| 2.5.6 | Pin and Terminal Assignments of ULTRAMAT 6F and OXYMAT 6F ... | 2-32 |
| 2.5.7 | Terminal Assignments of Autocal Module ULTRAMAT 6F and OXYMAT 6F | 2-33 |
| 2.5.8 | Example of Autocal Circuit ULTRAMAT 6F and OXYMAT 6F | 2-34 |
| 2.6 | Dimensional Drawings | 2-35 |
| 2.6.1 | ULTRAMAT 6E and OXYMAT 6E | 2-35 |
| 2.6.2 | ULTRAMAT 6F and OXYMAT 6F | 2-39 |

Technical Description **3-1**

| | | |
|------|--|------|
| 3.1 | Application, Design, Characteristics of ULTRAMAT 6E/F and OXYMAT 6E/F | 3-2 |
| 3.2 | Display and Control Panel | 3-4 |
| 3.3 | Communications Interface | 3-5 |
| 3.4 | Mode of Operation of ULTRAMAT Channel | 3-6 |
| 3.5 | Mode of Operation of OXYMAT Channel | 3-7 |
| 3.6 | Technical Data of ULTRAMAT 6E | 3-8 |
| 3.7 | Technical Data of OXYMAT 6E | 3-9 |
| 3.8 | Technical Data of ULTRAMAT 6F | 3-10 |
| 3.9 | Technical Data of OXYMAT 6F | 3-11 |
| 3.10 | Reference Gases, Zero Error for OXYMAT 6E/F | 3-12 |
| 3.11 | Materials in the Sample Gas Path | 3-13 |

| | | |
|--------------------|--|------------|
| Start-up | | 4-1 |
| 4.1 | Safety Information | 4-2 |
| 4.2 | Preparation for Start-up | 4-3 |
| 4.2.1 | General Information | 4-3 |
| 4.2.2 | Special Preparations for OXYMAT Channel | 4-4 |
| 4.2.3 | Special Preparations for ULTRAMAT Channel | 4-7 |
| 4.2.4 | Special Preparations for ULTRAMAT Channel with Flow-type Reference Side | 4-8 |
| 4.2.5 | Measuring Ranges with Suppressed Zero for ULTRAMAT Channel | 4-11 |
| 4.3 | Start-up and Operation | 4-12 |
| 4.3.1 | ULTRAMAT Channel | 4-12 |
| 4.3.2 | OXYMAT Channel | 4-14 |
| | | |
| Operation | | 5-1 |
| 5.1 | General | 5-2 |
| 5.2 | Summary of Input Functions | 5-7 |
| 5.2.1 | Analyzer Status | 5-9 |
| 5.2.2 | Calibration | 5-10 |
| 5.2.3 | Measuring Ranges | 5-17 |
| 5.2.4 | Parameters | 5-19 |
| 5.2.5 | Configuration | 5-26 |
| | | |
| Maintenance | | 6-1 |
| 6.1 | ULTRAMAT Channel | 6-3 |
| 6.1.1 | Design and Maintenance of the Heated ULTRAMAT 6F Wall Mount Analyzer | 6-3 |
| 6.1.2 | Design of Analyzer Section | 6-6 |
| 6.1.3 | Dismantling the Analyzer Section | 6-8 |
| 6.1.4 | Adjustment of Analyzer Section | 6-13 |
| 6.1.4.1 | ULTRAMAT 6F Service Position | 6-14 |
| 6.1.4.2 | Zero Adjustment with Adjustment Reserve used up | 6-15 |
| 6.1.4.3 | Total Calibration of Analyzer Section | 6-16 |
| 6.1.5 | Compensation of Influencing Variables | 6-18 |
| 6.2 | OXYMAT Channel | 6-21 |
| 6.2.1 | Design of Analyzer Section | 6-21 |
| 6.2.2 | Dismantling the Analyzer Section | 6-22 |
| 6.2.3 | Adjustment of Reference Gas Pressure Switch | 6-25 |
| 6.2.4 | Removal of Sample Gas Restrictor | 6-26 |
| 6.3 | Replacement of Motherboard and Option Board | 6-27 |
| 6.4 | Replacement of Fuses | 6-28 |

| | | |
|-------|---|------|
| 6.5 | Cleaning the Analyzer | 6-30 |
| 6.6 | Maintenance Request and Fault Messages | 6-30 |
| 6.6.1 | Maintenance Request | 6-32 |
| 6.6.2 | Fault | 6-34 |
| 6.6.3 | Further Errors (ULTRAMAT 6E/F) | 6-37 |
| 6.6.4 | Further Errors (OXYMAT 6E/F) | 6-38 |

List of Spare Parts 7-1

| | | |
|-------|------------------------------------|------|
| 7.1 | General | 7-2 |
| 7.2 | OXYMAT 6 | 7-8 |
| 7.2.1 | Analyzer Section | 7-8 |
| 7.2.2 | Electronics | 7-11 |
| 7.2.3 | Gas paths | 7-15 |
| 7.3 | ULTRAMAT 6 | 7-21 |
| 7.3.1 | Analyzer Part Single Channel | 7-21 |
| 7.3.2 | Analyzer Section 2R Channel | 7-31 |
| 7.3.3 | Electronics | 7-40 |
| 7.3.4 | Gas paths | 7-43 |
| 7.3.5 | Heating | 7-46 |

Appendix 8-1

| | | |
|-----|----------------------------------|------|
| 8.1 | List of Abbreviations | 8-2 |
| 8.2 | Returned Deliveries / Form | 8-3 |
| 8.3 | Software Release Versions | 8-5 |
| 8.4 | Parameter Lists | 8-11 |

Information for the User

1

| | | |
|--------|---|------|
| 1.1 | Information for our Customers | 1-2 |
| 1.2 | General Information | 1-4 |
| 1.3 | Notes on Using this Manual | 1-5 |
| 1.4 | Danger Information | 1-5 |
| 1.5 | Approved Use | 1-6 |
| 1.6 | Qualified Personnel | 1-6 |
| 1.7 | Warranty Information | 1-7 |
| 1.8 | Standards and Regulations | 1-7 |
| 1.9 | Supply and Delivery | 1-8 |
| 1.10 | Conformity to European Guidelines | 1-9 |
| 1.11 | Certificates | 1-10 |
| 1.11.1 | TÜV Test Certificate Containment System in rack units BB-EG1-KAR Gr02X | 1-10 |
| 1.11.2 | Statement of Conformity 94/9/EG TÜV 01 ATEX 1686 X (Gas-proof Analyzer - Zone 2) | 1-11 |
| 1.11.3 | EC type Examination Certificate TÜV 01 ATEX 1697 X (Simplified Pressurized Analyzers - Zone 2) | 1-13 |
| 1.11.4 | Statement of Conformity TÜV 03 ATEX 2278 X (Dust Ex Zone 22) | 1-15 |
| 1.11.5 | FM Certificate of Compliance (Class 1, Div. 2) | 1-16 |
| 1.11.6 | CSA Certificate of Compliance (Class 1, Zone 2) | 1-18 |
| 1.11.7 | EC type Examination Certificate BVS 03 ATEX G 013 X (Gas Warning Equipment) | 1-20 |

1.1 Information for our Customers



Please read this manual before you start work!

It contains important information and data whose observance will guarantee correct operation of the analyzer and also save you servicing costs. The information will help you when using the equipment and will lead to reliable results.

You have purchased a device which is available in different configurations:

Design:

Rack mount or wall mount analyzer. The latter can be heated or non-heated.

Channel:

Each device has one or more analyzer sections which are referred to as **channels**.

Wall mount analyzers always have only one channel, whereas rack mount analyzers can be equipped with one or two channels. All channels are connected to the same control panel (display).

In addition, an ULTRAMAT (NDIR) channel can measure two components simultaneously. In this version, two detectors are connected in series. They are referred to as 2R channels or 2R physical systems.

This means that a wall mount analyzer can be used to measure oxygen (once) or up to two IR-active components. The maximum configuration for the rack mount analyzer is either four IR-active components (two channels with two detectors each) or oxygen (once) together with two IR-active components.

This manual considers all these possibilities. Operations which are different between **OXYMAT 6** and **ULTRAMAT 6** are specifically identified and described.

Rack mount analyzers have an **E** at the end of their name, wall mount analyzers have an **F**. The designation **ULTRAMAT/OXYMAT** is used if both devices are meant, and the same applies to the ending **E/F**.

The following table lists all available types as well as the first block of the Order No.

| Type | O ₂ | NDIR single channel | NDIR single channel | NDIR 2R | NDIR 2R | Field* | Rack* |
|----------------------|----------------|---------------------|---------------------|--------------|-------------|----------------------------------|----------------------------------|
| OXYMAT | 1st channel | | | | | 7MB2021 <i>7MB2027</i> | 7MB2011 <i>7MB2017</i> |
| ULTRA-/OXYMAT | 1st channel | 2nd channel | | | | 7MB2023 <i>7MB2028</i> | |
| | 1st channel | | | 2 nd channel | | 7MB2024 <i>7MB2026</i> | |
| ULTRA-MAT | | | 1st channel | | | 7MB2121 <i>7MB2127</i> | 7MB2111 <i>7MB2117</i> |
| | | 1st channel | 2nd channel | | | 7MB2123 <i>7MB2128</i> | |
| | | | | 1st channel | | 7MB2124 <i>7MB2126</i> | 7MB2112 <i>7MB2118</i> |
| | | 2nd channel | | 1st channel | | 7MB2124 <i>7MB2126</i> | |
| | | | | 1st channel | 2nd channel | ----- <i>7MB2126</i> | |

* 2nd line in bold type and italics means special application

Special analyzers may differ from the standard analyzers with respect to the measured components, design of the physical section etc. Their operation, and the connection system are the same as with the standard analyzers.

For gas warning equipment, this manual refers to software release version 4.5.0.

An overview of all SW release versions and their functionalities can be found in Section 8 of this manual.

1.2 General Information

The product described in this manual has left the factory in a perfect and tested condition as regards safety. In order to retain this state and to achieve correct and safe operation of this product, it must only be used in the manner described by the manufacturer. In addition, correct and safe operation of this product is dependent on proper transport, storage and installation as well as careful operation and maintenance.

This manual contains the information required for approved use of the product described. The manual has been prepared for technically qualified personnel who have been specially trained or who possess appropriate knowledge in the field of instrumentation and control, referred to further as automation technology.

Knowledge of the safety information and warnings present in this manual and their technically correct implementation are prerequisites for danger-free installation and commissioning and for safety during operation and maintenance of the described product. Only a qualified person possesses the required specialist knowledge to correctly interpret the general safety information and warnings present in this manual and to apply them to the specific case.

This manual is included in the delivery of the analyzer, even if separate ordering has been made possible for logistic reasons. For clarity reasons this manual cannot cover all possible details for all versions of the described product and cannot describe every possible case in connection with installation, operation, maintenance or the use in systems. Should you require further information, or should particular problems occur which are not handled in sufficient depth in this manual, help can be requested through your local Siemens office or representative.

Note



When considering use of the analyzer for new research and development applications, we recommend that you discuss your application with our specialist department.

1.3 Notes on Using this Manual



This manual describes the applications of the equipment and how you can start it up, operate and service it.



Of particular importance are the **warning and information texts**. These are separated from the remaining text, specially identified by appropriate pictograms (see examples on left), and provide valuable tips on how to avoid maloperations.

1.4 Danger Information

The following information serves on the one hand for your personal safety and on the other hand protects the described product or connected devices from damage.

Safety information and warnings to prevent danger to the life and health of users or maintenance personnel or to prevent damage to property are emphasized in this manual by the terms defined here. They are additionally identified by warning symbols (pictograms) matched to the significance of the accompanying text and which may therefore deviate from the examples shown here. The terms used in this manual and the information on the product itself have the following meaning:



Danger

means that death, severe personal injury and/or substantial damage to property **will occur** if the appropriate safety precautions are not observed.



Warning

means that death, severe personal injury and/or substantial damage to property **can occur** if the appropriate safety precautions are not observed.



Caution

with a warning triangle means that slight personal injury **can occur** if the appropriate safety precautions are not observed.

Caution

without a warning triangle means that damage to property **can occur** if the appropriate safety precautions are not observed.

Attention

means that an undesirable effect or state can occur if the corresponding information is not observed.



Note

is an important information on the product itself, the handling of the product or the respective part of the manual to which particular attention should be paid.



Danger of burns

means that severe personal injury **can occur** if the appropriate safety precautions are not observed.

1.5 Approved Use

Approved use in the sense of this manual means that this product may only be used for the applications described in the catalog and in the Technical Description (see also Chapter 3 of this manual) and only in conjunction with other devices and components which have been recommended or approved of by Siemens.

The product described here has been developed, manufactured, tested and documented taking into account the appropriate safety standards. No danger therefore exists in the normal case with respect to damage to property or the health of persons if the handling guidelines and safety information described for configuring, assembly, approved use and maintenance are observed. This device has been designed such that safe isolation is guaranteed between the primary and secondary circuits. Low voltages which are connected must also be generated using safe isolation.



Warning

Following removal of the housing or guard, or after opening the system cabinet, certain parts of these devices/systems are accessible which may carry dangerous voltages. Therefore only suitably qualified personnel may work on this device. These individuals must be well acquainted with all sources of danger and the maintenance measures as described in this manual.

1.6 Qualified Personnel

Severe personal injury and/or extensive damage to property may occur following unqualified work on the device/system or the failure to observe the warnings described in the manual or on the device/system cabinet. Therefore only suitably qualified personnel may work on this device/system.

Qualified persons in the sense of the safety information present in this manual or on the product itself are persons who

- are either familiar as configuring engineers with the safety concepts of automation technology
- or have been trained as operators in the use of automation technology equipment and are acquainted with the contents of this manual which refer to operation
- or have been appropriately trained as commissioning and/or maintenance personnel for such automation technology equipment or are authorized to energize, ground and tag circuits and devices/ systems in accordance with established safety practices.

1.7 Warranty Information

Your attention is drawn to the fact that the contents of this product documentation are not part of a previous or existing agreement, commitment or statutory right and do not change these. All commitments on the part of Siemens are contained in the respective sales contract which also contains the complete and solely applicable warranty conditions. The warranty conditions in the contract are neither extended nor limited by the contents of this manual.

1.8 Standards and Regulations

The harmonized European standards have been applied as far as possible to the specification and production of this device. If no harmonized European standards have been applied, the standards and regulations for the Federal Republic of Germany apply (see also the technical data in Chapter 3).

When using this product outside the range of applicability of these standards and regulations, the appropriate standards and regulations in the country of use must be observed.

1.9 Supply and Delivery

The respective scope of delivery according to the valid contract is listed on the shipping documents accompanying the delivery.

When opening the packaging, please observe the corresponding information on the packaging material. Check that the delivery is complete and undamaged. In particular, compare the order numbers on the labels (if present) with the ordering data.

Please retain the packaging material if possible so that you can reuse it if it is necessary to return the device. A form for this purpose can be found in Chapter 8.3.

Year of manufacture

The date of manufacture is present coded in the serial number (F.-Nr., see rating plate). Details are shown in the following tables:

| Year/fiscal year 2) | Key 1) | Month | Key 1) |
|---------------------|--------|-----------|--------|
| 1950, 1970, 1990 | A | January | 1 |
| 1951, 1971, 1991 | B | February | 2 |
| 1952, 1972, 1992 | C | March | 3 |
| 1953, 1973, 1993 | D | April | 4 |
| 1954, 1974, 1994 | E | May | 5 |
| 1955, 1975, 1995 | F | June | 6 |
| 1956, 1976, 1996 | H | July | 7 |
| 1957, 1977, 1997 | J | August | 8 |
| 1958, 1978, 1998 | K | September | 9 |
| 1959, 1979, 1999 | L | October | O, 0 |
| 1960, 1980, 2000 | M | November | N |
| 1961, 1981, 2001 | N | December | D |
| 1962, 1982, 2002 | P | | |
| 1963, 1983, 2003 | R | | |
| 1964, 1984, 2004 | S | | |
| 1965, 1985, 2005 | T | | |
| 1966, 1986, 2006 | U | | |
| 1967, 1987, 2007 | V | | |
| 1968, 1988, 2008 | W | | |
| 1969, 1989, 2009 | X | | |

Example of date of manufacture:

F-Nr.³⁾ R O - 5352 is coded as follows:

Consecutive No.
October
2003

1) In compliance with DIN IEC 62

2) Coding of the fiscal year is made using the key for the second named year: e.g. A for 1989/90, B for 1990/91, C for 1991/92 etc.

3) In certain cases the key for the place of manufacture (e.g. N1) may precede the actual serial no.

1.10 Conformity to European Guidelines

CE marking



The manufacture of this gas analyzer is authorized to use a CE marking on the rating plate since the device complies with the following applicable regulations:

EMC directive

The requirements of the EC directives 89/336/EEC, 91/263/EEC, 92/31/EEC, 93/68/EEC and 93/97/EEC "Electromagnetic compatibility".

Low-voltage directives

The requirements of the EC directives 72/23/EEC and 93/68/EEC "Low-voltage directives".

Ex directive

The requirements of the EC directive 94/9/EC on "Devices in hazardous areas".

This directive only refers to the Ex devices described in this manual, i.e. not to devices and gas warning equipment certified by FM or CSA.

Applied harmonized standards, in particular:

All devices

EN 61326
EN 61010

Additionally for Ex devices

EN 50021
EN 60079-14
EN 50014
EN 50016
EN 50281-1-1

Additionally for gas warning equipment

EN 50270
EN 50271
EN 50104

In line with the above-mentioned guidelines, the EU declarations of conformity are available at the following address for inspection by appropriate authorities:



SIEMENS

Siemens Aktiengesellschaft
Automation & Drives
A&D PI 2
D-76181 Karlsruhe

When using this product outside the European Union, the standards and regulations applicable in the country of use must be observed!

1.11 Certificates

1.11.1 TÜV Test Certificate Containment System in rack units BB-EG1-KAR Gr02X

| | | |
|--|--|---|
| <p>Page 2 of 2 Test Certificate of Series 6</p> <p>1. Results</p> <p>1.1 Containment System</p> <p>The following gases or gas mixtures are allowed to be connected with the containment system (gas path) of Series 6:</p> <ul style="list-style-type: none"> - non-flammable gas/air mixtures or - flammable gas/air mixtures but the gas concentration is always below the lower explosion limit (LEL) or - gas mixtures according to definition of zone 2 (rarely flammable gas mixtures) or gas mixtures according to definition of zone 1 (occasionally flammable gas mixtures). <p>1.2 Purging of housing</p> <p>The 19" rack housing of Series 6 does not need to be purged as</p> <ul style="list-style-type: none"> - the released amount of gases from the containment can be regarded as limited and - the gas exchange rate of the housing is sufficiently high enough, so that - any enrichment of the released gases above the LEL is not possible. <p>2. Special conditions</p> <p>Connection of flammable gases or gas mixtures above the LEL is only allowed when the containment system of the analyser is equipped with pipes.</p> <p>Connection of occasionally flammable gas mixtures is only allowed when a flame barrier is used.</p> <p>Maximum temperature class for the analysers of Series 6 is T4.</p> <p>If the 19" rack housing is mounted in a rack a sufficient air exchange with the ambient air must be guaranteed.</p> <p>For closed cabinets sufficient purging with protective gas is absolutely necessary. Flow rate depends on free internal volume of the cabinet and has to be chosen in accordance with the requirements of BGR 104 or other respective international standards.</p> <p>To guarantee continuous tightness of the containment system a leakage test must be performed regularly according to the specifications in the manual. The user is responsible for the frequency of this test; however, potentially negative effects of the sample gases to the containment system must be taken into account.</p> <p>3. Other</p> <p>Detailed explanations to this test report and certificate BB-EG1/KAR Gr02X are available on request.</p> <p>Karlsruhe, September 29, 2003 BB-EG1-KAR/Greif</p> | <p>TÜV SÜDDEUTSCHLAND</p> <p>Bau und Betrieb</p> <p>Region Baden-Württemberg Hedderstrasse Karlsruhe</p> <p>TÜV Bayern Hessen Sichano, Südwest e.V.</p> <p>Dornmühlener Str. 146 D-76189 Karlsruhe Phone: (07 21) 97 96-2 51 Telex: (07 21) 97 96-2 59 www.tuv.com</p> <p>Karlsruhe, September 28, 2003 BB-EG1-KAR/Greif Test Certificate of Series 6</p> <p>This document consists of 2 pages</p> | <p>TÜV SÜDDEUTSCHLAND</p> <p>Test Certificate BB-EG1- KAR Gr02X</p> <p>Containment System of the Analysers CALOMAT 6, OXYMAT 6, ULTRAMAT 6 and ULTRAMAT / OXYMAT 6</p> <p>Certificate Holder</p> <p>Siemens AG A&D PI 2 CA 76181 Karlsruhe Germany</p> <p>Test unit</p> <p>Gasanalysers CALOMAT 6 OXYMAT 6, ULTRAMAT 6 and ULTRAMAT / OXYMAT 6 (Series 6); Manufacturer Siemens</p> <p>Test Basis</p> <p>EN 50016 and EN 60079-14 (current revisions); ExRL; Guidelines for explosion protection of EG Chemie (BGR 104)</p> <p>Scope of the Test</p> <p>Evaluation of the tightness of the containment system without external purging in non explosive areas</p> <p>Documents</p> <ul style="list-style-type: none"> - Technical Description of Series 6; - leakage test of the containment system; - calculations; - technical manual; - Decay of He and CO₂ concentration in the housing with no moving ambient air <p>Date of examination September 29, 2003</p> <p>Test Results see page 2</p> <p>Certified  K.-D. Greif</p> <p></p> |
|--|--|---|

1.11.2 Statement of Conformity 94/9/EG TÜV 01 ATEX 1686 X (Gas-proof Analyzer - Zone 2)



SCHEDULE

- (13) **STATEMENT OF CONFORMITY N° TÜV 1686 X**

(15) Description of equipment or protective system
 Gas analysers of the OXYMAT 6F and ULTRAMAT 6F types conforming to this Statement of Conformity serve the purpose of measuring the individual components in gas mixtures which are not explosive. They can be set up and operated in areas in which Category 3 apparatus are necessary.
 Electronic analysis systems and a control unit are located in the left-hand part of the housing, and are virtually identical in all versions of the analyser. In the right-hand part of the housing there are specific sensor components for each type of gas analyser, and measurement gas pipes and connections.
 The ambient temperature range is +5°C to +45°C.

The temperature class depends on the version of the analysers, and can be seen from the following table:

| Gas analyser type | Temperature class |
|--|-------------------|
| OXYMAT 6F and ULTRAMAT 6F without heated measurement gas route | T6 |
| ULTRAMAT 6F with heated measurement gas route | T6 |
| OXYMAT 6F with heated measurement gas route | T4 |

Electrical data
 (Connecting terminals for circuits in left-hand part of housing)
 Power supply circuit 100 ... 120 V a. c., 48 ... 63 Hz or
 210 ... 240 V a. c., 48 ... 63 Hz
 U_n = 284 V a. c.
 Analogue output 0/2/4 ... 20 mA, floating, impedance: 750
 optionally
 in type of protection intrinsic safety EEx ia/ib IIC/IIIB
 as shown on the test certificate of an associated apparatus
 Relay outputs 24 V, 1 A a. c. or 1 A d. c.
 (6 switch-over contacts)

Serielle Schnittstelle RS 485
 Serial interface RS 485
 Option Profibus PA
 optionally
 in type of protection intrinsic safety EEx ia/ib IIC/IIIB
 according to the test certificate of a built in associated
 apparatus



Translation

STATEMENT OF CONFORMITY



- (1) Equipment or Protective System intended for use in potentially explosive atmospheres - Directive 94/9/EC
- (3) Test certificate number

TÜV 01 ATEX 1686 X

- (4) Equipment or Protective System: Gasanalysers types OXYMAT 6F and ULTRAMAT 6F
- (5) Manufacturer: Siemens AG
- (6) Address: Östliche Rheinbrückenstraße 50
D-76187 Karlsruhe

(7) This equipment or protective system and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.
 (8) The TÜV Hannover/Sachsen-Anhalt e.V., TÜV Certification Body N° 0032, notified body in accordance with Article 9 of the Council Directive 94/9/EC of March 23, 1994, certifies that this equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive.
 The examination and test results are recorded in confidential report N° 01PX03510.

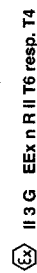
(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 50 021: 1999

(10) If the sign "X" is placed after the certification number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.

(11) This EC-type examination certificate relates only to the design and construction of the specified equipment or protective system according to Directive 94/9/EC. Further requirements of this Directive apply to the manufacture and placing on the market of this equipment or protective system.

(12) The marking of the equipment or protective system shall include the following:



Hanover, 2001-03-14

TÜV Hannover/Sachsen-Anhalt e.V.
 TÜV CERT-Zertifizierungsstelle
 Am TÜV 1
 D-30519 Hannover



Head of the Certification Body
G. Lind

This statement of conformity may only be reproduced without any change.
 Excerpts or changes shall be allowed by the TÜV Hannover/Sachsen-Anhalt e.V.



Schedule to Statement of Conformity № TÜV 01 ATEX 1686 X

Hint for the manufacturer

The test for the restricted breathing enclosure has to be carried out as a routine test in accordance with sub-section 27.2.3 of EN 50 021.

- (16) Test documents are listed in the test report No. 01PX03510.
- (17) Special conditions for safe use
 - 1. Only devices non sparking in normal operation, which are suitable for the operation in explosion hazardous areas of the zone 2 and the conditions available at the place of operation, are allowed to be connected to non intrinsically safe circuits in the zone 2.
 - 2. The analysers are only allowed to be used on media that are not inflammable. If they are inflammable, it must be ensured that their concentration in the air lies below the lower explosion limit (UEG).
 - 3. The connections for a protection gas to the electronic part must be given gas-tight seals in case of the execution of the analysers in type of protection Pressurization "p".
 - 4. It must be ensured that no potentially explosive atmosphere is present when the housing is opened.
 - 5. When the analysers are being set up out of doors, sufficient protection from the sun must be installed.

- (18) Essential Health and Safety Requirements
 - no additional ones

1.11.3 EC type Examination Certificate TÜV 01 ATEX 1697 X
(Simplified Pressurized Analyzers - Zone 2)



SCHEDULE

- (13)
- (14) **EC-TYPE EXAMINATION CERTIFICATE N° TÜV 01 ATEX 1697 X**
- (15) Description of equipment

Gas analysers of the OXYMAT 6F and ULTRAMAT 6F types serve the purpose of measuring the individual components in gas mixtures which may also be inflammable or occasionally form an explosive atmosphere when mixed with air.
Electronic analysis systems, which are virtually identical in all versions of the analyser, and a control unit are located in the left-hand part of the housing (This is the electronic part.). In the right-hand part of the housing there are specific sensor components for each type of gas analyser, and measurement gas pipes and connections (This is the physical part.).
The gas analysers are executed in type of protection Simplified Pressurization with continuous flow. The internal release from the Containment System (CS) can be regarded as limited if all the relevant technical safety precautions are taken.
The electronic part of the gas analysers may optionally be excluded from the Simplified Pressurization. According to the Statement of Conformity TÜV 01 ATEX 1686 X the electronic part is executed as a restricted breathing enclosure.
If required, a number of housings in type of protection Simplified Pressurization can be connected pneumatically in sequence.
The monitoring system for the type of protection Simplified Pressurization with continuous flow does not form part of the EC-type examination certificate.
The gas analysers can be set up and operated in potentially explosive areas in which Category 3 apparatus are necessary.
The permissible ambient temperature range is +5°C to +45°C.

The temperature class depends on the version of the analysers, and can be seen from the following table:

| Gas analysers type | Temperature class | |
|--------------------|--------------------------------------|-----------------------------------|
| | Without heated measurement gas route | With heated measurement gas route |
| ULTRAMAT 6F | T6 | T6 |
| OXYMAT 6F | T4 | T3 |

Electrical data

(Connecting terminals for circuits in left-hand part of housing)

Power supply circuit 100 ... 120 V a. c., 48 ... 63 Hz or
210 ... 240 V a. c., 48 ... 63 Hz
U_n = 264 V a. c.

Analogue output 0/2/4 ... 20 mA, floating, impedance: 750
optionally

in type of protection intrinsic safety EEx ia/ib IIC/IIB
as shown on the test certificate of an associated apparatus

Relay outputs 24 V, 1 A a. c. or 1 A d. c.
(6 switch-over contacts)



Translation

EC TYPE-EXAMINATION CERTIFICATE



- (1)
- (2) Equipment or protective system intended for use in potentially explosive atmospheres - Directive 94/9/EC
- (3) EC-Type Examination Certificate Number

TÜV 01 ATEX 1697 X

- (4) Equipment or Protective System: Gasanalysers types OXYMAT 6F and ULTRAMAT 6F
- (5) Manufacturer: Siemens AG
- (6) Address: Östliche Rheinbrückenstraße 50
D-76187 Karlsruhe

- (7) This equipment or protective system and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.
- (8) The TÜV Hannover/Sachsen-Anhalt e.V., TÜV CERT-Certification Body, notified body number N° 0032 in accordance with Article 9 of the Council Directive of the EC of March 23, 1994 (94/9/EC), certifies that this equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive.

- (9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:
EN 50 021: 1989 EN 60 079-14: 1997, Section 13 ZH 1/10, Sections 1.4.3.2; 2.3.1
If the sign "X" is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.
- (11) This EC-type examination certificate relates only to the design and construction of the specified equipment or protective system according to Directive 94/9/EC. Further requirements of this Directive apply to the manufacture and placing on the market of this equipment or protective system.

- (12) The marking of the equipment or protective system must include the following:

II 2/3 G EEx n R P II T6 resp. T4 resp. T3 or
II 2/3 G EEx n P II T6 resp. T4 resp. T3

Hanover, 2001-04-06



TÜV Hannover/Sachsen-Anhalt e.V.
TÜV CERT-Zertifizierungsstelle
A-UL
D-30519 Hannover

i.v.R.

Head of the Certification Body

This certificate may only be reproduced without any change. Excerpts or changes shall be allowed by the TÜV Hannover/Sachsen-Anhalt e.V.

1.11.4 Statement of Conformity TÜV 03 ATEX 2278 X (Dust Ex Zone 22)



SCHEDULE

STATEMENT OF CONFORMITY N° TÜV 03 ATEX 2278 X

- (13) Description of equipment
- (14) The gas analyser type CALOMAT 6F, OXYMAT 6F and ULTRAMAT 6F are used for measuring the particular components in gas mixtures. The gas analyser may be installed in explosion hazardous areas for equipment of category 3D. Separate certificates do exist with regard to explosion protection of mixtures of air with flammable gases, vapours or mists
- (15) Technical data

| | | | | |
|--|--|----------|-------------|-------|
| Permissible ambient temperature range | 5°C to 45 °C | | | |
| Degree of protection (IP) | IP 65 | | | |
| Supply voltage | 100 ... 120 V a. c., 47 ... 63 Hz resp. 200 ... 240 V a. c., 47 ... 63 Hz | | | |
| Analog output | 0/2/4 ... 20 mA, floating, impedance: 750 Ω | | | |
| Relay outputs (6 switch-over contacts) | 24 V, 1 A a. c. or 1 A d. c. | | | |
| Serial Interface | RS 485 | | | |
| Option | Profibus PA, EEx ia IIC | | | |
| Temperatures for labelling (Surface temperatures), see item (12) | | | | |
| Calomat 6F | Oxymat 6F | | | |
| only without heating | not heatable | heatable | Ultramat 6F | |
| T65°C | T60°C | T130°C | T65°C | T82°C |

- (16) Test documents are listed in the test report No. 03YEX550833.
- (17) Special condition for safe use
All connected cables have to be installed fixed.
- (18) Essential Health and Safety Requirements
no additional ones



Translation

STATEMENT OF CONFORMITY

- (1) Equipment or Protective System intended for use in potentially explosive atmospheres - Directive 94/9/EC
- (2) Test certificate number
- (3) TÜV 03 ATEX 2278 X
- (4) Equipment: Gas analyser type CALOMAT 6F, OXYMAT 6F and ULTRAMAT 6F
- (5) Manufacturer: Siemens AG
- (6) Address: Östliche Rheinbrückenstraße 50, D-76187 Karlsruhe
- (7) This equipment and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.
- (8) The TÜV NORD CERT GmbH & Co. KG, TÜV CERT-Certification Body, notified body number N° 0002 in accordance with Article 9 of the Council Directive 94/9/EC of March 23, 1994, certifies that this equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive.
- (9) The examination and test results are recorded in confidential report N° 03YEX550833. Compliance with the Essential Health and Safety Requirements has been assured by this certificate.
- (10) EN 50 281-1-1:1998+A1
- (11) If the sign "X" is placed after the certification number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.
- (12) This statement of conformity certificate relates only to the design, examination and tests of the specified equipment in accordance to the Directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment or protective system. These are not covered by this certificate.
- (13) The marking of the equipment or protective system shall include the following:
 II 3 D, IP65, T60°C resp. T65°C resp. T85°C resp. T130°C
 Hannover, 2003-10-08



TÜV NORD CERT GmbH & Co. KG
 TÜV CERT-Certification Body
 Am TÜV 1
 Steinstraße 1
 D-37075 Göttingen
 Tel.: 051 9136-3333
 Fax: 051 9136-3339



[Signature]
 Head of the Certification Body

1.11.5 FM Certificate of Compliance (Class 1, Div. 2)



h = Language: 0, 1, 2, 3, 4
 i = Further versions: A11, A28, A32, B03, B04, E20, Y01, Y02, Y03, Y11, Y12, Y13
 * Note: T4 without heater

ULTRAMAT 6F 7MB2112-abcde-fgh-i, Gas Analyzer

NI/1/2/ABCD/T3, Ta = 45°C; IP 54
 I/2/1/IC/T3, Ta = 45°C; IP 54

- a = Gas Connections: 0, 1
- b = Measured Component/Smallest/Largest Range: AA, AB, AC, BA, BB, BC, BD, BE, BF, BG, CG, DA, DB
- d = Internal gas paths/Sample cell/Reference cell: 0, 1, 3, 6, 8
- e = Additional electronics: 0, 1, 6, 7
- f = Power supply: 0, 1
- g = Heating: A, B
- h = Language: 0, 1, 2, 3, 4
- i = Further versions: A11, A28, A32, B03, B04, E20, Y01, Y02, Y03, Y11, Y12, Y13
 * Note: T4 without heater

ULTRAMAT 6E 7MB2121-abcde-fgh-i, Gas Analyzer

NI/1/2/ABCD/T4, Ta = 45°C; IP 54
 I/2/1/IC/T4, Ta = 45°C; IP 54

- a = Gas Connections: 0, 1
- b = Measured Component: A, B, X, C, D, E, F, G, H, J, K, L, M, N, P, Q, R, S
- c = Smallest/Largest Range: A, B, C, D, E, F, G, H, J, K, L, M, N, P, Q, R, S, T, U, V, W
- d = Internal gas paths/Sample cell/Reference cell: 0, 1, 2, 3, 4, 5, 6, 8
- e = Additional electronics: 0, 1, 6, 7
- f = Power supply: 0, 1
- h = Language: 0, 1, 2, 3, 4
- i = Further versions: A11, A20, A21, A31, A32, B03, B04, E20, Y01, Y02, Y03, Y11, Y12, Y13
 * Note: T4 without heater

ULTRAMAT 6E-2K 7MB2123-abcde-fgh-i, Gas Analyzer

NI/1/2/ABCD/T4, Ta = 45°C; IP 54
 I/2/1/IC/T4, Ta = 45°C; IP 54

- a = Gas Connections: 0, 1
- b = Measured Component: A, B, X, C, D, E, F, G, H, J, K, L, M, N, P, Q, R, S
- c = Smallest/Largest Range: A, B, C, D, E, F, G, H, J, K, L, M, N, P, Q, R, S, T, U, V, W
- d = Internal gas paths/Sample cell/Reference cell: 0, 1, 2, 3, 4, 5, 6, 8
- e = Additional electronics: 0, 1, 2, 3, 6, 7
- f = Power supply: 0, 1
- g = Measured Component: A, B, X, C, D, E, F, G, H, J, K, L, M, N, P, Q, R, S
- h = Smallest/Largest Range: A, B, C, D, E, F, G, H, J, K, L, M, N, P, Q, R, S, T, U, V, W
- i = Further versions: A11, A20, A21, A22, A23, A24, A25, A31, A32, A40, A41, B03, B04, B05, E20, Y01, Y02, Y03, Y11, Y12, Y13

ULTRAMAT 6E 7MB2124-abcde-fgh-i, Gas Analyzer

NI/1/2/ABCD/T4, Ta = 45°C; IP 54
 I/2/1/IC/T4, Ta = 45°C; IP 54

- a = Gas Connections: 0, 1
- b = Measured Component/Smallest/Largest Range: AA, AB, AC, BA, BB, BC, BD, BE, BF, BG, CG, DA, DB
- d = Internal gas paths/Sample cell/Reference cell: 0, 1, 3, 4, 5, 6, 8
- e = Additional electronics: 0, 6
- f = Power supply: 0, 1
- g = Measured Component: W, A, B, X, C, D, E, F, G, H, J, K, L, M, N, P, Q, R, S
- h = Smallest/Largest Range: A, B, C, D, E, F, G, H, J, K, L, M, N, P, Q, R, S, T, U, V, W
- i = Further versions: A11, A20, A21, A22, A23, A24, A25, A31, A32, A40, A41, B03, B04, B05, E20, Y01, Y02, Y03, Y11, Y12, Y13



FM Approvals
 1151 Boston-Providence Turnpike
 P.O. Box 9102, Norwood, MA, 02062, USA
 T: 781.762.4300 F: 781.762.9375 www.finglobal.com

CERTIFICATE OF COMPLIANCE

HAZARDOUS (CLASSIFIED) LOCATION ELECTRICAL EQUIPMENT

This certificate is issued for the following equipment:

OXYMAT 6F 7MB2071-abcde-fgh-i, Gas Analyzer

NI/1/2/ABCD/T3, Ta = 45°C; IP 54
 I/2/1/IC/T3, Ta = 45°C; IP 54

- a = Gas Connections: 0, 1, 2, 3
- b = Smallest possible span O₂: A, B, C, D, E, F
- c = Sample cell: A, B, C, D
- d = Heating: 0, 1
- e = Power supply: 0, 1
- f = Reference gas monitoring: A, B
- g = Additional electronics: A, B, E, F
- h = Language: 0, 1, 2, 3, 4
- i = Further versions: A11, A32, B01, E20, Y01, Y02, Y11
 * Note: T4 without heater

OXYMAT 6E 7MB2071-abcde-fgh-i, Gas Analyzer

NI/1/2/ABCD/T4, Ta = 45°C; IP 54
 I/2/1/IC/T4, Ta = 45°C; IP 54

- a = Gas Connections: 0, 1, 2, 3
- b = Smallest possible span O₂: A, B, C, D, E, F
- c = Sample cell: A, B, C, D
- d = Internal gas paths: 0, 1, 3
- e = Power supply: 0, 1
- f = Reference gas monitoring: A, B, C, D
- g = Additional electronics: A, B, D, E, F
- h = Language: 0, 1, 2, 3, 4
- i = Further versions: A11, A31, A32, B01, B03, E20, Y01, Y02, Y03, Y11, Y20

ULTRAMAT 6F 7MB2111-abcde-fgh-i, Gas Analyzer

NI/1/2/ABCD/T4, Ta = 45°C; IP 54
 I/2/1/IC/T4, Ta = 45°C; IP 54

- a = Gas Connections: 0, 1
- b = Measured Component: A, B, X, C, D, E, F, G, H, J, K, L, M, N, P, Q, R, S
- c = Smallest/Largest Range: A, B, C, D, E, F, G, H, J, K, L, M, N, P, Q, R, S, T, U, V, W
- d = Internal gas paths/Sample cell/Reference cell: 0, 1, 3, 6, 8
- e = Additional electronics: 0, 1, 6, 7
- f = Power supply: 0, 1
- g = Heating: 0, 1



FM Approvals h.C. 802
 3016050
 Page 1 of 4



FM Approvals h.C. 802
 3016050
 Page 2 of 4



This certifies that the equipment described has been found to comply with the following FM Approval Standards and other documents:

Class 3600 1988
Class 3811 1989

Original Project ID: 3016050 FM Approval Granted: July 15, 2003

Subsequent Revision Reports / Date FM Approval Amended
Report Number Date Report Number Date

July 17, 2003
Date

FM Global Technologies LLC

Nicholas P. Ludlam
Nicholas P. Ludlam
Technical Team Manager



FM Approvals HLC 802 3016050 Page 4 of 4



FM Approvals
1151 Boston-Providence Turnpike
P.O. Box 9102, Norwood, MA 02062 USA
T: 781.762.4300 F: 781.762.3375 www.fmglobal.com

CERTIFICATE OF COMPLIANCE

HAZARDOUS (CLASSIFIED) LOCATION ELECTRICAL EQUIPMENT

This certificate is issued for the following equipment:

OXYMAT 6F TMB2071-abc00-e1gh-Z-41 Gas Analyzer

NI/1/2 / ABCD / T3, Ta = 45°C; IP 54
I/2 / IIC / T3, Ta = 45°C; IP 54

- a = Gas Connections: 0, 1, 2, 3
- b = Smallest possible span O₂: A, B, C, D, E, F
- c = Sample cell: A, B, C, D
- d = Heating: 0, 1
- e = Power supply: 0, 1
- f = Reference gas monitoring: A, B
- g = Additional electronics: A, B, E, F
- h = Language: 0, 1, 2, 3, 4
- i = Further versions: A11, A32, B01, E20, Y01, Y02, Y11

* Note: T4 without heater

OXYMAT 6E TMB2071-abc00-e1gh-Z-41 Gas Analyzer

NI/1/2 / ABCD / T4, Ta = 45°C; IP 54
I/2 / IIC / T4, Ta = 45°C; IP 54

- a = Gas Connections: 0, 1, 2, 3
- b = Smallest possible span O₂: A, B, C, D, E, F
- c = Sample cell: A, B, C, D
- d = Internal gas paths: 0, 1, 3
- e = Power supply: 0, 1
- f = Reference gas monitoring: A, B, C, D
- g = Additional electronics: A, B, D, E, F
- h = Language: 0, 1, 2, 3, 4
- i = Further versions: A11, A31, A32, B01, B03, E20, Y01, Y02, Y03, Y11, Y20

ULTRAMAT 6F TMB21711-abc00-fga1h-Z + I Gas Analyzer


NI/1/2 / ABCD / T4, Ta = 45°C; IP 54
I/2 / IIC / T4, Ta = 45°C; IP 54

- a = Gas Connections: 0, 1
- b = Measured Component: A, B, X, C, D, E, F, G, H, J, K, L, M, N, P, Q, R, S
- c = Smallest/Largest Range: A, B, C, D, E, F, G, H, J, K, L, M, N, P, Q, R, S, T, U, V, W
- d = Internal gas paths/Sample cell/Reference cell: 0, 1, 3, 6, 8
- e = Additional electronics: 0, 1, 6, 7
- f = Power supply: 0, 1
- g = Heating: 0, 1



FM Approvals HLC 802 3016050 Page 1 of 4

1.11.6 CSA Certificate of Compliance (Class 1, Zone 2)




Certificate of Compliance

Master Contract: 220224
Date Issued: April 17, 2003

Certificate: 1431560
Project: 1431560

Issued to: Siemens AG - A & D PA21/22,
 Ostliche Rheinbruckenstrabe 50
 D-76187 Karlsruhe
 GERMANY

The products listed below are eligible to bear the CSA Mark shown



Authorized by: G. Foulem

PRODUCTS


CLASS 2258 02 - PROCESS CONTROL EQUIPMENT - For Hazardous Locations

Permanently connected Ultramat 6 gas analyzer and Oxyamat 6 gas analyzer, Rack mounted or Panel Mounted.

Gasanalyzers for Class 1, Zone 2 Ex nA II T4/T3 (without/with heater) , Class I, D,Ive. 2, Gps ABCD, T4/T3 (without/with heater)

| Model code | Description |
|-------------------------|--|
| 7MB2011-xxxx0-xxxx-Z +a | OXYMAT 6F (Field Version) |
| 7MB2021-xxxx0-xxxx-Z +a | OXYMAT 6E (Rack Version) |
| 7MB2111-xxxx-xxAx-Z +a | ULTRAMAT 6F (Field Version) |
| 7MB2112-xxxx-xxAX-Z +a | ULTRAMAT 6 E (2 IR-Components Field Version) |
| 7MB2121-xxxx-xxxx-Z +a | ULTRAMAT 6E (Rack Version) |
| 7MB2123-xxxx-xxxx-Z +a | ULTRAMAT 6E-2K(Two Channel Rack Version) |
| 7MB2124-xxxx-xxxx-Z +a | ULTRAMAT 6E (2 or 3 IR-Comp., 1 or 2 Channel Rack Version) |
| 7MB2023-xxxx-xxxx-Z +a | ULTRAMAT/OXYMAT 6E (2 Channel Rack Version) |
| 7MB2024-xxxx-xxxx-Z +a | ULTRAMAT/OXYMAT 6E (2 IR + 1 O2 Comp., 2 Channel Rack Version) |

suffix -a (3 digits) denotes any letter or number referring to non electrical properties as product associates, documentation etc..



Master Contract: 220224
Date: April 17, 2003

Certificate: 1431560
Project: 1431560

ELECTRICAL RATINGS:


Voltage: 100 - 120 / 200 - 240Vac
 Power: 70 VA

NOTE:
 For use in other equipment where the suitability of the combination is to be determined by CSA INTERNATIONAL.

Rackmount versions must be installed in a suitable enclosure, cabinet or rack with provisions for connections of Division 2 wiring methods, acceptable to the local inspection authority having jurisdiction.

APPLICABLE REQUIREMENTS

CAN/CSA-C22.2 No. 1010.1-92 - Safety Requirement for Electrical Equipment for Measurement, Control and Laboratory Use, Part 1, General Requirements
 CAN/CSA-C22.2 No. 213-M87 - Non-incendive Electrical Equipment for Use in Class I, Division 2 Hazardous Locations
 CAN/CSA-E60079-15.02 - Electrical Apparatus for Explosive Gas Atmosphere - Part 15: Type of protection "ip".


CSA INTERNATIONAL

Supplement to Certificate of Compliance

Certificate: 1431560 Master Contract: 220224

*The products listed, including the latest revision described below,
are eligible to be marked in accordance with the referenced Certificate.*

Product Certification History

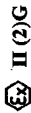
| Project | Date | Description |
|---------|----------------|--|
| 1431560 | April 17, 2003 | Original Certification. Model Ultramat 6 Gas analyzer and Oxymat Gas analyzer. |

LXOD-807WD-2003/01/01

1.11.7 EC type Examination Certificate BVS 03 ATEX G 013 X (Gas Warning Equipment)



(12) The marking of the equipment shall include the following:



Deutsche Montan Technologie GmbH
Bochum, dated 17. October 2003

Signed: Jockers

Certification body

Signed: Kleewetter

Special services unit



Translation

EC-Type Examination Certificate

(1) - Directive 94/9/EC -
Equipment and protective systems intended for use
in potentially explosive atmospheres

(2) **BVS 03 ATEX G 013 X**

(3) **gas analysers types Oxymat 6E and Oxymat 6F**

(4) **Manufacturer: Siemens AG**

(5) **Address: D-76187 Karlsruhe**

(6) The design and construction of this equipment and any acceptable variation thereto are specified in the schedule to this type examination certificate.

(7) The certification body of Deutsche Montan Technologie GmbH, notified body no. 0158 in accordance with Article 9 of the Directive 94/9/EC of the European Parliament and the Council of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive.

(8) The examination and test results are recorded in the test report PFG-no. 41300203P.

(9) The Essential Health and Safety Requirements with respect to the measuring function for explosion protection are assured by application of:

DIN EN 50104 (VDE 0400 part 20 / 10/2002)
DIN EN 50271 (VDE 0400 part 21 / 05/2002)

This EC-type examination certificate covers the measuring function for oxygen (for use for the measurement of inertiation) in the measuring range 0 - 21 % (v/v). This EC-type examination certificate covers apparatus (order no. 7MB20xx-xxxx-xxxx-2A...-E50...) with software version V4.5.0.

(10) If the sign 'X' is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

(11) This EC-Type Examination Certificate relates only to the design, examination and tests of the specified equipment in accordance to Directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment. These are not covered by this certificate.



page 2 of 3 to BVS 03 ATEX G 013 X
This certificate may only be reproduced in its entirety and without change
Direktionsbüro 44889 Bochum Telefon-Phone 0201/7253947 Telefax-Fax 0201/72-5348
until 31.05.2008; Deutsche Montan Technologie GmbH, Am Technologiepark 1, 45307 Essen

page 1 of 3 to BVS 03 ATEX G 013 X
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Appendix to

EC-Type Examination Certificate

BVS 03 ATEX G 013 X

(13)

(15) **15.1 Subject and type**

gas analyzers type Oxymat 6E and Oxymat 6F (not explosion-protected mode)

15.2 Description

The gas analyzers type Oxymat 6E and Oxymat 6F (not explosion-protected mode) are fixed apparatus for the measurement of oxygen. The apparatus are not intended to be used in potentially explosive atmospheres.

15.3 Parameters

not applicable

(16)

TEST AND ASSESSMENT REPORT

PTG-no. 41300203P dated 16/10/2003

(17)

Special conditions for safe use

- Suitable flame arrestors shall be built into the measuring gas intake and outlet pipes if there is any possibility that the measuring gases could be potentially explosive.
- Relays shall be configured for signalling the indicators fault and function control.
- The analogue output shall be configured to the setting: 4-20 (Nemur).
- The analogue output shall be monitored for falling below 0 mA or exceeding 22 mA in order to detect faults of the apparatus which are not signalled by a fault indication.
- If the automatic change between measuring ranges is activated, the four alarms shall be configured with the same settings for all measuring ranges.

We confirm the correctness of the translation from the German original.
In the case of arbitration only the German wording shall be valid and binding.

44809 Bochum, 17. October 2003
PFG-Kic

Deutsche Montan Technologie GmbH

[Signature]
Certification body

[Signature]
Special services unit

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Translation



1st Supplement
 (Supplement in accordance with Directive 94/9/EC Annex III number 6)
to the EC-Type Examination Certificate
BVS 03 ATEX G 013 X

Equipment: gas analyzer type Oxyamat 6F
Manufacturer: Siemens AG
Address: D-76187 Karlsruhe

Description

The Essential Health and Safety Requirements with respect to the measuring function for explosion protection are assured by application of:

DIN EN 50104 (VDE 0490 part 20 / 10/2002)
 DIN EN 50271 (VDE 0490 part 21 / 05/2002)

This supplement to the EC-type examination certificate covers the measuring function for oxygen (for use for the measurement of inertness) in the measuring range 0 - 21 % (v/v). This EC-type examination certificate covers apparatus type Oxyamat 6F in explosion-protected design (order no. 7MBE201x-xxxx-xxxx-Z1-...-HE31-...) with software version V4.5.0.

marking

II 2 G EEx p [ia] ia IIC T4 bzw. T3

Test report

PTG-no. 41300203P dated 16/10/2003
 EC-type examination certificate PTB 00 ATEX 2022 X
 2nd supplement to the EC-type examination certificate PTB 00 ATEX 2022 X

Page 1 of 2 to BVS 03 ATEX G 013 X NI
 This certificate is not valid for other equipment than the one described above.
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 mail 31.03.2003 Deutsche Montan Technologie GmbH, Am Technologiepark 1, 45307 Essen

Special conditions for safe use

- see 2nd supplement to the EC-type examination certificate PTB 00 ATEX 2022 X
- Relays shall be configured for signalling the indications fault and function control.
- The analogue output shall be configured to the setting "4-20 (Numer)".
- The analogue output shall be monitored for falling below 0 mA or exceeding 22 mA in order to detect faults of the apparatus which are not signalled by a fault indication.
- If the automatic change between measuring ranges is activated, the four alarms shall be configured with the same settings for all measuring ranges.

Deutsche Montan Technologie GmbH
 Bochum, dated 17/10/2003

Signed: Jockers Certification body
 Signed: Klasevotzer Special services unit

We confirm the correctness of the translation from the German original.
 In the case of arbitration only the German wording shall be valid and binding.

44809 Bochum, 17. October 2003
 PFG-Kie

Deutsche Montan Technologie GmbH

Certification body

 Special services unit

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Translation



3rd Supplement
 (Supplement in accordance with Directive 94/9/EC Annex III number 6)
to the EC-Type Examination Certificate
BVS 03 ATEX G 013 X

Equipment: gas analyzer type Oxyamat 6F
Manufacturer: Siemens AG
Address: D-76187 Karlsruhe

Description

The Essential Health and Safety Requirements with respect to the measuring function for explosion protection are assured by application of:

DIN EN 50104 (VDE 0400 part 20 / 10/2002)
 DIN EN 50271 (VDE 0400 part 21 / 05/2002)

This supplement to the EC-type examination certificate covers the measuring function for oxygen (for use for the measurement of inertisation) in the measuring range 0 - 21 % (v/v). This EC-type examination certificate covers apparatus type Oxyamat 6F in explosion-protected design (order no. 7MB201x-xxxx-xxxx-Z...-E32...) with software version V4.5.0.

marking

II 2 G EEx p ia [ia] IIC T4 bzw. T3

Test report

PRG.no. 41300203P dated 16/10/2003
 EC-type examination certificate TÜV 01 ATEX 1708 X

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Special conditions for safe use

- see EC-type examination certificate TÜV 01 ATEX 1708 X
- Relays shall be configured for signalling the indications fault and function control.
- The analogue output shall be configured to the setting "4..20 (NAmur)".
- The analogue output shall be monitored for falling below 0 mA or exceeding 22 mA in order to detect faults of the apparatus which are not signalled by a fault indication.
- if the automatic change between measuring ranges is activated, the four alarms shall be configured with the same settings for all measuring ranges.

Deutsche Montan Technologie GmbH
 Bochum, dated 17/10/2003

Signed: Jockers _____ Signed: Kieseeweter _____
 Certification body _____ Special services unit _____

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44809 Bochum, 17. October 2003

PRG-Kie

Deutsche Montan Technologie GmbH

 Certification body _____
 Special services unit _____

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Installation Guidelines

2

| | | |
|---------|---|------|
| 2.1 | Safety Information | 2-2 |
| 2.2 | Installation Requirements | 2-3 |
| 2.2.1 | General | 2-3 |
| 2.2.2 | Gas-proof Analyzers for Measurement of Non-flammable Gases or Gas/air Mixtures Below the LEL in Potentially Explosive Atmospheres of Zone 2 | 2-4 |
| 2.2.3 | Simplified Pressurized Analyzers for Measurement of Flammable Gases or Gas/air Mixtures Occasionally Above the LEL in Potentially Explosive Atmospheres of Zone 2 | 2-5 |
| 2.2.4 | Dust-protected Analyzers for Analysis of Gases in Zone 22 | 2-9 |
| 2.2.5 | OXYMAT 6 Gas Warning Equipment for Monitoring of Inertisation Processes | 2-10 |
| 2.2.6 | Use of Gas Analyzers with CSA and FM Certificates | 2-11 |
| 2.2.6.1 | Field Devices | 2-11 |
| 2.2.6.2 | Rack-mounted Devices | 2-12 |
| 2.3 | Gas Connections and Internal Gas Paths | 2-14 |
| 2.3.1 | Sample Gas Line | 2-14 |
| 2.3.2 | Reference Gas Line | 2-17 |
| 2.3.3 | Purging Gas Connection | 2-18 |
| 2.3.4 | Pressure Sensor | 2-18 |
| 2.3.5 | Gas Path | 2-19 |
| 2.4 | Gas Conditioning | 2-24 |
| 2.5 | Electric Connection | 2-25 |
| 2.5.1 | Power Supply Connection | 2-25 |
| 2.5.2 | Connection of Signal Cables | 2-26 |
| 2.5.3 | Pin Assignments of ULTRAMAT 6E and OXYMAT 6E | 2-29 |
| 2.5.4 | Pin Assignments of Autocal Module ULTRAMAT 6E and OXYMAT 6E .. | 2-30 |
| 2.5.5 | Example of Autocal Circuit ULTRAMAT 6E and OXYMAT 6E | 2-31 |
| 2.5.6 | Pin and Terminal Assignments of ULTRAMAT 6F and OXYMAT 6F ... | 2-32 |
| 2.5.7 | Terminal Assignments of Autocal Module ULTRAMAT 6F and OXYMAT 6F | 2-33 |
| 2.5.8 | Example of Autocal Circuit ULTRAMAT 6F and OXYMAT 6F | 2-34 |
| 2.6 | Dimensional Drawings | 2-35 |
| 2.6.1 | ULTRAMAT 6E and OXYMAT 6E | 2-35 |
| 2.6.2 | ULTRAMAT 6F and OXYMAT 6F | 2-39 |



Note!

All text positions within a section which require special treatment either of the **ULTRAMAT 6E/F** or the **OXYMAT 6E/F** are shown in frames and identified by the respective analyzer name. Complete paragraphs on an analyzer have the associated name in the title line.

2.1 Safety Information



Warning

Certain parts in this analyzer carry dangerous voltages. The housing must be closed and grounded before switching on the analyzer. Death, personal injury and/or damage to property may result if this is not observed. Also refer to Sections 2.5 and 2.5.1.

A standard analyzer must not be used in potentially explosive atmospheres. Use with gases with flammable components at concentrations above the lower explosion limit (LEL) is only permissible in analyzers with piping (see also expert's report BB-EG1-KAR Gr01X (German) or Gr02X (English) from the TÜV Süddeutschland (South German Technical Inspectorate)). Field devices must be additionally purged with inert gas at a flow rate of at least 1 l/min.

With observation of specific conditions, the **ULTRAMAT 6F** and **OXYMAT 6F** may be used in areas where non-metallic combustible dusts only seldom occur, and then only briefly (Ex Zone 22). Details can be found in the EC conformity statement TÜV 03 ATEX 2278 X and must always be observed.

With observation of specific conditions and with application of appropriate safety equipment, the **ULTRAMAT 6F** and **OXYMAT 6F** may be used in areas where explosive gas mixtures seldom occur (Ex zone 2 or Class 1, Div. 2). Further details can be obtained from the test certificates TÜV 01 ATEX 1686X and TÜV 01 ATEX 1697 X or the Certificates of Compliance by CSA International, certificate No. 1431560 and the FM Approvals, Project ID 3016050, and must always be observed.

With observation of specific conditions and with application of appropriate safety equipment, the **ULTRAMAT 6F** and **OXYMAT 6F** in the Ex version may be used in areas where explosive gas mixtures occasionally occur (Ex zone 1). Non-flammable and flammable gases may be measured, and also explosive gas mixtures occasionally. The details can be obtained from the EC-Type Examination Certificates PTB 00 ATEX 2022 X and TÜV 01 ATEX 1708 X, and must always be observed. More details can also be found in the supplementary instructions for Ex analyzers for use in Ex Zone 1 (Order No. A5E00058873).

In all cases, the appropriate explosion protection measures must be clarified with the responsible authorities. Start-up is the responsibility of the owner.

When measuring toxic or corrosive gases, it may occur that sample gas collects in the analyzer as a result of leaks in the gas path. To prevent the danger of poisoning, and/or damage to parts of the device, the analyzer or the system must be purged with inert gas (e.g. nitrogen). The gas displaced by purging must be collected using suitable equipment (**ULTRAMAT 6E** and **OXYMAT 6E**) and routed for environmentally-friendly disposal via an exhaust line. The same applies to purging of the **ULTRAMAT 6F** and **OXYMAT 6F**.

Heated analyzers must **always** be purged when used with corrosive gases.

**Danger of burns**

The temperature of heated analyzers only drops slowly because of the high thermal capacity of the materials used. Therefore temperatures of up to 130 °C may still be present even when the device has been switched off for a longer time.

2.2 Installation Requirements

2.2.1 General

In order to achieve as high a measuring quality as possible, the installation location should be free of vibrations (see also Section 3.5).

The **ULTRAMAT 6E** and **OXYMAT 6E** must be placed on supporting rails if they are to be fitted in a cabinet or desktop housing. Assembly only at the front is insufficient because the weight of the analyzer would place too great a load on the chassis.

When installing in switchgear cabinets, ensure that there is sufficient ventilation between the devices.

When installing the **ULTRAMAT 6F** and **OXYMAT 6F** wall mount analyzers, use a support dimensioned according to the weight of the analyzer. The housing must be securely fixed at all four mounting points.

If the device is to be installed outdoors, ensure that it is protected from direct solar radiation.

Make sure during operation that the permissible ambient temperature of 5 to 45 °C is retained (see Sections 3.6 to 3.9 "Technical data").

OXYMAT 6E/F

Magnetically sensitive devices should not be installed in the immediate vicinity of the **OXYMAT 6E/F** since it emits magnetic stray fields as a result of its principle. Depending on the sensitivity, distances up to 50 cm are necessary (see also *function 57*).

ULTRAMAT 6E/F

Correct results can only be expected if the ambient air of the analyzer section is completely free of the measured component. The same applies to gases which exhibit a cross-sensitivity to the measured gas component. If the component is present in the ambient air, the **ULTRAMAT 6E/F** housing must be purged with inert gas (e.g. N₂). In all CO₂ rack mount analyzers in standard versions, the analyzer section is sealed by O-rings.

2.2.2 Gas-proof Analyzers for Measurement of Non-flammable Gases or Gas/air Mixtures Below the LEL in Potentially Explosive Atmospheres of Zone 2

| | |
|----------------------------------|---|
| Application | <p>Only gases whose composition is below the lower explosion limit (LEL) may be connected to gas-proof analyzers (degree of protection EEx nR).</p> <p>Connection of flammable and/or occasionally explosive gas mixtures is not permissible with the above-mentioned Ex degree of protection!</p> |
| Installation instructions | <ul style="list-style-type: none">• The wetted parts materials must be resistant to the sample gas.• The requirements of VDE 0165 (EN 60079-14) must be observed when installing gas-proof analyzers. Special care must be taken with the cable inlets (PG screwed cable glands) since the gas-proof function may be threatened if carried out improperly.• All cables must be fixed when layed!• Torque and permissible cable diameter range for the PG screwed cable glands:<ul style="list-style-type: none">- M20 x 1,5: $3,8 \pm 0,2$ Nm; cable diameter: 7 ... 12 mm- M20 x 1,5: $5,0 \pm 0,2$ Nm; cable diameter: 10 ... 14 mm• When installing the analyzer outdoors, ensure that it is protected from direct solar irradiation; also observe the permissible ambient temperature range on the rating plate.• The purging gas couplings must be closed gas-tight.• If signals (e.g. analog output 4 ... 20 mA) are to be conducted into a potentially explosive atmosphere of zone 1, they must be intrinsically-safe. Supplementary retrofitting of the analyzer with energy-limiting modules is necessary. <p>The Ex identification of these modules must be clearly visible on the housing.</p> |
| Notes on operation | <ul style="list-style-type: none">• The control panel (window + keyboard) must only be cleaned with a moist cloth.• The keyboard must only be used for servicing purposes (diagnostics, calibration/adjustment).• Before opening the analyzer, make sure that there is no danger of explosion. |

2.2.3 Simplified Pressurized Analyzers for Measurement of Flammable Gases or Gas/air Mixtures Occasionally Above the LEL in Potentially Explosive Atmospheres of Zone 2

Application

Flammable gases or gas/air mixtures (sample gases) which are occasionally above the lower explosion limit (LEL) may also be connected to simplified pressurized analyzers (degree of protection EEx nP).
Frequently or permanently explosive gas mixtures must not be connected!

Notes on installation and operation

- The regulations for the installation of electrical equipment in potentially explosive atmospheres according to EN 60079-14 (DIN VDE0165), especially Section 13, must be observed. Furthermore, the statements ("Special conditions") made in the EC-Type Examination Certificate must be observed.
- When connecting flammable gases or occasionally explosive gas mixtures up to an absolute pressure of 3000 hPa (3 bar) to the **OXYMAT 6** or 1500 hPa (1.5 bar) to the **ULTRAMAT 6**, an inert gas (e.g. nitrogen) must be used as the protective gas.
- Appropriate flame arrestors must be additionally provided at the sample gas inlet and outlet for the **OXYMAT 6**. In addition, the reference gas pressure must be present for at least 5 minutes prior to starting up the analyzer, and must be permanently monitored. It must be at least 0.1 MPa above the sample gas pressure for safety reasons!
- Depending on the density of the sample gas, the inlet for the protective gas on the right half of the analyzer must be selected as follows:

Density of sample gas > density of protective gas: inlet: coupling 8, outlet: coupling 7
Density of sample gas < density of protective gas: inlet: coupling 7, outlet: coupling 8.
- Before starting up, preliminary purging must be carried out with at least five times the housing volume (approx. 50 l). This preliminary purging can also be started and terminated manually.
- To achieve a pressurized enclosure, permanent purging of the housing must be carried out with an excess pressure of at least 50 Pa; the volume flow of the protective gas must be at least 1 l/min.
- Excess pressure must be monitored in reliable form, the volume flow in fail proof form (redundant) using appropriate equipment. Measures must be taken immediately in the event of a failure in order e.g. to guarantee system safety.
- The minimum internal diameter and length of the protective gas exhaust lines must be dimensioned such that an internal housing pressure of 165 hPa is not violated on the one hand, and that the volume flow of the protective gas is at least 1 l/min on the other.

- It is always possible to purge several housings in series. The preliminary purging duration and the volume flow for continuous purging must be adapted to the number of analyzers; the volumes of the protective gas connection lines must also be taken into account. The volume flow of the protective gas must be monitored at the purging gas outlet of the last analyzer.
- It is additionally possible to only purge the right-hand side (approx. 25 l) of the housing in which the analyzer section is present. The left-hand side is a gas-proof enclosure and does not require purging; the additional information on the gas-proof function must be observed (see Section 5).
- When installing the analyzer outdoors, ensure that it is protected from direct solar radiation; also observe the permissible ambient temperature range on the rating plate.
- If signals (e.g. analog output 4 ... 20 mA) are to be connected into a potentially explosive atmosphere of zone 1, they must be intrinsically-safe. Supplementary retrofitting of the analyzer with energy-limiting modules is necessary.

The Ex identification of these modules must be clearly visible on the housing.

Sample gas path in the analyzer (containment system)

- The wetted parts materials must be resistant to the sample gas.
- The analyzer should be subject to annual maintenance to check the electrical safety and functionality, especially a leak test of the containment system is strongly recommended. The procedure is described below (recommended test setup: see Fig. 2-1).

It's entirely up to the owner whether the maintenance interval can be extended in individual cases if no negative influences are expected especially as far as chemical corrosion of the gaskets wetted by the sample gas is concerned.

The gaskets must be replaced if the leak test is negative.

- A leak test must also be carried out following any service work on the containment system.

OXYMAT 6 leak test: Recommended test setup

Reference gas connection 3 and sample gas outlet 4 must be closed using a dummy cap. A shut-off device (e.g. solenoid valve) with sufficient tightness must be connected between sample gas inlet 2 and the sample gas line.

A pressure sensor (range: 2000 hPa, resolution: 0.1 hPa) must be connected to the line.

A needle valve with sufficient tightness must be connected between the test gas source and sample gas outlet 4.

**ULTRAMAT 6 leak test:
Recommended
test setup**

Sample gas outlet 2 must be closed using a dummy cap. A shut-off device (e.g. solenoid valve) with sufficient tightness must be connected between sample gas inlet 1 and the sample gas line (dashed line).
A pressure sensor (range: 500 hPa, resolution: 0.1 hPa) must be connected to the line.
A needle valve with sufficient tightness must be connected between the test gas source and sample gas outlet 4.

Leak test

- To establish the pressure, carefully open the needle valve until the test pressure is achieved in the containment system. Then close the needle valve.
- Wait for 5 minutes to permit thermal compensation prior to determining the rate of pressure drop.
- Then carry out the subsequent leak test by determining the change in pressure Δp within a further 5 minutes.
- The gas path is sufficiently leak-proof if the change in pressure Δp in 5 minutes lies below the value listed in the following table.

| Device | Test pressure | Test value ^{*)} Δp |
|-------------------|------------------------|-------------------------------------|
| OXYMAT 6 | 2000 hPa (rel.) | 4.2 hPa |
| ULTRAMAT 6 | 500 hPa (rel.) | 1.2 hPa |

^{*)} The test values have been defined under the assumption that the total volume between the pressure sensor (manometer), the shut-off equipment and the containment system is approx. 25 ml greater than the volume of the containment system in the analyzer. These 25 ml correspond to a pipe length of approx. 2 m with an internal diameter of 4 mm.

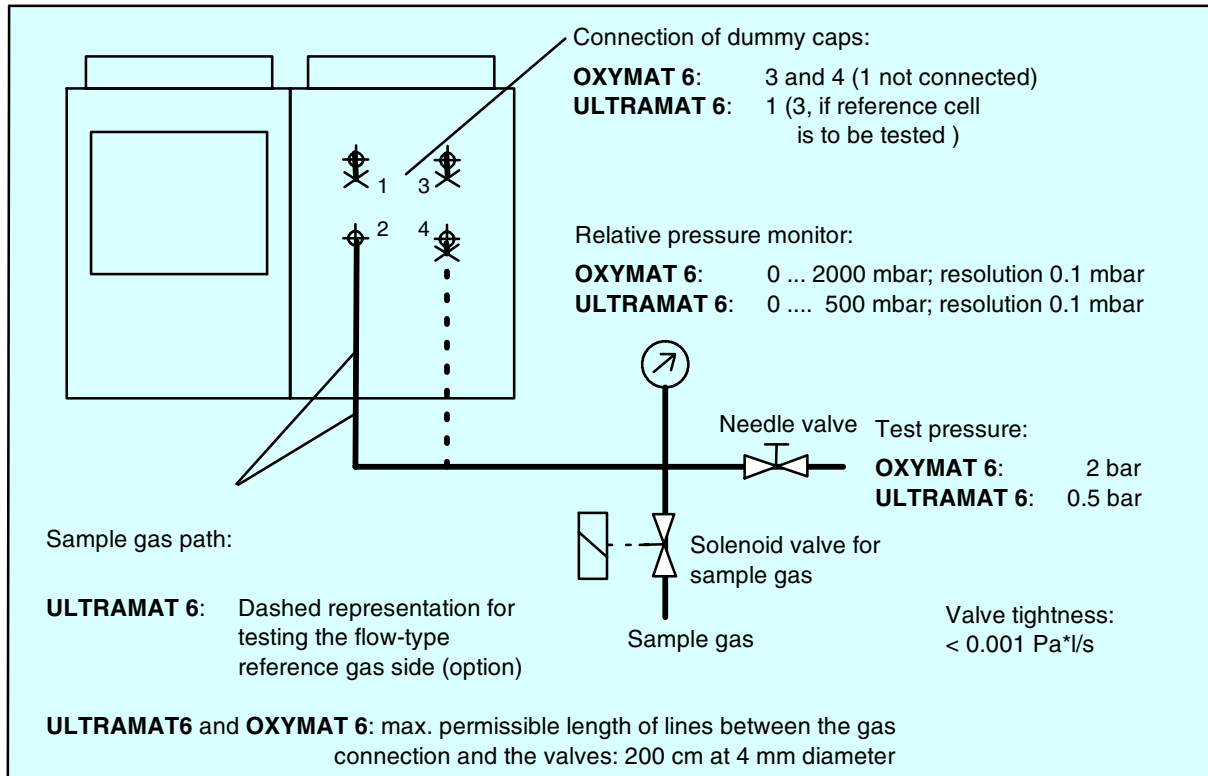


Fig. 2-1 Recommended test setup for leak testing of OXYMAT 6F and ULTRAMAT 6F

Notes on operation

- The control panel (window + keyboard) must only be cleaned with a moist cloth.
- The keyboard must only be used for servicing purposes (diagnostics, calibration/adjustment).
- Before opening the analyzer, make sure that there is no explosion hazard.

Additional information on gas-proof function

- Special care must be taken with the cable inlets (screwed cable glands) since the gas-proof function may be threatened if carried out improperly.
- All cables must be fixed when routing!
- Torque and permissible cable diameter range for the screwed cable glands:
 - PG 13.5: $3.8 \pm 0.2 \text{ Nm}$; cable diameter: 6 ... 12 mm
 - PG 16: $5.0 \pm 0.2 \text{ Nm}$; cable diameter: 10 ... 14 mm
- The purging gas couplings of the left-hand half of the housing must be closed gas-tight.

Connection to monitoring equipment

The simplified pressurized enclosure permits manual connection of the preliminary purging with subsequent manual switchover to the operating phase. Should a fault occur in the purging during the operating phase, it is additionally possible to select whether only an alarm is distributed (see Fig. 2-2, top half) or whether the analyzer is to be automatically switched off (Fig. 2-2, bottom half).

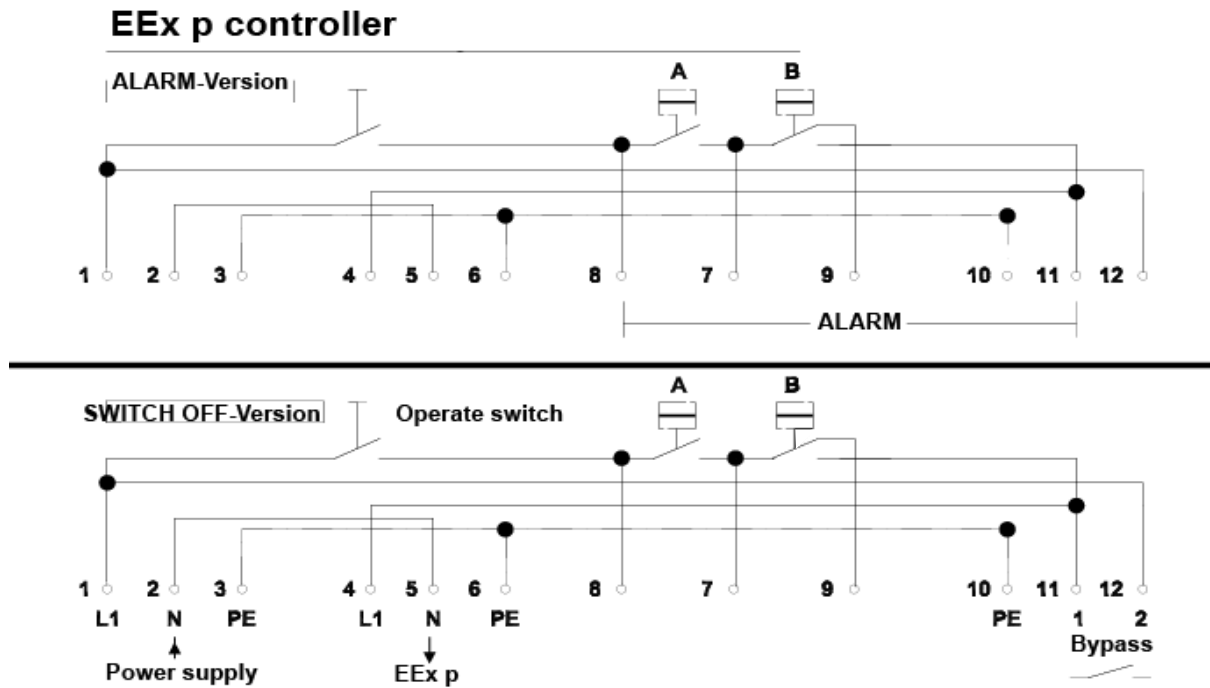


Fig. 2-2 EEx nP controller

2.2.4 Dust-protected Analyzers for Analysis of Gases in Zone 22

- When installing in Zone 22, the associated sections in the installation standard VDE 0165, Part 2 and EN 50281-1-2 must always be observed.
- All connected cables must be fixed when layed!
- Ensure in particular that dust deposits above 5 mm are avoided. The analyzer must therefore be regularly cleaned.
- Only a moist cloth may be used for cleaning around the display.
- The analyzer may only be opened if no explosive atmosphere is present.
- The points described in Sections 2.2.2 and 2.2.3 must be observed for the passage of gases into the analyzer!

2.2.5 OXYMAT 6 Gas Warning Equipment for Monitoring of Inertisation Processes

The special conditions of the EC-Type Examination Certificate BVS 03 ATEX G013 X must be observed!

Reference is expressly made at this point to a number of special features concerning device parameterization:

- Only 4-20 mA/NAMUR is permitted as setting for the analog output.
- The limit monitoring is factory-set such that upward and downward violations of limits must be acknowledged.
- A overload conductor must be fitted in analyzers with heated gas path.
These special features are identified and described in detail in the respective sections.
- Appropriate flame arrestors must be fitted in the sample gas inlet and outlet lines if it cannot be excluded that the sample gases could be explosive.
- Relays must be configured for display of the messages "Fault" and "Function control".
- The analog output must be monitored for falling below 0 mA and exceeding 22 mA in order to be able to detect analyzer faults which are not covered by an error message.
- When using autoranging, the four alarms must be configured with the same setting in all measuring ranges.

2.2.6 Use of Gas Analyzers with CSA and FM Certificates

2.2.6.1 Field Devices

The following table lists the instructions and requirements for use of the gas analyzers certified according to the CSA and FM guidelines in hazardous areas of Class 1, Division 2 and Class 1, Zone 2

| Requirement for | FM/CSA Class 1, Division 2 | FM/CSA Class 1, Zone 2 |
|-------------------|---|---|
| Enclosure | The degree of protection IP 65 for the gas analyzer satisfies all requirements; no additional measures are necessary. | |
| Cable connections | <p>Only the following types of cable may be used for the installation:</p> <ol style="list-style-type: none"> 1. Type MI (Mineral Insulated), Type MC (Metal Clad), Type MV (Medium Voltage), or Type TC (Tray Cable) with terminal connectors, or cables which are routed in trays such that expansion stress at the ends is positively avoided 2. Type ITC (Instrumentation Tray Cable) in cable trays or ducts, supported by communication cables, require mechanical protection and must be routed open or recessed directly at the marked position 3. Type PLTC (Power Limited Tray Cable) according to the stipulations of the National Electrical Code, Article 725 or the Canadian Electric Code, Rule 12-2202 or in cable tray systems 4. Enclosed, sealed bus cables, enclosed, sealed connections 5. Conduit thread 6. Steel conduit adapter 7. Every connection method suitable for Class 1, Division 1. | <p>Only the following types of cable may be used for the installation:</p> <ol style="list-style-type: none"> 1. Every connection method suitable for Class 1, Division 2 (see left column) 2. Every connection method suitable for Class 1, Zone 1 |
| Flammable gases | Measurements of flammable gases are only permissible with analyzers with piping and with additional monitoring of the purging gas (e.g. Siemens Minipurge, Order No. 7MB8000-1AA). | |
| Explosive gases | Measurements of permanently explosive gases or gas mixtures are not permissible. Measurement of gases or gas mixtures which are seldom or only briefly explosive are only permissible with analyzers equipped with piping, flame arrestors and additional monitoring of the purging gas. | |

2.2.6.2 Rack-mounted Devices

The following table lists the instructions and requirements for use of the gas analyzers certified according to the CSA and FM guidelines in hazardous areas of Class 1, Division 2 and Class1, Zone 2

| Requirement for | FM/CSA Class 1, Division 2 | FM/CSA Class 1, Zone 2 |
|-------------------|--|--|
| Enclosure | The degree of protection IP20 for the gas analyzer requires installation in an appropriate housing, cabinet or rack. These must be provided with facilities for connecting the types of cable associated with Division 2, and must be accepted by the locally responsible authorities. | The degree of protection IP20 for the gas analyzer requires installation in an appropriate housing, cabinet or rack. These must be provided with facilities for connecting the types of cable associated with Zone 2. These facilities must at least satisfy the requirements of degree of protection IP54, and must be accepted by the locally responsible authorities. |
| Cable connections | <p>Only the following types of cable may be used for the installation:</p> <ol style="list-style-type: none"> 1. Type MI (Mineral Insulated), Type MC (Metal Clad), Type MV (Medium Voltage), or Type TC (Tray Cable) with terminal connectors, or cables which are routed in trays such that expansion stress at the ends is positively avoided 2. Type ITC (Instrumentation Tray Cable) in cable trays or ducts, supported by communication cables, require mechanical protection and must be routed open or recessed directly at the marked position 3. Type PLTC (Power Limited Tray Cable) according to the requirements of the National Electrical Code, Article 725 or the Canadian Electric Code, Rule 12-2202 or in cable tray systems 4. Enclosed, sealed bus cables, enclosed, sealed connections 5. Conduit thread 6. Steel conduit adapter 7. Every connection method suitable for Class 1, Division 1. | <p>Only the following types of cable may be used for the installation:</p> <ol style="list-style-type: none"> 1. Every connection method suitable for Class 1, Division 2 (see left column) 2. Every connection method suitable for Class 1, Zone 1 |

The following table lists the instructions and requirements for use of the gas analyzers certified according to the CSA and FM guidelines in hazardous areas of Class 1, Division 2 and Class1, Zone 2

| Requirement for | FM/CSA Class 1, Division 2 | FM/CSA Class 1, Zone 2 |
|------------------------|---|-------------------------------|
| Flammable gases | For safety reasons, we advise against use of the rack-mounted analyzers for measuring flammable gases. However, since this is not explicitly forbidden in the regulations, it therefore lies within the responsibility of the owner and the responsible local authority. Depending on the type of housing, cabinet or rack, it may be necessary to provide monitoring of the purging gas, and this lies within the area of responsibility of the local authority. | |
| Explosive gases | Measurements of permanently explosive gases or gas mixtures are not permissible. For safety reasons, we advise against use of the rack-mounted analyzers for applications in areas where a potential danger exists that explosive gases or gas mixtures may occur. | |

2.3 Gas Connections and Internal Gas Paths

The assignments of the gas connections can be seen in the gas flow diagrams (**ULTRAMAT 6E/F**: Figs. 2-4, 2-5 **OXYMAT 6E/F**: Figs. 2-9, 2-10, 2-11, 2-12 and the dimensional drawings (**ULTRAMAT/OXYMAT 6E**: Figs. 2-21, 2-24; **ULTRAMAT/OXYMAT 6F**: Fig. 2-26).

2.3.1 Sample Gas Line

All gas connections are couplings with a diameter of 6 mm or 1/4" (rack mount analyzers) or screwed cable glands for a pipe diameter of 6 mm or 1/4" (wall mount analyzers). Select a material which is suitable for the sample gas for the inlet and outlet piping.



Warning

When tightening union nuts on the gas couplings, it is essential to counter using an appropriate open-end spanner; otherwise the danger exists that the gas path will leak.



Note

If the analyzer is used as gas warning equipment, a flow monitor suitable for the monitoring purpose must be connected to the sample gas outlet. The sample gas should be able to flow out without restriction.

Sample gas quality

The sample gas must be free of particles $\geq 2 \mu\text{m}$ and also of condensate. More details can be found in Section 4.2 "Preparation for Start-up".



Caution

ULTRAMAT 6E/F and **OXYMAT 6E/F** should normally be operated such that the sample gas pressure cannot build up in the analyzer section. If several analyzers are connected in series, make sure that the series-connected analyzer does not have a restrictor in the gas path (unrestricted exhaust outlet). The restrictor present in the gas path of the **ULTRAMAT 6E/F** or **OXYMAT 6E/F** depending on the version may have to be removed. A restrictor may only be present between the sample gas inlet line and the first gas analyzer section.

Two-channel analyzers with two parallel analyzer sections (two **ULTRAMAT** channels or one **ULTRAMAT** and one **OXYMAT** channel) have a separate, independent gas path for each analyzer section. The restrictor of the second analyzer section must also be removed in this case if the channels are connected in series.

**Note!**

Sample gas monitoring (pressure switch), which is optional in rack mount analyzers, has no function following removal of the sample gas restrictors for the series-connected analyzer sections. To avoid error messages ("Sample gas flow too low") in the configuration function of the software (Section 5.2.5, *function 87*, error S16). Also note in this case that the assignment of a relay with the error message "Flow of sample gas" has no function.

Pressure variations in the sample gas path

The OXYMAT 6 is a pneumatic measuring system, and therefore very sensitive to irregular or fast changes in pressure superimposed on the flow of sample gas. It must therefore be guaranteed that such pressure variations are sufficiently dampened. A capillary located in the sample gas inlet is usually sufficient. A further measure is the use of a "pneumatic low-pass", consisting of a restrictor and a damping vessel (see Fig. 2-3).

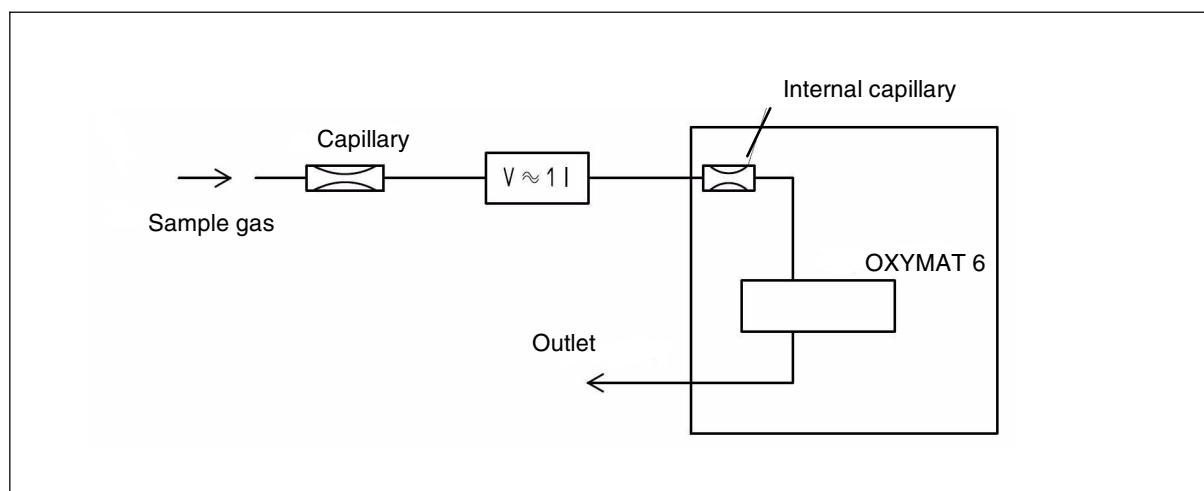


Fig. 2-3 Damping measure for pressure variations superimposed on the sample gas

If the sample gas flows into an exhaust gas line, observe the following points:

- The flow resistance in the exhaust gas line should be kept small by using as short a line as possible or by adapting to a larger diameter.
- The exhaust gas line must be free of rapid changes in pressure. If this is not the case, either use a separate exhaust line or fit a surge tank (> 1 l) with downstream restrictor between the analyzer and the exhaust line (pneumatic low-pass).



Warning

In the case of toxic or corrosive gases, or those which can lead to explosive gas mixtures, the exhaust should be routed such that there is no danger to persons or equipment and that the environment is not polluted.



Note!

Since the reference gas of OXYMAT 6 protects the microflow sensor from damage it is important that the reference gas is always allowed to flow freely even if it is necessary to block the sample gas inlet and / or outlet (e.g. via a 2-way valve at the sample gas outlet; it must also be ensured that the gas flowing out can be disposed of appropriate to the environment).

Furthermore the subsequent reference gas would produce a pressure in the analyzer section which would destroy the internal pressure sensor or its connection to the analyzer section.

It is not advisable to switch off the reference gas since corrosive sample gases could destroy the microflow sensor (see also note in Section 4.2.2).

2.3.2 Reference Gas Line

The **OXYMAT 6E/F** is always equipped with reference gas connections, the **ULTRAMAT 6E/F** only in analyzer versions with a flow-type reference side. Couplings are present with a diameter of 6 mm or 1/4" (rack mount analyzers) or screwed cable glands for a pipe diameter of 6 mm or 1/4" (wall mount analyzers). Select a material which is suitable for the reference gas for the inlet and outlet piping.

ULTRAMAT 6E/F

For certain measuring tasks, the **ULTRAMAT 6E/F** is supplied with a flow-type reference side. Depending on the version, the reference side can either have a normal flow or a reduced flow. A flow of approx. 0.5 l/min is recommended for a reference side with normal flow. Possible values are between 0.1 l/min and 1.5 l/min. With the reduced flow (approx. 8 ml/min), the reference gas line is connected to the reference cell via a pressure switch with a prepressure of 200 ... 400 kPa and restrictor (see Fig. 2-5). Analyzers without a flow-type reference cell do not have reference gas connections; the reference cell is sealed.



Warning

The reduced flow-type reference side of the ULTRAMAT 6 must never be used with flammable or toxic gases or gas mixtures, or those containing oxygen.

Warning

ULTRAMAT 6E/F reference side with reduced flow

Ensure that the inlets and outlets of the reference side with the reduced flow are not interchanged. The excess pressure which would then build up can falsify the result or damage the analyzer cell.



Note

ULTRAMAT 6E/F reference side with reduced flow

The gas supply to the reference side with the reduced flow should have a pressure of 200 ... 400 kPa. In the case of CO₂ analyzers and with analyzers exhibiting a high cross-sensitivity to steam, a pipe must be used as the reference gas line to prevent diffusion-based measuring errors.

As a result of the low flow, analyzers with a reference side with reduced flow require approx. 3 - 6 hours following starting-up until they are fully functional. During this period, they zero point drifts greatly.

OXYMAT 6E/F

A metal pipe must be used for the reference gas inlet if N₂ and O₂ are used as reference gases. The pipe must be as short as possible and have a small cross-section.

If air is used as the reference gas, it should be drawn in via a fine filter with a pore size of approx. 40 µm using an external pump. It is additionally recommendable in this case to connect a drier into the suction line to prevent a volume error on the reference gas side as a result of the air humidity.

When subsequently converting the analyzer to a different reference gas supply, the couplings and the reference gas restrictor (low-pressure operation 0.1 bar) must be replaced by trained servicing personnel.

2.3.3 Purging Gas Connection

The **ULTRAMAT 6F** and **OXYMAT 6F** are provided with four purging gas couplings (10 mm or 3/8"). The positions of these connections are shown in Fig. 2-26.

The housing can be purged with inert gas (e.g. N₂) if necessary (see Section 2.1 "Safety information" for more details). Depending on the density of the sample gas, purging of the housing should be carried out either from bottom to top or from top to bottom to prevent the accumulation of explosive or toxic gases in the housing.

It is recommendable to always commence purging with the left half of the housing. The purging gas must be output via an exhaust hose of appropriate cross-section and disposed of in an environmentally-friendly manner.

The purging gas overpressure produced in the housing must not exceed 165 hPa.

If the analyzer is used without a purging gas, the purging gas connections must be sealed gas-tight to prevent the generation of condensation within the analyzer as a result of changes in climate.

2.3.4 Pressure Sensor

All **ULTRAMAT 6F** and **OXYMAT 6** analyzers have an internal pressure sensor to correct the influence of pressure on the measured value.

In the **OXYMAT 6 E/F**, this sensor is mounted on the analyzer section and directly measures the sample gas pressure using the reference gas inlet. It need not be considered further during the installation. The bursting pressure of the sensor itself is approx. 0.5 MPa (5 bar).

In the **ULTRAMAT 6 E/F**, the sensor measures the atmospheric pressure. The sensor connection is led out of the housing (ULTRAMAT 6F: see Fig. 2-7; ULTRAMAT 6E: see Fig. 2-5). The pressure correction therefore only operates correctly if the sample gas can escape freely. If this is not guaranteed, deactivate the internal sensor, and connect an external sensor in the sample gas path.

2.3.5 Gas Path

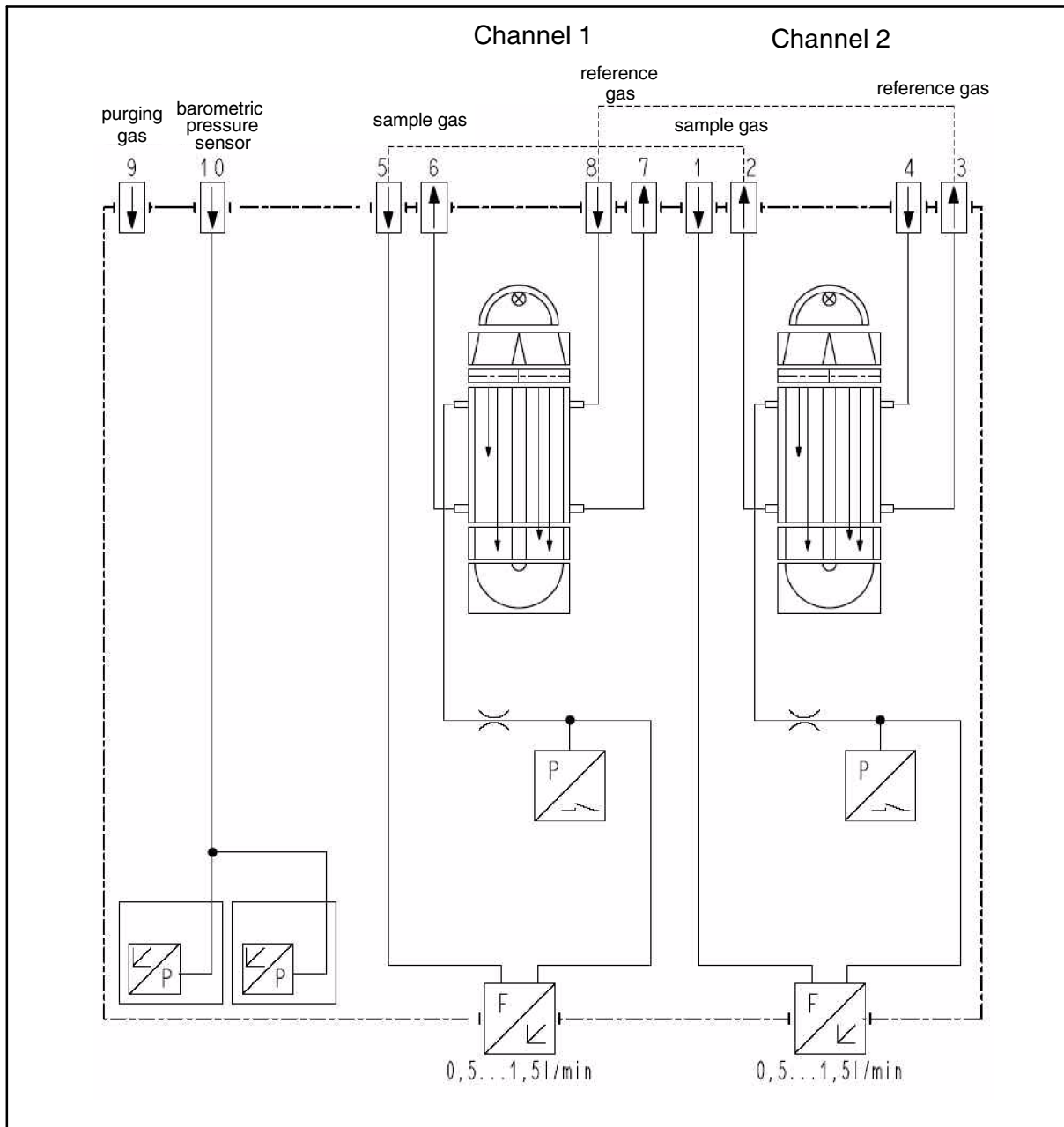


Fig. 2-4 Gas path **ULTRAMAT 6E** with sample gas monitoring (option 2, only hoses analyzers) and flow-type reference chamber (option 1)

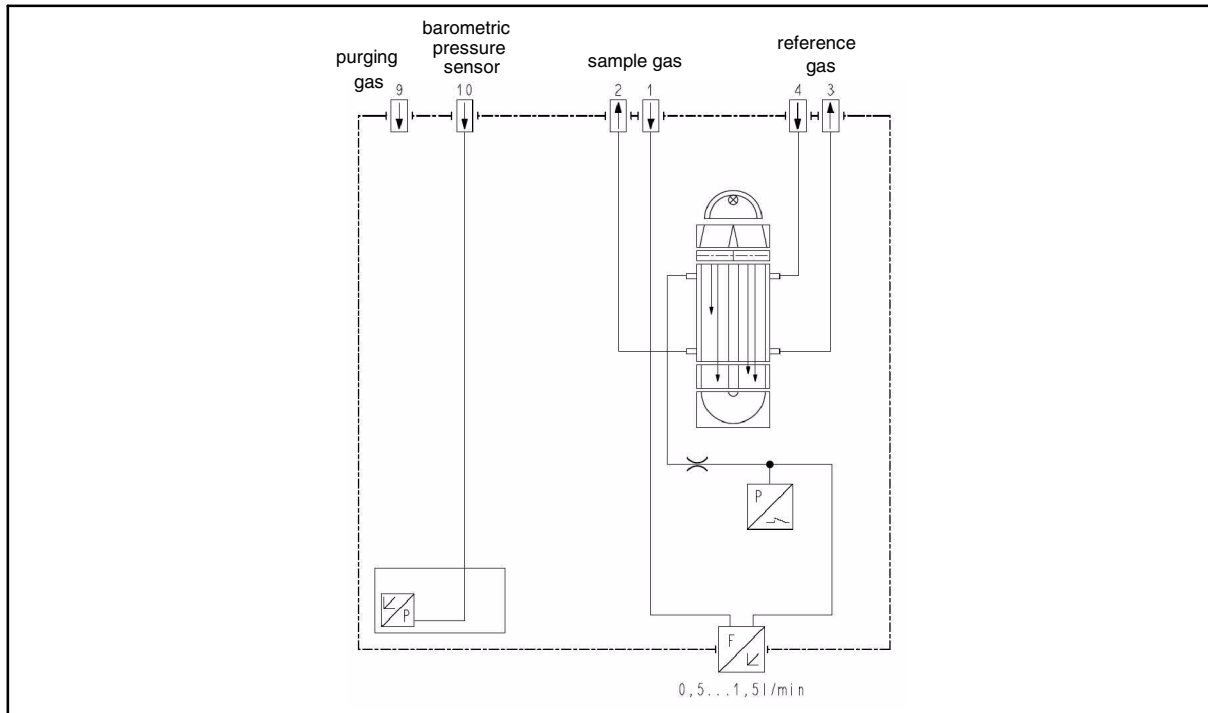


Fig. 2-5 Gas path **ULTRAMAT 6E** with sample gas monitoring (option 2, only hoses analyzers) and flow-type reference chamber (option 3)

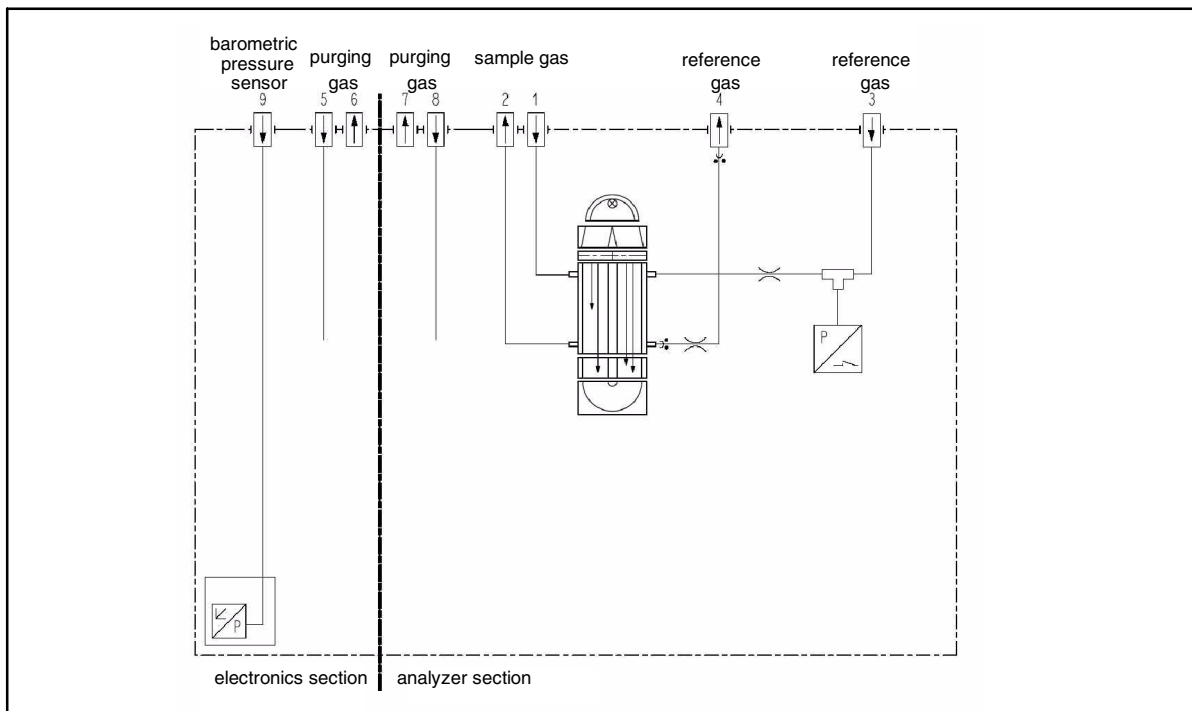


Fig. 2-6 Gas path **ULTRAMAT 6F** with reference chamber with reduced flow (option)

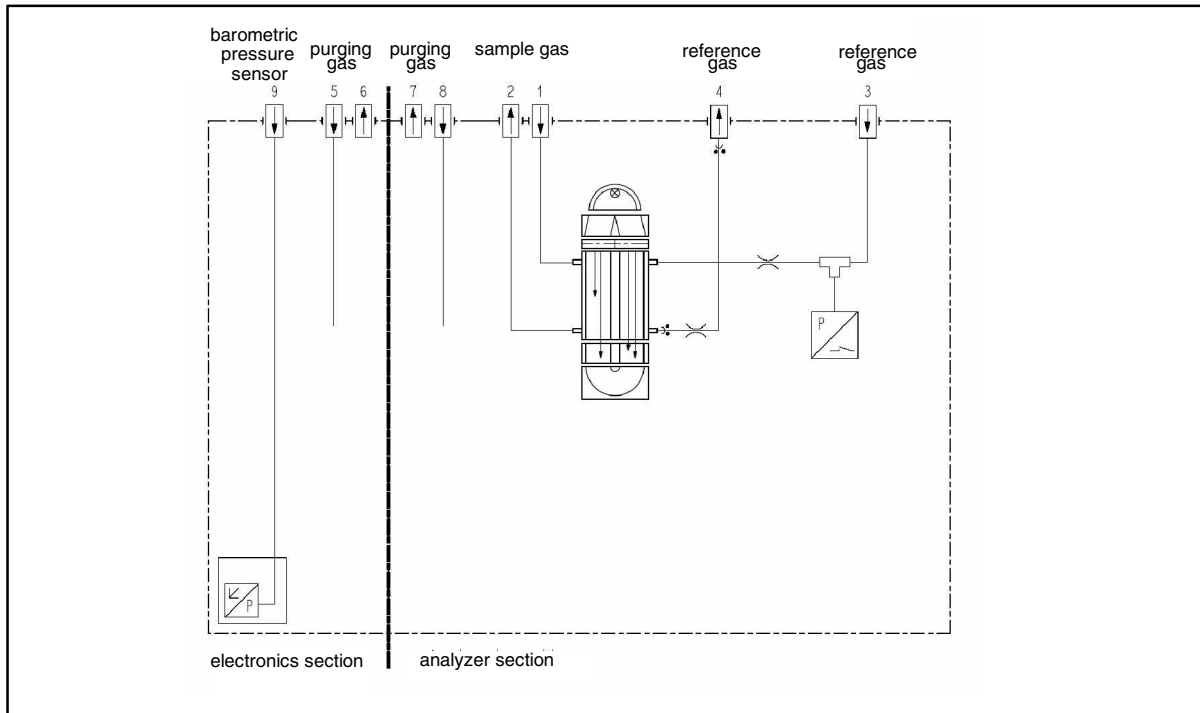


Fig. 2-7 Gas path **ULTRAMAT 6F** with reference chamber with reduced flow (option)

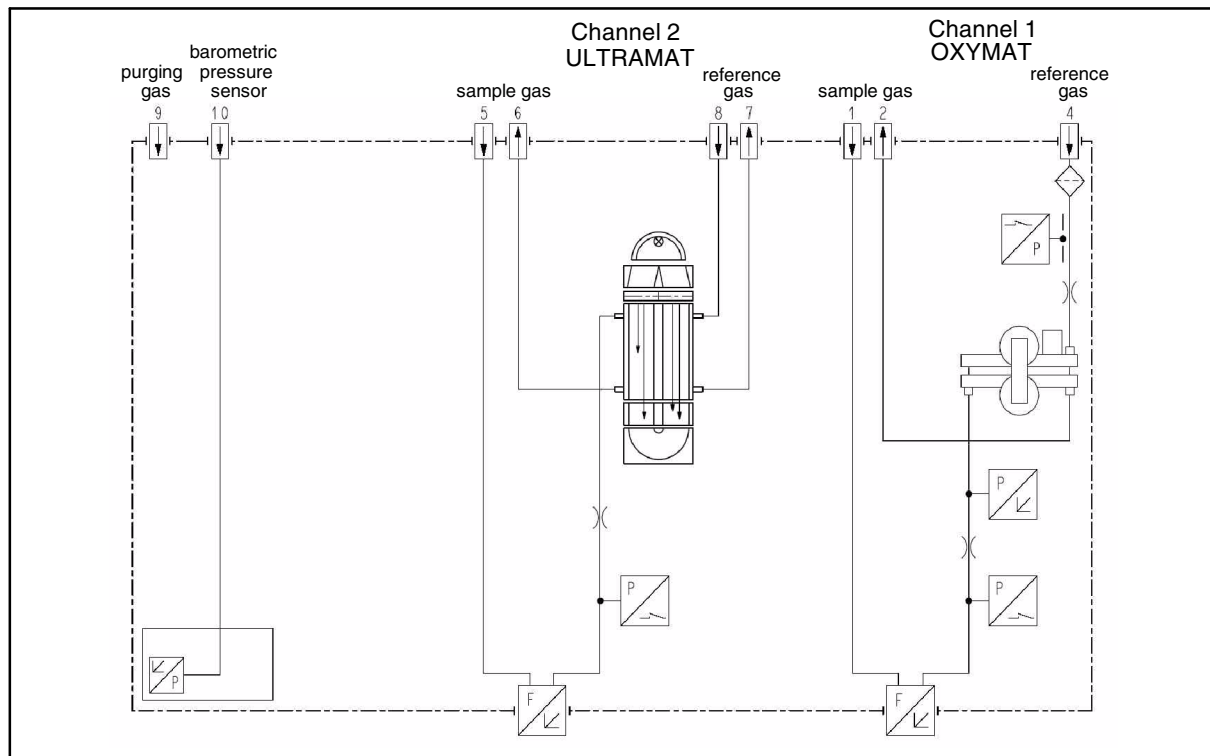


Fig. 2-8 Gas path **ULTRAMAT 6E/OXYMAT 6E**

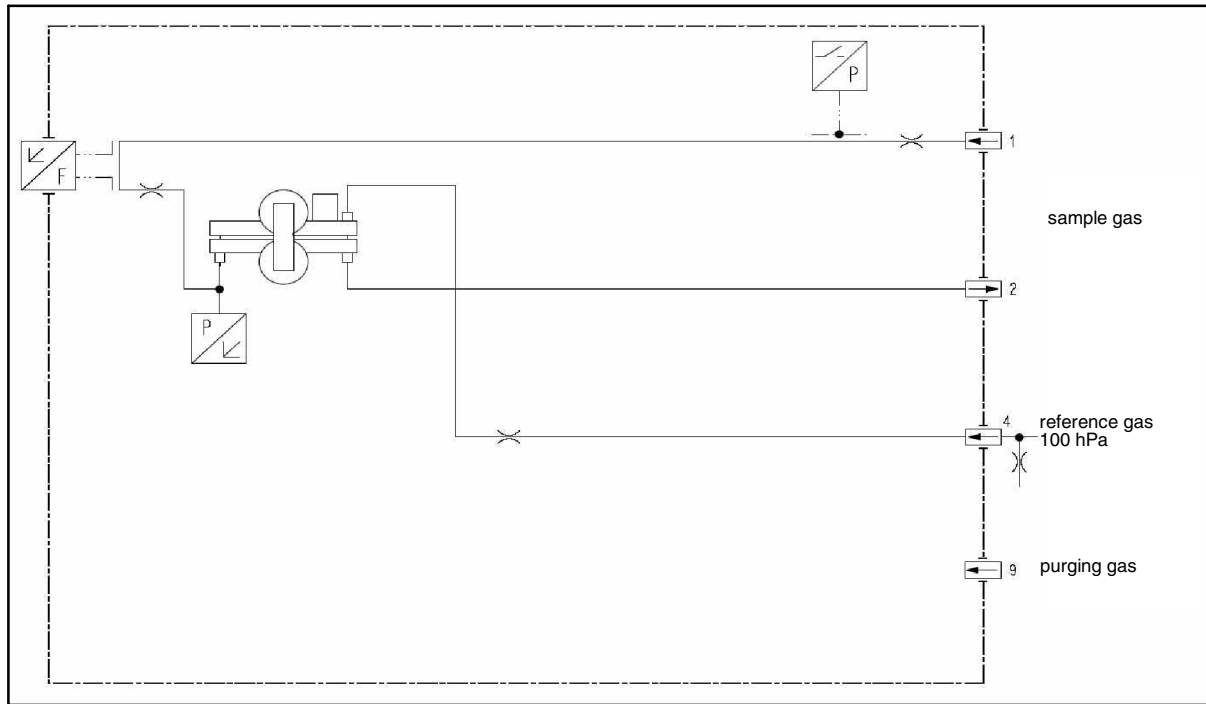


Fig. 2-9 Gas path **OXYMAT 6E** with reference gas connection 100 hPa

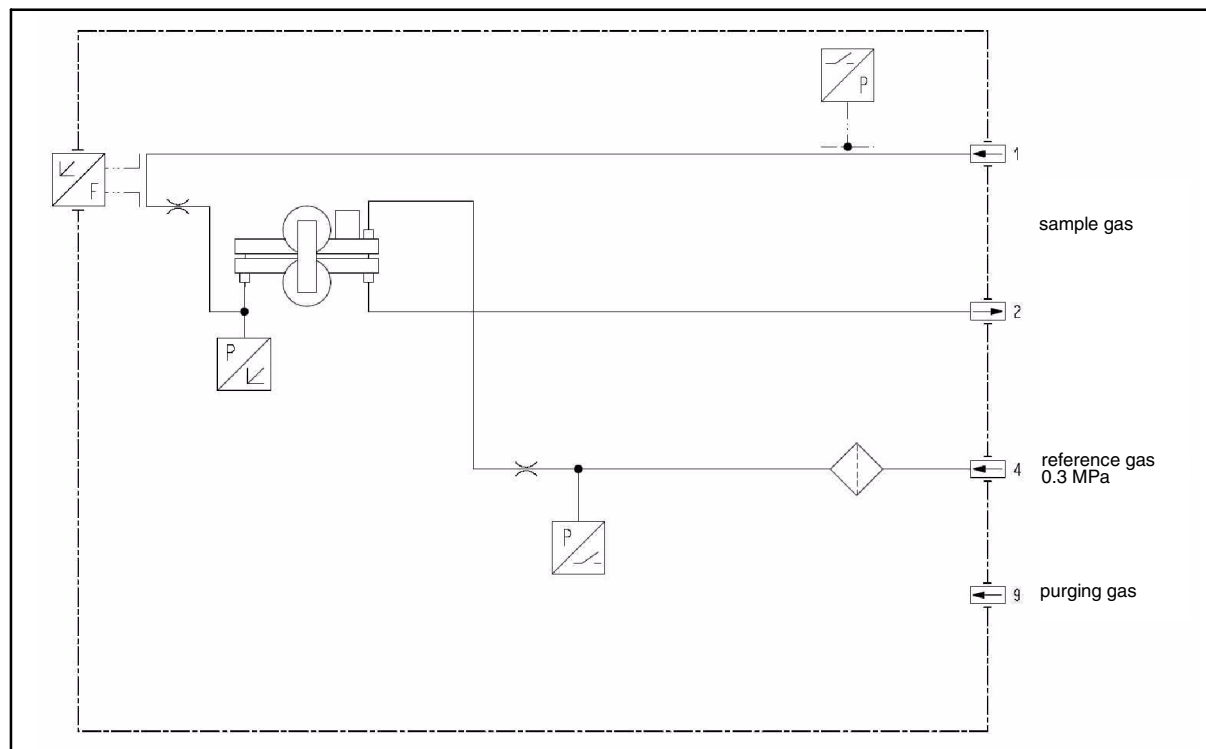


Fig. 2-10 Gas flow **OXYMAT 6E** with reference gas connection 0.2 ... 0.4 MPa

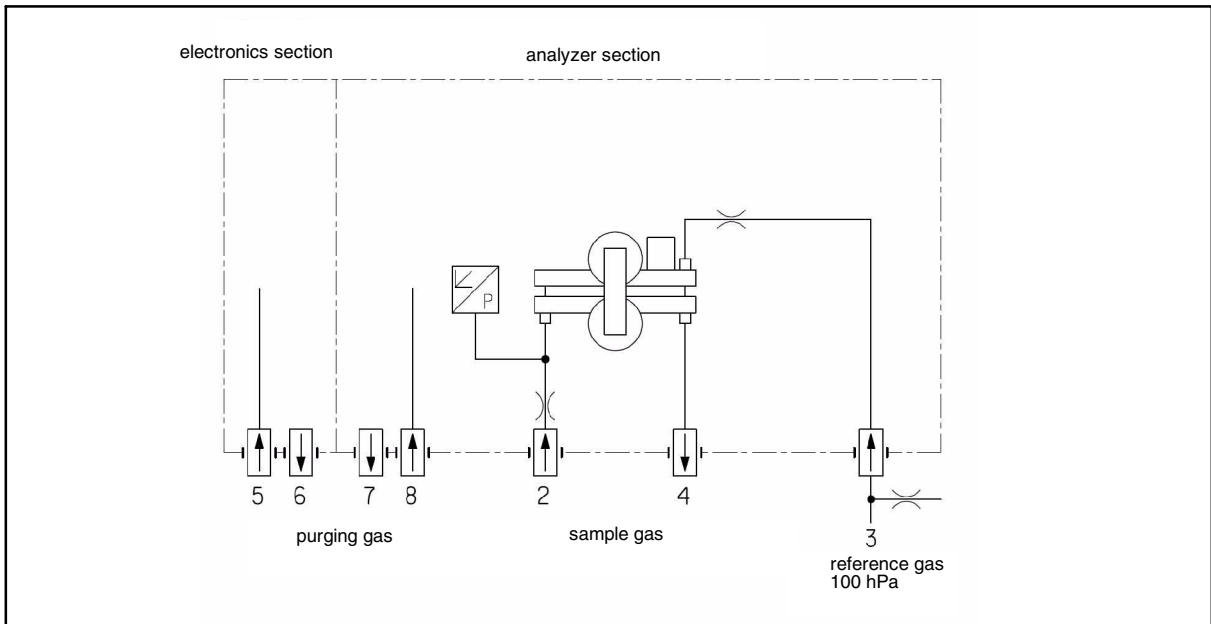


Fig. 2-11 Gas path **OXYMAT 6F** *) with reference gas connection 100 hPa

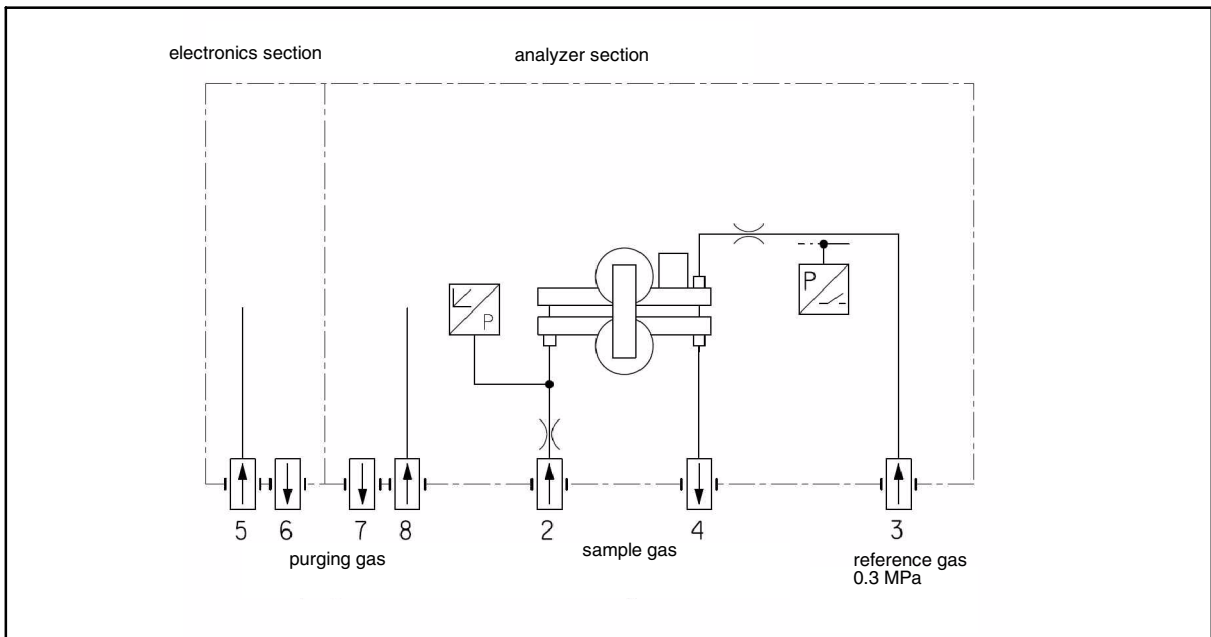


Fig. 2-12 Gas path **OXYMAT 6F** *) with reference gas connection 0.2 ... 0.4 MPa

2.4 Gas Conditioning

The sample gas must be sufficiently conditioned to prevent contamination of the wetted parts and the associated errors in measurement.

The **ULTRAMAT 6E/F** and **OXYMAT 6E/F** are usually preceded by

- a gas sampling device,
- a sample gas cooler,
- a filter and
- a gas suction pump.

Depending on the composition of the sample gas, additional equipment may be necessary such as e.g. a washbottle, additional filters and a pressure regulator.

Corrosive components or those which interfere with the measurement should be eliminated by appropriate series-connected absorption filters.

ULTRAMAT 6E/F

Insufficient gas conditioning may lead to contamination of the analyzer cell and thus to drifting of the measured value and temperature-dependent errors in measurement.

2.5 Electric Connection



Warning

The following must be observed during the electric installation:

The respective country-specific standard for the installation of power systems with rated voltages below 1000 V (in Germany: VDE 0100).

When installing the analyzers in potentially explosive atmospheres of Zone 2, it is necessary to observe the specifications of VDE 0165, Part 1 (EN 60079-14), and for atmospheres of Zone 22 (combustible dusts) the specifications of VDE 0165, Part 2 (EN 50281-1-2) or equivalent international standards. Special care must be taken with the cable inlets (PG screwed cable glands) since the function may be threatened if carried out improperly.

All cables must be fixed when layed.

Torque and permissible cable diameter range for the PG screwed cable glands:

M20 x 1,5: 3,8 ±0,2 Nm; Ø 7 ... 12 mm
M20 x 1,5: 5,0 ±0,2 Nm; Ø 10 ... 14 mm

Failure to observe these regulations may result in death, personal injury and/or damage to property.

2.5.1 Power Supply Connection

- The analyzer is supplied with an appliance plug which may only be connected to the power supply by qualified personnel (see Section 1.5). The power supply cable that fulfills the country-specific requirements must include a protective earth conductor which is on housing potential. The cross-section of the conductors must be $\geq 1 \text{ mm}^2$. The phase conductor must be connected to the identified position in the plug.
- The power cable must be layed separately from the signal cables.
- A circuit-breaker must be provided in the immediate vicinity of the analyzer (see rating plate for loading capacity). It must be readily accessible in this case.
- Check that the local mains voltage agrees with that specified on the label on the analyzer.

OXYMAT 6



Note

Gas warning equipment with heater function must be additionally equipped with a surge arrester. The following types are offered:

- Power supply 230 V: DEHNrail 230 FML; Order No. A5E00259086
- Power supply 120 V: DEHNrail 120 FML; Order No. A5E00259091.

These can be fitted on a DIN rail (top hat rail) in the left half of the field housing.

Securing bracket in rack mount analyzers

The enclosed securing bracket protects the power supply plug in rack mount analyzers from being disconnected unintentionally. In particular, it must be fitted with installations in hazardous areas of FM/CSA Class I, Div. 2.

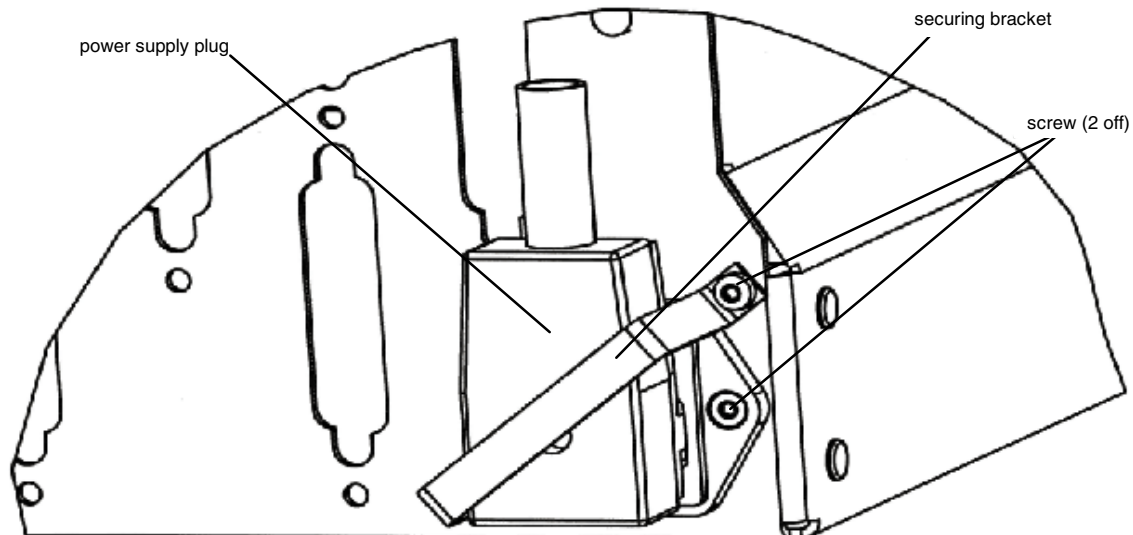


Fig. 2-13 Securing bracket for power supply plug in rack mount analyzers

2.5.2 Connection of Signal Cables



Warning

The signal cables must only be connected to devices which guarantee safe isolation from their power supply.

If signals (e.g. analog output 4 ... 20 mA) are to be conducted into a potentially explosive atmosphere of zone 1, they must be intrinsically-safe. Supplementary retrofitting of the analyzer with energy-limiting modules is necessary.

The Ex identification of these modules must be clearly visible on the housing.

- The signal cables in the rack mount analyzer are connected to the D-SUB plugs at the rear. In the wall mount analyzer, the signal cables are connected using the terminal blocks A and B (option). These are located on the flange plate on the base of the left internal side of the housing (see also Fig. 6-7).
- RC elements must be connected according to Fig. 2-14 as a measure to suppress the generation of sparks across the relay contacts (e.g. limit relays). Note that the RC element causes a delay concerning the rate of fall of an inductive component (e.g. solenoid valve).

The RC element should therefore be dimensioned according to the following rule-of-thumb:

$$R [\Omega] \approx 0,2 \times R_L [\Omega] \qquad C [\mu F] \approx I_L [A]$$

Additionally make sure that you only use a non-polarized capacitor C.

When using direct current, it is possible to fit a spark quench diode instead of the RC element.

- The cables to the relay outputs and binary inputs as well as the analog inputs and outputs must be screened. They must be connected to the corresponding trapezoidal plug (D-SUB plug) according to the pin assignment diagrams (Figs. 2-15 and 2-16). The conductor cross-section should be $\geq 0.5 \text{ mm}^2$. Cables of type JE-LiYCY ... BD are recommended. The cable length of the analog outputs depends on the load.

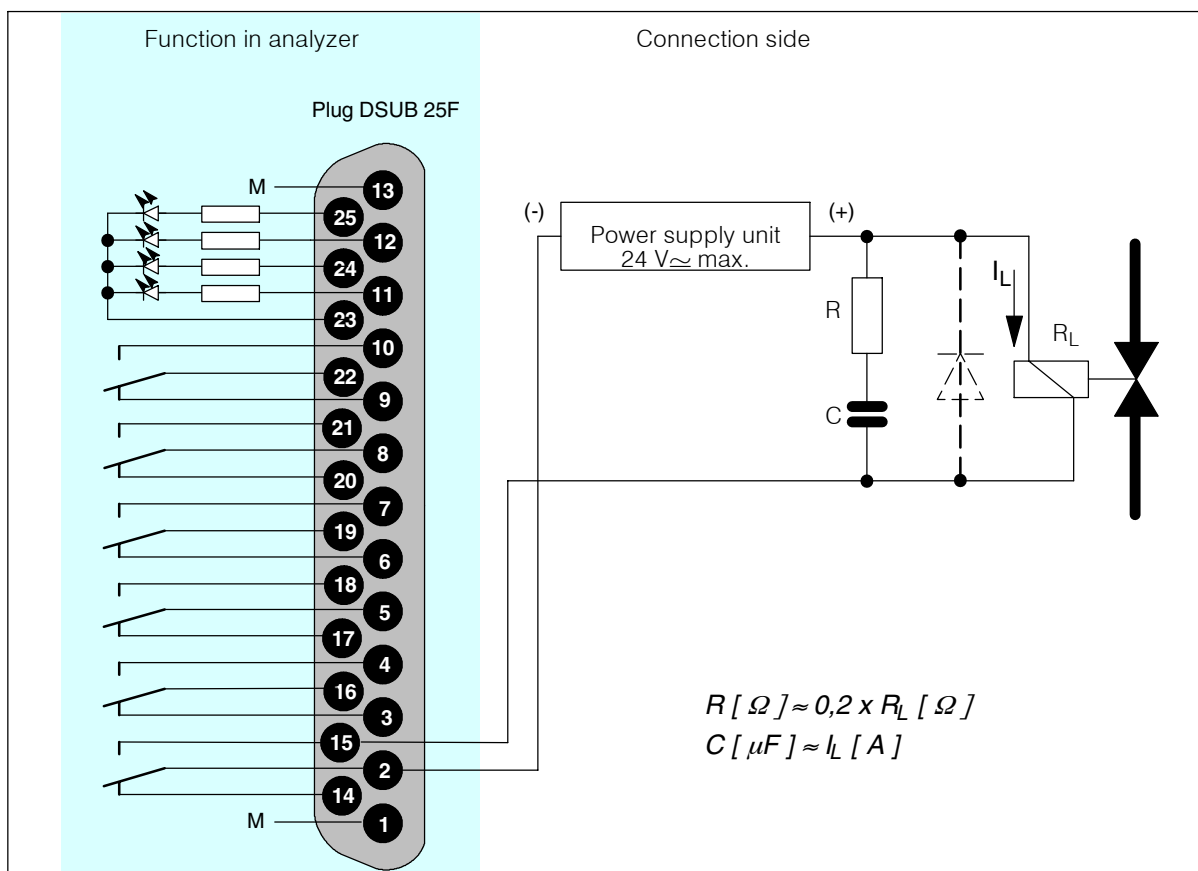


Fig. 2-14 Example of measure to suppress sparks on a relay contact (rack mount analyzer)

**ULTRAMAT 6F
and OXYMAT 6F**

All cables (except the power cable) must be screened.

The screen must be connected to the respective PG screwed cable glands with a large-area contact and without gaps. The conductors must be connected to the corresponding terminals as shown in the pin assignment diagrams (Figs 2-18 and 2-19). The conductor cross-section should be $\geq 0.5 \text{ mm}^2$. Cables of type JE-LiYCY ... BD are recommended. The cable length of the analog outputs depends on the load.

- The reference ground of the analog inputs is the housing potential.
- The analog outputs are floating, also with respect to one another.
- The interface cable (RS 485) must be screened and connected to housing potential. The cable screen must be connected with a large-area contact to the screen of the D-SUB plug. The conductor cross-section should be $\geq 0.5 \text{ mm}^2$. The interface cable must not be longer than 500 m.
- In the case of **dual-channel analyzers** with two analyzer sections connected in parallel, the signal cables of each channel are independent. Only the power plug is common to both channels.



Note!

If the clock generation of the processor electronics is faulty, it is possible for the interfaces to assume an undefined status, and for the analog output to remain stationary at approx. -1 mA or approx. +24.5 mA.

2.5.3 Pin Assignments of ULTRAMAT 6E and OXYMAT 6E

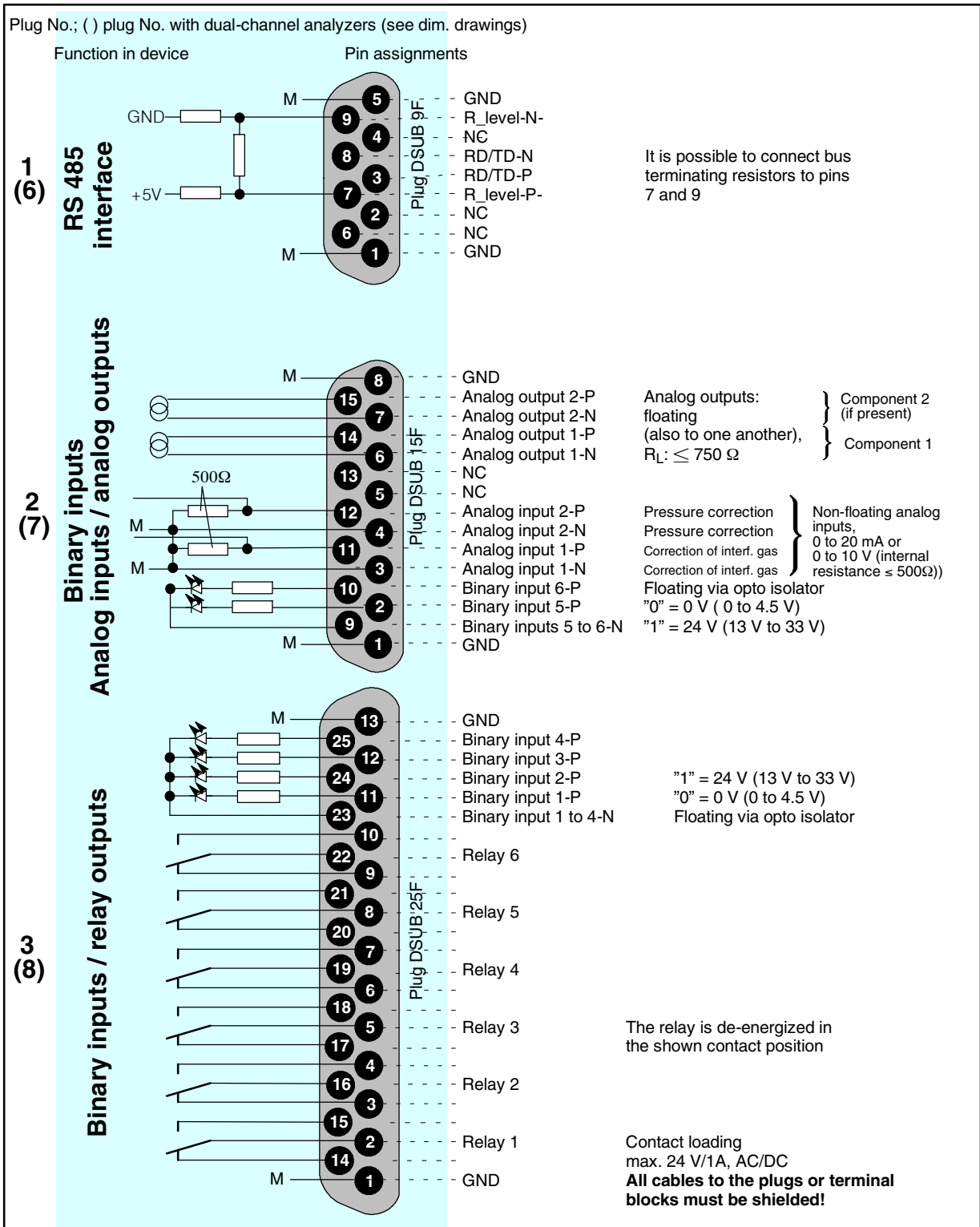


Fig. 2-15 Pin assignments of ULTRAMAT 6E and OXYMAT 6E

2.5.4 Pin Assignments of Autocal Module ULTRAMAT 6E and OXYMAT 6E

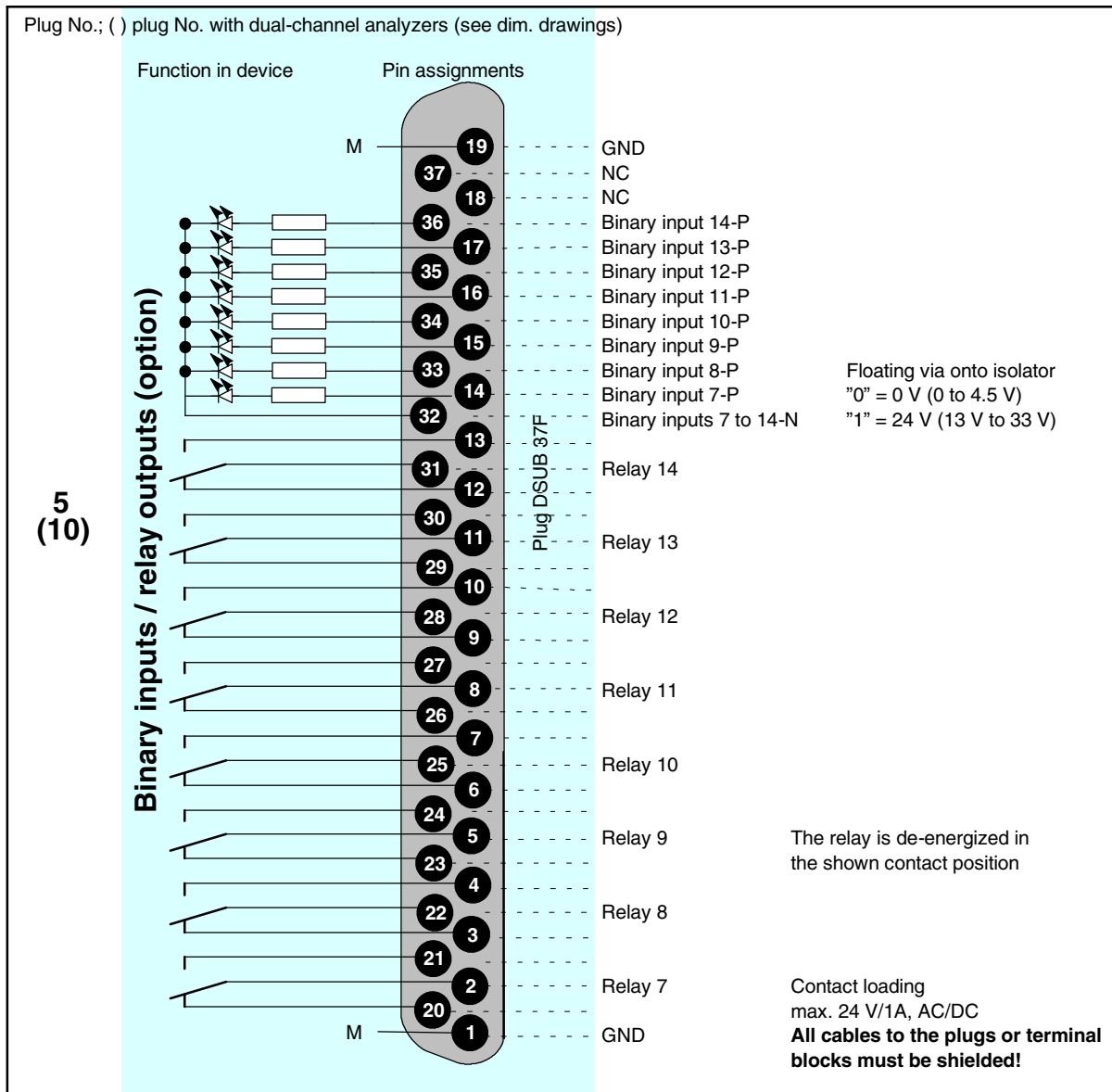


Fig. 2-16 Pin assignments of Autocal module **ULTRAMAT 6E** and **OXYMAT 6E**

Other supplementary electronics (AK interface, Profibus, ...) are described in the supplied documents.

2.5.5 Example of Autocal Circuit ULTRAMAT 6E and OXYMAT 6E

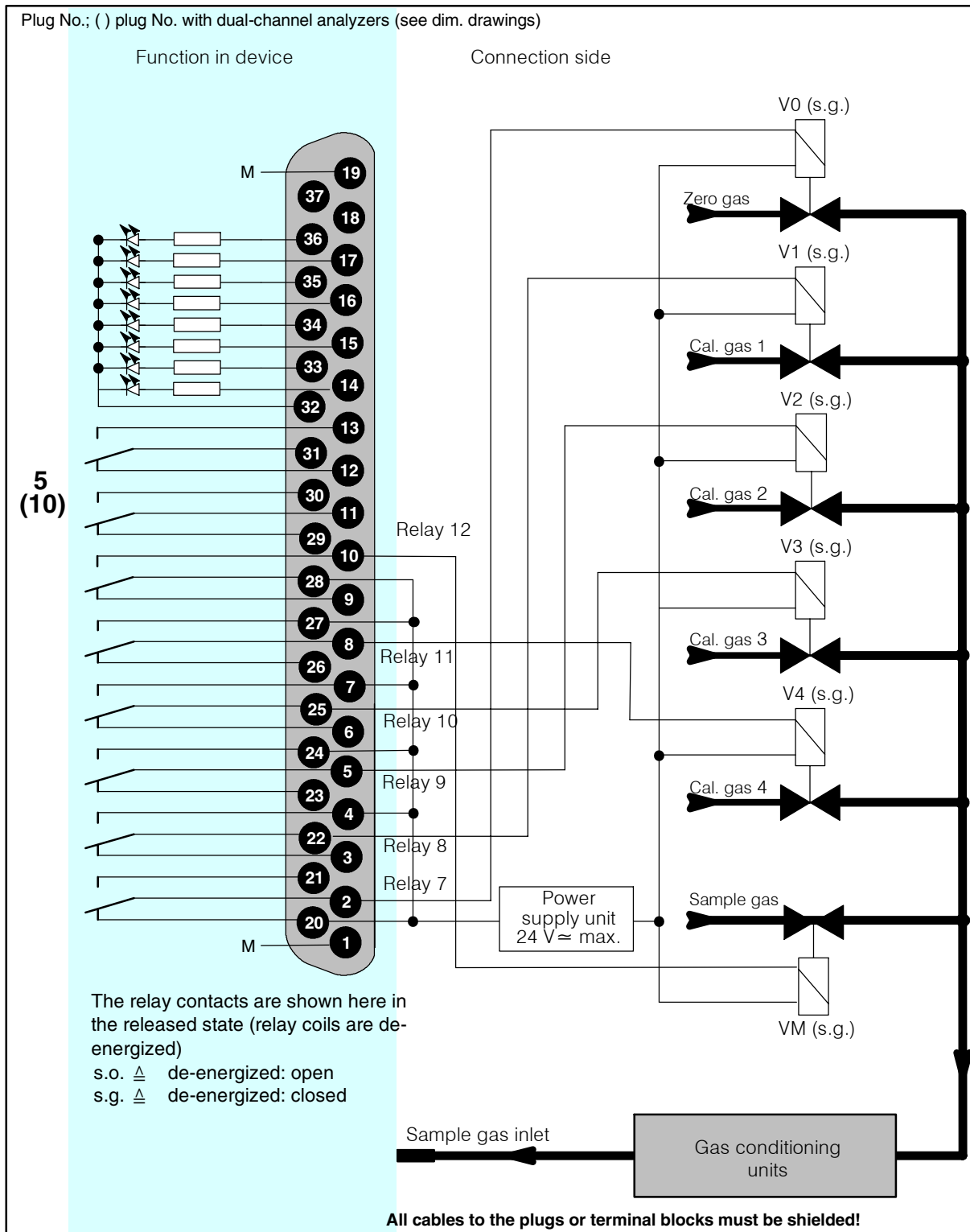


Fig. 2-17 Pin assignments and valve diagram "Autocal" for ULTRAMAT 6E and OXYMAT 6E

2.5.6 Pin and Terminal Assignments of ULTRAMAT 6F and OXYMAT 6F

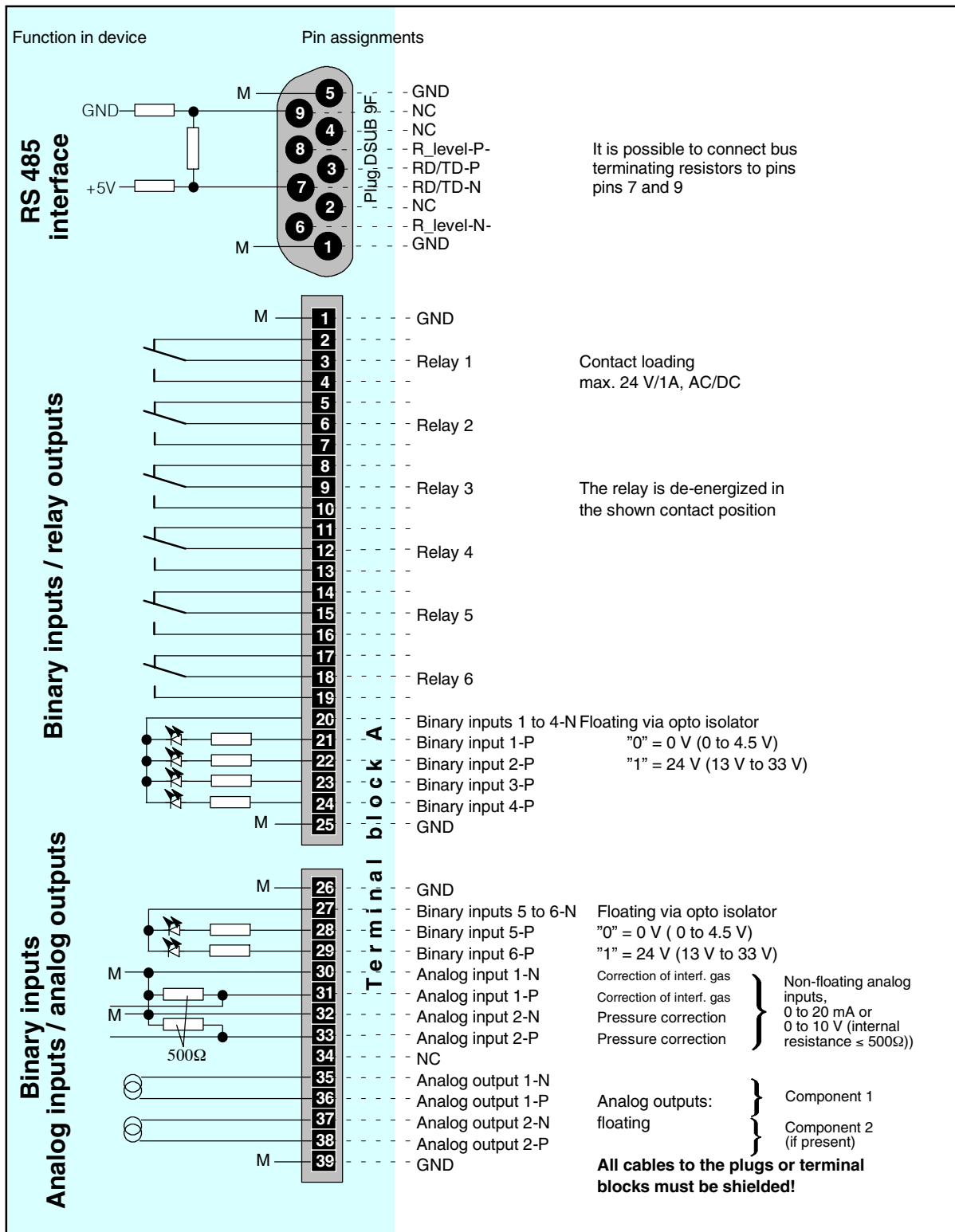


Fig. 2-18 Pin and terminal assignments of ULTRAMAT 6F and OXYMAT 6F

2.5.7 Terminal Assignments of Autocal Module ULTRAMAT 6F and OXYMAT 6F

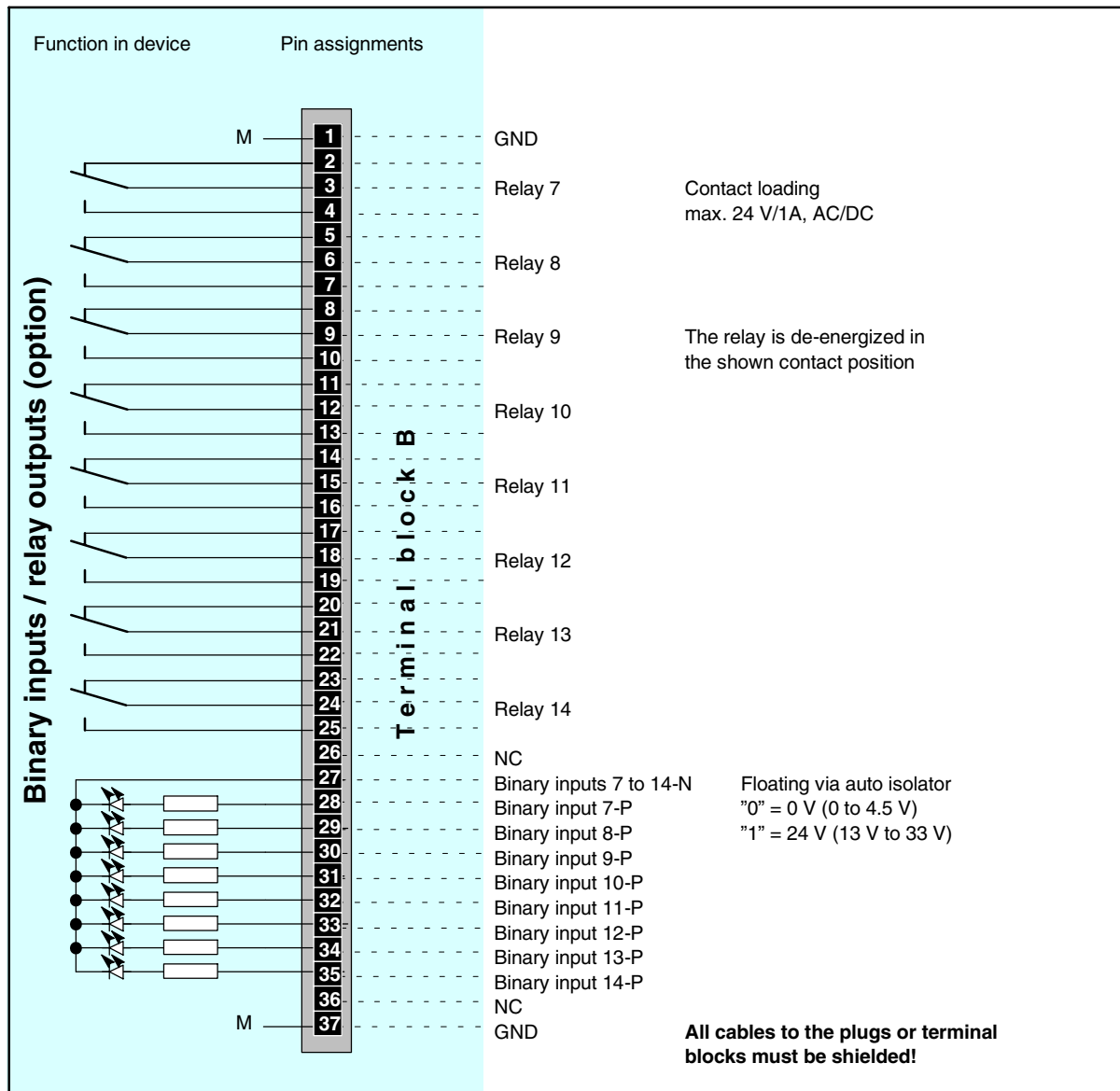


Fig. 2-19 Terminal assignments of Autocal module **ULTRAMAT 6F** and **OXYMAT 6F**

Other supplementary electronics (AK interface, Profibus, ...) are described in the supplied documents.

2.5.8 Example of Autocal Circuit ULTRAMAT 6F and OXYMAT 6F

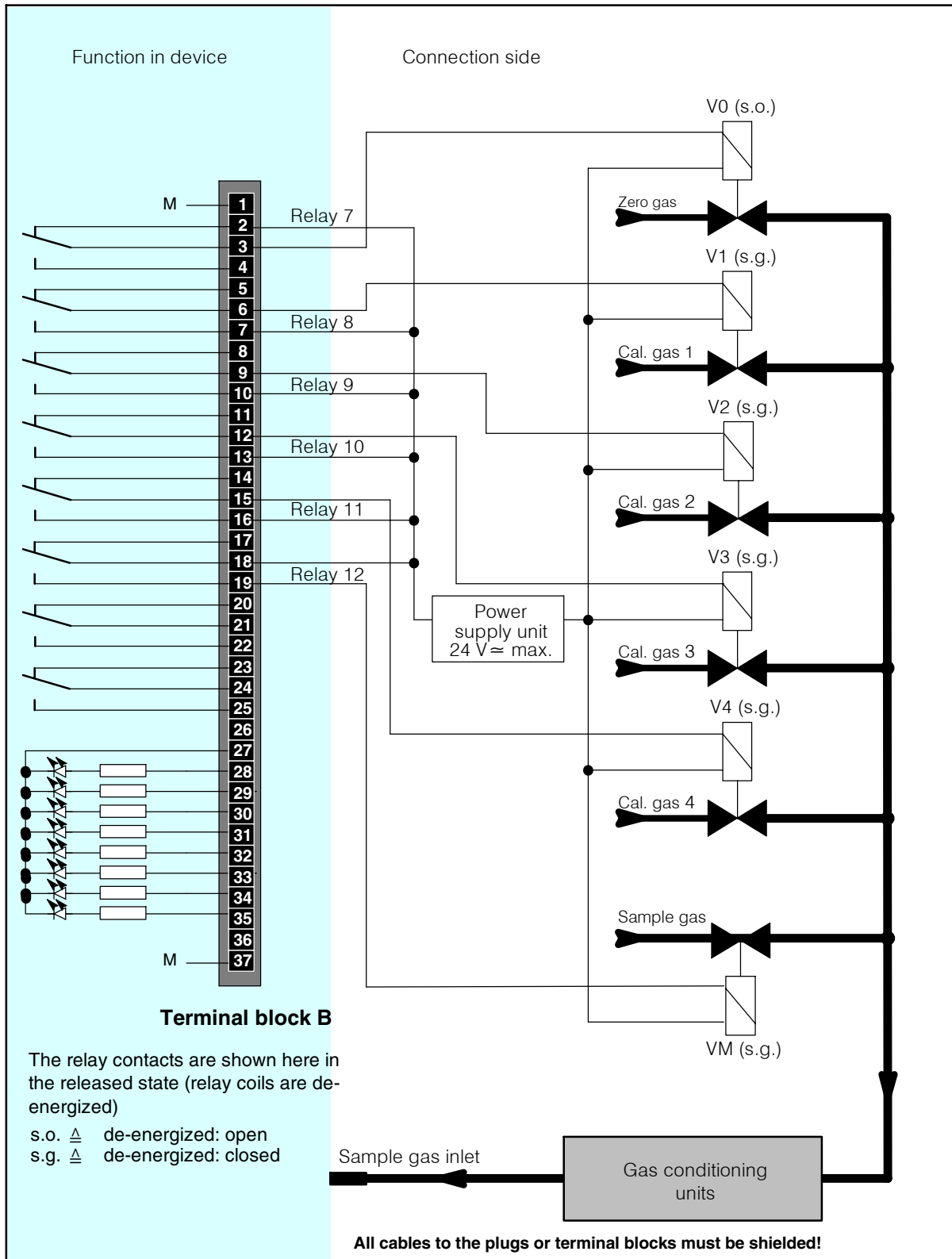


Fig. 2-20 Terminal assignments and valve diagram "Autocal" ULTRAMAT 6F and OXYMAT 6F

2.6 Dimensional Drawings

2.6.1 ULTRAMAT 6E and OXYMAT 6E

When viewed from the rear, the left side is either an IR channel or an O₂ channel (with single-channel analyzers), whereas the second analyzer section (with dual-channel analyzers) is always an IR channel.

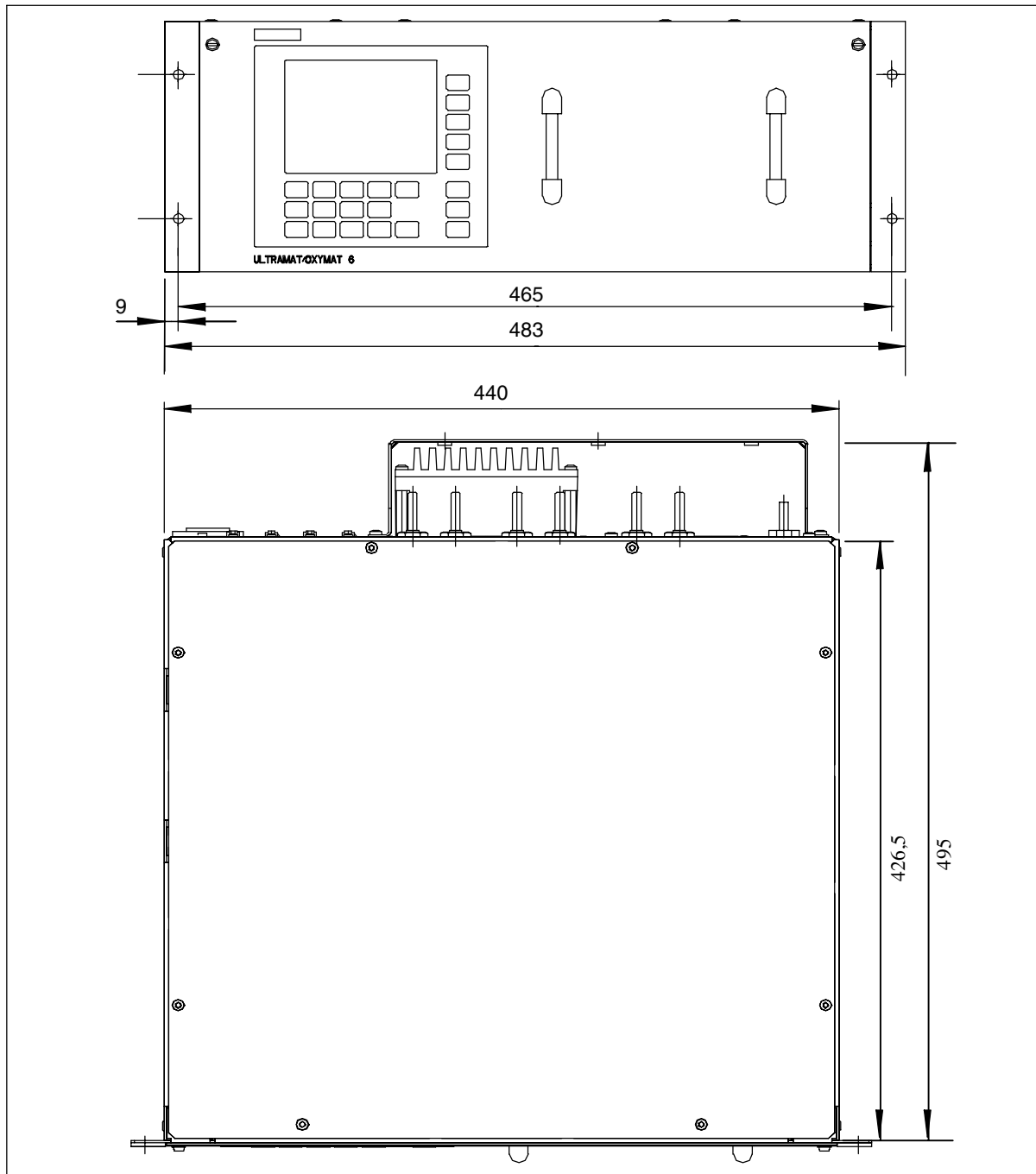


Fig. 2-21 Installation dimensions (front and plan views, valid for ULTRAMAT 6E and ULTRAMAT/OXYMAT 6E, see Fig. 2-19 for dimensions for OXYMAT 6E (7MB2021, 7MB2027)

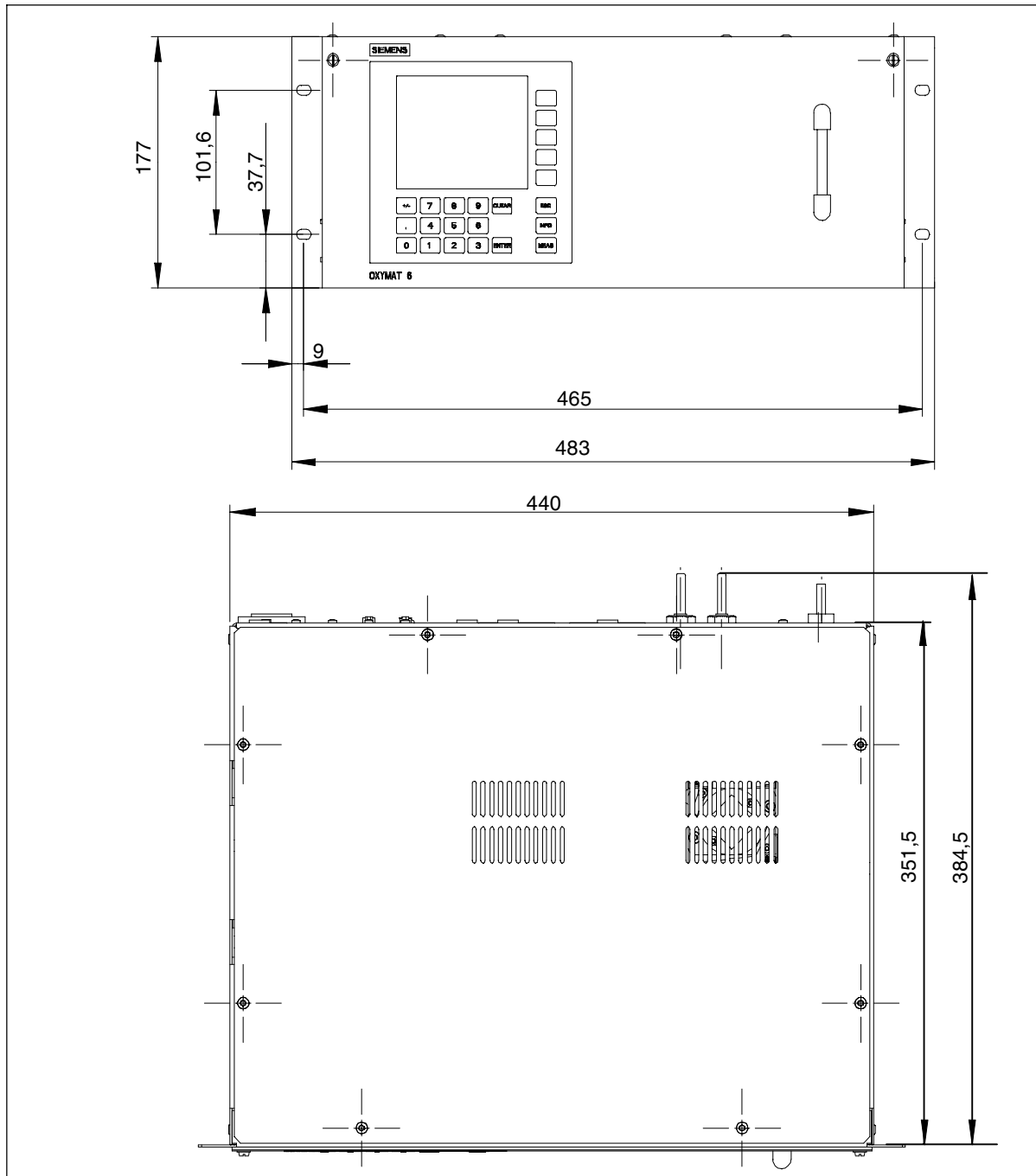


Fig. 2-22 Installation dimensions (front and plan views), OXYMAT 6E

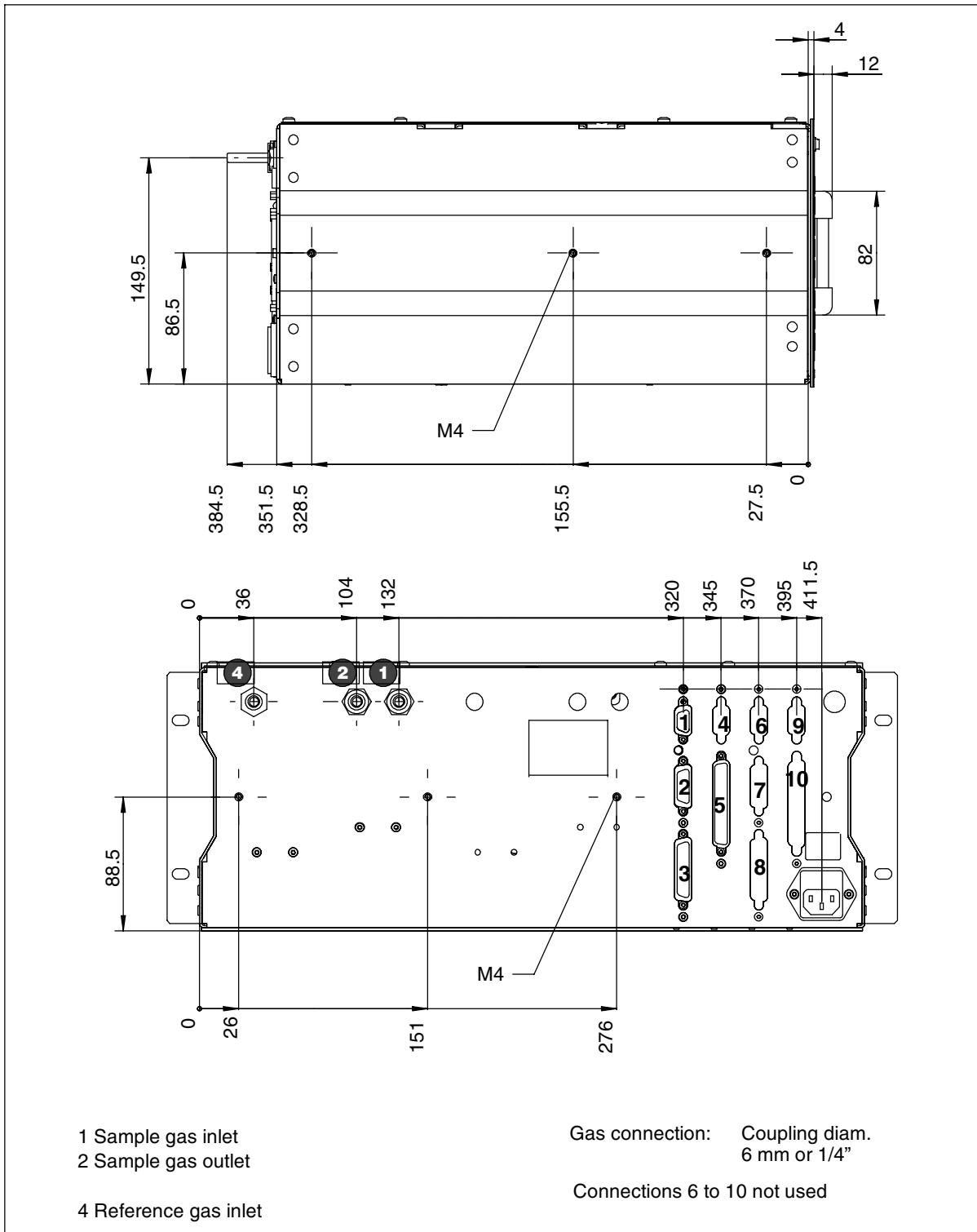


Fig. 2-23 Dimensional drawing for 7MB2021 and 7MB2027 (OXYMAT 6E)

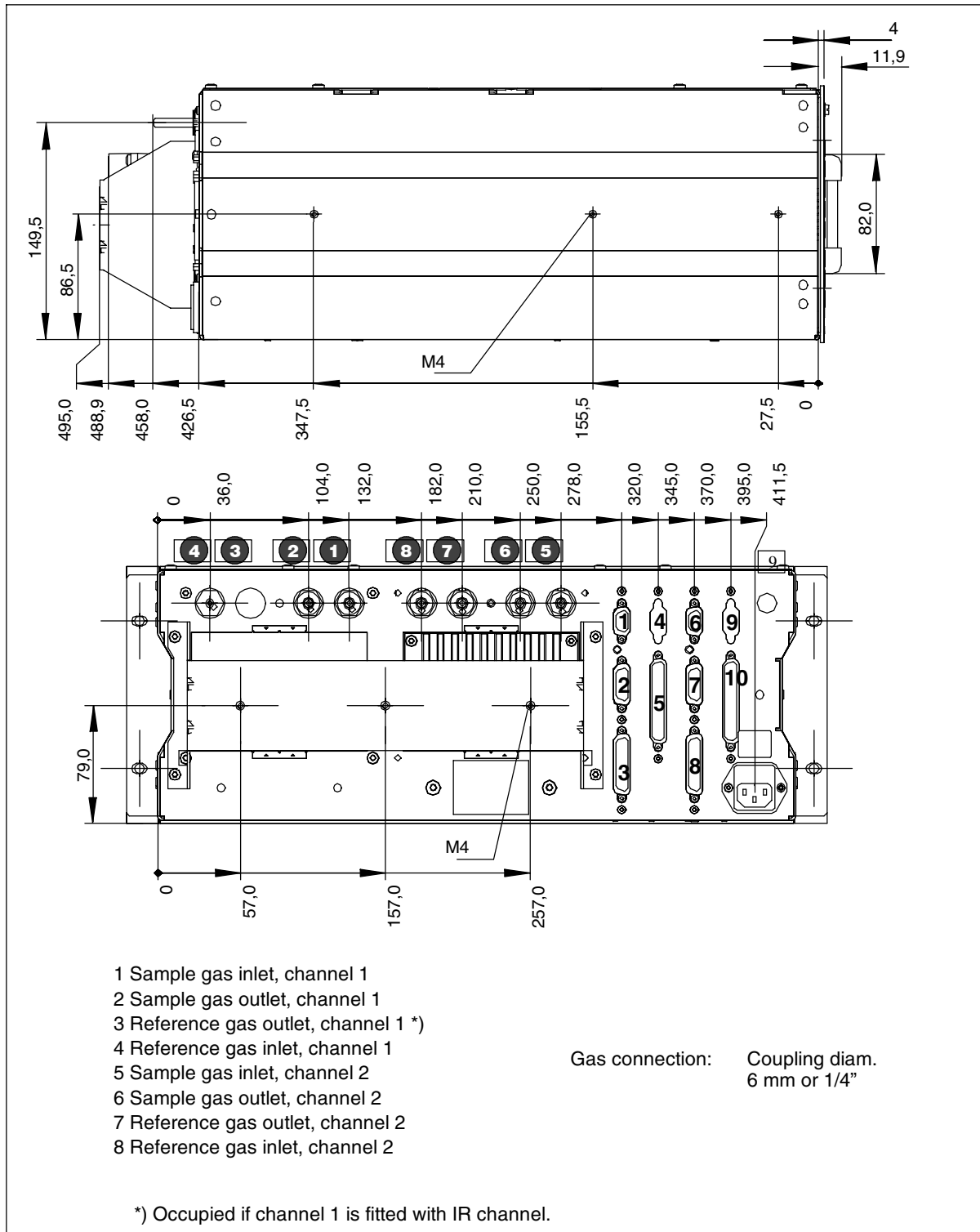


Fig. 2-24 Dimensional drawing for 7MB2023, 7MB2024, 7MB2121, 7MB2123, 7MB2124, 7MB2028, 7MB2026, 7MB2127, 7MB2128, 7MB2126

2.6.2 ULTRAMAT 6F and OXYMAT 6F

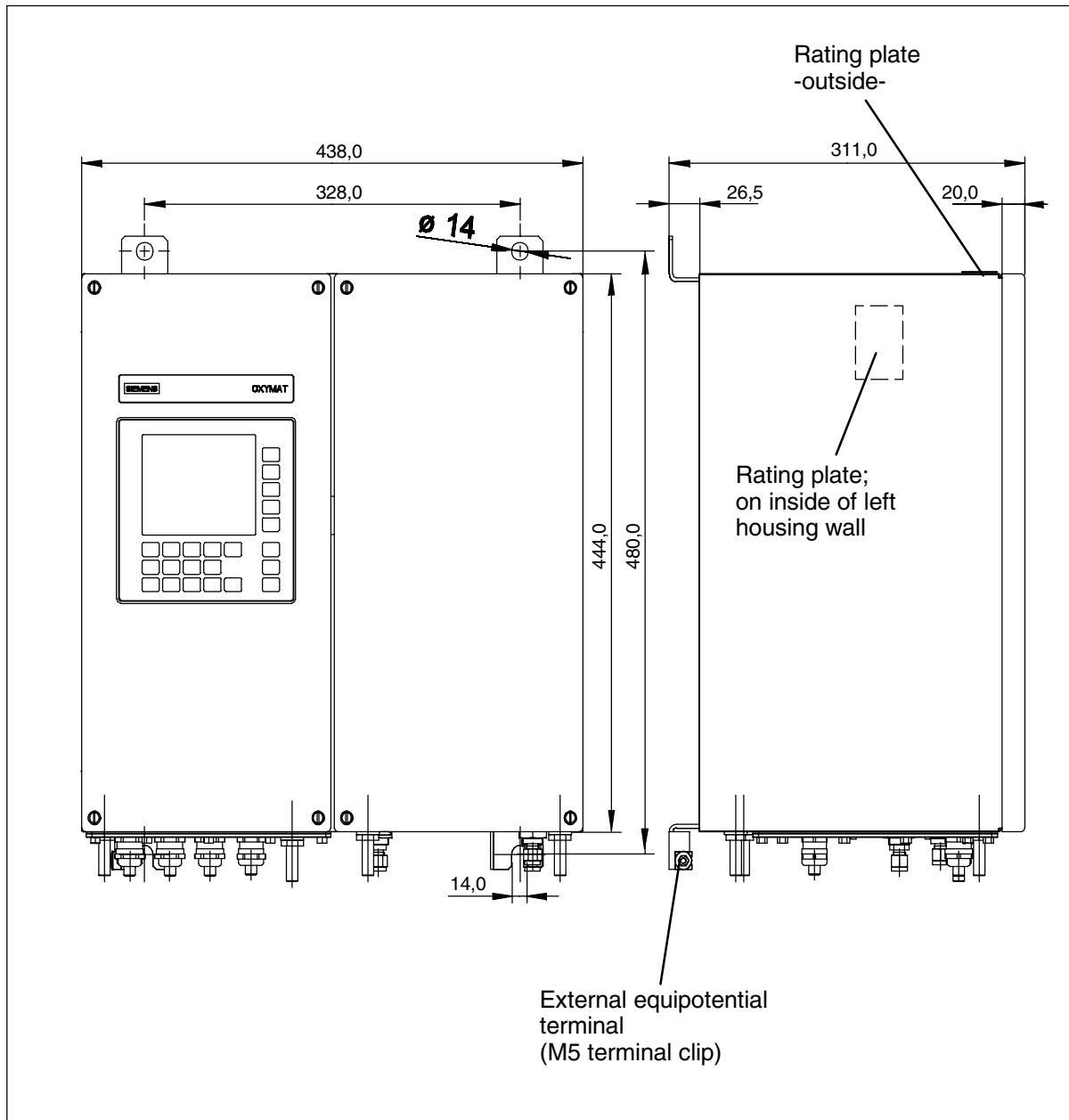


Fig. 2-25 Installation dimensions (front and side views, **ULTRAMAT 6F and OXYMAT 6F; 7MB2011, 7MB2017, 7MB2111, 7MB2117, 7MB2112, 7MB2118**)

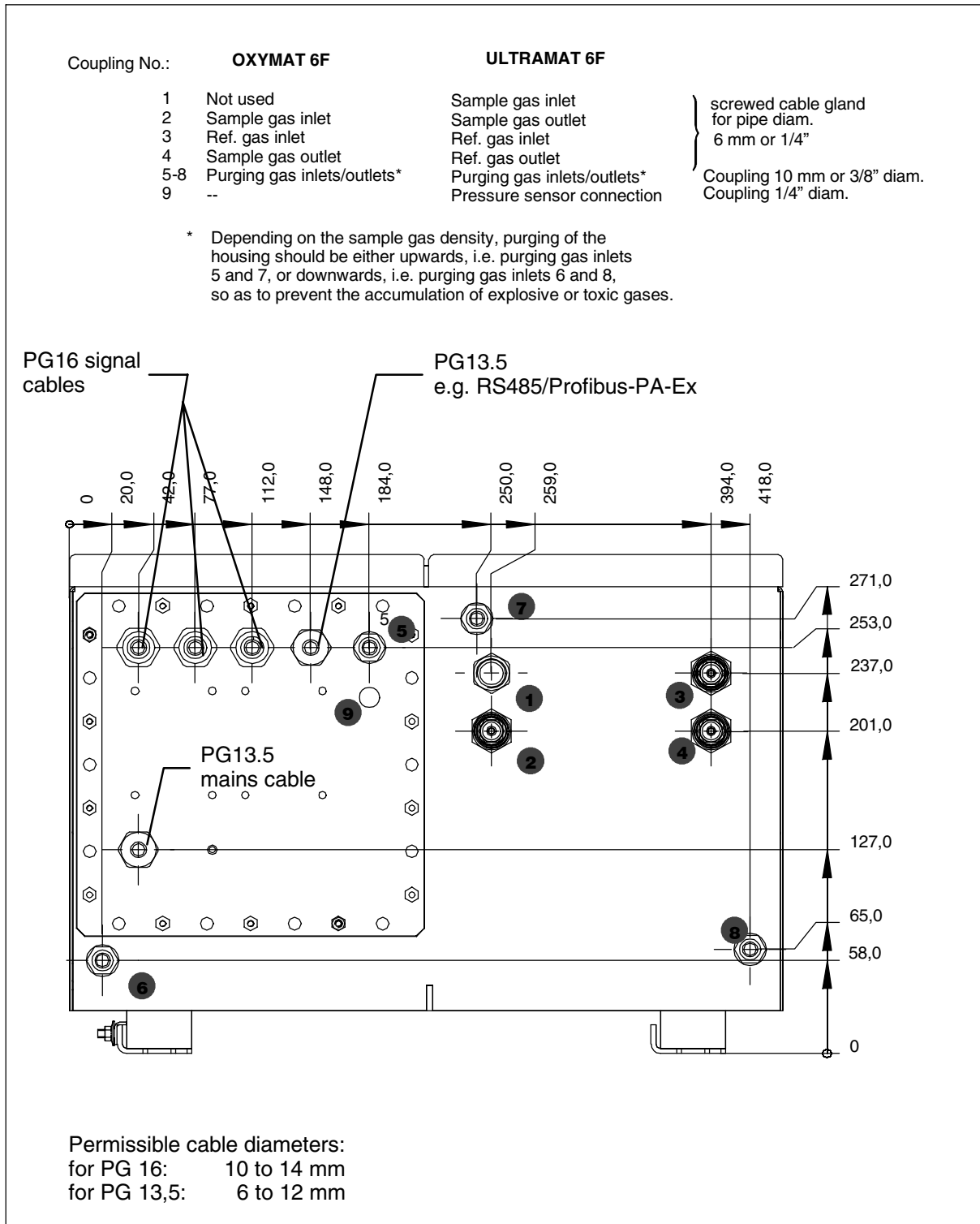


Fig. 2-26 Installation dimensions (view from below, **ULTRAMAT/OXYMAT 6F; 7MB2011, 7MB2017, 7MB2111, 7MB2117, 7MB2112, 7MB2118**)

Technical Description

3

| | | |
|------|---|------|
| 3.1 | Application, Design, Characteristics of ULTRAMAT 6E/F and OXYMAT 6E/F | 3-2 |
| 3.2 | Display and Control Panel | 3-4 |
| 3.3 | Communications Interface | 3-5 |
| 3.4 | Mode of Operation of ULTRAMAT Channel | 3-6 |
| 3.5 | Mode of Operation of OXYMAT Channel | 3-7 |
| 3.6 | Technical Data of ULTRAMAT 6E | 3-8 |
| 3.7 | Technical Data of OXYMAT 6E | 3-9 |
| 3.8 | Technical Data of ULTRAMAT 6F | 3-10 |
| 3.9 | Technical Data of OXYMAT 6F | 3-11 |
| 3.10 | Reference Gases, Zero Error for OXYMAT 6E/F | 3-12 |
| 3.11 | Materials in the Sample Gas Path | 3-13 |



Note!

All text positions within a section which require special treatment either of the **ULTRAMAT 6E/F** or the **OXYMAT 6E/F** are identified by the respective analyzer name.

Complete paragraphs on an analyzer have the associated name in the title line.

3.1 Application, Design, Characteristics of ULTRAMAT 6E/F and OXYMAT 6E/F

The **ULTRAMAT 6** gas analyzer operates according to the NDIR two-beam alternating light principle and measures gases highly selectively whose absorption bands lie in the infrared wavelength range from 2 to 9 μm such as e.g. CO, CO₂, NO, SO₂, NH₃, H₂O, CH₄ and other hydrocarbons.

The **OXYMAT 6** gas analyzer operates according to the paramagnetic alternating pressure principle and is used to measure oxygen in gases.

The combined **ULTRAMAT/OXYMAT 6E** analyzer includes one **ULTRAMAT** channel and one **OXYMAT** channel in a single housing.

Application examples

- Measurements for boiler control in combustion plants
- Measurements in safety-relevant areas
- Measurements as reference variable for statutory emission measurements
- Measurements in the automotive industry (test bay systems)
- Warning equipment
- Emission measurements in combustion plants
- Process gas concentrations in chemical plants
- Trace measurements with pure gas processes for quality monitoring
- Inertization monitoring; only permissible with suitability-tested analyzer (gas warning equipment)

Special characteristics

- Four freely-programmable measuring ranges per component, also with suppressed zero, all measuring ranges linear
- One electrically isolated signal output 0/2/4 to 20 mA per component
- Two analog inputs programmable e.g. for correction of cross-interferences, external pressure sensor
- Six binary inputs freely-configurable e.g. for range switching
- Six relay outputs freely-configurable e.g. for failure, maintenance request, limit alarm, external solenoid valves
- Optionally with eight additional binary inputs and eight additional relay outputs for automatic calibration with up to four calibration gases
- Autoranging, remote switching or manual range selection possible

- Storage of measured values possible during calibration
- Time constants selectable within a wide range (static/dynamic noise suppression); i.e. the response time of each component can be adapted to the respective application
- Menu-based operation
- Fast response time
- Low long-term drift
- Two-stage access code to prevent unintentional and unauthorized inputs
- Internal pressure sensor for correction of variations in atmospheric pressure in the range 600 ... 1200 hPa absolute (with IR channel) or correction of variations in the process gas pressure in the range 500 ... 2000 hPa absolute (with O₂ channel)
- External pressure sensor can be connected for correction of variations in the process gas pressure in the range 600 ... 1500 hPa absolute (with IR channel) or 500 ... 3000 hPa absolute (with O₂ channel)
- Automatic range calibration can be parameterized
- Operation based on NAMUR recommendations
- One RS 485 serial interface per channel
 - to connect several *series 6* gas analyzers
 - to construct local networks/systems
 - for remote control/maintenance via PC
- Siprom GA as service and maintenance tool
- Profibus DP and PA, also PA EEx i
- Customer-specific analyzer options such as:
 - Customer acceptance
 - TAG labels
 - Drift recording
 - Cleaned for O₂ service
 - FFKM (e. g. Kalrez) gaskets
- Monitoring of sample and/or reference gas (option)
- Different smallest spans (down to 0.5% with O₂ channel)
- Analyzer section with flow-type compensation circuit to reduce the vibration dependency (O6 only). A flow can be passed through the compensation branch in the case of highly different densities of the sample and reference gases (with O₂ channel)
- Differential ranges with flow-type reference cell (with IR channel)

Display and control panel

- Large LCD panel for simultaneous display of:
 - Measured value (digital and analog displays)
 - Status line
 - Measuring ranges
- Contrast of LCD panel adjustable using menu
- Permanent LED backlighting
- Five-digit measured-value display (decimal point counts as digit)
- Membrane keyboard/front panel easy to clean
- Menu-based operation for configuration, test functions, calibration
- User help in plain text
- Graphic display of concentration trend; programmable time intervals
- Operating software in two languages: German/English, English/Spanish, French/English, Spanish/English, Italian/English

Interfaces per channel

- RS 485 present in basic unit (connection possible at rear or also behind the front panel)

Options:

- AK interface for the automotive industry with extended functions
- Incorporation into network via RS 485 interface (see Section 3.3)
- Autocal function with 8 additional binary inputs and 8 relay outputs, also with PROFIBUS PA or DP

Design of housing/analyzer section

ULTRAMAT 6E and OXYMAT 6E

- 19" unit with 4 HU, for installation in hinged bays
- 19" unit with 4 HU, for installation in cabinets, with or without telescopic rails
- Front panel can be swung down for servicing (laptop connection)
- Internal gas paths: FKM (e. g. Viton) tubing or titanium or 1.4571 stainless steel piping
- Gas connections: pipe diameter 6 mm or 1/4"
- Flowmeter for sample gas on front panel (option)
- Sample chamber (OXYMAT channel) - with or without flow-type compensation branch - made of stainless steel or tantalum for highly corrosive sample gases (such as HCl, Cl₂, SO₂, SO₃, etc.)
- Material of analyzer chambers in **ULTRAMAT 6E/F**: In the standard version, the analyzer chamber consists of an aluminium body which is equipped with a thin lining of aluminium or tantalum. With very short chambers (large measuring ranges), this lining is omitted. For further details and special versions, see Section 3.11.

Design of housing/analyzer section

ULTRAMAT 6F and OXYMAT 6F

- Housing for field mounting with gas-tight separation of electronic modules from wetted parts
- Each half of the housing can be purged separately
- Simple replacement of analyzer since electric connections are easy to remove
- Parts wetted by the sample gas can be heated up to 130 °C (OXYMAT 6F) or 65 °C (ULTRAMAT 6F) (option)
- Gas path: stainless steel 1.4571 or Ti; if the pipe sockets are made of Ti, gases containing HCl or Cl₂ must have a moisture content of at least 0.5% H₂O on the one hand, and condensation must be avoided on the other; stainless steel is only suitable for dry corrosive gases!
- Gas path (ULTRAMAT 6F): FKM (e. g. Viton) tubing or titanium or 1.4571 stainless steel piping
- Gas connections: pipe gland for pipe diameter 6 mm or 1/4"
- Purging gas connections: pipe diameter 10 mm or 3/8"
- Sample chamber (OXYMAT channel) - with or without flow-type compensation branch - made of stainless steel 1.4571 or tantalum for highly corrosive sample gases (such as HCl, Cl₂, SO₂, SO₃, etc.)
- Material of analyzer chambers in **ULTRAMAT 6E/F**: In the standard version, the analyzer chamber consists of an aluminium body which is equipped with a thin lining of aluminium or tantalum. With very short chambers (large measuring ranges), this lining is omitted. For further details and special versions, see Section 3.11.

3.2 Display and Control Panel

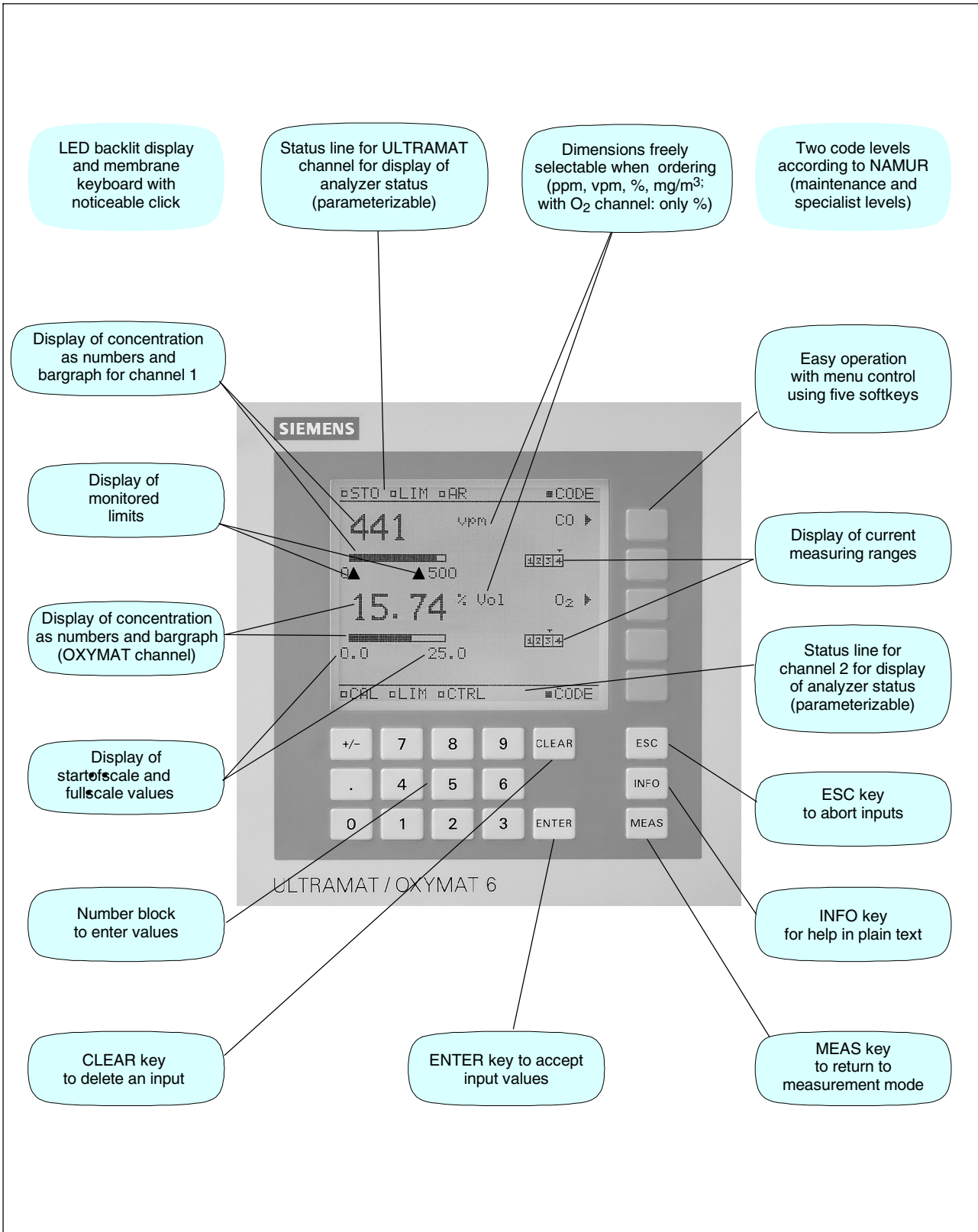


Fig. 3-1 Membrane keyboard and graphic display

3.3 Communications Interface

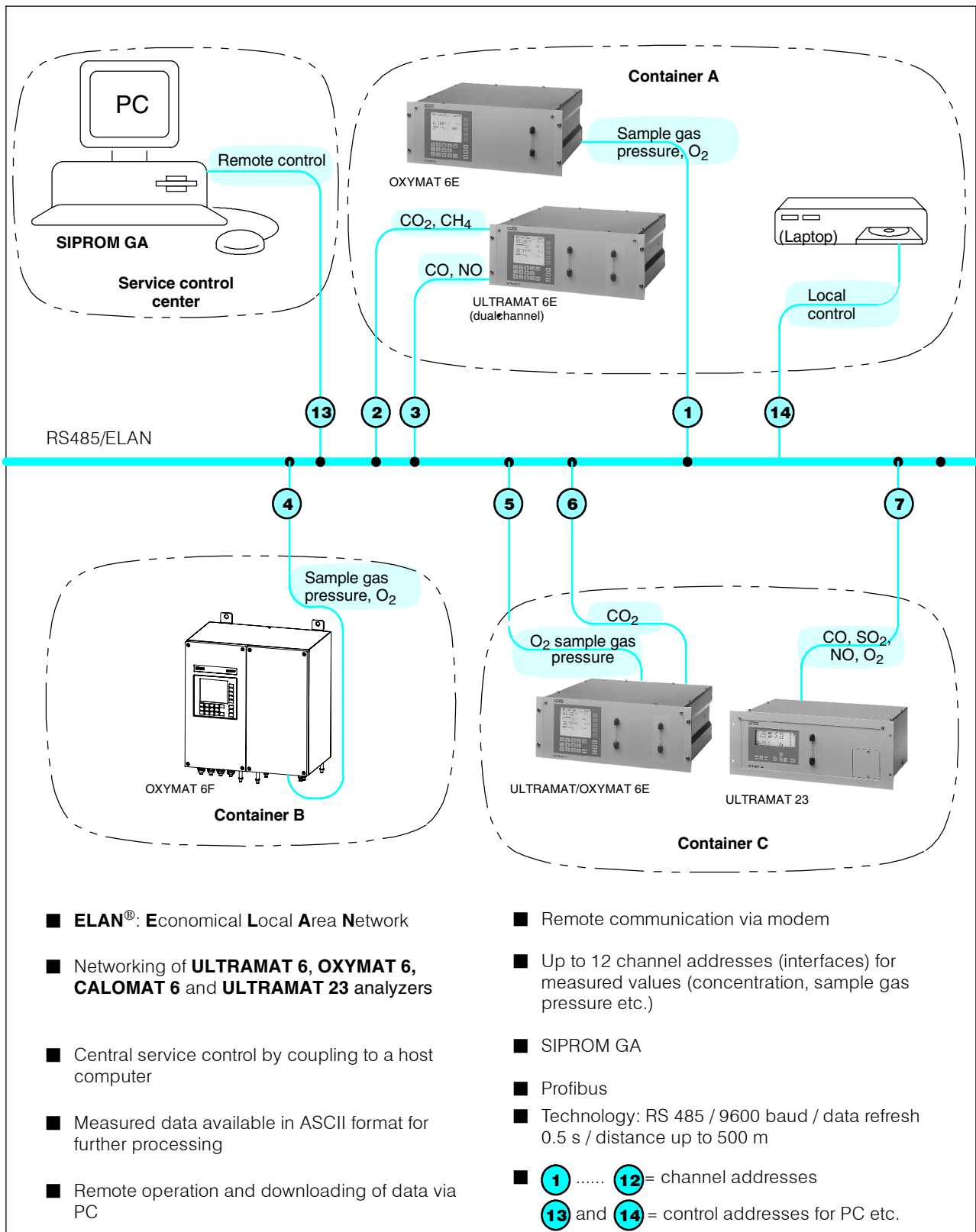


Fig. 3-2 Various analyzers networked via RS 485

3.4 Mode of Operation of ULTRAMAT Channel

The **ULTRAMAT** channel operates according to the infrared two-beam alternating light principle with double-layer detector and optical coupler.

The measuring principle is based on the molecule-specific absorption of bands of infrared radiation. The absorbed wavelengths are characteristic to the individual gases, but may partially overlap. This results in cross-sensitivities which are reduced to a minimum in the ULTRAMAT channel by the following measures:

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

Fig. 3-3 shows the measuring principle. An IR source (5) which is heated to approx. 700 °C and which can be shifted to balance the system is divided by the beam divider (7) into two equal beams (sample and reference beams). The beam divider also acts as a filter cell.

The reference beam passes through a reference cell (11) filled with N₂ (a non-infrared-active gas) and reaches the right-hand side of the detector (12) practically unattenuated. The sample beam passes through the sample cell (10) through which the sample gas flows and reaches the left-hand side of the detector (13) attenuated to a lesser or greater extent depending on the concentration of the sample gas. The detector is filled with a defined concentration of the gas component to be measured.

The detector is designed as a double-layer detector. The center of the absorption band is preferentially absorbed in the upper detector layer, the edges of the band are absorbed to approximately the same extent in the upper and lower layers. The upper and lower detector layers are connected together via the microflow sensor (15). This coupling means that the spectral sensitivity has a very narrow band.

The optical coupler (14) lengthens the lower detector chamber layer optically. The infrared absorption in the second detector layer is varied by changing the slider position (16). It is thus possible to individually minimize the influence of interfering components.

A chopper (8) rotates between the beam divider and the sample cell and interrupts the two beams alternately and periodically. If absorption takes place in the sample cell, a pulsating current is generated which is converted by the microflow sensor (15) into an electric signal.

The microflow sensor consists of two nickel grids heated to approx. 120 °C which, together with two further resistors, form a Wheatstone bridge. The pulsating flow together with the very close arrangement of the Ni grids leads to a change in resistance. This leads to an offset in the bridge which is dependent on the concentration of the sample gas.

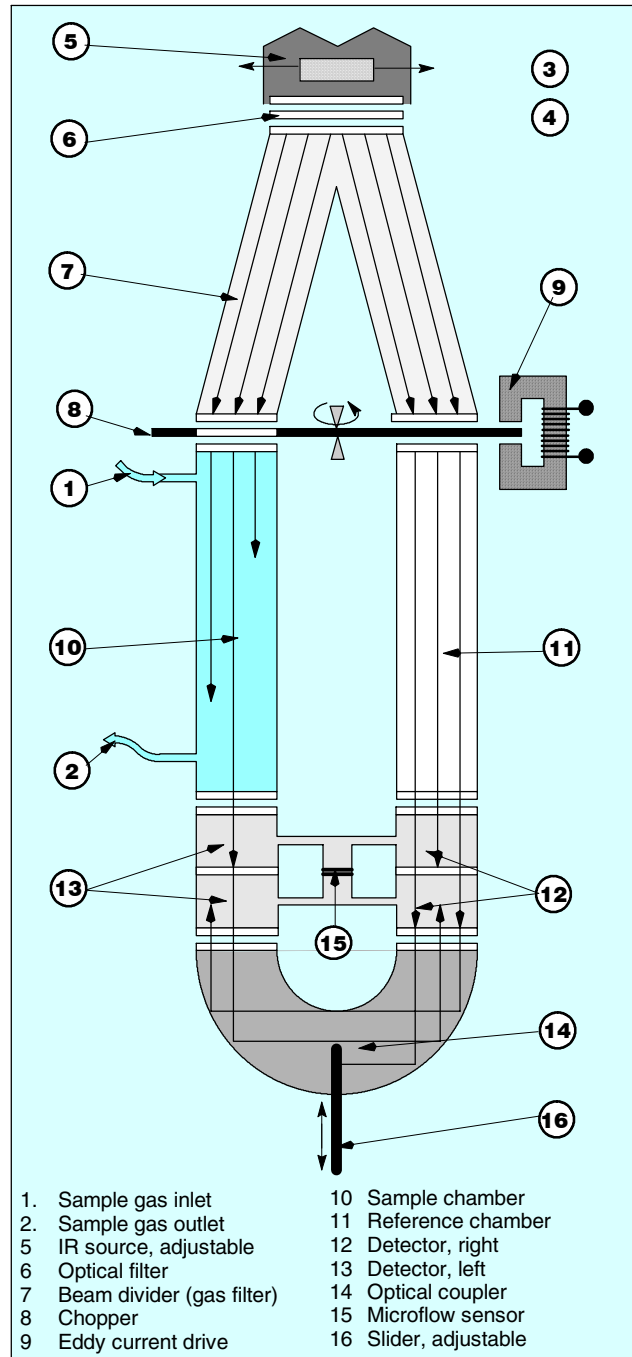


Fig. 3-3 Mode of operation

3.5 Mode of Operation of OXYMAT Channel

In contrast to almost all other gases, oxygen is paramagnetic. This property is used as the measuring principle by the OXYMAT channel.

Oxygen molecules in an inhomogeneous magnetic field are drawn in the direction of increased field strength due to their paramagnetism. When two gases with different oxygen concentrations meet in a magnetic field, a pressure difference is produced between them.

For the OXYMAT channel, one of the gases (17, Fig. 3-4) is a reference gas (N_2 , O_2 or air), the other is the sample gas (21, Fig. 3-4). The reference gas is introduced into the sample chamber (22) through two channels (19). One of these reference gas streams meets the sample gas within the area of a magnetic field (23). Because the two channels are connected, the pressure, which is proportional to the oxygen concentration, causes a flow. This flow is converted into an electric signal by a microflow sensor (20).

The microflow sensor consists of two nickel grids heated to approx. 120 °C which form a Wheatstone bridge together with two supplementary resistors. The pulsating flow results in a change in the resistance of the Ni grids. This results in a bridge offset which depends on the oxygen concentration in the sample gas.

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

By using a magnetic field with alternating strength (24), the effect of the background flow in the microflow sensor is not detected, and the measurement is thus independent of the instrument orientation.

The sample chamber is directly in the sample path and has a small volume. There is therefore a very short response time for the OXYMAT channel.

Vibrations frequently occur at the place of measurement and may falsify the measured signal (noise). A further microflow sensor (26) through which no gas passes acts as a vibration sensor. Its signal is connected to the measured signal as compensation.

If the density of the sample gas deviates by more than 50 % from that of the reference gas, the compensation microflow sensor (26) is flushed with reference gas just like the measuring sensor (20).

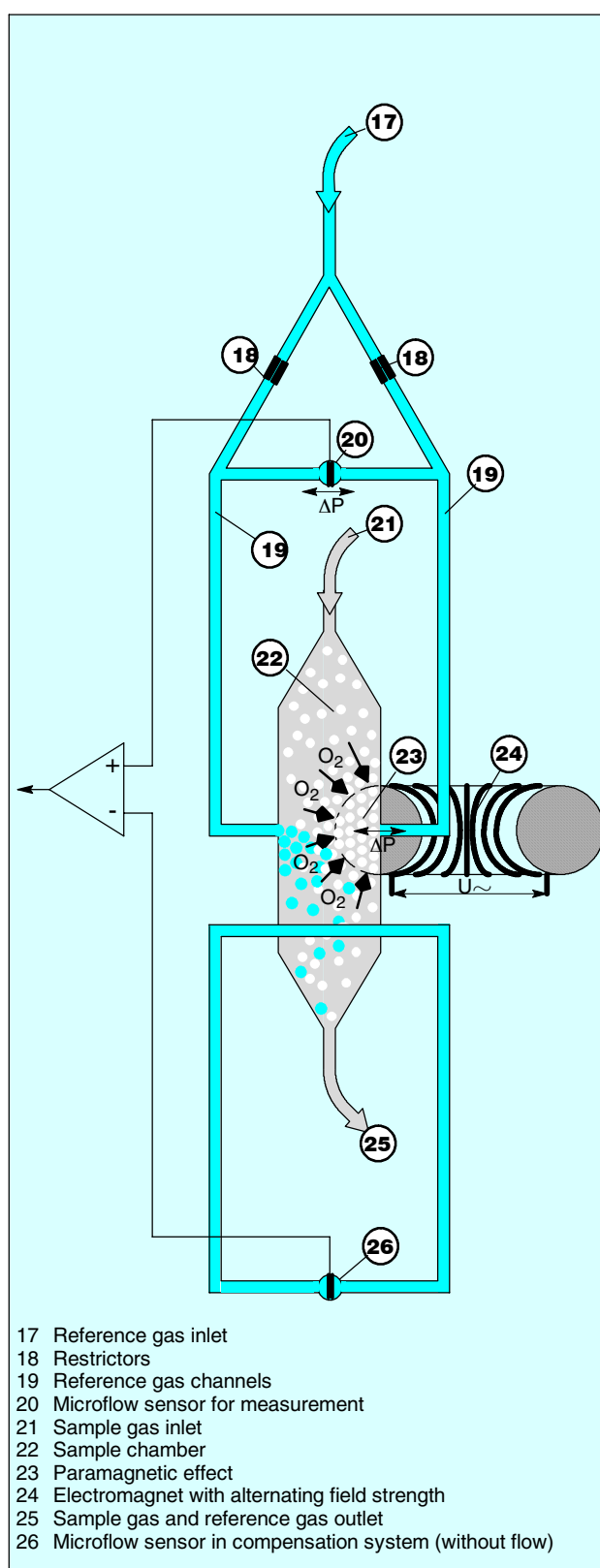


Fig. 3-4 Mode of operation

3.6 Technical Data ^{*)} of ULTRAMAT 6E and Dual-channel Analyzer ULTRAMAT 6

| General | |
|-----------------------------------|---|
| Measuring ranges | 4, switchable internally and externally; autoranging is also possible |
| Smallest possible measuring range | Dependent on application, e.g. CO: 0 to 10 vpm CO ₂ : 0 to 5 vpm |
| Largest possible measuring range | Dependent on application |
| Characteristic | Linearized |
| Electromagnetic compatibility | Conforms to standard requirements of NAMUR NE21 (08/98); EN 61326/A2 |
| Electrical safety | According to EN 61010-1 Category of overload III |
| Degree of protection | IP 20 to EN 60529 |
| Position of use | Front panel vertical |
| Dimensions | See Figs. 2-21 and 2-24 |
| Weight | Approx. 15 kg/33 lbs. (with one IR channel); approx. 21 kg/46 lbs. (with two IR channels) |

| Power supply | |
|-------------------------------------|--|
| Power connection (see rating plate) | AC 100 to 120 V (rated range: 90 to 132 V), 48 to 63 Hz or AC 200 to 240 V (rated range: 180 to 264 V), 48 to 63 Hz |
| Power consumption | Single-channel analyzer: approx. 35 VA Dual-channel analyzer: approx. 70 VA |
| Fuse ratings | 1 channel device (7MB2121, 7MB2127, 7MB2124, 7MB2126) 100...120V: 1T/250 200...240V: 0,63T/250 2 channel device (dual channel device ULTRAMAT 6) (7MB2123, 7MB2128), 7MB2124, 7MB2126) 100...120V: 1,6 T/250 200...240V: 1T/250 |

| Gas inlet conditions | |
|------------------------|---|
| Sample gas pressure | 600 to 1500 hPa (8.7 to 21.7 psi) abs. with external pressure sensor 700 to 1300 hPa (10 to 19 psi) absolute with internal pressure sensor |
| 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 ⁵⁾ or depending on application |

| Time response | |
|---|---|
| Warm-up time | At room temperature: < 30 min ²⁾ |
| Response time (T ₉₀ time) | Dependent on length of analyzer cell, sample gas line and parameterizable damping |
| Damping (electric time constant) | 0 to 100 s parameterizable |
| Dead time (purging time of gas path in analyzer at 1 l/min) | Approx. 0.5 to 5 s depending on version |
| Time for internal signal processing | < 1 s |

| Pressure correction range | |
|---------------------------|---|
| Pressure sensor internal | 600 to 1200 hPa / 8.4 to 17 psi absolute |
| external | 600 to 1500 hPa / 12.6 to 21 psi absolute |

| Measuring response ²⁾ | |
|---------------------------------------|---|
| Output signal variation ⁶⁾ | < ± 1 % of smallest possible measuring range according to rating plate with analyzer-specific damping constant (this corresponds to ± 0.33 % at 2σ) |
| Zero drift | < ± 1% of measuring range/week |
| Span drift | < ± 1% of measuring range/week |
| Repeatability | ≤ 1% of respective measuring range |
| Linearity deviation | < 0.5% of full-scale value |

| Influencing variables ³⁾ | |
|-------------------------------------|---|
| Ambient temperature | < 1% of measuring range/10 K |
| Sample gas pressure | With pressure compensation switched on: < 0.15% of setpoint / 1% change in pressure |
| Sample gas flow | Negligible |
| Power supply | < 0.1% of output signal span at rated voltage ± 10% |
| Ambient conditions | Application-dependent influencing of measurement possible if ambient air contains measured component or cross-sensitive gases |

| Electric inputs and outputs | |
|-----------------------------|--|
| Analog output | 0 / 2 / 4 to 20 mA, floating max. load ≤ 750 Ω |
| Relays outputs | 6 with changeover contacts, freely-parameterizable e.g. for range identification; loading capacity: AC/DC 24 V/1 A floating, non sparking |
| Analog inputs | 2, designed for 0/2/4 to 20 mA for external pressure sensor and correction of influence of residual gas (correction of cross-interference) |
| Binary inputs | 6, designed for 24 V, floating, freely-parameterizable e.g. for range selection |
| Serial interface | RS 485 |
| Options | Autocal functions with 8 additional binary inputs and 8 additional relay outputs, also with PROFIBUS PA or PROFIBUS DP |

| Climatic conditions | |
|---------------------------------|---|
| Permissible ambient temperature | -30 to +70 °C during storage and transport +5 to +45 °C during operation |
| Permissible humidity | < 90% RH ⁵⁾ as annual average during storage and transport ⁴⁾ |

¹⁾ Based on DIN EN 61207/IEC 1207

²⁾ Maximum accuracy achieved after 2 hours

³⁾ Referred to 1 bar sample gas pressure, 0.5 l/min sample gas flow and 25 °C ambient temperature

⁴⁾ Dew point must not be fallen below

⁵⁾ RH: relative humidity

⁶⁾ All signal cables must be of screened design!

⁷⁾ The specified errors refer to the measured values with a stable temperature of the detector chamber. With short-term, strong variations in the ambient temperature, and thus in the chamber temperature, the range may be exceeded.

3.7 Technical Data ¹⁾ of OXYMAT 6E and OXYMAT 6 Channel in the Dual-channel Analyzer ULTRAMAT 6*/OXYMAT 6

| General | | Measuring response ³⁾ | |
|--|--|---------------------------------------|---|
| Measuring ranges | 4, switchable internally and externally; autoranging is also possible | Output signal variation ⁶⁾ | < ± 0.75 % of smallest possible measuring range according to rating plate with electronic damping constant of 1 s (this corresponds to ± 0.25 % at 2σ) |
| Smallest possible span ³⁾ With gas warning equipment | 0.5 vol. %, 2 vol. % or 5 vol. % O ₂ 2 vol. % or 5 vol. % O ₂ | Zero drift | < 0.5% / month of smallest possible span acc. to rating plate |
| Largest possible span | 100 vol. % O ₂ (with pressure above 2 bar: 25 vol. % O ₂) | Measured-value drift | < 0.5% / month of respective span |
| Measuring ranges with suppressed zero | Any zero point is possible between 0 and 100 vol. % as long as a suitable reference gas is used (see also Table 3.1) | Repeatability | < 1% of respective span |
| Electromagnetic compatibility | Conforms to standard requirements of NAMUR NE21 (08/98), EN 50270 ⁷⁾ , EN 61326/A2 | Calibration error | Dependent on accuracy of calibration gases ⁷⁾ |
| Degree of protection | IP 20 to EN 60529 | Linearity deviation | < 0.1% of respective span |
| Electrical safety | According to EN 61010-1 Category of overload III | Influencing variables ³⁾ | |
| Position of use | Front panel vertical | Ambient temperature | < 1 % / 10 K, referred to the smallest possible span according to rating plate; with span 0.5 %: twice the error (1 %/10 K) |
| Dimensions | See Figs. 2-21 and 2-24 | Sample gas pressure | With pressure compensation switched off: 2% of span with 1% change in pressure; with pressure compensation switched on: < 0.2% of span with 1% change in pressure |
| Weight | Approx. 13 kg/29 lbs. (only O ₂ channel); approx. 19 kg/42 lbs. (O ₂ and IR channels) | Residual gases | Deviation in zero point corresponding to paramagnetic/diamagnetic deviation of residual gas (s. Table 3.2) |
| Power supply | | Sample gas flow | < 1% of smallest possible span according to rating plate with a change in flow of 0.1 l/min within the permissible flow range |
| Power connection (see rating plate) | AC 100 to 120 V (rated range: 90 to 132 V), 48 to 63 Hz or AC 200 to 240 V (rated range: 180 to 264 V), 48 to 63 Hz | Power supply | < 0.1% of output signal span with rated voltage ±10% |
| Power consumption Single-channel analyzer Dual-channel analyzer (ULTRAMAT/OXYMAT 6) | approx. 35 VA approx. 70 VA | Electric inputs and outputs | |
| Fuse ratings | | Analog output | 0 / 2 / 4 to 20 mA, floating, max. load 750 Ω |
| 1 channel device (7MB2021, 7MB2027) | 100...120V: 1T/250 200...240V: 0,63T/250 | Relay outputs | 6, with changeover contacts, freely-parameterizable e.g. for range identification; loading capacity: AC/DC 24 V / 1 A floating |
| 2 channel device (dual channel device ULTRAMAT6/OXYMAT 6) (7MB2023, 7MB2028, 7MB2024, 7MB2026) | 100...120V: 1,6T/250 120...240V: 1T/250 | Analog inputs | 2, designed for 0 / 2 / 4 to 20 mA, for external pressure sensor and correction of influence of residual gas (correction of cross-interference) |
| Gas inlet conditions | | Binary inputs | 6, designed for 24 V, floating, freely-selectable e.g. for range switching |
| Sample gas pressure analyzers with hose | 500 to 1500 hPa / 7.2 to 21.7 psi absolute | Serial interface | RS 485 |
| with built-in pressure switch: | 700 to 1300 hPa / 10 to 18.8 psi absolute | Options | Autocal functions with 8 additional binary inputs and 8 additional relay outputs, also with PROFIBUS PA or PROFIBUS DP |
| analyzers with piping | 500 to 3000 hPa / 7.2 to 43.5 psi absolute | | |
| Gas warning equipment | 800 to 1100 hPa / 11.6 to 15.9 psi absolute | Climatic conditions | |
| Sample gas flow | 18 to 60 l/h (0.3 to 1 l/min) | Permissible ambient temperature | -30 to +70 °C during storage and transport +5 to +45 °C during operation |
| Sample gas temperature | 0 to 50 °C | Permissible ambient pressure | 800 to 1200 hPa/11.6 to 17.4 psi ⁷⁾ |
| Sample gas humidity | < 90% RH ⁵⁾ | Permissible humidity | < 90% RH ⁵⁾ as annual average for storage and transport ⁴⁾ |
| Time response | | | |
| Warm-up time | < 30 min ²⁾ at room temperature | | |
| Response time with flow 1 l/min and signal damping 0 s | Min. 1.5 to 3.5 s depending on version | | |
| Damping (electric time constant) | 0 to 100 s parameterizable | | |
| Dead time (purging time of gas path in analyzer at 1 l/min) | Approx. 0.5 to 2.5 s depending on version | | |
| Time for internal signal processing | < 1 s | | |
| Pressure correction range | | | |
| Pressure sensor internal | 500 to 2000 hPa/7.2 to 29 psi absolute | | |
| external | 500 to 3000 hPa/7.2 to 43.5 psi abs. | | |

^{*)} ULTRAMAT channel: see Technical data in Section 3.6

¹⁾ Based on DIN EN 61207/IEC 1207

²⁾ Maximum accuracy achieved after 2 hours

³⁾ Referred to 1 bar sample gas pressure, 0.5 l/min sample gas flow and 25 °C ambient temperature

⁴⁾ Dew point must not be fallen below

⁵⁾ RH: relative humidity

⁶⁾ All signal cables must be of shielded design!

⁷⁾ Accuracy of calibration and reference gases must be appropriate to the application.

3.8 Technical Data ¹⁾ of ULTRAMAT 6F

General

| | |
|---|---|
| Measuring ranges | 4, switchable internally and externally; autoranging is also possible |
| Smallest possible measuring range | Dependent on application, e.g. CO: 0 to 10 vpm CO ₂ : 0 to 5 vpm |
| Largest possible measuring range | Dependent on application |
| Characteristic | Linearized |
| Electromagnetic compatibility | Conforms to standard requirements of NAMUR NE21 (08/98), EN 61326/A2 |
| Degree of protection | IP 65 to EN 60529 |
| Electrical safety heated version normal version | According to EN 61010-1 category of overload II category of overload III |
| Position of use | Front panel vertical |
| Dimensions | See Figs. 2-25 and 2-26 |
| Weight | Approx. 32 kg / 71 lbs. |

Power supply

| | | | |
|--|---|-----------|-----------|
| Power connection (see rating plate) | AC 100 to 120 V (rated range: 90 to 132 V), 48 to 63 Hz or AC 200 to 240 V (rated range: 180 to 264 V), 48 to 63Hz | | |
| Power consumption (analyzer) | Approx. 35 VA; approx. 330 VA for heated version | | |
| Fuse ratings (analyzer without heater) | 100 ... 120V | F3 | 1T/250 |
| | | F4 | 1T/250 |
| Fuse ratings (analyzer with heater) | 200 ... 240V | F3 | 0.63T/250 |
| | | F4 | 0.63T/250 |
| | 100 ... 120V | F1 | 1T/250 |
| | | F2 | 4T/250 |
| | | F3 | 4T/250 |
| | | F4 | 4T/250 |
| 200 ... 240V | F1 | 0.63T/250 | |
| | F2 | 2.5T/250 | |
| | F3 | 2.5T/250 | |
| | F4 | 2.5T/250 | |

Gas inlet conditions

| | |
|------------------------|--|
| Sample gas pressure | 600 to 1500 hPa/8.7 to 21.7 psi abs. |
| Purging gas pressure | < 165 hPa/2.4 psi above amb. pressure |
| Sample gas flow | 18 to 90 l/h (0.3 to 1.5 l/min) |
| Sample gas temperature | 0 to 50 °C; with heated version: 0 to 80 °C |
| Sample gas humidity | < 90% RH ⁵⁾ or depending on application |

Time response

| | |
|---|--|
| Warm-up time | At room temperature: < 30 min ²⁾ Heated version: approx. 90 min |
| Response time (T ₉₀ time) | Dependent on length of analyzer chamber, sample gas line and parameterizable damping |
| Damping (electric time constant) | 0 to 100 s parameterizable |
| Dead time (purging time of gas path in analyzer at 1 l/min) | Approx. 0.5 to 5 s depending on version |
| Time for internal signal processing | < 1 s |

Pressure correction range

| | |
|-----------------|--------------------------------------|
| Pressure sensor | |
| internal | 600 to 1200 hPa/8.7 to 17.4 psi abs. |
| external | 600 to 1500 hPa/8.7 to 21.7 psi abs. |

Measuring response ²⁾

| | |
|---------------------------------------|---|
| Output signal variation ⁶⁾ | < ± 1 % of smallest possible measuring range according to rating plate with analyzer-specific damping constant (this corresponds to ± 0.33 % at 2σ) |
| Zero drift | < ± 1% of measuring range/week |
| Span drift | < ± 1% of measuring range/week |
| Repeatability | Between 0.1% and 1% of respective meas. range depending on model |
| Linearity deviation | < 0.5% of full-scale value |

Influencing variables ³⁾

| | |
|---------------------|---|
| Ambient temperature | < 1% of measuring range/10 K ⁷⁾ (non-heated version) |
| Sample gas pressure | With pressure compensation switched on: < 0.15% of setpoint with 1% change in pressure |
| Sample gas flow | Negligible |
| Power supply | < 0.1% of output signal span at rated voltage ± 10% |
| Ambient conditions | Application-dependent influencing of measurement possible if ambient air contains measured component or cross-sensitive gases |

Electric inputs and outputs

| | |
|------------------|--|
| Analog output | 0 / 2 / 4 to 20 mA, floating max. load ≤ 750 Ω |
| Relay outputs | 6 with changeover contacts, freely-parameterizable e.g. for range identification; loading capacity: AC/DC 24 V/1 A floating, non sparking |
| Analog inputs | 2, designed for 0/2/4 to 20 mA for external pressure sensor and correction of influence of residual gas (correction of cross-interference) |
| Binary inputs | 6, designed for 24 V, floating, freely-parameterizable e.g. for range selection |
| Serial interface | RS 485 |
| Options | Autocal functions with 8 additional binary inputs and 8 additional binary outputs, also with PROFIBUS PA or PROFIBUS DP |

Climatic conditions

| | |
|---------------------------------|---|
| Permissible ambient temperature | -30 to +70 °C during storage and transport +5 to +45 °C during operation |
| Permissible humidity | < 90% RH ⁵⁾ as annual average during storage and transport ⁴⁾ |

¹⁾ Based on DIN EN 61207/IEC 1207
²⁾ Maximum accuracy achieved after 2 hours
³⁾ Referred to 1 bar sample gas pressure, 0.5 l/min sample gas flow and 25 °C ambient temperature
⁴⁾ Dew point must not be fallen below
⁵⁾ RH: relative humidity
⁶⁾ All signal cables must be of screened design!
⁷⁾ The specified errors refer to the measured values with a stable temperature of the detector chamber. With short-term, strong variations in the ambient temperature, and thus in the chamber temperature, the range may be exceeded.

3.9 Technical Data ¹⁾ of OXYMAT 6F

| | | | |
|--|--|---|---|
| General | | Measuring response ³⁾ | |
| Measuring ranges | 4, switchable internally and externally; autoranging is also possible | Output signal variation ⁹⁾ | < ± 0.75 % of smallest possible measuring range according to rating plate with electronic damping constant of 1 s (this corresponds to ± 0.25 % at 2σ) |
| Smallest possible span ³⁾ With gas warning equipment | 0.5 vol. % ⁵⁾ , 2 vol. % or 5 vol. % O ₂ 2 vol. % or 5 vol. % O ₂ | Zero drift | < 0.5% / month of smallest possible span according to rating plate |
| Largest possible span | 100 vol. % O ₂ (with a pressure above 2000 hPa/29 psi : 25 vol. % O ₂) | Measured-value drift | < 0.5% / month of respective span |
| Measuring ranges with suppressed zero | Any zero point is possible between 0 and 100 vol. % as long as a suitable calibration gas is used (s. also Table 3.1) | Repeatability | < 1% of respective span |
| Electromagnetic compatibility | Conforms to standard requirements of NAMUR NE21 (08/98), EN 50270 ⁸⁾ , EN 61326/A2 | Calibration error | Dependent on accuracy of calibration gases ⁷⁾ |
| Degree of protection | IP 65 to EN 60529 | Linearity deviation | < 1% of respective span |
| Electrical safety heated version normal version | According to EN 61010-1 category of overload II category of overload III | Influencing variables ³⁾ | |
| Position of use | Front panel vertical | Ambient temperature | < 0.5% / 10 K referred to smallest possible span according to rating plate; with span 0.5 %: twice the error (1 %/10 K) |
| Dimensions | See Figs. 2-25 and 2-26 | Sample gas pressure | With pressure comp. switched off: < 2% of span/1% change in pressure With pressure comp. switched on: < 0.2% of span/1% change in pressure |
| Weight | Approx. 28 kg / 62 lbs. | Residual gases | Deviation in zero point corresponding to paramagnetic/diamagnetic deviation of residual gas (see Table 3.2) |
| Power supply | | Sample gas flow | < 1% of smallest possible span according to rating plate with a change in flow of 0.1 l/min within the permissible flow range; heated version: up to twice the error (< 2 %) ⁵⁾ |
| Power connection (see rating plate) | AC 100 to 120 V (rated range 90 V ⁶⁾ to 132 V), 48 to 63 Hz or AC 200 to 240 V (rated range 180 V ⁶⁾ to 264 V), 48 to 63 Hz | Power supply | < 0.1 % of output signal span with rated voltage ±10% |
| Power consumption | Approx. 35 VA; approx. 330 VA for heated version: | Electric inputs and outputs | |
| Fuse ratings (analyzer without heater) | 100 ... 120V F3 1T/250 F4 1T/250 200 ... 240V F3 0,63T/250 F4 0,63T/250 | Analog output | 0 / 2 / 4 to 20 mA. floating, max. load 750 Ω |
| Fuse ratings (analyzer with heater) | 100 ... 120V F1 1T/250 F2 4T/250 F3 4T/250 F4 4T/250 200 ... 240V F1 0,63T/250 F2 2,5T/250 F3 2,5T/250 F4 2,5T/250 | Relay outputs | 6, with changeover contacts, freely selectable e.g. for range identification; loading capacity: AC/DC 24 V / 1 A floating |
| Gas inlet conditions | | Analog inputs | 2, designed for 0 / 2 / 4 to 20 mA, for external pressure sensor and correction of influence of residual gas (correction of cross-interference) |
| Sample gas pressure | 500 to 3000 hPa/7.2 to 43.5 psi abs. 800 to 1100 hPa/11.6 to 16 psi abs. ⁸⁾ | Binary inputs | 6, designed for 24 V, floating, freely-selectable e.g. for range switching |
| Purging gas pressure Permanent Short-term | <165 hPa/2.4 psi above amb. pressure Max. 250 hPa/3.6 psi above ambient pressure | Serial interface | RS 485 |
| Sample gas flow | 18 to 60 l/h (0.3 to 1 l/min) | Options | Autocal functions with 8 additional binary inputs and 8 additional relay outputs, also with PROFIBUS PA or PROFIBUS DP |
| Sample gas temperature | 0 to 50 °C (without heater), or up to 15 °C above temperature of analyzer section (heated) | Climatic conditions | |
| Sample gas humidity | < 90% rel. humidity | Permissible ambient temperature | -30 to +70 °C during storage and transport 5 to +45 °C during operation |
| Reference gas | See Section 3.10 | Permissible ambient pressure | 800 to 1200 hPa / 11.6 to 17.4 psi ⁸⁾ |
| Time response | | Permissible humidity | < 90% rel. humidity as annual average, for storage and transport ⁴⁾ |
| Warm-up time | < 30 min ²⁾ at room temperature | Limitations in some of the technical data may result if the analyzer is to be used in potentially explosive atmospheres of zone 1 or 2 | |
| Response time (T ₉₀ time) | < 1.5 s | ¹⁾ Based on DIN EN 61207/IEC 1207 | |
| Damping with flow 1 l/min and signal damping 0 s | 0 to 100 s parameterizable | ²⁾ Maximum accuracy achieved after 2 hours | |
| Dead time (purging time of gas path in analyzer at 1 l/min) | Approx. 0.5 s | ³⁾ Referred to 1 bar sample gas pressure, 0.5 l/min sample gas flow and 25 °C ambient temperature | |
| Time for internal signal processing | < 1 s | ⁴⁾ Dew point must not be fallen below! | |
| Pressure correction range | | ⁵⁾ Smallest possible span for heated version: 0.5% (<65 °C); 0.5%-1% (65 ... 90 °C); 1%-2% (90 ... 130 °C) | |
| Pressure sensor internal external | 500 to 2000 hPa/7.2 to 29 psi absolute 500 to 3000 hPa/7.2 to 43.5 psi abs. | ⁶⁾ Brief voltage dip of 20 ms to EN 61000-4-11: interference criterion A (no influencing of function) in the rated range of use from 94 V to 132 V and 187 V to 264 V and interference criterion B (reduction in function, but no loss of data) in the rated range of use from 90 V to 93 V and 180 V to 186 V | |
| | | ⁷⁾ Accuracy of calibration and reference gases must be appropriate to the application | |
| | | ⁸⁾ Only gas warning equipment | |
| | | ⁹⁾ All signal cables must be of screened design! | |

3.10 Reference Gases, Zero Error for OXYMAT 6E/F

| Measuring range | Recommended reference gas | Reference gas pressure | Remarks |
|---|---------------------------|---|--|
| 0 to . . . vol. % O ₂ | N ₂ , 4.6 | 200 to 400 kPa/29 to 58 psi above sample gas pressure (max. 500 kPa/72.5 psi absolute) | The reference gas flow is set automatically to 5 to 10 ml/min (up to 20 ml/min with flow-type compensation branch) |
| . . . to 100 vol. % O ₂ (suppressed zero with full-scale value 100 vol. % O ₂) | O ₂ * | | |
| Around 21% O ₂ (suppressed zero with 21 vol. % O ₂ within the span) | Air | 100hPa (1.45 psi) with respect to sample gas pressure which may vary by max. ±50 hPa (0.72 psi) around the atmospheric pressure | |

Table 3.1: Reference gases for OXYMAT channel

* No suitability test for gas warning equipment!

| Residual gas (concentration 100 vol. %) | Zero deviation in vol. % O ₂ absolute | Residual gas (concentration 100 vol. %) | Zero deviation in vol. % O ₂ absolute |
|---|--|---|--|
| Organic gases | | Noble gases | |
| Acetic acid CH ₃ COOH | -0.64 | Argon Ar | -0.25 |
| Acetylene C ₂ H ₂ | -0.29 | Helium He | +0.33 |
| 1,2 Butadiene C ₄ H ₆ | -0.65 | Krypton Kr | -0.55 |
| 1,3 Butadiene C ₄ H ₆ | -0.49 | Neon Ne | +0.17 |
| iso-Butane C ₄ H ₁₀ | -1.30 | Xenon Xe | -1.05 |
| n-Butane C ₄ H ₁₀ | -1.26 | | |
| 1-Butene C ₄ H ₈ | -0.96 | Inorganic gases | |
| iso-Butene C ₄ H ₈ | -1.06 | Ammonia NH ₃ | -0.20 |
| cyclo-Hexane C ₆ H ₁₂ | -1.84 | Carbon dioxide CO ₂ | -0.30 |
| Ethene C ₂ H ₆ | -0.49 | Carbon monoxide CO | +0.07 |
| Ethylene C ₂ H ₄ | -0.22 | Chlorine Cl ₂ | -0.94 |
| Dichlorodifluoromethane (R12) CCl ₂ F ₂ | -1.32 | Dinitrogen monoxide N ₂ O | -0.23 |
| n-Heptane C ₇ H ₁₆ | -2.4 | Hydrogen H ₂ | +0.26 |
| n-Hexane C ₆ H ₁₄ | -2.02 | Hydrogen bromide HBr | -0.76 |
| Methane CH ₄ | -0.18 | Hydrogen chloride HCl | -0.35 |
| Methanol CH ₃ OH | -0.31 | Hydrogen fluoride HF | +0.10 |
| n-Octane C ₈ H ₁₈ | -2.78 | Hydrogen iodide HI | -1.19 |
| n-Pentane C ₅ H ₁₂ | -1.68 | Hydrogen sulphide H ₂ S | -0.44 |
| iso-Pentane C ₅ H ₁₂ | -1.49 | Oxygen O ₂ | +100 |
| Propane C ₃ H ₈ | -0.87 | Nitrogen N ₂ | 0.00 |
| Propylene C ₃ H ₆ | -0.64 | Nitrogen dioxide NO ₂ | +20.00 |
| Trichlorofluoromethane (R11) CCl ₃ F | -1.63 | Nitrogen oxide NO | +42.94 |
| Vinyl chloride C ₂ H ₃ Cl | -0.77 | Sulphur dioxide SO ₂ | -0.20 |
| Vinyl fluoride C ₂ H ₃ F | -0.55 | Sulphur hexafluoride SF ₆ | -1.05 |
| 1,1 Vinylidene chloride C ₂ H ₂ Cl ₂ | -1.22 | Water H ₂ O | -0.03 |

Table 3.2 Zero error due to diamagnetism and paramagnetism of residual gases with nitrogen as the reference gas at 60 °C and 1 bar absolute (according to IEC 1207/3)

3.11 Materials in the Sample Gas Path

| Standard | | 19" rack unit | Wall mount unit | Wall mount unit Ex |
|--------------------|--|---------------|---|--------------------|
| Gas path with hose | Bushing Hose Hose connector Sample chamber (O6) Sample chamber (U6): ● Body ● Lining ● Gaskets (O rings) ● Windows | | 1.4571 stainless steel FKM (e.g. Viton) Polyamide 6 1.4571 or Ta Aluminium Aluminium or Tantalum FKM (e.g. Viton) or FFKM (e.g. Kalrez) CaF ₂ , adhesive: E353 | - |
| Gas path with pipe | Bushing Pipe Sample chamber(O6) Sample chamber (U6) ● Body ● Lining ● Gaskets (O rings) ● Windows | | Titanium or 1.4571 stainless steel Titanium or 1.4571 stainless steel 1.4571 or Tantalum Aluminium t Aluminium or Tantalum FKM (e.g. Viton) or FFKM (e.g. Kalrez) CaF ₂ , adhesive: E353 | |

| Special applications (examples) | | 19" rack unit | Wall mount unit | Wall mount unit Ex |
|---------------------------------|---|---------------|---|--------------------|
| Gas path with pipe ULTRAMAT | Bushing Pipe Detector: ● Body ● Lining ● Gaskets (sample cell) ● Window | | Titanium, 1.4571 stainless steel, Hastelloy C22 Titanium, 1.4571 stainless steel, Hastelloy C22 Titanium, 1.4571 stainless steel, Hastelloy C22 Tantalum, Aluminium O ring: FKM (e.g. Viton) or FFKM (e.g. Kalrez) CaF ₂ , without adhesive | |
| Gas path with pipe OXYMAT | Bushing Pipe Sample chamber ● Gaskets (O rings) | | Hastelloy C22 Hstelloy C22 Tantalum O ring: FKM (e.g. Viton) or FFKM (e.g. Kalrez) special O ring material upon request | |

Further designs on request

| Options | | 19" rack unit | Wall mount unit | Wall mount unit Ex |
|-------------------------------|---|--|-----------------|--------------------|
| Flowmeter | Metering pipe Float Float limit Elbows | Duran glass Duran glass PTFE (e.g. Teflon) FKM (e.g. Viton) | - | - |
| Pressure switch Sample gas | Diaphragm Housing | FKM (e.g. Viton) PA 6.3 T | - | - |

4

Start-up

| | | |
|-------|--|------|
| 4.1 | Safety Information | 4-2 |
| 4.1 | Safety Information | 4-2 |
| 4.2 | Preparation for Start-up | 4-3 |
| 4.2.1 | General Information | 4-3 |
| 4.2.2 | Special Preparations for OXYMAT Channel | 4-4 |
| 4.2.3 | Special Preparations for ULTRAMAT Channel | 4-7 |
| 4.2.4 | Special Preparations for ULTRAMAT Channel with Flow-type Reference Side | 4-8 |
| 4.2.5 | Measuring Ranges with Suppressed Zero for ULTRAMAT Channel | 4-11 |
| 4.3 | Start-up and Operation | 4-12 |
| 4.3.1 | ULTRAMAT Channel | 4-12 |
| 4.3.2 | OXYMAT Channel | 4-14 |



Note

All text positions within a section which require special treatment either of the **ULTRAMAT 6E/F** or the **OXYMAT 6E/F** are enclosed within a frame and identified by the respective analyzer name. Complete paragraphs on an analyzer have the associated name in the title line.

4.1 Safety Information



Caution

Certain parts in this analyzer carry dangerous voltages. The housing must be closed and grounded before switching on the analyzer. Death, personal injury and/or damage to property may result if this is not observed. Also refer to Sections 2.5 and 2.5.1.

A standard analyzer must not be used in hazardous (explosive) areas. Gases containing combustible components at concentrations above the lower explosion limit (LEL) may only be connected with Series 6 analyzers with piping (see also expert's report BB-EG1-KAR Gr02X from the TÜV Süddeutschland (South German Technical Inspectorate)). Field devices must be additionally purged with inert gas at a flow rate of at least 1 l/min.

With observation of specific conditions, the **ULTRAMAT 6F and OXYMAT 6F** may be used in areas where non-metallic combustible dusts only seldom occur, and then only briefly (Ex Zone 22). Details given in the EC conformity statement TÜV 03 ATEX 2278 X must always be observed.

With observation of specific conditions and with application of appropriate safety equipment, the **ULTRAMAT 6F and OXYMAT 6F** may be used in areas where explosive gas mixtures seldom occur (Ex zone 2 or Class 1, Div. 2). The details concerning this can be obtained from the test certificates TÜV 01 ATEX 1686X and TÜV 01 ATEX 1697 X or the Certificate of Compliance of the CSA International, certificate 1431560 and the FM Approval, Project ID 3016050 and must always be observed.

With observation of specific conditions and with application of appropriate safety equipment, the **ULTRAMAT 6F and OXYMAT 6F** in the Ex version may be used in areas where explosive gas mixtures occasionally occur (Ex zone 1). Non-flammable and flammable gases may be measured, as well as explosive gas mixtures if they only occur occasionally in the sense of EN 50016. The details can be obtained from the EC-type examination certificate PTB 00 ATEX 2022 X, and must always be observed. More details can also be found in the supplementary instructions for Ex analyzers for use in Ex Zone 1 (Order No. A5E00058873).

In all cases, the appropriate explosion protection measures must be clarified with the responsible authorities. Start-up is the responsibility of the owner.

When measuring toxic or corrosive gases, it may occur that sample gas accumulates in the analyzer as a result of leaks in the gas path. To prevent the danger of poisoning, or also of damage to parts of the device, the analyzer or the system must be purged with inert gas (e.g. nitrogen). The gas displaced by purging must be collected using suitable equipment (**ULTRAMAT 6E and OXYMAT 6E**) and routed for environmentally-friendly disposal via an exhaust line. The same applies to purging of the **ULTRAMAT 6F and OXYMAT 6F**.

In the case of analyzers with a heated sample gas path, the housing must **always** be purged when operating with corrosive gases.

**Danger of burns!**

The temperature of heated analyzers only drops slowly because of the high thermal capacity of the materials used. Therefore temperatures of up to 130 °C may still be present even when the device has been switched off for a longer time.

4.2 Preparation for Start-up

**Caution**

When tightening union nuts on the gas couplings, it is essential to counter by using an appropriate open-end spanner; the danger otherwise exists that the gas path will leak.

4.2.1 General Information

Gas conditioning

Gas sampling devices, gas cooler, condensation vessel, filters and any controllers, recorders or indicators (if connected) should be made ready for operation (refer to respective Instruction Manuals).

Sample gas quality

The sample gas must be free of particles. Condensation must be avoided.

The particulate filter must permanently retain dust > 2 µm.

To avoid condensation in the sample gas line, it is recommendable to pass the sample gas through a compressor cooler. The dew point should not exceed 4 °C.

If a higher dew point cannot be avoided in the sample gas, heated analyzers should be used. The sample gas line should then also be heated.

Select the temperature of the heated gas path such that it is always at least 10 K above the dew point of the condensation components in the sample gas.

**Caution**

Please observe the notes in Section 2.5 “Electric Connection”!

| | |
|----------------------------|---|
| Operation | Before connecting and switching on the analyzer, make yourself acquainted with operation (Chapter 5 of this Manual). |
| Interfaces | Prior to start-up, connect and parameterize the interfaces. |
| Two-channel version | In dual analyzers (two different components) the analyzer sections connected in parallel operate independent of one another with respect to operation and interfaces (also refer to Section 2.3). |

4.2.2 Special Preparations for OXYMAT Channel

Selection of reference gas

It should always be ensured that the various spans have at least one common point. This point is then defined as the "physical zero" and applies to all measuring ranges. The reference gas can be selected once this point has been found.

The following example clarifies this:

Assume there are four measuring ranges:

| | |
|-------------------------|---|
| 17 - 22 %O ₂ | The range 17-22 % O ₂ is common to all these |
| 15 - 25 %O ₂ | measuring ranges. The physical zero must be |
| 0 - 25 %O ₂ | present in this range. Air (20.95% O ₂) is |
| 0 -100 %O ₂ | suitable as the reference gas in this case. |

An exception can be made if the smallest measuring range is $\geq 5\%$ O₂ and the difference from the reference gas is not more than 20 % O₂. In this case the physical zero can also be outside the measuring range. The pressure correction (see *function 82* in Chapter 5) must be activated in this case since a pressure dependence exists as a result of the large zero offset.

The purity of the reference gas must be appropriate to the task.

Note

Using gas warning devices only nitrogen is permitted as reference gas!



Assembly of reference gas connection

The reference gas connection has a different design depending on the order:

- Air
With air as the reference gas (applied via a diaphragm pump with inlet pressure of approx. 100 hPa/1.5 psi), the reference gas inlet is fitted with a discharge nozzle through which the permanent excess of reference gas can flow. This ensures that the inlet line can be purged rapidly if incorrect air has been sucked in by mistake for a short period.

As protection against contamination, a fine filter with a pore size $\leq 2\ \mu\text{m}$ must be fitted between the pump and coupling.

- Nitrogen, oxygen
When using nitrogen or oxygen as the reference gas, check that the gas purity is appropriate (4.6)!
With nitrogen or oxygen as the reference gas, the supply is from a cylinder with a pressure setting of 2000 to 4000 hPa (29 to 58 psi) above the sample gas pressure (no outlet restrictor fitted in coupling!).

A sintered metal filter (porous filter) has been pressed into the coupling to prevent the entry of dirt into the gas path.

Reference gas quality

The same applies to the quality of the reference gas as is described in the section "Sample gas quality".

Application of reference gas

The reference gas must always be flowing for a certain time before measuring is started. The reference gas should continue to flow even if there is a temporary interruption in measuring. The resulting additional consumption is insignificant if there are no leaks in the reference gas line.

Compressed gas cylinder

If the reference gas is supplied from a cylinder, the reference gas line should be purged prior to start-up. Then check the line for leaks, since the leakage loss is often greater than the actual consumption of reference gas. For this purpose, shut off the valve on the cylinder. The gas connection is sufficiently leak-proof if the pressure gauge on the reduction valve of the cylinder does not drop by more than 1000 hPa/min (14.5 psi/min). The reference gas pressure must always be more than 2000 hPa (29 psi) above the sample gas pressure.

Checking the reference gas pressure

Check the flow of the reference gas:
If the option "Reference gas pressure switch" (see also Fig. 2-10) is present, note that the switch point of the pressure switch is factory-set to 2000 hPa (29 psi) above atmospheric pressure.

If it is necessary to increase the reference gas pressure as a result of a higher sample gas pressure, it is necessary to adapt the switching point of the pressure switch (see Section 6.2.3).

Checking the flow of reference gas

Check the flow as follows:

- Close sample gas inlet coupling.
- Connect a hose with an ID of 4 mm to the sample gas outlet coupling and dip into a beaker filled with water. The reference gas must escape slowly from the hose (1...2 bubbles/sec., or 2...4 bubbles/sec. with a flow-type compensation circuit).

Checking for leaks Hosed analyzers

Check for leaks in the sample gas path as follows:

- Close the reference gas connection.
- Apply approx. 100 hPa (1.5 psi) to the sample gas path.
- Wait for approx. 1 min. for thermal balancing of the test.
- Note the pressure (can be read using *function 2*).
- Wait for approx. 5 minutes, and note the pressure again. The sample gas path is sufficiently leak-proof if the pressure has changed by a maximum of 1 hPa (1 mbar, 0.015 psi) within the 5 minutes.

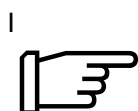
Checking for leaks Piped analyzers

Close reference gas connection 3 and sample gas outlet 4 using dummy caps. Connect a sufficiently leak-proof shut-off unit (e.g. solenoid valve) between sample gas inlet 2 and the sample gas supply line.

Connect a pressure sensor (measuring range: 2000 hPa/30 psi, resolution: 0.1 hPa, approx. 0.0015 psi) to the supply line.

Connect a sufficiently leak-proof needle valve between the test gas source and sample gas outlet 4 (see Fig. 4-1).

- Carefully open the needle valve until the test pressure has been reached in the containment system. Then close the needle valve.
- It is necessary to permit thermal stabilization before determining the rate of pressure loss. A waiting time of 5 minutes is recommend.
- Carry out the leak test by determining the change in pressure Δp within a further 5 minutes.
- The gas path is sufficiently leak-proof if the change in pressure Δp is below 4.2 hPa (0.06 psi)* in 5 minutes.



Note!

The reference gas protects the microflow sensor from the sample gas, and is essential when measuring with the OXYMAT 6. It is therefore recommendable to monitor the pressure of the reference gas. If the reference gas pressure fails, it is strongly recommendable to interrupt the flow of sample gas and to switch over to purging of the sample gas path using an inert gas.

*) The test values have been defined under the assumption that the volume between the shut-off units (valves) and the containment system is max. 25 ml; this corresponds to a *length* of approx. 2 m with an *internal diameter* of 4 mm.

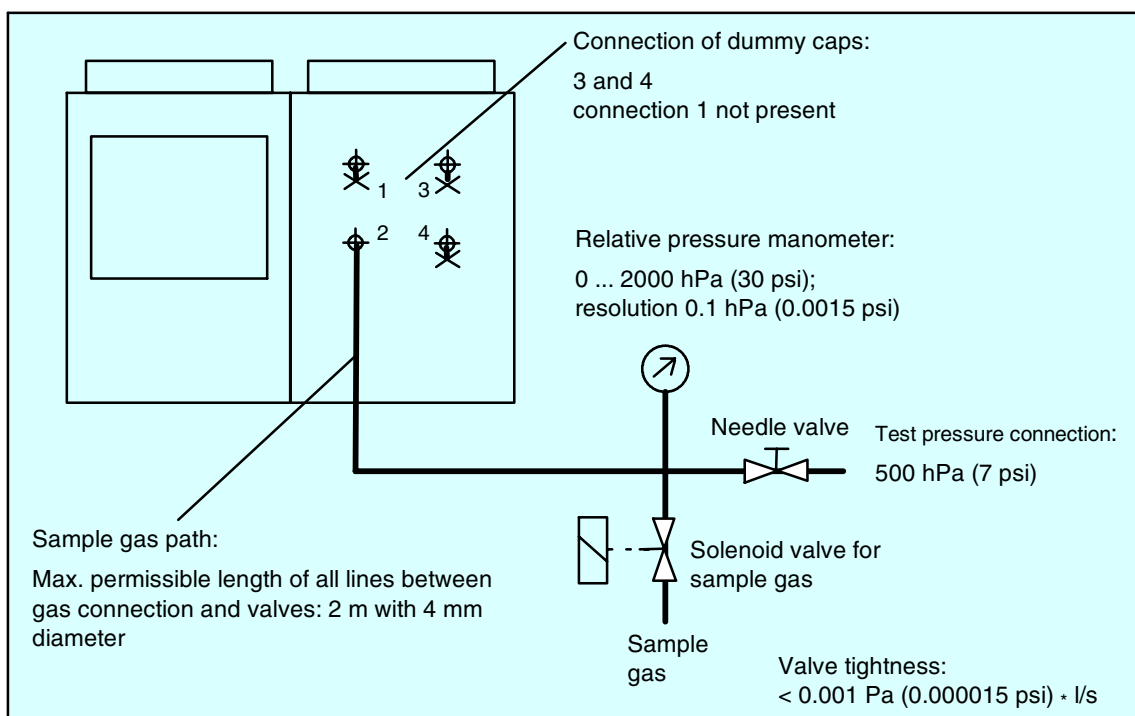


Fig. 4-2 Recommended test setup for leak test of OXYMAT 6F

4.2.3 Special Preparations for ULTRAMAT Channel

Checking for leaks

Hosed analyzers

Check for leaks in the sample gas path as follows:

- Block off the reference gas connection.
- Apply approx. 100 hPa (1.5 psi) to the sample gas path and close off pressure source.
- Wait for approx. 1 min. for thermal balancing of the test.
- Note the pressure
- Wait 15 minutes, and note the pressure again. The sample gas path is sufficiently leak-proof if the pressure has changed by a maximum of 1 hPa (1 mbar, 0.015 psi) within the 15 minutes.

Checking for leaks

Piped analyzers

Close sample gas outlet 2 (Figs. 2-1 and 4-2) using a dummy cap. Connect a sufficiently leak-proof shut-off device (e.g. solenoid valve) between sample gas inlet 1 and the sample gas supply line (dashed line).

Connect a pressure sensor (measuring range: 500 hPa /7 psi), resolution: 1 hPa/0.015 psi) to the supply line.

Connect a sufficiently leak-proof needle valve between the test gas source and sample gas outlet 4.

- Carefully open the needle valve until the test pressure (500 hPa/7.2 psi) has been reached in the containment system. Then close the needle valve.
- Before determining the pressure drop, wait for 5 minutes to permit thermal balancing.

- Carry out the leak test by determining the change in pressure Δp within a further 5 minutes.
 - The gas path is sufficiently leak-proof if the change in pressure Δp in 5 minutes is less than 1.2 hPa (0.018 psi).
- *) The test values have been defined under the assumption that the volume between the shut-off units (valves) and the containment system is max. 25 ml; this corresponds to a length of approx. 2 m with an internal diameter of 4 mm.

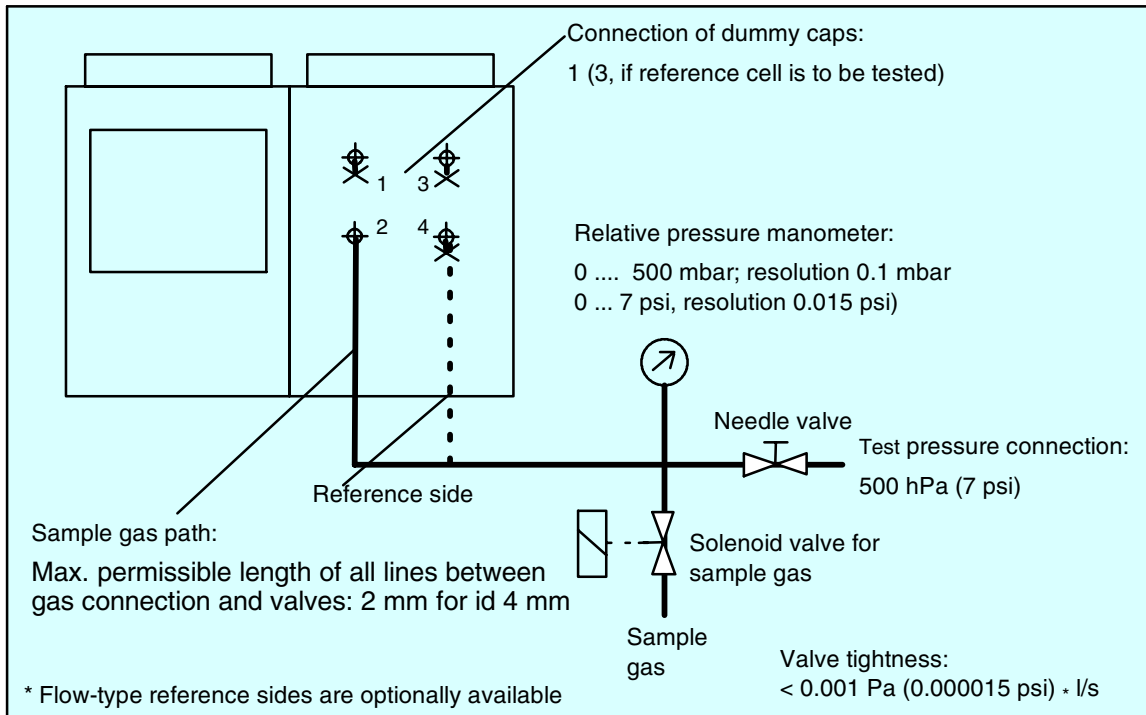


Fig. 4-2 Recommended test setup for leak test of ULTRAMAT 6F

4.2.4 Special Preparations for ULTRAMAT Channel with Flow-type Reference Side

Selection of reference gas

- Nitrogen (purity 4.6) must be selected as the reference gas for channels **without a physically** suppressed zero, i.e. with a start-of-scale value of zero according to the rating plate.
- The reference gas specified in the supplied documents must be used for channels **with a physically** suppressed zero. The reference gas concentration generally corresponds to the start-of-scale value, in special cases also to the full-scale value or intermediate values (see also Section 4.2.5 - suppressed zeros).
- To compensate the influence of interfering gases, sample gas cleaned of the measured component can be connected to the reference side (absorber mode), or a cylinder gas corresponding to the mean composition of the interfering gas.

**Note!**

In case of doubt, we recommend that you discuss your application with our specialist department.

Reference gas connection

Depending on the version, the reference gas connection is designed either for normal or reduced flow. Refer to Section 2.3.2 for details.

Application of reference gas

The reference gas must always be applied before starting the measurements. With a reduced flow, and depending on the length of the analyzer chamber, you must wait for up to three hours until the signal is stable before starting measurements. For reduced flowing reference sides the reference gas should continue to flow even if there is a temporary interruption in measurements. The resulting additional consumption is insignificant if there are no leaks in the reference gas line.

Compressed gas cylinder

If the reference gas for a reduced-flow reference side is supplied from a cylinder, the reference gas line should be purged prior to startup. Then check the line for leaks, since the leakage loss is often greater than the actual consumption of reference gas. To do this, switch off the valve on the gas cylinder. The gas connection is sufficiently leak-proof if the pressure gauge on the reduction valve of the cylinder does not drop by more than 1 bar/min. The reference gas pressure should have a constant pressure between 2000 and 4000 hPa/ 29 to 58 psi (absolute).

Checking the flow

Check the flow as follows:

- Connect reference gas.
- Connect a hose with an ID of 4 mm to the reference gas outlet, and dip into a beaker filled with water. The gas must escape slowly from the hose (approx. 1 bubble/second).

**Caution**

The reduced flow-type reference side of the ULTRAMAT 6 must never be used with flammable or toxic gases or gas mixtures, or those containing oxygen.

**Caution**

ULTRAMAT 6 reference side with reduced flow:

Ensure that the inlets and outlets of the reference side with the reduced flow are not interchanged. The excess pressure which would then build up may falsify the result or damage the analyzer cell.

Note!



ULTRAMAT 6 reference side with reduced flow:

The gas supply to the reference side with the reduced flow should have a pressure of 2000 - 4000 hPa (29 - 58 psi). In the case of CO₂ devices with small measuring ranges, and with analyzers exhibiting a high cross-sensitivity to steam, a pipe must be used as the reference gas line to prevent diffusion-based measuring errors.

A leak test as described above must again be carried out following each maintenance or servicing measure made on the analyzer section or gas path.

Note!



Leak tests are greatly influenced by temperature effects, and should therefore only be carried out at a constant temperature. Wait for the corresponding warming-up times in the case of analyzers in operation.

4.2.5 Measuring Ranges with Suppressed Zero for ULTRAMAT Channel ¹

If the start-of-scale value is not at zero concentration, one refers to measuring ranges with a suppressed zero (e.g. 200 - 300 ppm CO). In this case 200 ppm is the start-of-scale value, 300 ppm the full-scale value, and 100 ppm the span.

Electronic zero suppression

Channels with electronic zero suppression are physically identical to those with a non-suppressed zero. They only differ in parameterization of the measuring ranges and the setpoint for the suppressed zero (e.g. 200 ppm CO). The characteristic is stored from zero up to the full-scale value (according to the rating plate).

Analyzers with non-suppressed zeros can be subsequently converted to suppressed zeros by modifying these parameters (*functions 22 and 41*). However, note that influences such as noise, temperature errors and pressure errors increase by the factor

$$F = \frac{\text{Full-scale value of smallest range}}{\text{Full-scale value of smallest range} - \text{Start-of-scale value}}$$

F should therefore not exceed a value of 7. It is generally recommendable to increase the smallest span by approx. 30 %.

Note!

Applications with **electric** zero suppression are available as standard analyzers, but we recommend that you discuss your application with our technical department.



Physical zero suppression

Special applications (e.g. with highly suppressed zeros) required physical suppression of the zero by passing a suitable reference gas through the reference side. The reference gas concentration generally corresponds to the start-of-scale value, or in special cases also the full-scale value or an intermediate value. As a result of optimization to the specific task, these channels have a start-of-scale value which differs from zero (see rating plate). This value must not be fallen below when changing the start-of-scale values.

The advantage of this mode is that temperature and pressure errors occur on both the measuring and reference sides, and largely compensate one another.

Note!

Applications with **physically** suppressed zeros are only available as special applications. Please discuss with our specialist department before ordering.



Note!

Apply the corresponding gas concentrations to the measuring and reference sides before adjusting the physical setup (Sections 6.1.4.2 and 6.1.4.3).



¹ These modes are available from software release version 4.3.0 onwards

4.3 Start-up and Operation

4.3.1 ULTRAMAT Channel

Switching on the power supply

The measured value appears in the display after a short time. The status bar is positioned above these in the top line (see Section 5.1).

The ULTRAMAT is in the warming-up phase for the first 30 minutes. The message **■CTRL** (function check) is displayed in the status line during this time. A number of functions (e.g. calibration of zero and full-scale value) are not available during this time. The message "Analyzer is not measuring" is displayed if these functions are activated.

The analyzer is ready following expiry of the warming-up phase, but it is recommendable to wait approx. two hours to achieve the full measuring accuracy.

Pass zero gas into the analyzer (0.5 to 1.5 l/min).

Set the required output current range (0/2/4 to 20 mA) using *function 70*.

Zero setpoint

In the case of 2R channels, the zero setpoints of both components are set independently using *function 22* (these setpoints are usually 0 (vpm, ppm, %, ...)) for all measuring ranges). Exception: see Section 4.2.5 - suppressed zeros.

Zero adjustment

The zero can be adjusted using *function 20*. In the case of 2R analyzers, the zeros for the two components can be adjusted separately or together. The zero reserve in *function 2* is displayed for each component separately.

Suppressed zero

In the case of analyzers with a suppressed zero, observe the start-of-scale value (ppm; % v/v etc.) shown on the label. This start-of-scale value applies to all ranges.

Adjust sensitivity

Pass calibration gas into the analyzer chamber (0.5 to 1.5 l/min). Check the sensitivity setpoint using *function 22*.

The displayed setpoint must agree with the concentration of the calibration gas. Otherwise adjust using *function 22*.

When carrying out a total calibration, also select the master range.

In the case of 2R channels, the sensitivity setpoints of both components are set independently using *function 22*.

Single/total calibration

Set a total or single calibration using *function 23* or *52*.

A **single calibration** means that each range is calibrated with its own calibration gas.

With a **total calibration**, only the master range is calibrated (selected using *function 22*), the other ranges are determined according to the switching ratio.

Then select *function 21* and carry out the adjustment.

All ranges have then been calibrated in the case of a total calibration.

With a single calibration, the procedure described above must then be carried out for each individual range using corresponding calibration gases after the respective concentrations have been programmed for each range using *function 21*.

In the case of 2R channels, use *function 21* to carry out the sensitivity adjustment for each component independently.

Changing the measuring ranges

The linearized characteristic is stored in memory for the largest range (according to rating plate). This full-scale value must not be exceeded when changing the largest range (*function 41*).

A range smaller than the smallest range (according to rating plate) should not be used since in this case the noise and influence of temperature on the measured value increase relative to the measuring range, and the reproducibility and the drift response become poorer.

Analyzers with a **physically** suppressed zero have a start-of-scale value different from zero (see rating plate). This value must not be fallen below when changing the start-of-scale values.

If the same values are entered for the start-of-scale and full-scale values of a measuring range, this range is considered as being non-existent.

4.3.2 OXYMAT Channel

| | |
|--|--|
| Switching on the power supply | <p>The measured value appears after a short delay in the LCD. The status bar appears above this in the top line (see Section 5.1 for more details).</p> <p>The measuring head is in the warming-up phase for the first five minutes. The message CTRL (function check) is displayed during this time in the status line.</p> |
| Spans | <p>Define the desired spans (full-scale value - start-of-scale value) using <i>function 41</i>. The 0(2/4) and 20 mA of the analog output are assigned to the start-of-scale and full-scale values respectively.</p> <p>In the case of several measuring ranges it is recommendable to assign the smallest span to range 1 etc. The following then applies: span1<span2<span3<span4.</p> |
| Setting the physical zero | <p>If the composition of the calibration and reference gases is the same, i.e. their O₂ difference is zero, a signal is not present. This is referred to as the physical zero. Depending on the reference gas, the physical zero can thus have a value of 0 to 100 % O₂. The setpoint of the physical value is entered using <i>function 22</i>.</p> |
| Setpoint for sensitivity adjustment | <p>The setpoints should be as far as possible away from the physical zero (at least 60 % of the respective span). The corresponding calibration gases should be available, and the setpoint is entered using <i>function 22</i>.</p> |
| Single/total calibration | <p>Set a total or single calibration using <i>function 23</i> or <i>52</i>.</p> <p>A single calibration means that each range is calibrated with its own calibration gas.</p> <p>With a total calibration, only the master range is calibrated (selected using <i>function 22</i>), the other ranges are determined according to the switching ratio.</p> <p>Make sure that the gas flow is between 0.3 and 1 l/min.</p> |
| Calibrating the zero | <p>The physical zero is calibrated using <i>function 20</i>. It applies to all parameterized measuring ranges.</p> |
| Calibrating the sensitivity | <p>The sensitivity is calibrated in a similar manner using <i>function 21</i>.</p> |

Calibration examples

- a) O₂ monitoring in gases
 Oxygen is to be measured in N₂.
 Measuring range: 0-0.5 % O₂;
 reference gas N₂;
 calibration gas: 0.43% O₂

| Procedure | Function No. | Input | Remarks |
|--|--------------|---------|-----------------------------|
| Selection of start-of-scale and full-scale values of range | 41 | 0 - 0.5 | 0 ⇒ 0(2/4)mA 0.5 ⇒ 20 mA |
| Input of setpoints for physical zero and sensitivity | 22 | 0 | Setpoint for physical zero |
| | | 0.43 | Setpoint for sensitivity |
| Calibration of zero | 20 | | Flow of N ₂ |
| Calibration of sensitivity | 21 | | Flow of calibration gas |

- b) Room air monitoring
 Measuring range 15 to 21% O₂;
 reference gas: air (20.95% O₂);
 calibration gas: 15.3% O₂

| Procedure | Function No. | Input | Remarks |
|--|--------------|---------|-----------------------------|
| Selection of start-of-scale and full-scale values of range | 41 | 15 - 21 | 15 ⇒ 0(2/4)mA 21 ⇒ 20 mA |
| Input of setpoints for physical zero and sensitivity | 22 | 20.95 | Setpoint for physical zero |
| | | 15.3 | Setpoint for sensitivity |
| Calibration of zero | 20 | | Flow of air |
| Calibration of sensitivity | 21 | | Flow of calibration gas |

- c) O₂ measurement in flue gas
 Measuring range: 0 -10% O₂ ;
 reference gas: air;
 calibration gas: N₂

Note:

The O₂ concentration of the reference gas is not in the measuring range 0 -10% O₂. However, since the span is > 5% it is permissible to violate this selection criterion of the reference gas. Please ensure that the pressure correction (see *function 82* in Chapter 5) is activated!

| Procedure | Function No. | Input | Remarks |
|--|--------------|-------|----------------------------|
| Selection of start-of-scale and full-scale values of range | 41 | 0 -10 | 0 ⇒ 0(2/4)mA 10 ⇒ 20 mA |
| Input of setpoints for physical zero and sensitivity | 22 | 20.95 | Setpoint for physical zero |
| | | 0 | Setpoint for sensitivity |
| Calibration of zero | 20 | | Flow of air |
| Calibration of sensitivity | 21 | | Flow of N ₂ |

- d) Monitoring of oxygen purity
 Measuring range 99.5 - 100 % O₂;
 reference gas: O₂;
 calibration gas: 99.53 % O₂

| Procedure | Function No. | Input | Remarks |
|--|--------------|------------|-------------------------------------|
| Selection of start-of-scale and full-scale values of range | 41 | 99.5 - 100 | 99.5 ⇒ 0(2/4)mA 100 ⇒ 20 mA |
| Input of setpoints for physical zero and sensitivity | 22 | 100 | Setpoint for physical zero |
| | | 99.53 | Setpoint for sensitivity |
| Calibration of zero | 20 | | Flow of pure O ₂ (100 %) |
| Calibration of sensitivity | 21 | | Flow of calibration gas |

Please refer to Chapter 5 (Operation) for exact instructions concerning operation of the above-mentioned functions.

Vibrations, oscillations

The analyzer operates with two measuring bridges. One bridge supplies the measured signal upon which a fault signal may be superimposed as a result of vibrations at the mounting location. The second bridge is fitted as a vibration sensor and outputs a signal which is combined with the measured signal in order to compensate the influence of vibrations (see Section 3.5: "Mode of operation of **OXYMAT** channel"). Adaptation of the vibration compensation to the conditions present at the mounting location is carried out using *function 61*.

It is occasionally possible to reduce vibration-dependent "oscillations" in the output signal by adjusting the frequency of the magnetic field (see *function 57*).

Compensation of temperature influence

Compensation of the influence of temperature at span is a fixed component in the software (firmware) of the **OXYMAT 6E/F**. Modifications can only be made by servicing personnel. Compensation of the influence of temperature on the zero is device-specific; a parameter sheet with the respective coefficients is delivered with each analyzer section and must be stored in a safe place.

Noise suppression

Noise on the measurement signal can be suppressed using *function 50*. This function permits the setting of a lowpass filter which can be assigned a time constant up to 100 s.

If no vibrations occur at the mounting location, the compensation circuit can also be switched off (see *function 61*). It is unnecessary in this case and only acts as a source of noise.

Operation

5

| | | |
|-------|----------------------------------|------|
| 5.1 | General | 5-2 |
| 5.2 | Summary of Input Functions | 5-7 |
| 5.2.1 | Analyzer Status | 5-9 |
| 5.2.2 | Calibration | 5-10 |
| 5.2.3 | Measuring Ranges | 5-19 |
| 5.2.4 | Parameters | 5-21 |
| 5.2.5 | Configuration | 5-29 |



Note

All text positions within a section which require special treatment either of the **ULTRAMAT 6E/F** or the **OXYMAT 6E/F** are enclosed within a frame and identified by the respective analyzer name. Complete paragraphs on an analyzer have the associated name in the title line.

5.1 General

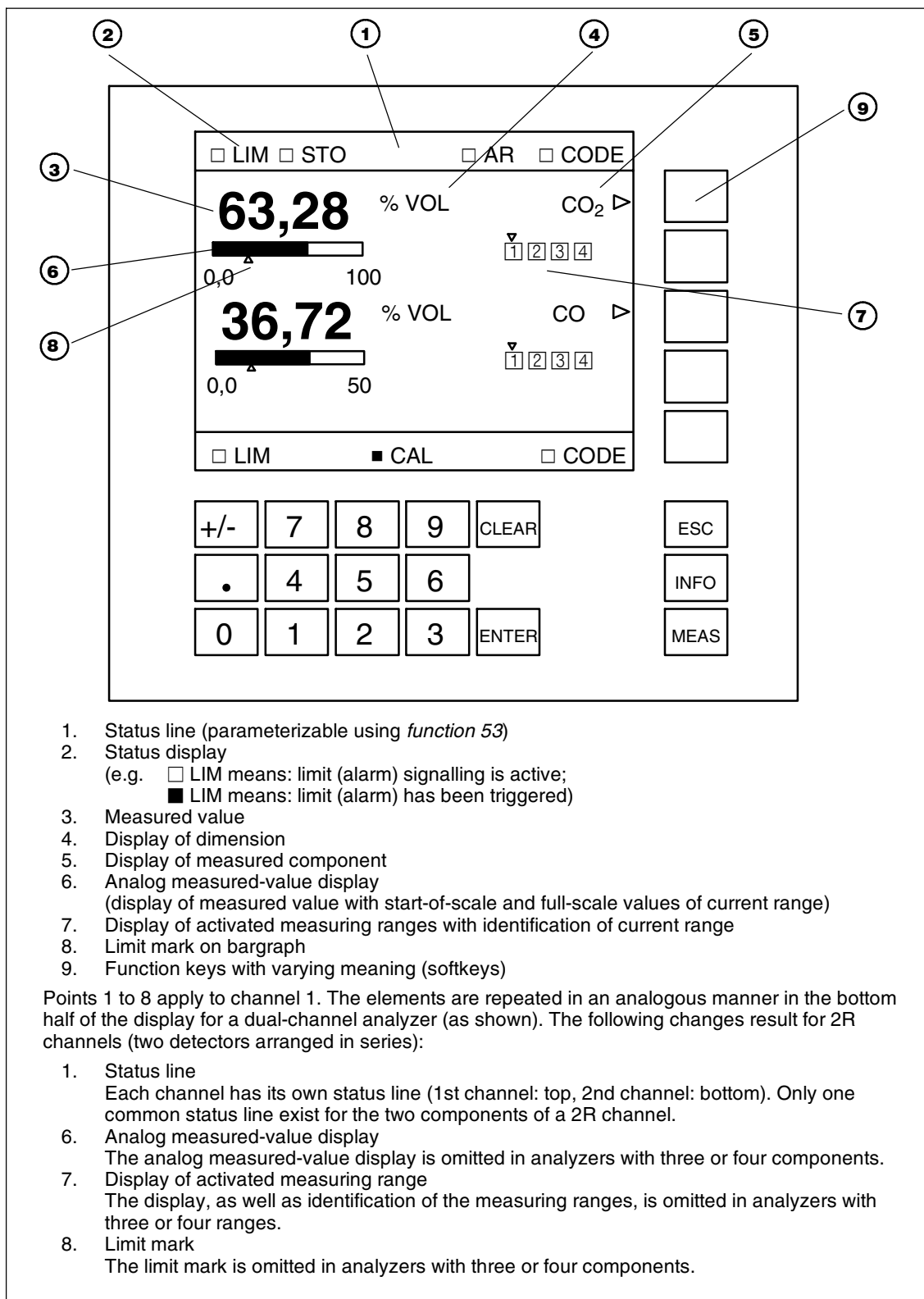


Fig. 5-1 Display and control panel

Switches/keys and their meanings

| Key | Meaning |
|--------------|--|
| CLEAR | Deletes a commenced number input |
| ENTER | Every digit input (except fast selection of a function) must be confirmed using ENTER |
| ESC | Return by one step in the input structure. Modifications are imported |
| INFO | Help information |
| MEAS | Return from any position in the input structure to display mode (possibly with request whether to import the entered data). Pressing the MEAS key again results in locking of analyzer; i.e. changing to input mode again is only possible following input of the code. |
| Softkey | Varying meaning; possible in this case: <ul style="list-style-type: none"> • Selection of item in menu tree • Selection function • Switch function ON/OFF • Channel selection. |

Editing of inputs

The values in the menu shown in Chapter 5 should be understood as examples.

- An active input field is represented with colons (:10:) as limiters. The cursor is positioned as a flashing line underneath the number to be entered (e.g. :23.45:).
- The input is terminated by pressing the **ENTER** key, and the value stored. If several input fields are present in a menu, the cursor is automatically positioned to the next input field.

**Caution**

Each input value must be confirmed with **ENTER** before you leave the menu. Also the last of several values in a menu.

- The **CLEAR** key can be used to delete an input. The cursor then returns to the first position of the input field.

Graphic styling elements

- Switching function (ON status)
- Switching function (OFF status, also status display in the status line)
- ▶ Entry into a subsequent menu
- Triggering of a function (e.g. start calibration, ...)

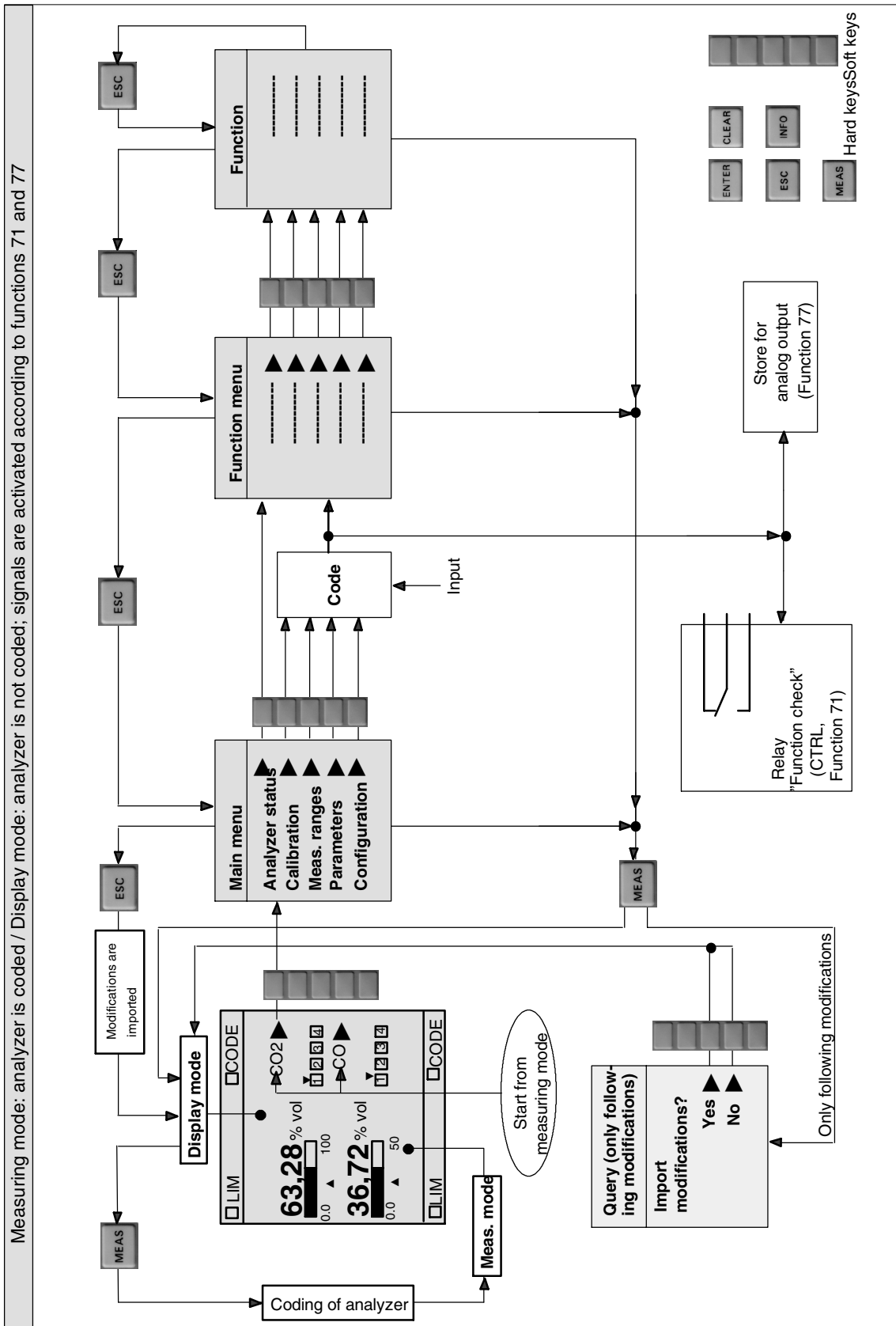


Fig. 5-2 Input sequence, example for channel 1

Caution

To avoid static charges, the keyboard must only be used for servicing and input purposes.

Note

The display of the screen menu is shown for the **ULTRAMAT 6E/F** as an example. For the **OXYMAT6E/F**, the CO₂ in the top line must be replaced by O₂ and the concentration data in vpm replaced by % v/v.

Deviating **OXYMAT**-specific menus are appropriately identified.

Input sequence**Entry into main menu**

| | |
|------------------|-----------------|
| Main menu | CO ₂ |
| Analyzer status | ▶ |
| Calibration | ▶ |
| Measuring ranges | ▶ |
| Parameters | ▶ |
| Configuration | ▶ |

The analyzer is in **measuring mode**. The measured component is shown on the right of the display, together with an arrow pointing to the right (▶). A softkey is assigned to this component. The main menu is called by pressing this softkey.

The main menu consists of the following items (followed by the associated code level):

| | |
|------------------|-----------------|
| Analyzer status | Not coded |
| Calibration | Code of level 1 |
| Measuring ranges | Code of level 1 |
| Parameters | Code of level 1 |
| Configuration | Code of level 2 |

The code for level 1 is factory-set to the value "111", that for level 2 to the value "222".

Multi-channel version

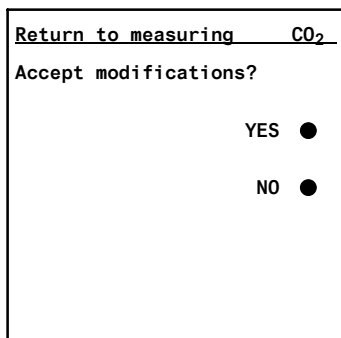
Each channel can be operated independently.

Entering a submenu

Following the selection of a submenu, you will be asked to enter the code of the input level (exception: submenu "Analyzer status" is not coded and is thus freely-accessible). Decoding of level 2 also decodes level 1. External signalling via a relay contact is possible when decoding if a corresponding relay has been configured with **CTRL** under *function 71*. The warming-up and calibration phases of the analyzer or the channel are then also signalled via this relay contact. The measured-value memory becomes active together with the decoding if it has been switched on under *function 77*. The coding of a channel can be recognized by the symbol CODE in the display (**display mode**), and decoding by the symbol CODE.

Return to measuring mode

MEAS key: Returns immediately to display mode from any position in the menu structure. A commenced input is aborted.



The adjacent question is displayed before the return is carried out.

Pressing either the YES or NO softkey returns to **display mode**. The modifications are finally imported into the working area of the parameter memory if you press YES, or rejected with NO.

Pressing the **ESC** key returns to the last function display.

ESC key: Leads back step-by-step to display mode. Modifications are imported without questioning.

Coding of analyzer

After returning to **display mode** using **ESC** or **MEAS**, the analyzer can be coded again (CODE) by pressing the **MEAS** key again, thus entering **measuring mode**. All statuses produced by the decoding (see above) are cancelled by this.

Fast selection of functions

A "Power user" input has been introduced to permit immediate switching from the measuring display to the desired function display if frequent inputs are necessary. It is then possible to directly access the desired function by bypassing the menu levels. The "Power user" input can only be started from **measuring mode** and comprises the following input steps:

- Enter number of desired function in measuring display using the digit keys.
- Press the softkey next to the desired component.
- You will then be requested to enter the code if the desired function is protected by a code.

5.2 Summary of Input Functions

The analyzer functions can be divided into the following three categories:

- **Analyzer-specific functions**
act on all channels and components of the analyzer, independent of the analyzer component via which the function was called.
- **Channel-specific functions**
act on all components of the corresponding channel, independent of the analyzer component via which the function was called. They are combined in the respective menus, or are present only once.
- **Component-specific functions**
act on a single component, and can only be called via this.

In the case of analyzers with two independent physical sections, certain functions can only be displayed or accessed if the master (the component to which the display is assigned) has been selected. If the slave is active in such cases, a corresponding error message is output: "This function is not possible/meaningful with slave operations".

Since the **OXYMAT** does not have different components, the component-specific functions there must be interpreted as channel-specific ones!

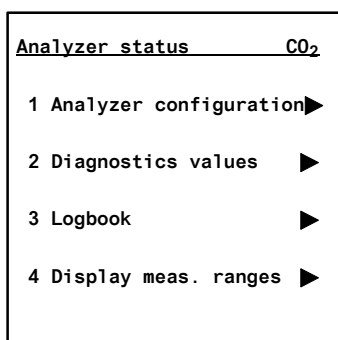
The following list summarizes the analyzer functions. This list corresponds to software release version 4.

| Main menu item (section) | Function number | Function designation | 1* | 2* | 3* |
|---------------------------------|----------------------------------|--|----|----|----|
| 5.2.1 Analyzer status | 1 | Analyzer configuration | | x | |
| | 2 | Diagnostics values | | x | |
| | 3 | Logbook | | x | |
| | 4 | Display measuring ranges | | | x |
| 5.2.2 Calibration (code 1) | 20 | Zero calibration | | x | x |
| | 21 | Span calibration | | | x |
| | 22 | Setpoints for zero/span | | | x |
| | 23 | Total/single range calibration | | | x |
| | 24 | Autocal | | x | |
| 5.2.3 Measuring ranges (code 1) | 40 | Range selection | | | x |
| | 41 | Define measuring ranges | | | x |
| 5.2.4 Parameters (code 1) | 50 | Time constants | | | x |
| | 51 | Limits | | | x |
| | 52 | On/off configuration | | x | x |
| | 53 | Status messages | | x | |
| | 54 | Graphic signal display | | | x |
| | 55 | Select display digits | | | x |
| | 56 | LCD contrast | x | | |
| | 57 | Chopper frequency (ULTRAMAT 6E/F) | | x | |
| | | Magnetic field frequency (OXYMAT 6E/F) | | x | |
| | 58 | Date/time | | x | |
| | 59 | Sample point selection | | x | |
| 60 | Setup logbook | | x | | |
| 61 | Shock compensation (OXYMAT 6E/F) | | x | | |
| 5.2.5 Configuration (code 2) | 70 | Analog output | | | x |
| | 71 | Relay outputs | | x | |
| | 72 | Binary inputs | | x | |
| | 73 | ELAN configuration | | x | |
| | 74 | Reset | | x | |
| | 75 | Save data, load data | | | |
| | 76 | Suppress short noise signals | | | x |
| | 77 | Store analog output | | | |
| | 78 | Calibration tolerances | | | x |
| | 79 | Codes for input levels | | | x |
| | 80 | Analyzer test | | x | |
| | 81 | Select language | x | x | |
| | 82 | Pressure correction | | x | |
| | 83 | Interference correction | | x | |
| | 84 | Phase adjust | | | x |
| | 85 | Switch valves | | | x |
| | 86 | Linear temperature compensation | | x | |
| | 87 | Error On/Off | | | x |
| 88 | AK configuration | | x | | |
| 89 | Heating (ULTRAMAT/OXYMAT 6F) | | x | | |
| 90 | PROFIBUS configuration | | x | | |

- 1* Analyzer-specific functions
- 2* Channel-specific functions
- 3* Component-specific functions

Table 5-1 Summary of input functions

5.2.1 Analyzer Status



The adjacent display appears following selection of the diagnostics functions in the main menu by pressing the first softkey ("Analyzer status").

The diagnostics functions are freely-accessible. You will not be asked to enter a code.

Each channel provides the following diagnostics functions:

1 Analyzer configuration

Important manufacturing data of the analyzer are visible when you select this function:

- Firmware No.
Order No. of software stored in the EPROM
- Order No.
Information on ordering data of analyzer
- Serial No.
Information on date of manufacture and consecutive number of analyzer
- Hardware version
Information on hardware design of analyzer
- Software version and date
Information on scope of analyzer functions

2 Diagnostics values

The most important values are listed under *function 2*. They may be of interest for assessing faults or adjustment operations.

3 Logbook

All faults which led to a maintenance request (**W**) or fault message (**S**) are listed in the logbook (see also Section 6.6).

Limit alarms (**LIM**) and function check (**CTRL**) are also recorded. However, these do not trigger a maintenance request or fault message.

The logbook contains a maximum of eight pages, each of which can accommodate four messages. It operates according to the principle of a circulating buffer, i.e. the oldest message is overwritten when all eight pages are full.

The logbook entries can be deleted or blocked (*function 60*), or also switched off individually (*function 87*).

Note

If a fault occurs whose error message is switched off by *function 87*, there is no reaction at the interface which may be configured. This applies to the ELAN interface as well as to the analog and relay outputs.



- ### 4 Display measuring ranges
- The measuring ranges defined using *function 41* are listed using *function 4*. However, they cannot be modified in this menu.

5.2.2 Calibration

The **ULTRAMAT/OXYMAT 6E/F** permits either a manual or automatic calibration. The latter (autocal: *function 24*) is only possible with an option board which contains 8 additional binary inputs and 8 additional relay outputs.

Note

If the analyzer has been fitted with an option board with Autocal function, it automatically enters the Autocal mode when switched on. In order to carry out a manual calibration or via the binary inputs, it is first necessary to switch off the Autocal mode (*function 24*).



The setpoints for the zero and sensitivity adjustments must be set under *function 22*.

The corresponding gases must be applied manually for *functions 20* and *21*.

20 Zero calibration

| 20 Zero calib. | | CO ₂ |
|-------------------|-------|-----------------|
| Setpoint | 0.000 | % v/v |
| Act. value | 5.388 | % v/v |
| Start calibration | | ● |
| CANCEL | | |

The zero is calibrated simultaneously for all measuring ranges, even if the sensitivity is calibrated individually for the ranges.

The calibration procedure should only be triggered when the measured value (actual value) has stabilized following application of the zero gas.

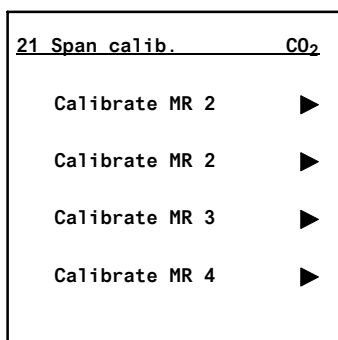
If the measured value is unsteady, increase the time constant (*function 50*) prior to the calibration.

| 20 Zero calib. | | CO ₂ |
|-------------------|--------|-----------------|
| Setpoint 1 : | 0.000 | % v/v |
| Setpoint 2 : | 0.000 | % v/v |
| Act. val. 1 : | 15.388 | % v/v |
| Act. val. 2 : | 15.388 | % v/v |
| Start calibration | | ● |
| CANCEL | | ● |

2R channels:

The zero points for 2R channels can be calibrated together or separately (depending on setting of *function 23*). The adjacent display is output for the separate zero calibration.

21 Span calibration

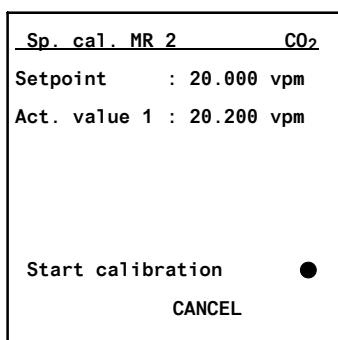


A single or total calibration is carried out depending on the setting of *function 23* (component-specific).

Single calibration:

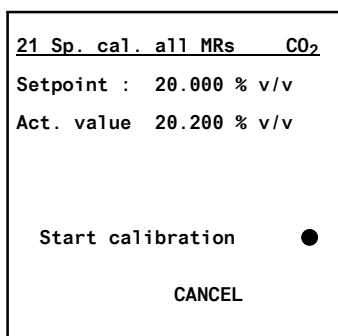
The display lists the ranges which were previously defined using *function 41*. The adjacent display is therefore an example of the single calibration of four ranges.

If you now wish to calibrate e.g. range 3, press the corresponding softkey.



The display lists the setpoint and the current value of range 3.

Once the actual value has stabilized, the calibration procedure can be triggered by pressing 4th softkey. The actual value is then set to coincide with the setpoint.



Total calibration:

With a total calibration (*function 23*), all measuring ranges are calibrated together. The "master" range is defined using *function 22*. It is advisable to select the largest range for this.

The display lists the setpoint and the current value of the "master" range.

Once the actual value has stabilized, the calibration procedure can be triggered by pressing 4th softkey. The actual value is then set to coincide with the setpoint.

Calibration via binary input

In order to trigger a process via a binary input, it is always sufficient if a voltage is only briefly present (approx. 1 s) (see also Figs. 2-15 to 2-20 for voltage values).

Example of a zero calibration:

At least two binary inputs (BI) are required for a calibration procedure:

- First BI for switching a solenoid valve (from sample gas to zero gas)
- Second BI for triggering the calibration procedure

During the calibration, the analyzer switches from measuring mode to calibration mode; this is displayed in the status line if appropriately parameterized.

The various binary inputs are described under *function 72*.

22 Setpoints for zero/span

| 22 Setpoints total CO ₂ | |
|-------------------------------------|-------------------------------------|
| Setpoint for zero : 0.000 % v/v | |
| Setpoint for MR 1 : 2.500 % v/v | <input type="checkbox"/> |
| Setpoint for MR 2 : 5.000 % v/v | <input type="checkbox"/> |
| Setpoint for MR 3 : 10.000 % v/v | <input checked="" type="checkbox"/> |

The adjacent example shows the setpoint input for a total calibration. The third measuring range has been selected as the master range.

It is not possible to select a master range for a single calibration.

Definition of the master range does not apply in Autocal mode!

23 Total/single range calibration

| 23 Total/single cal. CO ₂ | |
|--------------------------------------|--------------------------|
| Total range calibration | <input type="checkbox"/> |

These functions are used to select a total or single calibration of the measuring ranges and - with 2R channels - common or separate calibration of the zeros.

A total calibration means that a "master range" is calibrated and that all other ranges are calculated by means of a ratio.

If this function is not activated, each range is calibrated individually.

| 23 Total/single cal. CO ₂ | |
|--------------------------------------|-------------------------------------|
| Total calibration | <input type="checkbox"/> |
| Common zero calibration | <input checked="" type="checkbox"/> |

2R channels:

A common zero calibration means that the zeros of the two components of the 2R channel are calibrated together.

If this function is not activated, the zeros of the two components are calibrated separately.

24 Autocal/check

| 24 Autocal/-check | CO ₂ |
|---------------------------------|-----------------|
| Autocal/-check mode | ▶ |
| Autocal/-check sequence | ▶ |
| Autocal/-check cyclic parameter | ▶ |
| Autocal Check | ▶ |

The Autocal/check functionality is only available if the corresponding (measuring) channel has supplementary electronics (option). If this is not the case, a corresponding message is displayed in the window if an Autocal/check parameter is selected.

If an option card containing an Autocal functionality is already fitted (Autocal, AK or PROFIBUS supplementary electronics), the operating mode "Autocal/check" is automatically set to "On" when the analyzer is switched on. At the same time, the switches

"Start Autocal/check cyclically" and

"Start Autocal/check via binary input" are set to "Off".

To permit a manual adjustment, the operating mode

"Autocal/check on/off" must always be switched off!



Important note

The term "Autocal" is used in the sense of **calibration**; violation of the calibration tolerances results in the message **W1 "Tolerance violation"** (see also Function 78).

On the other hand, the term "Autocal/check" applies to checking; the "Autocal/check" therefore serves to **check** the calibration. A calibration is **not** carried out in this case! Only the deviations between the setpoint and actual value are checked with respect to the selectable tolerances. Violation of these tolerances results in the message **W10 "Autocal/check error"**.

Autocal/check is aborted if there is a fault. The acknowledged fault message S 15 "Calibration cancelled" appears simultaneously in the logbook (as of software version 4.3.4 of 3.7.01).

Autocal/check mode

| Autocal/-check mode | CO ₂ |
|---------------------------------------|--------------------------|
| Autocal/-check on/off | <input type="checkbox"/> |
| Start autocal/-check cyclically | <input type="checkbox"/> |
| Start autocal/-check via binary input | <input type="checkbox"/> |
| Trigger autocal once | |
| Abort autocal | |

You can use this subfunction to parameterize the various operating modes of the autocal/check function.

In operating mode "Start cyclically", an Autocal/check is started following expiry of a certain time (more detail under cyclic parameters).

Autocal/check on/off

An Autocal/check can only be carried out if the Autocal/check switch is set to "On"!

The functionality "Trigger Autocal once" is switched off during the status "Autocal/check off".

Autocal/check Start cyclically

Autocal/check can be activated in a regular cycle if the parameter "Time from Autocal to Autocal" has been previously set. Whether an Autocal or an Autocal/check is to be carried out following expiry of the cycle time is determined in the menu line "Trigger Autocal/check at start of cycle" (see menu "Autocal/check").

Start Autocal/check via binary input

Autocal/check can be activated via a binary input if you have configured this using *function 72*.

It is possible to define or assign a binary input for "Autocal" as well as for "Autocal/check".

The modes "Start cyclically" and "Start via binary input" can be activated simultaneously. It is therefore possible, for example, to define a cyclic Autocal/check and to trigger an "Autocal" signal (adjustment) when the adjustment tolerance is violated (output of message W10).

Starting using "Start Autocal/check via binary input" has no influence on the cycle time.

Trigger autocal once

In addition, an autocal sequence can be started in the status "Autocal/check on" at any time using the softkey "Trigger autocal once" providing the analyzer is ready for measurement (recognizable by a point next to the softkey). A sequence triggered in this manner has no influence whatsoever on the time cycle of an autocal, i.e. the cycle time continues irrespective of this.

When triggered, the point disappears (and simultaneously appears at the "Abort Autocal" menu item) until the process has been finished.

Abort autocal

An Autocal procedure (recognizable by a point next to the "Abort Autocal" softkey) can be cancelled at any time. All calibration data which have been determined so far are rejected, and the calibration data (zero and sensitivity) prior to starting the autocal are used further.

The abort has no influence on the sequence of the time cycle. All valid adjustment procedures are retained.

The appearance or disappearance of the point next to the menu lines "Trigger Autocal once" and "Abort Autocal" has the following meaning:

1. Trigger Autocal once:
 Abort Autocal:
 → No Autocal possible (analyzer is not in measurement mode, or Autocal is not permissible).
2. Trigger Autocal once:
 Abort Autocal:
 → Triggering of Autocal is possible (analyzer is in measurement mode; Autocal is permissible, but has not been triggered).
3. Trigger Autocal once:
 Abort Autocal:
 → Autocal running; the Autocal procedure can be cancelled if applicable.

Autocal/check sequence

| Acal / -check sequence | | CO ₂ |
|------------------------|------------|-----------------|
| 1. Zero gas | : 1.0: min | ● |
| 2. Cal.gas 1: | 2.0: min | ● |
| 3. Cal.gas 2: | 1.0: min | ● |
| 4. Cal.gas 3: | 2.0: min | ● |
| Continue | | ▶ |

This subfunction can be used to combine several calibration phases into one autocal/check sequence.

The sequence of the automatic calibration can be freely defined. It is possible to "compose" a sequence from up to 12 different phases.

In addition to the connection of one zero gas and up to four calibration gases per component, it is also possible to program purging with sample gas, an intermediate sample gas mode, and a signalling contact. This signalling contact is available if it has been previously assigned to a relay output using *function 71*.

With a single calibration, the number of the calibration gas always corresponds to the measuring range which is being calibrated.

Example: when selecting calibration gas 1, the calibration is made in range 1, etc.

With a total calibration, the calibration procedure is carried out in the measuring range which corresponds to the selected calibration gas No.

Intermediate sample gas mode

An intermediate sample gas mode may be necessary if the system is only permitted to leave measuring mode for a specific period. If the total time then required for purging is greater than the permissible loss time, a return must be made to measuring mode between the calibrations (intermediate sample gas mode).

Signalling contact

The signalling contact can be used e.g. to trigger the automatic calibration of a second analyzer or to signal the start or end of the autocal function.

Relay outputs

If relay outputs have been assigned for sample gas, zero gas, calibration gases and/or measure/calibrate (*function 71*), these are switched to trigger the corresponding solenoid valves. The same also applies to the signalling contact "Autocal"; this is closed for approx. one second when the command is executed.

Example

| Acal/-check sequence | | CO ₂ |
|----------------------|-----------|-----------------|
| 1. Zero gas | :15.0:min | ● |
| 2. Calib. gas 1 | :10.0:min | ● |
| 3. SG purging | : 8.0:min | ● |
| 4. Int. SG mode | :30.0:min | ● |
| ...Continue | | ▶ |

The following sequence is to programmed:

1. Zero gas calibration following 15 minutes purging with zero gas
2. Calibration with gas 1 following purging for 10 minutes
3. Purging with sample gas for 8 minutes
4. Intermediate sample gas mode for 30 minutes
5. Calibration with gas 2 following purging for 8 minutes
6. Calibration with gas 3 following purging for 8 minutes
7. Calibration with gas 4 following purging for 10 minutes
8. Purging with sample gas for 8 minutes
9. Brief signalling contact in order to start "Autocal" on a further analyzer or channel

| Acal/-check sequence | | CO ₂ |
|----------------------|-----------|-----------------|
| 5. Calib. gas 2 | : 8.0:min | ● |
| 6. Calib. gas 3 | : 8.0:min | ● |
| 7. Calib. gas 4 | : 8.0:min | ● |
| 8. SG purging | : 8.0:min | ● |
| ...Continue | | ▶ |

The defined autocal sequence is shown in the adjacent displays.

| Acal/-check sequence | | CO ₂ |
|----------------------|--------------|-----------------|
| 9. Sig. cont | :I::I::I:min | ● |
| 10. | :I::I::I:min | ● |
| 11. | :I::I::I:min | ● |
| 12. | :I::I::I:min | ● |
| ...Continue | | ▶ |

List for the Autocal sequence:

| Display | Step | Component | Autocal sequence |
|------------|------------------------------|-----------|------------------|
| Zero gas 1 | Zero gas 1 | Comp. 1 | Function code 1 |
| Zero gas 2 | Zero gas 2 | - " - | Function code 2 |
| Cal. gas 1 | Calibration gas 1 | - " - | Function code 3 |
| Cal. gas 2 | Calibration gas 2 | - " - | Function code 4 |
| Cal. gas 3 | Calibration gas 3 | - " - | Function code 5 |
| Cal. gas 4 | Calibration gas 4 | - " - | Function code 6 |
| Purge SG | Purge sample gas | | Function code 7 |
| SG i/m. op | Sample gas intermediate mode | | Function code 8 |
| Sig. cont. | Signalling contact | | Function code 9 |
| Zero g. 1b | Zero gas 1b | Comp. 2 | Function code 10 |
| Cal. g. 1b | Calibration gas 1b | - " - | Function code 11 |
| Cal. g. 2b | Calibration gas 2b | - " - | Function code 12 |
| Cal. g. 3b | Calibration gas 3b | - " - | Function code 13 |
| Cal. g. 4b | Calibration gas 4b | - " - | Function code 14 |

**Note!**

Zero gas 2: only required with Autocal in absorber mode

**Hinweis!**

Selection of the calibration gas 1 ... 4 simultaneously defines the measuring range 1 ... 4 to be calibrated.

Example: calibration gas 1 means that the calibration is carried out in measuring range 1.

Autocal/check cyclic parameter

| Acal/-check cycle | CO ₂ |
|--|-----------------|
| Time from autocal to autocal (cycle time): | 2:[h] |
| Time up to next autocal cycle | : 15:[min] |
| Carry out span calibration for each 8. cycle | |
| Limit alarm 3 cal. gas 3 | |

This subfunction can be used to parameterize various time constants for activating a cyclic, repetitive autocal.

- Time from autocal to autocal (cycle time). Any setting between 0 and 500 (hours) is accepted by the analyzer.
- Time up to first Autocal cycle (from the time of setting). This setting can be used to start the Autocal/check at a defined time (e.g. during the night when no measurements are being carried out). When this menu item is called, the time up to the next Autocal is visible. A time can also be entered here to achieve synchronization with other analyzers. The time only starts when the menu is left. If "0" is entered here, and if Autocal is switched on (see "Autocal on/off"), the analyzer commences with the Autocal cycle at the earliest possible time.
- Number of cycles up to execution of a calibration using calibration gas

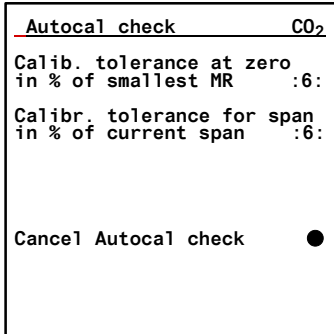
The zero is calibrated with each autocal. If it is unnecessary to also calibrate the sensitivity each time the zero is calibrated - e.g. in order to save calibration gas - a value >1 must be entered in the line "Carry out calibration with calibration gas every : : cycle".

The information in the last lines indicates that the entered parameters refer to a total calibration with calibration gas for measuring range 3. This range has been previously selected using *function 22*.

Autocal/check

The "Autocal/check" is used to check the calibration. As with "Autocal", the sequence parameterized in "Autocal cycle" is executed. However, in contrast to "Autocal", no new calibrations are triggered, only the deviations from selectable calibration tolerances are checked. The message W10 is displayed if these tolerances are violated.

The thresholds to be set for "Autocal/check" and "Autocal" can therefore differ, which can also result in different messages (W10 or W1)!

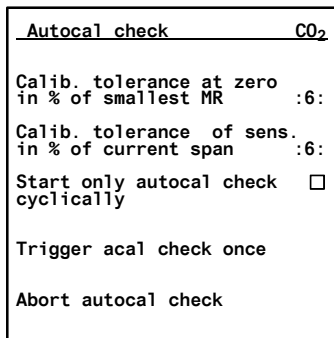


Autocal check sequence:

1. Enter the desired calibration tolerances in the menu "Autocal check". If necessary, select the relay output and the binary input for "Autocal check".
2. Start the "Autocal check" using the button in the menu "Autocal check" or via the binary input.
3. The analyzer then carries out a sequence as parameterized in the menu "Autocal sequence".
4. If a calibration limit is violated, the maintenance request W10 is set and, if parameterized, also the relay "AcalChk Dif.".
5. Both of these are reset following a fault-free Autocal.

The responses of the menu items "Start Autocal check" and "Cancel Autocal check" are the same as with "Trigger Autocal once" and "Abort Autocal".

**With cyclic start:
Start Autocal check**



This menu item can be used to select whether an Autocal cycle or an Autocal check cycle is to be executed.

An Autocal check cycle is started if the button has been set to "On". If the button is set to "Off", a cyclic Autocal sequence is executed.

5.2.3 Measuring Ranges

| Meas. ranges | | CO ₂ |
|--------------|---------------------|-----------------|
| 40 | Range selection | ▶ |
| 41 | Define meas. ranges | ▶ |

The adjacent display appears following selection of the range functions in the main menu by pressing the third softkey ("Measuring ranges").

40 Select ranges

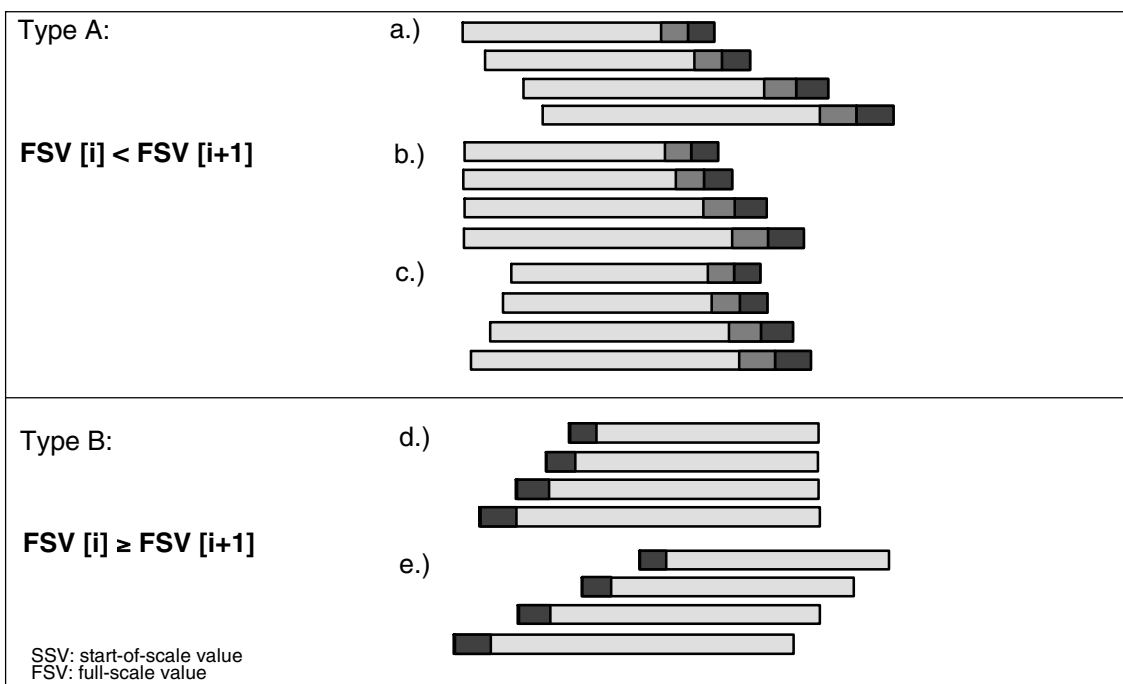
| 40 Select range | | CO ₂ |
|-----------------|-----------------|-------------------------------------|
| MR1 | 0.0 - 5.0 vpm | <input type="checkbox"/> |
| MR2 | 0.0 - 10.0 vpm | <input type="checkbox"/> |
| MR3 | 0.0 - 25.0 vpm | <input checked="" type="checkbox"/> |
| MR4 | 0.0 - 100.0 vpm | <input type="checkbox"/> |
| | Auto range | <input type="checkbox"/> |

It is possible to select one measuring range or to switch to autoranging. All selection possibilities are subject to mutual interlocking.

Autoranging is only possible under the following conditions:

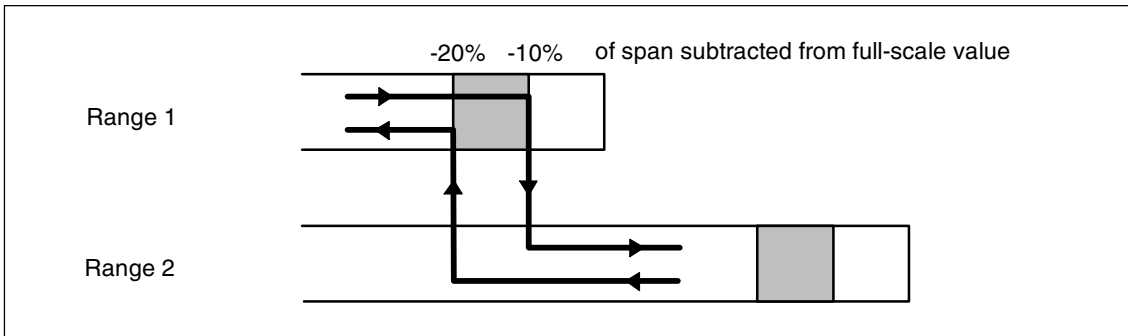
- At least two ranges must be available. A range is considered as present if the start-of-scale value is not equal to the full-scale value.
- The spans must become greater.
- The ranges must be adjacent to one another or overlap.

This results in the following permissible constellations:

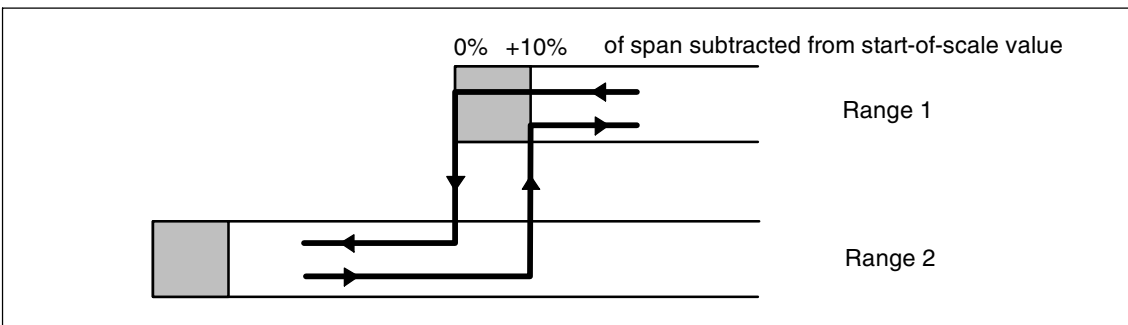


A differentiation is made between two types of range:

Type A: The full-scale value must be smaller than the subsequent full-scale value.
The following applies to autoranging:



Type B: The full-scale value must be greater then or equal to the subsequent full-scale value. Since the spans must become larger at the same time, the start-of-scale values of the subsequent ranges are always smaller.
The following applies to autoranging:



41 Define ranges

| 41 Define ranges | | CO ₂ |
|-----------------------|-------------|-----------------|
| MR | Start value | End value |
| 1 | : 0.000 | : 10.0 : % v/v |
| 2 | : 0.000 | : 50.0 : % v/v |
| 3 | : 0.000 | : 100.0 : % v/v |
| 4 | : 0.000 | : 500.0 : % v/v |
| Non-plausible ranges! | | |

Up to four measuring ranges can be defined whose start-of-scale values are assigned to the bottom value (0/2/4 mA) and whose full-scale values are assigned to the top value (20 mA) of the analog output.

If the message "Ranges not plausible" is displayed, this means that autoranging is not possible.

ULTRAMAT 6E/F

Note!

It is essential to refer to Section 4.2.5 if a start-of-scale value other than "0" is set.

5.2.4 Parameters

| Parameters | CO ₂ |
|-------------------------|-----------------|
| 50 El. time constants | ▶ |
| 51 Limits | ▶ |
| 52 On/off configuration | ▶ |
| 53 Status messages | ▶ |
| Continue | ▶ |

The adjacent display with selection of the parameter functions 50 to 53 appears following selection of the parameter functions in the main menu by pressing the fourth softkey ("Parameters"). You can branch to the parameter functions 54 to 61 by pressing the fifth softkey (...Continue).

50 Electric time constants

| 50 Electr. time con | CO ₂ |
|--|-----------------|
| Effective bandwidth in % of smallest MR:: | 6.0:% |
| Time constant within bandwidth t _i : | 10.0:s |
| Time constant outside bandwidth t _a : | 1.0:s |
| Actual measured value: | 0.982 vpm |

This function can be used to set various time constants to reduce the noise superimposed on the measured value. The reduction in noise approximately corresponds to that of a low-pass filter with a corresponding time constant.

The time constant t_i is effective within a parameterizable interval defined in % of the smallest measuring range (adjustment using Function 41). On the one hand, this dampens small changes in measured value (e.g. noise), but becomes immediately ineffective when the signal passes through the effective interval. In this case, the signal is dampened by the external time constant t_a.

You can set values up to 100 % for the effective interval, and values up to 300 s for the time constants t_i and t_a. Appropriate combination of these three parameters permits the implementation of a low display delay (90 % time) despite high noise suppression.

The effect of the set damping parameters can be observed in the bottom line in which the "real" measured value is displayed (in % of full-scale value).

51 Limits

| 51 Limits | CO ₂ |
|------------------------------------|---|
| Limit 1 : 22.125: % v/v on relay 3 | |
| alarms at decrease signal | ● |
| Applies to MR | ▼ <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> |
| Limit alarm on/off | <input type="checkbox"/> |
| Limit 2 | ▶ |

The analyzer can monitor up to 4 limits which you can assign to the measuring ranges as desired.

Any relay can be assigned to each limit (see *function 71*). If this has not been configured, "-" appears in the limit display.

Only positive limit values up to 100 % can be parameterized.

It is additionally possible to select whether an alarm is to be output when the entered limit is exceeded or fallen below.

The assignment of the limit to the measuring ranges is achieved by repeatedly pressing the third softkey. Pointers above the bordered range numbers move in the process and show the ranges in which the limit monitoring is to be active (all ranges in the adjacent example).

Limit monitoring can be switched off individually for each limit (see also *function 52*).

The limit monitoring is not active during the warming-up phase of the analyzer or during the calibration phase.

The program jumps to limit display 2 etc. when you press the fifth softkey ("...Continue").

Resetting of limit alarm:

The following applies to standard analyzers:

The logbook entry need not be acknowledged; only the arrival (GW+) or return to normal (GW-) is displayed.

The following applies to gas warning equipment:

The defined limits must be assigned to all measuring ranges. If a limit relay has been triggered, this status is also retained when the measured value returns to its permissible range. The triggering of a limit relay is registered in the logbook (function 3). The limit relay can be reset (manually or via binary input) as soon as the cause of triggering has been eliminated.

52 On/off configurations

Channel-specific on/off configurations (e.g. flow check for sample gas) can only be called **using the first component** of the channel.

| 52 On/off config. | CO ₂ |
|--------------------------|-------------------------------------|
| Auto range | <input checked="" type="checkbox"/> |
| Store function | <input type="checkbox"/> |
| Temperature compensation | <input type="checkbox"/> |
| Pressure compensation | <input type="checkbox"/> |
| ...Continue ▶ | |

This function permits simple switching on and off of the functions listed in the adjacent display.

This simplified input means that it is not necessary to pass through the various menu levels for these functions.

It is possible to switch up to four functions on and off in each of the displays which can be called. Switched-on configurations are identified by , switched-off ones by . The next display can be selected in each case using the fifth softkey ("...Continue").

Various menu items of this Function 52 only appear in the display if they have already been activated in the factory functions (e.g. "Pressure compensation").

The following configurations can be switched on and off using *function 52*:

| Designation | No. | Remarks | 1* | 2* | 3* |
|--|-----|---|----|----|----|
| Total range calibration | 23 | ULTRAMAT1/2 / OXYMAT | | | x |
| Automatic calibration | 24 | Only with supplementary electronics ULTRAMAT / OXYMAT | | x | |
| Auto range | 40 | ULTRAMAT1/2 / OXYMAT | | | x |
| Limit alarm 1 | 51 | ULTRAMAT1/2 / OXYMAT | | | x |
| Limit alarm 2 | 51 | ULTRAMAT1/2 / OXYMAT | | | x |
| Limit alarm 3 | 51 | ULTRAMAT1/2 / OXYMAT | | | x |
| Limit alarm 4 | 51 | ULTRAMAT1/2 / OXYMAT | | | x |
| Lock logbook | 60 | ULTRAMAT / OXYMAT | | x | |
| Suppress negative measured values | 70 | ULTRAMAT1/2 / OXYMAT | | | x |
| Store function | 77 | ULTRAMAT1/2 / OXYMAT | | | x |
| Signal tolerance violation | 78 | ULTRAMAT1/2 / OXYMAT | | | x |
| Temperature aftercompensation of zero | 86 | ULTRAMAT1/2 / OXYMAT | | | x |
| Temperature aftercompensation of span | 86 | ULTRAMAT1/2 / OXYMAT | | | x |
| FMonitor sample gas pressure | | Only with hosed analyzers ULTRAMAT / OXYMAT | | x | |
| Monitor reference gas pressure | | Only with hosed analyzers ULTRAMAT / OXYMAT or with ULTRAMAT with reduced flow-type reference gas side | | x | |
| Fault / maintenance request / CTRL NAMUR | 72 | ULTRAMAT / OXYMAT | | x | |
| Pressure correction | 82 | ULTRAMAT1/2 | | x | |

1* Analyzer-specific functions

2* Channel-specific functions

3* Component-specific functions

Table 5-2 Functions accessible using *function 52*

Apart from the functions listed in Table 5-2, further service functions can be addressed using *function 52*. These are reserved for servicing personnel and are only visible following input of the service code (code stage 3).

53 Status messages

| 50 Status messages | CO ₂ |
|------------------------------------|-------------------------------------|
| Display automat. calibration [CAL] | <input type="checkbox"/> |
| Display stored value [ST0] | <input checked="" type="checkbox"/> |
| Display limits [LIM] | <input type="checkbox"/> |
| Display autorange [AR] | <input checked="" type="checkbox"/> |
| Display control function [CTRL] | <input type="checkbox"/> |

This function can be used to display - in the status line - up to four different statuses which can be assumed by the analyzer. The top line in the display applies to channel 1, the bottom line to channel 2.

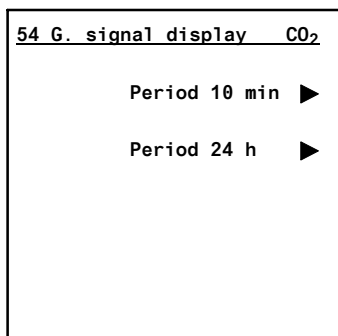
| Status | Output in display depending on <i>functions 52 and 53</i> | | | | |
|----------------------|---|---|--|--|--|
| | Fct. 53 <input type="checkbox"/> | Fct. 52 <input type="checkbox"/> Fct. 53 <input checked="" type="checkbox"/> | Fct. 52 <input checked="" type="checkbox"/> Fct. 53 <input checked="" type="checkbox"/> | | |
| Calibration: CAL | None | CAL | <input type="checkbox"/> CAL | <input checked="" type="checkbox"/> CAL | Calibration running |
| Stored value : STO | None | STO | <input type="checkbox"/> STO | <input checked="" type="checkbox"/> STO | Analog output connected to memory (see also <i>function 77</i>) |
| Limit: LIM | None | LIM | <input type="checkbox"/> LIM | <input checked="" type="checkbox"/> LIM | Upward or downward violation of limit (see also <i>function 51</i>) |
| Autoranging: AR | None | AR | <input type="checkbox"/> AR | <input checked="" type="checkbox"/> AR | During switching over of ranges |
| Function check: CTRL | None | CTRL | <input type="checkbox"/> CTRL | <input checked="" type="checkbox"/> CTRL | Analyzer is decoded Warming-up phase Calibration running Remote |

Table 5-3 Status messages

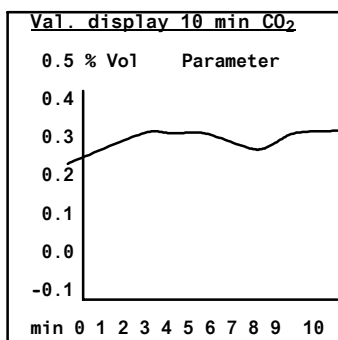
The type of status "Code" is always present in the status line.

If a fault occurs during operation, the message "Maintenance request" or "Fault" appears in the status line depending on the importance of the fault. This message is output alternately with the status messages.

54 Graphic signal display



Using this function you can follow the trend of the measured values for the last 10 minutes or 24 hours in the display.



When you select a time axis (period), the measured value is displayed as a trend. The most recent value is at the far right on this axis.

| Meas.-val. disp. par. CO ₂ | |
|---------------------------------------|--------------------------|
| Optimum meas. val. dis. | ■ |
| Range 2 | <input type="checkbox"/> |
| Range 3 | <input type="checkbox"/> |
| Range 4 | <input type="checkbox"/> |

A specific range can be assigned under "Parameter" to the measured-value axis. Also possible is a facility for an "Optimum measured-value display". This means that the software automatically carries out scaling of the measured-value axis when this parameter is activated. The scale is matched to the scatter of the measured values.

55 Select display digits

| 55 Select digits CO ₂ | |
|-------------------------------------|--------------------------|
| Suppress negative values | <input type="checkbox"/> |
| Automatic | <input type="checkbox"/> |
| Total digits | 4 ● |
| Digits after decimal point | 2 ● |
| The decimal point counts as a digit | |

This function permits you to suppress the output of negative values.

It is also possible to select the total number of digits and the number of decimal places.

Note that a maximum of four digits can be displayed which can be distributed before and after the decimal point.

56 LCD contrast

| 56 LCD contrast CO ₂ | |
|---------------------------------|---|
| Brighter | ● |
| Darker | ● |
| Basic setting | ● |
| Test | ● |

You can adjust the display contrast using this function.

If the contrast is maladjusted you can reestablish the factory setting by pressing the third softkey ("Basic setting").

It is additionally possible to carry out an LCD test by pressing the fourth softkey ("Test"). Various test displays are then output in succession.

If the LCD contrast is extremely maladjusted, and if the analyzer is in measuring mode, you can reestablish the basic setting by pressing the following key sequence:

[8][8][8][8] ENTER.

ULTRAMAT 6E/F

57 Chopper frequency

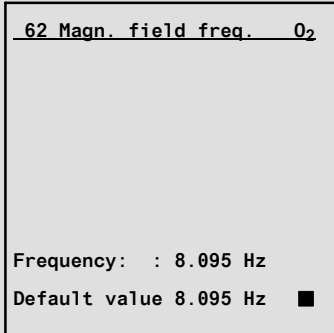
| 57 Chopper freq. CO ₂ | |
|----------------------------------|--------------|
| Frequency: | : 13.098 :Hz |
| Default value | 13.098 Hz ■ |

The chopper frequency for the first channel is factory-set to 13.098 Hz, and for the second channel (if present) to 11.201 Hz. A modification (possible in range from 10...15 Hz) is necessary if an interfering frequency (possibly caused by vibration) is superimposed on the measured signal. The output signal then exhibits low-frequency beats.

A change in the chopper frequency on the ULTRAMAT 6 also leads to a change in the phase position which then has to be readjusted (see function 84).

OXYMAT 6E/F

57 Magnetic field frequency



By adjusting the magnetic frequency, this function can be used e.g. to minimize vibration-dependent frequencies superimposed on the analog output. In the most favorable case, the superimposed frequencies can be eliminated completely.

You must enter the desired value in the editing field "Frequency" using *function 57*. Values between 7 and 11 Hz are permissible.

If the change to a particular frequency has not resulted in the desired success, try again by entering other frequencies.

You can set the frequency of 8.095 Hz stored in the basic factory data by pressing the fifth softkey.



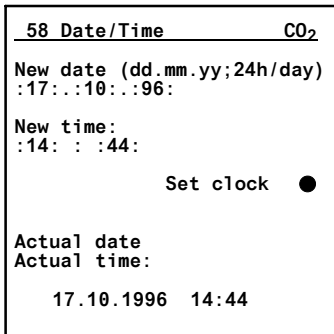
Caution

New adjustment of the zero and sensitivity is necessary following each change in frequency.

When combining an **ULTRAMAT 6** with an **OXYMAT 6**, note that the alternating magnetic fields of the **OXYMAT 6** may be coupled into the signal flow of the **ULTRAMAT 6**. Oscillations may possibly appear at the analog output of the **ULTRAMAT 6**.

No oscillations occur if the ratio between the chopper and magnetic field frequencies is 1.618. This has been taken into account for the factory-set frequencies.

58 Date/time



The analyzer has a system clock which is not protected against power failure (not a real-time clock). The clock commences at 1.1.1995 when the analyzer is started.

This function permits you to exactly set the date and time.

This is particularly important to be able to assign a specific point in time to faults stored in the logbook. This can be advantageous when troubleshooting.

An editing field appears when you call this function in which you can enter the day, month and year as the "New date". Hours (24-hour system) and minutes are entered as "New time".

The set data are imported when you press the third softkey ("Set clock"). The data then appear as an active display at the bottom of the display.

Caution

The date and time are deleted in the event of a power failure and must then be reset.



59 Sample point selection

| 59 Sample selection | | CO ₂ |
|-----------------------|---------|-----------------|
| M. pt. 1 | Rel. 3 | 0: min |
| M. pt. 3 | Rel. 2 | 0: min |
| M. pt. 2 | Rel. 10 | 0: min |
| M.p. switching on/off | | ■ |

You can use this function to assign up to six measuring points to the analyzer and to switch these over automatically.

A prerequisite is that the measuring point relays, which then trigger the corresponding solenoid valves, have first been parameterized using *function 71* ("Relay outputs").

A time duration is also assigned to each measuring point relay and must be entered into the appropriate editing field using *function 59*. Values between 0 and 60000 minutes are possible.

You can switch the measuring point switching on and off by pressing the fifth softkey.

It is additionally possible to assign a signal relay to each measuring-point relay. This permits signalling of the measuring point separate from the measuring point relay. These signal relays must also have already been configured using *function 71*.

60 Setup logbook

| 60 Setup logbook | | CO ₂ |
|------------------|---|-----------------|
| Clear logbook | ● | |
| Lock logbook | ■ | |

You can use this function to delete logbook entries (see also *function 3*) or to lock them.

Status messages, maintenance requests or faults cannot be suppressed by this function; they appear even if the logbook is locked.

Deletion of the logbook resets all error messages (also those to be acknowledged!)

OXYMAT 6E/F

61 Shock compensation

The microflow sensor located in the compensation circuit detects vibration signals which may be superimposed on the measured signal. By subtracting the two signals, the measured signal on its own is obtained in the ideal case (see also Chapter 3 "Mode of Operation"). In this manner, the analyzer can be adapted to the specific mounting conditions.

| | |
|--|----------------------------------|
| 61 Shock comp. | 0 ₂ |
| Amplification of the shock compensation in % : xx.x : | |
| Meas. val.: | 36.3% v/v |
| automatic search | <input checked="" type="radio"/> |
| Cancel automatic search | <input checked="" type="radio"/> |

Zero gas must be passed into the **OXYMAT** during the manual or automatic determination.

Manual setting:

The gain of the compensation circuit can be set in the range 0 ... 100% referred to the gain of the measuring circuit.

Automatic determination:

The analyzer automatically searches for the optimum gain for the compensation circuit. This process may take up to 6 minutes; the measured value changes during this time. The compensation circuit should be switched off if no vibrations occur at the position of installation since this circuit represents an additional source of noise. This is achieved by entering "0" as the gain.

5.2.5 Configuration

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

Input menu

| | |
|-----------------------|-----------------|
| <u>Configuration</u> | CO ₂ |
| 70 Analog output | ▶ |
| 71 Relay outputs | ▶ |
| 72 Binary inputs | ▶ |
| 73 ELAN configuration | ▶ |
| ...Continue | ▶ |

Following selection of the configuration functions in the main menu by pressing the fifth softkey ("...Continue"), you can branch to the further configuration functions.

70 Analog output

| | |
|-----------------------------------|--------------------------|
| <u>70 Analog output</u> | CO ₂ |
| 0 - 20 mA | ● |
| Output inverted | <input type="checkbox"/> |
| Suppress negative measured values | <input type="checkbox"/> |

With this function you can define the start-of-scale value of the measuring range (0, 2 or 4 mA). The functionality of the selected analog range is shown in the list below.

Select the desired value by pressing the softkey assigned to it; the other two values are reset at the same time.

In addition, the analog output can be displayed in reversed form; e.g.

0 to 10% CO \triangleq 0 to 20 mA \rightarrow 0 to 10% CO \triangleq 20 to 0 mA.

| Defined analog output / mA | Range limit in normal mode | | Range limit with fault / CTRL | |
|----------------------------|----------------------------|-----------------------|-------------------------------|-----------------------|
| | Start-of-scale value / mA | Full-scale value / mA | Start-of-scale value / mA | Full-scale value / mA |
| 0-20 | -1 | 21 | 0 | 21 |
| 2-20 | 1 | 21 | 2 | 21 |
| 4-20 | 2 | 21 | 2 | 21 |
| 4-20 (NAMUR) | 3.8 | 21.5 | 3 | 21.5 |

Negative measured values: if negative measured values have an unfavorable effect on further processing, activate this function to set the negative measured values to 0 (or 2/4) mA at the analog output. (Digital interface in analogous manner). The correct measured value is still output in the display.

Note



If the clock generation of the processor electronics is faulty, it is possible for the analog output to remain stationary at approx. -1 mA or approx. +24 mA.

71 Relay outputs

| 71 Relay outputs | | CO ₂ |
|------------------|--------------|-----------------|
| R01 | Fault | ● |
| R02 | Maint. req. | ● |
| R03 | Funct. cont. | ● |
| R04 | not used | ● |
| | ...cont. | ▶ |

Six freely-configurable relays are available per channel in the basic version. Their switchable output contacts (max. 24 V AC/DC / 1 A) can be used for signalling, controlling valves etc. If six relays are insufficient, it is possible to retrofit eight further relays with additional electronics (option). Each relay can be assigned one of the functions listed in Table 5.4, but each function may only be assigned once. This means, for example, that the fault signal cannot be applied to two relays.

| Function | Relay is de-energized with | Relay is energized | Remarks |
|------------------------------------|-----------------------------------|---|---|
| Vacant | | | Relay permanently de-energized |
| Fault | Fault | | Also output in display (in measuring mode) (see Section 6.6) |
| Maint. req. | Maintenance request | | |
| Calibration | | Calibration running | For information |
| Range 1 (...4), | | Range 1 (...4) on | For range identification |
| Limit 1 (or 2), | Limit 1 (...4) has been triggered | | Limit signalling |
| Funct. cont. (CTRL) | Function check on | Decoding, warming-up phase, autocal running | Signalling with: <ul style="list-style-type: none"> ● Analyzer is decoded ● Warming-up phase ● Calibration running (Autocal) ● Remote |
| | | | OXYMAT 6F <ul style="list-style-type: none"> ● Sample chamber temperature outside tolerance (only with heated version) |
| Sample gas | | Supply of sample gas | Triggering of valves with autocal |
| Zero gas 1 | | Supply of zero gas | |
| Span gas 1(...4), 1b ... 4b* | | Supply of calibration gas | |
| Sample pt 1 (...6) | | Measuring point 1 (...6) selected | For gas sampling via solenoid valves at different measuring points |
| Signal m p 1 (...6) | | Measuring point 1 (...6) selected | For measuring point identification (parallel to measuring point) |
| Sign. cont. | | When signalling, the relay is briefly energized | e.g. with autocal: control of a 2nd analyzer |
| Pr. sam. gas | | Sample gas flow too low | For information |
| ULTRAMAT 6E/F Zero gas 2 | | Supply of zero gas | Only necessary with autocal in absorber mode (see Section 4.2.4) |
| Pr. ref. gas | | Pressure of calibration gas too low | For information |
| Heating | | Heater ready | For information |
| Acal/chk dif. | | Autocal difference too large (function 24) | |

* 1b ... 4b for 2nd component with 2R channels

Table 5-4 Relay assignments

In the case of 2R channels, the relays can be used for both components. The differences described in 5.4 must be observed.

Refer to the terminal assignment diagram in Section 2.5 "Electric connection" for the assignments of the individual relays when de-energized. On delivery, the relays are preset as shown.

Up to four relays can be configured in one menu. Switching to further menus - and thus to further relays - is always carried out by pressing the fifth (last) softkey ("...Continue").

Caution

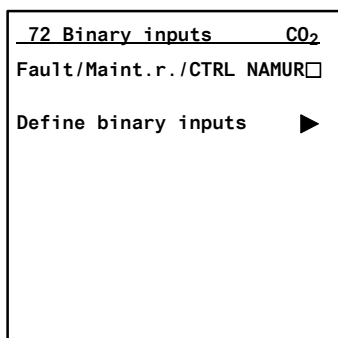
Every change to the configuration of the relay outputs should always be stored in the user data memory using *function 75*. If this is not done, the danger exists that a previous (undesired) configuration is called when selecting "Load user data" (*function 75*).

Note

If the clock generation of the processor electronics is faulty, it is possible for the relay interfaces to assume an undefined status.



72 Binary inputs



Six floating binary inputs ["0" = 0 V (0...4.5 V); "1" = 24 V (13...33 V)] which you can configure freely are available in the basic version. If these six inputs are insufficient, you must fit additional electronics with a further eight binary inputs (option).

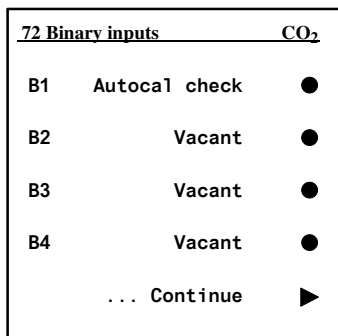
The mode for the binary inputs is defined here. With "NAMUR" (■) mode, the binary inputs respond as identified by "N" in Table 5-5.

If "NAMUR" mode is not activated (□), the binary inputs respond compatible to the older software release versions V4.3.0 (identified by "X" in Table 5-5).

You can assign one of the **control functions** listed below to each input, but each function must only be assigned once.

Refer to Section 2.5 "Electric connection" for the assignments of the individual inputs.

No binary channels are already assigned on delivery. Up to four relays can be configured in one menu. Switching to further menus - and thus to further relays - is always carried out by pressing the fifth (last) softkey ("...Continue").



Caution

Every change to the configuration of the binary inputs should always be stored in the user data memory using *function 75*. If this is not done, the danger exists that a previous (undesired) configuration is called when selecting "Load user data" (*function 75*).

Control functions/ NAMUR

| Function | Required control voltage | | | Remarks / effects |
|-----------------------------|--------------------------|------|------------------|--|
| | 0 V | 24 V | 24 V pulse (1 s) | |
| Vacant | | | | No effect when triggered |
| Fault 1, 2, ..., 7 | N | X | | e.g. Signal from gas conditioning: condensation overflow, gas cooler faulty etc. (see also Section 6.6) |
| E Maint. req. 1, 2, ..., 7 | N | X | | |
| Deletion of logbook entries | | | N, X | Following deletion, the analyzer is set to the initial state. If the cause of a fault or maintenance request has not been eliminated, the corresponding message appears in the logbook again. |
| Functi. cont. 1 ... 4 | N | X | | Relay must be configured to function check using <i>function 71</i> if e.g. the function is to be checked with a second analyzer. |
| Autocalib. | | | N, X | Autocal must be parameterized (<i>functions 23, 24 and 25</i>) |
| M. range 1 (... 4) | | N, X | | For remote range switching (switch off autoranging (<i>function 52</i>)) |
| Zero gas 1, 1b | | N, X | | Relay must be configured with <i>function 71</i> to zero gas, calibration gas or sample gas, and the corresponding valves must be connected. Only applies to total calibration since only one calibration gas can be considered (<i>function 22</i>). |
| Span gas 1, 1b | | | | |
| Sample gas on 1, 1b | | | | |
| Zero cal. 1, 1b | | | N, X | |
| Span cal. 1, 1b | | | | |
| Autorange | | N, X | | Automatic switching over of measuring ranges |
| Acal check | | N, X | | Start Autocal check (<i>function 24</i>) |
| Meas. protection | | N, X | | You can define a binary input "Measuring protection" with the following effects: If the analyzer is in the status "Measure" (not carrying out function check), it remains in this status, i.e.: - The analyzer can no longer be opened - The analyzer can no longer be set to "Remote". The message "Measuring protection switched on" is output in the status line of the measurement display |

Table 5-5 Control functions

The meaning of "N" in the columns "Required control voltage" is described in *function 72* "Binary inputs".

73 ELAN configuration

The same settings (especially the same channel No.) apply to the two components of 2R channels. The components are addressed using the component No.

| 73 ELAN config. | | CO ₂ |
|---------------------------|----|-----------------|
| Channel address : | 01 | ● |
| Measured value telegram : | On | ● |

The parameters for an ELAN network can be set in this dialog.

- Channel address
The channel address for this analyzer can be set here. Addresses between 1 and 12 can be set. Each address must only be used **once** in an ELAN network. Addresses of analyzers used to correct the pressure or the influence of interfering gases must not be entered at this point.
- Measured-value telegrams (on/off)
The automatic, cyclic transmission of measured values every 500 ms can be switched on/off here.



Tip!

For further details on ELAN, refer to the ELAN interface description (C79000-B5274-C176, German/English).

74 Reset

| 74 Reset | | CO ₂ |
|---------------|--|-----------------|
| Trigger reset | | ● |

This function is used to carry out a cold restart of the analyzer, e.g. in the event of a fault in program execution.

You must wait for the warming-up time following triggering of this function. The analyzer is only fully ready for use following this time.

75 Save data, load data

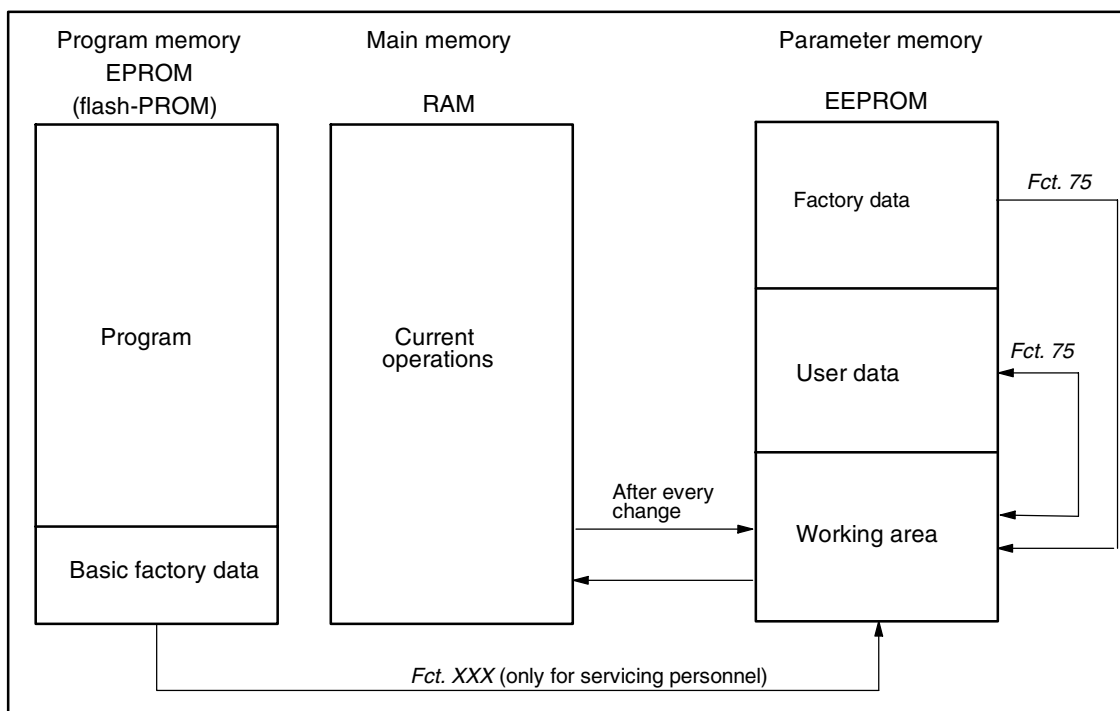
| 75 Save data | | CO ₂ |
|-----------------------|--|-----------------|
| Save user data | | ● |
| Load user data | | ● |
| Load factory settings | | ● |

You can use this function to save user-specific data in the user data memory.

This should always be carried out e.g. following successful starting-up of a system. All individual settings are then saved and can be recalled if necessary (load user data).

This is significant if repairs or maintenance are to be carried out on an analyzer or e.g. new parameter settings are to be tried.

The following Fig. provides a summary of the interactions between the various memory components.



The basic status of the analyzer (factory settings) can be reestablished using the function "**Load factory settings**" (function 75).

76 Suppress short noise signals

| 76 Suppress fault | | CO ₂ |
|---|---|-----------------|
| Suppress noise signals with a duration of up to | : | 1.0 : s |
| Level in % of smallest MR | : | 1.0 % |

This function is used to eliminate undesirable spikes which exceed an adjustable threshold of the smallest measuring range.

Spikes are caused by electromagnetic interferences or occasional mechanical shocks. These interferences can be suppressed by entering an "action time" of 0 to 5 s. This time means that spikes with a shorter duration are suppressed and no longer influence the measured values..

The input can be made in steps of 0.1 s.

If a change in concentration occurs directly after a fault, there may be a delay in its display.

The settings of *function 50* ("Electric time constants") must be taken into account when activating this function. It should particularly be ensured that the "Threshold in % of smallest range" is larger than the effective bandwidth set in *function 50*.

77 Store analog output

| 77 Store | | CO ₂ |
|--------------------------|--|-------------------------------------|
| analog out.to meas.value | | <input checked="" type="checkbox"/> |
| analog out.to 0/2/4 mA | | <input type="checkbox"/> |
| analog out.to 20 mA | | <input type="checkbox"/> |
| store on/off | | <input type="checkbox"/> |

You can use this function to define the response of the analog output or the digital interface with certain analyzer statuses:

In the event of a fault (**S**), **CTRL** (decoding; calibration; warming-up phase), either

- the last measured value
- or 0 (2/4) mA
- or 20 mA

is output at the analog output.

"Store on" () activates the setting described above.

78 Calibration tolerances

| 78 Calib. tolerance | | CO ₂ |
|---|---|-------------------------------------|
| Calib. tolerance at zero in % of smallest MR: | : | 10 : |
| Calib. tolerance of span in % of current MR: | : | |
| Signal tolerance violation. | | <input checked="" type="checkbox"/> |

Using this function it is possible to signal changes in the zero or sensitivity compared to the last calibration as a "Maintenance request" if a relay output was configured to "Maintenance request" using *function 71*.

The analyzer must also be set to "**Total calibration**" (using *function 22*) for this function to be effective.

The calibration tolerance, adjustable from 0 to 99 %, refers at the zero to the smallest measuring range (or span) and at the sensitivity to the measuring range (or span) in which the total calibration is carried out.

This can be clarified by an example:

| | | |
|----------------------|--|--|
| ULTRAMAT 6E/F | Measuring range 1: | 0 ... 50 % CO ₂ |
| | Measuring range 2: | 0 ... 100 % CO ₂ |
| | Smallest span: | 50% CO ₂ |
| | Range in which calibration is carried out: | Range 2 |
| | Defined calibration tolerance: | e.g. 6% |
| | Response threshold for zero: | 50% CO ₂ • 0.06 = 3% CO ₂ |
| | Response threshold for sensitivity: | 100% CO ₂ • 0.06 = 6% CO ₂ |

| | | |
|--------------------|--|--|
| OXYMAT 6E/F | Measuring range 1: | 98...100% O ₂ |
| | Measuring range 2: | 95...100% O ₂ |
| | Smallest span: | 100% O ₂ - 98% O ₂ = 2% O ₂ |
| | Range in which calibration is carried out: | Range 2 |
| | Calibration tolerance: | 6% |
| | Response threshold for zero: | 2% O ₂ • 0.06 = 0.12% O ₂ |
| | Response threshold for sensitivity: | 5% O ₂ • 0.06 = 0.3% O ₂ |

If the zero (sensitivity) differs from the last calibration by more than the parameterized value, the correspondingly configured relay signals a maintenance request.

79 Codes for input levels

| 79 Codes program. | | CO ₂ |
|-------------------|-------|-----------------|
| Code 1 | :111: | |
| Code 2 | :222: | |

You can use this function to replace the factory-set codes ("111" for level 1, "222" for level 2) by your own. The value "000" for a code means that disabling is not present and that complete access is possible to the corresponding input level.

80 Analyzer test

| 80 Analyzer test | CO ₂ |
|-----------------------|-----------------|
| Keyboard | ▶ |
| Relay and binary test | ▶ |
| Analog test | ▶ |

The analyzer test comprises

| | |
|-----------------------|-------------------|
| Keyboard test | Analyzer-specific |
| Relay and binary test | Channel-specific |
| Analog test | Channel-specific. |

- **Keyboard test**

The keyboard test can be used to check various keys on the input panel.

The five softkeys at the right margin can make the associated point disappear or appear.

If the digit keys and the sign key are pressed, the corresponding digit is stored in the editing field in the bottom line of the display.

A message is output in plain text when you press the **INFO** key; the **MEAS** and **ESC** keys retain their return functions.

- **Relay and binary test**



Caution

First remove data plugs.

The first display shows 6 of the relay and binary channels. With an option board, a further 8 channels are present on a second page.

Individual relays can be activated using the relay test. This is carried out using the input field. A "1" makes the relay pull up, a "0" makes it return to the de-energized state.

Digits other than 0 and 1 are not accepted by the input field. After leaving *function 80*, the relays reassume the status which they had prior to selection of the relay and binary test. The column "Binary" shows the current status of the binary inputs in this display..

- **Analog test**

The analog test can be used to parameterize the analog output with a constant current of 0 - 24000 μ A for test purposes.

The analog input permanently shows the input currents in μ A.

81 Select language

| 81 Select language | CO ₂ |
|--------------------|-------------------------------------|
| other | <input type="checkbox"/> |
| English | <input checked="" type="checkbox"/> |

You can use this function to switch the analyzer to a second dialog language.

The analyzer is delivered in the ordered language. If English is set as the first language, Spanish is set as the second language. Otherwise, English is usually present as the second language.

82 Pressure correction

| 82 Pressure corr. | CO ₂ |
|--|-------------------------------------|
| With ext.pressure sign. on analog input 2 | <input checked="" type="checkbox"/> |
| Analog inp.2: 0 - 20 mA | <input checked="" type="checkbox"/> |
| for range: : 0 : - 0 hPa | |

The parameters for the pressure correction in the corresponding factory function are component-specific, selection of the pressure sensor in *function 82* is channel-specific:

You can use this function to select

- Pressure correction using an internal pressure sensor
- Pressure correction using an external pressure sensor via analog input 2 (example as shown on left)
- Pressure correction using an external pressure sensor via ELAN (RS 485)

ULTRAMAT 6E/F

The **ULTRAMAT 6E** is fitted as standard with a pressure sensor which permits the correction of variations in the sample gas pressure from 600 to 1200 hPa (9 to 22 psi) resulting from variations in atmospheric pressure. This compensation has already been factory-set.

With a closed sample gas circuit, the compensation must be carried out using an external process gas pressure sensor. In this case the compensation is effective in the range from 600 to 1500 hPa (9 to 22 psi).

OXYMAT 6E/F

The **OXYMAT 6E/F** permits the correction of variations in the sample gas pressure from 500 to 2000 hPa/7.2 to 29 psi absolute.

If a larger sample gas pressure range is to be covered (up to 3000 hPa/43.5 psi absolute), an external, commercially available absolute pressure sensor with an appropriate measuring range must be connected to the analyzer.

The external pressure sensor must be equipped with a diaphragm suitable for the application. Its analog input signal range must be 0(2/4) to 20 mA or 0(1/2) to 10 V.

You can enter the characteristic data of the external pressure sensor using *function 82*. The pressure measuring range is entered in hPa (1 hPa = 1 mbar, approx. 0.0015 psi).

The full-scale value of the pressure sensor can be offset if it no longer agrees with the true value.

82 Pressure correction with external pressure sensor via ELAN

| | | |
|---|---------|------|
| 82 Pressure correct. CO ₂ | | |
| With ext. pressure sign. ● from ELAN | | |
| Channel: | :4: | |
| NO: | 994 hPa | ctr1 |

A pressure correction can also be carried out via the ELAN if e.g. a further gas analyzer is already provided with an external pressure sensor and is connected to the **ULTRAMAT/OXYMAT 6E/F** via a serial interface.

- **Channel**

Input of channel number of analyzer which delivers the measured value "Pressure" (e.g. **ULTRAMAT 6E**).

The following line shows the component, the pressure, and the status of the channel connected via ELAN.



Note!

The measured value "Pressure" is an internal value in the **ULTRAMAT 6E/F** or **OXYMAT 6E/F** which can be applied via the ELAN to a further analyzer. It is also possible to use other pressure measuring instruments if they possess the ELAN. However, a prerequisite is that both (all) gas analyzers are operating at the same pressure level.

ULTRAMAT 6E/F

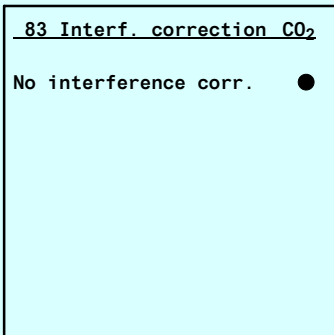
83 Interference correction

The correction of cross-interference is cancelled for the duration of a calibration (zero or sensitivity). The correction is reactivated when the calibration has been terminated and a return made to measuring mode.

Note



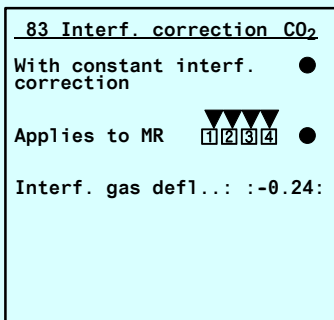
Correction of cross-interference is usually only meaningful if the sample gas equivalent to be corrected is not larger than the smallest span.



When correcting the cross-interference, it is necessary to differentiate whether the residual gas has a constant or variable composition.

The type of interference correction is first defined by pressing the first softkey. The following possibilities exist:

- No interference correction
- Correction of cross-interference for constant influence of residual gas
- Correction of cross-interference for variable influence of residual gas via analog input
- Correction of cross-interference for variable influence of residual gas via ELAN
- Correction of cross-interference for variable influence of residual gas via 2R components



Correction of cross-interference with **constant influence of interfering gas**:

The analyzer must be informed of the value of the zero offset - referred to below as the sample gas equivalent.

It is also possible to define that the correction of cross-interference is only to apply to certain measuring ranges.

Example:

If the sample gas of a CO₂ analyzer (0-10%) contains a cross-interference whose concentration is approximately constant and which results in a display deviation of -0.24% CO₂, you should enter -0.24 as the interfering gas deflection.

ULTRAMAT 6E/F

continued...

| | |
|--|-------------------|
| 83 Interfer. corr. CO ₂ | |
| With var. interference infl. via analog outp. | ● |
| Applies to MR | ▼▼▼▼ 1 2 3 4 ● |
| Interfering gas conc. 8.2 results in interfering gas deflection: | 8 |
| Analog inp. 1: 0 - 20 mA for meas. range | ● |
| | : 0 : - : 10 : |

The conditions are different with a **variable residual gas composition**.

A variable influence of interfering gas is active here. This can be measured using a separate analyzer and then applied as an analog or digital signal (via ELAN) to the **ULTRAMAT6E/F** for calculation of the cross-interference.

Example:

The sample gas of a CO₂ analyzer contains a concentration of CO varying from approx. 1 to 7% CO. This is measured by a CO analyzer where 0 ... 10% CO = 0 ... 20 mA. A calibration gas with 8.2% CO is available for this analyzer.

Procedure:


1. Enter data:
 - Measuring ranges for which the correction of cross-interference is to be applicable (e.g. 1, 2, 3, 4)
 - Analog input 1: 4...20 mA for 0...10% (CO)
- 2 Set analyzer to display mode
- 3 Connect calibration gas with 8.2 % CO to the CO₂ analyzer and record deflection. (In the example, 8.2 % CO result in a deflection on the CO₂ analyzer corresponding to +8 ppm CO₂).
- 4 Enter the value 8.2 as the interfering gas concentration.
- 5 Enter the value 8 as the interfering gas deflection.

ULTRAMAT 6E/F

continued...

83 Interfer. correct. CO₂

With var. interference influence via ELAN ●

Applies to MR  ●

Interfering gas conc.: 100: %
results in interfering gas deflection: : 42.9: %

Channel: :03: Comp.: :1:

NO : 5 % % v/v

If the correction of cross-interference is to be carried out via the RS485 serial interface (ELAN), the same inputs must be made as for **correction of the cross-interference via analog input**.


The following is additionally required:

Channel number and component number of the cross-interference gas analyzer. The type of gas, the measuring range and possibly the analyzer status which are assigned to the channel and the component are then displayed (see also *function 82* "Pressure compensation").

83 Interference correction via 2R analyzer

83 Interf. correction CO₂

With var. interference influence internally for 2R channels ●

Applies to MR  ●

Interf. gas conc. : : 8.2: %
results in interfering gas deflection: : 8 : %

The correction of cross-interference via the second component for 2R channels must be parameterized accordingly.

OXYMAT 6E/F

83 Interference correction



Caution

The correction of cross-interference is cancelled for the duration of a calibration (zero or sensitivity). The correction is reactivated when the calibration has been terminated and a return made to measuring mode..

Note

- Correction of cross-interference is usually only meaningful if the O₂ equivalent to be corrected is not larger than the smallest span.

83 Interf. correction O₂

No interference correct. ●

If the reference gas and residual gas (sample gas without O₂ component) have different compositions, a zero offset occurs as a result of the paramagnetic or diamagnetic difference between the two gases. To compensate this offset, the analyzer must be informed of the value of the zero offset.

When correcting the cross-interference, it is necessary to differentiate whether the residual gas has a constant or variable composition.

The type of interference correction is first defined by pressing the first softkey. The following possibilities exist:

- No interference correction
- Correction of cross-interference for constant influence of residual gas
- Correction of cross-interference for variable influence of residual gas via analog input
- Correction of cross-interference for variable influence of residual gas via ELAN

83 Interf. correction O₂

With const. interference correction ●

Applies to MR ●

Interference: :-0.43:

Correction of cross-interference with **constant influence of interfering gas**:

With a constant residual gas composition and a low O₂ concentration there is a residual gas influence which only varies as a result of variations in the O₂ concentration and can thus be considered as being approximately constant.

The value of the zero offset (O₂ equivalent) must be passed on to the device (see example 1).

Example 1:

Sample gas without O₂ (zero gas) is 50 % propane, residual gas is N₂. N₂ is used as the reference gas.

- The diamagnetic zero offset (O₂ equivalent) of propane is -0.86 % O₂. With a concentration of 50 %, the O₂ equivalent is -0.43 % .
- Enter the O₂ equivalent (-0.43 % in this case).

OXYMAT 6E/F

continued...

83 Interf. correction O₂

With var. interference influence via analog input ●

Applies to MR 1234 ●

Interfering gas :100:% causes an interference of: : 42,94:

Analog inp: 0 - 20 mA ●
for range:
: 0.0 : - : 5.0 :

The conditions are different with a **variable residual gas composition**:

This residual gas influence must be measured using another analyzer and then applied as an analog or digital signal (via ELAN) to the **OXYMAT 6E/F** for calculation of the cross-interference.

The O₂ equivalent to be entered must always be that of the pure residual gas.

Internal calculation of the actual O₂ offset is possible by entering the measuring range of the residual gas analyzer in % as well as its current output.

Example 2:

A sample gas consists of 4% NO and 96% N₂. It is to be monitored for O₂.

The O₂ equivalent of 100% NO is 42.94% O₂.

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

If correction of cross-interference is to be carried out via the RS485 serial interface (ELAN), the same inputs must be made as for **correction of the cross-interference via analog input**.

The following are required in addition:

Channel number and component number of the cross-interference gas analyzer. The type of gas, the measuring range and possibly the analyzer status which are assigned to the channel and the component are then displayed (see also *function 82* "Pressure").

83 Interf. correction O₂

With var. interference influence via ELAN ●

Applies to MR 1234 ●

Interfering gas :100: % causes an interference of: : 42.94:

Channel: :03: Comp.: :1:

ULTRAMAT 6E/F

84 Phase adjust

| 84 Phase adjust | | CO ₂ |
|-----------------|---|-----------------|
| E (φ) | : | 312400 |
| E (φ+90°) | : | -104 |
| φ | : | 280 5 |
| Meas. val. | : | 99.3 vpm |
| Reduction | : | 39400 |
| Phase adjust | | ● |

The physical principle of measurement together with the mechanical design result in a delayed reaction (phase offset) of the analog measured-value signal with respect to the sync signal tapped by a photodetector on the chopper.

This delay (phase offset) also depends on the fitted receiver chamber. The phase angle of the rectifier signal must therefore be synchronized delayed by the same amount.

To do this, insert a paper strip approx. 3 cm wide between the analyzer cell and the detector on the sample gas side (thus simulating a large signal). Subsequently trigger the phase adjustment by selecting the corresponding softkey.



Note

The optical coupler must not be mounted during the phase adjustment

OXYMAT 6E/F

84 Phase adjust

| 84 Phase adjust | | CO ₂ |
|-----------------|---|-----------------|
| V (φ) | : | 144349 |
| W (φ+90°) | : | 9 |
| φ | : | 31.2 5 |
| Meas. val. | : | 20.95 vpm |
| Phase adjust | | ● |

The physical principle of the measurement together with the mechanical design result in a delayed reaction (phase offset) of the analog measured-value signal compared to the clock signal of the magnet controller.

The gain is automatically set by as large a signal as possible (sample gas: e.g. air), so that E (φ) assumes a value of approx. 500.000. The phase angle φ is subsequently calculated using this signal value and saved, where E (φ) is maximized and E (φ+90°) minimized.

This angle has been determined in the factory and should only be readjusted when changing the magnetic field frequency.

85 Switch valves

| 85 Switch valves | | CO ₂ |
|------------------|-------|--------------------------|
| 01 Sample pt.1 | Re1.4 | <input type="checkbox"/> |
| 02 Sample pt.2 | Re1.5 | <input type="checkbox"/> |
| 03 Zero gas | Re1.6 | <input type="checkbox"/> |

It is possible to manually switch up to six valves per channel using this function. This is achieved using the relays assigned to the individual valves. The relays are located on the motherboard and option board.

A prerequisite is that the corresponding relays have first being configured using *function 71* ("Relay assignment"). The function "Switch valves" only applies to the relay configurations "Zero gas", "Calibration gas 1...4" and "Sample gas".

Only one valve of a maximum of six can be switched at a time since the corresponding relays are mutually interlocked under this function.

86 Linear temperature compensation

| |
|--|
| 86 Lin. temp. comp. CO ₂ |
| after compensation of the zero point ► |
| after compensation of the span ► |

The **ULTRAMAT/OXYMAT 6E/F** is temperature-compensated both for the zero and the sensitivity. If an additional temperature error occurs during operation, e.g. as a result of slight contamination of the cell, it can be compensated using this function.

Temperature compensation for zero:

Starting with an average temperature T_M it is possible to define two different correction variables for ranges with a higher or lower temperature.

Example:

| | |
|----------------------|--|
| ULTRAMAT 6E/F | If an increase in temperature of the receiver chamber from T_M to T_M' results in a change in zero by e.g. +0.3% referred to the difference between the full-scale and start-of-scale values (according to rating plate) (see <i>function 2</i> , Fig. 2), the value below |
|----------------------|--|

| | |
|--------------------|---|
| OXYMAT 6E/F | If an increase in temperature of the receiver chamber from T_M to T_M' results in a change in zero by e.g. +0.3% (relative) referred to the difference between 100% O ₂ and the start-of-scale value of the smallest span, the value below |
|--------------------|---|

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

must be entered under "Δ" for a temperature increase.

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

If only one correction value is determined, it is meaningful to enter the same value for the second correction value but with the opposite sign.

Temperature compensation for measured value:

The procedure is the same as for the zero, except that the percentage change applies to the measured value itself.

Example:

If the measured values changes from 70 % to 69 % when the temperature increases by 4°C, the percentage change is

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

and

$$\Delta = 3.55 \quad [%/10^\circ\text{C}].$$

Note



If the zero changes negatively on changes in temperature, Δ has a positive sign. The same applies to a measured value which becomes smaller.

87 Error On/Off

| | | |
|------------------------|-----------------------|-----------------------|
| 87 Error On/Off | | CO₂ |
| S1 | Parameter memory | ■ |
| S2 | Magnetic field supply | ■ |
| S3 | Microflow sensor | ■ |
| S4 | External fault | ■ |
| | .Continue | ▶ |

Signalling of maintenance requests and faults (see Tables 6.3 and 6.4) can be switched off individually using this function so that neither an entry in the logbook, nor a status signal nor external signalling takes place.

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

In the case of 2R channels, the maintenance requests and faults of both components can be parameterized independent of the component via which the function is called.

88 AK configuration

| | | |
|----------------------|--------------|----------------------|
| 88 AK config. | | O₂ |
| Baud rate: | 9600 | ● |
| Format: | 8DB, kP, 15B | ● |
| Start character: | :2: | |
| End character: | :3: | |
| Don't care character | :10: | |

- DB = data bits
- kP = no parity
- uP = odd parity
- gP = even parity

The following serial interface parameters can be set:

- Baud rate: 300; 600; 1200; 2400; 4800; 9600
(basic setting: 9600)
- Transmission format: 7 data bits, no parity bit, 2 stop bits
7 data bits, even parity, 1 stop bit
7 data bits, odd parity, 1 stop bit*)
8 data bits, no parity bit, 1 stop bit*)
7 data bits, even parity, 2 stop bits
7 data bits, odd parity, 2 stop bits
8 data bits, even parity, 1 stop bit
8 data bits, odd parity, 1 stop bit
8 data bits, no parity bit, 2 stop bits
) Basic setting
- Start character: All characters from 1 to 255 are possible, but must not be same as end character.
Basic setting: 2 (STX)
- End character: All characters from 1 to 255 are possible, but must not be same as start character.
Basic setting: 3 (ETX)
- Don't care character: All characters from 1 to 255 are possible, but must not be same as start or end character.
Basic setting: 10 (Line Feed)

ULTRAMAT 6F (heated version)

89 Analyzer section heater (analyzer-specific function)

| | |
|--|-----------------------|
| 89 Heater | CO₂ |
| Heater on/off | ■ |
| Setpoint temperature for sample chamber: | :65 °C |
| Actual temperature of sample chamber | 64.9 °C |

The setpoint temperature of the analyzer section of the heated **ULTRAMAT 6F** is fixed at 65 °C.

In addition to the recirculating air heating, the gas inlets and outlets are heated by self-regulating heating elements.

To protect against overtemperature, the heater element of the recirculating air heating contains a thermal fuse which permanently interrupts the heating circuit at a temperature of approx. 152 °C.

The status signal "Function check (CTRL)" is displayed if the actual temperature deviates by more than 5 °C from the setpoint. A signalling contact is switched on in addition if configured (see also *function 71* "Relay outputs").

Correct measurements are not possible if a fault is present in the heater control electronics. An error message is output in this case.

OXYMAT 6F (heated version)

89 Heating (analyzer-specific function)

| | |
|----------------------------|----------------------|
| 89 Heating | O₂ |
| Heating on/off | ■ |
| Nominal temperature Bench: | :130 °C |
| Actual temperature Bench: | :112 °C |

The temperature of the **OXYMAT 6F** sample chamber can be freely selected between 65 °C and 130 °C.

Further parts with which the sample gas comes into contact are heated in addition to the sample chamber.

To protect against overtemperature, the analyzer section contains a thermal fuse which permanently interrupts the heating circuit at a temperature between 163 °C and 168 °C.

The status signal "Function check (CTRL)" is displayed if the temperature of the sample chamber deviates by more than 5 °C from the setpoint. A signalling contact is switched on in addition if configured (see also *function 71* "Relay outputs").

Correct measurements are not possible if a fault is present in the heater control electronics. An error message is output in this case.

90 PROFIBUS configuration

| | |
|--|-------|
| <u>90 PROFIBUS config.</u> CO ₂ | |
| Address | :126: |
| Software version: 1.5.0 | |

This function can only be called if the channel contains additional PROFIBUS electronics.

You can use this function to set the PROFIBUS station address. The address range is from 0 to 126.

Each analyzer has a station-specific ID number and a PROFILE ID number. These can be used to set the configuration response of the analyzer. The parameters 0, 1 and 3 can be selected on the analyzer, and have the following meanings:

- 0: Only the PROFILE ID number is positively acknowledged
- 1: Only the station-specific ID number is positively acknowledged
- 3: Only the PROFILE ID number for multi-variable analyzers (complex analyzers) is positively acknowledged

The display footer shows the current software version of the PROFIBUS card.

Maintenance

| | | |
|---------|---|------|
| 6.1 | ULTRAMAT Channel | 6-3 |
| 6.1.1 | Design and Maintenance of the Heated ULTRAMAT 6F Wall Mount Analyzer | 6-3 |
| 6.1.2 | Design of Analyzer Section | 6-6 |
| 6.1.3 | Dismantling the Analyzer Section | 6-8 |
| 6.1.4 | Adjustment of Analyzer Section | 6-13 |
| 6.1.4.1 | ULTRAMAT 6F Service Position | 6-14 |
| 6.1.4.2 | Zero Adjustment with Adjustment Reserve used up | 6-15 |
| 6.1.4.3 | Total Calibration of Analyzer Section | 6-16 |
| 6.1.5 | Compensation of Influencing Variables | 6-18 |
| 6.2 | OXYMAT Channel | 6-21 |
| 6.2.1 | Design of Analyzer Section | 6-21 |
| 6.2.2 | Dismantling the Analyzer Section | 6-22 |
| 6.2.3 | Adjustment of Reference Gas Pressure Switch | 6-25 |
| 6.2.4 | Removal of Sample Gas Restrictor | 6-26 |
| 6.3 | Replacement of Motherboard and Option Board | 6-27 |
| 6.4 | Replacement of Fuses | 6-28 |
| 6.5 | Cleaning the Analyzer | 6-30 |
| 6.6 | Maintenance Request and Fault Messages | 6-30 |
| 6.6.1 | Maintenance Request | 6-32 |
| 6.6.2 | Fault | 6-34 |
| 6.6.3 | Further Errors (ULTRAMAT 6E/F) | 6-37 |
| 6.6.4 | Further Errors (OXYMAT 6E/F) | 6-38 |



Note

All text positions within a section which require special treatment either of the **ULTRAMAT 6E/F** or the **OXYMAT 6E/F** are enclosed within a frame and identified by the respective analyzer name. Complete paragraphs on an analyzer have the associated name in the title line.

Before commencing with maintenance work, make sure that an explosive atmosphere is not present.

The top cover can be removed and the front panel can be swung to the front to permit maintenance work on rack-mounted analyzers.

The front doors of the wall mount analyzers must be opened to permit maintenance work.

The analyzer must be closed again if the maintenance work is interrupted for longer than two hours.



Note

When closing the wall mount analyzer doors, tighten the screws until the doors rest on the housing frame. Only a moist cloth may be used to clean the display.



Warning

All gas lines and the power supply must be interrupted before opening the device.

Only carry out adjustments using a suitable tool to avoid short-circuits on the electronic boards.

Dangerous gas may be discharged if assembly or calibration are carried out incorrectly, resulting in a danger to health (poisoning, burns) as well as corrosion damage on the device.

When using analyzers in potentially explosive atmospheres, ensure **before opening** the analyzer that there is **no danger of explosion**.

In atmospheres with combustible dusts, avoid deposits above 5 mm. Therefore clean all equipment regularly.



Danger of burns!

The temperature of heated analyzers only drops slowly because of the high thermal capacity of the materials used. Therefore temperatures of up to 130 °C may still be present even when the device has been switched off for a longer time.

The analyzer must be subject to annual maintenance with respect to checking of its electrical safety and functional accuracy, in particular with respect to absence of leaks in the gas path (containment system). The procedure is described below (recommended test setup: see Fig. 2-1).

Owners can judge whether the maintenance interval can be extended in individual cases if no negative influences with respect to chemical corrosion on the gaskets in the sample gas path are expected.

6.1 ULTRAMAT Channel

6.1.1 Design and Maintenance of the Heated ULTRAMAT 6F Wall Mount Analyzer

The heated version of the **ULTRAMAT 6F** is equipped with recirculating air heating as well as with heated sample gas inlets and outlets. The reference gas inlets and outlets are also heated in the case of heated analyzers with a normal flow-type reference cell.

The recirculating air heating regulates the internal temperature of the right-hand side of the housing such that the gas path and the analyzer section do not exceed a temperature of 65 °C. The heater elements for the gas bushings are self-regulating at approx. 70 °C.

As protection against an excessively high temperature, the heating block of the recirculating air heating contains a thermal fuse which permanently interrupts the heating current at approx. 152 °C.

Following start-up, the analyzer passes through a warm-up phase; the operating temperature is reached after approx. 90 minutes. To deactivate the recirculating air heating, press the corresponding function key in the operating *function 89*. The self-regulating heaters of the gas bushings and fans can only be switched off by disconnecting the corresponding plugs. It is essential that you observe the warning information!



Warning

Live parts

The heating elements of the heated **ULTRAMAT 6F** are connected to the mains voltage. Disconnect the analyzer from the power supply before opening the right half of the analyzer and working on the power supply plugs. The danger of an electric shock otherwise exists.



Danger of burns!

The gas inlets and outlets are hot in heated analyzers. The danger of burns from the externally visible parts of the gas bushings exists during operation as well as for a long period after switching off.

Replacement of fan

Replace the fan as follows (see Fig. 6-1):

- Disconnect the plug (X80) for the fan
- Unwind the supply cable from the loom
- Loosen the four mounting screws of the fan

Install in the reverse order.

Replacement of thermal fuse

The thermal fuse may blow if there is a malfunction (e.g. fan failure). Replace as follows (see Fig. 6-7):

- Disconnect the top plug (X60) for the recirculating air heating
- Loosen the cable from the loom
- Loosen the locking screw of the thermal fuse
- Remove the thermal fuse from the heater element

Install in the reverse order.

Replacement of heater cartridge for recirculating air heating

Proceed as follows (see Fig. 6-7):

- Disconnect the top plug (X60) for the recirculating air heating
- Loosen the cable on the plug (pins 1 and 2 for heater cartridge 1 and pins 3 and 4 for heater cartridge 2)
- Unwind the supply cable from the loom
- Loosen the locking screw of the heater cartridge
- Remove the heater cartridge from the heater element (see Fig. 6-1)

Install in the reverse order.

Replacement of self-regulating heater cartridges for the heated gas bushings

Proceed as follows (see Fig. 6-7):

- Disconnect the top plug (X70) for the self-regulating heater cartridges
- Loosen the cable on the plug (pins 1 and 2 for heater cartridge 1 and pins 3 and 4 for heater cartridge 2)
- Unwind the supply cable from the loom
- Loosen the locking screw of the heater cartridge
- Remove the heater cartridge from the heater element (see Fig. 6-1)

Install in the reverse order.

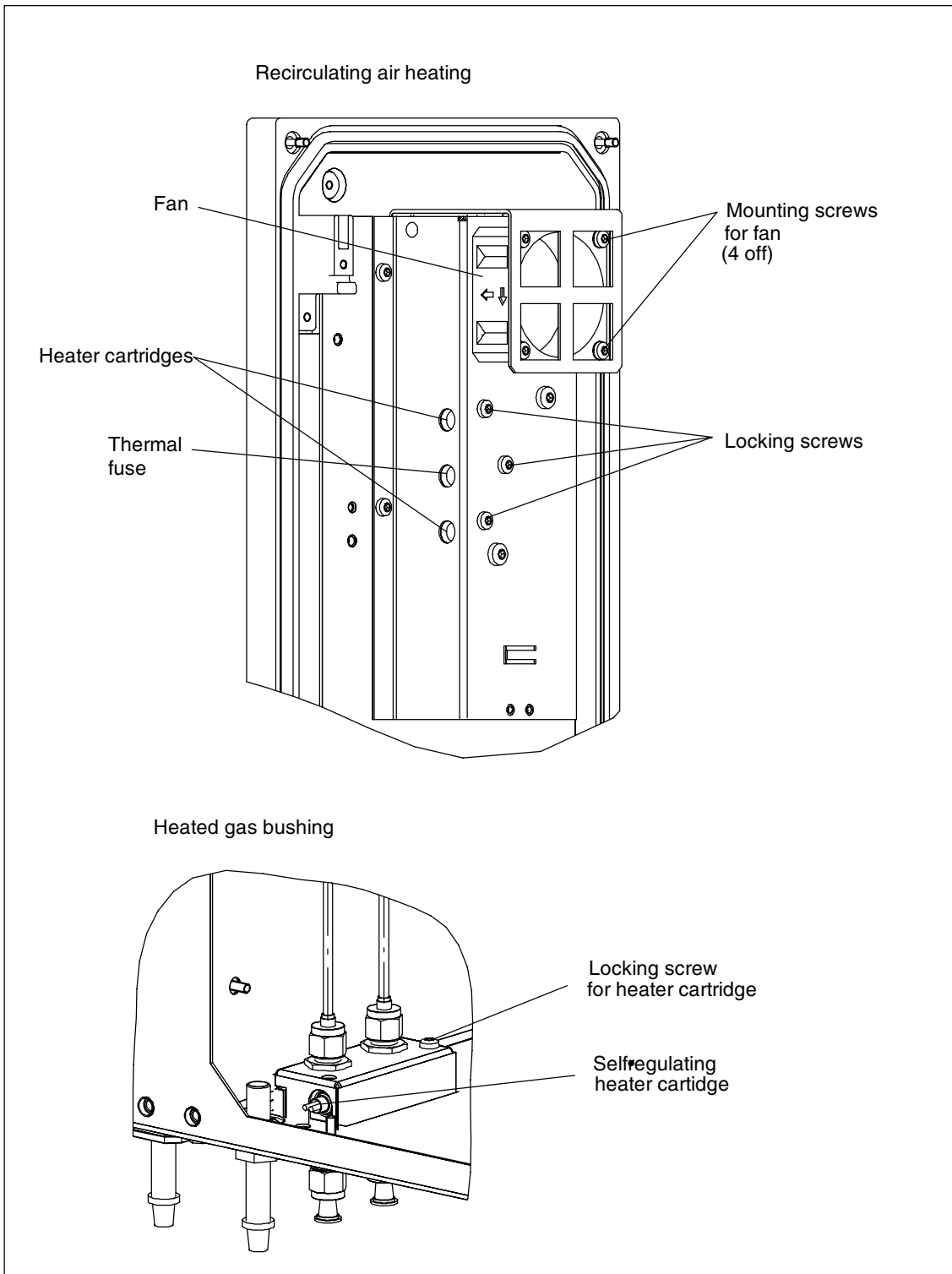


Fig. 6-1 Recirculating air heating and heated gas bushing for **ULTRAMAT 6F**

6.1.2 Design of Analyzer Section

| | |
|--------------------------|--|
| Mode of operation | <p>The mode of operation of the analyzer is described in Chapter 3.</p> <p>This chapter describes the design and function of individual components.</p> |
| IR source | <p>The IR source consists of a round ceramic plate in which a resistance wire is potted. The source is heated up to 700 °C by a load-independent current of approx. 0.5 A (11 Watt). The IR housing flat is sealed gas-tight and provided for certain tasks with an absorber cartridge for CO₂. An optical filter mounted in aluminium can be screwed onto the source. The source can be shifted in position.</p> |
| Beam divider | <p>The beam divider is used to divide the IR beam into sample and reference beams. It is also filled with gas to permit simultaneous use as a filter.</p> |
| Chopper | <p>The chopper is a rotating black disk which converts the constant IR beam into an alternating beam.</p> <p>The disk is balanced by the asymmetric design of the border. It is simultaneously used to interrupt a light barrier which provides the square-wave voltage for the phase-controlled rectification.</p> <p>The chopper is driven by a current which is induced in the disk by means of magnet coils (frequency 1 kHz). The speed (10 to 15 Hz) can be modified - and thus also controlled - by offsetting the voltage phase in pairs of coils. Digital control is used.</p> |
| Detector | <p>The detector is filled gas-tight with the type of gas to be measured. It reacts to the pulsed IR radiation in that it is warmed up, its pressure increases, and there is a compensation flow via a microflow sensor (two heated miniature nickel resistors). The change in resistance is used to evaluate the signal.</p> <p>In the case of the 2R channels, two detectors are mounted in series. A zero adjuster is located in between.</p> <p>The zero adjuster permits independent calibration of the two detectors. Its major effect is on the first detector (viewed from the IR source). The second detector is only weakly influenced.</p> <p>Special analyzer versions also contain a dual filter support with two optical filters between the zero adjuster and the rear detector.</p> |
| Optical coupler | <p>The optical coupler optically extends the lower receiver chamber layer. The infrared absorption in the second receiver chamber layer is varied by varying the position of the slide. It is thus possible to individually minimize the influence of interfering components.</p> <p>In the case of the 2R channels, the optical coupler has its major effect on the second detector (viewed from the IR source).</p> |

Certain analyzer versions are fitted with a sealed coupler filled with desiccant. This prevents errors in measurement resulting from changes in ambient humidity.

Analyzer chamber

The analyzer chamber consists of sample and reference sides. The reference side is usually filled with N₂ and provided with a cartridge for absorbing water vapor.

Various optical lengths of chamber are available depending on the gas concentration:

- 0.2 mm
- 0.6 mm
- 2.0 mm
- 6.0 mm
- 20.0 mm
- 60.0 mm
- 90.0 mm
- 180.0 mm

The product between the gas concentration to be measured (%) and the chamber length (mm) provides an important basic variable (%mm) for the measurement, e.g. for a sag in the characteristic or sensitivity.

The chambers from 20 to 180 mm are lined with 0.2 mm thick pure aluminium sheet, in special cases, as an option, also with tantalum.

The chambers can be opened for cleaning. The following should be used as cleaning agents: alcohol, ether, distilled water and a lint-free cloth (nylon) wound around a bottle brush.

Convection pump

In certain versions of the analyzer, the analyzer chamber is additionally fitted with a convection pump on the reference side to stabilize the measuring properties.

Servicing of the convection pump is not possible. It should not be dismantled.

The heating resistor of the convection pump is never connected in wall mount analyzers, it may be connected in rack mount analyzers depending on the release version.



Warning

The IR-permeable windows made of CaF₂ are very sensitive to mechanical stress.

Be extremely careful when screwing in!
Tighten the screws uniformly!

6.1.3 Dismantling the ULTRAMAT 6E/F Analyzer Section

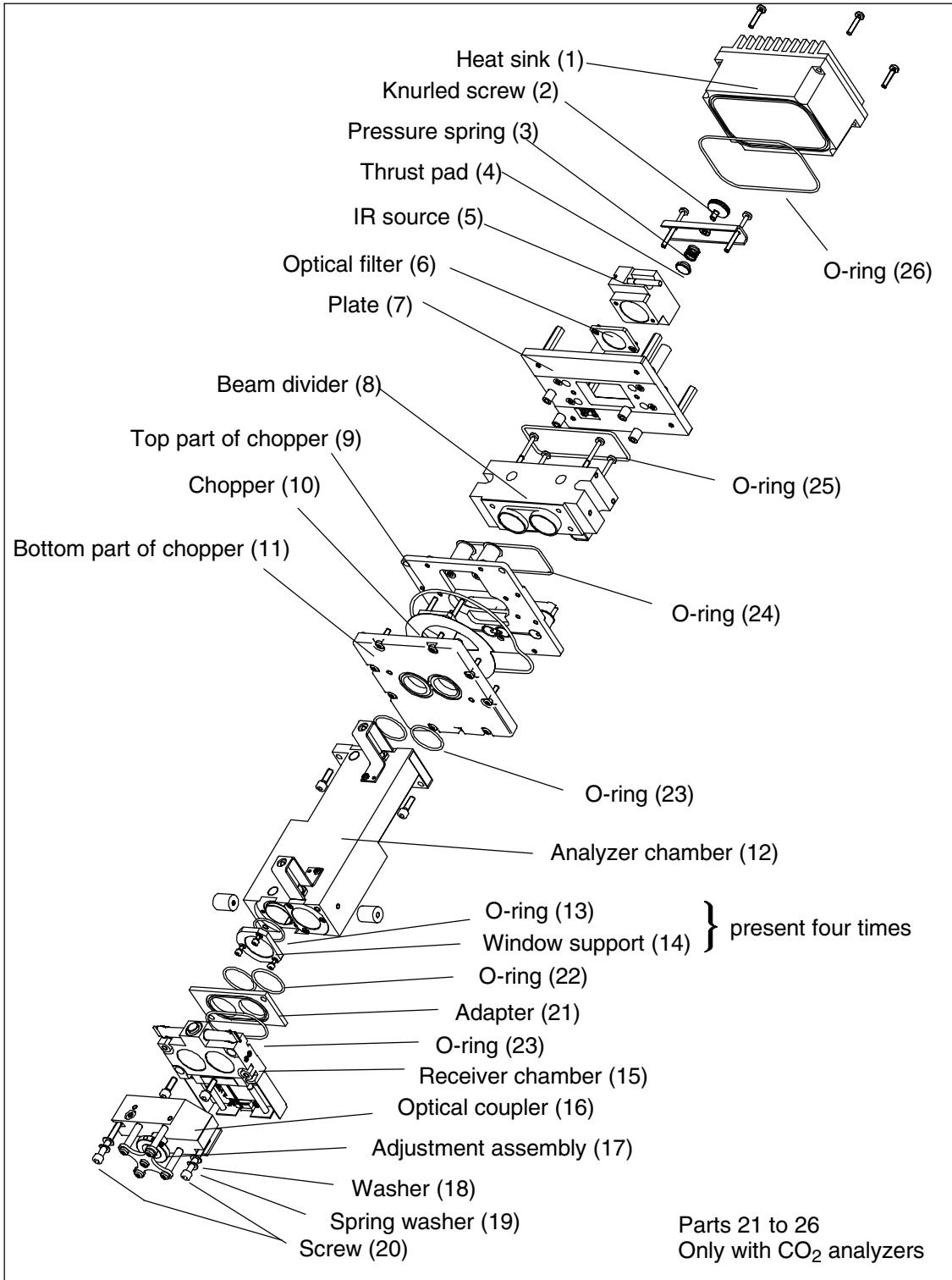


Fig. 6-2 Exploded view of **ULTRAMAT 6E** analyzer section

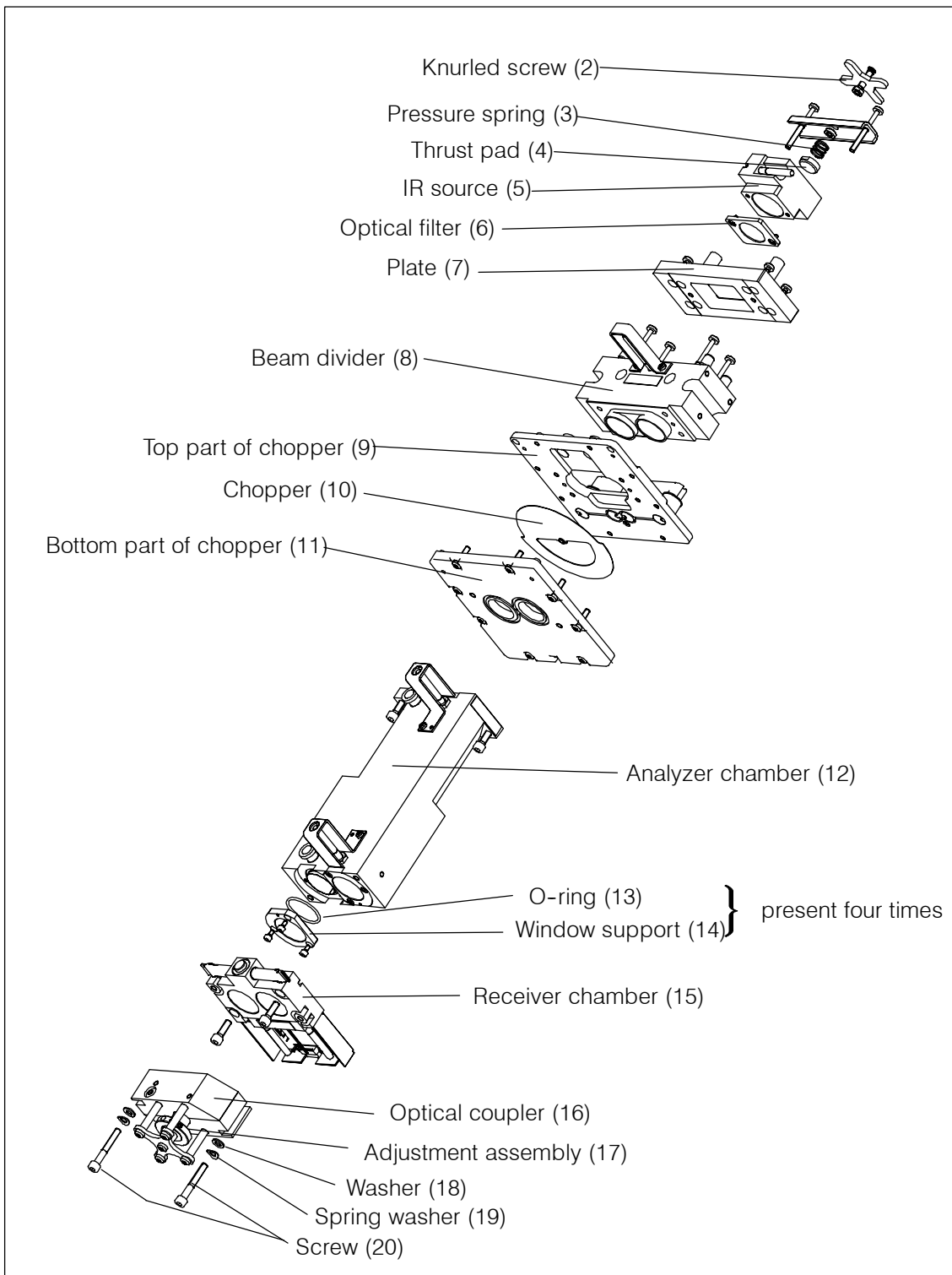


Fig. 6-3 Exploded view of **ULTRAMAT 6F** analyzer section

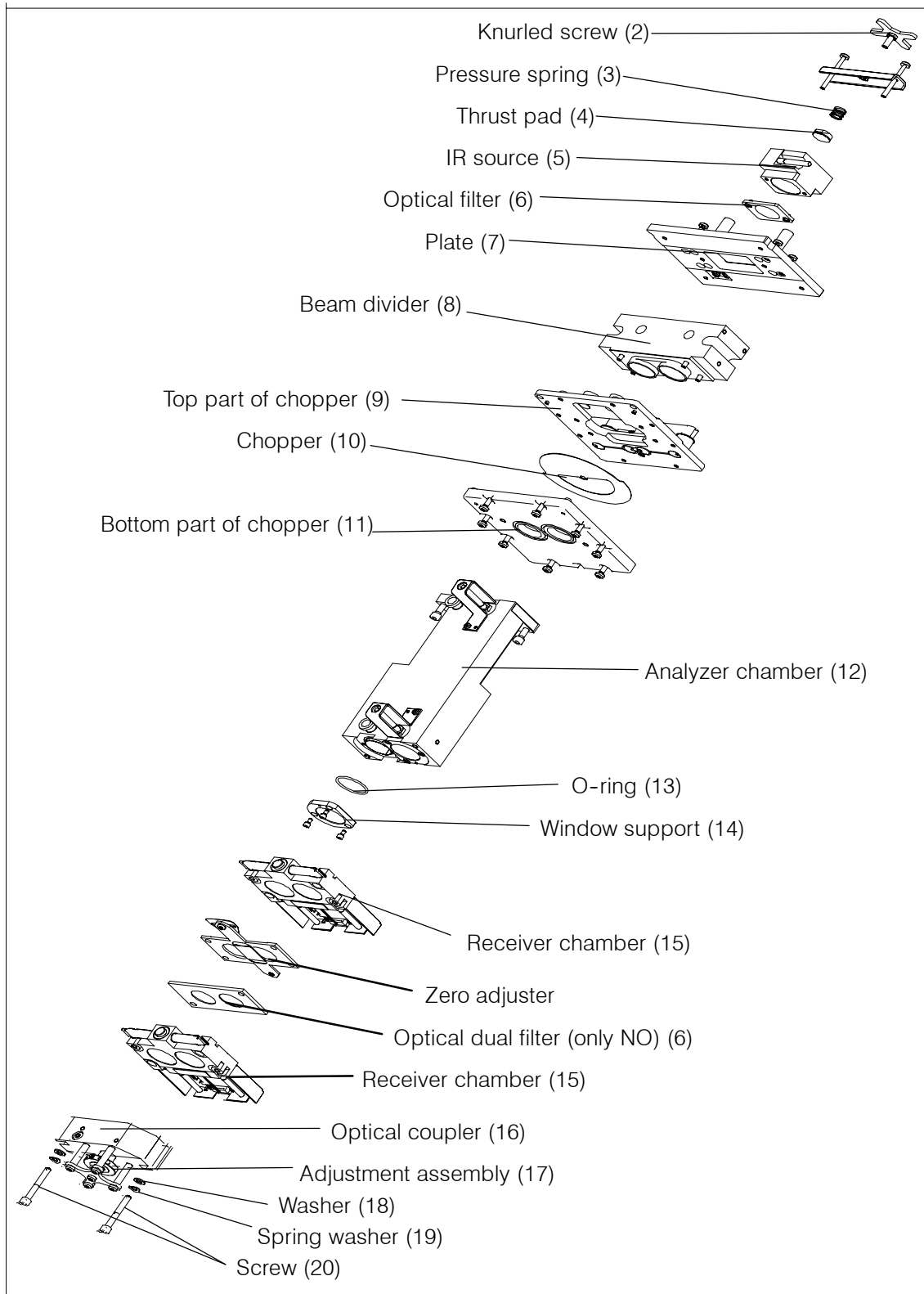


Fig. 6-4 Exploded view of **ULTRAMAT 6E/F-2R** analyzer section



Danger of burns!

The temperature of heated analyzers only drops slowly because of the high thermal capacity of the materials used. Therefore temperatures of up to 130 °C may still be present even when the device has been switched off for a longer time.

Removal of ULTRAMAT 6E analyzer section

Remove the analyzer section of the **ULTRAMAT6E** from the 19"-housing (see Fig. 2-18) as described below:

- Loosen the two screws at the top on the front of the housing.
- Swing down the front panel.
- Loosen gas supply from rear panel.
- Loosen the two screws underneath the heat sink.
- Loosen the screw in the center above the heat sink.
- Loosen the two securing screws for the support from the front.
- To completely remove the analyzer section, unscrew the housing cover, and disconnect the receiver chamber and chopper plugs, and also the convection pump connection if applicable.

The analyzer section can then be removed together with the support.

Removal of ULTRAMAT 6F analyzer section

Remove the analyzer section of the **ULTRAMAT6F** from the wall housing as described below:

- Disconnect the analyzer from the power supply.
- Open the right-hand side of the housing by loosening the four screws.
- Disconnect the hoses or pipes of the analyzer section from the couplings.
- Loosen the four mounting screws of the support for the physical section.
- With heated analyzers: disconnect the heater plugs from the housing bushing.
- Disconnect the receiver chamber and chopper plugs.
- You can now pull the analyzer section forwards with the support, lift it over the front limit of the rails and remove it. In the case of analyzers with piping, ensure that the pipes are not bent.

Install in the reverse order. In the case of analyzers with piping, check all joints in the gas path for tightness; tighten the nuts if necessary.

Subsequently carry out a leak test according to Section 4.2.4. This leak test complies with the requirements defined in the Ex test certificate.

Removal of detector and cleaning of analyzer chamber

Cleaning the analyzer chamber is only necessary if the gas conditioning is faulty or insufficient.

Remove the detector as follows:

- Unscrew coupler
- Unscrew receiver chamber
- Unscrew analyzer chamber from bottom part of chopper
- Unscrew window on sample side and remove O-ring.

Carefully clean the respective chamber (180 mm, 90 mm, 60 mm) using a lint-free cloth (e.g. nylon) wound around a bottle brush. Alcohol, ether or distilled water can be used as cleaning agents. Clean and retighten the CaF₂ windows very carefully since they crack easily under mechanical stress. Tighten the screws uniformly. The chambers must be completely dry (flush with N₂ or grease-free compressed air for 30 minutes if necessary).

Assemble in the reverse order, but do not yet screw on the coupler.

Note

Contaminated analyzer chambers can lead to an additional temperature error at the zero value and in the deflection!



Removal of chopper

Proceed in the following order:

- Unscrew coupler (16)
- Unscrew receiver chamber (15)
- Unscrew analyzer chamber (12) from bottom cover of chopper
- Desolder IR source cable from chopper circuit board
- Unscrew heat sink (1) from IR source (only **ULTRAMAT 6E**)
- Loosen four immersed screws through the holes in the plate (7), and remove the chopper
- Remove the eight knurled screws on the bottom part of the chopper, and replace the bottom part of the chopper with blade.

Caution!

Sensitive bearings, ensure perfect cleanliness!

Removal of IR source

Proceed in the following order:

- Unscrew heat sink (1) from IR source (only **ULTRAMAT 6E**)
- Desolder IR source cables
- Unscrew cross-bracket on IR source (be careful with the round pressure plate and spring), and remove the IR source
- Insert new IR source in reverse order.

6.1.4 Adjustment of Analyzer Section

Principle

The sample channel is opened and closed during one rotation of the chopper, and the reference channel is closed and opened. The IR radiation modulated in this manner then reaches the gas layers of the detector with the same intensity but in phase opposition.

As a result of the absorption of radiation, the temperature of the gas in the left section of the detector increases, and that in the right section decreases. Thus the gas expansion in one of the chambers is counteracted by a gas contraction in the other chamber of the same layer.

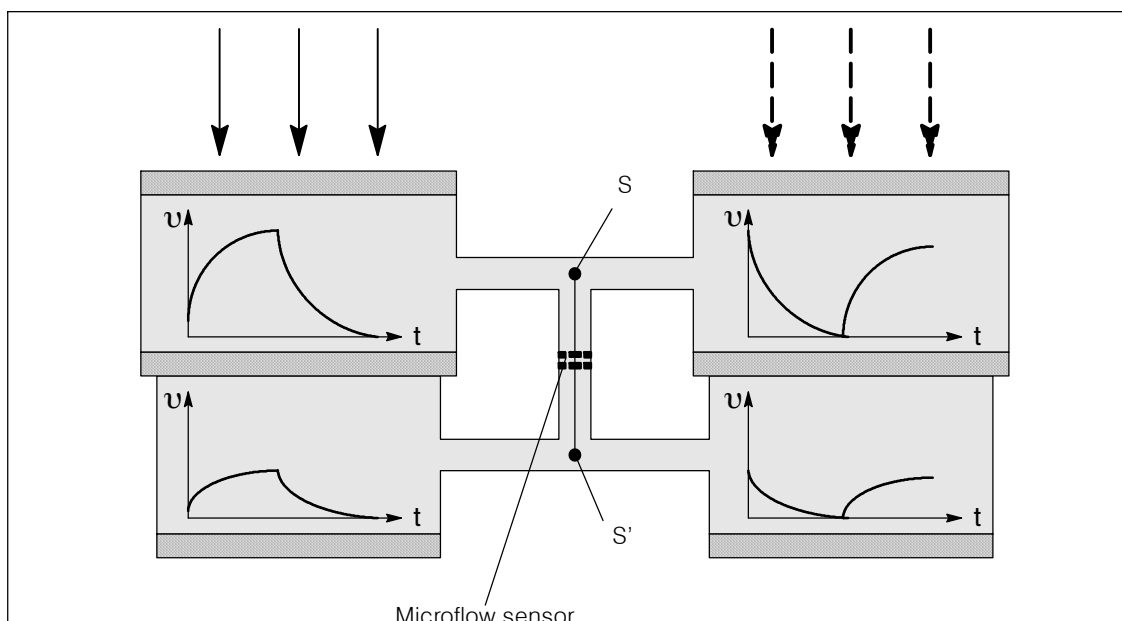


Fig. 6-5 Double-layer detector

If the heating-up procedures in the top and bottom gas layers on the left and right have exactly the same amplitude and phase position, a pulsating flow does not occur in the connection channel between S and S' (see Fig. 6-5), i.e. a signal is not output by the microflow sensor (balanced pneumatic bridge).

A pulsed flow is produced in the microflow sensor if sample gas is present in the sample chamber. This flow is converted by a phase-controlled rectifier into an electric signal. The analyzer section must be correctly adjusted to guarantee optimum signal processing. This means:

- If IR-active gases are present, the radiation amplitudes or the signal components must be equally large in the detector on the sample and reference sides (zero setting)
- The modulated IR radiations of the sample and reference cells must be exactly of opposite phase (minimization of zero voltage)
- The phase-controlled rectifier must be optimized with respect to the detector signals (adjustment of signal phase)

6.1.4.1 ULTRAMAT 6F Service Position

To enable optimum access to the analyzer section of the **ULTRAMAT 6F**, it should be set to the service position during maintenance and repair work.



Danger of burns!

The temperature of heated analyzers only drops slowly because of the high thermal capacity of the materials used. Therefore temperatures of up to 130 °C may still be present even when the device has been switched off for a longer time.



Warning

Live parts

The heating elements of the heated **ULTRAMAT 6F** analyzer are connected to mains voltage. Disconnect the analyzer from the power supply before opening the right-hand side of the housing and working on the power plugs. Otherwise there is the danger that you may get an electric shock.

| Procedure: set analyzer to service position | With heater | Without heater |
|---|------------------------|---------------------------|
| Disconnect analyzer from power supply | x | |
| Open the right-hand side of the housing by loosening the four screws | x | x |
| Disconnect the two heater plugs on the housing bushing | x | |
| Disconnect the fan cable | x | |
| Disconnect the hoses or pipes of the analyzer section from the couplings | x | x |
| Loosen the four mounting screws of the physical section support | x | x |
| Pull the analyzer section forwards; hook the physical section onto the bent bracket at the top and onto the housing frame at the bottom | x | x |
| Switch on analyzer | x | |
| In <i>function 89</i> : deactivate heater | x | |

6.1.4.2 Zero Adjustment with Adjustment Reserve used up

The adjustment reserve is an electronic variable to compensate zero drift (e.g. with a contaminated chamber). The reserve can be used up by frequently readjusting the zero. *Function 2* (analyzer status, 2nd page) indicates the percentage of the adjustment reserve which has already been used (max. $\pm 100\%$, this corresponds to twice the smallest parameterized measuring range). The zero point offset can be corrected by slightly rotating the knurled nut on the coupler or by shifting the IR source so that the full adjustment reserve is available again (cleaning of the analyzer chamber should also be considered).

Note

Slightly rotating the knurled nut on the coupler only influences the zero point, but not the minimization of cross-interference which has been set in the factory. For this reason, the knurled nut must not be rotated by more than $\pm 90^\circ$.



| | |
|--|----------------------------------|
| Procedure: correct zero offset | |
| Set analyzer section to service position (see Section 6.1.4.1) | Wall mount analyzers only |
| Allow analyzer to warm up for at least 30 minutes | |
| Pass N ₂ into the sample channel, and possibly also into the reference channel (with piped wall mount analyzers, connect an appropriate hose to the ends of the pipes). Alternatively, the chamber can be completely sealed following sufficient purging. | |
| Determine E(φ) by calling <i>function 2</i> (2nd page); rotate the knurled nut (17, Figs. 6-2 and 6-3) on the optical coupler (max. $\pm 90^\circ$) until E(φ) is between -1000 and +1000. | Single-channel analyzers |
| Determine E(φ) by calling <i>function 2</i> (2nd page). Correct the second detector using the knurled nut on the coupler, and the first detector using the zero adjuster, until E(φ) for both components is between -1000 and +1000. Then lock the screw of the zero adjuster. | 2R channel analyzers |

If the correction using the knurled nut is unsuccessful, a total calibration of the analyzer section is required (see Section 6.1.4.3).

Note

With **physically** suppressed zeros, corresponding concentrations must be selected for the zero and calibration gases (see Section 4.2.5).



6.1.4.3 Total Calibration of Analyzer Section

A complete calibration including a phase adjustment is necessary following replacement of the detector or chopper. The phase adjustment can be omitted if other parts are replaced or cleaned.



Caution

The optical coupler must not be fitted when carrying out the phase adjustment.

Following replacement of the analyzer chamber and/or the receiver chamber, there may be a slight offset in the factory-set temperature characteristic.

If such a temperature error is detected, compensate using *function 86* (see Section 5.2.5).

| | |
|---|--|
| <p>Procedure: total calibration of analyzer section</p> | |
| <p>Set analyzer section to service position (see Section 6.1.4.1)</p> | <p>Wall mount analyzers only</p> |
| <p>Unscrew heat sink from IR source</p> | <p>Rack-mounted analyzers only</p> |
| <p>Unscrew optical coupler</p> | |
| <p>Allow analyzer to warm up for at least 30 minutes</p> | |
| <p>Pass N₂ into the sample channel, and possibly also into the reference channel (with piped wall mount analyzers, connect an appropriate hose to the ends of the pipes). With physically suppressed zeros, corresponding concentrations must be selected for the zero and calibration gases (see Section 4.2.5). Alternatively, the chamber can be completely sealed following sufficient purging.</p> | |
| <p>Phase adjustment: ----- Insert a strip of paper approx. 3 cm wide between the analyzer cell and the detector on the sample gas side in order to interrupt the IR radiation in the sample channel. Activate the phase adjustment using <i>function 84</i>; then remove the paper strip. With CO₂ analyzers, first loosen the detector so that the paper strip is not hindered by the O-ring. It is alternatively possible with CO₂ analyzers to carry out the phase adjustment by loosening the detector if the analyzer cell is flushed with gas of full-scale value for the duration of the adjustment. The paper strip is not required in this case. ----- Insert a strip of paper approx. 3 cm wide between the analyzer cell and the first detector (viewed from the IR source) on the sample gas side. Activate the phase adjustment for the first and/or second component using <i>function 84</i>; then remove the paper strip. With 2R channels and the component CO₂, first loosen the detector so that the paper strip is not hindered by the O-ring. It is alternatively possible with CO₂ analyzers to carry out the phase adjustment by loosening the detector if the analyzer cell is flushed with gas of full-scale value for the duration of the adjustment. The paper strip is not required in this case.</p> | <p>Single-channel analyzers</p> <p>-----</p> <p>2R channel analyzers</p> |

| | |
|---|--|
| <p>Procedure: total calibration of analyzer section</p> | |
| <p>Adjustment of zero using IR source: In order to adjust the zero or the zero voltage, the sample side must be purged with nitrogen. In the case of analyzers with a physically suppressed zero (flow-type reference side), the corresponding gases must be purged through the sample and reference sides. In the case of analyzers with a (reduced) flow-type reference side (e.g. absorber mode with normal-flow reference side), both sides must be purged with nitrogen.</p> <p>-----</p> <p>Loosen screw on IR source. Call <i>function 2</i> (2nd page); shift the IR source such that $E(\varphi)$ is between -1000 and +1000. Lock the IR source screw, ensure that $E(\varphi)$ remains in the stated tolerance range.</p> <p>-----</p> <p>Set zero adjuster to neutral position (center). Loosen screw on IR source. Call <i>function 2</i> (2nd page); shift the IR source and zero adjuster such that $E(\varphi)$ is between -1000 and +1000 for both components. Since the two corrections influence one another, it may be necessary to repeat the two steps. Lock the IR source screw, ensure that $E(\varphi)$ remains in the stated tolerance range.</p> | <p>Single-channel analyzers</p> <p>-----</p> <p>2R channel analyzers</p> |
| <p>Minimization of zero voltage: In order to adjust the zero or the zero voltage, the sample side must be purged with nitrogen. In the case of analyzers with a physically suppressed zero (flow-type reference side), the corresponding gases must be purged through the sample and reference sides. In the case of analyzers with a (reduced) flow-type reference side (e.g. absorber mode with normal-flow reference side), both sides must be purged with nitrogen.</p> <p>-----</p> <p>Slightly loosen the four hidden screws so that the chopper can be shifted with respect to the beam divider (see also removal of chopper, Section 6.1.2); with long analyzer cells held on the side, it may be necessary to loosen the screws on the physical section support. Shift the chopper with respect to the beam divider until $E(\varphi + 90^\circ)$ is between -15000 and +15000; tighten the screws again. If $E(\varphi)$ has left the tolerance range following this step, correct the position of the IR source again.</p> <p>-----</p> <p>Correct as described above until $E(\varphi + 90^\circ)$ is between -15000 and +15000 for both components; tighten the screws again. If the value $E(\varphi)$ is out of the tolerance range for one of the components following this step, correct the zero using the IR source again.</p> | <p>Single-channel analyzers</p> <p>-----</p> <p>2R channel analyzers</p> |
| <p>Screw heat sink onto IR source</p> | <p>Only rack-mounted analyzers</p> |

| | |
|---|--|
| <p>Procedure: total calibration of analyzer section</p> | |
| <p>Installation of optical coupler: Screw on the coupler such that it can just still be shifted. Ensure that the polished point on the black coupler pin is exactly symmetrical in the center, as also shown by the mark on the knurled nut.</p> | |
| <p>Adjustment of zero using coupler: In order to adjust the zero or the zero voltage, the sample side must be purged with nitrogen. In the case of analyzers with a physically suppressed zero (flow-type reference side), the corresponding gases must be purged through the sample and reference sides. In the case of analyzers with a (reduced) flow-type reference side (e.g. absorber mode with normal-flow reference side), both sides must be purged with nitrogen.</p> <p>-----</p> <p>Shift the coupler such that $E(\varphi)$ is between -1000 and +1000. Then tighten the coupler, ensuring that $E(\varphi)$ remains within the stated tolerance range.</p> <p>-----</p> <p>Shift the coupler and zero adjuster such that $E(\varphi)$ is between -1000 and +1000 for both couplers. Then tighten the coupler, ensuring that $E(\varphi)$ for both components remains within the stated tolerance range.</p> | <p>Single-channel analyzers</p> <p>-----</p> <p>2R channel analyzers</p> |
| <p>Fine adjustment using knurled nut on coupler: In order to adjust the zero or the zero voltage, the sample side must be purged with nitrogen. In the case of analyzers with a physically suppressed zero (flow-type reference side), the corresponding gases must be purged through the sample and reference sides. In the case of analyzers with a (reduced) flow-type reference side (e.g. absorber mode with normal-flow reference side), both sides must be purged with nitrogen.</p> <p>-----</p> <p>Rotate the knurled nut on the coupler (max. $\pm 90^\circ$) such that $E(\varphi)$ is between -1000 and +1000.</p> <p>-----</p> <p>Correct the first detector using the knurled nut on the coupler, and the second detector using the zero adjuster, until $E(\varphi)$ for both components is between -1000 and +1000. Then lock the screw of the zero adjuster..</p> | <p>Single-channel analyzers</p> <p>-----</p> <p>2R channel analyzers</p> |



Tip

An LED is visible on the rear of the rack-mounted analyzer. This can assist you if the display cannot be seen.

After calling *function 2 / page 2* or *function 84*, the brightness of the LED is a measure of the symmetry of the analyzer section. It has a minimum intensity when the zero is set correctly.

6.1.5 Compensation of Influencing Variables

Ambient influences on the measured value resulting from pressure and temperature changes as well as interfering gases (cross-sensitivity) can be corrected in the **ULTRAMAT 6E/F**. Even a non-linear response can be compensated for changes in the temperature.

Pressure compensation

As a result of physical relationships, the measured value display depends on the pressure of the sample gas. With an open sample gas exhaust line, variations in atmospheric pressure have an effect, whereas with a closed sample gas circuit (e.g. sample gas outlet into process), only the current pressure in the chamber is significant (max. 150 kPa absolute is permissible). The built-in pressure sensor largely compensates the influence of atmospheric pressure in the range 60 ... 120 kPa. With a closed sample gas circuit, the influence of pressure must be compensated by an external pressure sensor (in the range 60 ... 150 kPa). In this case, the internal pressure compensation must be switched over to external pressure compensation and the data of the external pressure sensor entered (*function 82*).

The pressure compensation has already been set in the factory.

Compensation of influence of pressure on zero

If an analyzer operates with a suppressed zero (e.g. 70% CO with a CO range of 70 - 80%), a gas concentration subject to variations in pressure also has an effect on the zero.

Temperature compensation

The temperature compensation for the zero and measured value has already been set in the factory (see also *function 86*).

Following replacement of the analyzer chamber and/or the receiver chamber, it may occur that the factory-set temperature characteristic is slightly offset.

If you detect such a temperature fault, compensate it using *function 86* (see Section 5.2.5).

Compensation of influence of temperature on zero

Temperature influences on the zero are particularly noticeable with sensitive measuring ranges because the zero with two-beam NDIR analyzers is based on the compensation of two large radiation intensities.

Compensation of influence of temperature on measured value

The sensitivity is influenced by temperature variations in the case of analyzers which are not thermostatically-controlled. The deviation in the deflection is theoretically

$$- \left(\frac{1}{273} \right) \times 100 = 0.37\% \text{ of the "reference value" per } 1 \text{ } ^\circ\text{C} \text{ increase in temperature.}$$

Note

Contaminated analyzer chambers can lead to an additional temperature error at the zero value and in the deflection!



Compensation of cross-sensitivity using optical coupler

The principle of operation of the optical coupler is described in Section 3.4. The detector including the coupler has been factory-set such that the cross-sensitivity is minimized for water vapor. As a result of the response characteristics of individual gases, it is not possible to achieve a zero which agrees for all concentrations of a cross-sensitive gas or for several gases. It is generally thus only possible to refer to minimization.

Adjustment using optical coupler

The coupler has been factory-set and need only be readjusted in exceptional cases (possibly following replacement of detector).

Once adjustment of the zero has been carried out according to Section 6.1.4, flush the analyzer with nitrogen. Then select measuring range 1 using *function 40*. Subsequently connect interfering gas and observe the measured value: if the measured value moves in the positive direction, flush the with N₂ and rotate the pin (knurled nut) counterclockwise by a few revolutions until zero is approximately output again in the display. Connect the interfering gas again and repeat the procedure until an optimum result is achieved. If the measured value moves in the negative direction, rotate the pin in the clockwise direction.

Correction of cross-sensitivity using second analyzer or second analyzer channel or with constant concentration of interfering gas

The sensitivity of a component different to that being measured can be compensated, in addition to with the optical coupler, by using a second analyzer channel or an analyzer which measures the interfering component. If a second analyzer is used, a signal (0/2/4 to 20 mA or 0/1/2 to 10 V) must be applied from this via analog input 1 for a specific concentration of interfering gas (see *function 83*).

If this is e.g. the channel of an **ULTRAMAT 6**, the correction can be made via ELAN in the case of networked systems (see *function 83*).

With a constant concentration of interfering gas, a constant value is added to or subtracted from the measured value in measuring mode (without use of a second analyzer) depending on whether the cross-interference is positive or negative (see *function 83*).

6.2 OXYMAT Channel

6.2.1 Design of Analyzer Section

Analyzer section

The analyzer section consists of the magnetic circuit, measuring chamber and measuring head. See also the exploded view (Fig. 6-6).

- **Magnetic circuit**

A magnetic pole shoe is adhered in each part of the casing. The cut strip-wound core is pressed onto this by a spring. This design means that the forces of the magnetostriction are kept away from the measuring chamber.

- **Measuring chamber**

The measuring chamber consists of a 1 mm thick center plate from which the sample gas channel is punched, and two 0.3 mm thick cover plates which contain the openings for supply of the sample and reference gases. The **OXYMAT 6** can be used for almost all compositions of sample gas since the gas only comes into contact with the chamber plates and these can be made of many different types of corrosion-resistant materials. The other channels of the measuring system are flushed with reference gas. Within the complete analyzer section, the measuring chamber is fitted between the two parts of the casing.

- **Measuring head**

The measuring head contains the two microflow sensors of the measuring and compensation circuits. These are fitted in a temperature-controlled aluminium block. A strong magnetic field is required to produce the measuring effect, and this results in interferences in the microflow sensors. To minimize this effect, the aluminium block with the preamplifier electronics is screened.

The screening consists of a shielding cup and a restrictor board. The latter contains restrictors whose function is described in Fig. 3-4 in Chapter 3. The two parts are made of material with high permeability.

- **Spacer**

The heated version of the **OXYMAT 6F** has a spacer made of poorly conducting material between the measuring head and the top part of the casing.

Reference gas path

The reference gas line between the connection coupling and the analyzer section consists of a steel tube which is pinched. This acts as a restrictor which reduces the applied reference gas pressure such that a flow of 5 to 20 ml/min results.

Depending on the reference gas pressure (see Section 4.2), a reference gas line must be fitted into the analyzer which has a larger (at 2000 to 4000 hPa or 30 to 60 psi) or smaller (at 100 hPa or 1.5 psi) restrictive effect.

Remove the reference gas line as follows:

- Loosen the screwed joint of the reference gas line from the coupling and the analyzer section.
- Unscrew the reference gas line.

Assemble in the reverse order.



Warning

It is essential to make sure that no liquid or dust can enter the coupling or the reference gas line!

6.2.2 Dismantling the Analyzer Section

Removal of measuring head

- Disconnect the measuring head cable from its plug connection.
- Loosen socket screws and remove measuring head.
- Reassemble in the reverse order. It is essential to ensure that all O-rings are re-inserted!



Warning

The shield cup must not be removed from the measuring head!

Cleaning the measuring chamber

The measuring chamber is not usually susceptible to faults. If condensation is passed through the analyzer as a result of a fault in the gas conditioning, there is a temporary fault in the measurement (highly oscillating measurement value), but the **OXYMAT 6** is ready for measuring again once the measuring chamber has dried out. However, one of the inlets for the reference gas could become blocked in the case of extremely high contamination, and the measurement will then fail (extremely large variations in measured value). In such a case, clean the measuring chamber as follows:

- Remove measuring head according to Section "Removal of measuring head".
- Clean the measuring chamber by passing compressed air into it. The compressed air passes through the sample gas outlet and through the reference gas channels in the upper part of the casing.

You can also flush the measuring chamber with trichloroethylene or alcohol. Subsequently dry it with a flow of dry gas.

- Replace the measuring head.

If the cleaning procedure described above does not lead to the desired result, you must remove the measuring chamber and clean it in an ultrasonic bath. It may also be necessary to replace the measuring chamber.

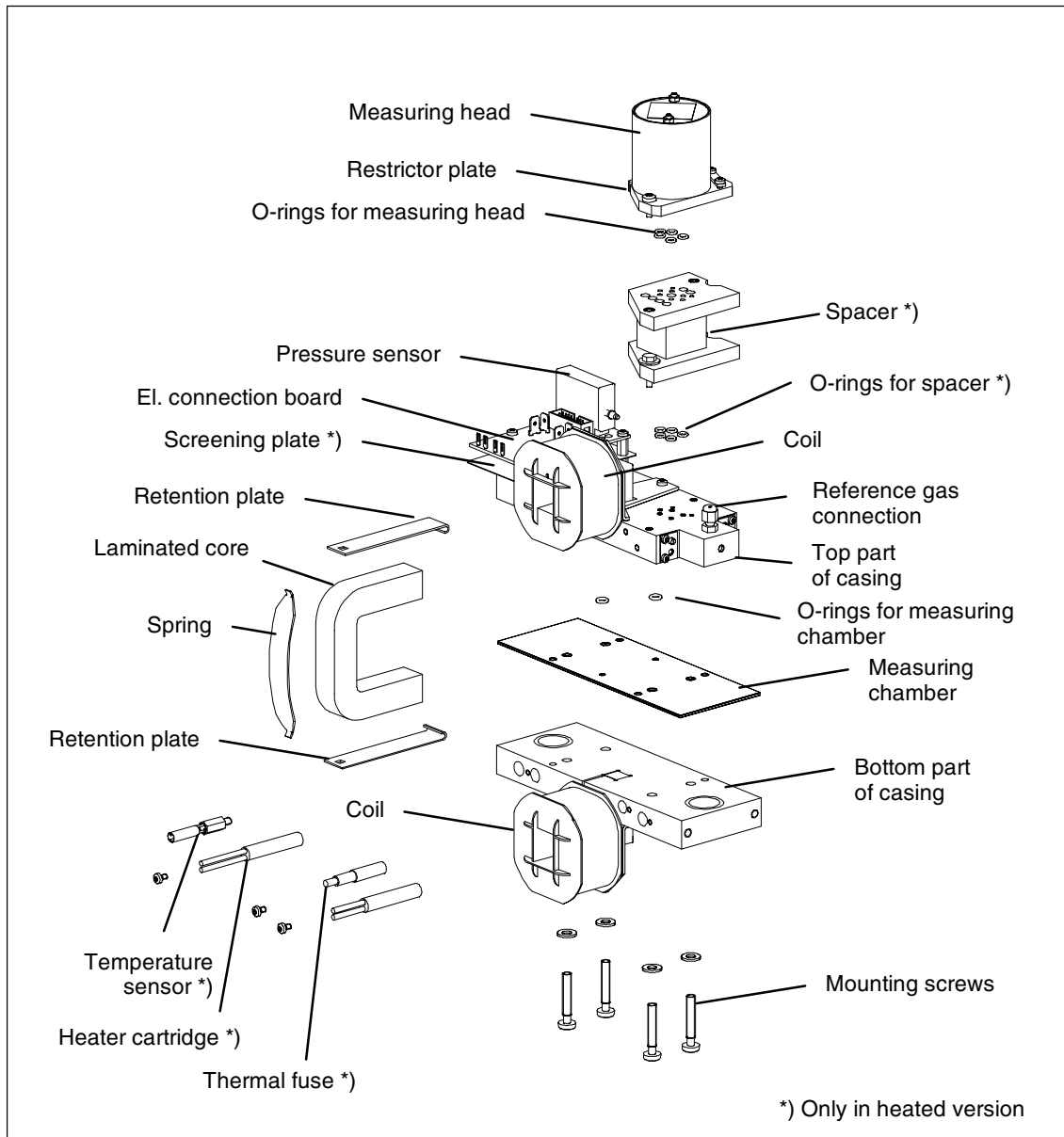


Fig. 6-6 OXYMAT 6 analyzer section

Removal of analyzer section in rack-mounted analyzer

Proceed as follows:

- Pull out the magnetic field cable from the connector on the magnetic field connection board.
- Unscrew the reference gas inlet pipe from the analyzer section.

Removal of analyzer section in wall mount analyzers

- Disconnect the pipe on the rear housing (piped version) or disconnect the hoses at an appropriate point (hosed version).
- Dismount the analyzer section together with the retention plate and take out of the analyzer (together with the sample gas lines in the case of the piped version).
- Dismount analyzer section from retention plate.
- Unscrew sample gas lines from analyzer section.

Proceed as follows:

- Disconnect the plug connections between the analyzer section and the partition
- Unscrew the reference gas inlet pipe from the pipe bushing.
- Unscrew the sample gas inlet and outlet pipes on the analyzer.
- Remove the nuts from the sample gas couplings.
- Unscrew the cap nut of the analyzer section from the inside of the rear wall.
- Lift out the analyzer section with mounting block, and subsequently unscrew from the block.

Removal of measuring chamber

Proceed as described below:

- Remove measuring head according to Section "Removal of measuring head".
- Insert a suitable tool (e.g. screwdriver) between the retention plate and the laminated core (U-shaped core) and push out the plate until the tension spring is released.
- Remove the laminated core and the retention plate.
- Loosen the four mounting screws and pull the two parts of the casing apart.

The measuring chamber is now accessible and can be removed.

Reassemble in the reverse order.

The following must be observed:

- Check all O-rings, and replace if damaged.
- Tighten the mounting screws in a diagonally opposite sequence with a torque of 6 Nm.

Calibration

Following replacement of a measuring head or reassembly of the analyzer section it is necessary to recalibrate the analyzer as described in Section 5.2.2 "Calibration".

Leak test

Each maintenance operation or servicing measure concerning the analyzer section or gas path must be followed by a leak test as described in Section 4.2.2.

If the leak test leads to a negative result, replace all gaskets and hoses or pipes.

6.2.3 Adjustment of Reference Gas Pressure Switch



Note

The reference gas pressure switch has been factory-set to a switching point of approx. 0,2 MPa (2 bar, 30 psi).

For measurements which require a higher sample gas pressure also the reference gas pressure and thus the switching point of the reference gas pressure switch must be increased in an appropriate way. (see also Section 3.10 "Reference gases").

Adjustment

To adjust the reference gas pressure switch, connect an appropriate manometer to the sample gas inlet via a T-piece. A hexagon nut is located between the pressure switch contacts to permit adjustment of the pressure switching point. Adjust as follows:

- To increase the switching point, rotate the nut in the clockwise direction until the switching contact opens (check using a continuity tester) at a defined pressure (read on the monitor).
- The lower switching point can be determined by reducing the pressure until the contact closes (lower switching point). A hysteresis of <80 kPa (0.8 bar, 12 psi) is present between the top and bottom switching points.
- The pressure switch can be loaded up to 0.6 MPa (6 bar, approx. 90 psi).

6.2.4 Removal of Sample Gas Restrictor

The sample gas restrictor must be removed if it is blocked by condensation or if it must be disconnected for other reasons (e.g. when using the **OXYMAT 6** in certain test setups together with **ULTRAMAT 6** analyzers). Proceed as follows:

Hosed version of analyzer (rack-mounted analyzers)

If a flowmeter (option) is not present, the sample gas restrictor is located in the sample gas hose between the pipe inlet coupling and the analyzer section or - with the flowmeter present - between this and the analyzer section. The restrictor is secured using a hose clamp.

Remove as follows:

- Loosen the hose section containing the restrictor.
- Remove the restrictor clamp.
- Push the restrictor out of the hose using a suitable tool (rod or similar).

Piped version of analyzer

OXYMAT 6E

The sample gas restrictor is located in the sample gas inlet coupling on the inside of the analyzer.

Remove as follows:

- Disconnect the internal sample gas pipe from the screwed gland of the inlet coupling.
- Unscrew the restrictor out of the screwed gland.

OXYMAT 6F

The sample gas restrictor is located in the screwed gland of the sample gas inlet at the rear of the housing.

Remove as follows:

- Remove the sample gas line.
- Unscrew the restrictor out of the screwed gland.

6.3 Replacement of Motherboard and Option Board

The motherboard and option board can be fitted or replaced simply.

Removal of motherboard

Proceed as follows:

- Disconnect analyzer from power supply.

ULTRAMAT 6E/ OXYMAT 6E

- Unscrew housing cover and remove.
- Disconnect data plug from rear panel.
- Unscrew the three M3 screws located between the plugs.
- Disconnect plugs of ribbon cables from the motherboard.
- Remove motherboard.

ULTRAMAT 6F/ OXYMAT 6F

- Open left housing door.
- Disconnect ribbon plug from the connection terminal boards
- Remove the sheet-steel cover.
- Disconnect the cables leading to the motherboard.
- Remove the sheet-steel cassette into which the motherboard is fitted.
- Disconnect plugs of ribbon cables from the motherboard.
- Unscrew the three M3 screws located between the plugs.
- Remove the locking assembly on the top of the motherboard.
- Remove motherboard.

Removal of option board

Proceed in the same manner as for the motherboard. In contrast to the latter, the option board is only secured to the rear panel using two screws (**ULTRAMAT/OXYMAT 6E**) or to the sheet-steel cassette (**ULTRAMAT/OXYMAT 6F**).

Installation

Install the two boards in the reverse order.

6.4 Replacement of Fuses



Warning

Disconnect the analyzer from the power supply before replacing fuses!

In addition, the information described in Section 1.5 concerning operating/maintenance personnel applies.

The analyzer has several fuses whose ratings depend on various conditions (e.g. analyzer version, mains voltage, heater):

You can obtain the appropriate fuse values from the spare parts list (Section 7, item O2.4 for the OXYMAT 6 or item U2.4 for the ULTRAMAT 6).

ULTRAMAT 6E/F and OXYMAT 6E/F (without heater)

Fuses F3, F4

The fuses are located in a drawer above the mains socket. To replace the fuses, lever out the drawer using a screwdriver and pull out.

Please note that dual-channel analyzers must have a fuse of higher rating than that for single-channel analyzers. The exact values are specified in Sections 3.6 and 3.7!

ULTRAMAT 6F and OXYMAT 6F (heated version)

Fuses F1, F2

These fuses are located on the heater control board behind the left cover plate (see Fig. 6-7).

Fuses F3, F4

The fuses are located in a drawer underneath the mains socket. To replace the fuses, lever out the drawer using a screwdriver and pull out.

Only replace fuses with ones of the same type. Refit the cover panel on the wall mount analyzer.

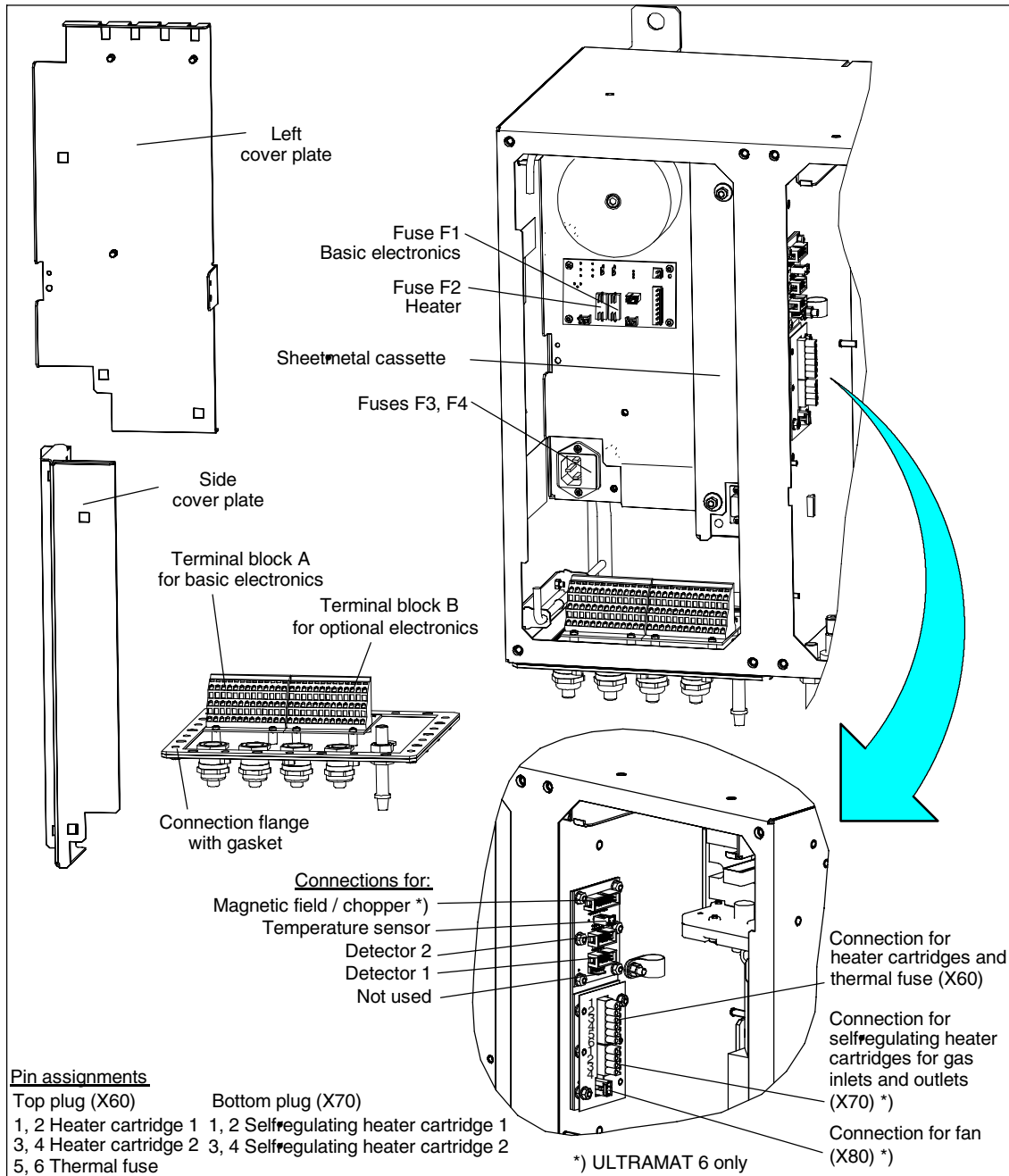


Fig. 6-7 **ULTRAMAT 6F and OXYMAT 6F (heated version)**

6.5 Cleaning the Analyzer

Surface

The front panels and doors can be washed. Clean using a sponge or cloth soaked in water contained cleansing agent. The surface of the display area in particular must only be cleaned using a slight pressure to prevent damage to the thin foil. Make sure that no water enters the analyzer when cleaning.

Caution

The control panel (keyboard and window) of analyzers used in potentially explosive atmospheres must only be cleaned using a moist cloth.

Interior

If necessary, the inside can be carefully blown out using a compressed air gun after opening up the analyzer.

6.6 Maintenance Request and Fault Messages

The **ULTRAMAT/OXYMAT 6** is able to recognize irregularities in the functions. These appear either as a "Maintenance request" or a "Fault" in the status line. These are recorded in the **logbook** (*function 3*) at the same time and can also be called from there. Logbook entries which need to be acknowledged are identified by a point.

Latching

Certain logbook messages are latching (e.g. "Magnetic field supply faulty"). These must be acknowledged (manually or via binary input) in order to reset them, and appear again immediately if the cause of the message has not been eliminated.

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

If a new message occurs, the report stored in the logbook is shifted by one memory location. A total of 32 locations are available, and the oldest of the 32 reports is deleted when a new report occurs. A power failure deletes all reports.

It cannot be precluded that all pages of the logbook are rapidly used up if there is a high message rate (logbook has "overflowed"). It can then occur that non-acknowledged messages cannot be seen in the logbook, but are still saved nevertheless. These entries still result in error messages. Deletion can only be carried out by deleting the complete logbook using function 60.

Logbook entries which have to be acknowledged are identified in the lists in 6.6.1 (Maintenance Request) and 6.6.2 (Faults) by a "Q" in the column "No."

Function 60 can be used to switch off the logbook or also to delete the messages present in it.

The output of messages can be particularly inconvenient during test runs. They can therefore be switched off using *function 87*. It is not recommendable to use this facility during normal operation.

Maintenance request

If references to modifications of device-internal parameters occur, "Maintenance request" is output in the status line of the display. Such modifications need not influence the measuring ability of the analyzer at the time they occur. However, to guarantee reliable measurement in the future, it may be necessary to carry out remedial measures.

If the relay output of the analyzer has been configured accordingly (see also Section 5, *function 71*), it is also possible to output a signal.

Fault

Faults in the hardware or modifications to analyzer parameters which make the analyzer unable to carry out measurements result in a fault message. "Fault" appears in the status line if the analyzer is in measuring mode. The measured value flashes, and it is always necessary to carry out remedial measures in such a case.

It is also possible to output a signal via a relay output just like with a maintenance request (*function 71*). In addition, the analog output can be set to the output current range set using *function 77* ("Store analog output").

Further messages

Further important messages are recorded in the logbook in addition to maintenance requests and faults:

LIM 1 (... 4) (upward/downward violation of limits) and **CTRL** (function check, see Section 5.1).

Troubleshooting

Errors are defined as statuses which result in a maintenance request or a fault message. Individual errors, their causes and remedies are described below.

6.6.1 Maintenance Request

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

Maintenance requests can be individually deactivated using *function 87*.

| No. | Error message | Possible causes | Remedy | Remarks |
|--|---|---|---|---|
| W1 | Calibration difference too large | ULTRAMAT6E/F Chamber contaminated | Clean chamber | See also <i>function 78</i> for calibration tolerance. Drift of channel according to technical data: zero: 1% of full-scale value/week, sensitivity: 1% of full-scale value/week. |
| | | Calibration gas has been replaced | Repeat calibration | |
| | | Drift response | Check whether drift is normal | |
| W2 | ULTRAMAT 6E/F Zero adjustment reserve used up by 80 % | Chamber contaminated | Clean chamber length | See also W1 |
| | | Drift response | Readjust IR source (see Section 6.1.4.2) | |
| | OXYMAT 6E/F Signal voltage zero too large | Zero gas contains too much oxygen | Check zero gas | Zero gas and reference gas should be identical |
| | | Reference gas contains too much oxygen | Check reference gas | |
| W3 | ULTRAMAT6E/F Signal voltage < 30% of full-scale value with sensitivity adjustment | Incorrect calibration gas; incorrect measuring range; detector faulty | Check. Following replacement of detector, calibrate full-scale value and also the sag if necessary | If the analyzer was previously measuring correctly, the detector is probably faulty |
| | OXYMAT6E/F Signal voltage adjustment too small | Calibration gas contains too little oxygen | Check calibration gas | |
| | | Calibration gas flow too low | Check calibration gas flow and correct if necessary | |
| An incorrect measuring range has been selected for the calibration | Select correct range | | | |
| W4 | Set clock | Device has been switched off | New input of date and time | See <i>function 58</i> |

Continued ...

| No. | Error message | Possible causes | Remedy | Remarks |
|-----|--|---|--|--|
| W5 | Temperature LCD too high or too low | Ambient temperature outside range specified in technical data: 5 °C ... 45 °C | Make sure that the ambient temperature is in the range 5 °C ... 45 °C | |
| W6 | ULTRAMAT 6E/F Temperature of receiver chamber | Temperature ≥ 70 °C | Check ambient temp. (max. 45 °C), especially with analyzers fitted in systems | |
| | OXYMAT 6E/F Temperature sensor LCD display | Ambient temperature too high (≥ 45 °C) | | |
| | | Measuring head temperature too high (≥ 78 °C) (only applies to non-heated version) | Contact servicing department if necessary | |
| | | If a lower setpoint temperature has been selected for a heated sample chamber, or if the heater has been switched off, the message W7 appears until the new setpoint temperature has been reached | Not a fault! Please wait until the analyzer section has cooled down to the new setpoint temperature. | |
| W7 | OXYMAT 6E/F Temperature analyzer section > 70 °C | Deviation from setpoint temperature greater than ± 3 °C (see also S7) | If temperature remains constant: no immediate need for action; otherwise: contact servicing department | |
| W8 | Temperature measuring head > ± 3 °C | ?? | ?? | ?? |
| W9 | External maintenance request | Signal from outside | Check | <i>Function 72</i> must be configured accordingly |
| W10 | Autocal-Check-Difference | Toleranzen, die im Autocal/-Check überschritten werden oder falsches Prüfgas (Zuordnung zum Messbereich ist falsch) | Autocal erneut durchführen | Diese Meldung erlischt erst dann, wenn Autocal erfolgreich abgelaufen ist. |

Table 6-1 Causes of maintenance requests

6.6.2 Faults

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

Faults can be individually deactivated using *function 87*.

| No. | Fault message | Possible causes/diagnosis | Remedy/Remarks |
|---------|--|---|---|
| S1 Q | Parameter memory | EEPROM contains incorrect or incomplete data in working area | 1. Carry out RESET or switch the analyzer off and on again If error message S1 appears again: 2. Load user data (<i>function 75</i>) 3. Contact servicing department Leave analyzer in operation to assist troubleshooting by the servicing staff |
| S2 Q | ULTRAMAT 6E/F Chopper motor faulty | Plug loose Ball bearings contaminated Control faulty IR source faulty | Contact servicing department |
| S2 Q | OXYMAT 6E/F Magnetic field supply | Ribbon cable connection interrupted Motherboard faulty | Check connection Contact servicing department |
| S3 Q | Microflow sensor faulty | One half of the grid has been destroyed | Replace detector (ULTRAMAT 6) or measuring head (OXYMAT 6) or contact servicing department |
| S4 Q | External fault message | External signalling | Check <i>Function 72</i> must be configured accordingly |
| S5 Q | OXYMAT 6E/F Temperature analyzer | Ambient temperature outside range specified in technical data: 5 °C ... 45 °C | Make sure that the ambient temperature is in the range 5 °C ... 45 °C |
| | | Measuring head temperature too high (≥ 70 °C) or too low (< 10 °C) (only applies to non-heated version) | Carry out restart (RESET) If unsuccessful, contact servicing department |
| | | If a lower setpoint temperature has been selected for a heated sample chamber, or if the heater has been switched off, the message S5 appears until the new setpoint temperature has been reached | Not a fault! Please wait until the analyzer section has cooled down to the new setpoint temperature. |
| | | Temperature sensor faulty ⇒ Temperature rises above setpoint temperature | Carry out restart (RESET) If unsuccessful, contact servicing department |

Continued...

| No. | Fault message | Possible causes/diagnosis | Remedy/remarks |
|---------|---|---|---|
| S5 Q | OXYMAT 6E/F Temperature analyzer | Measuring head was replaced when the analyzer was switched on | Call <i>function 52</i> and switch off the measuring head heater and then on again. Check whether the measuring head temperature rises (see diagnostics figure under <i>function 2</i>). If unsuccessful: contact servicing department. |
| S5 Q | ULTRAMAT 6E/F Temperature of receiver chamber too high or too low | Ambient temperature is outside the tolerance range of 5 °C ... 45 °C defined in the Technical data | Make sure that the ambient temperature is within the range of 5 °C ... 45 °C |
| | | Temperature of receiver chamber is too high (≥ 75 °C) | Contact servicing department |
| S6 Q | Heating defective | Fuse blown on control board | Replace faulty components or contact servicing department |
| | | Control board is faulty | |
| | | Thermal fuse blown | |
| | | Temperature sensor faulty | |
| S7 Q | OXYMAT 6E/F Temperature measuring head | More than ± 5 °C deviation from the setpoint temperature (75 °C or 91 °C), dependent on selected temperature of analyzer section | Replace measuring head or contact servicing department |
| | | Temperature of measuring head not plausible: (120 °C or 0 °C) | |
| S8 Q | Signal pressure sensor | ULTRAMAT 6E/F Blockage in gas flow | 1. Check pressure sensor 2. Remove blockage 3. Contact servicing department |
| | | OXYMAT 6E/F Sample gas blocked at outlet (> 0.2 MPa (30 psi) with internal or > 0.3 MPa (45 psi) with external pressure sensor) or system pressure too high | Caution The internal pressure sensor will be destroyed if the system pressure exceeds 0.4 MPa (60 psi)! 1. Eliminate flow resistance at analyzer outlet until the sample gas pressure is below 0.2 or 0.3 MPa (30 or 45 psi) 2. or regulate the system pressure accordingly 3. Check for leaks (see Section 4.2.2 "Preparations for Startup") If leaks present: contact servicing department |

Continued...

| No. | Fault message | Possible causes/diagnosis | Remedy/remarks |
|----------|---|---|--|
| S8 Q | Signal of selected pressure sensor outside tolerance | OXYMAT E/F Sample gas pressure too low (< 500 hPa, 7.5 psi) | Set system pressure to > 500 hPa (7.5 psi) |
| S9 | OXYMAT 6E/F Signal too large | Sample gas pressure > 0.3 MPa (45 psi); O ₂ concentration in range 0.2 ... 0.3 MPa (30 ... 45 psi) too large | Reduce pressure or O ₂ concentration or contact servicing department |
| S10 Q | 24 h RAM/flash check | RAM or flash PROM | Replace motherboard Contact servicing department |
| S11 | Reference gas pressure too low (ULTRAMAT 6E/F with reduced flow-type reference side) | Reference gas line leaks, is interrupted or blocked | Check reference gas flow (see Section 4.2.2 "Preparations for Startup") |
| | | Reference gas source empty | Connect new reference gas source |
| | | Reference side pressure too low (the pressure must be between 0.2 and 0.4 MPa (30 and 60 psi). | Set inlet pressure to a value between 0.2 and 0.4 MPa (30 and 60 psi). |
| S12 Q | Power supply | Mains voltage outside tolerance | Mains voltage must be within tolerance limits specified on rating plate |
| S13 Q | Hardware/ Power frequency | Mains frequency outside tolerance | Connect power system stabilizer |
| | | Crystal faulty or external ADC faulty | Replace motherboard |
| S14 Q | Measured value > 100 % | ULTRAMAT 6E/F Incorrect calibration gas Pressure accumulation at outlet of analyzer chamber Sample gas concentration too high | Check |
| | | OXYMAT 6E/F Sample gas pressure exceeds pressure correction range of 0.2 or 0.3 MPa (30 or 45 psi) | Check sample gas pressure and reduce if necessary or switch over to an external pressure sensor with a suitable measuring range |
| | | OXYMAT 6E/F Incorrect calibration of measuring range | Repeat calibration, and check calibration gas if necessary |
| S15 Q | Calibration aborted | Fault if analyzer is in Autocal mode | Eliminate causes |
| | | Fault during calibration via binary input | |
| S16 | Gas flow too low | | Ensure that the flow is sufficiently high |

Table 6-2 Causes of fault messages

6.6.3 Further Errors (ULTRAMAT 6E/F)

Within an appropriate period and according to the drift data (see Chapter 3, Technical Data), calibrate the zero and sensitivity (*functions 20 and 21* respectively) using the corresponding zero and calibration gases. Pay particular attention to use of the zero adjustment reserve (*function 2*) which should not exceed 80 %; otherwise proceed as Section 6.1.4. Make sure that the gas conditioning results in pure gases. A larger zero drift usually indicates that the analyzer chamber is contaminated (see Section 6.1 for cleaning).

| Fault and possible causes | Possible cause and elimination |
|---|--|
| Large positive zero drift | Check gas conditioning (filter). Clean analyzer chamber (see Section 6.1.3) |
| Large span drift -> detector leaking | Change detector (service) |
| Span largely dependant on flow -> restrictor in exhaust line | Reduce restriction |
| Influence of vibrations (variations at analog oputput) -> Interfering frequency too close to chopper frequency or one of its overtones. | Use <i>Function 57</i> to modify chopper frequency up to 2 Hz. Modify using steps of $\pm 0,2$ Hz and check for an eventual improvement after each step. |
| Green LED at rear flashes at a specific cyclic interval (not regular flashing) | Contact servicing department |
| Occurance of one of the following errors: - analog output remains stationary at approx. -1 mA or +24 mA - interfaces turn to an undefined state - device is inoperable is probably caused by a failure of the clock generation of the processor electronics | Exchange motherboard (inform service)! |
| | |

Table 6-3 Causes of unstable measured value display

6.6.4 Further Errors (OXYMAT 6E/F)

In addition to the error messages recorded in the logbook, the following effects can lead to an unsteady or faulty display:

| Fault and possible causes | Remedy |
|---|---|
| Unsteady sample gas flow | A damping unit must be fitted into the sample gas line |
| Pressure surges or variations in the sample gas outlet | Route sample gas outlet separate from the outlets of the other analyzers and/or fit a damping unit into the sample gas outlet. |
| Sample chamber is contaminated; typically occurs if condensation has inadvertently entered the measuring chamber | Clean measuring chamber (see Section 6.2.2 "Dismantling the Analyzer Section") |
| Sample gas flow is too large (> 1 l/min). Turbulences occur in the measuring chamber. | Restrict the sample gas flow to ≤ 1 l/min |
| Excessive vibrations at mounting location | Change magnetic field frequency and/or increase electric time constant. With gases with a high or low density, fit the analyzer section with a flow-type compensation branch if necessary (servicing department) |
| Occurrence of sporadic spikes | See also <i>function 76</i> ; contact servicing department if necessary |
| Fluctuations in output signal | Change the magnetic field frequency |
| Green LED at rear (rack-mounted analyzer) or underneath the cassette (wall mount analyzer) flashes at a specific cyclic interval (not regular flashing) | Contact servicing department |
| Occurance of one of the following errors: - analog output remains stationary at approx. -1 mA or +24 mA - interfaces turn to an undefined state - device is inoperable is probably caused by a failure of the clock generation of the processor electronics | Exchange motherboard (inform service) |

Table 6-4 Causes of unstable measured value display

Spare Parts List

| | | |
|-------|------------------------------------|------|
| 7.1 | General | 7-2 |
| 7.2 | OXYMAT 6 | 7-8 |
| 7.2.1 | Analyzer Section | 7-8 |
| 7.2.2 | Electronics | 7-11 |
| 7.2.3 | Gas paths | 7-15 |
| 7.3 | ULTRAMAT 6 | 7-21 |
| 7.3.1 | Analyzer Part Single Channel | 7-21 |
| 7.3.2 | Analyzer Section 2R Channel | 7-30 |
| 7.3.3 | Elektronics | 7-40 |
| 7.3.4 | Gas paths | 7-43 |
| 7.3.5 | Heating | 7-46 |

7.1 General

Diese Ersatzteilliste entspricht dem technischen Stand November 2005.

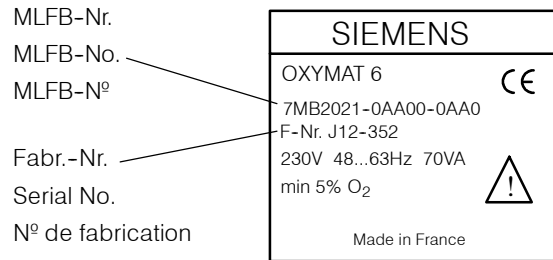
This Parts List corresponds to the technical state of November 2005.

Cette list de pièces de rechange correspond au niveau technique de Novembre 2005.

Am Typenschild ist das Baujahr des Gasanalysengerät (verschlüsselt) aufgeführt.

The rating plate shows the year of construction (coded) of the gas analyzer.

La plaque signalétique de l'analyseur indique l'année de fabrication (codifié) de l'appareil.



Hinweis für die Bestellung

Die Ersatzteilbestellung muß enthalten:

1. Menge
2. Bezeichnung
3. Bestell-Nr.
4. Gerätename, MLFB und Fabr.-Nr. des Gasanalysengerätes, zu dem das Ersatzteil gehört.

Ordering instructions

All orders should specify the following:

1. Quantity
2. Designation
3. Order No.
4. Name of gas analyzer MLFB-No. and Serial No. of the instrument to which spare part belongs.

Indications lors de la commande

La commande de pièces de rechange doit comporter:

1. Quantité
2. Désignation
3. N° de référence
4. Nom, type et N° de fabrication de l'analyseur de gaz pour lequel est destiné la pièce de rechange.

Bestellbeispiel:

2 Meßköpfe
C79451-A3460-B25
für OXYMAT 6
Typ 7MB2021-0AA00-0AA0
Fabr.-Nr. J12-352

Example for ordering:

2 Measuring heads
C79451-A3460-B25
for OXYMAT 6
type 7MB2021-0AA00-0AA0
Serial No. J12-352

Exemple de commande:

2 têtes de mesure
C79451-A3460-B25
pour OXYMAT 6
type 7MB2021-0AA00-0AA0
N° de fab. J12-352

Wir haben den Inhalt der Druckschrift auf die Übereinstimmung mit der beschriebenen Hard- und Software geprüft. Dennoch können Abweichungen nicht ausgeschlossen werden, sodaß wir für die vollständige Übereinstimmung keine Gewähr übernehmen. Die Angaben in dieser Druckschrift werden jedoch regelmäßig überprüft, und notwendige Korrekturen sind in den nachfolgenden Auflagen enthalten. Für Verbesserungsvorschläge sind wir dankbar.

We have checked the contents of this manual for agreement with the hardware and software described. Since deviations cannot be excluded entirely, we cannot guarantee full agreement. However, the data in this manual are reviewed regularly and any necessary corrections are included in subsequent additions. Suggestions for improvement are welcomed.

Nous avons vérifié la concordance du contenu de ce document avec les caractéristiques du matériel et du logiciel. Toutefois des divergences ne sont pas à exclure ce qui ne nous permet pas de garantir une conformité intégrale. Les informations contenues dans ce document sont régulièrement vérifiées, et les indispensables corrections apportées dans les éditions suivantes. Nous vous remercions pour toutes propositions visant à améliorer la qualité de ce document.

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Technische Änderungen vorbehalten

Technical data subject to change.

Sous réserve de modifications techniques

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Analysierteile/Analyzer sections/Parties analytiques ULTRAMAT/OXYMAT 6

(Sonderapplikationen/special applications/applications spéciales)

7MB2017
7MB2026
7MB2027
7MB2028
7MB2117
7MB2118
7MB2126
7MB2127
7MB2128

Caution

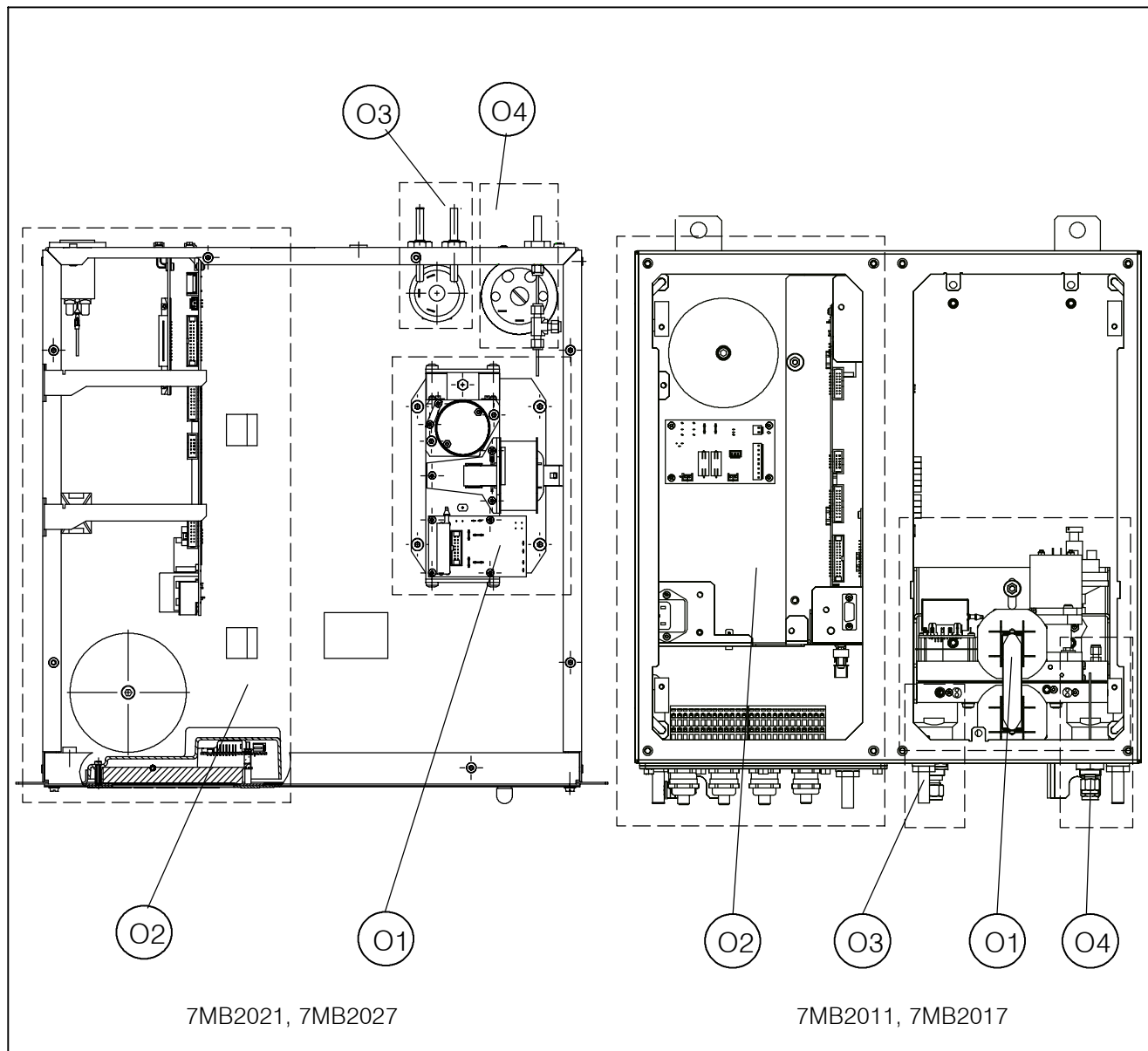
If the ULTRAMAT 6 E/F or OXYMAT 6 E/F was delivered with a specially purified gas path for high oxygen concentrations (so-called "Cleaned for O₂ service"), it is essential to specify this when ordering spare parts. Only then can it be guaranteed that the gas path continues to correspond to the special demands placed on this version.

Bitte setzen Sie sich mit dem Fachvertrieb in Verbindung

Please contact your local dealer

Prière de prendre contact avec votre revendeur

Übersicht Baugruppen / Overview / vue d'ensemble
 OXYMAT 6 (7MB2021, 7MB2011, 7MB2027, 7MB2017)

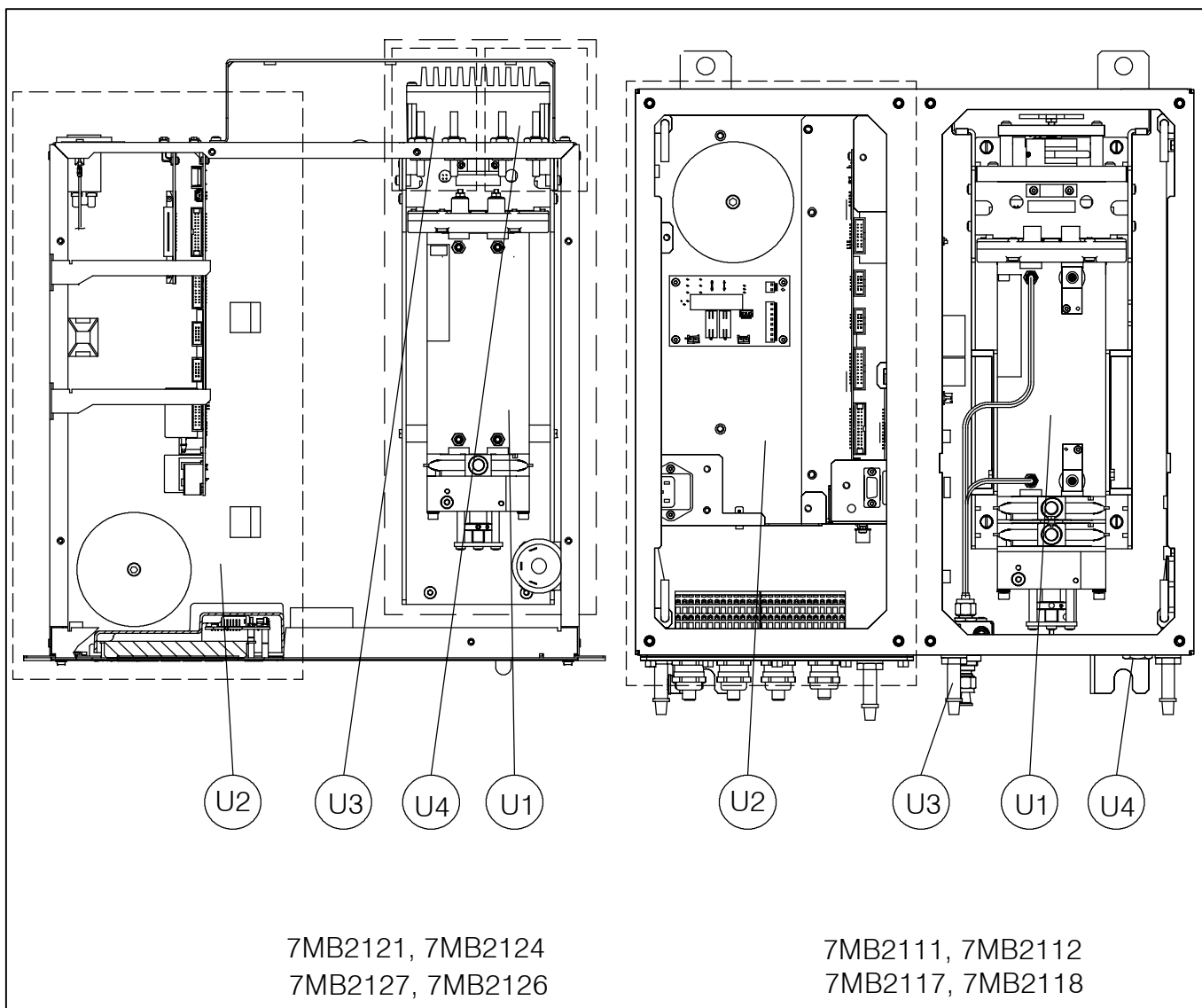


| | |
|----|--|
| O1 | Analysierteil Analyzer section Partie analytique |
| O2 | Elektronik Electronics Electronique |
| O3 | Meßgasweg Hosing system for sample gas Circuit du gaz de mesure |
| O4 | Vergleichsgasweg Hosing system for reference gas Circuit du gaz de référence |

Übersicht Baugruppen / Overview / vue d'ensemble

ULTRAMAT 6 (7MB2121, 7MB2111, 7MB2127, 7MB2117)

ULTRAMAT 6-2R (7MB2124, 7MB2112, 7MB2126, 7MB2118)

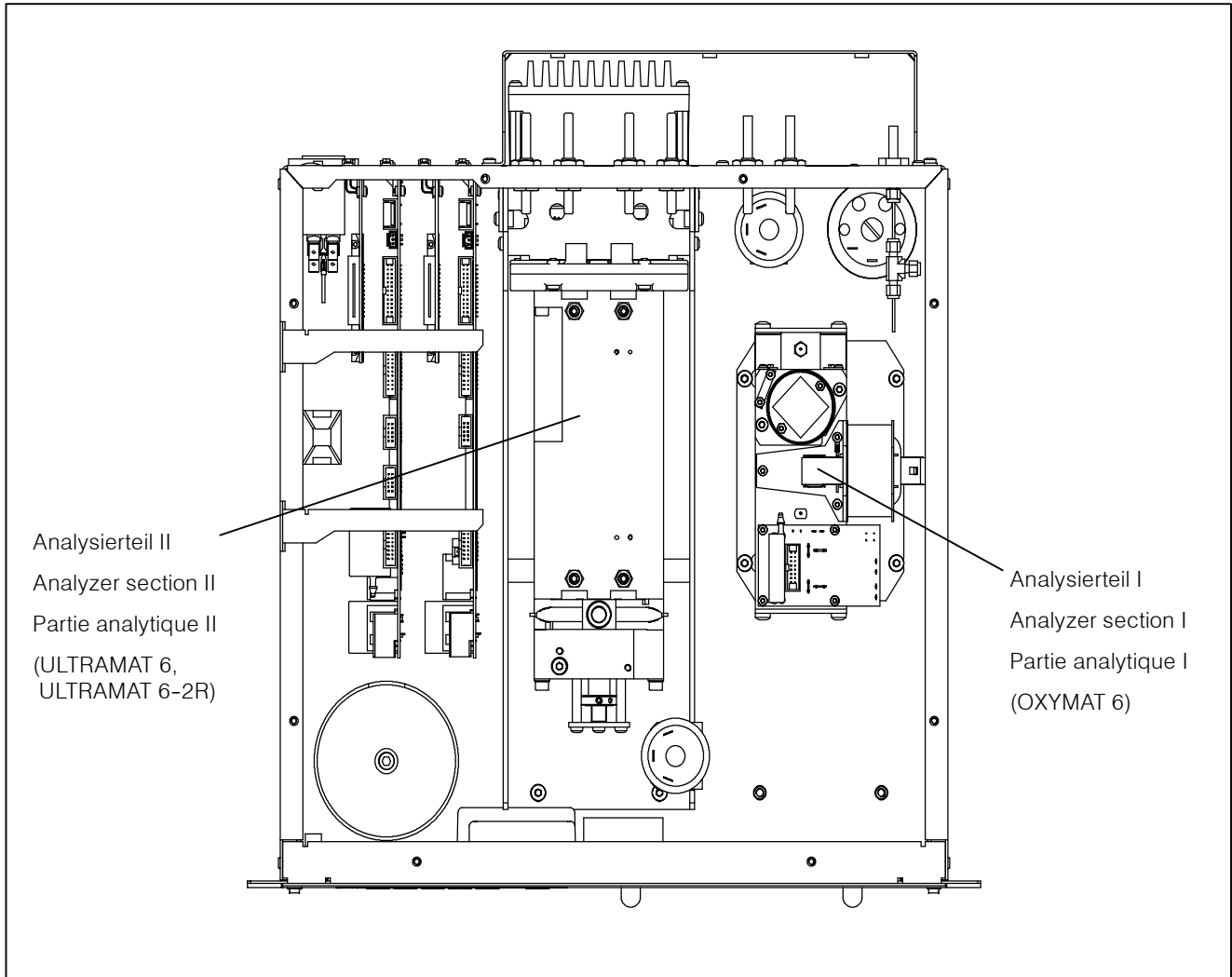


| | |
|----|--|
| U1 | Analysierteil Analyzer section Partie analytique |
| U2 | Elektronik Electronics Electronique |
| U3 | Meßgasweg Hosing system for sample gas Circuit du gaz de mesure |
| U4 | Vergleichsgasweg Hosing system for reference gas Circuit du gaz de référence |

Übersicht Baugruppen / Overview / vue d'ensemble

ULTRAMAT/OXYMAT 6 (7MB2023, 7MB2028)

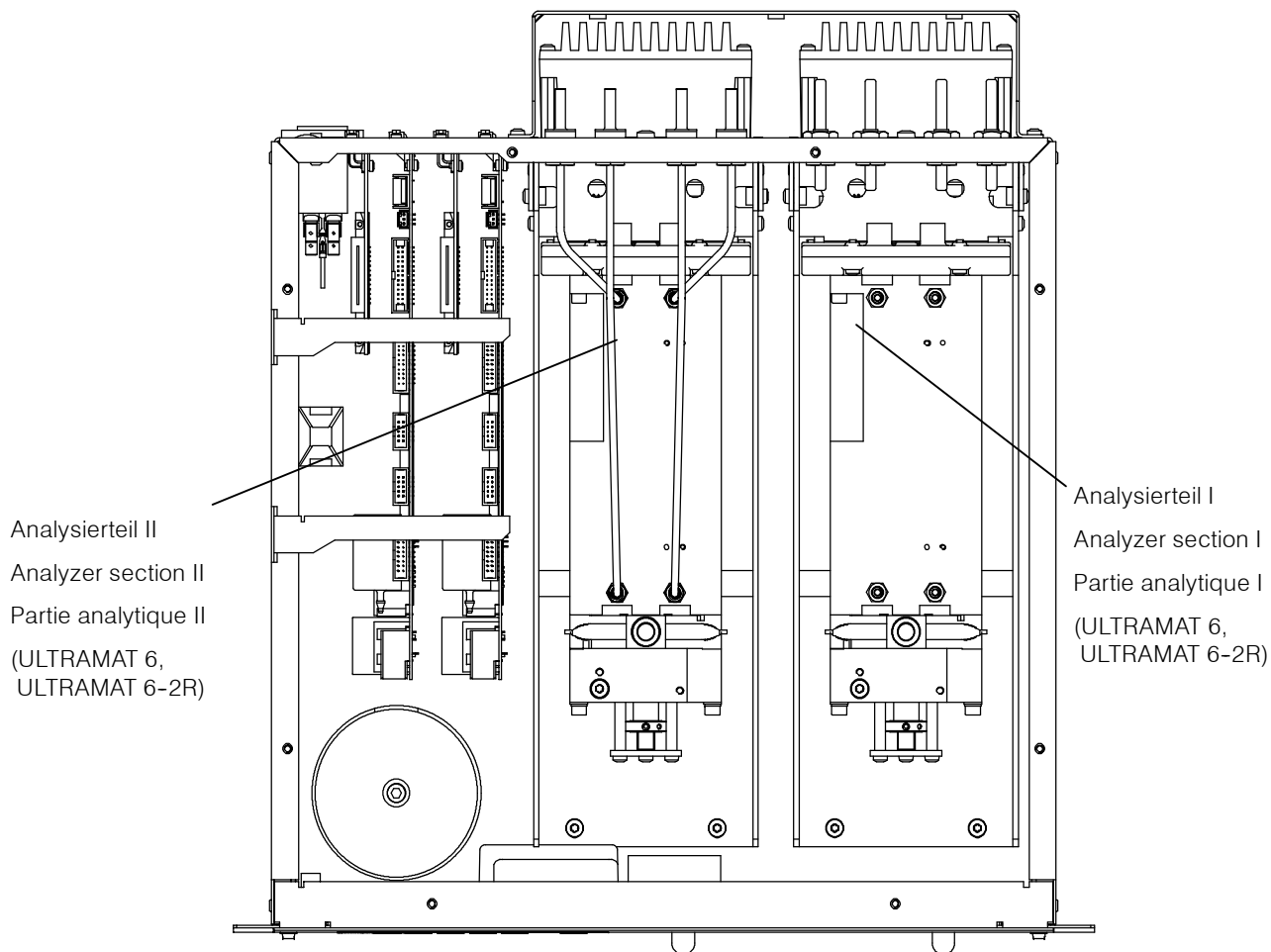
ULTRAMAT/OXYMAT 6-2R (7MB2024, 7MB2026)



Übersicht Baugruppen / Overview / vue d'ensemble

ULTRAMAT 6-2P (7MB2123, 7MB2128)

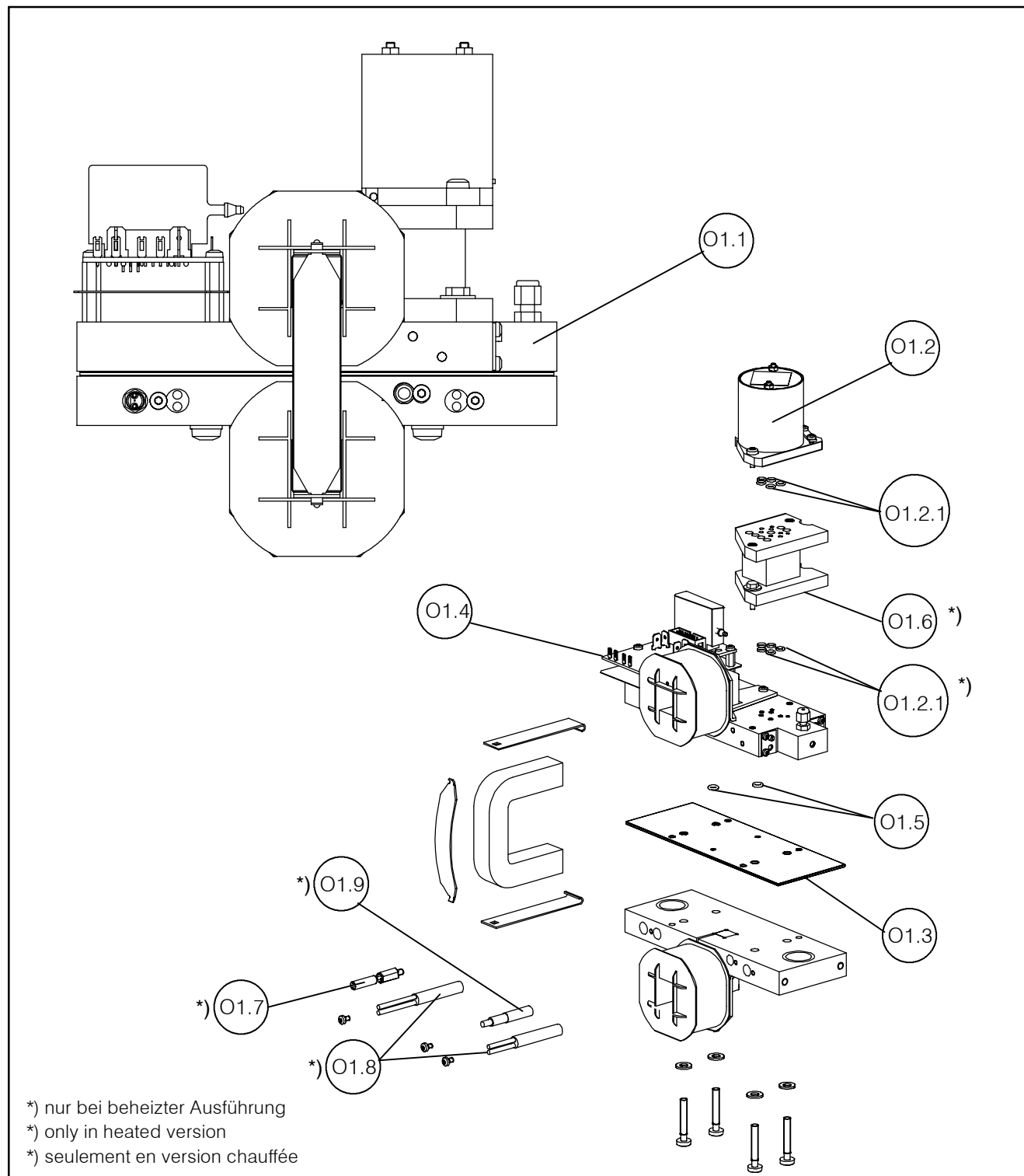
ULTRAMAT 6-3K/4K (7MB2124, 7MB2126)



7.2 OXYMAT 6

7.2.1 Analyzer Section

OXYMAT 6



Bezeichnungen siehe Seite 7-9

Designation see page 7-9

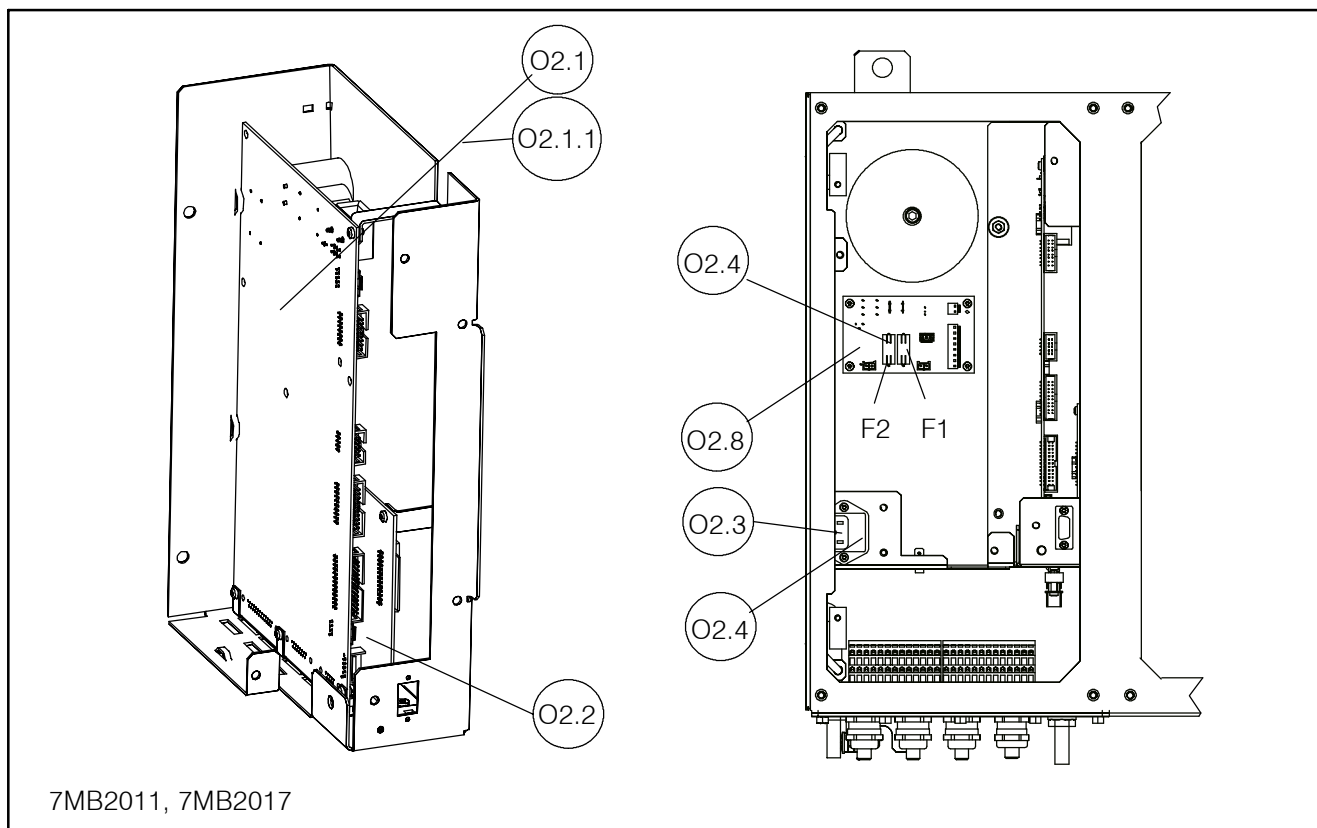
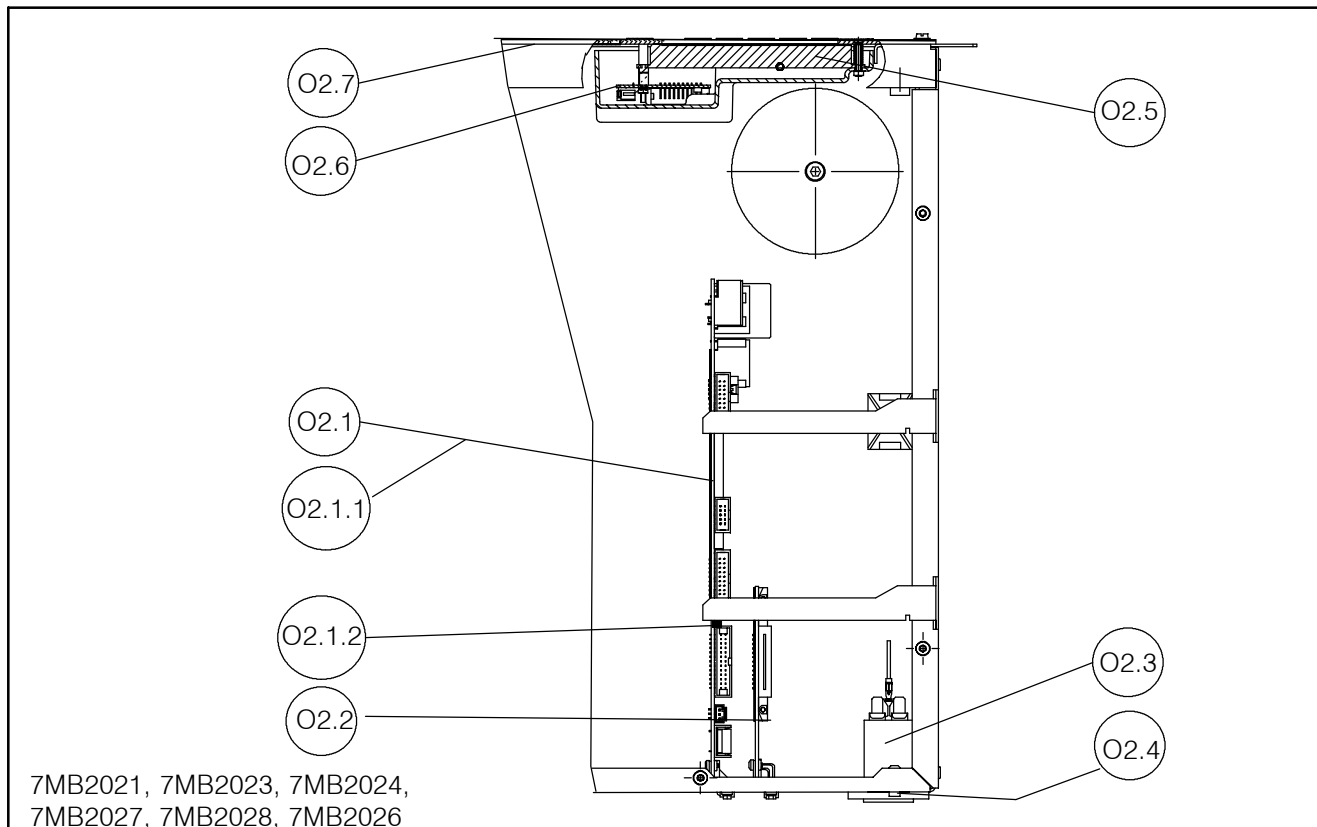
Désignation voir page 7-9

Analysierteil / Analyzer section / Partie analytique

OXYMAT 6

| Teil-Nr. Part No. Pièce Nr. | Bezeichnung Designation Désignation | Bestell-Nr. Order No. Nr. de référence | Bemerkungen Remarks Remarques |
|-----------------------------------|--|--|--|
| O1.1 | Analysierteil komplett, W.-Nr. 1.4571 Analyzer section, mat. No. 1.4571 Partie analytique, Nr. du mat. 1.4571 Analysierteil komplett Tantal Analyzer section, tantalum Partie analytique, tantale Analysierteil komplett, W.-Nr. 1.4571 Analyzer section, mat. No. 1.4571 Partie analytique, Nr. du mat. 1.4571 Analysierteil komplett Tantal Analyzer section, tantalum Partie analytique, tantale | C79451-A3460-B31 beheizt / heated ver. / vers. échauffé: C79451-A3460-B61 C79451-A3460-B34 beheizt / heated ver. / vers. échauffé: C79451-A3460-B63 C79451-A3460-B37 beheizt / heated ver. / vers. échauffé: C79451-A3460-B65 C79451-A3460-B40 beheizt / heated ver. / vers. échauffé: C79451-A3460-B67 | ohne beströmten Kompensationszweig without flow-type compensation side circuit de compensation fermé ohne beströmten Kompensationszweig without flow-type compensation side circuit de compensation fermé mit beströmtem Kompensationszweig with flow-type compensation side circuit de compensation avec balayage mit beströmtem Kompensationszweig with flow-type compensation side circuit de compensation avec balayage |
| O1.2 | Meßkopf Measuring head Tête de mesure Meßkopf Measuring head Tête de mesure | C79451-A3460-B25 C79451-A3460-B26 | ohne beströmten Kompensationszweig without flow-type compensation side circuit de compensation fermé mit beströmtem Kompensationszweig with flow-type compensation side circuit de compensation avec balayage |
| O1.2.1 | O-Ring O-ring Joint torique | C79121-Z100-A32 | 1 Stück 1 Part 1 Pièce |
| O1.3 | Meßkammer, W.-Nr. 1.4571 Sample cell, mat. No. 1.4571 Cellule de mesure, Nr. du mat. 1.4571 Meßkammer, Tantal Sample cell, tantalum Cellule de mesure, tantale Meßkammer, W.-Nr. 1.4571 Sample cell, mat. No. 1.4571 Cellule de mesure, Nr. du mat. 1.4571 Meßkammer, Tantal Sample cell, tantalum Cellule de mesure, tantale | C79451-A3277-B35 C79451-A3277-B36 C79451-A3277-B37 C79451-A3277-B38 | ohne beströmten Kompensationszweig without flow-type compensation side circuit de compensation fermé ohne beströmten Kompensationszweig without flow-type compensation side circuit de compensation fermé mit beströmtem Kompensationszweig with flow-type compensation side circuit de compensation avec balayage mit beströmtem Kompensationszweig with flow-type compensation side circuit de compensation avec balayage |
| O1.4 | Magnetanschlußplatte Magnet connecting board Platine de raccordement de l'électro-aimant | C79451-A3474-B606 | |
| O1.5 | O-Ring, FKM (VITON) O-ring, FKM (VITON) Joint torique, FKM (VITON) O-Ring, FFKM (KALREZ) O-ring, FFKM (KALREZ) Joint torique, FFKM (KALREZ) | C71121-Z100-A159 | 1 Stück 1 Part 1 Pièce siehe Punkt 3.3 see 3.3 voir 3.3 |
| O1.6 | Distanzstück Spacer Entroise | C79451-A3277-B22 | 1 Stück 1 Part 1 Pièce |
| O1.7 | Temperaturfühler Temperature sensor Décteur de température | C79451-A3480-B25 | |
| O1.8 | Heizpatrone Heating cartridge Cartouche chauffante | W75083-A1004-F120 | 1 Stück 1 Part 1 Pièce |
| O1.9 | Temperatursicherung Temperature fuse Sécurité thermique | W75054-A1001-A150 | |

7.2.2 Electronics



Bezeichnungen siehe Seite 7-11

Designation see page 7-11

Désignation voir page 7-11

Elektronik / Electronics / Electronique OXYMAT 6

| Teil-Nr. Part No. Pièce Nr. | Bezeichnung Designation Désignation | Bestell-Nr. Order No. Nr. de référence | Bemerkungen Remarks Remarques |
|-----------------------------------|---|---|---|
| O2.1 | Grundplatte Motherboard Carte électronique | C79451-A3480-D501 | Grundplatte u. Firmware; deutsch Motherboard a. Firmware; german Carte électronique et Firmware; allemande |
| | | C79451-A3480-D502 | Grundplatte u. Firmware; englisch Motherboard a. Firmware; english Carte électronique et Firmware; anglais |
| | | C79451-A3480-D503 | Grundplatte u. Firmware; französisch Motherboard a. Firmware; french Carte électronique et Firmware; français |
| | | C79451-A3480-D504 | Grundplatte u. Firmware; spanisch Motherboard a. Firmware; spanish Carte électronique et Firmware; espagnol |
| | | C79451-A3480-D505 | Grundplatte u. Firmware; italienisch Motherboard a. Firmware; italian Carte électronique et Firmware; italien |
| O2.1.1 | Grundplatte ohne Firmware Motherboard without Firmware Carte électronique sans Firmware | C79451-A3474-B601 | |
| O2.1.2 | Firmware (FlashPROM) | C79451-A3480-S501 C79451-A3480-S502 C79451-A3480-S503 C79451-A3480-S504 C79451-A3480-S505 | deutsch / german / allemande englisch / english / anglais französisch / french / français spanisch / spanish / espagnol italienisch / italian / italien |
| O2.2 | Optionsplatte Option board Platine optional | C79451-A3480-D511 | Relais Relays Relais |
| | | C79451-A3474-D512 | mit serieller Schnittstelle für Automobilindustrie (AK) With serial interface for automotive industry (AK) |
| | | A5E00057307 | PROFIBUS PA PROFIBUS PA PROFIBUS PA |
| | | A5E00057312 | PROFIBUS DP PROFIBUS DP PROFIBUS DP |
| | | A5E00057164 | Firmware-Update Profibus Firmware update Profibus Mise à jour firmware Profibus |
| O2.3 | Steckerfilter Plug with filter Prise avec filtre | W75041-E5602-K2 | |

Elektronik / Electronics / Electronique OXYMAT 6

| Teil-Nr. Part No. Pièce Nr. | Bezeichnung Designation Désignation | Bestell-Nr. Order No. Nr. de référence | Bemerkungen Remarks Remarques | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------------------|--|---|---|---------------|----|----|----|----|---------|---|---|------|------|----------|------|-----|-----|-----|---------|---|---|------|------|----------|------|-----|-----|-----|---------|---|---|------|------|---------|---|---|---|---|---------|---|---|---|---|---------|---|---|---|---|---------|---|---|------|------|---------|---|---|---|---|---------------|----|----|----|----|---------|---|---|---|---|----------|---|---|---|---|---------|---|---|---|---|----------|---|---|---|---|---------|---|---|---|---|---------|---|---|-----|-----|---------|---|---|-----|-----|---------|---|---|-----|-----|---------|---|---|---|---|---------|---|---|-----|-----|
| O2.4 | G-Schmelzeinsatz G-type fuse Fusible T 0,63A / 250V T 1A / 250V T 1,6A / 250V T 2,5A / 250V T 4A / 250V | W79054-L1010-T630 W79054-L1011-T100 W79054-L1011-T160 W79054-L1011-T250 W79054-L1011-T400 | Bitte aus Liste auswählen/ Please select from list/ Selectionner dans la liste s. v. p. <table border="1"> <thead> <tr> <th>200 ... 240 V</th> <th>F1</th> <th>F2</th> <th>F3</th> <th>F4</th> </tr> </thead> <tbody> <tr><td>7MB2011</td><td>-</td><td>-</td><td>0.63</td><td>0.63</td></tr> <tr><td>7MB2011*</td><td>0.63</td><td>2.5</td><td>2.5</td><td>2.5</td></tr> <tr><td>7MB2017</td><td>-</td><td>-</td><td>0.63</td><td>0.63</td></tr> <tr><td>7MB2017*</td><td>0.63</td><td>2.5</td><td>2.5</td><td>2.5</td></tr> <tr><td>7MB2021</td><td>-</td><td>-</td><td>0.63</td><td>0.63</td></tr> <tr><td>7MB2023</td><td>-</td><td>-</td><td>1</td><td>1</td></tr> <tr><td>7MB2024</td><td>-</td><td>-</td><td>1</td><td>1</td></tr> <tr><td>7MB2026</td><td>-</td><td>-</td><td>1</td><td>1</td></tr> <tr><td>7MB2027</td><td>-</td><td>-</td><td>0.63</td><td>0.63</td></tr> <tr><td>7MB2028</td><td>-</td><td>-</td><td>1</td><td>1</td></tr> </tbody> </table> <table border="1"> <thead> <tr> <th>100 ... 120 V</th> <th>F1</th> <th>F2</th> <th>F3</th> <th>F4</th> </tr> </thead> <tbody> <tr><td>7MB2011</td><td>-</td><td>-</td><td>1</td><td>1</td></tr> <tr><td>7MB2011*</td><td>1</td><td>4</td><td>4</td><td>4</td></tr> <tr><td>7MB2017</td><td>-</td><td>-</td><td>1</td><td>1</td></tr> <tr><td>7MB2017*</td><td>1</td><td>4</td><td>4</td><td>4</td></tr> <tr><td>7MB2021</td><td>-</td><td>-</td><td>1</td><td>1</td></tr> <tr><td>7MB2023</td><td>-</td><td>-</td><td>2.5</td><td>2.5</td></tr> <tr><td>7MB2024</td><td>-</td><td>-</td><td>2.5</td><td>2.5</td></tr> <tr><td>7MB2026</td><td>-</td><td>-</td><td>2.5</td><td>2.5</td></tr> <tr><td>7MB2027</td><td>-</td><td>-</td><td>1</td><td>1</td></tr> <tr><td>7MB2028</td><td>-</td><td>-</td><td>2.5</td><td>2.5</td></tr> </tbody> </table> * beheizte Version heated version version chauffée | 200 ... 240 V | F1 | F2 | F3 | F4 | 7MB2011 | - | - | 0.63 | 0.63 | 7MB2011* | 0.63 | 2.5 | 2.5 | 2.5 | 7MB2017 | - | - | 0.63 | 0.63 | 7MB2017* | 0.63 | 2.5 | 2.5 | 2.5 | 7MB2021 | - | - | 0.63 | 0.63 | 7MB2023 | - | - | 1 | 1 | 7MB2024 | - | - | 1 | 1 | 7MB2026 | - | - | 1 | 1 | 7MB2027 | - | - | 0.63 | 0.63 | 7MB2028 | - | - | 1 | 1 | 100 ... 120 V | F1 | F2 | F3 | F4 | 7MB2011 | - | - | 1 | 1 | 7MB2011* | 1 | 4 | 4 | 4 | 7MB2017 | - | - | 1 | 1 | 7MB2017* | 1 | 4 | 4 | 4 | 7MB2021 | - | - | 1 | 1 | 7MB2023 | - | - | 2.5 | 2.5 | 7MB2024 | - | - | 2.5 | 2.5 | 7MB2026 | - | - | 2.5 | 2.5 | 7MB2027 | - | - | 1 | 1 | 7MB2028 | - | - | 2.5 | 2.5 |
| 200 ... 240 V | F1 | F2 | F3 | F4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2011 | - | - | 0.63 | 0.63 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2011* | 0.63 | 2.5 | 2.5 | 2.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2017 | - | - | 0.63 | 0.63 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2017* | 0.63 | 2.5 | 2.5 | 2.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2021 | - | - | 0.63 | 0.63 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2023 | - | - | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2024 | - | - | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2026 | - | - | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2027 | - | - | 0.63 | 0.63 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2028 | - | - | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 100 ... 120 V | F1 | F2 | F3 | F4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2011 | - | - | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2011* | 1 | 4 | 4 | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2017 | - | - | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2017* | 1 | 4 | 4 | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2021 | - | - | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2023 | - | - | 2.5 | 2.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2024 | - | - | 2.5 | 2.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2026 | - | - | 2.5 | 2.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2027 | - | - | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2028 | - | - | 2.5 | 2.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| O2.5 | LC-Display LC-Display carte d'affichage de LC | W75025-B5001-B1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| O2.6 | Adapterplatte, LCD/Tastatur Connection board Carte de connexion | C79451-A3474-B605 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| O2.7 | Frontplatte Front panel Plaque frontale (7MB2021, 7MB2027) | C79165-A3042-B505 | mit Folien-Tastatur with sealed keyboard avec clavier à membrane | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Frontplatte Front panel Plaque frontale (7MB2023, 7MB2024, 7MB2028, 7MB2026) | C79165-A3042-B506 | mit Folien-Tastatur with sealed keyboard avec clavier à membrane | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| O2.8 | Temperaturregler - Elektronik Thermostat board Carte de régulation de température | A5E00118530 A5E00118527 | 115 V AC, ohne Sicherungen F1, F2 115 V AC, without fuses F1, F2 115 V AC, sans fusibles F1, F2 230 V AC, ohne Sicherungen F1, F2 230 V AC, without fuses F1, F2 230 V AC, sans fusibles F1, F2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

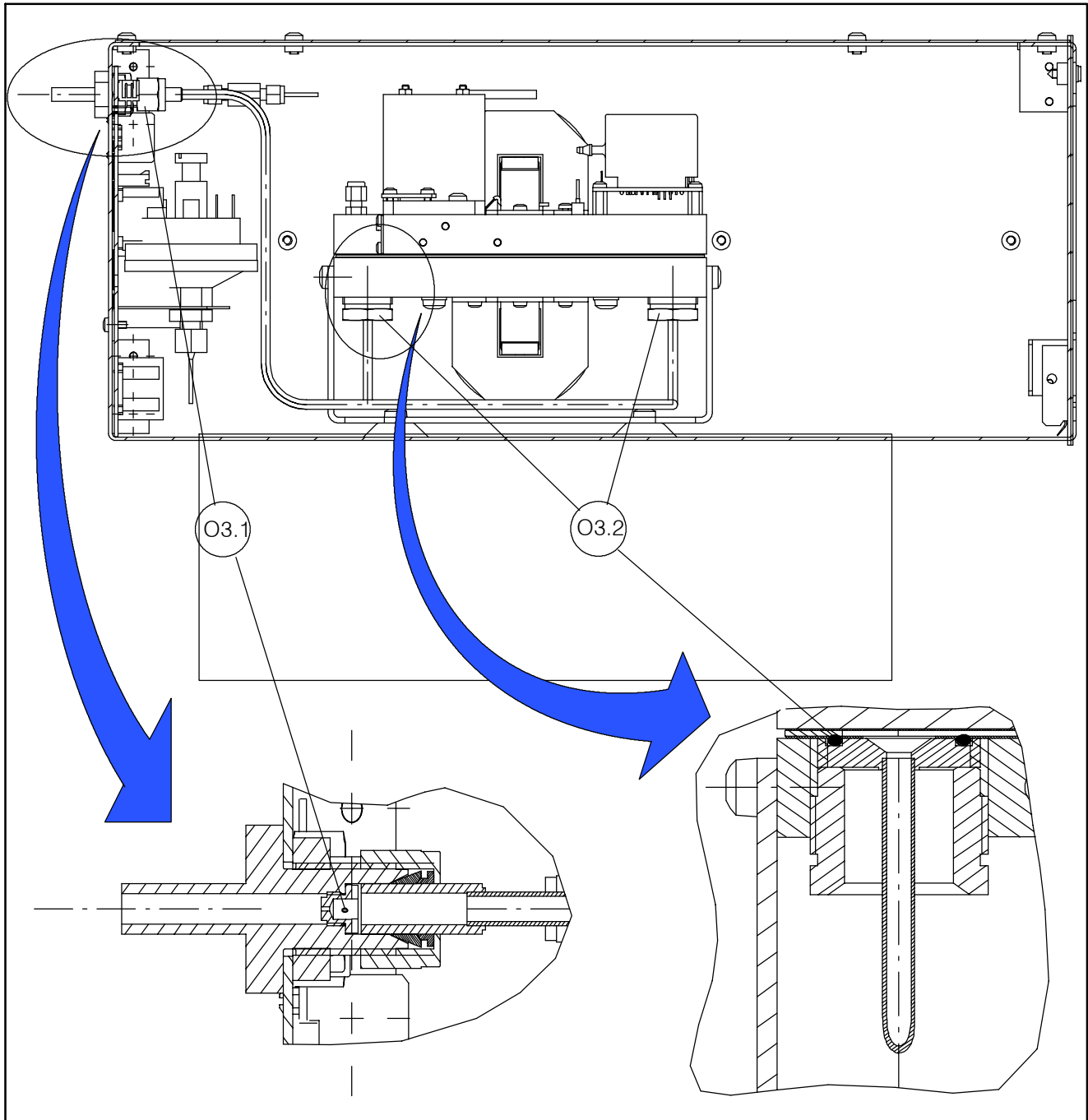
7.2.3 Gas paths

Meßgasweg, Rohr

Hosing system for sample gas, pipe

Circuit du gaz de mesure, tube

OXYMAT 6 (7MB2021, 7MB2023, 7MB2024)

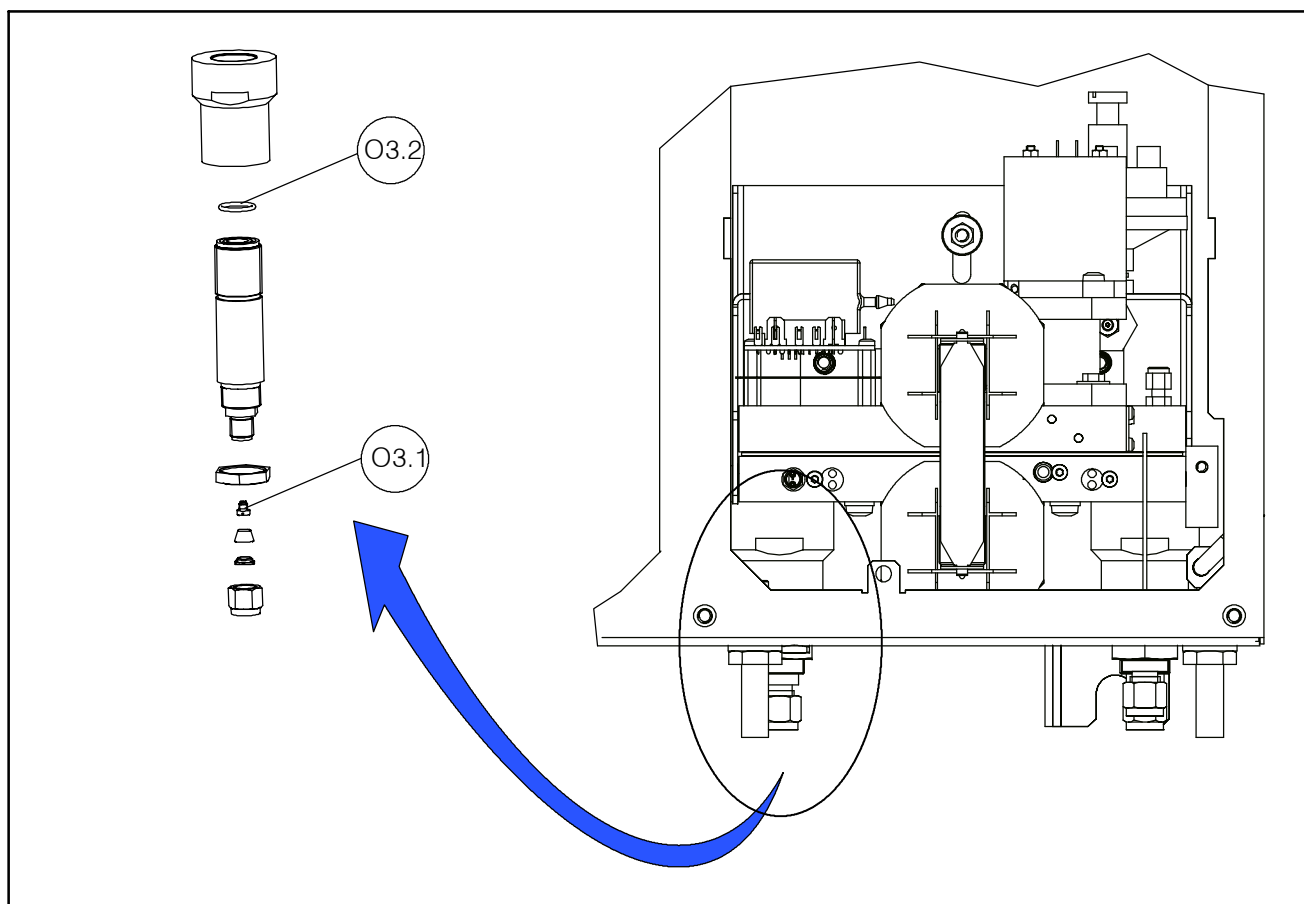


Bezeichnungen siehe Seite 7-15

Designation see page 7-15

Désignation voir page 7-15

Meßgasweg, Rohr
 Hosing system for sample gas, pipe
 Circuit du gaz de mesure, tube
 OXYMAT 6 (7MB2011)



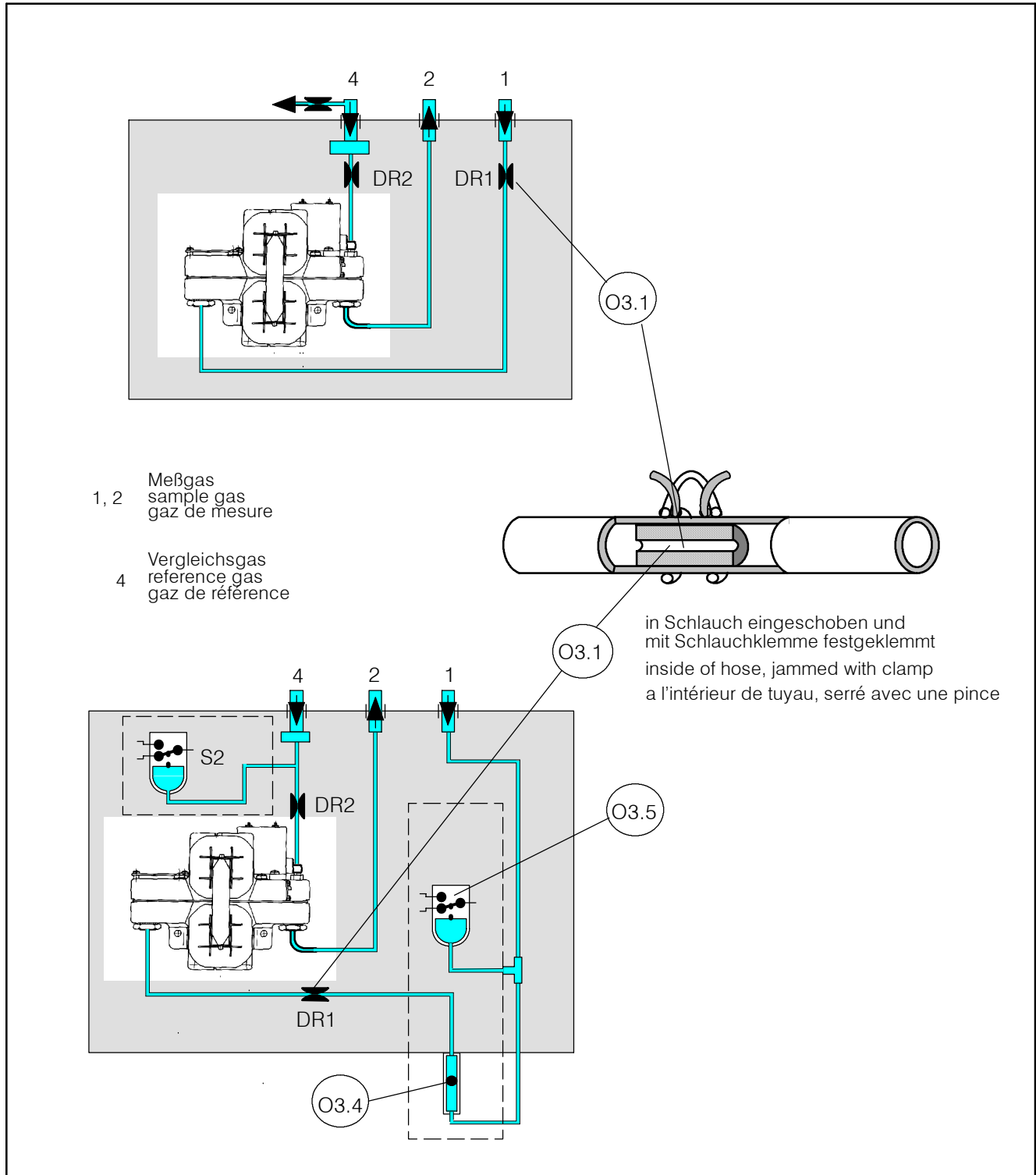
| Teil-Nr. Part No. Pièce Nr. | Bezeichnung Designation Désignation | Bestell-Nr. Order No. Nr. de référence | Bemerkungen Remarks Remarques |
|-----------------------------------|--|--|---|
| O3.1 | Drossel (Titan) Restrictor Etranglement | C79451-A3480-C37 | Gasweg Rohr Hosing system for sample gas pipe Circuit du gaz de mesure en tube acier |
| | Drossel (Edelstahl 1.4571) Restrictor Etranglement | C79451-A3520-C5 | Gasweg Rohr Hosing system for sample gas pipe Circuit du gaz de mesure en tube acier |
| O3.2 | O-Ring, FKM (VITON) O-ring, FKM (VITON) Joint torique, FKM (VITON) | C74121-Z100-A6 | 1 Stück 1 Parts 1 Pièces |
| | O-Ring, FFKM (KALREZ) O-ring, FFKM (KALREZ) Joint torique, FFKM (KALREZ) | | siehe Punkt 3.3 see 3.3 voir 3.3 |
| O3.3 | O-Ring, FFKM (KALREZ) | C79451-A3277-D11 | Satz O-Ringe, bestehend aus je zwei Stück der Teil-Nr. 1.5 und 3.2 Set of O-rings, consisting of each two parts of part No. 1.5 and 3.2 Assortiment de joint torique, composé de deux pièces de pièce Nr. 1.5 et 3.2 |
| | O-ring, FFKM (KALREZ) Joint torique, FFKM (KALREZ) | | |

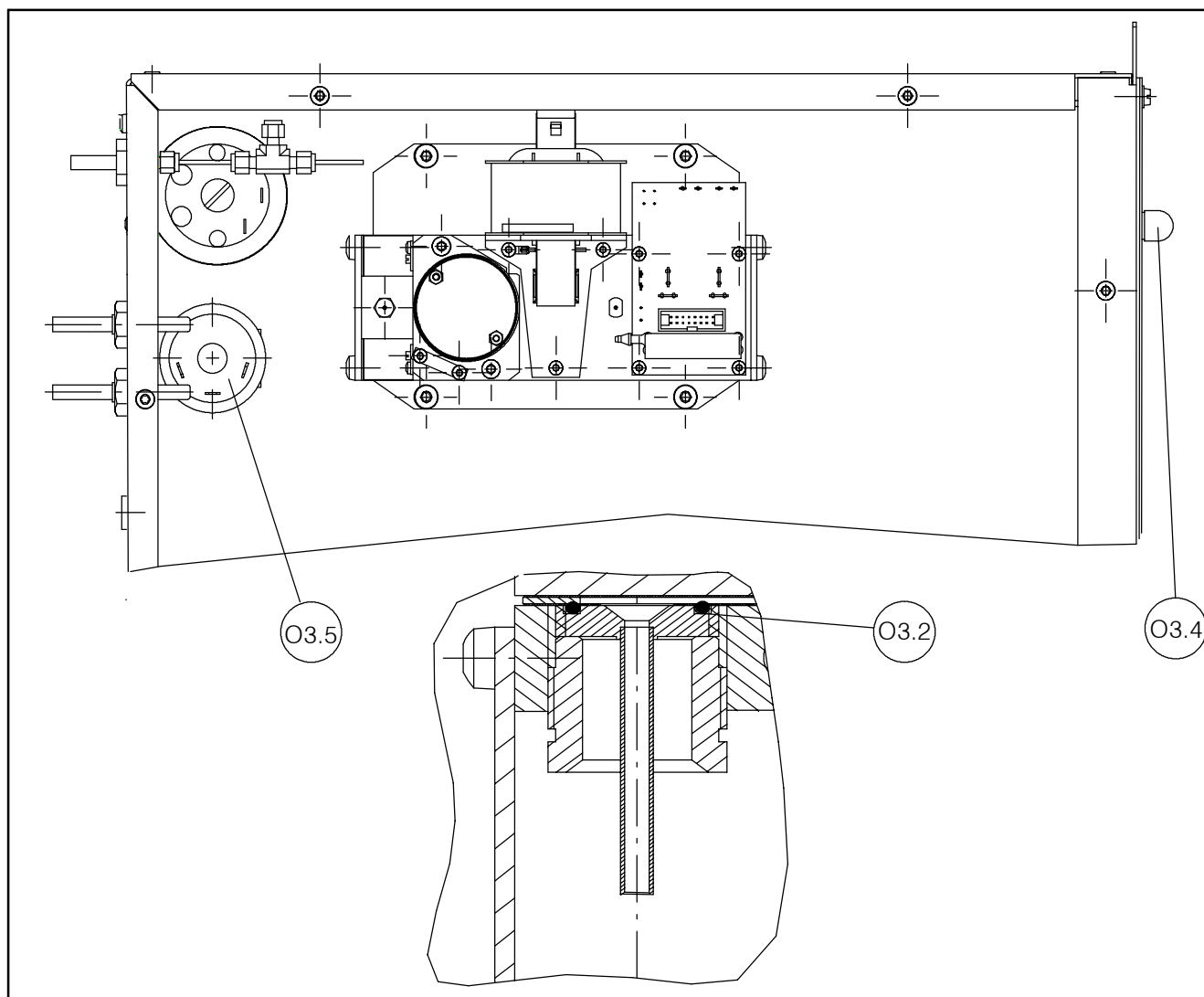
Meßgasweg, Schlauch

Hosing system for sample gas, hose

Circuit du gaz de mesure, tuyau souple

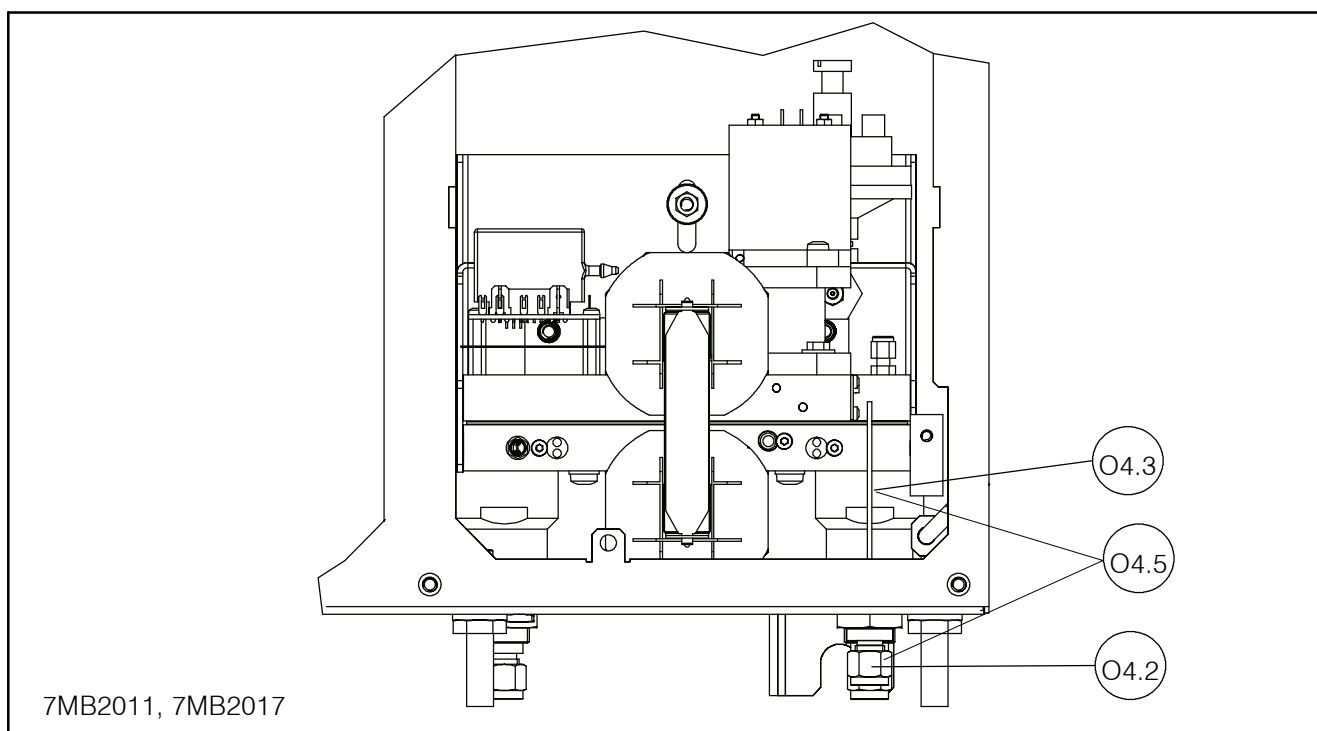
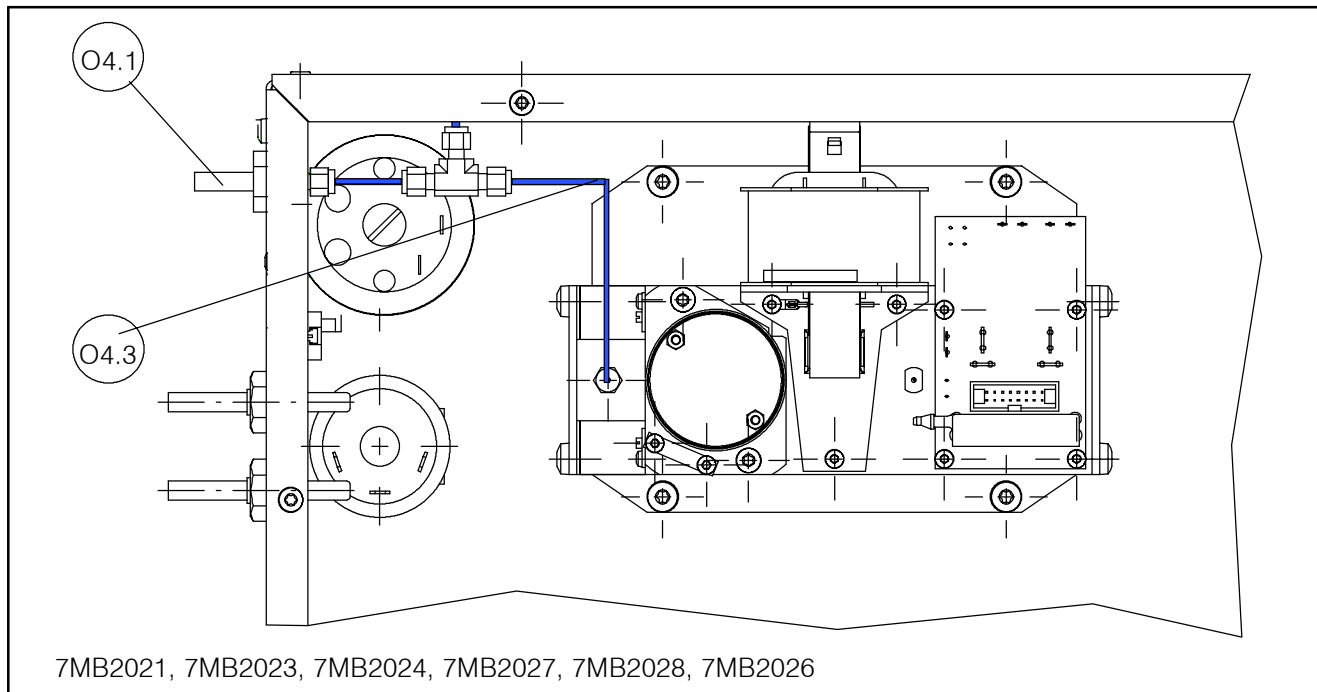
OXYMAT 6 (7MB2021, 7MB2023, 7MB2024, 7MB2027, 7MB2028, 7MB2026)





| Teil-Nr. Part No. Pièce Nr. | Bezeichnung Designation Désignation | Bestell-Nr. Order No. Nr. de référence | Bemerkungen Remarks Remarques |
|-----------------------------------|--|--|---|
| O3.1 | Drossel Restrictor Etranglement | C79451-A3480-C10 | Gasweg Schlauch Hosing system for sample gas in plastic Circuit du gaz de mesure en tuyau |
| O3.2 | O-Ring, FKM (VITON) O-ring, FKM (VITON) Joint torique, FKM (VITON) O-Ring, FFKM (KALREZ) O-ring, FFKM (KALREZ) Joint torique, FFKM (KALREZ) | C74121-Z100-A6 | 1 Stück 1 Parts 1 Pièces siehe Punkt 3.3 see 3.3 voir 3.3 |
| O3.3 | O-Ring, FFKM (KALREZ) O-ring, FFKM (KALREZ) Joint torique, FFKM (KALREZ) | C79451-A3277-D11 | Satz O-Ringe, bestehend aus je zwei Stück der Teil-Nr. 1.5 und 3.2 Set of O-rings, consisting of each two parts of part No. 1.5 and 3.2 Assortiment de joint torique, composé de deux pièces de pièce Nr. 1.5 et 3.2 |
| O3.4 | Strömungsmesser Flowmeter Débitmètre | C79402-Z560-T1 | |
| O3.5 | Druckschalter Pressure switch Pressostat | C79302-Z1210-A2 | |

Vergleichsgasweg
Hosing system for reference gas
Circuit du gaz de référence
OXYMAT 6



Bezeichnungen siehe Seite 7-19
Designation see page 7-19
Désignation voir page 7-19

Vergleichsgasweg
Hosing system for reference gas
Circuit du gaz de référence
OXYMAT 6

| Teil-Nr. Part No. Pièce Nr. | Bezeichnung Designation Désignation | Bestell-Nr. Order No. Nr. de référence | Bemerkungen Remarks Remarques |
|-----------------------------------|---|--|--|
| O4.1 | Stutzen, kpl., 7MB2021 Connection, male Raccord mâle | C79451-A3480-B1 | Ø 6 mm, 0,3 MPa (3 bar, 45 psi) Ø 6 mm, 0,3 MPa (3 bar, 45 psi) Ø 6 mm, 0,3 MPa (3 bar, 45 psi) |
| | | C79451-A3480-B2 | 1/4", 0,3 MPa (3 bar, 45 psi) 1/4", 0,3 MPa (3 bar, 45 psi) 1/4", 0,3 MPa (3 bar, 45 psi) |
| O4.2 | Rohrverschraubung, kpl., 7MB2011 Tube fitting, female Raccord femelle | C79451-A3520-B1 | Ø 6 mm, 3 bar 0,3 MPa (3 bar, 45 psi) Ø 6 mm, 3 bar 0,3 MPa (3 bar, 45 psi) Ø 6 mm, 3 bar 0,3 MPa (3 bar, 45 psi) |
| | Rohrverschraubung, kpl., 7MB2011 Tube fitting, female Raccord femelle | C79451-A3520-B2 | 1/4", 3bar 0,3 MPa (3 bar, 45 psi) 1/4", 3bar 0,3 MPa (3 bar, 45 psi) 1/4", 3bar 0,3 MPa (3 bar, 45 psi) |
| O4.3 | Kapillarrohr, 7MB2011 Capillary, 7MB2011 Capillaire, 7MB2011 | C79451-A3480-D518 | 0,3 MPa, Kapillarrohr und Verschraubungsteile 0,3 MPa, capillary and parts for connection 0,3 MPa, capillaire et pièces pour raccordement |
| O4.4 | Kapillarrohr-Anschluss-Set, 7MB2021 | C79451-A3480-D519 | 100 hPa; Stutzen und Kapillarrohr; nur als Satz erhältlich (Stutzen Ø 6mm und 1/4" befinden sich im gleichen Set) 100 hPa (1.5 psi); male connection and capillary; only available as set (Ø 6mm und 1/4" female tube fittings present in same set) |
| | Capillary connection set, 7MB2021 | | |
| | Capillaire, set de raccordement, 7MB2021 | | |
| O4.5 | Kapillarrohr-Anschluss-Set, 7MB2011 | C79451-A3520-D511 | 100 hPa; Rohrverschraubung und Kapillarrohr; nur als Satz erhältlich (Rohrverschraubungen Ø 6mm und 1/4" befinden sich im gleichen Set) 100 hPa (1.5 psi); male connection and capillary; only available as set (Ø 6mm und 1/4" female tube fittings present in same set) |
| | Capillary connection set, 7MB2011 | | |
| | Capillaire, set de raccordement, 7MB2011 | | |

7.3 ULTRAMAT 6

7.3.1 Analyzer Part Single Channel

Hinweis



Nach dem Tausch des Strahlers, der Analysenkammer und/oder der Empfängerammer kann unter Umständen die werkseitig eingestellte Temperaturkennlinie geringfügig verstellt sein. Sollte ein solcher Temperaturfehler festgestellt werden, kann er mit Hilfe der *Funktion 86* (s. Abschnitt 5.2.5) kompensiert werden.

Nach dem Tausch der Empfängerammer oder des optischen Kopplers muss die Kompensation gegen Quergase überprüft und ggf. nachgestellt werden.

Note



Following replacement of the IR source, analyzer chamber and/or receiver chamber, under certain circumstances a slight offset in the factory-set temperature characteristic might occur. If such a temperature error is detected, it must be compensated using *function 86* (see Section 5.2.5).

Following replacement of the receiver chamber or the optical coupler the compensation against interfering gases must be checked and readjusted if necessary.

Remarque



Après le remplacement de la source rayonnante, cellule d'analyse et/ou cellule de détection, la courbe caractéristique de température réglée en usine risque d'être légèrement dérégulée. Si vous détectez une telle erreur de température, vous pouvez la compenser à l'aide de la *fonction 86* (voir chap. 5.2.5).

Après le remplacement de la cellule de détection ou du coupleur optique la compensation contre des gaz perturbateurs doit être vérifiée et éventuellement réglée.

¡Nota!



Al intercambiar el radiador, la cámara de análisis y/o la cámara receptora, la línea característica de la temperatura ajustada de fábrica puede desplazarse un poco. Si se presenta dicho error de temperatura, éste se puede compensar con ayuda de la *función 86* (v. apto. 5.2.5).

Al intercambiar la cámara receptora o el acoplador óptico se debe comprobar, y en caso dado corregir, la compensación de gases de interferencias.

Nota



Dopo lo scambio del radiatore, della camera analisi e/o del detettore sotto determinate condizioni la linea caratteristica della temperatura impostata da fabbrica può avere uno spostamento minimo. Se un tale errore della temperatura viene trovato, questo può essere compensato con l'aiuto della *funzione 86* (vedi paragrafo 5.2.5).

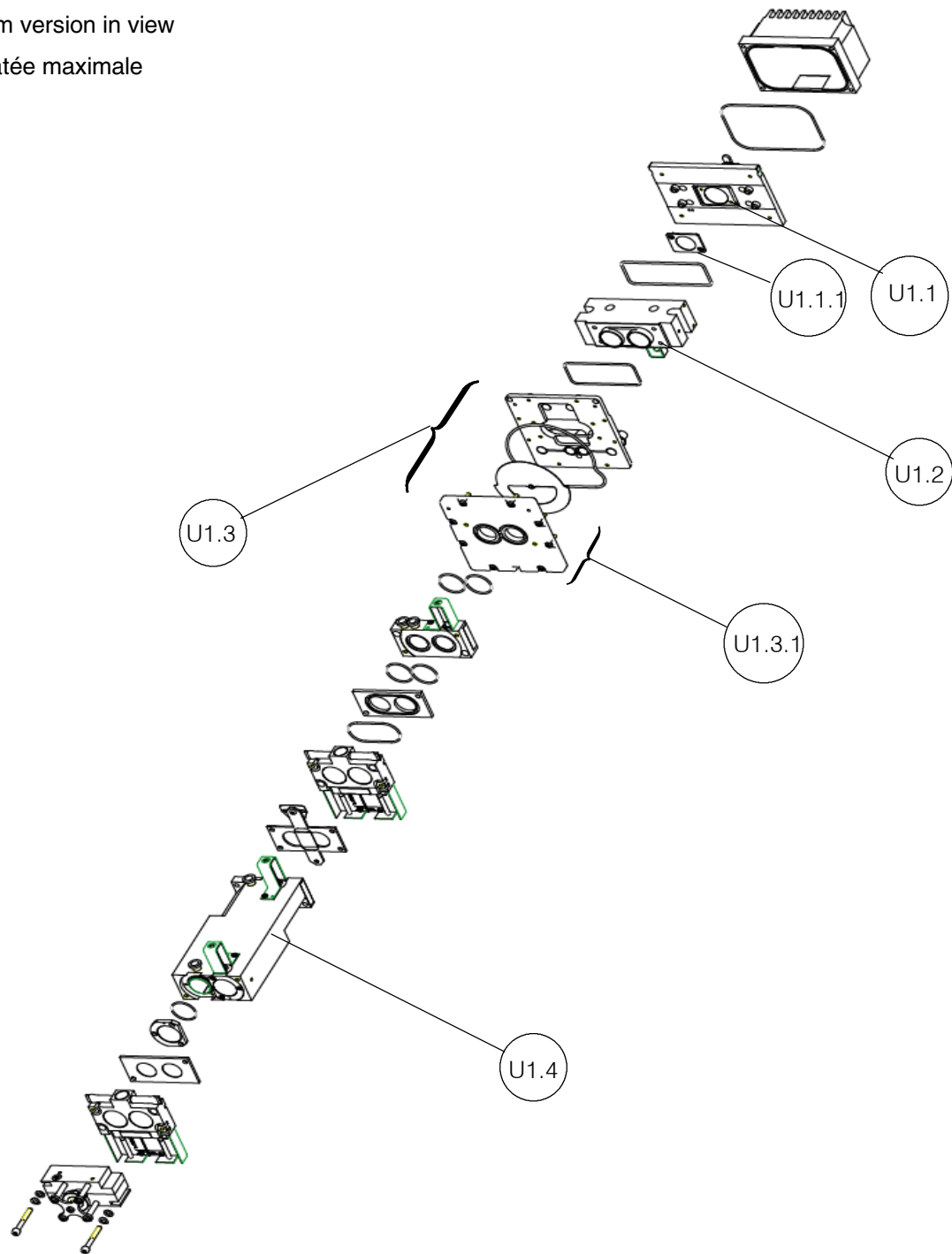
Dopo lo scambio del detettore o dell'accoppiatore ottico la compensazione dei gas trasversali deve essere verificata e ricalibrata se necessario.

7MB2111, 7MB2121, 7MB2123, 7MB2124, 7MB2023

dargestellt ist maximale Ausbaustufe

maximum version in view

Vue éclatée maximale



Bezeichnungen siehe Seite 7-22 und folgende
Designation see page 7-22 and following pages
Désignation voir page 7-22 et pages suivantes

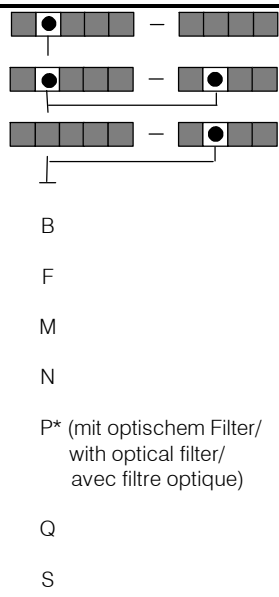
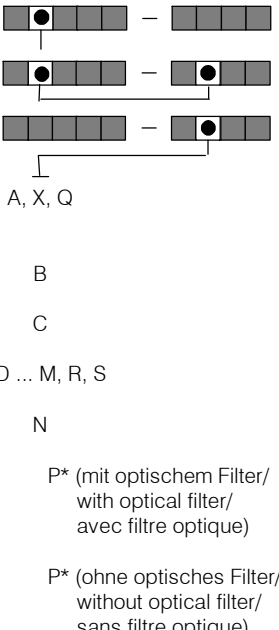
Analysierteil / Analyzer section / Partie analytique

ULTRAMAT 6 Einzelkanal / single channel / canal unique

7MB2121, 7MB2111, 7MB2112

7MB2123, 7MB2124 (1. u. 2. Kanal, 1st and 2nd channel, 1^{er} et 2^{ème} canal)

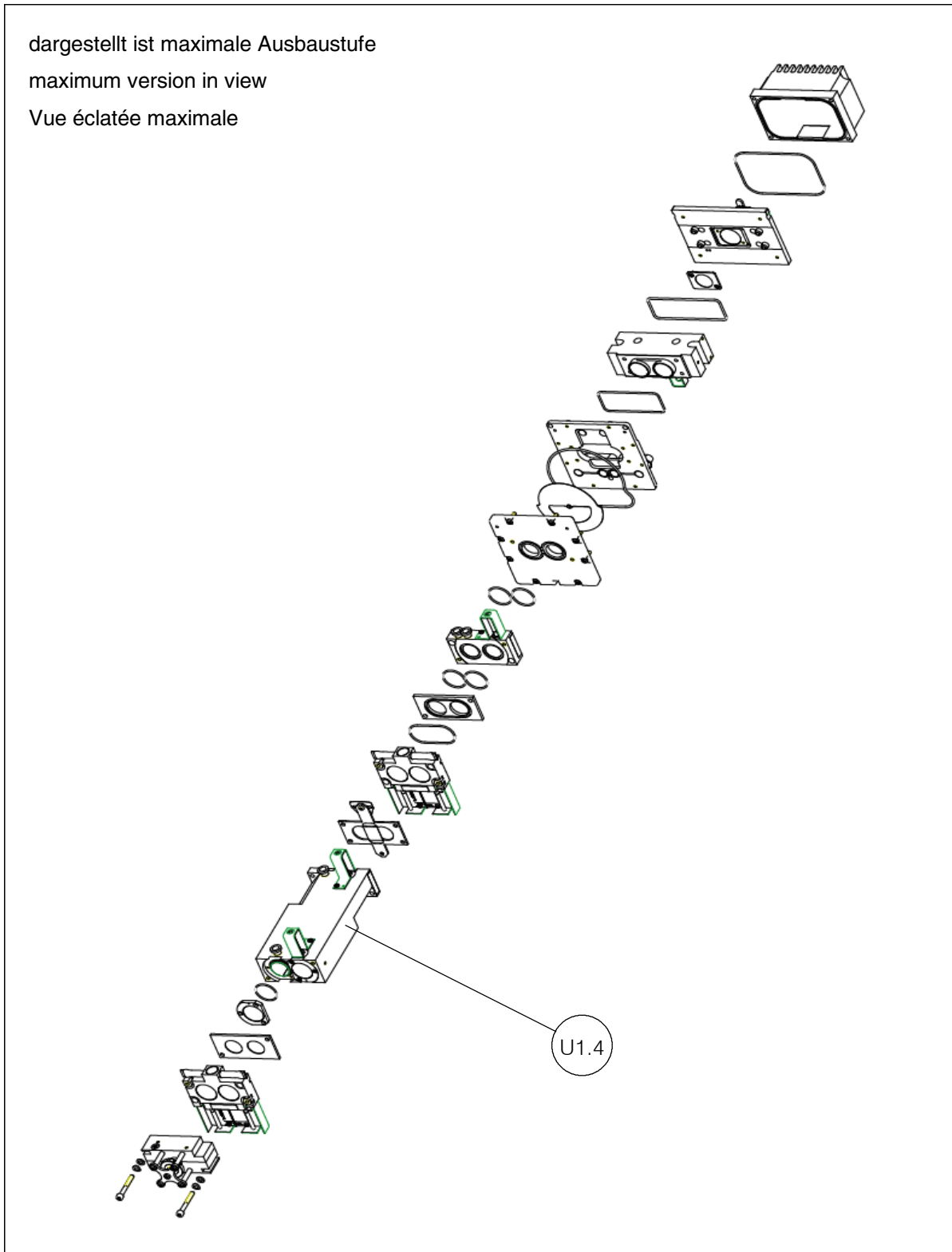
7MB2023, 7MB2024 (2. Kanal, 2nd channel, 2^{ème} canal)

| Teil-Nr. Part No. Pièce Nr. | Bezeichnung Designation Désignation | Bestell-Nr. Order No. Nr. de référence | Bemerkungen Remarks Remarques |
|-----------------------------------|--|---|---|
| U1.1 | Strahler IR Source Source rayonnante | A5E00415397 | für/for/pour/para/per 7MB2121, 7MB2123, 7MB2124 7MB2023, 7MB2024 |
| U1.1 | Strahler IR Source Source rayonnante | A5E00415399 | für/for/pour/para/per 7MB2111, 7MB2112 |
| U1.1.1 | MLFB Optisches Filter Optical filter Filtre optique | 7MB2121, 7MB2111 7MB2123 7MB2023, 7MB2124 |  |
| U1.2 | MLFB Hosenkammer Y-cell Diviseur de faisceau | 7MB2121, 7MB2111 7MB2123 7MB2023, 7MB2124 |  |
| | CO, CO-TÜV, NH ₃ | C79451-A3462-B537 | |
| | CO sel. | C79451-A3462-B540 | |
| | CO ₂ | C79451-A3462-B534 | |
| | HC, H ₂ O, N ₂ O | C79451-A3462-B536 | |
| | SO ₂ | C79451-A3462-B539 | |
| | NO | C79451-A3462-B537 | |
| | NO | C79451-A3462-B535 | |

* siehe Seite/see page/voir page/vease página/vedi pagina 7-29

| Teil-Nr. Part No. Pièce Nr. | Bezeichnung Designation Désignation | Bestell-Nr. Order No. Nr. de référence | Bemerkungen Remarks Remarques |
|-----------------------------------|--|---|---|
| U1.3 | Chopper Chopper Hacheur | C79451-A3462-B510 | |
| U1.3.1 | Chopperunterteil Chopper, bottom part Pièce inférieure du modulateur | C79451-A3462-B501 | |
| U1.4 | Analysenkammer Analyzer cell Cellule de mesure | Länge: 0,2 mm Length: 0.2 mm Longueur: 0,2 mm | Vergleichskammer nicht beströmt No flow in reference gas cell Cellule de référence étanche |
| | " : 0.2 mm | A5E00117417 | Vergleichskammer beströmt Flow in reference gas cell Cellule de référence balayée |
| | " : 0.6 mm | A5E00117418 | Vergleichskammer nicht beströmt No flow in reference gas cell Cellule de référence étanche |
| | " : 0.6 mm | A5E00117419 | Vergleichskammer beströmt Flow in reference gas cell Cellule de référence balayée |
| | " : 2 mm | A5E00117420 | Vergleichskammer nicht beströmt No flow in reference gas cell Cellule de référence étanche |
| | " : 2 mm | A5E00117421 | Vergleichskammer beströmt Flow in reference gas cell Cellule de référence balayée |
| | " : 6 mm | A5E00117422 | Vergleichskammer nicht beströmt No flow in reference gas cell Cellule de référence étanche |
| | " : 6 mm | A5E00117423 | Vergleichskammer beströmt Flow in reference gas cell Cellule de référence balayée |
| | " : 20 mm | A5E00117424 | Vergleichskammer nicht beströmt, Aluminium No flow in reference gas cell, aluminium Cellule de référence étanche, aluminium |
| | " : 20 mm | A5E00117425 | Vergleichskammer beströmt, Aluminium Flow in reference gas cell, aluminium Cellule de référence balayée, aluminium |
| | " : 20 mm | A5E00117426 | Vergleichskammer nicht beströmt, Tantal No flow in reference gas cell, tantalum Cellule de référence étanche, tantale |
| | " : 20 mm | A5E00117427 | Vergleichskammer beströmt, Tantal Flow in reference gas cell, tantalum Cellule de référence balayée, tantale |
| | " : 60 mm | A5E00117428 | Vergleichskammer nicht beströmt, Aluminium No flow in reference gas cell, aluminium Cellule de référence étanche, aluminium |
| | " : 60 mm | A5E00117429 | Vergleichskammer beströmt, Aluminium Flow in reference gas cell, aluminium Cellule de référence balayée, aluminium |
| | " : 60 mm | A5E00117430 | |

Analysierteil / Analyzer section / Partie analytique
ULTRAMAT 6 (Einzelkanal/single channel/canal unique)

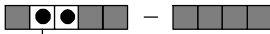
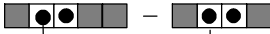



Bezeichnungen siehe Seite 7-23/7-25

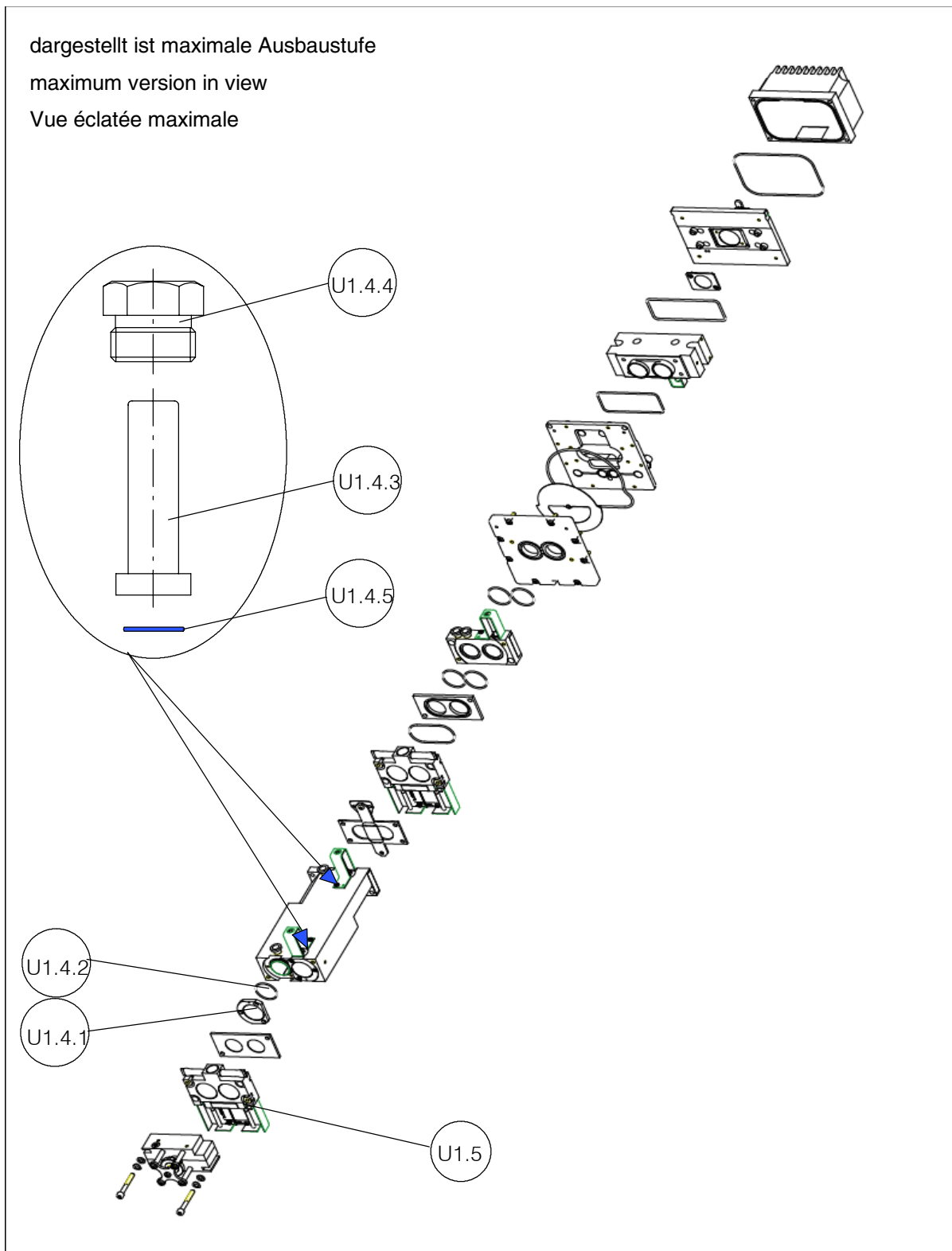
Designation see page 7-23/7-25

Désignation voir page 7-23/7-25

Analysierteil / Analyzer section / Partie analytique

| Teil-Nr. Part No. Pièce Nr. | Bezeichnung Designation Désignation | Bestell-Nr. Order No. Nr. de référence | Bemerkungen Remarks Remarques |
|-----------------------------------|--|--|---|
| U1.4 Forts. contd. cont. | Analysenkammer Länge: 60 mm Analyzer cell Length: 60 mm Cellule de mesure Longueur: 60 mm | A5E00117431 | Vergleichskammer nicht beströmt, Tantal No flow in reference gas cell, tantalum Cellule de référence étanche, tantale |
| | " : 60 mm | A5E00117432 | Vergleichskammer beströmt, Tantal Flow in reference gas cell, tantalum Cellule de référence balayée, tantale |
| | " : 90 mm | A5E00117433 | Vergleichskammer nicht beströmt, Aluminium No flow in reference gas cell, aluminium Cellule de référence étanche, aluminium |
| | " : 90 mm | A5E00117434 | Vergleichskammer beströmt, Aluminium Flow in reference gas cell, aluminium Cellule de référence balayée, aluminium |
| | " : 90 mm | A5E00117435 | Vergleichskammer nicht beströmt, Tantal No flow in reference gas cell, tantalum Cellule de référence étanche, tantale |
| | " : 90 mm | A5E00117436 | Vergleichskammer beströmt, Tantal Flow in reference gas cell, tantalum Cellule de référence balayée, tantale |
| | MLFB | 7MB2121, 7MB2111 |  |
| | | 7MB2123 |  |
| | | 7MB2023, 7MB2124 |  |
| | Analysenkammer Länge: 180 mm Analyzer cell Length: 180 mm Cellule de mesure Longueur: 180 mm | A5E00117437 | Nicht für/not for/pas pour CA, CB, CC, CD Vergleichskammer nicht beströmt, Aluminium No flow in reference gas cell, aluminium Cellule de référence étanche, aluminium |
| " : 180 mm | A5E00117441 | Nur für/only/seulement pour CA, CB, CC, CD Vergleichskammer nicht beströmt, Aluminium No flow in reference gas cell, aluminium Cellule de référence étanche, aluminium | |
| " : 180 mm | A5E00117438 | Vergleichskammer beströmt, Aluminium Flow in reference gas cell, aluminium Cellule de référence balayée, aluminium | |
| " : 180 mm | A5E00117439 | Nicht für/not for/pas pour CA, CB, CC, CD Vergleichskammer nicht beströmt, Tantal No flow in reference gas cell, tantalum Cellule de référence étanche, tantale | |
| " : 180 mm | A5E00117442 | Nur für/only/seulement pour CA, CB, CC, CD Vergleichskammer nicht beströmt, Tantal No flow in reference gas cell, tantalum Cellule de référence étanche, tantale | |
| " : 180 mm | A5E00117440 | Vergleichskammer beströmt, Tantal Flow in reference gas cell, tantalum Cellule de référence balayée, tantale | |

Analysierteil / Analyzer section / Partie analytique
ULTRAMAT 6 (Einzelkanal/single channel/canal unique)

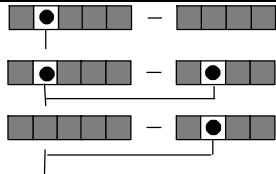


Bezeichnungen siehe Seite 7-27

Designation see page 7-27

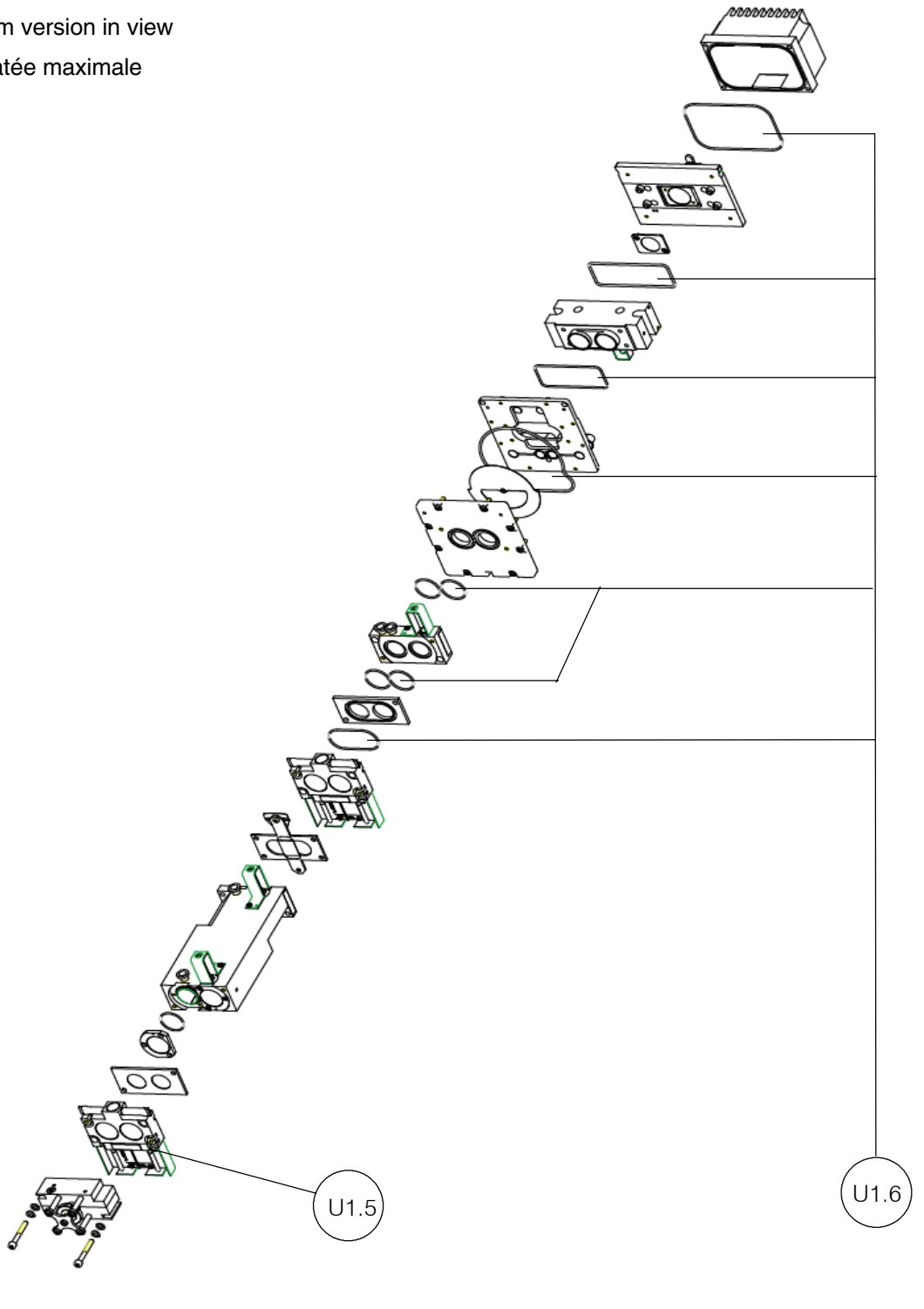
Désignation voir page 7-27

Analysierteil / Analyzer section / Partie analytique

| Teil-Nr. Part No. Pièce Nr. | Bezeichnung Designation Désignation | Bestell-Nr. Order No. Nr. de référence | Bemerkungen Remarks Remarques | |
|-----------------------------------|--|---|--|--------------------------------------|
| U1.4.1 | Verschlußdeckel Cover Couvercle d'obturation | C79451-A3462-B152 | für Kammerlänge 0,2 mm ... 6 mm for length of cell 0.2 mm ... 6 mm pour cellule 0,2 mm ... 6 mm | |
| | Verschlußdeckel Cover Couvercle d'obturation | C79451-A3462-B151 | für Kammerlänge 20 mm ... 180 mm for length of cell 20 mm ... 180 mm pour cellule 20 mm ... 180 mm | |
| U1.4.2 | O-Ring O-ring Joint torique | C79121-Z100-A24 | | |
| U1.4.3 | Schlauchstutzen Hose connector Raccord de tuyau | C79451-A3478-C9 | | |
| U1.4.4 | Überwurfmutter Nut Écrou | C79451-A3478-C8 | | |
| U1.4.5 | O-Ring O-ring Joint torique | C71121-Z100-A159 | | |
| U1.5 | MLFB | 7MB2121, 7MB2111 7MB2123 7MB2023, 7MB2124 |  | |
| | Empfängerkammer Detector cell Cellule réceptrice | CO | C79451-A3462-B581 | A |
| | | CO sel., CO TÜV | C79451-A3462-B598 | B, X |
| | | CO ₂ | C79451-A3462-B582 | C, only for single-channel analyzers |
| | | CH ₄ | C79451-A3462-B588 | D |
| | | C ₂ H ₂ | C79451-A3462-B591 | E |
| | | C ₂ H ₄ | C79451-A3462-B590 | F |
| | | C ₂ H ₆ | C79451-A3462-B587 | G |
| | | C ₃ H ₆ | C79451-A3462-B586 | H |
| | | C ₃ H ₈ | C79451-A3462-B589 | J |
| | | C ₄ H ₆ | C79451-A3462-B595 | K |
| | | C ₄ H ₁₀ | C79451-A3462-B593 | L |
| | | C ₆ H ₁₄ | C79451-A3462-B584 | M |
| | | SO ₂ | C79451-A3462-B599 | N |

Analysierteil / Analyzer section / Partie analytique
ULTRAMAT 6 (Einzelkanal/single channel/canal unique)

dargestellt ist maximale Ausbaustufe
maximum version in view
Vue éclatée maximale



Bezeichnungen siehe Seite 7-29

Designation see page 7-29

Désignation voir page 7-29

Analysierteil / Analyzer section / Partie analytique
 ULTRAMAT 6

| Teil-Nr. Part No. Pièce Nr. | Bezeichnung Designation Désignation | Bestell-Nr. Order No. Nr. de référence | Bemerkungen Remarks Remarques |
|-----------------------------------|--|--|---|
| U1.5 Forts. Cont. Cont. | MLFB Empfängerkammer Detector cell Cellule réceptrice | NO | 7MB2121, 7MB2111 7MB2123 7MB2023 A5E00076341 |
| | | NO | C79451-A3462-B583 |
| | | NH ₃ | C79451-A3462-B585 |
| | | H ₂ O | C79451-A3462-B596 |
| | | N ₂ O | C79451-A3462-B592 |
| | | | |
| U1.6 | Satz O-Ringe Set of o-rings Assortiment de joint torique | C79451-A3462-D501 | für dichtes Analysierteil for tight analyzer section pour partie analytique étanche |

| NO (ohne opt. Filter/without opt. Filter/sans filtre opt.) | | NO (mit opt. Filter/with opt. Filter/avec filtre opt.) | |
|--|--|--|--|
| MLFB-Nr. MLFB No. MLFB Nr. | bis Fabrikate-Nr. until serial No. jusqu'au Nr. de fabrication | MLFB-Nr. MLFB No. MLFB Nr. | ab Fabrikate-Nr. as from serial No. à partir du Nr. de fabrication |
| 7MB2023: | M5-178 | 7MB2023: | M5-179 |
| 7MB2111: | MO-117 | 7MB2111: | MO-118 |
| 7MB2121: | M7-520 | 7MB2121: | M7-521 |
| 7MB2123: | M5-271 | 7MB2123: | M5-272 |
| 7MB2124: | -- | 7MB2124: | alle Geräte/all devices/tous les appareils |

*

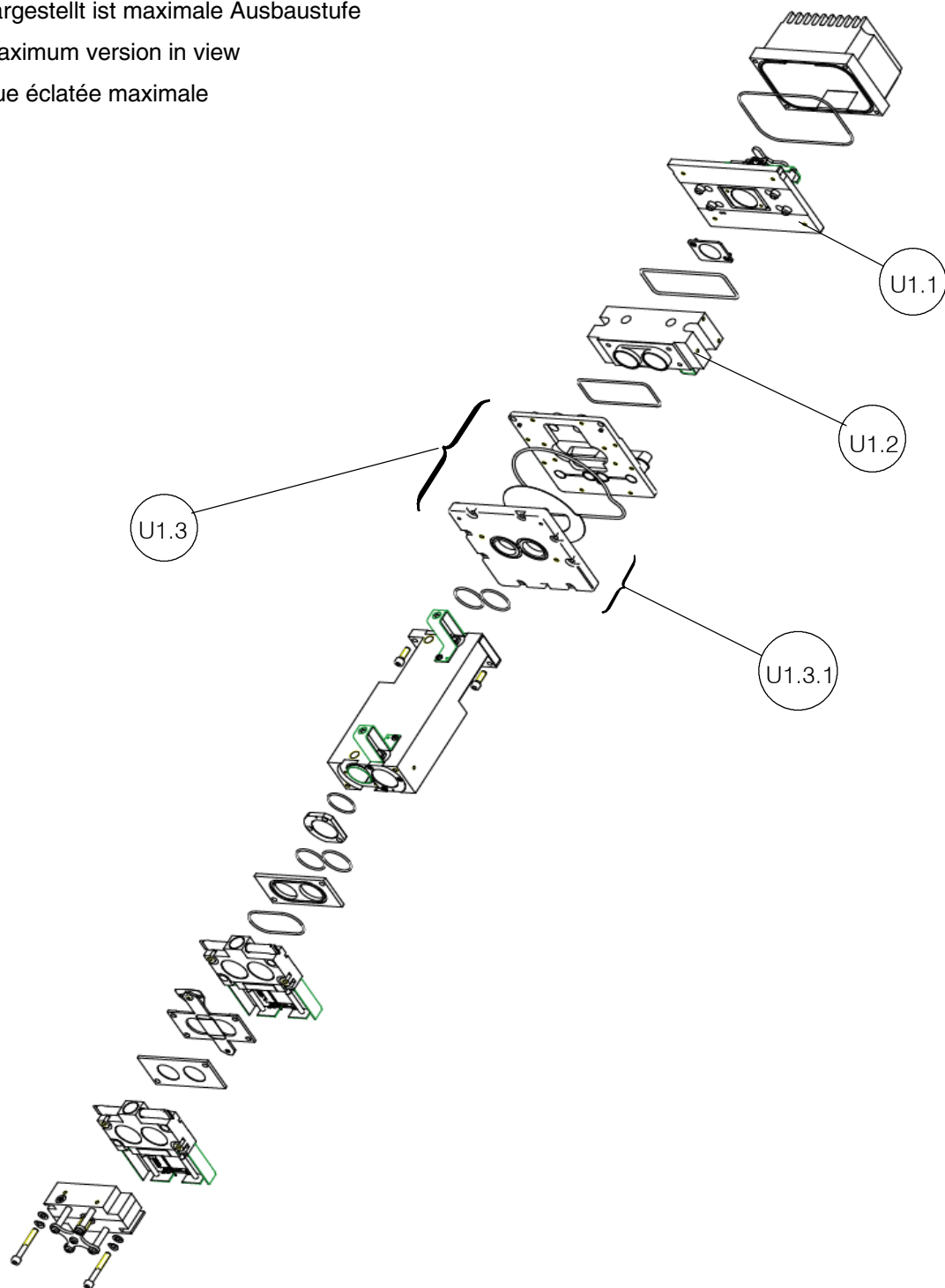
7.3.2 Analyzer Section 2R Channel

7MB2112, 7MB2124 (1. Kanal), 7MB2024 (2. Kanal)

dargestellt ist maximale Ausbaustufe

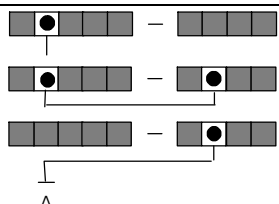
maximum version in view

Vue éclatée maximale



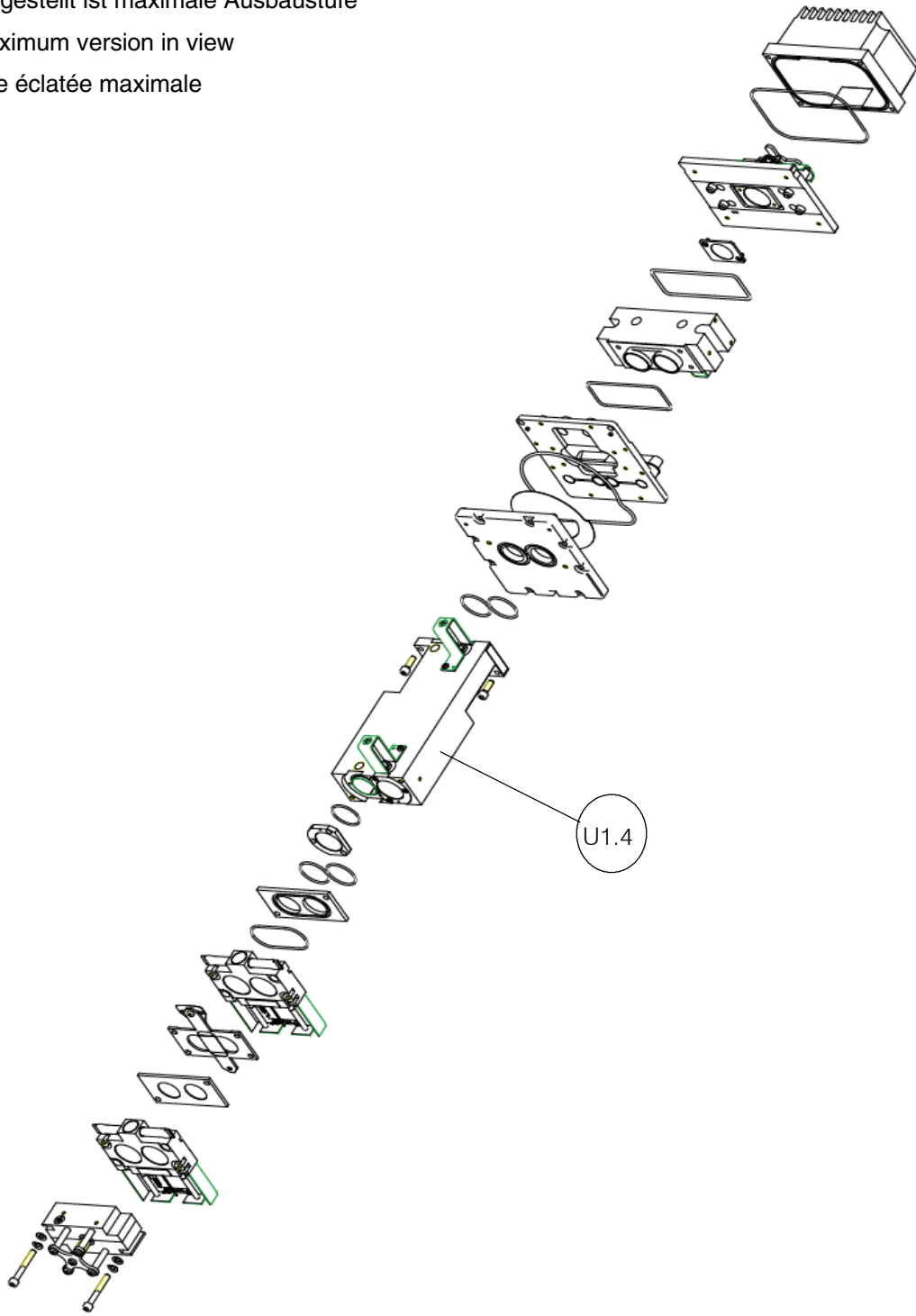
Bezeichnungen siehe Seite 7-31 und folgende
Designation see page 7-31 and following pages
Désignation voir page 7-31 et pages suivantes

Analysierteil / Analyzer section / Partie analytique
 ULTRAMAT 6 (2R-Kanal / 2R channel / canal 2R)
 7MB2112
 7MB2124 (1. Kanal, 1st channel, 1^{er} canal)
 7MB2024 (2. Kanal, 2nd channel, 2^{ème} canal)

| Teil-Nr. Part No. Pièce Nr. | Bezeichnung Designation Désignation | Bestell-Nr. Order No. Nr. de référence | Bemerkungen Remarks Remarques |
|-----------------------------------|--|---|---|
| U1.1 | Strahler IR Source Source rayonnante | A5E00415397 | für/for/pour/para/per 7MB21247 MB2024 |
| U1.1 | Strahler IR Source Source rayonnante | A5E00415399 | für/for/pour/para/per 7MB2112 |
| U1.2 | MLFB Hosenkammer Y-cell Diviseur de faisceau | 7MB2121, 7MB2111 7MB2123 7MB2023 CO/NO C79451-A3462-B537 CO ₂ /CO C79451-A3462-B539 CO ₂ /CH ₄ C79451-A3462-B534 CO ₂ /NO C79451-A3462-B539 |  A B C D |
| U1.3 | Chopper Chopper Hacheur | C79451-A3462-B510 | |
| U1.3.1 | Chopperunterteil Chopper, bottom part Pièce inférieure du modulateur | C79451-A3462-B501 | |

Analysierteil / Analyzer section / Partie analytique
ULTRAMAT 6 (2R-Kanal/2R channel/canal 2R)

dargestellt ist maximale Ausbaustufe
maximum version in view
Vue éclatée maximale



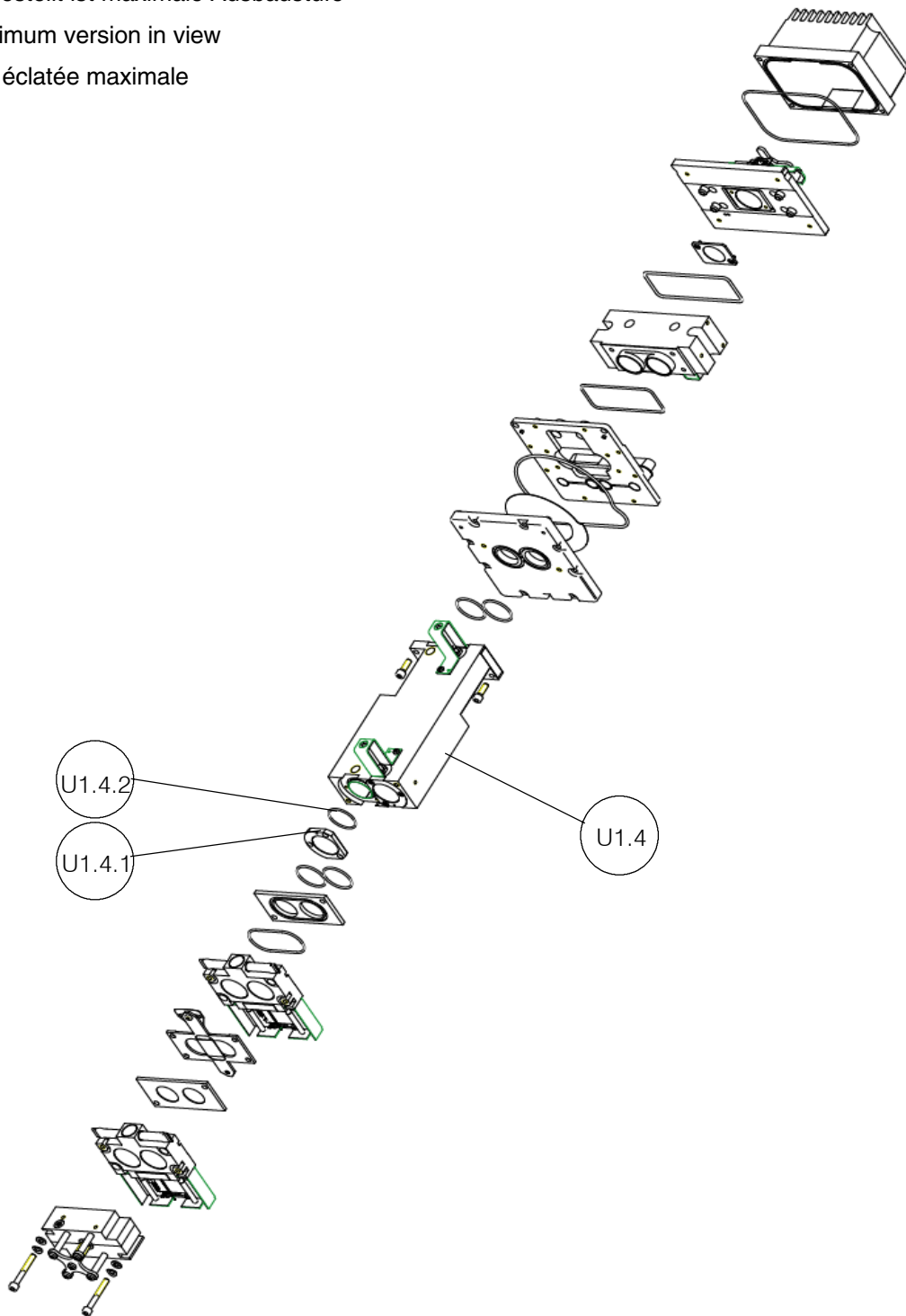
Bezeichnungen siehe Seite 7-32 und folgende
Designation see page 7-33 and following pages
Désignation voir page 7-33 et pages suivantes

Analysierteil / Analyzer section / Partie analytique
ULTRAMAT 6 (2R-Kanal / 2R channel / canal 2R)

| Teil-Nr. Part No. Pièce Nr. | Bezeichnung Designation Désignation | Bestell-Nr. Order No. Nr. de référence | Bemerkungen Remarks Remarques | |
|-----------------------------------|--|---|---|---|
| U1.4 | Analysenkammer Analyzer cell Cellule de mesure | Länge: 0,2 mm Length: 0.2 mm Longueur: 0,2 mm | A5E00117417 | Vergleichskammer nicht beströmt No flow in reference gas cell Cellule de référence étanche |
| | | " : 0.2 mm | A5E00117418 | Vergleichskammer beströmt Flow in reference gas cell Cellule de référence balayée |
| | | " : 0.6 mm | A5E00117419 | Vergleichskammer nicht beströmt No flow in reference gas cell Cellule de référence étanche |
| | | " : 0.6 mm | A5E00117420 | Vergleichskammer beströmt Flow in reference gas cell Cellule de référence balayée |
| | | " : 2 mm | A5E00117421 | Vergleichskammer nicht beströmt No flow in reference gas cell Cellule de référence étanche |
| | | " : 2 mm | A5E00117422 | Vergleichskammer beströmt Flow in reference gas cell Cellule de référence balayée |
| | | " : 6 mm | A5E00117423 | Vergleichskammer nicht beströmt No flow in reference gas cell Cellule de référence étanche |
| | | " : 6 mm | A5E00117424 | Vergleichskammer beströmt Flow in reference gas cell Cellule de référence balayée |
| | | " : 20 mm | A5E00117425 | Vergleichskammer nicht beströmt, Aluminium No flow in reference gas cell, aluminium Cellule de référence étanche, aluminium |
| | | " : 20 mm | A5E00117426 | Vergleichskammer beströmt, Aluminium Flow in reference gas cell, aluminium Cellule de référence balayée, aluminium |
| | | " : 20 mm | A5E00117427 | Vergleichskammer nicht beströmt, Tantal No flow in reference gas cell, tantalum Cellule de référence étanche, tantale |
| | | " : 20 mm | A5E00117428 | Vergleichskammer beströmt, Tantal Flow in reference gas cell, tantalum Cellule de référence balayée, tantale |
| | | " : 60 mm | A5E00117429 | Vergleichskammer nicht beströmt, Aluminium No flow in reference gas cell, aluminium Cellule de référence étanche, aluminium |
| | | " : 60 mm | A5E00117430 | Vergleichskammer beströmt, Aluminium Flow in reference gas cell, aluminium Cellule de référence balayée, aluminium |
| | " : 60 mm | A5E00117431 | Vergleichskammer nicht beströmt, Tantal No flow in reference gas cell, tantalum Cellule de référence étanche, tantale | |
| | " : 60 mm | A5E00117432 | Vergleichskammer beströmt, Tantal Flow in reference gas cell, tantalum Cellule de référence balayée, tantale | |

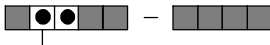
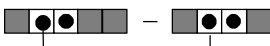
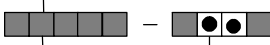
Analysierteil / Analyzer section / Partie analytique
ULTRAMAT 6 (2R-Kanal/2R channel/canal 2R)

dargestellt ist maximale Ausbaustufe
maximum version in view
Vue éclatée maximale

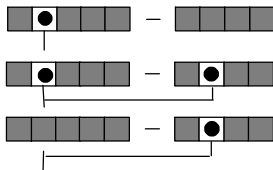
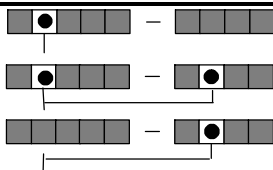


Bezeichnungen siehe Seite 7-33 und folgende
Designation see page 7-33 and following pages
Désignation voir page 7-33 et pages suivantes

Analysierteil / Analyzer section / Partie analytique

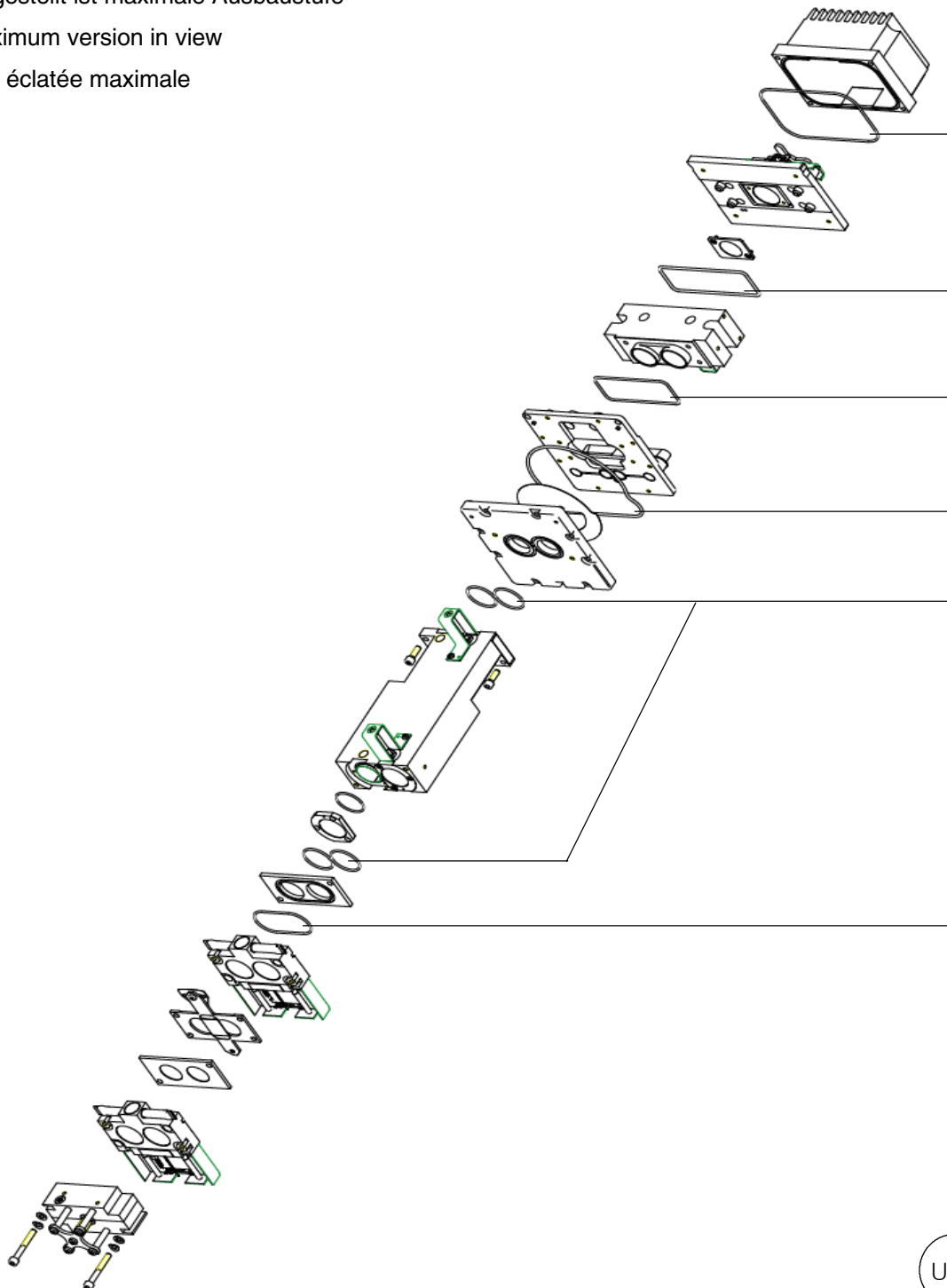
| Teil-Nr. Part No. Pièce Nr. | Bezeichnung Designation Désignation | Bestell-Nr. Order No. Nr. de référence | Bemerkungen Remarks Remarques |
|--|---|--|--|
| U1.4 Forts. contd. cont. | Analysenkammer Länge: 90 mm Analyzer cell Length: 90 mm Cellule de mesure Longueur: 90 mm | A5E00117433 | Vergleichskammer nicht beströmt, Aluminium No flow in reference gas cell, aluminium Cellule de référence étanche, aluminium |
| | | A5E00117434 | Vergleichskammer beströmt, Aluminium Flow in reference gas cell, aluminium Cellule de référence balayée, aluminium |
| | | A5E00117435 | Vergleichskammer nicht beströmt, Tantal No flow in reference gas cell, tantalum Cellule de référence étanche, tantale |
| | | A5E00117436 | Vergleichskammer beströmt, Tantal Flow in reference gas cell, tantalum Cellule de référence balayée, tantale |
| | MLFB | 7MB2121, 7MB2111 |  |
| | | 7MB2123 |  |
| | | 7MB2023 |  |
| | | A5E00117437 | Nicht für/not for/pas pour CA, CB, CC, CD Vergleichskammer nicht beströmt, Aluminium No flow in reference gas cell, aluminium Cellule de référence étanche, aluminium |
| | | A5E00117441 | Nur für/only/seulement pour CA, CB, CC, CD Vergleichskammer nicht beströmt, Aluminium No flow in reference gas cell, aluminium Cellule de référence étanche, aluminium |
| | | A5E00117438 | Vergleichskammer beströmt, Aluminium Flow in reference gas cell, aluminium Cellule de référence balayée, aluminium |
| Analysenkammer Länge: 180 mm Analyzer cell Length: 180 mm Cellule de mesure Longueur: 180 mm | A5E00117439 | Nicht für/not for/pas pour CA, CB, CC, CD Vergleichskammer nicht beströmt, Tantal No flow in reference gas cell, tantalum Cellule de référence étanche, tantale | |
| | A5E00117442 | Nur für/only/seulement pour CA, CB, CC, CD Vergleichskammer nicht beströmt, Tantal No flow in reference gas cell, tantalum Cellule de référence étanche, tantale | |
| | A5E00117440 | Vergleichskammer beströmt, Tantal Flow in reference gas cell, tantalum Cellule de référence balayée, tantale | |
| | A5E00117440 | Vergleichskammer beströmt, Tantal Flow in reference gas cell, tantalum Cellule de référence balayée, tantale | |
| U1.4.1 | Verschlußdeckel Cover Couvercle d'obturation | C79451-A3462-B152 | für Kammerlänge 0,2 mm ... 6 mm for length of cell 0.2 mm ... 6 mm pour cellule 0,2 mm ... 6 mm |
| | | C79451-A3462-B151 | für Kammerlänge 20 mm ... 180 mm for length of cell 20 mm ... 180 mm pour cellule 20 mm ... 180 mm |
| U1.4.2 | O-Ring O-ring Joint torique | C79121-Z100-A24 | |

Analysierteil / Analyzer section / Partie analytique

| Teil-Nr. Part No. Pièce Nr. | Bezeichnung Designation Désignation | Bestell-Nr. Order No. Nr. de référence | Bemerkungen Remarks Remarques |
|-----------------------------------|--|--|---|
| U1.4.3 | Schlauchstutzen Hose connector Raccord de tuyau | C79451-A3478-C9 | |
| U1.4.4 | Überwurfmutter Nut Écrou | C79451-A3478-C8 | |
| U1.4.5 | O-Ring O-ring Joint torique | C71121-Z100-A159 | |
| U1.5 | MLFB Empfängerkammer Detector cell Cellule réceptrice | 7MB2112 7MB2124 7MB2024 CO/NO C79451-A3462-B581 A5E00076341 CO ₂ /CO A5E00075673 C79451-A3462-B581 CO ₂ /CH ₄ C79451-A3462-B582 C79451-A3462-B581 CO ₂ /NO C79451-A3462-B582 A5E00076341 |  <p>A 1. Detektor/1st detector/1^{er} détecteur(CO) A 2. Detektor/2nd detector/2^{ème} détecteur(NO) B 1. Detektor/1st detector/1^{er} détecteur(CO₂) B 2. Detektor/2nd detector/2^{ème} détecteur(NO) C 1. Detektor/1st detector/1^{er} détecteur(CO₂) C 2. Detektor/2nd detector/2^{ème} détecteur(CH₄) D 1. Detektor/1st detector/1^{er} détecteur(CO₂) D 2. Detektor/2nd detector/2^{ème} détecteur(NO)</p> |
| U1.5.1 | Nullpunktschieber Zero slide Réglage du zéro | C79451-A3478-B191 | |
| U1.5.2 | MLFB Optisches Filter Optical filter Filtre optique | 7MB2112 7MB2124 7MB2024 CO/NO C79451-A3462-B154 CO ₂ /NO C79451-A3462-B154 |  <p>A D</p> |

Analysierteil / Analyzer section / Partie analytique
ULTRAMAT 6 (2R-Kanal/2R channel/canal 2R)

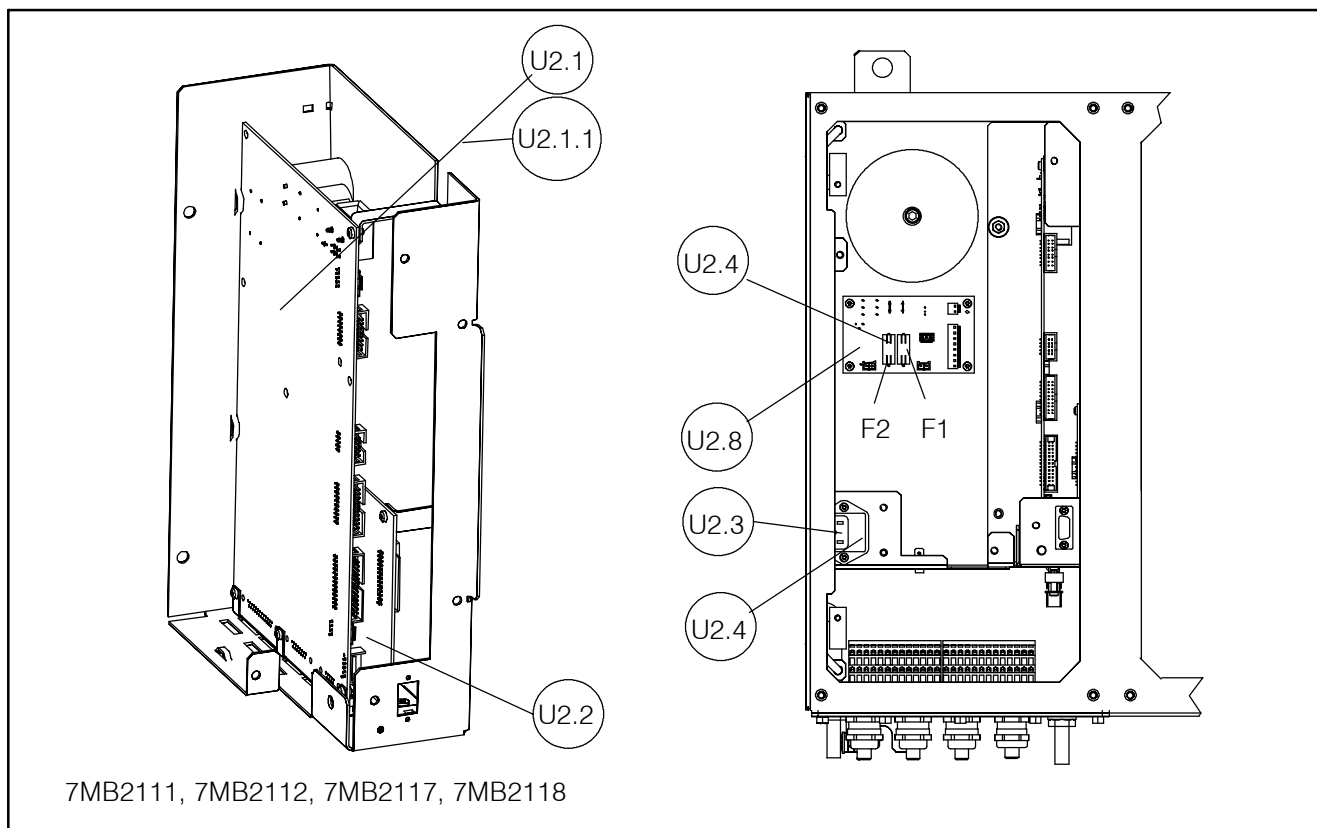
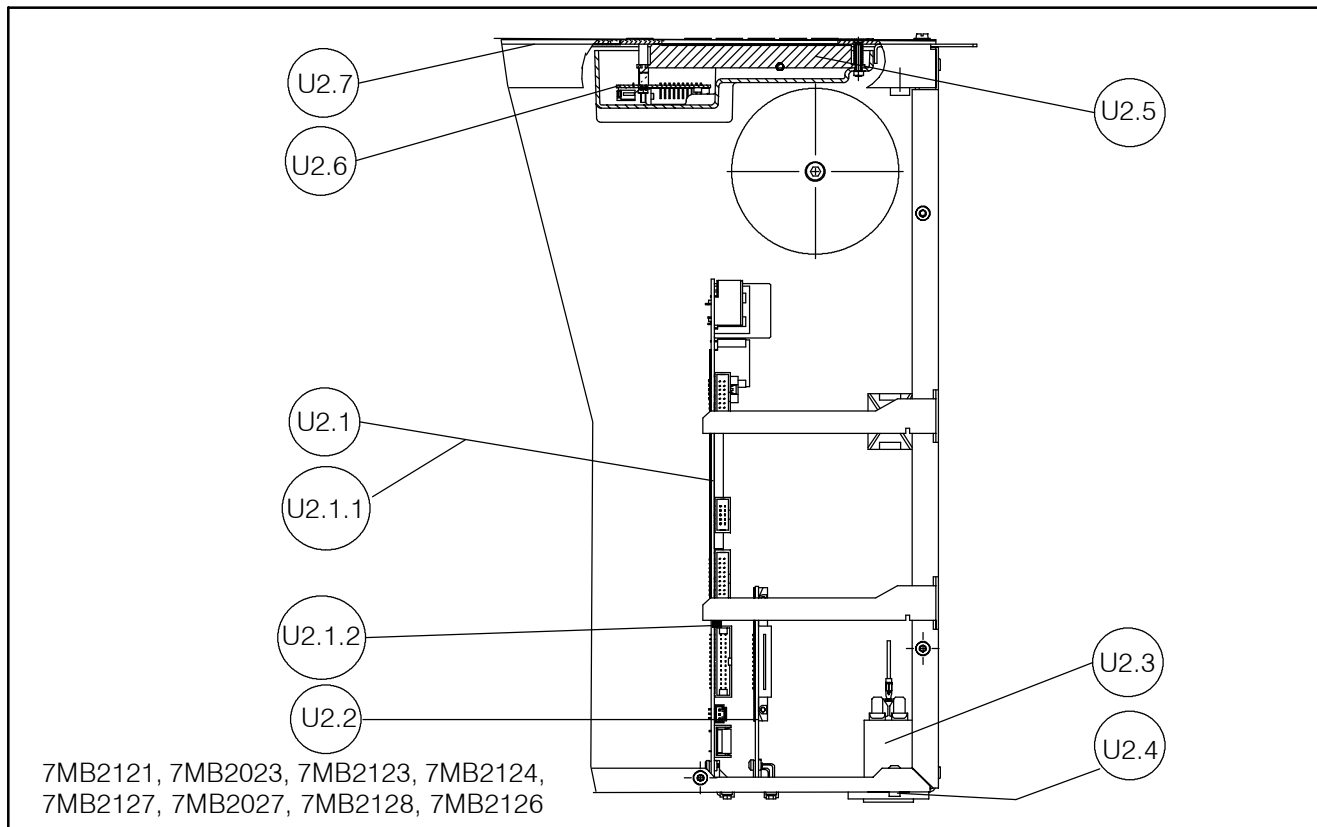
dargestellt ist maximale Ausbaustufe
maximum version in view
Vue éclatée maximale



Bezeichnungen siehe Seite 7-38 und folgende
Designation see page 7-38 and following pages
Désignation voir page 7-38 et pages suivantes

| Teil-Nr. Part No. Pièce Nr. | Bezeichnung Designation Désignation | Bestell-Nr. Order No. Nr. de référence | Bemerkungen Remarks Remarques |
|-----------------------------------|--|--|---|
| U1.6 | Satz O-Ringe Set of o-rings Assortiment de joint torique | C79451-A3462-D501 | für dichtes Analysierteil for tight analyzer section pour partie analytique étanche |

7.3.3 Electronics



Bezeichnungen siehe Seite 7-41

Designation see page 7-41

Désignation voir page 7-41

Elektronik / Electronics / Electronique ULTRAMAT 6

| Teil-Nr. Part No. Pièce Nr. | Bezeichnung Designation Désignation | Bestell-Nr. Order No. Nr. de référence | Bemerkungen Remarks Remarques |
|-----------------------------------|---|--|--|
| U2.1 | Grundplatte Motherboard Carte électronique | C79451-A3478-D507 | Grundplatte u. Firmware; deutsch Motherboard incl. Firmware; german Carte électronique et Firmware allemande |
| | | C79451-A3478-D508 | Grundplatte u. Firmware; englisch Motherboard incl. Firmware; english Carte électronique et Firmware; anglais |
| | | C79451-A3478-D509 | Grundplatte u. Firmware; französisch Motherboard incl. Firmware; french Carte électronique et Firmware; français |
| | | C79451-A3478-D510 | Grundplatte u. Firmware; spanisch Motherboard incl. Firmware; spanish Carte électronique et Firmware; espagnol |
| | | C79451-A3478-D511 | Grundplatte u. Firmware; italienisch Motherboard incl. Firmware; italian Carte électronique et Firmware; italien |
| U2.1.1 | Grundplatte ohne Firmware Motherboard without Firmware Carte électronique sans Firmware | C79451-A3474-B620 | |
| U2.1.2 | Firmware (FlashPROM) Firmware (FlashPROM) Firmware (FlashPROM) | C79451-A3478-S501 | deutsch / german / allemande |
| | | C79451-A3478-S502 | englisch / english / anglais |
| | | C79451-A3478-S503 | französisch / french / français |
| | | C79451-A3478-S504 | spanisch / spanish / espagnol |
| | | C79451-A3478-S505 | italienisch / italian / italien |
| U2.2 | Optionsplatte Option board Platine optional | C79451-A3480-D511 | Relais Relais Relais |
| | | C79451-A3480-D512 | mit serieller Schnittstelle für Automobilindustrie (AK) With serial interface for automotive industry (AK) |
| | | A5E00057307 | PROFIBUS PA PROFIBUS PA PROFIBUS PA |
| | | A5E00057312 | PROFIBUS DP PROFIBUS DP PROFIBUS DP |
| | | A5E00057164 | Firmware-Update PROFIBUS Firmware update PROFIBUS Mise à jour firmware PROFIBUS |
| U2.3 | Steckerfilter Plug with filter Prise avec filtre | W75041-E5602-K2 | |

Elektronik / Electronics / Electronique ULTRAMAT 6

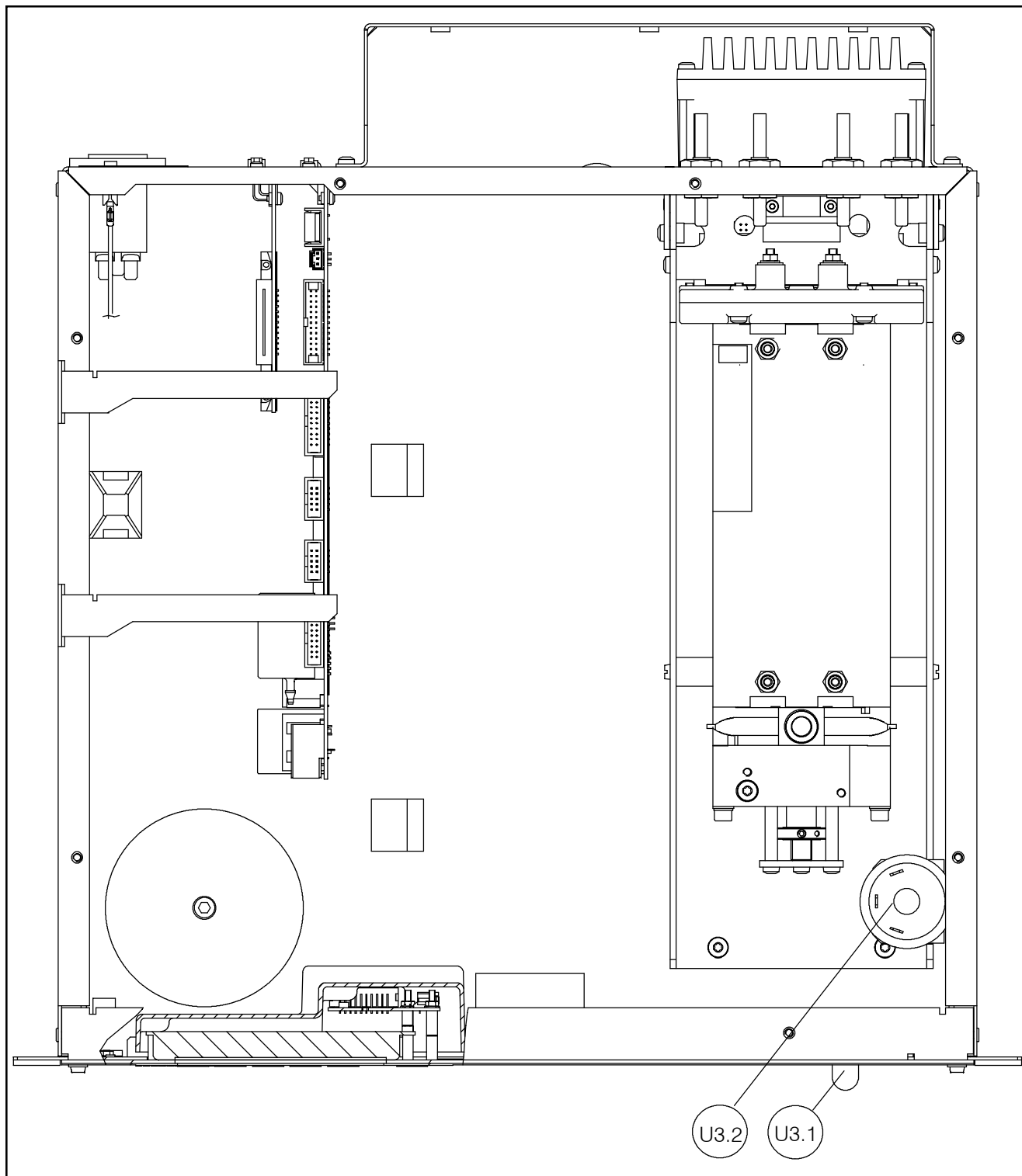
| Teil-Nr. Part No. Pièce Nr. | Bezeichnung Designation Désignation | Bestell-Nr. Order No. Nr. de référence | Bemerkungen Remarks Remarques | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------------------|--|---|---|---------------|----|----|----|----|---------|---|---|------|------|----------|------|-----|-----|-----|---------|---|---|------|------|----------|------|-----|-----|-----|---------|---|---|------|------|----------|------|-----|-----|-----|---------|---|---|------|------|----------|------|-----|-----|-----|---------|---|---|------|------|---------|---|---|---|---|--------------|---|---|------|------|--------------|---|---|---|---|--------------|---|---|------|------|----------------|---|---|---|---|---------|---|---|------|------|---------|---|---|---|---|---------------|----|----|----|----|---------|---|---|---|---|----------|---|---|---|---|---------|---|---|---|---|----------|---|---|---|---|---------|---|---|---|---|----------|---|---|---|---|---------|---|---|---|---|----------|---|---|---|---|---------|---|---|---|---|---------|---|---|-----|-----|--------------|---|---|---|---|--------------|---|---|-----|-----|--------------|---|---|---|---|----------------|---|---|-----|-----|---------|---|---|---|---|---------|---|---|-----|-----|
| O2.4 | G-Schmelzeinsatz G-type fuse Fusible T 0,63A / 250V T 1A / 250V T 1,6A / 250V T 2,5A / 250V T 4A / 250V | W79054-L1010-T630 W79054-L1011-T100 W79054-L1011-T160 W79054-L1011-T250 W79054-L1011-T400 | Bitte aus Liste auswählen/ Please select from list/ Selectionner dans la liste s. v. p. <table> <thead> <tr> <th>200 ... 240 V</th> <th>F1</th> <th>F2</th> <th>F3</th> <th>F4</th> </tr> </thead> <tbody> <tr><td>7MB2111</td><td>-</td><td>-</td><td>0.63</td><td>0.63</td></tr> <tr><td>7MB2111*</td><td>0.63</td><td>2.5</td><td>2.5</td><td>2.5</td></tr> <tr><td>7MB2112</td><td>-</td><td>-</td><td>0.63</td><td>0.63</td></tr> <tr><td>7MB2112*</td><td>0.63</td><td>2.5</td><td>2.5</td><td>2.5</td></tr> <tr><td>7MB2117</td><td>-</td><td>-</td><td>0.63</td><td>0.63</td></tr> <tr><td>7MB2117*</td><td>0.63</td><td>2.5</td><td>2.5</td><td>2.5</td></tr> <tr><td>7MB2118</td><td>-</td><td>-</td><td>0.63</td><td>0.63</td></tr> <tr><td>7MB2118*</td><td>0.63</td><td>2.5</td><td>2.5</td><td>2.5</td></tr> <tr><td>7MB2121</td><td>-</td><td>-</td><td>0.63</td><td>0.63</td></tr> <tr><td>7MB2123</td><td>-</td><td>-</td><td>1</td><td>1</td></tr> <tr><td>7MB2124 (2R)</td><td>-</td><td>-</td><td>0.63</td><td>0.63</td></tr> <tr><td>7MB2124 (3K)</td><td>-</td><td>-</td><td>1</td><td>1</td></tr> <tr><td>7MB2126 (2R)</td><td>-</td><td>-</td><td>0.63</td><td>0.63</td></tr> <tr><td>7MB2126 (3-4K)</td><td>-</td><td>-</td><td>1</td><td>1</td></tr> <tr><td>7MB2127</td><td>-</td><td>-</td><td>0.63</td><td>0.63</td></tr> <tr><td>7MB2128</td><td>-</td><td>-</td><td>1</td><td>1</td></tr> </tbody> </table> <table> <thead> <tr> <th>100 ... 120 V</th> <th>F1</th> <th>F2</th> <th>F3</th> <th>F4</th> </tr> </thead> <tbody> <tr><td>7MB2111</td><td>-</td><td>-</td><td>1</td><td>1</td></tr> <tr><td>7MB2111*</td><td>1</td><td>4</td><td>4</td><td>4</td></tr> <tr><td>7MB2112</td><td>-</td><td>-</td><td>1</td><td>1</td></tr> <tr><td>7MB2112*</td><td>1</td><td>4</td><td>4</td><td>4</td></tr> <tr><td>7MB2117</td><td>-</td><td>-</td><td>1</td><td>1</td></tr> <tr><td>7MB2117*</td><td>1</td><td>4</td><td>4</td><td>4</td></tr> <tr><td>7MB2118</td><td>-</td><td>-</td><td>1</td><td>1</td></tr> <tr><td>7MB2118*</td><td>1</td><td>4</td><td>4</td><td>4</td></tr> <tr><td>7MB2121</td><td>-</td><td>-</td><td>1</td><td>1</td></tr> <tr><td>7MB2123</td><td>-</td><td>-</td><td>1.6</td><td>1.6</td></tr> <tr><td>7MB2124 (2R)</td><td>-</td><td>-</td><td>1</td><td>1</td></tr> <tr><td>7MB2124 (3K)</td><td>-</td><td>-</td><td>1.6</td><td>1.6</td></tr> <tr><td>7MB2124 (2R)</td><td>-</td><td>-</td><td>1</td><td>1</td></tr> <tr><td>7MB2124 (3-4K)</td><td>-</td><td>-</td><td>1.6</td><td>1.6</td></tr> <tr><td>7MB2127</td><td>-</td><td>-</td><td>1</td><td>1</td></tr> <tr><td>7MB2128</td><td>-</td><td>-</td><td>1.6</td><td>1.6</td></tr> </tbody> </table> * beheizte Version heated version version chauffée | 200 ... 240 V | F1 | F2 | F3 | F4 | 7MB2111 | - | - | 0.63 | 0.63 | 7MB2111* | 0.63 | 2.5 | 2.5 | 2.5 | 7MB2112 | - | - | 0.63 | 0.63 | 7MB2112* | 0.63 | 2.5 | 2.5 | 2.5 | 7MB2117 | - | - | 0.63 | 0.63 | 7MB2117* | 0.63 | 2.5 | 2.5 | 2.5 | 7MB2118 | - | - | 0.63 | 0.63 | 7MB2118* | 0.63 | 2.5 | 2.5 | 2.5 | 7MB2121 | - | - | 0.63 | 0.63 | 7MB2123 | - | - | 1 | 1 | 7MB2124 (2R) | - | - | 0.63 | 0.63 | 7MB2124 (3K) | - | - | 1 | 1 | 7MB2126 (2R) | - | - | 0.63 | 0.63 | 7MB2126 (3-4K) | - | - | 1 | 1 | 7MB2127 | - | - | 0.63 | 0.63 | 7MB2128 | - | - | 1 | 1 | 100 ... 120 V | F1 | F2 | F3 | F4 | 7MB2111 | - | - | 1 | 1 | 7MB2111* | 1 | 4 | 4 | 4 | 7MB2112 | - | - | 1 | 1 | 7MB2112* | 1 | 4 | 4 | 4 | 7MB2117 | - | - | 1 | 1 | 7MB2117* | 1 | 4 | 4 | 4 | 7MB2118 | - | - | 1 | 1 | 7MB2118* | 1 | 4 | 4 | 4 | 7MB2121 | - | - | 1 | 1 | 7MB2123 | - | - | 1.6 | 1.6 | 7MB2124 (2R) | - | - | 1 | 1 | 7MB2124 (3K) | - | - | 1.6 | 1.6 | 7MB2124 (2R) | - | - | 1 | 1 | 7MB2124 (3-4K) | - | - | 1.6 | 1.6 | 7MB2127 | - | - | 1 | 1 | 7MB2128 | - | - | 1.6 | 1.6 |
| 200 ... 240 V | F1 | F2 | F3 | F4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2111 | - | - | 0.63 | 0.63 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2111* | 0.63 | 2.5 | 2.5 | 2.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2112 | - | - | 0.63 | 0.63 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2112* | 0.63 | 2.5 | 2.5 | 2.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2117 | - | - | 0.63 | 0.63 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2117* | 0.63 | 2.5 | 2.5 | 2.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2118 | - | - | 0.63 | 0.63 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2118* | 0.63 | 2.5 | 2.5 | 2.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2121 | - | - | 0.63 | 0.63 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2123 | - | - | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2124 (2R) | - | - | 0.63 | 0.63 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2124 (3K) | - | - | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2126 (2R) | - | - | 0.63 | 0.63 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2126 (3-4K) | - | - | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2127 | - | - | 0.63 | 0.63 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2128 | - | - | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 100 ... 120 V | F1 | F2 | F3 | F4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2111 | - | - | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2111* | 1 | 4 | 4 | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2112 | - | - | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2112* | 1 | 4 | 4 | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2117 | - | - | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2117* | 1 | 4 | 4 | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2118 | - | - | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2118* | 1 | 4 | 4 | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2121 | - | - | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2123 | - | - | 1.6 | 1.6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2124 (2R) | - | - | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2124 (3K) | - | - | 1.6 | 1.6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2124 (2R) | - | - | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2124 (3-4K) | - | - | 1.6 | 1.6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2127 | - | - | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7MB2128 | - | - | 1.6 | 1.6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| U2.5 | LC-Display LC-Display carte d'affichage de LC | W75025-B5001-B1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| U2.6 | Adapterplatte, LCD/Tastatur Connecting board, LCD/keyboard Carte de connexion, affichage/clavier | C79451-A3474-B605 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| U2.7 | Frontplatte Front panel Plaque frontale | C79165-A3042-B504 | mit Folien-Tastatur with sealed keyboard avec clavier à membrane | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| U2.8 | Temperaturregler - Elektronik Thermostat board Carte de régulation de température | A5E00118530 A5E00118527 | 115 V AC, ohne Sicherungen F1, F2 115 V AC, without fuses F1, F2 115 V AC, sans fusibles F1, F2 230 V AC, ohne Sicherungen F1, F2 230 V AC, without fuses F1, F2 230 V AC, sans fusibles F1, F2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

* beheizt / heated version / version chauffée

7.3.4 Gas paths

Meßgasweg, Schlauch/hosing system for sample gas, hose/
circuit du gaz de mesure, tuyau souple

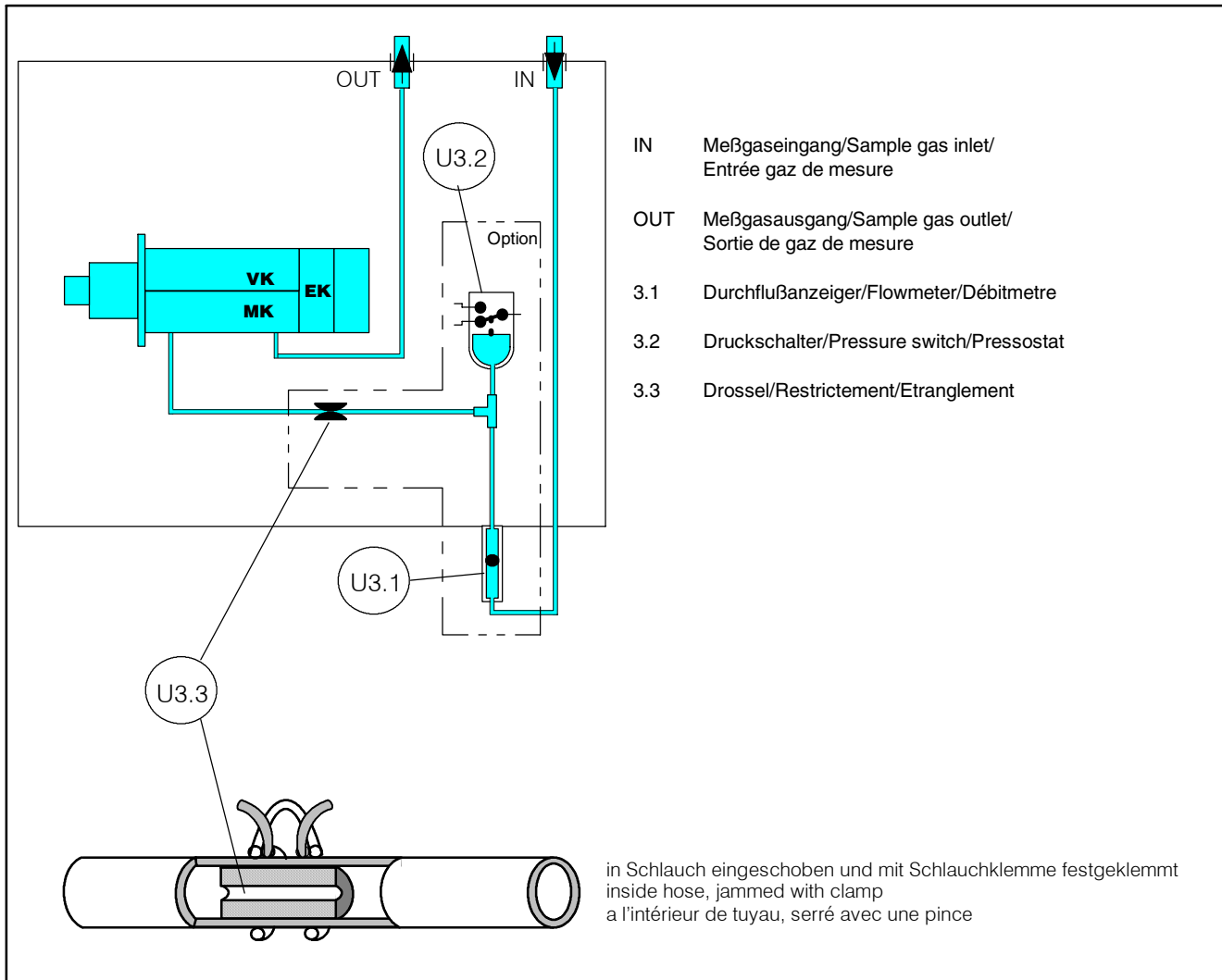
ULTRAMAT 6 (7MB2023, 7MB2024, 7MB2121, 7MB2123, 7MB2124,
7MB2028, 7MB2026, 7MB2127, 7MB2128, 7MB2126)



Bezeichnungen siehe Seite 7-44
Designation see page 7-44
Désignation voir page 7-44
ULTRAMAT 6E/F, OXYMAT 6E/F Gas Analyzers
Instruction Manual - C79000-G5276-C143-08

Meßgasweg -Schlauch-/hosing system for sample gas, hose circuit du gaz de mesure, tuyau souple

ULTRAMAT 6 (7MB2023, 7MB2024, 7MB2121, 7MB2123, 7MB2124, 7MB2028, 7MB2026, 7MB2127, 7MB2128, 7MB2126)



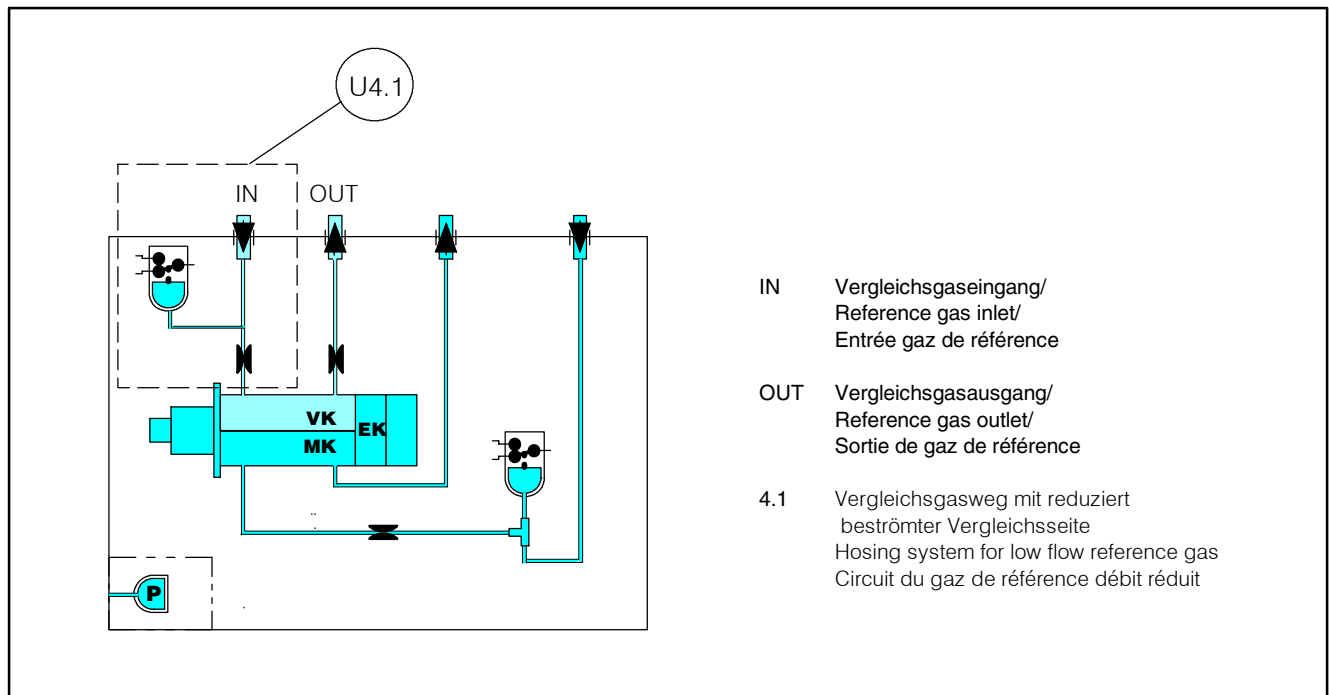
| Teil-Nr. Part No. Pièce Nr. | Bezeichnung Designation Désignation | Bestell-Nr. Order No. Nr. de référence | Bemerkungen Remarks Remarques |
|-----------------------------------|--|--|--|
| U3.1 | Strömungsmesser Flowmeter Débitmètre | C79402-Z560-T1 | |
| U3.2 | Druckschalter Pressure switch Pressostat | C79302-Z1210-A2 | |
| U3.3 | Drossel Restrictor Etranglement | C79451-A3480-C10 | befindet sich im Schlauch inside hose a l'intérieur de tuyau |

Vergleichsgasweg mit reduziert beströmter Vergleichsgasseite

Hosing system for low flow reference gas

Circuit du gaz de référence débit réduit

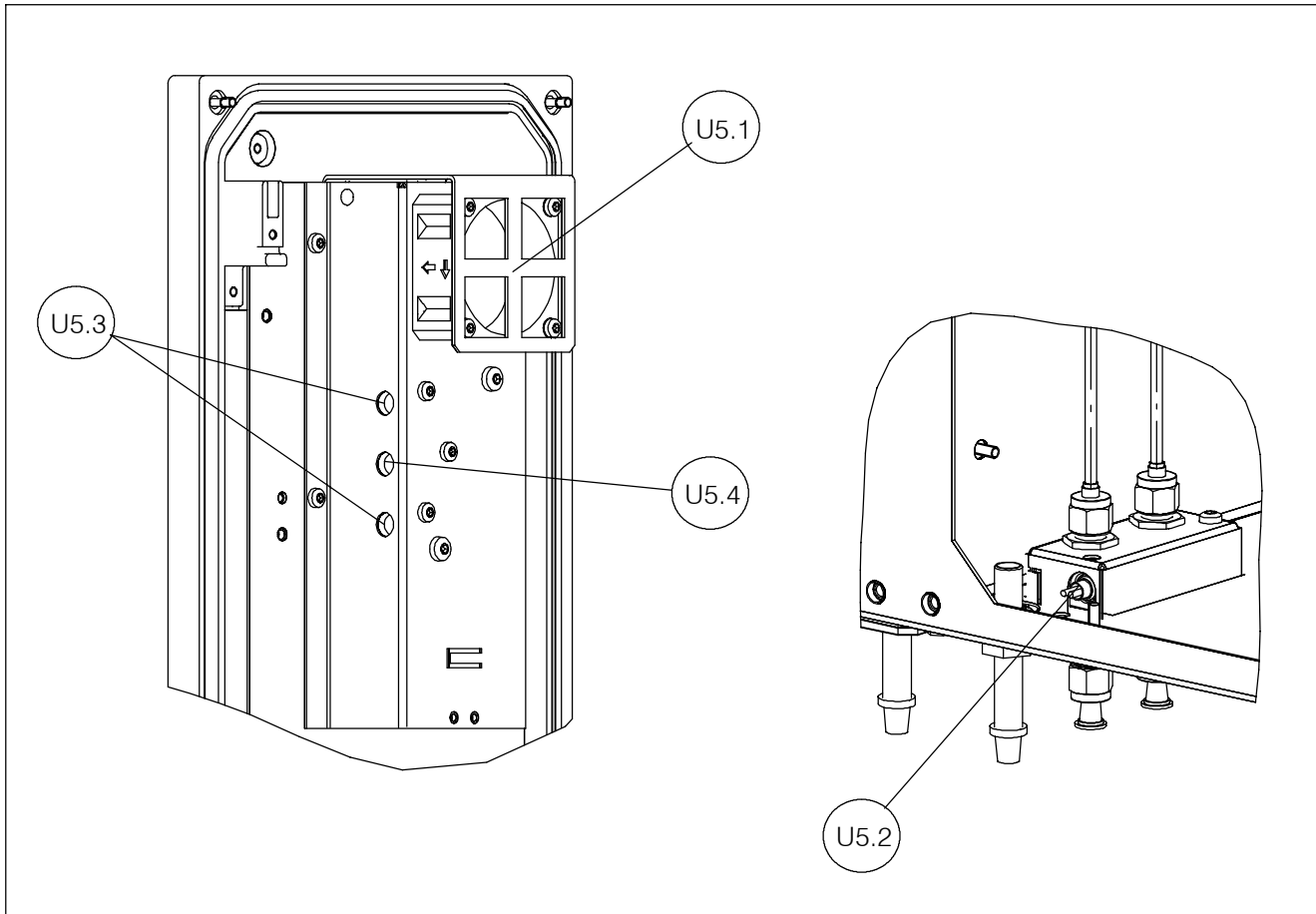
ULTRAMAT 6 (7MB2023, 7MB2024, 7MB2111, 7MB2112, 7MB2121, 7MB2123, 7MB2124)



| Teil-Nr. Part No. Pièce Nr. | Bezeichnung Designation Désignation | Bestell-Nr. Order No. Nr. de référence | Bemerkungen Remarks Remarques |
|-----------------------------------|--|--|---|
| U4.1 | Vergleichsgasweg mit reduziert beströmter Vergleichsseite Hosing system for low flow reference gas Circuit du gaz de référence débit réduit | C79451-A3478-D34 | 6 mm: 7MB2023 / 7MB2024 / 7MB2121 / 7MB2123 / 7MB2124 |
| | | C79451-A3478-D35 | 1/4" : 7MB2023 / 7MB2024 / 7MB2121 / 7MB2123 / 7MB2124 |
| | | C79451-A3526-D60 | 6 mm: 7MB2111 / 7MB2112 |
| | | C79451-A3526-D61 | 1/4" : 7MB2111 / 7MB2112 |

7.3.5 Heating

ULTRAMAT 6 (7MB2111, 7MB2112, 7MB2117, 7MB2118)



| Teil-Nr. Part No. Pièce Nr. | Bezeichnung Designation Désignation | Bestell-Nr. Order No. Nr. de référence | Bemerkungen Remarks Remarques |
|-----------------------------------|---|--|-------------------------------------|
| U5.1 | Lüfter Fan Ventilateur | W75087-A1005-A40 | |
| U5.2 | Heizpatrone Heating cartridge Cartouche chauffante | A5E00016674 | 1 Stück 1 Part 1Pièce |
| U5.3 | Heizpatrone Heating cartridge Cartouche chauffante | W75083-A1004-F120 | 1 Stück 1 Part 1Pièce |
| U5.4 | Temperatursicherung Temperature fuse Sécurité thermique | A5E00023094 | |

Appendix

8

| | | |
|-----|----------------------------------|------|
| 8.1 | List of Abbreviations | 8-2 |
| 8.2 | Returned Deliveries / Form | 8-3 |
| 8.3 | Software Release Versions | 8-5 |
| 8.4 | Parameter Lists | 8-11 |

8.1 List of Abbreviations

| | |
|------------------|--|
| A | Ampere |
| EEPROM memory | Electrically erasable programmable read-only memory |
| e.g. | for example |
| EPROM | Erasable programmable read-only memory |
| fA | Femtoampere (10^{-15} Ampere) |
| GAL | Gate array logic, can be written once |
| He | Helium |
| hPa | Hektopascal |
| H ₂ | Hydrogen |
| IC | Integrated circuit |
| k Ω | Kiloohm |
| l | Liter |
| mA | Milliampere |
| max. | Maximum |
| mbar | Millibar |
| mg | Milligram |
| min | Minute |
| min. | Minimum |
| ml | Milliliter |
| mm | Millimeter |
| m Ω | Milliohm |
| M Ω | Megohm |
| mV | Millivolt |
| m ³ | Cubic meter |
| No. | Number |
| Ω | Ohm |
| pA | Picoampere |
| pF | Picofarad |
| ppm | Parts per million |
| PTFE | Polytetrafluoroethylene (commercial name e.g. Teflon) |
| RAM | Random access memory |
| s | Second |
| V | Volt |
| vpm | Volume per million |
| ° | Degree |
| °C | Degrees centigrade |
| " | Inch (1" = 25.4 mm) |
| > | Greater than |
| < | Less than |
| \geq | Equal to or greater than |
| \leq | Equal to or less than |
| Δ | Difference |

8.2 Returned Deliveries / Form

The gas analyzer or spare parts should be returned in the original packing material. If the original packing material is no longer available, wrap the analyzer in plastic foil and pack in a sufficiently large box lined with padding material (wood shavings or similar). When using wood shavings, the stuffing should be at least 15 cm thick on all sides.

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

Please photocopy the form printed overleaf, fill in, and enclose with the returned device.

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

Addresses for Returned Deliveries

- Spare parts service**
- Please send your orders for spare parts to the following address:
SIEMENS SPA
CSC
Tel.: (00333)88906677
Fax: (00333)88906688
1, chemin de la Sandlach
F-67506 Haguenau
 - DP order form receiver: 0011E

- Repairs**
- To enable fast detection and elimination of faults, please return the analyzers to the following address until further notice:
- SIEMENS SPA
CSC
Tel.: (00333)88906677
Fax: (00333)88906688
1, chemin de la Sandlach
F-67506 Haguenau
 - DP order form receiver: 0011E

Returned deliveries form

() Repair () Guarantee

Software update: () yes () no

| | |
|--|--|
| Name of customer | |
| Address | |
| Person responsible | |
| Delivery address | |
| Telephone Fax E-Mail | |
| Address for returned delivery (if different from above) | |
| Customer (original) Order No. | |
| Siemens (original) order confirmation No. | |
| Device name | |
| MLFB No. | |
| Serial No. | |
| Designation of returned part | |
| Description of fault | |
| Process data at position of use | |
| Operating temperature | |
| Operating pressure | |
| Composition of sample gas | |
| Duration of use/ date of first use | |

| | |
|----------------------|--|
| Repair report | |
| RH Nr.: | Arrival date: Ready: Technician: |

Do not fill in this block; for internal use only

8.3 Software Release Versions

Supplied firmware versions for OXYMAT 6 (C79451-A3480-S50x):

Note: x => language version

- German/English = 1
- English/Spanish = 2
- French/English = 3
- Spanish/English = 4
- Italian/English = 5

Table 9-1 Software versions for OXYMAT 6

| Software version | Production starting | Most important new features |
|------------------|---------------------|--|
| 1.1 | 06.96 | Initial version |
| 1.2 | 11.96 | No information available |
| 1.3 | 12.96 | Slow increase/reduction in LCD voltage |
| 1.5 | 01.97 | <ul style="list-style-type: none"> • Languages revised • Layout of logbook changed • Checksum active |
| 1.8 | 04.97 | <ul style="list-style-type: none"> • Compensation can be switched on/off, and partially revised • Dual analyzer communication improved • ELAN extended |
| 2.0.0 | 10.97 | <ul style="list-style-type: none"> • Warm analyzer bypasses warming-up phase • Display without maintenance switch • Status line changed • REMOTE display as new status line <p>Please note :</p> <ul style="list-style-type: none"> • When upgrading to version V2.0.0 or later, check the parameters of the following functions: 41, 55, 76, 77, 86, 87, 108 • GAL V4 is required from V2.0.0 onwards |
| 2.1.1 | 11.97 | <ul style="list-style-type: none"> • Delay in function check now 1 second instead of 30 seconds • Function of 2P analyzer (2 motherboards) improved • Display of function 59 (select measurement points) corrected • ELAN extended |
| 2.2.0 | 12.97 | <ul style="list-style-type: none"> • ELAN commands extended |
| 2.3.2 | 03.98 | <ul style="list-style-type: none"> • Heater introduced for wall mount analyzers • Analog output improved • Broadcast telegram extended by pressure value • ELAN extended and improved |
| 3.0.0 | 07.98 | <ul style="list-style-type: none"> • Selection of cross-interference and pressure correction changed • Maintenance requests and faults revised • Resolution of analog current output increased • ELAN improved |
| 3.0.1 | 08.98 | <ul style="list-style-type: none"> • ELAN improved |

Table 9-1 Software versions for **OXYMAT 6** (continued)

| Software version | Production starting | Most important new features |
|------------------|---------------------|---|
| 4.0.1 | 05.99 | <ul style="list-style-type: none"> • Dynamic response improved (0.5 % to 100 % O₂) ! • Phase adjustment improved • TC follow-up compensation revised • Logbook recording improved • Fct 76 - fault suppression - improved • Measuring-point switchover active following on/off • Fct 70 - analog output - modified according to NAMUR |
| 4.1.0 | 07.00 | <ul style="list-style-type: none"> • PROFIBUS card can be connected • Binary inputs extended |
| 4.2.0 | 09.00 | <ul style="list-style-type: none"> • Banking for 2 languages implemented • Full-scale value/sag calibration with Newton • New AK linearization • Software version identification added • Autocal check added |
| 4.3.0 | 05.01 | <ul style="list-style-type: none"> • New mode of operation included: Menu cannot be exited as long as an input sequence is being executed. Cancellation of input sequence, and exiting of menu, then carried out by pressing key F5 • Parameterizable response of binary inputs according to NAMUR • New binary input "Measuring protection" • The calibration is aborted when a fault occurs • Suppression of output of negative values |
| 4.3.4 | 07.01 | <ul style="list-style-type: none"> • Abort ACAL/check with fault; acknowledgeable error message S15 with entry in logbook |
| 4.5.0 | 08.03 | <ul style="list-style-type: none"> • Parameterized transmission via ELAN added • 24-hour RAM/flash check • Mains frequency measurement • Modifications in menu "ACAL/check cycle time" • Universal code modified |
| 4.6.0 | 03.05 | <ul style="list-style-type: none"> • Analog output: suppression of overshoots when changing the measuring range • Improvement in 24 h RAM/FlashPROM check • Measuring head on/off removed in <i>Function 52</i> |

Table 9-2 Software versions for **ULTRAMAT 6**

| Software version | Production starting | Most important new features |
|-------------------------|----------------------------|--|
| 4.0.1 | 05.99 | <ul style="list-style-type: none"> • Phase adjustment improved • TC follow-up compensation revised • Logbook recording improved • Fct 76 - fault suppression - improved • Measuring-point switchover active following on/off • Freely-selectable gas names • Fct 70 - analog output - modified according to NAMUR • Pressure switches for sample and reference gases separated |
| 4.1.0 | 07.00 | <ul style="list-style-type: none"> • PROFIBUS card can be connected • Binary inputs extended |
| 4.2.0 | 09.00 | <ul style="list-style-type: none"> • Banking for 2 languages implemented • Full-scale value/sag calibration with Newton • New AK linearization • Software version identification added • Autocal check added |
| 4.3.0 | 05.01 | <ul style="list-style-type: none"> • Measured-value processing with suppressed zero • New mode of operation included: Menu cannot be exited as long as an input sequence is being executed. Cancellation of input sequence, and exiting of menu, then carried out by pressing key F5 • Parameterizable response of binary inputs according to NAMUR • New binary input "Measuring protection" • Different start-of-scale values • The calibration is aborted when a fault occurs • Suppression of output of negative values |
| 4.3.4 | 07.01 | <ul style="list-style-type: none"> • same as OXYMAT 6 |
| 4.5.0 | 08.03 | <ul style="list-style-type: none"> • same as OXYMAT 6 |
| 4.6.0 | 03.05 | <ul style="list-style-type: none"> • Analog output: suppression of overshoots • Improvement in 24 h RAM/FlashPROM check |

Please note when upgrading:

- Firmware from V1.1 onwards requires a PCB of version 2 or later.
- Firmware from V2.0.0 onwards requires GAL of version 2 or later.
- Operation in a wall mount housing (with or without heater) requires a PCB of version 5 or later (**ULTRAMAT 6**) or version 4 or later (**OXYMAT 6**).
- Operation of a heater requires firmware from V3.0.0 onwards (**ULTRAMAT 6**) or V2.3.2 onwards (**OXYMAT 6**).
- When upgrading an analyzer with firmware < V2.0.0 to firmware V2.0.0 or onwards, check the parameters of the functions 41, 55, 76, 77, 86, 87, 108.
- A boot of version 2 or later (displayed version number 2.5) is required for reliable downloading.
- Firmware from V3.1.0 onwards is required for operation with the PC program "SIPROM GA".
- Firmware from V3.0.0 onwards is required for operation of an option card with serial interface for automotive industry AK (C79451-A3474-B61).
- Firmware from V3.0.0 onwards is required for operation of an adapter board LCD/TAST (see spare parts list) of version 2 or later.
- With **OXYMAT** analyzers with software versions V1.5 and older, the TK zero is executed using LogX and LogY, subsequently using LogV with a different polynomial. The coefficients are therefore completely different, and may have to be redetermined.
- **Caution:** when replacing the chopper motor (the new ones are without a temperature sensor), the analyzer must have software V3.0.3 (15.01.99) or later.
- If an analyzer with firmware prior to **V3.0.0** is provided with more recent firmware, "Save user data" (function 75) and "Save factory data" (function 106) must be carried out following replacement of the firmware and possible correction of certain data (the data blocks contain a checksum).
Caution: "Load user data" or "Load factory settings" (function 75) following replacement of the firmware may possibly delete all data.

General:

- In the case of data set problems following a power failure, the analyzer can be set to a valid status again by downloading a saved data set (e.g. function 75 "Load user data").
The analyzer must then be recalibrated.
- If the analyzer does not start following replacement of the PCB (display lights up, but no characters), check the inscription on the CPU. If "SAB 80C166 M DA" is present, you must use boot software of version 3 or later, and firmware of version 3.0.0 or later.

8.4 Parameter Lists

| Fct. No. | Function description | Parameter list/ analyzer settings | | Range/ switching status | Typical value/ setting |
|----------|--------------------------------|--|---|----------------------------|---------------------------|
| 22 | Setpoints for zero/sensitivity | Zero | | -1 ... 100 % | 0% |
| | | Sensitivity | | -1 ... 100 % | 20.95 % |
| 23 | Single/total calibration | | | | Total calibration |
| 24 | Autocal/check | Operating mode | Autocal/check | | Off |
| | | | Start via cycle | | Off |
| | | | Start via binary input | | |
| | | Sequence | | | Application-dependent |
| | | Cycle parameter | Time from Autocal to Autocal (cycle time) | 1 ... 500 h | Application-dependent |
| | | | Time up to first Autocal | 0 ... 30000 min | Application-dependent |
| | | | Adjustment with calibration gas at x-th cycle | 01 ... 99 | Application-dependent |
| | | Autocal/check | Calibration tolerance for zero | 0 ... 99 % | Application-dependent |
| | | | Calibration tolerance for sensitivity | 0 ... 99 % | Application-dependent |
| | | | Trigger Autocal via cycle | On/off | Off |
| 40 | Select range | | | Direct or automatic | Automatic |
| 41 | Define range | Measuring range 1 | | -1 ... 100 % | 0.000 ... 2.000 % |
| | | Measuring range 2 | | -1 ... 100 % | 0.000 ... 5.000 % |
| | | Measuring range 3 | | -1 ... 100 % | 0.000 ... 10.000 % |
| | | Measuring range 4 | | -1 ... 100 % | 0.000 ... 25.000 % |
| 50 | El. time constant | Bandwidth | | 0 ... 100 % | 6 % |
| | | Time constant within bandwidth | | 0 ... 300 s | 10 s |
| | | Time constant outside bandwidth | | 0 ... 300 s | 1 s |
| 51 | Limits | Limit 1 | Upward/downward violation | Upward/downward violation | Upward violation |
| | | | Assignment of measuring range | 1 ... 4 | 1, 2, 3, 4 |
| | | | Limit monitoring | On/off | Off |
| | | Limits 2 ... 4 | Limit monitoring | On/off | Off |
| 52 | On/off function | Autoranging | | On/off | On |
| | | Save measured value | | On/off | Off |
| | | Pressure compensation | | On/off | Off |
| | | Linearization | | On/off | Off |
| | | Temperature compensation for zero | | On/off | Off |
| | | Temperature compensation for sensitivity | | On/off | Off |
| | | Signaling of tolerance violation | | On/off | Off |

| Fct. No. | Function description | Parameter list/ analyzer settings | | Range/ switching status | Typical value/ setting |
|----------|--------------------------------|--|--------------------------------|----------------------------|---------------------------|
| 52 | On/off function (continued) | Limit monitoring 1 ... 4 | | On/off | Off |
| | | Suppression of negative measured values | | On/off | Off |
| | | Automatic calibration | | On/off | Off |
| | | Total calibration | | On/off | On |
| | | Disable logbook | | On/off | Off |
| | | Check sample gas flow | | On/off | Off |
| | | Check reference gas flow | | On/off | On |
| | | Suppression of negative measured values | | On/off | Off |
| | | Fault/Maint.A/ CTRL NAMUR | | On/off | On |
| | | Suppression of negative measured values on display | | On/off | Off |
| | | Measuring head heater | | On/off | On |
| 53 | Status messages | Display automatic calibration (CAL) | | On/off | Off |
| | | Display storing of measured value (STO) | | On/off | Off |
| | | Display limit (LIM) | | On/off | Off |
| | | Display autorange (AR) | | On/off | On |
| | | Display function control (CTRL) | | On/off | On |
| 54 | Measured- value display | Period 10 min | | 10 min ... 24 h | 10 min |
| | | | Parameter | | |
| | | | Optimum measured-value display | On/off | On |
| | | | Measuring range 1 ... 4 | On/off | Off |
| 56 | Measured value display | Suppression of negative measured values | | On/off | Off |
| | | Automatic | | On/off | On |
| | | Number of digits | | 3 ... 5 | Automatic/manual |
| 57 | Magnetic field frequency | Frequency | | 7 ... 11 Hz | 8.095 |
| | | Basic setting | | 7 ... 11 Hz | 8.095 |
| 58 | Date/time | Date | | | Enter date |
| | | Time | | | Enter time |
| 59 | Switch over channel | Channel 1 ... 6 | | 0 ... 60000 min | 0 min |
| | | Switch over channel | | On/off | Off |
| 61 | Vibration compensation | Gain factor | | 0 ... 100 % | 0 % |
| 70 | Analog output | Selection of analog output | | 0/2/4/NAMUR | NAMUR 4 - 20 mA |
| | | Output inverted | | On/off | Off |

| Fct. No. | Function description | Parameter list/ analyzer settings | | Range/ switching status | Typical value/ setting |
|----------|----------------------------------|--|---------------------------------|------------------------------|-------------------------------|
| | | Suppression of negative measured values | | On/off | Off |
| 70 | Relay assignment | R1 ... R6 (only motherboard) | | Free assignment | See function 71 |
| 71 | Binary inputs | Fault/maint.A/ CTRL NAMUR | | On/off | On |
| | | Define binary input | | On/off | See function 72 |
| 73 | ELAN configuration | Channel address | | 01 ... 12 | 01 |
| | | Measured-value telegram | | On/off | On |
| 76 | Fault suppression | Suppression duration for fault | | 0 ... 5 s | 0 s |
| | | Threshold | | 1 ... 100 % | 12 % |
| 77 | Store | 1st possibility | Analog output to measured value | On/off | Off |
| | | 2nd possibility | Analog output to 0/2/4 mA | On/off | On |
| | | 3rd possibility | Analog output to 21 mA | On/off | Off |
| | | Store | | On/off | Off |
| 78 | Calibration tolerance | Calibration tolerance for zero | | 0 ... 99 % | 6 % |
| | | Calibration tolerance for sensitivity | | 0 ... 99 % | 6 % |
| 79 | Change codes | Level 1 | | 0 ... 999 | 111 |
| | | Level 2 | | 0 ... 999 | 222 |
| 81 | Language | 1st possibility | German | On/off | On |
| | | 2nd possibility | English | On/off | Off |
| 82 | Pressure correction | Using internal pressure sensor | | External via analog output 2 | With internal pressure sensor |
| | | | | External via ELAN | |
| | | | | Internal pressure sensor | Off |
| | | Pressure offset | | -100 ... 100 hPa | 0 hPa |
| 83 | Correction of cross-interference | No correction of cross-interference | | | Selected |
| | | With constant influence of interfering gas | | | |
| | | With variable influence of interfering gas, analog | | | |
| | | With variable influence of interfering gas, ELAN | | | |
| 84 | Phase adjustment | ϕ | | 0 ... 360 ° | 35 ° |
| 85 | Switch valves | See function 71 - relay assignment | | | |

| Fct. No. | Function description | Parameter list/ analyzer settings | | Range/ switching status | Typical value/ setting |
|----------|---|--|-------------------------------|----------------------------|---------------------------|
| 86 | Linear temperature compensation | Additional compensation of zero | Temperature compensation | On/off | On |
| | | | TM | -999 ... 999 °C | 35 °C |
| | | | Decrease Δ temperature | -99 ... 99 °C | 10 °C |
| | | | Increase Δ temperature | -99 ... 99 °C | 10 °C |
| 86 | Linear temperature compensation (continued) | Additional compensation of measured value | Temperature compensation | On/off | Off |
| | | | TM | -999 ... 999 °C | 35 °C |
| | | | Decrease Δ temperature | -99 ... 99 °C | 10 °C |
| | | | Increase Δ temperature | -99 ... 99 °C | 10 °C |
| 87 | Fault on/off | S 1 - S 16 | | On/off | On |
| | | W 1 ... W 10 | | On/off | On |
| | | LIM - CTRL | | On/off | On |
| 89 | Heater (only field device) | Heater | | On/off | On |
| | | Setpoint temperature for measuring chamber | | 65 ... 130 °C | 65 °C |
| 107 | LIM | Factory function, not accessible to user | (only gas warning equipment) | | 20/ON ... 00/OFF |
| | | | (standard equipment) | | 00/ON ... 00/OFF |
| | | | | | |

Please remove and store in a safe place!

| Fct. No. | Function description | Analyzer settings - parameter list | Range/switching status | Typical value/setting |
|----------|----------------------|------------------------------------|--------------------------------|-----------------------|
| 79 | Change codes | Level 1 | 0-999 | 111 |
| | | Level 2 | 0-999 | 222 |
| | | Universal code for levels 1 and 2 | Cannot be changed | 301 |
| | | Factory setting | Cannot be changed | |
| | | | Access code to factory setting | |

Please detach, supplementary sheet for Section 8.4

If code 1 or 2 is no longer known

Universal code: 301

Bypassing of warming-up time

2 0 0 6 ENTER

Delete logbook

5 5 5 5 ENTER

| | |
|----------------------|---------------------|
| Order No. (MLFB No.) | Serial No. (F-Nr.): |
|----------------------|---------------------|

Please read Order No. and Serial No. by calling Function 1 (manufacturing data) and enter here (also important for returned deliveries form).



C79000-G5276-C143



40191694128285

C79000-G5276-C143-08

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