ULTRAMAT 23

Gas analyzer for IR-absorbing gases and oxygen

7MB2335, 7MB2337, 7MB2338

Operating Instructions · 09/2009

Continuous Gas Analysis

SIEMENS

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ULTRAMAT 23

**Gas Analyzer For IR-absorbing Gases And Oxygen
7MB2335, 7MB2337, 7MB2338
Operating Instructions**

**Order No.: C79000-B5276-C216
Version 09/2009**

Contents

Information for the User

1

Dear Customer,

Please read these instructions before you start work!
It contains important information and data whose observance will guarantee correct functioning of the analyzer and also save you servicing costs. The information will significantly help you when using the equipment and will lead to reliable results.

☞ **Notice**

We recommend that you discuss your application with our specialist department, especially before using the analyzer for new applications, for example in research and development.

1.1 General Information

The product described in this instructions 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 instructions contains the information required for approved use of the product described in it. The instructions 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 instructions 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 instructions and to apply them to the specific case.

This instructions is included in the delivery of the analyzer, even if separate ordering has been made possible for logistic reasons. For clarity reasons this instructions 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 instructions, help can be requested through your local Siemens office or representative.

1.2 Notes on Using this Instructions

This instructions 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 Section 1.3).

1.3 Danger Information

Safety information and warnings serve to prevent danger to the life and health of users or maintenance personnel or to prevent damage to property and are emphasized in this instructions by the terms defined here. They are additionally identified by warning symbols (pictograms). The terms used in this instructions 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 warning triangle means that slight personal injury **can occur** if the appropriate safety precautions are not observed.

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

Attention
means that an undesirable event or state can occur if the appropriate safety precautions are not observed.

Notice

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

1.4 Approved Use

Approved use in the sense of this instructions 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 instructions) and only in conjunction with other devices and components which have been recommended or approved of by Siemens.

The product described in this instructions 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.

Correct and safe operation of this analyzer is additionally dependent on proper transport, storage, installation and assembly, as well as careful operation and maintenance.

Warning

This analyzer is an electrical unit. Following removal of the housing or guard, or after opening the system cabinet, certain parts of the device/system are accessible which may carry dangerous voltages. Therefore only suitably qualified personnel may work on this device. These must be thoroughly acquainted with all sources of danger and the maintenance measures as described in this instructions.

Notice

The desktop version of this analyzer has **also** been tested according to the DIN EN 61010-2-081 standard (safety directives for electrical measuring, control and laboratory devices)

The 19" rack unit of this analyzer has **not** been tested as a laboratory device according to the DIN EN 61010-2-081 standard (safety directives for electrical measuring, control and laboratory devices).

1.5   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 instructions 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 instructions 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 instructions 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.

1.6   Warranty Information

Your attention is drawn to the fact that the contents of this instructions 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. These warranty conditions in the contract are neither extended nor limited by the contents of this instructions.

1.7   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 Nos. on the rating plates (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 9.1.

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   Conformity with European Guidelines

CE symbol

$\mathsf{C}\,\mathsf{E}$

EMC guideline

The ULTRAMAT 23 gas analyzer complies with the requirements of the EU guideline 89/336/EEC "Electromagnetic compatibility". Observation of this EU guideline has been checked according to DIN EN 61326-1 2006.

Low voltage guideline

The ULTRAMAT 23 gas analyzer complies with the requirements of the EU guideline 72/23/EEC "Low-voltage guideline". Observation of this EU guideline is checked according to DIN EN 61010-1.

Declaration of conformity

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

    Siemens Aktiengesellschaft
    Automation and Drives Group
    I IA SC PA
    Östliche Rheinbrückenstraße 50

    D-76187 Karlsruhe
    Germany

Installation Guidelines

2

2.1   Safety Information

Warning

Certain parts in this analyzer carry dangerous voltages. The housing must be closed and earthed before switching on the analyzer.

Warning

The analyzer must not be used in hazardous areas. Explosive gas mixtures (e.g. flammable gases together with air or oxygen in a potentially explosive ratio) must not be measured.

Warning

if the sample gas could contain flammable components above the lower explosion limit (LEL), the analyzer version 'Gas path as pipe' is required (see chapter 8.4).

Warning

The gas path must be checked for leaks at regular intervals depending on the corrosivity, toxicity and flammability of the sample gas. When measuring toxic or corrosive gases, it may occur that sample gas collects within the analyzer as a result of leaks in the gas path. To prevent the danger of poisoning or the damaging of analyzer components, the analyzer or system must be purged with inert gas (e.g. nitrogen). The gas displaced by purging must be collected using an appropriate assembly and routed for environment-friendly disposal via an exhaust line.

FM/CSA Class I Div. 2 , ATEX Zone 2

The follwoing safety and warning notes apply to all devices, which are operated according to FM/CSA Class I Div. 2 (hazard locations) and ATEX zone 2:

Warning

Exposure to some chemicals may degrade the sealing properties of materials used in the following devices:

- Relais on mainboard: W79052-K5001-C5; manufacturer: Axicom, part V23026-A1001-B20
- IR-Radiation Source: C79451-A3468-B205 or 206; manufacturer: Siemens AG

⚠

Explosion hazard

Do not disconnect equipment when a flammable or combustible atmosphere is present.

Do not remove or replace lamps or fuses unless power has been disconnected or when a flammable or combustible atmosphere is present.

Failure to observe these safety instructions may result in death, severe personal injuries and or substantial damage to property and environment.

ATEX Zone 2 ULTRAMAT 23 Type 7MB2335, 7MB2337 and 7MB2338 must be installed in a suitable enclosure in accordance with EN 60079-15, taking into account all environmental conditions under which the equipment will be used.

When the temperature under rated conditions exceeds 70 °C at the cable or conduit entry point, or 80 °C at the branching point of the conductors, the temperature specification of the selected cable must be in compliance with the actual measured temperature values.

Provisions must be made to prevent the rated voltage from being exceeded by transient disturbances of more than 40%.

2.2   Assembly instructions

- A location should be selected which is as free as possible from vibration. The permissible ambient temperature must be observed during operation.

- The ULTRAMAT 23 must be placed on supporting rails if it is to be fitted in a cabinet or benchtop housing. Assembly only at the front is insufficient because the weight of the analyzer would place too great a load on the chassis.

- The heat sink on the rear panel must be unrestricted to permit appropriate air circulation.

2.3   Gas Connections and Internal Gas Paths

Sample gas line

A pipe with an outer diameter of 6 mm or 1/4" is present as the gas connection.

Materials to be used: must be suitable for the respective measurement.

If the sample gas is to flow into a collective exhaust line, observe the following points:

- The exhaust line must be free of rapid changes in pressure. If this is not possible, either use a separate exhaust line or

- fit a damping vessel (> 1 l) between the analyzer and the exhaust line.

- The exhaust line should always be routed with a falling gradient since water make condense in it.

Paths for AUTO-CAL/zero gas

The corresponding gases must be sucked in via a fine filter. The amount of the measured gas component must be negligibly small in the AUTOCAL gas (zero gas). In particular when carrying out an AUTOCAL for CO_2 ranges < 3 %, the air must be routed via a CO_2 absorber (e.g. soda lime).

Path for chopper section purging

With certain CO_2 ranges (see Section 3), the chopper section is purged with clean nitrogen or CO_2 free synthetic air at an inlet pressure of 300 to 350 kPa.

Path for pressure sensor

The internal atmospheric pressure sensor is routed to connection 6 in the 19" rack version via a hose. It is therefore possible to connect the pressure sensor (e.g. when using analyzer cabinets or houses) such that it is guaranteed that only changes in atmospheric pressure are recorded.

Gas connections and gas paths

Refer to the Technical Description (Chapter 3) in this Manual.

2.4   Gas Conditioning

The sample gas must be sufficiently conditioned to prevent contamination of the parts through which it flows. The ULTRAMAT 23 is usually preceded by

*   a gas sampling device with filter,

*   a sample gas cooler,

*   an analysis filter (1-2 μm) and

*   an external gas suction pump (with sample gas lines > 20 m)

(see Fig. 2.1).

☞   **Notice**

With the analyzer version with pipe 1.4571, there is **no** safety filter and **no** condensation trap in the internal gas path. Therefore correct gas preparation must always be ensured!

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

1	Gas sampling probe
2	Gas coolert
3	Analyzer filter
4	Sample gas pump (option)
5	Flow regulator (option)
6	Gas outlet
7	AUTOCAL/zero gas supply
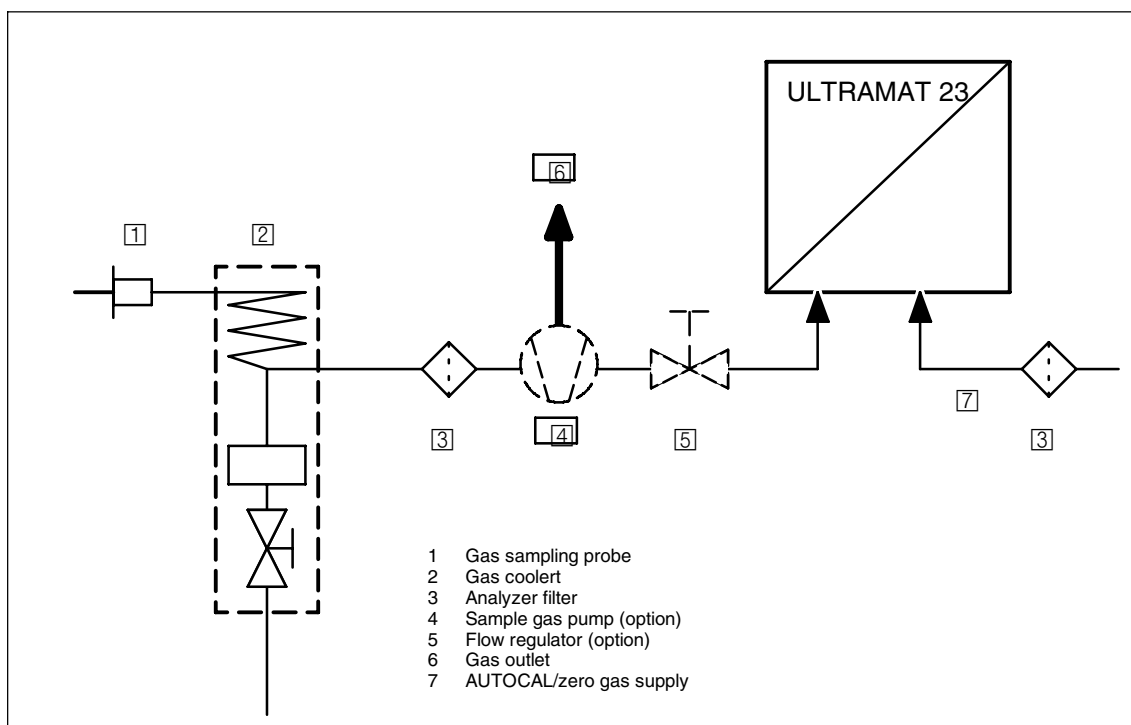
Fig. 2-1   Gas conditioning

2.5 Electric Connection

Warning

The following must be observed during the electric installation:

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

The failure to observe the standards may result in death, personal injury and/or damage to property.

2.5.1 Power Supply Connection

The analyzer is supplied with a power cable which must only be connected by qualified personnel (see Section 1.5). The cable is connected at the device end to the appliance plug. At the power supply end, the cable is inserted into a mains outlet.

19" rack analyzer

If the supplied power cable cannot be used, a flexible cable suitable for the power supply must be used. The cross-section of each conductor must be at least 1 mm^2. The cross-section of the PE conductor must not be less than that of the L and N conductors. The cable must be suitable for a temperature of at least 70 °C. It must be approved for the country of use or the location.
A readily accessible facility for mains disconnection must be provided in the immediate vicinity of the analyzer.

Bench top analyzer

A power supply cable must be used which is approved for the country of use or the location. The minimum cross-section of each conductor must be at least 0.75 mm^2, the maximum length for this cross-section is 2 m. Longer cables require larger conductor cross-sections than 0.75 mm^2. The cable must be suitable for a temperature of at least 70 °C. When positioning the analyzer, make sure that the power switch on the rear is accessible at all times.

Check that the local mains voltage agrees with that specified on the rating plate on the analyzer.

2.5.2 Connection of Signal Cables

RC elements must be connected according to Fig. 2-2 as a measure to suppress the generation of sparks across the relay contacts (e.g. limit relays). Note that the RC element results in a drop-out delay for an inductive component (e.g. solenoid valve). The RC element should therefore be dimensioned according to the following rule-of-thumb:

$R = R_L/2; \ C = 4L/R^2_L$.

The following are usually sufficient: $R = 100 \ \Omega$ and $C = 200$ nF.

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

When using direct current, it is possible to fit a spark suppression diode instead of the RC element.
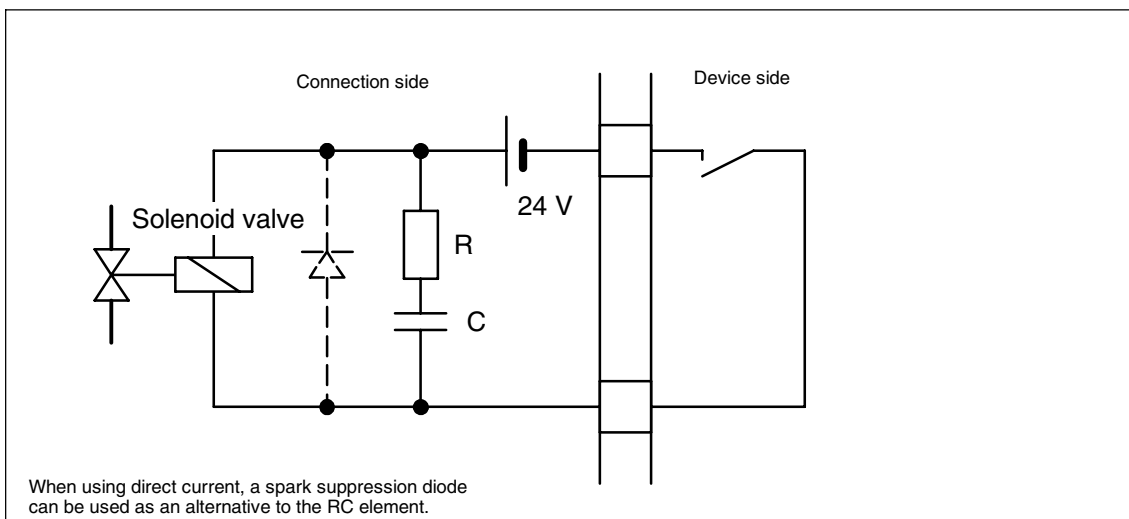
Fig. 2-2   Measure to suppress sparks on a relay contact

The reference ground of the analog inputs is the housing potential.

The analog outputs are floating, but have a common negative pole.

The input/output cables must be connected to the corresponding trapezoidal plug (SUB-D plug) according to the pin assignment diagrams (see Chapter 3, Technical Description, pages 3-23 and 3-24). The conductor cross-section should be ≥ 0.5 mm^2. The interface cable must not be longer than 500 m.

☞   **Notice**

The cables (apart from the mains cable) must be screened, and their screen must be screen connected at both ends to ground.

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

Technical Description

3

3.1 General
3.1.1 Overview

The ULTRAMAT 23 gas analyzer can measure up to 4 gas components at once: A maximum of three infrared sensitive gases such as CO, CO_2, NO, SO_2, CH_4 plus O_2 with an electrochemical oxygen measuring cell.

ULTRAMAT 23 basic versions for:

- 1 infrared gas component with/without oxygen measurement
- 2 infrared gas components with/without oxygen measurement
- 3 infrared gas components with/without oxygen measurement.

ULTRAMAT 23

3.1.2 Benefits

- AUTOCAL with ambient air
  (depends on measured component)
  High efficiency so no calibration gas and accessories required
- High selectivity by multiple layer detectors, small cross sensitivity e.g. to water vapor
- Easy to clean sample cells,
  reduced maintenance cost
- Menu-assisted operation in plain text
  operation control without manual, high operational safety
- Service information and log book,
  preventive maintenance; help for service and maintenance personnel, cost reduction
- Coded operator level against unauthorized access, increased safety
- Open interface architecture (RS 485, RS 232; PROFIBUS, SIPROM GA);
  simplified process integration, remote control.

3.1.3 Applications

Application areas

- Optimization of small firing systems
- Monitoring of exhaust gas concentration from firing systems with all types of fuel (oil, gas and coal) as well as operational measurements with thermal incineration plants
- Room air monitoring
- Monitoring of air in fruit stores, greenhouses, fermenting cellars and warehouses
- Monitoring of process control functions
- Atmosphere monitoring during heat treatment of steel
- For use in non-potentially explosive atmospheres.

Further applications

- Environmental protection
- Chemical plants
- Cement industry.

Special applications

The ULTRAMAT 23 with 2 IR components without pump is also available with two separate gas paths. This allows the measurement of two measuring points as used e.g. for the NO_x measurement before and after the NO_x converter.

The ULTRAMAT 23 gas analyzer can be used in emission measuring systems and for process and safety monitoring.

TÜV-approved versions of the ULTRAMAT 23 are available for measurement of CO, NO, SO_2 and O_2 according to 13. BImSchV 27.BImSchV, 30.BImSchV (N_2O) and TA Luft.

Smallest TÜV-approved and permitted measuring ranges:

- 1- and 2-component analyzer
  - CO: 0 to 150 mg/m^3
  - NO: 0 to 250 mg/m^3
  - SO_2: 0 to 400 mgm^3
- 3-component analyzer
  - CO: 0 to 250 mg/m^3
  - NO: 0 to 400 mg/m^3
  - SO_2: 0 to 400 mg/m^3

All larger measuring ranges are also permitted.

In addition, the TÜV-approved versions of the ULTRAMAT 23 fulfill the requirements according to EN 14956 and QAL 1 according to EN 14181. Conformity of the analyzers with both standards has been certified by the TÜV. The analyzer drift according to EN 14181 (QAL 3) can be carried out manually or by PC using the SIPROM GA maintenance and servicing software. In addition, certain manufacturers of emission evaluation computers offer the possibility for reading the drift data out of the analyzer over its serial interface and automatically logging and processing it in the evaluation computer.

- Version with faster response time
  The connection between the two condensation traps is provided with a plug so that the complete flow passes through the measuring cell (otherwise only 1/3 of the flow), i.e. the response time is 2/3 faster. All other components retain their function.
- Chopper section purging: consumption 100 ml/min
  (inlet pressure setting: ca. 3 000 hPa)

3.2 Design

- 19" unit with 4 HU for installation
  - in swing frame
  - in cabinets, with or without slide rails
- Flowmeter for sample gas on front panel (not in version with pipes);
  Option: integrated sample gas pump (standard for bench-top version)
- Gas connections for sample gas input and output as well as combustion gas and combustion air, pipe diameter 6 mm or ¼"
- Gas and electrical connections at the rear (portable version: sample gas inlet at front).

Display and control panel

- Operation according to NAMUR recommendation
- Simple, fast programming and commissioning of analyzer
- Large, backlit LCD for measured values
- Menu-based inputs for programming, test functions and calibration
- Washable membrane keypad
- User help in plain text

- Multi-language operation software.

Inputs and outputs

- Three binary inputs for sample gas pump On/Off, triggering of AUTOCAL and synchronization of several devices
- Eight relay outputs can be freely configured for fault, maintenance request, maintenance switch, limits, range identification and external solenoid valves
- Eight additional relay outputs as an option
- Eight additional binary inputs as an option
- Electrically isolated analog outputs.

Communication

- RS 485 present in basic unit (connection from the rear).

Options

- Converter to RS 485/USB
- Converter to TCP/IP Ethernet
- Incorporation in networks via PROFIBUS DP/PA interface
- SIPROM GA software as service and maintenance tool.

LED backlit display; brightness adjustable via menu

Dimension freely selectable (ppm, vpm, mg/m^3, %)

One line per component for measured value, dimension and component name

Two columns reserved for status displays

Immediate return to measurement mode

CAL key to start AUTOCAL with ambient air or N_2 or air without CO_2

Switch internal pump on and off; pump flowrate adjustable via menu

Scroll back in menu or cancel an input

↑↓ → Keys for menu control; increasing/decreasing numerical values

ENTER key to call the main menu or to save entered values

Executions of the wetted parts

Gas path		19" unit	Desktop unit
With hoses	Condensation trap/gas inlet	-	PA (polyamide)
	Condensation trap	-	PE (polyethylene)
	Gas nipples 6 mm	PA (polyamide)	PA (polyamide)
	Gas nipples ¼"	SS, type No. 1.4571	SS, type No. 1.4571
	Hose	FPM (Viton)	FPM (Viton)
	Pressure switch	FPM (Viton) + PA6-3-T (Trogamide)	FPM (Viton) + PA6-3-T (Trogamide)
	Flowmeter	PDM/Duran glass/X10CrNiTi1810	PDM/Duran glass/X10CrNiTi1810
	Elbows/T-pieces	PA6	PA6
	Internal pump	PVDF/PTFE/EPDM/FPM/Trolene/ SS, type No. 1.4571	PVDF/PTFE/EPDM/FPM/Trolene/ SS, type No. 1.4571
	Solenoid valve	FPM70/Ultramide/1.4310/1.4305	FPM70/Ultramide/1.4310/1.4305
	Safety reservoir	PA66/NBR/PA6	PA66/NBR/PA6
	Sample cell		
	• Body	Aluminium	Aluminium
	• Cell lining	Aluminium	Aluminium
	• Stub	SS, type No. 1.4571	SS, type No. 1.4571
	• Window	CaF2	CaF2
	• Adhesive	E353	E353
	• O-ring	FPM (Viton)	FPM (Viton)
With pipes	Gas nipples (6 mm / ¼ ")	SS, type No. 1.4571	
	Pipes	SS, type No. 1.4571	
	Sample cell		
	• Body	Aluminium	
	• Cell lining	Aluminium	
	• Stub	SS, type No. 1.4571	
	• Window	CaF2	
	• Adhesive	E353	
	• O-ring	FPM (Viton)	

ULTRAMAT 23 also available as bench-top unit:
● 2 handles on top cover
● 4 rubber feet for setting up
● No mounting frame

80-digit display
(4 lines/20 characters)

Also available
with slide rails

Dust-tight and washable
membrane keypad

Flowmeter in conjunction with
pressure switch for monitoring
the sample gas flow

Gas and electrical
connections on rear
panel (portable version
simple gas at front)

Control keys
for menus

Optional O$_2$ sensor,
removable from front

3 function keys for
measurement, pump On/Off
and AUTOCAL

ULTRAMAT 23, design

Gas path

Key to gas path figures

1	Inlet fo sample gas/ calibration gas	9	Safety fine filter
2	Gas outlet	10	Solenoid valve
3	Inlet for AUTOCAL/zero gas or	11	Sample gas pump
	Inlet for sample gas/ adjusting gas (channel 2)	12	Pressure switch
4	Gas outlet (channel 2)	13	Flowmeter
5	Enclosure flushing	14	Infrared measuring cell
6	Inlet atmospheric pressure sensor	15	Safety condensate trap
7	Inlet/chopper compartment flushing	16	Oxygen measuring cell
8	Condensation trap with filter	17	Atmospheric pressure sensor
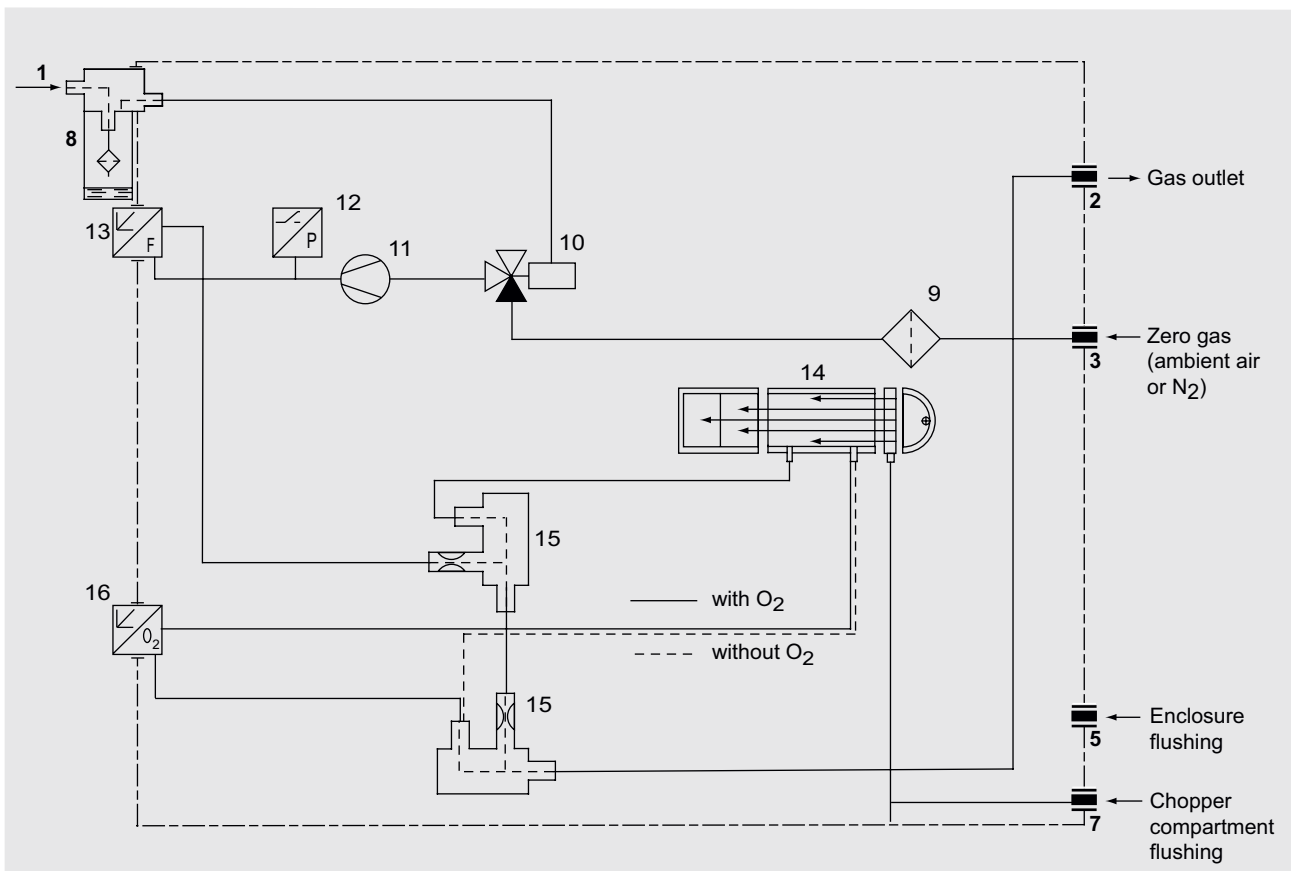
ULTRAMAT 23, portable, in sheet-steel housing with internal sample gas pump, condensation trap with safety filter on front panel, optional oxygen measurement
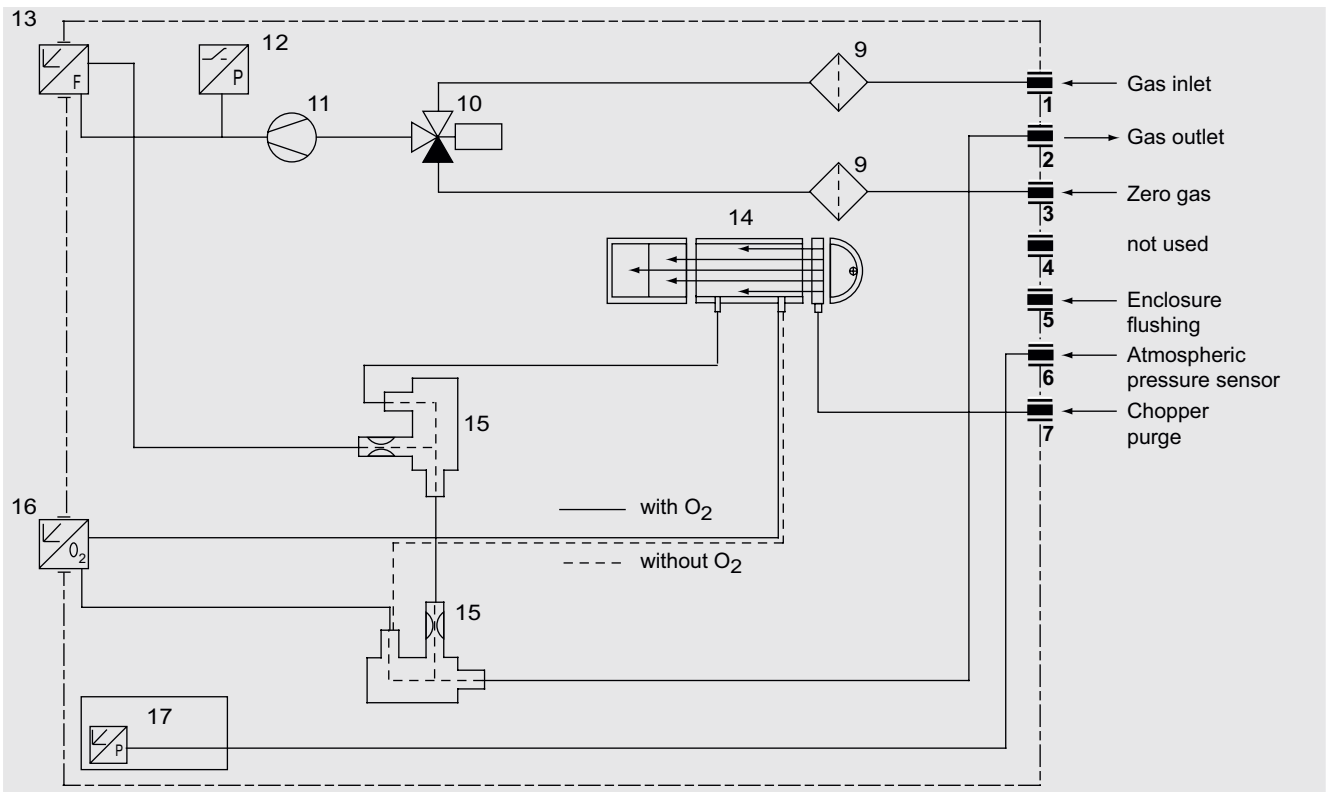
ULTRAMAT 23, 19" unit with internal sample gas pump, optional oxygen measurement
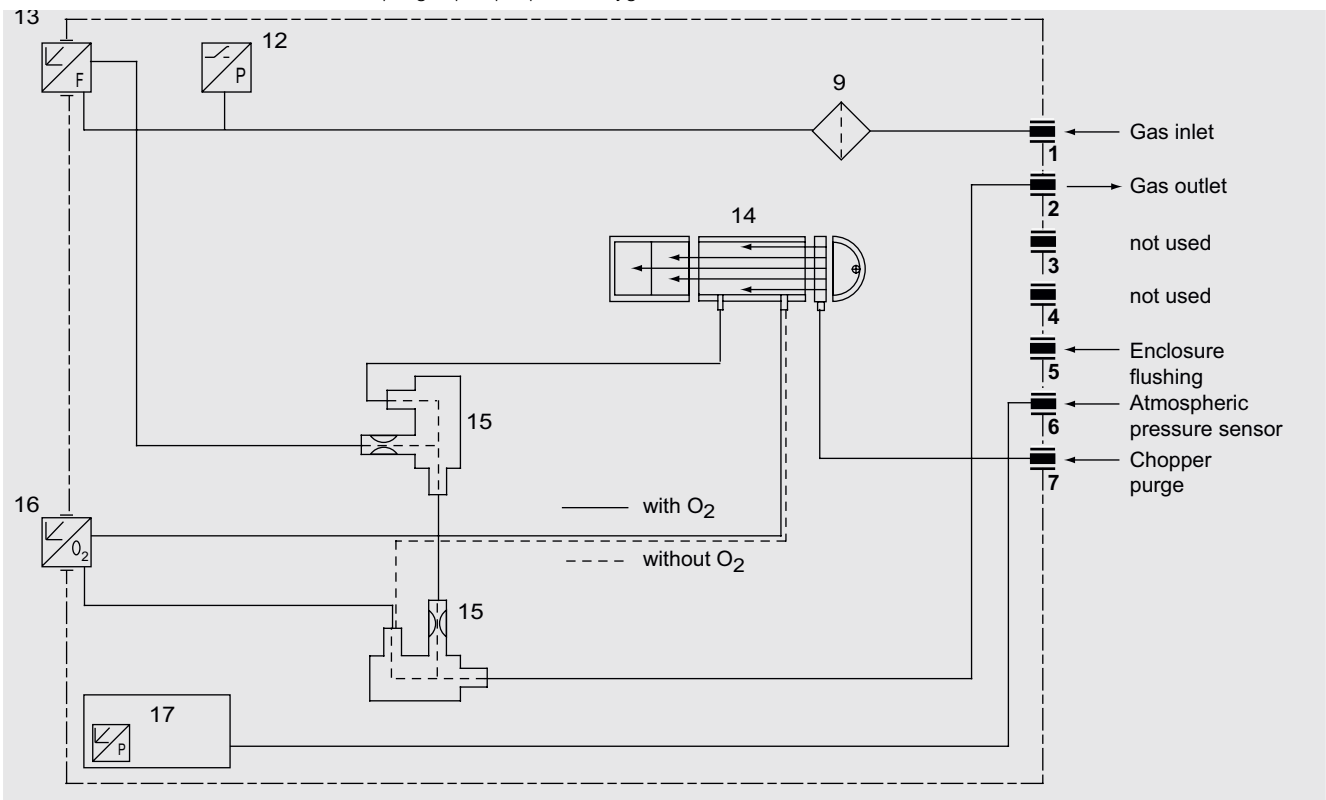
ULTRAMAT 23, 19" unit without internal sample gas pump, optional oxygen measurement
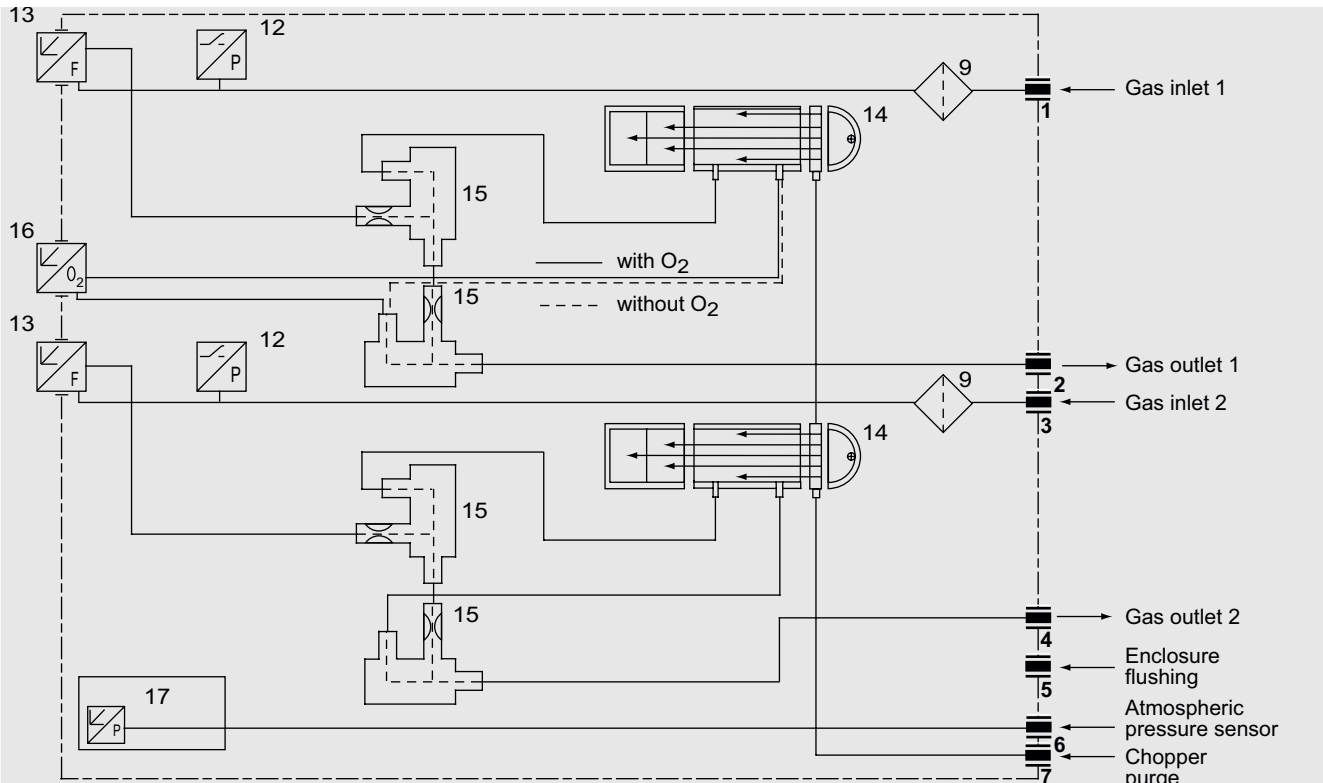
ULTRAMAT 23, 19" unit without internal sample gas pump, with separate gas path for the second component or for the 2nd and 3rd components, optional oxygen measurement
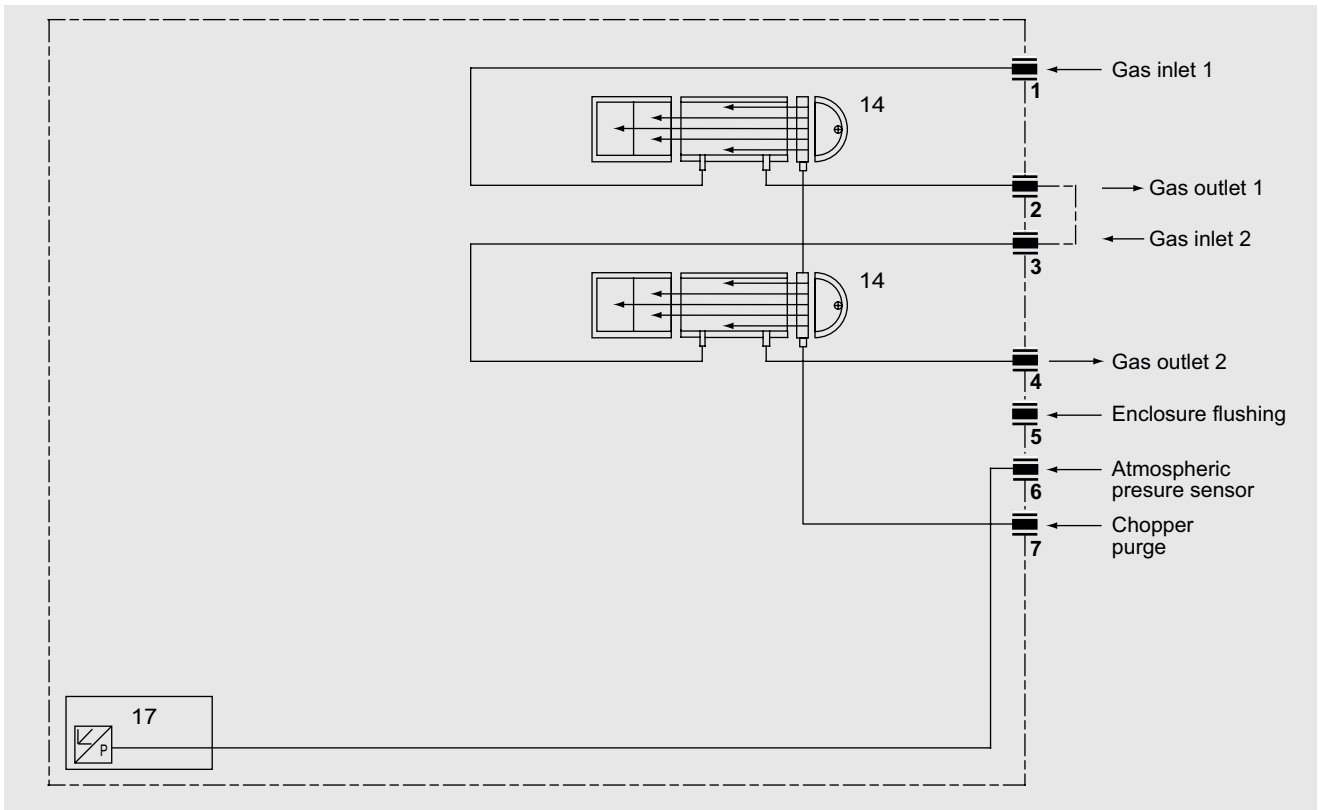
ULTRAMAT 23, 19" unit, sample gas path version in pipes, optional separate gas path, always without safety filter and without safety trap

3.3 Function

Two independent, selective measuring principles are used in the ULTRAMAT 23.

Infrared measurement

An IR source (7) at 600 °C emits an infrared radiation which is modulated with 8 1/3 Hz by a chopper (5). After passing the sample cell (4), the intensity of the radiation is measured by the detector (11, 12).

The represented detector is composed of layers filled with the component to be analyzed. The energy of the middles of the IR bands of the measured gases is mainly absorbed in the first layer. The second layer absorbs the edge energy which is tuned on high selectivity in the third layer via an aperture.

When passing through the layers the radiation absorption results in different pressure increases and so to a flow via the capillary hole. The microflow sensor there generates a signal which is nearly independent of interferences from components at the band edges.

Note

The sample gases have to enter the analyzer dustfree. Avoid condensate in the sample cells. Therefore an appropriated gas preparation is required depending of the application.

The ambient air of the analyzer should be, in a large extent, free of high concentrations of the component to be measured.

Mode of operation of infrared channel (example with three-layer detector)

1 Capillary	7 IR source
2 Second detector layer	8 Reflector
3 Microflow sensor	9 Window
4 Sample cell	10 Aperture
5 Chopper wheel	11 First detector layer
6 Chopper motor	12 Third detector layer
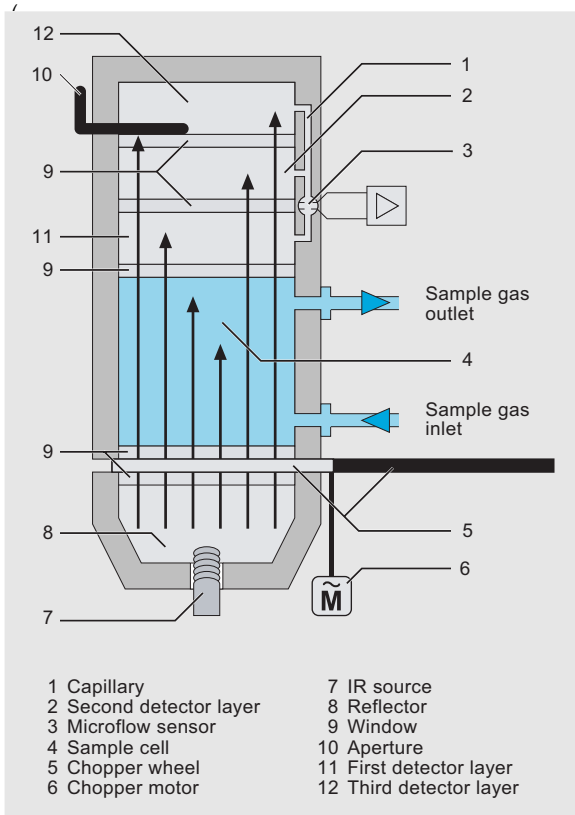
Oxygen measurement

The oxygen sensor operates according to the principle of a fuel cell. The oxygen is converted at the boundary layer between cathode and electrolyte; the resulting current is proportional to the concentration of oxygen.

1 Gold cathode	4 Signal output
2 Electrolyte (acetic acid)	5 Lead anode
3 Thermistor and load resistor for temperature compensation	6 Oxygen diffusion membrane made of FEP
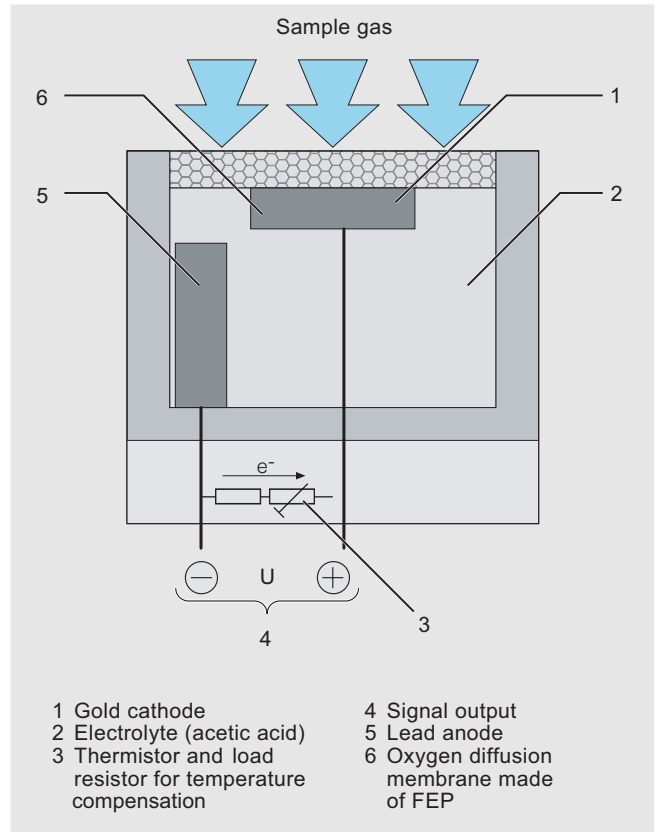
ULTRAMAT 23, mode of operation of oxygen measuring cell

Essential characteristics

- Practically maintenance-free as a result of AUTOCAL with ambient air (or with N_2, devices without oxygen sensor); both the zero and the span are calibrated in the process
- Calibration with calibration gas is only necessary every 12 months, depending on application
- Two measuring ranges can be set per component within defined limits;
  all measuring ranges linearized;
  autoranging with range identification
- Automatic correction of variations in atmospheric pressure
- Gas flow monitoring;
  Low-flow alarm at <1 l/min (with viton sample gas path only)
- Maintenance request alert
- Two limits can be freely configured for each component, for upward or downward violation.

3.4 Integration

Communication

Communications facilities

The gas analyzers of series 6 (ULTRAMAT 6, ULTRAMAT/OXYMAT 6, OXYMAT 6/61/64, FIDAMAT 6 and CALOMAT 6/62), as well as the ULTRAMAT 23 offer the following communications facilities:

• RS 485 interface

• PROFIBUS DP/PA

• AK interface (only OXYMAT 6, ULTRAMAT 6 and ULTRAMAT/OXYMAT 6).

RS 485 interface (ELAN)

The standard integrated series interface permits to communicate between several gas analyzers via the internal bus (ELAN).

Up to 12 gas analyzers with max. four components can be networked.

The operating principle is shown in the following figure.
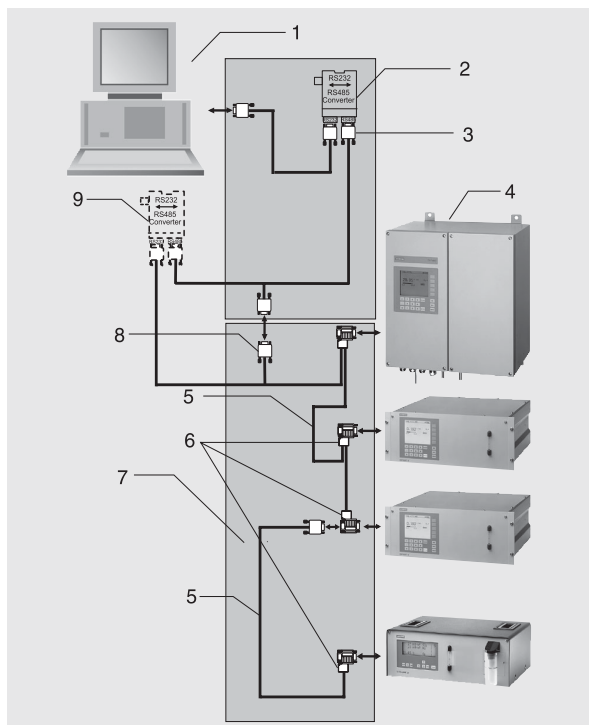
Typical design of an RS 485 network

Item	Designation
1	Computer
2	RS 485/RS 232 converter with RS 485/RS 232 cable
3	RS 485 bus connector with jumper
4	Analyzers
5	RS 485 cable
6	RS 485 bus connector
7	RS 485 network
8	9-pin SUB-D plug
9	Option: RS 485 repeater

Interface parameters

Level	RS 485
Baud rate	9600
Data bits	8
Stop bit	1
Start bit	1
Parity	None
No echo mode	

Ordering information	Order No.
Interface description	**A5E00054148**
RS 485/RS 232 converter	**C79451-Z1589-U1**
RS 485/USB converter	**A5E00852382**
Further accessories (e.g. cable, connectors, repeater, etc.)	**see Catalog IK PI**

RS 485 interface (SIPROM GA)

SIPROM GA is a software tool for service and maintenance. All analyzer functions (except factory functions) can be remote-controlled and monitored via RS 485/RS 232 converters, RS485/ethernet converters and RS 485/USB converters.

Up to 12 gas analyzers with max. four components can be networked.

Networking of several gateways is possible when using the RS 485/Ethernet converter (gateway). The number of operatable analyzers is increased correspondingly.

Functions

• Display and saving of all analyzer data
• Remote operation of all analyzer functions
• Parameter and configuration settings
• Comprehensive diagnostics information
• Remote calibration
• Online help
• Cyclic saving of measured values and status on hard disk
• Exporting to commercially available application programs
• Downloading of new software.
• *Hardware requirements:*
• PC/Laptop Pentium 133 MHz, RAM 32 MB, CD-ROM drive
• Free disk capacity min. 10 MB
• Free COM-Port: RS 232 or RS 485:
  - for coupling to ELAN network RS 485/RS 232
  - Linking the RS 485/Ethernet converter requires a 10 MB standard network (RJ 45 connection) with TCP/IP. The distance should not exceed 500 m with an RS 485 network, a repeater should be inserted for a longer distance.

Software requirements:

• Windows 95
• Windows 98
• Windows NT 4.0
• Windows 2000
• Windows XP.

Ordering information	Order No.
Firmware retrofitting sets for older analyzers:	
ULTRAMAT 23 (prior to SW version 4.1) all langages	**C79451-A3494-S501**
ULTRAMAT 6 (prior to SW version 4.1)	
• German	**C79451-A3478-S501**
• English	**C79451-A3478-S502**
• French	**C79451-A3478-S503**
• Spanish	**C79451-A3478-S504**
• Italian	**C79451-A3478-S505**
OXYMAT 6 (prior to SW version 4.1)	
• German	**C79451-A3480-S501**
• English	**C79451-A3480-S502**
• French	**C79451-A3480-S503**
• Spanish	**C79451-A3480-S504**
• Italian	**C79451-A3480-S505**

The SIPROM GA software is available for free download at:
http://support.automation.siemens.com/WW/llisapi.dll?func=cs-lib.csinfo&lang=en&siteid=csius&aktprim=0&extranet=stan-dard&viewreg=WW&objid=10807005&treeLang=en
There navigate to the 'Entry list' tab and select 'Download' as entry type.

PROFIBUS DP/PA is the leading field bus on the market. All Siemens gas analyzers are suitable for PROFIBUS when equipped with an optional plug-in card (retrofitting also possible) and satisfy the binding "Device profile for analyzers" defined by the **PNO** (PROFIBUS user organization). Central access to the analyzers in the system is possible using the SIMATIC PDM operator input software.

The term field bus describes a digital communications system with which distributed field devices in a plant are networked together via one single cable, and connected at the same time to programmable controllers or to a process control system. PROFIBUS is the leading field bus on the market. The **PROFIBUS DP** version is widely used for production automation because of its high transmission ratefor relatively small data quantities per device, whereas **PROFIBUS PA** particularly takes into account the features required for process engineering, e.g. large data quantities and application in potentially explosive atmospheres.

User benefits can be found in the extremely high potentials for cost savings in all areas of the plant, covering configuring and commissioning, operation and maintenance, and up to later plant extensions.

Operation of the gas analyzers from a control system or separate PC is possible using the SIMATIC PDM (Process Device Manager) operator input tool which is software executing under Windows and which can also be incorporated into the SIMATIC PCS 7 process control system. This permits clear display of both the incorporation of devices into the system and the complex parameter structure of the analyzers, permitting operation to be carried out simply by clicking.
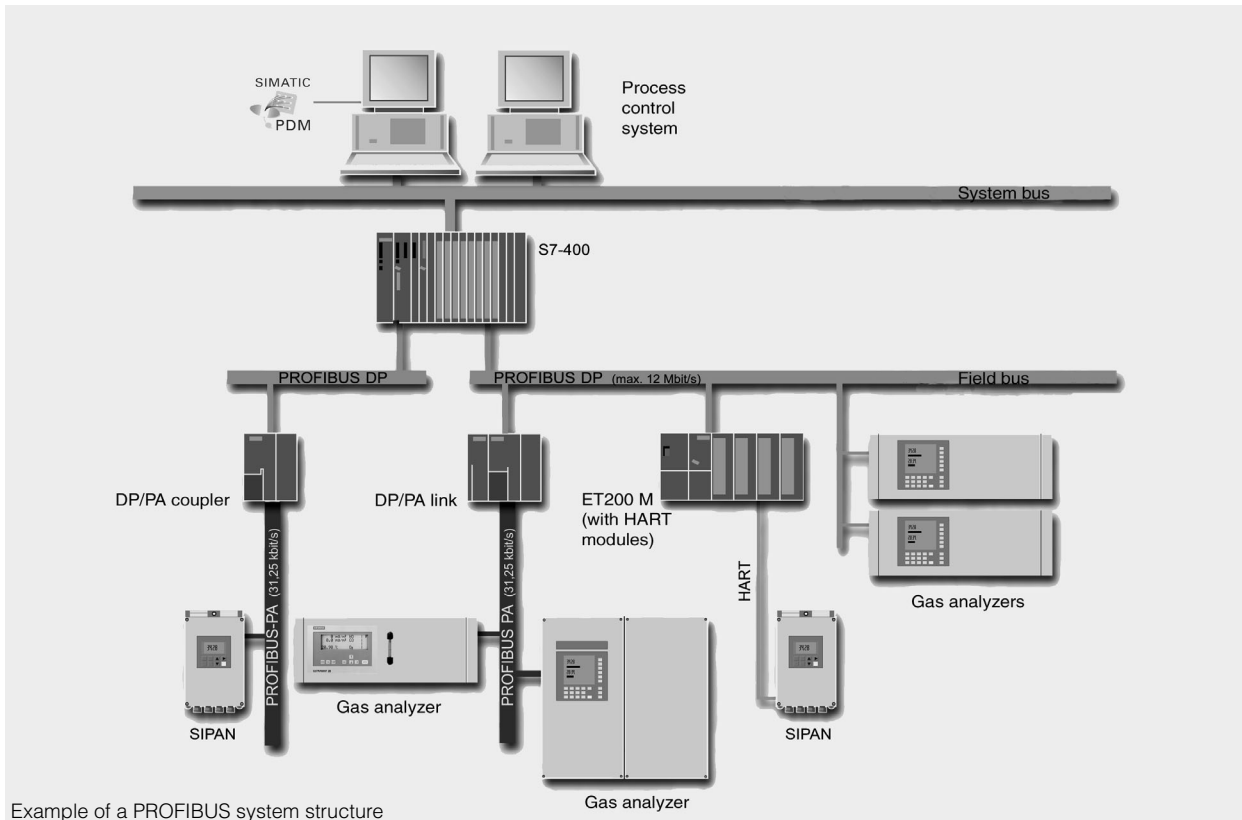
Example of a PROFIBUS system structure

The PROFIBUS user organization (PNO) is an independent international institution, and represents the interests of many vendors and users. In addition to services such as consultation, training and device certification, its prime task is the further development, standardization and promotion of the PROFIBUS technology. The definition of a binding functionality for a device class in a profile is a prerequisite for the uniform response of devices from different vendors, the so-called interoperability.The **profile for analyzers** was defined as binding at the end of 1999, thus guaranteeing the interaction of all PROFIBUS-based devices in a plant.

This profile defines the functionality of the analyzers in a block model: e.g. the **physical block** describes the measuring procedure, analyzer and vendor names, serial number and operating state (operation, maintenance). Various **functional blocks** contain the execution of specific functions such as the processing of measured values or alarms. The **transducer blocks** describe the functionality of the actual measuring procedure and its control, e.g. preprocessing of a measured value, correction of cross-interferences, characteristics, measuring ranges as well as switching and control procedures. Protocols define the data transmission between the stations on the bus.

A differentiation is made between **cyclic and acyclic services**. Cyclic services are used to transmit time-critical data such as measured values and statuses. The acyclic services permit the scanning or modification of device parameters during operation.

All gas analyzers of Series 6, (ULTRAMAT 6, ULTRAMAT/OXYMAT 6, OXYMAT 6, OXYMAT 61, FIDAMAT 6 and CALOMAT 6), as well as the ULTRAMAT 23 are suitable for PROFIBUS when fitted with the optional plug-in card.

AK interface (only OXYMAT 6, ULTRAMAT 6 and ULTRAMAT/OXYMAT 6)

The user benefits of numerous functions especially in the automotive industry, e.g. to operate a re-linearization

Unlike to PROFIBUS and ELAN, communication between only one unit and one PC is possible and operates according to the master-slave principle. The unit only transmits data on request with a command message, but always only command can be processed and answered.

Funktion 88 permits to call the menu and to set the parameters.

3.5 Technical Data

General

Measured components	Max. 4, of which up to 3 infrared-sensitive gases plus oxygen
Measuring ranges	2 per channel
Characteristics	Linearized
Conformity	CE-identification to EN 61326/A1, EN 61010-1
Display	LCD with LED backlighting and contrast control, function keys 80 characters (4 lines/20 characters)
Position of use	Front panel vertical

Design, enclosure

Weight	Approx. 10 kg
Degree of protection, 19" unit and desktop unit	IP20 to EN 60529

Electrical characteristics

EMC interference immunity (Electro-Magnetic Compatibility), safety extra-low voltage (SELV) with safe isolation	According to standard requirements of NAMUR NE21 (08/98) or EN 50081-1, EN 50082-2
Power supply	100 V AC, +10%/-15%, 50 Hz, 120 V AC, +10%/-15%, 50 Hz, 200 V AC, +10%/-15%, 50 Hz, 230 V AC, +10%/-15%, 50 Hz, 100 V AC, +10%/-15%, 60 Hz, 120 V AC, +10%/-15%, 60 Hz, 230 V AC, +10%/-15%, 60 Hz
Power consumption	Approx. 60 VA

Electric inputs and outputs

Analog output	per component, 0/2/4 to 20 mA, floating, max. load 750 Ω
Relay outputs	8, with changeover contacts, freely selectable, e.g. for range identification, loading capacity, 24 V AC/DC /1 A, floating, non sparking
Binary inputs	3, designed for 24 V, floating • Pump • AUTOCAL • Synchronization
Serial interface	RS 485
AUTOCAL function	Automatic analyzer calibration with ambient air (depending on measured component), cycle time adjustable from 0 (1) to 24 hours
Options	Supplementary electronics with 8 additional binary inputs and relay outputs, e.g. for external automatic calibration and for PROFIBUS PA or PROFIBUS DP

Ambient conditions

Permissible ambient temperature	
• Operation	+5 to +45 °C
• Storage and transport	-20 to +60 °C
Permissible ambient humidity	< 90% RH (relative humidity) for storage and transport
Permissible pressure variations	700 to 1200 hPa

Sample gas

Sample gas pressure	
• Without pump	unpressurized
• With pump	unpressurized suction mode, factory-adjusted with 2-m hose at sample gas outlet; an upper range value calibration is required in case of other venting conditions
Sample gas flow	72 to120 l/h (1.1 to 2 l/min)
Sample gas temperature	0 to 50 °C
Sample gas humidity	< 90% RH (relative humidity) no condensation

Technical data, infrared channel

Measuring ranges	See Ordering Data
Smallest measuring range	See Ordering Data
Largest measuring range	See Ordering Data
Chopper section purging - Input pressure - Purging gas consumption	approx. 3000 hPa approx. 100 ml/min

Time response

Warm-up period	Approx. 30 min (maximum accuracy is achieved after approx. 2 hours)
Response time (T_{90} time)	Dependent on the length of the sample gas cell, the sample line and the programmable damping
Damping (electronic time constant)	Selectable from 0 to 99.9 s

Measuring response

Noise of output signal	< ±1 % of the current measuring range (see rating plate)
Display resolution	Max. 4.5 digits, dependent on selected measuring range; the number of digits after the decimal point can be selected
Resolution of output signal	< 0.1% of output signal span
Characteristic	Linearized
Linearity error	In largest measuring range: < ±1% of full-scale value; in smallest measuring range: < 2% of full-scale value
Reproducibility	≤ ±1% of current measuring range

Influencing variables

Drift	
• With AUTOCAL	Negligible
• Without AUTOCAL	< 2% of smallest measuring range/week
Temperature	Max. 2% of smallest possible measuring range according to rating plate per 10 K with an AUTOCAL cycle time of 6 h
Atmospheric pressure	< 0.2% of measuring range per 1% change in pressure
Power supply	< 0.1% of output signal span with a variation of ± 10%
Power frequency	± 2% of full-scale value with a frequency variation of ± 5%

Technical data, oxygen channel

Measuring ranges	0 ... 5% to 0 ...25% O_2, parameter can be set
Auxiliary gas	the oxygen sensor must not be used when the auxiliary gas contains the following components: H_2S, chlorine or fluorine compounds, heavy metals, aerosols, mercaptans, alkaline components (as e.g. NH_3 in % range)
Typical combustion exhaust gas	Influence: < 0.05% O_2
Lifetime	Approx. 2 years with 21% O_2; continuous operation < 0.5% O_2 will damage the measuring cell

Time response

Response time (T_{90} time)	Dependent on dead time and selectable damping < 30 s with a sample gas flow of approx. 1.2 l/min

Measuring response

Noise of output signal	< 0.5% of full-scale value
Display resolution	< 0.2% of full-scale value
Resolution of output signal	< 0.2% of output signal span
Reproducibility	≤ 0.05% O_2

Influencing variables

Oxygen content	operation at times < 0.5 % O_2 distorts the measured value
Humidity	H_2O dew point ≥ 2 °C; the oxygen sensor must not be used with dry sample gases (no condensation)
Drift	
• with AUTOCAL	Negligible
• without AUTOCAL	1 % O_2/year in air, typical
Temperature	< 0.5% O_2 per 20 K, referred to a measured value at 20 °C
Atmospheric pressure	< 0.2% of measured value per 1% pressure variation

3.6 Dimensional drawings

Gas connections: stubs ⌀ 6 mm or ¼

Caution: always install on supporting rails when mounted in bench-top housing or in cabinet

ULTRAMAT 23, 19" unit, dimensions in mm

Gas connections: stubs ⌀ 6 mm

ULTRAMAT 23, desktop unit, dimensions in mm

3.8 Circuit diagrams (electric and gas connections)

Connector SUB-D 9F (RS 485)

GND

+5 V

M

M

5 — GND
9 — R_level-N-
4 — NC
8 — RD/TD-N
3 — RD/TD-P
7 — R_level-P-
2 — NC
6 — NC
1 — GND

Possibility for connection of bus terminating resistors to pins 7 and 9

Connector SUB-D 37F

M

Analog output 1 P (for IR component 1)

Analog output 2 P (for IR component 2)

Analog output 3 P (for IR component 3)

Analog output 4 P (for O$_2$)

Relay 7

Relay 5

Relay 3

Relay 1

37 / 19
18 — Analog output N
36 / 17 — Analog output N
35 / 16 — Analog output N
34 / 15 — Analog output N

Analog output N
Analog output N
Analog output N
Analog output N

Connected internally Cable and plug must be shielded and connected to chassis potential.

33 / 14
32 / 13 — Relay 8
31 / 12
30 / 11
29 / 10 — Relay 6
28 / 9
27 / 8
26 / 7 — Relay 4
25 / 6
24 / 5
23 / 4 — Relay 2
22 / 3

Contact loading max. 24 V/1 A, AC/DC; relay contacts shown: de-energized relay coil. Safety extra-low voltage (SELV) with save electrical isolation.

21 / 2 — P 21 Synchron. input
2 — P 2 CAL input
20 / 1 — P 20 Pump On/Off
N (2, 20, 21)

Inputs
N = 0 V
P = 24 V (external)
Safety extra-low voltage (SELV) with save electrical isolation.

Note:
Cable and connectors must be shielded and connected to chassis potential.

ULTRAMAT 23, pin assignment (standard)

Connector SUB-D 37F (option)

Pin	Signal
M — 19 / 37	GND
18	NC
37	NC
36	Binary input 14-P
17	Binary input 13-P
35	Binary input 12-P
16	Binary input 11-P
34	Binary input 10-P
15	Binary input 9-P
33	Binary input 8-P
14	Binary input 7-P
32 / 13	Binary input 7 to 14-N

Floating via opto isolator
"0" = 0 V (0 to 4.5 V)
"1" = 24 V (13 to 33 V)
Safety extra-low voltage (SELV) with safe electrical isolation.

Pin	Signal
31 / 12	Relay 16
30 / 11	Relay 15
29 / 10	Relay 14
28 / 9	Relay 13
27 / 8	
26 / 7	Relay 13
25 / 6	Relay 12
24 / 5	Relay 11
23 / 4	
22 / 3	Relay 10
21 / 2	Relay 9
20 / 1	GND

Contact loading max. 24 V/1 A, AC/DC; relay contacts shown: de-energized relay coil. Safety extra-low voltage (SELV) with save electrical isolation.

Note:
Cable and connectors must be shielded and connected to chassis potential.

Connector SUB-D 9F -X90 PROFIBUS-DP ——— optional ——— **Connector SUB-D 9M -X90 PROFIBUS-PA**

Pin	Signal
5	DGND
9	CNTR-N
4	CNTR-P/direction control
8	RxD/TxD-N (A)
3	RxD/TxD-P (B)
7	
2	
6	VP /+ 5 V
1	

Pin	Signal
5	
9	
4	
8	Pa-N(-)
3	PA-P(+)
7	
2	
6	
1	

ULTRAMAT 23, pin assignment of the optional PROFIBUS interface board

19" rack
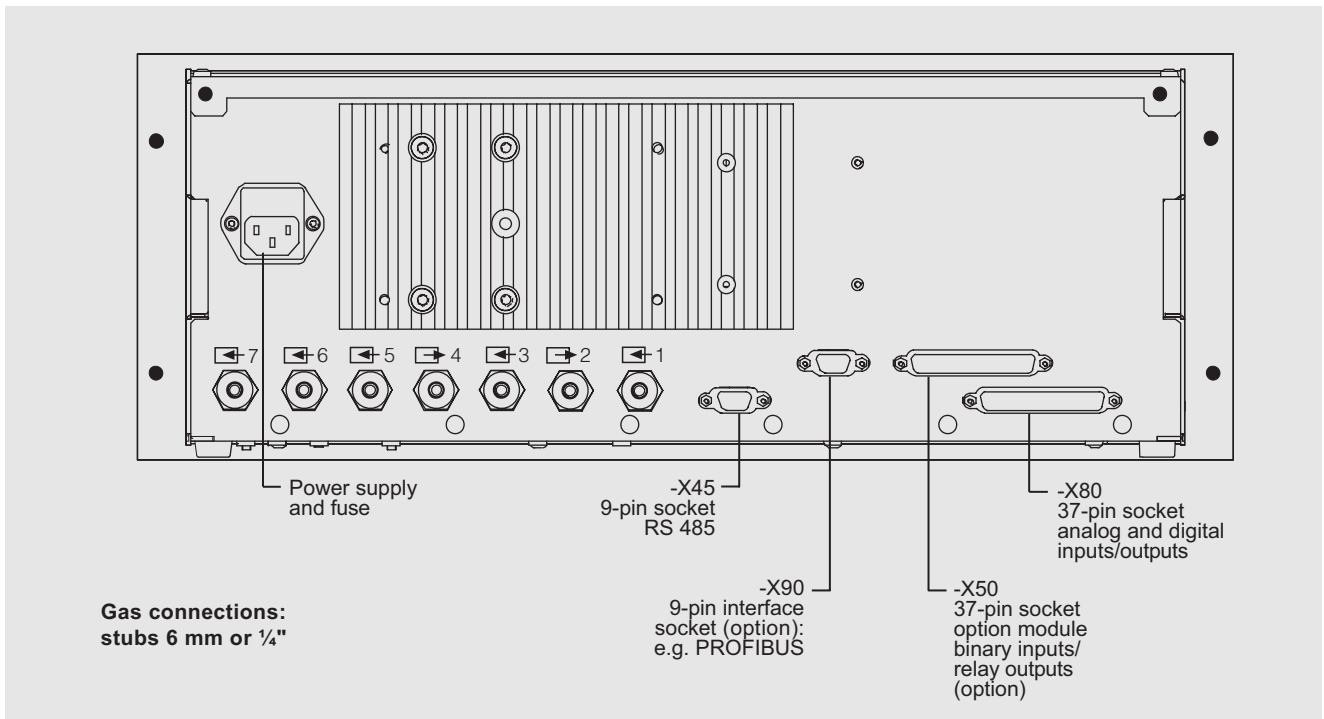
ULTRAMAT 23, 19"rack, e.g. one infrared component with oxygen measurement

Portable unit
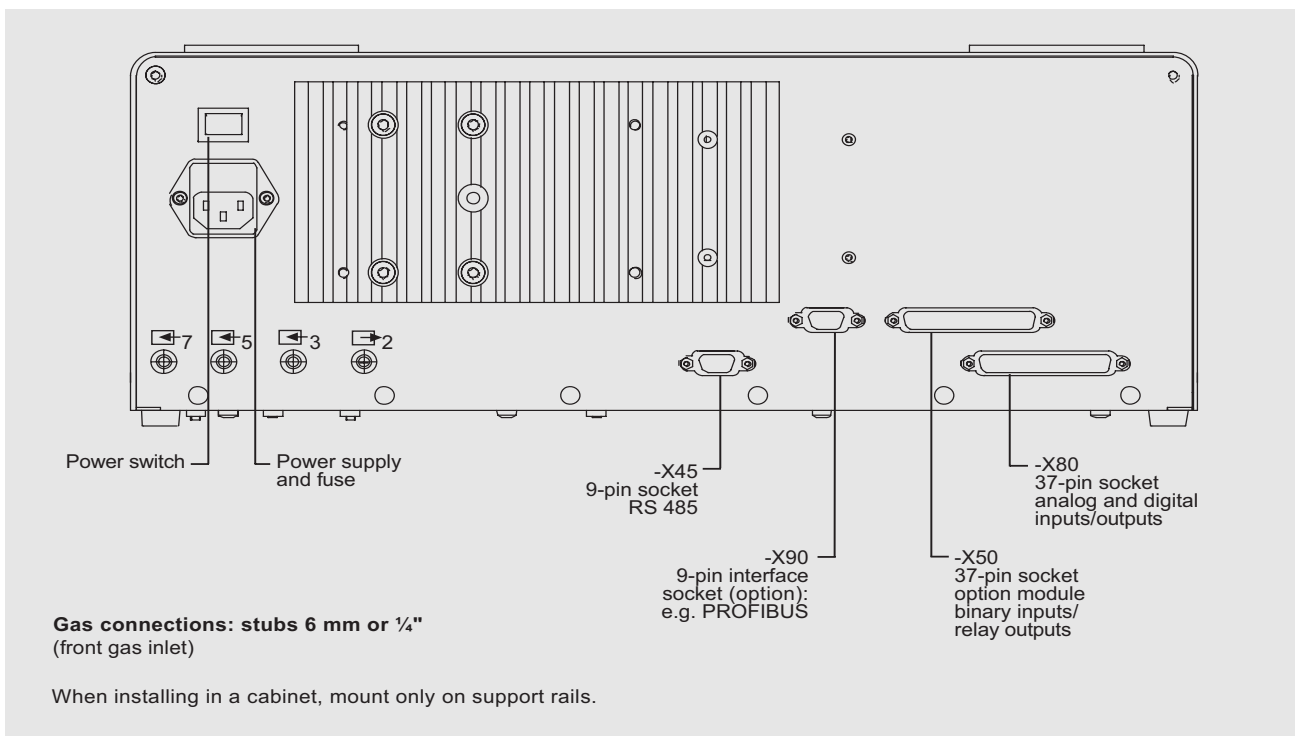
ULTRAMAT 23 portable unit, in sheet-steel housing, gas and electrical connections

**Key to symbols
ULTRAMAT 23
portable, in sheet-steel
housing**

2 Messgas/Prüfgas
Sample gas/Span gas
Gaz de mesure/d'ajustage

3 AUTOCAL-Gas/Nullgas
AUTOCAL gas/Zero gas
Gaz AUTOCAL/zéro

5 Gehäusebespülung
Enclosure purge
Balayage de l'appareil

7 Chopperraumbespülung
Chopper purge
Balayage de l'obturateur

**Key to symbols
ULTRAMAT 23
19" rack unit
with sample gas pump**

1 Messgas/Prüfgas
Sample gas/Span gas
Gaz de mesure/d'ajustage

2

3 AUTOCAL-Gas/Nullgas
AUTOCAL gas/Zero gas
Gaz AUTOCAL/zéro

4 nicht belegt
not used
non utilisé

5 Gehäusebespülung
Enclosure purge
Balayage de l'appareil

6 atmosphärischer Druckaufnehmer
atmospherical pressure transducer
capteur de pression atmosphérique

7 Chopperraumbespülung
Chopper purge
Balayage de l'obturateur

**Key to symbols
ULTRAMAT 23
19" rack unit
without sample gas pump**

1 Messgas/Prüfgas
Sample gas/Span gas
Gaz de mesure/d'ajustage

2

3 nicht belegt
not used
non utilisé

4 nicht belegt
not used
non utilisé

5 Gehäusebespülung
Enclosure purge
Balayage de l'appareil

6 atmosphärischer Druckaufnehmer
atmospherical pressure transducer
capteur de pression atmosphérique

7 Chopperraumbespülung
Chopper purge
Balayage de l'obturateur

**Key to symbols
ULTRAMAT 23
19" rack unit
with two separate gas
paths or pipe version**

1 Messgas/Prüfgas 1
Sample gas/Span gas
Gaz de mesure/d'ajustage 1

2

3 Messgas/Prüfgas 2
Sample gas/Span gas 2
Gaz de mesure/d'ajustage 2

4

5 Gehäusebespülung
Enclosure purge
Balayage de l'appareil

6 atmosphärischer Druckaufnehmer
atmospherical pressure transducer
capteur de pression atmosphérique

7 Chopperraumbespülung
Chopper purge
Balayage de l'obturateur

ULTRAMAT 23, designation of the different

Start-up

4

4.1   Safety Information

Warning

Certain parts in this analyzer carry dangerous voltages. The housing must be closed before switching on the analyzer.

Warning

The analyzer must not be used in hazardous areas. Explosive gas mixtures (e.g. flammable gases together with air or oxygen in a potentially explosive ratio) must not be measured.

Warning

if the sample gas could contain flammable components above the lower explosion limit (LEL), the analyzer version 'Gas path as pipe' is required (see chapter 8.4).

FM/CSA Class I Div. 2 , ATEX Zone 2

The follwoing safety and warning notes apply to all devices, which are operated according to FM/CSA Class I Div. 2 (hazard locations) and ATEX zone 2:

Warning

Exposure to some chemicals may degrade the sealing properties of materials used in the following devices:

- Relais on mainboard: W79052-K5001-C5; manufacturer: Axicom, part V23026-A1001-B20
- IR-Radiation Source: C79451-A3468-B205 or 206; manufacturer: Siemens AG

Explosion hazard

Do not disconnect equipment when a flammable or combustible atmosphere is present.

Do not remove or replace lamps or fuses unless power has been disconnected or when a flammable or combustible atmosphere is present.

Failure to observe these safety instructions may result in death, severe personal injuries and or substantial damage to property and environment.

ATEX Zone 2 ULTRAMAT 23 Type 7MB2335, 7MB2337 and 7MB2338 must be installed in a suitable enclosure in accordance with EN 60079-15, taking into account the environmental conditions under which the equipment will be used.

When the temperature under rated conditions exceeds 70 °C at the cable or conduit entry point, or 80 °C at the branching point of the conductors, the temperature specification of the selected cable must be in compliance with the actual measured temperature values.

Provisions must be made to prevent the rated voltage from being exceeded by transient disturbances of more than 40%.

4.2   Preparations for Start-up

Checking for leaks The pressure can be measured easiest using a U-tube manometer. Check for leaks in the sample gas paths as follows:

- Apply approx. 150 hPa (0.1 bar) to the sample gas path

- Wait for approx. 1 min until the temperature of the inflowing gas has stabilized

- Note the pressure

- Wait another 15 minutes, and note the pressure again.

   The sample gas path is sufficiently leak-proof if the pressure has changed by a maximum of 2 hPa (2 mbar) within 15 minutes.

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

Check that the interfaces (see Chapter 3) are correctly assigned and parameterized.

4.3   Start-up

Switching on the
power supply   Once you have established that the analyzer is set to the required
voltage and that all connections have been made, connect it to the
power supply. Switch the analyzer on and permit it to warm up (see
Section 5.3).

4.3.1   AUTOCAL

General   The analyzer carries a calibration with the connected medium when
switched on. This AUTOCAL calibrates the zero and sensitivity of the
IR channels. If an O_2 sensor is present, its sensitivity is calibrated in
addition.

☞   **Notice**

In analyzers without an O_2 sensor, the AUTOCAL can be executed
with nitrogen, in the case of analyzers with an O_2 sensor, it must be
executed with air. The supplied medium is selected depending on the
analyzer configuration (gas connections) and cannot be parameterized
using the software.

The chopper section purging must be connected in analyzers with
certain CO_2 ranges. This can be achieved using nitrogen or synthetic
air with an input pressure of 300 to 350 kPa (3 to 3.5 bar), and should
be connected at least 30 minutes prior to switching on in order to
guarantee good purging of the analyzer section.

You can manually trigger an AUTOCAL during operation by pressing
the **CAL** key. The ULTRAMAT 23 can also execute an AUTOCAL
cyclically, i.e. at adjustable, regular intervals (see below).

Duration   The duration of the AUTOCAL depends on various factors. It takes
approx. 3 min and is comprised as follows:

• Twice the set purge time (see Section 5.8.4)

• Duration of internal electronic adjustment (corresponds to
two-and-a-half times the time constant "T90 within"; see Section
5.9.3); if an O_2 sensor is used, the electronic adjustment is at least
60 s.

Cycle time   The cycle time of the AUTOCAL (time between two automatically triggered calibrations) can be set between 0 and 24 h. The cyclic calibration is switched off if you enter "0" as the parameter.

☞   **Notice**

During warm-up mode, however, an AUTOCAL is carried out twice, approx. 5 min and approx. 30 min after switching on.

In order to compensate variations in ambient temperature, you should select cycle times between 3 and 12 h.

4.3.2   Calibration

Use of calibration gas   Following installation of the analyzer, you can calibrate it using calibration gas (see Section 5.8). The calibration should be carried out with a gas containing a sufficient concentration of the measured component (between 70 and 100 % of the full-scale value in N_2 or synthetic air).

Caution

The calibration gas is connected via the sample gas inlet.

Carrying out a calibration

- Make sure that the gas flow is between 1.2 and 2.0 l/min.

- The analyzer must have been in operation for at least 30 minutes before commencing with measurements since a good stability of the analyzer section is only guaranteed after this time (99 % value).

Compensation of temperature influence   The compensation of the temperature influence is stored in the EEPROM in the ULTRAMAT 23. Modifications can only be made in the factory.

Noise suppression   Any noise which may occur can be suppressed by adjusting various time constants (see Section 5.9).

The calibration should be repeated every six to twelve months depending on the ambient conditions.

4.3.3   System Setup with Several Analyzers in Parallel

Example 1   **Both analyzers with internal pump and solenoid valve switching between sample gas and zero gas for AUTOCAL**

The cyclic AUTOCAL of the master device triggers an AUTOCAL in parallel for the slave device via its digital output SYNC and the digital input SYNC of the slave device.

The simultaneous connection between the digital output SYNC of the slave device and the digital input SYNC of the master device guarantees that zero gas is always passed **simultaneously** through both analyzers.
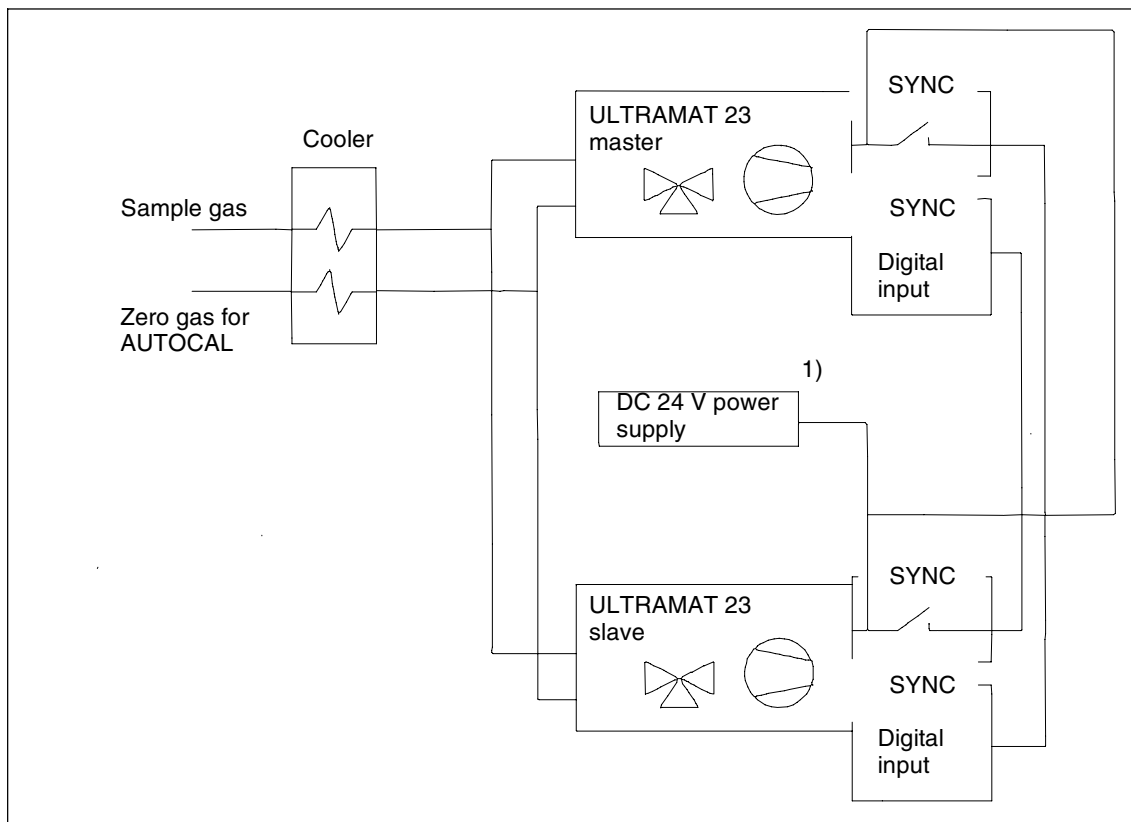
Fig. 4-1   Example with internal pump and solenoid valve switching
[1]) Protective extra-low voltage with safe electrical isolation (SELV)

Parameter settings   Master:

- Enter the AUTOCAL cycle time, e.g.: 6 hours (see Section 5.8.4).

- Assign the function "Sync." to a relay (see Section 5.10.1.2).

- Assign the function "CAL/MEAS" to the digital input SYNC (see Section 5.10.1.3).

Slave:

- Set the AUTOCAL cycle time to "0" to prevent a cyclic AUTOCAL from being triggered (see Section 5.8.4).

- Assign the function "Sync." to a relay (see Section 5.10.1.2).

- Assign the function "activate CAL relay" to the digital input SYNC (see Section 5.10.1.3).

Example 2   **Both analyzers without internal pump and without internal solenoid valve switching between sample gas and zero gas for AUTOCAL**

Via a digital output, the master controls a solenoid valve for switching between sample gas and zero gas for the AUTOCAL.

The cyclic AUTOCAL of the master device triggers an AUTOCAL in parallel for the slave device via its digital output SYNC and the digital input SYNC of the slave device.

Parameter settings   Master:

- Enter the AUTOCAL cycle time, e.g.: 6 hours (see Section 5.8.4).

- Assign the function "Sync." to a relay (see Section 5.10.1.2).

- Assign the function "Zero gas" to a relay (see Section 5.10.1.2).

- Assign the function "activate CAL relay" to the digital input SYNC (see Section 5.10.1.3).

Slave:

- Set the AUTOCAL cycle time to "0" to prevent a cyclic AUTOCAL from being triggered (see Section 5.8.4).

- Assign the function "Sync." to a relay (see Section 5.10.1.2).

- Assign the function "AUTOCAL" to the digital input SYNC (see Section 5.10.1.3).
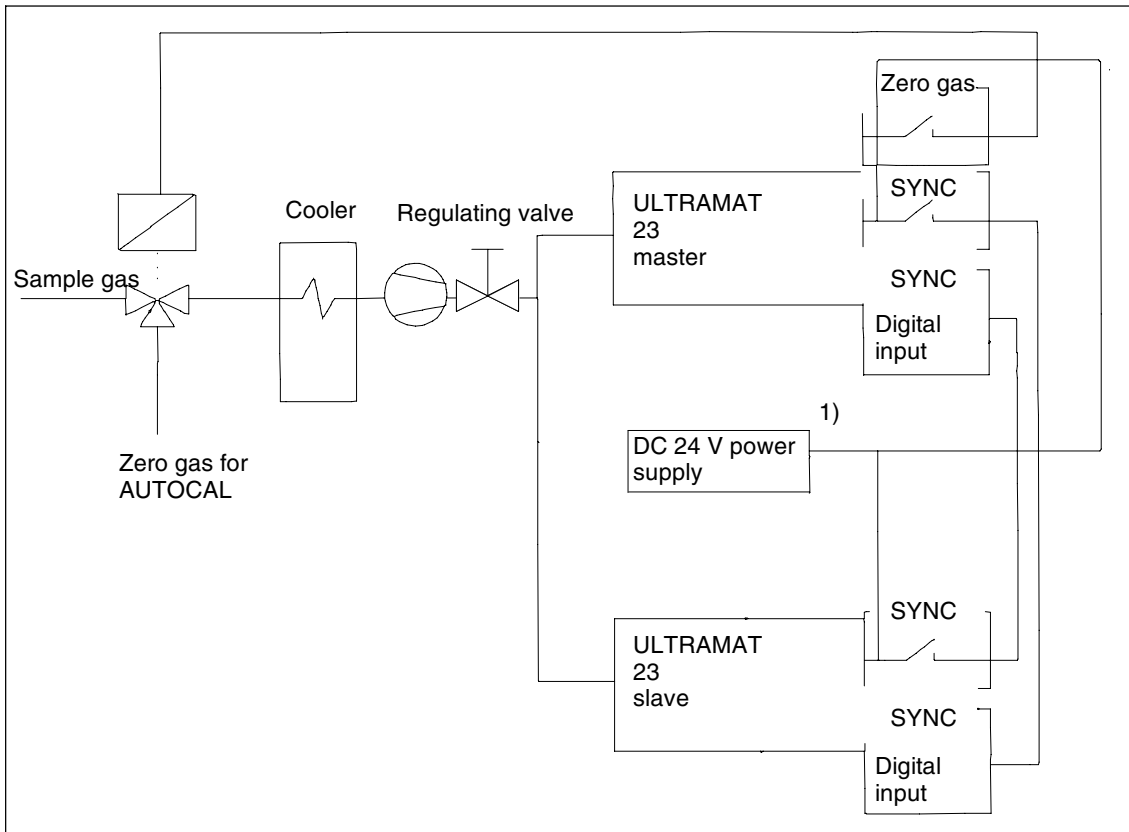
Fig. 4-2   Example without internal pump and solenoid valve switching
[1] Protective extra-low voltage with safe electrical isolation (SELV)

Operation

5

5.1 General

The ULTRAMAT 23 has been parameterized and calibrated prior to delivery. However, a large number of parameters can be subsequently adapted to specific requirements using menu-based functions.

The following sections provide you with information on the display and input panel as well as the operating modes. You will learn how to scan analyzer statuses, how to calibrate the analyzer, and how you can enter or modify parameters.

The input sequences are described using the maximum configuration. If your analyzer has a different configuration (different measured components, number of infrared ranges, no oxygen measuring cell, no pump, no serial interface etc.), the explanations can be applied accordingly.

The used numbers must be considered as examples. They therefore probably differ from the values displayed on your analyzer. The corresponding line remains empty if components are not present in your analyzer.

User prompting

In the next sections, operation of the ULTRAMAT 23 is explained according to the following scheme:

Example menu 1: Example menu 2: Example menu 3

```
   ULTRAMAT 23
Example of a display



                    12345
```
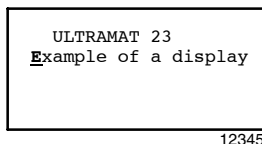
Example text.

Cross-reference.

The heading of the respective section indicates the complete menu path, starting from the main menu, on which the shown display can be reached (see Section 5.2). The various menu levels are separated from one another by colons.

The display, as it appears on the analyzer, is shown to the left of the text. The accompanying text explains the display, including inputs and instructions if necessary, e.g.:

• You can **start** the function using the **ENTER** key

• You can **terminate** the function using the **ESC** key

You can recognize the position of the cursor in the display in these instructions in that the corresponding character is printed in bold type and underlined (in this display: **E**xample).

The number on the right below the display (12345 in this case) is used as a cross-reference to the summaries of all menus and dialogs which proceed Sections 5.7 to 5.10 in order to facilitate the locating of the described display in these overviews.

A reference may be made that the respective function is protected by a **code level** (see Section 5.5.1) or is **specific to a component**. In the case of functions specific to a component, you must enter the measured components (up to four) for which you wish to call the respective function (see Section 5.5.2).

5.2 Display and Input Panel
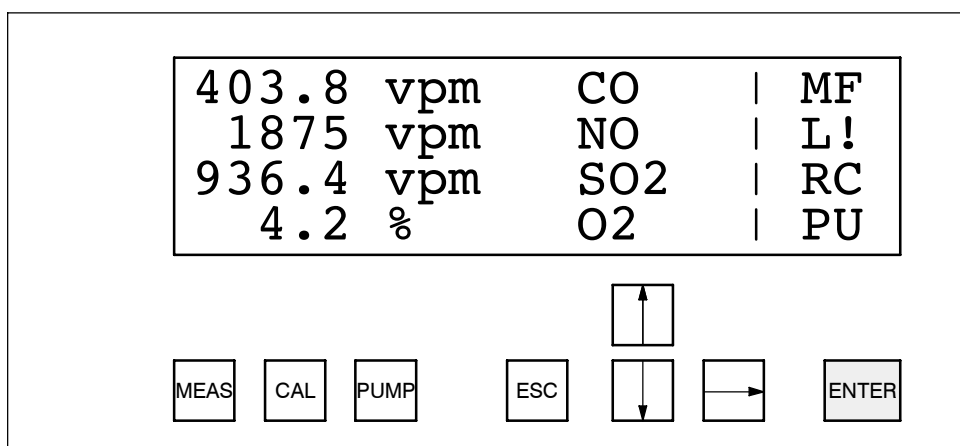
Fig. 5-1   Input panel consisting of display and keypad

The display is a backlit liquid crystal display with four lines with 20 characters each (5 x 8-dot matrix) and is covered by a foil. One line is reserved for each measured component in the display. The line displays from left to right: measured value, dimension and name of component. The last two positions of each line are reserved for displaying certain analyzer statuses. The meanings are as follows:

- M: **M**aintenance request

- F: **F**ault present

- L: **L**imit violated

- !: Fault logged which is no longer present

- R: **R**emote control

- C: Function **C**ontrol (analyzer uncoded, or access via RS485 serial interface, or AUTOCAL, or in approx. 30 min warm-up mode)

- P: **P**ump running

- U: **U**ncoded

User desktop   The ULTRAMAT 23 has a menu-based user desktop. The menu structures can always be represented as follows: MAIN MENU → Submenu 1 → Submenu 2 → Submenu 3 → Submenu 4.
Fig. Fig. 5-2 shows a diagram of the basic configuration of the user desktop.
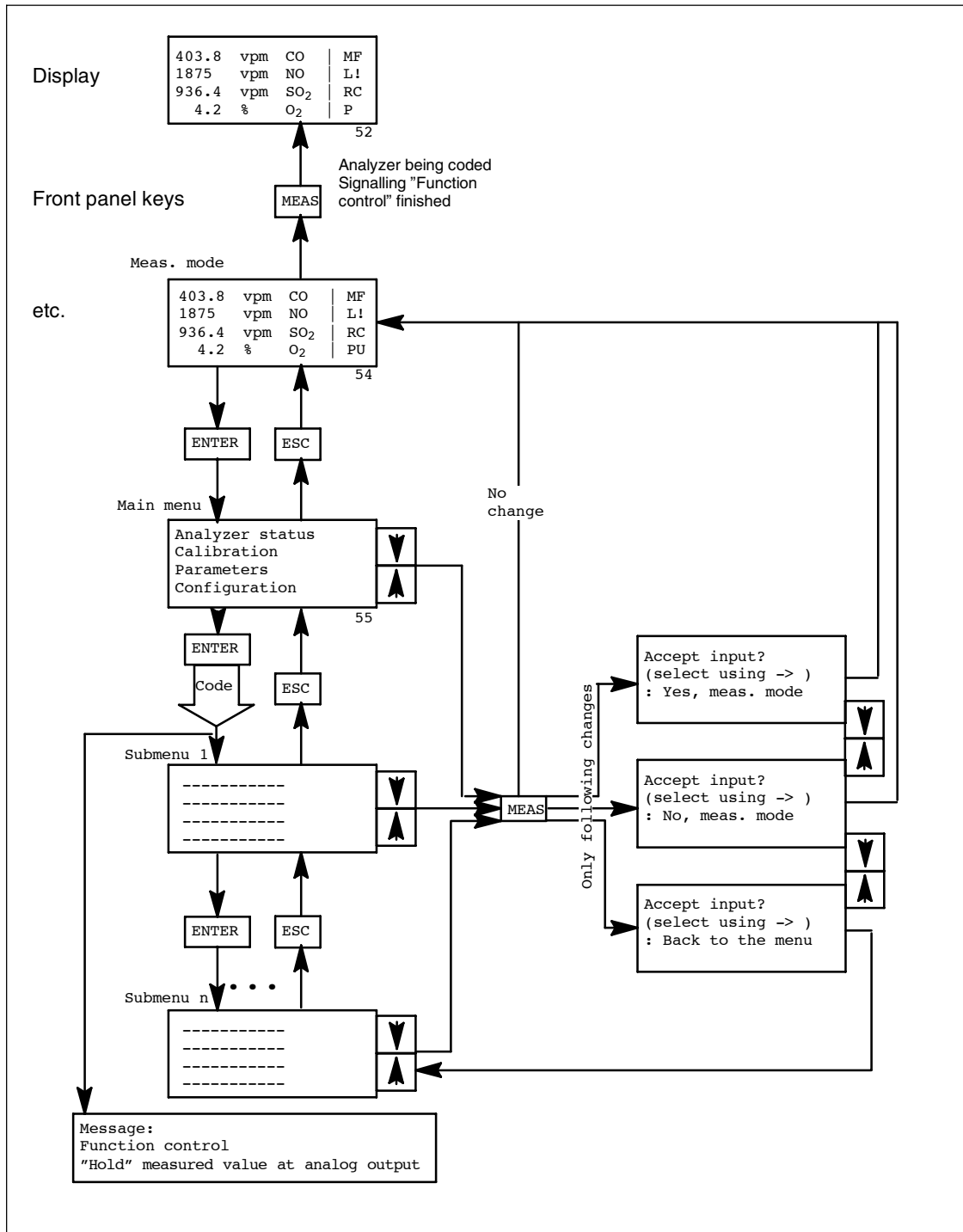
Fig. 5-2   Menu structure of ULTRAMAT 23

Key assignments Eight keys are available for operating the ULTRAMAT 23. These keys have the following meanings:

Table 5-1 Input keys

No.	Designation	Meaning	Function
1*	MEAS	Measure	Measure; abort input operations; leave input mode (from any menu level); switch from input mode to measuring mode and code analyzer again (cf. Section 5.6.1)
2	CAL	AUTOCAL	Automatic calibration; activation of calibration with ambient air or nitrogen
3*	PUMP	Pump	Switch internal sample gas pump on/off
4	ESC	Escape	In input mode: return by one menu level <u>or</u> cancel current input <u>or</u> cancel calibration*
5	↑	Arrow upwards	Increase selected digit; select previous menu item
6	↓	Arrow downwards	Reduce selected digit; select next menu item
7	→	Arrow to right	Move input cursor by one position to right (cyclic, i.e. the cursor is set to the left edge when the right edge has been reached)
8	ENTER	Enter	In measuring mode: switch over to input mode In input mode: import entered parameters <u>or</u> call a menu item

*   The input is suppressed if certain conditions are fulfilled. A corresponding message is then output briefly on the display.

You can use the arrow keys to modify numerical values by increasing or decreasing the digit at which the cursor is located. The digits are modified continuously, i.e. 0 and 1 follow again after digit 9, and you can also decrement to 9, 8... following digit 0. The analyzer outputs the value FFF... if incorrect numbers are entered.

Use of the **MEAS**, **ESC** and **ENTER** keys is described using examples in Section 5.5. Use of the **CAL** and **PUMP** keys is described in Section 5.11.

5.3   Warm-up Mode

The analyzer can be in one of three operating modes:

*   In the **warm-up mode,**

*   in **measuring mode** (Section 5.4),

*   or in **input mode** (Section 5.5)**.**
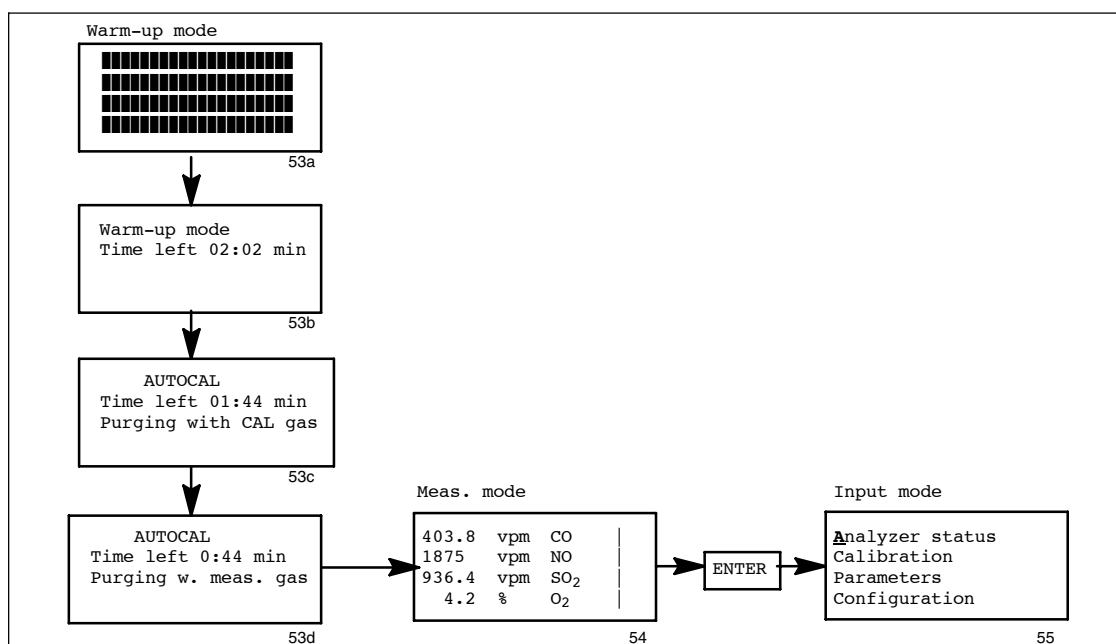
Fig. 5-3   Warm-up mode, measuring mode and input mode
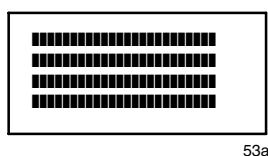
Immediately following switching-on, the ULTRAMAT 23 tests the display elements. During this test, all elements light up simultaneously for approx. five seconds.
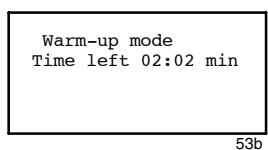
The adjacent display subsequently appears with the remaining warm-up time which is counted down in seconds to 00:00 (minutes : seconds).
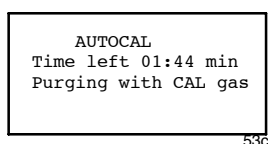
The analyzer initially carries out an AUTOCAL during the warm-up mode (see Section 4.3.1). The flow of AUTOCAL gas (nitrogen or air) is displayed in the bottom line, and the remaining time is shown in the line above this. This calibration cannot be interrupted.

```
      AUTOCAL
 Time left 0:44 min
 Purging w. meas. gas


                  53d
```

Following the calibration, the analyzer switches to purging with sample gas.

At the end of the purging phase, the analyzer switches to measuring mode; however, full measuring accuracy is only reached after approx. 30 min if a further AUTOCAL has been automatically carried out by the analyzer. The warm-up mode is then finished.

5.4 Measuring Mode

```
 403.8   vpm   CO    |
 1875    vpm   NO    |
 936.4   vpm   SO2   |
   4.2   %     O2    |P
                  54
```

The measured components are output on the display together with their values and the units in mg/m^3, vpm or volume percent. With a change in the analyzer status, the corresponding letter appears in the last two columns ("P" in the example; see also Section 5.2). The analyzer remains in measuring mode until an AUTOCAL (automatic, remote-controlled or manual) is carried out or until you manually switch the analyzer to input mode (see Section 5.2).

```
 *****   vpm   CO    |
 1875    vpm   NO    |
 936.4   vpm   SO2   |
   4.2   %     O2    |P
                  54
```

If '*****' occurs in measuring mode without a fault being present, this means:

• Concentration in sample gas more than 5 % higher than the largest measuring range

• Signal saturation resulting from excessively high sample gas concentrations

5.5 Input Mode

In input mode, you can view instrument parameters or calibrate and parameterize the analyzer.

⚠ **Caution**

The analyzer must only be calibrated and/or parameterized by trained specialists and with reference to this Instruction Manual.

```
 Analyzer status
 Calibration
 Parameters
 Configuration

                  55
```

Analyzer status

Once you have selected input mode, the first menu to appear is the **main menu** which displays four menu items. You can use these to select the individual input functions of the ULTRAMAT 23:

You can call submenus which provide information on the analyzer status, e.g. entries in the logbook, diagnostics data and factory data (see Fig. 5-4 for menu structure).

Calibration   You can calibrate the zero and sensitivity of the analyzer using calibration gas (see Fig. 5-5 for menu structure).

Parameters   You can match the analyzer functions to your specific application, e.g. by entering limits, measuring ranges and time constants (see Fig. 5-6 for menu structure).

Configuration   You can define the assignments of the analyzer interfaces etc., e.g. the assignments of relays and current outputs (see Fig. 5-9 for menu structure).

5.5.1   Code Levels

The ULTRAMAT 23 is provided with two code levels to protect against unauthorized or unintentional inputs. As soon as you call a protected function for the first time, you will be requested to enter the defined three-digit code number.

☞   **Notice**

You should change the codes once you have become acquainted with operation of the ULTRAMAT 23 (see Section 5.10.2.1).

The lowest code level (level 1) is factory-set to "111", and the higher level (level 2) to "222".

The following are protected by code level 1:

- The dialogs "Logbook/faults" and "Maintenance requests" in the menu "Analyzer status", submenu "Status",

- the menu "Calibration" and

- the menu "Parameters".

The following is protected by code level 2:

- The menu "Configuration".

☞   **Notice**

If the analyzer requests you to enter code level 1, you can enter level 2 instead. Level 1 is then enabled simultaneously. Level 1 is automatically enabled as soon as the higher code level 2 has been enabled.

5.5.2   Key Operations Step-by-step

```
403.8  vpm  CO    |
1875   vpm  NO    |
936.4  vpm  SO₂   |
 4.2   %    O₂    |
```

This section describes operation of the analyzer with the keys using an example. The analyzer is in measuring mode (see Section 5.4).

```
Analyzer status
Calibration
Parameters
Configuration
```

- Change from measuring mode to input mode by pressing the **ENTER** key. You first access the main menu. A cursor flashes on the character "**A**" at the left edge of the first line.

- You can set the cursor to the start of each line using the ↑ and ↓ keys. Cursor movements are cyclic, i.e. if you move above the top edge of the display, the cursor appears again in the bottom line, and vice versa.

- Call the respective menu item by pressing the **ENTER** key.

```
Analyzer status
Calibration
Parameters
Configuration
```

The cursor is located at "**P**" when you have pressed the ↓ key twice.

- Now call the submenu "Parameters" by pressing the **ENTER** key.

```
Level 1 required
Please enter code
: 000
```

The adjacent display appears in which you will be requested to enter the code number for code level 1.

- You can change the value of the code digit to which the cursor is pointing using the ↑ and ↓ keys.

- Move to the next position of the code number using the → key. This function is also cyclic, and the cursor appears at the first position again when you move it beyond the last position

```
Level 1 required
Please enter code
: 111
```

- Close the code input by pressing the **ENTER** key.

```
Measuring ranges
Limit values
Time constants
Pump/LCD contrast
```

- Press the **ENTER** key again to call the submenu "Measuring ranges".

```
Choose component
: NO  1
```

- Now select components 1 to 4 for which the subsequently set ranges are to apply. Up to four components can be present.

```
Choose component
: CO  3
```

- If your analyzer is configured accordingly, you can select another component by pressing one of the ↑ or ↓ keys, e.g. component 3 in this case.

```
Switch ranges CO
Change ranges CO
Hysteresis CO
```

- Press the **ENTER** key. The analyzer offers further menu items which you can select by pressing one of the ↑ and ↓ keys.

- Branch to the selected function by pressing the **ENTER** key.

```
Switch ranges CO
Actual range :1
MR 1:0. 250   mg/m3
MR 2:0.1250   mg/m3
```

In this example, the adjacent display appears following selection of the function "Switch ranges CO". The first line contains the heading, the second line the parameter and its value to be changed; the cursor is positioned in this line. Only supplementary information is present in lines 3 and 4. To switch over the measuring range, proceed as follows:

- Press the **ENTER** key.

- The cursor jumps to the measuring range number which you can change using one of the ↑ and ↓ keys.

- The range definition is imported when you press the **ENTER** key again, and you return to the start of the line.

You cannot carry out any further settings here. To do so, you must leave the menu display again. This is possible:

- By pressing the **ESC** key, you then return by one step in the menu sequence

```
Save changes?
(choose with -> )
: continue
```

- By pressing the **MEAS** key. You then have the following possibilities:

    To process the previous menu item further using **ENTER,**

```
Save changes?
(choose with -> )
: Yes, go to meas.
```

    or return to measuring mode using ↑ or → and **ENTER**, where all modifications are imported which you have made since the last decoding operation,

    or return to measuring mode using ↓ and **ENTER** without importing the modifications.

```
Save changes?
(choose with -> )
: No, go to meas.
```

Once you have carried out the above sequence on the analyzer, you are already acquainted with a number of important points for operation of the ULTRAMAT 23.

5.5.3 Using the ESC key

You can trigger two different functions by pressing the **ESC** key:

Firstly, you can cancel a commenced procedure, e.g.:

- The input of a number

- A calibration procedure with calibration gas

- Any function if a fault occurs, e.g. if the flow of sample gas to the analyzer is missing.

Secondly, you can use the **ESC** key to move <u>one</u> level higher in submenus ("scroll back"). This procedure is the opposite to selection of a submenu using the **ENTER** key ("scroll forwards"). If you repeatedly press the **ESC** key, you return back to the main menu step-by-step. If you press the **ESC** key again in the main menu, the analyzer switches over from input to measuring mode. All inputs are imported at the same time. However, you will not be asked to confirm the inputs.

An example will clarify this:

```
403.8  vpm  CO    |
1875   vpm  NO    |
936.4  vpm  SO2   |
 4.2   %    O2    | U
```

The analyzer is in measuring mode and is uncoded.

```
Analyzer status
Calibration
Parameters
Configuration
```

Switch from measuring mode to input mode using **ENTER**, select the menu item "Parameters" using the ↑ or ↓ key, and press **ENTER**.

```
Measuring ranges
Limit values
Time constants
Pump/LCD contrast
```

In this manner, you enter the first submenu. Press **ESC** and then **ENTER** again. You have returned by one level and then moved forwards by one level again; you are therefore in the same menu again.

```
403.8 vpm  CO    |
1875  vpm  NO    |
936.4 vpm  SO2   |
 4.2  %    O2    | U
```

Press the **ESC** key twice, you are back in measuring mode again.

5.6 Recoding the Analyzer

Following input of the code, inputs are possible until the analyzer is recoded.

☞ **Notice**

In order to code the analyzer again when the input procedures have been finished (to protect against unauthorized and unintentional interventions), press the **MEAS** key in measuring mode.
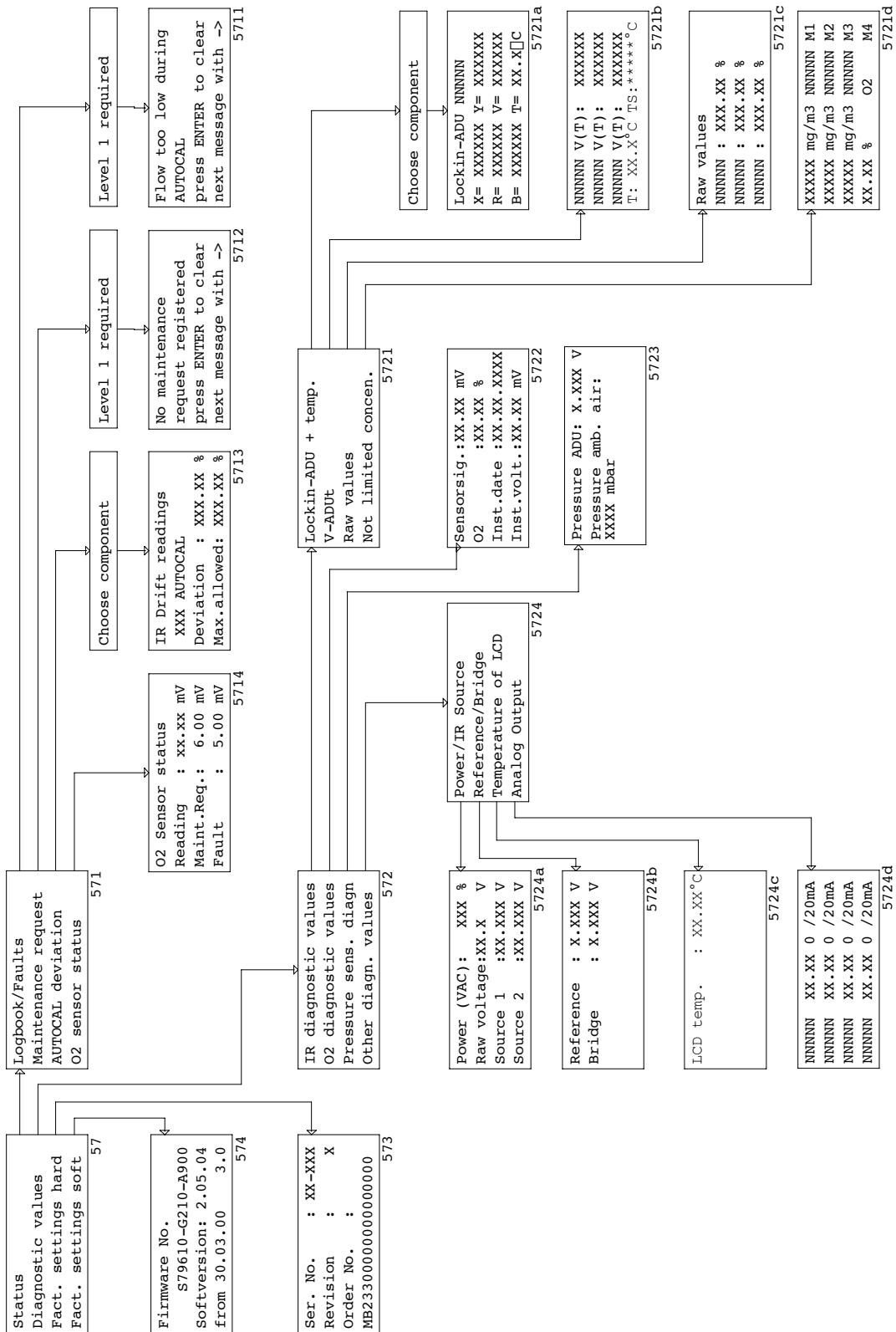
Fig. 5-4   Menu sequence for "Analyzer status"

Boxes in the diagram:

571
```
Logbook/Faults
Maintenance request
AUTOCAL deviation
O2 sensor status
```

5711 — Level 1 required
```
Flow too low during
AUTOCAL
press ENTER to clear
next message with ->
```

5712 — Level 1 required
```
No maintenance
request registered
press ENTER to clear
next message with ->
```

5713 — Choose component
```
IR Drift readings
XXX AUTOCAL
Deviation  : XXX.XX %
Max.allowed: XXX.XX %
```

5714
```
O2 Sensor status
Reading  : xx.xx mV
Maint.Req.: 6.00 mV
Fault    : 5.00 mV
```

5721
```
Lockin-ADU + temp.
V-ADUt
Raw values
Not limited concen.
```

5721a — Choose component
```
Lockin-ADU NNNNN
X= XXXXXX Y= XXXXXX
R= XXXXXX V= XXXXXX
B= XXXXXX T= XX.X C
```

5721b
```
NNNNN V(T):  XXXXXX
NNNNN V(T):  XXXXXX
NNNNN V(T):  XXXXXX
T: XX.X°C TS:*****°C
```

5721c
```
Raw values
NNNNN : XXX.XX %
NNNNN : XXX.XX %
NNNNN : XXX.XX %
```

5721d
```
XXXXX mg/m3 NNNNN M1
XXXXX mg/m3 NNNNN M2
XXXXX mg/m3 NNNNN M3
XX.XX % O2      M4
```

5722
```
Sensorsig.:XX.XX mV
O2        :XX.XX %
Inst.date :XX.XX.XXXX
Inst.volt.:XX.XX mV
```

5723
```
Pressure ADU: X.XXX V
Pressure amb. air:
XXXX mbar
```

572
```
IR diagnostic values
O2 diagnostic values
Pressure sens. diagn
Other diagn. values
```

5724
```
Power/IR Source
Reference/Bridge
Temperature of LCD
Analog Output
```

5724a
```
Power (VAC): XXX %
Raw voltage:XX.X  V
Source 1  :XX.XXX V
Source 2  :XX.XXX mV
```

5724b
```
Reference : X.XXX V
Bridge    : X.XXX V
```

5724c
```
LCD temp.  : XX.XX°C
```

5724d
```
NNNNN  XX.XX  0 /20mA
NNNNN  XX.XX  0 /20mA
NNNNN  XX.XX  0 /20mA
NNNNN  XX.XX  0 /20mA
```

57
```
Status
Diagnostic values
Fact. settings hard
Fact. settings soft
```

574
```
Firmware No.
  S79610-G210-A900
Softversion: 2.05.04
from 30.03.00   3.0
```

573
```
Ser. No.  : XX-XXX
Revision  :      X
Order No. :
MB233000000000000
```

5.7   Analyzer Status

Here you can view all analyzer data. The menu sequence in Fig. 5-4 shows all submenus which can be accessed from the menu "Analyzer status". The arrows lead by one menu item to the next lower menu/dialog level which is called by this menu item.

5.7.1   Analyzer Status: Status

```
Logbook/faults
Maintenance request
AUTOCAL deviation
O₂ sensor status
```
571

In this menu you can call the status messages of the ULTRAMAT 23 via further menu items.

5.7.1.1   Analyzer Status: Status: Logbook/Faults

```
Mains voltage
beyond tolerance
Press ENTER to clear
Next message with –>
```
5711

This dialog displays a logbook of all recorded fault messages. Each type of fault message only appears once in the logbook and is output in alphanumeric text (see Chapter 6 for list of possible fault messages).

Viewing the logbook is protected by code level 1.

You can:

- **Display** all recorded faults in succession using the → key

- **Delete** the currently displayed fault message using the **ENTER** key, whereupon the next fault message appears, if present. You should delete those fault messages whose causes have been eliminated.

☞   **Notice**

By deleting the fault message you do not eliminate the cause of the fault (see Chapter 6)!

- A corresponding text is output when all stored fault messages have been displayed. Terminate display of the logbook using the → key.

☞   **Notice**

If the analyzer is in measuring mode, you can recognize the occurrence of a fault in that an **"F"** appears at the right edge. A **"!"** at the right edge signals that a fault has been logged which is no longer currently present.

5.7.1.2 Analyzer Status: Status: Maintenance Request

```
AUTOCAL drift
beyond tolerance
Press ENTER to clear
Next message with ->
```
5712

This dialog indicates the logged maintenance requests. A maintenance request is set if the values of certain parameters have reached defined limits, but the analyzer is still able to measure (e.g. AUTOCAL deviation or O_2 sensor status; also refer to later in this section). A corresponding message is output in alphanumeric text.

Access is protected by code level 1.

Operations in the maintenance request list (continue, delete) are carried out analogous to operations in the fault logbook.

☞ **Notice**

If the analyzer is in measuring mode, you can recognize the occurrence of a maintenance request in that an **"M"** appears at the right edge.

5.7.1.3 Analyzer Status: Status: AUTOCAL Deviation

```
IR drift readings
1 AUTOCAL
Deviation:  2.25 %
Max. allowed:   6 %
```
5713

This dialog indicates the deviation in setpoint between two AUTOCAL procedures. The parameters has the following meanings:

- The text in the two first lines provides information on the number of AUTOCAL procedures which have been carried out since the reference value for AUTOCAL was last set (see Section 5.10.2.2).

- **Deviation** is the measured deviation of the actual value from the reference value, displayed in % of the set measuring range (with autorange, range 1 is assumed). This deviation must not be above the set maximum value.

- **Max. allowed** is the maximum permissible value for the deviation. Refer to Section 5.10.2.2 to set the maximum value.

This function is specific to the component.

5.7.1.4 Analyzer Status: Status: O_2 Sensor Status

```
O₂ sensor status
Reading:    12.02 mV
Maint. req:  6.00 mV
Fault:       5.00 mV
```
5714

The cell voltage of the measuring cell drops during operation as a result of the aging process of the sensor. An exact message is no longer possible if it has reached the minimum value of 5.0 mV (fault message). The O_2 measuring cell should therefore be replaced when below 6.0 mV (maintenance request).

- **Reading** is the current voltage of O_2 measuring cell

- **Maint. req** and **Fault** are the two minimum values which output a maintenance request or a fault message when fallen below.

5.7.2 Analyzer Status: Diagnostic Values

```
IR diagnostic values
O₂ diagnostic values
Pressure sens. diagn
Other diagn. values
```
572

The diagnostic values which can be displayed provide important information for troubleshooting and adjustments. You can select four different function groups in this menu:

5.7.2.1 Analyzer Status: Diagnostic Values: IR Diagnostic Values

```
Lock-in ADU + temp.
V-ADUt
Raw values
Not limited concen.
```
5721

In this submenu, you can call the diagnostic values of the infrared measuring ranges:

```
Lock-in ADU SO₂
X= 408399   Y= 103444
R= 444912   V= 444912
B= 10016    T= 41.0°C
```
5721a

- **ADU** are voltage and signal values of the analog-to-digital converter <u>prior</u> to temperature compensation. These values are specific to the component.

```
NO    V(T): 440206
CO    V(T): 505577
SO₂   V(T): 494135
T: 42.2°C TS: *****°C
```
5721b

- **V-ADUt** are voltage and signal values of the analog-to-digital converter <u>following</u> temperature compensation. T in the bottom line corresponds to the temperature of the analyzer section, TS the temperature of the IR source (**not yet implemented.** "*****" = no measured value).

```
Raw values
NO  :       1.99 %
CO  :       0.27 %
SO₂ :   5.08 %
```
5721c

- **Raw values** are the measured values in % of the full-scale value (= 100 %).

```
 18  mg/m³ NO     M1
  2  mg/m³ CO     M1
 14  mg/m³ SO₂    M1
20.93 %     O₂    M2
```
5721d

- **Not limited concen.** are the values as in measuring mode except that you can <u>approximately</u> display the concentrations here even with an upward or downward violation of the largest range. Negative values are also displayed (live zero). The current measuring range is output on this display in the last two columns.

5.7.2.2 Analyzer Status: Diagnostic Values: O₂ Diagnostic Values

```
Sensorsig:   12.02 mV
O2:          20.94 %
Date: 27.05.1996
Inst.volt.:  12.10 mV
                   5722
```

This dialog displays the diagnostic values of the optional oxygen sensor.

- **Sensorsig** is the current pessure-compensated voltage of the O_2 sensor in mV

- **O₂** is the current oxygen value (negative values are also possible)

- **Date** is the installation date of the O_2 sensor (see Section 5.8.2)

- **Inst.volt** is the pressure-compensated voltage of the O_2 sensor when it was installed.

5.7.2.3 Analyzer Status: Diagnostic Values: Pressure Sensor Diagnosis

```
Pressure ADU: 3.965 V
Pressure air: 999 mbar
                   5723
```

This dialog displays the diagnostic values of the pressure sensor (see Section 5.8.3). The displayed values have the following meaning:

- **ADU pressure** is the voltage of the pressure sensor measured at the output of the A/D converter.

- **Pressure air** is the current atmospheric pressure in mbar.

5.7.2.4 Analyzer Status: Diagnostic Values: Other Diagnostic Values

```
Power/IR source
Reference/Bridge
Temperature of LCD
Analog output
                   5724
```

This menu is used to call further diagnostic functions. You can call the following dialogs:

```
Power (VAC) :   101 %
Raw voltage :    30 V
Source 1    : 7.541 V
Source 2    :15.023 V
                  5724a
```

- **Power/IR source**

  Power: Data on the mains voltage in % of the nominal value of the respective mains voltage (e.g.: 100 % corresponds to 230 V or 120 V).

  Raw voltage: Raw voltage following the rectification

  Source 1, Source 2: Data on the IR source voltage(s), in Volt provided the IR source is present.

```
Reference  :  2.513 V
Bridge     :  3.755 V
                  5724b
```

- **Reference/Bridge**

  Reference: The reference voltage for the electronics of the analyzer.

  Bridge: The supply voltage to the measuring bridge.

```
LCD temp.    : 34.9°C
                  5724c
```

- **LCD temperature**

  The temperature which determines the display contrast. Refer to Section 5.9.4.2 for adjustment of the LCD contrast.

```
NO   3.11 4 /20mA
CO   4.25 4 /20mA
SO₂  4.04 4 /20mA
O₂  17.82 4 /20mA
                5724d
```

- **Analog output**

  The actual value of the output current in mA; (the dimension is not shown for space reasons) as well as the start-of-scale value (either 0, 2 or 4 mA) and the full-scale value (20 mA) of the output current range are displayed for each of the measured components. Refer to Section 5.10.2 for adjustment of the start-of-scale values.

5.7.3 Analyzer Status: Factory Settings Hardware

```
Ser. No. IK-001
Revision:
Order No.:
                573
```

Factory settings are parameters which are already set on delivery and which cannot be modified by the user, such as the Serial No., revision and Order No. The hardware configuration and release version can be read here.

5.7.4 Analyzer Status: Factory Settings Software

```
Firmware No.:

Software version:
date
                574
```

Factory settings are parameters which are already set on delivery and which cannot be modified by the user, such as the software/firmware release version. The software release version can be read here.
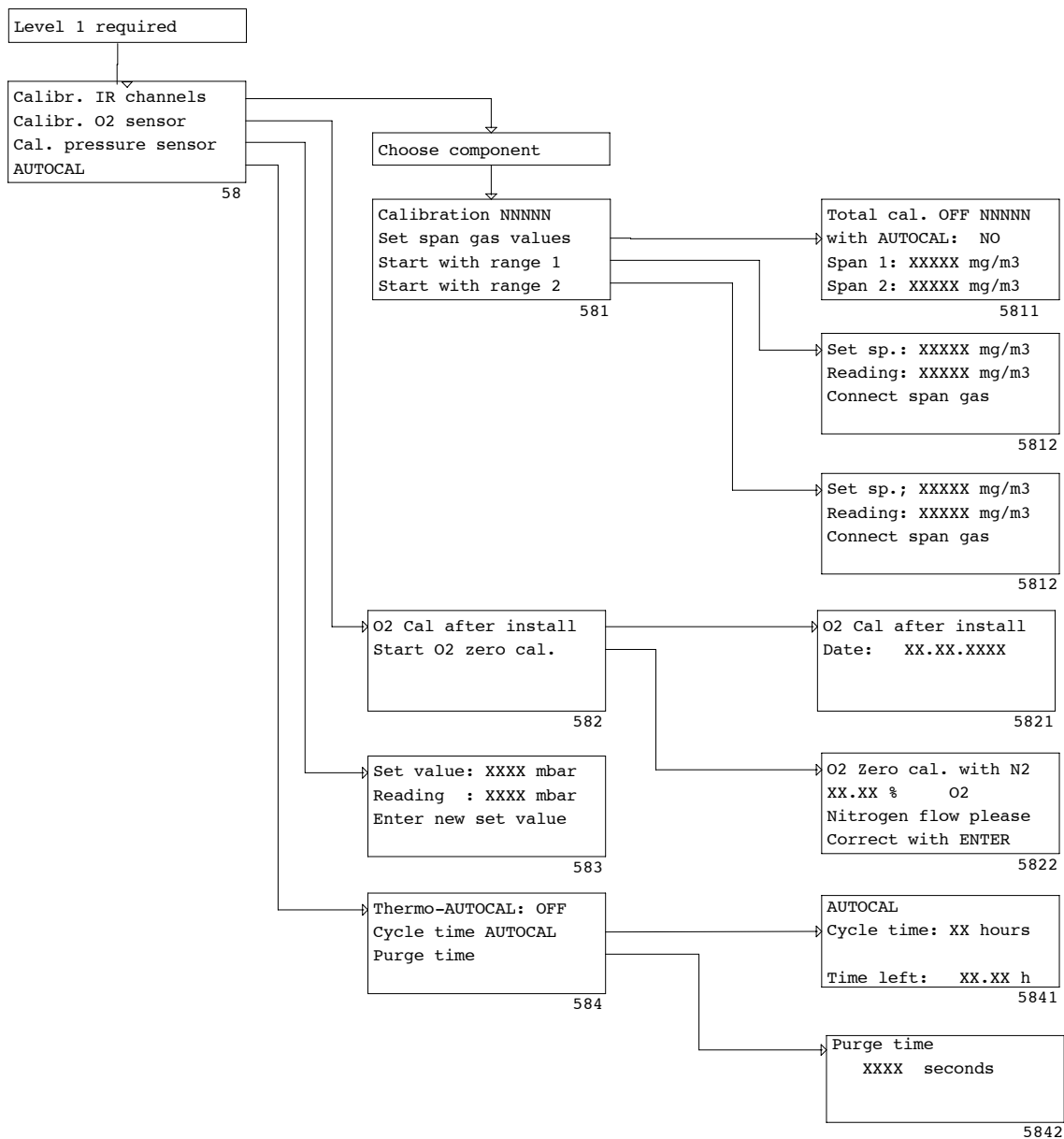
Fig. 5-5   Menu sequence for "Calibration"

5.8   Calibration

Using this function it is possible to calibrate the IR channels of the ULTRAMAT 23 using one or more calibration gases, and to reset the sensitivity. In addition, you can calibrate the oxygen sensor and the pressure sensor and also define the AUTOCAL parameters. Fig. 5-5 shows the associated menu sequence (see Section 5.7 for description of display elements).

Calibration is only possible if you have enabled code level 1.

5.8.1   Calibration: Calibrate IR Channels

```
Calibration SO₂
Set span gas values
Start with range 1
Start with range 2
```
581a

In this menu you can:

* Set, in line 2, the setpoints of the calibration gases for the individual ranges or select a total or single calibration.

* Start a calibration procedure in lines 3 and 4.

This function is specific to the component.

5.8.1.1   Calibration: Calibrate IR Channels: Set Span Gas Values

```
Total cal.: OFF SO₂
With AUTOCAL: NO
Span 1 :   386 mg/m³
Span 2 : 1920 mg/m³
```
5811

* **Total cal.:** In the first line of this dialog, you can select either a total or single calibration.

    ON means that one range is calibrated and that this calibration is used for the other ranges (total calibration).

    OFF means that each range is calibrated separately (single calibration, e.g. with different calibration gases).

* **With AUTOCAL**: You can define here whether you wish to carry out an AUTOCAL prior to the calibration procedure (**YES** or **NO**). An AUTOCAL is not necessary here if it has already been carried out shortly before the calibration procedure, e.g. a calibration procedure has taken place directly previously.

```
Total cal.: OFF SO₂
With AUTOCAL: NO
Span 1+2 :   12 %
Span 1+2 :   12 %
```
5811a

* **Span1, Span2**: Here you can enter the setpoints for the individual measuring ranges (these are the concentrations of the components in the respective calibration gas). They should be set to a value which is between 70 and 100 % of the full-scale value. If **Total cal.: ON** has been selected, the analyzer automatically uses the setpoint of range 2 for range 1. With **Total cal.: OFF** any input is possible between the start-of-scale and full-scale values of the respective range.

5.8.1.2 Calibration: Calibrate IR Channels: Start with Range MR 1/2

```
Set span:    386 mg/m³
Reading:       1 mg/m³
Connect span gas
```
5812

The analyzer interrupts the current measurement if you call one of these two dialogs. If the parameter **With AUTOCAL** was set to **OFF,** the analyzer expects an immediate flow of calibration gas; if the value is set to **ON**, an AUTOCAL is carried out prior to the flow of gas. The values of the setpoint and actual-value calibrations are displayed in the first two lines.

```
Set span:    386 mg/m³
Reading:       1 mg/m³
If the reading is
stable, press ENTER
```
5812a

If the analyzer recognizes a flow of calibration gas, the display changes as shown. If the measured value in the second line remains constant for more than approx. 10 s or does not change significantly, press the **ENTER** key.

```
Set span:    386 mg/m³
Reading:     380 mg/m³
Calibration o.k.
Press ESC to return
```
5812b

The analyzer then compares the setpoint and actual value (measured value) of the calibration. If the deviation between the values is within the tolerance, the adjacent message is output. (**o.k.**)

```
Set span:    386 mg/m³
Reading:       5 mg/m³
Tolerance not o.k.
Press ESC to return
```
5812c

If the actual value is approx. 20 % greater or smaller than the setpoint determined in the factory, the message **not o.k.** appears instead (no calibration possible).

5.8.2 Calibration: Calibrate O$_2$ Sensor

```
O₂ cal. after install
Start O₂ zero cal.
```
582

In this menu, you can call dialogs:

- To re-enter the installation date of the O$_2$ sensor
- To recalibrate the zero of the O$_2$ sensor.

5.8.2.1 Calibration: Calibrate O$_2$ Sensor: O$_2$ Cal. after Install

```
O₂ cal after install
Date :01.01.2000
```
5821

Following the installation of a new sensor, you must re-enter the installation date.

The entered date is checked for plausibility. A calibration (AUTOCAL) is then carried out with ambient air.

A check is carried out during this procedure to establish whether the sensor voltage is greater than 9 mV. If this is not the case, a fault message "Sensor voltage too low".

5.8.2.2 Calibration: Calibrate O$_2$ Sensor: O$_2$ Zero Cal.

```
O2 zero ca. with N2
0.18 %
Nitrogen flow please
Calibrate with ENTER
```
5822

In this dialog you can recalibrate the zero point of the O$_2$ sensor using nitrogen. Connect a flow of nitrogen and commence the calibration using **ENTER**.

```
O2 zero cal with N2
1.25 %
>1% => default value
Press ESC to return
```
5822a

When you call the calibration function, the current oxygen value is displayed in the second line. If this does not deviate by more than 1 % from the set value, it is used as the new zero (this is not the case in the example display, see third line).

If the value is greater than 1 %, a fixed standard value is used instead.

☞   **Notice**

Please note that the exchange of gas takes place very slowly with low oxygen concentrations. Purge for 30 min, and then use the current value.

5.8.3 Calibration: Calibrate Pressure Sensor

```
Set value: 1000 mbar
Reading: 1007 mbar
Enter new set value
```
583

In the first line of this dialog, you can re-enter the setpoint of the pressure sensor. Measure a value e.g. using an accurate barometer, and change the setpoint in the first line if necessary.

5.8.4 Calibration: AUTOCAL

In this dialog you can change the following values of the AUTOCAL parameters:

```
Thermo-AUTOCAL:  OFF
Cycle time AUTOCAL
Purge time
```
<div align="right">584</div>

- **Thermo-AUTOCAL**

    OFF: An automatic AUTOCAL only takes place when the cycle time has expired (see below).

    ON: An automatic AUTOCAL is carried out when the set cycle time has expired, and is also triggered in the case of changes in temperature > 8°C.

```
AUTOCAL
Cycle time:  6 hours

Time left 04:44 h
```
<div align="right">5841</div>

- **Cycle time AUTOCAL**

    A further dialog is called, and you can set and modify the cycle time (the time between two AUTOCAL procedures triggered by the analyzer) in the second line. Valid cycle times are from 0 to 24 hours. In the display, 6 hours has been set as an example. A cyclic AUTOCAL is not carried out if 0 hours is set.

    The cycle time must not be set > 6 h if the analyzer is used in German systems subject to TA Luft and 13.BlmSchV.

    The fourth line indicates when the next AUTOCAL will take place.

    If the flow during an automatic (cyclic) zero adjustment is too low, this zero adjustment is aborted, and an error status set. The failed zero adjustment is entered in the logbook.

```
Purge time
_  80 seconds
```
<div align="right">5842</div>

- **Purge time**

    If you call the menu item "Purge time", you can change the purge time (duration of flow with sample gas) in the second line of the displayed dialog. Valid purge times for analyzers with an O_2 sensor are 60 to 300 s, otherwise 0 to 300 s. There are minimum purge times depending on the measured components, and shorter times should not be used. 80 seconds has been selected in our example.

```
┌─────────────────────┐
│ Level 1 required    │
└─────────────────────┘
          │
┌─────────────────────┐                    ┌─────────────────────────┐
│ Measuring ranges    │───────────────────▷│ Switch range XXXXXX     │
│ Limit values        │                    │ Actual range: AR        │
│ Time constants      │    ┌───────────────│ MR 1:0..XXXXX  mg/m3    │
│ Pump / LCD contrast │    │               │ MR 2:0..XXXXX  mg/m3    │
└─────────────────────┘    │               └─────────────────────────┘
                   59      │                                      5911
          │                ▼
┌─────────────────────┐                    ┌─────────────────────────┐
│ Choose component    │                    │ Change range XXXXX      │
└─────────────────────┘                    │                         │
          │                                │ MR 1:0..XXXXX  mg/m3    │
┌─────────────────────┐                    │ MR 2:0..XXXXX  mg/m3    │
│ Switch ranges XXXXX │───────────────────▷└─────────────────────────┘
│ Change ranges XXXXX │                                           5912
│ Hysteresis   XXXXX  │
└─────────────────────┘                    ┌─────────────────────────┐
                 591                        │ Hysteresis AUTORANGE    │
                                            │ MR1 XXXXX mg/m3 NNNNN   │
                                            │ MR1->MR2: XXX.X% MR1    │
                                            │ MR2->MR1: XXX.X% MR1    │
┌─────────────────────┐                     └─────────────────────────┘
│ Choose component    │                                          5913
└─────────────────────┘
          │                                ┌─────────────────────────┐
┌─────────────────────┐                    │ Limit 1     NNNNN       │
│ Limit 1     NNNNN   │───────────────────▷│ Lim. 1: XXXXX mg/m3     │
│ Limit 2     NNNNN   │                    │ Alarm conc.:  -----     │
└─────────────────────┘                    └─────────────────────────┘
                 592                                            592a

                                           ┌─────────────────────────┐
                                           │ Limit 2     NNNNN       │
                                           │ Lim. 2: XXXXX mg/m3     │
                                           │ Alarm conc.:  -----     │
                                           └─────────────────────────┘
┌─────────────────────┐                                        592a
│ Choose component    │
└─────────────────────┘
          │                                ┌─────────────────────────┐
┌─────────────────────┐                    │ Adjust pump/flow        │
│ Time constants NNNNN│                    │ Use -> to adjust        │
│ T90 within : XX.X s │                    │ ENTER: Save new val.    │
│ T90 outside: XX.X s │                    │ ESC:   Keep old val.    │
│ Threshold  : XX.X % │                    └─────────────────────────┘
└─────────────────────┘                                         5941
                 593
┌─────────────────────┐                    ┌─────────────────────────┐
│ Adjsut pump / flow  │───────────────────▷│ Adjust LCD contrast     │
│ Adjust LCD contrast │                    │ Use -> to adjust        │
└─────────────────────┘                    │ ENTER: Save new val.    │
                 594                        │ ESC:   Keep old val.    │
                                            └─────────────────────────┘
                                                                5942
```

Fig. 5-6   Menu sequence for "Parameters"

5.9   Parameters

It is possible here for you to modify various analyzer parameters. These modifications can only be made within the limits which have been preset for your analyzer. The analyzer checks parameter changes for plausibility and rejects them if applicable. Fig. 5-6 shows the menu sequence (see Section 5.7 for explanation of display elements).

The menu "Parameters" is protected by code level 1.

5.9.1   Parameters: Measuring Ranges

```
Switch ranges SO₂
Change ranges SO₂
Hysteresis SO₂
```
591

You can use this menu to select dialogs in order to permit or cancel the switching over between measuring ranges, to set the full-scale values and to define a hysteresis.

☞

Notice

Please note that the range parameters only refer to the analog outputs (see Section 5.10). The display always shows the complete, physically possible range with the factory-set digital resolution.

5.9.1.1   Parameters: Measuring Ranges: Switch Ranges

```
Switch ranges SO₂
Actual range: 1
MR 1:0..    400 mg/m³
MR 2:0..   2000 mg/m³
```
5911

In the second line of this dialog you can set the measuring ranges 1 or 2 or permit autoranging (automatic switching over between these two ranges). The parameter **Actual range** can have the following values:

- **1**: The analyzer is set to the smaller range (**MR 1**) and does not switch over the analog output (see Chapter 3, Pin Assignments) (see Fig.).

- **2**: The analyzer is set to the larger range (**MR 2**) and does not switch over the analog output.

- **AR**: The analyzer switches over automatically from one range to the other (AR = autorange). Refer to Section 5.9.1.3 for how to set the switch over criteria.

5.9.1.2 Parameters: Measuring Ranges: Change Ranges

```
Change ranges SO₂

MR 1:0..    400 mg/m³
MR 2:0..   2000 mg/m³
```
5912

The full-scale values of the measuring ranges can be set in the third and fourth lines of this dialog. They must be present within the factory settings, i.e. if an analyzer is factory-set for a total range from 0 to 2000 mg/m^3, modifications are only possible within this range + 3 %, i.e. up to 2060 mg/m^3. In addition, the full-scale value of range 1 must not be smaller than - 3 % of the factory-set minimum permissible range, e.g. not smaller than 388 mg for 400 mg, and not greater than that of range 2.

5.9.1.3 Parameters: Measuring Ranges: Hysteresis

```
Hysteresis AUTORANGE
MR1   400 mg/m³ SO₂
MR1->MR2: 100.0% MR1
MR2->MR1:  90.0% MR1
```
5913

In the third and fourth lines of this dialog, you can set the value at which the analyzer switches from one range to the other. The values are specified in % of the full-scale value of range 1 (**MR1**) (see Section 5.9.1.1) .

☞
Notice

The hysteresis is only active if the parameter **Actual range** has been set to the value **AR** (autorange) in the dialog "Switch ranges".

The two switch over points should be as far apart as possible, and the switch over point from MR1 to MR2 must be greater than that from MR2 to MR1. The following conditions have been assumed in the above display:

Your analyzer has two ranges: MR1 from 0 to 400 mg/m^3, MR2 from 0 to 2000 mg/m^3. The hystereses are defined as: **MR1->MR2** at 100 %; **MR2->MR1** at 90 %.

This means:

- If your analyzer is working in the smaller range (MR1), it switches over to the larger range (MR2) when a value greater than 400 mg/m^3 SO$_2$ is measured.

- If your analyzer is working in the larger range (MR2), it switches over to the smaller range (MR1) when a value less than 360 mg/m^3 SO$_2$ is measured (= 90 % of 400 mg/m^3).
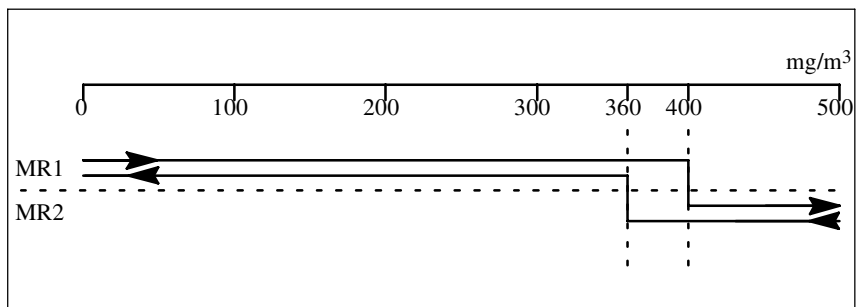
Fig. 5-7   Hysteresis curve

5.9.2   Parameters: Limit values

```
Limit 1 SO₂
Limit 2 SO₂
```

592

☞

Two limits are assigned to each component, and can be set using this menu. A relay is triggered when the limits are violated (see Section 5.10.1.2). **Limit 1** is the lower limit, **Limit 2** the upper limit.

Notice

A set limit only triggers a relay contact if a relay has been assigned to the corresponding limit signal (see Section 5.10.1.2).

The limits are not updated:

during the first warm-up phase

during an AUTOCAL

during the message: function check and analog output at 'Hold measured value' (see section 5.10.1.1)

```
Limit 1 SO₂
Limit 1:  2000 mg/m³
Alarm at conc.:-----
```

592a

If you have selected "Limit 1" or "Limit 2", a dialog appears in which you can enter the lower or upper limit for each component. You can define the value in the second line, and the condition under which a contact is be triggered in the third (**Alarm at conc.:**):

*   **High:** with upward violation

*   **Low:** with downward violation

*   **- - - - -:** no signal; see Fig.

5.9.3 Parameters: Time Constants

```
Time constant SO₂
T90 within:   12 s
T90 outside:   3 s
Threshold:     3 %
```
593

You can use this function to set various time constants to suppress noise in the measured signal. During processing of the measured signals, these time constants reduce the noise by delaying the signal.

The time constant "T90 within" is effective within a parameterized interval whose threshold values are defined as a percentage of the smallest measuring range. The time constant dampens small changes in signal (e.g. noise), but becomes immediately ineffective if a fast change in signal exceeds a threshold. When this occurs, the signal is dampened by the time constant "T90 outside" until it falls below the threshold value again, whereupon "T90 within" becomes effective again.
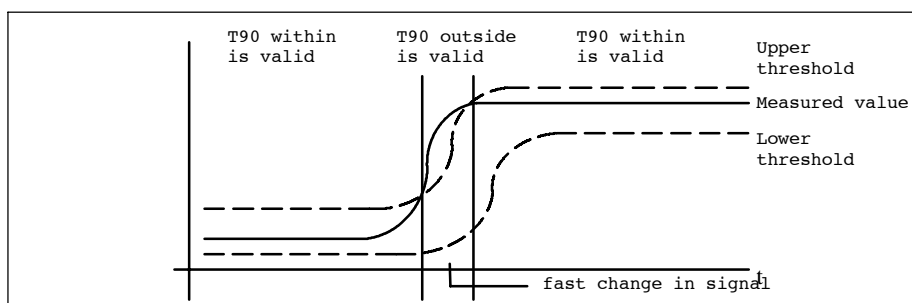
Fig. 5-8   Thresholds and time constants

The following values are possible for the time constants:

- **T90 within, outside**: 0.1 to 99.9 (s)

- **Threshold**: Data in %: 0 to 100 % of smallest range

5.9.4 Parameters: Pump/LCD Contrast

```
Adjust pump/flow
Adjust LCD contrast
```
594

You can use this menu to select two dialogs via which the pump capacity and the contrast of the LCD can be changed.

5.9.4.1 Parameters: Pump/LCD Contrast: Adjust Pump

```
Adjust pump/flow
Use  -> to adjust
ENTER: save new val.
ESC: keep old value
```
5941

Here you can:

- **Increase** the pump capacity using the → or ↑ key

- **Decrease** the pump capacity using the ↓ key

- Store the set pump capacity using the **ENTER** key

- Cancel the input using the **ESC** key.

Changes to the pump capacity are shown on the flowmeter and directly in the menu display by the message OK or NOK.

5.9.4.2 Parameters: Pump/LCD Contrast: Adjust LCD Contrast

```
Adjust LCD contrast
Use -> to adjust
ENTER: save new value
ESC : keep old value
```
5942

Here you can:

- **Increase** the contrast using the → or ↑ key (darken the characters)

- **Decrease** the contrast using the ↓ key (brighten the characters)

- Store the set contrast using the **ENTER** key

- Cancel the input using the **ESC** key.

☞ **Notice**

Press the three keys ↑ , ↓ and → simultaneously to set an average contrast again.

Fig. 5-9   Menu sequence for "Configuration"

Code 1 : XXX
Code 2 : XXX
Language: italiano
51021

Preset AUTOCAL drift
Quantity: XXX
Limit : XX %
51022

Interf. NNNNN mg/m3
Chan.: XX Comp: X
I1: +X.XXXXe+X
51023a

Interf. NNNNN mg/m3
Chan.: XX Comp. X
I2: +X.XXXXe+X
51023b

Firmware : 2.0.0
Boot FW : 0.2.0
TAG : UTWENTYTHREE

Choose component
Unit for NNNNN
set : mg/m3
MR min: XXXXX -3%
MR max: XXXXX +3%
51024c

Channel : XX
Name :ULTRAMAT23
Protocol :OFF
Sync. zero cal. :OFF
51023a

Choose component

Interference NNNNN
Interferences: OFF
Interference 1
Interference 2

Address :
Ident number: 2
PB relay: OFF
Diagnosis

ATTENTION! Data will
be overwritten!
press ENTER to cont.
press ESC to cancel

Warning! Analyzer is
set to warm-up mode!
press ENTER to cont.
press ESC to cancel
51024a

Test of inputs
Active input:
NONE
press ESC to cancel
51032d

ELAN parameters
ELAN ext.Interfer.
PROFIBUS Parameters
Const. interference
51023

Load factory data
Reset analyzer
Change units
51024

Test of display
press ESC to cancel

Test of keys
Time left: 29 sec
Pressed key:
no key

Test of flow sensor
Flow O.K.
Press ESC to cancel

Test of inputs
Active input:
NONE
press ESC to cancel

Optional board
not found!
Back with ESC

a)
Codes/language
AUTOCAL drift
ELAN
Fact.data/res/units
5102

b)
Test:displ/keys/flow
Inputs/outputs
Chopper/IR source
RAM monitor
5103

Test of display
Test of keys
Test of flow switch
51031

Functions for
SIEMENS service

Functions for
SIEMENS service

Test of analog output
Test of relays
Test of ext. sol. valve
Test of inputs
51032

Analog 1: XX.XX mA
Analog 2: XX.XX mA
Analog 3: XX.XX mA
Analog 4: XX.XX mA
51032a

Test of relays
Relay number: 1
Condition: active
press ESC to cancel
51032b

XXXXX mg/m3 NNNNN ZV
XXXXX mg/m3 NNNNNOFF
XXXXX mg/m3 NNNNN SV
XXXXX % O2 OFF
51032c

Input CAL/pomp/sync
Binary inputs

Interf. CO 5 mg/m3
Const. interf.: OFF
C.I.: +X.XXXXe+X
51023c

Fig. 5-10   Menu sequence for "Configuration" (continued)

5.10 Configuration

Here you can assign relays and inputs/outputs and use special functions and test functions. Fig. 5-9 shows the associated menu sequence (see Section 5.7 for explanation of elements).
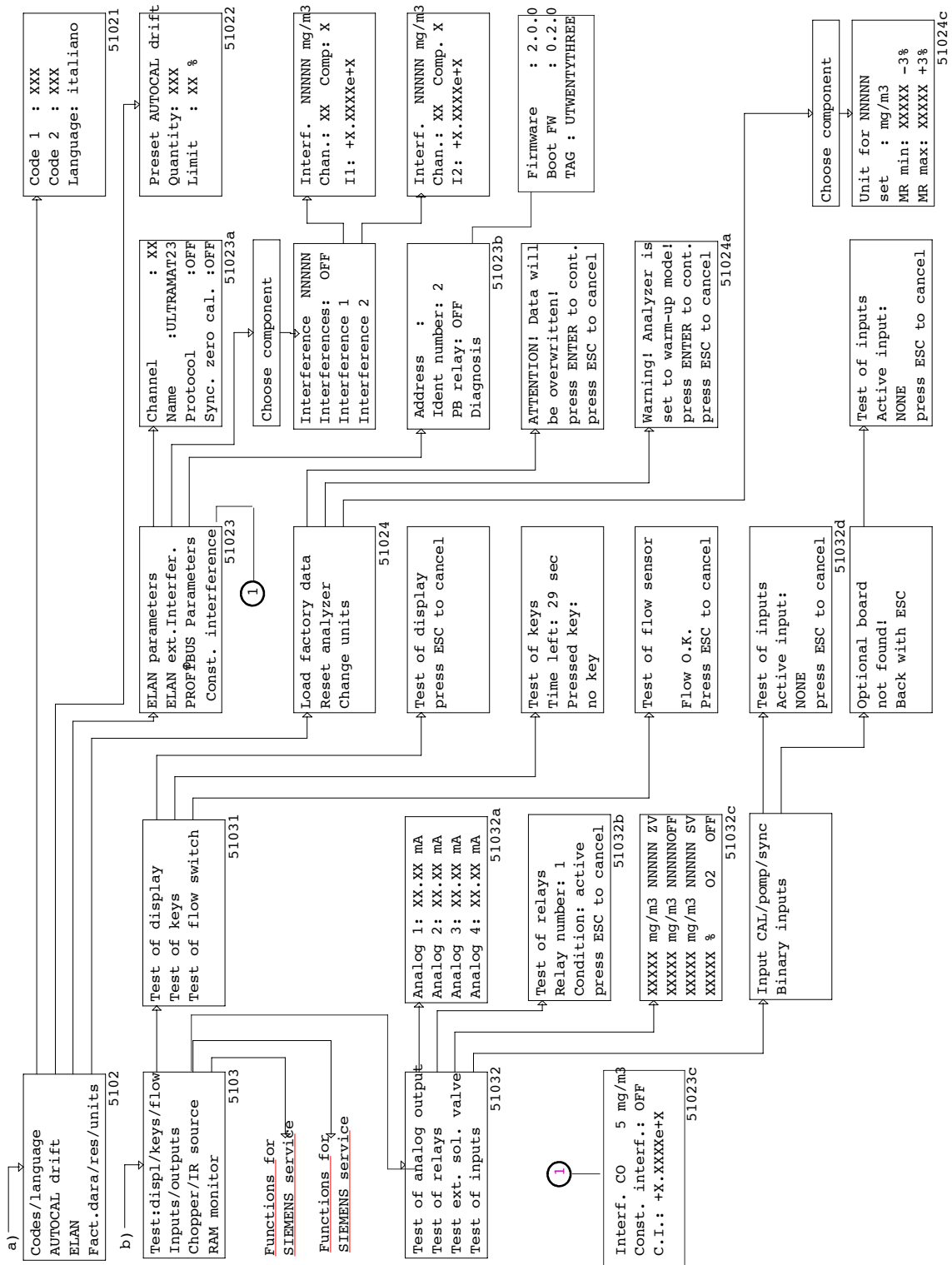
This menu is protected by code level 2.

5.10.1 Configuration: Inputs/Outputs/Pump

```
Analog outputs
Assign relays
Binary-/Sync-Inputs
Pump ON/OFF modes
                5101
```

This menu provides functions in order to define relays, inputs and outputs, the synchronization and the pump response during calibration and in measuring mode:

5.10.1.1 Configuration: Inputs/Outputs/Pump: Analog Outputs

```
Analog output ranges
Output during FCTRL
Output during faults
                51011
```

You can use this menu to parameterize the analog outputs. This input always refers equally to all components.

```
Analog output
Set value :
Range  4 / 20 mA
Meas.value neg: ON
                51011a
```

- **Analog output ranges (start-of-scale value of analog output)**

  0, 2 , 4 mA or **NAM** can be set in the third line as the start-of-scale value of the analog current range. The suppression of negative measured values can be switched on or off in the fourth line. The ON option is preset. This means that negative measured values are output. With a setting of 2 or 4 mA as the lower limit, values below this down to 0 mA can nevertheless be output, i.e. negative measured values can be displayed (live zero).

  If display of negative measured values is switched off, the current output is limited to the start-of-scale value. If 2 or 4 mA is set as the lower limit, the output is now indeed limited to 2 or 4 mA.

```
Analog output
Set value :
Range  4 / 20 mA
Meas.value neg. OFF
                51011a
```

In the adjacent display, the start-of-scale value of the analog current range is set to 4 mA.

The following tables represent the correlation between analog current outputs and measuring range limits.

Table 5-2   Analog current output for start-of-scale values

selectable	Analog current (neg. on)	Analog current (neg. off)
0 - 20 mA	0 mA	0 mA
2 - 20 mA	2 mA	2 mA
4 - 20 mA	4 mA	4 mA
NAMUR - 20 mA	4 mA	4 mA

Table 5-3   Analog output current for downward limiting of measured
value

selectable	Analog current (neg. on)	Analog current (neg. off)
0 - 20 mA	0.0 mA	0.0 mA
2 - 20 mA	0.0 mA	2.0 mA
4 - 20 mA	0.0 mA	4.0 mA
NAMUR - 20 mA	3.8 mA	4.0 mA

Table 5-4   Analog output current for upward limiting of measured value

selectable	Analog current (neg. on)	Analog current (neg. off)
0 - 20 mA	21.0 mA	21.0 mA
2 - 20 mA	21.0 mA	21.0 mA
4 - 20 mA	21.0 mA	21.0 mA
NAMUR - 20 mA	20.5 mA	20.5 mA

1) if measuring range 2 is set to the maximum possible value, the limiting
value of range 2 ... 20 mA is at 20.9 mA and of range 4 ... 20 mA at
20.8 mA.

```
Analog output during
function control
Meas. value: hold
```
51011b

• **Analog output during FCTRL (analog output during function
control)**

The following measured value outputs are possible with the
AUTOCAL procedure, in warm-up mode and in the uncoded state:

Hold: The value measured directly prior to commencement is
output unchanged. This also applies to the limits which are
output (see section 5.9.2)

Actual: The measured value is continuously updated.

Zero: see following table:

selectable	Analog current (neg. on)	Analog current (neg. off)
0 - 20 mA	0 mA	0 mA
2 - 20 mA	2 mA	2 mA
4 - 20 mA	4 mA	4 mA
NAMUR - 20 mA	3 mA	3 mA

21 mA: see following table:

selectable	Analog current (neg. on)	Analog current (neg. off)
0 - 20 mA	21.0 mA	21.0 mA
2 - 20 mA	21.0 mA	21.0 mA[1]
4 - 20 mA	21.0 mA	21.0 mA[1]
NAMUR - 20 mA	21.5 mA	21.5 mA

1) If measuring range 2 is set to the maximum possible value, the limiting value of range 2 ... 20 mA is at 20.9 mA and of range 4 ... 20 mA at 20.8 mA.

```
Analog output
during fault
Meas. value: hold
```
51011c

• **Output during faults (analog output during a fault)**

It is possible for you to define the type of measured value output during a fault. The following are possible:

Hold: The last value measured prior to the fault is output for the duration of the fault.

Actual: The measured value is continuously updated during the fault.

Zero: see following table:

selectable	Analog current (neg. on)	Analog current (neg. off)
0 - 20 mA	0 mA	0 mA
2 - 20 mA	2 mA	2 mA
4 - 20 mA	4 mA	4 mA
NAMUR - 20 mA	3 mA	3 mA

21 mA: see following table:

selectable	Analog current (neg. on)	Analog current (neg. off)
0 - 20 mA	21.0 mA	21.0 mA
2 - 20 mA	21.0 mA	21.0 mA[1]
4 - 20 mA	21.0 mA	21.0 mA[1]
NAMUR - 20 mA	21.5 mA	21.5 mA

1) If measuring range 2 is set to the maximum possible value, the limiting value of range 2 ... 20 mA is at 20.9 mA and of range 4 ... 20 mA at 20.8 mA.

5.10.1.2 Configuration: Inputs/Outputs/Pump: Assign Relays
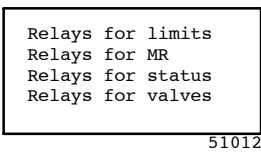
```
Relays for limits
Relays for MR
Relays for status
Relays for valves
```
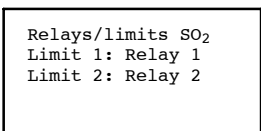51012

You can use this menu to assign different functions to up to eight relays which are installed in the analyzer. These functions can be signals for limits or ranges, status signals, and the functions of the external solenoid valves. If an option module is present, eight additional relays, i. e. a total of 16 relays, can be assigned to the corresponding functions.

Each function may only be assigned to one single relay. The analyzer outputs an error message if you attempt a double assignment for a relay which has already been assigned. A relay to which a function has not been assigned is shown on the display by a dash.

Table 5-5   Summary of relay assignments

Function	Relay de-energized	Relay energized	Signalling
Limit	Limit has been triggered		Limit, see Section 5.9.2
Measuring range	Range 2	Range 1	
Fault	Fault present		
Maintenance request	Maintenance request		
CAL/MEAS	Measure	AUTOCAL	AUTOCAL
Function control	Function control present		With warm-up mode (approx. 30 min), AUTOCAL, uncoded
Zero gas	Zero gas flowing		Ext. solenoid valve open
Calibration gas (Sample gas inlet)		Calibration gas flowing	Ext. solenoid valve open
Sync.		Synchronization signal is output	AUTOCAL only "Zero gas flow" and adjustment not during sample gas purge phase

The pin assignments of the relays in the de-energized state are described in Chapter 3.

```
Relays/limits SO₂
Limit 1: Relay 1
Limit 2: Relay 2
```
51012a

- **Relays for limits**

  The upper and lower limits can be defined as events for triggering relays. Select the desired relay number in the second and third lines.

  This function is specific to the component.

```
NO    MR relay 3
CO    MR relay -
SO2   MR relay 4
O2    MR relay -
```
51012b

- **Relays for MR**

  A relay can be assigned to the range switchover of each component. This guarantees reliable assignment of the analog signal to the currently active range, especially in autorange mode (see Section 5.9.1).

```
Fault          :R-
Mainten. req.  :R5
CAL/MEAS       :R6
Service sw.    :R-
```
51012c

- **Relays for status**

  You can use this dialog to apply the signalling of various operating states of the device as an event for relay control (R= Relay). The following signals are possible (see also Table 5-5):

  Fault: The occurrence of a fault message

  Maintenance request: The occurrence of maintenance request (applied to relay 5 in Fig.)

  CAL/MEAS: Switching over from measurement to AUTOCAL (applied to relay 6 in Fig.)

  Service switch: The occurrence of a function control.

```
External valves
Zero gas :Relay -
Span gas :Relay 7
Sync     :Relay 8
```
51012d

- **External valves**

  You can use this to trigger external solenoid valves via relay contacts:

  Zero gas: The zero gas supply which is also triggered with AUTOCAL

  Span gas: The calibration gas supply (assigned to relay 7 in Fig.; see Section 5.10.3.2)

  Sync: The synchronization of an AUTOCAL with other devices within a system (assigned to relay 8 in Fig.; see Section 4.3.3).

5.10.1.3   Configuration: Inputs/Outputs/Pump: Binary/Sync Inputs

```
Sync inputs
Binary inputs



                    51013
```

```
Modes of sync input

(press -> to toggle)
_:activate CAL relay


           51013a
```

You can use this dialog to set the response of the synchronization input and the binary intputs. Select an option.

- **Sync Input**
  You can use this dialog to set the response of the synchronization input. An AUTOCAL can then be triggered simultaneously for several analyzers within a system. The following settings are possible in the third line (see also section 4.3.3)**:**

  AUTOCAL: The analyzer carries out an AUTOCAL and activates its sync output up to the end of the electronic adjustment.
  If the flow is too low during a zero adjustment triggered via the sync input, this zero adjustment is aborted, and an error status set. The aborted zero adjustment is entered in the logbook.

  only CAL contact (set in Fig.)**:** The analyzer enters the CAL status, but does not carry out an AUTOCAL. The analyzer waits until the Sync input becomes inactive. It then enters the status 'Purge sample gas' and subsequently returns to measuring mode again.

```
Fault/MaintenanceReq
function control
meaasuring ranges
Clear logbook

           51015b
```

- **Binary Inputs:**
  You can use this dialog to freely configure 8 floating binary inputs ["0" = 0 V (0...4,5 V); "1" = 24 V (13...33 V)] in analyzers with an option module. The pin assignments of the 37-contact plug are described in Chapter 3. No inputs are preset on delivery.

  Using a submenu for the 8 inputs, you can

  switch over 7 different messages for faults/maintenance requests or

  switch over 4 different messages for function check or

  switch over measuring ranges or

  delete the logbook.

The following table explains the functions:

Table 5-6   Summary of binary inputs

Function	Control with		Effect
	0 V	24 V	
- (vacant)			
External fault 1-7		x	e.g. signalling of a fault in gas conditioning (cooler, flow, condensation trap, ...)
External maintenance request		x	e.g. signalling of a maintenance request in gas conditioning (filter, flow, ...)
Function check		x	e.g. signalling of maintenance
Measuring range 1, 2		x	The corresponding range is selected (autorange OFF)
Autorange		x	Autorange is switched on
Delete logbook		x	Delete all fault and maintenance request entries

5.10.1.4   Configuration: Inputs/Outputs/Pump: Pump at CAL/MEAS

```
Pump at CAL:  ON
Pump at MEAS: ON
```
51014
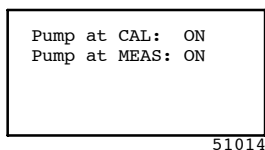
You can use this dialog to define the response of the pump. The following parameters and values are possible:

- **Pump at CAL:** Pump **ON** or **OFF** during a calibration procedure (AUTOCAL)
- **Pump at MEAS:** Pump **ON** or **OFF** during measuring mode.

5.10.2   Configuration: Special Functions

```
Codes/Language
AUTOCAL drift
ELAN/PROFIBUS
Fact.data/Res/Units
```
5102
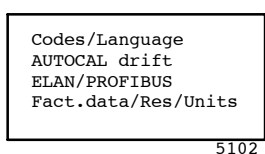
You can use this menu to call dialogs in order to modify the access code, to set the AUTOCAL drift, to parameterize the interfaces and to change the physical units in which the measured values are output.

5.10.2.1   Configuration: Special Functions: Codes/Language

```
Code 1: 111
Code 2: 222
Language: English
```
51021
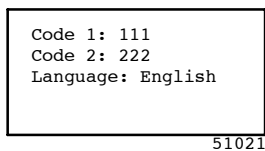
In the first two lines of this dialog, you can change the codes of the two code levels 1 and 2 (see also Section 5.5.1). The factory settings are:

- **Code 1:** 111;
- **Code 2:** 222.

You can also reduce the number of code levels by assigning the same code to both levels. The new values are saved when you subsequently switch off the ULTRAMAT 23; you should therefore make a note of the changed code numbers and keep this at a safe place.

You should note the code numbers before you leave the menu.

In third line of this dialog you can change the language of the display dialogs:

- deutsch

- English

- español

- français

- italiano

- polski

A change is immediately effective when you leave the dialog.

5.10.2.2   Configuration: Special Functions: AUTOCAL Drift

```
Preset AUTOCAL drift
Quantity: 004
Limit: 6 %
```
51022

You can use this dialog to define the conditions under which the drift of an AUTOCAL procedure triggers a maintenance request. The adjustable parameters are:

- **Quantity:** The number of AUTOCAL procedures up to setting of a new reference value (4 in this case)

- **Limit:** The highest value in % of the set measuring range (max. 99%) by which the calibration may deviate from the reference value (6 % in this case. See also Section 5.7.1.3). If Autorange is set, measuring range 1 is assumed.

```
0. AUTOCAL:                                        = 0. AUTOCAL::
Set a reference                                         Set a new
value              1.        2.        3.        4.  reference value



      |            |         |         |         |
      |            |         |         |         |            t
      |_____|_____|_____|_____|_____>
      |            |         |         |         |
```
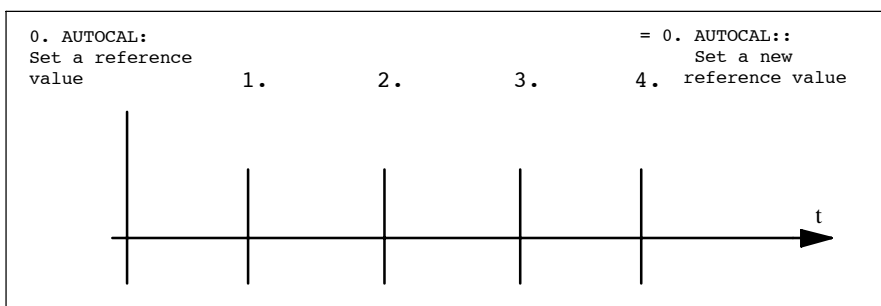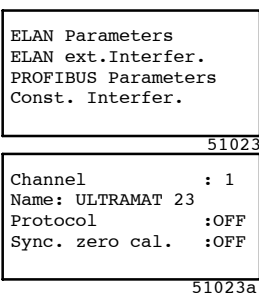
Fig. 5-11   Number of AUTOCAL procedures until a reference is set again (set number: 4)

The deviation is still displayed with the 4th AUTOCAL; at the same time the value of the 4th AUTOCAL is used as the new reference value. If an error message 'AUTOCAL deviation too large' is acknowledged, the values are reset during the next AUTOCAL, and counting commences at 1 again.

5.10.2.3   Configuration: Special Functions: ELAN/PROFIBUS

```
ELAN Parameters
ELAN ext.Interfer.
PROFIBUS Parameters
Const. Interfer.
                    51023
```

```
Channel       : 1
Name: ULTRAMAT 23
Protocol      :OFF
Sync. zero cal.  :OFF
                    51023a
```

You can use this dialog to set the parameters for an ELAN or PROFIBUS network (see Chapter 3).

- **ELAN Parameters**

  You can use this dialog to set the parameters for an ELAN network (see Chapter 3).

  Channel

  Here you can set the channel address for this analyzer. Addresses from 1 to 12 can be set. Each address may only be used <u>once</u> in an ELAN network.

  Name

  You can set an analyzer name here. During communication with ELAN, it can be used for the plain text identification of the analyzers.

  Protocol (ON/OFF)

  The cyclic, automatic transmission of measured values every 500 ms can be switched on/off.

  Sync. zero cal. (ON/OFF)

  This function is not yet available. It must be set to OFF.
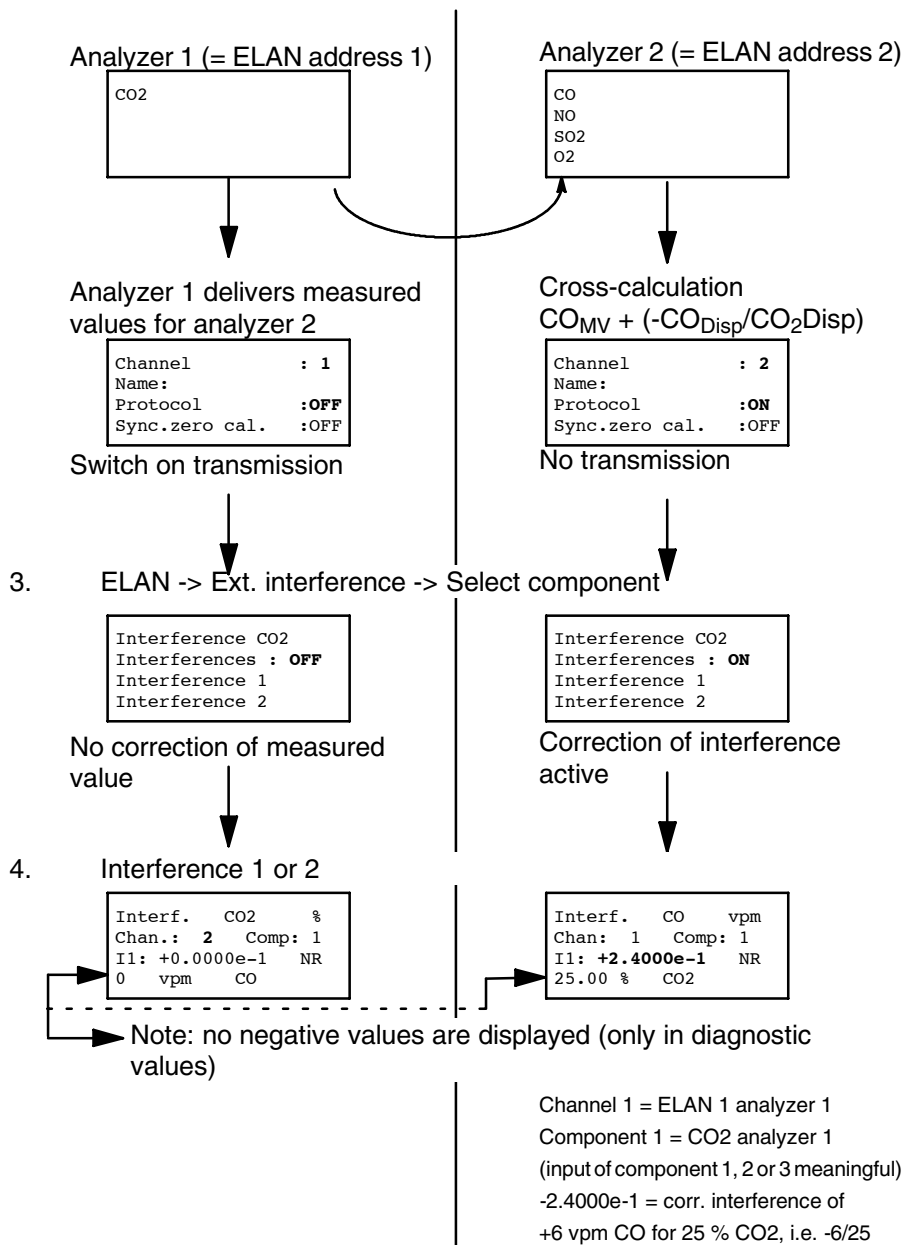
☞
Notice

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

- **ELAN ext. Interfer.**

  Parameterization with two analyzers is used as an example.

  Analyzer 1 delivers measured values, analyzer 2 uses these values for a correction calculation.

1. Connect two analyzers to the ELAN interface using a cable (see ELAN interface description (C79000-B5274-C176 Chapter 2)).

2. Access the ELAN menu, and select components.

Analyzer 1 (= ELAN address 1)

```
CO2
```

Analyzer 2 (= ELAN address 2)

```
CO
NO
SO2
O2
```

Analyzer 1 delivers measured values for analyzer 2

```
Channel        : 1
Name:
Protocol       :OFF
Sync.zero cal. :OFF
```

Switch on transmission

Cross-calculation $CO_{MV} + (-CO_{Disp}/CO_2 Disp)$

```
Channel        : 2
Name:
Protocol       :ON
Sync.zero cal. :OFF
```

No transmission

3. ELAN -> Ext. interference -> Select component

```
Interference CO2
Interferences : OFF
Interference 1
Interference 2
```

No correction of measured value

```
Interference CO2
Interferences : ON
Interference 1
Interference 2
```

Correction of interference active

4. Interference 1 or 2

```
Interf.  CO2    %
Chan.:  2  Comp: 1
I1: +0.0000e-1  NR
0   vpm   CO
```

```
Interf.  CO   vpm
Chan: 1   Comp: 1
I1: +2.4000e-1  NR
25.00 %   CO2
```

Note: no negative values are displayed (only in diagnostic values)

Channel 1 = ELAN 1 analyzer 1
Component 1 = CO2 analyzer 1
(input of component 1, 2 or 3 meaningful)
-2.4000e-1 = corr. interference of
+6 vpm CO for 25 % CO2, i.e. -6/25

5. Neither analyzer is capable of measurements during the AUTOCAL process   -> Evaluate function check (see Section 5.10.1.2)!

Fig. 5-1   ELAN external interferences

```
Address :   125
Ident number   : 1
PB relay: OFF
dIAGNOSIS
```
51023b

- **PROFIBUS parameters**

  If the analyzer has a PROFIBUS-PA/DP option module, you can set here the station address as a decimal number as well as further PROFIBUS parameters.

☞

Notice

For further details on these PROFIBUS parameters, please refer to the PROFIBUS-PA/DP interface description (A5E00054148).

```
INTERF: NNNNN
const.Interfer: OFF
C.I: +X.XXXXe+X
```
51023c

- **ELAN const. Interf.**

  The adjacent display appears following selection of this parameter.

  This function is used to switch on or off the correction of the influence of a constant interference. If the correction function is on, the set correction value is added to the measured value of the corresponding canal.

  Example:
  A constant interference of +10 ppm is detected. You enter -10 ppm as correction value. Thus the measured value will be modified from +10 ppm to 0 ppm.

5.10.2.4 Configuration: Special Functions: Fact. data/Res/Units

```
Load factory data
Reset analyzer
Change units
```
51024

You can use this menu to select a number of items with which e.g. faulty configurations and analyzer settings can be cancelled:

• **Load factory data**

  You can use this to reestablish the original parameters present when the analyzer was delivered. <u>All modifications</u> made since then are deleted.

```
Warning! Analyzer is
set to warm-up mode
Press ENTER to cont.
Press ESC to cancel
```
51024a

• **Reset analyzer**

  You can use this function to restart the analyzer. You will be warned (see Fig.) that the analyzer runs through a warm-up mode following the restart and is thus unavailable for measurements for a certain time. The **ENTER** key starts the warm-up mode. A restart can be cancelled here if necessary using the **ESC** key.

```
Unit for SO₂
Set: mg/m³
MR min:   400 −3%
MR max: 2000 +3%
```
51024c

• **Change units**

  The second line of this dialog permits you to change the factory-set units of the measured components.

```
Unit for SO₂
Set: vpm
MR min:   321 −3%
MR max: 1603 +3%
```

After changing the unit, the display of the parameters **MR min** and **MR max** is adapted accordingly.

This dialog is specific to the components.

☞   **Notice**

The full-scale values may assume unusual values as a result of the component-specific conversion factors. Adaptations can be carried out as described in Section 5.9.1.2. Please also check the setpoints of the calibration gases (Section 5.8.1) and the settings for the limits (Section 5.9.2)**.**
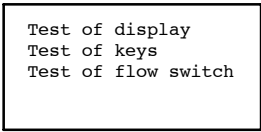
5.10.3 Configuration: Tests

```
Test:Displ/Keys/Flow
Inputs/Outputs
Chopper/IR source
RAM monitor
```
5103

You can use this test to check the selected components of the analyzer. These include the front panel keys, the LCD, inputs and outputs and a number of internal analyzer components.

5.10.3.1   Configuration: Tests: Display/Keys/Flow

```
Test of display
Test of keys
Test of flow switch
```

                                    51031

You can select the following three tests in this menu:

- **Test of display**

  All characters in the character set of this analyzer are output in succession at every position of the display. The display remains empty if characters are output which cannot be displayed. This is a cyclic test, i.e. once the complete character set has been processed, the test is repeated until terminated by pressing the **ESC** key (a message on the display will remind you of this before the test is started).
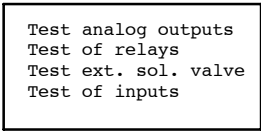
- **Test of keys**

  This test takes 30 s, and the time remaining up to the end of the test is output on the display. You can press all input keys in succession during this test; the analyzer recognizes that a key has been pressed and indicates this. This test cannot be cancelled before the 30 s have expired.

- **Test of flow switch**

  This indicates whether the flow is correct or not. The flow can be switched on and off by pressing the **PUMP** key.

5.10.3.2   Configuration: Tests: Inputs/Outputs

```
Test analog outputs
Test of relays
Test ext. sol. valve
Test of inputs
```

                                    51032

The electric inputs and outputs of the analyzer are tested here. You require the following equipment to carry out these tests:

- Ammeter,

- Ohmmeter,

- Power supply and/or

- Test plugs.

You can carry out the following tests:

```
Analog 1: 0.20 mA
Analog 2: 0.40 mA
Analog 3: 1.55 mA
Analog 4: 2.60 mA
```
51032a

- **Test analog outputs**

    You can use this dialog to set any value of the output current between 0 and 20 mA. There are four analog outputs (0/4 to 20 mA). To test these outputs, connect an ammeter to the corresponding analog outputs on plug X80 and measure the output current.

    Please refer to Chapter 3 for the pin assignments of plug X80.

```
Test of relays
Relay number 1
Condition: inactive
Press ESC to cancel
```
51032b

- **Test of relays**

    You can use this dialog to select a relay for testing. There are eight relays whose contacts you can test. Connect a ohmmeter to the corresponding relay outputs on plug X80. You can process the following parameters:

    Relay number: One of the relays 1 to 8 (for analyzers with option module: relays 1 to 16) or ”-” (no relay)

    Condition: The current state of the selected relay (**active** or **inactive**; inactive in the Fig.).

    Please refer to Chapter 3 for the pin assignments of plug X80/X50.

```
130 mg/m³ NO   ZV
 89 mg/m³ CO   OFF
249 mg/m³ SO₂  SV
20.77 %    O₂  OFF
```
51032c

- **External solenoid valve**

    You can use this dialog to trigger external solenoid valves for the zero and calibration gas supplies via the relay contacts. Use the arrows keys ↑ and ↓ to select either the zero gas valve (**ZV**) in the first line and the calibration (span) gas valve (**SV**) in the third line. Call the selected valve using the **ENTER** key. Switch the previously assigned relay using any arrow key in the second or fourth line (the value on the right toggles between **OFF** and **ON**). The measured values output on the display during this test usually change following the switching operation.

```
Test of inputs
Press ESC to cancel
Active input:
None
```
51032d

- **Test of inputs (binary test)**

    After calling this dialog, apply a voltage of 24 V to one of the three inputs ”Pump ON/OFF”, ”CAL” or ”SYNC”. The result is displayed in the fourth line (no input in this case).

    The external binary inputs of analyzers with option module can be tested in the menu ”Binary inputs” (see Section 5.10.1.3).

5.10.3.3 Configuration: Tests: Chopper/IR Source

You can use this function to switch the chopper and IR source off.

⚠ **Warning**

Important! Essential!
The analyzer is not ready for measurements if the IR source or chopper has been switched off! Depending on the switch-off period, you must therefore provide a sufficiently long warm-up mode (e.g. by restarting the analyzer).

☞ **Notice**

This function must only be carried out by qualified servicing engineers.

5.10.3.4 Configuration: Tests: RAM Monitor

Servicing engineers can use this function to view the contents of certain memory areas.

5.10.4 Configuration: Factory Configuration

```
Factory config. !
Please enter special
code: 0000
```
5104

These are factory settings made especially for your analyzer. Since modifications to these parameters may influence the functions of your analyzer, access to these factory settings is only possible by servicing engineers using a special access code.

5.11   Other Inputs

5.11.1   PUMP Key

This key switches the internal, sample gas pump (if present) on and off. If the pump is switched off whilst the analyzer is in input mode, it is also switched on again by pressing the **MEAS** key if parameterized accordingly (see Section 5.10.1.4).

The pump can also be switched on and off via the binary input (see Chapter 3). The binary input has priority over the button.

5.11.2   CAL Key

If the analyzer is in measuring mode, pressing the **CAL** key triggers a single, automatic calibration with ambient air or nitrogen (AUTOCAL). The **CAL** key cannot be used during the warm-up mode.

If the flow is too low during a zero adjustment triggered by pressing the key, the analyzer remains in this status until either the flow is sufficient or the zero adjustment is aborted by pressing the ESC key.

In addition to the CAL key, an AUTOCAL can also be triggered via the binary input. The binary input has priority ober the key.

Maintenance

6

6.1 Messages

The ULTRAMAT 23 can detect and display various fault statuses. The fault statuses are divided into maintenance requests and fault messages.

6.1.1 Maintenance Requests

Maintenance requests are references to certain changes in the analyzer which - at the time they are made - have no influence on the analyzer measurements. However, remedial measures are recommended to guarantee that measurements remain possible.

If the analyzer is in measuring mode, the occurrence of a maintenance request is indicated by an "**M**" at the right edge of the display.

```
AUTOCAL-drift beyond
tolerance
press ENTER to clear
next message with ->
```

Maintenance requests are logged and can be called in input mode using the menu path "Analyzer status - Status - Maintenance requests" (see Section 5.7.1.2). The corresponding message texts are stored. You can delete the messages by pressing the **ENTER** key. However, they appear again if the cause has not been eliminated.

The analyzer outputs a maintenance request in the following three cases:

AUTOCAL drift beyond tolerance

Message "AUTOCAL drift beyond tolerance"
The zero drift of a component is too large during the AUTOCAL procedure. The calibration parameters can be entered as described in Section 5.8.4. The actual deviation from the maximum permissible value can be read using the AUTOCAL deviation (see Section 5.10.2.2). It may be meaningful to set a shorter interval between two AUTOCAL procedures, otherwise contact the servicing department.

O$_2$ Sensor

Message "O$_2$ sensor"
The measuring voltage of the O$_2$ sensor has dropped as a result of aging, but is still within the permissible range. This means that it is not necessary to replace the O$_2$ sensor immediately, but this will soon be used up. Order a new O$_2$ sensor if necessary.

LCD temperature beyond tolerance

Message "LCD temperature beyond tolerance"
The contrast control is no longer guaranteed if the LCD temperature is outside the permissible tolerance. It may then be difficult to read the display.

The ambient temperature is too high, provide sufficient ventilation or air conditioning. If the fault still occurs, contact the servicing department.

External maintenance request

Signaling via binary inputs (only with option module).

6.1.2 Fault Messages

Fault messages are references to certain changes in the analyzer which influence its ability to measure correctly.

If the analyzer is in measuring mode, the occurrence of a fault is indicated by an "**F**" at the right edge of the display.

```
Mains voltage beyond
tolerance
press ENTER to clear
next message with ->
```

Fault messages are logged and can be called in input mode using the menu path "Analyzer status - Status - Logbook/faults" (see Section 5.7.1.1). The corresponding message texts are stored as alphanumeric text in the logbook. You can delete the messages by pressing the **ENTER** key. However, they appear again if the cause has not been eliminated.

Table 6-1 provides a summary of fault messages, their causes, and measures to eliminate the faults. If a remedy is not listed, you must contact the servicing department when this fault message occurs.

Table 6-1   Fault messages

Fault message	Possible causes	Remedy
Meas. value channel 1 beyond tolerance Meas.value display: *****	Analyzer section of first component is faulty	
Meas. value channel 2 beyond tolerance Meas.value display: *****	Analyzer section of second component is faulty	
Meas. value channel 3 beyond tolerance Meas.value display: *****	Analyzer section of third component is faulty	
Meas. value O_2 beyond tolerance Meas. value display: *****	O_2 sensor faulty or old	Replace the O_2 sensor as described in Section 6.2.1.
	Motherboard faulty	
Mains voltage beyond tolerance	Mains voltage varies	Correct such that the mains voltage is within the tolerance values permissible for the analyzer.
	Power supply unit faulty	
Temp. of analyzer beyond tolerance	Ambient temperature too high or too low	Provide sufficient ventilation or air conditioning.
	Temperature sensor of a detector faulty	
Pressure of amb. air beyond tolerance	Pressure sensor faulty	

Table 6-1   Fault messages

Fault message	Possible causes	Remedy
Flow too low during measuring	Sample gas path blocked or leaky	Clean or replace the blocked parts (hose, filter etc.). If the problem is still present:
	Pump not running	Switch the pump on.
	Pump capacity too low	Increase the pump capacity as described in Section 5.9.4.1.
	Pump faulty	
No data for temperature compensation	Temperature compensation not completed successfully	
	New components have been loaded	
	EEPROM has been initialized	
Flow too low during AUTOCAL	CAL gas path blocked or leaky	Clean or replace the blocked parts (hose, filter etc.). If the problem is still present:
	Pump not running	Switch the pump on.
	Pump capacity too low	Increase the pump capacity as described in Section 5.9.4.1.
	Pump faulty	
Conc. of O_2 too low during AUTOCAL Meas. value display: *****	O_2 sensor faulty or old	Replace the O_2 sensor as described in Section 6.2.1.
	O_2 sensor zero not calibrated	Calibrate the zero of the O_2 sensor as described in Section 5.8.2.2.
Fault at analog output	Component could not be initialized when switching on	
	Limits were violated when calibrating the analog section	
General fault of all IR channels MV-C1/2/3 beyond tolerance	Chopper faulty	
	IR source faulty	
Fault of addresses for IR channels	Plug-in jumper on detector for detection of components not OK	
	The cable of the detector has no contact	Check that the plug is correctly connected to the detector (the plug must latch in twice).
	Cable of detector faulty	

Table 6-1   Fault messages

Fault message	Possible causes	Remedy
AUTOCAL drift beyond tolerance	Sample cell contaminated	
	Detector faulty	
	IR source power too low	
Fault at EEPROM	Checksum not OK	
	Read character ≠ written character	
IR channel 1 not calibrated	Calibration of full-scale value/sag missing	
IR channel 2 not calibrated	Calibration of full-scale value/sag missing	
IR channel 3 not calibrated	Calibration of full-scale value/sag missing	
Voltage for IR source beyond tolerance	IR source not OK	
	Motherboard faulty	
Supply of bridge beyond tolerance	Channel amplifier faulty	
	Motherboard faulty	
Half-bridge voltage beyond tolerance	Channel amplifier faulty	
	Motherboard faulty	
Lock-in fault	Channel amplifier faulty	
	Motherboard faulty	
Sensitivity of O_2 sensor too low	O_2 sensor faulty or old	Replace the O_2 sensor as described in Section 6.2.1 .
Overflow of AD converter	Electronics faulty	
External fault	Signaling of an external fault	

6.2 Maintenance Work

Warning

Certain parts in this electrical device contain dangerous voltage during operation.

Severe personal injury and/or damage to property may occur if the power supply is connected incorrectly, if maintenance work is carried out incorrectly, or if the warnings are not observed.

Correct and safe operation of this device is dependent on proper transport, storage and installation as well as careful operation and maintenance.

Warning

When working with toxic gases, ensure that no concentrations dangerous to health can occur at the position of work. If the gas connections are made incorrectly, accidents may occur as a result of toxic, flammable or explosive gases.

Caution

The electronic components and modules fitted in this device must be protected against electrostatic charges and discharging. Comprehensive measures must therefore be made to protect them wherever they are manufactured, tested, transported and installed.

Warning

Before opening the analyzer, disconnect all poles from the mains sup•ply.

6.2.1   Replacement of O$_2$ Sensor

⚠

Warning

Danger of burns

The O$_2$ sensor contains acetic acid which can burn unprotected skin. The sensor housing must not be damaged when the sensor is re• placed.

If you nevertheless come into contact with the acid, immediately rinse affected skin with plenteous amounts of water.

Please also note that old or faulty O$_2$ sensors are toxic waste and must be packed and disposed of accordingly!

Removal

- Unscrew the two screws of the front cover and remove the cover.

- Unlock the plug of the sensor connection, and remove.

- Unscrew the O$_2$ sensor.

- Remove the gasket of the O$_2$ sensor.

Disposal of the O$_2$ sensor

The exhausted O$_2$ sensor must be disposed of as electronic waste with the code number 160215 "*Dangerous component removed from used equipment*". It must therefore be disposed of in a correct and environmentally safe manner.

Installation

- Insert the new gasket.

- Screw in the new O$_2$ sensor and tighten hand-tight.

- Reconnect the plug.

- Enter the date of installation in the menu item "O$_2$ cal. after install" as described in Section 5.8.2.1.

- Calibrate the O$_2$ zero as described in Section 5.8.2.2.

6.2.2 Replacement of Fuse

⚠

Explosion hazard

Do not disconnect equipment when a flammable or combustible atmosphere is present.

Do not remove or replace lamps or fuses unless power has been disconnected or when a flammable or combustible atmosphere is present.

Failure to observe these safety instructions may result in death, severe personal injuries and or substantial damage to property and environment.

To replace the fuse proceed as follows:

• Remove the fuse holder underneath the appliance plug (see Section 3, Technical Description). Use a small screwdriver to do this.

• Remove the blown fuse from the holder.

• Insert a new fuse.

☞ **Note**

Only fuses of the type printed on the rear of the analyzer may be used (see also Spare Parts List on page 8-14).

• Insert the fuse holder into the compartment again.

6.2.3 Replacement of Safety Filter

Preparation

• Unscrew the four screws of the top housing cover, and remove the cover to the rear.

• Find the contaminated filter according to its type (see Section 7, spare parts list, page 7-18, pos. 14 and 15).

• Remove the hoses from the filter.

• Replace the contaminated filter.
The filter must be disposed of as residual waste!

☞   **Note**

When installing the filter, make sure that the arrow on the filter points in the gas flow direction.

- Push the cover back onto the housing and screw tight.

6.2.4   Emptying the Condensation Trap (Benchtop Unit Only)

- Switch of the pump by pressing the **PUMP** key.
- Disconnect the analyzer from the power supply.
- Loosen the condensation trap on the front of the analyzer by tilting it slightly, and pull downwards carefully.
- Empty the trap and dispose of the condensation according to the composition of the sample gas.
- Push the condensation trap on again from below.

☞   **Note**

If condensation is unintentionally spilled onto the analyzer, it can penetrate into the analyzer through gaps in the housing. The analyzer must not be used again in this case!

6.2.5   Replacement of Coarse Filter (Benchtop Unit Only)

- Switch of the pump by pressing the **PUMP** key.
- Loosen the condensation trap on the front of the analyzer as described in Section 6.2.4.
- Remove the contaminated filter.
- Insert the new filter.
- Push the condensation trap on again from below.

6.3   Maintenance of Gas Path

Depending on the corrosivity of the sample gas, check the state of the gas path at regular intervals.

Servicing may be necessary.

6.4   Cleaning the Analyzer

Wipe the outer surfaces of the analyzer using a soft cloth dampened with a solution of mild cleaning agent.

Shut-down

<div style="text-align: right; font-size: 3em; font-weight: bold;">7</div>

It may be necessary to shut down the ULTRAMAT 23 for the following reasons:

- Repair
- New location of use
- Scrapping

7.1 Measures for Repair or Changing of Location

If the ULTRAMAT 23 is shut down for repair or for changing the location of use, proceed as follows:

19" rack version
- Make sure that gas is no longer flowing through the analyzer. If external pumps are present, switch all of them off.
- Switch the analyzer off.
- Disconnect the power plug.
- Disconnect all hose connections from the rear of the analyzer.
- With pipe versions, unscrew all pipes.

Benchtop version
- Make sure that gas is no longer flowing through the analyzer. If external pumps are present, switch all of them off.
- Switch the analyzer off.
- Disconnect the power plug.
- Empty the condensation trap (see Section 6.2.4).
- Disconnect the supply hose from the condensation trap.
- Disconnect all hose connections from the rear of the analyzer

7.2 Measures for Scrapping the Analyzer

If the ULTRAMAT 23 is to be scrapped, shut down as follows:

19" rack version
- Make sure that gas is no longer flowing through the analyzer. If external pumps are present, switch all of them off.
- Switch the analyzer off.
- Disconnect the power plug.
- Disconnect all hose connections from the rear of the analyzer.
- With pipe versions, unscrew all pipes.
- In the case of analyzers with an electrochemical oxygen sensor, remove this from the analyzer (see Section 6.2.1).

Benchtop version
- Make sure that gas is no longer flowing through the analyzer. If external pumps are present, switch all of them off.
- Switch the analyzer off.
- Disconnect the power plug.
- Empty the condensation trap (see Section 6.2.4).
- Disconnect the supply hose from the condensation trap.
- Disconnect all hose connections from the rear of the analyzer

Disposal of the oxygen sensor

The exhausted O_2 sensor must be disposed of as electronic waste with the code number 160215 "*Dangerous component removed from used equipment*". It must therefore be disposed of in a correct and environmentally safe manner.

Warning

Danger of burns

The O_2 sensor contains acetic acid which can burn unprotected skin. The sensor housing must not be damaged when the sensor is replaced.

If you nevertheless come into contact with the acid, immediately rinse the affected skin with plenteous amounts of water.

Disposal of the analyzer

The analyzer must be disposed of as electronic waste with the code number 160213 "*Equipment containing dangerous components*". It must therefore be disposed of in a correct and environmentally safe manner.

Spare Parts List

8

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 editions. Suggestions for improvement are welcomed.

Wir haben den Inhalt der Druckschrift auf die Übereinstimmung mit der beschriebenen Hard- und Software geprüft. Dennoch können Abweichungen nicht ausgeschlossen werden, so daß 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.

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.

Technical data subject to change

Technische Änderungen vorbehalten

Sous réserve de modifications techniques

This Parts List corresponds to the technical state at the time of printing.
Diese Ersatzteilliste entspricht dem technischen Stand zum Zeitpunkt der Drucklegung.
Cette liste de pièces de rechange correspond au niveau technique de la mise à l'impression.

The rating plate shows the year of construction (coded) of the gas analyzer.
Am Typenschild ist das Baujahr des Gasanalysengerätes (verschlüsselt) aufgeführt.
La plaque signalétique de l'analyseur indique l'année de fabrication (codifiée) de l'appareil.

MLFB-Nr.
MLFB No.
Nº MLFB

Fab.-Nr.
Serial No.
Nº de fab.

SIEMENS

Ultramat 23
7MB2337-2AF10-3PH0
F-Nr.J2-111
230V 50Hz 60VA
CO:150/750vpm
NO:500/2500vpm

CE

Made in France
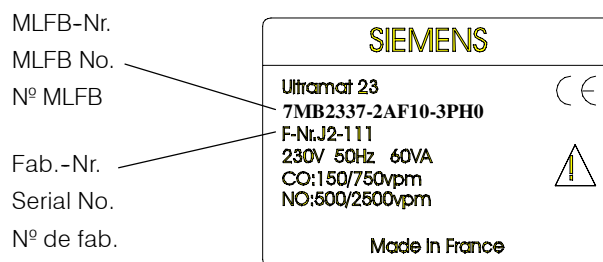
Ordering instructions

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 the spare part belongs.

Ordering address: Siemens AG
                         CSC (Centre Service Client)
                         1, chemin de la Sandlach
                         F-67506 Haguenau/France
                         Tel.: +33 3 6906 5555
                         Fax: +33 3 6906 6688.

Hinweis für die Bestellung

Die Ersatzteilbestellung muß enthalten:
1. Menge
2. Bezeichnung
3. Bestell-Nr.
4. Gerätename, MLFB- und Fab.-Nr. des Gasanalysengerätes, zu dem das Ersatzteil gehört.

Bestelladresse: Siemens AG
                         CSC (Centre Service Client)
                         1, chemin de la Sandlach
                         F-67506 Haguenau/Frankreich
                         Tel.: +33 3 6906 5555
                         Fax: +33 3 6906 6688

Indications lors de la commande

La commande de pièces de rechange doit comporter:
1. Quantité
2. Désignation
3. N° de referénce
4. Nom, N° MLFB et N° de fabrication de l'analyseur de gaz pour lequel est destiné la pièce de rechange.

L'adresse de commande: Siemens AG
                        CSC (Centre Service Client)
                        1, chemin de la Sandlach
                        67506 Haguenau
.   Tel.: +33 3 88 90 5555
                        Fax: +33 3 88 90 6688

Example for ordering:

1 oxygen sensor

C79451-A3458-B55

for ULTRAMAT 23

type 7MB2337-2AF10-3PH1

Serial No. J2-111

Bestellbeispiel:

1 Sauerstoffsensor

C79451-A3458-B55

für ULTRAMAT 23

Typ 7MB2337-2AF10-3PH0

Fab.-Nr. J2-111

Exemple de commande:

1 capteur d'oxygène

C79451-A3458-B55

pour ULTRAMAT 23

type 7MB2337-2AF10-3PH2

N° de fab. J2-111

Caution!

Special work is required to change parts on the analyzer section which can only be carried out by the CSC in Haguenau or by qualified and trained personnel. Improper handling may reduce the measuring accuracy or lead to a malfunction of the device.

Vorsicht!

Für den Austausch von Teilen besonders am Analysierteil sind spezielle Arbeiten notwendig, die nur im CSC Haguenau oder von qualifiziertem, geschultem Personal durchgeführt werden können. Ein unsachgemäßer Eingriff kann zu einer Einschränkung der Messgenauigkeit oder zu einer Funktionsunfähigkeit des Gerätes führen.

Attention!

Le remplacement de pièces, en particulier au bloc d'analyse ne peut être effectué qu'au CSC de Haguenau ou par du personnel qualifié. Une intervention inappropriée peut réduire la précicion de mesure ou entraver le bon fonctionnement de l'appareil.

Note of the measuring accuracy

To maintain the measuring accuracy of the ULTRAMAT 23 it may be necessary to perform temperature compensation after changing parts. The appropriate parts are marked by *).

This is particularly the case when brief temperature fluctuations >5 °C occur at the erection site. This temperature dependence will not occur for example after a cyclic zero point adjustment "AUTOCAL" of 3 hours.

We recommend having temperature compensation performed at CSC Haguenau.

Hinweis zur Messgenauigkeit

Um die Messgenauigkeit des ULTRAMAT 23 zu erhalten, kann es nach dem Austausch von Teilen notwendig werden, eine Temperaturkompensation durchzuführen. Entsprechende Teile sind mit einem *) gekennzeichnet.

Dies ist besonders dann der Fall, wenn am Aufstellungsort kurzzeitige Temperaturschwankungen >5 °C auftreten. Durch einen zyklischen Nullpunktabgleich "AUTOCAL" von zum Beispiel 3 Stunden wird diese Temperaturabhängigkeit nicht in Erscheinung treten.

Wir empfehlen, eine Temperaturkompensation im CSC in Haguenau durchführen zu lassen.

Remarque concernant l'exactitude des mesures

Il peut s'avérer nécessaire après le remplacement des pièces de procéder à une compensation de la température afin de conserver l'exactitude des mesures de l'ULTRAMAT 23. Les pièces correspondantes sont mises en évidence par un astérisque *).

Ceci est particulièrement le cas si de courtes variations de température supérieures à 5 °C surgissent sur le lieu d'implantation. Cette dépendance de la température n'apparaît pas grâce à un réglage cyclique du point zéro "AUTOCAL" de 3 heures par exemple.

Nous recommandons de faire exécuter une compensation de température dans le CSC à Haguenau.
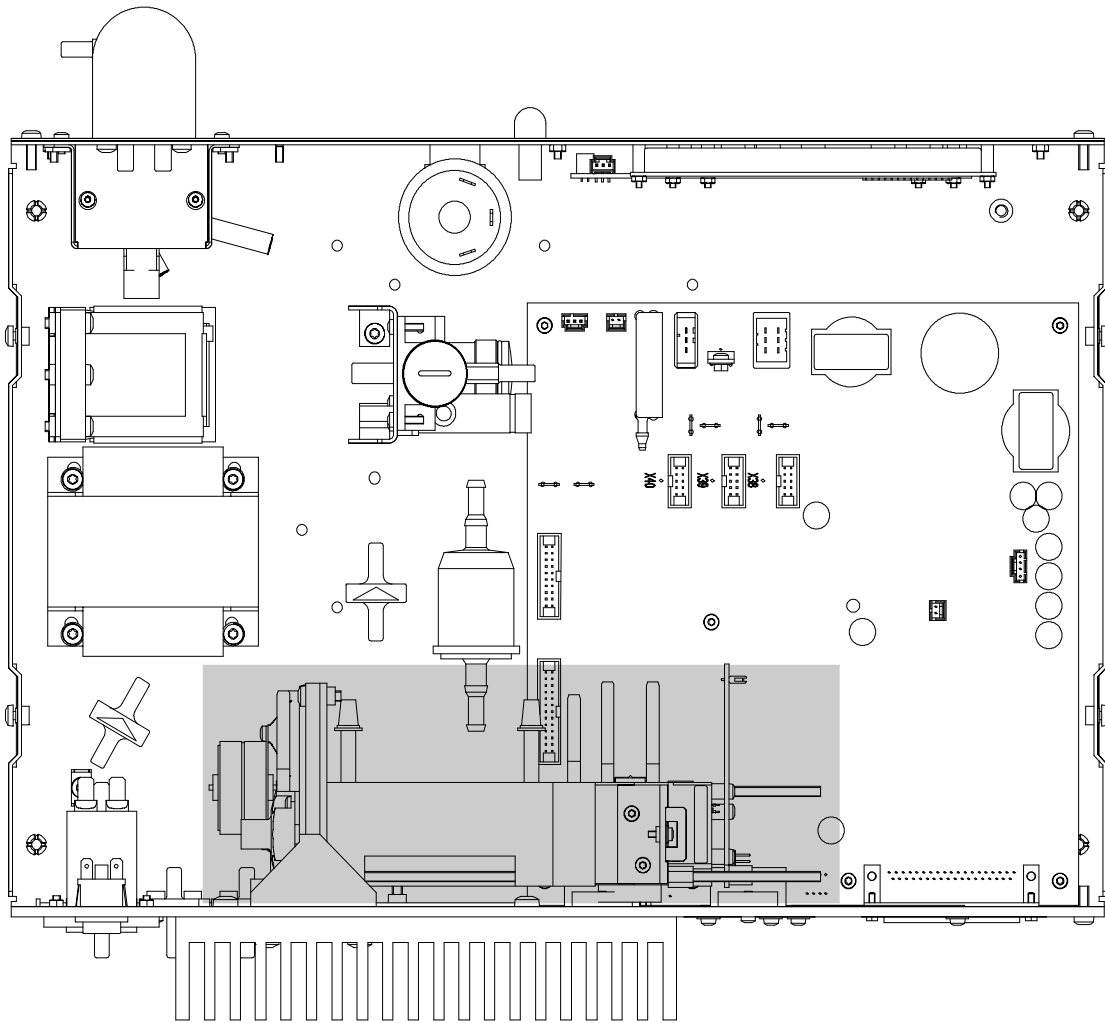
| Grau: | Analysierteil | Gray: | Analyzer section | Gris:. | Partie analyse |
| Weiß: | Elektronikteil | White: | Electronics section | Blanc: | Partie électronique |

GASWEG/HOSING SYSTEM FOR GAS/CIRCUIT DE GAZ
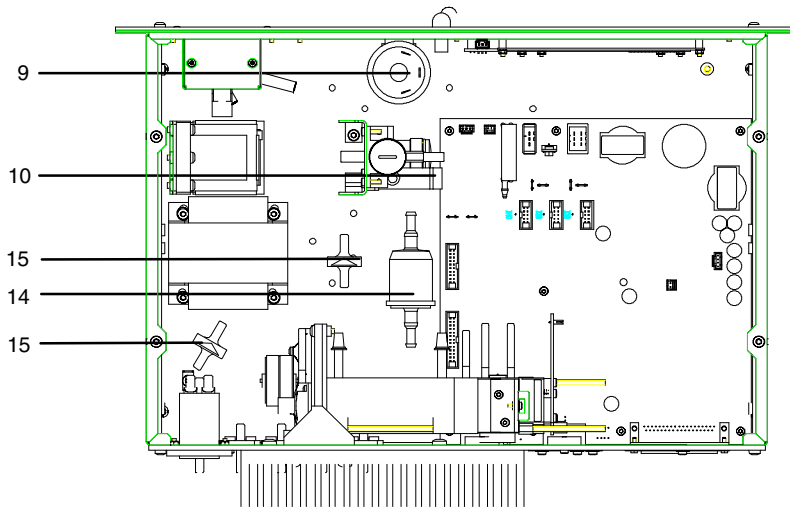

```
19-Zoll-Ausführung
19" rack version
Variante rack 19"
```
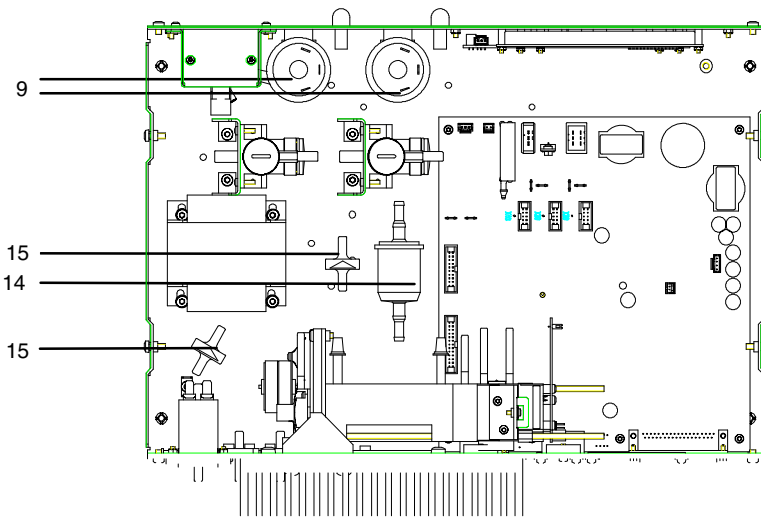


```
19-Zoll-Ausführung
mit getrennten  Gaswegen
19" rack version
with separate gas paths
Variante rack 19" avec des
circuits de gaz séparés
```
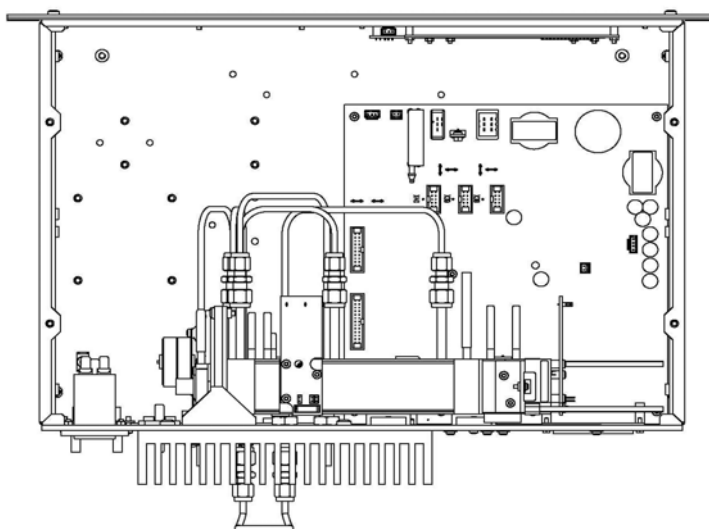


```
19-Zoll-Ausführung in Rohr
19" rack version, pipe
variante rack 19", tube
```

Bezeichnungen s. Seite 8-10   Designations see page 8-10   Désignations voir page 8-10

GASWEG/HOSING SYSTEM FOR GAS/CIRCUIT DE GAZ


```
19-Zoll-Ausführung, Rohr
mit getrennten  Gaswegen
19" rack version, pipe
with separate gas paths
Variante rack 19", tube
avec des circuits de gaz
séparés
```



```
Tischausführung
Bench-top version
Variante portable
```

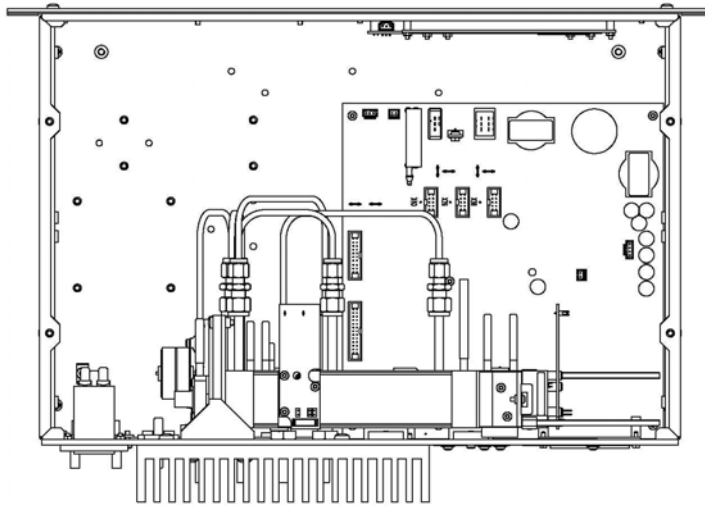| Teil-Nr. Part No. N° Pièce	Bezeichnung Designation Désignation	Bestell-Nr. Order No. N° de référence	Bemerkungen Remarks Remarques
9	Druckschalter Pressure switch Pressostat	C79302-Z1210-A2	
10	Magnetventil Solenoid valve Electrovanne	C79451-A3494-B33	
14	Sicherheitsfilter Meßgas Safety filter sample gas Filtre de sécurité pour gaz de mesure	C79127-Z400-A1	innenliegend inside à l'ìntérieur
15	Sicherheitsfilter Nullgas/ Chopperraumbespülung Safety filter zero gas/ chopper purge Filtre de sécurité pour gaz de zéro/ balayage de l'obturateur	A5E00059149	innenliegend inside à l'ìntérieur
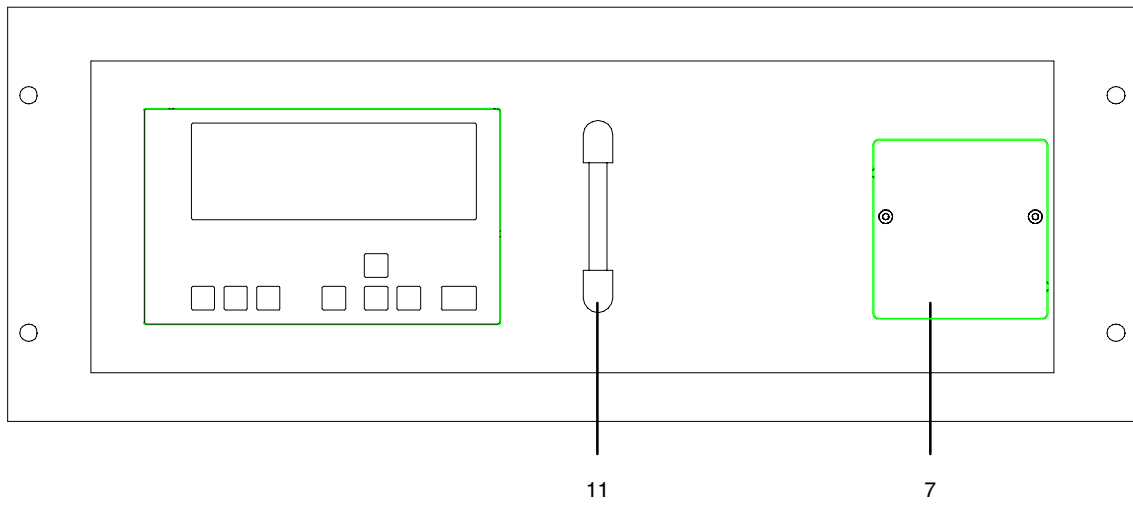
```
19-Zoll-Ausführung
19" rack version
Variante rack 19"
```



```
Tischausführung
Bench-top version
Variante portable
```
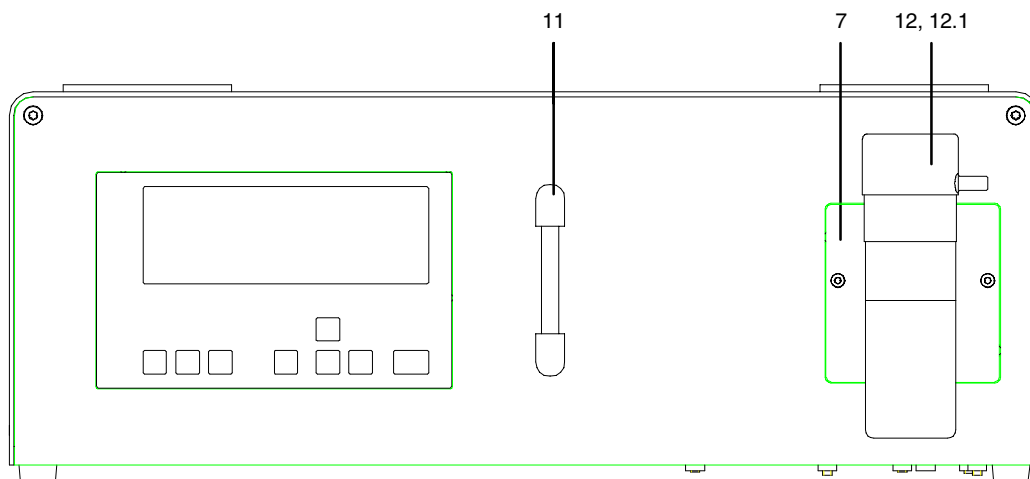
Bezeichnungen s. Seite 8-12   Designations see page 8-12   Désignations voir page 8-12

Teil-Nr. Part No. Pièce N°	Bezeichnung Designation Désignation	Bestell-Nr. Order No. N° de référence	Bemerkungen Remarks Remarques
7	Sauerstoffsensor Oxygen sensor Capteur d'oxygène	C79451–A3458–B55	
11	Strömungsmesser Flowmeter Débitmètre	C79402–Z560–T1	
12	Kondensatbehälter Condensation trap Pot de condensation	C79451–A3008–B43	Frontseite front face avant
12.1	Filter Filter Filtre	C79451–A3008–B60	im Kondensatbehälter, Packungseinheit: 3 Stück in the condensation trap, package size: 3 units dans le pot de condensation, Paquet de 3 pcs.

ELEKTRONIK/ELECTRONICS/ELECTRONIQUE


```
19-Zoll-Ausführung
19" rack version
Variante rack 19"
```



```
Tischausführung
Bench-top version
Variante portable
```

Bezeichnungen s. Seite 8-14   Designations see page 8-14   Désignations voir page 8-14
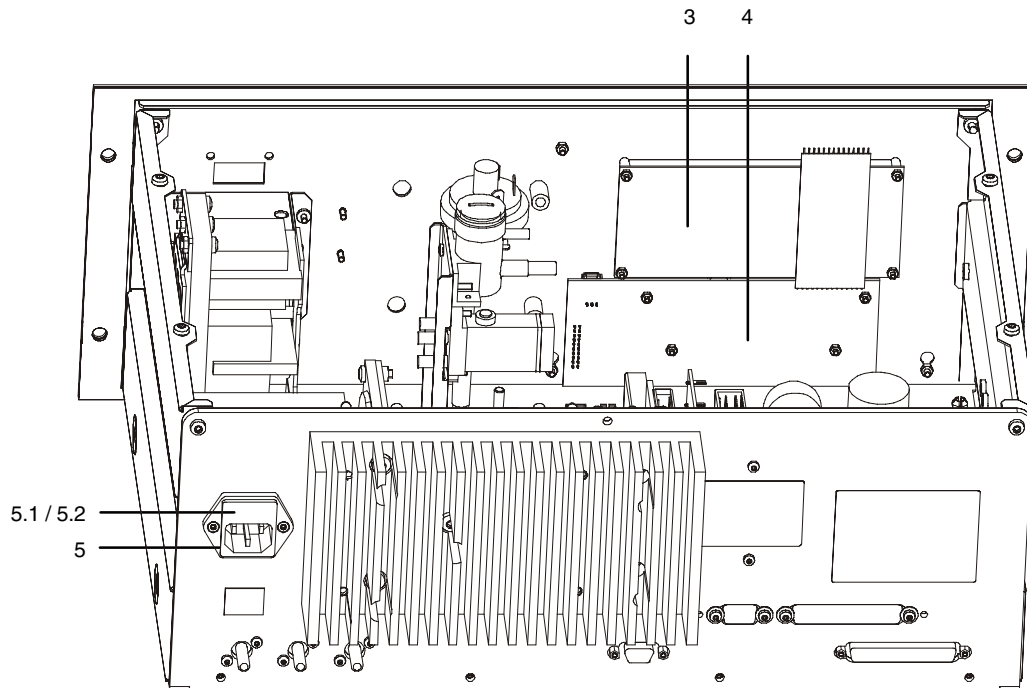
Teil-Nr. Part No. N° Pièce	Bezeichnung Designation Désignation	Bestell-Nr. Order No. N° de référence	Bemerkungen Remarks Remarques
3	LCD-Modul LCD module Module LCD	C79451–A3494–B16	
4	Tastenplatte Keyboard Panneau de touches	C79451–A3492–B605	
5	Steckerfilter Plug filter Connecteur secteur avec filtre	W75041–E5602–K2	
5.1	Schmelzeinsatz Fuse Fusible	W79054–L1010–T630	200 V/230 V; T 0,63/250 V s. Aufschrift Geräterückseite/see rear of device/voir au dos de l'appareil
5.2	Schmelzeinsatz Fuse Fusible	W79054–L1011–T125	100 V/120 V; T 1,25/250 V s. Aufschrift Geräterückseite/see rear of device/voir au dos de l'appareil
6	Netzschalter Power switch Interrupteur de mise sous tension	W75050-T1201-U101	

PUMPE/PUMP/POMPE

Dichtung
Gasket
Joint d'étanchéité

8.1 / 8.2

8.3

Ventilplättchen
Valve reed
Lame de soupape

Membran
Diaphragm
Membrane

3.3

3.1/2

2.1 (2)

2.2
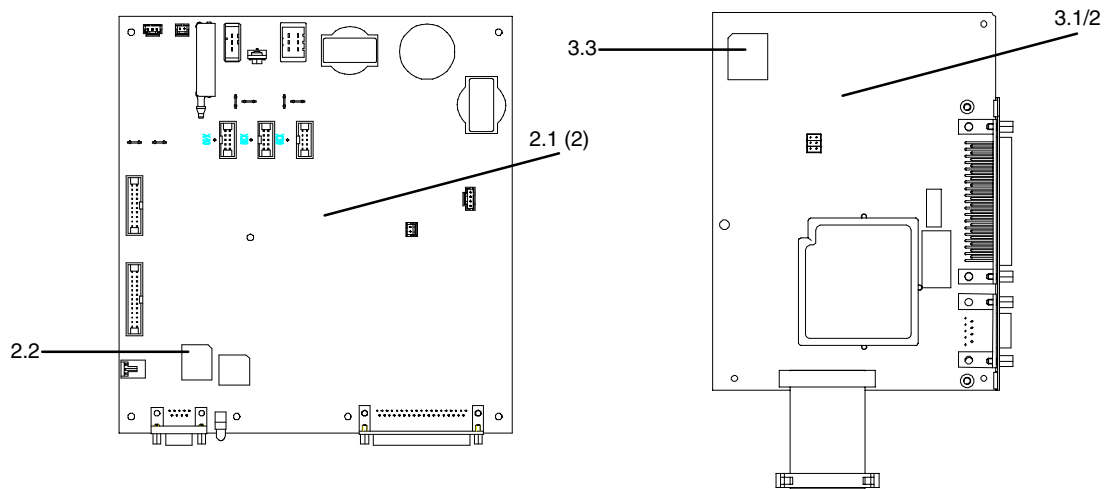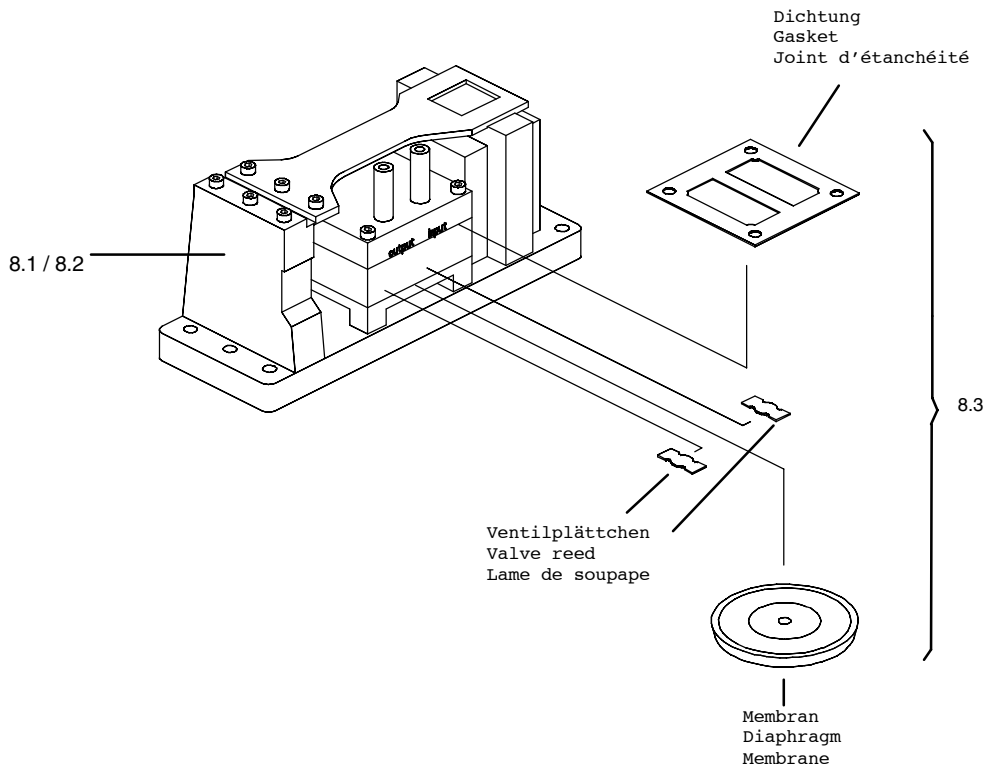
Bezeichnungen s. Seite 8-16   Designations see page 8-16   Désignations voir page 8-16
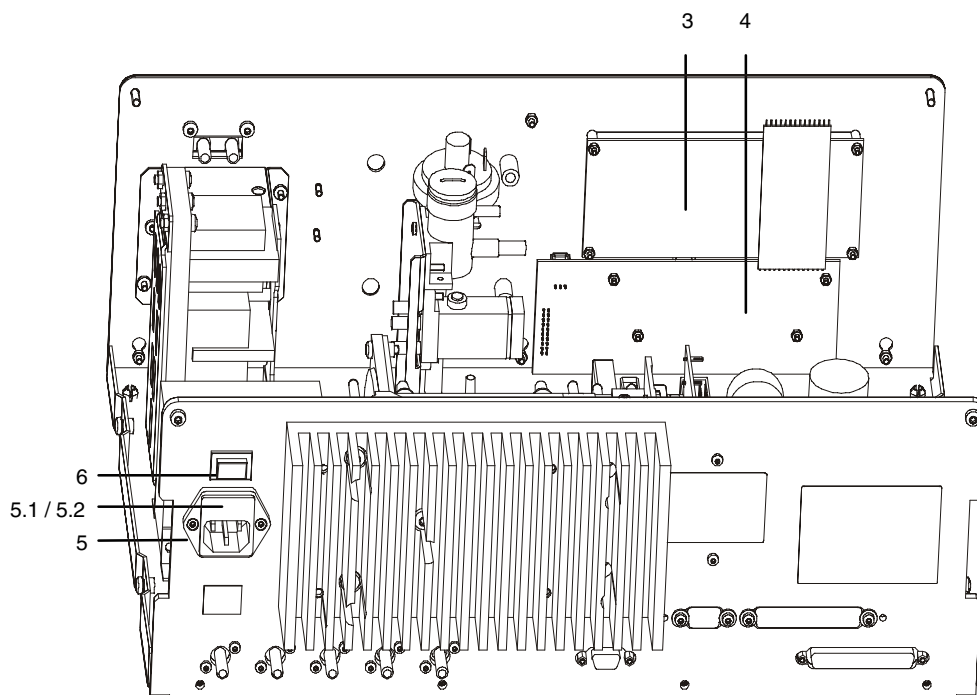
Teil-Nr. Part No. Nº Pièce	Bezeichnung Designation Désignation	Bestell-Nr. Order No. Nº de référence	Bemerkungen Remarks Remarques
8.1	Meßgaspumpe Sample gas pump Pompe de gaz de mesure	C79451–A3494–B10	50 Hz
8.2	Meßgaspumpe Sample gas pump Pompe de gaz de mesure	C79451–A3494–B11	60 Hz
8.3	Dichtungssatz Set of gaskets Jeu de joints d'étanchéité	C79402–Z666–E20	für Meßgaspumpe lfd. Nr. 8.1 und 8.2 for sample gas pump Nos. 8.1 and 8.2 pour pompe de gaz de mesure Nº 8.1 et 8.2

Teil-Nr. Part No. Nº Pièce	Bezeichnung Designation Désignation	Bestell-Nr. Order No. Nº de référence	Bemerkungen Remarks Remarques
2 *)	Grundplatte Motherboard Carte mère	C79451–A3494–D501	Grundplatte und Firmware; deutsch/englisch/französisch/spanisch/italienisch Motherboard and firmware; German/English/French/Spanish/Italian Carte mère et firmware; allemand/anglais/français/espagnol/italien
2.2	Firmware (FlashPROM)	C79451–A3494–S501	deutsch/englisch/französisch/spanisch/italienisch German/English/French/Spanish/Italian allemand/anglais/français/espagnol/italien
3.1	Optionsbaugruppe DP Additional electronics DP Eléctronique additionelle DP	A5E00057159	PROFIBUS DP
3.2	Optionsbaugruppe PA Additional electronics PA Eléctronique additionelle PA	A5E00056834	PROFIBUS PA
3.3	Firmware (PROFIBUS)	A5E00057164	deutsch/englisch/französisch/spanisch/italienisch German/English/French/Spanish/Italian allemand/anglais/français/espagnol/italien

*) Nach dem Austausch werden spezielle Arbeiten notwendig, die nur von qualifiziertem, geschultem Fachpersonal durchgeführt werden können wie z. B. Temperaturkompensation, elektrischer Grundabgleich etc.

Following replacement, special work is required which can only be carried out by qualified and trained personnel, for example temperature compensation, basic electronic adjustment etc.

Des travaux particuliers comme p. ex. la compensation de température, le réglage de base électrique etc., ne pouvant être exécutés que par du personnel qualifié sont à effectuer après un remplacement de pièces.

Gas	MR min	MR max	Order no. comp	Order no. MR	IR source C79451-A3468-	Chopper C79451-A3468	Plate w. threaded bolts and windows C79451-A3468-	Opt. Filter	Sample cell 1 length [mm]	Sample cell 1 C79451-A3468-	Gas filter 1 C79451-	Detector 1 type	Detector 1 C79451-A3468-	Opt. Filter	Sample cell 2 length [mm]	Sample cell 2 C79452-A3468-	Gas filter 2 C79451-	opt. filter C79451-A3458-	Detector 2 type	Detector 2 C79451-A3468
CO	50 vpm	250 vpm	A	D	B206	B515/516	B513/514	-	180	B231	A3458-B500	2 layer HC	B525							
CO	100 vpm	500 vpm	A	E					90	B232										
CO	150 vpm	750 mg/m³	A	U					60	B233										
CO	150 vpm	750 vpm	A	F					20	B234										
CO	200 vpm	1000 vpm	A	G					6	B235										
CO	500 vpm	2500 mg/m³	A	H					6	B235										
CO	50 vpm	2500 vpm	A	X					2	B236										
CO	1000 vpm	5000 vpm	A	J																
CO	2000 vpm	10000 vpm	A	K																
CO	0,5 %	2,5 %	A	L																
CO	1 %	5 %	A	M																
CO	2 %	10 %	A	N																
CO	5 %	25 %	A	P																
CO	10 %	50 %	A	Q																
CO	20 %	100 %	A	R					2	B236										
CO2	50 vpm	250 vpm	C	D		B515/516 purged		-	180	B231	A3468-B541	2 layer HC	B528 / B536							
CO2	200 vpm	1000 vpm	C	G					90	B232										
CO2	500 vpm	2500 vpm	C	H					20	B234										
CO2	1000 vpm	5000 vpm	C	J					6	B235										
CO2	2000 vpm	10000 vpm	C	K					2	B236										
CO2	0,5 %	2,5 %	C	L	B206	B515/516	B513/514	-	60	B233	-	2 layer HC	B526							
CO2	1 %	5 %	C	M					20	B234										
CO2	2 %	10 %	C	N					6	B235										
CO2	5 %	25 %	C	P					2	B236										
CO2	10 %	50 %	C	Q																
CO2	20 %	100 %	C	R																
NO	100 mg/m³	750 mg/m³	P	T	B206	B515/516	B513/514	C75285-Z1491-C5	180	B231	-	3 layer	B521 ch.1 / B523 ch.2							
NO	100 vpm	500 vpm	P	E					180	B231	-									
NO	200 vpm	1000 vpm	P	G					90	B232										
NO	250 mg/m³	1250 mg/m³	P	V																
NO	400 mg/m³	2000 mg/m³	P	W																
NO	500 vpm	2500 vpm	P	H																
SO2	200 vpm	1000 vpm	S	G	B206	B515/516	B513/514	C79285-Z1302-A4	180	B231	A3468-B508	3 layer	B521 ch.1 / B523 ch.2							
SO2	500 vpm	2500 vpm	S	H					60	B233										
SO2	1000 vpm	5000 vpm	S	J					20	B234										
SO2	2000 vpm	10000 vpm	S	K																
SO2	0,5 %	2,5 %	S	L					90	B232										
CH4	100 vpm	500 vpm	D	E	B206	B515/516	B513/514	-	180	B231	A3468-B542	2 layer HC	B527							
CH4	400 vpm	2000 mg/m³	D	H					20	B234										
CH4	500 vpm	1000 vpm	D	L					6	B235										
CH4	0,5 %	2,5 %	D	N					2	B236										
CH4	2 %	10 %	D	P																
CH4	5 %	25 %	D	R											B529						
CH4	20 %	100 %	D	R					2	B236										
N2O	50 mg/m³	500 mg/m³	S	S	B206	B516	B514	-	180	B231	-	2 layer HC	B581							
N2O	100 vpm	500 vpm	S	E		B515/516	B513/514		90	B232	A3468-B553	2 layer HC	B581							
N2O	500 vpm	5000 vpm	S	Y		B516	B514		6	B235	-	2 layer HC	B537							
C2H4	2000 vpm	10000 vpm	F	K	B206	B515/516	B513/514	C79285-Z1491-C2	180	B231	A3468-B553	2 layer HC	B538								B520 ch.1	3 layer
C6H14	2000 vpm	10000 vpm	M	K	B206	B515/516	B513/514	A5E00069310	20	B234	-	2 layer spec.	B539	A5E00050502911	180	B231					
SF6	500 vpm	2500 vpm	V	H	B206	B515/516	B513/514	C79451-A3182-C161	90	B232		2 layer HC			20	B234					
CO2/CO	5/100	25 %/500 vpm		BJ	B206	B516	B514	-	6	B235	-	as top detector	B531	-	180	B231	A3458-B500	-	B525	2 layer HC
CO2/CO	5/75	25 %/750 mg/m³		BL					2	B236	-				20	B234			B528	2 layer HC
CO2/CO	10/0,5	50/2,5 %		BK					6	B235	-				6	B235	-	-	B527	2 layer HC
CO2/CH4	5/1	25/5 %		CA	B206	B516	B514	-	6	B235	-	as top detector	B531	-	180	B231			B520 ch.1	3 layer
CO2/CH4	5/2	25/10 %		CB					6	B235	-				20	B234			B526	2 layer HC
CO/CO2	10/0,5	50/2,5 %		DC	B206	B516	B514	-	20	B234	-	as top det.	B531	-						
CO/CO2	10/10	50/50 %		BB	B206	B516	B514	-	2	B236	A3468-B500	as top detector	B532	-	-	-	-	-	B520 ch.1	3 layer
CO/CO2	20/20	100/100 %		BA																
CO/NO	250/400	1250/2000 mg/m³		AK	B206	B516	B514	-	180	B231	A3458-B500	as top detector	B530	-	60	B233	A3468-B542	B103	B520 ch.1	3 layer
CO/NO	500/500	2500/2500 vpm		AA					60	B233										
CO/NO	2000/1000	10000/5000 vpm		AB					90	B232										
CO/NO	1000/1000	5000/5000 vpm		AC					6	B235										
CO/NO	1/1000	5 %/5000 vpm		AD																

ANALYSIERTEIL/ANALYZER SECTION/PARTIE ANALYSE

Analysierteil **7MB2335-**
Analyzer Section **7MB2335-**
Partie analyse **7MB2335-**
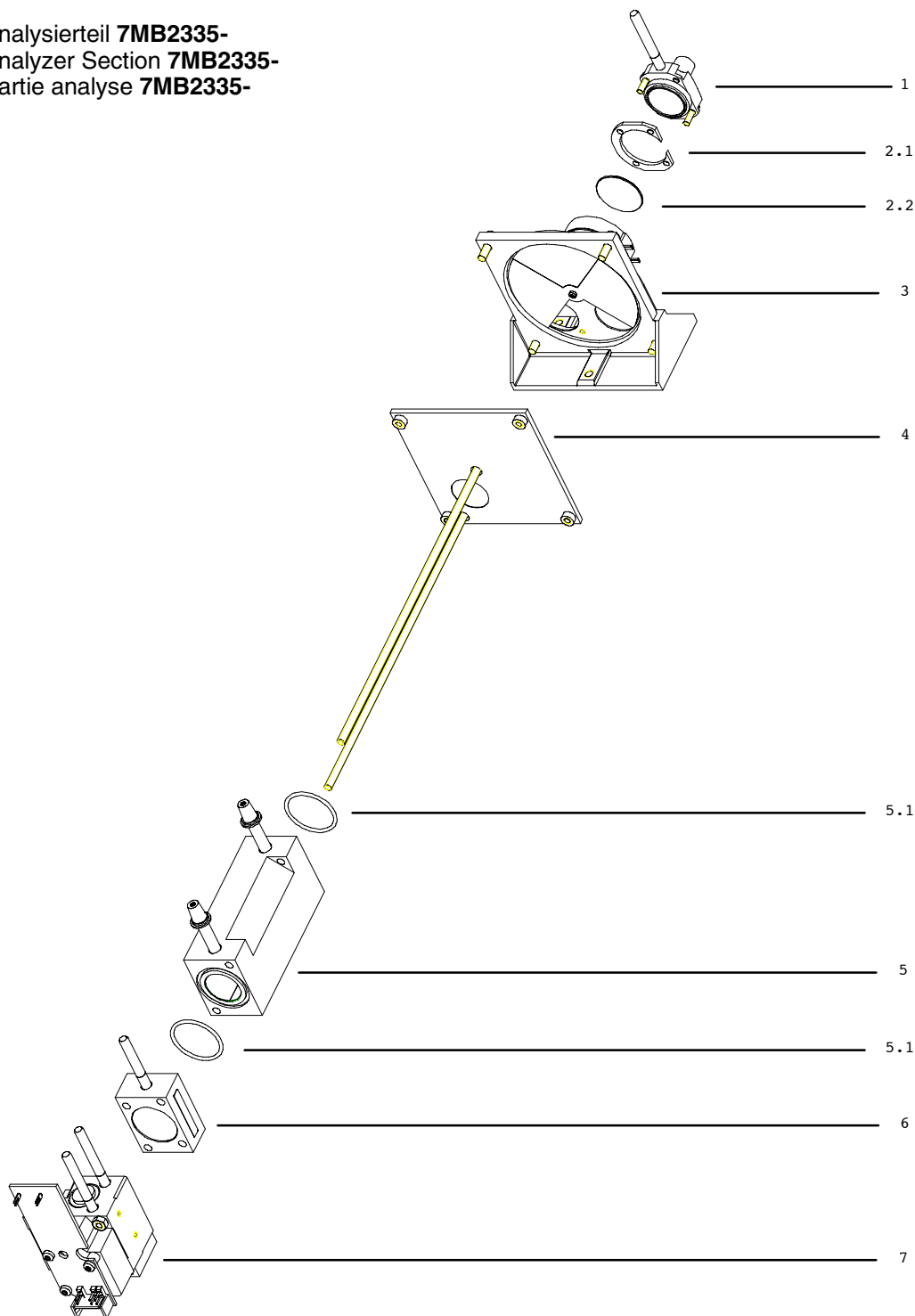
Bezeichnungen s. Seiten 8-19, 8-20   Designations see pages 8-19, 8-20
Désignations voir pages 8-19, 8-20

7MB2335-

Teil-Nr. Part No. N° Pièce	Bezeichnung Designation Désignation	Bestell-Nr. Order No. N° de référence	Bemerkungen Remarks Remarques
1 *)	Strahler IR source Source de rayonnement	C79451–A3468–B206	
2.1	Distanzstück Spacer Entretoise	C79451–A3468–C20	
2.2	Optisches Filter Optical filter Filtre optique	C75285–Z1491–C5	für NO **) for NO **) pour NO **)
2.2	Optisches Filter Optical filter Filtre optique	C79285–Z1302–A4	für SO_2 **) for SO_2 **) pour SO_2 **)
2.2	Optisches Filter Optical filter Filtre optique	C79285–Z1491–C2	für C_2H_4 for C_2H_4 pour C_2H_4
2.2	Optisches Filter Optical filter Filtre optique	A5E00069310	für C_6H_{14} for C_6H_{14} pour C_6H_{14}
2.2	Optisches Filter Optical filter Filtre optique	C79451–A3182–C161	für SF_6 for SF_6 pour SF_6
3 *)	Chopper Chopper Obturateur tournant	C79451–A3468–B515	
4	Platte mit Gewindebolzen und Fenster Plate with threaded bolts and windows Plaque avec tiges filetées et fenêtres	C79451–A3468–B513	
5.1	O–Ring O-ring Joint torique	C71121–Z100–A99	
5	Analysenkammer mit O–Ring Sample cell with O-ring Cellule d'analyse avec joint torique	C79451–A3468–B231	Analysenkammer 180 mm Sample cell 180 mm Cellule d'analyse 180 mm
5	Analysenkammer mit O–Ring Sample cell with O-ring Cellule d'analyse avec joint torique	C79451–A3468–B232	Analysenkammer 90 mm Sample cell 90 mm Cellule d'analyse 90 mm
5	Analysenkammer mit O–Ring Sample cell with O-ring Cellule d'analyse avec joint torique	C79451–A3468–B233	Analysenkammer 60 mm Sample cell 60 mm Cellule d'analyse 60 mm
5	Analysenkammer mit O–Ring Sample cell with O-ring Cellule d'analyse avec joint torique	C79451–A3468–B234	Analysenkammer 20 mm Sample cell 20 mm Cellule d'analyse 20 mm
5	Analysenkammer Sample cell Cellule d'analyse	C79451–A3468–B235	Analysenkammer 6 mm Sample cell 6 mm Cellule d'analyse 6 mm
5	Analysenkammer Sample cell Cellule d'analyse	C79451–A3468–B236	Analysenkammer 2 mm Sample cell 2 mm Cellule d'analyse 2 mm
6	Gasfilter Gas filter Filtre de gaz	C79451–A3458–B500	für CO for CO pour CO
6	Gasfilter Gas filter Filtre de gaz	C79451–A3458–B508	für SO_2 for SO_2 pour SO_2
6	Gasfilter Gas filter Filtre de gaz	C79451–A3468–B541	für CO_2, kleinster MB < 5 % for CO_2, smallest meas. range < 5 % pour CO_2, étendue min. < 5 %
6	Gasfilter Gas filter Filtre de gaz	C79451–A3468–B542	für CH_4, kleinster MB< 2 % for CH_4, smallest meas. range < 2 % pour CH_4, étendue min. < 2 %
6	Gasfilter Gas filter Filtre de gaz	C79451–A3468–B543	für C_6H_{14} for C_6H_{14} pour C_6H_{14}

*), **) siehe Folgeseite, see following page, voir page suivante

7MB2335-

Teil-Nr. Part No. N° Pièce	Bezeichnung Designation Désignation	Bestell-Nr. Order No. N° de référence	Bemerkungen Remarks Remarques
7 *)	Empfängerkammer Detector Cellule de détection	C79451–A3468–B525	für CO, kleinster MB < 5 % for CO, smallest meas. range < 5 % pour CO, étendue min. < 5 %
7 *)	Empfängerkammer Detector Cellule de détection	C79451–A3468–B528	für CO, kleinster MB $\geq$ 5 % for CO, smallest meas. range $\geq$ 5 % pour CO, étendue min. $\geq$ 5 %
7 *)	Empfängerkammer Detector Cellule de détection	C79451–A3468–B536	für CO_2, kleinster MB < 1000 vpm for CO_2, smallest meas.range < 1000 vpm pour CO_2, étendue min. < 1000 vpm
7 *)	Empfängerkammer Detector Cellule de détection	C79451–A3468–B526	für CO_2, kleinster MB $\geq$ 1000 vpm for CO_2, smallest meas.range $\geq$ 1000 vpm pour CO_2, étendue min. $\geq$ 1000 vpm
7 *)	Empfängerkammer Detector Cellule de détection	C79451–A3468–B527	für CH_4, kleinster MB < 20 % for CH_4, smallest meas. range < 20 % pour CH_4, étendue min. < 20 %
7 *)	Empfängerkammer Detector Cellule de détection	C79451–A3468–B529	für CH_4, kleinster MB $\geq$ 20 % for CH_4, smallest meas. range $\geq$ 20 % pour CH_4, étendue min. $\geq$ 20 %
7 *)	Empfängerkammer Detector Cellule de détection	C79451–A3468–B537	für C_2H_4 for C_2H_4 pour C_2H_4
7 *)	Empfängerkammer Detector Cellule de détection	C79451–A3468–B520	für NO for NO pour NO
7 *)	Empfängerkammer Detector Cellule de détection	C79451–A3468–B521	für SO_2 for SO_2 pour SO_2
7 *)	Empfängerkammer Detector Cellule de détection	C79451–A3468–B581	für N_2O for N_2O pour N_2O
7 *)	Empfängerkammer Detector Cellule de détection	C79451–A3468–B539	für SF_6 for SF_6 pour SF_6
7 *)	Empfängerkammer Detector Cellule de détection	C79451–A3468–B538	für C_6H_{14} for C_6H_{14} pour C_6H_{14}

*) Nach dem Austausch werden spezielle Arbeiten notwendig, die nur von qualifiziertem, geschultem Fachpersonal durchgeführt werden können wie z. B. Temperaturkompensation, elektrischer Grundabgleich etc.

Following replacement, special work is required which can only be carried out by qualified and trained personnel, for example temperature compensation, basic electronic adjustment etc.

Des travaux particuliers comme p. ex. la compensation de température, le réglage de base électrique etc., ne pouvant être exécutés que par du personnel qualifié sont à effectuer après un remplacement de pièces.

**) Bitte nach Austausch die Wasserdampfquerempfindlichkeiten überprüfen.

Following replacement, please check the water vapor interference.

Après le remplacement, veuillez contrôler l'influence de la vapeur d'eau.

ANALYSIERTEIL/ANALYZER SECTION/PARTIE ANALYSE

Analysierteil **7MB2337-**
Analyzer Section **7MB2337-**
Partie analyse **7MB2337-**

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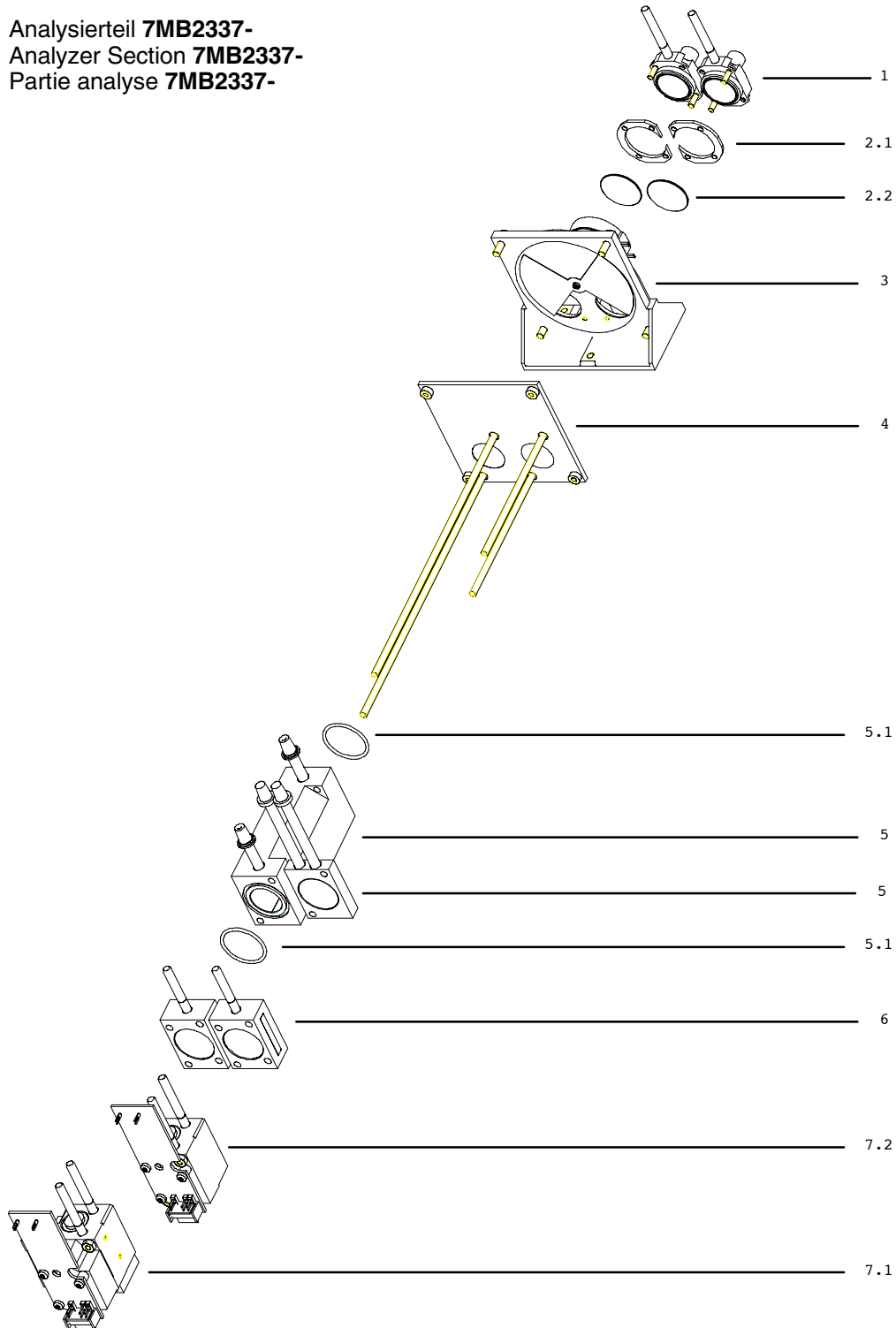
Bezeichnungen s. Seite 8-23   Designations see page 8-23   Désignations voir page 8-23

7MB2337-

Teil-Nr. Part No. N° Pièce	Bezeichnung Designation Désignation	Bestell-Nr. Order No. N° de référence	Bemerkungen Remarks Remarques
1 *)	Strahler IR source Source de rayonnement	C79451-A3468-B206	
2.1	Distanzstück Spacer Entretoise	C79451-A3468-C20	
2.2	Optisches Filter Optical filter Filtre optique	C75285-Z1491-C5	für NO **) for NO **) pour NO **)
2.2	Optisches Filter Optical filter Filtre optique	C79285-Z1302-A4	für SO_2 **) for SO_2 **) pour SO_2 **)
2.2	Optisches Filter Optical filter Filtre optique	C79285-Z1491-C2	für C_2H_4 for C_2H_4 pour C_2H_4
2.2	Optisches Filter Optical filter Filtre optique	A5E00069310	für C_6H_{14} for C_6H_{14} pour C_6H_{14}
2.2	Optisches Filter Optical filter Filtre optique	C79451-A3182-C161	für SF_6 for SF_6 pour SF_6
3 *)	Chopper Chopper Obturateur tournant	C79451-A3468-B516	
4	Platte mit Gewindebolzen und Fenstern Plate with threaded bolts and windows Plaque avec tiges filetées et fenêtres	C79451-A3468-B514	
5.1	O-Ring O-ring Joint torique	C71121-Z100-A99	
5	Analysenkammer mit O-Ring Sample cell with O-ring Cellule d'analyse avec joint torique	C79451-A3468-B231	Analysenkammer 180 mm Sample cell 180 mm Cellule d'analyse 180 mm
5	Analysenkammer mit O-Ring Sample cell with O-ring Cellule d'analyse avec joint torique	C79451-A3468-B232	Analysenkammer 90 mm Sample cell 90 mm Cellule d'analyse 90 mm
5	Analysenkammer mit O-Ring Sample cell with O-ring Cellule d'analyse avec joint torique	C79451-A3468-B233	Analysenkammer 60 mm Sample cell 60 mm Cellule d'analyse 60 mm
5	Analysenkammer mit O-Ring Sample cell with O-ring Cellule d'analyse avec joint torique	C79451-A3468-B234	Analysenkammer 20 mm Sample cell 20 mm Cellule d'analyse 20 mm
5	Analysenkammer Sample cell Cellule d'analyse	C79451-A3468-B235	Analysenkammer 6 mm Sample cell 6 mm Cellule d'analyse 6 mm
5	Analysenkammer Sample cell Cellule d'analyse	C79451-A3468-B236	Analysenkammer 2 mm Sample cell 2 mm Cellule d'analyse 2 mm
6	Gasfilter Gas filter Filtre de gaz	C79451-A3458-B500	für CO for CO pour CO
6	Gasfilter Gas filter Filtre de gaz	C79451-A3458-B508	für SO_2 for SO_2 pour SO_2
6	Gasfilter Gas filter Filtre de gaz	C79451-A3468-B541	für CO_2, kleinster MB < 5 % for CO_2, smallest meas. range < 5 % pour CO_2, étendue min. < 5 %
6	Gasfilter Gas filter Filtre de gaz	C79451-A3468-B542	für CH_4, kleinster MB < 2 % for CH_4, smallest meas. range < 2 % pour CH_4, étendue min. < 2 %
6	Gasfilter Gas filter Filtre de gaz	C79451-A3468-B543	für C_6H_{14}, N_2O 500/5000 vpm for C_6H_{14}, N_2O 500/5000 vpm pour C_6H_{14}, N_2O 500/5000 vpm

*), **) siehe Folgeseite, see following page, voir page suivante

7MB2337-

Teil-Nr. Part No. N° Pièce	Bezeichnung Designation Désignation	Bestell-Nr. Order No. N° de référence	Bemerkungen Remarks Remarques
7.1/7.2 *)	Empfängerkammer Detector Cellule de détection	C79451–A3468–B525	für CO, kleinster MB < 5 % for CO, smallest meas. range < 5 % pour CO, étendue min. < 5 %
7.1/7.2 *)	Empfängerkammer Detector Cellule de détection	C79451–A3468–B528	für CO, kleinster MB $\geq$ 5 % for CO, smallest meas. range $\geq$ 5 % pour CO, étendue min. $\geq$ 5 %
7,1/7.2 *)	Empfängerkammer Detector Cellule de détection	C79451–A3468–B536	für CO_2, kleinster MB < 1000 vpm for CO_2, smallest meas. range < 1000 vpm pour CO_2, étendue min. < 1000 vpm
7.1/7.2 *)	Empfängerkammer Detector Cellule de détection	C79451–A3468–B526	für CO_2, kleinster MB $\geq$ 1000 vpm for CO_2, MBmin $\geq$ 1000 vpm pour CO_2, MBmin $\geq$ 1000 vpm
7.1/7.2 *)	Empfängerkammer Detector Cellule de détection	C79451–A3468–B527	für CH_4, kleinster MB < 20 % for CH_4, smallest meas. range < 20 % pour CH_4, étendue min. < 20 %
7.1/7.2 *)	Empfängerkammer Detector Cellule de détection	C79451–A3468–B529	für CH_4, kleinster MB $\geq$ 20 % for CH_4, smallest meas. range $\geq$ 20 % pour CH_4, étendue min. $\geq$ 20 %
7.1/7.2 *)	Empfängerkammer Detector Cellule de détection	C79451–A3468–B537	für C_2H_4 for C_2H_4 pour C_2H_4
7.1 *)	Empfängerkammer Detector Cellule de détection	C79451–A3468–B520	für NO (Kanal 1) for NO (channel 1) pour NO (canal 1)
7.2 *)	Empfängerkammer Detector Cellule de détection	C79451–A3468–B522	für NO (Kanal 2) for NO (channel 2) pour NO (canal 2)
7.1 *)	Empfängerkammer Detector Cellule de détection	C79451–A3468–B521	für SO_2 (Kanal 1) for SO_2 (channel 1) pour SO_2 (canal 1)
7.2 *)	Empfängerkammer Detector Cellule de détection	C79451–A3468–B523	für SO_2 (Kanal 2) for SO_2 (channel 2) pour SO_2 (canal 2)
7 *)	Empfängerkammer Detector Cellule de détection	C79451–A3468–B581	für N_2O for N_2O pour N_2O
7 *)	Empfängerkammer Detector Cellule de détection	C79451–A3468–B539	für SF_6 for SF_6 pour SF_6
7 *)	Empfängerkammer Detector Cellule de détection	C79451–A3468–B538	für C_6H_{14} for C_6H_{14} pour C_6H_{14}

*) Nach dem Austausch werden spezielle Arbeiten notwendig, die nur von qualifiziertem, geschultem Fachpersonal durchgeführt werden können wie z. B. Temperaturkompensation, elektrischer Grundabgleich etc.

Following replacement, special work is required which can only be carried out by qualified and trained personnel, for example temperature compensation, basic electronic adjustment etc.

Des travaux particuliers comme p. ex. la compensation de température, le réglage de base électrique etc., ne pouvant être exécutés que par du personnel qualifié sont à effectuer après un remplacement de pièces.

**) Bitte nach Austausch die Wasserdampfquerempfindlichkeiten überprüfen.

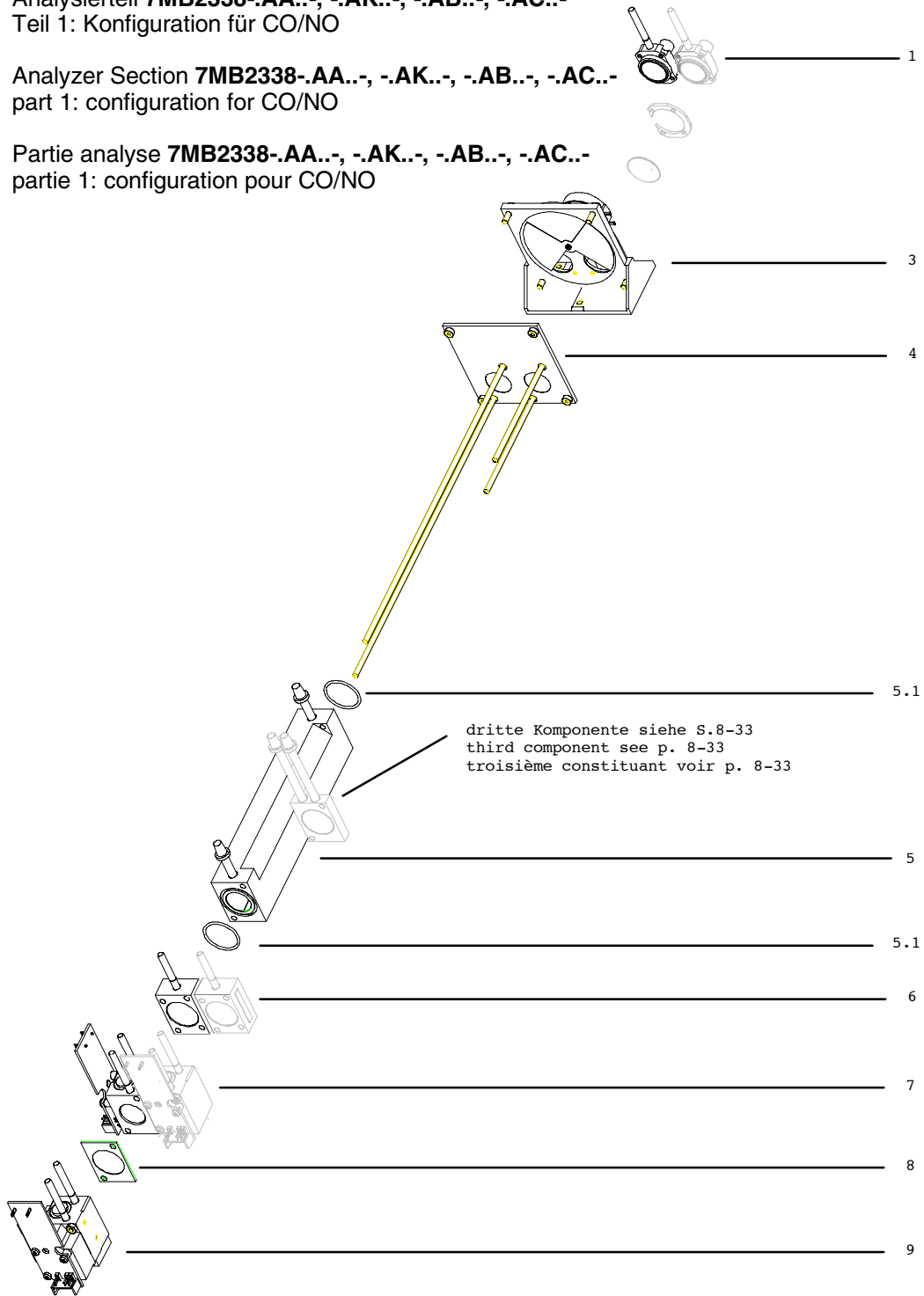Following replacement, please check the water vapor interference.

Après le remplacement, veuillez contrôler l'influence de la vapeur d'eau.

ANALYSIERTEIL 1/ANALYZER SECTION 1/PARTIE ANALYSE 1 CO/NO

Analysierteil **7MB2338-.AA..-, -.AK..-, -.AB..-, -.AC..-**
Teil 1: Konfiguration für CO/NO

Analyzer Section **7MB2338-.AA..-, -.AK..-, -.AB..-, -.AC..-**
part 1: configuration for CO/NO

Partie analyse **7MB2338-.AA..-, -.AK..-, -.AB..-, -.AC..-**
partie 1: configuration pour CO/NO

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dritte Komponente siehe S.8-33
third component see p. 8-33
troisième constituant voir p. 8-33
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Bezeichnungen s. Seite 8-27   Designations see page 8-27   Désignations voir page 8-27

7MB2338-.AA..-, -.AK..-, -.AB..-, -.AC..-

Teil-Nr. Part No. N° Pièce	Bezeichnung Designation Désignation	Bestell-Nr. Order No. N° de référence	Bemerkungen Remarks Remarques
1 *)	Strahler IR source Source de rayonnement	C79451-A3468-B206	
3 *)	Chopper Chopper Obturateur tournant	C79451-A3468-B516	
4	Platte mit Gewindebolzen und Fenstern Plate with threaded bolts and windows Plaque avec tiges filetées et fenêtres	C79451-A3468-B514	
5.1	O-Ring O-ring Joint torique	C71121-Z100-A99	
5	Analysenkammer mit O-Ring Sample cell with O-ring Cellule d'analyse avec joint torique	C79451-A3468-B231	Analysenkammer 180 mm -.AA.., -.AK.. Sample cell 180 mm -.AA.., -.AK.. Cellule d'analyse 180 mm -.AA.., -.AK..
5	Analysenkammer mit O-Ring Sample cell with O-ring Cellule d'analyse avec joint torique	C79451-A3468-B232	Analysenkammer 90 mm -.AC.. Sample cell 90 mm -.AC.. Cellule d'analyse 90 mm -.AC..
5	Analysenkammer mit O-Ring Sample cell with O-ring Cellule d'analyse avec joint torique	C79451-A3468-B233	Analysenkammer 60 mm -.AB.. Sample cell 60 mm -.AB.. Cellule d'analyse 60 mm -.AB..
6	Gasfilter Gas filter Filtre de gaz	C79451-A3458-B500	für CO for CO pour CO
7 *)	Empfängerkammer Detector Cellule de détection	C79451-A3468-B530	für CO for CO pour CO
8	Optisches Filter Optical filter Filtre optique	C79451-A3458-B103	für NO **) for NO **) pour NO **)
9 *)	Empfängerkammer Detector Cellule de détection	C79451-A3468-B520	für NO (Kanal 1) for NO (channel 1) pour NO (canal 1)

*) Nach dem Austausch werden spezielle Arbeiten notwendig, die nur von qualifiziertem, geschultem Fachpersonal durchgeführt werden können wie z. B. Temperaturkompensation, elektrischer Grundabgleich etc.

Following replacement, special work is required which can only be carried out by qualified and trained personnel, for example temperature compensation, basic electronic adjustment etc.

Des travaux particuliers comme p. ex. la compensation de température, le réglage de base électrique etc., ne pouvant être exécutés que par du personnel qualifié sont à effectuer après un remplacement de pièces.

**) Bitte nach Austausch die Wasserdampfquerempfindlichkeiten überprüfen.

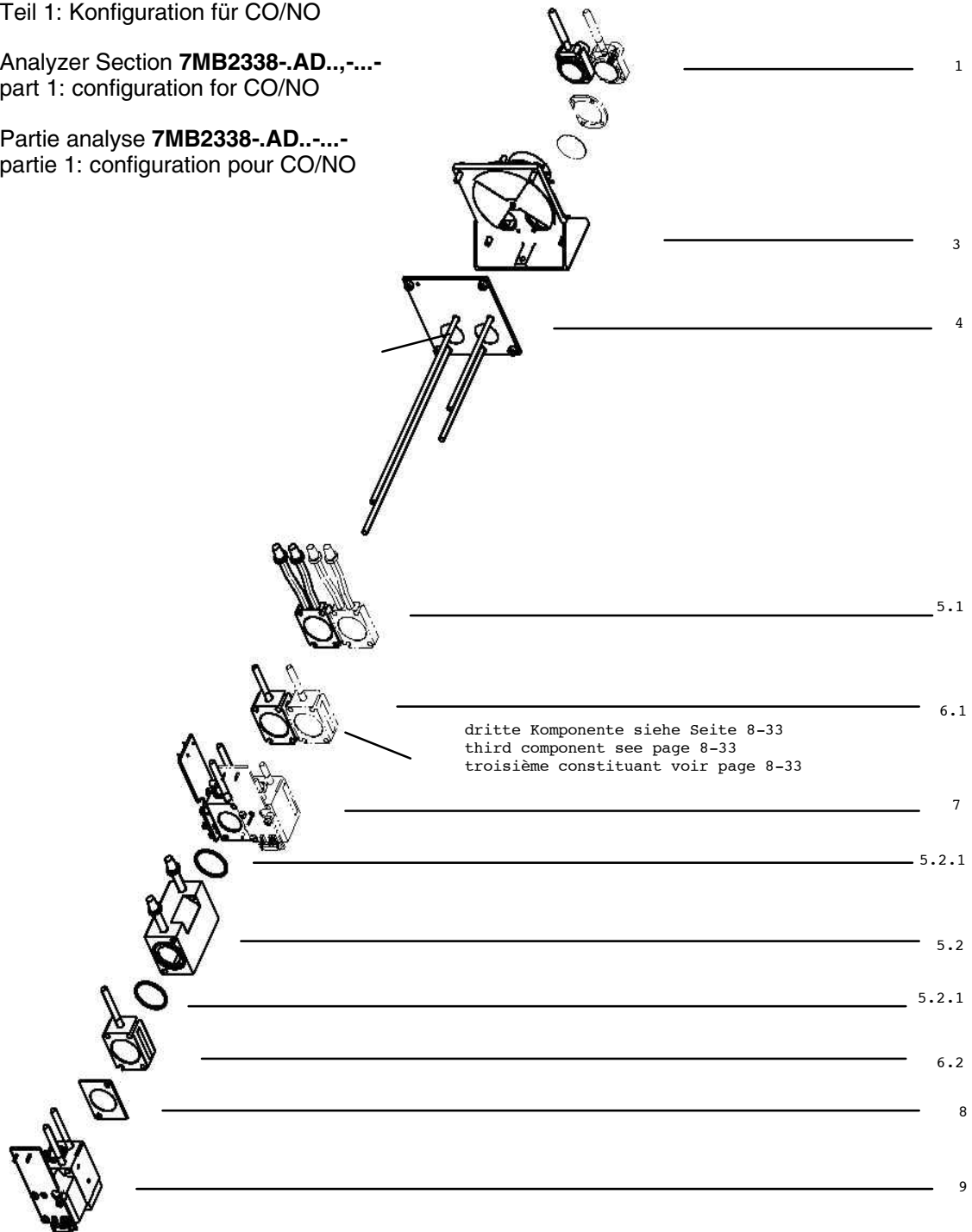Following replacement, please check the water vapor interference.

Après le remplacement, veuillez contrôler l'influence de la vapeur d'eau.

ANALYSIERTEIL 1/ANALYZER SECTION 1/PARTIE ANALYSE 1 CO/NO

Analysierteil **7MB2338-.AD...-...-**
Teil 1: Konfiguration für CO/NO

Analyzer Section **7MB2338-.AD..,-...-**
part 1: configuration for CO/NO

Partie analyse **7MB2338-.AD..-...-**
partie 1: configuration pour CO/NO

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dritte Komponente siehe Seite 8-33
third component see page 8-33
troisième constituant voir page 8-33
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Bezeichnungen s. Seite 8-29   Designations see page 8-29   Désignations voir page 8-29

7MB2338-.AD..-

Teil-Nr. Part No. N° Pièce	Bezeichnung Designation Désignation	Bestell-Nr. Order No. N° de référence	Bemerkungen Remarks Remarques
1 *)	Strahler IR source Source de rayonnement	C79451–A3468–B206	
3 *)	Chopper Chopper Obturateur tournant	C79451–A3468–B516	
4	Platte mit Gewindebolzen und Fenstern Plate with threaded bolts and windows Plaque avec tiges filetées et fenêtres	C79451–A3468–B514	
5.1	Analysenkammer Sample cell Cellule d'analyse	C79451–A3468–B235	Analysenkammer 6 mm Sample cell 6 mm Cellule d'analyse 6 mm
6.1	Gasfilter Gas filter Filtre de gaz	C79451–A3458–B500	für CO for CO pour CO
7 *)	Empfängerkammer Detector Cellule de détection	C79451–A3468–B530	für CO for CO pour CO
5.2	Analysenkammer mit O-Ring Sample cell with o-ring Cellule d'analyse avec joint torique	C79451–A3468–B233	Analysenkammer 60 mm Sample cell 60 mm Cellule d'analyse 60 mm
5.2.1	O-Ring O-ring Joint torique	C71121–Z100–A99	
6.2	Gasfilter Gas filter Filtre de gaz	C79451–A3468–B542	für NO for NO pour NO
8	Optisches Filter Optical filter Filtre optique	C79451–A3458–B103	für NO **) for NO **) pour NO **)
9 *)	Empfängerkammer Detector Cellule de détection	C79451–A3468–B520	für NO (Kanal 1) for NO (channel 1) pour NO (canal 1)

*) Nach dem Austausch werden spezielle Arbeiten notwendig, die nur von qualifiziertem, geschultem Fachpersonal durchgeführt werden können wie z. B. Temperaturkompensation, elektrischer Grundabgleich etc.

Following replacement, special work is required which can only be carried out by qualified and trained personnel, for example temperature compensation, basic electronic adjustment etc.

Des travaux particuliers comme p. ex. la compensation de température, le réglage de base électrique etc., ne pouvant être exécutés que par du personnel qualifié sont à effectuer après un remplacement de pièces.

**) Bitte nach Austausch die Wasserdampfquerempfindlichkeiten überprüfen.

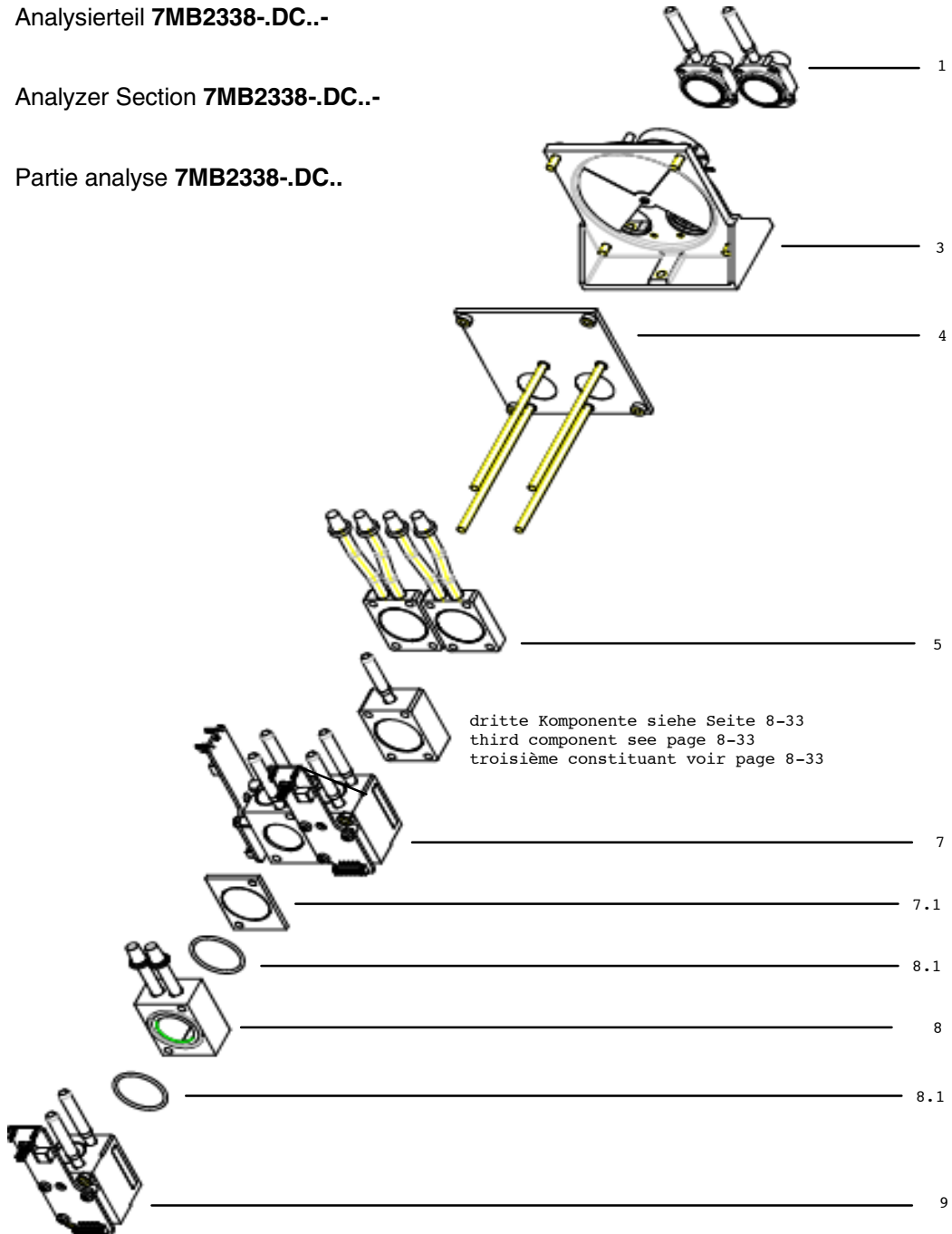Following replacement, please check the water vapor interference.

Après le remplacement, veuillez contrôler l'influence de la vapeur d'eau.

ANALYSIERTEIL 1/ANALYZER SECTION 1/PARTIE ANALYSE 1 CO/CO$_2$ und CO$_2$/CH$_4$

Analysierteil **7MB2338-.DC..-**

Analyzer Section **7MB2338-.DC..-**

Partie analyse **7MB2338-.DC..**

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dritte Komponente siehe Seite 8-33
third component see page 8-33
troisième constituant voir page 8-33
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Bezeichnungen s. Seite 8-31   Designations see page 8-31   Désignations voir page 8-31

7MB2338-.DC..-

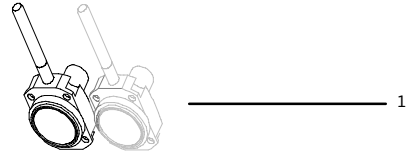| Teil-Nr. Part No. N° Pièce	Bezeichnung Designation Désignation	Bestell-Nr. Order No. N° de référence	Bemerkungen Remarks Remarques
1 *)	Strahler IR source Source de rayonnement	C79451–A3468–B206	
3 *)	Chopper Chopper Obturateur tournant	C79451–A3468–B516	
4	Platte mit Gewindebolzen und Fenstern Plate with threaded bolts and windows Plaque avec tiges filetées et fenêtres	C79451–A3468–B514	
5	Analysenkammer Sample cell Cellule d'analyse	C79451–A3468–B235	Analysenkammer 6 mm Sample cell 6 mm Cellule d'analyse 6 mm
7 *)	Empfängerkammer Detector Cellule de détection	C79451–A3468–B235	für CO_2 for CO_2 pour CO_2
7.1	Optisches Filter mit Filterträger Optical filter with filter support Filtre optique avec support	A5E00502911	
8	Analysenkammer mit O–Ring Sample cell with o-ring Cellule d'analyse avec joint torique	C79451–A3468–B231	Analysenkammer 180 mm Sample cell 180 mm Cellule d'analyse 180 mm
8.1	O–Ring O-ring Joint torique	C71121–Z100–A99	
9 *)	Empfängerkammer Detector Cellule de détection	C79451–A3468–B520	für NO (Kanal 1) for NO (channel 1) pour NO (canal 1)

*) Nach dem Austausch werden spezielle Arbeiten notwendig, die nur von qualifiziertem, geschultem Fachpersonal durchgeführt werden können wie z. B. Temperaturkompensation, elektrischer Grundabgleich etc.

Following replacement, special work is required which can only be carried out by qualified and trained personnel, for example temperature compensation, basic electronic adjustment etc.

Des travaux particuliers comme p. ex. la compensation de température, le réglage de base électrique etc., ne pouvant être exécutés que par du personnel qualifié sont à effectuer après un remplacement de pièces.
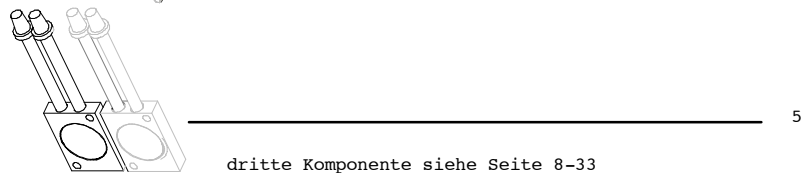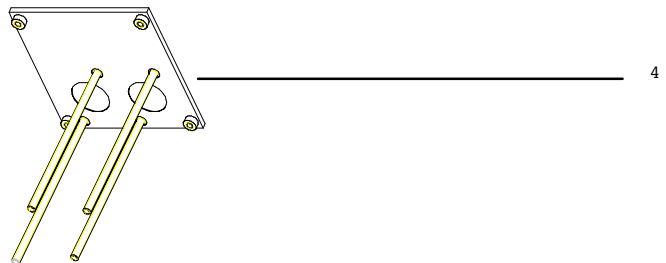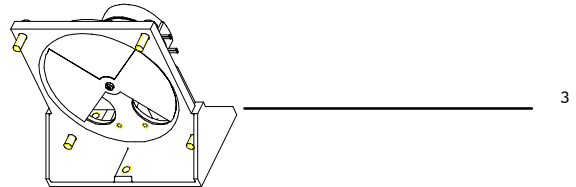
ANALYSIERTEIL 1/ANALYZER SECTION 1/PARTIE ANALYSE 1 CO/CO$_2$ und CO$_2$/CH$_4$

Analysierteil **7MB2338-.BA.., -.BD, -.CB..-**
Teil 1: Konfiguration für CO/CO$_2$, CO$_2$/CH$_4$

Analyzer Section **7MB2338-.BA.., -.BD, -.CB..-**
part 1: configuration for CO/CO$_2$, CO$_2$/CH$_4$

Partie analyse **7MB2338-.BA.., -.BD, -.CB..-**
partie 1: configuration pour CO/CO$_2$, CO$_2$/CH$_4$

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dritte Komponente siehe Seite 8-33
third component see page 8-33
troisième constituant voir page 8-33
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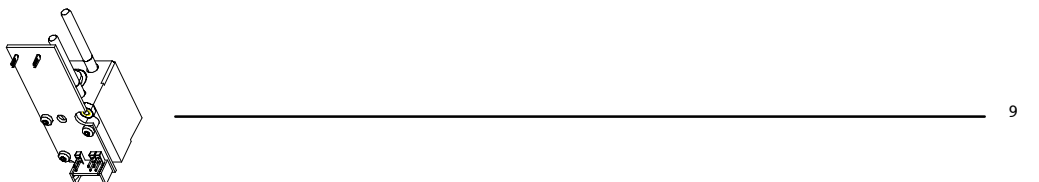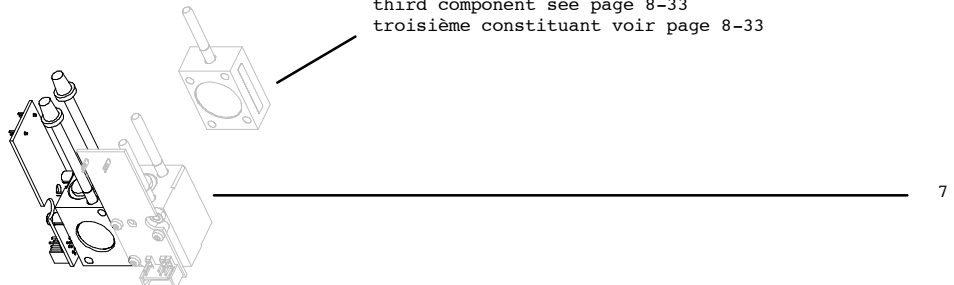
Bezeichnungen s. Seite 8-33   Designations see page 8-33   Désignations voir page 8-33

7MB2338-

Teil-Nr. Part No. N° Pièce	Bezeichnung Designation Désignation	Bestell-Nr. Order No. N° de référence	Bemerkungen Remarks Remarques
1 *)	Strahler IR source Source de rayonnement	C79451-A3468-B206	
3 *)	Chopper Chopper Obturateur tournant	C79451-A3468-B516	
4	Platte mit Gewindebolzen und Fenstern Plate with threaded bolts and windows Plaque avec tiges filetées et fenêtres	C79451-A3468-B514	

7MB2338-.BA..,- -.BD...-

5	Analysenkammer Sample cell Cellule d'analyse	C79451-A3468-B236	Analysenkammer 2 mm Sample cell 2 mm Cellule d'analyse 2 mm
7 *)	Empfängerkammer Detector Cellule de détection	C79451-A3468-B532	für CO for CO pour CO
9 *)	Empfängerkammer Detector Cellule de détection	C79451-A3468-B526	für CO_2 for CO_2 pour CO_2

7MB2338-.CB..-

5	Analysenkammer Sample cell Cellule d'analyse	C79451-A3468-B235	Analysenkammer 6 mm Sample cell 6 mm Cellule d'analyse 6 mm
7 *)	Empfängerkammer Detector Cellule de détection	C79451-A3468-B531	für CO_2 for CO_2 pour CO_2
9 *)	Empfängerkammer Detector Cellule de détection	C79451-A3468-B527	für CH_4 for CH_4 pour CH_4

*) Nach dem Austausch werden spezielle Arbeiten notwendig, die nur von qualifiziertem, geschultem Fachpersonal durchgeführt werden können wie z. B. Temperaturkompensation, elektrischer Grundabgleich etc.

Following replacement, special work is required which can only be carried out by qualified and trained personnel, for example temperature compensation, basic electronic adjustment etc.

Des travaux particuliers comme p. ex. la compensation de température, le réglage de base électrique etc., ne pouvant être exécutés que par du personnel qualifié sont à effectuer après un remplacement de pièces.

ANALYSIERTEIL 1/ANALYZER SECTION 1/PARTIE ANALYSE 1 CO/CO$_2$ und CO$_2$/CH$_4$

Analysierteil **7MB2338-.BB..-, -.CA..-**
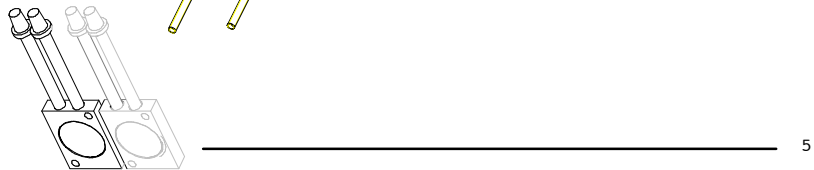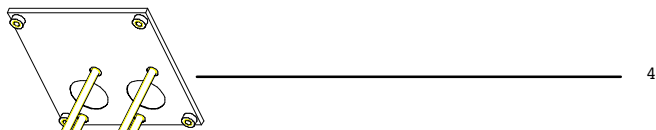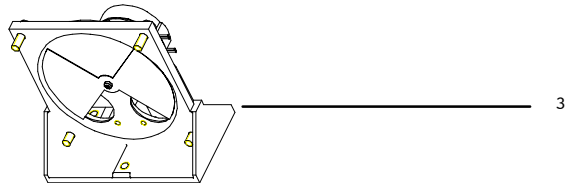Teil 1: Konfiguration für CO/CO$_2$, CO$_2$/CH$_4$

Analyzer Section **7MB2338-.BB..-, -.CA..-**
part 1: configuration for CO/CO$_2$, CO$_2$/CH$_4$

Partie analyse **7MB2338-.BB..-, -.CA..-**
partie 1: configuration pour CO/CO$_2$, CO$_2$/CH$_4$
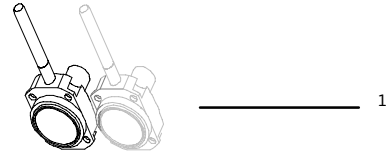

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dritte Komponente siehe S. 8-33
third component see p. 8-33
troisième constituant voir p. 8-33
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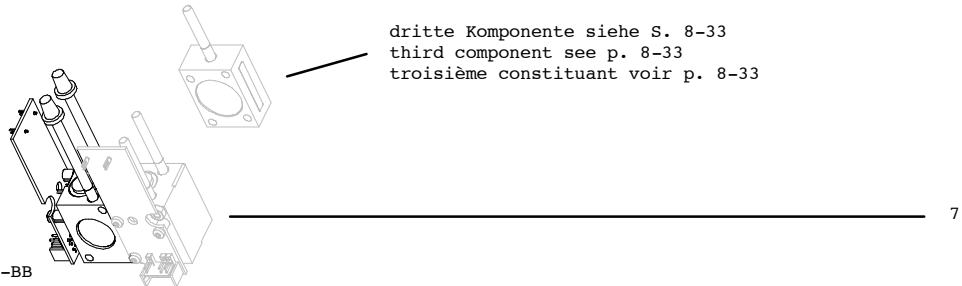
nur 7MB2338-BB
only 7MB2338-BB
seulement 7MB2338-BB
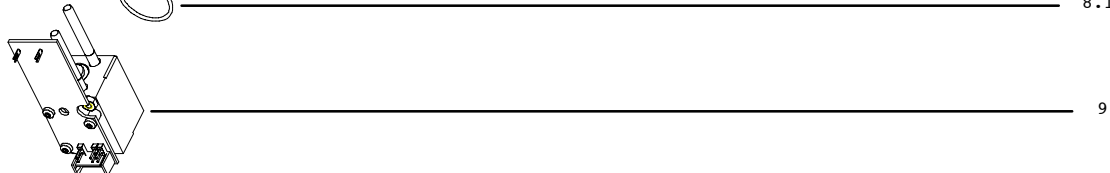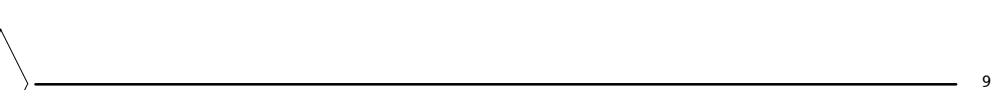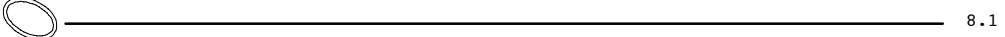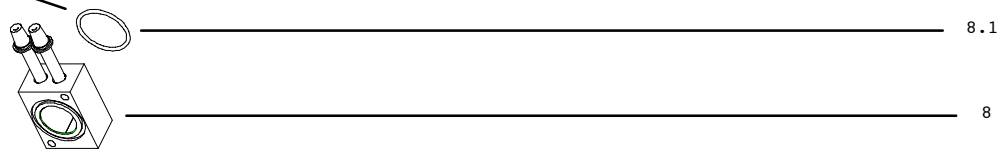
Bezeichnungen s. Seite 8-35   Designations see page 8-35   Désignations voir page 8-35

7MB2338-

Teil-Nr. Part No. N° Pièce	Bezeichnung Designation Désignation	Bestell-Nr. Order No. N° de référence	Bemerkungen Remarks Remarques
1 *)	Strahler IR source Source de rayonnement	C79451−A3468−B206	
3 *)	Chopper Chopper Obturateur tournant	C79451−A3468−B516	
4	Platte mit Gewindebolzen und Fenstern Plate with threaded bolts and windows Plaque avec tiges filetées et fenêtres	C79451−A3468−B514	

7MB2338-.BB..-

5	Analysenkammer Sample cell Cellule d'analyse	C79451−A3468−B236	Analysenkammer 2 mm Sample cell 2 mm Cellule d'analyse 2 mm
7 *)	Empfängerkammer Detector Cellule de détection	C79451−A3468−B532	für CO for CO pour CO
8.1	O−Ring O−ring Joint torique	C71121−Z100−A99	
8	Analysenkammer mit O−Ring Sample cell with O−ring Cellule d'analyse avec joint torique	C79451−A3468−B234	Analysenkammer 20 mm Sample cell 20 mm Cellule d'analyse 20 mm
9 *)	Empfängerkammer Detector Cellule de détection	C79451−A3468−B526	für CO_2 for CO_2 pour CO_2

7MB2338-.CA..-

5	Analysenkammer Sample cell Cellule d'analyse	C79451−A3468−B235	Analysenkammer 6 mm Sample cell 6 mm Cellule d'analyse 6 mm
7 *)	Empfängerkammer Detector Cellule de détection	C79451−A3468−B531	für CO_2 for CO_2 pour CO_2
8	Analysenkammer Sample cell Cellule d'analyse	C79451−A3468−B235	Analysenkammer 6 mm Sample cell 6 mm Cellule d'analyse 6 mm
9 *)	Empfängerkammer Detector Cellule de détection	C79451−A3468−B527	für CH_4 for CH_4 pour CH_4

*) Nach dem Austausch werden spezielle Arbeiten notwendig, die nur von qualifiziertem, geschultem Fachpersonal durchgeführt werden können wie z. B. Temperaturkompensation, elektrischer Grundabgleich etc.

Following replacement, special work is required which can only be carried out by qualified and trained personnel, for example temperature compensation, basic electronic adjustment etc.

Des travaux particuliers comme p. ex. la compensation de température, le réglage de base électrique etc., ne pouvant être exécutés que par du personnel qualifié sont à effectuer après un remplacement de pièces.

**ANALYSIERTEIL 1/ANALYZER SECTION 1/PARTIE ANALYSE 1 CO$_2$/CO**

Analysierteile **7MB2338-.BJ..-, -.BK..-, -.BL..-**
Teil 1: Konfiguration für CO$_2$/CO

Analyzer Section **7MB2338-.BJ..-, -.BK..-, -.BL..-**
part 1: configuration for CO$_2$/CO

Partie analyse **7MB2338-.BJ..-, -.BK..-, -.BL..-**
partie 1: configuration pour CO$_2$/CO

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dritte Komponente siehe S. 8-33
third component see p. 8-33
troisième constituant voir p. 8-33
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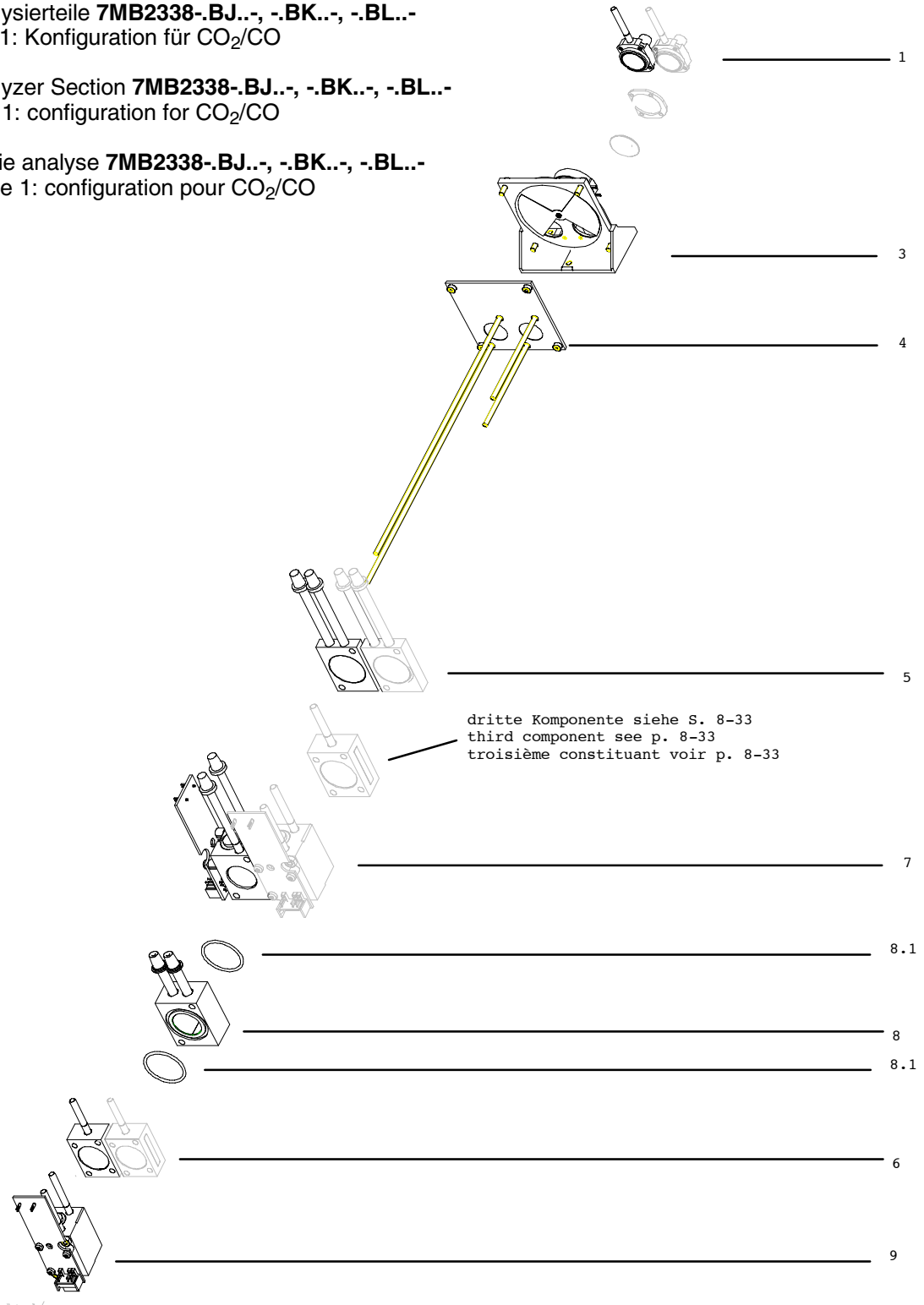
Bezeichnungen s. Seite 8-37   Designations see page 8-37   Désignations voir page 8-37

7MB2338-

Teil-Nr. Part No. N° Pièce	Bezeichnung Designation Désignation	Bestell-Nr. Order No. N° de référence	Bemerkungen Remarks Remarques
1 *)	Strahler IR source Source de rayonnement	C79451-A3468-B206	
3 *)	Chopper Chopper Obturateur tournant	C79451-A3468-B516	
4	Platte mit Gewindebolzen und Fenstern Plate with threaded bolts and windows Plaque avec tiges filetées et fenêtres	C79451-A3468-B514	

7MB2338-.BK..-

5	Analysenkammer Sample cell Cellule d'analyse	C79451-A3468-B236	Analysenkammer 2 mm Sample cell 2 mm Cellule d'analyse 2 mm
7 *)	Empfängerkammer Detector Cellule de détection	C79451-A3468-B531	für CO_2 for CO_2 pour CO_2
8.1	O-Ring O-ring Joint torique	C71121-Z100-A99	
8	Analysenkammer mit O-Ring Sample cell with O-ring Cellule d'analyse avec joint torique	C79451-A3468-B234	Analysenkammer 20 mm Sample cell 20 mm Cellule d'analyse 20 mm
6	Gasfilter Gas filter Filtre de gaz	C79451-A3458-B500	für CO for CO pour CO
9 *)	Empfängerkammer Detector Cellule de détection	C79451-A3468-B528	für CO for CO pour CO

7MB2338-.BJ..-, -.BL..

5	Analysenkammer Sample cell Cellule d'analyse	C79451-A3468-B235	Analysenkammer 6 mm Sample cell 6 mm Cellule d'analyse 6 mm
7 *)	Empfängerkammer Detector Cellule de détection	C79451-A3468-B531	für CO_2 for CO_2 pour CO_2
8.1	O-Ring O-ring Joint torique	C71121-Z100-A99	
8	Analysenkammer mit O-Ring Sample cell with O-ring Cellule d'analyse avec joint torique	C79451-A3468-B231	Analysenkammer 180 mm Sample cell 180 mm Cellule d'analyse 180 mm
6	Gasfilter Gas filter Filtre de gaz	C79451-A3458-B500	für CO for CO pour CO
9 *)	Empfängerkammer Detector Cellule de détection	C79451-A3468-B525	für CO for CO pour CO

*)   s. Fußnote Seite 7-37

*)   see footnote page 7-37

*)   voir page 7-37

ANALYSIERTEIL 2/ANALYZER SECTION 2/PARTIE ANALYSE 2

Analysierteile **7MB2338-....0-.☐☐.**
Teil 2: dritte Komponente

Analyzer Sections **7MB2338-....0-.☐☐.**
part 2: third component

Parties analyse **7MB2338-....0-.☐☐.**
partie 2: troisième constituant

Graue Bauteile: Teil 1 (Beispiel)
Gray parts: part 1 (example)
Pièces grises: partie 1 (exemple)
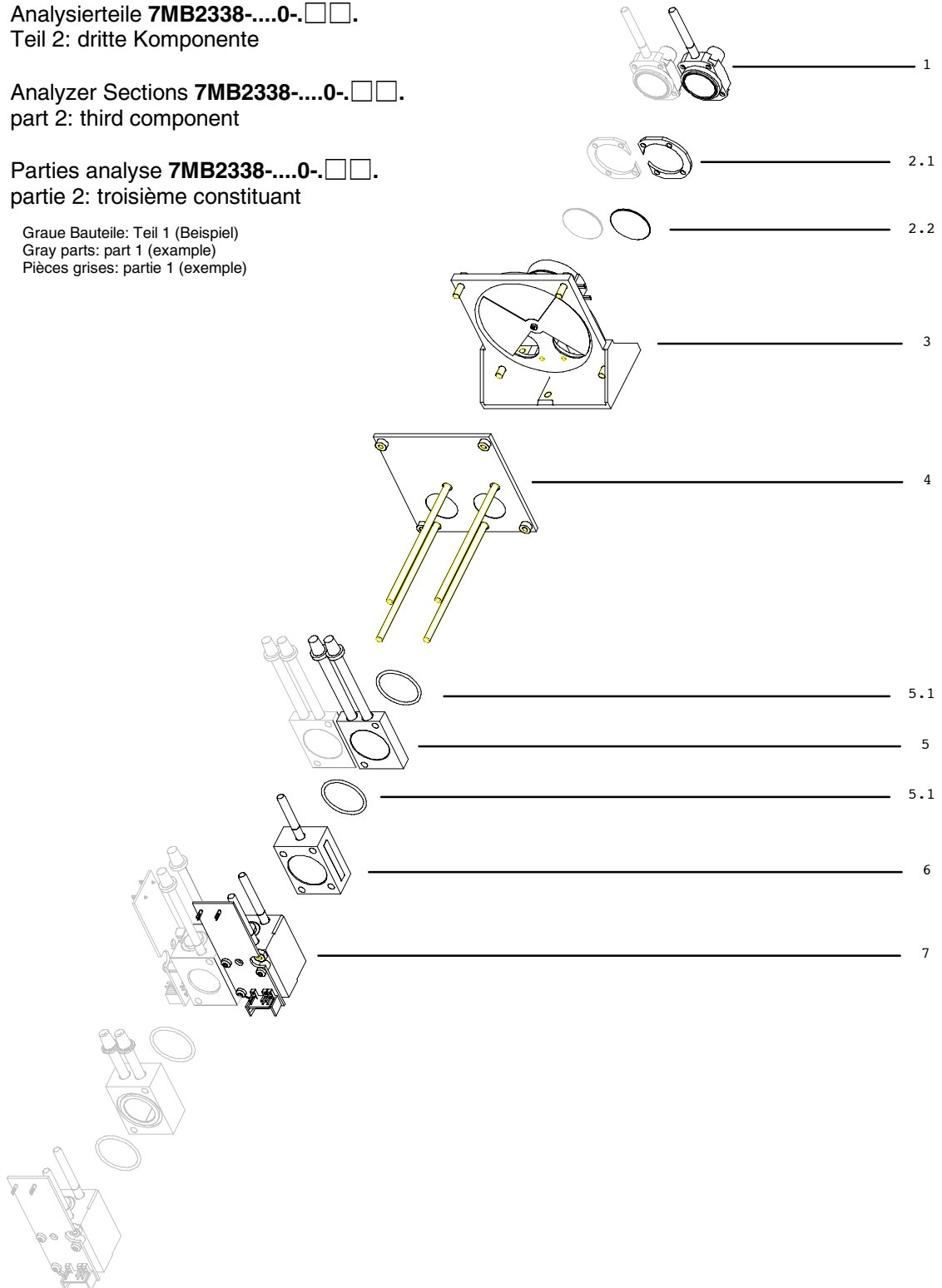
Bezeichnungen s. Seiten 8-39/8-40 Designations see pages 8-39/8-40
Désignations voir pages 8-39/8-40

7MB2338-....0-.☐☐.

Teil-Nr. Part No. N° Pièce	Bezeichnung Designation Désignation	Bestell-Nr. Order No. N° de référence	Bemerkungen Remarks Remarques
1 *)	Strahler IR source Source de rayonnement	C79451-A3468-B206	
2.1	Distanzstück Spacer Entretoise	C79451-A3468-C20	
2.2	Optisches Filter Optical filter Filtre optique	C75285-Z1491-C5	für NO **) for NO **) pour NO **)
2.2	Optisches Filter Optical filter Filtre optique	C79285-Z1302-A4	für SO_2 **) for SO_2 **) pour SO_2 **)
2.2	Optisches Filter Optical filter Filtre optique	C79285-Z1491-C2	für C_2H_4 for C_2H_4 pour C_2H_4
2.2	Optisches Filter Optical filter Filtre optique	A5E00069310	für C_6H_{14} for C_6H_{14} pour C_6H_{14}
2.2	Optisches Filter Optical filter Filtre optique	C79451-A3182-C161	für SF_6 for SF_6 pour SF_6
3 *)	Chopper Chopper Obturateur tournant	C79451-A3468-B516	
4	Platte mit Gewindebolzen und Fenstern Plate with threaded bolts and windows Plaque avec tiges filetées et fenêtres	C79451-A3468-B514	
5.1	O-Ring O-ring Joint torique	C71121-Z100-A99	
5	Analysenkammer mit O-Ring Sample cell with O-ring Cellule d'analyse avec joint torique	C79451-A3468-B231	Analysenkammer 180 mm Sample cell 180 mm Cellule d'analyse 180 mm
5	Analysenkammer mit O-Ring Sample cell with O-ring Cellule d'analyse avec joint torique	C79451-A3468-B232	Analysenkammer 90 mm Sample cell 90 mm Cellule d'analyse 90 mm
5	Analysenkammer mit O-Ring Sample cell with O-ring Cellule d'analyse avec joint torique	C79451-A3468-B233	Analysenkammer 60 mm Sample cell 60 mm Cellule d'analyse 60 mm
5	Analysenkammer mit O-Ring Sample cell with O-ring Cellule d'analyse avec joint torique	C79451-A3468-B234	Analysenkammer 20 mm Sample cell 20 mm Cellule d'analyse 20 mm
5	Analysenkammer Sample cell Cellule d'analyse	C79451-A3468-B235	Analysenkammer 6 mm Sample cell 6 mm Cellule d'analyse 6 mm
5	Analysenkammer Sample cell Cellule d'analyse	C79451-A3468-B236	Analysenkammer 2 mm Sample cell 2 mm Cellule d'analyse 2 mm

*) siehe Folgeseite, see following page, voir page suivante

**) Bitte nach Austausch die Wasserdampfquerempfindlichkeiten überprüfen.

Following replacement, please check the water vapor interference.

Après le remplacement, veuillez contrôler l'influence de la vapeur d'eau.

7MB2338-....0-.□□.

Teil-Nr. Part No. N° Pièce	Bezeichnung Designation Désignation	Bestell-Nr. Order No. N° de référence	Bemerkungen Remarks Remarques
6	Gasfilter Gas filter Filtre de gaz	C79451-A3458-B500	für CO for CO pour CO
6	Gasfilter Gas filter Filtre de gaz	C79451-A3458-B508	für SO_2 for SO_2 pour SO_2
6	Gasfilter Gas filter Filtre de gaz	C79451-A3468-B541	für CO_2, kleinster MB < 5 % for CO_2, smallest meas. range < 5 % pour CO_2, étendue min. < 5 %
6	Gasfilter Gas filter Filtre de gaz	C79451-A3468-B542	für CH_4, kleinster MB < 2 % for CH_4, smallest meas. range < 2 % pour CH_4, étendue min. < 2 %
6	Gasfilter Gas filter Filtre de gaz	C79451-A3468-B543	für C_6H_{14} for C_6H_{14} pour C_6H_{14}
7 *)	Empfängerkammer Detector Cellule de détection	C79451-A3468-B525	für CO, kleinster MB < 5 % for CO, smallest meas. range < 5 % pour CO, étendue min. < 5 %
7 *)	Empfängerkammer Detector Cellule de détection	C79451-A3468-B528	für CO, kleinster MB $\geq$ 5 % for CO, smallest meas. range $\geq$ 5 % pour CO, étendue min. $\geq$ 5 %
7 *)	Empfängerkammer Detector Cellule de détection	C79451-A3468-B536	für CO_2, kleinster MB < 1000 vpm for CO_2, smallest meas. range < 1000 vpm pour CO_2, étendue min. < 1000 vpm
7 *)	Empfängerkammer Detector Cellule de détection	C79451-A3468-B526	für CO_2, kleinster MB $\geq$ 1000 vpm for CO_2, smallest meas. range $\geq$ 1000 vpm pour CO_2, étendue min. $\geq$ 1000 vpm
7 *)	Empfängerkammer Detector Cellule de détection	C79451-A3468-B527	für CH_4, kleinster MB < 20 % for CH_4, smallest meas. range < 20 % pour CH_4, étendue min. < 20 %
7 *)	Empfängerkammer Detector Cellule de détection	C79451-A3468-B529	für CH_4, kleinster MB $\geq$ 20 % for CH_4, smallest meas. range $\geq$ 20 % pour CH_4, étendue min. $\geq$ 20 %
7 *)	Empfängerkammer Detector Cellule de détection	C79451-A3468-B537	für C_2H_4 for C_2H_4 pour C_2H_4
7 *)	Empfängerkammer Detector Cellule de détection	C79451-A3468-B522	für NO (Kanal 2) for NO (channel 2) pour NO (canal 2)
7 *)	Empfängerkammer Detector Cellule de détection	C79451-A3468-B523	für SO_2 (Kanal 2) for SO_2 (channel 2) pour SO_2 (canal 2)
7 *)	Empfängerkammer Detector Cellule de détection	C79451-A3468-B581	für N_2O for N_2O pour N_2O
7 *)	Empfängerkammer Detector Cellule de détection	C79451-A3468-B539	für SF_6 for SF_6 pour SF_6
7 *)	Empfängerkammer Detector Cellule de détection	C79451-A3468-B538	für C_6H_{14} for C_6H_{14} pour C_6H_{14}

*)   Nach dem Austausch werden spezielle Arbeiten notwendig, die nur von qualifiziertem, geschultem Fachpersonal durchgeführt werden können wie z. B. Temperaturkompensation, elektrischer Grundabgleich etc.

       Following replacement, special work is required which can only be carried out by qualified and trained personnel, for example temperature compensation, basic electronic adjustment etc.

       Des travaux particuliers comme p. ex. la compensation de température, le réglage de base électrique etc., ne pouvant être exécutés que par du personnel qualifié sont à effectuer après un remplacement de pièces.

Appendix

9

9.1 Returned Deliveries

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 analyzers must be additionally sealed air-tight in a 0.2 mm thick polyethylene foil with the addition of a drying agent (e.g. silica gel). In addition, the transport container should be lined internally with a layer of union paper.

Please photocopy the form printed overleaf, fill in, and enclose with the returned device.

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

Addresses for Returned Deliveries

Contact

Technical support

- For technical support, please contact our service helpline:
  Tel.:+49 180 5050 222
  Fax:+49 180 5050 223
  email: support.automation@siemens.com

Spare parts service

Please send your orders for spare parts to the following address:
-   SIEMENS CSC (Centre Service Client)
  Tel.: +33 3 6906 5555
  Fax: +33 3 6906 6688
  1, chemin de la Sandlach
  F-67506 Haguenau

Repairs

To enable fast detection and elimination of faults, please return the analyzers to the following address:
- SIEMENS CSC (Centre Service Client)
  Tel.: +33 3 6906 5555
  Fax: +33 3 6906 6688
  1, chemin de la Sandlach
  F-67506 Haguenau

Returned deliveries form

( ) Repair   ( ) Guarantee

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	
Fault description	
Process data at point of measurement	
Operating temperature	
Operating pressure	
Composition of sample gas	
Duration of use/ date put into service	

Repair report	
RH No.:	Incoming date: Outgoing date: Technician:

Do not fill in this block; for internal use

Your comments please

9.2   Explanations

9.2.1   Abbreviations

Table 9-1   List of abbreviations used

Abbreviation	Meaning
ADC	Voltage on the analog-to-digital converter (A/D converter)
AR	Autorange
AUTOCAL	Automatic calibration of analyzer
CAL	Calibration
CAL-Gas	Calibration gas
ELAN	Economical Local Area Network
ERR	Faulty operation of analyzer
IR	Infrared
LEL	lower explosion limit
LCD	Liquid Crystal Display
MEAS	Measure
MR	Measuring range
MV	Measured value
NAM	NAMUR **N**ormen**A**rbeitsgemeinschaft für **M**ess- **U**nd **R**egelungstechnik in der chemischen Industrie (standards committee for measuring and control technology in the chemical industry)
PUMP	Pump on/off
R	Relay or computer mode (remote)
SV	Span (calibration) gas valve
Sync	Synchronization (with other devices in the system)
V-ADCt	
ZV	Zero gas valve

9.2.2   Explanation of Symbols

To avoid danger to the life or health of users or service engineers, and to avoid damage to property, certain sections of text in this Manual are identified by warning symbols (pictograms).

General indication of danger
It is essential to observe the operating instructions

9.3 Software Release Versions

This Manual refers to the software release version 2.14._
(see Section 5.7.4). The most important modifications are listed below.

If analyzers are to be upgraded to the software version 2.14._, please observe the listed measures.

Table 9-2   Measures for upgrading to version 2.14._-

Software version	Manufac-turing period starting	Most important innovations	Measures for upgrading to version 2.14._: Replace ROM package C79451-A3494-S501 and ...
0.24 ... 0.94	Up to approx. 12/96	• Functionality completed (pre-production analyzers)	• **Only possible in service center!** Replace ROM package (flash PROM) C79451-A3494-S501, GAL • New temperature adjustment necessary
1.0	1/97	• Complete functionality with German dialogs	
1.1	1/97	• Internal correction	
1.2	2/97	• Complete functionality with German dialogs	
1.3	2/97	• Internal corrections	
1.4	2/97	• Complete functionality with German, English, French, Spanish Italian dialogs	
1.5	3/97	• Signalling "Function control" introduced • Analyzer status displays: "Function control" instead of "Maintenance" (see Section 5.2)	
1.6	6/97	• Error correction in display "O_2 cal after install date" (see Section 5.8.2.1) • In dialog "Parameters: Time constants" T90 instead of Tau (T63) (see Section 5.9.3) • Company name "SIEMENS" removed • Internal corrections	• Check time constant

Table 9-2   Measures for upgrading to version 2.14._-, continued

Software version	Manufac-turing period starting	Most important innovations	Measures for upgrading to version 2.14._: Replace ROM package C79451-A3494-S501 and ...
2.0._	11/97	• Variable chopper frequency (factory setting) • Language selection introduced (see Section 5.10.2.1) • Error eliminated: With AUTOCAL time = 0 h, analyzer remains in warm-up mode • Response of analog current output with function control can now be parameterized (see Section 5.10.1.1) • The dialogs "Analyzer status: factory settings hardware" and "Analyzer status: factory settings software" revised • In dialog "Analyzer status: Diagnostic values: O_2 diagnostic values", the sensor voltage is displayed in mV • Error eliminated: relay signalling measuring range 1/2 • Maintenance switch omitted. Instead signalling "Function control" if the analyzer is uncoded (see Fig. Fig. 5-2) • Limits with fixed hysteresis of 2 % of measuring range (see Section 5.9.2) • Display of current measuring ranges in "Analyzer status: Diagnostic values: IR diagnostic values: Not corrected conc." (see Section 5.7.2.1)	• Check corresponding parameters
2.01_	3/98	• Error correction: texts in menu "O2 zero calibration" in English, French, Spanish, Italian	

Table 9-2   Measures for upgrading to version 2.14._-, continued

Software version	Manufac- turing period starting	Most important innovations	Measures for upgrading to version 2.14._: Replace ROM package C79451-A3494-S501 and ...
2.02_	5/98	• The automatic determination of the synchronous rectifier phase has been improved (error message "Phase not found")	
2.03_	9/98	• RS485 interface (ELAN) completed	• Check ELAN parameters
2.04_	11/98	• Error correction: sporadic measured-value spikes with ambient temperatures > 40 ˚C.	
2.05_	3/99	• Error correction: display of parameters following acknowledgment of "Accept modifications" by NO not always updated.	

Table 9-2   Measures for upgrading to version 2.14._-, continued

Software version	Manufac-turing period starting	Most important innovations	Measures for upgrading to version 2.14._: Replace ROM package C79451-A3494-S501 and ...
2.06_	2/00	• The option module "PROFIBUS-DP" or "-PA" including 8 additional relay outputs and 8 binary inputs is supported. • Error correction: measured values at analog output are not always stored during faults if the measured value changes range. • Set LCD contrast to basic state: press the three arrow keys simultaneously. • The command "Remote" via the RS485 interface (ELAN) results in signalling of "Function check" to identify an intervention on the analyzer. • The number of digits following the decimal point (resolution) dependent on the measuring range has been optimized. • The factory status can be generated again by using the function "Load factory data". • The current status is now always displayed in the menu "IR source ON/OFF". • Pressure sensor can measure up to 600 mbar without error message (previously 700 mbar).	• Set PROFIBUS address. Parameterization of additional relay outputs and binary inputs. • No factory data are stored in the analyzer when upgrading from versions <= 2.05.

Table 9-2   Measures for upgrading to version 2.14._-, continued

Software version	Manufac-turing period starting	Most important innovations	Measures for upgrading to version 2.14._: Replace ROM package C79451-A3494-S501 and ...
2.07_	7/00	• Extension of communication via RS485/ELAN • Saving/reloading factory data in/from EEPROM.	
2.08_	8/00	• Internal correction	
2.09_	12/00	• Larger range of adjustment for LCD contrast	
2.10_	06/02	• Lockin (signal recording) improved • Chopper control modified • ON/OFF functions • Flow switch	
2.11_	12/03	• Parameter set transfer via ELAN supplemented • Detection of phase jumps with very high concentration values without triggering of an error message	
2.12_	04/05	• Extension of communication via RS485/ELAN • Extension for PROFIBUS menu: ID number, PROFIBUS firmware • Extension of options for correction of cross-interference: constant correction of cross-interference possible • Extension in menu "Range calibration" • Extension of factory settings	
2.14_	02/06	• Extension of communication via RS485/ELAN • Extension for PROFIBUS menu: error correction • Optimization of function "Correction of cross-interference"	

9.4 Certificates

TÜV Test certificate BB-EG1 - KAR Gr01 X for measurement of flammable gases

TÜV
SÜDDEUTSCHLAND

Test Certificate
BB-EG1- KAR Gr01X

Containment System of
Gas analyser Type ULTRAMAT 23

Bau und
Betrieb

Certificate Holder	Siemens AG A&D PI 2 CA D-76181 Karlsruhe Germany	Region Baden-Württemberg Niederlassung Karlsruhe TÜV Bayern Hessen Sachsen Südwest e.V.
Test unit	Gas analyser ULTRAMAT 23 Manufacturer Siemens	Durmersheimer Str. 145 D-76189 Karlsruhe Phone (07 21) 57 06-2 51
Test Basis	EN 50016 and EN 60079 -14 (current revisions); ExRL; Guidelines for explosion protection of BG Chemie (BGR 104)	Telefax (07 21) 57 06-2 89 www.tuev-sued.de Karlsruhe, September 15, 2003 BB-EG1-KAR/Greß Test Certificate ULTRAMAT 23
Scope of the Test	Evalution of the tightness of the containment system without external purging in non explosive areas	This document consists of 2 pages

Documents	- Technical Description of the
	  ULTRAMAT 23;
	- leakage test of the containment
	  system;
	- calculations;
	- technical manual;
	- Decay of He and CO_2
	  concentration in the housing with
	  no moving ambient air	

Date of examination **Test Results**	August 27, 2003 see page 2	

Certified

K.-D. Greß

TÜV
SÜDDEUTSCHLAND

1.   Results
1.1   Containment System

The following gases or gas mixtures are allowed to be measured with the containment system (gas path) of ULTRAMAT 23:
-    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).

1.2   Purging of housing

The 19" rack housing of the ULTRAMAT 23 does not need to be purged as
-    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.

2.   Special conditions

Connection of flammable gases or gas mixtures above the LEL is only allowed when the containment system of the analyser is equipped with pipes.

Connection of occasionally flammable gas mixtures is only allowed when a flame barrier is used.

Maximum temperature class for the analyser type ULTRAMAT 23 is T4.

If the 19" rack housing is mounted in a rack a sufficient air exchange with the ambient must be guaranteed.

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 choosen in accordance with the requirements of BGR 104 or other respective international standards.

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.

3. Other

Detailed explanations to this test report and certificate BB-EG1/KAR Gr01X are available on request.

Karlsruhe, September 15, 2003
BB-EG1-KAR/Greß

9.5 Approvals

Table 9-3   Approvals

CSA	CSA C22.2 NO 213 CAN/CSA-E60079-15 Cl.1, Div. 2, GP, A, B, C, D, T4 CL. 1, Zone 2, Ex nA IIC T4 T_a : +5°C ... +45°C
FM	FM 3611 Cl.1, Div. 2, GP, A, B, C, D, T4 CL. 1 ; Zone 2, GP, IIC, T4 T_a : +5°C ... +45°C
CE	EN 61000-6-2, EN 61000-6-4 (replaces EN 50081-2)
ATEX Zone 2	EN 60079-15 : 2005, EN 60079-0 : 2006 II 3 G Ex nA II T4 KEMA 09 ATEX 0027X