

# ULTRAMAT 23

## NDIR gas analyzers, one to three IR channels and oxygen



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# Gas Analysis

## ULTRAMAT 23

### General

#### 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<sub>2</sub>, NO, SO<sub>2</sub>, CH<sub>4</sub> or R22 (freon, CHClF<sub>2</sub>) plus O<sub>2</sub> 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

#### 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.

#### Application

##### 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<sub>x</sub> measurement before and after the NO<sub>x</sub> 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<sub>2</sub> and O<sub>2</sub> according to 13. BImSchV and TA Luft.

Smallest TÜV-approved and permitted measuring ranges:

- 1- and 2-component analyzer
  - CO: 0 to 150 mg/m<sup>3</sup>
  - NO: 0 to 250 mg/m<sup>3</sup>
  - SO<sub>2</sub>: 0 to 400 mg/m<sup>3</sup>
- 3-component analyzer
  - CO: 0 to 250 mg/m<sup>3</sup>
  - NO: 0 to 400 mg/m<sup>3</sup>
  - SO<sub>2</sub>: 0 to 400 mg/m<sup>3</sup>

All larger measuring ranges are also permitted.

## 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;  
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 1/4"
- 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

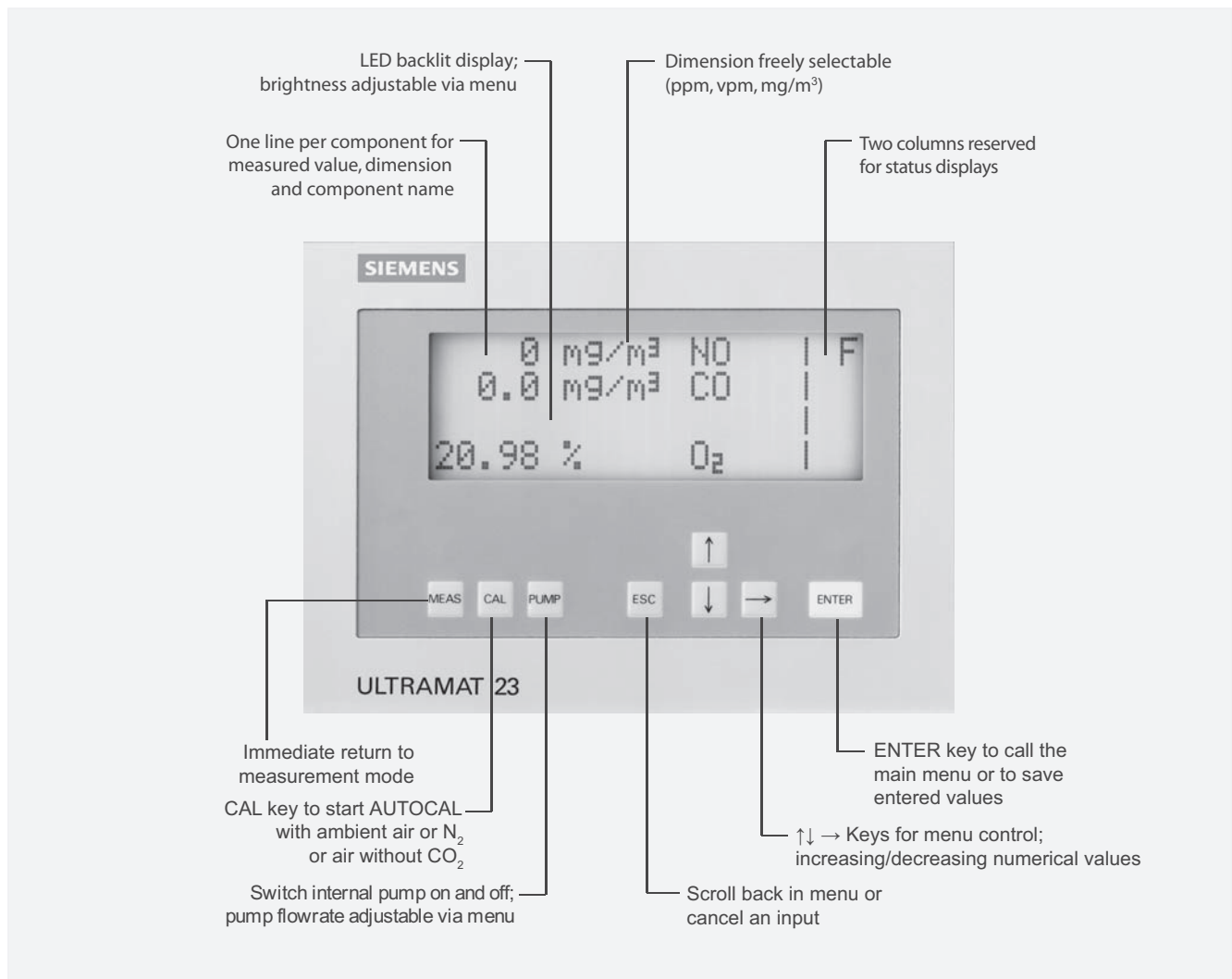
- Three binary inputs for sample gas pump On/Off, triggering of AUTOCAL and synchronization of several devices
- Eight relay outputs can be freely configured for fault, maintenance request, maintenance switch, limits, range identification and external solenoid valves
- Eight additional relay outputs 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 232
- Converter to TCP/IP Ethernet
- Incorporation in networks via PROFIBUS DP/PA interface
- SIPROM GA software as service and maintenance tool.



ULTRAMAT 23, membrane keypad and graphic display

# Gas Analysis

## ULTRAMAT 23

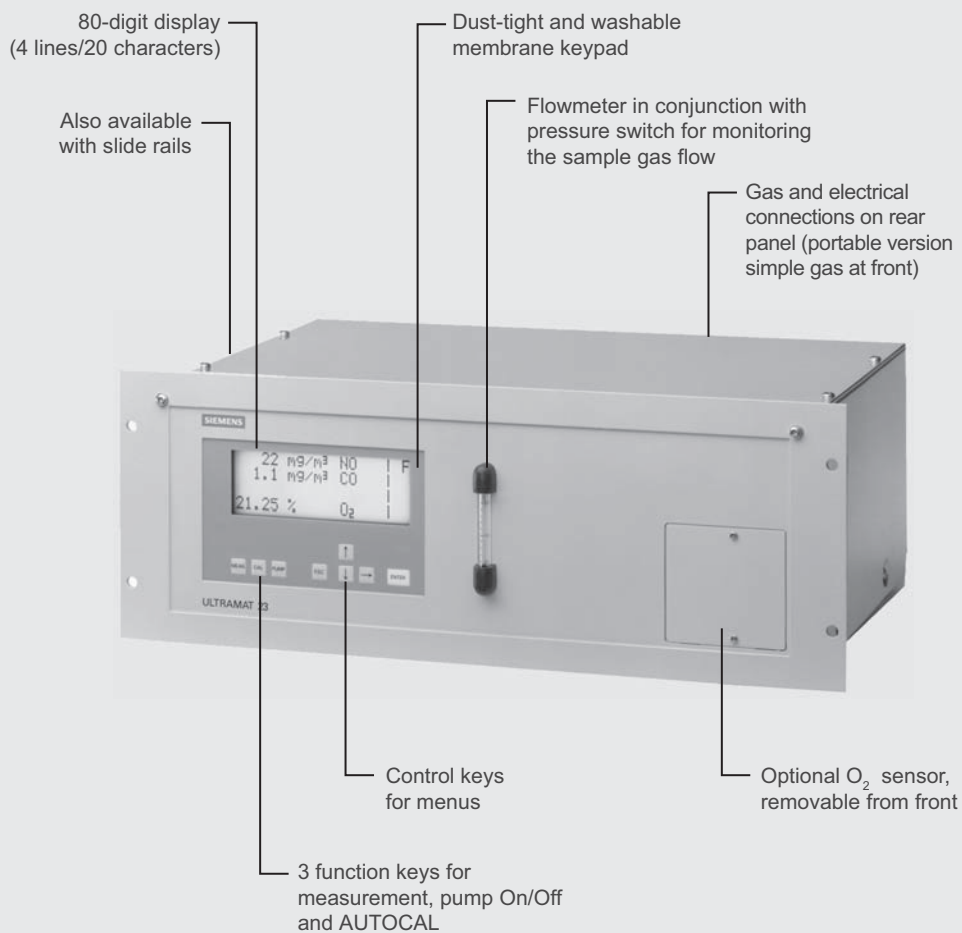
### General

#### Executions of the wetted parts

Gas path		19" unit	Desktop unit
<b>With hoses</b>	Condensation trap/gas inlet	-	PA (polyamide)
	Condensation trap	-	PE (polyethylene)
	Gas nipples 6 mm	PA (polyamide)	PA (polyamide)
	Gas nipples 1/4"	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)	
<b>With pipes</b>	Gas nipples (6 mm / 1/4 ")	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



ULTRAMAT 23, design

# Gas Analysis

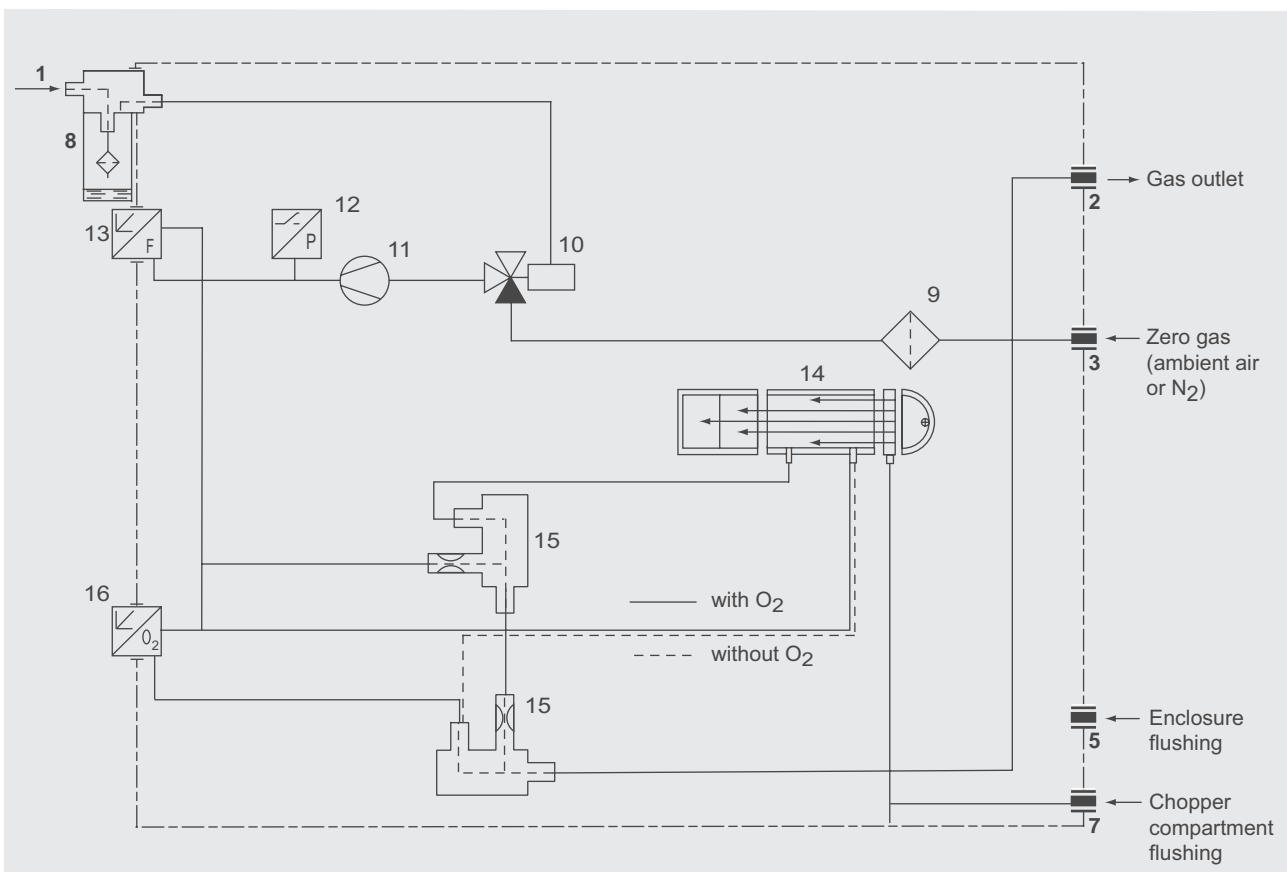
## ULTRAMAT 23

### General

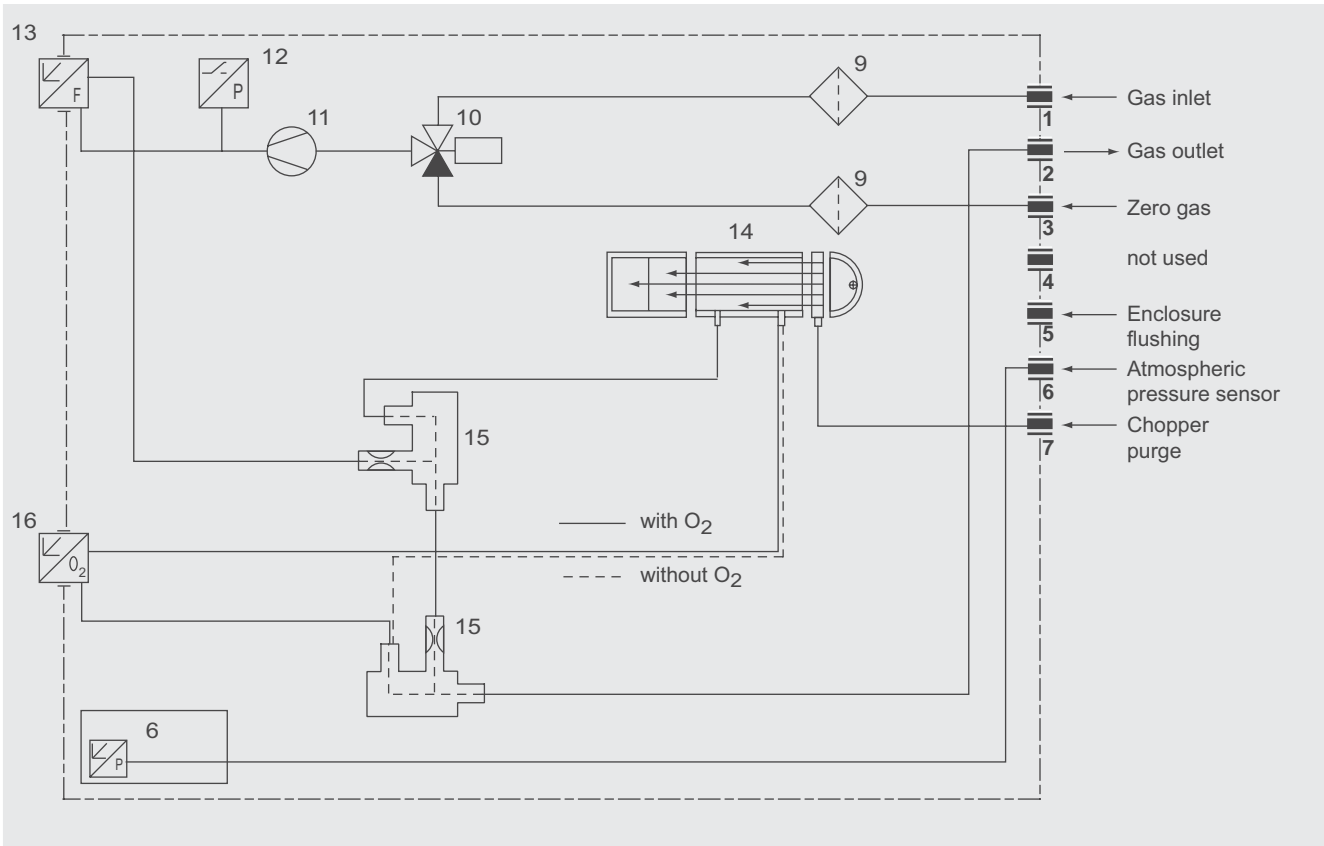
#### Gas path

##### Key to gas path figures

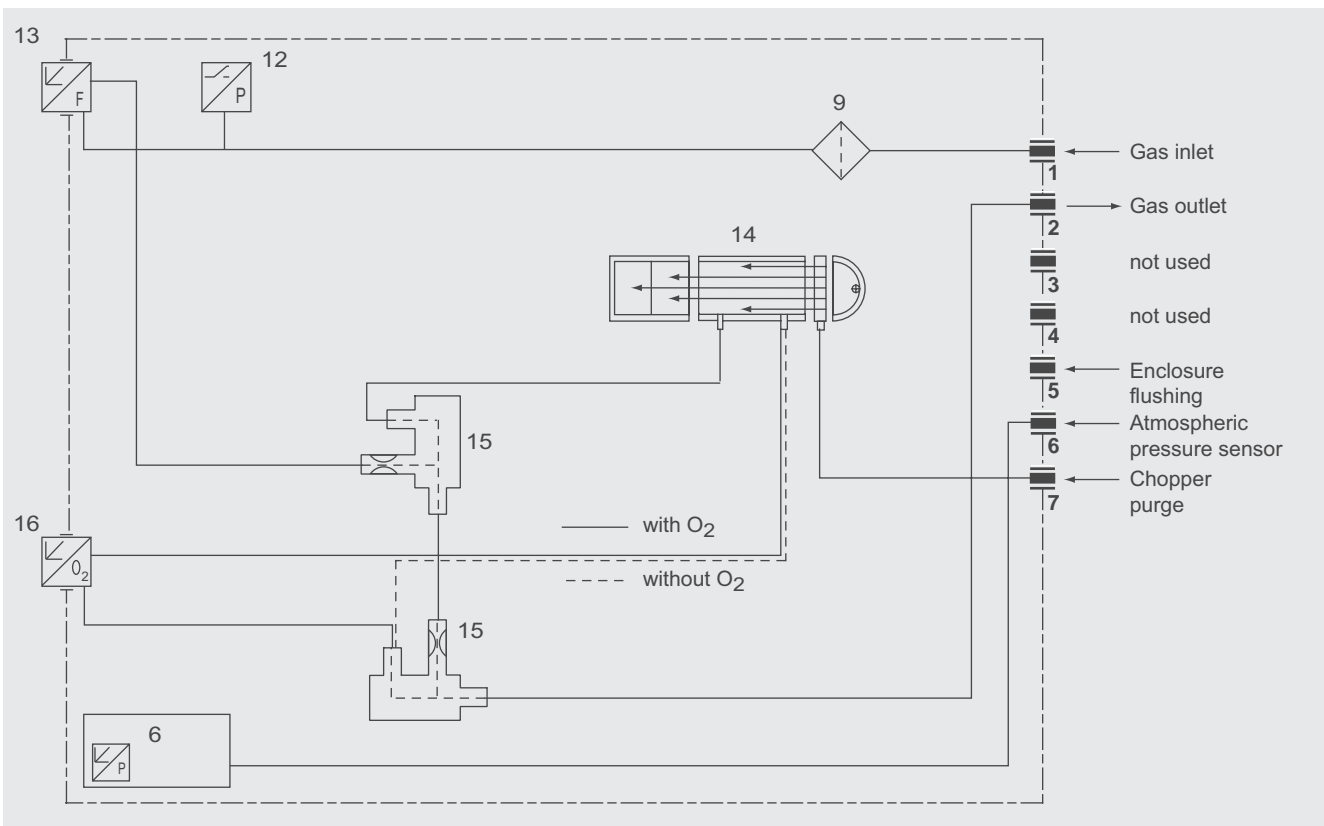
1	Inlet fo sample gas/ calibration gas	9	Safety fine filter
2	Gas outlet	10	Solenoid valve
3	Inlet for AUTOCAL/zero gas or Inlet for sample gas/ adjusting gas (channel 2)	11	Sample gas pump
4	Gas outlet (channel 2)	12	Pressure switch
5	Enclosure flushing	13	Flowmeter
6	Atmospheric pressure sensor	14	Infrared measuring cell
7	Inlet/chopper compartment flushing	15	Safety condensate trap
8	Condensation trap with filter	16	Oxygen measuring cell



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

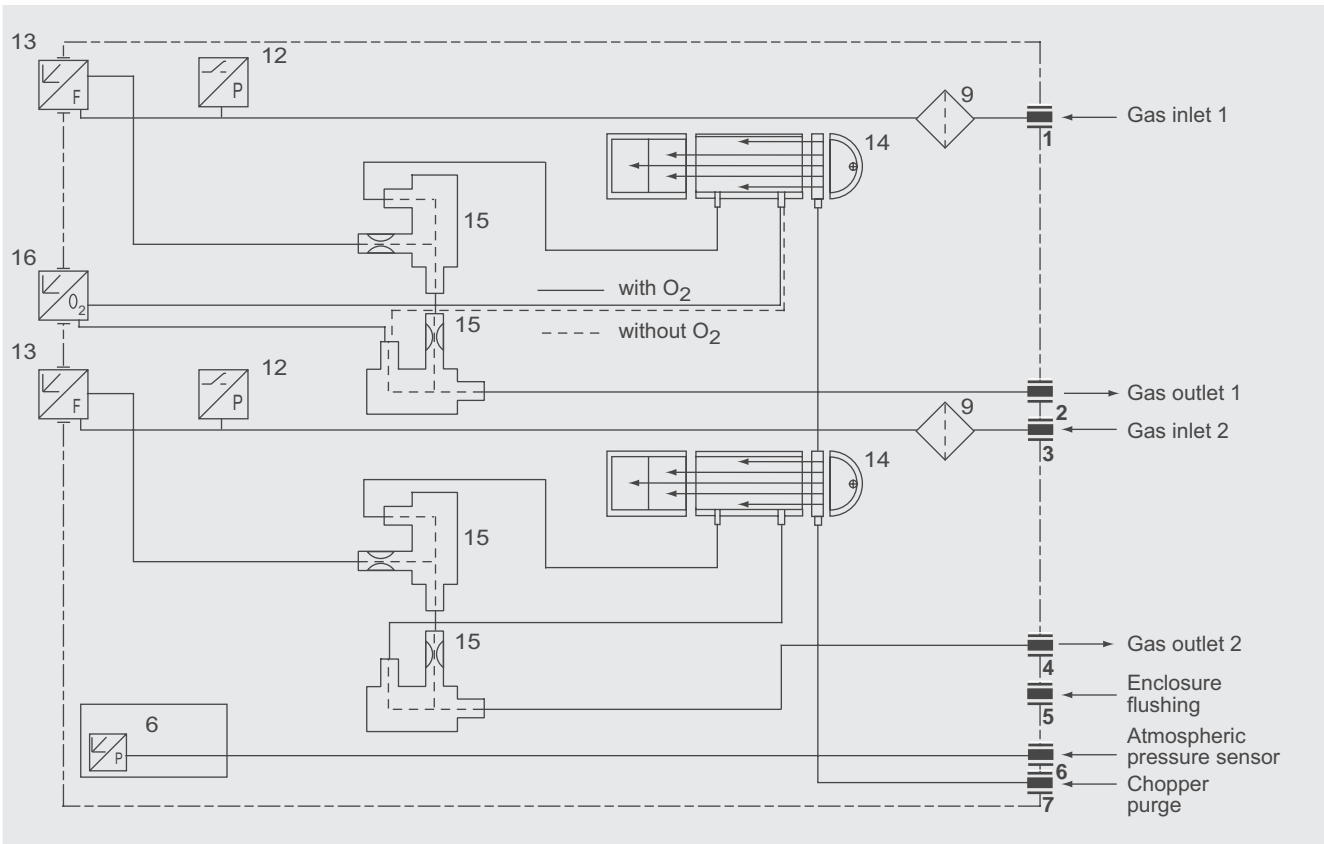


ULTRAMAT 23, 19" unit without internal sample gas pump, optional oxygen measurement

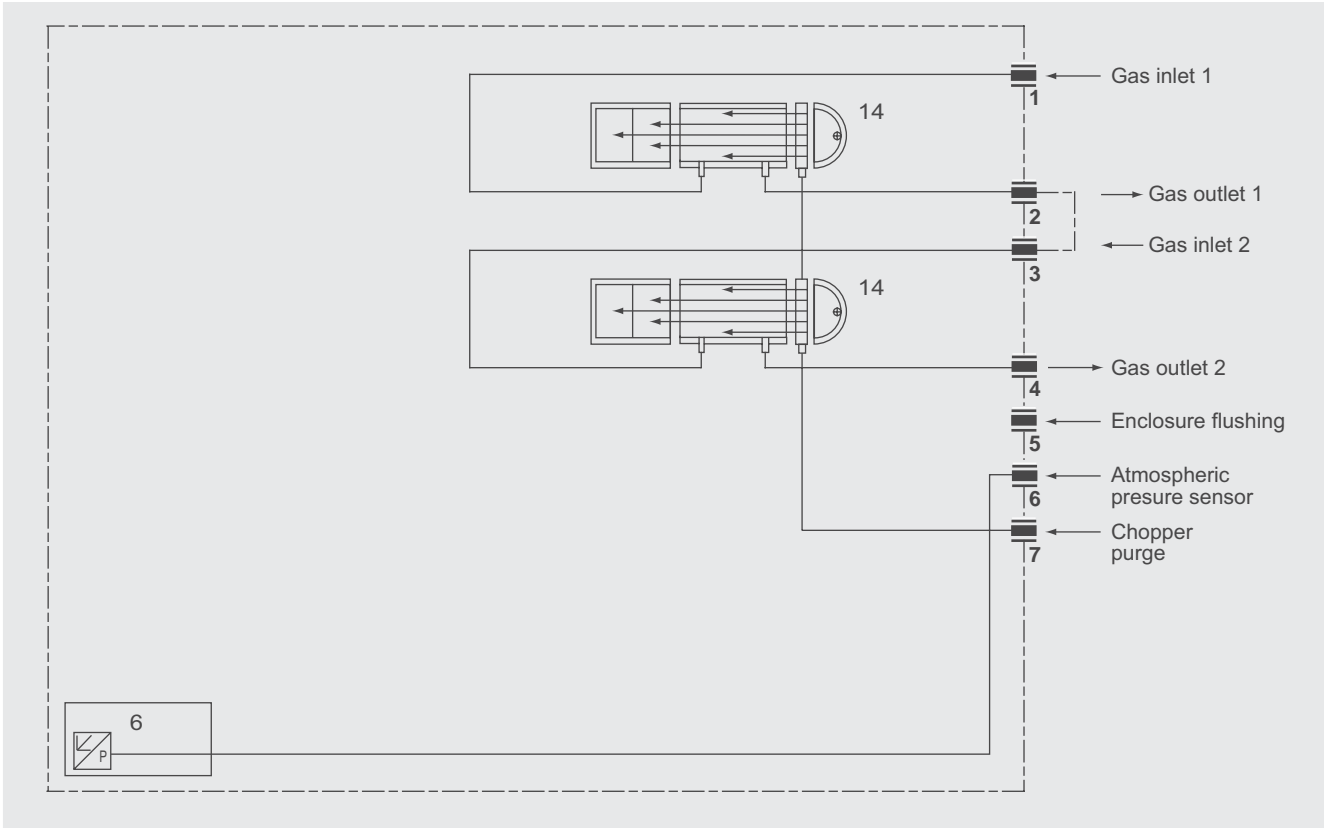
# Gas Analysis

## ULTRAMAT 23

### General



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



## 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).

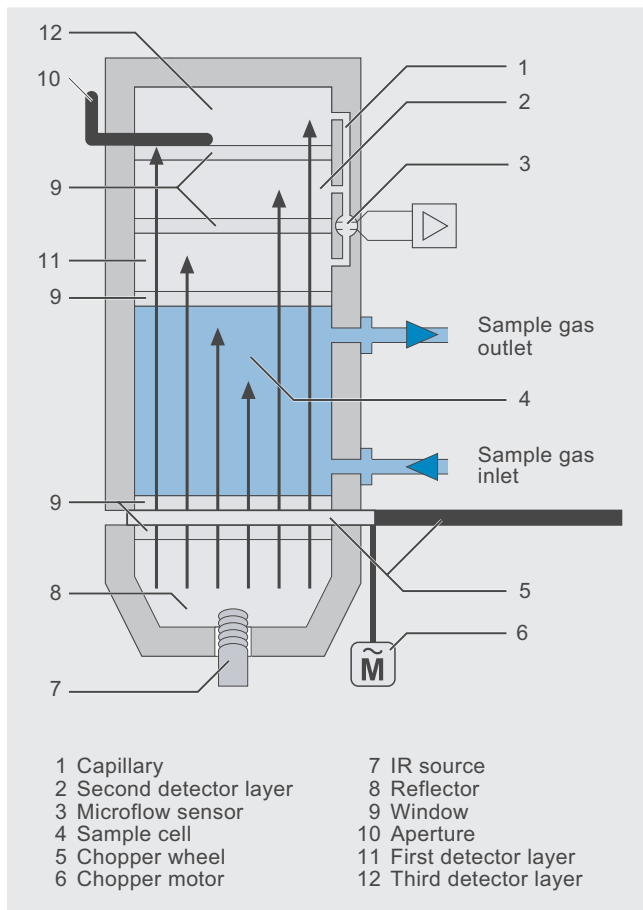
The represented detector is composed of layers filled with the component to be analyzed. The energy of the middles of the IR bands of the measured gases is mainly absorbed in the first layer. The second layer absorbs the edge energy which is tuned on high selectivity in the third layer via an aperture.

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.

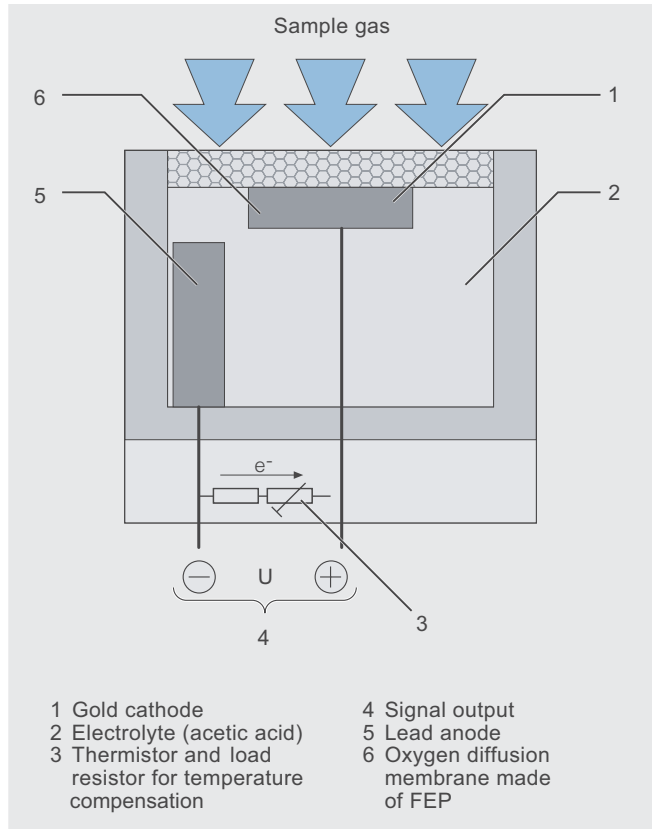


ULTRAMAT 23, mode of operation of infrared channel (example with three-layer detector)

### 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.

This sensor version with an acid based electrolyte is less sensitive to cross interferences, especially CO<sub>2</sub>, CO, CH<sub>4</sub> and H<sub>2</sub> than other sensor types.



ULTRAMAT 23, mode of operation of oxygen measuring cell

### Essential characteristics

- Practically maintenance-free as a result of AUTOCAL with ambient air; 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.

# Gas Analysis

## ULTRAMAT 23

### General

#### Integration

##### Communication

##### Communications facilities

The 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 offer the following communications facilities:

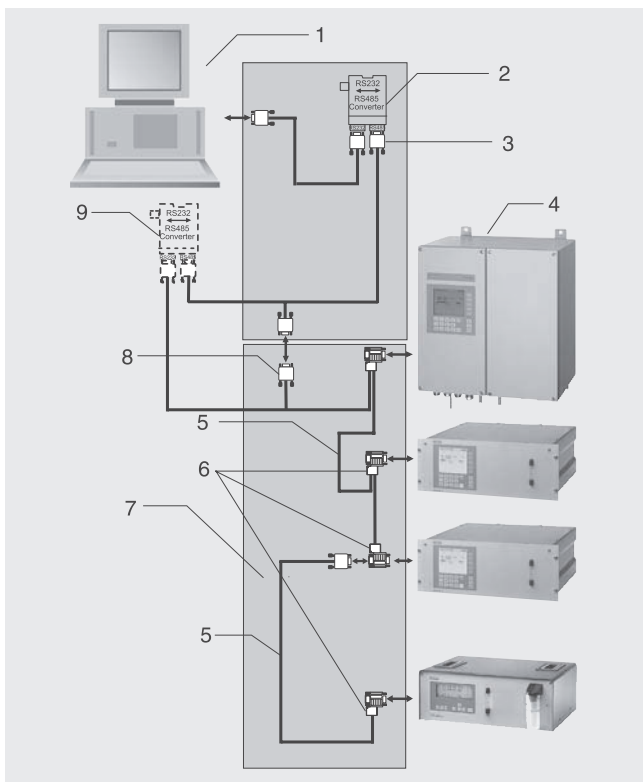
- RS 485 interface
- PROFIBUS DP/PA
- AK interface (only OXYMAT 6, ULTRAMAT 6 and ULTRAMAT/OXYMAT 6).

##### 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

Interface description  
 RS 485/RS 232 converter  
 RS 485/Ethernet converter  
 Further accessories (e.g. cable, connectors, repeater, etc.)

Order No.

**A5E00054148**  
**C79451-Z1589-U1**  
**C79451-A3364-D61**  
 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.

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
- Compreh26
- extensive 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.

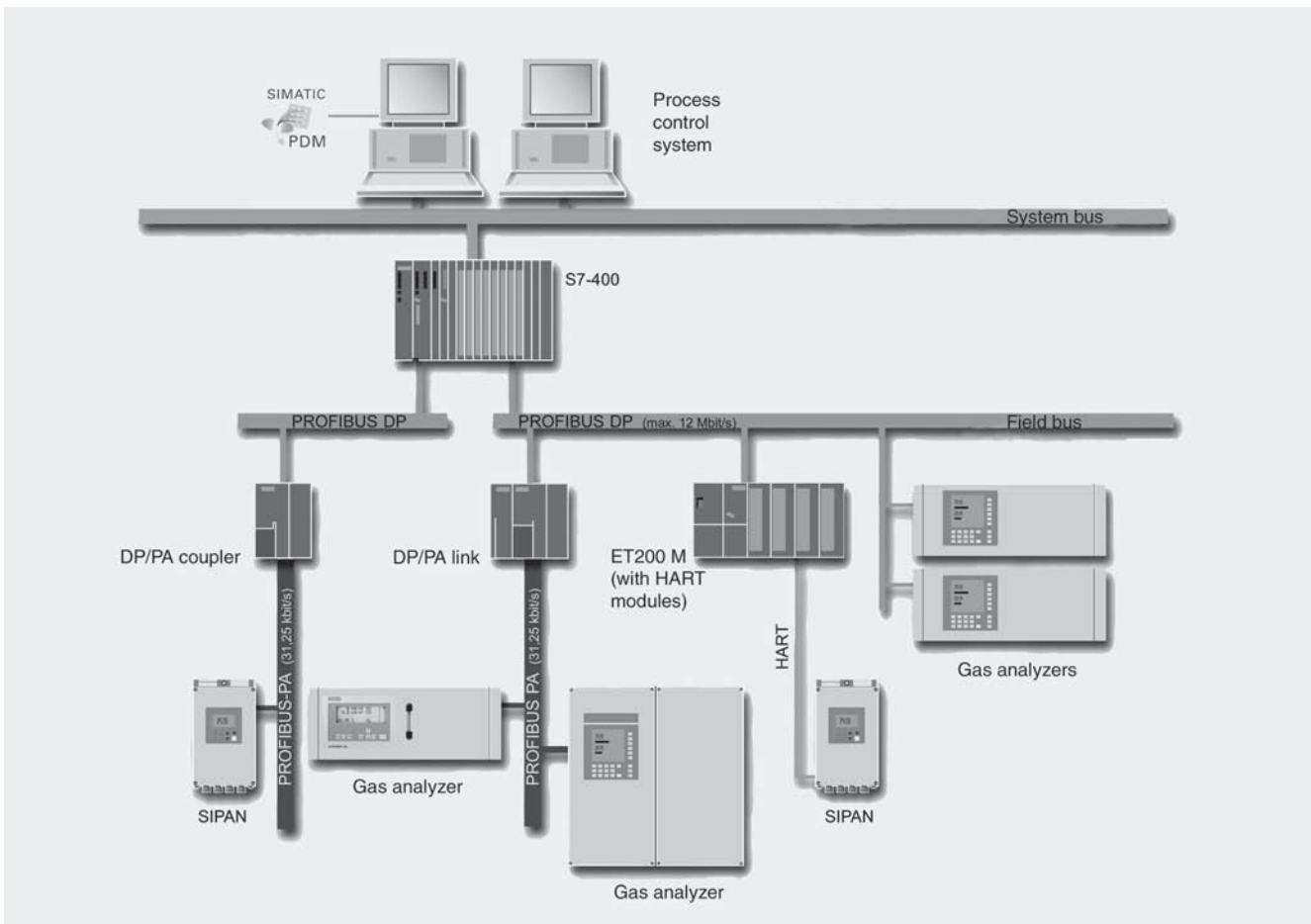
Ordering information	Order No.
SIPROM GA software German/English selectable during installation, comprising 1 CD, with installation instructions, software product certificate and registration form	<b>S79610-B4014-A1</b>
<b>Firmware retrofitting sets for older analyzers:</b>	
ULTRAMAT 23 (prior to SW version 4.1) all languages	<b>C79451-A3494-S501</b>
ULTRAMAT 6 (prior to SW version 4.1)	
• German	<b>C79451-A3478-S501</b>
• English	<b>C79451-A3478-S502</b>
• French	<b>C79451-A3478-S503</b>
• Spanish	<b>C79451-A3478-S504</b>
• Italian	<b>C79451-A3478-S505</b>
OXYMAT 6 (prior to SW version 4.1)	
• German	<b>C79451-A3480-S501</b>
• English	<b>C79451-A3480-S502</b>
• French	<b>C79451-A3480-S503</b>
• Spanish	<b>C79451-A3480-S504</b>
• Italian	<b>C79451-A3480-S505</b>

**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 rate for 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.



Basic structure of a PROFIBUS system

# Gas Analysis

## ULTRAMAT 23

### General

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.

### Technical specifications

#### 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 <ul style="list-style-type: none"> <li>• Pump</li> <li>• AUTOCAL</li> <li>• Synchronization</li> </ul>
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 pressure

Messgasdruck	
• 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 to 120 l/h (1.1 to 2 l/min)
Sample gas temperature	0 to 50 °C
Sample gas humidity	< 90% RH (relative humidity) no condensation

# Gas Analysis

## ULTRAMAT 23

### 19" unit and portable version

#### Technical data, infrared channel

Measuring ranges	See Ordering Data
Smallest measuring range	See Ordering Data
Largest measuring range	See Ordering Data

#### 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 smallest 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 smallest 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, corrected by internal pressure sensor
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 to 5% or 0 to 25% O <sub>2</sub> , parameter can be set
Auxiliary gas	the oxygen sensor must not be used when the auxiliary gas contains the following components: H <sub>2</sub> S, chlorine or fluorine compounds, heavy metals, aerosols, mercaptans, alkaline components (as e.g. NH <sub>3</sub> in % range)
Typical combustion exhaust gas	Influence: < 0.05% O <sub>2</sub>
Lifetime	Approx. 2 years with 21% O <sub>2</sub> ; continuous operation < 0.5% O <sub>2</sub> 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
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#### 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 <sub>2</sub>

#### Influencing variables

Oxygen content	operation at times < 0.5 % O <sub>2</sub> distorts the measured value
Humidity	H <sub>2</sub> O 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 <sub>2</sub> /year in air, typical
Temperature	< 0.5% O <sub>2</sub> per 20 K, referred to a measured value at 20 °C
Atmospheric pressure	< 0.2% of measured value per 1% pressure variation

### Ordering data

#### ULTRAMAT 23 gas analyzer for measurement of 1 infrared component and oxygen

Order-No.

7 MB 2 3 3 5 - 0 - AA

#### Enclosure, version and gas paths

19" unit for cabinet mounting

#### Gas connections

Gas connections	Gas path	Internal sample gas pump
6 mm pipe	Viton	without <sup>2)</sup>
¼" pipe	Viton	without <sup>2)</sup>
6 mm pipe	Viton	with
¼" pipe	Viton	with
6 mm pipe	SS, type No. 1.4571	without <sup>2)</sup>
¼" pipe	SS, type No. 1.4571	without <sup>2)</sup>

Portable, in sheet-steel enclosure, 6 mm gas connections, gas path made of Viton, with integrated sample gas pump, condensation trap with safety filter on the front panel

#### Measured component

#### Possible with range classification code

CO	D, E, F, G ... R, U, X
CO <sub>2</sub> <sup>1)</sup>	D <sup>8)</sup> , G <sup>8)</sup> , H <sup>8)</sup> , J <sup>8)</sup> , K ... R
CH <sub>4</sub>	H, L, N, P, R
C <sub>2</sub> H <sub>4</sub>	K
C <sub>6</sub> H <sub>14</sub>	K
SO <sub>2</sub>	F ... L, W
NO	G ... J, V, W
N <sub>2</sub> O <sup>9)</sup>	E
R22	H
SF <sub>6</sub>	H

#### Smallest measuring range

#### Largest measuring range

0 to 50 vpm	0 to 250 vpm
0 to 100 vpm	0 to 500 vpm
0 to 150 vpm	0 to 750 vpm
0 to 200 vpm	0 to 1000 vpm
0 to 500 vpm	0 to 2500 vpm
0 to 1000 vpm	0 to 5000 vpm
0 to 2000 vpm	0 to 10000 vpm
0 to 0,5%	0 to 2,5%
0 to 1%	0 to 5%
0 to 2%	0 to 10%
0 to 5%	0 to 25%
0 to 10%	0 to 50%
0 to 20%	0 to 100%
0 to 150 mg/m <sup>3</sup>	0 to 750 mg/m <sup>3</sup>
0 to 250 mg/m <sup>3</sup>	0 to 1250 mg/m <sup>3</sup>
0 to 400 mg/m <sup>3</sup>	0 to 2000 mg/m <sup>3</sup>
0 to 50 vpm	0 to 2500 vpm

#### Oxygen measurement

Without O<sub>2</sub> sensor

With O<sub>2</sub> sensor, not suitable with the SS type version

#### Power supply

100 V AC, 50 Hz  
120 V AC, 50 Hz  
200 V AC, 50 Hz  
230 V AC, 50 Hz  
100 V AC, 60 Hz  
120 V AC, 60 Hz  
230 V AC, 60 Hz

#### Operating software, documentation <sup>3)</sup>

German  
English  
French  
Spanish  
Italian

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5  
6

0  
1  
2  
3  
4

# Gas Analysis

## ULTRAMAT 23

### 19" unit and portable version

Further versions	Order code
Please add „-Z“ to Order No. and specify Order code	
RS 485/RS 232 converter <sup>4)</sup>	<b>A11</b>
Supplementary electronics with 8 binary inputs/outputs, PROFIBUS PA interface	<b>A12</b>
Supplementary electronics with 8 binary inputs/outputs, PROFIBUS DP interface	<b>A13</b>
Slide rails (2 rails, only possible for 19" unit version)	<b>A31</b>
Set of Torx tools, socket spanner	<b>A32</b>
TAG labels (labeling to customer specification)	<b>B03</b>
Gas path for a short response time	<b>C01</b>
Chopper purge for gas connection 6 mm <sup>8)</sup>	<b>C02</b>
Chopper purge for gas connection 1/4" <sup>8)</sup>	<b>C03</b>
Customer acceptance <sup>5)</sup>	<b>Y01</b>
Drift recording	<b>Y03</b>
Measuring range in plain text <sup>6)</sup>	<b>Y11</b>
Measurement of CO <sub>2</sub> in forming gas <sup>10)</sup> (only in relation with measuring range 0-20/0-100%) with optimized interference correction	<b>Y14</b>
<b>Accessories</b>	Order No.
CO <sub>2</sub> absorber cartridge	<b>7MB1933-8AA</b>
<b>Retrofitting sets</b>	
RS 485/Ethernet converter	<b>C79451-A3364-D61</b>
RS 485/RS 232 converter	<b>C79451-Z1589-U1</b>
Autocal function with 8 binary inputs/outputs and PROFIBUS PA	<b>A5E00056834</b>
Autocal function with 8 binary inputs/outputs and PROFIBUS DP	<b>A5E00057159</b>

- 1) For measuring ranges below 1% a CO<sub>2</sub> absorber cartridge can be used for the autocal (see Accessories).
- 2) Without separate zero gas input and without internal solenoid valve.
- 3) User language switchable.
- 4) Supplied separately (including interface description).
- 5) Customer acceptance: 1/2 day at factory in presence of customer.  
The following work is carried out: comparison of analyzer with ordering data: linearization check (zero, mid point value and full-scale value); reproducibility check with calibration gas (recording in each case on XT recorder, logging of results)..
- 6) Specific measuring range within min./max. range.
- 7) O<sub>2</sub> sensor in gas path of infrared measured component 1.
- 8) With chopper purge (with N<sub>2</sub> approx. 300 kPa for measuring ranges below 0.1 % CO<sub>2</sub> required), order in addition (see Order code C02 or C03).
- 9) Not suitable for stack emission.
- 10) CO<sub>2</sub> measurement in Ar or Ar/He (3:1); forming gas.



### Ordering data

#### ULTRAMAT 23 gas analyzer for measurement of 2 infrared components and oxygen

Order-No.

7 MB 2 3 3 7 - 0 0

Enclosure, version and gas paths  
19" unit for cabinet mounting

Gas connections	Gas path	Internal sample gas pump
6 mm pipe	Viton, not separated	without <sup>2)</sup>
¼" pipe	Viton, not separated	without <sup>2)</sup>
6 mm pipe	Viton, not separated	with
¼" pipe	Viton, not separated	with
6 mm pipe	Viton, separated	without <sup>2)</sup>
¼" pipe	Viton, separated	without <sup>2)</sup>
6 mm pipe	SS, type No. 1.4571, separated	without <sup>2)</sup>
¼" pipe	SS, type No. 1.4571, separated	without <sup>2)</sup>

Portable, in sheet-steel enclosure, 6 mm gas connections, gas path made of Viton, with integrated sample gas pump, condensation trap with safety filter on the front panel

1st infrared component

Measured component	Possible with range classification code
CO	D, E, F, G ... R, U, X
CO <sub>2</sub> <sup>1)</sup>	D <sup>B)</sup> , G <sup>B)</sup> , H <sup>B)</sup> , J <sup>B)</sup> , K ... R
CH <sub>4</sub>	H, L, N, P, R
C <sub>2</sub> H <sub>4</sub>	K
C <sub>6</sub> H <sub>14</sub>	K
SO <sub>2</sub>	F ... L, W
NO	G ... J, V, W
N <sub>2</sub> O <sup>9)</sup>	E
R22	H
SF <sub>6</sub>	H

Smallest measuring range	Largest measuring range
0 to 50 vpm	0 to 250 vpm
0 to 100 vpm	0 to 500 vpm
0 to 150 vpm	0 to 750 vpm
0 to 200 vpm	0 to 1000 vpm
0 to 500 vpm	0 to 2500 vpm
0 to 1000 vpm	0 to 5000 vpm
0 to 2000 vpm	0 to 10000 vpm
0 to 0,5%	0 to 2,5%
0 to 1%	0 to 5%
0 to 2%	0 to 10%
0 to 5%	0 to 25%
0 to 10%	0 to 50%
0 to 20%	0 to 100%
0 to 150 mg/m <sup>3</sup>	0 to 750 mg/m <sup>3</sup>
0 to 250 mg/m <sup>3</sup>	0 to 1250 mg/m <sup>3</sup>
0 to 400 mg/m <sup>3</sup>	0 to 2000 mg/m <sup>3</sup>
0 to 50 vpm	0 to 2500 vpm

#### Oxygen measurement

Without O<sub>2</sub> sensor

With O<sub>2</sub> sensor, not suitable with the SS type version

#### Power supply

100 V AC, 50 Hz  
120 V AC, 50 Hz  
200 V AC, 50 Hz  
230 V AC, 50 Hz  
100 V AC, 60 Hz  
120 V AC, 60 Hz  
230 V AC, 60 Hz

2nd Infrared component

Measured component	Possible with range classification code
CO	D, E, F, G ... R, U, X
CO <sub>2</sub> <sup>1)</sup>	D <sup>B)</sup> , G <sup>B)</sup> , H <sup>B)</sup> , J <sup>B)</sup> , K ... R
CH <sub>4</sub>	H, L, N, P, R
C <sub>2</sub> H <sub>4</sub>	K
C <sub>6</sub> H <sub>14</sub>	K
SO <sub>2</sub>	F ... L, W
NO	G ... J, V, W
N <sub>2</sub> O <sup>9)</sup>	E
R22	H
SF <sub>6</sub>	H

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V

D  
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F  
G  
H  
J  
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L  
M  
N  
P  
Q  
R  
U  
V  
W  
X

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1  
2  
3  
4  
5  
6

A  
C  
D  
F  
M  
N  
P  
S  
U  
V

# Gas Analysis

## ULTRAMAT 23

19" unit and portable version

### Ordering data

#### ULTRAMAT 23 gas analyzer for measurement of 2 infrared components and oxygen

Smallest measuring range	Largest measuring range
0 to 50 vpm	0 to 250 vpm
0 to 100 vpm	0 to 500 vpm
0 to 150 vpm	0 to 750 vpm
0 to 200 vpm	0 to 1000 vpm
0 to 500 vpm	0 to 2500 vpm
0 to 1000 vpm	0 to 5000 vpm
0 to 2000 vpm	0 to 10000 vpm
0 to 0,5%	0 to 2,5%
0 to 1%	0 to 5%
0 to 2%	0 to 10%
0 to 5%	0 to 25%
0 to 10%	0 to 50%
0 to 20%	0 to 100%
0 to 150 mg/m <sup>3</sup>	0 to 750 mg/m <sup>3</sup>
0 to 250 mg/m <sup>3</sup>	0 to 1250 mg/m <sup>3</sup>
0 to 400 mg/m <sup>3</sup>	0 to 2000 mg/m <sup>3</sup>
0 to 50 vpm	0 to 2500 vpm

#### Operating software, documentation<sup>3)</sup>

German  
English  
French  
Spanish  
Italian

Order-No.

7 MB 2 3 3 7 - 0 -

D  
E  
F  
G  
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J  
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V  
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X  
  
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2  
3  
4

### Further versions

Please add „Z“ to Order No. and specify Order code

RS 485/RS 232 converter<sup>4)</sup>

Supplementary electronics with 8 binary inputs/outputs, PROFIBUS PA interface

Supplementary electronics with 8 binary inputs/outputs, PROFIBUS DP interface

Verbindungsrohr aus Edelstahl (1.4571) 6 mm, komplett mit Verschraubung

Connection pipe made of stainless steel (1.4571) ¼", complete with screwed gland

Slide rails (2 rails, only possible for 19" unit version)

Set of Torx tools, socket spanner

TAG labels (labeling to customer specification)

Gas path for a short response time

Chopper compartment purge for gas connection 6 mm

Chopper compartment purge for gas connection ¼"

Customer acceptance<sup>5)</sup>

Drift recording

Measuring range in plain text<sup>6)</sup>

Measurement of CO<sub>2</sub> in forming gas<sup>10)</sup> (only in relation with measuring range 0-20/0-100%)

### Accessories

CO<sub>2</sub> absorber cartridge

### Retrofitting sets

RS 485/Ethernet converter

RS 485/RS 232 converter

Autocal function with 8 binary inputs/outputs and PROFIBUS PA

Autocal function with 8 binary inputs/outputs and PROFIBUS DP

Order code

A11

A12

A13

A27

A29

A31

A32

B03

C01

C02

C03

Y01

Y03

Y11

Y14

Order No.

7MB1933-8AA

C79451-A3364-D61

C79451-Z1589-U1

A5E00056834

A5E00057159

1) For measuring ranges below 1% a CO<sub>2</sub> absorber cartridge can be used for the autocal (see Accessories).

2) Without separate zero gas input and without internal solenoid valve.

3) User language switchable.

4) Supplied separately (including interface description).

5) Customer acceptance: ½ day at factory in presence of customer.

The following work is carried out: comparison of analyzer with ordering data: linearization check (zero, mid point value and full-scale value); reproducibility check with calibration gas (recording in each case on XT recorder, logging of results)..

6) Specific measuring range within min./max. range.

7) O<sub>2</sub> sensor in gas path of infrared measured component 1.

8) With chopper purge (with N<sub>2</sub> approx. 300 kPa for measuring ranges below 0.1 % CO<sub>2</sub> required), order in addition (see Order code C02 or C03).

9) Not suitable for stack emission.

10) CO<sub>2</sub> measurement in Ar or Ar/He (3:1); forming gas.

### Ordering data

#### ULTRAMAT 23 gas analyzer for measurement of 3 infrared components and oxygen

Order-No.

7 MB 2 3 3 8 - 0 0 0 0 0 0

#### Enclosure, version and gas paths

19" unit for cabinet mounting

#### Gas connections

Gas connections	Gas path	Internal sample gas pump
6 mm pipe	Viton, not separated	without <sup>2)</sup>
¼" pipe	Viton, not separated	without <sup>2)</sup>
6 mm pipe	Viton, not separated	with
¼" pipe	Viton, not separated	with
6 mm pipe	Viton, separated	without <sup>2)</sup>
¼" pipe	Viton, separated	without <sup>2)</sup>
6 mm pipe	Stainless steel, separated	without <sup>2)</sup>
¼" pipe	Stainless steel, separated	without <sup>2)</sup>

Portable, in sheet-steel enclosure, 6 mm gas connections, gas path made of Viton, with integrated sample gas pump, condensation trap with safety filter on the front panel

#### 1st and 2nd infrared components

	Smallest measuring range	Largest measuring range
CO	0 to 500 vpm	0 to 2500 vpm
NO	0 to 500 vpm	0 to 2500 vpm
CO	0 to 2000 vpm	0 to 10000 vpm
NO	0 to 1000 vpm	0 to 5000 vpm
CO	0 to 1000 vpm	0 to 5000 vpm
NO	0 to 1000 vpm	0 to 5000 vpm
CO	0 to 1%	0 to 5%
NO	0 to 1000 vpm	0 to 5000 vpm
CO	0 to 250 mg/m <sup>3</sup>	0 to 1250 mg/m <sup>3</sup>
NO	0 to 400 mg/m <sup>3</sup>	0 to 2000 mg/m <sup>3</sup>
CO	0 to 10%	0 to 50%
CO <sub>2</sub>	0 to 10%	0 to 50%
CO	0 to 10%	0 to 50%
CO <sub>2</sub>	0 to 0,5%	0 to 2,5%
CO	0 to 20%	0 to 100%
CO <sub>2</sub>	0 to 20%	0 to 100%
CO <sub>2</sub>	0 to 5%	0 to 25%
CO	0 to 100 vpm	0 to 500 vpm
CO <sub>2</sub>	0 to 10%	0 to 50%
CO	0 to 0,5%	0 to 2,5%
CO <sub>2</sub>	0 to 5%	0 to 25%
CH <sub>4</sub>	0 to 1%	0 to 5%
CO <sub>2</sub>	0 to 5%	0 to 25%
CH <sub>4</sub>	0 to 2%	0 to 10%

#### Oxygen measurement

Without O<sub>2</sub> sensor

With O<sub>2</sub> sensor, not suitable with the SS type version

#### Power supply

100 V AC, 50 Hz

120 V AC, 50 Hz

200 V AC, 50 Hz

230 V AC, 50 Hz

100 V AC, 60 Hz

120 V AC, 60 Hz

230 V AC, 60 Hz

#### 3rd infrared component

#### Measured component

#### Possible with range classification code

CO	D, E, F, G ... R, U, X
CO <sub>2</sub> <sup>1)</sup>	D <sup>8)</sup> , G <sup>8)</sup> , H <sup>8)</sup> , J <sup>8)</sup> , K ... R
CH <sub>4</sub>	H, L, N, P, R
C <sub>2</sub> H <sub>4</sub>	K
C <sub>6</sub> H <sub>14</sub>	K
SO <sub>2</sub>	F ... L, W
NO	G ... J, V, W
N <sub>2</sub> O <sup>9)</sup>	E
R <sub>22</sub>	H
SF <sub>6</sub>	H

#### Smallest measuring range

#### Largest measuring range

0 to 50 vpm	0 to 250 vpm
0 to 100 vpm	0 to 500 vpm
0 to 150 vpm	0 to 750 vpm
0 to 200 vpm	0 to 1000 vpm
0 to 500 vpm	0 to 2500 vpm
0 to 1000 vpm	0 to 5000 vpm
0 to 2000 vpm	0 to 10000 vpm

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AA

AB

AC

AD

AK

BA

BB

BD

BJ

BK

CA

CB

0

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0

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A

C

D

F

M

N

P

S

U

V

D

E

F

G

H

J

K

# Gas Analysis

## ULTRAMAT 23

19" unit and portable version

### Ordering data

#### ULTRAMAT 23 gas analyzer for measurement of 3 infrared components and oxygen

0 to 0,5%	0 to 2,5%
0 to 1%	0 to 5%
0 to 2%	0 to 10%
0 to 5%	0 to 25%
0 to 10%	0 to 50%
0 to 20%	0 to 100%
0 to 150 mg/m <sup>3</sup>	0 to 750 mg/m <sup>3</sup>
0 to 250 mg/m <sup>3</sup>	0 to 1250 mg/m <sup>3</sup>
0 to 400 mg/m <sup>3</sup>	0 to 2000 mg/m <sup>3</sup>
0 to 50 vpm	0 to 2500 vpm

#### Operating software, documentation <sup>3)</sup>

German  
English  
French  
Spanish  
Italian

Order-No.

7 MB 2 3 3 8 - 0 -

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X

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4

### Further versions

Please add „Z“ to Order No. and specify Order code

RS 485/RS 232 converter <sup>4)</sup>

Supplementary electronics with 8 binary inputs/outputs, PROFIBUS PA interface

Supplementary electronics with 8 binary inputs/outputs, PROFIBUS DP interface

Connection pipe made of stainless steel (1.4571) 6 mm, complete with screwed gland

Connection pipe made of stainless steel (1.4571) ¼", complete with screwed gland

Slide rails (2 rails, only possible for 19" unit version)

Set of Torx tools, socket spanner

TAG labels (labeling to customer specification)

Gas path for a short response time

Chopper compartment purge for gas connection 6 mm

Chopper compartment purge for gas connection ¼"

Customer acceptance <sup>5)</sup>

Drift recording

Measuring range in plain text <sup>6)</sup>

Measurement of CO<sub>2</sub> in forming gas <sup>10)</sup> (only in relation with measuring range 0-20/0-100%)

### Accessories

CO<sub>2</sub> absorber cartridge

### Retrofitting sets

RS 485/Ethernet converter

RS 485/RS 232 converter

Autocal function with 8 binary inputs/outputs and PROFIBUS PA

Autocal function with 8 binary inputs/outputs and PROFIBUS DP

Order code

A11

A12

A13

A27

A29

A31

A32

B03

C01

C02

C03

Y01

Y03

Y11

Y14

Order-No.

7MB1933-8AA

C79451-A3364-D61

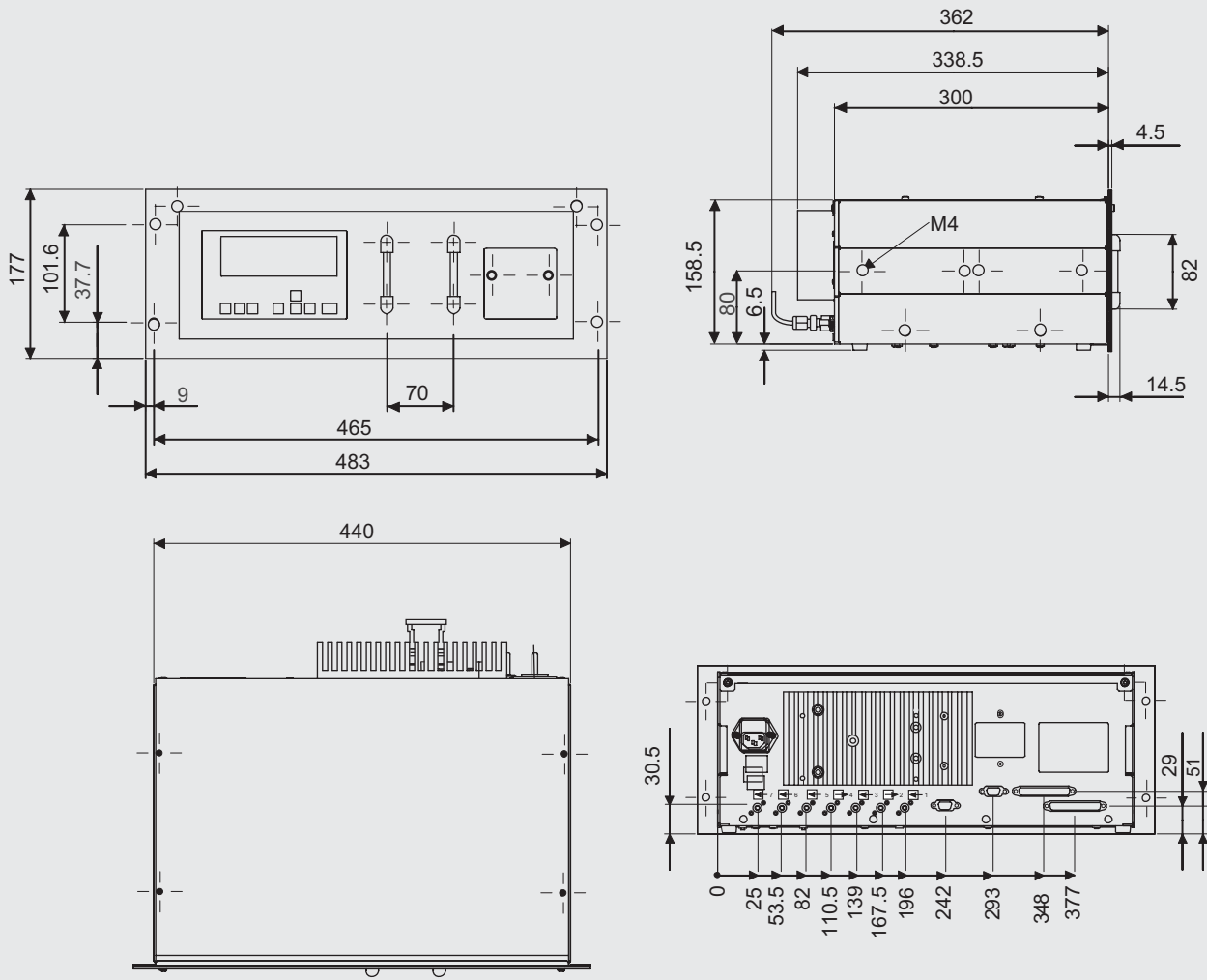
C79451-Z1589-U1

A5E00056834

A5E00057159

- 1) For measuring ranges below 1% a CO<sub>2</sub> absorber cartridge can be used for the autocal (see Accessories).
- 2) Without separate zero gas input and without internal solenoid valve.
- 3) User language switchable.
- 4) Supplied separately (including interface description).
- 5) Customer acceptance: ½ day at factory in presence of customer. The following work is carried out: comparison of analyzer with ordering data: linearization check (zero, mid point value and full-scale value); reproducibility check with calibration gas (recording in each case on XT recorder, logging of results)..
- 6) Specific measuring range within min./max. range.
- 7) O<sub>2</sub> sensor in gas path of infrared measured component 1.
- 8) With chopper purge (with N<sub>2</sub> approx. 300 kPa for measuring ranges below 0.1 % CO<sub>2</sub> required), order in addition (see Order code C02 or C03).
- 9) Not suitable for stack emission.
- 10) CO<sub>2</sub> measurement in Ar or Ar/He (3:1); forming gas.

## Dimensional drawings



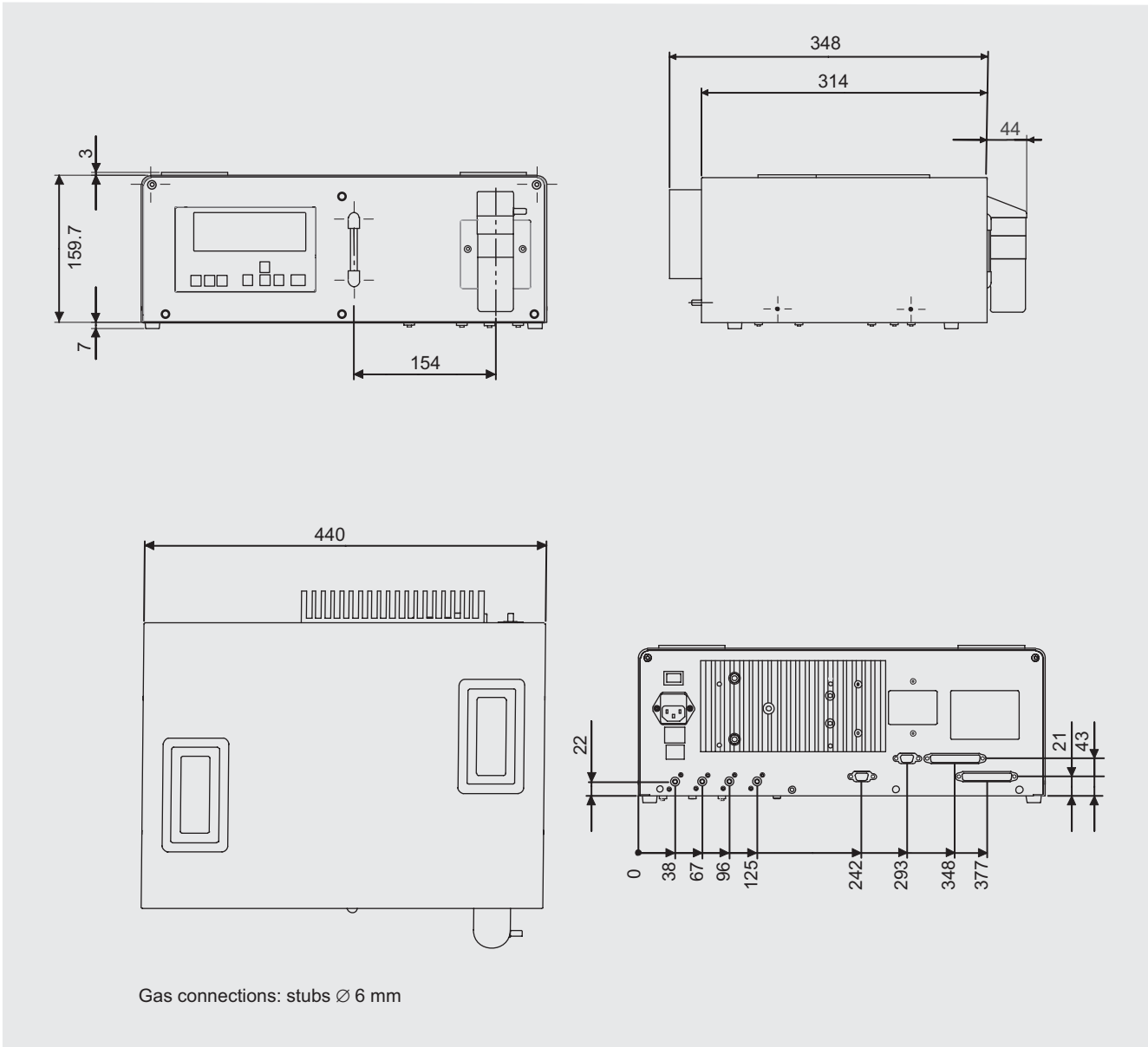
Gas connections: stubs  $\varnothing$  6 mm or  $\frac{1}{4}$ "

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

ULTRAMAT 23, 19" unit, dimensions in mm

# Gas Analysis ULTRAMAT 23

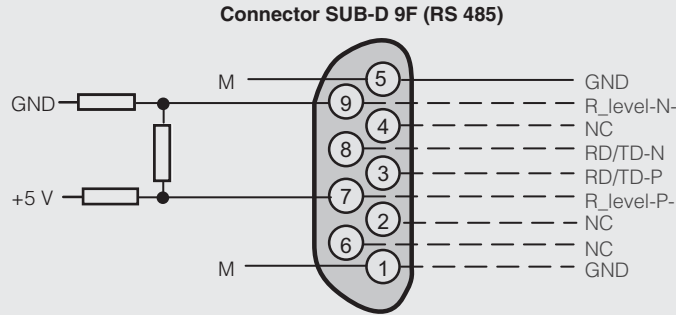
19" unit and portable version



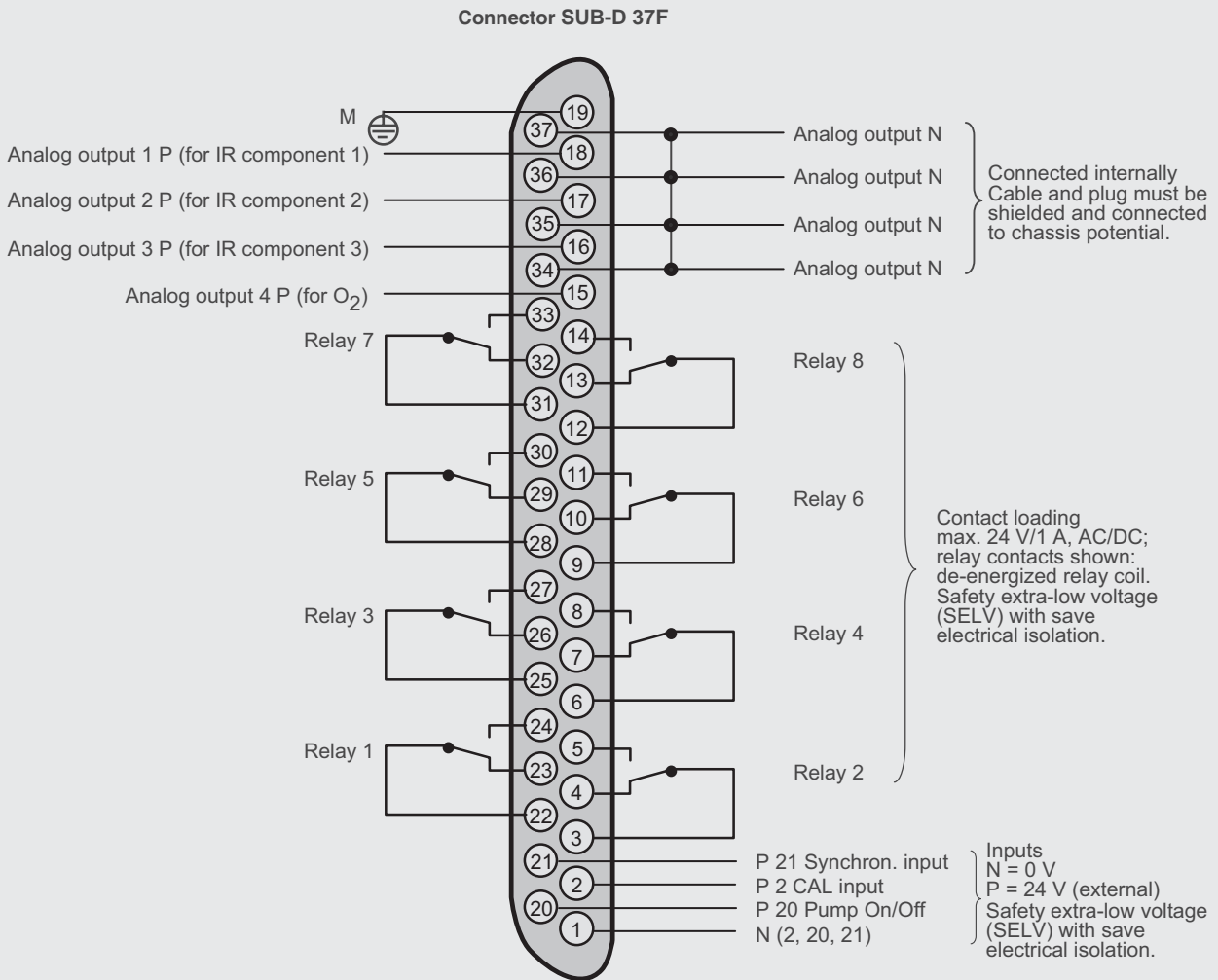
ULTRAMAT 23, desktop unit, dimensions in mm

## Schematics

### Pin assignment



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



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

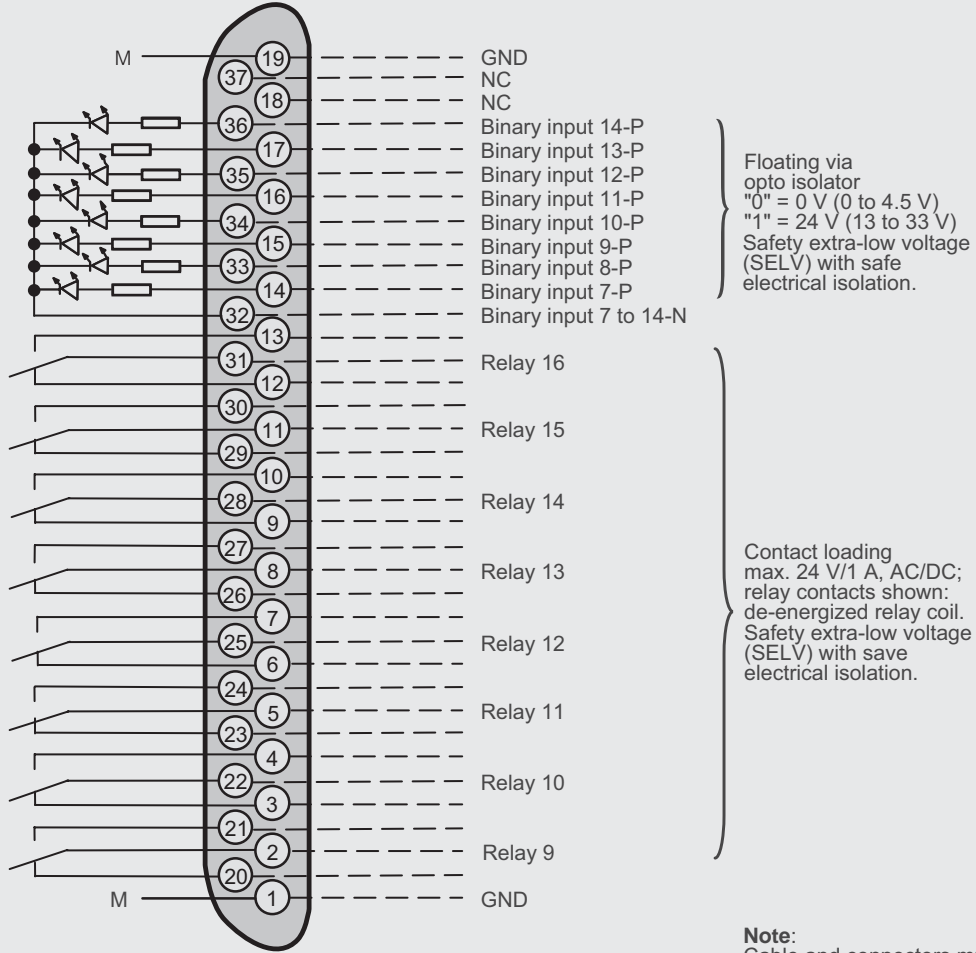
Contact loading  
max. 24 V/1 A, AC/DC;  
relay contacts shown:  
de-energized relay coil.  
Safety extra-low voltage (SELV) with save electrical isolation.

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

# Gas Analysis ULTRAMAT 23

19" unit and portable version

## Connector SUB-D 37F (option)

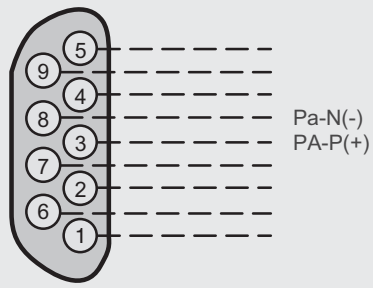
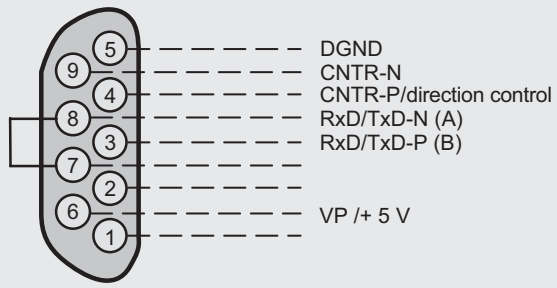


**Note:**  
Cable and connectors must be shielded and connected to chassis potential.

## Connector SUB-D 9F -X90 PROFIBUS-DP

optional

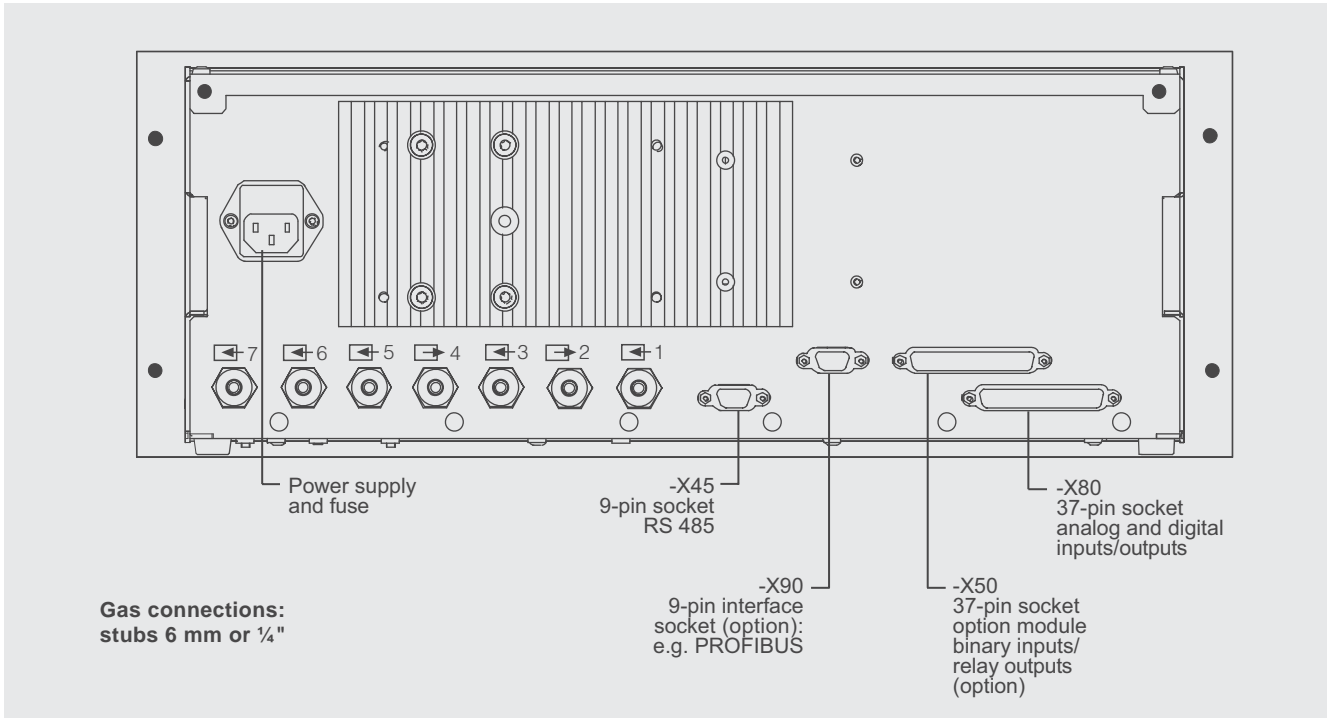
## Connector SUB-D 9M -X90 PROFIBUS-PA



ULTRAMAT 23, pin assignment of the optional PROFIBUS interface board

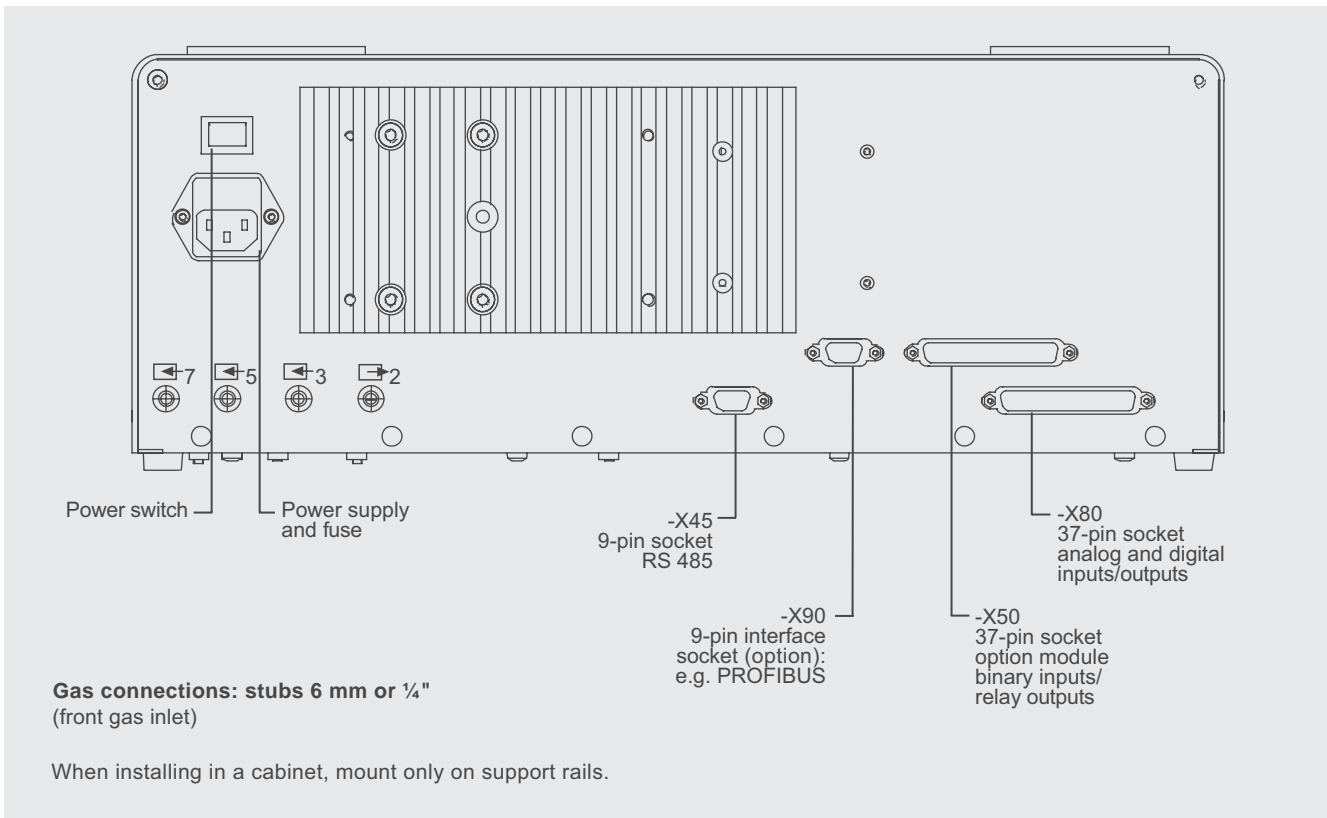


## 19" unit



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

## Desktop unit

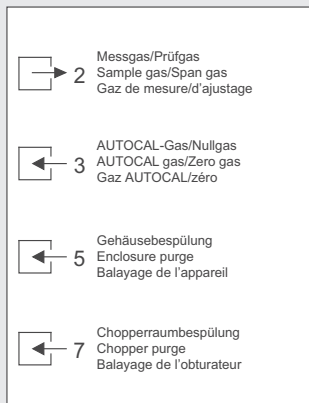


ULTRAMAT 23, portable unit, in sheet-steel housing, gas and electrical connections

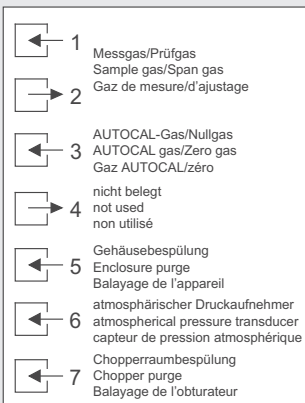
# Gas Analysis

## ULTRAMAT 23

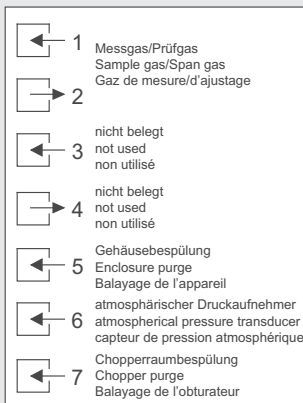
### 19" unit and portable version



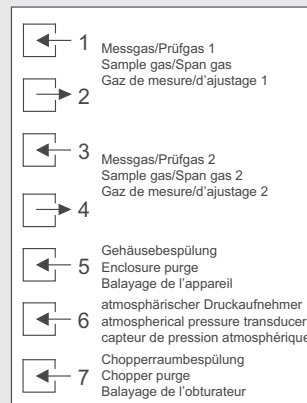
**Key to symbols  
ULTRAMAT 23  
portable, in sheet-steel  
housing**



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



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



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

ULTRAMAT 23, designation of the different labels

### More information

#### Documentation

Manual	Order No.
<b>ULTRAMAT 23</b> Gasanalysengerät für IR-absorbierende Gase und Sauerstoff (German)	<b>C79000-G5200-C216</b>
<b>ULTRAMAT 23</b> Gas Analyzers for IR-absorbing Gases and Oxygen (English)	<b>C79000-G5276-C216</b>
<b>ULTRAMAT 23</b> Analyseurs de gaz pour la mesure de composants infrarouges et doxygène (French)	<b>C79000-G5277-C216</b>
<b>ULTRAMAT 23</b> Analizadores para gases absorbentes de infrarrojo y oxígeno (Spanish)	<b>C79000-G5278-C216</b>
<b>ULTRAMAT 23</b> Analizzatori ad infrarossi e per ossigeno (Italian)	<b>C79000-G5272-C216</b>

#### Proposition of spare parts for a 2-year and 5-year service

Description	Qty for 2 years	Qty for 5 years	Order No.
<b>Analyzer section</b>			
O-ring for sample cell, 180, 90, 20 mm	2	4	C71121-Z100-A99
Chopper			
• with motor, for 1 IR channel (7MB2335-...)	1	1	C79451-A3468-B515
• with motor, for 2 IR channels (7MB2337-..., 7MB2338-...)	1	1	C79451-A3468-B516
<b>Electronics</b>			
Motherboard	-	1	C74951-A3492-B601
Keypad	1	1	C79451-A3492-B605
LCD module	1	1	C79451-A3494-B16
Connector filter	-	1	W75041-E5602-K2
Mains switch	-	1	W75050-T1201-U101
Fuse 220 V ... 240 V	2	4	W79054-L1010-T630
Fuse 120 V	2	4	W79054-L1011-T125
<b>Other</b>			
Safety filter (zero gas), internal	2	2	A5E00059149
Safety filter (sample gas), internal	2	3	C79127-Z400-A1
Pressure switch	1	2	C79302-Z1210-A2
Flowmeter (version with pump only)	1	2	C79402-Z560-T1
Set of gaskets (membrane/valve kit) for sample gas pump	2	5	C79402-Z666-E20
Condensation trap (for portable unit)	1	2	C79451-A3000-B43
Filter (for portable unit, in sheet-steel enclosure)	1	2	C79451-A3008-B60
Oxygen sensor	1	1	C79451-A3458-B55
Sample gas pump 50 Hz	1	1	C79451-A3494-B10
Sample gas pump 60 Hz	1	1	C79451-A3494-B11
Solenoid valve	1	1	C79451-A3494-B33

## Conditions of sale and delivery Export regulations, contact addresses

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