

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, CO₂, NO, SO₂, CH₄ plus O₂ 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 for further use in case of pollution
- 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

- Separate gas paths

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 version

TÜV-approved versions of the ULTRAMAT 23 are available for measurement of CO, NO, SO₂ and O₂ according to 13. BImSchV and TA Luft.

Smallest TÜV-approved and permitted measuring ranges:

- 1- and 2-component analyzer
CO: 0 to 150 mg/m³
NO: 0 to 100 mg/m³
SO₂: 0 to 400 mg/m³
- 3-component analyzer
CO: 0 to 250 mg/m³
NO: 0 to 400 mg/m³
SO₂: 0 to 400 mg/m³

All larger measuring ranges are also approved.

Furthermore, the TÜV-approved versions of the ULTRAMAT 23 comply with the requirements of EN 14956 and of QAL 1 according to EN 14181. Conformity of the analyzers with both standards is TÜV-certified.

Determination of the analyzer drift according to EN 14181 (QAL 3) can be carried out manually or also with a PC using the SIPROM GA maintenance and servicing software. In addition, selected manufacturers of emission evaluation computers offer the possibility for downloading the drift data via the analyzer's serial interface and to automatically record and process them in the evaluation computer.

- Version with reduced response time
The connection between the two condensate traps is equipped with a stopper to lead the whole flow through the measuring cell (otherwise only 1/3 of the flow), i.e. the response time is 2/3 faster. All other components preserve their function.
- Chopper compartment flushing: consumption 100 ml/min.

Continuous Gas Analyzers, extractive

ULTRAMAT 23

General

Design

- 19" unit with 4 HU for installation
 - in hinged frames
 - 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 zero gas; 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 display 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

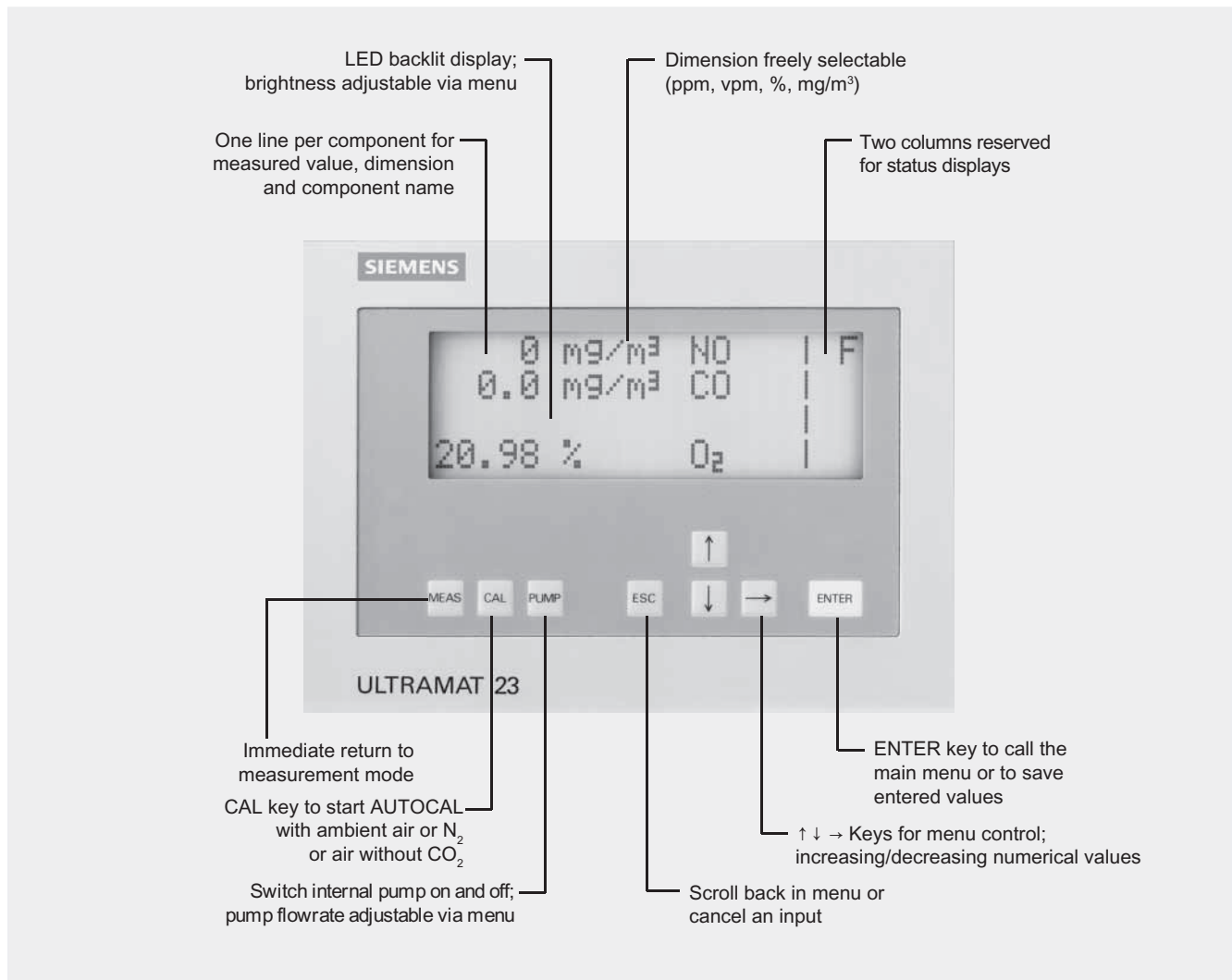
- Three binary inputs for sample gas pump On/Off, triggering of AUTOCAL and synchronization of several devices
- Eight relay outputs can be freely configured for fault, maintenance request, limits, range identification and external solenoid valves
- Eight additional binary inputs and relay outputs as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

Communication

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

Options

- RS 485/RS 232 converter
- RS 485/Ethernet converter
- Incorporation in networks via PROFIBUS DP/PA interface
- SIPROM GA software as service and maintenance tool.



ULTRAMAT 23, membrane keypad and graphic display

Executions of the wetted parts

Gas path		19" unit	Desktop unit
With hoses	Condensation trap/gas inlet	—	PA (polyamide)
	Condensation trap	—	PE (polyethylene)
	Gas connections 6 mm	PA (polyamide)	PA (polyamide)
	Gas connections 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/ SS, type No. 1.4310/1.4305	FPM70/Ultramide/ SS, type No. 1.4310/1.4305
	Safety reservoir	PA66/NBR/PA6	PA66/NBR/PA6
	Sample cell		
	<ul style="list-style-type: none"> • Body • Cell lining • Stub • Window • Adhesive • O-ring 	<ul style="list-style-type: none"> Aluminium Aluminium SS, type No. 1.4571 CaF₂ E353 FPM (Viton) 	<ul style="list-style-type: none"> Aluminium Aluminium SS, type No. 1.4571 CaF₂ E353 FPM (Viton)
With pipes	Gas connections (6 mm / 1/4 ")	SS, type No. 1.4571	
	Pipes	SS, type No. 1.4571	
	Sample cell		
	<ul style="list-style-type: none"> • Body • Cell lining • Stub • Window • Adhesive • O-ring 	<ul style="list-style-type: none"> Aluminium Aluminium SS, type No. 1.4571 CaF₂ E353 FPM (Viton) 	

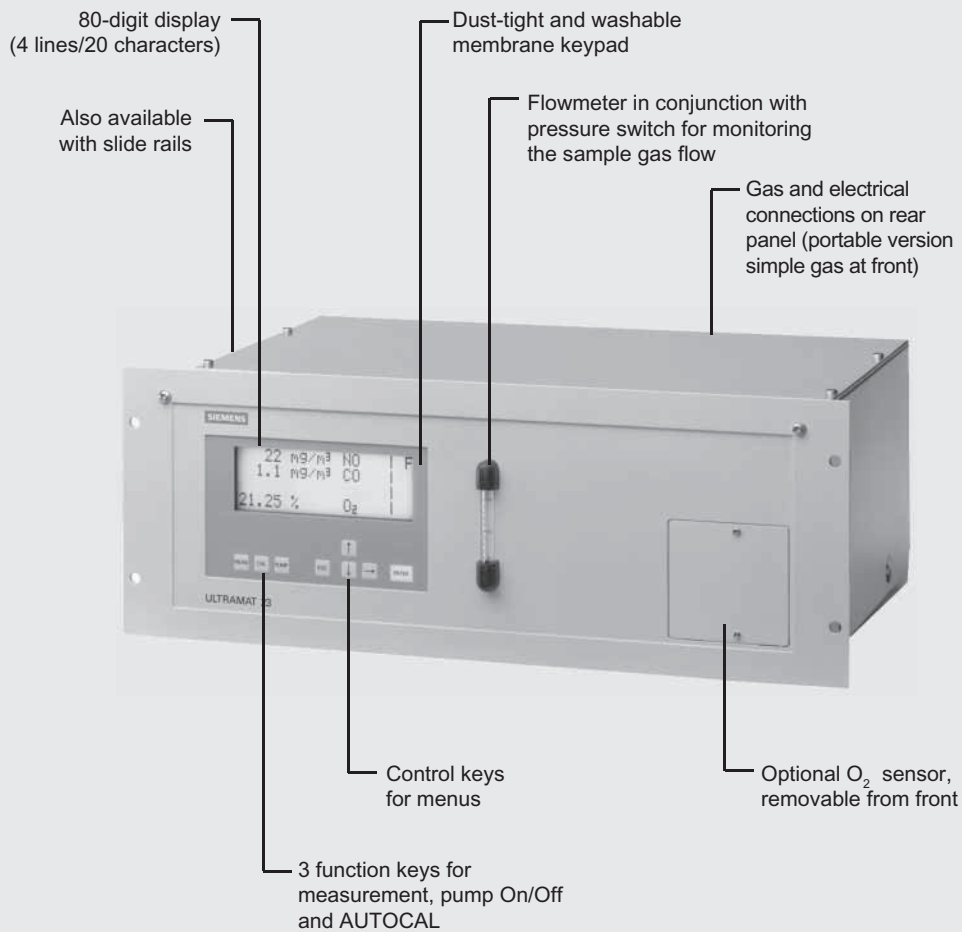
Continuous Gas Analyzers, extractive ULTRAMAT 23

General

2

ULTRAMAT 23 also available as bench-top unit:

- 2 handles on top cover
- 4 rubber feet for setting up
- No mounting frame

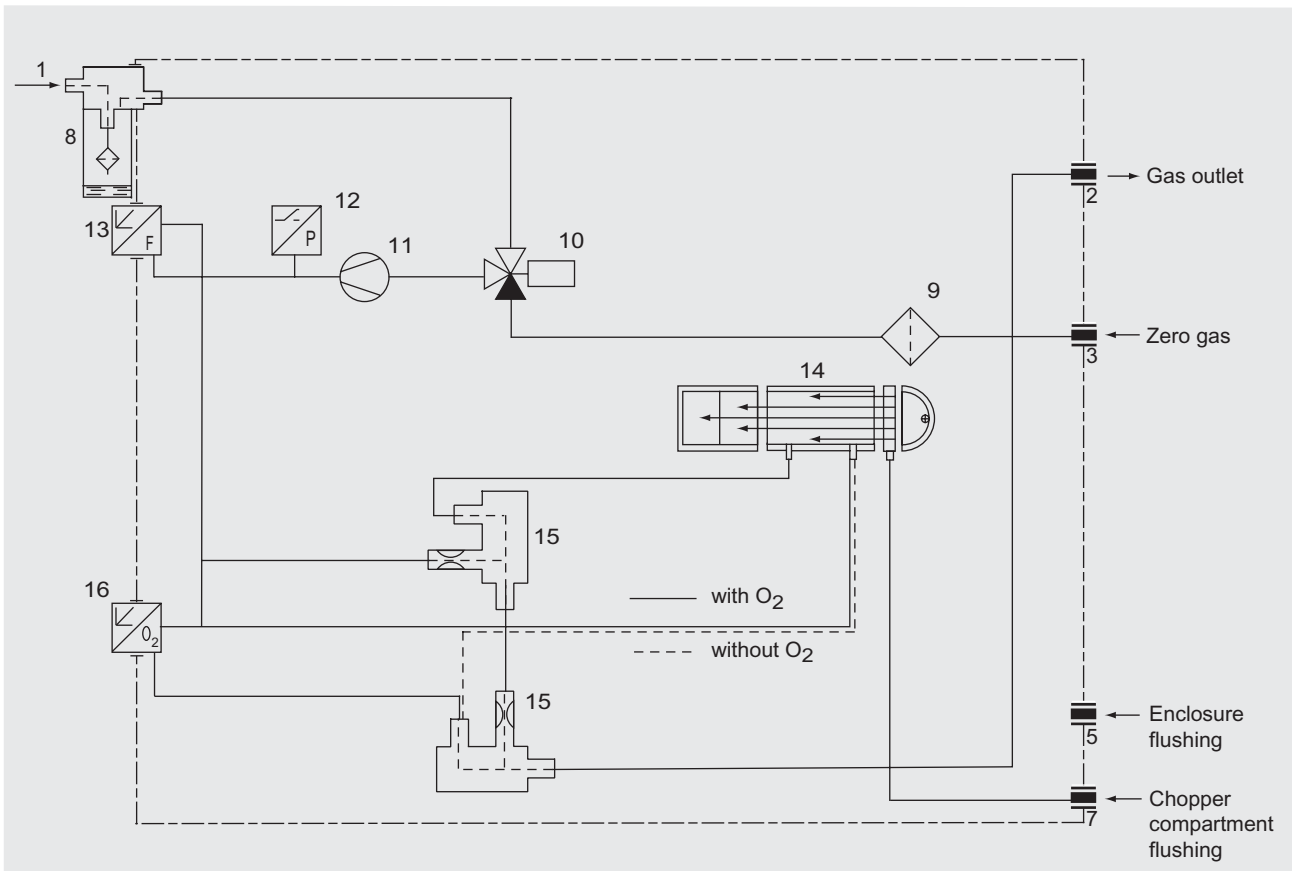


ULTRAMAT 23, design

Gas path

Key to gas path figures

- | | |
|--|--------------------------------|
| 1 Inlet to 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 Inlet atmospheric pressure sensor | 14 Analyzer section |
| 7 Inlet housing/chopper compartment flushing | 15 Safety condensate trap |
| 8 Condensation trap with filter | 16 Oxygen measuring cell |
| | 17 Atmospheric pressure sensor |

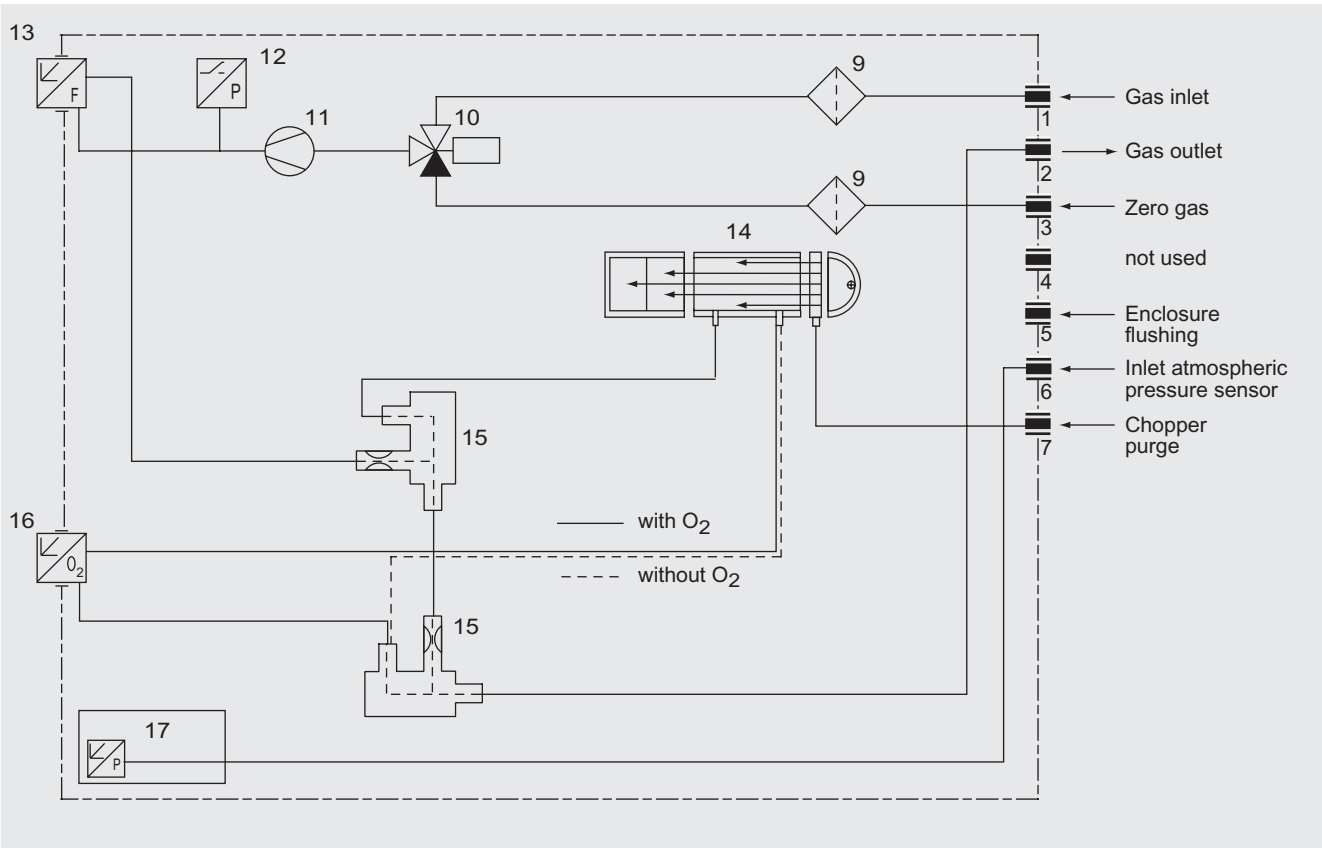


ULTRAMAT 23, portable, in sheet-steel housing with internal sample gas pump, condensation trap with safety filter on front panel, optional oxygen measurement

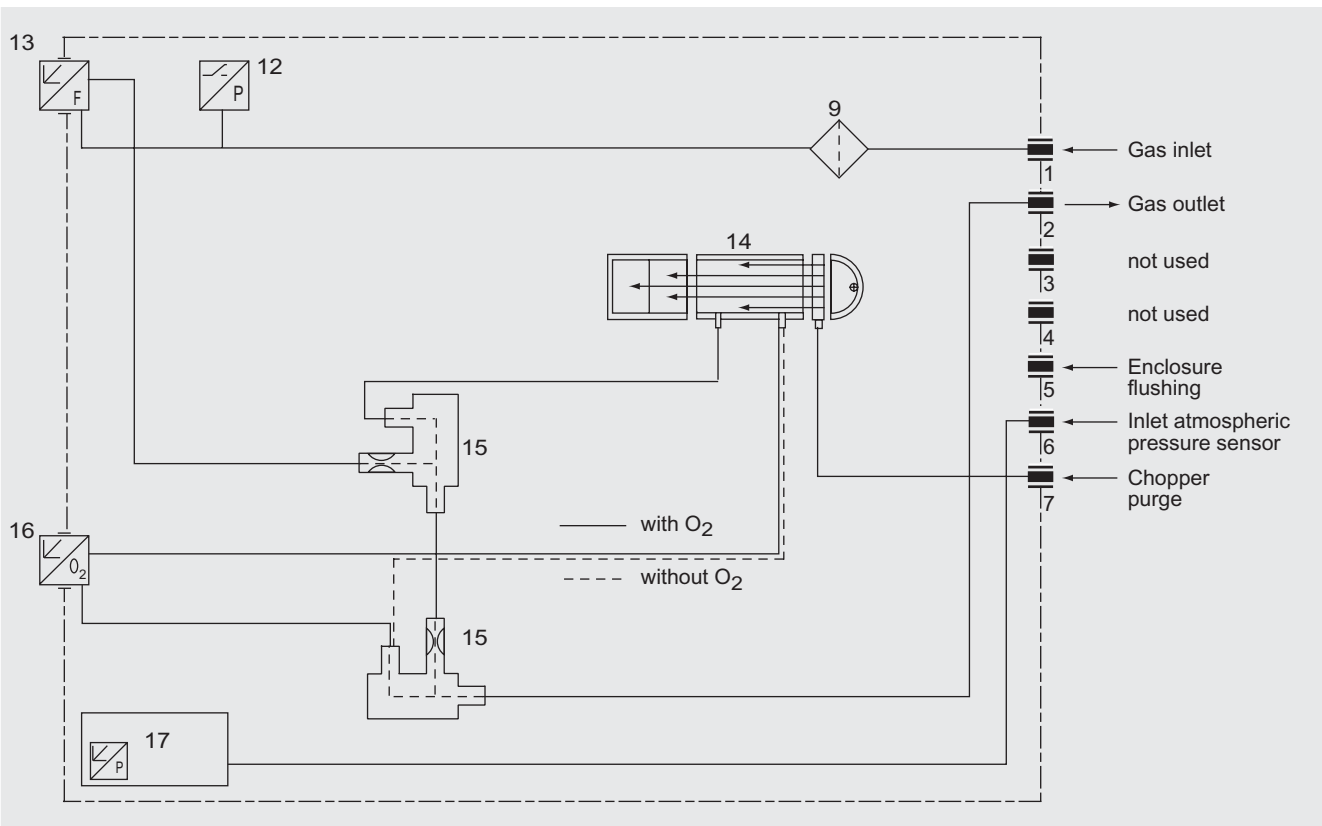
Continuous Gas Analyzers, extractive ULTRAMAT 23

General

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ULTRAMAT 23, 19" unit with internal sample gas pump, optional oxygen measurement

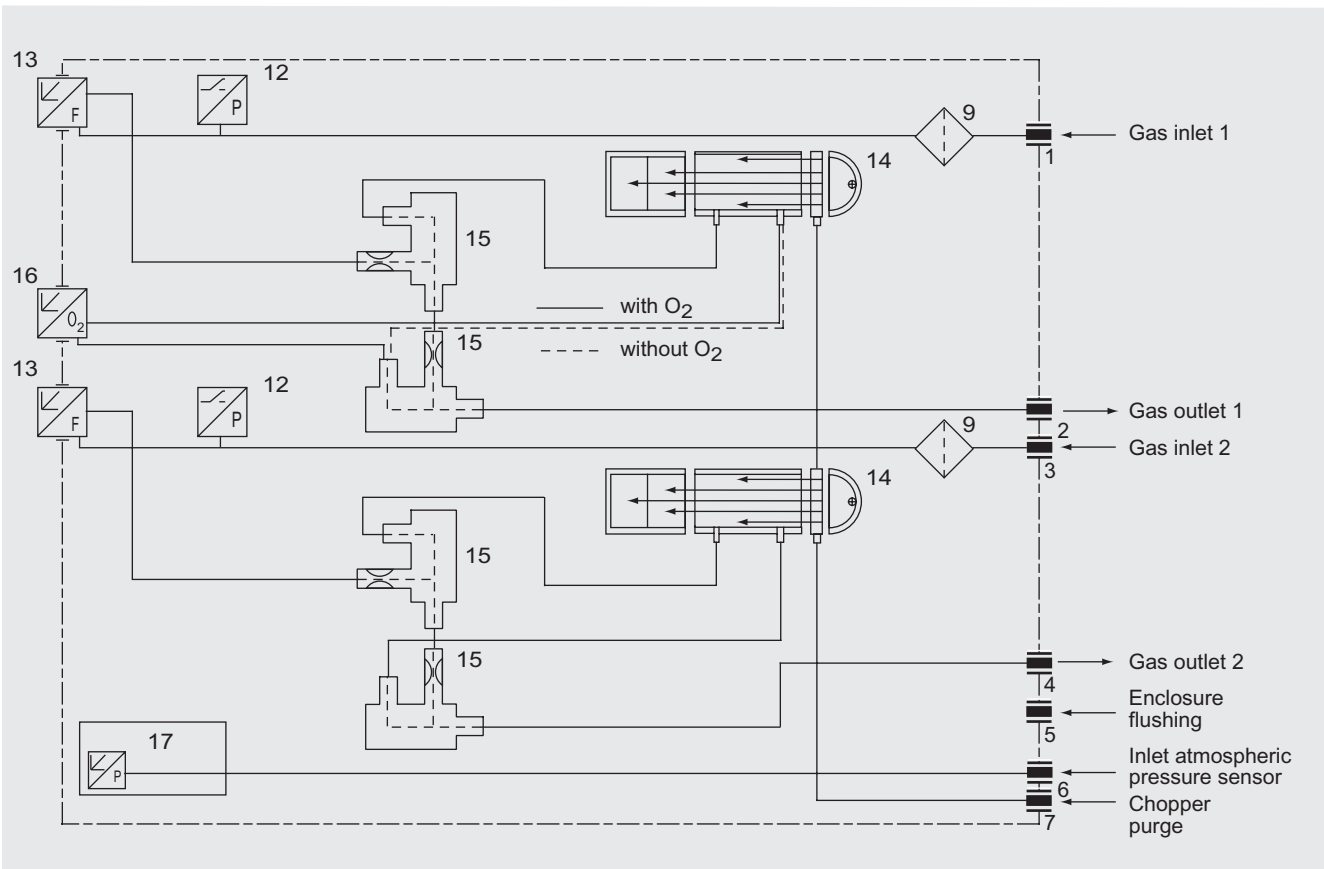


ULTRAMAT 23, 19" unit without internal sample gas pump, optional oxygen measurement

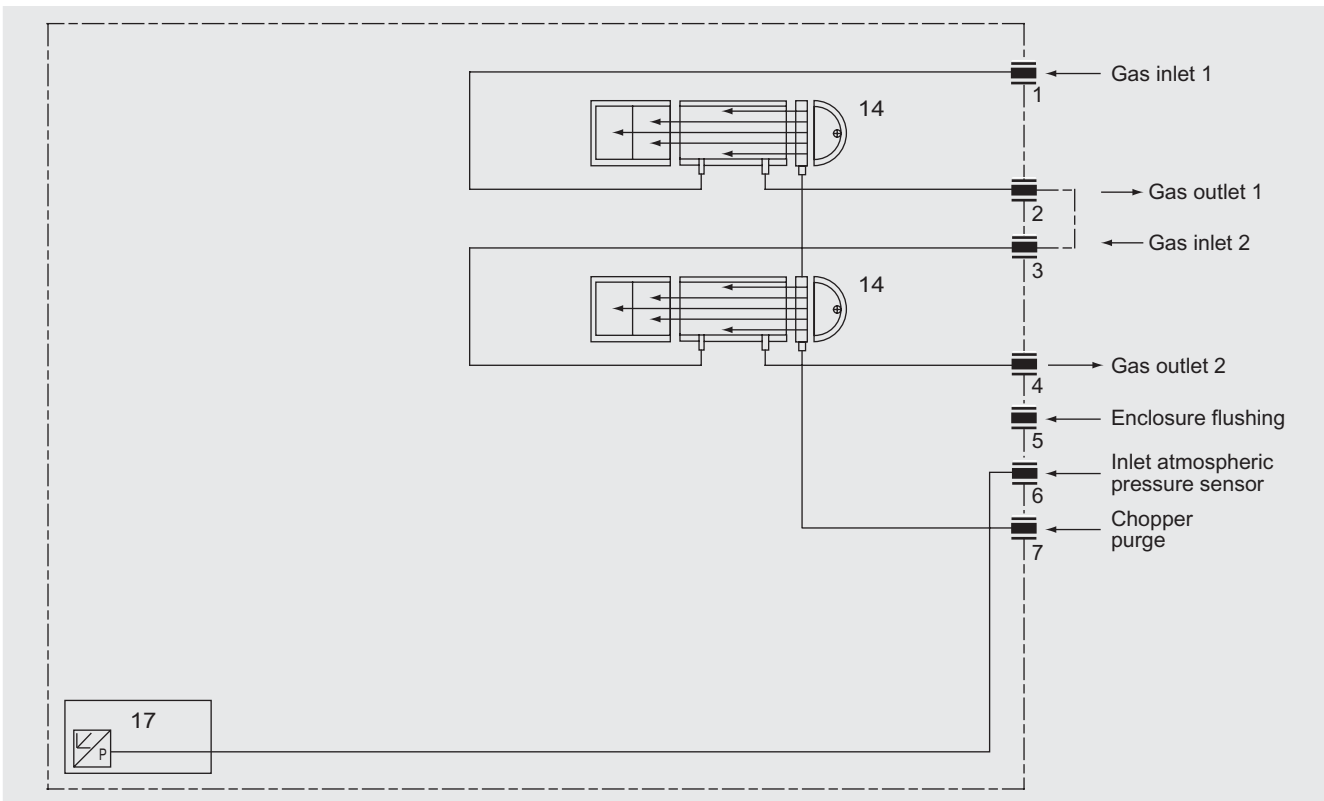
Continuous Gas Analyzers, extractive ULTRAMAT 23

General

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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 sample gas pump, without safety filter and without safety trap

Continuous Gas Analyzers, extractive

ULTRAMAT 23

General

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).

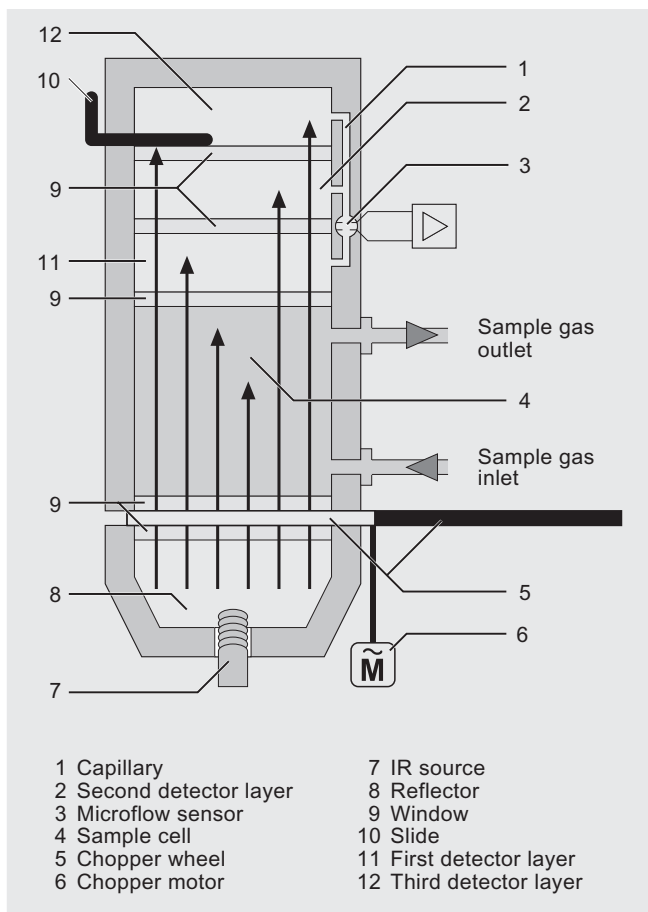
The represented detector is composed of layers filled with the component to be analyzed. The energy of the middles of the IR bands of the measured gases is mainly absorbed in the first layer. The second layer absorbs the edge energy which is tuned on high selectivity in the third layer via an aperture.

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)

Automatic calibration with air

The ULTRAMAT 23 can be calibrated e.g. with ambient air. During this AUTOCAL (adjustable between 0 and 24 hours), the chamber is purged with air. The detector then generates the largest signal U_0 (no pre-absorption in the sample chamber). This signal is used as the reference for the zero calibration and serves simultaneously as the initial value for calculation of the full-scale value in the manner described below.

The absorption in the sample chamber increases along with the concentration of the measured component. As a result of this pre-absorption, the radiation energy measured in the detector decreases, and thus also the signal voltage. The mathematical relationship between the concentration of the measured component and the signal voltage corresponds to a good approximation in the single-beam procedure of the ULTRAMAT 23 to an exponential function of form:

$$U = U_0 \cdot e^{-kc}$$

- c Concentration
- k Device-specific constant
- U_0 Basic signal with zero gas (sample gas without measured component)
- U Detector signal

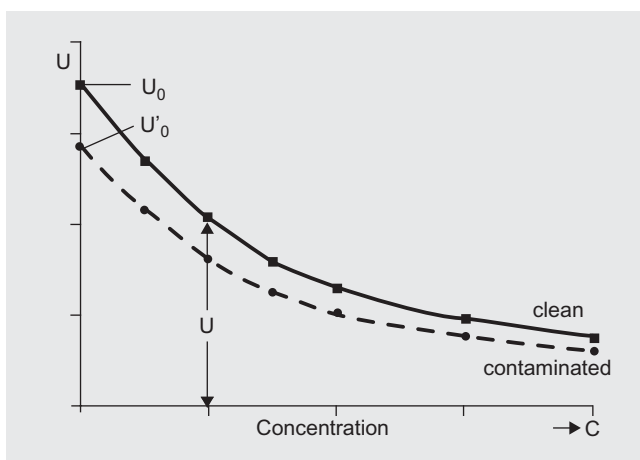
Changes in the radiated power, contamination of the sample chamber, or ageing of detector components have the same effect on both U_0 and U, and result in:

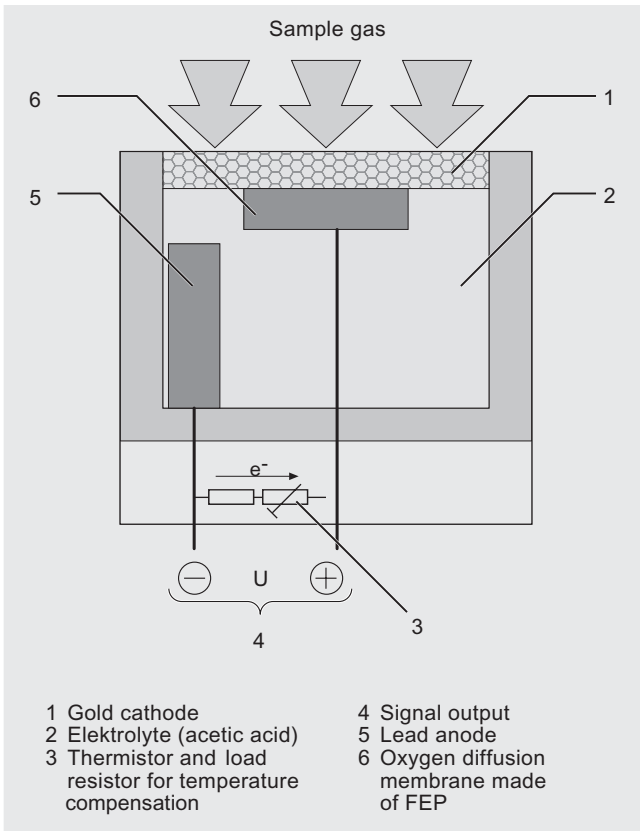
$$U' = U'_0 \cdot e^{-kc}$$

Apart from being dependent on the concentration c, the measured voltage therefore changes continuously with increased ageing of the radiator or with persistent contamination.

The mentioned influences of contamination and ageing will have a negligible effect on the measurement as long as U' remains within a certain tolerance range which is monitored by the analyzer.

The analyzers carry out automatic calibration of the zero point with ambient air every 1, 2, 3 ... 24 hours as desired. Calibration with a calibration gas is unnecessary since the calibration curve is calculated with the new U'_0 value.





ULTRAMAT 23, mode of operation of oxygen measuring cell

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_2 , CO , CH_4 and H_2 than other sensor types.

Essential characteristics

- Practically maintenance-free as a result of AUTOCAL with ambient air (or with N_2 , only with units 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.

Continuous Gas Analyzers, extractive

ULTRAMAT 23

19" unit and portable version

Technical specifications

General

Measured components	Max. 4, of which up to 3 infrared-sensitive gases plus oxygen
Measuring ranges	2 per component
Characteristics	Linearized
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 (ElectroMagnetic Compatibility)	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 ... 20 mA, NAMUR, 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"> • 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) ... 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 ... +45 °C
• Storage and transport	-20 ... +60 °C
Permissible ambient humidity	< 90% RH (relative humidity) for storage and transport
Permissible pressure variations	700 ... 1200 hPa

Sample gas pressure

Messgasdruck	
• Without pump	unpressurized
• With pump	unpressurized suction mode, fac- tory-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 ... 120 l/h (1.1 ... 2 l/min)
Sample gas temperature	0 ... 50 °C
Sample gas humidity	< 90% RH (relative humidity) no condensation

Continuous Gas Analyzers, extractive ULTRAMAT 23

19" unit and portable version

2

Technical specifications, infrared channel

Measuring ranges	See Ordering Data
Chopper compartment purge	Inlet pressure ca 3000 hPa, purging gas consumption ca 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 ... 99.9 s

Measuring response

Noise of output signal	< 1 % of smallest measuring range (see rating plate)
Display resolution	Dependent on selected measuring range; the number of digits after the decimal point can be selected
Minimum detection limit	1% of current measuring range
Resolution of output signal	< 0.1% of output signal span, max. 4.5 digits
Characteristic	Linearized
Linearity error	In largest measuring range: < 1% of full-scale value; in smallest measuring range: < 2% of full-scale value
Reproducibility	$\leq 1\%$ 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 $\pm 10\%$
Power frequency	$\pm 2\%$ of full-scale value with a frequency variation of $\pm 5\%$

Technical specifications, oxygen channel

Measuring ranges	0 ... 5% or 0 ... 25% O ₂ , parameter can be set
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 not > 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	$\leq 0.05\%$ O ₂

Influencing variables

Oxygen content	operation at times < 0.5 % O ₂ distorts the measured value
Auxiliary gas	the oxygen sensor must not be used when the auxiliary gas contains the following components: H ₂ S, chlorine or fluorine compounds, heavy metals, aerosols, mercaptans, alkaline components (as e.g. NH ₃ in % range)
Humidity	H ₂ 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 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

Continuous Gas Analyzers, extractive

ULTRAMAT 23

19" unit and portable version

Selection and Ordering Data

Order-No.

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

7 MB 2 3 3 5 - 0 - AA

Enclosure, version and gas paths

19" unit for cabinet mounting

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

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

Measured component	Possible with range classification code
CO	D, E, F, G ... R, U, X
CO ₂ ¹⁾	D ⁷⁾ , G ⁷⁾ , H ⁷⁾ , J ⁷⁾ , K ... R
CH ₄	H, L, N, P, R
C ₂ H ₄	K
C ₆ H ₁₄	K
SO ₂	F ... L, W
NO	G ... J, T, V, W
N ₂ O ⁸⁾	E
SF ₆	H

Smallest measuring range

Smallest measuring range	Largest measuring range
0 ... 50 vpm	0 ... 250 vpm
0 ... 100 vpm	0 ... 500 vpm
0 ... 150 vpm	0 ... 750 vpm
0 ... 200 vpm	0 ... 1000 vpm
0 ... 500 vpm	0 ... 2500 vpm
0 ... 1000 vpm	0 ... 5000 vpm
0 ... 2000 vpm	0 ... 10000 vpm
0 ... 0.5%	0 ... 2.5%
0 ... 1%	0 ... 5%
0 ... 2%	0 ... 10%
0 ... 5%	0 ... 25%
0 ... 10%	0 ... 50%
0 ... 20%	0 ... 100%
0 ... 100 mg/m ³	0 ... 750 mg/m ³
0 ... 150 mg/m ³	0 ... 750 mg/m ³
0 ... 250 mg/m ³	0 ... 1250 mg/m ³
0 ... 400 mg/m ³	0 ... 2000 mg/m ³
0 ... 50 vpm	0 ... 2500 vpm

Oxygen measurement ⁶⁾

Without O₂ sensor

With O₂ 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 ³⁾

German
English
French
Spanish
Italian

Footnotes: see next page.

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2

Continuous Gas Analyzers, extractive ULTRAMAT 23

19" unit and portable version

2

Further versions	Order code
Please add „-Z“ to Order No. and specify Order code	
RS 485/RS 232 converter ⁴⁾	A11
Supplementary electronics with 8 binary inputs/outputs, PROFIBUS PA interface	A12
Supplementary electronics with 8 binary inputs/outputs, PROFIBUS DP interface	A13
Slide rails (2 rails, only possible for 19" unit version)	A31
Set of Torx tools, socket spanner	A32
TAG labels (labeling to customer specification)	B03
Gas path for a short response time	C01
Chopper compartment purge for gas connection 6 mm	C02
Chopper compartment purge for gas connection 1/4"	C03
Measuring range in plain text ⁵⁾	Y11
Measurement of CO ₂ in forming gas ⁹⁾ (only in relation with measuring range 0-20/0-100%)	Y14
Accessories	Order No.
CO ₂ absorber cartridge	7MB1933-8AA
Retrofitting sets	
RS 485/Ethernet converter	C79451-A3364-D61
RS 485/RS 232 converter	C79451-Z1589-U1
Autocal function with 8 binary inputs/outputs and PROFIBUS PA	A5E00056834
Autocal function with 8 binary inputs/outputs and PROFIBUS DP	A5E00057159

- 1) For measuring ranges below 1% a CO₂ absorber cartridge can be used for the zero adjustment (see Accessories).
- 2) Without separate zero gas input and without internal solenoid valve.
- 3) User language switchable.
- 4) Supplied separately (including interface description).
- 5) Standard measuring range: smallest measuring range, largest measuring range.
- 6) O₂ sensor in gas path of infrared measured component 1.
- 7) With chopper compartment purge (with N₂ approx. 300 kPa for measuring ranges below 0.1 % CO₂ required), order in addition (see Order code C02 or C03).
- 8) Not suitable for stack emission.
- 9) CO₂ measurement in Ar or Ar/He (3:1); forming gas.

Footnotes: see next page.

Continuous Gas Analyzers, extractive

ULTRAMAT 23

19" unit and portable version

Selection and Ordering Data

Order-No.

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

7MB2337 - 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 ²⁾
¼" pipe	Viton, not separated	without ²⁾
6 mm pipe	Viton, not separated	with
¼" pipe	Viton, not separated	with
6 mm pipe	Viton, separated	without ²⁾
¼" pipe	Viton, separated	without ²⁾
6 mm pipe	SS, type No. 1.4571, separated	without ²⁾
¼" pipe	SS, type No. 1.4571, separated	without ²⁾

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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 ₂ ¹⁾	D ⁷⁾ , G ⁷⁾ , H ⁷⁾ , J ⁷⁾ , K ... R
CH ₄	H, L, N, P, R
C ₂ H ₄	K
C ₆ H ₁₄	K
SO ₂	F ... L, W
NO	G ... J, T, V, W
N ₂ O ⁸⁾	E
SF ₆	H

A
C
D
F
M
N
P
S
V

Smallest measuring range

Largest measuring range

0 ... 50 vpm	0 ... 250 vpm
0 ... 100 vpm	0 ... 500 vpm
0 ... 150 vpm	0 ... 750 vpm
0 ... 200 vpm	0 ... 1000 vpm
0 ... 500 vpm	0 ... 2500 vpm
0 ... 1000 vpm	0 ... 5000 vpm
0 ... 2000 vpm	0 ... 10000 vpm
0 ... 0.5%	0 ... 2.5%
0 ... 1%	0 ... 5%
0 ... 2%	0 ... 10%
0 ... 5%	0 ... 25%
0 ... 10%	0 ... 50%
0 ... 20%	0 ... 100%
0 ... 100 mg/m ³	0 ... 750 mg/m ³
0 ... 150 mg/m ³	0 ... 750 mg/m ³
0 ... 250 mg/m ³	0 ... 1250 mg/m ³
0 ... 400 mg/m ³	0 ... 2000 mg/m ³
0 ... 50 vpm	0 ... 2500 vpm

D
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X

Oxygen measurement ⁶⁾

Without O₂ sensor

With O₂ sensor, not suitable with the SS type version

0
1

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

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2nd Infrared component

Measured component	Possible with range classification code
CO	D, E, F, G ... R, U, X
CO ₂ ¹⁾	D ⁷⁾ , G ⁷⁾ , H ⁷⁾ , J ⁷⁾ , K ... R
CH ₄	H, L, N, P, R
C ₂ H ₄	K
C ₆ H ₁₄	K
SO ₂	F ... L, W
NO	G ... J, T, V, W
N ₂ O ⁸⁾	E
SF ₆	H




A
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D
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2

Continuous Gas Analyzers, extractive ULTRAMAT 23

19" unit and portable version

2

Selection and Ordering Data		Order-No.
ULTRAMAT 23 gas analyzer for measurement of 2 infrared components and oxygen		7 MB 2 3 3 7 -  0 - 
<u>Smallest measuring range</u>	<u>Largest measuring range</u>	
0 ... 50 vpm	0 ... 250 vpm	
0 ... 100 vpm	0 ... 500 vpm	
0 ... 150 vpm	0 ... 750 vpm	
0 ... 200 vpm	0 ... 1000 vpm	
0 ... 500 vpm	0 ... 2500 vpm	
0 ... 1000 vpm	0 ... 5000 vpm	
0 ... 2000 vpm	0 ... 10000 vpm	
0 ... 0.5%	0 ... 2.5%	
0 ... 1%	0 ... 5%	
0 ... 2%	0 ... 10%	
0 ... 5%	0 ... 25%	
0 ... 10%	0 ... 50%	
0 ... 20%	0 ... 100%	
0 ... 100 mg/m ³	0 ... 750 mg/m ³	
0 ... 150 mg/m ³	0 ... 750 mg/m ³	
0 ... 250 mg/m ³	0 ... 1250 mg/m ³	
0 ... 400 mg/m ³	0 ... 2000 mg/m ³	
0 ... 50 vpm	0 ... 2500 vpm	
<u>Operating software, documentation</u> ³⁾		
German		0
English		1
French		2
Spanish		3
Italian		4

Further versions	Order code
Please add „Z“ to Order No. and specify Order code	
RS 485/RS 232 converter ⁴⁾	A11
Supplementary electronics with 8 binary inputs/outputs, PROFIBUS PA interface	A12
Supplementary electronics with 8 binary inputs/outputs, PROFIBUS DP interface	A13
Connection pipe made of stainless steel (mat. No. 1.4571) 6 mm, komplett mit Verschraubung	A27
Connection pipe made of stainless steel (mat. No. 1.4571) 1/4", complete with screwed gland	A29
Slide rails (2 rails, only possible for 19" unit version)	A31
Set of Torx tools, socket spanner	A32
TAG labels (labeling to customer specification)	B03
Gas path for a short response time	C01
Chopper compartment purge for gas connection 6 mm	C02
Chopper compartment purge for gas connection 1/4"	C03
Measuring range in plain text ⁵⁾	Y11
Measurement of CO ₂ in forming gas ⁹⁾ (only in relation with measuring range 0-20/0-100%)	Y14
Accessories	Order No.
CO ₂ absorber cartridge	7MB1933-8AA
Retrofitting sets	
RS 485/Ethernet converter	C79451-A3364-D61
RS 485/RS 232 converter	C79451-Z1589-U1
Autocal function with 8 binary inputs/outputs and PROFIBUS PA	A5E00056834
Autocal function with 8 binary inputs/outputs and PROFIBUS DP	A5E00057159

- 1) For measuring ranges below 1% a CO₂ absorber cartridge can be used for the zero adjustment (see Accessories).
- 2) Without separate zero gas input and without internal solenoid valve.
- 3) User language switchable.
- 4) Supplied separately (including interface description).
- 5) Standard measuring range: smallest measuring range, largest measuring range.
- 6) O₂ sensor in gas path of infrared measured component 1.
- 7) With chopper compartment purge (with N₂ approx. 300 kPa for measuring ranges below 0.1 % CO₂ required), order in addition (see Order code C02 or C03).
- 8) Not suitable for stack emission.
- 9) CO₂ measurement in Ar or Ar/He (3:1); forming gas.

Continuous Gas Analyzers, extractive

ULTRAMAT 23

19" unit and portable version

Selection and Ordering Data

Order-No.

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

7 MB 2 3 3 8 - 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 ²⁾
¼" pipe	Viton, not separated	without ²⁾
6 mm pipe	Viton, not separated	with
¼" pipe	Viton, not separated	with
6 mm pipe	Viton, separated	without ²⁾
¼" pipe	Viton, separated	without ²⁾
6 mm pipe	Stainless steel, separated	without ²⁾
¼" pipe	Stainless steel, separated	without ²⁾

0
1
2
3
4
5
6
7
8

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 ... 500 vpm	0 ... 2500 vpm
NO	0 ... 500 vpm	0 ... 2500 vpm
CO	0 ... 2000 vpm	0 ... 10000 vpm
NO	0 ... 1000 vpm	0 ... 5000 vpm
CO	0 ... 1000 vpm	0 ... 5000 vpm
NO	0 ... 1000 vpm	0 ... 5000 vpm
CO	0 ... 1%	0 ... 5%
NO	0 ... 1000 vpm	0 ... 5000 vpm
CO	0 ... 250 mg/m ³	0 ... 1250 mg/m ³
NO	0 ... 400 mg/m ³	0 ... 2000 mg/m ³
CO	0 ... 10%	0 ... 50%
CO ₂	0 ... 10%	0 ... 50%
CO	0 ... 10%	0 ... 50%
CO ₂	0 ... 0.5%	0 ... 2.5%
CO	0 ... 20%	0 ... 100%
CO ₂	0 ... 20%	0 ... 100%
CO ₂	0 ... 5%	0 ... 25%
CO	0 ... 100 vpm	0 ... 500 vpm
CO ₂	0 ... 10%	0 ... 50%
CO	0 ... 0.5%	0 ... 2.5%
CO ₂	0 ... 5%	0 ... 25%
CH ₄	0 ... 1%	0 ... 5%
CO ₂	0 ... 5%	0 ... 25%
CH ₄	0 ... 2%	0 ... 10%

AA
AB
AC
AD
AK
BA
BB
BD
BJ
BK
CA
CB

Oxygen measurement ⁸⁾

Without O₂ sensor

With O₂ sensor, not suitable with the SS type version

0
1

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

0
1
2
3
4
5
6

3rd infrared component

Measured component

Measured component	Possible with range classification code
CO	D, E, F, G ... R, U, X
CO ₂ ¹⁾	D ⁷⁾ , G ⁷⁾ , H ⁷⁾ , J ⁷⁾ , K ... R
CH ₄	H, L, N, P, R
C ₂ H ₄	K
C ₆ H ₁₄	K
SO ₂	F ... L, W
NO	G ... J, V, W
N ₂ O ⁸⁾	E
SF ₆	H

A
C
D
F
M
N
P
S
V

Smallest measuring range

Smallest measuring range	Largest measuring range
0 ... 50 vpm	0 ... 250 vpm
0 ... 100 vpm	0 ... 500 vpm
0 ... 150 vpm	0 ... 750 vpm
0 ... 200 vpm	0 ... 1000 vpm
0 ... 500 vpm	0 ... 2500 vpm
0 ... 1000 vpm	0 ... 5000 vpm
0 ... 2000 vpm	0 ... 10000 vpm
0 ... 0.5%	0 ... 2.5%
0 ... 1%	0 ... 5%



D
E
F
G
H
J
K
L
M

2

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Selection and Ordering Data	Order-No.
ULTRAMAT 23 gas analyzer for measurement of 3 infrared components and oxygen	7 MB 2 3 3 8 -  0 - 
0 ... 2%	0 ... 10%
0 ... 5%	0 ... 25%
0 ... 10%	0 ... 50%
0 ... 20%	0 ... 100%
0 ... 150 mg/m ³	0 ... 750 mg/m ³
0 ... 250 mg/m ³	0 ... 1250 mg/m ³
0 ... 400 mg/m ³	0 ... 2000 mg/m ³
0 ... 50 vpm	0 ... 2500 vpm
<u>Operating software documentation</u> ³⁾	
German	0
English	1
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Set of Torx tools, socket spanner	A32
TAG labels (labeling to customer specification)	B03
Gas path for a short response time	C01
Chopper compartment purge for gas connection 6 mm	C02
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Retrofitting sets	
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RS 485/RS 232 converter	C79451-Z1589-U1
Autocal function with 8 binary inputs/outputs and PROFIBUS PA	A5E00056834
Autocal function with 8 binary inputs/outputs and PROFIBUS DP	A5E00057159

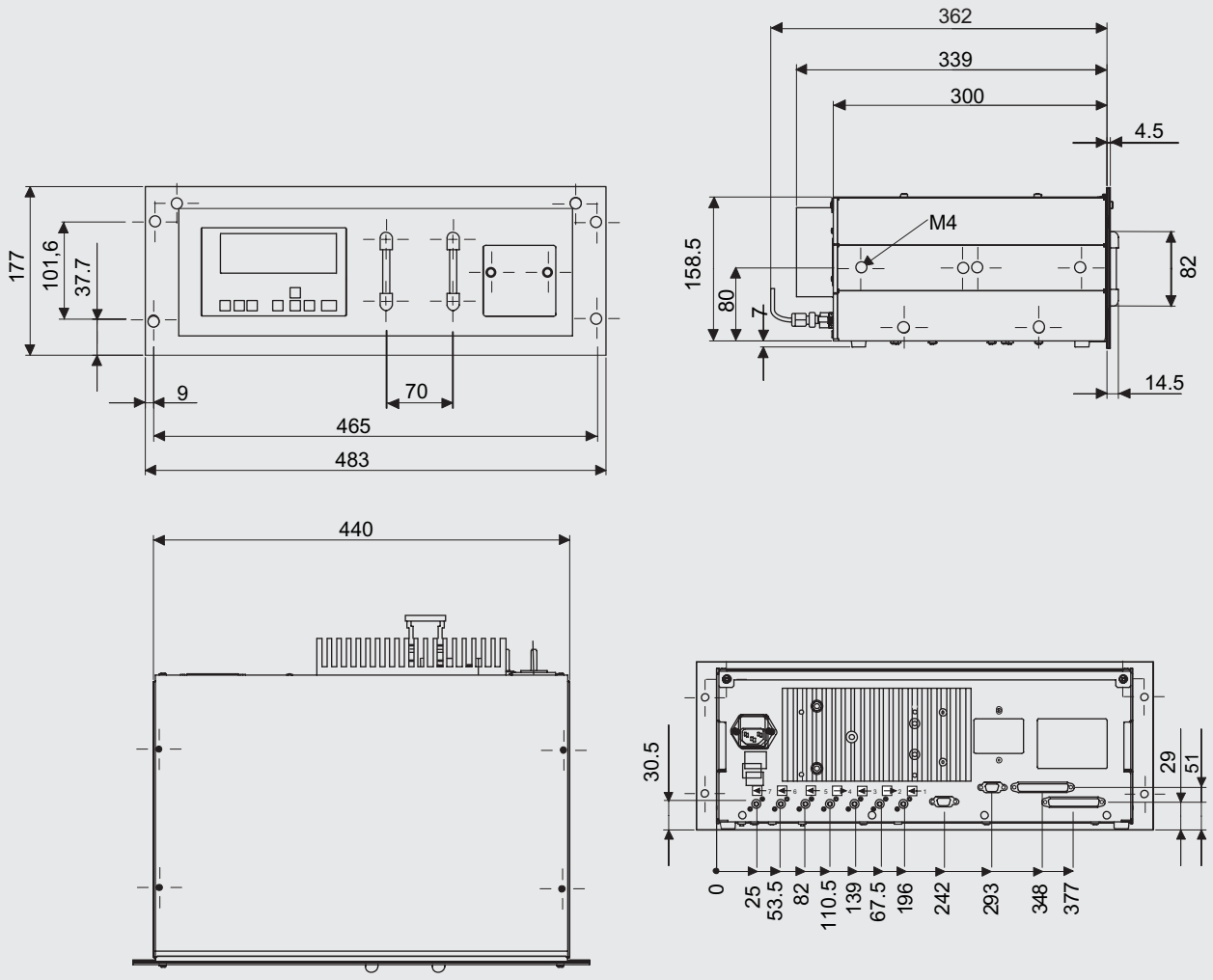
- 1) For measuring ranges below 1% a CO₂ absorber cartridge can be used for the zero adjustment (see Accessories).
- 2) Without separate zero gas input and without internal solenoid valve.
- 3) User language switchable.
- 4) Supplied separately (including interface description).
- 5) Standard measuring range: smallest measuring range, largest measuring range.
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- 8) Not suitable for stack emission.
- 9) CO₂ measurement in Ar or Ar/He (3:1); forming gas.

Continuous Gas Analyzers, extractive ULTRAMAT 23

19" unit and portable version

Dimensional drawings

2



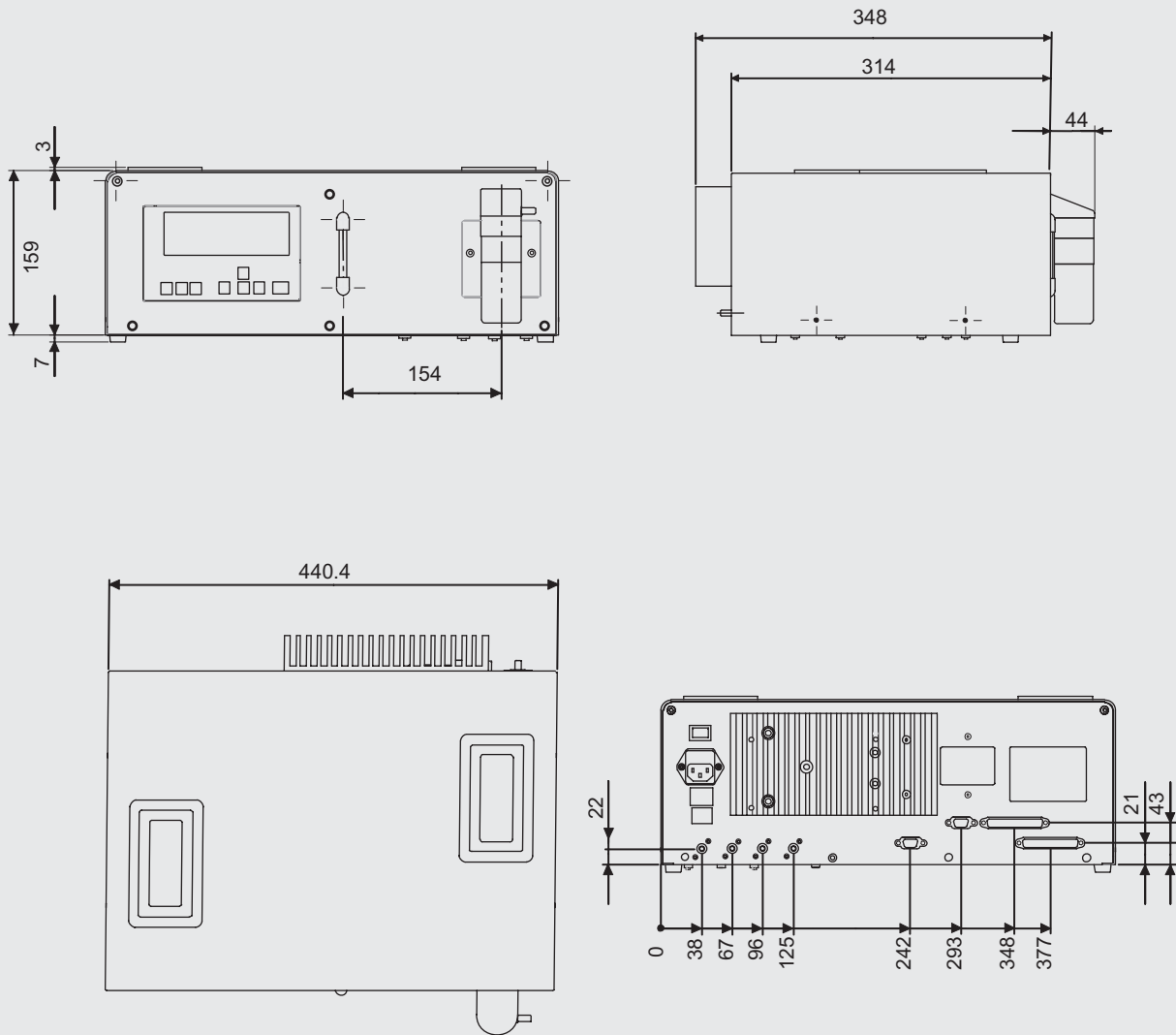
Gas connections: stubs \varnothing 6 mm or $\frac{1}{4}$ "
Caution: always install on supporting rails when mounted in bench-top housing or in cabinet

ULTRAMAT 23, 19" unit, dimensions in mm

Continuous Gas Analyzers, extractive ULTRAMAT 23

19" unit and portable version

2



Gas connections: stubs \varnothing 6 mm

ULTRAMAT 23, desktop unit, dimensions in mm

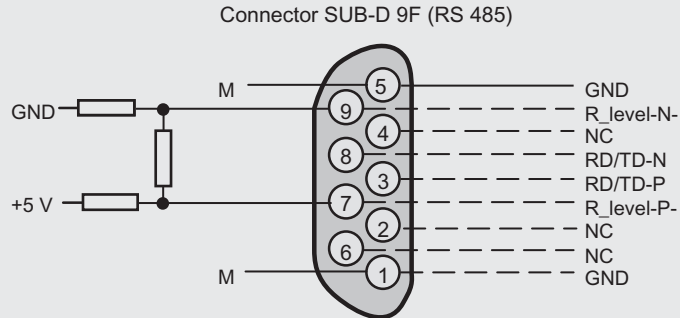
Continuous Gas Analyzers, extractive ULTRAMAT 23

19" unit and portable version

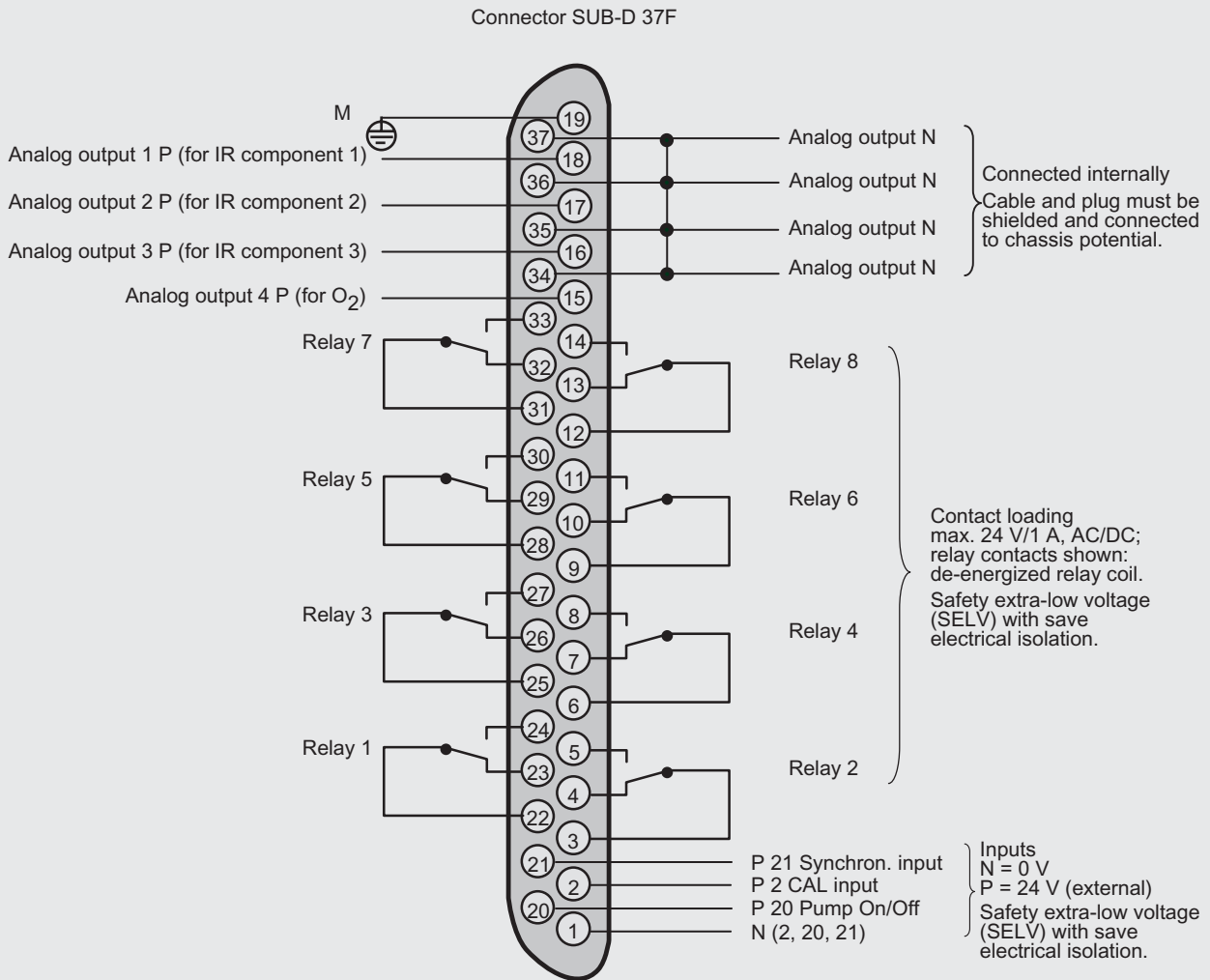
Schematics

Pin assignment (electrical and gas connections)

2



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.

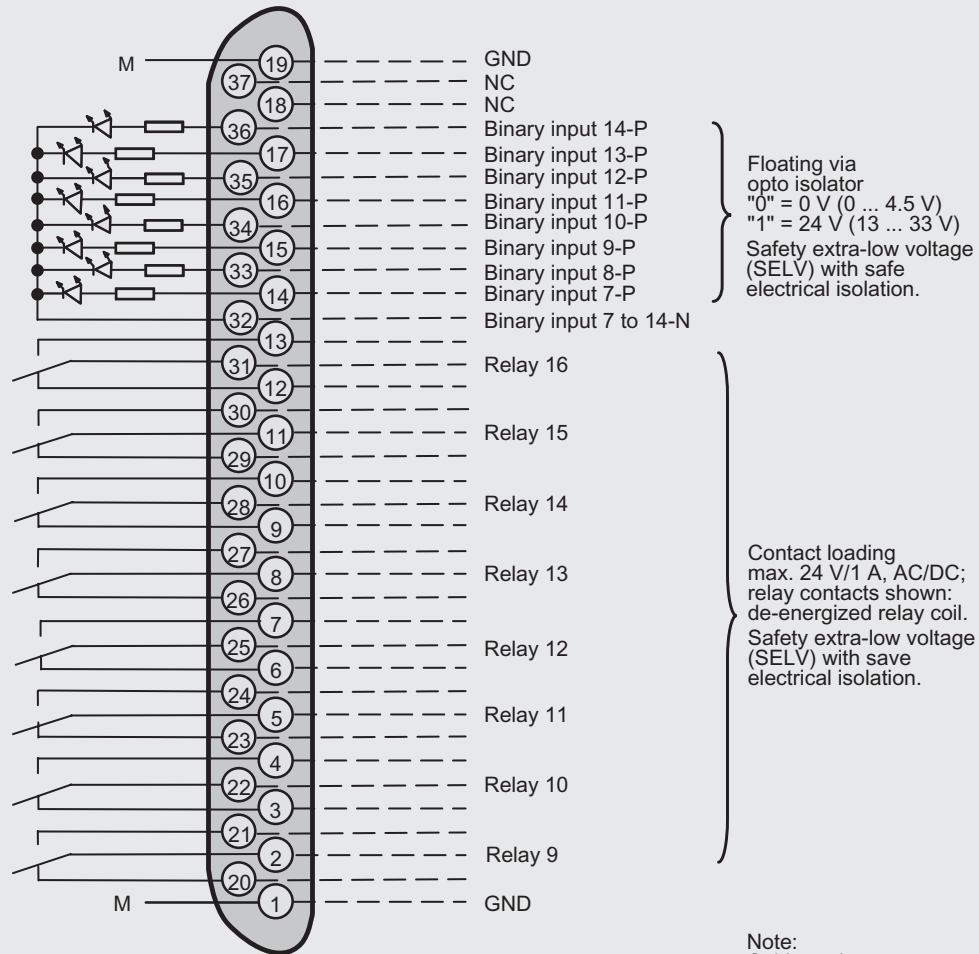
Note:
Cable and connectors must be shielded and connected to chassis potential.

Continuous Gas Analyzers, extractive ULTRAMAT 23

19" unit and portable version

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Connector SUB-D 37F (option)

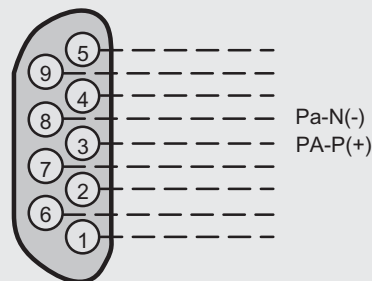
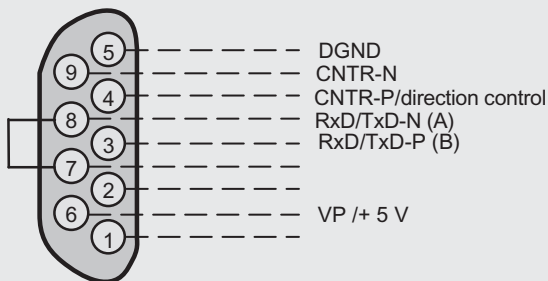


Note:
Cable and connectors must be shielded and connected to chassis potential.

Connector SUB-D 9F -X90
PROFIBUS DP

optional

Connector SUB-D 9M -X90
PROFIBUS PA



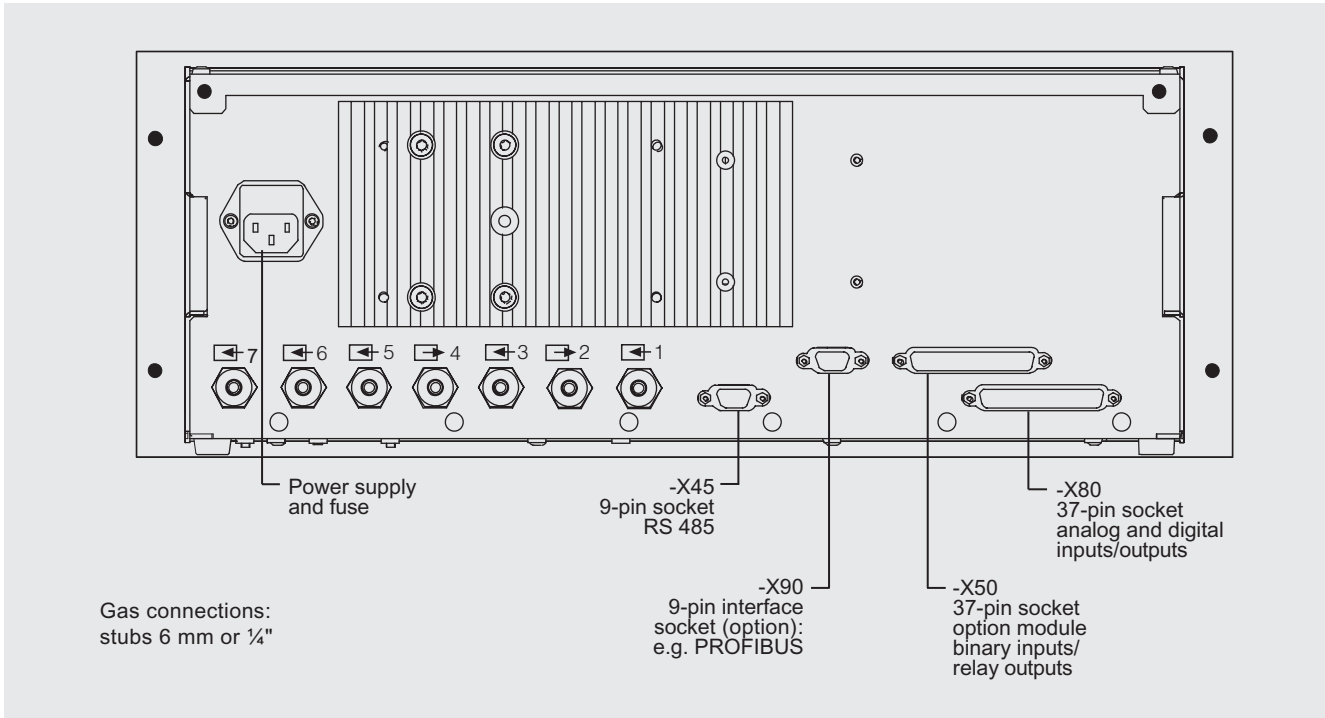
ULTRAMAT 23, pin assignment of the optional PROFIBUS interface board

Continuous Gas Analyzers, extractive ULTRAMAT 23

19" unit and portable version

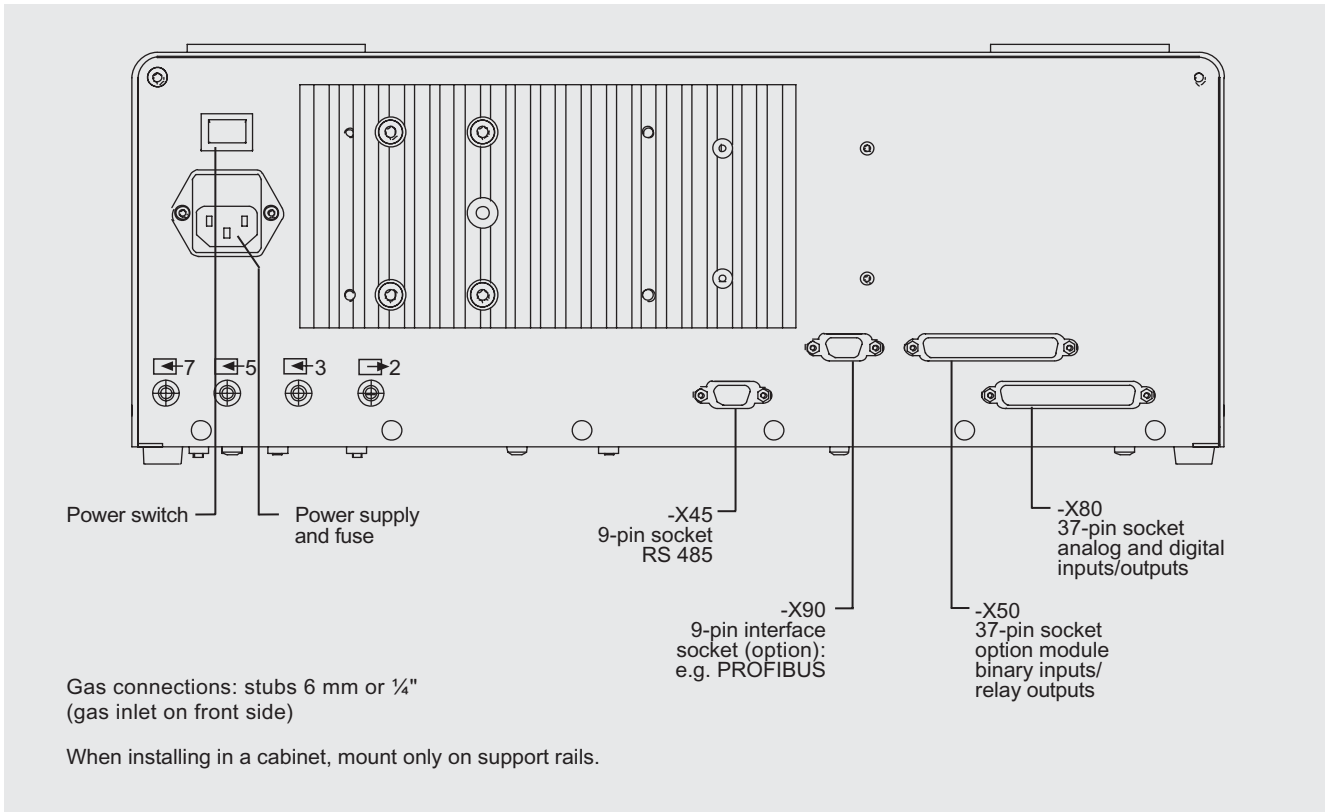
19" unit

2



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

Desktop unit

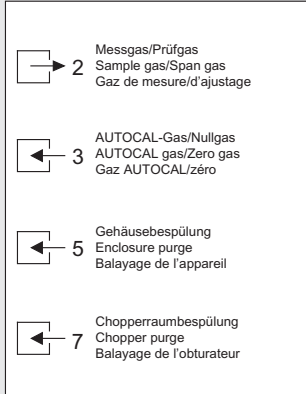


ULTRAMAT 23, portable unit, in sheet-steel housing, gas and electrical connections

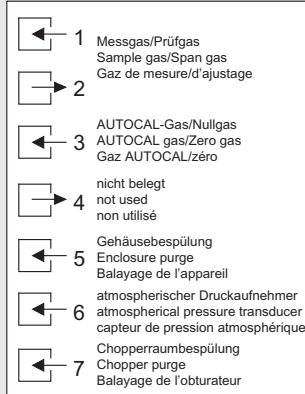
Continuous Gas Analyzers, extractive ULTRAMAT 23

19" unit and portable version

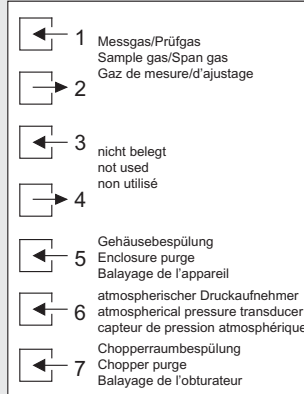
2



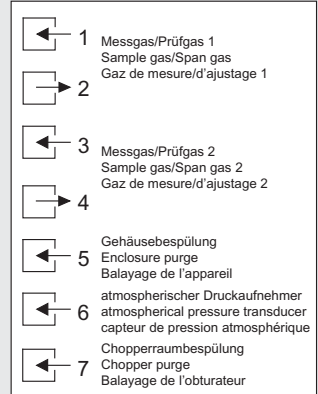
Key to symbols
ULTRAMAT 23
portable, in sheet-steel housing



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

Continuous Gas Analyzers, extractive

ULTRAMAT 23

Documentation

Selection and Ordering Data

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

2

Selection and Ordering Data

Description	Qty for 2 years	Qty for 5 years	Order No.
Analyzer section			
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
Electronics			
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 link 220 V ... 240 V	2	4	W79054-L1010-T630
Fuse link 100 ... 120 V	2	4	W79054-L1011-T125
Other			
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 for sample gas pump	2	5	C79402-Z666-E20
Condensation trap (for portable unit, in sheet-steel enclosure)	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

Continuous Gas Analyzers, extractive

ULTRAMAT 23



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