

ULTRAMAT 6 Gas Analyzers for the Determination of IR-active Components



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Gas Analysis

ULTRAMAT 6

General

Overview

The ULTRAMAT 6 single-channel or dual-channel gas analyzers operate according to the NDIR two-beam alternating light principle and measure gases highly selectively whose absorption bands lie in the infrared wavelength range from 2 to 9 μm , such as CO, CO₂, NO, SO₂, NH₃, H₂O, CH₄ and other hydrocarbons.

Single-channel analyzers measure up to 2 gas components. Dual-channel analyzers measure up to 4 gas components simultaneously.



ULTRAMAT 6, 19" unit and field unit

Benefits

- High selectivity with double-layer detector and optical coupler
 - Reliable measurements even in complex gas mixtures
- Low detection limits
 - Measurements with low concentrations
- Corrosion-resistant materials in gas path (option)
 - Measurement possible in highly corrosive sample gases
- Cleanable sample cells
 - Cost saving in further use in case of pollution
- Electronics and physics: gas-tight isolation, purging is possible, IP65
 - High service life even in harsh environments
- Heated versions (option)
 - Use also in presence of gases condensing at low temperature
- EEx(p) for zones 1 and 2 according to ATEX 2G and ATEX 3G.

Application

Application

- Measurements for boiler control in combustion plants
- Measurement of pollutant for emission monitoring according to TA-Luft, 13. and 17. BImSchV
- Emission measurements in incineration plants
- Measurements in the automotive industry (test benches)
- Warning equipment
- Process gas concentrations in chemical plants
- Trace measurements in pure gas processes
- Environment protection
- MAC-value monitoring at place of work
- Quality monitoring
- Ex versions to analyze flammable and non-flammable gases or vapors for use in hazardous areas.

Special applications

Besides the standard combinations special applications concerning material of the gas path, material of the sample cells and sample components are also available on request.

Special materials of the sample cell (e.g. titanium, Hastelloy C22).

Design

19" unit

- With 4 HU for installation
 - in swing frame
 - in cabinets, with or without slide rails
- Front panel for service can be hinged down (laptop connection)
- Internal gas paths: flexible tube made of FKM (Viton) or pipe made of titanium or stainless steel
- Gas connections for sample gas input and output: pipe diameter 6 mm or 1/4"
- Flowmeter for sample gas on the front panel (option).

Field unit

- Two-door housing with gas-tight separation of analyzer and electronics sections from gas path
- Each half of the enclosure can be purged separately
- Analyzer section and piping can be heated up to 65 °C (option)
- Gas path: hose made of FKM (Viton) or pipe made of titanium or stainless steel (further materials possible as special applications)
- Gas connections for sample gas inlet and outlet: pipe union for pipe diameter 6 mm or 1/4"
- Purging gas connections: pipe diameter 10 mm or 3/8".

Display and control panel

- Large LCD panel for simultaneous display of:
 - Measured value (digital and analog displays)
 - Status line
 - Measuring ranges
- Contrast of LCD panel adjustable using menu
- Permanent LED backlighting
- Washable membrane keyboard with five softkeys
- Menu-based operation for configuration, test functions, calibration
- User help in plain text
- Graphic display of concentration trend; programmable time intervals
- Operating software in two languages: German/English, English/Spanish, French/English, Italian/English.

Inputs and outputs

- One analog output per sample component

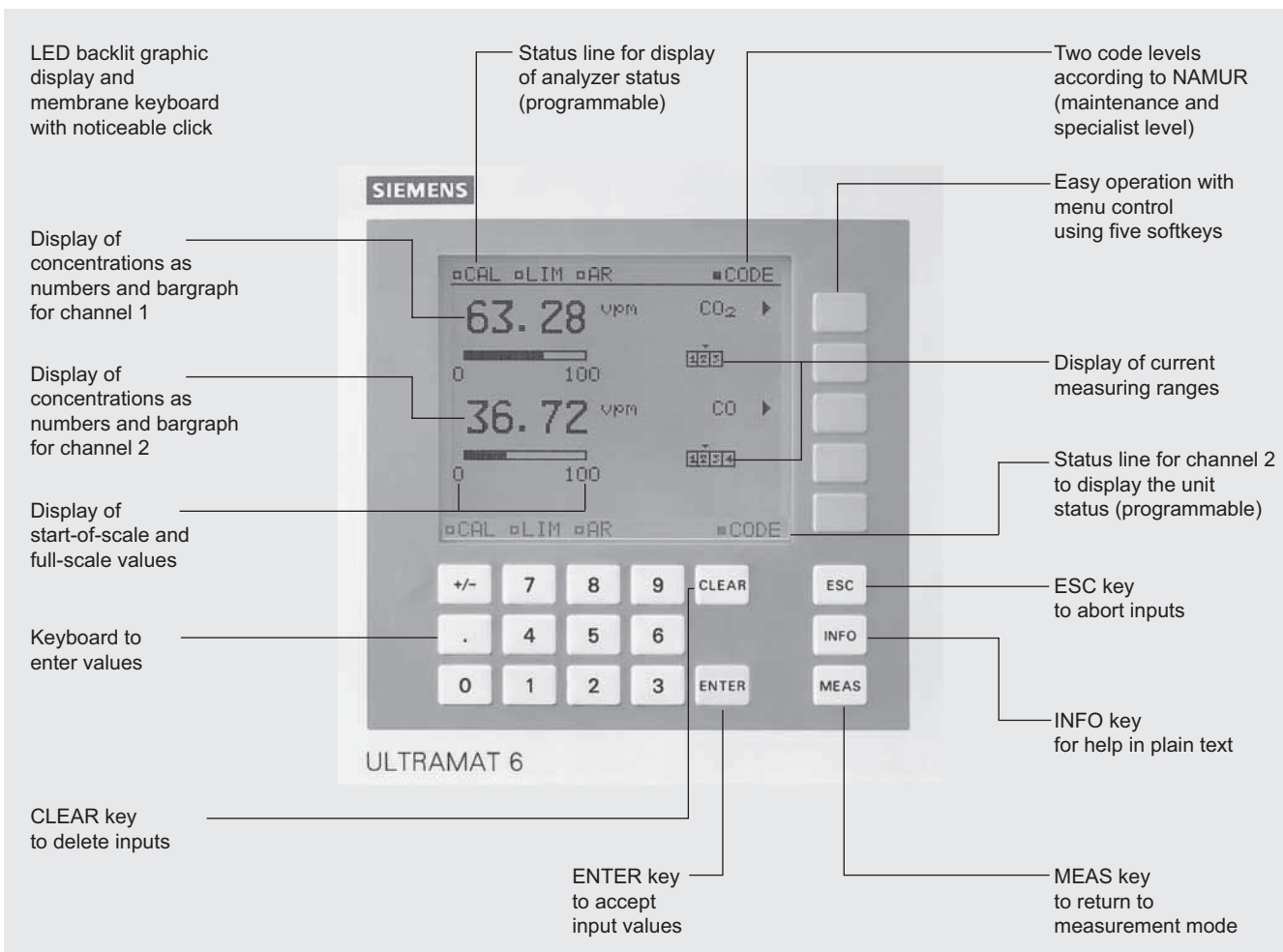
- Two analog inputs freely configurable (e.g. correction of cross interferences or external pressure sensor)
- Six binary inputs freely configurable (e.g. for range switching, processing external signals from sample conditioning)
- Six relay outputs freely configurable (e.g. failure, maintenance request, limit alarm, external solenoid valves)
- Extension with eight additional binary inputs and eight additional relay outputs, e.g. for automatic calibration with up to four calibration gases.

Communication

- RS 485 present in basic unit (connection at the rear; with 19" unit also possibility of connection behind the front plate).

Options

- AK interface for the automotive industry with extended functions
- Converter to RS 232
- Converter to TCP/IP Ethernet
- Linking to networks via PROFIBUS DP/PA interface
- SIPROM GA software as service and maintenance tool.



ULTRAMAT 6, membrane keyboard and graphic display

Gas Analysis

ULTRAMAT 6

General

Versions – Wetted parts, standard

Gas path		19" unit	Field unit	Ex field unit
With hoses	Bushing Hose Sample cell: <ul style="list-style-type: none"> • Body • Cell lining • Stub • Window 	SS, type No. 1.4571 FKM (e.g. Viton) Aluminum Aluminum SS, type No. 1.4571, O-ring: FKM (e.g. Viton) or FFKM (Kalrez) CaF ₂ , adhesive: E353, O-ring: FKM (e.g. Viton) or FFKM (Kalrez)		—
With pipes	Bushing Pipe Sample cell: <ul style="list-style-type: none"> • Body • Cell lining • Window 	Titanium Titanium, O-ring: FKM (e.g. Viton) or FFKM (Kalrez) Aluminum Tantalum (only for cell length 20 mm to 180 mm) CaF ₂ , adhesive: E353, O-ring: FKM (e.g. Viton) or FFKM (Kalrez)		
With pipes	Bushing Pipe Sample cell: <ul style="list-style-type: none"> • Body • Cell lining • Window 	SS, type No. 1.4571 SS, type No. 1.4571, O-ring: FKM (e.g. Viton) or FFKM (Kalrez) Aluminum Aluminum or tantalum (Ta: only for cell length 20 mm to 180 mm) CaF ₂ , adhesive: E353, O-ring: FKM (e.g. Viton) or FFKM (Kalrez)		

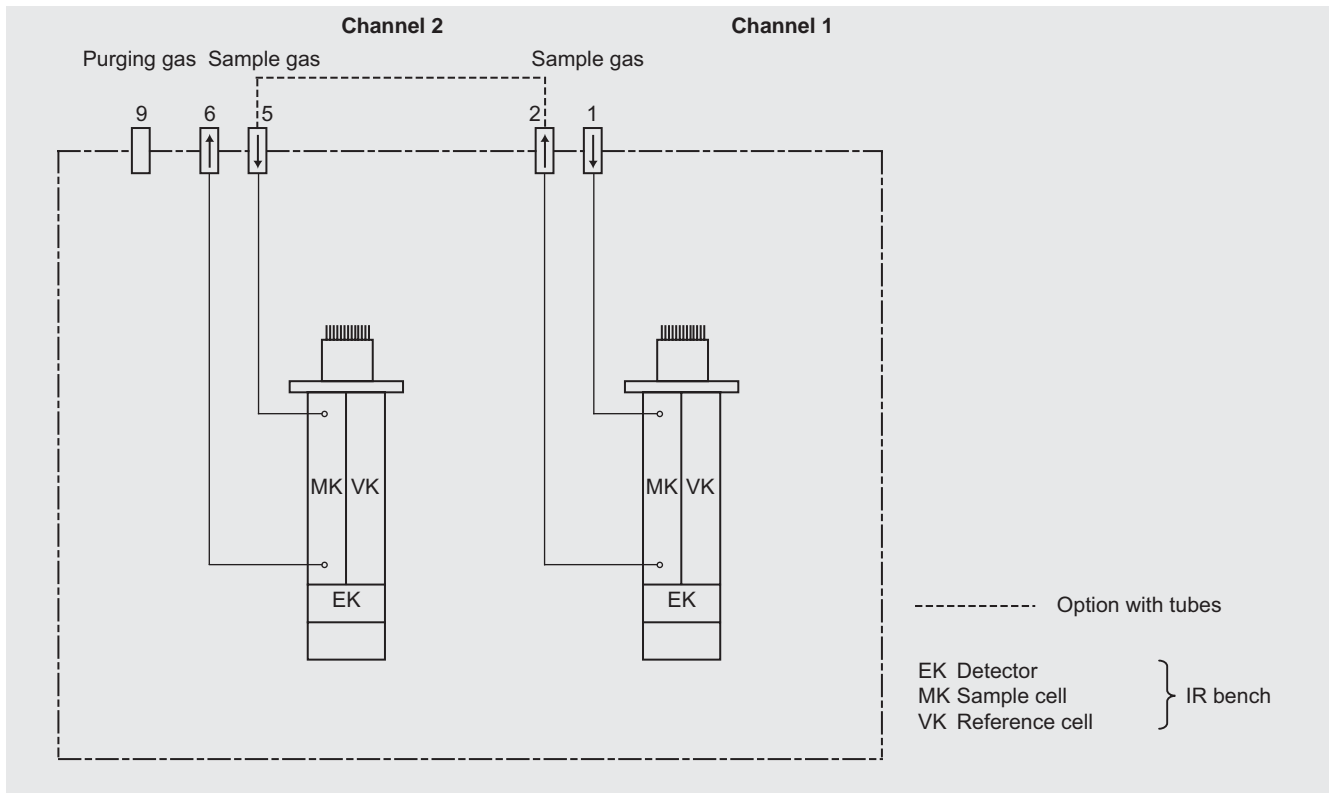
Versions – Wetted parts, special applications (examples)

Gas path		19" unit	Field unit	Ex field unit
With pipes	Bushing Pipe Sample cell: <ul style="list-style-type: none"> • Body • Window 		e.g. Hastelloy C22 e.g. Hastelloy C22, O-ring: FKM (e.g. Viton) or FFKM (Kalrez) e.g. Hastelloy C22 CaF ₂ , without adhesive O-ring: FKM (e.g. Viton) or FFKM (Kalrez)	

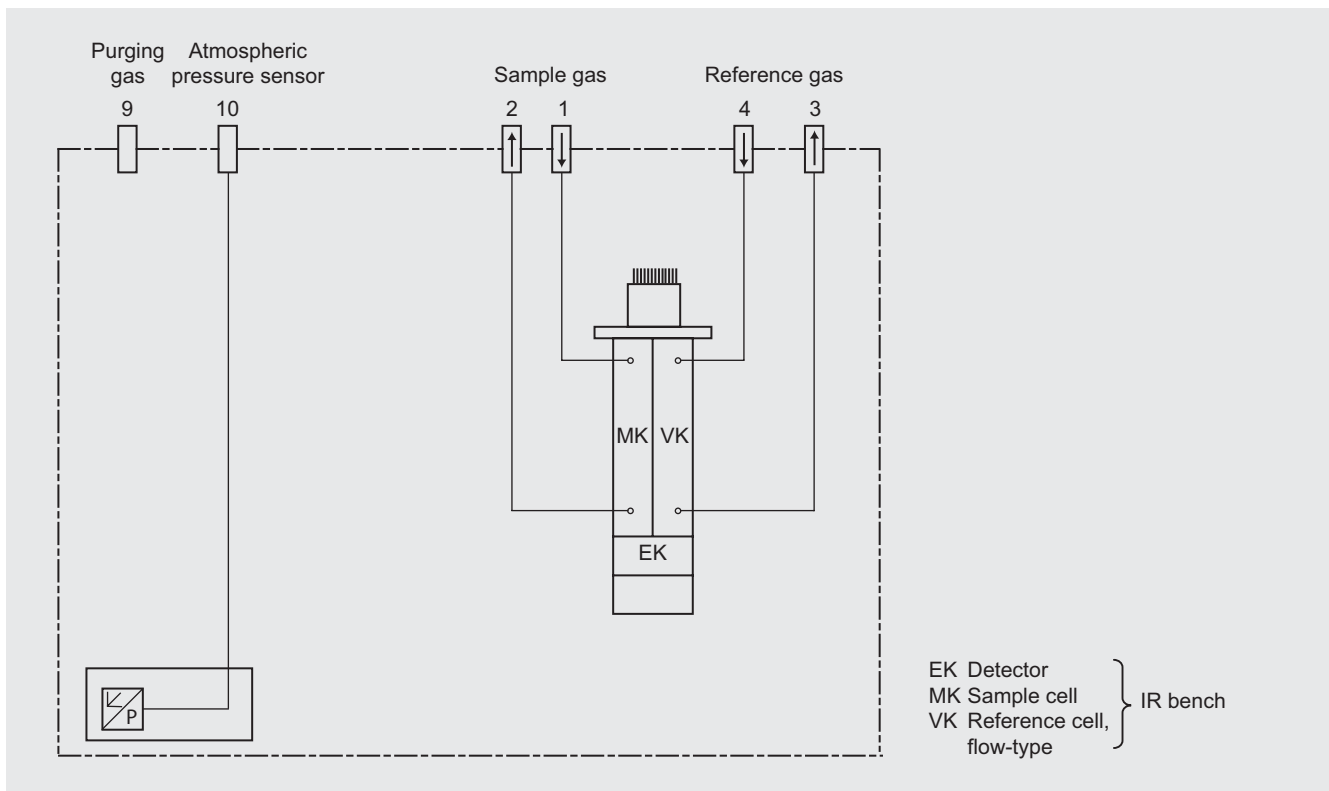
Options

Gas path		19" unit	Field unit	Ex field unit
Flowmeter	Metering pipe Float Float limit Elbows	Duran glass Duran glass PTFE (e.g. Teflon) FKM (e.g. Viton)	—	—
Pressure switch	Membrane Enclosure	FKM (e.g. Viton) PA 6.3 T	—	—

Gas path (19" unit)



Gas path ULTRAMAT 6, dual-channel unit, 19" unit



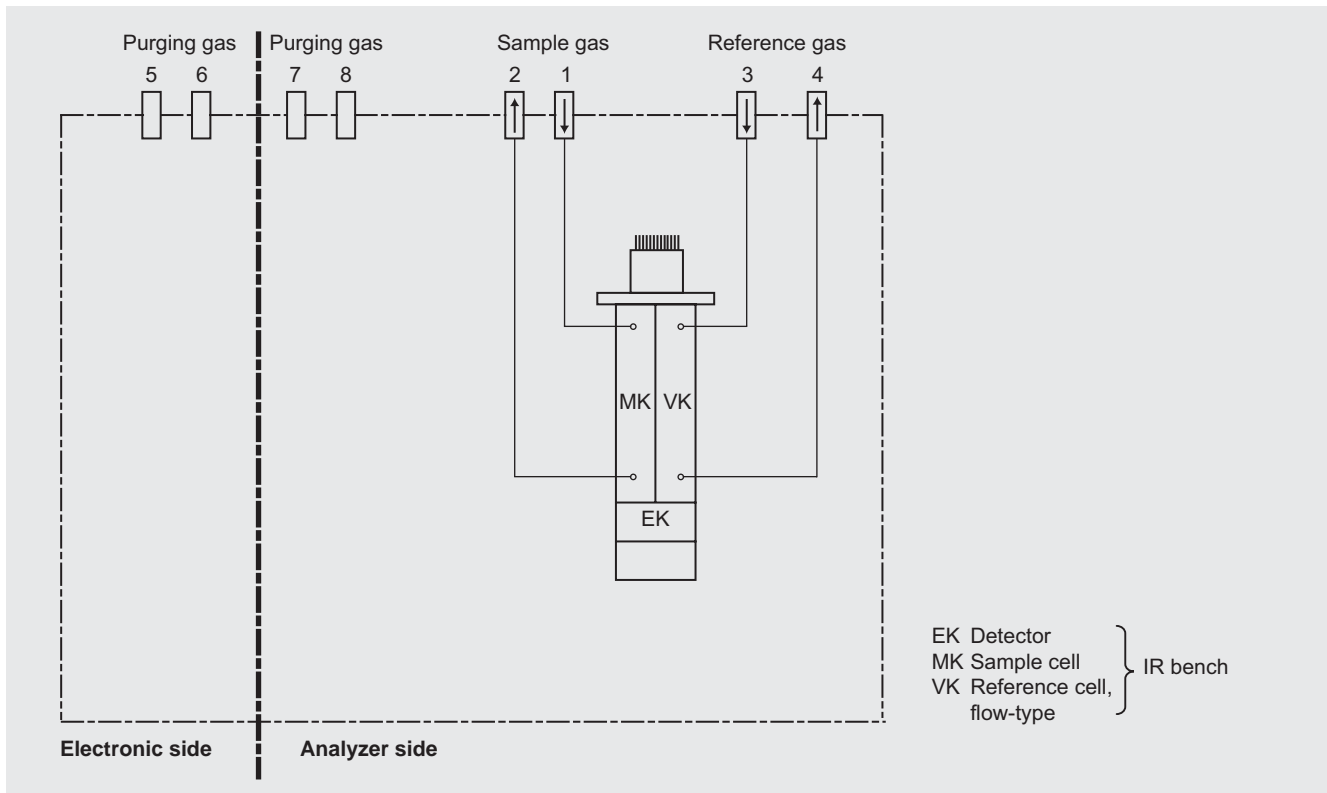
Gas path ULTRAMAT 6, single-channel unit, 19" unit, with flow-type reference cell (option)

Gas Analysis

ULTRAMAT 6

General

Gas path (field unit)



Gas path ULTRAMAT 6, field unit, with flow-type reference cell (option)

Function

Mode of operation

The ULTRAMAT 6 gas analyzer operates according to the infrared two-beam alternating light principle with double-layer detector and optical coupler.

The measuring principle is based on the molecule-specific absorption of bands of infrared radiation. The absorbed wavelengths are characteristic to the individual gases, but may partially overlap. This results in cross-sensitivities which are reduced to a minimum in the ULTRAMAT 6 gas analyzers by the following measures:

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

The figure shows the measuring principle. An IR source (1) which is heated to approx. 700 °C and which can be shifted to balance the system is divided by the beam divider (3) into two equal beams (sample and reference beams). The beam divider also acts as a filter cell.

The reference beam passes through a reference cell (8) filled with N₂ (a non-infrared-active gas) and reaches the right-hand side of the detector (11) practically unattenuated. The sample beam passes through the sample cell (7) through which the sample gas flows and reaches the left-hand side of the detector (10) attenuated to a lesser or greater extent depending on the concentration of the sample gas. The detector is filled with a defined concentration of the gas component to be measured.

The detector is designed as a double-layer detector. The center of the absorption band is preferentially absorbed in the upper detector layer, the edges of the band are absorbed to approximately the same extent in the upper and lower layers. The upper and lower detector layers are connected together via the microflow sensor (12). This coupling means that the spectral sensitivity has a very narrow band.

The optical coupler (13) lengthens the lower receiver cell layer optically. The infrared absorption in the second detector layer is varied by changing the slider position (14). It is thus possible to individually minimize the influence of interfering components.

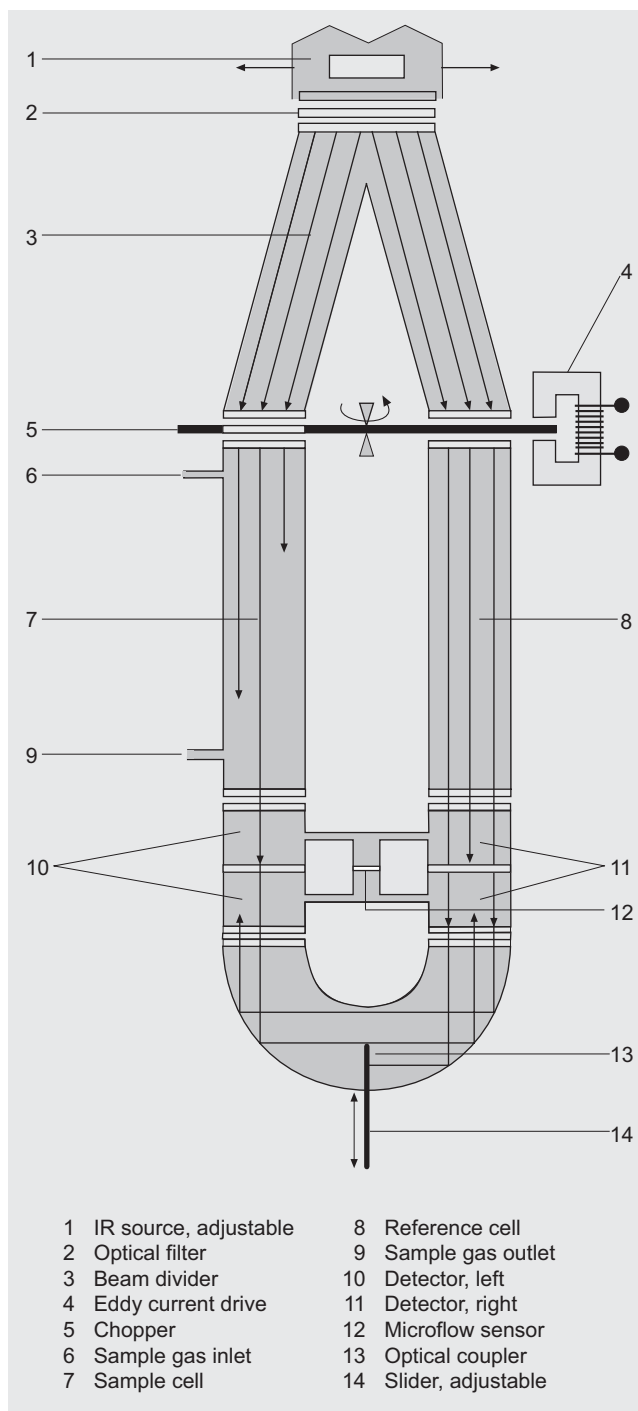
A chopper (5) rotates between the beam divider and the sample cell and interrupts the two beams alternately and periodically. If absorption takes place in the sample cell, a pulsating flow is generated between the two detector levels which is converted by the microflow sensor (12) into an electric signal.

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

Note

The sample gases have to enter the analyzer dustfree. Avoid condensate in the sample cells. Therefore an appropriate gas preparation is required in most applications.

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



ULTRAMAT 6, mode of operation

Gas Analysis

ULTRAMAT 6

General

Essential characteristics

- Four freely-programmable measuring ranges per component
- Measuring ranges with suppressed zero possible
- Measuring range identification
- One electrically isolated signal output 0/2/4 to 20 mA per component
- Autoranging or manual range switching possible; remote switching is also possible
- Differential measuring ranges with flow-type reference cell
- Storage of measured values possible during calibration
- Time constants selectable within wide limits (static/dynamic noise suppression); i.e. the response time of the analyzer or the component can be matched to the respective application.
- Fast response time
- Low long-term drift
- Measuring-point selection for up to 6 measuring points (programmable)
- Measuring point identification
- Monitoring of sample gas flow (option)
- Internal pressure sensor for correction of variations in atmospheric pressure in the range 600 to 1200 hPa absolute
- External pressure sensor can be connected for correction of variations in the process gas pressure in the range 600 to 1500 hPa absolute (option)
- Two-stage access code to prevent unintentional and unauthorized inputs
- Automatic range calibration can be parameterized
- Simple handling using menu-based operation with numerical membrane keyboard
- Operation based on NAMUR Recommendation
- Customer-specific analyzer versions such as e.g.:
 - Customer acceptance
 - Tag labels
 - Drift recording
- Simple analyzer exchange since electric connections are easy to remove
- Sample cell for use in presence of highly corrosive sample gases (e.g. tantalum layer or Hastelloy C22).

Additional characteristics, dual-channel version

- Separate design of physical unit, electronics, inputs/outputs and power supply for each channel
- Display and operation via common LCD panel and keyboard
- Channels 1 and 2 can be converted to connection in series (linking of gas connections from channel 1 to channel 2 on rear).

Integration

Communication

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:

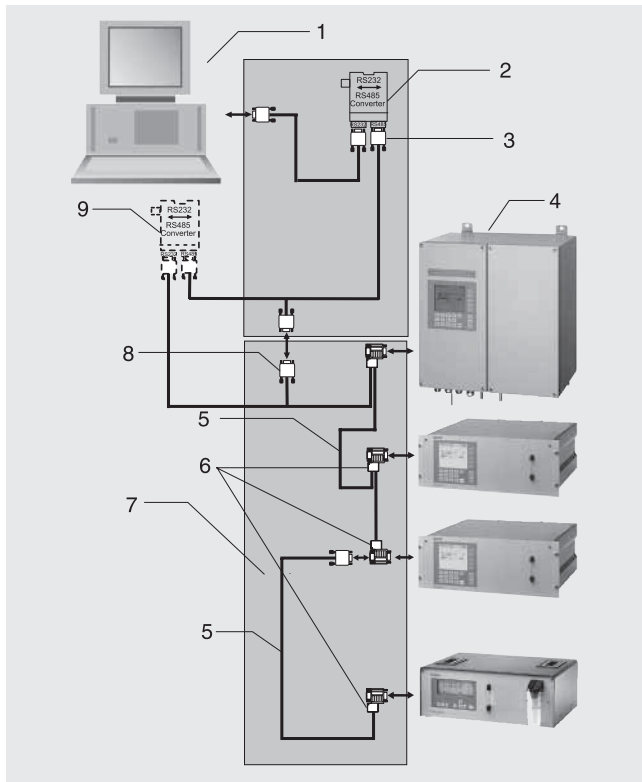
- RS 485 interface
- PROFIBUS DP/PA
- AK interface (only OXYMAT 6, ULTRAMAT 6 and ULTRAMAT/OXYMAT 6).

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

Order No.

Interface description

A5E00054148

RS 485/RS 232 converter

C79451-Z1589-U1

RS 485/Ethernet converter

C79451-A3364-D61

Further accessories (e.g. cable, connectors, repeater, etc.)

see Catalog IK PI or in the Mall / in CA 01 „SIMATIC NET Communications systems / PROFIBUS / Network components“

SIPROM GA via converter

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.

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.

Software requirements:

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

Gas Analysis

ULTRAMAT 6

General

SIPROM GA via Ethernet

Networking of several gateways is possible when using the RS 485/Ethernet converter. 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:
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	S79610-B4014-A1
Firmware retrofitting sets for older analyzers:	
ULTRAMAT 23 (prior to software version 2.06) all languages	C79451-A3494-S501
ULTRAMAT 6 (prior to software 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 software version 4.1)	
• German	C79451-A3480-S501
• English	C79451-A3480-S502
• French	C79451-A3480-S503
• Spanish	C79451-A3480-S504
• Italian	C79451-A3480-S505

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.

PROFIBUS DP/PA

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.

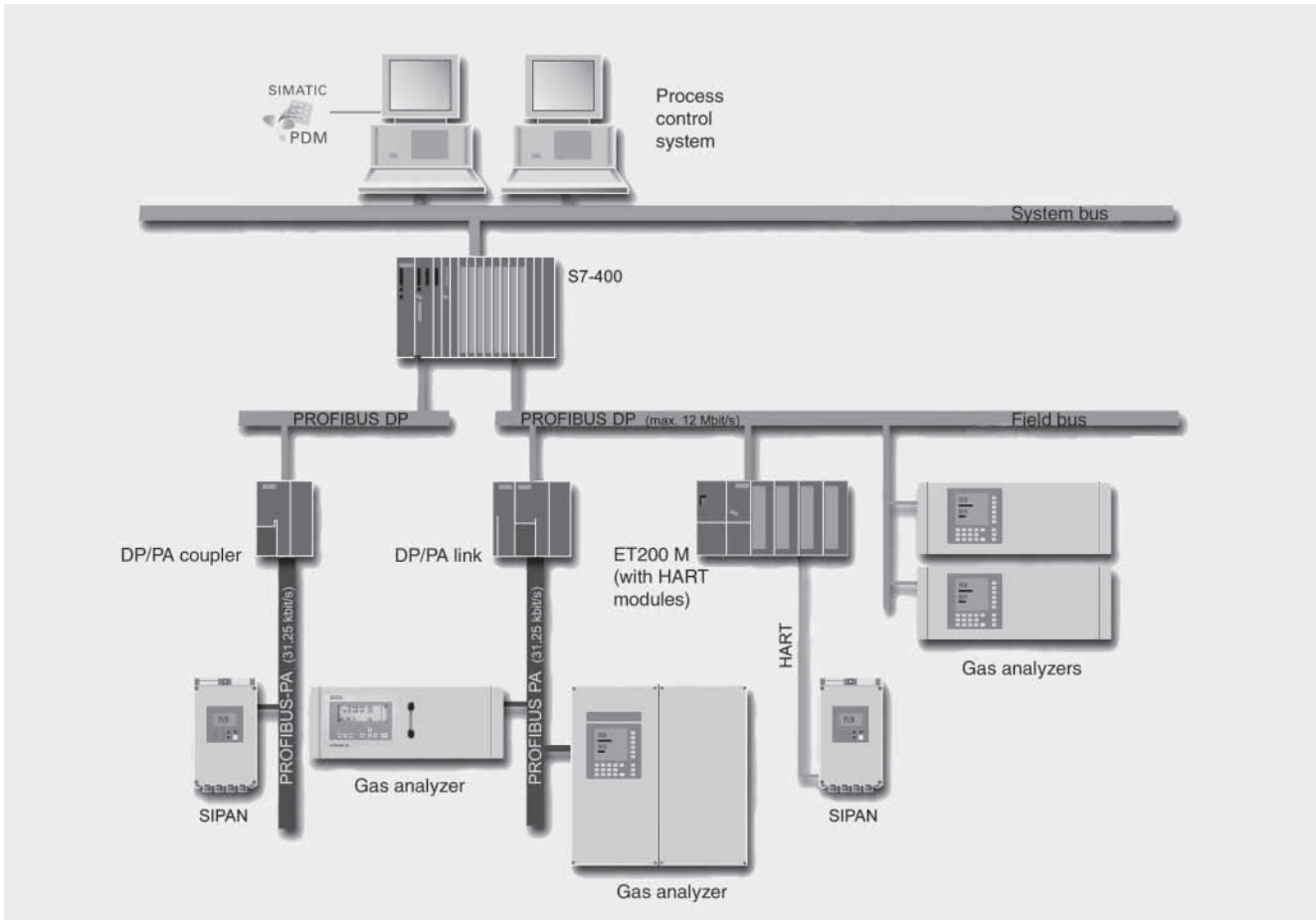
Operation of the gas analyzers from a control system or separate PC is possible using the SIMATIC PDM (Process Device Manager) operator input tool which is software executing under Windows and which can also be incorporated into the SIMATIC PCS 7 process control system. This permits clear display of 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.

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, OXYMAT 6/61, CALOMAT 6, FIDAMAT 6) as well as the ULTRAMAT 23 are suitable for PROFIBUS when fitted with the optional plug-in card.



Basic structure of a PROFIBUS system

Gas Analysis

ULTRAMAT 6

19" unit

Technical specifications

General

Measuring ranges	4, switchable internally and externally; autoranging is also possible
Smallest possible measuring range	Depending on application, e.g., CO: 0 to 10 vpm, CO ₂ : 0 to 5 vpm
Largest possible measuring span	Depending on application
Measuring range with suppressed zero	Every zero possible within 0 to 100 Vol.%, smallest possible measuring span 20%
Characteristic	Linearized
Position of use	Front panel vertical
Conformity	CE identification EN 50081-1, EN 50082-2

Design, enclosure

Weight	Approx. 15 kg (with one IR channel), approx. 21 kg (with two IR channels)
Degree of protection	IP20 according to EN 60529

Electrical characteristics

Electromagnetic compatibility (EMC)	According to standard requirements of NAMUR NE21 (08/98)	
Electrical safety	According to EN 61010-1, overvoltage category III	
Power supply	100 to 120 V AC (rated range 90 to 132 V), 48 to 63 Hz or 200 to 240 V AC (rated range 180 to 264 V), 48 to 63 Hz	
Power consumption	1-channel unit: approx. 40 VA 2-channel unit: approx. 70 VA	
Fuses		
• 100... 120 V	1T/250 1.6T/250	(7MB2121), (7MB2123)
• 200... 240 V	0.63T/250 1T/250	(7MB2121), (7MB2123)

Gas inlet conditions

Perm. sample gas pressure	
• for analyzers with hoses	
- without pressure switch	600 to 1500 hPa (absolute)
- with pressure switch	600 to 1300 hPa (absolute)
• for analyzers with pipes (without pressure switch)	600 to 1500 hPa (absolute)
Sample gas flow	18 to 90 l/h (0.3 to 1.5 l/min)
Sample gas temperature	0 to 50 °C
Sample gas humidity	< 90 % RH (relative humidity) or depending on application, non condensing

Time response

Warm-up period	With amb. temperature < 30 min (maximum accuracy achieved after 2 hours)
Response time (T ₉₀ time)	Dependent on length of analyzer cell, sample gas line and damping
Damping (electric time constant)	0 to 100 s, programmable
Dead time (purging time of gas path in analyzer at 1 l/min)	Approx. 0.5 to 5 s, depending on version
Time for internal signal processing	< 1 s

Pressure correction range

Pressure sensor	
• internal	600 to 1200 hPa absolute
• external	600 to 1500 hPa absolute

Measuring response (maximum accuracy achieved after 2 hours)

Output signal fluctuation	± 0.1 % to ± 1 % of smallest possible measuring range specified on rating plate depending on application with the unit specific electronic time constant (corresponds to ± 0.33 % at 2σ)
Zero drift	< 1% of measuring range/week
Measured-value drift	< 1% of measuring range/week
Repeatability	= 1% of respective measuring range
Linearity error	< 0.5% of full-scale value

Influencing variables (referred to 1000 hPa sample gas pressure, 0.5 l/min sample gas flow and 25 °C ambient temperature)

Ambient temperature	< 1% of measuring range/10 K
Sample gas pressure	With pressure compensation: < 0.15% of span/1% change in atmospheric pressure without pressure compensation: < 1.5% of span/1% change in atmospheric pressure
Sample gas flow	Negligible
Power supply	< 0.1% of output signal span with rated voltage ± 10%
Ambient conditions	Application-dependent influencing of measurement if ambient air contains measured component or cross-sensitive gases

Electric inputs and outputs

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

Ambient conditions

Permissible ambient temperature	-30 to +70 °C during storage and transport, +5 to +45 °C during operation
Permissible humidity	< 90 % RH (relative humidity) as annual average, during storage and transport (dew point must not be fallen below)

Selection and ordering data

ULTRAMAT 6 gas analyzer

Single-channel 19" unit for installation in cabinets

Gas connections for sample gas and reference gas

Piping with outer diameter 6 mm

Piping with outer diameter 1/4"

Measured component	possible with range code
CO	11 ... 30
CO highly selective (with optical filter)	12 ... 30
CO (TÜV; see Table TÜV, single component)	
CO ₂	10 ... 30
CH ₄	13 ... 30
C ₂ H ₂	15 ... 30
C ₂ H ₄	15 ... 30
C ₂ H ₆	14 ... 30
C ₃ H ₆	14 ... 30
C ₃ H ₈	13 ... 30
C ₄ H ₆	15 ... 30
C ₄ H ₁₀	14 ... 30
C ₆ H ₁₄	14 ... 30
SO ₂ (TÜV; see Table TÜV, single component)	13 ... 30
NO (TÜV; see Table TÜV, single component)	14 ... 20, 22
NH ₃ (dry)	14 ... 30
H ₂ O	17 ... 20, 22
N ₂ O	13 ... 30

Smallest meas. range	Largest meas. range	Meas. range code
0 ... 5 vpm	0 ... 100 vpm	10
0 ... 10 vpm	0 ... 200 vpm	11
0 ... 20 vpm	0 ... 400 vpm	12
0 ... 50 vpm	0 ... 1000 vpm	13
0 ... 100 vpm	0 ... 1000 vpm	14
0 ... 300 vpm	0 ... 3000 vpm	15
0 ... 500 vpm	0 ... 5000 vpm	16
0 ... 1000 vpm	0 ... 10000 vpm	17
0 ... 3000 vpm	0 ... 10000 vpm	19
0 ... 3000 vpm	0 ... 30000 vpm	19
0 ... 5000 vpm	0 ... 15000 vpm	20
0 ... 5000 vpm	0 ... 50000 vpm	21
0 ... 1%	0 ... 3%	22
0 ... 1%	0 ... 10%	23
0 ... 3%	0 ... 10%	24
0 ... 3%	0 ... 30%	25
0 ... 5%	0 ... 15%	26
0 ... 5%	0 ... 50%	27
0 ... 10%	0 ... 30%	28
0 ... 10%	0 ... 100%	29
0 ... 30%	0 ... 100%	30

Internal gas paths	Sample cell (lining)	Reference cell (flow-type)
Hose made of FKM (Viton)	Aluminum	Non-flow-type
	Aluminum	Flow-type
Pipe made of titanium	Tantalum ¹⁾	Non-flow-type
	Tantalum ¹⁾	Flow-type
Pipe made of SS (type No. 1.4571)	Aluminum	Non-flow-type
	Tantalum ¹⁾	Non-flow-type

With sample gas monitoring

Hose made of FKM (Viton)	Aluminum	Non-flow-type
	Aluminum	Flow-type

Order No.

7MB2121 - - AA

cannot be combined

0 → A21
1 → A20

A
B
X
C
D
E
F
G
H
J
K
L
M
N
P
Q
R
S

Q
R

A
B
C
D
E
F
G
H
J
K
L
M
N
P
Q
R
S
T
U
V
W

0 → A20, A21
1 →
4 → A20, A21, Y02
5 → Y02
6 → A20, A21
8 → A20, A21
2 → A20, A21
3

1) Only for sample cell length 20 mm to 180 mm

Selection and ordering data

ULTRAMAT 6 gas analyzer

Dual-channel 19" unit for installation in cabinets to measure 2 IR-components

Gas connections for sample gas and reference gas

Piping with outer diameter 6 mm

Piping with outer diameter 1/4"

Measured component possible with range codes

CO	11 ... 30
CO (highly selective (with optical filter))	12 ... 30
CO (TÜV; see Table TÜV, 2 components)	
CO ₂	10 ... 30
CH ₄	13 ... 30
C ₂ H ₂	15 ... 30
C ₂ H ₄	15 ... 30
C ₂ H ₆	14 ... 30
C ₃ H ₆	14 ... 30
C ₃ H ₈	13 ... 30
C ₄ H ₆	15 ... 30
C ₄ H ₁₀	14 ... 30
C ₆ H ₁₄	14 ... 30
SO ₂ (TÜV; see Table TÜV, 2 components)	13 ... 30
NO (TÜV; see Table TÜV, 2 components)	14 ... 20, 22
NH ₃ (dry)	14 ... 30
H ₂ O	17 ... 20, 22
N ₂ O	13 ... 30

Smallest meas. range Largest meas. range Meas. range code

0 ... 5 vpm	0 ... 100 vpm	10
0 ... 10 vpm	0 ... 200 vpm	11
0 ... 20 vpm	0 ... 400 vpm	12
0 ... 50 vpm	0 ... 1000 vpm	13
0 ... 100 vpm	0 ... 1000 vpm	14
0 ... 300 vpm	0 ... 3000 vpm	15
0 ... 500 vpm	0 ... 5000 vpm	16
0 ... 1000 vpm	0 ... 10000 vpm	17
0 ... 3000 vpm	0 ... 10000 vpm	19
0 ... 3000 vpm	0 ... 30000 vpm	19
0 ... 5000 vpm	0 ... 15000 vpm	20
0 ... 5000 vpm	0 ... 50000 vpm	21
0 ... 1%	0 ... 3%	22
0 ... 1%	0 ... 10%	23
0 ... 3%	0 ... 10%	24
0 ... 3%	0 ... 30%	25
0 ... 5%	0 ... 15%	26
0 ... 5%	0 ... 50%	27
0 ... 10%	0 ... 30%	28
0 ... 10%	0 ... 100%	29
0 ... 30%	0 ... 100%	30

Internal gas paths Sample cell (lining) Reference cell (flow-type)

Hose made of FKM (Viton)	Aluminum	Non-flow-type
	Aluminum	Flow-type
Pipe made of titanium	Tantalum ¹⁾	Non-flow-type
	Tantalum ¹⁾	Flow-type
Pipe made of SS (type No. 1.4571)	Aluminum	Non-flow-type
	Tantalum ¹⁾	Non-flow-type

With sample gas monitoring

Hose made of FKM (Viton)	Aluminum	Non-flow-type
	Aluminum	Flow-type

Order No.

7MB2123 - - - - -

cannot be combined

0
1

0 → A21, A41
1 → A20, A40

A
B
X
C
D
E
F
G
H
J
K
L
M
N
P
Q
R
S

Q
R

A
B
C
D
E
F
G
H
J
K
L
M
N
P
Q
R
S
T
U
V
W

0
1
4
5
6
8
2
3

0 → A20, A21, A40, A41
1
4 → A20, A21, A40, A41, Y02
5 → Y02
6 → A20, A21, A40, A41
8 → A20, A21, A40, A41
2 → A20, A21, A40, A41
3

1) Only for sample cell length 20 mm to 180 mm.

Selection and ordering data

Further versions	Order code	<u>cannot be combined</u>
Please add „-Z“ to Order No. and specify Order code.		
Interface converter from RS 485 to RS 232	A11	→ E20
Flow-type reference side with reduced flow, 6 mm (channel 1)	A20	
Flow-type reference side with reduced flow, ¼" (channel 1)	A21	
Flow-type reference side with reduced flow, 6 mm (channel 2)	A40	
Flow-type reference side with reduced flow, ¼" (channel 2)	A41	
Connection pipes (can only be combined with the according gas connection diameter and materials of the internal gas path)		
- Connection pipe made of titanium 6 mm, complete with screwed gland, for sample gas side	A22	
- Connection pipe made of titanium 6 mm, complete with screwed gland, for reference gas side	A23	
- Connection pipe made of titanium ¼", complete with screwed gland, for sample gas side	A24	
- Connection pipe made of titanium ¼", complete with screwed gland, for reference gas side	A25	
- Connection pipe made of SS (type no. 1.4571) 6 mm, compl. with screwed gland for sample gas side	A27	
- Connection pipe made of SS (type no. 1.4571) ¼", complete with screwed gland, for sample gas side	A29	
Slide rails (2 rails)	A31	
Set of Torx tools, socket spanner	A32	
TAG labels (customer-defined inscriptions)	B03	
Kalrez gaskets in sample gas path (channel 1)	B04	
Kalrez gaskets in sample gas path (channel 2)	B05	
Certificate CSA – Class I Div 2	E20	
Customer acceptance (in factory before delivery)	Y01	
Clean for O ₂ -Service (specially cleaned gas path) (channel 1 + 2)	Y02	→ A22 - A25
Drift recording	Y03	
Measuring range in plain text, if different from standard setting	Y11	
Special setting (only in conjunction with an application No., e.g. extended measuring range outside standard ranges)	Y12	
Extended special setting (only in conjunction with an application No., e.g. determination of cross-interferences)	Y13	
TÜV version according to 17. BlmSch	Y17	
TÜV version according to 17. BlmSch (channel 2)	Y18	
Retrofitting sets		
RS 485/Ethernet converter	C79451-A3364-D61	
RS 485/RS 232 converter	C79451-Z1589-U1	
Autocal function with serial interface for the automotive industry (AK)	C79451-A3480-D12	
Autocal function with 8 binary inputs/outputs for channel 1 or channel 2	C79451-A3480-D511	
Autocal function with 8 binary inputs/outputs and PROFIBUS PA for channel 1 or channel 2	A5E00057307	
Autocal function with 8 binary inputs/outputs and PROFIBUS DP for channel 1 or channel 2	A5E00057312	
1) Only for sample cell length 20 mm to 180 mm.		

Gas Analysis

ULTRAMAT 6

19" unit

Selection and ordering data

ULTRAMAT 6 gas analyzer

Single or dual-channel 19" unit for installation in cabinets to measure 2-3 IR-components

Gas connections for sample gas and reference gas

Piping with outer diameter 6 mm

Piping with outer diameter 1/4"

Meas. component	Smallest meas. range	Largest meas. range
CO	0 ... 100 vpm	0 ... 1000 vpm
NO	0 ... 100 vpm	0 ... 1000 vpm
CO	0 ... 300 vpm	0 ... 3000 vpm
NO	0 ... 300 vpm	0 ... 3000 vpm
CO	0 ... 1000 vpm	0 ... 10000 vpm
NO	0 ... 1000 vpm	0 ... 10000 vpm
für CO/NO (TÜV; see Table TÜV, 2 components)		
CO ₂	0 ... 100 vpm	0 ... 1000 vpm
CO	0 ... 100 vpm	0 ... 1000 vpm
CO ₂	0 ... 300 vpm	0 ... 3000 vpm
CO	0 ... 300 vpm	0 ... 3000 vpm
CO ₂	0 ... 1000 vpm	0 ... 10000 vpm
CO	0 ... 1000 vpm	0 ... 10000 vpm
CO ₂	0 ... 3000 vpm	0 ... 30000 vpm
CO	0 ... 3000 vpm	0 ... 30000 vpm
CO ₂	0 ... 1%	0 ... 10%
CO	0 ... 1%	0 ... 10%
CO ₂	0 ... 3%	0 ... 30%
CO	0 ... 3%	0 ... 30%
CO ₂	0 ... 10%	0 ... 100%
CO	0 ... 10%	0 ... 100%
CO ₂	0 ... 10%	0 ... 100%
CH ₄	0 ... 10%	0 ... 100%
CO ₂	0 ... 100 vpm	0 ... 1000 vpm
NO	0 ... 100 vpm	0 ... 1000 vpm
CO ₂	0 ... 300 vpm	0 ... 3000 vpm
NO	0 ... 300 vpm	0 ... 3000 vpm

Internal gas paths	Sample cell (lining)	Reference cell (flow-type)
Hose made of FKM (Viton)	Aluminum	Non-flow-type
	Aluminum	Flow-type
Pipe made of titanium	Tantalum ¹⁾	Non-flow-type
	Tantalum ¹⁾	Flow-type
Pipe made of SS (type No. 1.4571)	Aluminum	Non-flow-type
	Tantalum ¹⁾	Non-flow-type

Without
Autocal board
• With 8 additional binary inputs/outputs for channel 1
• With 8 additional binary inputs/outputs for channel 1 and channel 2
• With serial interface for the automotive industry (AK), channel 1
• With serial interface for the automotive industry (AK), channel 1 and channel 2
• With 8 additional binary inputs/outputs for channel 1 and PROFIBUS PA interface
• With 8 additional binary inputs/outputs for channel 1 and channel 2 and PROFIBUS PA interface
• With 8 additional binary inputs/outputs for channel 1 and PROFIBUS DP interface
• With 8 additional binary inputs/outputs for channel 1 and channel 2 and PROFIBUS DP interface

Additional electronics

Without

Autocal board

• With 8 additional binary inputs/outputs for channel 1

• With 8 additional binary inputs/outputs for channel 1 and channel 2

• With serial interface for the automotive industry (AK), channel 1

• With serial interface for the automotive industry (AK), channel 1 and channel 2

• With 8 additional binary inputs/outputs for channel 1 and PROFIBUS PA interface

• With 8 additional binary inputs/outputs for channel 1 and channel 2 and PROFIBUS PA interface

• With 8 additional binary inputs/outputs for channel 1 and PROFIBUS DP interface

• With 8 additional binary inputs/outputs for channel 1 and channel 2 and PROFIBUS DP interface

Order No.

7MB2124 - - - - -

cannot be combined

0
1

0 → A21, A41
1 → A20, A40

AA
AB
AC
BA
BB
BC
BD
BE
BF
BG
CG
DA
DB

0 0 → A20, A21, A40, A41
1
4 → A20, A21, A40, A41, Y02
5 → Y02
6 → A20, A21, A40, A41
8 → A20, A21, A40, A41
2 2 → A20, A21, A40, A41
3
2
3 → E20
4 → E20
6
8

1) Only for sample cell length 20 mm to 180 mm.

Selection and ordering data

Order No.

ULTRAMAT 6 gas analyzer

Single or dual-channel 19" unit for installation in cabinets to measure 2-3 IR-components

Power supply

100 ... 120 V AC, 48 ... 63 Hz

200 ... 240 V AC, 48 ... 63 Hz

Channel 2

Measured component

possible with
range codes

Without channel 2

CO	11 ... 30
CO (highly selective (with optical filter))	12 ... 30
CO (TÜV; see Table TÜV, 2 components)	
CO ₂	10 ... 30
CH ₄	13 ... 30
C ₂ H ₂	15 ... 30
C ₂ H ₄	15 ... 30
C ₂ H ₆	14 ... 30
C ₃ H ₆	14 ... 30
C ₃ H ₈	13 ... 30
C ₄ H ₆	15 ... 30
C ₄ H ₁₀	14 ... 30
C ₆ H ₁₄	14 ... 30
SO ₂ (TÜV; see Table TÜV 2 components)	13 ... 30
NO (TÜV; see Table TÜV 2 components)	14 ... 20, 22
NH ₃ (dry)	14 ... 30
H ₂ O	17 ... 20, 22
N ₂ O	13 ... 30

Smallest meas. range Largest meas. range Meas. range code

Without channel 2

0 ... 5 vpm	0 ... 100 vpm	10
0 ... 10 vpm	0 ... 200 vpm	11
0 ... 20 vpm	0 ... 400 vpm	12
0 ... 50 vpm	0 ... 1000 vpm	13
0 ... 100 vpm	0 ... 1000 vpm	14
0 ... 300 vpm	0 ... 3000 vpm	15
0 ... 500 vpm	0 ... 5000 vpm	16
0 ... 1000 vpm	0 ... 10000 vpm	17
0 ... 3000 vpm	0 ... 10000 vpm	19
0 ... 3000 vpm	0 ... 30000 vpm	19
0 ... 5000 vpm	0 ... 15000 vpm	20
0 ... 5000 vpm	0 ... 50000 vpm	21
0 ... 1%	0 ... 3%	22
0 ... 1%	0 ... 10%	23
0 ... 3%	0 ... 10%	24
0 ... 3%	0 ... 30%	25
0 ... 5%	0 ... 15%	26
0 ... 5%	0 ... 50%	27
0 ... 10%	0 ... 30%	28
0 ... 10%	0 ... 100%	29
0 ... 30%	0 ... 100%	30

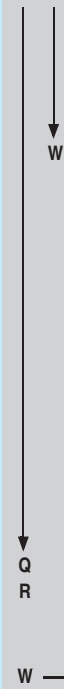
Operating software and documentation

German
English
French
Spanish
Italian

7MB2124 -

0
1
W
A
B
X
C
D
E
F
G
H
J
K
L
M
N
P
Q
R
S
W
A
B
C
D
E
F
C
H
J
K
L
M
N
P
Q
R
S
T
U
V
W
0
1
2
3
4

cannot be combined



W → A40, A41, B05

Gas Analysis

ULTRAMAT 6

19" unit

Selection and ordering data

Further versions

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

Order code

cannot be combined

Interface converter from RS 485 to RS 232

A11

→ E20

Flow-type reference side with reduced flow, 6 mm (channel 1)

A20

Flow-type reference side with reduced flow, 1/4" (channel 1)

A21

Flow-type reference side with reduced flow, 6 mm (channel 2)

A40

Flow-type reference side with reduced flow, 1/4" (channel 2)

A41

Connection pipes

(can only be combined with the according gas connection diameter and materials of the internal gas path)

- Connection pipe made of titanium 6 mm, complete with screwed gland, for sample gas side

A22

- Connection pipe made of titanium 6 mm, complete with screwed gland, for reference gas side

A23

- Connection pipe made of titanium 1/4", complete with screwed gland, for sample gas side

A24

- Connection pipe made of titanium 1/4", complete with screwed gland, for reference gas side

A25

- Connection pipe made of SS (type no. 1.4571) 6 mm, compl. with screwed gland for sample gas side

A27

- Connection pipe made of SS (type no. 1.4571) 1/4", complete with screwed gland, for sample gas side

A29

Slide rails (2 rails)

A31

Set of Torx tools, socket spanner

A32

TAG labels (customer-defined inscriptions)

B03

Kalrez gaskets in sample gas path (channel 1)

B04

Kalrez gaskets in sample gas path (channel 2)

B05

Certificate CSA – Class I Div 2

E20

Customer acceptance (in factory before delivery)

Y01

Clean for O₂-Service (specially cleaned gas path) (channel 1 + 2)

Y02

→ A22 - A25

Drift recording

Y03

Measuring range in plain text, if different from standard setting

Y11

Special setting (only in conjunction with an application No., e.g. extended measuring range outside standard ranges)

Y12

Extended special setting (only in conjunction with an application No., e.g. determination of cros-interferences)

Y13

TÜV version according to 17. BlmSch

Y17

TÜV version according to 17. BlmSch (channel 2)

Y18

Retrofitting sets

Order No.

RS 485/Ethernet converter

C79451-A3364-D61

RS 485/RS 232 converter

C79451-Z1589-U1

Autocal function with serial interface for the automotive industry (AK)

C79451-A3480-D12

Autocal function with serial interface for the automotive industry (AK) (channel 1 + 2)

C79451-A3480-D33

Autocal function with 8 binary inputs/outputs for channel 1 or channel 2

C79451-A3480-D511

Autocal function with 8 binary inputs/outputs and PROFIBUS PA for channel 1 or channel 2

A5E00057307

Autocal function with 8 binary inputs/outputs and PROFIBUS DP for channel 1 or channel 2

A5E00057312

TÜV, single component

Component Measuring range identification	CO (TÜV)		SO ₂ (TÜV)		NO (TÜV)	
	Smallest measuring range from 0 to ...	Largest measuring range from 0 to ...	Smallest measuring range from 0 to ...	Largest measuring range from 0 to ...	Smallest measuring range from 0 to ...	Largest measuring range from 0 to ...
C			75 mg/m ³	1500 mg/m ³		
D	50 mg/m ³	1000 mg/m ³	300 mg/m ³	3000 mg/m ³		
E			500 mg/m ³	5000 mg/m ³	100 mg/m ³	2000 mg/m ³
F	300 mg/m ³	3000 mg/m ³	1000 mg/m ³	10000 mg/m ³	300 mg/m ³	3000 mg/m ³
G	500 mg/m ³	5000 mg/m ³			500 mg/m ³	5000 mg/m ³
H	1000 mg/m ³	10000 mg/m ³	3000 mg/m ³	30000 mg/m ³	1000 mg/m ³	10000 mg/m ³
K	3000 mg/m ³	30000 mg/m ³	10 g/m ³	100 g/m ³	3000 mg/m ³	30000 mg/m ³
P	10 g/m ³	100 g/m ³	30 g/m ³	300 g/m ³	10 g/m ³	100 g/m ³
R	30 g/m ³	300 g/m ³	100 g/m ³	1000 g/m ³	30 g/m ³	300 g/m ³
V	100 g/m ³	1160 g/m ³	300 g/m ³	2630 g/m ³	100 g/m ³	1250 g/m ³

Example for ordering

ULTRAMAT 6, TÜV
 Component CO
 Measuring range 0 ... 50/1000 mg/m³
 with hoses, non-flow-type reference side
 without automatic adjustment (Autocal)
 230 V AC; German
7MB2121-0XD00-1AA0-Z +Y17

TÜV, 2 components in series

Component Measuring range identification	CO (TÜV)		NO (TÜV)	
	Smallest measuring range from 0 to ...	Largest measuring range from 0 to ...	Smallest measuring range from 0 to ...	Largest measuring range from 0 to ...
AA	75 mg/m ³	1000 mg/m ³	200 mg/m ³	2000 mg/m ³
AB	300 mg/m ³	3000 mg/m ³	300 mg/m ³	3000 mg/m ³
AC	1000 mg/m ³	10000 mg/m ³	1000 mg/m ³	10000 mg/m ³

Example for ordering

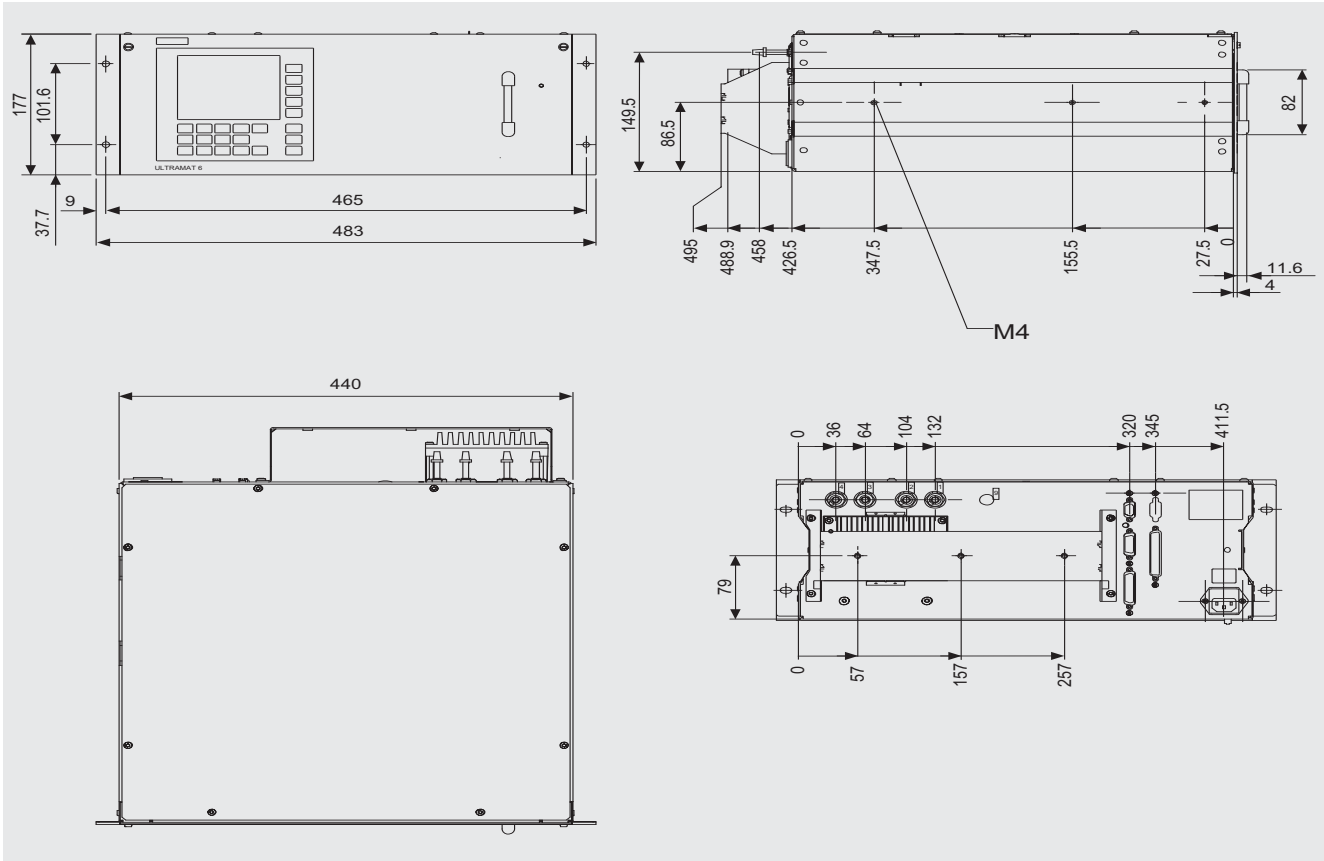
ULTRAMAT 6, 2-Kanal, TÜV
 Component CO/NO + SO₂
 Measuring range CO: 0 ... 75/1000 mg/m³,
 NO: 0 ... 200/2000 mg/m³,
 SO₂: 0 ... 75/1500 mg/m³
 with hoses, non-flow-type reference side
 without automatic adjustment (Autocal)
 230 V AC; German
7MB2124-0AA00-1NC0-Z +Y17+Y18

Note: for 3 components take both tables into consideration.

Gas Analysis ULTRAMAT 6

19" unit

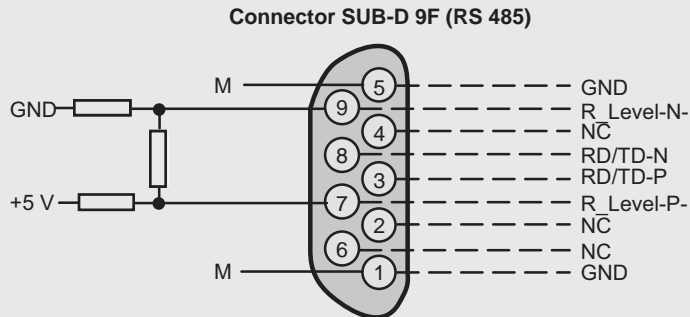
Dimensional drawings



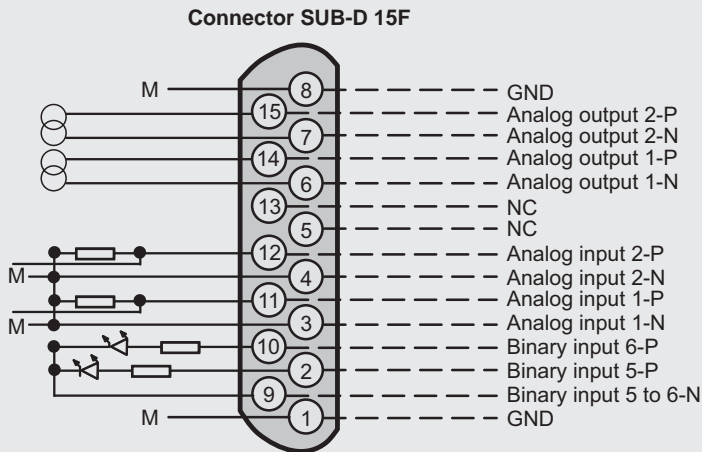
ULTRAMAT 6, 19" unit, dimensions in mm

Schematics

Pin assignment (electrical and gas connections)

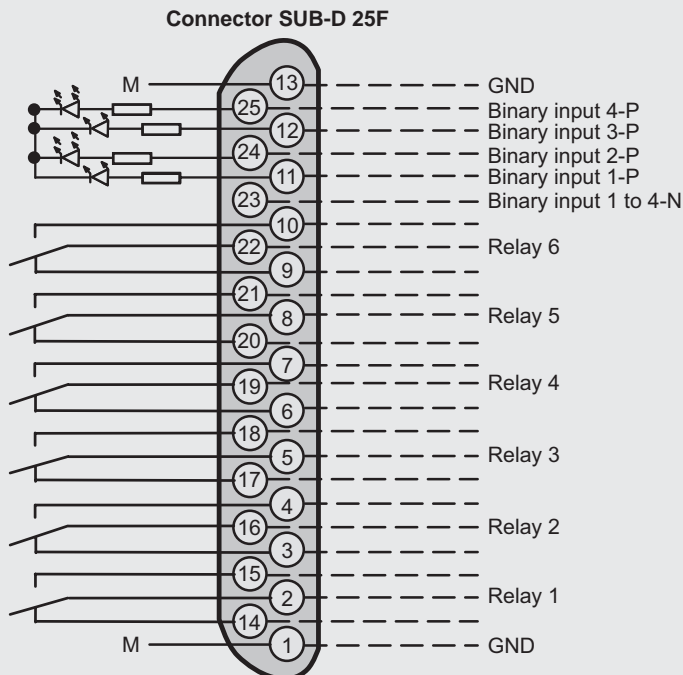


Possibility for connection of bus terminating resistors to pins 7 and 9.



only with 2-component version of the ULTRAMAT part
Floating analog outputs (also with respect to one another), $R_L \leq 750 \Omega$

Pressure correction } Non-floating analog inputs,
Pressure correction } 0 to 20 mA/500 Ω
Interfering gas corr. } or 0 to 10 V
Interfering gas corr. } (low-resistance)
Floating via optical coupler
"0" = 0 V (0 to 4.5 V)
"1" = 24 V (13 to 33 V)



Floating via optical coupler
"0" = 0 V (0 to 4.5 V)
"1" = 24 V (13 to 33 V)

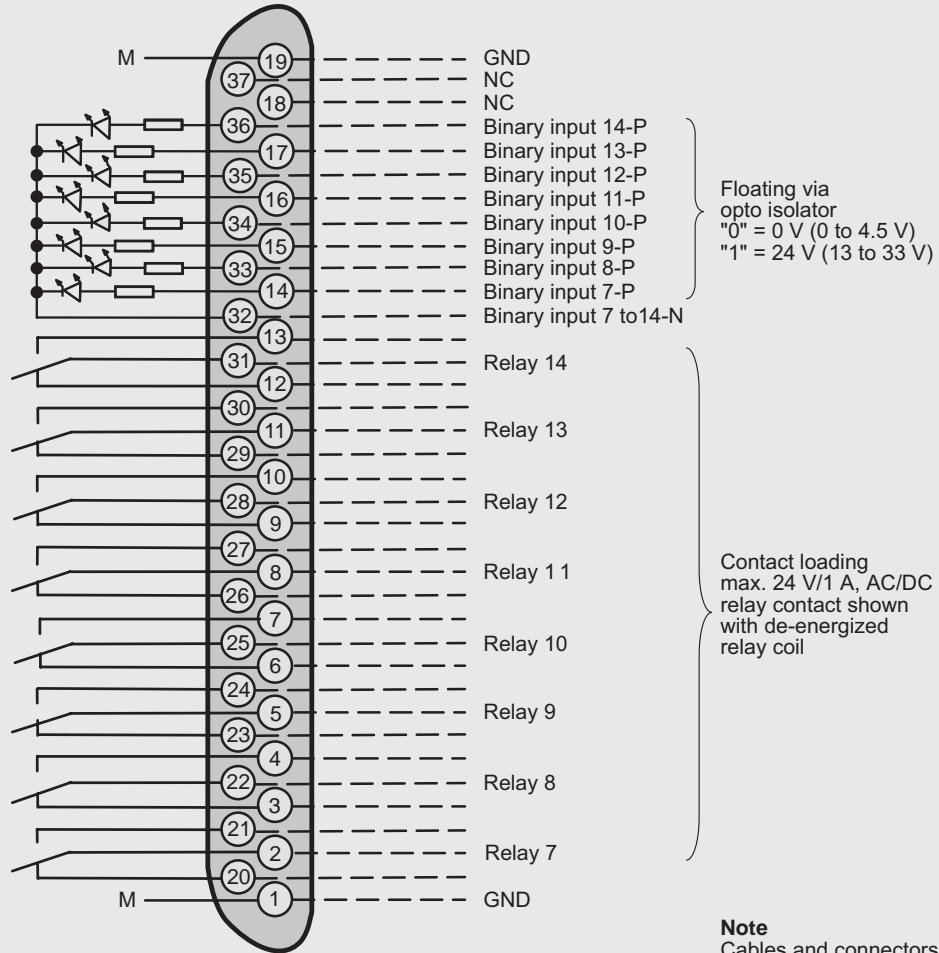
Contact loading
max. 24 V/1 A, AC/DC;
relay contacts shown:
de-energized relay coil

Note
Cables and plugs must be shielded and connected to chassis potential

Gas Analysis ULTRAMAT 6

19" unit

Connector SUB-D 37F (Option)

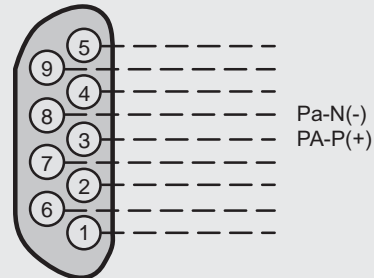
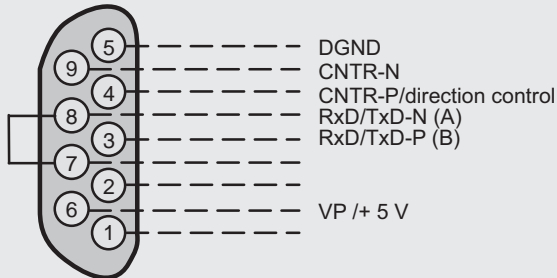


Note
Cables and connectors must be shielded and connected to chassis potential.

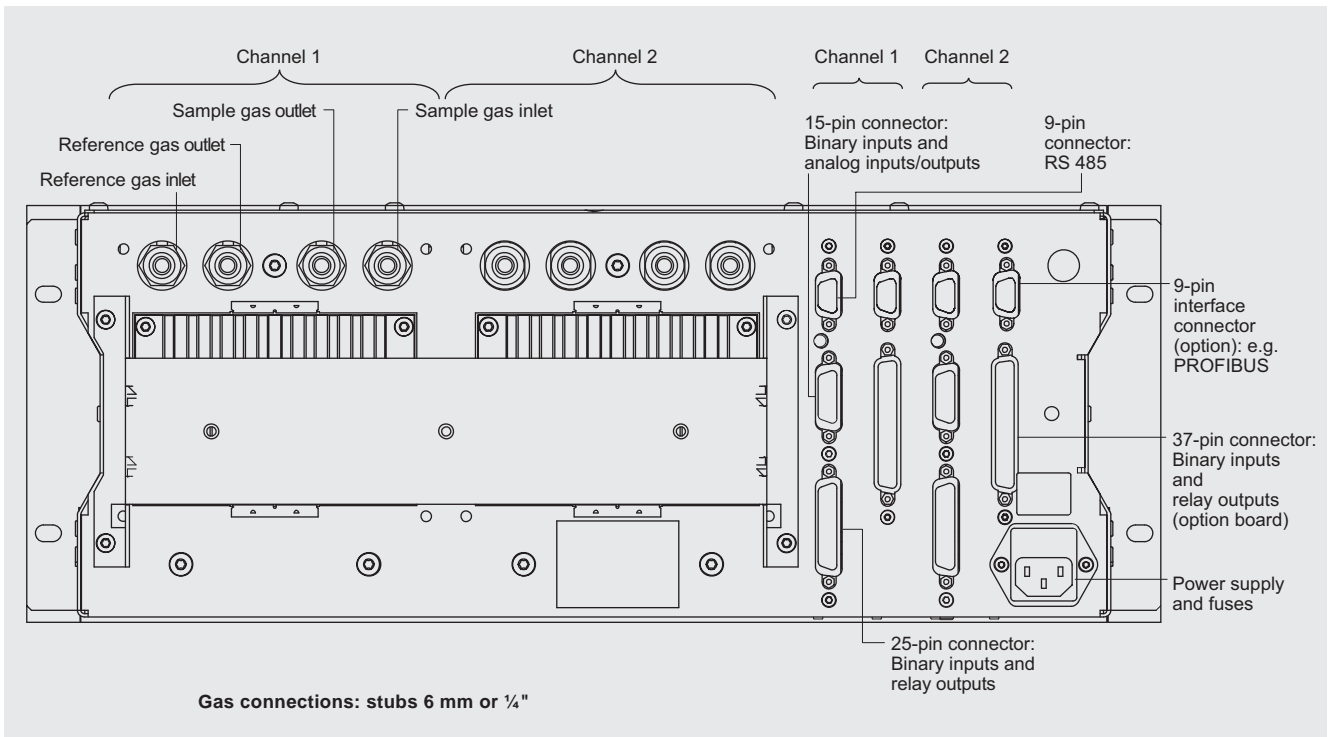
Connector SUB-D 9F -X90 PROFIBUS DP

optional

Connector SUB-D 9M -X90 PROFIBUS PA



ULTRAMAT 6, 19" unit, pin assignment of Autocal board and PROFIBUS connectors



ULTRAMAT 6, 19" unit, gas and electrical connections

Gas Analysis

ULTRAMAT 6

Field unit

Technical specifications

General

Measuring ranges	4, switchable internally and externally; autoranging is also possible
Smallest possible measuring range	Depending on application, e.g. CO: 0 to 10 vpm, CO ₂ : 0 to 5 vpm
Largest possible measuring range	Depending on application
Measuring range with suppressed zero	Any zero point within 0 to 100 % can be achieved; smallest possible span 20 %
Characteristic	Linearized
Position of use	Front panel vertical
Conformity	CE identification EN 50081-1, EN 50082-2

Design, enclosure

Weight	Approx. 32 kg
Degree of protection	IP65 according to EN 60529, restricted breathing to EN 50021

Electrical characteristics

Power supply	100 to 120 V AC (rated range 90 to 132 V), 48 to 63 Hz or 200 to 240 V AC (rated range 180 to 264 V), 48 to 63 Hz
Power consumption	Approx. 35 VA; approx. 330 VA with heated version
Electromagnetic compatibility (EMC)	According to standard requirements of NAMUR NE21 (08/98)
Electrical safety	According to EN 61010-1
• heated units	overvoltage category II
• unheated units	overvoltage category III
Fuses (unit without heater)	
• 100... 120 V	F3: 1T/250; F4: 1T/250
• 200... 240 V	F3: 0.63T/250; F4: 0.63T/250
Fuses (unit with heater)	
• 100... 120 V	F1: 1T/250; F2: 4T/250 F3: 4T/250; F4: 4T/250
• 200... 240 V	F1: 0.63T/250; F2: 2.5T/250 F3: 2.5T/250; F4: 2.5T/250

Gas inlet conditions

Perm. sample gas pressure	
• for analyzers with hoses (without pressure switch)	600 to 1500 hPa (absolute)
• for analyzers with pipes (without pressure switch)	600 to 1500 hPa (absolute)
- Ex (leakage compensation)	600 to 1160 hPa (absolute)
- Ex (continuous purging)	600 to 1500 hPa (absolute)
Purging gas pressure	
• Permanent	< 165 hPa above ambient
• For short periods	250 hPa above ambient
Sample gas flow	18 to 90 l/h (0.3 to 1.5 l/min)
Sample gas temperature	0 to 50 °C; with heated version: 0 to 80 °C
Sample gas humidity	< 90% RH (relative humidity) or depending on application

Time response

Warm-up period	With amb. temperature < 30 min (maximum accuracy achieved after 2 hours); heated version: approx. 90 min
----------------	--

Response time (T ₉₀ time)	Dependent on length of analyzer cell, sample gas line and damping
Damping (electric time constant)	0 to 100 s, programmable
Dead time (purging time of gas path in analyzer at 1 l/min)	Approx. 0.5 to 5 s, depending on version
Time for internal signal processing	< 1 s

Pressure correction range

Pressure sensor	
• internal	600 to 1200 hPa absolute
• external	600 to 1500 hPa absolute

Measuring response (maximum accuracy achieved after 2 hours)

Output signal fluctuation	± 0.1% to ± 1% of smallest possible measuring range specified on rating plate, depending on application with the unit specific electronic time constant (corresponds to ± 0.33% at 2σ)
Zero drift	< 1% of measuring range/week
Measured-value drift	< 1% of measuring range/week
Repeatability	Between 0.1% and 1% of respective measuring range
Linearity error	< 0.5% of full-scale value

Influencing variables (referred to 1000 hPa absolute sample gas pressure, 0.5 l/min sample gas flow and 25 °C ambient temperature)

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

Electric inputs and outputs

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

Ambient conditions

Permissible ambient temperature	-30 to +70 °C during storage and transport, +5 to +45 °C during operation
Permissible humidity	< 90 % RH (relative humidity) as annual average, during storage and transport) dew point must not be fallen below)

Selection and ordering data

ULTRAMAT 6 gas analyzer

for field mounting, single-channel, 1 component

Gas connections

Ferrule screw connection for pipe, outer diameter 6 mm

Ferrule screw connection for pipe, outer diameter 1/4"

Measured component

possible with
range codes

CO	11 ... 30
CO (highly selective (with optical filter))	12 ... 30
CO (TÜV; see Table TÜV, single component)	
CO ₂	10 ... 30
CH ₄	13 ... 30
C ₂ H ₂	15 ... 30
C ₂ H ₄	15 ... 30
C ₂ H ₆	14 ... 30
C ₃ H ₆	14 ... 30
C ₃ H ₈	13 ... 30
C ₄ H ₆	15 ... 30
C ₄ H ₁₀	14 ... 30
C ₆ H ₁₄	14 ... 30
SO ₂ (TÜV; see Table TÜV, single component)	13 ... 30
NO (TÜV; see Table TÜV, single component)	14 ... 20, 22
NH ₃ (dry)	14 ... 30
H ₂ O	17 ... 20; 22 (17 ... 24, 26; heated)
N ₂ O	13 ... 30

Smallest meas. range	Largest meas. range	Meas. range code
0 ... 5 vpm	0 ... 100 vpm	10
0 ... 10 vpm	0 ... 200 vpm	11
0 ... 20 vpm	0 ... 400 vpm	12
0 ... 50 vpm	0 ... 1000 vpm	13
0 ... 100 vpm	0 ... 1000 vpm	14
0 ... 300 vpm	0 ... 3000 vpm	15
0 ... 500 vpm	0 ... 5000 vpm	16
0 ... 1000 vpm	0 ... 10000 vpm	17
0 ... 3000 vpm	0 ... 10000 vpm	19
0 ... 3000 vpm	0 ... 30000 vpm	19
0 ... 5000 vpm	0 ... 15000 vpm	20
0 ... 5000 vpm	0 ... 50000 vpm	21
0 ... 1%	0 ... 3%	22
0 ... 1%	0 ... 10%	23
0 ... 3%	0 ... 10%	24
0 ... 3%	0 ... 30%	25
0 ... 5%	0 ... 15%	26
0 ... 5%	0 ... 50%	27
0 ... 10%	0 ... 30%	28
0 ... 10%	0 ... 100%	29
0 ... 30%	0 ... 100%	30

Order No.

7MB2111 - - - - - A

cannot be combined

0
1

0 → A29
1 → A28

A
B
X
C
D
E
F
G
H
J
K
L
M
N
P
Q
R
S

Q
R

A
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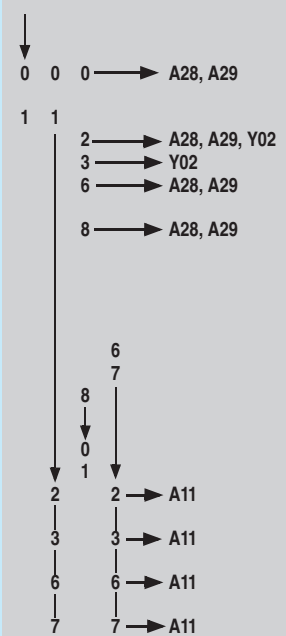
Gas Analysis

ULTRAMAT 6

Field unit

Selection and ordering data			Order No.
ULTRAMAT 6 gas analyzer for field mounting, single-channel, 1 component			7MB2111 - ■■■■ - ■■A■
<u>Internal gas paths</u>	<u>Sample cell (lining)</u>	<u>Reference cell (flow-type)</u>	
Hose made of FKM (Viton)	Aluminum	Non-flow-type	0
Pipe made of titanium	Aluminum	Flow-type	1
	Tantalum ¹⁾	Non-flow-type	2
	Tantalum ¹⁾	Flow-type	3
Pipe made of SS (type No. 1.4571)	Aluminum	Non-flow-type	6
	Tantalum ¹⁾	Non-flow-type	8
<u>Additional electronics</u>			
Without Autocal board			0
• With 8 additional binary inputs/outputs			1
• With 8 binary inputs/outputs and PROFIBUS PA interface			6
• With 8 binary inputs/outputs and PROFIBUS DP interface			7
• With 8 binary inputs/outputs and PROFIBUS PA Ex i			8
<u>Power supply</u>			
100 ... 120 V AC, 48 ... 63 Hz			0
200 ... 240 V AC, 48 ... 63 Hz			1
100 ... 120 V AC, 48 ... 63 Hz, acc. to ATEX II 2G ²⁾ (operating mode: leakage compensation)			2
200 ... 240 V AC, 48 ... 63 Hz, acc. to ATEX II 2G ²⁾ (operating mode: leakage compensation)			3
100 ... 120 V AC, 48 ... 63 Hz, acc. to ATEX II 2G ²⁾ (operating mode: continuous purging)			6
200 ... 240 V AC, 48 ... 63 Hz, acc. to ATEX II 2G ²⁾ (operating mode: continuous purging)			7
<u>Heating of the internal gas paths and analyzer section</u>			
Without			A
With (max. 65 °C)			B
<u>Operating software and documentation</u>			
German			0
English			1
French			2
Spanish			3
Italian			4

cannot be combined



1) Only for sample cell length 20 to 180 mm.
2) Only in relation with an approved purging unit.

Gas Analysis

ULTRAMAT 6

Field unit

Selection and ordering data

Further versions

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

Interface converter from RS 485 to RS 232

Order code

cannot be combined

A11

→ E20

Flow-type reference side with reduced flow, 6 mm

A28

Flow-type reference side with reduced flow, 1/4"

A29

Set of Torx tools, socket spanner

A32

TAG labels (customer-defined inscriptions)

B03

Kalrez gaskets in sample gas path

B04

Ex versions

Combination possibilities s. Table Ex configurations in „Ex versions“

ATEX II 3G certificate; restricted breathing, non-flammable gases

E11

ATEX II 3G certificate; flammable gases ¹⁾

E12

CSA certificate – Class I Div. 2

E20

ATEX II 3D certificate; dust Ex areas and additionally:

- in non-hazardous gas zone
- in Ex zone acc. ATEX II 3G, and non-flammable gases
- in Ex zone acc. ATEX II 3G, and flammable gases ¹⁾

E40

E41

E42

Customer acceptance (in factory before delivery)

Y01

Clean for O₂-Service (specially cleaned gas path)

Y02

Drift recording

Y03

Customer acceptance explosion-protected units incl. BARTEC purging enclosure

Y04

→ E11, E20, E40, E41

Measuring range in plain text, if different from standard setting

Y11

Special setting (only in conjunction with an application No., e.g. extended measuring range outside standard ranges)

Y12

Extended special setting

Y13

(only in conjunction with an application No., e.g. determination of cross-interferences)

TÜV version according to 17. BlmSch

Y17

Additional units for explosion-proof versions Category ATEX II 2G (Zone 1)

Order No.

BARTEC EEx p control unit, 230 V, „leakage compensation“

7MB8000-2BA

BARTEC EEx p control unit, 115 V, „leakage compensation“

7MB8000-2BB

BARTEC EEx p control unit, 230 V, „continuous purging“

7MB8000-2CA

BARTEC EEx p control unit, 115 V, „continuous purging“

7MB8000-2CB

Explosion-protected isolation amplifier

7MB8000-3AA

Explosion-protected isolating relay, 230 V

7MB8000-4AA

Explosion-protected isolating relay, 110 V

7MB8000-4AB

Differential pressure switch for corrosive gases

7MB8000-5AA

Differential pressure switch for non-corrosive gases

7MB8000-5AB

Flame arrester made of stainless steel

7MB8000-6BA

Flame arrester made of Hastelloy

7MB8000-6BB

Category ATEX II 3G (Zone 2)

BARTEC EEx p control unit (flammable gases)

7MB8000-1BA

FM /CSA (Class I Div. 2)

Ex purging unit MiniPurge FM

7MB8000-1AA

Retrofitting sets

RS 485/Ethernet converter

C79451-A3364-D61

RS 485/RS 232 converter

C79451-Z1589-U1

Autocal function with 8 binary inputs/outputs

A5E00064223

Autocal function with 8 binary inputs/outputs and PROFIBUS PA

A5E00057315

Autocal function with 8 binary inputs/outputs and PROFIBUS DP

A5E00057318

Autocal function with 8 binary inputs/outputs and PROFIBUS PA Ex i (requires Firmware 4.1.10)

A5E00057317

1) Only in relation with an approved purging unit.

Gas Analysis

ULTRAMAT 6

Field unit

Selection and ordering data

Order No.

ULTRAMAT 6 gas analyzer

for field mounting, single-channel, 2 components

7 MB 2 1 1 2 - ■■■■ - ■■ A ■

cannot be combined

Gas connections

Ferrule screw connection for pipe, outer diameter 6 mm

Ferrule screw connection for pipe, outer diameter 1/4"

0

0 → A29

1

1 → A28

Measured component	Smallest meas. range	Largest meas. range
CO	0 ... 100 vpm	0 ... 1000 vpm
NO	0 ... 100 vpm	0 ... 1000 vpm
CO	0 ... 300 vpm	0 ... 3000 vpm
NO	0 ... 300 vpm	0 ... 3000 vpm
CO	0 ... 1000 vpm	0 ... 10000 vpm
NO	0 ... 1000 vpm	0 ... 10000 vpm
für CO/NO (TÜV; see Table TÜV, 2 components)		
CO ₂	0 ... 100 vpm	0 ... 1000 vpm
CO	0 ... 100 vpm	0 ... 1000 vpm
CO ₂	0 ... 300 vpm	0 ... 3000 vpm
CO	0 ... 300 vpm	0 ... 3000 vpm
CO ₂	0 ... 1000 vpm	0 ... 10000 vpm
CO	0 ... 1000 vpm	0 ... 10000 vpm
CO ₂	0 ... 3000 vpm	0 ... 30000 vpm
CO	0 ... 3000 vpm	0 ... 30000 vpm
CO ₂	0 ... 1%	0 ... 10%
CO	0 ... 1%	0 ... 10%
CO ₂	0 ... 3%	0 ... 30%
CO	0 ... 3%	0 ... 30%
CO ₂	0 ... 10%	0 ... 100%
CO	0 ... 10%	0 ... 100%
CO ₂	0 ... 10%	0 ... 100%
CH ₄	0 ... 10%	0 ... 100%
CO ₂	0 ... 100 vpm	0 ... 1000 vpm
NO	0 ... 100 vpm	0 ... 1000 vpm
CO ₂	0 ... 300 vpm	0 ... 3000 vpm
NO	0 ... 300 vpm	0 ... 3000 vpm

AA

AB

AC

BA

BB

BC

BD

BE

BF

BG

CG

DA

DB

Internal gas paths

Sample cell

(lining)

Reference cell

(flow-type)

Hose made of FKM (Viton)

Aluminum

Non-flow-type

0

0 0 → A28, A29

Pipe made of titanium

Aluminum

Flow-type

1

Tantalum¹⁾

Non-flow-type

2

2 → A28, A29, Y02

Tantalum¹⁾

Flow-type

3

3 → Y02

Pipe made of SS (type No. 1.4571)

Aluminum

Non-flow-type

6

6 → A28, A29

Tantalum¹⁾

Non-flow-type

8

8 → A28, A29

Additional electronics

Without

Autocal board

- With 8 additional binary inputs/outputs
- With 8 binary inputs/outputs and PROFIBUS PA interface
- With 8 binary inputs/outputs and PROFIBUS DP interface
- With 8 binary inputs/outputs and PROFIBUS PA Ex i

0

1

6

7

8

Power supply

100 ... 120 V AC, 48 ... 63 Hz

200 ... 240 V AC, 48 ... 63 Hz

100 ... 120 V AC, 48 ... 63 Hz, acc. to ATEX II 2G²⁾

(operating mode: leakage compensation)

200 ... 240 V AC, 48 ... 63 Hz, acc. to ATEX II 2G²⁾

(operating mode: leakage compensation)

100 ... 120 V AC, 48 ... 63 Hz, acc. to ATEX II 2G²⁾

(operating mode: continuous purging)

200 ... 240 V AC, 48 ... 63 Hz, acc. to ATEX II 2G²⁾

(operating mode: continuous purging)

0

1

2

3

6

7

6

7

8

0

1

2

3

6

7

2 2 → A11

3 3 → A11

6 6 → A11

7 7 → A11

Heating of the internal gas paths and analyzer section

Without

With (max. 65 °C)

A

B

Operating software and documentation

German

English

French

Spanish

Italian

0

1

2

3

4

- 1) Only for measuring cell length 20 to 180 mm.
- 2) Only in relation with an approved purging unit.

Selection and ordering data

Further versions	Order code	cannot be combined
Please add „Z“ to Order No. and specify Order code.		
Interface converter from RS 485 to RS 232	A11	→ E20
Flow-type reference side with reduced flow, 6 mm	A28	
Flow-type reference side with reduced flow, 1/4“	A29	
Set of Torx tools, socket spanner	A32	
TAG labels (customer-definde inscriptions)	B03	
Kalrez gaskets in sample gas path	B04	
Ex versions		
Combination possibilities s. Table Ex configurations in „Ex versions“		
ATEX II 3G certificate; restricted breathing, non-flammable gases	E11	
ATEX II 3G certificate; flammable gases ¹⁾	E12	
CSA certificate – Class I Div. 2	E20	
ATEX II 3D certificate; dust Ex areas and additionally:		
• in non-hazardous gas zone	E40	
• in Ex zone acc. ATEX II 3G, and non-flammable gases	E41	
• in Ex zone acc. ATEX II 3G, and flammable gases ¹⁾	E42	
Customer acceptance (in factory before delivery)	Y01	
Clean for O ₂ -Service (specially cleaned gas path)	Y02	
Drift recording	Y03	
Customer acceptance explosion-protected units incl. BARTEC purging enclosure	Y04	→ E11, E20, E40, E41
Measuring range in plain text, if different from standard setting	Y11	
Special setting (only in conjunction with an application No., e.g. extended measuring range outside standard ranges)	Y12	
Extended special setting (only in conjunction with an application No., e.g. determination of cross-interferences)	Y13	
TÜV version according to 17. BlmSch	Y17	

Additional units for explosion-proof versions Category ATEX II 2G (Zone 1)

	Order No.
BARTEC EEx p control unit, 230 V, „leakage compensation“	7MB8000-2BA
BARTEC EEx p control unit, 115 V, „leakage compensation“	7MB8000-2BB
BARTEC EEx p control unit, 230 V, „continuous purging“	7MB8000-2CA
BARTEC EEx p control unit, 115 V, „continuous purging“	7MB8000-2CB
Explosion-protected isolation amplifier	7MB8000-3AA
Explosion-protected isolating relay, 230 V	7MB8000-4AA
Explosion-protected isolating relay, 110 V	7MB8000-4AB
Differential pressure switch for corrosive gases	7MB8000-5AA
Differential pressure switch for non-corrosive gases	7MB8000-5AB
Flame arrester made of stainless steel	7MB8000-6BA
Flame arrester made of Hastelloy	7MB8000-6BB
Category ATEX II 3G (Zone 2)	
BARTEC EEx p control unit (flammable gases)	7MB8000-1BA
FM /CSA (Class I Div. 2)	
Ex purging unit MiniPurge FM	7MB8000-1AA

Retrofitting sets

	Order No.
RS 485/Ethernet converter	C79451-A3364-D61
RS 485/RS 232 converter	C79451-Z1589-U1
Autocal function with 8 binary inputs/outputs	A5E00064223
Autocal function with 8 binary inputs/outputs and PROFIBUS PA	A5E00057315
Autocal function with 8 binary inputs/outputs and PROFIBUS DP	A5E00057318
Autocal function with 8 binary inputs/outputs and PROFIBUS PA Ex i (requires Firmware 4.1.10)	A5E00057317

1) Only in relation with an approved purging unit.

TÜV, single component

Component Measuring range identification	CO (TÜV)		SO ₂ (TÜV)		NO (TÜV)	
	Smallest measuring range from 0 to ...	Largest measuring range from 0 to ...	Smallest measuring range from 0 to ...	Largest measuring range from 0 to ...	Smallest measuring range from 0 to ...	Largest measuring range from 0 to ...
C			75 mg/m ³	1500 mg/m ³		
D	50 mg/m ³	1000 mg/m ³	300 mg/m ³	3000 mg/m ³		
E			500 mg/m ³	5000 mg/m ³	100 mg/m ³	2000 mg/m ³
F	300 mg/m ³	3000 mg/m ³	1000 mg/m ³	10000 mg/m ³	300 mg/m ³	3000 mg/m ³
G	500 mg/m ³	5000 mg/m ³			500 mg/m ³	5000 mg/m ³
H	1000 mg/m ³	10000 mg/m ³	3000 mg/m ³	30000 mg/m ³	1000 mg/m ³	10000 mg/m ³
K	3000 mg/m ³	30000 mg/m ³	10 g/m ³	100 g/m ³	3000 mg/m ³	30000 mg/m ³
P	10 g/m ³	100 g/m ³	30 g/m ³	300 g/m ³	10 g/m ³	100 g/m ³
R	30 g/m ³	300 g/m ³	100 g/m ³	1000 g/m ³	30 g/m ³	300 g/m ³
V	100 g/m ³	1160 g/m ³	300 g/m ³	2630 g/m ³	100 g/m ³	1250 g/m ³

Example for ordering

ULTRAMAT 6, TÜV (1-component unit)
 Component CO
 Measuring range 0 ... 50/1000 mg/m³
 with hoses, non-flow-type reference side
 without automatic adjustment
 230 V; without heating, German
7MB2111-0XD00-1AA0-Z +Y17

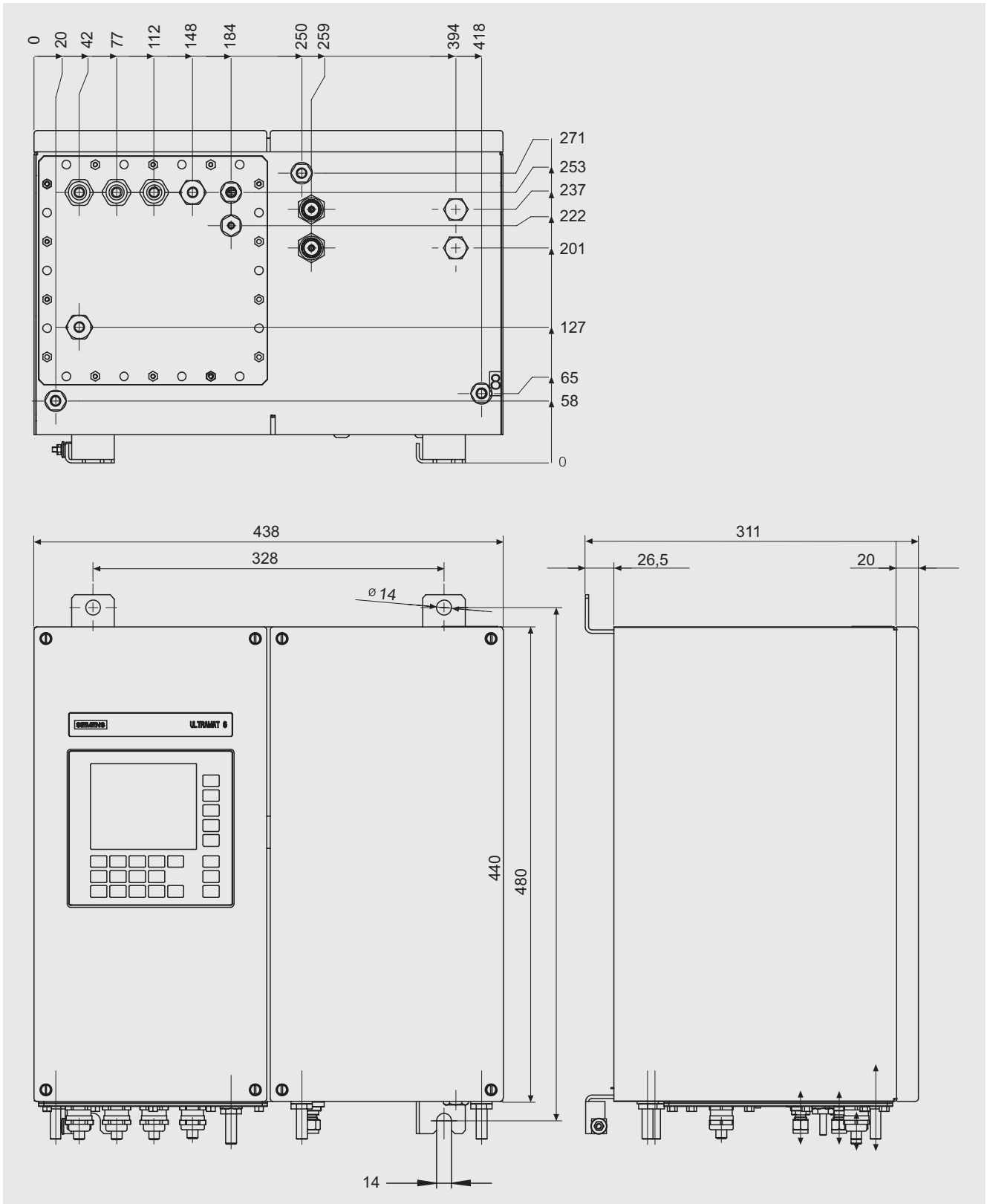
TÜV, 2 components in series

Component Measuring range identification	CO (TÜV)		NO (TÜV)	
	Smallest measuring range from 0 to ...	Largest measuring range from 0 to ...	Smallest measuring range from 0 to ...	Largest measuring range from 0 to ...
AA	75 mg/m ³	1000 mg/m ³	200 mg/m ³	2000 mg/m ³
AB	300 mg/m ³	3000 mg/m ³	300 mg/m ³	3000 mg/m ³
AC	1000 mg/m ³	10000 mg/m ³	1000 mg/m ³	10000 mg/m ³

Example for ordering

ULTRAMAT 6, TÜV (2- component unit)
 Components CO/NO
 Measuring range CO: 0 ... 75/1000 mg/m³
 NO: 0 ... 200/2000 mg/m³
 with hoses, non-flow-type reference side
 without automatic adjustment
 230 V; without heating, German
7MB2112-0AA00-1AA0-Z +Y17

Dimensional drawings

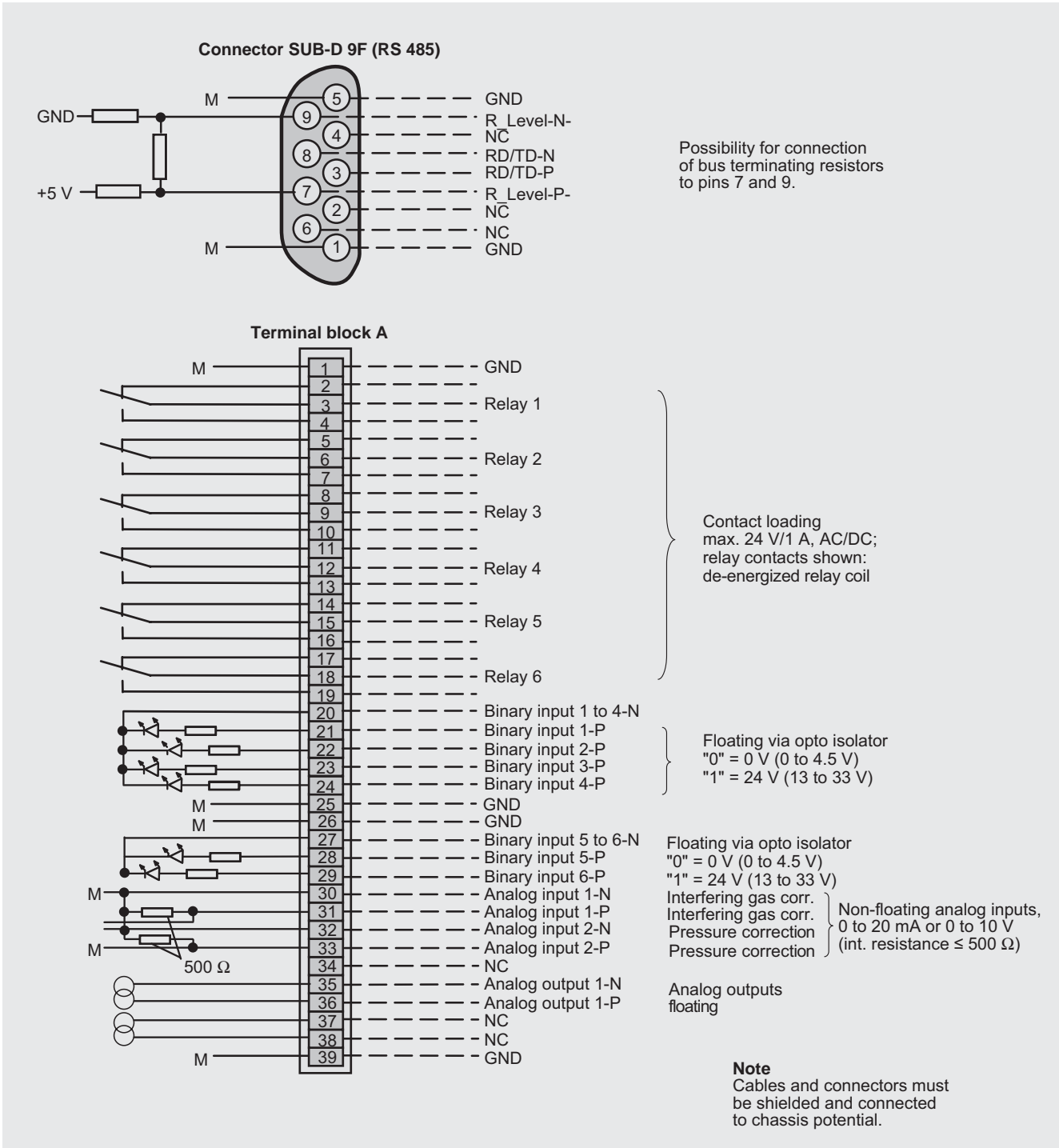


ULTRAMAT 6, field unit, dimensions in mm

Gas Analysis ULTRAMAT 6

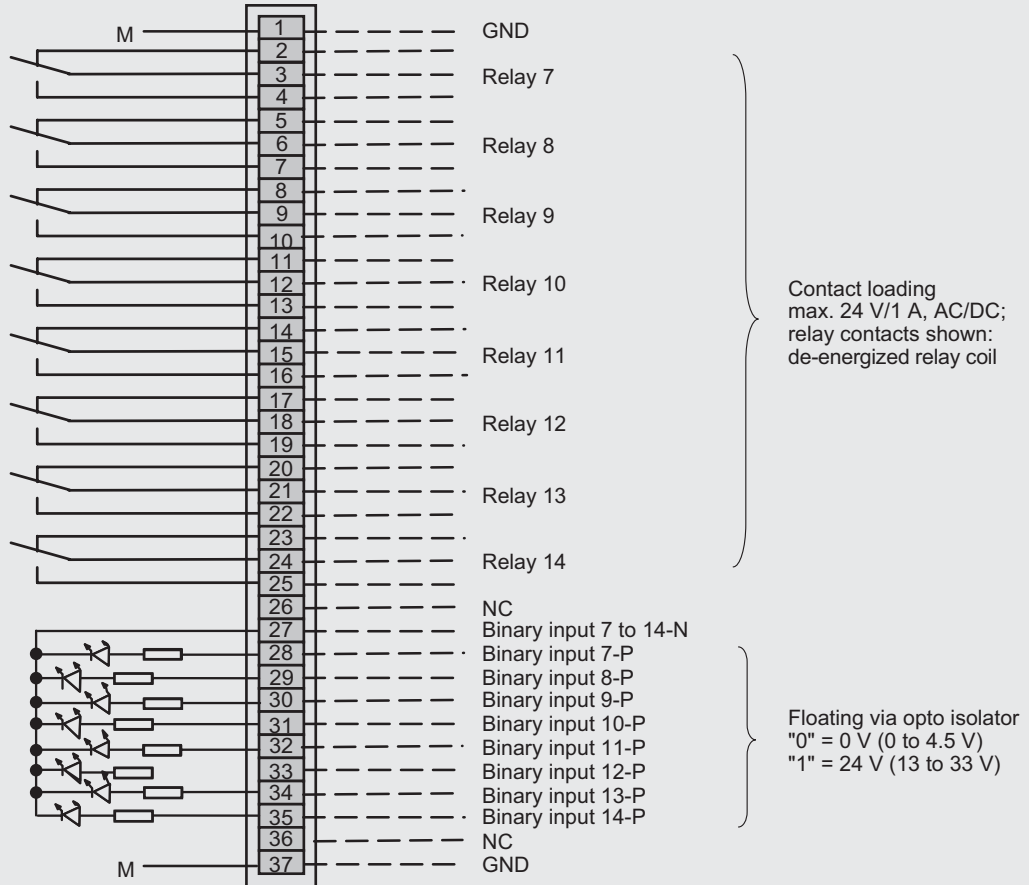
Field unit

Schematics



ULTRAMAT 6, field unit, connector and terminal assignment

Terminal block B (option)

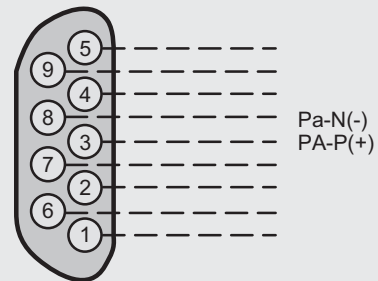
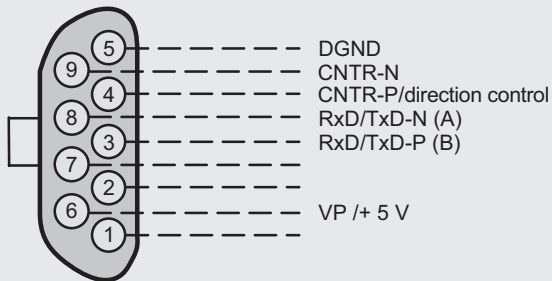


Note
Cables and connectors must be shielded and connected to chassis potential.

Connector SUB-D 9F -X90 PROFIBUS DP

optional

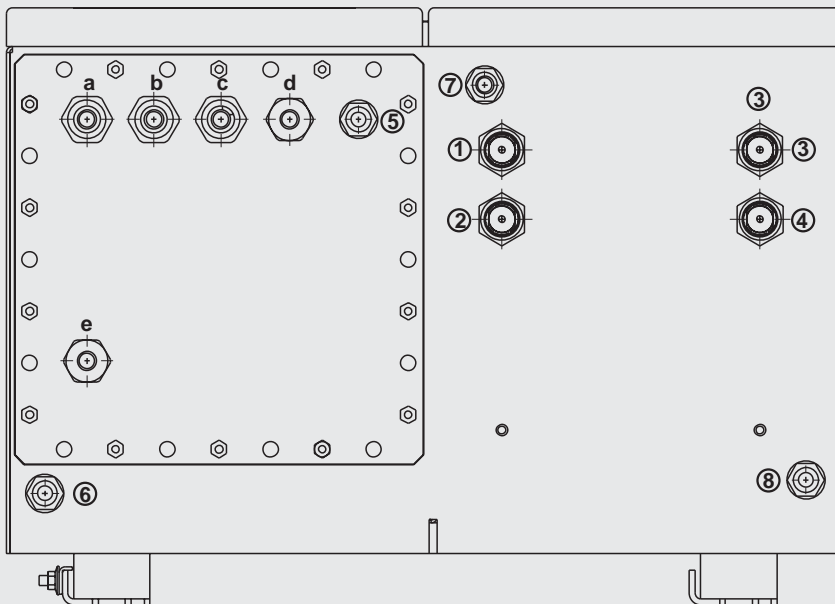
Connector SUB-D 9M -X90 PROFIBUS PA



ULTRAMAT 6, field unit, connector and terminal assignment of the Autocal board and PROFIBUS connectors

Gas Analysis ULTRAMAT 6

Field unit



Gas connections

- ① Sample gas inlet
 - ② Sample gas outlet
 - ③ Reference gas inlet (option)
 - ④ Reference gas outlet (option)
 - ⑤-⑧ Purging gas inlets/outlets stubs \varnothing 10 mm or $\frac{3}{8}$ "
- } Clamping gland for pipe \varnothing 6 mm or $\frac{1}{4}$ "

Electrical connections

- a - c Signal cable (\varnothing 10-14 mm)
(analog + digital): cable gland M20x1.5
- d Interface connection: (\varnothing 7-12 mm)
cable gland M20x1.5
- e Power supply: (\varnothing 7-12 mm)
cable gland M20x1.5

ULTRAMAT 6, field unit, gas and electrical connections

Application

Use of the ULTRAMAT 6 in hazardous areas

Suitability-tested field analyzers of series 6 must be used to measure gases in hazardous areas. The preferred explosion protection for these analyzers is the pressurized enclosure EEx p for zone 1 or the simplified pressurized enclosure EEx n P for zone 2. In addition, these analyzers must be connected to monitoring equipment which must also be suitability-tested for zone 1.

Exception: a pressurized enclosure is not required in zone 2 for the measurement of gases whose composition always remains below the lower explosion limit (LEL); in this case, it is sufficient for the field housing to be gas damp-proof (type of protection EEx n R).

Following pre-purging of 5 minutes, the monitoring equipment ensures that no gas damp can enter the housing, and accumulation of the samples gas in the housing is prevented. The volume flow during the pre-purging phase is > 50 l/min. The protective gas is usually fed into the analyzer housing from a supply network via the monitoring equipment.

Category ATEX II 2G (Ex zone 1)

Two versions of pressurized enclosure EEx p complying with the directive 94/9/EC are available for use in zone 1:

- *Pressurized enclosure with compensation of losses resulting from leaks*

Only that volume of protective gas required to hold an overpressure of at least 50 Pa compared to the sample gas pressure and atmospheric pressure is fed into the housing. The maximum purging gas pressure is 165 hPa; this causes a max. permissible sample gas pressure of 160 hPa.

Test certificate: PTB 00 ATEX 2022 X
Analyzer identification: II 2 G EEx p [ia] ia IIC T4

- *Pressurized enclosure with continuous purging*
Protective gas continuously flows through the housing with a volume flow of at least 1 l/min; furthermore, the flow results in an overpressure in the housing of at least 50 Pa compared to atmospheric pressure.
The max. permissible purging gas pressure is 25 hPa. The max. permissible sample gas pressure is equivalent to the permissible analyzer sample gas pressure.
Test certificate: TÜV 01 ATEX 1708 X
Analyzer identification: II 2 G EEx p [ia] ia IIC T4.

The fundamental safety requirements are satisfied by compliance with the European standards EN 50014:1997, EN 50016:1995, EN 50020:1994 and EN 954:1996.

The EEx p monitoring equipment is a stand-alone unit which is connected electrically and pneumatically to the analyzer. Ex protection is only provided when these two units are connected together.

Category ATEX II 3G (Ex zone 2)

Two versions complying with directive 94/9/EC are available for use in zone 2:

- *Ex protection resulting from gas damp-proof housing*
The housing is sealed sufficiently such that gas damp cannot penetrate. With this type of protection, only sample gases may be connected which are below the LEL.
Test certificate: TÜV 01 ATEX 1686 X
Analyzer identification: II 3 G EEx n R II T6

- *Simplified pressurized enclosure with continuous purging*
This type of protection must always be selected if flammable gases or gas mixtures are to be connected.
Protective gas continuously flows through the housing with a volume flow of at least 1 l/min; furthermore, the flow results in an overpressure in the housing of at least 50 Pa compared to atmospheric pressure. Manually controlled pre-purging with the analyzer power supply switched off is sufficient for the simplified pressurized enclosure. It is not necessary for the analyzer to be switched off automatically should the protective gas fail.
Test certificate: TÜV 01 ATEX 1697 X
Analyzer identification: II 2/3 G EEx n P II T4.

The fundamental safety requirements are satisfied by compliance with the European standards EN 50021:1999, EN 60079:1997, Sec. 13 and ZH 1/10, Sec. 1.

The EEx nP monitoring equipment is a stand-alone unit which is connected electrically and pneumatically to the analyzer. Ex protection is only provided when these two units are connected together.

Category ATEX II 3D (Ex zone 22)

Ex zone 22 concerns the so-called dust protection. This is the European successor to the previous German zone 11. Zone 22 concerns the area "in which during normal operation it is not expected that potentially explosive atmospheres occur in the form of a cloud of flammable dust in the air. Should such a cloud occur, however, then only briefly.

Considering the tightened conditions for zone assignment, for which now 13 possible ignition sources have to be taken into consideration, it can be expected that there will be increased demands for dust-protected analyzers.

The field versions of CALOMAT 6, OXYMAT 6 and ULTRAMAT 6 can be used in this zone according to the conformity statement TÜV 03 ATEX 2278 X.

They are assigned the Ex identification II 3 D IP65 T60 °C or T65 °C or T85 °C or T135 °C.

However, this only concerns the so-called external Ex protection. With respect to the measurement of flammable gases, the additional measures applicable to gas explosion protection apply in addition, such as flame inhibitors. These separate certificates apply here.

FM Class I Div. 2

The same applies here as to the simplified pressurized enclosure with continuous purging; the required Ex protection is only provided when appropriate equipment is connected.

Type of protection and flame arrester

It generally applies that selection of the protective gas and use of flame inhibitors depend on the type of sample gas:

- Connection of combustible gases above the LEL always require an inert gas (e.g. N₂) as the protective gas. Furthermore, the process must be protected by flame arresters if it cannot be excluded that explosive gas mixtures could occasionally be present in the sample gas path.
- Gas mixtures which could be frequently or permanently explosive must not be connected!
- With gases below the LEL, air can also be used as the protective gas, and flame arresters can be omitted.

Gas Analysis

ULTRAMAT 6

Explosion-proof design

Zone	Gas type	Sample gas non-flammable below the lower explosive limit (LEL)	Sample gas flammable and/or seldom and than only briefly above LEL	Sample gas flammable and/or occasionally above LEL
Category ATEX II 1G (zone 0)		Individual acceptance (on request)	Individual acceptance (on request)	Individual acceptance (on request)
Category ATEX II 2G (zone 1) Operating mode „Leakage compensation“	Analyzer	• Ex analyzer EEx p (certificate ATEX 2022X)	• Ex analyzer EEx p (certificate ATEX 2022X)	• Ex analyzer EEx p (certificate ATEX 2022X)
	Gas path	• Pipe gas path	• Pipe gas path	• Pipe gas path
	Flame arrester	—	—	• Flame arrester in sample gas inlet and outlet
	Monitoring	• EEx p control unit (certificate ATEX E 082)	• EEx p control unit sample gas pressure < 165 hPa, fail-safe (certificate ATEX E 082)	• EEx p control unit sample gas pressure < 165 hPa, fail-safe (certificate ATEX E 082)
	Pressure switch	—	• Differential pressure switch (when sample gas pressure not fail-safe)	• Differential pressure switch (when sample gas pressure not fail-safe)
Category ATEX II 2G (zone 1) Operating mode „Continuous purging“	Analyzer	• Ex analyzer EEx p (certificate ATEX 1708X)	• Ex analyzer EEx p (certificate ATEX 1708X)	• Ex analyzer EEx p (certificate ATEX 1708X)
	Gas path	• Pipe gas path	• Pipe gas path	• Pipe gas path
	Flame inhibitor	—	—	• Flame inhibitor in sample gas inlet and outlet
	Monitoring	• EEx p control unit (certificate DMT 99 ATEX E 082)	• EEx p control unit (certificate DMT 99 ATEX E 082)	• EEx p control unit (certificate DMT 99 ATEX E 082)
	Pressure switch	—	—	—
Category ATEX II 3G (zone 2)	Analyzer	• Standard analyzer in field enclosure (order code E11: certificate ATEX 1686X)	• Standard analyzer in field enclosure (order code E12: certificate ATEX 1697X)	• Standard analyzer in field enclosure (order code E12: certificate ATEX 1697X)
	Gas path	• Pipe or hose gas path	• Pipe gas path	• Pipe gas path
	Flame arrester	—	—	• Flame arrester in sample gas inlet and outlet
	Monitoring	—	• Control unit simplified pressurized enclosure with continuous inert gas purging (certificate ATEX 1748X)	• Control unit simplified pressurized enclosure with continuous inert gas purging (certificate ATEX 1748X)
Non-hazardous zone	Analyzer	• Analyzer as rack or in field enclosure	• Analyzer as rack or in field enclosure	• Analyzer as rack or in field enclosure
	Gas path	• Pipe or hose gas path	• Pipe gas path recommended • Enclosure purging with inert gas (N ₂) recommended	• Pipe gas path recommended • Enclosure purging with inert gas (N ₂) recommended
	Flame arrester	—	—	• Flame arrester in sample gas inlet and outlet
	Monitoring	—	—	• Simplified monitoring of purging recommended

Explosion-proof configurations – Principle selection criteria

	Signal line guide		
	Within zone 1	From zone 1 to zone 2	From zone 1 to non-hazardous zone
Ex-i isolation amplifier	required	conditional use (when feeding back cannot be excluded)	conditional use (when feeding back cannot be excluded)
Isolating relay	required	not required	not required

Additional units, selection criteria (ATEX II 2G)

		Certification + Orde codes			Additional unit				
Category	Operating mode	Order No.	Gas	Dust	Purging unit	Flame arrester	Pressure switch	Ex-i isolation amplifier	Ex-i isolating relay
			Ex zone	Ex zone	7MB8000-	7MB8000-	7MB8000-	7MB8000-	7MB8000-
ATEX II 2G	Leakage compensation	-.*****-2*A*	—	—	2BB	6BA/6BB ²⁾	5AA ²⁾	3AA ²⁾	4AB ²⁾
		-.*****-3*A*	—	—	2BA	6BA/6BB ²⁾	5AA ²⁾	3AA ²⁾	4AA ²⁾
	Continuous purging	-.*****-6*A*	—	—	2CB	6BA/6BB ²⁾	o	3AA ²⁾	4AB ²⁾
		-.*****-7*A*	—	—	2CA	6BA/6BB ²⁾	o	3AA ²⁾	4AA ²⁾
ATEX II 3G	Flammable gases	-.*****-0*A*	E42		1BA ¹⁾	6BA/6BB ²⁾	o	o	o
		-.*****-1*A*	E42		1BA ¹⁾	6BA/6BB ²⁾	o	o	o
		-.*****-0*A*	E12	—	1BA	o	o	o	o
		-.*****-1*A*	E12	—	1BA	o	o	o	o
	Non-flammable gases	-.*****-0*A*	E41		o	o	o	o	o
		-.*****-1*A*	E41		o	o	o	o	o
		-.*****-0*A*	E11	—	o	o	o	o	o
		-.*****-1*A*	E11	—	o	o	o	o	o
Non-hazardous zone	Gas non-hazardous zone	-.*****-0*A*	—	E40	o	o	o	o	o
		-.*****-1*A*	—	E40	o	o	o	o	o

— Combination not permitted

o not required

Explosion-proof configurations, combination possibilities

- 1) The purging unit has to be mounted in dust-tight enclosure until approved for installation in zones of the category ATEX II 3D.
- 2) Conditionnally required: see table "Explosion-proof configurations, selection criteria".

Gas Analysis

ULTRAMAT 6

Ex version: additional units Category ATEX II 2G
BARTEC EEx p control unit

Overview

BARTEC EEx p control unit „Leakage compensation“

The APEX 2003.SI/A2 control unit controls and monitors the pre-purging phase and the operating phase of gas analyzers with „Containment Systems“ in Ex zone 1.

The control unit redundantly monitors the set overpressure of the purging gas. When the overpressure decreases, it is corrected to the adjustable setpoint (max. purging gas pressure 165 hPa).

Additional function

Due to the connection of additional pressure sensors, the internal pressure of the enclosure is maintained at a pressure higher than the sample gas with a proportional valve. During the pre-purging phase the purging gas flow is max. 4100 NI/h with an internal enclosure pressure of 50 hPa.

4 programmable relay inputs (8 relay outputs) are available to separate the data lines.

Technical specifications

Guidelines	EC EMC guideline 89/336/EEC, EC low voltage, RL 73/23/EWG, Ex guideline 94/9EC
Design	Explosion-protected enclosure (EEx e) with viewing window in the cover

Enclosure material	glas-fiber reinforced polyester
Degree of protection	IP65
Terminals	2.5 mm, fine wired
Pressure sensors	MIN A = 0 ... 300 hPa, MIN B = 0 ... 300 hPa, MAX = 0 ... 300 hPa, MAX 1 = 0 ... 300 hPa, DIFF A = 0 ... 25 hPa, DIFF B = 0 ... 25 hPa
Prepurging time	0 ... 99 min; 5 s delayed
Weight	11 kg

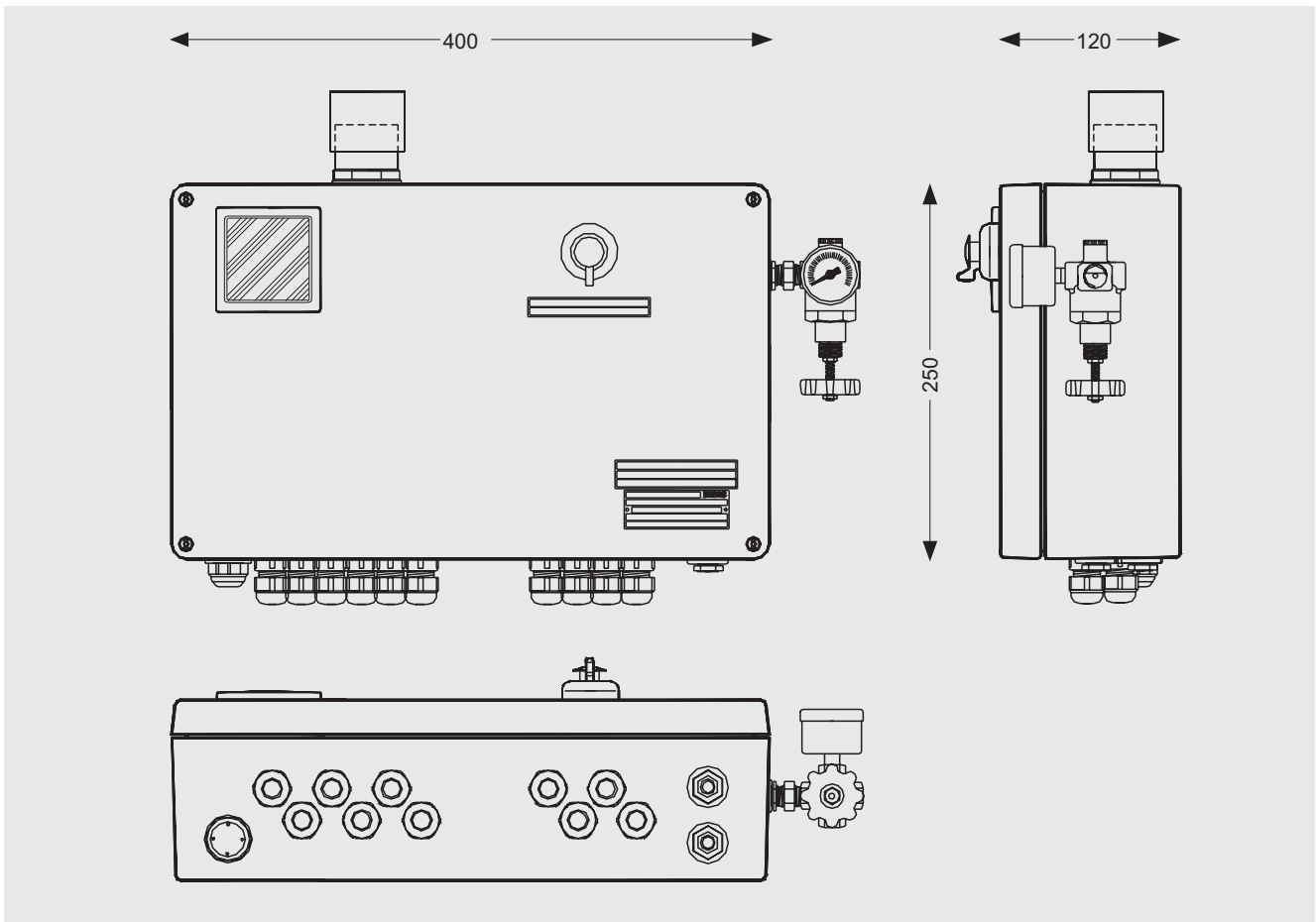
Electrical data

Supply voltage	230 V AC (115 V AC)
Power consumption	21 W /230 V
NO contacts	K2/3; max. 250 V, 5 A with cos . = 1, K4/K5; supply voltage or floating, max. 250 V, 5 A with cos . = 1
Communication	RS 485 interface
Temperature switching value (option)	0 ... +40 °C

Explosion protection

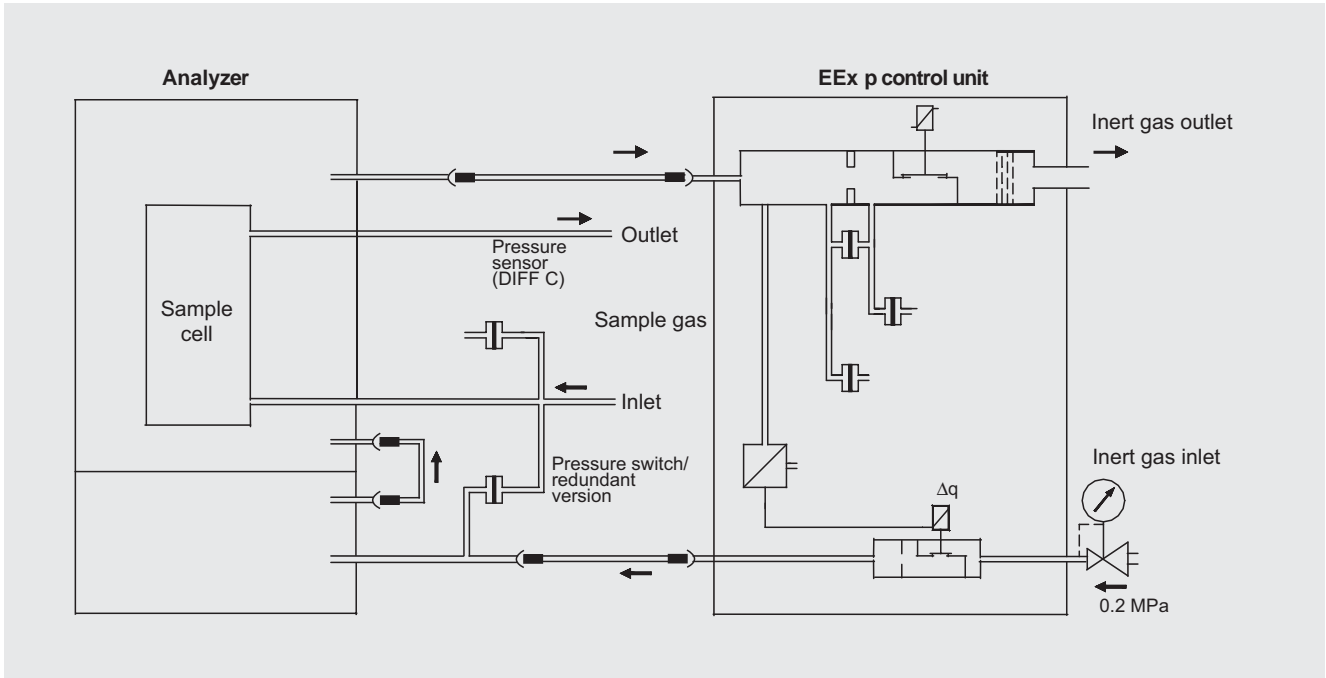
Marking	EEx e d ib [ia p] IIC T4/T6
Certification	DMT 99 ATEX E 082
Ambient temperature	-20 ... +40 °C

Dimensional drawings

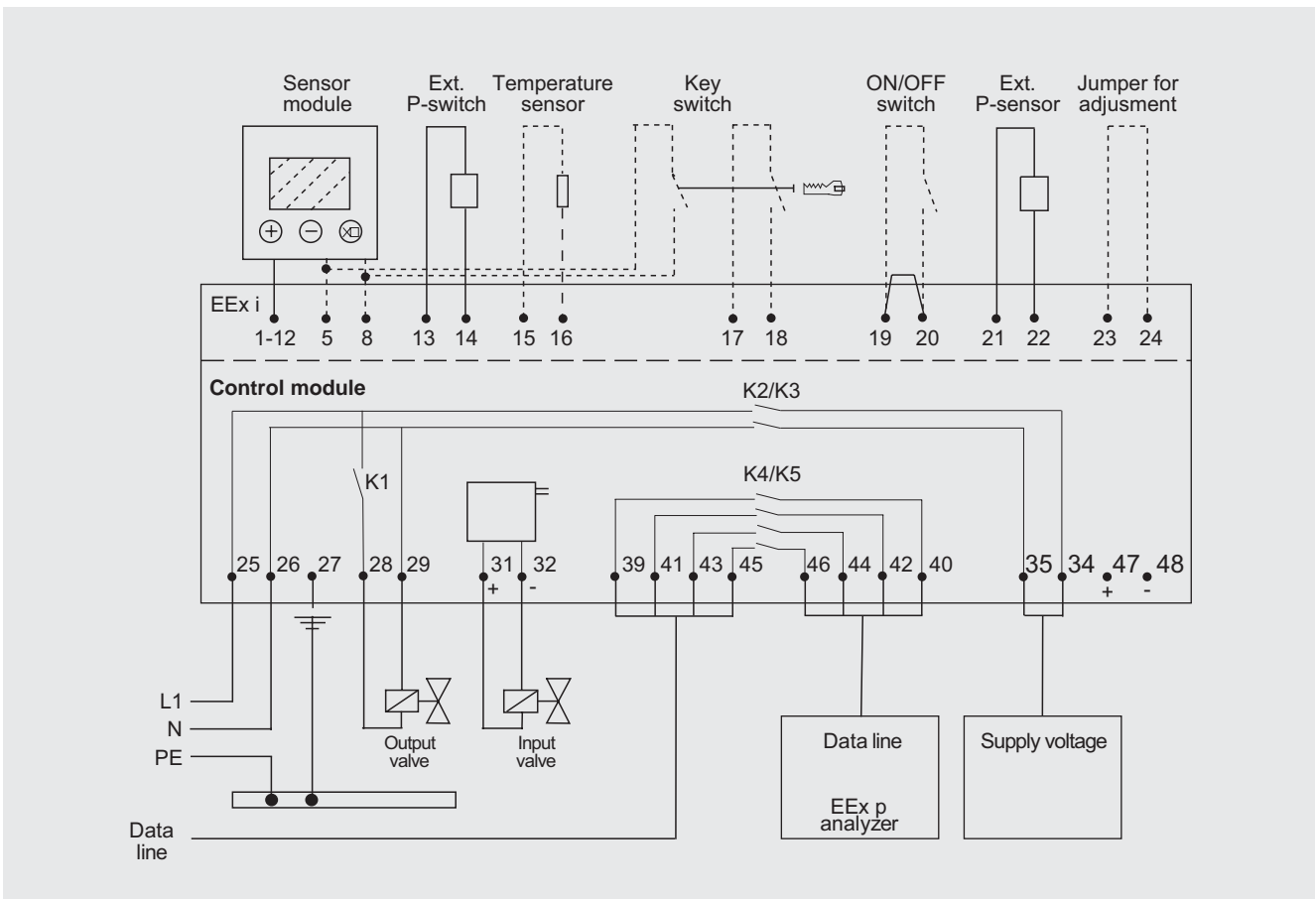


BARTEC control unit, dimensions in mm

Schematics



BARTEC control unit „Leakage compensation“, gas connection diagram



BARTEC control unit „Leakage compensation“, electric connection diagram

Gas Analysis

ULTRAMAT 6

Ex version: additional units Category ATEX II 2G
BARTEC EEx p control unit

Overview

BARTEC EEx p control unit „Continuous purging“

The APEX 2003.SI/A4 control unit controls and monitors the prepurging phase and the operating phase of gas analyzers with „Containment Systems“ in Ex zone 1.

The control unit redundantly monitors a continuous current of protection gas through the connected analyzer and thereby dilutes the eventually appearing sample gas below the lower explosive limit (max. purging gas pressure 25 hPa).

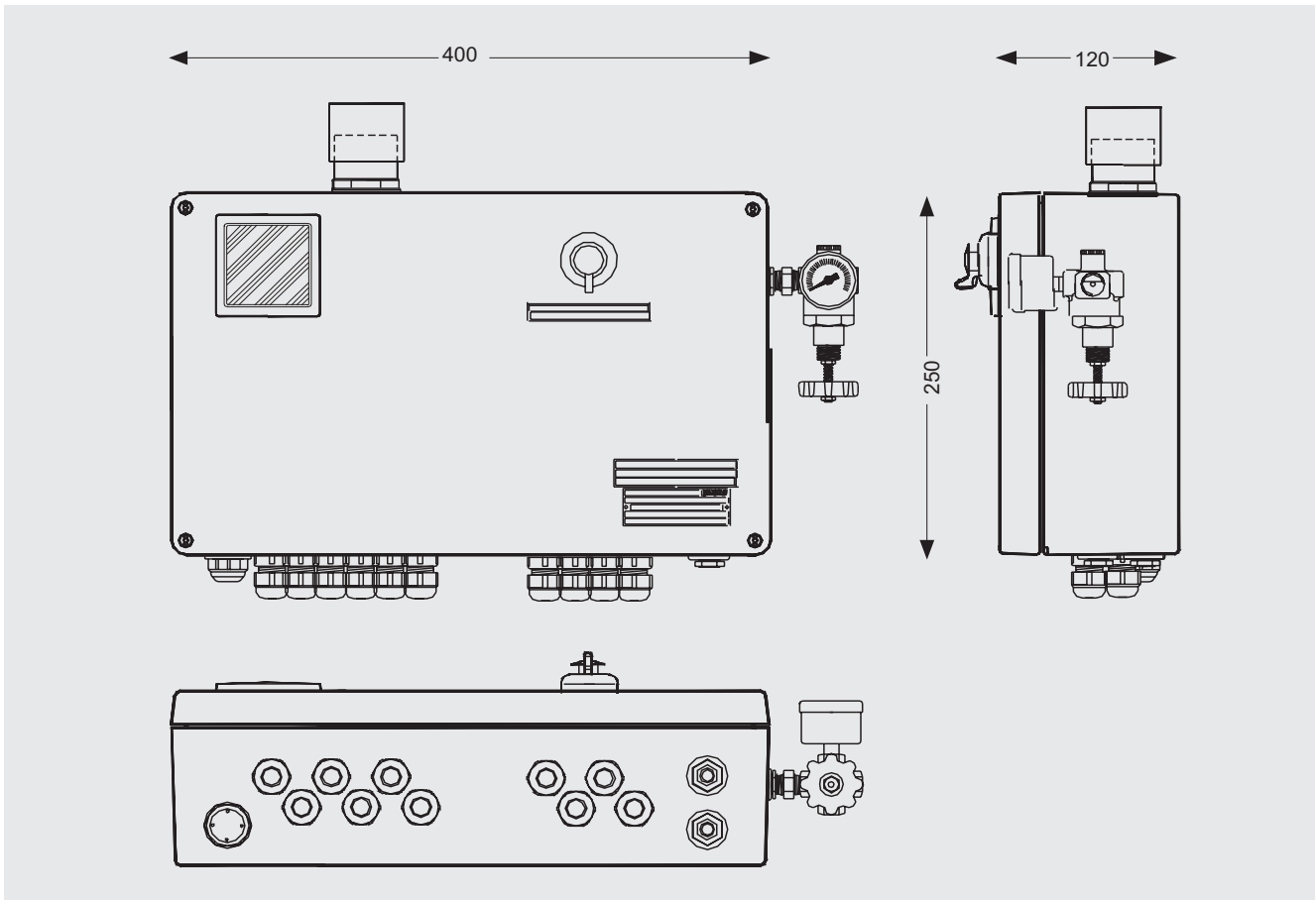
4 programmable relay outputs (8 relay outputs) are available to interrupt the data lines.

Technical specifications

Guidelines	EC EMC guideline 89/336/EEC, EC low voltage, RL 73/23/EWG, Ex guideline 94/9EC
Design	Explosion-protected enclosure (EEx e) with viewing window in the cover
Degree of protection	IP65
Terminals	2.5 mm, fine wired

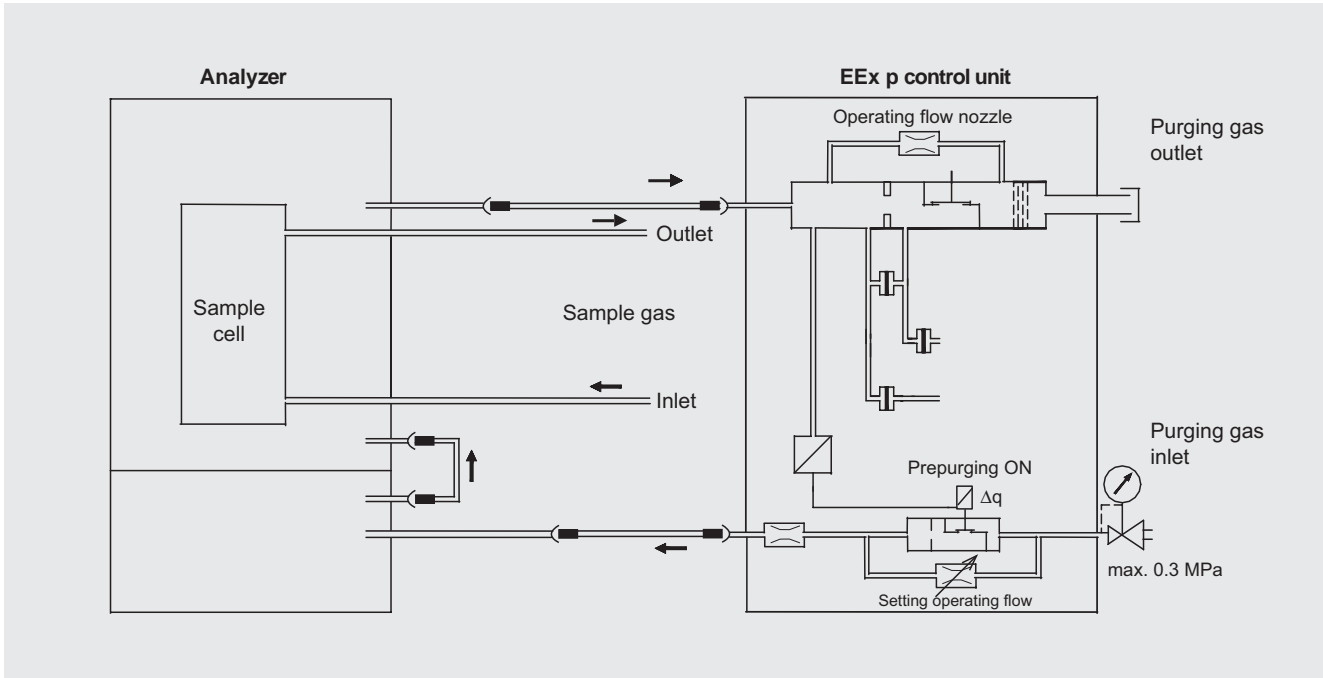
Pressure sensors	MIN A = 0 to 25 hPa, MIN B = 0 to 25 hPa, MAX = 0 to 25 hPa, MAX 1 = 0 to 25 hPa, DIFF A = 0 to 25 hPa, DIFF B = 0 to 25 hPa
Prepurging time	0 ... 99 min; 5 s delayed
Weight	10 kg
Electrical data	
Supply voltage	230 V AC (115 V AC)
Power consumption	21 W /230 V
NO contacts	K2/3; max. 250 V, 5 A with cos . = 1, K4/K5; supply voltage or floating, max. 250 V, 5 A with cos . = 1
Communication	RS 485 interface
Temperature switching value (option)	0 ... +40 °C
Explosion-protected type	
Marking	EEx e d ib [ia p] IIC T4/T6
Certification	DMT 99 ATEX E 082
Ambient temperature	-20 ... +40 °C

Dimensional drawings

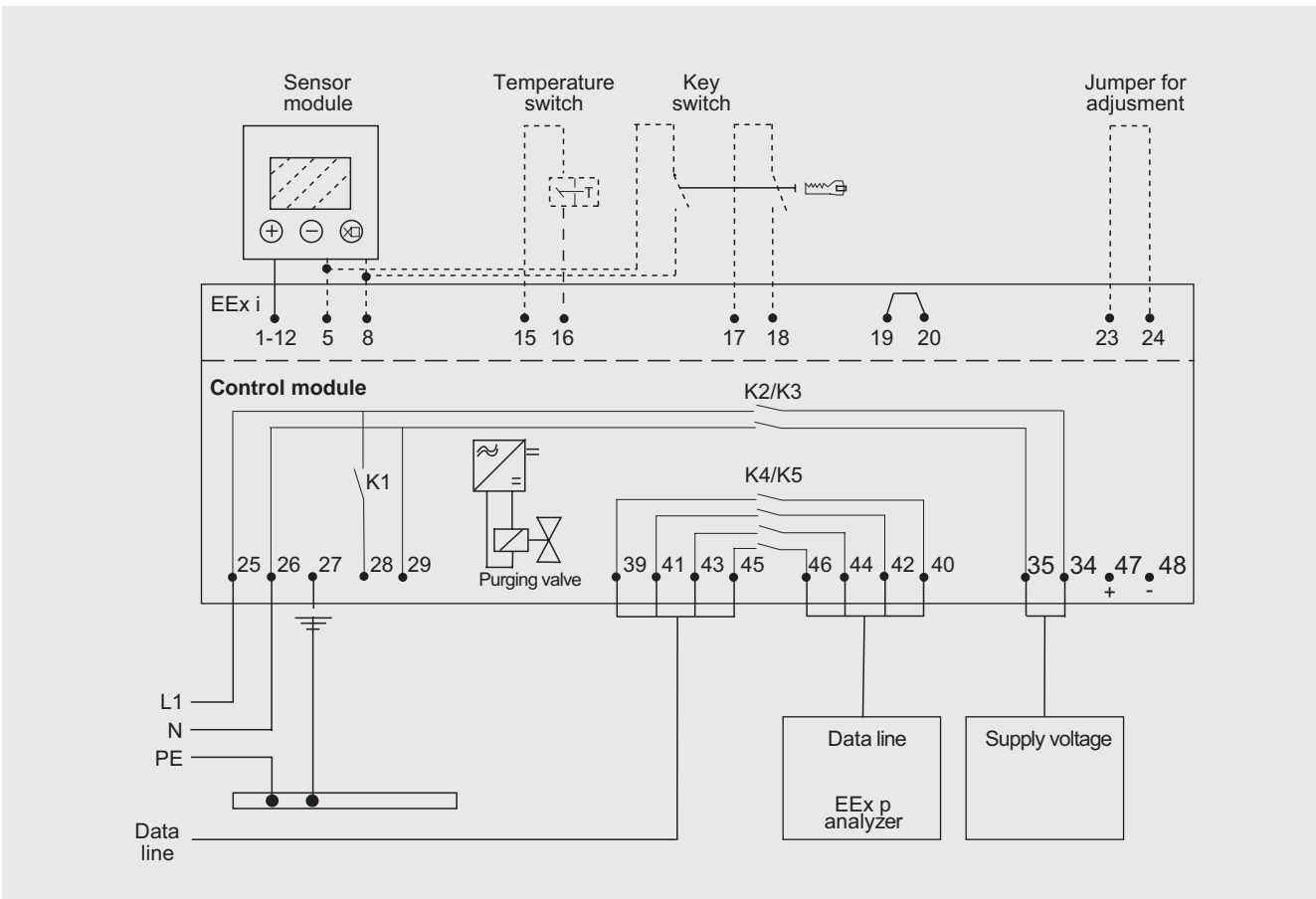


BARTEC control unit, dimensions in mm

Schematics



BARTEC control unit, continuous purging, gas connection diagram



BARTEC control unit, continuous purging, electric connection diagram

Gas Analysis

ULTRAMAT 6

Ex version: additional units Category ATEX II 3G
BARTEC EEx p control unit

Overview

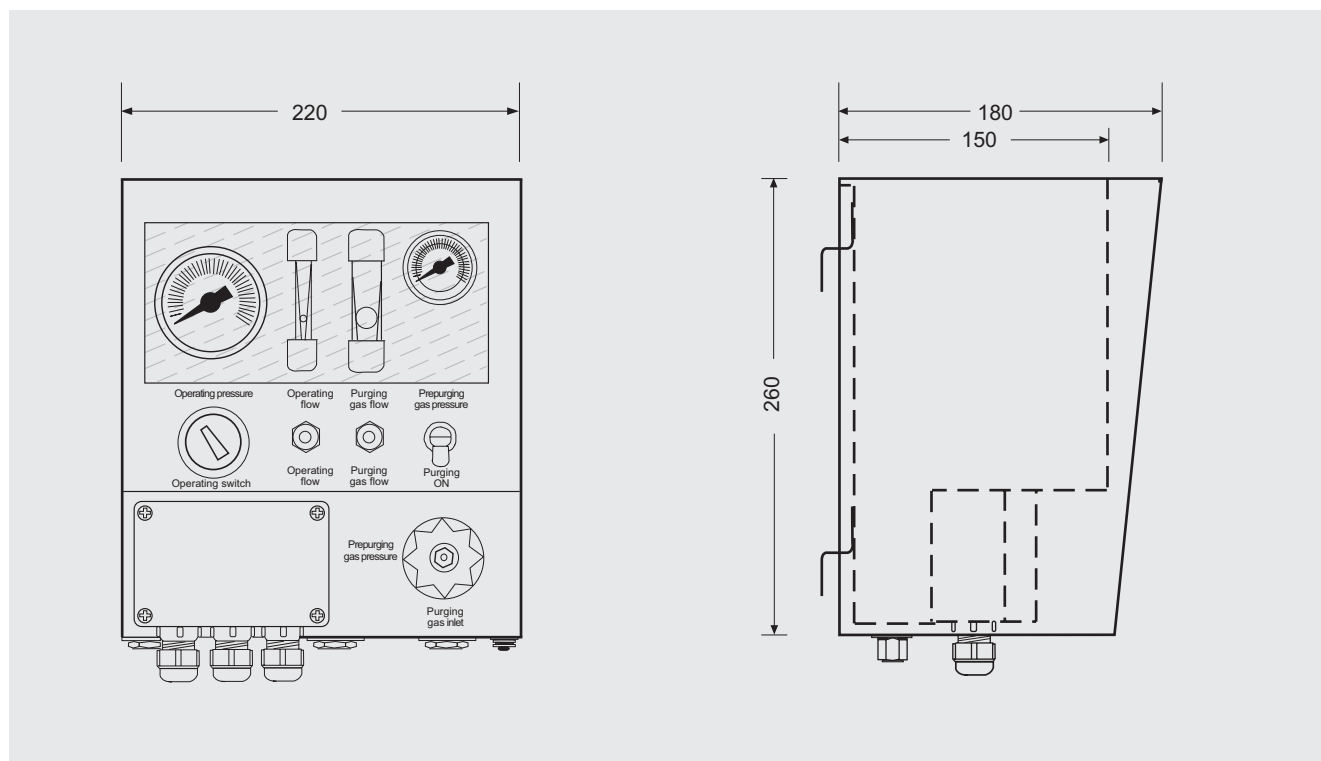
BARTEC EEx p control unit for flammable gases

Compact EEx p control unit for the explosion protection of pressurized analyzers in zone 2, inclusive redundant surveillance of the purging gas pressure and flow during purging and operating phase.

Technical specifications

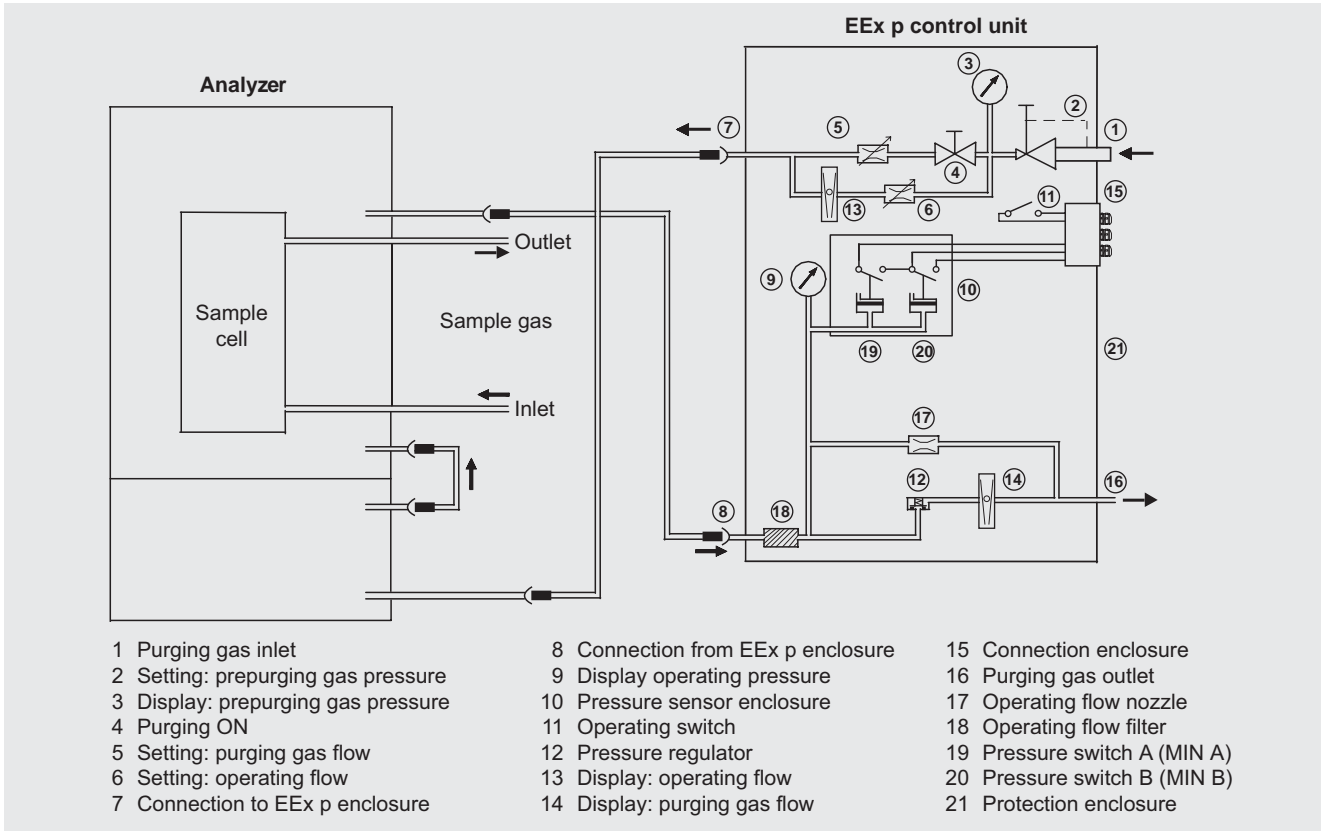
Guidelines	EC EMC guideline 89/336/EEC RL 73/23/EWG Ex guideline 94/9EC
Design	Explosion-protected enclosure (EEx e) with viewing window in the cover
Enclosure material	stainless steel
Terminals	2.5 mm, fine wired
Pressures	
• Purging gas pressure	0.2 MPa ... 1.0 MPa (0.2 MPa)
• Purging gas flow	0 ... 3.5 m ³ /h (2.0 m ³ /h)
• Operating pressure	0 ... 60 hPa (8 hPa)
• Operating flow	0 ... 1.5 l/min (1 l/min)
Weight	4.3 kg
Electrical data	
Line voltage	0 ... 230 V AC, 0 ... 30 V DC
Switching capacity	max. 6 A with cos φ = 1/max. 253 V AC, max. 1.5 A with cos φ = 0.6 /max. 253 V AC, max. 2 A with L/R ~ 0 ms/max. 30 V DC
Explosion-protected type	
Marking	EEx n A C R (P) II C T6
Certification	TÜV 01 ATEX 1748 X
Ambient temperature	-20 ... +60 °C

Dimensional drawings

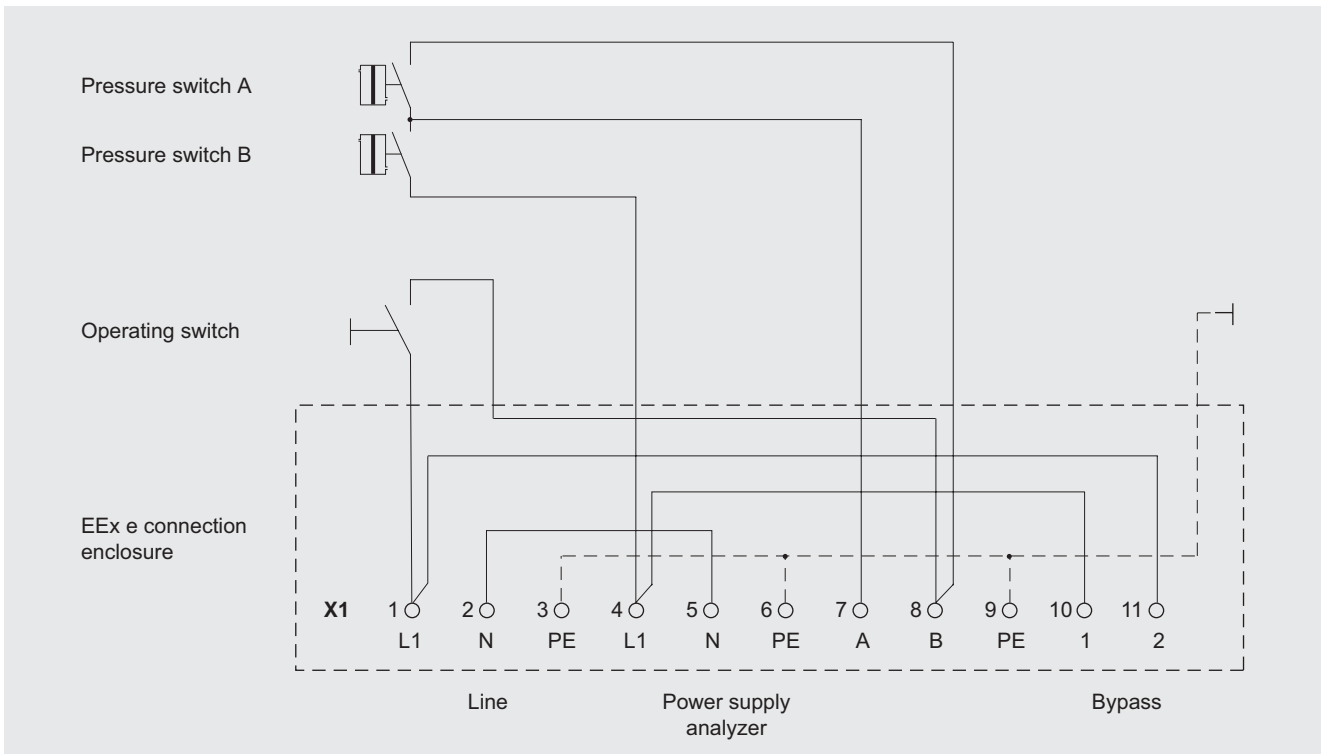


BARTEC control unit, dimensions in mm

Schematics



BARTEC control unit, flammable gases, gas connection diagram



BARTEC control unit, flammable gases, electric connection diagram

Gas Analysis

ULTRAMAT 6

Ex version: additional units Class I Div. 2
Ex purging unit MiniPurge FM

Application

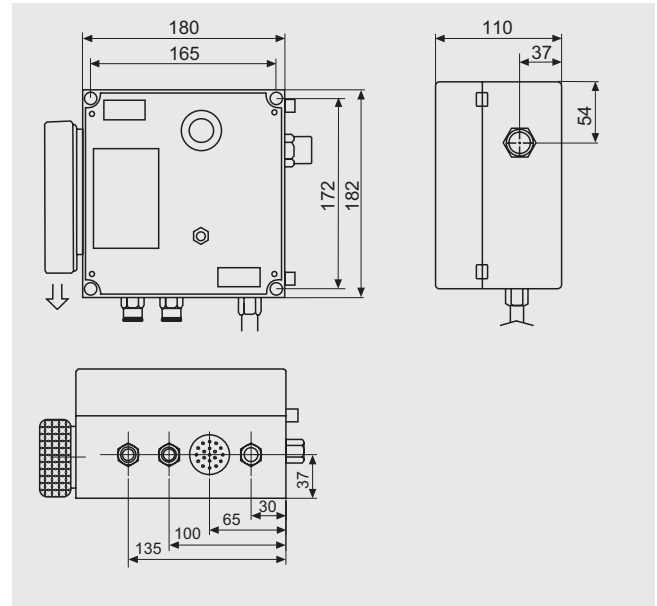
The Ex purging unit MiniPurge FM is used to monitor the pressure during continuous purging of an analyzer with purging gas or inert gas. If the pressure falls below the set value, an optical display is triggered and the relay is activated. This monitoring unit is driven by the purging gas pressure and therefore does not require an additional power supply.

Technical specifications

Classification	Class I Division 2
Enclosure dimensions (in mm)	444 x 438 x 275
Enclosure volume (l)	ca 50 l
Enclosure pressure (normal)	1 hPa
FM certificate	Certificate of compliance 1X8A4.AE / 0B3A3.AE
Reaction upon failure of pressure	Opening of switching contact, and alarm via signal indicator (red display)
System type	MiniPurge complete system
Operating mode	Continuous purging
Type of enclosure	Reinforced polycarbonate
Enclosure surface	RAL 7035 gray with transparent cover
Pressure supply	Dry, oil-free air or inert gas with regulated pressure of approx. 30 psi/2000 hPa at inlet of MiniPurge
Supply connections	Pressure via 1/4 BSPP connection, pressure hose at least 1/2" or 12 mm
Display (signal indicator)	Pneumatically driven color signal: green/red
Switching contact	Via SPCO switch approved for Class 1 Division 2

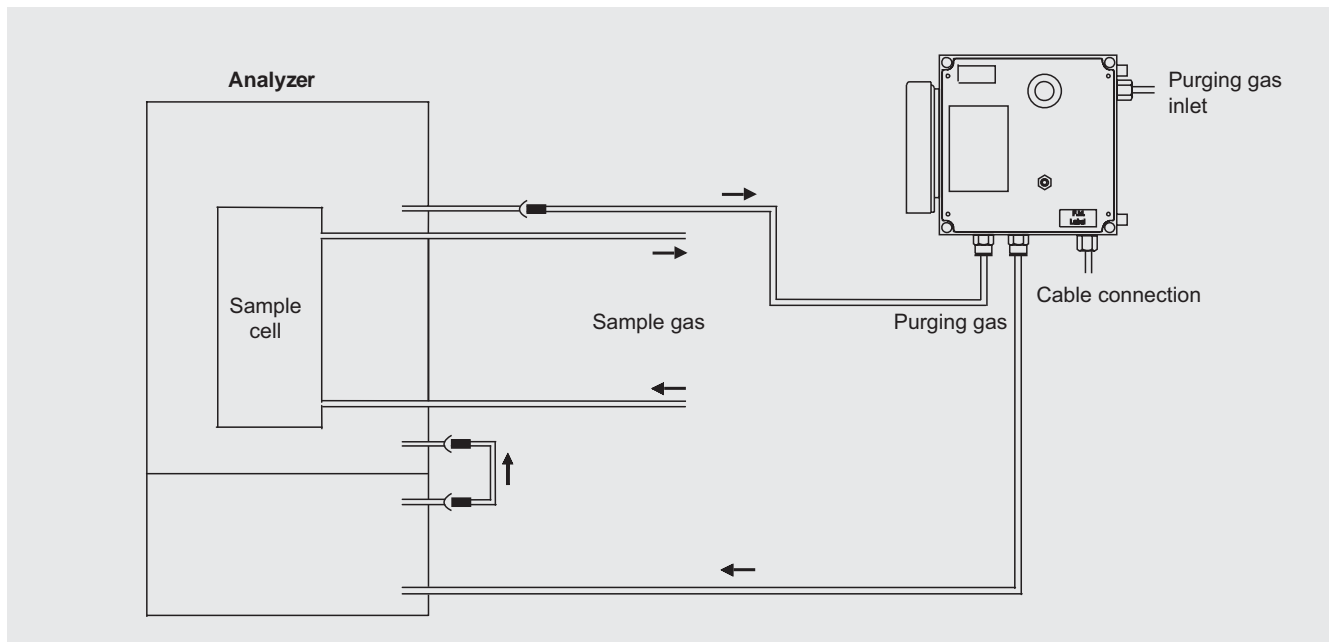
Settings	Lower operating limit 0.5 hPa set relative to purging gas flow of 1 to 2 l/min
Prepurging time	Is defined by operator, and controlled manually
Housing pressure limitation	By means of stainless steel with integrated flame arrester; opens at 10 hPa \pm 10%

Dimensional drawings



MiniPurge, dimensions in mm

Schematics



MiniPurge, purging unit, Class I, Div. 2, gas connection diagram

Documentation

Documentation

Manual	Order No.
ULTRAMAT 6 / OXYMAT 6 Gasanalysengerät für IR-absorbierende Gase und Sauerstoff (German)	C79000-G5200-C143
ULTRAMAT 6 / OXYMAT 6 Gas Analyzers for IR-absorbing Gases and Oxygen (English)	C79000-G5276-C143

Manual	Order No.
ULTRAMAT 6 / OXYMAT 6 Analyseurs de gaz pour la mesure de composants infrarouges et doxygène (French)	C79000-G5277-C143
ULTRAMAT 6 / OXYMAT 6 Analizadores para gases absorbentes de infrarrojo y oxígeno (Spanish)	C79000-G5278-C143
ULTRAMAT 6 / OXYMAT 6 Analizzatori per i gas assorbenti raggi infrarossi ed ossigeno (Italian)	C79000-G5272-C143

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

Description	7MB-2121	7MB-2123	7MB-2124	7MB-2111	7MB-2112	7MB-2111/2 Ex	2 years (qty)	5 years (qty)	Order No.
Analyzer section									
O-ring for hose cell	x	x	x	x	x	x	1	2	C75121-Z101-C1
O-ring after hose cell	x	x	x	x	x	x	1	2	C75121-Z101-C2
O-ring for reflector	x	x	x	x	x	x	1	2	C75121-Z101-C3
O-ring for cover (window, front side)	x	x	x	x	x	x	2	2	C75121-Z101-C4
O-Ring for cooler element	x	x	x	x	x	x	1	1	C75121-Z101-C5
O-ring for cover (window, rear side)	x	x	x	x	x	x	2	4	C79121-Z100-A24
IR source	x	x	x	x	x	x	1	1	C79451-A3462-B12
Window (cell length 20 mm ... 180 mm)	x	x	x	x	x	x	2	2	C79451-A3462-B151
Window (cell length 0.2 mm ... 6 mm)	x	x	x	x	x	x	2	2	C79451-A3462-B152
O-rings, set	x	x	x	x	x	x		1	C79451-A3462-D501
Sample gas circuit									
O-ring (stubs)				x	x	x	2	4	C71121-Z100-A159
O-ring (chopper)	x	x	x	x	x	x	1	2	C75121-Z100-C3
Pressure switch	x	x	x						C79302-Z1210-A2
Flowmeter	x	x	x						C79402-Z560-T1
Stub	x	x	x	x	x	x		1	C79451-A3478-C9
Heating cartridge (heated unit)				x	x	x		1	W75083-A1004-F120
Electronics									
Temperatur fuse (heated unit)				x	x			1	A5E00023094
Fuse-link (heated unit)						x	1	2	A5E00061501
Temperature controller - electronic, 230 V AC				x	x			1	A5E00118527
Temperature controller - electronic, 115 V AC				x	x			1	A5E00118530
Fan, 24 V DC (heated unit)				x	x	x		1	A5E00302916
Front plate with keyboard	x	x	x				1	1	C79165-A3042-B504
Temperature sensor				x	x	x		1	C79165-A3044-B176
Adapter board, LCD/ keyboard	x	x	x	x	x		1	1	C79451-A3474-B605
Base plate, without firmware	x	x	x	x	x	x		1	C79451-A3474-B620
LC display	x	x	x	x	x		1	1	W75025-B5001-B1
Connector filter	x	x	x	x	x			1	W75041-E5602-K2
Fuse-link, T 0.63/250 V	x		x	x	x	x	2	3	W75054-L1010-T630
Fuse-link, 1 A, 110/220 V	x	x	x				2	3	W75054-L1011-T100
Fuse-link, 1,6 A, 250 V		x	x	x	x	x	2	3	W75054-L1011-T160
Fuse-link, 2,5 A, 250 V				x	x	x	2	3	W75054-L1011-T250

Gas Analysis

ULTRAMAT 6

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Siemens AG
A&D PI 2M Process Analytics
Oestliche Rheinbrueckenstr. 50
D-76187 Karlsruhe
Germany
Tel.: +49 721 595 4234
Fax: +49 721 595 6375
E-Mail: processanalytics@siemens.com
www.processanalytics.com

Siemens Applied Automation
500 West Highway 60
Bartlesville, OK 74003
USA
Tel.: +1 918 662 7000
Fax: +1 918 662 7052
E-Mail: saaisales@sea.siemens.com
www.sea.siemens.com/ia

Siemens Pte. Limited
A&D PI2 Regional Head Quarter
The Siemens Center
60 MacPherson Road
Singapore 348615
Tel.: +65 6490 8702
Fax: +65 6490 8703
E-Mail: splanalytics.sgp@siemens.com
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Order No.
E86060-K3510-B131-A4-7600
KG K 0105 4.0 ROT 48 En / 515081
Printed in the Federal Republic of Germany