Overview

The CALOMAT 6 gas analyzer is primarily used for quantitative determination of H_2 or He in binary or quasi-binary non-corrosive gas mixtures.
Concentrations of other gases can also be measured if their thermal conductivities differ significantly from the accompanying gases like Ar, CO_2, CH_4, NH_3.

Benefits

- Small T_{90} time due to micromechanical-produced Si sensor
- Universally applicable hardware basis, high measuring range dynamics (e.g. 0 to 1%, 0 to 100%, 95 to 100% H_2)
- Integrated correction of cross-interference, no external calculation required
- Open interface architecture (RS 485, RS 232, PROFIBUS)
- SIPROM GA network for maintenance and service information (option)
- Electronics and physics: gas-tight separation, purgeable, IP65, long service life even in harsh environments
- Ex(p) for Zones 1 and 2 (in accordance with 94/9/EC (ATEX 2G and ATEX 3G), and Class I Div 2 (CSA) Ex(n)

Application

Application areas

- Pure gas monitoring (0 to 1% H_2 in Ar)
- Protective gas monitoring (0 to 2% He in N_2)
- Hydroargon gas monitoring (0 to 25% H_2 in Ar)
- Forming gas monitoring (0 to 25% H_2 in N_2)
- Gas production:
  - 0 to 2% He in N_2
  - 0 to 10% Ar in O_2
- Chemical applications:
  - 0 to 2% H_2 in NH_3
  - 50 to 70% H_2 in N_2
- Wood gasification (0 to 30% H_2 in $CO/CO_2/CH_4$)
- Blast furnace gas (0 to 5% H_2 in $CO/CO_2/CH_4/N_2$)
- Bessemer converter gas (0 to 20% H_2 in CO/CO_2)
- Monitoring equipment for hydrogen-cooled turbo-alternators:
  - 0 to 100% CO_2/Ar in air
  - 0 to 100% H_2 in CO_2/Ar
  - 80 to 100% H_2 in air
- Versions for analyzing flammable and non-flammable gases or vapors for use in hazardous areas (Zone 1 and Zone 2)

Application (Continued)

Special versions

Special applications

In addition to the standard combinations, special applications are also available on request (e.g. higher sample gas pressure up to 2 000 hPa absolute).

Design

19" rack unit

- With 4 U for installation
  - In hinged frame
  - In cabinets with or without telescopic rails
- Front plate can be swung down for servicing purposes (laptop connection)
- Internal gas paths: Stainless steel pipe (mat. no. 1.4571)
- Gas connections for sample gas inlet and outlet and for purging gas: Fittings, pipe diameter of 6 mm or ¼"

Field device

- Two-door enclosure (IP65) with gas-tight separation of analyzer and electronics sections
- Individually purgeable enclosure halves
- Gas path and stubs made of stainless steel (mat. no. 1.4571)
- Purging gas connections: Pipe diameter 10 mm or 3/8"
- Gas connections for sample gas inlet and outlet: Clamping ring connection for a pipe diameter of 6 mm or ¼"

Display and operator panel

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

Inputs and outputs

- One analog output per medium (from 0, 2, 4 to 20 mA; NAMUR parameterizable)
- Two analog inputs configurable (e.g. correction of cross-interference or external pressure sensor)
- Six digital inputs freely configurable (e.g. for measuring range switchover, processing of external signals from sample preparation)
- Six relay outputs, freely configurable (e.g. failure, maintenance demanded, limit alarm, external solenoid valves)
- Expansion by eight additional digital inputs and eight additional relay outputs each (e.g. for autocalibration with up to four calibration gases)

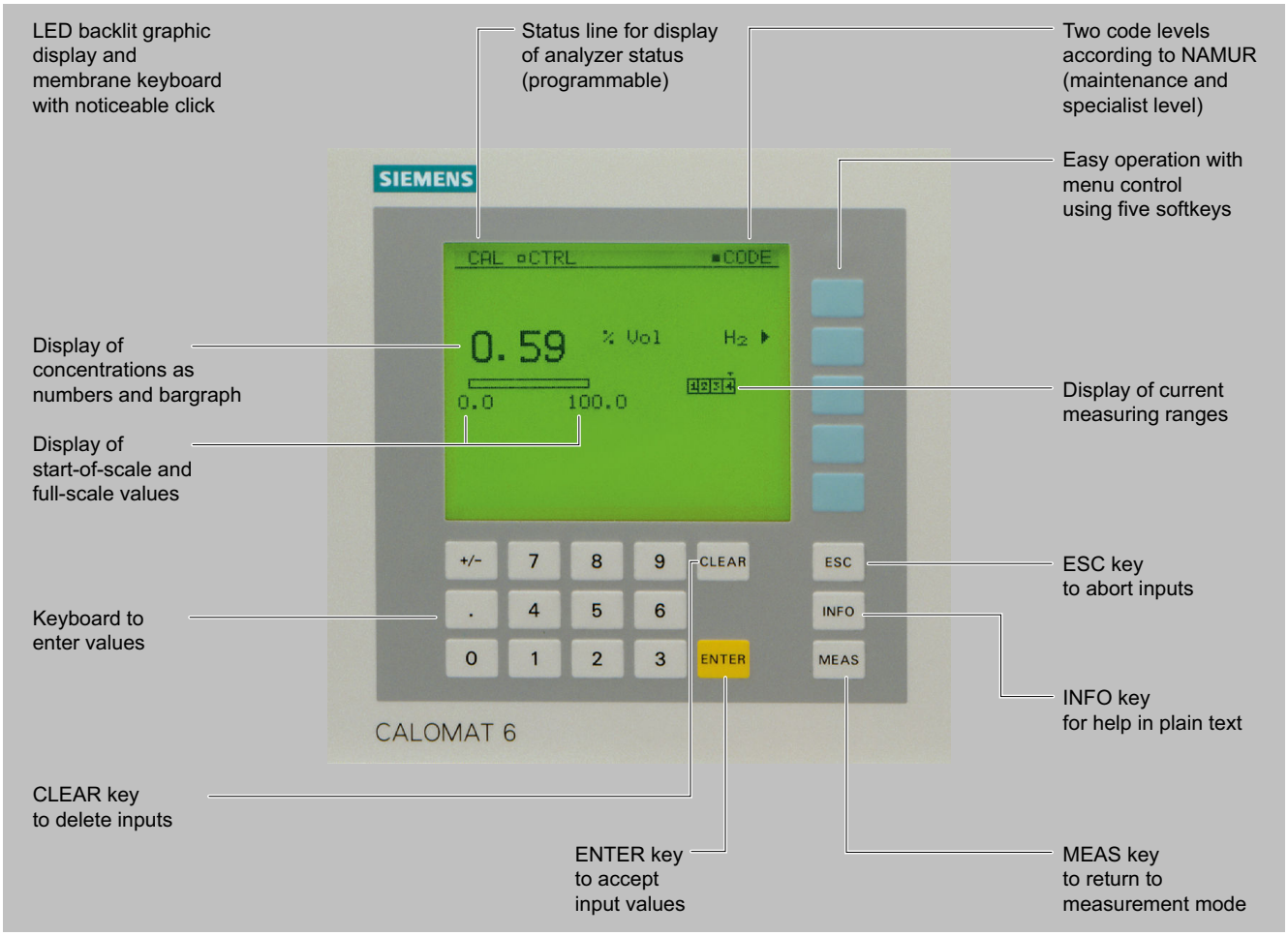
Communication

RS 485 present in basic unit (connection from the rear; for the slide-in module also behind the front plate).

Options

- RS 485/RS 232 converter
- RS 485/Ethernet converter
- RS 485/USB converter
- Connection to networks via PROFIBUS DP/PA interface
- SIPROM GA software as the service and maintenance tool

Design (Continued)

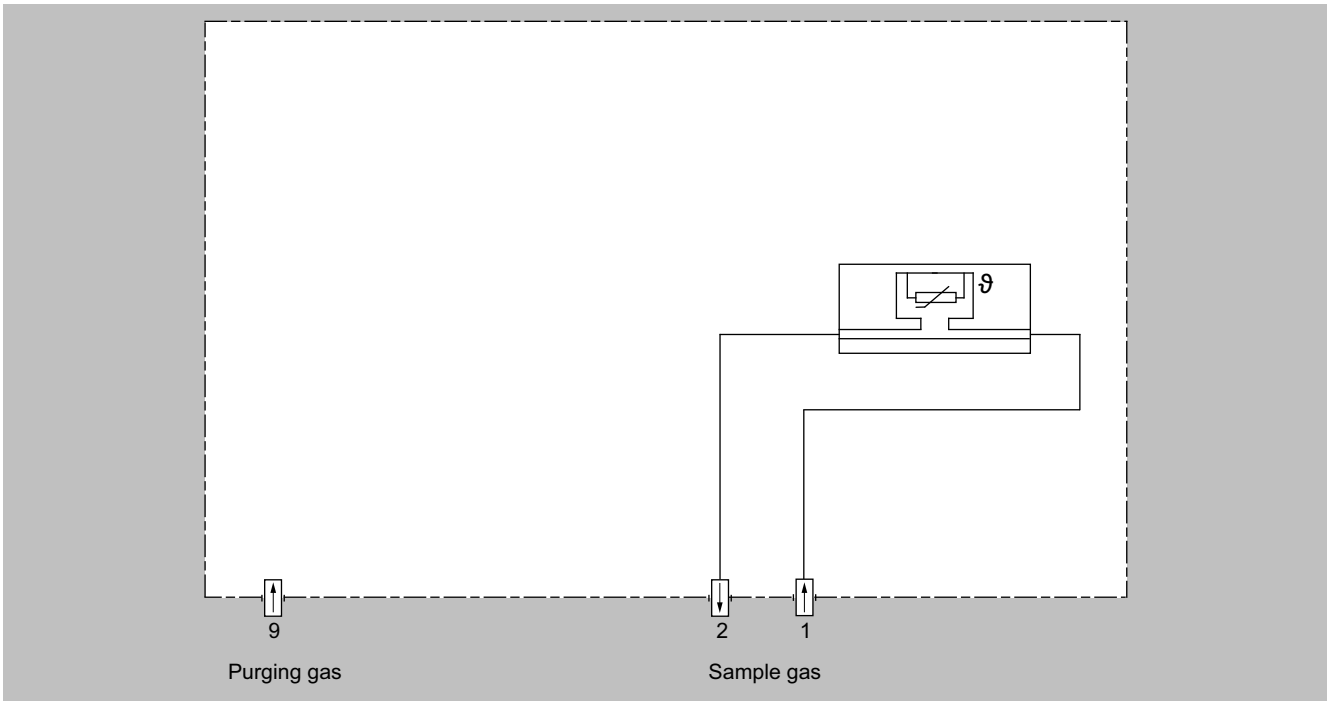


CALOMAT 6, membrane keyboard and graphic display

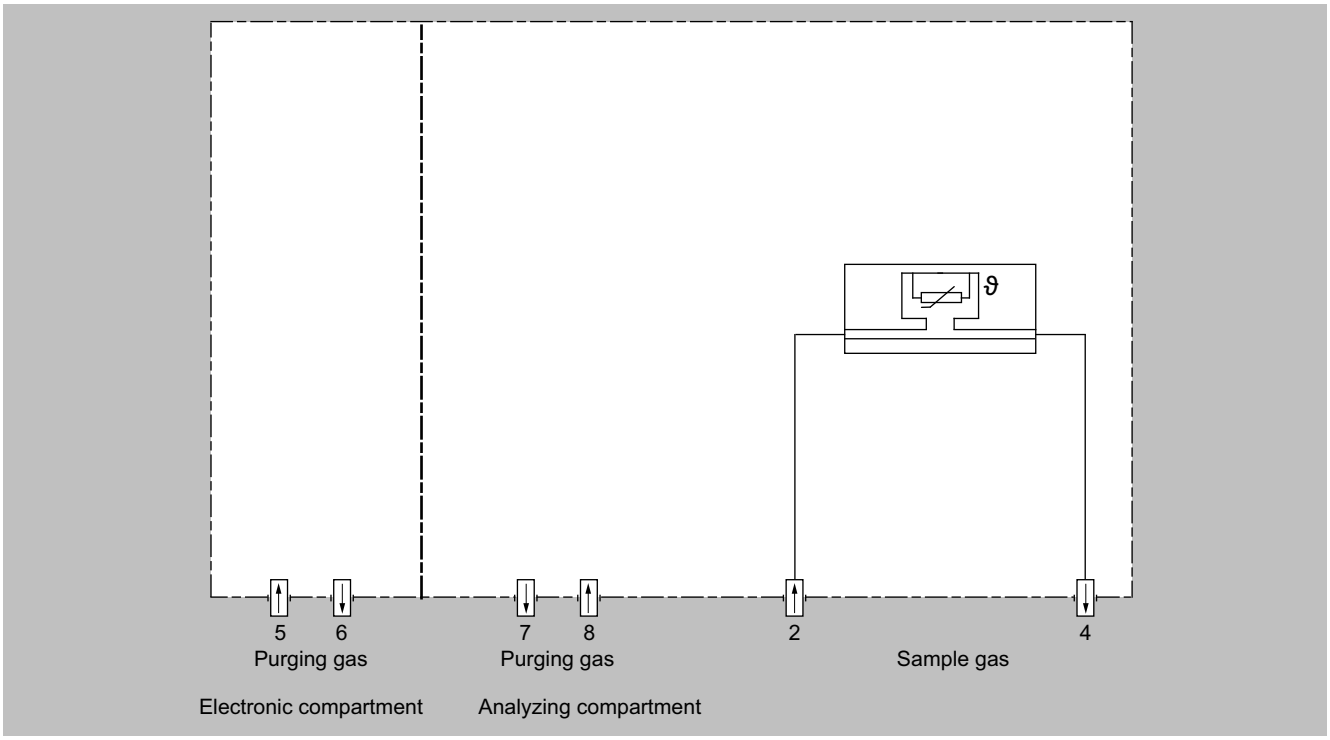
Designs – parts wetted by sample gas

Gas path		19" rack unit	Field device	Field device Ex
With pipes	Bushing	Stainless steel, mat. no. 1.4571	Stainless steel, mat. no. 1.4571	Stainless steel, mat. no. 1.4571
	Pipe	Stainless steel, mat. no. 1.4571	Stainless steel, mat. no. 1.4571	Stainless steel, mat. no. 1.4571
	Sample cell body	Stainless steel, mat. no. 1.4571	Stainless steel, mat. no. 1.4571	Stainless steel, mat. no. 1.4571
	O-rings	Chemraz (FFKM)	Chemraz (FFKM)	Chemraz (FFKM)
	Sensor	Si, SiO_xN_y, AU, epoxy resin, glass	Si, SiO_xN_y, AU, epoxy resin, glass	Si, SiO_xN_y, AU, epoxy resin, glass
	Tightness	Leakage loss < 1 µl/s	Leakage loss < 1 µl/s	Leakage loss < 1 µl/s

Design (Continued)



CALOMAT 6, 19" rack unit, gas path



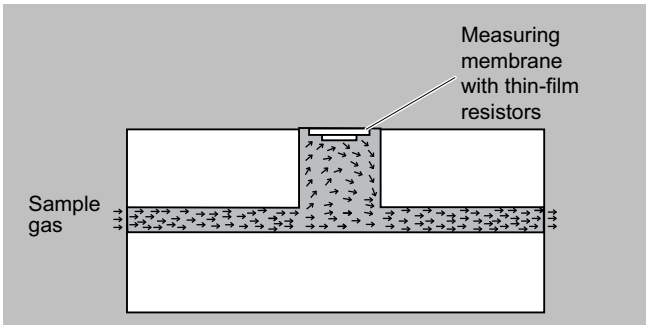
CALOMAT 6, field device, gas path

Mode of operation

The measuring principle is based on the different thermal conductivity of gases.
The CALOMAT 6 works with a micromechanically produced Si chip whose measuring diaphragm is equipped with thin-film resistors. The resistors are kept at a constant temperature. This requires a current intensity that takes on a specific value depending on the thermal conductivity of the sample gas. This "raw value" is electronically further processed to calculate the gas concentration.
The sensor is located in a thermostatically-controlled stainless steel enclosure in order to prevent the influence of changes in ambient temperature.
To prevent the influence of changes in flow, the sensor is positioned in a bore hole located to the side of the main flow.

Note

The sample gases must be fed into the analyzers free of dust. Condensation (dew point sample gas < ambient temperature) is to be avoided in the sample chambers. Therefore, the use of gas modified for the measuring tasks is necessary in most application cases.



CALOMAT, principle of operation

Function

Main features

- Four measuring ranges which can be freely configured, even with suppressed zero point; all measuring ranges are linear
- Smallest measuring spans down to 1% H_2 (with suppressed zero point: 95 to 100% H_2) possible
- Measuring range identification
- Electrically isolated measured value output 0/2/4 through to 20 mA (including inverted)
- Automatic or manual measuring range switchover selectable; remote switching is also possible
- Storage of measured values possible during calibration
- Wide range of selectable time constants (static/dynamic noise damping); i.e. the response time of the device can be adapted to the respective measuring task
- Short response time
- Low long-term drift
- Measuring point switchover for up to 6 measuring points (parameterizable)
- Measuring range identification
- Measuring point identification
- External pressure sensor can be connected – for correction of variations in sample gas pressure
- Automatic measuring range calibration parameterizable
- Operation based on NAMUR recommendation

Function (Continued)

- Two control levels with separate authorization codes for the prevention of accidental and unauthorized operator interventions
- Simple handling using a numerical membrane keyboard and operator prompting
- Custom-made device designs, such as:
  - Customer acceptance
  - TAG plates
  - Drift recording
  - Clean for O_2 service

Measuring spans

The smallest and largest possible measuring spans depend on both the measured component (gas type) and the respective application. The smallest possible measuring spans listed below refer to N_2 as the accompanying gas. With other gases which have a larger/smaller thermal conductivity than N_2, the smallest possible measuring span is also larger/smaller.

Component	Smallest possible measuring span
H_2	0 ... 1% (95 ... 100%)
He	0 ... 2%
Ar	0 ... 10%
CO_2	0 ... 20%
CH_4	0 ... 15%
H_2 in blast furnace gas	0 ... 10%
H_2 in converter gas	0 ... 20%
H_2 with wood gasification	0 ... 30%

Cross-interferences

Knowledge of the sample gas composition is necessary to determine the cross-interference of accompanying gases with multiple interference gas components.
The following table lists the zero offsets expressed in % H_2 resulting from 10% accompanying gas (interference gas) in each case.

Component	Zero offset
Ar	-1.28%
CH_4	+1.59%
C_2H_6 (non-linear response)	+0.04%
C_3H_8	-0.80%
CO	-0.11%
CO_2	-1.07%
He	+6.51%
H_2O (non-linear response)	+1.58%
NH_3 (non-linear response)	+1.3%
O_2	+0.18%
SF_6	-2.47%
SO_2	-1.34%
100% air (dry)	+0.27%

For accompanying gas concentrations differing from 10%, the corresponding multiple of the associated value in the table provides an acceptable approximation. This is valid for accompanying gas concentrations up to 25% (dependent on gas type).
The thermal conductivity of most gas mixtures has a non-linear response. Even ambiguous measurement results, such as e.g. with NH_3/N_2 mixtures, can occur within a specific concentration range.
In addition to a zero offset, it should also be noted that the gradient of the characteristic curve is influenced by the accompanying gas. However, this effect is negligible for most gases.

Function (Continued)

When correcting cross-interferences with additional analyzers (ULTRAMAT 6/ULTRAMAT 23), the resulting measuring error can – depending on the application – amount to up to 5% of the smallest measuring range of the respective application.

Example of correction of cross-interference

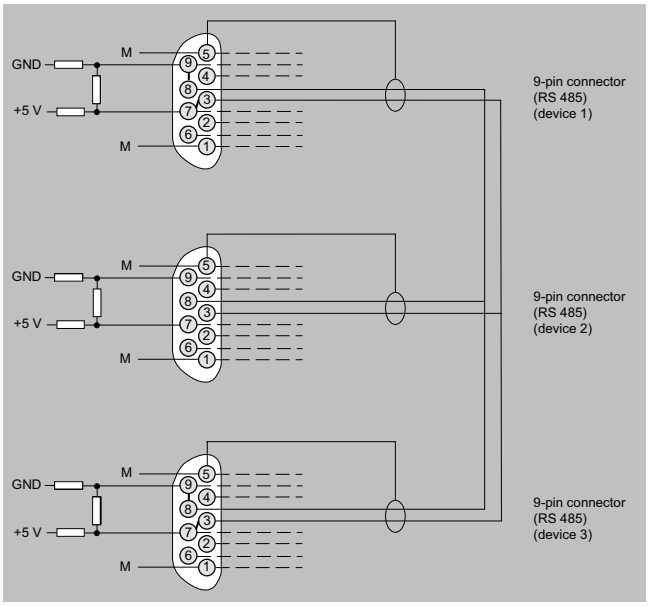
Specification for the interface cable	
Surge impedance	100 ... 300 Ω, with a measuring frequency of > 100 kHz
Cable capacitance	Typ. < 60 pF/m
Core cross-section	> 0.22 mm², corresponds to AWG 23
Cable type	Twisted pair, 1 x 2 conductors of cable section
Signal attenuation	Max. 9 dB over the whole length
Shielding	Copper braided shield or braided shield and foil shield
Connection	Pin 3 and pin 8

Bus terminating resistors

Pins 3-7 and 8-9 of the first and last plugs of bus cables must be bridged (see Graphic "Bus line with plug connection, example").

Note

It is advisable to install a repeater on the device side in the case of a cable length of more than 500 m or with high interferences.
Up to four components can be corrected via the ELAN bus, correction of cross-interference can be carried out for one or two components via the analog input.



Bus cable with plug connections, example

Selection and ordering data

CALOMAT 6 gas analyzer 19" rack unit for installation in cabinets			Article No. 7MB2521-	●	●	●	0	●	-	●	A	●	●
Click on the Article No. for online configuration in the PIA Life Cycle Portal. ***Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".***													
Connections for sample gas													
Pipe with 6 mm outer diameter				0									
Pipe with ¼" outer diameter				1									
Measured component	**Smallest measuring range**	**Largest measuring range**											
H_2 in N_2	0 ... 1%	0 ... 100%			A	A							
H_2 in N_2 (blast furnace gas measurement)[1]	0 ... 5%	0 ... 100%			A	W							
H_2 in N_2 (converter measurement)[1]	0 ... 5%	0 ... 100%			A	X							
H_2 in N_2 (wood gasification)[1]	0 ... 5%	0 ... 100%			A	Y							
H_2 in Ar	0 ... 1%	0 ... 100%			A	B							
H_2 in NH_2	0 ... 1%	0 ... 100%			A	C							
He in N_2	0 ... 2%	0 ... 100%			B	A							
He in Ar	0 ... 2%	0 ... 100%			B	B							
He in H_2	0 ... 10%	0 ... 80%			B	C							
Ar in N_2	0 ... 10%	0 ... 100%			C	A							
Ar in O_2	0 ... 10%	0 ... 100%			C	B							
CO_2 in N_2	0 ... 20%	0 ... 100%			D	A							
CH_4 in Ar	0 ... 15%	0 ... 100%			E	A							
NH_3 in N_2	0 ... 10%	0 ... 30%			F	A							
H_2 monitoring (turbo generators)													
• CO_2 in air	0 ... 100%				G	A							
• H_2 in CO_2	0 ... 100%				G	A							
• H_2 in air	80 ... 100%				G	A							
Add-on electronics													
Without								0					
AUTOCAL function with 8 additional digital inputs and outputs								1					
AUTOCAL function 8 additional digital inputs/outputs and PROFIBUS PA interface								6					
AUTOCAL function with 8 additional digital inputs/outputs and PROFIBUS DP interface								7					
Auxiliary power													
100 V ... 120 V AC, 48 ... 63 Hz										0			
200 V ... 240 V AC, 48 ... 63 Hz										1			
Explosion protection													
Without											A		
Certificate: ATEX II 3G, flammable and non-flammable gases											B		
FM/CSA certificate – Class I Div 2											D		
Language of the operating software													
German													0
English													1
French													2
Spanish													3
Italian													4

[1] Ready to enter external correction of cross-interference for CO, CO_2 and CH_4 (CH_4 only for blast furnace gas and wood gasification).

Options	Order code
Add "**-Z**" to article number and then add order code.	
Settings	
Telescopic rails (2 units)	**A31**
Set of Torx screwdrivers, ball Allen screwdrivers	**A32**
Tag plates (specific inscription based on customer information)	**B03**

Selection and ordering data (Continued)

Options	Order code
Clean for O_2 service (specially cleaned gas path)	**Y02**
Measuring range indication in plain text, if different from default setting	**Y11**
Special setting (only in conjunction with an application no.)	**Y12**

Accessories	Article No.
RS 485/Ethernet converter	**A5E00852383**
RS 485/RS 232 converter	**C79451-Z1589-U1**
RS 485/USB converter	**A5E00852382**
AUTOCAL function with 8 digital inputs/outputs	**C79451-A3480-D511**
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS PA	**A5E00057307**
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS DP	**A5E00057312**
Set of Torx screwdrivers	**A5E34821625**

Technical specifications

CALOMAT 6, 19" rack unit	
General information	Based on EN 61207/IEC 1207. All data based on H_2 in N_2 binary mixture
Measuring ranges	4, internally and externally switchable; automatic measuring range switchover also possible
Largest possible measuring span	100 vol.% H_2 (see "Function" for smallest measuring span)
Measuring ranges with suppressed zero point	Any zero point within 0 ... 100 vol.% can be implemented, smallest possible measuring span: 5% H_2
Operating position	Front wall, vertical
Conformity	CE mark in accordance with EN 61326/A1 and EN 61010/1
Design, enclosure	
Degree of protection	IP20 according to EN 60529
Weight	Approx. 10 kg
Electrical characteristics	
EMC interference immunity (electromagnetic compatibility) All signal lines must be shielded. Measured value deviations of up to 4% of the smallest measuring range may occur in ranges with strong electromagnetic interference.	In accordance with standard requirements of NAMUR NE21 (08/98)
Electrical safety	In accordance with EN 61010-1; overvoltage category II
Auxiliary power (see nameplate)	100 V AC -10% ... 120 V AC +10%, 48 ... 63 Hz or 200 AC -10% ... 240 V AC +10%, 48 ... 63 Hz
Power consumption	Approx. 20 VA
Fuse ratings	100 ... 120 V: 1.0T/250 200 ... 240 V: 0.63T/250
Gas inlet conditions	
Sample gas pressure	800 ... 1 100 hPa (absolute)
Sample gas flow	30 ... 90 l/h (0.5 ... 1.5 l/min)
Sample gas temperature	Min. 0 ... max. 50 °C, but above the dew point
Temperature of the measuring cell	Approx. 60 °C
Sample gas humidity	< 90% relative humidity
Time response	
Warm-up period	< 30 min (the technical specification will be met after 2 hours)

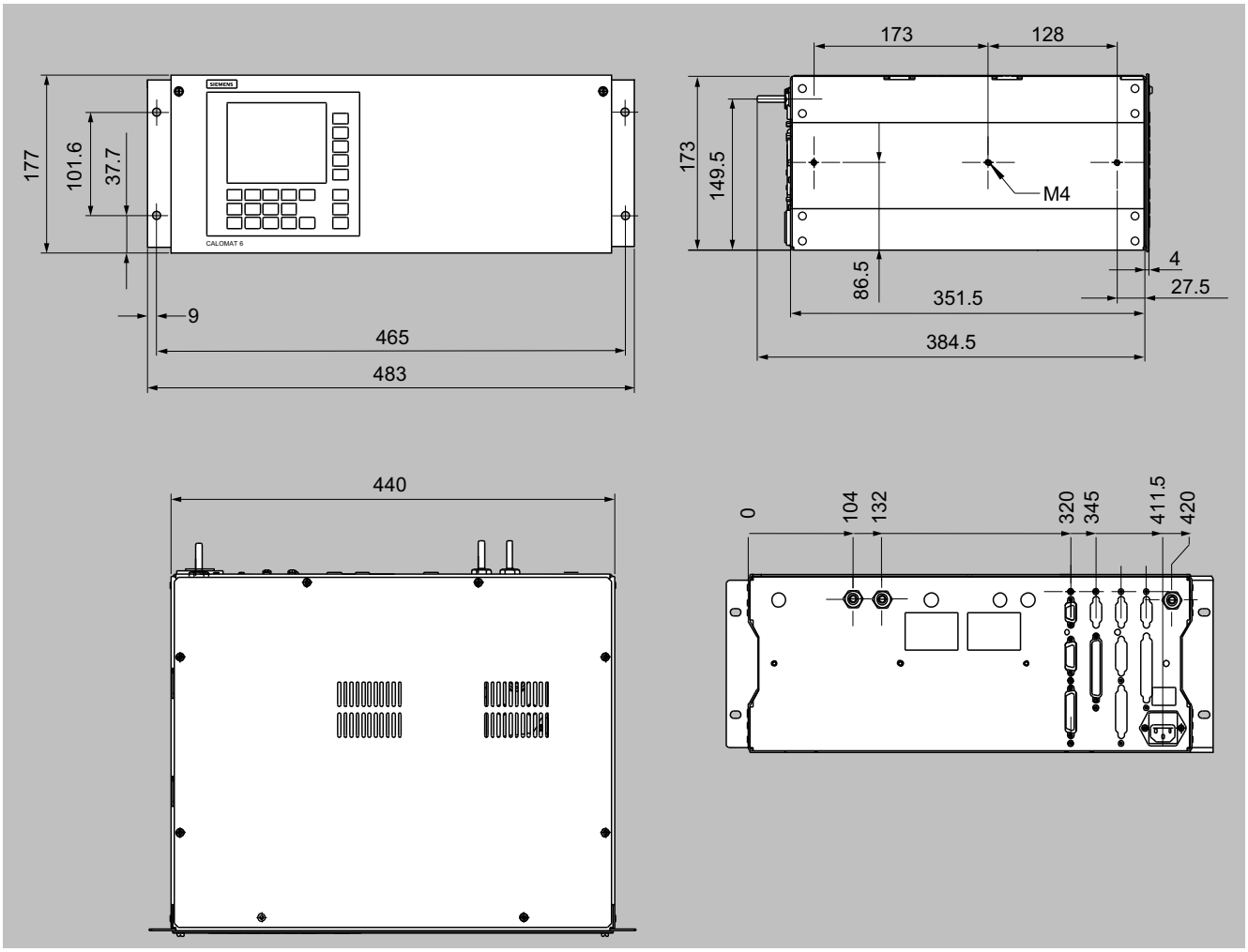
Technical specifications (Continued)

CALOMAT 6, 19" rack unit	
Delayed display (T_{90})	< 5 s
Damping (electrical time constant)	0 ... 100 s, configurable
Dead time (purging time of the gas path in the device at 1 l/min)	Approx. 0.5 s
Measuring response	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation	< ± 0.75% of the smallest possible measuring range according to nameplate, with electronic damping constant of 1 s (σ = 0.25%)
Zero point drift	< ± 1%/week of the smallest possible measuring span according to nameplate
Measured value drift	< ± 1%/week of the smallest possible measuring span according to nameplate
Repeatability	< 1% of the current measuring range
Detection limit	1% of the current measuring range
Linearity error	< ± 1% of the current measuring range
Influencing variables	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Ambient temperature	< 1%/10 K referred to smallest possible measuring span according to nameplate
Accompanying gases	Zero point deviation (for influence of interference gas, see "Cross-interferences")
Sample gas flow	< 0.2% of the smallest possible measuring span according to nameplate with a change in flow of 0.1 l/min within the permissible flow range
Sample gas pressure	< 1% of the current measuring range with a pressure variation of 100 hPa
Auxiliary power	< 0.1% of the current measuring range with nominal voltage ± 10%
Electrical inputs and outputs	
Analog output	0/2/4 ... 20 mA, floating; max. load 750 Ω
Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load rating: 24 V AC/DC/1 A, floating
Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and correction of cross-interference

Technical specifications (Continued)

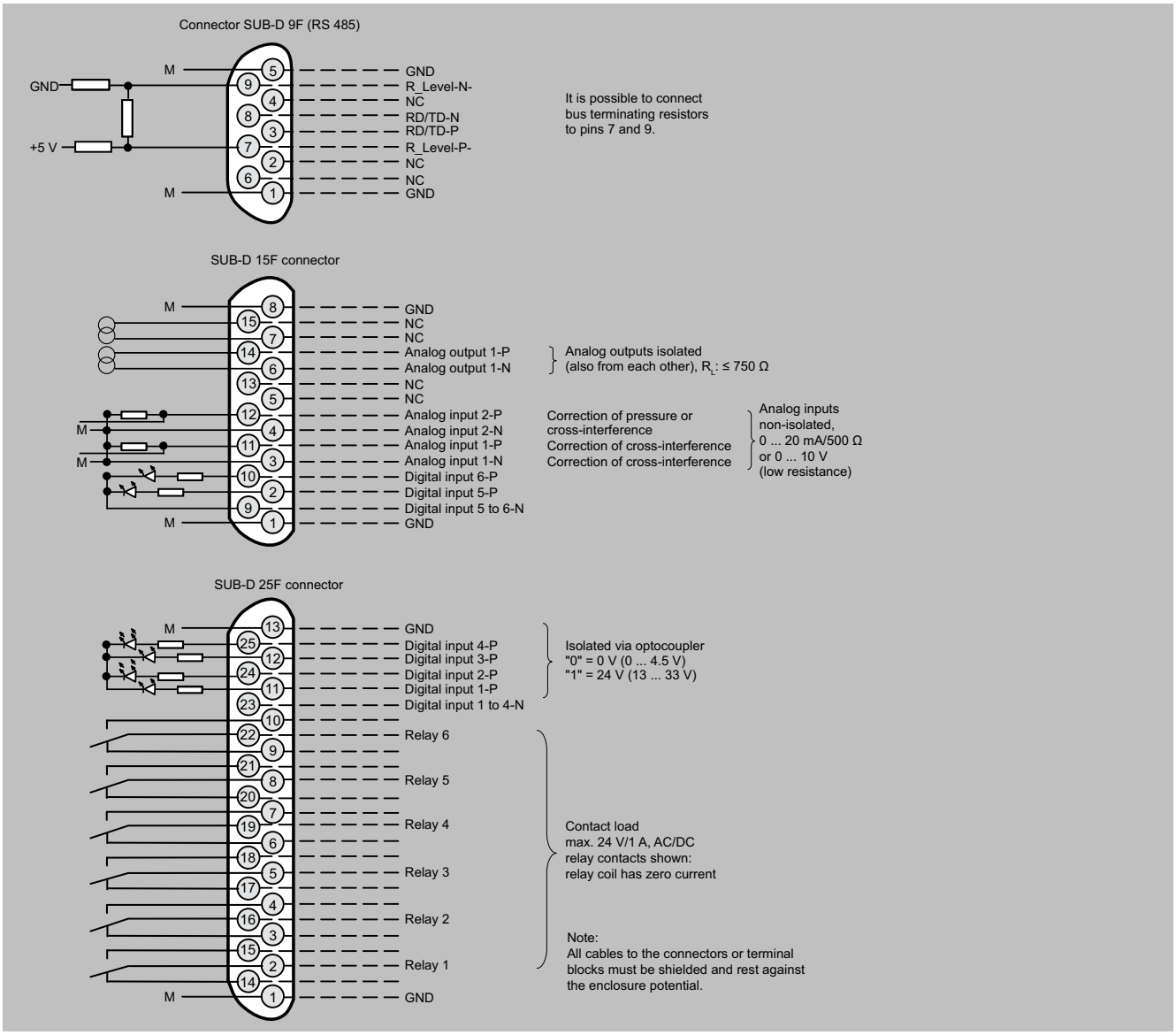
CALOMAT 6, 19" rack unit	
Digital inputs	6, designed for 24 V, floating, freely configurable, e.g. for measuring range switchover
Serial interface	RS 485
Options	AUTOCAL function each with 8 additional digital inputs and relay outputs, also with PROFIBUS PA or PROFIBUS DP
Climatic conditions	
Permissible ambient temperature	-30 ... +70 °C during storage and transportation, 5 ... 45 °C during operation
Permissible humidity (must not fall below dew point)	< 90% relative humidity as annual average during storage and transportation

Dimensional drawings



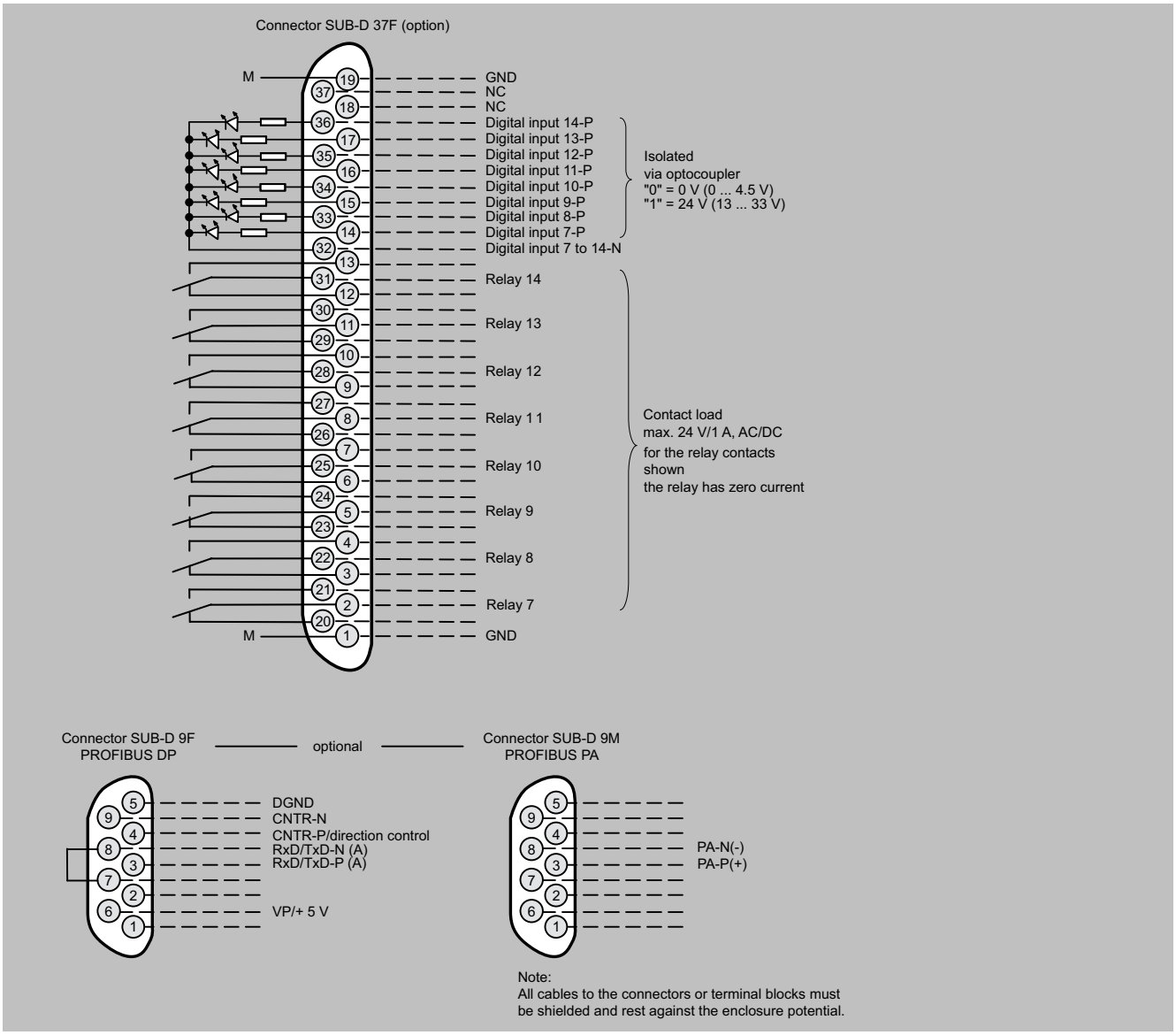
CALOMAT 6, 19" rack unit, dimensions in mm

Circuit diagrams



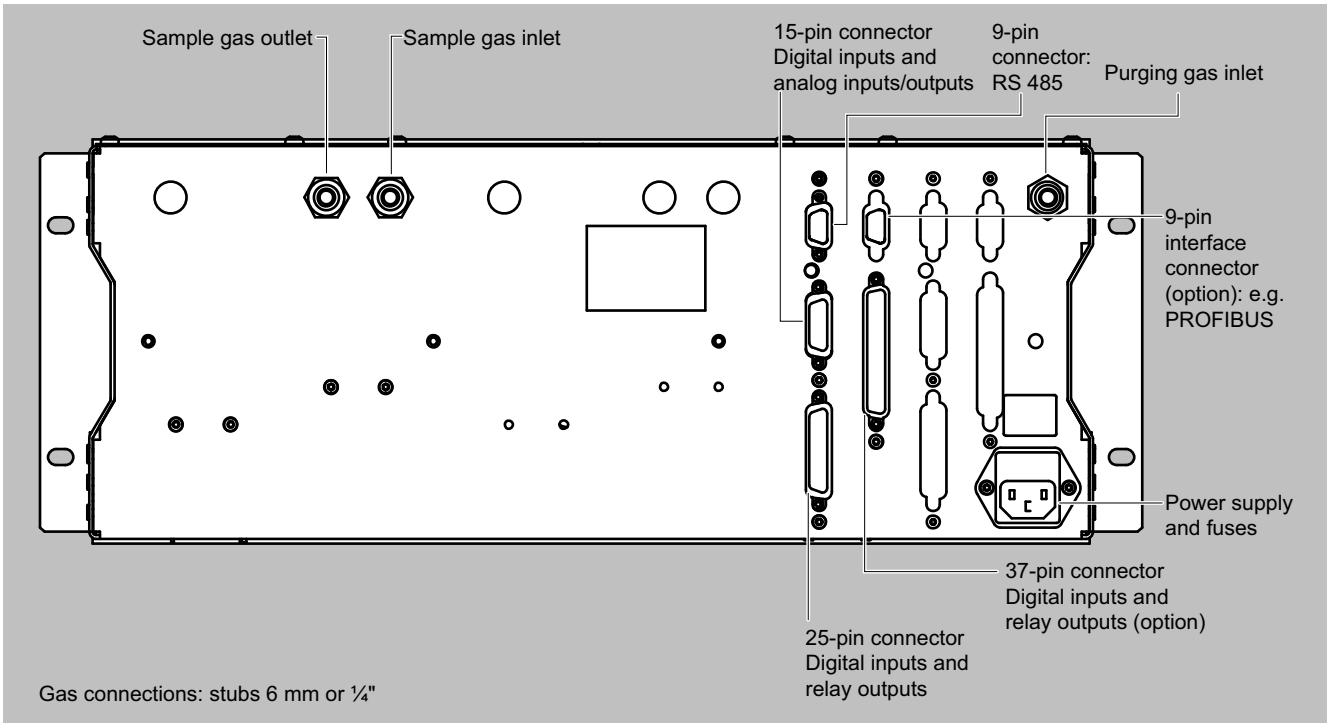
CALOMAT 6, 19" rack unit, pin assignment

Circuit diagrams (Continued)



CALOMAT 6, 19" rack unit, pin assignment of AUTOCAL board and PROFIBUS plugs

Circuit diagrams (Continued)



CALOMAT 6, 19" rack unit, gas and electrical connections

Selection and ordering data

CALOMAT 6 gas analyzer For installation in the field			Article No. 7MB2511-	●	●	●	0	●	-	●	A	●	●
Click on the Article No. for online configuration in the PIA Life Cycle Portal.													
Unavailable combinations are shown in PIA Life Cycle Portal as "not permitted".													
Connections for sample gas													
Cutting ring fitting for pipe, outer diameter 6 mm				0									
Cutting ring fitting for pipe, outer diameter ¼"				1									
Measured component	**Smallest measuring range**	**Largest measuring range**											
H_2 in N_2	0 ... 1%	0 ... 100%			A	A							
H_2 in N_2 (blast furnace gas measurement)[1]	0 ... 5%	0 ... 100%			A	W							
H_2 in N_2 (converter measurement)[1]	0 ... 5%	0 ... 100%			A	X							
H_2 in N_2 (wood gasification)[1]	0 ... 5%	0 ... 100%			A	Y							
H_2 in Ar	0 ... 1%	0 ... 100%			A	B							
H_2 in NH_3	0 ... 1%	0 ... 100%			A	C							
He in N_2	0 ... 2%	0 ... 100%			B	A							
He in Ar	0 ... 2%	0 ... 100%			B	B							
He in H_2	0 ... 10%	0 ... 80%			B	C							
Ar in N_2	0 ... 10%	0 ... 100%			C	A							
Ar in O_2	0 ... 10%	0 ... 100%			C	B							
CO_2 in N_2	0 ... 20%	0 ... 100%			D	A							
CH_4 in Ar	0 ... 15%	0 ... 100%			E	A							
NH_3 in N_2	0 ... 10%	0 ... 30%			F	A							
H_2 monitoring (turbo generators)													
• CO_2 in air	0 ... 100%				G	A							
• H_2 in CO_2	0 ... 100%				G	A							
• H_2 in air	80 ... 100%				G	A							
Add-on electronics													
Without								0					
AUTOCAL function with 8 additional digital inputs and outputs								1					
AUTOCAL function 8 additional digital inputs/outputs and PROFIBUS PA interface								6					
AUTOCAL function with 8 additional digital inputs/outputs and PROFIBUS DP interface								7					
AUTOCAL function with 8 additional digital inputs/outputs and PROFIBUS PA Ex i interface								8					
Auxiliary power													
100 V ... 120 V AC, 48 ... 63 Hz										0			
200 V ... 240 V AC, 48 ... 63 Hz										1			
Explosion protection, including certificates													
Without											A		
According to ATEX II 3G, non-flammable gases											B		
According to ATEX II 3G, flammable gases[2]											C		
FM/CSA certificate – Class I Div 2											D		
According to ATEX II 2G, continuous purging[2]											F		
ATEX II 3D certificate; potentially explosive dust atmospheres													
• In non-hazardous gas zone											G		
• In hazardous zone according to ATEX II 3G; non-flammable gases											H		
• In hazardous zone according to ATEX II 3G; flammable gases[2]											J		
Language of the operating software													
German													0
English													1
French													2
Spanish													3
Italian													4

[1] Ready to enter external correction of cross-interference for CO, CO_2 and CH_4 (CH_4 only for blast furnace gas and wood gasification).
[2] Only in connection with an approved purging unit.

Selection and ordering data (Continued)

Options	Order code
Add "-**Z**" to article number and then add order code.	
Settings	
Set of Torx screwdrivers, ball Allen screwdrivers	**A32**
Tag plates (specific inscription based on customer information)	**B03**
BARTEC Ex p control station	
• "Leakage compensation"	**E71**
• "Continuous purging"	**E72**
BARTEC Ex p purging unit for use in ATEX or IECEx Zone 1 • BARTEC Ex p control unit for continuous flow • BARTEC Ex control station with bypass key switch	**E74**
BARTEC Ex purging unit for use in ATEX or IECEx Zone 1 • BARTEC Ex p control unit for continuous flow • BARTEC Ex control station with bypass key switch • Operator display for visualization of system states	**E75**
Clean for O_2 service (specially cleaned gas path)	**Y02**
Measuring range indication in plain text, if different from default setting	**Y11**
Special setting (only in conjunction with an application no., e.g. additional components, measuring range)	**Y12**

Additional units for Ex versions	Article No.
ATEX Category II 2G (Zone 1)	
BARTEC Ex p purging unit for use in ATEX or IECEx Zone 1	
• BARTEC Ex p control unit for continuous flow, BARTEC Ex control station with bypass key-switch	**7MB8000-7CA**
• BARTEC Ex p control unit for continuous flow, BARTEC Ex control station with bypass key-switch, operator display for visualization of system states	**7MB8000-7CB**
Ex i isolating transformer	**7MB8000-3AB**
Ex isolating relay, 230 V	**7MB8000-4AA**
Ex isolating relay, 110 V	**7MB8000-4AB**
Differential pressure switch for corrosive and non-corrosive gases	**7MB8000-5AA**
Stainless steel flame arrestor	**7MB8000-6BA**
Hastelloy flame arrestor	**7MB8000-6BB**
ATEX Category II 3G (Zone 2)	
BARTEC Ex p purging unit for use in ATEX or IECEx Zone 1	
• BARTEC Ex p control unit for continuous flow, BARTEC Ex control station with bypass key-switch	**7MB8000-7CA**
• BARTEC Ex p control unit for continuous flow, BARTEC Ex control station with bypass key-switch, operator display for visualization of system states	**7MB8000-7CB**

Selection and ordering data (Continued)

Additional units for Ex versions	Article No.
FM/CSA (Class I Div 2)	
Ex purging unit MiniPurge FM	**7MB8000-1AA**

Accessories	Article No.
RS 485/Ethernet converter	**A5E00852383**
RS 485/RS 232 converter	**C79451-Z1589-U1**
RS 485/USB converter	**A5E00852382**
AUTOCAL function with 8 digital inputs/outputs	**A5E00064223**
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS PA	**A5E00057315**
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS DP	**A5E00057318**
AUTOCAL function with 8 digital inputs/outputs and PROFIBUS PA Ex i (firmware 4.1.10 required)	**A5E00057317**
Set of Torx screwdrivers	**A5E34821625**

Technical specifications

CALOMAT 6, field device	
General information	Based on EN 61207/IEC 1207. All data based on H_2 in N_2 binary mixture
Measuring ranges	4, internally and externally switchable; automatic measuring range switchover also possible
Largest possible measuring span	100 vol.% H_2 (see "Function" for smallest measuring span)
Measuring ranges with suppressed zero point	Any zero point within 0 ... 100 vol.% can be implemented; smallest possible measuring span: 5% H_2
Operating position	Front wall, vertical
Conformity	CE mark in accordance with EN 61326/A1 and EN 61010/1
Design, enclosure	
Degree of protection	IP65 according to EN 60529
Weight	Approx. 25 kg
Electrical characteristics	
EMC interference immunity (electromagnetic compatibility) All signal lines must be shielded. Measured value deviations of up to 4% of the smallest measuring range may occur in ranges with strong electromagnetic interference.	In accordance with standard requirements of NAMUR NE21 (08/98)
Electrical safety	In accordance with EN 61010-1; overvoltage category II
Auxiliary power (see nameplate)	100 V AC -10% ... 120 V AC +10%, 48 ... 63 Hz or 200 AC -10% ... 240 V AC +10%, 48 ... 63 Hz
Power consumption (device)	Approx. 20 VA
Fuse ratings	100 ... 120 V: 1.0T/250 200 ... 240 V: 0.63T/250
Gas inlet conditions	
Sample gas pressure	800 to 1 100 hPa (absolute)
Sample gas flow	30 ... 90 l/h (0.5 ... 1.5 l/min)
Sample gas temperature	Min. 0 to max. 50 °C, but above the dew point
Temperature of the measuring cell	Approx. 60 °C
Sample gas humidity	< 90% relative humidity
Purging gas pressure	
• Permanent	165 hPa above atmospheric pressure
• For short periods	Max. 250 hPa above ambient pressure

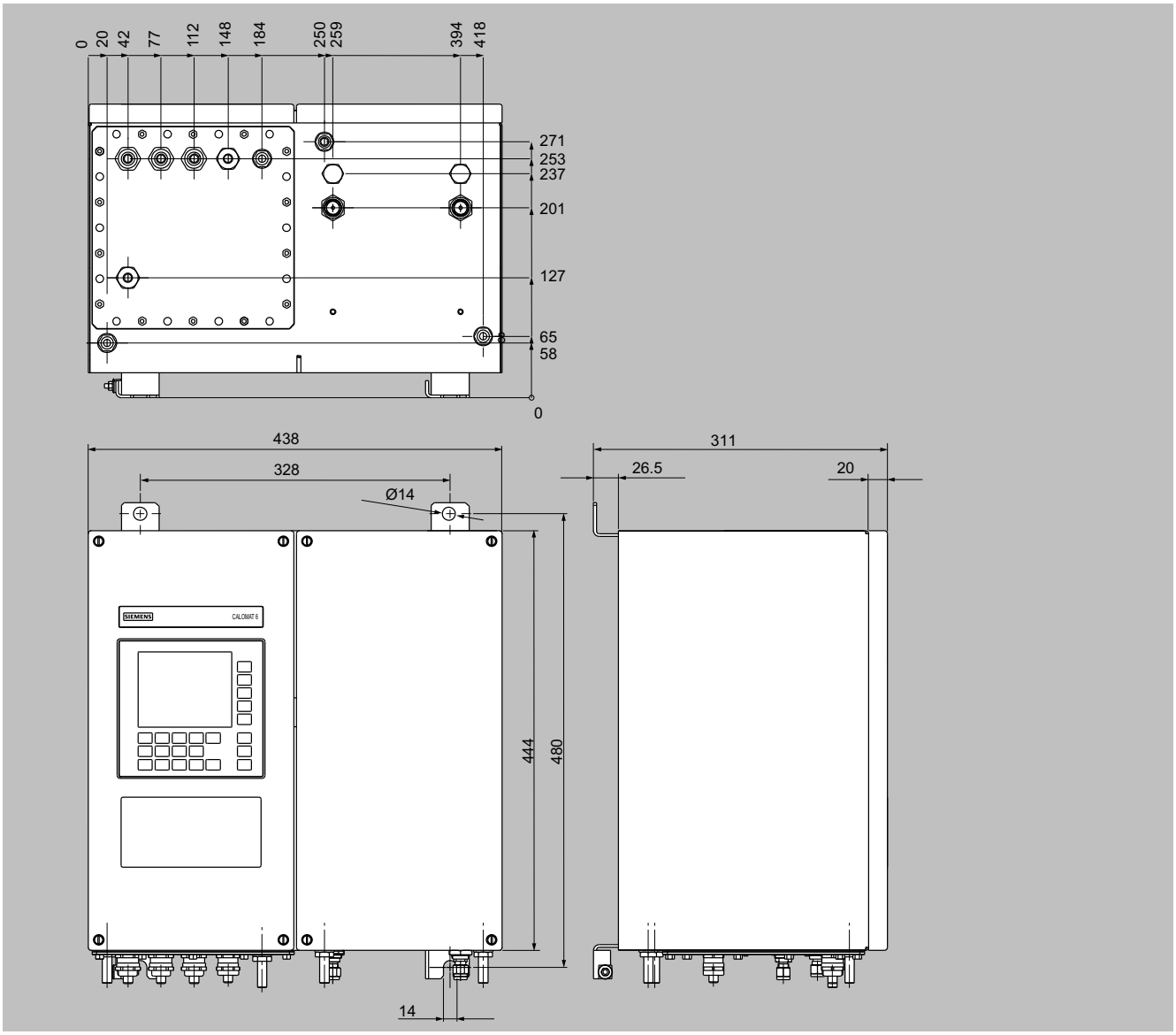
Technical specifications (Continued)

CALOMAT 6, field device	
Time response	Based on sample gas pressure 1 000 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Warm-up period	< 30 min (the technical specification will be met after 2 hours)
Delayed display (T_{90})	< 5 s
Electrical damping	0 ... 100 s, configurable
Dead time (at 1 l/min)	Approx. 0.5 s
Measuring response	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Output signal fluctuation (maximum accuracy achieved after 2 hours)	< ± 0.75% of the smallest possible measuring range according to nameplate, with electronic damping constant of 1 s (σ = 0.25%)
Zero point drift	< ± 1%/week of the smallest possible measuring span according to nameplate
Measured value drift	< ± 1%/week of the smallest possible measuring span according to nameplate
Repeatability	< 1% of the current measuring range
Detection limit	1% of the current measuring range
Linearity error	< ± 1% of the current measuring range
Influencing variables	Based on sample gas pressure 1013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature
Ambient temperature	< 1%/10 K referred to smallest possible measuring span according to nameplate
Accompanying gases	Zero point deviation (for influence of interference gas, see "Cross-interferences")
Sample gas flow	< 0.2% of the smallest possible measuring span according to nameplate with a change in flow of 0.1 l/min within the permissible flow range
Sample gas pressure	< 1% of the current measuring range with a pressure variation of 100 hPa
Electrical inputs and outputs	
Analog output	0/2/4 ... 20 mA, floating; max. load 750 Ω
Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load rating: 24 V AC/DC/1 A, floating
Analog inputs	2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and correction of cross-interference

Technical specifications (Continued)

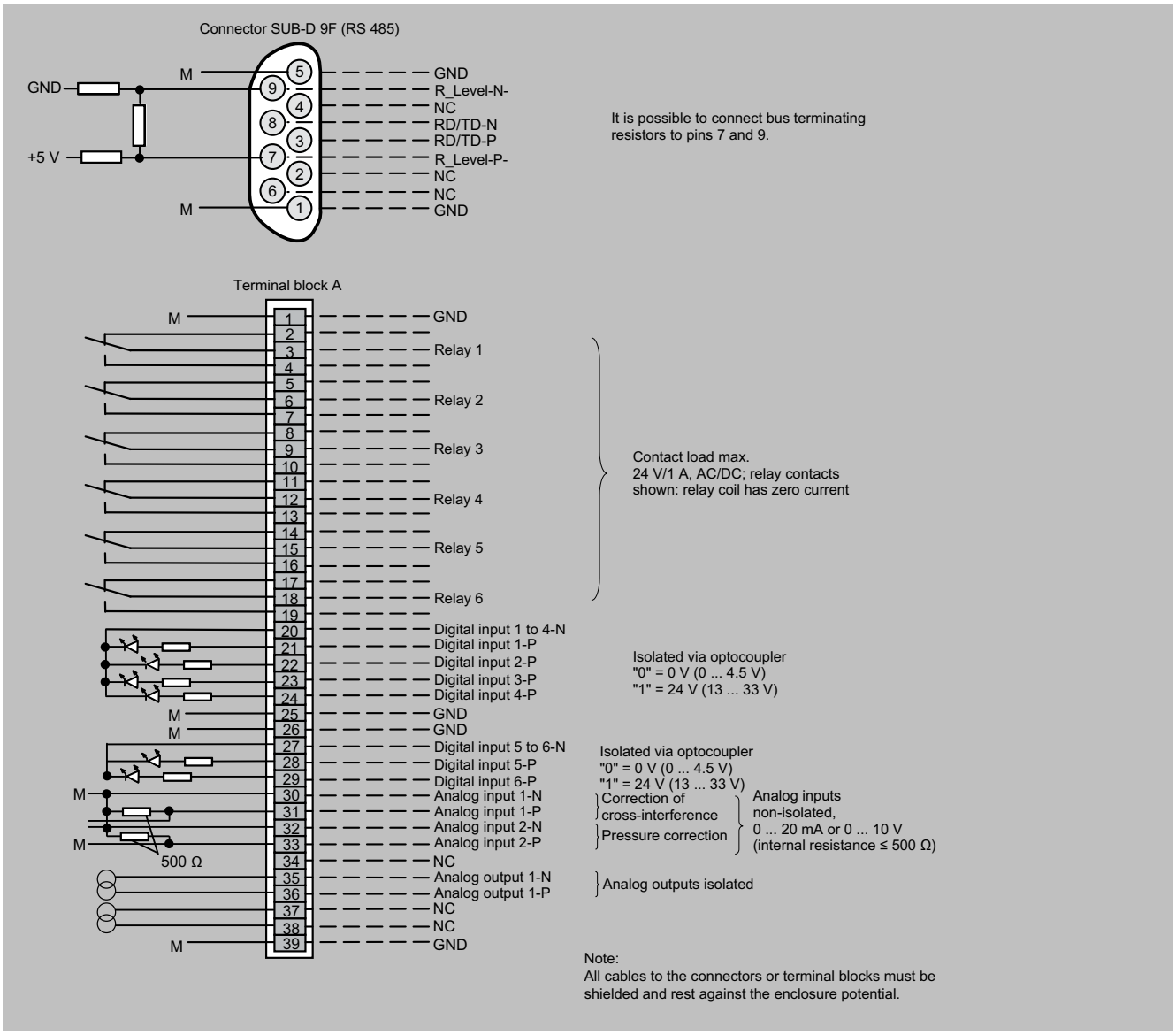
CALOMAT 6, field device	
Digital inputs	6, designed for 24 V, floating, freely configurable, e.g. for measuring range switchover
Serial interface	RS 485
Options	AUTOCAL function each with 8 additional digital inputs and relay outputs, also with PROFIBUS PA or PROFIBUS DP
Climatic conditions	
Permissible ambient temperature	-30 ... +70 °C during storage and transportation, 5 ... 45 °C during operation
Permissible humidity (must not fall below dew point)	< 90% relative humidity as annual average during storage and transportation

Dimensional drawings



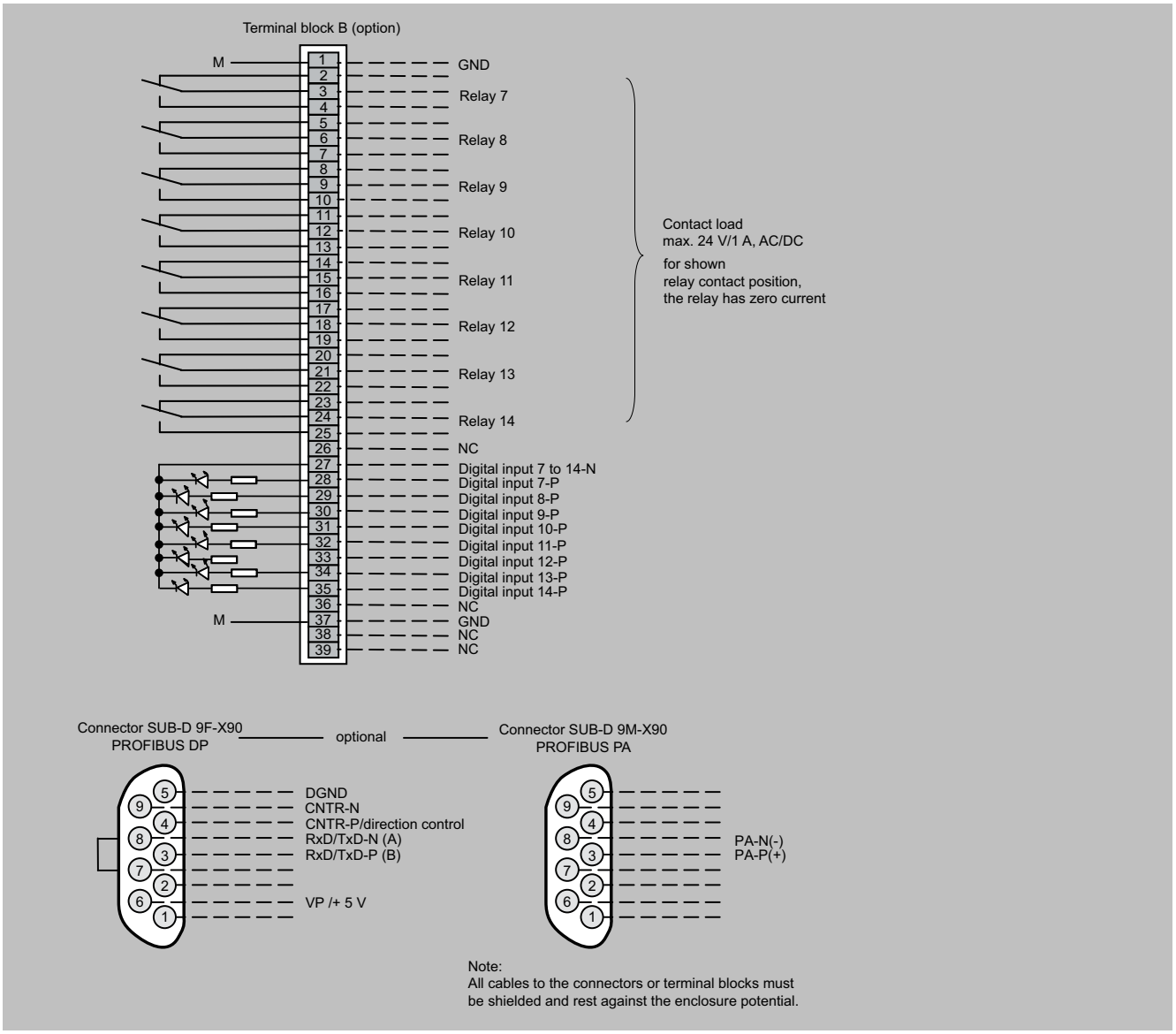
CALOMAT 6, field unit, dimensions in mm

Circuit diagrams



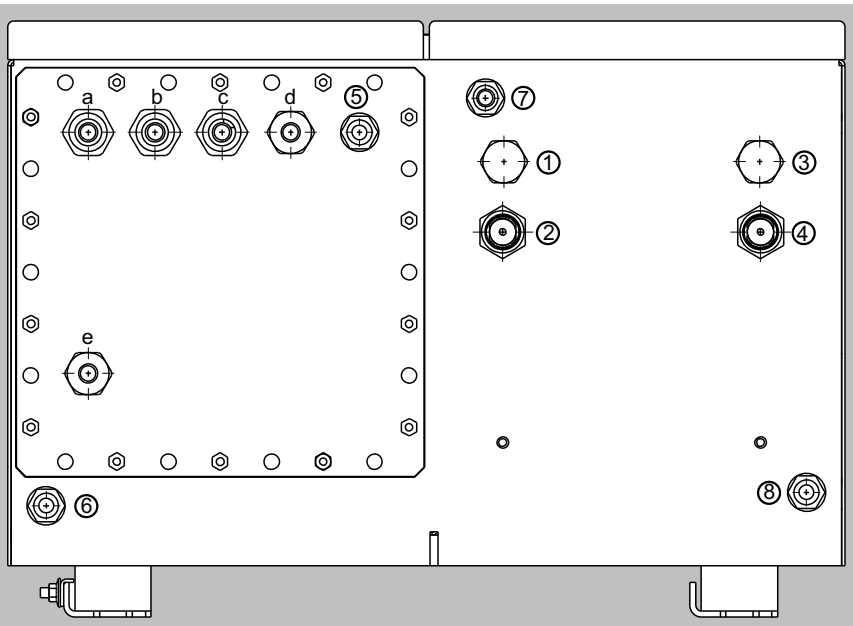
CALOMAT 6, field device, pin and terminal assignment

Circuit diagrams (Continued)



CALOMAT 6, field device, pin and terminal assignment of the AUTOCAL board and PROFIBUS plugs

Circuit diagrams (Continued)



Gas connections

1	not used	Clamping gland for pipe Ø 6 mm or ¼"
2	Sample gas inlet	
3	not used	
4	Sample gas outlet	

5 ... 8 Purging gas inlets/outlets stubs Ø 10 mm or 3/8 "

Electrical connections

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

CALOMAT 6, field device, gas connections and electrical connections

Selection and ordering data

Description	7MB2521	7MB2511	7MB2511 Ex	2 years (unit)	5 years (unit)	Article No.
Analyzer unit						
Measuring cell	x	x	x	1	1	**A5E00095332**
O-Ring (set of 4)	x	x	x	1	2	**A5E00124182**
Electronics						
Fuse (device fuse)			x	1	2	**A5E00061505**
Front plate without LC display	x			1	1	**C79165-A3042-B508**
Motherboard, with firmware: see spare parts list	x	x	x	-	1	
Adapter plate, LCD/keyboard	x	x		1	1	**C79451-A3474-B605**
LC display (non-Ex version)	X			1	1	**A5E31474846**
Line transformer, 115 V	x	x	x	-	1	**W75040-B21-D80**
Line transformer, 230 V	x	x	x	-	1	**W75040-B31-D80**
Plug-in filter	x	x	x	-	1	**W75041-E5602-K2**
Fusible element, T 0.63/250 V	x	x		2	3	**W79054-L1010-T630**
Fusible element, 1 A, 110/120 V	x	x	x	2	3	**W79054-L1011-T100**

If the CALOMAT 6 was supplied with a specially cleaned gas path for high oxygen context (so-called "Clean for O_2 service"), please ensure that you specify this when ordering spare parts. This is the only way to ensure that the gas path will continue to comply with the special requirements for this version.

More information

If the CALOMAT 6 was supplied with a specially cleaned gas path for high oxygen context ("Clean for O_2 service"), please ensure that you specify this when ordering spare parts. This is the only way to ensure that the gas path will continue to comply with the special requirements for this version.