

## Overview



The CALOMAT 6 gas analyzer is primarily used for quantitative determination of H<sub>2</sub> or He in digital or quasi-digital non-corrosive gas mixtures.

Concentrations of other gases can also be measured if their thermal conductivities differ significantly from the residual gases like Ar, CO<sub>2</sub>, CH<sub>4</sub>, NH<sub>3</sub>.

## Benefits

- Small T<sub>90</sub> 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<sub>2</sub>)
- 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

### Fields of application

- Pure gas monitoring (0 to 1 % H<sub>2</sub> in Ar)
- Protective gas monitoring (0 to 2 % He in N<sub>2</sub>)
- Hydroargon gas monitoring (0 to 25 % H<sub>2</sub> in Ar)
- Forming gas monitoring (0 to 25 % H<sub>2</sub> in N<sub>2</sub>)
- Gas production:
  - 0 to 2 % He in N<sub>2</sub>
  - 0 to 10 % Ar in O<sub>2</sub>
- Chemical applications:
  - 0 to 2 % H<sub>2</sub> in NH<sub>3</sub>
  - 50 to 70 % H<sub>2</sub> in N<sub>2</sub>
- Wood gasification (0 to 30 % H<sub>2</sub> in CO/CO<sub>2</sub>/CH<sub>4</sub>)
- Blast furnace gas (0 to 5 % H<sub>2</sub> in CO/CO<sub>2</sub>/CH<sub>4</sub>/N<sub>2</sub>)
- Bessemer converter gas (0 to 20 % H<sub>2</sub> in CO/CO<sub>2</sub>)
- Monitoring equipment for hydrogen-cooled turbo-alternators:
  - 0 to 100 % CO<sub>2</sub>/Ar in air
  - 0 to 100 % H<sub>2</sub> in CO<sub>2</sub>/Ar
  - 80 to 100 % H<sub>2</sub> in air
- Versions for the analysis of flammable and non-flammable gases or vapors for use in hazardous areas (Zone 1 and Zone 2)

## Special versions

### Special applications

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

## Design

### 19" rack unit

- With 4 HU for installation
  - In hinged frame
  - In cabinets with or without telescope 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 1/4"

### Field device

- Two-door enclosure (IP65) with gas-tight separation of analyzer and electronics sections
- Individually purgeable enclosure halves
- Stainless steel gas path and stubs (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 1/4"

### Display and control 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

### Input 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 measurement range switchover, processing of external signals from sample preparation)
- Six relay outputs, freely configurable (e.g. failure, maintenance demanded, threshold alarm, external magnetic 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

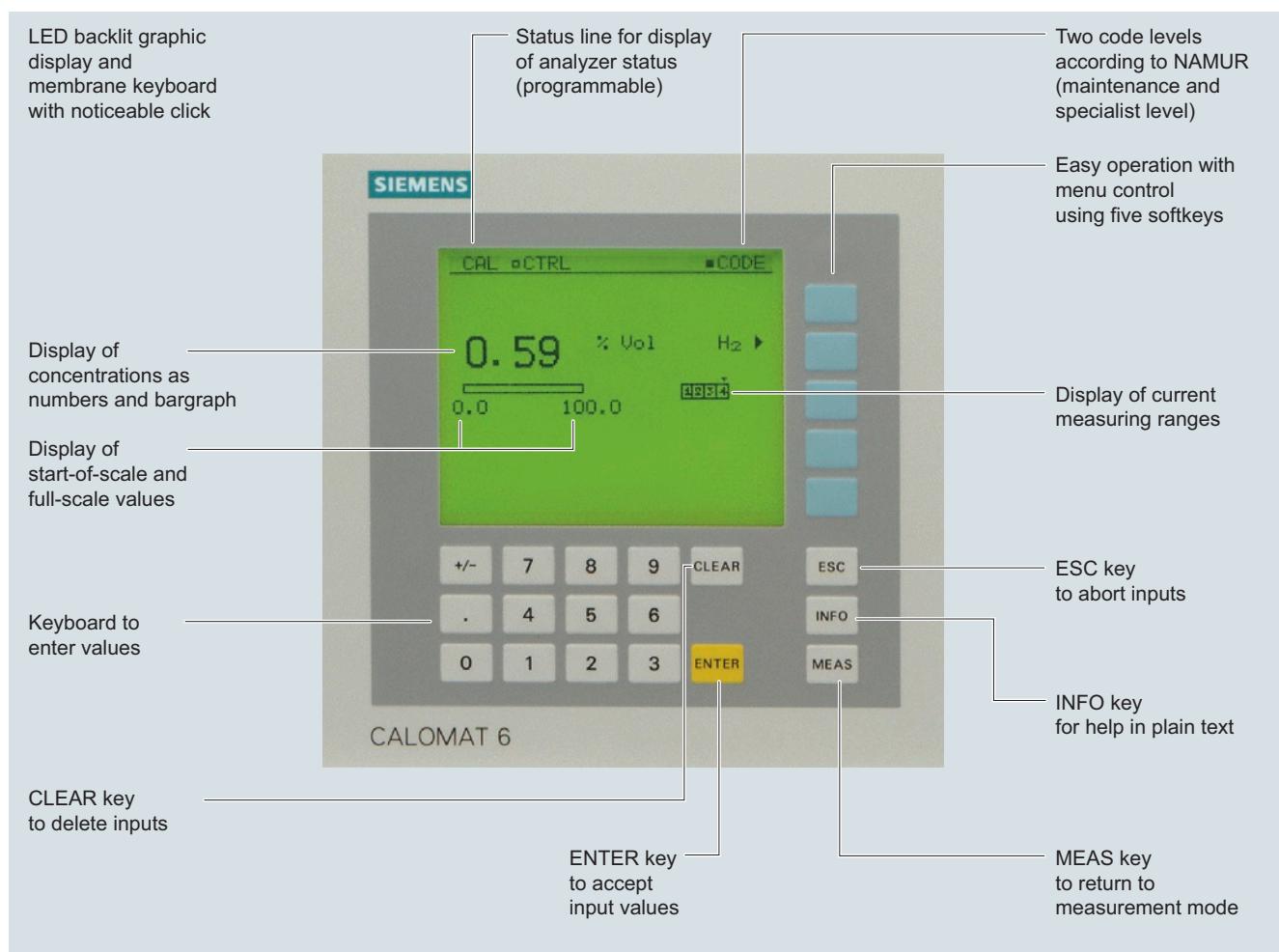
# Extractive continuous process gas analysis

Series 6

CALOMAT 6

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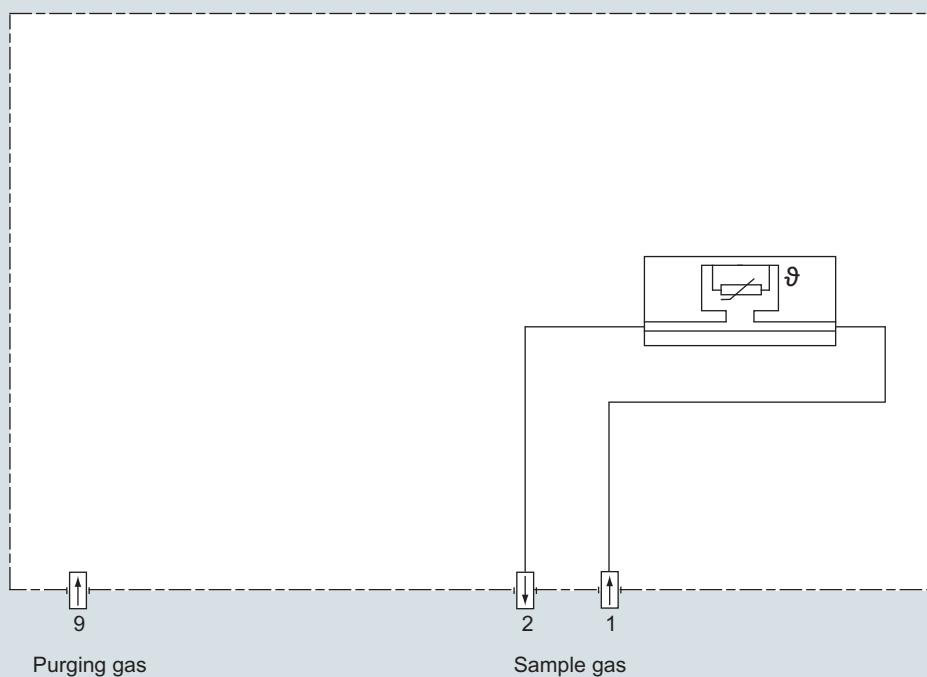
## General information



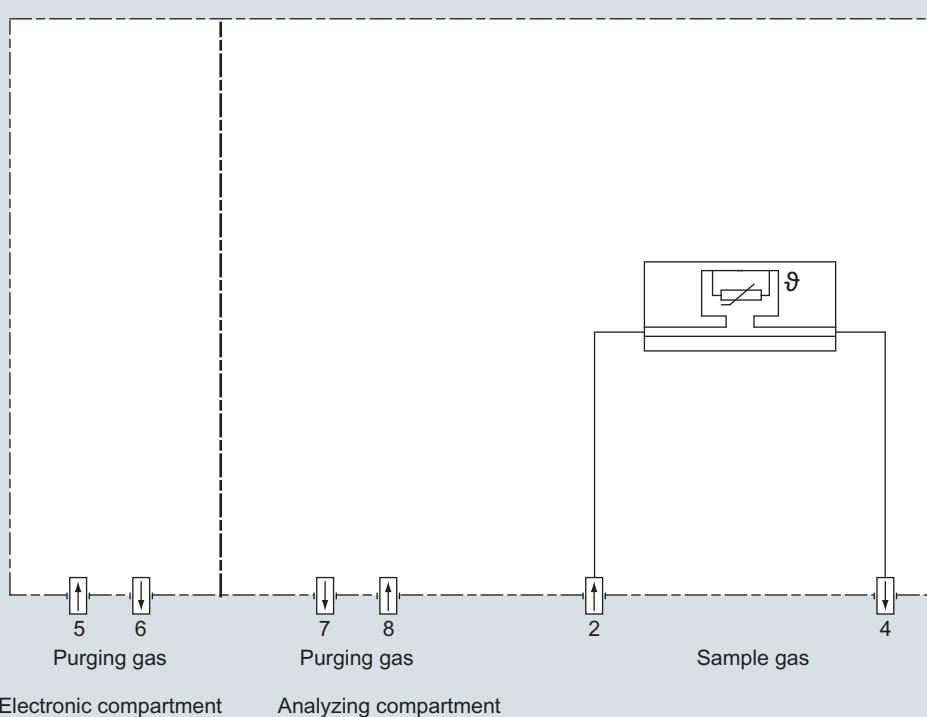
CALOMAT 6, membrane keyboard and graphic display

## 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                             |              |                 |
| Pipe             | Stainless steel, mat. no. 1.4571                             |              |                 |
| Sample cell body | Stainless steel, mat. no. 1.4571                             |              |                 |
| O-rings          | FFKM-Chemraz   |              |                 |
| Sensor           | Si, SiO <sub>x</sub> N <sub>y</sub> , AU, epoxy resin, glass |              |                 |
| Tightness        | Leakage < 1 µl/s   |              |                 |



CALOMAT 6, 19" rack unit, gas path



CALOMAT 6, field device, gas path

# Extractive continuous process gas analysis

Series 6

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## General information

### Function

#### Principle 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 membrane is equipped with thin-film resistors.

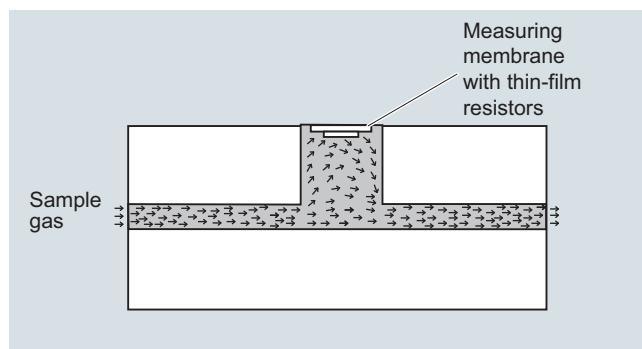
The resistors are kept at a constant temperature. This requires an current intensity depending on the thermal conductivity of the sample gas. This "raw value" is processed further electronically to calculate the gas concentration.

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 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 measurement chambers. Therefore, the use of gas modified for the measuring tasks is necessary in most application cases.



CALOMAT, principle of operation

### Essential characteristics

- Four freely parameterizable measuring ranges, also with suppressed zero point, all measuring ranges linear
- Smallest measuring spans up to 1 % H<sub>2</sub> (with disabled zero point: 95 to 100 % H<sub>2</sub>) possible
- Measuring range identification
- Galvanically isolated measured-value output 0/2/4 to 20 mA (also inverted)
- Autoranging or manual measurement range switchover possible; remote switching is also possible
- Storage of measured values possible during adjustments
- Wide range of selectable time constants (static/dynamic noise suppression); i.e. the response time of the analyzer can be matched to the respective measuring task
- Short response time
- Low long-term drift
- Measuring point switchover for up to 6 measuring points (programmable)
- Measuring range identification
- Measuring point identification
- External pressure sensor can be connected – for the correction of sample gas fluctuations
- Automatic range calibration can be parameterized

- Operation based on the NAMUR recommendation
- Two control levels with their own authorization codes for the prevention of accidental and unauthorized operator interventions
- Simple handling using a numerical membrane keyboard and operator prompting
- Customer-specific analyzer options such as:
  - Customer acceptance
  - TAG labels
  - Drift recording
  - Clean for O<sub>2</sub> service

### Measuring spans

The smallest and largest possible spans depend on both the measured component (type of gas) and the respective application.

The smallest possible spans listed below refer to N<sub>2</sub> as the residual gas. With other gases which have a larger/smaller thermal conductivity than N<sub>2</sub>, the smallest possible span is also larger/smaller.

| Component                             | Smallest possible span   |
|---------------------------------------|--------------------------|
| H <sub>2</sub>                        | 0 ... 1 % (95 ... 100 %) |
| He                                    | 0 ... 2 %                |
| Ar                                    | 0 ... 10 %               |
| CO <sub>2</sub>                       | 0 ... 20 %               |
| CH <sub>4</sub>                       | 0 ... 15 %               |
| H <sub>2</sub> in blast furnace gas   | 0 ... 10 %               |
| H <sub>2</sub> in converter gas       | 0 ... 20 %               |
| H <sub>2</sub> with wood gasification | 0 ... 30 %               |

### Influence of interfering gases

Knowledge of the sample gas composition is necessary to determine the influence of residual gases with several interfering components.

The following table lists the zero offsets expressed in % H<sub>2</sub> resulting from 10 % residual gas (interfering gas) in each case.

| Component   | Zero offset |
|---|-------------|
| Ar  | -1.28 %     |
| CH <sub>4</sub>                                     | +1.59 %     |
| C <sub>2</sub> H <sub>6</sub> (non-linear response) | +0.04 %     |
| C <sub>3</sub> H <sub>8</sub>                       | -0.80 %     |
| CO  | -0.11 %     |
| CO <sub>2</sub>                                     | -1.07 %     |
| He  | +6.51 %     |
| H <sub>2</sub> O (non-linear response)              | +1.58 %     |
| NH <sub>3</sub> (non-linear response)               | +1.3 %      |
| O <sub>2</sub>                                      | +0.18 %     |
| SF <sub>6</sub>                                     | -2.47 %     |
| SO <sub>2</sub>                                     | -1.34 %     |
| 100 % air (dry)                                     | +0.27 %     |

For residual gas concentrations differing from 10 %, the corresponding multiple of the associated value in the table provides an acceptable approximation. This is valid for residual gas concentrations up to 25 % (dependent on type of gas).

The thermal conductivity of most gas mixtures has a non-linear response. Even ambiguous results, such as e.g. with NH<sub>3</sub>/N<sub>2</sub> 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 is influenced by the residual gas. However, this effect is negligible for most gases.

In case of correction of the influence of interfering gases with additional analyzers (ULTRAMAT 6/ULTRAMAT 23), the resulting measuring error can – depending on the application – amount 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 $\Omega$ , with a measuring frequency of > 100 kHz |
| Cable capacitance  | Typ. < 60 pF/m   |
| Core cross-section | > 0.22 mm <sup>2</sup> , 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  |

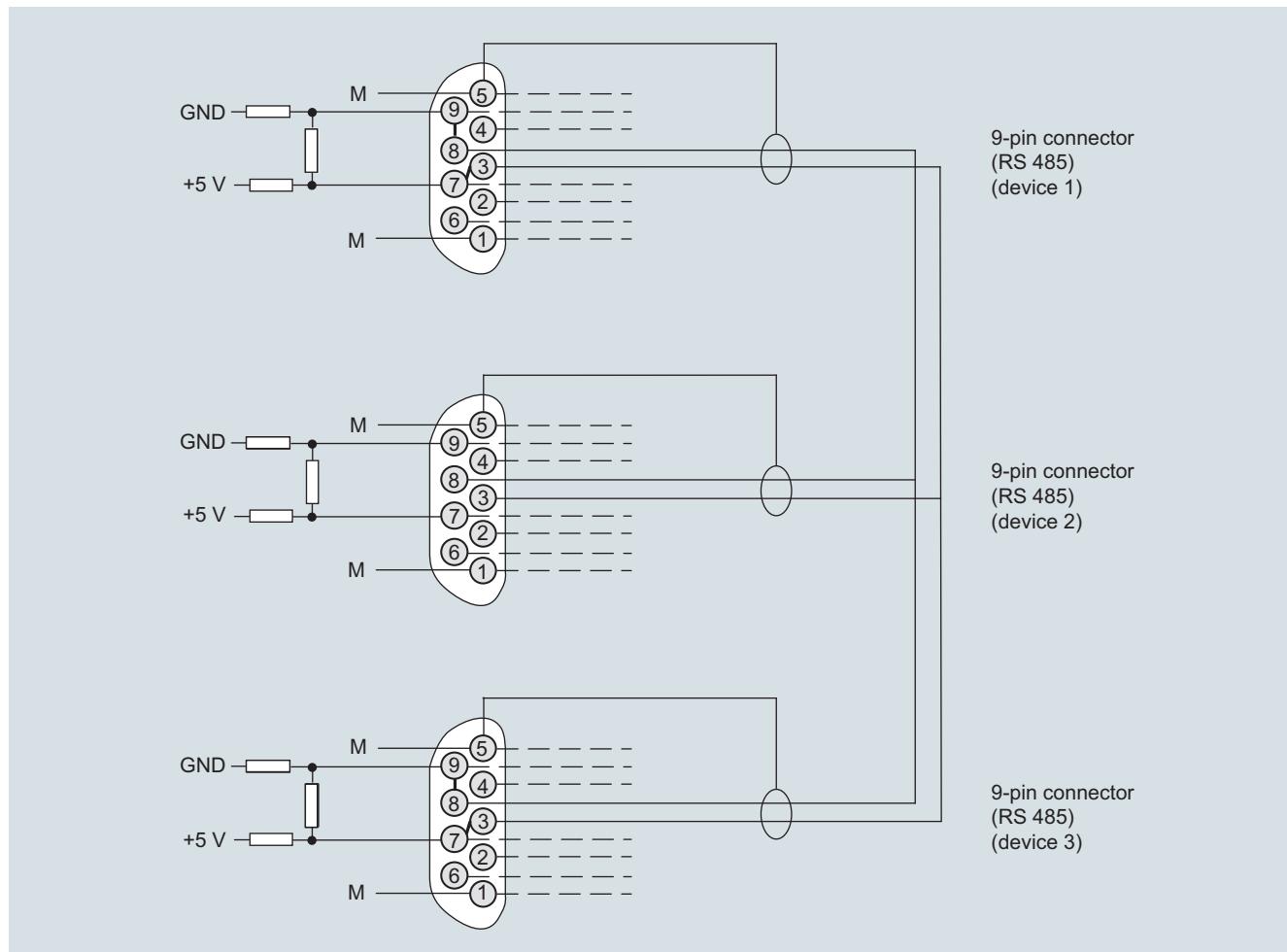
#### Bus terminating resistors

Pins 3-7 and 8-9 of the first and last connectors of a bus cable must be bridged (see graphic).

#### 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

# Extractive continuous process gas analysis

Series 6

CALOMAT 6

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## 19" rack unit

### Technical specifications

|  |  |   |                           |   |
|--|--|---|---------------------------|---|
| <b>General information</b>   |  | Based on DIN EN 61207 / IEC 1207. All data based on digital gas mixture H <sub>2</sub> in N <sub>2</sub>                            | <b>Measuring response</b> | Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature                                    |
| Measuring ranges   |  | 4, internally and externally switchable; automatic measuring range switchover also possible   | Output signal fluctuation | < ± 0.75% of the smallest possible measuring range according to rating plate, with electronic damping constant of 1 s ( $\sigma = 0.25\%$ ) |
| Largest possible measuring span  |  | 100 vol.% H <sub>2</sub> (for smallest measuring span, see "Function")  | Zero point drift          | < ± 1%/week of the smallest possible measuring span according to rating plate   |
| Measuring ranges with suppressed zero point  |  | Any zero point within 0 ... 100 vol.% can be implemented, smallest possible measuring span: 5% H <sub>2</sub>                       | Measured-value drift      | < ± 1%/week of the smallest possible measuring span according to rating plate   |
| Operating position   |  | Front wall, vertical  | Repeatability             | < 1% of the current measuring range   |
| Conformity   |  | CE mark in accordance with EN 61326/A1 and EN 61010/1   | Detection limit           | 1% of the current measuring range   |
| <b>Design, enclosure</b>   |  |   | Linearity error           | < ± 1% of the current measuring range   |
| Degree of protection   | IP20 according to EN 60529   | <b>Influencing variables</b>  |                           |   |
| Weight   | Approx. 10 kg  | Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature                            |                           |   |
| <b>Electrical characteristics</b>  |  | Ambient temperature   |                           |   |
| EMC interference immunity (electromagnetic compatibility)  |  | < 1%/10 K referred to smallest possible measuring span according to rating plate  |                           |   |
| 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. |  | Accompanying gases  |                           |   |
| Electrical safety  | In accordance with EN 61010-1; overvoltage category II                                   | Deviation from zero point (for influence of interfering gas see paragraph titled "Interference influences")                         |                           |   |
| Auxiliary power (see nameplate)  | 100 V -10% ... 120 V +10% AC, 48 ... 63 Hz or 200 V -10% ... 240 V +10% AC, 48 ... 63 Hz | Sample gas flow   |                           |   |
| Power consumption  | Approx. 20 VA  | < 0.2% of the smallest possible span according to rating plate with a change in flow of 0.1 l/min within the permissible flow range |                           |   |
| Fuse values  | 100 to 120 V: 1.0T/250<br>200 ... 240 V: 0.63 T/250                                      | Sample gas pressure   |                           |   |
| <b>Gas inlet conditions</b>  |  | < 1% of the current measuring range with a pressure change of 100 hPa   |                           |   |
| Sample gas pressure  | 800 ... 1 100 hPa (absolute)   | Auxiliary power   |                           |   |
| Sample gas flow  | 30 ... 90 l/h (0.5 ... 1.5 l/min)  | < 0.1% of the current measuring range with rated voltage ± 10%  |                           |   |
| Sample gas temperature   | Min. 0 to max. 50 °C, but above the dew point  | <b>Electrical inputs and outputs</b>  |                           |   |
| Temperature of the measuring cell  | Approx. 60 °C  | Analog output   |                           |   |
| Sample gas humidity  | < 90% relative humidity  | 0/2/4 ... 20 mA, floating; load max. 750 Ω  |                           |   |
| <b>Dynamic response</b>  |  | Relay outputs   |                           |   |
| Warm-up period   | < 30 min (the technical specification will be met after 2 hours)                         | 6, with changeover contacts, freely parameterizable, e.g. for measuring range identification; load: 24 V AC/DC/ 1 A, isolated       |                           |   |
| Delayed display (T <sub>90</sub> )   | < 5 s  | Analog inputs   |                           |   |
| Damping (electrical time constant)   | 0 ... 100 s, configurable  | 2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and correction of cross-interference                                |                           |   |
| Dead time (purging time of the gas path in the unit at 1 l/min)  | Approx. 0.5 s  | Digital inputs  |                           |   |
|  |  | 6, designed for 24 V, isolated, freely parameterizable, e.g. for measurement 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                      |                           |   |
| <b>Climatic conditions</b>   |  |   |                           |   |
| Permissible ambient temperature  |  | Permissible ambient temperature   |                           |   |
|  |  | -30 ... +70 °C during storage and transportation, 5 ... 45 °C during operation  |                           |   |
| Permissible humidity (dew point must not be fallen below)  |  | Permissible humidity (dew point must not be fallen below)   |                           |   |
|  |  | < 90% relative humidity as annual average, during storage and transportation  |                           |   |

| Selection and ordering data   |   | Article No.        |
|---|---|--------------------|
| <b>CALOMAT 6 gas analyzer</b><br>19" rack unit for installation in cabinets           |   | 7MB2521-0-A        |
| ↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal. |   | Cannot be combined |
| Connections for sample gas  | 0<br>1                                  |                    |
| Pipe with 6 mm outer diameter   |   |                    |
| Pipe with 1/4" outer diameter   |   |                    |
| <u>Measured component</u>   | <u>Smallest/largest measuring range</u> |                    |
| H <sub>2</sub> in N <sub>2</sub>  | 0 ... 1/100 %                           | A A                |
| H <sub>2</sub> in N <sub>2</sub> (blast furnace gas measurement) <sup>1)</sup>        | 0 ... 5/100 %                           | A W                |
| H <sub>2</sub> in N <sub>2</sub> (converter measurement) <sup>1)</sup>                | 0 ... 5/100 %                           | A X                |
| H <sub>2</sub> in N <sub>2</sub> (wood gasification) <sup>1)</sup>                    | 0 ... 5/100 %                           | A Y                |
| H <sub>2</sub> in Ar  | 0 ... 1/100 %                           | A B                |
| H <sub>2</sub> in NH <sub>3</sub>   | 0 ... 1/100 %                           | A C                |
| He in N <sub>2</sub>  | 0 ... 2/100 %                           | B A                |
| He in Ar  | 0 ... 2/100 %                           | B B                |
| He in H <sub>2</sub>  | 0 ... 10/80 %                           | B C                |
| Ar in N <sub>2</sub>  | 0 ... 10/100 %                          | C A                |
| Ar in O <sub>2</sub>  | 0 ... 10/100 %                          | C B                |
| CO <sub>2</sub> in N <sub>2</sub>   | 0 ... 20/100 %                          | D A                |
| CH <sub>4</sub> in Ar   | 0 ... 15/100 %                          | E A                |
| NH <sub>3</sub> in N <sub>2</sub>   | 0 ... 10/30 %                           | F A                |
| H <sub>2</sub> monitoring (turbo generators)  |   | G A                |
| • CO <sub>2</sub> in air  | 0 ... 100 %                             |                    |
| • H <sub>2</sub> in CO <sub>2</sub>   | 0 ... 100 %                             |                    |
| • H <sub>2</sub> in air   | 80 ... 100 %                            |                    |
| <u>Add-on electronics</u>   |   | GA                 |
| Without   | 0                                       |                    |
| AUTOCAL function  |   |                    |
| • With 8 additional digital inputs and outputs  | 1                                       |                    |
| • With 8 additional digital inputs/outputs and PROFIBUS PA interface                  | 6                                       |                    |
| • With 8 additional digital inputs/outputs and PROFIBUS DP interface                  | 7                                       |                    |
| <u>Power supply</u>   |   | 6<br>7             |
| 100 ... 120 V AC, 48 ... 63 Hz  | 0                                       |                    |
| 200 ... 240 V AC, 48 ... 63 Hz  | 1                                       |                    |
| <u>Explosion protection</u>   |   |                    |
| Without   |   |                    |
| Certificate: ATEX II 3G, flammable and non-flammable gases                            |   |                    |
| FM/CSA certificate – Class I Div 2  |   |                    |
| <u>Language (supplied documentation, software)</u>                                    |   |                    |
| German  | 0                                       |                    |
| English   | 1                                       |                    |
| French  | 2                                       |                    |
| Spanish   | 3                                       |                    |
| Italian   | 4                                       |                    |

<sup>1)</sup> Ready to enter external correction of cross-interferences for CO, CO<sub>2</sub> and CH<sub>4</sub> (CH<sub>4</sub> only for blast furnace gas and wood gasification).

**Extractive continuous process gas analysis**

Series 6

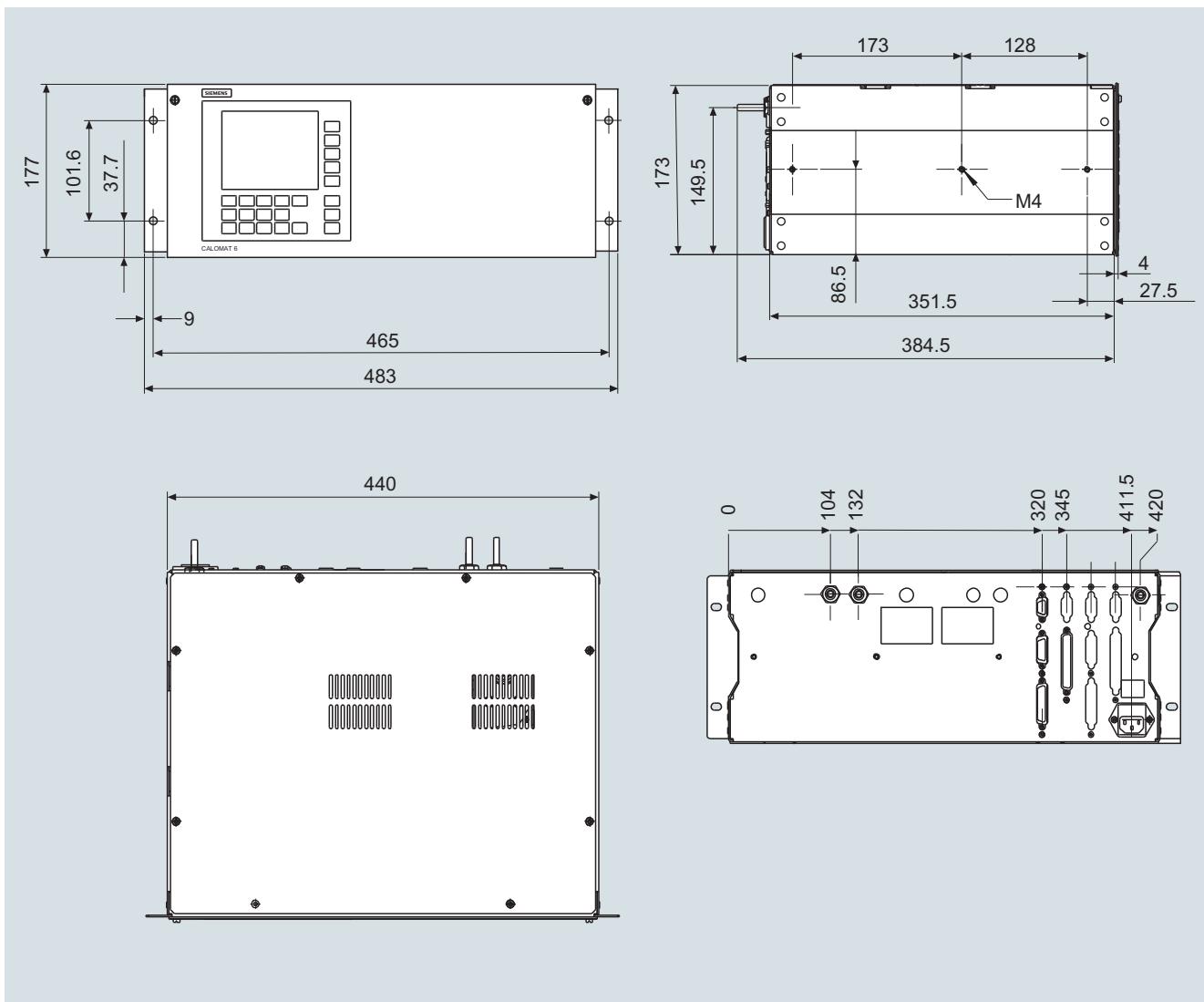
CALOMAT 6

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**19" rack unit****Selection and ordering data**

| <i>Additional versions</i>   | <b>Order code</b>        |
|--|--------------------------|
| Add "-Z" to Article No. and specify Order codes.                                 |                          |
| Telescopic rails (2 units)   | <b>A31</b>               |
| TAG labels (specific lettering based on customer information)                    | <b>B03</b>               |
| Clean for O <sub>2</sub> service (specially cleaned gas path)                    | <b>Y02</b>               |
| Measuring range indication in plain text, if different from the standard setting | <b>Y11</b>               |
| Special setting (only in conjunction with an application no.)                    | <b>Y12</b>               |
| <i>Accessories</i>   | <b>Article No.</b>       |
| RS 485/Ethernet converter  | <b>A5E00852383</b>       |
| RS 485/RS 232 converter  | <b>C79451-Z1589-U1</b>   |
| RS 485/USB converter   | <b>A5E00852382</b>       |
| AUTOCAL function with 8 digital inputs/outputs                                   | <b>C79451-A3480-D511</b> |
| AUTOCAL function with 8 digital inputs/outputs and PROFIBUS PA                   | <b>A5E00057307</b>       |
| AUTOCAL function with 8 digital inputs/outputs and PROFIBUS DP                   | <b>A5E00057312</b>       |
| Set of Torx screwdrivers   | <b>A5E34821625</b>       |

## Dimensional drawings



CALOMAT 6, 19" unit, dimensions in mm

# Extractive continuous process gas analysis

Series 6

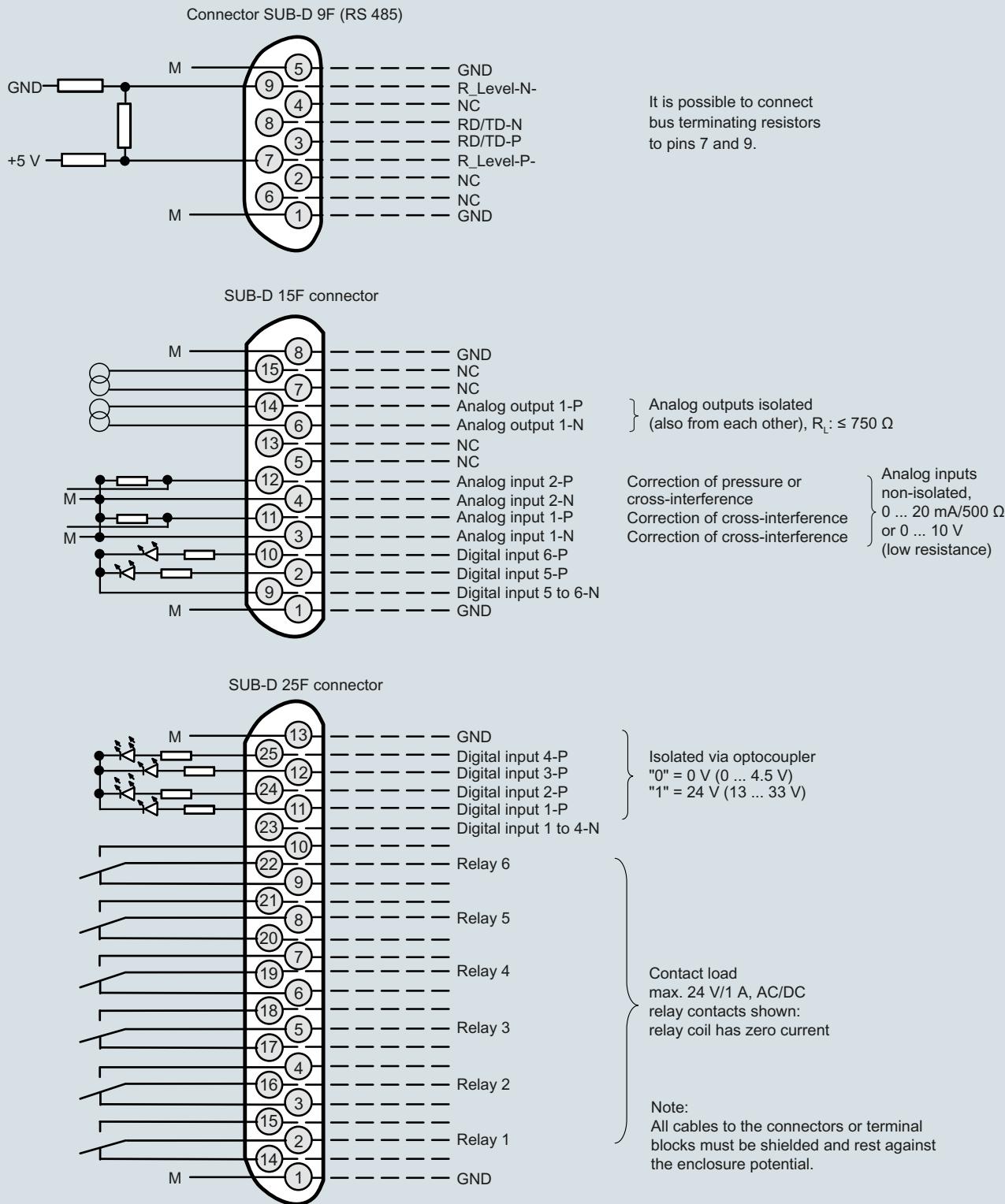
CALOMAT 6

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## 19" rack unit

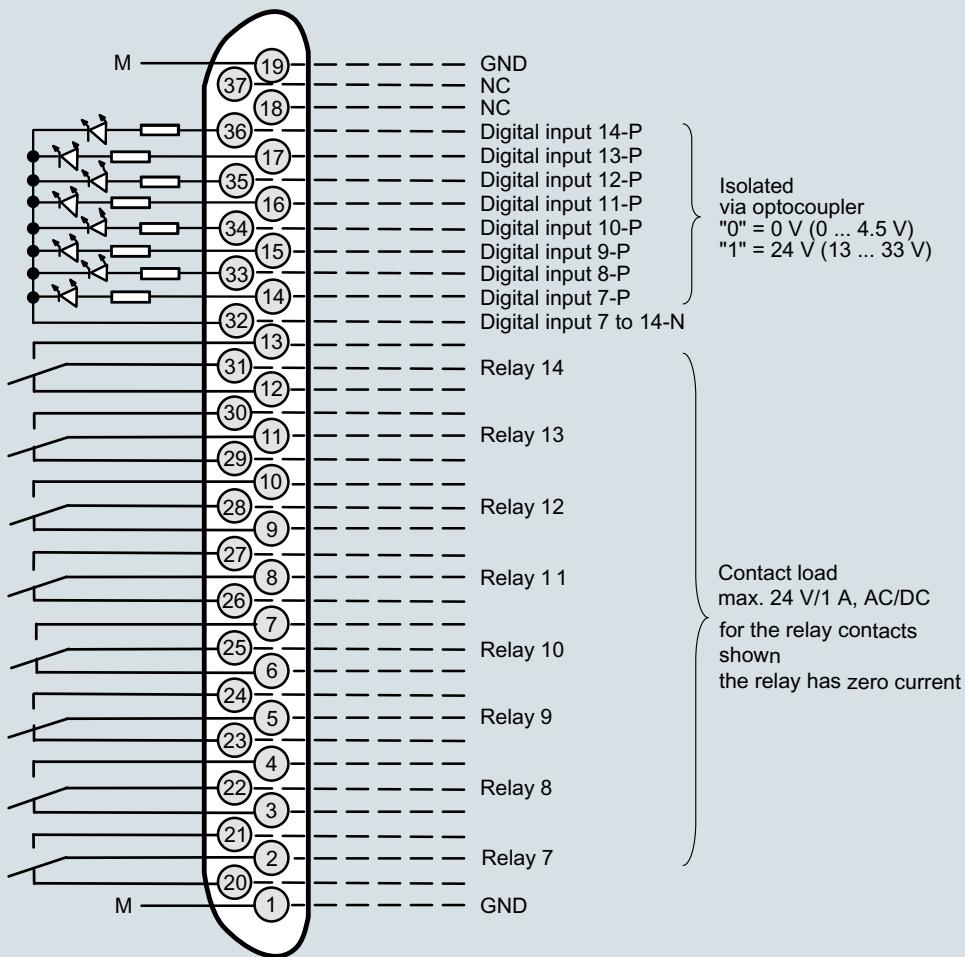
### Circuit diagrams

#### Pin assignment (electrical and gas connections)

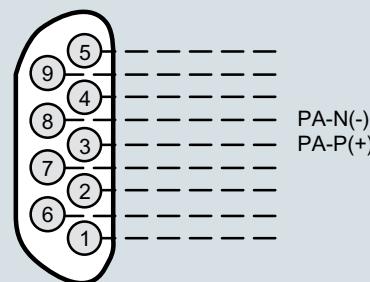
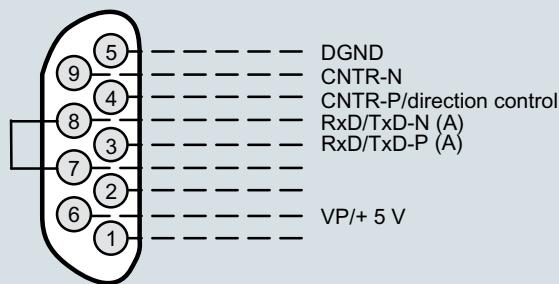


CALOMAT 6, 19" unit, pin assignment

Connector SUB-D 37F (option)

Connector SUB-D 9F  
PROFIBUS DP

optional

Connector SUB-D 9M  
PROFIBUS PA

## Note:

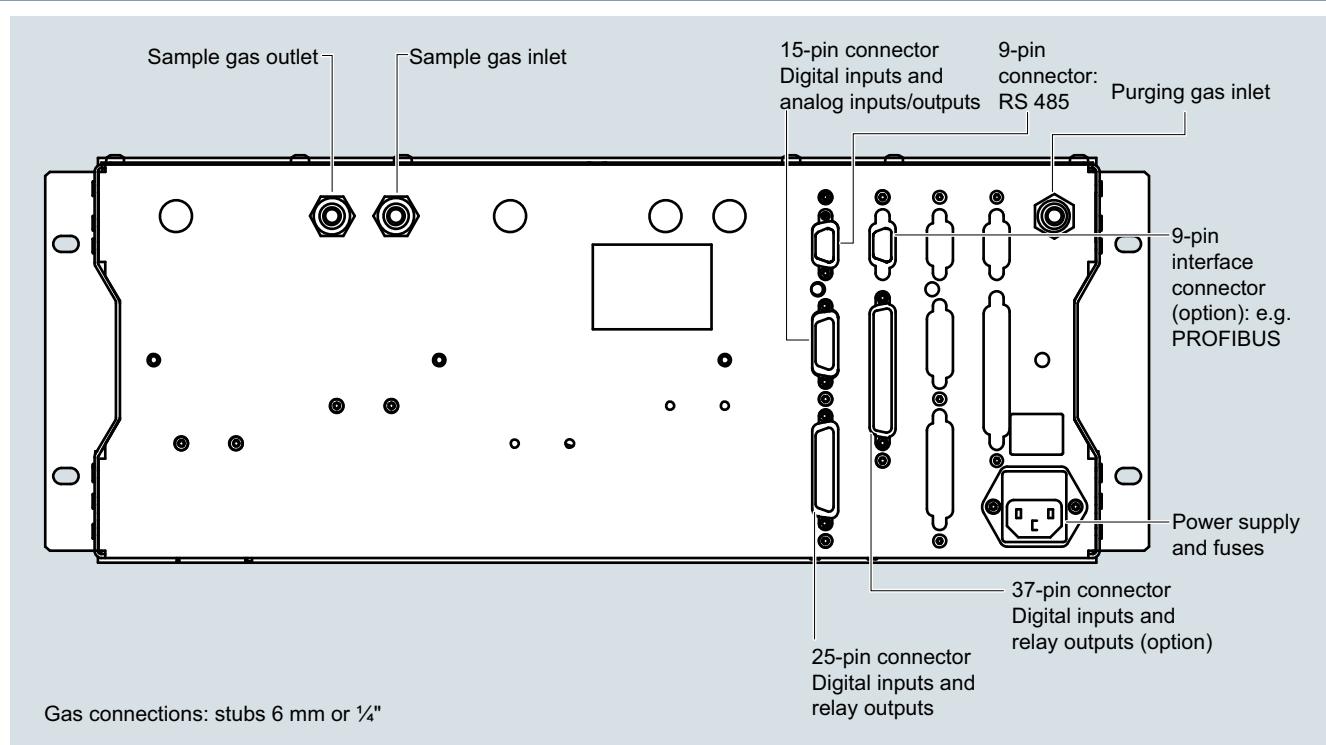
All cables to the connectors or terminal blocks must be shielded and rest against the enclosure potential.

**Extractive continuous process gas analysis**

Series 6

CALOMAT 6

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**19" rack unit**

CALOMAT 6, 19" unit, gas and electrical connections

**Technical specifications**

| <b>General information</b>   |   | <b>Measuring response</b>   |
|--|---|---|
| Measuring ranges   | Based on DIN EN 61207/IEC 1207. All data based on digital gas mixture H <sub>2</sub> in N <sub>2</sub>        | Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature                                    |
| Largest possible measuring span  | 4, internally and externally switchable; automatic measuring range change-over also possible                  | < ± 0.75% of the smallest possible measuring range according to rating plate, with electronic damping constant of 1 s ( $\sigma = 0.25\%$ ) |
| Measuring ranges with suppressed zero point  | 100 vol.% H <sub>2</sub> (for smallest measuring span, see "Function")  | < ± 1%/week of the smallest possible measuring span according to rating plate   |
| Operating position   | Any zero point within 0 ... 100 vol.% can be implemented; smallest possible measuring span: 5% H <sub>2</sub> | < ± 1%/week of the smallest possible measuring span according to rating plate   |
| Conformity   | Front wall, vertical  | Repeatability   |
|  | CE mark in accordance with EN 61326/A1 and EN 61010/1   | Detection limit   |
|  |   | Linearity error   |
| <b>Design, enclosure</b>   |   | <b>Influencing variables</b>  |
| Degree of protection   | IP65 according to EN 60529  | Based on sample gas pressure 1013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature                                     |
| Weight   | Approx. 25 kg   | Ambient temperature   |
| <b>Electrical characteristics</b>  |   | Accompanying gases  |
| EMC interference immunity (electromagnetic compatibility)  | In accordance with standard requirements of NAMUR NE21 (08/98)  | Deviation from zero point (for influence of interfering gas, see section "Cross-interference")  |
| 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. |   | Sample gas flow   |
| Electrical safety  | In accordance with EN 61010-1; overvoltage category II  | < 0.2% of the smallest possible span according to rating plate with a change in flow of 0.1 l/min within the permissible flow range         |
| Auxiliary power (see nameplate)  | 100 V -10% ... 120 V +10% AC, 48 ... 63 Hz or 200 V -10% ... 240 V +10% AC, 48 ... 63 Hz                      | Sample gas pressure   |
| Power consumption (unit)   | Approx. 20 VA   | < 1% of the current measuring range with a pressure change of 100 hPa   |
| Fuse values  | 100 to 120 V: 1.0T/250<br>200 ... 240 V: 0.63 T/250   | <b>Electrical inputs and outputs</b>  |
| <b>Gas inlet conditions</b>  |   | Analog output   |
| Sample gas pressure  | 800 to 1 100 hPa (absolute)   | 0/2/4 ... 20 mA, floating; load max. 750 Ω  |
| Sample gas flow  | 30 to 90 l/h (0.5 to 1.5 l/min)   | Relay outputs   |
| Sample gas temperature   | Min. 0 to max. 50 °C, but above the dew point   | 6, with changeover contacts, freely configurable, e.g. for measuring range identification; load: 24 V AC/DC/1 A, floating                   |
| Temperature of the measuring cell  | Approx. 60 °C   | Analog inputs   |
| Sample gas humidity  | < 90% relative humidity   | 2, dimensioned for 0/2/4 ... 20 mA for external pressure sensor and correction of cross-interference  |
| Purging gas pressure   | 165 hPa above ambient pressure  | Digital inputs  |
| • Permanent  | Max. 250 hPa above ambient pressure   | 6, designed for 24 V, floating, freely configurable, e.g. for measuring range switchover  |
| • For short periods  |   | Serial interface  |
| <b>Time response</b>   |   | RS 485  |
| Warm-up period   | Based on sample gas pressure 1 000 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature      | Options   |
| Delayed display (T <sub>90</sub> )   | < 30 min (the technical specification will be met after 2 hours)  | AUTOCAL function each with 8 additional digital inputs and relay outputs, also with PROFIBUS PA or PROFIBUS DP                              |
| Electrical damping   | < 5 s   | <b>Climatic conditions</b>  |
| Dead time (at 1 l/min)   | 0 ... 100 s, configurable   | Permissible ambient temperature   |
|  | Approx. 0.5 s   | -30 ... +70 °C during storage and transportation, 5 ... 45 °C in operation  |
|  |   | Permissible humidity (dew point must not be fallen below)   |
|  |   | < 90% relative humidity as annual average, during storage and transportation  |

# Extractive continuous process gas analysis

Series 6

CALOMAT 6

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## Field device

| Selection and ordering data   | Article No.                             |
|---|---|
| <b>CALOMAT 6 gas analyzer</b><br>For field installation   | 7MB2511-0-A                             |
| ↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.   | Cannot be combined                      |
| <b>Connections for sample gas</b><br>Ferrule screw connection for pipe, outer diameter 6 mm<br>Ferrule screw connection for pipe, outer diameter 1/4" |   |
| <u>Measured component</u>   | <u>Smallest/largest measuring range</u> |
| H <sub>2</sub> in N <sub>2</sub>  | 0 ... 1/100 %                           |
| H <sub>2</sub> in N <sub>2</sub> (blast furnace gas measurement) <sup>1)</sup>  | 0 ... 5/100 %                           |
| H <sub>2</sub> in N <sub>2</sub> (converter measurement) <sup>1)</sup>  | 0 ... 5/100 %                           |
| H <sub>2</sub> in N <sub>2</sub> (wood gasification) <sup>1)</sup>  | 0 ... 5/100 %                           |
| H <sub>2</sub> in Ar  | 0 ... 1/100 %                           |
| H <sub>2</sub> in NH <sub>3</sub>   | 0 ... 1/100 %                           |
| He in N <sub>2</sub>  | 0 ... 2/100 %                           |
| He in Ar  | 0 ... 2/100 %                           |
| He in H <sub>2</sub>  | 0 ... 10/80 %                           |
| Ar in N <sub>2</sub>  | 0 ... 10/100 %                          |
| Ar in O <sub>2</sub>  | 0 ... 10/100 %                          |
| CO <sub>2</sub> in N <sub>2</sub>   | 0 ... 20/100 %                          |
| CH <sub>4</sub> in Ar   | 0 ... 15/100 %                          |
| NH <sub>3</sub> in N <sub>2</sub>   | 0 ... 10/30 %                           |
| H <sub>2</sub> monitoring (turbo generators)  |   |
| • CO <sub>2</sub> in air  | 0 ... 100 %                             |
| • H <sub>2</sub> in CO <sub>2</sub>   | 0 ... 100 %                             |
| • H <sub>2</sub> in air   | 80 ... 100 %                            |
| <u>Add-on electronics</u>   |   |
| Without   |   |
| AUTOCAL function  |   |
| • With 8 additional digital inputs and outputs  | 0                                       |
| • With 8 additional digital inputs/outputs and PROFIBUS PA interface  | 1                                       |
| • With 8 additional digital inputs/outputs and PROFIBUS DP interface  | 6                                       |
| • With 8 additional digital inputs/outputs and PROFIBUS PA Ex-i interface   | 7                                       |
|   | 8                                       |
| <u>Power supply</u>   |   |
| 100 ... 120 V AC, 48 ... 63 Hz  | 0                                       |
| 200 ... 240 V AC, 48 ... 63 Hz  | 1                                       |
| <u>Explosion protection, incl. certificate</u>  |   |
| Without   |   |
| Acc. to ATEX II 3G, non-flammable gases   | A                                       |
| Acc. to ATEX II 3G; flammable gases <sup>2)</sup>   | B                                       |
| FM/CSA certificate – Class I Div 2  | C                                       |
| According to ATEX II 2G, leakage compensation <sup>2)</sup>   | D                                       |
| According to ATEX II 2G, continuous purging <sup>2)</sup>   | E                                       |
| ATEX II 3D certificate; potentially explosive dust atmospheres  | F                                       |
| • In non-hazardous gas zone   | G                                       |
| • In Ex zone acc. to ATEX II 3G, non-flammable gases  | H                                       |
| • In Ex zone acc. to ATEX II 3G, flammable gases <sup>2)</sup>  | J                                       |
| <u>Language (supplied documentation, software)</u>  |   |
| German  | 0                                       |
| English   | 1                                       |
| French  | 2                                       |
| Spanish   | 3                                       |
| Italian   | 4                                       |

<sup>1)</sup> Ready to enter external correction of cross-interferences for CO, CO<sub>2</sub> and CH<sub>4</sub> (CH<sub>4</sub> only for blast furnace gas and wood gasification).

<sup>2)</sup> Only in connection with an approved purging unit.

**Selection and ordering data**

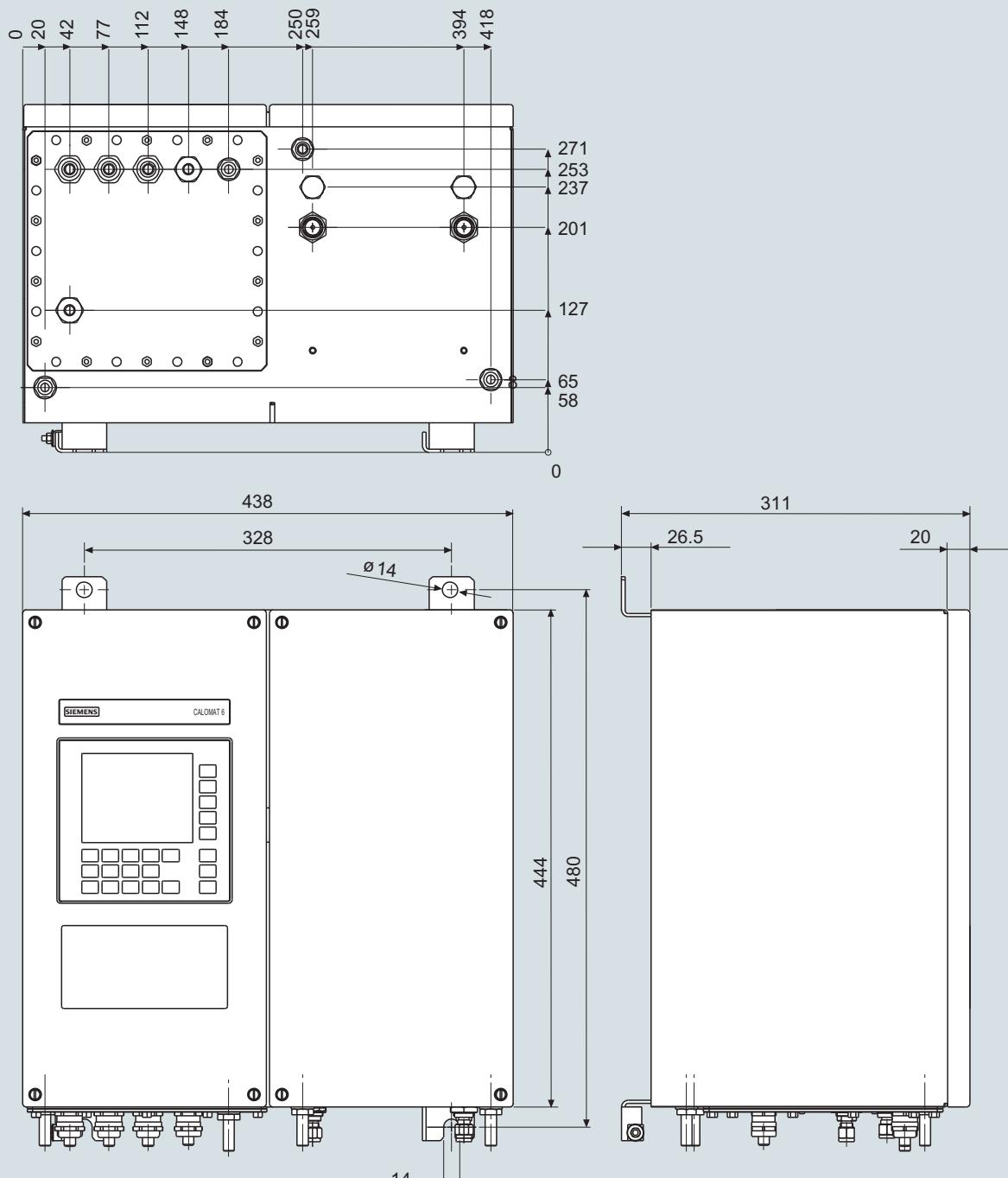
| <i>Additional versions</i>   | <b>Order code</b>      |
|--|------------------------|
| <b>Add "-Z" to Article No. and specify Order codes.</b>  |                        |
| TAG labels (specific lettering based on customer information)                                  | <b>B03</b>             |
| BARTEC Ex p purging unit "Leakage compensation"  | <b>E71</b>             |
| BARTEC Ex p purging unit "Continuous purging"  | <b>E72</b>             |
| Clean for O <sub>2</sub> service (specially cleaned gas path)                                  | <b>Y02</b>             |
| Measuring range indication in plain text, if different from the standard setting               | <b>Y11</b>             |
| <i>Additional units for Ex versions</i>  | <b>Article No.</b>     |
| <b>ATEX Category II 2G (zone 1)</b>  |                        |
| BARTEC Ex p purging unit, 230 V, "leakage compensation"  | <b>7MB8000-2BA</b>     |
| BARTEC Ex p purging unit, 115 V, "leakage compensation"  | <b>7MB8000-2BB</b>     |
| BARTEC Ex p purging unit, 230 V, "continuous purging"  | <b>7MB8000-2CA</b>     |
| BARTEC Ex p purging unit, 115 V, "continuous purging"  | <b>7MB8000-2CB</b>     |
| Ex i isolating transformer   | <b>7MB8000-3AB</b>     |
| Ex isolating relay, 230 V  | <b>7MB8000-4AA</b>     |
| Ex isolating relay, 110 V  | <b>7MB8000-4AB</b>     |
| Differential pressure switch for corrosive and non-corrosive gases                             | <b>7MB8000-5AA</b>     |
| Stainless steel flame arrestor   | <b>7MB8000-6BA</b>     |
| Hastelloy flame arrestor   | <b>7MB8000-6BB</b>     |
| <b>ATEX Category II 3G (zone 2)</b>  |                        |
| BARTEC Ex p purging unit, 230 V, "continuous purging"  | <b>7MB8000-2CA</b>     |
| BARTEC Ex p purging unit, 115 V, "continuous purging"  | <b>7MB8000-2CB</b>     |
| <b>FM/CSA (Class I Div. 2)</b>   |                        |
| Ex purging unit Minipurge FM   | <b>7MB8000-1AA</b>     |
| <i>Accessories</i>   |                        |
| RS 485/Ethernet converter  | <b>A5E00852383</b>     |
| RS 485/RS 232 converter  | <b>C79451-Z1589-U1</b> |
| RS 485/USB converter   | <b>A5E00852382</b>     |
| AUTOCAL function with 8 digital inputs/outputs   | <b>A5E00064223</b>     |
| AUTOCAL function with 8 digital inputs/outputs and PROFIBUS PA                                 | <b>A5E00057315</b>     |
| AUTOCAL function with 8 digital inputs/outputs and PROFIBUS DP                                 | <b>A5E00057318</b>     |
| AUTOCAL function with 8 digital inputs/outputs and PROFIBUS PA Ex i (firmware 4.1.10 required) | <b>A5E00057317</b>     |
| Set of Torx screwdrivers   | <b>A5E34821625</b>     |

**Extractive continuous process gas analysis**

Series 6

CALOMAT 6

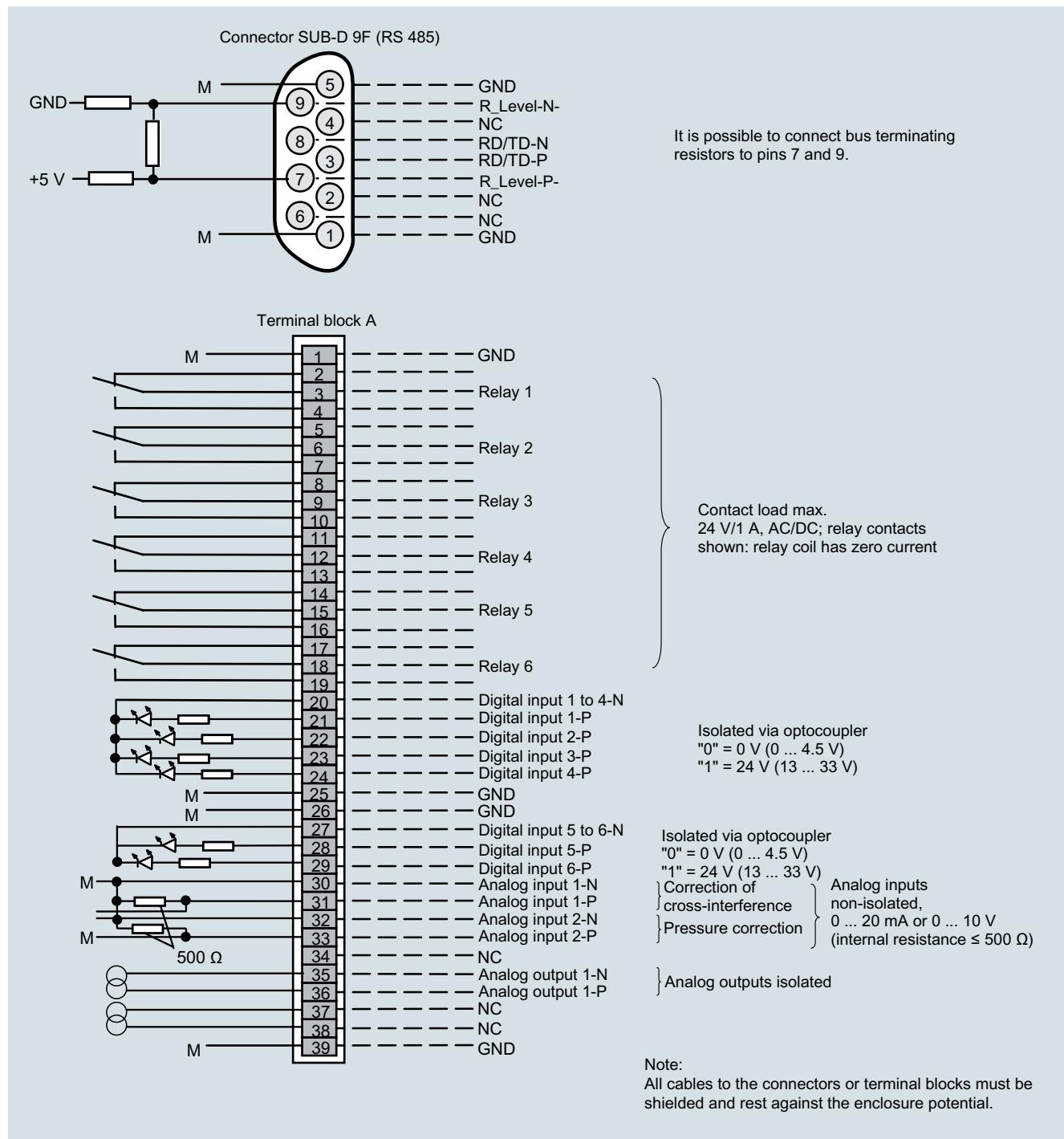
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**Field device****Dimensional drawings**

CALOMAT 6, field unit, dimensions in mm

## Circuit diagrams

## Pin assignment (electrical and gas connections)



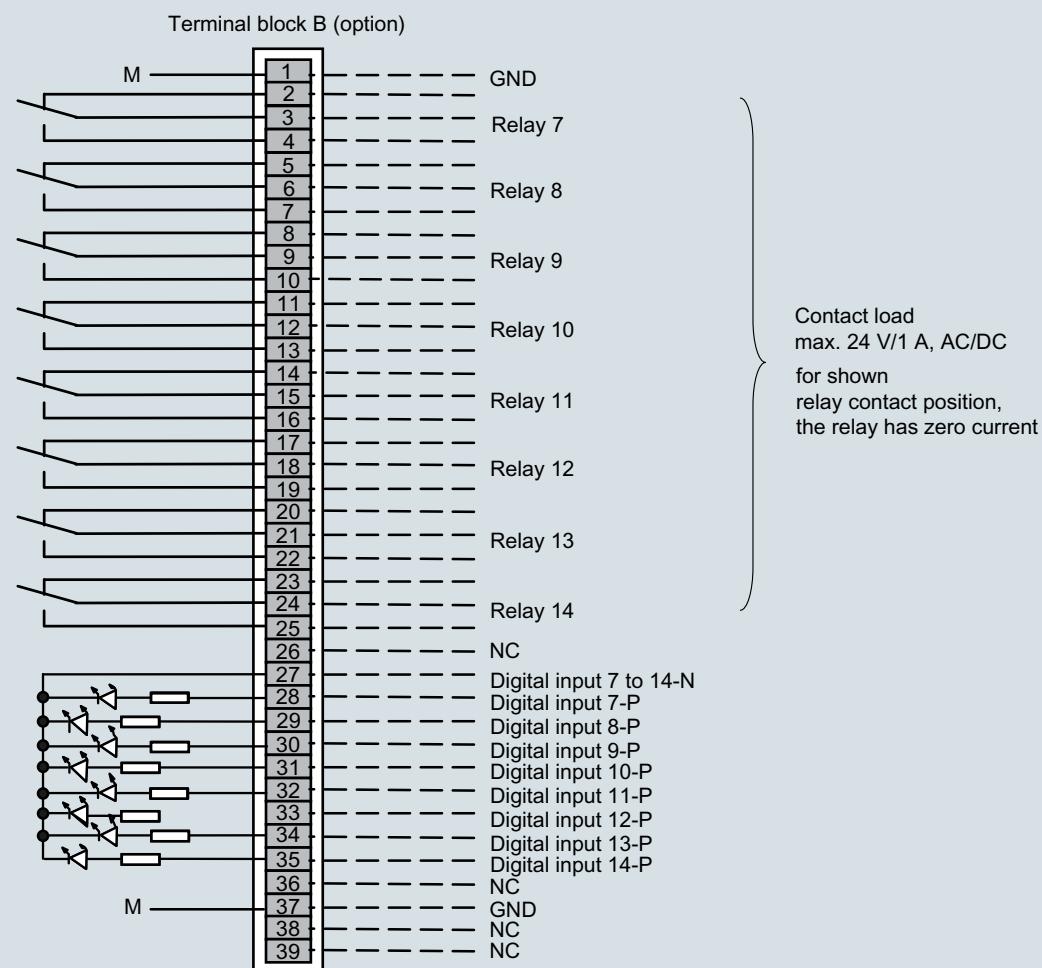
CALOMAT 6, field unit, connector and terminal assignment

**Extractive continuous process gas analysis**

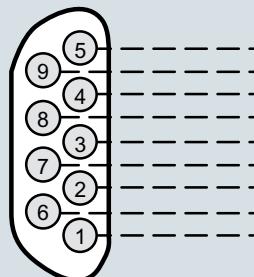
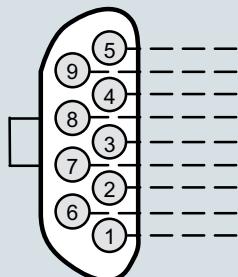
Series 6

CALOMAT 6

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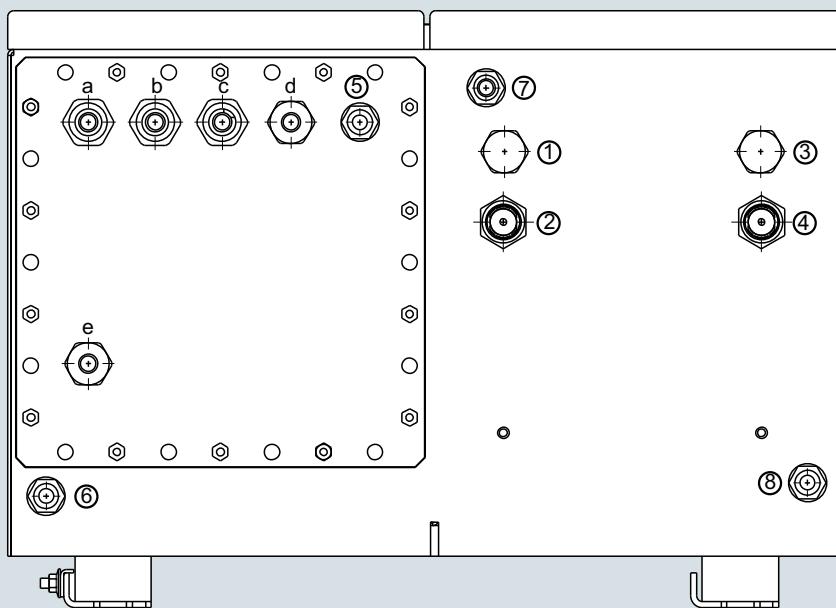
**Field device**Connector SUB-D 9F-X90  
PROFIBUS DP

optional

Connector SUB-D 9M-X90  
PROFIBUS PA**Note:**

All cables to the connectors or terminal blocks must be shielded and rest against the enclosure potential.

CALOMAT 6, field unit, connector and terminal assignment of the AUTOCAL board and PROFIBUS connectors



## Gas connections

|   |                   |   |
|---|-------------------|---|
| ① | not used          | Clamping<br>gland for pipe<br>Ø 6 mm or $\frac{1}{4}$ " |
| ② | Sample gas inlet  |   |
| ③ | not used          |   |
| ④ | Sample gas outlet |   |

⑤-⑧ Purging gas inlets/outlets stubs Ø 10 mm or  $\frac{3}{8}$ "

## Electrical connections

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

CALOMAT 6, field unit, gas and electrical connections

# Extractive continuous process gas analysis

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## Documentation, suggestions for spare parts

### Selection and ordering data

| Operating instructions                           | Article No.        |
|--|--------------------|
| <b>CALOMAT 6</b>                                 |                    |
| Thermal conductivity gas analyzer                |                    |
| • German   | <b>A5E00116454</b> |
| • English  | <b>A5E00116455</b> |
| • French   | <b>A5E00116456</b> |
| • Italian  | <b>A5E00116457</b> |
| • Spanish  | <b>A5E00116458</b> |
| <b>Gas analyzers of Series 6 and ULTRAMAT 23</b> |                    |
| Schnittstelle/Interface PROFIBUS DP/PA           |                    |
| • German and English                             | <b>A5E00054148</b> |

### More information

The complete documentation is available in various languages for downloading free of charge:  
<http://www.siemens.com/processanalytics/documentation>

### Selection and ordering data

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

If the CALOMAT 6 is supplied with a specially cleaned gas path for high oxygen context ("Cleaned for O<sub>2</sub> service"), please ensure that you specify this when ordering spare parts. This is the only way to guarantee that the gas path will continue to comply with the special requirements for this version.