

# Extractive continuous process gas analysis

Series 6

FIDAMAT 6

## General information

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### Overview



The FIDAMAT 6 gas analyzer is suitable for the determination of the total hydrocarbon content in the air and high-boiling gas mixtures.

### Benefits

The FIDAMAT 6 gas analyzer is distinguished by its wide range of applications:

- In the presence of up to 100 % H<sub>2</sub>O vapor
- In ultra-pure gas applications
- With high-boiling components (up to 200 °C)
- In the presence of corrosive gases (with preliminary filter)

The FIDAMAT 6 exhibits:

- Extremely low cross-sensitivity to interfering gases
- Low consumption of combustion air
- Low influence of oxygen on measured value

The analyzer is additionally equipped with warning and fault messages:

- For failure of combustion gas
- If the flame is extinguished
- To indicate pump and filter faults

### Application

#### Areas of application

- Environmental protection
- Wastewater (in conjunction with a stripping device, verification of the hydrocarbon content of liquids)
- TLV (Threshold Limit Value) monitoring at places of work
- Quality monitoring
- Process exhaust monitoring
- Ultra-pure gas measurements in media such as O<sub>2</sub>, CO<sub>2</sub>, inert gases and cold sample gases
- Measurement of corrosive and condensing gases
- Process optimization

#### Further applications

- Chemical plants
- Gas manufacturers (ultra-pure gas monitoring)
- Research and development
- Cement industry (measurement of emissions)
- Paint shops and dry-cleaning systems
- Refineries (tank farms, wastewater)
- Drying systems
- Solvent recovery systems
- Pharmaceutical industry
- Automotive industry (engine development, engine and transmission development and certification)

#### Special applications

##### Special applications

Special applications are available on request in addition to the standard combinations, e.g. measuring range 0 to 100 %.

##### Performance-tested version

Configuration prepared based on QAL1 according to EN 15267 for systems 13th BImSchV/27th BImSchV and TA Luft.

**Design**

- 19" slide-in module with 4 HU for installation
  - In hinged frame
  - In cabinets with or without telescopic rails
- Front plate can be swung down for servicing purposes (laptop connection)
- Gas connections for sample gas inlet and outlet as well as combustion gas and combustion air; pipe diameter 6 mm or 1/4"
- Gas and electrical connections at the rear
- Internal gas paths: stainless steel (mat. no. 1.4571)

**Display and control panel**

- Large LCD field for simultaneous display of
  - Measured value
  - 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

**Input and outputs**

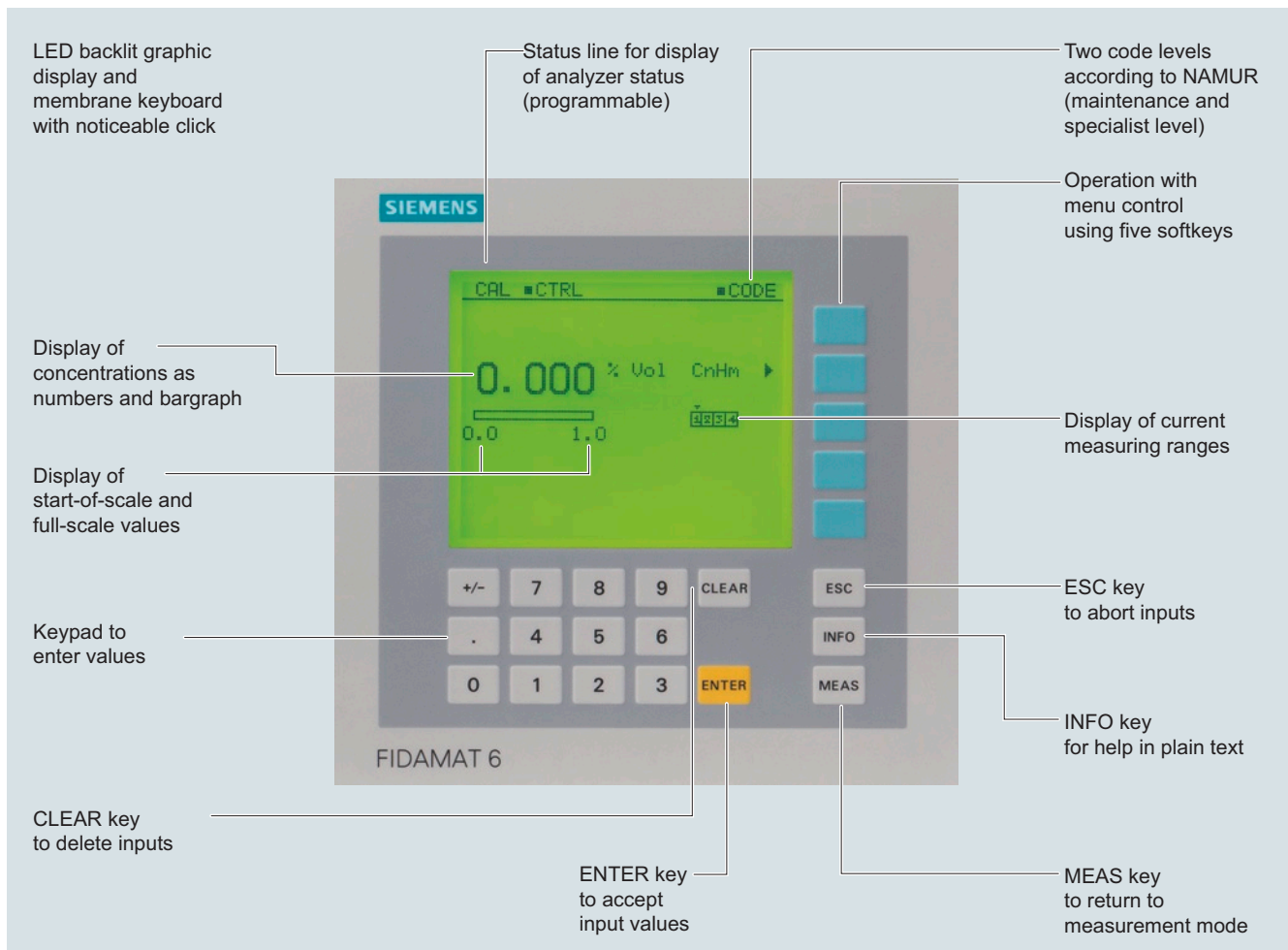
- One analog output for each measured component
- Two programmable analog inputs
- Six digital inputs freely configurable (e.g. for measurement range switchover, processing of external signals from sample preparation)
- Six relay outputs freely configurable (failure, maintenance demanded, maintenance switch, limit alarm, external solenoid valves, measuring point switchover)
- Expansion by eight additional digital inputs and eight additional relay outputs for autocalibration with up to four calibration gases

**Communication**

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

**Options**

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



FIDAMAT 6, membrane keyboard and graphic display

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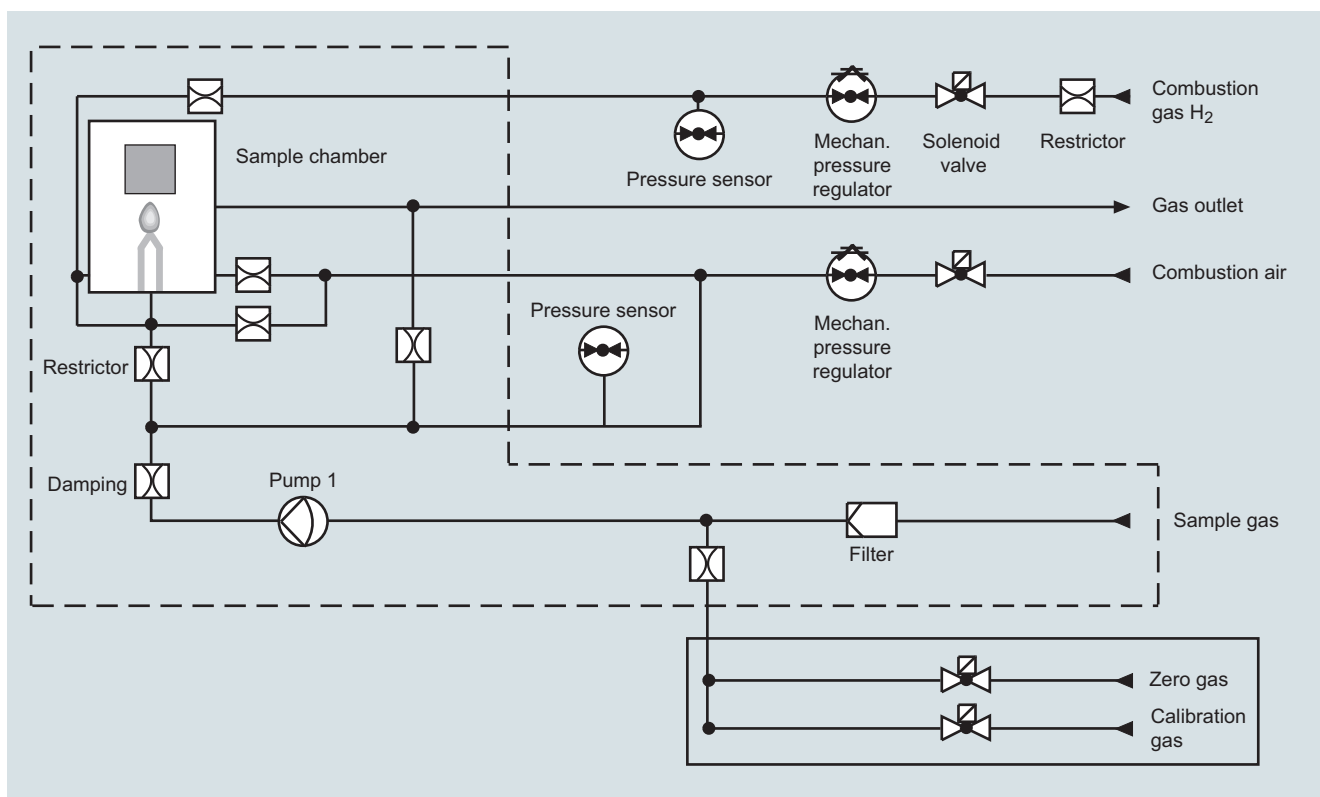
FIDAMAT 6

## General information

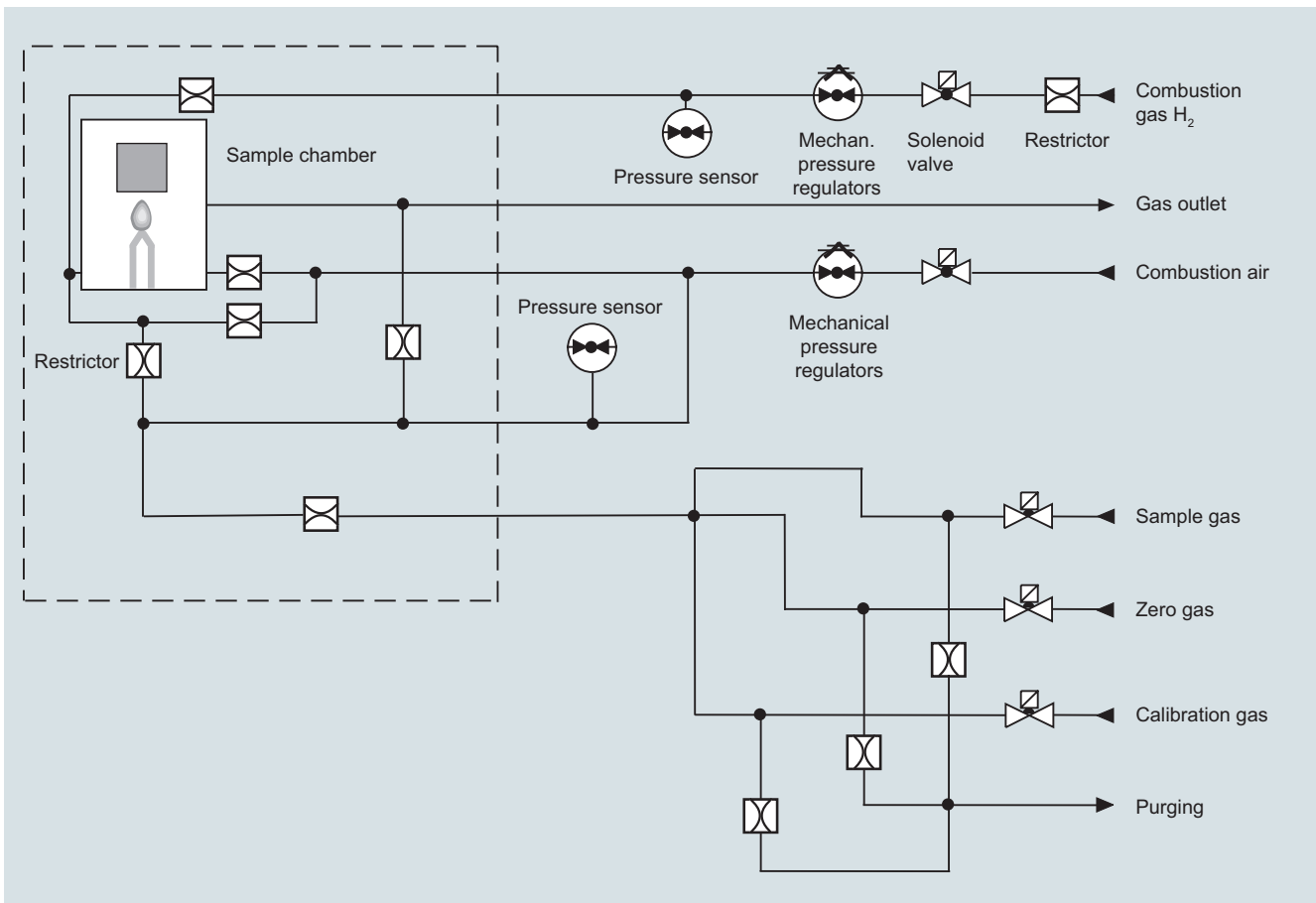
### Designs – parts wetted by sample gas

Gas path	Material
Piping	Stainless steel, mat. no. 1.4571
Gas inlet	Stainless steel, mat. no. 1.4571
Gaskets	Graphite
Sample gas restrictor	Quartz
Auxiliary gas restrictors	Stainless steel, mat. no. 1.4571
Pump membrane	PTFE
Pump head	Stainless steel, mat. no. 1.4571
<b>Detector</b>	
• Nozzle	Quartz
• FID housing	Stainless steel, mat. no. 1.4571

### Gas path



FIDAMAT 6 total hydrocarbon analyzer, gas path with pump and with connection for combustion air



FIDAMAT 6 total hydrocarbon analyzer, gas path without pump and with connection for combustion air

# Extractive continuous process gas analysis

Series 6

FIDAMAT 6

## General information

### Function

#### Principle of operation

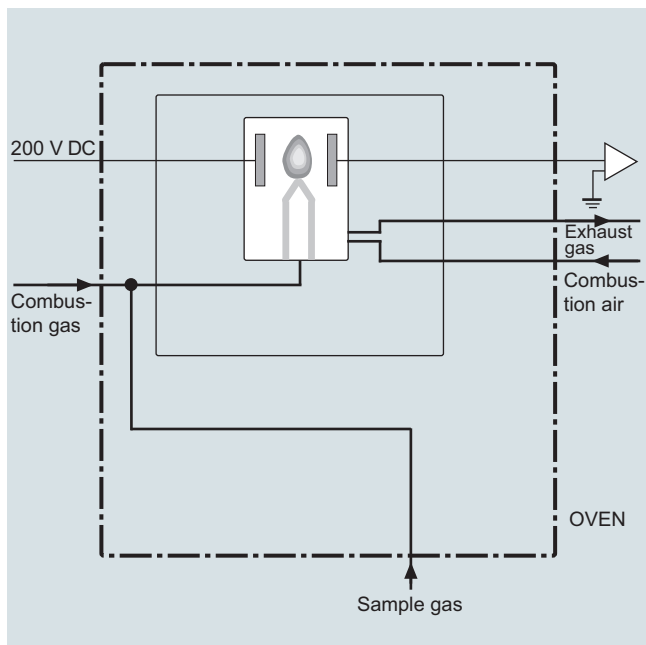
The FIDAMAT 6 carries out substance-specific measurements and not component-specific measurements. It measures the total of all hydrocarbons in a sample gas, but with different weighting of the hydrocarbon molecules. To a first approximation, the display is proportional to the number of C atoms in the respective molecule. However, there are fluctuations in practice. The display deviation for the respective molecule is expressed by the response factor.

The sample gas is supplied to the FIDAMAT 6 through overpressure or drawn in by the built-in diaphragm pump (optionally via a heated line and an additional filter) and passed on to the flame ionization detector via an obstruction-proof fused-silica restrictor.

In the detector, the hydrocarbons in the sample gas are burned in an oxyhydrogen gas flame. Burning partially ionizes the proportion of organically-bound hydrocarbons. The released ions are converted into an ionic current by the voltage present between two electrodes, and measured using a highly sensitive amplifier. The current measured is proportional to the quantity of organically-bound C atoms in the sample gas.

A pressure regulator keeps the combustion gas pressure constant. The balanced system of pump, capillary tubes, and pressure regulator for combustion air ensures that the sample gas pressure is kept constant.

When the analyzer is switched on, ignition is carried out automatically when the setpoint temperature has been reached and, for versions "with pump", the pump is also started up.



FIDAMAT 6, principle of operation

The FIDAMAT 6 provides various messages in the form of floating contacts:

- Maintenance request  
E.g. sample gas flow (filter/pump)  
Fan failure (advance warning for measuring accuracy)  
The measured value remains unaffected.
- Fault  
e. g., hydrogen, combustion air and sample gas pressures, temperature, analyzer part and pump, fault in the electronics (temperature).  
The measured value may be influenced.
- Failure  
In the event of failure of, for example, the electronics, power supply, combustion gas, combustion air or sample gas, the analyzer automatically shuts down (the combustion gas valve is closed).

#### Note

The sample gases must be fed into the analyzers free of dust. Condensation should be avoided. Therefore, the use of gas modified for the measuring task is necessary in most application cases.

#### Calibration

The calibrating interval should be adapted to the respective measuring task. We recommend  $N_2$  as zero gas (at least 5.0; for measuring of hydrocarbons < 1 vpm: at least 6.0).

The calibration gas should have a concentration of at least 60 % of the leading measuring range. The concentration of residual hydrocarbons must not exceed 0.1 vpm.

For pure gas measurement, use suitable additional gases.

#### Example:

##### 1. Emission measurement

Measuring range	0 ... 50 mg C/m <sup>3</sup>
Zero gas	N <sub>2</sub> (5.0 or better)
Calibration gas	21 vpm C <sub>3</sub> H <sub>8</sub> in N <sub>2</sub> (corresponds to 31.43 mg C/m <sup>3</sup> at 20 °C)

##### 2. Purity measurement in 100 % O<sub>2</sub>

Measuring range	0 ... 50 vpm C <sub>1</sub>
Zero gas	N <sub>2</sub> (5.0 or better)
Calibration gas	At least 30 vpm CH <sub>4</sub> in O <sub>2</sub>

**Essential characteristics**

- Four measuring ranges which can be freely configured, even with suppressed zero point, all measuring ranges are linear
- Galvanically isolated measured-value output 0/2/4 to 20 mA (also inverted)
- Autoranging possible; remote switching is also possible
- Storage of measured values possible during adjustments
- Measuring range identification
- Measuring point switchover for up to 6 measuring points
- Measuring point identification
- Wide range of selectable time constants (static/dynamic noise suppression); i.e. the response time of the device can be adapted to the respective measuring task
- Easy handling thanks to menu-driven operation
- Low long-term drift
- Two control levels with their own authorization codes for the prevention of accidental and unauthorized operator interventions
- Automatic measuring range calibration can be configured
- Operation based on the NAMUR recommendation
- Customer-specific analyzer options such as:
  - Customer acceptance
  - TAG labels
  - Drift recording
- Wear-free, corrosion-proof filter housing
- No blocking of the sample gas capillaries through the use of a quartz restrictor
- Purge function in the event of analyzer or power supply failure (avoids build-up of toxic and corrosive substances in the device)
- Low consumption of combustion air
- Response factors comply with the minimum requirements in accordance with German air purity guidelines and the Working Group of the German automotive Industry
- Simple handling using a numerical membrane keyboard and operator prompting

**Response factors (examples, mean values)**

Substance	Mean response factor
n-butane	1.00
n-propane	1.00
n-heptane	1.00
Cyclohexane	1.08
Isopropanol	0.81
Toluene	1.06
Acetone	0.92
Ethyl acetate	0.76
Isobutyl acetate	0.83
Methane	1.06
Ethane	0.99
n-hexane	1.01
iso-octane	1.04
Ethine (acetylene)	0.91
Propene	0.84
Methanol	0.87
Ethanol	0.83
Ethanoic acid	1.13
Methyl acetate	0.67
Benzene	1.01
Ethyl benzene	0.96
p-xylene	1.03
Dichloromethane	1.13
Trichloroethene	1.01
Tetrachlorethene	1.07
Chloroform	0.72
Chlorobenzene	1.15

**Cross-interferences (examples)<sup>1)</sup>**

Interfering component	Concentration of the interfering component	Induced cross-interference
O <sub>2</sub> in N <sub>2</sub>	(21 vol. %)	< 0.3 mg/m <sup>3</sup>
SO <sub>2</sub> in N <sub>2</sub>	(258 mg/m <sup>3</sup> )	< 0.15 mg/m <sup>3</sup>
NO in N <sub>2</sub>	(310 mg/m <sup>3</sup> )	< 0.5 mg/m <sup>3</sup>
NO <sub>2</sub> in synth. Air	(146 mg/m <sup>3</sup> )	< 0.1 mg/m <sup>3</sup>
CO in N <sub>2</sub>	(461 mg/m <sup>3</sup> )	< 0.15 mg/m <sup>3</sup>
CO <sub>2</sub> in N <sub>2</sub>	(18 vol. %)	< 0.1 mg/m <sup>3</sup>
HCl in N <sub>2</sub>	(78 mg/m <sup>3</sup> )	< 0.3 mg/m <sup>3</sup>

<sup>1)</sup> With measuring range 0 to 15 mg/m<sup>3</sup>.

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FIDAMAT 6

19" rack unit

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## Technical specifications

<b>General information</b>		<b>Measuring response</b>	
Measuring ranges	4, internally and externally switchable; manual and autoranging possible	Output signal fluctuation	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature < 0.75% of the smallest possible measuring range according to rating plate, with electronic damping constant of 1 s (corresponds to $\pm 0.25\%$ at $2\sigma$ )
Smallest possible measuring span	0 ... 10 vpm	Zero point drift	< 0.5%/month of the smallest possible measuring span according to rating plate
Largest possible measuring span	99.999 vpm <sup>*)</sup>	Measured-value drift	< 1%/week of the current measuring range
Concentration units	vpm, C <sub>1</sub> , C <sub>3</sub> , C <sub>6</sub> or mgC/m <sup>3</sup>	Repeatability	< 1% of the current measuring range
Autoranging	Hysteresis, selectable	Detection limit	0.1 vpm (version for ultra-pure gas measurement: 50 ppb)
Measured-value display	Digital concentration display (5 digits with floating point)	Linearity error	< 1% of the current measuring range
Resolution of digital display	0.1% of measured value	<b>Influencing variables</b>	
Operating position	Front wall, vertical	Ambient temperature	Based on sample gas pressure 1 013 hPa absolute, 0.5 l/min sample gas flow and 25 °C ambient temperature < 1%/10 K referred to smallest possible span according to rating plate
Conformity	CE mark in accordance with EN 50081-1, EN 50082-2	Atmospheric pressure	< 1%/50 hPa
Oven temperature	Adjustable, 100 ... 200 °C	Sample gas pressure	< 2% of the current measuring range/ 1% pressure change (within 600 ... 1 100 hPa)
<b>Design, enclosure</b>		Auxiliary power	< 1% of the current measuring range with rated voltage $\pm 10\%$
Degree of protection	IP20 according to EN 60529	Position influence	< 1% with < 15° inclination
Weight	Approx. 23 kg	<b>Electrical inputs and outputs</b>	
<b>Electrical characteristics</b>		Analog output	0/2/4 ... 20 mA, isolated; max. load 750 $\Omega$
Auxiliary power	100 ... 120 V AC (nominal range of use 90 ... 132 V), 48 ... 63 Hz or 200 ... 240 V AC (nominal range of use 180 ... 264 V), 48 ... 63 Hz	Relay outputs	6, with changeover contacts, freely configurable, e.g. for measuring range identification; load: 24 V AC/DC/1 A, potential-free
Power consumption	<ul style="list-style-type: none"> <li>• Approx. 150 VA during operation,</li> <li>• Approx. 350 VA during warm-up phase</li> </ul>	Analog inputs	2, dimensioned for 0/2/4 to 20 mA for external pressure sensor and correction of influence of accompanying gas (correction of cross-interference)
EMC interference immunity (electromagnetic compatibility)	In accordance with standard requirements of NAMUR NE21 (08/98)	Digital inputs	6, designed for 24 V, floating, freely configurable, e.g. for measuring range switchover
Electrical safety	In accordance with EN 61010-1, overvoltage category II	Serial interface	RS 485
Fuse values	<ul style="list-style-type: none"> <li>• 100 ... 120 V: 4.0T/250</li> <li>• 200 ... 240 V: 2.5 T/250</li> </ul>	Options	AUTOCAL function each with 8 additional digital inputs and relay outputs, also with PROFIBUS PA or PROFIBUS DP
<b>Gas inlet conditions</b>		<b>Climatic conditions</b>	
Permissible sample gas pressure	< 2 000 hPa abs.	Permissible ambient temperature	5 ... 45 °C in operation, -30 ... +70 °C during storage and transportation
• Without pump	600 ... 1 100 hPa	Permissible humidity	< 90% RH (RH: relative humidity) as annual average, during storage and transportation (must not fall below dew point)
• With integrated pump			
Sample gas temperature	0 ... 200 °C		
Sample gas humidity	< 90% RH (RH: relative humidity)		
<b>Dynamic response</b>			
Warm-up period	At room temperature, approx. 2 ... 3 h		
Delayed display (T <sub>90</sub> )	2 ... 3 s		
Damping (electrical time constant)	0 ... 100 s, configurable		
Dead time (purging time of the gas path in the unit at 1 l/min)	With filter, 2 ... 3 s		
Time for device-internal signal processing	< 1 s		

\*) 100% as special application

**FIDAMAT 6 with pump and heated oven, with combustion air connection**

Gases	Inlet pressure hPa (abs.)	Operating pressure Pump startup		Flow through FID ml/min	Flow through bypass ml/min
		Without hPa (abs.)	With hPa (abs.)		
		Combustion gas	3 000 ... 5 000		
Combustion air	3 000 ... 5 000	1 420 ± 20	1 500	~ 320	~ 500
Sample gas	~ 1000	—	1 500 ± 2	~ 3	~ 1 000
Zero gas	3 500 ... 4 000	—	1 500 ± 2	~ 3	~ 1 000
Calibration gas	3 500 ... 4 000	—	1 500 ± 2	~ 3	~ 1 000

**FIDAMAT 6 without pump, with heated oven, with combustion air connection**

Gases	Inlet pressure hPa (abs.)	Operating pressure Sample/calibration gas		Flow through FID ml/min	Flow through bypass ml/min
		Without hPa (abs.)	With hPa (abs.)		
		Combustion gas	3 000 ... 5 000		
Combustion air	3 000 ... 5 000	1 480 ± 5	—	~ 320	~ 300
Sample gas	1 500 ... 2 000	—	1 500 ± 2	~ 3	~ 500
Zero gas	1 500 ... 2 000	—	1 500 ± 2	~ 3	~ 500
Calibration gas	1 500 ... 2 000	—	1 500 ± 2	~ 3	~ 500

The supply gases (combustion gas, combustion air) must have a degree of purity of 5.0 in order to guarantee correct measurements. The degree of purity must be increased in the case of very small hydrocarbon concentrations (< 1 ppm).



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**19" rack unit****Selection and ordering data****Article No.****FIDAMAT 6 gas analyzer**

19" rack unit for installation in cabinets

7MB2421- - - - - A

Click on the Article No. for the online configuration in the PIA Life Cycle Portal.

Gas connections

Pipe with 6 mm outer diameter

Pipe with 1/4" outer diameter

0

1

VersionWithout pump, for sample gas with overpressure<sup>1)</sup>

With heated pump, for sample gas with atm. pressure

B

D

Combustion air feed

With connection for combustion air

A

Number of channels

1-channel version

1

Add-on electronics

Without

AUTOCAL function

• With 8 additional digital inputs/outputs

• With 8 digital inputs/8 digital outputs, PROFIBUS PA interface

• With 8 digital inputs/8 digital outputs, PROFIBUS DP interface

0

1

6

7

Power supply

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

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

0

1

Combustion gasesH<sub>2</sub>

A

Language (supplied documentation, software)

German

English

French

Spanish

Italian

0

1

2

3

4

Additional versions**Order code**

Add "-Z" to Article No. and specify Order code

Telescopic rails (2 units)

**A31**

TAG labels (specific lettering based on customer information)

**B03**Clean for O<sub>2</sub> service (specially cleaned gas path)**Y02**

Measuring range indication in plain text, if different from the standard setting

**Y11**

Special setting (only in conjunction with an application No.)

**Y12**

Extended special setting (only in conjunction with an application No.)

**Y13**

Configuration according to EN 14181:2004

**Y17**Prepared for EN 15267:2015<sup>2)</sup>**Y27**Accessories**Article No.**

RS 485/Ethernet converter

**A5E00852383**

RS 485/RS 232 converter

**C79451-Z1589-U1**

RS 485/USB converter

**A5E00852382**

AUTOCAL function each with 8 digital inputs/outputs

**C79451-A3480-D511**

AUTOCAL function 8 digital inputs/outputs each and PROFIBUS PA

**A5E00057307**

AUTOCAL function 8 digital inputs/outputs each and PROFIBUS DP

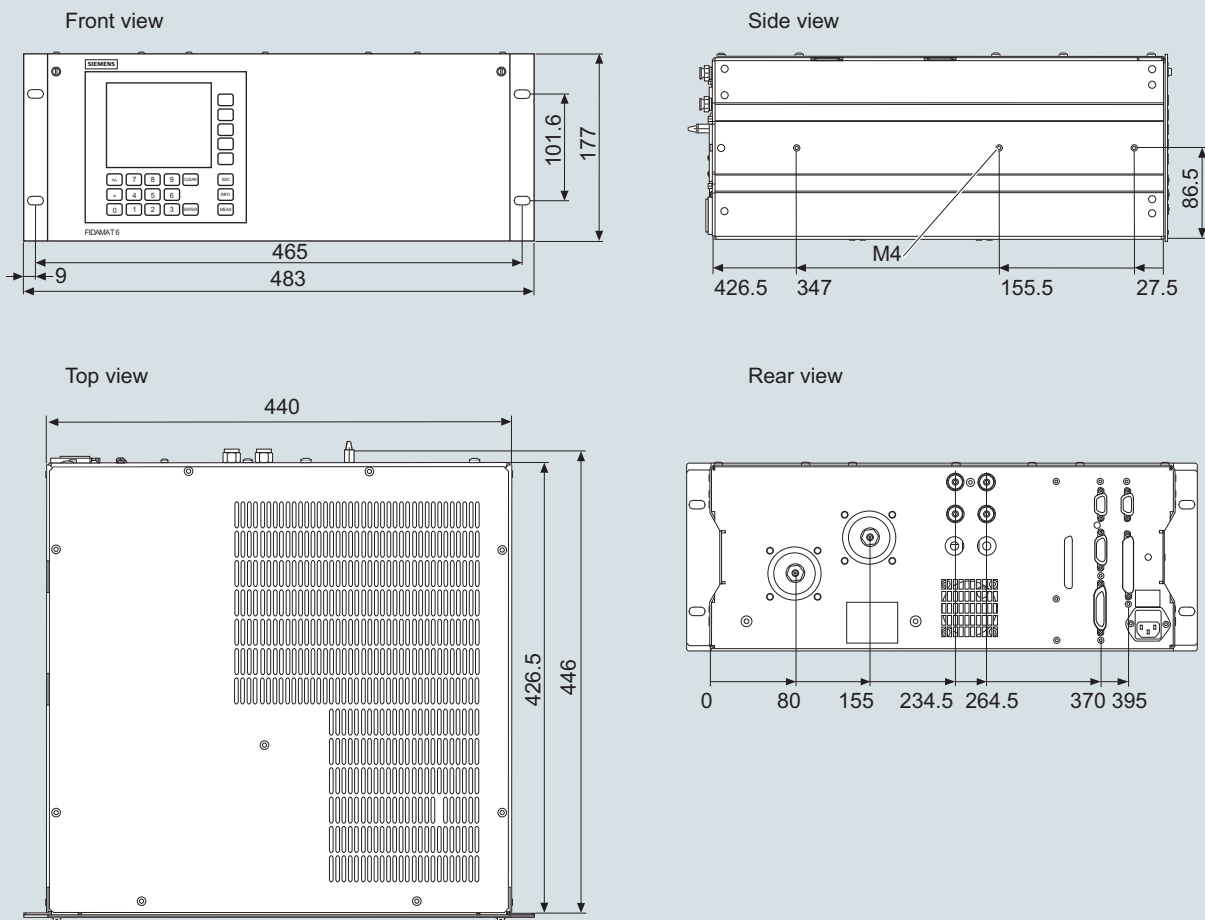
**A5E00057312**

Set of Torx screwdrivers

**A5E34821625**

<sup>1)</sup> No QAL1 certification according to EN 15267

<sup>2)</sup> For certified operation, compensation of the cross-interference caused by the oxygen is required. To do this, the device must be supplied with the current oxygen concentration value of the sample gas. The supply takes place over an external measuring instrument that must also meet the requirements of EN 15267-3 (e.g. ULTRAMAT 23 or OXYMAT 6). The FIDAMAT 6E -Y27 is preconfigured accordingly and expects an analog signal of 4 ... 20 mA corresponding to 0 ... 21 vol % O<sub>2</sub> at analog input AI2.

**Dimensional drawings**

FIDAMAT 6, 19" unit, dimensions in mm

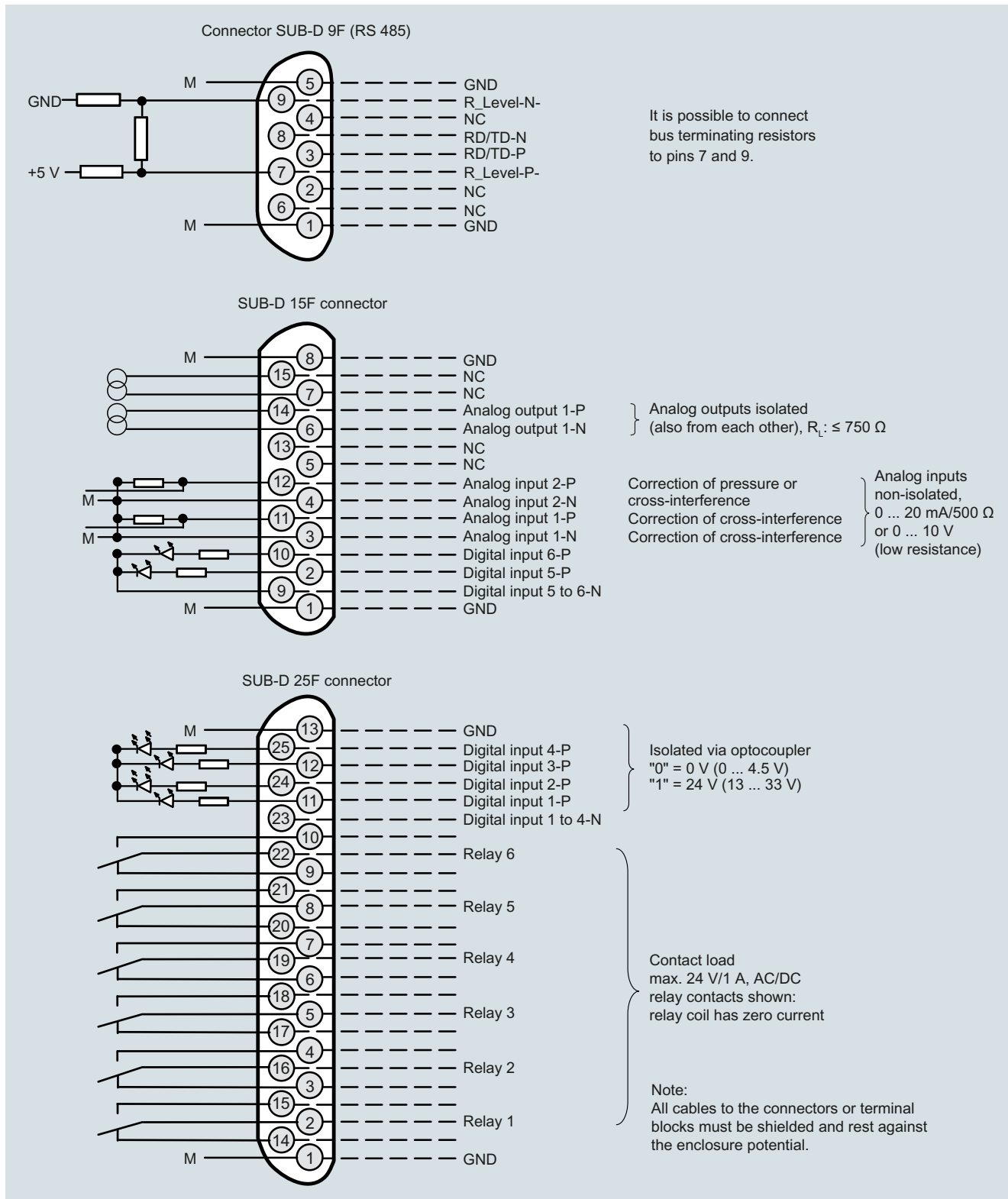
# Extractive continuous process gas analysis

Series 6  
FIDAMAT 6

19" rack unit

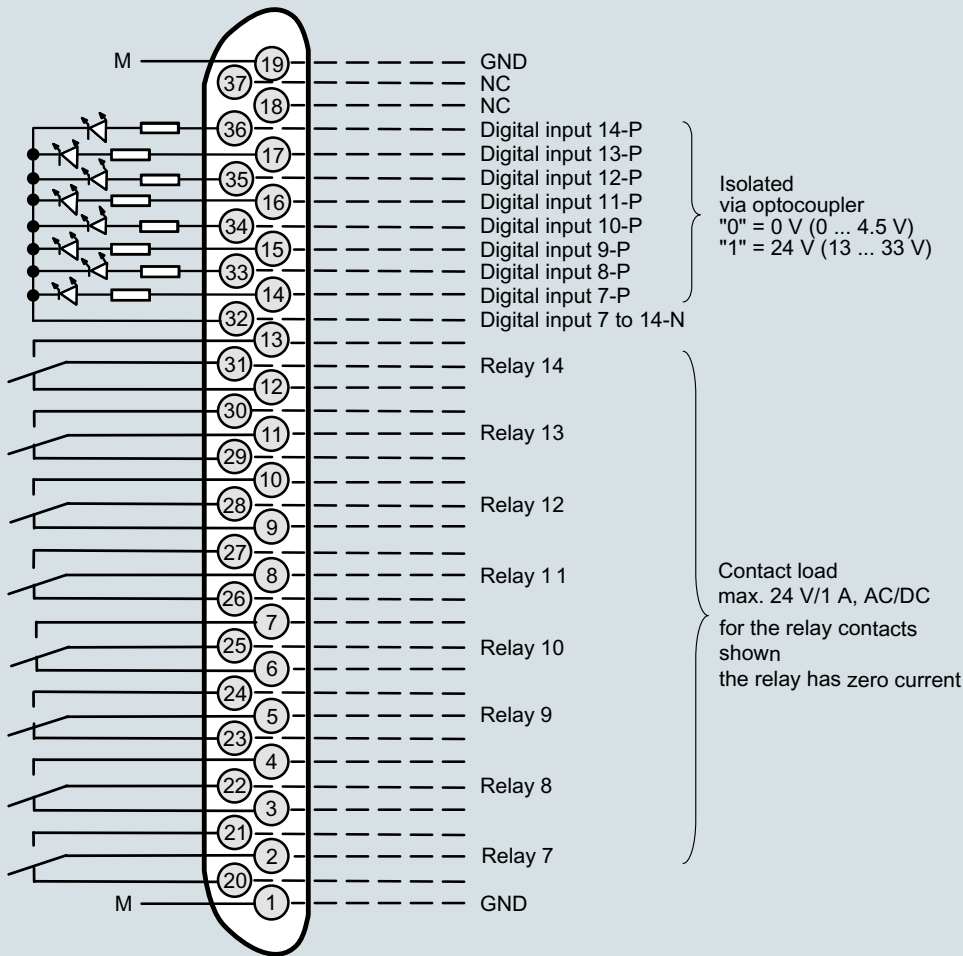
## Circuit diagrams

### Pin assignment (electrical and gas connections)



FIDAMAT 6, 19" rack unit, pin assignment

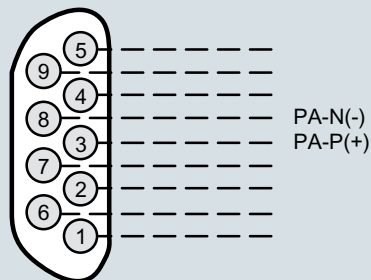
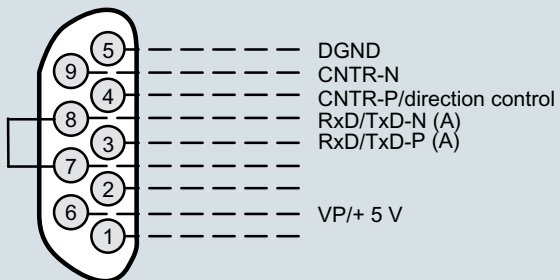
Connector SUB-D 37F (option)



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.

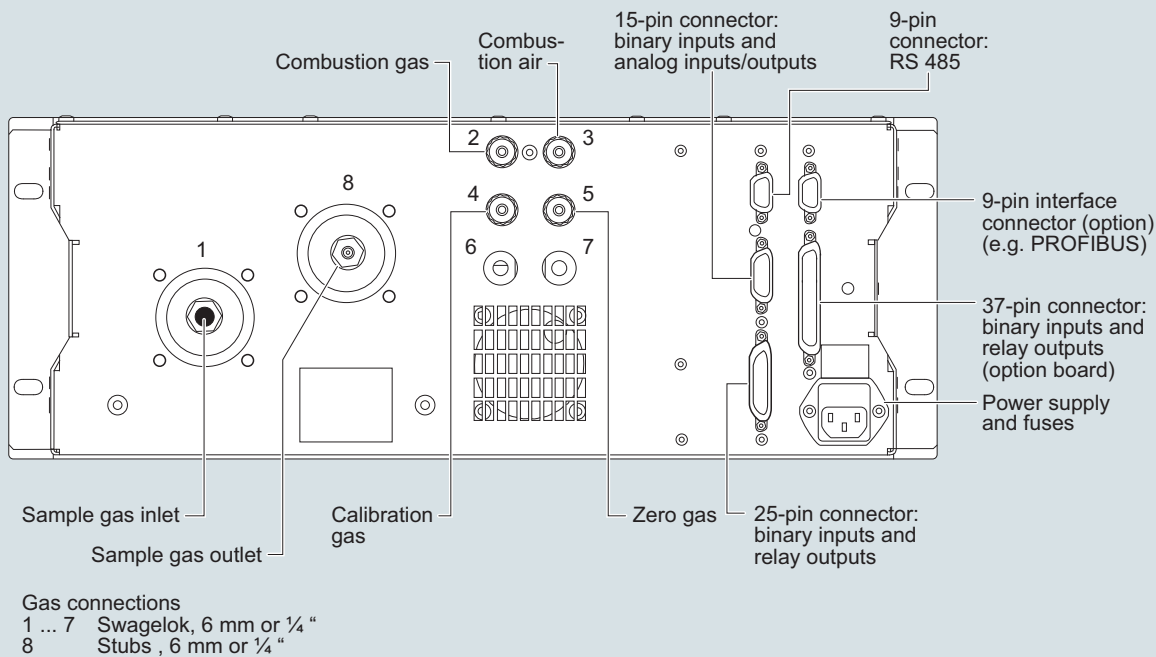
FIDAMAT 6, 19" rack unit, pin assignment of the AUTOCAL board and PROFIBUS connectors

# Extractive continuous process gas analysis

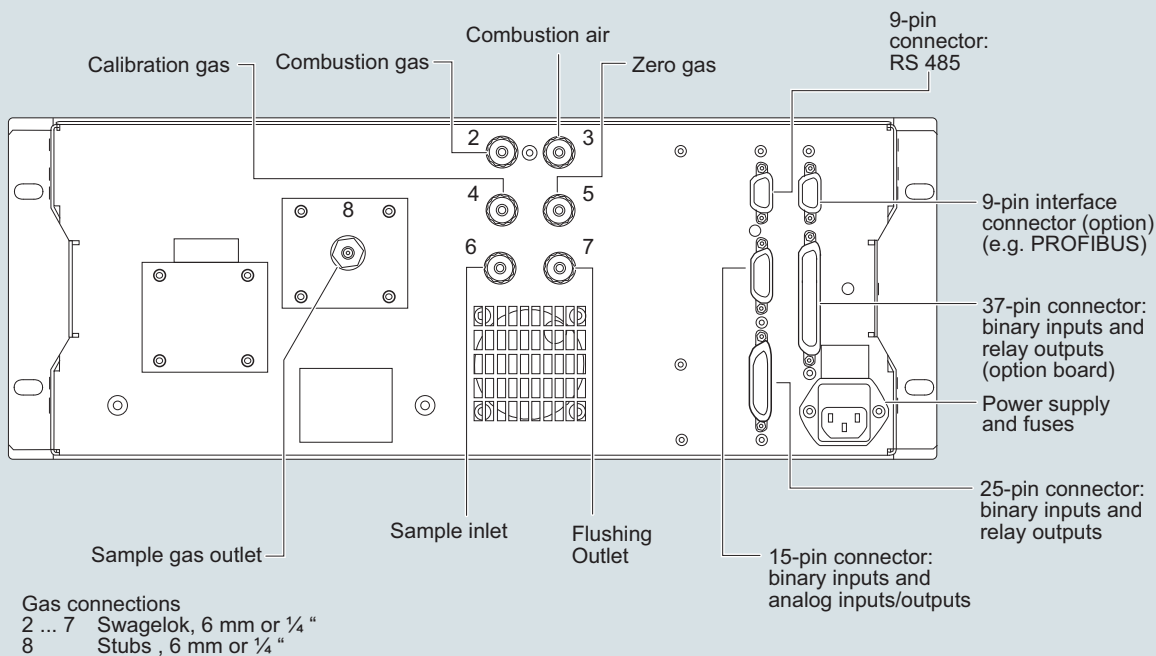
Series 6  
FIDAMAT 6

19" rack unit

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FIDAMAT 6, gas connections and pin assignment, version with pump



FIDAMAT 6, gas connections and pin assignment, version without pump