

SIEMENS

A&D PA Process Automation and Instruments

PROBENCH

Manual

Automation and Drive Engineering

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Title	PROBENCH manual
Edition	1.0
Filename	Probench manual version 1.0
Date	April, 01

PROBENCH Manual Version 1.0

Instructions for installing and operating the PROBENCH

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1 Installation Instructions

1.1 Structure of the PROBENCH

The PROBENCH is a compact module for measuring gas conditioning for vehicle exhaust gas measuring instruments. It contains a complete gas line with double water trap, a double head pump for measuring gas and condense water, filters, flow sensor and solenoid valve. Facilities for installing electro-chemical nitrogen monoxide and oxygen sensors are provided.

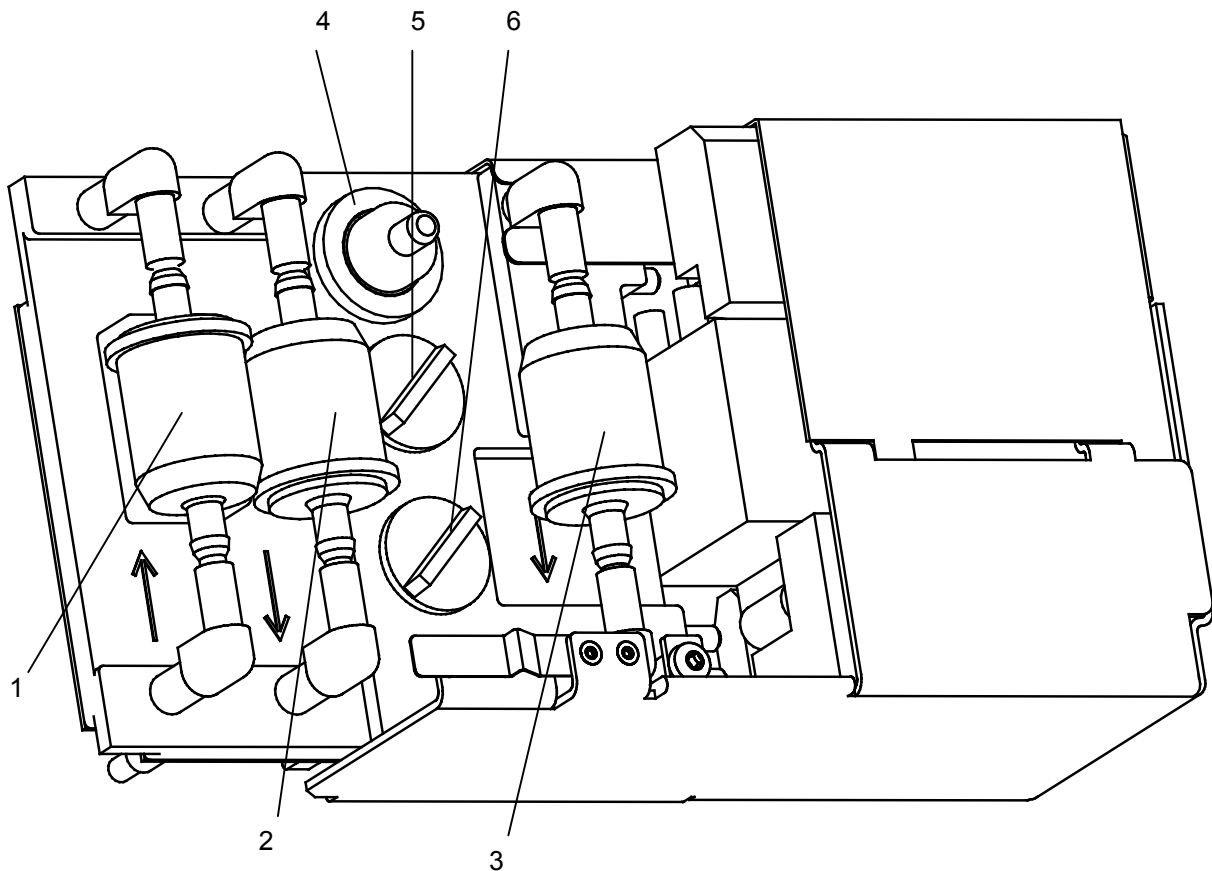


Figure 1

1. Gas filter GF2
2. Gas filter GF3
3. Gas filter GF4
4. Flow sensor
5. Location for electro-chemical oxygen sensor O₂
6. Location for electro-chemical nitrogen monoxide sensor NO

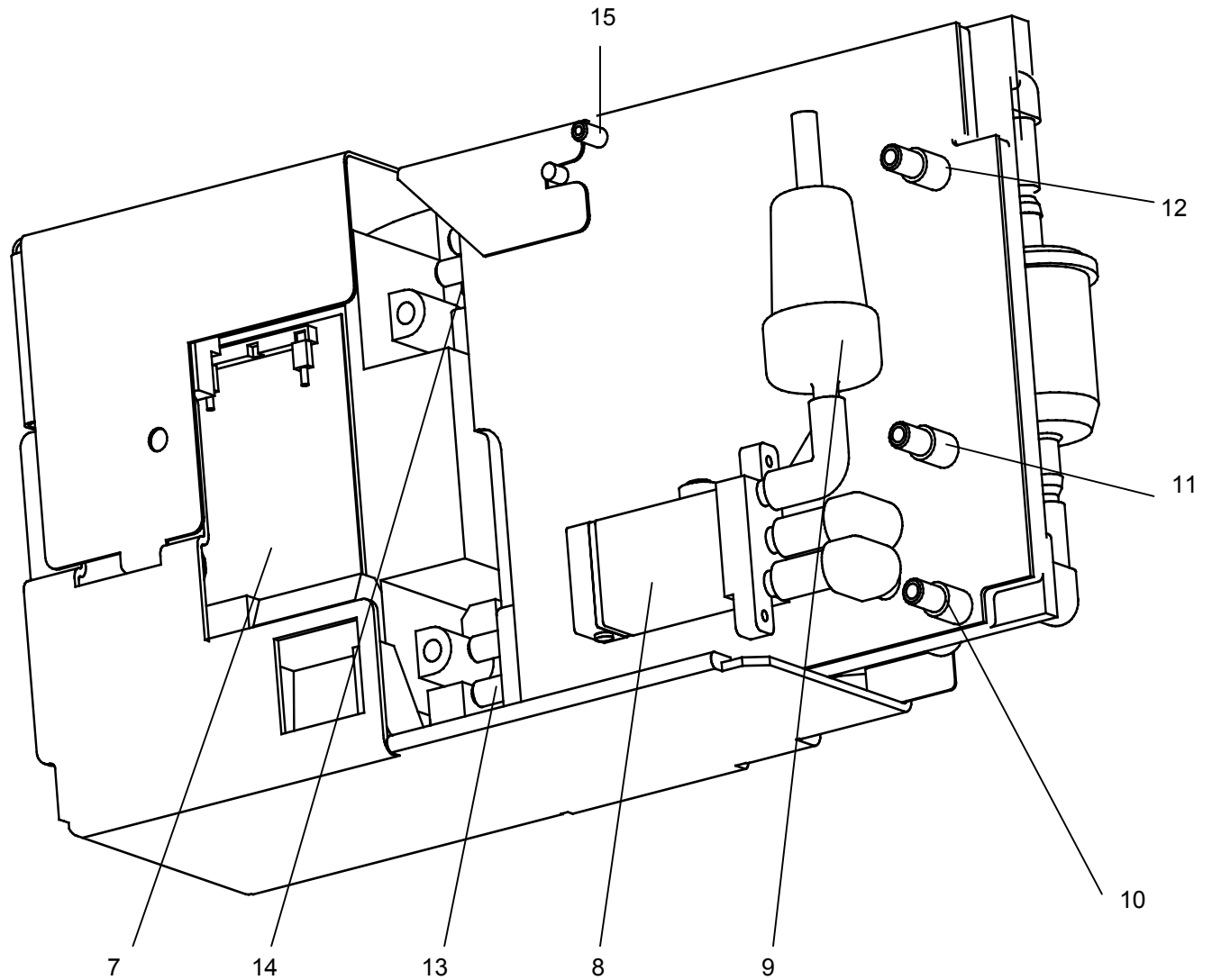


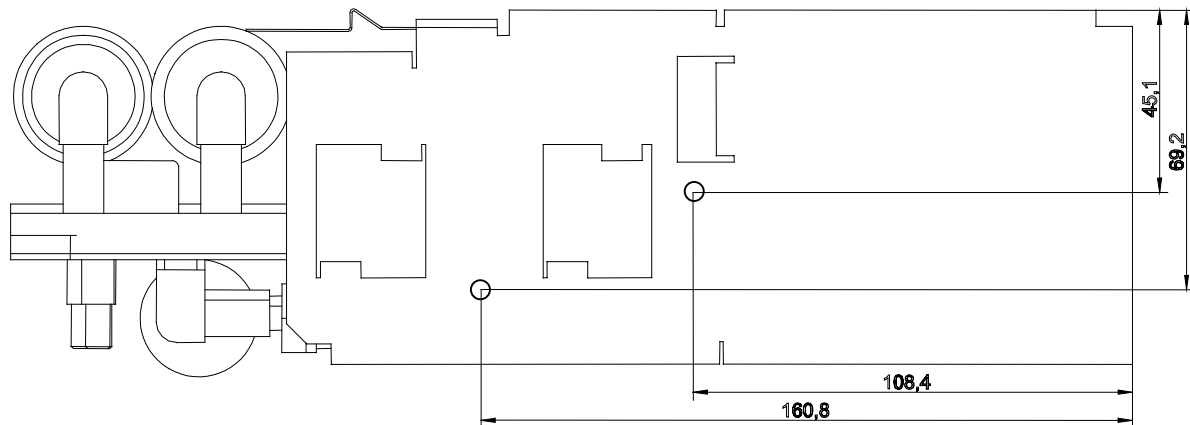
Fig. 2

- 7. Pump (double head)
- 8. Fresh-air solenoid valve
- 9. HC absorber (char-coal filter)
- 10. Condensation and gas outlet
- 11. Measuring gas outlet, test gas inlet
- 12. Measuring gas inlet
- 13. from the analysis bench
- 14. to the analysis bench
- 15. optional: connection for pressure sensor before the pump (sealed)

1.2 Mechanical installation conditions

Installation:

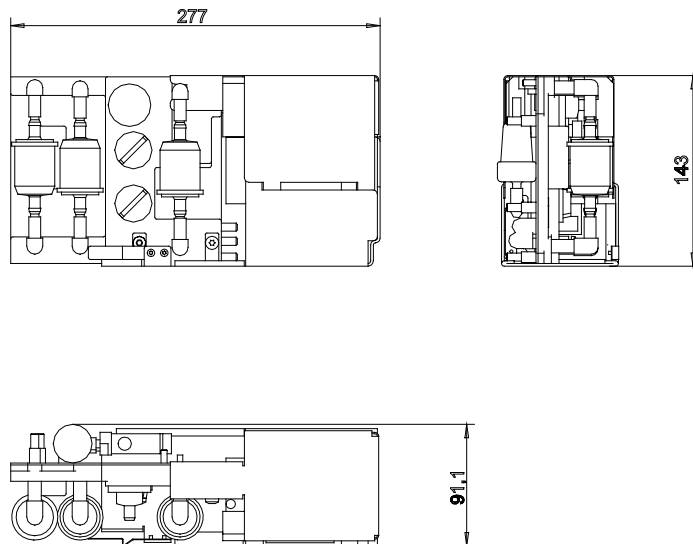
The Probench has two M4 assembly nuts in the base plate.



Operating position:

The Probench must be mounted so that the fastening screws face the base of the exhaust gas measuring instrument. Only then is the automatic condensation trapping with draining off of condensed water guaranteed.

Dimensions:



1.3 EMC installation conditions

The following conditions must be observed for **EMC reasons**:

- Leads to the oxygen sensor and to an electro-chemical NO-sensor must be either shielded or twisted because of the small signals.

1.4 Pneumatic installation conditions

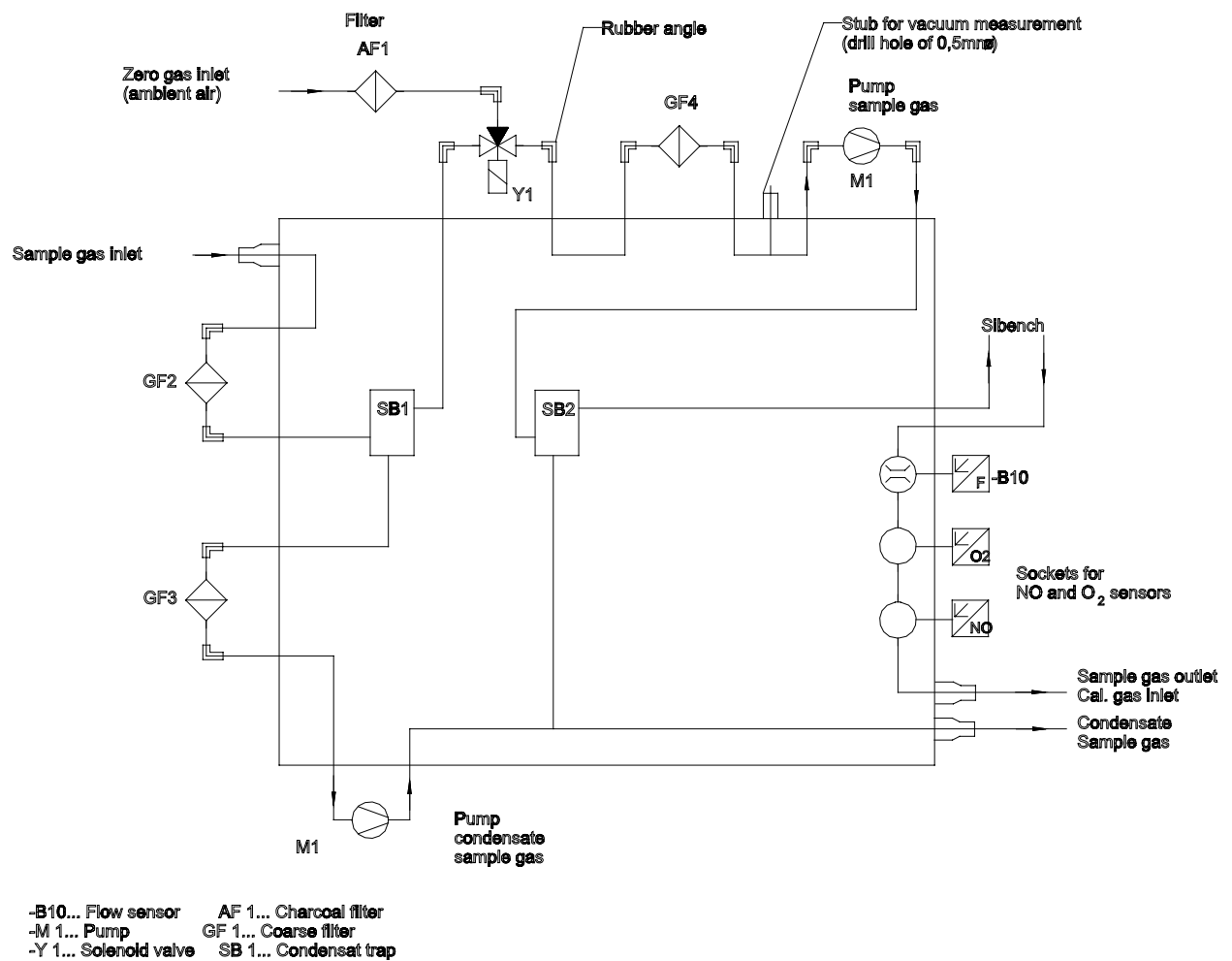
Gas flow plan:

Gas inlet: 4 l/min total flow
 On SB1 division: 2 l/min through pump M1
 2 l/min through pump M2

On SB2 division: 1 l/min through Sibench
 1 l/min to outlet/condensation trap

Pressure sensor connection:

Can be activated for vacuum pressure measuring in front of the pump (fig. 2/item 15)
 Drill with \varnothing 0,5 mm drill, with penetration depth, max. 3 mm into the plastic.



External tubing:

A 70 cm long tube must be connected to the “gas outlet/test gas inlet” and to the “condensate/sample gas” outlet for discharging gas and condensed water. These tubes must be laid at a down gradient from the connection. The water flowing downwards produces a vacuum which improves water drainage.

A sample tube of about 8 m in length must be connected at the gas inlet. This tube must be protected by a filter (e.g. type KL 13 from Mahle Co.). The sample probe is connected before this by about 50 cm of tube.

1.5 Thermal installation conditions

The electrical power is produced as lost heat. The operating range of the PROBENCH allows internal temperatures of +2 °C to 70 °C. The PROBENCH must therefore be installed in the housing in such a way that the internal temperature does not exceed 70 °C.

The main heat is generated by the pump. In a sufficiently ventilated structure the lost heat is dissipated by convection. In very compact installations, a fan must be used to cool the pump.

Check the specific application to find out whether a fan needs to be installed.

1.6 Electrical connections

Number	Funktion	Order No.									
1	Analogou inputs Pump <table style="margin-left: 20px;"> <tr> <td style="border: 1px solid black; padding: 2px;">1</td> <td rowspan="4" style="vertical-align: middle;"> Coil at the top, on the right Coil below, on the right Coil below, on the right Coil below, on the left </td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">2</td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">3</td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">4</td> </tr> </table> <div style="margin-left: 100px;"> <table style="border-collapse: collapse;"> <tr> <td style="padding-right: 10px;">parallel</td> <td style="padding-right: 10px;">serial</td> </tr> <tr> <td style="padding-right: 10px;">12 V</td> <td style="padding-right: 10px;">24 V</td> </tr> </table> </div>	1	Coil at the top, on the right Coil below, on the right Coil below, on the right Coil below, on the left	2	3	4	parallel	serial	12 V	24 V	AMP Serie MTE 0-0103670-3 / 0-0104257-3
1	Coil at the top, on the right Coil below, on the right Coil below, on the right Coil below, on the left										
2											
3											
4											
parallel	serial										
12 V	24 V										
2	Solenoid valve Cable connection <table style="margin-left: 20px;"> <tr> <td style="border: 1px solid black; padding: 2px;">1</td> <td rowspan="3" style="vertical-align: middle;">12 V = open GND</td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">2</td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">3</td> </tr> </table>	1	12 V = open GND	2	3	AMP Serie MTE 0-0103670-2 / 0-0104257-2					
1	12 V = open GND										
2											
3											
5	SIEMENS Flow sensor (Option) Cable connection <table style="margin-left: 20px;"> <tr> <td style="border: 1px solid black; padding: 2px;">1</td> <td rowspan="3" style="vertical-align: middle;">common Meas Ref</td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">2</td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">3</td> </tr> </table>	1	common Meas Ref	2	3	AMP Serie MTE 0-0103670-2 / 0-0104257-2					
1	common Meas Ref										
2											
3											

Data of components and sensors

Solenoid valve:	12 V, 2 W
	Suggested circuit for 12 V power supply: <ul style="list-style-type: none">- Switch on with 12 V- Continuous operation with pulse value modulated signal derived from 12 V, integration by inductance of the solenoid valve.
Pump:	12 V (parallel connected windings) 24 V (windings in series)
Suggested circuit: setting	Continuous operation with pulse value modulated signal. Power by pulse/pause ratio. Connection by half or full bridge
Electrochemical sensors:	The Probench is designed for using electro-chemical sensors with A connection thread M16 x 1.
Recommended are:	for oxygen measurement: Envitec, Teledyne, City-Technology with Molex-Connector respectively for NO measurement: Envitec, City-Technology
Flow sensor:	Temperature voltage of silicon diodes The flow sensor consists of two diodes, whereby the reference diode is shut off from external influences in a sealed volume and the measuring diode is cooled by the measuring gas flow. The actual measuring variable represents the difference of the temperature-dependent flow voltage ($I_F \sim 1\text{mA}$) of the two diodes. Suggested circuit: bridge circuit The flow sensor can be connected to the Sibench.
Gas filter:	Pre-filtering in the discharge tube directly after the discharge Probe is necessary. The filter GF 2 must be changed about every 3 months. The filters GF 3 and GF 4 need not be changed more often than once a year.
Recommended are: Suitable and proven:	Pore width 5 μm ; petrol filter; no metal may be used on the inside. Type KL 13 micro-star from the Mahle Co.
Charcoal filter:	Filter filled with charcoal. Capacity 2000 ppm HC* hours. As Hexan (C6H14)

2 Technical Data

Siemens flow sensor	0 to 4 l/min	Resolution	0.01 l/min
Supply voltage:	Pump 12/24 V AC Solenoid valve 12 V DC		
Power consumption:	Pump max. 20 VA Solenoid valve 2 W		
Ambient temperatures: Storage temperature:	0 °C to approx. 60 °C, internal temperature not above 70 °C -20 °C to 70 °C		
Air pressure: Humidity:	700 to 1100 hPa 5 % to 95 % relative humidity, no condensation		
Flow:	Measuring gas (total flow)	normal	4 l/min
		max.	8 l/min
	Measuring bench (partial flow)	normal	1 l/min
		max.	2 l/min
Operating position	horizontal $\pm 15^\circ$		