bürkert
FLUID CONTROL SYSTEMS

Mass Flow Meter (MFM) for Gases

- Bypass MFC with capillary technology for nominal flow rates from 5 ml_N/min to 15 l_N/min
- Applicable for aggressive gases
- Fieldbus option

Type 8700 can be combined with...

Type 8619
Multichannel program controller

Type 0330
3/2 or 2/2-way solenoid valve

Type 6013
2/2-way solenoid valve

Mass flow meters are used in process technology for the direct measurement of the mass flow of gases. In case of volumetric flow meters, it is necessary to measure the temperature and the pressure either the density, because gases change their density or rather their volume depending on the pressure. The measurement of the mass flow, on the other hand, is independent of the pressure and the temperature.

The digital mass flow meter Type 8700 uses a classic bypass sensor (see the description on page 2). The actual flow is given as an analog output signal or could be read out over RS-communication, also fieldbus devices are available. Type 8700 can optionally be calibrated for two different gases, the user is able to switch between these two gases.

The materials of the parts that come into contact with the medium are selected according to customer specification so that the unit can be operated with the complete range of standard process gases. The MassFlowCommunicator software can be used for parameterisation and diagnosis.

Typical application areas are gas flow measurement in:

- Test benches
- Environmental technology
- Laboratories
- Analytical equipment

Technical data

Full scale ranges[1] (Q_{nom})	5 to 15000 ml_N/min[2] N_2 equivalent
Control range	1:50
Operating gases	Neutral, or aggressive gases
Calibration gas	Operating gas or air with conversion factor
Max. operating pressure (Inlet pressure)	10 bar (145 psi)
Medium temperature	-10 to +70°C (-10 to +60°C for oxygen)
Ambient temperature	-10 to +50°C, others on request
Accuracy (after 30min. warm-up time)	±1.5% o.R. ±0.3% F.S.
Repeatability	±0.1% F.S.
Response time ($t_{95\%}$)	<3 s
Materials Body Housing Seals	 Stainless steel PC (Polycarbonate) or metal FKM, EPDM or FFKM
Port connections	NPT 1/4, G 1/4, Screw-in fitting or sub-base, others on request
Electr. connection	D-Sub plug 15-pin with PROFIBUS-DP: Socket M12 5-pin with DeviceNet, CANopen: Socket M12 5-pin
Power supply	24V DC
Voltage tolerance	±10 %
Residual ripple	<2 %
Power consumption	2.5 W / 5 W (with fieldbus)
Output signal Max. current (voltage output) Max. load (current output)	0-5 V, 0-10 V, 0-20 mA or 4-20 mA 10 mA 600 Ω
Digital communication via adapter possible:	RS232, Modbus RTU (via RS adapter) RS485, RS422 or USB (see accessories table on p. 3)
Fieldbus option	PROFIBUS-DP, DeviceNet, CANopen
Protection class	IP40
Dimensions [mm]	See drawings on pages 5 and 6
Total weight	ca. 850 g (stainless steel)
Mounting position	Horizontal or vertical
Light emitting diode display (default, other allocations possible)	Indication for Power, Limit (with analog signals) / Communication (with fieldbus), Error
Binary input (default, other functions possible)	Two 1. Not assigned 2. Not assigned
Binary output (default, other functions possible)	One relay-output for 1. Limit (process value close to Q_{nom}) Max. load: 25V, 1A, 25VA

[1] The nominal flow value is the max. flow value calibrated which can be measured. The nominal flow range defines the range of nominal flow rates (full scale values) possible.
[2] Index N: Flow rates referred to 1.013 bar and 0° C. Alternatively there is an Index S available which refers to 1.013 bar and 20° C

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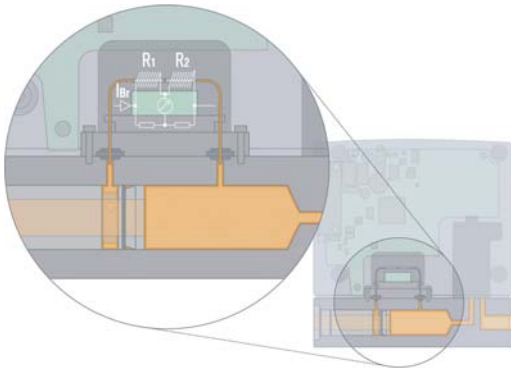
Measuring principle



The measurement is based on the bypass principle. A laminar flow element in the main channel generates a small pressure drop. This drives a small flow, proportional to the main flow, through the bypass (sensor tube).

Two heating resistors, which are connected in a measuring bridge, are wounded on this stainless steel tube. In the zero-flow state, the bridge is balanced, but with flow, heat is transported in the flow direction and the bridge becomes unbalanced.

The dynamics of the measurement is limited by the tube walls, which act as a thermal barrier.

With contaminated gases we recommend to install filter elements upstream. This avoids changes in the division ratio between main flow and sensor tube, as well as changes in the heat transmission caused by deposits on the walls of the sensor tube.

With these sensors even aggressive gases can be measured, because all essential parts in contact with the gas are fabricated in stainless steel. With this sensor principle it is also possible to convert between different gases.

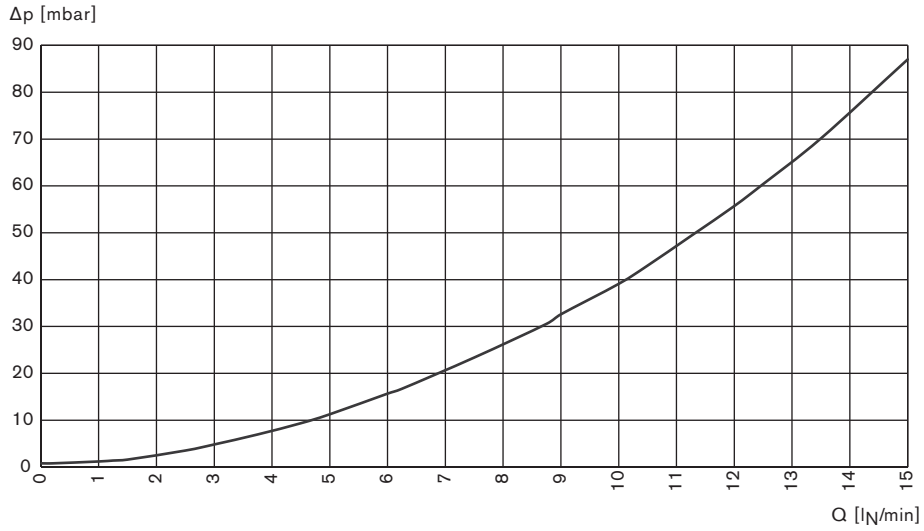
$Q(Gas) = f \times Q(N_2)$

gas	factor f
N_2	1.00
Luft	1.00
O_2	0.98
H_2	1.01
Ar	1.4
He	1.42
CO_2	0.77

By using the gas factors it is possible that the accuracy is not within the datasheet specification.
For applications which need high accuracy it is recommended to calibrate under application conditions.

The compatibility of the sealing materials of the MFMs should be checked before use with another gas.

Pressure loss diagram (ref. to air)



The diagram shows exemplarily the pressure loss characteristics when air flows through a flowmeter with ¼" pipe connection. For determining the pressure loss with another gas it needs to calculate the air equivalent.

Notes regarding the selection of the unit

The decisive factors for the perfect functioning of a MFM within the application are the fluid compatibility, the normal inlet pressure and the correct choice of the flow meter range. The pressure drop over the MFM depends on the flow rate and the operating pressure.

The request for quotation form on page 7 contains the relevant fluid specification. Please use in this way the experience of Bürkert engineers already in the design phase and provide us with a copy of the request containing the data of your application together with your inquiry or order.

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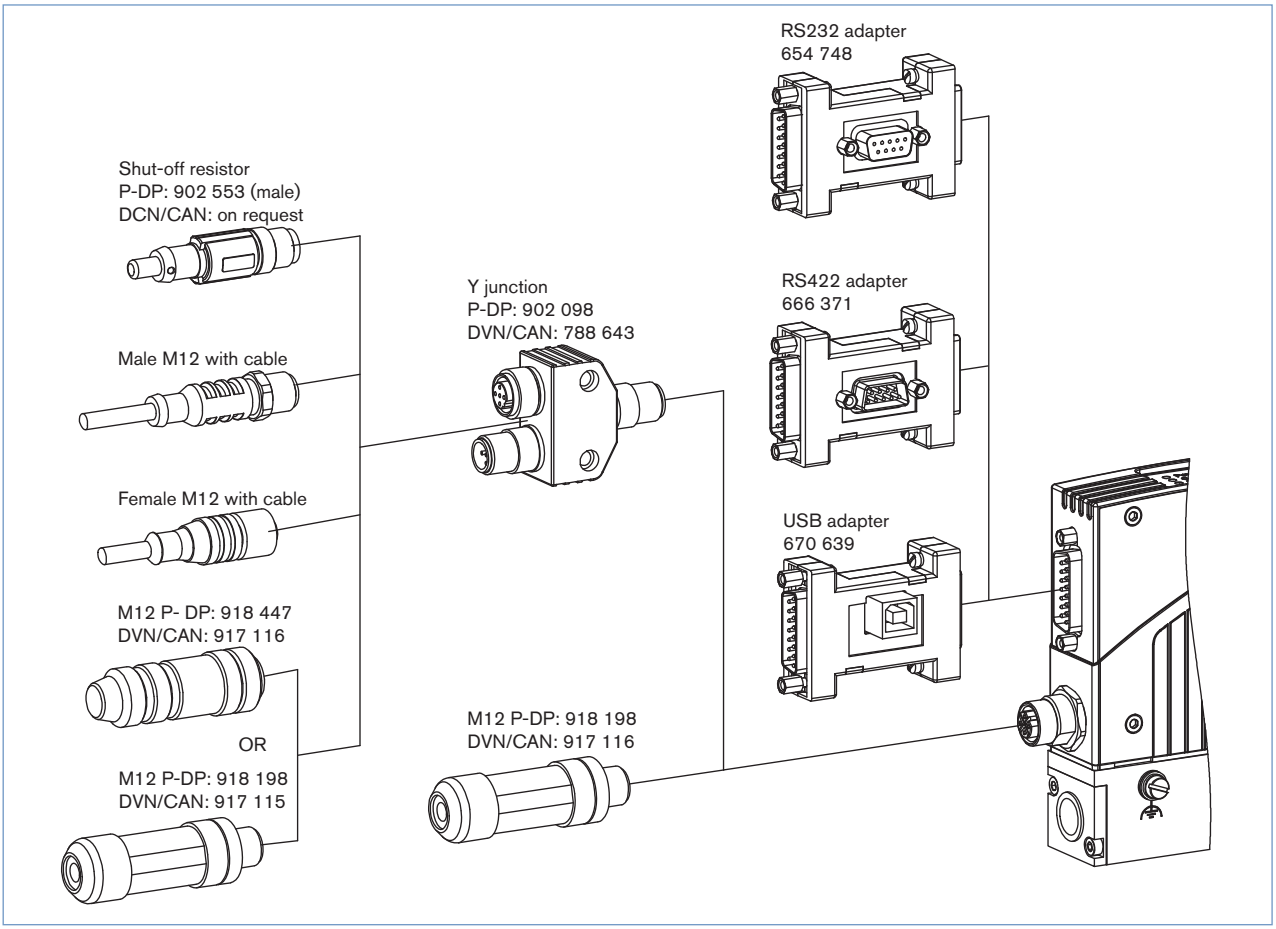
Ordering Chart for Accessories

Article	Item No.	
Connections/Cables		
Socket D-Sub 15-pin solder connection	918 274	
Hood for D-Sub socket, with screw locking	918 408	
Socket D-Sub 15-pin with 5m cable	787 737	
Socket D-Sub 15-pin with 10m cable	787 738	
Adapters [3]		
RS232 adapter	654 748	
PC extension cable for RS232 9-pin socket/plug 2 m	917 039	
RS422 adapter (RS485 compatible)	666 371	
USB adapter (Version 1.1, USB socket type B)	670 639	
USB connection cable 2 m	772 299	
Communication software MassFlowCommunicator	Download from www.buerkert.com	
Accessories for Fieldbus	**PROFIBUS DP (B-coded)**	**DeviceNet, CANopen (A-coded)**
Plug M12 [4]	918 198	917 115
Socket M12 (coupling) [4]	918 447	917 116
Y-junction [4]	902 098	788 643
Termination resistor	902 553	(on request)
GSD-File (PROFIBUS), EDS-File (DeviceNet, CANopen)	Download from www.buerkert.com (see Type 8711)	

[3] The adapters serve mainly for initial operation or diagnosis. Those are not obligatory for continuous operation.

[4] The two M12 connectors as listed above cannot be used together on the same side of the Y-junction. At least one of the two M12 connections needs to be a prefabricated cable which uses typically a thinner connector.



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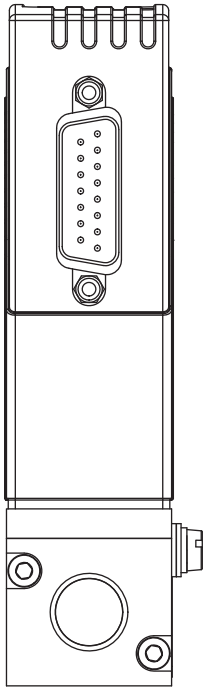
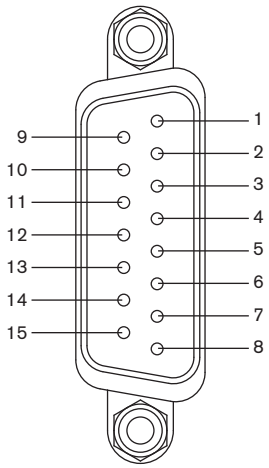
Pin Assignment



Plug D-Sub, 15-pin	Pin	Assignment	
		Analogue Control	Bus control
	1	Relay – normally closed	
	2	Relay – normally open	
	3	Relay – middle contact	
	4	GND for 24V-Supply and Binary inputs	
	5	24V-Supply +	
	6	Only for internal company use	
	7	N.C.	N.C. [5]
	8	N.C.	N.C.
	9	Actual value output GND	N.C.
	10	Actual value output +	N.C.
	11	DGND (for RS232) [6]	
	12	Binary input 1	
	13	Binary input 2	
	14	RS232 RxD (without driver) [6]	
	15	RS232 TxD (without driver) [6]	

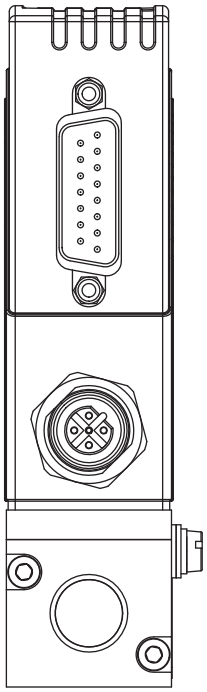


[5] N.C.: not connected (not used)

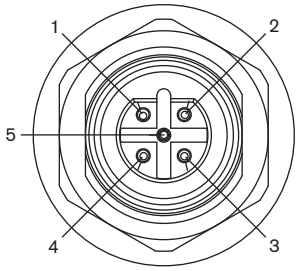
Note:
– Optional Pin 7 and 8 with bus version as transmitter input possible
– The cable length for RS232/ actual value signal is limited to 30 meters.

[6] Driving RS232 interface only by RS232 adapter including an adaption of TTL levels

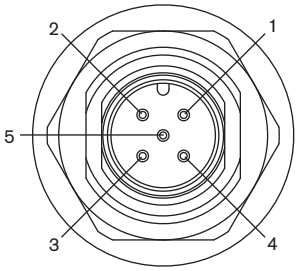
With Fieldbus version:



PROFIBUS DP – socket B-coded M12 (DPV1 max. 12 MBaud)	Pin	Assignment
	1	VDD (only for termination resistor)
	2	RxD/ TxD – N (A-Line)
	3	DGND
	4	RxD/ TxD – P (B-Line)
	5	N.C.



DeviceNet, CANopen – Plug M12	Pin	Assignment
	1	Shield
	2	N.C.
	3	DGND
	4	CAN_H
	5	CAN_L



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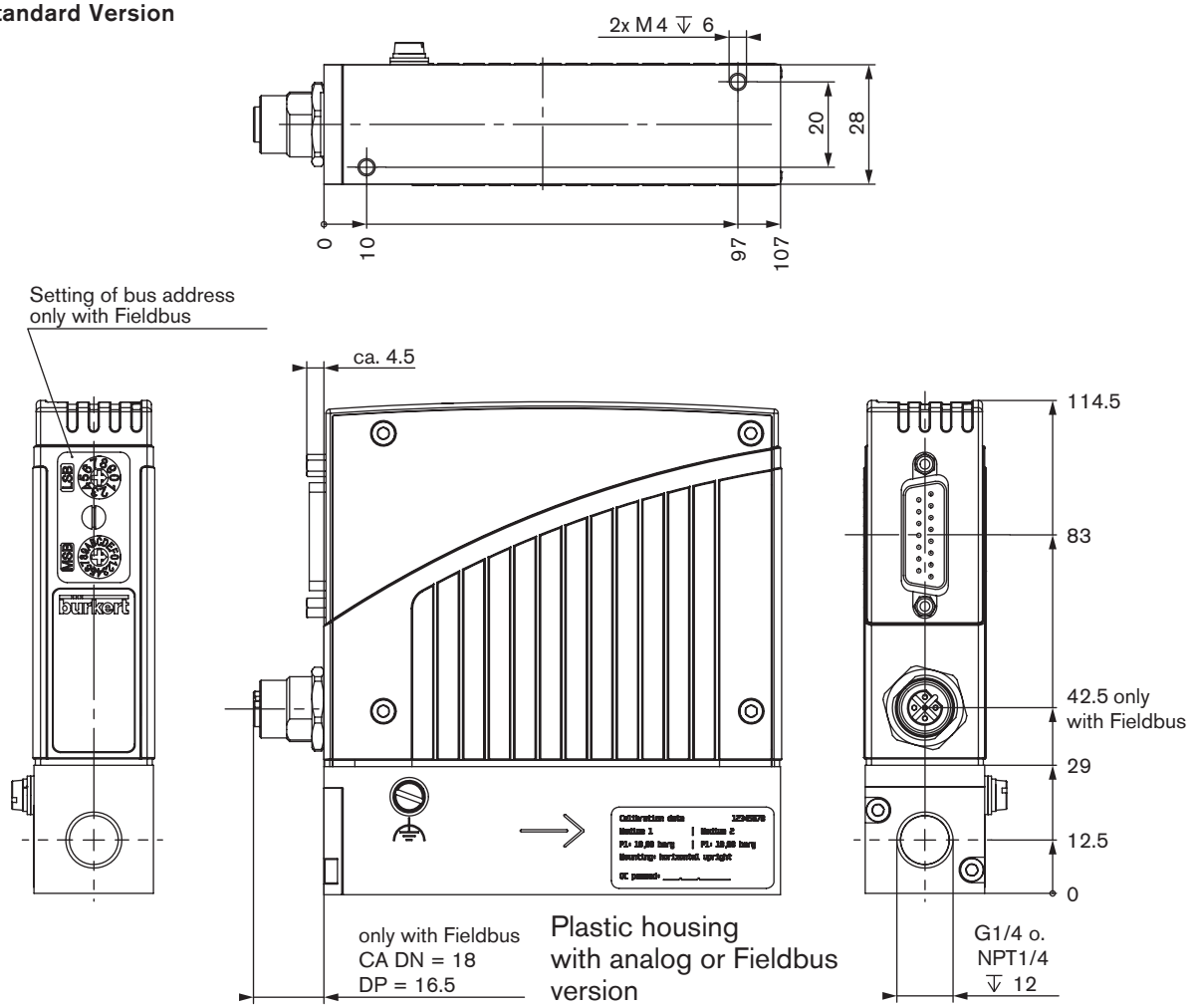
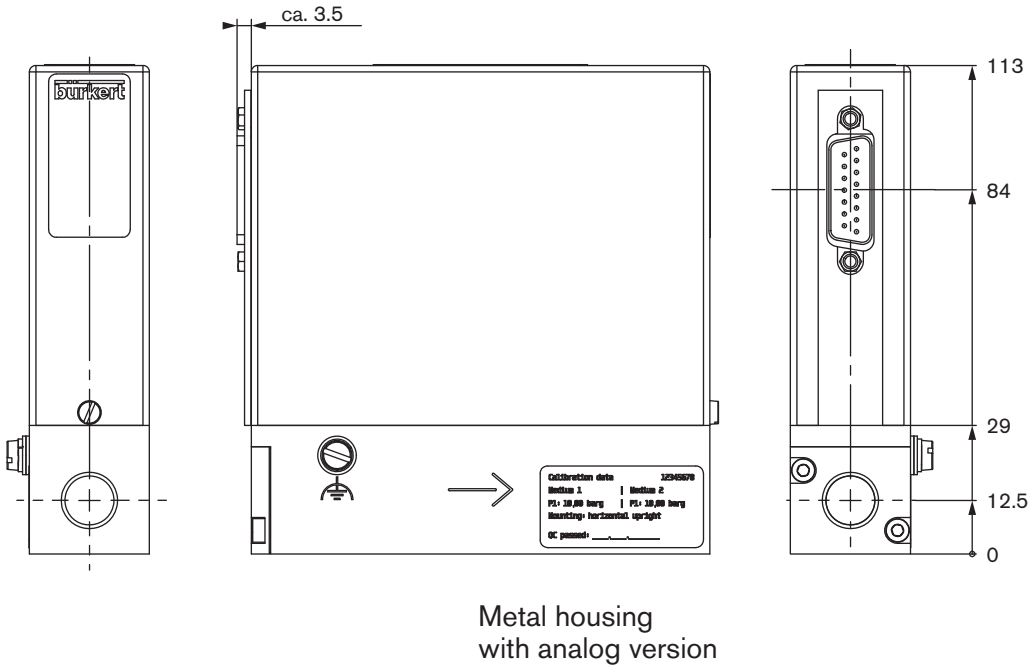
Dimensions [mm]

Standard Version





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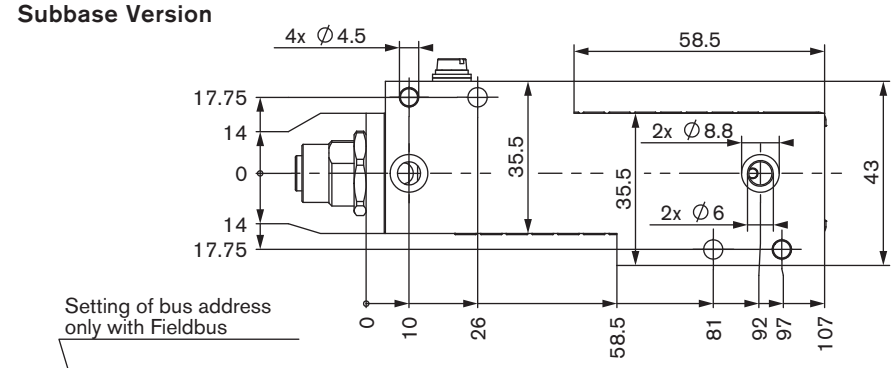
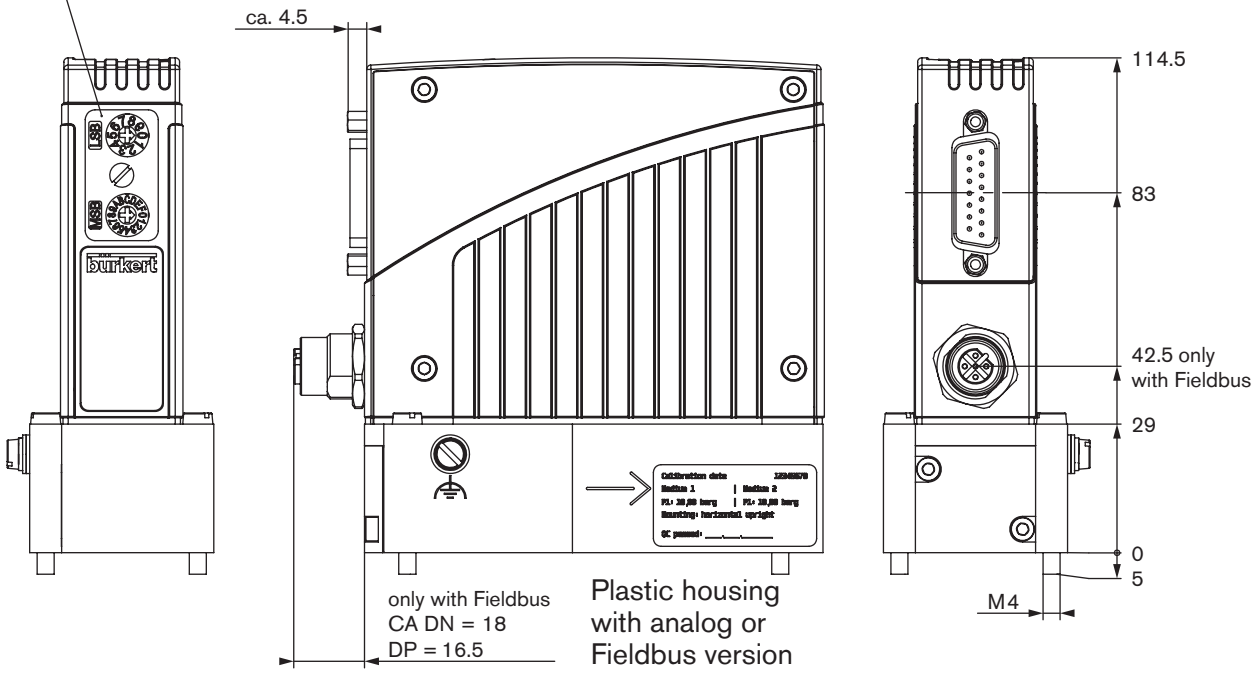
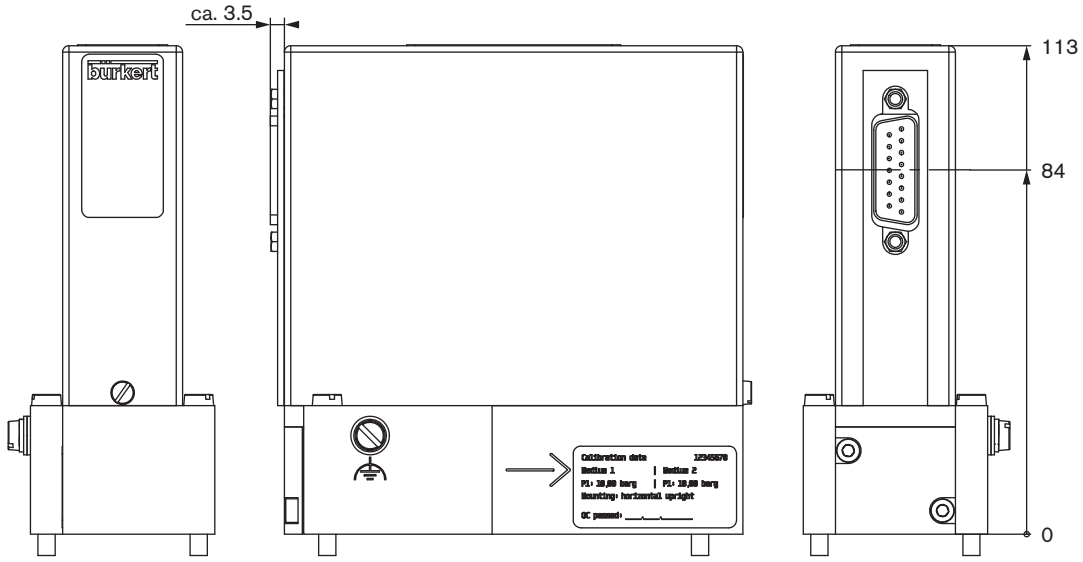
Dimensions [mm]

Subbase Version







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Note

You can fill out the fields directly in the PDF file before printing out the form.

MFC/MFM-applications - Request for quotation

Please complete and send to your nearest Bürkert sales centre

Company	Contact person
Customer No	Department
Address	Tel./Fax
Postcode/Town	E-mail

☐ MFC-Application ☐ MFM-Application ☐ Quantity ☐ Required delivery date

Medium data

Type of gas (or gas proportion in mixtures)

Density ☐ kg/m³ 7)

Gas temperature [°C or °F] ☐ °C ☐ °F

Moisture content ☐ g/m³

Abrasive components/solid particles ☐ no ☐ yes, as follows: ☐

Fluidic data

Flow range Q_{nom} ☐ Min. ☐ Max.

☐ l_N/min 7) ☐ l_S/min (slpm) 8)
☐ m_N^3/h 7) ☐ kg/h
☐ cm_N^3/min 7) ☐ cm_S^3/min (sccm) 8)
☐ l_N/h 7) ☐ l_S/h 8)

Inlet pressure at Q_{nom} 9) p_1= ☐ bar(g) ■

Outlet pressure at Q_{nom} p_2= ☐ bar(g) ■

Max. inlet pressure P_{1max} ☐ bar(g) ■

MFC/MFM port connection

☐ without screw-in fitting
- ☐ 1/4" G-thread (DIN ISO 228/1)
- ☐ 1/4" NPT-thread (ANSI B1.2)

☐ with screw-in fitting (acc. to specification for pipeline)
- ☐ mm Pipeline (external Ø)
- ☐ inch Pipeline (external Ø)

☐ Flange version

Installation

☐ horizontal
☐ vertical, flow upwards ☐ vertical, flow downwards

Ambient temperature ☐ °C

Material data

Body ☐ Stainless steel

Housing ☐ Plastic ☐ Metal (not with type 8712/8702 and not with fieldbus)

Seal ☐ FKM ☐ EPDM ☐ FFKM

Electrical data

Signals for set point and actual value

with standard signal

Setpoint	actual value
☐ 0-5 V	☐ 0-5 V
☐ 0-10 V	☐ 0-10 V
☐ 0-20 mA	☐ 0-20 mA
☐ 4-20 mA	☐ 4-20 mA

with fieldbus

☐ PROFIBUS DP ☐ M12
☐ DeviceNet ☐ D-Sub (only for type 8712/8702)
☐ CANopen

■ Please quote all pressure values as overpressures with respect to atmospheric pressure bar(ü)

reset form

7) at: 1,013 bar(a) and 0°C 8) at: 1.013 bar (a) and 20°C 9) matches with calibration pressure

To find your nearest Bürkert facility, click on the orange box → **www.burkert.com**

In case of special application conditions, please consult for advice.

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