bürkert
FLUID CONTROL SYSTEMS

Mass Flow Controller for Gases (MFC)

- Nominal flow ranges from 0.010 l_N/min to 80 l_N/min
- High accuracy and repeatability
- Very fast settling times
- Optional: Fieldbus interface

Type 8711 can be combined with…

Type 8619
Multichannel program controller

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

Typ 6027
2/2 way plunger valve

Typ 8611
eCONTROL

Typ 6013
2/2 way plunger valve

Typ 6606
3/2 or 2/2 way solenoid valve

The mass flow controller (MFC) Type 8711 is suited for regulating the mass flow of gases over a big flow range. The thermal MEMS sensor is located directly in the gas stream and therefore reaches very fast response times. A direct-acting proportional valve from Bürkert guarantees a high sensitivity. The integrated PI controller ensures outstanding control characteristics of the MFC.
Type 8711 can optionally be calibrated for two different gases; the user can switch between these two gases. As electrical interfaces both, analog standard signals and fieldbuses are available.

The mass flow controller type 8711 fits for various applications, like e.g. burner controls, heat treatment, material coatings, bio reactors, fuel cell technology or test benches.

Technical Data

Nominal flow range[1] ($Q_{nominal}$)	10 ml_N/min[2] to 80 l_N/min (N_2), see table on p. 2
Turn-down ratio	1:50, higher turn-down ratio on request
Operating gas	Neutral, non-contaminated gases, on request
Calibration gas	Operating gas or air with conversion factor
Max. operating pressure (Inlet pressure)	10 bar (145 psi) depending on the orifice of the valve
Gas temperature	-10 … +70 °C (-10 … +60 °C with oxygen)
Ambient temperature	-10 … +50 °C
Accuracy	±0.8% o.R. ±0.3% F.S. (after 1 min. warm up time)
Repeatability	±0.1% F.S.
Settling time ($t_{95\%}$)	< 300 ms
Materials Body Housing Seals	Aluminium or stainless steel PC (Polycarbonate) or metal FKM, EPDM
Port connection	NPT ¼, G ¼, screw-in fitting or flange, others on request
Regulating unit (Proportional Valve) Valve orifice k_{VS} value	Normally closed 0.05…4.0 mm 0.00006…0.32 m^3/h
Electr. connection Additionally with fieldbus:	Plug D-Sub 15 pin with PROFIBUS-DP: Socket M12 5 pin with CANopen: Socket M12 5 pin
Power supply	24 V DC

[1] The nominal flow value is the max. flow value calibrated which can be controlled. 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

Voltage tolerance	±10%
Residual ripple	< 2%
Power consumption	Max. 3.5…14 W (depending on proportional valve used)
Input signal Input impedance	0…5 V, 0…10 V, 0…20 mA or 4…20 mA > 20 kΩ (voltage), < 300 Ω (current)
Output signal Max. current (voltage) Max. load (current)	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, CANopen
Protection class	IP40
Dimensions [mm]	see drawings 5 - 7
Total weight	ca. 500 g (aluminium body)
Installation	horizontal or vertical
Light emitting diodes (default functions, other functions programmable)	Indication for power, Limit (with analog signals) / Communication (with fieldbus) and error
Binary inputs (default functions, other functions programmable)	Two 1. Start Autotune 2. not assigned
Binary output (default functions, other functions programmable)	A relay output for: 1. Limit (setpoint not reached) Max. Load: 25 V, 1 A, 25 VA

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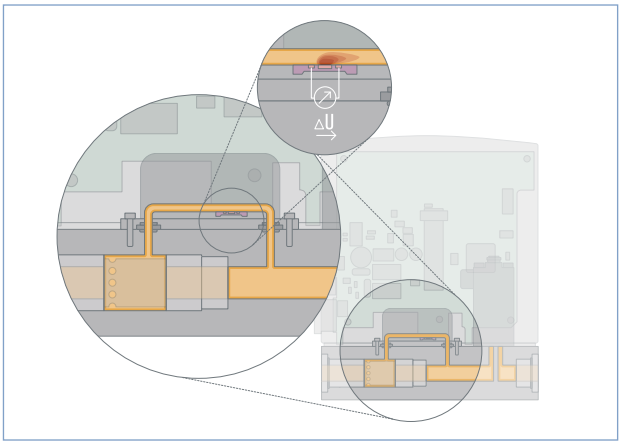
Measuring Principle



The actual flow rate is detected by a sensor. This operates according to a thermal principle which has the advantage of providing the mass flow which is independent on pressure and temperature.

A small part of the total gas stream is diverted into a small, specifically designed bypassing channel whitch ensures laminar flow conditions. The sensor element is a chip immersed into the wall of this flow channel. The chip, produced in MEMS technology, contains a heating resistor and two temperature sensors (thermopiles) which are arranged symmetrically upstream and downstream of the heater. The differential voltage of the thermopiles is a measure of the mass flow rate passing the flow sensor. The calibration procedure effectuates a unique assignment of the sensor signal to the total flow rate through the device.

Nominal Flow Range of Typical Gases

(other gases on request)

Gas	Min. Q_{nom} [l_N/min]	Max. Q_{nom} [l_N/min]
Argon	0.01	80
Helium	0.01	500
Carbon dioxide	0.02	40
Air	0.01	80
Methane	0.01	80
Oxygen	0.01	80
Nitrogen	0.01	80
Hydrogen	0.01	500

Notes Regarding the Configuration

For the proper choice of the actuator orifice within the MFC, not only the required maximum flow rate Q_{nom}, but also the pressure values *directly* before and after the MFC (p_1, p_2) at this flow rate Q_{nom} should be known. In general, these pressures are not the same as the overall inlet and outlet pressures of the whole plant, because usually there are additional flow resistors (tubing, additional shut-off valves, nozzles etc.) present both before and after the controller.

Please use the request for quotation form on p. 8 to indicate the pressures *directly* before and after the MFC. If these should be unknown or not accessible to a measurement, estimates are to be made by taking into account the approximate pressure drops over the flow resistors before and after the MFC, respectively, at a flow rate of Q_{nom}.
In addition, please quote the maximum inlet pressure $p_{1\,max}$ to be encountered. This data is needed to make sure the actuator is able to provide a close-tight function within all the specified modes of operation.

The request form on page 8 contains the relevant fluid specification. Using the experience of Bürkert engineers already in the design phase provide us with a copy of the request containing the necessary data together with your inquiry or order.

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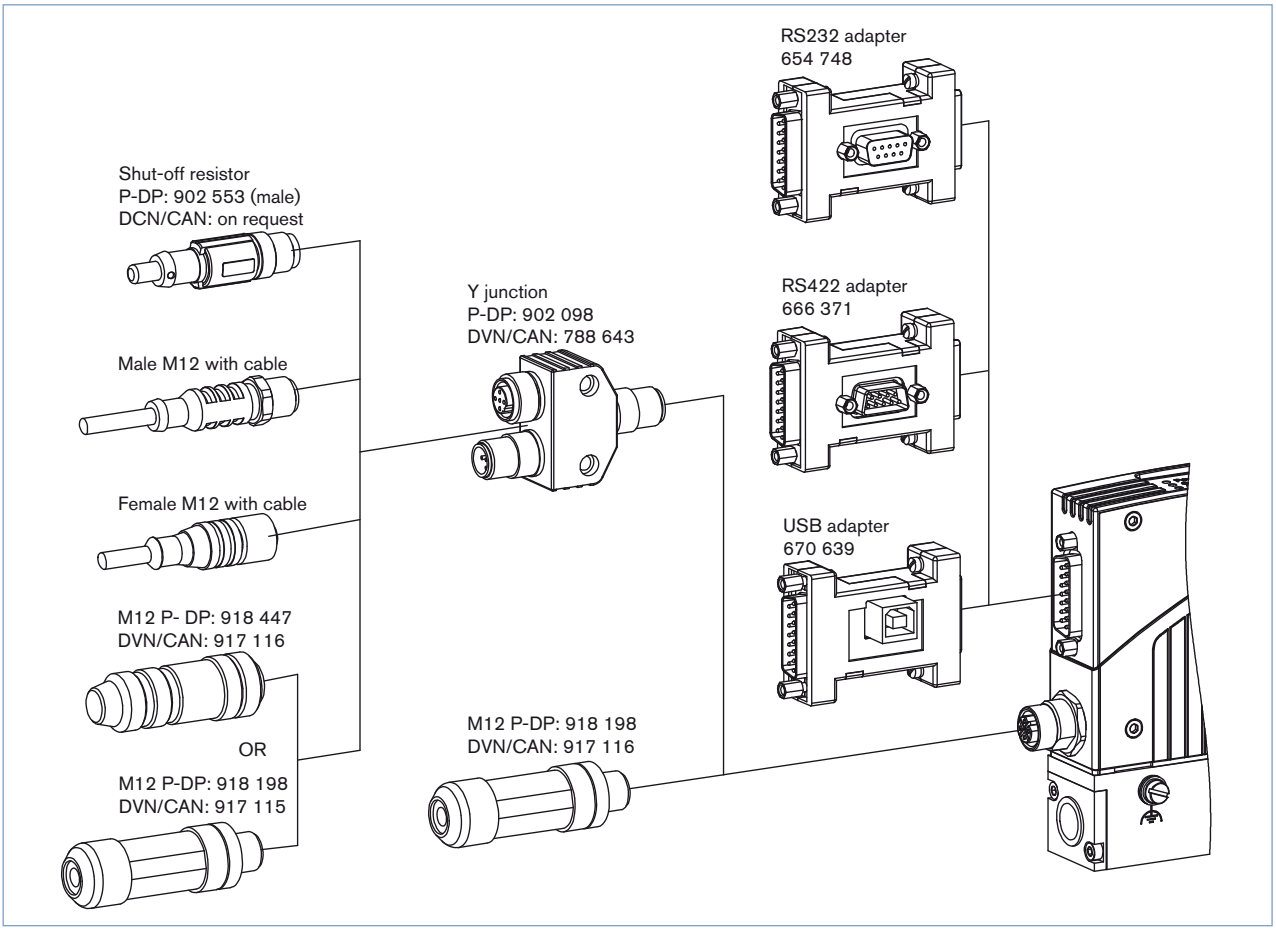
Ordering Chart for Accessories

Article	Article no.	
Connections/Cables		
Socket D-Sub 15 pin solder connection	918274	
Hood for D-Sub socket, with screw locking	918408	
Socket D-Sub 15 pin with 5 m cable	787737	
Socket D-Sub 15 pin with 10 m cable	787738	
Adapters[3]		
RS232 adapter	654748	
PC extension cable for RS232 9 pin socket/plug 2 m	917039	
RS422 adapter (RS485 compatible)	666371	
USB adapter (Version 1.1, USB socket type B)	670639	
USB connection cable 2 m	772299	
Communication software MassFlowCommunicator	Download from www.buerkert.com	
Accessories for Fieldbus	**PROFIBUS DP (B-coded)**	**CANopen (A-coded)**
Plug M12[4]	918198	917115
Socket M12 (coupling) [4]	918447	917116
Y-junction[4]	902098	788643
Shut-off resistor	902553	(on request)
GSD-File (PROFIBUS), EDS-File (CANopen)	Download from www.buerkert.com	

[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 connection needs to be a prefabricated cable which uses typically a thinner connector.



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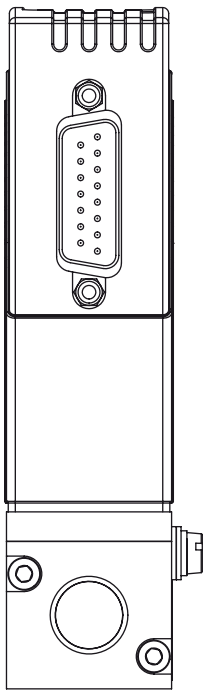
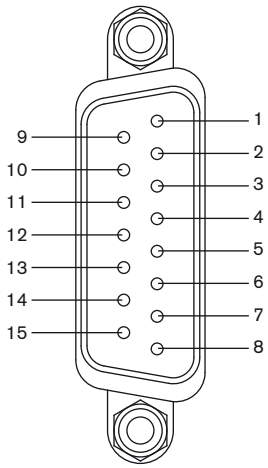
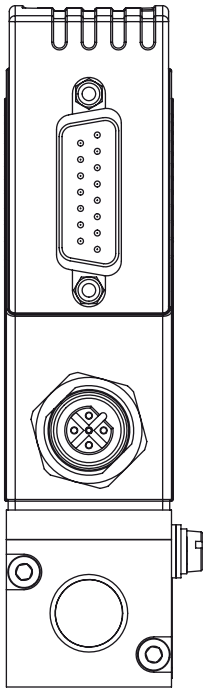
Pin Assignment

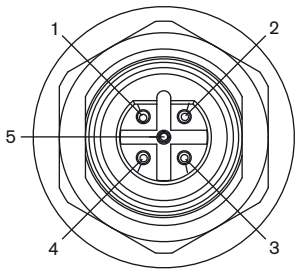


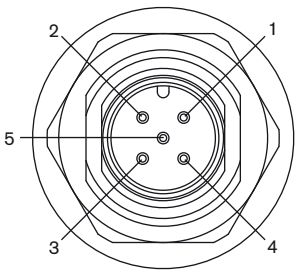
Plug D-Sub, 15 pin	Pin	Assignment	
		Analogue Control	Bus control
	1	Relay – normally closed	
	2	Relay – normally opened	
	3	Relay – middle contact	
	4	GND for 24 V-Supply and Binary inputs	
	5	24 V-Supply +	
	6	12 V-Output (only for internal company use)	
	7	Set value input GND	N.C. [5]
	8	Set value input +	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/ Setpoint and 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	C (4)

CANopen – Plug M12	Pin	Assignment
	1	Shield
	2	N.C. [7]
	3	DGND
	4	CAN_H
	5	CAN_L

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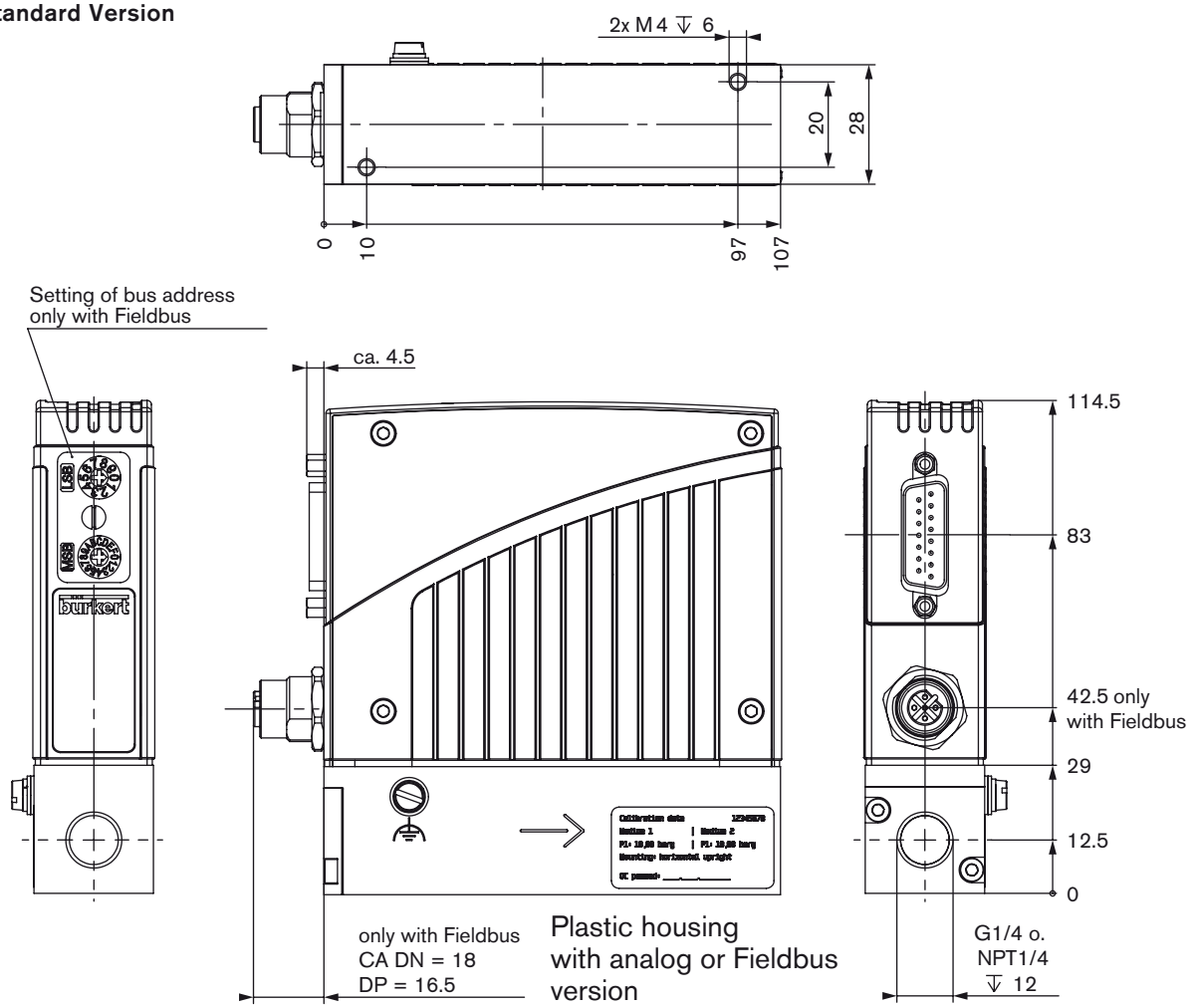
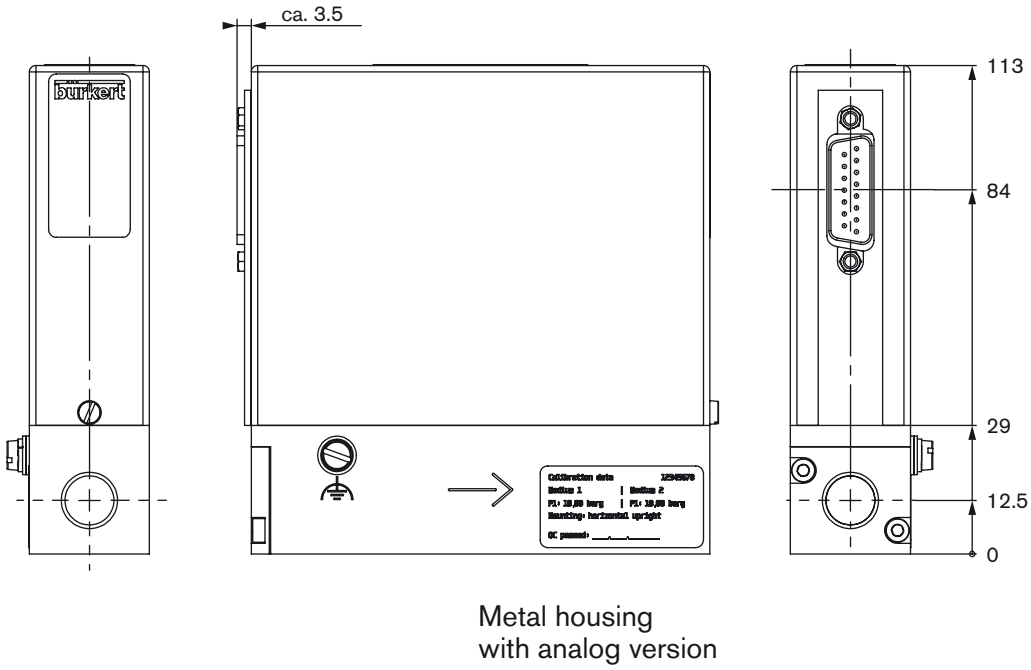
Dimensions [mm]

Standard Version





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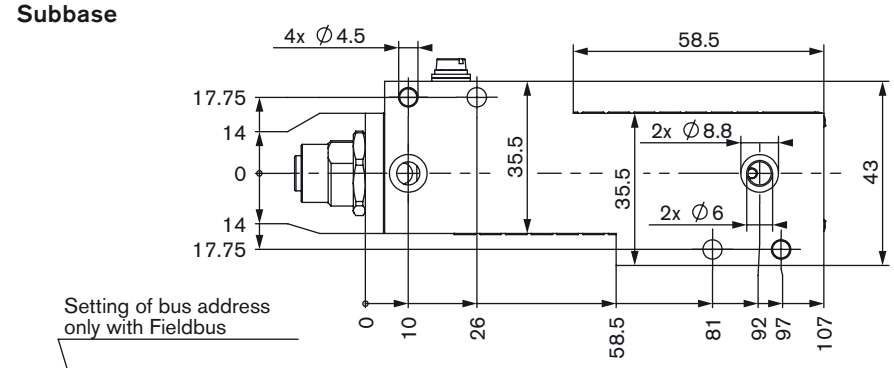
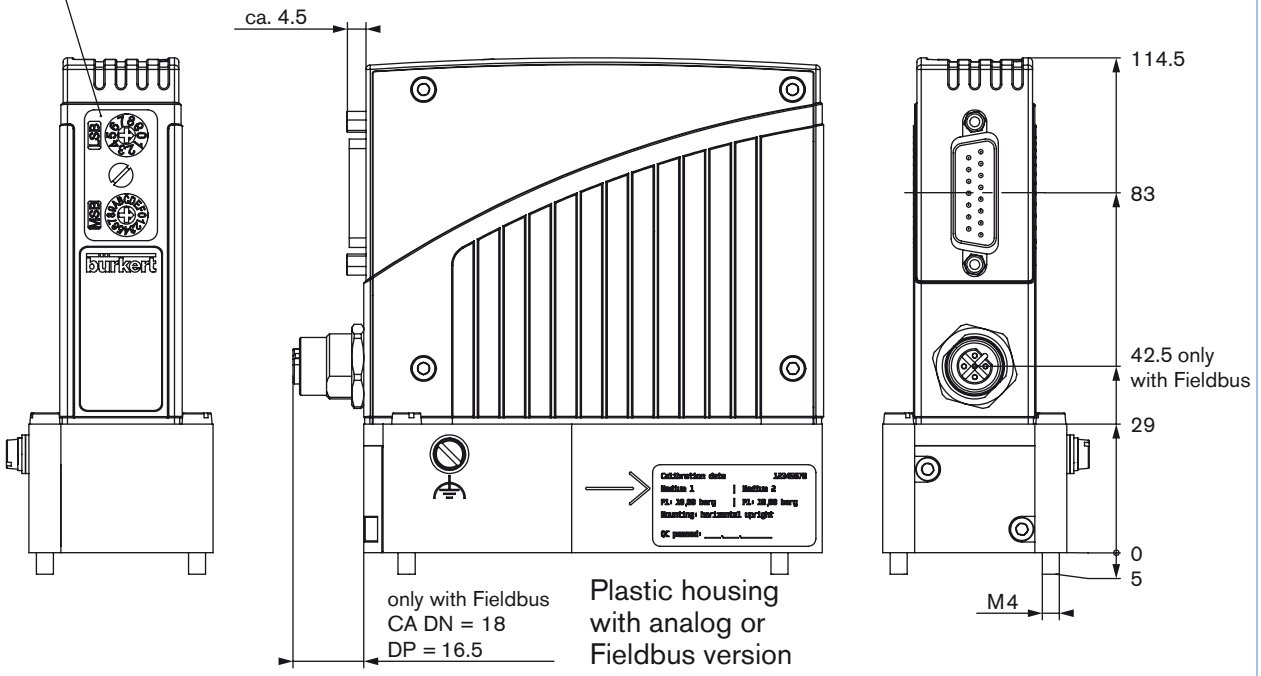
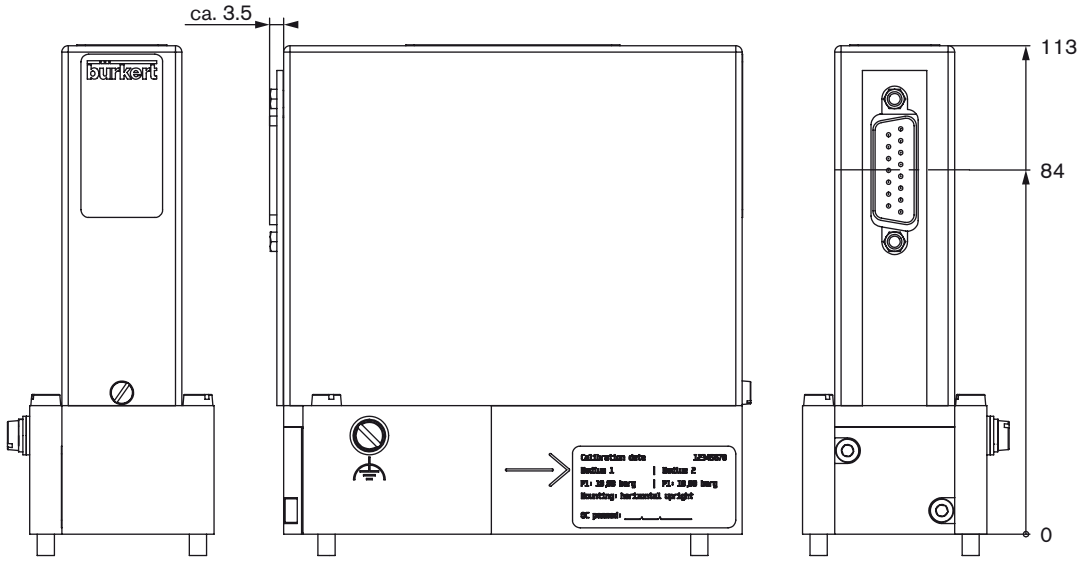
Dimensions [mm]

Subbase

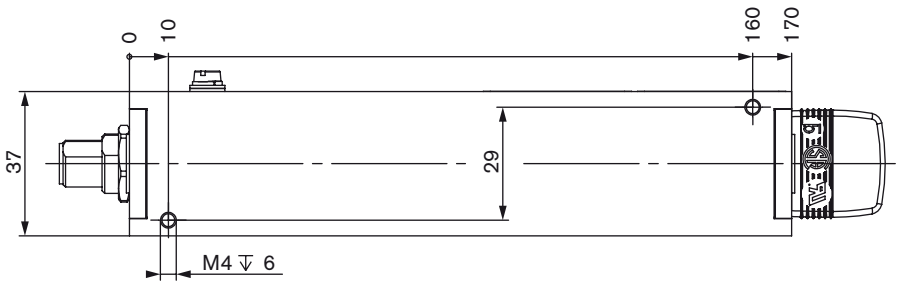


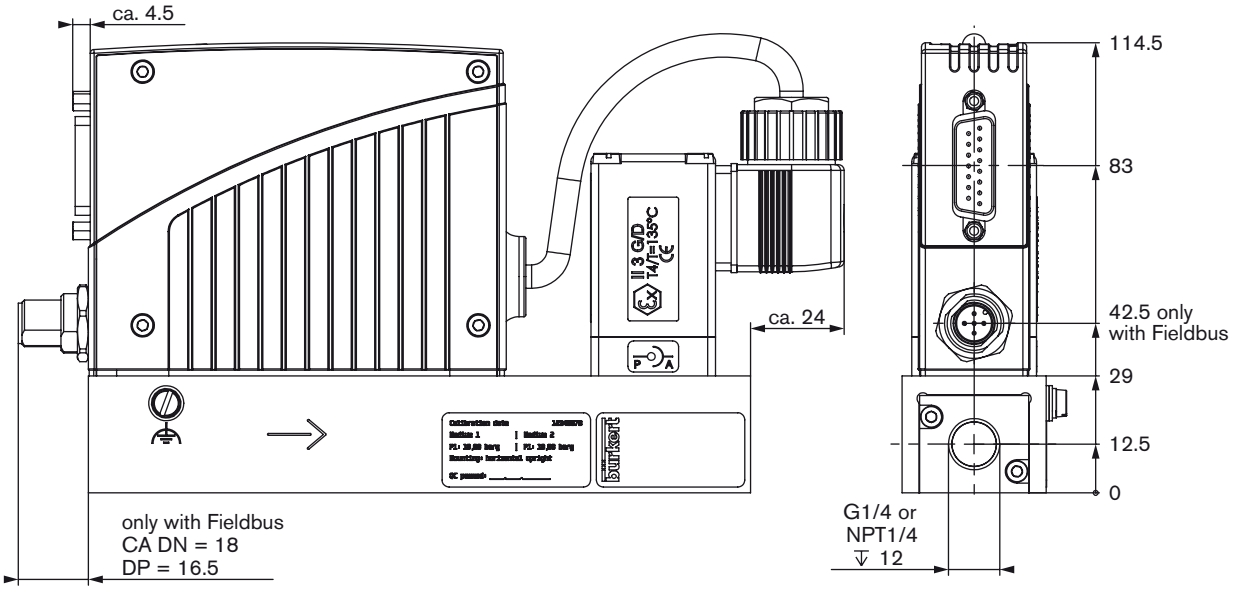


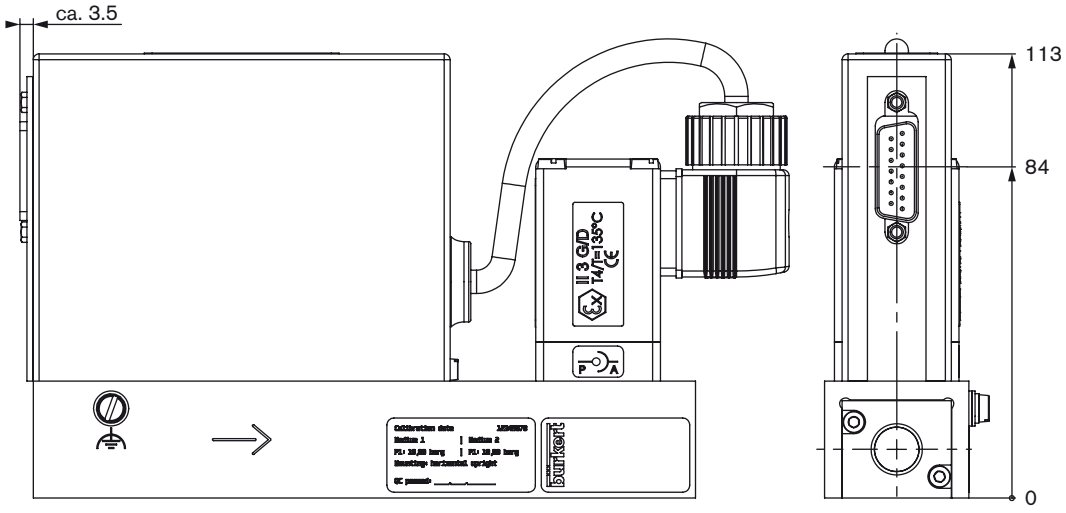


Dimensions [mm]

Version with external valve







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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 8)

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 8) ☐ l_S/min (slpm) 9)
☐ m_N^3/h 8) ☐ kg/h
☐ cm_N^3/min 8) ☐ cm_S^3/min (sccm) 9)
☐ l_N/h 8) ☐ l_S/h 9)

Inlet pressure at Q_{nom} 10) **p_1=** ☐ bar(g) ■

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

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

MFC/MFM port connection
☐ without screw-in fitting
- ☐ ¼" G-thread (DIN ISO 228/1)
- ☐ ¼" 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 base ☐ Aluminium ☐ Stainless steel
Body ☐ Plastic ☐ Metal (not with type 8712/8702 and not with fieldbus)
Seal ☐ FKM ☐ EPDM

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
☐ CANopen

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

8) at: 1.013 bar(a) and 0 °C 9) at: 1.013 bar (a) and 20 °C 10) matches with calibration pressure

reset form

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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