bürkert
FLUID CONTROL SYSTEMS

Mass flowmeter for gases (MFM)

- Nominal flow ranges from 0.010 l/min to 80 l/min
- High accuracy
- Very fast response times
- Option: fieldbus interface

Product variants described in the data sheet may differ from the product presentation and description.

Can be combined with

Type 8611
eCONTROL – Universal controller

Type 0330
Direct-acting 2/2 or 3/2-way pivoted armature valve

Type 8619
multiCELL - multi-channel/ multi-function transmitter/ controller

Type 6027
Direct-acting 2/2-way plunger valve

Type description

The mass flow meter (MFM) Type 8701 is suited for measuring 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. Type 8701 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.

Phase out

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1. General technical data

Product properties	
Dimensions	Further information can be found in chapter "4. Dimensions" on page 6.
Material	
Seal	FKM, EPDM
Housing	PC (polycarbonate) or stainless steel sheet 1.4301
Base block	Aluminium or stainless steel 1.4305
Total weight	Approx. 500 g (aluminium)
LED display	Status indication: 1. Power 2. Communication (only in fieldbus variant), limit (only in analogue variant) 3. Error
Performance data	
Nominal flow range (Q_N) [1.]	10 ml/min...80 l/min regarding N_2 [2.] Further information can be found in chapter "7.2. Flow characteristic" on page 10.
Operating pressure [3.]	Max. 10 bar (145 psi) (depending on the nominal diameter of the proportional valve)
Measuring accuracy	± 0.8 % of reading ± 0.3 % FS (under calibration conditions and after 1 min warm-up time to achieve best measurement results)
Repeatability	± 0.1 % FS
Measuring span	1:50 (higher measuring span on request)
Response time ($t_{95\,\%}$)	< 300 ms
Electrical data	
Operating voltage	24 V DC
Power consumption	Max. 2.5 W (5 W with fieldbus variant)
Residual ripple	< 2 %
Voltage tolerance	± 10 %
Electrical connection	D-Sub, 15-pin With PROFIBUS DPV1: socket M12, 5-pin With CANopen: socket M12, 5-pin
Medium data	
Operating medium	Neutral, pure gases (others on request)
Calibration medium	Operating gas or air with conversion factor
Medium temperature	- 10 °C...+ 70 °C (- 10 °C...+ 60 °C for oxygen)
Process/Port connection & communication	
Digital outputs	1 relay output for: 1. Limit (desired value cannot be reached) Loading capacity: max. 25 V, 1 A, 25 VA
Digital inputs	2 digital inputs: 1. not assigned 2. not assigned
Digital communication interface	RS232, Modbus RTU (via RS-Adapter), RS485, RS422 or USB (see "8.4. Ordering chart accessories" on page 11) Fieldbus option: PROFIBUS DPV1, CANopen
Analogue interfaces	4...20 mA, 0...20 mA, 0...10 V or 0...5 V Input impedance > 20 kΩ (voltage) resp. < 300 Ω (current) Maximum current: 10 mA (voltage output) Maximum load: 600 Ω (current output)
Port connection	G ¼, NPT ¼, sub-base, screw-in fitting (others on request)
Approvals and conformities	
Protection class	IP40
Environment and installation	
Installation position	Horizontal or vertical
Ambient temperature	- 10 °C...+ 50 °C
Accessories	
Software	Mass Flow Communicator

1.) The nominal flow value is the maximum 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 refer to 1.013 bar and 0 °C. Alternatively there is an Index S available which refers to 1.013 bar and + 20 °C.
3.) Overpressure to atmospheric pressure

2. Approvals and conformities

2.1. General notes

- The approvals and conformities listed below must be stated when making enquiries. This is the only way to ensure that the product complies with all required specifications.
- Not all available variants can be supplied with the below mentioned approvals or conformities.

2.2. Conformity

In accordance with the Declaration of Conformity, the product is compliant with the EU Directives.

2.3. Standards

The applied standards which are used to demonstrate compliance with the EU Directives are listed in the EU-Type Examination Certificate and/or the EU Declaration of Conformity.

2.4. North America (USA/Canada)

Approval	Description
c UL us LISTED	**Optional: UL Listed for the USA and Canada** The products are UL Listed for the USA and Canada according to: • UL 61010-1 (ELECTRICAL EQUIPMENT FOR MEASUREMENT, CONTROL, AND LABORATORY USE – Part 1: General Requirements) • CAN/CSA-C22.2 No. 61010-1

2.5. Foods and beverages/Hygiene

Conformity	Description
FDA	**FDA – Code of Federal Regulations (valid for variable code PL02, PL03)** All wetted materials are compliant with the Code of Federal Regulations published by the FDA (Food and Drug Administration, USA) according to the manufacturer's declaration.
USP	**United States Pharmacopeial Convention (USP) (valid for variable code PL04)** All wetted materials are biocompatible according to the manufacturer's declaration.
	EC Regulation 1935/2004 of the European Parliament and of the Council (valid for variable code PL01, PL02) All wetted materials are compliant with EC Regulation 1935/2004/EC according to the manufacturer's declaration.

2.6. Oxygen

Conformity	Description
O_2	**Optional: Suitability for oxygen (valid for the variable code NL02)** The products are suitable for use with gaseous oxygen, according to the manufacturer's declaration.

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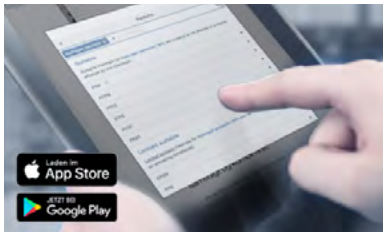
3. Materials

3.1. Bürkert resistApp



Bürkert resistApp – Chemical resistance chart

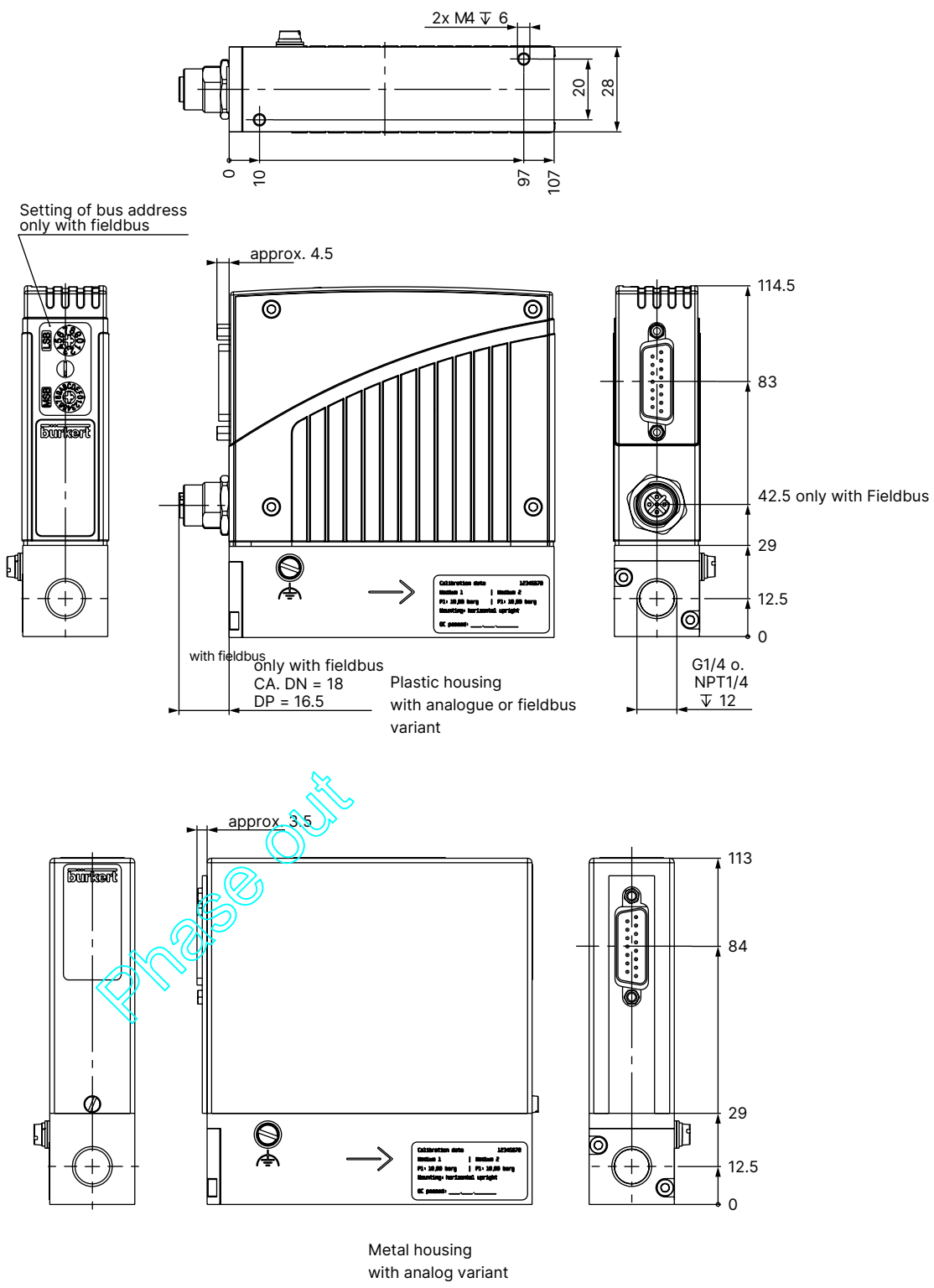
You want to ensure the reliability and durability of the materials in your individual application case? Verify your combination of media and materials on our website or in our resistApp.

Start chemical resistance check

4. Dimensions

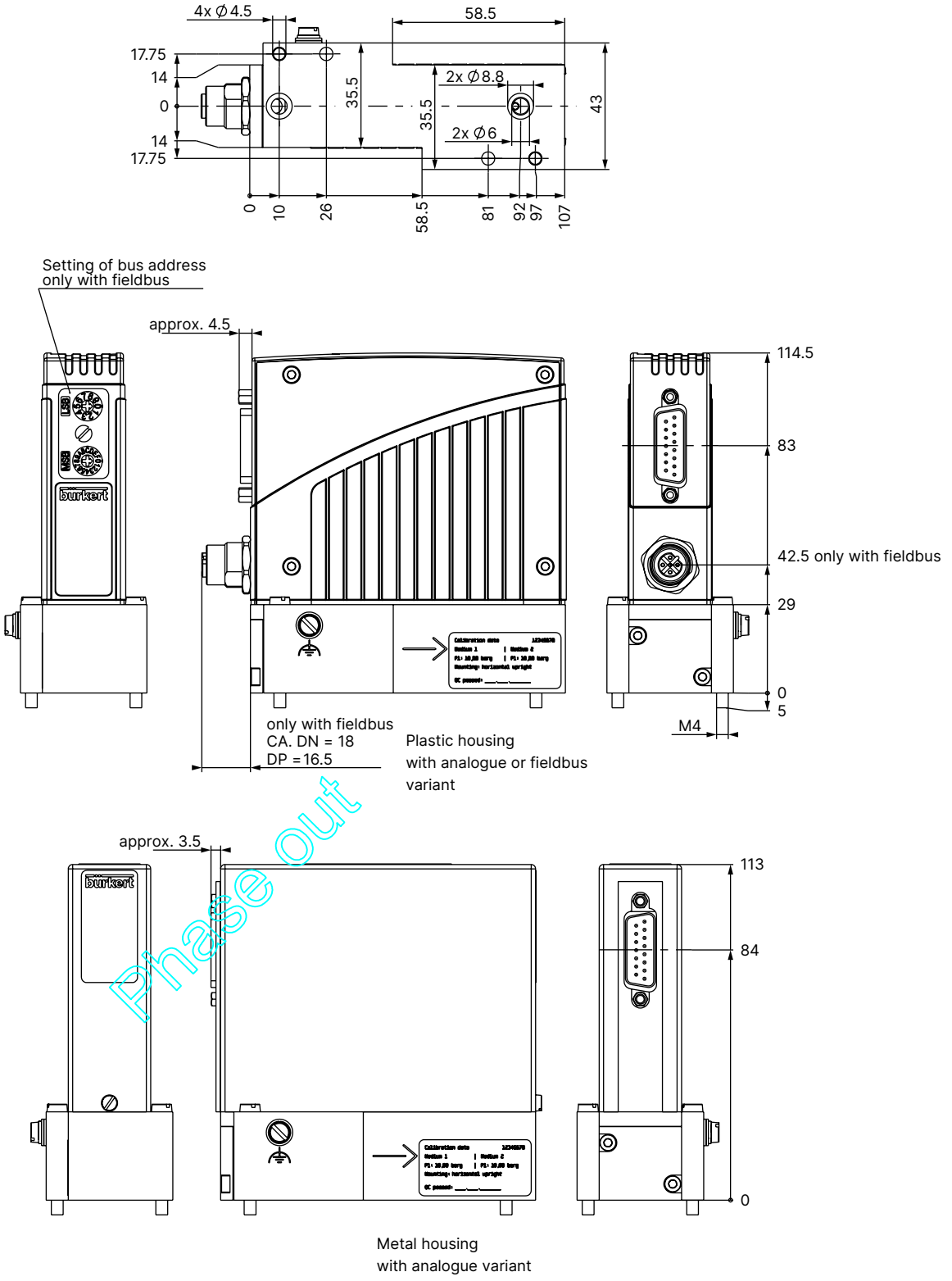
4.1. Threaded variant

Note:
Dimensions in mm



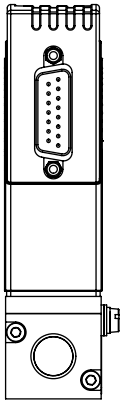
4.2. Sub-base variant

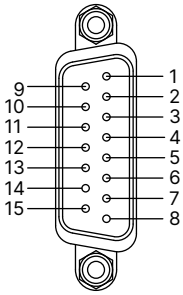
Note:
Dimensions in mm



5. Device/Process connections

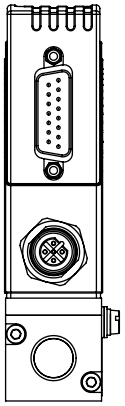
5.1. Analogue variant

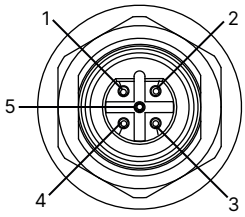


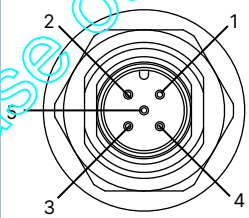
Plug D-Sub, 15-pin	Pin	Assignment	
		Analogue control unit	Bus actuation
	1	Relay – normally closed contact	
	2	Relay – normally open contact	
	3	Relay – middle contact	
	4	GND for 24 V supply and binary inputs	
	5	Power supply 24 V DC	
	6	Only for in-plant use	
	7	Not connected	Not connected
	8	Not connected	Not connected
	9	Actual value output GND	Not connected
	10	Actual value output +	Not connected
	11	DGND (for RS232) [1.]	
	12	Binary input 1	
	13	Binary input 2	
	14	RS232 RxD (without driver) [1.]	
	15	RS232 TxD (without driver) [1.]	

1.) RS232 communication is only possible when using an RS232 adapter, see "8.4. Ordering chart accessories" on page 11.

5.2. Fieldbus variant



PROFIBUS DPV1 – 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	Not connected

CANopen – Plug M12	Pin	Assignment
	1	Shielding
	2	Not connected
	3	DGND
	4	CAN_H
	5	CAN_L

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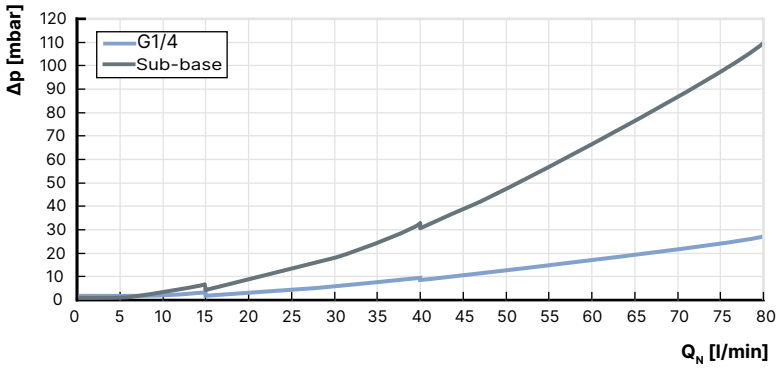
6. Performance specifications

6.1. Pressure loss diagram (MFM)

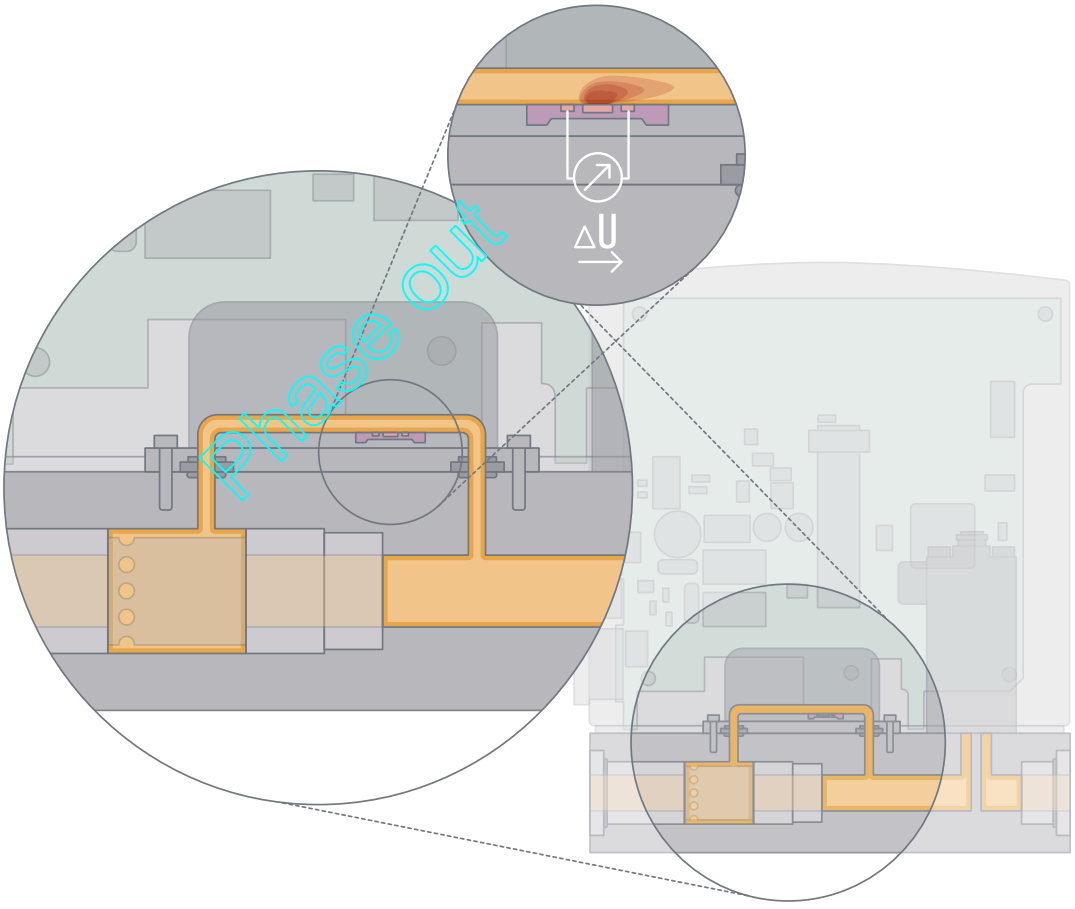
The diagram shows an example of the pressure loss curves for air flow. To determine the pressure loss of another gas, it must first be converted to the corresponding air flow rate and the fluidics used for the other gas must be taken into account.



7. Product operation

7.1. Measuring principle

Measurement takes place via bypass. A laminar flow element (LFE) in the main channel creates a low pressure drop. A part of the gas flow is thereby directed into a side channel. A sensor measures the mass flow as temperature difference. The measurement is performed in a specially shaped flow channel whose wall contains a Si chip with an etched membrane. A heating resistor and 2 temperature sensors, one upstream and one downstream, are placed on this membrane.
If the heating resistor is fed with a constant voltage, the differential voltage of the temperature sensors indicate the gas flow over the chip.



7.2. Flow characteristic

Nominal flow range of typical gases

Note:

- Q(Gas) = f x Q(N_2)
- When using the gas factors, measurement errors may occur that are outside the data sheet specification. For applications requiring high accuracy, calibration under field conditions is recommended.
- Furthermore, the media compatibility of the sealing materials of the MFM should be checked before use with another gas.

Gas	Min. Q_N [l/min]	Max. Q_N [l/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

8. Ordering information

8.1. Bürkert eShop

Bürkert eShop – Easy ordering and quick delivery

You want to find your desired Bürkert product or spare part quickly and order directly? Our online shop is available for you 24/7. Sign up and enjoy all the benefits.

Order online now

8.2. Recommendation regarding product selection

Note:
Contact your Bürkert partner for device design.

The media compatibility, the maximum inlet pressure and the correct selection of the flow measuring span are decisive for the proper function of an MFM within the application. The pressure loss across the MFM depends on the nominal flow rate and operating pressure.

8.3. Bürkert product filter

Bürkert product filter – Get quickly to the right product

You want to select products comfortably based on your technical requirements?
Use the Bürkert product filter and find suitable articles for your application quickly and easily.

Try out our product filter

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8.4. Ordering chart accessories

Overview of accessories

Note:
The adapters serve mainly for initial operation or diagnosis. Those are not obligatory for continuous operation.

Description	Article no.
Connections/cables	
Socket D-Sub, 15-pin, soldered connection	918274
Bonnet for D-Sub socket, with screw lock	918408
D-Sub socket with cable, 15-pin, cable length: 5 m, assembled on one side	787737
D-Sub socket with cable, 15-pin, cable length: 10 m, assembled on one side	787738
Adapters [1.]	
RS232 adapter	654748
Extension cable for RS232, M12 socket and/or M12 plug, 9-pin, cable length: 2 m	917039
RS422 adapter (RS485-compatible)	666371
USB adapter	670639
USB connection cable, cable length: 2 m	772299
Accessories for fieldbus	
PROFIBUS DPV1 (B-coded)	
M12 plug, 5-pin, straight, B-coded [2.]	918198
M12 socket (coupling), straight [2.]	918447
Y-distributor [2.]	902098
PROFIBUS terminating resistor, M12 plug, B-coded	902553
GSD file (PROFIBUS), EDS file (CANopen)	**LINK**
CANopen (A-coded)	
M12 plug, 5-pin, straight [2.]	917115
M12 circular socket with plastic threaded clamping ring, 5-pin, straight, to be wired [2.]	917116
Y push-in connector, M12, 5-pin, LUM [2.]	788643
Termination resistor	On request
GSD file (PROFIBUS), EDS file (CANopen)	**LINK**

1.) The adapters serve mainly for initial operation or diagnosis. Those are not obligatory for continuous operation.
2.) For space reasons, M12 individual cable plugs may not be suitable for simultaneous use on the same side as a Y distributor. Use a commercially available covered cable in this case.

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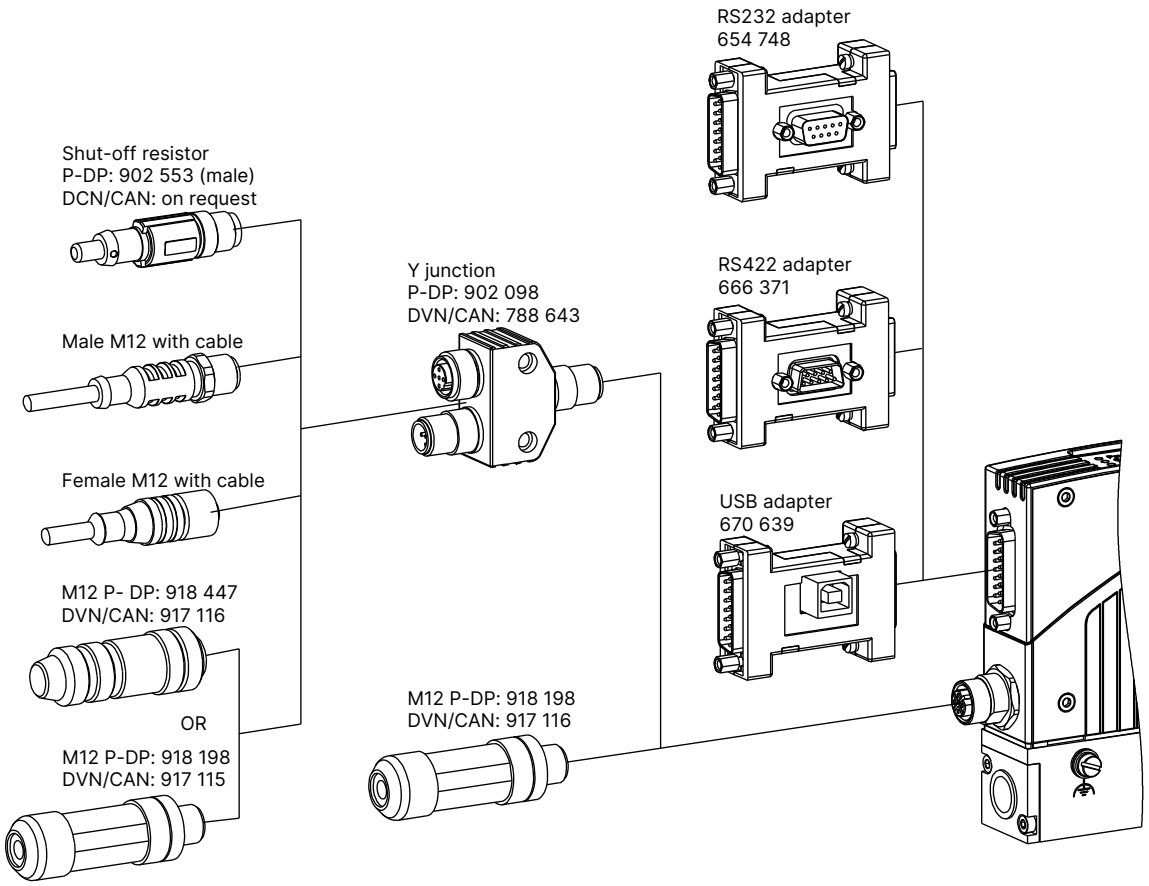
Adapter sketch



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