



Mass Flow Meter for Gases (MFM)

- Nominal flow ranges from 0.010 l_N/min to 80 l_N/min
- High accuracy
- Very fast response times
- Protection class IP65
- Optional: Fieldbus interface

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

Can be combined with

	Type 0330 Direct-acting 2/2 or 3/2 way pivoted armature valve	▶
	Type 8611 eCONTROL - Universal controller	▶
	Type 8619 multiCELL - Multi-channel and multi-function transmitter/controller	▶
	Type 6027 Direct-acting 2/2 way plunger valve	▶

Type description

The mass flow meter (MFM) type 8702 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 8702 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. Type 8712 is especially designed for use in harsh environments due to the high protection class.

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1. General Technical Data

Product properties

Material

Block	Stainless steel
Body	PC (Polycarbonate)
Seal	FKM, EPDM (others on request)
Dimensions	Detailed information can be found in chapter “3. Dimensions” on page 4.
Total weight	1000 g
LED display	Indication for power, limit (with analogue signals) / communication (with fieldbus) and error

Performance data

Nominal flow range (Q_{Nom}) ^{1.)}	0.01 $l_N/min^{2.)}$...80 l_N/min (N_2) Detailed information can be found in chapter “6.2. Flow characteristic” on page 8.
Measuring range	1:50, higher measuring range on request
Max. operating pressure	10 bar (145 psi) (depending on the nominal valve size)
Measuring accuracy	± 0.8 % o. R. ± 0.3 % F. S. (after 1 min. warm-up time)
Repeatability	± 0.1 % F. S.
Response time (t95 %)	< 300 ms

Electrical data

Operating voltage	24 V DC
Power consumption ^{1.)}	Max. 2.5 W (analog communicator) to 5 W (digital communicator)
Voltage tolerance	± 10 %
Residual ripple	< 2 %
Electrical connection	Socket M16, round, 8 pin and socket D-Sub HD15, 15 pin with PROFIBUS DP: Socket M12 5 pin (for IP65) or D-Sub 9 pin with CANopen: Plug M12 5 pin (for IP65) or D-Sub 9 pin

Medium data

Operating medium	Neutral, non-contaminated 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

Port connection	G 1/4, NPT 1/4 or screw-in fitting
Fieldbus option	PROFIBUS-DP, CANopen (D-Sub HD15 covered with sealed plate with fieldbus)
Digital outputs	Two relay outputs 1. Limit (Q_{Nom} almost reached) 2. Error (i.e. sensor fault) Load capacity: max. 60 V, 1 A, 60 VA
Digital inputs	Three different functions programmable
Digital (communication) interface	RS232, Modbus RTU (via RS-Adapter) RS485, RS422 or USB (see “7.4. Ordering chart accessories” on page 10)
Analogue interfaces	4...20 mA, 0...20 mA, 0...10 V or 0...5 V Input impedance > 20 kΩ (Voltage) resp. < 300 Ω (Current) Max. load: 10 mA (Voltage output); max. load: 600 Ω (Current output)

Environment and installation

Installation position	Horizontal or vertical
Ambient temperature	- 10 °C...+ 50 °C
Degree of protection	IP65

Accessories

Software-Tool	Mass Flow Communicator
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1.) The nominal flow value is the max. flow value calibrated which can be measured.

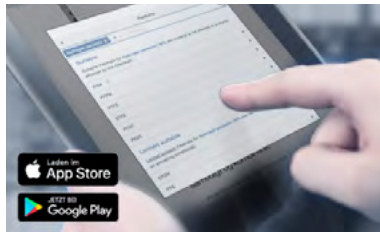
The nominal flow range defines the range of nominal flow rates (full scale values) possible.

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.

2. Materials

2.1. Chemical Resistance Chart – 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.

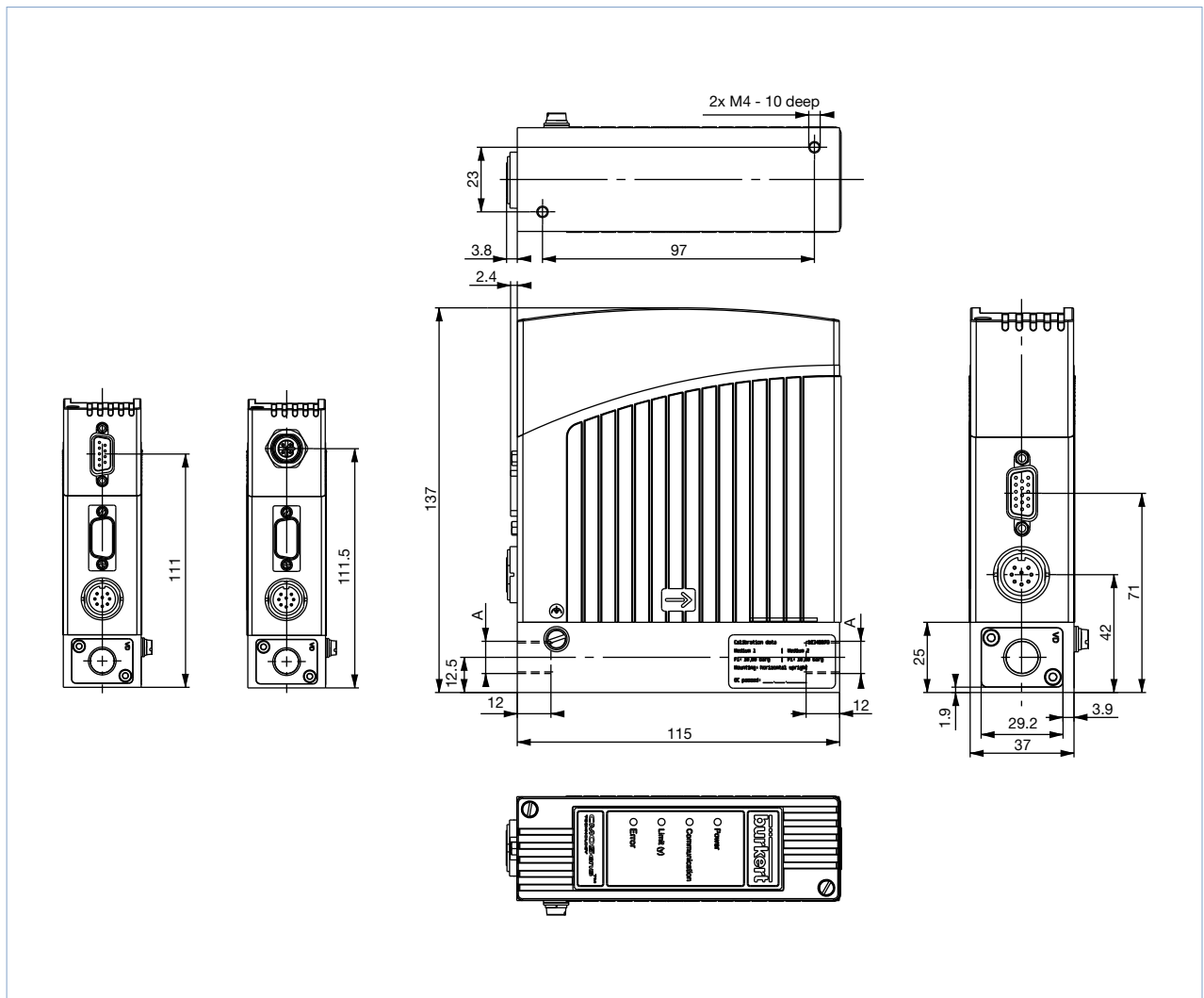
[Start Chemical Resistance Check](#)

3. Dimensions

3.1. Standard version

Note:

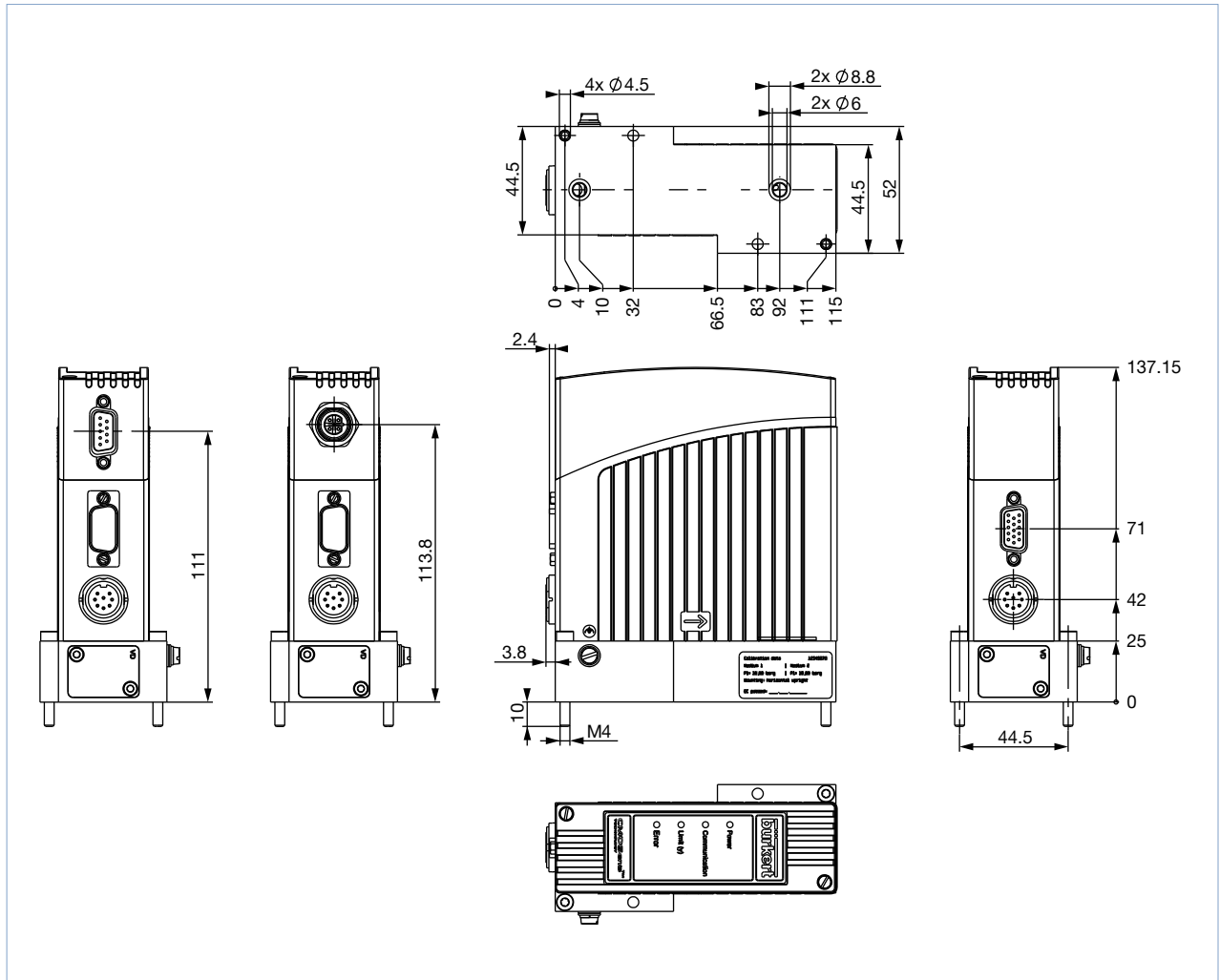
Dimensions in mm



3.2. Sub-base version

Note:

Dimensions in mm

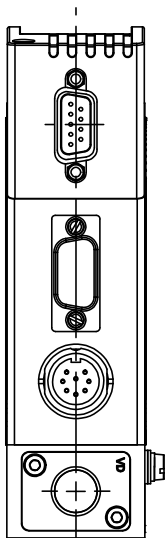
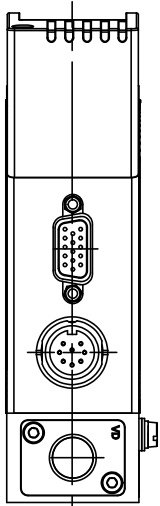


4. Device/Process connections

4.1. Analogue version/Fieldbus version

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.



Analogue version

Socket D-Sub HD15	Pin	Configuration	
		Analogue control unit	Bus actuation
	1	Not connected	Not connected
	2	Not connected	Not connected
	3	Actual value output +	Not connected
	4	Binary input 2	
	5	12 V output (only for internal company use)	
	6	RS232 TxD (direct connection to PC)	
	7	Binary input 1	
	8	GND (for binary inputs)	
	9	Only for internal company use (do not use)	
	10	12 V output (only for internal company use)	
	11	12 V output (only for internal company use)	
	12	Binary input 3	
	13	Actual value output GND	Not connected
	14	RS232 RxD (direct connection to PC)	
	15	DGND (for RS232-interface)	

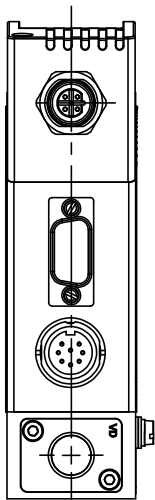
Fieldbus version

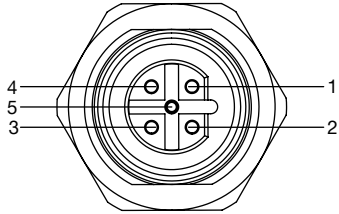
Socket M16, round 8 pin	Pin	Configuration
	1	24 V supply +
	2	Relay 1 – Reference contact
	3	Relay 2 – Reference contact
	4	Relay 1 – normally open
	5	Relay 1 – normally closed
	6	24 V supply GND
	7	Relay 2 – normally closed
	8	Relay 2 – normally open

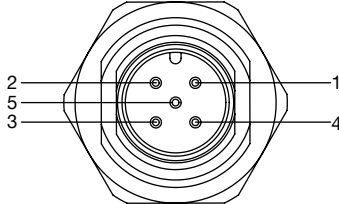
CANopen – Plug M12	Pin	Configuration
	1	Shield
	2	Not connected
	3	DGND
	4	CAN_H
	5	CAN_L

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.



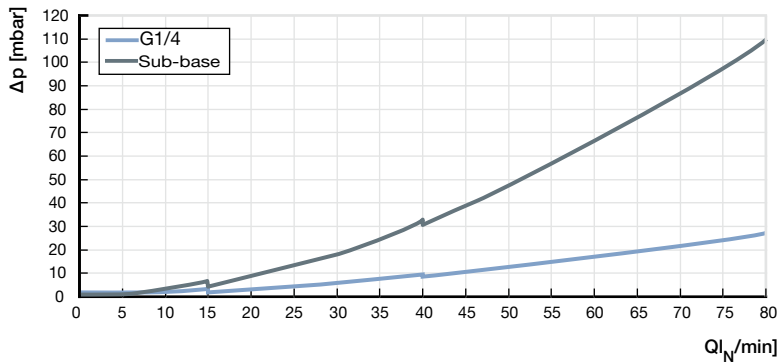
PROFIBUS DP – Socket, B-coded M12 (DPV1 max. 12 Mbaud)		Pin	Configuration
		1	VDD (only for termination resistor)
		2	RxD/TxD – N (A-Line)
		3	DGND
		4	RxD/TxD – P (B-Line)
		5	Not connected

CANopen – Plug, A-coded M12		Pin	Configuration
		1	Shield
		2	Not connected
		3	DGND
		4	CAN_H
		5	CAN_L

5. Performance specifications

5.1. Pressure loss diagram of MFMs

The diagram shows exemplary the pressure loss characteristics when air flowing through. To determine the pressure loss of another gas, it must first be converted to the corresponding air flow.

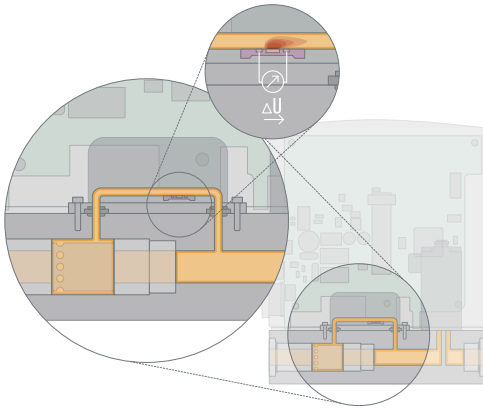


6. Product operation

6.1. Measuring principle

The mass flow sensor 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 which 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.



6.2. Flow characteristic

Nominal flow range of typical gases

Note:

- $Q(\text{Gas}) = f \times Q(N_2)$
- 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_{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

7. Ordering information

7.1. Bürkert eShop – Easy ordering and quick delivery



Bürkert eShop – Easy ordering and fast delivery

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7.2. Recommendation regarding product selection

Note:

The „**Product Enquiry Form**“ at the end of this document 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.

For the proper choice of the actuator orifice within the MFM, not only the required maximum flow rate Q_{Nom} , but also the pressure values directly before and after the MFM (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 „**Product Enquiry Form**“ at the end of this document to indicate the pressures directly before and after the MFM. If these are 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 MFM, 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.

7.3. 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.

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7.4. Ordering chart accessories

Note:

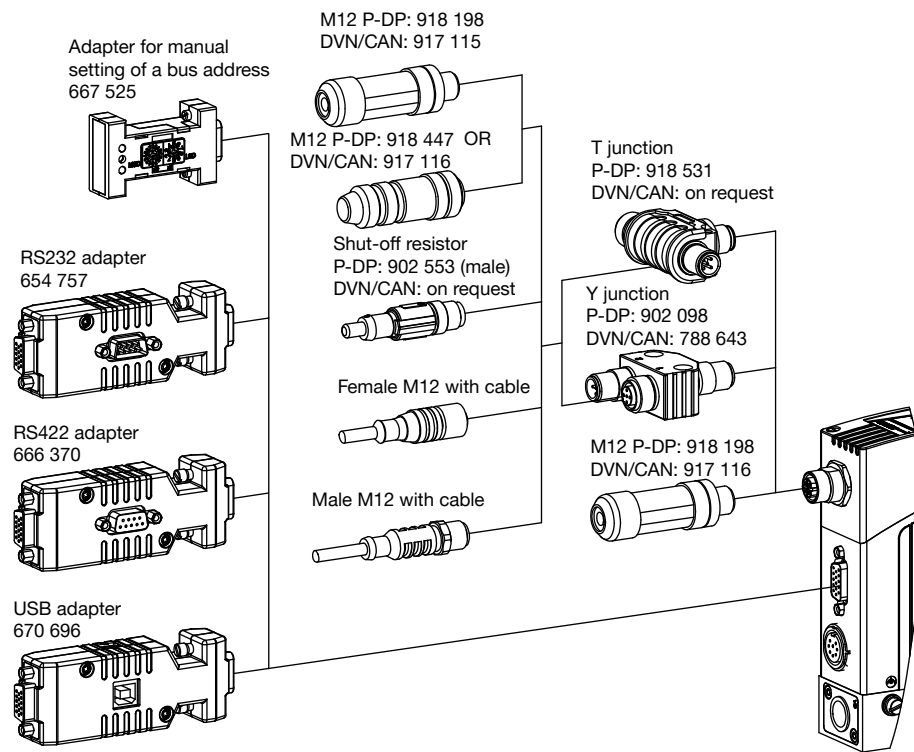
The adapters serve mainly for initial operation or diagnosis. Those are not obligatory for continuous operation.

Description	Article no.
Connections/Cables	
Round plug M16, 8 pin (solder connection)	918299 
Round plug M16, 8 pin with 5 m cable	787733 
Round plug M16, 8 pin with 10 m cable	787734 
Plug D-Sub HD15, 15 pin with 5 m cable	787735 
Plug D-Sub HD15, 15 pin with 10 m cable	787736 
Adapters^{1.)}	
RS232 adapter for connection to a computer, connection with an extension cable (Article no. 917039)	654757 
Extension cable for RS232 9 pin socket/plug 2 m	917039 
RS422 adapter (RS485 compatible)	666370 
USB adapter	670696 
USB connection cable 2 m	772299 
Adapter for manual setting of bus address	667525 
Communication software Mass Flow Communicator	LINK ►
Accessories for Fieldbus	
PROFIBUS-DP (B-coded)	
Plug M12 ^{2.)}	918198 
Socket M12 (coupling) ^{2.)}	918447 
Y-junction ^{2.)}	902098 
T-junction	918531 
Termination resistor	902553 
GSD-File (PROFIBUS), EDS-File (CANopen)	LINK ►
CANopen (A-coded)	
Plug M12 ^{2.)}	917115 
Socket M12 (coupling) ^{2.)}	917116 
Y-Stück ^{2.)}	788643 
T-junction	On request
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.) The M12 single connectors as listed here are not suitable for their simultaneous use with the Y-piece for reasons of space. Please always use at least one commercially available overmoulded cable whose connector is usually smaller.

7.5. Adapter sketch



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DTS 1000011286 EN Version: R Status: RL (released | freigegeben | validé) printed: 26.03.2021

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Arab
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Malaysia
Philippines
Singapore
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Product Enquiry Form - Mass Flow Controller For Gases

Thank you for your interest in our products! In order to provide you with optimum advice, please fill out the following form and send it to your **Bürkert representative** or e-mail address: info@buerkert.com. All information submitted will of course be kept strictly confidential.

Please fill in the **required fields!** ☐ *

*Note: The interactive functions of this PDF may be restricted depending on the PDF reader used.

Personal Information				
Company			Contact person	
Customer no.			Department	
Street			Postcode / Town	
Telephone no.			Email	

Delivery			
MFC Application	MFM Application	Quantity	Required delivery date

Medium data			
Type of gas or gas mixture			
Medium temperature	°C	/	°F
Ambient temperature	°C	/	°F

Fluidic data				
Flow range Q_{Nom}	Min.	Max.	Ref. N ^{1.)}	unit Ref. S ^{1.)}
Inlet pressure at Q_{Nom} ^{2.)}	p_1	=	barg ^{3.)}	
Outlet pressure at Q_{Nom}	p_2	=	barg ^{3.)}	
Max. inlet pressure	p_{1max}	=	barg ^{3.)}	
Port connection	Compression fitting	Subbase	Vacuum fitting	
	Thread:	G (DIN ISO 228/1)	NPT (ANSI B1.2)	
		1/4" 3/8" 1/2" 3/4" 1"		
Installation	horizontal, valve upright horizontal, valve horizontal		vertical, upward flow vertical, downward flow ^{4.)}	

1.) Reference conditions: Ref. N: T=0°C, P=1,013 bar(a); Ref. S: T=20°C, P=1,013 bar(a)
2.) Corresponds to the calibration pressure
3.) Please indicate all pressure values as overpressure to atmospheric pressure [barg] (g = relative pressure)
4.) Possible reduction of the setting range to 1:10 for a vertical downwards flow

Material specifications	
Body	Aluminium Stainless steel
Seals	FKM EPDM

Electrical data				
IP protection	Yes (IP65)	No (IP20 or better)		
Control / Communication	Normsignal	CANopen/büS	PROFIBUS DP	Industrial Ethernet
Note: Please choose one of the following options!	0 ... 5 V	CANopen		PROFINET
	0 ... 10 V	büS		Ethernet IP
	0 ... 20 mA			Modbus TCP
	4 ... 20 mA			EtherCAT
Connection	D Sub socket	M12 socket	D Sub socket	(RJ45 always standard)
Note: Please choose one of the following options!	Terminal block	Terminal block	M12 socket	

Approvals / Conformities
UL
ATEX II Cat. 3 G/D, IECEx
USP Class VI conformity
FDA conformity
EG 1935/2004 conformity

Additional Requirements / Comment