

## Mass Flow Meter (MFM)



- Nominal flow ranges from 20  $I_N$ /min up to 2500  $I_N$ /min
- High accuracy
- Fast response time
- Protection class IP65
- Optional: Fieldbus interface

Type 8006 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

The mass flow meter (MFM) type 8006 is suited for measuring the mass flow of high gas flows. The thermal inline sensor is located directly in the gas stream and therefore reaches very fast response times.

Type 8006 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 MFM type 8006 is especially designed for use in harsh environments due to a low sensitivity to contamination and the high protection class.

Technical Data			
<b>Nominal flow range<sup>1)</sup></b> <b>(<math>Q_{nom}</math>)</b>	20...2500 $I_N$ /min <sup>2)</sup> , $N_2$ equivalent see table on page 2, higher flows on request	<b>Port connection</b>	G 1/4, 3/8, 1/2, 3/4, 1 NPT 1/4, 3/8, 1/2, 3/4, 1 With compression fittings (see p. 7)
<b>Turn-down ratio</b>	1:50 <sup>3)</sup>	<b>Electr. connection</b>	Socket M16, round, 8 pin and socket D-Sub HD15, 15 pin
<b>Operating gas</b>	Neutral, non-contaminated gases, others available on request	<b>Additionally with:</b> -PROFIBUS-DP: -CANopen: with RS485 version only:	Socket M12 5 pin or D-Sub 9 pin Plug M12 5 pin or D-Sub 9 pin Plug D-Sub 9 pin
<b>Calibration gas</b>	Operating gas or air with correcting function	<b>Operating voltage</b>	24 V DC
<b>Max. operating pressure</b> (Inlet pressure)	10 bar, up to 25 bar ( $N_2$ , air, argon)	<b>Voltage tolerance</b>	± 10%
<b>Gas temperature</b>	- 10... + 70 °C (- 10... + 60 °C with oxygen)	<b>Residual ripple</b>	< 2%
<b>Ambient temperature</b>	- 10... + 45 °C (higher temperatures on re- quest)	<b>Power consumption</b>	3.5... 10 W, with fieldbus: 4... 12.5 W (acc. to the version)
<b>Accuracy</b> (after 15 min warm up time)	± 1.5% o.R. ± 0.3% F.S. (o.R.: of reading; F.S.: of full scale)	<b>Type of protection</b> (with connected cables)	IP50 (RS485, RS422 versions) IP65
<b>Repeatability</b>	± 0.1% F.S.	<b>Dimensions</b>	See drawings on p. 6
<b>Response time (<math>t_{95\%}</math>)</b>	< 500 ms	<b>Total weight</b> (Example standard block)	1.2 kg (Al) 3.0 kg (VA)
<b>Materials</b>	Body: Aluminium (black anodized) or stainless steel Housing: Aluminium (coated) Seals: FKM, EPDM	<b>Mounting position</b>	Horizontal or vertical
		<b>Light emitting diodes</b> (Default, other functions programmable)	Indication for 1. Power                                   3. Limit 2. Communication                   4. Error

<sup>1)</sup> 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.

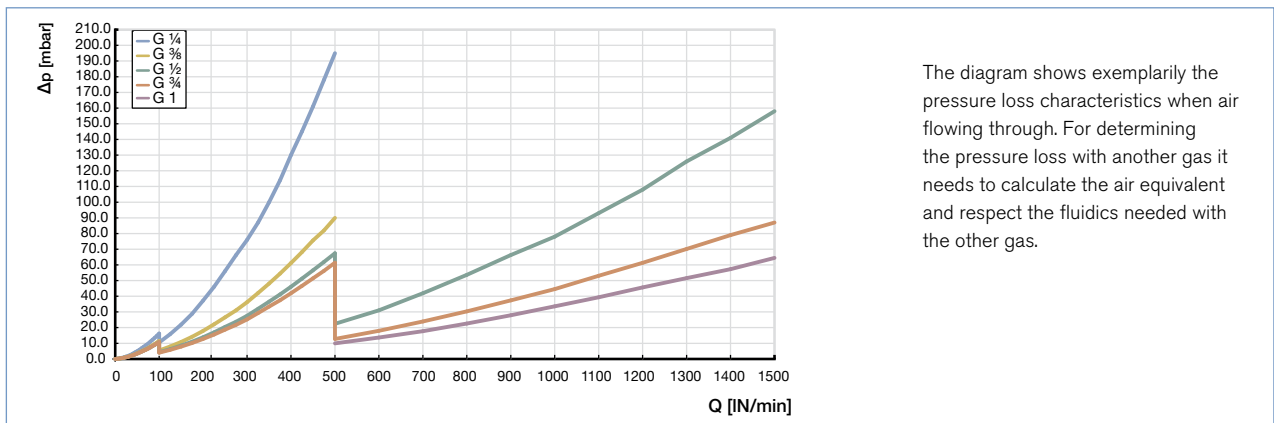
<sup>2)</sup> Index N: Flow rates referred to 1.013 bar and 0 °C.

Alternatively there is an Index S available which refers to 1.013 bar and 20 °C

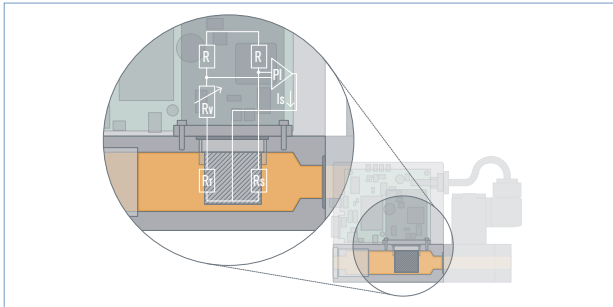
<sup>3)</sup> With vertical installation and flow downwards the turn-down ratio is 1:10

Technical Data (cont.)			
Device variant	Analog signal version	Fieldbus version	RS485 version (only D-Sub, 9 pin)
<b>Analog communication</b> Output signal (actual flow) 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	None	None
<b>Fieldbus option</b> (D-Sub HD15 covered with sealed plate for, pins for analogue inputs/outputs not connected)	None	PROFIBUS-DP, CANopen	Modbus RTU (via RS interface)
<b>Digital communication</b> via adapter possible:	RS232 (supports Modbus RTU) RS485, RS422 or USB		RS485, RS422 USB
<b>Binary inputs</b> (Default, other functions programmable)	Three: 1. not assigned 2. not assigned 3. not assigned		One: not assigned
<b>Binary outputs</b> (Default, other functions programmable)	Two relay outputs 1. Limit ( $Q_{nom}$ almost reached) 2. Error (e.g. sensor fault) Load capacity: max. 60 V, 1 A, 60 VA		One relay output 1. Limit ( $Q_{nom}$ almost reached) Load capacity: max. 25 V, 1 A, 25 VA

### Pressure Loss Diagram (ref. to air, with 250µm inlet filter)



### Measuring Principle



This sensor works as a hot-film anemometer in the so-called CTA operational mode (Constant Temperature Anemometer). To do this, two resistors with precisely specified temperature coefficients located directly in the media flow and three resistors located outside the flow are connected together to form a bridge.

The first resistor in the gas flow ( $R_1$ ) measures the fluid temperature, while the second, low-value resistor ( $R_2$ ) is heated so that it is maintained at a fixed, predefined over-temperature with respect to the fluid temperature.

### Notes Regarding the Configuration

The decisive factors for the perfect functioning of an MFM within the application are the fluid compatibility, the max. 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 questionnaire on page 7 contains the relevant fluid specification. Please use in this way the experience of Burkert engineers already in the design phase and provide us with a copy of the questionnaire containing the data of your application together with your inquiry or order.**

### Nominal Flow Ranges of Typical Gases

(Other gases on request)

Gas	Min. $Q_{nom}$ [l <sub>N</sub> /min]	Max. $Q_{nom}$ [l <sub>N</sub> /min]
Acetylene	20	975
Ammonia	20	1250
Argon	20	1500
Carbon dioxide	20	800
Air	20	2500
Methane	20	750
Propane	20	400
Oxygen	20	2500
Nitrogen	20	2500

The heating current required to maintain this is a measure of the heat being removed by the flowing gas, and represents the primary measurement.

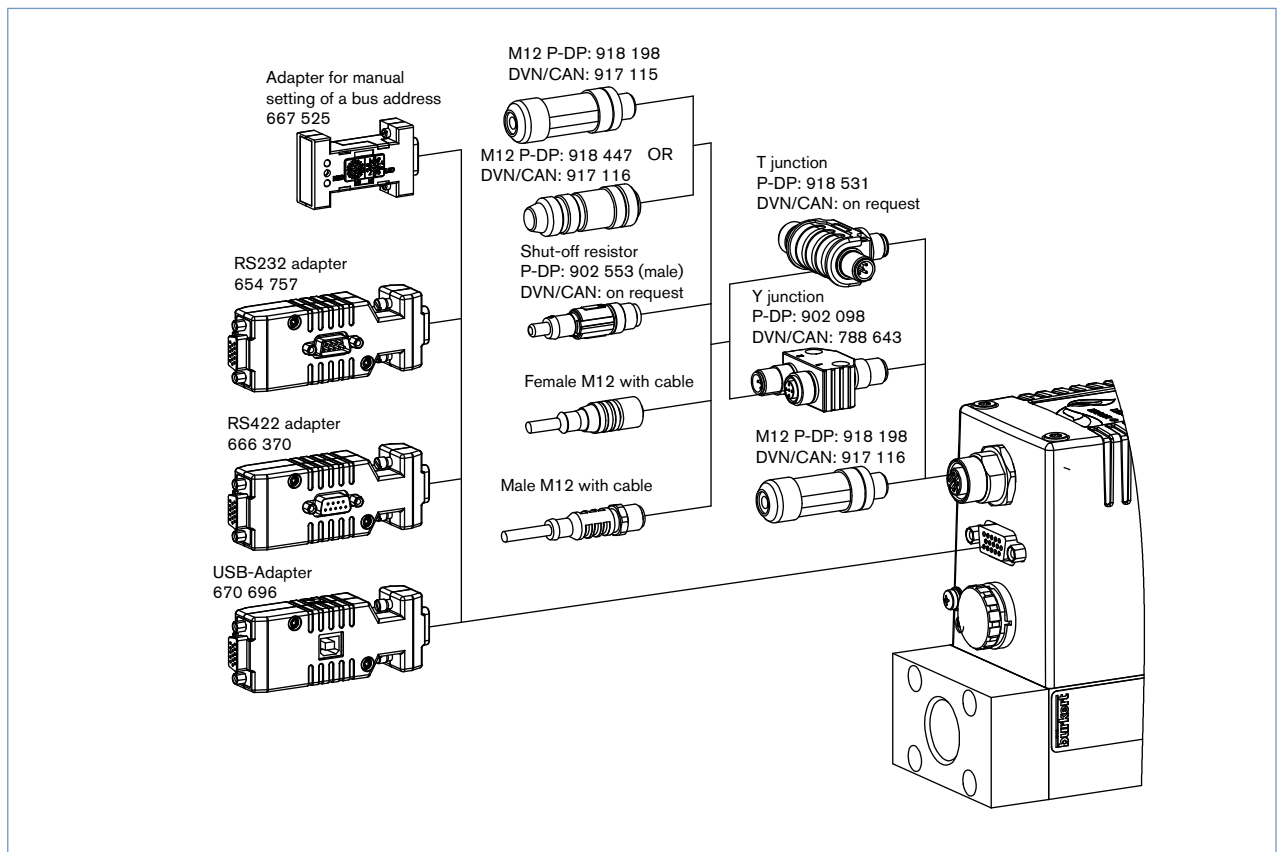
An adequate flow conditioning within the MFM and the calibration with high-quality flow standards ensure that the mass of gas flowing per time unit can be derived from the primary signal with high accuracy.

Ordering Chart for Accessories

Article	Article no.	
<b>Connectors / Cables</b>		
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	
<b>Adapters<sup>4)</sup></b>		
RS232 adapter for connection to a computer, connection with an extension cable (Article no. 917 039)	654757	
Extension cable for RS232 9 pin socket/plug 2 m	917039	
RS422-Adapter (RS485 compatible)	666370	
USB-Adapter (Version 1.1, USB socket type B)	670696	
USB connection cable 2 m	772299	
Adapter for manual bus adresse settings (instad of SW)	667525	
Software MassFlowCommunicator	Download from <a href="http://www.buerkert.com">www.buerkert.com</a>	
<b>Accessories for Fieldbus</b>	<b>PROFIBUS DP (B-coded)</b>	<b>CANopen (A-coded)</b>
M12-Plug <sup>5)</sup>	918198	917115
M12-socket <sup>5)</sup>	918447	917116
Y-junction <sup>5)</sup>	902098	788643
T-junction	918531	(on request)
Terminating resistor	902553	(on request)
GSD-File (PROFIBUS), EDS-File (CANopen)	Download from <a href="http://www.buerkert.com">www.buerkert.com</a>	

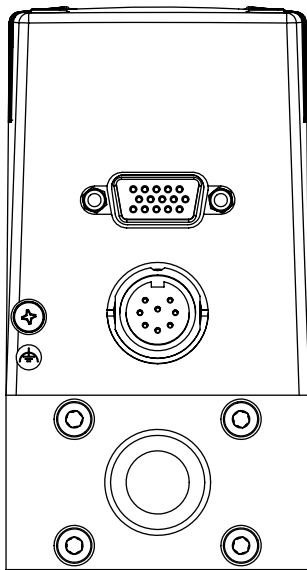
<sup>4)</sup> The adapters serve mainly for initial operation or diagnosis. Those are not obligatory for continuous operation.

<sup>5)</sup> 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 an overmoulded cable which uses typically a thinner connector.

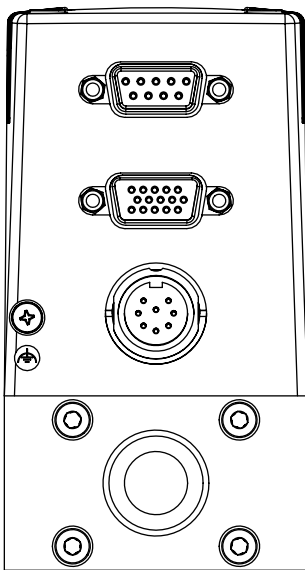


Pin Assignment

DTS 1000017532 EN Version: O Status: RL (released | freigegeben | valide) printed: 07.05.2019

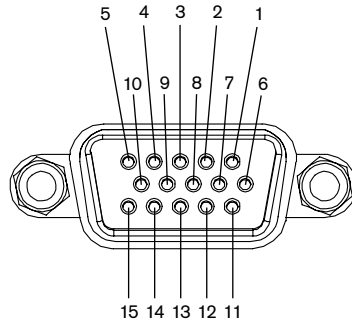


Standard



Fieldbus D-SUB

Socket D-Sub HD15



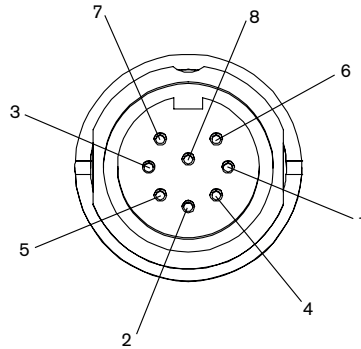
Pin	Assignment	
	Analog Version	Bus Version
1	N.C. <sup>®)</sup>	N.C.
2	N.C.	N.C.
3	Actual value output +	N.C.
4	Binary input 2	
5	12 V-Output (only for factory use)	
6	RS232 TxD (direct connection to computer)	
7	Binary input 1	
8	GND (for binary inputs)	
9	only for factory use (do not connect!)	
10	12 V-Output (only for factory use)	
11	12 V-Output (only for factory use)	
12	Binary input 3	
13	Actual value output GND	N.C.
14	RS232 RxD (direct connection to computer)	
15	DGND (for RS232-interface)	

<sup>®)</sup>N.C.: not connected (not used)

Note:

- Optional Pin 1 and 2 with bus version as transmitter input possible
- The cable length for RS232/ Setpoint and flow value signal is limited to 30 meters.

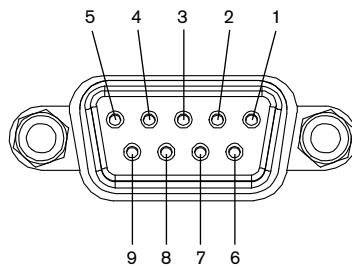
Socket M16, round, 8 pin



Pin	Assignment
1	24 V-Supply +
2	Relay 1 – reference contact
3	Relay 2 – reference contact
4	Relay 1 – Normally closed contact
5	Relay 1 – Normally open contact
6	24 V-Supply GND
7	Relay 2 – Normally open contact
8	Relay 2 – Normally closed contact

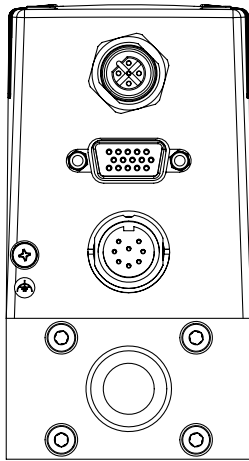
Socket D-Sub 9 pin

(only with fieldbus version)

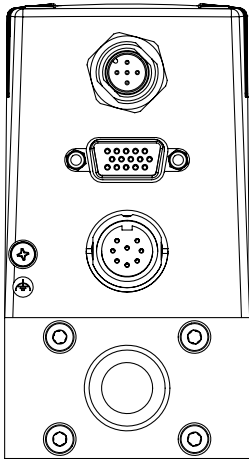


Pin	Assignment	
	PROFIBUS DP	CANopen
1	Shield	Shield
2	N.C.	CAN-L data line
3	RxD/TxD - P (B-line)	GND
4	RTS (control signal for repeater)	N.C.
5	GND	N.C.
6	VDD (only for termination resistor)	N.C.
7	N.C.	CAN-H data line
8	RxD/TxD - N (A-line)	N.C.
9	N.C.	N.C.

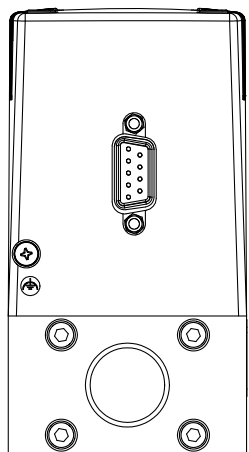
Pin Assignment (continued)



M12 Profibus

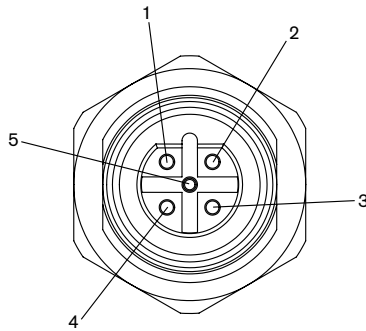


M12



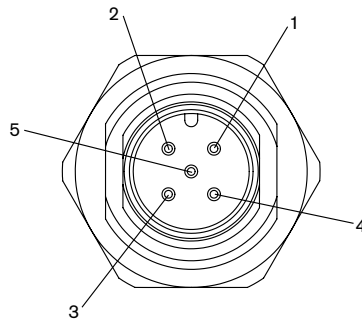
RS485 version

**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.

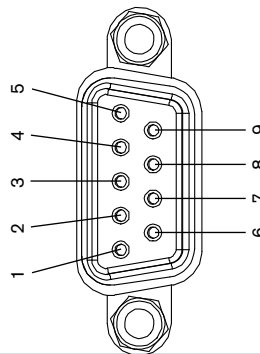
**CANopen – Plug A-coded M12**



Pin	Assignment
1	Shield
2	N.C. <sup>7)</sup>
3	DGND
4	CAN_H
5	CAN_L

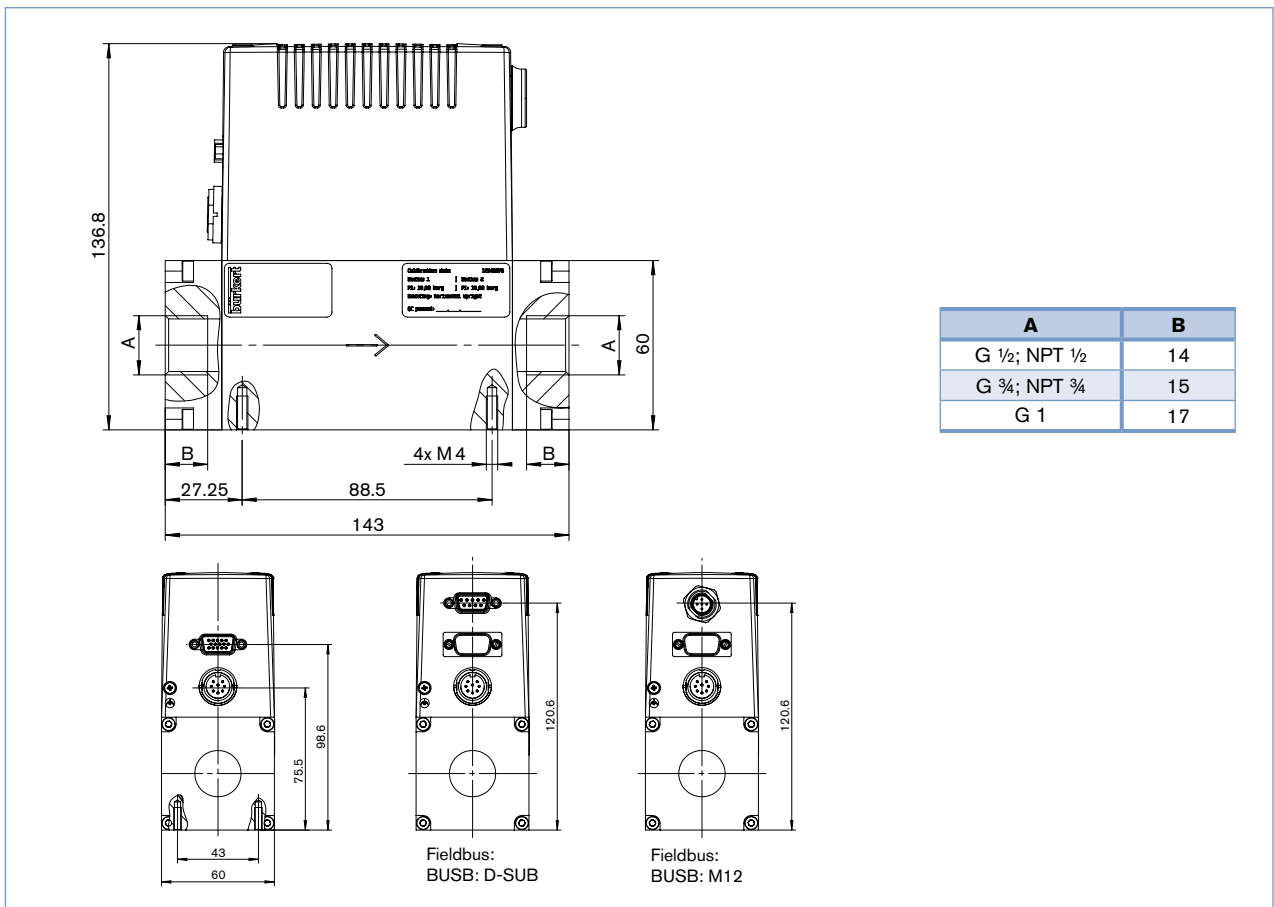
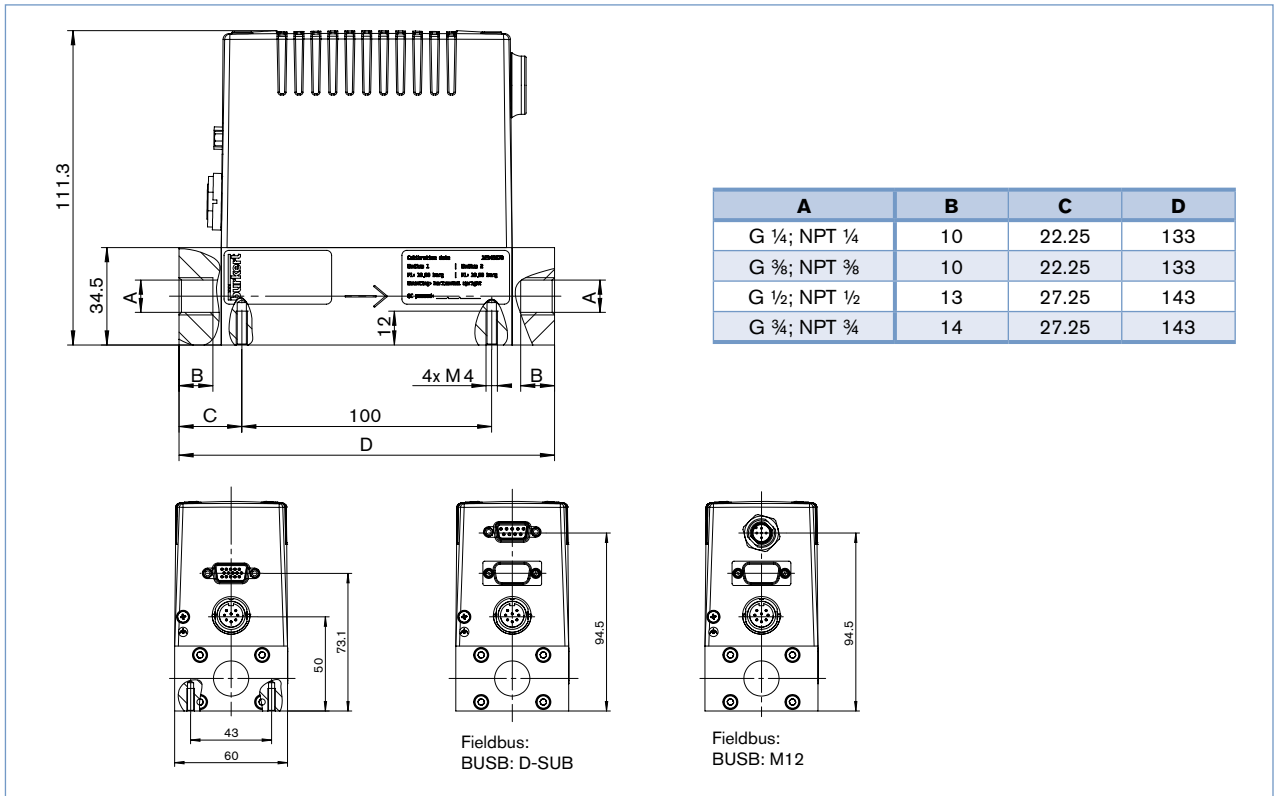
<sup>7)</sup> Optional configuration with 24 V DC possible for power supply via fieldbus connector. With this no power supply connection on round M16 plug needed.

**Plug D-Sub 9 pin**



Pin	Assignment
1	Binary input (related to GND Pin2)
2	GND
3	Power supply + 24 V DC
4	Relay, normally opened
5	Relay, normally closed
6	TX+ (RS485-Y) – bridge with pin 9 at half duplex
7	TX- (RS485-Z) – bridge with pin 8 at half duplex
8	RX- (RS485-B)
9	RX+ (RS485-A)

Dimensions [mm]



## 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

## Fluid data

Type of gas (or gas proportion in mixtures)

Density  kg/m<sup>3</sup><sup>9)</sup>

Gas temperature  °C     °F

Moisture content  g/m<sup>3</sup>

Abrasive components/solid particles     no     yes, as follows:

## Fluidic data

Flow range  $Q_{nom}$      Min.     l<sub>N</sub>/min<sup>9)</sup>     l<sub>S</sub>/min (slpm)<sup>9)</sup>  
 Max.     m<sub>N</sub><sup>3</sup>/h<sup>9)</sup>     kg/h  
 cm<sub>N</sub><sup>3</sup>/min<sup>9)</sup>     cm<sub>S</sub><sup>3</sup>/min (sccm)<sup>9)</sup>  
 l<sub>N</sub>/h<sup>9)</sup>     l<sub>S</sub>/h<sup>9)</sup>

Inlet pressure at  $Q_{nom}$ <sup>10)</sup>     $p_1 =$   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  
 1/4" G-thread (DIN ISO 228/1)     1/4" NPT-thread (ANSI B1.2)  
 3/8" G-thread (DIN ISO 228/1)     3/8" NPT-thread (ANSI B1.2)  
 1/2" G-thread (DIN ISO 228/1)     1/2" NPT-thread (ANSI B1.2)  
 3/4" G-thread (DIN ISO 228/1)     3/4" NPT-thread (ANSI B1.2)  
 1" G-thread (DIN ISO 228/1)

with screw-in fitting  
 mm Pipeline (external Ø)  
 inch Pipeline (external Ø)

Installation     horizontal, valve upright (standard)     horizontal, valve on side  
 vertical, flow upwards     vertical, flow downwards

Ambient temperature     °C

## Material data

Body (base block)     Aluminium (anodised)     Stainless steel

Seal material     FKM     EPDM

## Electrical data

Signals for set point and actual value	Standard signal Setpoint / Actual value	with fieldbus	with RS485
<input type="checkbox"/> 0...5 V	<input type="checkbox"/> 0...20 mA	<input type="checkbox"/> PROFIBUS DP	<input type="checkbox"/> M12
<input type="checkbox"/> 0...10 V	<input type="checkbox"/> 4...20 mA	<input type="checkbox"/> CANopen	<input type="checkbox"/> D-Sub

■ 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

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