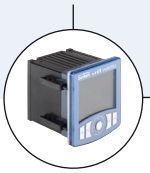
burkert
FLUID CONTROL SYSTEMS

Mass Flow Meter (MFM) for Gases

- Direct flow measurement by MEMS- Technology for nominal flow rates from 10 ml_N/min to 80 l_N/min (N_2)
- High accuracy
- Short response time
- Compact design and digital communication

Type 8703 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 meter 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 or 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 temperature. The digital mass flow meter type 8703 uses a sensor on silicon chip basis located directly in contact with the gas.

Due to the fact that the sensor is directly in the bypass channel a very fast response time of the MFM is reached. The actual flow is given over RS485-communication.
Type 8703 can optionally be calibrated for two different gases, the user is able to switch between these two gases. This instrument communicates with master devices digitally, no further A/D conversions needed. The MassFlowCommunicator software can be used for parameterisation and diagnosis.

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 to +70 °C (-10 to +60 °C with oxygen)
Ambient temperature	-10 to +50 °C
Accuracy	±0.8 % o.R. ±0.3 % F.S. (after 1 min. warm up time)
Repeatability	±0.1 % F.S.
Response time ($t_{95\,\%}$)	<300 ms
Materials	
Body	Aluminium or stainless steel
Housing	Metal
Seals	FKM, EPDM
Port connection	NPT ¼, G ¼, screw-in fitting or sub-base, others on request

Electr. connection	Plug D-Sub 9 pin
Power supply	24 V DC
Voltage tolerance	±10 %
Residual ripple	<2 %
Power consumption	5 W
Communication	Digital via RS485 (half-duplex or full-duplex), RS422
Protection class	IP40
Dimensions [mm]	see drawings p. 5-6
Total weight	ca. 500 g (aluminium body)
Installation	horizontal or vertical
Light emitting diodes (default functions, other functions programmable)	Indication for power, limit and error
Binary Input (default, other functions programmable)	Not assigned
Binary Output (default, other functions programmable)	One relay-output for Limit (process value close to full scale value) Max. load: 25 V, 1 A, 25 VA

[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 Index S which refers to 1.013 bar and 20 °C.

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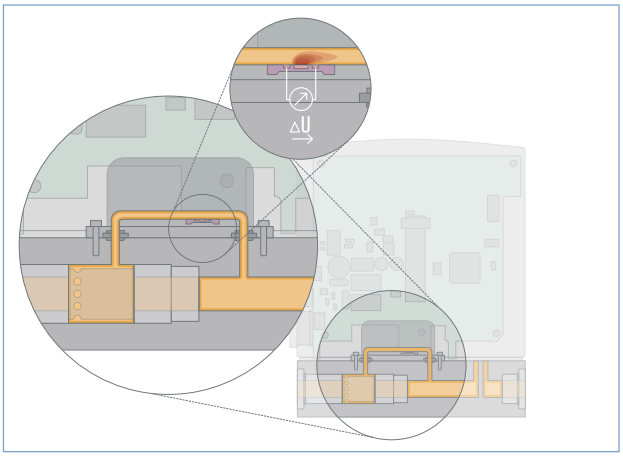
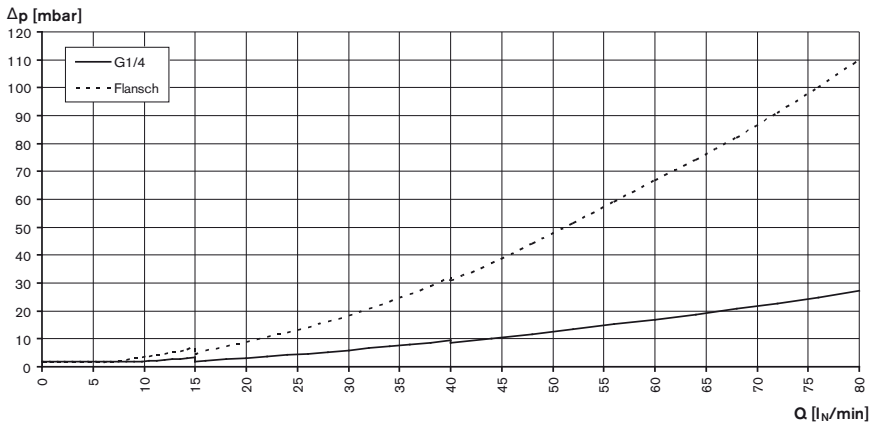
Measurement principle



The actual flow rate is detected by a sensor. This operates according to a thermal principle which has the advantage of delivering the mass flow without any corrections for the required pressure or temperature.

A small part of the total gas stream is diverted into a small, specifically designed bypass channel, that ensures laminar flow conditions. The sensor element is a chip immersed into the wall of this 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 this bypass channel. The calibration procedure effectuates a unique assignment of the sensor signal to the total flow rate passing the device.

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



The diagram shows exemplarily the pressure loss characteristics when air
fl owing through.
For determining the pressure loss with another gas it needs to calculate
the air equivalent and respect the fl uidics needed with the other gas.

Notes regarding the selection of the unit

(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 selection of the unit

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

The request for quotation form on page 6 contains the relevant fl uid specifi cation.

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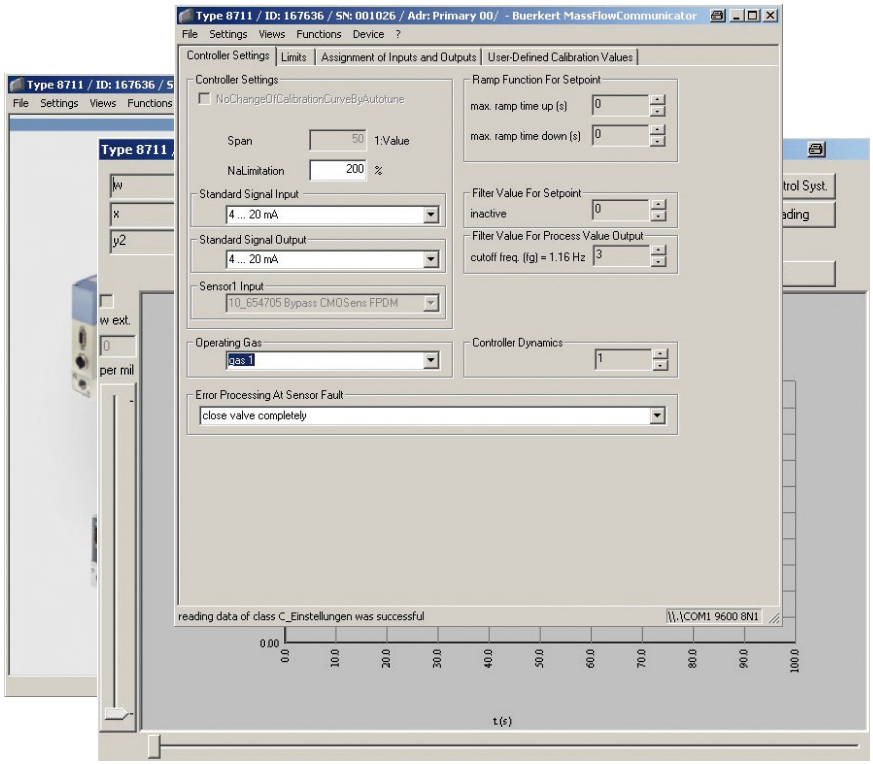
Ordering table for accessories

Article	Article no.
9 pin electrical connection	
D-Sub socket 9 pin solder connection with housing	917623
Adapters[3)]	
USB adapter (version 1.1, USB-socket type B)	670693
USB connection cable 2 m	772299
Communication software “MassFlowCommunicator”	Download from www.buerkert.com

[3)] The adapter accessories are used for commissioning and diagnostics and are not absolutely necessary for operation.

Software MassFlowCommunicator for Communication with Bürkert MFC/MFM

The communication software allows the user to program additionally various functions. For that purpose the MFC or MFM has to be connected to the computer by a RS232 adapter.



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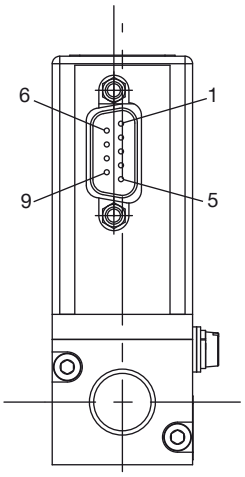
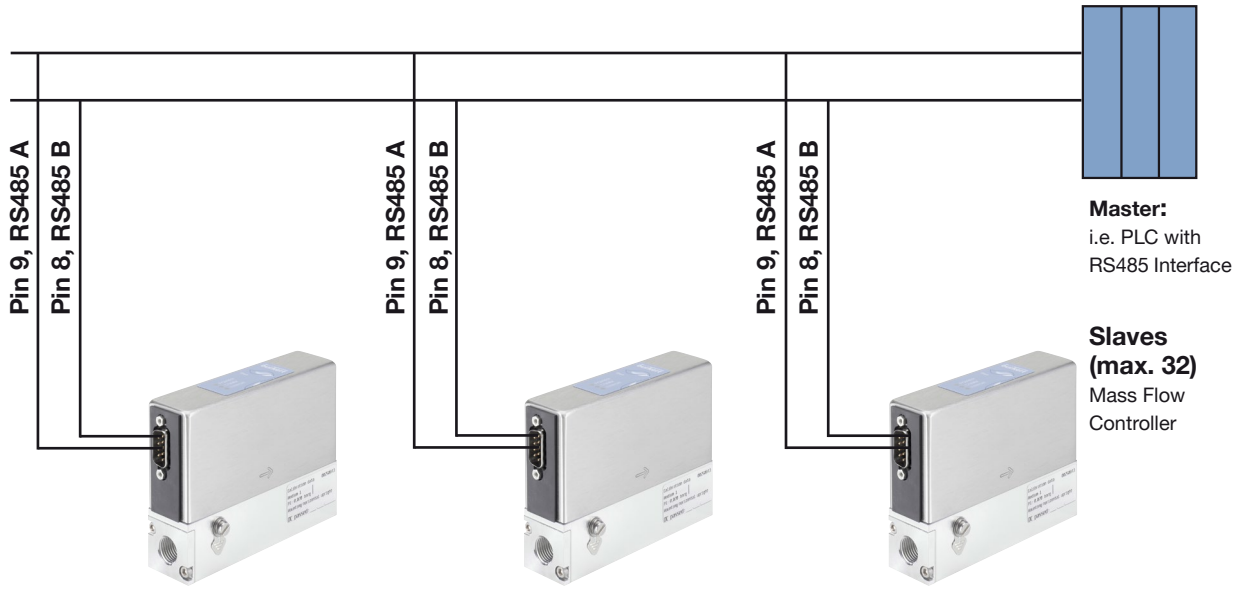
Pin Assignment



Pin	Connection
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)

Networking



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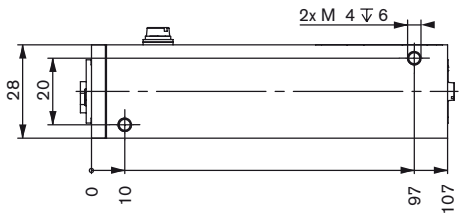
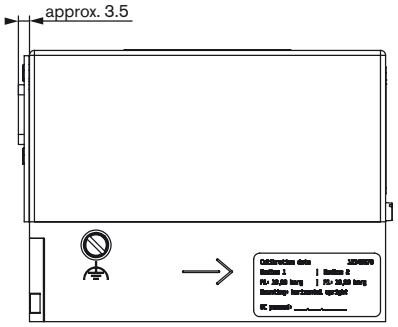
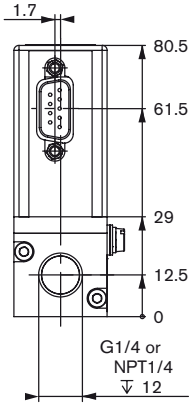
Dimensions [mm]

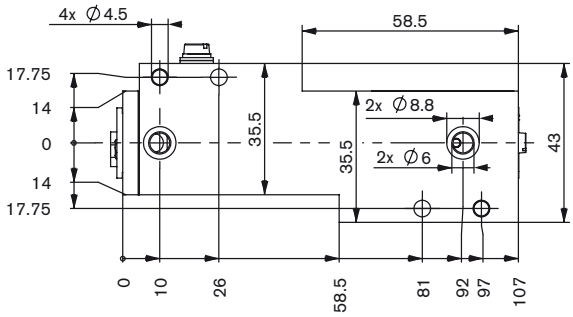
Threaded version

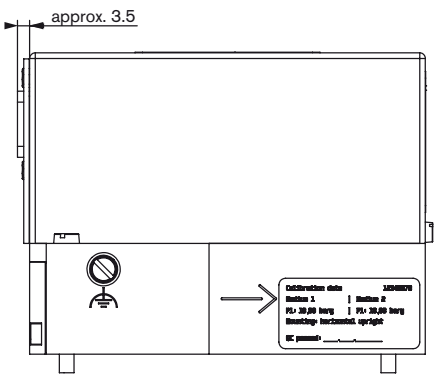


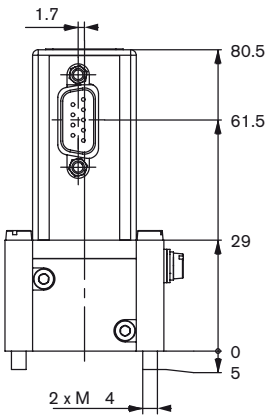




Sub-base version







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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 4)

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 4) ☐ l_S/min (slpm) 5)
☐ m_N^3/h 4) ☐ kg/h
☐ cm_N^3/min 4) ☐ cm_S^3/min (sccm) 5)
☐ l_N/h 4) ☐ l_S/h 5)

Inlet pressure at Q_{nom} 6) 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
- ☐ 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 ☐ Aluminium ☐ Stainless steel

Seal ☐ FKM ☐ EPDM

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

4) at: 1.013 bar(a) and 0 °C 5) at: 1.013 bar (a) and 20 °C 6) 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.

Subject to alteration.

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