bürkert
FLUID CONTROL SYSTEMS

Mass Flow Meter (MFM) for Gases

- Bypass MFC with capillary technology for nominal flow rates from 5 ml_N/min to 15 l_N/min
- Applicable for aggressive gases
- Compact design and digital communication

Type 8705 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 meters 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 either 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 the temperature.

The digital mass flow meter Type 8705 uses a classic bypass sensor (see the description on page 2). The actual flow can be read out digitally over RS-communication. Type 8705 can optionally be calibrated for two different gases, the user can switch between these two gases.

The materials of the parts that come into contact with the medium are selected according to customer specification so that the unit can be operated with the complete range of standard process gases.

Technical data

Full scale range[1] (Q_{nom})	5 to 15000 ml_N/min[2] N_2 equivalent
Control range	1:50
Operating gases	Neutral, or aggressive gases
Calibration gas	Operating gas or air with conversion factor
Max. operating pressure (Inlet pressure)	10 bar (145 psi)
Medium temperature	-10 to +70°C (-10 to +60°C for oxygen)
Ambient temperature	-10 to +50°C[3], others on request
Accuracy	±1.5% o.R. ±0.3% F.S. (after 30min. heating period)
Repeatability	±0.1% F.S.
Response time ($t_{95\%}$)	<3 s
Materials Body Housing Seals	 Stainless steel PC (Polycarbonate) or metal FKM, EPDM or FFKM
Port connections	NPT 1/4, G 1/4, Screw-in fitting or sub-base, others on request

Electr. connection	D-Sub plug 9-pin
Power supply	24V DC
Voltage tolerance	±10 %
Residual ripple	<2 %
Power consumption	Max. 2.5 W
Communication	Digital via RS485 (half duplex or full duplex), RS422, RS232 with adapter
Protection class	IP40
Dimensions [mm]	See drawings on page 5
Total weight	ca. 850 g (stainless steel)
Mounting position	Horizontal or vertical
Light emitting diode display (default, other allocations possible)	Indication for Power, Limit Error
Binary input (default, other functions possible)	Two 1. Not assigned 2. Not assigned
Binary output (default, other functions possible)	One relay-output for Limit (process value close to full scale value) Max. load: 25V, 1A, 25VA

[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
[3] Higher temperatures on request

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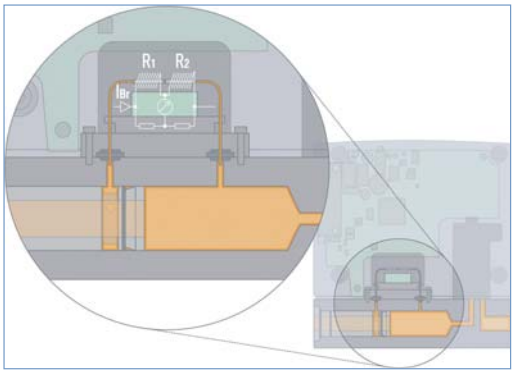
Measuring principle



The measurement is based on the bypass principle. A laminar flow element in the main channel generates a small pressure drop. This drives a small flow, proportional to the main flow, through the bypass (sensor tube).

Two heating resistors, which are connected in a measuring bridge, are wounded on this stainless steel tube. In the zero-flow state, the bridge is balanced, but with flow, heat is transported in the flow direction and the bridge becomes unbalanced.

The dynamics of the measurement is limited by the tube walls, which act as a thermal barrier. Through use of suitable software response times are obtained (in the range of a few seconds) that are adequate for a wide range of applications.

With contaminated gases we recommend to install filter elements upstream. This avoids changes in the division ratio between main flow and sensor tube, as well as changes in the heat transmission caused by deposits on the walls of the sensor tube.

With these sensors even aggressive gases can be measured, because all essential parts in contact with the gas are fabricated in stainless steel. With this sensor principle it is also possible to convert between different gases.

$Q(Gas) = f \times Q(N_2)$

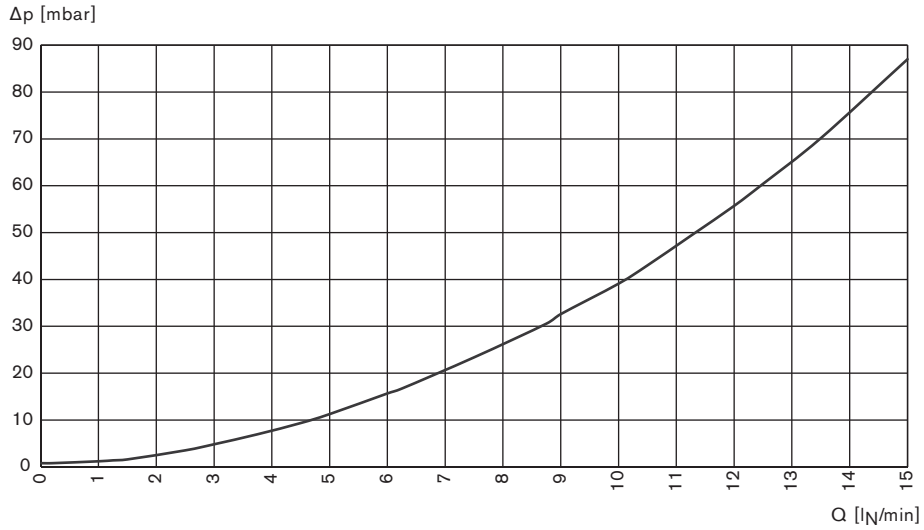
By using the gas factors it is possible that the accuracy is not within the datasheet specification.

gas	factor f
N_2	1.00
Luft	1.00
O_2	0.98
H_2	1.01
Ar	1.4
He	1.42
CO_2	0.77

For applications which need high accuracy it is recommended to calibrate under application conditions.

The compatibility of the sealing materials of the MFMs should be checked before use with another gas.

Pressure loss diagram (ref. to air)



The diagram shows exemplarily the pressure loss characteristics when air flows through a flowmeter with ¼" pipe connection. For determining the pressure loss with another gas it needs to calculate the air equivalent.

Notes regarding the selection of the unit

The decisive factors for the perfect functioning of a MFM within the application are the fluid compatibility, the normal 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 request for quotation form on page 6 contains the relevant fluid specification. Please use in this way the experience of Bürkert engineers already in the design phase and provide us with a copy of the request containing the data of your application together with your inquiry or order.

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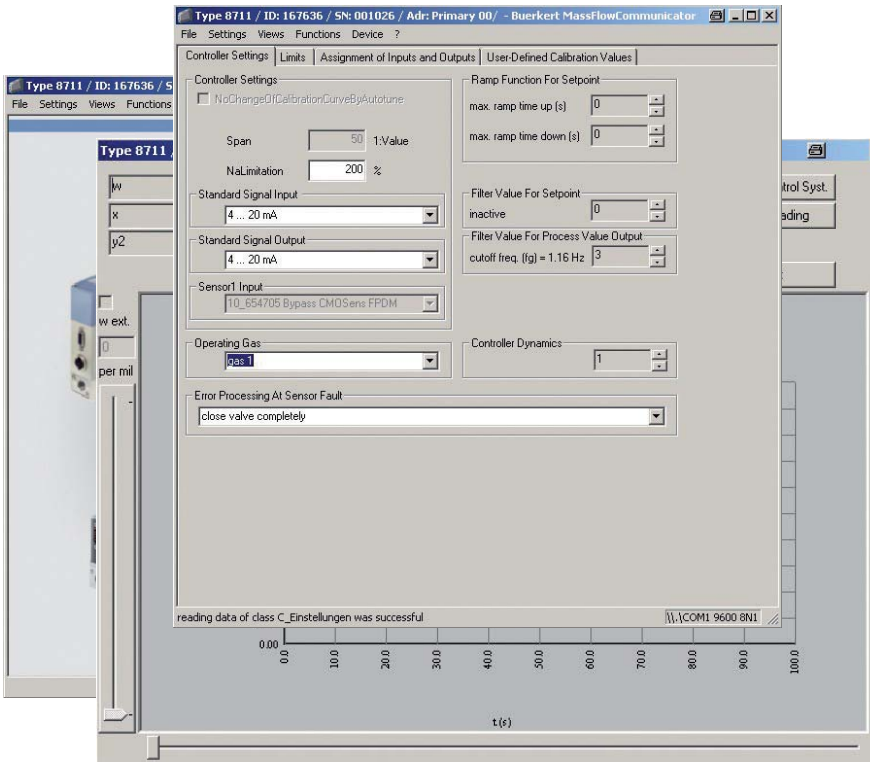
Ordering table for accessories

Article	Item no.
9-pin electrical connection	
D-Sub socket 9-pin solder connection with housing	917 623
Adapters [4)]	
RS232 adapter for connection with an extension cable (item N0.917 039)	667 530
Computer extension cable for RS232 9-pin socket/plug 2m	917 039
USB adapter (version 1.1, USB-socket type B)	670 693
USB cable 2m, connector type A to connector type B	772 299
Communication software “MassFlowCommunicator”	Info at www.burkert.com (type 8713)

[4)] The adapters serve mainly for initial operation or diagnosis. Those are not obligatory for continuous 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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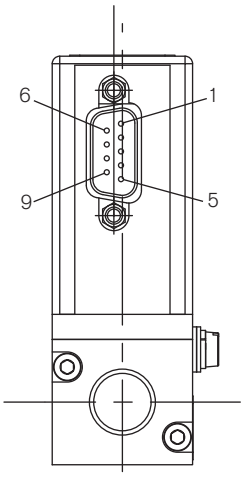
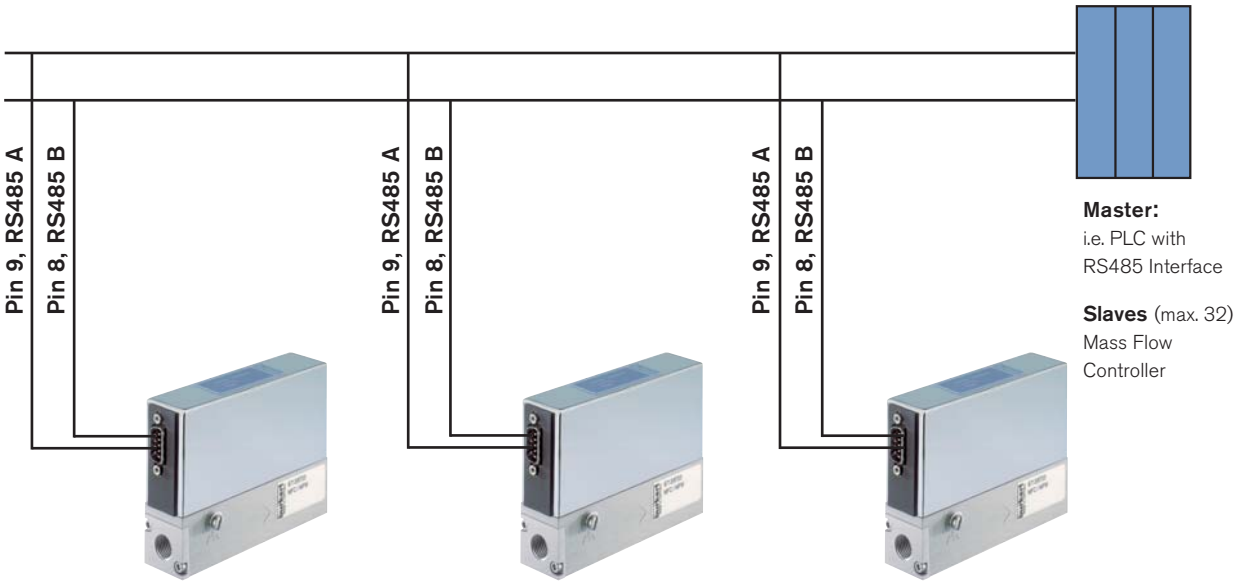
Pin Assignment



Pin	Connection
1	Binary input (related to GND Pin 2)
2	GND
3	Power supply +24V DC
4	Relay, C contact
5	Relay, NC contact
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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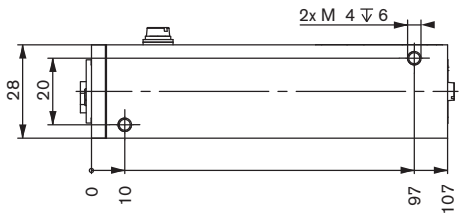
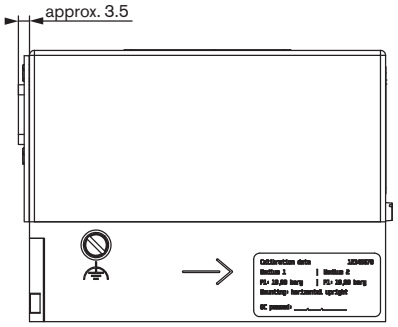
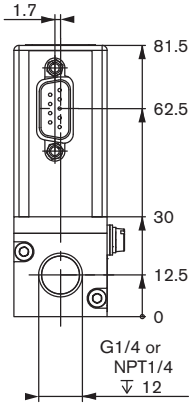
Dimensions [mm]

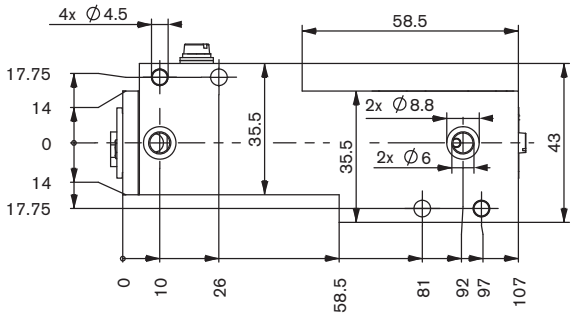
Threaded version

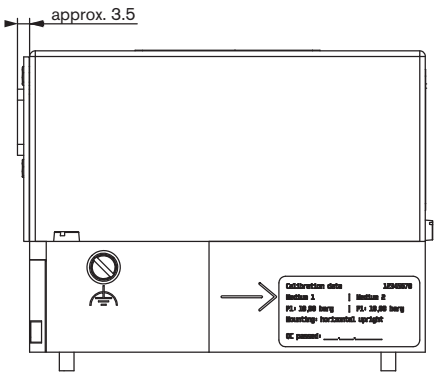


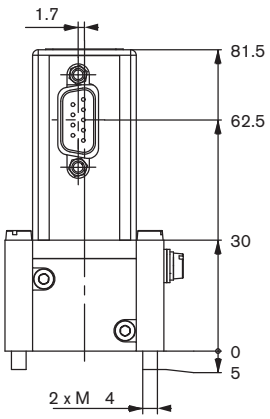




Sub-base version







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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 5)

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 5) ☐ l_S/min (slpm) 6)
☐ m_N^3/h 5) ☐ kg/h
☐ cm_N^3/min 5) ☐ cm_S^3/min (sccm) 6)
☐ l_N/h 5) ☐ l_S/h 6)

Inlet pressure at Q_{nom} 7) 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
- ☐ 1/4" G-thread (DIN ISO 228/1)
- ☐ 1/4" 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)

5) at: 1,013 bar(a) and 0°C 6) at: 1.013 bar (a) and 20°C 7) matches with calibration pressure

reset form

In case of special application conditions, please consult for advice.

Subject to alteration.

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