

## Mass Flow Meter (MFM) for Gases



Type 8703 can be combined with...



**Type 0330**

3/2 or 2/2-way  
valve



**Type 6013**

2/2-way valve

- Direct flow measurement by MEMS- Technology for nominal flow rates from 10 ml<sub>N</sub>/min to 80 l<sub>N</sub>/min (N<sub>2</sub>)
- High accuracy
- Short response time
- Compact design and digital communication

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.

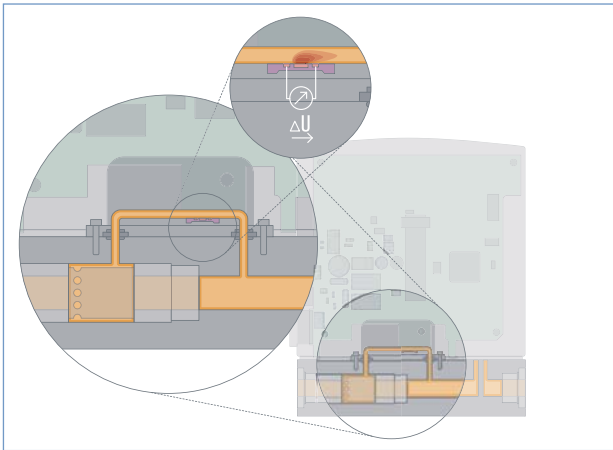
Technical Data			
<b>Nominal flow range<sup>1)</sup></b> (Q <sub>nominal</sub> )	10 ml <sub>N</sub> /min <sup>2)</sup> to 80 l <sub>N</sub> /min (N <sub>2</sub> ), see table on p. 2	<b>Power supply</b>	24V DC
<b>Turn-down ratio</b>	1:50, higher turn-down ratio on request	<b>Voltage tolerance</b>	±10%
<b>Operating gas</b>	Neutral, non-contaminated gases, on request	<b>Residual ripple</b>	< 2%
<b>Calibration gas</b>	Operating gas or air with conversion factor	<b>Power consumption</b>	Max. 11.5 W (depending on control valve used)
<b>Max. operating pressure</b> (Inlet pressure)	10 bar (145 psi) depending on the orifice of the valve	<b>Communication</b>	Digital via RS485 (half-duplex or full-duplex), RS422, RS232 via adapter
<b>Gas temperature</b>	-10 to +70°C (-10 to +60°C with oxygen)	<b>Protection class</b>	IP40
<b>Ambient temperature</b>	-10 to +50°C <sup>3)</sup>	<b>Dimensions [mm]</b>	see drawings p. 5-6
<b>Accuracy</b>	±0.8% o.R. ±0.3% F.S. (after 1 min. warm up time)	<b>Total weight</b>	ca. 500 g (aluminium body)
<b>Repeatability</b>	±0.1% F.S.	<b>Installation</b>	horizontal or vertical
<b>Response time (t<sub>95%</sub>)</b>	< 300 ms	<b>Light emitting diodes</b> (default functions, other functions programmable)	Indication for power, limit and error
<b>Materials</b>	Body Housing Seals	<b>Binary inputs</b> (default functions, other functions programmable)	Two 1. Start Autotune 2. not assigned
<b>Port connection</b>	NPT 1/4, G 1/4, screw-in fitting or sub-base, others on request	<b>Binary output</b> (default functions, other functions programmable)	One relay output for: 1. Limit (setpoint not reached) Max. Load: 25V, 1A, 25VA
<b>Electr. connection</b>	Plug D-Sub 9-pin		

<sup>1)</sup> 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.

<sup>2)</sup> Index N: Flow rates referred to 1.013 bar and 0° C.  
Alternatively Index S which refers to 1.013 bar and 20° C.

<sup>3)</sup> Higher temperature on request.

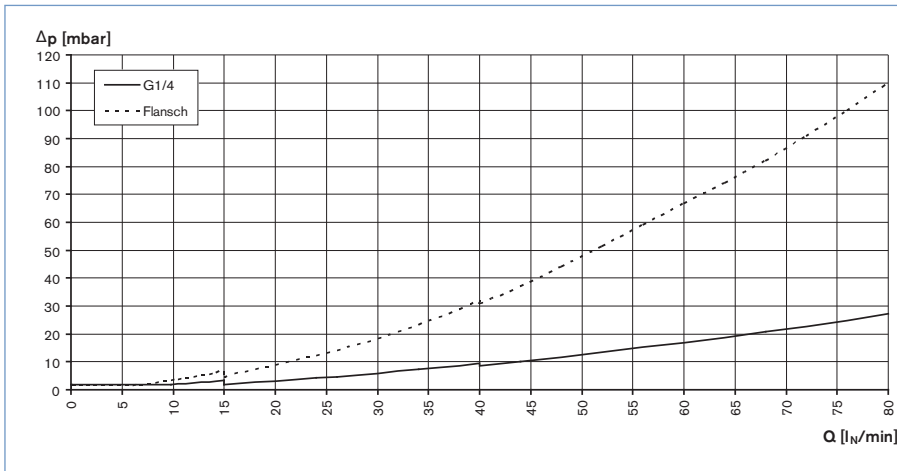
**Measurement principle**



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 flowing through. For determining the pressure loss with another gas it needs to calculate the air equivalent and respect the fluidics needed with the other gas.

**Notes regarding the selection of the unit**

(Other gases on request)

Gas	Min. Q <sub>Nom</sub> [l <sub>N</sub> /min]	Max. Q <sub>Nom</sub> [l <sub>N</sub> /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 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.**

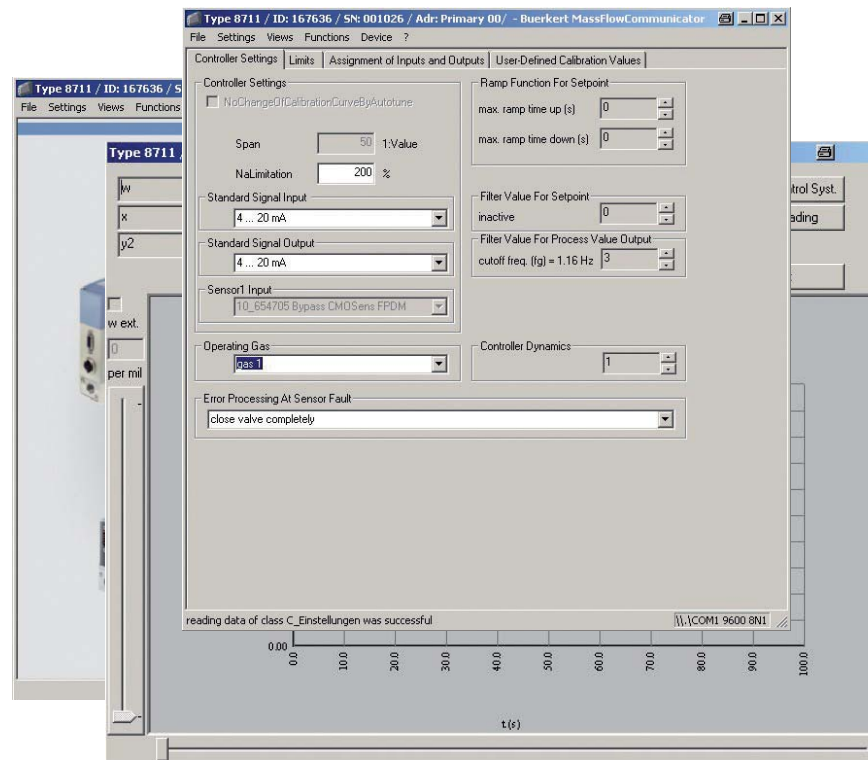
## Ordering table for accessories

Article	Item no.
<b>9-pin electrical connection</b>	
D-Sub socket 9-pin solder connection with housing	917 623
<b>Adapters <sup>4)</sup></b>	
RS232 adapter for connection with an extension cable (item NO.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
Communication software "MassFlowCommunicator"	Info at <a href="http://www.burkert.com">www.burkert.com</a> (type 8713)

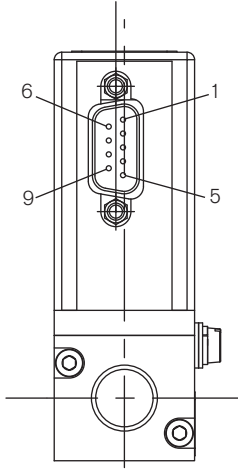
<sup>4)</sup> Das Adapterzubehör dient der Inbetriebnahme und Diagnose und ist nicht zwingend für den Betrieb erforderlich

## 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.

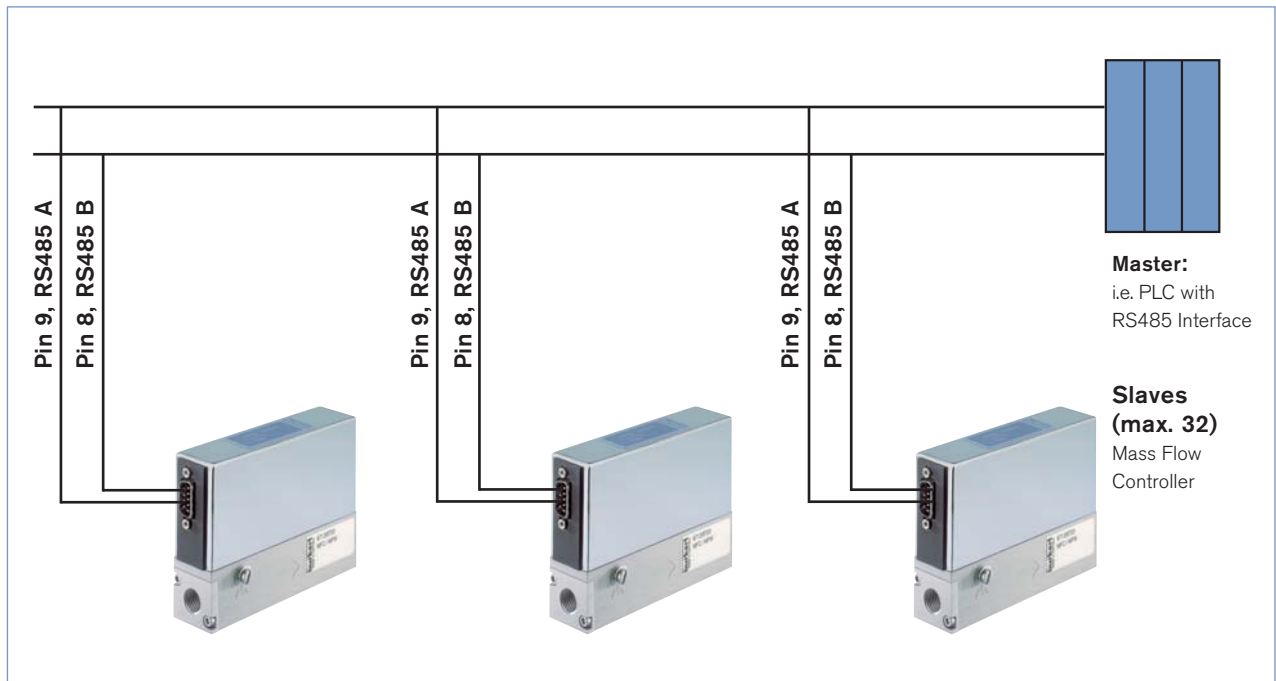


Pin Assignment



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





## 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/m<sup>3</sup> <sup>5)</sup>

Gas temperature [°C or °F]  °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>5)</sup>     l<sub>S</sub>/min (slpm) <sup>6)</sup>  
 Max.  m<sub>N</sub><sup>3</sup>/h <sup>5)</sup>     kg/h  
 cm<sub>N</sub><sup>3</sup>/min <sup>5)</sup>     cm<sub>S</sub><sup>3</sup>/min (sccm) <sup>6)</sup>  
 l<sub>N</sub>/h <sup>5)</sup>     l<sub>S</sub>/h <sup>6)</sup>

Inlet pressure at  $Q_{nom}$  <sup>7)</sup>     $p_1 =$   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

To find your nearest Bürkert facility, click on the orange box → [www.burkert.com](http://www.burkert.com)

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

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