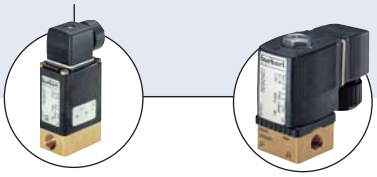
burkert
FLUID CONTROL SYSTEMS

Mass Flow Controller (MFC) 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 and repeatability
- Short settling time
- Compact design and digitally communication

Type 8713 can be combined with...



Typ 0330
3/2 or 2/2-way valve

Typ 6013
2/2-way valve

Type 8713 controls the mass flow of gases that is relevant for most applications in process technologies. The measured value will be compared in the digital control electronics with the predefined set point according to the signal; if a control difference is present, the control value output to the proportional valve will be modified using a PI-control algorithm. Due to the fact that the sensor is directly in contact with the gas a very fast response time of the MFC is reached. In this way, the mass flow can be maintained at a fixed value or a predefined profile can be followed, regardless of pressure variations or other changes in the system. Type 8713 can optionally be calibrated for two different gases, the user is able to switch between these two gases. As control element a direct-acting proportional valve guarantees a high sensitivity and a good control characteristics of the MFC. This instrument communicates digitally with master devices, 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[3]
Accuracy	±0.8% o.R. ±0.3% F.S. (after 1 min. warm up time)
Repeatability	±0.1% F.S.
Settling time ($t_{95\%}$)	< 300 ms
Materials	
Body	Aluminium or stainless steel
Housing	Metal
Seals	FKM, EPDM
Port connection	NPT 1/4, G 1/4, screw-in fitting or sub-base, others on request
Control valve	Normally closed
Valve orifice	0.05 to 4.0 mm
k_{VS} value	0.00006 to 0.32 m^3/h

Electr. connection	Plug D-Sub 9-pin
Power supply	24V DC
Voltage tolerance	±10%
Residual ripple	< 2%
Power consumption	3.5 - 11.5 W (depending on control valve used)
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 inputs (default functions, other functions programmable)	Start Autotune
Binary output (default functions, other functions programmable)	One relay output for: 1. Limit (setpoint not reached) 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 Index S which refers to 1.013 bar and 20° C
[3] When an internal 5 W valve is used: Max. 40°C

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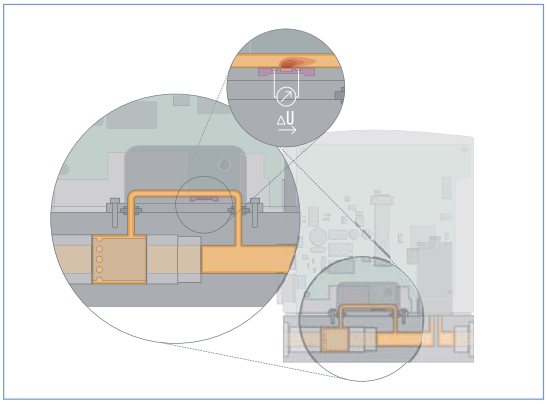
Measurement principle



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 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.

Nominal Flow Range of Typical Gases

(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

For the proper choice of the actuator orifice within the MFC, not only the required maximum flow rate Q_{nom}, but also the pressure values *directly* before and after the MFC (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 request for quotation form on p. 7 to indicate the pressures *directly* before and after the MFC. If these should be 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 MFC, respectively, at a flow rate of Q_{nom}.
In addition, please quote the maximum inlet pressure p_{1max} 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.

The request form on page 7 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.

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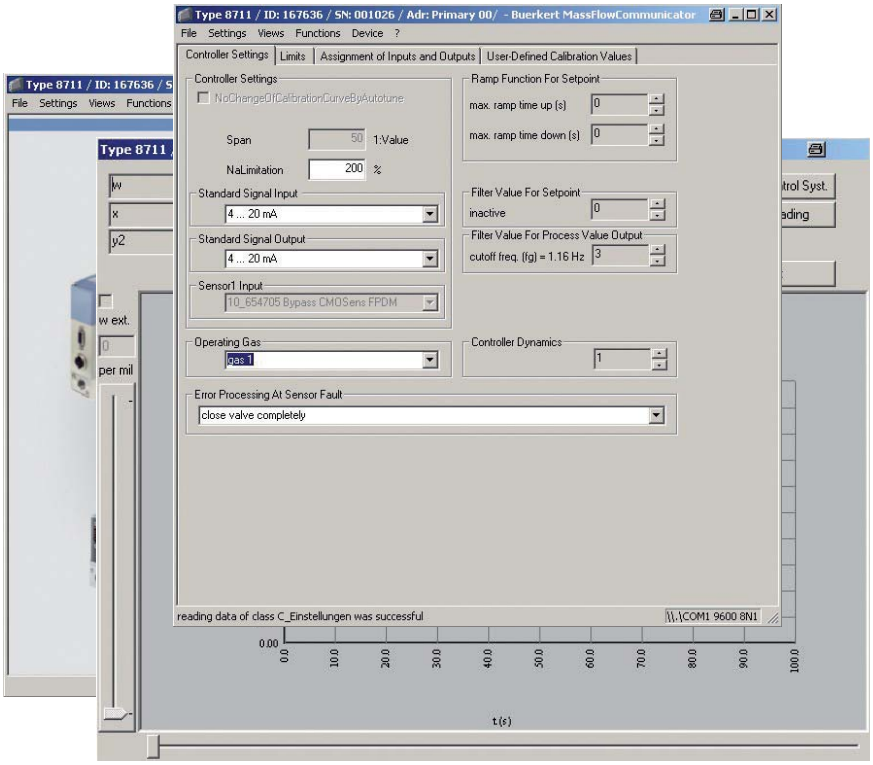
Ordering table for accessories

Article	Item no.
9-pin electrical connection	
D-Sub socket 9-pin solder connection with housing	917 623
Adapters [4]	
USB adapter (version 1.1, USB-socket type B)	670 693
USB connection cable 2 m	772 299
Communication software “MassFlowCommunicator”	Info at www.burkert.com

[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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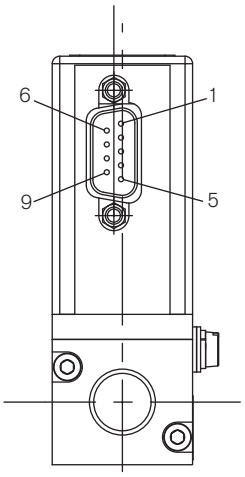
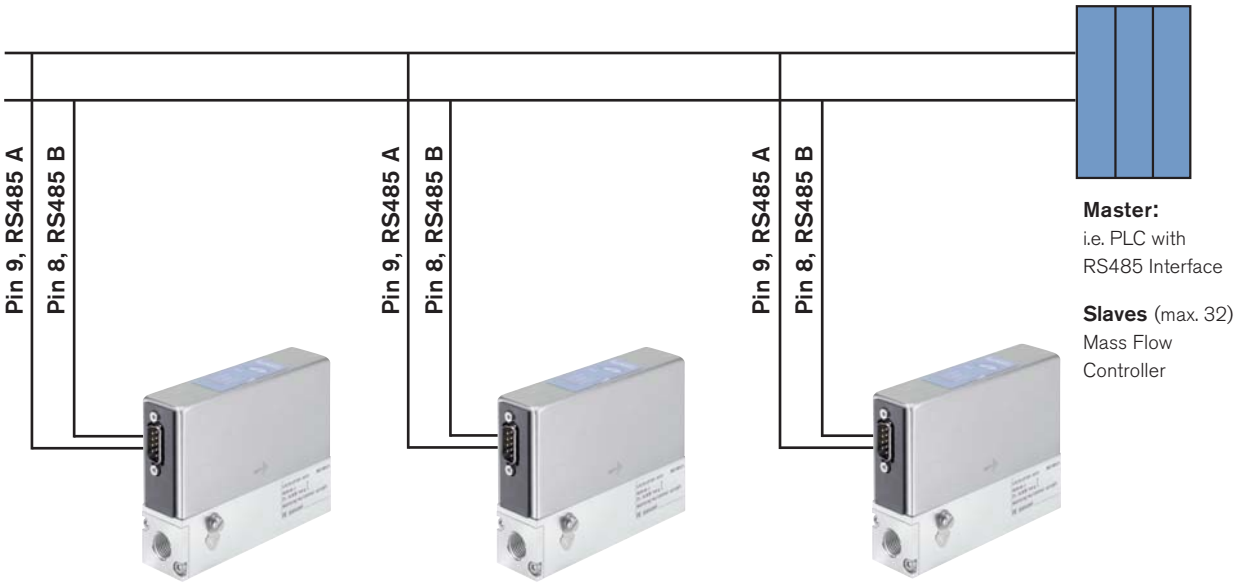
Pin Assignment



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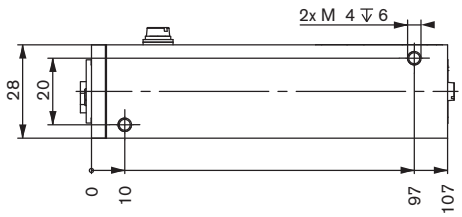
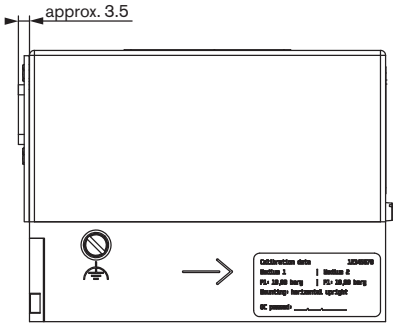
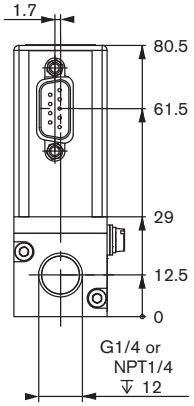
Dimensions [mm]

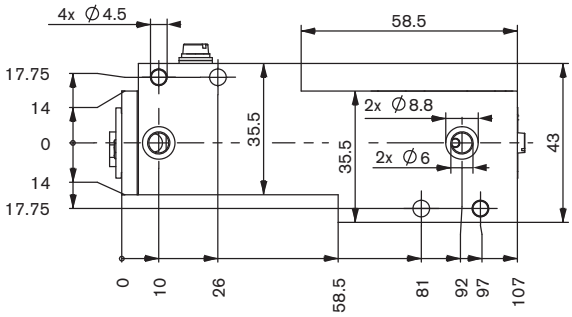
Threaded version

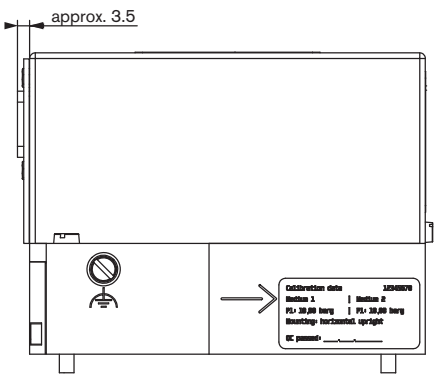


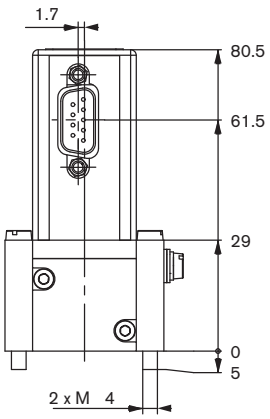




Sub-base version







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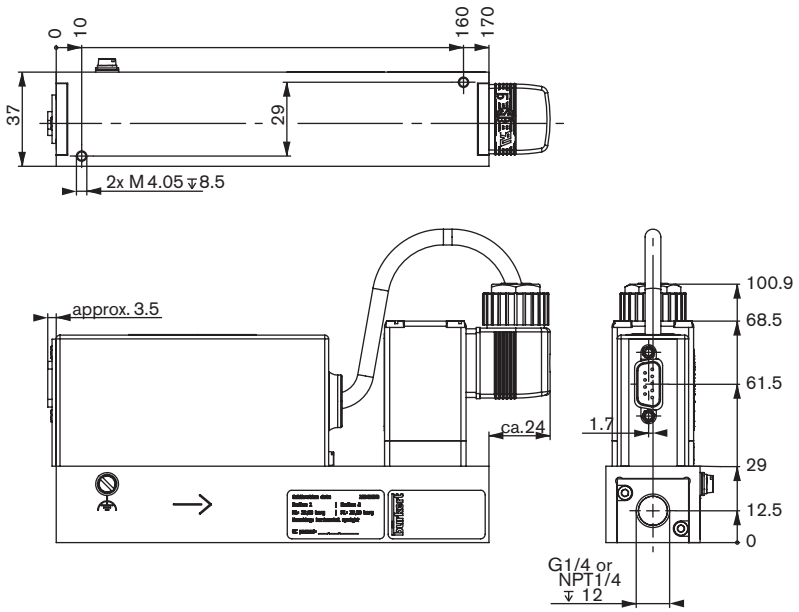
Dimensions [mm], continued

Version with external valve



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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

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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