bürkert
FLUID CONTROL SYSTEMS

Mass Flow Controller (MFC) for Gases

- Direct flow measurement with CMOSens®- Technology for nominal flow rates from 20 ml_N/min to 80 l_N/min (N_2)
- High accuracy and reproducibility
- Fast settling time
- Optional fieldbus

Type 8711 can be combined with...

Type 1150
Multi-channel program controller

Type 0330
3/2 or 2/2-way solenoid valve

Type 6013
2/2-way solenoid valve

Type 6606
2/2 or 3/2-way solenoid valve

MFC
Communications Software

Type 8711 controls the mass flow of gases that is relevant for most applications in process technology. The measured value provided by the sensor (see the description on page 2) 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 the bypass channel a very fast settling 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 8711 can optionally be calibrated for two different gases, the user is able to switch between these two gases. As the control element, a proportional valve working at low friction guarantees a high sensitivity and a good control characteristics of the unit. Typical application areas are gas dosing or rather the production of gas mixtures in:

- Test benches,
- Bio reactors,
- Heat treatment,
- Material coating,
- Burner controls and
- Fuel cell technology

Technical data	
Full scale ranges[1] (Q_{nom})	20 ml_N/min to 80 l_N/min (N_2), please see table on page 2
Operating Media	Neutral, non-contaminated gases, others on request
Max. operating pressure (at inlet)	10 bar (145 psi) depending on the orifice of the valve
Calibration medium	Operating gas or air with conversion factor
Medium temperature	-10 to +70°C
Ambient temperature	-10 to +50°C
Accuracy	±0.8% o.R. ±0.3% FS (after 1 min. warm up time)
Linearity	±0.1% FS
Repeatability	±0.1% FS
Control range	1:50, higher control range on request
Settling time ($t_{95\%}$)	< 300 ms
Body material	Aluminium or stainless steel
Electr. housing material	PC (Polycarbonate), optional metal
Sealing material	FKM, EPDM, others on request
Port connections	NPT 1/4, G 1/4, screw-in fitting or flange, others on request
Control valve valve orifices k_{VS}-values	Valve is closed when power is off 0.05 to 4.0 mm 0.00006 to 0.32 m^3/h
Electr. connection	Sub-D plug, 15-pin M12 5-pin for fieldbus
Power supply	24V DC
Voltage tolerance	±10%
Residual ripple	< 2%
Power consumption	Max. 3.5 - 14 W (depending on proportional valve used)
Set point Feed impedance	0-5 V, 0-10 V, 0-20 mA or 4-20 mA > 20 kΩ (voltage), < 300 Ω (current)
Output signal Max. current (volt. output) Max. load (current output)	0-5 V, 0-10 V, 0-20 mA or 4-20 mA 10 mA 600 Ω
Digital communication	PROFIBUS-DP, DeviceNet, CANopen, RS232 or RS485 (RS interface only with Adapter)
Protection class	IP40
Dimensions [mm] (without fitting)	See drawings
Total weight	ca. 500 g (aluminium body)
Mounting position	Horizontal or vertical
Light emitting diode display (default, other allocations possible)	Indication for Power, Limit (with analog signals) / Communication (with fieldbus), Error
Binary input (default, other allocations programmable)	Two 1. start autotune 2. not assigned
Binary output (default, other allocations programmable)	One relay-output 1. Limit (setpoint not reached) Load capacity: 25V, 1A, 25VA

[1] at standard conditions 1.013 bar (a) and 0°C

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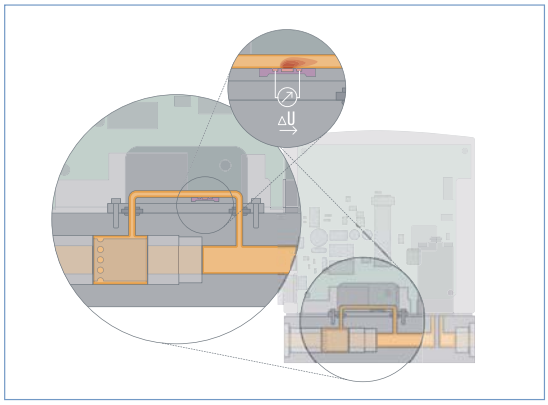
Measurement principle

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 CMOS 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.



Gas	Min. Q_{Nom} [Nl/min]	Max. Q_{Nom} [Nl/min]
Acetylene	0.02	40
Argon	0.05	80
Helium	0.2	500
Carbon dioxide	0.06	40
Air	0.02	80
Methane	0.03	80
Propane	0.01	20
Oxygen	0.02	80
Nitrogen	0.02	80
Hydrogen	0.2	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. 4 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 5 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.

Ordering table for accessories (connectors are not included in the delivery)

Article	Item no.
15-pin electrical connection	
Sub-D socket 15-pin solder connection	918 274
Sub-D hood for Sub-D socket, with screw locking	918 408
Sub-D socket 15-pin with 5m cable, ass. on one side	787 737
Sub-D socket 15-pin with 10m cable, ass. on one side	787 738
PROFIBUS DP	
M12 plug	918 198
M12 socket	918 447
PROFIBUS T-Connector	902 098
Adapter	
RS232 adapter	654 748
RS485 adapter	654 538
2m PC extension cable for RS232 9-pin socket/plug	917 039
USB adapter	670 639
MassFlowCommunicator Communication software	Download at www.burkert.com

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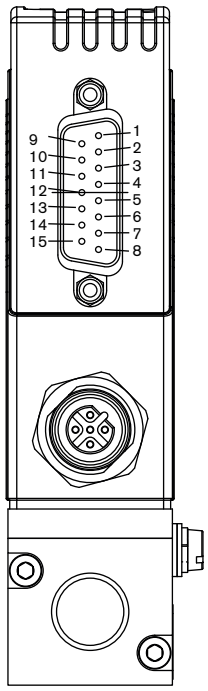
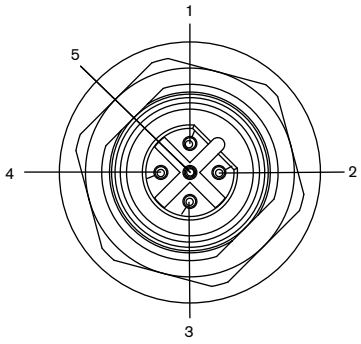
Pin Assignment



Sub-D plug, 15-pin

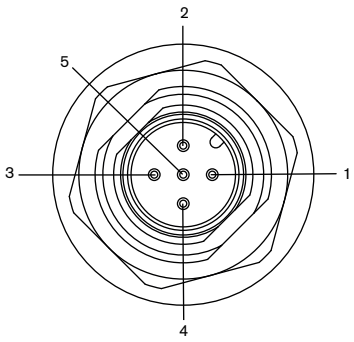
Pin	Connection
1	relay, NC contact
2	relay, NO contact
3	relay - middle contact
4	GND 24V-supply and binary inputs
5	supply +24V
6	8V output (only internal company use)
7	set-value input GND
8	set-value input +
9	actual value output GND
10	actual value output +
11	DGND (for RS232)
12	binary input 1
13	binary input 2
14	RS232 RxD (without driver)
15	RS232 TxD (without driver)

Fieldbus version



PROFIBUS DP – B-coded, M12 socket (DPV1 max. 12 MBaud)

Pin	Connection
1	VDD
2	RxD/ TxD – N (A-circuit)
3	DGND
4	RxD/ TxD – P (B-circuit)
5	not configured



DeviceNet, CANopen – plug M12

Pin	Connection
1	Shield
2	not configured
3	DGND
4	CAN_H
5	CAN_L

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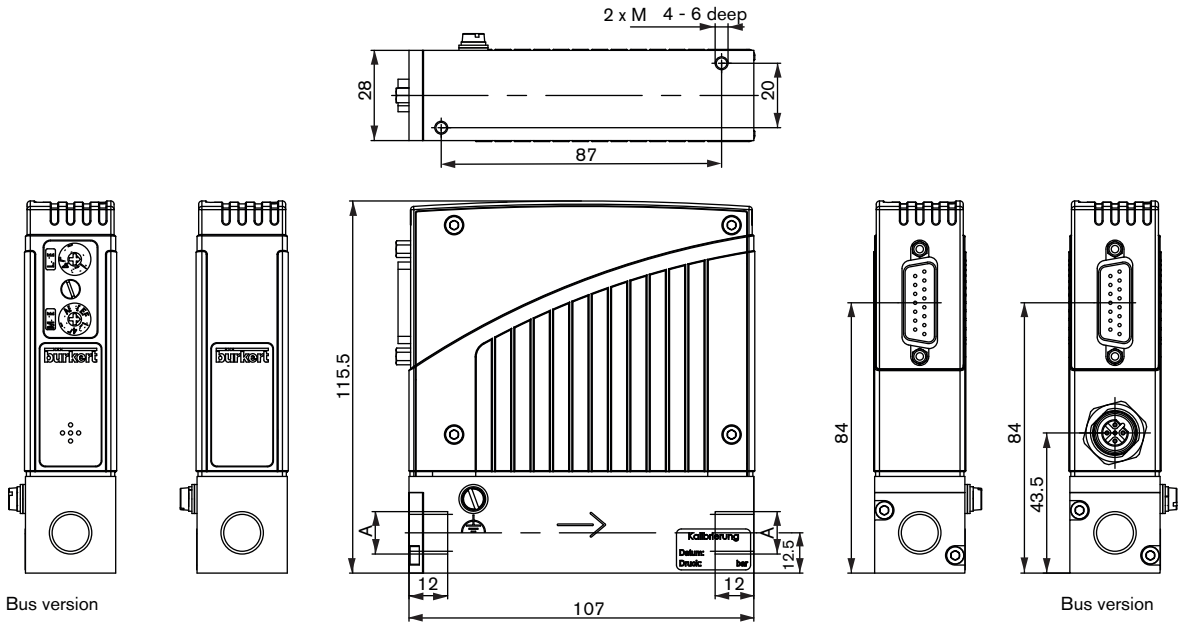
Dimensions [mm]

Standard version



Size A
G 1/4
NPT 1/4

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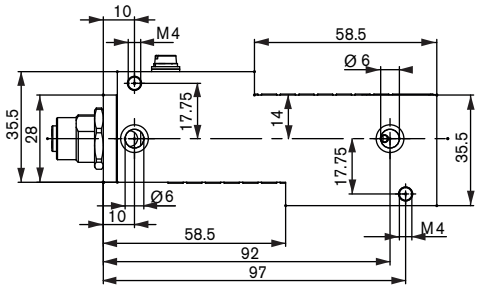
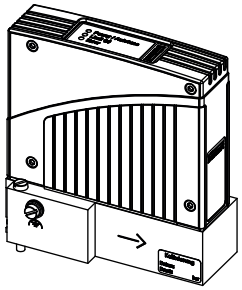
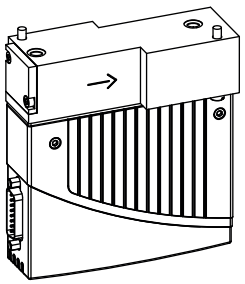
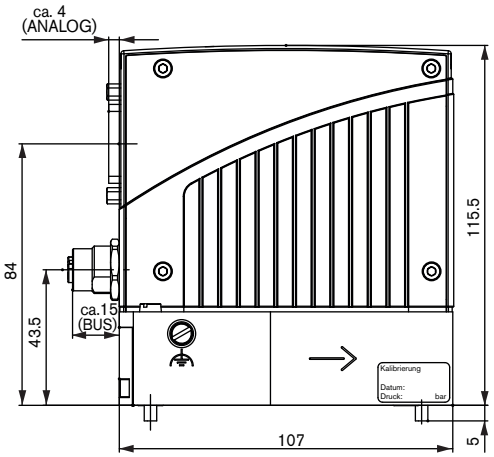
Dimensions [mm]

Sub-base version

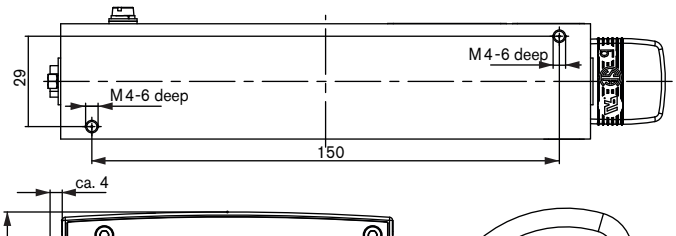


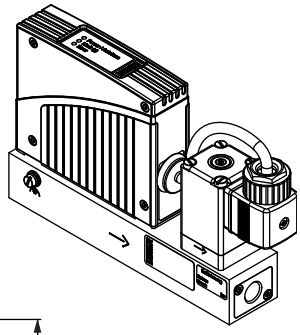


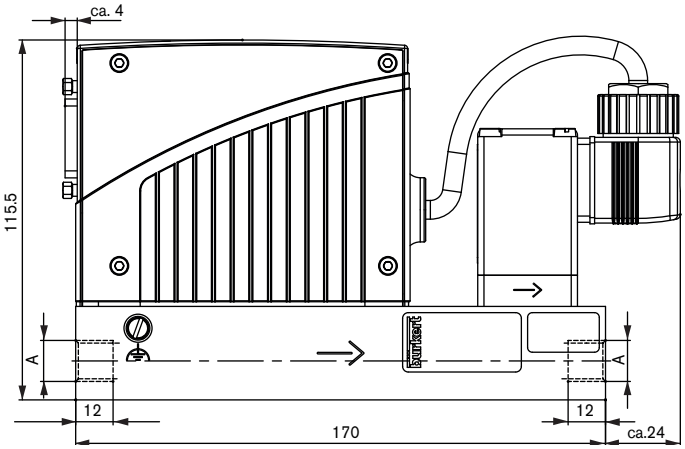


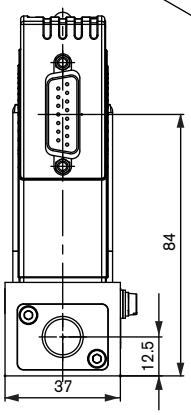


Version with external valve









Size A
G1/4
NPT 1/4

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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 fill out and send to your nearest Bürkert sales centre* together with your inquiry or order

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] [1] ☐

Medium temperature [°C or °F] ☐ °C ☐ °F

Moisture content [g/m³] ☐

Abrasive components / solid particles ☐ no ☐ yes as follows ☐

Fluidic data

Maximum flow Q_{nom} ☐ l_N/min [1] ☐ cm_N^3/min [1]

☐ m_N^3/h [1] ☐ cm_S^3/min (sccm) [2]

☐ kg/h ☐ l_S/min (slpm) [2]

Minimum flow Q_{min} ☐ l_N/min [1] ☐ cm_N^3/min [1]

☐ m_N^3/h [1] ☐ cm_S^3/min (sccm) [2]

☐ kg/h ☐ l_S/min (slpm) [2]

Inlet pressure at Q_{nom} p_1= ☐ barg ■

Outlet pressure at Q_{nom} p_2= ☐ barg ■

Max. inlet pressure p_{1max} ☐ barg ■

Pipe run (external-Ø) ☐ metric, mm ☐ imperial, inch

MFC/MFM-port connection

☐ without screw-in fitting

☐ 1/4" without screw-in fitting (DIN ISO 228/1)

☐ 1/4" NPT-thread (ANSI B1.2)

☐ with screw-in fitting

☐ sub-base version

Installation

☐ horizontal, valve upright (Standard) ☐ horizontal, valve reclined

☐ vertical, flow from above ☐ vertical, flow from below

Ambient temperature ☐ °C

Material data

Body material ☐ Aluminium ☐ Stainless steel

Seal material ☐ FKM ☐ EPDM ☐ other: _____

Electrical data

Output/input signal

with standard signal		with fieldbus
output	input	
☐ 0-5 V	☐ 0-5 V	☐ PROFIBUS-DP
☐ 0-10 V	☐ 0-10 V	☐ DeviceNet
☐ 0-20 mA	☐ 0-20 mA	☐ CANopen
☐ 4-20 mA	☐ 4-20 mA	

■ Please quote all pressure values as overpressures with respect to atmospheric pressure [barg]

1) at: 1.013 bar(a) and 0°C 2) at: 1.013 bar(a) and 20°C

To find your nearest Bürkert facility, click on the orange box → www.burkert.com

reset form

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

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