Mass Flow Controller for gases — **Type 8710**

Bypass-MFC, digital electronics, for nominal flow-rates of 50 ml_N/min to 30 l_N/min

PRODUCT INFORMATION

TECHNICAL DATA

Full scale ranges [1] (Q_{nom})	0.05 to 30 l_N/min ref. medium N_2	**Electrical connection**	15-pole Sub-D plug
Operating media	neutral, non-contaminated gases, others on request	**Power supply**	24V DC
		Voltage tolerance	±10%
		Residual ripple	<5%
Max. oper. pressure (Inlet pressure)	up to max. 10 bar, dep. on the valve's nom. diameter	**Power consumption**	max. 300mA at 24V DC
		Input signal (set point)	0-5 V, 0-10 V, 0-20 mA or 4-20 mA
Calibration medium	operating gas or N_2 with conversion factor	Input impedance	>300 kΩ (voltage), <200 Ω (current)
Medium temperature	-10 to +70°C	**Output signal** (actual value output)	0-5 V, 0-10 V, 0-20 mA or 4-20 mA
Ambient temp.	-10 to +55°C	Max. current, volt. out.	10 mA
Accuracy (after 15min warm up time)	±1.5% of Rdg. ±0.5% F.S.	Max. load, current out.	600 Ω
		Protection class	IP50
Linearity	±1% F.S.	**Dimensions [mm]** (without fittings)	80x109x25 (see drawing)
Repeatability	±0.5% F.S.		
Control range	1:50	**Total weight**	725 g (with fitting)
Settling time ($t_{95\%}$)	<2 s	**Mounting position**	horizontal or vertical
Body material	stainl. steel 1.4305	**LED display** (Default, other allocations possible)	status display for Power, Limit and Error
Electronics housing material	chromium plated steel sheet		
Sealing material	FPM, EPDM, others on request	**Binary input** (Default, other functions possible)	two 1. start autotune 2. not assigned
Port connection	G1/4 or with screw-in fitting for 6mm, 8mm or 1/4" pipe, others on request	**Binary output** (Default, other functions possible)	relay output for setpoint not reached loading: max. 25V, 1A, 25VA
Control valve (Proportional valve)	normally closed	**Certification** (see operating instructions)	different environmental testing, electromagnetic compatibility
Valve nom. diameter	0.05 to 1.6 mm		
k_{VS}-values	0.0002 to 0.05 m^3/h		

[1] at standard conditions 1.013 bar(a) and 273 K

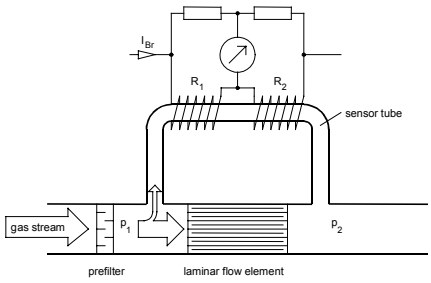
Please use the specification sheet for MFC / MFM applications on Page 3 for your query.

Functional principle

Flow sensors of the MFC type 8710 work according to an anemometric measuring procedure, which delivers the mass-flow value directly. Additional variables, such as the density, do not need to be measured or to be taken into consideration.

The measurement is carried out the Bypass principle. A laminar flow element in the main channel generates a small pressure drop that drives a small portion of the total flow, which is proportional to it, through the bypass channel. The bypass channel consists of a thin stainless steel tube onto which the two heating resistances R_1 and R_2 are wound. These heating resistances are connected to a measuring bridge (see illustration). When flow is taking place, heat will be transported in the direction of flow and will thereby unbalance the measurement bridge, which had previously been balanced.

The dynamic character of the measurement is determined by the sides of the sensor tubing, which act as a thermal barrier and is, in principle, worse than sensors whose resistances are located directly in the main flow. Using software algorithms, settling times are achieved which are sufficient for most applications. For applications with higher dynamic requirements, MFCs with inline sensors (Types 8626 and 8716) or bypass sensors using the CMOSens® technology (Typ 8712) should therefore be used.



Upstream filters are recommended for polluted media, in order to avoid a change of the division ratio between the main and the auxiliary flow and in the heat transfer due to deposition on the sides of the sensor tubing.

DESCRIPTION

The Type 8710 is a unit for the regulation of mass flows of gases that is relevant for most applications in Process Technology.

The measured value provided by the sensor (see the description alongside) will be compared in the digital regulation electronics with the predefined set-value according to the nominal signal; if a control difference is present, the control value output to the proportional valve will be modified using a PI-control algorithm.

In this way, the mass flow can be maintained at a fixed value or a predefined profile can be followed, independently of pressure variations or other changes in the system.

As the control element, a proportional valve working at low friction guarantees a high sensitivity and the good regulation characteristics of the unit.

Typical application areas are gas metering and/or the production of gas mixtures in

- process technology,
- packaging and foodstuff industry,
- environmental technology,
- surface refinement,
- material coating,
- burner controllers and
- fuel cell technology.

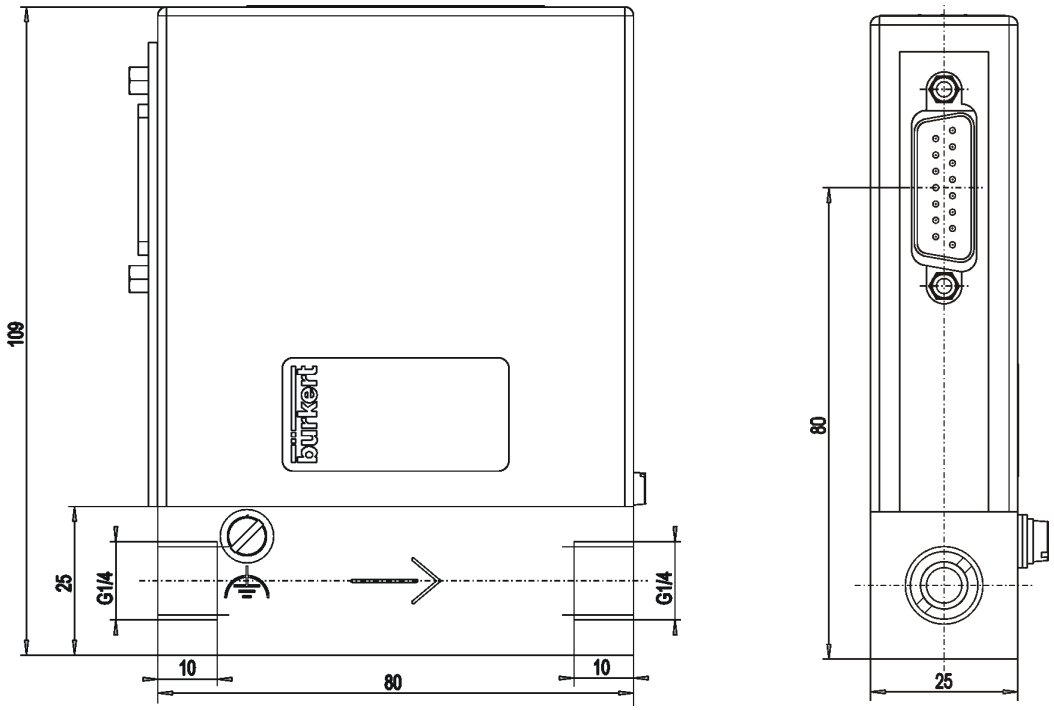
bürkert
Fluid Control Systems

Notes regarding the selection of the device

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 specification sheet (p. 3) 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 questionnaire on page 3 contains the relevant fluid specification. Please use in this way the experience of Burkert engineers already in the design phase and provide us with a copy of the questionnaire containing the data of your application together with your inquiry or order.

DIMENSIONS [mm]



PIN CONFIGURATION
15-pole Sub-D Plug

PIN	Connection
1	relay, NC contact
2	relay, NO contact
3	relay, C contact
4	supply GND
5	supply +24V
6	8V output (only company internal use)
7	set-value input GND
8	set-value input +
9	actual value output GND
10	actual value output +
11	GND (for binary inputs)
12	binary input 1
13	binary input 2
14	connection to a PC only over adapter
15	(see accessories)

Specification sheet for MFC / MFM applications

Please copy, fill in and send to your local Bürkert Sales Centre with your inquiry or order.

Design data for MFC- ☐/ MFM- ☐ applications,
Quantity: _____, Desired delivery date: _____

MEDIUM DATA	**Please fill in and mark the respective boxes with a cross**	
Type of gas (or gas proportion in mixtures)		
Density	_____ kg/ m^3	
Medium temperature	_____ ☐ °C or ☐ °F	
Moisture content	_____ g/ m^3	
Abrasive components / solid particles	☐ no ☐ yes, as follows:	
FLUIDIC DATA		
Maximum flow Q_{nom}	☐ _____ l_N/min ☐ _____ m_N^3/h ☐ _____ kg/h	☐ _____ cm_N^3/min ☐ _____ cm_s^3/min (sccm) ☐ _____ l_s/min (slpm)
Minimum flow Q_{min}	☐ _____ l_N/min ☐ _____ m_N^3/h ☐ _____ kg/h	☐ _____ cm_N^3/min ☐ _____ cm_s^3/min (sccm) ☐ _____ l_s/min (slpm)
Inlet pressure at Q_{nom} Outlet pressure at Q_{nom}	p_1 = _____ ☐ barg or ☐ psig ■ p_2 = _____ ☐ barg or ☐ psig ■	
Max. inlet pressure p_{1max}	_____ ☐ barg or ☐ psig ■	
Pipe run (external-∅)	☐ metric, _____ mm ☐ imperial, _____ inch	
MFC-/MFM-port connection (1/4"-3/4"-internal thread or screw-in fitting)	☐ without screw-in fitting, _____ inch ☐ G-thread (DIN ISO 228/1) ☐ NPT-thread (ANSI B1.2) ☐ with screw-in fitting	
Mounting position of the MFC/MFM	☐ horizontal, valve on top (standard) ☐ horizontal, valve on side ☐ vertical, flow upwards ☐ vertical, flow downwards	
Ambient temperature	_____ °C	
MATERIAL DATA		
Body material	☐ Aluminium (anodized) ☐ Stainless steel	
Sealing material	☐ FPM (Viton) ☐ EPDM ☐ other:	
ELECTRICAL DATA		
Output/input signal	☐ 0-20mA / 0-20mA ☐ 4-20mA / 4-20mA ☐ 0-10V / 0-10V ☐ 0-5V / 0-5V	

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

Please don't forget the customer data!

Company	Contact person
Customer No.	Department
Address	Tel. / Fax
Postcode / Town	E-mail