



## Mass Flow Controller (MFC) for gases

- Bypass MFC with CMOSens® technology for nominal flow rates from 20 ml<sub>N</sub>/min to 50 l<sub>N</sub>/min
- High accuracy
- Fast settling time
- Fieldbus option

Type 8712 is a unit for the control of 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 regulation 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 8712 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 the good control characteristics of the unit.

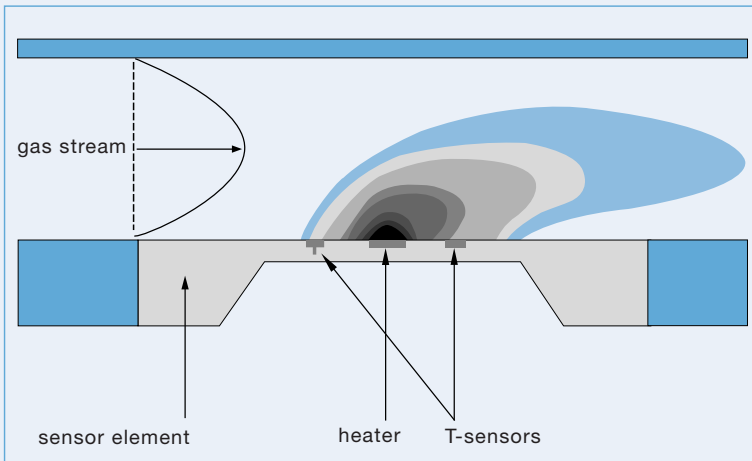
Typical application areas are gas dosing or rather the production of gas mixtures in:

- Process technology
- Packaging and foodstuff industry
- Environmental technology
- Surface treatment
- Material coating
- Burner controllers
- Fuel cell technology

Technical Data	
<b>Full scale ranges<sup>1)</sup></b> (Q <sub>nom</sub> )	0.02 to 50 l <sub>N</sub> /min N <sub>2</sub> equivalent
<b>Operating media</b>	neutral, non-contaminated gases, other gases on request
<b>Max. operating pressure</b> (Inlet pressure)	10 bar (145 psi) depending on the orifice of the valve
<b>Calibration medium</b>	operating gas or air with conversion factor
<b>Medium temperature</b>	-10 to +70°C
<b>Ambient temperature</b>	-10 to +50°C
<b>Accuracy</b> (after 1 min. warm up time)	±1% of rate. ±0.5% F.S.
<b>Linearity</b>	±1% F.S.
<b>Repeatability</b>	±0.5% F.S.
<b>Control range</b>	1:50; 1:500 on request
<b>Settling time (t<sub>95%</sub>)</b>	<300ms
<b>Body material</b>	stainless steel 1.4305
<b>Electr. housing material</b>	PPS
<b>Sealing material</b>	FPM, EPDM, others on request
<b>Port connections</b>	G 1/4, NPT 1/4 or screw-in fitting
<b>Control valve</b> (proportional valve) valve orifice k <sub>v</sub> -value	valve is closed when power is off 0.05 to 1.6 mm 0.0002 to 0.05 m <sup>3</sup> /h
<b>Electr. connection</b> round socket sub-HD socket <b>Fieldbus comm.</b>	8-pin 15-pin 9-pin sub-D socket
<b>Power supply</b>	24V DC
<b>Voltage tolerance</b>	±10%
<b>Residual ripple</b>	<5%
<b>Power consumption</b>	max. 7.5 W at 24V DC, max. 10 W at 24V DC with Fieldbus comm.
<b>Set point</b>  Feed impedance	0-5V, 0-10V, 0-20 mA or 4-20 mA >20 kΩ (voltage) <300 Ω (current)
<b>Output signal</b>  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
<b>Fieldbus comm.</b>	Profibus-DP, DeviceNet, others on request
<b>Protection class</b>	IP65
<b>Dimensions [mm]</b> (without fitting)	115 x 137.5 x 37 mm
<b>Total weight</b>	1200 g
<b>Mounting position</b>	horizontal or vertical
<b>Light emitting diodes</b> (Default, other allocations possible)	indication for Power, Communication, Limit, Error
<b>Binary input</b> (Default, other functions possible)	three 1. start autotune 2. not assigned 3. not assigned
<b>Binary output</b> (Default, other functions possible)	two relay-outputs for 1. setpoint not reached 2. error (e.g. sensor fault) max.load: 60 V, 1 A, 60 VA
<b>Certification</b> (see operating instructions)	various environmental testing, electromagnetic compatibility

<sup>1)</sup> at reference conditions 1.013 bar(a) and 0°C

## Functional principle of the registration of the measured values



The actual flow rate is detected by a sensor operating according to a thermal principle which has the advantage of delivering the mass flow without any corrections for pressure or temperature being needed.

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) being 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.

### 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.

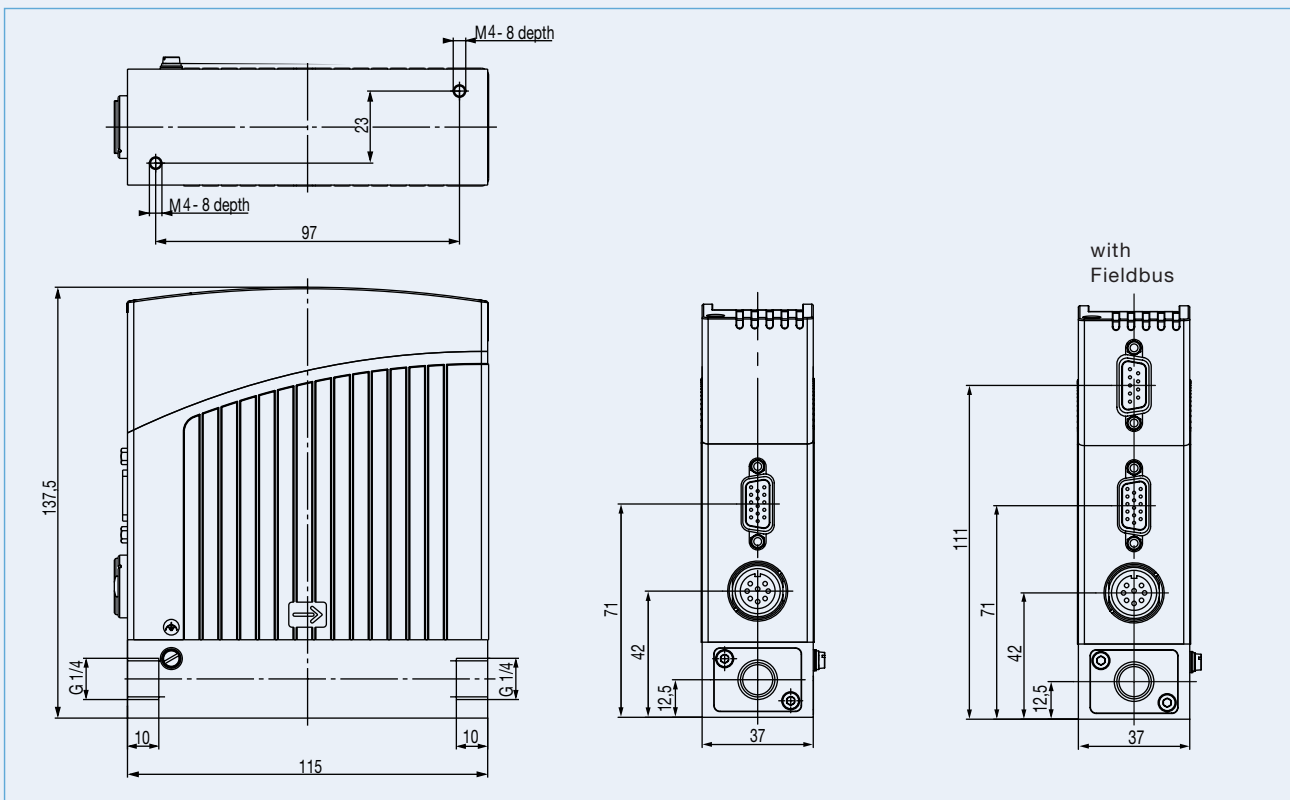
Please use the specification sheet (p. 4) to indicate the pressures *directly* before and after the MFC. If these should

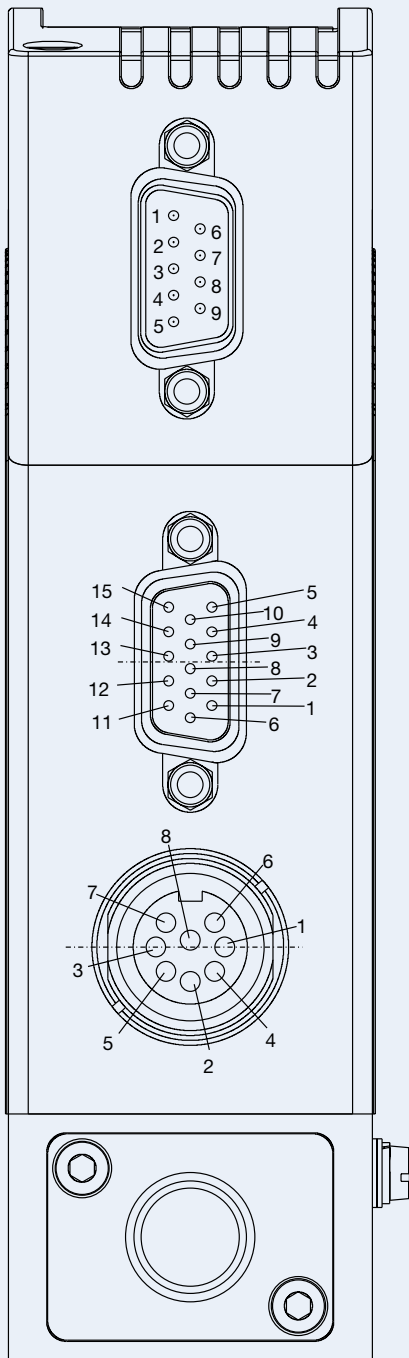
be unknown or not accessible to a measurement, estimates are to be made by taking into account the approximate pressure drops over the flow resistors before and after the MFC, respectively, at a flow rate of  $Q_{nom}$ .

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 questionnaire on page 4 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]





**9-pin Sub-D socket**

with Profibus-DP

Pin	Connection
1	shield
2	not used
3	RxD/TxD - P (B-line)
4	RTS (control signal for repeater)
5	GND
6	VDD
7	not used
8	RxD/TxD - N (A-line)
9	not used

with DeviceNet

Pin	Connection
1	shield
2	CAN_L
3	GND
4	not used
5	not used
6	not used
7	CAN_H
8	not used
9	not used

**15-pin Sub-HD socket**

Pin	Connection
1	signal input +
2	signal input GND
3	signal output +
4	binary input 2
5	12V-output (only company internal use)
6	RS232 TxD (direct connection to PC)
7	binary input 1
8	DGND (for binary inputs)
9	only company internal use (do not connect!)
10	12V-output (only company internal use)
11	12V-output (only company internal use)
12	binary input 3
13	signal output GND
14	RS232 RxD (direct connection to PC)
15	DGND (for RS232)

(with bus version 1-3 and 13 not used)

**8-pin socket round**

Pin	Connection
1	supply 24V +
2	relay 1 - middle contact
3	relay 2 - middle contact
4	relay 1 - opener
5	relay 1 - closer
6	supply GND
7	relay 2 - closer
8	relay 2 - opener

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

Article	Ordering- No.
Round plug 8-pin Binder (solder termination)	918 299
Round plug 8-pin with 5m – cable, on one side prefabricated	787 733
Round plug 8-pin with 10m – cable, on one side prefabricated	787 734
SUB-HD-plug 15-pin with 5m – cable, on one side prefabricated	787 735
SUB-HD-plug 15-pin with 10m – cable, on one side prefabricated	787 736
RS232-adapter – for connection to a PC	654 757
Cable for RS232 9-pin socket/plug 2m	917 039

## Specification sheet for MFC/MFM applications

▶ Please fill in and send to your local Bürkert Sales Centre via e-mail, fax or regular post together with your inquiry or order

<input type="checkbox"/> MFC-application	<input type="checkbox"/> MFM-application	<input type="text"/> Quantity	<input type="text"/> Desired delivery date
<b>Medium Data</b>			
Type of gas (or gas proportion in mixtures)	<input type="text"/>		
Density [kg/m <sup>3</sup> ] <sup>1)</sup>	<input type="text"/>		
Medium temperature [°C or °F]	<input type="text"/> °C	<input type="text"/> °F	
Moisture content [g/m <sup>3</sup> ]	<input type="text"/>		
Abrasive components/solid particles	<input type="checkbox"/> no	<input type="checkbox"/> yes, as follows <input type="text"/>	
<b>Fluidic Data</b>			
Maximum flow $Q_{nom}$	<input type="text"/> l <sub>N</sub> /min <sup>1)</sup>	<input type="text"/> cm <sub>N</sub> <sup>3</sup> /min <sup>1)</sup>	
	<input type="text"/> m <sub>N</sub> <sup>3</sup> /h <sup>1)</sup>	<input type="text"/> cm <sub>s</sub> <sup>3</sup> /min (sccm) <sup>2)</sup>	
	<input type="text"/> kg/h	<input type="text"/> l <sub>s</sub> /min (slpm) <sup>2)</sup>	
Minimum flow $Q_{min}$	<input type="text"/> l <sub>N</sub> /min <sup>1)</sup>	<input type="text"/> cm <sub>N</sub> <sup>3</sup> /min <sup>1)</sup>	
	<input type="text"/> m <sub>N</sub> <sup>3</sup> /h <sup>1)</sup>	<input type="text"/> cm <sub>s</sub> <sup>3</sup> /min (sccm) <sup>2)</sup>	
	<input type="text"/> kg/h	<input type="text"/> l <sub>s</sub> /min (slpm) <sup>2)</sup>	
Inlet pressure at $Q_{nom}$	$p_1 =$ <input type="text"/> barg or	<input type="text"/> psig	■
Outlet pressure at $Q_{nom}$	$p_2 =$ <input type="text"/> barg or	<input type="text"/> psig	■
Max. inlet pressure $p_{1max}$	<input type="text"/> barg or	<input type="text"/> psig	■
Pipe run (external-Ø)	<input type="text"/> metric, mm	<input type="text"/> imperial, inch	
MFC/MFM-port connection (1/4"-internal thread or screw-in fitting)	<input type="checkbox"/> without screw-in fitting <input type="checkbox"/> G-thread (DIN ISO 228/1) <input type="checkbox"/> NPT-thread (ANSI B1.2) <input type="checkbox"/> with screw-in fitting		
Ambient temperature	<input type="text"/> °C		
<b>Material Data</b>			
Body material	<input type="checkbox"/> Stainless steel		
Sealing material	<input type="checkbox"/> FPM (Viton) <input type="checkbox"/> EPDM   Other: <input type="text"/>		
<b>Electrical Data</b>			
Output/input signal	<input type="checkbox"/> 0–20 mA/0–20 mA	<input type="checkbox"/> 4–20 mA/4–20 mA	
	<input type="checkbox"/> 0–10 V/0–10 V	<input type="checkbox"/> 0–5 V/0–5 V	
Fieldbus communication	<input type="checkbox"/> Profibus-DP	<input type="checkbox"/> DeviceNet	
■ 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

▶ Please do not forget to fill in the customer data below

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

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

We reserve the right to make technical changes without notice.

DTS-8712/ 301-GB/ 1-0276