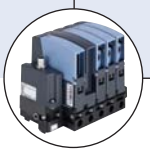
burkert
FLUID CONTROL SYSTEMS

Mass Flow Controller (MFC)/ Mass Flow Meter (MFM) for Gases

- Nominal flow ranges from 20 lN/min up to 2500 lN/min
- High accuracy and repeatability
- Communication via fieldbus based on CANopen
- Optional: ATEX II Cat. 3G/D
- Electromagnetic and motor-driven valve actuation available

büS

Type 8746 can be combined with…



Type ME2X
System Control Unit with Gateway functionality

Type 0330
3/2 way valve

Type 6013
2/2 way valve

Type 6027
2/2 way valve

The mass flow controller / meter Type 8746 for gases is intended for the use in a büS or CANopen network. The büS network technology is based on CAN physics and was developed by Bürkert especially for Industrial Ethernet or fieldbus communication in applications with multiple control loops. In combination with the system control unit (SCU) Type ME2X, the CANopen based communication can be translated to the customer's fieldbus. The mass flow controller (MFC) / meter (MFM) can always be switched between büS and CANopen communication. Given that, Type 8746 can also be directly integrated into existing CANopen networks.

Type 8746 can be configured as MFM or MFC. Optional, four different gases can be calibrated. The thermal inline sensor is located directly in the main gas stream and therefore reaches very fast response times. A direct-acting proportional valve as regulating unit guarantees high sensitivity. The integrated PI controller ensures outstanding control characteristics of the MFC / MFM. Type 8746 is especially designed for use in harsh environments due to a low sensitivity to contamination, high protection class and explosion-proof.

MFC Type 8746 is available in two versions:
- Type 8746: with electromagnetic proportional valve
- Type 8746: with motor-driven proportional valve

General technical data	
Operating medium	Neutral, non-contaminated gases, others on request
Calibration medium	Operating gas or air with correction function
Medium temperature	-10 °C[1] to +70 °C (-10 °C[1] to +60 °C with oxygen)
Ambient temperature	-10 °C to +50 °C (higher temperatures on request)
Materials	
Body	Stainless steel or aluminium
Housing	Aluminium diecasting (coated)
Seals	FKM or EPDM (depending on gas)[2]
Port connection	G 1/4″, 3/8″, 1/2″, 3/4″, 1″, NPT 1/4″, 3/8″, 1/2″, 3/4″, 1″
Electr. connection	M12 plug, 5-pin
Operating voltage	24 V DC
Voltage tolerance	± 10%
Residual ripple	± 2%
Digital Comm.	CANopen or CAN based büS
Configuration memory (included in delivery)	EEPROM (µSIM card: büS relevant data and information about spec. control loop in order to ease replacement)
Input-/ Output signals	none, communication via bus
Installation	horizontal or vertical

Nom. flow ranges of typical gases (Other gases on request)		
Gas	**Min. Q_{nom} [l_N/min]**	**Max. Q_{nom} [l_N/min]**
Acetylene	20	975
Ammoniac	20	1250
Argon	20	1600
Carbon dioxide	20	1000
Air	20	2500
Methane	20	400
Propane	20	400
Oxygen	20	2500
Nitrogen	20	2500

[1] When using a motor valve the minimum medium temperature is 0 °C.
[2] When using a motor valve additionally:
- Type 3280 DN4: Seat seal in PEEK
- Type 3285: Seat seal in Al_2O_3

DTS 1000241027 EN Version: F Status: RL (released | freigegeben | validé) printed: 30.03.2017

Technical data: Type 8746 with electromagnetic proportional valve

Type 8746 can be configured as MFM or MFC. For MFCs the direct-acting proportional valves of Types 287x are used. These electromagnetic proportional valves are normally closed and stand for highest accuracy and repeatability with settling / response times of few hundred milliseconds.

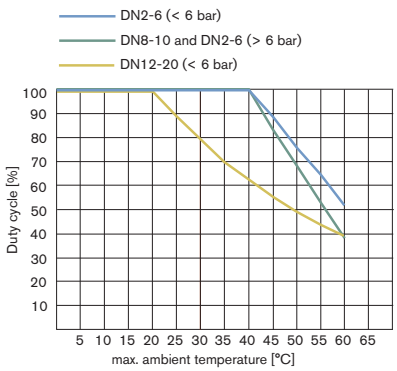
Technical data	
Nominal flow range (Q_{Nom})	20 to 1500 l_N/min (N_2), MFM up to 2500 l_N/min (N_2)
Turn-down ratio	50:1 [3]
Max. operating pressure Data in overpressure to atmospheric pressure	10 bar (with MFCs the max. pressure depends on the orifice of the valve) optional up to 25 bar for MFM
Accuracy	±1.5% v.M. ±0.3% v.E. (after 15 min. warm up time)
Repeatability	±0.1% v.E.
Settling (MFC)/ Response (MFM) time ($t_{95\%}$)	< 500 ms
Proportional valve (electromagnetic) Valve orifice range k_vs value range	normally closed 0.8 to 12 mm 0.02 to 2.5 m³/h
Power consumption [4]	Max. 2 W (as MFM) Max. 10.5 – 29.5 W (as MFC, depending on valve type)
Protection class	IP65 and IP67
ATEX compliance (optional)	II 3G Ex nA IIC T* Gc X and II 3D Ex tc IIIC T***°C Dc X [5]
Dimensions	See pages 5-8
Total weight	ca. 1.8 kg (Al, 16 W-valve), ca. 3.1 kg (VA, 16 W-valve)
Device status	RGB-LED based on NAMUR NE107

[3] With vertical installation and flow downwards the turn-down ratio is 1:10
[4] Referring to the typical power consumption (at 23 °C ambient temperature, nominal flow and 30 mins regular operation) The data according to UL 61010-1 may differ (see manual)
[5] Acc. to DIN EN 60079-0 and DIN EN 60079-15, T3/4 and T160°C/135°C depending on the device version

Technical data: Type 8746 with motor-driven proportional valve

The Type 8746 with motor-driven valves is especially designed for applications with high inlet pressures up to 22 bars or high flow rates (at a low pressure drop). The motor's power consumption to hold a specific opening position is nearly zero. This key feature can reduce the energy consumption of a plant dramatically. Without electrical power the valve remains in its current position.
The maximum duty cycle of the motor depends on the ambient temperature. The duty cycle does not refer to the duty cycle of the device but to the duty cycle of the motor. The motor is not switched on unless the valve is to move. Frequent set-point value changes will drastically increase the duty cycle of the motor.

Derating curve for Type 8746 with motor valve



Technical data	
Nominal flow range (Q_{Nom})	20 up to 2500 lN/min (N_2)
Turn-down ratio	50:1 [6]
Max. operating pressure Data in overpressure to atmospheric pressure	22 bar (with MFCs the max. pressure depends on the orifice of the valve)
Accuracy	± 2% v.E. (after 15 min. warm up time)
Repeatability	± 0.5% v.E.
Settling time (t95%)	< 5 s
Proportional valve (motor-driven) Valve orifice range k_vs value range	normally persisting 2 to 20 mm 0.5 to 7.8 m³/h
Power consumption	Max. 2 W (as MFM) Max. 10 – 14 W (as MFC) [7]
Protection class	IP50 (higher protection class on request)
Dimensions	See pages 9-10
Total weight	ca. 1.67 kg (Al, standard, valve 3280), ca. 2.94 kg (VA, standard, valve 3280)
Device status [8]	at MFM: RGB-LED based on NAMUR NE107 at valve: RGB-LED displaying the valve opening

[6] With vertical installation and flow downwards the turn-down ratio is 1:10
[7] Data during moving of the valve. The power to hold a specific valve opening <1 W
[8] Detailed description of the LED colors: see manual

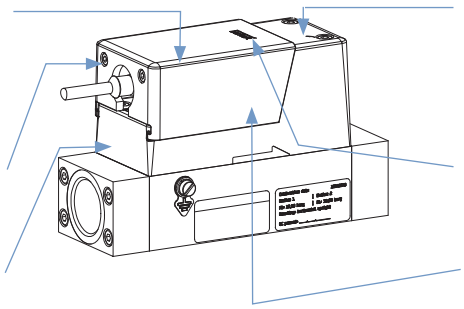
DTS 1000241027 EN Version: F Status: RL (released | freigegeben | validé) printed: 30.03.2017

Features to fulfil the ATEX requirements

Impact protection cap prevents damage of the M12 plug and all connected elements if mechanical stress is applied. No particular ATEX sockets are required

Screws prevent uncoupling of the M12 connection under tension

Die cast housing maintains IP protection under high mechanical stress

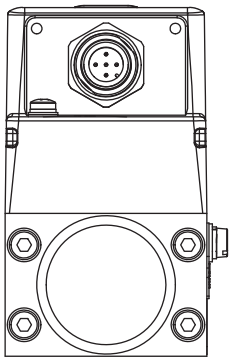


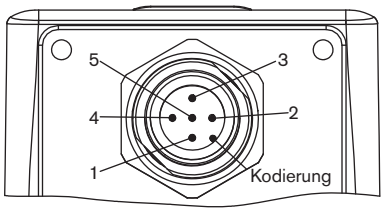
Standard requirements for cable glands are fulfilled for versions with external valve

LED display protected against mechanical stress

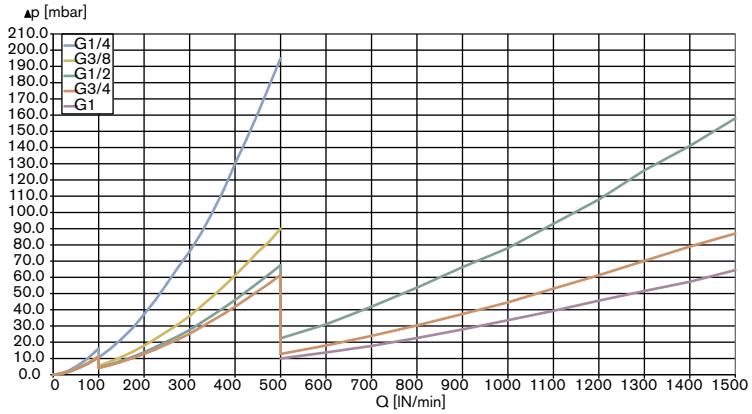
M12 plug achieves protection class IP65 and IP67 with and without mounted counterpart

Pin Configuration



M12 Plug, 5-pin (A-coded)	Pin	Configuration
	1	SHIELD
	2	V+
	3	DGND
	4	CAN_H
	5	CAN_L

Pressure Loss Diagram of a MFM (ref. to air, with 250 µm 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.

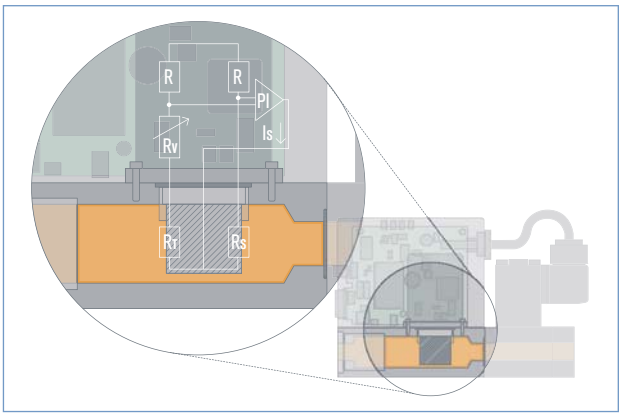
Notes Regarding the Configuration

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. 12 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 p1max 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 12 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.

DTS 1000241027 EN Version: F Status: RL (released | freigegeben | validé) printed: 30.03.2017

Measuring Principle



This sensor works as a hot-film anemometer in the so-called CTA operational mode (Constant Temperature Anemometer). To do this, two resistors with precisely specified temperature coefficients located directly in the media flow and three resistors located outside the flow are connected together to form a bridge.

The first resistor in the gas flow (R_T) measures the fluid temperature, while the second, low-value resistor (R_S) is heated so that it is maintained at a fixed, predefined over-temperature with respect to the fluid temperature. The heating current required to maintain this is a measure of the heat being removed by the flowing gas, and represents the primary measurement.

An adequate flow conditioning within the MFC and the calibration with high-quality flow standards ensure that the mass of gas flowing per time unit can be derived from the primary signal with high accuracy.

Software Bürkert Communicator

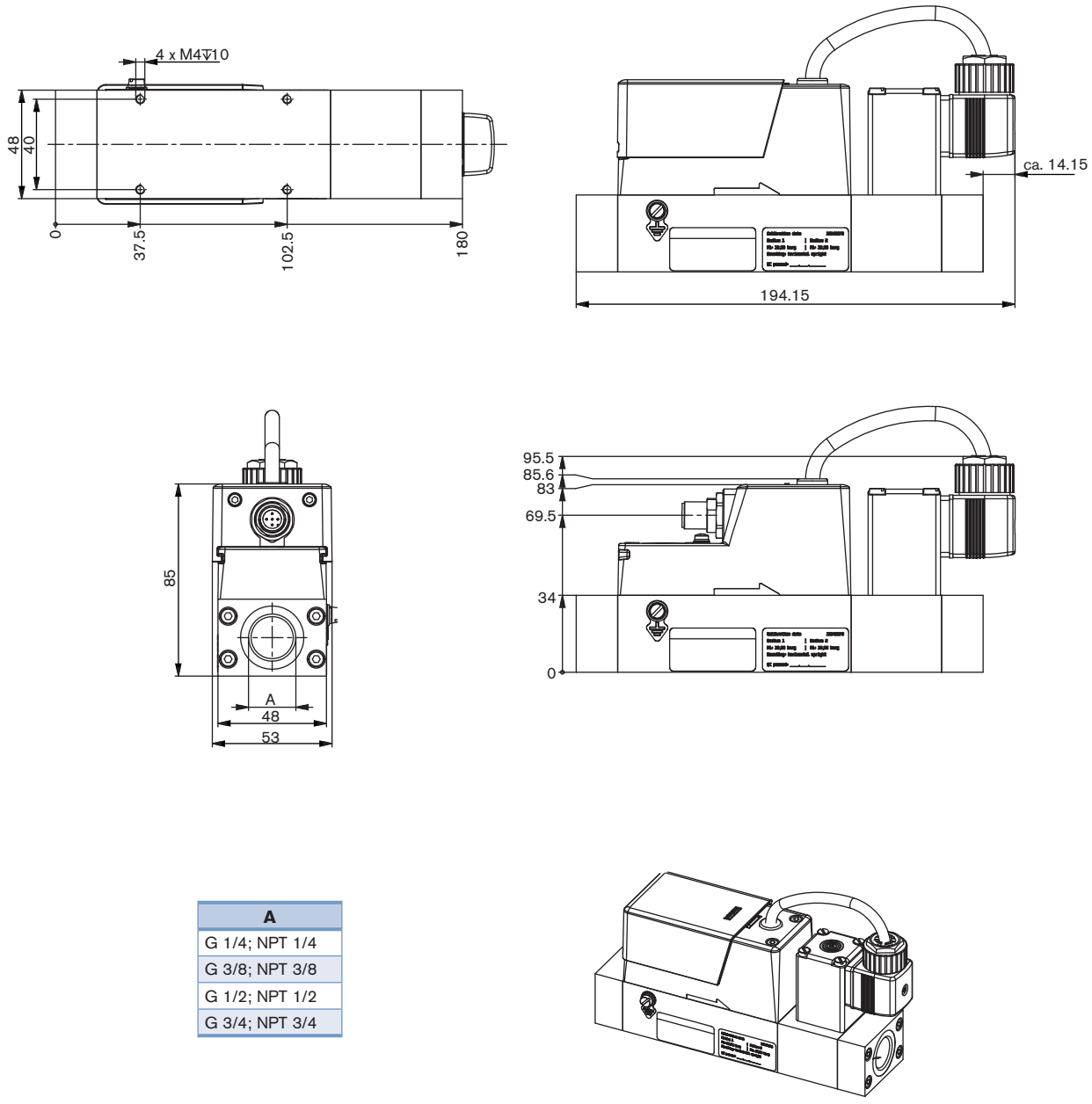
Part of Bürkert's new EDIP program (Efficient Device Integration Platform) is the Bürkert Communicator. This software can be run under MS-Windows and it is available on Bürkert's website for free. The Bürkert Communicator allows convenient system configuration and parameterization of all connected field devices. An accessory part, the büS stick – please see ordering chart for accessories – serves as the interface between computer and process instruments. It transfers "USB data" to "CAN data". The Communicator allows:

- Diagnosis - Parameterization - Registration and storage of process data. The Communicator allows:
- Diagnosis
- Parameterization
- Registration and storage of process data
- Data logging
- To watch graph of process
- To update firmware of the büS device connected
- To program system controls by User-f(x) – e.g. gas blending
- guided re-calibration
- …

DTS 1000241027 EN Version: F Status: RL (released | freigegeben | validé) printed: 30.03.2017

Dimensions [mm] Type 8746

MFC with valve Type 2873 (9 W-coil)

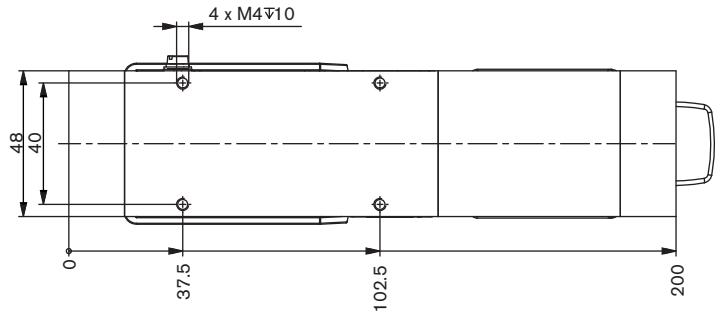


A
G 1/4; NPT 1/4
G 3/8; NPT 3/8
G 1/2; NPT 1/2
G 3/4; NPT 3/4

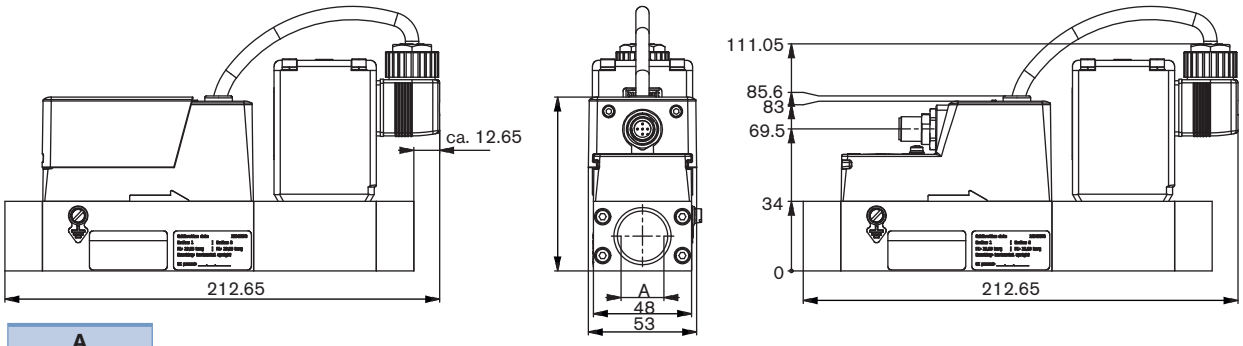
DTS 1000241027 EN Version: F Status: RL (released | freigegeben | validé) printed: 30.03.2017

Dimensions [mm] Type 8746

MFC with valve Type 2875 (16 W-coil)



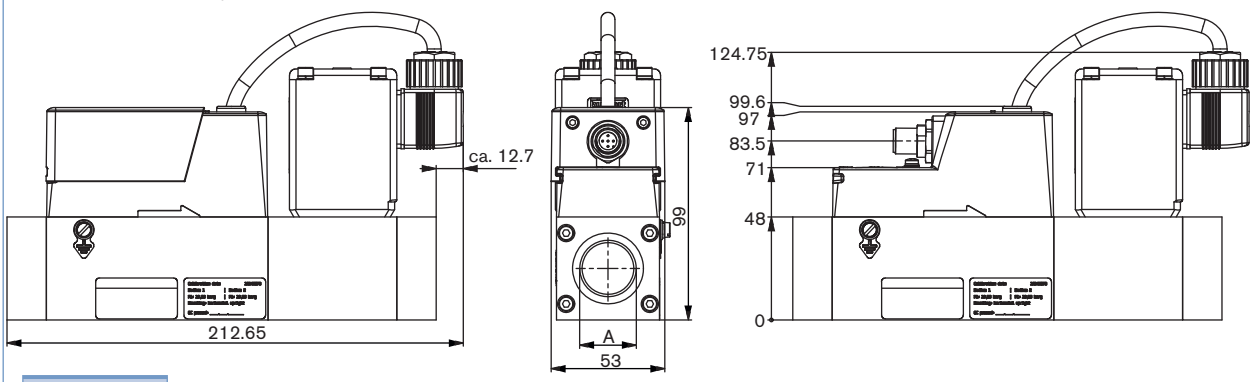
Version with standard base block



A
G 1/4; NPT 1/4
G 3/8; NPT 3/8
G 1/2; NPT 1/2
G 3/4; NPT 3/4

Version with base block for large nominal flow rates

For a nominal flow Q_{nom} > 1500 l_N/min the overall length increases by 30 mm

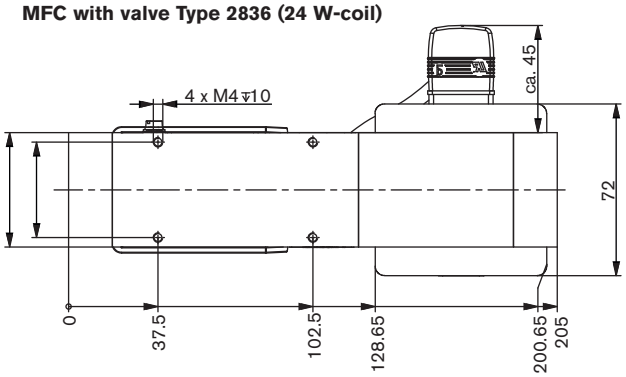


A
G 1/2; NPT 1/2
G 3/4; NPT 3/4
G 1; NPT 1

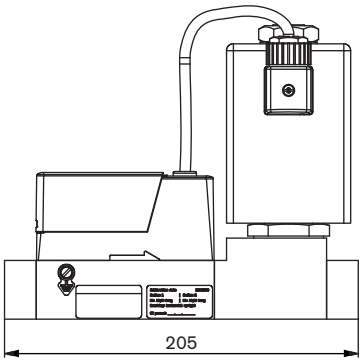
DTS 1000241027 EN Version: F Status: RL (released | freigegeben | validé) printed: 30.03.2017

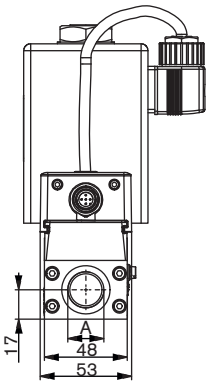
Dimensions [mm] Type 8746

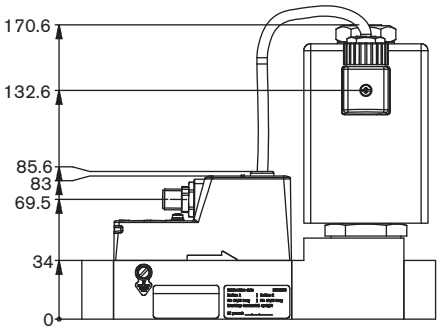
MFC with valve Type 2836 (24 W-coil)



Version with standard base block



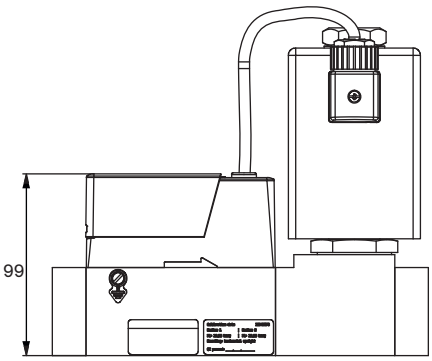


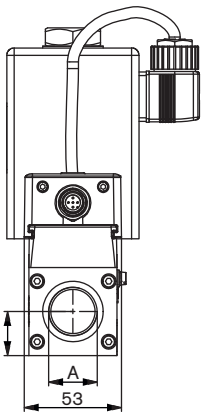


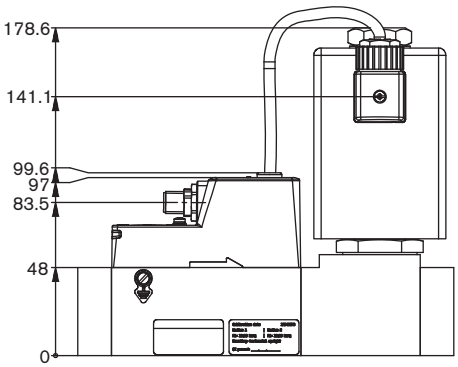
A
G 1/4; NPT 1/4
G 3/8; NPT 3/8
G 1/2; NPT 1/2
G 3/4; NPT 3/4

Version with base block for large nominal flow rates

For a nominal flow Q_{nom} > 1500 l_N/min the overall length increases by 30 mm





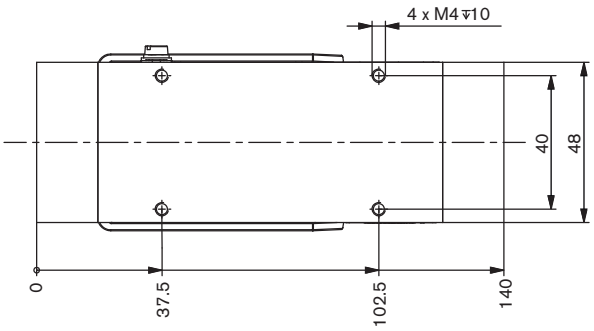


A
G 1/2; NPT 1/2
G 3/4; NPT 3/4
G 1; NPT 1

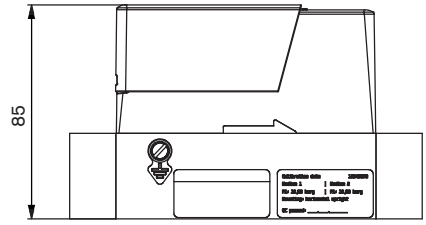
DTS 1000241027 EN Version: F Status: RL (released | freigegeben | validé) printed: 30.03.2017

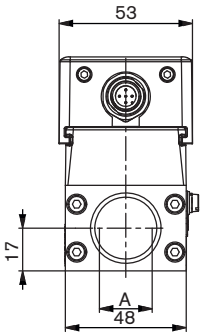
Dimensions [mm] Type 8746

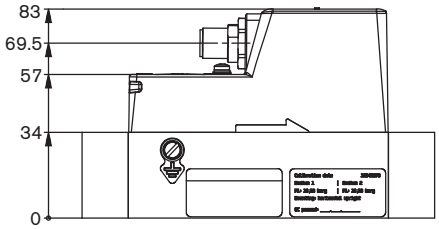
MFM version



Version with standard base block



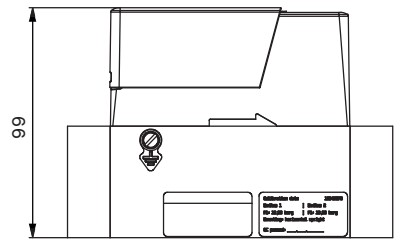


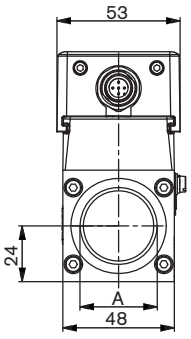


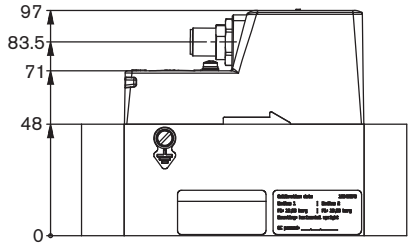
A
G 1/4; NPT 1/4
G 3/8; NPT 3/8
G 1/2; NPT 1/2
G 3/4; NPT 3/4

Version with base block for large nominal flow rates

For a nominal flow Q_{nom} > 1500 l_N/min the overall length increases by 30 mm





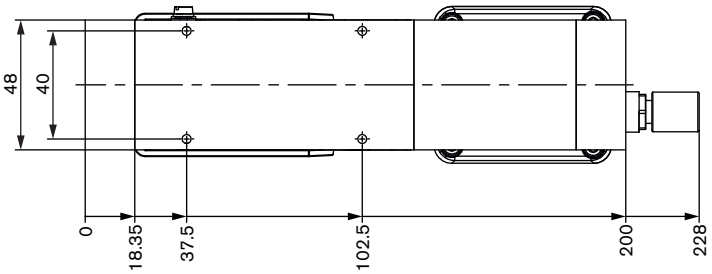


A
G 1/2; NPT 1/2
G 3/4; NPT 3/4
G 1; NPT 1

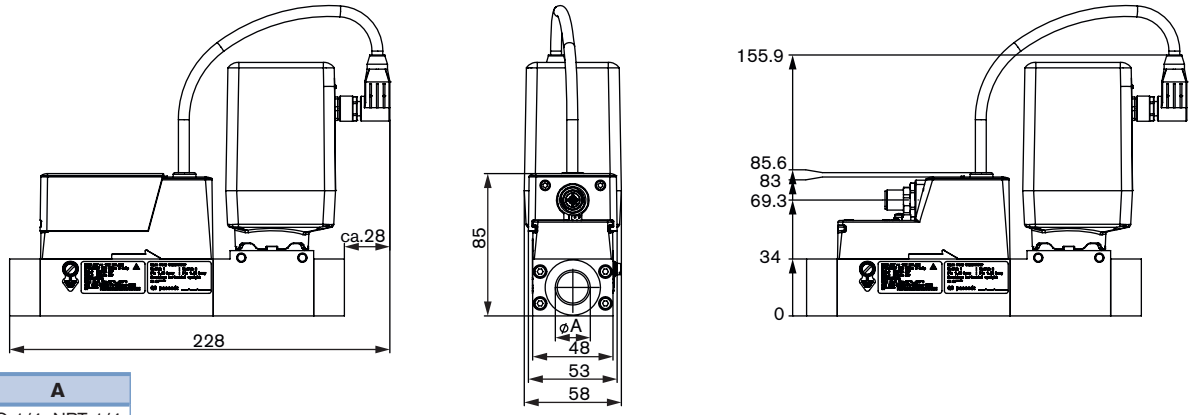
DTS 1000241027 EN Version: F Status: RL (released | freigegeben | validé) printed: 30.03.2017

Dimensions [mm] Type 8746

MFC with valve Type 3280



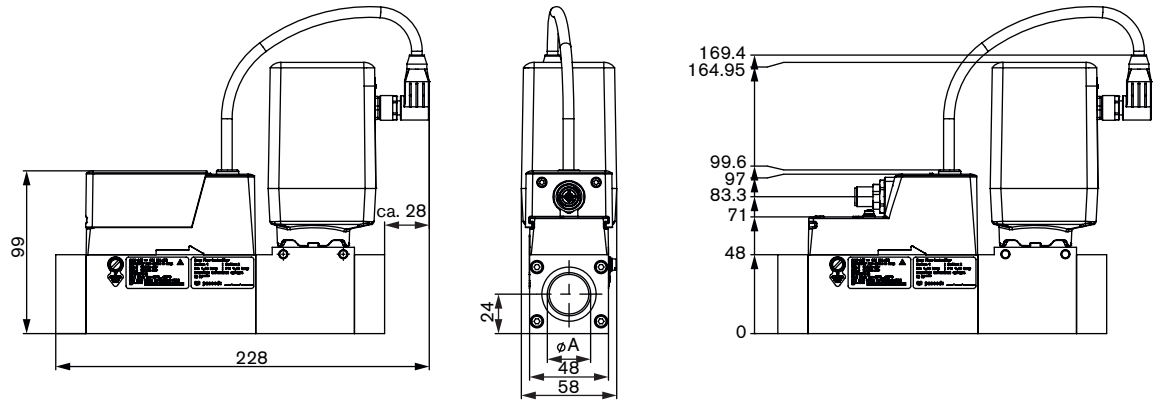
Version with standard base block



A
G 1/4; NPT 1/4
G 3/8; NPT 3/8
G 1/2; NPT 1/2
G 3/4; NPT 3/4

Version with base block for large nominal flow rates

For a nominal flow Q_{nom} > 1500 l_N/min the overall length increases by 30 mm



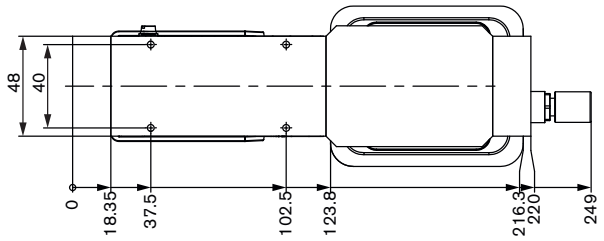
A
G 1/2; NPT 1/2
G 3/4; NPT 3/4
G 1; NPT 1

DTS 1000241027 EN Version: F Status: RL (released | freigegeben | validé) printed: 30.03.2017

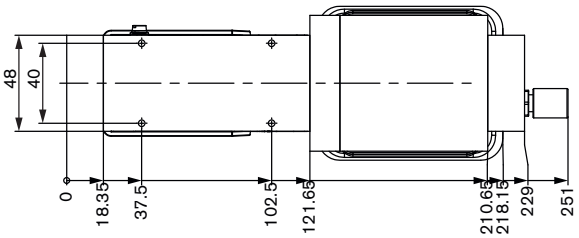
Dimensions [mm] Type 8746

MFC with valve Type 3285

Valve orifice DN12 and DN15

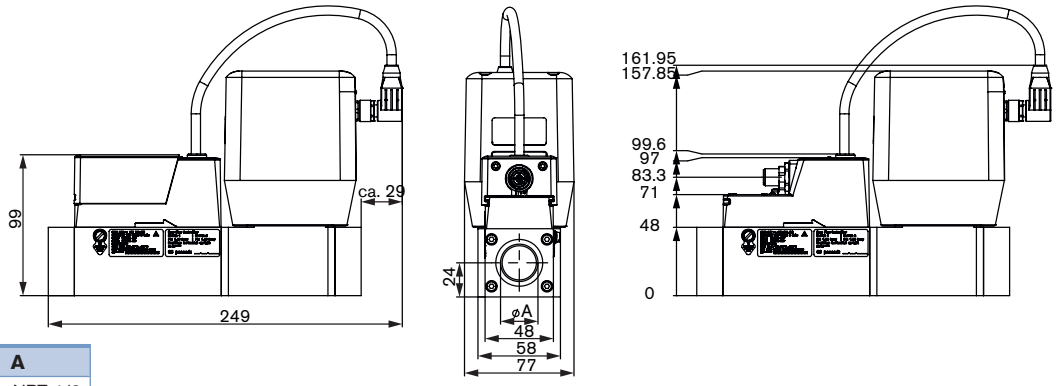


Valve orifice DN20 and DN25



Version with base block for large nominal flow rates: Valve orifice DN12 and DN15

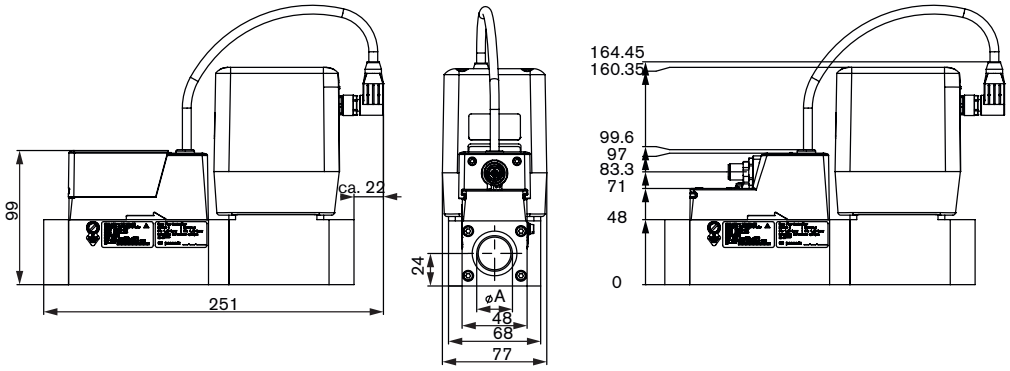
For a nominal flow Q_{nom} > 1500 l_N/min the overall length increases by 30 mm



A
G 1/2; NPT 1/2
G 3/4; NPT 3/4
G 1; NPT 1

Version with base block for large nominal flow rates: Valve orifice DN20 and DN25

For a nominal flow Q_{nom} > 1500 l_N/min the overall length increases by 30 mm



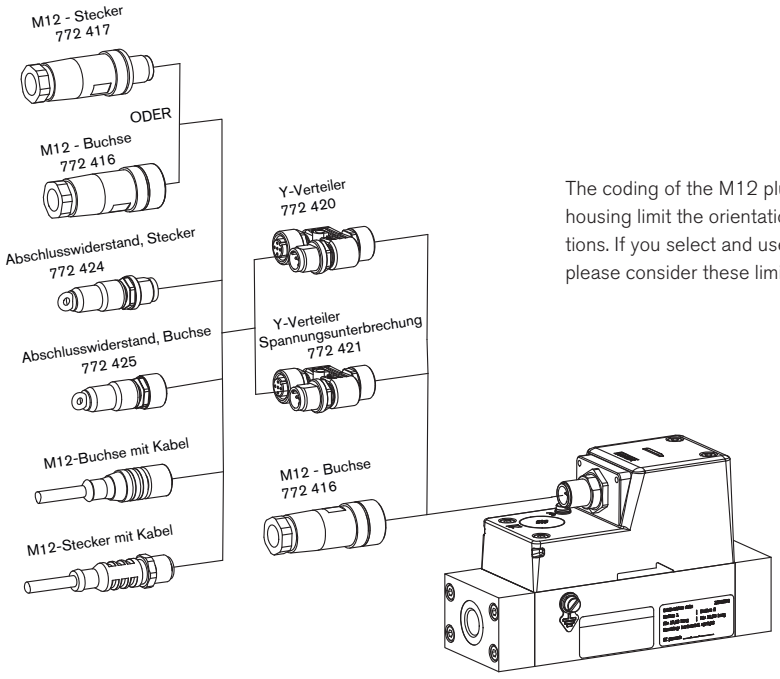
A
G 1/2; NPT 1/2
G 3/4; NPT 3/4
G 1; NPT 1

DTS 1000241027 EN Version: F Status: RL (released | freigegeben | validé) printed: 30.03.2017

Ordering Chart for Accessories

Article	Item no.
büS cable extension M12 0.1 m	772 492
büS cable extension M12 0.2 m	772 402
büS cable extension M12 0.5 m	772 403
büS cable extension M12 1 m	772 404
büS cable extension M12 3 m	772 405
Connector M12, female, straight [9)]	772 416
Connector M12, male, straight [9)]	772 417
Connector M12, female, angled [9)]	772 418
Connector M12, male, angled [9)]	772 419
Y junction	772 420
Y junction for connecting two separately powered segments of a büS network	772 421
Termination resistor 120 Ohm M12 male	772 424
Termination resistor 120 Ohm M12 female	772 425
büS-Stick Set 1 ((incl. cable (M12)), stick with integrated termination resistor, power supply and software)	772 426
büS-Stick Set 2 (incl. cable (M12)), stick with integrated termination resistor)	772 551
SIM card	on request
LabVIEW device driver	on request
EDS-File (CANopen)	Download from www.burkert.com
Software Bürkert Communicator	Download from www.burkert.com

[9)] It is possible that the M12 connectors cannot be used together on the same side of a Y-junction. If that is the case, please use a prefabricated cable which uses typically a thinner connector.



The coding of the M12 plug (see p.3) and the housing limit the orientation of the Y or T-junctions. If you select and use your own junctions, please consider these limitations.

bürkert

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**

☐ **ATEX compliance**

Preferred valve type: ☐ electromagnetic (highly dynamic) ☐ motor-driven (energy saving)

Medium data

Type of gas (or gas proportion in mixtures) ☐

Density ☐ kg/m³ [10]

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 [10] ☐ l_S/min (slpm) [11]
☐ m_N^3/h [10] ☐ kg/h
☐ cm_N^3/min [10] ☐ cm_S^3/min (sccm) [11]
☐ l_N/h [10] ☐ l_S/h [11]

Inlet pressure at Q_{nom} [13] p_1= ☐ bar(ü)

Outlet pressure at Q_{nom} p_2= ☐ bar(ü)

Max. inlet pressure P_{1max} ☐ bar(ü)

MFC/MFM port connection

☐ without screw-in fitting

☐ 1/4" G-thread (DIN ISO 228/1) ☐ 1/4" NPT-thread (ANSI B1.2)
☐ 3/8" G-thread (DIN ISO 228/1) ☐ 3/8" NPT-thread (ANSI B1.2)
☐ 1/2" G-thread (DIN ISO 228/1) ☐ 1/2" NPT-thread (ANSI B1.2)
☐ 3/4" G-thread (DIN ISO 228/1) ☐ 3/4" NPT-thread (ANSI B1.2)
☐ 1" G-thread (DIN ISO 228/1) ☐ 1" NPT-thread (ANSI B1.2)

☐ with screw-in fitting (acc. to specification for pipeline)

☐ mm Pipeline (external Ø)
☐ inch Pipeline (external Ø)

Installation

☐ horizontal
☐ vertical, flow upwards ☐ vertical, flow downwards

Ambient temperature ☐ °C

Material data

Body base ☐ Aluminium ☐ Stainless steel

Seal ☐ FKM ☐ EPDM

Electrical data

Signals for set point and actual valve ☐ CANopen or ☐ büS

■ Please quote all pressure values as overpressures with respect to atmospheric pressure [bar(ü)]

[10] at: 1.013 bar(a) and 0 °C [11] at: 1.013 bar(a) and 20 °C [13] 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.
© Christian Bürkert GmbH & Co. KG

1703/6_EU-en_00895280

DTS 1000241027 EN Version: F Status: RL (released | freigegeben | validé) printed: 30.03.2017