

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



- Nominal flow ranges from 20 I_N/min up to 2500 IN/min
- High accuracy and repeatability
- Communication via standard signals or Industrial Ethernet
- Electromagnetic and motor-driven valve actuation available
- Easy device exchange through configuration memory

Type 8745 can be combined with...



Type 0330

3/2 way valve



Type 6013

2/2 way valve



Type 6027

2/2 way valve



Type 8619

Multichannel-/
Multifunctions Transmitter/
Controller

The MFC / MFM type 8745 is suitable for the mass flow control of high flow rates. 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.

MFC Type 8746 is available in two versions:

Type 8745: with electromagnetic proportional valve

Type 8745: with motor-driven proportional valve

| 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 | PC (Polycarbonate) |
| Seals | FKM or EPDM (depending on gas) ²⁾ |
| Port connection | G or NPT ¼", ⅜", ½", ¾", 1" |
| Operating voltage | 24 V DC |
| Voltage tolerance | ± 10 % |
| Residual ripple | ± 2 % |
| Configuration memory (included in delivery) | EEPROM (µSIM card: bus relevant data and information about spec. control loop in order to ease replacement) |
| Installation | Horizontal or vertical |
| Software tool | Bürkert Communicator |
| Electrical connection | |
| Industrial Ethernet | PROFINET, Ethernet/IP, EtherCAT via 2 x RJ45 (Switch) ³⁾ |
| Analog | 4 - 20 mA, 0 - 20 mA, 0 - 10 V or 0 - 5 V via D-Sub 9 ⁴⁾ |
| Input impedance | > 20 kΩ (voltage), < 300 Ω (current) |
| Max. current (voltage output) | 10 mA |
| Max. load (current output) | 600 Ω |

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 Al₂O₃

³⁾ Supply voltage via separate terminal block.

⁴⁾ The analog version with D-Sub9 features an additional digital input and a relay output.

Nom. flow ranges of typical gases

| Gas (other gases on request) | 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, Oxygen, Nitrogen | 20 | 2500 |
| Methane | 20 | 400 |
| Propane | 20 | 400 |

Technical data: Type 8745 with solenoid proportional valve

Type 8745 can be configured as MFM or MFC. For MFCs the direct-acting proportional valves of Types 287x are used. These solenoid proportional valves are normally closed and stand for highest accuracy and repeatability with settling/response times of a few hundred milliseconds.

| Technical data | |
|--|--|
| Nominal flow range (Q_{nom}) | 20...1500 l_N/min (N_2), MFM up to 2500 l_N/min (N_2) |
| Turndown ratio | 50:1 ⁵ |
| 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/Response time (t95 %) | < 500 ms |
| Proportional valve (solenoid) Valve orifice range K_{vs} value range | normally closed 0.8 ... 12 mm 0.02...2.5 m^3/h |
| Power consumption⁶⁾ | Max. 4 W (as MFM) Max. 12.5-31.5 W (as MFC, depending on proportional valve type) |
| Protection class | IP20 |
| Dimensions | See pages 5-7 |
| Total weight | ca. 1.8 kg (AI, 16 W valve), ca. 3.1 kg (VA, 16 W valve) |
| Device status | RGB-LED based on NAMUR NE107 |

⁵ With vertical installation and flow downwards the turndown ratio is 10:1

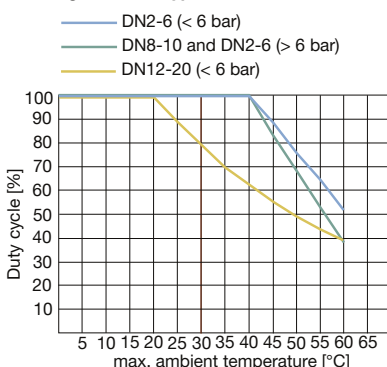
⁶ Referring to the typical power consumption (at 23 °C ambient temperature, nominal flow and 30 min. regular operation) The data according to UL 61010-1 may differ (see manual)

Technical data: Type 8745 with motor-driven proportional valve

The Type 8745 with motor-driven valves is especially designed for applications with high inlet pressures of 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 8745 with motor valve



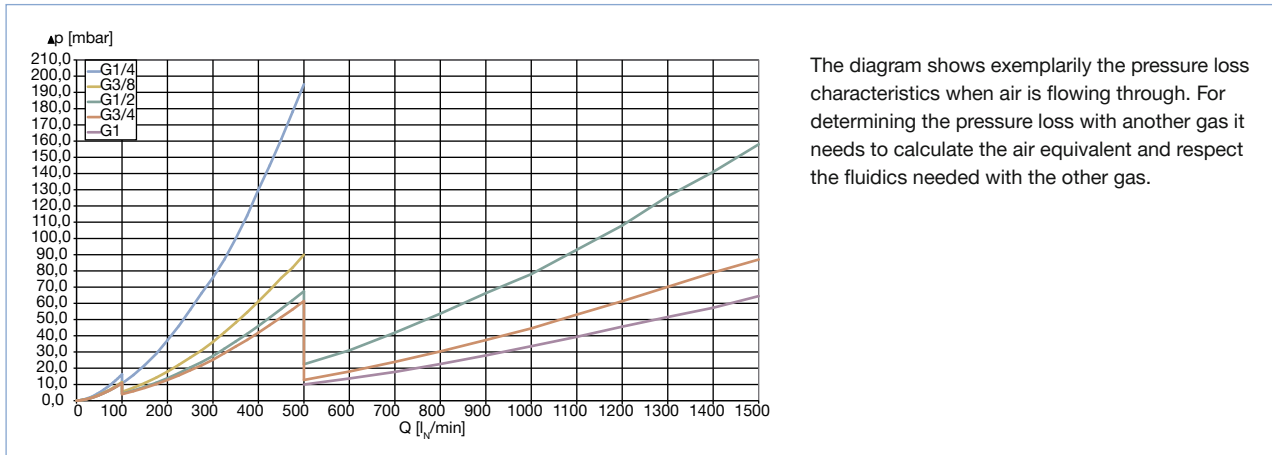
| Technical data | |
|--|--|
| Nominal flow range (Q_{nom}) | 20...2500 l_N/min (N_2) |
| Turndown ratio | 50:1 ⁷⁾ |
| Max. operating pressure Data in overpressure to atmospheric pressure | 22 bar (with MFCs the max. pressure depends on the orifice of the valve) |
| Accuracy | ± 2 % v. M. ± 0.5 % v. E. (after 15 min. warm up time) |
| Repeatability | ± 0.5 % v.E. |
| Settling/Response time (t95 %) | < 5 sec. |
| Proportional valve (motor-driven) Valve orifice range K_{vs} value range | normally persistent 2...20 mm 0.5...7.8 m^3/h |
| Power consumption⁸⁾ | Max. 4 W (as MFM) Max. 12 W (as MFC) ⁸⁾ |
| Protection class | IP20 |
| Dimensions | See pages 8-9 |
| Total weight | ca. 1.67 kg (AI, standard, valve 3280), ca. 2.94 kg (VA, standard, valve 3280) |
| Device status⁹⁾ | For MFM: RGB-LED acc. to NAMUR NE107 For valve: RGB-LED to indicate the valve opening |

⁷⁾ With vertical installation and flow downwards the turndown ratio is 10:1

⁸⁾ Data during moving of the valve. The power to hold a specific valve opening < 1 W

⁹⁾ Detailed description of the LED colours: see manual

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



Notes Regarding the Configuration

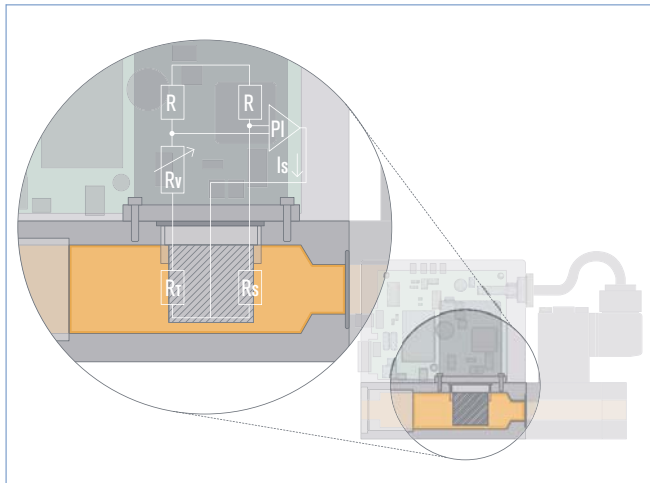
For the proper choice of the actuator orifice within the MFC, not only should the required maximum flow rate Q_{nom} be known, but also the pressure values directly before and after the MFC (p_1 , p_2) at this flow rate Q_{nom} should be known.

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. 11 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 $p_{1,max}$ 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 11 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.

Measuring Principle



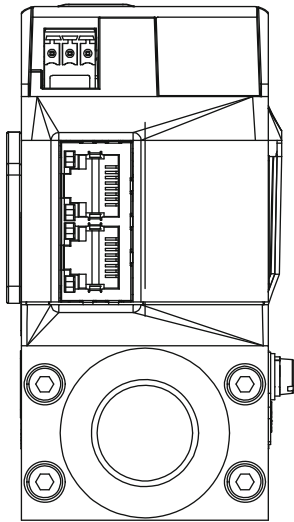
This sensor works as a hot-film anemometer in the so called CTA operational mode (Constant Temperature Anemometer). To do this, two resistors with precisely specified temperature coefficients located directly in the media flow and three resistors located outside the flow are connected together to form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

The first resistor in the gas flow (RT) measures the fluid temperature, while the second, low value resistor (RS) is heated so that it is maintained at a fixed, predefined overtemperature 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.

Pin Assignment

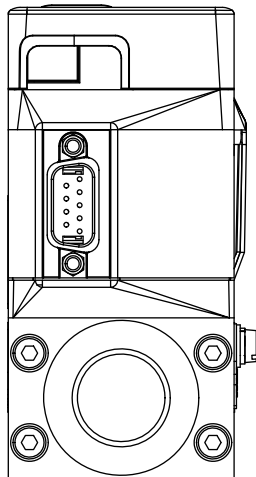
8745 Industrial Ethernet



| Terminal block 3 pin | Pin | Assignment |
|----------------------|-----|-----------------------|
| | 1 | FE (Functional earth) |
| | 2 | DGND |
| | 3 | +24 V DC |

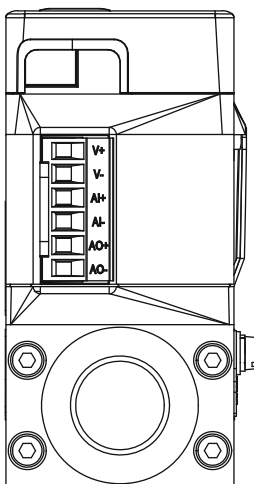
| Screw M3 | Pin | Assignment |
|----------|--------|---------------|
| | 1 | TX + |
| | 2 | TX - |
| | 3 | RX + |
| | 4 | not connected |
| | 5 | not connected |
| | 6 | RX - |
| | 7 | not connected |
| | 8 | not connected |
| Body | SHIELD | |

8745 Analogue



| D-Sub 9 pin, plug | Pin | Assignment |
|-------------------|--------|---------------------------|
| | 1 | Digital input |
| | 2 | GND |
| | 3 | +24 V DC |
| | 4 | Relay - Opener |
| | 5 | Relay - Reference contact |
| | 6 | Set value input + |
| | 7 | Set value input GND |
| | 8 | Actual value output |
| | 9 | Actual value output GND |
| Body | SHIELD | |

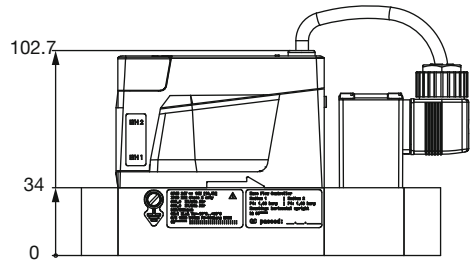
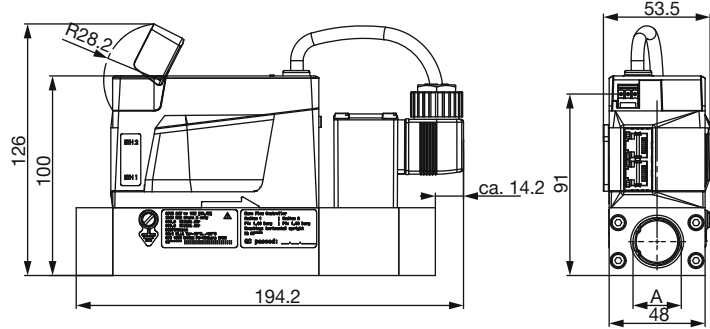
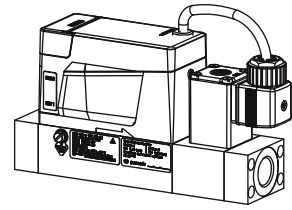
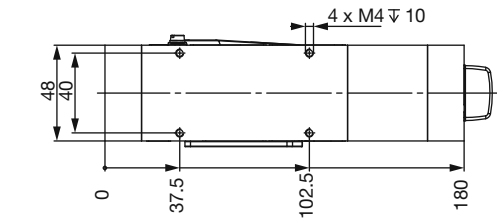
8745 Analogue



| Terminal block 6 pin | Pin | Assignment |
|----------------------|-----|------------------------|
| | 1 | +24 V DC |
| | 2 | GND |
| | 3 | Set value input + |
| | 4 | Set value input GND |
| | 5 | Actual value output + |
| | 6 | Actual value outputGND |

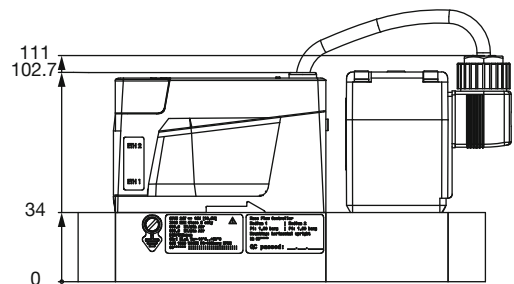
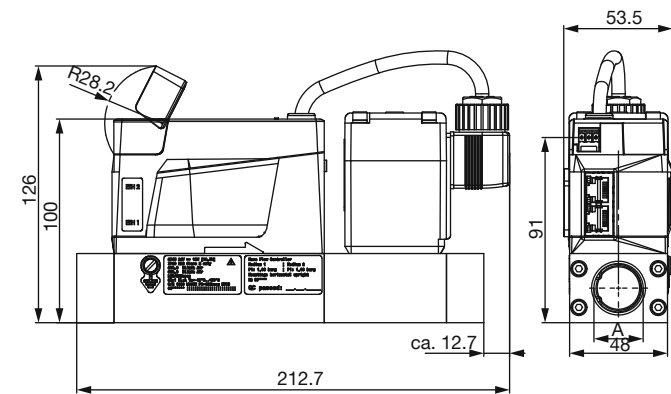
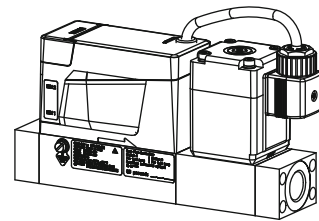
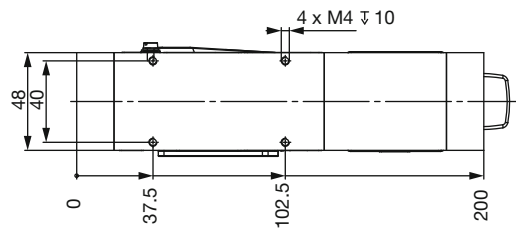
Dimensions [mm] Type 8745

MFC with valve Type 2873 (9 W coil)



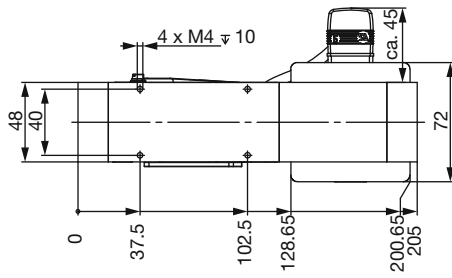
| A | Thread depth |
|---------|--------------|
| G 1/4 | 12 |
| NPT 1/4 | 11 |
| G 3/8 | 12 |
| NPT 3/8 | 11 |
| G 1/2 | 15 |
| NPT 1/2 | 14 |
| G 3/4 | 16 |
| NPT 3/4 | 15 |

MFC with valve Type 2875 (16 W coil)

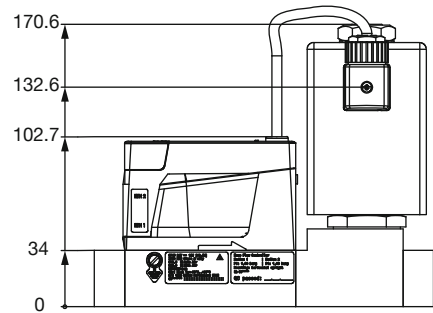
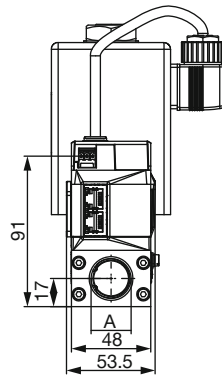
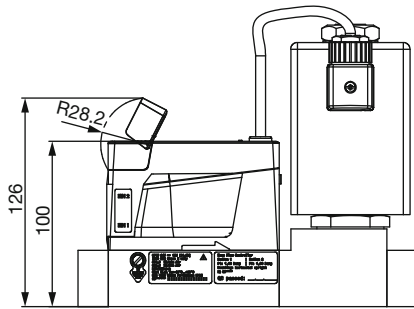
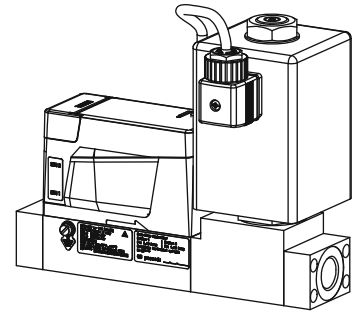


Dimensions [mm] Type 8745

MFC with valve Type 2836 (24 W coil)

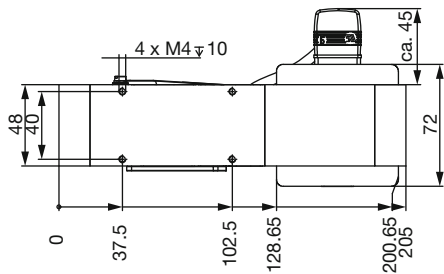


| A | Thread depth |
|---------|--------------|
| G 1/4 | 12 |
| NPT 1/4 | 11 |
| G 3/8 | 12 |
| NPT 3/8 | 11 |
| G 1/2 | 15 |
| NPT 1/2 | 14 |
| G 3/4 | 16 |
| NPT 3/4 | 15 |

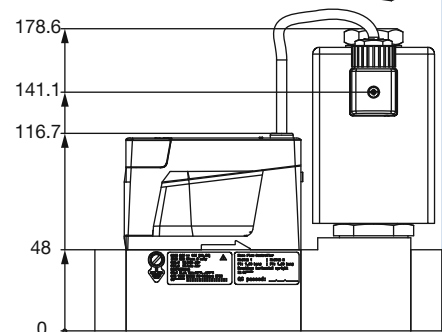
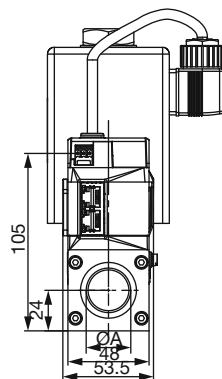
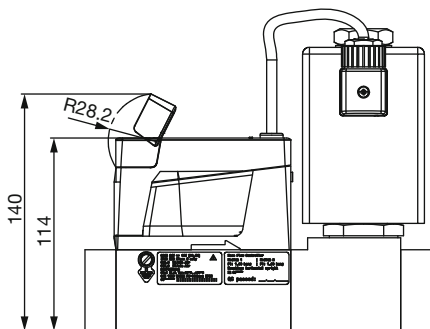
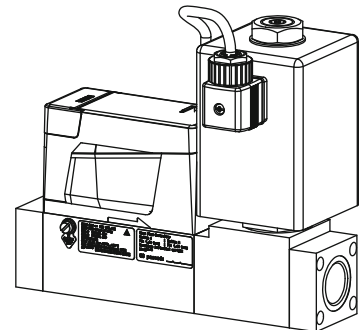


Version with base block for large nominal flow rates

For a nominal flow $Q_{nom} > 1500 \text{ l}_N/\text{min}$ the overall length increases by 30 mm

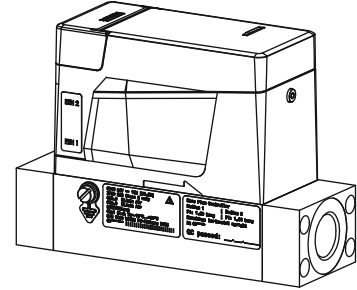
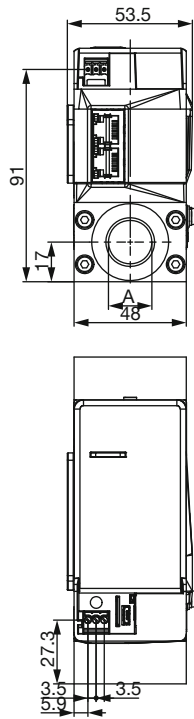
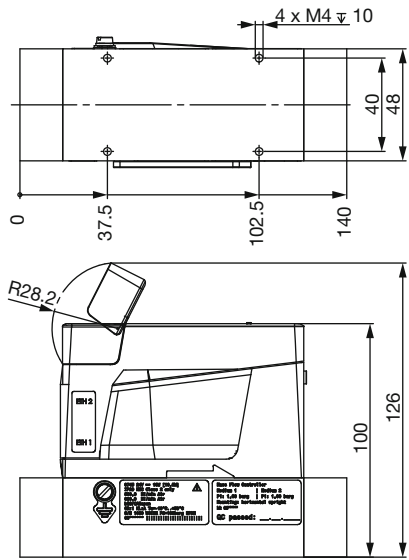


| A | Thread depth |
|---------|--------------|
| G 1/2 | 15 |
| NPT 1/2 | 14 |
| G 3/4 | 16 |
| NPT 3/4 | 15 |
| G 1 | 18 |
| NPT 1 | 16.8 |



Dimensions [mm] Type 8745

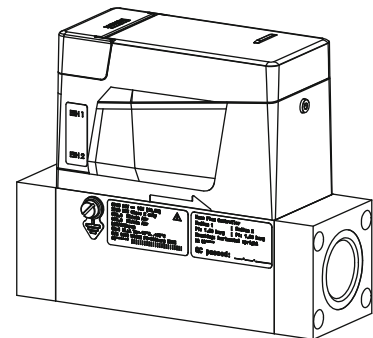
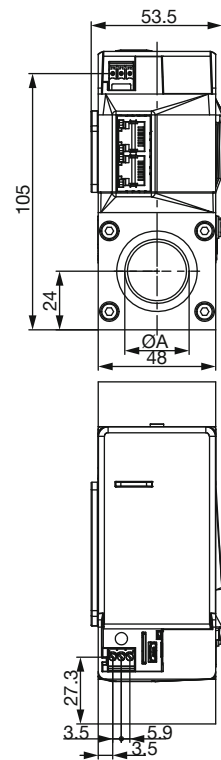
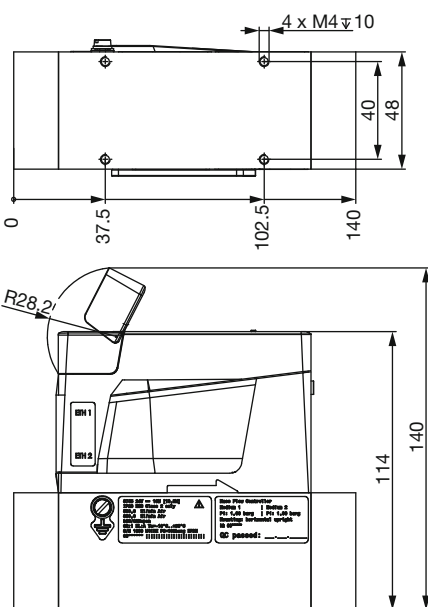
MFM version



| A | Thread depth |
|-------|--------------|
| G ¼ | 12 |
| NPT ¼ | 11 |
| G ⅜ | 12 |
| NPT ⅜ | 11 |
| G ½ | 15 |
| NPT ½ | 14 |
| G ¾ | 16 |
| NPT ¾ | 15 |

Version with base block for large nominal flow rates

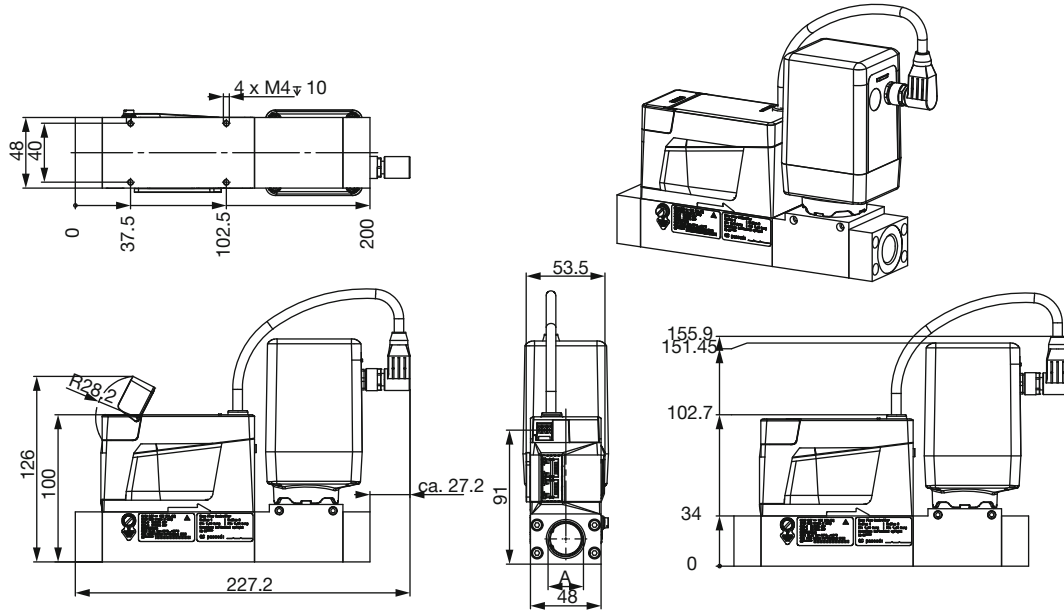
For a nominal flow $Q_{nom} > 1500 l_v/min$ the overall length increases by 30 mm



| A | Thread depth |
|-------|--------------|
| G ½ | 15 |
| NPT ½ | 14 |
| G ¾ | 16 |
| NPT ¾ | 15 |
| G 1 | 18 |
| NPT 1 | 16.8 |

Dimensions [mm] Type 8745

MFC with valve Type 3280

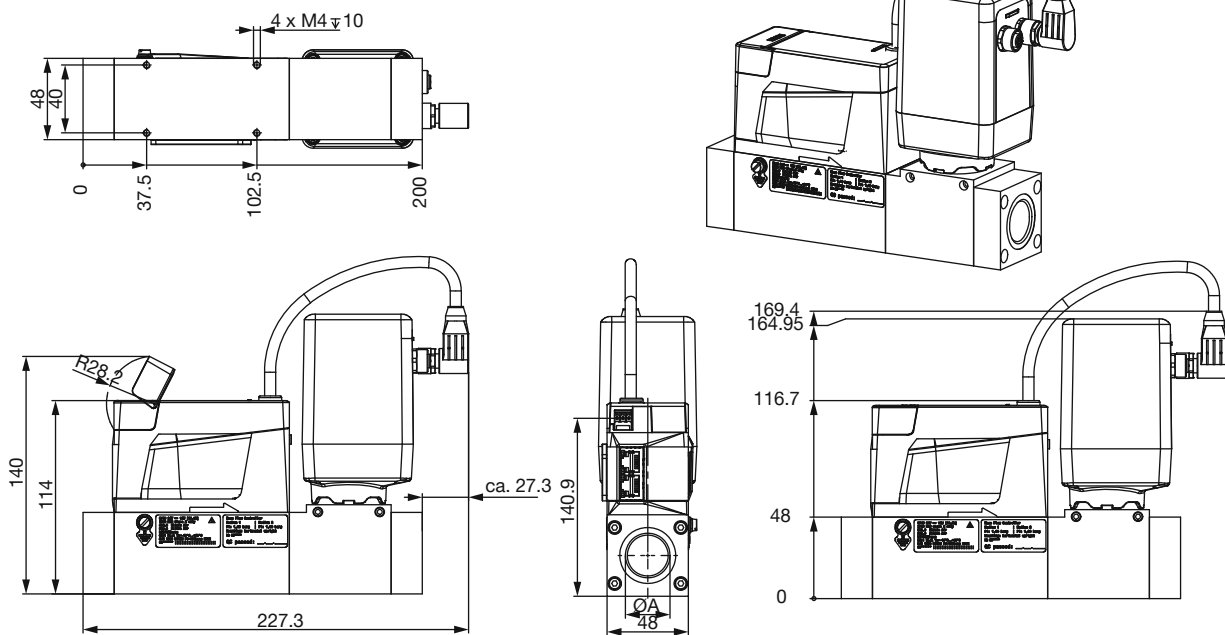


| A | Thread depth |
|-------|--------------|
| G ¼ | 12 |
| NPT ¼ | 11 |
| G ⅜ | 12 |
| NPT ⅜ | 11 |
| G ½ | 15 |
| NPT ½ | 14 |
| G ¾ | 16 |
| NPT ¾ | 15 |

| A | Thread depth |
|-------|--------------|
| G ½ | 15 |
| NPT ½ | 14 |
| G ¾ | 16 |
| NPT ¾ | 15 |
| G 1 | 18 |
| NPT 1 | 16.8 |

Version with base block for large nominal flow rates

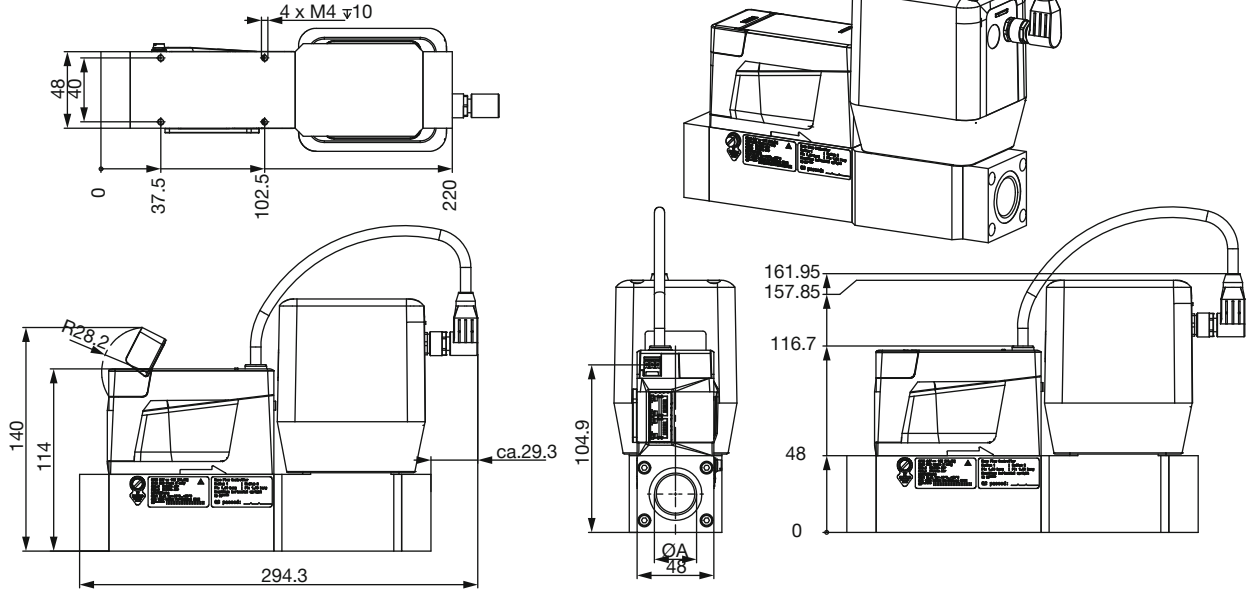
For a nominal flow $Q_{nom} > 1500 \text{ l}_N/\text{min}$ the overall length increases by 30 mm



Dimensions [mm] Type 8745

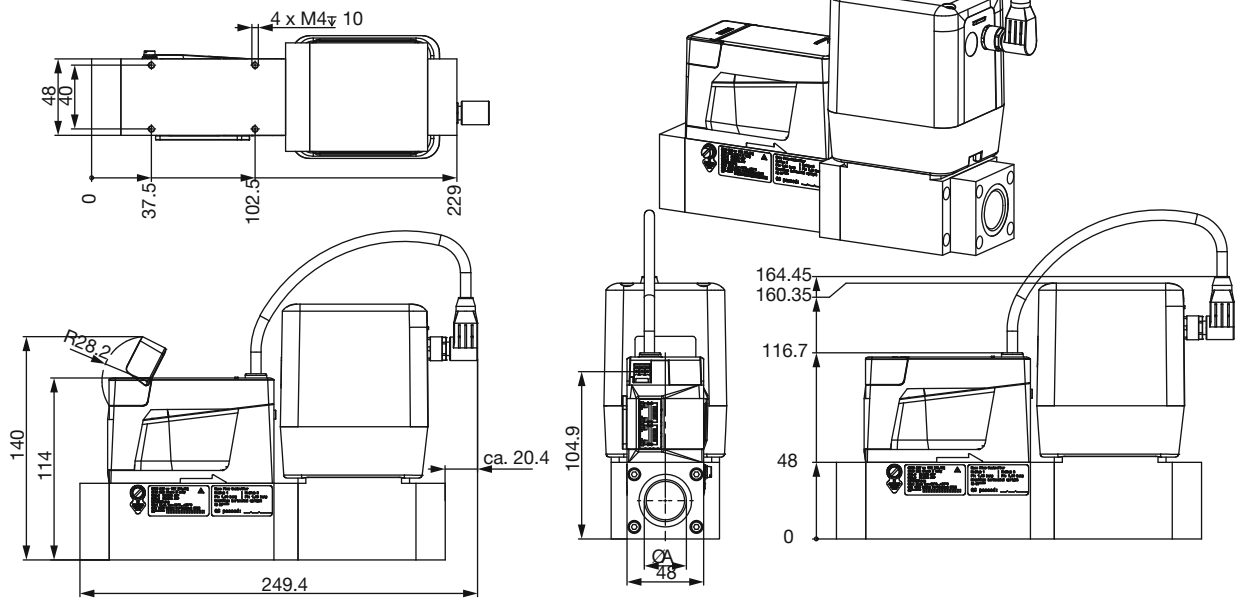
MFC with valve Type 3285

Valve orifice DN12 and DN15



| A | Thread depth |
|---------|--------------|
| G 1/2 | 15 |
| NPT 1/2 | 14 |
| G 3/4 | 16 |
| NPT 3/4 | 15 |
| G 1 | 18 |
| NPT 1 | 16.8 |

Valve orifice DN12 and DN15



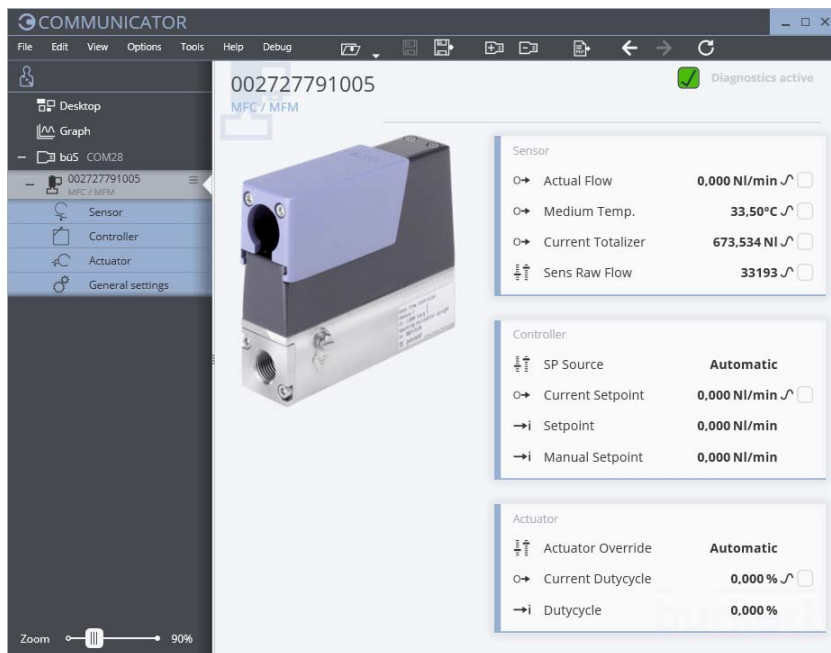
Version with base block for large nominal flow rates

For a nominal flow $Q_{nom} > 1500 \text{ l}_N/\text{min}$ the overall length increases by 30 mm

Ordering Chart for Accessories

| Article | Item no. |
|---|--|
| büS-Stick Set 1 (incl. cable (M12 and Micro-USB) Stick with integrated terminating resistor, power supply and software) | 772 426 |
| büS-Stick Set 2 (incl. cable (M12 and Micro-USB) Stick with integrated terminating resistor) | 772 551 |
| Power supply Type 1573 for rail mounting, 100-240 V AC/ 2 V DC, 1.25A, NEC Class 2 (UL 1310) | 772 438 |
| Power supply Type 1573 for rail mounting, 100-240 V AC/ 2 V DC, 1A, NEC Class 2 (UL 1310) | 772 361 |
| Power supply Type 1573 for rail mounting, 100-240 V AC/ 2 V DC, 2A, NEC Class 2 (UL 1310) | 772 362 |
| Power supply Type 1573 for rail mounting, 100-240 V AC/ 2 V DC, 4A | 772 363 |
| µSIM-Card (included in delivery of MFC) | on request |
| LabVIEW device driver | on request |
| Device description files for PROFINET (GSDML), Ethernet/IP (EDS), EtherCAT (ESI) | Download from www.burkert.com |
| Software Bürkert Communicator | Download from www.burkert.com |

Software Bürkert Communicator



To install the software, click on the download button.

[Download](#)

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
 - ...

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

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

Medium data

Type of gas (or gas proportion in mixtures)

Density kg/m³¹⁰

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. l_N/min¹⁰ l_g/min (slpm)¹¹

Max. m_N³/h¹⁰ kg/h

cm_N³/min¹⁰ cm_S³/min (sccm)¹¹

l_N/h¹⁰ l_g/h¹¹

Inlet pressure at Q_{nom} ¹³ $p_1 =$ 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

¼" G-thread (D_N ISO 228/1) ¼" NPT-thread (ANSI B1.2)

⅜" G-thread (D_N ISO 228/1) ⅜" NPT-thread (ANSI B1.2)

½" G-thread (D_N ISO 228/1) ½" NPT-thread (ANSI B1.2)

¾" G-thread (D_N ISO 228/1) ¾" NPT-thread (ANSI B1.2)

1" G-thread (D_N 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

PROFINET Ethernet/IP EtherCAT Modbus TCP

4...20 mA 0...20 mA 0...10 V 0...5 V Terminal block version, Default: D-Sub

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

¹⁰ at: 1.013 bar(a) and 0 °C

¹¹ at: 1.013 bar(a) and 20 °C

¹³ matches with calibration pressure

DTS 1000338235 EN Version: - Status: RL (released | freigegeben | valide) printed: 20.10.2017