



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

- Nominal flow ranges from 0.010 I<sub>N</sub>/min to 160 I<sub>N</sub>/min
- High accuracy and repeatability
- Very fast response times
- Easy device exchange through configuration memory
- Optional: USP Class VI, FDA, EG 1935 conformity

Product variants described in the data sheet may differ from the product presentation and description.

### Can be combined with

|   |   |   |
|---|---|---|
|   | <b>Type 6011</b><br>Plunger valve 2/2 way direct-acting                 | ▶ |
|  | <b>Type 6013</b><br>Plunger valve 2/2 way direct-acting                 | ▶ |
|  | <b>Type 6027</b><br>Direct-acting 2/2 way plunger valve                 | ▶ |
|  | <b>Type 0330</b><br>Direct-acting 2/2 or 3/2 way pivoted armature valve | ▶ |
|  | <b>Type ME43</b><br>Fieldbus gateway                                    | ▶ |

### Type description

The mass flow controller (MFC)/meter (MFM) Type 8741 for gases is suitable for a wide range of applications and available with Industrial Ethernet, analogue or fieldbus interfaces. The version with CANopen based Bürkert system bus (büS) is suitable for the integration into existing CANopen networks, as well as Industrial Ethernet or fieldbus networks in combination with the fieldbus gateway of Type ME43. The second option is tailor-made for applications with many control loops. Up to 32 MFC/MFM can be connected to one fieldbus gateway. Type ME43 translates the internal CANopen based communication to industry standards for both Industrial Ethernet and fieldbuses. The mass flow controller/meter can always be switched between büS and CANopen communication.

Type 8741 can be configured as MFM or MFC. Optional, up to four different gas calibrations can be stored in the device. The thermal MEMS sensor is located directly in the 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.

## Table of contents

|   |           |
|---|-----------|
| <b>1. General technical data</b>                                      | <b>3</b>  |
| <b>2. Approvals</b>   | <b>4</b>  |
| <b>3. Dimensions</b>  | <b>5</b>  |
| 3.1. Analogue or Industrial Ethernet .....                            | 5         |
| MFM or MFC with internal valve (Type 2871) .....                      | 5         |
| Sub-base version of MFM or MFC with internal valve (Type 2871) .....  | 5         |
| MFC with external valve (Type 2873) .....                             | 6         |
| MFM for large nominal flow rates .....                                | 6         |
| MFC with external valve (Type 2873) for large nominal flow rates..... | 7         |
| MFC with external valve (Type 2875) for large nominal flow rates..... | 7         |
| 3.2. 8741 büS/CANopen.....  | 8         |
| MFM or MFC with internal valve (Type 2871) .....                      | 8         |
| Sub-base version of MFM or MFC with internal valve (Type 2871) .....  | 8         |
| MFC with external valve (Type 2873) .....                             | 9         |
| MFM for large nominal flow rates .....                                | 9         |
| MFC with external valve (Type 2873) for large nominal flow rates..... | 10        |
| MFC with external valve (Type 2875) for large nominal flow rates..... | 10        |
| <b>4. Device / Process connections</b>                                | <b>11</b> |
| 4.1. büS / CANopen.....   | 11        |
| 4.2. Industrial Ethernet.....   | 11        |
| 4.3. Analogue.....  | 12        |
| <b>5. Performance specifications</b>                                  | <b>13</b> |
| 5.1. Pressure loss diagram of the MFM.....                            | 13        |
| 5.2. Flow characteristic.....   | 13        |
| Nominal flow range of typical gases.....                              | 13        |
| <b>6. Product operation</b>   | <b>14</b> |
| 6.1. Measuring principle .....  | 14        |
| <b>7. Product accessories</b>   | <b>15</b> |
| 7.1. Bürkert Communicator Software .....                              | 15        |
| Type 8741 connection with Bürkert Communicator software .....         | 15        |
| <b>8. Ordering information</b>  | <b>16</b> |
| 8.1. Bürkert eShop – Easy ordering and quick delivery.....            | 16        |
| 8.2. Advice on product choice.....                                    | 16        |
| 8.3. Ordering chart accessories.....                                  | 16        |

## 1. General technical data

| Product properties   |   |
|--|---|
| <b>Materials</b>   |   |
| Body   | Aluminium or stainless steel  |
| Housing  | PC (Polycarbonate)  |
| Seal   | FKM or EPDM (dep. on gas)   |
| Dimensions   | See „3. Dimensions“ on page 5   |
| Total weight   | ca. 500 g (aluminium body)  |
| Protection class   | IP20  |
| Configuration memory (included in delivery)                        | Industrial $\mu$ SIM card for ease of replacement   |
| Device status  | RGB-LED based on NAMUR NE107  |
| <b>Electrical data</b>   |   |
| Power Supply   | 24 V DC   |
| Voltage tolerance  | $\pm 10\%$  |
| Residual ripple  | $\pm 2\%$   |
| Power consumption <sup>1.)</sup>                                   | 1 ... 3 W (as MFM)<br>Max. 3...19.5 W (as MFC, depending on type of solenoid control valve)   |
| <b>Electrical connection</b>                                       |   |
| Industrial Ethernet  | PROFINET, Ethernet/IP, EtherCAT, Modbus-TCP via 2 x RJ45 (Switch) <sup>2.)</sup>  |
| Fieldbus   | b $\ddot{u}$ S (CAN-based Bus) / CANopen via terminal block, 4 pin  |
| Analogue   | 4 ... 20 mA, 0 ... 20 mA, 0 ... 10 V or 0 ... 5 V via D-Sub 9 <sup>3.)</sup> or terminal block 6 pin<br>Input impedance > 20 k $\Omega$ (voltage) or < 300 $\Omega$ (current)<br>Max. Current: 10 mA (voltage output); Max. Load: 600 $\Omega$ (current output) |
| <b>Performance data</b>  |   |
| Nominal flow range ( $Q_{nom}$ )                                   | 10 ml <sub>N</sub> /min to 160 l <sub>N</sub> /min (N <sub>2</sub> )  |
| Turn-down ratio  | 1:50, optional 1:100  |
| Max. operating pressure (overpressure to the atmospheric pressure) | 10 bar (145 psi), for MFCs the max. operating pressure depends on the medium and the nominal valve size   |
| Medium temperature   | -10 °C ... +70 °C (-10 °C ... +60 °C with oxygen)   |
| Ambient temperature  | -10 ... +50 °C (higher temperatures on request)   |
| Measuring accuracy   | $\pm 0.8\%$ o.R. $\pm 0.3\%$ F.S. (after 1 min. warm up time)   |
| Repeatability  | $\pm 0.1\%$ F.S.  |
| Settling (MFC) /response (MFM) time ( $t_{95\%}$ )                 | < 300 ms  |
| Control valve (proportional valve)                                 | Normally closed   |
| Valve orifice range  | 0.05...8 mm   |
| K <sub>vs</sub> value range  | 0.00006...1.1 m <sup>3</sup> /h   |
| <b>Medium data</b>   |   |
| Operating medium   | Neutral, non-contaminated gases, others on request  |
| Calibration medium   | Operating gas or air  |
| <b>Product connections</b>   |   |
| Port connection  | NPT 1/4, G 1/4, flange, clamp ring or vacuum fitting, others on request   |
| <b>Environment and installation</b>                                |   |
| Installation   | Horizontal or vertical  |
| <b>Accessories</b>   |   |
| Software   | Bürkert Communicator  |

1.) Data refers to the typical power consumption (at 23 °C ambient temperature, nominal flow rate and 30 min. control mode). The specifications according to UL 61010-1 can differ (see instruction manual).






2.) Supply voltage via separate terminal block

3.) The analogue version with D-Sub 9 features an additional digital input and a relay output

## 2. Approvals

### Note:

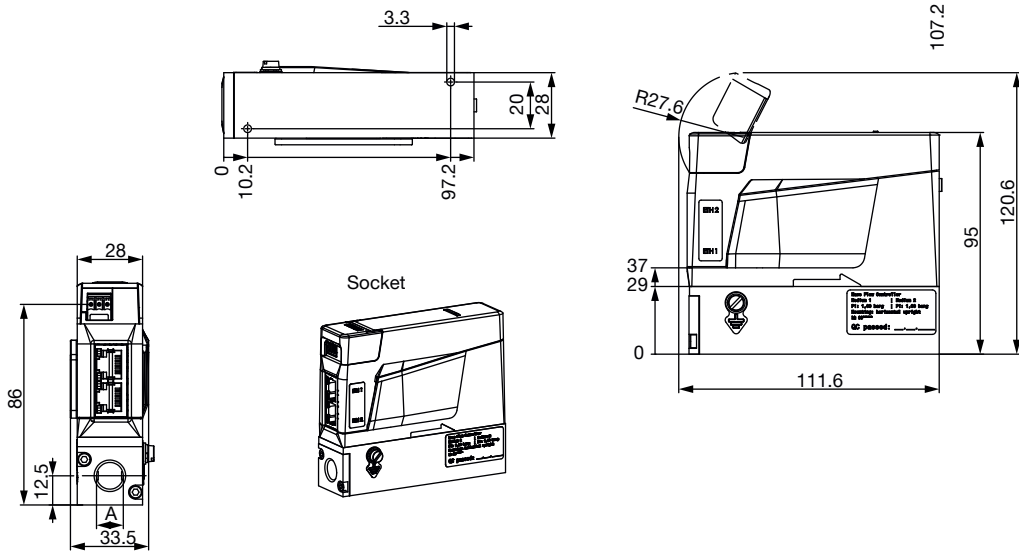
- The approvals and conformities listed below must be stated when making enquiries. This is the only way to ensure that the product complies with all required specifications.
- Not all available types can be supplied with the above approvals or conformities.

| Approvals   | Description   |
|---|---|
|  | <b>Approval</b><br>UL 611010 – 1 (ELECTRICAL EQUIPMENT FOR MEASUREMENT, CONTROL, AND LABORATORY USE - Part 1: General Requirements)   |
|  | <b>Approval</b><br>CAN/CSA-C22.2 No. 61010-1 (ELECTRICAL EQUIPMENT FOR MEASUREMENT, CONTROL, AND LABORATORY USE - Part 1: General Requirements)   |
| <b>Conformity</b>   | <b>Description</b>  |
|  | <b>Conformity of all materials in contact with the medium</b><br>USP Class VI Kapitel “87 in vitro” and “88 in vivo, Implantation” – Code of Federal Regulations Title 21 Paragraph 177 (CFR 21 177.2600) |
|  | <b>Conformity of all materials in contact with the medium</b><br>FDA – Code of Federal Regulations Title 21 Paragraph 177 (CFR 21 177.2600)   |
|  | <b>Conformity of all materials in contact with the medium</b><br>Regulation (EC) No 1935/2004 on materials and objects intended to come into contact with food  |

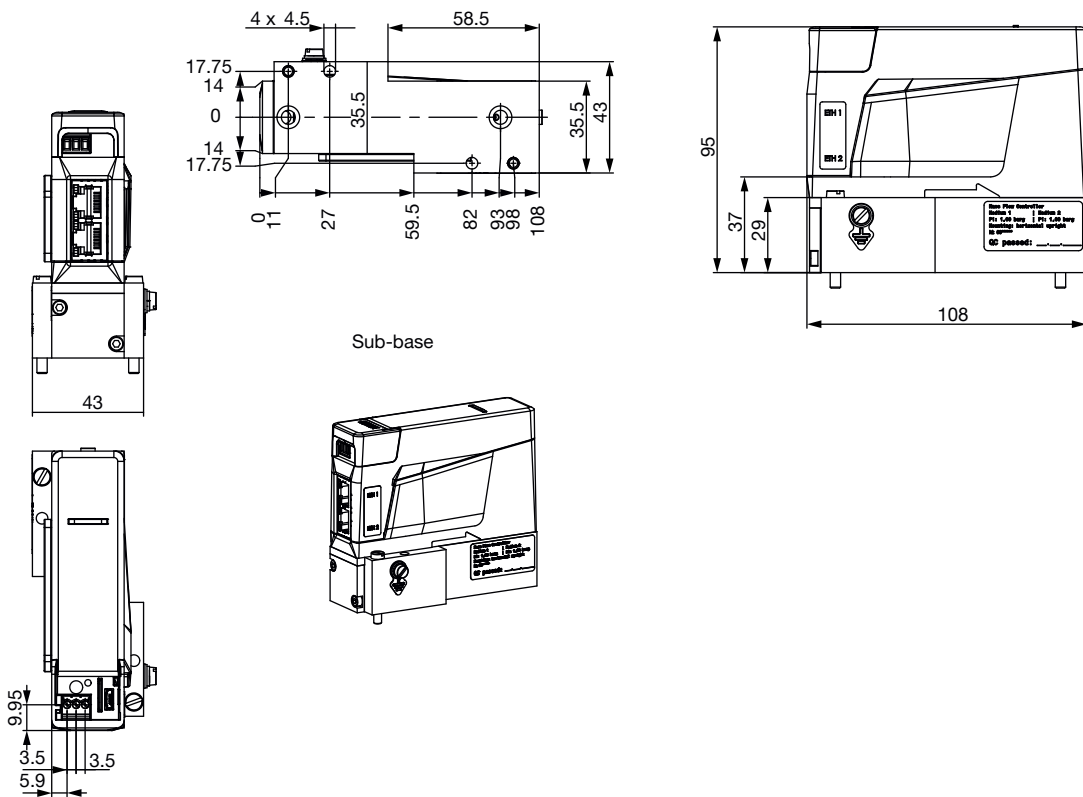
### 3. Dimensions

#### 3.1. Analogue or Industrial Ethernet

##### MFM or MFC with internal valve (Type 2871)

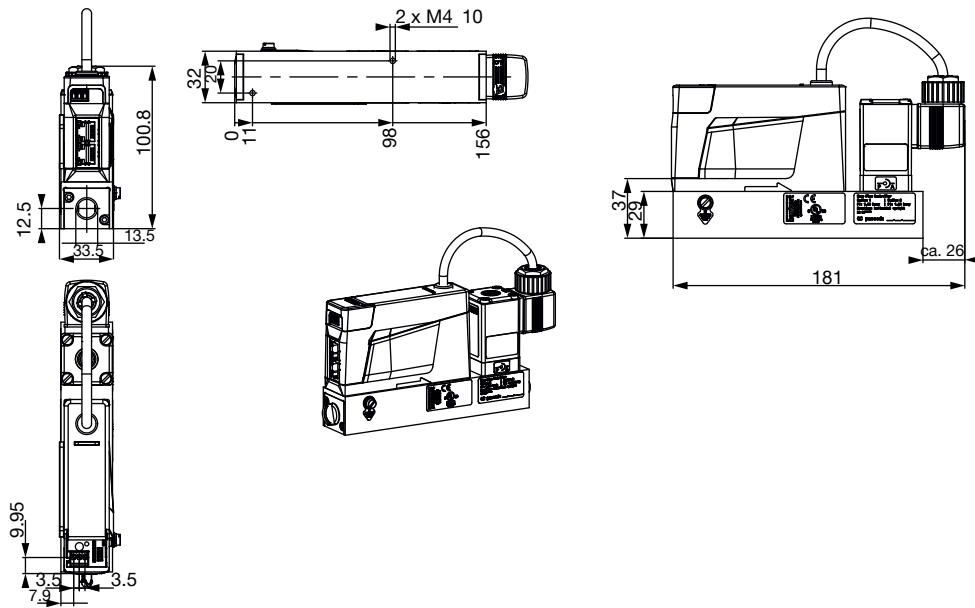


##### Sub-base version of MFM or MFC with internal valve (Type 2871)

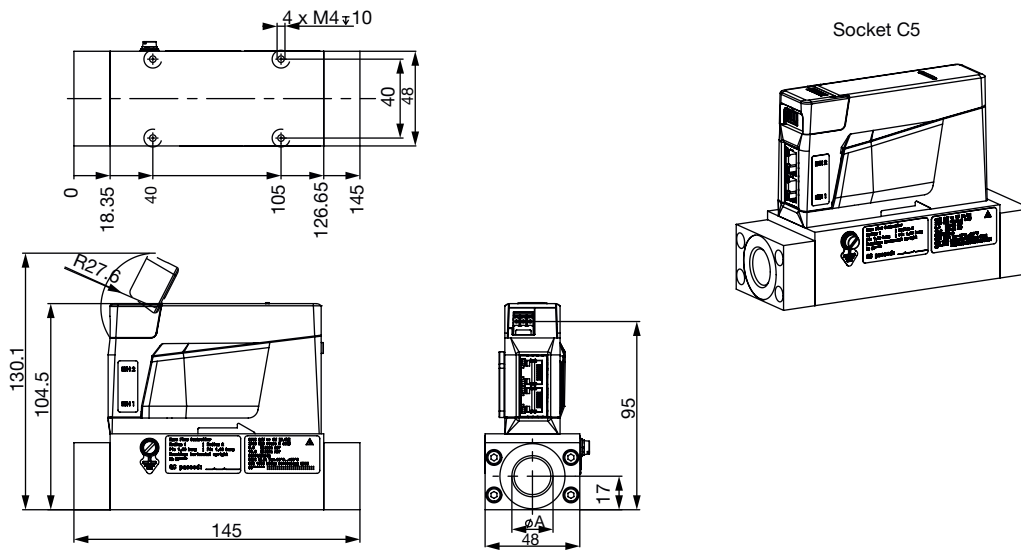


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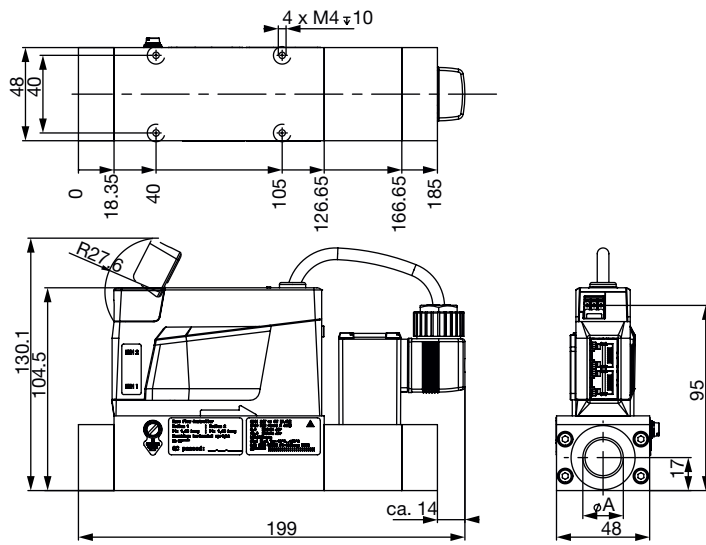
MFC with external valve (Type 2873)



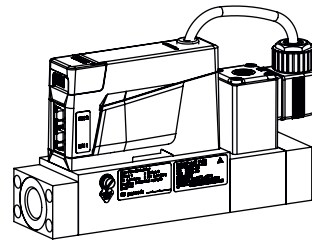
MFM for large nominal flow rates



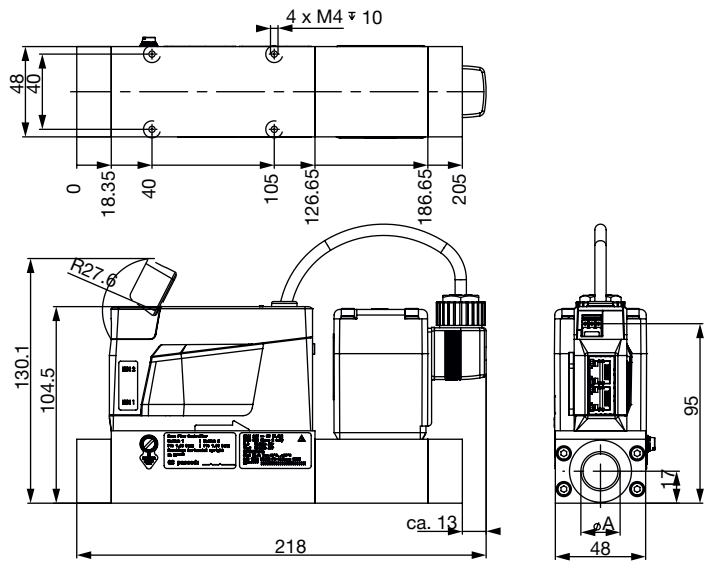
MFC with external valve (Type 2873) for large nominal flow rates



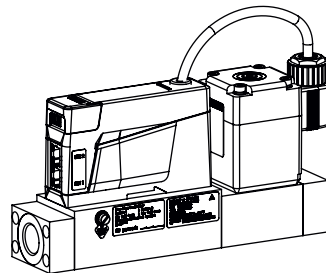
C5 with valve 2873



MFC with external valve (Type 2875) for large nominal flow rates

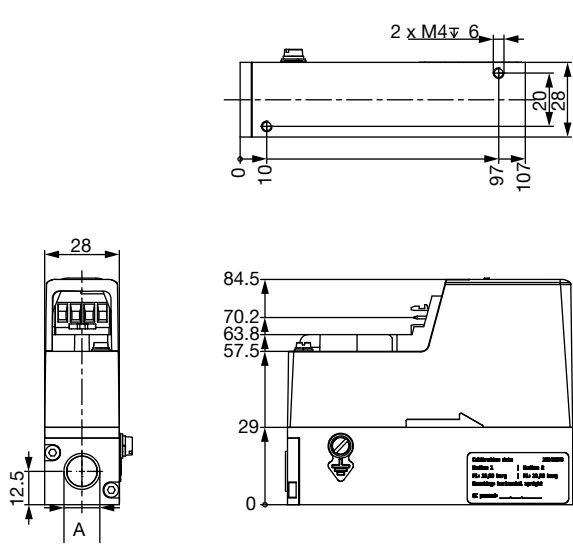


C5 with valve 2875

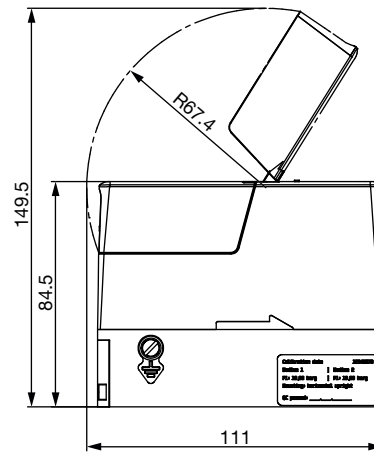
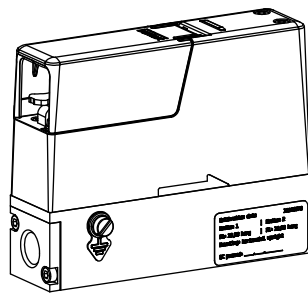


### 3.2. 8741 büS/CANopen

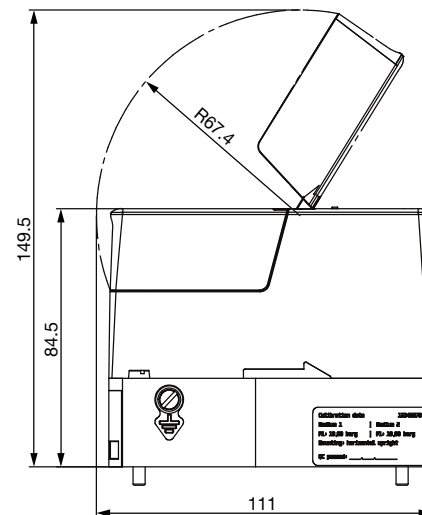
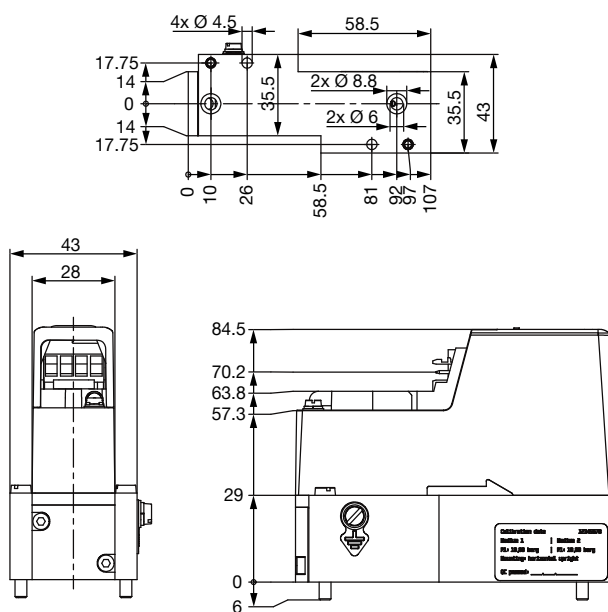
#### MFM or MFC with internal valve (Type 2871)



A: G1/4 or NPT1/4,  
depth 12 mm

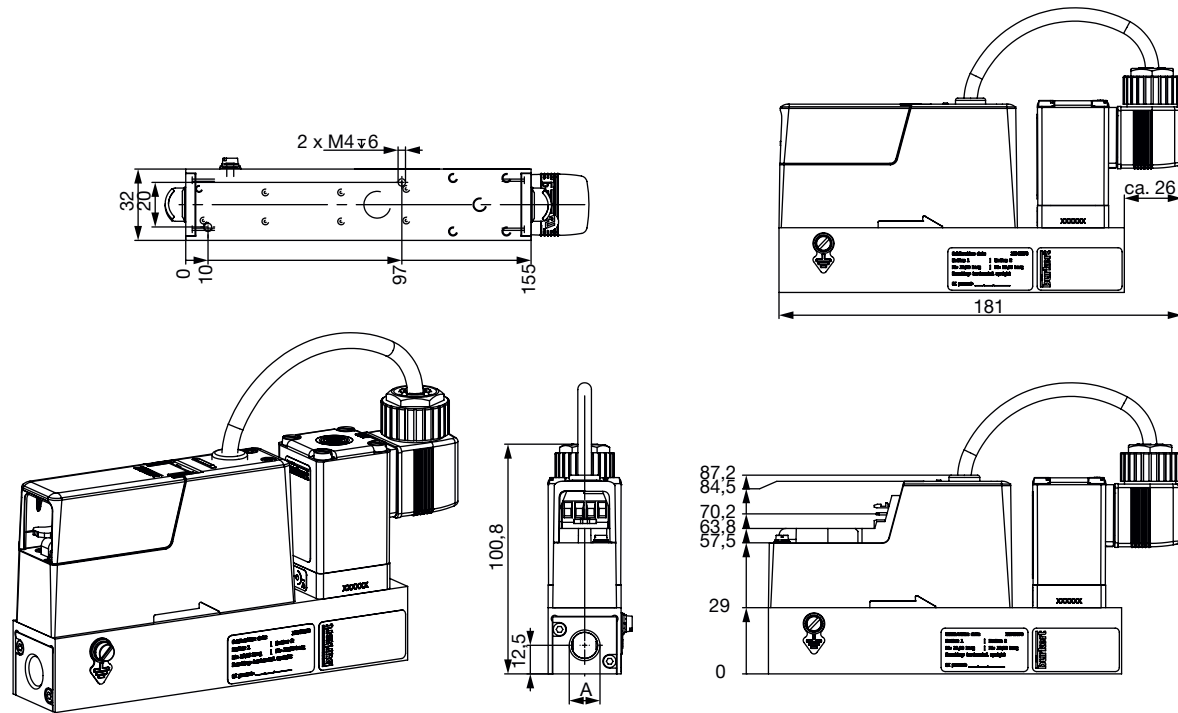


#### Sub-base version of MFM or MFC with internal valve (Type 2871)

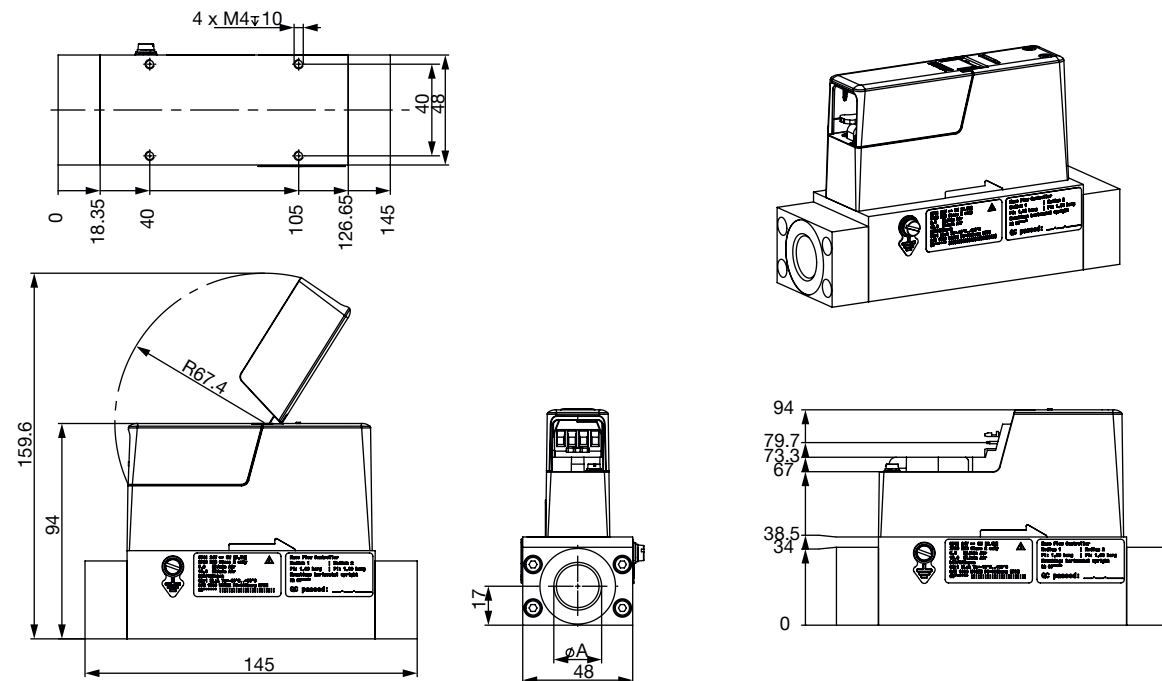




MFC with external valve (Type 2873)

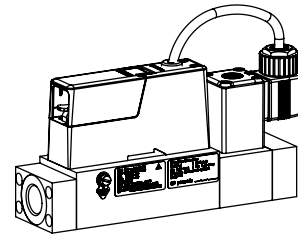
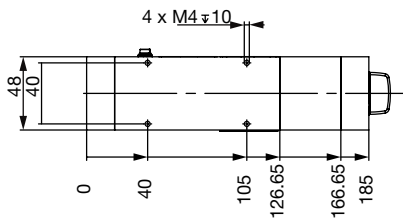


MFM for large nominal flow rates

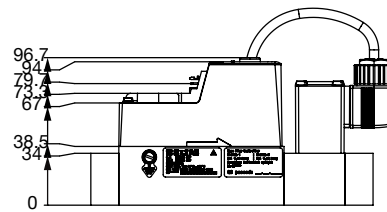
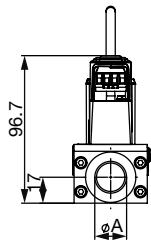
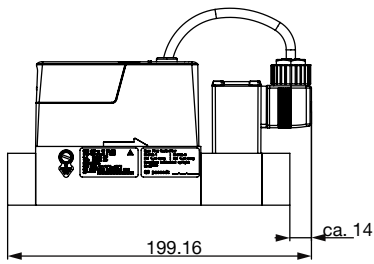


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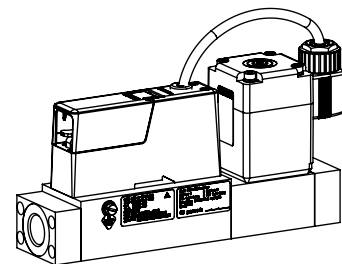
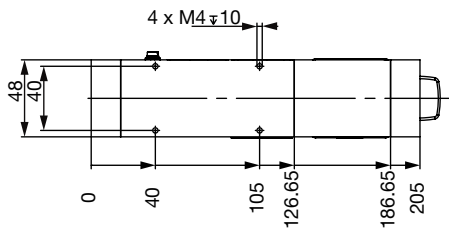
MFC with external valve (Type 2873) for large nominal flow rates



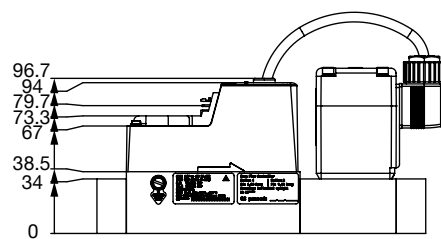
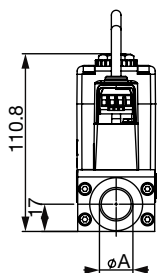
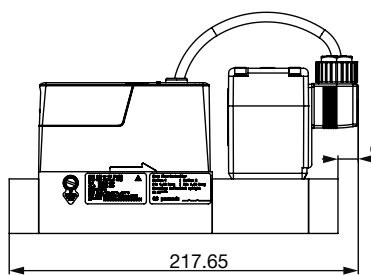
C5 with valve 2873



MFC with external valve (Type 2875) for large nominal flow rates

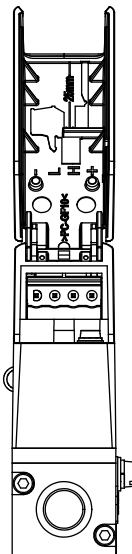


C5 with valve 2875



## 4. Device / Process connections

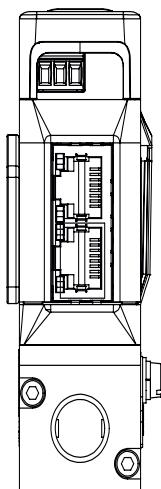
### 4.1. büS / CANopen



| Terminal block, 4 pin | Pin | Assignment |
|-----------------------|-----|------------|
|                       | 1   | DGND       |
|                       | 2   | CANL       |
|                       | 3   | CANH       |
|                       | 4   | +24 V DC   |

| Screw M3 |  |
|----------|--|
|          | When using Bürkert büS cables, the following colour coding applies: <ul style="list-style-type: none"> <li>• Red +24 V DC</li> <li>• Blue CANL</li> <li>• White CANH</li> <li>• Black GND</li> </ul> |

### 4.2. Industrial Ethernet

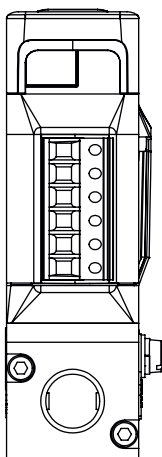
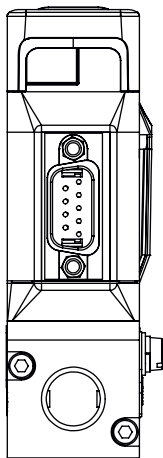


| Terminal block, 3 pin | Pin | Assignment            |
|-----------------------|-----|-----------------------|
|                       | 1   | FE (functional earth) |
|                       | 2   | DGND                  |
|                       | 3   | +24 V DC              |

| RJ45 Socket | Pin | Assignment    |
|-------------|-----|---------------|
|             | 1   | TX +          |
|             | 2   | TX -          |
|             | 3   | RX +          |
|             | 4   | Not connected |
|             | 5   | Not connected |
|             | 6   | RX -          |
|             | 7   | Not connected |
|             | 8   | Not connected |
| Body        |     | Shield        |

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4.3. Analogue



| D-Sub 9 pin, plug |  | Pin  | Assignment                                 |
|-------------------|--|------|--|
|                   |  | 1    | Digital input                              |
|                   |  | 2    | GND (For supply voltage and digital input) |
|                   |  | 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                                     |

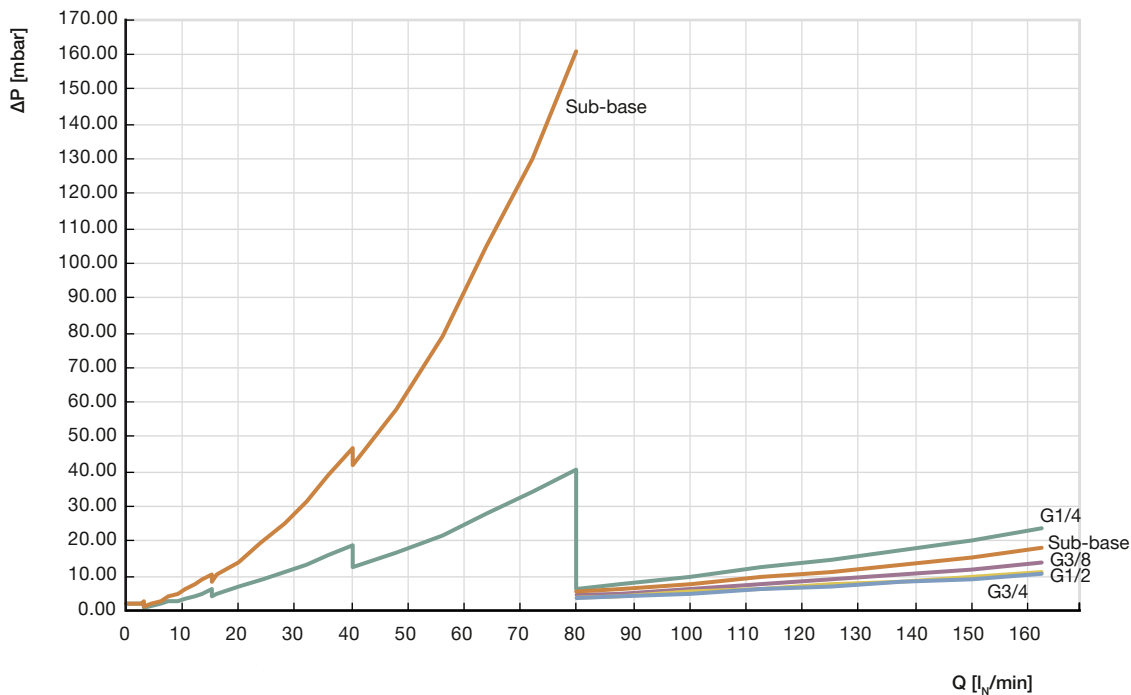
| Terminal block 6 pin |  | Pin | Assignment              |
|----------------------|--|-----|-------------------------|
|                      |  | 1   | + 24 V DC               |
|                      |  | 2   | GND                     |
|                      |  | 3   | Set value input +       |
|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

## 5. Performance specifications

### 5.1. Pressure loss diagram of the MFM

The diagram shows an example of the pressure loss characteristics when air flows through. To determine the pressure loss of another gas, the corresponding air equivalent must first be calculated and the basic fluidics used for the other gas taken into account.

Chip Sensor up to 160 l<sub>N</sub>/min



### 5.2. Flow characteristic

#### Nominal flow range of typical gases

**Note:**

All values refer to 1.013 bar(a) and 0 °C (Index N)

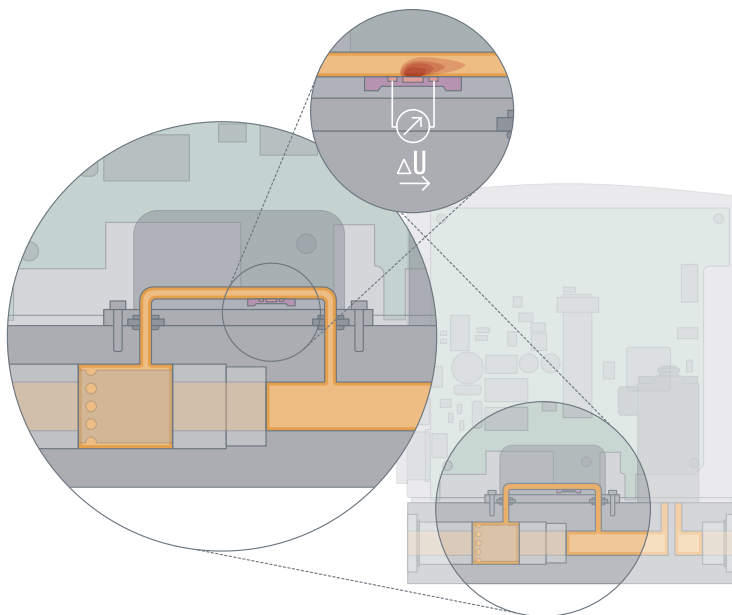
| Gas            | Min. Q <sub>nom</sub> [l <sub>N</sub> /min] | Max. Q <sub>nom</sub> [l <sub>N</sub> /min] |
|----------------|---|---|
| Argon          | 0.01  | 160   |
| Acetylene      | 0.01  | 65  |
| Helium         | 0.01  | 1000  |
| Carbon dioxide | 0.02  | 80  |
| Air            | 0.01  | 160   |
| Methane        | 0.01  | 160   |
| Oxygen         | 0.01  | 160   |
| Nitrogen       | 0.01  | 160   |
| Hydrogen       | 0.01  | 1000  |
| Propane        | 0.03  | 44  |

## 6. Product operation

### 6.1. Measuring principle

The actual flow rate is detected by a sensor. This operates according to a thermal principle which has the advantage of providing the mass flow which is independent on pressure and temperature.

A small part of the total gas stream is diverted into a small, specifically designed bypassing channel which ensures laminar flow conditions. The sensor element is a chip immersed into the wall of this flow channel. The chip, produced in MEMS 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 the flow sensor. The calibration procedure effectuates a unique assignment of the sensor signal to the total flow rate through the device.



## 7. Product accessories

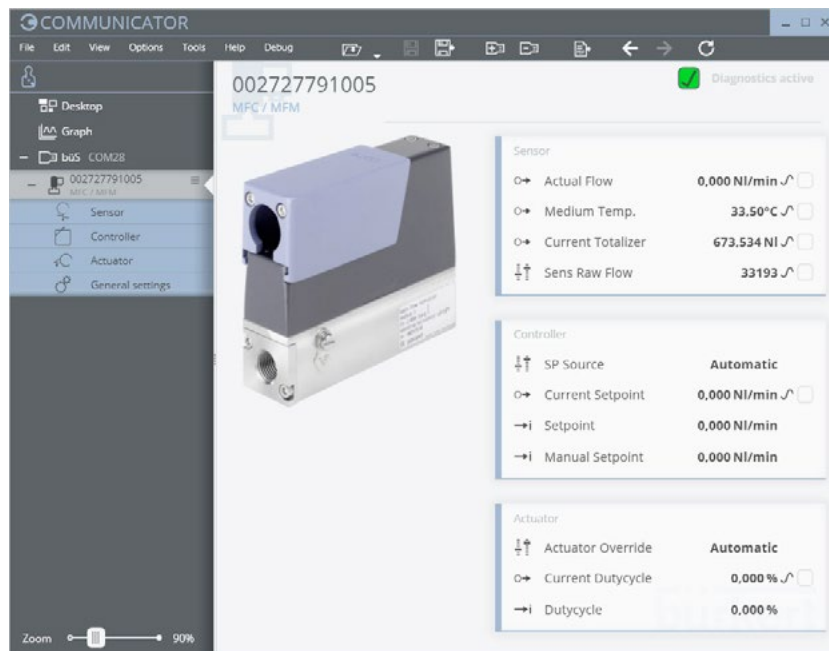
### 7.1. Bürkert Communicator Software

**Note:**

To install the software, click [here](#).

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 parametrisation of all connected field devices. An accessory part, the büS-stick serves as the interface between computer and process instruments (see „8.3. Ordering chart accessories“ on page 16). It transfers “USB data” to “CAN data”. The Communicator allows:

- Diagnosis
- Parametrization
- Registration and storage of process data
- To watch graph of process
- To update firmware of the büS device connected
- Guided re-calibration



#### Type 8741 connection with Bürkert Communicator software

The interface to the “Bürkert Communicator” software tool is based on CANopen. The appropriate bus termination is mandatory. Hence, please activate, for Type 8741 with analogue or Industrial Ethernet interface, the termination resistor switch on the büS-stick. For Type 8741 büS / CANopen, this termination resistor should not be activated, in case the device is already integrated in a properly terminated bus network

To connect the MFC / MFM with the “Bürkert Communicator” software tool, you need a büS-stick. The büS-stick sets contain the necessary accessories.

- For Type 8741 büS / CANopen, the connection is made directly via the 4 pin terminal block (büS-stick Set 1 contains the necessary accessories).
- For Type 8741, with analogue or Industrial Ethernet, the connection is made via the micro-USB socket on the device (büS-stick Set 2 contains the necessary accessories).

## 8. Ordering information

### 8.1. Bürkert eShop – Easy ordering and quick delivery

You would like to find your desired Bürkert product or spare part quickly? Our eShop is available for you around the clock! Register now and order easily and conveniently. Find out about articles, stocks, delivery times, individual prices and benefits from additional “MyBürkert”-functions.

**Discover the many advantages of the Bürkert eShop now! ▶**

### 8.2. Advice on product choice















#### Note:

The “[product questionnaire form](#)” on page 18 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.

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 “[product questionnaire form](#)” on page 18 to indicate the pressures directly before and after the MFC. If these are 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.

### 8.3. Ordering chart accessories

| Description   | Article-No.  |
|---|--|
| büS-stick Set 1 (incl. cable (M12 and Micro-USB), büS-stick with integrated terminating resistor, power supply and other accessories) | 772426  |
| büS-stick Set 2 (incl. cable (M12 and Micro-USB) and büS-stick with integrated terminating resistor)                                  | 772551  |
| Power supply Type 1573 for rail mounting, 100 ... 240 V AC/ 24 V DC, 1.25 A, NEC Class 2 (UL 1310)                                    | 772438  |
| Power supply Type 1573 for rail mounting, 100 ... 240 V AC/ 24 V DC, 1 A, NEC Class 2 (UL 1310)                                       | 772361  |
| Power supply Type 1573 for rail mounting, 100 ... 240 V AC/ 24 V DC, 2 A, NEC Class 2 (UL 1310)                                       | 772362  |
| Power supply Type 1573 for rail mounting, 100 ... 240 V AC/ 24 V DC, 4 A  | 772363  |
| µSIM-card (included in delivery of MFC)   | on request   |
| LabVIEW device driver   | on request   |
| Device description files for CANopen (EDS), PROFINET (GSDML), Ethernet/IP (EDS), EtherCAT (ESI)                                       | Download from <a href="http://www.burkert.com">www.burkert.com</a>                           |
| Bürkert Communicator Software   | Download from <a href="http://www.burkert.com">www.burkert.com</a>                           |
| <b>For 8741 büS / CANopen</b>   |  |
| Terminal block 4 pin (included in delivery)   | 565876  |
| Terminal block 4 pin with integrated 120 Ohm resistance for büS-ending  | 566066  |
| büS cable, 50 m   | 772413  |
| büS cable, 100 m  | 772414  |
| Fieldbus Gateway Type ME43 for Industrial Ethernet (PROFINET, Ethernet/IP, Modbus/TCP, EtherCAT)                                      | 307390  |
| Fieldbus Gateway Type ME43 for PROFIBUS DPV1  | 307393  |
| <b>For 8741 Analogue</b>  |  |
| Terminal block 6 pin (for 8741 Standard; included in delivery of the corresponding analogue version)                                  | on request   |
| Connector cable D-Sub 9 to leads, 5 m   | 580882  |
| Connector cable D-Sub 9 to leads, 10 m  | 580883  |



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DTS 1000222224 EN Version: S Status: RL (released | freigegeben | validé) printed: 31.01.2019



## Product Enquiry Form - Mass Flow Controller

Thank you for your interest in our products! In order to provide you with optimum advice, please fill out the following form and send it to your **Bürkert representative** or e-mail address: [info@burkert.com](mailto:info@burkert.com). All information submitted will of course be kept strictly confidential.

Please fill in the **required fields!**  \*

\*Note: The interactive functions of this PDF may be restricted depending on the PDF reader used.

| Personal Information |  |                 |  |
|----------------------|--|-----------------|--|
| Company              |  | Contact person  |  |
| Customer no.         |  | Department      |  |
| Street               |  | Postcode / Town |  |
| Telephone no.        |  | E-Mail          |  |

| Delivery        |                 |          |                        |
|-----------------|-----------------|----------|------------------------|
| MFC Application | MFM Application | Quantity | Required delivery date |

| Medium data                |  |      |    |
|----------------------------|--|------|----|
| Type of gas or gas mixture |  |      |    |
| Medium's temperature       |  | °C / | °F |
| Ambient temperature        |  | °C / | °F |

| Fluidic data                               |                              |                     |                 |  |                |
|--|------------------------------|---------------------|-----------------|--|----------------|
| Flow range $Q_{Nom}$                       |                              | Min.                | Max.            | unit                                   |                |
| Inlet pressure at $Q_{Nom}$ <sup>1.)</sup> | $p_1 =$                      | barg <sup>2.)</sup> |                 |  |                |
| Outlet pressure at $Q_{Nom}$               | $p_2 =$                      | barg <sup>2.)</sup> |                 |  |                |
| Max. inlet pressure                        | $p_{1max} =$                 | barg <sup>2.)</sup> |                 |  |                |
| Port connection                            | Compression fitting          |                     | Subbase         |  | Vacuum fitting |
|  | Thread:                      | G (DIN ISO 228/1)   | NPT (ANSI B1.2) |  |                |
|  |                              | 1/4"    3/8"        | 1/2"            | 3/4"                                   | 1"             |
| Installation                               | horizontal, valve upright    |                     |                 | vertical, upwards flow                 |                |
|  | horizontal, valve horizontal |                     |                 | vertical, downward flow <sup>3.)</sup> |                |

1.) Corresponds to the calibration pressure

2.) Please indicate all pressure values as overpressure to atmospheric pressure [barg] (g = relative pressure)

3.) Possible reduction of the setting range to 1:10 for a vertical downwards flow

| Material specifications |           |                 |
|-------------------------|-----------|-----------------|
| Body                    | Aluminium | Stainless steel |
| Seals                   | FKM       | EPDM            |

| Electrical data  |                |                |                     |                        |
|--|----------------|----------------|---------------------|------------------------|
| IP protection  | Yes (IP65)     |                | No (IP20 or better) |                        |
| Control / Communication<br>Note:<br>Please choose <b>one</b> of the following options! | Normsignal     | CANopen/büS    | PROFIBUS DP         | Industrial Ethernet    |
|  | 0 ... 5 V      | CANopen        |                     | PROFINET               |
|  | 0 ... 10 V     | büS            |                     | Ethernet IP            |
|  | 0 ... 20 mA    |                |                     | Modbus TCP             |
| 4 ... 20 mA  |                | EtherCAT       |                     |                        |
| Connection<br>Note:<br>Please choose <b>one</b> of the following options!              | D Sub socket   | M12 socket     | D Sub socket        | (RJ45 always standard) |
|  | Terminal block | Terminal block | M12 socket          |                        |

| <b>Approvals / Conformities</b> |
|---------------------------------|
| UL                              |
| ATEX II Cat. 3 G/D, IECEx       |
| USP Class VI conformity         |
| FDA conformity                  |
| EG 1935/2004 conformity         |

| <b>Additional Requirements / Comment</b> |
|--|
| <br><br><br><br><br><br><br><br><br><br> |