



Mass flow controller (MFC)/mass flow meter (MFM) for gases

- Nominal flow ranges from 20 l/min up to 2500 l/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

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

Can be combined with

| | | |
|---|---|---|
|  | Type 6013 Plunger valve 2/2-way direct-acting | ▶ |
|  | Type 6027 Direct-acting 2/2-way plunger valve | ▶ |
|  | Type 0330 Direct-acting 2/2 or 3/2-way pivoted armature valve | ▶ |
|  | Type 0290 Servo-assisted 2/2-way diaphragm valve | ▶ |

Type description

The mass flow controller (MFC)/mass flow meter (MFM) Type 8745 is suitable for mass flow control of high flow rates.

Type 8745 can be configured as MFM or MFC. Optionally, 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 while causing a very low pressure drop. A direct-acting proportional valve as regulating unit guarantees high sensitivity. The integrated PI controller ensures outstanding control characteristics of the MFC.

MFC Type 8745 is available in two variants:

with electromagnetic proportional valve and with motor-driven proportional valve. Aside of an analog and Industrial Ethernet variant, a Modbus RTU variant is available as well.



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1. General technical data

1.1. General

| Product properties | |
|---|---|
| Dimensions | Further information can be found in chapter "4. Dimensions" on page 7. |
| Material | |
| Seal | FKM or EPDM (depending on gas) ^{1.)} |
| Housing | PC (polycarbonate) |
| Base block | Aluminium or stainless steel 1.4404/316L |
| Configuration management | Further information can be found in chapter "8.3. Configuration management for easy device replacement" on page 25. |
| Electrical data | |
| Operating voltage | 24 V DC |
| Residual ripple | ± 2 % |
| Voltage tolerance | ± 10 % |
| Electrical connection | |
| Analogue variant | D-Sub 9 ^{2.)} or terminal block, 6-pin |
| Industrial Ethernet variant | 2 x RJ45 (Switch) ^{3.)} |
| Modbus RTU variant | D-Sub 9 |
| Medium data | |
| Operating medium | Neutral, pure gases (others on request) |
| Calibration medium | Operating medium or air |
| Medium temperature | - 10 °C ^{4.)} ...+ 70 °C (- 10 °C ^{4.)} ...+ 60 °C with oxygen) |
| Process/Port connection & communication | |
| Analogue interface | 4...20 mA, 0...20 mA, 0...10 V or 0...5 V Input impedance: >20 kΩ (voltage) or <300 Ω (current) Maximum current: 10 mA (voltage output) Maximum load: 600 Ω (current output) |
| Digital communication interface | Modbus RS485/RTU list 0 and list 1, Industrial Ethernet: EtherCAT®, EtherNet/IP, Modbus TCP, PROFINET (all digitally via fieldbus) |
| Port connection | G or NPT ¼", ⅜", ½", ¾", 1", sub-base |
| Environment and installation | |
| Installation position | Horizontal or vertical |
| Ambient temperature | - 10 °C...+ 50 °C (higher temperatures on request) |
| Accessories | |
| Software | Bürkert Communicator Further information can be found in chapter "8.1. Bürkert Communicator software" on page 24. |

1.) In addition, when using the electromotive proportional valve:

- Type 3280 DN4: PEEK valve seat seal
- Type 3285: Al₂O₃ valve seat seal

2.) An additional digital input and a relay output are available for the analogue variant with D-Sub 9.

3.) Supply voltage via separate terminal block

4.) When using an electromotive proportional valve, the minimum medium temperature is 0 °C.

1.2. Variant with electromagnetic proportional valve

Type 8745 can be configured as MFM or MFC as required. The MFC variant uses direct-acting proportional valves of the 287x series. These electromagnetic proportional valves are normally closed and stand for highest measuring accuracy and repeatability with settling times resp. response times of a few hundred milliseconds.

| Product properties | |
|---|---|
| Dimensions | Further information can be found in chapter "1.2. Variant with electromagnetic proportional valve" on page 4. |
| Total weight | Approx. 1800 g (aluminium, 16 W valve) Approx. 3100 g (stainless steel 1.4404/316L, 16 W valve) |
| LED display ^{1.)} | RGB-LED based on NAMUR NE107 |
| Control valve (proportional valve) | |
| Valve orifice | 0.8...12 mm |
| K _{vs} value range | 0.02...2.5 m ³ /h |

| Performance data | |
|---|--|
| Nominal flow range (Q_N) | MFC: 20...1500 l/min (N_2) MFMs \leq 2500 l/min (N_2) |
| Maximum operating pressure (overpressure to atmospheric pressure) | 10 bar, optional up to 25 bar (MFM) For MFCs, the maximum operating pressure depends on the medium and nominal valve size |
| Measuring accuracy ²⁾ | ± 1.5 % of reading ± 0.3 % FS (under calibration conditions) |
| Repeatability | ± 0.1 % FS |
| Measuring span | 1:50 |
| Settling time (MFC)/Response time (MFM) ($t_{95\%}$) | < 500 ms |
| Electrical data | |
| Power consumption ³⁾ | Max. 4 W (as MFM) Max. 12.5...31.5 W (as MFC, depending on proportional valve type) |
| Approvals and conformities | |
| Protection class | IP20 |
| North America (USA/Canada) | Further information can be found in chapter "2.4. North America (USA/Canada)" on page 6. |
| Foods and Beverages/Hygiene | Further information can be found in chapter "2.5. Foods and beverages/Hygiene" on page 6. |
| Oxygen | Further information can be found in chapter "2.6. Oxygen" on page 6. |

1.) For a detailed description of LED colours see **operating instructions Type 8745** ▶

2.) If the operating medium is different from the calibration medium, the actual measurement accuracy might vary from the indicated value. If the operating medium is natural gas, the measurement accuracy depends on the composition of the natural gas, which can vary depending on the origin and season.

3.) Information in relation to the typical power consumption (at +23 °C ambient temperature, nominal flow and 30 min closed-loop control mode). Information according to UL 61010-1 may vary (see **operating instructions Type 8745** ▶).

1.3. Variant with electromotive proportional valve

Type 8745 with electromotive proportional valve is especially suitable for applications with high inlet pressures of up to 22 bar 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 input changes will drastically increase the motor's duty cycle. Further information about the derating curve can be found in the chapter "6.3. Derating diagram for electromotive variants" on page 23.

| Product properties | |
|--|--|
| Dimensions | Further information can be found in chapter "1.3. Variant with electromotive proportional valve" on page 5. |
| Total weight | Approx. 1670 g (aluminium, valve Type 3280) Approx. 2940 g (stainless steel 1.4404/316L, valve Type 3280) |
| LED display ¹⁾ | With MFM: RGB LED according to NAMUR NE107 With valve: RGB LED to indicate valve opening |
| Control valve (proportional valve) | Normally closed |
| Valve orifice | 2...20 mm |
| K_{VS} value range | 0.5...7.8 m ³ /h |
| Performance data | |
| Nominal flow range (Q_N) | 20...2500 l/min (N_2) |
| Maximum operating pressure (overpressure to atmospheric pressure) | 22 bar (MFM) For MFCs, the maximum operating pressure depends on the medium and nominal valve size |
| Measuring accuracy | ± 2 % of reading ± 0.5 % FS (under calibration conditions) |
| Repeatability | ± 0.5 % FS |
| Measuring span | 1:50 |
| Settling time (MFC)/Response time (MFM) ($t_{95\%}$) ²⁾ | < 5 s |
| Electrical data | |
| Power consumption | Max. 4 W (as MFM) Max. 12 W (as MFC) ³⁾ |
| Approvals and conformities | |
| Degree of protection | IP20 |
| North America (USA/Canada) | Further information can be found in chapter "2.4. North America (USA/Canada)" on page 6. |

| | |
|-----------------------------|---|
| Foods and Beverages/Hygiene | Further information can be found in chapter “2.5. Foods and beverages/Hygiene” on page 6. |
| Oxygen | Further information can be found in chapter “2.6. Oxygen” on page 6. |

- 1.) For a detailed description of LED colours see **operating instructions Type 8745** ▶
- 2.) If the operating medium is different from the calibration medium, the actual measurement accuracy might vary from the indicated value. If the operating medium is natural gas, the measurement accuracy depends on the composition of the natural gas, which can vary depending on the origin and season.
- 3.) Data during the movement of the electromotive proportional valve. Valve holding power is < 1 W.

2. Approvals and conformities

2.1. General notes

- 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 variants can be supplied with the below mentioned approvals or conformities.

2.2. Conformity

In accordance with the Declaration of Conformity, the product is compliant with the EU Directives.

2.3. Standards

The applied standards which are used to demonstrate compliance with the EU Directives are listed in the EU-Type Examination Certificate and/or the EU Declaration of Conformity.

2.4. North America (USA/Canada)

| Approval | Description |
|----------|--|
| | <p>Optional: UL Listed for the USA and Canada The products are UL Listed for the USA and Canada according to:</p> <ul style="list-style-type: none"> • UL 61010-1 (ELECTRICAL EQUIPMENT FOR MEASUREMENT, CONTROL, AND LABORATORY USE – Part 1: General Requirements) • CAN/CSA-C22.2 No. 61010-1 |

2.5. Foods and beverages/Hygiene

| Conformity | Description |
|------------|---|
| FDA | <p>FDA – Code of Federal Regulations (valid for variable code PL02, PL03) All wetted materials are compliant with the Code of Federal Regulations published by the FDA (Food and Drug Administration, USA) according to the manufacturer’s declaration.</p> |
| USP | <p>United States Pharmacopeial Convention (USP) (valid for variable code PL04) All wetted materials are biocompatible according to the manufacturer’s declaration.</p> |
| | <p>EC Regulation 1935/2004 of the European Parliament and of the Council (valid for variable code PL01, PL02) All wetted materials are compliant with EC Regulation 1935/2004/EC according to the manufacturer’s declaration.</p> |

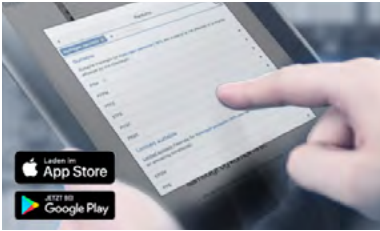
2.6. Oxygen

| Conformity | Description |
|----------------|--|
| O ₂ | <p>Optional: Suitability for oxygen (valid for the variable code NL02) The products are suitable for use with gaseous oxygen, according to the manufacturer’s declaration.</p> |

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3. Materials

3.1. Bürkert resistApp



Bürkert resistApp – Chemical Resistance Chart

You want to ensure the reliability and durability of the materials in your individual application case? Verify your combination of media and materials on our website or in our resistApp.

[Start Chemical Resistance Check](#)

4. Dimensions

4.1. Thread depths of base blocks

MFC/MFM for small nominal flow rates

Note:

The following table applies to base blocks 00...A1.

| Thread (A) | Thread depth [mm] |
|------------|-------------------|
| G ¼ | 12 |
| NPT ¼ | 11 |
| G ⅜ | 12 |
| NPT ⅜ | 11 |
| G ½ | 15 |
| NPT ½ | 14 |
| G ¾ | 16 |
| NPT ¾ | 15 |

MFC/MFM for large and very large nominal flow rates

Note:

The following table applies to base blocks A2...A3.

| Thread (A) | Thread depth [mm] |
|------------|-------------------|
| G ½ | 15 |
| NPT ½ | 14 |
| G ¾ | 16 |
| NPT ¾ | 15 |
| G 1 | 18 |
| NPT 1 | 16.8 |

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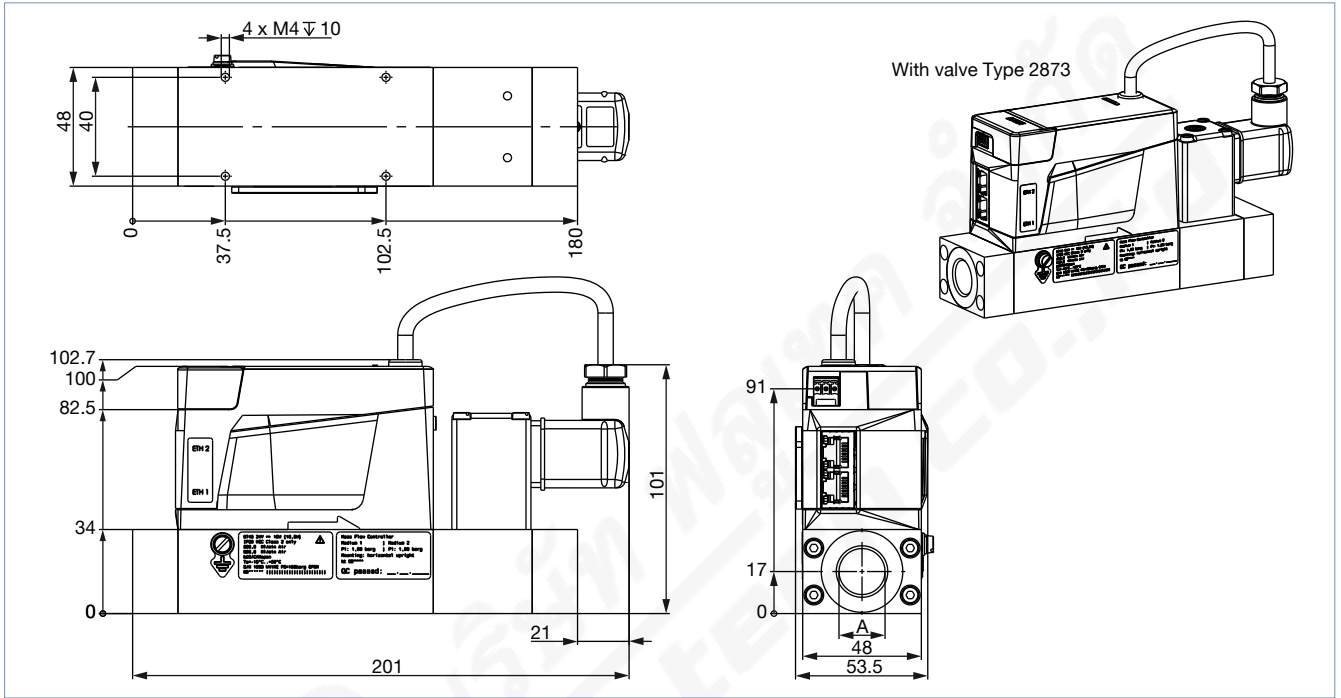
4.2. Variant with electromagnetic proportional valve

MFC with valve Type 2873

Variant with base block 00 or A1 for small nominal flow rates

Note:

Dimensions in mm



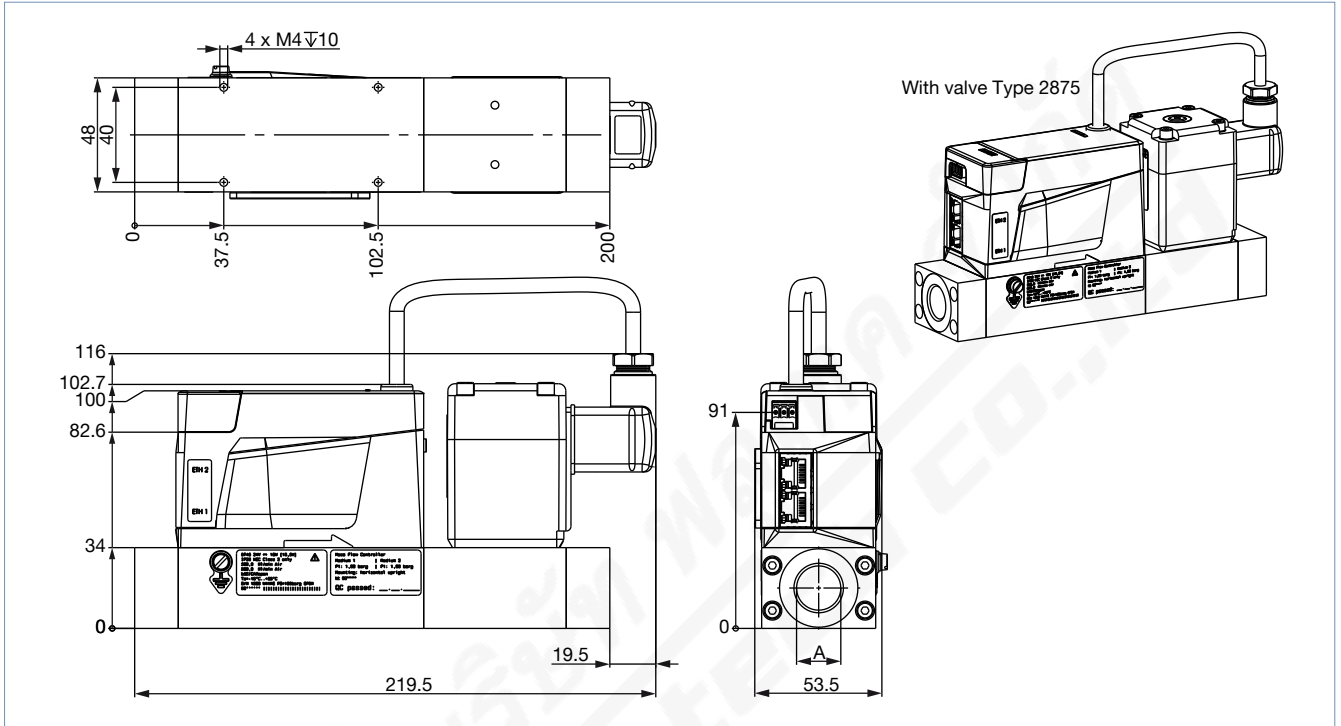
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MFC with valve Type 2875

Variant with base block 00 or A1 for small nominal flow rates

Note:

Dimensions in mm

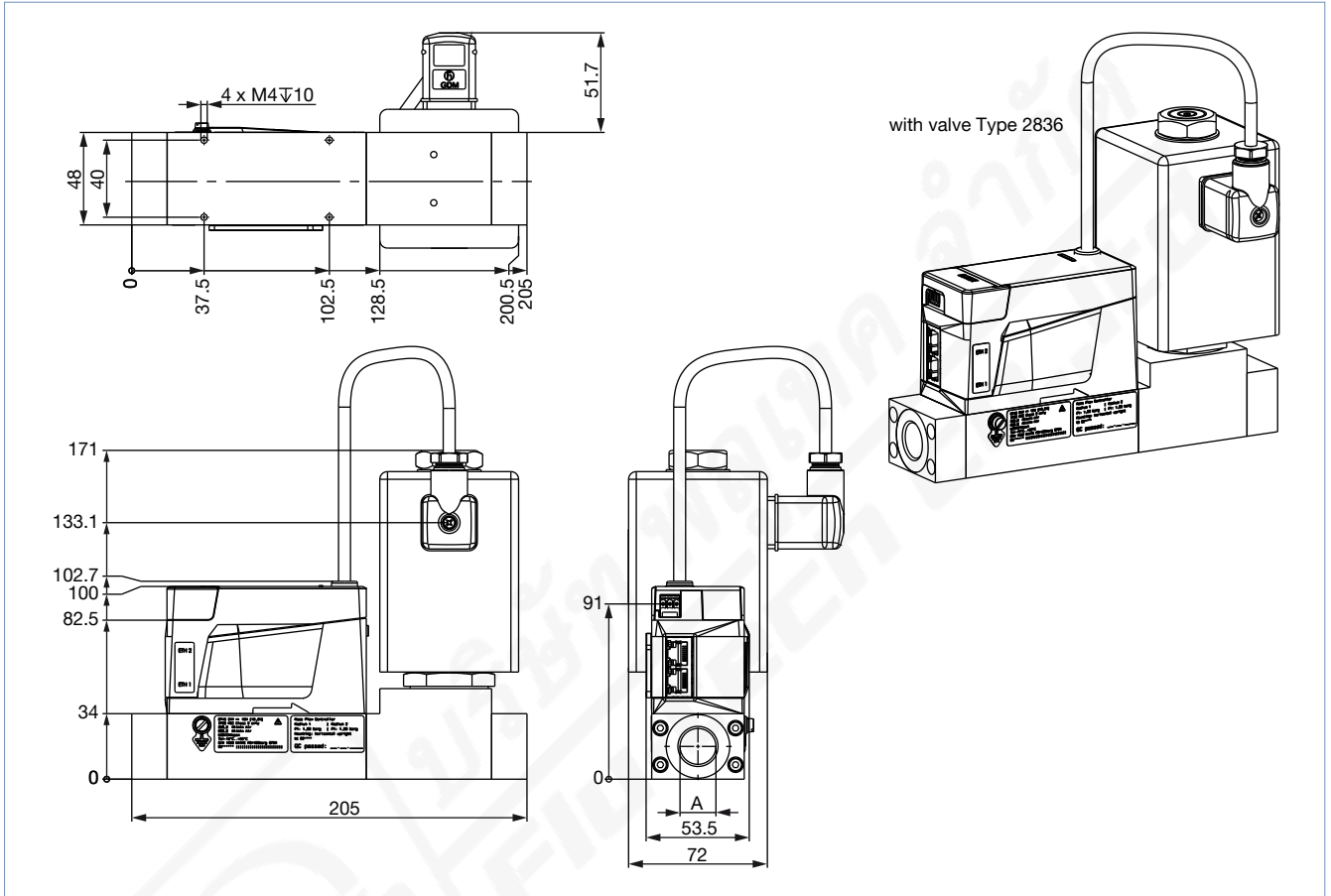


MFC with valve Type 2836

Variant with base block 00 or A1 for small nominal flow rates

Note:

Dimensions in mm

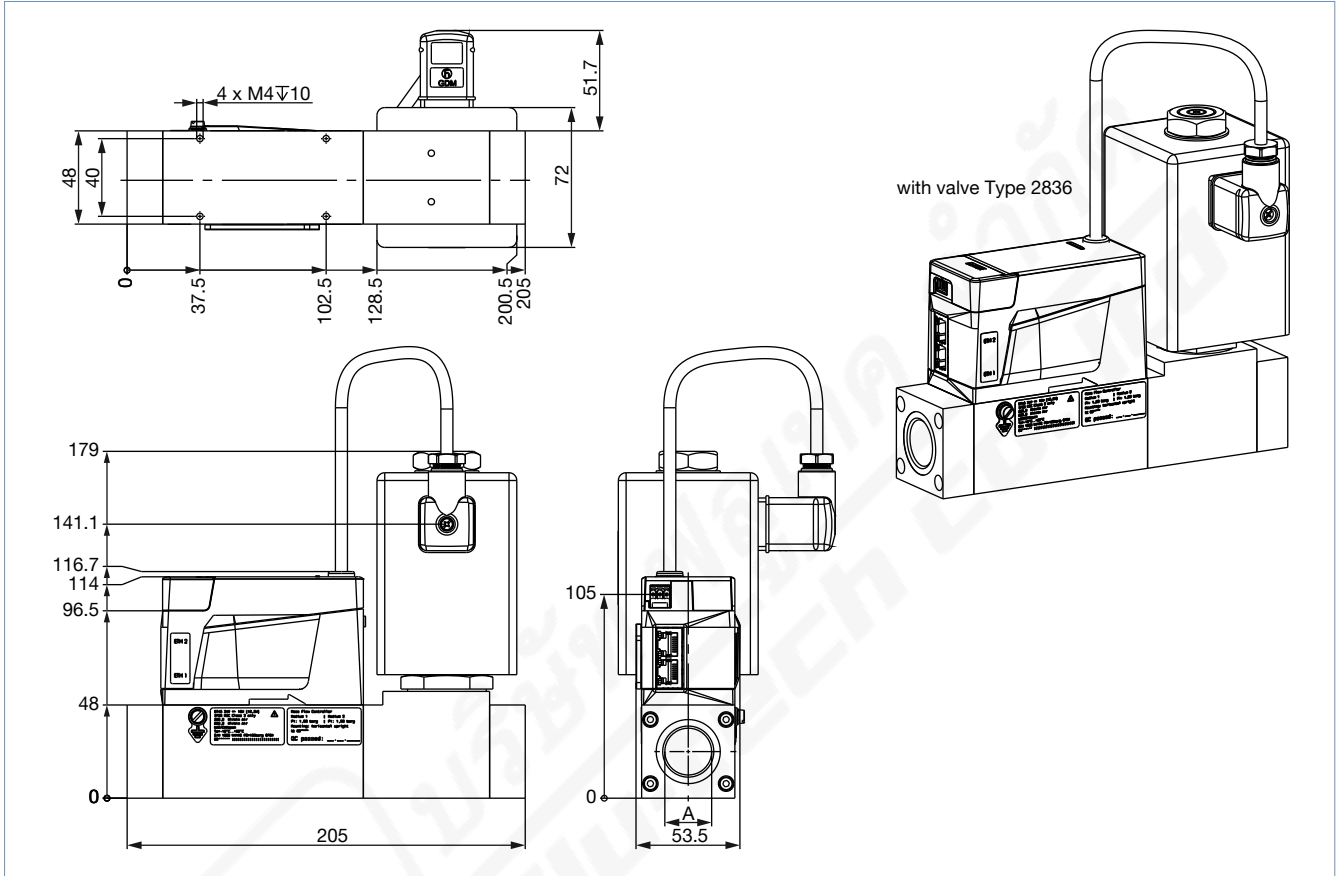


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Variant with base block A2 for large nominal flow rates

Note:

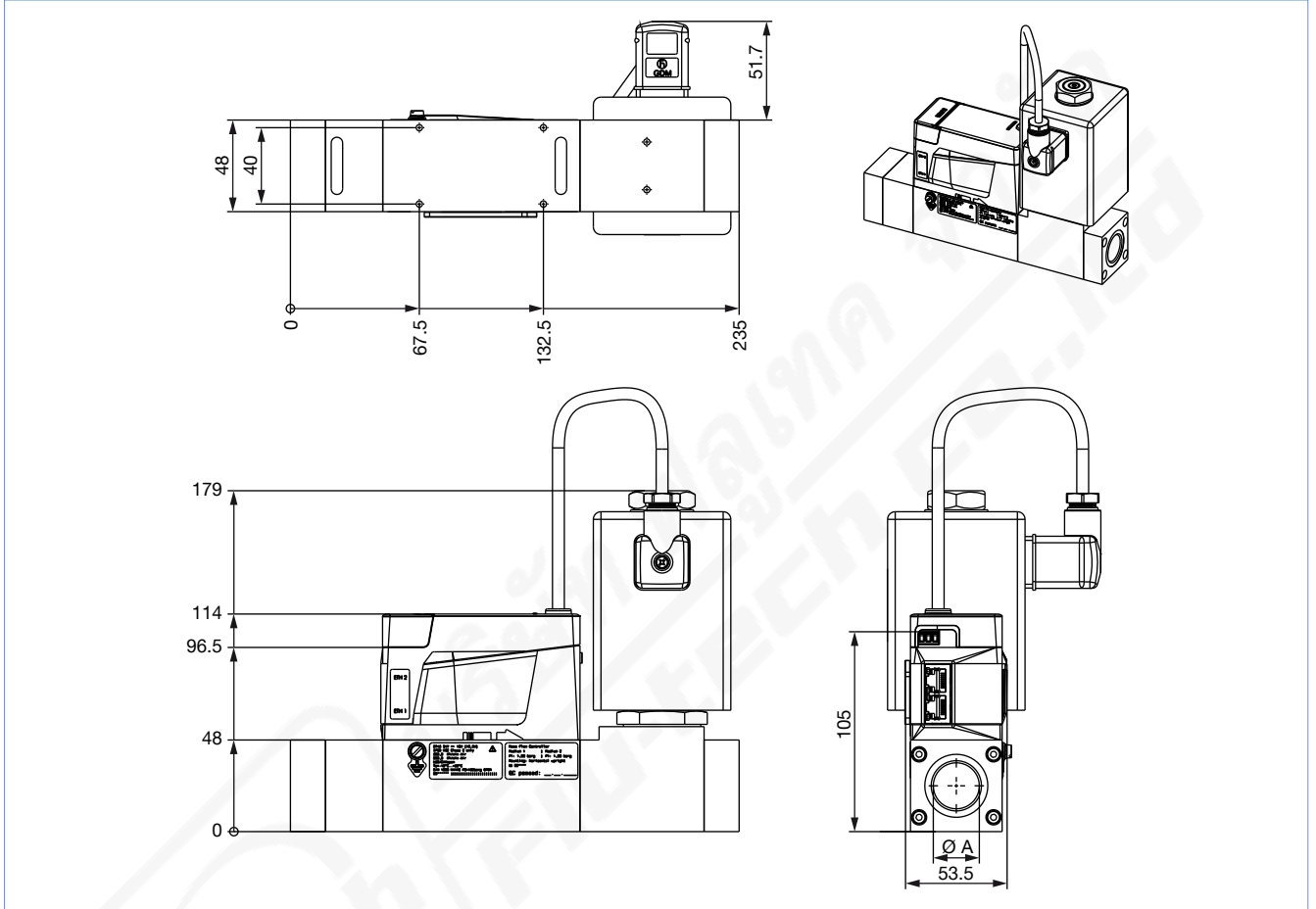
Dimensions in mm



Variant with base block A3 for very large nominal flow rates

Note:

- From a nominal flow rate $Q_N > 1500$ l/min onwards, the overall length increases by 30 mm.
- Dimensions in mm



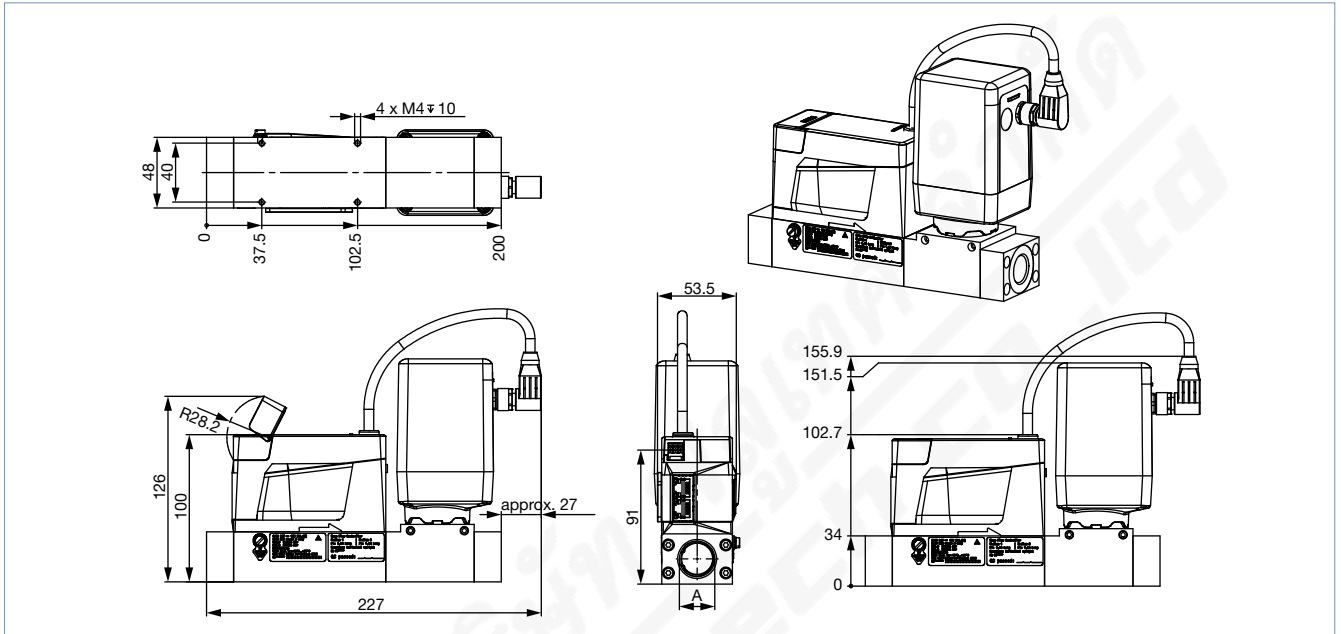
4.3. Variant with electromotive proportional valve

MFC with valve Type 3280

Variant with base block 00 or A1 for small nominal flow rates

Note:

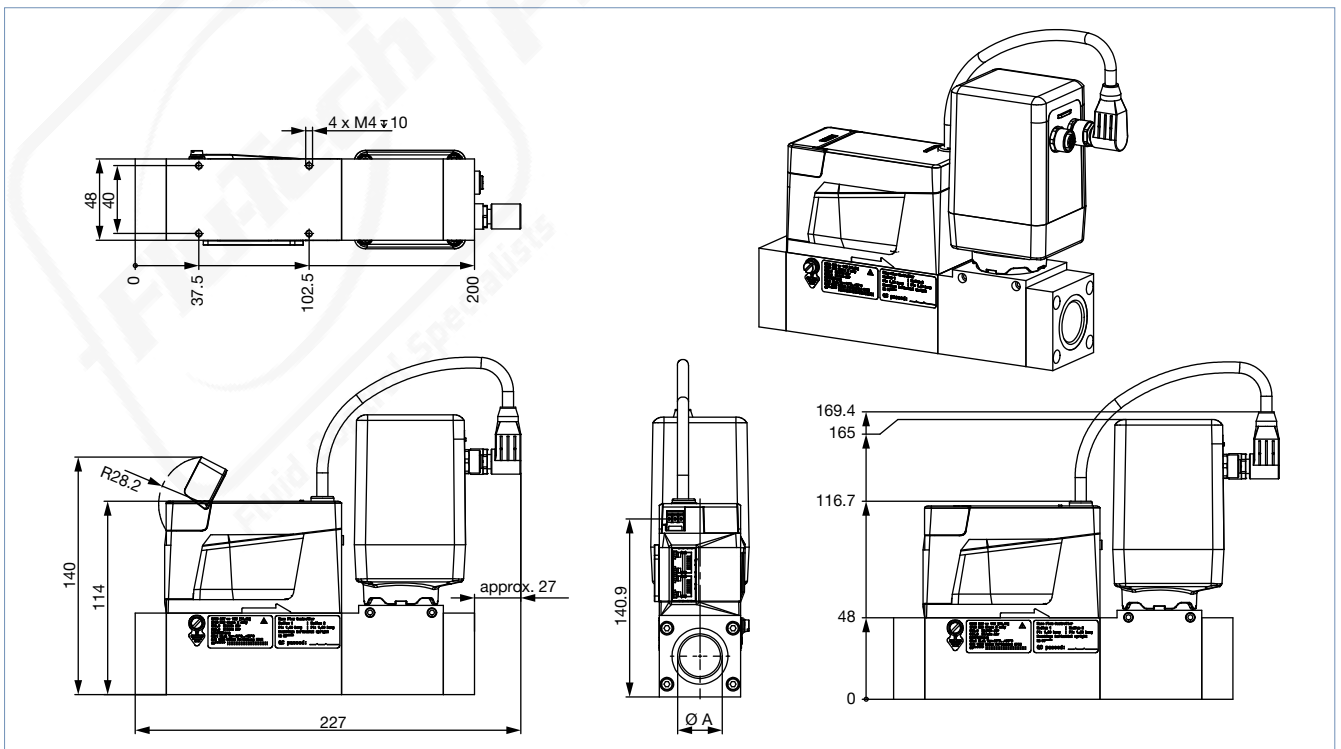
Dimensions in mm



Variant with base block A2 for large nominal flow rates

Note:

Dimensions in mm

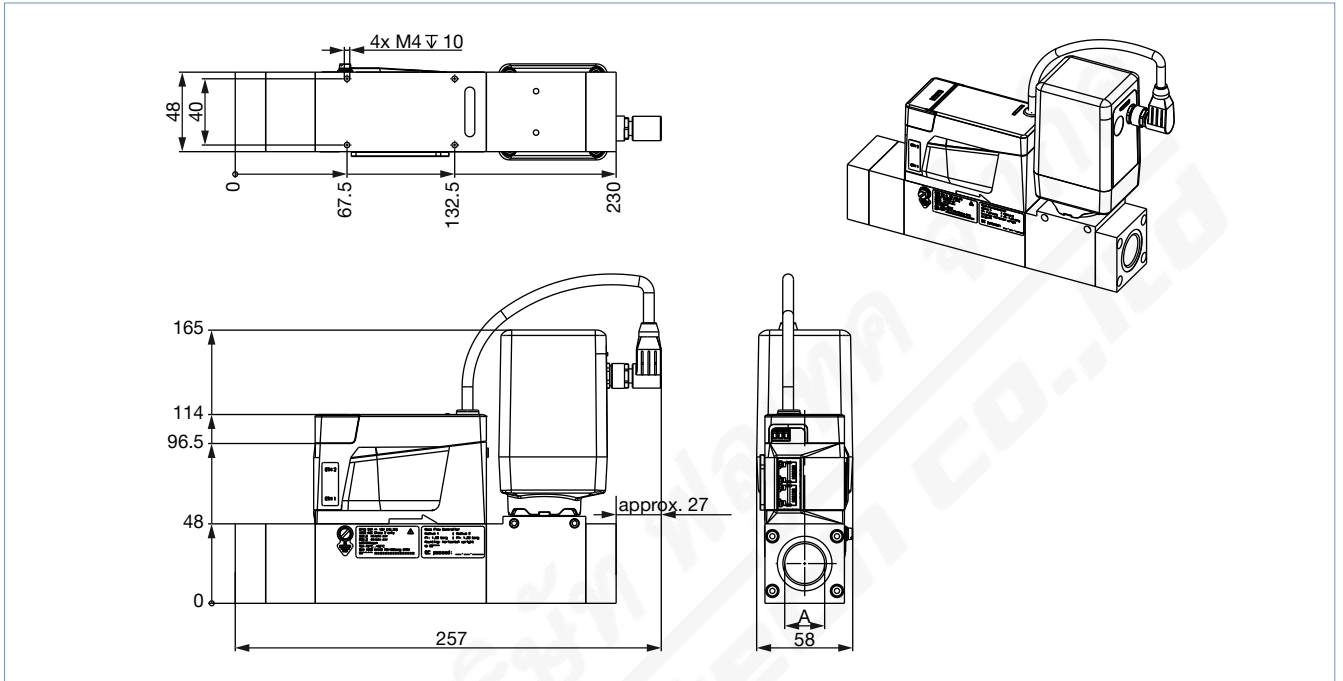


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Variant with base block A3 for very large nominal flow rates

Note:

- From a nominal flow rate $Q_N > 1500$ l/min onwards, the overall length increases by 30 mm.
- Dimensions in mm

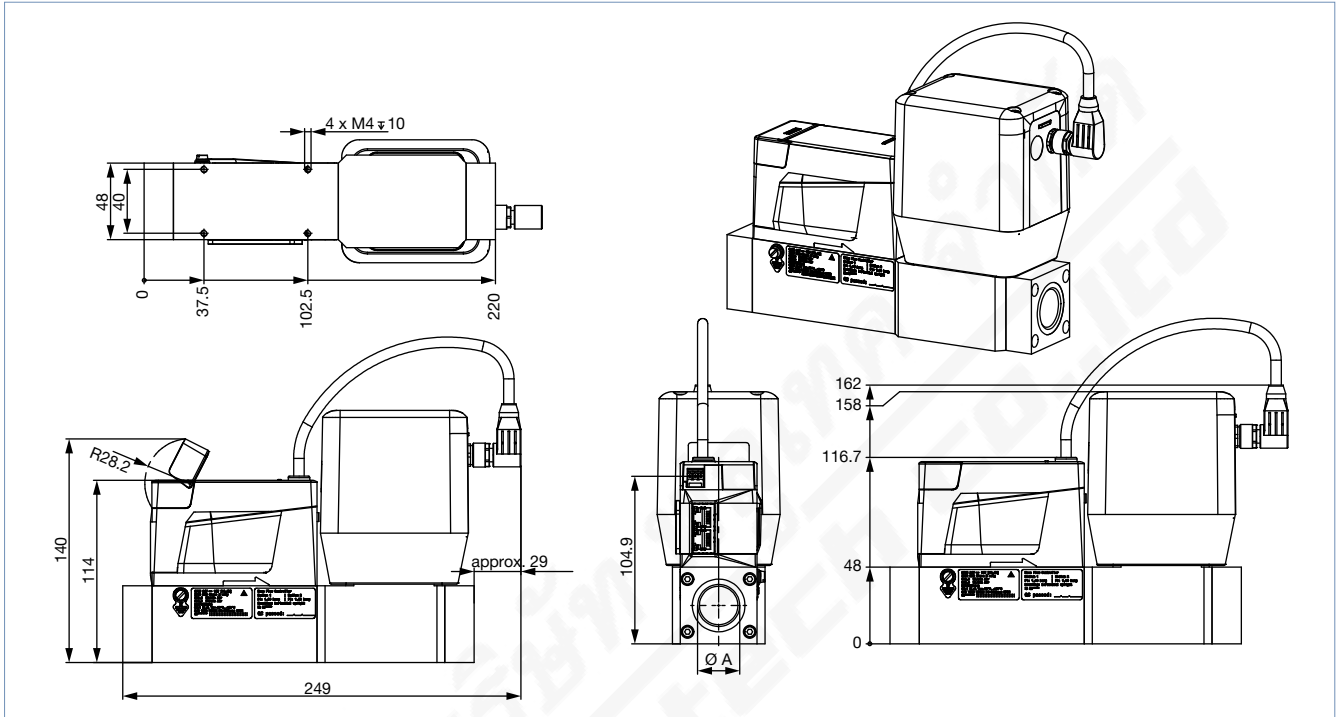


MFC with valve Type 3285 (DN12 and DN15)

Variant with base block A2 for large nominal flow rates

Note:

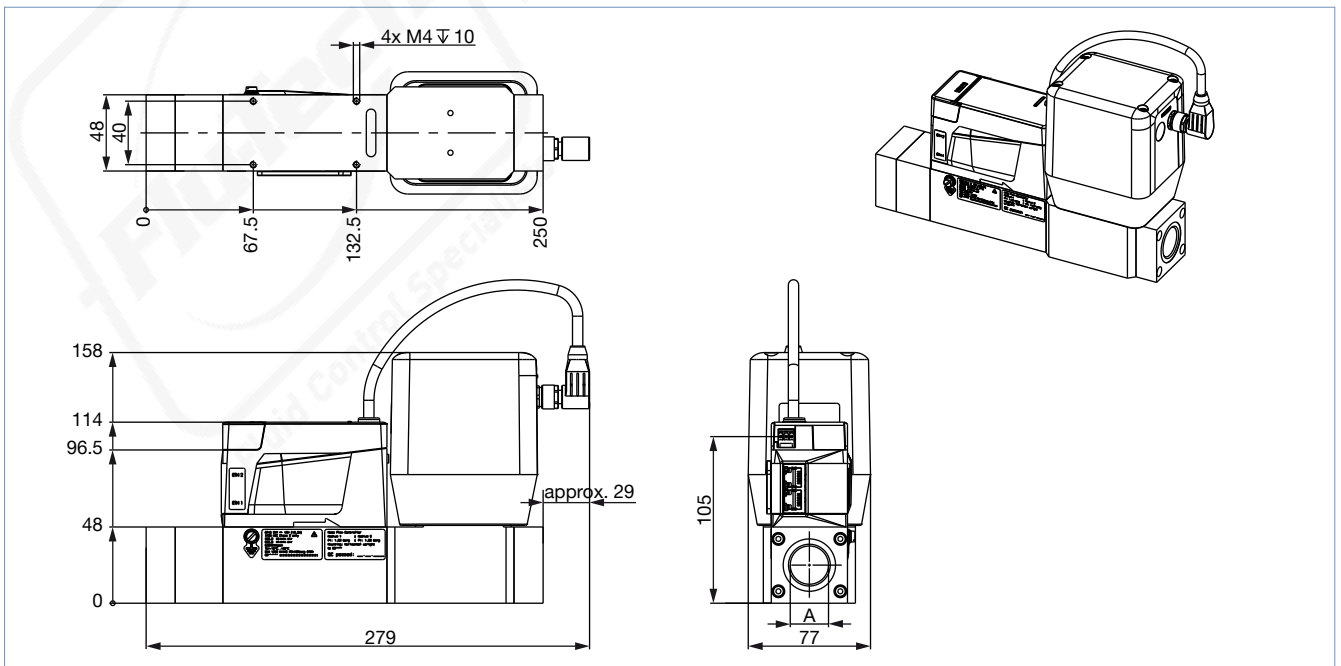
Dimensions in mm



Variant with base block A3 for very large nominal flow rates

Note:

- From a nominal flow rate $Q_N > 1500$ l/min onwards, the overall length increases by 30 mm.
- Dimensions in mm



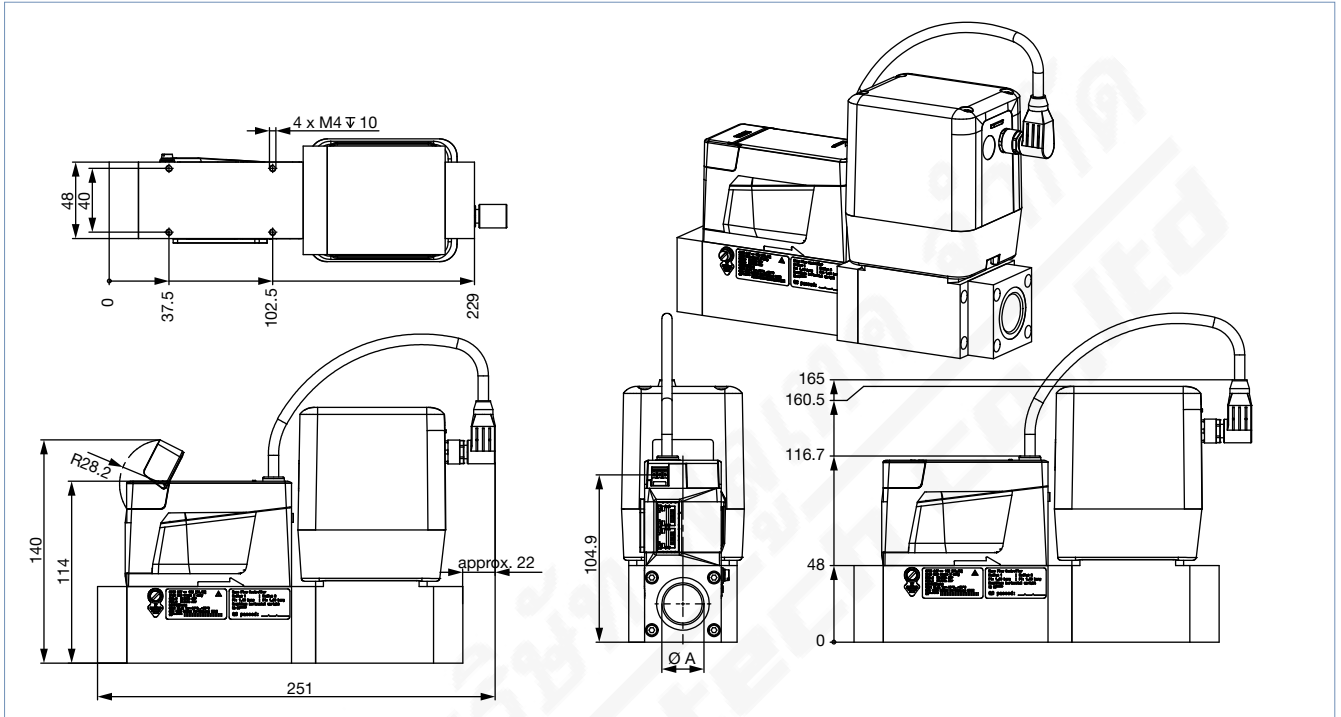
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MFC with valve Type 3285 (DN20 and DN25)

Variant with base block A2 for large nominal flow rates

Note:

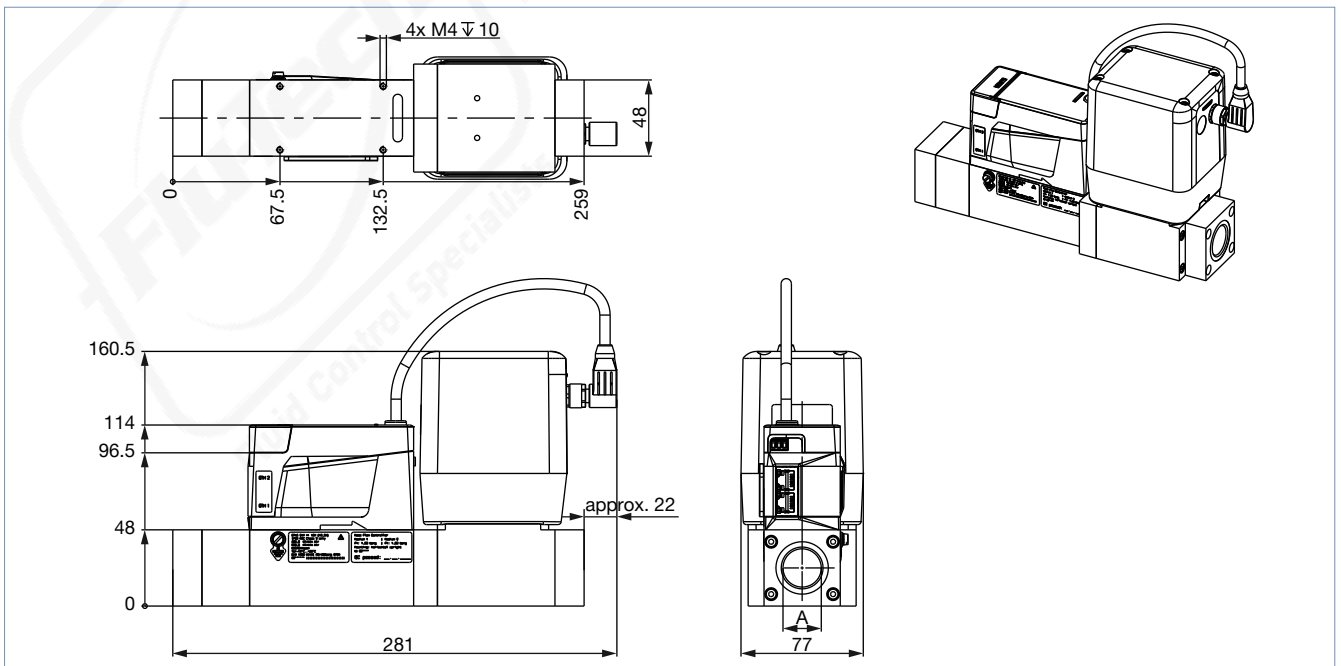
Dimensions in mm



Variant with base block A3 for very large nominal flow rates

Note:

- From a nominal flow rate $Q_N > 1500$ l/min onwards, the overall length increases by 30 mm.
- Dimensions in mm



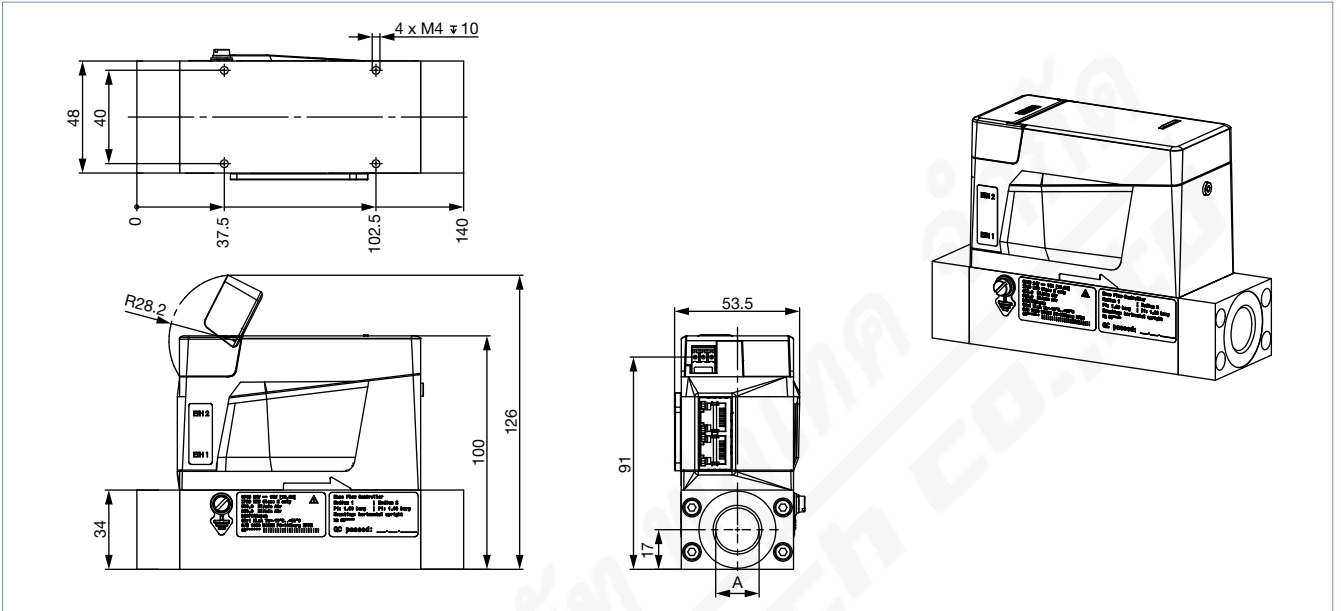
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4.4. MFM variant

Variant with base block 00 or A1 for small nominal flow rates

Note:

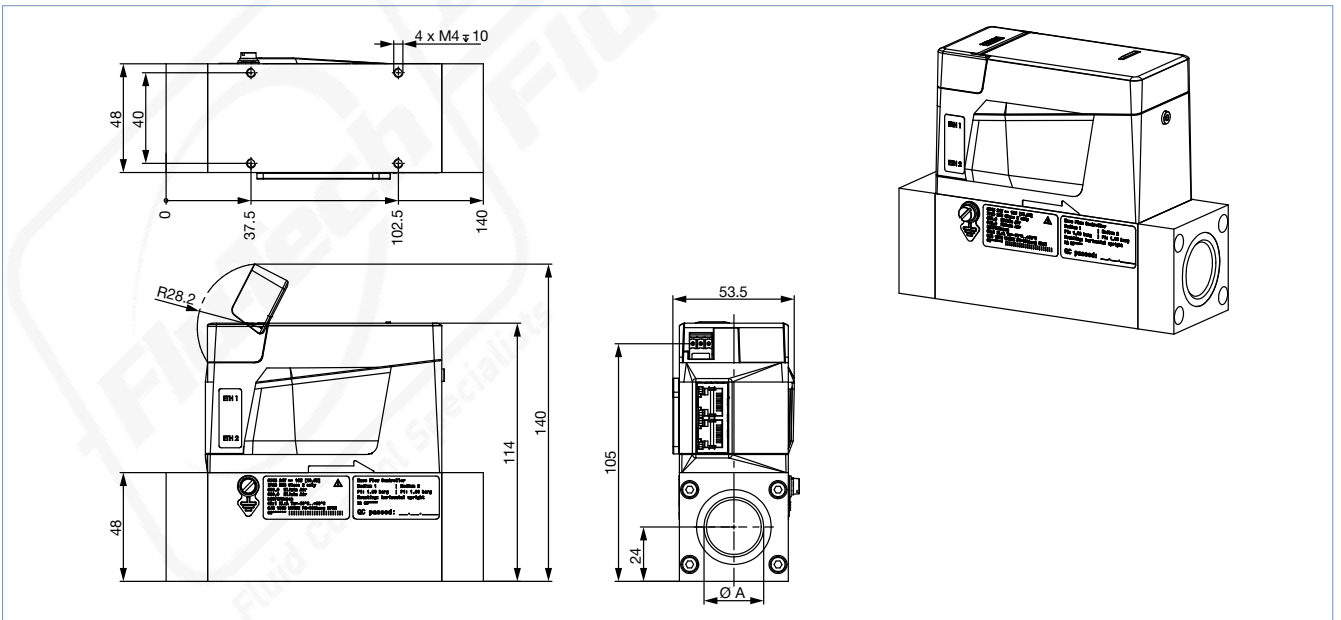
Dimensions in mm



Variant with base block A2 for large nominal flow rates

Note:

Dimensions in mm

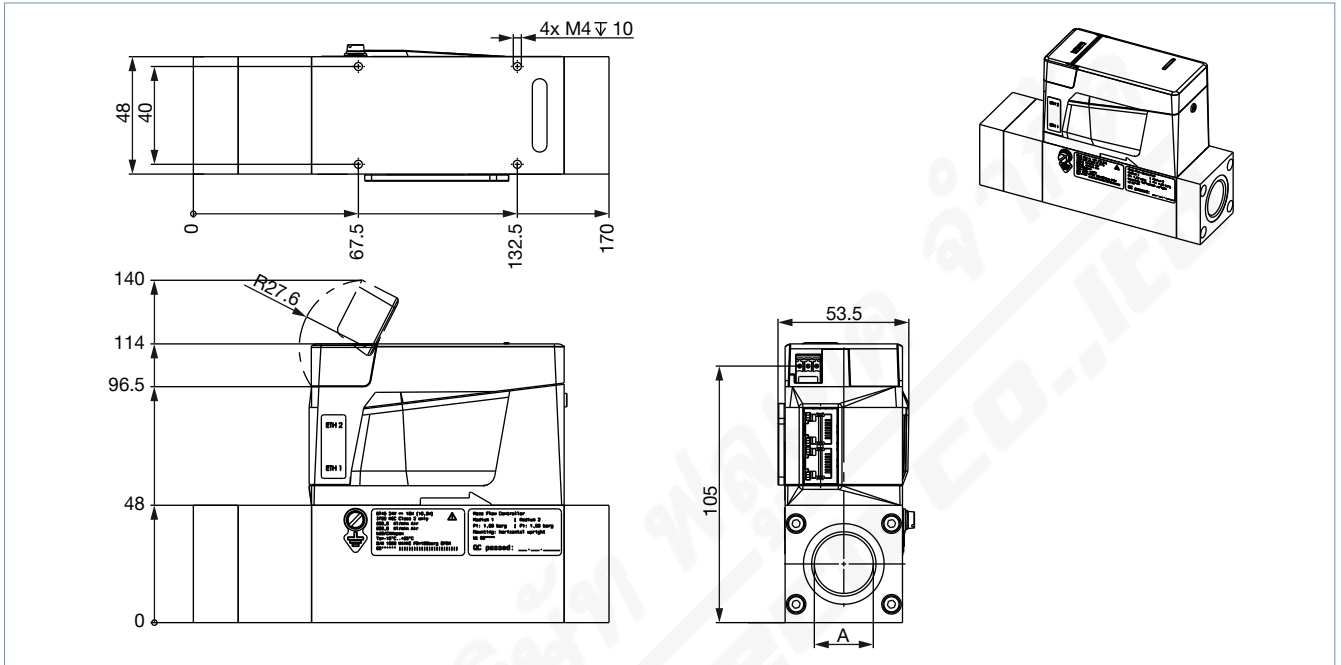


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Variant with base block A3 for very large nominal flow rates

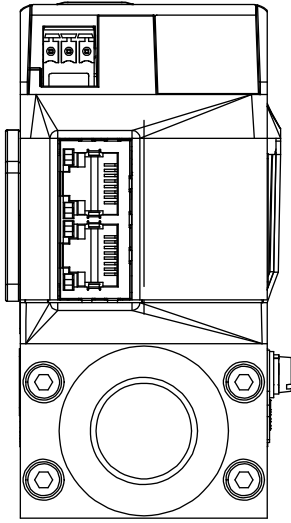
Note:

- For a nominal flow $Q_N > 1500$ l/min onwards, the overall length increases by 30 mm.
- Dimensions in mm



5. Device / Process connections

5.1. Industrial Ethernet



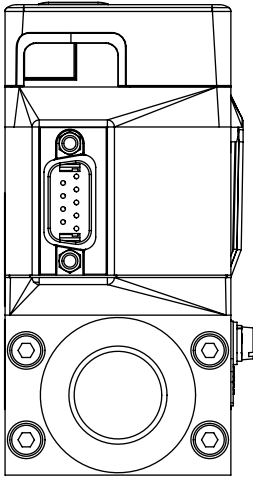
| Terminal block, 3-pin | Pin | Assignment |
|-----------------------|-----|-----------------------|
| | 1 | FE (functional earth) |
| | 2 | DGND |
| | 3 | 24 V |

| RJ45 socket | Pin | Assignment |
|-------------|-----|---------------|
| | 1 | TX + |
| | 2 | TX - |
| | 3 | RX + |
| | 4 | Not connected |
| | 5 | Not connected |
| | 6 | RX - |
| | 7 | Not connected |
| | 8 | Not connected |
| Housing | | Shielding |

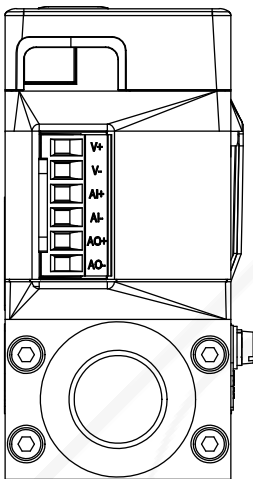
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5.2. Analogue



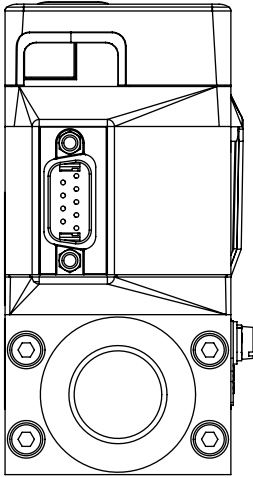
| D-Sub, 9-pin, plug | | Pin | Assignment |
|--------------------|---|-----|---|
| | 1 | 1 | Digital input |
| | 2 | 2 | GND (for supply voltage and digital input) |
| | 3 | 3 | 24 V |
| | 4 | 4 | Relay, normally closed contact |
| | 5 | 5 | Relay, reference contact |
| | 6 | 6 | Set-point value input + |
| | 7 | 7 | Set-point value input GND |
| | 8 | 8 | Actual value output |
| | 9 | 9 | Actual value output GND |
| Housing | | | Shielding |



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

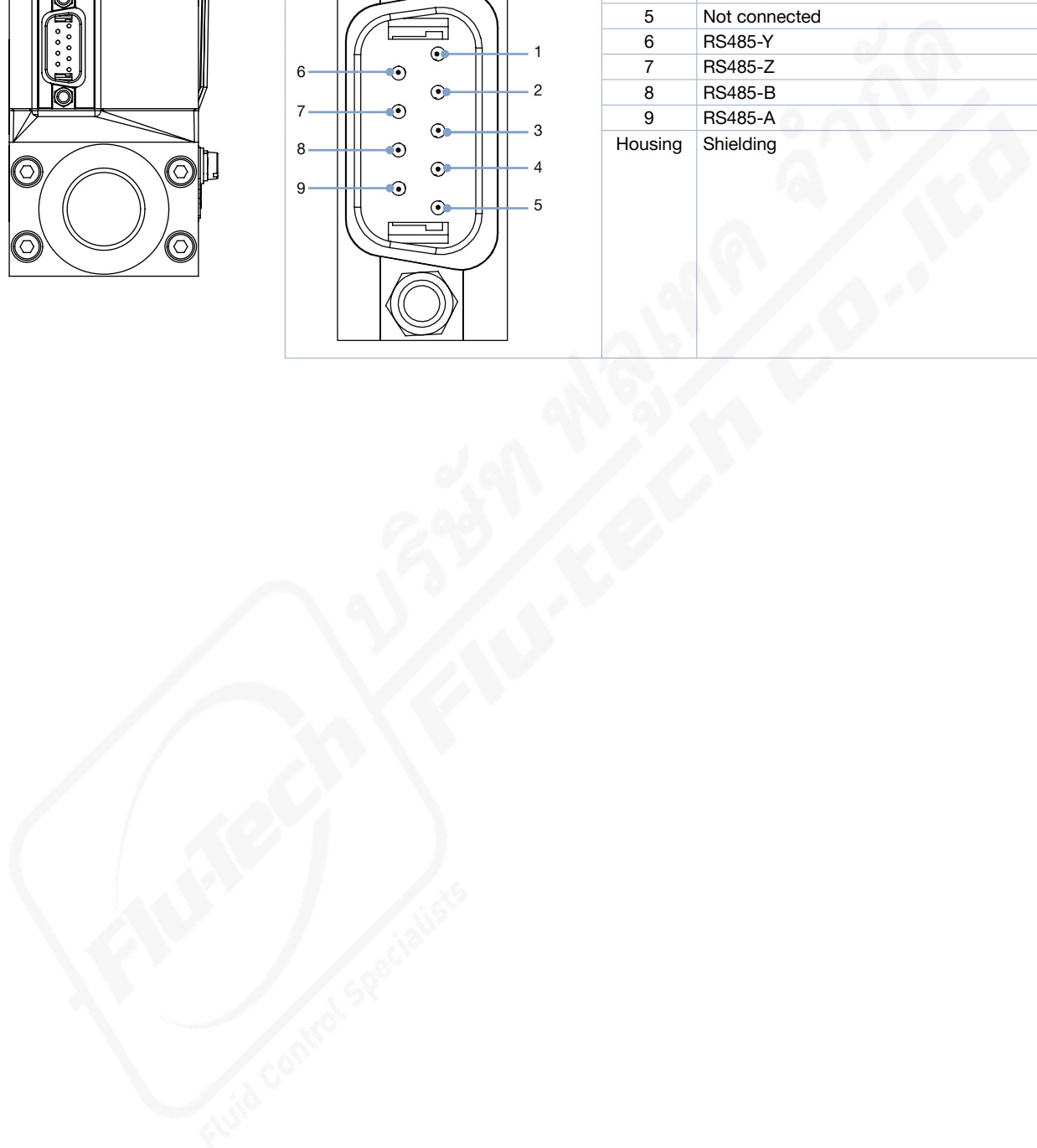
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5.3. Modbus RTU



| D-Sub, 9-pin, plug | | Pin | Assignment |
|--------------------|--|-----|---------------|
| | | 1 | Not connected |
| | | 2 | GND |
| | | 3 | 24 V |
| | | 4 | Not connected |
| | | 5 | Not connected |
| | | 6 | RS485-Y |
| | | 7 | RS485-Z |
| | | 8 | RS485-B |
| | | 9 | RS485-A |
| Housing | | | Shielding |

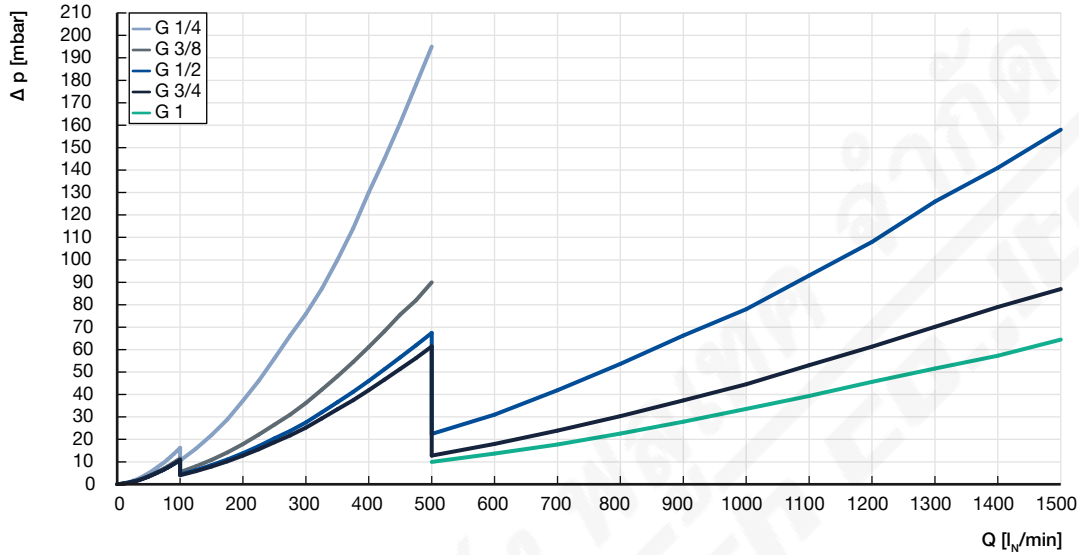
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6. Performance specifications

6.1. MFM pressure loss diagram

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



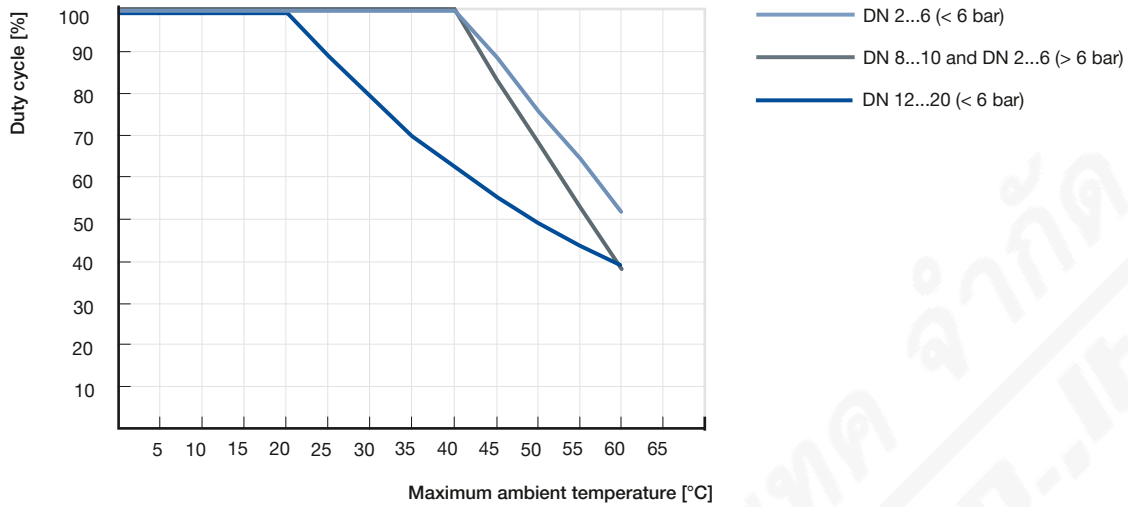
6.2. Nominal flow range of typical gases

Note:

- All values refer to 1013.25 mbar abs and 273.15 K (0 °C) (Index N)
- Other gases and gas mixtures are possible on request.

| Gas | Min. Q _N [l/min] | Max. Q _N [l/min] |
|----------------|--------------------------------|--|
| Acetylene | 20 | 320 (from 65 l/min with air calibration) |
| Ammonia | 8 | 1000 |
| Argon | 20 | 1600 |
| Carbon dioxide | 20 | 800 |
| Air | 20 | 2500 |
| Methane | 20 | 1200 |
| Propane | 20 | 200 |
| Oxygen | 20 | 2500 |
| Nitrogen | 20 | 2500 |

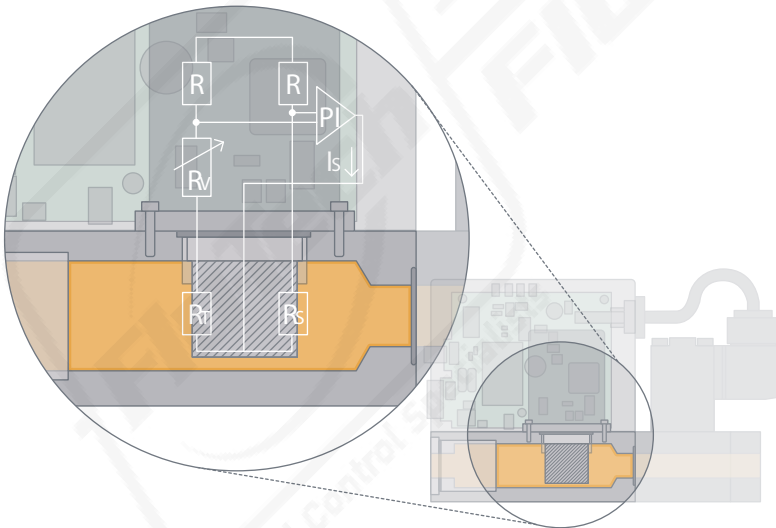
6.3. Derating diagram for electromotive variants



7. Product operation

7.1. Measuring principle

This sensor works as a hot-film anemometer in the so called CTA operational mode (Constant Temperature Anemometer). 2 resistors with precisely specified temperature coefficients are located directly in the media flow. 3 resistors are located outside the flow. All resistors are connected to form a bridge. The first resistor in the gas flow (R_1) measures the fluid temperature, while the second, low value resistor (R_2) 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 temperature 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.



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8. Product accessories

8.1. Bürkert Communicator software

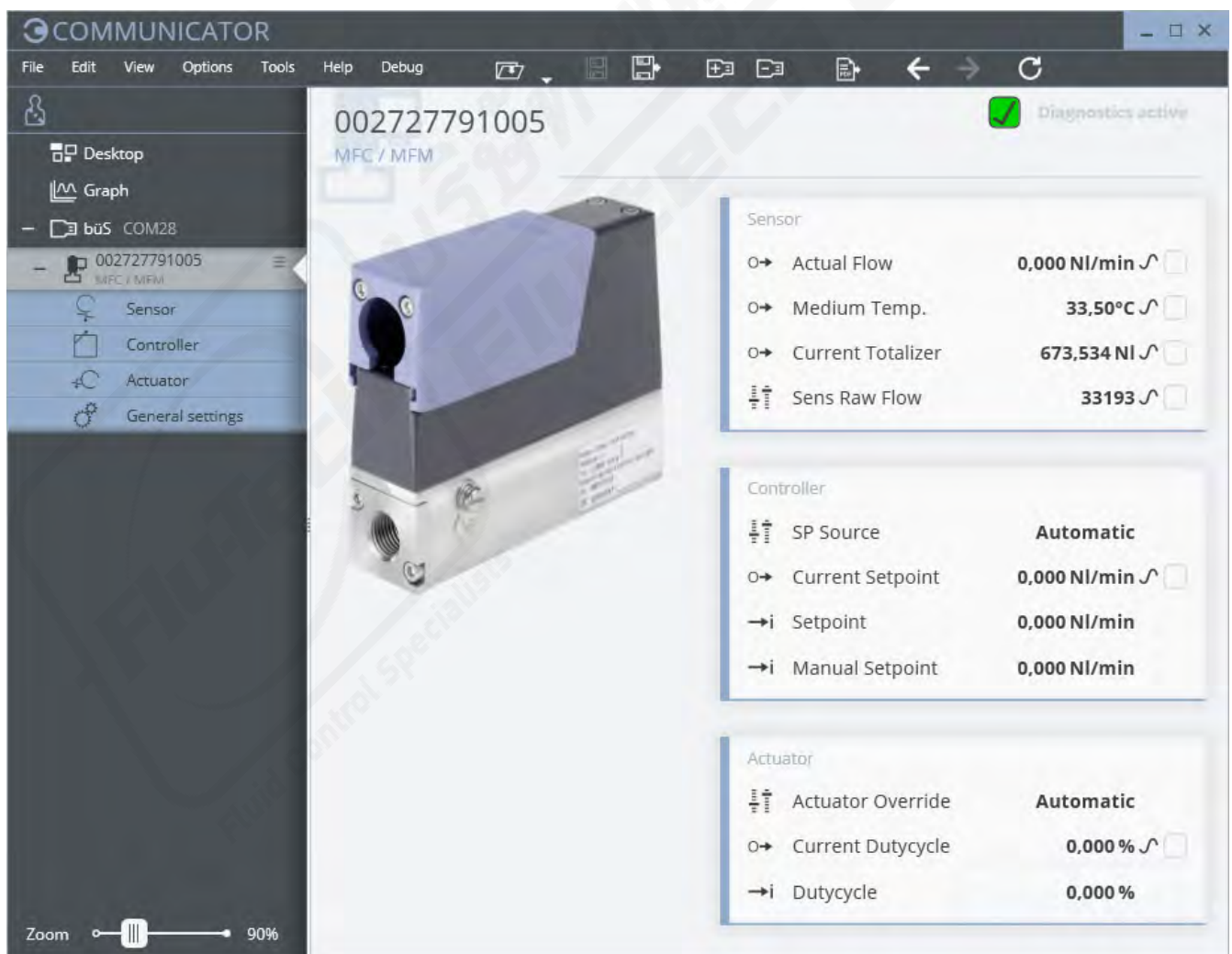
Note:

The corresponding communication software can be downloaded from the website [Type 8920](#) ▶.

The Bürkert Communicator is the most important software component of the EDIP (Efficient Device Integration Platform). Various features of this universal tool simplify the configuration and parametrisation of devices equipped with a digital CANopen-based interface. With this tool, the user has a complete overview of cyclic process values as well as acyclic diagnostic data. The integrated graphical programming environment enables the creation of decentralised sub-system control functions. The connection to the PC is established with a USB bus interface set. The adapter is available as an accessory (see [“9.5. Ordering chart accessories”](#) on page 26).

The Bürkert Communicator enables:

- Configuration, parametrisation and diagnosis of EDIP devices / networks
- Switching between defined gases
- Easy and comfortable mapping of cyclic values
- Graphic display, monitoring and storage of process values
- Firmware update of the connected EDIP devices
- Saving and restoring device configurations
- Zero-point adjustment in case of changed ambient conditions
- Guided re-calibration routine



8.2. Connecting Type 8745 with the Bürkert Communicator software

The Bürkert Communicator interface is based on CANopen. The appropriate bus termination is mandatory. Activate the termination resistor switch on the bus stick.

The connection is established via the device's micro USB socket (USB bus interface set 2 contains the necessary accessories).

Please note: no external power supply must be connected to the micro USB socket. The device must be provided with power as described in chapter "5. Device / Process connections" on page 19.

8.3. Configuration management for easy device replacement

If a device needs to be replaced, the memory card can be removed from the defective device and inserted into the new one. This transfers all data of the device to be replaced to the new device. The memory card is available as an accessory and must be ordered separately (see "9.5. Ordering chart accessories" on page 26).


In order to successfully exchange the device, it is necessary that both the new device and the device to be replaced possess the same device ID.

8.4. Web server for Industrial Ethernet variant

All Industrial Ethernet-based devices (except for the EtherCAT® protocol) from software version A.13.00.00 dispose of an integrated web server. The server can be accessed via a web browser when entering the device's IP address (factory setting IP192.168.1.100).

9. Ordering information

9.1. Bürkert eShop



Bürkert eShop – Easy ordering and quick delivery

You want to find your desired Bürkert product or spare part quickly and order directly? Our online shop is available for you 24/7. Sign up and enjoy all the benefits.

[Order online now](#)

9.2. Recommendation regarding product selection

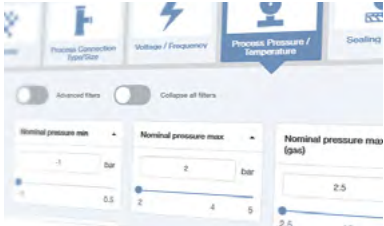
Note:

Use the Product Enquiry Form (see "9.4. Bürkert Product Enquiry Form" on page 26) for the device details and send it to us once completed.

For the proper choice of the actuator orifice within the MFC, you need to know not only the required maximum flow rate Q_N but also the pressure values directly before and after the MFC (p_1, p_2) at Q_N . In general, these pressures are not the same as the overall inlet and outlet pressures of the whole plant, because usually, additional flow resistors (tubing, additional shut-off valves, nozzles etc.) are present both before and after the MFC.

Please use the Product Enquiry Form to indicate the pressures directly before and after the MFC. If these are unknown or not accessible to measurement, estimates are to be made by taking into account the approximate pressure drops over the flow resistors before and after the MFC, at Q_N flow rate. 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.

9.3. Bürkert product filter

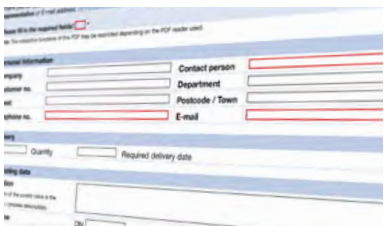


Bürkert product filter – Get quickly to the right product

You want to select products comfortably based on your technical requirements? Use the Bürkert product filter and find suitable articles for your application quickly and easily.

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9.4. Bürkert Product Enquiry Form



Bürkert Product Enquiry Form – Your enquiry quickly and compactly

Would you like to make a specific product enquiry based on your technical requirements? Use our Product Enquiry Form for this purpose. There you will find all the relevant information for your Bürkert contact. This will enable us to provide you with the best possible advice.

[Fill out the form now](#)

9.5. Ordering chart accessories

| Description | Article no. |
|--|----------------------------------|
| General accessories | |
| USB bÜS interface set 2 (Type 8923) for connection to the Bürkert Communicator software: including bÜS stick, connection cable to M12 plug, M12 connection cable on micro USB for the bÜS service interface and Y-distributor, cable length: 0.7 m | 772551 |
| Power supply unit Phoenix Class2 (Type 1573), 85...240 V AC/24 V DC, 1.25 A, NEC Class 2 (UL 1310) | 772438 |
| Power supply unit for standard rail (Type 1573), 100...240 V AC/24 V DC, 1 A, NEC Class 2 (UL 1310) | 772361 |
| Power supply unit for standard rail (Type 1573), 100...240 V AC/24 V DC, 2 A, NEC Class 2 (UL 1310) | 772362 |
| Power supply unit for standard rail (Type 1573), 100...V AC/24 V DC, 4 A | 772363 |
| Memory card | On request |
| Device description files for software interfaces | Download from Type 8745 ▶ |
| Bürkert Communicator software | Download from Type 8920 ▶ |
| For Type 8745 Analogue | |
| Terminal block 6-pin (standard for Type 8745, included in delivery of the corresponding analogue variant) | 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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