bürkert
FLUID CONTROL SYSTEMS

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

- Nominal flow range from 0.010 l_N/min to 160 l_N/min (re. nitrogen)
- High accuracy in measurement and repeat accuracy
- Very fast response times
- Easy device exchange due to configuration memory
- Optional: ATEX II Cat. 3G/D or USP Class VI, FDA, EC 1935 conformity

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

Can be combined with

Type 7011
Direct-acting 2/2-way plunger valve

Type 6013
Plunger valve 2/2-way direct-acting

Type 0330
Direct-acting 2/2 or 3/2-way pivoted armature valve

Type ME43
Fieldbus gateway

Type ME63
Industrial Ethernet gateway, IP65/IP67/IP69k

Type ME61
EDIP process display

Type ME66
Passive junction box, IP65/ IP67/ IP69k

Type description

The mass flow controller (MFC)/mass flow meter (MFM) Type 8742 for gases is suitable for a wide range of applications, e.g. metal and glass manufacturing or processing, fermentation processes, test benches or filling systems and packaging machines. Type 8742 is available in two variants: The variant with several analogue or digital (communication) interfaces and the variant with only a CANopen-based interface. The latter is suitable for integration into existing CANopen networks or - in combination with the fieldbus gateway Type ME43 - for integration in all common industry standards for Industrial Ethernet or fieldbus. This variant is tailor-made for applications with many control loops. Up to 32 MFCs/ MFMs can be connected to one fieldbus gateway. Type ME43 transmits the internal CANopen-based communication to Industrial Ethernet and fieldbus standards. The Mass Flow Controller / Mass Flow Meter can always be switched between büS and CANopen communication. Type 8742 can be configured as required as an MFM or MFC. Optionally, up to four calibration curves can be stored in the device. The thermal MEMS sensor is located directly in the gas flow and achieves very fast response times and the highest level of measuring accuracy, with long-term stable calibration. As the actuator, a Bürkert direct-acting proportional valve guarantees high response sensitivity. The integrated PI controller ensures excellent control characteristics of the MFC. Type 8742 is especially designed for use in harsh environments thanks to its high IP degree of protection and explosion protection.

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Visit product website

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1. General technical data

Product properties	
Dimensions	Further information can be found in chapter "4. Dimensions" on page 7.
Material	
Seal	FKM or EPDM (depending on gas)
Housing	Aluminium die casting (painted)
Base block	Aluminium or stainless steel 1.4404/316L
Wetted parts	Stainless steel 1.4310/302, 1.4113/434, 1.4305/303
Total weight	Approx. 950 g (stainless steel base block)
Configuration management	Further information can be found in chapter "9.3. Configuration management for easy device replacement" on page 25.
LED display [1.]	RGB-LED according to NAMUR NE107
Performance data	
Nominal flow range (Q_N) [2.]	10 ml_N/min...160 l_N/min (N_2) [2.]
Operating pressure [3.]	MFM: max. 25 bar MFC: max. 25 bar (the maximum operating pressure depends on medium and nominal valve size)
Measuring accuracy [4.]	± 0.8 % MV [5.] ± 0.3 % FS [6.] (under calibration conditions and after warm-up time to achieve the best measuring conditions)
Repeatability	± 0.1 % FS
Turndown ratio	1:50, optionally 1:100
Settling time (MFC)/Response time (MFM) (t95)	< 300 ms
Actuator (proportional valve)	
Valve position	Normally closed
Nominal diameter	0.05...8 mm
K_{VS} value range	0.00006...1.1 m^3/h
Electrical data	
Operating voltage	24 V DC
Power consumption [7.]	MFM: 1 W MFC: max. 3...17.5 W (depending on the type of proportional valve)
Residual ripple	± 2 %
Voltage tolerance	± 10 %
Electrical connection	
büS/CANopen variant	M12 plug, 5-pin
Analogue variant	M12 plug, 5-pin, M12 socket, 5-pin
Industrial Ethernet variant	M12 plug, 5-pin, 2 x M8 socket, 4-pin
PROFIBUS DPV1 variant	M12 plug, 5-pin, M12 socket, 5-pin
Medium data	
Operating medium	Neutral, pure gases (others on request) Further information can be found in chapter "6.2. Nominal flow rate of typical gases" on page 22.
Calibration medium	Operating medium or air
Medium temperature	- 10 °C...+ 70 °C (- 10 °C...+ 60 °C with oxygen)
Product connections	
Analogue interface	4...20 mA, 0...20 mA, 0...10 V or 0...5 V Input impedance: > 20 kΩ (voltage) resp. < 300 Ω (current) Maximum current: 10 mA (voltage output) Maximum load: 400 Ω (current output)
Digital communication interface	büS/CANopen, PROFIBUS DPV1, Industrial Ethernet: EtherCAT®, EtherNet/IP, Modbus TCP
Port connection	G ¼, NPT ¼, surface mounting, compression fitting or vacuum fitting, clamp connection (others on request)
Approvals and conformities	
Certificate	Material certificate 3.1 (optionally)
Explosion protection	Further information can be found in chapter "2.4. Explosion protection" on page 5.
North America (USA/Canada)	Further information can be found in chapter "2.5. North America (USA/Canada)" on page 6.

Foods and Beverages/Hygiene	Further information can be found in chapter "2.6. Foods and beverages/Hygiene" on page 6.
Oxygen	Further information can be found in chapter "2.7. Oxygen" on page 6.
Environment and installation	
Installation position	Horizontal or vertical
Storage temperature	- 10 °C...+ 70 °C
Relative air humidity	Max. 95 % at + 55 °C, non-condensing
Degree of protection	IP65
Ambient temperature	- 10 °C...+ 50 °C (higher temperatures on request)
Accessories	
Software-Tool	Bürkert Communicator Further information can be found in chapter "9.1. Bürkert Communicator software" on page 24.

1.) For a detailed description of LED colours see **operating instructions Type 8742** ▸
2.) Index N: flow rates with respect to 1.013 bar abs and 0 °C
3.) Overpressure to atmospheric pressure
4.) If the operating medium differs from the calibration medium, the actual measuring accuracy may deviate from the specified value. If the operating medium is natural gas, the measuring accuracy depends on the composition of the natural gas, which can vary depending on origin and season.
5.) Of measured value
6.) Of full scale
7.) Information based on typical power consumption (at + 23 °C ambient temperature, nominal flow rate and 30 min closed-loop control mode). The specifications according to UL 61010...1 may deviate (see **operating instructions Type 8742** ▸).

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. Explosion protection

Approval	Description
 	**Optional: Explosion protection** **ATEX:** **EPS 22 ATEX 1 277 X** II 3G Ex ec IIC T4 Gc II 3D Ex tc IIIC T135 °C Dc **IECEx:** **IECEx EPS 22.0066X** Ex ec IIC T4 Gc Ex tc IIIC T135 °C Dc

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2.5. North America (USA/Canada)

Approval	Description
c UL us LISTED	**Optional: UL Listed for the USA and Canada** The products are UL Listed for the USA and Canada according to: • UL 61010-1 (ELECTRICAL EQUIPMENT FOR MEASUREMENT, CONTROL, AND LABORATORY USE – Part 1: General Requirements) • CAN/CSA-C22.2 No. 61010-1

2.6. Foods and beverages/Hygiene

Conformity	Description
FDA	**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.
USP	**United States Pharmacopeial Convention (USP) (valid for variable code PL04)** All wetted materials are biocompatible according to the manufacturer's declaration.
	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.

2.7. Oxygen

Conformity	Description
O_2	**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.

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

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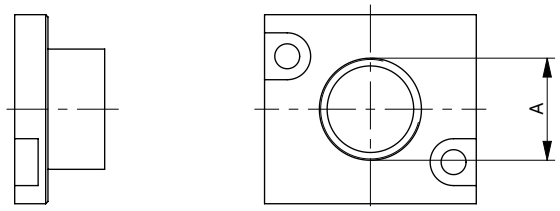
4. Dimensions

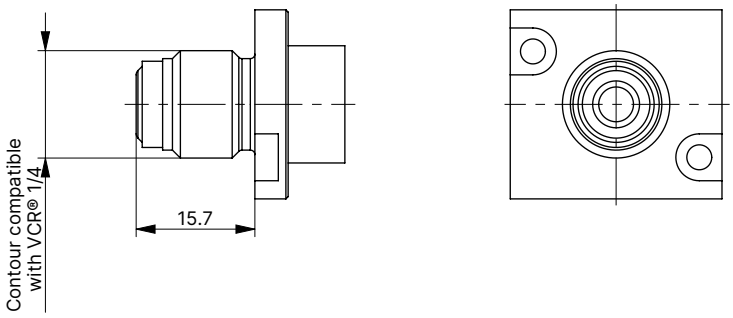
4.1. Threaded variant connections

Small nominal flow rates, with internal thread

Dimensions	Thread (A)	Thread depth [mm]
	G ¼, NPT ¼	12
	G ⅛, NPT ⅛	12

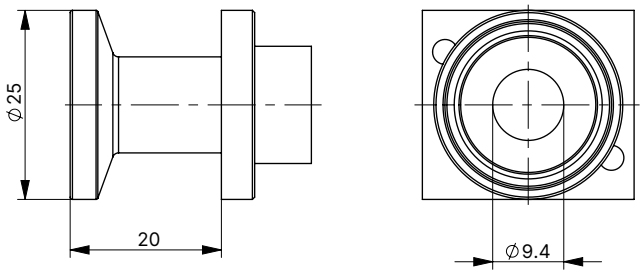
Small nominal flow rates, compatible with VCR®

Note:
Dimensions in mm



Small nominal flow rates, with clamp connection DN 15...½"

Note:
Dimensions in mm



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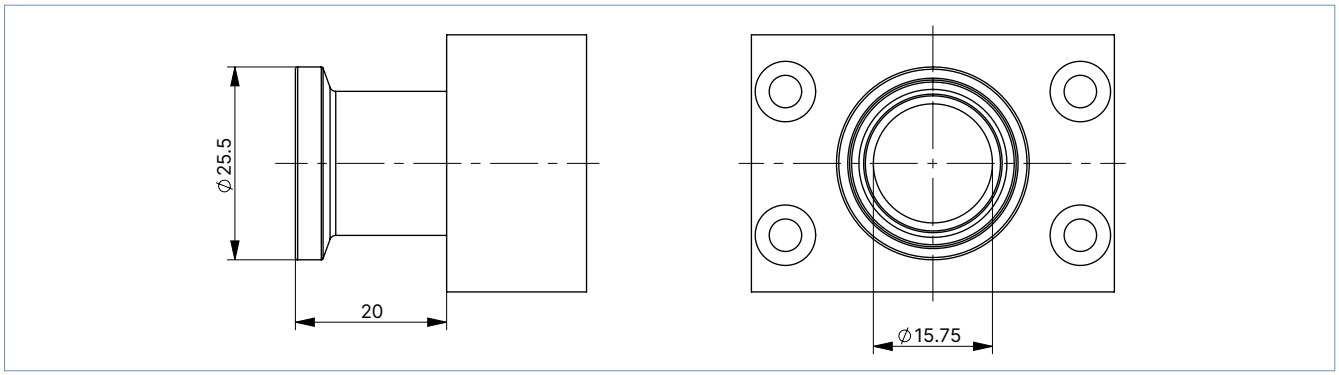
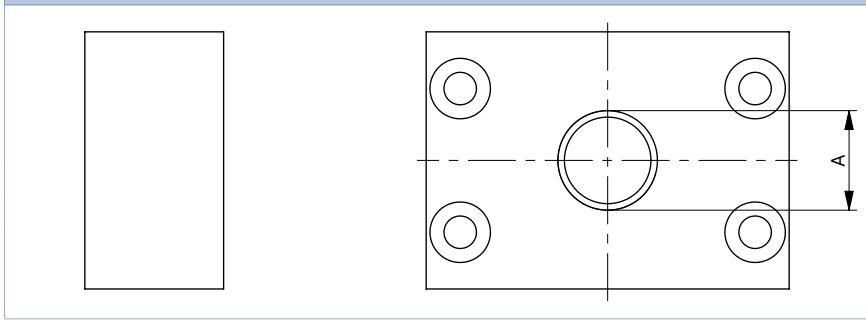
Small nominal flow rates, with clamp connection DN 20...¾"

Note:
Dimensions in mm



Large nominal flow rates, with internal thread

Dimensions	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

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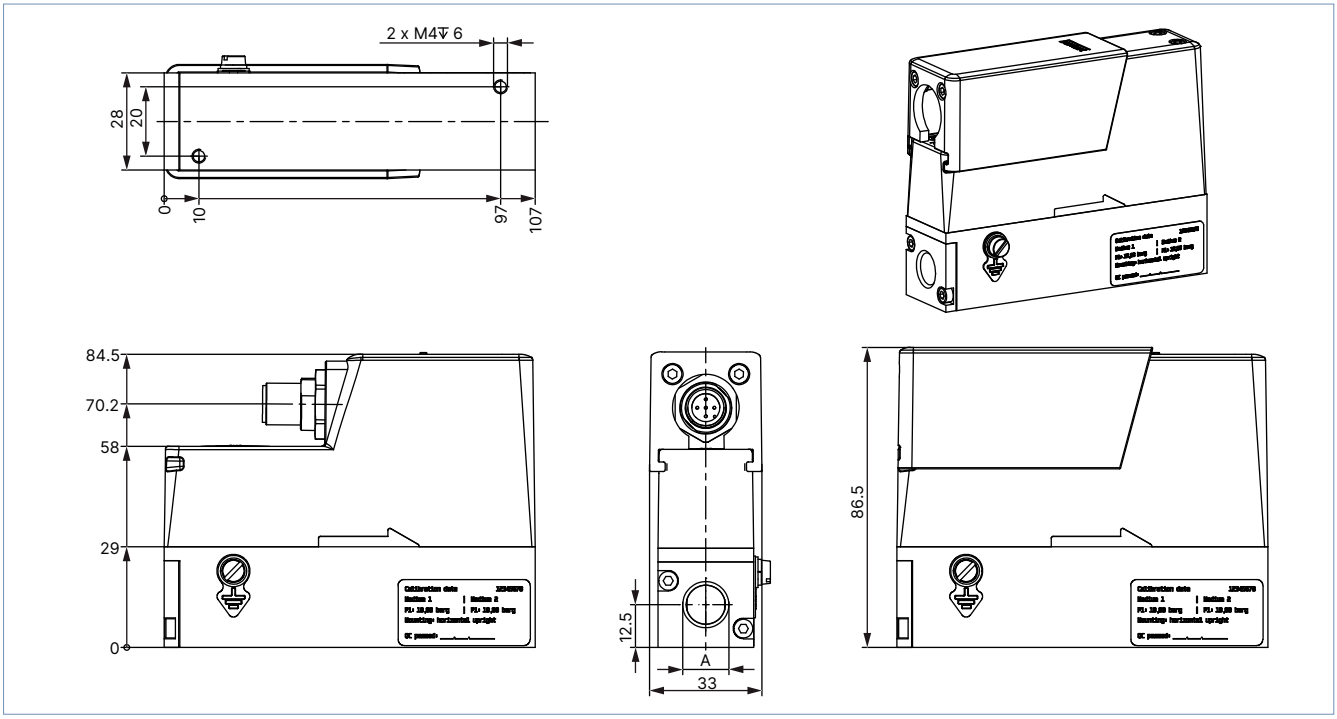
4.2. Variant with büS/CANopen interface

MFC with valve Type 2871/MFM

Variant with base block C0...C4 for small nominal flow rates

Note:
Dimensions in mm



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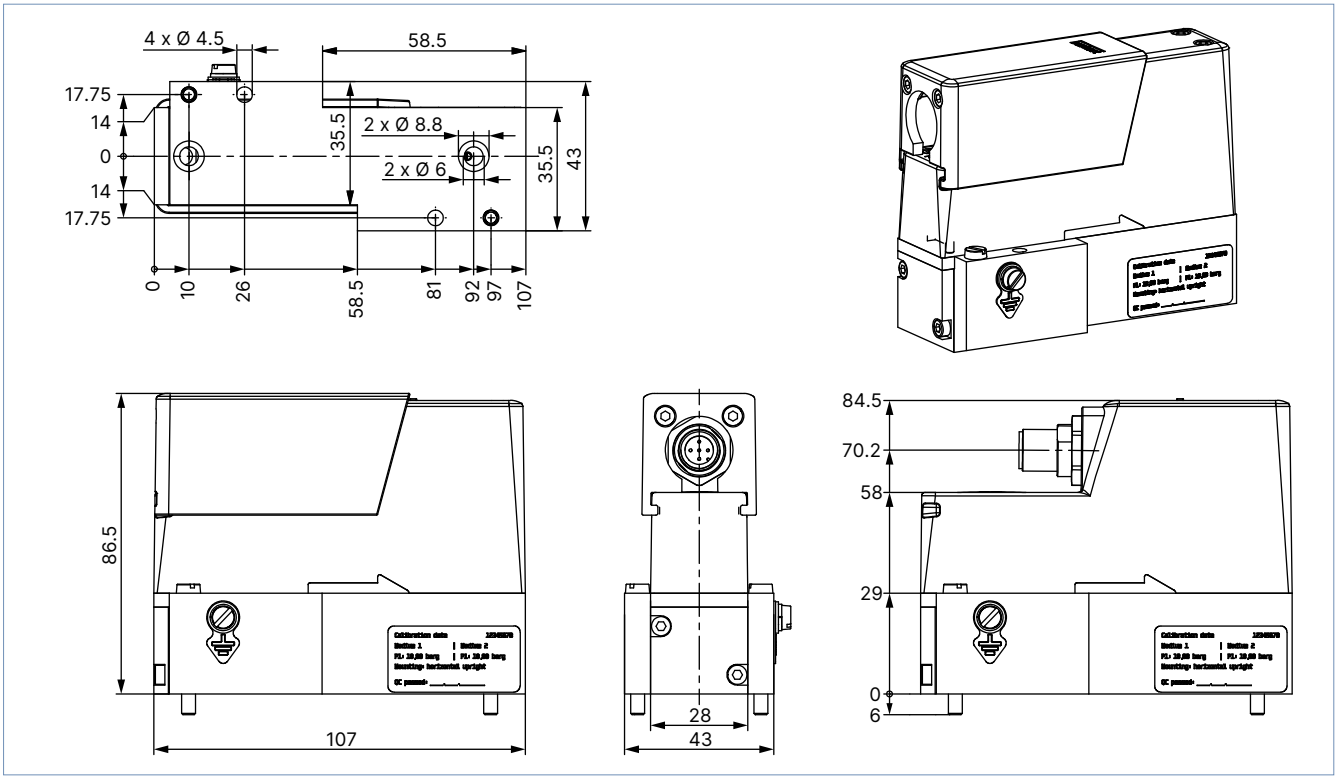
Surface-mounted variant

Note:
Dimensions in mm



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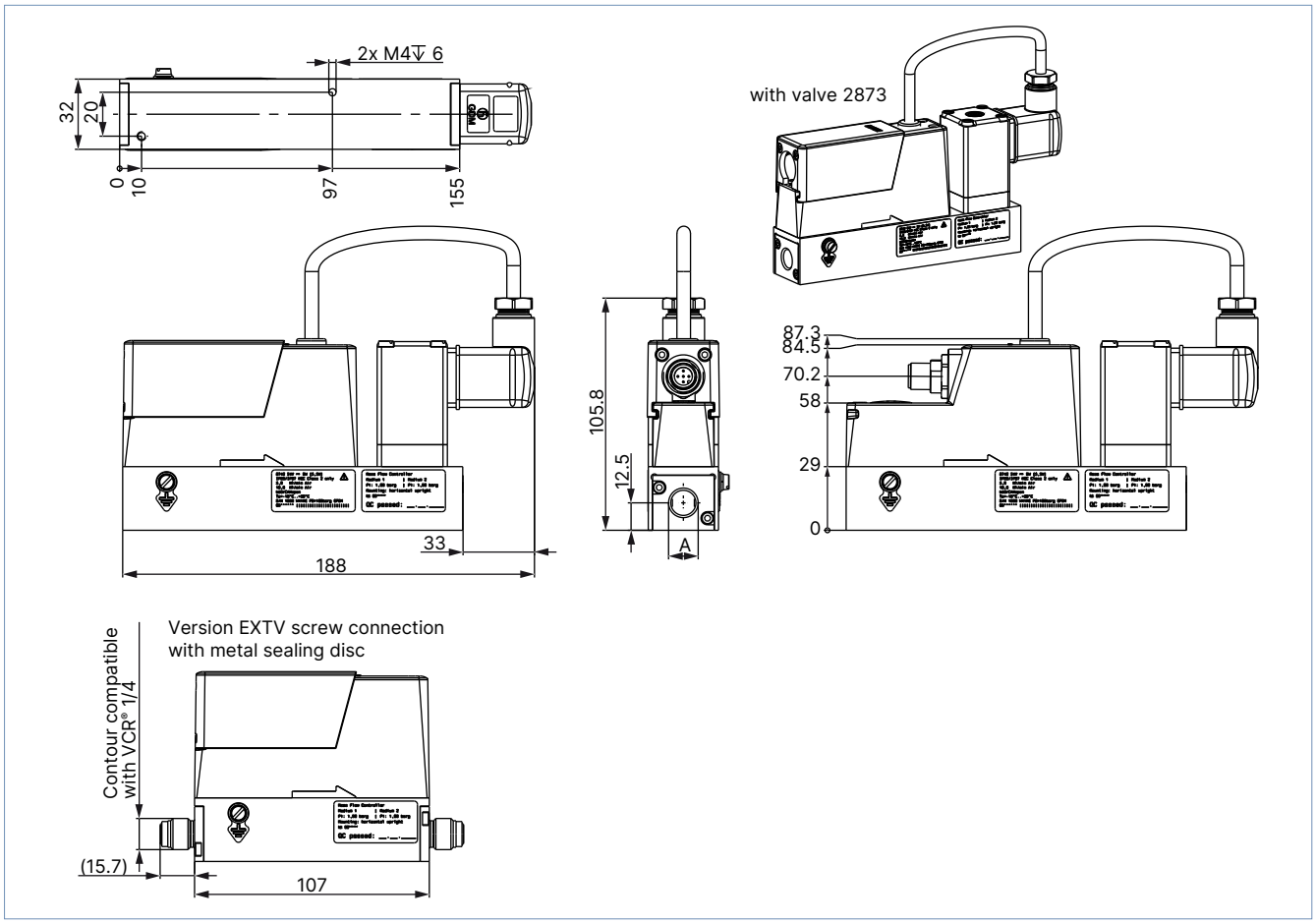
MFC with valve Type 2873

Variant with base block C0...C4 for small nominal flow rates

Note:
Dimensions in mm



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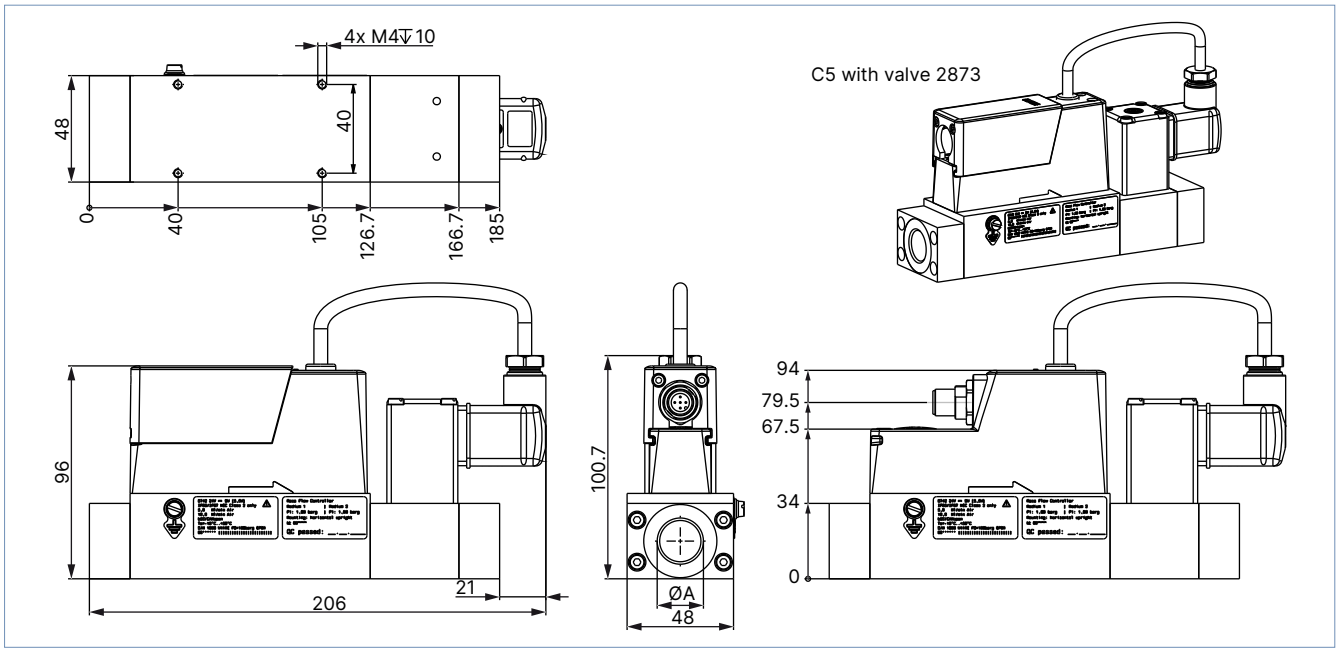
Variant with base block C5 for large nominal flow rates

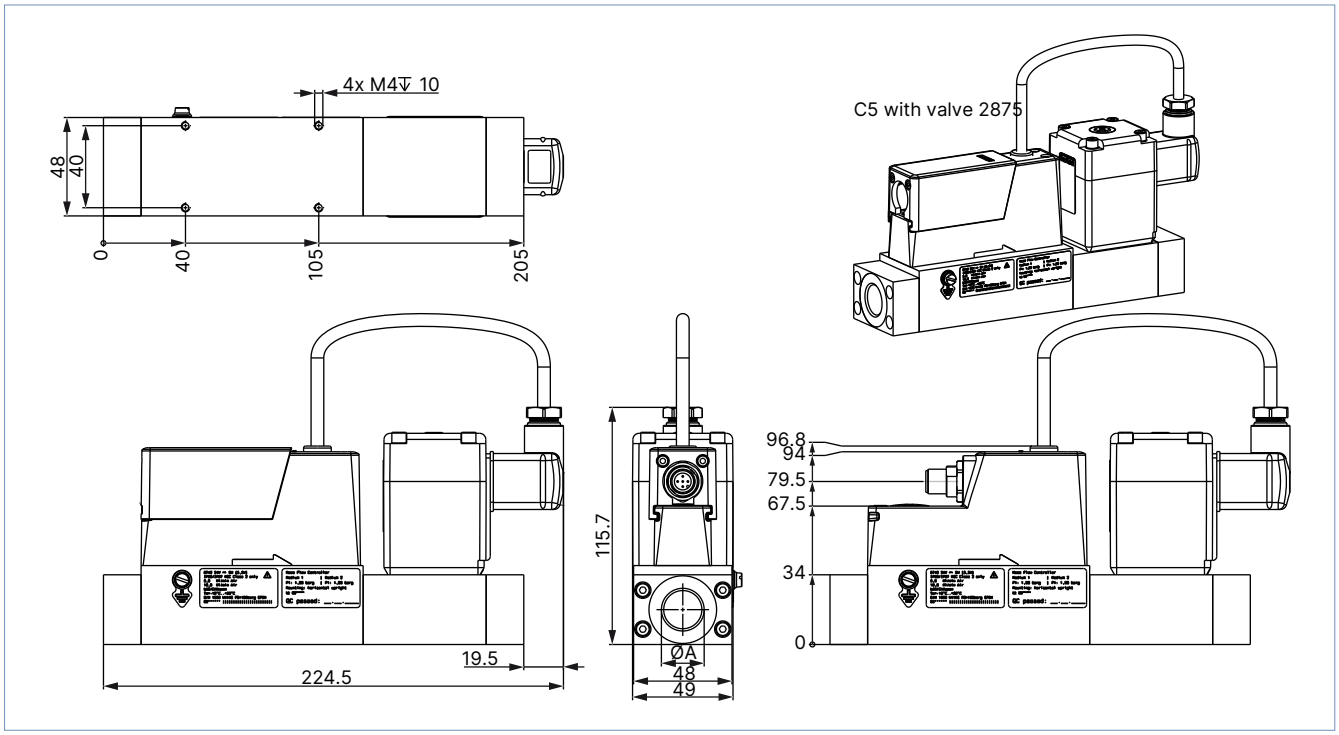
Note:
Dimensions in mm



MFC with valve Type 2875

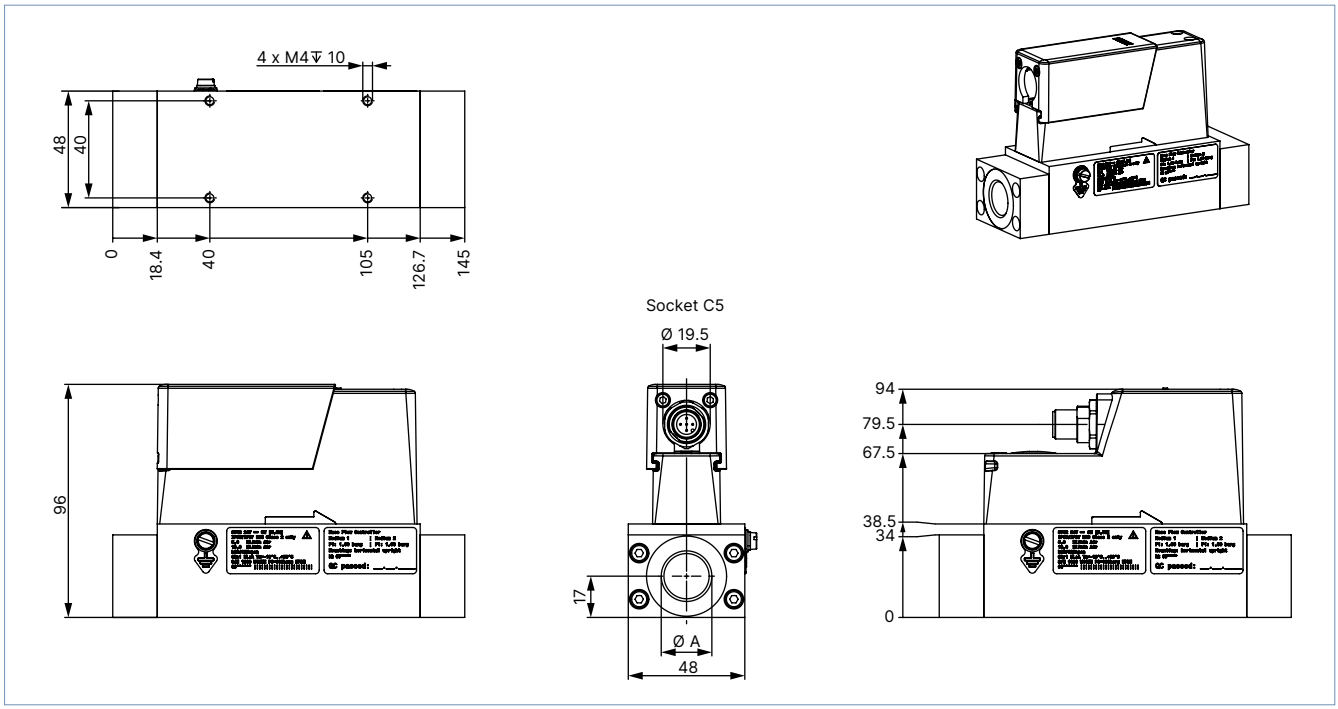
Variant with base block C5 for large nominal flow rates

Note:
Dimensions in mm



Variant with base block C5 for large nominal flow rates

Note:
Dimensions in mm

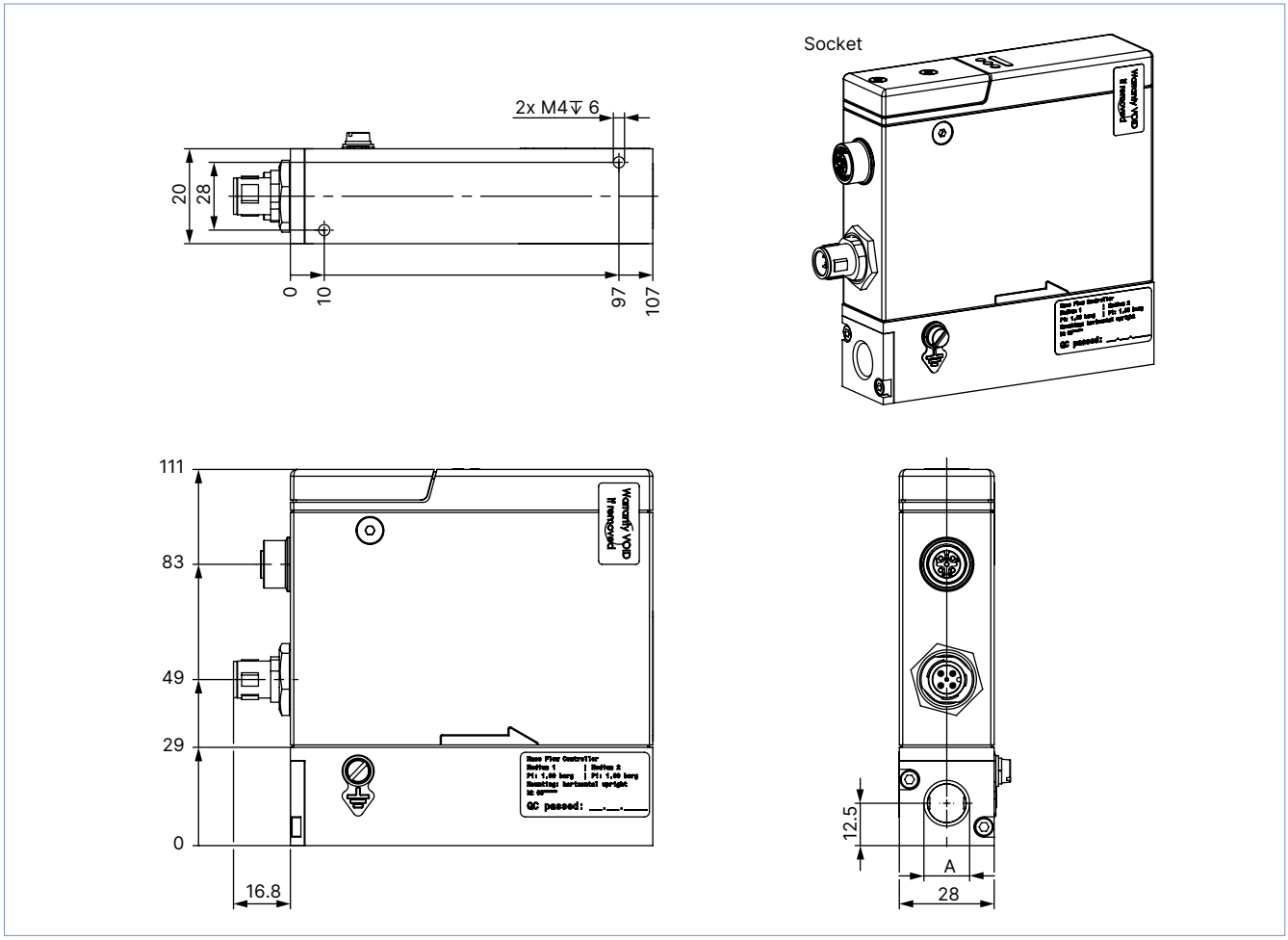


4.3. Variant with analogue or PROFIBUS DPV1 interface

MFC with valve Type 2871/MFM

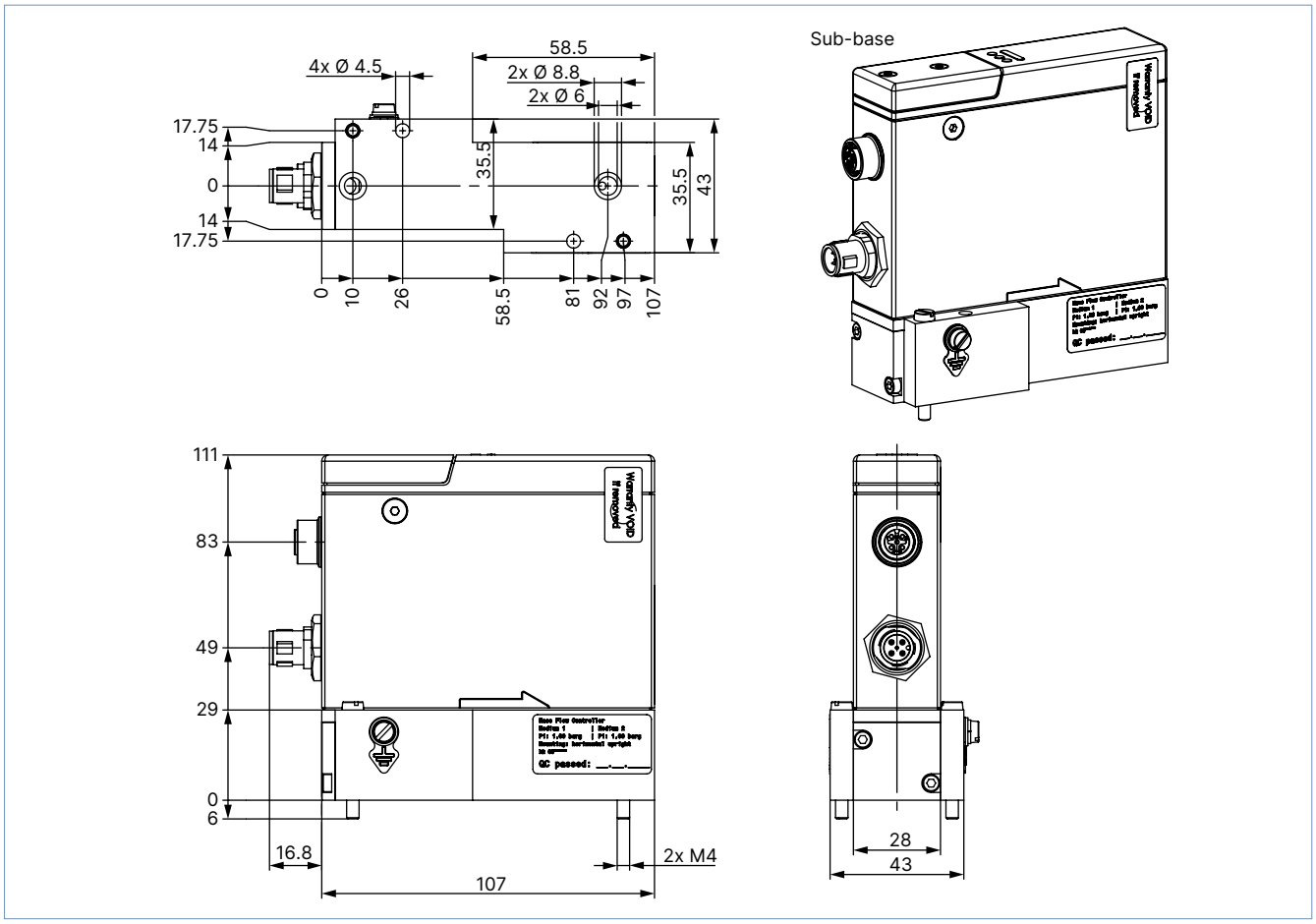
Variant with base block C0...C4 for small nominal flow rates

Note:
Dimensions in mm



Surface-mounted variant

Note:
Dimensions in mm



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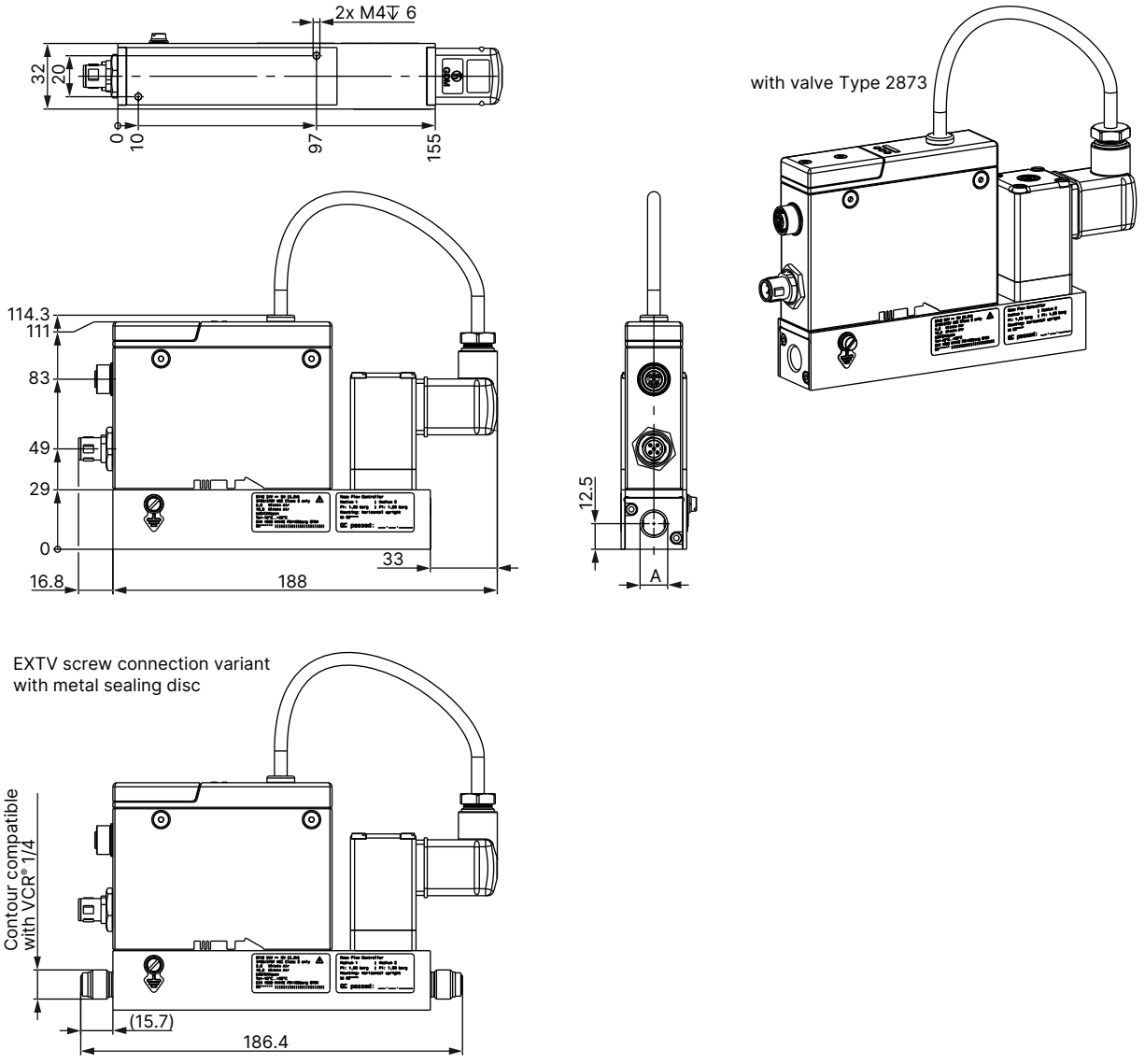
MFC with valve Type 2873

Variant with base block C0...C4 for small nominal flow rates

Note:
Dimensions in mm



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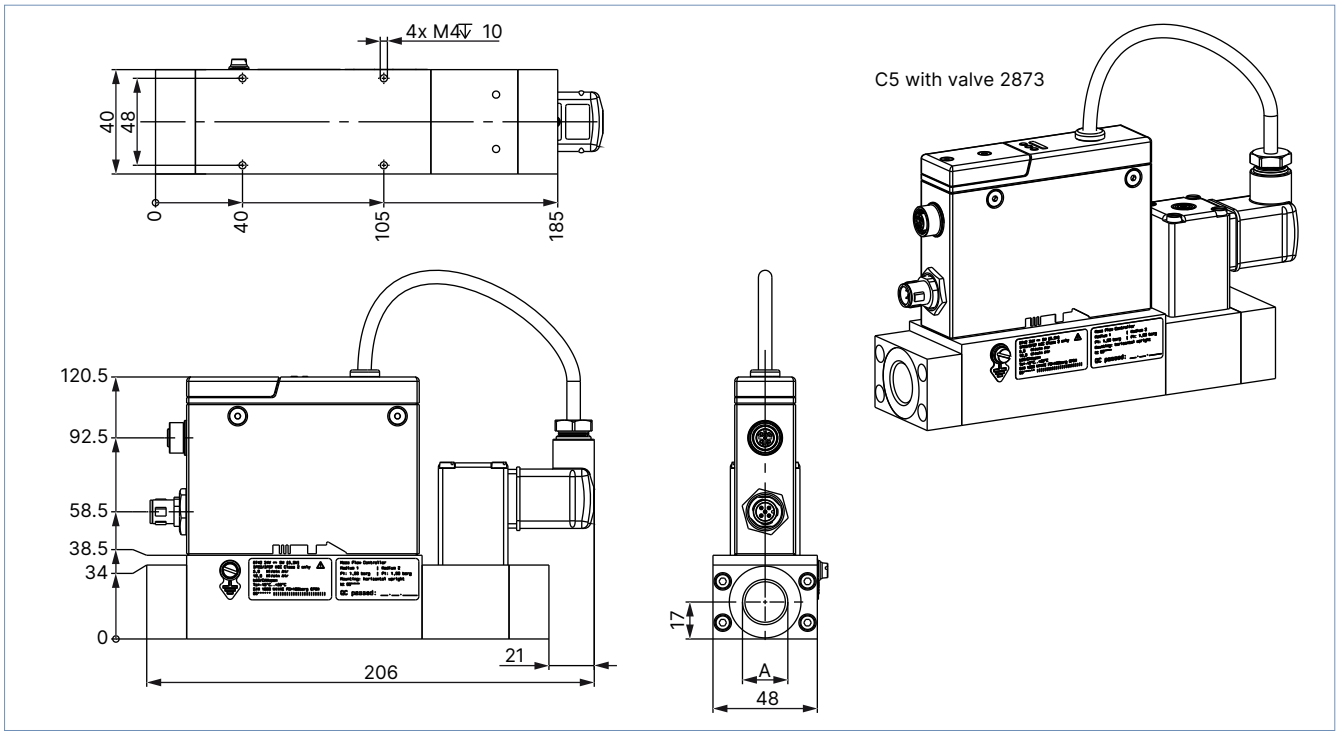
Variant with base block C5 for large nominal flow rates

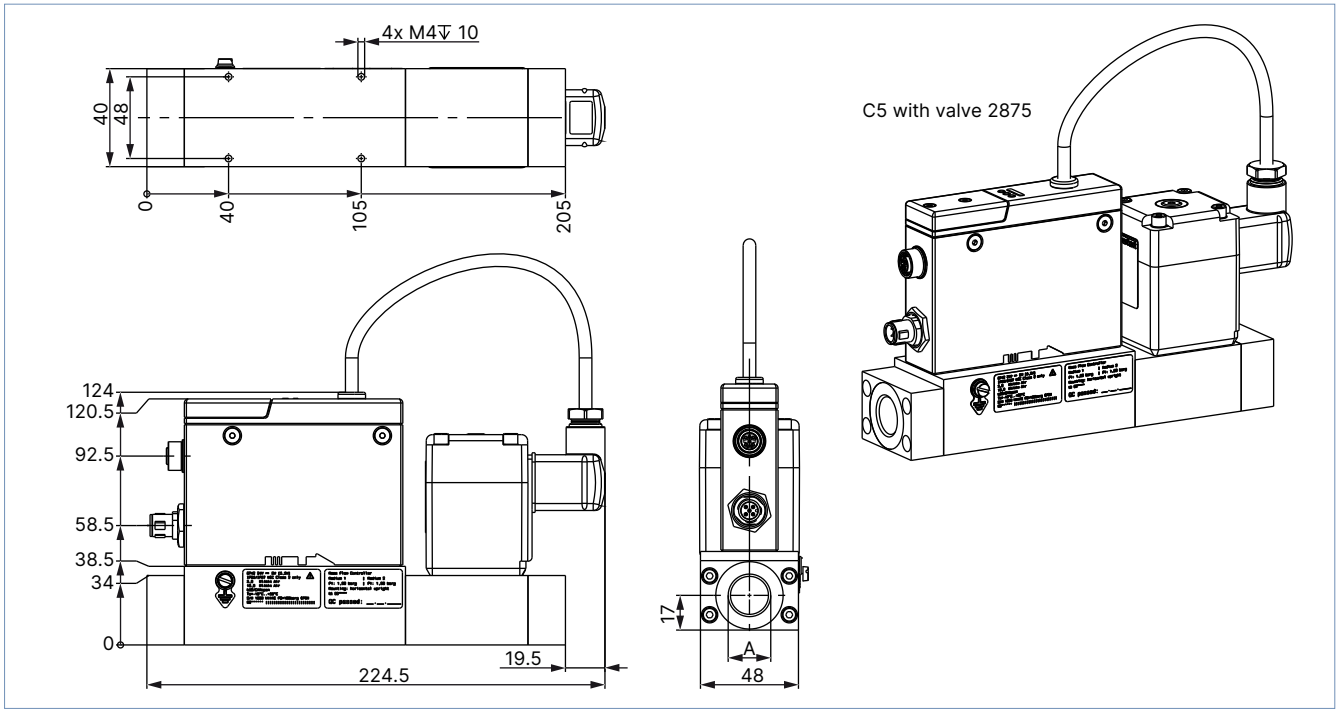
Note:
Dimensions in mm



MFC with valve Type 2875

Variant with base block C5 for large nominal flow rates

Note:
Dimensions in mm



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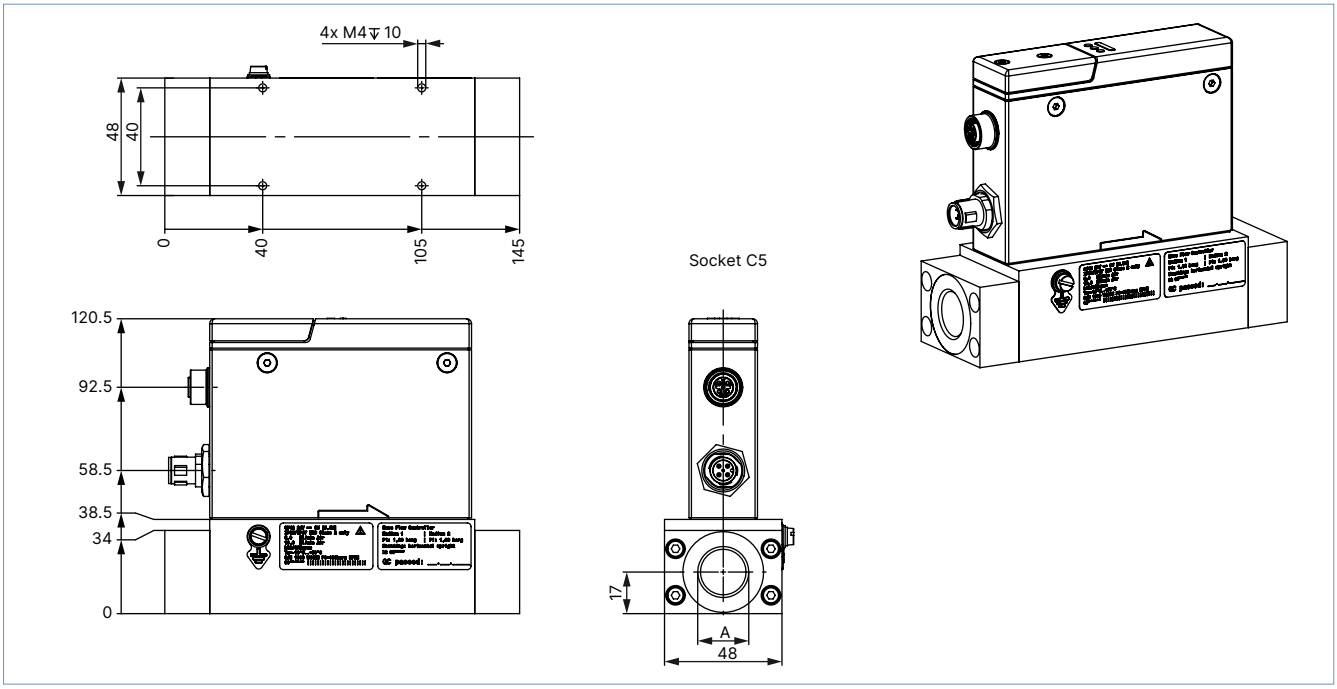
Variant with base block C5 for large nominal flow rates

Note:
Dimensions in mm



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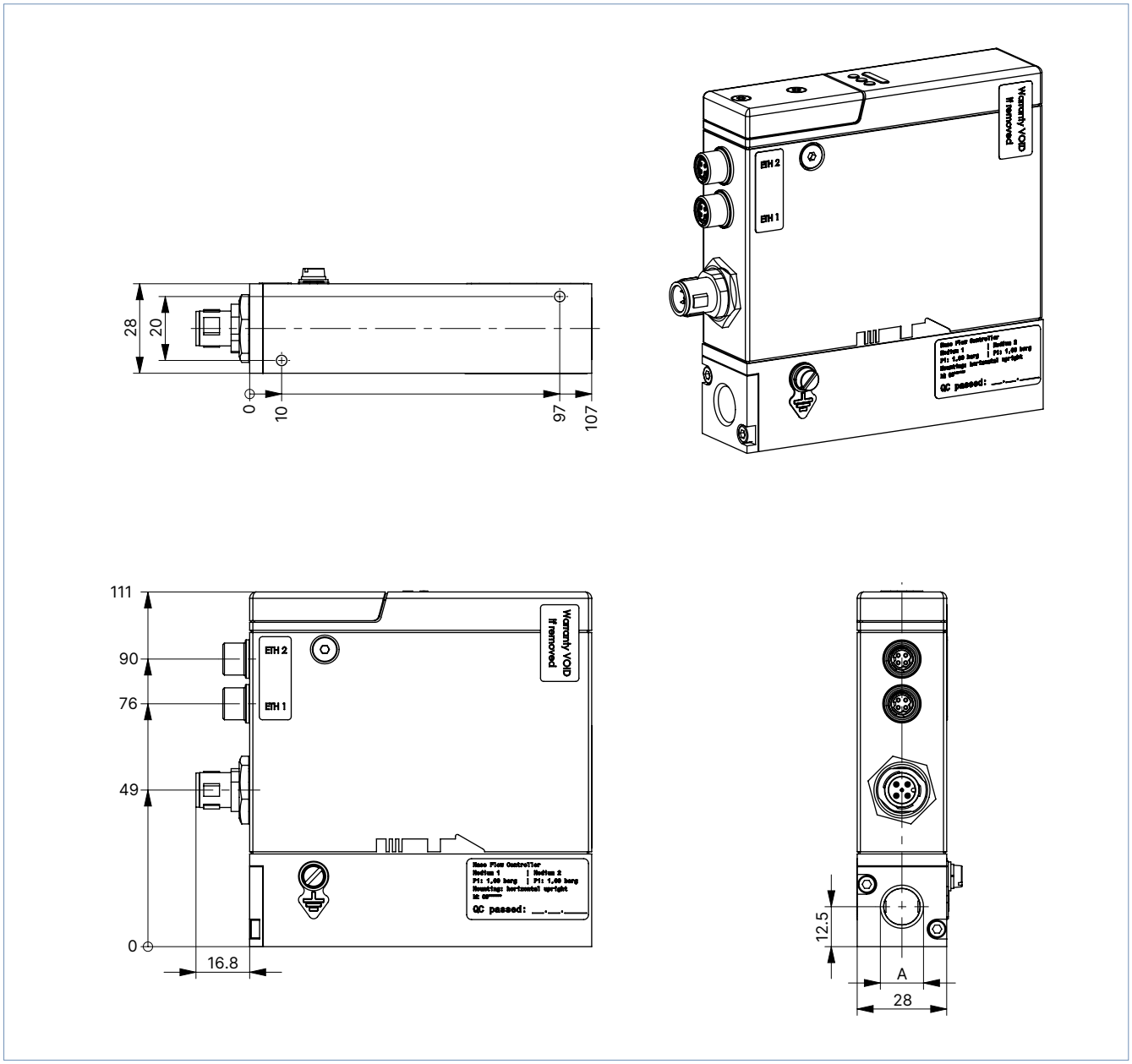
4.4. Variant with Industrial Ethernet interface

Note:
Dimensions in mm



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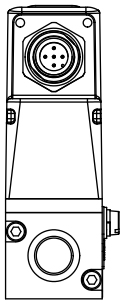
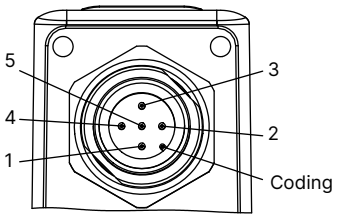
5. Product connections

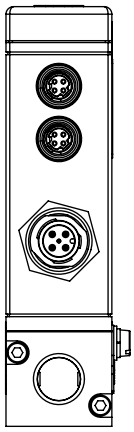
5.1. Communication

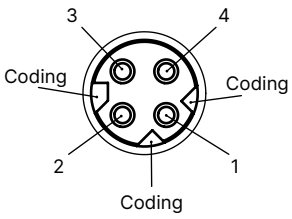
büS/CANopen

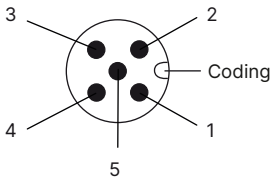


M12 plug, 5-pin (A-coded)	Pin	Assignment
	1	Shielding
	2	24 V
	3	DGND
	4	CAN_H
	5	CAN_L

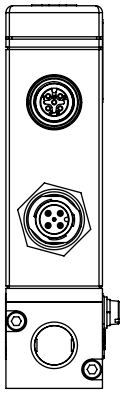
Industrial Ethernet

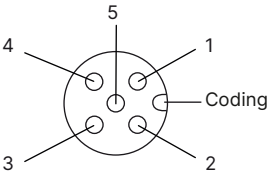


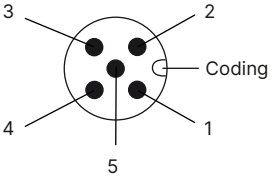
2 x M8 socket, 4-pin (D-coded)	Pin	Assignment
	1	TX +
	2	RX +
	3	TX –
	4	RX –

M12 plug, 5-pin (A-coded)	Pin	Assignment
	1	Shielding
	2	24 V
	3	GND
	4	Not connected
	5	Not connected

Analogue



M12 socket, 5-pin (A-coded)	Pin	Assignment
	1	Digital input GND
	2	Digital input +
	3	Relay, reference contact
	4	Relay, normally closed contact
	5	Relay, normally open contact

M12 plug, 5-pin (A-coded)	Pin	Assignment
	1	GND for analogue output (for MFM) or GND for analogue output and set-point value input (for MFC)
	2	24 V
	3	GND for supply voltage
	4	Set-point value input (not connected for MFM)
	5	Analogue output for measured value

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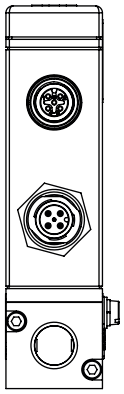
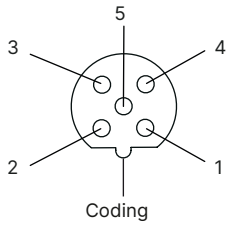
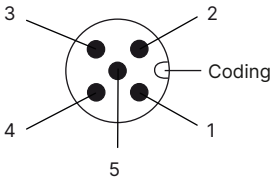
PROFIBUS DPV1



M12 socket, 5-pin (B-coded)	Pin	Assignment
	1	5 V
	2	RxD / TxD (line A)
	3	DGND
	4	RxD / TxD (line B)
	5	Not connected

M12 plug, 5-pin (A-coded)	Pin	Assignment
	1	Shielding
	2	24 V
	3	GND
	4	Not connected
	5	Not connected

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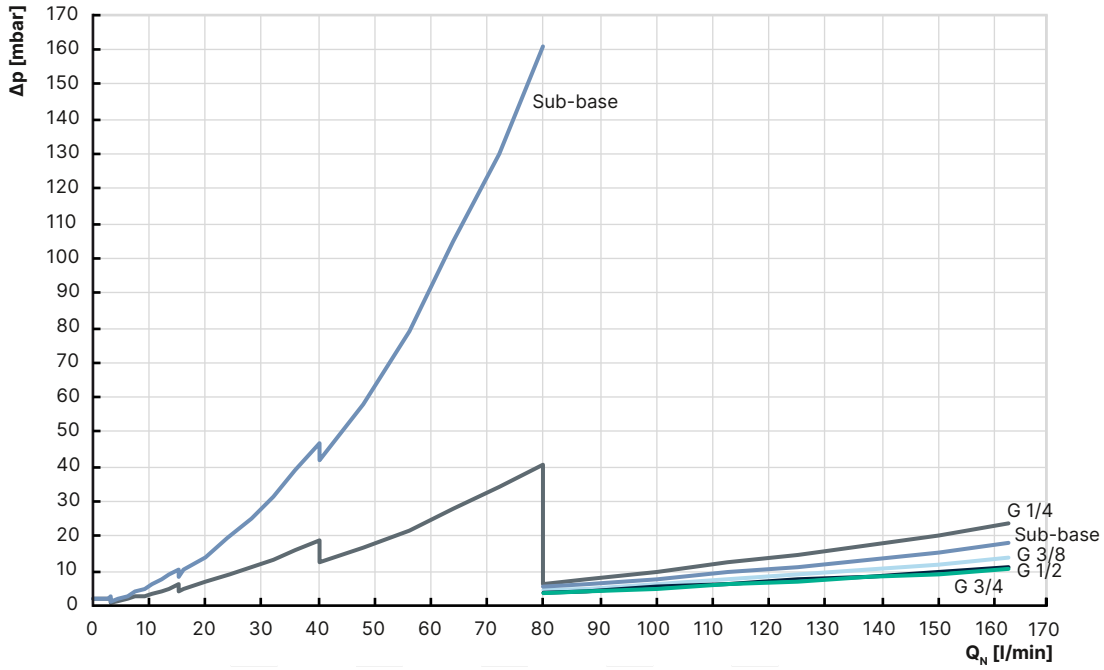
6. Performance specifications

6.1. MFM pressure loss diagram

The diagram shows an example of the pressure loss curves with air flowing 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 must be taken into account.



Formula for calculating the pressure loss in an MFM:

$$\Delta P_{Gas} = \Delta P_{Air} \sqrt{\frac{\rho_{N\,Gas}}{\rho_{N\,Air}}}$$

6.2. Nominal flow rate of typical gases

Note:

- All values refer to 1.013 bar 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	0.01	65
Argon	0.01	160
Helium	0.01	1000
Carbon dioxide	0.02	80
Air	0.01	160
Methane	0.01	160
Propane	0.03	44
Oxygen	0.01	160
Nitrogen	0.01	160
Hydrogen	0.01	1000

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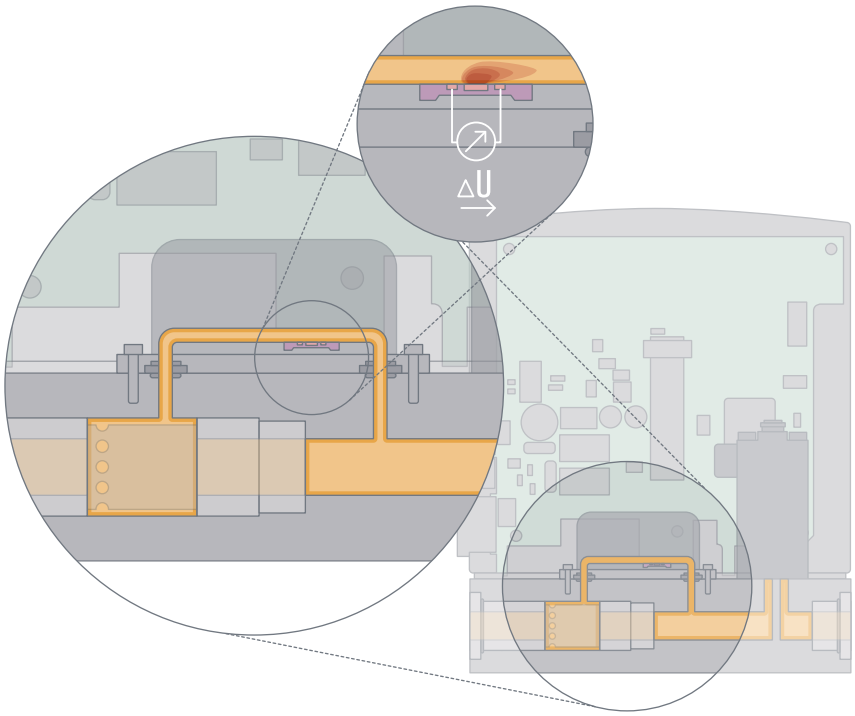
7. Product operation

7.1. Measurement principle

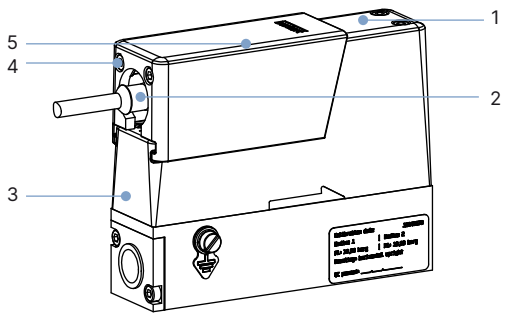
The measured values are recorded in a secondary channel. A laminar flow element in the main channel creates a slight pressure drop. A part of the gas flow is thereby directed into the secondary channel. The sensor located there records the mass flow as a temperature difference. The measurement is performed in a specially shaped flow channel whose wall contains a silicon chip with an etched membrane. A heating resistor and 2 temperature sensors, one upstream and one downstream, are attached on this membrane.
If the heating resistor is fed with a constant voltage, the differential voltage of the temperature sensors indicates the flow rate of the gas flowing over the chip.



8. Product design and assembly

8.1. Measures to comply with ATEX requirements

Note:
Devices with ATEX conformity meet degree of protection IP65.

Device	No.	Description
	**1**	The normative requirements for cable and line entries are met for devices with an external valve.
	2	The M12 plug provides degree of protection IP65 regardless if plugged in or not.
	3	The die-cast housing provides IP protection even under high mechanical stress.
	4	The screws prevent the impact protection cover and thus the M12 connection from loosening under tensile stress.
	5	The protective cap prevents damage of the M12 plug and all connected elements under mechanical stress. No particular ATEX sockets are required.

9. Product accessories

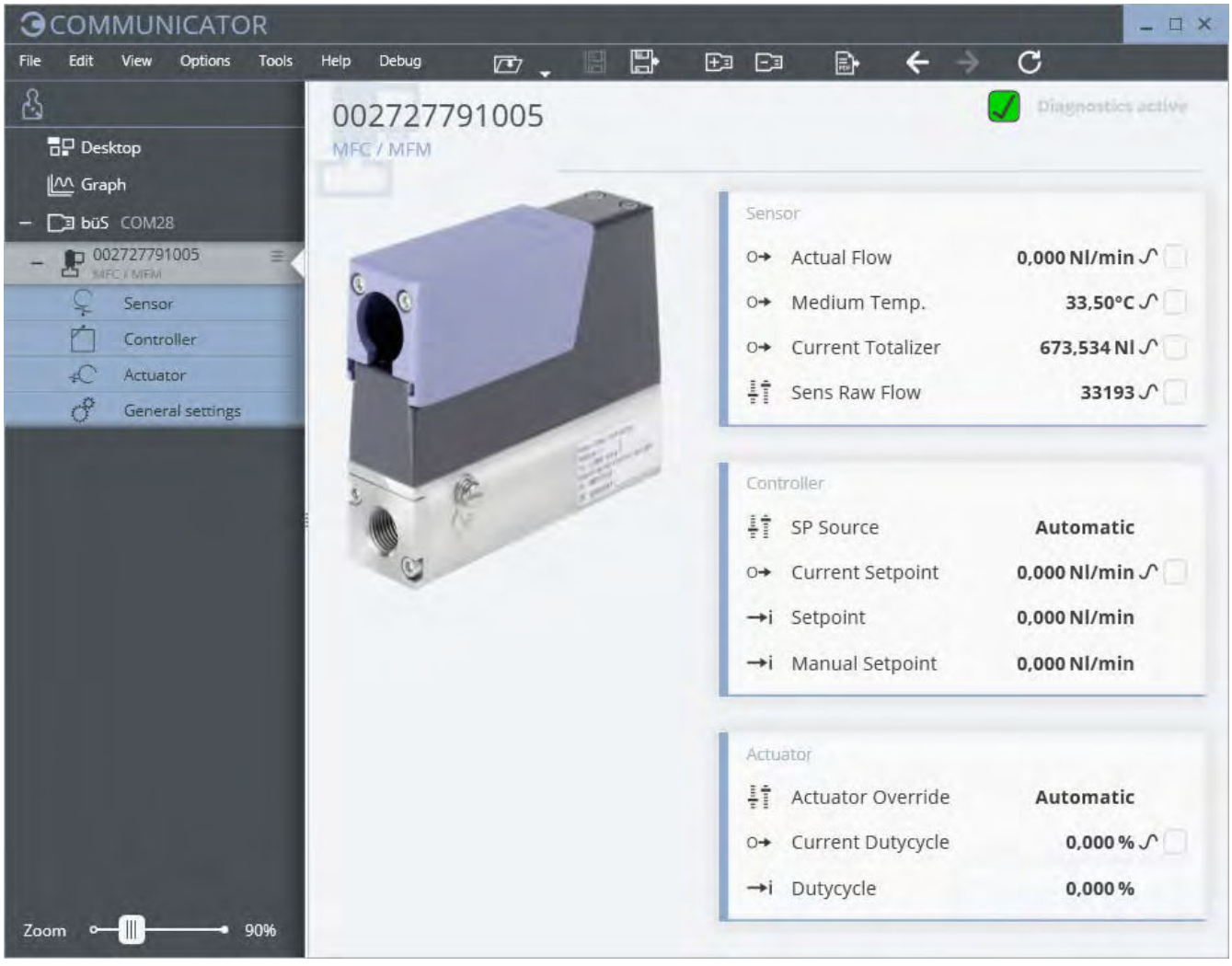
9.1. Bürkert Communicator software

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-büS interface set. The adapter is available as an accessory (see "10.5. 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



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9.2. Connecting Type 8742 with the Bürkert Communicator software

The Bürkert Communicator interface is based on CANopen. An appropriate bus termination is mandatory.

- Type 8742 Analogue, Industrial Ethernet resp. PROFIBUS DPV1:
  - Activate the switchable terminating resistor on the büS stick.
  - The device is connected via the micro USB socket (USB-büS interface set 2 contains the necessary accessories).
- Type 8742 büS/CANopen:
  - Activate the switchable terminating resistor on the büS stick. Exception: if the device is already integrated in a properly terminated bus network, the terminating resistor must not be activated.
  - The device is connected via the 5-pin M12 plug (USB-büS interface set 1 contains the necessary accessories).

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. Product connections" on page 20.

9.3. Configuration management for easy device replacement

Depending on the electrical connection of the MFC, the following options are available for device replacement:

- If a device needs to be replaced, the memory card can be removed from the defective device and can be inserted into the new device. This transfers all data from the device to be replaced to the new device. The memory card is available as an accessory and must be ordered separately (see "10.5. Ordering chart accessories" on page 26).
- Option for Type 8742 büS/CANopen: the device is exchanged via the configuration provider of the higher-level gateway control (ME43 or ME63). This requires a memory card in the gateway. The memory card is available as an accessory and must be ordered separately (see "10.5. 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 have the same article number.

9.4. Web server for Industrial Ethernet variant

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

10. Ordering information

10.1. 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

10.2. Recommendation regarding product selection

Note:
Use the Product Enquiry Form (see "10.4. Bürkert Product Enquiry Form" on page 26) for information on the device layout 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 upstream and downstream of the MFC (p_1, p_2) at Q_N. These are often not identical to the inlet and outlet pressures of the entire system, because there are usually additional flow resistances (pipework, additional shut-off valves, nozzles, etc.) both upstream and downstream of the MFC.
Use the Product Enquiry Form to indicate the pressures directly upstream and downstream of the MFC. If the pressure values are unknown or not accessible to measurement, estimates are to be made by taking into account the approximate pressure drops over the flow resistors upstream and downstream of the MFC at Q_N. The maximum expected inlet pressure $p_{1\,max}$ must be specified to ensure the tight-closing function of the actuator in all operating states.

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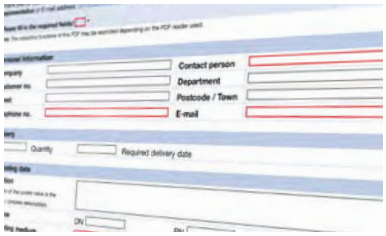
10.3. Bürkert product filter

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.

Try out our product filter

10.4. 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

10.5. Ordering chart accessories

Description	Article no.
General accessories	
USB-büS interface set 1 (Type 8923) for connection to the Bürkert Communicator software: includes connection cable (M12 and micro USB), stick with integrated terminating resistor, power supply and software	772426
USB-büS interface set 2 (Type 8923) for connection to the Bürkert Communicator software: includes 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...240 V AC/24 V DC, 4 A	772363
Memory card	On request
Device description files for software interfaces	Download from **Type 8742** ▶
Bürkert Communicator software	Download from **Type 8742** ▶
For Type 8742 büS/CANopen	
büS cable extension, M12, cable length: 0.1 m	772492
büS cable extension, M12, cable length: 0.2 m	772402
büS cable extension, M12, cable length: 0.5 m	772403
büS cable extension, M12, cable length: 1 m	772404
büS cable extension, M12, cable length: 1 m	772405
büS socket, M12, straight, A-coded [1.)]	772416
büS plug, M12, straight, A-code [1.)]	772417
büS socket, M12, angled, A-coded [1.)]	772418
büS plug, M12, angled, A-coded [1.)]	772419
büS Y-plug	772420
büS Y-plug for linking two separately supplied segments of a büS network	772421
büS plug, M12, terminating resistor 120 Ω	772424
büS plug, M12, terminating resistor 120 Ω	772425
LabVIEW device driver	On request

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Description	Article no.
EDS file	Download from **Type 8742** ▸
Power supply Type 8742 Analogue/Industrial Ethernet /Profibus DPV1	
Communication Type 8742 Analogue, analogue signals	
M12 socket with cable, on strands, A-coded, cable length: 0.7 m	772626
M12 socket with cable, on strands, A-coded, cable length: 1 m	772409
M12 socket with cable, on strands, A-coded, cable length: 3 m	772410
M12 socket with cable, on strands, A-coded, cable length: 5 m	772411
M12 socket with cable, on strands, A-coded, cable length: 10 m	772412
büS socket, M12, straight, A-coded [1.)]	772416
Communication Type 8742 Analogue, digital signals	
M12 plug with cable, on strands, A-coded, cable length: 5 m	566923
M12 plug with cable, on strands, A-coded, cable length: 10 m	571393
Communication Type 8742 Industrial Ethernet [2.)]	
M8 plug, D-coded, to M12 plug, D-coded, cable length: 0.3 m	575443
Communication Type 8742 PROFIBUS DPV1 [3.)]	
M12 plug, 5-pin, B-coded, straight	918198
M12 socket, 5-pin, straight (coupling)	918447
PROFIBUS DPV1 T-distributor	918531
PROFIBUS DPV1 terminating resistor, M12 plug, B-coded	902553

1.) For space reasons, M12 individual cable plugs may not be suitable for simultaneous use on the same side as a Y-distributor. Use a commercially available overmolded cable in this case.
2.) All approved Ethernet cables with M8 connectors possible
3.) All approved Profibus accessories with M12 connectors (B-coded) possible

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