

Magnetic Inductive Flow Meter MAG-VIEW™ Series MVM-P



Please keep this operating manual for future reference.
If the device is resold, please provide the operating manual along with it.




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0 About this operating manual

Symbols used:

 	<p>WARNING Failure to do so may result in death or serious injury</p> <p>CAUTION Failure to do so may result in minor or moderate injury.</p>
	<p>IMPORTANT Failure to do so may result in damage to property and the environment.</p>

If you have any problems or questions, please contact your supplier or contact us directly at:



Exclusion of liability

We accept no liability for any damage or malfunctions resulting from incorrect installation, inappropriate use of the device or failure to follow the instructions in this operating manual.

1 Safety instructions

Before you install the device, read through this operating manual carefully. If the instructions contained within it are not followed, in particular the safety guidelines, this could result in danger for people, the environment, and the device and the system it is connected to.

The device corresponds to the state-of-the-art technology. This concerns the accuracy, the operating mode and the safe operation of the device.

In order to guarantee that the device operates safely, the operator must act competently and be conscious of safety issues.

MASS FLOW ONLINE B.V. provides support for the use of its products either personally or via relevant literature. The customer verifies that our product is fit for purpose based on our technical information. The customer performs customer- and application-specific tests to ensure that the product is suitable for the intended use. With this verification all hazards and risks are transferred to our customers; our warranty is not valid.

Intended use

The magnetic inductive flow sensor MVM-P must only be used for measuring and metering liquids with a minimum conductivity of 50 $\mu\text{S}/\text{cm}$.



WARNING

The magnetic inductive flow sensors of the MVM-P series are no safety components in accordance with Directive 2006/42/EC (Machine Directive).

↪ Never use the device as a safety component.

The operational safety of the device supplied is only guaranteed by intended use. The specified limits (→ § 9 "Technical data") may under no circumstances be exceeded.

Before installation, check whether the wetted materials of the device are suitable for the liquid used (→ § 9.2 "Materials table").



MEASURING TUBE EMPTY (OR PARTIALLY FILLED) / CONDUCTIVITY TOO LOW

The green LED may blink irregularly if the measuring tube of the MVM-P is empty or partially filled or if the conductivity of the fluid being used is too low. Random pulses will be present at the output, but they do not represent an actual flow.

↪ Ensure that the measuring tube of the MVM-P is always completely filled (→ § 4.1 "Installation instructions").

↪ Ensure that the conductivity of the fluid is at least 50 $\mu\text{S}/\text{cm}$.

Qualified personnel

- The personnel who are charged for the installation, operation and maintenance of the MVM-P must hold a relevant qualification. This can be based on training or relevant tuition.
The personnel must be aware of this operating manual and have access to it at all times.
- The electrical connection should only be carried out by a fully qualified electrician.

General safety instructions

- In all work, the existing national regulations for accident prevention and safety in the workplace must be complied with. Any internal regulations of the operator must also be complied with, even if these are not mentioned in this manual.
- Degree of protection according to EN 60529:
Please ensure that the ambient conditions at the site of use does not exceed the requirements for the stated protection rating (→ § 9 "Technical data").
- Prevent freezing of the medium in the device with appropriate measures.
- Only use the MVM-P if it is in perfect condition. Damaged or faulty devices must be checked without delay and, if necessary, replaced.
- When fitting, connecting and removing the MVM-P use only suitable appropriate tools.
- Do not remove or obliterate type plates or other markings on the device, as otherwise the warranty is rendered null and void.

2 Device description

The MVM-P series from MASS FLOW ONLINE B.V. is a flow sensor without moving parts. The measurement is performed using magnetic induction.

The MVM-P is used for measuring or metering water and electrically conductive fluids. The compact design and independence from the intake and discharge sections allows the MVM-P to be used under a variety of conditions.

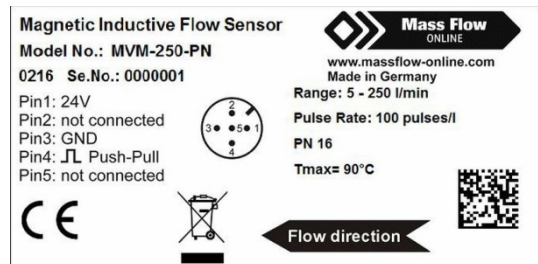
Versions

The MVM-P is available in nominal sizes DN 2, DN 7, DN 10 and DN 20.

Type plate

The type plate sticker is located on the bottom side of the MVM-P.

It contains the most important data, the connection diagram and the arrow for the flow direction (example → Fig.).



All units have been carefully checked for their operational reliability before shipment.

- Immediately after receipt, please check the outer packaging for damages or any signs of improper handling.
- Report any possible damages to the forwarder and your responsible sales representative. In such a case, state a description of the defect, the type and the serial number of the device.
Report any in-transit damage immediately. Damage reported at a later date shall not be recognized.

Unpacking

- ↪ Carefully unpack the unit to prevent any damage.
- ↪ Check the completeness of the delivery based on the delivery note.

Scope of delivery

- 1x MVM-P as ordered.
- 1x Operating manual.
- 1x Calibration Certificate.

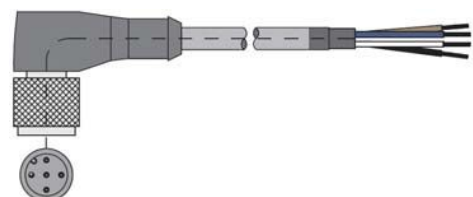


IMPORTANT

- ↪ Use the type plate to check if the delivered unit corresponds to your order.
- ↪ In particular, for devices with electrical components, check to see if the correct power supply voltage is specified.

Accessories

- Connection cable with moulded M12x1 coupling socket.



3 Construction and function

Components

- ① Housing.
- ② Electrical connection:
The electrical connection is made via 5-pin plug M12x1.
- ③ Operation / flow indicator LED.
- ④ Process connection:
The process connections are available in different sizes.
- ⑤ Type plate (sticker).



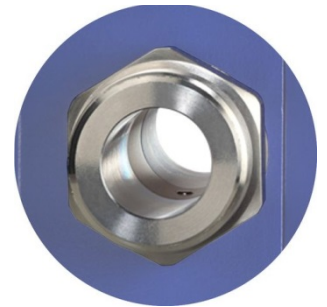
Construction

The measuring tube with its earthing sleeves and electrodes passes through the housing and forms the external process connection of the MVM-P.

A magnetic field for the measurement process is generated inside the sensor housing, which also contains the sensor and signal conditioning circuitry.

The two stainless steel electrodes are located in the middle of the measuring tube between the earthing sleeves.

The MVM-P does not need any moving parts to make measurements. The inside of the measuring tube is completely open, allowing the fluid to flow unhindered through the measuring tube.



Function

The magnetic inductive flow sensor operates in accordance with the principle of induction, i.e. a DC voltage is generated by the movement of a conductor in a magnetic field:

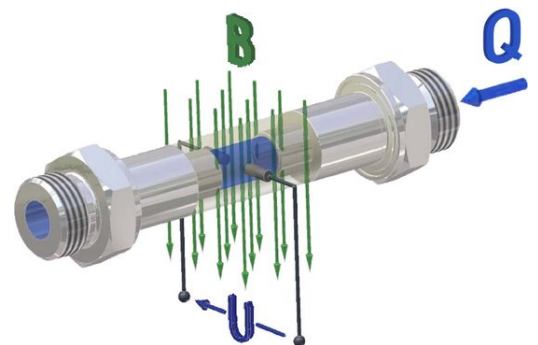
The measuring tube of the MVM-P is located in a magnetic field (B).

An electrically conductive liquid (Q) flows through the measuring tube. The positive and negative charge carriers are deflected in opposite directions.

A voltage perpendicular to the magnet field is generated and picked up by the two electrodes.

The resulting induced voltage is proportional to the mean flow velocity of the liquid.

The electronics of the MVM-P converts the induced voltage to a frequency and / or analogue output signal.



4 Installation of MVM-P

Before installing, check that

- the wetted materials of the device are suitable for the liquid being used (→ § 9.2 "Materials table").
- the equipment is switched off and is in a safe and de-energised state.
- the equipment is depressurised and has cooled down.

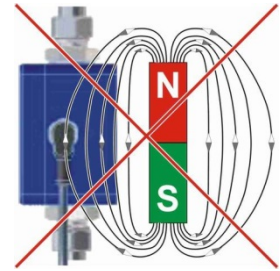
4.1 Installation instructions



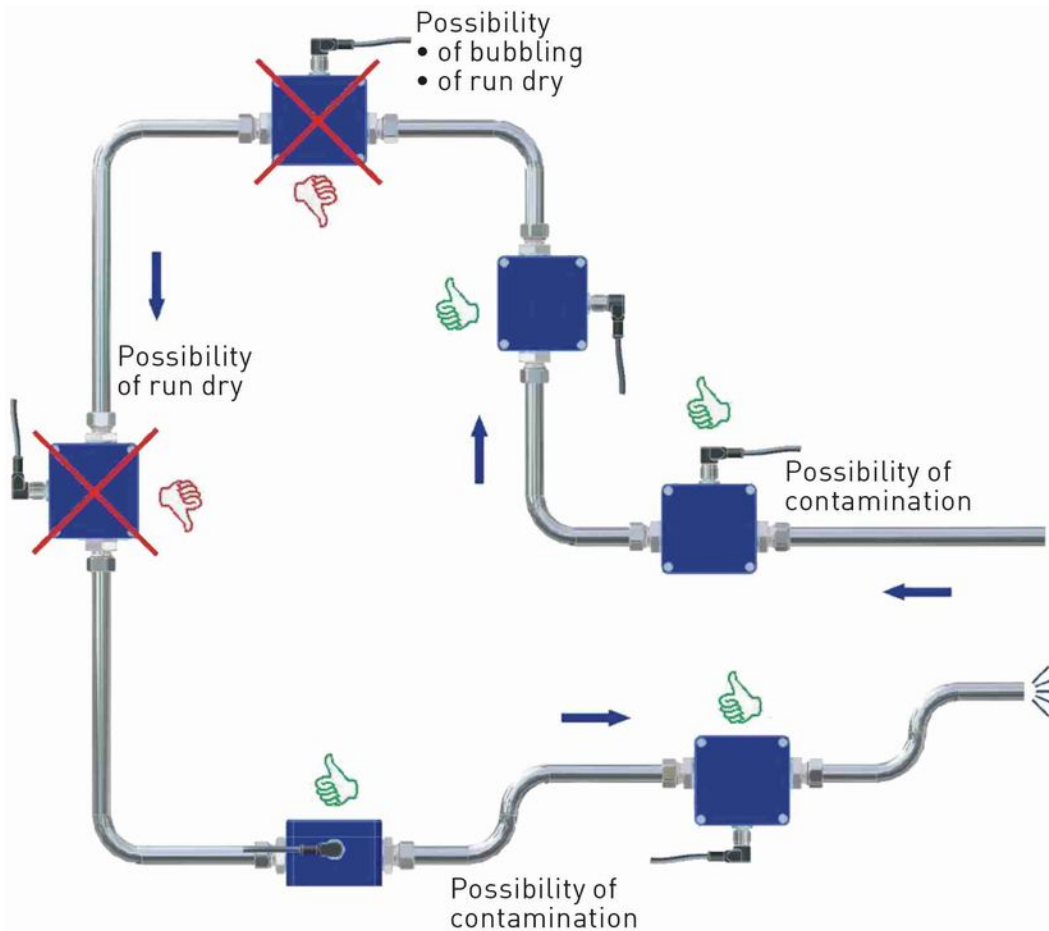
RISK OF MALFUNCTION DUE TO EXTERNAL MAGNETIC FIELDS

Magnetic fields close to the device can cause malfunctions and should be avoided.

- ↳ Ensure that no external magnetic fields are present at the installation site of the MVM-P.



- The MVM-P can always be installed anywhere along the pipeline. Straight sections of piping are preferable, however.



- Installation can occur in horizontal and vertical pipes. The flow sensor is only suitable for application in completely filled pipe systems.
- As a matter of principle magnetic inductive flow sensors are widely independent from the flow profile. An inlet section is not absolutely necessary.
To reach a most highly accuracy of the measurement, you should use straight inlet and outlet sections according to the nominal width (DN). The inlet section has to be at least 10 x DN; the outlet section 5 x DN in order to achieve the specified accuracy.
- The inlet and outlet sections and the gaskets must have the same or a slightly larger inside diameter than the measuring tube in order to achieve the specified accuracy.

4.2 Mounting

The MVM-P is installed directly into the pipeline. The compact design and light weight of the unit make wall-mounting unnecessary.



IMPORTANT

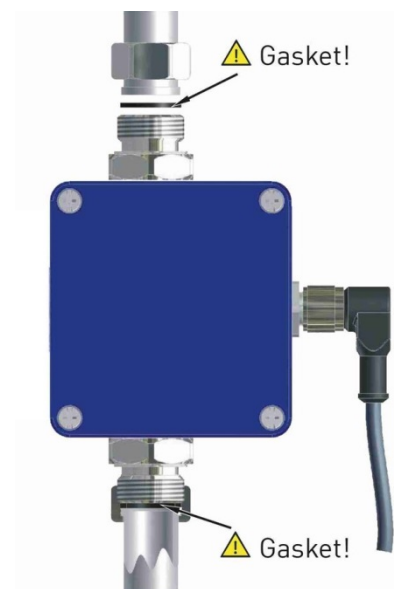
- Only use suitable gaskets for installation.
- Observe the flow direction indicated on the MVM-P.
- Observe the mounting dimensions (→ § 9.5 "Dimensions").

- ↪ Select an appropriate location for installation (→ § 4.1 "Installation instructions").
To ensure the best possible measuring accuracy, a vertical installation position with increasing flow is preferable (no collecting of dirt deposits).
- ↪ Install the appropriate screwed connections at the installation location.
- ↪ Insert the MVM-P together with the gaskets.
- ↪ Screw the union nuts of the screwed connection onto the process connections of the MVM-P.



PAY ATTENTION TO MAXIMUM TORQUE

While tightening, counter the union nut on the hexagon of the process connection!
If you do not counter it, the MVM-P can be damaged!



Maximum Torque			
MVM-001 / MVM-002 • G ¹ / ₄	MVM-030 • G ¹ / ₂	MVM-060 • G ¹ / ₂	MVM-250 • G ¹
8 Nm	15 Nm	15 Nm	30 Nm



- ↪ Tighten both union nuts.
When tightening, use a spanner to counter the process connection on the hexagon in place.

5 Electrical connection

The electrical connection of the MVM-P is made via the 5-pin plug M12x1 on the top of the housing.

The wiring of the MVM-P depends on the version ordered. A distinction is made between frequency and analogue output, as well as basic and optional wiring.



CAUTION

The electrical connection should only be carried out by a fully qualified electrician.

↪ De-energize the electrical system before connecting the MVM-P.



FIRE HAZARD DUE TO OVERHEATING OF THE DEVICE

Exceeding the specified limits will cause damage to the electronics. Without current limiting, there is a fire hazard due to overheating of the device.

↪ Connect the MVM-P only to a power source with limited power.



FOR USE ON SHIPS OR OTHER MARITIME EQUIPMENT

MVM-P devices do not offer isolation between Frame Ground (FG/PE) and Signal Ground (GND/0V).

24 VDC power needs to be supplied via a Safety Extra Low Voltage (SELV) and Limited Energy Circuit or SELV and Class II (double insulated) DC power supply. Pulse and current signals coming from our device may only be connected to galvanic insulated input ports.

Optional wirings

Depending on the version, an analogue output can be optionally connected.

Connecting cable

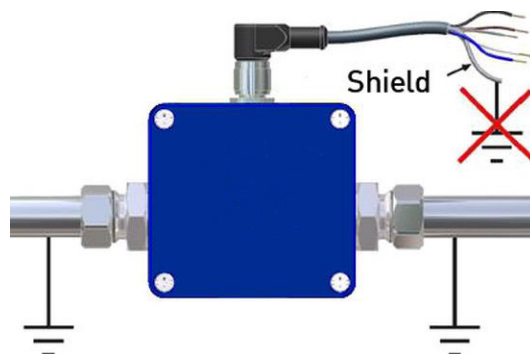
Suitable connection cables with moulded coupling socket are available included in the range of MASS FLOW ONLINE B.V. accessories. The shielding is already connected with the knurled nut. The maximum length of the connecting cable is 30 m.



SHIELDING REQUIRED

↪ Use only shielded connection cables.

↪ The shield of the connection cable should not be connected to earth.



We recommend to earth the pipes directly before and behind the MVM-P (→ Figure).

**IMPORTANT**

Pay attention to the temperature resistance of the connecting cable (→ § 9 "Technical data") at high media temperatures.

If the temperature resistance is smaller than the medium temperature, the cable may not be directly laid on the pipe.

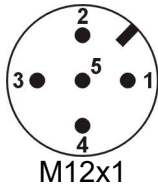
Connection 5-pin plug M12x1

- ↪ Screw the coupling socket of the connection cable to the plug of the MVM-P.
- ↪ Tighten the knurled nut of the coupling socket with a maximum torque of 1 Nm.

5.1 Wirings

Pinout

The pinout differs according to the chosen configuration of the device.

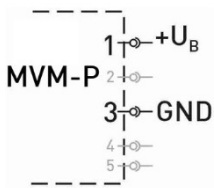


Possible pinout:

- Pin 1: **+U_B**
- Pin 2: d. n. c. (do not connect) / Analogue U/I
- Pin 3: **GND**
- Pin 4: Frequency
- Pin 5: n. c. (not connected)

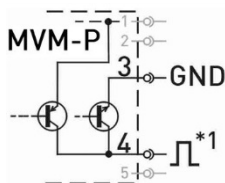
↪ Connect the connecting cable according to your version and the pinout on the type plate.

Supply voltage

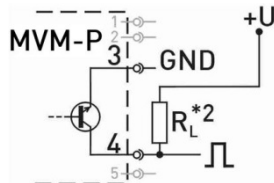


MVM-P with frequency output

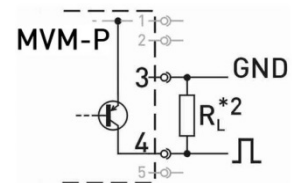
Push-Pull



NPN Open Collector



PNP Open Collector

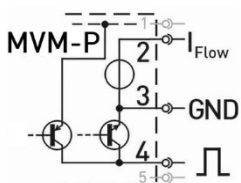


*1: Push-Pull switching outputs of several MVM-P may not be connected in parallel.

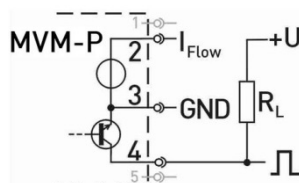
*2: Recommendation Pull-Up / Pull-Down resistance $R_L \sim 5\text{ k}\Omega$

Use of frequency and analogue output

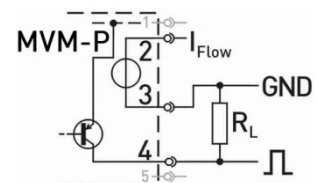
Push-Pull



NPN Open Collector



PNP Open Collector



Recommendation for resistance $R_L \sim 5\text{ k}\Omega$

6 Commissioning and measuring mode

Before switching on the MVM-P for the first time, please follow the instructions in the following section.

6.1 Commissioning

Check that

- the MVM-P has been installed correctly and that all screw connections are sealed.
- the electrical wiring has been connected properly.
- the measuring system is vented by flushing.

6.2 Switching on and off

The MVM-P has no switch and can therefore not be switched on and off independently. Switching on and off takes place via the connected supply voltage.

↪ Switch on the supply voltage.

The green LED lights up once for ~1 s. The MVM-P is ready and goes into measuring mode.



6.3 Measuring mode

In measuring mode, the green LED flashes proportional to the measured flow.

The human eye cannot detect the flashing any longer from a frequency of ~30 ... 40 Hz.

In that case the green LED seems to be lit permanently.

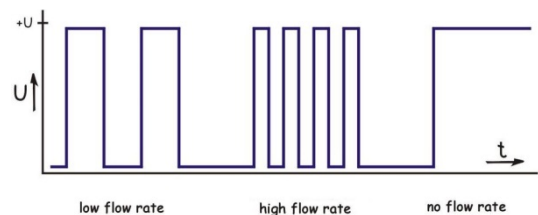


The following subsections only apply to devices which have the correspondent functionality.

MVM-P with frequency output

The MVM-P provides according to the version a flow proportional NPN, PNP or Push-Pull square wave signal.

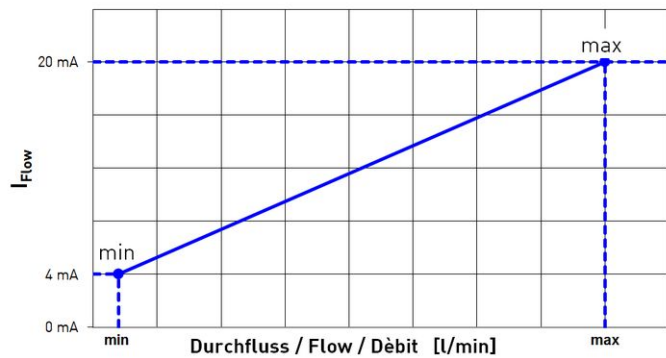
The frequency of the pulse output changes according to the flow (→ Fig.).



MVM-P with analogue output

According to the configuration of the MVM-P, the analogue output provides a voltage or current signal.

This signal is proportional to the measured flow.



7 Maintenance and cleaning

Maintenance

The MVM-P is maintenance-free and cannot be repaired by the user. In case of a defect, the device must be replaced or sent back the manufacturer for repair.



IMPORTANT

When opening the device, critical parts or components can be damage.

↪ Never open the device and perform any repair yourself.

Cleaning

Clean the MVM-P with a dry or slightly damp lint-free cloth. Do not use sharp objects or aggressive agents for cleaning.

8 Disassembly and disposal



CAUTION

Never remove the device from a plant in operation.

↪ Make sure that the plant is shut down professionally.

Before disassembly

Prior to disassembly, ensure that

- the equipment is switched off and is in a safe and de-energised state.
- the equipment is depressurised and has cooled down.

Disassembly

- ↪ Remove the electrical connectors.
- ↪ Remove the MVM-P using suitable tools.

Disposal



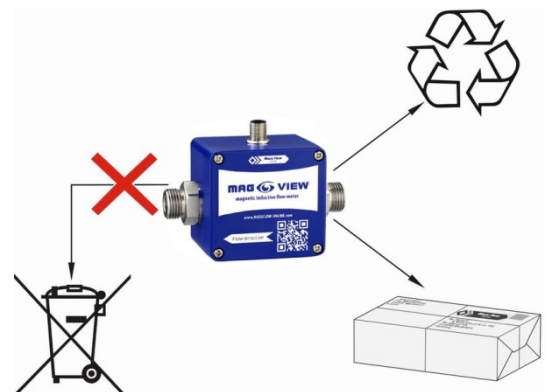
NO HOUSEHOLD WASTE

The MVM-P consists of various different materials. It must not be disposed of with household waste.

↪ Take the device to your local recycling plant

or

↪ send the device back to your supplier or to MASS FLOW ONLINE B.V..



9 Technical data

The technical data of customised versions may differ from the data in these instructions. Please observe the information specified on the type plate.

9.1 Characteristics MVM-P

Type	MVM-001 MVM-002	MVM-030	MVM-060	MVM-250
Measurement device characteristics				
Measuring range	0.0083...1 l/min • 0.05...2 l/min	0.1...30 l/min	0.2...60 l/min	5...250 l/min
Accuracy *1 (Frequency output)	±1 % of range *2 • ±2 % of range *3	± (0.7 % of reading + 0.3 % of range)		±(1.5 % of reading + 0.3 % of range)
Repeatability *1	1%			
Response time (Frequency / Frequency + Analogue)	< 500 ms			
Flow indication	LED green, flow proportional flashing			
Output signal characteristics				
Frequency output:				
Pulse rate	10000 pulses/l	1000 pulses	500 pulses	100 pulses
Resolution	0.1 ml/pulse	1.0 ml/pulse	2.0 ml/pulse	10 ml/pulse
Signal shape	Square wave signal • duty cycle 50:50 Push-Pull • NPN open collector (o.c.) • PNP o.c.			
Signal current	≤ 100 mA, current limited			
Analogue output 4...20 mA (optional):				
Signal current corresponds to flow rate of	0...1 l/min • 0...2 l/min	0...30 l/min	0...60 l/min	0...250 l/min
Max. load	250 Ω to GND			

*1 Test conditions: Water 23 °C at 150 ±100 µS/cm; Standard pulse rate.

*2 0...50 % of measuring range.

*3 50...100 % of measuring range.

Type	MVM-001 MVM-002	MVM-030	MVM-060	MVM-250
Electrical characteristics				
Supply voltage	12...24 VDC ($\pm 10\%$)			24 VDC ($\pm 10\%$)
Current consumption	≤ 150 mA			
Electrical connection	5-pin-plug M12x1			
Degree of protection (EN 60529)	IP 65 and IP67 (with MFO.CB.25)			
Process variables				
Medium to measure:	Water and other conductive liquids			
- Conductivity	> 50 $\mu\text{S/cm}$			
- Temperature	$-20\dots 90$ $^{\circ}\text{C}$			
Ambient temperature	$-10\dots T_{\text{max}}$ $^{\circ}\text{C}$ (\rightarrow § 9.4)*			
Nominal diameter	DN 2	DN 7	DN 10	DN 20
Nominal pressure	PN 16			
Process connection	G $\frac{1}{4}$ -ISO 228 male	G $\frac{1}{2}$ - ISO 228 male	G $\frac{1}{2}$ - ISO 228 male	G1 - ISO 228 male

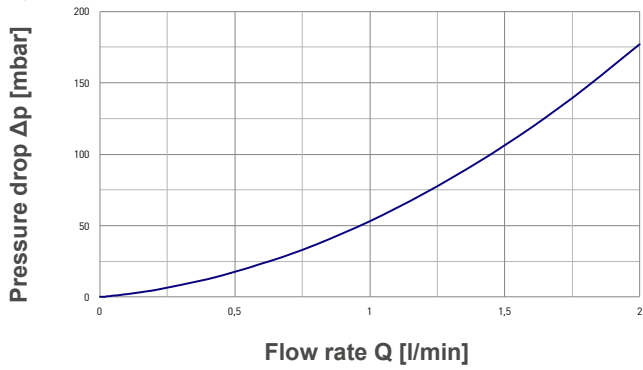
* The maximum ambient temperature depends on the temperature of the medium and the wiring of the MVM-P.

9.2 Materials table

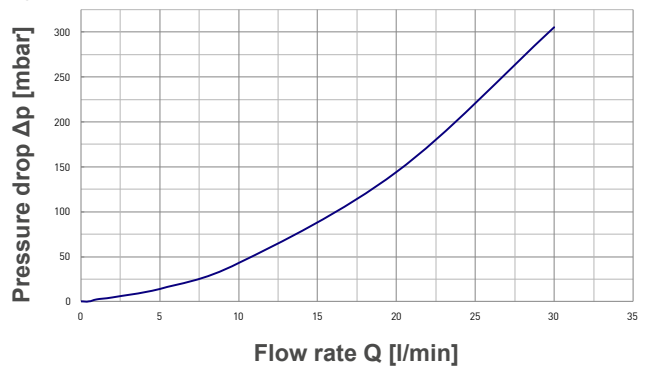
Component	Material	Wetted component
Housing	Aluminium die casting	
Measuring tube	PEEK-GF30	X
Electrodes	Stainless steel 1.4571	X
Gaskets	EPDM	X
Process connections	Stainless steel 1.4571	X

9.3 Pressure drop

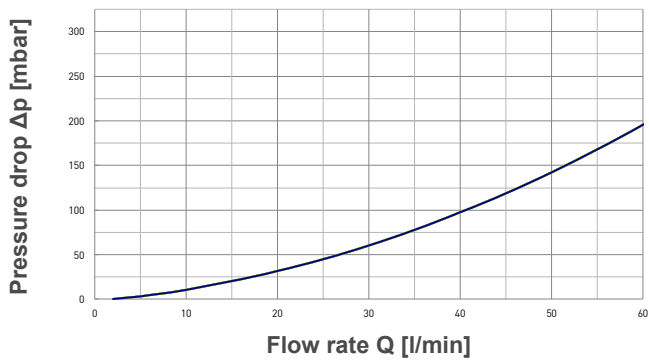
Typical pressure drop MVM-001 / MVM-002



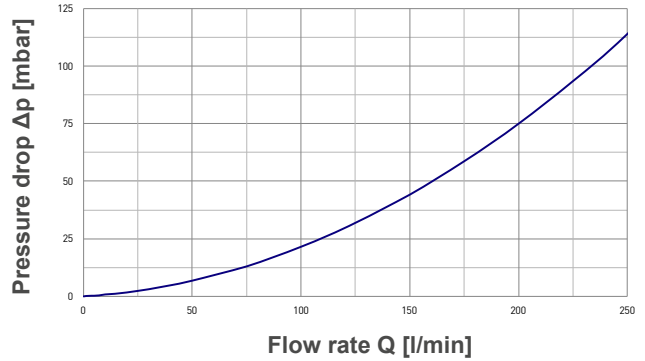
Typical pressure drop MVM-030



Typical pressure drop MVM-060

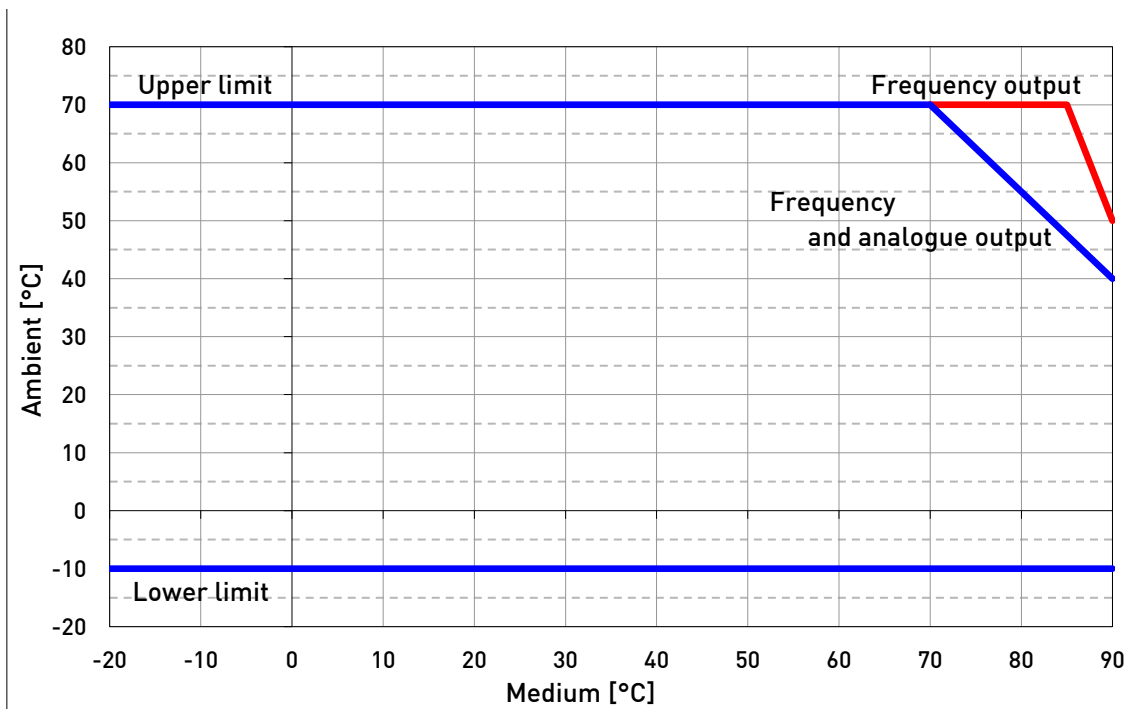


Typical pressure drop MVM-250

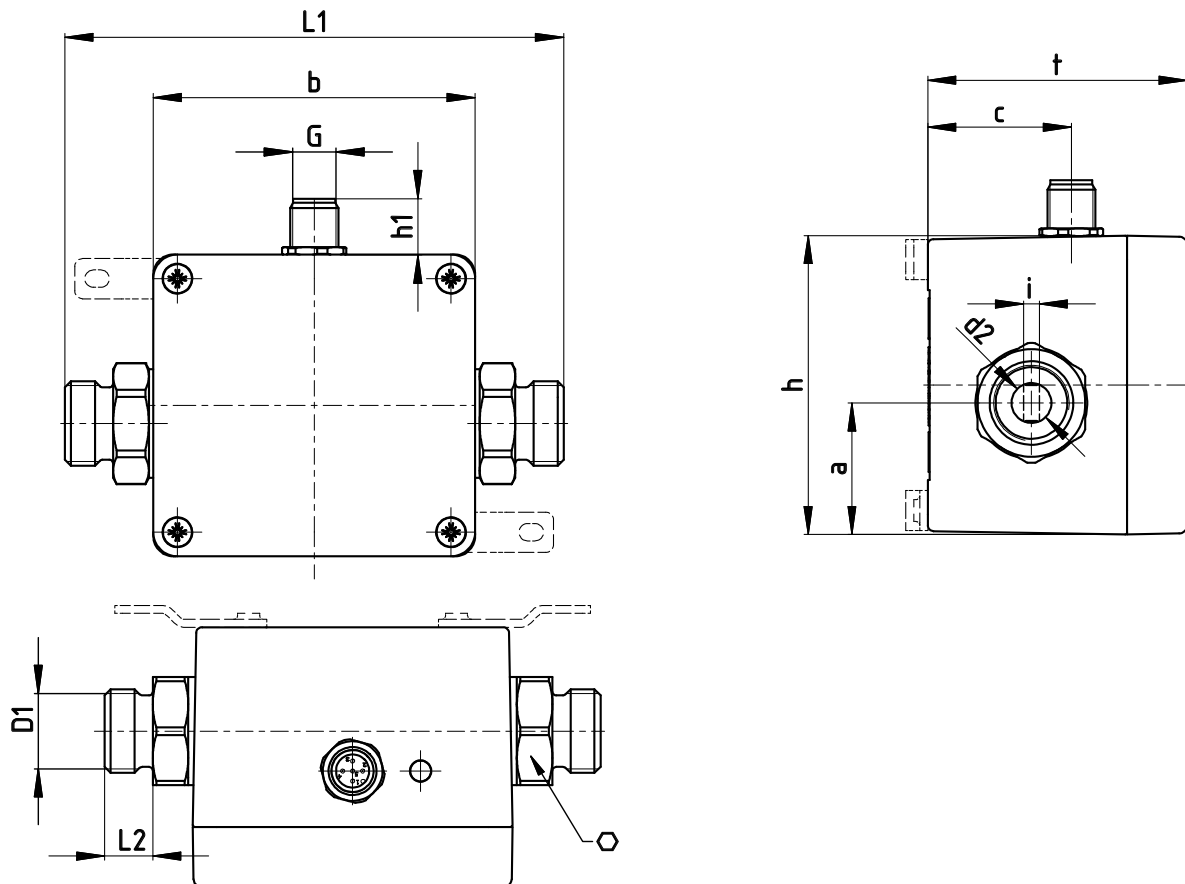


9.4 Temperature limits

The maximum ambient temperature depends on the medium temperature and the version of the MVM-P.



9.5 Dimensions



Dimensions from drawing in mm												
MVM-	L1 ±0,5	L2 ±0,5	D1	d2	i	b	h	t	a	c	h1	⬡
001 / 002	120	12	G ¼ A	∅3	□ 1.9	80	75	65	34	36	14	17
030	124	12	G ½ A	∅10	4	80	75	65	33	36	14	27
060	124	12	G ¾ A	∅10	-/-	80	75	65	33	36	14	27
250	140	18	G 1 A	∅20	-/-	80	75	65	33.5	36	14	36

