Dwyer MFS2 Series Magnetic Inductive Flow Sensor Instruction Manual

Dwyer MFS2 Series Magnetic Inductive Flow Sensor Instruction Manual

Contents

About this operating manual

- The operating manual is aimed at specialists and semi-skilled personnel.
- Before each step, read through the relevant advice carefully and keep to the specified order.
- Thoroughly read and understand the information in the section “Safety instructions”

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

Hazard signs and other symbols used:

 **WARNING**! / CAUTION! Risk of injury!
This sign indicates dangers that cause personal injuries that can lead to health defects or cause considerable damage to property

 **CAUTION**! Electric current!
This sign indicates dangers which could arise from handling of electric current.

 **CAUTION**! Material damage!
This sign indicates actions which could lead to possible damage to material or environmental damage.

 ADHERE TO OPERATING MANUAL!

 NO DOMESTIC WASTE!
The device must not be disposed of together with domestic waste

 Pay attention to and comply with information that is marked with this symbol.

- Follow the specified instructions and steps. Adhere to the given order.

NOTICE!
This symbol indicates important notices, tips or information.

- heck the specified points or notices.
- Reference to another section, document or source.
- Item

Device description

The MFS2 series from Dwyer is a flow sensor without moving parts. The measurement is performed using magnetic induction

The MFS2 is used for measuring or metering water and electrically conductive fluids. The compact design and independence from the intake and discharge sections allows the MFS2 to be used under a variety of conditions.

Versions:
The MFS2 is available in different inner diameters from 0.12 in to 0.98 in.

Type plate:
You can find the type plate on the back of the MFS2.
It contains the most important technical data.

Delivery, unpacking and accessories

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:

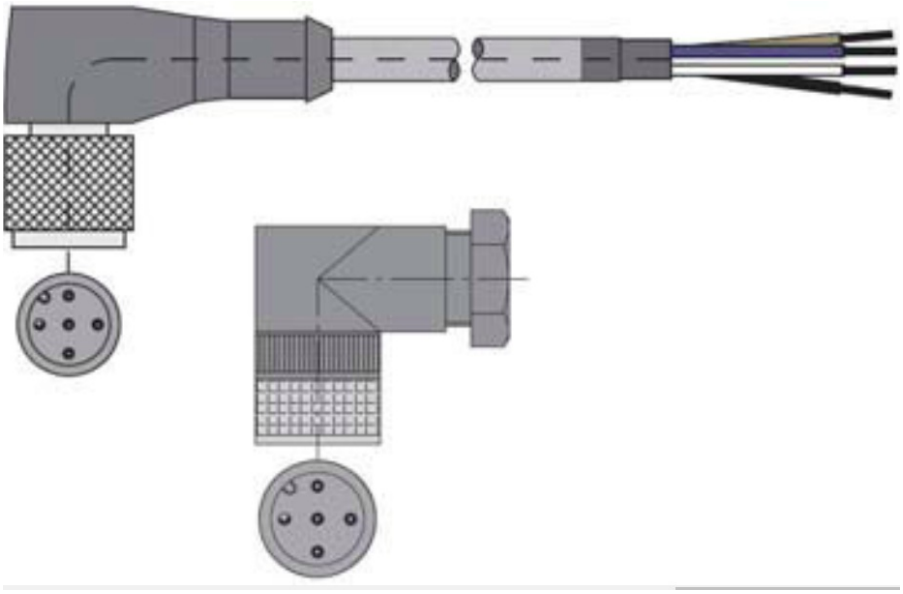
- 1x MFS2 according to the order data.
- 1x Operating manual.

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 molded M12x1 coupling socket.
- M12x1 coupling socket as component.



Intended use

The magnetic inductive flow sensor MFS2 must only be used for measuring and metering liquids with a minimum conductivity of 20 µS/cm

WARNING! No safety component!
The magnetic inductive flow sensor of the series MFS2 is no safety component in accordance with Directive 2006/42/EC (Machine Directive).

- Never use the MFS2 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 installing the device, check that the wetted materials of the device are compatible with the media being 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 MFS2 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 MFS2 is always completely filled (§ 4.1 “Installation instructions”).

- Ensure that the conductivity of the fluid is at least 20 µS/cm.

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.

Safety instructions

Before you install the MFS2, 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 MFS2 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

Dwyer 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.

Qualified personnel:

- The personnel who are charged for the installation, operation and maintenance of the MFS2 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 MFS2 if it is in perfect condition. Damaged or faulty devices must be checked without delay and, if necessary, replaced.
- When fitting, connecting and removing 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.

Special safety instructions:

- Crystallizing liquids:

  Liquids which crystallize when dried out can cause a malfunction of the MFS2.
- Make sure that the MFS2 is not run dry.
- Prevent the crystallization of the fluid in the device by taking appropriate measures.

Further warnings that are specifically relevant to individual operating procedures or activities can be found at the beginning of the relevant sections of this operating manual

Construction and function

Components

1. Housing:

   The Housing consists of plastic and has theIP65 degree of protection.
2. Electrical connection:

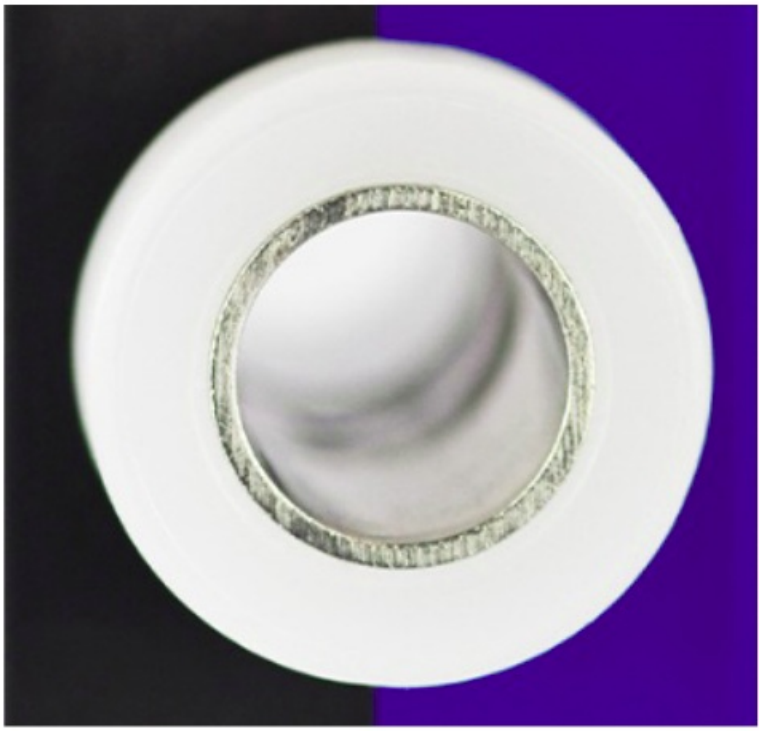
   The electrical connection is made via 4-pin plug M12x1.
3. Process connection:

   The process connections are available in different sizes.
4. Operation / flow indicator LED

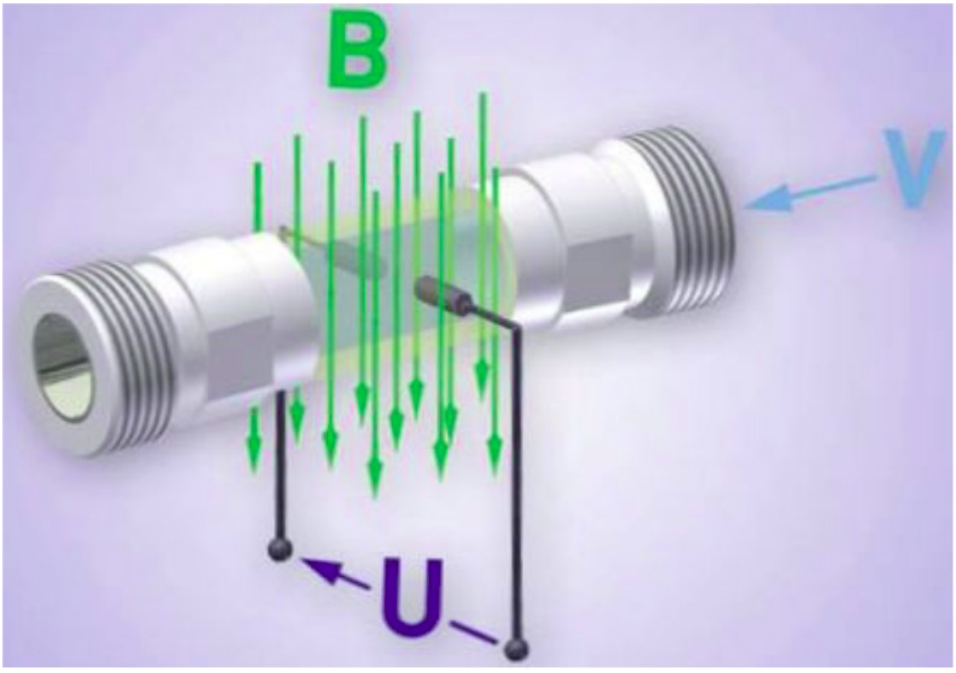
Construction:

The measuring tube with its grounding sleeves and electrodes passes through the housing and forms the external process connection of the MFS2.

A magnetic field for the measurement process is generated inside the 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 grounding sleeves.
The MFS2 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 functions according to the induction principle. A DC voltage is generated by the movement of a conductor in a magnetic field
The measuring tube of the MFS2 is located in a magnetic field (B)
.An electrically conductive medium (V) flows through
the measuring tube. The positive and negative charge carriers are oppositely deflected.
A voltage (U) is generated at right angles to the magnetic field, which is picked up by the twoelectrodes.
Thereby, the induced voltage is proportional to the average flow velocity of the liquid.
The electronics of the MFS2 converts the induced voltage into a flow-proportional frequency signal.



Installation of MFS2

Before installing, check that

- the wetted materials of the device are suitable for the media being used (§ 9.2 “Materials table”).
- the equipment is switched off and is in a safe and de-energized state.
- the equipment is depressurized and has cooled down.

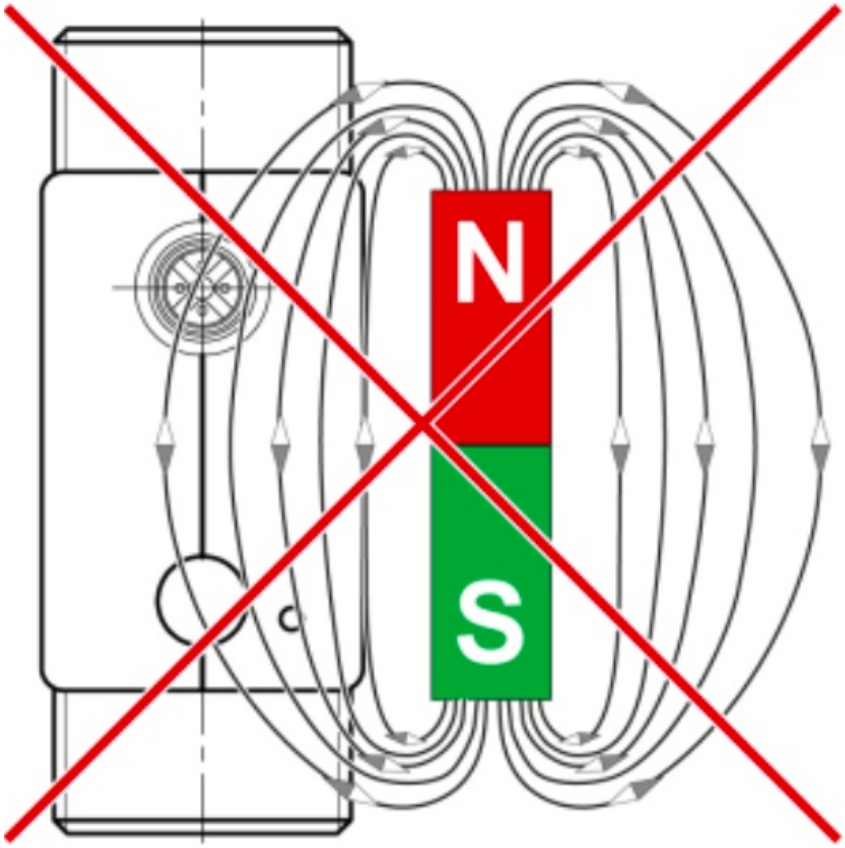
SUITABLE TOOLS:

- Use only suitable tools of the correct size.

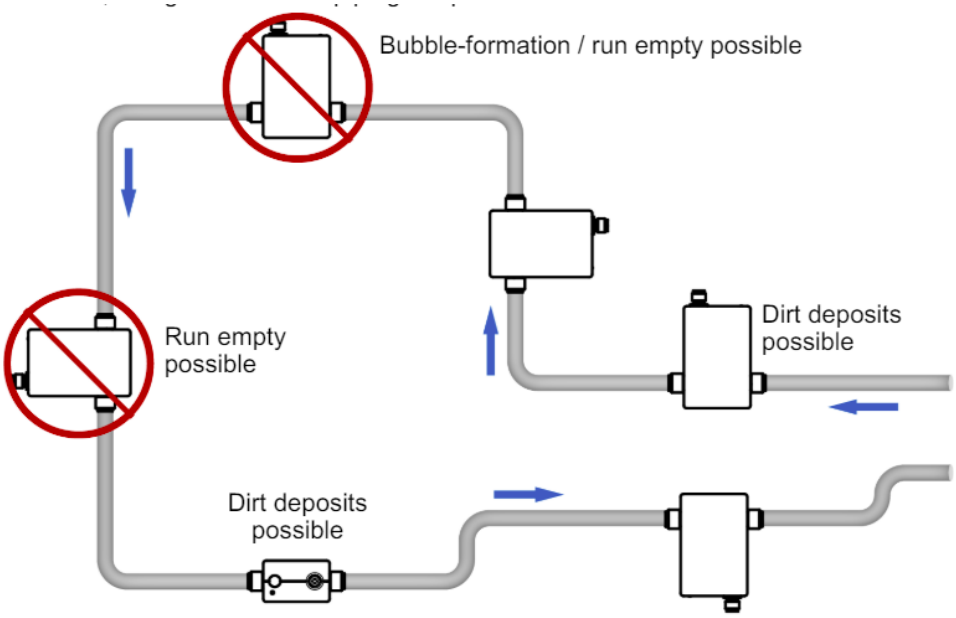
Installation instructions

CAUTION! Risk of malfunction due to external magnetic fields! Magnetic fields close to the device can cause malfunctions and should be avoided.

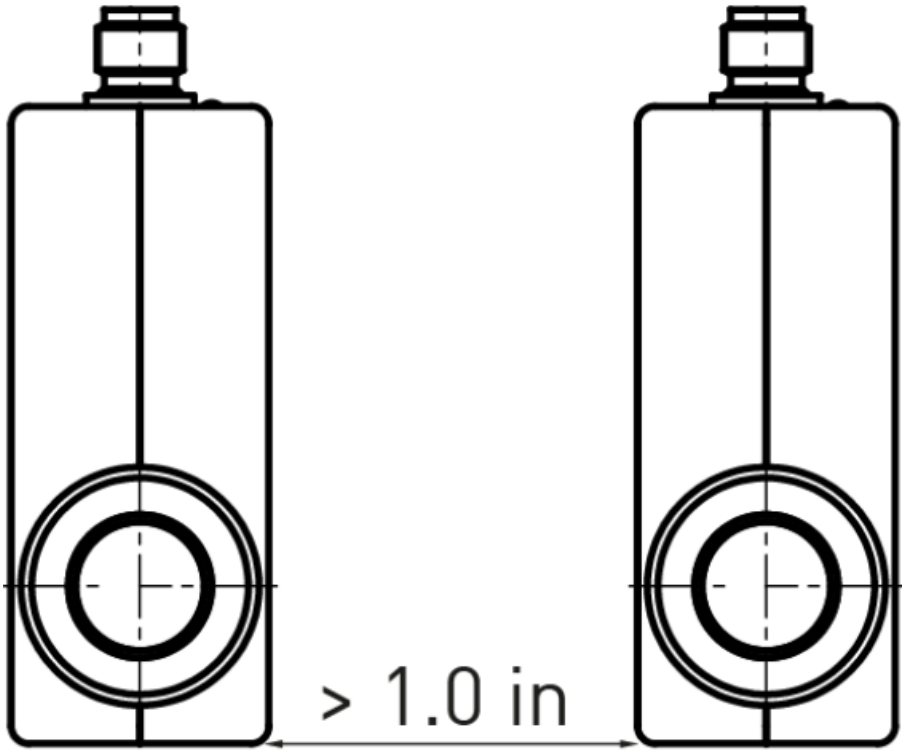
Ensure that no external magnetic fields are present at the installation site of the MFS2



- The MFS2 can always be installed anywhere along the pipeline. However, straight sections of piping are preferable.



- 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 inner diameter. The inlet section has to be at least 10 x inner diameter; the outlet section 5 x inner diameter 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.
- If two or more MFS2 devices are used side by side, maintain a separation of at least 1.0 inch between adjacent devices. If adjacent devices are too close together, operation of both devices may be impaired due to mutual interference.

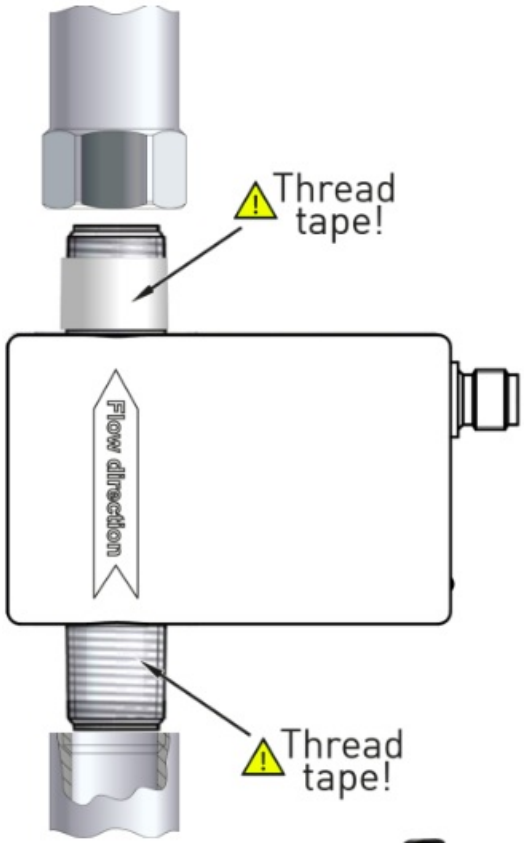


Assembly

The MFS2 is installed directly into the pipeline. The compact design and light weight of the unit make wall-mounting unnecessary.

IMPORTANT NOTICES:

- Only use suitable gaskets for installation.
- Observe the flow direction indicated on the type plate.
- Observe the mounting dimensions (§ 9.4 “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).
- Wrap the MFS2 connections with 1 to 2 wraps of thread tape (e.g. Teflon® tape). Wrap tape in a clockwise direction, viewed form the end, leaving the first two threads uncovered.
- Make sure the tape does not intrude into the flow path.
- Attach the MFS2 with arrow pointed in the direction of flow.
- The fittings should be screwed into MFS2 hand tight.



CAUTION! Material damage!

Maximum torque 3.7 ft lb.
While tightening, counter the MFS2 only by hand! If you use an open-end or a pipe wrench, the MFS2 can be damaged.

- To tighten the MFS2, use an open-end or a pipe wrench for the fittings and only the hand for the MFS2.

Electrical connection

The electrical connection of the MFS2 is made via the 4-pin plug M12x1 at the top of the housing.
The wiring of the MFS2 depends on the ordered version. A distinction is made between frequency output or analogue output and frequency output

CAUTION! Electric current!
The electrical connection should only be carried out by a fully qualified electrician.

- De-energize the electrical system before connecting the MFS2.

Connection cable:
Suitable connection cables with molded coupling socket M12x1 are available in different lengths as Dwyer accessories. The maximum permissible cable length is 32.8 ft (10 m).

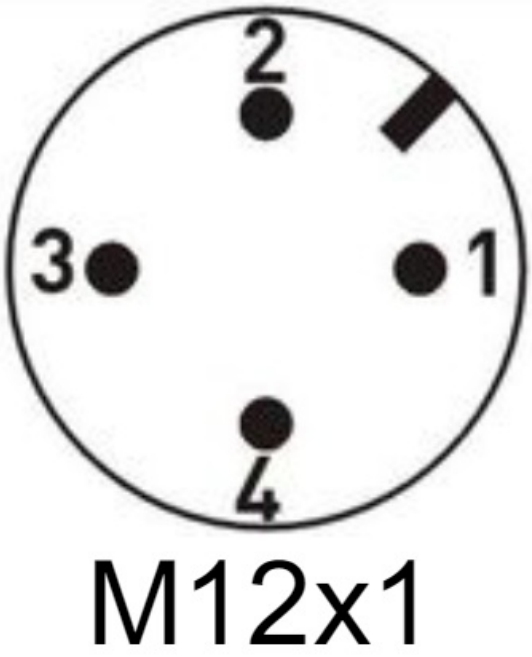
Connection 4-pin plug M12x1:

- Screw the coupling socket of the connection cable to the plug of the MFS2.
- Tighten the knurled nut of the coupling socket with a maximum torque of 1 Nm.

Wirings

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

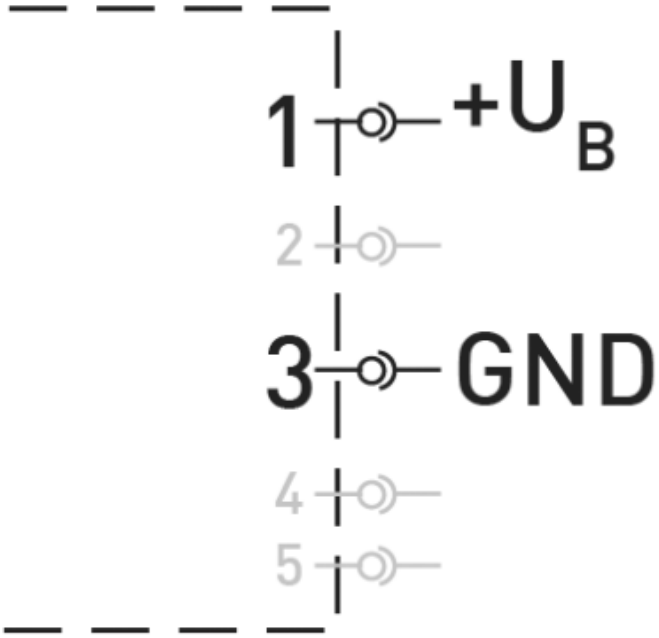
Pinout



Possible pinout:
Pin 1: +UB
Pin 2: n. c. (not connected) / Analog U/I
Pin 3: GND
Pin 4: Frequency

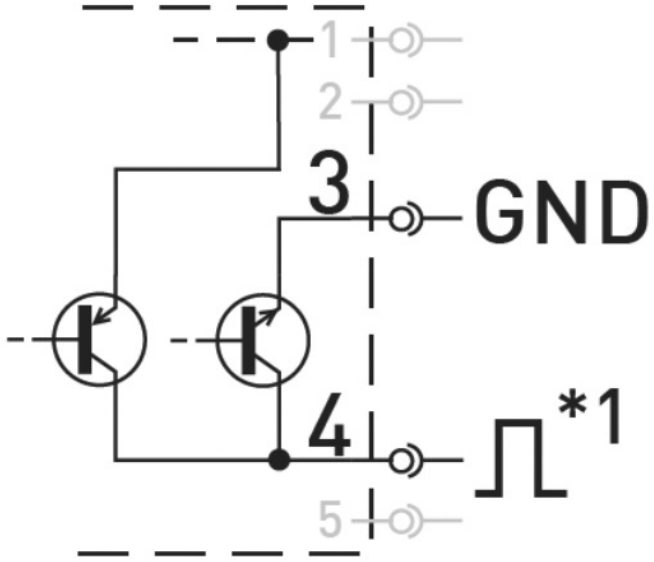
- Connect the connection cable according to your version and the pinout on the type plate

Supply voltage:



MFS2 with frequency output:

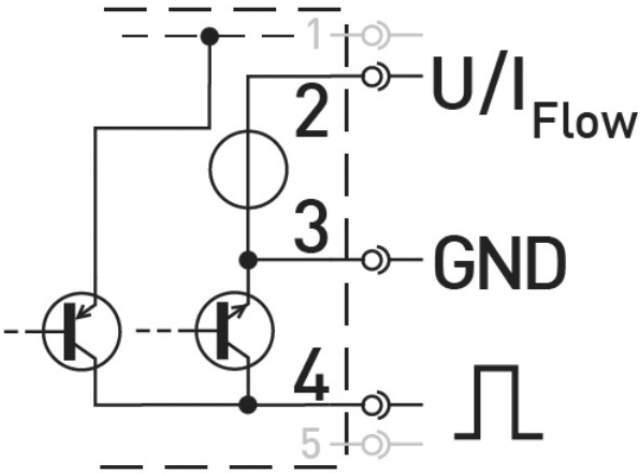
Push-Pull:



- 1: Push-Pull switching outputs of several MFS2 may not be connected in parallel.

Use of frequency and analogue output:

Push-Pull:



- Ensure that the maximum signal current of 100 mA is not exceeded

Commissioning and measuring operation

Before switching on the MFS2 for the first time, please follow the instructions in the following section.

Commissioning

Check that

- the MFS2 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.

Switching on and off

The MFS2 has no switch and cannot be switched on or off on its own. Switching on and off is carried out by the applied supply voltage.

- Switch on the supply voltage.

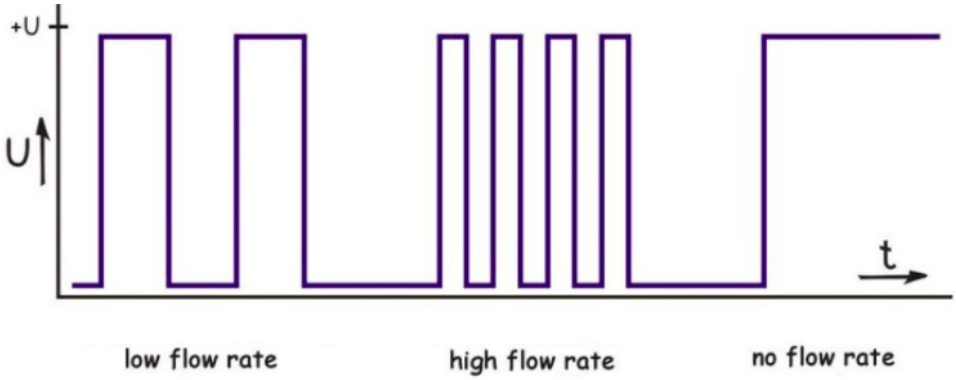
The green LED lights up. The MFS2 is ready and goes into measuring mode

Measuring operation

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

For the human eye, the flashing is no longer visible from a frequency of ~30…40 Hz. The green LED then seems to light up permanently.

MFS2 with frequency output:
The MFS2 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.).



MFS2 with analogue output:
According to the configuration of the MFS2, the analogue output provides a voltage or current signal.
This signal is proportional to the measured flow. You will find the scaling of the analogue output on the type plate.

Maintenance and cleaning

Maintenance:
The MFS2 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

CAUTION! Material damage!

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

- Never open the device and perform any repair yourself.

Cleaning:
Clean the MFS2 with a dry or slightly damp lint-free cloth. Do not use sharp objects or

aggressive agents for cleaning

Disassembly and disposal

CAUTION! Risk of injury!

 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-energized state.
- the equipment is depressurized and has cooled down.

Disassembly:

- Remove the electrical connectors.
- Remove the MFS2 using suitable tools.

Disposal:
Compliant with the Directives 2011/65/EU (RoHS) and 2012/19/EU (WEEE), the device must be disposed of separately as electrical and electronic waste.

 **NO HOUSEHOLD WASTE!**
The MFS2 consists of various different materials. It must not be disposed of with household waste.

- Take the MFS2 to your local recycling plant

  or
- send the MFS2 back to Dwyer.

Technical data

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

Characteristics MFS2

Type MFS2-…	**…-0(A)**	**…-1(A)**	**…-2(A)**	**…-3A)**	**…-4(A)…-5 (A)**	**…-6(A)**
Measurement device characteristics						
Flow range [gpm]	0.026…0 .53	0.066…1.3	0.26…5.3	0.66…13.2	1.3…53	3.3… 66
Accuracy*	±0.7 % of reading ±0.3 % of range					

Repeatability	±1%					
Output signal starting from [gpm]	0.013	0.026	0.07	0.27	0.53	1.32
Max. flow rate [gpm]	0.66	1.58	6.6	15.8	63.4	79.2
Response time	< 100 ms					
Indication	LED green, flow proportional flashing					
Output signal characteristics						
Frequency output:						
– Pulse rate / K-Factor [pulses/gal]	30000	15000	3000	1500	750	300
– Resolution [ml/pulse]	0.1	0.25	1.0	2.5	5.0	12.5
– Signal shape	Square wave signal • duty cycle 50:50Push-Pull • NPN open collector • PNP open collector					
– Signal current	≤ 100 mA					
Analog output 4…20 mA (…-…A)						
Corresponds to flow rate [US gpm]	0…0.53	0…1.3	0…5.3	0…13.2	0…53	0…66
Max. burden	250 Ω to GND					
Electrical characteristics						
Supply voltage	12…24 VDC (±10 %)**					
Power consumption	Max 3.6 W					
Electrical protection measures	short-circuit proof • protected against polarity reversal					
Electrical connection	4-pin plug M12x1					
Degree of protection(EN 60529)	IP 65 (only with a connected coupling)					
Process variables						
Medium to measure	Water and other conductive liquids					
– Conductivity	> 20 µS/cm					
– Temperature	14…140 °F (non-freezing)					
Ambient temperature	41…140 °F					
Storage temperature	5…140 °F					
Inner diameter	0.12 in	0.31 x0.08 in	0.31 in	0.55 in	0.71 in	0.98 in
Max. working pressure (at … °F)	145 psi (68 °F) • 116 psi (104 °F) • 87 psi (140 °F)higher pressure ratings on request					

Process connection- male thread	⅜” NPT	½” NPT	¾” NPT	1” NPT	1¼” NPT

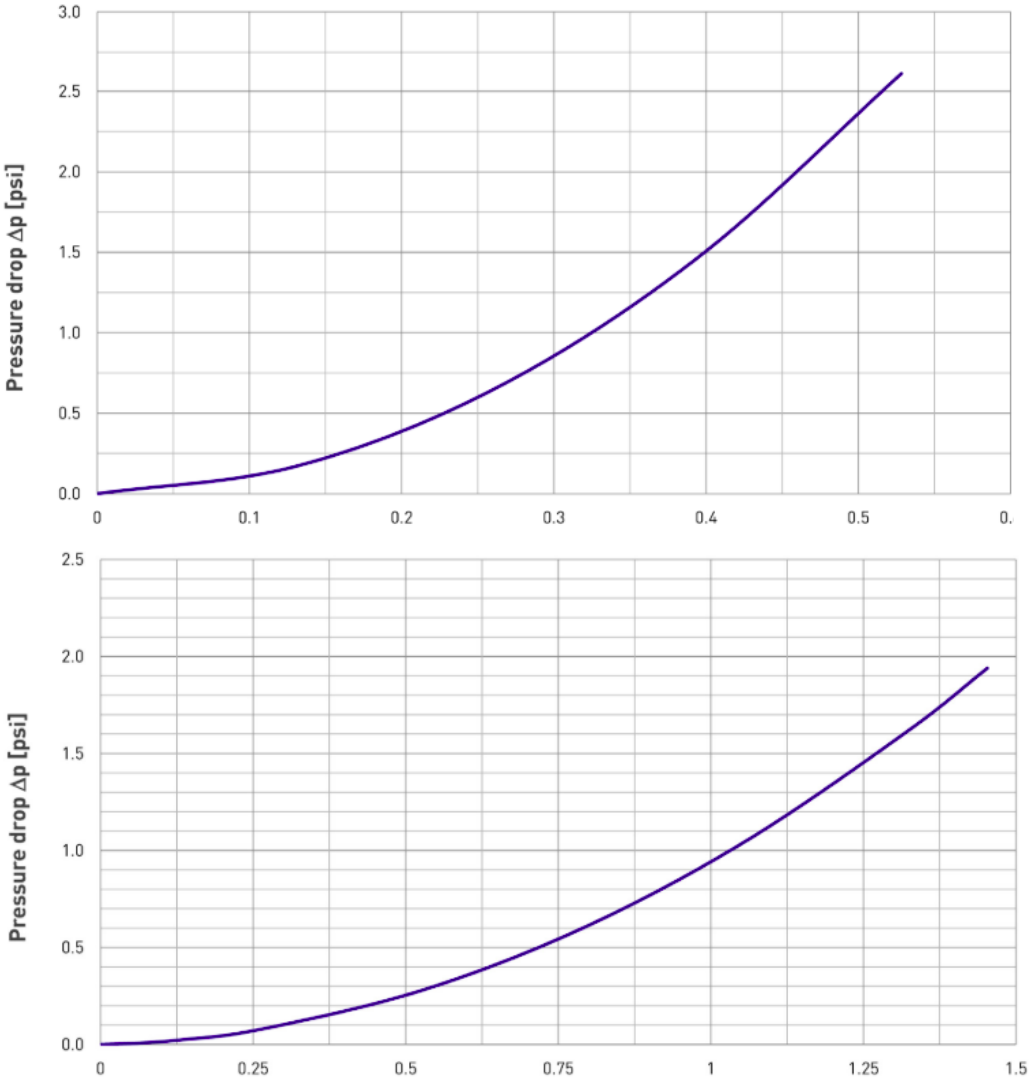
test conditions: Water 73 °F
** Voltage output 0.5…10 V only available with 16…24 VDC

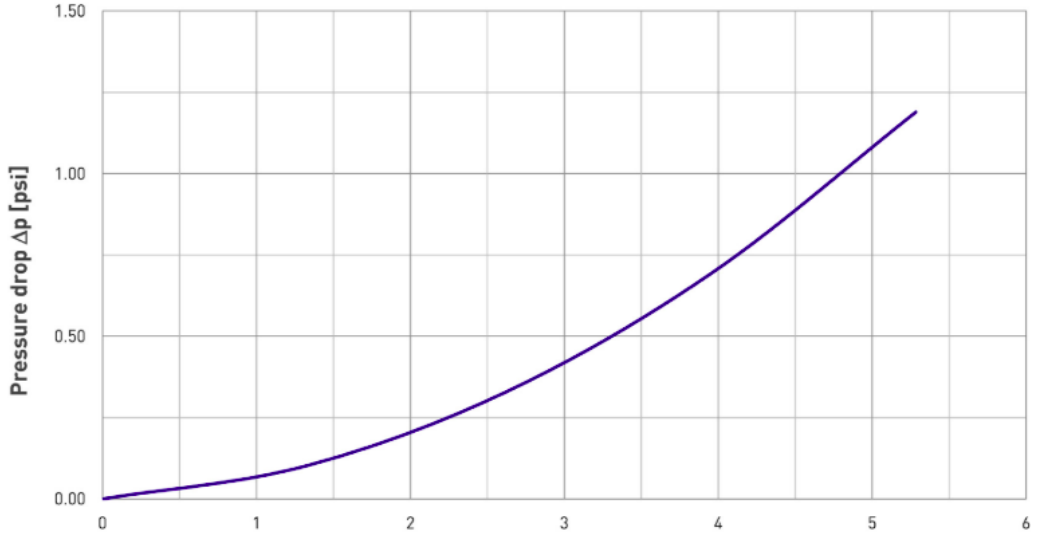
Materials table

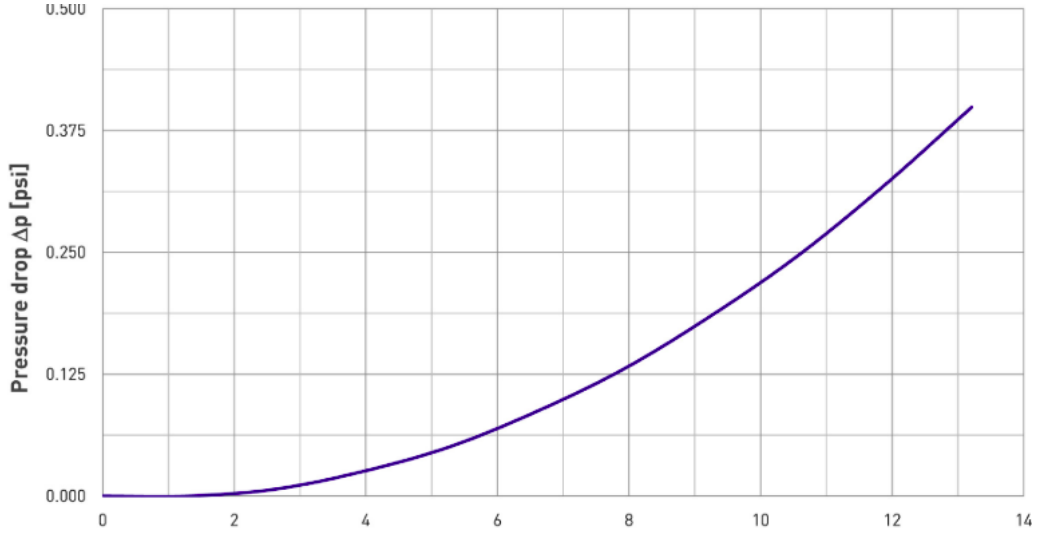
Component	**Material**	**Component - wetted**
Housing	ABS	
Measuring tube	POM	**X**
Process connections	POM	**X**
O-ring	EPDM	**X**
Electrodes and grounding rings	Stainless steel 1.4404	**X**

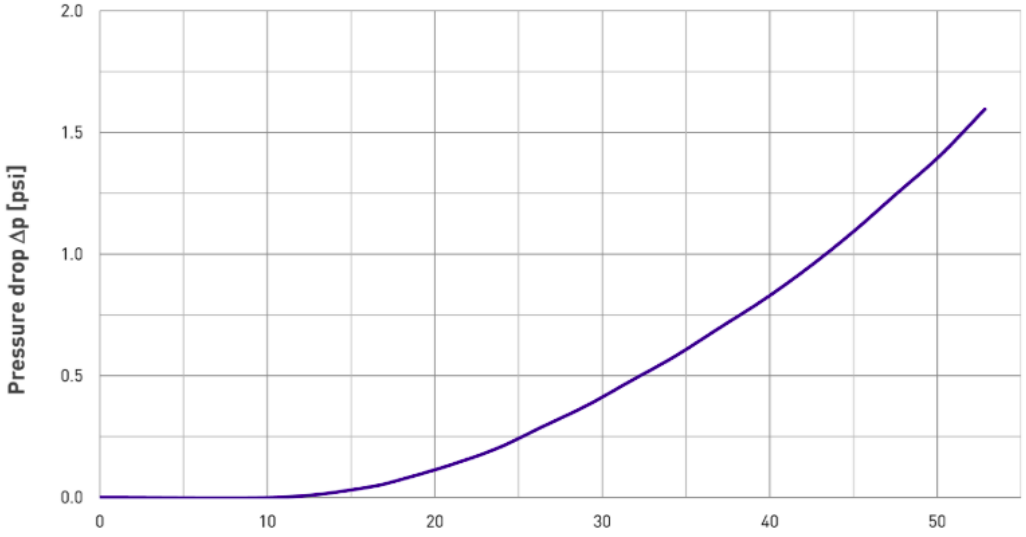
Pressure drop

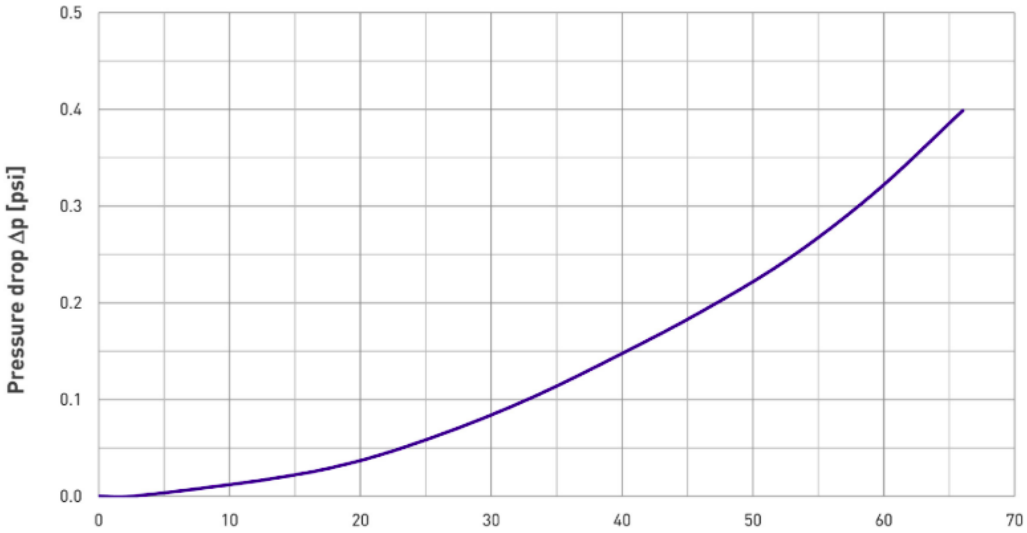
MFS2-0(A)




Pressure drop Δp [psi]
1.50
1.00
0.50
0.00
0
1
2
3
4
5
6

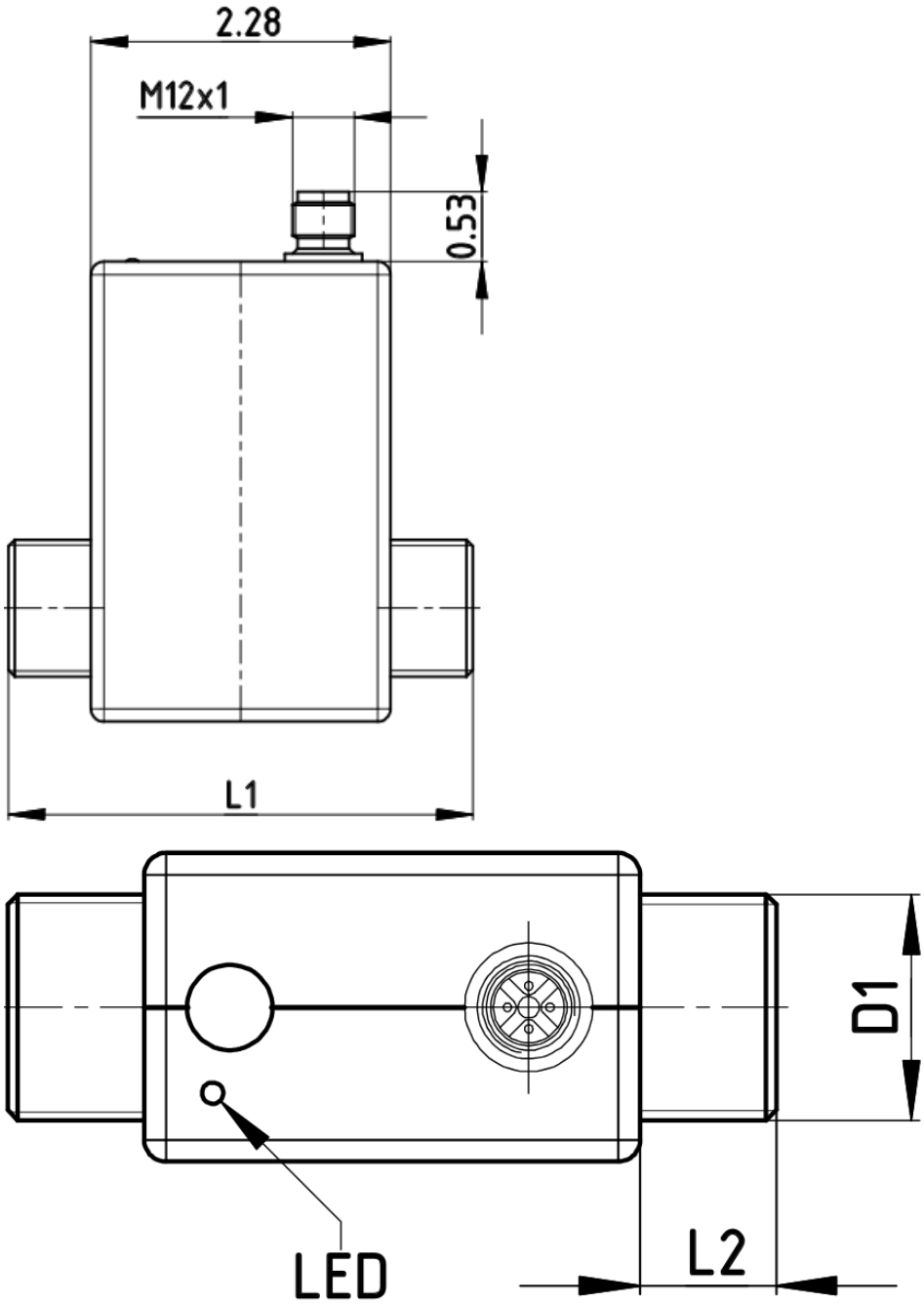

Pressure drop Δp [psi]
0.500
0.375
0.250
0.125
0.000
0
2
4
6
8
10
12
14

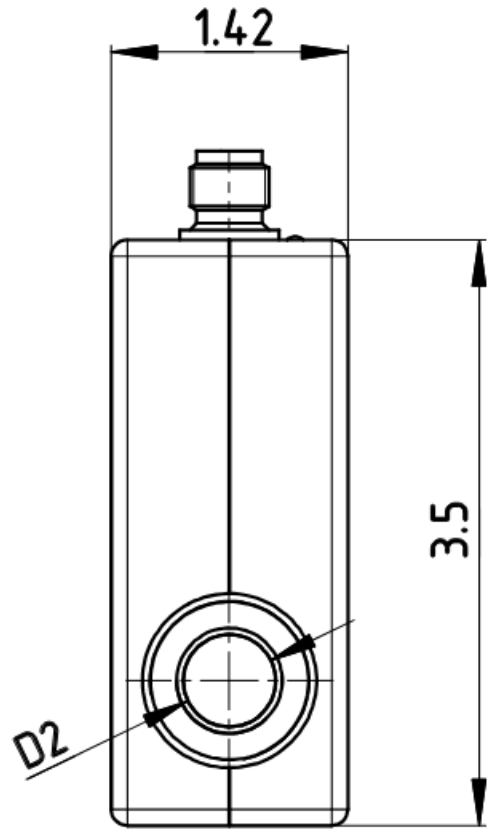

Pressure drop Δp [psi]
2.0
1.5
1.0
0.5
0.0
0
10
20
30
40
50



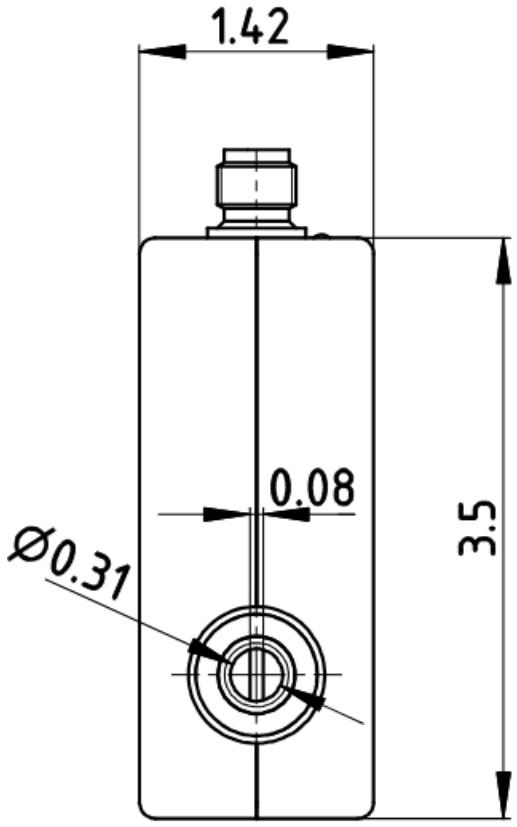
Dimensions

MFS2-0(A)/1(A)/2(A)/3(A)/4(A)/5(A):



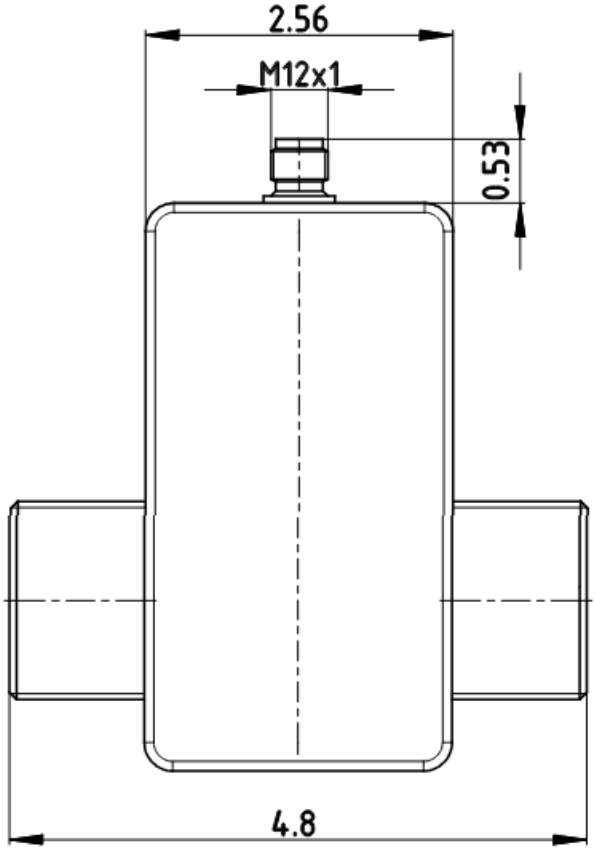


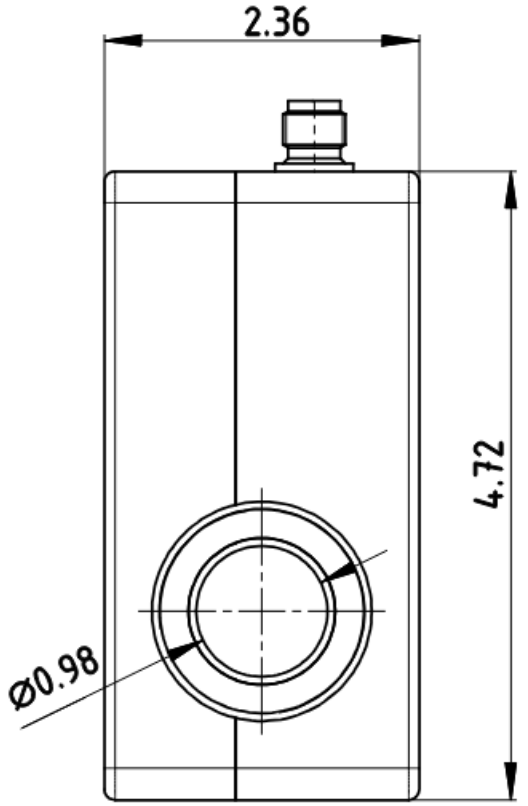
MFS2-1(A)

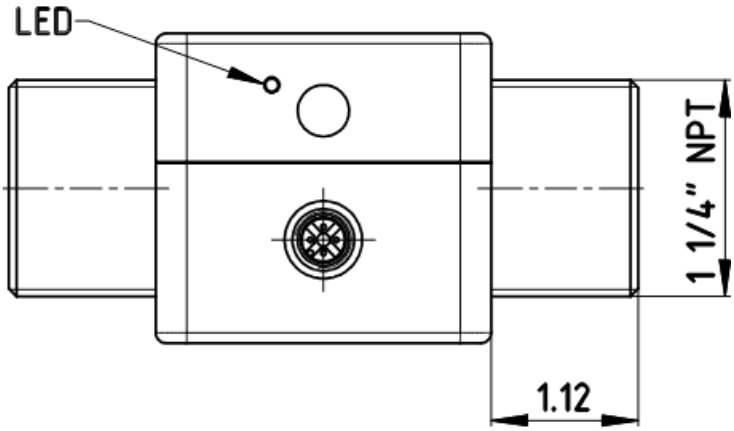


Type	L1	L2	D1	D2
MFS2-0(A)	3.35	0.51	⅜“ NPT	Ø 0.12
MFS2-1(A)	3.35	0.51	½“ NPT	Ø 0.31x 0.08
MFS2-2(A)	3.35	0.51	½“ NPT	Ø 0.31
MFS2-3(A)	3.54	0.63	¾“ NPT	Ø 0.55
MFS2-4(A)MFS2-5(A)	3.54	0.63	1“ NPT	Ø 0.71

MFS2-6(A):







Documents / Resources

	**Dwyer MFS2 Series Magnetic Inductive Flow Sensor** [pdf] Instruction Manual MFS2 Series Magnetic Inductive Flow Sensor, MFS2 Series, Magnetic Inductive Flow Sensor, Inductive Flow Sensor, Flow Sensor, Sensor

References

- **User Manual**