Instruction Manual

DM01A

Compact magnetic inductive flowmeter

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Safety Information

General Instructions

To ensure safe operation, the device should only be operated according to the specifications in the instruction manual. The requisite Health & Safety regulations for a given application must also be observed. This statement also applies to the use of accessories.
Every person who is commissioned with the initiation or operation of this device must have read and understood the operating instructions and in particular the safety instructions!

The liability of the manufacturer expires in the event of damage due to improper use, non-observance of this operating manual, use of insufficiently qualified personnel and unauthorized modification of the device.

Proper Usage

The devices of the DM01A series are used for reliable magnetic inductive flow measurement of conductive liquids which do not attack the materials used. Any other use of the device is not permitted and is outside the scope of application.

The devices of the DM01A should not be used as sole monitoring devices in order to detect or even avoid dangerous operating states in plants and machines. The plant or machine itself must be planned and constructed in such a way that critical conditions which pose a danger to man and the environment are excluded from the outset.

Dangerous substances

For dangerous media such as e.g. Oxygen, Acetylene, flammable or toxic substances as well as refrigeration systems, compressors, etc. must comply with the relevant regulations beyond the general rules.

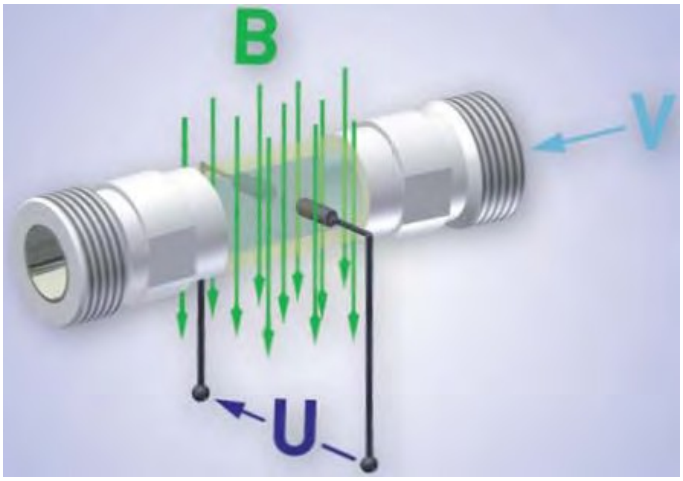
Qualified Personnel

The DM01A devices may only be installed by trained, qualified personnel who are able to mount the devices correctly. Qualified personnel are persons, who are familiar with assembling, installation, placing in service and operating these devices and who are suitably trained and qualified.

Inward Monitoring

Please check directly after delivery the device for any transport damages and deficiencies. Additional with reference to the accompanying delivery note the number of parts must be checked.
Claims for replacement or goods which relate to transport damage can only be considered valid if the delivery company is notified without delay.

Functional description



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 DM01A 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 two electrodes. Thereby, the induced voltage is proportional to the average flor velocity of the liquid.
The electronics of the DM01A converts the induced voltage into a flow-proportional frequency signal.

Construction

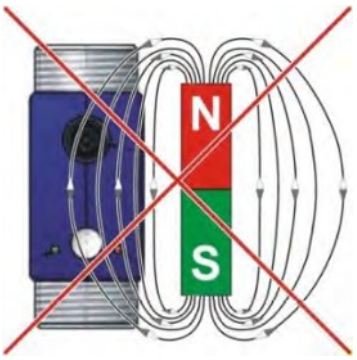
The measuring tube with its earthing sleeves and electrodes passes through the housing and forms the external process connection of the DM01A. A magnetic field for the measurement process is generated inside the housing, which also contains the sensor and signal conditioning circuitry. The two stainless steel electrodes are located in the middle of the measuring tube between the earthing sleeves.
The DM01A 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.

Installation

Before installing, check that

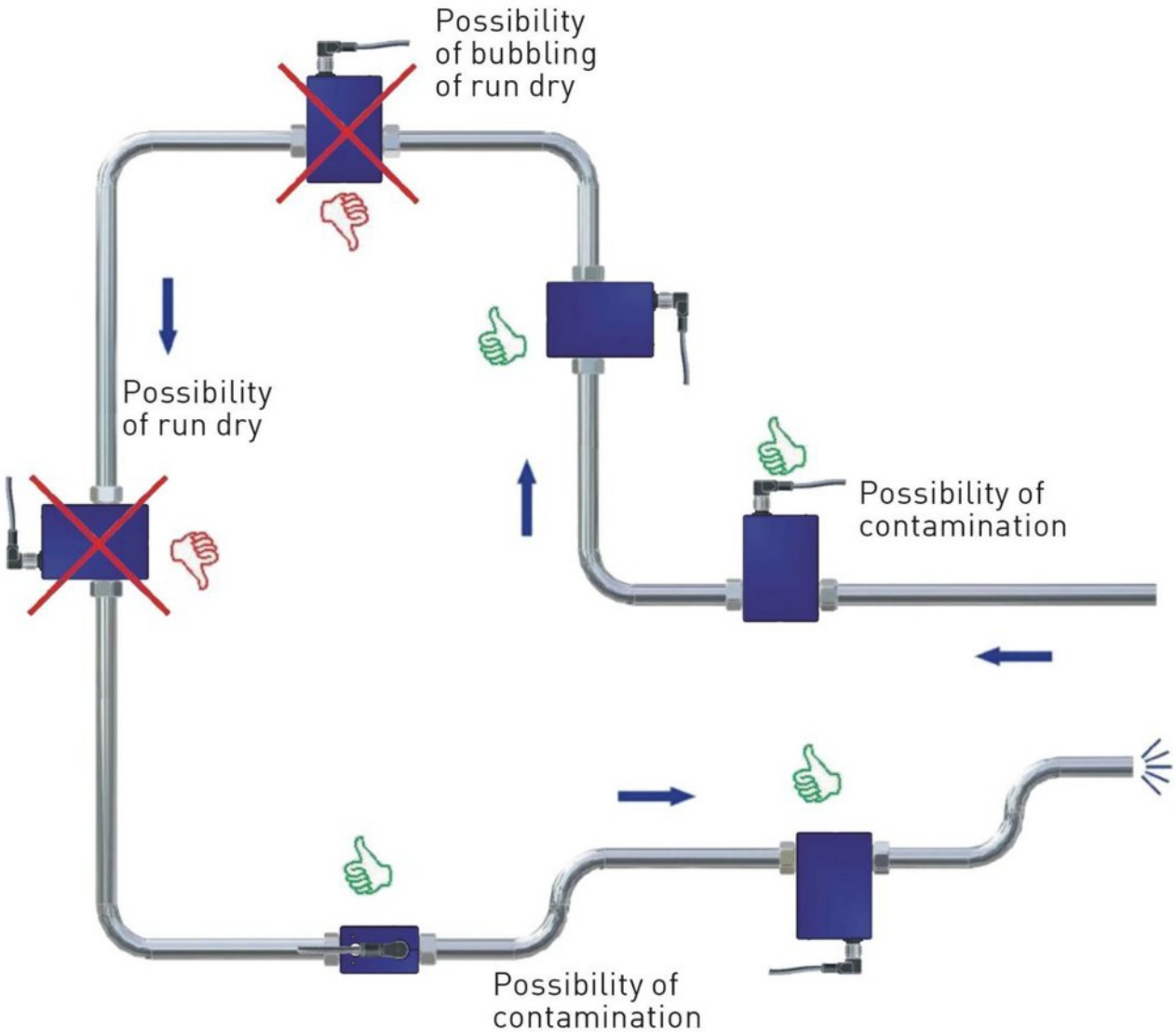
- the wetter materials of the device are suitable for the media being used.
- the equipment is switched off and is in a safe and de-energised state.
- the equipment is depressurised and has cooled down.

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 DM01A

The DM01A 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 nominal width (DN). The inlet section has to be at least 10xDN; the outlet section 5xDN 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 DM01A devices are used side by side, maintain a separation of at least 2,5 cm between adjacent devices. If adjacent devices are too close together, operation of both devices may be impaired due to mutual interference.

Assembly

The DM01A 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.

1. Select an appropriate location for installation
2. To ensure the best possible measuring accuracy, a vertical installation position with increasing flow is preferable (no collecting of dirt deposits).
3. Install the appropriate screwed connections at the installation location.
4. Insert the DM01A together with the gaskets
5. Screw the union nuts of the screwed connection onto the process connections of the DM01A.

Caution! Material damage!

While tightening, counter the DM01A only by hand! If you use an open-end or a pipe wrench, the DM01A can be damaged

- Tighten the two union nuts to the respective tightening torque (see table)

Maximum torque:

Order code:

0MG		**01G/02G**		**03G**		**05G**		**06G**	
POM	PVDF	POM	PVDF	POM	PVDF	POM	PVDF	POM	PVDF
3 Nm	3 Nm	3 Nm	4 Nm	5 Nm	6 Nm	6 Nm	8 Nm	17 Nm	22 Nm

Electrical connection

The electrical connection of the DM01A is made via the 4-pin plug M12x1 at the top of the housing

CAUTION! Electric current!

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

- De-energize the electrical system before connecting the DM01A.

Connection:

- Screw the coupling socket of the connection cable to the plug of the DM01A.
- Tighten the knurled nut of the coupling socket with a maximum torque of 1 Nm.

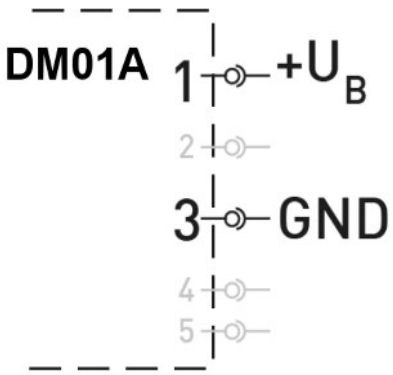
Wirings

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

Possible pinout:
Pin 1: $+U_B$
Pin 2: d. n. c. (do not connect) / Analogue U/I
Pin 3: GND
Pin 4: Frequency

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

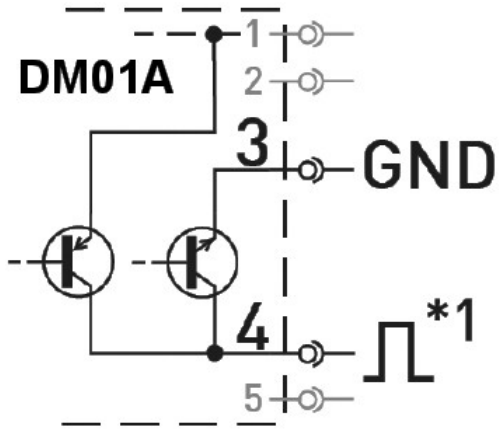
Supply voltage:



DM01A with frequency or pulse output:

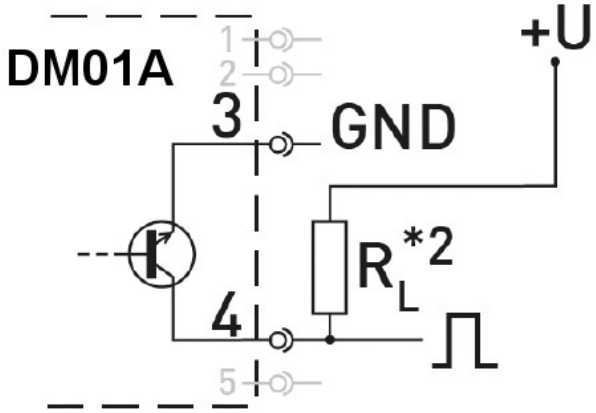
Push-Pull:

*1: Push-Pull switching outputs of several DM01A may not be connected in parallel.
Ensure that the maximum signal current of 100 mA is not exceeded.



NPN Open Collector:

*2: Recommendation Pull-Up / Pull-Down resistance RL ~2.5 kΩ (12 V) or ~5 kΩ (24 V). Ensure that the maximum signal current of 100 mA is not exceeded.



PNP Open Collector:

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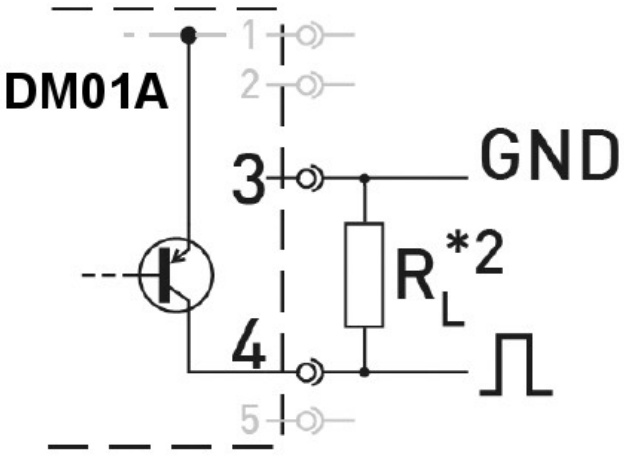


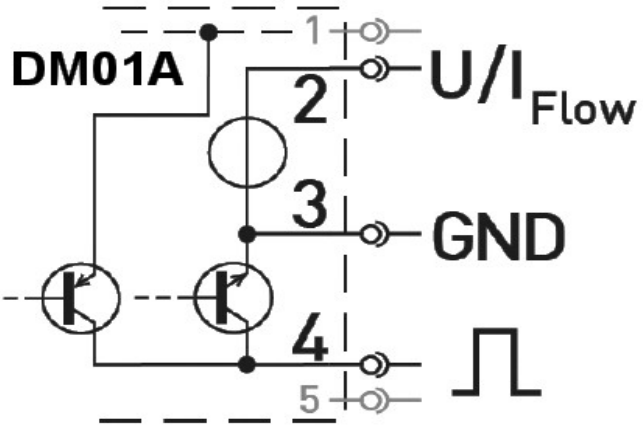
Use of frequency / pulse and analogue output:

Push-Pull:

Push-Pull switching outputs of several DM01A may not be connected in parallel.

Recommendation for resistance
RL ~2.5 kΩ (12 V) or ~5 kΩ (24 V)

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



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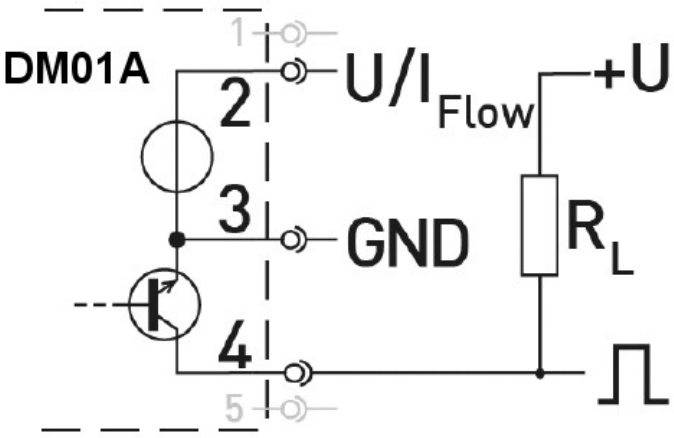

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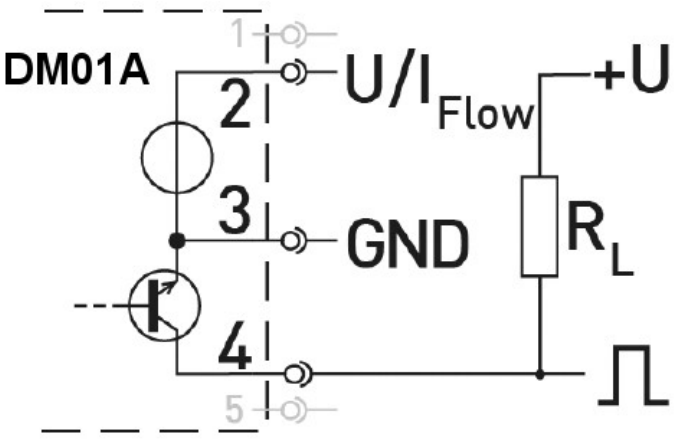


Commissioning

Check that
- the DM01A has been installed correctly and thal all screw connections are sealed.
- the electrical wiring has been connected properly.
- the measuring system is vented by flushing.

The DM01A 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 DM01A is ready and goes into measuring mode.

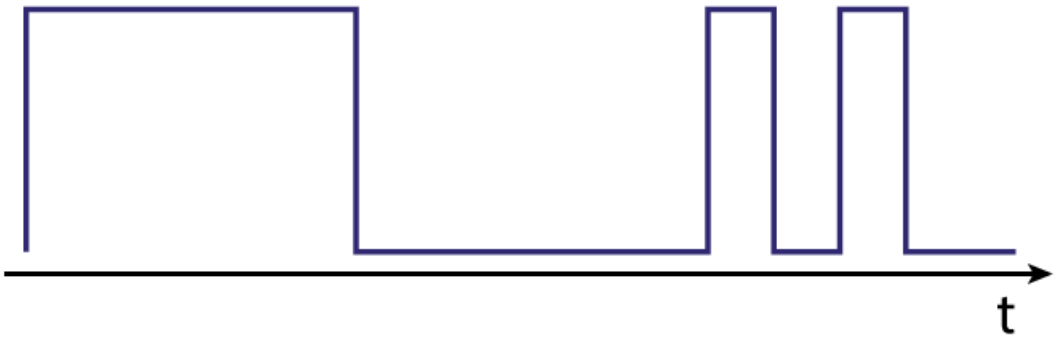
Measuring operation

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.

DM01A with frequency output:
The DM01A 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.)



DM01A with pulse output
Depending on the version, the DM01A provides a flow proportional NPN, PNP or Push-Pull square wave signal.
The number of pulses changes according to the flow rate (Fig.).

DM01A with analogue output:
According to the configuration of the DM01A, 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

The DM01A 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 damge.

Never open the device and perform any repair yourself.

Cleaning:
Clean the DM01A with a dry or slightly damp lint-free cloth. Do not use sharp objects or aggressive agents for cleaning.

Return shipment to PKP Prozessmesstechnik

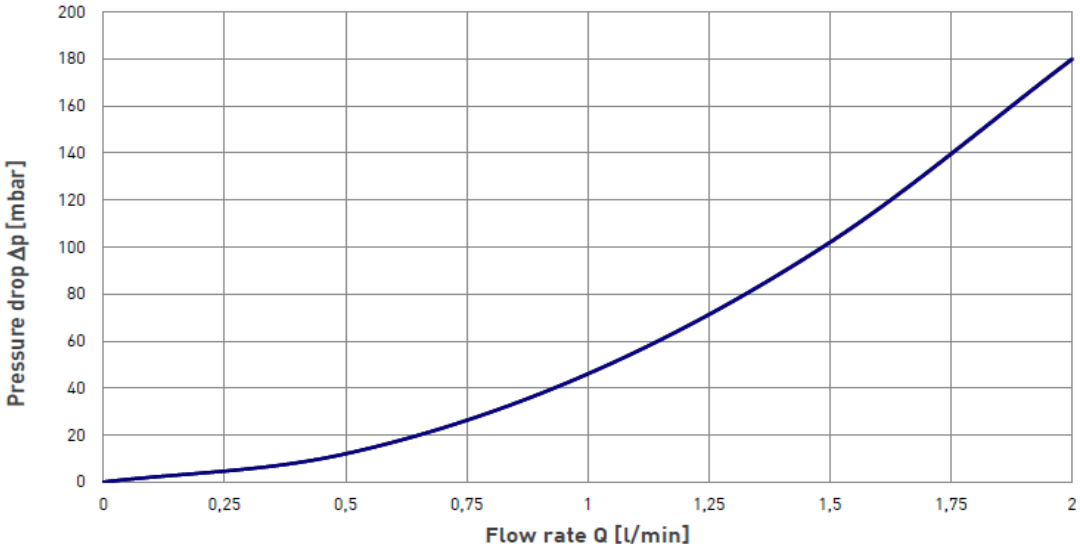
Please observe the following instructions before returning the device.

- Clean the device thoroughly. This is of extreme importance if the medium is hazardous to health, i.e. caustic, toxic, carcinogenic or radioactive etc.
- Remove all residues of the media and pay special attention to sealing grooves and slits.
- Attach a note describing the malfunction, state the application field and the chemical / physical properties of the media.
- Send the device to:

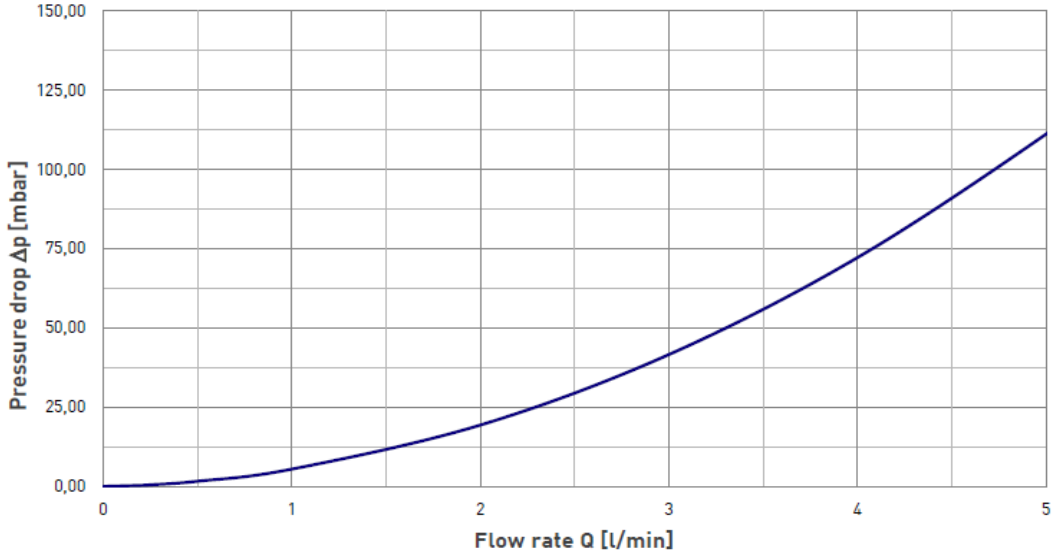
PKP Prozessmesstechnik GmbH
Service
Borsigstraße 24
D-65205 Wiesbaden-Nordenstadt
Germany

Pressure loss

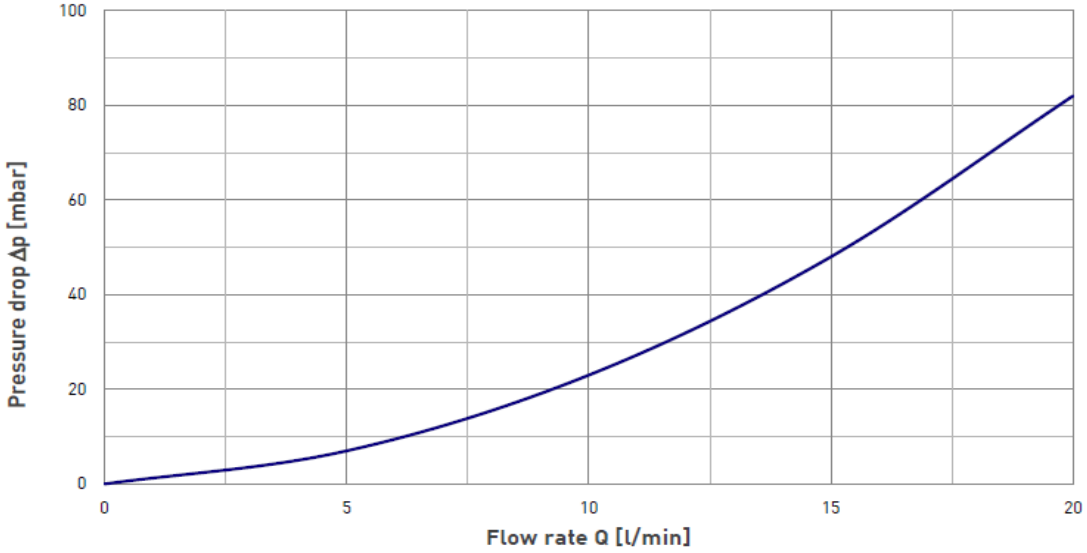
Measuring range: 0MG, 0,05...2 l/min



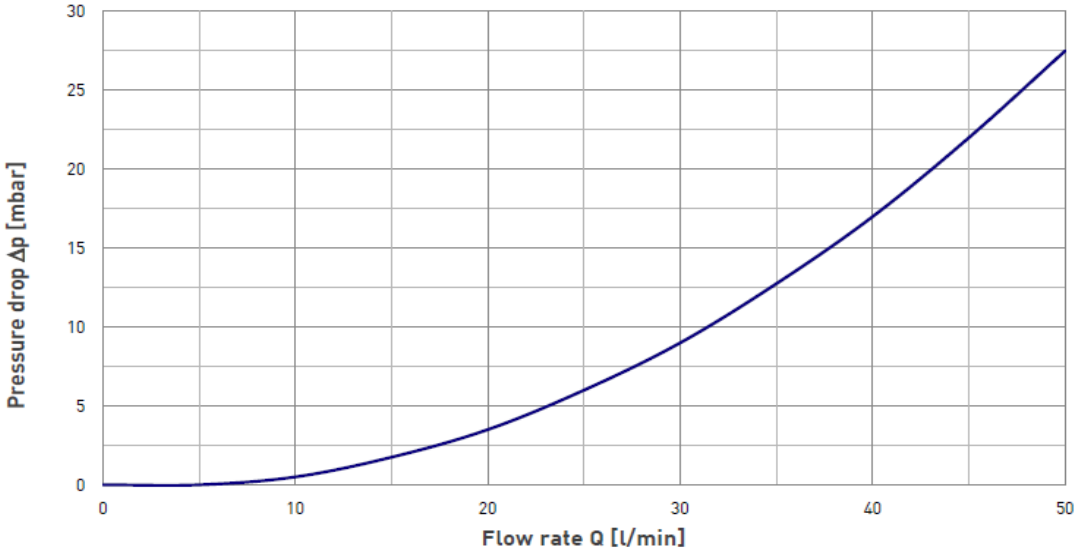
Measuring range: 01G, 0,1...5 l/min



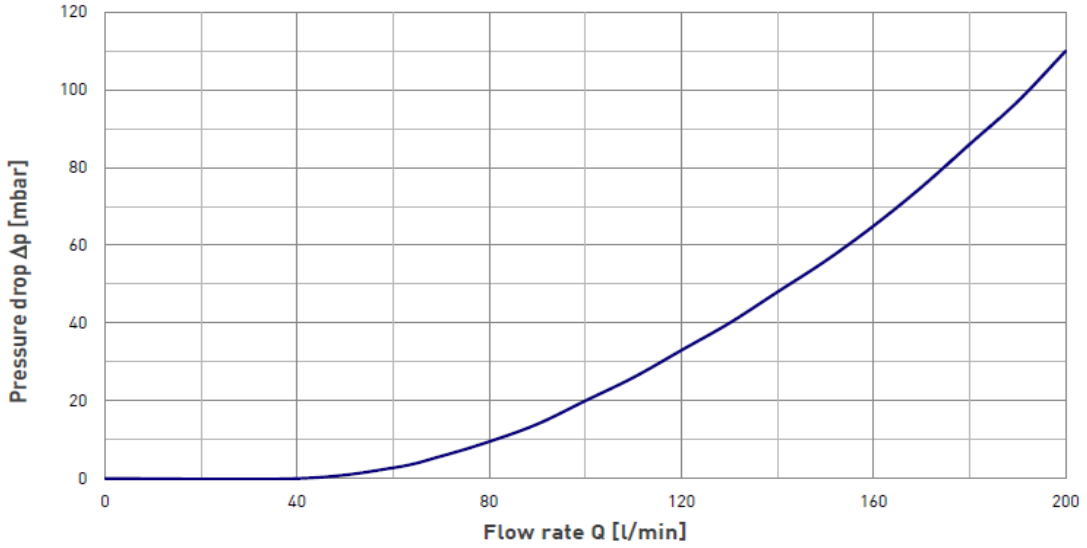
Measuring range: 02G, 0,25...20 l/min



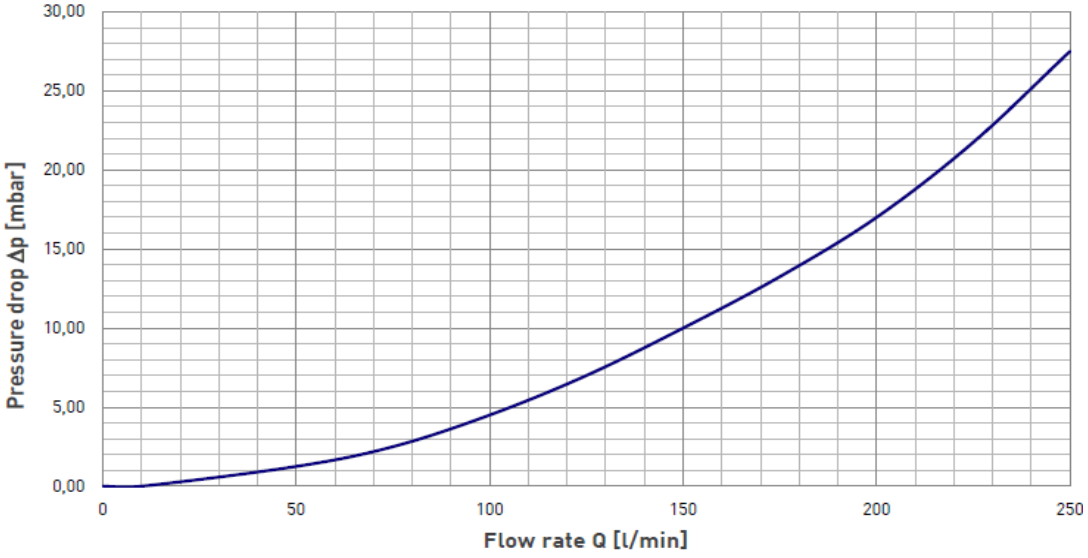
Measuring range: 03G, 1...50 l/min



Measuring range: 05G, 4...200 l/min



Measuring range: 06G, 5...250 l/min



DM01A

Compact Magnetic Inductive Flowmeter

- **independent of viscosity, density, pressure and temperature**
- **maintenance free**
- **practically no pressure loss**
- **high measuring accuracy**
- **measuring range span up to 1:50**
- **smallest dimensions**
- **frequency and analogue output**
- **measuring ranges 0,05...2 l/min to 5...250 l/min**
- **max. pressure: 10 bar, max. temperature: 60 °C**

Description:

The electromagnetic compact flow meter DM01A works without moving parts thanks to the electromagnetic measuring principle. It is specially designed for low flow rates and tight installation conditions. Measuring ranges from 0,05 l/min to 250 l/min are available, as are process connections from 3/8" to 1 1/4". A push-pull frequency output is available as an output signal. An analogue 4...20 mA or 0,5...10 V signal is also available as an option.

Advantages:

- no moving parts, therefore the DM01A is maintenance and wear free.
- no components protrude into the measuring tube, thus the pressure loss is kept very small and is not larger than with a pipeline of the same length.
- the measuring is independent of temperature, viscosity, concentration and pressure under normal operating conditions.
- the very wide measuring span of 1:50 makes the DM01A universally applicable.
- foreign bodies carried along in the flow and viscous media interspersed with solids are also unproblematic.
- due to the compact design and the favourable price the DM01A is suitable for serial applications.

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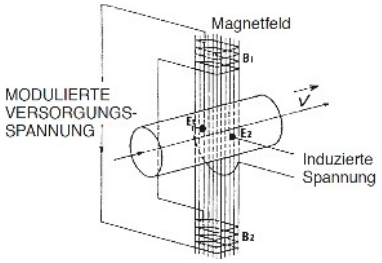
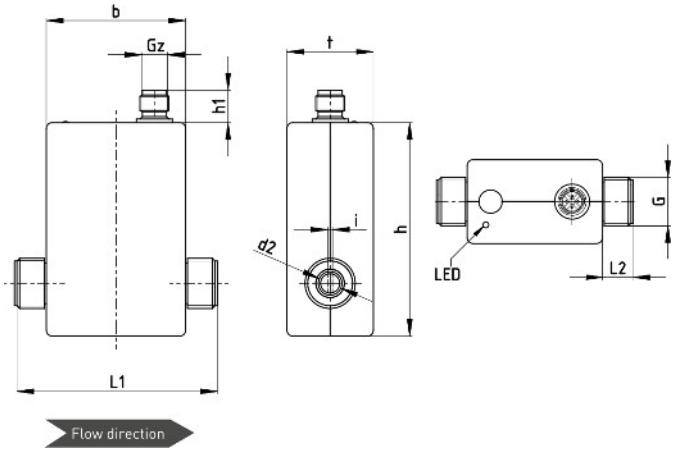
Operating principle:



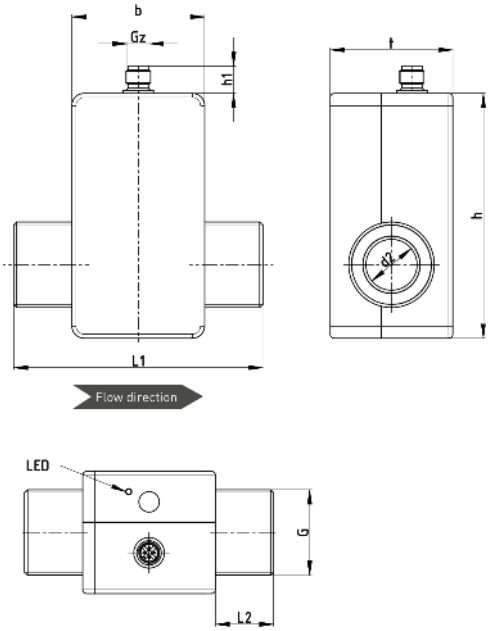
Magnetic-inductive flow measurement is based on Faraday´s law of induction. The liquid to be measured (electrically conductive) flows perpendicular to a magnetic field. This induces an electrical voltage in the liquid. This voltage is picked up by two electrodes inserted in the measuring tube and further processed by the downstream electronics. The level of the voltage is proportional to the flow velocity.

Dimensions:

Measuring ranges 0MG, 01G, 02G, 03G, 05G (G 3/8 … G 1):



Measuring range 06G (G 1 1/4):



Order Code:

Order number:	DM01A.	3.	P.	01G.	F.	0

Compact magnetic inductive flow meter

Power supply:
3 = 12...24 VDC (± 10 %)
16...24 VDC (at output 0,5...10 V)

Material meas. tube / electrodes / O-ring:
P = PVDF / stainless steel 1.4404 / EPDM
PH = PVDF / Hastelloy C276 (2.4819) / FKM
M = POM / stainless steel 1.4404 / EPDM
MH = POM / Hastelloy C276 (2.4819) / FKM

Measuring range, connection size:
0MG= 0,05...2 l/min, G 3/8“ male (from 0,1 l/min in tol.*)
01G = 0,1...5 l/min, G 1/2“ male (from 0,25 l/min in tol.*)
02G = 0,25...20 l/min ,G 1/2“ male (from 1 l/min in tol.*)
03G = 1...50 l/min, G 3/4“ male (from 2,5 l/min in tolerance*)
05G = 4...200 l/min, G 1“ male (from 5 l/min in tolerance*)
06G = 5...250 l/min, G 1 1/4“ male (from 12,5 l/min in tol.*)
NPT thread on request

Output signal:
F = frequency (Push-Pull)
A = frequency (Push-Pull) and analogue signal 4...20 mA
V = frequency (Push-Pull) and analogue signal 0,5...10 V
P = pulses
PA = pulses and analogue signal 4...20 mA
PV = pulses and analogue signal 0,5...10 V

Options:
0 = without
9 = please specify in plain text

Accessories:

SM12.: M12-plug connector with PVC cable
length: 2 m, 5 m, 10 m
design: straight/angled
(see accessories, type: SM12)

Dimension table:

	0MG	01G	02G	03G	05G	06G
L1	85	85	85	90	90	122
L2	13	13	13	16	16	28,5
G	G 3/8 B	G ½ B	G ½ B	G ¾ B	G 1 B	G 1 ¼ B
d2	Ø 3	Ø 3	Ø 3	Ø 3	Ø 3	Ø 3
b	58	58	58	58	58	65
Gz	M12x1	M12x1	M12x1	M12x1	M12x1	M12x1
h	89	89	89	89	89	120
h1	13,5	13,5	13,5	13,5	13,5	13,5
t	36	36	36	36	36	60
i		2				

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Technical Data:

Order code range:	0MG	01G	02G	03G	05G	06G
Nominal Diameter:	DN 3	DN 6	DN 8	DN 15	DN 20	DN 25
Process connection (male)	G 3/8	G 1/2	G 1/2	G 3/4	G 1	G 1 1/4
Inner diameter [mm]	3	6	8	14	18	25
Measuring range [l/min]	0,05...2	0,1...5	0,25...20	1...50	4...200	5...250
Range in tolerance [l/min]	0,1...2	0,25...5	1...20	2,5...50	5...200	12,5...250
Accuracy [1]	± 0,7 % of reading, ± 0,3 % of range					
Repeatability:	± 1 %					
Response time:	< 100 ms					
Signal output starting at [l/min]:	0,05	0,1	0,25	1	4	5
Max. flow rate:	2,5	6	25	60	240	300
Medium:	Water and other conductive liquids					
Min. conductivity of medium:	20 µS/cm					
Medium temperature:	PVDF-pipe: -15...+80 °C (non-freezing) POM-pipe: 15...+60 °C (non freezing)					
Ambient temperature:	-15...+60 °C					
Storage temperature:	-15...+60 °C					
Max. pressure rating:	10 bar at 20 °C, 8 bar at 40 °C, 6 bar at 60 °C, 5 bar at 80 °C					
Materials wetted parts:	Measuring tube: PVDF or POM Electrodes / O-ring: stainless steel 1.4404 / EPDM or Hastelloy C276 (2.4819) / FKM					
Indications:	LED green,flow proportional flashing					
Degree of protection EN 60529:	IP65 (with attached cable socket)					

Electrical Data:

Electrical connection:	4 pin plug connector M12x1
Power supply:	12...24 VDC (± 10 %) 16...24 VDC (± 10 %) with analogue output 0,5...10 V
Power consumption:	Typical 1,1 W, max. 3,6 W
Electrical protection measures:	Short-circuit proof and polarity protection

Frequency and pulse output:

Pulse rate [pulses/l] [2]	10 000	4000	1000	400	200	80
Resolution [ml/pulse] [2]	0,1	0,25	1	2,5	5	12,5
Signal shape:	Square wave signal, pulse duty ratio 50:50, Push-Pull NPN open collector, PNP open collector					
Signal current:	Max. 100 mA					

Analogue output 4...20 mA or 0,5...10 V:

Corresponds to flow rate [l/min] [3]	0...2	0...5	0...20	0...50	0...200	0...250
Max. burden:	250 Ω against GND					

[1] Test conditions: Ex works, water 23 °C
[2] Other pulse rates/resolutions available on request, optional: output signal with lower frequency, designed specifically for connection to digital PLC inputs
[3] Other ranges available on request

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