



Instruction Manual

DR05

Plastic Rotating Vane 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

Series DR05 paddle wheel flow meters are designed to measure continuous flow rates of liquids which do not attack the device materials. All other usage is regarded as being improper and outside the scope of the device.

In particular, applications in which shock loads occur (for example, pulsed operation) should be discussed and checked in advance with our technical staff.

The series DR05 flow meter devices should not be deployed as the sole agents to prevent dangerous conditions occurring in plant or machinery. Machinery and plant need to be designed in such a manner that faulty conditions and malfunctions do not arise that could pose a safety risk for operators.

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 DR05 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.

Installation

The following requirements must be strictly observed, otherwise the flow meter and/or the system may be damaged:

Installation position:

The flow sensor can be installed in any position, but we recommend horizontal installation for best ventilation. If it is installed in vertical pipes, the direction of flow from bottom to top is preferred.

The direction of flow must correspond to the marking on the body.

Process connection:

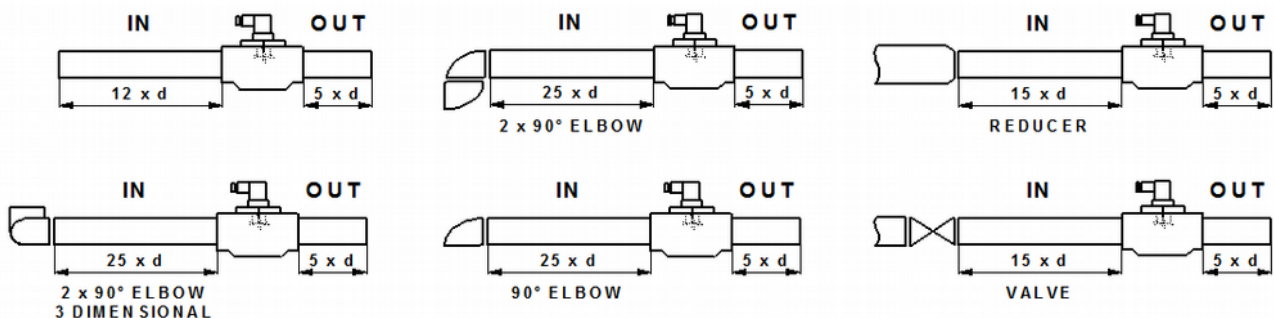
- A process connector matched to the device must be provided on-site
- Check connector size
- Check screw engagement depth
- Use a suitable sealant (N.B. fluid sealant can damage the flowmeter if it enters the measurement chamber)
- Seal correctly

Ambient conditions:

- Do not use the flowmeter as a load-bearing component in pipe structures.
- The medium must not contain solid particles. Magnetic particles gather on the magnets and impair the function.
- The formation of gas bubbles in the medium, and cavitation must be avoided
- Check the compatibility of corrosion protection and anti-freeze agents before use.
- Durability of the specified materials with regard to the chemicals you use must be guaranteed.

Installation

- External magnetic fields influence the flowmeter. Ensure sufficient distance from magnetic fields (e.g. electric motors).
- Ferro-magnetic tubes, process connectors or supports influence the magnetic field of the flowmeter. Keep a minimum clearance of 100 mm from such materials (e.g. steel).
- Ensure ventilation of the device.
- Cross-section changes, branches or bends in the piping influence the measurement accuracy. Use the following stabilizing sections (extract from DIN 1952) (d = nominal internal pipe diameter)



Electrical connection

Attention: We recommend using only shielded connection cables.

Prior to the electrical connection of the device, it must be ensured that the supply voltage matches that required:

Pulse output: 4,5...24 VDC (Push-Pull)
Analogue output: 15...24 VDC (4...20 mA-Output)
limit relays: 15...24 VDC, 1 x MAX-contact, potential free

The supply voltage must be switched off before the device is electrically connected.

Pin assignment

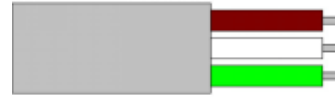
The 4...20 mA analogue output is a 2-wire circuit, therefore no connection to ground (GND) is required for all connection variants.

1. Cable connection:

white: Power supply

green: Signal (Push Pull or 4...20 mA)

brown: Ground (GND) (only for Push Pull)



2. M12-Plug connection

PIN 1: Power supply

PIN 3: Ground (GND) (only for Push Pull)

PIN 4: Signal (Push Pull or 4...20 mA)

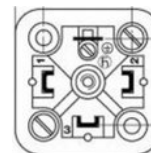


3. Angle plug (EN 175301-803A)

PIN 1: Power supply

PIN 2: Signal (Push Pull or 4...20 mA)

PIN 3: Ground (GND) (only for Push Pull)



Determination of the K-factor

K-Factor for H₂O at 21 °C at continuous flow:

Measuring range [l/min]	Connection (G or NPT female)	Pulse / l (K-factor) (approx.)
5...250	1"	54
10...400	1 1/4"	32
15...600	1 1/2"	20
20...1000	2"	10

If a medium other than H₂O and/or other temperatures or discontinuous flow is used, then it is necessary to determine the individual K-factor.

Determine the K-factor as follows:

1. Ensure that the flow meter is connected properly.
2. Ensure that sufficient medium is present.
3. Ensure that the system is free of air.
4. Place a sufficiently large, empty measuring beaker under the outlet (recommended measuring period of the K-factor > 60 seconds).
5. Start the measuring process and count the pulses (e.g. using a pulse counter).
6. Stop the measuring process and divide the number of pulses counted by the volume (converted to litres) of the drained medium:

$$\text{K - factor} = \frac{\text{counted_pulses}}{\text{measured_quantity_ [liters]}}$$

7. Repeat this process at least three times.
8. Calculate the average value from the results obtained under Point 6 (do not use runaway values).

Maintenance and care

The flowmeters require little maintenance due to the small number of moving parts. A regular function check and maintenance increases the service life and functional safety not only of the device, but also of the whole plant.

The maintenance intervals depend on:

- Contamination of the medium
- Ambient conditions (e.g. vibration)

At least the following points must be inspected during maintenance:

For maintenance please proof at least following items:

- signal output and free movement of paddle wheel:
Free movement of the paddle wheel and the output of the output signal can be tested by changing the flow and observing the signal (signal change is directly proportion to the flow).
- Leakages in the device

It is the responsibility of the operator to define suitable maintenance intervals depending on the application.

Remarks:

Flushing with clean medium provides sufficient cleaning in most cases. Commercially available cleaning agents can be used in stubborn cases (e.g. lime deposits) insofar as these materials do not attack the materials in the device.

Attention!!!: The guarantee becomes void if the device is opened.

Troubleshooting

No signal output:

1. No flow
 - ▶ Check that medium is flowing
2. Flow less than measurement range
 - ▶ Use flowmeter with different measuring range
3. Incorrectly installed or connected
 - ▶ Install according to Section Installation
4. Paddle wheel or oval wheel pair blocked (dirt)
 - ▶ Clean flowmeter according to Section Maintenance
5. Electronics defective
 - ▶ Remove the cause of the defect (e.g. short-circuit, overload)
 - ▶ Exchange flowmeter
6. Device defective
 - ▶ Send flowmeter to manufacturer for repair or calibration

Measured quantity does not agree with the actual flow:

1. Wrong K-factor
 - ▶ Determination of the K-factor
2. Paddlewheel or oval wheel pair contaminated
 - ▶ Clean flowmeter according to Section Maintenance
3. Device defective
 - ▶ Send flowmeter to manufacturer for repair or calibration

DR05

Paddle Wheel Flow Sensor and Switch

- **solid plastic version without metallic parts**
- **for pipe sizes from 1" to 2"**
- **materials: PP, ECTFE, ceramic, FKM**
- **output signals: pulses, 4...20 mA or 2 limit switches**
- **range ratio up to 50:1**
- **measuring ranges: 5...250 l/min up to 20...1000 l/min**
- **P_{max}: 10 bar, T_{max}: 85 °C**



Description:

The DR05 paddle-wheel flow sensor measures the flow of water and substances similar to water. The flow sensor consists of a section of polypropylene pipe fitted with a paddle wheel. The paddle wheel, which extends into the area of flow, is set into rotation by the flowing liquid. The rotary motion is detected by a Hall sensor and output as a series of pulses. The output frequency of these pulses is directly proportional to the flow rate. Alternatively, the pulsed output can be converted into an analogue signal (4 to 20 mA) or into two limit contacts by optional integrated electronics. DR05 paddle-wheel flow sensors are made completely of plastic; they have no metal parts. These devices are available for pipe sizes of 1" to 2" with range ratio of up to 50:1.

Typical applications:

Model DR05 paddle-wheel flow sensors are used wherever the flow of liquids having low viscosities must be reliably and economically measured, including but by no means limited to, the following cases:

- in cooling systems
- for demineralized water
- for aggressive / caustic liquids in the chemical industry and much more

Measuring ranges:

Measuring range [l/min]	Connection (G or NPT female)	Pulse / l (approx.)
5...250	1"	54
10...400	1 1/4"	32
15...600	1 1/2"	20
20...1000	2"	10

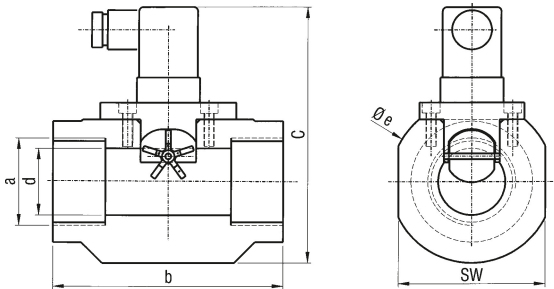
Materials:

Housing: PP
Rotor: ECTFE
Pivot, bearing: Ceramic
Gaskets: FKM (optional EPDM)

Output signal:

DR05...P: output signal, push-pull rectangular pulses
DR05...A: analogue output 4...20 mA, 2-wire
DR05...S: switching output 2 limit switches (0,1 A at 24 VDC), programmable

Dimensions:



Nominal size a	b [mm]	c [mm]	d [mm]	e [mm]	SW [mm]
DN 25 / 1"	110	119	25	74	70
DN 32 / 1 1/4"	110	123	32	78	70
DN 40 / 1 1/2"	120	125	40	80	75
DN 50 / 2"	125	135	50	89	75

Electrical connection:

	DR05...P	DR05...A	DR05...S
Supply	Pin 1	-	white
Signal	Pin 2	-	green
Ground	Pin 3	-	brown
Relay 1	-	-	yellow
Relay 1	-	-	grey
Relay 2	-	-	pink
Relay 2	-	-	blue
4...20 mA signal +	-	Pin 1	-
4...20 mA signal -	-	Pin 2	-

Order Code:

Order number: DR05. P. V. 25G. P. 0

Paddle wheel flow sensor and switch

Model:

P = housing PP, rotor from ECTFE

Gasket:

V = FKM (standard)
E = EPDM

Measuring range and process connection:

25G = 5...250 l/min, G 1 female thread
 25N = 5...250 l/min, 1" NPT female thread
 32G = 10...400 l/min, G 1 1/4 female thread
 32N = 10...400 l/min, 1 1/4" NPT female thread
 40G = 15...600 l/min, G 1 1/2 female thread
 40N = 15...600 l/min, 1 1/2" NPT female thread
 50G = 20...1000 l/min, G 2 female thread
 50N = 20...1000 l/min, 2" NPT female thread

Output signal:

P = pulse output, push-pull
 A = analogue output 4...20 mA
 S = 2 limit switches and pulse output

Options:

0 = without
 N = NPN O/C pulse output
 9 = please specify in plain text

Technical Data:

Max. pressure: 10 bar
Medium temperature: 0...85 °C
Measuring error: ± 3 % of full scale
Repeatability: < ± 0,5 % of full scale
Process connection: G 1 female up to G 2 female, optional NPT
Installation position: any
Voltage supply:
 pulse output: 4,5...24 VDC, push-pull
 analogue output: 15...24 VDC
 limit switch: 15...24 VDC, 1 x MIN-, 1 x MAX-contact, potential free
Electrical connection:
Pulse- and analogue output: cubic plug acc. to EN 175301-803A
Limit relay: plug connection with mating plug and 1 m cable
Protection class: IP65