



Insertion Paddle Wheel Flowmeter/Monitor

for low viscous liquids



measuring
•
monitoring
•
analysing

DOR



- Flow range:
0.25 ... 6,300 l/s to 0.4 ... 49,000 l/s
- Flow velocity range: 0.3 - 10 m/s
- Viscosity range: low viscous
- p_{\max} : 80 bar; t_{\max} : 150 °C
- Connection: R 1½, R 2 male,
1½" NPT, 2" NPT male
for pipe sizes: DN40 ... DN2500
- Linearity: $\pm 1.5\%$ with well established
flow profile
- Material: stainless steel
- Outputs: pulses, LCD display,
batching, totalising



S4

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KOBOLD Messring GmbH



Description

The DOR series insertion paddle wheel flow sensor is a very cost effective instrument for accurately measuring the flow of water or water-like liquids in large pipes.

The sensor is inserted into the process piping via a thread-onlet or half nipple fitting. Liquid flow through the pipe results in rotation of the affixed paddle wheel. The rotational speed of the paddle is proportional to the flow velocity, and therefore, proportional to the flowrate in the pipe.

The insertion type design provides a measuring technique that is much less expensive than full bore flowmeters, especially in larger pipe sizes. Insertion paddle wheel sensors are a robust measuring technology that boasts exceptional tolerance to dirt and solids.

The DOR series features an all 316L stainless steel body. The rotor is made of PVDF or PEEK, with a long-life, graphite/PTFE self-lubricating bearing. The DOR has an integral, precision insertion mechanism that allows the installer to insert the rotor to the precise depth in the pipe for optimal readings.

Outputs include NPN open collector frequency, and/or reed contact frequency. Optional indicators include battery powered totalisers, loop powered ratemeter/totalizers and batch controllers.

The DOR-5 is suitable for "hot tap" installation. With its symmetrical design the DOR may be used for bi-directional flow measurement.

Applications

- HVAC: Hot and Chilled water, Fire system and thermal energy monitoring
- Municipal: Water distribution, water management and water treatment
- Irrigation: Water management
- Water treatment: Chlorination, de-salination and mechanical filtration plants, chemical injection systems
- Refineries: Primary flow additive injection, fire and cooling systems
- Power generation: Boiler feed water, steam condensate, process water and water balancing
- Chemical: Process & cooling tower water, chemical and water batching
- Others: Cement manufacturing, diesel fuel transferring, flow testing, fire truck and hydrant flow monitoring, food processing, pulp/paper, mining

Technical Details

| | |
|------------------------------------|--|
| Velocity measuring range (linear): | 0.3 ... 10 m/s equates to approx. 0.25 ... 49,000 l/s in DN 40 to DN 2500 pipes; 0.15 ... 10 m/s when using the linearisation function of electronic type ZOK-Z3 or ZOE |
| Linearity: | ±1.5% with well est. flow profile |
| Repeatability: | ±1% of f. s. at factory conditions and optimal straight runs |
| Max. pressure: | 80 bar |
| Temperature range: | -40 ... +100 °C standard, see max. allowable medium temperature table for other options and restrictions |

Material

| | |
|--------------|--|
| Body: | stainless steel 1.4404 (316L) |
| Rotor: | PVDF or PEEK (depending on model) |
| Rotor shaft: | stainless steel 1.4404 (316L) |
| Bearing: | graphite/PTFE |
| Seals: | FPM (standard): -15 ... +200 °C NBR (Nitril): -65 ... +125 °C |

Electronics

| | |
|------------------------------------|---|
| Output frequency at max. velocity: | 220 ... 240 Hz (hall effect and voltage output), 73 ... 80 Hz (reed switch output) |
| Supply voltage: | see electrical output specifications and electronics comparison table |
| Electronic features: | see data sheet ZOK (only available as remote version) |
| Wiring (standard): | 5 core, screened cable, length, 1 m (DOR-52), 1.5 m (DOR-42) |
| Transmission distance: | 1000 meters maximum |
| Protection class: | IP68 (cable connection) |
| Straight piping requirement: | Minimum: 10xd (upstream), 5xd (downstream) Optimal: 25xd (upstream), 10xd (downstream) |
| Weight: | (approx., without electronics): 1.6 kg (DOR-4), 2.5 kg (DOR-5) |



Electrical Output Specifications

Hall Effect Sensor Output (FX, NX, QX)

The **Hall Effect Sensor** is a high resolution solid state 3 wire device providing an unsourced, open collector, NPN transistor output. The term "unsourced" means that no voltage is applied to the output from within the flowmeter. It must be pulled to a 'high' or 'on' state by between 5 - 24V_{DC} supplied from an external source, typically the receiving instrument. The pulse output between signal and -0V is a voltage square wave with the high level being the DC voltage available at the open collector and the low level being -0V.

The receiving instrument must incorporate a pull up resistor (typically greater than 10k Ω in most instruments) which ties the open collector to the available DC voltage level when the Hall sensor is not energized. When energized the open collector output is pulled to ground through the emitter (-0V).

Power supply: max. 5 - 24 V_{DC}, max. 20 mA

Voltage Pulse Output (FX)

A self generating 2 wire **voltage pulse output** with 1.5 V voltage spike of approximately 10 microseconds duration is generated with no dependence on rotor speed.

Reed Switch Pulse Output (RX)

The **reed switch** output is a two wire normally open SPST voltage free contact ideal for installations without power or for use in hazardous area locations (simple apparatus) when Intrinsically Safe (I.S.) philosophy is adopted.

Note: when using the reed switch output the liquid temperature must not change at a rate greater than 10°C per minute. In general the reed switch life will exceed 2 billion actuations when switching less than 5V_{DC} at 10mA.

Power supply: max. 30 V_{DC}, 200 mA

Quadrature Pulse Output (QX)

Two Hall Effect sensors arranged to give separate outputs out of phase with one another. The Quadrature output is typically suited to ensure output signal integrity or to measure bi-directional flow.

Power supply: max. 8 - 24 V_{DC}, max. 20 mA

NPN Inductive Pick-up (EX)

Inductive pick-up with non-magnetic rotor for applications with high ferrous content liquids.

Output is 3-wire NPN, 5-24 V_{DC}, 20 mA max.



Order Details (Example: DOR-52 4 F R9 H5 00)

| Model/ housing material | Rotor/shaft | Sealing material | Mechanical connection | Output/electrical connection | Electronics | Special op- tions |
|--|--|--|--|--|---|---|
| DOR-42 (for pipe size 40 ... 900 mm) stainless steel | 2 = PVDF/st. steel (max. 100 °C) | F = FPM (standard) N = NBR | R8 = R 1½ male R9 = R2 male N8 = 1½" NPT male N9 = 2" NPT male | F0 = NPN OC + 1,5 V-pulse + standard cable length ²⁾ F2 = NPN OC + 1,5 V-pulse + 10 m cable F5 = NPN OC + 1,5 V-pulse + terminal box on stem kit N5 ¹⁾ = NPN OC + terminal box on stem kit + high temp. Sensor (+150 °C) R0 = reed switch + standard cable length ²⁾ R2 = reed switch + 10m cable R5 = reed switch + terminal box on stem kit Q0 = 2xNPN OC + standard cable length ²⁾ Q2 = 2xNPN OC + 10m cable Q5 = 2xNPN OC + terminal box on stem kit XX = special option (specified in clear text, consult factory) | 00 = frequency output only XX = special option (specified in clear text) | none = with- out Y = speci- fied in clear text |
| | DOR-52 (for pipe size 50 ... 2,500 mm) stainless steel | | 4 = PEEK/st. steel (max. 150 °C) X = special (on request) | R9 = R2 male N9 = 2" NPT male | | |

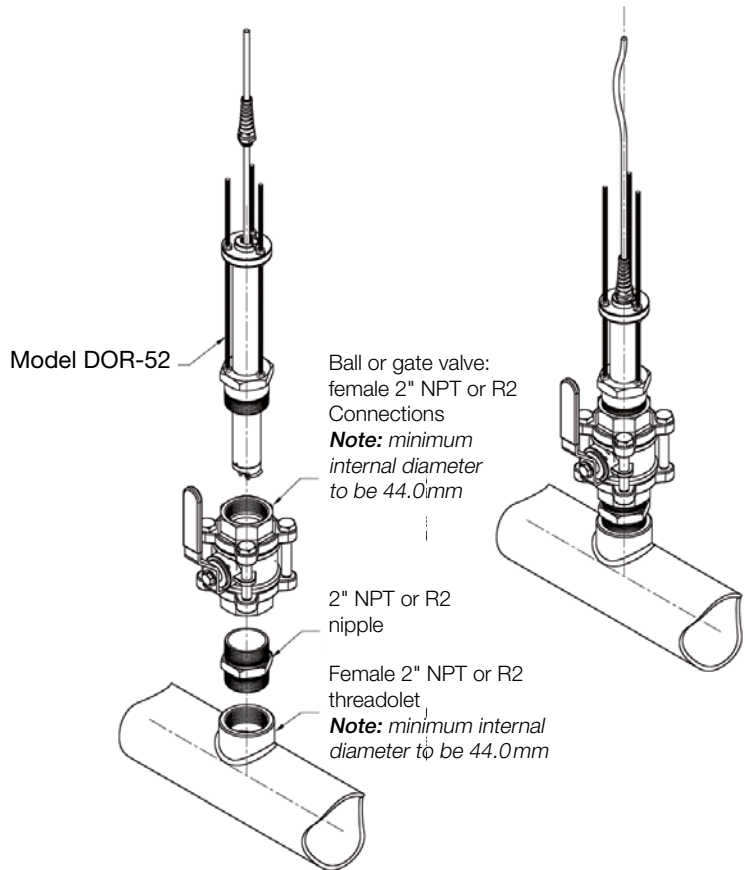
¹⁾ Only possible with PEEK rotor and FPM seal
²⁾ Standard cable length DOR-42 = 1,5 m, DOR-52 = 1 m



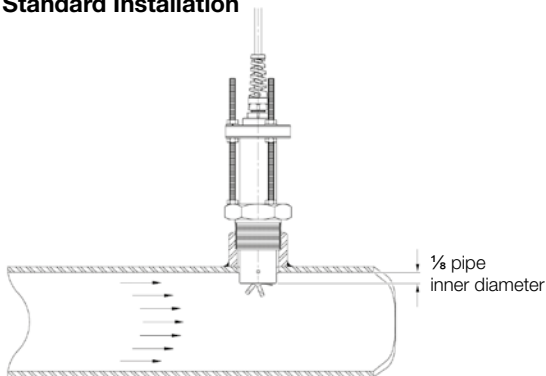
Process Temperature Limits with Rotor and Output Options*

| Rotor | Max. medium temperature |
|----------------------------|-------------------------|
| PVDF | 100 °C |
| PEEK | 200 °C |
| Output/Pick-up type | |
| F0, F2 R0, R2 Q0, Q2 | 100 °C |
| N5 | 150 °C |
| R5, F5, Q5 | 125 °C |

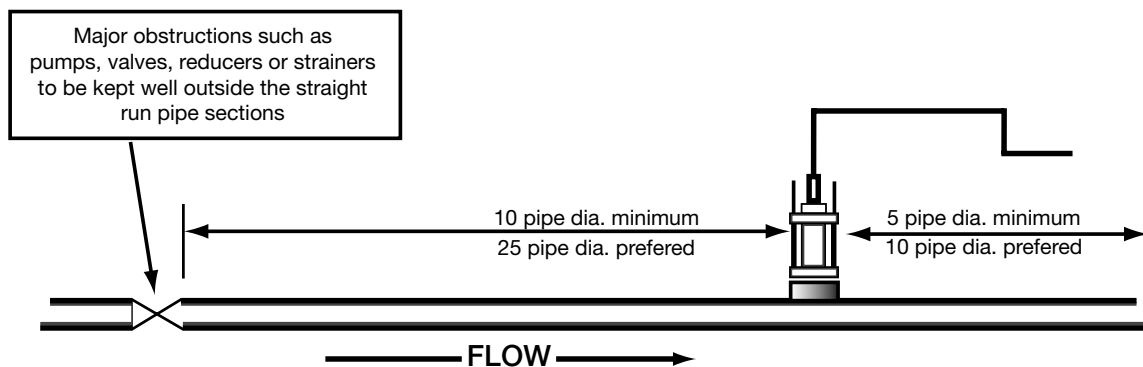
*Choose PEEK rotor for all options >100°C, keep temperature limits of sealing materials also in mind while selecting different options.



Standard Installation

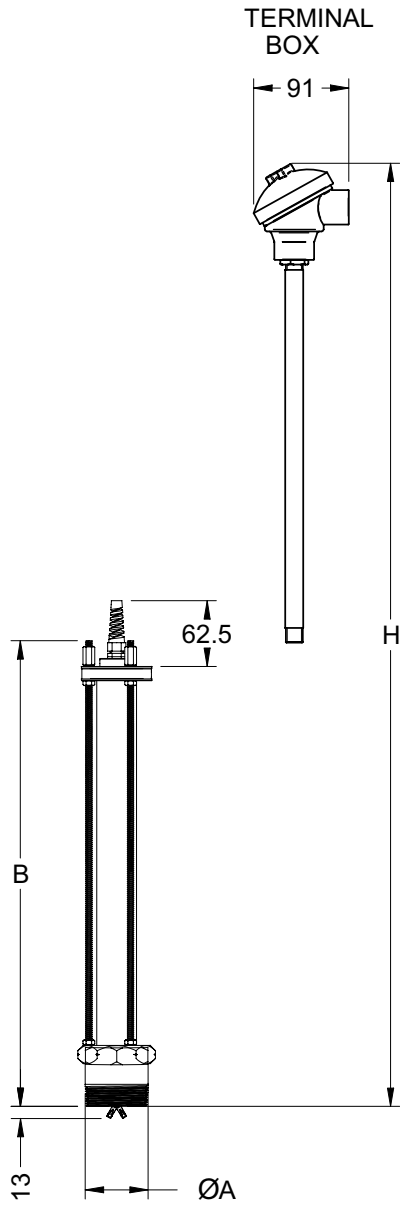


Installation Straight Piping Requirements





Dimensions (in mm)



All dimensions in mm, ± 2 mm

| | DOR-42 | DOR-52 |
|---------------|---------------------|-----------|
| $\text{Ø}A$ | 1 1/2" or 2" NPT/R2 | 2" NPT/R2 |
| B | 198 | 444 |
| Configuration | H | H |
| Terminal box | 385 | 869 |