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# OPTIFLUX 2000

## Electromagnetic flow sensor

- Engineered and manufactured for all water and wastewater applications
- Approvals for potable water
- Long term reliability  and negligible maintenance
- Robust, fully welded construction

HART COMMUNICATION PROTOCOL

Fieldbus Foundation

## Standard solution for the water and wastewater industry

The Optiflux 2000 electromagnetic flow sensor is the standard for water and wastewater and suitable for demanding applications.

### Highlights

- Robust and reliable
- Quick and easy to install and operate
- Bidirectional flow measurement
- Suitable for subsoil and constant flooding installation (IP68)
- Maintenance free
- Extensive diagnostic capabilities


### Industries

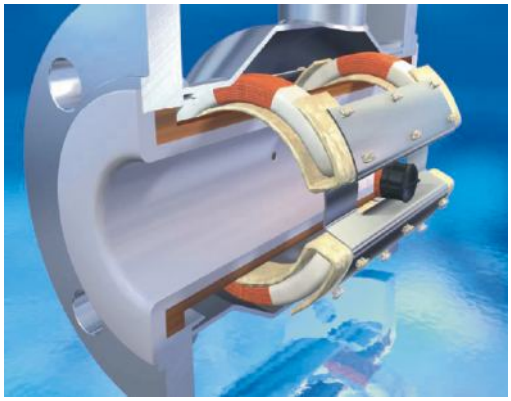
- Municipal water and wastewater
- Industrial water
- Irrigation
- Effluent treatment plants
- Power plants
- Iron, Steel and Metals
- Desalination plants

### Applications

- Raw water, Drinking water, revenue metering,
- Sewage, sludge, effluent
- Water distribution, leakage detection
- HVAC systems
- Cooling water
- Raw water
- Sea water

The Optiflux 2000 has been designed for measuring any application in any industry. Furthermore the modular concept allows tailor-made solutions for challenging applications. Every meter that leaves our factory is wet-calibrated on our calibration rigs (ISO/IEC 17025 standards).

## Construction



The measuring tube of the sensor has a smooth, cylindrical shape. This design, consisting of a circular cross section (no moving parts) and a homogeneous magnetic field, forms the basis for a flow-optimised pipe cross section, thereby providing reliable measurements that are largely independent of the flow profile. This design allows the sensor to measure the flow bi-directional. As an additional benefit, there is no pressure drop. The liner of the measuring tube is made of Hard Rubber or Neoprene and is resistant to vacuum, corrosion, aging and abrasion. The surface and shape of the measuring tube also minimize mineral deposits, resulting in exemplary measurement quality - even over the long term.

Electromagnetic flowmeters have many important advantages over mechanical flowmeters like outstanding long-term stability, maximum process reliability, no maintenance - to name just a few. As a result, these meters can deliver precise and reliable measurements for many years.

## Measuring Principle – Faraday's law

An electrically conductive fluid flows inside an electrically insulated pipe through a magnetic field. This magnetic field is generated by a current, flowing through a pair of field coils. Inside of the fluid, a voltage U is generated:

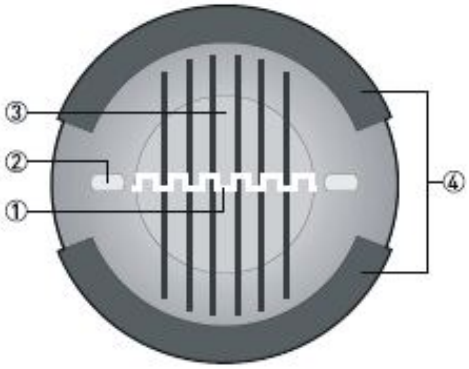
**U = V * K* B * D**

Where

V = Mean flow velocity
K = Meter constant / correction factor for geometry
B = Magnetic field strength
D = Inner diameter of flowmeter

The signal voltage U is picked up by electrodes and is directly proportional to the mean flow velocity V and thus the flow rate Q. The generated signal voltage is very low.

Signal converter is used to amplify this signal voltage, filter it (separate from noise) and convert it into signals for totalising, recording and output processing.




1. Voltage (Induced voltage is directly proportional to flow velocity)
2. Electrodes
3. Magnetic field
4. Field coils

# Technical Data

## Measuring System

| | |
|---|---|
| Measuring principle | Faraday's law of electromagnetic induction |
| Application range | Electrically conductive fluids |
| Measured value | Volumetric flow and velocity |

## Design

| | |
|---|---|
| Features | Fully welded maintenance free sensor |
| | Flange version with full bore flow tube |
| Modular construction | Liner approved for drinking water<br>The measurement system, consisting of a flow sensor and a signal converter, is available in compact or separate version. More information about the signal converter can be found in the technical data sheet of the signal converter. |
| Nominal diameter | 1" .... 120" / DN 25 .... DN 3000 |
| Measurement range | -12...12 m/s / -40...40 ft/s |

## Measuring accuracy

| | |
|---|---|
| Measuring error (with signal converter) | IFC 050 converter – DN 25 ... DN 1200 / 1" ... 48" ±0.5% of mv |
| | IFC 100 converter – DN 25 ... DN 1200 / 1" ... 48" ±0.3% of mv |
| | IFC 300 converter – DN 25 ... DN 3000 / 1" ... 120" ±0.2% of mv + 1mm/s |
| | IFC 011 converter – DN 25 ... DN 600 / 1" ... 24" : ±0.5% of mv + 1mm/s |
| Special calibration | Higher accuracy available on request |
| Repeatability | ±0.1% of mv |

## Operating conditions

### Temperature

| | |
|---|---|
| Process temperature | Hard Rubber / Neoprene : -5...+80°C / -23...+176°F for remote version |
| | Hard Rubber / Neoprene : -5...+80°C / -23...+176°F for compact |

### Pressure

| | |
|---|---|
| ASME B16.5 | Standard: 150 lbs RF for ASME / 1" .... 24" |
| | Higher pressure rating available on request |
| DIN | Standard: |
| | PN 40 for DN 50 and DN 80 |
| | PN 16 for DN 65 and DN 100 ... DN 150 |
| | PN 10 for DN 200 .... DN 600 |
| | Option: Higher pressure rating available on request. |
| Other flange standards | Available on request |
| Pressure loss | Negligible |

## Chemical properties

| | |
|---|---|
| Physical condition | Liquids |
| Electrical conductivity | Water ≥ 20 µS/cm |
| | Process fluids ≥ 1 µS/cm |
| Permissible gas content | ≤ 5% by volume |
| Permissible solid content | ≤ 70% by volume |

## Installation conditions

| | |
|---|---|
| Installation | Take care that flow sensor is fully filled |
| Flow direction | Forward and reverse |
| | Arrow on flow sensor indicates positive flow direction |
| Inlet straight run | ≥ 5 DN |
| Outlet straight run | ≥ 2 DN |

## Materials

| | |
|---|---|
| Measuring tube | Standard: SS 304<br>Optional: SS 316, SS 316L, SS 304L |
| Liner | Hard Rubber / Neoprene for 1" ... 120" / DN 25 ... DN 3000 |
| Sensor housing | Standard: Sheet Steel PU coated |
| | Optional: SS 304, SS 316, SS 304L, SS 316L |
| Flanges | Standard: Carbon Steel PU coated |
| | Optional: SS 304, SS 316, SS 304L, SS 316L |
| Process connection size | Connection size same as meter size |
| Measuring electrodes | Standard: SS 316 |
| | Optional: Hastelloy C, Titanium, SS316L etc |
| Grounding rings | Standard: SS 316 |
| | Optional: SS 316L, Hastelloy C, Titanium etc |
| Grounding electrodes | Available optionally in above materials |
| Cable entry | M 20 x 1.5, fitted with blind plugs |

## Electrical connections

| | |
|---|---|
| Signal Cable | Only for remote versions |
| Type DS | Standard cable: Double shielded<br>Standard length: 10 m<br>Maximum: 600 m / 1950 ft (depending on electrical conductivity) |

## Approvals and Certifications

| | |
|---|---|
| Protection category according to IEC 529 / EN 60529 | Standard: IP 66 / 67 (NEMA 4 / 4X)<br>Optional: IP 68 / NEMA 6P |
| Hazardous area | CCOE approval |
| Drinking water approval | Available on request |

## Technical information

### Selection of meter size

| Meter size | | Full scale range Q 100% m³/h |
|---|---|---|
| DN mm | inch | v = 1 m/s |
| 2.5 | 1/10 | 0.017674 |
| 4 | 1/8 | 0.045239 |
| 6 | 1/4 | 0.101790 |
| 10 | 3/8 | 0.2827 |
| 15 | 1/2 | 0.6362 |
| 20 | 3/4 | 1.131 |
| 25 | 1 | 1.767 |
| 32 | - | 2.895 |
| 40 | 1½ | 4.524 |
| 50 | 2 | 7.069 |
| 65 | - | 11.95 |
| 80 | 3 | 18.10 |
| 100 | 4 | 28.27 |
| 125 | - | 44.18 |
| 150 | 6 | 63.62 |
| 200 | 8 | 113.1 |
| 250 | 10 | 176.7 |
| 300 | 12 | 254.5 |
| 350 | 14 | 346.4 |
| 400 | 16 | 452.4 |
| 450 | 18 | 572.56 |
| 500 | 20 | 706.9 |
| 600 | 24 | 1018 |
| 700 | 28 | 1385 |
| 800 | 32 | 1810 |
| 900 | 36 | 2290 |
| 1000 | 40 | 2827 |
| 1200 | 48 | 4072 |
| 1400 | 56 | 5542 |
| 1600 | 64 | 7238 |
| 1800 | 72 | 9161 |
| 2000 | 80 | 11310 |
| 2200 | 88 | 13685 |
| 2400 | 96 | 16286 |
| 2600 | 104 | 19113 |
| 2800 | 112 | 22167 |
| 3000 | 120 | 25447 |

The optimum flow velocity should be 2-3 m/s or 6-9 ft/s, for products with solids contents between 3 and 5 m/s or 9 and 15 ft/s. The exact flow velocity can be determined from the columns in the tables for v=1m/s as shown in the following examples

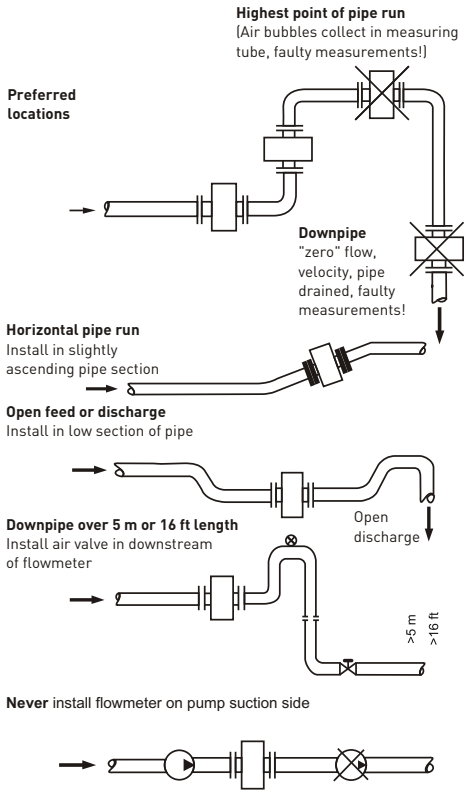
Example for m³/h

- Meter size: DN 80
- Desired measuring range: 55m³/h

From the table obtain for v = 1 m/s the flow rate of 18.10 m³/h at DN 80.

$$v = \frac{55 m^3/h \times 1 m/s}{18.10 m^3/h}$$

## Suggestions for installation

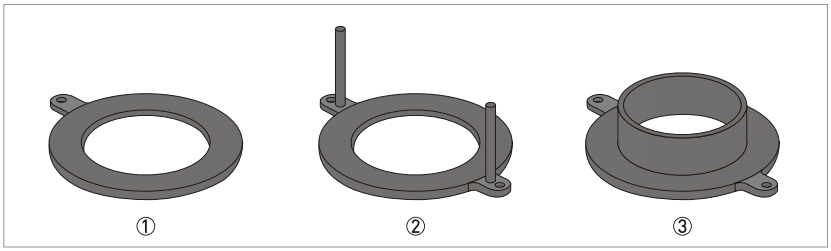



## Grounding rings

The instrument must be grounded for proper functioning as well as to provide safety against electric shocks.

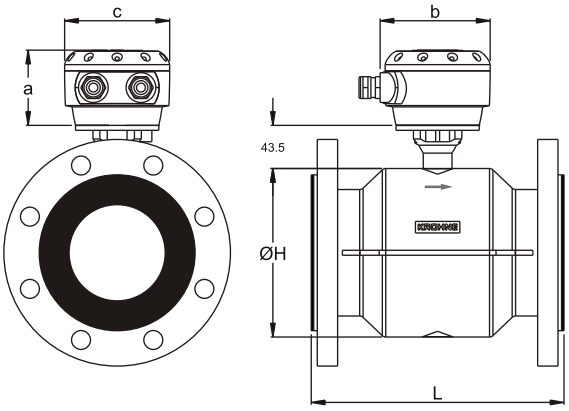
Such a grounding system is lacking in the pipes with internal lining / coating or plastic pipes. In such cases, grounding rings must be fitted on both sides of the primary head.

Grounding rings also function as liner protectors and available below types in various material of construction.

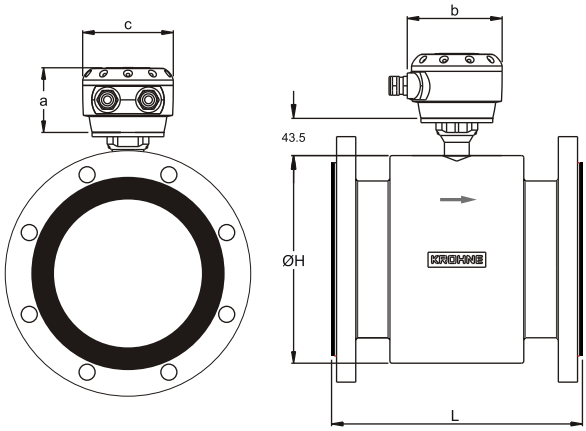



1. Grounding ring type 1
2. Grounding ring type 2: Prevents damage to liner during transportation and installation
3. Grounding ring type 3: With cylindrical neck, prevents damage to liner when handling abrasive media

## Dimensions and Weights




DN25 ... DN150 / 1" ... 6"




DN25 ... DN2000 / 1" ... 80"

- All data given in the following tables are based on standard versions of flow sensor only.
- For other pressure rating and flange standards, the dimensions may be different.
- For information on signal converter dimensions see relevant catalogue.

| |
|---|
| a = 88 mm / 3.5" |
| b = 113 mm / 4.5" |
| c = 106 mm / 4.2" |

## Dimensions for flow sensors with 150 lbs flanges

| Meter Size (ANSI / DIN) | Standard Length [L] | Dimensions [mm] ISO Length [L] | ØH / H | Approx. Weight [Kg] |
|---|---|---|---|---|
| 1" / 25 | 150 | 200 | 78 | 3 |
| 1 1/4" / 32 | 150 | 200 | 86 | 4 |
| 1 1/2" / 40 | 150 | 200 | 95 | 5 |
| 2" / 50 | 200 | 200 | 119 | 8 |
| 2 1/2" / 65 | 200 | 200 | 126 | 10 |
| 3" / 80 | 200 | 200 | 137 | 12 |
| 4" / 100 | 250 | 250 | 166 | 20 |
| 5" / 125 | 250 | 250 | 194 | 22 |
| 6" / 150 | 300 | 300 | 226 | 29 |
| 8" / 200 | 350 | 350 | 292 | 43 |
| 10" / 250 | 400 | 450 | 332 | 65 |
| 12" / 300 | 500 | 500 | 382 | 94 |
| 14" / 350 | 500 | 550 | 446 | 129 |
| 16" / 400 | 600 | 600 | 495 | 165 |
| 18" / 450 | 800 | -- | 546 | 186 |
| 20" / 500 | 800 | -- | 597 | 224 |
| 24" / 600 | 800 | -- | 709 | 307 |

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