Electromagnetic signal converter

- Battery driven with low energy consumption
- Quick and easy to install and operate
- External data logger and GSM module for remote data transfer
1 Product features

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1.1 Solution for the water and wastewater industry

The IFC 070 electromagnetic signal converter is designed for use in water industry such as potable water distribution networks, for revenue billing and for water abstraction. It is battery powered, making it especially suitable for applications where no power connection is available and provides certainty in case of power failure. Optional a GSM and data logger module is available for the remote transmission of measurement data and status information.

① Battery-powered totaliser
② Rigid flow sensor
Highlights
• Battery operated, stand alone water meter, battery life up to 15 years
• Excellent performance in low flow conditions and over a wide flow range
• Easy installation, short inlet and outlet runs, no filters and bi-directional flow
• Maintenance free operation, no moving parts, no wear and obstruction free
• Optional, battery powered data logger and GSM module for remote data transfer

Industries
• Water abstraction
• Distribution of potable water
• Irrigation

Applications
• Raw water, potable water, irrigation water
• Well chambers
• Monitoring of distribution networks
• Pipeline leakage detection
• Measuring water consumption
1.2 Features

**GSM and data logger module**
There is an increased demand by utilities for remote reading. Often water meters are installed at remote locations in the distribution network or below the ground for example in busy city centers. The IFC 070 can be supplied with a state-of-the-art data logger and GSM modem. The stored data is transmitted (for example once a day) by SMS and can be forwarded to the customer’s management system.

**Quick to install and easy to operate - Remote or Compact**
The IFC 070 signal converter can be supplied in either compact or remote design. In case of a remote design, the converter can be installed on the wall or on a pipe. The functionality of the compact and remote versions is identical.
Low energy consumption
The IFC 070 signal converter has an extreme low power consumption. It delivers precise and reliable measurements for many years operating on batteries. With a sampling rate of 1/15 Hz, the water meter can operate for more than fifteen years.

Long term reliability
In addition to a long battery lifetime of up to 15 years, the IFC 070 provides diagnostic information. The IFC 070 has two status outputs for self checking, battery warnings and counter overrun.
1.3 Measuring principle

An electrically conductive fluid flows inside an electrically insulating 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:

$$U = v \cdot k \cdot B \cdot D$$

in which:
- $v$ = mean flow velocity
- $k$ = factor correcting for geometry
- $B$ = magnetic field strength
- $D$ = inner diameter of flow meter

The signal voltage $U$ is picked off by electrodes and is proportional to the mean flow velocity $v$ and thus the flow rate $q$. The signal voltage is quite small (typically 1 mV at $v = 3$ m/s / 10 ft/s and field coil power of 1 W). Finally, a signal converter is used to amplify the signal voltage, filter it (separate from noise) and convert it into signals for totalising, recording and output processing.

1. Voltage (induced voltage proportional to flow velocity)
2. Electrodes
3. Magnetic field
4. Field coils
2.1 Technical data

- The following data is provided for general applications. If you require data that is more relevant to your specific application, please contact us or your local representative.
- Additional information (certificates, special tools, software,...) and complete product documentation can be downloaded free of charge from the website (Downloadcenter).

### Measuring system

<table>
<thead>
<tr>
<th>Measuring principle</th>
<th>Faraday’s law</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application range</td>
<td>Electrically conductive fluids</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measured value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary measured value</td>
</tr>
<tr>
<td>Secondary measured value</td>
</tr>
</tbody>
</table>

### Design

Modular construction: The measurement system consists of a flow sensor and a signal converter. It is available as compact and as remote version. More information about the sensor can be found in the relevant documentation.

- **Compact version**
  - With WATERFLUX 3000 sensor: WATERFLUX 3070 C
  - With OPTIFLUX 2000 sensor: OPTIFLUX 2070 C

- **Remote version**
  - With WATERFLUX 3000 sensor: WATERFLUX 3070 F
  - With OPTIFLUX 2000 sensor: OPTIFLUX 2070 F

Maximum cable length 25 m / 75 ft

### User interface

- **Display**
  - 8 digits LCD
  - Display of positive and negative counter, sum counter, flow rate
  - Status indication for battery, flow / counter direction, empty pipe

- **Units**
  - Volume in m³, US Gallons
  - Flow rate in m³/h, USGPM

- **Cable connections**
  - Standard: 2x M20x1.5
  - Optional: ½” NPT, PF

### Measuring accuracy

- **Reference conditions**
  - Medium: water
  - Temperature: 20°C / 68°F
  - Inlet section: 5 DN
  - Operating pressure: 1 bar / 14.5 psig

- **Maximum measuring error**
  - ±0.2% of measured value ±1.5 mm/s / 0.06 inch/s
  - For detailed information on the measuring accuracy, see chapter “Measuring accuracy”.

- **Repeatability**
  - ±0.1% (v > 0.5 m/s / 1.5 ft/s)
### Operating conditions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temperature</strong></td>
<td></td>
</tr>
<tr>
<td>Process temperature</td>
<td>-5…+70°C / 23…+158°F</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-40…+65°C / -40…+149°F</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-50…+70°C / -58…+158°F</td>
</tr>
<tr>
<td><strong>Chemical properties</strong></td>
<td></td>
</tr>
<tr>
<td>Physical condition</td>
<td>Liquids</td>
</tr>
<tr>
<td>Electrical conductivity</td>
<td>≥ 20 μS/cm</td>
</tr>
<tr>
<td>Recommended flow velocity</td>
<td>in pipeline: -9…9 m/s / -30…30 ft/s</td>
</tr>
<tr>
<td></td>
<td>in sensor: -18…18 m/s / -59…59 ft/s</td>
</tr>
<tr>
<td><strong>Process conditions</strong></td>
<td></td>
</tr>
<tr>
<td>Raw water, ground- and surface water</td>
<td></td>
</tr>
<tr>
<td>Potable water</td>
<td></td>
</tr>
<tr>
<td>Irrigation water</td>
<td></td>
</tr>
</tbody>
</table>

### Installation conditions

<table>
<thead>
<tr>
<th>Dimension and weights</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>For detailed information see chapter &quot;Dimensions and weights&quot;.</td>
<td></td>
</tr>
</tbody>
</table>

### Materials

<table>
<thead>
<tr>
<th>Component</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing</td>
<td>Die-cast aluminium, polyurethane coated</td>
</tr>
<tr>
<td>Connection box (remote versions only)</td>
<td>Die-cast aluminium, polyurethane coated</td>
</tr>
</tbody>
</table>

### Electrical connections

<table>
<thead>
<tr>
<th>Power supply</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery</td>
<td></td>
</tr>
<tr>
<td><strong>Standard</strong></td>
<td>1 Lithium battery (D-cell)</td>
</tr>
<tr>
<td><strong>Optional</strong></td>
<td>2 Lithium batteries (D-cell)</td>
</tr>
<tr>
<td></td>
<td>External battery pack with 4 lithium batteries (D-cell)</td>
</tr>
<tr>
<td>Typical lifetime</td>
<td>See graph at the end of this table.</td>
</tr>
<tr>
<td>Alarm</td>
<td>Pre-alarm 1 year before battery depletion and final alarm</td>
</tr>
<tr>
<td>Battery replacement</td>
<td>Possible without loss of totalizer data</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>In- and output</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outputs</td>
<td>2 Passive pulse outputs for remote totalising: f ≤ 500 Hz; I ≤ 10 mA; U: 5…24 VDC [P ≤ 100 mW]</td>
</tr>
<tr>
<td></td>
<td>2 Passive status outputs: I ≤ 10 mA; U: 5…24 VDC [P ≤ 100 mW]</td>
</tr>
<tr>
<td>Communication</td>
<td>External data logger / GSM module, SMS protocol to:</td>
</tr>
<tr>
<td></td>
<td>SCADA system [at customer’s site]</td>
</tr>
<tr>
<td></td>
<td>OPC server [to be connected to customer’s OPC client]</td>
</tr>
<tr>
<td></td>
<td>PCWin [mini-SCADA can be supplied by KROHNE]</td>
</tr>
</tbody>
</table>
Approvals and certifications

<table>
<thead>
<tr>
<th>CE Sign</th>
<th>This device fulfills the statutory requirements of the EC directives. The manufacturer certifies successful testing of the product by applying the CE mark.</th>
</tr>
</thead>
</table>

Hazardous areas

<table>
<thead>
<tr>
<th>Non-Ex</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATEX</td>
<td>Not available</td>
</tr>
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</table>

Other approvals and standards

<table>
<thead>
<tr>
<th>Protection category acc. to IEC 529 / EN 60529</th>
<th>IP 66/67 (NEMA 4/4X/6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shock- and vibration resistance</td>
<td>IEC 68-2-3</td>
</tr>
<tr>
<td></td>
<td>Harmonized standard: EN 61326-1 : 2006</td>
</tr>
<tr>
<td>Low voltage directive</td>
<td>Directive: 2006/95/EC</td>
</tr>
<tr>
<td></td>
<td>Harmonized standard: EN 61010 : 2001</td>
</tr>
<tr>
<td>Custody transfer</td>
<td>Standard: without</td>
</tr>
<tr>
<td></td>
<td>Europe: MI-001 pending</td>
</tr>
<tr>
<td></td>
<td>Worldwide: OIML R-49 pending</td>
</tr>
</tbody>
</table>

Typical lifetime of batteries (at 25°C)

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Figure 2-1: X = Sampling interval in seconds, Y = typical lifetime in years

1. dual battery pack
2. single battery
```
2.2 Measuring accuracy

![Graph showing measuring accuracy]

Figure 2-2: X [m/s]: flow velocity
Y [%]: deviation from the actual measured value

1. with WATERFLUX 3000 water meter
2. with OPTIFLUX 2000 flow sensor
### 2.3 Dimensions and weights

<table>
<thead>
<tr>
<th>Compact version</th>
<th>Remote version, signal converter</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Compact version diagram" /></td>
<td><img src="image2" alt="Remote version diagram" /></td>
</tr>
<tr>
<td><strong>a</strong> = 170 mm / 6.7”</td>
<td><strong>b</strong> = 122 mm / 4.8”</td>
</tr>
<tr>
<td><strong>b</strong> = 122 mm / 4.8”</td>
<td><strong>c</strong> = 335 mm / 13.2”</td>
</tr>
<tr>
<td><strong>c</strong> = 140 mm / 5.5”</td>
<td><strong>H</strong> = 310 mm / 12.2”</td>
</tr>
</tbody>
</table>

Sizes of sensor can be found in the relevant datasheet.
3.1 Notes on installation

Inspect the cartons carefully for damage or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.

Check the packing list to check if you received completely all that you ordered.

Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

3.2 Mounting position and flange deviation

![Diagram showing mounting position and flange deviation]

Figure 3-1: Mounting position and flange deviation

1. $L_{\text{max}}$
2. $L_{\text{min}}$

- Mount flowmeter either with converter aligned upwards or downwards.
- Install flowmeter in line with the pipe axis.
- Pipe flange faces must be parallel to each other.

*Max. permissible deviation of pipe flange faces: $L_{\text{max}} - L_{\text{min}} \leq 0.5 \text{ mm}*$
3.3 Vibration

Figure 3-2: Avoid vibrations

3.4 Magnetic field

Figure 3-3: Avoid magnetic fields
4.1 Safety instructions

All work on the electrical connections may only be carried out with the power disconnected. Take note of the voltage data on the nameplate!

Observe the national regulations for electrical installations!

Observe without fail the local occupational health and safety regulations. Any work done on the electrical components of the measuring device may only be carried out by properly trained specialists.

Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

4.2 Installation of converter

Only applicable for remote versions.

- Mount converter with mounting plate on wall or standpipe.
- Keep distance between sensor and signal converter as short as possible.
- Observe length of the delivered signal cable.

4.3 Grounding

Figure 4-1: Grounding
4.4 Connection of signal cable

The signal cable is only used with remote versions. The standard cable includes both electrode and field current leads, the optional type A / B cable is only used for the electrodes. In that case, the field current cable is no part of the supply.

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Figure 4-2: Cable connection at converter side, standard cable

1. cable length: 13 cm / 5"
2. cable length: 5 cm / 2"
3. brown + white cable, used for field current
4. purple and blue cable, used for electrode signals
5. cable length: 8 cm / 3"
6. Shield (terminal 1 of connector X2 + U-clamp)

- Prepare appropriate cable lengths (1)...(3)
- Connect the shield to the U-clamp, the brown cable to terminal 7 and the white to terminal 8.
- Connect the shield to terminal 1, the purple cable (red in case of type A or B cable) to terminal 2 and the blue (white in case of type A or B cable) to terminal 3.
4.5 Terminal assignment of converter

Electrical values
- **Pulse output passive:**
  \[ f \leq 500 \text{ Hz}; \ I \leq 10 \text{ mA}; \ U: 5...24 \text{ VDC} \ (P \leq 100 \text{ mW}) \]
- **Status output passive:**
  \[ I \leq 10 \text{ mA}; \ U: 5...24 \text{ VDC} \ (P \leq 100 \text{ mW}) \]
KROHNE product overview

- Electromagnetic flowmeters
- Variable area flowmeters
- Ultrasonic flowmeters
- Mass flowmeters
- Vortex flowmeters
- Flow controllers
- Level meters
- Temperature meters
- Pressure meters
- Analysis products
- Measuring systems for the oil and gas industry
- Measuring systems for sea-going tankers