Capaflux IFM 5080 K-CAP
Electromagnetic Flowmeter

... non-contact process flow measurement from 0.05 µS/cm electrical conductivity

- Ceramic measuring tube, dimensionally stable, vacuum resistant
- Optimum flow shaping and unimpeded tube cross-section
- Outstanding accuracy
- Non-wetted electrodes
Capaflux IFM 5080 K-CAP
Electromagnetic Flowmeter

... non-contact process flow measurement
from 0.05 µS/cm electrical conductivity

No restrictions ...

... through insulating products with a
film-forming tendency:
asphalt, latex suspensions

... through low electrical conductivity:
ultra-high-purity water, alcohols,
glycerins, glycols

... through high solids content:
fruit pieces, pulps, concrete

... for sterile processes:
chemical and food industries

... when used in hazardous areas:
ATEX approval
FM certification pending

... through electrode materials:
the capacitive electrodes are located
behind the ceramic tube, i.e. non-
contact measurement, no contact with
the process product.

Calibrated on EN 17 025
accredited calibration rigs,
accuracy of calibration better
than 99.97% of the measured value.

non-contact flow measurement
no electrodes
easy to specify
unimpeded flow cross-sectional area
optimum flow shaping
resistant to abrasion
ceramic measuring tube
dimensionally stable vacuum-resistant
outstanding accuracy

Special advantages

- capacitive electrodes for non-contact measurement.
- the measuring section is resistant to abrasion from even high solids contents.
- the ceramic measuring tube is dimensionally stable and vacuum-resistant.
- the special shape of the measuring tube helps to optimize the flow profile, even with minimum pressure drop, refer to diagram on page 3.
- the measuring error is less than 0.5% of the measured value.
- the integral design ensures easy installation, safe and reliable operation.
- the crevice-free measuring tube has no blind spots and conforms to food requirements, the ceramic surface is ultrasmooth, \( R_s < 0.8 \) µm surface finish.

ATEX approval
Ex II 2 GD KEMA 01 ATEX 2232X

- CAPAFLUX IFM 5080 K/CAP-EE:
  EEEx d IIC T6 ... T4
  EEEx de IIC T6 ... T4

- CAPAFLUX IFM 5080 K/CAP/EEEx:
  with outputs intrinsic safety
  EEEx d [ia] IIC T6 ... T4
  EEEx de [ia] IIC T6 ... T4
**CAPAFLUX**

**Highlights**
Measuring error $\leq 0.5\%$ of the measured value, ‘sandwich’ design, easy installation, reliable and safe operation

Electrical conductivity $\geq 0.05\mu\text{S/cm}$, e.g. ultrahigh-purity water, alcohols, glycerols, glycols, etc.

Hazardous-duty version, flameproof enclosure

Self-supporting ceramics measuring tube, press-fitted into stainless steel housing

Meter sizes DN 25-100 or 1”-4”

Measuring error $\leq 0.5\%$ of the measured value, ‘sandwich’ design, easy installation, reliable and safe operation

Electrical conductivity $\geq 0.05\mu\text{S/cm}$, e.g. ultrahigh-purity water, alcohols, glycerols, glycols, etc.

Dimensionally stable measuring tube, very good thermal and long-time stability, no flow, creep and no abrasion, as is usually the case with plastic liners

No crevices, no blind spots in the measuring tube, conforms to food standards, extremely smooth, surface roughness $< 0.8\,\mu\text{m}$

**Design**

Flow profile influence
(\pm SE) as % of measured value

Example for DN80 (3”) with quarter bend, straight inlet run
$5 \times \text{DN} (=400\,\text{mm} = 16”)$ from quarter bend to electrode plane

\[
\Delta P = \rho \times v^2 \quad (\text{in mbar})
\]

\[
\Delta P = \rho \times v^2 \quad (\text{in psig})
\]

$\rho$ = product density in (kg/m$^3$)
$v$ = flow velocity in m/s
$p$ = specific gravity (e.g. water = 1)
$v$ = flow velocity in ft/s

<table>
<thead>
<tr>
<th>Meter size</th>
<th>Dimensions in mm (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN mm</td>
<td>$D_a$</td>
</tr>
<tr>
<td>25</td>
<td>1</td>
</tr>
<tr>
<td>40</td>
<td>1 1/2</td>
</tr>
<tr>
<td>50</td>
<td>2</td>
</tr>
<tr>
<td>80</td>
<td>3</td>
</tr>
<tr>
<td>100</td>
<td>4</td>
</tr>
</tbody>
</table>
Measuring ranges and error limits

<table>
<thead>
<tr>
<th>Meter size 1)</th>
<th>Electrical conductivity</th>
<th>Error limits 2)</th>
<th>Full-scale range Q100%</th>
<th>in m³/h</th>
<th>in US gal/min</th>
</tr>
</thead>
<tbody>
<tr>
<td>mm inches</td>
<td>(water 0.05-0.2 µS/cm)</td>
<td>(water &gt; 0.2 µS/cm)</td>
<td>v&gt;1 m/s &gt;3 ft/s</td>
<td>v≤1 m/s ≤3 ft/s</td>
<td>v=0.3 m/s (minimum)</td>
</tr>
<tr>
<td>DN 25 1</td>
<td>depending on product and application for all applications</td>
<td>&lt;± 0.5% of measured value</td>
<td>5.302</td>
<td>1.767</td>
<td>21.20</td>
</tr>
<tr>
<td>DN 40 1 1/2</td>
<td>depending on product and application for all applications</td>
<td>&lt;± 5 mm/s</td>
<td>1.358</td>
<td>4.524</td>
<td>54.28</td>
</tr>
<tr>
<td>DN 50 2</td>
<td>depending on product and application for all applications</td>
<td>&lt;± 0.20 inches/s</td>
<td>2.121</td>
<td>7.069</td>
<td>84.82</td>
</tr>
<tr>
<td>DN 80 3</td>
<td>depending on product and application for all applications</td>
<td>&lt;± 0.20 inches/s</td>
<td>5.429</td>
<td>18.10</td>
<td>217.1</td>
</tr>
<tr>
<td>DN100 4</td>
<td>depending on product and application for all applications</td>
<td>&lt;± 0.20 inches/s</td>
<td>8.483</td>
<td>28.27</td>
<td>339.2</td>
</tr>
</tbody>
</table>

1) Where low electrical conductivities are concerned, the meter size should be such that flow velocity v < 1 m/s (< 3 ft/s).
2) Error limits for display, pulse output, digital values.

Calibrated on EN 17025 accredited calibration rigs by direct comparison of volumes

Reference conditions similar to EN 29104
- Product water at 10 – 30°C / 50 – 86°F
- Electromagnetic conductivity > 300 µS/cm
- Power supply (rated voltage) U0 (± 2%)
- Ambient temperature 20 – 22°C / 68 – 71.6°F
- Warm-up time 60 min
- Inlet/outlet runs 10 x DN / 2 x DN (DN = meter size)
- Primary head properly grounded and centered

Current output: same error limits as above, additionally ±10 µA

Reproducibility or repeatability: 0.1 % of MV, minimum 1 mm/s / 0.04 inches/s at constant flow, measuring time > 100 s

External influences:
- Pulse output: 0.003% of MV (3)
- Current output: 0.01% of MV (3)
- Power supply: <0.02% of MV
- Load: <0.01% of MV

(3) All KROHNE signal converters undergo burn-in tests, duration minimum 20 hours at varying ambient temperatures -20 to +60 °C / -4 to +140 °F. The tests are controlled by computers.

Dimensions and weights
- all dimensions in mm and (inches)
- without grounding rings: Dimension a incl. gaskets between primary head and pipe flanges
- with grounding rings: Dimension a + 10 mm or a + 0.4”, incl. 2 gaskets between measuring tube and grounding rings and 2 between grounding rings and pipe flanges

<table>
<thead>
<tr>
<th>Meter size</th>
<th>Dimensions in mm and (inches)</th>
<th>approx. weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN mm inches</td>
<td>a</td>
<td>b</td>
</tr>
<tr>
<td>25 1</td>
<td>58 (2.28)</td>
<td>302 (11.89)</td>
</tr>
<tr>
<td>40 1 1/2</td>
<td>83 (3.27)</td>
<td>318 (12.52)</td>
</tr>
<tr>
<td>50 2</td>
<td>103 (4.06)</td>
<td>336 (13.23)</td>
</tr>
<tr>
<td>80 3</td>
<td>153 (6.02)</td>
<td>368 (14.49)</td>
</tr>
<tr>
<td>100 4</td>
<td>203 (7.99)</td>
<td>392 (15.43)</td>
</tr>
</tbody>
</table>
CAPAFLUX Primary head

**Meter size**
DN 25, 40, 50, 80, 100 and 1", 1½", 2", 3", 4", flangeless version

**Operating data**

- **Temperatures**
  - Ambient temperature: -25 to +60°C / -13 to +140°F
  - Product temperature: -25 to +100°C / -13 to +212°F  
  - Non Ex: +140°C/+284°F for max. 30 min
  - Ex version: +115°C/+239°F

- **Pressure**
  - DN 25 – 80: 40 bar / 580 psig
  - DN 100: 16 bar / 230 psig (option 25 bar)
  - 1" – 4": 16 bar / 230 psig for 150 lb
  - 1" – 3": 40 bar / 580 psig for 300 lb
  - 4": 25 bar / 360 psig for 300 lb

- **Vacuum**
  - 0 mbar abs. / 0 psia

**Temperature change**

- **Temperature rising**
  - in 10 minutes: \( \Delta T = 125 \, ^\circ \text{C}, \text{or} \, 257 \, ^\circ \text{F} \)
  - for sudden change: \( \Delta T = 120 \, ^\circ \text{C}, \text{or} \, 248 \, ^\circ \text{F} \)

- **Temperature falling**
  - in 10 minutes: \( \Delta T = 100 \, ^\circ \text{C}, \text{or} \, 212 \, ^\circ \text{F} \)
  - for sudden change: \( \Delta T = 180 \, ^\circ \text{C}, \text{or} \, 176 \, ^\circ \text{F} \)

**Insulation class of field coils**

- H

**Electrode design**

- Capacitive signal pickup, electrodes not in contact with the product

**Protection category (IEC 529 / EN 60 529)**

- IP 67 equivalent to NEMA 6

**Items included with supply**

- **for pipe flanges**
  - Standard DN 25 – 80 / PN 40
  - DN 100 / PN 16
  - 1" – 4" / 150 lb
  - Centering material yes
  - Stud bolts steel
  - Grounding rings -
  - Gaskets 2 (without grounding rings)
  - Ex versions: European standard
  - FM approval -

- **Option**
  - DN 100 / PN 25
  - 1" – 4" / 300 lb
  - Centering material
  - Stud bolts stainless steel
  - Grounding rings yes
  - Gaskets 4 (with grounding rings)
  - Ex versions: EEx d IIC T6-T4
  - FM approval in preparation

**Materials**

- **Measuring section**
  - DN 25, 1" zirconium oxide, ZrO₂
  - DN 40 – 100, 1½" – 4" fused aluminium oxide, 99.7 % Al₂O₃

- **Housing (with polyurethane finish)**
  - Stainless steel 1.4301 / SS 304 – AISI

- **Gaskets**
  - Gylon 3500 (beige) gaskets (application range similar to that of PTFE), optionally Chemotherm (graphite) gaskets

- **Grounding rings (option)**
  - Stainless steel 1.4571 / SS 316 Ti – AISI, others on request

- **Centering material**
  - DN 25, 1" EPDM rings
  - DN 40 – 100, 1½" – 4" rubber sleeves

- **Stud bolts**
  - Steel electrogalvanized, optionally stainless steel 1.4301 / SS 304 – AISI

The responsibility as to the suitability, intended use and corrosion-resistance of the materials used in their construction rests solely with the purchaser.
### IFC 090 K-CAP Signal converter

#### Versions
- **IFC 090 K/B (Standard)**: Basic version, without local display and control elements
- **IFC 090 K/D (Option)**: Display version, with local display and control elements
- **IFC 090 K/D-EEx (Option)**: Ex version with “Increased Safety” outputs
  - HART®
  - RS 485/PROFIBUS/FIELDBUS (switch-selectable add-on module)

#### Add-on equipment (option)
- CONFIG-Software and adapter for operator control via MS-DOS PC, connection to internal IMoCom interface (equipment bus)

#### Current output
- **Function**:
  - all operating data configurable
  - galvanically isolated from current output and all input circuits
  - for active or passive mode
- **Current**:
  - fixed ranges: 0 - 20 mA and 4 - 20 mA
  - variable ranges:
    - for \( Q = 0\% \): \( I_{0\%} = 0 - 16 \text{ mA} \)
    - for \( Q = 100\% \): \( I_{100\%} = 4 - 20 \text{ mA} \)
    - for \( Q > 100\% \): \( I_{\text{max}} = 22 \text{ mA} \)
  - adjustable in 1 mA increments
- **Active mode**
  - max. 500 \( \Omega \) load
  - passive mode: external voltage: 15...20 V DC, 20...32 V DC
    - load: min...max. 0...500 \( \Omega \), 250...750 \( \Omega \)
- **Error identification**
  - 0/22 mA and variable
direction identified via status output

#### Pulse output
- **Function**:
  - all operating data configurable
  - galvanically isolated from all input and output circuits
  - digital pulse division, interpulse period non-uniform, therefore if frequency and cycle meters connected allow for minimum counting interval:
    - gate time, totalizer \( \geq 1000 \text{ P100\% } [\text{Hz}] \)
- **Active mode**
  - connection: electronic totalizers
  - voltage: approx. 15 V DC, from current output
  - load: \( I_{\text{max}} \leq 23 \text{ mA} \), operation without current output
  - load: \( I_{\text{max}} \leq 3 \text{ mA} \), operation with current output
- **Passive mode**
  - connection: electronic or electromechanical totalizers
  - voltage: external, \( U_{\text{ext}} \leq 30 \text{ V DC} / \leq 24 \text{ V AC} \)
  - load: \( I_{\text{max}} \leq 150 \text{ mA} \)
- **Pulse width**
  - automatic: pulse duty cycle 1:1, max 1000 pulses/s = 1 kHz
  - variable: 10 ms - 2 s
  - \( P_{100\%} \) [pulses/s] = \( f_{\text{max}} \) [kHz] = \( \frac{1}{2 \times \text{pulse width}} \)
- **Forward/reverse flow measurement**
  - flow direction identified via status output

#### Status output (passive)
- **Function**
  - configurable as measuring range identification for BA mode, indicator for flow direction, errors or trip point
- **Connection**
  - voltage: external, \( U_{\text{ext}} \leq 30 \text{ V DC} / \leq 24 \text{ V AC} \)
  - load current: \( I_{\text{max}} \leq 150 \text{ mA} \)

#### Control input (passive)
- **Function**
  - configurable for range change, totalizer reset, error reset, set outputs to min. values or hold actual output values
  - initiate function by “low” or “high” control signals
- **Control signals**
  - \( U_{\text{max}} \) = 24 V AC 32 V DC (any polarity)
  - low: \( \leq 1.4 \text{ V} \)
  - \( \leq 2 \text{ V} \)
  - high: \( \geq 3 \text{ V} \)
  - \( \geq 4 \text{ V} \)

<table>
<thead>
<tr>
<th>Output/input combinations</th>
<th>( I ) = current output</th>
<th>( P ) = pulse output</th>
<th>( S ) = status output</th>
<th>( C ) = control input</th>
</tr>
</thead>
<tbody>
<tr>
<td>1)</td>
<td>I</td>
<td>P</td>
<td>S</td>
<td>C</td>
</tr>
<tr>
<td>2)</td>
<td>I</td>
<td>P</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>3)</td>
<td>I</td>
<td>C</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>4)</td>
<td>I</td>
<td>S1</td>
<td>S2</td>
<td></td>
</tr>
<tr>
<td>5)</td>
<td>I</td>
<td>C1</td>
<td>C2</td>
<td></td>
</tr>
</tbody>
</table>

#### Time constant
- 0.2 - 99.9 s, adjustable in increments of 0.1 second

#### Low-flow cutoff
- Cutoff “on” value: 1 - 19%
- Cutoff “off” value: 2 - 20%
  \( \text{of } Q_{100\%} \), adjustable in 1% increments
**Local display**
Display function: 3-field LCD
- Actual flow rate, forward, reverse and sum totalizers (7-digit), or 25-character bar graph with percentage indication and status messages.

Units:
- Actual flow rate: m³/h, liters, US gallons/min or user-defined unit, e.g., hecto-liters/day
- Totalizer: m³, liters, US gallons or user-defined unit, e.g., hecto-liters or US million gallons (adjustable count duration up to overflow)

Language of plain texts:
English, German, French, others on request

Display:
- Top field: 8-character, 7-segment numeral and sign display, and symbols for key acknowledgement
- Middle field: 10-character, 14-segment text display
- Bottom field: 4 markers to identify display in measuring mode

**Power supply**

<table>
<thead>
<tr>
<th>1. AC Version</th>
<th>2. AC Version</th>
<th>AC/DC-Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>Option</td>
<td>Option</td>
</tr>
<tr>
<td>1. Rated voltage</td>
<td>230 / 240 V</td>
<td>200 V</td>
</tr>
<tr>
<td>2. Rated voltage</td>
<td>115 / 120 V</td>
<td>100 V</td>
</tr>
<tr>
<td>Tolerance band</td>
<td>100 – 130 V</td>
<td>85 – 110 V</td>
</tr>
<tr>
<td>Frequency</td>
<td>48 – 63 Hz</td>
<td>–</td>
</tr>
</tbody>
</table>

Power consumption (incl. primary head): approx. 10 VA

When connected to functional extra-low voltage, 24 V, safety separation (PELV) is essential (to VDE 0100 / VDE 0106 and IEC 364 / IEC 536 or equivalent national standard.)

**Housing**

- Material: die-cast aluminium with polyurethane finish
- Ambient temperature: – 25 to + 60°C (– 13 to + 140°F)
- Protection category (IEC 529 / EN 60 529): IP 67, equivalent to NEMA 6

**Electrical connection**

- Binary outputs and inputs (B1, B2)
- Current output (I+)
- Status output (S)
- Control input (C)
- Passive or active (P)
- Electronic or electro-mechanical totalizer (S)

**Current output (I)**
- Passive
- Active

**Pulse output (P)**
- Status output (S)
- Passive or active

**Control input (C)**
- Passive

Electrical connection in conformity with VDE 0100 “Regulations governing heavy-current installations with mains voltages up to 1000 V” or equivalent national standard.

If to be connected to a functional extra-low voltage source (24 V), protective separation in conformity with VDE 0100, Part 410, or equivalent national standard, must be ensured.

Operating data of receiver instruments, outputs and inputs, see pages 6 and 7.