Installation and operating instructions

**IFC 210 E**

**IFC 210 E-EEEx**

Signal converters for electromagnetic flowmeters

---

**Applicable to Software Versions**

- Operating and check elements
  No. 3.18393.01
- Amplifier (ADC)
  No. 3.17116.01
- Outputs/inputs (I/O)
  No. 3.19005.01

---

**How to use these Instructions**

The flowmeters are supplied ready for operation.

The primary head must be installed in the pipeline as described in the installation instructions inside the packing of the primary head.

- Installation location and connection to power (Section 1) Pages 6-15
- Electrical connection of outputs and inputs (Section 2) Pages 16-22
- Factory settings and start-up (Section 3) Pages 23

Power the flowmeter. THAT’S ALL. The system is operative.
Contents

Signal converter versions 4
Items included with supply 4
Instrument nameplates 4
System description 5
Product liability and warranty 5
CE / EMC / Standards / Approvals 5
Software history 5

1 Electrical connection: power supply 6
1.1 Location and important installation notes 6
1.2 Power supply - Electrical connection 7
1.3 Electrical connection of separate primary heads 8
1.3.1 General remarks on signal cables A and B and field current line C 8
1.3.2 Stripping (preparation) of signal cables 9
1.3.3 Grounding of primary head 10
1.3.4 Cable lengths (max. distance between signal converter and primary head) 10
1.3.5 Connection diagrams for power supply and primary head 12
1.3.6 EEx-Connection diagrams for power supply and primary head 14

2 Electrical connection of outputs and inputs 16
2.1 Current output I 16
2.2 Pulse output P 17
2.3 Status outputs B1 and B2 18
2.4 Control inputs B1 and B2 19
2.5 Connection diagrams for outputs and inputs 20

3 Start-up 23
3.1 Power-on and measurement 23
3.2 Factory setting 23
3.3 Setting data 24

4 Operation of the signal converter 25
4.1 KROHNE operator control concept 25
4.2 Operating and check elements 26
4.3 Function of keys 27
4.4 Table of settable functions 30
4.5 Error messages in measuring mode 36
4.6 Reset totalizer and cancel error messages 37
4.7 Examples of setting the signal converter 37

5 Description of functions 38
5.1 Full-scale range \(Q_{100\%}\) (Fct. 1.01) 38
5.2 Timeconstant (Fct. 1.02) 38
5.3 Low Flow Cutoff (Fct.1.03) 39
5.4 Internal electronic totalizer 39
5.5 Display (Fct. 1.04) 40
5.6 Currentoutput I (Fct. 1.05) 42
5.7 Pulsoutput P (Fct. 1.06) 43
5.8 Statusoutput B1 and / or B2 44
5.9 Controlinput 45
5.10 F/R mode, forward/reverse flow measurement 45
5.11 Set limit values (status output B1 and/or B2) 46
5.12 Automatic range change BA (with status output B1 or B2) and external range change (with control input B1 or B2) 47
5.13 Language (Fct. 3.01) 48
5.14 Zero check (Fct. 3.03) 48
5.15 Determine Entry Code (Fct. 3.04) 48
5.16 Primary head – Set data (Fct. 3.02) 49
5.17 User-defined unit (Fct. 3.05) 50
5.18 Application (Fct. 3.06) 51
5.19 Hardware (Fct. 3.07) Assignment of terminals B1 + B2 and field current supply 51
5.20 Measuring point identification – Location (Fct. 3.08) 52
5.21 Set communication interface (Fct. 3.09) 52
5.22 Characteristic of outputs 53

6 Special applications 54
6.1 IFC 210 E – EEx for primary heads in hazardous areas 54
6.1.1 General 54
6.1.2 Electrical connection 55
6.1.3 Technical data and terminal assignment 56
6.1.4 Fuse protection of the field power circuit 57
6.2 Interfaces 58
6.2.1 HART® interface 58
6.2.2 KROHNE RS 485 Interface (Option) 60
6.3 Unsteady display and outputs 61
6.4 Pulsating flow 62
6.5 Rapid changes in flowrate 63
6.6 Stable signal outputs when measuring tube empty 64

7 Functional checks 66
7.1 Zero check 66
7.2 Test of measuring range Q 66
7.3 Hardware information and error status, Fct. 2.02 67
7.4 Faults and symptoms during start-up and process flow measurement 67
7.5 Checking the primary head 70
7.6 Test of signal converter using GS 8 A simulator (option) 71

8 Service 74
8.1 Illustrations used for service work 74
8.2 Replacement of power supply fuse 75
8.3 Replacement of electronics unit of signal converter 75
8.4 Illustrations of the PCBs 76

9 Order numbers 78

10 Technical data 79
10.1 IFC 210 E signal converter 79
10.2 Full-scale range Q_{100%} 85
10.3 Dimensions and weights IFC 210 E-EEx / ZD / ZD-EEx 86

11 Measuring principle 88

12 Block diagram – signal converter IFC 210 E 89

13 EU-Model test certificate ATEX 90

14 Index 92

If you need to return flowmeters for testing or repair to KROHNE 95
Signal converter versions

All signal converter versions include local display and control elements. The operating data are factory-set to your ordered specifications.

**IFC 210 E**
(Standard) with large graphic display and integrated HART® interface

**IFC 210 E / RS 485**
(Option) but additionally with RS 485 interface

**IFC 210 E / _ / EEx**
(Option) for operation with primary heads installed in hazardous areas

Items included with supply

Signal converter in the version as ordered, see above. These installation and operating instructions for the signal converter, including pull-out condensed instructions for installation, electrical connection, start-up and operator control of the signal converter.

signal cable in the version and length as ordered (standard: signal cable A, length 10 m / 30 ft)

Instrument nameplates

**signal converter** (example)

**signal converter IFC 210E-EEx** (example)

**primary head** (example)

Materials for liner and electrodes see Installation Instructions for primary heads

Materials for liner and electrodes see Installation Instructions for primary heads
**System description**

Electromagnetic flowmeters are precision instruments designed for linear flow measurement of liquid products.

The process liquids must be electrically conductive: \( \geq 5 \) µS/cm (for cold demineralized water \( \geq 20 \) µS/cm).

The full-scale range \( Q_{100\%} \) can be set as a function of the meter size: flow velocity of 0.3 - 12 m/s or 1 - 40 ft/s (s. Section 10.1.).

**Product liability and warranty**

The electromagnetic flowmeters are designed solely for measuring the volumetric flowrate of electrically conductive, liquid process products.

These flowmeters are available for use in hazardous areas. Special regulations apply in this case, which are given in the special EEx directions.

Responsibility as to suitability and intended use of these electromagnetic flowmeters rests solely with the operator.

Improper installation and operation of the flowmeters (systems) may lead to loss of warranty.

In addition, the “General conditions of sale” forming the basis of the purchase contract are applicable.

If flowmeters need to be returned to KROHNE, please note the information given on the last-but-one page of these Instructions. KROHNE regrets that it cannot repair or check your flowmeter(s) unless accompanied by the completed form sheet.

**CE / EMC / Standards / Approvals**


**Software history**

<table>
<thead>
<tr>
<th>Display &amp; control unit</th>
<th>Amplifier (ADC)</th>
<th>Inputs and outputs (I/O)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software</td>
<td>Status</td>
<td>Software</td>
</tr>
<tr>
<td>3.18393.01</td>
<td>current</td>
<td>3.17116.01</td>
</tr>
<tr>
<td>3.19005.01</td>
<td>current</td>
<td></td>
</tr>
</tbody>
</table>

**IMPORTANT!**

In respect of EEx versions, pay regard to all directions marked with the \( \text{Ex} \) symbol, and also the information given in Sect. 6.1 and 13.

Only the EEx primary head may be installed in the hazardous area. The signal converter must be installed outside the hazardous area!
1 Electrical connection: power supply

1.1 Location and important installation notes

- **Electrical connection in accordance with VDE 0100 “Regulations governing heavy-current installations with line voltages up to 1000 V” or equivalent others national regulations.**

- Do not cross or loop cables.

- Use **separate cable** entries (see below) for power supply, field current cables, signal cables, outputs and inputs.

- Protect flowmeters or switchgear cabinets with built-in devices from direct sunlight. Fit a sunshade if necessary.

- When **installed in switchgear cabinets**, signal converters must be adequately cooled, e.g. use fans or heat exchangers. (dust-free air and no aggressive gases)

- Do not expose signal converters to intense vibration.

- Keep **distance between primary head and signal converter** as short as possible. Refer to Sect. 1.3.4 for maximum permissible length of signal and field current cables.

- Use the supplied KROHNE **signal cable A** (Type DS), standard length 10 m (33 ft), or optional **signal cable B** (Type BTS).

- Always **calibrate** primary head and signal converter **together**. Therefore, when installing, ensure **primary constant GK is identical**; refer to instrument nameplate for the primary head.
  If the GK is not identical, set the signal converter to the GK of the primary head.
  Refer also to Section 4.

- **Dimensions of signal converter**, refer to Section 10.4.

**IMPORTANT!**
For EEx versions, also pay regard to all special directions included in Sect. 6.1 and 13.
Only the EEx primary head may be installed in the hazardous area.
The signal converter must be installed outside the hazardous area!
1.2 Power supply - Electrical connection

PLEASE NOTE!

- **Rated values**: The flowmeter housings meet the requirements of IP 20 in conformity with EN 60529. No protection against water and moisture. If necessary, take appropriate protective measures. The selected creepage distances and clearances have been dimensioned in conformity with VDE 0110 and IEC 664 for contamination category 2. Supply circuits and output circuits are designed to meet the standards of overvoltage class II.

- **Fuse protection, disconnecting device**: fuse protection for the feeding power circuit, and also a disconnecting device (switch, circuit breaker) for isolating the signal converters must be provided (see also Sect. 1.3.5).

**Power supply 100-230 V AC** *(Tolerance zone: 85-255 V AC)*

- Note information on instrument nameplate: supply voltage and frequency

- Connection diagrams for electrical connection between primary head and signal converter: refer to Section 1.3.5.

**Power supply 24 Volt AC / DC** *(Tolerance zone: AC 20.4 - 26.4 V / DC 18 - 31.2 V)*

- Note information on instrument nameplate: supply voltage and frequency

- For measurement reasons, connect an **FE functional ground conductor**.

- If connected to a functional extra-low voltage source (24 V AC / DC, 48 V AC), provide for protective separation (PELV) in conformity with e.g. VDE 0100 / VDE 0106 or IEC 364 / IEC 536, or equivalent national regulations.

- Connection diagrams for power supply and electrical connection between primary head and signal converter: refer to Section 1.3.5.

**IMPORTANT!**
For EEx versions, also pay regard to all special directions included in Sect. 6.1 and 13.
**Only the EEx primary head may be installed in the hazardous area. The signal converter must be installed outside the hazardous area!**
### 1.3 Electrical connection of separate primary heads

#### 1.3.1 General remarks on signal cables A and B and field current line C

Proper operation of the equipment is ensured when KROHNE signal cables A and B are used with foil screen and magnetic shield.

- Signal cables must be firmly installed.
- Shields are connected via stranded drain wires.
- Underwater or underground routing is possible.
- Insulating material flame-retardant to IEC 332.1 / VDE 0742.
- Low-halogen, unplasticized signal cables which remain flexible at low temperatures.

#### Signal cable A (type DS) with double shielding

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Stranded drain wire, 1st shield, 1.5 mm²</td>
</tr>
<tr>
<td>2</td>
<td>Insulation</td>
</tr>
<tr>
<td>3</td>
<td>Stranded wire 0.5 mm² (3.1 red/3.2 white)</td>
</tr>
<tr>
<td>4</td>
<td>Special foil, 1st shield</td>
</tr>
<tr>
<td>5</td>
<td>Insulation</td>
</tr>
<tr>
<td>6</td>
<td>Mu-metal foil, 2nd shield</td>
</tr>
<tr>
<td>7</td>
<td>Stranded drain wire, 2nd shield, 0.5 mm²</td>
</tr>
<tr>
<td>8</td>
<td>Outer sheath</td>
</tr>
</tbody>
</table>

#### Signal cable B (type BTS) with triple shielding (bootstrap line)

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<table>
<thead>
<tr>
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<th></th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Dummy glider wire</td>
</tr>
<tr>
<td>2</td>
<td>Insulation (2.1 red/2.2 white)</td>
</tr>
<tr>
<td>3</td>
<td>Special foil, 1st shield (3.1/3.2)</td>
</tr>
<tr>
<td>4</td>
<td>Insulation (4.1/4.2)</td>
</tr>
<tr>
<td>5</td>
<td>Stranded wire 0.5 mm² (5.1 red/5.2 white)</td>
</tr>
<tr>
<td>6</td>
<td>Stranded drain wire, 1st shield, 0.5 mm² (6.1 / 6.2)</td>
</tr>
<tr>
<td>7</td>
<td>Special foil, 2nd shield</td>
</tr>
<tr>
<td>8</td>
<td>Stranded drain wire, 2nd shield, 1.5 mm²</td>
</tr>
<tr>
<td>9</td>
<td>Insulation</td>
</tr>
<tr>
<td>10</td>
<td>Mu-metal foil, 3rd shield</td>
</tr>
<tr>
<td>11</td>
<td>Stranded drain wire, 3rd shield, 0.5 mm²</td>
</tr>
<tr>
<td>12</td>
<td>Outer sheath</td>
</tr>
</tbody>
</table>

#### Field current line C

Line $2 \times 0.75 \text{mm}^2$, $2 \times 1.5 \text{mm}^2$ or $4 \times 1.5 \text{mm}^2 \text{Cu}$, single shielding  
(Cu = copper cross section)  
The cross section depends on the required cable length, see table in Section 1.3.4.

**IMPORTANT!**  
For EEx versions, also pay regard to all special directions included in Sect. 6.1 and 13.  
Only the EEx primary head may be installed in the hazardous area.  
The signal converter must be installed outside the hazardous area!
1.3.2 Stripping (preparation) of signal cables

Please note: The numbers in the drawings designate the stranded drain wires of signalling cables A and B, see sectional drawings in Sect. 1.3.1.

### primary head

<table>
<thead>
<tr>
<th>Length</th>
<th>primary head</th>
</tr>
</thead>
<tbody>
<tr>
<td>mm</td>
<td>inch</td>
</tr>
<tr>
<td>a</td>
<td>90 3.60</td>
</tr>
<tr>
<td>b</td>
<td>8 0.30</td>
</tr>
<tr>
<td>c</td>
<td>25 1.00</td>
</tr>
<tr>
<td>d</td>
<td>8 0.30</td>
</tr>
<tr>
<td>e</td>
<td>70 2.80</td>
</tr>
</tbody>
</table>

### Converter

<table>
<thead>
<tr>
<th>Length</th>
<th>Converter</th>
</tr>
</thead>
<tbody>
<tr>
<td>mm</td>
<td>inch</td>
</tr>
<tr>
<td>a</td>
<td>40 2.80</td>
</tr>
<tr>
<td>b</td>
<td>10 0.30</td>
</tr>
<tr>
<td>d</td>
<td>5 0.30</td>
</tr>
<tr>
<td>e</td>
<td>20 2.00</td>
</tr>
</tbody>
</table>

Signal cable A (type DS), double shielding
for primary head

Signal cable A (type DS), double shielding
for IFC 210 E Converter

Signal cable B (type BTS), with triple shielding (bootstrap)
for primary head

Signal cable B (type BTS), with triple shielding (bootstrap)
for IFC 210 E Converter

Customer-supplied materials

- **V**  Tin-coat all stranded drain wire ends!
- **W**  Insulation tubing (PVC), Ø 2.0-2.5 mm (Ø 1")
- **X**  Heat-shrinkable tubing or cable sleeve
- **Y**  Wire end sleeve to DIN 41 228: E 1.5-8
- **Z**  Wire end sleeve to DIN 41 228: E 0.5-8
1.3.3 Grounding of primary head

- All flowmeters must be grounded.
- The grounding conductor should not transmit any interference voltages.
- Do not ground any other electrical device together with this conductor.
- The primary head is connected to ground by means of a FE functional ground conductor.
- Special information on grounding various primary heads is contained in the separate installation instructions for primary heads.
- These instructions also contain detailed descriptions on how to use grounding rings and how to install primary heads in metal or plastic pipes or internally coated pipelines.

IMPORTANT!
For EEx versions, also pay regard to all special directions included in Sect. 6.1 and 13.
Only the EEx primary head may be installed in the hazardous area.
The signal converter must be installed outside the hazardous area!

1.3.4 Cable lengths (max. distance between signal converter and primary head)

Abbreviations and explanatory notes
used in the following tables, diagrams and connection diagrams

A Signal cable A (type DS), with double shielding, see diagram A for max. length
B Signal cable B (type BTS) with triple shielding, max. length see diagram B
C Field current cable min. cross-section (AF) and max. length, see Table
D High-temperature silicone cable, 3 × 1.5 mm² (14 AWG) Cu, (with single shielding, max. length 5 m (16 ft)
E High-temperature silicone cable, 2 × 1.5 mm² (14 AWG) Cu, max. length 5 m (16 ft)
A_F Cross section of field current line C in Cu, see table
L Cable length
κ Electrical conductivity of the process liquid
ZD Intermediate connection box required in connection with cables D and E for primary heads ALTOFLUX IFS 4000 F, PROFIFLUX IFS 5000 F and VARIFLUX IFS 6000 F in cases where process temperatures exceed 150 °C (302 °F)
Recommended length of signal cable A (Type DS) and B (Type BTS)

<table>
<thead>
<tr>
<th>Primary head</th>
<th>Meter size</th>
<th>Signal cable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DN mm</td>
<td>inch</td>
</tr>
<tr>
<td>AQUAFLUX F</td>
<td>10 - 1600</td>
<td>3/8</td>
</tr>
<tr>
<td>ECOFLUX IFS 1000 F</td>
<td>10 - 15</td>
<td>3/8</td>
</tr>
<tr>
<td>ALTOFLUX IFS 2000 F</td>
<td>150 - 250</td>
<td>6</td>
</tr>
<tr>
<td>ALTOFLUX IFS 4000 F</td>
<td>10 - 150</td>
<td>3/8</td>
</tr>
<tr>
<td>PROFIFLUX IFS 5000 F</td>
<td>25 - 150</td>
<td>1/10</td>
</tr>
<tr>
<td>VARIFLUX IFS 6000 F</td>
<td>2.5 - 15</td>
<td>1/10</td>
</tr>
<tr>
<td>ALTOFLUX M 900</td>
<td>10 - 300</td>
<td>3/8</td>
</tr>
</tbody>
</table>

Field current cable C

<table>
<thead>
<tr>
<th>Length L</th>
<th>Cross section A_F (Cu), minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 150 m 5 – 500 ft</td>
<td>2 x 0.75 mm² / 2 x 18 AWG</td>
</tr>
<tr>
<td>150 – 300 m 500 – 1000 ft</td>
<td>2 x 1.50 mm² / 2 x 14 AWG</td>
</tr>
<tr>
<td>300 – 600 m 1000 – 1900 ft</td>
<td>4 x 1.50 mm² / 2 x 12 AWG</td>
</tr>
</tbody>
</table>
1.3.5 Connection diagrams for power supply and primary head

**PLEASE NOTE:** Undocumented contacts/terminals to remain unwired.

The figures in brackets indicate the stranded drain wires for the shields (see cross-sectional drawing of signal cable in Section 1.3.1).

- **Electrical connection to VDE 0100 "Regulations governing heavy-current installations with line voltages up to 1000 V" or equivalent national regulations.**

- **24 V AC / DC power supply:** Functional extra-low voltage with protective separation in conformity with VDE 0100, Part 410 or equivalent national regulations (IFC 020 E: 24 V DC in preparation).

- **Fuse protection of the feed line circuit with \( I_{RAT} \leq 16 \text{ A} \) is required. Also, a disconnecting device (switch/circuit breaker) must be provided in the vicinity of the solidly connected signal converters or device groups, refer to EN 61 010. This disconnecting device must be easy to reach and also identifiable as such.

- *Contacts 2\( d \), 2\( z \), 4\( d \), 4\( z \) of \( XA \) must be electrically connected.*

- **Connection to 8\( d \) and/or 8\( z \) of \( XA \).**

- ***Contacts d\( 2 \) to d\( 32 \) of \( XB \) are of leading type, for connection of PE (safety conductor) or FE (functional ground). At least 4 contacts with adequate cross-section to be electrically connected.***

**Important:**

Electrical connection of EEx primary heads and EEx signal converters To be carried out as described in Sect. 1.3.6.
Part A    System installation and start-up                                                                     Sect. 1.3.5

Process temperature < 150°C (302°F)

I  Signal cable A (type DS)  II  Signal cable B (type BTS)

Process temperature > 150°C (302°F)

III Signal cable A (type DS)  IV Signal cable B (type BTS)
1.3.6 EEx-Connection diagrams for power supply and primary head

Connection diagrams

PLEASE NOTE: Undocumented contacts/terminals to remain unwired.

The figures in brackets indicate the stranded drain wires for the shields (see cross-sectional drawing of signal cable in Section 1.3.1).

- Electrical connection to VDE 0100 "Regulations governing heavy-current installations with line voltages up to 1000 V" or equivalent national regulations.

- 24 V AC / DC power supply: Functional extra-low voltage with protective separation in conformity with VDE 0100, Part 410 or equivalent national regulations (IFC 020 E: 24 V DC in preparation).

- Fuse protection of the feed line circuit with $I_{RAT} \leq 16$ A is required. Also, a disconnecting device (switch/circuit breaker) must be provided in the vicinity of the solidly connected signal converters or device groups, refer to EN 61 010. This disconnecting device must be easy to reach and also identifiable as such.

\* Contacts 2d, 2z, 4d, 4z of XA must be electrically connected.

\** Connection to 8d and/or 8z of XA.

\*** Contacts d2 to d32 of XB are of leading type, for connection of PE (safety conductor) or FE (functional ground). At least 4 contacts with adequate cross-section to be electrically connected.

Important:
In respect of EEx versions, pay regard to all directions marked with the \( \text{Ex} \) symbol, and also the information given in Sect. 6.1 and 13. Only the EEx primary head may be installed in the hazardous area. The signal converter must be installed outside the hazardous area!
Process temperature < 150°C (302°F)

I Signal cable A (type DS)  II Signal cable B (type BTS)

IFC 210 E-EEx

<table>
<thead>
<tr>
<th>IFA</th>
<th>IFB</th>
<th>CPE/PA</th>
<th>PA</th>
</tr>
</thead>
</table>

Hazardous area

Primary head

Process temperature > 150°C (302°F)

III Signal cable A (type DS)  IV Signal cable B (type BTS)

IFC 210 E-EEx

<table>
<thead>
<tr>
<th>IFA</th>
<th>IFB</th>
<th>CPE/PA</th>
<th>PA</th>
</tr>
</thead>
</table>

Hazardous area

Primary head

Hazardous area

Primary head
Important:
In respect of EEx versions, pay regard to all directions marked with the symbol, and also the information given in Sect. 6.1 and 13. Only the EEx primary head may be installed in the hazardous area. The signal converter must be installed outside the hazardous area!

2.1 Current output I

- The current output is galvanically isolated from all input and output circuits.
- Setting data and functions can note down in Section 3.3. Please also refer to Sect. 3.2 Factory settings.
- Typical current output

![Diagram of current output](image)

- approx. 22-25 V DC positive voltage of current output
- current sink
- chassis ground, current output
- All operating data and functions can be set, see Sect. 4 and 5.6, Fct. 1.05 for operator control
- The current output can also be used as an internal voltage source for the binary outputs and inputs.
- $U_{int} = 22-25$ V DC $I = 23$ mA when operated without receiver instruments at the current output
  $I = 3$ mA when operated with receiver instruments at the current output
- Connection diagrams, see Sect. 2.5: diagrams ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩
2.2 Pulse output P

- The pulse output is galvanically isolated from the current output and all input circuits.
- Setting data and functions can be noted down in Section 3.3. Please also refer to Sect. 3.2 Factory settings.
- Typical pulse output P

```
P pulse output
```

- All operating data and functions can be set, see Sect. 4 and 5.7, Fct. 1.06 for operator control.
- The pulse output can be operated in the active or passive mode.
  - Active mode: The current output is the internal voltage source, connection of electronic totalizers (EC).
  - Passive mode: External DC or AC voltage source required, connection of electronic (EC) or electromechanical (EMC) totalizers.

Please note:
A fixed pulse width (0.01 – 1s) must be set for operation with EMC totalizer. Only then is an optocoupler active for higher output currents.

- Digital pulse division, interpulse period is non-uniform. Therefore, if frequency meters or cycle counters are connected, allow for minimum counting interval:
  - gate time, counter \( \leq \frac{1000}{P_{100\%} \, [\text{Hz}]} \)

- Connection diagrams, see Sect. 2.5: diagrams ③ ④ ⑤ ⑥
2.3 Status outputs B1 and B2

- The status outputs are galvanically isolated from the current output and all input circuits.

- Setting data and functions can be noted down in Section 3.3. Please also refer to Sect. 3.2 Factory settings.

- Typical status outputs B1 and/or B2

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+-------------------+-------------------+
<table>
<thead>
<tr>
<th>Status Outputs B1/B2</th>
<th>Status Outputs B1/B2</th>
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<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>B1</td>
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<tr>
<td></td>
<td>B2</td>
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<td></td>
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</tr>
<tr>
<td></td>
<td>chasis ground,</td>
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<tr>
<td></td>
<td>binary outputs and</td>
</tr>
<tr>
<td></td>
<td>inputs</td>
</tr>
</tbody>
</table>
```

- All operating data and functions can be set, see Sect. 4 and 5.9, Fct 1.07 and/or 1.08 for operator control

The status outputs can be operated in the active or passive mode.
Active mode: The current output is the internal voltage source.
Passive mode: External DC or AC voltage source required.

### Characteristics of the status outputs

<table>
<thead>
<tr>
<th>Status Outputs</th>
<th>Switch Open</th>
<th>Switch Closed</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF (switched off)</td>
<td>no function</td>
<td></td>
</tr>
<tr>
<td>ON (e.g. operation indicator)</td>
<td>Power supply OFF</td>
<td>Power supply ON</td>
</tr>
<tr>
<td>SIGN I (F/R mode)</td>
<td>Forward flow</td>
<td>Reverse flow</td>
</tr>
<tr>
<td>SIGN P (F/R mode)</td>
<td>Forward flow</td>
<td>Reverse flow</td>
</tr>
<tr>
<td>TRIP POINT (limit switch)</td>
<td>inactive</td>
<td>active</td>
</tr>
<tr>
<td>AUTO RANGE (automatic range change)</td>
<td>high range</td>
<td>low range</td>
</tr>
<tr>
<td>OVERFLOW I (I overranged)</td>
<td>current output OK</td>
<td>current output overranged</td>
</tr>
<tr>
<td>OVERFLOW, P (P overranged)</td>
<td>pulse output OK</td>
<td>pulse output overranged</td>
</tr>
<tr>
<td>SMU I (low-flow cutoff active)</td>
<td>Inactive</td>
<td>active</td>
</tr>
<tr>
<td>SMU P (low-flow cutoff active)</td>
<td>Inactive</td>
<td>active</td>
</tr>
<tr>
<td>ALL. ERROR (all errors)</td>
<td>errors</td>
<td>no error</td>
</tr>
<tr>
<td>FATAL ERROR (fatal errors only)</td>
<td>errors</td>
<td>no error</td>
</tr>
<tr>
<td>EMPTY PIPE (option)</td>
<td>when measuring tube is empty</td>
<td>when measuring tube is full</td>
</tr>
</tbody>
</table>

- Connection diagrams, see Sect. 2.5: diagrams ③ ⑥ ⑨ ⑬
2.4 Control inputs B1 and B2

- The control inputs are galvanically isolated from the current output and all input circuits.

- Setting data and functions can be noted down in Section 3.3. Please also refer to Sect. 3.2 Factory settings.

- Typical current inputs B1 and B2

  ![Control inputs B1 and B2 diagram]

- All operating data and functions can be set, see Sect. 4 and 5.10, Fct 1.07 and/or 1.08 for operator control.

- The control inputs must be operated in the passive mode.

<table>
<thead>
<tr>
<th>Function of the control inputs</th>
<th>Inactive no voltage</th>
<th>active voltage present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>No functions</td>
<td></td>
</tr>
<tr>
<td>External range</td>
<td>High range</td>
<td>Low range</td>
</tr>
<tr>
<td>Hold measured values</td>
<td>Measured values follow the measurement</td>
<td>Hold measured values</td>
</tr>
<tr>
<td>Measured values at zero</td>
<td>Measured values follow the measurement</td>
<td>Measured values set to &quot;zero&quot;</td>
</tr>
<tr>
<td>Reset totalizer</td>
<td>inactive</td>
<td>Reset totalizer</td>
</tr>
<tr>
<td>Delete errors</td>
<td>inactive</td>
<td>Delete error messages</td>
</tr>
</tbody>
</table>

Connection diagram, see Sect. 2.5: diagram 📚 📚
2.5 Connection diagrams for outputs and inputs

**Important:**
In respect of EEx versions, pay regard to all directions marked with the symbol, and also the information given in Sect. 6.1 and 13. Only the EEx primary head may be installed in the hazardous area. The signal converter must be installed outside the hazardous area!

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Current output (included HART®)</td>
</tr>
<tr>
<td>P</td>
<td>Pulse output</td>
</tr>
<tr>
<td>B1, B2</td>
<td>Status output (S) and/or Control input (C)</td>
</tr>
<tr>
<td></td>
<td><strong>Please note!</strong> Unwired contacts may not have any conductive connection with other electrically conducting parts.</td>
</tr>
<tr>
<td></td>
<td>Electrical connection to socket connector XC Wiring diagrams 1 to 10 of outputs and inputs.</td>
</tr>
<tr>
<td></td>
<td>Interface operation with HART® or RS 485 (Option) see Sect. 6.2.1 and 6.2.2.</td>
</tr>
</tbody>
</table>

**Active mode**
Power for operation (activation) of outputs and inputs supplied by the current output.

**Passive mode**
External power source required for operation (activation) of outputs and inputs.

1. Current output $I_{\text{activ}}$
   - $U = 0/4-20$ mA
   - $R_L < 800$ Ω
   - $I = 0/4-20$ mA

2. Current output $I_{\text{passiv}}$
   - $U_{\text{ext}} = 15-22$ V DC
   - $22-32$ V DC
   - $R_L = 0-500$ Ω
   - $0-800$ Ω
   - $I = 0/4-20$ mA
### Sect. 2.5

#### Part A  
System installation and start-up

<table>
<thead>
<tr>
<th></th>
<th>Pulsoutput $P_{\text{activ}}$ for electronic totalizer (EC)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$U_{\text{int}} = 22-25$ V DC from current output</td>
</tr>
<tr>
<td></td>
<td>$I_{\text{max}} \leq 3$ mA operation with current output</td>
</tr>
<tr>
<td></td>
<td>$I_{\text{max}} \leq 23$ mA operation without current output</td>
</tr>
</tbody>
</table>

#### Pulsoutput $P_{\text{passiv}}$ for electronic totalizer (EC) or electromechanical totalizer (EMC)

|   | EC: $U_{\text{ext}} \leq 32$ V DC / $I_{\text{max}} \leq 150$ mA |
|   | $f \leq 50$ Hz |
|   | EMC: $U_{\text{ext}} \leq 32$ V DC / $I_{\text{max}} \leq 20$ mA |

<table>
<thead>
<tr>
<th></th>
<th>Pulses</th>
<th>$\leq 1$ kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$R_{\text{load}}$</td>
<td>1-10 kΩ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1-3 kΩ</td>
</tr>
</tbody>
</table>

R = 10 kΩ, prevents incorrect counts when pulse output in open circuit

Where frequencies are > 100 Hz, use shielded cables (RFD)

<table>
<thead>
<tr>
<th></th>
<th>Statusoutput $S_{\text{activ}}$ (connection to B2 and/or B1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$U_{\text{int}} = 22-25$ V DC from current output</td>
</tr>
<tr>
<td></td>
<td>$I_{\text{max}} \leq 3$ mA operation with current output</td>
</tr>
<tr>
<td></td>
<td>$I_{\text{max}} \leq 23$ mA operation without current output</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Statusoutput $S_{\text{passiv}}$ (connection to B2 and/or B1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$U_{\text{ext}} \leq 32$ V DC / $I_{\text{max}} \leq 150$ mA</td>
</tr>
</tbody>
</table>

Where frequencies are > 100 Hz, use shielded cables (RFD)
### Sect. 2.5  Control input $C_{active}$ (connection to B2 and/or B1)

**$U_{int}$ = 22-25 V DC from current output**

- $I_{con} \leq 4$ mA (max. contact rating)

### Sect. 2.5  Control input $C_{passive}$ (connection to B2 and/or B1)

**$U_{ext}$ \leq 32 V DC / \leq 24 V AC**

- $I_{con} \leq 6$ mA (max. contact rating)

### Sect. 2.5  F/R measurement ($F$=forward) ($R$=reverse)

**Current output $I_{active}$ and/or pulse output $P_{active}$ (for EC) without external changeover relay**

- $U_{int}$ = 22-25 V DC from current output
- $I_{max} \leq 3$ mA operation with current output $I$
- $I_{max} \leq 23$ mA operation without current output $I$

### Sect. 2.5  F/R measurement ($F$=forward) ($R$=reverse)

**Current output $I_{passive}$ and/or pulse output $P_{passive}$ (for EC or EMC) without external changeover relay**

- $U_{ext}$ \leq 32 V DC / \leq 24 V AC
- $I_{max} \leq 150$ mA / $f \leq 50$ Hz
- $U_{ext}$ \leq 32 V DC
- $I_{max} \leq 20$ mA

<table>
<thead>
<tr>
<th>Pulses</th>
<th>\leq 1 kHz</th>
<th>&lt; 10 kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R$ (load)</td>
<td>1-10 kΩ</td>
<td>1-3 kΩ</td>
</tr>
</tbody>
</table>

### Diagram

- $R = 10$ kΩ, prevents incorrect counts when pulse output in open circuit
- Where frequencies are > 100 Hz, use shielded cables (RFD)

### Diagram

- $R = \text{load impedance with EC totalizer operation; for value refer to table above}$
- Where frequencies are > 100 Hz, use shielded cables (RFD)
3 Start-up

3.1 Power-on and measurement

* Before powering the system, please check that it has been correctly installed according to Sect. 1 and 2.
* The flowmeter is delivered ready for operational use. All operating data have been factory set in accordance with your specifications. Please refer to Sect. 3.2 “factory settings”.
* Power the unit, and the flowmeter will immediately start process flow measurement.
* Refer to Sect. 4 and 5 for operator control.

3.2 Factory setting

All operating data are factory set according to your order specifications.

If you have not made any particular specifications at the time of ordering, the instruments will be delivered with the standard parameters and functions listed in the Table below.

To facilitate easy and rapid initial start-up, current output and pulse output are set to process flow measurement in “2 flow directions”, so that the current flowrate is displayed and the volumetric flow counted independent of the flow direction. The measured values may possibly be shown with a “–” sign.

This factory setting for the current and pulse outputs may possibly lead to measuring errors, particularly in the case of volume flow counting:

For example, if pumps are switched off and a “backflow” occurs which is not within the range of the low-flow cutoff (SMU), or if separate displays and counts are required for both flow directions.

To avoid faulty measurements, therefore, it may be necessary to change the factory setting of some or all of the following functions:

- low-flow cutoff SMU, Fct. 1.03, Sect. 5.3
- display, Fct. 1.04, Sect. 5.4
- current output I, Fct. 1.05, Sect. 5.6
- pulse output P, Fct. 1.06, Sect. 5.7

Operation see Section 4 and 5.

### Standard factory settings

<table>
<thead>
<tr>
<th>Function</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.01 Full-scale range Qₘₐₓ</td>
<td>100%</td>
</tr>
<tr>
<td>1.02 Time constant</td>
<td>3 s, for I, B1, B2 and display</td>
</tr>
<tr>
<td>1.03 Low-flow cutoff SMU</td>
<td>ON: 1%, OFF: 2%</td>
</tr>
<tr>
<td>1.04 Display ( \text{flow rate} )</td>
<td>( \text{m}^3/\text{hr} ) or ( \text{US Gal/min} )</td>
</tr>
<tr>
<td>( \text{totalizer(s)} ) ( \text{Mittelwert} )</td>
<td>yes</td>
</tr>
<tr>
<td>Trend</td>
<td>1 sec. auto</td>
</tr>
<tr>
<td>Updating</td>
<td>Scaling</td>
</tr>
<tr>
<td>1.05 Current output I ( \text{function} )</td>
<td>2 directions</td>
</tr>
<tr>
<td>Range I</td>
<td>4-20 mA</td>
</tr>
<tr>
<td>Max</td>
<td>22 mA</td>
</tr>
<tr>
<td>I Error</td>
<td>22 mA</td>
</tr>
<tr>
<td>1.06 Pulse output P ( \text{function} )</td>
<td>2 directions</td>
</tr>
<tr>
<td>pulse width</td>
<td>50 ms</td>
</tr>
<tr>
<td>pulse value</td>
<td>1 pulse/s</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Function</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.07 Status output B1</td>
<td>flow directions</td>
</tr>
<tr>
<td>1.08 Control input B2</td>
<td>off</td>
</tr>
<tr>
<td>1.09 Language for display only</td>
<td>English</td>
</tr>
<tr>
<td>1.10 Flowmeter diameter ( \text{flow direction} ) ( \text{see nameplate} )</td>
<td></td>
</tr>
<tr>
<td>1.11 Application: Flow</td>
<td>steady</td>
</tr>
<tr>
<td>1.12 Hardware: Terminal B1</td>
<td>Status output B1</td>
</tr>
<tr>
<td>Control input B2</td>
<td></td>
</tr>
<tr>
<td>3.04 Location</td>
<td>ALTOMETER</td>
</tr>
<tr>
<td>3.05 User unit</td>
<td>Lit/hr or USMGal/day</td>
</tr>
<tr>
<td>3.06 Application: Flow</td>
<td>steady</td>
</tr>
<tr>
<td>3.07 Hardware: Terminal B1</td>
<td>Status output B1</td>
</tr>
<tr>
<td>Control input B2</td>
<td></td>
</tr>
<tr>
<td>3.08 Location</td>
<td>ALTOMETER</td>
</tr>
<tr>
<td>3.09 Communication</td>
<td>off</td>
</tr>
</tbody>
</table>
### 3.3 Setting data

Here you can note down the settings of the signal converter!

<table>
<thead>
<tr>
<th>Fct. No.</th>
<th>Function</th>
<th>Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.01</td>
<td>Full-scale range</td>
<td></td>
</tr>
<tr>
<td>1.02</td>
<td>Time constant</td>
<td></td>
</tr>
<tr>
<td>1.03</td>
<td>Low-flow cut-off</td>
<td>ON: OFF:</td>
</tr>
<tr>
<td>1.04</td>
<td>Display</td>
<td>Flow Totalizer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Messages</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Trend</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Updating</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Scaling</td>
</tr>
<tr>
<td>1.05</td>
<td>Current output I</td>
<td>Function</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reverse Range</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Range I</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I Max</td>
</tr>
<tr>
<td>1.06</td>
<td>Pulse output P</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Function</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pulswidth</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pulsvalue</td>
</tr>
<tr>
<td>1.07</td>
<td>Status output B1 or Control input B1</td>
<td>(for setting see below, Fct. No. 3.07, terminal B1)</td>
</tr>
<tr>
<td>1.08</td>
<td>Status output B2 or Control input B2</td>
<td>(for setting see below, Fct. No. 3.07, terminal B2)</td>
</tr>
<tr>
<td>3.01</td>
<td>Language</td>
<td></td>
</tr>
<tr>
<td>3.02</td>
<td>Primary head</td>
<td>Diameter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GK Value</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Field Frequency</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Line Frequency</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flow Direction</td>
</tr>
<tr>
<td>3.04</td>
<td>Entry code required ?</td>
<td>no yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>→ → ↓ ↓ ↑ ↑</td>
</tr>
<tr>
<td>3.05</td>
<td>User-defined unit</td>
<td></td>
</tr>
<tr>
<td>3.06</td>
<td>Application</td>
<td>Flow is</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ steady</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ pulsating</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Empty Pipe</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ no</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ yes</td>
</tr>
<tr>
<td>3.07</td>
<td>Hardware-setting</td>
<td>Terminal B1 is</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Status output</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Control input</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Terminal B2 is</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Status output</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Control input</td>
</tr>
<tr>
<td>3.08</td>
<td>Measuring point</td>
<td></td>
</tr>
<tr>
<td>3.09</td>
<td>Communication</td>
<td>□ off</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ HART or</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ KROHNE RS 485</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Address:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Baud rate:</td>
</tr>
</tbody>
</table>
4 Operation of the signal converter

4.1 KROHNE operator control concept

When this display appears, press following keys:

- - - -  ↓ ↓ ↑ ↑

Direction of movement:

↑ ↓ → → → → see Sect. 4.4

Menu column

Function column

- 3.09 Communication
- 3.08 Location
- 3.07 Hardware
- 3.06 Application
- 3.05 User Units
- 3.04 Entrycode
- 3.03 Zero Point
- 3.02 Flow Meter
- 3.01 Language

Data column

- - - -

- 2.03 Test Display
- 2.02 Hardwareinfo
- 2.01 Test Q

- 1.08 Out/Input B2
- 1.07 Out/Input B1
- 1.06 Pulsoutput P
- 1.05 Currentoutput I
- 1.04 Display
- 1.03 Low Flow Cutoff
- 1.02 Timeconstant
- 1.01 Full Scale

Measuring mode

1 3 6 4 9
m 3 / h r
4.2 Operating and check elements

- Graphic LCD
- 5 keys for operator control
- ImoCom interface

**Flowrate** in m³/hr
+ and – totalizer in m³

**Graphic display (Trend)**

**Flowrate** in m³/hr
sum totalizer in m³ (+ and – totalizer)

**Flowrate** in m³/hr
+ totalizer in m³
4.3 Function of keys

The cursor has a grey background in the following descriptions.

**To start operator control**

```
-298 m³/hr
Σ +00000.00 m³
Σ -05632.01
```

**To select a function**

```
1.06 Pulsoutput P
1.05 Currentoutput I
1.04 Display
1.03 Low Flow Cutoff
1.02 Timeconstant
1.01 Full Scale
```

---

**To select a subfunction**

```
1.05 Currentoutput I
```

---

**To alter texts**

```
Function: 1 Direction
Range I: 00 – 20 mA
I Max: 20.5 mA
```

---

**PLEASE NOTE:** When “yes” is set under Fct. 3.04 Entry Code, “Code” appears in the display after pressing the → key. The 9-keystroke Entry Code 1 must now be entered: → → → ↓ ↓ ↑ ↑ ↑ ↑ (each keystroke acknowledged by “*”).
To select next subfunction

Function:
2 Directions

Range I:
00 – 20 mA

I Max:
20.5 mA

To alter units

Full Scale
2 8 2 7 4 m³ hr
[00849 – 33929]

select next unit

Full Scale
7 8 5 3 . 9 Liter s
[0235.7 – 9424.7]

the numerical value is converted automatically

select preceding unit

To transfer to number setting

Full Scale
2 8 2 7 4 m³ hr
[00849 – 33929]

Full Scale
2 8 2 7 4 m³ hr
[00849 – 33929]

To shift cursor

Full Scale
2 8 2 7 4 m³ hr
[00849 – 33929]

shift to right

Full Scale
2 8 2 7 4 m³ hr
[00849 – 33929]

shift to left
To change numbers

Increase number

Full Scale

2 8 2 7 4

$m^3/hr$

[00849 – 33929]

Decrease number

Full Scale

2 8 3 7 4

$m^3/hr$

[00849 – 33929]

To revert to function display

1 x to several times Press key ↓

Full Scale

2 8 3 7 4

$m^3/hr$

[00849 – 33929]

Press key ↓

1.06 Pulsoutput P
1.05 Currentoutput I
1.04 Display
1.03 Low Flow Cutoff
1.02 Timeconstant
1.01 Full Scale

To terminate operator control

Press key ↓ repeatedly until one of the following menus
1.00 Operation, 2.00 Test or 3.00 Installation

3.00 Installation
2.00 Test
1.00 Betrieb

Press key ↓

Save changes:

3.00 Installation
2.00 Test
1.00 Betrieb

Store new parameters:
acknowledge by pressing key ↓.
Measuring mode continued with the new parameters.

New parameters not to be stored:
Press ↑ key 1 or 2 times:

1 × ↑)

Save changes: return
= return to parameter setting after pressing ↓ key.

2 × ↑)

Save changes: No
= new parameters not saved after pressing ↓ key.
Continue measuring mode with "old" parameters.
4.4 Table of settable functions

Abbreviations used

- **B1/B2**: Status output, control input
- **DN**: Nominal size, meter size
- **FM**: Conversion factor volume for any unit, see Fct. 3.05 "Factor Volume"
- **Fmax**: Highest frequency of pulse output
- **Fmin**: Lowest frequency of pulse output
- **FT**: Conversion factor time for any unit, see Fct. 3.05 "Factor Time"
- **GK**: Primary constant
- **I**: Current output
- **IPS**: Current at 0% flow
- **IM**: Current at 100% flow
- **I100%**: I Max.
- **P**: Pulse output
- **Pmax**: P Max.
- **PM**: Pulse output
- **I0%**: I 0%
- **I100%**: I 100%
- **IError**: I Error, I 0% ≤ I Error ≤ I max
- **Q**: actual flowrate
- **Q100%**: 100% flow = full scale range
- **Qmax**: = \( \frac{\pi}{4} \) DN² × v max = \( \) max. full-scale range Q100%
- **Qmax**: = \( \frac{\pi}{4} \) DN² × v max = \( \) max. full-scale range Q100%
- **Qmin**: = \( \frac{\pi}{4} \) DN² × v min = \( \) min. full-scale range Q100%
- **Qmin**: = \( \frac{\pi}{4} \) DN² × v min = \( \) min. full-scale range Q100%
- **SMU**: Low-flow cutoff for I and P
- **V**: Flow velocity
- **Vmax**: Max. flow velocity (12 m/s / 40 ft/s) at Q100%
- **Vmin**: Min. flow velocity (0.3 m/s / 1 ft/s) at Q100%
- **F/R**: Forward/Reverse flow at F/R operation
- **π**: 3.14159

### Fct. Display- Texts Description and settings

#### 1.00 OPERATION

**1.01 FULL SCALE**: Full-scale range for flowrate Q100%
- Select unit:
  - m³/hr
  - Liter/Sec
  - US.Gal/min
- user unit, factory set is Liter/hr or US MGal/day (see Fct. 3.05)
- Setting ranges:
  - The ranges are dependent on the meter size (DN) and the
  - flow velocity (v):
    - Q min = \( \frac{\pi}{4} \) DN² × v min
    - Q max = \( \frac{\pi}{4} \) DN² × v max
  - Nom. dia./meter size
    - DN 2.5–1600 / 1 /10 – 64: 0.0053 – 86 859 m³/hr
    - DN 2.5–1600 / 1 /10 – 64: 0.0237 – 401 080 US Gal/min

**VALUE P**: Pulse value has been changed.
- With the old pulse values the output frequency (F) would have been exceeded or not reached.
  - \( P_{\text{max}} = F_{\text{max}} / Q_{100\%} \), \( P_{\text{min}} = F_{\text{min}} / Q_{100\%} \)
  - Check new values!

#### 1.02 TIMECONST.

**Time constant**
- Select:
  - ALL (applies to display and all outputs)
  - ONLY Current output (only display, current and status outputs)
- Range:
  - 0.2 – 99.9 Sec

#### 1.03 L.F.CUTOFF

**Low-flow cutoff (SMU)**
- OFF (fixed values: ON = 0.1% / OFF = 0.2%)
- PERCENT (variable values)
  - ON
  - 1 – 19%
  - OFF
  - 2 – 20%

**Note**: Cutoff off value must be greater than cutoff on value.

**Press → key to return to Fct. 1.03 L.F. CUTOFF.**
**Part B     IFC 210 Signal converter                                                                                   Sect. 4.4**

**1.04 DISPLAY**

**Contrast**
- **Set display contrast**
  - range from +15 (high contrast) to -15 (low contrast)
  - Press ↵ key to transfer to subfunction “Flow”.

**Flow**
- **Set format for flow rate display**
  - #### • ### . # • ## . ### • Auto
  - Press ↵ key to move to unit selection.
  - Selection unit: m³/hr • Liter/Sec • US Gal/min
  - user unit, factory set is Liter/hr or US MGal/day (see Fct. 3.05)
  - Press ↵ key to transfer to subfunction “Totalizer”.

**Totalizer**
- **Set format for display of volume**
  - Select decimal positions:
    - ####### • ###### . # • ##### . ## • #### . ### • Auto
    - Press ↵ key to move to unit selection.
    - m³ • Liter • US Gal
  - user unit, factory set is Liter or US MGal (see Fct. 3.05)
  - Press ↵ key to transfer to subfunction “Messages”.

**Messages**
- **Additional displays wanted in measuring mode?**
  - no • yes (overlay additional messages)
  - Press ↵ key to transfer to subfunction “Trend”.

**Trend**
- **Set graphic display**
  - Selection:
    - Average (show average values over time base)
    - Min. & Max. (min./max. values over time base)
    - Every Value (all values numbered consecutively)
  - Press ↵ key to transfer to subfunction “Updating”.
  - When “every value” selected, transfer to subfunction “Scaling”.

**Updating**
- **Update measured values in graphic display**
  - (this not shown when ‘every value’ see above, selected)
  - Selection:
    - 0.1 Sec. • 0.2 Sec. • 0.5 Sec. • 1 Sec. • 2 Sec. • 5 Sek. • 1 Min. • 2 Min. • 5 Min.
  - Press ↵ key to transfer to subfunction “Scaling”.

**Scaling**
- **Set scaling of graphic display**
  - Selection:
    - 0% ... 100% • -25% ... 100%
    - 0% ... 50% • 50% ... 100%
    - -100% ... 0% • 25% ... -100%
    - -50% ... 0% • -100% ... -50%
    - Auto
  - Press ↵ key to return to Fct. 1.04 DISPLAY.

**1.05 Current output I**

**Function**
- **Set Function**
  - Off (switched off)
  - 1 Direction (1 flow direction)
  - 2 Directions (forward/reverse flow, F/R flow measurement)
  - Press ↵ key to transfer to subfunction “Range I”.

**Range I**
- **Set measuring range (I₀% ... I₁₀₀%)**
  - 0 - 20 mA • 4 - 20 mA (fixed ranges)
  - mA (user-defined range)
  - Range: I₀% - I₁₀₀%
  - (Value I₀% < I₁₀₀%)
  - 0 - 16 mA • 4 - 20 mA
  - Press ↵ key to transfer to number setting.
  - Press ↵ key to transfer to subfunction “I Max”.

**I Max**
- **Set I Max**
  - Selection:
    - 20.5 mA • 22 mA
  - Press ↵ key to transfer to subfunction “I Error”.

---

**Fct.** | **Display-Texts** | **Description and settings**
---|---|---
1.04 | DISPLAY | Display functions

**Contrast** | | Set display contrast

**Flow** | | Set format for flow rate display

**Totalizer** | | Set format for display of volume

**Messages** | | Additional displays wanted in measuring mode?

**Trend** | | Set graphic display

**Updating** | | Update measured values in graphic display

**Scaling** | | Set scaling of graphic display

**Current output I** | | Set Current output I

**Function** | | Set Function
Fct. Display- Texts Description and settings

1 Error
Set current for error identification (\(I_{err}\))
- 22 mA
- 0.0 mA (\(< I_{err} \), variable only, see above if \(I_{err} \) \(> 1 \) mA)
Press → key to transfer to number setting.
Press ↓ key to transfer to subfunction “Range I”.

Reverse Range
Set full-scale range for reverse flow
(appears only when 2 Directions selected, see above)
setting range: 005 - 150% of \(Q_{max}\)
(different value for reverse flow)
Press → key to transfer to number setting.
Press ↓ key to transfer to Fct. 1.05 “Current output I”.

1.06 Pulsoutput P
Set Pulsoutput P
Function
Set Function
Selection:
- Off (switched off)
- 1 Direction (1 flow direction)
- 2 Directions (forward/reverse flow, F/R flow measurement)
Press ↓ key to transfer to subfunction “Pulswidth”.

Pulswidth
Set pulse width
Selection:
- 0.01 - 1.00 Sec (only for \(F_{max} < 50\) pulse/s)
- automatic (= 50% of the period duration)
- symmetrical (= pulse duty ratio 1:1 over total range)
Press ↓ key to transfer to subfunction “Pulsvalue”.

Pulsvalue
Set pulse value
pulse value per unit
- 1/m³
- 1/Liter
- 1/US Gal
volume
- PulS/ user-defined unit, factory-set is Liter or US M.Gal (see Fct. 3.05)
pulse value per unit
- PulSe/Sec (=Hz)
- PulSe/min
- PulSe/hr
time
- PulSe/user-defined unit, factory-set is hr
(see Fct. 3.05)
Press ↓ key to return to Fct. 1.06 “Pulsoutput P”.

1.07 Output/Input B1
Assignment of terminal B1
see Fct. 3.07 Hardware:
Either STATUS OUTPUT or CONTROL INPUT
For settings, refer to one of the following descriptions.

1.08 Output/Input B2
Assignment of terminal B2
see Fct. 3.07 Hardware:
Either STATUS OUTPUT or CONTROL INPUT
For settings, refer to one of the following descriptions.

1.0 Status output B1 and/or B2
Setting as status output
- Off (status output switched off)
- On (status output switched on, e.g. as operation indicator)
EMPTY PIPE (signals that pipe is empty, only if option installed)
- SIGN.I or P (F/R flow measurement)
- Overflow I or P (overranging of outputs)
- SMU I or P (signals when low-flow cutoff is active)
- Inverse B1
- Trip Point: (press key ↓ to transfer to Characteristics)
Selection:
- + direction
- - direction
- 2 directions
(transfer to number setting)
Setting range 005 - 150%
- automatic range change (press ↓ key to transfer to number setting)
Setting range 05 - 80% (= ratio of lower to upper range)
- All Errors
- Fatal error only
Press ↓ key to return to Fct. 1.07 and/or 1.08 “Statusoutput”
### Fct. Display-Texts Description and settings

<table>
<thead>
<tr>
<th>Fct.</th>
<th>Display-Texts</th>
<th>Description and settings</th>
</tr>
</thead>
</table>
| **1.0** | Controlinput B1 and/or B2 | Set as Control input  
- Off (switched off)  
- Ext.Range (external range change)  
  - Setting range: 05 - 80% (= ratio of lower to upper range from 1:20 to 1:1.25. Value must be greater than that of Fct. 1.03 L.F. CUTOFF).  
  - Outp.Hold (hold value of outputs)  
  - Outp.Zero (set outputs to min.values)  
  - Total. Reset (reset totalizers)  
  - Error. Reset (delete error messages)  
  - Press $\downarrow$ key to transfer to number setting.  
  - Setting range: 05 - 80% (="ratio of lower to upper range from 1:20 to 1:1.25. Value must be greater than that of Fct. 1.03 L.F. CUTOFF).  
  - Outp.Hold (hold value of outputs)  
  - Outp.Zero (set outputs to min.values)  
  - Total. Reset (reset totalizers)  
  - Error. Reset (delete error messages)  
  - Press $\downarrow$ key to transfer to number setting. |
| **2.00** | Test | Description and settings  
**Test menu**  
- Test Q  
  - Precautionary query  
  - SURE NO  
  - Press $\downarrow$ key to return to Fct. 2.01 TEST Q.  
  - SURE YES  
  - Press $\rightarrow$ key to transfer to number setting.  
  - select value: -110 / -100 / -50 / -10 / 0 / +10 / +50 / +100 / +110 PCT.  
  - Press $\downarrow$ key to return to Fct. 2.01 "TEST Q".  
  - Of set full-scale range Q$_{100\%}$.  
  - Displayed value present at outputs I and P.  
  - Press $\downarrow$ key to return to Fct. 2.01 "TEST Q". |
| **2.02** | Hardwareinfo | Hardware information and error status  
- Before consulting factory, please note down all codes.  
- Modul ADC  
  - X.XXXXXX.XXX  
  - YYYYYYY  
  - Modul IO  
  - X.XXXXXX.XXX  
  - YYYYYYY  
  - Press $\downarrow$ key to transfer to next info.  
  - Modul DISP..  
  - X.XXXXXX.XXX  
  - YYYYYYY  
  - (only provided if “computer interface” Option installed)  
  - Press $\downarrow$ key to return to Fct. 2.02 "Hardwareinfo".  
  - Press $\downarrow$ key to transfer to next info.  
  - Modul RS  
  - X.XXXXXX.XXX  
  - YYYYYYY  
  - Press $\downarrow$ key to transfer to next info.  
  - Modul IO  
  - X.XXXXXX.XXX  
  - YYYYYYY  
  - Press $\downarrow$ key to return to Fct. 2.02 "Hardwareinfo". |
| **2.03** | Test Display | Press $\rightarrow$ key to start test of display, duration approx. 5 sec.  
- Press $\rightarrow$ key to return to Fct. 2.02 "Hardwareinfo".  
- Press $\rightarrow$ key to transfer to next info.  
- Modul RS  
  - X.XXXXXX.XXX  
  - YYYYYYY  
  - Press $\downarrow$ key to transfer to next info.  
  - Modul IO  
  - X.XXXXXX.XXX  
  - YYYYYYY  
  - Press $\downarrow$ key to return to Fct. 2.02 "Hardwareinfo".  
  - Press $\downarrow$ key to transfer to next info. |
| **3.00** | Installation | Installation menu  
**Installation menu**  
- Language  
  - Select language for display texts  
  - GB / USA (English)  
  - F (French)  
  - D (German)  
  - others on request  
  - Press $\downarrow$ key to return to Fct. 3.01 "Language".  
- Flowmeter  
  - Select data for primary head  
  - Diameter  
    - Select size from meter size table  
    - DN 2.5 - 3000 mm equivalent to $\frac{1}{10}$ – 120 inch  
    - Select with $\uparrow$ key.  
    - Press $\downarrow$ key to transfer to subfunction “Full Scale”.  
  - Full Scale  
    - Full-scale range for flow Q$_{100\%}$  
    - Selection unit: m³/hr  
    - Liter/Sec  
    - US Gal/min  
    - user unit, factory set is Liter/hr or US MGal/day (see Fct. 3.05)  
    - Press $\downarrow$ key to transfer to number setting.  
    - Setting ranges:  
      - The ranges are dependent on the meter size (DN) and the flow velocity ($v$).  
      - $Q_{min} = DN^2 \times v_{min}$  
      - $Q_{max} = DN^2 \times v_{max}$  
      - $v_{max} = 0.3$ m/s (1 ft/s)  
      - $v_{max} = 12$ m/s (40 ft/s)  
      - DN 2.5 - 1600 / $\frac{1}{10}$ – 64: 0.0053 – 86 859 m³/hr  
      - 0.0237 – 401 080 US Gal/min  
      - Press $\downarrow$ key to transfer to subfunction “Gk Value".  
      - Press $\downarrow$ key to transfer to number setting.  
      - Setting ranges:  
        - The ranges are dependent on the meter size (DN) and the flow velocity ($v$).  
        - $Q_{min} = DN^2 \times v_{min}$  
        - $Q_{max} = DN^2 \times v_{max}$  
        - $v_{max} = 0.3$ m/s (1 ft/s)  
        - $v_{max} = 12$ m/s (40 ft/s)  
        - DN 2.5 - 1600 / $\frac{1}{10}$ – 64: 0.0053 – 86 859 m³/hr  
        - 0.0237 – 401 080 US Gal/min  
        - Press $\downarrow$ key to transfer to subfunction “Gk Value". |
### Fct. Display-Texts Description and settings

#### Value P
Pulse value has been changed.
With the old pulse values the output frequency (F) would have been exceeded or not reached.

\[
P_{\text{max}} = \frac{F_{\text{max}}}{Q_{100\%}} \quad P_{\text{min}} = \frac{F_{\text{min}}}{Q_{100\%}}
\]

Check new values!

#### Gk Value
Set primary constant GK
see primary head nameplate.

Range: • 1.0000 - 9.9999

Press \(\uparrow\) key to transfer to subfunction “Field Frequency”.

#### Field Frequency
Set Magnetic field frequency \((f_{\text{Net}} = \text{power frequency})\)

\[
\begin{align*}
\frac{1}{2} \times f_{\text{Net}} & \quad \frac{1}{6} \times f_{\text{Net}} & \quad \frac{1}{18} \times f_{\text{Net}} & \quad \frac{1}{36} \times f_{\text{Net}}
\end{align*}
\]

Select with \(\uparrow\) key.

Press \(\downarrow\) key to transfer to subfunction “Flow Direction”.

#### Line Frequency
Normal line frequency in your country
This function is only provided for units with DC power supply

• 50 Hz • 60 Hz

Select with \(\uparrow\) key.

Press \(\downarrow\) key to transfer to subfunction “Flow Direction”.

#### Flow Direction
Define flow direction (in F/R mode: forward flow)

• + Direction • - Direction

Select with \(\uparrow\) key.

Press \(\downarrow\) key to return to Fct. 3.02 “Flowmeter”.

### 3.03 Zero Point
Zero calibration

- return (quit function without making change)
- calculate (calculate new zero value)

Press \(\downarrow\) key to start, duration approx. 15-90 seconds.

Save new value, select with \(\uparrow\) key:
- save no (do not save zero value)
- save yes (save new zero value)

Press \(\downarrow\) key to transfer to unit selection:

- m³/h • Liter/s • US Gal/min
- any unit, see Fct. 3.05 (factory setting: Liter/h)

Press \(\downarrow\) key to transfer to number setting.

Value may be max. 10% of \(Q_{100\%}\).

Press \(\downarrow\) key to return to Fct. 3.03 “Zero Point”.

### 3.04 Entrycode
Entry code required to enter setting mode?

- NO (= entry with \(\rightarrow\) only)
- YES (= entry with \(\rightarrow\) and Code 1: \(\rightarrow\) \(\rightarrow\) \(\rightarrow\) \(\rightarrow\) \(\rightarrow\) \(\rightarrow\))

Press \(\downarrow\) key to return to Fct. 3.04 “Entrycode”.

### 3.05 User Units
Set any required unit for flowrate and counting

#### Text Volume
Set text for required flowrate unit (max. 5 characters)

Factory-set: Liter or MGal.

Characters assignable to each place: • A-Z, a-z, 0-9, or — (= blank character)

Press \(\downarrow\) key to transfer to subfunction “Factor Volume”.

#### Factor Volume
Set conversion factor (FM) for volume

Factory set 1.00000 for Liter or 2.64172E-4 for US MGal (exponent notation, here: 1x\(10^1\) or 2.64172x\(10^{-4}\)).

Factor FM = volume per 1m³.

Setting range • 1.00000 E-9 to 9.99999 E+9 (= 10⁻⁹ to 10⁹)

Press \(\downarrow\) key to transfer to subfunction “Text Time”.

#### Text Time
Set text for required time unit (max. 5 characters)

Factory-set: hr.

Characters assignable to each place: • A-Z, a-z, 0-9, or — (= blank character)

Press \(\downarrow\) key to transfer to subfunction “Factor Time”.

#### Factor Time
Set conversion factor (FT) for time

Factory-set: 3.60000 E+3 for hour or 8.64000 E+4 for day (exponent notation, here: 3.6 x\(10^3\) or 8.64 x\(10^4\)).

Set factor FT in seconds.

Setting range • 1.00000 E-9 to 9.99999 E+9 (= 10⁻⁹ to 10⁹)

Press \(\downarrow\) key to return to Fct. 3.05 “User Units”.
### Fct. 3.06 Application

#### Display-Texts
**Set application conditions**

<table>
<thead>
<tr>
<th>Application</th>
<th>Description and settings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Flow</strong></td>
<td>Set characterization for flow</td>
</tr>
<tr>
<td></td>
<td>• Steady (steady flow, max. 150% of Q&lt;sub&gt;100%&lt;/sub&gt;)</td>
</tr>
<tr>
<td></td>
<td>• Pulsating (pulsating flow, up to 1000% of Q&lt;sub&gt;100%&lt;/sub&gt;)</td>
</tr>
<tr>
<td></td>
<td>e.g. caused by reciprocating pumps, refer to Sect. 6.4)</td>
</tr>
<tr>
<td>Press ↓ key to transfer to subfunction “Empty Pipe”.</td>
<td></td>
</tr>
<tr>
<td><strong>Empty Pipe</strong></td>
<td>Signal when measuring tube is empty (refer to Sect. 6.3)</td>
</tr>
<tr>
<td></td>
<td>• no  • yes (possible only with built-in option)</td>
</tr>
<tr>
<td>Press ↓ key to return to Fct. 3.06 “Application”.</td>
<td></td>
</tr>
</tbody>
</table>

#### Application

<table>
<thead>
<tr>
<th>Flow</th>
<th>Steady (steady flow, max. 150% of Q&lt;sub&gt;100%&lt;/sub&gt;)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulsating</td>
<td>(pulsating flow, up to 1000% of Q&lt;sub&gt;100%&lt;/sub&gt;)</td>
</tr>
<tr>
<td>e.g. caused by reciprocating pumps, refer to Sect. 6.4)</td>
<td></td>
</tr>
</tbody>
</table>

**Press ↓ key to transfer to subfunction “Empty Pipe”.**

<table>
<thead>
<tr>
<th>Empty Pipe</th>
<th>Signal when measuring tube is empty (refer to Sect. 6.3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>no</td>
<td>yes (possible only with built-in option)</td>
</tr>
</tbody>
</table>

**Press ↓ key to return to Fct. 3.06 “Application”.**

#### Fct. 3.07 Hardware

**Assign outputs and inputs to terminals B1 and B2**

<table>
<thead>
<tr>
<th>Terminal B1</th>
<th>Define function of terminal B1 (valid for Fct. 1.07)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Statusoutput • Controlinput (Select with ↑ key.)</td>
</tr>
<tr>
<td></td>
<td>Press ↓ key to transfer to subfunction “Terminal B2”.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Terminal B2</th>
<th>Define function of terminal B2 (valid for Fct. 1.08)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Statusoutput • Controlinput (Select with ↑ key.)</td>
</tr>
<tr>
<td></td>
<td>Press ↓ key to transfer to subfunction “Fieldcurrent”.</td>
</tr>
</tbody>
</table>

**Fieldcurrent**

Define field current supply

<table>
<thead>
<tr>
<th></th>
<th>Intern</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Extern (&gt; DN 1600 / &gt; 64” with power driver)</td>
</tr>
</tbody>
</table>

**Press ↑ key to return to Fct. 3.07 “Hardware”.**

#### Fct. 3.08 Location

**Set measuring point tag**

Factory setting: ALTOMETER

Characters assignable to each place:

| A-Z, a-z, 0-9 or . (blank character). |

**Press ↑ key to return to Fct. 3.08 “Location”.**

#### Fct. 3.09 Communication

**Set communication interface**

<table>
<thead>
<tr>
<th></th>
<th>Off (switched off)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HART (HART®-interface switched on)</td>
</tr>
<tr>
<td></td>
<td>KROHNE (KROHNE RS 485-interface switched on), (only provided if daughter board installed (option).)</td>
</tr>
<tr>
<td></td>
<td>Address: „HART“ 00-15 / „KROHNE“ 000-239</td>
</tr>
<tr>
<td></td>
<td>Baud rate: 1200, 2400, 4800, 9600 or 19200 (appears with selection “KROHNE” only)</td>
</tr>
</tbody>
</table>

**Press ↑ key to return to Fct. 3.09 “Communication”.**
### 4.5 Error messages in measuring mode

The following list gives all errors that can occur during process flow measurement. Errors shown in display when “Yes” set in Fct. 1.04 Display, subfunction “Messages.”.

<table>
<thead>
<tr>
<th>Error messages</th>
<th>Description of error</th>
<th>Error clearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line Int.</td>
<td>Power failure</td>
<td>Cancel error in Reset-Quit menu, see Sect. 4.6. Reset totalizer if necessary.</td>
</tr>
<tr>
<td></td>
<td>Note: no counting during power failure</td>
<td></td>
</tr>
<tr>
<td>Overflow I</td>
<td>Current output overranged (Flow &gt; I Max)</td>
<td>Check and if necessary correct instrument parameters. After elimination of cause, error message deleted automatically.</td>
</tr>
<tr>
<td>Overflow P</td>
<td>Pulse output overranged. (Flow &gt; I Max)</td>
<td>Check and if necessary correct instrument parameters. After elimination of cause, error message deleted automatically.</td>
</tr>
<tr>
<td>Totalizer</td>
<td>Totalizer has been reset.</td>
<td>Cancel error message in Reset/Quit. menu, see Sect. 4.6.</td>
</tr>
<tr>
<td>ADC</td>
<td>Analog / digital converter overranged</td>
<td>Error message deleted automatically after elimination of cause.</td>
</tr>
<tr>
<td>Fatal Error</td>
<td>Fatal error, all outputs set to “min. values”</td>
<td>Please consult factory.</td>
</tr>
<tr>
<td>Empty Pipe</td>
<td>Pipe has run dry. This message appears only when the “empty pipe identifier” option is installed and the function is switched on under Fct. 3.06 Application, submenu “Empty Pipe”.</td>
<td>Fill pipe.</td>
</tr>
</tbody>
</table>
4.6 Reset totalizer and cancel error messages

Cancel error messages in RESET / QUIT menu

<table>
<thead>
<tr>
<th>Key</th>
<th>Display</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>↓</td>
<td>Code 2</td>
<td>Key in entry code 2 for Reset / Quit menu: ↑ →</td>
</tr>
<tr>
<td>↑ →</td>
<td>Error Quit ....</td>
<td>Menu for error acknowledgement</td>
</tr>
<tr>
<td>↑</td>
<td>... Yes</td>
<td>Delete error messages</td>
</tr>
<tr>
<td>↓</td>
<td>Reset totalizer ...</td>
<td></td>
</tr>
<tr>
<td>↓</td>
<td>- - - - - - - / - - -</td>
<td>Return to measuring mode</td>
</tr>
</tbody>
</table>

Reset totalizer(s) in RESET / QUIT menu

<table>
<thead>
<tr>
<th>Key</th>
<th>Display</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>↓</td>
<td>Code 2</td>
<td>Key in entry code 2 for Reset / Quit menu: ↑ →</td>
</tr>
<tr>
<td>↑ →</td>
<td>Error Quit ....</td>
<td>Menu for error acknowledgement</td>
</tr>
<tr>
<td>↓</td>
<td>Reset totalizer ...</td>
<td></td>
</tr>
<tr>
<td>→</td>
<td>... No</td>
<td>Do not delete error messages, press ↓ twice = return to measuring mode.</td>
</tr>
<tr>
<td>↑</td>
<td>... Yes</td>
<td>Reset totalizer</td>
</tr>
<tr>
<td>↓</td>
<td>- - - - - - - / - - -</td>
<td>Return to measuring mode</td>
</tr>
</tbody>
</table>

4.7 Examples of setting the signal converter

As an example the cursor, flashing part of display, is shown below in **bold** type.

- Change measuring range of current output and value for error messages (Fct. 1.05):
  - Change measuring range from 04-20 mA to 00-20 mA
  - Change value for error messages from 0 mA to 22 mA

<table>
<thead>
<tr>
<th>Key</th>
<th>Display</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>→</td>
<td>Fct. 1.00</td>
<td>Operation</td>
</tr>
<tr>
<td>→</td>
<td>Fct. 1.01</td>
<td>Full Scale</td>
</tr>
<tr>
<td>→</td>
<td>Fct. 1.05</td>
<td>Current output</td>
</tr>
<tr>
<td>→</td>
<td>4 × ↑</td>
<td>Function</td>
</tr>
<tr>
<td>→</td>
<td>04-20</td>
<td>Range I</td>
</tr>
<tr>
<td>→</td>
<td>00-20</td>
<td>mA</td>
</tr>
<tr>
<td>2 x ↓</td>
<td>I Error</td>
<td>mA</td>
</tr>
<tr>
<td>↑</td>
<td>22</td>
<td>mA</td>
</tr>
<tr>
<td>↓</td>
<td>Fct. 1.05</td>
<td>Old value for error messages</td>
</tr>
<tr>
<td>↓</td>
<td>Fct. 1.00</td>
<td>New value for error messages</td>
</tr>
<tr>
<td>↓</td>
<td>- - - - - - - / - - -</td>
<td>Measuring range with new data for the current output</td>
</tr>
</tbody>
</table>
5 Description of functions

5.1 Full-scale range \( Q_{100\%} \) (Fct. 1.01)

Fct. 1.01 FULL SCALE
Press → key.

Choice of unit for full-scale range \( Q_{100\%} \)
- \( \text{m}^3/\text{hr} \) (cubic metres per hour)
- Liter/Sec (litres per second)
- US Gal/min (US gallons per minute)
- User-defined unit, factory-set is "Liter/hr" (litres per hour) or "US MGal/day", see Sect. 5.07

Select with ↑ or ↓ key.
Use → key to transfer to numerical setting, 1st number (cursor) flashes.

Set full-scale range \( Q_{100\%} \)
The setting range is dependent on meter size (DN) and flow velocity (v).

\[
Q_{min} = \frac{\pi}{4} \times DN^2 \times v_{min} \quad Q_{max} = \frac{\pi}{4} \times DN^2 \times v_{max}
\]

(see Sect. 10.2)

0.00531 -- 86 858 \( \text{m}^3/\text{hr} \)
0.00147 -- 24 120 Liter/Sec
0.02335 -- 382 420 US Gal/min

Change flashing number (cursor) with ↑ or ↓ key.
Use → key to shift cursor 1 place to right.
Press ↓ key to return to Fct. 1.01 Full Scale.

Note if "Pulsvalue" is displayed after pressing ↓ key:
Pulse/Val. is set under Fct. 1.06 Puls B1, subfunction "Select P". Due to the changed full-scale range \( Q_{100\%} \), the output frequency (F) of the pulse output will be over- or undershot:

\[
P_{min} = \frac{F_{min}}{Q_{100\%}} \quad P_{max} = \frac{F_{max}}{Q_{100\%}}
\]

Change pulse value accordingly, see Sect. 5.7 pulse output P, Fct. 1.06.

5.2 Timeconstant (Fct. 1.02)

Fct. 1.02 Timeconstant
Press → key.

Choice
- All (applies to display and all outputs)
- Only I (applies only to display, current and status output)

Select with ↑ or ↓ key.
Transfer to number setting with ↓ key. 1st number (cursor) flashes.

Set numerical value
- 0.2 - 99.9 Sec (seconds)

Change flashing number (cursor) with ↑ or ↓ key.
Use → key to shift cursor 1 place to right.
Press ↓ key to return to Fct. 1.02 Timeconstant.
5.3 Low Flow Cutoff (Fct.1.03)

**Fct. 1.03 Low Flow Cutoff**

Press → key.

**Choice**
- Off fixed tripping point: ON = 0.1% / OFF = 0.2%
- Percent variable tripping points: ON = 1 - 19% / OFF = 2 - 20%

Select with ↑ or ↓ key.

Transfer to number setting using → key (only if “PERCENT” selected).

1st number (cursor) flashes.

**Setting the numerical value when “Percent” selected**
- 01 to 19 (cutoff “on” value, left of hyphen)
- 02 to 20 (cutoff “off” value, right of hyphen)

**Note:** The cutoff “off” value must be greater than the cutoff “on” value.

Use → key to shift cursor 1 place to right.

Press ↵ key to return to Fct. 1.03 Low Flow Cutoff.

5.4 Internal electronic totalizer

The internal electronic totalizer counts in m³, regardless of the unit set under Fct. 1.04, subfunction “totalizer.”

The counting range is dependent upon the meter size and has been selected such that the totalizer will count for a minimum of 1 year without overflow:

<table>
<thead>
<tr>
<th>DN mm</th>
<th>Counting range</th>
<th>US Gal equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5 - 50</td>
<td>0 - 999 999 99999999</td>
<td>0 - 264 172 052 358.00</td>
</tr>
<tr>
<td>65 - 200</td>
<td>0 - 9 999 999 9999999</td>
<td>0 - 2 641 720 523 580.00</td>
</tr>
<tr>
<td>250 - 600</td>
<td>0 - 99 999 999 999999</td>
<td>0 - 26 417 205 235 800</td>
</tr>
<tr>
<td>700 - 1600</td>
<td>0 - 999 999 999 9999</td>
<td>0 - 264 172 052 358.00</td>
</tr>
</tbody>
</table>

Only part of the totalizer count is shown in the display because it is not possible to output a 14-digit number. Unit and format of the display are freely selectable, see Fct. 1.04, subfunction “totalizer” and Sect. 5.5. This determines which part of the count is to be displayed.

Display overflow and totalizer overflow are independent of one another.

**Example**

Internal count 0000123 . 7654321 m³

Format, display unit XXXX . XXX Liter

Internal count in unit 0123765 . 4321000 Liter

Displayed 3765 . 432 Liter
5.5 Display (Fct. 1.04)

Fct. 1.04 Display

Press → key.

Contrast = set required contrast
- Range adjustable from +15 (high contrast) to –15 (= low contrast)

Change setting with ↑ or ↓ key,
Press ↓ key to transfer to subfunction "flow".

Flow = set required flow unit and number format
- Auto
- # . ####
- ## . ##
- ### . # Change setting with ↑ or ↓ key,
- #### Transfer to Unit Selection with → key.
- m³/hr (cubic metres per hour)
- Liter/Sec (litres per second)
- US Gal/min (US gallons per minute)
- User-defined unit, factory setting = Liter/hr (litres per hour) or US MGal/day, see Sect. 5.17

Select with ↑ or ↓ key.
Press ↓ key to change to subfunction "totalizer".

Totalizer = set required totalizer unit and number format
- Auto
- # . ###### (= exponent notation)
- ## . ####
- ### . ####
- #### . ###
- ##### . # Change setting with ↑ or ↓ key,
- ###### Transfer to Unit Selection with → key.
- m³ (cubic metres)
- Liter (litres)
- US. Gal (US gallons)
- User-defined unit, factory setting = Liter (litres) or US MGal/day, see Sect. 5.17

Select with ↑ or ↓ key.
Press ↓ key to change to subfunction "messages".
Messages: additional messages desired in measuring mode

- No (no additional messages)
- Yes (display additional messages, e.g. errors, in sequence with measured values)

Select with ↑ or ↓ key.
Press ↓ key to change to subfunction “Trend”.

Trend = set graphic display (trend)

- Mean values Show mean values over time base
- Min. & Max. Min./Max. values over time base
- Every value All values numbered consecutively

Select with ↑ or ↓ key.
Press ↓ key to transfer to subfunction “Updating”.

Updating = update measured values in the graphic display
(This selection not shown when "every value" selected, see above)

Selection:

- 0.1 sec. • 0.2 sec. • 0.5 sec. • 1 sec. • 2 sec.
- 5 sec. • 1 min. • 2 min. • 5 min.

Select with ↑ or ↓ key.
Press ↓ key to transfer to subfunction "Scaling"

Scaling = Set scaling of graphic display

Selection:

- Auto • 0% ... 100% • 100% ... 0% • -100% ... 100% • -100% ... 25%
- -100% ... 50% • -50% ... 0% • 50% ... 100% • -100% ... -50%
- 0% ... 50% • 50% ... 100% • -100% ... -50%

Select with ↑ or ↓ key.
Press ↓ key to return to Fct. 1.04 Display

Please refer to Section 3.2 Factory settings
5.6 Current output I (Fct. 1.05)

**Fct. 1.05 Current output I**

*Press → key.*

**Function** = Select function for current output.
- **Odd** switched off, no function
- **1 Direction** 1 flow direction
- **2 Directions** 2 flow directions, F/R mode, forward/reverse

Select with ↑ or ↓ key. *Press ↓ key to change to subfunction “Range I”.*

**Exceptions:** When “Off” selected, return to Fct. 1.05 Current output I.

**Range I = select measuring range (I₀% - I₁₀₀%)***
- 0 - 20 mA
- 4 - 20 mA
- mA (user-defined value) \[ I₀% = \frac{I₁₀₀%}{0...16\ mA - 4...20\ mA} \] (Wert \( I₀% < I₁₀₀% \))

*Press → key to transfer to number setting. Select with ↑ or ↓ key. Press ↓ key to change to subfunction “I Max”.*

**I Max = Set (I_max)**
- 20.5 mA
- 22 mA

Select with ↑ or ↓ key. *Press ↓ key to change to subfunction “I Error”.*

**I Error = set error value, (I_{error})***
- 22 mA (fixed value)
- 0.0 - \( I₀% \) mA variable value; only variable when \( I₀% > 1 \) mA, see “Range I” above)

Select with ↑ or ↓ key. *Press ↓ key to change to subfunction “Reverse Range”.*

**Reverse Range = define full-scale range for reverse flow***
- XXX . XX % 5 - 150 % of full-scale range for forward flow

Change negative-image number (cursor) using ↑ or ↓ key, Move cursor 1 place to right with → key. *Press ↓ key to return to Fct. 1.05 Current output I*

---

Please refer to Sect. 3.2 Factory settings.

Refer to Sect. 2.5 for connection diagrams, and to Sect. 5.22 for characteristics.
5.7 Pulsoutput P (Fct. 1.06)

**Fct. 1.06 Pulsoutput P**

*Press → key.*

**Function** = select function for pulse output.
- **Off** switched off, no function
- **1 Direction** 1 flow direction
- **2 Directions** 2 flow directions, F/R mode, forward/reverse

*Select with ↑ or ↓ key.*

*Press ↓ key to change to subfunction “Pulswidth”.*

**Exceptions:** When “Off” selected, return to Fct. 1.06 Pulsoutput P.

**Pulswidth** = Set puls width
- **0.01 – 1.00 s** Only for \( F_{\text{max}} < 50 \) pulses (select this function when operating with EMC.)
- **Automatic** = 50 % of cycle duration of 100 % output frequency
- **Symmetric** = pulse duty factor 1:1 across entire range

*Please note !*

\[
F_{\text{min}} = 10 \text{ pulses/hr} \\
F_{\text{max}} = \frac{1}{2 \times \text{Pulswidth}[s]} \leq 10 \text{ kHz, if “automatic” or “symmetric is selected under subfunction Pulswidth.}
\]

*Select with ↑ or ↓ key.*

*Press ↓ key to change to subfunction “Pulswidth”.*

**Pulse value** = set pulse value

- **Pulses per unit volume**
  - \( 1/\text{m}^3 \)
  - \( 1/\text{Liter} \)
  - \( 1/\text{US Gal} \)
  - any unit, see Fct. 3.05, factory-set is “Pulses per Liter”

- **Pulses per unit time**
  - \( 1/\text{s} (= \text{Hz}) \)
  - \( 1/\text{min} \)
  - \( 1/\text{h} \)
  - any unit, see Fct. 3.05, factory-set is “Pulses per hour”

*Select with ↑ or ↓ key.*

*Press ↓ key to return to Fct. 1.06 Pulsoutput P*

---

Please refer to Sect. 3.2 Factory settings .

Refer to Sect. 2.5 for connection diagrams, and to Sect. 5.22 for characteristics.
5.8 Statusoutput B1 and / or B2

Statusoutput: Fct. 1.07 (output terminal B1) and Fct. 1.08 (output terminal B2)

Press → key.

Select function of status outputs, Select with ↑ or ↓ key.

- Off switched off, no function
- On indicates that flowmeter is operative
- All Error indicates all errors
- Only Fatal indicates fatal errors only
- Signum for V/R mode, measurement in both flow directions, see also Sect. 5.10
  - I or P
- Overrange I or P signals overranging of outputs
- Low Flow Cutoff signals active low-flow cutoff (SMU)
  - I or P
- Invers B1 Status output B2 inverse function to B1
  (only provided if B1 and B2 are set as status output)
- Trip Point
  Define flow direction (characteristics) for limit value
  - + direction
  - - direction Select with ↑ or ↓ key
  - 2 directions

Define limit value

<table>
<thead>
<tr>
<th>NO contact:</th>
<th>XXX &gt; YYY</th>
<th>NC contact:</th>
<th>XXX &lt; YYY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hysteresis:</td>
<td>Difference XXX to YYY</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Transfer to number setting with ↓ key,
1st number (cursor) with negative image.
Change negative-image number (cursor) with ↑ or ↓ key, move cursor 1 place to right or left with → and ← key, resp..

- Auto Range see also Sect. 5.11
  Setting range: 05 – 80 %
  ratio of upper to lower range, 1:20 to 1:1.25
  (value must be greater than that of Fct. 1.03 L.F.Cutoff, s. also Sect. 5.3)
- Empty Pipe Signals that tube is empty (only with built-in option), see Sect. 6.4 – 6.6.

Press ↓ key to return to Fct. 1.07 or 1.08 Statusoutput.

<table>
<thead>
<tr>
<th>Characteristics of status outputs</th>
<th>Switch open</th>
<th>Switch closed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off (switched off)</td>
<td>no function</td>
<td></td>
</tr>
<tr>
<td>On (e.g. operation indicator)</td>
<td>power OFF</td>
<td>power ON</td>
</tr>
<tr>
<td>Empty Pipe</td>
<td>Tube is empty</td>
<td>Tube is full</td>
</tr>
<tr>
<td>Signum I or P</td>
<td>Forward flow</td>
<td>Reverse flow</td>
</tr>
<tr>
<td>Overrange I or P</td>
<td>not overranged</td>
<td>overranged</td>
</tr>
<tr>
<td>Low Flow Cutoff I or P</td>
<td>inactive</td>
<td>active</td>
</tr>
<tr>
<td>Invers B1</td>
<td>B2 closed</td>
<td>B2 open</td>
</tr>
<tr>
<td>Trip Point (limit switch)</td>
<td>inactive</td>
<td>active</td>
</tr>
<tr>
<td>Auto Range</td>
<td>high range</td>
<td>low range</td>
</tr>
<tr>
<td>All Error (all errors)</td>
<td>errors</td>
<td>no error</td>
</tr>
<tr>
<td>Only Fatal (fatal errors only)</td>
<td>errors</td>
<td>no error</td>
</tr>
</tbody>
</table>

Please refer to Sect. 3.2 Factory settings.

Refer to Sect. 2.5 for connection diagrams, and to Sect. 5.22 for characteristics.
5.9 Controlinput
Controlinput: Fct. 1.07 (output terminal B1) and Fct. 1.08 (output terminal B2)
Press → key.

Select function of control inputs, Select with ↑ or ↓ key.
- Off switched off, no function
- Hold Value hold value of outputs and display
- Zero Value set outputs and display to “min. values”
- Total Reset reset totalizers
- Error Reset delete/acknowledge error messages
- Extern Range external range change

Setting range: 05 – 80 %
Ratio of high to low range, 1:20 to 1:1.25, (value must be greater than that of Fct. 1.03 L.F.Cutoff, s. also Sect. 5.3)

Press → key to return to Fct. 1.07 or 1.08 Statusoutput.

Characteristics of status inputs
<table>
<thead>
<tr>
<th>inactive (no voltage)</th>
<th>active (voltage present)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>no function</td>
</tr>
<tr>
<td>Extern Range</td>
<td>high range/low range</td>
</tr>
<tr>
<td>Hold Value</td>
<td>measured values follow the measurement/hold measured values</td>
</tr>
<tr>
<td>Zero Value</td>
<td>measured values follow the measurement/set measured values to “zero”</td>
</tr>
<tr>
<td>Total Reset</td>
<td>inactive/Reset totalizer</td>
</tr>
<tr>
<td>Error Reset</td>
<td>inactive/Delete error messages</td>
</tr>
</tbody>
</table>

5.10 F/R mode, forward/reverse flow measurement
- Refer to Sect. 2.5 for electrical connection of outputs.
- Define direction of forward (normal) flow, see Fct. 3.02, subfunction Flow Dir.:
  in conjunction with F/R operation, set the direction for the forward flow here.
  “+” signifies the same direction as shown by the arrow on the primary head,
  “-“ signifies the opposite direction.
- Set the status output to SIGN I or SIGN P, see Fct. 1.07.
- Current and/or pulse output must be set to 2 Directions,
  see Fct. 1.05 and/or 1.06, subfunction “Function”.
5.11 Set limit values (status output B1 and/or B2)

(Before the following settings can be carried out, set the “Status output” mode for output terminals B1 and/or B2 in Fct. 3.07, see Sect. 5.19.)

**Status output: Fct. 1.07** (output terminal B1) and/or **Fct. 1.08** (output terminal B2)

- Press → key.
- **Set Function "Trip Points"** with ↑ or ↓ key.
- Press ↓ key.
- **Set flow direction:**
  - + direction
  - − direction
  - 2 directions
- Press ↓ key. Display: XXX - YYY
- **Set Trip Point**, cursor for the 1st digit shown negatively.
  - Set with ↑ or ↓ keys.
  - Use → key to shift cursor 1 place to right.
  - **Setting ranges** for XXX and YYY:
    - 0 – 150 % of Q100% full-scale range
    - hysteresis ≥ 1%
    - (=difference between XXX and YYY value)
- Press ↓ key to return to Fct. 1.07 or 1.08 Statusoutput.
- **Switching behaviour** (N/O or N/C contact) and **hysteresis** are adjustable.
  - **N/O contact:** XXX- value > YYY- value
  - Switch closes when flow exceeds XXX value
  - **N/C contact:** XXX- value < YYY- value
  - Switch opens when flow exceeds YYY value

*Example 1:* XXX = 55%
YYY = 45%
hysteresis = 10%

*Example 2:* XXX = 45%
YYY = 55%
hysteresis = 10%

Please note!: When the two status outputs B1 and B2 are activated (see Sect. 5.19), **min. and max. values** can, for example, be signalled.
5.12 Automatic range change BA (with status output B1 or B2) and external range change (with control input B1 or B2)

1. Description of automatic range change BA and external range change

The automatic range change BA has two measuring ranges that are automatically changed over as a function of the flow rate. The ratio between low and high range is adjustable between 1:20 and 1:1.25, equivalent to 05 – 80% of Q_{100%} (full-scale range).

- Changeover from high to low range: at approx. 85% of the low range
- Changeover from low to high range: at approx. 98% of the low range

F/R flow operation is also possible, direction then identified via the 2nd status output.

In the case of external range change, changeover from high to low range (and conversely from low to high range) is effected by the control input being activated by an external pulse.

2. Automatic range change BA by one of the status outputs B1 or B2

(Before the following settings can be carried out, the "status output" mode for output terminal B1 or B2 must be set in Fct. 3.07, see Sect. 5.19.)

**Status output:** Fct. 1.07 (terminal B1) or Fct. 1.08 (terminal B2)

- Press → key.
- Set Function "Auto Range" with ↑ or ↓ key.
- Press ↓ key.

- Set Range Value, cursor for the 1st digit shown negatively.
  - Set with ↑ or ↓ keys.
  - Use → key to shift cursor 1 place to right.
  - Setting range 05 – 80% of Q_{100%} full-scale range (ratio between low and high range between 1:20 and 1:1.25)

- Press ↓ key to return to Fct. 1.07 or 1.08 Status output.

3. External range change by one of the control input B1 or B2

(Before the following settings can be carried out, the "control input" mode for output terminal B1 or B2 must be set in Fct. 3.07, see Sect. 5.19.)

**Control input:** Fct. 1.07 (terminal B1) or Fct. 1.08 (terminal B2)

- Press → key.
- Set Function "Extern Range" with ↑ or ↓ key.
- Press ↓ key.

- Set Range Value, cursor for the 1st digit shown negatively.
  - Set with ↑ or ↓ key.
  - Use → key to shift cursor 1 place to right.
  - Setting range 05 – 80% of Q_{100%} full-scale range (ratio between low and high range between 1:20 and 1:1.25)

- Press ↓ key to return to Fct. 1.07 or 1.08 Status output.

**Please note:** Only one of the two functions can be used. Automatic range change and external range change act only on the current output.
5.13 Language (Fct. 3.01)

**Fct. 3.01 Language**

Press → key.

**Select language for texts in display**

- **D** (German)
- **GB/USA** (English)
- **F** (French)
- others on request

Select with ↑ or ↓ key.

Press ↓ key to return to Fct. 3.01 Language.

5.14 Zero check (Fct. 3.03)

- Set **zero flow** in the pipeline, but make sure that the **measuring tube** is completely filled with fluid.
- Switch on the system and wait 15 minutes.
- Press the following keys for zero measurement:

<table>
<thead>
<tr>
<th>Key</th>
<th>Display</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>→</td>
<td>Fct. 1.00 Operation</td>
<td>If &quot;Yes&quot; set under Fct. 3.04 ENTRY CODE, key in 9 keystroke CODE 1 now: → → → ↓ ↓ ↑ ↑ ↑</td>
</tr>
<tr>
<td>2x ↑</td>
<td>Fct. 3.00 Installation</td>
<td></td>
</tr>
<tr>
<td>→</td>
<td>Fct. 3.01 Language</td>
<td></td>
</tr>
<tr>
<td>2x ↑</td>
<td>Fct. 3.03 Zero Point</td>
<td></td>
</tr>
<tr>
<td>↑</td>
<td>back enquire</td>
<td>Zero measurement in progress, duration approx. 50 seconds. When flow &gt; 0 WARNING notice appears, confirm with ↓ key. If new value not to be stored, press ↓ key (3x) 4x = return to measuring mode.</td>
</tr>
<tr>
<td>↓</td>
<td>0.00 - - - / - - -</td>
<td>Store No</td>
</tr>
<tr>
<td>↑</td>
<td>Store Yes</td>
<td></td>
</tr>
<tr>
<td>↓</td>
<td>Fct. 3.03 Zero Point</td>
<td>Store new zero value.</td>
</tr>
<tr>
<td>(2x) 3x ↓</td>
<td>- - - - - / - - -</td>
<td>Measuring mode with new zero.</td>
</tr>
</tbody>
</table>

5.15 Determine Entry Code (Fct. 3.04)

**Fct. 3.04 Entry Code**

Press → key.

**Choice**

- **No** (no code, enter setting mode with → key)
- **Yes** (enter setting mode with → key and Code 1: → → ↓ ↓ ↑ ↑ ↑)

Select with ↑ or ↓ key.

Press ↓ key to return to Fct. 3.04 Entry Code.
Part B     IFC 210 Signal converter                                                                                  Sect. 5.16

5.16 Primary head – Set data (Fct. 3.02)

Fct. 3.02 Flow Meter

Press → key.

**Diameter = set meter size** (see instrument nameplate)
Select size from table of meter sizes:
DN 2.5 - 1600 mm equivalent to \( \frac{1}{10} - 64 \) inch

Select using ↑ or ↓ key.
Transfer to subfunction “Full Scale” with ↓ key.

**Full Scale = set full-scale range**
Set as described in Sect. 5.1.

Note: if “Pulsvalue” is displayed after pressing ↓ key.
Pulse/Vol. is set under Fct. 1.06 Pulsoutput P, subfunction “Pulsvalue”. Because the full-scale range \( Q_{100\%} \) has been changed, the output frequency (F) of the pulse output is over- or undershot:

\[
P_{\text{min}} = \frac{F_{\text{min}}}{Q_{100\%}} \quad P_{\text{max}} = \frac{F_{\text{max}}}{Q_{100\%}}
\]

Change pulse value accordingly, see Sect. 5.7 Pulseoutput P, Fct. 1.06.

Press ↓ key to change to subfunction “GK Value”.

**GK Value = set primary constant GK,**
- \( 1.0000 - 9.9999 \) (note information on instrument nameplate, do not change setting !)

Change flashing digit (cursor) with ↑ or ↓ key.
Shift cursor 1 place to right or left with → or ← key.
Press ↓ key to change to subfunction “Field Frequency”.

**Field Frequency = set magnetic field frequency**
- \( 1/2 \)  \( 1/18 \) \( 1/6 \)  \( 1/36 \) (1/2, 1/6, 1/18 or 1/36 of power frequency, see instrument nameplate, do not change setting !)

Select with ↑ or ↓ key.
Press ↓ key to change to subfunction “Flow Direction”.
(only for units with DC power supply, transfer to subfunction “Line Frequency”).

**Line Frequency = normal line frequency in your country**
(Please note, applicable for flowmeters equipped with DC power supply!)
- \( 50 \text{ Hz} \) Select with ↑ or ↓ key.
- \( 60 \text{ Hz} \) Press ↓ key to change to subfunction “Flow Direction”.

**Flow Direction = set flow direction**
- \( + \text{ Direction} \) (for identification of flow direction, see “+ arrow” on primary head; for F/R mode, identifies the positive flow direction)
- \( - \text{ Direction} \)

Select with ↓ or ↑ key.
Press ↓ key to return to Fct. 3.02 Flow Meter.

Zero check, see Fct. 3.03 in Sect. 5.14 or in Sect. 7.1.

Please refer to Sect. 3.2 Factory settings .
5.17 User-defined unit (Fct. 3.05)

**Fct. 3.05 User Units**

Press → key.

**Text Volume** = set text for user-defined unit
- **Liter**
  - (max. 5 characters, factory-set: Liter or US MGal)
  - Characters assignable to each place: A-Z, a-z, 0-9, or “-” (=blank character)

Change flashing digit (cursor) with ↑ or ↓ key.
Shift cursor 1 place to right or left with → or ← key.
Press ↓ key to change to subfunction “Factor Volume”.

**Factor Volume** = set factor \( F_M \) for volume
- \( 1.00000 \times 10^3 \) (factory-set: \( 10^3 \) or \( 2.64172 \times 10^{-4} \) / factor \( F_M \) = volume per 1 m\(^3\))
  - Setting range: 1.00000 E-9 to 9.99999 E+9 (\( = 10^{-9} \) to 10+9)

Change flashing digit (cursor) with ↑ or ↓ key.
Shift cursor 1 place to right or left with → or ← key.
Press ↓ key to change to subfunction “Text Time”.

**Text Time** = set text for required time
- **hr**
  - (max. 3 places, factory-set: hr = hour or day)
  - Characters assignable to each place: A-Z, a-z, 0-9, or “-” (=blank character)

Change flashing digit (cursor) with ↑ or ↓ key.
Shift cursor 1 place to right or left with → or ← key.
Press ↓ key to change to subfunction “Factor Time”.

**Factor Time** = set factor \( F_T \) for time
- \( 3.60000 \times 10^3 \) (factory-set: \( 3.6 \times 10^3 \) for hour or \( 8.64 \times 10^4 \) for day / factor \( F_T \) in seconds)
  - Setting range: 1.00000 E-9 to 9.99999 E+9 (\( = 10^{-9} \) to 10-9)

Change flashing digit (cursor) with ↑ or ↓ key.
Shift cursor 1 place to right or left with → or ← key.
Press ↓ key to return to Fct. 3.05 User Units.

**Factors for volume \( F_M \)** (factor \( F_M \) = volume per 1 m\(^3\))

<table>
<thead>
<tr>
<th>Volumetric unit</th>
<th>Text examples</th>
<th>Factor ( F_M )</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cubic metres</td>
<td>m(^3)</td>
<td>1.0</td>
<td>1.00000 E+0</td>
</tr>
<tr>
<td>Litres</td>
<td>Liter</td>
<td>1000</td>
<td>1.00000 E+3</td>
</tr>
<tr>
<td>Hectolitres</td>
<td>h Lit</td>
<td>10</td>
<td>1.00000 E+1</td>
</tr>
<tr>
<td>Decilitres</td>
<td>d Lit</td>
<td>100</td>
<td>1.00000 E+0</td>
</tr>
<tr>
<td>Centilitres</td>
<td>c Lit</td>
<td>10000</td>
<td>1.00000 E+5</td>
</tr>
<tr>
<td>Millilitres</td>
<td>m Lit</td>
<td>1000000</td>
<td>1.00000 E+6</td>
</tr>
<tr>
<td>US gallons</td>
<td>USGal</td>
<td>264.172</td>
<td>2.64172 E+2</td>
</tr>
<tr>
<td>Millions US gallons</td>
<td>USMG</td>
<td>0.000264172</td>
<td>2.64172 E-4</td>
</tr>
<tr>
<td>Imperial gallons</td>
<td>GBGal</td>
<td>219.969</td>
<td>2.19969 E+2</td>
</tr>
<tr>
<td>Mega imperial gallons</td>
<td>GBMG</td>
<td>0.000219969</td>
<td>2.19969 E-4</td>
</tr>
<tr>
<td>Cubic inches</td>
<td>inch</td>
<td>61.0240</td>
<td>6.10240 E+4</td>
</tr>
<tr>
<td>US barrels liquid</td>
<td>US BaL</td>
<td>8.36384</td>
<td>8.36384 E+0</td>
</tr>
<tr>
<td>US barrels ounces</td>
<td>US BaO</td>
<td>33 813.5</td>
<td>3.38135 E+4</td>
</tr>
</tbody>
</table>

**Factors for time \( F_T \)** (factor \( F_T \) in seconds)

<table>
<thead>
<tr>
<th>Time unit</th>
<th>Text examples</th>
<th>Factor ( F_T ) (seconds)</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seconds</td>
<td>Sec</td>
<td>1</td>
<td>1.00000 E+0</td>
</tr>
<tr>
<td>Minutes</td>
<td>min</td>
<td>60</td>
<td>6.00000 E+1</td>
</tr>
<tr>
<td>Hours</td>
<td>hr</td>
<td>3 600</td>
<td>3.60000 E+3</td>
</tr>
<tr>
<td>Day</td>
<td>Day</td>
<td>86 400</td>
<td>8.64000 E+4</td>
</tr>
<tr>
<td>Year (= 365 days)</td>
<td>Yr</td>
<td>31 536 000</td>
<td>3.15360 E+7</td>
</tr>
</tbody>
</table>
5.18 Application (Fct. 3.06)

**Fct. 3.06 Application**

*Press → key.*

**Flow = Set characterization for the flow**
- **steady** flow is steady, max. 150 % of Q_{100%}.
- **pulsating** pulsating flow, up to 1000 % of Q_{100%}, e.g. due to reciprocating pumps.

Select with ↑ or ↓ key.

Press → key to return to Fct. 3.06 Application.

**Empty pipe = signals that measuring tube is empty** (possible only with built-in option)
- **No**
- **Yes**

Select with ↑ or ↓ key.

Press → key to return to Fct. 3.06 Application.

5.19 Hardware (Fct. 3.07)

**Assignment of terminals B1 + B2 and field current supply**

**Fct. 3.07 Hardware**

*Press → key.*

**Terminal B1 = define function of terminal B1** (valid for Fct. 1.07)
- **Statusoutput**
- **Controlinput**

Select with ↑ or ↓ key.

Press ↓ key to change to subfunction "Terminal B2".

**Terminal B2 = define function of terminal B2** (valid for Fct. 1.08)
- **Statusoutput**
- **Controlinput**

Select with ↑ or ↓ key.

Press ↓ key to change to subfunction "Fieldcurrent".

**Field current = define field current supply**
- **Intern**
- **Extern (> DN 1600 / > 64")**

Select with ↑ or ↓ key.

Press ↓ key to return to Fct. 3.07 Hardware.

Please note:
- Only correct settings will give accurate measurement results.
- The setting "external" is only required if a field current power driver is connected.
5.20 Measuring point identification – Location (Fct. 3.08)

**Fct. 3.08 Location**

Press → key.

**Set measuring point identification using max. 10 characters**, (e.g. TQ1_532197)

You can use any out of: A...Z / a...z / 0...9 / or _ (= underscore)

- Select with ↑ or ↓ key.
- Use key → to shift one place to the right, back with ← key.
 Press ↓ key to return to Fct. 3.08 Location.

5.21 Set communication interface (Fct. 3.09)

**Fct. 3.09 Communication**

Press → key.

**Specify function**

Select with ↑ or ↓ key and subsequently acknowledge by pressing ↓ key.

- **Aus** Switched off
- **HART** HART® interface selected
  Press ↓ key to set addresses: 000 - 015
  Press ↑ ↓ → key to set
- **KROHNE** RS 485 Interface gewählt
  Press ↓ key to set addresses: 000 - 239
  Press ↓ key to set baud rate:
  - 1200
  - 2400
  - 4800
  Press ↑ ↓ → key to set

Press ↓ key to return to Fct. 3.09 Communication.
5.22 Characteristic of outputs

I  Current output
I₀%  0 or 4 mA
I₁₀₀%  20 mA

P  Pulse output
P₁₀₀%  Pulses at Q₁₀₀%, full-scale range

Q₉₈  1 flow direction, forward flow in F/R operation
Q₉₈  Reverse flow in F/R operation
Q₁₀₀%  Full-scale range

S  Status output B1 and/or B2
   switch open
   switch closed

1 flow direction  2 flow directions, F/R mode
6 Special applications

6.1 IFC 210 E – EEx for primary heads in hazardous areas

6.1.1 General

The following notes and directions contain only the data relevant to explosion protection. The technical details given in the Installation and Operating Instructions for the non-hazardous-duty version apply unchanged unless excluded or superseded by these directions.

In compliance with European Directive 94/9/EC (ATEX 100a), signal converters of the IFC 210E – EEEx series are, in conformity with European Standards EN 50xxx, certified as associated electrical apparatus for supplying intrinsically safe equipment in hazardous areas by the Physikalisch – Technische Bundesanstalt (PTB) under PTB 00 ATEX 2026 X (see Sect. 13).

Important, please note!

- Observe the directions and regulations and the electrical data specified in the EC type test certificate.
- In addition to the regulations for heavy-current installations (VDE 0100), pay particular attention to the requirements specified in EN 60079-14 “Electrical equipment in hazardous areas”.
- Assembly, installation, commissioning and maintenance work may only be carried out by “personnel trained in explosion protection”!

6.1.2 Electrical connection

The signal converter must be installed outside the hazardous area. If used inside the hazardous area, type IFC 210E–EEx signal converters need to have additional type of protection (e. g. flameproof enclosure “d”).

The electrical connection of all circuits leading into the device is carried out using plug-in connectors in conformity with DIN 41612, Style F. Type IFC 210E–EEx signal converters are delivered with associated socket connectors with soldering tags. Operation is only permitted with these socket connectors.

To ensure that the thread measure is min. 50 mm between the connections of the intrinsically safe electrode circuit and those of the non-intrinsically safe circuits, all live connections on socket connectors XA, XC, XD need to be insulated with shrinkdown sleeves. In this connection, non-intrinsically safe circuits of adjacent subassemblies will also need to be taken into consideration.

Both generation of the ungrounded intrinsically safe electrode circuit and also fuse-protection of the field current circuit by fusible cutouts are integral components of the IFC 210E-EEx signal converter.

The connections for the intrinsically safe electrode circuit, including the shield connections, are safety-separated up to a peak value of 375 V from the connections for supply power, for the inputs/outputs and for the field current circuit, and are metallically separated from the housing (PE/PA).

For connection of the intrinsically safe electrode circuit, including shield connections, to the primary head, please refer to Point 12 in EN 60079-14.

Connect the non-intrinsically safe field current circuit to the primary head in keeping with the requirements specified in Point 9 of EN 60079-14.

The non-intrinsically safe input and output circuits may only be routed into the hazardous area taking relevant measures into account in accordance with EN 60079-14.

---

Important, please note!

- All unused cores and shield ends of the power cables to be carefully insulated from each other and from ground.
- All shields to be joined to the shield terminals by the shortest route.
- Undocumented terminals of all connectors to be left unused.
- Please take note of details given in Sect. 1.3.3 and 1.3.5.

Rated insulation levels

The insulation of IFC 210E - EEx signal converters is dimensioned in conformity with VDE 0110/IEC 664 and takes into account the following ratings:
- overvoltage category for the power line circuit: III
- overvoltage category for the signalling circuits: II
- insulation contamination level: 2
### Sect. 6.1 Part C Special applications, functional checks, service, and order numbers

#### 6.1.3 Technical data and terminal assignment

<table>
<thead>
<tr>
<th><strong>Supply power</strong></th>
<th><strong>Terminals</strong></th>
<th><strong>Supply voltage</strong></th>
<th><strong>Internal fuse protection</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Terminals</strong></td>
<td>L or 1L: z28</td>
<td>Plug XB</td>
<td></td>
</tr>
<tr>
<td></td>
<td>N or 0L: z32</td>
<td>Plug XB</td>
<td></td>
</tr>
<tr>
<td><strong>24 DC / AC</strong></td>
<td>U(_N) = 24 V DC (+30% / -25%), 15 W</td>
<td></td>
<td>(I_N \leq 1.6) AT</td>
</tr>
<tr>
<td></td>
<td>U(_N) = 24 V AC (+10% / -15%), 20 VA</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>100 ... 230 V AC</strong></td>
<td>U(_N) = 100 ... 230 V AC (+10% / -15%), 25 VA</td>
<td></td>
<td>(I_N \leq 0.8) AT</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Protective conductor/equipotential bonding</strong></th>
<th><strong>Terminals</strong></th>
<th><strong>Terminals</strong> (optional)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PE / PA</td>
<td>d14, d16, d18, d20</td>
<td>Plug XB</td>
</tr>
<tr>
<td></td>
<td>d2 ... d12, d22 ... d32</td>
<td>Plug XB</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Signalling circuits</strong></th>
<th><strong>Terminals</strong></th>
<th><strong>Terminals</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Outputs and inputs</strong></td>
<td>d16, d18, z18</td>
<td>Plug XC:</td>
</tr>
<tr>
<td><strong>Binary</strong></td>
<td>d24, d26, z26</td>
<td>Plug XC</td>
</tr>
<tr>
<td><strong>Pulses</strong></td>
<td>d32, z32</td>
<td>Plug XC</td>
</tr>
<tr>
<td><strong>RS 485</strong></td>
<td>d16, d18, d20, d22, d24</td>
<td>Plug XC (optional)</td>
</tr>
</tbody>
</table>

| **DC voltage** | U\(_N\) (DC) | \(\leq 50\) V (connection to devices with operating voltages up to 250 V) |
| **AC voltage** | U\(_N\) (AC) | \(\leq 25\) V |

<table>
<thead>
<tr>
<th><strong>Field circuit</strong></th>
<th><strong>Terminals</strong></th>
<th><strong>Terminals</strong></th>
<th><strong>Internal fuse protection</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Core 7</td>
<td>d30</td>
<td>Plug XA</td>
<td></td>
</tr>
<tr>
<td>Core 8</td>
<td>d32</td>
<td>Plug XA</td>
<td></td>
</tr>
</tbody>
</table>

| **Frequency-controlled DC voltage** | \(U_N \leq 40\) V |
| **Internal fuse protection**       | \(I_N \leq 160\) mAF |

<table>
<thead>
<tr>
<th><strong>Electrode circuit</strong></th>
<th><strong>Terminals</strong></th>
<th><strong>Terminals</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>in Intrinsic Safety type of protection EEx ib IIC</td>
<td>Z6, z10</td>
<td>Plug XA</td>
</tr>
<tr>
<td>(BTS conductor only)</td>
<td>D6, d10</td>
<td>Plug XA</td>
</tr>
<tr>
<td>Shield 2, 3</td>
<td>D8, z8</td>
<td>Plug XA</td>
</tr>
<tr>
<td>Shield 20, 30</td>
<td>D2, z2, d4, z4</td>
<td>Plug XA</td>
</tr>
</tbody>
</table>

| **Peak values** | \(U_0 \leq 18\) V (cumulative value) |
| **Peak values** | \(I_0 \leq 40\) mA (cumulative value) |
| **Peak values** | \(P_0 \leq 80\) mW |

The intrinsically safe electrode circuit is safety-separated (isolated) from the non-intrinsically safe circuits up to a peak nominal voltage of 375 V.

| **Ambient temperature** | max. allowable \(-20\) to \(+55^\circ\)C |

---
Important, please note.

- **Universal supply 24 V DC / AC**
  When connected to a “**functional extra-low voltage with safety separation**” power source (SELV or PELV) in accordance with VDE 0100, Part 410, connection of a safety conductor (PE) is not required.

- **Equipotential bonding**
  Independent of the type of power supply, IFC 210 E – EEx signal converters must be incorporated in the PA equipotential bonding system. To achieve equipotential bonding, terminals d14, d16, d18, d20 must be connected to the appropriate ground potential of the hazardous area.

  IFC 210E-EEx is ungrounded in the electrode circuit, but the primary head is not! For that reason, equipotential bonding is required in the entire run of the intrinsically safe cable!

  Cancellation of equipotential bonding is only permitted when the device is disconnected from supply.

### 6.1.4 Fuse protection of the field power circuit

The field power circuit is fuse-protected in the IFC 210E – EEx signal converter by two TR5 fusible links on the amplifier board (ADC/FSV), see Fig. A in Sect. 8.4.

Before starting up the system, check that both nominal fuse values are consistent with the maximum allowable nominal value specified for the primary head.
6.2 Interfaces

Important, please note!

- Observe the directions and regulations and the electrical data specified in the EC type test certificate.
- In addition to the regulations for heavy-current installations (VDE 0100), pay particular attention to the requirements specified in EN 60079-14 “Electrical equipment in hazardous areas”.
- Assembly, installation, commissioning and maintenance work may only be carried out by “personnel trained in explosion protection”.

6.2.1 HART®-interface

The HART® interface is a smart interface, in other words a communication signal superimposed on the current output. All functions and parameters can be accessed via this interface.

The following HART® features are supported:

- point-to-point connection
- multidrop (up to 15 HART devices)

The burst mode is not normally used.

Further information about HART is available from the HART® Communication Foundation, of which KROHNE is a member.

Electrical connection

**HART® - active**

**HART® - passive**

Power supply unit (and section switch amplifier) must be set up accordingly if in use for HART® operation.
Settings and operation

<table>
<thead>
<tr>
<th>Fct.</th>
<th>Parameter</th>
<th>Point-to-point mode</th>
<th>Multidrop mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.05</td>
<td>Function</td>
<td>1 CORRECT. or 2 CORRECT.</td>
<td>OFF</td>
</tr>
<tr>
<td></td>
<td>Range I</td>
<td>4-20 mA or I_{0%} ≥ 4 mA</td>
<td>I_{0%} ≥ 4 mA</td>
</tr>
<tr>
<td>3.09</td>
<td>Communication</td>
<td>HART</td>
<td>HART</td>
</tr>
<tr>
<td></td>
<td>Address</td>
<td>0</td>
<td>01, 02, 03 .... 15</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(use one address at one time only)</td>
</tr>
<tr>
<td></td>
<td>Operation</td>
<td>active or passive</td>
<td>passive only</td>
</tr>
<tr>
<td></td>
<td>Current output</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For further information on setting the signal converter refer to chapters 4 and 5.

**HART® operating tools / Device Description (DD)**

The signal converter can be operated either via its local operator interface or by means of the HART® communicator, which is available from KROHNE.

Operator control by means of the HART® communicator requires a device description (DD) which we can load for you into the communicator. We can, of course, also load the DDs of all manufacturers who have filed their DDs with the HART® Communication Foundation.

If you wish to use the signal converter in your operating tool, for example, please ask for the description of the HART® command used so that you can address the complete signal converter functionality via HART®.
6.2.2 KROHNE RS 485 Interface (Option)

Electrical connection

RS 485 Interface (Option, connection at multipole connector XD)

Address, e.g.:

<table>
<thead>
<tr>
<th>Address</th>
<th>001</th>
<th>002</th>
<th>003</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>d18</td>
<td>z18</td>
<td>d18</td>
</tr>
<tr>
<td>B</td>
<td>z20</td>
<td>z20</td>
<td>z20</td>
</tr>
<tr>
<td>FE</td>
<td>d24</td>
<td>d24</td>
<td>d24</td>
</tr>
</tbody>
</table>

* The shields can be grounded as follows:
  1) directly at both ends
  2) directly at one end (static shielding) or
  3) directly at one end and capacitive at the other end.

In the case of 2) and 3), a decrease in EMC is to be expected.

It is essential to blank off the final signal converter's electrical bus. To do this, solder up the semicircular circuits of solder points S3 and S4 on the RS485 - PCB. For further information refer to section 8.7.

The RS 485 protocol is available. Please contact your local KROHNE supplier / company.

Settings for use in interface operation

<table>
<thead>
<tr>
<th>Fct.</th>
<th>Parameter</th>
<th>KROHNE RS 485 Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.09</td>
<td>Communication</td>
<td>KROHNE</td>
</tr>
<tr>
<td></td>
<td>Address</td>
<td>000-239</td>
</tr>
<tr>
<td></td>
<td>Baud rate</td>
<td>1200 9600</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2400 19200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4800</td>
</tr>
</tbody>
</table>

For further information on setting the signal converter refer to chapters 4 and 5.
6.3 Unsteady display and outputs

**Important, please note!**

- Observe the directions and regulations and the electrical data specified in the EC type test certificate.
- In addition to the regulations for heavy-current installations (VDE 0100), pay particular attention to the requirements specified in EN 60079-14 “Electrical equipment in hazardous areas”.
- Assembly, installation, commissioning and maintenance work may only be carried out by "personnel trained in explosion protection".

Unsteady display and outputs can occur in connection with
- high solids contents,
- non-homogeneity,
- poor blending, or
- chemical reactions still in progress in the process liquid.

If, in addition, flow is also pulsating due to the use of diaphragm or reciprocating pumps, refer to Sect. 6.4.

**Operator control of the signal converter for the new settings**, see Sect. 4 and 5.

**To change settings**

- **Fct. 1.04 Display Flow** (change display presentation of the flow)
  Change setting to “Trend” to allow better assessment of display unsteadiness.

- **Fct. 1.02 Timeconstant** (change time constant)
  - Setting to “Only Current I”, to “All” if pulse output too unsteady.
  - Set time constant to approx. “20 s”, observe unsteadiness of display and adjust time constant if necessary.

- **Fct. 3.06 Application** (adjust overload point of the A/D converter to the application).
  Set to “Pulsating” on trial basis, if unsuccessful return to “Steady”.

- **Fct. 3.02 Field Frequency** (change magnetic field frequency) On trial basis, change setting to “1/2”; if unsuccessful return to previous setting, usually “1/6”.

Only practical with IFS 5000 F (DN 2.5-100 / 1/10"-4")
and IFS 4000 F (DN 10, 15, 50-100 / 1/10", 1/2", 2"-4”),
Consult factory where other types and meter sizes are concerned.
6.4 Pulsating flow

**Important, please note!**
- Observe the directions and regulations and the electrical data specified in the EC type test certificate.
- In addition to the regulations for heavy-current installations (VDE 0100), pay particular attention to the requirements specified in EN 60079-14 “Electrical equipment in hazardous areas”.
- Assembly, installation, commissioning and maintenance work may only be carried out by “personnel trained in explosion protection”!

**Application**
downstream of positive-displacement pumps (reciprocating or diaphragm pumps) without pulsation dampener

**Operator control of the signal converter for the new settings,** see Sect. 4 and 5.

**To change settings**
- **Fct. 3.2 Field Frequency** (change magnetic field frequency)
  - Stroke frequency **less than 80 strokes/min** (at max. pump lift): do **not** change setting.
  - Stroke frequency **80 – 200 strokes/min** (at max. pump lift): change setting to 1/2, only practical with IFS 5000 F (DN 2.5-100 / 1/16”-4”) and IFS 4000 F (DN 10, 15, 50-100 / 1/8”, 1/2”, 2”-4”).
  - Please consult factory where other types and meter sizes are concerned.
  - Please note: given stroke frequencies close to the tripping point of 80 strokes/min, additional measuring errors of approx. ± 0.5% of the measured value may occasionally occur.

- **Fct. 3.06 Application** (adjust overload point of the A/D converter to the application) Change setting to “pulsating”.

- **Fct. 1.04 Display** (change display presentation of flow)
  Change setting to “Trend” to allow better assessment of display unsteadiness.

- **Fct. 1.02 Timeconstant** (change time constant)
  - Set to “All” and time (t) in seconds.

  - **Recommended:** $t [\text{Sec}] = \frac{1000}{\text{min. strokes / min}}$
  - **Example:** min. number of strokes in operation = 50 strokes/minute

  $$t [\text{Sec}] = \frac{1000}{50 \text{ / min}} = 20 \text{ Sec}$$

  With this setting, the residual ripple of the display will amount to approx. ±2% of the measured value. Doubling the time constant will reduce the residual ripple by a factor of 2.
6.5 Rapid changes in flowrate

Important, please note!

- Observe the directions and regulations and the electrical data specified in the EC type test certificate.
- In addition to the regulations for heavy-current installations (VDE 0100), pay particular attention to the requirements specified in EN 60079-14 “Electrical equipment in hazardous areas”.
- Assembly, installation, commissioning and maintenance work may only be carried out by “personnel trained in explosion protection”!

Application
in conjunction with batching processes, fast-response control loops, etc.

Operator control of the signal converter for the new settings refer to chapters 4 and 5

To change settings
- **Fct. 1.02 Timeconstant** (change time constant)
  Setting to “Only Current I” and set time to 0.2 s.

- **Dynamic response** with meter sizes DN 2.5-300 / 1/10",-12"
  Dead time: approx. 0.06 s at 50 Hz line frequency
  approx. 0.05 s at 60 Hz line frequency
  Time constant: set as above, current output (mA) additionally plus 0.1 s

- **Reducing the dead time by a factor of 3** (possible by changing the magnetic field frequency)
  Fct. 3.02 Flow Meter, subfunction “Field Frequency”, change to 1/2 only practical with IFS 5000 F (DN 2.5-100 / 1/10",-4") and IFS 4000 F (DN 10, 15, 50-100 / 1/10", 1/2", 2"-4"
  Please consult factory where other types and meter sizes are concerned.
6.6 Stable signal outputs when measuring tube empty

**Important, please note!**

- Observe the directions and regulations and the electrical data specified in the EC type test certificate.
- In addition to the regulations for heavy-current installations (VDE 0100), pay particular attention to the requirements specified in EN 60079-14 “Electrical equipment in hazardous areas”.
- Assembly, installation, commissioning and maintenance work may only be carried out by “personnel trained in explosion protection”!

Output signals can be stabilized to values as for “zero” flow to prevent random output signals when the measuring tube is empty.

- Display: 0
- Current output: 0 or 4 mA, see setting in Fct. 1.05
- Pulse output: no pulses (≈ 0 Hz), see setting in Fct. 1.06

**Precondition:**

- electrical conductivity of product: ≥ 200 µS/cm,
  ≥ 500 µS/cm for meter sizes DN 2.5 – 15 and 1/10” – 1/2”
- Signal cable length ≤ 10m and vibration free with signal converter
- Homogeneous liquid products, free of solids and gases and do not tend to electrical or catalytic reactions.

<table>
<thead>
<tr>
<th>LA / S3 Empty Tube indication</th>
<th>LA / S2 Empty Tube stabilization and Empty Tube stabilization</th>
<th>LA / S4 electrode cleaning and Empty Tube stabilization</th>
</tr>
</thead>
<tbody>
<tr>
<td>LA / S3 actively detects an empty measuring tube and switches outputs and display to “0” flow. When the measuring tube is empty, resistance between the electrodes becomes very high. A low current flows through the -15 V at the one electrode (the other is connected to 0 V, chassis) via the high-resistance resistor and overdrives the instrumentation amplifier and then the A/D converter. This overdriving is evaluated.</td>
<td>LA / S2 should be used when problems are encountered with LA / S3, e.g. due to electrolysis effects. Display is then particularly unsteady. At “0” flow, the electrodes are connected to 0 V (chassis) via high-resistance resistors.</td>
<td>LA / S4 prevents any deposits of high-resistance layers on the electrodes (e.g. fat from very creamy milk) and effects stabilization similar to the LA / S2. For this purpose, the electrodes are connected to –15 V via high-resistance resistors.</td>
</tr>
</tbody>
</table>

To join the “semicircles” of the two soldering points S1 and S4, see under “Point 5”.

Under Fct. 3.06 Applications, set "yes" for empty pipe.

Possibly reset low-flow cutoff (SMU), see under Point 8

Possibly reset low-flow cutoff (SMU), see under Point 8
Changes on amplifier PCB, see Fig. in Sect. 8.7.

Always switch off power source before starting work!

Please refer to the Figure in Sect. 8.1.

1) Detach 4 screws (S1) from the front side.
2) Pull the plug-in module out of the subrack.
3) Detach 4 recessed-head screws (S3) on the rear side and remove the imprinted rear panel from the plug-in unit.
4) Carefully pull the now visible rear panel with mounted pc boards out of the plug-in unit.
5) On the back of the amplifier board, join the “seam circles” of 2 points with tin-lead solder, depending on activation of the desired function, see Table and Figures in Sect. 6.6. Previous to that, carefully scrape off the protective varnish at the selected soldering points ............... Be careful not to damage circuit-board conductors.
6) Assemble in the reverse order, Points 4) – 1).
7) Power the unit.
8) For LA / S2 (empty tube stabilization) and LA / S4 (electrode cleaning and empty tube stabilization), check the setting of the low-flow cutoff SMU, Fct. 1.03, and reset if necessary:

<table>
<thead>
<tr>
<th>L.F. Cutoff switched on, range:</th>
<th>Full scale range Q100%</th>
<th>Cutoff ...... values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>... OFF ...</td>
</tr>
<tr>
<td>&gt; 3 m/s</td>
<td>&gt; 10 ft/s</td>
<td>&gt; 2 %</td>
</tr>
<tr>
<td>1 – 3 m/s</td>
<td>3 -10 ft/s</td>
<td>&gt; 6 %</td>
</tr>
<tr>
<td>&lt; 1 m/s</td>
<td>&lt; 3 ft/s</td>
<td>&gt; 10 %</td>
</tr>
</tbody>
</table>
7 Functional checks

7.1 Zero check

- Set zero flow in the pipeline, but make sure that the measuring tube is completely filled with fluid.
- Switch on the system and wait 15 minutes.
- Press the following keys for zero measurement:

<table>
<thead>
<tr>
<th>Key</th>
<th>Display</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>→</td>
<td>Fct. 1.00 Operation</td>
<td>If &quot;Yes&quot; set under Fct. 3.04 ENTER CODE, key in 9-keystroke CODE 1 now: → → → ↓ ↓ ↓</td>
</tr>
<tr>
<td>2x ↑</td>
<td>Fct. 3.00 Installation</td>
<td></td>
</tr>
<tr>
<td>→</td>
<td>Fct. 3.01 Language</td>
<td></td>
</tr>
<tr>
<td>2x ↑</td>
<td>Fct. 3.03 Zero Point back</td>
<td></td>
</tr>
<tr>
<td>↑</td>
<td>0.00 - - - / - - - Zero measurement in progress, duration approx. 50 seconds.</td>
<td></td>
</tr>
<tr>
<td>↓</td>
<td>Store No</td>
<td>When flow &gt; 0 WARNING notice appears, confirm with ↓ key.</td>
</tr>
<tr>
<td>↑</td>
<td>Fct. 3.03 Zero Point</td>
<td>If new value not to be stored, press ↓ key (3x) 4x = return to measuring mode.</td>
</tr>
<tr>
<td>(2x) 3x ↓</td>
<td>- - - - - / - - - Measuring mode with new zero.</td>
<td></td>
</tr>
</tbody>
</table>

7.2 Test of measuring range Q

- For this test a measured value can be simulated in the range of -110 to +110 percent of $Q_{100\%}$ (full-scale range set, see Fct. 1.01 Full Scale).
- Switch on the system..
- Press the following keys for this test:

<table>
<thead>
<tr>
<th>Key</th>
<th>Display</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>→</td>
<td>Fct. 1.00 Operation</td>
<td>If &quot;Yes&quot; set under Fct. 3.04 ENTER CODE, key in 9-keystroke CODE 1 now: → → → ↓ ↓ ↓</td>
</tr>
<tr>
<td>↑</td>
<td>Fct. 2.00 Test</td>
<td></td>
</tr>
<tr>
<td>→</td>
<td>Fct. 2.01 Test Q sure no</td>
<td></td>
</tr>
<tr>
<td>↑</td>
<td>↑ sure yes</td>
<td></td>
</tr>
<tr>
<td>↓</td>
<td>0 % Current, pulse and status indication outputs indicate the corresponding values.</td>
<td></td>
</tr>
<tr>
<td>± 10 %</td>
<td>Select using ↑ or ↓ key</td>
<td></td>
</tr>
<tr>
<td>± 50 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>± 100 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>± 110 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>↓</td>
<td>Fct. 2.01 Test Q</td>
<td>End of test, actual measured values again present at outputs.</td>
</tr>
<tr>
<td>(2x) 3x ↓</td>
<td>- - - - - / - - - Measuring mode</td>
<td></td>
</tr>
</tbody>
</table>

---

KROHNE

ICF 210 E
05/2002
7.3 Hardware information and error status, Fct. 2.02

- Before consulting factory about errors or flow measurement problems, please invoke Fct. 2.02 Hardwareinfo (hardware information).
- An 8-character and a 10-character status code are stored under this function in each of 3 (4) "windows". These 6 (8) status codes allow rapid and simple diagnosis of your compact flowmeter.
- Switch on system.
- Press the following keys for display of the status codes:

<table>
<thead>
<tr>
<th>Key</th>
<th>Display</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>✅</td>
<td>Fct. 1.00 Operation</td>
<td>✅ 9 keystroke CODE 1 now: → → → → ↓ ↓ ↓</td>
</tr>
<tr>
<td>✅</td>
<td>Fct. 2.00 Test</td>
<td>✅ Fct. 2.02 Hardware Information</td>
</tr>
</tbody>
</table>
| ✅ ✅ | Modul ADW | ✅ 1st window Sample status code
| ✅ ✅ | Modul EA | ✅ 2nd window 325105.02 (8-character code, 1st line)
| ✅ ✅ | Modul Anzeige | ✅ 3rd window 3A47FO1DB1 (10-character code, 2nd line)
| ✅ ✅ | Modul RS | ✅ 4th window (only provided if “computer interface” Option installed)

PLEASE NOTE DOWN ALL 6 (8) STATUS CODES !

Fct. 2.02 Hardware Information Terminate hardware information

If you need to return your flowmeter to KROHNE, please refer to last but one page of these Instructions !

7.4 Faults and symptoms during start-up and process flow measurement

CAUTION!
The following applies to primary heads in hazardous areas:
Installation, electrical connection, commissioning and maintenance work may only be carried out by persons who have been trained for work in hazardous areas and are authorized to do so.

- Most faults and symptoms occurring with the flowmeters can be eliminated with the aid of the following tables.
- For greater clarity, faults and symptoms in the tables are divided into various groups.

Groups: D Display
         I Current output
         P Pulse output
         B Status output or control input
         D / I / P / B Display, current output, pulse output, binary outputs/inputs

Before contacting KROHNE Service, please read through the following tables. THANK YOU !

Safety notice
Some of the following measurements are carried out when the system is in the switched on condition. Exercise caution when handling measuring leads in the vicinity of power connections – electric shock hazard and risk of short-circuiting!
<table>
<thead>
<tr>
<th>Gruppe D</th>
<th>Display shows . . .</th>
<th>Cause</th>
<th>Remedial action</th>
</tr>
</thead>
<tbody>
<tr>
<td>D 1</td>
<td>Line Int.</td>
<td>Power failure. Note: no counting during power failure</td>
<td>Delete error message in RESET/QUIT menu, reset totalizer(s) if need be.</td>
</tr>
<tr>
<td>D 2</td>
<td>I Overrange</td>
<td>Current output overranged. (Flow &gt; measuring range)</td>
<td>Check instrument parameters and correct if necessary, Error message deleted automatically after cause has been eliminated.</td>
</tr>
<tr>
<td>D 3</td>
<td>P Overrange</td>
<td>Pulse output overranged. Note: totalizer deviation possible (Flow &gt; I Max)</td>
<td>Check instrument parameters, correct if necessary, and reset totalizer(s). Error message deleted automatically after cause has been eliminated.</td>
</tr>
<tr>
<td>D 4</td>
<td>Totalizer</td>
<td>Counts lost (overflow, data error)</td>
<td>Delete error message in RESET/QUIT menu.</td>
</tr>
<tr>
<td>D 5</td>
<td>ADC</td>
<td>Analog/digital converter overranged.</td>
<td>Error message deleted automatically after cause has been eliminated.</td>
</tr>
<tr>
<td>D 6</td>
<td>Fatal Error</td>
<td>Fatal Error, all outputs set to &quot;min.&quot; values.</td>
<td>Replace signal converter (see Sect. 8.3) or contact KROHNE Service, having first noted down hardware information and error status, see Fct. 2.02.</td>
</tr>
<tr>
<td>D 7</td>
<td>Startup cyclic flashing</td>
<td>Hardware fault, Watchdog activated.</td>
<td>Replace signal converter (see Sect. 8.3) or contact KROHNE Service.</td>
</tr>
<tr>
<td>D 8</td>
<td>Pipe empty</td>
<td>The measuring tube is empty. This message appears only when the Option &quot;empty pipe identifier&quot; is built in and when the function is switched on under Fct. 3.06 Application, submenu &quot;empty pipe&quot;</td>
<td>Fill the pipe.</td>
</tr>
<tr>
<td>D 9</td>
<td>Unsteady display</td>
<td>– Process product conductivity too low, particles/air inclusions too large or inhomogeneous – Pulsating flow – Time constant too low or switched off.</td>
<td>Increase time constant, see Fct. 1.02, or switch on.</td>
</tr>
<tr>
<td>D 10</td>
<td>No display</td>
<td>Power supply OFF</td>
<td>Power supply ON</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group I</th>
<th>Fault / Symptom</th>
<th>Cause</th>
<th>Remedial action</th>
</tr>
</thead>
<tbody>
<tr>
<td>I 1</td>
<td>Receiver instrument indicates &quot;0&quot;.</td>
<td>Receiver instrument or current output defective.</td>
<td>Connect properly, see Sect. 2.4.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check output (see Sect. 7.2) with new milliammeter. Test cables and receiver instrument, replace if necessary. Test unsuccessfully, current output defective. Replace signal converter (see Sect. 8.3) or contact KROHNE Service.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Current output disabled, see Fct. 1.05.</td>
<td>Activate under Fct. 1.05.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Short-circuit between current output and pulse output.</td>
<td>Check connection and cables, see Sect. 2.4. Voltage between I+ and I- (connecting block XC Pins d16 and z18), approx. 24 V. Switch off device, eliminate short-circuit, and switch device on again.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>External voltage source defective</td>
<td>Check power lines and/or external voltage source, and replace if necessary.</td>
</tr>
<tr>
<td>Group</td>
<td>Fault / Symptom</td>
<td>Cause</td>
<td>Remedial action</td>
</tr>
<tr>
<td>--------</td>
<td>--------------------------</td>
<td>----------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| I 2    | Unsteady display         | Process product conductivity too low, particles/air inclusions too large or inhomogeneous  
Pulsating flow  
Time constant too low or switched off. | Increase time constant, see Fct. 1.02                                                                                                         |
| P 1    | Totalizer connected but does not count any pulses | Incorrect connection/polarity  
Totalizer or external voltage source defective.  
Current output is external voltage source, short circuit or current / pulse output defective | Connect properly, see Sect. 2.4.  
Check output (see Sect. 7.2) with new totalizer: Test ok, check connection and cables, see Sect. 7.2.  
Check connection and cables, see Sect. 2.4. Voltage between \( I_+ \) and \( I_- \) (connecting block XC, Pins d16 and z18), approx. 24 V. Switch off device, eliminate short-circuit, and switch device on again. If no function, then current or pulse output defective. Replace signal converter (see Sect. 8.3) or contact KROHNE Service.  
Pulse output is deactivated, see Fct. 1.06.  
Switch on under Fct. 1.06.                                                                 |
| P 2    | Unsteady pulse rate      | Process product conductivity too low, particles/air inclusions too large or inhomogeneous  
Pulsating flow  
Time constant too low or activated only for current output I | Increase or switch on time constant, under Fct. 1.02 or switch on if necessary.                                                                 |
| P 3    | Pulse rate too high or too low. | Incorrect setting for pulse output. | Change setting under Fct. 1.06.                                                                                                                   |

<table>
<thead>
<tr>
<th>Group B</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>B 1</td>
<td>No function</td>
<td>Faulty connection</td>
<td>Connect properly, see Sect. 2.4.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Output/input defective</td>
<td>Replace electronics unit of signal converter, see Sect. 8.3.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>External or internal voltage source not supplying voltage</td>
<td>Check voltage source, rectify any short-circuit or replace defective voltage source.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Receiver instruments faulty</td>
<td>Check connection, if necessary replace receiver instruments.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Function setting faulty</td>
<td>Correct function settings.</td>
</tr>
</tbody>
</table>

| Gruppe D / I / P / B | Unsteady display and outputs          | Process product conductivity too low, particles/air inclusions too large or inhomogeneous  
Pulsating flow  
Time constant too low | Increase time constant, under Fct. 1.02                                                                 |
|---------------------|----------------------------------------|------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| D / I / P / B 1     | No display and no function of outputs | Power supply OFF  
Check power fuse FS. | Replace if defective, see Sect. 8.2.                                                                                                   |
7.5 Checking the primary head
This method describes the testing of the primary head and its interconnecting cables at the installation location of the signal converter.

**CAUTION!**
The following applies to primary heads in hazardous areas:
Installation, electrical connection, commissioning and maintenance work may only be carried out by persons who have been trained for work in hazardous areas and are authorized to do so.

Always switch off power source before starting work on the subrack connections.

**Required measuring instruments and tools**
- Ohmmeter with at least 6 V measuring voltage range
- or AC voltage/resistance bridge
- Note: accurate measurements in the electrode area can only be obtained with an AC voltage/resistance bridge. The measured resistance also heavily depends on the electrical conductivity of the process liquid.

**Preparations**
- Switch off the power supply.
- Pull plug-in unit out of the subrack.
- Fill the measuring tube of the flowmeter completely with process liquid.
- Please note: the following measurements must only be carried out for connections which are occupied (used).
- The Nos. in brackets ( _ _ _ ) identify the power terminals at the primary head.

**Action**
Resistance measurements at the plug connector XA, electrical connection to primary head: signalling cable (max. 5-pin) and field current cable

<table>
<thead>
<tr>
<th>Action</th>
<th>Typical result</th>
<th>Incorrect result for 1 – 3 = defective primary head, return to factory for repair, refer to last-but-one page!</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Measure resistance of cables between Pins d30 and d32 (7 and 8);</td>
<td>30 – 170 Ω</td>
</tr>
<tr>
<td>2</td>
<td>Measure resistance of cables between Pins d8/z8 and d30 (1 and 7) or Pins d8/z8 and d32 (1 and 8);</td>
<td>&gt; 20 M Ω</td>
</tr>
<tr>
<td>3</td>
<td>Measure resistance of cables between Pins d8/z8 and z6 (1 and 2), and also between Pins d8/z8 and z10 (1 and 3). Always use the same measuring lead on Pin d8/z8 (1)!</td>
<td>1 kΩ – 1 MΩ (see Note above). Both values should be approx. equal.</td>
</tr>
<tr>
<td>4</td>
<td>When signal cable B (type BTS/ bootstrap) is used: measure resistance between the following lines: Pins d8/z8 and d6 (1 and 20), Pins d8/z8 and d10 (1 and 30), Pins d6 and d10 (20 and 30), Pins z6 and d6 (2 and 20), Pins z10 and d10 (3 and 30);</td>
<td>&gt; 20 M Ω</td>
</tr>
</tbody>
</table>
7.6 Test of signal converter using GS 8 A simulator (option)

CAUTION!
The following applies to primary heads in hazardous areas: Installation, electrical connection, commissioning and maintenance work may only be carried out by persons who have been trained for work in hazardous areas and are authorized to do so.

GS 8 A operating elements and accessories

---

**a)** Switch off power supply before starting work!

**b)** Unscrew the 4 recessed head screws (S1) on the front plate (see Sect. 8.1, Fig.).

**c)** Carefully pull off plug-in unit from subassembly support.

**d)** The electrical connection is on the X1 and X2 connectors at the rear hand side of the IFC 210 E signal converter as shown in connection diagram with cable M.

---

Electronic connection

---

A mA meter, accuracy class 0.1, 
R < 500 Ohm, range 4-20 mA

Electronic frequency counter,
input resistance approx. 1 k Ohm,
range 0-1 kHz,
time basis min. 1 second,
see connection diagrams in Sect. 2.5.
Check of setpoint display

1) Switch on power supply, allow at least 15 minutes' warm-up time.
2) Set switch D (front panel of GS 8A) to “0” position.
3) Adjust zero to 0 or 4 mA with the 10-turn potentiometer P (front panel of GS 8A),
depending on setting in Fct. 1.05, deviation < ±10 µA.
4) Calculate position of switch Y and displayed setpoints "I" and "f":

4.1) \[ X = \frac{Q_{100\%} \times K}{GK \times DN} \]

- \( Q_{100\%} \): full-scale range (100%) in volumetric unit \( V \) per unit time \( t \)
- \( GK \): primary constant, see instrument nameplate
- \( DN \): meter size DN im mm, not inches, see instrument nameplate
- \( t \): time in seconds (Sec), minutes (min) or hours (hr)
- \( V \): volumetric unit
- \( K \): constant, according to following table:

<table>
<thead>
<tr>
<th>( V )</th>
<th>( t )</th>
<th>100%</th>
<th>464</th>
<th>424.4</th>
<th>7.074</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liter</td>
<td>Sec</td>
<td>min</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25 464</td>
<td>424.4</td>
<td>7.074</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>m³</td>
<td>25 464</td>
<td>424 413</td>
<td>7 074</td>
<td></td>
<td></td>
</tr>
<tr>
<td>US-Gallonen</td>
<td>96 396</td>
<td>1 607</td>
<td>26.78</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4.2) Determine position of switch Y: Use table (front panel GS 8A) to determine value \( Y \),
which comes closest to factor \( X \) and meets condition \( Y \leq X \).

4.3) Calculate setpoint reading "I" for current output:

\[ I = I_{0\%} + \frac{Y}{X} (I_{100\%} - I_{0\%}) \text{ in mA} \]

- \( I_{0\%} \): current (0/4mA) at 0% flowrate
- \( I_{100\%} \): current (20mA) at 100% flowrate

4.4) Calculate setpoint reading "f" for pulse output:

\[ f = \frac{Y}{X} \times P_{100\%} \text{ in Hz} \]

- \( P_{100\%} \): pulses per second (Hz)
at 100% flowrate

5) Set switch D (front panel GS 8A) to position “+” or “-” (forward/ reverse flow).
6) Set switch Y (front panel GS 8A) to the value determined by the method described above.
7) Check setpoint readings I and f, see points 4.3 and 4.4 above.
8) Deviation < 1.5% of setpoint. If greater, replace signal converter, see Sect. 8.3.
9) Test of linearity: set lower Y values, readings will drop in proportion
to the calculated Y values.
10) **Switch off power supply** after completing the test.
11) Disconnect the GS 8A.
12) Reassemble in reverse order, see points e) – b) under “electrical connection”,
see illustration in Sect. 8.1.
13) The system is ready for operation after the power supply has been switched on.

Example: see overleaf
Example

Full-scale range

Meter size

Current at \( Q_{100\%} \) and \( Q_{0\%} \)

Pulses at \( Q_{100\%} \) and \( Q_{0\%} \)

Primary head constant

Constant \( (V \text{ in m}^3, t \text{ in hr}, DN \text{ in mm}) \)

\( Q_{100\%} = 200 \text{ m}^3/\text{hr} \) (Fct. 1.01)
\( DN = 80 \text{ mm} = 3'' \) (Fct. 3.02)
\( I_{0\%} = 4 \text{ mA} \)
\( I_{100\%} = 20 \text{ mA} \) (Fct. 1.05)
\( P_{100\%} = 200 \text{ Pulse/hr} \) (Fct. 1.06)
\( GK = 3.571 \) (s. Geräteschild)

\( K = 7074 \) (see Table)

\[ X = \frac{Q_{100\%} \times K}{GK \times DN^2} = \frac{200 \times 7074}{3.571 \times 80 \times 80} = 61.905 \]

\( Y = 40 \), position of switch \( Y \), see front panel GS 8A

(comes closest to \( X \) value and is smaller than \( X \)).

Calculation of setpoint readings \( I \) and \( f \)

\[ I = I_{0\%} + \frac{Y}{X} \times (I_{100\%} - I_{0\%}) = 4 \text{ mA} + \frac{40}{61.905} \times (20 \text{ mA} - 4 \text{ mA}) = 14.3 \text{ mA} \]

Deviations are permissible between 14.1 and 14.6 mA (equivalent to ± 1.5 %)

\[ f = \frac{Y}{X} \times P_{100\%} = \frac{40}{61.905} \times 200 \text{ pulses/hr} = 129.2 \text{ pulses/hr} \]

Deviations are permissible between 127.3 and 131.1 pulses/hr (equivalent to ± 1.5 %)

If you need to return your flowmeter to KROHNE, please refer to last but one page of these Instructions!
8.1 Illustrations used for service work

Fig. 1 Front view

Fig. 2 Back view

Fig. 3  Marking of terminal strips (on rear side of plug-in unit)
8.2 Replacement of power supply fuse

CAUTION!
The following applies to primary heads in hazardous areas:
Installation, electrical connection, commissioning and maintenance work may only
be carried out by persons who have been trained for work in hazardous areas and
are authorized to do so.

Switch off power supply before starting work

Refer to Sect. 8.1 for Figs. 1 and 2.

1) Unscrew the 4 recessed head screws (S1), on the front (Fig. 1).
2) Carefully remove the plug-in unit from the subassembly support.
3) Detach 4 recessed-head screws (S3) on the rear side of the plug-in unit (Fig. 2).
4) Carefully remove the electronics insert from the plug-in unit.
5) Change power fuse F5 on the “power supply unit” board (Fig. in Sect. 8.4). For values and
   order no., refer to Sect. 9.
6) Reassemble in reverse order, points 4) - 1) above.

8.3 Replacement of electronics unit of signal converter

CAUTION!
The following applies to primary heads in hazardous areas:
Installation, electrical connection, commissioning and maintenance work may only
be carried out by persons who have been trained for work in hazardous areas and
are authorized to do so.

Refer to Sect. 8.1 for Figs. 1 and 2.

1) Unscrew the 4 recessed head screws (S1), on the front (Fig. 1).
2) Carefully remove the plug-in unit from the subassembly support.
3) Detach 4 recessed-head screws (S3) on the rear side of the plug-in unit (Fig. 2).
4) Carefully remove the electronics insert from the plug-in unit.
5) Carefully transpose DATAPROM (IC 4) on conductor side the amplifier-PCB (see Fig. in Sect.
   8.4) from the “old” and the “new” electronic unit. Watch the position of the IC 4 when putting it
   on.
6) Check the power supply and fuse F5 on the new electronic unit.
7) Reassemble in reverse order, points 4) - 1) above.
8.4 Illustrations of the PCBs

A) Amplifier PCB

X1  Plug for internal connections

NOTE: not provided for

EEEx version, which instead has the additional GTEX board

X2 (= XA)  Push-on terminal strip XA, external connection via socket connector to DIN 41 612, Style F, 32-pin

F4 + F5  Field current fuse, 160 mA, miniature fuse TR 5

(for IFC 210 E-EEEx: if necessary, adjust to max. permissible fuse nominal value for the primary head)

IC 4  DATAPROM, stores all operating data, see Sect. 8.3 and 8.4 (on conductor side, see separate Figure)

B) Power supply PCB

AC versions (100 – 230 V AC)

X1 (= XB)  Push-on terminal strip XB, external connection via socket connector to DIN 41 612, Style F, 32-pin

X2  Plug for internal connections

Tr  Transformer

F5  Power fuse, 800 mA, (5 x 20 G, switching capacity 1500 A)

For order No. see Sect. 9

Sundry miniature fuses TR 5,

For order No. see Sect. 9

F1  Optocoupler, fuse 50 mA

F4  5V/15V fuse, 630 mA

F6  Current output, fuse 200 mA

F7  Field current supply, fuse 630 mA

C) Power supply PCB

AC-Version (24 V AC/DC)

X1 (= XB)  Push-on terminal strip XB, external connection via socket connector to DIN 41 612, Style F, 32-pin

X2  Plug for internal connections

Tr  Transformer

F5  Power fuse, 1.6 A, (5 x 20 G, switching capacity 1500 A)

For order No. see Sect. 9

Sundry miniature fuses TR 5,

For order No. see Sect. 9

F1  Current output, fuse 200 mA

F2  Field current supply, fuse 630 mA

F3  5V/15V fuse, 630 mA

F6  Optocoupler, fuse 100 mA
D) Amplifier PCB (conductor side)

X2 (= XA) Plug connector XA, external connection via socket connector to DIN 41 612, Style F, 32-pin

IC 4 DATAPROM, stores all operating data, see Sect. 8.4

S1 – S4 Soldering jumpers for various functions, see Sect. 6.3
## Order numbers

### Electronic unit, complete

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Description</th>
<th>Order Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 – 230 V AC</td>
<td>Standard (not EEx / not RS 485)</td>
<td>2.12233.01.00</td>
</tr>
<tr>
<td>24 V AC / DC</td>
<td></td>
<td>2.12233.02.00</td>
</tr>
</tbody>
</table>

### PCBs, single

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Description</th>
<th>Order Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 – 230 V AC</td>
<td>Power supply unit for</td>
<td>2.11671.01.00</td>
</tr>
<tr>
<td></td>
<td>24 V AC / DC</td>
<td>2.12070.01.00</td>
</tr>
<tr>
<td></td>
<td>Amplifier</td>
<td>2.11556.01.00</td>
</tr>
<tr>
<td></td>
<td>I / O (Inputs / Outputs)</td>
<td>2.11615.01.00</td>
</tr>
</tbody>
</table>

### Power fuses F5 (5 x 20 G / switching capacity 1500 A)

<table>
<thead>
<tr>
<th>Current</th>
<th>Description</th>
<th>Order Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>800 mA T</td>
<td>(100 – 230 V AC)</td>
<td>5.08085.00.00</td>
</tr>
<tr>
<td>1.6 A T</td>
<td>(24 V AC / DC)</td>
<td>5.07823.00.00</td>
</tr>
</tbody>
</table>

### miniature fuses TR 5

<table>
<thead>
<tr>
<th>Current</th>
<th>Order Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 mA T</td>
<td>5.07576.00.00</td>
</tr>
<tr>
<td>100 mA T</td>
<td>5.07561.00.00</td>
</tr>
<tr>
<td>160 mA F</td>
<td>5.10283.00.00</td>
</tr>
<tr>
<td>200 mA T</td>
<td>5.07563.00.00</td>
</tr>
<tr>
<td>500 mA T</td>
<td>5.07586.00.00</td>
</tr>
<tr>
<td>630 mA T</td>
<td>5.08019.00.00</td>
</tr>
</tbody>
</table>

### 19” subrack with guide rails, preassembled

<table>
<thead>
<tr>
<th>Description</th>
<th>Order Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>On request</td>
<td></td>
</tr>
</tbody>
</table>

### 19” subrack, fully assembled

with built-in IFC 210 E, socket connectors with solder terminals

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Description</th>
<th>Order Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 – 230 V AC</td>
<td></td>
<td>On request</td>
</tr>
<tr>
<td>24 V AC / DC</td>
<td></td>
<td>On request</td>
</tr>
</tbody>
</table>

### Blanking plates

<table>
<thead>
<tr>
<th>TE</th>
<th>Order Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>3.06660.00</td>
</tr>
<tr>
<td>3</td>
<td>3.06738.00</td>
</tr>
<tr>
<td>5</td>
<td>3.06739.00</td>
</tr>
<tr>
<td>8</td>
<td>3.06740.00</td>
</tr>
<tr>
<td>14</td>
<td>3.06741.00</td>
</tr>
<tr>
<td>21</td>
<td>3.06590.00</td>
</tr>
</tbody>
</table>
10 Technical data

10.1 IFC 210 E signal converter

1 Range of application
Flow measurement of liquid products

2 Mode of operation and system structure

<table>
<thead>
<tr>
<th>Measurement principle</th>
<th>Modularity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faraday’s laws of induction</td>
<td>Measuring system consisting of signal converter and separate primary head</td>
</tr>
</tbody>
</table>

Versions – signal converter
- IFC 210 E (Standard) - Standard version with large graphic LC display and integrated HART® interface
- IFC 210 E / RS 485 (Option) - same as standard version, but additionally with RS 485 interface
- IFC 210 E / _ / EEx (Option) - same as standard version, for operation with primary heads installed in hazardous areas
- Interface module (Option) - RS 485 / Profibus PA (in preparation)

Versions – primary head
Refer to Technical Data in separate Installation Instructions

3 Input

<table>
<thead>
<tr>
<th>Measured variable</th>
<th>Measured variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volumetric flow rate</td>
<td>(electrode voltage from primary head)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measuring range</th>
<th>Measuring range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent on meter size of primary head</td>
<td>see also Table in Sect. 10.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Full-scale range</th>
<th>Full-scale range</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 Liter/h to 86 860 m³/h, corresponding flow velocity v = 0.3 to 12 m/s</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Selectable units</th>
<th>Selectable units</th>
</tr>
</thead>
<tbody>
<tr>
<td>m³/h, Liter/s, US Gallons/min or freely selectable unit, e.g. Liter/day</td>
<td></td>
</tr>
</tbody>
</table>

4 Output

<table>
<thead>
<tr>
<th>Output/input signal</th>
<th>Current-output</th>
<th>Pulse-output</th>
<th>Status-output</th>
<th>Control-input</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation</td>
<td>active/passive</td>
<td>active/passive</td>
<td>passive</td>
<td>Passive</td>
</tr>
<tr>
<td>Failure signal (error)</td>
<td>22 mA, and others</td>
<td>–</td>
<td>yes</td>
<td>–</td>
</tr>
<tr>
<td>Load impedance</td>
<td>max. 800 Ω</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Low flow</td>
<td>Yes</td>
<td>–</td>
<td>yes</td>
<td>–</td>
</tr>
<tr>
<td>F/R mode</td>
<td>Yes</td>
<td>yes</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Other functions</td>
<td>Yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>detailed technical data (see below)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Refer to Technical Data in separate Installation Instructions.
### Current output

**Function**
- all operating data settable
- galvanically isolated from all output and 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 mA, \( I_{0\%} \) = 4 - 20 mA in 1 mA increments
- for Q > 100% \( I_{\max} \) = 22 mA

**Active mode**
max. 800 Ω load

**Error identification**
0 / 22 mA and variable

**Forward/reverse flow measurement**
direction identified via status output

### Pulse output

**Function**
- all operating data settable
- galvanically isolated from current output and all input circuits
- digital pulse division, interpulse period non-uniform, therefore if frequency and cycle meters connected to allow for minimum counting interval:

\[
gate \text{ time, totalizer} \geq \frac{1000}{P_{100\%} \text{ [Hz]}}
\]

**Active mode**
connection: electronic totalizers

**Passive mode**
connection: electronic or electromechanical totalizers

**Electrical data**
see connection diagrams in Sect. 2.5

**Pulse width**
automatic: pulse duty cycle 1:1,
max 10,000 pulses/sec = 10 kHz
variable: 10 ms - 1 s

\[
P_{100\%} \text{ [pulses/s]} = f_{\text{max}} \text{ [Hz]} = \frac{1}{2 \times \text{pulse width}}
\]

**Forward/reverse flow measurement**
direction identified via status output

### Status output (passive)

**Function**
settable as measuring range identification for BA mode, automatic range change, Overrange, Low Flow Cutoff, indicator for flow direction, errors or trip point, change-over contact (Statusoutput B2 inverse to B1)

**Electrical data**
see connection diagrams in Sect. 2.5

### Control input (passive)

**Function**
- settable 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: \( \geq 3 \text{ V} \geq 4 \text{ V} \)

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

**Low-flow cutoff**
- Cutoff on value: 1 - 19 % of \( Q_{100\%} \), adjustable in 1% increments
- Cutoff on value: 2 - 20 %
5 measuring accuracy

Display, digital values, pulse output
F maximum error in % of measured value (not typical values)

- Flow velocity in m/s and ft/s

Reference conditions similar to EN 29 104

<table>
<thead>
<tr>
<th>Product</th>
<th>Water at 10 – 30°C / 50 – 86°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical conductivity</td>
<td>&gt; 300 mS/cm</td>
</tr>
<tr>
<td>Power supply (rated voltage)</td>
<td>$U_N$ (± 2%)</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>20 – 22°C</td>
</tr>
<tr>
<td>Warm-up time</td>
<td>60 min</td>
</tr>
<tr>
<td>Max. calibration equipment error</td>
<td>10 × smaller than F</td>
</tr>
<tr>
<td>Inlet/outlet runs</td>
<td>10 × DN / 2 × DN (DN = meter size)</td>
</tr>
<tr>
<td>Primary head</td>
<td>properly grounded and centered</td>
</tr>
</tbody>
</table>

Calibrated on EN 17025 accredit to calibration equipment in direct volumetric comparsion.

<table>
<thead>
<tr>
<th>Type/Meter size</th>
<th>Maximum error in % of measured value (MV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN 2.5 – 6* 1/10'' – 1/4''</td>
<td>$\leq \pm 0.5%$ of MV $\leq \pm (0.4%$ of MV + $1$ mm/s) $\leq \pm (0.4%$ of MV + $0.04$ inch/s)</td>
</tr>
<tr>
<td>$\geq$ DN 10 $\geq 7/8''$</td>
<td>$\leq \pm 0.3%$ of MV $\leq \pm (0.2%$ of MV + $1$ mm/s) $\leq \pm (0.2%$ of MV + $0.04$ inch/s)</td>
</tr>
</tbody>
</table>

Current output same error limits as above, additionally $\pm 10 \mu$A

Reproducibility and repeatability 0.1\% of MV, minimum 1 mm/s / 0.04 inch/s at constant flow

<table>
<thead>
<tr>
<th>Ambient temperature</th>
<th>typical values</th>
<th>maximum values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulse output</td>
<td>0.003% of MV (1)</td>
<td>0.01 % of MV (1)</td>
</tr>
<tr>
<td>Current output</td>
<td>0.01 % of MV (1)</td>
<td>0.025% of MV (1)</td>
</tr>
<tr>
<td>Power supply</td>
<td>$&lt; 0.02$ % of MV</td>
<td>0.05 % of MV</td>
</tr>
<tr>
<td>Load</td>
<td>$&lt; 0.01$ % of MV</td>
<td>0.02 % of MV</td>
</tr>
</tbody>
</table>

(1) 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.
6 Field service conditions

6.1 Installation conditions

Signal converter
  Installation in 19” rack, dust-free and dry.
  For further information, refer to Sect. 1.1 and 10.3

Primary head
  Refer to separate Installation Instructions

6.2 Ambient conditions

Signal converter
  Ambient temperature: -25 to +60 °C (EEx: -20 to +55 °C)
  Storage temperature: -25 to +60 °C
  Protection category (IEC 529/EN 60 529): IP 20
  Electromagnetic compatibility EMC: to EN 61326-1 (1997) and A1 (1998), and NAMUR Standard NE 21

Primary head
  Refer to separate Installation Instructions

6.3 Process product conditions

Electrical conductivity
  $\geq$ 5 µS/cm
  $\geq$ 20 µS/cm for demineralized cold water

Other product conditions
  Refer to Installation Instructions for the primary head

7 Construction

Signal converter
  19” plug-in unit to DIN 41 494.
  28 modules wide, 3 upright modules high

Dimensions
  Refer to Sect. 10.3

Weight
  approx. 1.3 kgs

Material
  Aluminium section, stainless steel and aluminium sheet, partially polyester-coated

Electrical connection
  Terminal strips
    XA: Primary head, see Sect. 1.3.5
    XB: Power supply, see Sect. 1.3.5
    XC: Inputs and outputs, see Sect. 2.5
    XD: Option, RS 485 interface, see Sect. 6.2.2

Styles
  • 32-pin, contact surface gold-plated
  • plug connectors Style F to DIN 41 612
  • socket connectors Style F to DIN 41 612 and transverse soldered connections (included)
  • Special versions on request

Primary head
  Refer to separate Installation Instructions
8 Display and User Interface

Local display
High-contrast, illuminated graphic LC display, temperature-compensated, very good readability, 128x64 dots, view surface approx. 69 mm x 36 mm

Display function
current flow, forward, reverse and sum totalizers or bar graph with status messages

Units:
actual flow m³/hr, Liter/Sec, US gallons/min. or user-defined unit such as Liter/day or US MGal/day

totalizer m³, Liter or US gallons or user-defined unit such as hectolitres or US MGal
(adjustable counting time up to overflow)

Language of clear texts
German, English, French, other languages on request

Operation
by 5 keys: ← → ↑ ↓

9 Power supply

Field current supply
Type bipolar, pulsed DC field for all KROHNE primary heads, galvanically isolated from all output and input circuits

Terminals
Plug connector XA, pins z30 and z32 (primary head: terminals 7 and 8)

Current/voltage ± 0.125 A (± 5%) / max. 40V

Clock frequency 1/36 to 1/2 of line frequency, adjustable acc. to calibration data of primary head

signal converter

<table>
<thead>
<tr>
<th>signal converter</th>
<th>AC-version</th>
<th>AC/DC version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage range (without change-over)</td>
<td>100 - 230 V AC</td>
<td>24 V AC</td>
</tr>
<tr>
<td>Tolerance range</td>
<td>85 - 255 V AC</td>
<td>20.4 - 26.4 V AC</td>
</tr>
<tr>
<td>Frequency</td>
<td>48 - 63 Hz</td>
<td>48 - 63 Hz</td>
</tr>
<tr>
<td>Power input (incl. primary head)</td>
<td>11 VA, typical</td>
<td>11 VA, typical</td>
</tr>
<tr>
<td>(max. 14 VA)</td>
<td>(max. 14 VA)</td>
<td>(max. 14 VA)</td>
</tr>
</tbody>
</table>

When connected to a functional extra-low voltage, 24 V AC/DC, safety separation (PELV) must be ensured.
### 10 Certificates and Approvals

<table>
<thead>
<tr>
<th>Component</th>
<th>Approval Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal converter</td>
<td>[Ex ib] IIC / II(2)G PTB 00 ATEX 2026X</td>
</tr>
<tr>
<td>Primary head</td>
<td>see separate Installation Instructions</td>
</tr>
</tbody>
</table>

### 11 Order information

<table>
<thead>
<tr>
<th>Component</th>
<th>Information Provided</th>
</tr>
</thead>
<tbody>
<tr>
<td>Versions Signal converter</td>
<td>see Sect. 10.1, part 2 &quot;Mode of operation and system structure&quot;</td>
</tr>
<tr>
<td>Versions Primary head</td>
<td>Refer to Technical Data in separate Installation Instructions</td>
</tr>
</tbody>
</table>

### 12 External Standards and Directives

see Page 5
10.2 Full-scale range Q\textsubscript{100%}

Full-scale range Q\textsubscript{100%}  
Flow rate Q = 100%  
6 liter/hr up to 86 860 m\textsuperscript{3}/hr, (0.03 – 401 000 US Gal/min), 
adjustable required, 
equivalent flow velocity 0.3 - 12 m/s (1 - 40 ft/s)

Unit  
m\textsuperscript{3}/hr, Liter/Sec, US gallons/min or user-defined unit, 
e.g. Liter/day or US MGal/day

Flow table

\( v = \text{flow velocity in m/s} \)

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<th>DN</th>
<th>mm</th>
<th>( v = 0.3 \text{ m/s} )</th>
<th>( v = 1 \text{ m/s} )</th>
<th>( v = 12 \text{ m/s} )</th>
<th>Q\textsubscript{100%} in US Gal/min</th>
<th>( v = 1 \text{ ft/s} )</th>
<th>( v = 40 \text{ ft/s} )</th>
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</table>
10.3 Dimensions and weights IFC 210 E-EEx / ZD / ZD-EEx

IFC 210 E and IFC 210 E-EEx Signal converters / IFC 210 E-EEx

Dimensions in mm

Weight approx. 1.3 kg  support 3 HE, assembly dimensions in compliance with DIN 41494, Part 5

19" Subassembly support purchase order numbers

- Subassembly support
  including guiding rails, pre-installed  2.07230

- Subassembly support fully installed
  including IFC 210 E,
  multipole connectors plus solder points

  - Blind plates
    2 TE  3.06660.00
    3 TE  3.06738.00
    5 TE  3.06739.00
    8 TE  3.06740.00
    14 TE 3.06741.00
    21 TE 3.07590.00

- Special design of
  multipole connectors X1 and X2:

  Threaded terminal end 1)  5.08400
  Wire-Wrap (1 x 1) mm  5.08402
  Termi-Point (0.8 x 1.6) mm  5.08403

1) Designated BG
connection component  2.07412
The flowmeter is designed for electrically conductive fluids. Measurement is based on Faraday’s law of induction, according to which a voltage is induced in an electrically conductive body which passes through a magnetic field. The following expression is applicable to the voltage:

\[ U = K \times B \times \bar{v} \times D \]

- \( K \) an instrument constant
- \( B \) magnetic field strength
- \( \bar{v} \) mean velocity
- \( D \) pipe diameter

Inside the electromagnetic flowmeter, the fluid passes through a magnetic field applied perpendicular to the direction of flow. An electric voltage is induced by the movement of the fluid (which must have a minimum electrical conductivity). This is proportional to the mean flow velocity and thus to the volume of flow. The induced voltage signal is picked up by two electrodes which are in conductive contact with the fluid and is transmitted to a signal converter for a standardized output signal.

This method of measurement offers the following advantages:

1) No pressure loss through pipe constriction or protruding parts.
2) Since the magnetic field passes through the entire flow area, the signal represents a mean value over the pipe cross-section; therefore, only relatively short straight inlet pipes 5 x DN from the electrode axis are required upstream of the primary head.
3) Only the pipe liner and the electrodes are in contact with the fluid.
4) Already the original signal produced is an electrical voltage which is an exact linear function of the mean flow velocity.
5) Measurement is independent of the flow profile and other properties of the fluid.

The magnetic field of the primary head is generated by a square wave current fed from signal converter to the field coils. This field current alternates between positive and negative values. Alternate positive and negative flowrate-proportional signal voltages are generated at the same frequency by the effect of the magnetic field, which is proportional to the current. The positive and negative voltages at the primary head electrodes are subtracted from one another in the signal converter. Subtraction always takes place when the field current has reached its stationary value, so that constant interference voltages or external or fault voltages changing slowly in relation to the measuring cycle are suppressed. Power line interference voltages coupled in the primary head or in the connecting cables are similarly suppressed.
The standard

- outstanding accuracy
- practice-oriented standard equipment, current and pulse output (galvanically isolated)
- status and/or control input, adjustable for numerous tasks: limit switch, direction indication, error messages, external initiation of functions, etc.
- IMoCom bus, suitable for numerous internal and external tasks
- simplified, standard KROHNE operator control concept
- low power consumption

Printed circuit board ADC/FSV

- overdrive-proof signal processing, processes flow rate peaks up to 20 m/s and more, fast and accurate
- digital signal processing and sequence control
- patented, high-resolution analog/digital converter, digitally controlled and monitored
- input amplifier with facility for voltage grading of the signalling core shield (bootstrap)
- high signal-to-noise ratio through low-loss field current supply with high frequencies and high currents
- pulsed DC current, electronically controlled, for supplying the magnetic coils in the primary head
- customer parameters and internal calibration data are filed in separate EEPROMs (easily replaceable in the event of a service)

Printed circuit board: display/operator control unit

- large illuminated graphic LC display
- 5 keys for operation of the signal converter
- connection to the internal IMoCom bus
- distribution of general signals, such as IMoCom bus, supply power, etc.

IMoCom bus plug for connection of external control and testing equipment, such as adapters and CONFIG software for operator control via MS-DOS PC

Printed circuit board I/O-HART®, outputs and inputs

All outputs and inputs galvanically isolated

Current output I

- for active or passive operation
- converts the digital output signal from microprocessor \( \mu P \) into a proportional current

Pulse output \( P \)

- for electronic totalizers up to max. 10 kHz
- for electromechanical totalizers up to max. 50 Hz
- KROHNE-specific integrated circuit KSA 04 for fine quantization of the output signals over a wide dynamic range

Binary output and input B1 and B2

- any output/input combination selectable
- status output for limit value, error detection, flow direction in F/R mode, etc.
- control input for totalizer and error resets, also for holding outputs or setting to “zero”

Plug-in module slots for upgrading or retrofitting the signal converter

- RS 485 interface module
- GTEX module for Ex-i operation of the signal converter outside hazardous areas
- Further modules in preparation
13 EU-Model test certificate ATEX
<table>
<thead>
<tr>
<th>Keyword</th>
<th>Section No.</th>
<th>Fct. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abbreviations</td>
<td>1.3.2, 1.3.4, 4.4</td>
<td>2.1, 4.4</td>
</tr>
<tr>
<td>Accuracies</td>
<td>10.1</td>
<td>2.1</td>
</tr>
<tr>
<td>ADC = analog digital converter</td>
<td>4.5, 12</td>
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<tr>
<td>Ambient temperature</td>
<td>10.1</td>
<td>1.06</td>
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<tr>
<td>Appliance</td>
<td>5.19</td>
<td>3.06</td>
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<tr>
<td>Automatic range change (BA)</td>
<td>4.4, 5.12</td>
<td>1.06, 1.07</td>
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<td>3.07 (1.07, 1.08)</td>
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<td>B1/B2 output/input terminals</td>
<td>2.3, 2.4, 5.12</td>
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<td>BA = automatic range change</td>
<td>4.4, 5.18</td>
<td>3.02</td>
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<td>Block diagram IFC 210 E</td>
<td>12</td>
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<td>C</td>
<td>3.07</td>
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<td>C = control input</td>
<td>2.4, 2.5, 5.12</td>
<td>1.06, 1.07</td>
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<tr>
<td>Changeover, power supply</td>
<td>8.2</td>
<td></td>
</tr>
<tr>
<td>Characteristics of outputs</td>
<td>5.22</td>
<td></td>
</tr>
<tr>
<td>Clearing error messages</td>
<td>4.6</td>
<td></td>
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<td>Configuring &amp; operating points</td>
<td>5.15</td>
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<td>7.6</td>
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<td>Cut-off &quot;off&quot; value (SMU OFF)</td>
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<td>Cut-off &quot;on&quot; value (SMU ON)</td>
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<td>DN + meter size in mm</td>
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<td>E</td>
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<td>EC = electronic totalizer</td>
<td>2.2, 2.5</td>
<td>4.4</td>
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<tr>
<td>Electrical connection</td>
<td>7.6</td>
<td></td>
</tr>
<tr>
<td>GSA simulator</td>
<td>4.4, 5.16</td>
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</tr>
<tr>
<td>Outputs and inputs</td>
<td>2.6</td>
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</tr>
<tr>
<td>Power supply</td>
<td>1.1, 1.1, 1.2, 1.5</td>
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<tr>
<td>Electromagnetic compatibility</td>
<td>page 8.5</td>
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<tr>
<td>EMC = electromagnetic totalizer</td>
<td>2.2, 2.5, 5.7</td>
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</tr>
<tr>
<td>EN technical standards</td>
<td>page 8.5</td>
<td></td>
</tr>
<tr>
<td>Error</td>
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<td></td>
</tr>
<tr>
<td>Error list</td>
<td>4.5</td>
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</tr>
<tr>
<td>Error (messages)</td>
<td>4.5</td>
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</tr>
<tr>
<td>Cancel</td>
<td>4.5</td>
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</tr>
<tr>
<td>Limits</td>
<td>10.1</td>
<td></td>
</tr>
<tr>
<td>Reset / delete</td>
<td>4.6</td>
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<tr>
<td>External range change</td>
<td>4.4, 5.12</td>
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</table>

### Section B

- B1/B2 output/input terminals: 2.3, 2.4, 5.12
- BA = automatic range change: 4.4, 5.18
- Block diagram IFC 210 E: 12

### Section C

- C = control input: 2.4, 2.5, 5.12
- Changeover, power supply: 8.2
- Characteristics of outputs: 5.22
- Clearing error messages: 4.6
- Configuring & operating points: 5.15
- DISPLAY: 6.2
- Connecting diagrams: 7.6
- Control input C: 1.3.5, 1.3.6, 1.3.5, 1.3.6
- - connection: 2.5
- - description: 2.4, 2.5, 5.9
- Conversion factor: 4.4, 5.17
  - Quantity (volume): 3.05
  - Time: 4.4, 5.17
- Current output: 4.4, 4.4, 4.2, 5.22
- Cut-off "off" value (SMU OFF): 5.3, 5.3
- Cut-off "on" value (SMU ON): 5.3, 5.3

### Section D

- Data: 4.4
- Data column: 4.4, 4.3
- Data errors: 4.5
- Dimensions: IFC 210 E: 10.3
  - ZD: 10.3
  - ZD-ES: 10.3
- Display: 4.2, 5.5
- DN + meter size in mm: 4.4
- DS, signal cable A: 1.3.5

### Section E

- EC = electronic totalizer: 2.2, 2.5, 5.4
- Electrical connection: GSA simulator: 7.6
- Outputs and inputs: 2.6
- Power supply: 1.1, 1.1, 1.2, 1.5
- Electromagnetic compatibility: page 8.5
- EMC = electromagnetic totalizer: 2.2, 2.5, 5.7
- EN technical standards: page 8.5
- Error: 4.5
- Error list: 4.5
- Error (messages): 4.5
- Cancel: 4.5
- Limits: 10.1
- Reset / delete: 4.6
- External range change: 4.4, 5.12
<table>
<thead>
<tr>
<th>Keyword</th>
<th>Section No.</th>
<th>Fct. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>4.4, 4.16</td>
<td>3.02</td>
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<tr>
<td>Magnetic field frequency</td>
<td>4.4, 4.16</td>
<td>3.02</td>
</tr>
<tr>
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<td>4.2</td>
<td>1.04</td>
</tr>
<tr>
<td>Main menu column</td>
<td>4.1</td>
<td>1.00, 2.00, 3.00</td>
</tr>
<tr>
<td>Mass flow measurement, see user defined unit</td>
<td>4.2, 5.17</td>
<td>3.00</td>
</tr>
<tr>
<td>Measuring principle</td>
<td>4.4, 5.16</td>
<td>3.02</td>
</tr>
<tr>
<td>Menu</td>
<td>4.1, 4.4</td>
<td>1.04</td>
</tr>
<tr>
<td>Meter size (DN)</td>
<td>4.4, 5.1, 5.4, 5.16</td>
<td>3.02</td>
</tr>
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<td>N</td>
<td>5.5</td>
<td>1.04</td>
</tr>
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<td>5.5</td>
<td>1.04</td>
</tr>
<tr>
<td>O</td>
<td>6.2, 10.1</td>
<td>1.06</td>
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<tr>
<td>Option = optional equipment</td>
<td>6.2, 10.1</td>
<td>1.06</td>
</tr>
<tr>
<td>Order numbers</td>
<td>9</td>
<td>1.06</td>
</tr>
<tr>
<td>Outputs</td>
<td>5.15</td>
<td>1.05</td>
</tr>
<tr>
<td>characteristics</td>
<td>2.5</td>
<td>1.06</td>
</tr>
<tr>
<td>- I</td>
<td>5.6</td>
<td>1.05</td>
</tr>
<tr>
<td>- P</td>
<td>5.7</td>
<td>1.03, 1.07, 1.06, 1.07</td>
</tr>
<tr>
<td>- S</td>
<td>5.8, 5.16</td>
<td>3.07</td>
</tr>
<tr>
<td>- voltage stable when measuring tube empty</td>
<td>6.3</td>
<td>1.04</td>
</tr>
<tr>
<td>Overflow, display</td>
<td>5.5</td>
<td>1.04</td>
</tr>
<tr>
<td>Overflowage</td>
<td>2.2, 2.4, 2.6, 2.8, 2.10.4</td>
<td>1.06, 1.07</td>
</tr>
<tr>
<td>- P (pulse output)</td>
<td>2.2, 2.4, 2.6, 2.8, 2.10.4</td>
<td>1.06, 1.07</td>
</tr>
<tr>
<td>- S</td>
<td>5.8, 5.16</td>
<td>3.07</td>
</tr>
<tr>
<td>P</td>
<td>2.2, 4.4, 4.5, 4.7</td>
<td>1.06</td>
</tr>
<tr>
<td>P = pulse output</td>
<td>2.2, 4.4, 4.5, 4.7</td>
<td>1.06</td>
</tr>
<tr>
<td>PCB = printed circuit boards</td>
<td>9.4</td>
<td>1.06</td>
</tr>
<tr>
<td>PE = protective conductor</td>
<td>6.1</td>
<td>1.06</td>
</tr>
<tr>
<td>Power supply (on-line voltage)</td>
<td>8.2</td>
<td>1.06</td>
</tr>
<tr>
<td>- changeover</td>
<td>8.2</td>
<td>1.06</td>
</tr>
<tr>
<td>- connection</td>
<td>2.1, 10.4</td>
<td>1.06</td>
</tr>
<tr>
<td>- consumption</td>
<td>10.4</td>
<td>1.06</td>
</tr>
<tr>
<td>- failure</td>
<td>4.5, 7.4</td>
<td>1.06</td>
</tr>
<tr>
<td>- frequency</td>
<td>1.2, 10.1</td>
<td>1.06</td>
</tr>
<tr>
<td>- voltage</td>
<td>1.2, 10.1</td>
<td>1.06</td>
</tr>
<tr>
<td>Primary constant, see GK</td>
<td>4.4, 5.16</td>
<td>1.06</td>
</tr>
<tr>
<td>Primary head</td>
<td>4.4, 5.16</td>
<td>1.06</td>
</tr>
<tr>
<td>- constant, see GK</td>
<td>4.4, 5.16</td>
<td>1.06</td>
</tr>
<tr>
<td>- simulator GS 8A</td>
<td>7.4</td>
<td>1.06</td>
</tr>
<tr>
<td>- testing</td>
<td>7.4</td>
<td>1.06</td>
</tr>
<tr>
<td>Primary simulator, see GS 8A</td>
<td>7.4</td>
<td>1.06</td>
</tr>
<tr>
<td>Printed circuit boards, see PCB</td>
<td>8.4</td>
<td>1.06</td>
</tr>
<tr>
<td>Program organization</td>
<td>4.1</td>
<td>1.06</td>
</tr>
<tr>
<td>Programming = input</td>
<td>4.1, 4.3</td>
<td>1.06</td>
</tr>
<tr>
<td>Programming mode, entry into protective conductor PE</td>
<td>4.1, 4.3</td>
<td>1.06</td>
</tr>
<tr>
<td>Protective conductor PE</td>
<td>6.1</td>
<td>1.06</td>
</tr>
<tr>
<td>Pulse - P</td>
<td>4.4, 4.5, 4.4, 5.1, 5.16</td>
<td>1.06</td>
</tr>
<tr>
<td>Pulse output</td>
<td>4.4, 4.5, 4.4, 5.1, 5.16</td>
<td>1.06</td>
</tr>
<tr>
<td>Pulse width</td>
<td>4.4, 4.5, 4.4, 5.1, 5.16</td>
<td>1.06</td>
</tr>
<tr>
<td>Pulses per unit time</td>
<td>4.4, 4.5, 4.4, 5.1, 5.16</td>
<td>1.06</td>
</tr>
<tr>
<td>Q</td>
<td>4.4, 5.12</td>
<td>1.04</td>
</tr>
<tr>
<td>Q = flow rate</td>
<td>4.4, 5.12</td>
<td>1.04</td>
</tr>
<tr>
<td>Q100% = full-scale range</td>
<td>5.16</td>
<td>1.01, 3.02</td>
</tr>
<tr>
<td>R</td>
<td>4.4, 5.6, 5.10</td>
<td>1.04</td>
</tr>
<tr>
<td>R = reverse flow</td>
<td>4.4, 5.6, 5.10</td>
<td>1.04</td>
</tr>
<tr>
<td>Range change</td>
<td>2.3, 5.10, 5.12</td>
<td>1.04</td>
</tr>
<tr>
<td>automatic</td>
<td>2.3, 5.10, 5.12</td>
<td>1.04</td>
</tr>
<tr>
<td>- external</td>
<td>2.3, 5.10, 5.12</td>
<td>1.04</td>
</tr>
<tr>
<td>Replacement</td>
<td>8.3</td>
<td>1.04</td>
</tr>
<tr>
<td>electronic unit</td>
<td>8.3</td>
<td>1.04</td>
</tr>
<tr>
<td>power fuses</td>
<td>8.2</td>
<td>1.04</td>
</tr>
<tr>
<td>Reset totalizers</td>
<td>4.4, 5.9</td>
<td>1.04</td>
</tr>
<tr>
<td>Reverse flow (R)</td>
<td>4.4, 5.10, 5.22</td>
<td>1.04</td>
</tr>
<tr>
<td>Reverse</td>
<td>4.4, 5.10, 5.22</td>
<td>1.04</td>
</tr>
<tr>
<td>- functions column</td>
<td>4.1, 4.3</td>
<td>1.04</td>
</tr>
<tr>
<td>- main menu column</td>
<td>4.1, 4.3</td>
<td>1.04</td>
</tr>
<tr>
<td>- measuring mode</td>
<td>4.1, 4.3</td>
<td>1.04</td>
</tr>
<tr>
<td>S</td>
<td>2.4, 4.4, 4.5</td>
<td>1.06</td>
</tr>
<tr>
<td>S = Status output</td>
<td>2.4, 4.4, 4.5</td>
<td>1.06</td>
</tr>
<tr>
<td>Safety solution</td>
<td>2.1</td>
<td>1.06, 1.07, 3.07</td>
</tr>
<tr>
<td>Setting level</td>
<td>4.1, 4.4</td>
<td>1.00 et seq., 1.00 et seq., 3.00 et seq.</td>
</tr>
<tr>
<td>Signal converter IFC 020</td>
<td>10.3</td>
<td>1.03</td>
</tr>
<tr>
<td>- accuracies</td>
<td>10.3</td>
<td>1.03</td>
</tr>
<tr>
<td>- cable A</td>
<td>1.3</td>
<td>1.03</td>
</tr>
<tr>
<td>- changeover, power supply</td>
<td>8.2</td>
<td>1.03</td>
</tr>
<tr>
<td>- connecting &amp; operating points</td>
<td>4.2, 4.9</td>
<td>1.03</td>
</tr>
<tr>
<td>- connection to power</td>
<td>12.4</td>
<td>1.03</td>
</tr>
<tr>
<td>- functional checks</td>
<td>10.3</td>
<td>1.03</td>
</tr>
<tr>
<td>- fuses, power</td>
<td>8.2</td>
<td>1.03</td>
</tr>
<tr>
<td>- mounting location</td>
<td>11.1</td>
<td>1.03</td>
</tr>
<tr>
<td>- nameplates</td>
<td>15.5</td>
<td>1.03</td>
</tr>
<tr>
<td>- operator control</td>
<td>4.1, 4.3</td>
<td>1.03</td>
</tr>
<tr>
<td>- power consumption</td>
<td>15.4</td>
<td>1.03</td>
</tr>
<tr>
<td>- printed circuit boards</td>
<td>8.9</td>
<td>1.03</td>
</tr>
<tr>
<td>- Spare parts</td>
<td>9</td>
<td>1.03</td>
</tr>
<tr>
<td>- technical data</td>
<td>10.1-10.4</td>
<td>1.03</td>
</tr>
<tr>
<td>- Simulator GS 8A</td>
<td>7.6</td>
<td>1.03</td>
</tr>
<tr>
<td>- power consumption</td>
<td>15.4</td>
<td>1.03</td>
</tr>
<tr>
<td>- printed circuit boards</td>
<td>8.9</td>
<td>1.03</td>
</tr>
<tr>
<td>- Spare parts, see order numbers</td>
<td>9</td>
<td>1.03</td>
</tr>
<tr>
<td>Status output B</td>
<td>2.4, 4.5, 4.8</td>
<td>1.06</td>
</tr>
<tr>
<td>T</td>
<td>5.2</td>
<td>1.02</td>
</tr>
<tr>
<td>T = time constant</td>
<td>5.2</td>
<td>1.02</td>
</tr>
<tr>
<td>Technical data</td>
<td>10.3</td>
<td>1.02</td>
</tr>
<tr>
<td>- accuracies</td>
<td>10.3</td>
<td>1.02</td>
</tr>
<tr>
<td>- dimensions &amp; weights</td>
<td>10.3</td>
<td>1.02</td>
</tr>
<tr>
<td>- signal converter IFC 020</td>
<td>10.1-10.4</td>
<td>1.02</td>
</tr>
<tr>
<td>- Terminals B1/B2</td>
<td>2.1, 2.4, 2.6, 2.8, 2.10.4</td>
<td>1.02</td>
</tr>
<tr>
<td>- Tests, see functional checks</td>
<td>7.1 et seq.</td>
<td>1.02</td>
</tr>
<tr>
<td>- Time constant</td>
<td>5.1</td>
<td>1.02</td>
</tr>
<tr>
<td>- Totalizer (maximum electronic)</td>
<td>5.4</td>
<td>1.02</td>
</tr>
<tr>
<td>- Trig point</td>
<td>2.3, 5.8</td>
<td>1.02</td>
</tr>
<tr>
<td>- Troubleshooting, see functional checks</td>
<td>7.1 et seq.</td>
<td>1.02</td>
</tr>
<tr>
<td>U</td>
<td>4.4, 5.1, 5.16</td>
<td>1.06</td>
</tr>
<tr>
<td>Units for display</td>
<td>4.4, 5.4</td>
<td>1.06</td>
</tr>
<tr>
<td>- flow</td>
<td>4.4, 5.1, 5.16</td>
<td>1.06</td>
</tr>
<tr>
<td>- P</td>
<td>4.4, 5.1, 5.16</td>
<td>1.06</td>
</tr>
<tr>
<td>- User-defined unit</td>
<td>4.4, 5.1, 5.16</td>
<td>1.06</td>
</tr>
<tr>
<td>V</td>
<td>4.4, 5.1</td>
<td>3.02</td>
</tr>
<tr>
<td>V = flow velocity</td>
<td>4.4, 5.1</td>
<td>3.02</td>
</tr>
<tr>
<td>VOE standards</td>
<td>1.1</td>
<td>3.02</td>
</tr>
<tr>
<td>W</td>
<td>10.3</td>
<td>1.06</td>
</tr>
<tr>
<td>Weights, see dimensions</td>
<td>10.3</td>
<td>1.06</td>
</tr>
<tr>
<td>Z</td>
<td>7.1</td>
<td>3.03</td>
</tr>
<tr>
<td>Zero check (adjustment)</td>
<td>7.1</td>
<td>3.03</td>
</tr>
</tbody>
</table>
Your electromagnetic flowmeter
• has been carefully manufactured and tested by a company with ISO 9001 certification
• and volumetrically calibrated in one of the world’s most accurate test rigs.

If installed and operated in accordance with these operating instructions, your flowmeter will rarely present any problems.

Should you nevertheless need to return a flowmeter for checkout or repair, please pay strict attention to the following points:
Due to statutory regulations concerning protection of the environment and the health and safety of our personnel, KROHNE may only handle, test and repair returned flowmeters that have been in contact with liquids if it is possible to do so without risk to personnel and environment. This means that KROHNE can only service your flowmeter if it is accompanied by a certificate in line with the following model confirming that the flowmeter is safe to handle.

If the flowmeter has been operated with toxic, caustic, flammable or water-endangering liquids, you are kindly requested
• to check and ensure, if necessary by rinsing or neutralizing, that all cavities in the flowmeter are free from such dangerous substances. (Directions on how you can find out whether the primary head has to be opened and then flushed out or neutralized are obtainable from KROHNE on request.)
• to enclose a certificate with the flowmeter confirming that the flowmeter is safe to handle and stating the liquid used.

KROHNE regret that they cannot service your flowmeter unless accompanied by such a certificate.

SPECIMEN certificate

Company: .......................................................... Address: ................................................................
Department: ....................................................... Name: ....................................................................
Tel. No.: ............................................................. Fax-No.: .................................................................

The enclosed electromagnetic flowmeter
Type: .................................................................. KROHNE Order No. or Series No.: ...................
has been operated with the following liquid: ....... .................................................................

Because this liquid is water-endangering * / toxic * / caustic * / flammable *
we have
- checked that all cavities in the flowmeter are free from such substances *
- flushed out and neutralized all cavities in the flowmeter *
(* delete if not applicable)

We confirm that there is no risk to man or environment through any residual liquid contained in this flowmeter.

Date: .................................................................... Signature: ............................................................

Company stamp: