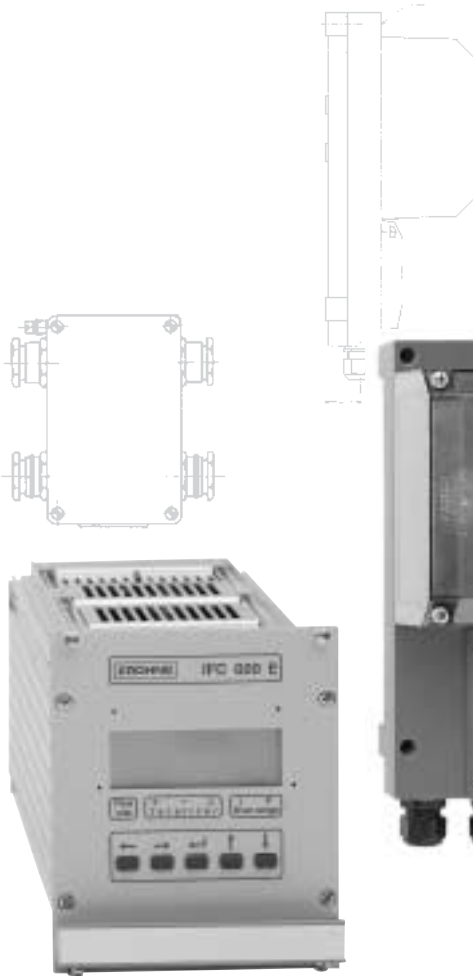


Condensed Instructions

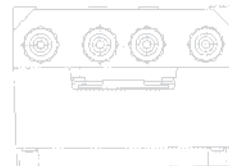
IFC 020 K IFC 020 F IFC 020 E

Signal converters for electromagnetic flowmeters



Applicable to Software Versions

- IFC 020 K and
IFC 020 F
No. **3170330200**
- IFC 020 E
No. **3175870200**



Variable area flowmeters

Vortex flowmeters

Flow controllers

Electromagnetic flowmeters

Ultrasonic flowmeters

Mass flowmeters

Level measuring instruments

Communications technology

Engineering systems & solutions

Switches, counters, displays and recorders

Heat metering

Pressure and temperature

Contents

- | | | |
|---|---------------------------------------|---------|
| 1 | Electrical connection: Power | 1/1-1/8 |
| 2 | Electrical connection: Outputs | 2/1-2/4 |
| 3 | Start-up | 3/1 |
| 4 | Operator control of signal converter | 4/1-4/4 |

PLEASE NOTE

These concise instructions do not include the following: device description, technical data, standards, approvals, etc., nor conditions pertaining to product liability and warranty.

The operator is, however, obligated to take note of these sections in the detailed Installation and Operating Instructions.

Part A System installation and start-up

1 Electrical connection: power supply

1.1 Important installation notes

PLEASE NOTE !

1.1.1 Location

- **Electrical connection in accordance with VDE 0100** "Regulations governing heavy-current installations with line voltages up to 1000 V" or **equivalent national regulations**.
- Do not cross or loop **cables inside the terminal compartment**.
- Use **separate cable entries** (see below) for power supply, field current cables, signal lines, 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.
- Do not expose signal converters to intense **vibration**.

1.1.2 Only for separate systems/signal converters (F- and E versions)

- 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).
- Always **calibrate** primary head and signal converter **together**. Therefore, when installing, ensure **primary constant GKL is identical**; refer to instrument nameplate for the primary head. If the GKL is not identical, set the signal converter to the GKL of the primary head. Refer also to Sections 4.
- **Dimensions of signal converter**; refer to Section 10.4.

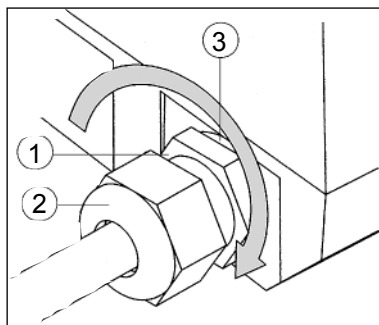
1.1.3 Cable entries (K- and F- versions)

Number of cable entries: 2 for the compact flowmeters

4 for the separate IFC 020 F signal converter

NOTE: Ensure gaskets are fitted correctly and maintain the following max. torques!

- 1 Max. torques for PG 13.5, 1/2" NPT or 1/2" PF adapters: **4 Nm / 2.8 ft × lbf**
- 2 Max. torques for PG 13.5 only: **3 Nm / 2.1 ft × lbf**
- 3 Gasket



A) PG 13.5 cable entries

These cable entries may only be used for flexible electrical cables if the relevant electrical regulations so allow, e.g. National Electric Code (NEC).

Do not fix rigid metal conduits (IMC) or flexible plastic conduits to the PG 13.5 cable entries, refer to "Point B, C" below (1/2" NPT or PF adapters).

B) 1/2" NPT adapters

For most North American systems the regulations require that electrical conductors be laid in conduits, particularly where power voltages > 100 V AC are concerned.

In such cases, use the 1/2" NPT or 1/2" PF adapters to which flexible plastic conduits can be screwed. **Do not use rigid metal conduits (IMC)!**

Lay conduits such that no moisture can penetrate into the converter housing.

Should there be risk of any condensation water forming, fill the cross-section of the conduit around the cables at these adapters with a suitable sealing compound.

C) 1/2" PF adapters

PLEASE NOTE !

- **Rated values:** The flowmeter housings protecting the electronic equipment from dust and moisture must always be kept closed. 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.
- **Safety isolation:** the flowmeters (signal converters) must be provided with an isolating facility.

1. AC Version

230/240 V AC (200 - 260 V AC)
switch-selectable to
115/120 V AC (100 - 130 V AC)

2. AC Version

200 V AC (170 - 220 V AC)
switch-selectable to
100 V AC (85 - 110 V AC)

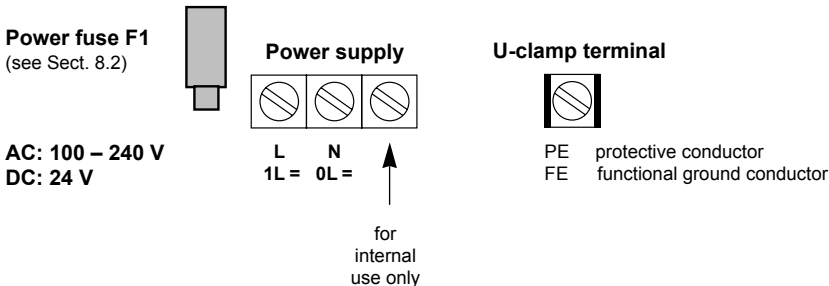
- **Note information on instrument nameplate:** supply voltage and frequency
- The **PE protective ground conductor** for the power supply **must be connected** to the separate U-clamp terminal in the terminal compartment of the signal converter. For exceptions (compact systems), refer to installation instructions for the primary head.
- **Connection diagrams** for electrical connection between primary head and signal converter: refer to Section 1.3.5 and 1.3.6.

DC Version (in preparation for IFC 020 E)

24 V DC (18 - 32 V DC)

- **Note information on instrument nameplate:** supply voltage and frequency.
- For measurement reasons, connect an **FE functional ground conductor** to the separate U-clamp terminal in the terminal compartment of the signal converter.
- If connected to a functional extra-low voltage source (24 V AC / DC, 48 V AC), provide for **protective separation (PELV)** in conformity with 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 1.3.6.

Connection to power (K- and F- versions only)



For electrical connection of the IFC 020 E power supply see Section 1.3.6, connection diagrams III to VI.

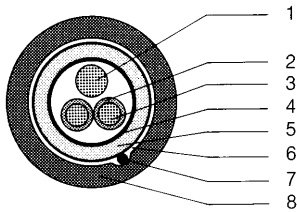
1.3 Electrical connection of separate primary heads (F- and E- versions)

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

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

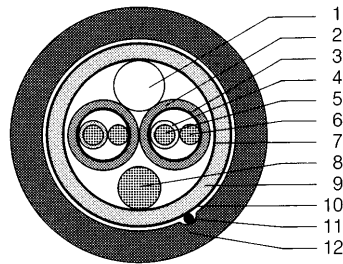
- Signal lines must be firmly installed.
- Shields are connected via stranded drain wires.
- Underwater or underground routing is possible.
- Insulating material flame-retardant to IEC 332.1 / VDE 0742.
- Low-halogen, unplasticized signal lines which remain flexible at low temperatures.

Signal line A (type DS) with double shielding



- 1 Stranded drain wire, 1st shield, 1.5 mm² or AWG 14
- 2 Insulation
- 3 Stranded wire 0.5 mm² or AWG 20 (3.1 red/3.2 white)
- 4 Special foil, 1st shield
- 5 Insulation
- 6 Mu-metal foil, 2nd shield
- 7 Stranded drain wire, 2nd shield, 0.5 mm² or AWG 20
- 8 Outer sheath

Signal line B (type BTS) with triple shielding (bootstrap line), for IFC 020 E only



- 1 Dummy glider wire
- 2 Insulation (2.1 red/2.2 white)
- 3 Special foil, 1st shield (3.1/3.2)
- 4 Insulation (4.1/4.2)
- 5 Stranded wire 0.5 mm² or AWG 20 (5.1 red/5.2 white)
- 6 Stranded drain wire, 1st shield, 0.5 mm² or AWG 20 (6.1/6.2)
- 7 Special foil, 2nd shield
- 8 Stranded drain wire, 2nd shield, 1.5 mm² or AWG 14
- 9 Insulation
- 10 Mu-metal foil, 3rd shield
- 11 Stranded drain wire, 3rd shield, 0.5 mm² or AWG 20
- 12 Outer sheath

Field current line C (single shielding with IFC 020 F)

Line 2 x 0.75 mm² (18 AWG) Cu, 2 x 1.5 mm² (14 AWG) Cu or 2 x 2.5mm² (12 AWG) Cu
single shielding (Cu = copper cross section)

The cross section depends on the required cable length, see table in Section 1.3.4.

1.3.2 Grounding of primary head

- All flowmeters must be properly 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 an **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.

Stripping (preparation) of signal cable A and B 1.3.3

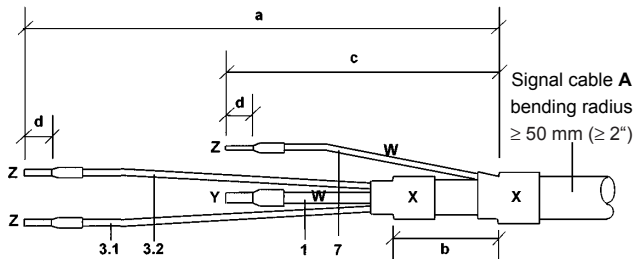
Please note the different lengths given in the table for signal converter and primary head.

Length mm (inch)	Converter		Primary head
	IFC 020 F + E Signalcable A	only IFC 020 E Signalcable B	
a	55 (2.17)	70 (2.76)	90 (3.54)
b	10 (0.39)	50 (1.97)	8 (0.31)
c	15 (0.59)	25 (0.98)	25 (0.98)
d	8 (0.31)	8 (0.31)	8 (0.31)
e	–	50 (1.97)	70 (2.76)
f	–	8 (0.31)	8 (0.31)

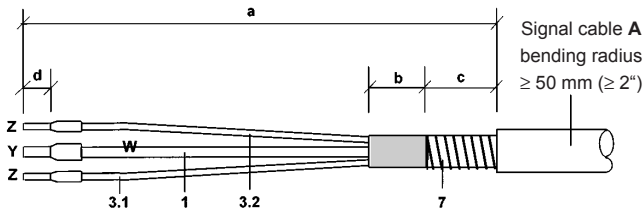
Customer-supplied materials

W	Insulation tubing (PVC), Ø 2.0 - 2.5 mm (dia. 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

Signal cable A (type DS) double shielding, for primary head and IFC 020 E



Signal cable A (type DS) double shielding, for IFC 020 F



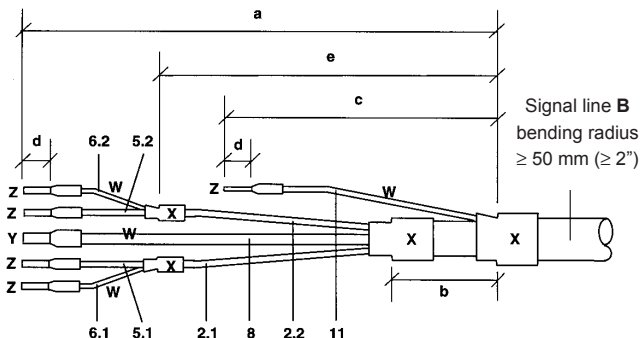
For cable fixation in signal converter housing IFC 020 F

see illustration in section 10.4

External shielding of signal cable A (Type DS)

Wrap stranded drain wire (7) around the mu-metal foil (6) and clamp under the shield terminal in the signal converter terminal box (see also diagram in Sect. 1.3.5).

Signal line B (type BTS) with triple shielding (bootstrap), for IFC 020 E



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 line B (type BTS) with triple shielding, max. length see diagram B (**IFC 020 E only**)
- C** Field current cable min. cross-section (A_F) and max. length, (**with single shielding for IFC 020 F**), see Table
- D** High-temperature silicone cable, $3 \times 1.5 \text{ mm}^2$ (14 AWG) Cu, (with single shielding, max. length 5 m (16 ft))
- E** High-temperature silicone cable, $2 \times 1.5 \text{ mm}^2$ (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) (Signal cable B, Type BTS, for **IFC 020 E** only)

Primary head	Meter size		Signal cable	
	DN mm	inch	A	B
AQUAFLUX F	10 - 1000	3/8 - 40	A1	B1
ECOFLUX IFS 1000 F	10 - 15	3/8 - 1/2	A4	B3
	25 - 150	1 - 6	A3	B2
ALTOFLUX IFS 2000 F	150 - 250	6 - 10	A1	B1
ALTOFLUX IFS 4000 F	10 - 150	3/8 - 6	A2	B2
	200 - 1000	8 - 40	A1	B1
PROFIFLUX IFS 5000 F	2.5 - 15	1/10 - 1/2	A4	B3
	25 - 100	1 - 4	A2	B2
VARIFLUX IFS 6000 F	2.5 - 15	1/10 - 1/2	A4	B3
	25 - 80	1 - 3	A2	B2
ALTOFLUX M 900	10 - 300	3/8 - 12	A1	B1

Diagram A

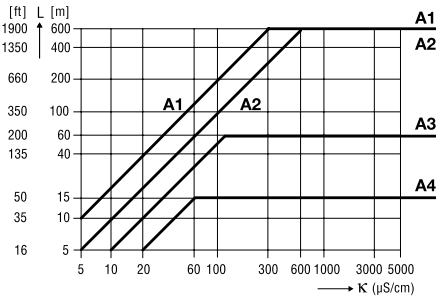
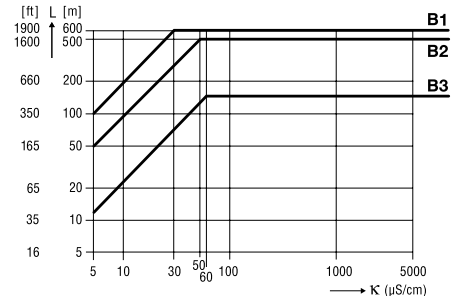


Diagram B (for IFC 020 E only)

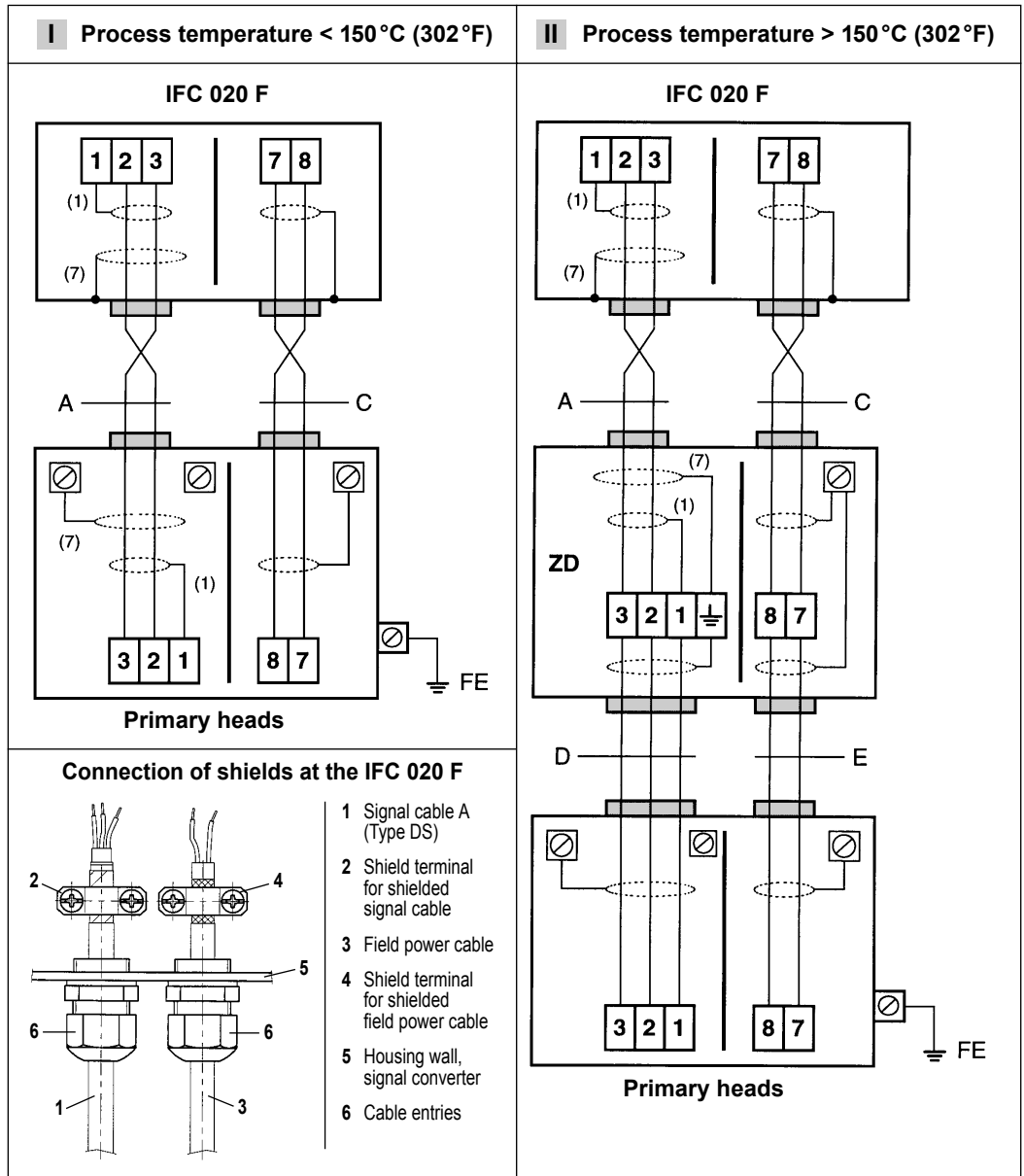


Field current cable C: (for IFC 020 F single shielding!)

Length	Cross section A_F (Cu), minimum
0 - 150 m 5 - 500 ft	$2 \times 0.75 \text{ mm}^2$ Cu / 2×18 AWG
150 - 300 m 500 - 1000 ft	$2 \times 1.50 \text{ mm}^2$ Cu / 2×14 AWG
300 - 600 m 1000 - 1900 ft	$2 \times 2.50 \text{ mm}^2$ Cu / 2×12 AWG

Important information on connection diagrams PLEASE NOTE!

- 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.
- **PE** = protective conductor **FE** = functional ground conductor



1.3.6 Connection diagrams III to VI (IFC 020 E signal converter and primary head)

Important information on connection diagrams PLEASE NOTE!

- 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 DC power supply** (in preparation): Functional extra-low voltage with protective separation in conformity with VDE 0100, Part 410 or equivalent national regulations.
- **For IFC 020 E, please note:** The internal bridges marked with * are needed for power supply > 100 V AC only.
- **PE** = Protective conductor **FE** = Functional ground conductor

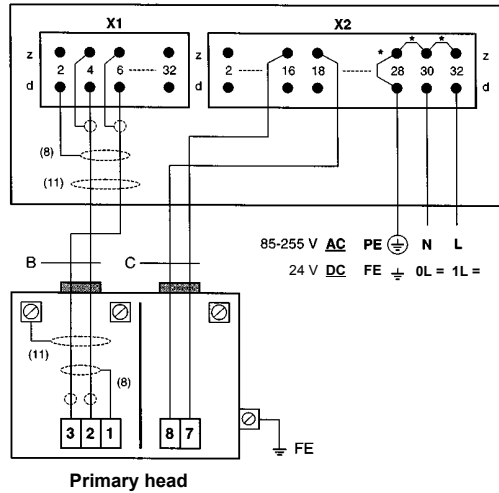
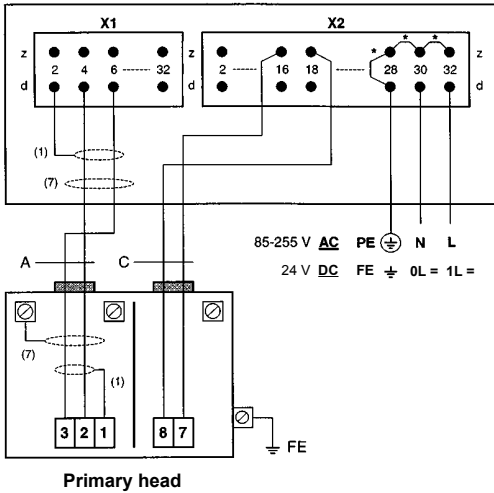
Process temperature < 150 °C (302 °F)

III Signal cable A (type DS)

IV Signal cable B (type BTS)

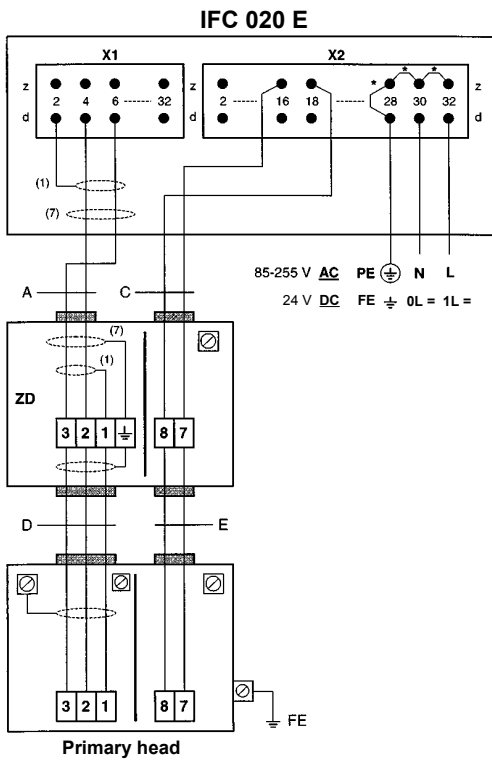
IFC 020 E

IFC 020 E

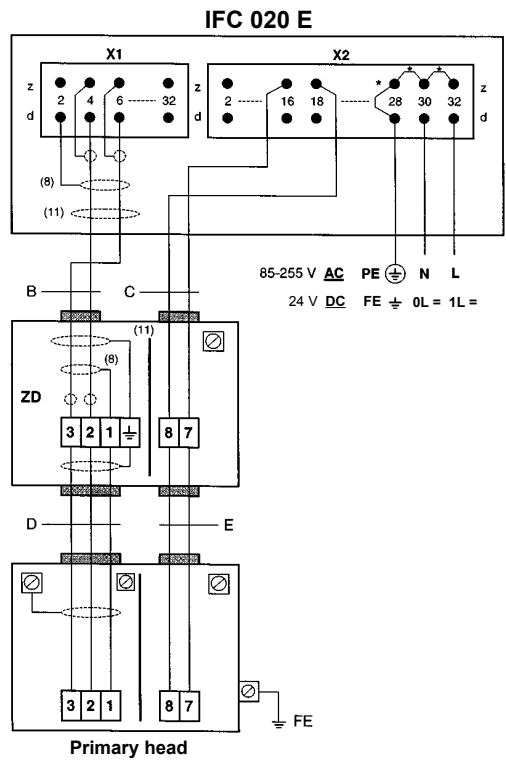


Process temperature > 150 °C (302 °F)

V Signal cable A (type DS)



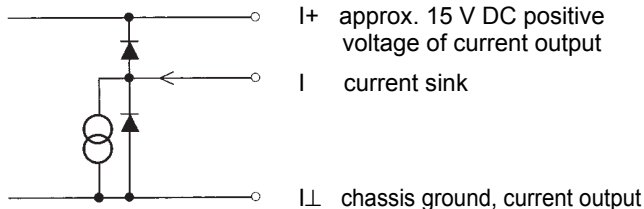
VI Signal cable B (type BTS)



2 Electrical connection of outputs and inputs

2.1 Current output I

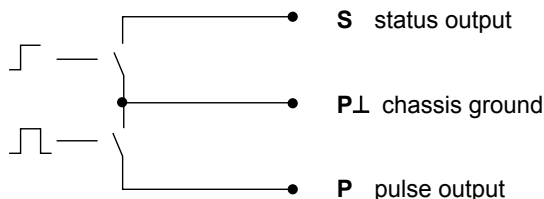
- The current output is galvanically isolated from all input and output circuits.
- Factory-set data and functions can be noted down in Sect. 5.16.
Please also refer to Sect. 3.2 "Factory settings".
- Typical current output



- All operating data and functions can be set: Operation see section 4 and 5.6 function 1.05.
- The current output can also be used as an internal voltage source for the outputs.
 $U_{int} = 15 \text{ V DC}$ $I = 23 \text{ mA}$ when operated **without** receiver instruments at the current output
 $I = 3 \text{ mA}$ when operated **with** receiver instruments at the current output
- **Connection diagrams**, see Sect. 2.4: diagrams ① ② ④ ⑥
- **For Connection and operation with HART®-interface see section 6.1.**

2.2 Pulse output P and status output S

- The pulse and status outputs are galvanically isolated from the current output and all input circuits.
- Factory-set data and functions can be noted down in Sect. 5.16.
Please also refer to Sect. 3.2 "Factory settings".
- Typical pulse and status outputs



- All operating data and functions can be set: Operation see section 4 and 5.7 function 1.06 and 1.07.
- The pulse and status outputs 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
- Digital pulse division, interpulse period is non-uniform. Therefore, if frequency meters or cycle counters are connected, allow for minimum counting interval:

$$\text{gate time, counter} \leq \frac{1000}{P_{100\%} [\text{Hz}]}$$

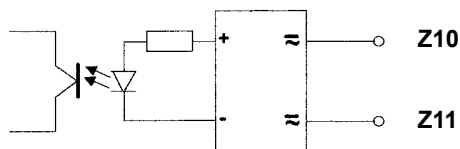
- **Connection diagrams** see Sect. 2.4: diagrams - pulse output ③ ④
diagrams - status output ⑤ ⑥

• **Characteristics of the status outputs**

	Switch open	Switch closed
OFF (switched off)	without function	
ON (e.g. operation indicator)	Power supply OFF	Power supply ON
F/R INDICATOR (F/R mode)	Forward flow	Reverse flow
TRIP POINT (Limit switch)	Inactive	Active
ALL ERRORS (all errors)	Errors	No errors
FATAL ERRORS (fatal errors only)	Errors	No errors

Control input E (with IFC 020 E only) 2.3

- The control inputs are galvanically isolated from the current output and all input circuits.
- Setting data and functions can note down in section 5.16..
Please also refer to Sect. 3.2 “Factory settings”.
- Typical current input E



- All operating data and functions can be set:
Operation see section 4 and 5.18 Fct. 1.08.
- The control inputs must be operated in the passive mode.

• **Function of the control inputs**

OFF	switched off
TOTAL.RESET	reset totalizer(s)
ERROR.RESET	delete error messages
OUTP. HOLD	hold value of outputs

Connection diagram, see Sect. 2.4: diagram ⑦

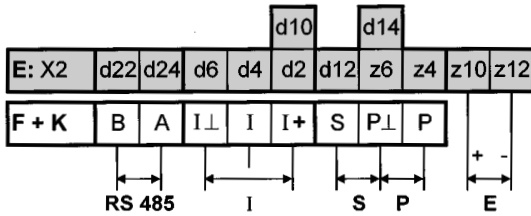
2.4 Input / output connection diagrams

Terminal identification

E: X2 IFC 020 E separated, 19" plug-in unit, connection

F IFC 020 F separated, field housing

K IFC 020 K compact



I Current output **C** Control input (IFC 020 E only)

P Pulse output

S Status output **RS 485** Interface

000 Totalizer
 Σ - electronic (EC)
 - electromechanical (EMC)

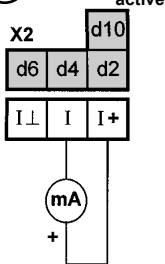
mA Milliammeter
 0 or 4-20mA and others

\overline{K} Key, N/O contact

\sim External voltage source (U_{ext}),
 DC or AC voltage,
 connection polarity arbitrary

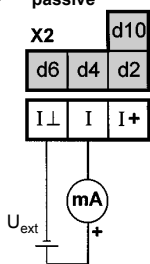
\perp DC voltage,
 external power source (U_{ext}),
 note connection polarity

1 Current output I_{active}



$I = 0/4 - 20 \text{ mA}$
 $R_i \leq 500 \Omega$

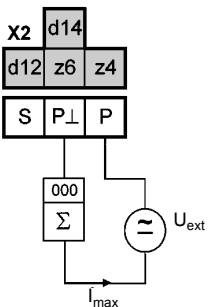
2 Current output $I_{passive}$



$I = 0/4 - 20 \text{ mA}$
 $U_{ext} \begin{matrix} 15 \dots 20 \text{ V DC} & | & 20 \dots 32 \text{ V DC} \end{matrix}$
 $R_i \begin{matrix} 0 \dots 500 \Omega & | & 250 \dots 750 \Omega \end{matrix}$

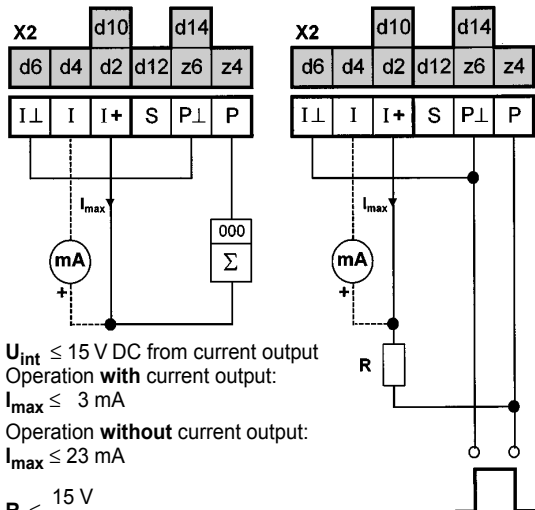
For connection and operation of the HART® interface,
 see section 6.1. Burden (load) at HART® operation ranges
 between min. 250 Ω and max. 500 Ω .

3 Pulse output $P_{passive}$ for electronic (EC) or electromechanical (EMC) totalizers



$U_{ext} \leq 32 \text{ V DC} / \leq 24 \text{ V AC}$
 $I_{max} \leq 150 \text{ mA}$
 (incl. status output S)

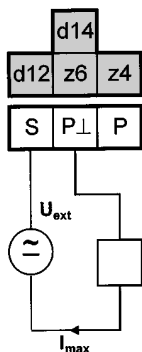
4 Pulse output P_{active} (and current output I_{active}) for electronic (EC) totalizers with and without current output I



$U_{int} \leq 15 \text{ V DC}$ from current output
 Operation **with** current output:
 $I_{max} \leq 3 \text{ mA}$
 Operation **without** current output:
 $I_{max} \leq 23 \text{ mA}$

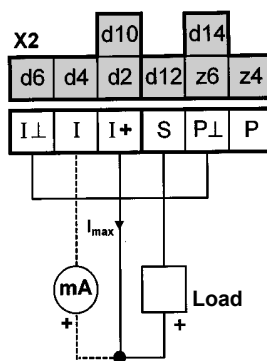
$R \leq \frac{15 \text{ V}}{I_{max}}$

5 Status output S_{passive}



$U_{ext} \leq 30 \text{ V DC} / \leq 24 \text{ V AC}$
 $I_{max} \leq 150 \text{ mA}$
 (incl. pulse output P)

6 Status output S_{active} with and without current output I

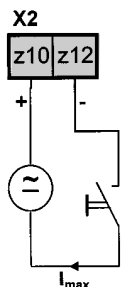


$U_{int} \leq 15 \text{ V DC}$
 from current output

$I_{max} \leq 3 \text{ mA}$
 Operation **with**
 current output

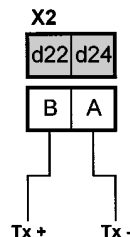
$I_{max} \leq 23 \text{ mA}$
 Operation **without**
 current output

7 Control input E_{passive} (IFC 020 E only)



$U_{ext} \leq 30 \text{ V DC} / \leq 24 \text{ V AC}$
 $I_{max} \leq 6 \text{ mA}$

8 RS 485 Interface



For connection and operation of the **Krohne RS 485 Interface**, see section 6.2.

Error messages in measuring mode 2.5

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 "DISP. MSG.".

Error messages	Description of error	Error clearance
LINE INT.	Power failure <u>Note:</u> no counting during power failure	Cancel error in RESET/QUIT. menu Reset totalizer if necessary.
CUR. OUTP. I	Current output overranged. (Flow > measuring rage)	Check and if necessary correct instrument parameters. After elimination of cause, error message deleted automatically.
PULSOUTP. P	Pulse output overranged. <u>Note:</u> totalizer deviation possible.	Check and if necessary correct instrument parameters. After elimination of cause, error message deleted automatically.
TOTALIZER	Totalizer has been reset	Cancel error message in RESET/QUIT. menu, see section 4.6.
ADC	Analog / digital converter overranged	Error message deleted automatically after elimination of cause.
FATAL. ERROR	Fatal error, all outputs set to "min. values"	Please consult factory.

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.
- When powered, the display shows in succession: START UP and READY.
This is followed by display of the current flow rate and/or the current totalizer count on either a continuous or alternating basis, depending on the setting under Fct. 1.04.
- Refer to Sect. 4 and 5 for operator control of the “display version”.

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. On instruments equipped with a display, 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
- current output I, Fct. 1.05, Sect. 5.6
- pulse output P, Fct. 1.06, Sect. 5.7
- display (option), Fct. 1.04, Sect. 5.4

Operation see Section 4 and 5.

Standard factory settings

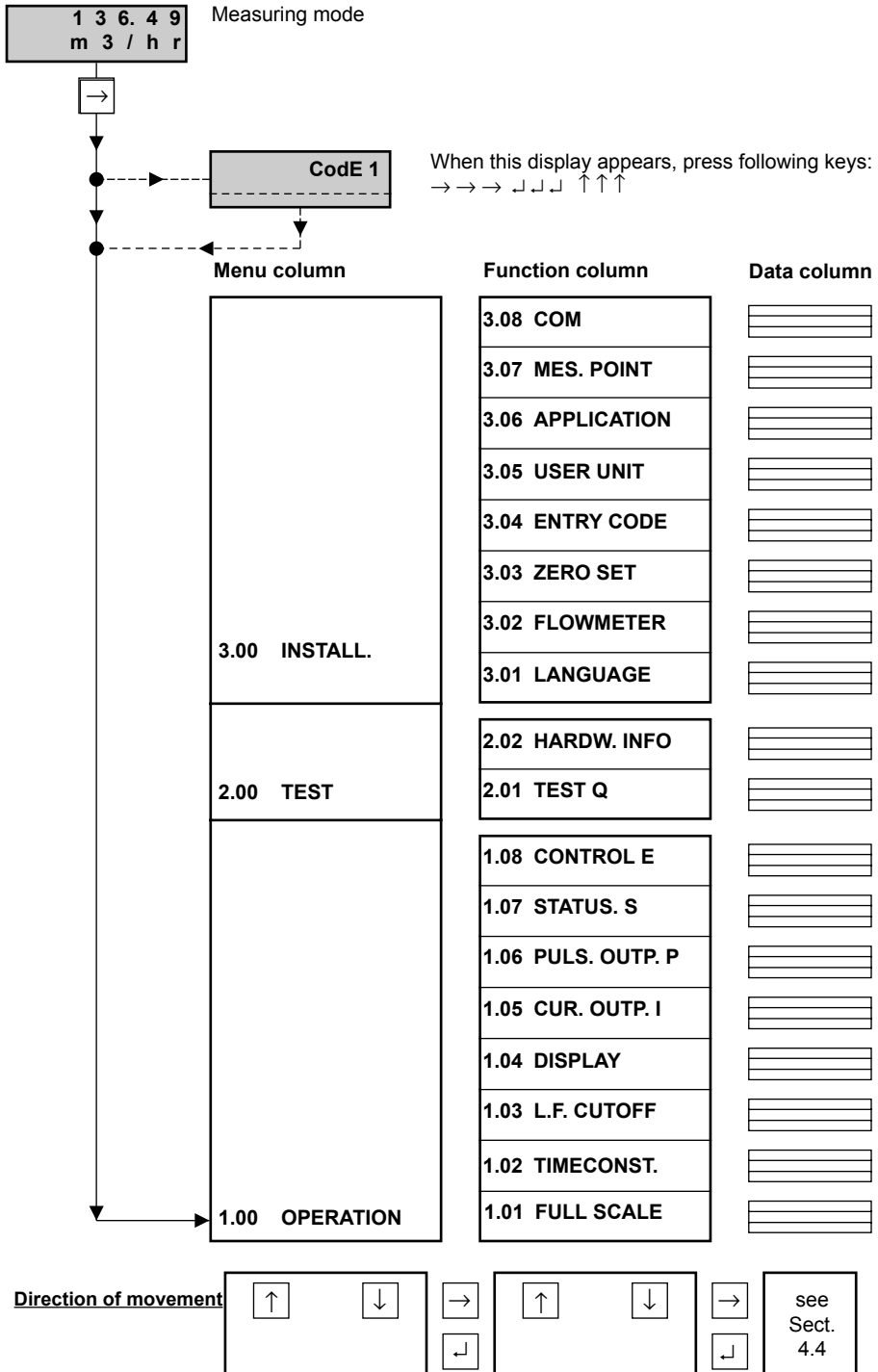
Function	Setting
1.01 Full-scale range $Q_{100\%}$	see nameplate
1.02 Time constant	3 s, for I, S and display
1.03 Low-flow cutoff SMU	ON: 1 % OFF: 2 %
1.04 Display (option) flow rate totalizer(s)	m^3/hr or US Gal/min m^3 or US Gal
1.05 Current output I function range error message	2 directions 4 - 20 mA 22 mA
1.06 Pulse output P function pulse value pulse width	2 directions 1 pulse/s 50 ms
1.07 Status output S	flow directions

Function	Setting
1.08 Control input	off
3.01 Language for display only	English
3.02 Flowmeter diameter flow direction (see arrow on primary head)	see nameplate } + direction
3.04 Entry code	no
3.05 User unit	Liter/hr or USMGal/day
3.06 Application	steady
3.07 Measuring point	Altometer
3.08 Communication interface	off

Teil B IFC 020 _ / D Signal converter

Operation of the signal converter 4

Krohne operator control concept 4.1



4.2 Table of settable functions

Fct.	Text	Description and settings
1.00	OPERATION	Operations menu
1.01	FULL SCALE	<p>Full-scale range for flowrate $Q_{100\%}$ <u>Select unit</u></p> <ul style="list-style-type: none"> • m³/hr • Liter/Sec • US.Gal/min <p>• user unit, factory set is "Liter/hr" or "US MGal/day" (see Fct. 3.05) <i>Press → key to transfer to number setting.</i></p> <p><u>Setting ranges</u> The ranges are dependent on the meter size (DN) and the flow velocity (v): $Q_{\min} = \frac{\pi}{4} DN^2 \times v_{\min}$ $Q_{\max} = \frac{\pi}{4} DN^2 \times v_{\max}$</p> <p><u>Nom. dia./meter size</u> $v_{\min} = 0,3 \text{ m/s (1 ft/s)}$ $v_{\max} = 12 \text{ m/s (40 ft/s)}$</p> <ul style="list-style-type: none"> • DN 2.5–1000 / 1/10"–40": 0.0053 – 33 900 m³/hr 0.0237 – 152 000 US.Gal/min <p><i>Press ↵ key to return to Fct. 1.01 FULL SCALE.</i></p>
	→ VALUE P	<p>Pulse value (Fct. 1.06 "VALUE P") has been changed. With the "old" pulse values the output frequency (F) would have been exceeded or not reached. $P_{\min} = F_{\min} / Q_{100\%}$ $P_{\max} = F_{\max} / Q_{100\%}$ Check new values!</p>
1.02	TIMECONST.	<p>Time constant <u>Select:</u> <ul style="list-style-type: none"> • ALL (applies to display and all outputs) • ONLY I+S (only display, current and status outputs) </p> <p><i>Press ↵ key to transfer to number setting.</i></p> <p><u>Range:</u> <ul style="list-style-type: none"> • 0.2 – 99.9 Sec </p> <p><i>Press ↵ key to return to Fct. 1.02 TIMECONST.</i></p>
1.03	L.F.CUTOFF	<p>Low-flow cutoff (SMU) • OFF (fixed values: ON = 0.1% / OFF = 0.2% at 100Hz and 1000Hz, see Fct. 106, 1% resp. 2%) • PERCENT (variable values) ON OFF 1 – 19% 2 – 20%</p> <p><i>Press → key to transfer to number setting.</i> Note: Cutoff "off" value must be greater than cutoff "on" value. <i>Press ↵ key to return to Fct. 1.03 L.F. CUTOFF.</i></p>
1.04	DISPLAY	Display functions
	→ DISP.FLOW	<p>Select flow display • NO DISP. • user unit, factory set is "Liter/hr" or "US MGal/day" (see Fct. 3.05) • m³/hr • PERCENT • Liter/Sec • BARGRAPH (value and bargraph display in %) • US.Gal/min</p> <p><i>Press ↵ key to transfer to subfunction "DISP. TOTAL".</i></p>
	→ DISP.TOTAL.	<p>Select totalizer display • NO DISP. (totalizer switched on but not displayed) • OFF (totalizer switched off) • +TOTAL • -TOTAL • ±TOTAL • SUM (Σ)</p> <p>• ALL (single totalizer or all) <i>Press ↵ key to transfer to display unit</i></p> <p>• m³ • Liter • US.Gal • user unit, factory set is "Liter" or "US MGal" (see Fct. 3.05). <i>Press → key to transfer to format setting.</i></p> <p><u>Format setting</u> • Auto (exponent notation) • # . ##### • ##### . ### • ## . ##### • ##### . ## • ### . ##### • ##### . # • #### . ##### • #####</p> <p><i>Press ↵ key to transfer to subfunction "DISP.MSG".</i></p>
	→ DISP.MSG.	<p>Additional messages required in measuring mode? • NO • YES (cyclic change with displays of measured values) <i>Press ↵ key to return to Fct. 1.04 DISPLAY.</i></p>

Fct.	Text	Description and settings
1.05	CURRENT I	Current output I
	→ FUNCT. I	Select function for current output I <ul style="list-style-type: none"> • OFF (switched off) • 1 DIR. (1 flow direction) • 2 DIR. (forward/reverse flow, F/R flow measurement) <i>Press key ↵, transfer to subfunction "RANGE I";</i>
	→ RANGE I	Select measuring range <ul style="list-style-type: none"> • 0 - 20 mA • 4 - 20 mA (fixed ranges) • mA (user-defined range) $\frac{I_{0\%}}{0 - 16 \text{ mA}} - \frac{I_{100\%}}{4 - 20 \text{ mA}}$ <i>(Value $I_{0\%} < I_{100\%}$!) To transfer to number setting, press key → ! Press key ↵ to transfer to subfunction "I ERROR".</i>
→ I ERROR	Select error value <ul style="list-style-type: none"> • 22 mA • 0.0 to $I_{0\%}$ mA (variable, see above if $I_{0\%} > 1$ mA) <i>To transfer to number setting, press key → ! Press key ↵ to revert to Fct. 1.05 CURRENT I.</i>	
1.06	PULS B1	Pulse output B1 (see Fct. 3.07 HARDWARE)
	→ FUNCT. P	Select function for pulse output P <ul style="list-style-type: none"> • OFF (switched off) • 1 DIR. (1 flow direction) • 2 DIR. (forward/reverse flow, F/R flow measurement) <i>Press key ↵ to transfer to subfunction "SELECT P".</i>
	→ SELECT P	Select pulse type <ul style="list-style-type: none"> • 100 HZ • PULSE/VOL. (pulses per unit volume, flowrate) • 1000 HZ • PULSE/TIME (pulses per unit time for 100% flowrate) <i>Press key ↵ to transfer to subfunction "PULSWIDTH". With selection 100 HZ and 1000 HZ, return to Fct.1.06 pulsoutput P (pulswidth 50% cyclic).</i>
	→ PULSWIDTH	Select pulse width <ul style="list-style-type: none"> • 50 msec • 100 msec • 200 msec • 500 msec • 1 sec <i>Press key ↵ to transfer to subfunction "VALUE P".</i>
	→ VALUE P	Set pulse value per unit volume (appears only when "PULSE/VOL." set under "SELECT P" above) <ul style="list-style-type: none"> • xxxx PulS/m³ • xxxx PulS/Liter • xxxx PulS/US.Gal • xxxx PulS/ user-defined unit, factory-set is "Liter" or "US M.Gal" (see Fct. 3.05) Setting range "xxxx" is dependent on the pulse width and the full-scale range: $P_{\min} = F_{\min} / Q_{100\%}$ $P_{\max} = F_{\max} / Q_{100\%}$ <i>Press key ↵ to return to Fct. 1.06 "PULS. OUTPUT P".</i>
→ VALUE P	Set pulse value per unit time (appears only when "PULSE/TIME" set under "SELECT P" above) <ul style="list-style-type: none"> • xxxx PulSe/Sec (=Hz) • xxxx PulSe/min • xxxx PulSe/hr • xxxx PulSe/user-defined unit, factory-set is "hr" (see Fct. 3.05) Setting range "xxxx" is dependent on the pulse width, see above <i>Press key ↵ to return to Fct. 1.06 "PULS. OUTPUT P".</i>	
1.07	STATUS. S	Status output S <ul style="list-style-type: none"> • ALL ERROR • FATAL ERROR • OFF • ON • F/R INDIC. (F/R indication for forward/reverse measurement) • TRIP. POINT <u>Setting range:</u> 002 - 115 PERCENT • EMPTY PIPE (appears only when this option is installed) <i>Press ↵ key to transfer to number setting Press ↵ key to return to Fct. 1.07 "STATUS. S".</i>
1.08	CONTROL E (IFC 020 E only)	Control input E (IFC 020 E only) <ul style="list-style-type: none"> • OFF (switched off) • OUTP. ZERO (set outputs to "min.values") • TOTAL. RESET (reset totalizers) • ERROR. RESET(delete error messages) <i>Press ↵ key to return Fct. 1.08 "Control E".</i>

Fct.	Text	Description and settings
2.00	TEST	Testmenu
2.01	TEST Q	<p>Test measuring range Q</p> <p>Precautionary_query</p> <ul style="list-style-type: none"> • SURE NO Press \downarrow key to return to Fct. 2.01 "TEST Q". • SURE YES Press \downarrow key, then use \uparrow key to select value: -110 / -100 / -50 / -10 / 0 / +10 / +50 / +100 / +110 PCT. of set full-scale range $Q_{100\%}$. Displayed value present at outputs I and P. <p>Press \downarrow key to return to Fct. 2.01 "TEST Q".</p>
2.02	HARDW. INFO	<p>Hardware information and error status</p> <p>Before consulting factory, please note down all 6 codes.</p>
	→ MODUL ADC	<p>X . X X X X X . X X Y Y Y Y Y Y Y Y Y Y Press \downarrow key to transfer to "MODUL IO".</p>
	→ MODUL IO	<p>X . X X X X X . X X Y Y Y Y Y Y Y Y Y Y Press \downarrow key to transfer to "MODUL DISP".</p>
	→ MODUL DISP.	<p>X . X X X X X . X X Y Y Y Y Y Y Y Y Y Y Press \downarrow key to transfer to "MODUL RS</p>
	→ MODUL RS	<p>X . X X X X X . X X Y Y Y Y Y Y Y Y Y Y Press \downarrow key to return to Fct. 2.02 "HARDW. INFO".</p>

Fct.	Text	Description and settings
3.00	INSTALL.	Installation menu
3.01	LANGUAGE	<p>Select language for display texts</p> <ul style="list-style-type: none"> • GB / USA (English) • D (German) • F (French) • others on request <p>Press \downarrow key to return to Fct. 3.01 "LANGUAGE".</p>
3.02	FLOWMETER	<p>Set data for primary head</p>
	→ DIAMETER	<p>Select size from meter size table</p> <ul style="list-style-type: none"> • DN 2.5 - 1000 mm equivalent to $1/10$ - 40 inch <p>Select with \uparrow key.</p> <p>Press \downarrow key to transfer to subfunction "FULL SCALE".</p>
	→ FULL SCALE	<p>Full-scale range for flow $Q_{100\%}$</p> <p>To set, refer to Fct. 1.01 "FULL SCALE" above.</p> <p>Press \downarrow key to transfer to subfunction "GK VALUE".</p>
	→ VALUE P	<p>Pulse value (Fct. 1.06 "VALUE P") has been changed.</p> <p>With the "old" pulse values the output frequency (F) would have been exceeded or not reached.</p> <p>$P_{\min} = F_{\min} / Q_{100\%}$ $P_{\max} = F_{\max} / Q_{100\%}$ Check new values!</p>
	→ GK VALUE	<p>Primary head - Set primary constant GK</p> <p>see primary head nameplate.</p> <p>Range: • 1.0000 - 9.9999</p> <p>Press \downarrow key to transfer to subfunction "FIELD. FREQ.".</p>
	→ FIELD FREQ.	<p>Magnetic field frequency</p> <p>Values: $1/6$ and $1/18$ of power frequency, see nameplate.</p> <p>Press \downarrow key to transfer to subfunction "FLOW DIR."; DC units only: to transfer to subfunction "LINE FREQ.".</p>
	→ LINE FREQ.	<p>Normal line frequency in your country</p> <p>Please note: This function is only provided for units with DC power supply to suppress line-frequency interference.</p> <p>Values: 50 Hz and 60 Hz</p> <p>Press \downarrow key to transfer to subfunction "FLOW DIR.".</p>
	→ FLOW DIR.	<p>Define flow direction (in F/R mode: forward flow).</p> <p>Set according to direction of arrow on primary head:</p> <ul style="list-style-type: none"> • + DIR. • - DIR. Select using \uparrow key. <p>Press \downarrow key to return to Fct. 3.02 "FLOWMETER".</p>

Fct.	Text	Description and settings
3.03	ZERO SET	<p>Zero calibration</p> <p><u>Note:</u> Carry out only at "0" flow and with completely filled measuring tube!</p> <p><u>Precautionary query</u></p> <ul style="list-style-type: none"> • CALIB. NO Press \downarrow key to return to Fct. 3.03 "ZERO SET". • CALIB. YES Press \downarrow key to start calibration. Duration approx. 15-90 seconds, (depends on frequency of magnetic field) current flowrate displayed in the selected unit (see Fct. 1.04 "DISP. FLOW"). <p>A "WARNING" sign appears when flowrate "> 0"; <u>acknowledge by pressing \downarrow key.</u></p> <ul style="list-style-type: none"> • STORE NO (do not store new zero value) • STORE YES (store new zero value) <p>Press \downarrow key to return to Fct. 3.03 "ZERO SET".</p>
3.04	ENTRY CODE	<p>Entry code required to enter setting mode?</p> <ul style="list-style-type: none"> • NO (= entry with \rightarrow only) • YES (= entry with \rightarrow and Code 1: $\rightarrow \rightarrow \rightarrow \downarrow \downarrow \downarrow \uparrow \uparrow \uparrow$) <p>Press \downarrow key to return to Fct. 3.04 "ENTRY CODE".</p>
3.05	USER UNIT	<p>Set any required unit for flowrate and counting</p>
	\rightarrow TEXT VOL.	<p>Set text for required flowrate unit (max. 5 characters) Factory-set: "Liter" or "MGal".</p> <p><u>Characters assignable to each place:</u></p> <ul style="list-style-type: none"> • A-Z, a-z, 0-9, or " " (= blank character). <p>Press \downarrow key to transfer to subfunction "FACT. VOL."</p>
	\rightarrow FACT. VOL.	<p>Set conversion factor (F_M) for volume</p> <p>Factory set "1.00000 E+3" for "Liter" or "2.64172E-4" for "US MGal" (exponent notation, here: 1×10^3 or 2.64172×10^{-4}).</p> <p>Factor F_M = volume per $1m^3$.</p> <p><u>Setting range</u> • 1.00000 E-9 to 9.99999 E+9 (= 10^{-9} to 10^{+9})</p> <p>Press \downarrow key to transfer to subfunction "TEXT TIME".</p>
	\rightarrow TEXT TIME	<p>Set text for required time unit (max. 3 characters) Factory-set: "hr" (=hour).</p> <p><u>Characters assignable to each place:</u></p> <ul style="list-style-type: none"> • A-Z, a-z, 0-9, or " " (= blank character). <p>Press \downarrow key to transfer to subfunction "FACT. TIME"</p>
	\rightarrow FACT. TIME	<p>Set conversion factor (F_T) for time</p> <p>Factory-set: "3.60000 E+3" for "hour" or "8.64000 E+4" for "day" (exponent notation, here: 3.6×10^3 or 8.64×10^4).</p> <p>Set factor F_T in seconds.</p> <p><u>Setting range</u></p> <ul style="list-style-type: none"> • 1.00000 E-9 to 9.99999 E+9 (= 10^{-9} to 10^{+9}) <p>Press \downarrow key to return to Fct. 3.05 "USER UNIT".</p>
3.06	APPLICAT.	<p>Set overload point for A/D converter</p>
	\rightarrow FLOW	<ul style="list-style-type: none"> • STEADY (150% of $Q_{100\%}$) • PULSATING (1000% of $Q_{100\%}$) <p>Press key \downarrow to return to Fct. 3.06 "APPLICAT.",</p>
3.07	MEASURING POINT	<p>Set measuring point no. Factory setting: ALTOMETER</p> <p><u>Characters assignable to each place:</u></p> <ul style="list-style-type: none"> • A-Z, a-z, 0-9, or " " (= blank character). <p>Press \downarrow key to return to Fct. 3.07 "MEASURING POINT"</p>
3.08	COM	<p>Set communication interface</p> <ul style="list-style-type: none"> • OFF (switched off) • HART (HART-interface switched on) • KROHNE (RS 485 interface switched on) • Address: "HART" 00-15 / "KROHNE" 000-239 • BAUD RATE: -1200 -2400 -4800 -9600 -19200 (appeare with selection "KROHNE") <p>Press key \downarrow to return to Fct. 3.08 "COM".</p>