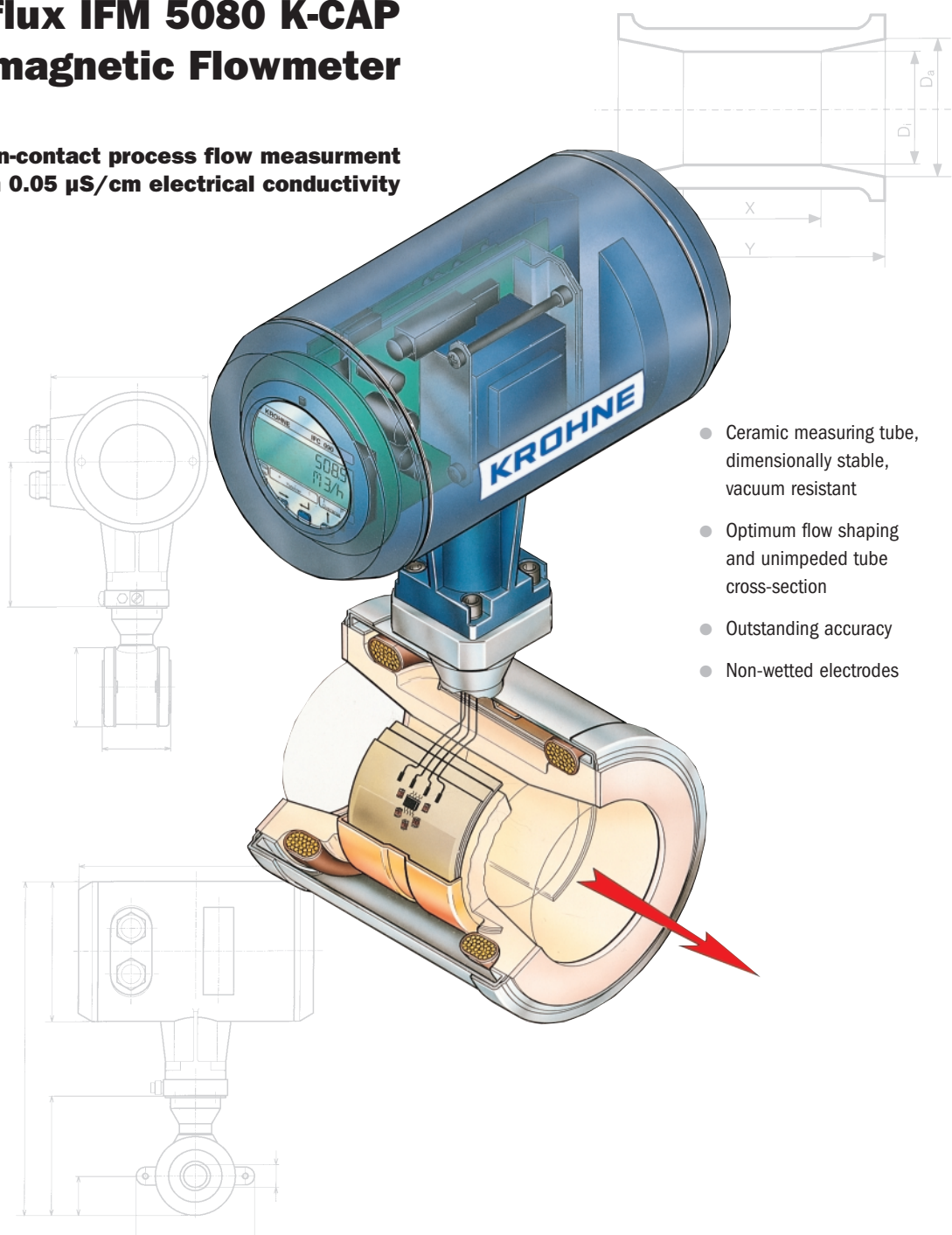


Capaflux IFM 5080 K-CAP Electromagnetic Flowmeter

... non-contact process flow measurement
from 0.05 $\mu\text{S/cm}$ electrical conductivity



- Ceramic measuring tube, dimensionally stable, vacuum resistant
- Optimum flow shaping and unimpeded tube cross-section
- Outstanding accuracy
- Non-wetted electrodes

Variable area flowmeters

Vortex flowmeters

Flow controllers

Electromagnetic flowmeters

Ultrasonic flowmeters

Mass flowmeters

Level measuring instruments

Communications engineering

Engineering systems & solutions



Capaflux IFM 5080 K-CAP Electromagnetic Flowmeter

... non-contact process flow measurement
from 0.05 $\mu\text{S}/\text{cm}$ electrical conductivity

No restrictions ...

- ... through insulating products with a film-forming tendency:
asphalt, latex suspensions
- ... through low electrical conductivity:
ultrahigh-purity water, alcohols, glycerins, glycols
- ... through high solids contents:
fruit pieces, pulps, concrete
- ... for sterile processes:
chemical and food industries
- ... when used in hazardous areas:
EEx d IIC T6...T4, KEMA No. Ex-96.D.2713X,
FM certification pending
- ... through electrode materials:
the capacitive electrodes are located behind the ceramic tube, i.e. **non-contact measurement, no contact with the process product.**

Calibrated on **EN 45 001**
certified calibration rigs,
accuracy of calibration better
than 99.97% of the measured value.

non-contact flow measurement

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

Special advantages

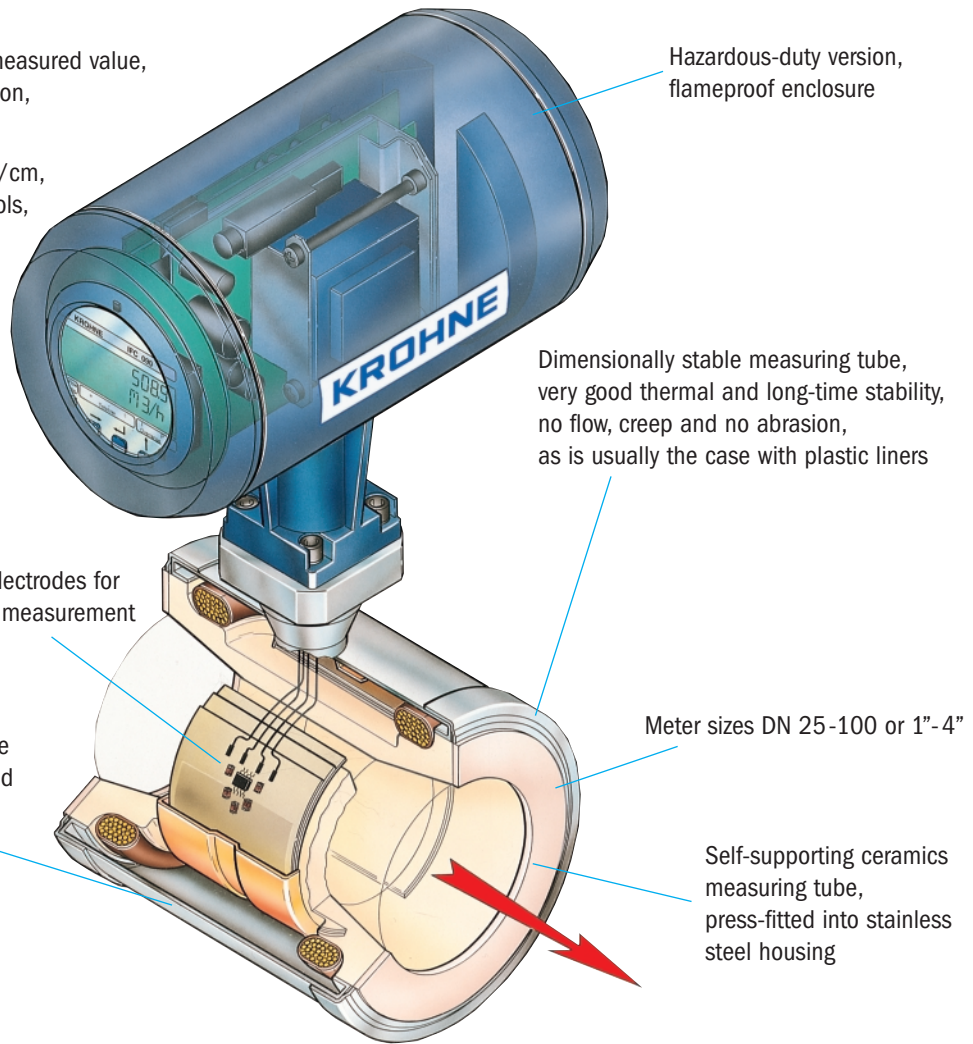
- capacitive electrodes for non-contact measurement.
- the measuring section is resistant to abrasion from even high solids contents.
- the ceramic measuring tube is dimensionally stable and vacuum-resistant.
- the special shape of the measuring tube helps to optimize the flow profile, even with minimum pressure drop, refer to diagram on page 3.
- the measuring error is less than 0.5% of the measured value.
- the integral design ensures easy installation, safe and reliable operation.
- the crevice-free measuring tube has no blind spots and conforms to food requirements, the ceramic surface is ultrasmooth, $R_a < 0,8 \mu\text{m}$ surface finish.



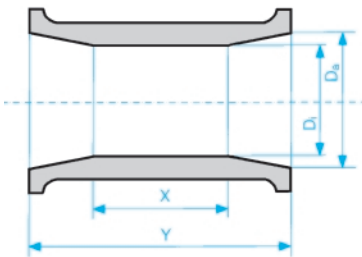
Highlights

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

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



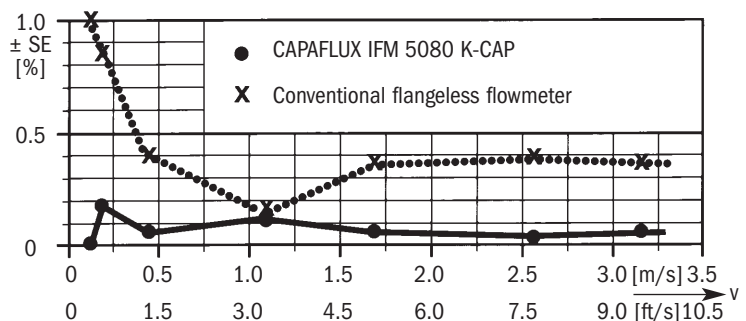
Design



Meter size	Dimensions in mm (inches)				
	DN mm	inches	D _a	D _i	X
25	1	24 (0.95)	20 (0.79)	26 (1.02)	55 (2.17)
40	1 1/2	37 (1.46)	30 (1.18)	36 (1.42)	80 (3.15)
50	2	49 (1.92)	40 (1.57)	51 (2.01)	100 (3.94)
80	3	78 (3.06)	60 (2.36)	70 (2.76)	150 (5.91)
100	4	98 (3.84)	80 (3.15)	103 (4.06)	200 (7.87)

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

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



Pressure drop:

$$\Delta P = \frac{\rho \times v^2}{800} \quad (\text{in mbar})$$

$$\Delta P = \frac{\rho \times v^2}{550} \quad (\text{in psig})$$

ρ = product density in (kg/m³)
 v = flow velocity in m/s

ρ = specific gravity (e.g. water = 1)
 v = flow velocity in ft/s

Background

Water
WastewaterAbrasive,
corrosive and
hot productsNon-contact
measurement
 $\kappa \geq 0.05 \mu\text{S/cm}$ Food,
Beverage,
PharmaceuticalHigh Pressure
and special
connectionsSignal converter
Integral
and Remote

Remote

Calibration /
Measuring
PrincipleSizing /
Installation
guidesOrdering
guideOrdering
guideOrdering
guide

3



Measuring ranges and error limits

Meter size ¹⁾		Electrical conductivity		Error limits ²⁾		Full-scale range $Q_{100\%}$				
mm	inches	0.05-0.2 $\mu\text{S/cm}$ (water 1-2.5 $\mu\text{S/cm}$)	> 0.2 $\mu\text{S/cm}$ (water > 2.5 $\mu\text{S/cm}$)	$v > 1 \text{ m/s}$ > 3 ft/s	$v \leq 1 \text{ m/s}$ $\leq 3 \text{ ft/s}$	in m^3/h		in US gal/min		
						$v = 0.3 \text{ m/s}$ (minimum)	$v = 1 \text{ m/s}$	$v = 12 \text{ m/s}$ (maximum)	$v = 1 \text{ ft/s}$ (minimum)	$v = 40 \text{ ft/s}$ (maximum)
DN 25	1	depending on product and application condition, please consult your local KROHNE office	for all applications	$< \pm 0.5\%$ of measured value	$< \pm 5 \text{ mm/s}$ $< \pm 0.20$ inches/s	0.5302	1.767	21.20	2.334	93.34
DN 40	1 1/2					1.358	4.524	54.28	5.979	239.0
DN 50	2					2.121	7.069	84.82	9.339	373.5
DN 80	3					5.429	18.10	217.1	23.900	955.6
DN 100	4					8.483	28.27	339.2	37.350	1493.0

1) Where low electrical conductivities are concerned, the meter size should be such that flow velocity $v < 1 \text{ m/s}$ ($< 3 \text{ ft/s}$).

2) Error limits for display, pulse output, digital values

Calibrated on EN 45001 certified calibration rigs by direct comparison of volumes

Reference conditions similar to EN 29104

Product	water at 10 – 30°C / 50 – 86°F
Electrical conductivity	> 300 $\mu\text{S/cm}$
Power supply (rated voltage)	$U_N (\pm 2\%)$
Ambient temperature	20 – 22°C / 68 – 71.6°F
Warm-up time	60 min
Inlet/outlet runs	10 x DN / 2 x DN (DN = meter size)
Primary head	properly grounded and centered

Current output	same error limits as above, additionally $\pm 10 \mu\text{A}$	
Reproducibility or repeatability	0.1 % of MV, minimum 1 mm/s / 0.04 inches/s at constant flow, measuring time > 100 s	
External influences	typical values	maximum values
Ambient temperature		
Pulse output	0.003% of MV (3)	0.01% of MV (3)
Current output	0.01% of MV (3)	0.025% of MV (3)
	} at 1 K / 1.8°F variation	
Power supply	<0.02% of MV	0.05% of MV at 10 % variation
Load	<0.01% of MV	0.02% of MV at max. permissible load, see pages 5 and 6

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

Technical data**CAPPAFLUX Primary head**

Meter size		DN 25, 40, 50, 80, 100 and 1", 1½", 2", 3", 4", flangeless version	
Operating data			
Temperatures		Ambient temperature - 25 to + 60 °C / - 13 to + 140 °F - 25 to + 40 °C / - 13 to + 104 °F	Product temperature - 25 to + 60 °C / - 13 to + 140 °F - 25 to + 100 °C / - 13 to + 212 °F (up to 120 °C/248 °F for maximum 30 min)
Pressure		DN 25 - 80: DN 100: 1" - 4": 1" - 3": 4": 4":	40 bar / 580 psig 16 bar / 230 psig (option 25 bar) 16 bar / 230 psig for 150 lb 40 bar / 580 psig for 300 lb 25 bar / 360 psig for 300 lb } pipe flanges
Vacuum		0 mbar abs. / 0 psia	
Temperature change		DN 2.5-15/1½"-1½"	DN 25-100/1"-4"
Temperature rising	in 10 minutes:	Δ T = 125 °C, or 257 °F	Δ T = 125 °C, or 257 °F
	for sudden change:	Δ T = 120 °C, or 248 °F	Δ T = 120 °C, or 248 °F
Temperature falling	in 10 minutes:	Δ T = 120 °C, or 248 °F	Δ T = 100 °C, or 212 °F
	for sudden change:	Δ T = 190 °C, or 194 °F	Δ T = 180 °C, or 176 °F
Insulation class of field coils		H	
Electrode design		capacitive signal pickup, electrodes not in contact with the product	
Protection category (IEC 529 / EN 60 529)		IP 67 equivalent to NEMA 6	
Items included with supply		Standard	Option
for pipe flanges		DN 25 - 80 / PN 40 DN 100 / PN 16 1" - 4" / 150 lb	DN 100 / PN 25 1" - 4" / 300 lb
Centering material		yes	-
Stud bolts		steel	stainless steel
Grounding rings		-	yes
Gaskets		2 (without grounding rings)	4 (with grounding rings)
Ex versions:	European standard FM approval	-	EEx d IIC T6-T4 in preparation
Materials			
<u>Measuring section</u>			
DN 25, 1"		zirconium oxide, ZrO ₂	
DN 40 - 100, 1½" - 4"		fused aluminium oxid, 99.7 % Al ₂ O ₃	
<u>Housing</u> (with polyurethane finish)		stainless steel 1.4301 / SS 304 - AISI	
<u>Gaskets</u>		Gylon 3500 (beige) gaskets (application range similar to that of PTFE), optionally Chemotherm (graphite) gaskets	
Grounding rings (option)		stainless steel 1.4571/ SS 316 Ti - AISI, others on request	
<u>Centering material</u>			
DN 25, 1"		EPDM rings	
DN 40 - 100, 1½" - 4"		rubber sleeves	
<u>Stud bolts</u>		steel electrogalvanized, optionally stainless steel 1.4301 / SS 304 - AISI	

Background

Water
WastewaterAbrasive,
corrosive and
hot productsNon-contact
measurement
K ≥ 0.05 µS/cmFood,
Beverage,
PharmaceuticalHigh Pressure
and special
connectionsSignal converter
Integral
and Remote

Remote

Calibration /
Measuring
PrincipleSizing /
Installation
guidesOrdering
guide

IFC 090 K-CAP Signal converter**Versions**

IFC 090 K/B (Standard)

IFC 090 K/D (Option)

IFC 090 K/D-EEEx

Interfaces (option)

Add-on equipment (option)

Basic version, **without** local display and control elementsDisplay version, **with** local display and control elements

Ex version with "Increased Safety" outputs

- HART®

- RS 485/PROFIBUS/FIELDBUS (switch-selectable add-on module)

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

Current output

Function

- all operating data configurable
- galvanically isolated from current output and all input circuits
- for active or passive mode

Current:

fixed ranges

variable ranges

0 - 20 mA and 4 - 20 mA

for Q = 0%

 $I_{0\%} = 0 - 16 \text{ mA}$

for Q = 100%

 $I_{100\%} = 4 - 20 \text{ mA}$

for Q > 100%

 $I_{\max} = 22 \text{ mA}$

} adjustable in 1 mA increments

Active mode

max. 500 Ω load

Passive mode

external voltage: 15 ... 20 V DC 20 ... 32 V DC

load: min ... max. 0 ... 500 Ω 250 ... 750 Ω

Error identification

0/22 mA and variable

Forward/reverse flow measurement

direction identified via status output

Pulse output

Function

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

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

Active mode

connection: electronic totalizers

voltage: approx. 15 V DC, from current output

load: $I_{\max} < 23 \text{ mA}$, operation without current outputload: $I_{\max} < 3 \text{ mA}$, operation with current output

Passive mode

connection: electronic or electromechanical totalizers

voltage: external, $U_{\text{ext}} \leq 30 \text{ V DC} / \leq 24 \text{ V AC}$ load: $I_{\max} \leq 150 \text{ mA}$

Pulse width

automatic: pulse duty cycle 1:1, max 1000 pulses/s = 1 kHz

$$\text{variable: } 10 \text{ ms} - 2 \text{ s} \quad P_{100\%} [\text{pulses/s}] = f_{\max} [\text{Hz}] = \frac{1}{2 \times \text{pulse width}}$$

Forward/reverse flow measurement

flow direction identified via status output

Status output (passive)

Function

configurable as measuring range identification for BA mode, indicator for flow direction, errors or trip point

Connection

voltage: external, $U_{\text{ext}} \leq 30 \text{ V DC} / \leq 24 \text{ V AC}$ load current: $I_{\max} \leq 150 \text{ mA}$ **Control input (passive)**

Function

- configurable for range change, totalizer reset, error reset, set outputs to min. values or hold actual output values
- initiate function by "low" or "high" control signals

Control signals

 U_{\max} : 24 V AC 32 V DC (any polarity)low: $\leq 1.4 \text{ V}$ $\leq 2 \text{ V}$ high: $\geq 3 \text{ V}$ $\geq 4 \text{ V}$ **Output/input combinations****I** = current output **P** = pulse output **S** = status output **C** = control input

The following combinations can be set:

1) I P S

2) I P C

3) I C S

4) I S1 S2

5) I C1 C2

Time constant

0.2 - 99.9 s, adjustable in increments of 0.1 second

Low-flow cutoff

Cutoff "on" value: 1 - 19%
 Cutoff "off" value: 2 - 20% } of $Q_{100\%}$, adjustable in 1% increments

Local display		3-field LCD
Display function		actual flowrate, forward, reverse and sum totalizers (7-digit), or 25-character bar graph with percentage indication and status messages
Units:	Actual flowrate	m ³ /h, liters, US gallons/min or user-defined unit, e.g. hecto-liters/day
Totalizer		m ³ , liters, US gallons or user-defined unit, e.g. hecto-liters or US million gallons (adjustable count duration up to overflow)
Language of plain texts		English, German, French, others on request
Display:	Top field	8-character, 7-segment numeral and sign display, and symbols for key acknowledgement
	Middle field	10-character, 14-segment text display
	Bottom field	4 markers to identify display in measuring mode

	1. AC Version	2. AC Version	AC/DC-Version	
	Standard	Option	Option	
1. Rated voltage	230 / 240 V	200 V	24 V AC	24 V DC
Tolerance band	200 – 260 V	170 – 220 V	20 – 27 V AC	18 – 32 V DC
2. Rated voltage	115 / 120 V	100 V	-	-
Tolerance band	100 – 130 V	85 – 110 V	-	-
Frequency	48 – 63 Hz		48 – 63 Hz	-
Power consumption (incl. primary head)	approx. 10 VA		approx. 10 VA	approx. 8 W

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

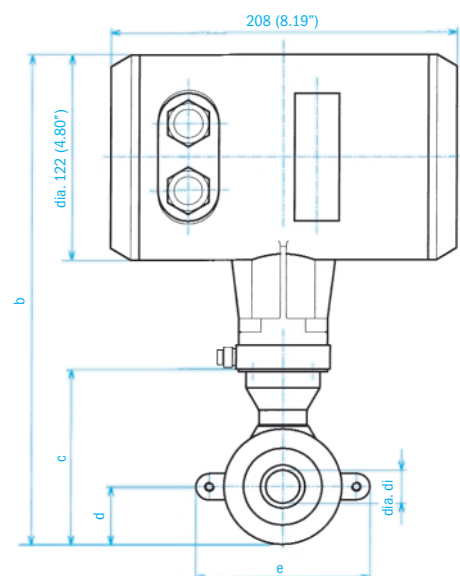
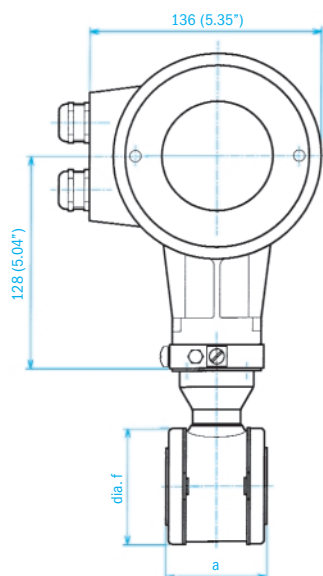
Housing

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

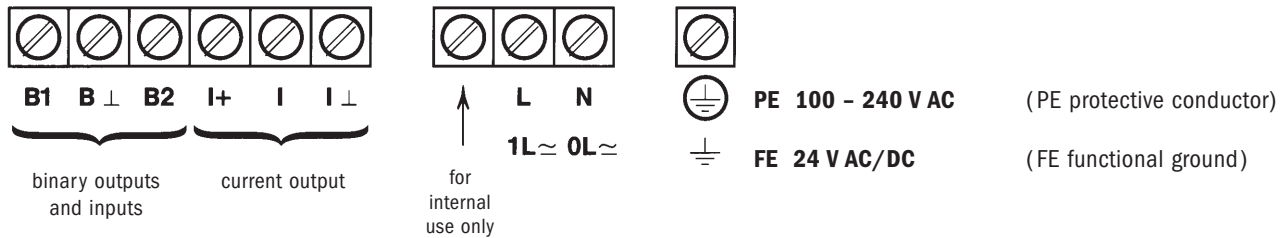
Dimensions and weights

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

Meter size		Dimensions in mm and (inches)										approx. weight	
DN mm	inches	a	b	c	d	e	Ø f	Ø di				in kg	(lb)
25	1	58 (2.28)	302 (11.89)	113 (4.45)	34 (1.34)	102 (4.02)	68 (2.68)	20 (0.79)				3.9	(8.6)
40	1½	83 (3.27)	318 (12.52)	129 (5.08)	42 (1.65)	117 (4.61)	83 (3.27)	30 (1.18)				4.7	(10.4)
50	2	103 (4.06)	336 (13.23)	147 (5.79)	51 (2.01)	135 (5.31)	101 (3.98)	40 (1.57)				5.2	(11.5)
80	3	153 (6.02)	368 (14.49)	179 (7.05)	67 (2.64)	167 (6.57)	133 (5.24)	60 (2.36)				7.7	(17.0)
100	4	203 (7.99)	392 (15.43)	203 (7.99)	79 (3.11)	192 (7.56)	158 (6.22)	80 (3.15)				11.1	(24.5)



IFC 090 K Electrical connection



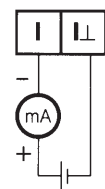
- B1** pulse output (P), status output (S) or control input (C)
- B2** status output (S) or control input (C)

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

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

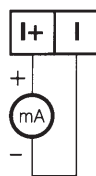
Current output (I)

passive

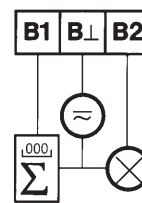


(not with Ex version)

active

Pulse output (P)
status output (S)

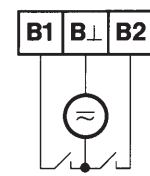
passive



P electronic or electro-mechanical totalizer
S e.g. signal indicator

Control input (C)

passive



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