KROHNE

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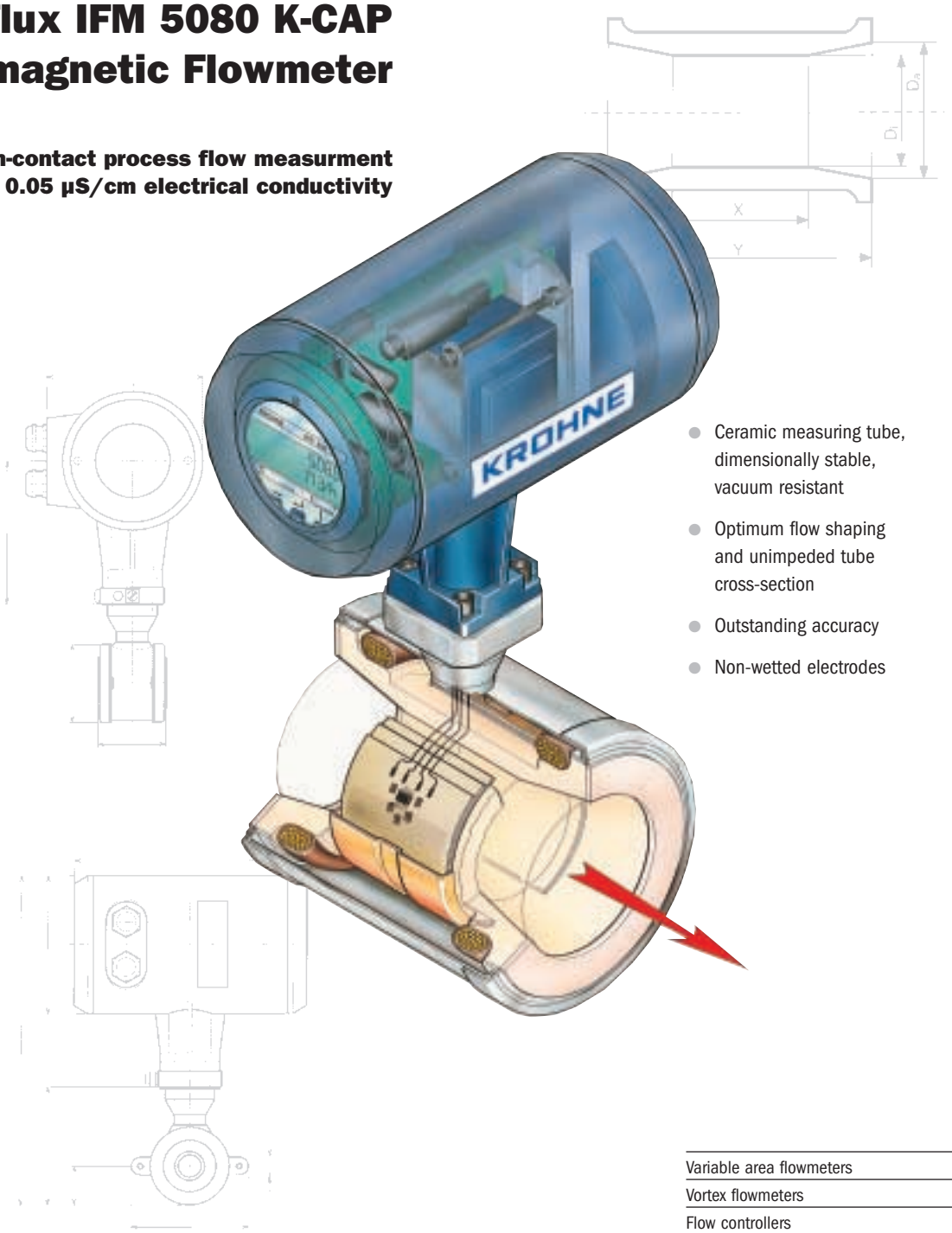
Capaflux IFM 5080 K-CAP Electromagnetic Flowmeter

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



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

Capaflux IFM 5080 K-CAP Electromagnetic Flowmeter

... non-contact process flow measurment from 0.05 µS/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 contens:
fruit pieces, pulps, concrete

... for sterile processes:
chemical and food industries

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

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

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

non-contact flow measurement

no electrodes

easy to specify

unimpeded flow cross-sectional area

optimum flow shaping

resistant to abrasion

ceramic measuring tube

dimensionally stable vacuum-resistant

outstanding accuracy

Special advantages

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

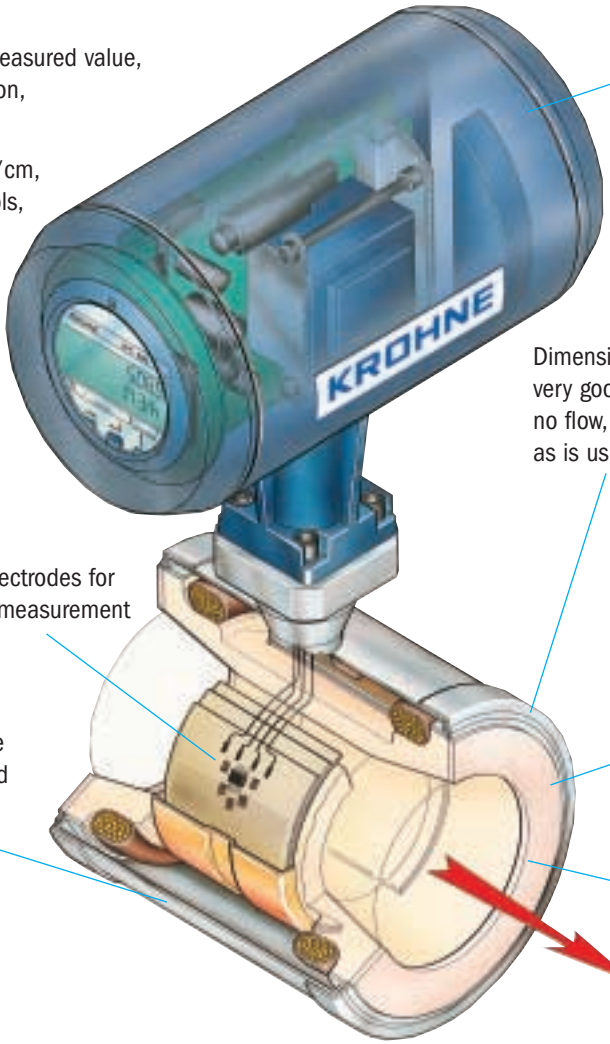
ATEX approval
Ex II 2 GD **KEMA 01 ATEX 2232X**

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

Highlights

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

Electrical conductivity ≥ 0.05 µS/cm, e.g. ultrahigh-purity water, alcohols, glycerols, glycols, etc.



Hazardous-duty version, flameproof enclosure

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

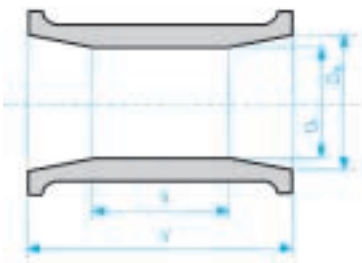
Capacitive electrodes for non-contact measurement

Meter sizes DN 25-100 or 1"-4"

No crevices, no blind spots in the measuring tube, conforms to food standards, extremely smooth, surface roughness < 0.8 µm

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

Design

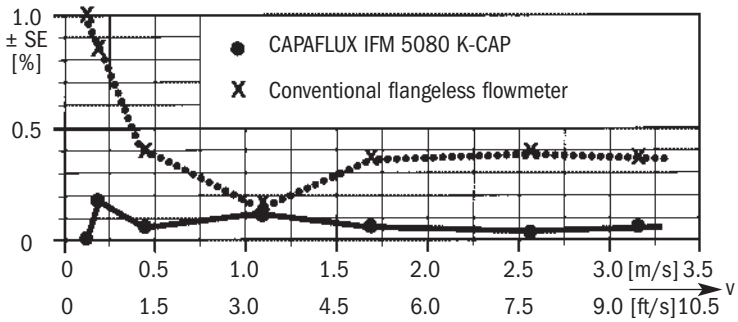


Meter size		Dimensions in mm (inches)			
DN mm	inches	D_a	D_i	X	Y
25	1	24 (0.95)	20 (0.79)	26 (1.02)	55 (2.17)
40	$1^1/_2$	37 (1.46)	30 (1.18)	36 (1.42)	80 (3.15)
50	2	49 (1.92)	40 (1.57)	51 (2.01)	100 (3.94)
80	3	78 (3.06)	60 (2.36)	70 (2.76)	150 (5.91)
100	4	98 (3.84)	80 (3.15)	103 (4.06)	200 (7.87)

Flow profile influence

(± SE) as % of measured value

Example for DN 80 (3") with quarter bend, straight inlet run 5 × DN (= 400 mm = 16") from quarter bend to electrode plane



Pressure drop:

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

$\Delta P = \frac{\rho \times v^2}{550}$ (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

Measuring ranges and error limits

Meter size 1)		Electrical conductivity 0.05-0.2 µS/cm	> 0.2 µS/cm	Error limits 2)		Full-scale range $Q_{100\%}$ in m³/h			in US gal/min	
mm	inches	(water 1-2.5 µS/cm)	(water >2.5 µS/cm)	v > 1 m/s > 3 ft/s	v ≤ 1 m/s ≤ 3 ft/s	v = 0.3 m/s (minimum)	v = 1 m/s	v = 12 m/s (maximum)	v = 1 ft/s (minimum)	v = 40 ft/s (maximum)
DN 25	1	depending on product and application condition, please consult your local KROHNE office	for all applications	< ± 0.5 % of measured value	< ± 5 mm/s < ± 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 m/s (< 3 ft/s).

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

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

Reference conditions similar to EN 29104

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

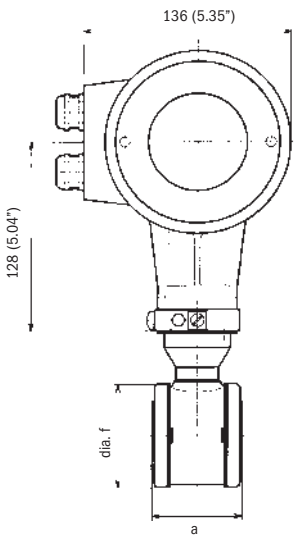
Current output	same error limits as above, additionally ± 10 µA	
Reproducibility or repeatability	0.1 % of MV, minimum 1 mm/s / 0.04 inches/s at constant flow, measuring time > 100 s	
External influences	typical values	maximum values
Ambient temperature		
Pulse output	0.003% of MV (3)	0.01% of MV (3) } at 1 K / 1.8 °F variation
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

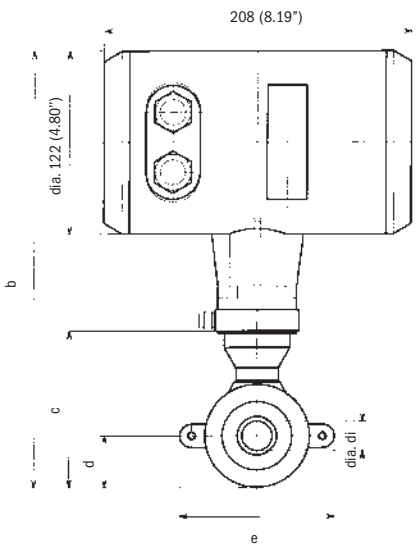
(3) All KROHNE signal converters undergo burn-in tests, duration minimum 20 hours at varying ambient temperatures – 20 to + 60 °C / – 4 to + 140 °F. The tests are controlled by computers.

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	$1^1/_2$	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)





The responsibility as to the suitability, intended use and corrosion-resistance of the materials used in their construction rests solely with the purchaser.

Technical data

CAPPAFLUX Primary head

Meter size		DN 25, 40, 50, 80, 100 and 1", 1$^1/_2$", 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 ● non Ex : **+ 140 °C/+284°F** for max. 30 min ● Ex version : **+ 115°C/+239°F**
Pressure		DN 25 – 80: DN 100: 1" – 4": 1" – 3": 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 } pipe flanges 25 bar / 360 psig for 300 lb
Vacuum		0 mbar abs. / 0 psia	
Temperature change			
Temperature rising	in 10 minutes: for sudden change:	Δ T = 125 °C, or 257 °F Δ T = 120 °C, or 248 °F	
Temperature falling	in 10 minutes: for sudden change:	Δ T = 100 °C, or 212 °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	
Measuring section	
DN 25, 1" DN 40 – 100, 1$^1/_2$" – 4"	zirconium oxide, Z_rO_2 fused aluminium oxid, 99.7 % Al_2O_3
Housing (with polyurethane finish)	stainless steel 1.4301 / SS 304 – AISI
Gaskets	Gylon 3500 (beige) gaskets (application range similar to that of PTFE), optionally Chemotherm (graphite) gaskets
Grounding rings (option)	stainless steel 1.4571/ SS 316 Ti – AISI, others on request
Centering material	
DN 25, 1" DN 40 – 100, 1$^1/_2$" – 4"	EPDM rings rubber sleeves
Stud bolts	steel electrogalvanized, optionally stainlees steel 1.4301 / SS 304 – AISI

IFC 090 K-CAP Signal converter

Versions

IFC 090 K/B (Standard)	Basic version, **without** local display and control elements
IFC 090 K/D (Option)	Display version, **with** local display and control elements
IFC 090 K/D-EEx	Ex version with "Increased Safety" outputs
Interfaces (option)	– HART® – RS 485/PROFIBUS/FIELDBUS (switch-selectable add-on module)
Add-on equipment (option)	CONFIG-Software and adapter for operator control via MS-DOS PC, connection to internal IMoCom interface (equipment bus)

Current output

Function		– all operating data configurable – galvanically isolated from current output and all input circuits – for active or passive mode
Current:	fixed ranges	0 – 20 mA and 4 – 20 mA
	variable ranges	for Q = 0% $I_{0\%}$ = 0 – 16 mA for Q = 100% $I_{100\%}$ = 4 – 20 mA for Q > 100% I_{max} = 22 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: gate time, totalizer $\geq \frac{1000}{P100\%\ [Hz]}$
Active mode	connection: electronic totalizers voltage: approx. 15 V DC, from current output load: I_{max} < 23 mA, operation without current output load: I_{max} < 3 mA, operation with current output
Passive mode	connection: electronic or electromechanical totalizers voltage: external, $U_{ext} \leq$ 30 V DC/≤ 24 V AC load: $I_{max} \leq$ 150 mA
Pulse width	automatic: pulse duty cycle 1:1, max 1000 pulses/s = 1 kHz variable: 10 ms – 2 s $P_{100\%}$ [pulses/s] = f_{max} [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, $U_{ext} \leq$ 30 V DC/≤ 24 V AC load current: $I_{max} \leq$ 150 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: ≤ 1.4 V ≤ 2 V high: ≥ 3 V ≥ 4 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

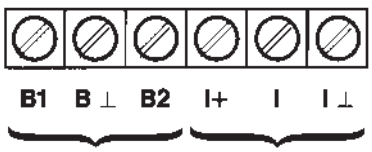
Power supply

	1. AC Version Standard	**2. AC Version** Option	**AC/DC-Version** 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

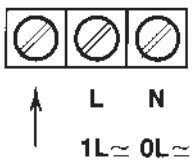
When connected to functional extra-low voltage, 24 V, safety separation (PELV) is essential (to VDE 0100 / VDE 0106 and IEC 364 / IEC 536 or equivalent national standard.)

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

Electrical connection



binary outputs and inputs — current output



for internal use only

PE 100 – 240 V AC (PE protective conductor)

FE 24 V AC/DC (FE functional ground)

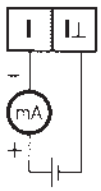
B1 pulse output (**P**), status output (**S**) or control input (**C**)
B2 status output (**S**) or control input (**C**)

Electrical connection in conformity with VDE 0100 "Regulations gover-ning 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.

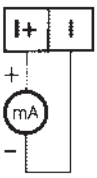
Current output (I)

passive



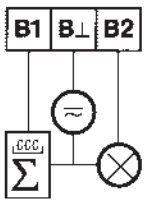
(not with Ex version)

active



Pulse output (P) status output (S)

passive

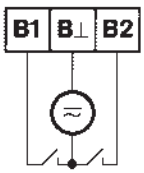


P electronic or electro-mechanical totalizer

S e.g. signal indicator

Control input (C)

passive



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