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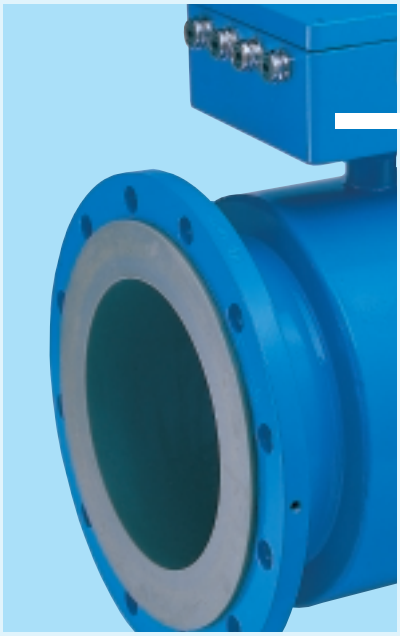
GR/PRINTO

TIDALFLUX
IFM 4110 PF and IFM 4210 PF
Electromagnetic Flowmeter

for partially filled pipelines

- Measurement in partially filled pipelines
- Patented, non-contact level measurement up to DN 1800 / 72"
- Electromagnetic process flow measurement system, proven in more than 40 years in the water and wastewater sector



TIDALFLUX

flowmeters measure the volumetric flowrate of electrically conductive liquids in partially filled pipelines

Innovative combination of time-proven measuring principles

The electromagnetic flowmeter and capacitive flow-level measuring system built into the wall of the measuring tube provide accurate flow measurements in partially filled pipelines, with levels between 10 and 100 % of the pipe cross-section.

TIDALFLUX flowmeters measure the volumetric flowrate of electrically conductive liquids in partially filled pipelines.

Fields of application

- Wastewater measurement in partially filled pipelines
- Abrasion resistance: very high
- Chemical resistance:
  alkaline solutions (e.g. NaOH)
  up to 10% at 30°C / 86°F
  acids (e.g. HNO_3)
  up to 5% at 20°C / 68°F

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

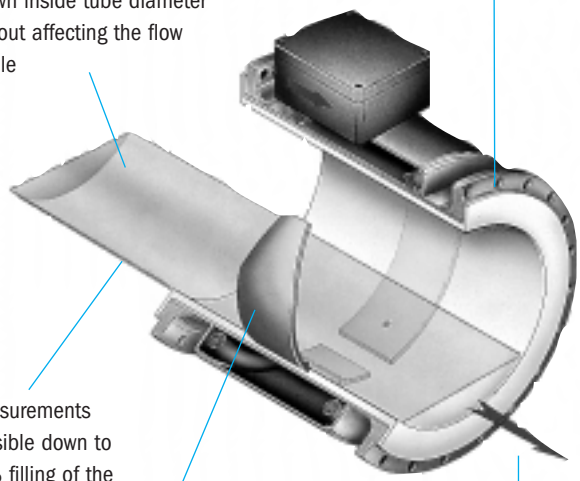
Precision from KROHNE

- Developed for the water and waste water sector.
- In-depth testing in cooperation with leading companies in the waste water sector.
- Steady display of measured values, even when product surface is rough or the flow profile distorted.
- Precise factory calibration ensures a level of measurement accuracy never possible before in partially filled pipes.

Measuring error < 1% of the measured value
Exact measurements with a low time constant, even in cases of wave motion and heavy contamination

Determination of the flow level and of the filled tube cross-sectional area by means of capacitive level measurement and the known inside tube diameter without affecting the flow profile

Meter sizes
DN 200-1800 / 8"-72"



Measurements possible down to 10% filling of the measuring tube

Patented, capacitive and non-contact flow level measuring system, integrated in the liner

Determination of the flow velocity by means of the proven electromagnetic measuring principle

Measuring principle

The TIDALFLUX IFM 4110 PF is an electromagnetic flowmeter with an integrated capacitive level measurement system.

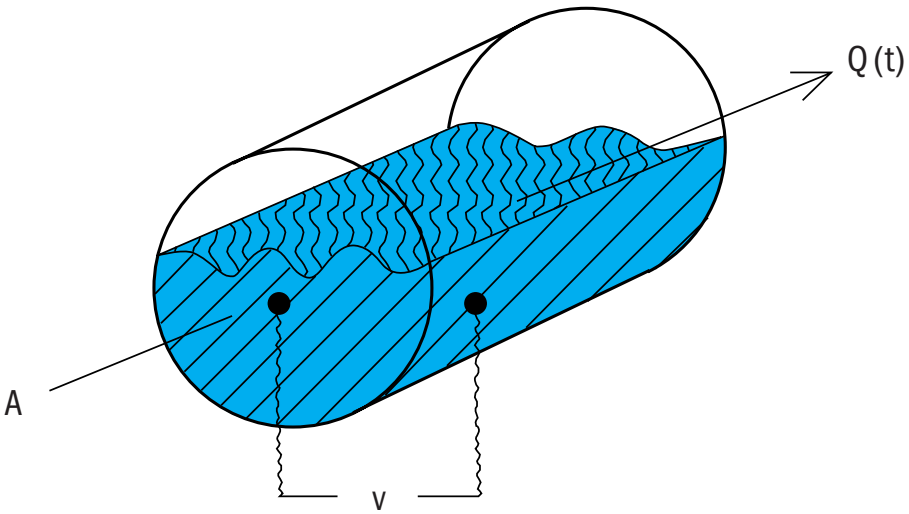
The flow rate **Q(t)** through the tube is: **Q(t) = v × A**

v = flow velocity of liquid product
A = wetted tube cross-section

Flow velocity v is determined on the basis of the known electromagnetic measurement principle.
The two measuring electrodes are located in the lower part of the measuring tube, on a level of approx. 0.1 x inside tube diameter.

Patented level measurement system

The wetted area **A** is computed from the known inside diameter of the tube by the capacitive level measurement system that is built into the measuring tube liner. The required electronics unit is accommodated in a integral housing that is mounted direct on the primary head. Communication with the remote signal converter is by way of an RS 485 interface.



Capacitive flow level measurement

- Capacitive level measuring system built into the measuring tube liner.
- Non-contact and accurate measurement of the flow level, with no additional flow obstructions.
- Independent of flow profile influences, such as super-critical flow.
- Exact measurement of the flow level with low time constant, even when waves are generated in the measuring tube.
- Reliable measurements, also when product is heavily contaminated.

Electromagnetic flow measurement

- No constriction of the pipe cross-section.
- No additional pressure drop or backpressure.
- Linear and accurate flow measurements.
- Electromagnetic flowmeters from KROHNE are practice-proven for over 40 years in the water and waste water sector

Measuring range and accuracies

Full-scale range $Q_{100\%}$			
	in pipe running full between 34 m³/h or 160 US Gal/min (minimum for DN 200 / 8") and 100000m³/h or 500000US Gal/min (maximum for DN 1800 / 72") equivalent flow velocity 0,3 – 12 m/s or 1 – 40 ft/s		
Units	m³, litres or US gallons per second, minute or hour, and 1 user-defined unit, e.g. litres per day or US million gallons per day		
Error limits to reference conditions			
Partially filled pipe	for full-scale ranges	v ≥ 1 m/s (≥ 3.3 ft/s):	≤ 1 % of full-scale range
Completely filled pipe	for current measured values	v ≥ 1 m/s (≥ 3.3 ft/s):	≤ 1 % of measured value
		v < 1 m/s (≥ 3.3 ft/s):	≤ 0.5 % of measured value + 5 mm/s or ≤ 0.5 % of measured value + 0.20 inches/s

Reference conditions:

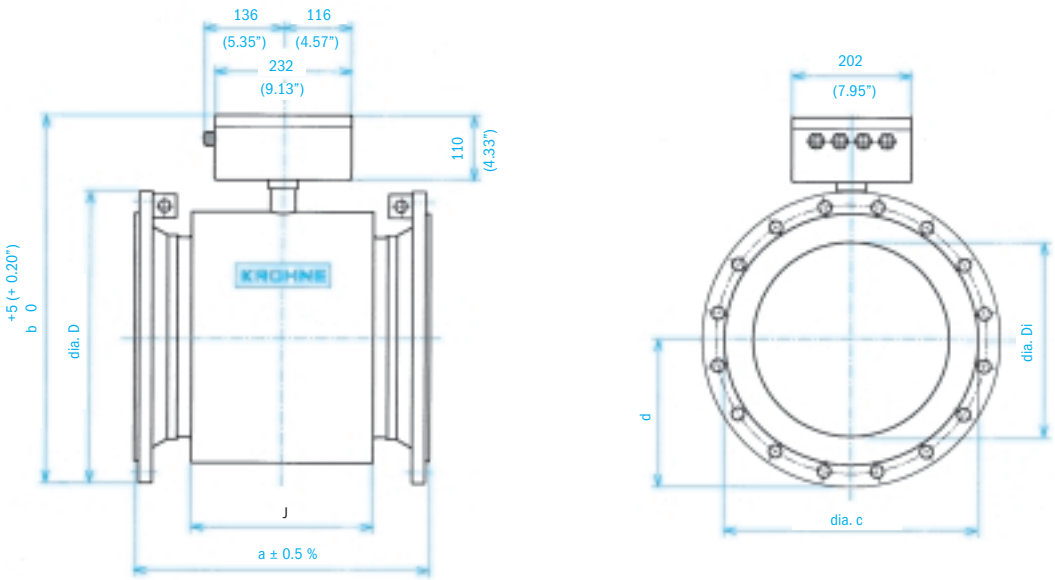
Product	water at 10 – 30°C / 50 – 86°F	Warm-up time	60 min
Electrical conductivity	> 300 µS/cm	Max. error of calibration system	10 x smaller than F
Power supply (line voltage)	UN (± 2%)	Inlet / outlet runs	10 x DN / 5 x DN (DN = meter size)
Ambient temperature	20 – 22°C / 68 – 71.6°F	Primary head	properly grounded and centered

IFS 4000 PF Dimensions and weights

Dimension **a** without flange gaskets, not included with flowmeter, to be provided by customer

Meter size to ...			**Dimensions** in mm (inches)							**Approx. weight**	
DIN 2501		ANSI									
mm	PN	B16.5	a	b	Øc	d	j	ØD	ØDi	kg	(lb)
DN 200	10	8"/150 lb	350 (13.78)	482 (18.98)	291 (11.46)	146 (5.75)	177 (6.97)	340 (13.39)	189 (7.44)	40	(90)
DN 250	10	10"/150 lb	400 (15.75)	530 (20.87)	331 (13.03)	166 (6.54)	205 (8.07)	395 (15.55)	231 (9.09)	54	(120)
DN 300	10	12"/150 lb	500 (19.69)	580 (22.83)	381 (15.00)	191 (7.52)	235 (9.25)	445 (17.52)	281 (11.06)	66	(145)
DN 350	10	14"/150 lb	500 (19.69)	632 (24.88)	428 (16.85)	214 (9.80)	306 (12.05)	505 (19.88)	316 (12.44)	95	(210)
DN 400	10	16"/150 lb	600 (23.62)	689 (27.13)	483 (19.02)	242 (9.53)	386 (15.20)	565 (22.24)	365 (14.37)	115	(255)
DN 500	10	20"/150 lb	600 (23.62)	792 (31.18)	585 (23.03)	293 (11.54)	386 (15.20)	670 (26.38)	467 (18.39)	145	(320)
DN 600	10	24"/150 lb	600 (23.62)	876 (34.49)	694 (27.32)	347 (13.66)	386 (15.20)	780 (30.71)	567 (22.32)	180	(400)

Dimensions > DN 700 / > 28" on request



Technical data

Meter sizes and versions

Meter sizes	DN 200 - 1600 / 8" - 64",
Connecting flanges	
DIN 2501	DN 200 – 1800 / PN 2.5 – PN 10
ANSI B16.5	8" – 72" / 150 lb
AWWA and others	on request
Protection category (IEC 529 / EN 60529)	IP 67, equivalent to NEMA 6
Hazardous-duty version	optionally Ex N, Zone 2

Process data

Liquid product	water, waste water and chemical
Electrical conductivity	≥ 50 µS/cm
Flow level in pipe	min. 10 % of inside tube diameter
Process temperature	– 5 to + 60 °C / + 23 to + 140 °F
Ambient temperature	– 25 to + 60 °C / – 13 to + 140 °F
Operating pressure	max. 10 bar / 150 psig

Integrated flow measuring system

Measuring principle	electromagnetic flow measurement
Full-scale range $Q_{100\%}$	in pipe running full between 34 m^3/h or 160 US Gal/min (minimum for DN 200 / 8") and 100 000 m^3/h or 500 000 US Gal/min (maximum for DN 1600 / 64") equivalent flow velocity 0.3 – 12 m/s or 1 – 40 ft/s
Electrode design	1 pair of electrodes, solidly fitted, surface polished
Power for field coils	from signal converter
Grounding rings	available as an option

Integrated level measuring system

Measuring principle	capacitive level measurement, built into the measuring tube liner
Pipe fill	min. 10% of inside tube diameter, outputs go to "zero" below 10% fill
Power for level measuring system	
Voltage / frequency	230 / 115 V AC, 50 – 60 Hz, others on request
Power consumption	14 VA
Communication with signal converter	via RS 485 interface
Electronics housing	integral, mounted directly on the primary head
Cable entries	3 x PG 16 and 1 x PG 9, optionally ½" NPT or ½" PF

Materials of construction

Measuring tube	stainless steel 1.4301 (or higher materials number) / AISI 304
Liner	Irathane®, 12 mm / 0.47"
Electrodes	Hastelloy C4, others on request
Connecting flanges*	steel 1.0038 (RST 37.2)
Converter housing*	sheet steel
Electronics housing*	cast aluminium
PG cable entries	nickel-plated brass
Grounding rings (option)	stainless steel 1.4571 / AISI 316 Ti

* with polyurethane finish 143 RAL 5015

IFC 110 PF Signal converter

Version		
IFC 110 PF		Display version, with local display / control elements (15 keys)
Current output		
Function		– all operating data configurable – galvanically isolated from all input and output circuits
Current:	fixed ranges	0 – 20 mA und 4 – 20 mA
	variable ranges	for Q = 0% $I_{0\%}$ = 0 – 16 mA for Q = 100% $I_{100\%}$ = 4 – 20 mA } adjustable in 1mA increments for Q > 100% I > 20 – 22 mA (maximum)
Load		min. 15 Ω
Error identification		0 / 22 mA and variable

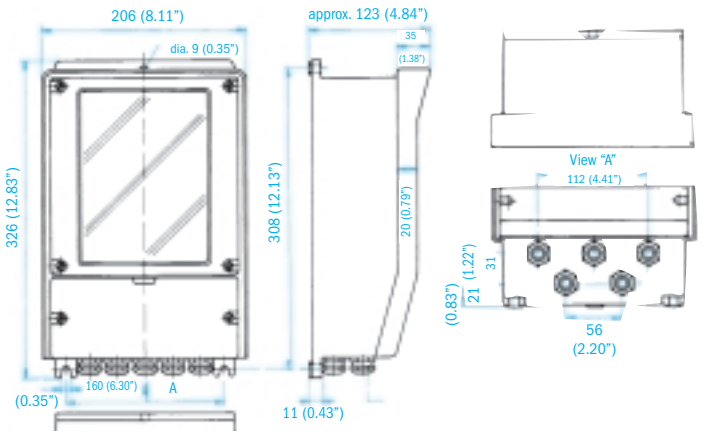
Pulse outputs (passive)	**P**	**A1** (can also be operated as status output)
Function	– for electronic totalizers – all operating data configurable	– for electromechanical totalizers – all operating data configurable
Terminals	P / P	A1 / A⊥
Pulse rate	0 – 10 000 pulses **per** s [= Hz], min, h, m^3, liter, etc., any scaling	0 – 50 pulses **per** s [= Hz], min, h, m^3, liter, etc., any scaling
Electrical data	galvanically isolated U ≤ 32 V DC / ≤ 24 V AC I ≤ 30 mA, any polarity	galvanically isolated, but not from A2 U ≤ 32 V DC / ≤ 24 V AC I ≤ 100 mA, any polarity **or** U ≤ 32 V DC, I ≤ 200 mA, note polarity
Pulse width	automatic: pulse duty cycle 1:1, max. 10 000 pulses/s = 10 kHz variable: 10 ms – 1 s, $P_{100\%}$ [pulses/s] = fmax [Hz] = $\frac{1}{2 \times \text{pulse width}}$ digital pulse division, interpulse period non-uniform, therefore if frequency and cycle meters connected allow for minimum counting interval: gate time, totalizer ≥ $\frac{1000}{P_{100\%}\ [\text{Hz}]}$	

Status outputs (passive)	**D1 / D2 / A2**	**A1** (can also be operated as pulse output)
Function, set for	trip point automatic range change error identification overdriving empty pipeline, < 10%	trip point automatic range change error identification overdriving empty pipeline, < 10%
Terminals	D1 / D⊥ D2 / D⊥ A2 / A⊥ **Please note:** D⊥ common reference potential for D1 and D2 A⊥ common reference potential for A1 and A2	A1 / A⊥
Electrical data	galvanically isolated U ≤ 32 V DC / ≤ 24 V AC I ≤ 100 mA, any polarity	galvanically isolated, but not from A2 U ≤ 32 V DC / ≤ 24 V AC I ≤ 100 mA, any polarity or U ≤ 32 V DC, I ≤ 200 mA, please note polarity

Control inputs C1 and **C2** (passive)		
Function, set for		automatic range change, totalizer reset, error reset, start self-test, set outputs to min. values or hold last measured values of outputs
Terminals		C1 / C⊥ and C2 / C⊥ (**Please note:** C⊥ common reference potential for C1 and C2)
Electrical data		galvanically isolated, U = 8 – 32 V DC, I ≤ 10 mA, any polarity
Internal power supply		for passive outputs and inputs and external receiver instruments
Terminals		E + and E –, please note polarity
Electrical data		galvanically isolated / U = 24 V DC / Ri = approx. 15 Ω / I ≤ 100 mA
Time constant		0.2 – 99.9 s, adjustable in increments of 0.1 second
Local display		3-line back-lit LCD
Display function		actual flowrate, sum totalizers (7 digits) or 25-character bar graph with percent display, status messages, level
Units:	actual flowrate	m^3/h, liter/s., US gallons/min or user-defined unit, e. g. hecto liter/h or US million gallons/day
	totalizer	m^3, liter, or US gallons or user-defined unit, e. g. hecto liter or US million gallons (adjustable counting time till overflow)
	level	percent of tube diameter
Language of plain texts		English, German, French, others on request
Display:	1st line	8-character, 7-segment, numerical and sign display, and symbols for key acknowledgement
	2nd line	10-character, 14-segment, text display
	3rd line	6 markers to identify display in measuring mode
Field power supply		
Type		pulsed bipolar DC field for all KROHNE primary heads, galvanically isolated from all input and output circuits
Terminals		7 and 8, each 2 ×
Current / voltage		± 0.125 A (± 5%) / maximum 40 V
Clock frequency		$^1/_{36}$ to $^1/_6$ of power frequency, configurable to the calibration data of the primary head
Power supply		**AC version**
Voltage range (without change over)		115/230 V AC
Frequency		48 – 63 Hz
Power consumption (incl. primary head)		12 W, typical (max. 18 W)
Field housing		
Material		die-cast aluminium with polyurethane finish
Ambient temperature		operation: – 25 to + 60 °C / – 13 to + 140 °F storage: – 40 to + 60 °C / – 40 to + 140 °F
Protection category (IEC529 / EN60529)		IP 65, equivalent to NEMA 4 / 4X

Dimensions in mm (inches)

Weight approx. 4.5 kg / 10 lb



IFC 210 PF Signal converter

Versions	
IFC 210 **E** (standard)	– standard version with large graphics LC display and integrated HART® interface
IFC 210 E / **RS 485** (option)	– same as standard version, additional with RS 485 interface
IFC 210 E / _ / **Ex** (option)	– same as standard version, for operation with primary heads used in hazardous areas
Interface module (option)	– RS 485 / Profibus PA (in preparation)
Full-scale range	
Flowrate for Q = 100%	6 Liter/h to 86850 m^3/h **or** 0.03 to 400000 US Gal/min, corresponding to flow velocity v = 0.3 – 12 m/s **or** v = 1 to 40 ft/s
Units	m^3/h, liter/s, US Gal/min or user-defined unit, e. g. liter/day or US Gal/day
Current output	
Function	– all operating data configurable – galvanically isolated from all input and output circuits – active and passive operation
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 1mA increments
Load (active operation)	max. 800 Ω
Error identification	0 / 22 mA and variable
Forward/reverse flow measurement	direction identified via status output
Pulse output	
Interface module (option)	– RS 485 / Profibus PA (in preparation)
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 $\geq \frac{1000}{P_{100\%}\ [Hz]}$
Active mode	connection: electronic totalizers
Passive mode	connection: electronic or electromechanical totalizers
Electrical data	see “Connection diagrams” on Pages 8 and 9
Pulse width	automatic: pulse duty cycle 1:1, max 10000 pulses/s = 10 kHz variable: 10 ms – 1 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
Electrical data	see “Connection diagrams” on Page 9
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	Umax: 24 V **AC** 32 V **DC** (any polarity) low: ≤ 1,4 V ≤ 2 V high: ≥ 3 V ≥ 4 V
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	
	high-contrast, illuminated graphics LC display, temperature-compensated, excellent readability, 128 x 64 dots, view surface approx. 69 mm x 36 mm (2.70" x 1.40")
Display function	actual flowrate, forward, reverse, sum totalizers, or bar graph and status messages
Units: actual flowrate	m^3/h, liter/s., US gallons/min or user-defined unit, e. g. hecto liter/h or US million gallons/day
totalizer	m^3, liter, or US gallons or user-defined unit, e. g. hecto liter or US million gallons (adjustable counting time till overflow)
Language of plain texts	English, German, French, others on request
Field power supply	
Type	pulsed bipolar DC field for all KROHNE primary heads, galvanically isolated from all input and output circuits
Terminals	2 x 7 and 8
Current / voltage	± 0.125 A (± 5 %) / maximum 40 V
Clock frequency	$^1/_{36}$ to $^1/_2$ of power frequency, configurable to the calibration data of the primary head

Power supply	**AC version**	**AC / DC version** (switch-selectable)	
	standard	option	
Voltage range (without change over)	100 – 230 V AC	24 V AC	24 V DC
Tolerance band	85 – 255 VAC	20.4 – 26.4 V AC	18 – 31.2 V DC
Frequency	48 – 63 Hz	48 – 63 Hz	–
Power consumption (incl. primary head)	11 W, typical (max. 14 W)	11 W, typical (max. 14 W)	11 W, typical (max. 14 W)

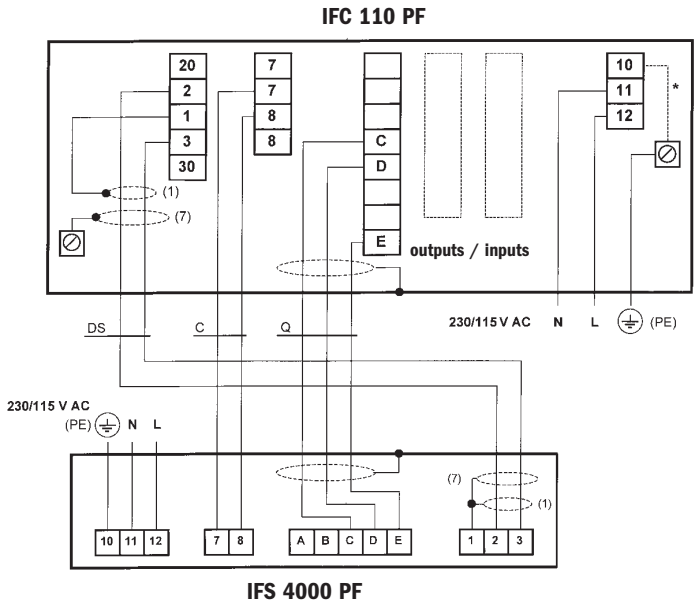
When connected to a functional extra-low voltage, 24 V AC / DC, protective separation (PELV) must be ensured (VDE 0100 / VDE 0106 and IEC 364 / IEC 536 or equivalent national standards).

Housing	
Material	aluminium section, stainless steel and aluminium sheet, partially polyester coated
Ambient temperature	operation: – 25 to + 60°C / – 13 to + 140°F storage: – 25 to + 60°C / – 13 to + 140°F
Protection category (IEC 529 / EN 60 529)	IP 20, equivalent to NEMA 1
Terminal strips XA-XC (XD)	
Standard	– 32-pin, contact surface gold-plated – male multipoint connector, style F to DIN 41 612 – female multipoint connector, style F to DIN 41 612, and transverse soldered connections (supply included)
Special versions	on request
Electrical connections	XA : primary head XB : power supply XC : outputs and inputs (XD) : option RS 485

IFC 110 PF Signal converter

- Protect signal converter or switchgear cabinets with built-in converters from direct sunlight, fit a sunshade if necessary.
- When installing one or several signal converters in switchgear cabinets, ensure adequate cooling with fans or heat exchangers.
- Do not expose to heavy vibration.
- Mount the signal converter as close as possible to the primary head.
- Use the supplied signal cable DS and data transmission cable Q, standard length of each cable: 10 m / 30 ft.

Electrical connection IFS 4000 PF ⟷ IFC 110 PF



Max. permissible cable lengths

C Field power supply cable, not included in supply, to be provided by customer

Max. permissible length		Type	
≤ 150 m	≤ 500 ft	2 x 0.75 mm²	2 x 18 AWG
≤ 300 m	≤ 1000 ft	2 x 1.50 mm²	2 x 14 AWG
≤ 600 m	≤ 2000 ft	4 x 1.50 mm²	4 x 14 AWG

DS Signal cable, with double shielding, 10 m / 30 ft cable in supply

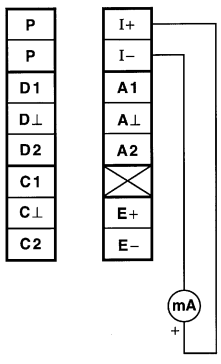
Max. permissible length		Electrical conductivity
≤ 100 m	≤ 330 ft	≥ 50 µS/cm **
≤ 200 m	≤ 660 ft	≥ 100 µS/cm **
≤ 600 m	≤ 2000 ft	≥ 400 µS/cm

Q Data transmission cable, with single shielding,
3 x 0.75 mm² / 3 x 14 AWG, e.g. LiYCY,
10 m / 30 ft cable in supply,
max. permissible length 600 m / 2000 ft

* internal connection, do not remove
** greater cable length on request

Connection of outputs

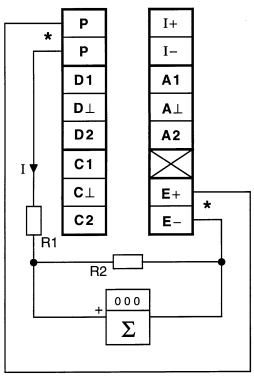
Current output I



R_i = 15 – 500 Ω

Pulse output P_{active} for electronic totalizer (EC)

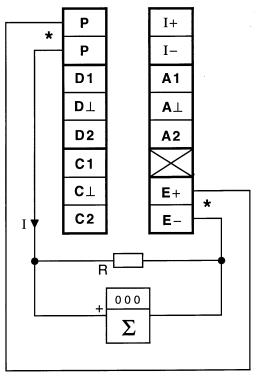
for frequencies ≤ 1 kHz



R1 = 1kΩ/0.5 W
I ≤ 20 mA
$R_{i\ EC}$ > 100 kΩ

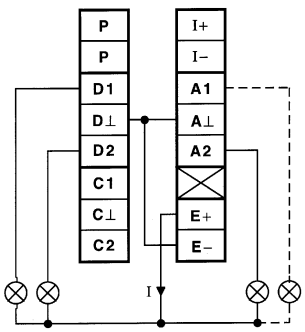
R2 / 0.2 W	10 kΩ	1k Ω	270 Ω
$U_{EC\ max}$	22 V	12 V	5 V

for frequencies > 1 kHz



R = 1kΩ/0.35 W **I** ≤ 30 mA

Status outputs
D1 / D2 / A1 / A2 active



I ≤ 100 mA

⊗ e.g. signal indicator

Please refer to pages 6 and 7 for technical data of the outputs and inputs.