



KROHNE

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GR/PRINTO

ALTOFLUX 2W **World's first and only** **electromagnetic flowmeter** **with hybrid connection** **technology**

... the low cost of ownership alternative
for high-maintenance flowmeters

Available !!!



- 2-Wire connection without additional cabling
- Intrinsically safe connection, as both 2 or 2x2 wire system
- Proven, stainless steel reinforced Teflon®-PFA liner
- Standard HART® communication

Variable area flowmeters

Vortex flowmeters

Flow controllers

Electromagnetic flowmeters

Ultrasonic flowmeters

Mass flowmeters

Level measuring instruments

Communications engineering

Engineering systems & solutions



ALTOFLUX 2W IFM 4042 K

World's first and only
electromagnetic flowmeter
with hybrid connection technology

If you thought that 2-wire electromagnetic flowmeters (magmeters) had limitations. Think again.

Announcing the new ALTOFLUX 2W Hybrid Meter.

While most 2-wire magmeters are good for 90% of all jobs, ALTOFLUX 2W features improved electronics that handle 99% of all situations. When process conditions change, and noise increases, simply plug in an extra power supply – a power booster – and you're ready to handle even the most difficult situations.

- no process turn-down
- no meter removal and replacement

And most importantly;

- no changes in EEx-Protection class,
- no recabling,
- no re-approval of the production unit.

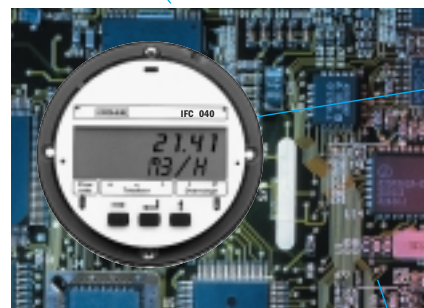
Applications

- water and wastewater
- chemical and pharmaceutical industries
- superior liner material with no limitations in resistance to chemicals
- plant requiring low-cost intrinsically safe magmeters

KROHNE magmeters are calibrated in accredited test rigs to EN 17025. Where others use master meters, KROHNE calibrates against up to almost half a million liters of water flowing through the meter under true flow conditions. This permits us to quote a genuine accuracy of calibration of greater than 99.97% of measured value.

Extremely stable and accurate results
with steady or pulsating flows

Large high-contrast LC display



Measuring error guaranteed less than
0.5% of the measured value



Highlights ALTOFLUX 2W IFM 4042 K

- Two wires for signal and power supply, so strongly reduced power consumption
- High accuracy & reliability for chemical, water & waste applications
- Unique power booster for extreme conditions
- Superior alternative for conventional (2-wire) flowmeter principles
- Flexibility and easy stocking through on-site selectable "i", "e" or "d" Ex-protection
- High security & low maintenance through integrated self diagnostics
- Low cost of ownership: easy to engineer, install and operate at lower price than conventional technology

Terminal compartment

either in protection class
 - Intrinsic safety „i“
 - Increased safety „e“ or
 - Flameproof enclosure „d“
 User selectable during installation.

2-wire connection,
 4-20 mA supply

Also for applications with high noise levels. By connecting the standard available power booster signal to noise ratio will be improved considerably.

Standard HART® communication



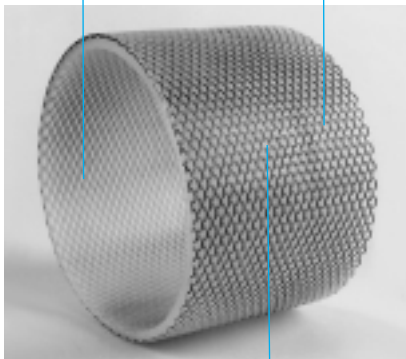
Optimum power use through processor-controlled energy management

Optimal dynamic behaviour, via power-independent field and measuring frequencies, without delay time.

IFS 4002 Primary head
Proven Technology in detail

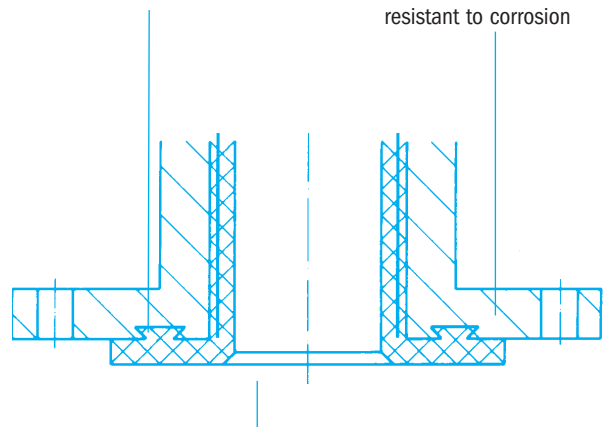
DN 25-150 or 1"-6" with KROHNE Teflon®-PFA liner

Dimensionally stable through stainless steel mesh reinforcement, also at elevated temperatures



No additional electrode gaskets required

With dovetail groove for easy installation



Fitting length also in conformity with ISO 13 359 For use in hazardous locations

Binary output parallel to mA interface, selectable to pulse or status output

Power consumption only 40-300 mW from 4-20 mA interface

Local display and keyboard under glass. Magnetic programming without opening the housing.

Meter sizes ranging DN 10-150 or 3/8"-6"

Background
Water Wastewater
Abrasive, corrosive and hot products
Non-contact measurement $K < 0.05 \mu\text{s}/\text{cm}$
Food, Beverage, Pharmaceutical
High Pressure and special connections
Integral and Remote
Signal converter
Remote
Calibration / Measuring Principle
Sizing / installation guides
Ordering guide

Technical Data

IFS 4002 K Flowmeter

Meter sizes		
Integral systems	DN 10, 15, 25, 50, 80, 100, 150 or $\frac{3}{8}$ " , $\frac{1}{2}$ " , 1" , 2" , 3" , 4" , 6"	
Pipe flanges		
to DIN 2501 (= BS 4504)	DN 10, DN 15, DN 25, DN 50 and DN 80 / PN 40 DN 100 and DN 150 / PN 16	
to ANSI B 16.5	$\frac{3}{8}$ " , $\frac{1}{2}$ " , 1" , 2" , 3" , 4" , and 6" / Class 150lb / RF	
Electrical conductivity		
	≥ 5μS/cm, ≥ 20μS/cm for demineralized cold water	
Temperatures		
Integral systems	Ambient temperature	Process temperature
	- 25 to + 60 °C	- 25 to ≤ + 60 °C
	- 13 to + 140 °F	- 13 to ≤ + 140 °F
	- 25 to + 40 °C	- 25 to ≤ + 140 °C
	- 13 to + 104 °F	- 13 to ≤ + 284 °F
Max. allowable operating data		
	Process temperature, operating pressure and vacuum load for the liner, refer to Page 7 "Limits"	
Insulation class of field coils		
	H / ≤ 140 °C / ≤ 284 °F process temperature	
Power supply for field coils		
	from signal converter	
Electrode design		
	flat elliptical electrodes, fixed mounted, polished surface	
Protection category (EN 60 529 / IEC 529)		
	IP 67, equivalent to NEMA 6	
Grounding rings		
	available as an option	
Materials		
<u>Measuring tube</u>	austenitic stainless steel	
<u>Liner</u>		
DN 10 - 15 / $\frac{3}{8}$ " - $\frac{1}{2}$ "	Teflon®-PTFE	
DN 25 - 150 / 1" - 6"	Teflon®-PFA (reinforced with stainless steel mesh)	
<u>Electrodes</u>		
Standard	Hastelloy C	
Option	Stainless steel 1.4571 or SS 316 Ti, Hastelloy B, Titanium, Tantalum, Platinum-Iridium, others on request	
<u>Connecting flanges*</u>		
DIN: DN 10 - 50, DN 80 ($\frac{3}{8}$ " - 2", 3")	Steel 1.0460 (C 22.8) or AISI C 1020	
≥ DN 100 (≥ 4")	Steel 1.0038 (RST 37.2) or AISI C 1035	
ANSI	Steel ASTM A 105 N	
<u>Housing*</u>		
DN 10 - 15 / $\frac{3}{8}$ " - $\frac{1}{2}$ "	GTW-S 30 (malleable cast iron)	
≥ DN 25 / ≥ 1"	Sheet steel	
<u>Grounding rings (option)</u>	Stainless steel 1.4571 or SS 316 Ti, Hastelloy C, Hastelloy B, Tantalum, Titanium	

* with polyurethane coating

Technical Data

IFC 040 K Signal converter

Current output		
Function		- all operating data configurable - standard HART® communication - for passive mode
Current:	fixed ranges variable ranges	4 - 20 mA for Q = 0% $I_{0\%} = 4 - 14 \text{ mA}$ for Q = 100% $I_{100\%} = 10 - 20 \text{ mA}$ for Q > 100% $I_{\text{max}} = 21 \text{ mA}$ } adjustable in 0.1 mA increments
Error identification (to NE 43) Forward/reverse flow measurement		3.6-4 mA or 20-22.4 mA adjustable in 0.1 mA increments direction identified via status output
Binary output		- selectable at pulse or status output - all operating data configurable - galvanically isolated from current output and all input circuits
Pulse output		- digital pulse division, interpulse period non-uniform, therefore if frequency and cycle meters connected allow for minimum counting interval: gate time counter $\geq \frac{10}{P_{100\%} [\text{Hz}]}$ pulse width: 30 - 1000 ms adjustable in 10 ms increments
Status output		configurable as measuring range identification for automatic range change, indicator for flow direction, overflow, errors, trip point or empty pipe indication
Passive mode		selectable according NAMUR (DIN 19 234) or as contact: - open: < 1 mA current, max 36 V - closed: 100 mA, max. voltage drop < 2 V
Time constant		0.5 - 99.9s, 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 (6-digit), and status messages
Units:	Actual flowrate Totalizer	m ³ /h, liter/s, US gallon/min or user-defined unit, e. g. liters/day m ³ , liter, US gallon or user-defined unit, e. g. hecto-liter
Language of plain texts		English, German, French, others on request
Display:	Top field	6-character, 7-segment numeral and sign display, and symbols for key acknowledgement
	Middle field	4-character, 14-segment text display
	Bottom field	6 markers to identify display in measuring mode and messages of outputs
Hazardous duty versions		connections in following protection classes can be selected by customer during installation ● intrinsic safety „i“ or ● increased safety „e“ or ● flameproof enclosure „d“
Power supply		
A) Current output (2-wire connection)		4-20 mA via proprietary power supply, 14-36 V
B) Power booster (additionally to A = 2 x 2 wire connection)		For demanding applications without changing or removing the meter. Connect power terminals to ... ● proprietary power supply 22 mA, 14-36 V DC or ● 24 V DC, max. 1 W (same protection class as A)
Housing		
Material		die-cast aluminium with polyurethane finish
Ambient temperature		- 25 to + 60 °C (- 13 to + 140 °F)
Protection category (IEC 529/EN 60529)		IP 67, equivalent to NEMA 6

Background

Wastewater
WaterAbrasive,
corrosive and
hot productsNon-contact
measurement
 $K \geq 0.05 \mu\text{s}/\text{cm}$ Food,
Beverage,
PharmaceuticalHigh Pressure
and special
connectionsIntegral
and Remote
Signal converter

Remote

Calibration /
Measuring
PrincipleSizing / instal-
lation guidesOrdering
guide

Dimensions and weights

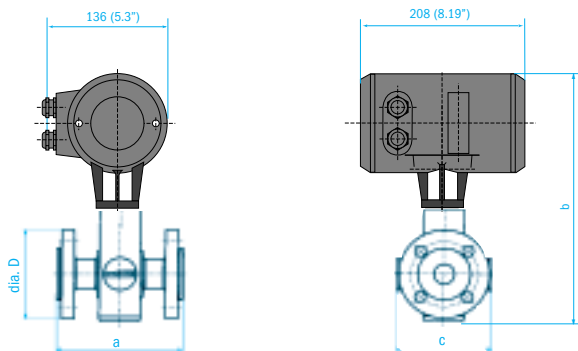
Flange connections to ...			Dimensions in mm (inches)
DIN 2501	DN 10- 150	PN40, 16, 10	see table
ANSI B 16.5	3/8"-6"	150lb / RF ≥ 300 lb / RF	see table dimensions supplied on request

- Dimension "a" without flange gaskets: not included with flowmeter, to be provided by customer.
- Meter size 3/8": flange connection 1/2"

Nominal size		Dimensions in mm (inches)										Approx. weight in kg (lb)			
DIN	ANSI	a (fitting length)			bmax		c		dia. D			with DIN flanges		with ANSI flanges	
DN	PN (psig)	inches	DIN	ISO 13 359	ANSI			DIN, ISO	ANSI						
10	40 (580)	3/8	150 (5.91)	-	150 (5.91)	330 (12.99)	121 (4.76)	90 (3.54)	88.9 (3.50)	7.5 (17)	8.5 (19)				
15	40 (580)	1/2	150 (5.91)	200 (7.87)	150 (5.91)	330 (12.99)	121 (4.76)	95 (3.74)	88.9 (3.50)	7.5 (17)	8.5 (19)				
25	40 (580)	1	150 (5.91)	200 (7.87)	150 (5.91)	301 (11.85)	121 (4.76)	115 (4.53)	108 (4.25)	9.5 (21)	11 (25)				
50	40 (580)	2	200 (7.87)	200 (7.87)	200 (7.87)	383 (15.08)	160 (6.30)	165 (6.50)	152 (6.00)	11 (25)	11 (25)				
80	40 (580)	3	200 (7.87)	200 (7.87)	200 (7.87)	400 (15.75)	173 (6.81)	200 (7.87)	191 (7.50)	15 (33)	16 (36)				
100	16 (232)	4	250 (9.84)	250 (9.84)	250 (9.84)	451 (17.76)	233 (9.17)	220 (8.66)	228 (8.98)	18 (40)	21 (46)*				
150	16 (232)	6	300 (11.81)	300 (11.81)	300 (11.81)	492 (19.37)	257 (10.12)	285 (11.22)	279 (10.98)	25 (55)	21 (46)*				

* max. pressure rating acc. DIN flanges, see column "PN (psig)"

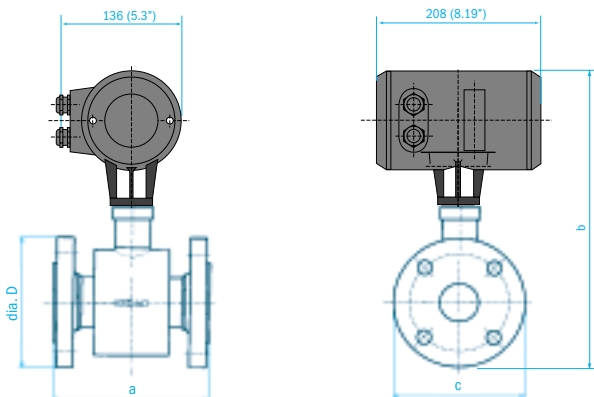
DN10 - 25 / 3/8" - 1"



Tolerance details for fitting length dimensions "a"

Standard	min. ± 1mm / ± 0.04"
to ISO DIS 13 359	+0/-3

DN50 - 150 / 2" - 6"



Limits

PLEASE NOTE!

- The limits specified in the table for process temperature and operating pressure make allowance for the tube liner and the flange standard.
- Refer to certificates of conformity for max. allowable operating data for hazardous-duty versions, provided only with hazardous-duty equipment.

● **Abbreviations used:**

DIN = DIN 2501 (= BS 4504)
ANSI = ANSI B 16.5

Limits for Teflon®-PFA, Teflon®-PTFE and Tefzel

Liner	Flange		Pressure rating/Class	Max. operating pressure in bar (psig) at a process temperature of								
				≤ 40 °C (≤ 105 °F)	≤ 60 °C (≤ 140 °F)	≤ 70 °C (≤ 158 °F)	≤ 90 °C (≤ 195 °F)	≤ 100 °C (≤ 210 °F)	≤ 120 °C (≤ 250 °F)	≤ 140 °C (≤ 284 °F)		
PFA	DIN	Standard	Nominal diameter	PN40	40.0 (580)	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)
		ANSI B16.5	1", 1½", 2", 3", 4", 6",	150 lb	19.6 (284)	19.0 (275)	18.7 (271)	18.1 (262)	17.7 (256)	17.0 (246)	16.2 (235)	16.2 (235)
	DIN	DN25-50, DN80 DN 100-150	PN16	16 (232)	16 (232)	16 (232)	16 (232)	16 (232)	16 (232)	16 (232)	16 (232)	16 (232)
PTFE	ANSI B16.5	DIN	DN10-15	PN40	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)
		ANSI B16.5	¾"-½"	150 lb	19.6 (284)	19.0 (275)	18.7 (271)	18.1 (262)	17.7 (256)	17.0 (246)	16.2 (235)	16.2 (235)

1) ambient temperature 40 °C / 104 °F

Vacuum load

Liner	Meter size / Nom. dia.		Max. operating pressure in mbar abs. (psia) at a process temperature of							
	DN	mm	inches	≤ 40 °C (≤ 105 °F)	≤ 60 °C (≤ 140 °F)	≤ 70 °C (≤ 158 °F)	≤ 90 °C (≤ 195 °F)	≤ 100 °C (≤ 210 °F)	≤ 120 °C (≤ 250 °F)	≤ 140 °C (≤ 284 °F)
PFA	DN 25- 150	1"- 6"		0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
PTFE	DN 10- 15	¾"- ½"		0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	500 (7.3)	750 (9.7)

Grounding rings

For process flow measurement reasons the product must be grounded. Such as grounding system is lacking in pipes upstream and downstream of the primary head which feature a corrosion-resistant internal coating or liner, or are made entirely of plastics material. In such cases, grounding rings must be fitted on both sides of the primary head.

Grounding ring No. 1

3 mm/0.10" thick (tantalum: 0.5 mm/0.02" thick)

Protective ring No. 2

3 mm/0.10" thick for Teflon®-PTFE liner.

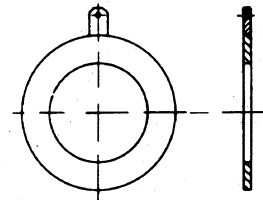
On primary heads with Teflon®-PTFE liner, protective rings No. 2 prevent damage to the flanges during transportation and installation. These rings can also be used as grounding rings.

Grounding ring No. 3

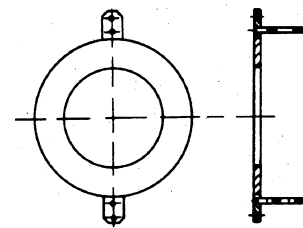
with cylindrical neck 3 mm/0.10" thick
 30 mm/1.25" long for DN 10-150 and ¾"-6"

Where abrasive liquids are concerned, grounding rings No. 3 with cylindrical neck should be used for the inlet side of the primary head to prevent damage to the inlet edge.

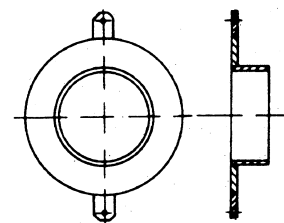
Grounding ring No. 1



Grounding ring, protective ring No. 2



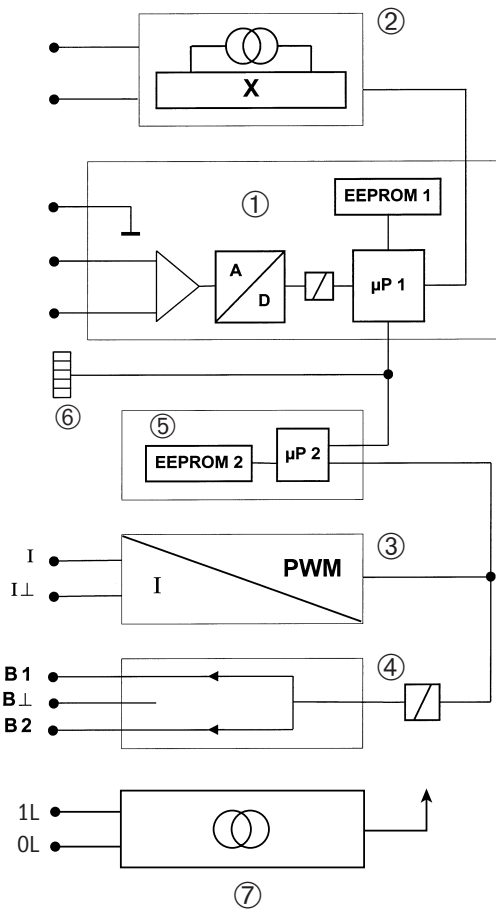
Grounding ring, protective ring No. 3



Background
 Water
 Wastewater
 Abrasive, corrosive and hot products
 Non-contact measurement K > 0.05 µs/cm
 Food, Beverage, Pharmaceutical
 High Pressure and special connections
 Integral and Remote
 Signal converter
 Remote
 Calibration / Measuring Principle
 Sizing / installation guides
 Ordering guide

The standard

- outstanding accuracy
- full set of standard equipment
- current output (galvanically isolated)
- pulse output **or** status output, easy to set for numerous tasks: as trip point, to indicate flow direction, error messages, external initiation of functions, etc.
- IMoCom bus can be used for numerous internal and external tasks
- simplified, standard KROHNE operator control concept
- low power consumption



1 AD converter

- overdrive-proof signal processing, processes flow peaks up to 20 m/s (65 ft/s) and more rapidly and accurately than competition modules
- digital signal processing and sequence control
- high-resolution Delta-Sigma A/D converter, digitally controlled and monitored
- high signal-to-noise ratio, signal processing: patent pending

2 Field power supply

- The low-loss field power supply generates the pulsed, electronically controlled DC current for the magnetic coils of the primary head
- The field current ensures matched to the power, an optimum signal amplitude and signal-to-noise separation

3 Current output, HART® modem

- galvanically isolated from all other terminals, but not from power booster
- converts the digital output signal from the µP 2 microprocessor into a proportional current
- communication via HART®

4 Binary output

- galvanically isolated from other groups
- can be used as pulse or status output
- output (B1), terminal for up to 100 mA
- output (B2), terminal according NAMUR (DIN 19 234)

5 Display/operator control unit

- large LCD display, 3-line
- 3 keys for operator control of the signal converter
- connection to the internal IMoCom bus

6 IMoCom bus plug connector

for connection of external control and test devices

7 Power booster input

Selection of meter size

The optimum flow velocity should be 2 – 3m/s or 6 – 9 ft/s, for products with solids contents between 3 and 5m/s or 9 and 15ft/s. The exact flow velocity can be determined from the columns in the tables for $v = 12\text{ m/s}$ or $v = 40\text{ ft/s}$ as shown in the following examples.

Example for m³/h

- Meter size: DN80
- Desired measuring range: 55m³/h

From the table obtain for $v = 12\text{ m/s}$ the flow rate of 217.1 m³/h at DN80.

$$v = \frac{55\text{ m}^3/\text{h}}{217.1\text{ m}^3/\text{h}} \times 12\text{ m/s}$$

$$v = 3.04\text{ m/s}$$

Flow table

v = flow velocity in m/s

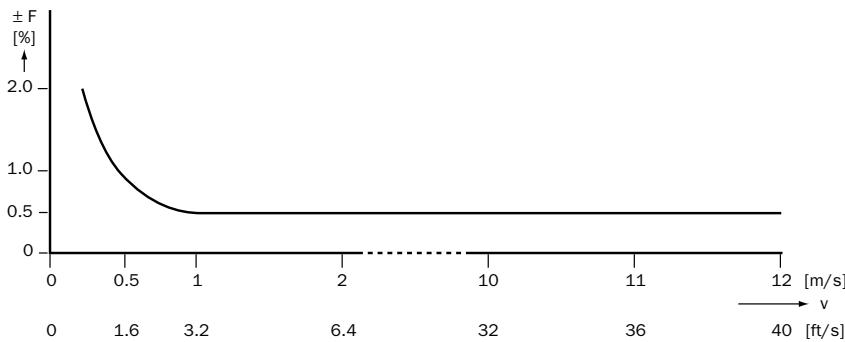
Meter size DN	Full scale range $Q_{100\%}$ in m³/h	$Q_{100\%}$ in m³/h		
		$v = 0,3\text{ m/s}$ (minimum)	$v = 1\text{ m/s}$	$v = 12\text{ m/s}$ (maximum)
10	$\frac{3}{8}$	0,0849	0,2827	3,392
15	$\frac{1}{2}$	0,1909	0,6362	7,634
25	1	0,5302	1,767	21,20
50	2	2,121	7,069	84,82
80	3	5,429	18,10	217,1
100	4	8,483	28,27	339,2
150	6	19,09	63,62	763,4

Error limits

Display, digital values, pulse output

F maximum error in % of measured value (not typical values)

v Flow velocity in m/s and ft/s



Reference conditions similar to EN 29104

Product	water at 10 – 30 °C / 50 – 86 °F
Electrical conductivity	> 300 µS/cm
Power supply (rated voltage)	$U_N (\pm 2\%)$
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
Measuring time	100 s

- Calibrated in accredited test rigs to EN 17025 rigs by direct comparison of volumes

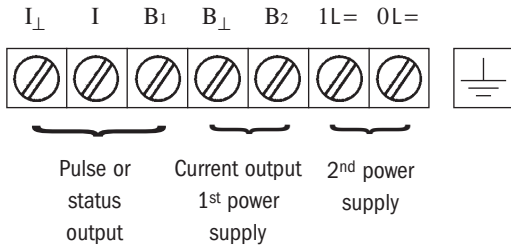
Type/Meter size	Maximum error in % of measured value (MV)	
DN mm	inches	$v \geq 1\text{ m/s} / \geq 3\text{ ft/s}$: $\leq \pm 0.5\%$ of MV
DN 10–150	$\frac{3}{8}$ " – 6"	$v < 1\text{ m/s} / < 3\text{ ft/s}$: $\leq \pm 5\text{ mm/s} (+ 0.2\text{ inch/s})$
Current output	same error limits as above, additionally $\pm 10\text{ }\mu\text{A}$	
Reproducibility at constant flow	$v \geq 1\text{ m/s} / \geq 3\text{ ft/s}$: $\leq \pm 0.1\%$ of MV	$v < 1\text{ m/s} / < 3\text{ ft/s}$: $\leq \pm 1\text{ mm/s} (+ 0.04\text{ inch/s})$
External influences	typical values	maximum values
<u>Ambient temperature</u>		
Pulse output	0.003 % of MV (1)	} at 1 K / 1.8 °F variation
Current output	0.01 % of MV (1)	
<u>Power supply</u>	< 0.02 % of MV	0.05 % of MV at 10% variation

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

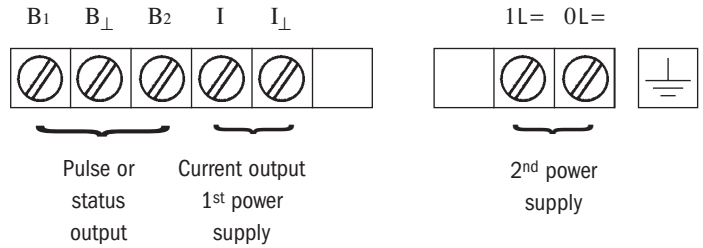
Background
Wastewater
Water
Abrasive, corrosive and hot products
Non-contact measurement $K < 0.05\text{ }\mu\text{S/cm}$
Food, Beverage, Pharmaceutical
High Pressure and special connections
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Electrical connection

EEx version



Standard version



Grounding

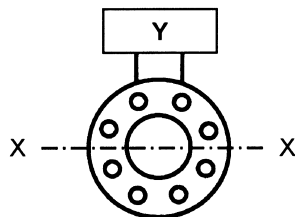
I_{\perp}	Current sink	max. voltage: 36 V nom. voltage: 24 V	max. current 22 mA (error) nom. current 4...20 mA
I	Current sink	min. voltage: 14 V	min. current 3,6 mA (error)
B ₂	Pulse/status output	NAMUR circuit max. voltage: 36 V	$I_{open} > 0.4 \text{ mA}$ $R_i = 900 \text{ Ohm}$
B ₁	Pulse/status output	High current circuit max. voltage: 36 V	max. current 100 mA
B _⊥	Pulse/status output	Ground	
1L=	2 nd power supply	max. voltage: 36 V nom. voltage: 24 V min. voltage: 14 V	nom. current 22 mA
0L=	2 nd power supply		

The supply for the current sink and the 2nd power supply (power booster) **must** be galvanically separated!

Installation requirements

- Location and position as required, but electrode axis

X - - - - - X
must be approximately horizontal in a horizontal pipe run

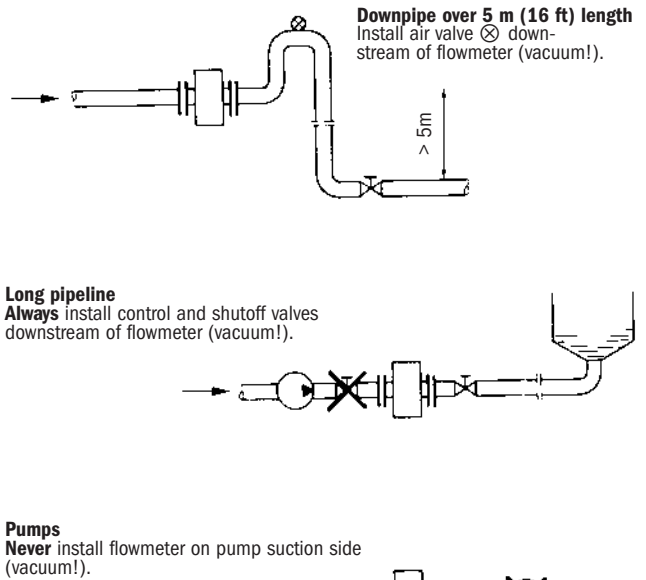
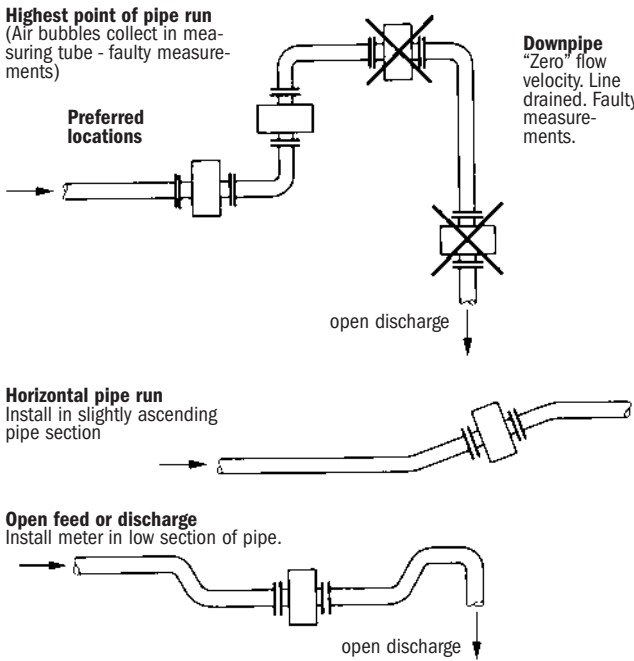


Y converter housing

- **Measuring tube must be completely filled at all times.**
- **Direction of flow is arbitrary.** Arrow on flowmeter can normally be ignored. For exceptions, refer to Section "Factory settings" in the installation and operating instructions for the signal converter.
- **Stud bolts and nuts:** to fit, make sure there is sufficient room next to the pipe flanges.
- **Vibration:** support the pipeline on both sides of the flowmeter. Level of vibration in conformity with IEC 068-2-34: below 2.2g in the frequency range of 20-150 Hz.
- **Do not expose to direct sunlight,** fit a sunshade if necessary, not included with flowmeter, to be provided by customer.
- **Strong electromagnetic fields,** avoid in vicinity of flowmeter.
- **Straight inlet run minimum of $5 \times DN$ and outlet run minimum of $2 \times DN$,** (DN = meter size), measured from the electrode axis.

- **Vortex and corkscrew flow:** increase length of inlet and outlet runs or install flow conditioners.
- **Mixing different process liquids:** install flowmeter upstream of mixing point or at an adequate distance downstream (minimum of $30 \times DN$), otherwise display may be unsteady.
- **Plastic pipes and internally coated metal pipelines:** grounding rings required.
- **Insulated pipeline:** do not insulate flowmeter.
- **Zero setting not necessary.** To check, it should be possible to set "zero" flow velocity in the completely filled measuring tube. Shutoff valves should therefore be provided either downstream of the flowmeter or upstream and downstream of the flowmeter.

To avoid measuring errors due to gas/air inclusion or to pipe running empty, please observe the following:



Background
Water Wastewater
Abrasive, corrosive and hot products
Non-contact measurement $K < 0.05 \mu\text{s}/\text{cm}$
Food, Beverage, Pharmaceutical
High Pressure and special connections
Signal converter Integral and Remote
Remote
Calibration / Measuring Principle
Sizing / installation guides
Ordering guide