KROHNE

09/97

Electromagnetic flowmeters

- **Primary heads**
- **Compact flowmeters**

Installation instructions

ALTOFLUX

IFS 4000 F
IFS 4005 F
IFM 4010 K
IFM 4020 K
IFM 4080 K

IFS 4000 F / IFS 4005 F


IFM 4010 K / IFM 4020 K

IFM 4080 K

3.1M48EA2 099721

Order No. DIN size 7.02147.32.00
US size 7.02147.72.00

Contents

System description

ALTOFLUX electromagnetic flowmeters are precision measuring instruments designed for the linear flow measurement of process liquids.

The process liquids must be electrically conductive: ≥ 5 µS/cm
≥ 20 µS/cm for demineralized cold water

The **full-scale range $Q_{100\%}$** can be set as a function of the **meter size**:

IFM 4010 K, IFM 4020 K, IFM 4080 K:	DN 10 - 1000 / $^3/_8$" - 40"	$Q_{100\%}$ = 0.1 - 33 900 m³/hr = 0.02 - 156 640 US GPM
IFS 4000 F:	DN 10 - 3000 / $^3/_8$" - 120"	$Q_{100\%}$ = 0.1 - 305 000 m³/hr = 0.02 - 1 400 000 US GPM
IFS 4005 F:	DN 50 - 1000 / 2" - 40"	$Q_{100\%}$ = 2.1 - 33 900 m³/hr = 9.80 - 156 640 US GPM

This is equivalent to a flow velocity of 0.3 - 12 m/s, or 1 - 40 ft/s.

Product liability and warranty

ALTOFLUX electromagnetic flowmeters are designed solely for measuring the volumetric flowrate of electrically conductive, liquid process products.

Special codes and regulations apply to their use in hazardous locations, and these are referred to in the special "Ex" installation and operating instructions (supplied only with hazardous-duty equipment).

Responsibility as to suitability and intended use of these electromagnetic flowmeters rests solely with the operator.

Improper installation and operation of the flowmeters (systems) may lead to loss of warranty.

In addition, the "General conditions of sale" forming the basis of the purchase contract are applicable.

If ALTOFLUX flowmeters need to be returned to Krohne, please note the information given on the last-but-one page of this manual. Krohne regret that they cannot repair or check your flowmeter(s) unless accompanied by the completed form sheet.

Standards and approvals

Please refer to the installation and operating instructions for the signal converter.

Items included with supply

IFS 4000 F / IFS 4005 F primary heads

- Primary head in the size as ordered
- Connecting wires for grounding, refer to Section 7 ”Grounding”
- Certificate of calibration data
- Grounding rings (optional), if ordered
- Installation instructions

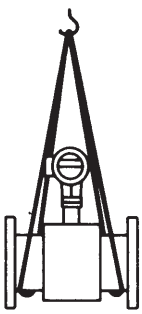
IFM 4010 K, IFM 4020 K and IFM 4080 K compact flowmeters

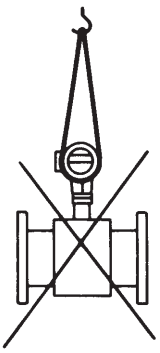
- Compact flowmeter in the size as ordered
- Connecting wires for grounding, see Section 7 ”Grounding”
- Certificate of calibration data
- Grounding rings (optional), if ordered
- Installation instructions
- Installation and operating instructions for the signal converter

Fitting accessories (stud bolts, nuts, gaskets, etc.) **are not supplied with the flowmeter, to be provided by customer!**

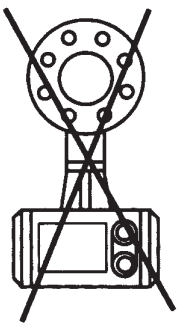
Handling

Do not lift flowmeter by the signal converter housing or the terminal box.





Do not set flowmeter down on signal converter housing or terminal box.



1 Important information for installation: PLEASE NOTE !

- Use only solventless detergents to **clean** the signal converter housing (polycarbonate).

- **Temperatures**
  Refer to Section 11 ”Limits” for operating pressure and vacuum load based on flange standards and type of tube liner.

	Ambient temperature	**Process temperature**
Compact systems	-25 to +**60** °C (-13 to +**140** °F)	-25 to ≤ +**60** °C (-13 to ≤ +**140** °F)
	-25 to +**40** °C (-13 to +**104** °F)	-25 to > +**60** °C (-13 to > +**140** °F)
IFS 4000 F IFS 4005 F	-25 to +60 °C (-13 to +140 °F)	-25 to > +**60** °C (-13 to > +**140** °F)
In storage	-25 to +60 °C (-13 to +140 °F) with liners made of Teflon®-PFA, Teflon®-PTFE, FEP, Tefzel, Irathane and soft rubber	
	-**20** to +60 °C (-04 to +140 °F), kept immobile, with **Neoprene** liner	
Transport	-25 to +60 °C (-13 to +140 °F), with liners made of Teflon®-PFA, Teflon®-PTFE, FEP, Tefzel, Irathane and soft rubber	
	- **5** to +**50** °C (- 4 to +**140** °F), with **Neoprene** liner	

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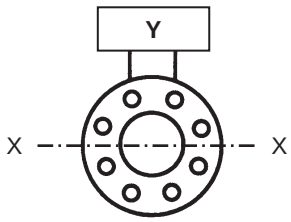
- **Location and position as required,**
  but electrode axis **X – • – • – • – X**
  must be approximately horizontal in a horizontal pipe run.

  Y terminal box or converter housing



- **Measuring tube must be completetly 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 compact flowmeter.
  Level of vibration in conformity with IEC 068-2-34: below 2.2g for compact flowmeters in the frequency range of 20-50 Hz with the IFC 010 K / IFC 020 K and 20-150 Hz with the IFC 090 K.

- **Do not expose to direct sunlight,**
  fit a sunshade if necessary, not included with flowmeter, to be provided by customer.

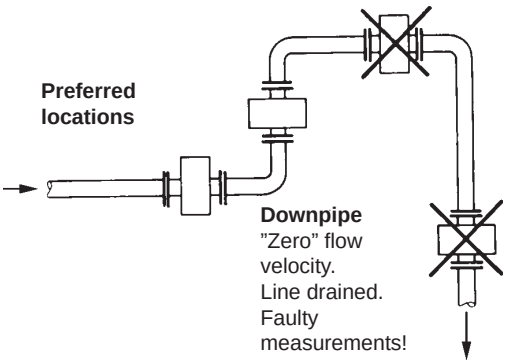
- **Large meter sizes (≥ DN 200 / ≥ 8”):** use adapter pipes to allow axial shifting of the counterflanges and to facilitate installation.

- **Strong electromagnetic fields,** avoid in vicinity of flowmeter
- **Straight inlet run minimum of 5 × DN and outlet run minimum of 2 × 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 × DN), otherwise display may be unsteady.
- **Plastic pipes and internally coated metal pipelines:** grounding rings required, see Section 7 ”Grounding”.
- **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.

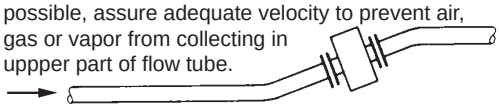
2 Suggestions for installation

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

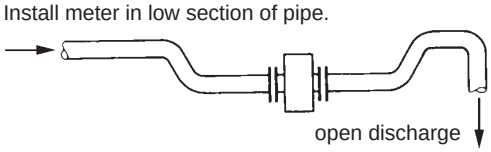
Highest point of pipe run
(Air bubbles collect in measuring tube - faulty measurements!)



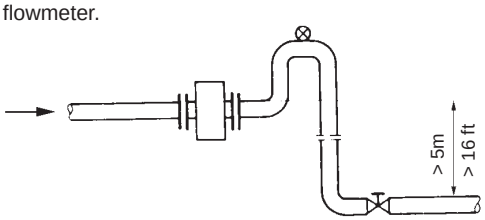
Horizontal pipe run
Install in slightly ascending pipe section. If not possible, assure adequate velocity to prevent air, gas or vapor from collecting in uppper part of flow tube.



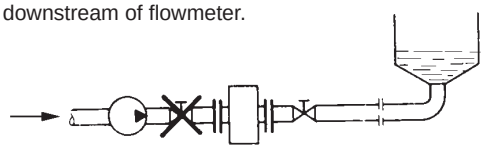
Open feed or discharge
Install meter in low section of pipe.



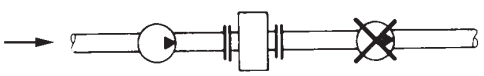
Downpipe over 5 m (16 ft) length
Install air valve ⊗ downstream of flowmeter.



Long pipeline
Always install control and shutoff valves downstream of flowmeter.

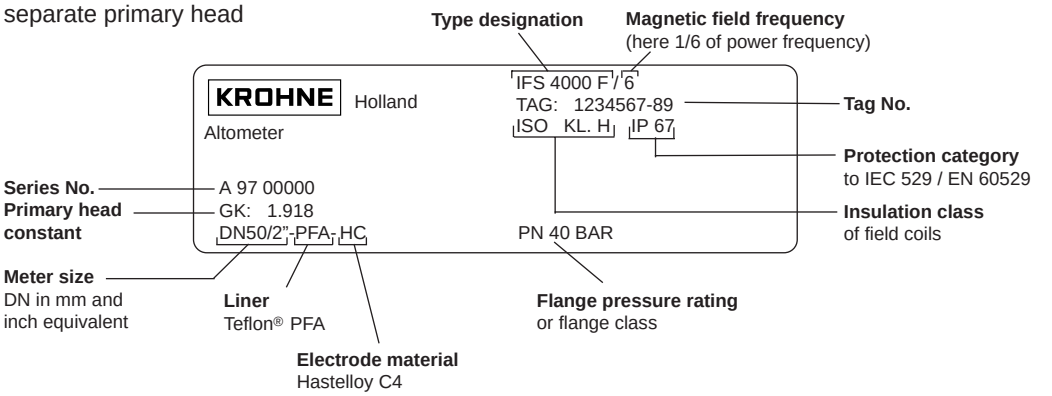


Pumps
Never install flowmeter on pump suction side.



3 Instrument nameplate

IFS 4000 F/IFS 4005 F
separate primary head



Liner materials

NE	Neoprene
PFA	Teflon®-PFA
PUI	Irathane
T	Teflon®-PTFE
TZ	Tefzel
W	Soft rubber
FEP	FEP

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Electrode materials

C	Conductive rubber compound
HB	Hastelloy B2
HC	Hastelloy C4
IN	Incoloy
M4	Monel 400
NI	Nickel
PT	Platinum
TA	Tantalum
TI	Titanium
V4A	Stainless steel 1.4571 / SS 316-Ti
XX/TC	**xx** with conductive, PTFE compound
XX/CO	**xx** low-noise version

} **XX** = base material, e.g. HC

Instrument nameplate for compact flowmeters
see installation and operating instructions for the signal converter.

4 Flowmeter versions

IFS 4000 F **Separate primary head (F)** , electrically connected to the signal converter by signal and field current cables.

IFM 4005 F **Separate primary head (F)** , electrically connected to the signal converter by signal and field current cables. Designed for higher field currents. The double coil insulation (insulation class II) rules out the need for special protective grounding.

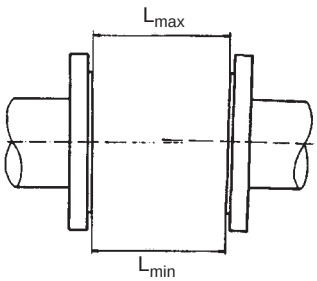
IFM 4010 K, IFM 4010 K **Compact flowmeter (K),** IFC 010 K or IFC 020 K signal converter mounted direct on the primary head.

IFM 4080 K **Compact flowmeter (K),** IFC 090 K signal converter mounted direct on the primary head.

Versions for hazardous locations
IFS 4000 F and IFM 4080 K are approved as electrical equipment to the harmonized European Standards and to Factory Mutual (FM).
Test certificate, certificate of conformity and wiring instructions for these devices are attached to the **"Ex" installation instructions**, provided only with hazardous-duty equipment.

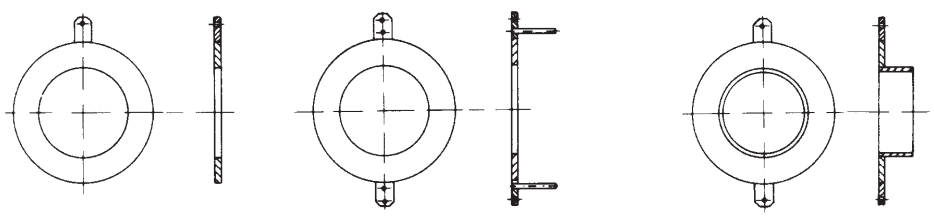
5 Installation in the pipeline

- **Installation material not included,** to be provided by customer (stud bolts, nuts, gaskets, etc.)
- **Pipe flanges and operating pressure:** refer to tables on ”limits” in Section 11.
- **Distance between pipe flanges**
  see **fitting dimension ”a”,** in Section 10 ”Dimensions and weights”.
- **High-temperature pipelines**
  Where process temperatures exceed 100 °C/212 °F, provide for facilities to compensate for longitudinal expansion on heat-up of the pipeline.
  For **short** pipelines use resilient gaskets and
  for **long** pipelines install flexible pipe elements (e.g. elbows).
- **Position of flanges**
  Install flowmeter in line with the pipe axis. Pipe flange faces must be parallel to each other,
  max. permissible deviation:
  L_{max} - L_{min} ≤ 0.5 mm
  ≤ 0.02”



- **Neoprene liners**
  Process temperatures **below - 5 °C (+ 23 °F)** are only permissible if the pipeline is supported on both sides of the flowmeter and provided there is only slight vibration and no water hammer in the pipe.
- **Teflon®-PTFE liners**
  Install at the lowest point of the pipe run to avoid an excessive vacuum condition at the meter. Do not remove or damage liner, which is formed around the flange edges.
- **Irathane liner, thickness > 12 mm / > 0.50”**
  The nominal diameter of the pipe flanges must be greater than the nominal diameter of the measuring tube, see tables in Section 10 ”Dimensions and weights”.
- **Gaskets**
  Use gaskets suitable for the application and appropriate to the liner, not included with flowmeter, to be provided by customer.
- **Grounding rings / protective rings** (option)
  On plastic pipes and internally coated metal pipelines, grounding rings must form the conductive connection with the fluid. Refer to Section 7 ”Grounding for electrical connection.

Grounding ring No. 1	Grounding ring, protective ring No. 2	Grounding ring, protective ring No. 3
3 mm/0.12” thick	for flowmeters with Teflon®-PTFE liner, solidly fitted to the flanges, 3 mm/0.12” thick	with cylindrical neck, to protect the liner particularly at the inlet edge against abrasive products, 3 mm/0.12” thick. Length: 30 mm/1.18”, for ≤ DN 300, ≤ 12“ 100 mm/3.94”, for ≥ DN 350, ≥ 14“



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6 Torques

- Tighten **stud bolts** uniformly in diagonally opposite sequence, see table for number and type.
- **Irathane liner, thickness > 12 mm / > 0.50”**
  The max. torque refers to the nominal diameter of the pipe flanges and **not** to the nominal diameter of the measuring tube.
- **Column A**
  Torques for Teflon®-PFA and Teflon®-PTFE liners.
- **Column B**
  Torques for liners made of
  Neoprene, Irathane, Tefzel, soft rubber and FEP.
- **10 Nm ~ 1.0 kpm ~ 7.23 ft × lbf**

Meter size DN mm	**Pressure rating** PN	**Bolts**	**Max. torque** Nm (ft × lbf)	
			A	**B**
10	40	4 × M 12	7.6 (5.5)	4.6 (3.3)
15	40	4 × M 12	9.3 (6.7)	5.7 (4.1)
20	40	4 × M 12	16 (11.6)	9.6 (6.9)
25	40	4 × M 12	22 (15.9)	11 (8.0)
32	40	4 × M 16	37 (26.8)	19 (13.0)
40	40	4 × M 16	43 (31.1)	25 (18.1)
50	40	4 × M 16	55 (39.8)	31 (22.4)
65	16	4 × M 16	51 (36.9)	42 (30.4)
65	40	8 × M 16	38 (27.5)	21 (15.2)
80	25	8 × M 16	47 (34.0)	25 (18.1)
100	16	8 × M 16	39 (28.2)	30 (21.7)
125	16	8 × M 16	53 (38.3)	40 (28.9)
150	16	8 × M 20	68 (49.2)	47 (34.0)
200	10	8 × M 20	84 (60.7)	68 (49.2)
200	16	12 × M 20	68 (49.2)	45 (32.5)
250	10	12 × M 20	78 (56.4)	65 (47.0)
250	16	12 × M 24	116 (83.9)	78 (56.4)
300	10	12 × M 20	88 (63.7)	76 (54.9)
300	16	12 × M 24	144 (104.2)	105 (75.9)
350	10	16 × M 20	97 (70.1)	75 (54.2)
400	10	16 × M 24	139 (100.5)	104 (75.2)
450	10	20 × M 24	127 (91.8)	93 (67.2)
500	10	20 × M 24	149 (107.7)	107 (77.4)
600	10	20 × M 27	205 (148.2)	138 (99.8)
700	10	20 × M 27	238 (172.1)	163 (117.8)
800	10	24 × M 30	328 (237.1)	219 (158.3)
900	10	28 × M 30	–	205 (148.2)
1000	10	28 × M 35	–	261 (188.7)

Meter size inch	**Body pressure rating** lb	**Bolts** for ANSI class 150 flanges	**Max. torque** Nm (ft × lbf)	
			A	**B**
3/8	580	4 × 1/2”	3.5 (2.5)	3.6 (2.6)
1/2	580	4 × 1/2”	3.5 (2.5)	3.6 (2.6)
3/4	580	4 × 1/2”	4.8 (3.5)	4.8 (3.5)
1	580	4 × 1/2”	6.7 (4.8)	4.4 (3.2)
1 1/2	580	4 × 1/2”	13 (9.4)	12 (8.7)
2	580	4 × 5/8”	24 (17.4)	23 (16.6)
3	360	4 × 5/8”	43 (31.1)	39 (28.2)
4	230	8 × 5/8”	34 (24.6)	31 (22.4)
6	230	8 × 3/4”	61 (44.1)	51 (36.9)
8	145	8 × 3/4”	86 (62.2)	69 (49.9)
10	145	12 × 7/8”	97 (70.2)	79 (57.1)
12	145	12 × 7/8”	119 (86.1)	104 (75.2)
14	145	12 × 1”	133 (96.2)	93 (76.2)
16	145	16 × 1”	130 (94.0)	91 (65.8)
18	145	16 × 1 1/8”	199 (143.9)	143 (103.4)
20	145	20 × 1 1/8”	182 (131.6)	127 (91.8)
24	145	20 × 1 1/4”	265 (191.6)	180 (130.1)
28	145	28 × 1 1/4”	242 (175.0)	161 (116.4)
32	145	28 × 1 1/2”	380 (274.7)	259 (187.3)
36	145	32 × 1 1/2”	–	269 (194.5)
40	145	36 × 1 1/2”	–	269 (194.5)

Note: Process pressure must not exceed ANSI flange rating. Refer to ANSI Standard B 16.5.

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7 Grounding

- All flowmeters must be properly grounded to avoid personnel shock hazard.
- The ground conductor should not transmit any interference voltages, therefore do not ground any other electrical devices together with this conductor.

IFS 4000 F and IFS 4005 F separate primary heads with terminal box

- An **FE functional ground** must always be connected.
- **Signal converter field power supply > 125 mA / 60 V:**
  IFS 4005 F primary head: no special measures required.
  IFS 4000 F primary head: because of the higher field current from the signal converter, a **PE protective conductor** must be connected to the primary head, see grounding diagrams below.

IFM 4010 K, IFM 4020 K and IFM 4080 K compact systems

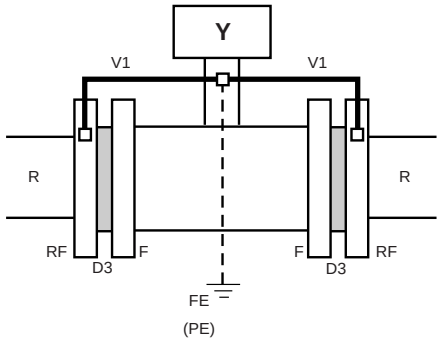
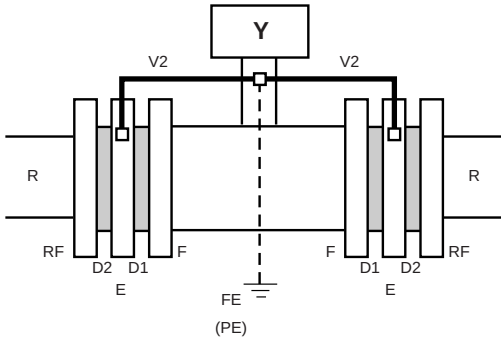
Supply power > 50 V AC

- Grounding is via the **PE protective ground conductor** incorporated in the power supply cable, see also Section "Connection to power" in the installation and operating instructions for the signal converter.
- **EXCEPTION: Do not connect up the PE protective ground conductor in the terminal box** if e.g. compact units are operated in the proximity of electric furnaces, electrolysis plants, etc., and large potential differences occur in the pipeline system. An FE functional ground must simultaneously take over the function of the protective conductor (combined protective/functional ground). Refer to appropriate national codes for specific requirements for this type of installation, which may require the addition of a ground fault detection circuit interrupter.

Power supply 24 V AC or DC

- Protective separation (PELV) must be ensured (VDE 0100 / VDE 0106 or IEC 364 / IEC 536 or equivalent national regulations).
- An **FE functional ground conductor** must be connected for measurement reasons.

Grounding diagrams

Metal pipelines, not internally coated grounding without grounding rings	**Metal pipelines, with or without internal coating, and plastic pipelines** grounding with grounding rings
	

D1, D2, D3 Gaskets, not included with supply, to be provided by customer.
E Grounding rings (option)
F Flowmeter flanges
FE Functional ground, wire ≥ 4 mm² Cu (10 AWG), not included with flowmeter, to be provided by customer
PE Protective conductor required if the IFS 4000 F is operated with a signal converter that supplies a field current of **> 125 mA / > 60 V** .
Wire ≥ 4 mm² Cu (10 AWG), not included with flowmeter, to be provided by customer.
R Pipeline
RF Pipe flanges
V1, V2 Interconnecting wires, included with flowmeter
Y Terminal box or signal converter

8 Replacement of the separate primary head

Switch off power source before commencing work !

1) Note down terminal assignment before dismantling the ”old” primary head.

2) Install the new primary head as described in the supplied installation instructions.

3) Make electrical connection at the signal converter as described in the installation and operating instructions for the signal converter.

4) Specific calibration data are defined during factory calibration for each primary head, which are indicated on the instrument nameplate.
This includes the primary constant GK and the magnetic field frequency. These data need to be reset in the signal converter.

5) If the size of primary head is also different from the old one, the full-scale range $Q_{100\%}$ and the meter size will need to be reset.

6) After resetting the signal converter, carry out a zero point check.

7) If necessary, reset the internal electronic totalizer of the signal converter.

9 Technical data

Meter sizes		
IFM 4010 K, IFM 4020 K, IFM 4080 K	DN 10 - 1000 and 3/8” - 40”	
IFS 4000 F	DN 10 - 3000 and 3/8” - 120”	
IFS 4005 F	DN 50 - 1000 and 2” - 40”	
Pipe flanges		
to DIN 2501 (=BS 4504)	DN 10-50 and DN 80 / PN 40 DN 65 and DN 100-150 / PN 16 DN 200-1000 / PN 10 DN 1100-2000 / PN 6 DN 2200-3000 / PN 2.5	
to ANSI B 16.5	3/8”- 24” / Class 150 lb / RF	
to AWWA	14”-120” / Class B or D / FF	
Electrical conductivity	≥ 5 µS/cm, ≥ 20 µS/cm for demineralized cold water	
Temperatures	Ambient temperature	Process temperature
Compact systems	-25 to + **60** °C -13 to +**140** °F	-25 to ≤ + 60 °C -13 to ≤ +140 °F
	-25 to + **40** °C -13 to +**104** °F	-25 to +140 °C***** -13 to +284 °F*****
IFS 4000 F / IFS 4005 F	-25 to + 60 °C -13 to +140 °F	-25 to +180 °C***** -13 to +356 °F*****
	***** dependent on liner, flange standard, etc.	
Max. allowable operating data	Process temperature, operating pressure and vacuum load for the liner, refer to Section 11 ”Limits”	

Insulation class of field coils

IFM 4010 K, IFM 4020 K, IFM 4080 K	
DN 10- 300 / 3/8" - 6"	H / ≤ 140 °C / ≤ 284 °F process temperature
DN 350-1000 / 14" - 40"	E / ≤ 120 °C / ≤ 248 °F process temperature, (option H / ≤ 140 °C / ≤ 284 °F)
IFS 4000 F	
DN 10- 300 / 3/8" - 6"	H / ≤ 180 °C / ≤ 356 °F process temperature
DN 350-1000 / 14" - 40"	E / ≤ 120 °C / ≤ 248 °F process temperature, (option H / ≤ 180 °C / ≤ 356 °F)
IFS 4005 F	
DN 50-1000 / 3/8" - 40"	H / ≤ 180 °C / ≤ 356 °F process temperature

Electrode design

DN 10-3000 / 3/8" - 120"	flat elliptical electrodes, solidly fitted, surface-polished
Option DN 350-3000 / 14" - 120"	field-replaceable electrodes WE

Protection category (EN 60 529/IEC 529)

Standard	IP 67, equivalent to NEMA 6 (with field replaceable electrodes WE: IP 65, equivalent to NEMA 4/4X)
Option (not IFS 4005 F)	IP 68, equivalent to NEMA 6

Grounding rings available as an option

Materials

Measuring tube			stainless steel 1.4301 (or higher materials number), equivalent to SS 304
Liner			
Standard	DN	10- 20 / 3/8"- 3/4"	Teflon®-PTFE
	DN	25- 150 / 1"- 6"	Teflon®-PFA (reinforced with stainless steel mesh)
	DN	200- 600 / 8"- 24"	Tefzel
	DN	700-2000 / 4"- 80"	FEP
Option	DN	200- 600 / 8"- 24"	Teflon®-PTFE
	DN	200-1200 / 8"- 48"	soft rubber
	DN	200-1800 / 8"- 72"	Irathane
	DN	200-3000 / 8"-120"	Neoprene
	≥ DN 200 / ≥ 8"		others on request
Electrodes			
Standard			Hastelloy C4
Option			stainless steel 1.4571 or SS 316 Ti, Hastelloy B2, titanium, tantalum, platinum, platinum-iridium, others on request
Field replaceable WE			stainless steel 1.4571 or SS 316 Ti
Connecting flanges*			
DIN: DN 10 - 50, DN 80 (3/8" - 2", 3")			steel1.0402 (C 22) or AISI C 1020
DN 65, ≥ DN 100 (≥ 4")			steel 1.0501 (RST 37.2) or AISI C 1035
ANSI			steel ASTM A 105 N
Housing*			
DN 10 - 40 / 3/8"-1 1/2"			GTW-S 30 (malleable cast iron)
≥ DN 50 / ≥ 2"			sheet steel
Terminal box*			
(IFS 4000 and IFS 4005 F only)			die-cast aluminium
Grounding rings (option)			stainless steel 1.4571 or SS 316 Ti

* with polyurethane coating

Teflon® is a registered trademark of Du Pont.

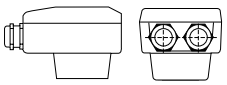
10 Dimensions and weights

PLEASE NOTE

The **total dimension for the height** is obtained from **dimension b** (see table) **plus the height** of the terminal box or the signal converter, see drawings.

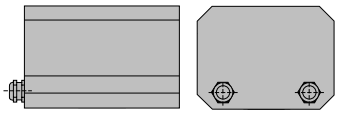
The **total weight** is made up of the weight of the signal converter (see table) **plus** the weight of the terminal box or signal converter, see below.

Terminal box



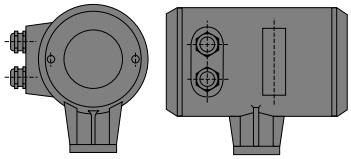
Weight approx.
0.5 kg (1.1 lb)

IFC 010 K and IFC 020 K signal converters



Weight approx.
1.6 kg (3.6 lb)

IFC 090 K signal converter



Weight approx.
2.3 kg (5.1 lb)

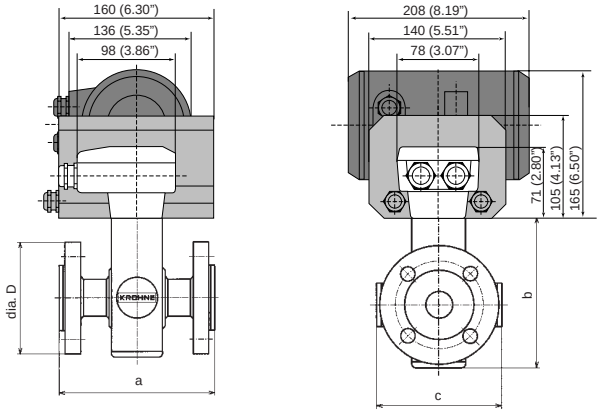
Flange connections to ...			**Dimensions** in mm (inch)
DIN 2501	DN 10- 300	PN 40, 16, 10	see table
(= BS 4504)	DN 350-1000	PN 10	see table
	DN 350-1000	PN 25	see table, dimension "$a_{standard}$" + 200 mm
	≥ DN 1200	PN 6, 2.5	information supplied on request
ANSI B 16.5	3/8"-24"	150 lb / RF	see table
		≥ 300 lb / RF	dimensions supplied on request
AWWA	≥ 14"	Class B, D / FF	dimensions supplied on request

- **Dimension "a" without flange gaskets:**
  not included with flowmeter, to be provided by customer.
- **Irathane liner ≥ DN 350 / ≥ 14"; thickness > 12 mm:**
  nominal size of flanges greater than nominal size of measuring tube, see table
- **Meter size 3/8":** flange connection 1/2"

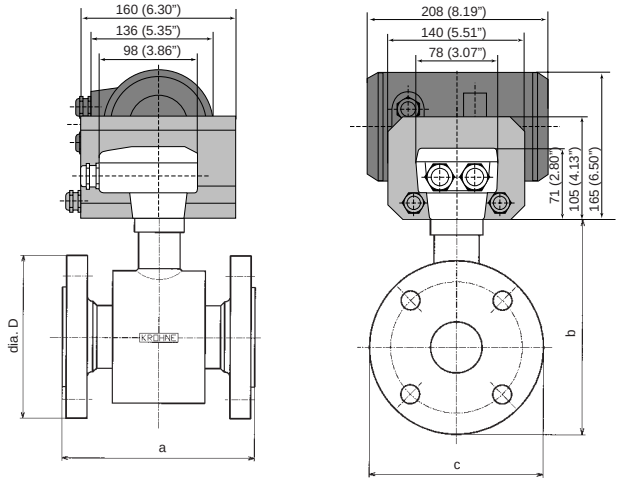
Nominal size			**Dimensions** in mm (inch)														**Approx. weight**	
DIN		ANSI	**a** (fitting length)						**b**		**c**		**dia. D**				in	
DN	PN	inch	Standard		ISO 13 359		ANSI						DIN, ISO		ANSI		kg (lb)	
10	40	3/8	150	(5.91)	–				146	(5.75)	121	(4.76)	90	(3.54)	88.9	(3.50)	3.5	(7.7)
15	40	1/2	150	(5.91)	200	(7.87)	150	(5.91)	146	(5.75)	121	(4.76)	95	(3.74)	88.9	(3.50)	3.5	(7.7)
20	40	3/4	150	(5.91)	200	(7.87)	150	(5.91)	146	(5.75)	121	(4.76)	105	(4.13)	98.6	(3.88)	5.5	(12.1)
25	40	1	150	(5.91)	200	(7.87)	150	(5.91)	146	(5.75)	121	(4.76)	115	(4.53)	108	(4.25)	5.5	(12.1)
32	40	–	150	(5.91)	200	(7.87)	–		161	(6.34)	139	(5.47)	140	(5.51)	–		6.5	(15)
40	40	1 1/2	150	(5.91)	200	(7.87)	150	(5.91)	161	(6.34)	139	(5.47)	150	(5.91)	127	(5.00)	6.5	(15)
50	40	2	200	(7.87)	200	(7.87)	200	(7.87)	199	(7.83)	160	(6.30)	165	(6.50)	152	(6.00)	7.5	(17)
65	16	–	200	(7.87)	200	(7.87)	–		209	(8.23)	173	(6.81)	185	(7.28)	–		12	(27)
80	40	3	200	(7.87)	200	(7.87)	200	(7.87)	216	(8.50)	173	(6.81)	200	(7.87)	191	(7.50)	12	(27)
100	16	4	250	(9.84)	250	(9.84)	250	(9.84)	267	(10.51)	233	(9.17)	220	(8.66)	228	(8.98)	14	(31)
125	16	–	250	(9.84)	250	(9.84)	–		278	(10.94)	233	(9.17)	250	(9.84)	–		19	(42)
150	16	6	300	(11.81)	300	(11.81)	300	(11.81)	308	(12.13)	257	(10.12)	285	(11.22)	279	(10.98)	22	(49)
200	10/16	8	350	(13.78)	350	(13.78)	350	(13.78)	366	(14.41)	291	(11.46)	340	(13.39)	343	(13.50)	45	(100)
250	10/16	10	400	(15.75)	450	(17.72)	400	(15.75)	418	(16.46)	331	(13.03)	395	(15.55)	406	(16.00)	65	(144)
300	10/16	12	500	(19.69)	500	(19.69)	500	(19.69)	481	(18.94)	381	(15.00)	445	(17.52)	533	(21.00)	95	(210)
350	10/16	14	500	(19.69)	550	(21.65)	700	(27.56)	529	(20.83)	428	(16.85)	505	(19.88)	597	(23.50)	135	(298)
400	10/16	16	600	(23.62)	600	(23.62)	800	(31.50)	587	(23.11)	483	(19.02)	565	(22.24)	635	(25.00)	170	(375)
500	10/16	20	600	(23.62)	–		800	(31.50)	632	(24.88)	533	(20.98)	670	(26.38)	699	(27.50)	230	(508)
600	10/16	24	600	(23.62)	–		800	(31.50)	801	(31.54)	585	(23.03)	780	(30.71)	813	(32.00)	315	(695)
700	10/16	28	700	(27.56)	–		flanges		918	(36.14)	694	(27.32)	895	(35.24)	flanges		255	(565)*
800	10/16	32	800	(31.50)	–		to AWWA,		1039	(40.91)	922	(36.30)	1015	(39.96)	to AWWA,		335	(740)*
900	10/16	36	900	(35.43)	–		dimensions		1145	(45.08)	1026	(40.39)	1115	(43.90)	dimensions		435	(960)*
1000	10/16	40	1000	(39.37)	–		on request		1259	(49.57)	1132	(44.57)	1230	(48.43)	on request		520	(1150)*

***** weight with DIN flanges

DN 10 - 40 / 3/8" - 1 1/2"



DN 50 - 300 / 2" - 12"

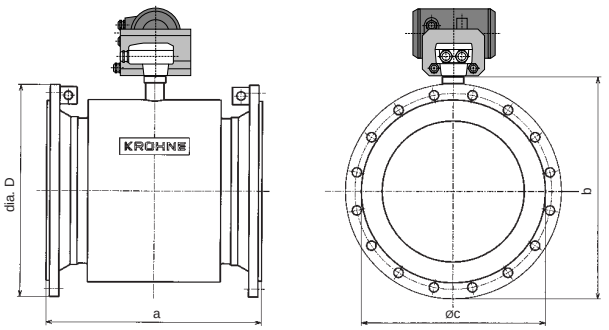


Tolerance details for fitting length dimension "a"

to DIN 2501 and ANSI B 16.5
DN ≤ 300 / ≤ 12": ± 0.5 %,
min. ± 1 mm / ± 0.04"
DN ≥ 350 / ≥ 14": ± 0.5 %

to ISO DIS 13 359
DN ≤ 200 / ≤ 8": +0 / -3
DN ≥ 250 / ≥ 10": +0 / -5

DN 350 - 2000 / 14" - 80"



Flange size for Irathane liners, thickness > 12 mm/> 0.50"

Nominal diameter of measuring tube			
Flange size			
DN in mm		**in inch**	
DN 350	DN 400	14	16
DN 400, 500	DN 500	14, 16	20
DN 500, 550	DN 600	20, 22	24
DN 600, 650	DN 700	24, 26	28
DN 700, 750	DN 800	28, 30	32
DN 800, 850	DN 900	32, 34	36
DN 900, 950	DN 1000	36, 38	40
DN 1000	DN 1200	40	48

11 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 also to footnotes 1) to 4).
- 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
  AWWA = AWWA
  API = API 6 BX

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

Liner	Flange			**Max. operating pressure in bar (psig)** at a process temperature of							
	Standard	Nominal diameter	Pressure rating/ Class	≤ 40 °C (≤ 105 °F)	≤ 60 °C (≤ 140 °F)	≤ 70 °C (≤ 158 °F)	≤ 90 °C (≤ 195 °F)	≤ 100 °C (≤ 210 °F)	≤ 120 °C (≤ 250 °F) **1)**	≤ 140 °C (≤ 285 °F) **1) 2)**	≤ 180 °C (≤ 355 °F) **1) 2)**
PFA	DIN	DN 25-50, DN 80	PN 40	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)
		DN 65, DN 100-150	PN 16	16 (230)	16 (230)	16 (230)	16 (230)	16 (230)	16 (230)	16 (230)	16 (230)
	ANSI	1"-6"	150 lb	19.6 (284)	19.0 (275)	18.7 (271)	18.1 (262)	17.7 (256)	17.0 (246)	16.2 (235)	14.7 (213)
PTFE	DIN	DN 10-20	PN 40	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	on request
		DN 200-600	PN 10	10 (150)	10 (150)	10 (150)	10 (150)	10 (150)	10 (150)	10 (150)	10 (150)
			PN 16	16 (230)	16 (230)	16 (230)	16 (230)	16 (230)	16 (230)	16 (230)	16 (230)
	ANSI	3/8"-3/4", 8"-24"	150 lb	19.6 (284)	19.0 (275)	18.7 (271)	18.1 (262)	17.7 (256)	17.0 (246)	16.2 (235)	14.7 (213)
			300 lb	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	on request
Tefzel	DIN	DN 200-600	PN 10	10 (150)	10 (150)	10 (150)	10 (150)	10 (150)	10 (150)	–	–
			PN 16	16 (230)	16 (230)	16 (230)	16 (230)	16 (230)	16 (230)	–	–
	ANSI	8"-24"	150 lb	19.6 (284)	19.0 (275)	18.7 (271)	18.1 (262)	17.7 (256)	17.0 (246)	–	–
			300 lb	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	–	–

1) With **insulation class E** of the field coils, the **maximum** process temperature allowable is **120 °C (250 °F)**.
2) **Max. process temperature 140 °C (285 °F)** for the IFM 4010 K, IFM 4020 K and IFM 4080 K compact flowmeters.
Ambient temperature max. 40 °C (105 °F).

Limits for FEP, soft rubber, Irathane and Neoprene

Flange			**Max. operating pressure in bar (psig)** at a process temperature of									
Standard	Meter size/ Nom. dia.	Pressure/ rating/Class	Soft rubber ≤ 40 °C (≤ 105 °F)		Neoprene ≤ 60 °C (≤ 140 °F)		Irathane ≤ 70 °C (≤ 158 °F)		FEP ≤ 100 °C (≤ 210 °F)	
DIN	DN 200-1000	PN 10	10	(150)	10	(150)	10	(150)		
		PN 16-1500	16-64	(150-920) **3)**	16-100	(150-1450) **3)**	16-1500	(150-20000) **3)**		
	≥ DN 1100	DN 2.5-6	2.5-6	(37-90) **3)**	2.5-6	(37-90) **3)**	2.5-6	(37-90) **3)**		
ANSI	8"-40"	150 lb	≤ 19.6	(≤ 284) **4)**	≤ 19.0	(≤ 275) **4)**	≤ 18.7	(≤ 271) **4)**		
		300 lb	≤ 50.8	(≤ 737) **4)**	≤ 49.2	(≤ 714) **4)**	≤ 48.4	(≤ 702) **4)**	on request	
		600 lb	≤ 64.0	(≤ 920)	≤ 100.0	(≤ 1450)	≤ 100.0	(≤ 1450)		
AWWA	≥ 14"	B	6	(90)	6	(90)	6	(90)		
		D	10	(150)	10	(150)	10	(150)		
API	≥ 8"	20 000 psig	–		–		≤ 1500	(≤ 20000)		

3) dependent on flange pressure rating
4) dependent on process temperature

Vacuum load

Liner	Meter size/Nom. dia.		**Min. operating pressure in mbar abs. (psia)** at a process temperature of							
	DN mm	inch	≤ 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 (≤ 285 °F)	≤ 180 °C (≤ 355 °F)
PFA	DN 25- 150	1"- 6"	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
PTFE	DN 10- 20	3/8"- 3/4"	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	500 (7.3)	750 (9.7)	1000 (15.0)
	DN 200- 300	8"- 12"	500 (7.3)	750 (9.7)	1000 (15.0)	1000 (15.0)	1000 (15.0)	1000 (15.0)	1000 (15.0)	1000 (15.0)
	DN 350- 600	14"- 24"	800 (11.2)	1000 (15.0)	1000 (15.0)	1000 (15.0)	1000 (15.0)	1000 (15.0)	1000 (15.0)	1000 (15.0)
Tefzel	DN 200- 600	8"- 12"	100 (1.5)	100 (1.5)	100 (1.5)	100 (1.5)	100 (1.5)	100 (1.5)	–	–
Soft rubber	DN 200- 300	8"- 12"	500 (7.3)	–	–	–	–	–	–	–
	DN 350-1200	14"- 48"	600 (8.7)	–	–	–	–	–	–	–
Irathane	DN 200-1800	8"- 72"	500 (7.3)	–	–	–	–	–	–	–
Neoprene	DN 200- 300	8"- 12"	400 (5.6)	400 (5.6)	–	–	–	–	–	–
	DN 350-3000	14"-120"	600 (8.7)	600 (8.7)	–	–	–	–	–	–
FEP	DN 200-2000	8"- 80"	on request							

Teflon® is a registered trademark of Du Pont.

If you need to return flowmeters for testing or repair to Krohne

Your electromagnetic flowmeter
- has been carefully manufactured and tested by a company with ISO 9001 certification
- and volumetrically calibrated in one of the world's most accurate test rigs.

If installed and operated in accordance with these operating instructions, your flowmeter will rarely present any problems.

Should you nevertheless need to return a flowmeter for checkout or repair, please pay strict attention to the following points:

Due to statutory regulations concerning protection of the environment and the health and safety of our personnel, Krohne may only handle, test and repair returned flowmeters that have been in contact with liquids if it is possible to do so without risk to personnel and environment. This means that Krohne can only service your flowmeter if it is accompanied by a certificate in line with the following model confirming that the flowmeter is safe to handle.

If the flowmeter has been operated with toxic, caustic, flammable or water-endangering liquids, you are kindly requested

- to check and ensure, if necessary by rinsing or neutralizing, that all cavities in the flowmeter are free from such dangerous substances.
  (Directions on how you can find out whether the primary head has to be opened and then flushed out or neutralized are obtainable from Krohne on request.)
- to enclose a certificate with the flowmeter confirming that the flowmeter is safe to handle and stating the liquid used.

Krohne regret that they cannot service your flowmeter unless accompanied by such a certificate.

S P E C I M E N certificate

Company: ..... Address: .....

Department: ..... Name: .....

Tel. No.: .....

The enclosed electromagnetic flowmeter

Type: ..... Krohne Order No. or Series No.: .....

has been operated with the following liquid: .....

Because this liquid is

water-endangering * / toxic * / caustic * / flammable *

we have

– checked that all cavities in the flowmeter are free from such substances *

– flushed out and neutralized all cavities in the flowmeter *

(* delete if not applicable)

We confirm that there is no risk to man or environment through any residual liquid contained in this flowmeter.

Date: ..... Signature: .....

Company stamp: