KROHNE

10/94

Primary heads for electromagnetic flowmeters

Installation instructions

ALTOFLUX
IFS 2000
IFS 4000
IFS 5000
IFS 6000
M 900

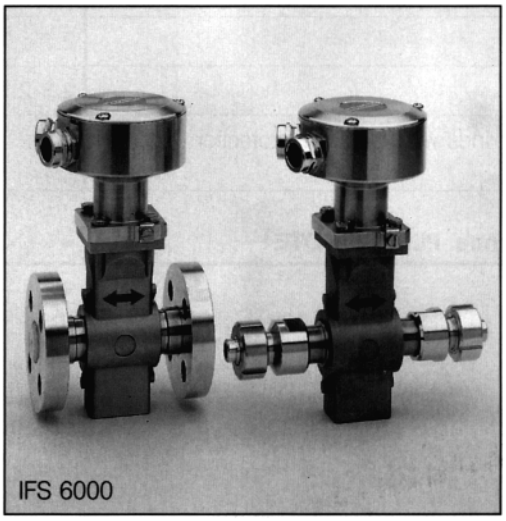
IFS 2005
IFS 4005


IFS 4000 / 4005

CONTENTS

PLEASE READ THESE INSTRUCTIONS BEFORE INSTALLING FLOWMETER!!


IFS 5000


IFS 6000

3.1M57EA1 109421

Order No. DIN A4: 7.02141.31.00
US Size: 7.02141.71.00

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Use of these installation instructions

These installation instructions describe how to install and ground the ALTOFLUX primary head in the pipeline (functional ground; when operated with SC 150 signal converter: protective ground).

Please refer to the signal converter installation and operating instructions for connection diagrams for connecting the primary head and signal converter.

Product liability and warranty

These electromagnetic flowmeters are suitable solely for measuring the volumetric flowrate of electrically conductive liquids, slurries and pastes.

For use in hazardous areas, special codes and regulations are applicable which are specified in the special "Ex installation and operating instructions" (supplied only with hazardous-duty equipment).

Responsibility as to suitability and intended use of our instruments 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 have to be returned to Krohne, please note the information given on page 31!

Electromagnetic flowmeters from Krohne

The electromagnetic flowmeters from Krohne are precision measuring devices designed for linear flowmetering of electrically conductive liquids, pastes and slurries having a minimum conductance $> 5\ \mu$S/cm (μmho/cm) ($> 20\ \mu$S/cm for demineralized cold water).

The systems consist of an ALTOFLUX primary head (refer to these installation instructions) and a signal converter (refer to separate installation and operating instructions).

Depending on type and meter size of the primary head (DN 2.5 – DN 3000 / $^1/_{10}$" – 120"), the full-scale range can be set between 6 litres per hour and 305 000 m^3 per hour, or 0.002 to 1342 800 US gallons per hour, equivalent to a flow velocity of 0.3 to 12 m/s or 1 to 40 ft/s.

Possible combinations of primary heads and signal converters

Primary head			Meter size		... compatible with signal converter			
Type		Liner/ measuring section	DN mm	inch	IFC 080 F 1) 5) 9)	IFC 200 2) 5) 9)	SC 100 AS 3) 9)	SC 150 3) 4)
IFS 2000		Fused aluminium oxide	150 - 250	6- 8	–	yes	yes	8)
IFS 4000	9)	PTFE	10 - 20	3/8- 3/4	yes	yes	yes	8)
		Teflon®-PFA	25 - 150	1- 6				
		Others	200 - 450	6- 18				
			500 - 600	20- 24		6)		
			700 -1200	28- 48	–			
			1300 -3000	52-120	–	7)	7)	
IFS 5000	9)	Fused aluminium oxide	2.5- 100	1/10- 4	yes	yes	yes	8)
IFS 6000	9)	Teflon®-PFA	2.5- 10	1/10- 3/8	no	6)	yes	-
			15 - 80	1/2- 3	yes	yes	yes	-
M 900	9)	PTFE	10 - 20	3/8- 3/4	yes	yes	yes	8)
		Others	25 - 300	1- 12				
IFS 2005	4)	Fused aluminium oxide	150 - 250	6- 8	–	–	–	yes
IFS 4005	4)	Teflon®-PFA	50 - 150	2- 6	–	–	–	yes
		Others	200 -3000	8-120				

Teflon® is a registered trademark of Du Pont

Special features

1) Rotatable field housing for wall mounting

2) 19″ plug-in unit

3) Field housing for wall mounting

4) Designed for high field currents and field frequencies (refer to SC 150 installation and operating instructions)

5) Also available as smart version (refer to smart operating instructions)

6) Only with FSA power driver

7) Only with NB 900 F power driver

8) Use in conjunction with these primary heads possible with meter sizes ≥ DN 50 / ≥ 2″ (IFS 2000: ≥ DN 150 / ≥ 6″), please refer to SC 150 installation and operating instructions or consult factory

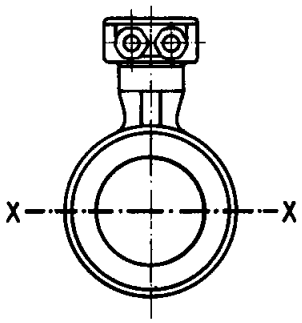
9) Also available as "Ex" version in accordance with the harmonized European Standards or with FM Approval, please refer to additional "Ex" instructions

1 Important information for primary head installation

1.1 Choice of installation location

1. **Location and position as required,** but electrode axis must be approximately horizontal.

Electrode axis



2. **Measuring tube must be completely filled at all times.**
3. **Flow direction +/–,** arrows on primary heads can normally be ignored. For exceptions, refer to Sect. "factory setting" in the signal converter instructions.
4. Ensure **adequate space** next to the pipe connections to facilitate installation and maintenance of the primary heads.
5. **Vibration:** support the pipeline on both sides of the flowmeter.
6. **Large meter sizes, DN > 200/> 8":** use adapter pipes to permit axial shifting of counterflanges to facilitate installation.
7. **Straight inlet run minimum of 5 x DN and outlet run minimum of 2 x DN** (DN = meter size), measured from the electrode axis.
8. **Vortex or corkscrew flow:** increase inlet and outlet sections or install flow straighteners.
9. **Strong electromagnetic fields and large "iron masses":** avoid in vicinity of flowmeter.
10. **Zero setting** is automatic in flowmeters with pulsed DC field. Electrode contamination does not therefore cause any zero drift.

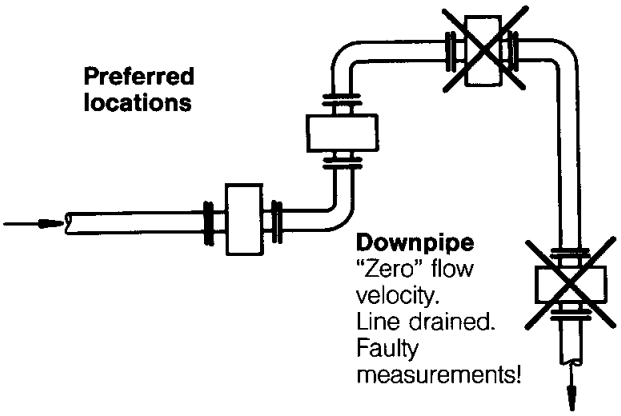
    In water and waste water applications, it is frequently not practical to shut the flow off to check zero after major repair, recalibration or inadvertent and improper adjustment of the converter. In this case the primary head zero can be checked under flowing conditions as outlined. For zero check, see signal converter instructions.

    For most applications it is convenient and customary to check the zero by shutting off the flow. Shutoff valves should therefore be provided upstream and/or downstream of the primary head unless the pipe configuration already rules out the possibility of the primary head being drained of fluid. For zero check, see signal converter instructions.
11. **Mixing different fluid products.** Install flowmeter upstream of mixing point or at an adequate distance downstream, minimum 30 x DN (DN = meter size), otherwise output/display may be unsteady.
12. **Ambient temperature < 60° C / < 140° F**
    (for "Ex" versions, refer to certificate of conformity)
    Refer to Sect. 2.2, 3.2 or 4.2 for process temperature, pressure and vacuum limits due to material used for measuring section/liner.

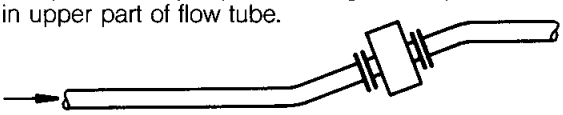
1.2 Installation examples

To avoid measuring errors due to air inclusion and vacuum-induced damage to PTFE and rubber liners, please observe the following:

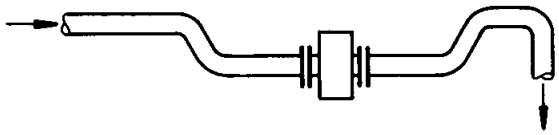
Highest point of pipe run
(Air bubbles collect in measuring tube – faulty measurements!)



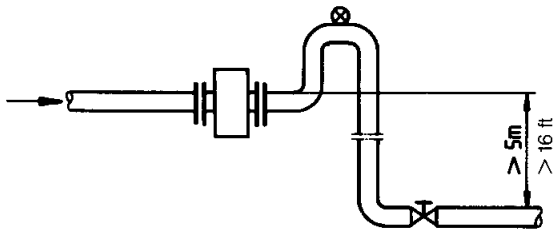
Horizontal pipe run
Install in slightly ascending pipe section. If not possible, assure adequate velocity to prevent air, gas or vapor from collecting in upper part of flow tube.



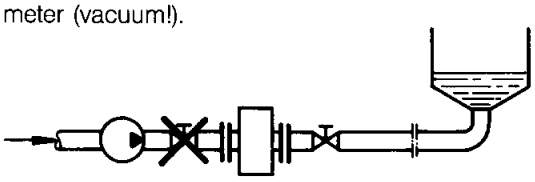
Open feed or discharge
Install meter in low section of pipe.



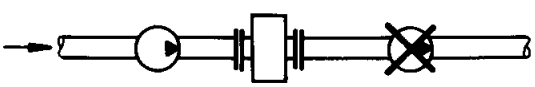
Downpipe over 5m (16 ft) length
Install air valve ⊗ downstream of flowmeter, else vacuum, measuring errors due to gas bubbles.



Long pipeline
Always install control and shutoff valves downstream of flowmeter (vacuum!).



Pumps
Never install flowmeter on pump suction side, else vacuum, measuring errors due to gas bubbles.



1.3 Instrument nameplate

Liner

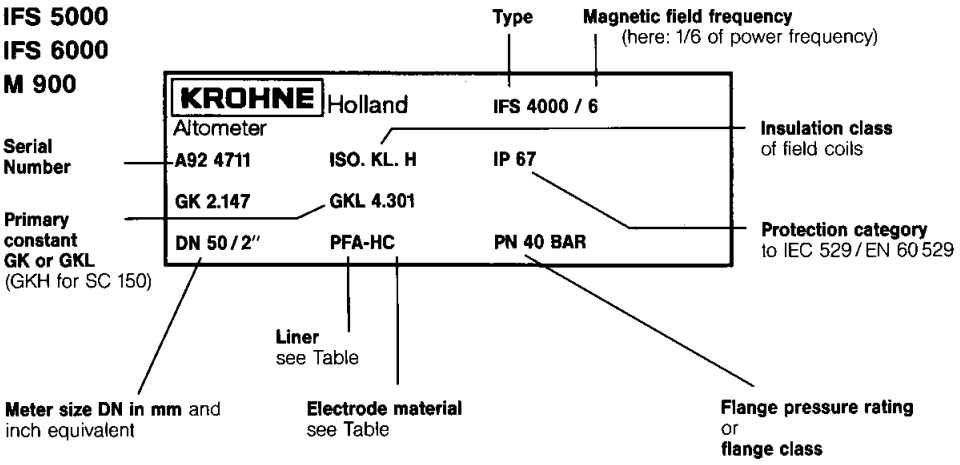
AL	Fused aluminium oxide (99.7% Al_2O_3)
H	Hard rubber
NE	Neoprene
PFA	Teflon-PFA
PUI	Irethane
T	PTFE
W	Soft rubber
ZR	Zirconium oxide

Electrode material

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 = base material, e.g. HC

Primary heads:

IFS 2000 **IFS 2005**
IFS 4000 **IFS 4005**
IFS 5000
IFS 6000
M 900



1.4 Replacement of the primary head

Always switch off power source before commencing work!

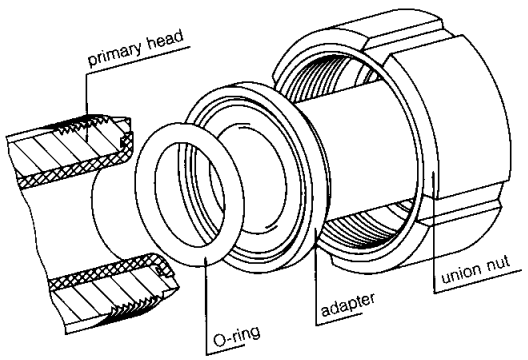
- Note terminal assignment first, then disconnect signal and field power cables from the terminals in the primary head outlet box. Detach grounding wires, if provided, from the pipe flanges.
- Remove primary head from the pipeline.
- Install and ground the new primary head as described in Sect. 1 and Sect. 2, 3 or 4 in these installation instructions.
- Reconnect signal and field power cables to terminals, see also signal converter instructions.
- **PLEASE NOTE:**

  All primary heads are factory-calibrated and their specific calibration data are indicated on the instrument nameplate. These include the magnetic field frequencies and the primary constant GK or GKL.

  For that reason, following replacement of the primary head the new calibration data must be set in the signal converter, refer to signal converter instructions.
- If the size of the primary head has also been changed, the new meter size and any new full-scale range must be set in the signal converter.

1.5 IFS 6000 with adapters, replacement of O-ring gaskets

- Unscrew union nuts.
  Caution: keep hold of the IFS 6000 to prevent it from dropping out of the pipeline.
- Remove IFS 6000 from the pipeline.
- Remove O-rings (gaskets D1, see grounding diagram in Sect. 3.6) from the adapter grooves.
- Apply grease to new gaskets D1 (Paraliq GTE 703, Silubin or similar).
- Insert O-rings into the adapters.
- Slide IFS 6000 between the adapters.
- Tighten union nuts down to metal stop.



2. Installation of primary heads IFS 2000 / IFS 2005 and IFS 5000

2.1 Scope of supply, pipe flanges, max. allowable operating pressure and torques

- Primary head in size ordered, and fitting accessories according to the table below
- Installation instructions for the primary head
- Calibration certificate for the primary head

Primary head						Scope of supply ...		X = Standard		O = Option	Max. allowable torques						
Type	Size of measuring tube to ...	Pipe flanges (for IFS 2000/IFS 2005 also connecting flanges)		max. allowable operating pressure 1)		... with centering material	... with stud bolts	... with grounding rings E and gaskets ... 2)		... without grounding rings but with gaskets D3 and wires V	with gaskets made of ...				... e.g. built-up material		2) 3) 4)
		Meter size	Pressure rating flange class	bar	psig			D1	D1+D2		... Gylon Nm	... Gylon ft lbf	... Chemo-therm Nm	... Chemo-therm ft lbf	Nm	ft lbf	
	... DIN 2501 (BS 4505)																
IFS 5000	DN 2.5–10	DN 10, 15	PN 40	≤ 40	≤ 580	2 x ring	4 x M12	X							**32**	23	**5)**
	DN 15	DN 15	PN 40	≤ 40	≤ 580	2 x ring	4 x M12	X							**36**	23	**5)**
	DN 25	DN 25	PN 40	≤ 40	≤ 580	2 x ring	4 x M12		O	X	**22**	16	**32**	23			
	DN 40	DN 40	PN 40	≤ 40	≤ 580	4 x sleeve	4 x M16		O	X	**47**	34	**66**	48			
	DN 50	DN 50	PN 40	≤ 40	≤ 580	4 x sleeve	4 x M16		O	X	**58**	42	**82**	59			
	DN 80	DN 80	PN 40	≤ 40	≤ 580	6 x sleeve	8 x M16		O	X	**48**	35	**69**	50			
	DN 100	DN 100	PN 16	≤ 16	≤ 230	6 x sleeve	8 x M16		O	X	**75**	54	**106**	77			
			PN 25	≤ 25	≤ 360	6 x sleeve	8 x M20		O	X	**94**	68	**133**	96			
IFS 2000 IFS 2005	DN 150	DN 150	PN 16	≤ 16	≤ 230			X							**148**	107	**5)**
	DN 200	DN 200	PN 10	≤ 10	≤ 145			X							**183**	132	**5)**
	DN 250	DN 250	PN 10	≤ 10	≤ 145			X							**158**	114	**5)**
	... ANSI B 16.5																
IFS 5000	1/10–3/8"	1/2"	150 lb	≤ 20	≤ 290	2 x ring	4 x 1/2"	X							**35**	25	**5)**
			300 lb	≤ 40	≤ 580	2 x ring	4 x 1/2"	X							**35**	25	**5)**
	1/2"	1/2"	150 lb	≤ 20	≤ 290	4 x sleeve	4 x 1/2"		O	X					**35**	25	**5)**
			300 lb	≤ 40	≤ 580	2 x ring	4 x 1/2"		O	X					**35**	25	**5)**
	1"	1"	150 lb	≤ 20	≤ 290	4 x sleeve	4 x 1/2"		O	X	**24**	17	**33**	24			
			300 lb	≤ 40	≤ 580	4 x sleeve	4 x 5/8"		O	X	**30**	22	**42**	30			
	1 1/2"	1 1/2"	150 lb	≤ 20	≤ 290	4 x sleeve	4 x 1/2"		O	X	**38**	28	**54**	39			
			300 lb	≤ 40	≤ 580	4 x sleeve	4 x 3/4"		O	X	**57**	41	**81**	59			
	2"	2"	150 lb	≤ 20	≤ 290	4 x sleeve	4 x 5/8"		O	X	**58**	42	**83**	60			
			300 lb	≤ 40	≤ 580	6 x sleeve	8 x 5/8"		O	X	**30**	22	**42**	30			
	3"	3"	150 lb	≤ 20	≤ 290	4 x sleeve	4 x 5/8"		O	X	**98**	71	**138**	100			
			300 lb	≤ 40	≤ 580	6 x sleeve	8 x 3/4"		O	X	**59**	43	**84**	61			
	4"	4"	150 lb	≤ 20	≤ 290	6 x sleeve	8 x 5/8"		O	X	**75**	54	**108**	78			
			300 lb	≤ 25	≤ 360	6 x sleeve	8 x 3/4"		O	X	**92**	67	**131**	95			
IFS 2000 IFS 2005	6"	6"	150 lb	≤ 20	≤ 290			X							**148**	107	**5)**
	8"	8"	150 lb	≤ 20	≤ 290			X							**183**	132	**5)**
	10"	10"	150 lb	≤ 20	≤ 290			X							**158**	114	**5)**

1) For ANSI pipe flanges, the max. allowable operating pressure is dependent on the process temperature, see Sect. 2.2 "Limits".
2) For arrangement of gaskets see Sect. 2.6 "Grounding".
3) For dimensions of gaskets see Sect. 2.8-2.10.
4) The max. allowable torque is dependent on the gasket material. **10 Nm ~ 7.23 ft lbf**
5) Gaskets D1 are special O-rings.

2.2 Limits (operating pressure, process temperature and vacuum load)

PLEASE NOTE!

- The limits for temperature and pressure specified in the table take flange standard and liner into account.
- Please refer to certificates of conformity for max. allowable operating data for "Ex" versions: certificates provided only with hazardous-duty equipment.
- **Operation with SC 150 high-power signal converters:** meter sizes ≥ DN 50 / ≥ 2" process temperature ≤ 120°C / ≤ 248°F
- **Vacuum load rating = 0 mbar abs / 0 psia.** Applies to all sizes, independent of process temperature.

Flange standard	Primary head		Pipe flanges [and connecting flanges 1)]		S = Standard O = Option	Max. operating pressure in bar (psig) for product temperature	
	Type	Size	Meter size	Pressure rating or flange class		≤ 120°C (≤ 250°F)	≤ 180°C (≤ 356°F)
DIN 2501	IFS 5000 IFS 5000 P 2)	DN 2.5–80 DN 100	DN 10 or 15–80 DN 100 DN 100	PN 40 PN 16 PN 25	S S O	40 (580) 16 (230) 25 (360)	40 (580) **3)** 16 (230) 25 (360)
	IFS 2000 IFS 2005	DN 150 DN 200–250	DN 150 DN 200–250	PN 16 PN 10	S S	16 (230) 10 (145)	– –
ANSI B 16.5	IFS 5000	1/10"–4" 1/10"–3" 4"	3/8" or 1/2"–4" 3/8" or 1/2"–3" 4"	150 lb 300 lb 300 lb	S O O	16 (230) 40 (580) 25 (360)	16 (230) **3)** 40 (580) 25 (360)
	IFS 2000 IFS 2005	6" 8"–10"	6" 8"–10"	150 lb 150 lb	S S	16 (230) 10 (145)	– –

1) IFS 2000 and IFS 2005 only
2) with EPDM gaskets max. 155°C/max. 311°F, for DN 2.5 – 15 and 1/10" – 1/2"

2.3 Installation requirements

Mounting material
see Sect. 2.1 "Items included with supply"

Pipe flange and operating pressure
see Table "torques" in Sect. 2.1 and 2.2

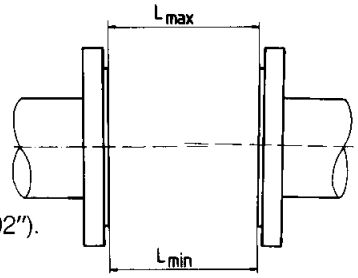
Pipe flanged spacing
- For arrangement of grounding rings and gaskets refer to Sect. 2.6 "Grounding".
- For size of gaskets D1, D2 and D3 refer to Sect. 2.10 "Items included with supply".

Primary head			Fitting dimensions "a" in mm (inch)	
Type	Meter size		with	without
	DN mm	inch	grounding rings	grounding rings
IFS 5000	2.5 - 15	1/10 - 1/2	65 (2.56) **1)**	-
	25	1	68 (2.68) **2)**	58 (2.28) **3)**
	40	1 1/2	93 (3.66) **2)**	83 (3.27) **3)**
	50	2	113 (4.45) **2)**	103 (4.06) **3)**
	80	3	163 (6.42) **2)**	153 (6.02) **3)**
	100	4	213 (8.39) **2)**	203 (7.99) **3)**
IFS 2000	150	6	265 (10.43) **1)**	-
IFS 2005	200	8	315 (12.40) **1)**	-
	250	10	365 (14.37) **1)**	-

1) **plus** 2 x thickness of gasket D2 between grounding rings and pipe flanges, gasket D2 not included with supply, customer supplied.
2) **incl.** gasket D2 between grounding rings and pipe flanges.
3) **incl.** gasket D3 between measuring tube and pipe flanges.

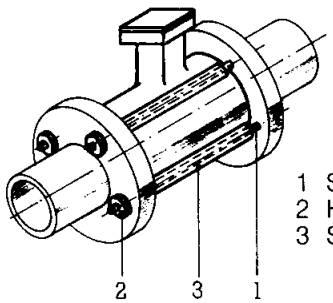
High-temperature pipelines
Where process temperatures exceed 100 °C (212 °F), provide for facilities to compensate for longitudinal expansion on heat-up of the pipeline:
- For **short** pipelines use resilient gaskets.
- For **long** pipelines install flexible pipe elements (e.g. elbows).

Position of flanges
- Install flowmeter in line with the pipe axis.
- Pipe flange faces must be parallel to each other, max. permissible deviation:
  $L_{max} - L_{min} \leq 0.5$ mm (0.02").

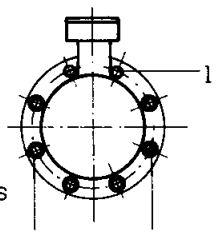


Arrangement of centering sleeves for IFS 5000
For number of supplied centering sleeves see Sect. 2.1 "Items included with supply".

with four centering sleeves



with six centering sleeves



1 Stud bolts
2 Hex. nuts
3 Sleeves

2.4 Other versions

2.4.1 IFS 5000 in the food industry

The IFS 5000 is also suitable for use in the food and beverage industry. The outlet box is also optionally available in stainless steel.

The measuring tube can be cleaned in-situ, for example with steam up to 140°C / 284°F. Note thermal shock limits specified in Sect. 2.7.

2.4.2 IFS 5000 in hazardous areas

In connection with "Ex" signal converters, the IFS 5000-EEx primary head is approved as electrical equipment in conformity with the harmonized European Standards and Factory Mutual (FM).

Only the primary heads are permitted to be installed in the hazardous area. The signal converter must always be installed **outside** the hazardous area.

Allocation of temperature class to temperature of the fluid, meter size and material of the measuring tube liner is specified in the test certificate.

Since the intrinsically safe signal circuit is grounded under field conditions via the fluid, equipotential bonding is required in the entire hazardous area and in the cable run of the intrinsically safe signal circuit (inside and outside the hazardous area).

Test certificate, certificate of conformity and wiring instructions are attached to the Installation and Operating Instructions (applies only to hazardous-duty equipment).

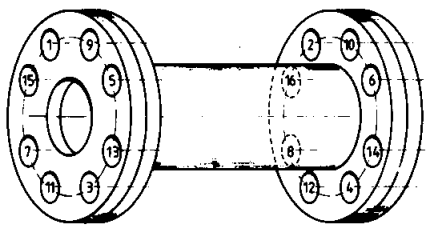
2.4.3 IFS 2005 and SC 150 high-power signal converter

The IFS 2005 primary head is designed for higher level field currents and field frequencies in conjunction with the SC 150 signal converter. The double coil insulation is designed in conformity with insulation class II. A special protective grounding system is not required. Please refer to the **SC 150 installation and operating instructions** for electrical connection, (initial) startup, operator control of the signal converter, service, etc.

2.5 Torques

IFS 5000
Stud bolts and nuts tighten down uniformly at diametrically opposed points.

IFS 2000 / IFS 2005
Tighten down in the sequence shown in the drawing below.



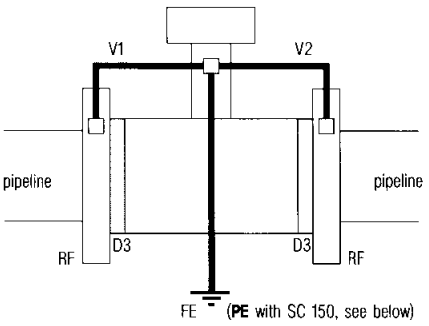
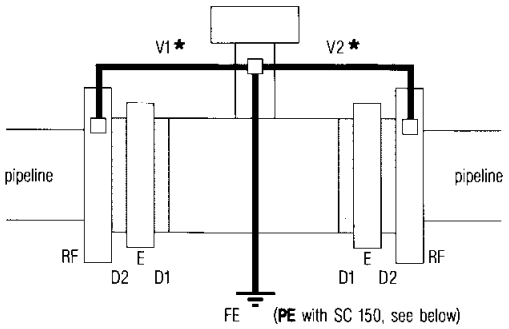
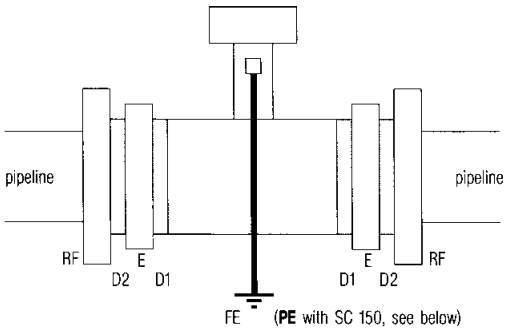
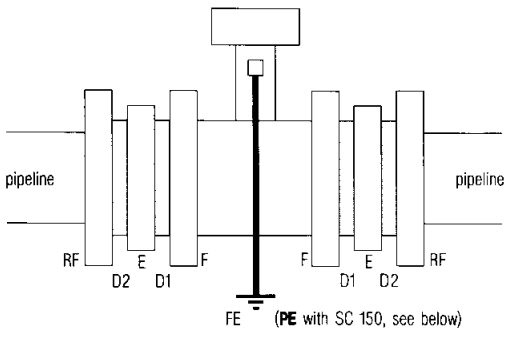
Max. torques
1st sequence: approx. 50%
2nd sequence: approx. 80%
3rd sequence: approx. 100%
} of max. torque, see Table in Sect. 2.1

See next page for flowmeter grounding!

2.6 Grounding IFS 2000/IFS 2005 and IFS 5000

- All flowmeters (primary heads) must be properly grounded.
- The ground conductor must not transmit any interference voltages. Therefore, do not connect any other electrical devices to this conductor.
- In hazardous areas, the grounding system of the primary head is also used for equipotential bonding, refer to Sect. 2.4.2 and special "Ex" installation instructions.

Warning: Instrument must be properly grounded to avoid personnel shock hazard.

	Metal pipeline, not internally coated Grounding without grounding rings	**Metal pipeline with or without internal coating, and plastic pipeline** Grounding with grounding rings
IFS 5000 DN 25–100 / 1"–4"		
IFS 5000 DN 2.5–15 / 1/10"–1/2"		
IFS 2000 DN 150–250 / 6"–10"		

D1, D3 **Gaskets,** bonded to measuring tube

D2 **Gaskets**
IFS 5000, DN 25-100 and 1"-4":
Bonded to grounding rings (option).
IFS 2000/IFS 2005 and
IFS 5000, DN 2.5-15 and 1/10"-1/2":
Not included with flowmeter, provided by customer. Use commercial flat gaskets.

E **Grounding rings**
IFS 5000, DN 25-100 and 1"-4":
Grounding rings (option) with bonded gasket D2 are supplied loose and must be bolted to the housing, mounting material supplied.
IFS 2000/IFS 2005 and
IFS 5000, DN 2.5-15 and 1/10"-1/2":
Grounding rings bolted to housing.

F **Flanges** of IFS 2000/IFS 2005 primary head

FE **Functional ground,** wire ≥ 4 mm² (10 AWG) Cu, connected to U-clamp terminal on "neck" of primary head. Wire not included with supply, to be provided by customer.

RF **Pipe flanges**

PE A **PE protective ground** must be connected when IFS 2000 and IFS 5000 standard primary heads are operated with the SC 150 signal converter. Wire ≥ 4 mm² (10 AWG) Cu, not included with flowmeter, to be provided by customer. Connected to "neck" of primary head.

V1, V2 **Connecting wires,** bolted to the "neck" of the primary head. Threaded holes for M6 bolts to be provided for flange-side (RF) connection.

*** V1 and V2 not required for plastic pipelines**

2.7 Technical data IFS 2000 / IFS 2005 and IFS 5000

Primary head Standard High-power version	**IFS 2000** **IFS 2005**	**IFS 5000** –
Version	with flanges	Sandwich (flangeless) design
Meter size	DN 150 – 250 6″ – 10″	DN 2.5 to 100 $^1/_{10}$″ to 4″
Scope of supply	see Table in Sect. 2.1	see Table in Sect. 2.1
Pipe flanges and **rated pressure of measuring tube** (max. operating pressure)	see Tables in Sect. 2.1 and 2.2	see Tables in Sect. 2.1 and 2.2
Electrical conductivity	≥ 5μS/cm (μmho/cm); ≥ 20μS/cm (μmho/cm) for demineralized cold water	≥ 5μS/cm (μmho/cm); ≥ 20μS/cm (μmho/cm) for demineralized cold water
Process temperature (see Sect. 2.2)	– 60 to + 120°C **or** 76 to + 248°F	– 60 to + 180°C **or** – 76 to + 356°F
Ambient temperature	– 25 to + 60°C **or** – 13 to + 140°F	– 25 to + 60°C **or** – 13 to + 140°F
Change in process temperature Temperature rising Temperature falling	 – –	 ΔT ≤ 150°C or 302°F, in 10 minutes ΔT ≤ 100°C or 212°F, for sudden change ΔT ≤ 80°C or 176°F, in 10 minutes ΔT ≤ 60°C or 140°F, for sudden change
Vacuum load	0 mbar abs. or 0 psia	0 mbar abs. or 0 psia
Insulation class of field coils	E	H
Power supply for field coils	from signal converter	from signal converter
Electrode design	flat-elliptical, self cleaning, surface-polished	fused-fitted electrodes
Protection category (IEC 529/EN 60529)	IP 65 equivalent to NEMA 4X	IP 67 equivalent to NEMA 6
Materials Measuring section	fused aluminium oxide, 99.7% Al_2O_3	fused aluminium oxide, 99.7% Al_2O_3
Electrodes Standard Special	 stainless steel 1.4571 or SS 316 Ti – AISI Hastelloy C4, titanium, tantalum, platinum	 platinum
Housing ≤ DN 15, ≤ $^1/_2$″ ≥ DN 25, ≥ 1″	 – tubular steel or grey cast iron GG 20 *	 stainless steel 1.4462/Duplex stainless steel 1.4301 or SS 304 – AISI
Terminal box * Standard Special	 die-cast aluminium –	 die-cast aluminium stainless steel 1.4301 or SS 304 – AISI, others on request
Grounding rings ** Standard Special	 stainless steel 1.4571 or SS 316 – AISI Hastelloy C4	 stainless steel 1.4571 or SS 316 Ti – AISI –
Gaskets ** ≤ DN 15, ≤ $^1/_2$″ ≥ DN 25, ≥ 1″	 – Viton O-rings	 Viton O-rings, optionally EPDM or Kalrez Gylon 3500 (beige) gaskets (range of application similar to that of PTFE), optionally Chemotherm (graphite) gaskets
Centering material ** ≤ DN 25, ≤ 1″ ≥ DN 40, ≥ 1 $^1/_2$″	 – –	 EPDM rings rubber sleeves
Stud bolts Standard Special version	 – –	 steel, electrogalvanized stainless steel 1.4301 or SS 304 – AISI
Connecting flanges *	cast steel (GS 45 N)	–
Cable entries Standard Special	 brass, nickel-plated polyamide (PA)	 brass, nickel-plated polyamide (PA)

* with polyurethane finish ** see Table in Sect. 2.1

2.8 Dimensions and weights IFS 5000

Dimensions in mm and (inch)

Necessary flange spacing

DN 2.5 to 15, 1/10" to 1/2": Dimension a + 2 times gasket thickness (gasket between grounding rings and pipe flanges)

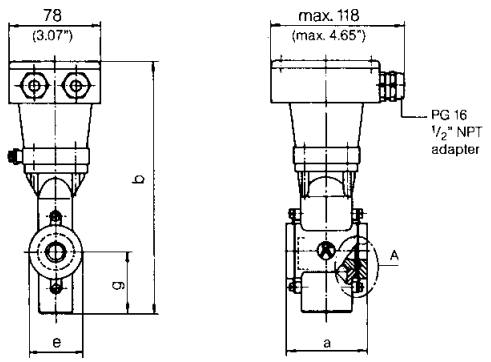
DN 25 to 100, 1" to 4"
without grounding rings: Dimension a incl. gaskets between primary head and pipe flanges
with grounding rings (option): Dimension a + 10 mm or a + 0.4", incl. gaskets between grounding rings and pipe flanges

*** Meter size DN 2.5 – 15 and 1/10" – 1/2":** Pipe flanges DN 15 / PN 40 or 1/2" / Class 150 lb (300 lb).

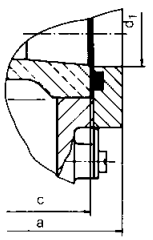
Meter size		**Dimensions** in mm (inch)								**approx. weight**
DN mm	inch	a	b	c	d_1	d_2	e	f	g	in kg (lb)
2.5 – 15 *	1/10 – 1/2 *	65 (2.56)	208 (8.19)	50 (1.97)	15 (0.58)	–	44 (1.73)	–	51 (1.99)	1.7 (3.7)
25	1	58 (2.28)	189 (7.44)	55 (2.17)	26 (1.02)	46 (1.81)	102 (4.02)	68 (2.68)	34 (1.34)	1.7 (3.7)
40	1 1/2	83 (3.27)	204 (8.03)	80 (3.15)	39 (1.54)	62 (2.44)	117 (4.61)	83 (3.27)	42 (1.63)	2.5 (5.5)
50	2	103 (4.06)	222 (8.74)	100 (3.94)	51 (2.01)	74 (2.91)	135 (5.31)	101 (3.98)	51 (1.99)	3.0 (6.6)
80	3	153 (6.02)	254 (10.00)	150 (5.91)	80 (3.15)	106 (4.17)	167 (6.57)	133 (5.24)	67 (2.62)	5.6 (12.3)
100	4	203 (7.99)	279 (10.98)	200 (7.87)	101 (3.98)	133 (5.24)	192 (7.56)	158 (6.22)	79 (3.11)	8.9 (19.6)

IFS 5000

DN 2.5 – 15
1/10" – 1/2"

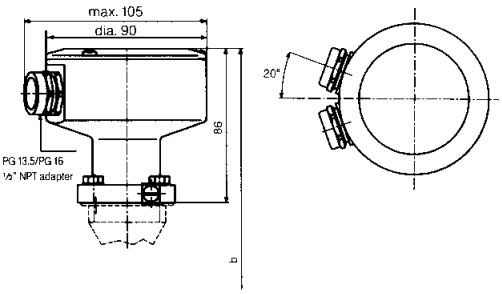


Detail A

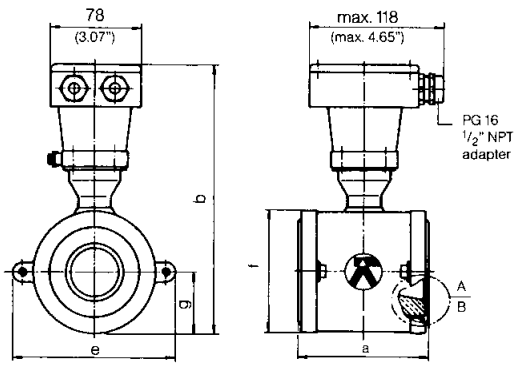


Stainless steel outlet box (option)

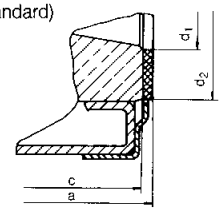
Overall height "dimension b" – no change



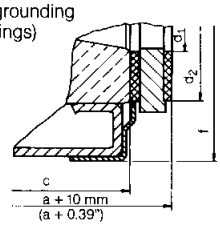
DN 25 – 100
1" – 4"



Detail A
(standard)



Detail B
(option with grounding rings)



2.9 Dimensions and weights IFS 2000 / IFS 2005

Dimensions in mm and (inch)

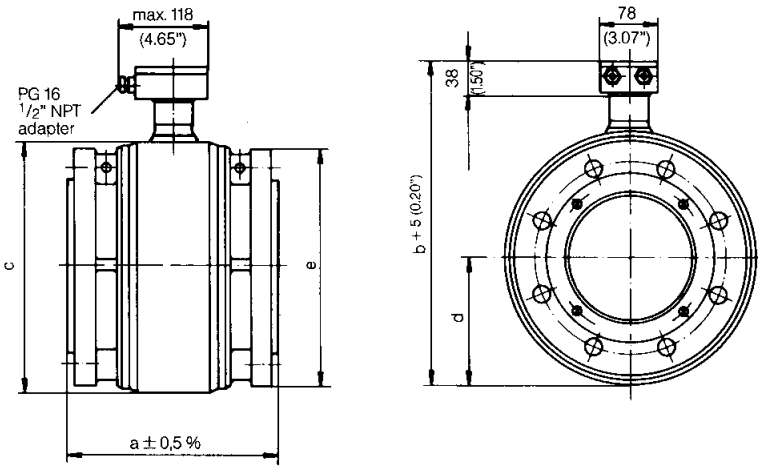
Necessary distance between pipe flanges (dimension a)
DN 150 – 250 and 6" – 10": dimension a + 2 x thickness of gaskets between grounding ring and pipe flange. These gaskets not supplied with flowmeter, to be provided by customer.

Dimension a incl. grounding rings and gaskets between primary head and grounding rings.

Flange Standard	Nominal size	Dimensions in mm (inch)					Approx. weight
		a	b	c	d	e	in kg (lb)
DIN 2501 (= BS 4504)	DN 150/PN 16	265 (10.43)	426 (16.77)	292 (11.50)	146 (5.75)	283 (11.14)	37 (82)
	DN 200/PN 10	315 (12.40)	467 (18.39)	324 (12.76)	171 (6.73)	342 (13.46)	53 (117)
	DN 250/PN 10	365 (14.37)	529 (20.83)	394 (15.51)	198 (7.80)	395 (15.55)	87 (192)
ANSI B16.5	6", 150 lb, FF	265 (10.43)	432 (17.01)	292 (11.50)	152 (5.98)	283 (11.14)	37 (82)
	8", 150 lb, FF	315 (12.40)	473 (18.62)	324 (12.76)	177 (6.97)	342 (13.46)	53 (117)
	10", 150 lb, FF	365 (14.37)	535 (21.06)	394 (15.51)	204 (8.03)	407 (16.02)	87 (192)

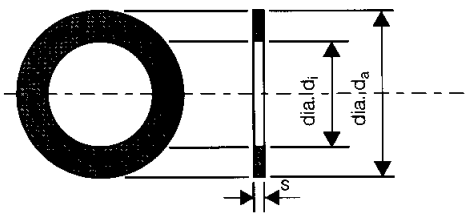
IFS 2000 / IFS 2005

DN 150 – 250
6" – 10"



2.10 Dimensions of gaskets D2 for IFS 2000/IFS 2005 and IFS 5000

Meter size to ...		Dimensions of gaskets D2 in mm (inch)		
... DIN 2501	... ANSI B 16.5	dia. d_a	dia. d_2	s (thickness)
DN 2.5-15	1/10"-1/2"	Use commercial flat gaskets		
DN 25	1"	46 (1.81)	26 (1.02)	1.6 (0.06)
DN 40	1 1/2"	62 (2.44)	39 (1.54)	1.6 (0.06)
DN 50	2"	74 (2.91)	51 (2.01)	1.6 (0.06)
DN 80	3"	106 (4.17)	80 (3.15)	1.6 (0.06)
DN 100	4"	133 (5.24)	101 (3.98)	1.6 (0.06)
DN 150	6"	Use commercial flat gaskets		
DN 200	8"			
DN 250	10"			



3 Installation of primary head IFS 6000

3.1 Scope of supply (pipe flanges and adapters)

- **Primary head in size as ordered, and fitting accessories**
  Flanged units: with fitted grounding rings E and inserted gaskets D1.
  Gaskets D2 not included with flowmeter, to be provided by customer.
  Other connections: fitted adapters with inserted O-ring gaskets D1 and union nuts, (the relevant counterparts for the pipeline, such as tapered sockets, union nuts, hinged clamps and gaskets D2 are not included with flowmeter, to be provided by customer). **Arrangement of gaskets: see Sect. 3.6 "Grounding"**
- Installation instructions for the primary head
- Calibration certificate for the primary head
- **Available sizes/types and connections**

Connectors/adapters

IFS 6000 size/type		Aseptic weld-on connections for pipes to DIN 11850	Aseptic weld-on connections for pipes to ISO 2037		Connection and pipe flanges to DIN 2501/PN 40	Connection and pipe flanges to ANSI B 16.5/150, 300 lb	Connection and pipe flanges to JIS 2210/20 K	Dairy screw connections and hose nozzles (option) to DIN 11851	Screwed pipe connections to ISO 2853		Screwed pipe connections to SMS 1145	Clamp joints to ISO 2852	
mm	inch	mm	mm	inch	mm	inch	mm	mm	mm	inch	mm	mm	inch
DN 2.5	1/10	DN 10	12	–	DN 10	1/2	DN 10	DN 10	12	–	–	12	–
DN 4	1/8	DN 10	12	–	DN 10	1/2	DN 10	DN 10	12	–	–	12	–
DN 6	1/4	DN 10	12	–	DN 10	1/2	DN 10	DN 10	12	–	–	12	–
DN 10	3/8	DN 10	12	–	DN 10	1/2	DN 10	DN 10	12	–	–	12	–
DN 15	1/2	DN 15	18	–	DN 15	1/2	DN 15	DN 15	18	–	–	18	–
DN 25	1	DN 25	25	1 [1]	–	–	–	DN 25	25	–	25	25	–
DN 40	1 1/2	DN 40	38	1 1/2	–	–	–	DN 40	38	1 1/2	38	38	1 1/2
DN 50	2	DN 50	51	2	–	–	–	DN 50	51	2	51	51	2
DN 65	2 1/2	DN 65	63.5	2 1/2	–	–	–	DN 65	63.5	2 1/2	63.5	63.5	2 1/2
DN 80	3	DN 80	76.1	3	–	–	–	DN 80	76.1	3	76	76.1	3

Other connections on request

[1] not to ISO 2037, but dimensions same as connection "25 mm" to ISO 2037

3.2 Limits (operating pressure, process temperature and vacuum load)

Please note!

- The limits for temperature and pressure specified in the tables take liner and connection into account.
- Please refer to the certificates of conformity for the max. allowable operating data for "Ex" versions, supplied only with hazardous-duty equipment.
- **Vacuum load rating = 0 mbar abs / 0 psia.** Applies to all sizes independent of process temperature.

Connections		Connection meter size	Max. operating pressure in bar/psig at product 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 (< 285°F)	< 180°C (< 355°F)
Flange DIN 2501/PN 40		DN 10* – 15	39	(566)	37	(537)	36	(522)	34	(493)	33	(479)	32	(464)	30	(435)	28	(406)
Flange JIS 2210/20K		DN 10* – 15	39	(566)	37	(537)	36	(522)	34	(493)	33	(479)	32	(464)	30	(435)	28	(406)
Flange ANSI B 16.5:	**150 lb**	1/2"*	19.6	(284)	19.0	(276)	18.7	(271)	18.1	(263)	17.7	(257)	17.0	(247)	16.2	(235)	14.7	(213)
	300 lb	1/2"*	39	(566)	37	(537)	36	(522)	34	(493)	33	(479)	32	(464)	30	(435)	28	(406)
Aseptic weld-on connection for pipes to DIN 11850		DN 10* – 40	40	(580)	40	(580)	40	(580)	40	(580)	40	(580)	40	(580)	40	(580)	–	
		DN 50 – 80	25	(360)	25	(360)	25	(360)	25	(360)	25	(360)	25	(360)	25	(360)	–	
Aseptic weld-on connection for pipes to ISO 2037		12* – 38/1" – 1 1/2"	40	(580)	40	(580)	40	(580)	40	(580)	40	(580)	40	(580)	40	(580)	–	
		51 – 76.1/2" – 3"	25	(360)	25	(360)	25	(360)	25	(360)	25	(360)	25	(360)	25	(360)	–	
Dairy screw connection DIN 11851		DN 10* – 40	40	(580)	40	(580)	40	(580)	40	(580)	40	(580)	40	(580)	40	(580)	–	
		DN 50 – 80	25	(360)	25	(360)	25	(360)	25	(360)	25	(360)	25	(360)	25	(360)	–	
Screwed pipe connection ISO 2853		12* – 38 mm	40	(580)	40	(580)	40	(580)	40	(580)	40	(580)	40	(580)	40	(580)	–	
		51 – 76.1 mm / 1 1/2" – 3.0"	25	(360)	25	(360)	25	(360)	25	(360)	25	(360)	25	(360)	25	(360)	–	
Screwed pipe connection SMS 1145		25 – 76 mm	6	(90)	6	(90)	6	(90)	6	(90)	6	(90)	6	(90)	–		–	
Clamp joint ISO 2852		12* – 51 mm / 1 1/2" – 2.0"	16	(230)	16	(230)	16	(230)	16	(230)	16	(230)	16	(230)	–		–	
		63.5 – 76.1 mm / 2 1/2" – 3.0"	10	(150)	10	(150)	10	(150)	10	(150)	10	(150)	10	(150)	–		–	

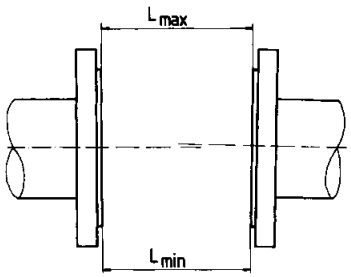
* for IFS 6000 primary head size DN 2.5 – 10 / 1/10" – 3/8"

3.3 Installation requirements

Fitting accessories
Refer to Sect. 3.1 "Items included with flowmeter".

IFS 6000 with flanged connections

- Flange spacing
  = dimension "a" + 2 x gasket thickness of D2
  (dimension "a": see Sect. 3.8 "Dimensions and weights"; arrangement of gaskets: see Sect. 3.6 "Grounding").
- Flange location
  Install primary head in line with pipe axis, pipe flanges plane-parallel.
  $L_{max} - L_{min} \leq 0.5$ mm (0.02")



Max. allowable operating data
refer to Sect. 3.2 "Limits"

3.4 Other versions

3.4.1 IFS 6000 in the food industry

The IFS 6000 is specifically suitable for use in the food industry or for similar sterile processes. The terminal box is optionally available in stainless steel.

The IFS 6000 is resistant to high-temperature steam and can be pigged. In installed condition, the measuring tube can be cleaned using either the SIP or CIP method.

Refer to Sect. 3.1 for available food approved connections.

3.4.2 IFS 6000 in hazardous areas

In connection with "Ex" signal converters, the IFS 6000-EEx primary head is approved as electrical equipment in conformity with the harmonized European Standards and Factory Mutual (FM).

Only the primary heads are permitted to be installed in the hazardous area. The signal converter must always be installed **outside** the hazardous area.

Allocation of temperature class to temperature of the fluid, meter size and material of the measuring tube liner is specified in the test certificate.

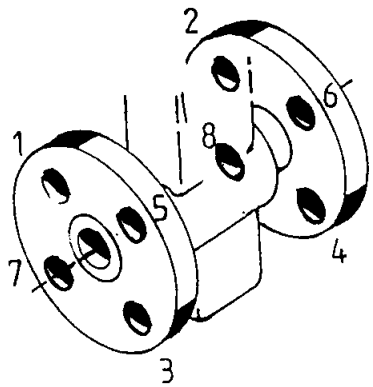
Since the intrinsically safe signal circuit is grounded under field conditions via the fluid, equipotential bonding is required in the entire hazardous area and in the cable run of the intrinsically safe signal circuit (inside and outside the hazardous area).

Test certificate, certificate of conformity and wiring instructions are attached to the Installation and Operating Instructions (applies only to hazardous-duty equipment).

3.5 Torques for IFS 6000

- **For all flanged instruments to DIN, ANSI and JIS**
  Tighten down stud bolts and nuts uniformly in the sequence shown in the drawing below.

  Max. torque: **32 Nm ~ 3.2 kpm ~ 23.1 ft lbf**
- **For all other connections to DIN and ISO**
  Tighten down to metal stop.



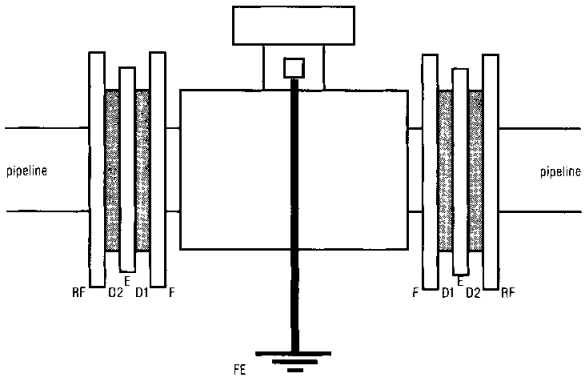
Refer to next page for grounding of primary head !

3.6 Grounding of IFS 6000

- All primary heads must be properly grounded.
- The ground conductor must not transmit any interference voltages, therefore do not use this conductor to ground any other electrical equipment.
- In hazardous areas, the grounding of the primary head is used for equipotential bonding, refer to Sect. 3.4.2 and special "Ex" instructions.

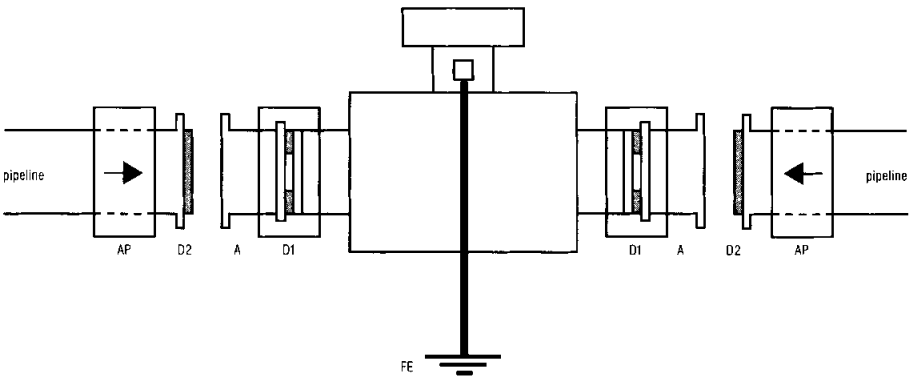
Warning: Instrument must be properly grounded to avoid personnel shock hazard.

IFS 6000 primary head with flanged connections and grounding rings



D1 O-ring gaskets
D2 Gaskets, not included with flowmeter, to be provided by customer. Use commercial flat gaskets.
E Grounding rings bolted to housing, with inserted gaskets D1
F Primary head flanges
FE **Functional ground,** wire ≥ 4 mm² (10 AWG) Cu, connected to U-clamp terminal on "neck" of primary head. Wire not included with flowmeter, to be provided by customer.
RF Pipe flanges

IFS 6000 primary head with adapters



A Adapter with union nut and O-ring gasket D1, ready fitted.
D1 O-ring gaskets, positioned in the adapter grooves.
AP Pipe adapters (tapered sockets, union nuts, hinged clamps and gaskets D2), not included with flowmeter, to be provided by customer.
D2 Gaskets D2, not included with flowmeter, to be provided by customer.
FE **Functional ground,** wire ≥ 4 mm² (10 AWG) Cu, connected to the U-clamp terminal on the "neck" of the primary head. Wire not included with flowmeter, to be provided by customer.

3.7 Technical data IFS 6000

Size/type	
IFS 6000 primary head	DN 2.5 – 80 and 1/10" – 3"
IFM 6080 K compact system	DN 10 – 80 and 3/8" – 3"
Available connections	see page 4
Electrical conductivity	≥ 5 µS/cm (≥ 20 µS/cm for demineralized water)
Ambient temperature	
... for ≤ 60°C / ≤ 140°F product temperature	–25 to + 60°C / –13 to + 140°F
... for > 60°C / > 140°F product temperature	
separate systems	–25 to + 60°C / –13 to + 140°F
compact systems	–25 to + 40°C / –13 to + 104°F
... for hazardous duty versions	–20 to + 40°C / – 4 to + 104°F
Max. permissible operating data	
Operating pressure / product temperature	see table "limits" on next page
Vacuum load	0 mbar abs. / 0 psia
Insulation class of field coils	H, for ≤ 180°C / 356°F product temperature
Electrode design	permanently fitted, surface polished
Power for field coils	< 60 V from signal converter
Grounding rings	standard for flanged connections
Protection category (IEC 529/EN 60 529)	IP 67, equivalent to NEMA 6
Hazardous-duty versions	in preparation
Materials	
Measuring tube	stainless steel 1.4301 / 304-AISI
Liner	clear, virgin Teflon®-PFA, FDA-approved
DN 2.5 – 10 mm / 1/10" – 3/8"	reinforced with sintered metal bearing bush
DN 15 – 80 mm / 1/2" – 3"	reinforced with stainless steel mesh
Electrodes	
Standard	Hastelloy C4
Special version	stainless steel 1.4571 / 316 Ti-AISI, titanium, tantalum, platinum, others on request
Connections	
Flanges to DIN 2501 / ANSI B 16.5 / JIS 2210	Standard: stainless steel 1.4301 / 304-AISI; Special version: stainless steel 1.4404 / 316L-AISI
Aseptic weld-on connection for pipes to DIN 11 850 / ISO 2037	Standard: stainless steel 1.4301 / 304-AISI; Special version: stainless steel 1.4404 / 316L-AISI
Dairy screw connection and hose nozzles (option) to DIN 11 851	Standard: stainless steel 1.4301 / 304-AISI; Special version: stainless steel 1.4404 / 316L-AISI
Screwed pipe connection to SMS 1145	Standard: stainless steel 1.4301 / 304-AISI; Special version: stainless steel 1.4404 / 316L-AISI
Screwed pipe connection to ISO 2853	Standard: stainless steel 1.4301 / 304-AISI; Special version: stainless steel 1.4404 / 316L-AISI
Clamp joint to ISO 2852	Standard: stainless steel 1.4301 / 304-AISI; Special version: stainless steel 1.4404 / 316L-AISI
Housing	
DN 2.5 – 15 / 1/10" – 1/2"	stainless steel 1.4462 Duplex
DN 25 – 80 / 1" – 3"	stainless steel 1.4301 / 304-AISI
Terminal box (for separate system only)	
Standard	die cast aluminium, paint finish
Special version	stainless steel 1.4301 / 304-AISI, other on request
Cable entries	
Standard	brass, nickel-plated
Special version	polyamide (PA)
Grounding rings (only for flange versions)	stainless steel 1.4571 / 316 Ti-AISI, others on request

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3.8. Dimensions and weights IFS 6000

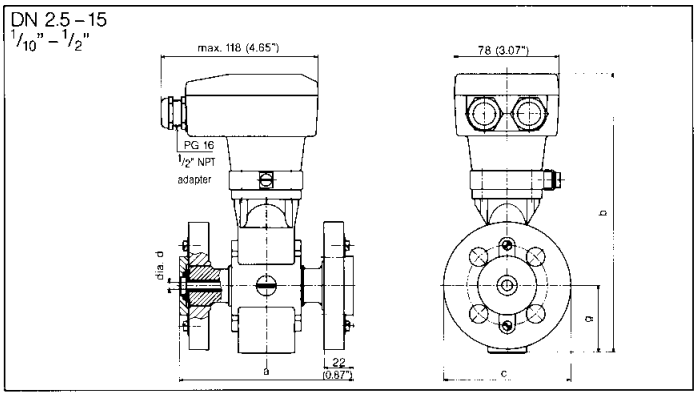
with flange connections to DIN, JIS and ANSI

Dimensions in mm and (inch)

Flowmeter				Dimensions in mm and inch								Approx. weight in kg (lb)
Size/type to ...		Flanges to ...		a	b	c				dia. d_i	g	
DIN and JIS	ANSI	DIN and JIS	ANSI			DIN/PN 40	JIS/20 K	ANSI/150 lb	ANSI/300 lb			
DN 2.5	1/10"	DN 10	1/2"	130 (5.12)	208 (8.19)	90 (3.54)	90 (3.54)	88.9 (3.50)	95.2 (3.75)	2.5 (0.10)	51 (2.01)	3.1 (6.8)
DN 4	1/8"									4 (0.16)		
DN 6	1/4"									6 (0.24)		
DN 10	3/8"									10 (0.39)		
DN 15	1/2"	DN 15				95 (3.74)	95 (3.74)			13 (0.51)		

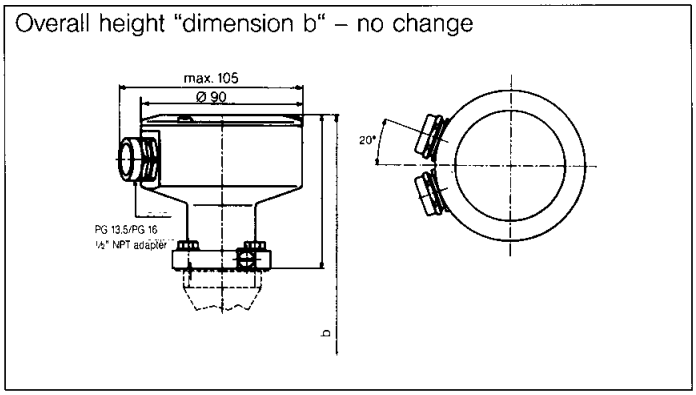
IFS 6000 primary head

DN 2.5 – 15
1/10" – 1/2"



Stainless steel outlet box (option)

Overall height "dimension b" – no change



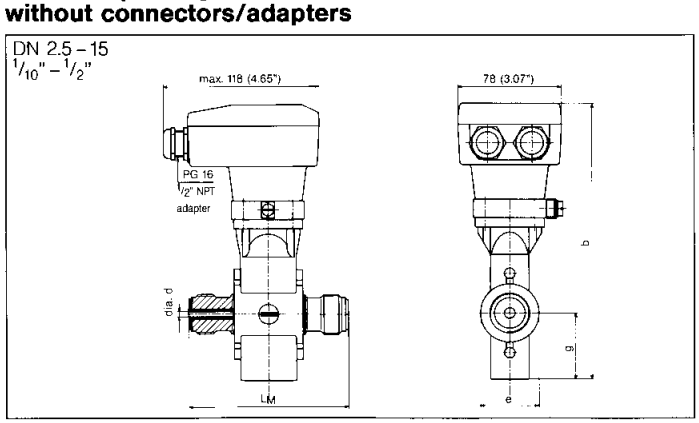
Dimensions without connectors/adapters

Dimensions in mm (inch)

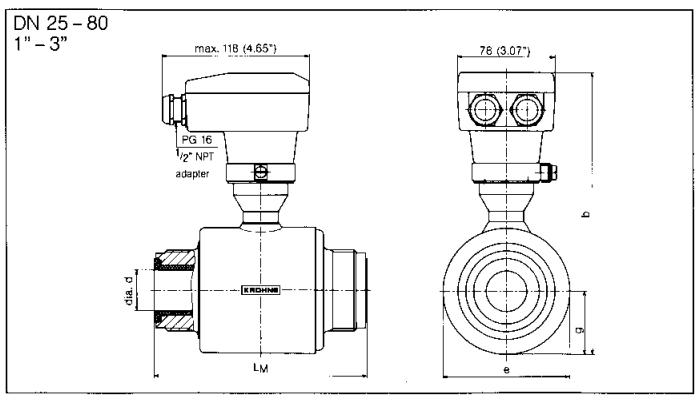
Size/type		dia. d_i in mm and (inch) for connections to ...		Dimensions in mm (inch)				Approx. weight in kg (lb) without adapters
mm	inch	DIN	ISO and SMS	L_M	b	e	g	IFS 6000
DN 2.5	1/10	2.5 (0.10)	2.5 (0.10)	120 (4.72)	208 (8.19)	44 (1.73)	51 (2.01)	1.7 (3.7)
DN 4	1/8	4 (0.16)	4 (0.16)					
DN 6	1/4	6 (0.24)	6 (0.24)					
DN 10	3/8	10 (0.39)	10 (0.39)					
DN 15	1/2	13 (0.51)	13 (0.51)					
DN 25	1	26 (1.02)	23 (0.91)	136 (5.35)	202 (7.95)	80 (3.15)	40 (1.57)	2.3 (5.1)
DN 40	1 1/2	38 (1.50)	36 (1.42)	154 (6.06)	220 (8.66)	98 (3.86)	49 (1.93)	3.7 (8.2)
DN 50	2	50 (1.97)	49 (1.93)	160 (6.30)	252 (9.92)	130 (5.12)	65 (2.56)	5.0 (11.0)
DN 65	2 1/2	66 (2.60)	60 (2.36)	208 (8.19)	278 (10.94)	156 (6.14)	78 (3.07)	7.5 (16.5)
DN 80	3	81 (3.19)	73 (2.87)					

IFS 6000 primary head without connectors/adapters

DN 2.5 – 15
1/10" – 1/2"



DN 25 – 80
1" – 3"

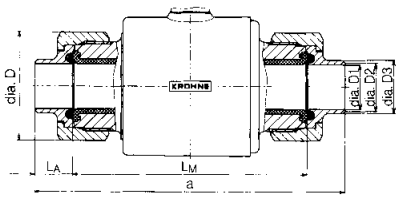


Dimensions with mounted connectors/adapters

Dimensions in mm and (inch)

Aseptic weld-on connection for pipes DIN 11 850

Connection meter size	dia. D	L_A	a	dia. D1	dia. D2	dia. D3
DN 10 [1]	38 (1.50)	30.0 (1.18)	180 (7.09)	10 (0.39)	12 (0.47)	15 (0.59)
DN 15				16 (0.63)	18 (0.71)	21 (0.83)
DN 25	63 (2.48)	25.0 (0.98)	186 (7.32)	26 (1.02)	28 (1.10)	31 (1.22)
DN 40	78 (3.07)	23.0 (0.91)	200 (7.87)	38 (1.50)	40 (1.57)	43 (1.69)
DN 50	92 (3.62)	22.0 (0.87)	204 (8.03)	50 (1.97)	52 (2.05)	55 (2.17)
DN 65	112 (4.41)	21.0 (0.83)	250 (9.84)	66 (2.60)	68 (2.68)	72 (2.83)
DN 80	127 (5.00)	29.0 (1.14)	266 (10.47)	81 (3.19)	83 (3.27)	87 (3.43)

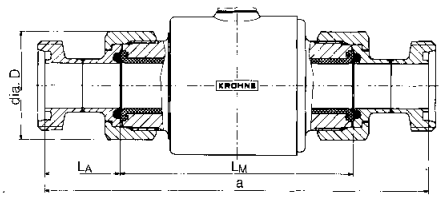


Aseptic weld-on connection for pipes ISO 2037

Connection meter size		dia. D	L_A	a	dia. D1	dia. D2	dia. D3
12 mm [1]	–	38 (1.50)	30.0 (1.18)	180 (7.09)	10.0 (0.39)	12.0 (0.47)	15.0 (0.59)
18 mm	–				16.0 (0.63)	18.0 (0.71)	21.0 (0.83)
25 mm	1 [2]	63 (2.48)	22.0 (0.87)		22.6 (0.89)	–	25.6 (1.01)
38 mm	1 1/2"	78 (3.07)	26.5 (1.04)	207 (8.15)	35.6 (1.40)	–	38.6 (1.52)
51 mm	2"	92 (3.62)	28.5 (1.12)	217 (8.54)	48.6 (1.91)	–	51.6 (2.03)
63.5 mm	2 1/2"	112 (4.41)	27.5 (1.08)	263 (10.35)	60.3 (2.37)	–	64.1 (2.52)
76.1 mm	3"	127 (5.00)			72.9 (2.87)	–	76.7 (3.02)

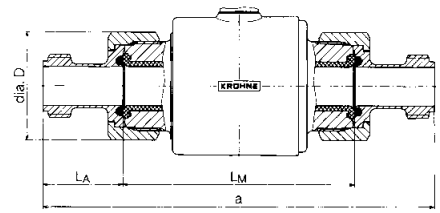
Dairy screw connection to DIN 11 851

Connection meter size	dia. D	L_A	a
DN 10 [1]	38 (1.50)	47.0 (1.85)	214 (8.43)
DN 15			
DN 25	63 (2.48)		230 (9.06)
DN 40	78 (3.07)	49.0 (1.93)	252 (9.92)
DN 50	92 (3.62)	50.0 (1.97)	260 (10.24)
DN 65	112 (4.41)	53.0 (2.09)	314 (12.36)
DN 80	127 (5.00)	66.0 (2.60)	340 (13.39)



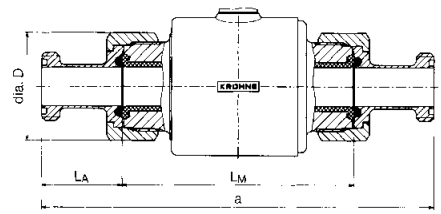
Screwed pipe connection to ISO 2853

Connection meter size		dia. D	L_A	a
12 mm [1]	–	38 (1.50)	53.0 (2.09)	226 (8.90)
18 mm	–			
25 mm	–	63 (2.48)	45.0 (1.77)	
38 mm	1 1/2"	78 (3.07)	49.5 (1.95)	253 (9.96)
51 mm	2"	92 (3.62)	51.5 (2.03)	263 (10.35)
63.5 mm	2 1/2"	112 (4.41)	50.5 (1.99)	309 (12.17)
76.1 mm	3"	127 (5.00)		



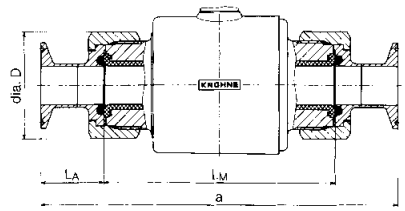
Screwed pipe connection to SMS 1145

Connection meter size	dia. D	L_A	a
25 mm	63 (2.48)	43.5 (1.71)	223 (8.78)
38 mm	78 (3.07)	51.0 (2.01)	256 (10.08)
51 mm	92 (3.62)	55.0 (2.17)	270 (10.63)
63.5 mm	112 (4.41)	59.0 (2.32)	326 (12.83)
76 mm	127 (5.00)	64.0 (2.52)	336 (13.23)



Clamp joint ISO 2852

Connection meter size		dia. D	L_A	a
12 mm [1]	–	38 (1.50)	47.5 (1.87)	215 (8.46)
18 mm	–		51.5 (2.03)	223 (8.78)
25 mm	–	63 (2.48)	43.5 (1.71)	
38 mm	1 1/2"	78 (3.07)	48.0 (1.89)	250 (9.84)
51 mm	2"	92 (3.62)	55.0 (2.17)	270 (10.63)
63.5 mm	2 1/2"	112 (4.41)	59.0 (2.32)	326 (12.83)
76.1 mm	3"	127 (5.00)		



1) for IFS 6000 primary heads, sizes DN 2.5 – 10 / 1/10" – 3/8"
2) not to ISO 2037, but dimensions same as connection "25 mm" to ISO 2037

4 Installation of primary heads IFS 4000/IFS 4005 and M 900

4.1 Scope of supply

- Primary head in the size as ordered
- Connecting wires V, refer to Sect. 4.6 "Grounding"
- Grounding rings E (optional), if ordered
- Installation instructions for the primary head
- Calibration certificate for the primary head

Not included: fitting accessories (stud bolts, gaskets, etc.), to be provided by customer.

4.2 Limits (operating pressure, process temperature and vacuum load

- The limits for temperature and pressure specified in the tables take the liner and flange standard into account.
- If the field coils have **insulation class E, the max. process temperature** is limited to **120°C/248°F. Insulation class H** is required for **temperatures above 120°C/248°F.**
- Refer to certificates of conformity for max. allowable operating data for "Ex" versions, provided only with hazardous-duty equipment.
- **Operation with SC 150 high-power signal converter:** meter sizes ≥ DN 50 / ≥ 2"
  process temperature ≤ 120°C / ≤ 248°F

Limits for PFA and PTFE

Liner	Flange standard	Nominal diameter of measuring tube and flanges	Flange pressure rating or class	S= Standard O= Option	Max. operating pressure in bar (and psig) at a product 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 (≤ 285°F)	≤ 180°C (≤ 355°F)
PFA	DIN 2501	DN 25–50, DN 80	PN 40	S	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)
		DN 65, DN 100–150	PN 16	S	16 (230)	16 (230)	16 (230)	16 (230)	16 (230)	16 (230)	16 (230)	16 (230)
	ANSI B 16.5	1"–6"	150 lb	S	19.6 (284)	19 (275)	18.7 (271)	18.1 (262)	17.7 (256)	17 (246)	16.2 (235)	14.7 (213)
PTFE	DIN 2501	DN 10–50, DN 80	PN 40	S	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	on request
		DN 65, DN 100–150	PN 16	S	16 (230)	16 (230)	16 (230)	16 (230)	16 (230)	16 (230)	16 (230)	16 (230)
		DN 200–600	PN 10	S	10 (150)	10 (150)	10 (150)	10 (150)	10 (150)	10 (150)	10 (150)	10 (150)
		DN 65, DN 100–150	PN 40	O	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	on request
		DN 200–600	PN 16	O	16 (230)	16 (230)	16 (230)	16 (230)	16 (230)	16 (230)	16 (230)	16 (230)
		≥ DN 700	≥ PN 10	S/O	on request							
	ANSI B 16.5	3/8"–24"	150 lb	S	19.6 (284)	19 (275)	18.7 (271)	18.1 (262)	17.7 (256)	17 (246)	16.2 (235)	14.7 (213)
		3/8"–24"	300 lb	O	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	40 (580)	on request
		≥ 28"	≥ 150 lb	S/O	on request							

Limits for neoprene, irethane, hard and soft rubber

Liner	Flange standard	Nominal diameter of measuring tube and flanges	Flange pressure rating or class	S= Standard O= Option	Max. operating pressure in bar (and psig) at max. possible product temperature of ...							
					Soft rubber ≤ 40°C (≤ 105°F)		Neoprene ≤ 60°C (≤ 140°F)		Irethane ≤ 70°C (≤ 158°F)		Hard rubber ≤ 90°C (≤ 195°F)	
Neoprene, irethane, hard and soft rubber	DIN 2501	DN 25–50, DN 80	PN 40	S	40	(580)	40	(580)	40	(580)	40	(580)
		DN 65, DN 100–150	PN 16	S	16	(230)	16	(230)	16	(230)	16	(230)
		DN 200–1000	PN 10	S	10	(150)	10	(150)	10	(150)	10	(150)
		DN 25–1000	PN 16–1500	O	* 16-64	(150-920)	* 16-100	(150-1450)	* 16-1500	(150-20000)	* 16-80	(150–1160)
		≥ DN 1100	PN 2.5–6	S/O	* 2.5-6	(37-90)	* 2.5-6	(37-90)	* 2.6-6	(37-90)	* 2.5-6	(37-90)
	ANSI B 16.5	1"–40"	150 lb	S	** ≤ 19.6	(≤ 284)	** ≤ 19.0	(≤ 275)	** ≤ 18.7	(≤ 271)	** ≤ 18.1	(≤ 262)
		1"–40"	300 lb	O	** ≤ 50.8	(≤ 737)	** ≤ 49.2	(≤ 714)	** ≤ 48.4	(≤ 702)	** ≤ 46.8	(≤ 679)
		1"–40"	600 lb	O	≤ 64	(≤ 920)	≤ 100	(≤ 1450)	≤ 100	(≤ 1450)	≤ 80	(≤ 1160)
	AWWA	≥ 24"	B	S	6	(90)	6	(90)	6	(90)	6	(90)
		≥ 24"	D	O	10	(150)	10	(150)	10	(150)	10	(150)
	API 6 BX	≥ 1"	20000 psig	O	–		–		≤ 1500	(≤ 20000)	–	

* dependent on flange pressure rating
** dependent on product temperature

Vacuum load

Liner	Meter size		Max. allowed vacuum load in mbar abs. (and psia) at a product 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 (≤ 285°F)	≤ 180°C (≤ 355°F)
PFA	25 – 150	1 – 6	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	150 (2.2)	200 (2.9)
PTFE	10 – 20	3/8 – 3/4	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	500 (7.3)	750 (10.9)	1000 (14.5)
	25 – 150 (M 900)	1 – 6 (M 900)	no vacuum allowed, use IFS 4000 or IFS 5000							
	200 – 600	8 – 24	500 (7.3)	750 (10.9)	1000 (14.5)	1000 (14.5)	1000 (14.5)	1000 (14.5)	1000 (14.5)	1000 (14.5)
	700 – 800	28 – 32	on request							
Neoprene	25 – 300	1 – 12	400 (5.6)	400 (5.6)	–	–	–	–	–	–
	350 – 3000	14 – 120	600 (8.7)	600 (8.7)	–	–	–	–	–	–
Irethane	25 – 3000	1 – 120	500 (7.3)	–	–	–	–	–	–	–
Hard rubber	25 – 300	1 – 12	250 (3.6)	400 (5.8)	400 (5.8)	400 (5.8)	–	–	–	–
	350 – 3000	14 – 120	500 (7.3)	600 (8.7)	600 (8.7)	600 (8.7)	–	–	–	–
Soft rubber	25 – 300	1 – 12	500 (7.3)	–	–	–	–	–	–	–
	350 – 3000	14 – 120	600 (8.7)	–	–	–	–	–	–	–

4.3 Installation requirements

4.3.1 Liners

- **Neoprene and hard-rubber liners**
  Note temperature limits

- Storage: – 20 to + 60 °C (– 4 to + 140 °F), keep immobile
- Transport: – 5 to + 50 °C (+ 23 to + 122 °F)
- Process: Neoprene – 20 to + 60 °C (– 4 to + 140 °F)
  Hard rubber – 20 to + 90 °C (– 4 to + 194 °F)
  [Temperatures below – 5 °C (+ 23 °F) are only permissible if the pipe run is supported on both sides of the flowmeter, and providing there is only slight vibration and no water hammer in the pipe.]

Gaskets are necessary for hard-rubber liners, e.g. Neoprene or soft-rubber gaskets.

Max. torques: see Sect. 4.5, Column B

- **PTFE liner**

Install to avoid an excessive vacuum condition at the meter.
The PTFE liner is formed around the ends of the flanges, **do not** remove or damage.
The flanges are factory-fitted with special **protection covers.** Do not remove these until just before installation. Replace by pieces of smooth sheet metal [0.3 to 0.6 mm (0.012" to 0.024") thick] when fitting the flowmeter between the pipe flanges (to be removed after installation).
Attached protective rings can optionally be supplied, in which case the above-mentioned sheet metal pieces are not required. These protective rings can simultaneously be used as grounding rings, see Sect. 4.3.2.
Max. torques: see Sect. 4.5, Column A.

- **Irethane liner**

Important for IFS 4000/IFS 4005 primary heads with irethane liner, > 12 mm / > 0.5" thick:
The flange connections are larger than the diameter of the measuring tube! Use pipe flanges according to the following tables.

Meter size DN in mm

Measuring tube	Flanges
DN 350	DN 400
DN 400, 450	DN 500
DN 500, 550	DN 600
DN 600, 650	DN 700
DN 700, 750	DN 800
DN 800, 850	DN 900
DN 900, 950	DN 1000
DN 1000	DN 1200

Meter size in inches

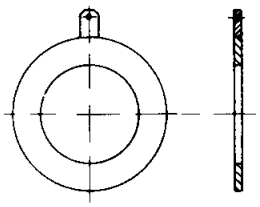
Measuring tube	Flanges
14"	16"
16", 18"	20"
20", 22"	24"
24", 26"	28"
28", 30"	32"
32", 34"	36"
36", 38"	40"
40"	48"

Max. torques (according to size of flanges!):
see Sect. 4.5, Column B

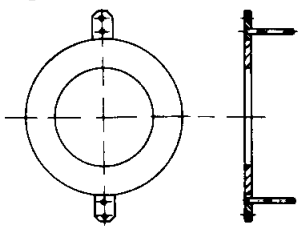
4.3.2 Grounding rings / Protective rings

- Required in conjunction with plastic or internally coated pipes.
- Grounding rings form a conductive connection with the fluid.
- Material stainless steel 1.4571 or SS 316 Ti-AISI, others on request.
- For Grounding and connection of the grounding rings, refer to Sect. 4.6

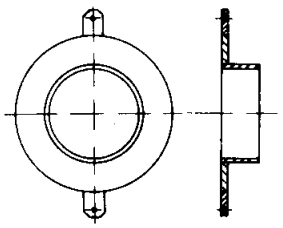
Grounding ring No. 1,
3 mm/0.12" thick.



Grounding/protective ring No. 2
for primary heads with PTFE liner, fitted to the flanges, 3 mm/0.12" thick.



Grounding/protective ring No. 3
with cylindrical neck, to protect the liner of the flowmeter particularly at the inlet edge in conjunction with abrasive fluids.



- Length 30 mm/1.18" for DN 10 to 300 or 3/8" to 12".
- Length 100 mm/3.94" for ≥ DN 350 or ≥ 14".

4.4 Other versions

4.4.1 IFS 4000 and M 900 in the food industry

IFS 4000 and M 900 are also suitable for use in the food and beverage industry. The electrodes, terminal box, and the M 900 housing, are optionally available in stainless steel. The liner consists of PTFE or PFA.

In installed condition, the measuring tube can be pigged or, for example, cleaned with steam up to 140°C/284°F.

Special food approved connections for the M 900 are:
- Dairy screw connection to DIN 11851, DN 10–125/PN 10
- Clamp connections 1"–4"

(pipe adapters included with flowmeter.)

4.4.2 IFS 4000 and M 900 in hazardous areas

In connection with "Ex" signal converters, the IFS 4000-EEx and M 900-Ex primary heads are approved as electrical equipment in conformity with the harmonized European Standards and Factory Mutual (FM).

Only the primary heads are permitted to be installed in the hazardous area. The signal converter must always be installed **outside** the hazardous area.

Allocation of temperature class to temperature of the fluid, meter size and material of the measuring tube liner is specified in the test certificate.

Since the intrinsically safe signal circuit is grounded under field conditions via the fluid, equipotential bonding is required in the entire hazardous area and in the cable run of the intrinsically safe signal circuit (inside and outside the hazardous area).

Test certificate, certificate of conformity and wiring instructions are attached to the Installation and Operating Instructions (applies only to hazardous-duty equipment).

4.4.3 IFS 4005 and SC 150 high-power signal converter

The IFS 4005 primary head is designed for higher level field currents and field frequencies in conjunction with the SC 150 signal converter. The double coil insulation is designed in conformity with insulation class II. A special protective grounding system is not required. Please refer to the **SC 150 installation and operating instructions** for electrical connection, (initial) startup, operator control of the signal converter, service, etc.

4.4.4 M 900 HJ with heating jacket

- M 900 HJ primary heads with heating jacket are available for DN 10 to 100 or 3/8" to 4" meter sizes (for dimensions see Sect. 4.9).
- The two connecting flanges for the heating jacket are designed to DIN 2501, DN 15, PN 40 or to ANSI, 1/2", 150 lb.
- Max. operating pressure of heating medium: 10 bar / 150 psig.
- The maximum permissible temperature of the heating medium, in liquid or vapor state, is governed by the insulation class of the field coils (**E** up to 120 °C / 248 °F, **H** up to 180 °C / 356 °F) and the liner used for the measuring tube. Refer to Sect. 4.2 for max. permissible operating data.

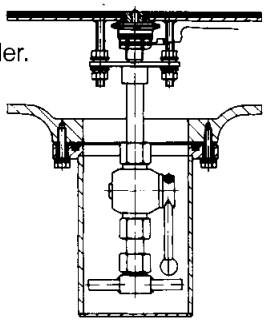
4.4.5 Field replaceable electrodes WE

M 900: DN 50 - 300 or 2" - 12"
IFS 4000/IFS 4005: DN ≥ 350 or ≥ 14"

This design enables the electrodes to be removed under operating conditions and efficiently cleaned.

To remove, undo the holding screws on the protective caps. Unscrew the electrodes and pull them out until the ring mark is visible on the electrode shaft. Close valve and withdraw electrode completely.

After cleaning, install in the reverse order.



4.5 Torques for IFS 4000 / IFS 4005 and M 900

Bolts: tighten uniformly in diagonally opposite sequence, see Table for number and type
Column A for PTFE and PFA liners
Column B for Neoprene, Irethane, hard and soft rubber liners
IFS 4000/IFS 4005 with Irethane liner, thickness > 12 mm / > 0.50": maximum torques refer to nominal diameter of connecting flange and not to nominal diameter of measuring tube, see Sect. 4.3.1 "Irethane liner"!
10 Nm ~ 1.0 kpm ~ 7.23 ft lbf

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

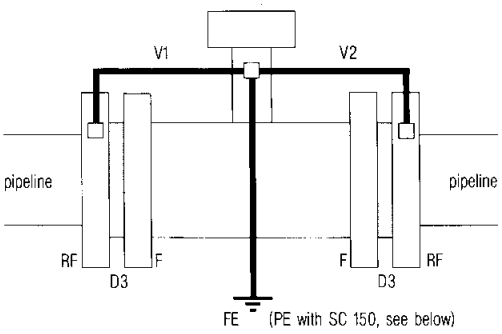
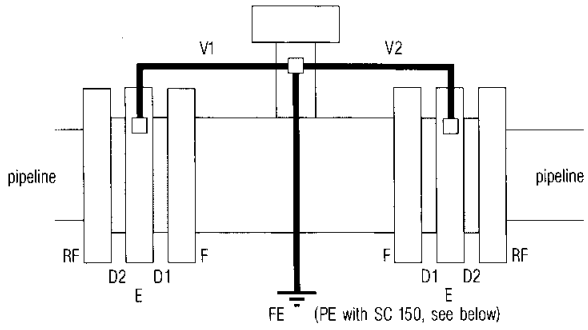
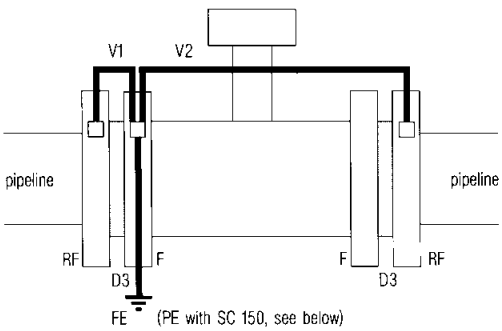
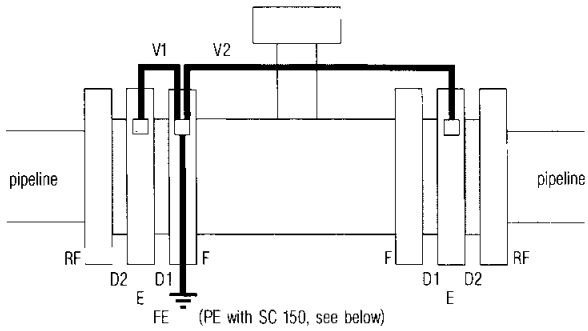
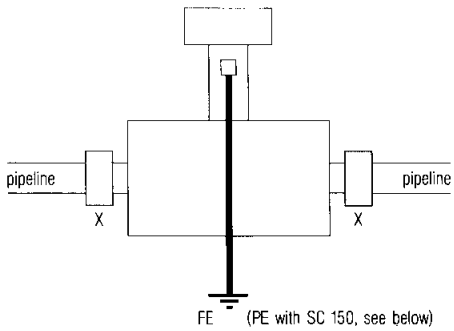
Meter size inch	Body pressure rating psig	Bolts for ANSI class 150 flanges	Max. torque Nm (ft lbf) A		B	
3/8	580	4 x 1/2"	3.5	(2.5)	3.6	(2.6)
1/2	580	4 x 1/2"	3.5	(2.5)	3.6	(2.6)
3/4	580	4 x 1/2"	4.8	(3.5)	4.8	(3.5)
1	580	4 x 1/2"	6.7	(4.8)	4.4	(3.2)
1 1/4	580	4 x 1/2"	10	(7.2)	8	(5.8)
1 1/2	580	4 x 1/2"	13	(9.4)	12	(8.7)
2	580	4 x 5/8"	24	(17.4)	23	(16.6)
2 1/2	580	4 x 5/8"	27	(19.5)	24	(17.4)
3	360	4 x 5/8"	43	(31.1)	39	(28.2)
4	230	8 x 5/8"	34	(24.6)	31	(22.4)
5	230	8 x 3/4"	53	(38.3)	47	(34.0)
6	230	8 x 3/4"	61	(44.1)	51	(36.9)
8	145	8 x 3/4"	86	(62.2)	69	(49.9)
10	145	12 x 7/8"	97	(70.2)	79	(57.1)
12	145	12 x 7/8"	119	(86.1)	104	(75.2)
14	145	12 x 1"	133	(96.2)	93	(76.2)
16	145	16 x 1"	130	(94.0)	91	(65.8)
18	145	16 x 1 1/8"	199	(143.9)	143	(103.4)
20	145	20 x 1 1/8"	182	(131.6)	127	(91.8)
24	145	20 x 1 1/4"	265	(191.6)	180	(130.1)
28	145	28 x 1 1/4"	242	(175.0)	161	(116.4)
32	145	28 x 1 1/2"	380	(274.7)	259	(187.3)
36	145	32 x 1 1/2"	–		269	(194.5)
40	145	36 x 1 1/2"	–		269	(194.5)

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

4.6 Grounding IFS 4000/IFS 4005 and M 900

- All flowmeters (primary heads) must be properly grounded.
- The ground conductor must not transmit any interference voltages. Therefore, do not connect any other electrical devices to this conductor.
- In hazardous areas, the grounding system of the primary head is also used for equipotential bonding, refer to Sect. 4.4.2 and special "Ex" installation instructions.

Warning: Instrument must be properly grounded to avoid personnel shock hazard.

	Metal pipeline, not internally coated Grounding without grounding rings	**Plastic pipeline and internally coated metal pipeline** Grounding with grounding rings (option)
IFS 4000 / IFS 4005		
M 900		
M 900 sanitary version		Refer to Section 4.10 for grounding of pipelines with cathodic protection.

D1, D2, D3 **Gaskets,** not included with supply, to be provided by customer.

E **Grounding rings,** option, see Sect. 4.3.2.

F **Flowmeter flanges**

FE **Functional ground,** wire ≥ 4 mm² (10 AWG) Cu, not included with supply, to be provided by customer.
IFS 4000/IFS 4005: connected to U-clamp terminal on "neck" of primary head.
M 900: connected to flowmeter flange F, but for sanitary version connected to "neck" of the M 900. Fit cable lug to FE for M6 bolt (or M8 if meter size ≥ DN 40 / ≥ 1½"), not included with supply, to be provided by customer.

RF **Pipe flanges**

V1, V2 **Connecting wires,** bolted to the "neck" of the IFS 4000 / IFS 4005 or to flange F of the M 900. For flange-side (RF) connection, threaded holes to be provided for M6 bolts (M8 for M 900 ≥ DN 40 / ≥ 1½"). For connection of grounding rings E use factory-supplied mounting material.

X **Sanitary screw connections**
to DIN 11851 or clamp connections.

PE A **PE protective ground** must be connected when IFS 4000 and M 900 standard primary heads are operated with the SC 150 signal converter. Wire ≥ 4 mm² (10 AWG) Cu, not included with flowmeter, to be provided by customer.
IFS 4000: connected to the U-clamp terminal on the "neck" of the primary head.
M 900: connected to flange F of the primary head, to the "neck" of the M 900 if food version. Fit cable FE with cable lug for M6 screw (or M8 where > DN 40 or < 1½"), not included with flowmeter, to be provided by customer.

4.7 Technical data IFS 4000 / IFS 4005 and M 900

Primary head Standard High-power version	**M 900** –	**IFS 4000** **IFS 4005**
Versions/meter sizes with flange connections	DN 10–300 and $^3/_8$"–12"	IFS 4000: DN 10–3000 and $^3/_8$"–120" IFS 4005: DN 50–3000 and 2"–120"
for the food industry Sanitary connection DIN 11851	Meter sizes DN 10–25 Pressure rating PN 10	–
Clamp connection	Measuring tube nom. dia. 1" to 4"	–
SMS connection	on request	–
Rated pressure	dependent on meter size, connecting flange, liner and process temperature, see Sect. 4.2 "Limits"	dependent on meter size, connecting flange, liner and process temperature, see Sect. 4.2 "Limits"
Connecting flanges to DIN 2501 (= BS 4504)	DN 10 to 50 and DN 80: PN 40 DN 65 and DN 100 to 150: PN 16 DN 200 to 300: PN 10	DN 10 to 50 and DN 80: PN 40 DN 65 and DN 100 to 150: PN 16 DN 200 to 1000: PN 10 DN 1100 to 2000: PN 6 DN 2200 to 3000: PN 2.5
to ANSI	$^3/_8$" to 12" Class 150 or 300 lb / RF	$^3/_8$" to 24" Class 150 lb / RF
to AWWA	–	24" to 120" / Class B or D / FF
Special versions	on request	on request
Electrical conductivity	≥ 5 µS/cm (µmho/cm); ≥ 20 µS/cm (µmho/cm) for demineralized cold water	≥ 5 µS/cm (µmho/cm); ≥ 20 µS/cm (µmho/cm) for demineralized cold water
Process temperature (see Sect. 10.5)	– 60 to + 180°C **or** – 76 to + 356°F	– 60 to + 180°C **or** – 76 to + 356°F
Ambient temperature	– 25 to + 60°C **or** – 13 to + 140°F	– 25 to + 60°C **or** – 13 to + 140°F
Insulation class of field coils Standard	E	DN 10 to 300 ($^3/_8$" to 12"): H DN 350 to 3000 (14" to 120"): E
Special version	H	DN 350 to 3000 (14" to 120"): H
Power supply for field coils	from converter	from converter
Electrode design Standard	flat elliptical, solidly fitted, surface-polished, self-cleaning	DN 25 to 150 **or** 1" to 6 " replaceable when measuring tube drained DN 10 to 20 / DN 200 to 3000 **or** $^3/_8$" to $^3/_4$" / 8" to 120" flat elliptical, surface-polished, self-cleaning
Special version	DN 50 to 300 **or** 2" to 12" field replaceable electrodes WE	DN 350 to 3000 **or** 14" to 120" field replaceable electrodes WE (not IFS 4005)
Protection category (to IEC 529 / EN 60 529) Standard	IP 65 equivalent to NEMA 4 and 4X	IP 67 equivalent to NEMA 6 (IP 65 equivalent to NEMA 4 and 4X with field replaceable electrodes WE)
Special version	IP 67, IP 68 equivalent to NEMA 6	IP 68 equivalent to NEMA 6 (not IFS 4005)
Grounding rings	available as option	available as option

Primary head Standard High-power version	**M 900** –	**IFS 4000** **IFS 4005**
Materials		
Measuring tube	stainless steel (1.4301 or higher material number) equivalent to SS 304 – AISI	stainless steel (1.4301 or higher material number) equivalent to SS 304 – AISI
Liner		
Standard: DN 10–20 or $^3/_8$ – $^3/_4$"	PTFE	PTFE
DN 25–150 or 1" – 6"	hard rubber or PTFE	PFA (reinforced with stainless steel mesh)
≥ DN 200 or ≥ 8"	hard rubber or PTFE	hard rubber or PTFE
Special versions		
≥ DN 200 or ≥ 8"	irethane, soft rubber, Neoprene, others on request	irethane, soft rubber, Neoprene, others on request
Food version	PTFE	–
Electrodes		
Standard	Hastelloy C4	Hastelloy C4
Special versions	stainless steel 1.4571 or SS 316 Ti – AISI, Hastelloy B2, titanium, tantalum, platinum, others on request	stainless steel 1.4571 or SS 316 Ti – AISI, Hastelloy B2, titanium, tantalum, platinum, platinum/iridium, others on request
Food version	stainless steel 1.4571 or SS 316 Ti – AISI	–
Field replaceable electrodes WE	stainless steel 1.4571 or SS 316 Ti – AISI	stainless steel 1.4571 or SS 316 Ti – AISI
Housing *		
DN 10 – 40 or $^3/_8$" – $1^1/_2$"	sheet steel	GTW 30
≥ DN 50 or ≥ 2"	sheet steel	sheet steel
Food version	optionally stainless steel 1.4571 or SS 316 Ti – AISI with or without enamel finish	–
Terminal box		
Standard	die-cast aluminium *	die-cast aluminium *
Food version	as option stainless steel 1.4301 or SS 304-AISI	as option stainless steel 1.4301 or SS 304-AISI
Connecting flanges *		
to DIN 2501: DN 10 – 50, DN 80	steel 1.0402 (C22) or AISI: C 1020	steel 1.0402 (C22) or AISI: C 1020
DN 65, ≥ DN 100	steel 1.0501 (RST 37.2) or AISI: C 1035	steel 1.0501 (RST 37.2) or AISI: C 1035
to ANSI B 16.5	steel ASTM A 105 N	steel ASTM A 105 N
Cable entries		
Standard	brass, nickel-plated	brass, nickel-plated
Special	polyamide (PA)	polyamide (PA)
Grounding rings	stainless steel 1.4571 or SS 316 Ti – AISI	stainless steel 1.4571 or SS 316 Ti – AISI

* with polyurethane finish

4.8 Dimensions and weights IFS 4000 / IFS 4005

Flanged connections
... DIN 2501 (=BS 4504) / DN 10–300 / PN 40, 16 or 10: see Table
... ANSI B 16.5 / 3/8"–12" / Class 150 lb / RF: see Table

Dimensions in mm (inch)

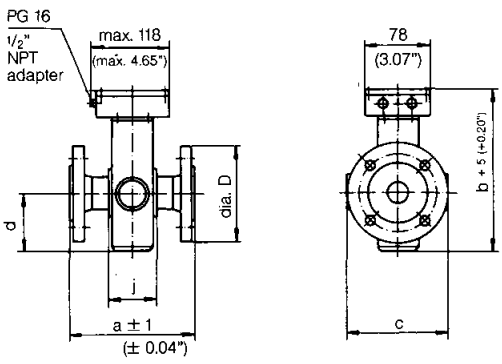
Dimension a without flange gaskets: Not supplied with flowmeter, to be provided by customer.

*** Meter size 3/8":** Flanged connection 1/2"

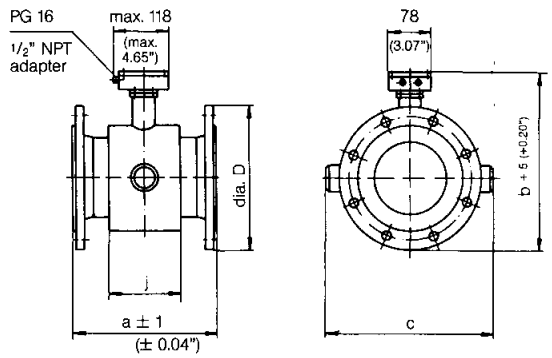
Meter size to ...			**Dimensions** in mm (inch)							**Approx. weight**
DIN		**ANSI**								
DN mm	PN	inch	a	b	c	d	j	dia. D_{DIN}	dia. D_{ANSI}	in kg (lb)
10	40	3/8*	150 (5.91)	231 (9.09)	121 (4.76)	61 (2.40)	58 (2.28)	90 (3.54)	88.9 (3.50)	4 (8.8)
15	40	1/2	150 (5.91)	231 (9.09)	121 (4.76)	61 (2.40)	58 (2.28)	95 (3.74)	88.9 (3.50)	4 (8.8)
20	40	3/4	150 (5.91)	231 (9.09)	121 (4.76)	61 (2.40)	58 (2.28)	105 (4.13)	98.6 (3.89)	6 (13)
25	40	1	150 (5.91)	231 (9.09)	121 (4.76)	61 (2.40)	58 (2.28)	115 (4.53)	108.0 (4.25)	6 (13)
32	40	–	150 (5.91)	247 (9.72)	139 (5.47)	70 (2.76)	73 (2.87)	140 (5.51)	–	7 (15)
40	40	1 1/2	150 (5.91)	252 (9.92)	150 (5.91)	75 (2.95)	73 (2.87)	150 (5.91)	127.0 (5.00)	7 (15)
50	40	2	200 (7.87)	290 (11.42)	181 (7.13)	–	99 (3.90)	165 (6.50)	152.4 (6.00)	8 (18)
65	16	–	200 (7.87)	300 (11.81)	181 (7.13)	–	99 (3.90)	185 (7.28)	–	12 (27)
80	40	3	200 (7.87)	307 (12.09)	195 (7.68)	–	99 (3.90)	200 (7.87)	190.5 (7.50)	12 (27)
100	16	4	250 (9.84)	358 (14.09)	257 (10.12)	–	131 (5.16)	220 (8.66)	228.6 (9.00)	14 (31)
125	16	–	250 (9.84)	369 (14.53)	257 (10.12)	–	131 (5.16)	250 (9.84)	–	19 (42)
150	16	6	300 (11.81)	399 (15.71)	281 (11.06)	–	143 (5.63)	285 (11.22)	279.4 (11.00)	22 (49)
200	10	8	350 (13.78)	457 (17.99)	342 (13.46)	–	177 (6.97)	340 (13.39)	342.9 (13.50)	35 (77)
250	10	10	400 (15.75)	509 (20.04)	383 (15.08)	–	205 (8.07)	395 (15.55)	406.4 (16.00)	49 (108)
300	10	12	500 (19.69)	572 (22.52)	433 (17.05)	–	235 (9.25)	445 (17.52)	482.6 (19.00)	61 (134)

IFS 4000 / IFS 4005

DN 10 – 40
3/8" – 1 1/2"

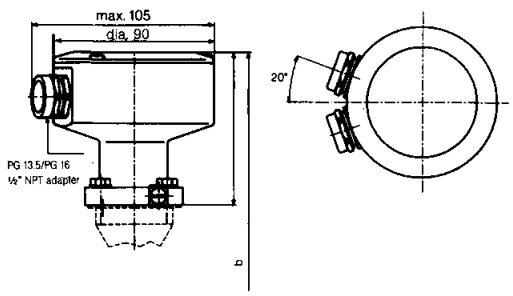


DN 50 – 300
2" – 12"



Stainless steel outlet box (option)

Overall height "dimension b" – no change



Flanged connections

... DIN 2501 (=BS 4504) / DN 350–2000 / PN 10 or 6: see Table, dimension a_{DIN}
... DIN 2501 (=BS 4504) / DN 350–2000 / PN 25: see Table, dimension a_{DIN} + 200 mm or + 7.87"
... ANSI B 16.5 / 14" – 40" / Class 150 lb / RF: see Table, dimension a_{ANSI}
... ANSI B 16.5 / 14" – 40" / Class ≥ 300 lb / RF: Dimensions supplied on request
... AWWA / ≥ 24" / Class B or D / FF: Dimensions supplied on request

Dimensions in mm (inch)

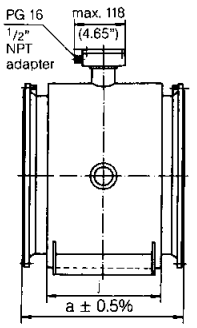
Dimension a without flanged gaskets: Not supplied with flowmeter, to be provided by customer

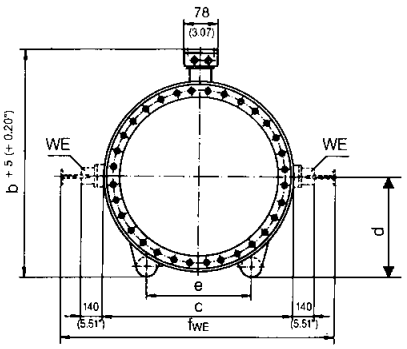
Irethane liner, thickness > 12 mm/> 0.5": Size of flange greater than size of measuring tube, see Tables below.

Meter size to ...			**Dimensions** in mm (inch)							**Approx. weight**
DIN		**ANSI**								
DN mm	PN	inch	a_{DIN}	a_{ANSI}	b	c	d	e	j	in kg (lb)
350	10	14	500 (19.69)	700 (27.56)	753 (29.65)	570 (22.44)	329 (12.95)	332 (13.07)	305 (12.01)	145 (320)
400	10	16	600 (23.62)	800 (31.50)	802 (31.57)	620 (24.41)	353 (13.90)	349 (13.74)	385 (15.16)	180 (400)
500	10	20	600 (23.62)	800 (31.50)	903 (35.55)	720 (28.35)	404 (15.91)	371 (14.61)	385 (15.16)	240 (530)
600	10	24	600 (23.62)	800 (31.50)	1005 (39.57)	822 (32.36)	455 (17.91)	493 (19.41)	385 (15.16)	330 (730)
700	10	28	700 (27.56)	900 (35.43)	1105 (43.50)	922 (36.30)	505 (19.88)	521 (20.51)	465 (18.31)	430 (950)
800	10	32	800 (31.50)	1000 (39.37)	1206 (47.48)	1024 (40.31)	555 (21.85)	555 (21.85)	545 (21.46)	540 (1190)
900	10	36	900 (35.43)	1100 (43.31)	1306 (51.42)	1122 (44.17)	606 (23.86)	569 (22.40)	635 (25.00)	650 (1440)
1000	10	40	1000 (39.37)	1200 (47.24)	1406 (55.35)	1222 (48.11)	656 (25.83)	645 (25.39)	705 (27.76)	800 (1770)
1200	6	48	1200 (47.24)	–	1627 (64.06)	1424 (56.06)	776 (30.55)	792 (31.18)	865 (34.06)	870 (1920)
1400	6	56	1400 (55.12)	–	1823 (71.77)	1624 (63.94)	872 (34.33)	858 (33.78)	1045 (41.14)	1230 (2720)
1600	6	64	1600 (62.99)	–	2033 (80.04)	1826 (71.89)	981 (38.62)	876 (34.49)	1245 (49.02)	1550 (3420)
1800	6	72	1800 (70.87)	–	2227 (87.68)	2026 (79.76)	1075 (42.32)	1053 (41.46)	1405 (55.31)	2080 (4590)
2000	6	80	2000 (78.74)	–	2428 (95.59)	2229 (87.76)	1175 (46.26)	1108 (43.62)	1605 (63.19)	2600 (5740)

IFS 4000/IFS 4005

DN 350 – 2000
14" – 40"





Flange size for irethane liner, thickness > 12 mm/> 0.5"

Nominal size DN in mm (DIN 2501)

Measuring tube	Flanges
DN 350	DN 400
DN 400, 450	DN 500
DN 500, 550	DN 600
DN 600, 650	DN 700
DN 700, 750	DN 800
DN 800, 850	DN 900
DN 900, 950	DN 1000
DN 1000	DN 1200

Nominal size in inch (ANSI B 16.5)

Measuring tube	Flanges
14"	16"
16", 18"	20"
20", 22"	24"
24", 26"	28"
28", 30"	32"
32", 34"	36"
36", 38"	40"
40"	48"

WE = Field replaceable electrodes
f_{WE} = Dimension c + 900 mm or c + 35.50" (minimum dimension)

4.9 Dimensions and weights M 900

Flanged connections
... DIN 2501 (=BS 4504) / DN 10–300 / PN 40, 16 or 10: see Table
... ANSI B 16.5 / 3/8"–12" / Class 150 lb / RF: see Table
... ANSI B 16.5 / 3/8"–12" / Class ≥ 300 lb / RF: dimensions on request

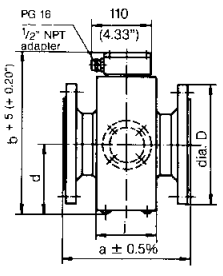
Dimensions in mm and (inch)

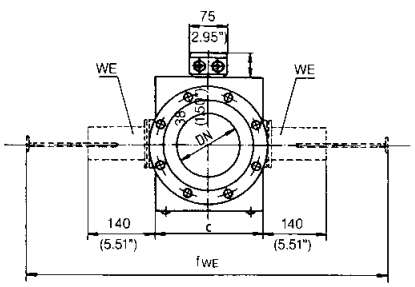
Dimension a without flange gaskets: Not supplied with flowmeter, to be provided by customer.
*** Meter size 3/8":** Flanged connection 1/2"
WE = Field replaceable electrodes, optional for meter sizes DN 50 – 300 and 2" – 12"
f_{WE} = Dimension c + 900 mm or c + 35.50" (minimum dimension)

Meter size to ...			**Dimensions** in mm (inch)							**Approx. weight**
DIN		**ANSI**								
DN mm	PN	inch	a	b	c	d	j	dia. D_{DIN}	dia. D_{ANSI}	in kg (lb)
10	40	3/8*	200 (7.87)	169 (6.65)	92 (3.62)	66 (2.60)	70 (2.76)	90 (3.54)	88.9 (3.50)	10 (22)
15	40	1/2	200 (7.87)	169 (6.65)	92 (3.62)	66 (2.60)	70 (2.76)	95 (3.74)	88.9 (3.50)	10 (22)
20	40	3/4	200 (7.87)	169 (6.65)	92 (3.62)	66 (2.60)	70 (2.76)	105 (4.13)	98.6 (3.89)	10 (22)
25	40	1	200 (7.87)	191 (7.52)	96 (3.78)	77 (3.03)	94 (3.70)	115 (4.53)	108.0 (4.25)	11 (24)
32	40	1 1/4	200 (7.87)	191 (7.52)	96 (3.78)	77 (3.03)	94 (3.70)	140 (5.51)	117.3 (4.62)	11 (24)
40	40	1 1/2	200 (7.87)	236 (9.29)	184 (7.24)	99 (3.90)	94 (3.70)	150 (5.91)	127.0 (5.00)	13 (29)
50	40	2	200 (7.87)	236 (9.29)	184 (7.24)	99 (3.90)	94 (3.70)	165 (6.50)	152.4 (6.00)	14 (31)
65	16	2 1/2	200 (7.87)	256 (10.08)	184 (7.24)	109 (4.29)	94 (3.70)	185 (7.28)	177.8 (7.00)	15 (33)
80	40	3	200 (7.87)	256 (10.08)	184 (7.24)	109 (4.29)	94 (3.70)	200 (7.87)	190.5 (7.50)	17 (37)
100	16	4	250 (9.84)	316 (12.44)	234 (9.21)	139 (5.47)	125 (4.92)	220 (8.66)	228.6 (9.00)	28 (62)
125	16	5	250 (9.84)	316 (12.44)	234 (9.21)	139 (5.47)	125 (4.92)	250 (9.84)	254.0 (10.00)	35 (77)
150	16	6	300 (11.81)	336 (13.23)	266 (10.47)	149 (5.87)	172 (6.77)	285 (11.22)	279.4 (11.00)	45 (99)
200	10	8	350 (13.78)	396 (15.59)	354 (13.94)	179 (7.05)	210 (8.27)	340 (13.39)	342.9 (13.50)	56 (123)
250	10	10	400 (15.75)	456 (17.95)	434 (17.09)	209 (8.23)	244 (9.61)	395 (15.55)	406.4 (16.00)	75 (165)
300	10	12	500 (19.69)	532 (20.94)	490 (19.29)	247(9.72)	280 (11.02)	445 (17.52)	482.6 (19.00)	110 (243)

M 900

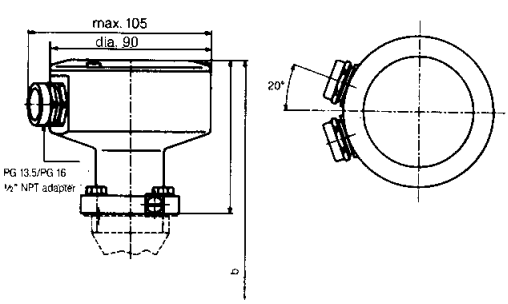
DN 10 – 300
3/8" – 12"





Stainless steel outlet box (option)

Overall height "dimension b" – no change



M 900 with sanitary connection to DIN 11851
Dimensions in mm and (inch)

* For stainless steel housing: Dimension c + 14 mm or + 0.55"

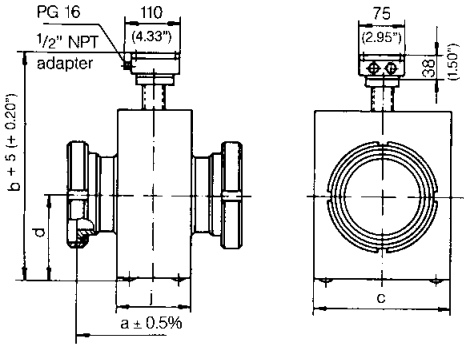
Meter size	**Dimensions** in mm (inch)					**Weight**
DN mm	a	b	c*	d	j	in kg (lb)
10 and 20	200 (7.87)	223 (8.78)	92 (3.62)	66 (2.60)	70 (2.76)	10 (22)
25 and 32	200 (7.87)	245 (9.65)	96 (3.78)	77 (3.03)	94 (3.70)	10 (22)
40 and 50	200 (7.87)	290 (11.42)	184 (7.24)	99 (3.90)	94 (3.70)	13 (29)
65 and 80	200 (7.87)	310 (12.20)	184 (7.24)	109 (4.29)	94 (3.70)	16 (35)
100 and 125	250 (9.84)	370 (14.57)	234 (9.21)	139 (5.47)	125 (4.92)	30 (66)

M 900 with clamp connection
Dimensions in mm and (inch)

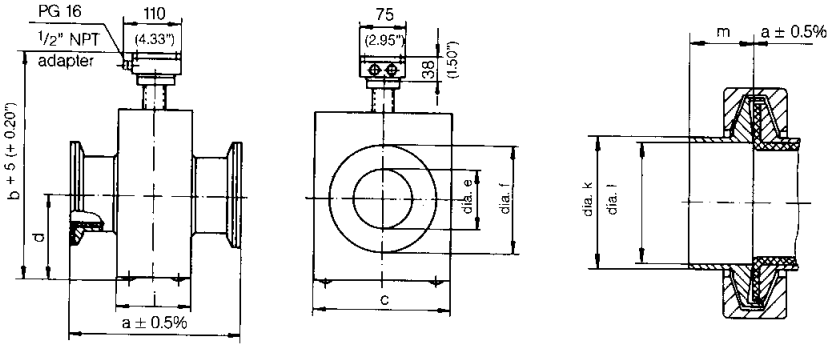
* For stainless steel housing: Dimension c + 14 mm or + 0.55"

Meter size	**Dimension** in mm (inch)										**Weight**
inch	a	b	c*	d	dia. e	dia. f	j	dia. k	dia. l	m	in kg (lb)
1	200 (7.87)	245 (9.65)	96 (3.78)	77 (3.03)	18 (0.71)	49.6 (1.95)	94 (3.70)	25.5 (1.00)	22.1 (0.87)	25.4 (1.00)	10 (22)
1 1/2	200 (7.87)	245 (9.65)	96 (3.78)	77 (3.03)	28.5 (1.12)	49.6 (1.95)	94 (3.70)	38.2 (1.50)	34.8 (1.37)	25.4 (1.00)	11 (24)
2	200 (7.87)	290 (11.42)	184 (7.24)	99 (3.90)	44 (1.73)	76.6 (3.02)	94 (3.70)	51.0 (2.01)	47.5 (1.87)	25.0 (0.98)	13 (29)
3	200 (7.87)	310 (12.20)	184 (7.24)	109 (4.29)	64 (2.52)	117.7 (4.63)	94 (3.70)	76.3 (3.00)	72.9 (2.87)	25.4 (1.00)	16 (35)
4	250 (9.84)	370 (14.57)	234 (9.21)	139 (5.47)	93 (3.66)	117.7 (4.63)	125 (4.92)	108 (4.25)	97.6 (3.84)	24.3 (0.96)	30 (66)

M 900 with sanitary connection to DIN 11851 DN 10 – 125 / PN 10



M 900 with clamp connection 1" – 4"



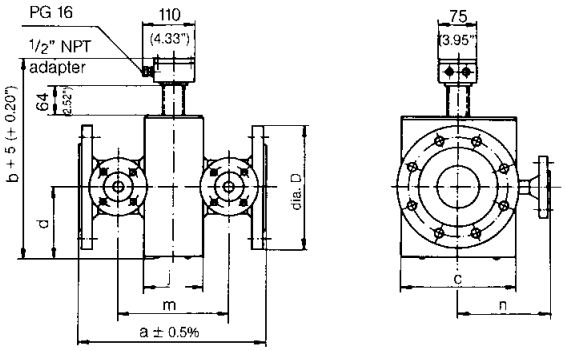
M 900 HJ primary head with heating jacket

Flange connections for measuring tube **Dimensions in mm (inch)**
... DIN 2501 (=BS 4504) / DN 10–100 / PN 40 or 16: see Table
... ANSI B 16.5 / 3/8"–4" / Class 150 lb / RF: see Table
... ANSI B 16.5 / 3/8"–4" / Class ≥ 300 lb / RF: dimensions on request

Flange connections for heating jacket
... DIN 2501 (=BS 4504) / DN 15 / PN 40 / stud bolts 4 x M 12
... ANSI B 16.5 / 1/2" / Class 150 lb / RF / stud bolts 4 x 1/2"

Dimension a without flange gaskets: Not supplied with flowmeter, to be provided by customer.

*** Meter size 3/8":** Flange connection 1/2"



Meter size to ...			**Dimensions** in mm (inch)									**Approx. Weight**
DIN		**ANSI**										
DN mm	PN	inch	a	b	c	d	j	m	n	dia. D_{DIN}	dia. D_{ANSI}	in kg (lb)
10	40	3/8*	250 (9.84)	233 (9.17)	106 (4.17)	66 (2.60)	70 (2.76)	150 (5.91)	110 (4.33)	90 (3.54)	88.9 (3.50)	18 (40)
15	40	1/2	250 (9.84)	233 (9.17)	106 (4.17)	66 (2.60)	70 (2.76)	150 (5.91)	110 (4.33)	95 (3.74)	88.9 (3.50)	18 (40)
20	40	3/4	250 (9.84)	233 (9.17)	106 (4.17)	66 (2.60)	70 (3.76)	150 (5.91)	110 (4.33)	105 (4.13)	98.6 (3.89)	18 (40)
25	40	1	250 (9.84)	255 (10.04)	109 (4.29)	77 (3.03)	94 (3.70)	150 (5.91)	110 (4.33)	115 (4.53)	108.0 (4.25)	20 (44)
32	40	1 1/4	250 (9.84)	255 (10.04)	109 (4.29)	77 (3.03)	94 (3.70)	150 (5.91)	110 (4.33)	140 (5.51)	117.3 (4.62)	20 (44)
40	40	1 1/2	250 (9.84)	300 (11.81)	198 (7.80)	99 (3.90)	94 (3.70)	150 (5.91)	160 (6.30)	150 (5.91)	127.0 (5.00)	20 (44)
50	40	2	250 (9.84)	300 (11.81)	198 (7.80)	99 (3.90)	94 (3.70)	150 (5.91)	160 (6.30)	165 (6.50)	152.4 (6.00)	21 (46)
65	16	2 1/2	250 (9.84)	380 (14.96)	248 (9.76)	139 (5.47)	125 (4.92)	160 (6.30)	160 (6.30)	185 (7.28)	177.8 (7.00)	22 (49)
80	40	3	250 (9.84)	380 (14.96)	248 (9.76)	139 (5.47)	125 (4.92)	160 (6.30)	160 (6.30)	200 (7.87)	190.5 (7.50)	25 (55)
100	16	4	300 (11.81)	380 (14.96)	248 (9.76)	139 (5.47)	125 (4.92)	180 (7.09)	180 (7.09)	220 (8.66)	228.6 (9.00)	35 (77)

4.10 Installation and grounding in pipelines with cathodic protection for IFS 4000 / 4005 and M 900

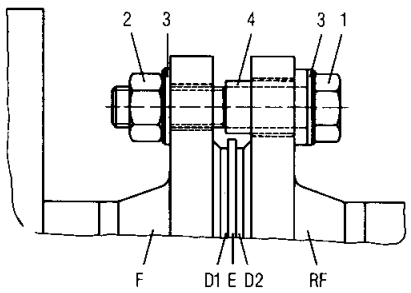
Pipes with electric corrosion protection are generally insulated inside and outside so that the liquid has no conductive connection to ground. The primary head must be insulated from the pipe. Note the following when installing the flowmeter:

- Grounding rings that are insulated from the pipe flanges must be fitted to both sides of the flowmeter. Grounding rings, flowmeter and functional ground must be interconnected.
- The pipe flanges must be connected to each other using a copper cable (L) but must not be connected to the primary head.

Warning: Instrument must be properly grounded to avoid personnel shock hazard.

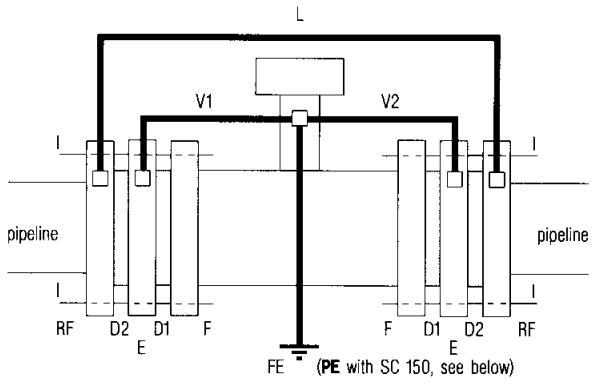
Insulated installation in the pipeline

Fit **insulated** stud bolts for the flange connections. Use **bushes and washers made of insulating material,** not included with supply, to be provided by customer.

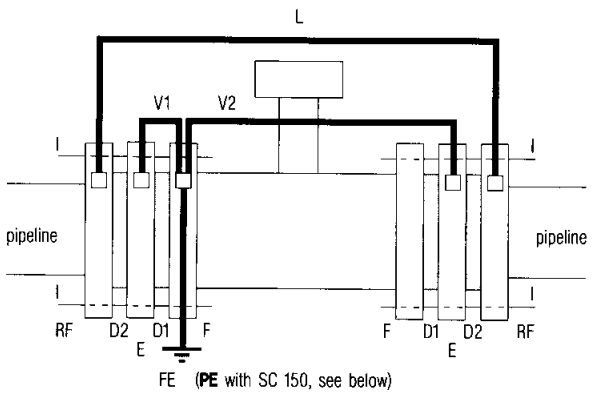


D1, D2	Gaskets, not included with supply, to be provided by customer
E	Grounding rings, option, see Sect. 4.3.2
F	Flange, primary head
RF	Pipe flanges
1	Bolt
2	Nut
3	Washer
4	Insulator

Gronding IFS 4000 / IFS 4005



Grounding M 900



D1, D2 **Gaskets,** not included with supply, to be provided by customer.

E **Grounding rings,** option, see Sect. 4.3.2.

F **Flanges, primary head**

FE **Functional ground,** cable ≥ 4 mm² Cu (10 AWG), not included with supply, to be provided by customer.
IFS 4000/IFS 4005: connection to U-clamp terminal on "neck" of primary head
M 900: connection to flange F of primary head. Equip FE cable with cable lug for M6 bolt (M8 for ≥ DN 40 or ≥ 1½"), not included with supply, to be provided by customer.

I **Insulated stud bolt**

L **Copper cable,** cross-section ≥ 4 mm² Cu (10 AWG), not included with supply, to be provided by customer.

PE A **PE protective ground** must be connected when IFS 4000 and M 900 standard primary heads are operated with the SC 150 signal converter. Wire ≥ 4 mm² (10 AWG) Cu, not included with flowmeter, to be provided by customer.
IFS 4000: connected to the U-clamp terminal on the "neck" of the primary head.
M 900: connected to flange F of the primary head, to the "neck" of the M 900 if food version. Fit cable FE with cable lug for M6 bolt (or M8 where ≥ DN 40 or ≥ 1½"), not included with flowmeter, to be provided by customer.

RF **Pipe flanges**

V1, V2 **Connecting wires,** bolted to grounding rings E and to "neck" of the IFS 4000, or to flange F of the M 900.

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

Your ALTOFLUX 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 an ALTOFLUX 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

ALTOFLUX, 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: