

AquaMaster4

Electromagnetic flowmeter flanged sensor



The ideal flowmeter for potable water distribution networks, revenue metering and irrigation applications

Measurement made easy

—
Harness the power
of electromagnetic
flowmeters

Introduction

AquaMaster4 flanged sensors are a range of high performance electromagnetic flowmeter sensors for the measurement of electrically-conductive fluids and are normally supplied as factory-configured, calibrated systems.

This publication provides end-user details for the AquaMaster4 flanged sensor range.

For more information

Further publications for AquaMaster4 are available for free download from <http://new.abb.com/products/measurement-products>

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1 Health & Safety

Document symbols

Symbols that appear in this document are explained below:



DANGER – SERIOUS DAMAGE TO HEALTH

This symbol in conjunction with the signal word 'DANGER' indicates an imminent electrical hazard. Failure to observe this safety information will result in death or severe injury.



WARNING – BODILY INJURY

This symbol in conjunction with the signal word 'WARNING' indicates a potential electrical hazard. Failure to observe this safety information will result in death or severe injury.



CAUTION – MINOR INJURIES

This symbol in conjunction with the signal word 'CAUTION' indicates a potentially dangerous situation. Failure to observe this safety information may result in minor or moderate injury. The symbol may also be used for property damage warnings.



IMPORTANT (NOTE)

This symbol indicates operator tips, particularly useful information or important information about the product or its further uses. The signal word 'IMPORTANT (NOTE)' does not indicate a dangerous or harmful situation.

Safety precautions

Be sure to read, understand and follow the instructions contained within this manual before and during use of the equipment. Failure to do so could result in bodily harm or damage to the equipment.



WARNING – BODILY INJURY

Installation, operation, maintenance and servicing must be performed:

- by suitably trained personnel only
- in accordance with the information provided in this manual
- in accordance with relevant national and local regulations

Intended use

This sensor is intended for the following uses:

- To measure the volumetric flow rate, flow velocity, volume flow (forward, reverse and net) and pressure (option) of a conductive fluid.

The sensor has been designed for use exclusively within the technical limit values indicated on the identification plate and in the data sheets.

In terms of the measuring medium, observe following points:

- Wetted parts such as measuring electrodes, liner, grounding electrodes, grounding rings, protection flanges must not be damaged by the chemical and physical characteristic of the measuring medium.
- The information on the name plate must be observed.

Improper use

The following are considered to be instances of improper use of the sensor:

- For operating as a flexible adapter in piping – for example, compensating pipe offsets, pipe vibrations, pipe expansions.
- For use as a climbing aid – for example, for mounting purposes.
- For use as a support – for example, external loads or as a support for piping.
- Material application – for example, by painting over the nameplate or welding / soldering on parts.
- Material removal – for example, by spot drilling the housing.

Potential safety hazards

FEW4 AquaMaster4 sensor – electrical



WARNING – BODILY INJURY

To ensure safe use when operating this equipment, the following points must be observed:

- Up to 240 V AC may be present. Be sure to isolate the supply before removing the terminal cover.
- Normal safety precautions must be taken to avoid the possibility of an accident occurring when operating in conditions of high pressure and / or temperature.

Safety advice concerning the use of the equipment described in this manual or any relevant Material Safety Data Sheets (where applicable) can be obtained from the Company, together with servicing and spares information.

Safety standards

This product has been designed to satisfy the requirements of IEC61010-1:2010 3rd edition 'Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use' and complies with US NEC 500, NIST and OSHA.

This equipment complies with the requirements of CEI/IEC 61010-1:2010 'Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use' and complies with US NEC 500 and Occupational Safety & Health Administration. If the equipment is used in a manner NOT specified by the Company, the protection provided by the equipment may be impaired.

Waste Electrical and Electronic Equipment (WEEE)

WEEE EU Directive 2012/19/EU covers disposal and recycling of electronic equipment at the end of life for reasons of environmental protection.



For industrial installations, portable equipment is included. This means that when the AquaMaster4 transmitter is used with a remote sensor, it is included in directive's scope and has the WEEE symbol (left) on its data label. Therefore, at the end of life, contact the supplier for specialist waste recycling. It must not be disposed of as municipal waste.

Permanent industrial installations are not designated within this directive for recycling. At the point of supply the intended use is not always known, so the WEEE symbol is included on all remote forms of the AquaMaster4 transmitter.

Product recycling and disposal (Europe only)



Electrical equipment marked with this symbol may not be disposed of in European public disposal systems after 12 August 2005. To conform to European local and national regulations (EU Directive 2012/19/EU), European electrical equipment users can now return old or end-of-life equipment to the manufacturer for disposal at no charge to the user. ABB is committed to ensuring that the risk of any environmental damage or pollution caused by any of its products is minimized as far as possible.



IMPORTANT (NOTE)

For return for recycling, please contact the equipment manufacturer or supplier for instructions on how to return end-of-life equipment for proper disposal.

... 1 Health & Safety

Information on ROHS Directive 2011/65/EU (RoHS II)

ABB, Industrial Automation, Measurement & Analytics, UK, fully supports the objectives of the ROHS II directive. All in-scope products placed on the market by IAMA UK on and following the 22nd of July 2017 and without any specific exemption, will be compliant to the ROHS II directive, 2011/65/EU.

Product symbols

Symbols that may appear on this product are shown below:



Risk of electric shock.



This symbol, when noted on a product, indicates a potential hazard which could cause serious personal injury and / or death. The user should reference this instruction manual for operation and / or safety information.



Protective earth (ground) terminal.



Functional earth (ground) terminal.



Direct current supply only.



Alternating current supply only.



This symbol, when noted on a product enclosure or barrier, indicates that a risk of electrical shock and / or electrocution exists and indicates that only individuals qualified to work with hazardous voltages should open the enclosure or remove the barrier.



Recycle separately from general waste under the WEEE directive.

2 Sensors overview

R-series | reduced bore

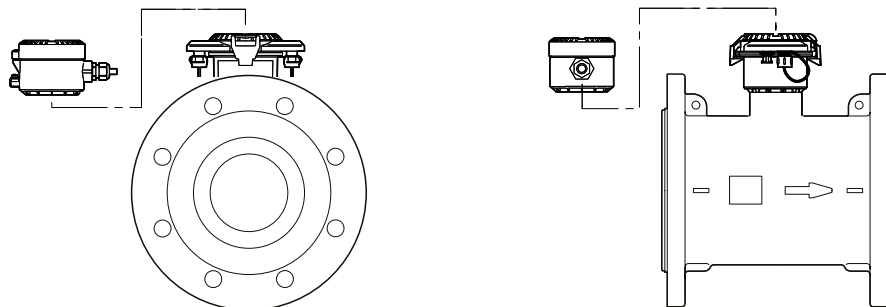


Figure 1 R-series DN40 to DN300

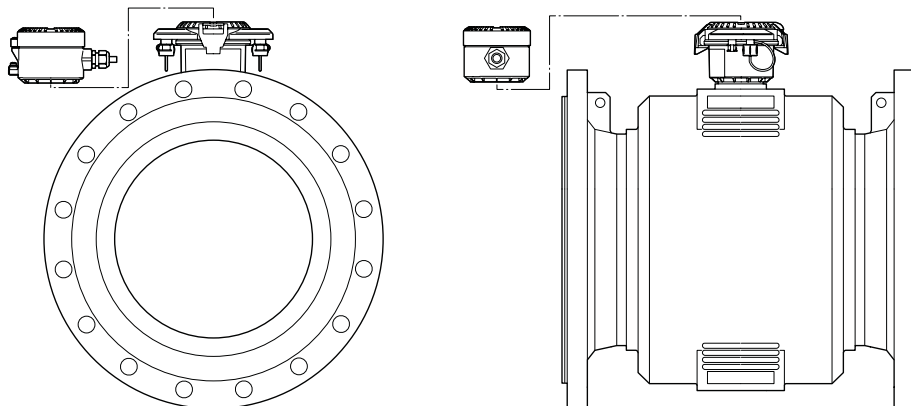


Figure 2 R-series DN350 to DN600

V-series | octagonal bore

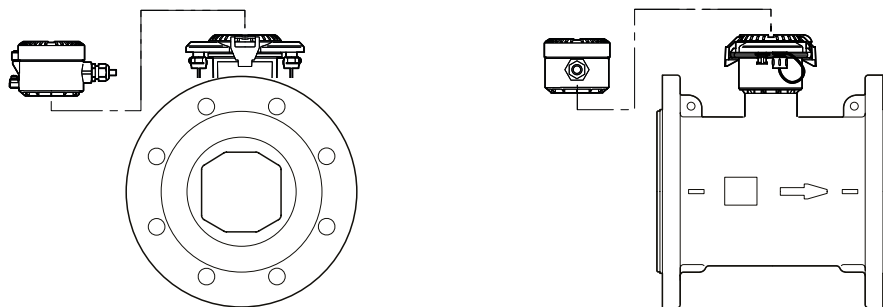


Figure 3 V-series DN40 to DN200

... 2 Sensors overview

F-series | full bore

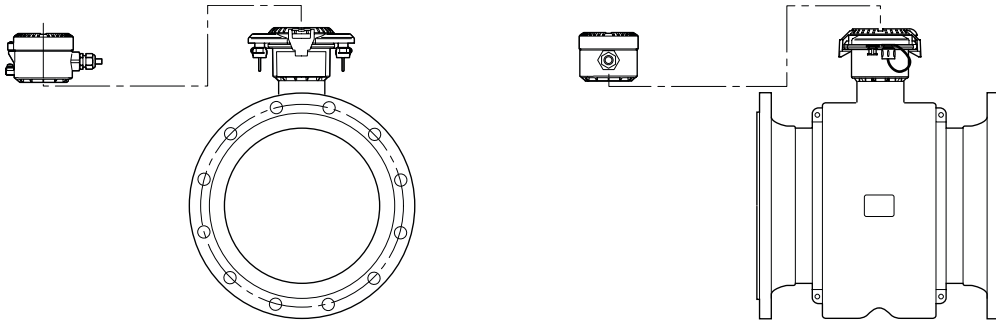


Figure 4 F-series DN250 to DN400

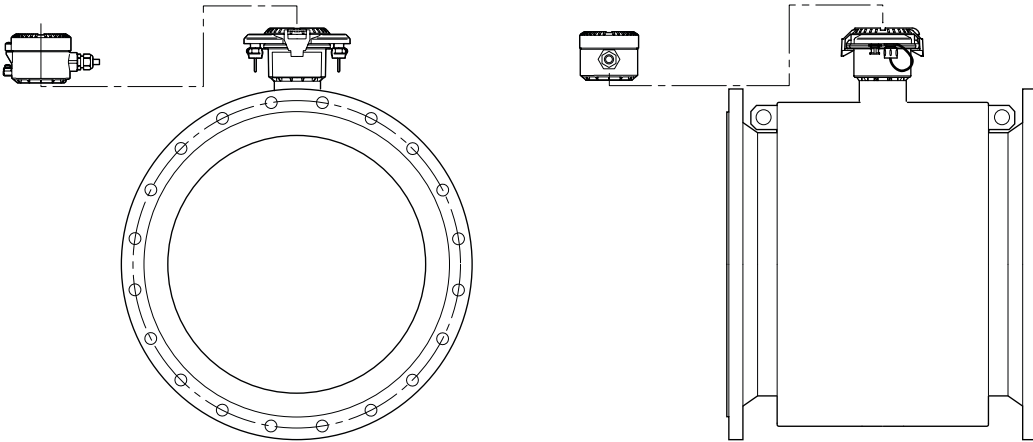


Figure 5 F-series DN450 to DN600

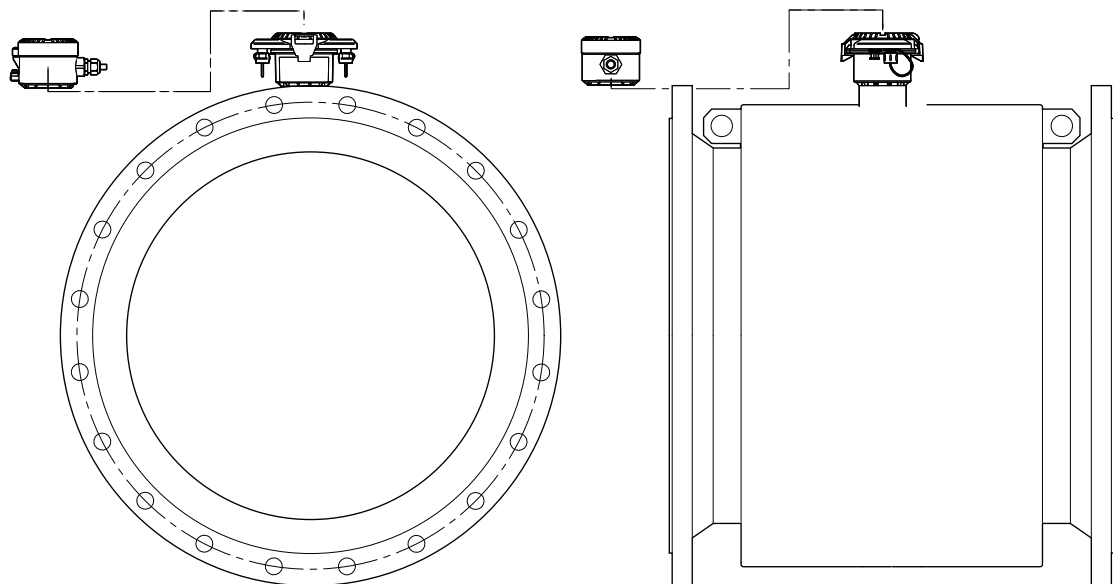
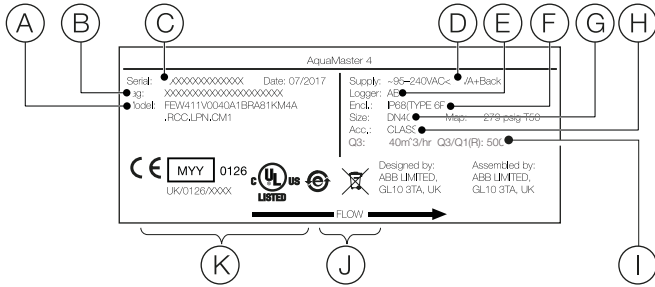


Figure 6 F-series DN700 to DN2400

3 Product identification

Nameplate

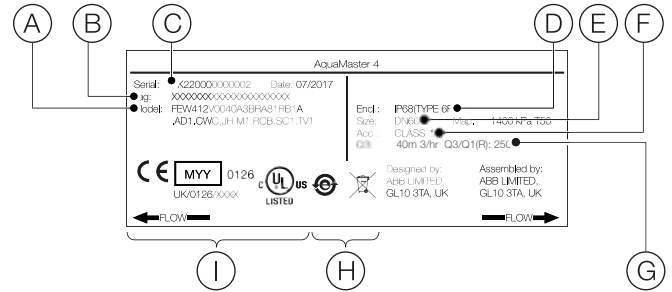
Integral sensor



- (A) Model type / number
- (B) Sensor-specific tag
- (C) ABB-defined product serial number
- (D) Power supply, m in. / max. voltage rating
- (E) Logger (shown if available)
- (F) Enclosure ingress protection rating
- (G) Sensor size / manifold absolute pressure (psig) / temperature
- (H) OIML R49 accuracy class
- (I) Highest flow rate within rated operating conditions
- (J) Sensor disposal categories
- (K) Applicable certification

Figure 7 Name plate – integral sensor (example)

Remote sensor



- (A) Model type / number
- (B) Sensor-specific tag
- (C) ABB-defined product serial number
- (D) Enclosure ingress protection rating
- (E) Sensor size
- (F) OIML R49 accuracy class
- (G) Highest flow rate within rated operating conditions
- (H) Disposal categories
- (I) Applicable certification

Figure 8 Name plate – remote sensor (example)

4 Transport and storage

Inspection

Check the sensors immediately after unpacking for possible damage that may have occurred from improper transport. Details of any damage that has occurred in transit must be recorded on the transport documents. All claims for damages must be submitted to the shipper without delay and before installation.

Transport



WARNING – BODILY INJURY

Life-threatening danger due to suspended loads. In the case of suspended loads, a danger of the load falling exists. Remaining under suspended loads is prohibited.



WARNING – RISK OF INJURY DUE TO SENSOR SLIPPING.

The sensor's center of gravity may be higher than the harness suspension points.

- Make sure that the sensor does not slip or turn during transport.
- Support the sensor laterally during transport.

Flanged sensors \leq DN 450

- Carrying straps must be used to transport flanged designs smaller than DN 450.
- Wrap the straps around both process connections when lifting the sensor.
- Do not use chains as they may damage the housing.

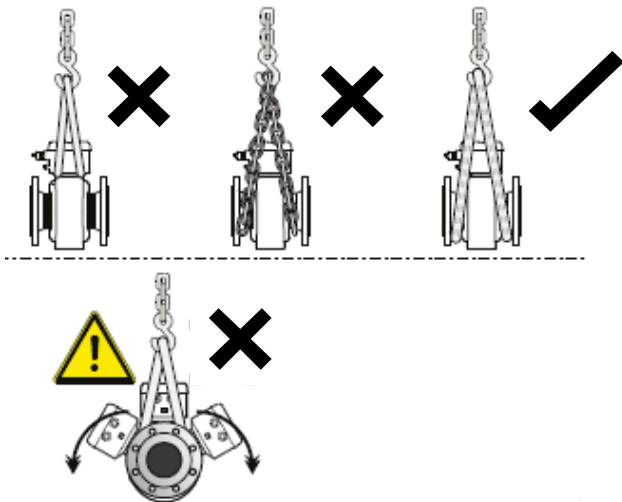


Figure 9 Transport instructions \leq DN 450

Flanged sensors \geq DN 450

- Flanged sensors must not be lifted by the center of the housing when using a forklift for transport.
- Flanged sensors must not be lifted by the terminal box or by the center of the housing.
- Only the transport lugs fitted to the sensor can be used to lift the sensor and insert it into the piping.

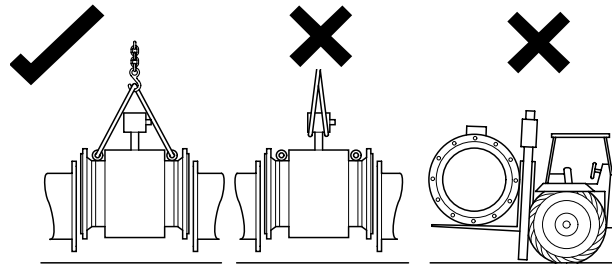


Figure 10 Transport instructions \geq DN 450

Storing the sensor

Note the following when storing sensors:

- Store the sensor in its original packaging in a dry and dust-free location.
- Observe the permitted ambient conditions for transport and storage.
- Do not store the sensor in direct sunlight.

Storage temperature

-20 to 70 °C (-4 to 158 °F)

The ambient conditions for the transport and storage of the sensor must correspond to the ambient conditions for operation of the sensor.

Adhere to the AquaMaster4 data sheet (DS/FET400-EN)!

5 Installation

General information

The following points must be observed during installation:

- The flow direction must correspond to the marking, if present. The flow direction must correspond to the identification plate. The sensor measures the flowrate in both directions. **Forward flow is the factory setting.**
- Secure the flange bolts and nuts against pipe vibration.
- The sensors must be installed without mechanical tension (torsion, bending).
- Install flanged sensors with plane parallel counter flanges and use appropriate gaskets only.
- Only gaskets made from a material that is compatible with the measuring medium and measuring medium temperature must be used.
- Gaskets must not extend into the flow area, since possible turbulence could influence the accuracy of the sensor.
- The piping may not exert any inadmissible forces or torques on the sensor.
- Ensure temperature limits are not exceeded operating the sensor.
- Vacuum shocks in the piping should be avoided to prevent damage to the liners. Vacuum shocks can destroy the sensor.
- Do not remove the sealing plugs in the cable glands until you are ready to install the electrical cable.
- The transmitter with a remote mount design must be installed at a largely vibration-free location.
- Do not expose the transmitter and sensor to direct sunlight. Provide appropriate sun protection as necessary.
- When installing the transmitter in a control cabinet, make sure adequate cooling is provided.
- When installing a remote mounted transmitter ensure the sensor and the transmitter are compatible (been assigned correctly). Compatible sensors have the same end numbers on the name plate, e.g. flowmeter sensor X001 belongs to transmitter Y001 or flowmeter sensor X002 belongs to transmitter Y002.

Installation requirements

Lay lengths

Before installing sensors, ensure lay lengths are correct for installation requirements.



CAUTION

The installation conditions shown must be observed to achieve the best operational results.

Unpacking the sensor

Care must be taken when lifting the sensor to use the lifting hooks provided or sling under the body of the meter. Never lift the sensor using the terminal box as this causes damage and invalidates the warranty.

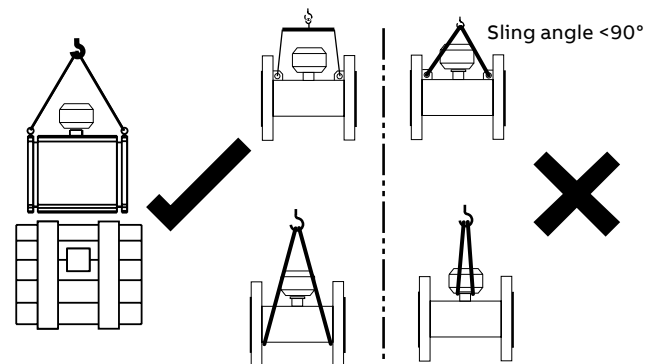


Figure 11 Unpacking

Fluid level

The sensor tube must always be completely full.

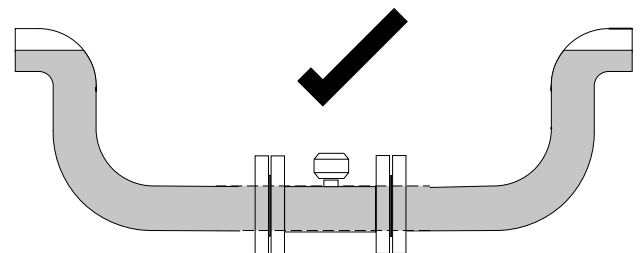


Figure 12 Fluid level in pipe

...5 Installation

...Installation requirements

Pipeline support

The sensor must be installed without mechanical tension (torsion, bending). If necessary, support the pipeline.

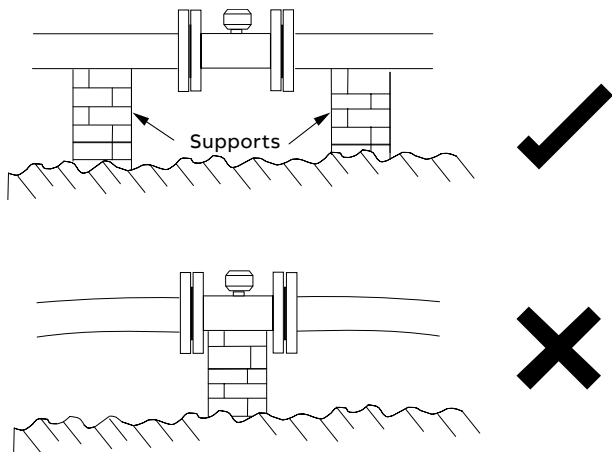


Figure 13 Pipeline support

Extremes of temperature

Do not install the sensor in a position that will expose it to extremes of temperature (direct sunlight, frost, snow). Provide appropriate weather protection where necessary.

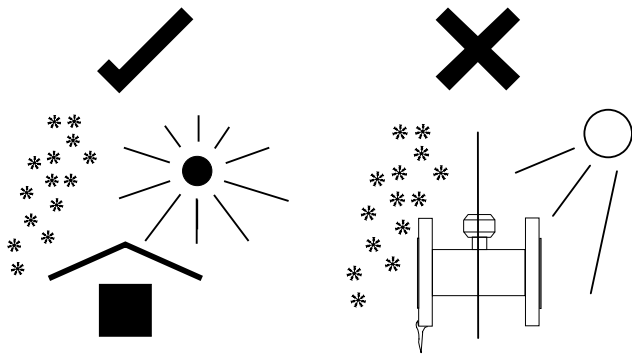


Figure 14 Extremes of temperature / adverse environments

Seal materials / fluid temperatures

The flange seal material must be compatible with the fluid and fluid temperatures.

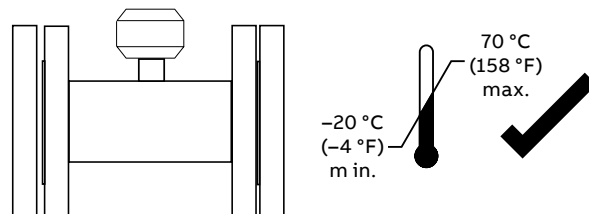


Figure 15 Within temperature limits

Pipeline forces / torque

The pipeline must not exert any forces and torques on the sensor (for example, vibration).

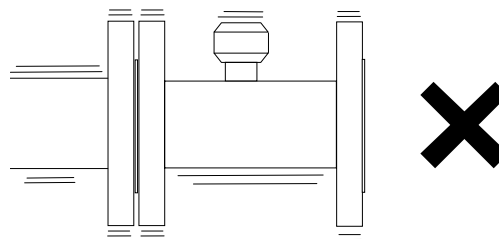


Figure 16 Vibration

Spillage onto the sensor

Do not install the sensor in an area where a spillage of any substance could damage the sensor.

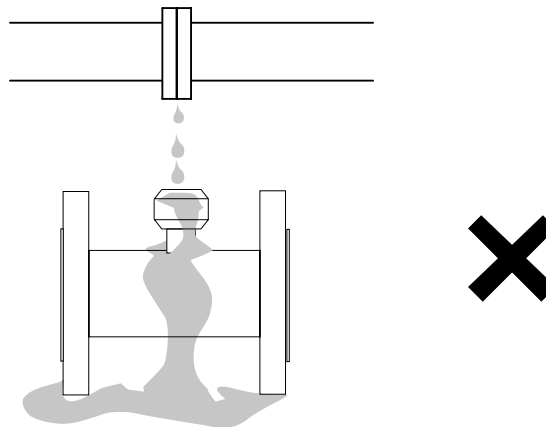


Figure 17 Spillage

Flow direction / straight pipe requirements

Ensure the flow direction in the pipeline corresponds to the identification plate. The sensor measures the flowrate in both directions. Forward flow is the factory setting.

V-style sensor: in most installations, a straight upstream section 5 x pipe diameters in length and a straight downstream section 0 x pipe diameters in length are sufficient.

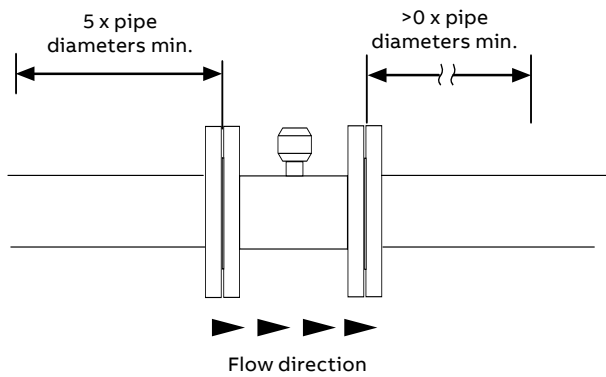


Figure 18 V-style sensor – flow direction / straight pipe requirements

R-style sensor: straight upstream and downstream sections 0 x 0 pipe diameters in length are recommended.

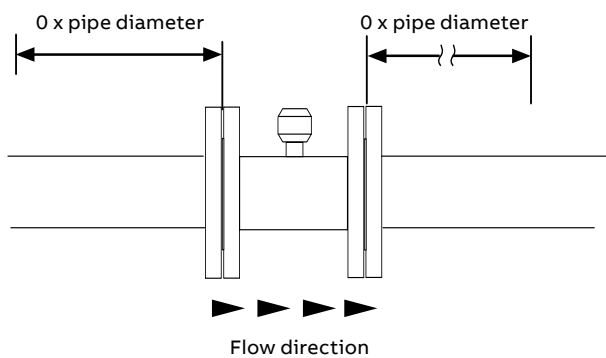


Figure 19 R-style sensor – flow direction / straight pipe requirements

F-style sensor: in most installations, a straight upstream section 5 x pipe diameters in length and a straight downstream section 2 x pipe diameters in length are sufficient.

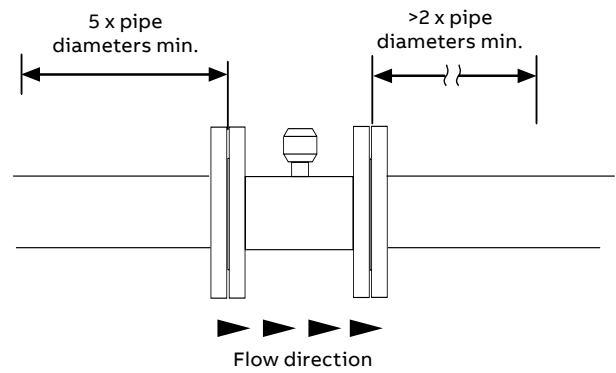


Figure 20 F-style sensor – flow direction / straight pipe requirements

Electrode axis

The electrode axis must be horizontal wherever possible or no more than 45° from horizontal.

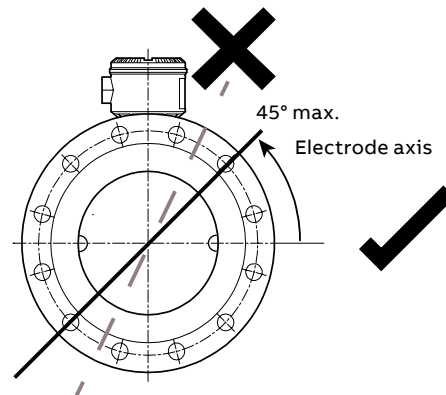


Figure 21 Flow conditions / orientation (electrode axis)

...5 Installation

Localized heating / welding

The sensor must not be submitted to localized heating during installation; take care to remember this is a measuring instrument.

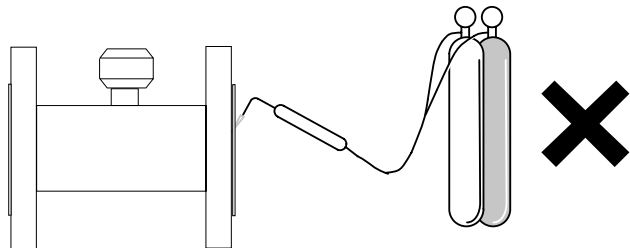


Figure 22 Localized heat

Environmental rating

Ensure the level of IP rating is correct for the required meter installation application. IP68 (NEMA 6P) rated meters can be submerged continuously.

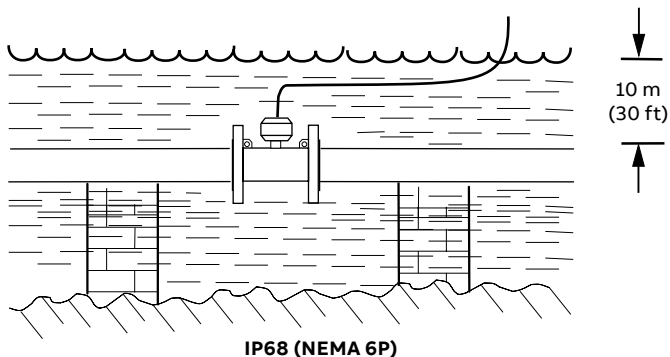


Figure 23 Within environmental rating

Gasket fitting

Use correctly sized gaskets. Do NOT fit gaskets that extend into the flow area – the turbulence caused adversely affects sensor accuracy.

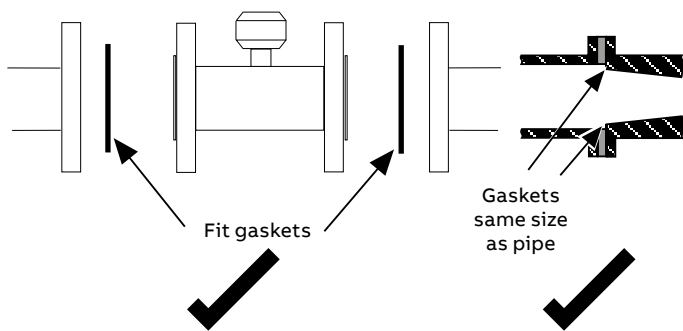


Figure 24 Fit gaskets same size as pipe

Cable routing

i IMPORTANT NOTE

Do not attempt to join signal cable to increase cable length.

The cable to the sensor must be installed neatly or within a conduit. Both loose or conduit installations must have a u-bend below terminal box height to enable any water to run off thus avoiding any capillary action into the sensor.

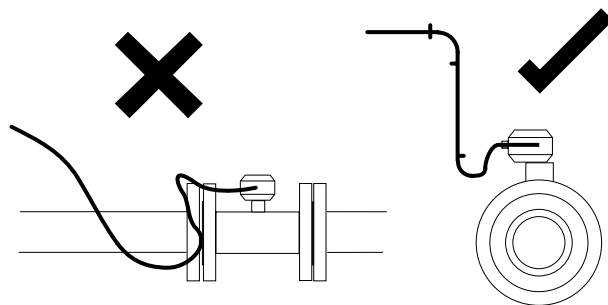


Figure 25 Cable routing to enable water run off

Observe the following points when routing signal cables:

- Keep the remote form sensor cable as short as possible to avoid unnecessary electrical and magnetic pickup. Lengths* up to 150 m (492 ft) are permitted, but are more susceptible to unwanted pickup.
- Avoid routing the cable in the vicinity of electrical equipment or switching elements that can create stray fields, switching pulses and induction
- Avoid running sensor cables adjacent to those from other electromagnetic flowmeters, especially in the same cable ducts, as unwanted magnetic coupling can induce unwanted signals and cause incorrect operation of the sensor. Ideally, adjacent cables should be >200 mm (8 in.) apart.
- Do not damage the sheathing of the cable during installation.
- Ensure that a drip loop (water trap) is used when installing the connecting cables for the sensor.

*Sensus™ cable is available in 5 and 20 m (15 and 65 ft) lengths. Renewable energy cable is available as a 10 m (30 ft) length.

Burying a sensor

When burying a sensor, ensure it can be found easily if required (for example, mark the installation position with a post). Installing a protection plate above the meter is also recommended.



CAUTION

For further advice when burying sensors, contact the ABB Service Organization.

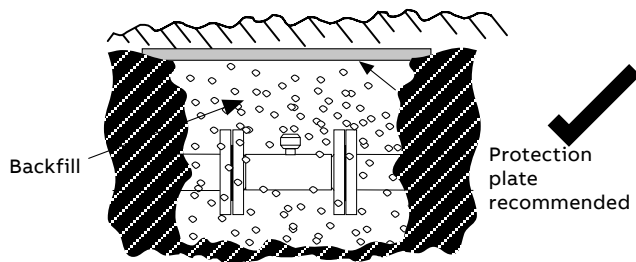


Figure 26 Underground installations

Sensor separation

If F-, V-, R-style sensors are installed in adjacent pipelines, ensure they are at least 0.7 m (2.3 ft) apart to prevent the electromagnetic field from one meter affecting the other.

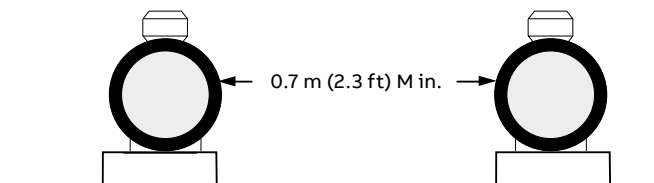


Figure 27 Sensor separation

...5 Installation

Dimensions

R-style sensor – DN 40 to DN 300 (1½ to 12 in.)

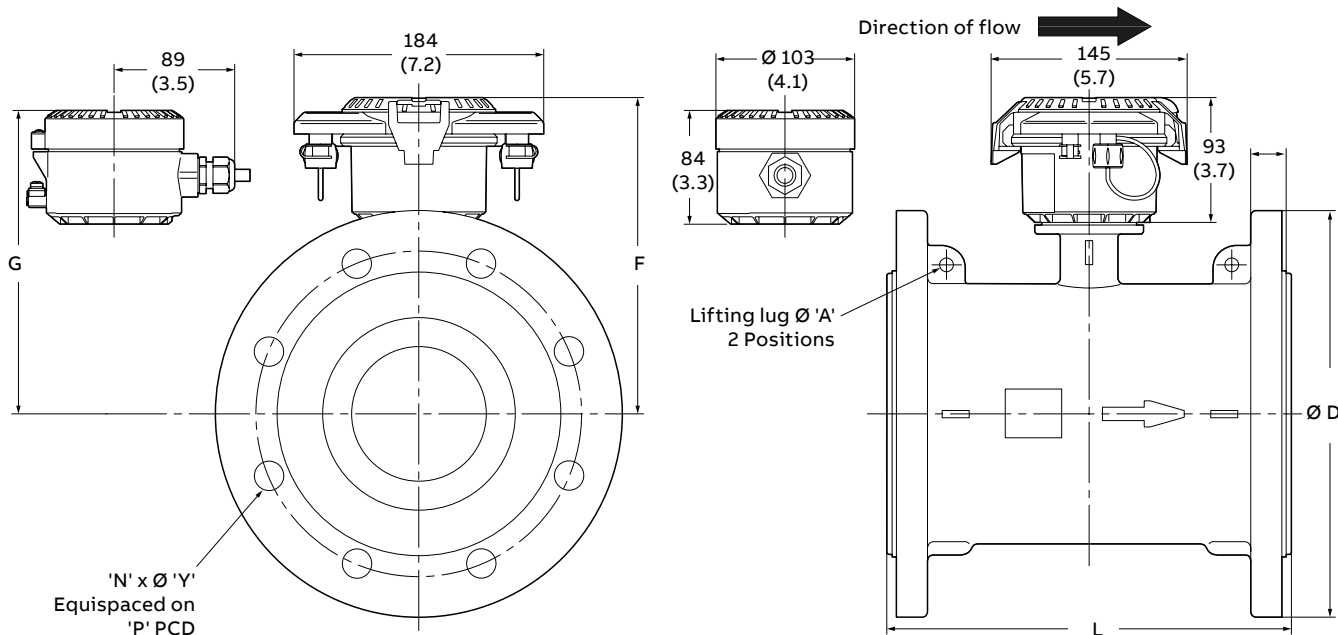


Figure 28 R-style sensor – DN 40 to DN 300 (1½ to 12 in.)

Sensor size	Flange		Flange OD D	No. holes N	Bolt hole dia. Y	Dimensions in mm (in.)			Tx. height F	T. box height G	Lifting lug A	Approx. weight kg (lbs)	
	Standard	Class				Bolt hole PCD P	Sensor length L						Integral
DN 40 (1½ in.)	EN 1092	PN 10, 16, 25	150 (5.9)	4	19 (0.75)	110 (4.3)	200 (7.9)	158 (6.2)	149 (5.9)	N/A	13 (29)	12 (27)	
	ASME B16.5	CL150			15.7 (0.62)								
	AS 2129	Table E	135 (5.3)	14 (0.55)	98 (3.9)	154 (6.1)	144 (5.7)	11 (24)	8 (18)				
	JIS B2220	5K 10K	120 (4.7) 140 (5.5)	15 (0.59) 19 (0.75)	95 (3.7) 105 (4.2)								
DN 50 (2 in.)	EN 1092	PN 10, 16, 25	165 (6.5)	4	19 (0.75)	125 (4.9)	200 (7.9)	162 (6.4)	153 (6.0)	N/A	15 (32)	14 (30)	
	ASME B16.5	CL150	150 (5.9)		18 (0.71)	121 (4.8)							
	AS 2129	Table E	150 (5.9)	18 (0.71)	114 (4.5)	168 (6.6)	158 (6.2)	14 (31)	11 (24)				
	AS 4087	PN 16	130 (5.1)	15 (0.59)	105 (4.1)								
	JIS B2220	5K 10K	130 (5.1) 155 (6.1)	15 (0.59) 19 (0.75)	105 (4.1) 120 (4.7)								
DN 65 (2½ in.)	EN 1092	PN 10, 16 PN 25	185 (7.3)	4	19 (0.75)	145 (5.7)	200 (7.9)	176 (6.9)	167 (6.6)	N/A	19 (42)	18 (40)	
	ASME B16.5	CL150		8	20 (0.79)	140 (5.5)							
	AS 2129	Table E	165 (6.5)	4	18 (0.71)	127 (5.0)	168 (6.6)	158 (6.2)	14 (31)	11 (24)			
	AS 4087	PN 16	155 (6.1)	15 (0.59)	130 (5.1)								
	JIS B2220	5K 10K	155 (6.1) 175 (6.9)	15 (0.59) 19 (0.75)	130 (5.1) 140 (5.5)								
DN 80 (3 in.)	EN 1092	PN 10, 16, 25	200 (7.9)	8	19 (0.75)	160 (6.3)	200 (7.9)	181 (7.1)	172 (6.8)	N/A	21 (47)	20 (44)	
	ASME B16.5	CL150		4	20 (0.79)	152 (6.0)							
	AS 2129	Table E	185 (7.3)	4	18 (0.71)	146 (5.8)	174 (6.9)	165 (6.5)	17 (37)	14 (31)			
	AS 4087	PN 16	180 (7.1)	19 (0.75)	145 (5.7)								
	JIS B2220	5K 10K	180 (7.1) 185 (7.3)	19 (0.75) 8	145 (5.7) 150 (5.9)								

Table 1 R-style sensor – DN 40 to DN 80 (1½ to 3 in.)

Sensor size	Flange		Dimensions in mm (in.)								Approx. weight			
	Standard	Class	Flange OD D	No. holes N	Bolt hole dia.		Bolt hole PCD P	Sensor length L	Tx. height F	T. box height G	Lifting lug A	kg (lbs)		
					Y	P						Integral	Remote	
DN 100 (4 in.)	EN 1092	PN 10, 16	235 (9.3)	8	19 (0.75)	180 (7.1)	250 (9.9)		202 (8.0)	193 (7.6)		27 (60)	26 (58)	
		PN 25			23 (0.91)	190 (7.5)								
	ASME B16.5	CL150	215 (8.5)	4	18 (0.71)	178 (7.0)					N/A			
		Table E												19 (0.75)
	AS 4087	PN 16	200 (7.9)	8	19 (0.75)	165 (6.5)			212 (8.3)	203 (8.0)			23 (51)	20 (44)
		5K												
JIS B2220	7.5K	238 (9.4)	4	19 (0.75)	175 (6.9)									
	10K	210 (8.3)	8											
DN 125 (5 in.)	EN 1092	PN 10, 16	270 (10.6)	8	18 (0.71)	210 (8.3)	250 (9.9)		221 (8.7)	212 (8.3)		30 (66)	29 (64)	
		PN 25			28 (1.10)	220 (8.7)								
	ASME B16.5	CL150	255 (10.0)	8	18 (0.71)	210 (8.3)			212 (8.3)	203 (8.0)			26 (57)	23 (51)
		Table E												
	AS 2129	5K	235 (9.3)	6	19 (0.75)	200 (7.9)								
		7.5K	250 (9.8)	8	23 (0.91)	210 (8.3)								
DN 150 (6 in.)	EN 1092	PN 10, 16	300 (11.8)	8	23 (0.91)	240 (9.5)	300 (11.8)		233 (9.2)	224 (8.8)		35 (77)	34 (75)	
		PN 25			22 (0.87)	242 (9.5)								
	ASME B16.5	CL150	280 (11.0)	8	18 (0.71)	235 (9.3)			233 (9.2)	223 (8.8)	10.2 (0.40)		33 (73)	31 (68)
		Table E												
	AS 4087	PN 16	265 (10.4)	6	19 (0.75)	247 (9.7)								
		5K	290 (11.4)	8	23 (0.91)	240 (9.5)								
DN 200 (8 in.)	EN 1092	PN 10	343 (13.5)	8	23 (0.91)	295 (11.6)	350 (13.8)		259 (10.2)			68 (150)	67 (147)	
		PN 16		12	28 (1.10)	310 (12.2)								
	ASME B16.5	CL150	360 (14.2)	8	18 (0.71)	292 (11.5)			258 (10.2)	249 (9.8)	10.2 (0.40)		51 (112)	48 (106)
		Table E	22 (0.87)											
	AS 4087	PN 16	335 (13.2)	8	19 (0.75)	280 (11.0)								
		5K	320 (12.6)	12	23 (0.91)	299 (11.8)								
JIS B2220	7.5K	342 (8.7)	12	23 (0.91)	290 (11.4)									
	10K	330 (13.0)												
DN 250 (10 in.)	EN 1092	PN10	395 (15.6)	12	22 (0.87)	350 (13.8)	450 (17.7)		285 (11.2)	276 (10.9)	10.2 (0.40)	78 (172)	75 (165)	
		PN16	405 (15.9)	8	26 (1.02)	355 (14.0)								
		PN25	425 (16.7)	12	30 (1.18)	370 (14.6)								
	AS 2129	Table E	405 (15.9)	8	22 (0.87)	356 (14.0)								
		PN 16	385 (15.2)	12	23 (0.91)	345 (13.6)								
	AS 4087	5K	410 (16.1)	8	23 (0.91)	360 (14.2)								
7.5K		400 (15.8)	12	25 (0.98)	355 (14.0)									
ASME B16.5	CL150	406 (16.0)	12	22 (0.87)	362 (14.3)									
DN 300 (12 in.)	EN 1092	PN10	445 (17.5)	12	22 (0.87)	400 (15.8)	500 (19.7)		310 (12.2)	301 (11.9)	10.2 (0.40)	115 (253)	112 (247)	
		PN16	460 (18.1)	16	26 (1.02)	410 (16.1)								
		PN25	485 (19.1)	12	30 (1.18)	430 (16.9)								
	AS 2129	Table E	455 (17.9)	12	26 (1.02)	406 (16.0)								
		PN 16	430 (16.9)	12	23 (0.91)	390 (15.4)								
	AS 4087	5K	464 (18.3)	10	23 (0.91)	414 (16.3)								
7.5K		445 (17.5)	16	25 (0.98)	400 (15.8)									
ASME B16.5	CL150	483 (19.0)	12	22 (0.87)	432 (17.0)									

Table 2 R-style sensor – DN 100 to DN 300 (4 to 12 in.)

...5 Installation

...Dimensions

R-style sensor – DN 350 to DN 600 (14 to 24 in.)

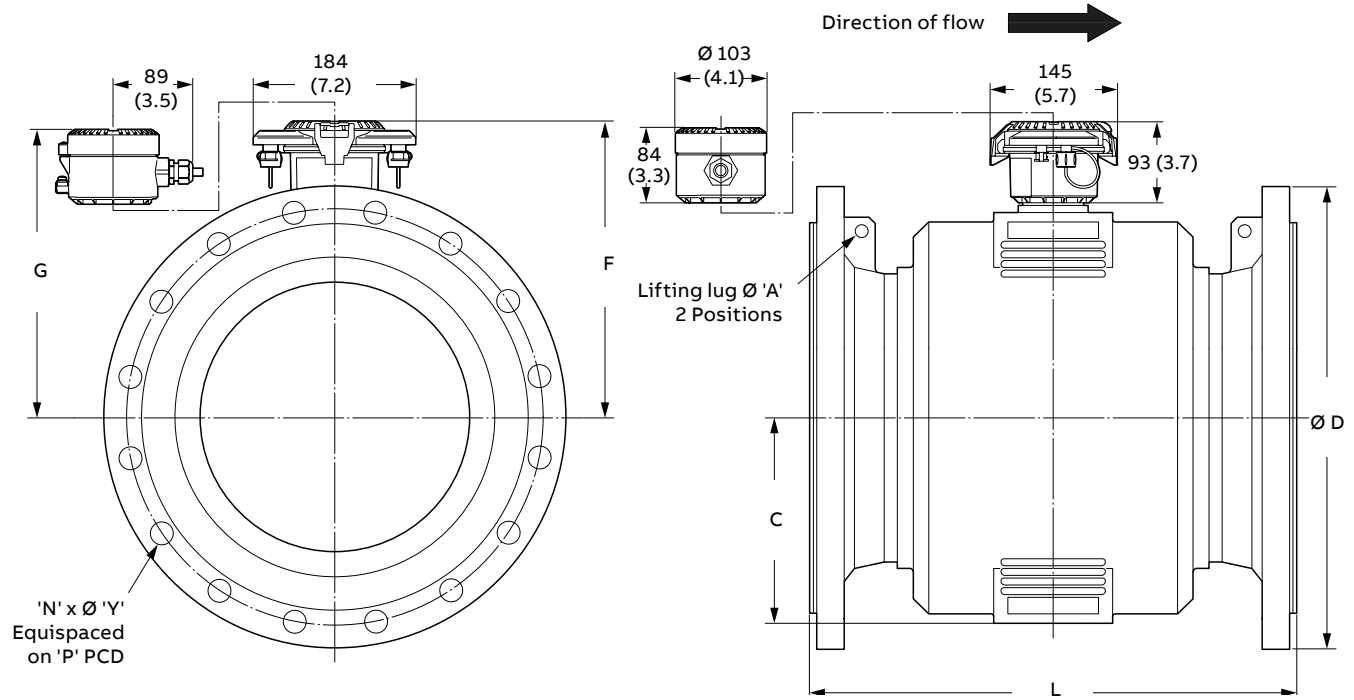


Figure 29 R-style sensor – DN 350 to DN 600 (14 to 24 in.)

Sensor size	Flange		Dimensions in mm (in.)										Approx. weight kg (lbs)	
	Standard	Class	Flange OD D	No. Holes N	Bolt hole dia Y	Bolt hole PCD P	Sensor length L	Tx. height F	T. box height G	Lifting lug A	Cover flat C	Integral	Remote	
DN 350 (14 in.)	EN 1092	PN 10	505 (19.9)	16	22 (0.87)	460 (18.1)	550 (21.7)	334 (13.2)	324 (12.8)	14.5 (0.57)	231 (9.1)	102 (225)	100 (220)	
		PN 16	520 (20.5)		26 (1.02)	470 (18.5)								
		PN 25	555 (21.9)		33 (1.30)	490 (19.3)								
	ASME B16.5	CL150	535 (21.1)	29.5 (1.16)	476 (18.8)									
	AS 2129	Table E	525 (20.7)	12	26 (1.02)	470 (18.5)								
	AS 4087	PN 16	480 (18.9)	16	435 (17.1)									
	JIS B2220	5K	530 (20.7)	10	25 (0.98)	472 (18.6)								
		10K	490 (19.3)	16	445 (17.5)									
DN 400 (16 in.)	EN 1092	PN 10	565 (22.3)	16	26 (1.02)	515 (20.3)	600 (23.6)	360 (14.2)	354 (13.9)	14.5 (0.57)	257 (10.1)	117 (258)	115 (254)	
		PN 16	580 (22.8)		30 (1.18)	525 (20.7)								
		PN 25	620 (24.4)		36 (1.42)	550 (21.7)								
	ASME B16.5	CL150	600 (23.6)	29.5 (1.16)	540 (21.3)									
	AS 2129	Table E	580 (22.8)	12	26 (1.02)	521 (20.5)								
	AS 4087	PN 16	540 (21.3)	16	25 (0.98)	495 (19.5)								
	JIS B2220	5K	582 (22.9)	12	25 (0.98)	524 (20.6)								
		7.5K	560 (22.1)	16	27 (1.06)	510 (20.1)								
DN 450 (18 in.)	EN 1092	PN 10	615 (24.2)	20	26 (1.02)	565 (22.3)	700 (27.6)	388 (15.3)	379 (14.9)	14.5 (0.57)	285 (11.2)	162 (357)	160 (353)	
		PN 16	640 (25.2)		30 (1.18)	585 (23.0)								
		PN 25	670 (26.4)		36 (1.42)	600 (23.6)								
	ASME B16.5	CL150	635 (25.0)	16	32.5 (1.28)	578 (22.8)								
	AS 2129	Table E	640 (25.2)	16	26 (1.02)	584 (23.0)								
	AS 4087	PN 16	605 (23.8)	16	25 (0.98)	555 (21.9)								
	JIS B2220	5K	652 (25.7)	12	27 (1.06)	585 (23.0)								
		7.5K	620 (24.4)	20	27 (1.06)	565 (22.3)								
DN 500 (20 in.)	EN 1092	PN 10	670 (26.4)	20	26 (1.02)	620 (24.4)	770 (30.3)	419 (16.5)	410 (16.2)	14.5 (0.57)	316 (12.5)	219 (483)	217 (477)	
		PN 16	715 (28.2)		33 (1.30)	650 (25.6)								
		PN 25	730 (28.7)		36 (1.42)	660 (26.0)								
	ASME B16.5	CL150	700 (27.6)	16	32.5 (1.28)	635 (25.0)								
	AS 2129	Table E	705 (27.8)	16	26 (1.02)	641 (25.2)								
	AS 4087	PN 16	655 (25.8)	20	25 (0.98)	605 (23.8)								
	JIS B2220	5K	706 (27.8)	12	27 (1.06)	639 (25.2)								
		7.5K	675 (26.6)	20	27 (1.06)	620 (24.4)								
DN 600 (24 in.)	EN 1092	PN 10	780 (30.7)	20	30 (1.18)	725 (28.6)	920 (36.2)	446 (17.6)	437 (17.2)	14.5 (0.57)	343 (13.5)	317 (699)	315 (695)	
		PN 16	840 (33.1)		36 (1.42)	770 (30.3)								
		PN 25	845 (33.3)		39 (1.54)	770 (30.3)								
	ASME B16.5	CL150	815 (32.1)	16	35.5 (1.40)	749.5 (29.5)								
	AS 2129	Table E	825 (32.5)	16	33 (1.30)	756 (29.7)								
	AS 4087	PN 16	770 (30.3)	20	30 (1.18)	715 (28.2)								
	JIS B2220	5K	810 (31.9)	16	27 (1.06)	743 (29.3)								
		7.5K	795 (31.3)	24	33 (1.30)	730 (28.7)								

Table 3 R-style sensor – DN 350 to DN 600 (14 to 24 in.)

...5 Installation

...Dimensions

V-style sensor – DN 40 to DN 200 (1½ to 8 in.)

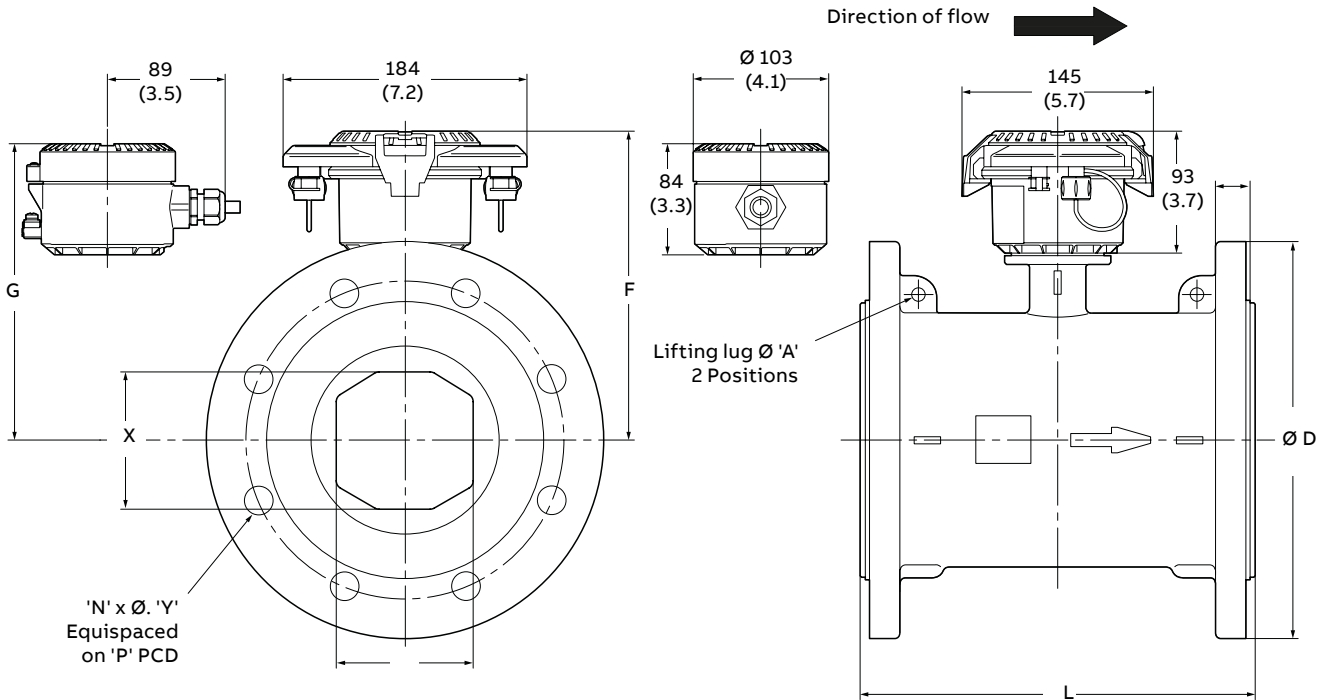


Figure 30 V-style sensor – DN 40 to DN 200 (1½ to 8 in.)

Sensor size	Flange		Dimensions in mm (in.)								Approx. weight	
	Standard	Class	Flange OD D	No. holes N	Bolt hole dia. Y	Bolt hole PCD P	Sensor length L	Tx. height F	T. box height G	Lifting lug A	kg (lbs)	
											Integral	Remote
DN 40 (1½ in.)	EN 1092	PN 10, 16, 25	150 (5.9)	4	19 (0.75)	110 (4.3)	200 (7.9)	158 (6.2)	149 (5.9)	N/A	13 (29)	12 (27)
	ASME B16.5	CL150			15.7 (0.62)	98 (3.9)					10 (22)	7 (15)
	AS 2129	Table E	135 (5.3)		14 (0.55)	105 (4.2)		154 (6.1)	144 (5.7)			
	JIS B2220	10K	140 (5.5)		19 (0.75)	105 (4.2)						
DN 50 (2 in.)	EN 1092	PN 10, 16, 25	165 (6.5)	4	19 (0.75)	125 (4.9)	200 (7.9)	162 (6.4)	153 (6.0)	N/A	14 (31)	13 (29)
	ASME B16.5	CL150			150 (5.9)	18 (0.71)					114 (4.5)	11 (24)
	AS 4087	PN 16	155 (6.1)		19 (0.75)	120 (4.7)						
	JIS B2220	10K										
DN 65 (2½ in.)	EN 1092	PN 10, 16	185 (7.3)	4	19 (0.75)	145 (5.7)	200 (7.9)	176 (6.9)	167 (6.6)	N/A	16 (35)	15 (33)
	ASME B16.5	CL150		8	20 (0.79)	140 (5.5)						
	AS 2129	Table E	165 (6.5)	4	18 (0.71)	127 (5.0)		168 (6.6)	158 (6.2)			
	AS 4087	PN 16										
	JIS B2220	10K	175 (6.9)	19 (0.75)	140 (5.5)							
DN 80 (3 in.)	EN 1092	PN 10, 16, 25	200 (7.9)	8	19 (0.75)	160 (6.3)	200 (7.9)	181 (7.1)	172 (6.8)	N/A	17 (38)	16 (36)
	ASME B16.5	CL150		4	20 (0.79)	152 (6.0)						
	AS 2129	Table E	185 (7.3)	4	18 (0.71)	146 (5.8)		174 (6.9)	165 (6.5)			
	AS 4087	PN 16										
JIS B2220	10K	8	19 (0.75)	150 (5.9)								
DN 100 (4 in.)	EN 1092	PN 10, 16	235 (9.3)	8	19 (0.75)	180 (0.71)	250 (9.9)	202 (8.0)	193 (7.6)	N/A	19 (42)	18 (40)
	ASME B16.5	CL150			23 (0.91)	190 (7.5)						
	AS 2129	Table E	215 (8.5)		18 (0.71)	178 (7.0)						
	AS 4087	PN 16			19 (0.75)	191 (7.5)						
	JIS B2220	7.5K	238 (9.4)		4	19 (0.75)		195 (7.7)	212 (8.3)		203 (8.0)	
JIS B2220	10K	210 (8.3)	8	19 (0.75)	175 (6.9)							
DN 125 (5 in.)	EN 1092	PN 10, 16	270 (10.6)	8	18 (0.71)	210 (8.3)	250 (9.9)	221 (8.7)	212 (8.3)	N/A	30 (66)	29 (64)
	ASME B16.5	CL150			28 (1.10)	220 (8.7)						
	AS 2129	Table E	255 (10.0)		22 (0.87)	216 (8.5)		212 (8.3)	203 (8.0)			
	JIS B2220	10K	250 (9.8)		18 (0.71)	210 (8.3)						
DN 150 (6 in.)	EN 1092	PN10, 16	300 (11.8)	8	23 (0.91)	240 (9.5)	300 (11.8)	233 (9.2)	224 (8.8)	10.2 (0.40)	35 (77)	34 (75)
	ASME B16.5	CL150			22 (0.87)	242 (9.5)						
	EN 1092	PN 25	280 (11.0)		26 (1.02)	250 (9.8)						
	AS 2129	Table E			22 (0.87)	235 (9.3)						
	AS 4087	PN 16	290 (11.4)		18 (0.71)	235 (9.3)		235 (9.3)	225 (8.9)			
	JIS B2220	7.5K			6	19 (0.75)					247 (9.7)	
JIS B2220	10K	280 (11.0)	8	23 (0.91)	240 (9.5)							
DN 200 (8 in.)	EN 1092	PN10	375 (11.8)	8	23 (0.91)	295 (11.6)	350 (13.8)	259 (10.2)	249 (9.8)	10.2 (0.40)	67 (147)	66 (145)
	ASME B16.5	CL150		12	28 (1.10)	310 (12.2)						
	AS 2129	Table E	343 (13.5)	8	22 (0.87)	298 (11.7)						
	AS 4087	PN 16			18 (0.71)	292 (11.5)						
	JIS B2220	7.5K	342 (8.7)	19 (0.75)	299 (11.8)	258 (10.2)		249 (9.8)				
	JIS B2220	10K	330 (13.0)	12	23 (0.91)				290 (11.4)			

Table 4 V-style sensor – DN 40 to DN 200 (1½ to 8 in.)

...5 Installation

...Dimensions

F-style sensor – DN 250 to DN 400 (10 to 16 in.)

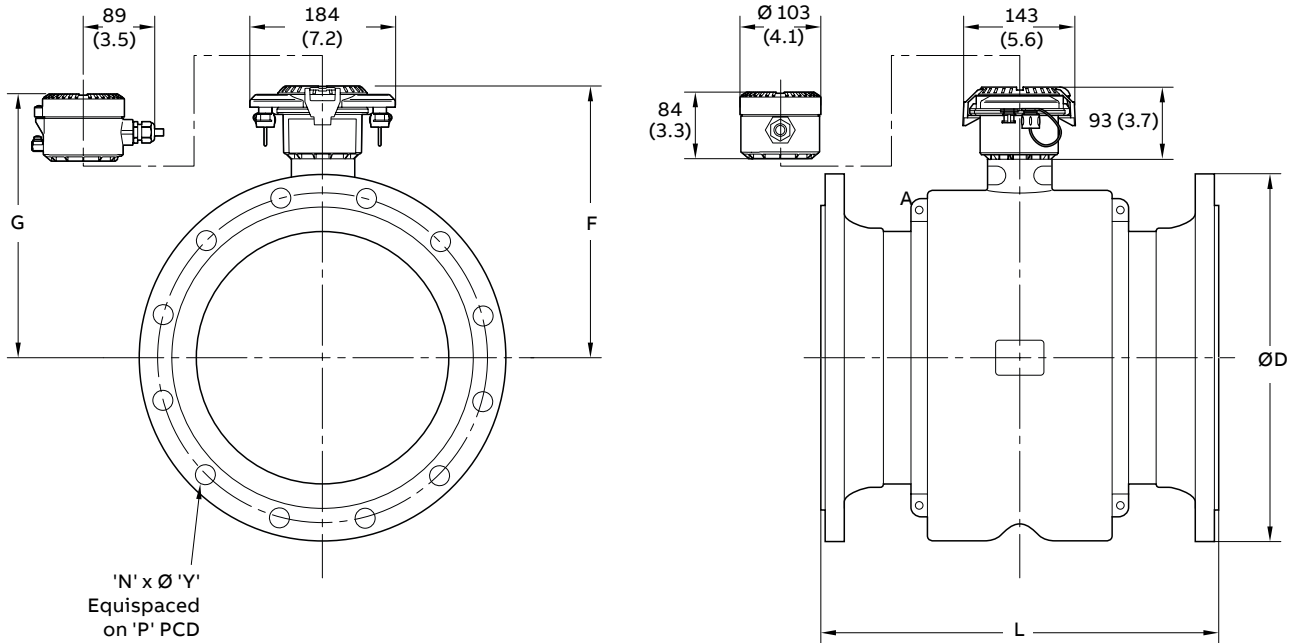


Figure 31 F-style sensor – DN 250 to DN 400 (10 to 16 in.)

Sensor size	Flange		Dimensions in mm (in.)								Approx. weight kg (lbs)		
	Standard	Class	Flange OD	No. holes	Bolt hole dia.	Bolt hole PCD	Sensor length	Tx. height	T. box height	Lifting lug	Integral	Remote	
			D	N	Y	P	L	F	G	A			
DN250 (10 in.)	EN 1092 or DIN	PN10	395 (15.55)	12	22 (0.87)	350 (13.78)	450 (17.72)	319 (12.56)	310 (12.20)	N/A	61 (134)	59 (130)	
		PN16	405 (15.94)		26 (1.02)	355 (13.98)					65 (143)	63 (139)	
		PN25	425 (16.73)		30 (1.18)	370 (14.57)					84 (185)	82 (181)	
		PN40	450 (17.72)		33 (1.30)	385 (15.16)					95 (209)	93 (205)	
	AS4087	PN16	405 (15.94)	8	22 (0.87)	356 (14.02)					65 (143)	63 (139)	
		PN35	430 (16.93)		26 (1.02)	381 (15.00)					95 (209)	93 (205)	
	JIS B2220	5K	385 (15.16)	12	23 (0.91)	345 (13.58)					65 (143)	63 (139)	
		10K	400 (15.75)		25 (0.98)	355 (13.98)							
	ASME B16.5	CL300	445 (17.52)	16	29 (1.13)	387 (15.25)					105 (231)	103 (227)	
		CL150	405 (15.94)	12	26 (1.02)	362 (14.25)					70 (154)	68 (150)	
DN300 (12 in.)	EN 1092 or DIN	PN10	445 (17.52)	12	22 (0.87)	400 (15.75)	500 (19.69)	342 (13.46)	333 (13.11)	N/A	74 (163)	72 (159)	
		PN16	460 (18.11)		26 (1.02)	410 (16.14)					80 (176)	78 (172)	
		PN25	485 (19.09)		16	30 (1.18)					430 (16.93)	100 (220)	98 (216)
		PN40	515 (20.28)			33 (1.30)					450 (17.72)	130 (287)	128 (282)
	JIS B2220	5K	430 (16.93)	12	23 (0.91)	390 (15.35)					80 (176)	78 (172)	
		10K	445 (17.52)	16	25 (0.98)	400 (15.75)							
	AS4087	PN16	455 (17.91)	12	22 (0.87)	406 (15.98)					130 (287)	128 (282)	
		PN35	490 (19.29)	26	26 (1.02)	438 (17.24)					150 (331)	148 (326)	
	ASME B16.5	CL300	520 (20.47)	16	32 (1.25)	451 (17.75)					105 (231)	103 (227)	
		CL150	485 (19.09)	12	26 (1.02)	432 (17.00)							
DN350 (14 in.)	EN 1092 or DIN	PN10	505 (19.88)	16	22 (0.87)	460 (18.11)	550 (21.65)	357 (14.06)	348 (13.70)	N/A	95 (209)	93 (205)	
		PN16	520 (20.47)		26 (1.02)	470 (18.50)					110 (243)	108 (238)	
		PN25	555 (21.85)		33 (1.30)	490 (19.29)					145 (320)	143 (315)	
		PN40	580 (22.83)		36 (1.42)	510 (20.08)					195 (430)	193 (425)	
	JIS B2220	5K	480 (18.90)	12	22 (0.87)	435 (17.13)					95 (209)	93 (205)	
		10K	490 (19.29)	16	25 (0.98)	445 (17.52)							
	AS4087	PN16	525 (20.67)	12	26 (1.02)	470 (18.50)					130 (287)	128 (282)	
		PN35	550 (21.65)	16	30 (1.18)	495 (19.49)					185 (408)	183 (403)	
	ASME B16.5	CL300	585 (23.03)	20	32 (1.25)	514 (20.25)					140 (309)	138 (304)	
		CL150	535 (21.06)	12	29 (1.14)	476 (18.75)					105 (231)	103 (227)	
DN400 (16 in.)	EN 1092 or DIN	PN10	565 (22.24)	16	26 (1.02)	515 (20.28)	600 (23.62)	399 (15.71)	390 (15.35)	N/A	103 (227)	101 (223)	
		PN16	580 (22.83)		30 (1.18)	525 (20.67)					126 (278)	124 (273)	
		PN25	620 (24.41)		36 (1.42)	550 (21.65)					170 (375)	168 (370)	
		PN40	660 (25.98)		39 (1.54)	585 (23.03)					258 (569)	256 (564)	
	JIS B2220	5K	540 (21.26)	12	25 (0.98)	495 (19.49)					103 (227)	101 (223)	
		10K	560 (22.05)	16	27 (1.06)	510 (20.08)					116 (256)	114 (251)	
	AS4087	PN16	580 (22.83)	12	26 (1.02)	521 (20.51)					154 (340)	152 (335)	
		PN35	610 (24.02)	20	30 (1.18)	552 (21.73)					302 (666)	300 (661)	
	ASME B16.5	CL300	650 (25.59)	24	35 (1.38)	572 (22.50)					265 (584)	263 (580)	
		CL150	600 (23.62)	12	29 (1.14)	540 (21.25)					175 (386)	173 (381)	

Table 5 F-style sensor – DN 250 to DN 400 (10 to 16 in.)

Sensor size	Flange		Dimensions in mm (in.)								Approx. weight kg (lbs)	
	Standard	Class	Flange OD	No. holes	Bolt hole dia.	Bolt hole PCD	Sensor length	Tx. height	T. box height	Lifting lug	Integral	Remote
			D	N	Y	P	L	F	G	A		
DN450 (18 in.)	EN 1092 or DIN	PN10	615 (24.21)	20	26 (1.02)	565 (22.24)	600 (23.62)				173 (381)	171 (377)
		PN16	640 (25.20)		30 (1.18)	585 (23.03)					188 (414)	186 (410)
		PN25	670 (26.38)		36 (1.42)	600 (23.62)	245 (540)				243 (536)	
		PN40	685 (26.97)		39 (1.54)	610 (24.02)	315 (694)				313 (690)	
	JIS B2220	5K	605 (23.82)	16	25 (0.98)	555 (21.85)	600 (23.62)	407 (16.02)	398 (15.67)	30 (1.18)	165 (364)	163 (359)
		10K	620 (24.41)	20	27 (1.06)	565 (22.24)					177 (390)	175 (386)
	AS4087	PN16	640 (25.20)	12	26 (1.02)	584 (22.99)	600 (23.62)				232 (511)	230 (507)
		PN35	675 (26.57)	20	33 (1.30)	610 (24.02)					328 (723)	326 (719)
	ASME B16.5	CL300	710 (27.95)	24	35 (1.38)	629 (24.75)	600 (23.62)				368 (811)	366 (807)
		CL150	635 (25.00)	16	32 (1.26)	578 (22.75)					250 (551)	248 (547)
DN500 (20 in.)	EN 1092 or DIN	PN10	670 (26.38)	20	26 (1.02)	620 (24.41)	600 (23.62)				190 (419)	188 (414)
		PN16	715 (28.15)		33 (1.30)	650 (25.59)					240 (529)	238 (525)
		PN25	730 (28.74)		36 (1.42)	660 (25.98)	300 (661)				298 (657)	
		PN40	755 (29.72)		42 (1.65)	670 (26.38)	392 (864)				390 (860)	
	JIS B2220	5K	655 (25.79)	16	25 (0.98)	605 (23.82)	600 (23.62)	407 (16.02)	398 (15.67)	30 (1.18)	190 (419)	188 (414)
		10K	675 (26.57)	20	27 (1.06)	620 (24.41)					290 (639)	288 (635)
	AS4087	PN16	705 (27.76)	16	26 (1.02)	641 (25.24)	600 (23.62)				435 (959)	433 (955)
		PN35	735 (28.94)	24	33 (1.30)	673 (26.50)					300 (661)	298 (657)
	ASME B16.5	CL150	700 (27.56)	20	32 (1.26)	635 (25.00)	600 (23.62)				490 (1080)	488 (1076)
		CL300	775 (30.51)	24	35 (1.38)	659 (25.94)					284 (626)	282 (622)
DN600 (24 in.)	EN 1092 or DIN	PN10	780 (30.71)	20	30 (1.18)	725 (28.54)	800 (31.50)				284 (626)	282 (622)
		PN16	840 (33.07)		36 (1.42)	770 (30.31)					318 (701)	316 (697)
		PN25	845 (33.27)		39 (1.54)	770 (30.31)	460 (1014)				458 (1010)	
		PN40	890 (35.04)		26 (1.02)	705 (27.76)	600 (1323)				598 (1318)	
	JIS B2220	5K	770 (30.31)	16	27 (1.06)	715 (28.15)	800 (31.50)	458 (18.03)	449 (17.68)	30 (1.18)	275 (606)	273 (602)
		10K	795 (31.30)	24	33 (1.30)	730 (28.74)					306 (675)	304 (670)
	AS4087	PN16	825 (32.48)	16	30 (1.18)	756 (29.76)	800 (31.50)				382 (842)	380 (838)
		PN35	850 (33.46)	24	36 (1.42)	781 (30.75)					452 (996)	450 (992)
	ASME B16.5	CL300	915 (36.02)	24	41 (1.61)	813 (32.00)	800 (31.50)				550 (1213)	548 (1208)
		CL150	815 (32.09)	20	35 (1.38)	750 (29.50)					425 (937)	423 (933)

Table 6 F-style sensor – DN 450 to DN 600 (18 to 24 in.)

...5 Installation

...Dimensions

F-style sensor – DN 700 to DN 2400 (28 to 96 in.)

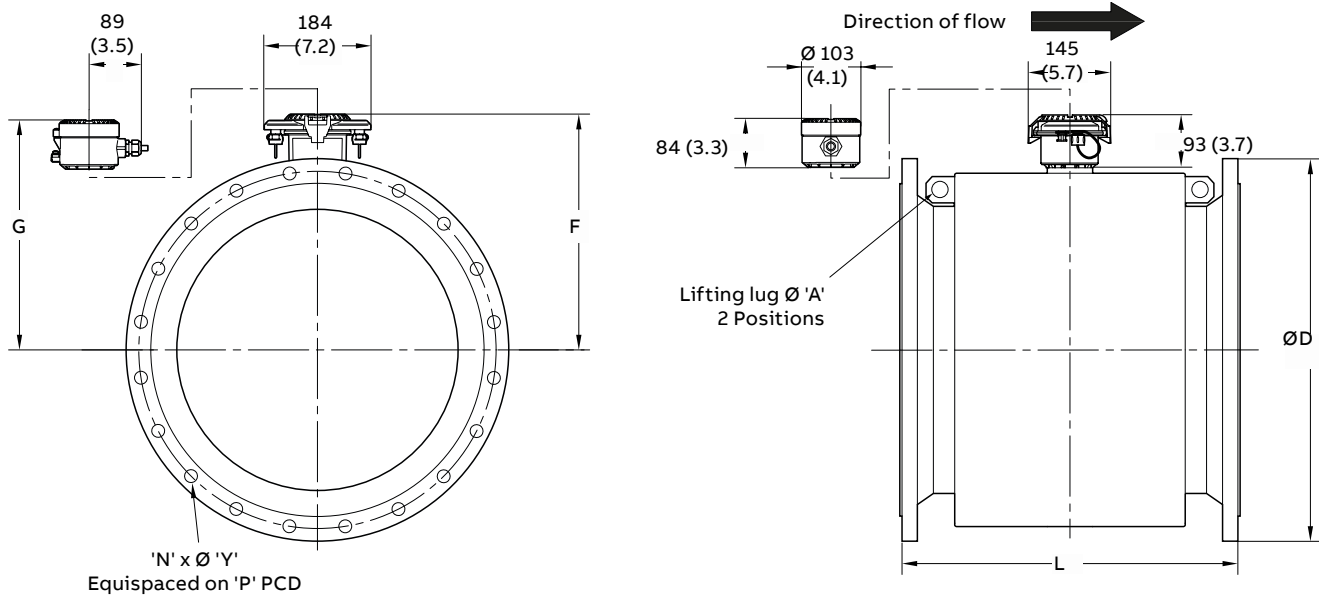


Figure 33 F-style sensor – DN 700 to DN 2400 (28 to 96 in.)

Sensor size	Flange		Dimensions in mm (in.)								Approx. weight kg (lbs)			
	Standard	Class	Flange OD D	No. holes N	Bolt hole dia. Y	Bolt hole PCD P	Sensor length L	Tx. height F	T. box height G	Lifting lug A	Integral Remote			
DN700 (28 in.)	JIS	5K	875 (34.45)	24	27 (1.06)	820 (32.28)	700 (27.56)					216 (476)	214 (472)	
		10K	905 (35.63)		33 (1.30)	840 (33.07)						282 (622)	280 (617)	
	EN 1092 or DIN	PN6	860 (33.86)	26 (1.02)	810 (31.89)	700 (27.56)	497 (19.57)	492 (19.37)	30 (1.18)	225 (496)	223 (492)			
		PN10	895 (35.24)	30 (1.18)	840 (33.07)					303 (668)	301 (664)			
		PN16	910 (35.83)	36 (1.42)	840 (33.07)					337 (743)	335 (739)			
		PN25	960 (37.80)	42 (1.65)	875 (34.45)					800 (31.50)	471 (1038)	469 (1034)		
		PN40	995 (39.17)	48 (1.89)	900 (35.43)					910 (35.83)	586 (1292)	584 (1287)		
	AWWA C207	CLASS B	927 (36.50)	28	32 (1.26)	864 (34.02)	700 (27.56)	497 (19.57)	492 (19.37)	30 (1.18)	249 (549)	247 (545)		
		CLASS D	927 (36.50)		32 (1.26)	864 (34.02)					280 (617)	278 (613)		
		CLASS E	927 (36.50)		32 (1.26)	864 (34.02)					472 (1041)	470 (1036)		
		CLASS F	1035 (40.75)		44 (1.73)	940 (37.01)					715 (1576)	713 (1572)		
	AS 4087	PN16	910 (35.83)	20	30 (1.18)	845 (33.27)	700 (27.56)					359 (791)	357 (787)	
		PN35	935 (36.81)	24	36 (1.42)	857 (33.74)						539 (1188)	537 (1184)	
	AS 2129	TABLE D	910 (35.83)	20	30 (1.18)	845 (33.27)	700 (27.56)						263 (580)	261 (575)
		TABLE E			33 (1.30)								337 (743)	335 (739)
	ASME B16.5	CL150 SERIES A	925 (36.42)	28	35 (1.38)	864 (34.00)	790 (31.10)						503 (1109)	501 (1105)
		CL150 SERIES B	835 (32.87)	40	22 (0.87)	795 (31.31)	910 (35.83)						323 (712)	321 (708)
	ASME B16.5	CL300 SERIES A	1035 (40.75)	28	45 (1.75)	940 (37.00)	940 (37.01)						811 (1788)	809 (1784)
		CL300 SERIES B	920 (36.22)	36	35 (1.38)	857 (33.75)	910 (35.83)						631 (1391)	629 (1387)

Table 7 F-style sensor – DN 700 (28 in.)

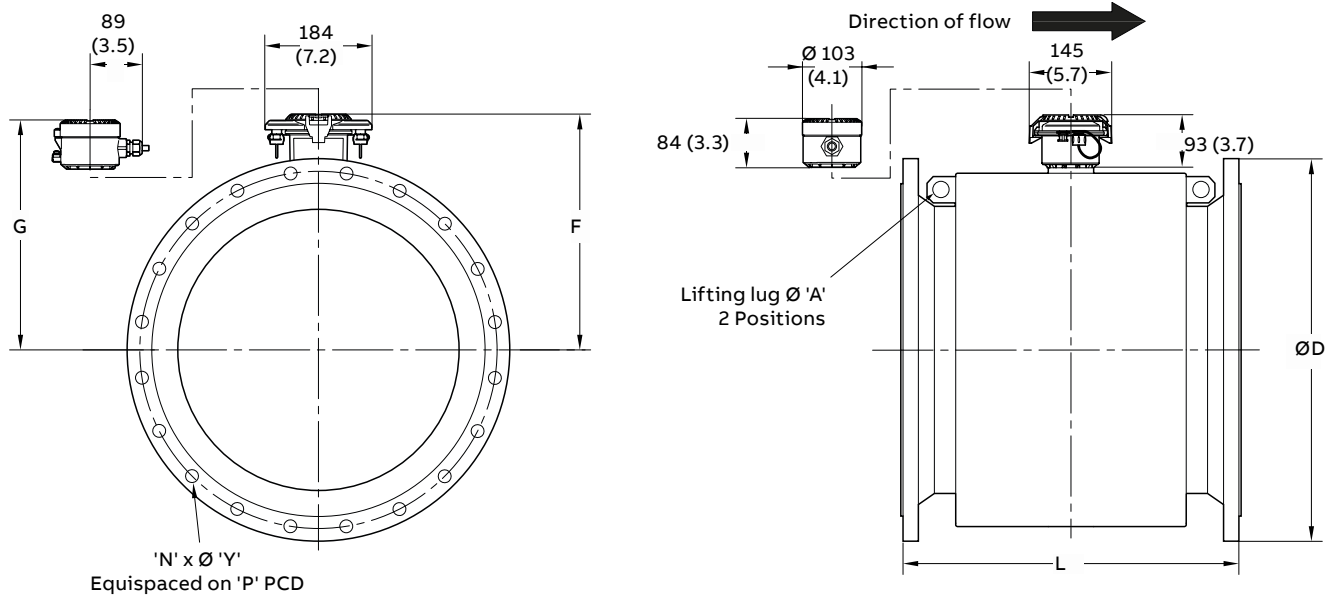
Sensor size	Flange		Dimensions in mm (in.)								Approx. weight kg (lbs)									
	Standard	Class	Flange OD D	No. holes N	Bolt hole dia. Y	Bolt hole PCD P	Sensor length L	Tx. height F	T. box height G	Lifting lug A	Integral	Remote								
DN750 (30 in.)	JIS	JIS5K	945 (37.20)	24	33 (1.30)	880 (34.65)	762 (30.00)					251 (553)	249 (549)							
		JIS10K	970 (38.19)			900 (35.43)						327 (721)	325 (717)							
	AWWA C207	CLASS B	984 (38.74)	28	32 (1.26)	914 (35.98)							273 (602)	271 (597)						
		CLASS D	984 (38.74)										32 (1.26)	914 (35.98)	32 (1.26)	914 (35.98)				
		CLASS E	984 (38.74)										32 (1.26)	914 (35.98)	32 (1.26)	914 (35.98)				
		CLASS F	1092 (42.99)										44 (1.73)	997 (39.25)	44 (1.73)	997 (39.25)				
	AS 4087	PN16	995 (39.17)	20	33 (1.30)	927 (36.50)	990 (38.98)	523 (20.59)	518 (20.39)	30 (1.18)			467 (1030)	465 (1025)						
		PN35	1015 (39.96)	28	36 (1.42)	940 (37.01)							663 (1462)	661 (1457)						
	AS 2129	TABLE D	995 (39.17)	20	33 (1.30)	927 (36.50)	762 (30.00)						340 (750)	338 (745)						
		TABLE E	995 (39.17)										36 (1.42)	927 (36.50)	36 (1.42)	927 (36.50)				
	ASME B16.5	CL150 SERIES A	985 (38.78)	28	35 (1.38)	914 (36.00)	820 (32.28)						544 (1199)	542 (1195)						
		CL150 SERIES B	885 (34.84)	44	22 (0.87)	846 (33.31)	990 (38.98)						320 (705)	318 (701)						
	ASME B16.5	CL300 SERIES A	1090 (42.91)	28	48 (1.87)	997 (39.25)	975 (38.39)						972 (2143)	970 (2138)						
		CL300 SERIES B	990 (38.98)	36	38 (1.50)	921 (36.25)	990 (38.98)						748 (1649)	746 (1645)						
DN800 (32 in.)	JIS	JIS5K	995 (39.17)	24	33 (1.30)	930 (36.61)	800 (31.50)					280 (617)	278 (613)							
		JIS10K	1020 (40.16)	28	33 (1.30)	950 (37.40)						364 (802)	362 (798)							
	EN 1092 or DIN	PN6	975 (38.39)	24	30 (1.18)	920 (36.22)	870 (34.25)						294 (648)	292 (644)						
		PN10	1015 (39.96)	34	33 (1.30)	950 (37.40)							406 (895)	404 (891)						
		PN16	1025 (40.35)	24	48 (1.89)	990 (38.98)							950 (37.40)	1040 (40.94)					469 (1034)	467 (1030)
		PN25	1085 (42.72)																615 (1356)	613 (1351)
	PN40	1140 (44.88)	56 (2.20)	1030 (40.55)	1040 (40.94)	866 (1909)	864 (1905)													
	AWWA C207	CLASS B	1060 (41.73)	28	38 (1.50)	978 (38.50)	800 (31.50)	547 (21.54)	542 (21.34)	30 (1.18)			328 (723)	326 (719)						
		CLASS D	1060 (41.73)										408 (899)	406 (895)						
		CLASS E	1060 (41.73)										38 (1.50)	978 (38.50)	897 (1978)	895 (1973)				
		CLASS F	1150 (45.28)										44 (1.73)	1054 (41.50)	897 (1978)	895 (1973)				
	AS 4087	PN16	1060 (41.73)	20	36 (1.42)	984 (38.74)	1040 (40.94)						530 (1168)	528 (1164)						
		PN35	1060 (41.73)	28									751 (1656)	749 (1651)						
	AS2129	TABLE D	1060 (41.73)	20	36 (1.42)	984 (38.74)	800 (31.50)						386 (851)	384 (847)						
		TABLE E	1060 (41.73)										519 (1144)	517 (1140)						
	ASME B16.5	CL150 SERIES A	1060 (41.73)	28	41 (1.63)	978 (38.50)	940 (37.01)						700 (1543)	698 (1539)						
		CL150 SERIES B	940 (37.01)	48	22 (0.87)	900 (35.44)	1040 (40.94)						406 (895)	404 (891)						
	ASME B16.5	CL300 SERIES A	1150 (45.28)	28	51 (2.01)	1054 (41.50)	1120 (44.09)						1227 (2705)	1225 (2701)						
CL300 SERIES B		1055 (41.54)	32	41 (1.63)	978 (38.50)	1040 (40.94)						933 (2057)	931 (2053)							
DN900 (36 in.)	JIS	JIS5K	1095 (43.11)	24	33 (1.30)	1030 (40.55)	900 (35.43)					369 (814)	367 (809)							
		JIS10K	1120 (44.09)	28	33 (1.30)	1050 (41.34)						445 (981)	443 (977)							
	EN 1092 or DIN	PN6	1075 (42.32)	24	30 (1.18)	1020 (40.16)	1050 (41.34)						390 (860)	388 (855)						
		PN10	1115 (43.90)	33 (1.30)	1050 (41.34)	502 (1107)							500 (1102)							
		PN16	1125 (44.29)	28	48 (1.89)	1090 (42.91)							1040 (40.94)	1170 (46.06)					589 (1299)	587 (1294)
		PN25	1185 (46.65)																819 (1806)	817 (1801)
	PN40	1250 (49.21)	56 (2.20)	1140 (44.88)	1170 (46.06)	1158 (2553)	1156 (2549)													
	AWWA C207	CLASS B	1168 (45.98)	32	38 (1.50)	1086 (42.76)	900 (35.43)	598 (23.54)	593 (23.35)	30 (1.18)			417 (919)	415 (915)						
		CLASS D											493 (1087)	491 (1082)						
		CLASS E											827 (1823)	825 (1819)						
		CLASS F											1270 (50.00)	51 (2.01)	1168 (45.98)	1150 (2535)	1148 (2531)			
	AS 4087	PN16	1175 (46.26)	24	36 (1.42)	1092 (42.99)	1170 (46.06)						706 (1556)	704 (1552)						
		PN35	1185 (46.65)	32	39 (1.54)	1105 (43.50)							1044 (2302)	1042 (2297)						
	AS 2129	TABLE D	1175 (46.26)	24	36 (1.42)	1092 (42.99)	900 (35.43)						514 (1133)	512 (1129)						
		TABLE E											694 (1530)	692 (1526)						
	ASME B16.5	CL150 SERIES A	1170 (46.06)	32	41.3 (1.63)	1086 (42.75)	1010 (39.76)						961 (2119)	959 (2114)						
		CL150 SERIES B	1055 (41.54)	44	25.4 (1.00)	1010 (39.75)	1170 (46.06)						595 (1312)	593 (1307)						
	ASME B16.5	CL300 SERIES A	1270 (50.00)	32	54 (2.13)	1168 (46.00)	1080 (42.52)						1513 (3336)	1511 (3331)						
CL300 SERIES B		1170 (46.06)	44.5 (1.75)										1089 (42.87)	1170 (46.06)	1147 (2529)	1145 (2524)				

Table 8 F-style sensor – DN 750 to DN 900 (30 to 36 in.)

...5 Installation

...Dimensions

...F-style sensor – DN 700 to DN 2400 (28 to 96 in.)



...Figure 33 F-style sensor – DN 700 to DN 2400 (28 to 96 in.)

Sensor size	Flange		Dimensional in mm (in.)							Approx. weight kg (lbs)		
	Standard	Class	Flange OD D	No. holes N	Bolt hole dia. Y	Bolt hole PCD P	Sensor length L	Trans height F	Tx. box height G	Lifting lug A		
											INT	REM
DN1000 (40 in.)	JIS	JIS5K	1195 (47.05)	28	33 (1.30)	1130 (44.49)	1000 (39.37)	648 (25.51)	643 (25.31)	30 (1.18)	441 (972)	439 (968)
		JIS10K	1235 (48.62)		39 (1.54)	1160 (45.67)					572 (1261)	570 (1257)
	EN 1092 or DIN	PN6	1175 (46.26)	30 (1.18)	1120 (44.09)	466 (1027)	464 (1023)					
		PN10	1230 (48.43)	36 (1.42)	1160 (45.67)	674 (1486)	672 (1482)					
		PN16	1255 (49.41)	42 (1.65)	1170 (46.06)	879 (1938)	877 (1933)					
		PN25	1320 (51.97)	56 (2.20)	1210 (47.64)	1207 (2661)	1205 (2657)					
		PN40	1360 (53.54)	56 (2.20)	1250 (49.21)	1413 (3115)	1411 (3111)					
	AWWA C207	CLASS B	1289 (50.75)	36	38 (1.50)	1200 (47.24)	1000 (39.37)	648 (25.51)	643 (25.31)	30 (1.18)	503 (1109)	501 (1105)
		CLASS D	1289 (50.75)								659 (1453)	657 (1448)
		CLASS E	1289 (50.75)								1028 (2266)	1026 (2262)
		CLASS F	1378 (54.25)								1367 (3014)	1365 (3009)
	AS 4087	PN16	1255 (49.41)	24	36 (1.42)	1175 (46.26)	831 (1832)	829 (1828)				
		PN35	1275 (50.20)	36	39 (1.54)	1194 (47.01)	1244 (2743)	1242 (2738)				
	AS 2129	TABLE D	1255 (49.41)	24	36 (1.42)	1175 (46.26)	610 (1345)	608 (1340)				
		TABLE E	1255 (49.41)	24	39 (1.54)	1175 (46.26)	833 (1836)	831 (1832)				
	ASME B16.5	CL150 SERIES A	1290 (50.79)	36	41 (1.63)	1200 (47.25)	1080 (42.52)	1149 (2533)	1147 (2529)			
		CL150 SERIES B	1175 (46.26)	44	29 (1.13)	1121 (44.13)	1300 (51.18)	738 (1627)	736 (1623)			
	ASME B16.5	CL300 SERIES A	1240 (48.82)	32	45 (1.75)	1156 (45.50)	1150 (45.28)	1349 (2974)	1347 (2970)			
CL300 SERIES B		1275 (50.20)	40	45 (1.75)	1191 (46.87)	1300 (51.18)	1487 (3278)	1485 (3274)				

Table 9 F-style sensor – DN 1000 (40 in.)

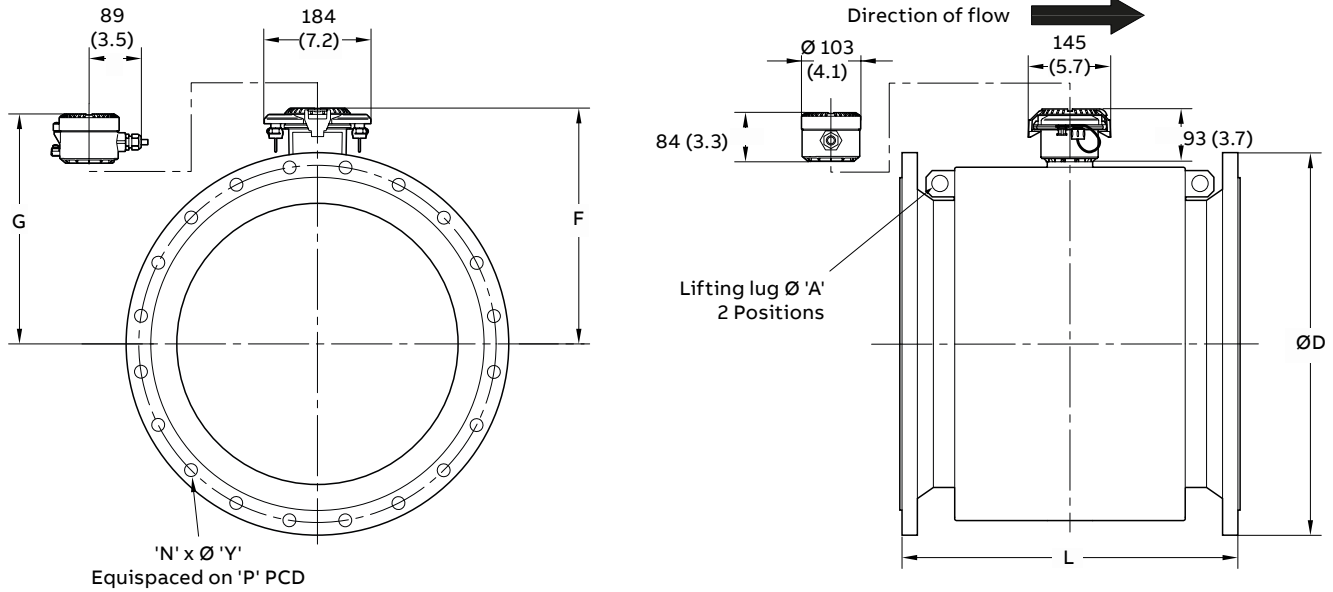
Sensor size	Flange		Dimensional in mm (in.)								Approx. weight kg (lbs)	
	Standard	Class	Flange OD	No. holes	Bolt hole dia.	Bolt hole PCD	Sensor length	Trans height	Tx. box height	Lifting lug	INT	REM
					Y	P						
D	N	Y	P	L	F	G	A	INT	REM			
DN1050 (42 in.)	AWWA C207	CLASS B									564 (1243)	562 (1239)
		CLASS D	1346 (52.99)	36	38 (1.50)	1257 (49.49)					669 (1475)	667 (1470)
		CLASS E					1067 (42.01)				1143 (2520)	1141 (2515)
	ASME B16.5	CLASS F	1448 (57.01)		51 (2.01)	1340 (52.76)		701 (27.6)	697 (27.44)	30 (1.18)	1568 (3457)	1566 (3452)
		CL150 SERIES A	1345 (52.95)		41.3 (1.63)	1257 (49.50)					1289 (2842)	1287 (2837)
	ASME B16.5	CL150 SERIES B	1225 (48.23)	48	28.6 (1.13)	1172 (46.13)					809 (1784)	807 (1779)
CL300 SERIES A		1290 (50.79)	32	44.5 (1.75)	1207 (47.50)	1170 (46.06)				1527 (3366)	1525 (3362)	
	CL300 SERIES B	1335 (52.56)	36	47.6 (1.87)	1245 (49.00)	1365 (53.74)				1704 (3757)	1702 (3752)	
DN1100 (44 in.)	JIS	JIS5K	1305 (51.38)	28	33 (1.30)	1240 (48.82)					510 (1124)	508 (1120)
		JIS10K	1345 (52.95)		39 (1.54)	1270 (50.00)					689 (1519)	687 (1515)
	AWWA C207	CLASS B	1403 (55.24)	40	38 (1.50)		1118 (44.02)	701 (27.60)	697 (27.44)	30 (1.18)	615 (1356)	613 (1351)
		CLASS D	1403 (55.24)			1315 (51.77)					807 (1779)	805 (1775)
		CLASS E	1404 (55.28)	40	38 (1.50)						1205 (2657)	1203 (2652)
		CLASS F	1505 (59.25)	36	51 (2.01)	1397 (55.00)					1719 (3790)	1717 (3785)
DN1200 (48 in.)	JIS	5K	1420 (55.91)		33 (1.30)	1350 (53.15)					651 (1435)	649 (1431)
		10K	1465 (57.68)		39 (1.54)	1380 (54.33)					967 (2132)	965 (2127)
	EN 1092 or DIN	PN6	1405 (55.31)	32	33 (1.30)	1340 (52.76)	1200 (47.24)				710 (1565)	708 (1561)
		PN10	1455 (57.28)		39 (1.54)	1380 (54.33)					1107 (2441)	1105 (2436)
		PN16	1485 (58.46)		48 (1.89)	1390 (54.72)					1363 (3005)	1361 (3000)
		PN25	1530 (60.24)		56 (2.20)	1420 (55.91)	1560 (61.42)				1559 (3437)	1557 (3433)
AWWA C207	PN40	1575 (62.01)		62 (2.44)	1460 (57.48)					2133 (4702)	2131 (4698)	
	CLASS B	1511 (59.49)	44	38 (1.50)	1422 (55.98)					772 (1702)	770 (1698)	
	CLASS D	1511 (59.49)					753 (29.65)	748 (29.49)	30 (1.18)	999 (2202)	997 (2198)	
	CLASS E	1511 (59.49)		38 (1.50)	1422 (55.98)					1458 (3214)	1456 (3210)	
	CLASS F	1651 (65.00)	40	51 (2.01)	1543 (60.75)	1200 (47.24)				2400 (5291)	2398 (5287)	
	AS 4087	PN16	1490 (58.66)	32	36 (1.42)						1253 (2762)	1251 (2758)
AS 2129	TABLE-D	1490 (58.66)	32	36 (1.42)	1410 (55.51)					1023 (2255)	1021 (2251)	
	TABLE-E	1490 (58.66)	32	39 (1.54)						1272 (2804)	1270 (2800)	
AS 4087	PN35	1530 (60.24)	40	42 (1.65)	1441 (56.73)	1560 (61.42)				2115 (4663)	2113 (4658)	
ASME CL150	SERIES A	1510 (59.45)	44	41 (1.63)	1422 (56.00)	1310 (51.57)				1707 (3763)	1705 (3759)	
	SERIES B	1390 (54.72)		32 (1.25)	1335 (52.56)	1200 (47.24)				1085 (2392)	1083 (2388)	
ASME CL300	SERIES A	1465 (57.68)	32	51 (2.01)	1372 (54.00)	1400 (55.12)				2163 (4769)	2161 (4764)	
	SERIES B	1510 (59.45)	40	51 (2.01)	1416 (55.75)	1560 (61.42)				2352 (5185)	2350 (5181)	
DN1350 (54 in.)	AWWA C207	CLASS B									981 (2163)	979 (2158)
		CLASS D	1683 (66.26)	44	44 (1.73)	1594 (62.76)	1350 (53.15)	848 (33.39)	843 (33.19)	45 (1.77)	1213 (2674)	1211 (2670)
		CLASS E									1942 (4281)	1940 (4277)
DN1400 (56 in.)	EN 1092 or DIN	PN6	1630 (64.17)	36	36 (1.42)	1560 (61.42)					1085 (2392)	1083 (2388)
		PN10	1675 (65.94)		42 (1.65)	1590 (62.60)	1400 (55.12)				1731 (3816)	1729 (3812)
		PN16	1685 (66.34)		48 (1.89)						1770 (3902)	1768 (3898)
		PN25	1755 (69.09)		62 (2.44)	1640 (64.57)					2368 (5221)	2366 (5216)
	ASME CL150	PN40	1795 (70.67)		62 (2.44)	1680 (66.14)	1820 (71.65)	848 (33.39)	843 (33.19)	45 (1.77)	3086 (6803)	3084 (6799)
		SERIES A	1745 (68.70)	48	48 (1.87)	1651 (65.00)	1490 (58.66)				2566 (5657)	2554 (5631)
		SERIES B	1600 (62.99)	60	32 (1.25)	1543 (60.75)	1400 (55.12)				1593 (3512)	1591 (3508)
		SERIES A	1710 (67.32)	28	60 (2.37)	1600 (63.00)	1600 (62.99)				3376 (7443)	3374 (7438)
ASME CL300	SERIES B	1765 (69.49)	36	60 (2.37)	1651 (65.00)	1820 (71.65)				3758 (8285)	3756 (8281)	

Table 10 F-style sensor – DN 1050 to DN 1400 (42 to 56 in.)

...5 Installation

...Dimensions

...F-style sensor – DN 700 to DN 2400 (28 to 96 in.)



...Figure 33 F-style sensor – DN 700 to DN 2400 (28 to 96 in.)

Sensor size	Flange		Dimensional in mm (in.)								Approx. weight kg (lbs)	
	Standard	Class	Flange OD	No. Holes	Bolt Hole Dia	Bolt Hole PCD	Sensor length	Trans Height	Tx. box Height	Lifting Lug	INT	REM
					Y	P						
DN1500 (60 in.)	JIS	5K	1730 (68.11)	36	33 (1.30)	1660 (65.35)	1524 (60.00)	958 (37.72)	953 (37.52)	45 (1.77)	1029 (2269)	1027 (2264)
		10K	1795 (70.67)	40	45 (1.77)	1700 (66.93)					1504 (3316)	1502 (3311)
	AWWA C207	CLASS B	1854 (72.99)	52	44 (1.73)	1759 (69.25)	1524 (60.00)	958 (37.72)	953 (37.52)	45 (1.77)	1229 (2709)	1227 (2705)
		CLASS D	1854 (72.99)								1514 (3338)	1512 (3333)
		CLASS E	1854 (72.99)								2544 (5609)	2542 (5604)
	ASME CL150	SERIES A	1855 (73.03)	32	47.6 (1.87)	1662 (65.44)	1640 (64.57)	958 (37.72)	953 (37.52)	45 (1.77)	3084 (6799)	3082 (6795)
		SERIES B	1725 (67.91)		35 (1.38)						2031 (4478)	2029 (4473)
	ASME CL300	SERIES A	1810 (71.26)	32	60 (2.37)	1702 (67.00)	1640 (64.57)	958 (37.72)	953 (37.52)	45 (1.77)	3875 (8543)	3873 (8539)
		SERIES B	1880 (74.02)	40	60 (2.37)	1764 (69.44)	1950 (76.77)				4181 (9218)	4179 (9213)
	DN1600 (64 in.)	EN 1092 or DIN	PN6	1830 (72.05)	40	36 (1.42)	1760 (69.29)	1600 (62.99)	959 (37.76)	954 (37.56)	45 (1.77)	1434 (3161)
PN10			1915 (75.39)	48 (1.89)		1820 (71.65)	2525 (5567)					2523 (5562)
PN16			1975 (77.76)	56 (2.20)		1820 (71.65)	2768 (6102)					2766 (6098)
PN25			1930 (75.98)	62 (2.44)		1860 (73.23)	3201 (7057)					3199 (7053)
PN40			2025 (79.72)	70 (2.76)		1900 (74.80)	4375 (9645)					4373 (9641)
DN1650 (66 in.)	AWWA C207	CLASS B	2032 (80.00)	52	44(1.75)	1930(75.98)	1650 (64.96)	1009 (39.72)	1004 (39.53)	45 (1.77)	1504 (3316)	1502 (3311)
		CLASS D	2032 (80.00)								2025 (4464)	2023 (4460)
DN1800 (72 in.)	EN 1092 or DIN	PN6	2045 (80.51)	44	39 (1.54)	1970 (77.56)	1800 (70.87)	1074 (42.28)	1069 (42.09)	45 (1.77)	1853 (4085)	1851 (4081)
		PN10	2115 (83.27)		48 (1.89)	2020 (79.53)					3180 (7011)	3178 (7006)
		PN16	2130 (83.86)		56 (2.20)	2070 (81.50)					3657 (8062)	3655 (8058)
		PN25	2195 (86.42)		70 (2.76)	2380 (93.70)					4422 (9749)	4420 (9744)
	AWWA C207	CLASS B	2197 (86.50)	60	44 (1.73)	2096 (82.52)	1800 (70.87)	1074 (42.28)	1069 (42.09)	45 (1.77)	1773 (3909)	1771 (3904)
		CLASS D									2387 (5262)	2385 (5258)
DN1950 (78 in.)	AWWA C207	CLASS B	2362 (92.99)	64	51(2.01)	2261(89.02)	1950 (76.77)	1184 (46.61)	1179 (46.42)	45 (1.77)	2309 (5090)	2307 (5086)
		CLASS D									3037 (6695)	3035 (6691)
DN2000 (80 in.)	EN 1092 or DIN	PN6	2265 (89.17)	48	42 (1.65)	2180 (85.83)	2000 (78.74)	1184 (46.61)	1179 (46.42)	45 (1.77)	2581 (5690)	2579 (5686)
		PN10	2325 (91.54)		48 (1.89)	2230 (87.80)					4254 (9378)	4252 (9374)
		PN16	2345 (92.32)		62 (2.44)	2300 (90.55)					4556 (10044)	4554 (10040)
		PN25	2425 (95.47)		70 (2.76)	2600 (102.36)					5896 (12998)	5894 (12994)
DN2100 (84 in.)	AWWA C207	CLASS B	2534 (99.76)	64	51(2.01)	2426 (95.51)	2100 (82.68)	1288 (50.71)	1283 (50.51)	45 (1.77)	2641 (5822)	2639 (5818)
		CLASS D									3487 (7688)	3485 (7683)
DN2200 (88 in.)	EN 1092 or DIN	PN6	2475 (97.44)	52	42 (1.65)	2390 (94.09)	2200 (86.61)	1288 (50.71)	1283 (50.51)	45 (1.77)	3363 (7414)	3361 (7410)
		PN10	2550 (100.39)		56 (2.20)	2440 (96.06)					5795 (12776)	5793 (12771)
DN2400 (96 in.)	EN 1092 or DIN	PN6	2685 (105.71)	56	42 (1.65)	2600 (102.36)	2400 (94.49)	1388 (54.65)	1283 (50.51)	45 (1.77)	4100 (9039)	4098 (9035)
		PN10	2760 (108.66)		56 (2.20)	2650 (104.33)					6968 (15362)	6966 (15357)

Table 11 F-style sensor – DN 1500 to DN 2400 (42 to 96 in.)

...5 Installation

Grounding

The sensor must be cross-bonded to the upstream and downstream pipes. For technical reasons, this potential must be identical to the potential of the metering fluid. The fluid connection is made by installing 2 fluid contact rings (for grounding).



IMPORTANT NOTE

- Connect the transmitter ground connection to the sensor body ground – see Operating Instruction OI/FET400-EN.
- The sensor must not be connected to a ground spike.
- For bonding connections use $\geq 4 \text{ mm}^2$ (<10AWG) cable.

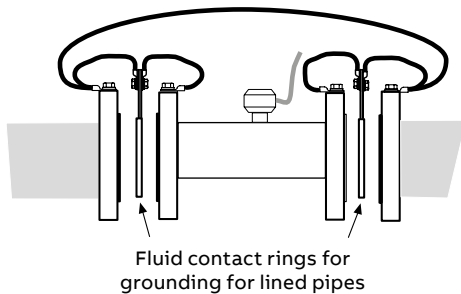


Figure 34 Cross-bonding – all flanged pipes

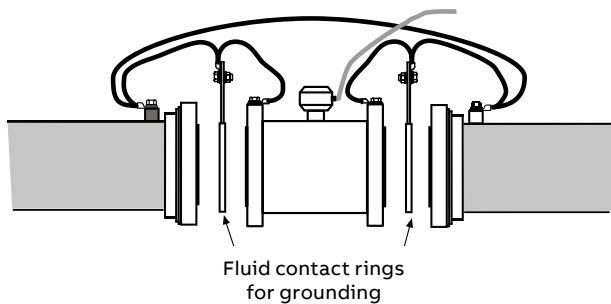


Figure 35 Cross-bonding – flange adapter

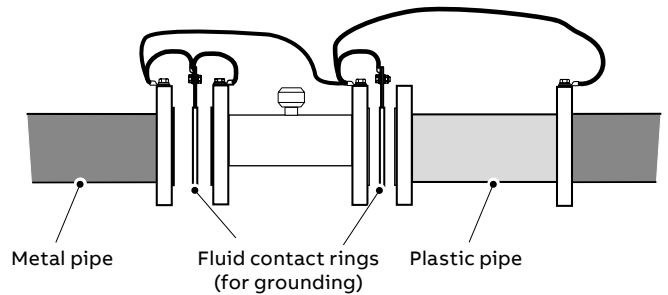


Figure 36 Cross-bonding – plastic pipe insert

Cathodic-protected systems



CAUTION

The grounding arrangement shown in Figure 37 is applicable only to:

- cathodic protected installations
- installations where E2 and E3 are different to E1

Do not ground cathodically-protected pipelines to an external earth.

Incorrect installation will result in fault currents flowing through the meter resulting in unstable readings.

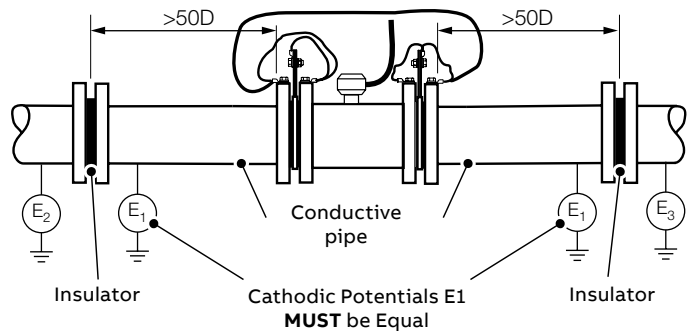


Figure 37 Cathodic-protected installations with different cathodic potential generator

Connections



DANGER – SERIOUS DAMAGE TO HEALTH

- The mains / line-powered transmitter option is not fitted with a switch – an isolator such as a switch or circuit breaker conforming to local safety standards must be fitted to the final installation. It must be fitted in close proximity to the transmitter, within easy reach of the operator and marked clearly as the isolation mechanism for the transmitter.
- Remove all power from supply, relay, any powered control circuits and high common mode voltages before accessing or making any connections.
- All connections to secondary circuits must have insulation to required local safety standards. After installation, there must be no access to live parts. Use screened cable for signal inputs and relay connections. Route signal leads and power cables separately, preferably in an earthed (grounded) flexible metal conduit.
- Maintain Environmental Protection at all times – see Figure 38.

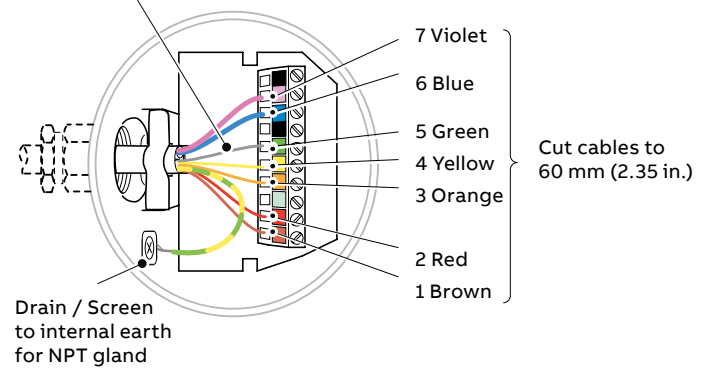
Signal cable preparation

To prepare the cable for connection at the transmitter and sensor terminal blocks:

- Remove the outer cable insulation and Mylar® wrap.
- Cut the cable connection wires to the lengths shown.
- Ensure the drain wire is sleeved.
- Twist the three screen wires together and sleeve them.
- Keep cable pairs twisted.
- Make connections only as shown.
- Conduit connections must provide cable entry sealing.

Signal cable connection – remote sensors

Drain / Screen wire for M20 gland



Signal cable connections

Environmental protection

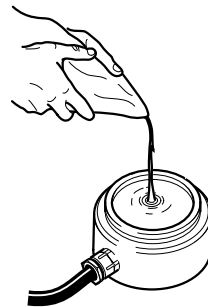


Figure 38 Potting the sensor terminal box



WARNING

- Potting materials are toxic. Read the manufacturers' instructions carefully before preparing the potting material and use suitable safety precautions.
- Power up and check all connections before potting.
- The remote sensor terminal box connections must be potted immediately on completion to prevent the ingress of moisture.
- Do not overfill or allow the potting material to come into contact with 'O' rings or grooves.
- Do not let potting material enter conduit (if used).

6 Commissioning

Safety instruction



WARNING

Risk of burns due to hot measuring media.
The sensor surface temperature may exceed 70 °C (158 °F), depending on the measuring medium temperature! Before starting work on the sensor, make sure that it has cooled sufficiently.

If there is a chance that safe operation is no longer possible, take the sensor out of operation and secure it against unintended startup.

Checks prior to commissioning

The following points must be checked before commissioning the sensor:

- The wiring must have been completed as described in the **Installation** section on page 10.
- The sensor must be grounded correctly.
- The ambient conditions must meet the requirements set out in the technical data.
- The power supply must meet the requirements printed on the identification plate.
- Checking the correct sensor to transmitter assignment (remote flowmeter only) – see Nameplate on page 9 for sensor label information.



IMPORTANT (NOTE)

The Flow Settings > Mains Noise Rejection Frequency (Hz) setting must match the mains frequency supplied at the point of installation – refer to Operating Instruction OI/FET400-EN.

7 Repair

Spare parts

Common accessories

Part number	Description
WABC2010/05	Sensor cable assembly 5 m (approx. 15 ft)
WABC2010/10	Sensor cable assembly 10 m (approx. 30 ft)
WABC2010/20	Sensor cable assembly 20 m (approx. 66 ft)
WABC2010/50	Sensor cable assembly 50 m (approx. 164 ft)
WABC2010/100	Sensor cable assembly 100 m (approx. 382 ft)
WABC2010/150	Sensor cable assembly 150 m (approx. 492 ft)

8 Recycling and disposal

Disassembly

**WARNING**

Risk of injury due to process conditions

The process conditions – for example, high pressures and temperatures, toxic and aggressive measuring media, can give rise to hazards when dismantling the sensor.

- If necessary, wear suitable personal protective equipment during disassembly.
- Before disassembly, ensure that the process conditions do not pose any safety risks.
- Depressurize and empty the sensor / piping, allow to cool and purge if necessary.

Disposal

This product and its packaging are manufactured from materials that can be recycled by specialist recycling companies.

Note the following points when disposing of them:

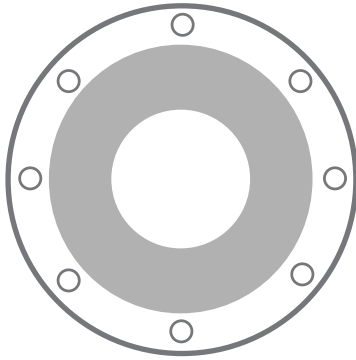
- This product is not subject to WEEE Directive 2012/19/EU or relevant national laws (for example, ElektroG in Germany).
- The product must be surrendered to a specialist recycling company. Do not use municipal garbage collection points.
- According to WEEE Directive 2012/19/EU, only products used in private applications may be disposed of at municipal garbage collection points.
- If it is not possible to dispose of old equipment properly, ABB Service can take receipt of and dispose of returns. Contact your local ABB Sales or Service representatives for a quotation.

**IMPORTANT (NOTE)**

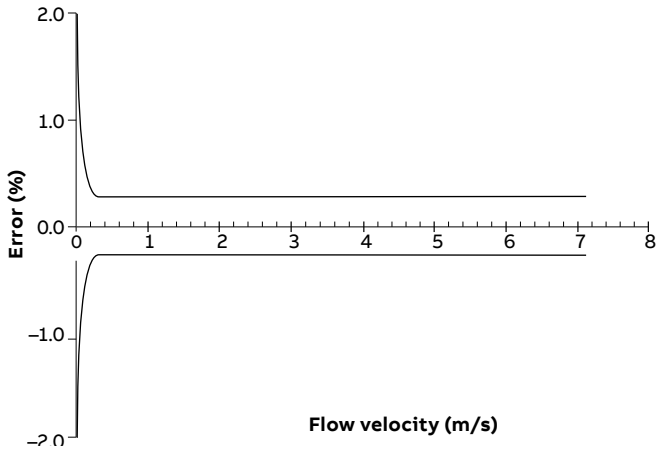
Products that are marked with this symbol may not be disposed of through municipal garbage collection points.

9 Specification

Reduced bore sensor



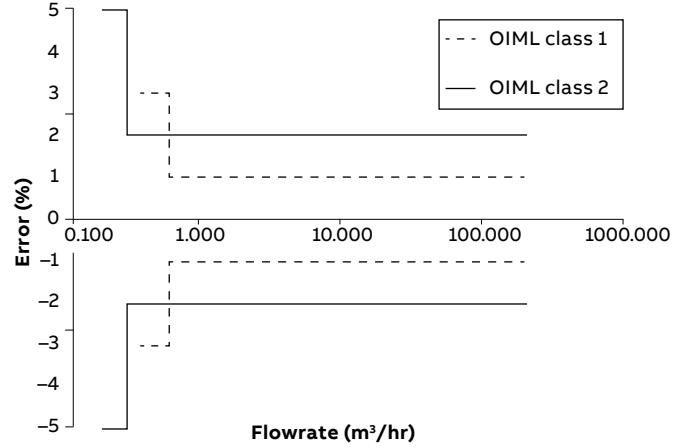
Measurement accuracy



DN	Mains powered		Battery / renewable energy powered	
	Class 2 ±0.5 or ±0.4 %	Class 1 ±0.2 %	Class 2 ±0.5 or ±0.4 %	Class 1 ±0.2 %
40 to 600	±1 mm/s*	±0.5 mm/s*	±2 mm/s*	±1 mm/s*

*Whichever is the greater

Metrological performance to OIML R49 (pending)



DN	in.	Q3 (m3/h)	Mains powered		Battery / renewable energy powered	
			Class 2 (R = 1000) Q1 (m3/h)	Class 1 (R = 1000) Q1 (m3/h)	Class 1 (R = 500) Q1 (m3/h)	Class 1 (R = 500) Q1 (m3/h)
40	1½	25	0.025	0.05	0.063	0.16
50	2	40	0.04	0.08	0.1	0.25
65	2½	63	0.063	0.126	0.158	0.39
80	3	100	0.1	0.2	0.25	0.63
100	4	160	0.16	0.32	0.4	1
125	5	160	0.16	0.32	0.4	1
150	6	400	0.4	0.8	1	2.5
200	8	630	0.63	1.26	1.58	3.94
250	10	1000	1	2	2.5	6.25
300	12	1600	1.6	3.2	4	10
350	14	1600	1.6	3.2	4	10
400	16	2500	2.5	5	6.3	15.6
450	18	2500	2.5	5	6.3	15.6
500	20	4000	4	8	10	25
600	24	6300	6.3	12.6	15.8	39.4

Q2 = 1.6 * Q1
Q4 = 1.25 * Q3

Bore sizes and flange types

Bore size range

DN40 to 600

Flanges to standards

ASME
AWWA
ISO 7005 EN1092-1
DIN
AS4087
AS2129
JIS

Pressure limitations for flanges

As per flange rating

Pressure equipment directive 97/23/EC

This product is applicable in networks for the supply, distribution and discharge of water and associated equipment and is therefore exempt.

Bore and flange material

- DN40 to 300: SG iron
- DN350 to 600: carbon steel
- All sizes coated with light grey 2-pack epoxy (RAL9002)
- Primer: Interpon PZ660 zinc-based system, 70 microns thick
- Top coat: Interpon 610 light grey polyester powder coating (RAL 9002), up to 150 microns thick, comparable to EN ISO 12944 grade C4
- As a special requirements: 2-pack epoxy primer / finish @ 300 µm DFT

Terminal box for remote sensors

Polycarbonate

Environmental and process conditions

Ingress rating

- IP68 (NEMA 6P) to 10 m (33 ft)
- For buriable applications: 1 m < sensor depth = 5 m

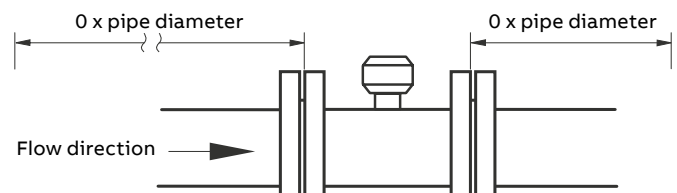
Temperature ranges

Ambient: -20 to 70 °C (-4 to 158 °F)
Process: -6 to 70 °C (21 to 158 °F)

Conductivity

>20 µS/cm

Upstream and downstream pipe conditions



Pressure loss

Flow rate	Pressure loss in bar (psi)
Q_3	<0.63 (9.1)
$Q_3 / 2$	<0.16 (2.3)

Potable water approvals for wetted parts

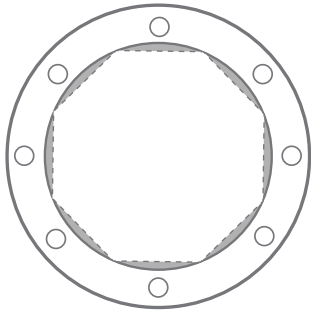
WRAS
ACS
DVGW
NSF
AZ/NZ 4020

Metrological certifications (pending)

- OIML R49 for accuracy class 1 and 2 and environmental class T50 0.1 to 50 °C (32.18 to 122 °F)
- MID MI-001
- NMI R49 and NMI 10 for Australia
- PAC for China

...9 Specification

Full bore sensor



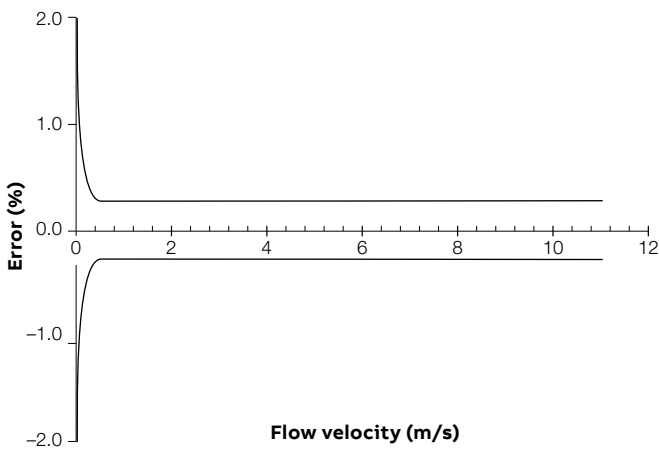
DN40 to 200

Octagonal bore, polypropylene liner

DN250 to 600

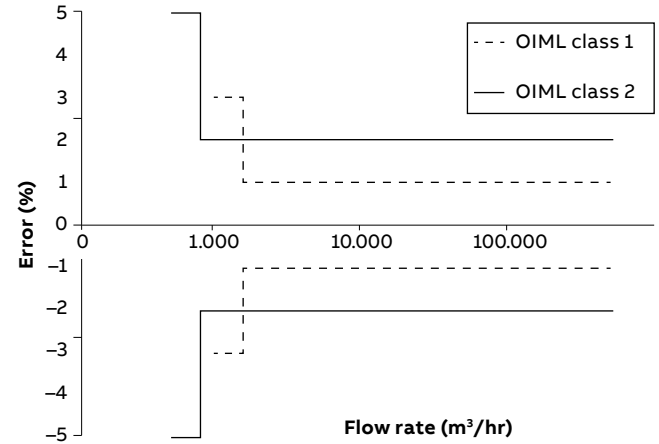
Full bore, elastomer or hard rubber liner

Measurement accuracy



DN	Mains powered		Battery / renewable energy powered	
	Class 2	Class 1	Class 2	Class 1
	±0.5 or ±0.4 %	±0.2 %	±0.5 or ±0.4 %	±0.2 %
40 to 600	±2 mm/s*	±1 mm/s*	±4 mm/s*	±2 mm/s*
700 to 2600	±4 mm/s*	±2 mm/s*	±6 mm/s*	±3 mm/s*

Metrological performance to OIML R49 (pending)



DN	in.	Q3 (m3/h)	Mains powered		Battery / renewable energy powered	
			Class 2 (R = 1000)	Class 1 (R = 1000)	Class 2 (R = 500)	Class 1 (R = 500)
			Q1 (m3/h)	Q1 (m3/h)	Q1 (m3/h)	Q1 (m3/h)
40	1½	40	0.08	0.2	0.16	0.32
50	2	63	0.13	0.25	0.25	0.5
65	2½	100	0.2	0.4	0.4	0.8
80	3	160	0.32	0.6	0.64	1.28
100	4	250	0.5	1	1	2
125	5	250	0.5	1	1	2
150	6	630	1.26	2.5	2.5	5
200	8	1000	2	4	4	8
250	10	1600	3.2	6	6.4	12.8
300	12	2500	5	10	10	20
350	14	4000	8	16	16	32
400	16	4000	8	16	16	32
450	18	6300	12.6	25.2	25.2	50
500	20	6300	12.6	25.2	25.2	50
600	24	10000	20	40	40	80

Q2 = 1.6 * Q1
Q4 = 1.25 * Q3

*Whichever is the greater

DN	in.	Q3 (m ³ /h)	Mains powered		Battery / renewable energy powered	
			Class 2 (R = 315)	Class 1 (R = 160)	Class 2 (R = 160)	Class 1 (R = 80)
700	28	16000	50.8	100	100	200
760	30	16000	50.8	100	100	200
800	32	16000	50.8	100	100	200
900	36	25000	79	156	156	312
1000	40	25000	79	156	156	312
1050	42	25000	79	156	156	312
1200	44	40000	127	250	250	500
1400	48	63000	200	394	394	787
1500	54	63000	200	394	394	787
1600	56	63000	200	394	394	787
1800	60	100000	317	625	625	1250
2000	64	100000	317	625	625	1250
2200	66	160000	508	1000	1000	2000
2400	72	160000	508	1000	1000	2000
2600	78	160000	508	1000	1000	2000

Q2 = 1.6 * Q1
Q4 = 1.25 * Q3

Bore sizes and flange types

Bore size range

DN40 to 2400

Flanges to standards

ASME
AWWA
ISO 7005 EN1092-1
DIN
AS4087
AS2129
JIS

Pressure limitations for flanges

As per flange rating
PN25 max. process temperature 50 °C (122 °F)
PN40 max. process temperature 40 °C (104 °F)

Pressure equipment directive 97/23/EC

This product is applicable in networks for the supply, distribution and discharge of water and associated equipment and is therefore exempt.

Bore and flange material

- DN40 to 300: SG iron
- DN350 to 2400: carbon steel
- All sizes coated with light grey 2-pack epoxy (RAL9002)
- Primer: Interpon PZ660 zinc-based system, 70 microns thick
- Top coat: Interpon 610 light grey polyester powder coating (RAL 9002), up to 150 microns thick, comparable to EN ISO 12944 grade C4
- As a special requirements: 2-pack epoxy primer / finish @ 300 µm DFT

Terminal box for remote sensors

Polycarbonate

Environmental and process conditions

Ingress rating

- IP68 (NEMA 6P) to 10 m (33 ft)
- For buriable applications (DN40 to 200, octagonal bore, polypropylene liner): 1 m < sensor depth ≤ 5 m

Temperature ranges

Ambient: -20 to 70 °C (-4 to 158°F)

Liner material	Bore size	Process temperature	
		Minimum	Maximum
Polypropylene	DN40 to 200	-6 °C (21 °F)	70 °C (158 °F)
Elastomer	DN250 to 600	-5 °C (23 °F)	50 °C (122 °F)
Hard rubber	DN250 to 2400	-10 °C (14 °F)	80 °C (176 °F)

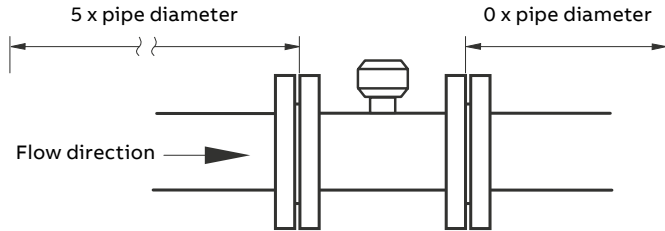
Conductivity

>20 µS/cm

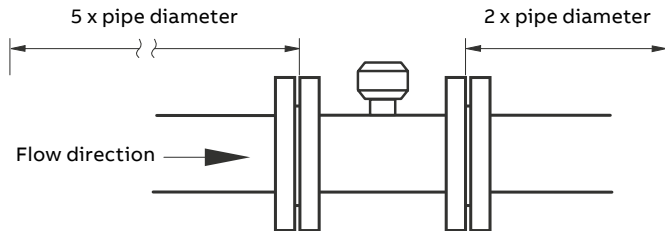
...9 Specification

... Environmental and process conditions

Upstream and downstream pipe conditions
(octagonal bore DN40 to 200)



Upstream and downstream pipe conditions
(full bore DN250 to 2400)



Pressure loss

Flow rate	Pressure loss in bar (psi)
Q_3	<0.25 bar (3.6 psi) for octagonal bore sensors
Q_3	Negligible for full bore sensors

Potable water approvals for wetted parts

WRAS
ACS
DVGW
NSF
AZ/NZ 4020

Metrological certifications (pending)

- OIML R49 for accuracy class 1 and 2 and environmental class T50 0.1 to 50 °C (32.18 to 122 °F)
- MID MI-001
- NMI R49 and NMI 10 for Australia
- PAC for China

10 Appendix

Declarations of conformity

**IMPORTANT (NOTE)**

All documentation, declarations of conformity, and certificates are available in ABB's download area:

www.abb.com/flow.

Acknowledgments

- Sensus is a registered trademark of Sensus USA, Inc.
- Mylar is a registered trademark of DuPont Teijin Films.

Notes

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