

Instruction

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CFS700A Coriolis Flow Sensor

Master Instruction

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1.1 Intended use

This mass flowmeter is designed for the direct measurement of mass flow rate, product density and product temperature. Indirectly, it also enables the measurement of parameters like total mass, concentration of dissolved substances and the volume flow. For use in hazardous areas, special codes and regulations are also applicable and these are specified in separate documentation.

**CAUTION!**

Responsibility for the use of the measuring devices with regard to suitability, intended use and corrosion resistance of the used materials against the measured fluid lies solely with the operator.

**NOTICE!**

This device is a Group 1, Class A device as specified within CISPR11:2009. It is intended for use in industrial environment. There may be potential difficulties in ensuring electromagnetic compatibility in other environments, due to conducted as well as radiated disturbances.

**NOTICE!**

The manufacturer is not liable for any damage resulting from improper use or use for other than the intended purpose.

1.2 CE certification



This device conforms with the most recent and up to date versions of the following:

- EMC Directive
- ATEX Directive
- Low Voltage Directive
- Pressure Equipment Directive (PED)
- RoHS
- Measuring Instrument Directive
- Radio Equipment Directive (RED)

The manufacturer declares conformity and the device carries the CE mark.

1.3 Associated documents

This handbook should be read in conjunction with relevant documents in relation to:

- hazardous areas
- communications
- concentration
- corrosion

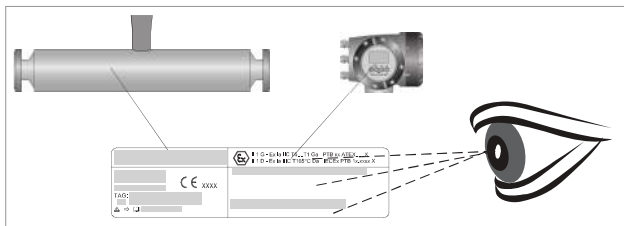
1.4 Pressure Equipment Directive (PED)



LEGAL NOTICE!

The Pressure Equipment Directive places legal requirements on both the manufacturer and the end user. Please read this section carefully!

Visual check



To ensure the PED integrity of the meter, you **MUST** check that the serial numbers on the transmitter nameplate and the sensor nameplate are the same.

To comply with the requirements of the Pressure Equipment Directive (PED) the manufacturer provides all the relevant technical data in the technical data section of this handbook. In addition to which, the following should also be noted:

- Secondary pressure containment is **NOT** supplied as standard.
- The non PED / CRN approved outer cylinder has a typical burst pressure greater than 100 barg / 1450 psig at 20°C / 68°F.
- The wiring feedthrough is made of Epoxy, PPS or PEEK with two O-rings made from FPM / FKM & Hydrogenated Nitrile.
- If the measuring tube/s fails, the O-ring and feedthrough will be in contact with the process product.
- You **MUST** make sure that the O-ring and feedthrough material is suitable for the application.
- Alternative O-ring materials are available on request.

Secondary pressure containment

Where the meter is being used to measure high pressure gases and / or gases kept as liquids by high pressure and / or where there is a risk of tube failure because of the use of corrosive or erosive fluids, frequent pressure and / or thermal cycling, seismic or other shock loading, a secondary containment option **MUST** be purchased

**DANGER!**

*If it is suspected that the primary measuring tube has failed, de-pressurise the meter and remove it from service as soon as it is safe to do so. Where the meter has a Tantalum primary measuring tube, extra care **MUST** be taken because the process fluid might be highly toxic and / or corrosive to the outer cylinder, wiring feedthrough and O-rings.*

1.5 Dirty gas

Dirty gas is gas that carries sand or other solid particles. Dirty gas causes excessive wear to the primary measuring tube that can eventually result in complete tube failure. In some situations tube failure where gas is being measured, can be very dangerous.

**DANGER!**

If the meter is being used to measure gas and there is a risk that the gas might be dirty, you must fit a filter upstream of the meter to catch solid particles.

1.6 Safety instructions from the manufacturer

1.6.1 Copyright and data protection

The contents of this document have been created with great care. Nevertheless, we provide no guarantee that the contents are correct, complete or up-to-date.

The contents and works in this document are subject to copyright. Contributions from third parties are identified as such. Reproduction, processing, dissemination and any type of use beyond what is permitted under copyright requires written authorisation from the respective author and/or the manufacturer.

The manufacturer tries always to observe the copyrights of others, and to draw on works created in-house or works in the public domain.

The collection of personal data (such as names, street addresses or e-mail addresses) in the manufacturer's documents is always on a voluntary basis whenever possible. Whenever feasible, it is always possible to make use of the offerings and services without providing any personal data.

We draw your attention to the fact that data transmission over the Internet (e.g. when communicating by e-mail) may involve gaps in security. It is not possible to protect such data completely against access by third parties.

We hereby expressly prohibit the use of the contact data published as part of our duty to publish an imprint for the purpose of sending us any advertising or informational materials that we have not expressly requested.

1.6.2 Disclaimer

The manufacturer will not be liable for any damage of any kind by using its product, including, but not limited to direct, indirect or incidental and consequential damages.

This disclaimer does not apply in case the manufacturer has acted on purpose or with gross negligence. In the event any applicable law does not allow such limitations on implied warranties or the exclusion of limitation of certain damages, you may, if such law applies to you, not be subject to some or all of the above disclaimer, exclusions or limitations.

Any product purchased from the manufacturer is warranted in accordance with the relevant product documentation and our Terms and Conditions of Sale.

The manufacturer reserves the right to alter the content of its documents, including this disclaimer in any way, at any time, for any reason, without prior notification, and will not be liable in any way for possible consequences of such changes.

1.6.3 Product liability and warranty

The operator shall bear responsibility for the suitability of the device for the specific purpose. The manufacturer accepts no liability for the consequences of misuse by the operator. Improper installation or operation of the devices (systems) will cause the warranty to be void. The respective "Standard Terms and Conditions" which form the basis for the sales contract shall also apply.

1.6.4 Information concerning the documentation

To prevent any injury to the user or damage to the device it is essential that you read the information in this document and observe applicable national standards, safety requirements and accident prevention regulations.

If this document is not in your native language and if you have any problems understanding the text, we advise you to contact your local office for assistance. The manufacturer can not accept responsibility for any damage or injury caused by misunderstanding of the information in this document.

This document is provided to help you establish operating conditions, which will permit safe and efficient use of this device. Special considerations and precautions are also described in the document, which appear in the form of icons as shown below.

1.6.5 Warnings and symbols used

Safety warnings are indicated by the following symbols.

	DANGER! <i>This warning refers to the immediate danger when working with electricity.</i>
	DANGER! <i>This warning refers to the immediate danger of burns caused by heat or hot surfaces.</i>
	DANGER! <i>This warning refers to the immediate danger when using this device in a hazardous atmosphere.</i>
	DANGER! <i>These warnings must be observed without fail. Even partial disregard of this warning can lead to serious health problems and even death.</i>
	WARNING! <i>Disregarding this safety warning, even if only in part, poses the risk of serious health problems. There is also the risk of damaging the device or parts of the operator's plant.</i>
	CAUTION! <i>Disregarding these instructions can result in damage to the device or to parts of the operator's plant.</i>
	NOTICE! <i>These instructions contain important information for the handling of the device.</i>
	LEGAL NOTICE! <i>This note contains information on statutory directives and standards.</i>



- **HANDLING**

This symbol designates all instructions for actions to be carried out by the operator in the specified sequence.

- ➞ **RESULT**

This symbol refers to all important consequences of the previous actions.

1.7 Safety instructions for the operator



WARNING!

In general, devices from the manufacturer may only be installed, commissioned, operated and maintained by properly trained and authorized personnel.

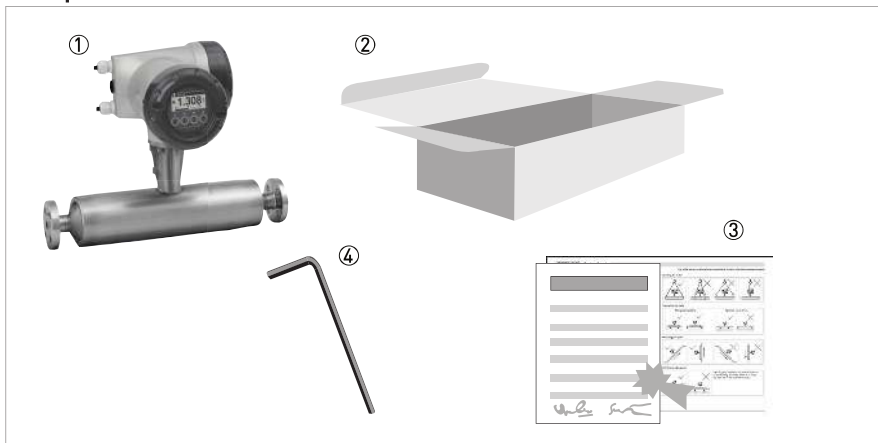
This document is provided to help you establish operating conditions, which will permit safe and efficient use of this device.

2.1 Model identification

Model	Nameplate
70Q	T/S 06
73E	T/S/H/A 10
70H	T/S/H/A 15
701	T/S/H/A 25
71H	T/S/H/A 40
702	T/S/H/A 50
703	T/H 80

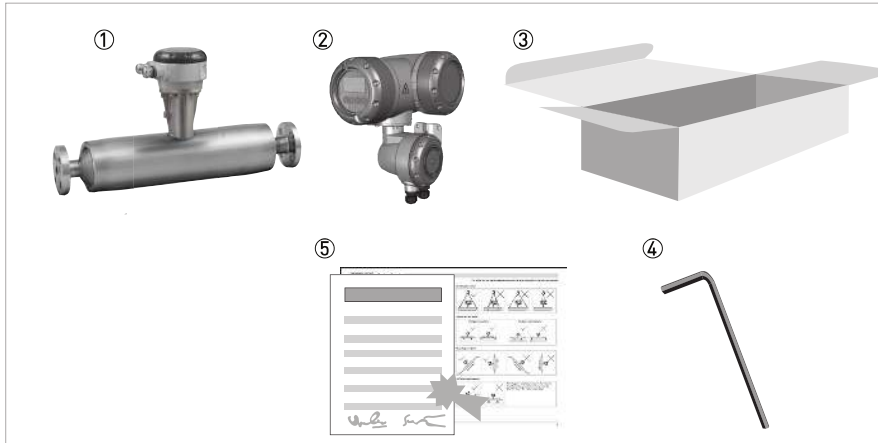
2.2 Scope of delivery

Compact version



- ① Mass flowmeter.
- ② Carton.
- ③ Documentation.
- ④ 2.5 mm hex head tool.

Remote version

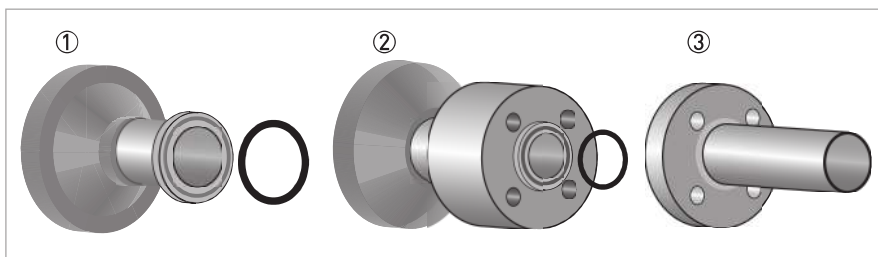


- ① Mass flowmeter.
- ② Transmitter. This will be either: field (as shown) or wall.
- ③ Carton.
- ④ 2.5 mm hex head tool.
- ⑤ Documentation.

If any items are missing, please contact the manufacturer.

If your meter has flange connections, the flange specification is stamped on the outer edge of the flange. Check that the specification on the flange is the same as your order.

2.2.1 Meters with hygienic connections



- ① Fully welded - the O-rings between the meter and the process pipework are not supplied as standard but can be ordered.
- ② DIN 11864-2 Form A - the O-rings between the Form A and Form B parts of the connection are not supplied as standard but can be ordered.
- ③ The 11864-2 Form B is not supplied as part of this connection but it can be ordered.

Inspect the condition of all seals between the meter and the process line (including seals supplied as part of the hygienic adapter) at regular intervals and replace them as necessary.

The time between inspections must be based on the seal material and the process conditions.

2.3 Nameplates

**NOTICE!**

*Look at the device nameplate to ensure that the device is delivered according to your order.
Check for the correct supply voltage printed on the nameplate.*

2.4 CSA Dual Seal

To comply with the requirements of ANSI/ISA -12.27.01-2003 "Requirements for process Sealing Between electrical systems and Flammable or Combustible process Fluids" a secondary seal is incorporated into all products. If the primary seal fails, the secondary seal will prevent escaping fluid reaching the electronic compartment.

Pressures and / or temperatures are limited by tube, temperature, connection and Ex limits. Check the meter nameplates and relevant documentation for full details. On all meters operating on gas measurement, the casing of the meter is fitted with a burst disc. If the primary seal (tube) fails leakage will occur from the burst disc. Install the meter so that the burst disc is pointing away from personnel.

Liquids (Example model code: CFS700C S25)

Pressure and temperature data:

CFS700C / CFS700F -40°C...+150°C and 100...10000 kPa

Pressures and/or temperatures may be further limited by tube, temperature, connection and Ex limits. Consult the meter nameplate and relevant documentation for full details

If the primary seal fails, the casing of the meter will fill with liquid and the meter will stop working. The meter will notify the operator by going into <Startup> mode and a diagnostic error will be shown on the transmitter or PLC display. This is an indication that the primary seal (tube) has failed and the status of the meter should be checked.

Meter status:

The meter will also go into <Startup> mode if the primary seal (tube) fails, or if they are not completely filled with fluid. For example, if the meter is drained or re/filled. To check the status of the meter, drain and re/fill with fluid and note the transmitter or PLC display. See the relevant section of the transmitter handbook for a list of status messages and diagnostics information.

If the meter remains in <Startup> mode you **MUST** assume that the primary seal (tube) has failed and the appropriate action **MUST** be taken.

Gases (Example model code: CFS 700C S25)

Pressure / temperature data:

CFS 700C S25 -40°C...+150°C and 500...10000 kPa

Pressures and/or temperatures may be further limited by tube, temperature, connection and Ex limits. Consult the meter nameplate and relevant documentation for full details.

On all meters operating on gas measurement the casing of the meter is fitted with a burst disc. If the primary seal (tube/s) fails leakage will occur from the burst disc. Install the meter so that the burst disc is pointing away from personnel.

Regular maintenance of the burst disc:

Carry out regular maintenance checks on burst discs for leakage and/or blockages. On all Coriolis Flow Sensor meters, the primary seal is considered to be the measuring tube of the meter. The materials of construction of the measuring tube/s are described within the relevant sections of this handbook and the customer's product and any other fluid flowing through the tube must be compatible with the material of construction. If failure of the primary seal is suspected then the process line should be de-pressurised and the meter removed as soon as it is safe to do so. Please contact customer service for servicing or replacement of the meter.

2.5 Temperature differential and thermal shock

Temperature differential

The maximum difference between ambient temperature and process (operating) temperature varies according to the measuring tube material.

Meter	Maximum temperature differential
Titanium	+130°C / +266°F
Stainless Steel	+80°C / +176°F
Hastelloy®	+80°C / +176°F
Tantalum	+80°C / +176°F

Extended range

Stainless Steel meters sizes 25, 40, 50 and 80 (fitted with hygienic connections) may be exposed to a temperature difference of 110°C / 230°F for a maximum of 2 hours.

Thermal shock

Thermal shock occurs when there is a sudden and extreme change (shift) in process temperature. To avoid thermal shock, refer to the following table for the maximum temperature shift.

Meter	Maximum temperature shift
Titanium	+130°C / +266°F
Stainless Steel	+80°C / +176°F
Hastelloy®	+80°C / +176°F
Tantalum	+80°C / +176°F



CAUTION!

Operation outside these limits may result in shifts in density and mass flow calibration. Repeated shocking may also lead to premature failure of the meter! However, higher thermal shocks are possible at lower working pressures. For more information, please contact your nearest representative.

3.1 General notes on installation

**NOTICE!**

Inspect the packaging carefully for damages or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.

**NOTICE!**

Do a check of the packing list to make sure that you have all the elements given in the order.

**NOTICE!**

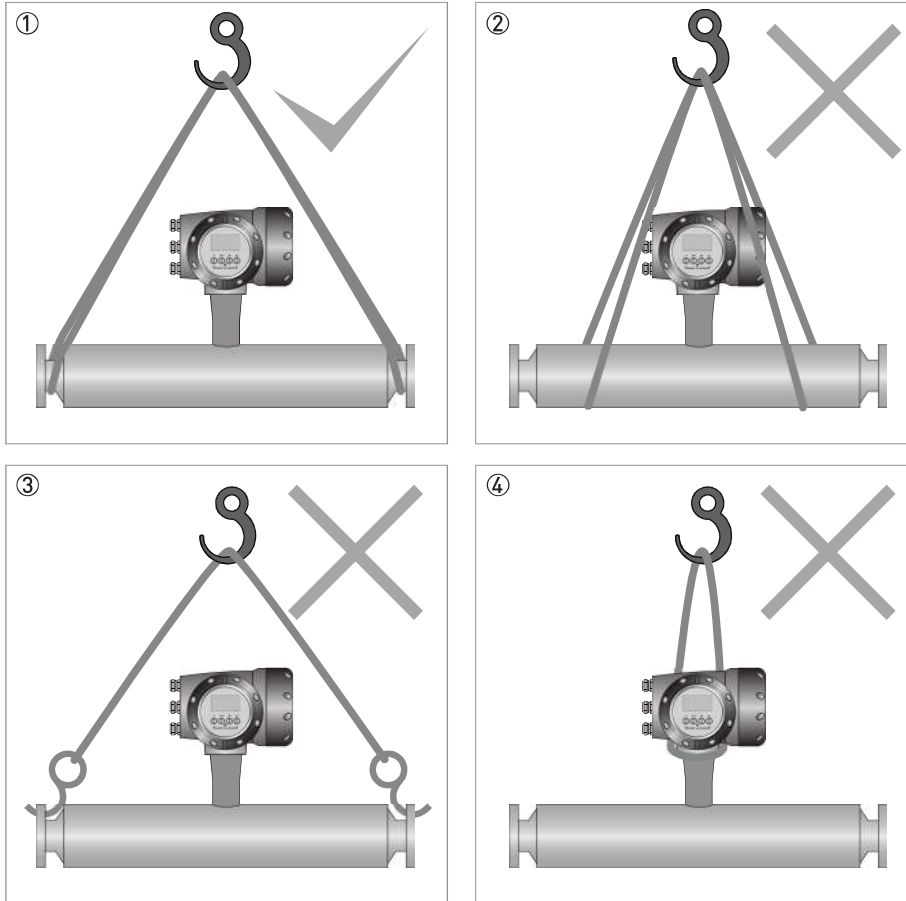
Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

3.2 Storage

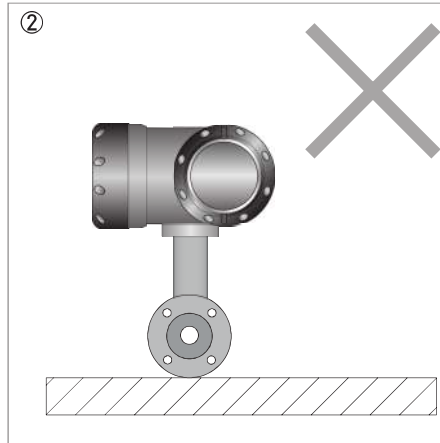
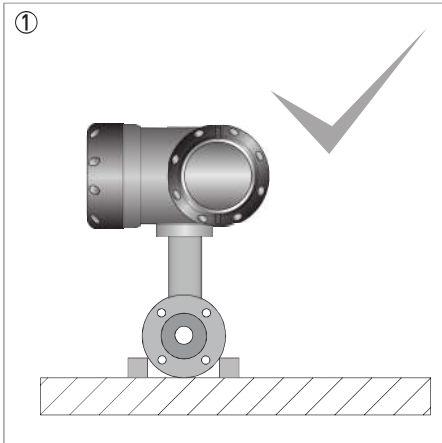
- Store the device in a dry and dust-free location.
- Avoid direct exposure to the sun.
- Store the device in its original packing.
- Do not allow the ambient temperature to fall below -50°C / -58°F or rise above +85°C / +185°F. (-40°C / -40°F and +70°C / +158°F, where a SIL capable Transmitter has been supplied)

3.3 Handling

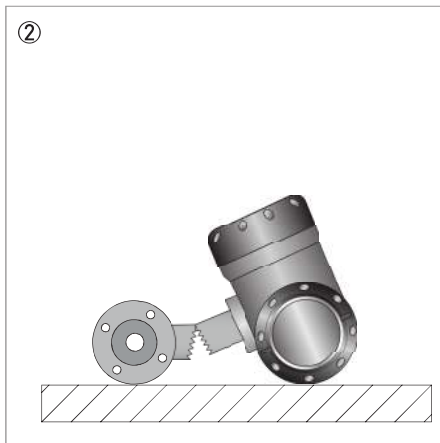
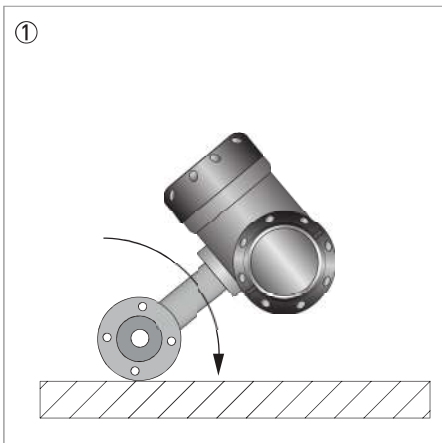
Using a sling to lift and carry the meter



- ① Use a well maintained sling to lift the meter by the spigots.
- ② DO NOT lift the meter with the sling part way along the outer cylinder.
- ③ DO NOT lift the meter using the flange bolt holes.
- ④ DO NOT lift the meter by the transmitter housing or the electronics stem.

Standing the meter before installation

- ① When standing the meter prior to installation, use blocks or similar to keep the meter upright.
② NEVER stand the meter upright without blocks (or similar) .

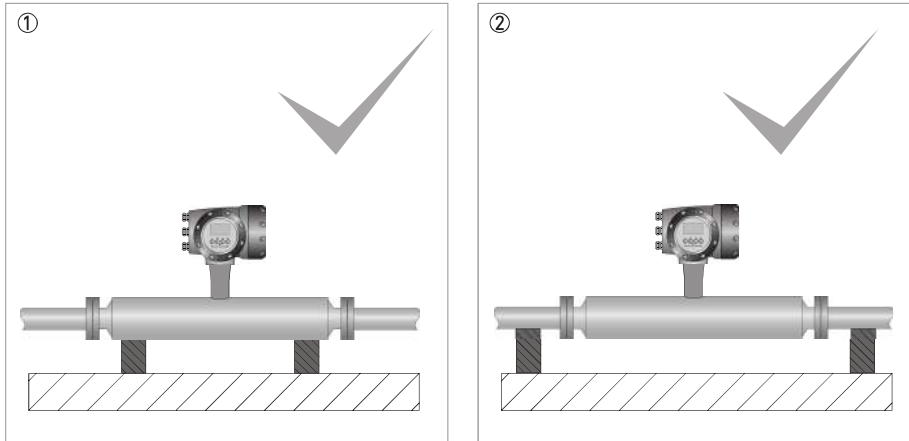


- ① If the meter is not blocked it can roll over
② This can cause severe damage to the meter, or injury to personnel

3.4 Installation conditions

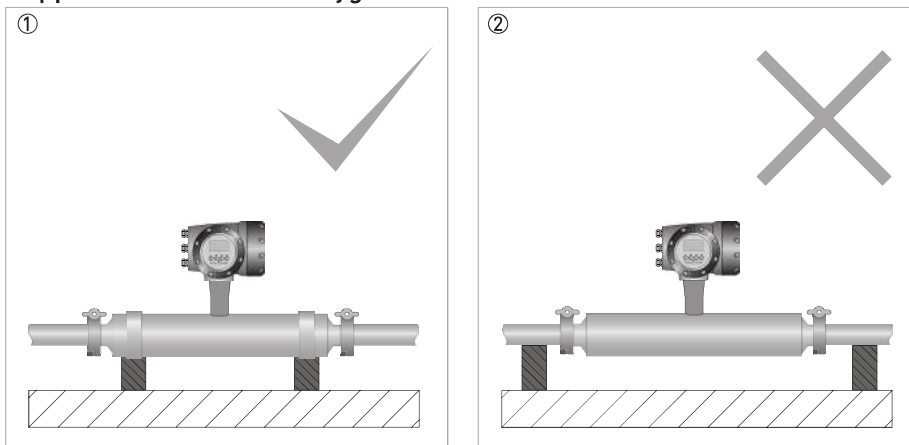
3.4.1 Supporting the meter

Support for meters with flange connections



- ① The meter can be supported directly by its body
- ② The meter can also be supported by the process pipework

Support for meters with hygienic connections



- ① Always support the meter body.
- ② DO NOT use the process pipework to support the weight of the meter. The thin wall of the pipework usually used in the hygienic industry, is not strong enough to carry the weight of the meter.

3.4.2 Excessive vibration

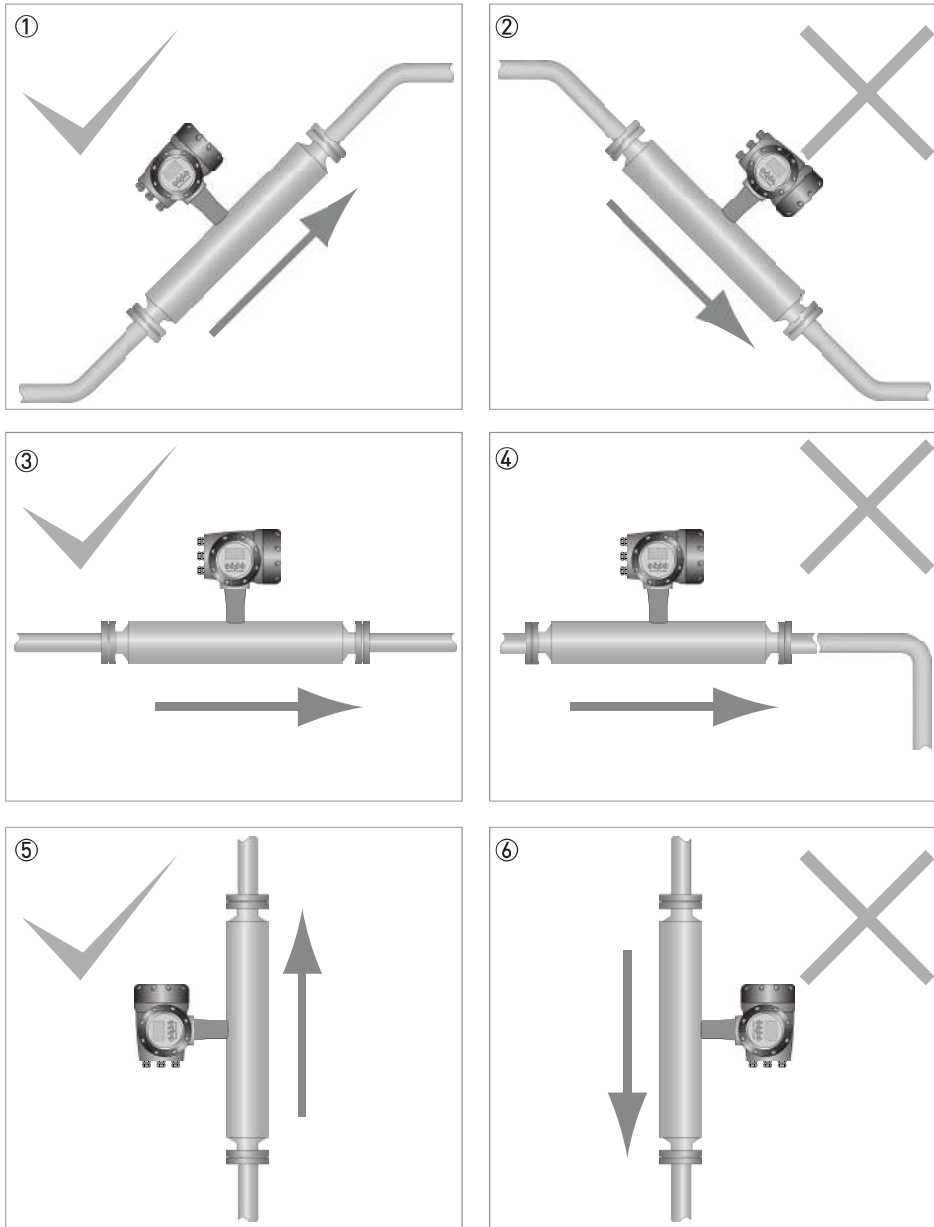
Vibration from pumps and other equipment in the process line can have an effect on the meter that, in some situations, can cause damage. Damage is most likely to occur if the meter has hygienic connections and the level of vibration is excessive.

**CAUTION!**

If there is excessive vibration in the process pipework, you must isolate the meter from its mounting. It is recommended that you place an insert made from rubber (or similar material) between the meter body, or pipework, and the mounting clamp or fixing point. For more information, contact the manufacturer.

3.4.3 Mounting the meter

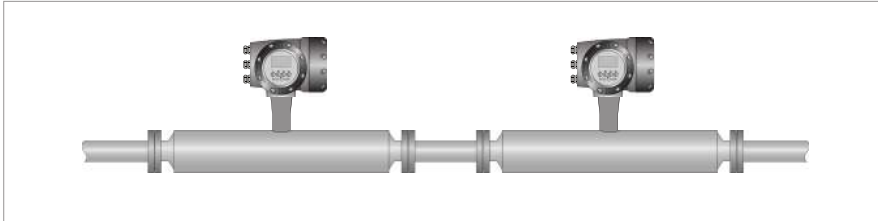
Mounting positions



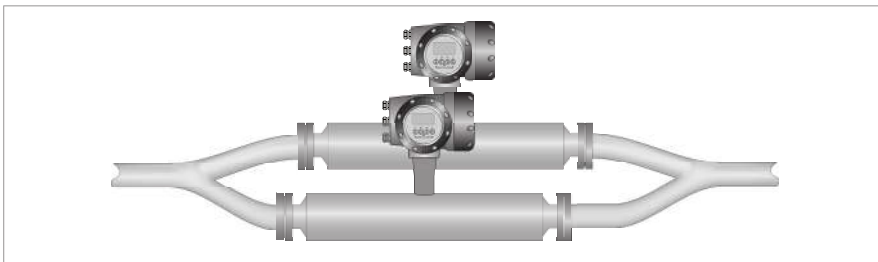
- ① The meter can be mounted at an angle but it is recommended that the flow is uphill.
- ② Avoid mounting the meter with the flow running downhill because it can cause siphoning. If the meter has to be mounted with the flow running downhill, install an orifice plate or control valve downstream of the meter to maintain backpressure.
- ③ Horizontal mounting with flow running left to right.
- ④ Avoid mounting meter with long vertical runs after the meter as it can cause cavitation. Where the installation includes a vertical run after the meter, install an orifice plate or control valve downstream to maintain backpressure.
- ⑤ The meter can be mounted vertically but it is recommended that the flow is uphill.
- ⑥ Avoid mounting the meter vertically with the flow running downhill. This can cause siphoning. If the meter has to be installed this way, install an orifice plate or control valve downstream to maintain backpressure.

3.4.4 Cross talk

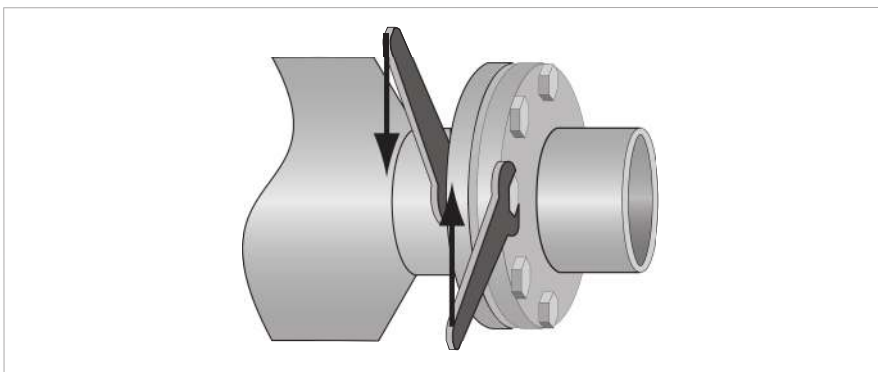
Where more than one meter is being installed, a very high level of immunity to cross talk means that the meters can be mounted within close proximity to each other. The meters can be mounted either in series or parallel, as shown.

**NOTICE!**

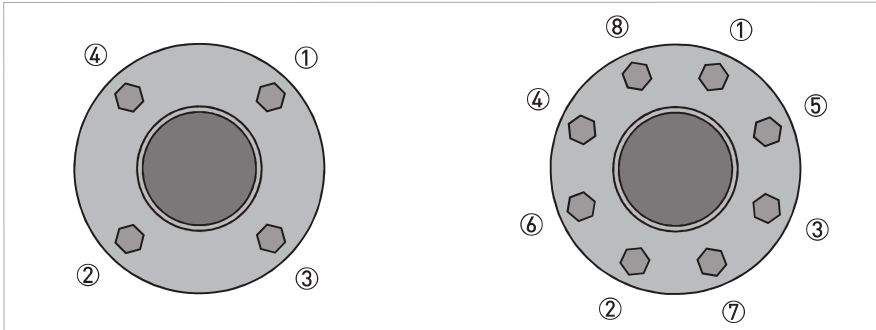
Where the meters are installed in series, it is strongly recommended that the process pipe diameter remains constant. For more information, please contact the manufacturer.



3.4.5 Flange connections

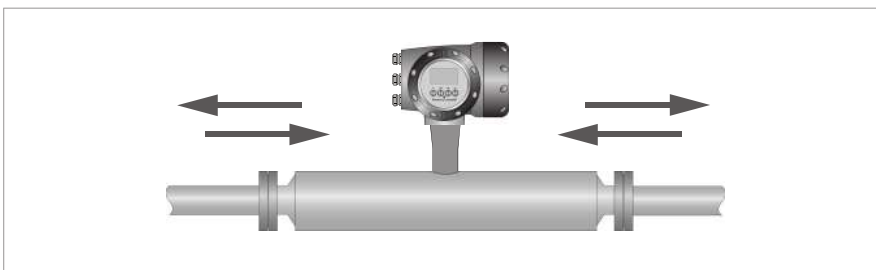


Tighten the flange bolts evenly and in turn.



Use a regular pattern to tighten the bolts evenly

3.4.6 Maximum pipework forces (end loadings)



Mass flowmeters have a maximum level of force (negative or positive) that can be applied to the ends of the meter.

Please refer to the table in the technical data section of this Handbook for the maximum end loadings.

3.4.7 Pipework reducers



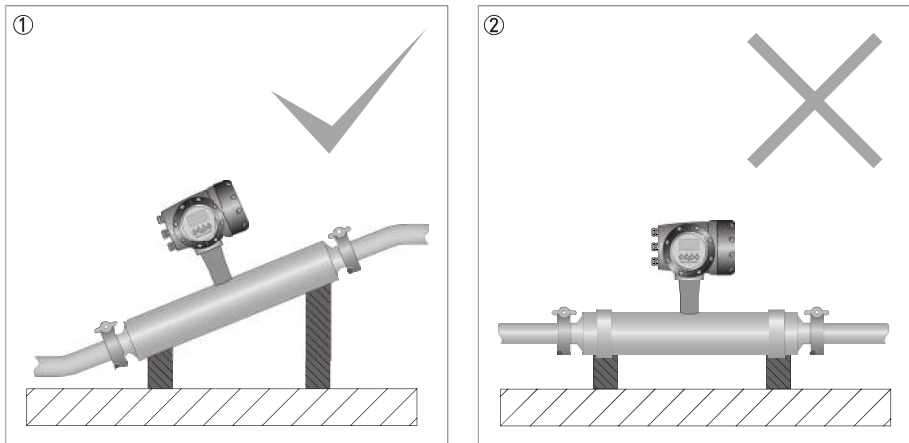
Always avoid extreme step changes in pipe size. Use pipework reducers, where there is a large difference between pipework size and meter flanges.

3.4.8 Flexible connections



Flexible connections can be used but because of the high flow rates associated with large diameter meters, it is recommended that flexible connections are not used on meters larger than size 80.

3.4.9 Hygienic installations



- ① Install the meter at an angle to allow self-draining.
- ② DO NOT install the meter horizontally.

Where the meter has been approved by the sanitary requirements of the European Hygienic Engineering and Design Group, you **MUST** give consideration to:

- Installation - install the meter at an angle to allow self-draining (see illustration).
- Cleaning fluids - cleaning fluids should flow uphill with a velocity rate greater than 1.5 m/s / 5ft/s. If the process flow is downhill, install a flow restrictor downstream of the meter. This will make sure that the meter is completely filled with the cleaning fluid.
- Process connections and seals **MUST** be in accordance with EHEDG documentation.

The manufacturer also recommends that you refer to EHEDG (www.ehedg.org) document number 8 "HYGIENIC EQUIPMENT DESIGN CRITERIA".

3.4.10 Heating and insulation

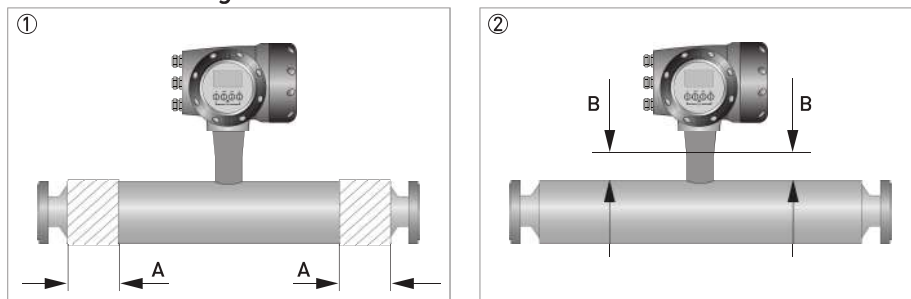
Heating

The meter can be heated by electrical tape (or similar) as shown. ONLY heat the meter in the area marked A.

Insulation

The meter can also be insulated to a maximum depth as shown (B). Do not insulate above this depth as this will cause the electronics to overheat.

Electrical heating and insulation



- ① Area that can be heated (A). Refer to the table for the maximum sizes.
- ② Maximum depth of insulation (B). Refer to the table.

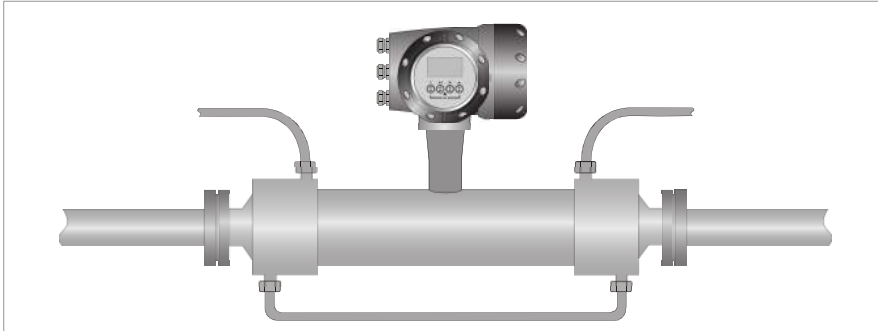
Heated area

Titanium		10	15	25	40	50	80
Dimension of A	mm	50	65	120	150	200	410
	Inches	1.97	2.56	4.7	5.9	7.9	16.1
Dimension of B	mm	50					
	Inches	2.0					

SS / Hastelloy® / Tantalum		10	15	25	40	50	80
Dimension of A	mm	-	65	75	150	125	225
	Inches	-	2.56	2.9	5.9	4.9	8.8
Dimension of B	mm	50					
	Inches	2.0					

Factory fitted heating jacket

If the meter has been ordered with a heating jacket, it will be supplied with NPT, Ermeto or flange connections.



Connecting / using the heating jacket

- Use reinforced flexible hoses to connect the heating jacket to the heat source.
- The heating jacket material is 316L but the heating medium is also in contact with the outer cylinder, which might be a lower grade Stainless Steel.
- Suitable heating mediums are steam or hot oil. Avoid the use of heating mediums that can cause crevice corrosion in Stainless Steel.
- Where liquid is being used, set up the pipe configuration so that air can be vented from the system.
- Where steam is being used, set up the pipe configuration so that condensation can be drained off.
- Heat the jacket to working temperature before flowing the process fluid through the meter.

**CAUTION!**

The maximum heating jacket pressure and temperature is 10 barg at 150° C / 145 psig at 302° F for Titanium measuring tubes and 10 barg at 100° C / 145 psig at 212° C for Stainless Steel, Hastelloy® and Tantalum measuring tubes.

Heating times

Temperature [°C / °F] ①	Time [minutes] for Titanium measuring tube					
	10	15	25	40	50	80
40 / 104	30			90		
60 / 140	80			160		
80 / 176	120			330		
100 / 212	190			495		
120 / 248	270			735		
140 / 284	480			1320		
① Measured at the centre of the measuring tube.						

Temperature [°C / °F] ①	Time [minutes] for Stainless Steel, Hastelloy® and Tantalum measuring tubes					
	10	15	25	40	50	80
40 / 104	105			90		
60 / 140	190			240		
80 / 176	330			480		
100 / 212	495			800		
① Measured at the centre of the measuring tube.						

Reference conditions

Ambient temperature	+25°C / +77°F
Heating medium	Hot liquid
Heating medium temperature	
Titanium	+150°C / +302°F
Stainless Steel, Hastelloy® and Tantalum	+100°C / +212°F

3.4.11 Purge ports

If the meter has been ordered with a purge port, it will be supplied with NPT female connections which are clearly marked. The connections are sealed with NPT plugs and PTFE tape.



CAUTION!

DO NOT remove these plugs.

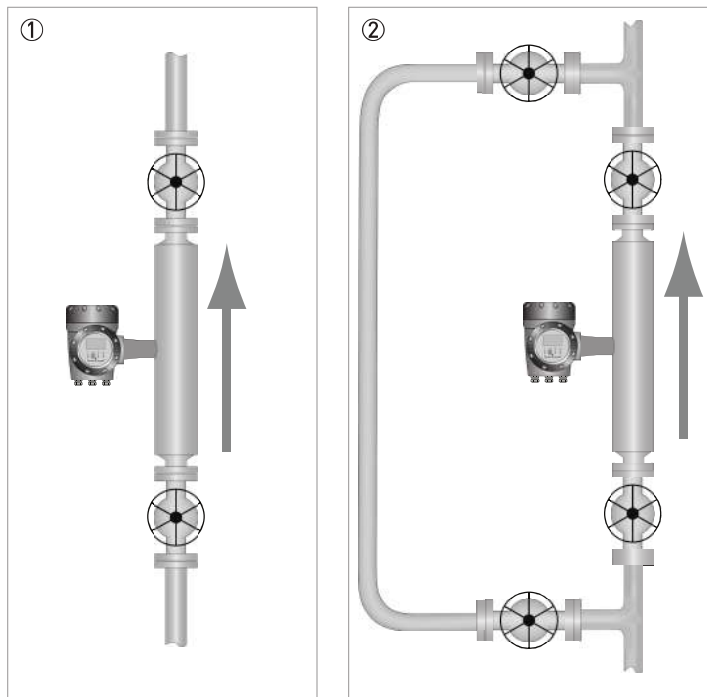
The meter is factory sealed with a dry nitrogen gas fill and if moisture is allowed to enter the meter casing it will cause damage. The plugs should only be removed to purge the meter casing in the event that the primary measuring tube fails.

If it is suspected that the primary measuring tube has failed, de-pressurise the meter and remove it from service, as soon as it is safe to do so.

3.4.12 Zero calibration

The procedure for zero calibration is contained in the transmitter handbook. However, the following information should be considered when installing the meter.

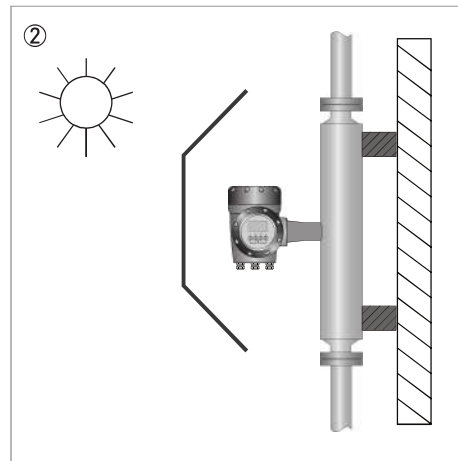
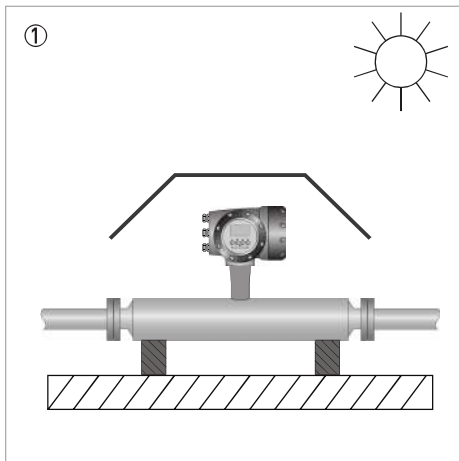
Zero calibration



- ① Where the meter has been installed vertically, install shut-off valves either side of the meter to assist with zero calibration.
- ② If the process flow cannot be stopped, install a bypass section for zero calibration.

3.4.13 Sunshades

The meter MUST be protected from strong sunlight.



- ① Horizontal installation
- ② Vertical installation

4.1 Safety instructions

**DANGER!**

*All work on the electrical connections may only be carried out with the power disconnected.
Take note of the voltage data on the nameplate!*

**DANGER!**

Observe the national regulations for electrical installations!

**DANGER!**

For devices used in hazardous areas, additional safety notes apply; please refer to the Ex documentation.

**WARNING!**

*Observe without fail the local occupational health and safety regulations.
Any work done on the electrical components of the measuring device may only be carried out by properly trained specialists.*

**NOTICE!**

*Look at the device nameplate to ensure that the device is delivered according to your order.
Check for the correct supply voltage printed on the nameplate.*

4.2 Electrical and I/O connections

For information regarding electrical and I/O connections, please refer to the handbook for the relevant signal transmitter.

5.1 Spare parts availability

The manufacturer adheres to the basic principle that functionally adequate spare parts for each device or each important accessory part will be kept available for a period of 3 years after delivery of the last production run for the device.

This regulation only applies to spare parts which are subject to wear and tear under normal operating conditions.

5.2 Availability of services

The manufacturer offers a range of services to support the customer after expiration of the warranty. These include repair, maintenance, technical support and training.



NOTICE!

For more precise information, please contact your local sales office.

5.3 Returning the device to the manufacturer

5.3.1 General information

This device has been carefully manufactured and tested. If installed and operated in accordance with these operating instructions, it will rarely present any problems.



WARNING!

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

- *Due to statutory regulations on environmental protection and safeguarding the health and safety of the personnel, the manufacturer may only handle, test and repair returned devices that have been in contact with products without risk to personnel and environment.*
- *This means that the manufacturer can only service this device if it is accompanied by the following certificate (see next section) confirming that the device is safe to handle.*



WARNING!

If the device has been operated with toxic, caustic, radioactive, flammable or water-endangering products, you are kindly requested:

- *to check and ensure, if necessary by rinsing or neutralising, that all cavities are free from such dangerous substances,*
- *to enclose a certificate with the device confirming that it is safe to handle and stating the product used.*

5.3.2 Preapproval form - Customer returned process-wetted products

**LEGAL NOTICE!**

In compliance with U.S. Federal OSHA Standard 29CFR1910.1200 process information must be reviewed previous to receiving authorization to return material to Schneider Electric Systems USA, Inc.

NO PRODUCT EXPOSED TO HYDROFLUORIC ACID OR MERCURY WILL BE ACCEPTED!

Date: _____

Customer information

Customer's name:

Address:

Phone no:

Fax no.:

Contact's name:

Rep information

Rep's name:

Address:

Phone no:

Fax no.:

Contacts' name:

Product being returned:

Model No.:

Serial no.:

Under warranty?

YES

NO

Copies of MSDS sheets for all processes including cleaning solutions may be required.

Type of process (what chemicals/materials were processed through the unit):

Explain what steps were taken to decontaminate the unit: (was unit steam cleaned, rinsed out with water, chemically cleaned etc.)

Form completed by:

Print name

Signature

Date: _____

CLEANING STATEMENT

(Note: Your item will not be serviced unless the following cleaning statement has been signed):

I certify that the above referenced item has been properly purged and cleaned, complies with U.S. Department of Transportation shipping requirements and DOES NOT present a health and/or safety hazard (as defined by OSHA) to our Customer Repair personnel.

Print name: _____

Signature: _____

Print title: _____

Date: _____

Please fax the completed form to the Customer Satisfaction Center +1-508-549-4999

5.4 Disposal

**LEGAL NOTICE!**

Disposal must be carried out in accordance with legislation applicable in your country.

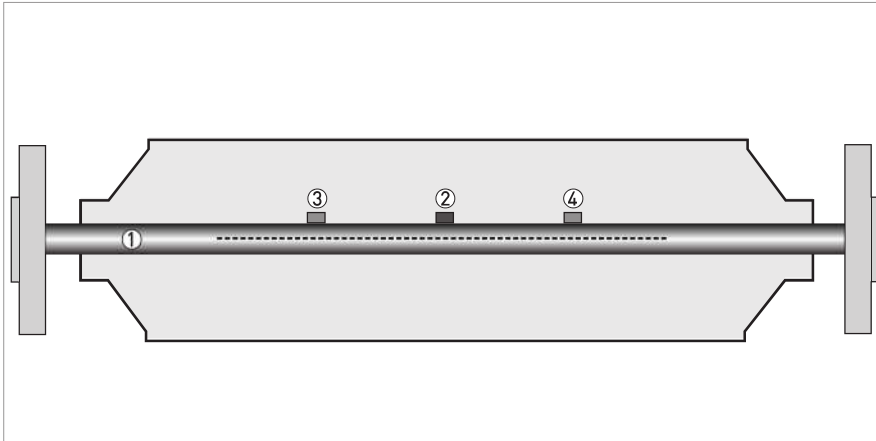
Separate collection of WEEE (Waste Electrical and Electronic Equipment) in the European Union:

According to the directive 2012/19/EU, the monitoring and control instruments marked with the WEEE symbol and reaching their end-of-life **must not be disposed of with other waste.**

The user must dispose of the WEEE to a designated collection point for the recycling of WEEE or send them back to our local organisation or authorised representative.

6.1 Measuring principle (single tube)

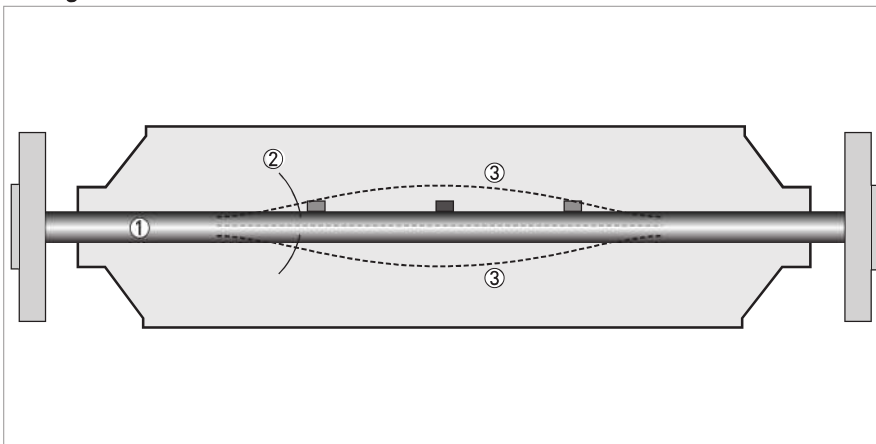
Static meter not energised and with no flow



- ① Measuring tube
- ② Drive coil
- ③ Sensor 1
- ④ Sensor 2

A Coriolis single tube mass flowmeter consists of a single measuring tube ① a drive coil ② and two sensors (③ and ④) that are positioned either side of the drive coil.

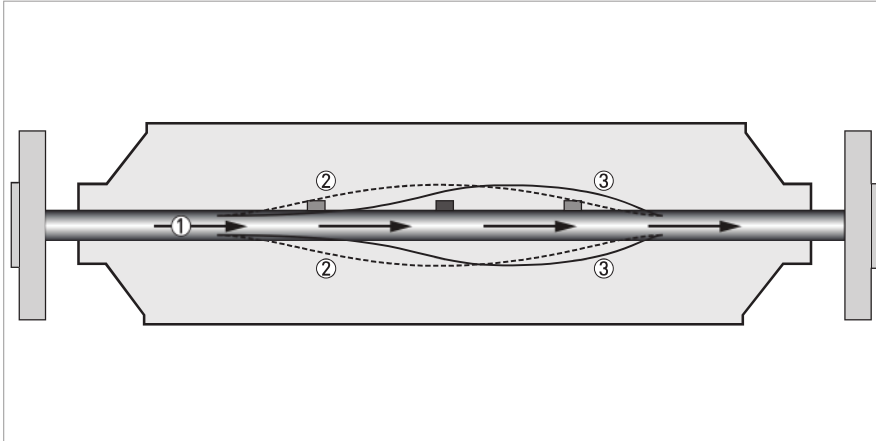
Energised meter



- ① Measuring tubes
- ② Direction of oscillation
- ③ Sine wave

When the meter is energised, the drive coil vibrates the measuring tube causing it to oscillate and produce a sine wave ③. The sine wave is monitored by the two sensors.

Energised meter with process flow



- ① Process flow
- ② Sine wave
- ③ Phase shift

When a fluid or gas passes through the tube, the coriolis effect causes a phase shift in the sine wave that is detected by the two sensors. This phase shift is directly proportional to the mass flow.

Density measurement is made by evaluation of the frequency of vibration and temperature measurement is made using a Pt500 sensor.

6.2 Technical data



NOTICE!

- The following data is provided for general applications. If you require data that is more relevant to your specific application, please contact us or your local sales office.
- Additional information (certificates, special tools, software,...) and complete product documentation can be downloaded free of charge from the website.

Measuring system

Measuring principle	Coriolis mass flow
Application range	Mass flow and density measurement of fluids, gases and solids
Measured values	Mass, density, temperature
Calculated values	Volume, referred density, concentration, velocity

Design

Basic	System consists of a measuring sensor and a transmitter to process the output signal
Features	Fully welded maintenance free sensor with single straight measuring tube
Variants	
Compact version	Integral transmitter
Remote version	Available with field mount versions of the transmitter
Modbus version	Sensor with integral electronics providing Modbus output for connection to a PLC

Measuring accuracy

Mass	
Liquid	$\pm 0.1\%$ of actual measured flow rate + zero stability
Gas	$\pm 0.35\%$ of actual measured flow rate + zero stability
Zero stability	
Titanium	$\pm 0.004\%$ of maximum flow rate with respective sensor size
Stainless Steel / Hastelloy® / Tantalum	$\pm 0.015\%$ of maximum flow rate with respective sensor size
Reference conditions	
Product	Water
Temperature	+20°C / +68°F
Operating pressure	1 barg / 14.5 psig
Effect on sensor zero point caused by a shift in process temperature	
Titanium	0.001% per 1°C / 0.00055% per 1°F
Stainless Steel / Hastelloy® / Tantalum	0.004% per 1°C / 0.0022% per 1°F
Effect on sensor zero point caused by a shift in process pressure	
Titanium / Stainless Steel / Hastelloy® / Tantalum	0.0011% of the max flow rate per 1 bar _{rel.} / 0.000076% per 1 psig

Density	
Measuring range	400...2500 kg/m ³ / 25...156 lbs/ft ³
Accuracy	±2 kg/m ³ / ±0.12 lbs/ft ³
On site calibration	±0.5 kg/m ³ / ±0.031 lbs/ft ³
Temperature	
Accuracy	±1°C / ±1.8°F

Operating conditions

Maximum flow rates	
06	1230 kg/h / 45 lbs/min
10	3500 kg/h / 129 lbs/min
15	14600 kg/h / 536 lbs/min
25	44800 kg/h / 1646 lbs/min
40	120000 kg/h / 4409 lbs/min
50	234000 kg/h / 8598 lbs/min
80	560000 kg/h / 20576 lbs/min
Ambient temperature	
Compact version with Aluminium transmitter	-40...+65°C / -40...+140°F Extended temperature range +65°C / +149°F for some I/O options. For more information contact manufacturer
Compact version with Stainless Steel transmitter	-40...+60°C / -40...+130°F
Remote versions	-40...+65°C / -40...+149°F
Process temperature	
Titanium	-40...+150°C / -40...+302°F
Stainless Steel	0...+100°C / 32...+212°F Extended temperature range 0...+130°C / 32...+266°F on Stainless Steel, sizes 25...80, hygienic connections only
Hastelloy®	0...+100°C / 32...+212°F
Tantalum	0...+100°C / 32...+212°F
Nominal pressure at 20°C / 68°F	
Measuring tube	
Titanium	-1...100 barg / -14.5...1450 psig
Stainless Steel / Hastelloy® / Tantalum	-1...50 barg / -14.5...725 psig
Outer cylinder	
Non PED / CRN approved	Typical burst pressure > 100 barg / 1450 psig at 20°C
PED approved secondary containment	
Titanium (Stainless Steel 304 or 316 outer cylinder)	-1...63 barg / -14.5...914 psig
Titanium (Stainless Steel 316 outer cylinder)	-1...100 barg / -14.5...1450 psig

Stainless Steel / Hastelloy® (Stainless Steel 304 or 316 outer cylinder)	-1...63 barg / -14.5...914 psig
Tantalum (316 outer cylinder)	-1...50 barg / -14.5...725 psig
CRN approved secondary containment	
Titanium (Stainless Steel 304 or 316 outer cylinder)	-1...63 barg / -14.5...914 psig
Stainless Steel / Hastelloy® (Stainless Steel 304 or 316 outer cylinder)	-1...63 barg / -14.5...914 psig
Fluid properties	
Permissible physical condition	Liquids, gases, slurries
Permissible gas content (volume)	Contact manufacturer for information
Permissible solid content (volume)	Contact manufacturer for information
Other operating conditions	
Protection category	IP 66 / 67 (EN 60529), NEMA 4X

Installation conditions

Inlet runs	None required
Outlet runs	None required

Materials

Titanium meter	
Measuring tube / raised faces	Titanium grade 9 / grade 2
Flanges	Stainless Steel 316 / 316L (1.4401 / 1.4404) dual certified
Outer cylinder	Stainless Steel 304 / 304L (1.4301 / 1.4307) dual certified
	Optional Stainless Steel 316 / 316L (1.4401 / 1.4404) dual certified
Stainless Steel meter	
Measuring tube / raised faces	Stainless Steel UNS S31803 (1.4462)
	Measuring tube surface finish (Ra) ≤ 0.8 μm
Flanges	Stainless Steel 316 / 316L (1.4401 / 1.4404) dual certified
Outer cylinder	Stainless Steel 304 / 304L (1.4301 / 1.4307) dual certified
	Optional Stainless Steel 316 / 316L (1.4401 / 1.4404) dual certified
Hastelloy® meter	
Measuring tube / raised faces	Hastelloy® C-22
Flanges	Stainless Steel 316 / 316L (1.4401 / 1.4404) dual certified
Outer cylinder	Stainless Steel 304 / 304L (1.4301 / 1.4307) dual certified
	Optional Stainless Steel 316 / 316L (1.4401 / 1.4404) dual certified
Tantalum meter	
Measuring tube / raised faces	UNS R05255 / R05200
Flanges	Stainless Steel 316 / 316L (1.4401 / 1.4404) dual certified
Outer cylinder	Stainless Steel 316 / 316L (1.4401 / 1.4404) dual certified
Heating jacket version	
Heating jacket	Stainless Steel 316L (1.4404)
	The outer cylinder is in contact with the heating medium

All versions	
Sensor electronics housing	Stainless Steel 316L (1.4409)
Junction box (remote version)	Die cast Aluminium (polyurethane coating)
	Optional Stainless Steel 316L (1.4401)

Process connections

Flange	
DIN	DN10...100 / PN40...100
ASME	½...4" / ASME150...600
JIS	10...100A / 10...20K
Hygienic	
Tri-clover	½...3"
Tri-clamp DIN 32676	DN10...80
Tri-clamp ISO 2852	1½...3"
DIN 11864-2 form A	DN10...80
Male thread DIN 11851	DN10...80
Male thread SMS	1...3"
Male thread IDF / ISS	1...3"

Electrical connections

Electrical connections	For full details, including power supply, power consumption etc., see technical data for the relevant transmitter
I/O	For full details of I/O options including data streams and protocols, see technical data for the relevant transmitter

Approvals and certifications

CE	The device fulfils the statutory requirements of the CE directive. The manufacturer certifies that these requirements have been met by applying the CE mark.
cFMus	Compact and transmitter
	Class I, Div 1, Groups A,B,C and D (US)
	Class I, Div 1, Groups C and D.(Canada)
	Class II, Div 1, Groups E, F and G
	Class III Div 1 T6...T1
	Class I, Div 2 Groups A,B,C and D
	Class II Div 2 Groups F and G
	Class III Div 2 T6...T1
	Remote (sensor only)
	Class I Div 1 Groups A,B,C and D
	Class I Div 2 Groups A,B,C and D
	Class II Div 1 Groups E,F and G
	Class III Div 1 T6...T1
	Class II Div 2 Groups F and G
	Class III Div 2 T6...T1

ANSI (Dual Seal)	12.27.901-2003
Hygienic	3A (most recent and up to date version)
	EHEDG
	ASME BPE
Custody transfer	MID 2004/22/EC MI-005
	OIML R117-1
ATEX (most recent and up to date version)	
CFS700A(F) (with or without heating jacket / insulation)	
	II 1 G Ex ia IIC T6...T1 Ga
	II 1 D Ex ia IIIC T165°C Da
CFS700A(C) Non Ex i signal outputs (with or without heating jacket / insulation)	
Ex d connection compartment	II 1/2 G Ex db ia IIC T6...T1 Ga/Gb
	II 2 D Ex tb IIIC T165°C Db
Ex e connection compartment	II 1/2 G Ex db eb ia IIC T6...T1 Ga/Gb
	II 2 D Ex tb IIIC T165°C Db
CFS700A(C) Ex i signal outputs (with or without heating jacket / insulation)	
Ex d connection compartment	II 1/2(1) G Ex db ia [ia Ga] IIC T6...T1 Ga/Gb
	II 2(1) D Ex tb [ia Da] IIIC T165°C Db
Ex e connection compartment	II 1/2(1) G Ex db eb ia [ia Ga] IIC T6...T1 Ga/Gb
	II 2(1) D Ex tb [ia Da] IIIC T165°C Db

6.2.1 ATEX temperature limits

	Ambient temp. T_{amb} °C	Max medium temp. T_m °C	Temp. class	Max. Surface temp. °C	
CFS700A(F)	-40...+40	65	T6 - T1	T80	
		80	T5 - T1	T95	
		100	T4 - T1	T115	
		115		T130	
		150	T3 - T1	T165	
	-40...+50	80	T5 - T1	T95	
		100	T4 - T1	T115	
		115		T130	
		150	T3 - T1	T165	
	-40...+65	100	T4 - T1	T115	
		115		T130	
		130	T3 - T1	T145	
	Minimum medium temp: -50°C				

CFS700A(C) with aluminium transmitter housing	-40...+40	65	T6 - T1	T80
		80	T5 - T1	T95
		100	T4 - T1	T115
		115		T130
		150	T3 - T1	T165
	-40...+50	100	T4 - T1	T115
		115		T130
		150	T3 - T1	T165
	-40...+65	65	T4 - T1	T80
	Minimum medium temp: -50°C			
CFS700A(C) with Stainless Steel transmitter housing	-40...+40	65	T6 - T1	T80
		80	T5 - T1	T95
		100	T4 - T1	T115
		115		T130
		130	T3 - T1	T145
	-40...+50	80	T5 - T1	T95
		100	T4 - T1	T115
		115	T4 - T1	T130
	-40...+60	60	T6 - T1	T75
	Minimum medium temp: -50°C			

6.3 Maximum end loadings

Maximum end loadings

Size	06	10	15	25	40	50	80
Titanium							
Flanges	19kN	25kN	38kN	60kN	80kN	170kN	230kN
Hygienic (welded)	1.5kN	2kN	5kN	9kN	12kN	12kN	30kN
Hygienic (adaptor)	1.5kN	1.8kN	3.3kN	3.8kN	2.2kN	5.8kN	9.6kN
Stainless Steel / Hastelloy® / Tantalum							
Flanges	19kN	25kN	38kN	60kN	80kN	80kN	170kN
Hygienic (welded)	1.5kN	2kN	5kN	9kN	12kN	12kN	18kN
Hygienic (adaptor)	1.5kN	1.8kN	3.3kN	3.8kN	2.2kN	5.8kN	9.6kN

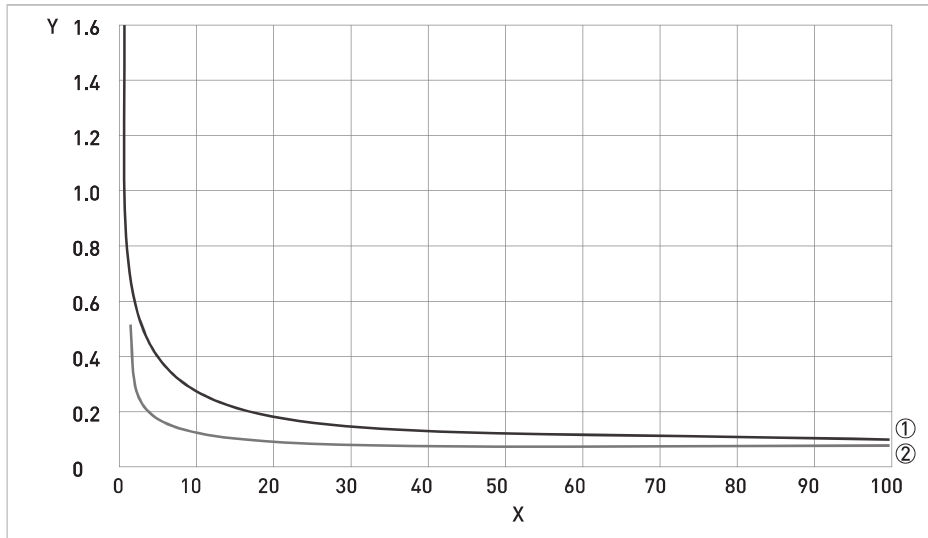
- These (axial) loads have been calculated, based on 316L schedule 40 process pipework, where un-radiographed butt welds have been used in pipe joints.
- The loads shown are the maximum permitted static load. If loads are cycling (between tension and compression) these loads should be reduced. For advice, consult the manufacturer.



CAUTION!

The maximum permitted end loading on size 15 meters fitted with ½" ASME flanges is 19kN

6.4 Measuring accuracy



X flow rate [%]
 Y measuring error [%]

- ① Stainless Steel, Hastelloy® and Tantalum
- ② Titanium

Measuring error

The measuring error is obtained from the combined effects of accuracy and zero stability.

Reference conditions

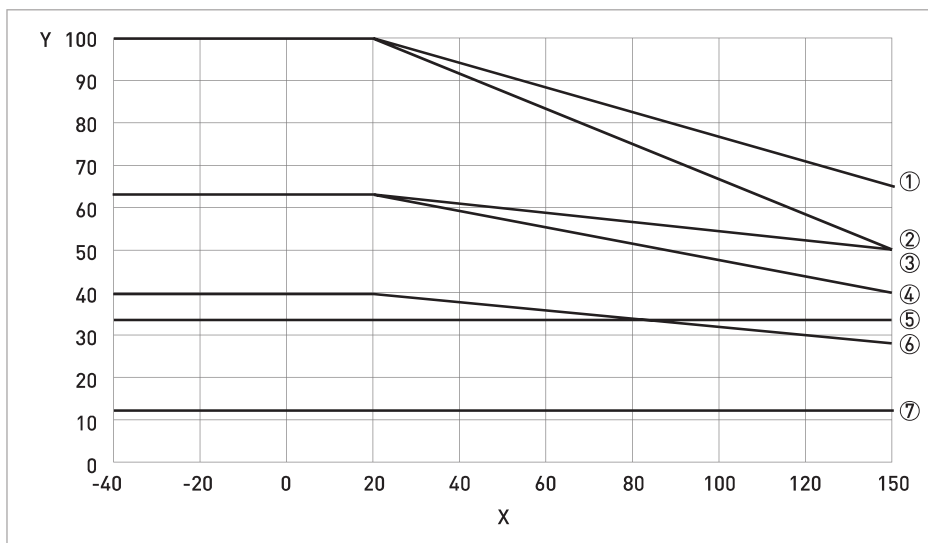
Product	Water
Temperature	+20°C / +68°F
Operating pressure	1 barg / 14.5 psig

6.5 Guidelines for maximum operating pressure

Notes

- Ensure that the meter is used within its operating limits
- Adapter type hygienic process connections have a maximum operating rating of 10 barg at 150°C / 145 psig at 302°F

Pressure / temperature de-rating for Titanium Gr 9 meters (all meter sizes, with flanged connections as per EN 1092-1 and JIS B 2220)

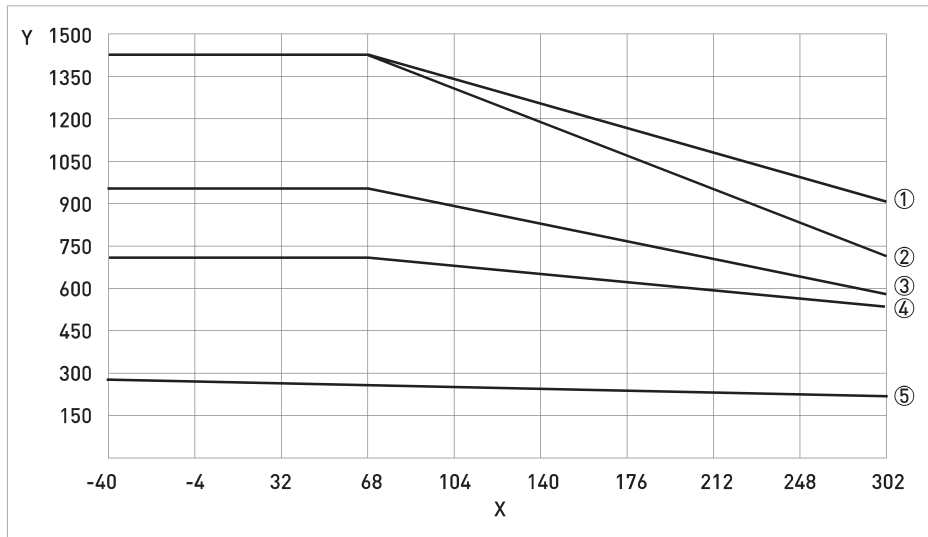


X temperature [°C]

Y pressure [barg]

- ① Standard tube and outer cylinder 316L (100 barg PED option) with PN100 flanges (sizes DN06...25)
- ② Standard tube and outer cylinder 316L (100 barg PED option) with PN100 flanges (sizes DN40...80)
- ③ DIN 2637 PN63 flanges
- ④ Outer cylinder (63 barg PED / CRN option)
- ⑤ JIS 20K flanges
- ⑥ DIN 2635 PN40 flanges
- ⑦ JIS 10K flanges

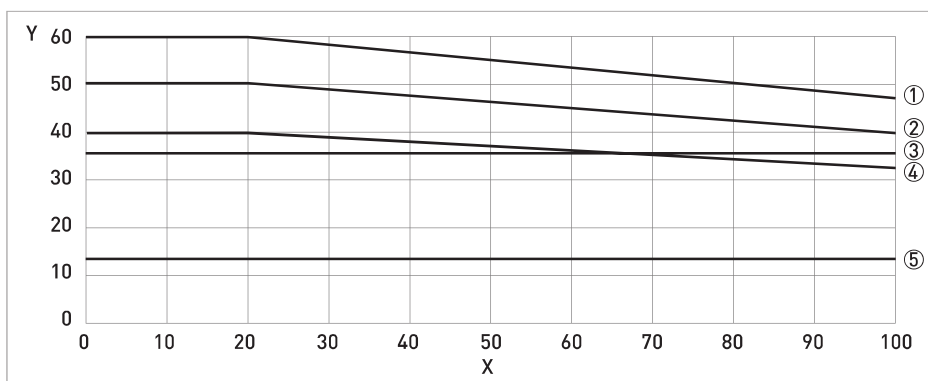
**Pressure / temperature de-rating for Titanium Gr 9 meters
(all meter sizes with flanged connections as per ASME B16.5)**



X temperature [°F]
Y pressure [psig]

- ① Standard tube and outer cylinder 316L (100 barg PED option) with ASME 600 lbs flanges (sizes DN06...25)
- ② Standard tube and outer cylinder 316L (100 barg PED option) with ASME 600 lbs flanges (sizes DN40...80)
- ③ Outer cylinder (63 barg PED / CRN option)
- ④ ASME 300 lbs
- ⑤ ASME 150 lbs

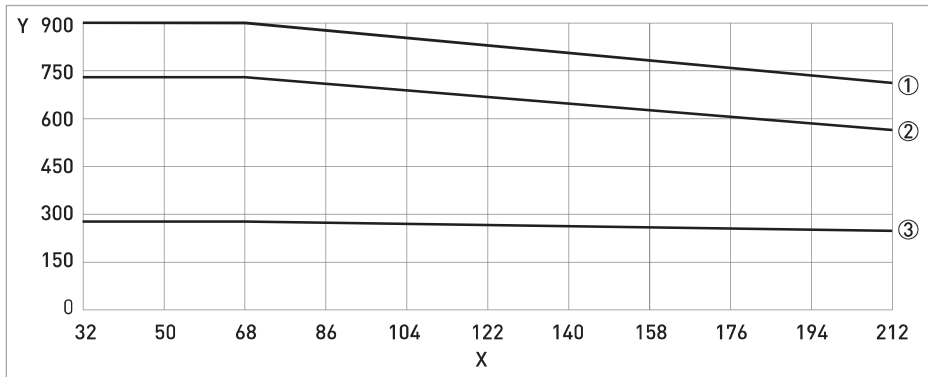
Pressure / temperature de-rating for Stainless Steel, Hastelloy® C22 and Tantalum meters (all meter sizes with flanged connections as per EN 1092-1 and JIS B 2220)



X temperature [°C]
Y pressure [barg]

- ① Outer cylinder de-rating for SS and Hastelloy® meters, all sizes. (63 barg PED / CRN option)
- ② De-rating for SS, Hastelloy® and Tantalum measuring tubes and outer cylinder de-rating for Tantalum meters (all sizes).
- ③ JIS 20K flanges
- ④ DIN 2635 PN40 flanges
- ⑤ JIS 10K flanges

Pressure / temperature de-rating for Stainless Steel, Hastelloy® C22 and Tantalum meters (all meters with flanged connections as per ASME B16.5)



X temperature [°F]

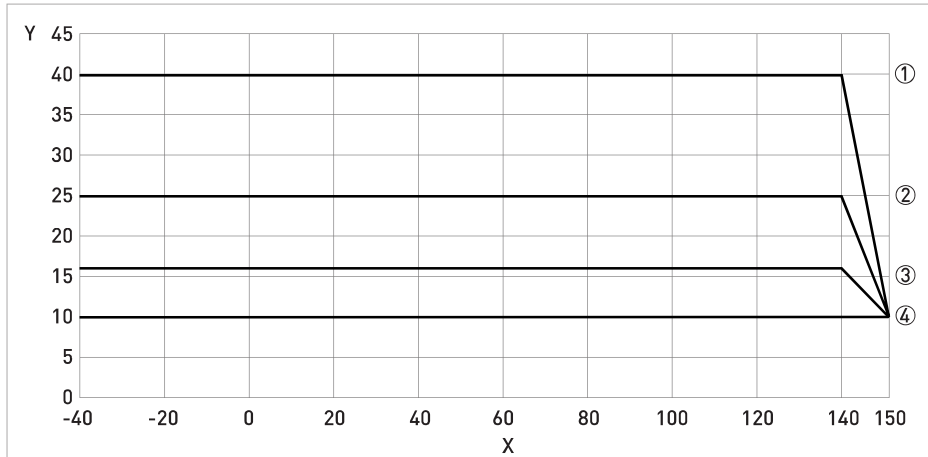
Y pressure [psig]

- ① Outer cylinder de-rating for SS and Hastelloy® meters, all sizes. (63 barg PED / CRN option)
- ② De-rating for SS, Hastelloy® and Tantalum measuring tubes and outer cylinder de-rating for Tantalum meters (all sizes). De-rating for ASME 300 lbs flanges
- ③ De-rating for ASME 150 lbs flanges

Flanges

- DIN flange ratings are based on EN 1092-1 2001 table 18, 1% proof stress material group 14EO
- ASME flange ratings are based on ASME B16.5 2003 table 2 material group 2.2
- JIS flange ratings are based on JIS B 2220: 2012 table 11 division 1 material group 022a

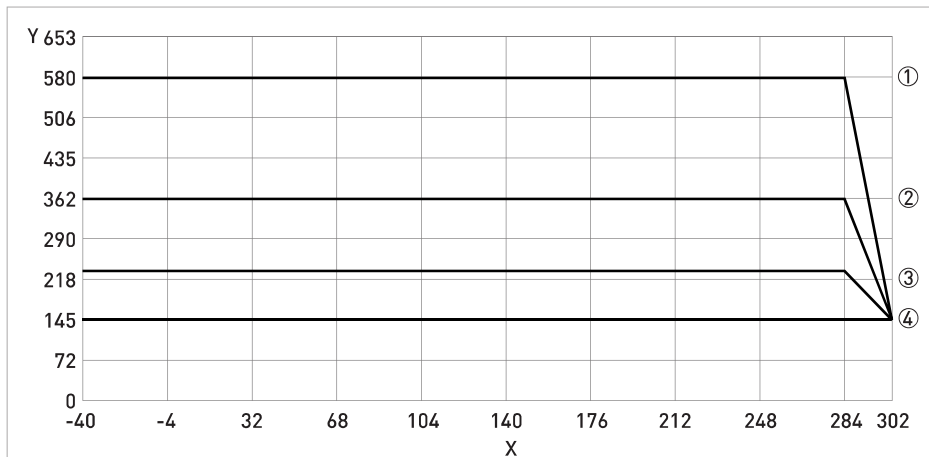
Pressure / temperature de-rating (metric) for Titanium meters with hygienic connections.



X temperature [°C]
Y pressure [barg]

- ① Welded connections DN06...40
- ② Welded connections DN50
- ③ Welded connections DN80
- ④ Adapter connections DN06...80

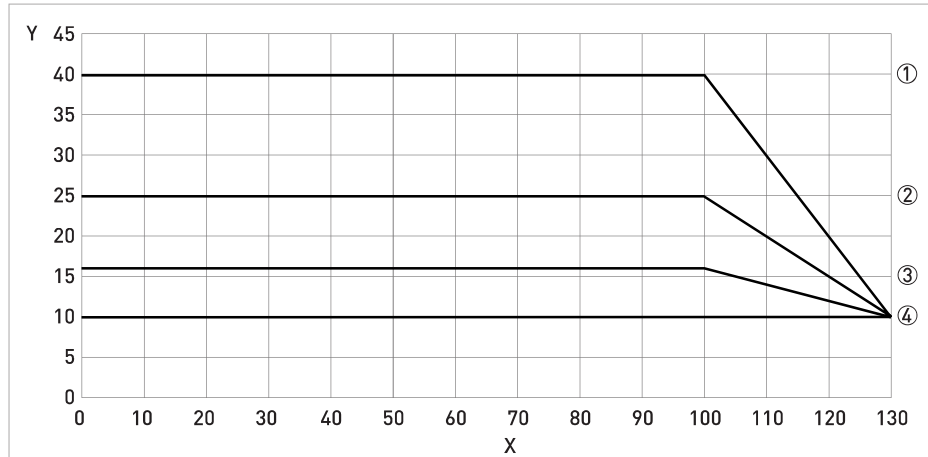
Pressure / temperature de-rating (Imperial) for Titanium meters with hygienic connections.



X temperature [°F]
Y pressure [PSI]

- ① Welded connections DN06...40
- ② Welded connections DN50
- ③ Welded connections DN80
- ④ Adapter connections DN06...80

Pressure / temperature de-rating (metric) for Stainless Steel meters with hygienic connections.

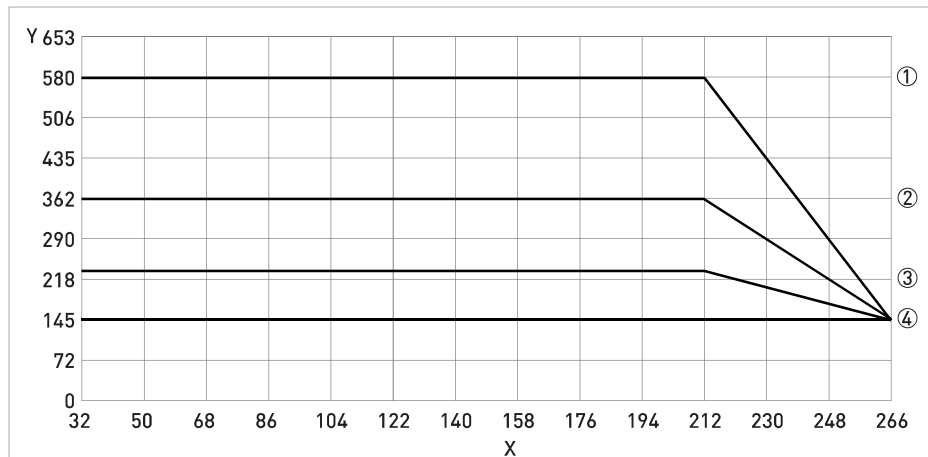


X temperature [°C]

Y pressure [barg]

- ① Welded connections DN06...40
- ② Welded connections DN50
- ③ Welded connections DN80
- ④ Adapter connections DN06...80

Pressure / temperature de-rating (imperial) for Stainless Steel meters with hygienic connections.



X temperature [°F]

Y pressure [PSI]

- ① Welded connections DN06...40
- ② Welded connections DN50
- ③ Welded connections DN80
- ④ Adapter connections DN06...80

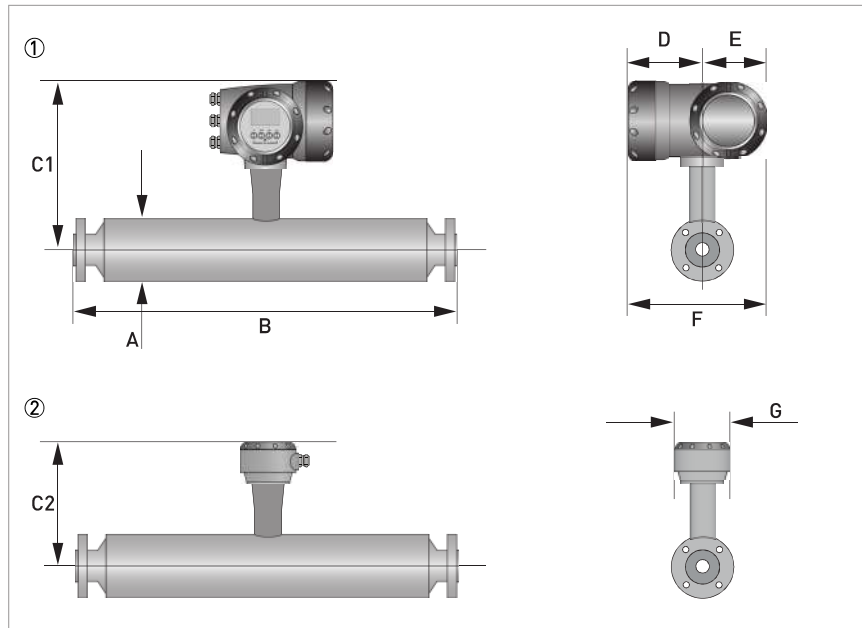
Notes

- The maximum operating pressure will be either the flange rating or the measuring tube rating, **WHICHEVER IS THE LOWER!**
- The manufacturer recommends that the seals are replaced at regular intervals. This will maintain the hygienic integrity of the connection.

6.6 Dimensions and weights

6.6.1 Flanged versions

Meter dimensions



- ① Compact version
② Remote version

Meter weights for Titanium (T), Stainless Steel (S), Hastelloy®(H) and Tantalum (A)

	Weight [kg]						
	T/S 06	T/S/H/A 10	T/S/H/A 15	T/S/H/A 25	T/S/H/A 40	T/S/H/A 50	T/H 80
Aluminium (compact)	18.5	23	26	37	83	147	265
Stainless Steel (compact)	25.2	29.7	32.7	43.7	89.7	153.7	271.7
Aluminium (remote)	15.7	20.2	23.2	34.2	80.2	144.2	262.2
Stainless Steel (remote)	16.5	21	24	35	81	145	263
For Tantalum add:	-	1.8	2.7	4.5	9.2	15.1	-

	Weight [lbs]						
	T/S 06	T/S/H/A 10	T/S/H/A 15	T/S/H/A 25	T/S/H/A 40	T/S/H/A 50	T/H 80
Aluminium (compact)	40.8	50.7	57.3	81.6	183.0	324.1	584.2
Stainless Steel (compact)	55.6	65.5	72.1	96.3	197.8	338.9	599.0
Aluminium (remote)	34.6	44.5	51.1	75.4	176.8	317.9	578.1
Stainless Steel (remote)	36.64	46.3	52.9	77.2	178.6	319.7	579.8
For Tantalum add:	-	4.0	6.0	9.9	20.3	33.3	-

Measuring tube in Titanium (T), Stainless Steel (S) or Hastelloy®(H)

	Dimensions [mm]						
	T/S 06	T/S/H 10	T/S/H 15	T/S/H 25	T/S/H 40	T/S/H 50	T/S/H 80
A	102			115	170	220	274
B ①	420 ±2	510 ±2	548 ±2	700 ±2	925 ±2	1101 ±2	1460 ±4
B ②	428 ±2	518 ±2	556 ±2	708 ±2	933 ±2	1109 ±2	1468 ±4
C1 (compact)	311			318	345	370	397
C2 (remote)	231 ±2			237 ±2	265 ±2	290 ±2	317 ±4
D	137						
E	123.5						
F	260.5						
G	118						

① all pressure ratings up to 600 lbs and all DIN flanges with standard raised faces.

② ASME flange 600 lbs and all DIN flanges with raised face types: C; D; E and F.

	Dimensions [inches]						
	T/S 06	T/S/H 10	T/S/H 15	T/S/H 25	T/S/H 40	T/S/H 50	T/S/H 80
A	4			4.5	6.7	8.7	10.8
B ①	16.5± 0.08	20.0 ±0.08	21.6 ±0.08	27.5 ±0.08	36.4 ±0.08	43.3 ±0.08	57.5 ±0.16
B ②	16.8 ±0.08	20.4±0.08	21.9 ±0.08	27.9 ±0.08	36.7±0.08	43.3 ±0.08	57.8 ±0.16
C1 (compact)	12.2			12.5	13.6	14.6	15.6
C2 (remote)	9.0 ±0.08			9.3 ±0.08	10.4 ±0.08	11.4 ±0.08	12.5 ±0.16
D	5.4						
E	4.9						
F	10.2						
G	4.6						

① all pressure ratings up to 600 lbs and all DIN flanges with standard raised faces.

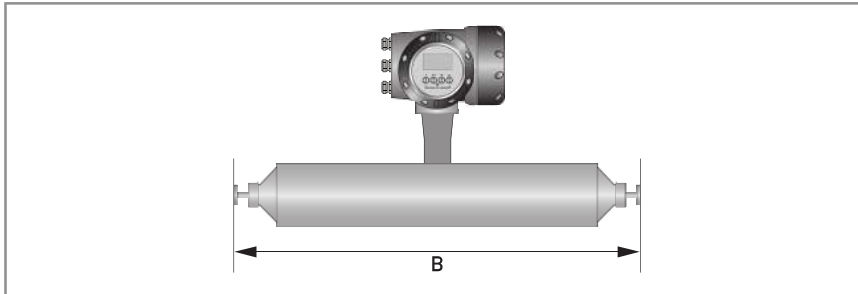
② ASME flange 600 lbs and all DIN flanges with raised face types: C; D; E and F.

Measuring tube in Tantalum (A)

	Dimensions [mm]				
	A 10	A 15	A 25	A 40	A 50
A	102	102	115	170	220
B (standard flange)	557 ±2	633 ±2	800 ±2	1075 ±2	1281 ±2
C1 (compact)	311	311	318	345	370
C2 (remote)	231 ±2	231 ±2	237 ±2	265 ±2	290 ±2
D	137				
E	123.5				
F	260.5				
G	118				

	Dimensions [inches]				
	A 10	A 15	A 25	A 40	A 50
A	4	4	4.5	6.7	8.7
B (standard flange)	21.9 ±0.08	24.9 ±0.08	31.5 ±0.08	42.3 ±0.08	50.4 ±0.08
C1 (compact)	12.2	12.2	12.5	13.6	14.6
C2 (remote)	9.0 ±0.08	9.0 ±0.08	9.3 ±0.08	10.4 ±0.08	11.4 ±0.08
D	5.4				
E	4.9				
F	10.2				
G	4.6				

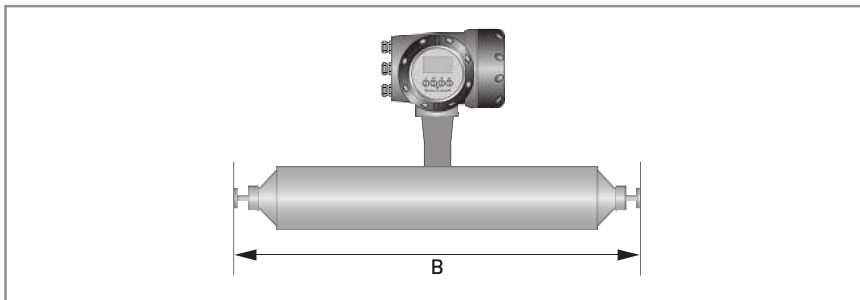
6.6.2 Hygienic versions



Hygienic connections: all welded versions

	Dimension B [mm]						
	T/S 06	T/S 10	T/S 15	T/S 25	T/S 40	T/S 50	T/S 80
Tri-clover							
½"	480 ±2	558 ±2	-	-	-	-	-
¾"	-	-	596 ±2	-	-	-	-
1½"	-	-	-	816 ±2	-	--	-
2"	-	-	-	-	1043 ±2	-	-
3"	-	-	-	-	-	1305 ±2	-
Tri-clamp DIN 32676							
DN10	484 ±2	564 ±2	-	-	-	-	-
DN15	-	-	602 ±2	-	-	-	-
DN25	-	-	-	761 ±2	-	-	-
DN40	-	-	-	-	986 ±2	-	-
DN50	-	-	-	-	-	1168 ±2	-
DN80	-	-	-	-	-	-	1584 ±2
Tri-clamp ISO 2852							
1½"	-	-	-	816 ±2	-	-	-
2"	-	-	-	-	1043 ±2	-	-
3"	-	-	-	-	-	1305 ±2	-
DIN 11864-2 form A							
DN10	-	528 ±2	-	-	-	-	-
DN15	-	-	566 ±2	-	-	-	-
DN25	-	-	-	718 ±2	-	-	-
DN40	-	-	-	-	948 ±2	-	-
DN50	-	-	-	-	-	1124 ±2	-
DN80	-	-	-	-	-	-	1538 ±2

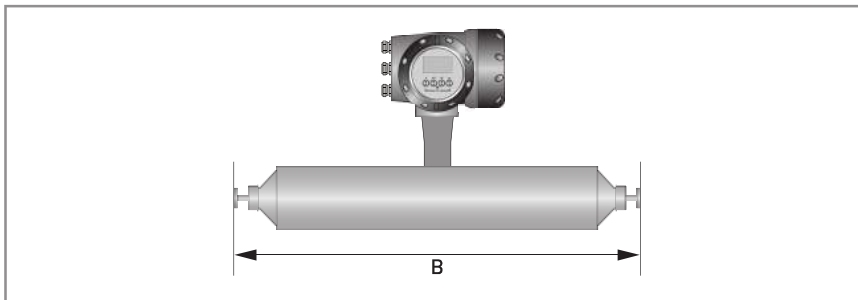
	Dimension B [inches]						
	T/S 06	T/S 10	T/S 15	T/S 25	T/S 40	T/S 50	T/S 80
Tri-clover							
½"	18.9 ±0.08	22 ±0.08	-	-	-	-	-
¾"	-	-	23.5 ±0.08	-	-	-	-
1½"	-	-	-	32.1 ±0.08	-	-	-
2"	-	-	-	-	41 ±0.08	-	-
3"	-	-	-	-	-	51.4 ±0.08	-
Tri-clamp DIN 32676							
DN10	19 ±0.08	22.2 ±0.08	-	-	-	-	-
DN15	-	-	23.7 ±0.08	-	-	-	-
DN25	-	-	-	30 ±0.08	-	-	-
DN40	-	-	-	-	38.8 ±0.08	-	-
DN50	-	-	-	-	-	46 ±0.08	-
DN80	-	-	-	-	-	-	62.4 ±0.08
Tri-clamp ISO 2852							
1½"	-	-	-	32.2 ±0.08	-	-	-
2"	-	-	-	-	41.1 ±0.08	-	-
3"	-	-	-	-	-	51.4 ±0.08	-
DIN 11864-2 form A							
DN10	-	20.8 ±0.08	-	-	-	-	-
DN15	-	-	22.3 ±0.08	-	-	-	-
DN25	-	-	-	28.3 ±0.08	-	-	-
DN40	-	-	-	-	37.3 ±0.08	-	-
DN50	-	-	-	-	-	44.3 ±0.08	-
DN80	-	-	-	-	-	-	60.5 ±0.08



Hygienic connections: adapter versions (Tri-Clover & Tri-clamp)

	Dimension B [mm]				
	T/S 10	T/S 15	T/S 25	T/S 40	T/S 50
Tri-clover					
½"	597 ±2	-	-	-	-
¾"	-	635 ±2	-	-	-
1"	-	665 ±2	-	-	-
1½"	-	-	855 ±2	-	-
2"	-	-	-	1077 ±2	-
3"	-	-	-	-	1355 ±2
Tri-clamp DIN 32676					
DN10	590 ±2	-	-	-	-
DN15	-	628 ±2	-	-	-
DN25	-	-	787 ±2	-	-
DN40	-	-	-	1017 ±2	-
DN50	-	-	-	-	1193 ±2
Tri-clamp ISO 2852					
1"	-	665 ±2	-	-	-
1½"	-	-	855 ±2	-	-
2"	-	-	-	1077 ±2	-
3"	-	-	-	-	1355 ±2

	Dimension B [inches]				
	T/S 10	T/S 15	T/S 25	T/S 40	T/S 50
Tri-clover					
½"	23.5 ±0.08	-	-	-	-
¾"	-	25 ±0.08	-	-	-
1"	-	26.2 ±0.08	-	-	-
1½"	-	-	33.7 ±0.08	-	-
2"	-	-	-	42.4 ±0.08	-
3"	-	-	-	-	53.3 ±0.08
Tri-clamp DIN 32676					
DN10	23.2 ±0.08	-	-	-	-
DN15	-	24.7 ±0.08	-	-	-
DN25	-	-	31 ±0.08	-	-
DN40	-	-	-	40 ±0.08	-
DN50	-	-	-	-	47 ±0.08
Tri-clamp ISO 2852					
1"	-	26.2 ±0.08	-	-	-
1½"	-	-	33.7 ±0.08	-	-
2"	-	-	-	42.4 ±0.08	-
3"	-	-	-	-	53.3 ±0.08

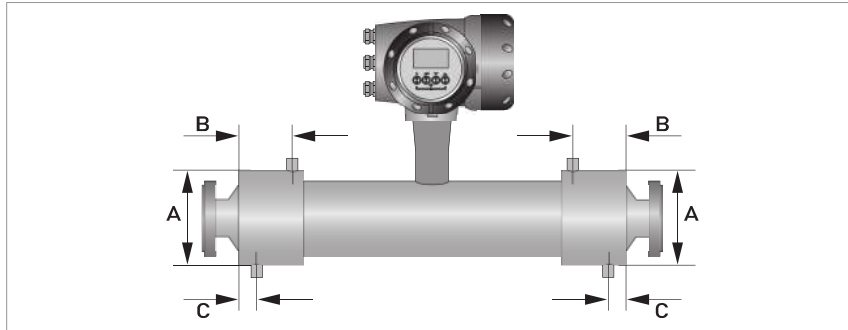


Hygienic connections: adapter versions (male thread)

	Dimension B [mm]					
	T/S 10	T/S 15	T/S 25	T/S 40	T/S 50	T/S 80
Male thread DIN 11851						
DN10	596 ±2	-	-	-	-	-
DN15	-	634 ±2	-	-	-	-
DN25	-	-	802 ±2	-	-	-
DN40	-	-	-	1040 ±2	-	-
DN50	-	-	-	-	1220 ±2	-
DN80	-	-	-	-	-	1658 ±2
Male thread SMS						
1"	-	665 ±2	-	-	-	-
1½"	-	-	852 ±2	-	-	-
2"	-	-	-	1074 ±2	-	-
3"	-	-	-	-	1360 ±2	-
Male thread IDF/ISS						
1"	-	664 ±2	-	-	-	-
1½"	-	-	854 ±2	-	-	-
2"	-	-	-	1076 ±2	-	-
3"	-	-	-	-	1354 ±2	-

	Dimension B [inches]					
	T/S 10	T/S 15	T/S 25	T/S 40	T/S 50	T/S 80
Male thread DIN 11851						
DN10	23.5 ±0.08	-	-	-	-	-
DN15	-	25 ±0.08	-	-	-	-
DN25	-	-	31.6 ±0.08	-	-	-
DN40	-	-	-	41 ±0.08	-	-
DN50	-	-	-	-	48 ±0.08	-
DN80	-	-	-	-	-	65.3 ±0.08
Male thread SMS						
1"	-	26.2 ±0.08	-	-	-	-
1½"	-	-	33.5 ±0.08	-	-	-
2"	-	-	-	42.3 ±0.08	-	-
3"	-	-	-	-	53.5 ±0.08	-
Male thread IDF/ISS						
1"	-	26.1 ±0.08	-	-	-	-
1½"	-	-	33.6 ±0.08	-	-	-
2"	-	-	-	42.4 ±0.08	-	-
3"	-	-	-	-	53.3 ±0.08	-

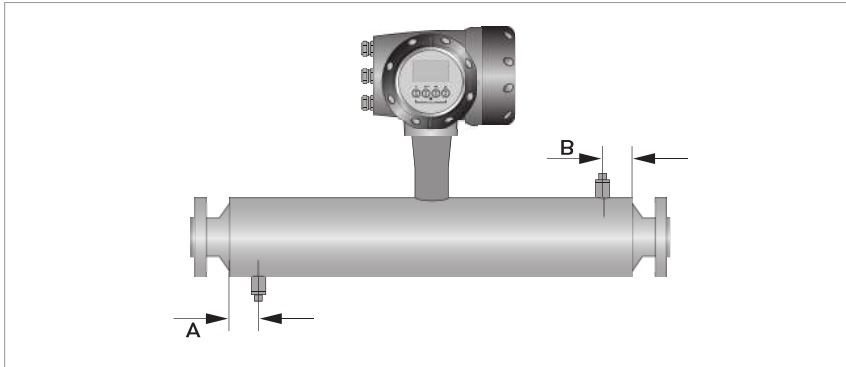
6.6.3 Heating jacket version



	Dimensions [mm]					
	10	15	25	40	50	80
Heating connection size	12 mm (ERMETO)			25 mm (ERMETO)		
A	115 ±1		142 ±1	206 ±1	254 ±1	305 ±1
Titanium						
B	36 ±1	51 ±1	100 ±1	90 ±1	175 ±1	385 ±1
C	20 ±1			26 ±1		
Stainless Steel & Hastelloy®						
B	-	51 ±1	55 ±1	90 ±1	100 ±2	200 ±2
C	-	20 ±1		26 ±1		
Tantalum						
B	-	51 ±1	55 ±1	90 ±1	100 ±1	-
C	-	20 ±1		26 ±1		-

	Dimensions [inches]					
	10	15	25	40	50	80
Heating connection size	½" (NPTF)			1" (NPTF)		
A	4.5 ±0.04		5.6 ±0.04	8.1 ±0.04	10 ±0.04	12 ±0.04
Titanium						
B	1.4 ±0.04	2.0 ±0.04	3.9 ±0.04	3.5 ±0.04	6.9 ±0.04	15.2 ±0.04
C	0.8 ±0.04			1.0 ±0.04		
Stainless Steel & Hastelloy®						
B	-	2.0 ±0.04	2.2 ±0.04	3.5 ±0.04	3.9 ±0.08	7.9 ±0.08
C	-	0.8 ±0.04		1.0 ±0.04		
Tantalum						
B	-	2.0 ±0.04	2.2 ±0.04	3.5 ±0.04	3.9 ±0.04	-
C	-	0.8 ±0.04		1.0 ±0.04		-

6.6.4 Purge port option



Dimensions [mm]							
	06	10	15	25	40	50	80
Titanium & Stainless Steel							
A	65	30			65		
B	30			65			
Hastelloy®							
A	-	30			65		
B	-	30			65		
Tantalum							
A	-	-	30	65		-	
B	-	-	30	65		-	

Dimensions [inches]							
	06	10	15	25	40	50	80
Titanium & Stainless Steel							
A	2.6	1.2			2.6		
B	1.2			2.6			
Hastelloy®							
A	-	1.2			2.6		
B	-	1.2			2.6		
Tantalum							
A	-	-	1.2	2.6		-	
B	-	-	1.2	2.6		-	

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