



OPTIMASS 5000

Handbook

Sensor for mass flow

The documentation is only complete when used in combination with the relevant documentation for the signal converter.

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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.

**INFORMATION!**

This device is a Group 1, Class A device as specified within CISPR11. 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.

**INFORMATION!**

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

1.2 Conformity

The manufacturer certifies successful testing of the product by applying the conformity mark on the device.

This device fulfills the statutory requirements of the relevant directives and regulations.

For further information on directives, regulations, standards and certifications, please refer to the declaration of conformity which you can download from the manufacturer's website.

**DANGER!**

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

1.3 Associated documents

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

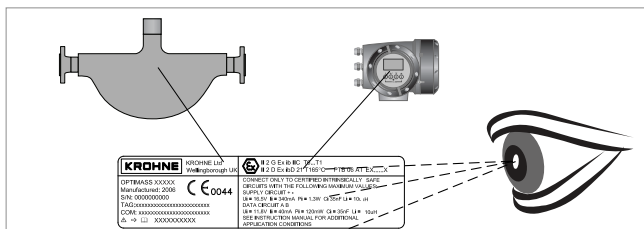
- signal converter
- hazardous areas
- communications
- concentration
- corrosion

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!



To ensure the PED integrity of the meter, you **MUST** check that the serial numbers on the converter 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. Secondary pressure containment is **NOT** supplied on this meter.

Tube failure

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, the manufacturer strongly recommends that the burst disc option is purchased. For more information, please contact your nearest representative.



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.

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 cannot 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!

This warning refers to the immediate danger when working with electricity.



DANGER!

This warning refers to the immediate danger of burns caused by heat or hot surfaces.



DANGER!

This warning refers to the immediate danger when using this device in a hazardous atmosphere.



DANGER!

These warnings must be observed without fail. Even partial disregard of this warning can lead to serious health problems and even death. There is also the risk of seriously damaging the device or parts of the operator's plant.



WARNING!

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.



CAUTION!

Disregarding these instructions can result in damage to the device or to parts of the operator's plant.



INFORMATION!

These instructions contain important information for the handling of the device.



LEGAL NOTICE!

This note contains information on statutory directives and standards.



• **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

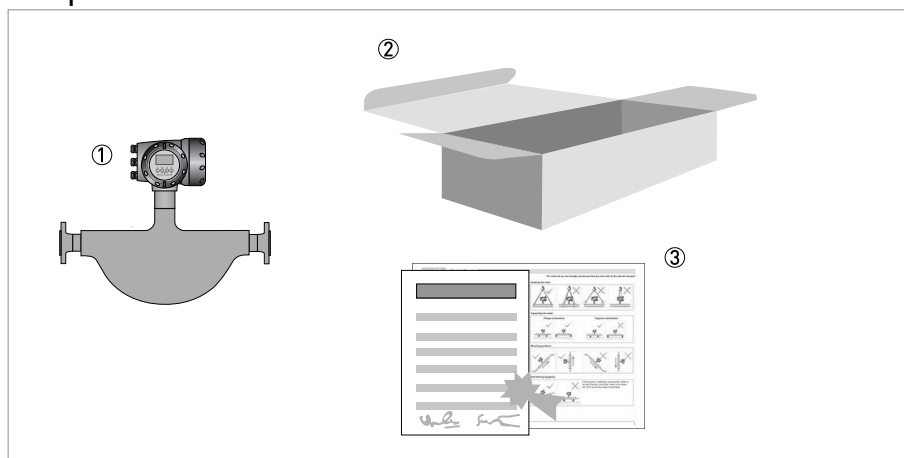


WARNING!

*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.*

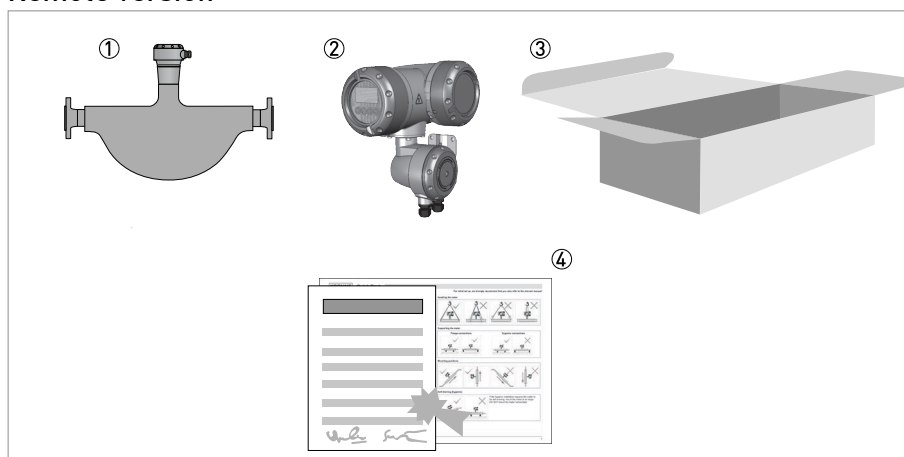
2.1 Scope of delivery

Compact version



- ① Mass flowmeter.
- ② Carton.
- ③ Documentation.

Remote version

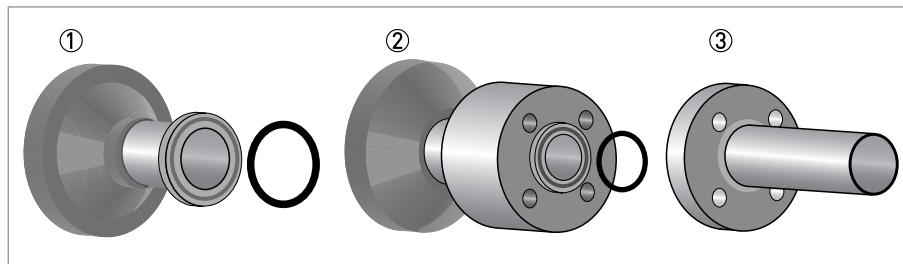


- ① Mass flowmeter.
- ② Converter.
- ③ Carton.
- ④ Documentation.

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.

2.1.1 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 DIN11864-2: The O-rings between the two parts of the connection are not supplied as standard but they can be ordered.
- ③ DIN11864-2: The counter flange is not supplied as part of the 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.

2.2 Nameplates



INFORMATION!

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.

2.3 Temperature differential and thermal shock

Temperature differential

The maximum difference between ambient temperature and process (operating) temperatures are:

Meter temperature range	Maximum temperature differential
-50°C...+180°C / -58°F...+356°F	160°C / 320°F

Thermal shock

Thermal shock occurs when there is a sudden and extreme change (shift) in process temperature. Continual shocking (cycles) reduces the life span of the meter depending on the temperature shift.

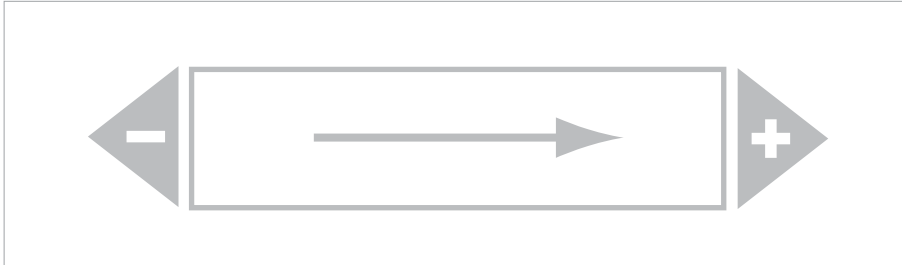
For more information, please contact the manufacturer.



CAUTION!

Operation outside these limits may result in shifts in density and mass flow calibration. Repeated shocking and / or rapid heating, may also result in premature failure of the meter. However, higher thermal shocks and / or an increased number of cycles are possible at lower working pressures. For more information, please contact the manufacturer.

2.4 Flow direction



The flow direction label on the sensor shows the default flow direction of the meter (left to right) as indicated by the arrow. If the flow direction is reversed (right to left) the converter or PLC display will show a negative value. The flow direction can be changed in the converter. For more information, see the relevant section of the converter handbook.

3.1 General notes on installation

**INFORMATION!**

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

**INFORMATION!**

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

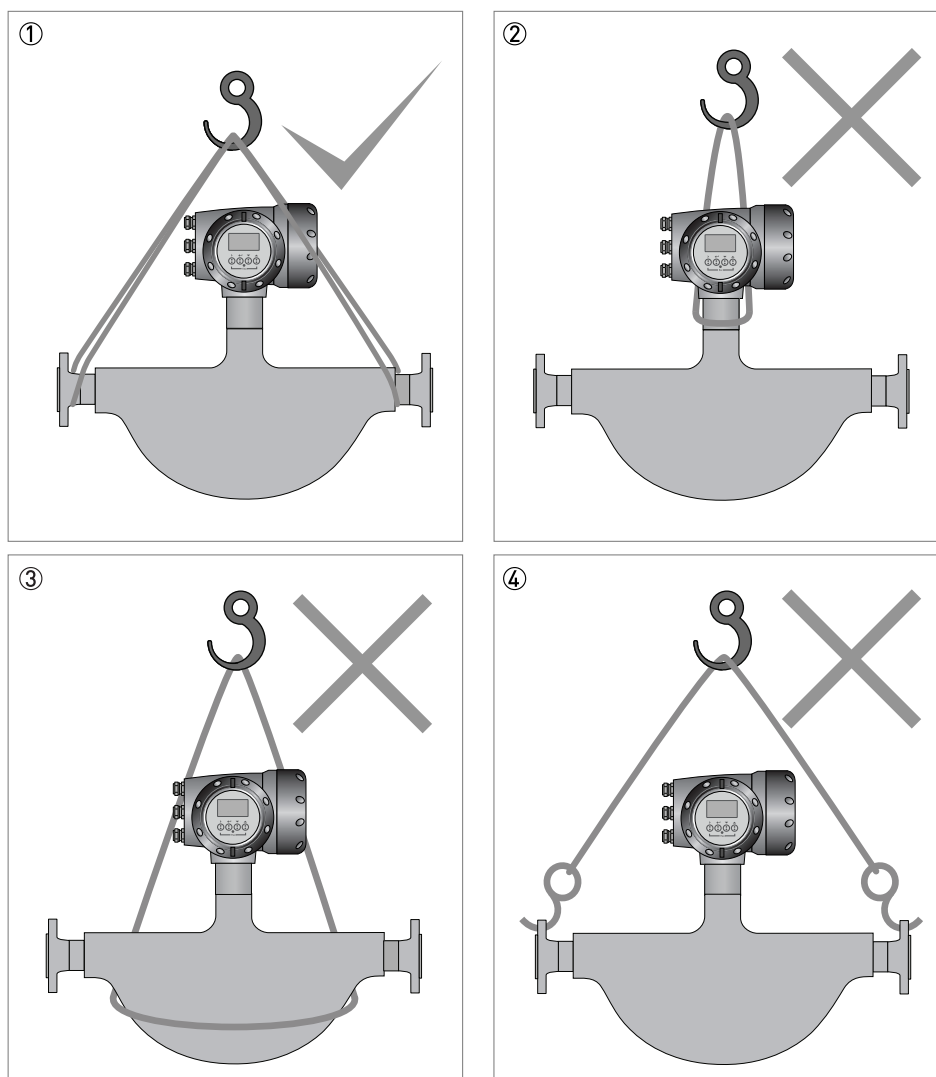
**INFORMATION!**

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 -40°C / -40°F or rise above +70°C / +158°F.

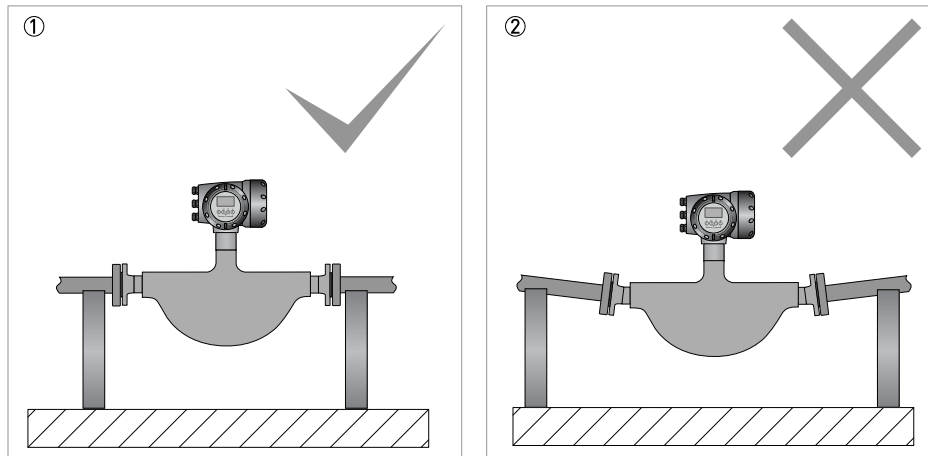
3.3 Handling



- ① Use a well maintained sling to lift the meter by the spigots.
- ② DO NOT lift the meter by the converter housing or the electronics stem.
- ③ DO NOT lift the meter by the meter body.
- ④ DO NOT lift the meter using the flange bolt holes.

3.4 Installation conditions

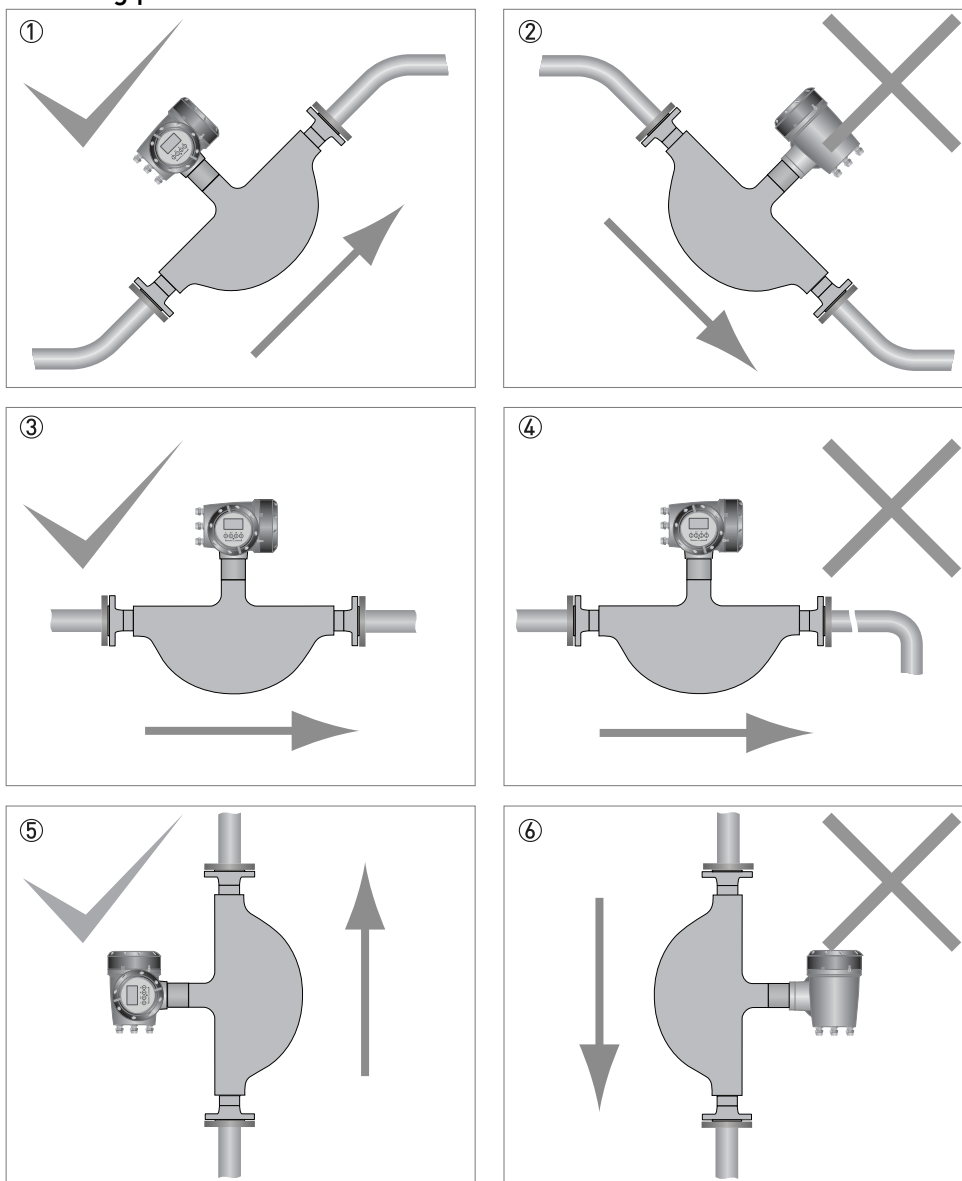
3.4.1 Supporting the meter



- ① Support the weight of the meter on the process pipework.
- ② DO NOT leave a long pipe run between the meter and the support. This can cause damage to the meter, especially on larger meter sizes.

3.4.2 Mounting the meter

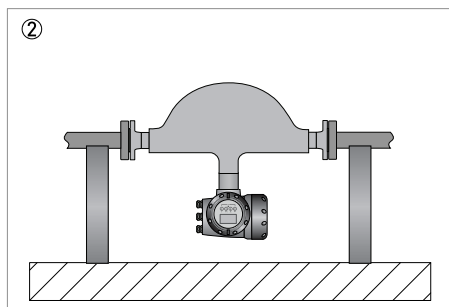
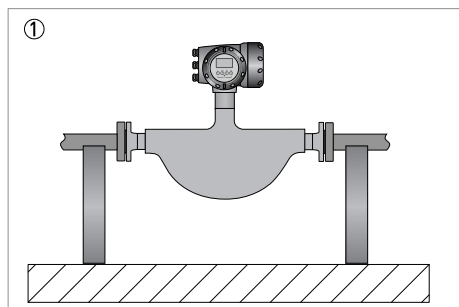
Mounting positions



- 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.

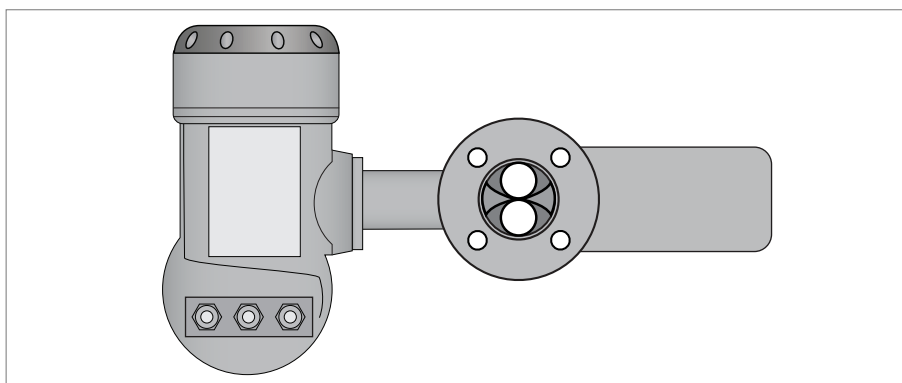
3.4.3 Gas / liquid build up

In certain applications, the design of the meter can cause either gas or liquid to build up in the measuring tube.



- ① Where liquids are being measured, mount the meter as shown. This will prevent gas building up in the measuring tube, when there is no flow.
- ② Where gases are being measured, mount the meter as shown. This will prevent liquids building up in the measuring tube, when there is no flow.

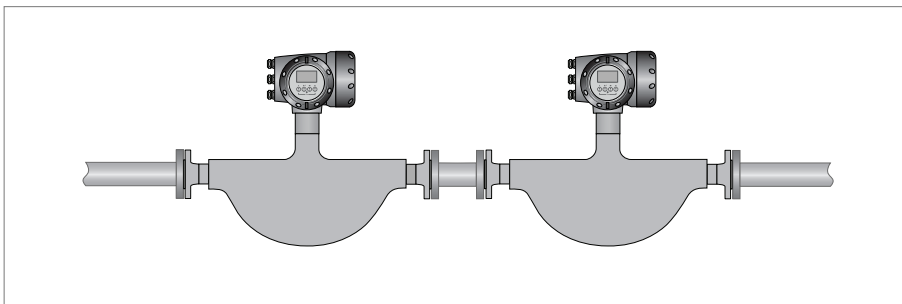
3.4.4 Side mounting



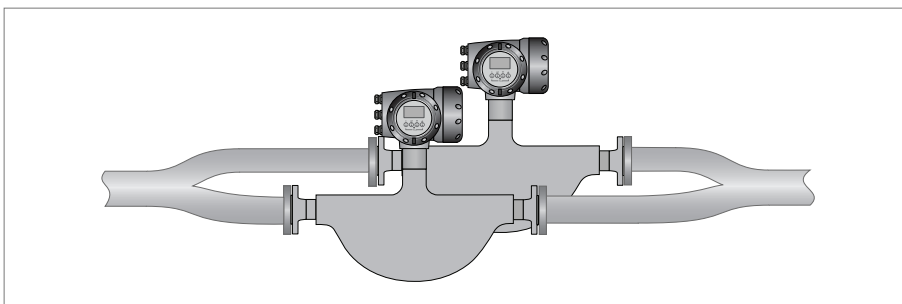
The meter can be installed with the converter (or remote junction box) on the side of the meter so that the measuring tubes are sitting one above the other. Avoid this method of installation where there is a two phase process flow, or where the process fluid contains gas. If this situation cannot be avoided, please contact the manufacturer for advice.

3.4.5 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.

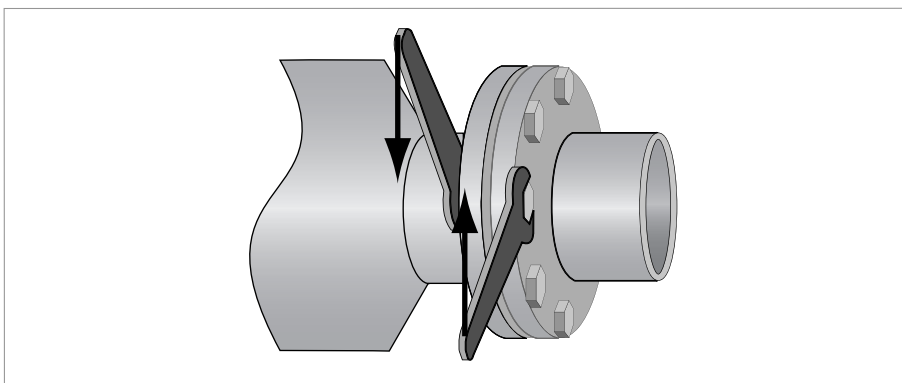
**INFORMATION!**

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

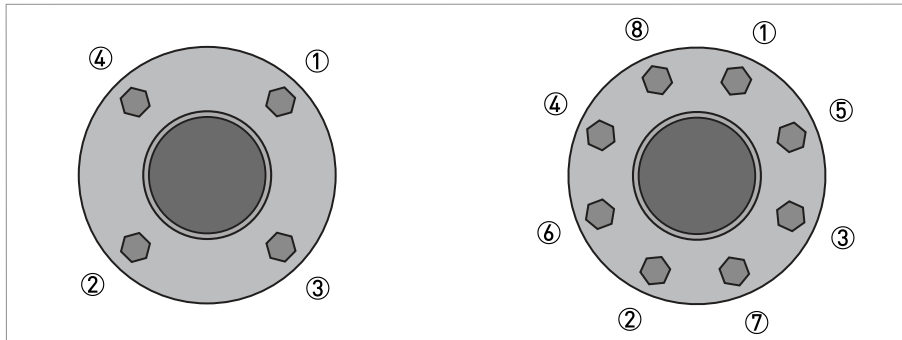


Where the meters are installed in parallel, it is strongly recommended that the pipework is clamped as close as possible to the meters. For more information, please contact the manufacturer.

3.4.6 Flange connections



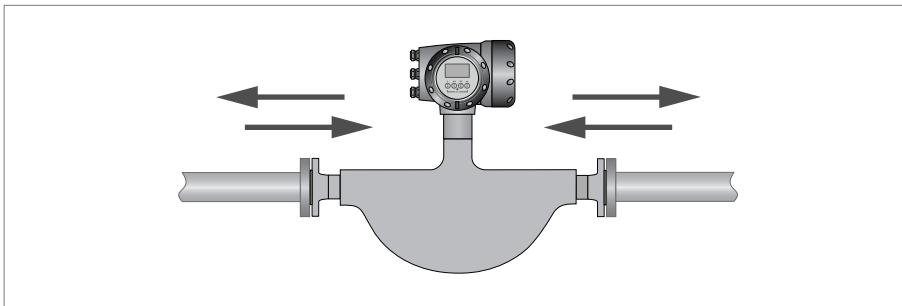
Tighten the flange bolts evenly and in turn.



Use a regular pattern to tighten the bolts evenly

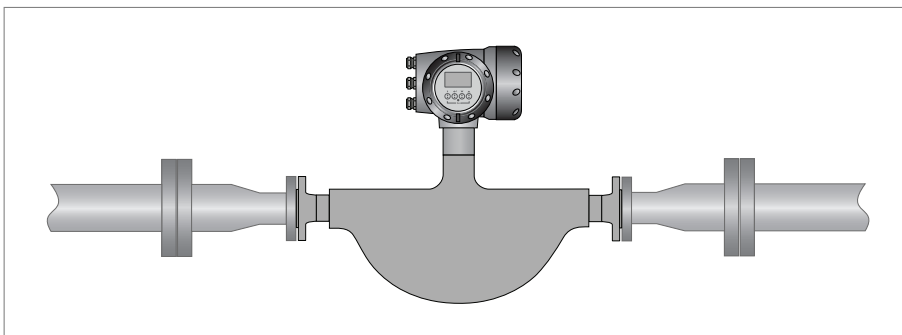
DO NOT use the meter to align the process pipework. Using the meter to align or straighten the pipework can cause stress on the meter that could affect performance.

3.4.7 Maximum pipework forces (end loadings)



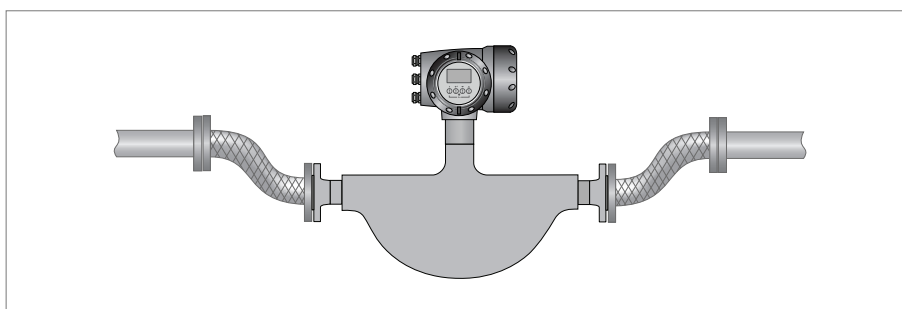
Avoid external forces that apply pressure (negative, positive or rotational) to the ends of the meter. If it is not possible to avoid such forces you **MUST** contact the manufacturer.

3.4.8 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.

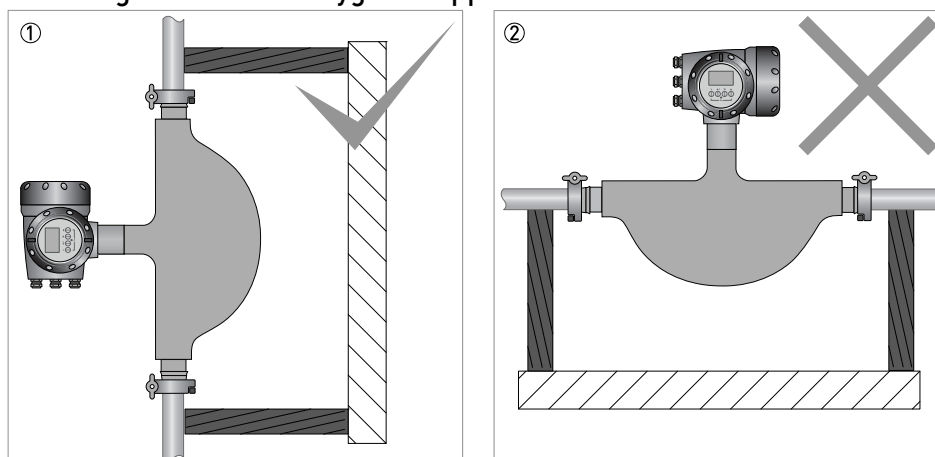
3.4.9 Flexible connections



Flexible connections can be used and the meter can be supported by the spigots.

3.4.10 Hygienic installations

Mounting the meter for hygienic applications



- ① Install the meter vertically 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 vertically 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.
- Use process connections and seals that comply with EHEDG position paper Doc P "Easy cleanable Pipe couplings and Process connections". This paper can be found at: <https://www.ehedg.org/guidelines-working-groups/guidelines/guidelines>

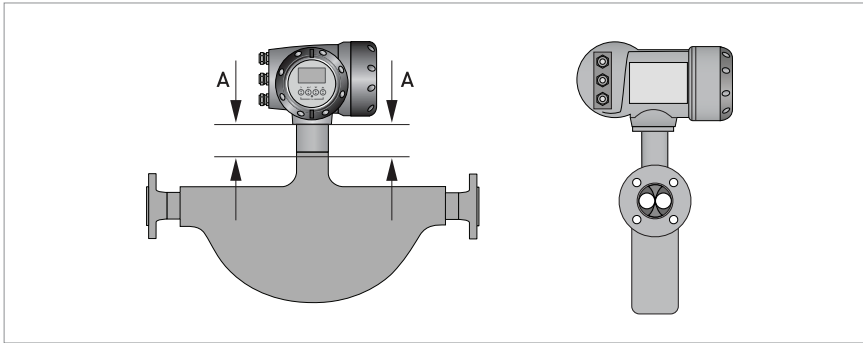
The manufacturer also recommends that you refer to EHEDG (www.ehedg.org) document number 8 "HYGIENIC EQUIPMENT DESIGN CRITERIA".

3.4.11 Heating and insulation

Insulation

When insulating the meter, leave a minimum gap of 65mm / 2.6" below the base of the converter, as shown (A). A gap of less than 65mm / 2.6" will cause the electronics to overheat.

Insulation



3.4.12 Burst discs

If the meter has been ordered with a burst disc, it will be supplied with the disc fitted. The failure pressure of the disc is 10 barg at +20°C / 145 psig at +68°F.

More information about how the manufacturer calculates the size of the burst disc, is available on request.

If the process product is hazardous (in any way) it is recommended that an exhaust tube is connected to the outlet of the burst disc and the pipe routed so that the process product can be discharged to a safe area. Use a tube with a diameter large enough AND routed in such a way, so that pressure cannot build up in the meter case.



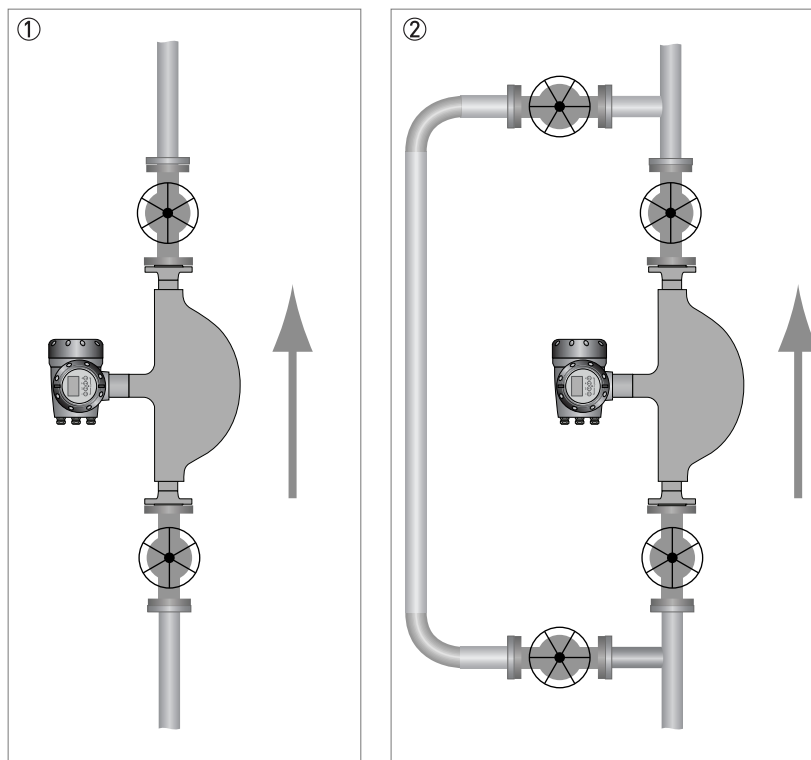
INFORMATION!

For gas applications where the operating pressure exceeds 50 barg / 725 psig, it is strongly recommended that a burst disc is used. The burst disc must be specified at the time of ordering.

3.4.13 Zero calibration

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

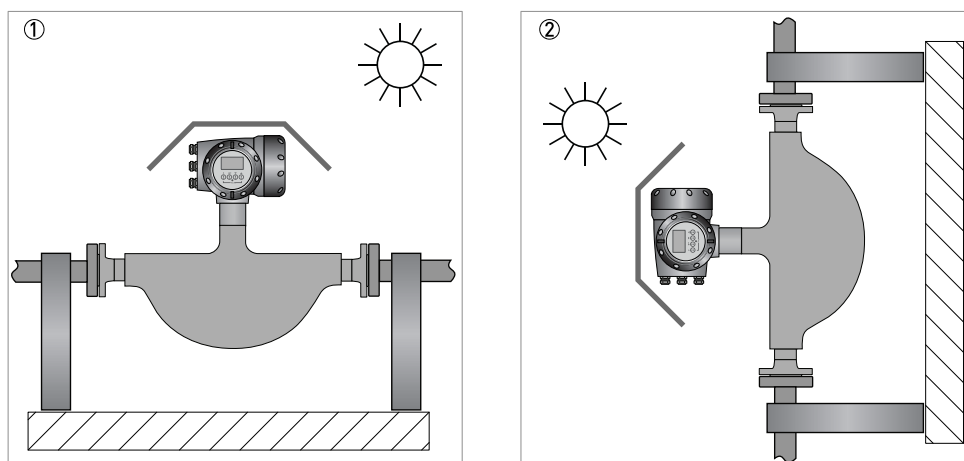
Zero calibration



- 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.

3.4.14 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.*

**INFORMATION!**

*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 converter.

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.



INFORMATION!

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 Form (for copying) to accompany a returned device



CAUTION!

To avoid any risk for our service personnel, this form has to be accessible from outside of the packaging with the returned device.

Company:		Address:	
Department:		Name:	
Telephone number:		Email address:	
Fax number:			
Manufacturer order number or serial number:			
The device has been operated with the following medium:			
This medium is:		radioactive	
		water-hazardous	
		toxic	
		caustic	
		flammable	
		We checked that all cavities in the device are free from such substances.	
		We have flushed out and neutralized all cavities in the device.	
We hereby confirm that there is no risk to persons or the environment caused by any residual media contained in this device when it is returned.			
Date:		Signature:	
Stamp:			

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):

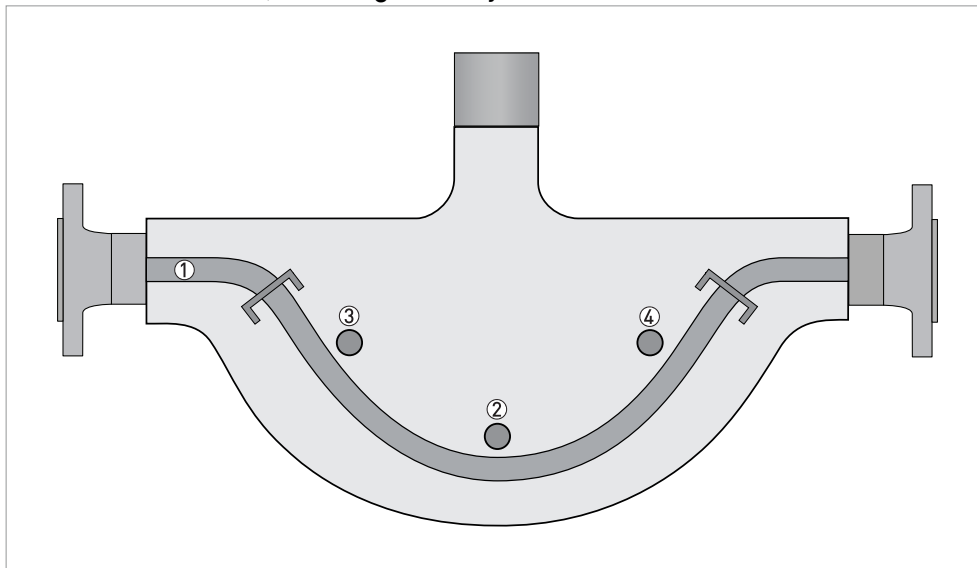


According to the directive 2012/19/EU or UK Regulation 2013 No. 3113, the monitoring and control instruments marked with the WEEE symbol and reaching their end-of-life **must not be disposed of with other waste.**

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.

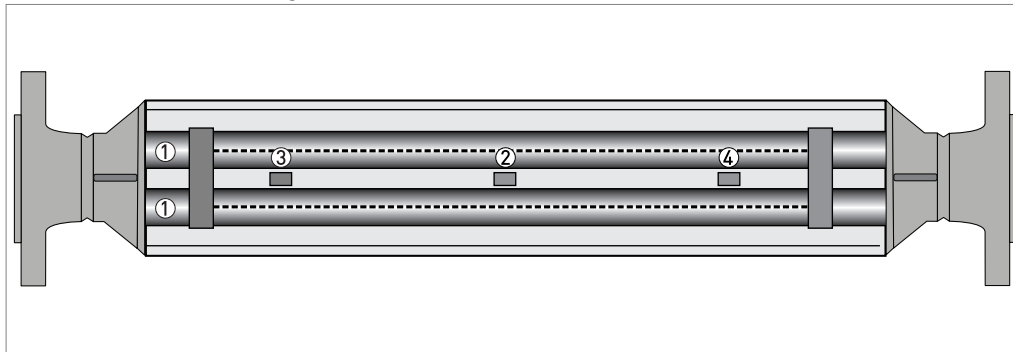
6.1 Measuring principle (twin tube)

Meter from the side, showing tube layout



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

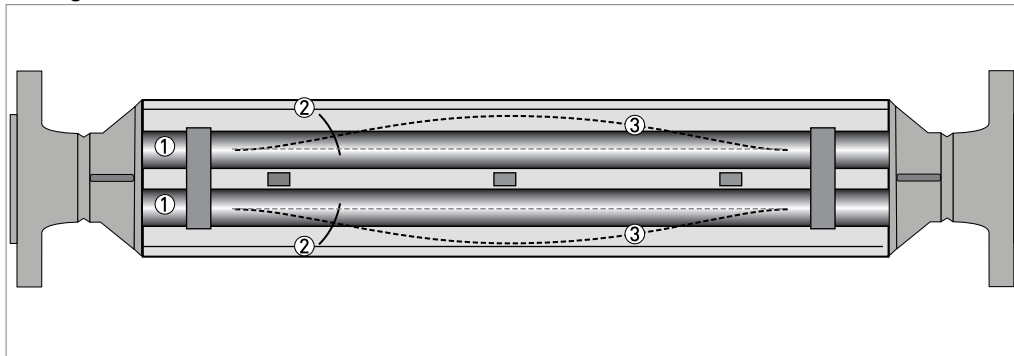
Static meter not energised and with no flow



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

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

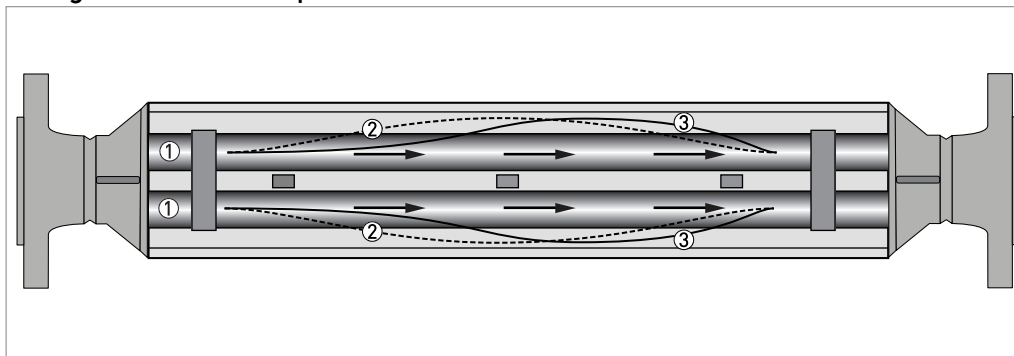
Energised meter



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

When the meter is energised, the drive coil vibrates the measuring tubes causing them 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 tubes, 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



INFORMATION!

- 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 (Download Center).

Measuring system

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

Design

Basic	System consists of a measuring sensor and a converter to process the output signal
Features	Fully welded maintenance free sensor with twin V-shaped measuring tubes
Variants	
Compact version	Integral converter (MFC400, MFC020)
Remote version	Available with a field version of the converter (MFC400)

Performance specification

Reference conditions	
Calibration fluid	Water
Calibration temperature	+20°C / +68°F (± 5°C)
Calibration pressure	1...6 barg / 14.5...87 psig
Calibration rig	Accreditation satisfies the requirements of BS EN ISO / IEC 17025
Mass flow (standard)	
Liquid (flow rate ≥ 10% of nominal flow)	
Maximum permissible error	±0.15% of actual measured flow rate
Repeatability	Better than 0.075% of actual measured flow rate
Liquid (flow rate < 10% of nominal flow)	
Maximum permissible error	±zero stability x 1.5
Repeatability	Better than 0.0075% of nominal flow rate
Mass flow (optional)	
Liquid (flow rate ≥ 10% of nominal flow)	
Maximum permissible error	±0.1% of actual measured flow rate
Repeatability	Better than 0.05% of measured flow rate
Liquid (flow rate < 10% of nominal flow)	
Maximum permissible error	±zero stability
Repeatability	Better than 0.005% of nominal flow rate
Mass flow (gases)	
Gas (flow rate ≥ 5% of nominal flow)	
Maximum permissible error	±0.5% of actual measured flow rate

Repeatability	Better than 0.25% of measured flow rate
Gas (flow rate < 5% of nominal flow)	
Maximum permissible error	±zero stability x 2.5
Repeatability	Better than 0.0125% of nominal flow rate
Zero stability	
Meter size	
10	0.12 kg/h / 0.0044 lb/min
15	0.45 kg/h / 0.0165 lb/min
25	1.2 kg/h / 0.0441 lb/min
40	2.5 kg/h / 0.0919 lb/min
50	5.0 kg/h / 0.1837 lb/min
80	12.5 kg/h / 0.4593 lb/min
Maximum permissible error on sensor zero point caused by a deviation in process temperature from zero calibration temperature	
All meter sizes	±0.0015% of nominal flow per 1°C / 0.00083% per 1°F
Maximum permissible error on mass flow caused by a deviation in process temperature from calibration temperature	
All meter sizes	±0.005% of actual measured flow rate per 1°C / 0.00278% per 1°F
Pressure effect on mass flow rate caused by deviation in process pressure from calibration pressure	
Sizes 10...25	Not applicable
Size 40	0.0024% of reading per bar / 0.00017% of reading per 1 psi
Size 50	0.0084% of reading per bar / 0.00058% of reading per 1 psi
Size 80	0.025% of reading per bar / 0.0017% of reading per 1 psi
Density (measuring range 400...2500 kg/m³ / 25.0...156.1 lb/ft³)	
Maximum permissible measurement error	
0.1% calibration option	±1.6 kg/m ³ / 0.1 lb/ft ³
0.15% calibration option	±2.0 kg/m ³ / 0.125 lb/ft ³
Repeatability / on site calibration	Better than 0.5 kg/m ³ / 0.03 lb/ft ³
Density (measuring range <400kg/m³ / 25.0 lb/ft³)	
Maximum permissible measurement error	±8.0 kg/m ³ / 0.5 lb/ft ³
Repeatability / on site calibration	Better than 4 kg/m ³ / 0.25 lb/ft ³
Maximum permissible error on density caused by a deviation in process temperature from calibration temperature	
All meter sizes	±0.05 kg/m ³ per 1°C / 0.0017 lb/ft ³ per 1°F
Pressure effect on density caused by deviation in process pressure from calibration pressure	
Size 10	0.014 kg/m ³ per bar / 0.00006 lb/ft ³ per psi
Size 15	0.032 kg/m ³ per bar / 0.00014 lb/ft ³ per psi
Size 25	0.027 kg/m ³ per bar / 0.00012 lb/ft ³ per psi
Size 40	0.107 kg/m ³ per bar / 0.00046 lb/ft ³ per psi
Size 50	0.148 kg/m ³ per bar / 0.00064 lb/ft ³ per psi
Size 80	0.300 kg/m ³ per bar / 0.00129 lb/ft ³ per psi

Volume flow	
Measurement error and repeatability calculations satisfy the requirements of BS ISO 10790 (most recent and up to date version)	
Temperature	
Maximum permissible error	$\pm 0.5^{\circ}\text{C} \pm 0.5\%$ / $\pm 0.9^{\circ}\text{F} \pm 0.5\%$ of reading

Operating conditions

Nominal flow rates (1 barg / 14.5 psig pressure drop)	
Meter size	
10	1200 kg/h / 44.1 lb/min
15	4500 kg/h / 165.3 lb/min
25	12000 kg/h / 440.9 lb/min
40	25000 kg/h / 918.6 lb/min
50	50000 kg/h / 1837.2 lb/min
80	125000 kg/h / 4593.0 lb/min
Maximum flow rates	
All meters	150% of nominal flow rate

Environmental

Ambient temperature	
Compact version with Aluminium converter (MFC400)	$-40^{\circ}\text{C} \dots +60^{\circ}\text{C}$ / $-40^{\circ}\text{F} \dots +140^{\circ}\text{F}$
Compact version with Stainless Steel converter (MFC400)	$-40^{\circ}\text{C} \dots +60^{\circ}\text{C}$ / $-40^{\circ}\text{F} \dots +140^{\circ}\text{F}$
Compact version with Stainless Steel converter (MFC020)	$-40^{\circ}\text{C} \dots +60^{\circ}\text{C}$ / $-40^{\circ}\text{F} \dots +140^{\circ}\text{F}$
Remote version	$-40^{\circ}\text{C} \dots +65^{\circ}\text{C}$ / $-40^{\circ}\text{F} \dots 149^{\circ}\text{F}$
Hazardous Area versions	Refer to temperature limits in hazardous areas documentation
Storage conditions	$-40^{\circ}\text{C} \dots +70^{\circ}\text{C}$ / $40^{\circ}\text{F} \dots +158^{\circ}\text{F}$
Other conditions	
Protection category	IP 66 / 67 (EN 60529), NEMA 4X
Vibration (acc IEC 60068-2-6)	10-150-10 Hz with 0.15 mm for 10...60 Hz, 20 m/s ² for 60...150 Hz
Process temperatures	
Temperature range	$-50^{\circ}\text{C} \dots +180^{\circ}\text{C}$ / $-58^{\circ}\text{F} \dots 356^{\circ}\text{F}$
Nominal pressure at 20°C / 68°F	
Measuring tube	-1...100 barg / -14.5...1450 psig
Outer casing typical burst pressure	> 200 barg @ 20°C / 2900 psig @ 68°F
If the process temperature is higher than 20°C / 68°F, the burst pressure will be lower. For more information please contact the manufacturer.	
Fluid properties	
Permissible physical condition	Liquids, gases, slurries
Permissible gas content (volume)	Contact manufacturer for information.
Permissible solid content (volume)	Contact manufacturer for information.
Installation conditions	
Inlet / outlet runs	None required

Materials

Measuring tubes / flanges	Stainless Steel AISI 316/316L (1.4401 / 1.4404) dual certified
Spigots	Meter size 10, and all hygienic meters, Stainless Steel AISI 316/316L (1.4401 / 1.4404) dual certified
	Meter sizes 15...80 Stainless Steel CF3M (1.4409)
Outer casing	Stainless Steel AISI 316/316L (1.4401 / 1.4404) dual certified
Junction box (remote version)	Die cast Aluminium (polyurethane coating)
	Optional Stainless Steel 316 (1.4401)

Process connections

Flange	
DIN	DN10...100 / PN16...100
ASME	½...4" / ASME 150...600
JIS	10...100A / 10...20K
Hygienic	
Tri-clamp ASME BPE	½...4"
Triclamp to DIN32676 Shape B	DN10...100
Triclamp to ISO 2037 (ISO 2852 equivalent)	½...4"
DIN 11864-1 Form A threaded ferrule (male)	DN10...100
DIN 11864-2 Form A, flange with groove (Nutflansch [NF])	DN10...100
DIN11851 threaded ferrule Shape SC (male)	DN10...100

Electrical connections

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

Approvals

Declaration of conformity	This device fulfils the statutory requirements of the relevant directives and regulations. The manufacturer certifies successful testing of the product by applying the conformity mark.
	For further information on directives, regulations, standards and certifications, please refer to the declaration of conformity which you can download from the manufacturer's website
CE / UKCA	The device fulfils the statutory requirements of the relevant CE directives and UK designated standards. The manufacturer certifies that these requirements have been met by applying the CE and UKCA marks.
cFMus	Class I, Div 1 groups A, B, C, D (US)
	Class I, Div 1 groups C, D (Canada)
	Class II, Div 1 groups E, F, G
	Class III, Div 1 hazardous areas
	Class I, Div 2 groups A, B, C, D
	Class II, Div 2 groups F, G
	Class III, Div 2 hazardous areas

CRN	acc to: ASME B31.3 (most recent and up to date version)
NACE	MR0175 / ISO 15156 ("Sulphide Stress Corrosion Cracking Resistant Metallic Materials for Oil Field Equipment") (most recent and up to date version)
Hazardous area markings	
OPTIMASS 5400C	
Gas, Ex e connection compartment	
II 1/2 G	Ex db eb ia IIC T6 - T1 Ga/Gb
Gas, Ex d connection compartment	
II 1/2 G	Ex db ia IIC T6 - T1 Ga/Gb
Dust	
II 2D/1G	Ex tb ia IIIC T220°C Db/Ga
OPTIMASS 5000F	
Gas	
II 1 G	Ex ia IIC T6-T1 Ga
Dust	
II 2D/1G	Ex ia IIIC T220°C Db/Ga

6.3 Guidelines for maximum operating pressure

Always make sure that the meter is used within its operating limits.

Pressure / temperature de-rating (metric).

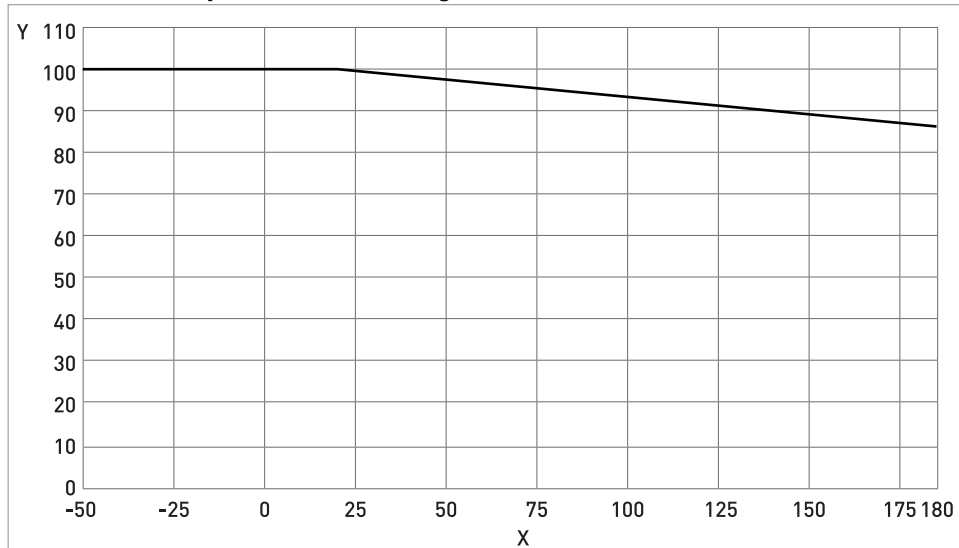


Figure 6-1: Measuring tube PED certification

X temperature [°C]

Y pressure [barg]

Pressure / temperature de-rating (imperial).

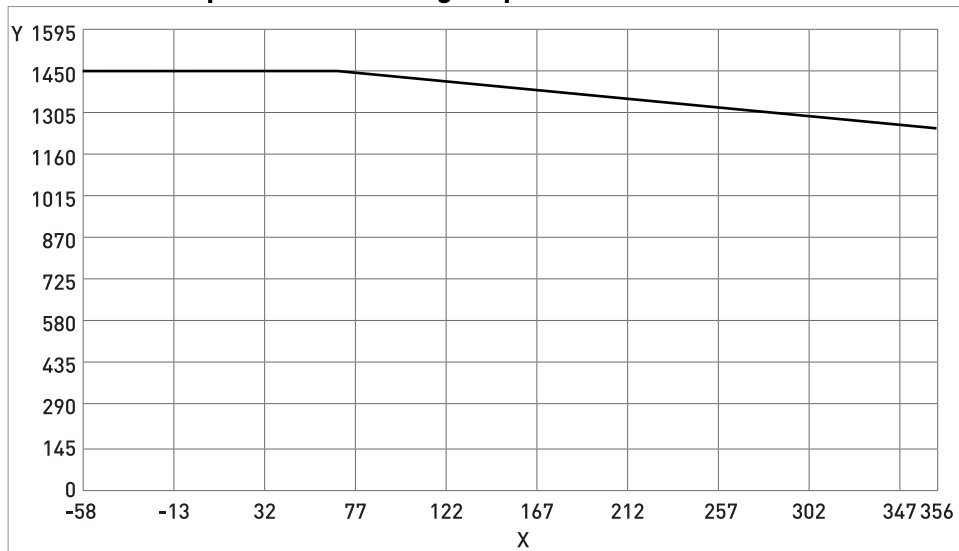


Figure 6-2: Measuring Tube PED certification

X temperature [°F]

Y pressure [psig]

Flanges

- DIN flange ratings are based on EN 1092-1 2007 table G.4.1 material group 14E0
- ASME flange ratings are based on ASME B16.5 2003 table 2 material group 2.2
- JIS flange ratings are based on JIS 2220: 2001 table 1 division 1 material group 022a
- JIS 10K flanges are limited to a maximum temperature of 300°C / 572°F

Notes

- The maximum operating pressure will be either the flange / hygienic connection rating or the measuring tube rating, **WHICHEVER IS THE LOWER!**
- For all connections excluding PN100 acc to EN 1092-1 and ASME B16.5 600 lbs, the lower rating will be the connection rating.
- Refer to the nameplate on the meter for the correct rating.
- For hygienic connections, the manufacturer recommends that the seals are replaced at regular intervals. This will maintain the hygienic integrity of the connection.
- For PN100 and ASME 600 lbs connections, the maximum operating pressures are shown in the tables below:

Metric

	Derating temp. °C	Max. pressure barg	Max. pressure at 180°C
PN100	20	100	86.8
ASME 600	28.6	99.3	73.5

Imperial

	Derating temp. °F	Max. pressure psig	Max. pressure at 356°F
PN100	68	1450.3	1260
ASME 600	83.5	1440.2	1067.1

6.4 Dimensions and weights

6.4.1 Flanged versions

Meter weights

	kg					
	S10	S15	S25	S40	S50	S80
Compact with Aluminium converter ①	9.2	12.3	14.4	22.3	32.4	51.8
Compact with Stainless Steel converter ①	15.1	18.2	20.3	28.2	38.3	57.7
Compact with Stainless Steel converter ②	7.1	10.2	12.3	20.2	30.3	49.7
Remote with Aluminium converter ①	3.6	6.7	8.9	16.8	26.8	46.3
Remote with Stainless Steel junction box ①	4.4	7.5	9.7	17.6	27.6	47.1

① MFC400

② MFC020

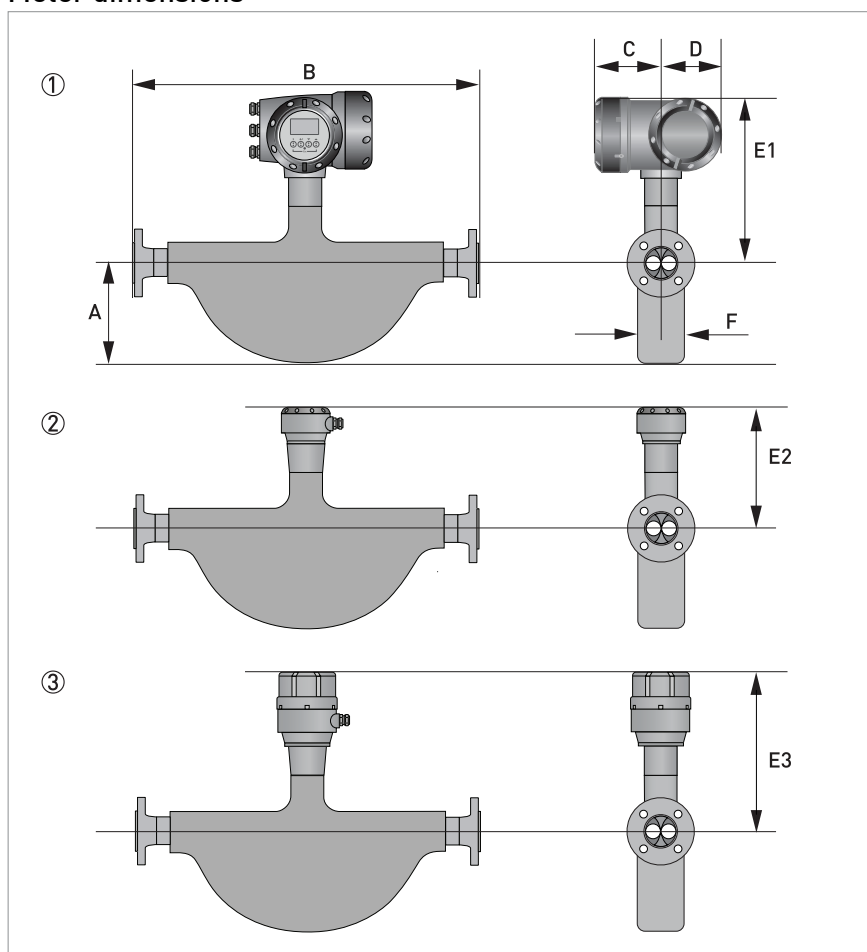
	lbs					
	S10	S15	S25	S40	S50	S80
Compact with Aluminium converter ①	20.3	27.1	31.7	49.2	71.4	114.2
Compact with Stainless Steel converter ①	33.3	40.1	44.8	62.2	84.4	127.2
Compact with Stainless Steel converter ②	15.7	22.5	27.1	44.5	66.8	109.6
Remote with Aluminium converter ①	7.9	14.8	19.6	37.0	59.1	102.1
Remote with Stainless Steel junction box ①	9.7	16.5	21.4	38.8	60.8	103.8

① MFC400

② MFC020

The weights shown are for meters fitted with PN40 flanges. Smaller or larger flange sizes will affect the overall weight. For further information, please contact the manufacturer.

Meter dimensions



- ① Compact version with MFC400
 ② Remote version with MFC400
 ③ Compact version with MFC020

General dimensions

	mm (±3)					
	S10	S15	S25	S40	S50	S80
A	103	134	152	204	246	299
C	137					
D	123					
E1	271	287	287	297	309	323
E2	204	220	220	230	242	256
E3	250	266	266	275	286	301
F	57	63	63	83	107	136

	Inches (±0.1)					
	S10	S15	S25	S40	S50	S80
A	4.1	5.3	6.0	8.0	9.7	11.8
C	5.4					
D	4.8					
E1	10.7	11.3	11.3	11.7	12.1	12.7
E2	8.0	8.6	8.6	9.0	9.5	10.1
E3	9.8	10.5	10.5	10.8	11.3	11.9
F	2.2	2.5	2.5	3.3	4.2	5.4

Dimension B

	mm (±5)					
	S10	S15	S25	S40	S50	S80
PN16						
DN50	-	-	-	-	706	-
DN80	-	-	-	-	716	866
DN100	-	-	-	-	-	896
PN40						
DN10	417	-	-	-	-	-
DN15	423	499	-	-	-	-
DN25	-	503	531	-	-	-
DN40	-	-	541	623	-	-
DN50	-	-	-	629	712	-
DN80	-	-	-	-	732	882
DN100	-	-	-	-	-	896
PN100						
DN10	437	-	-	-	-	-
DN15	437	513	-	-	-	-
DN25	-	539	567	-	-	-
DN40	-	-	575	657	-	-
DN50	-	-	-	669	752	-
DN80	-	-	-	-	772	922
DN100	-	-	-	-	-	946
ASME 150 (Raised Face)						
½"	443	-	-	-	-	-
¾"	453	529	-	-	-	-
1"	-	535	563	-	-	-
1½"	-	-	575	657	-	-
2"	-	-	-	661	744	-
3"	-	-	-	-	756	906
4"	-	-	-	-	-	920

	mm (±5)					
	S10	S15	S25	S40	S50	S80
ASME 300 (Raised Face)						
½"	453	-	-	-	-	-
¾"	463	539	-	-	-	-
1"	-	547	575	-	-	-
1½"	-	-	589	671	-	-
2"	-	-	-	673	756	-
3"	-	-	-	-	776	926
4"	-	-	-	-	-	938
ASME 600 (Raised Face)						
½"	465	-	-	-	-	-
¾"	475	551	-	-	-	-
1"	-	561	589	-	-	-
1½"	-	-	605	687	-	-
2"	-	-	-	693	776	-
3"	-	-	-	-	796	946
4"	-	-	-	-	-	984
JIS 10K						
50A	-	-	-	613	696	-
80A	-	-	-	-	706	856
100A	-	-	-	-	-	856
JIS 20K						
10A	413	-	-	-	-	-
15A	415	491	-	-	-	-
25A	-	499	527	-	-	-
40A	-	-	533	615	-	-
50A	-	-	-	617	700	-
80A	-	-	-	-	718	868
100A	-	-	-	-	-	882

	Inches (±0.2)					
	S10	S15	S25	S40	S50	S80
PN16						
DN50	-	-	-	-	27.8	-
DN80	-	-	-	-	28.2	34.1
DN100	-	-	-	-	-	35.3
PN40						
DN10	16.4	-	-	-	-	-
DN15	16.7	19.6	-	-	-	-
DN25	-	19.8	20.9	-	-	-
DN40	-	-	21.3	24.5	-	-

	Inches (±0.2)					
	S10	S15	S25	S40	S50	S80
DN50	-	-	-	24.8	28.0	-
DN80	-	-	-	-	28.8	34.7
DN100	-	-	-	-	-	35.3
PN100						
DN10	17.2	-	-	-	-	-
DN15	17.2	20.2	-	-	-	-
DN25	-	21.2	22.3	-	-	-
DN40	-	-	22.6	25.9	-	-
DN50	-	-	-	26.3	29.6	-
DN80	-	-	-	-	30.4	36.3
DN100	-	-	-	-	-	37.2
ASME 150 (Raised Face)						
½"	17.5	-	-	-	-	-
¾"	17.8	20.8	-	-	-	-
1"	-	21.1	22.2	-	-	-
1½"	-	-	22.6	25.9	-	-
2"	-	-	-	26.0	29.3	-
3"	-	-	-	-	29.8	35.7
4"	-	-	-	-	-	36.2
ASME 300 (Raised Face)						
½"	17.8	-	-	-	-	-
¾"	18.2	21.2	-	-	-	-
1"	-	21.5	22.6	-	-	-
1½"	-	-	23.2	26.4	-	-
2"	-	-	-	26.5	29.8	-
3"	-	-	-	-	30.6	36.5
4"	-	-	-	-	-	36.9
ASME 600 (Raised Face)						
½"	18.3	-	-	-	-	-
¾"	18.7	21.7	-	-	-	-
1"	-	27.4	23.2	-	-	-
1½"	-	-	23.8	27.0	-	-
2"	-	-	-	27.3	30.6	-
3"	-	-	-	-	31.3	37.2
4"	-	-	-	-	-	38.7
JIS 10K						
50A	-	-	-	24.1	27.4	-
80A	-	-	-	-	27.8	33.7
100A	-	-	-	-	-	33.7
JIS 20K						
10A	16.3	-	-	-	-	-

	Inches (±0.2)					
	S10	S15	S25	S40	S50	S80
15A	16.3	19.3	-	-	-	-
25A	-	19.6	20.7	-	-	-
40A	-	-	21.0	24.2	-	-
50A	-	-	-	24.3	27.6	-
80A	-	-	-	-	28.3	34.2
100A	-	-	-	-	-	34.7

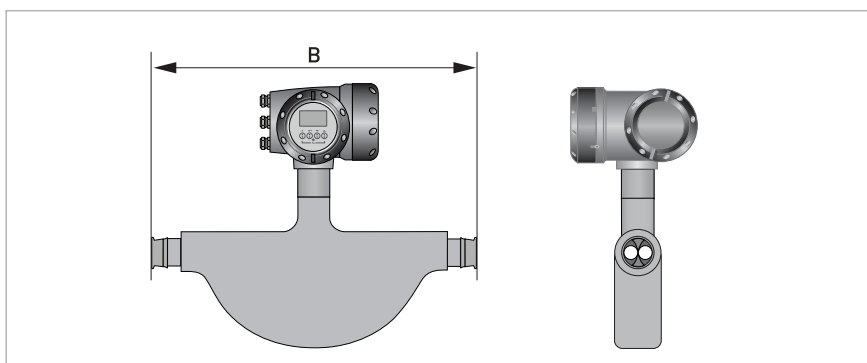
6.4.2 NAMUR dimensions

The following face to face dimensions comply with NAMUR NE132

mm (±3)						
	S10	S15	S25	S40	S50	S80
PN16						
DN100	-	-	-	-	-	1000
PN40						
DN 15	510	510	-	-	-	-
DN 25	-	-	600	-	-	-
DN 50	-	-	-	715	715	-
DN 80	-	-	-	-	-	915

Inches (±0.1)						
	S10	S15	S25	S40	S50	S80
PN16						
DN100	-	-	-	-	-	39.4
PN40						
DN 15	20.1	20.1	-	-	-	-
DN 25	-	-	23.6	-	-	-
DN 50	-	-	-	28.1	28.1	-
DN 80	-	-	-	-	-	36.0

6.4.3 Hygienic versions



Dimension B

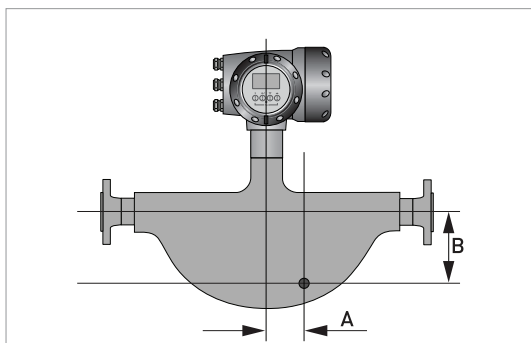
	mm (±5)					
	S10	S15	S25	S40	S50	S80
Tri-clamp ASME BPE						
1/2"	413	-	-	-	-	-
3/4"	413	-	-	-	-	-
1"	-	489	-	-	-	-
1 1/2"	-	-	533	-	-	-
2"	-	-	-	608	-	-
3"	-	-	-	-	682	-
4"	-	-	-	-	-	876
Tri-clamp ISO 2037 (ISO 2852 equivalent)						
1/2"	-	-	-	-	-	-
3/4"	-	-	-	-	-	-
1"	-	489	-	-	-	-
1 1/2"	-	-	502	-	-	-
2"	-	-	-	595	-	-
3"	-	-	-	-	667	-
4"	-	-	-	-	-	844
Tri-clamp DIN 32676						
DN10	409	-	-	-	-	-
DN15	413	-	-	-	-	-
DN25	-	468	-	-	-	-
DN40	-	-	515	-	-	-
DN50	-	-	-	594	-	-
DN80	-	-	-	-	686	-
DN100	-	-	-	-	-	824
DIN 11864-1 Form A						
DN10	415	-	-	-	-	-
DN15	413	-	-	-	-	-
DN25	-	489	-	-	-	-

	mm (±5)					
	S10	S15	S25	S40	S50	S80
DN40	-	-	543	-	-	-
DN50	-	-	-	625	-	-
DN80	-	-	-	-	738	-
DN100	-	-	-	-	-	876
DIN 11864-2 Form A, flange with groove (Nutflansch [NF])						
DN10	429	-	-	-	-	-
DN15	413	-	-	-	-	-
DN25	-	508	-	-	-	-
DN40	-	-	562	-	-	-
DN50	-	-	-	641	-	-
DN80	-	-	-	-	746	-
DN100	-	-	-	-	-	884
Male thread DIN 11851						
DN10	421	-	-	-	-	-
DN15	413	-	-	-	-	-
DN25	-	483	-	-	-	-
DN40	-	-	538	-	-	-
DN50	-	-	-	621	-	-
DN80	-	-	-	-	720	-
DN100	-	-	-	-	-	876

	inches (±0.2)					
	S10	S15	S25	S40	S50	S80
Tri-clamp ASME BPE						
1/2"	16.3	-	-	-	-	-
3/4"	16.3	-	-	-	-	-
1"	-	19.3	-	-	-	-
1 1/2"	-	-	21.0	-	-	-
2"	-	-	-	23.9	-	-
3"	-	-	-	-	26.9	-
4"	-	-	-	-	-	34.5
Tri-clamp ISO 2037 (ISO 2852 equivalent)						
1/2"	-	-	-	-	-	-
3/4"	-	-	-	-	-	-
1"	-	19.3	-	-	-	-
1 1/2"	-	-	19.8	-	-	-
2"	-	-	-	23.4	-	-
3"	-	-	-	-	26.3	-
4"	-	-	-	-	-	33.2

	inches (±0.2)					
	S10	S15	S25	S40	S50	S80
Tri-clamp DIN 32676						
DN10	16.1	-	-	-	-	-
DN15	16.3	-	-	-	-	-
DN25	-	18.4	-	-	-	-
DN40	-	-	20.3	-	-	-
DN50	-	-	-	23.4	-	-
DN80	-	-	-	-	27.0	-
DN100	-	-	-	-	-	32.4
DIN 11864-1 Form A						
DN10	16.4	-	-	-	-	-
DN15	16.3	-	-	-	-	-
DN25	-	19.3	-	-	-	-
DN40	-	-	21.4	-	-	-
DN50	-	-	-	24.6	-	-
DN80	-	-	-	-	29.1	-
DN100	-	-	-	-	-	34.5
DIN 11864-2 Form A, flange with groove (Nutflansch [NF])						
DN10	16.9	-	-	-	-	-
DN15	16.3	-	-	-	-	-
DN25	-	20.0	-	-	-	-
DN40	-	-	22.1	-	-	-
DN50	-	-	-	25.2	-	-
DN80	-	-	-	-	29.4	-
DN100	-	-	-	-	-	34.8
Male thread DIN 11851						
DN10	16.6	-	-	-	-	-
DN15	16.3	-	-	-	-	-
DN25	-	19.0	-	-	-	-
DN40	-	-	21.2	-	-	-
DN50	-	-	-	24.4	-	-
DN80	-	-	-	-	28.3	-
DN100	-	-	-	-	-	34.5

6.4.4 Burst disc option



Dimensions

	mm					
	S10	S15	S25	S40	S50	S80
A	27	30	32	40		
B	54	83	100	147	172	210

	inches					
	S10	S15	S25	S40	S50	S80
A	1.06	1.18	1.26	1.57		
B	2.13	3.27	3.94	5.79	6.77	8.27







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