

CFS700A Coriolis Flow Sensor



- ▶ The optimum meter for demanding applications
- ▶ A single straight measuring tube
- ▶ Choice of 4 tube materials

Equipment should be installed, operated, serviced, and maintained only by qualified personnel.

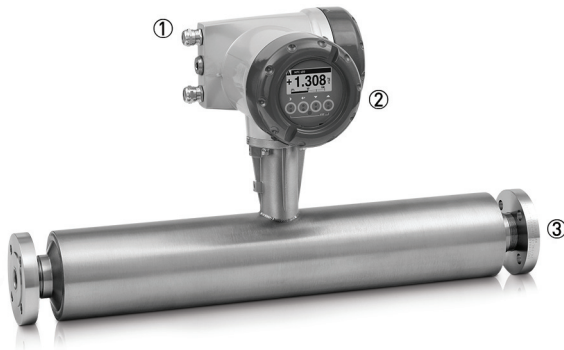
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1.1 Overview

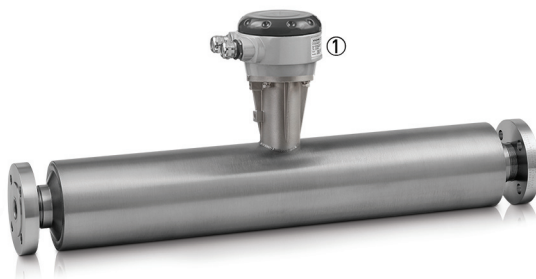
The CFS700A is the only sensor for mass flow with a single straight measuring tube that is available in Titanium, Stainless Steel, Hastelloy® or Tantalum.

Compact version



- ① Modular electronics with a range of output options (see separate documentation for details).
- ② The power of the CFT34A gives comprehensive diagnostics together with Entrained Gas Management (EGM).
- ③ Available with a range of flange and hygienic connections.

Remote version



- ① Remote terminal box.

Highlights

- Outer cylinder typical burst pressure greater than 100 barg / 1450 psig, with optional PED approved secondary pressure containment available
- Easily drained and easy to clean
- Resistant to installation and process effects
- Excellent zero stability
- Low energy consumption, means lower operating costs
- Rapid signal processing, even with product / temperature changes
- Modular electronics with data redundancy - "plug & play" replacement of electronics

Industries

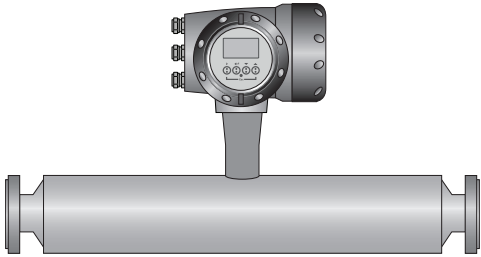
- Water & wastewater
- Mining & building materials
- Iron, steel and metal processing
- Food & beverage
- Oil, gas and alternative fuels
- Paper & pulp
- Petrochemical industry
- Pharmaceutical industry
- Chemical industry

Applications

- Viscous or shear-sensitive products
- Products requiring low flow velocities
- Non-homogeneous mixtures
- Products with entrained solids or gas
- Custody transfer
- Loading and product transfer measurement
- Slurries
- Highly corrosive fluids

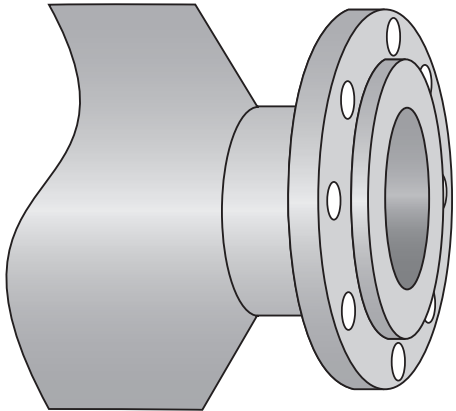
1.2 Features and options

Features



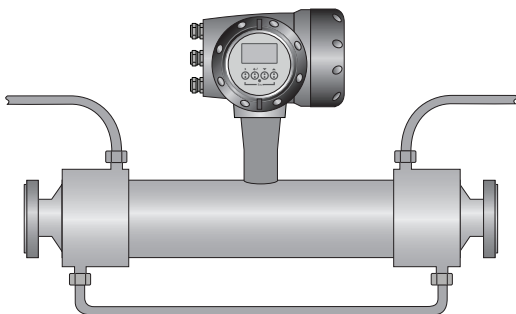
- Available as compact or remote.
- Low pressure loss - single straight tube design guarantees a low pressure drop across the meter.
- Self Draining.
- Easy to clean.
- With advanced Entrained Gas Management (EGM™) the meter maintains operation over a wide range of gas fractions and complex flow conditions.

Connection options



- A range of flanges up to ASME 600 / PN100.
- Supports a wide range of industry standard hygienic connections.
- Adaptable to suit customer's hygienic connections.

Heating jacket and purge port



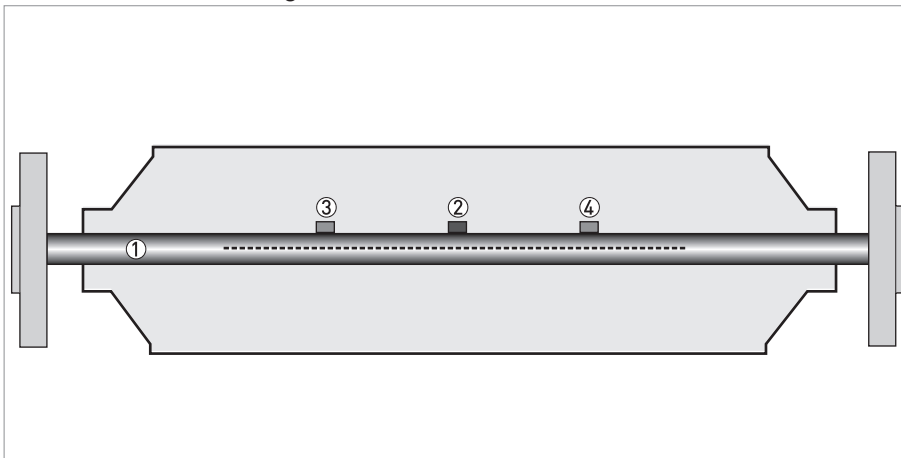
- Heating jacket option for use with temperature dependant products.
- Prevents solidification of process product.
- Purge port option for protection in the event of measuring tube failure.
- Allows hazardous chemicals to be drained away safely.
- Can also be used for the early detection of measuring tube failure where highly toxic chemicals are being measured.

1.3 Meter / transmitter combinations

Transmitter	CFT34A	
Configuration	Compact	Remote field
CFS700A	CFS700A(C)	CFS700A(F)

1.4 Measuring principle (single tube)

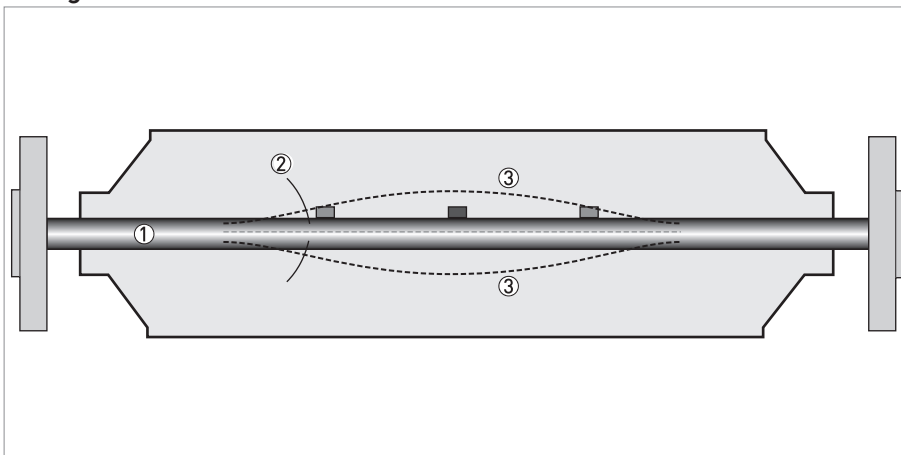
Static meter not energised and with no flow



- 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.

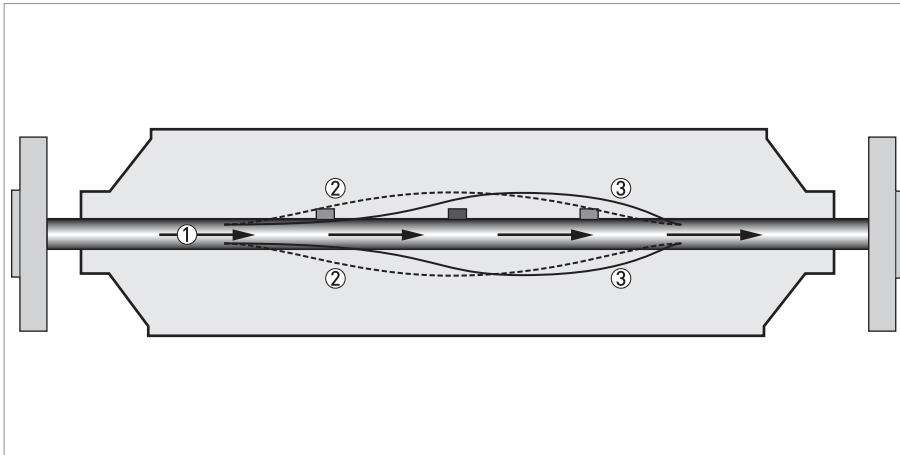
Energised meter



- 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 ②. 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.

2.1 Technical data

- *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 / 536lbs/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

2.1.1 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

2.1.2 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			

2.2 Maximum end loadings

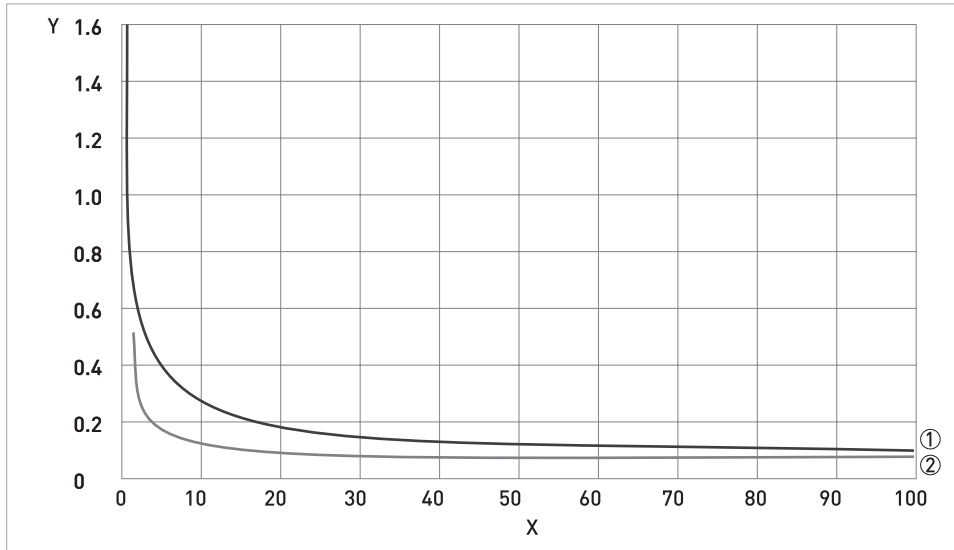
Maximum end loadings

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.

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

2.3 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

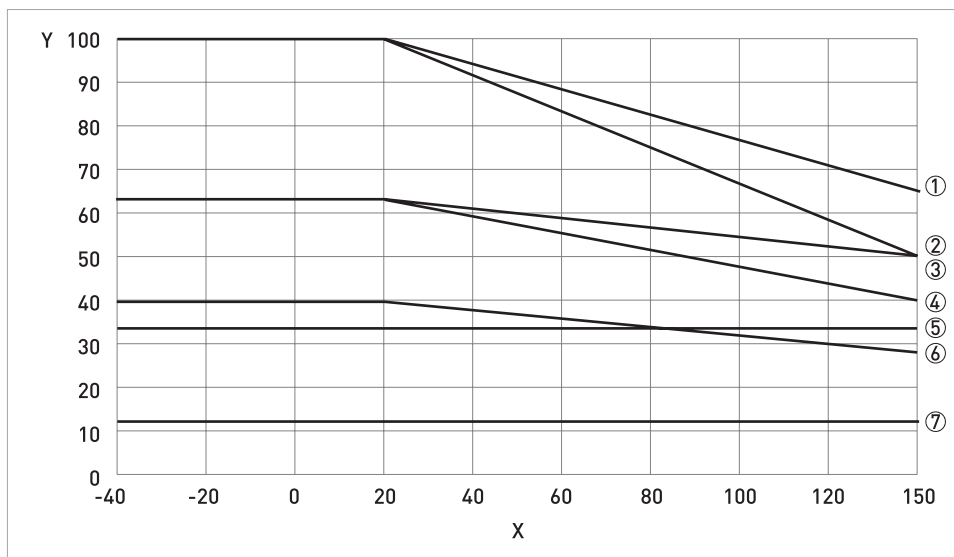
Product	Water
Temperature	+20°C / +68°F
Operating pressure	1 barg / 14.5 psig

2.4 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)

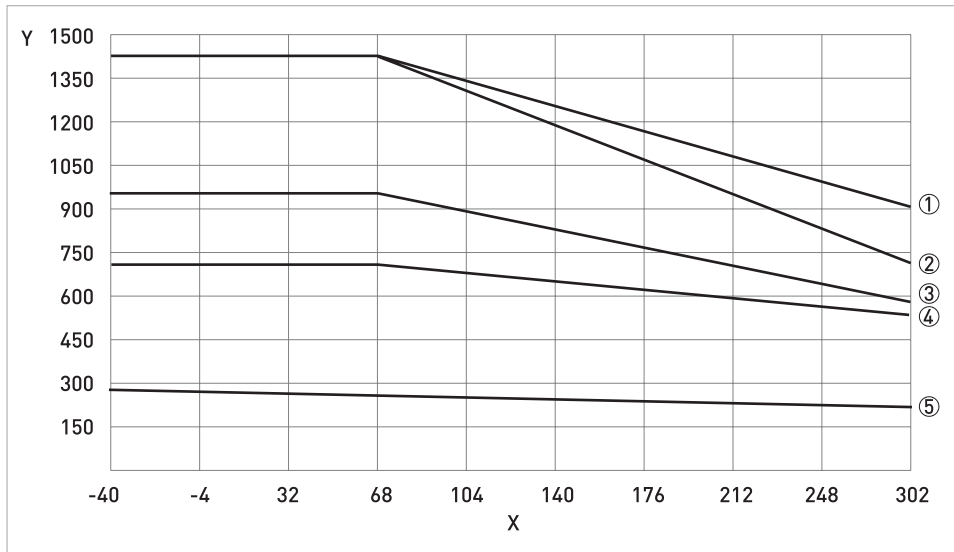


X temperature [°C]

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)**

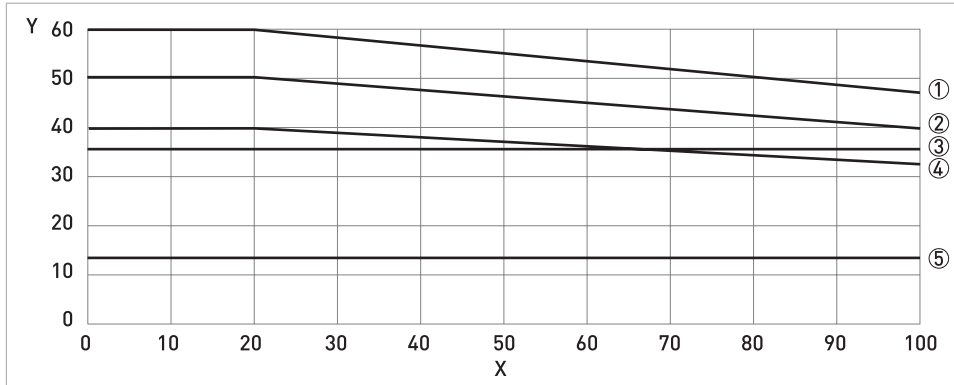


X temperature [°F]

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

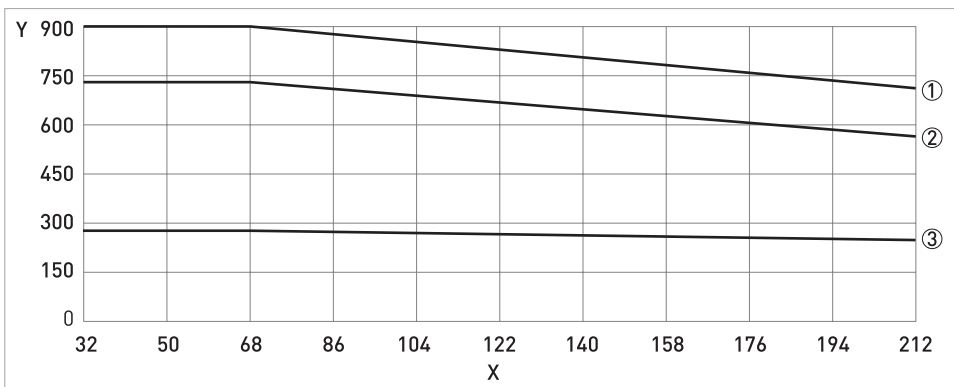
Pressure / temperature de-rating for Stainless Steel, Hastelloy® C22 and Tantalum meters (all meter sizes with flanged connections as per EN 1092-1 and JIS B 2220)



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)



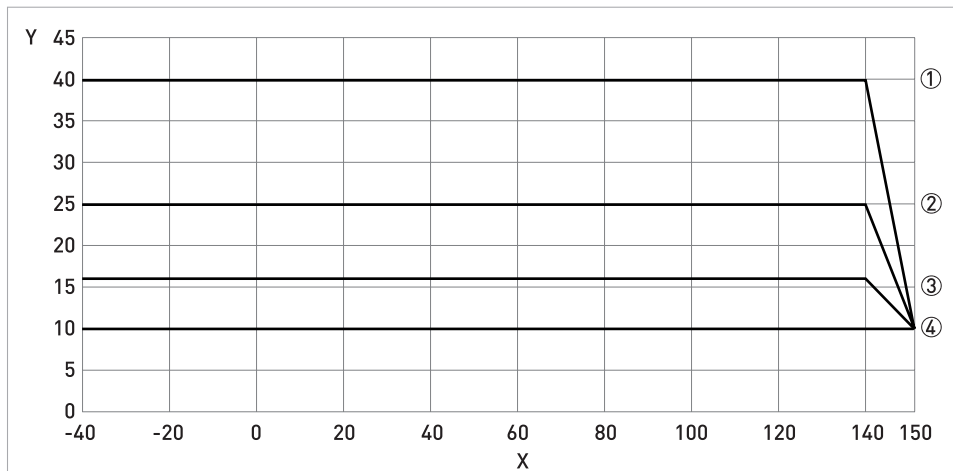
X temperature [°F]
Y pressure [psig]

- 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 14E0
- 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.

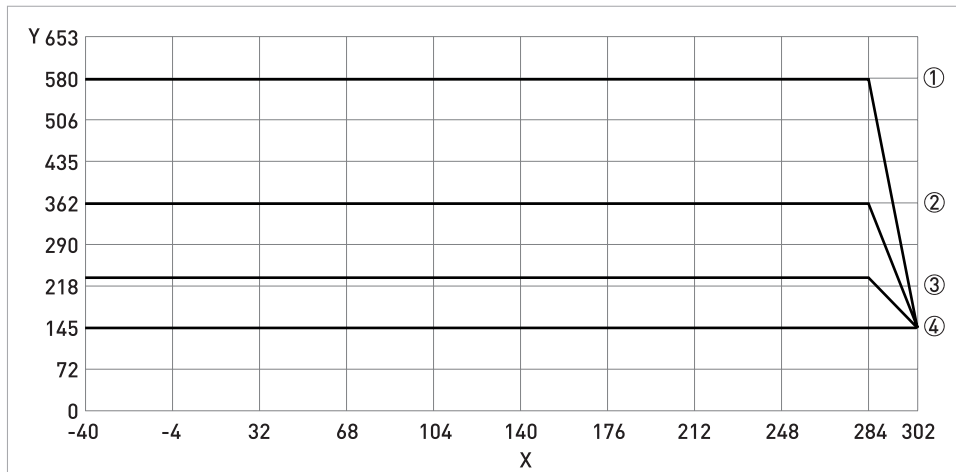


X temperature [°C]

Y pressure [barg]

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

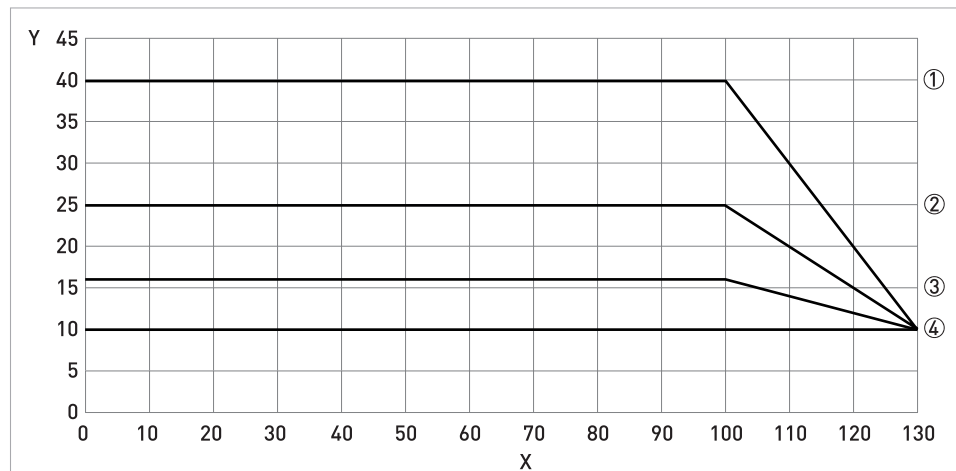
Pressure / temperature de-rating (Imperial) for Titanium meters with hygienic connections.



X temperature [°F]
Y pressure [PSI]

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

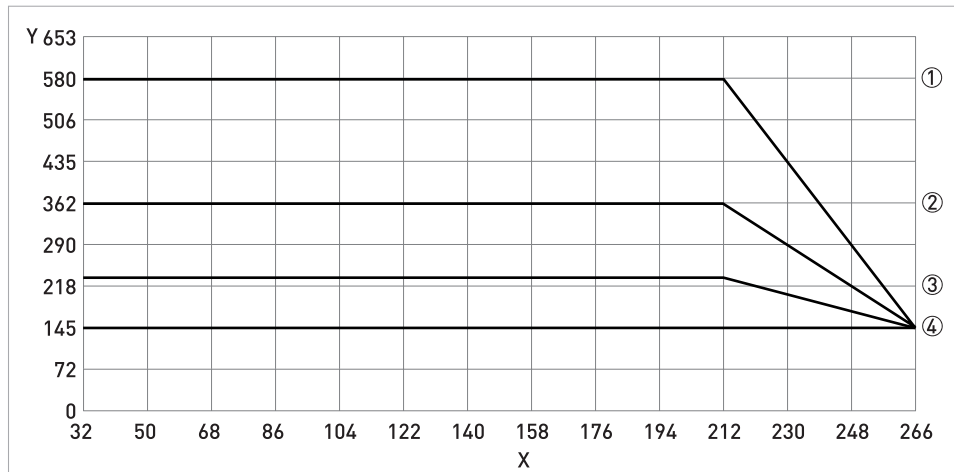
Pressure / temperature de-rating (metric) for Stainless Steel meters with hygienic connections.



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

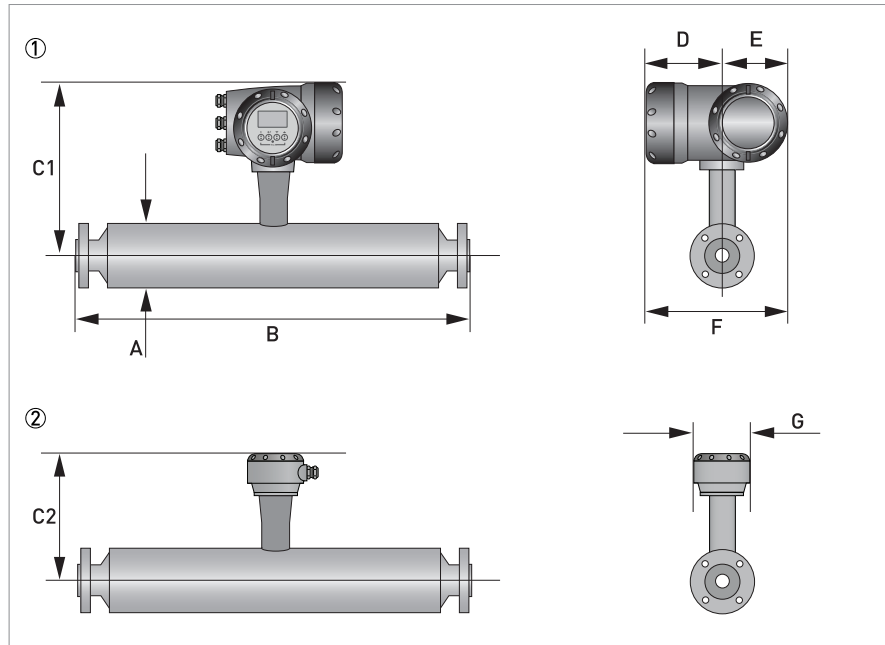
Notes

- 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.

2.5 Dimensions and weights

2.5.1 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.

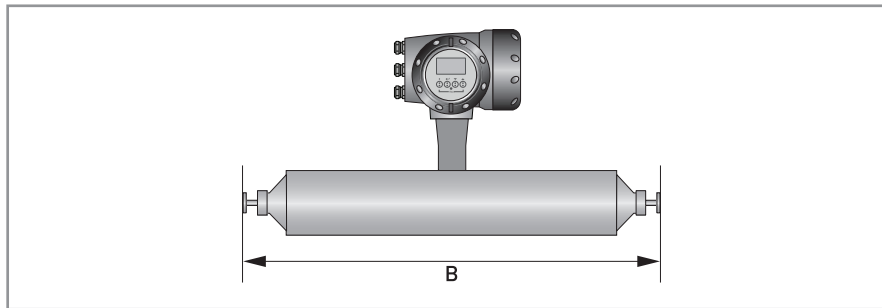
② ASME flange 600 lbs and all DIN flanges with raised face types: C; D; E and F.

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				

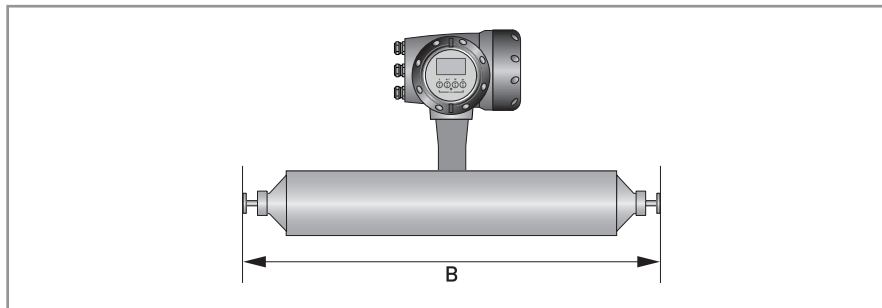
2.5.2 Hygienic versions



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							
1/2"	480 ±2	558 ±2	-	-	-	-	-
3/4"	-	-	596 ±2	-	-	-	-
1 1/2"	-	-	-	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							
1 1/2"	-	-	-	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

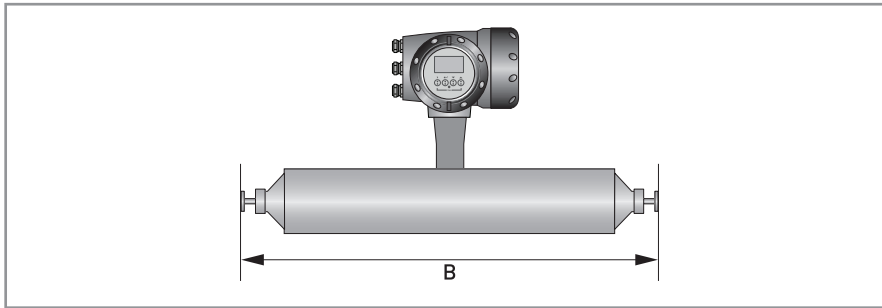
	Dimension B [inches]						
	T/S 06	T/S 10	T/S 15	T/S 25	T/S 40	T/S 50	T/S 80
Tri-clover							
1/2"	18.9 ±0.08	22 ±0.08	-	-	-	-	-
3/4"	-	-	23.5 ±0.08	-	-	-	-
1 1/2"	-	-	-	32.1 ±0.08	-	-	-
2"	-	-	-	-	41 ±0.08	-	-
3"	-	-	-	-	-	51.4 ±0.08	-
Tri-clamp DIN 32676							
DN10	19 ±0.08	22.2 ±0.08	-	-	-	-	-
DN15	-	-	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							
1 1/2"	-	-	-	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					
1/2"	597 ±2	-	-	-	-
3/4"	-	635 ±2	-	-	-
1"	-	665 ±2	-	-	-
1 1/2"	-	-	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	-	-	-
1 1/2"	-	-	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					
1/2"	23.5 ±0.08	-	-	-	-
3/4"	-	25 ±0.08	-	-	-
1"	-	26.2 ±0.08	-	-	-
1 1/2"	-	-	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	-	-	-
1 1/2"	-	-	33.7 ±0.08	-	-
2"	-	-	-	42.4 ±0.08	-
3"	-	-	-	-	53.3 ±0.08

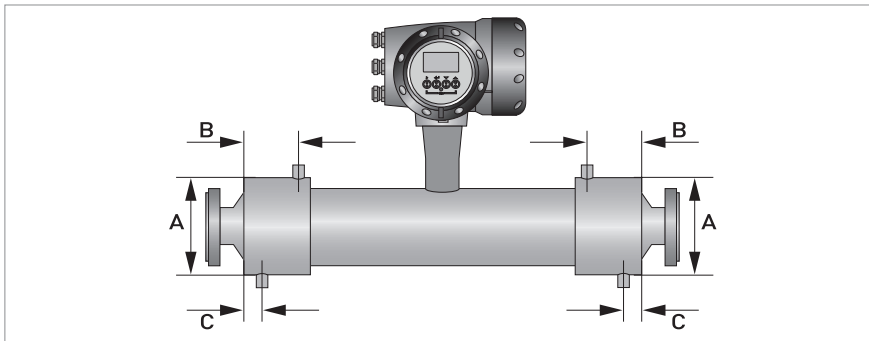


Hygienic connections: adapter versions (male thread)

	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	-

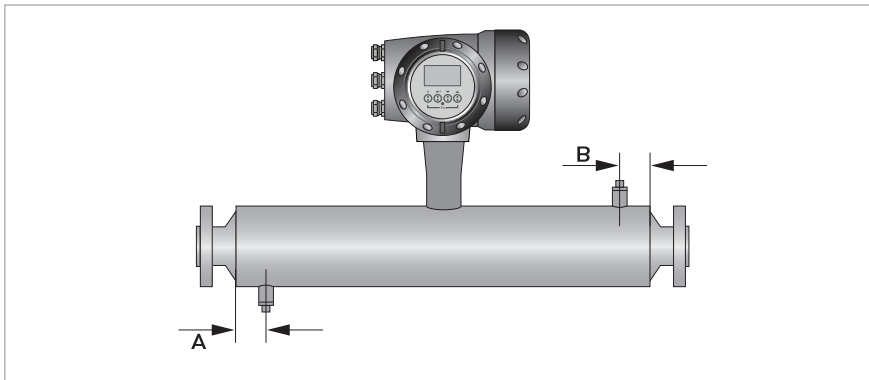
2.5.3 Heating jacket version



	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		-

2.5.4 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		-	

3.1 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.

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.

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.

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

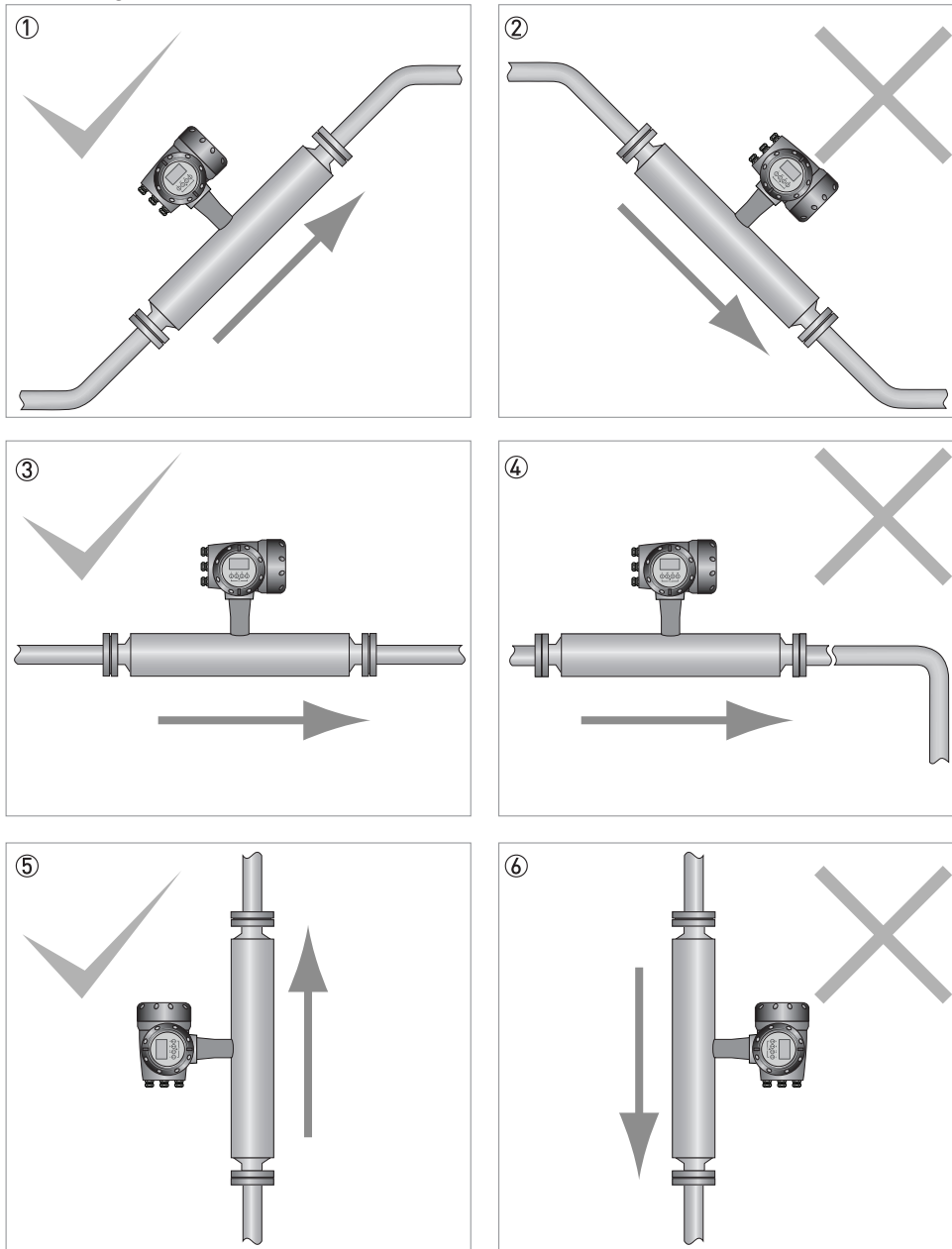
3.2 Mounting restrictions

3.2.1 General installation principles

There are no special installation requirements but you should note the following points:

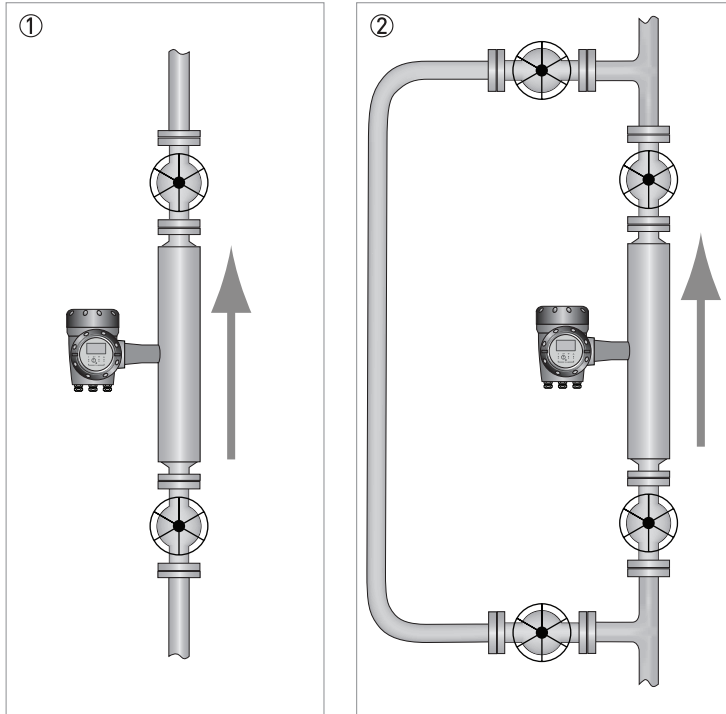
- Support the weight of the meter.
- The meter can be supported on the sensor body.
- On larger meter sizes and hygienic connections, it is strongly recommended that the meter is not supported solely by the process pipework.
- No straight runs are required.
- The use of reducers and other fittings at flanges, including flexible hoses, is allowed but you should take care to avoid cavitation.
- Avoid extreme pipe size reductions.
- Meters are not affected by crosstalk and can be mounted in series or in parallel.
- Avoid mounting the meter at the highest point in the pipeline where air / gas can collect.

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.

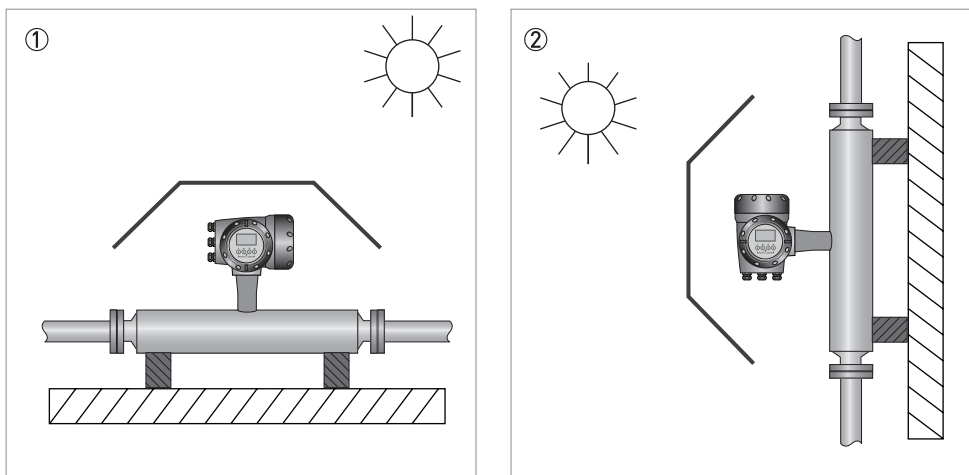
Zero calibration



- 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.

3.2.2 Sunshades

The meter **MUST** be protected from strong sunlight.



- ① Horizontal installation
- ② Vertical installation

Size	Code	Description
70Q	Tube material	
	T S	Titanium Stainless Steel
73E...702	T	Titanium
	S	Stainless Steel
	H A	Hastelloy C22 Tantalum
703	T	Titanium
	H	Hastelloy C22
All	Surface finish	
	0	Standard
	1 2	Surface finish Ra 0.5 µm Surface finish Ra 0.8 µm
70Q	Flange connections	
	AA	DN10 PN40 to EN 1092-1
	BA	DN15 PN40 to EN 1092-1
	BB	DN15 PN63 to EN 1092-1
	BC	DN15 PN100 to EN 1092-1
	KD	½" ASME 150 lb
	KE	½" ASME 300 lb
	KF	½" ASME 600 lb
	TH	10A JIS 20K
	UH	15A JIS 20K
Hygienic and aseptic connections		
AN	DN 10 Tri-clamp to DIN 32676	
KR	½" Tri-clover clamp	
KX	½" Tri-clamp to ASME BPE	
73E	Flange connections	
	AA	DN10 PN40 to EN 1092-1
	AB	DN10 PN63 to EN 1092-1
	AC	DN10 PN100 to EN 1092-1
	BA	DN15 PN40 to EN 1092-1
	BB	DN15 PN63 to EN 1092-1
	BC	DN15 PN100 to EN 1092-1
	KD	½" ASME 150 lb
	KE	½" ASME 300 lb
	KF	½" ASME 600 lb
	TH	10A JIS 20K
	UH	15A JIS 20K
	Hygienic and aseptic connections (adapter versions)	
AM	DN 10 DIN 11851 SC threaded sanitary connector	
AP	DN 10 Tri-clamp to DIN 32676	
KS	½" Tri-clover clamp	
TY	10A IDF clamp (Japanese)	
Hygienic and aseptic connections (all welded versions)		
AL	DN10 DIN 11864-2 Form A 'Nut' Flange (Female)	
AN	DN10 Tri-clamp to DIN 32676	
KR	½" Tri-clover clamp	
KX	½" Tri-clamp to ASME BPE	

Size	Code	Description
70H	Flange connections	
	BA	DN15 PN40 to EN 1092-1
	BB	DN15 PN63 to EN 1092-1
	BC	DN15 PN100 to EN 1092-1
	CA	DN25 PN40 to EN 1092-1
	CB	DN25 PN63 to EN 1092-1
	CC	DN25 PN100 to EN 1092-1
	KD	½" ASME 150 lb
	KE	½" ASME 300 lb
	KF	½" ASME 600 lb
	LD	¾" ASME 150 lb
	LE	¾" ASME 300 lb
	LF	¾" ASME 600 lb
	MD	1" ASME 150 lb
	ME	1" ASME 300 lb
	MF	1" ASME 600 lb
	UH	15A JIS 20K
	VH	25A JIS 20K
	Hygienic and aseptic connections (adapter versions)	
	BM	DN15 DIN 11851
	CM	DN25 to DIN 11851
BP	DN15 Tri-clamp to DIN 32676	
LS	¾" Tri-clover clamp	
MS	1" Tri-clover clamp	
MU	1" Tri-clover clamp to ISO 2852	
MV	1" / 25mm SMS 1146 Sanitary Connector	
MW	1" IDF (International Dairy Federation) Connector	
Hygienic and aseptic connections (all welded versions)		
BL	DN15 DIN 11864-2 Form A 'Nut' Flange (Female)	
BN	DN15 Tri-clamp to DIN 32676	
LR	¾" Tri-clover clamp	
LX	¾" Tri-clamp to ASME BPE	
701	Flange connections	
	CA	DN25 PN40 to EN 1092-1
	CB	DN25 PN63 to EN 1092-1
	CC	DN25 PN100 to EN 1092-1
	DA	DN40 PN40 to EN 1092-1
	DB	DN40 PN63 to EN 1092-1
	DC	DN40 PN100 to EN 1092-1
	MD	1" ASME 150 lb
	ME	1" ASME 300 lb
	MF	1" ASME 600 lb
	ND	1½" ASME 150 lb
	NE	1½" ASME 300 lb
	NF	1½" ASME 600 lb
	VH	25A JIS 20K
	WH	40A JIS 20K
	Hygienic and aseptic connections (adapter versions)	
	CM	DN 5 DIN 11851 SC Threaded Sanitary Connector
	CP	DN25 Tri-clamp to DIN 32676
	NS	1½" Tri -clover clamp
	NU	1½" Tri-clamp to ISO 2852
	NV	1½" / 38mm SMS 1146 Sanitary Connector
NW	1½" IDF (International Dairy Federation) Connector	
Hygienic and aseptic connections (all welded versions)		
CL	DN25 DIN 11864-2 Form A 'Nut' Flange (Female)	
CN	DN25 Tri-clamp to DIN 32676	
NR	1½" Tri-clover clamp	
NT	1½" Tri-clamp to ISO 2852	
NX	1½" Tri-clamp to ASME BPE	

Size	Code	Description
71H	Flange connections	
	DA	DN40 PN40 to EN 1092-1
	DB	DN40 PN63 to EN 1092-1
	DC	DN40 PN100 to EN 1092-1
	EA	DN50 PN40 to EN 1092-1
	EB	DN50 PN63 to EN 1092-1
	EC	DN50 PN100 to EN 1092-1
	ND	1½" ASME 300 lb
	NE	1½" ASME 300 lb
	NF	1½" ASME 600 lb
	PD	2" ASME 150 lb
	PE	2" ASME 300 lb
	PF	2" ASME 600 lb
	WH	40A JIS 20K
	XG	50A JIS 10K
	XH	50A JIS 20K
	Hygienic and aseptic connections (adapter versions)	
	DM	DN40 DIN 11851 SC Threaded Sanitary Connector
	DP	DN40 Tri-clamp to DIN 32676
PS	2" Tri-clover clamp	
PU	2" Tri-clamp to ISO 2852	
PV	2" / 51mm SMS 1146 Sanitary Connector	
PW	2" IDF (International Dairy Federation) Connector	
Hygienic and aseptic connections (all welded versions)		
DL	DN40 DIN 11864-2 Form A 'Nut' Flange (Female)	
DN	DN40 Tri-clamp to DIN 32676	
PR	2" Tri-clover clamp	
PT	2" Tri-clamp to ISO 2852	
PX	2" Tri-clamp to ASME BPE	
702	Flange connections	
	EA	DN50 PN40 to EN 1092-1
	EB	DN50 PN63 to EN 1092-1
	EC	DN50 PN100 to EN 1092-1
	FA	DN80 PN40 to EN 1092-1
	FB	DN80 PN63 to EN 1092-1
	FC	DN80 PN100 to EN 1092-1
	PD	2" ASME 150 lb
	PE	2" ASME 300 lb
	PF	2" ASME 600 lb
	RD	3" ASME 150 lb
	RE	3" ASME 300 lb
	RF	3" ASME 600 lb
	XG	50A JIS 10K
	XH	50A JIS 20K
	YG	80A JIS 10K
	YH	80A JIS 20K
	Hygienic and aseptic connections (adapter versions)	
	EM	DN 50 DIN 11851 SC Threaded Sanitary Connector
	EP	DN 50 Tri-clamp to DIN 32676
	RS	3" Tri-clover
RU	3" Tri-clamp to ISO 2852	
RV	3" / 76 mm SMS 1146 Sanitary Connector	
RW	3" IDF (International Dairy Federation) Connector	
Hygienic and aseptic connections (all welded versions)		
EL	DN 50 DIN 11864-2 Form A 'Nut' Flange (Female)	
EN	DN 50 Tri-clamp to DIN 32676	
RR	3" Tri-clover clamp	
RT	3" Tri-clamp to ISO 2852	
RX	3" Tri-clamp to ASME BPE	

Size	Code	Description
703	Flange connections	
	FA	DN80 PN40 to EN 1092-1
	FB	DN80 PN63 to EN 1092-1
	FC	DN80 PN100 to EN 1092-1
	GA	DN100 PN40 to EN 1092-1
	GB	DN100 PN63 to EN 1092-1
	GC	DN100 PN100 to EN 1092-1
	RD	3" ASME 150 lb
	RE	3" ASME 300 lb
	RF	3" ASME 600 lb
	SD	4" ASME 150 lb
	SE	4" ASME 300 lb
	SF	4" ASME 600 lb
	YG	80A JIS 10K
	YH	80A JIS 20K
ZG	100A JIS 10K	
ZH	100A JIS 20K	
Hygienic and aseptic connections (adapter versions)		
FM	DN 80 DIN 11851 SC Threaded Sanitary Connector	
Hygienic and aseptic connections (all welded versions)		
FL	DN80 DIN 11864-2 Form A 'Nut' Flange (Female)	
FN	DN80 Tri-clamp to DIN 32676	
RR	3" Tri-clover clamp	
RT	3" Tri-clamp to ISO 2852	
RX	3" Tri-clamp to ASME BPE	
All	Sealing face	
	0	Standard (Type B1 for PN40 & B2 for PN63 and PN100 acc. EN 1092-1)
	C	EN 1092-1 Type C with tongue
	D	EN 1092-1 Type D with groove
	E	RTJ Acc ASME B16.5
	G	EN 1092-1 Type E with spigot
H	EN 1092-1 Type F with recess	
All	Secondary containment	
	G	All externals SS 304 / 304L ①
	H	All externals SS 316 / 316L ①
	O	All externals SS 304 / 304L ②
	A	All externals SS 316 / 316L ②
B	All externals SS 316 / 316L ③	
① Non-certified secondary pressure containment. Typical burst pressure > 100 bar		
② Max secondary pressure containment 63 bar / 913 psi (PED approved)		
③ Max secondary pressure containment 100 bar / 1450 psi (PED approved)		
All	Options	
	0	Without
	3	Purge fittings ½" NPTF
73E...703	1	Liquid / steam heating jacket DN25 PN40
	2	Liquid / steam heating jacket ASME 150 lb flange

Size	Code	Description
All	Hazardous areas approvals	
	0	Without
	1	ATEX Ex ia (T1-T6)
	3	Not available
	7	NEPSI Ex ia
	A	Non Ex (USA)
	B	Non Ex (Canada)
	E	INMETRO (for Brazil only)
	R	IEC Ex ia (T1-T6)
	T	cFMus (USA Standards)
U	cFMus (Canadian Standards) / Dual seal for liquids	
V	cFMus (Canadian Standards) / Dual seal for gases	
All	Hygienic / sanitary approvals / design approvals	
	0	Without
	1	EHEDG
	2	3A
3	ASME Bioprocessing Equipment Standard	
All	Electronics configuration	
	0	Compact / integral mount
	1	Remote / field mount Aluminium junction box
2	Remote / field mount SS junction box	
All	Calibration	
	0	Standard 3 point mass flow calibration
1	5 point calibration evenly spread across nominal flow rate	
70H...703	3	3 point volume flow calibration
	4	5 point volume flow calibration
	5	5 point volume flow calibration bi-directional (plus ISO / IEC 17025 certificate)
	A	0 + custom density calibration with water at 3 temps. (plus certificate)
	B	1 + custom density calibration with water at 3 temps. (plus certificate)
	C	0 + Density at water plus two other liquids (plus certificate)
D	1 + ISO / IEC 17025 calibration certificate	
E	4 + ISO / IEC 17025 calibration certificate	
All	Custody Transfer approval	
	0	Without
70H...703	U	MI 005 acc. MID 2014/32/EU for liquids other than water
	4	INMETRO (Brasil)
	Z	acc. OIML R117-1 for liquids other than water
All	Transmitter type	
	6	Compact
	7	Field mount

ADDITIONAL PRODUCTS

These product lines offer a broad range of measurement and instrument products, including solutions for pressure, flow, analytical, temperature, positioning, controlling and recording.

For a list of these offerings, visit our website at:
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