

VersaFlow Coriolis 1000 Mass Flow Sensor Technical Datasheet

34-VF-03-03
29th May, 2009

Specification

The superior solution

The VersaFlow mass flow sensor is the only mass flow sensor with a straight measuring tube that is available in Stainless steel, Hastelloy®, Titanium or Tantalum. VersaFlow reliably measures mass flow, density, volume, temperature, mass or volume concentration and solids content.

Highlights

- Single straight measuring tube
- Secondary pressure containment
- Low pressure loss
- Easily drained and easy to clean
- Choice of three different tube materials
- Excellent zero stability
- Low operating and installation costs
- Rapid signal processing even with varying conditions
- Modular/Plug & play electronics

Industries

- Water and Wastewater
- Mining & Building Materials
- Chemical
- Iron, Steel & Metal
- Food & Beverage
- Oil & Gas
- Pulp & Paper
- Petrochemical
- Pharmaceutical



Figure 1 – VersaFlow Mass Flow Sensor

Applications

- Viscous or shear-sensitive products
- Products requiring low flow velocities
- Inhomogeneous mixtures
- Products with entrained solids or gas

Converter: Common hardware for all converters makes spares holding simpler



1. TWC 9000 C: Compact or integrally mounted on sensor
2. TWC 9000 F: Field mount up to 300 m / 1000 ft from sensor
3. TWC 9000 W: Wall mount for non-hazardous areas
4. TWC 9000 R: 19" Rack mount module for control room installation
5. TWC 010: Sensor electronics with Modbus output

Mass flowmeter product family

All meters consist of a sensor and a converter. The converter may be mounted integral to the sensor, or remotely, either with a field mounting kit, a wall-mounted housing or a rack mounted housing. See specification 34-VF-03-04 for converter details.

Sensor: Sensors for any applications



1. VersaFlow Coriolis 100 The general purpose solution for the process industry
2. VersaFlow Coriolis 1000: The optimum solution for chemical, food & beverage and pharmaceutical industry
3. VersaFlow Coriolis 200 (pending): Large diameter meter suitable for custody transfer measurement

Technical Data

Operating data

Size (Note 1)	DN06	DN10	DN15	DN25	DN40	DN50	DN80
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Flow Rate

Maximum flow rate [kg/h]	1230	3500	14600	44800	120000	234000	560000
Maximum flow rate [lbs/min]	35	100	400	1250	3300	6600	15800

Accuracy

Accuracy, liquid	±0.1% of actual measured flow rate
Accuracy, gas	±0.5% of actual measured flow rate
Repeatability	Better than 0.05% plus zero stability (includes the combined effects of repeatability, linearity and hysteresis)
Zero stability-Titanium	±0.004% of nominal flow rate with respective sensor size
Zero stability-Stainless Steel/ Hastelloy/ Tantalum	±0.015% of nominal flow rate with respective sensor size

Reference conditions

Product	Water
Temperature	20°C / 68°F
Operating pressure	1 bar _{rel.} / 14.5 psig

Density

Measuring range	500...2000 kg/m ³ / 30...125 lbs/ft ³
Accuracy	±2 kg/m ³ / ±0.13 lbs/ft ³
Accuracy (on-site calibration)	±0.5 kg/m ³ / ±0.033 lbs/ft ³

Temperature	Titanium	Stainless Steel	Hastelloy	Tantalum
Measuring range	-40... +150° C/ -40 ...+302° F	0... +100° C/32 ...+212° F Extended range 0... +130° C/32 ...+266° F on Stn. Stl sizes DN25..80, hygienic conn. only		
Accuracy	±1°C / ±1.8°F			
Materials	Titanium	Stainless Steel	Hastelloy	Tantalum
Measuring Tube/ raised face	Titanium	Stainless Steel	Hastelloy	Tantalum
Flanges	Stainless Steel 316/316L (1.4401/1.4404) dual certified			
Outer cylinder - standard	Stainless Steel 304/304L (1.3401/1.4307) dual certified			
Outer cylinder – optional	n/a	Stainless Steel 316/316L (1.4401/1.4404) dual certified		
Optional Heating Jacket	Stainless Steel 316L (1.4404)			
Sensor Electronics	Stainless Steel 316L (1.4409)			
Junction Box – remote version	Die cast Aluminum (polyurethane coating) Optional Stainless Steel 316L (1.4401)			
Nominal Pressure at 20°C /68°F	-1...100 barg/ -14.5 ...1450 psig	-1...100 bar g/ -14.5 ...1450 psig		
Outer Cylinder	Titanium	Stainless Steel	Hastelloy	Tantalum
Non PED/CRN Approved	Typical burst pressure > 100 barg. / 1450 psig			
PED/CRN Approved secondary containment	-1...63 barg. / -14.5...910 psig			
PED approved secondary containment	-1...100 barg. / -14.5...1450 psig			

Operating data

Size (Note 1)	DN06	DN10	DN15	DN25	DN40	DN50	DN80
	Titanium		Stainless Steel, Hastelloy and Tantalum				
Process Temperature	-40... +150° C/ -40 ...+302° F		0... +100° C/32 ...+212° F Extended range 0... +130° C/32 ...+266° F on Stn. Stl sizes DN25..80, hygienic conn. Only				
Ambient Temperature							
Compact w/Aluminum Housing	-40... +60° C/-40 ...+140° F Extended temperature range +65° C/+149° F for some I/O options. For more information contact Honeywell						
Compact w/Stn. Stl. Housing	-40... +55° C/-40 ...+130° F						
Remote versions	-40... +65° C/-40 ...+149° F						

Process effects on the sensor

Temperature - Titanium	0.001% per 1°C / 0.055% per 1°F
Temperature – Stainless Steel/ Hastelloy/ Tantalum	0.004% per 1°C / 0.0022% per 1°F
Pressure	0.0011% of the max flow rate per 1 bar _{rel.} / 0.000076% of the max flow rate per 1 psig

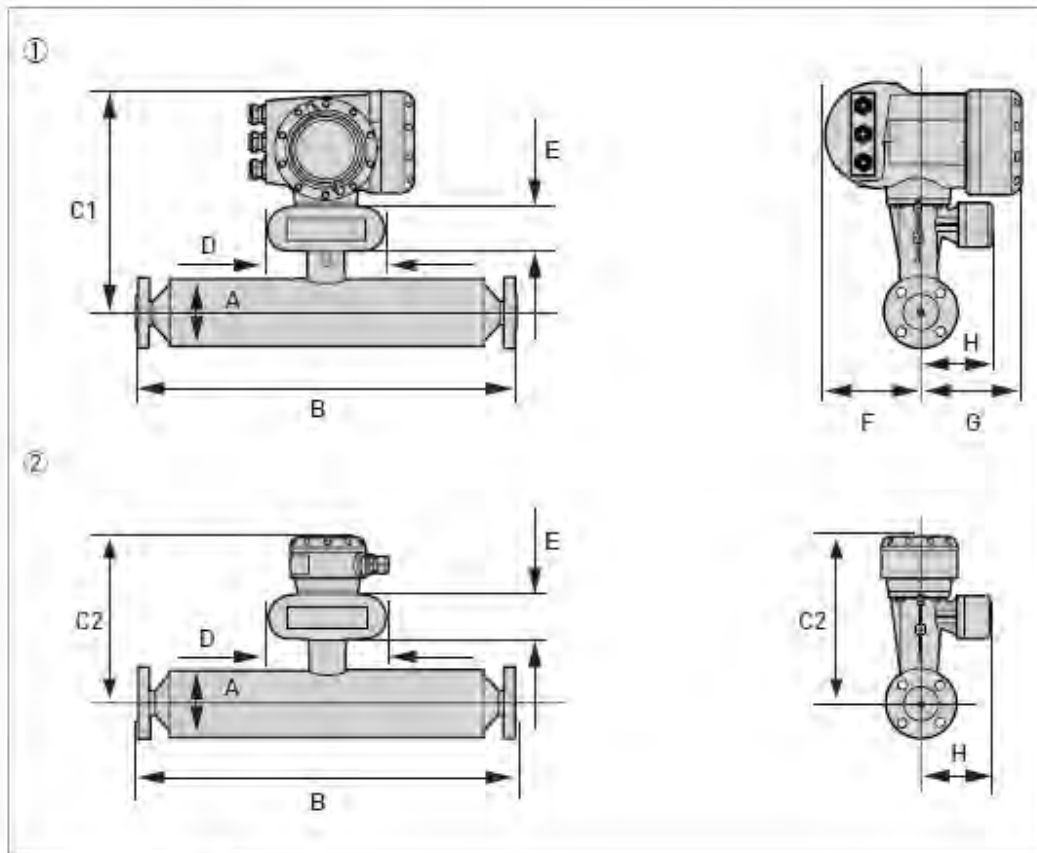
Note 1: Hastelloy available Sizes DN10 ... DN80. Tantalum available Sizes DN15 ... DN50

Approvals and certifications

<u>Mechanical:</u>	
Electromagnetic compatibility (EMC) acc. to CE	Namur NE 21/5.95 89/336/EEC (EMC) 72/73/EEC (Low Voltage Directive)
European Pressure Equipment Directive	PED 97-23 EC (acc. to AD 2000 Regelwerk)
<u>Factory Mutual / CSA</u>	Class I, Div 1 groups B, C, D Class II, Div 1 groups E, F, G Class III, Div 1 hazardous areas Class I, Div 2 groups B, C, D Class II, Div 2 groups F, G Class III, Div 2 hazardous areas
ANSI / CSA (Dual Seal)	12.27.901-2003
Hygienic	3A 28-03 EHEDG ASME BPE
Custody transfer (pending)	MID 2004/22/EC MI-005
<u>ATEX (acc. 94/9/EC)</u>	
Coriolis 1000 with TWM9000C non Ex i Signal outputs without heating jacket / insulation	
Ex d connection compartment	II 2 G Ex d [ib] IIC T6....T1 II 2 D Ex tD A21 IP6x T160°C
Ex e connection compartment	II 2 G Ex de [ib] IIC T6....T1 II 2 D Ex tD A21 IP6x T160°C
Coriolis 1000 with TWM9000C non Ex i signal outputs with heating jacket / insulation	
Ex d connection compartment	II 2 G Ex d [ib] IIC T6....T1 II 2 D Ex tD A21 IP6x T170°C
Ex e connection compartment	II 2 G Ex de [ib] IIC T6....T1 II 2 D Ex tD A21 IP6x T170°C
Coriolis 1000 with TWM9000C Ex i signal outputs without heating jacket / insulation	
Ex d connection compartment	II 2(1) G Ex d [ia/ib] IIC T6....T1 II 2(1) D Ex tD [iaD] A21 IP6x T160°C
Ex e connection compartment	II 2(1) G Ex de [ia/ib] IIC T6....T1 II 2(1) D Ex tD [iaD] A21 IP6x T160°C
Coriolis 1000 with TWM9000C Ex i signal outputs with heating jacket / insulation	
Ex d connection compartment	II 2(1) G Ex d [ia/ib] IIC T6....T1 II 2(1) D Ex tD [iaD] A21 IP6x T170°C
Ex e connection compartment	II 2(1) G Ex de [ia/ib] IIC T6....T1 II 2(1) D Ex tD [iaD] A21 IP6x T170°C
Coriolis 100 with TWM9000F or TWC 010 without heating jacket / insulation	
	II 2 G Ex ib IIC T6....T1 II 2 D Ex ibD 21 T150°C
Coriolis 100 with TWM9000F or TWC 010 with heating jacket / insulation	
	II 2 G Ex ib IIC T6....T1 II 2 D Ex ibD 21 T165°C
NEPSI (with TWC9000C/F, TWC 010)	Exdeib(ia)II C T1...T6, Exdib(ia)II C T1...T6,

Dimensions and weights

Flanged versions



- ① Compact version
- ② Remote version

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

Weight – kg (lbs)

	T/S 06	T/S/H 10	T/S/H/A 15	T/S/H/A 25	T/S/H/A 40	T/S/H/A 50	T/S/H 80
Aluminium (compact)	18.5 (40.7)	23 (50.6)	26 (57.2)	37 (81.4)	83 (182.6)	147 (323.4)	265 (583)
Stainless Steel (compact)	25.2 (55.4)	29.7 (65.3)	32.7 (71.9)	43.7 (96.1)	89.7 (197.3)	153.7 (338.1)	271.7 (597.7)
Aluminium (remote)	15.7 (34.5)	20.2 (44.4)	23.2 (51)	34.2 (75.2)	80.2 (176.4)	144.2 (317.2)	262.2 (576.8)
Stainless Steel (remote)	16.5 (36.3)	21 (46.2)	24 (52.8)	35 (77)	81 (178.2)	145 (319)	263 (578.6)
Tantalum add	n/a	n/a	2.7 (5.9)	4.5 (9.9)	9.2 (20.2)	15.1 (33.2)	n/a

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

Dimensions – mm (inches)

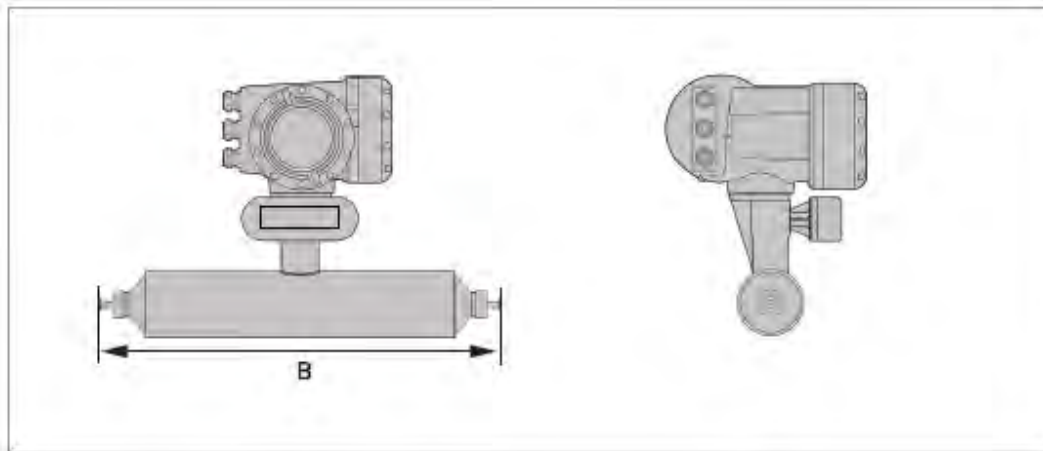
	T/S 06	T/S/H 10	T/S/H 15	T/S/H 25	T/S/H 40	T/S/H 50	T/S/H 80
A	102 (4)			115 (4.5)	170 (6.7)	220 (8.7)	274 (10.8)
B (standard flange)	420 ±2 (16.5± 0.08)	510 ±2 (20 ±0.08)	548 ±2 (21.6 ±0.08)	700 ±2 (27.5 ±0.08)	925 ±2 (36.4 ±0.08)	1101 ±2 (43.3 ±0.08)	1460 ±4 (57.5 ±0.16)
B (ASME flange 600 lbs)	428 ±2 (16.8 ±0.08)	518 ±2 (20.4±0.08)	556 ±2 (21.9 ±0.08)	708 ±2 (27.8 ±0.08)	933 ±2 (36.7±0.08)	1109 ±2 (43.7 ±0.08)	1468 ±4 (57.8 ±0.16)
C1 (compact)	311 (12.2)			318 (12.5)	345 (13.6)	370 (14.6)	397 (15.6)
C2 (remote)	231 ±2 (9 ±0.08)			237 ±2 (9.3 ±0.08)	265 ±2 (10.4 ±0.08)	290 ±2 (11.4 ±0.08)	317 ±4 (12.5 ±0.16)
D	160 (6.3)						
E	60 (2.4)						
F	123.5 (4.9)						
G	137 (5.4)						
H	98.5 (3.9)						

Measuring tube in Tantalum (A)

Dimensions – mm (inches)

	06	10	A15	A25	A40	A50	80
A	n/a		102 (4)	115 (4.5)	170 (6.7)	220 (8.7)	n/a
B (standard flange)	n/a	n/a	633 ±2 (21.6 ±0.08)	800 ±2 (27.5 ±0.08)	1075 ±2 (27.5 ±0.08)	1281 ±2 (43.3 ±0.08)	n/a
C1 (compact)	n/a	n/a	311 (12.2)	318 (12.5)	345 (13.6)	n/a	
C2 (remote)	n/a		231 ±2 (9 ±0.08)	237 ±2 (9.3 ±0.08)	265 ±2 (10.4 ±0.08)	370 (14.6)	n/a
D	n/a		160 (6.3)				
E	n/a		60 (2.4)				n/a
F	n/a		123.5 (4.9)				n/a
G	n/a		137 (5.4)				n/a
H	n/a		98.5 (3.9)				n/a

Hygienic versions Titanium (T) and Stainless Steel (S)



Hygienic connections: all welded versions

Dimension B [mm ±2]

	06	10	15	25	40	50	80
Tri-clover							
1/2"	480	558					
3/4"			596				
1 1/2"				816			
2"					1043		
3"						1305	
4"							1527

Dimension B [mm ±2]

	06	10	15	25	40	50	80
Tri-clamp DIN 32676							
DN10	484	564					
DN15			602				
DN25				761			
DN40					986		
DN50						1168	
DN80							1584

Dimension B [mm ±2]

	06	10	15	25	40	50	80
Tri-clamp ISO 2852							
1 1/2"				816			
2"					1043		
3"						1305	
4"							1527

Dimension B [mm ±2]

	06	10	15	25	40	50	80
DIN 11864-2 form A							
DN10		528					
DN15			566				
DN25				718			
DN40					948		
DN50						1124	
DN80							1538

Hygienic connections: all welded versions

Dimension B [inches ±0.08]

	06	10	15	25	40	50	80
Tri-clover							
½"	18.9	22					
¾"			23.5				
1½"				32.1			
2"					41		
3"						51.4	
4"							49.5

Dimension B [inches ±0.08]

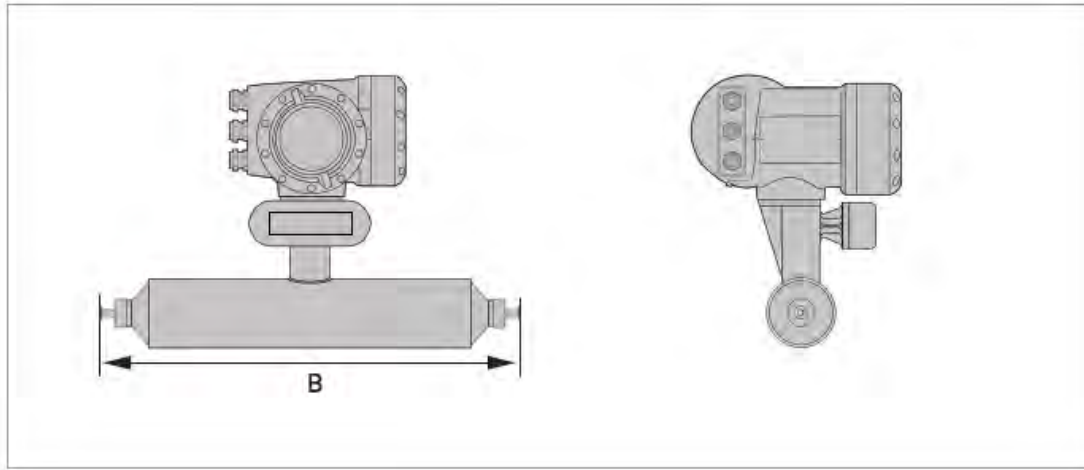
	06	10	15	25	40	50	80
Tri-clamp DIN 32676							
DN10	19	22.2					
DN15			23.7				
DN25				30			
DN40					38.8		
DN50						46	
DN80							62.4

Dimension B [inches ±0.08]

	06	10	15	25	40	50	80
Tri-clamp ISO 2852							
1½"				32.2			
2"					41.1		
3"						51.4	
4"							60.1

Dimension B [inches ±0.08]

	06	10	15	25	40	50	80
DIN 11864-2 form A							
DN10		20.8					
DN15			22.3				
DN25				28.3			
DN40					37.3		
DN50						44.3	
DN80							60.5



Hygienic connections: adapter versions (male thread) Titanium (T) and Stainless Steel (S)

Dimension B [mm ±2]

	10	15	25	40	50	80
Male thread DIN 11851						
DN10	596					
DN15		634				
DN25			802			
DN40				1040		
DN50					1220	
DN80						1658

Dimension B [mm ±2]

	10	15	25	40	50	80
Male thread SMS						
1"		665				
1½"			852			
2"				1074		
3"					1360	

Dimension B [mm ±2]

	10	15	25	40	50	80
Male thread IDF/ISS						
1"		664				
1½"			854			
2"				1076		
3"					1354	

Dimension B [mm ±2]

	10	15	25	40	50	80
Male thread RJT						
1"		676				
1½"			866			
2"				1088		
3"					1366	

Dimension B [inches ±0.08]

	10	15	25	40	50	80
Male thread DIN 11851						
DN10	23.5					
DN15		25				
DN25			31.6			
DN40				41		
DN50					48	
DN80						65.3

Dimension B [inches ±0.08]

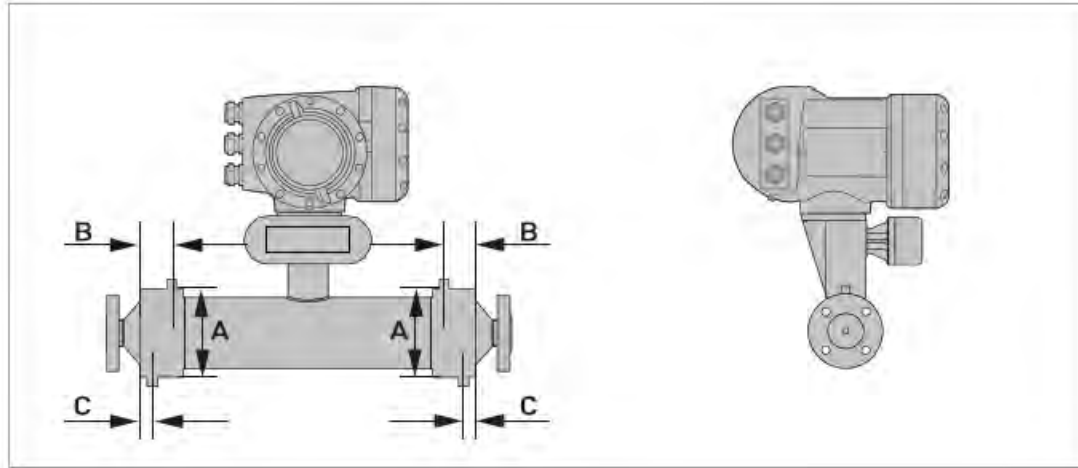
	10	15	25	40	50	80
Male thread SMS						
1"		26.2				
1½"			33.5			
2"				42.3		
3"					53.5	

Dimension B [inches ±0.08]

	10	15	25	40	50	80
Male thread IDF/ISS						
1"		26.1				
1½"			33.6			
2"				42.4		
3"					53.3	

Dimension B [inches ±0.08]

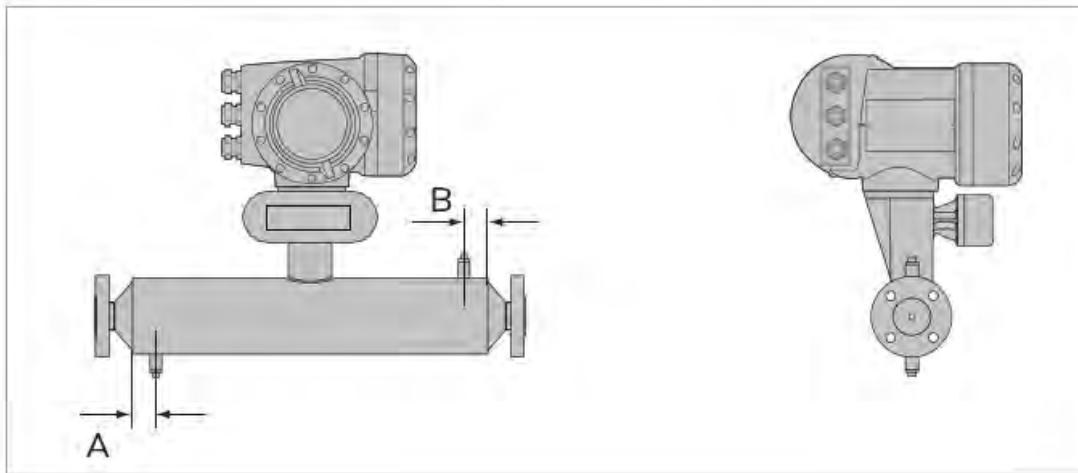
	10	15	25	40	50	80
Male thread RJT						
1"		26.6				
1½"			34.1			
2"				42.8		
3"					53.8	



Heating jacket version

Dimensions – mm (inches)

	10	15	25	40	50	80
Heating connection size	12mm (ERMETO) (½" (NPTF))			25mm (ERMETO) (1" (NPTF))		
A	115 ±1 (4.5 ±0.04)		142 ±1 (5.6 ±0.04)	206 ±1 (8.1 ±0.04)	254 ±1 (10 ±0.04)	305 ±1 (12 ±0.04)
Titanium						
B	36 ±1 (1.4 ±0.04)	51 ±1 (2 ±0.04)	100 ±1 (3.9 ±0.04)	90 ±1 (3.5 ±0.04)	175 ±1 (6.9 ±0.04)	385 ±1 (15.2 ±0.04)
C	20 (0.8)			26 ±1 (1.0 ±0.04)		
Stainless Steel & Hastelloy®						
B	-	51 ±1 (2 ±0.04)	55 ±1 (2.2 ±0.04)	90 ±1 (3.5 ±0.04)	100 ±2 (3.9 ±0.08)	200 ±2 (7.9 ±0.08)
C	-	20 (0.8)		26 ±1 (1.0 ±0.04)		
Tantalum						
B	-	51 ±1 (2 ±0.04)	55 ±1 (2.2 ±0.04)	90 ±1 (3.5 ±0.04)	100 ±2 (3.9 ±0.08)	-
C	-	20 (0.8)		26 ±1 (1.0 ±0.04)		-

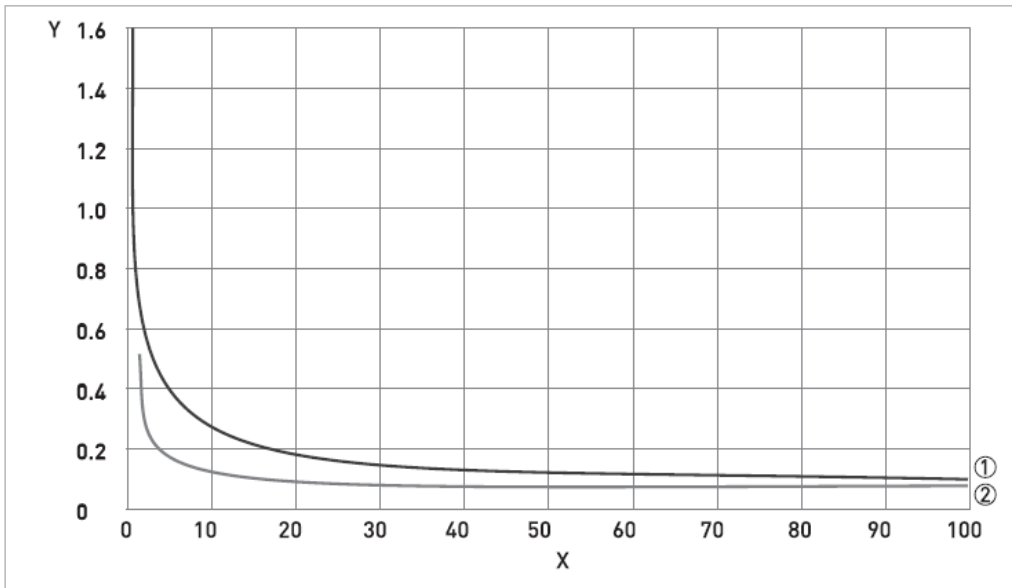


Purge port option

Dimensions – mm (inches)

	06	10	15	25	40	50	80
Titanium & Stainless Steel							
A	65 (2.6)		30 (1.2)			65 (2.6)	
B		30 (1.2)				65 (2.6)	
Hastelloy®							
A	-		30 (1.2)			65 (2.6)	
B	-		30 (1.2)			65 (2.6)	
Tantalum							
A	-	-	30 (1.2)		65 (2.6)		-
B	-	-	30 (1.2)		65 (2.6)		-

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

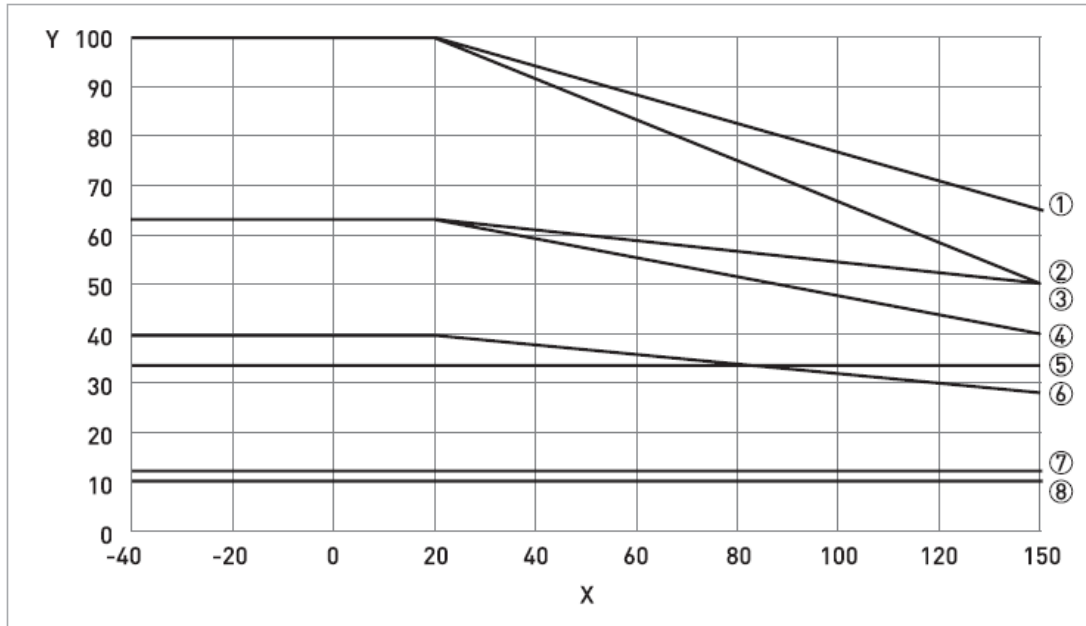
Product: Water
Temperature: +20°C / +68°F
Operating pressure: 1 barg / 14.5 psig

Guidelines for maximum operating pressure

Notes

- Ensure that the meter is used within its operating limits
- All hygienic process connections have a maximum operating rating of 10 barg at 130°C /145 psig at 266°F

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

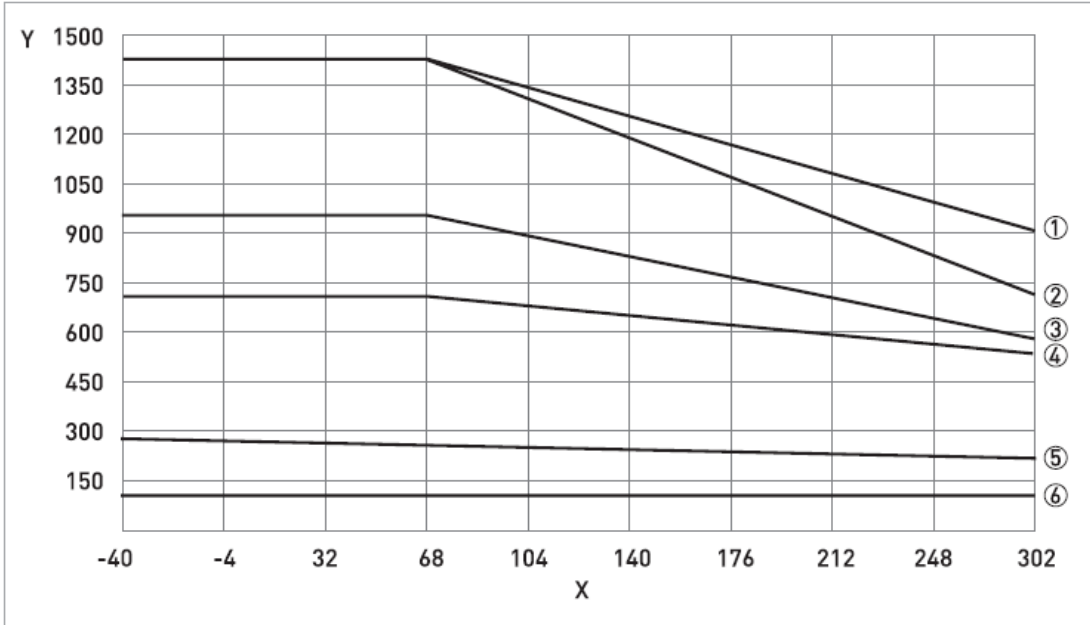


X temperature [°C]

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 304 (63 barg PED / CRN option)
- 5 JIS 20K flanges
- 6 DIN 2635 PN40 flanges
- 7 JIS 10K flanges
- 8 Hygienic connections

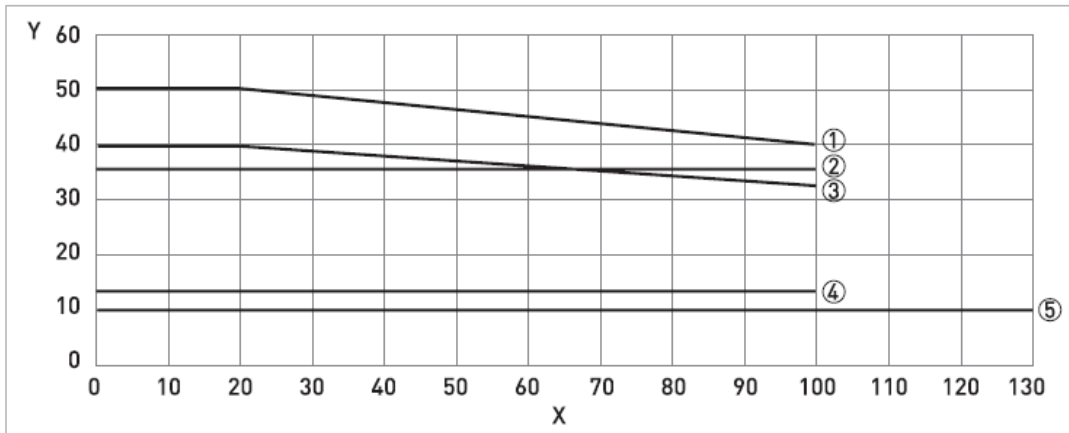
Pressure / temperature de-rating for Titanium Gr 9 meters
(all meter sizes with flanged connections as per ASME B16.5)



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 304 (63 barg PED / CRN option)
- 4 ASME 300 lbs
- 5 ASME 150 lbs
- 6 Hygienic connections

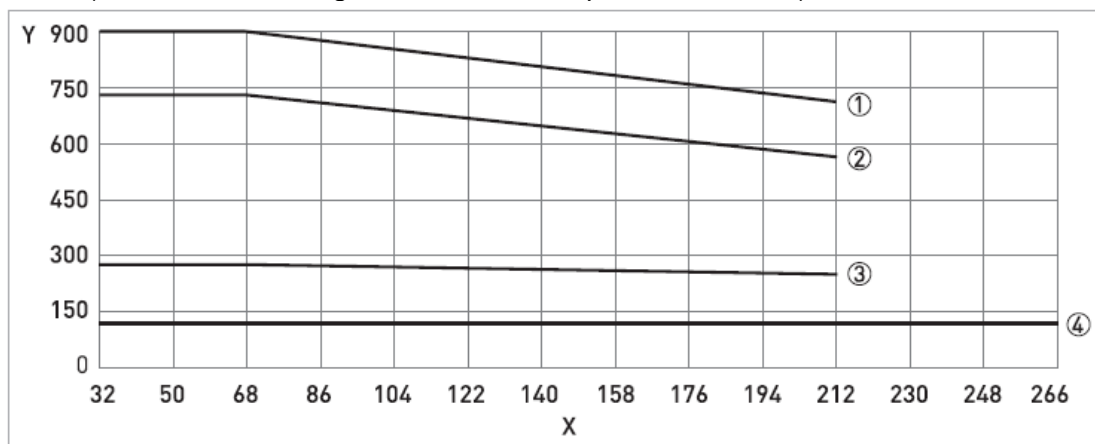
Pressure / temperature de-rating for Stainless Steel, Hastelloy® C22 and Tantalum meters
(all meter sizes with flanged connections as per EN 1092-1)



X temperature [°C]
Y pressure [barg]

- 1 Standard tubes and outer cylinder 304 (all sizes) (63 barg PED / CRN option)
- 2 JIS 20K flanges
- 3 DIN 2635 PN40 flanges
- 4 JIS 10K flanges
- 5 Hygienic connections (extended temperature option, Stainless Steel only)

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 (all sizes) (63 barg PED / CRN option)
- 2 ASME 300 lbs
- 3 ASME 150 lbs
- 4 Hygienic connections (extended temperature option, Stainless Steel only)

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 2220: 2001 table 1 division 1 material group 022a

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.

Ordering Information

Contact your nearest Honeywell sales office, or

In the U.S.:

Honeywell Process Solutions
Honeywell International Inc
2500 West Union Hills Drive
Phoenix, AZ 85027 1-800-343-0228

In Europe and Africa:

Honeywell S. A.
Avenue du Bourget 1
1140 Brussels, Belgium

In Asia:

Honeywell Asia Pacific Inc.
Honeywell Building,
17 Changi Business Park Central 1
Singapore 486073
Republic of Singapore

In Canada:

The Honeywell Centre
155 Gordon Baker Rd.
North York, Ontario M2H 3N7
1-800-461-0013

In Eastern Europe:

Honeywell Praha,
s.r.o. Budejovicka 1
140 21 Prague 4,
Czech Republic

In the Pacific:

Honeywell Pty Ltd.
5 Thomas Holt Drive
North Ryde NSW Australia 2113
(61 2) 9353 7000

In Latin America:

Honeywell Inc.
480 Sawgrass Corporate Parkway,
Suite 200 Sunrise, FL 33325
(954) 845-2600

In the Middle East:

Honeywell Middle East Ltd.
Khalifa Street,
Sheikh Faisal Building
Abu Dhabi, U. A. E.

In Japan:

Honeywell K.K.
14-6 Shibaura 1-chrome
Minato-ku, Tokyo, Japan 105-0023

Or, visit Honeywell on the World Wide Web at: <http://www.honeywell.com>
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