

# VersaFlow Coriolis 1000 Mass Flow Sensor Specifications

34-VF-03-03 May 2009



## 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 <sub>rel.</sub> / 14.5 psig

### Density

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

Hastelloy is a registered trademark of Haynes International.

**Technical Data, Continued**

<b>Temperature</b>	<b>Titanium</b>	<b>Stainless Steel</b>	<b>Hastelloy</b>	<b>Tantalum</b>
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			
<b>Materials</b>	<b>Titanium</b>	<b>Stainless Steel</b>	<b>Hastelloy</b>	<b>Tantalum</b>
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
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	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
<b>Ambient Temperature</b>		
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 <sub>rel.</sub> / 0.000076% of the max flow rate per 1 psig

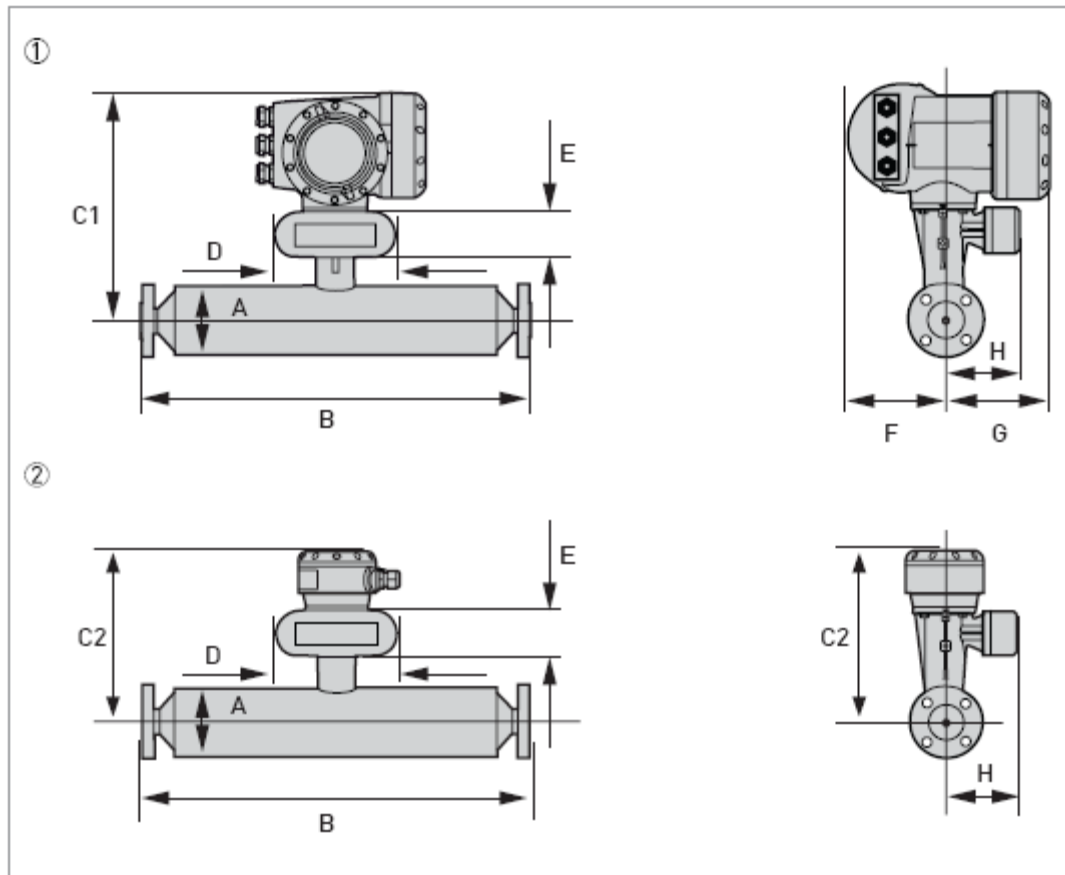
**Note 1: Hastelloy available Sizes DN10 ... DN80. Tantalum available Sizes DN15 ... DN50**

**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



### 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)**

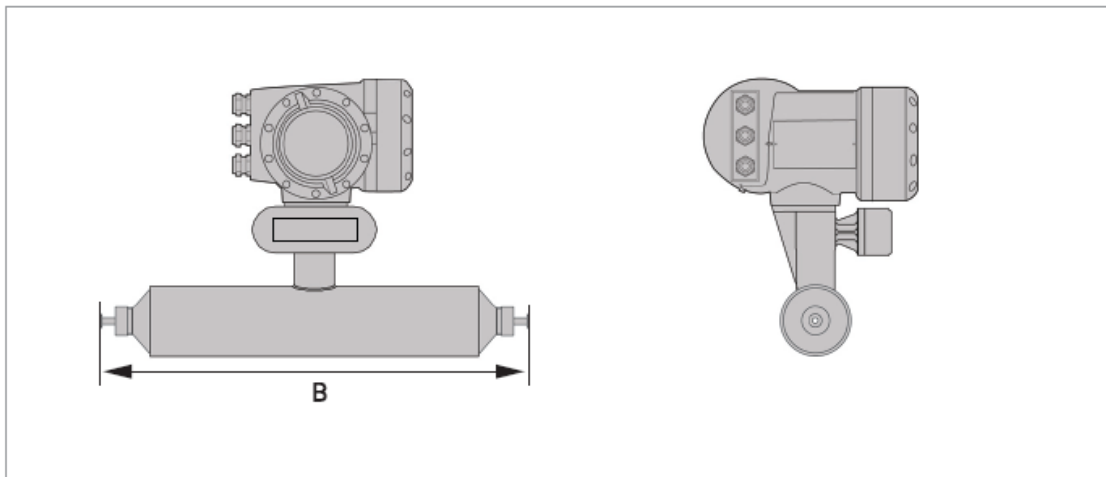
	06	10	A15	A25	A40	A50	80
A	n/a		102 (4)	115 (4.5)	170 (6.7)	220 (8.7)	n/a
B (standard flange)	n/a	n/a	633 ±2 (21.6 ±0.08)	800 ±2 (27.5 ±0.08)	1075 ±2 (27.5 ±0.08)	1281 ±2 (43.3 ±0.08)	n/a
C1 (compact)	n/a	n/a	311 (12.2)	318 (12.5)	345 (13.6)	n/a	
C2 (remote)	n/a		231 ±2 (9 ±0.08)	237 ±2 (9.3 ±0.08)	265 ±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 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]**

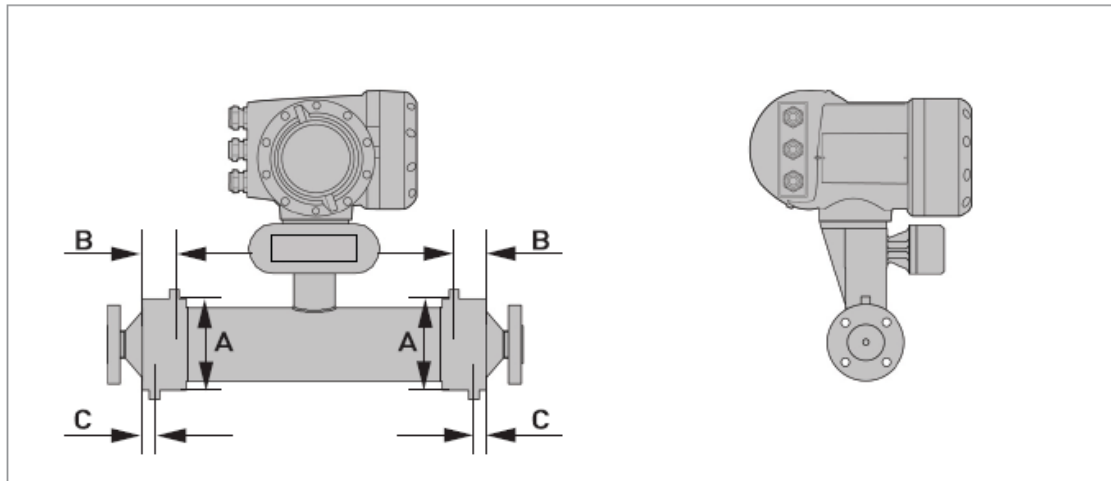
	10	15	25	40	50	80
Male thread SMS						
1"		26.2				
1½"			33.5			
2"				42.3		
3"					53.5	

**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]**

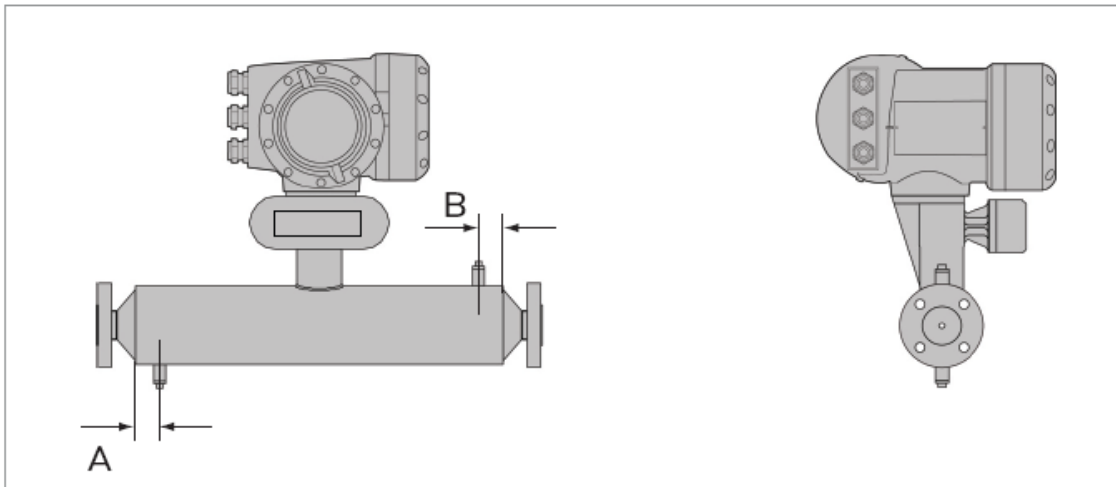
	10	15	25	40	50	80
Male thread RJT						
1"		26.6				
1½"			34.1			
2"				42.8		
3"					53.8	



### Heating Jacket Version

Dimensions – mm (inches)

	10	15	25	40	50	80
Heating connection size	12mm (ERMETO) ( $\frac{1}{2}$ " (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)		-

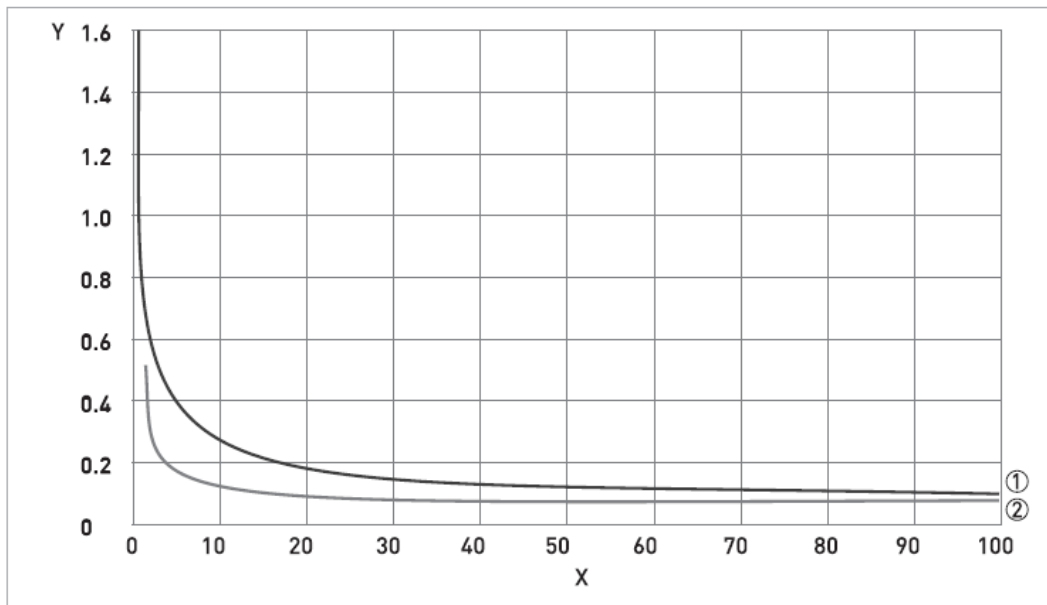


**Purge Port Option**

**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



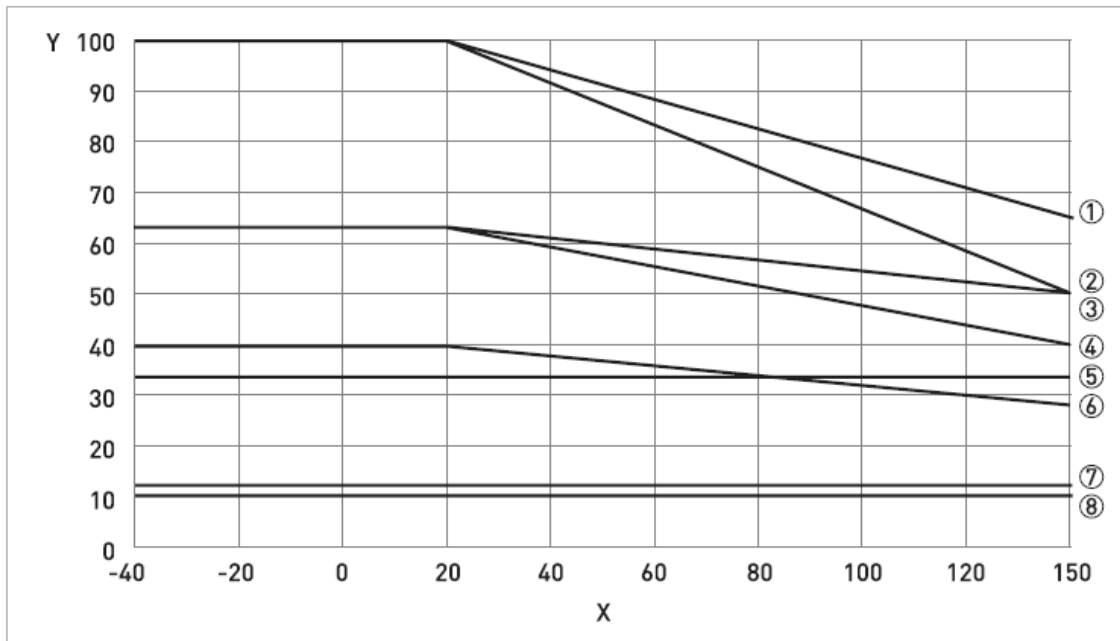
## Guidelines for Maximum Operating Pressure

### 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)

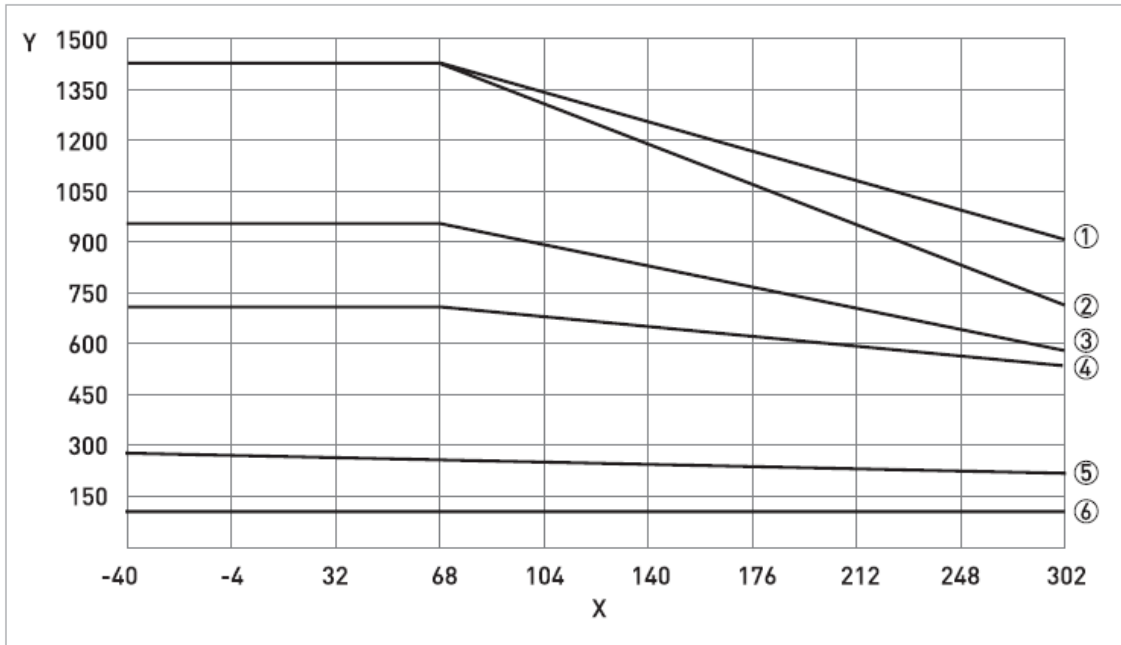


X temperature [° C]

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)

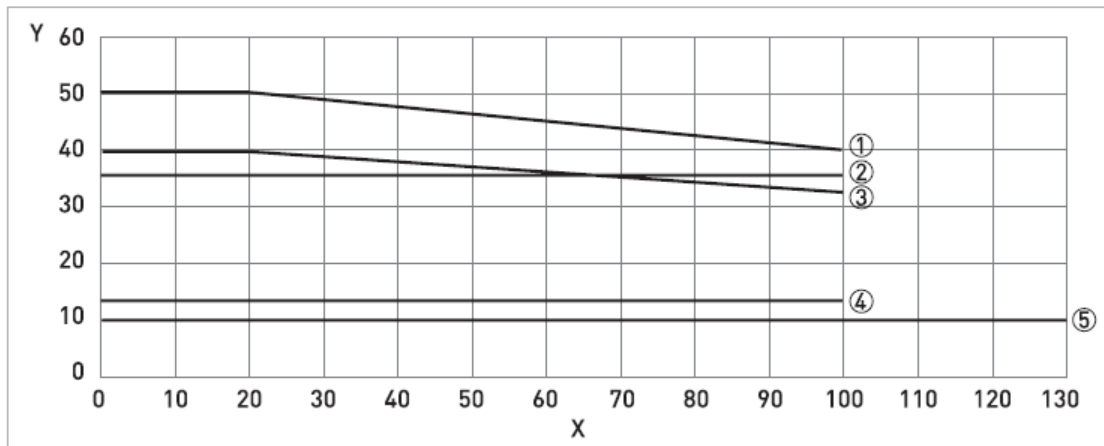


X temperature [°F]

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)

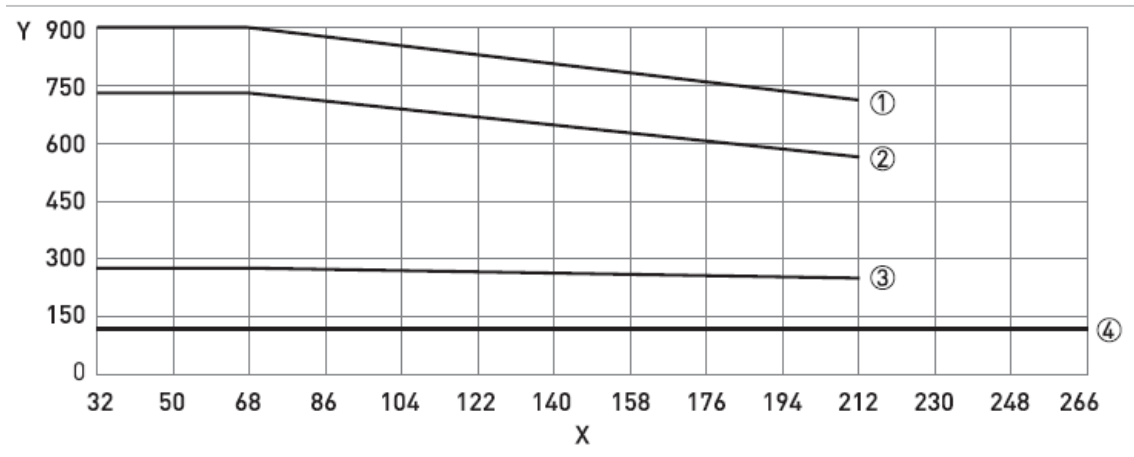


X temperature [° C]

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.

*Specifications are subject to change without notice*

**For More Information**

Learn more about how Honeywell's VersaFlow Coriolis 1000 Mass Flow Sensor can provide rapid signal processing even with varying conditions, visit our website [www.honeywell.com/ps/hfs](http://www.honeywell.com/ps/hfs) or contact your Honeywell account manager.

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