VersaFlow

Honeywell

Technical Information

VersaFlow Coriolis 200 Sensor for Mass Flow Specifications 34-VF-03-12, February 2022

The Solution for Bulk Mass Flow Measurement

The VersaFlow Coriolis 200 has been developed to meet the demanding requirements of the oil and gas industry and is well suited to bulk measurement in many applications. The option of Super Duplex (UNS S32760) provides a maximum operating pressure of 180 barg.

A high level of performance makes the VersaFlow Coriolis 200 suitable for the bulk measurement of petroleum and oil as well as products like syrup, molasses, and raw chemicals.

Combined with the power of the TWC9400, the VersaFlow Coriolis 200 will provide accurate measurement of mass, volume, density and concentration.

Highlights

- Innovative design with multiple large measuring tubes, gives a high flow rate capacity
- Easy to drain and easy to clean
- Optional heating jacket
- High levels of accuracy for custody transfer
- Optimized flow divider for minimum pressure loss
- Super Duplex option for operating pressures up to 180 barg
- Secondary containment up to 150 barg

Industries

- Oil & Gas
- Water & Wastewater
- Chemical & Petrochemical
- Paper &Pulp
- Pharmaceutical

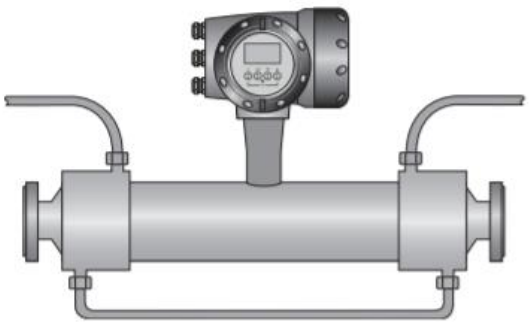
Figure 1 – VersaFlow Coriolis 200 mass flow sensor

1. Comprehensive diagnostic capabilities
2. Available with a range of process connections
3. Outer casing in stainless steel 304L or 316L
4. Common electronics across the range of sensors with redundant storage of calibration and sensor data
5. Modular electronics with all output options.

Applications

- Bulk loading/unloading
- High Volume
- Pipeline measurement applications
- Allocation metering

Features and Options



Features

VersaFlow Coriolis 200 provides the best solution for a variety of applications where bulk measurement is required.

- Flow rates up to 4,20,000 kg/h / 14698 lb/min.
- Integrated electronics.
- Self-draining.
- Best in class for zero stability.
- With advanced Entrained Gas Management (EGM) the meter maintains operation over a wide range of gas fractions and complex flow conditions.

Connection Options

- Flange sizes from 4" / DN100 to 6" / DN150 600 lbs / PN100.
- Supports a wide range of industry standard hygienic connections.
- Hygienic connections (DN100 only) for bulk measurement in the food and beverage industry.

Heating Jacket & Purge Port

- Heating jacket option for use with temperature dependent 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.

Table 1

Converter		
Configuration	Compact	Remote Field
VersaFlow Coriolis 200	TWC 9400C	TWC9400F

Versions

Figure 2

Compact

VersaFlow Coriolis 200 compact provides high accuracy with easy installation.

- Pre-programmed TWC9400 for “plug &play” installation.
- available with certified TWC9400 housing for use in hazardous areas.
- Stainless Steel option for TWC9400 housing for use in aggressive environments.

Figure 3

Remote

VersaFlow Coriolis 200 remote version for use with either the TWC9400F,

- Suited to applications where data collection needs to be centralized.
- Allows the TWC9400 converter to be installed in a safe area.
- 300m maximum distance between meter and converter.
- Stainless steel option for junction box housing for use in aggressive environments.

Outer Cylinder

Figure 4 – Outer Cylinder

Please Note

Honeywell strongly recommends that the burst disk option is ordered where the meter is being used to measure:

- High pressure gases.
- Gases kept as liquids at high pressure and/or where there is a risk of tube failure because of:
    - the use corrosive and/or erosive process
    - pressure and/or temperature shocking
    - seismic or other shock loading

If in doubt, please contact Honeywell Field Solutions.

Please note that meters ordered with flange rating of 100 barg or above, will automatically be supplied with a burst disk in the outer cylinder.

Technical data

Table 2

Size mm (inches) **Model Key**		**S100 (4")** **(CM41)**
Flow rate	**Maximum (kg/h)**	**420,000**
	Maximum (lbs/min)	**14,698**
	Nominal (kg/h)	**220,000**
	Maximum (lbs/min)	**8,084**

Table3

Measuring System	
Measuring principle	Coriolis mass flow
Application range	Mass flow and density measurement of fluids, gases and slurries
Measured values	Mass, density, temperature
Calculated values	Volume, concentration, velocity
Design	
Basic	Measuring sensor and a converter to process the output signal
Features	Fully welded maintenance free sensor with dual-straight measuring tube
Variants	
Compact version	Integral converter
Remote version	Available with field mount versions of the converter
Modbus version	Sensor with integral electronics providing Modbus output for connection to a host

Accuracy

Table 4

Mass Standard	
Liquid (≥ 20:1 of nominal flow rate)	±0.1% of actual measured flow rate
Liquid (< 20:1 of nominal flow rate)	±0.1% of actual measured flow rate ± zero stability
Repeatability	
(≥ 20:1 of nominal flow rate)	Better than ±0.05%
(< 20:1 of nominal flow rate)	Better than ± zero stability x 0.5
Gas	±0.35% of actual measured flow rate + zero stability
Repeatability	Better than 0.2% plus zero stability (includes the combined effects of repeatability, linearity and hysteresis)
Mass optional	
Liquid (≥ 10:1 of nominal flow rate)	±0.05% of actual measured flow rate
Liquid (< 10:1 of nominal flow rate)	±0.05% of actual measured flow rate ± zero stability
Repeatability	
≥10:1 of nominal flow rate	Better than ±0.025%
<10:1 of nominal flow rate	Better than ± zero stability x 0.5
Zero stability	
S100 (CM41)	< 11 kg/h

Table 5

Reference conditions	
Product	Water
Temperature	+20°C / +68°F
Operating pressure	1 barg / 14.5 psig
Effect on sensor zero caused by a shift in process temperature	
Stainless Steel	0.0004%of nominal flow rate per 1°C / 0.00022% per 1°F
Effect on sensor zero caused by a shift in process pressure	
Stainless Steel	0.0002% of the nominal flow rate per 1 barg. / 0.000014% of the nominal flow rate per 1 psig
Density	
Measuring range	400...3000 kg/m^3 / 25...187 lbs/ft^3
Accuracy	±1 kg/m^3 / ±0.06 lbs/ft^3
On site calibration	±0.2 kg/m^3 / ±0.012 lbs/ft^3
Temperature	
Accuracy	±1°C / ±1.8°F

Table 6

Ambient temperature		
Compact version with Aluminium converter	-40...+60°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 converter	-40...+55°C / -40…+130°F	
Remote versions	-40...+65°C / -40…+149°F	
Process temperature		
Flanged connection	-45…+130°C / -49…+266°F	
Hygienic connection		
Nominal pressure at 20°C / 68°F		
Measuring tube	**Duplex UNS S31803**	**Super Duplex UNS S32750**
PED	**-1…150 barg / -14.5…2175 psig**	**-1…180 barg / -14.5…2610 psig**
FM (S100)	-1…140 barg / -14.5…2030 psig	-1…152 barg / -14.5…2205 psig
CRN / ASME B31.3	-1…100 barg / -14.5…1450 psig	-1…120 barg / -14.5…1885 psig
Outer cylinder		
Non-PED/CRN approved	Typical burst pressure > 100 barg / 1450 psig at 20°C / 68°F	
PED approved secondary containment	-1…40 barg / -14.5…580 psig (S100)	
	-1…150 barg / -14.5…2175 psig (Duplex option)	

Table 7

Fluid properties	
Permissible physical condition	Liquids, gases, slurries
Permissible gas content (volume)	Contact manufacturer for information.
Permissible solid content (volume)	Contact manufacturer for information.
Protection category (acc. to EN 60529)	IP 67, NEMA 4X
Installation conditions	
Inlet runs	None required
Outlet runs	None required

Materials

Table 8

Measuring tube	Stainless Steel UNS S31803 (1.4462)
	Optional UNS S32750 (1.4501)
Spigot	Stainless Steel UNS J92205 (1.4470)
	Optional UNS J93404 (1.4469)
Flanges	Stainless Steel AISI 316 / 316L (1.4401 / 1.4404) dual certified
	Optional Stainless Steel UNS S31803 (1.4462) (NACE approved)
	Optional UNS S32750 (1.4501) (NACE approved)
Outer cylinder	Stainless Steel AISI 304 / 304L (1.4301 / 1.4307) dual certified
	Optional Stainless Steel AISI 316 / 316L (1.4401 / 1.4404) dual certified
	Optional Stainless Steel UNS S31803 (1.4462) (1)
Heating jacket version	
Heating jacket	Stainless Steel 316L (1.4404)
	Note: the outer cylinder is in contact with the heating medium
All versions	
Sensor electronics housing	Stainless Steel 316L (1.4409). Optional Stainless Steel (1.4469)
Junction box (remote version)	Die cast Aluminium (polyurethane coating)

Process Connections

Table 9

Flange	
DIN	DN100…150 / PN16…100
ASME	4... 6" / ASME 150…600 lb
JIS	100A / 10...20K
Hygienic (S100 only)	
Tri-clover	4"
Tri-clamp DIN 32676	DN100
Tri-clamp ISO 2852	4"
DIN 11864-2 Form A	DN100
Male thread DIN 11851	DN100
Male thread SMS	4"
Male thread IDF / ISS	4"
Male thread RJT	4"

Electrical Connections

Table 10

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

Approvals

Table 11

CE	The device fulfils the statutory requirements of the CE directive. The manufacturer certifies the requirements have been met.
Factory Mutual / CSA	Class I, Div 1 groups A, B, C, D
	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
ANSI / CSA (Dual Seal)	12.27.901-2003
IECEx	Available
Custody Transfer	OIML R117-1
Ingress protection	EN 60529
	NEMA 250

Table 12

ATEX	
Coriolis 200 with TWC9400C non-Ex i Signal outputs	
Ex-d connection compartment	II 1/2 G Ex-d ia IIC T6....T1 Ga/Gb
	II 2 D Ex-t IIIC T160°C Db
Ex-e connection compartment	II 1/2 G Ex de ia IIC T6....T1 Ga/Gb
	II 2 D Ex IIIC T160°C Db
Coriolis 200 with TWC9400C Ex i signal outputs	
Ex-d connection compartment	II 1/2(1) G Ex-d ia (ia Ga) IIC T6....T1 Ga/Gb
	II 2(1) D Ex-t (ia Da) IIIC T160°C Db
Ex-e connection compartment	II 1/2 (1) G Ex de ia (ia Ga) IIC T6....T1 Ga/Gb
	II 2(1) D Ex-t (ia Da) IIIC T160°C Db
Coriolis 200 with TWC9400F	II 1 G Ex ia IIC T6…T1 Ga
	II 1 D Ex ia IIIC T160°C Da

ATEX temperature limits

Table 13

	Ambient temp. Tamb °C	**Max. medium temp. Tm °C**	**Temp. class**	**Max. surface temp. °C**
Coriolis 200 with TWC010 with or without heating jacket / insulation	40	65	T6	T70
		75	T5	T85
		110	T4	T120
		130	T3-T1	T160
	50	55	T5	T85
		90	T4	T120
		130	T3-T1	T160
	65	65	T5	T95
		130	T3-T1	T160
Coriolis 200 with TWC9400C Aluminium converter housing - with or without heating jacket / insulation	40	40	T6	T70
		55	T5	T85
		90	T4	T120
		130	T3-T1	T160
	50	55	T5	T85
		90	T4	T120
		130	T3-T1	T160
	65 (1)	65	T4-T1	T95
Coriolis 200 with TWC9400C Stainless Steel converter housing - with or without heating jacket / insulation	40	40	T6	T70
		55	T5	T85
		90	T4	T120
		130	T3-T1	T160
	50	55	T5	T85
		90	T4-T1	T120
	60	60	T5-T1	T90

(1) depending on I/O option. Please call for more information.

Maximum End Loadings

Table 14

		S100 (CM41)
Flanges		
20°C	40 barg	150kN
	100 barg	100kN
	150 barg	
	180 barg	
130°C	32 barg	150kN
	80 barg	60kN
	115 barg	
	130 barg	
Hygienic (all connections)		
130°C	10 barg	5kN

These axial loads have been calculated based on SS316L schedule 80 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.

To prevent damage, do not apply loads to heating jacket connections on the meter. Recommendation is to use flexible connection pipes.

Measuring Accuracy

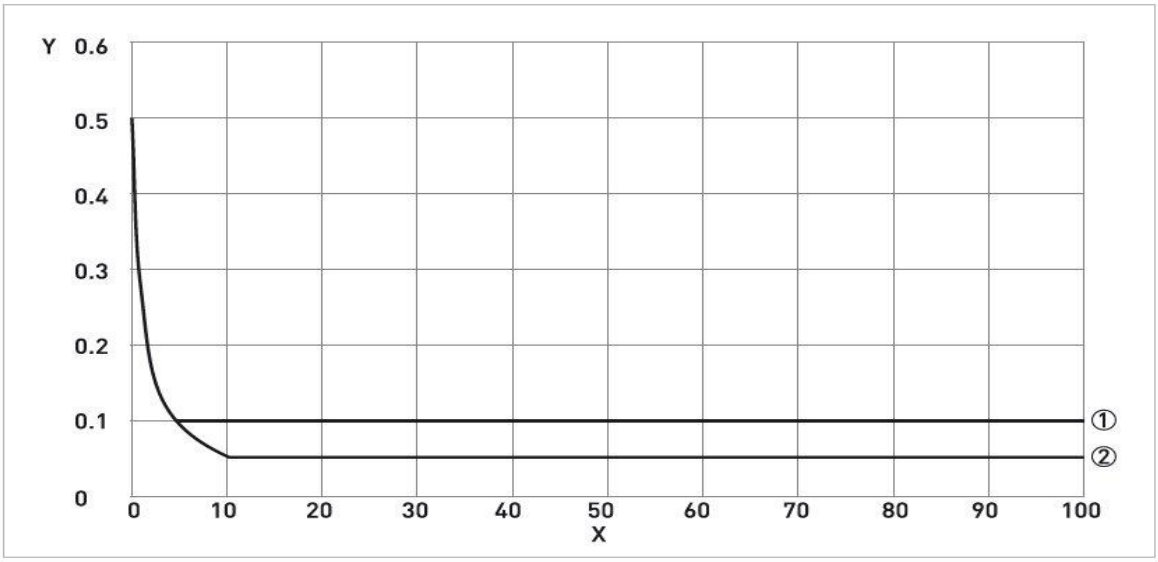


Figure 5 – Measuring Accuracy

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

(1) Standard measuring accuracy
(2) Optional measuring accuracy (not available in SIL mode)

Measuring Error

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

Reference Conditions

Table 15

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

Dimensions and Weights

Flanged Versions

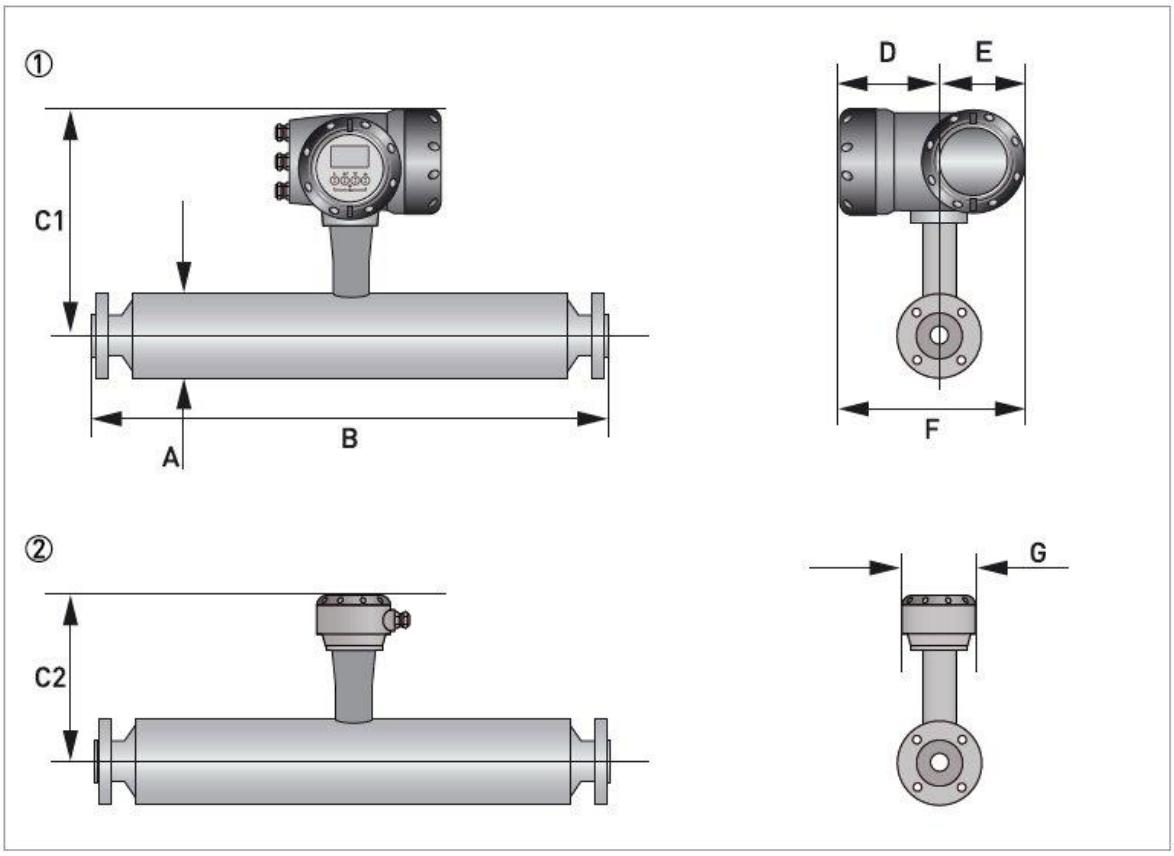


Figure 6: Flanged version

(1) Compact Version
(2) Remote Version

Weights (PN 40 flanges)

Table 16

Weights (Kg)	S100 (CM41)
Compact with aluminum converter	84.8
Compact with stainless steel converter	90.1
Remote with aluminum junction box	80.8
Remote with stainless steel junction box	81.7

Table 17

Weights (lbs)	S100 (CM41)
Compact with aluminum converter	187
Compact with stainless steel converter	198
Remote with aluminum junction box	178
Remote with stainless steel junction box	180

For meter weights with different flange ratings, please contact the manufacturer.

Dimensions

Measuring Tube in Stainless Steel

Dimensions mm (inches)
Table 18

	S100 (CM41)
A	219 ±5 (8.6 ±0.2)
C1 (compact)	370 ±5 (14.6 ±0.2)
C2 (remote)	307 ±5 (12.1 ±0.2)
D	137 (5.4)
E	123 (4.9)
F	260.5 (10.2)
G	118 (4.6)

Flange Connections

Table 19

	S100 (CM41)
PN16	
DN100	1284 (50.5)
DN150	1290 (50.8)
PN40	
DN100	1310 (51.6)
DN150	1330 (52.6)
PN63	
DN100	1336(53.2)
DN150	1370(53.9)
PN100	
DN100	1360(53.5)
DN150	1410(55.5)
ASME 150	
4”	1334 (52.5)
6”	1358 (53.4)
ASME 300	
4”	1352 (53.2)
6”	1378 (54.2)
ASME 600	
4”	1398 (54.9)
6”	1428 (56.1)
JIS 10K	
100A	1270(52.5)
JIS 20K	
100A	1296 (52.5)

Hygienic Versions

Hygienic Connections: All Welded Versions

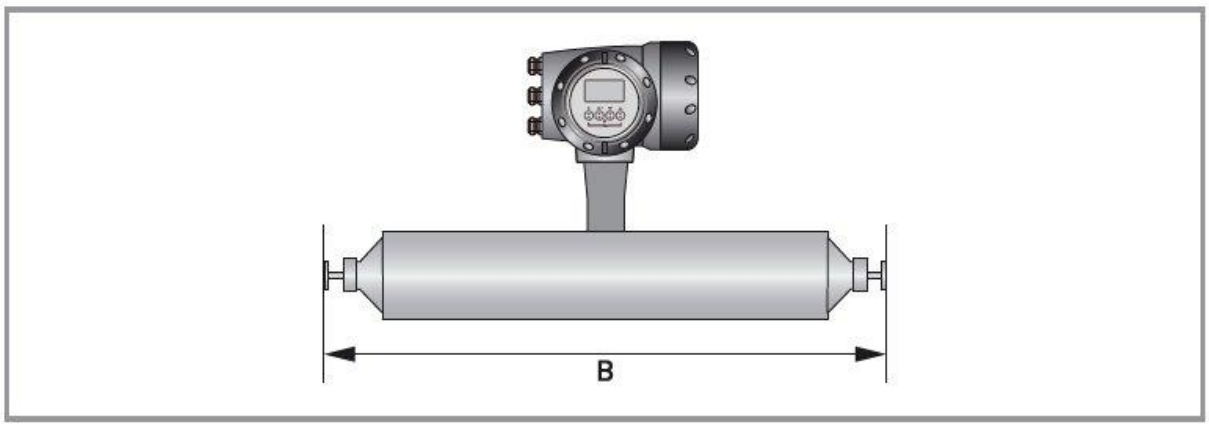


Figure 7 – Hygienic Connections: All Welded Versions

Dimension B mm (inches)
Table 21

	S100 (CM41)
Tri-clover	
4”	1223 (48)
Tri-clamp DIN 32676	
DN100	1236 (48.7)
Tri-clamp ISO 2852	
4”	1223 (48)
DIN 11864-2 Form A	
DN 100	1296 (51)

Hygienic Connections: Adapter Versions (male thread)

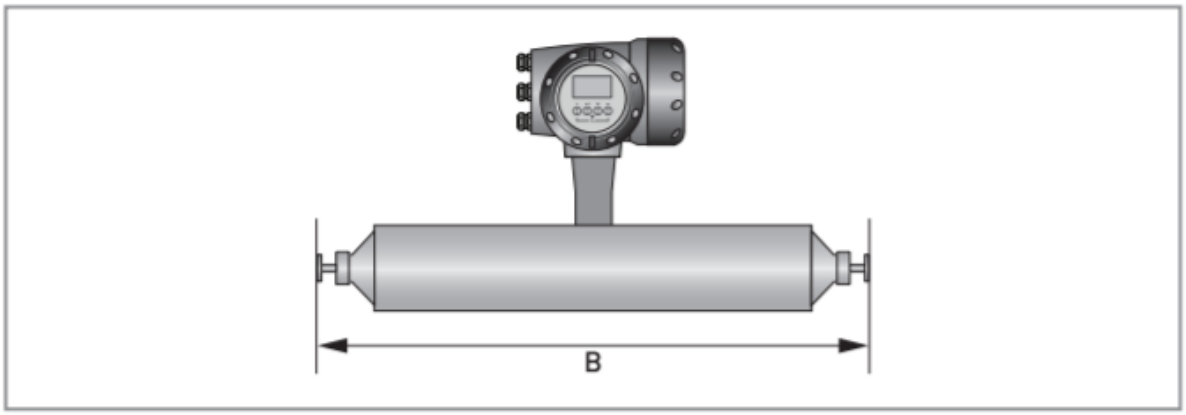


Figure 8 – Hygienic Connections: Adapter Versions (male thread)

Dimension B mm (inches)
Table 22

	S100 (CM41)
Male thread DIN 11851	
DN100	1288 (50.1)
Male thread SMS	
4”	1236 (48.7)
Male thread IDF/ISS	
4”	1223 (48)
Male thread RJT	
4”	1234 (48.6)

Heating Jacket Version

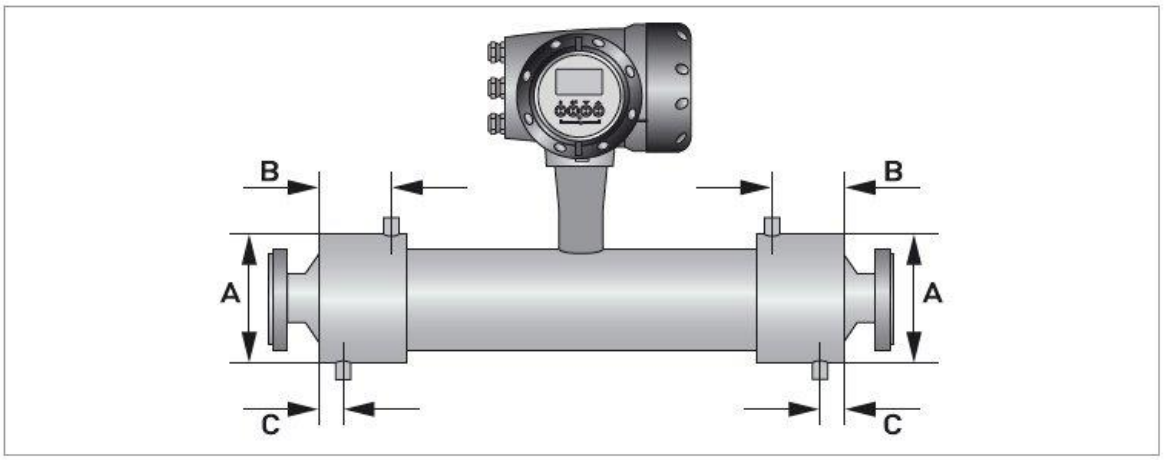


Figure 9 – Heating Jacket Version

Dimensions mm (inches)

Table 23

	S100 (CM41)
Heating connection size	25 mm (ERMETO) 1" (NPTF)
A	254 ±2.5 (10 ±0.1)
B	178 ±2.0 (7 ±0.08)
C	28 ±2.0 (1.1 ±0.08)

Purge Port Option

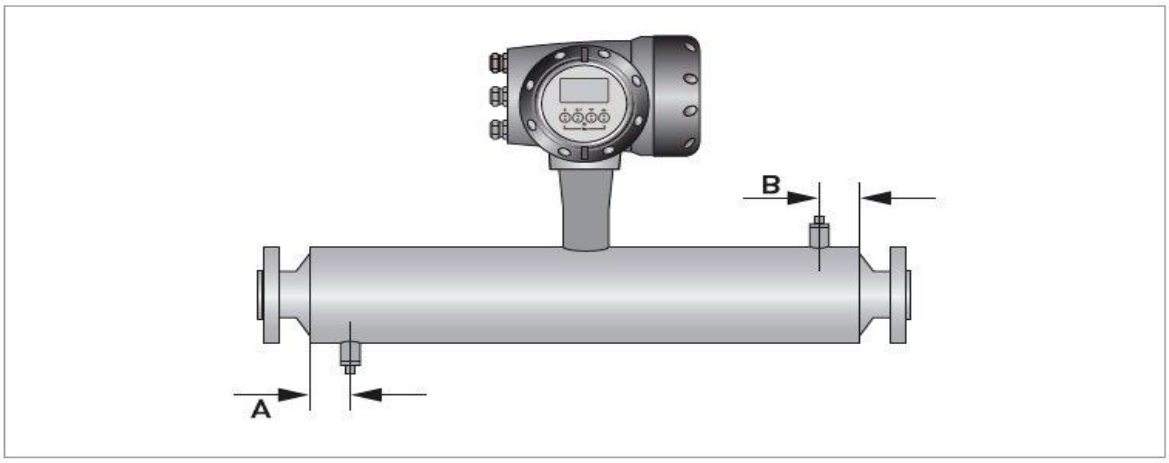


Figure 10: Purge Port Option

Dimensions mm (inches)
Table 24

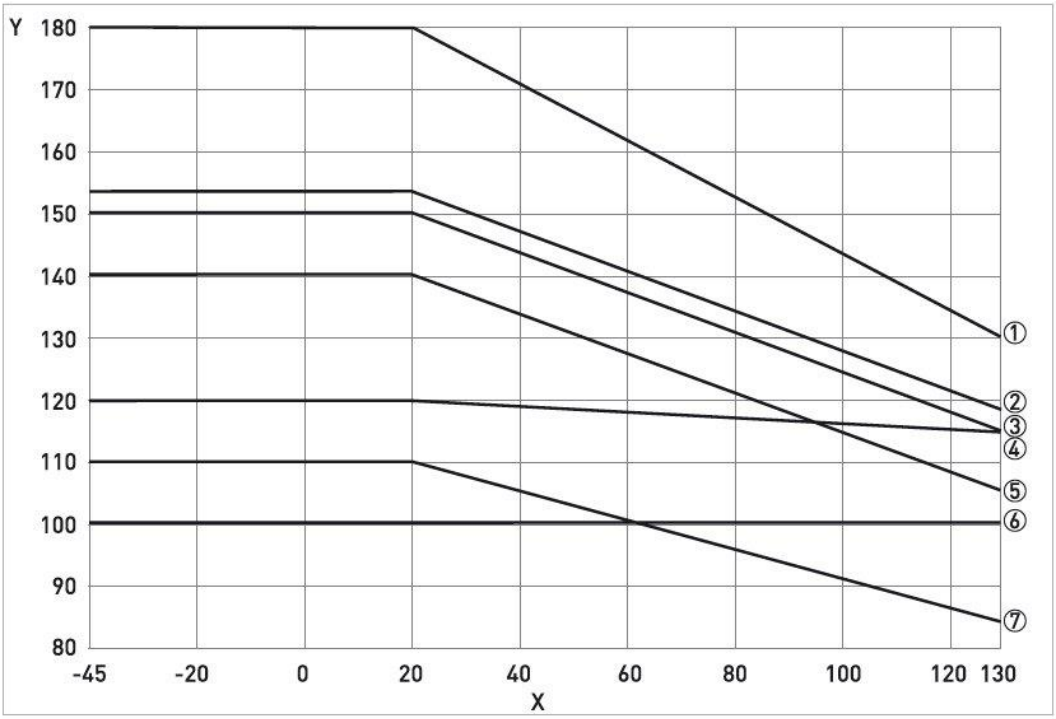
	S100 (CM41)
A	70 ±1.0 (2.75 ±0.04)
B	70 ±1.0 (2.75 ±0.04)

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, all meter sizes in metric (flanged connections as per EN 1092-1:2007)



X temperature [◦C]
Y pressure [barg]

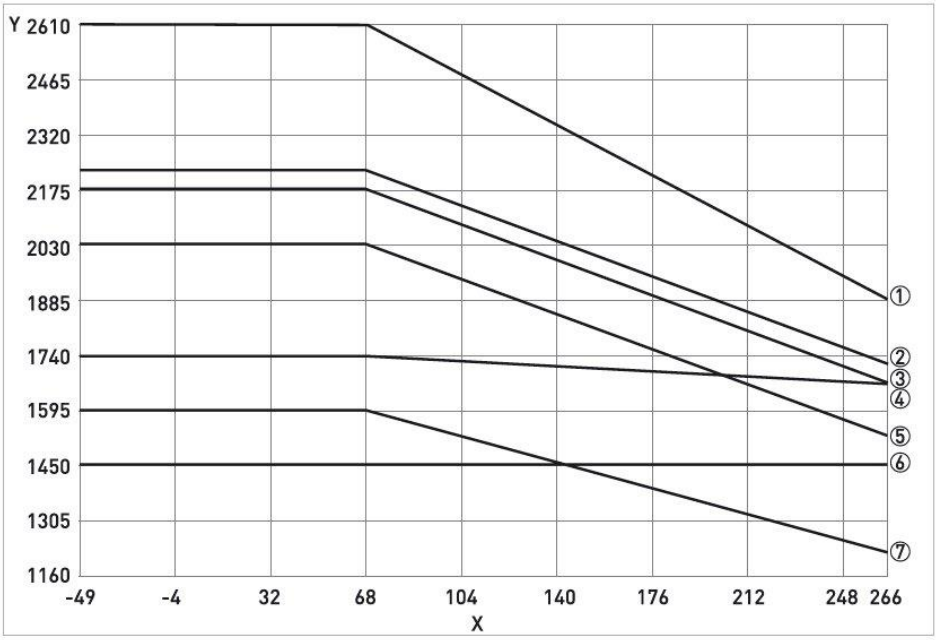
(1) Measuring tube [UNS S32750] PED certification
(2) Measuring tube [UNS 32760] FM certification
(3) Measuring tube [UNS S31803] PED certification
(4) Measuring tube [UNS 32760] CRN certification
(5) Measuring tube [UNS S31803] FM certification (S100)
(6) Measuring tube [UNS S31803] CRN certification

Linear de-rating of PED certified secondary containment

Table 25

Outer cylinder material	-45°C	20°C	130°C
304 /L or 316 /L	40 barg	40 barg	32 barg
UNS S31803	150 barg	150 barg	100 barg

Pressure / temperature de-rating, all meter sizes, in imperial (flanged connections as per ASME B16.5)



X temperature [◦F]
Y pressure [psig]

(1) Measuring tube [UNS S32750] PED certification
(2) Measuring tube [UNS 32760] FM certification
(3) Measuring tube [UNS S31803] PED certification
(4) Measuring tube [UNS 32760] CRN certification
(5) Measuring tube [UNS S31803] FM certification (S100)
(6) Measuring tube [UNS S31803] CRN certification

Table 26

Outer cylinder material	-49°F	68°F	266°F
304 /L or 316 /L	580 psig	580 psig	464 psig
UNS S31803	2175 psig	2175 psig	1450 psig

Flanges

- DIN flange ratings are based on EN 1092-1 2007 table G.4.1 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.

Installation

Intended use

This Coriolis mass flowmeter is designed for direct measurement of mass flow rate, density and temperature of the product. It also enables indirect measurement of parameters like total mass, volume flow and concentration of dissolved substances.

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,

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

General Installation principles

There are no special installation requirements, but the following points should be noted:

Support the weight of the meter especially the larger meter sizes and hygienic connections. The meter can be supported on the sensor body.

No straight runs are required.

Take care to avoid cavitation while using reducers and other fittings at flanges.

Avoid extreme pipe size reductions.

Meters are no 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

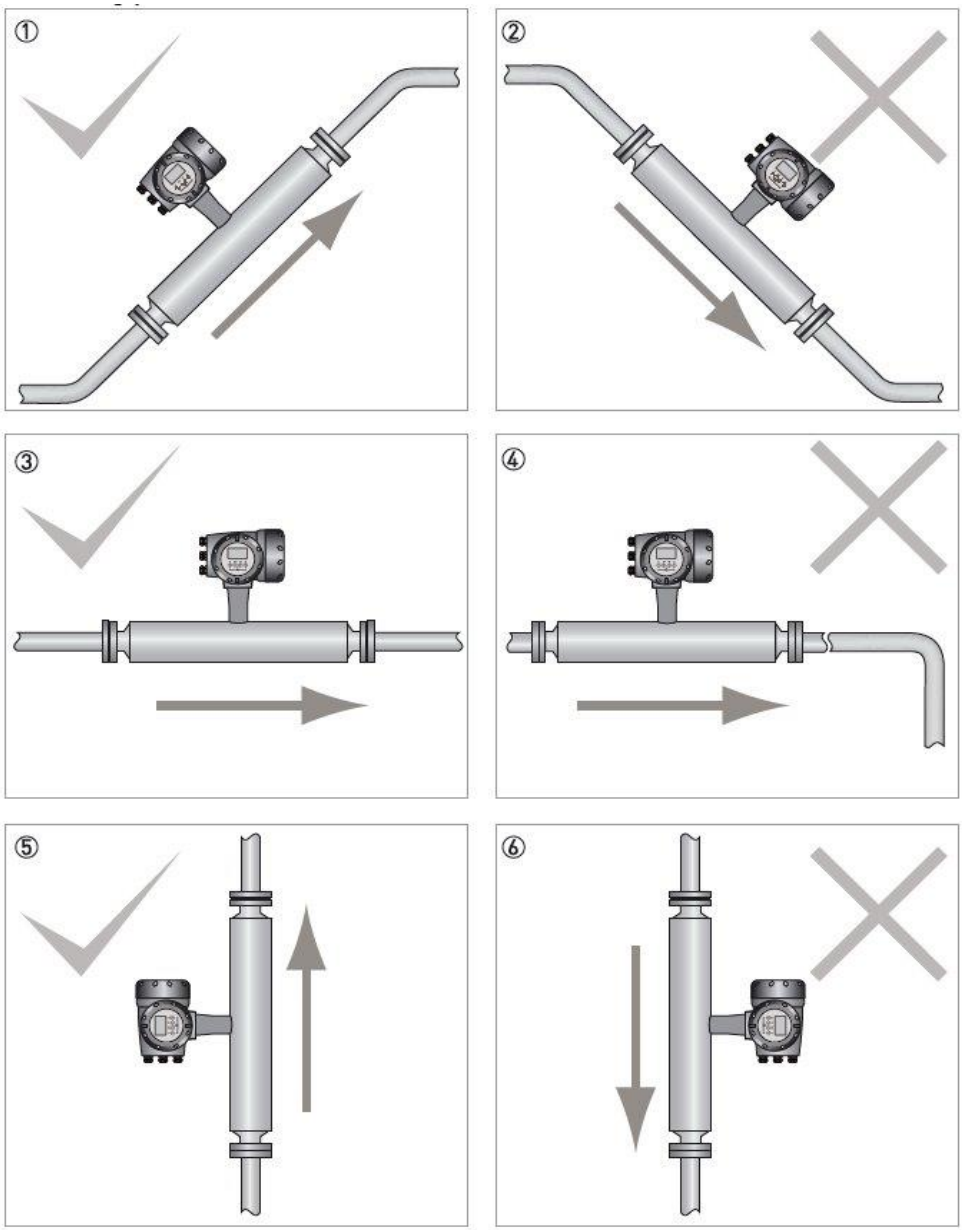


Figure 11 – Mounting Position

(1) Recommended flow direction is from bottom to top for meter mounted at an angle.

(2) Avoid mounting the meter with the flow running top to bottom as it can cause siphoning. In such a scenario, install an orifice plate or a control valve downstream of the meter to maintain backpressure.

(3) Horizontal mounting with flow left to right.

(4) Long vertical runs after the meter should be avoided as it can cause cavitation. Install an orifice plate or a control valve downstream to maintain backpressure.

(5) Recommended flow direction is from bottom to top for vertical installation.

(6) Avoid mounting the meter vertically with flow running downhill. This can cause siphoning. Install an orifice plate or a control valve downstream of the meter to maintain backpressure.

Zero Calibration

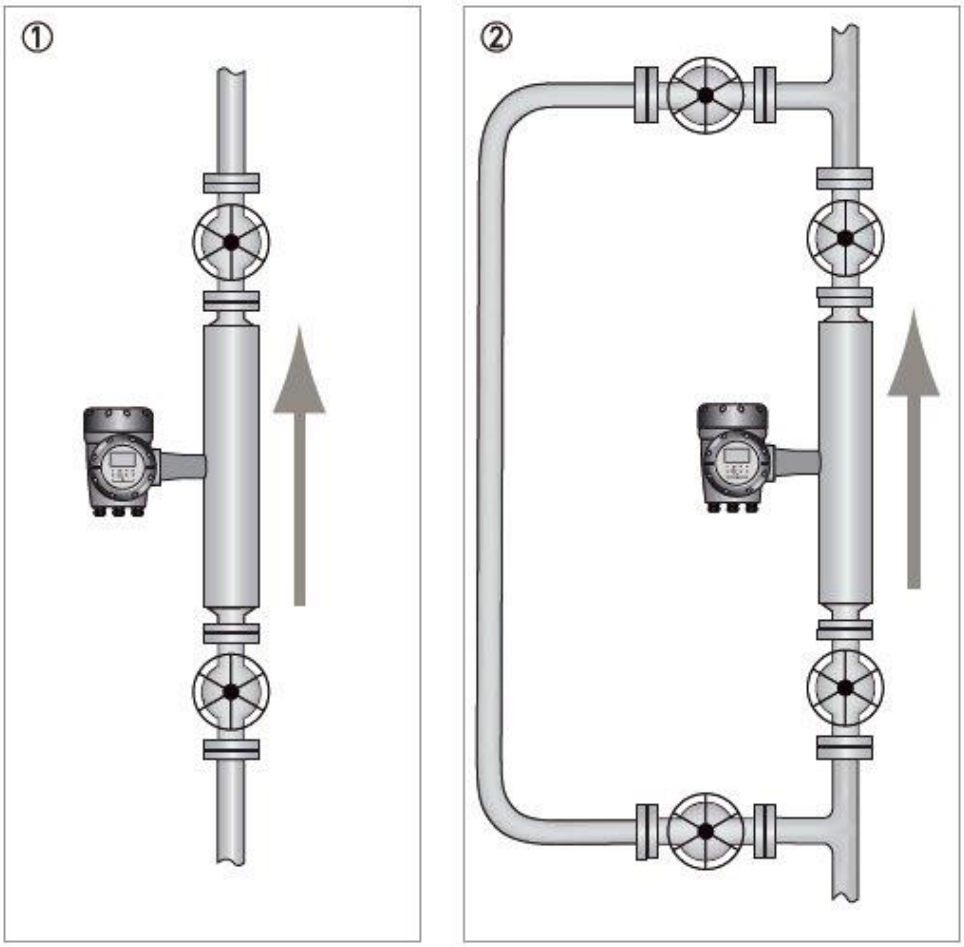


Figure 12 – Zero Calibration

(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 cannot be stopped, install a bypass section for zero calibration.

Sales and Service

For application assistance, current specifications, ordering, pricing, and name of the nearest Authorized Distributor, contact one of the offices below.

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Knowledge Base search
engine **http://bit.ly/2N5VIdi**

Specifications are subject to change without notice.

For more information
To learn more about VersaFlow,
visit **https://process.honeywell.com/**
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