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INSTRUMENTATION

F-1001 CORIOLIS MASS FLOW METER

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F-1001 Coriolis mass flow meter

Description

Coriolis mass flow meter is a major advance in mass flow measurement. These meters have got a precedent for accuracy and repeatability under a wide variety of flow conditions. The inherent precision has established it as a standard for numerous industrial applications. The ability of these meters to measure mass flow and density directly has led to their use in applications ranging from meeting food products to corrosive chemicals, CNG and LNG. Coriolis meters have proven extremely reliable when meeting non-corrosive medium. The same reliability can be achieved in corrosive services if consideration is given to the compatibility of the process fluid with the sensor materials of construction. Coriolis technology appealed to us, after all, Coriolis is the most accurate technique available for measuring process mass and volume flow.

Features

- **Robust, no moving parts for long life**
- **Custom flow connectors & installation lengths**
- **Excellent repeatability (±0.05% of flow rate)**
- **Optional Net Oil functionality**
- **NIST Traceable NTEP certificates for custody transfer**

Benefits

- Increased productivity, less maintenance
- Lower installation cost
- Increased product quality
- Simpler whole solution for Net Oil without PLC/RTU

Materials

- Tubes: 316SS (Hastalloy C for options)
- Flow Splitter: 304SS (316SS and Hastalloy C for options)
- Flanges: SS304 (316SS and Hastalloy C for options)
- Housing case (NON WETTED PARTS)
- 304SS (316SS for options)
- Options: NACE MR 0175/0103 compliant

EX Certificates

c UL us LISTED

IECEx

Ex

NTEP

UL& CSA
ATEX& IECEX

Class I,Division. 1 Group B, C and D
Zone 1 and Zone 2: Groups IIA or Group IIB or IIC, T1…T6
Ex db ib IIA/IIB/IIC T*Gb

Application

Peregrine F-1001 Coriolis Mass Flow Meter measures the fluid mass flow directly. The Coriolis measuring principle operates independently of physical fluid properties, such as viscosity and density. It is a proven technology that has been employed in a wide variety of industries such as petroleum, petrochemical industry, pharmaceutical industry, paper mill, food and energy, etc. The typical applications are as follows:

- Batch Control
- Blending
- Process Control
- Filling & Dosing
- Loading and unloading
- Custody transfer
- Process gas measurement

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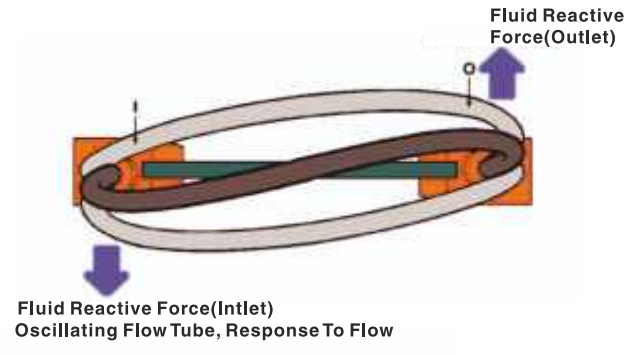
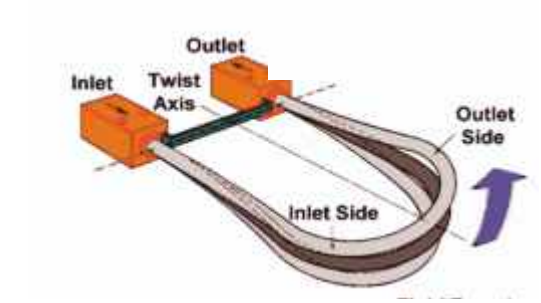
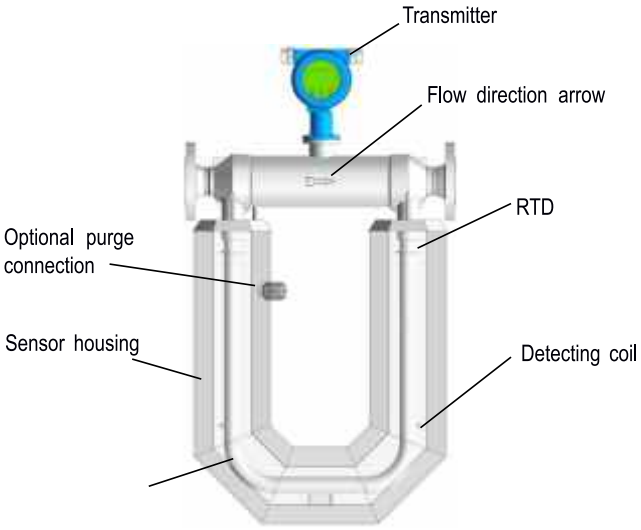
Principle

Peregrine F-1001 Coriolis Mass Flow Meter uses two parallel arranged pipes which are rotated at their resonant frequency by coils. Any mass flow passing through the tubes will generate Coriolis forces which appear, whenever a mass moves radially in a rotating system. The forces have opposed effects on the inlet and outlet sides, they slightly deform the pipes. The excursion of the pipes is detected by sensors on the inlet and outlet side. The phase shift between the rotational frequencies of both pipes are proportional to the mass flow rate. The resonant frequency of both pipes changes in accordance with the density of the medium. This effect determines the density. Using one sensor density and temperature can also be measured. The extent of deformation of the pipes depends on temperature. Therefore the temperature is measured for compensation purposes.







Flow range (kg/hr)

Model: F-1001-U Type Sensor. F-1001 - U Size 1 1/2" to 8"
Flow range for liquid (Metric unit) Table 1.1

Size inch/mm		Full flow range, kg/hr	Accuracy flow range, kg/hr		Zero stability kg/hr
			+/- 0.1%	+/- 0.2% and +/- 0.5%	
1½"	DN38	240 - 32,000	2,500 - 32,000	1,500 - 32,000	0.9
2"	DN50	500 - 50,000	3,500 - 50,000	2,000 - 50,000	1.5
3"	DN75	800 - 140,000	8,000 - 140,000	6,000 - 140,000	3.5
4"	DN100	1,500 - 200,000	15,000 - 200,000	10,000 - 200,000	7
6"	DN150	5,000 - 500,000	50,000 - 500,000	28,000 - 500,000	17
8"	DN200	10,000 - 1,200,000	200,000 - 1,200,000	80,000 - 1,200,000	45

Flow range (lb/hr)

Model: F-1001-U Type Sensor. F-1001 - U Size 1 1/2" to 8"
Flow range for liquid (US unit) Table 1.2

Size (inch)/mm		Full flow range, lb/hr	Accuracy flow range, lb/hr		Zero stability lb/hr
			+/- 0.1%	+/- 0.2% and +/- 0.5%	
1½"	DN38	530-70,548	5,511-70,548	3,306-70,548	1.98
2"	DN50	1,103-110,231	7,716-110,231	4409-110,231	3.31
3"	DN75	1763-308,647	17,636-308,647	13,227-308,647	7.72
4"	DN100	3370-440,924	33,069-440,924	22,046-440,924	15.43
6"	DN150	11,023-1,102,311	110,231-1,102,311	61,729-1,102,311	37.48
8"	DN200	22,046-2,645,547	440,924-2,645,547	176,369-2,645,547	99.21

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Model: F-1001-M series Micro bend sensor, Size 1/8 inch to 10 inch;
Flow range for liquid (metric unit in kg/hr) Table 1.3

Size (inch)		Full flow range, kg/hr	Accuracy flow range, kg/hr		Zero stability kg/hr
			+/- 0.1%	+/- 0.2% and +/- 0.5%	
1/8"	DN3	1.2 - 120	10 - 120	6 - 120	0.004
3/8"	DN10	10 - 1,000	100 - 1,000	50 - 1,000	0.045
1/2"	DN15	20 - 3,000	300 - 3,000	150 - 3,000	0.09
1"	DN25	80 - 8,000	600 - 8,000	300 - 8,000	0.25
1½"	DN38	240 - 3,200	2,400 - 3,200	1,000 - 3,200	1
2"	DN50	500 - 50,000	5,000 - 50,000	2,500 - 50,000	2
3"	DN75	800 - 120,000	10,000 - 120,000	6,000 - 120,000	3.5
4"	DN100	1,500 - 200,000	20,000 - 200,000	10,000 - 200,000	7
6"	DN150	5,000 - 500,000	50,000 - 5,00,000	30,000 - 5,00,000	23
8"	DN200	10,000 - 1,000,000	100,000 - 1,000,000	50,000 - 1,000,000	45
10"	DN250	15,000 - 1,500,000	150,000 - 1,500,0000	75,000 - 1,500,000	70

Model: F-1001-M series Micro bend sensor, Size 1/8 inch to 10 inch
Flow range for liquid (US unit in lb/hr) Table 1.4

Size (inch)		Full flow range, lb/hr	Accuracy flow range, lb/hr		Zero stability lb/hr
			+/- 0.1%	+/- 0.2% and +/- 0.5%	
1/8"	DN3	2 - 265	22 - 265	13 - 265	0.0088
3/8"	DN10	22 - 2,204	220.40 - 2,204	110 - 2,204	0.099
1/2"	DN15	44 - 6,613	661.30 - 6,613	330 - 6,613	0.2
1"	DN25	176 - 17,636	1322 - 17,636	661 - 17,636	0.55
1½"	DN38	529 - 52,910	5,291 - 52,910	2,204 - 52,910	2.2
2"	DN50	1,102 - 110,231	11,023 - 110,231	4,409 - 110,231	4.41
3"	DN75	1,767 - 264,555	22,046 - 264,555	13,227 - 264,555	7.72
4"	DN100	3306 - 440,925	44,092 - 440,925	22,046 - 440,925	15.43
6"	DN150	11,023 - 1,102,311	110,231 - 1,102,311	6,6138 - 1,102,311	50.71
8"	DN200	22,046 - 2,204,622	220,462 - 2,204,622	110,231 - 2,204,622	99.21
10"	DN250	33,069 - 3,307,000	330,693 - 3,307,000	165,346 - 3,307,00	154.32

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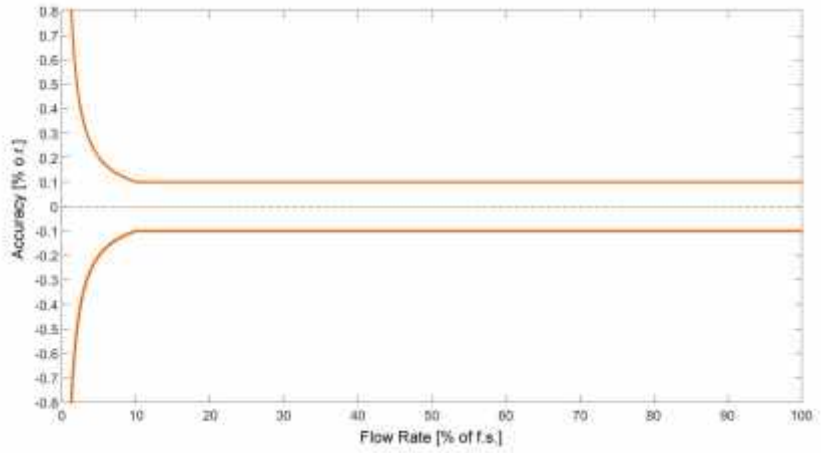
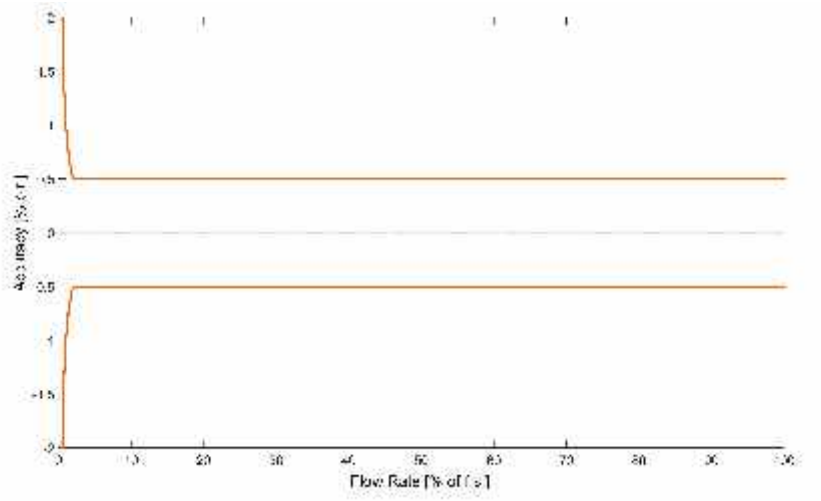
Technical Specification

Flow rate	
Mass flow rate(max)	3,307,000 lb/hr. (1500,000 kg/hr)
Volumetric Flow Rate (max.)	6604GPM or 9434BPD or 1500,000 liter/hr
Pressure	3770 PSI (26 Mpa), 5800PSIG (40MPa) available (see pressure range table)

Accuracy For Liquids:
(Five-Point Calibration, Basic Accuracy: ±0.1 %)



Accuracy For Gases:
(Five-Point Calibration, Basic Accuracy: ±0.5 %)



Flow Rate of full Scale	Accuracy
$\geq \frac{\text{Zero Point}}{\text{Basic Accuracy}} * 100$	± Basic Accuracy
$< \frac{\text{Zero Point}}{\text{Basic Accuracy}} * 100$	$\pm \frac{\text{Zero Point}}{\text{Measured Value}} * 100$

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ACCURACY (LIQUIDS)

Basic Accuracy (Mass flow)[2]	±0.1%, ±0.2% or ±0.5%
Mass Flow Repeatability	± 0.05% (for 0.1% accuracy), ± 0.1% (for 0.2% accuracy) or ±0.25% (for 0.5% accuracy)
Basic Accuracy (Volume flow)[2]	±0.4 % (option: up to ±0.15 %) of flow rate
Repeatability (Volume Flow)	±0.05 % of flow rate
Zero Stability	±0.01 % of full scale

ACCURACY (GASES)

Basic Accuracy (Mass flow)[2]	±1% (option: up to ±0.5 %) of flow rate
Mass Flow Repeatability	±0.25 % of flow rate

DENSITY

Density Range	up to 2500 kg/m³, 2.5 g/cm³
Density Accuracy[2]	±1.0 kg/m³, ±0.001 g/cm³
Density Repeatability	±0.5 kg/m³, ±0.0005 g/cm³

TEMPERATURE

Process Temperature Range	-50 °C … +250 °C (-40 °F … +212 °F)
Option	-196 °C … +55°C (-320.8°F...131°F)
Temperature Accuracy	±1 °C ±0.5 % of reading (±1.8 °F ± 0.5% of reading)
Temperature Repeatability	±0.2 °C (±0.36 °F)
Ambient Temperature	-40°F to 131°F (-40°C to +55°C)
Output	4-20 mA and Pulse/Frequency, Optional: HART or Modbus RTUC (RS485) Pulse Output: 0 to 10 kHz, 0.001%F.S; Current Output: 4 to 20mA, 0.005% F.S
Electronics	Direct Mount or Remote Mount
Graphic Display	OLED
Operating Elements	3 optical keys for operator
Electromagnetic compatibility	Criteria A, complied with IEC 61000-4-2
Power Supply	85 to 265 VAC, 18 to 36 VDC
IP	Standard IP65, IP67 for options

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F-1001 transmitter

F-1001 transmitter is a high-performing transmitter that uses a micro-processor and offers zero calibration, adjustable pulse outputs, an RS485, and a HART communication protocol. It is highly stable and accurate, as well as easy to install and operate. It requires low maintenance, which keeps your process downtime to a minimum and covers the cost of ownership over the long term.

F-1001 Series Coriolis Mass Flowmeter

The F-1001 Coriolis Mass Flowmeters are available in the following 3 configurations

U type super bend sensor
Size from 1 1/2”to 8”

These flowmeters are comprised of two tubes that are arranged in the shape of the letter 'U', a magnet and coil assembly, and sensors at the inlet and outlet of the tubes. Coriolis forces exerted by the flow medium are used to determine the mass flow rate and density of the medium.
U type is the best and most stable sensor for custody transfer measurement.

M type Micro-bend sensor
Size from 1/8” to 12”

These flowmeters are comprised of two V-Shaped tubes in a casing with a considerably smaller radius than conventional U-Shaped Coriolis flowmeters. The smaller radius ensures a more compact instrument with significantly lower pressure loss values compared to other flowmeters.

S type super bend sensor
Size from 2”to 3”

These flowmeters are comprised of two less bend tubes in a casing with a considerably smaller radius than conventional M-Shaped Coriolis flowmeters. Less sizing means less installation dimension requirement for smart process measurement.

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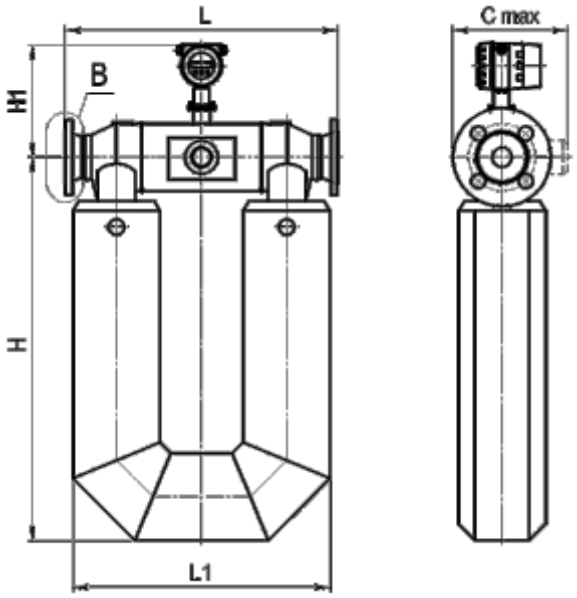
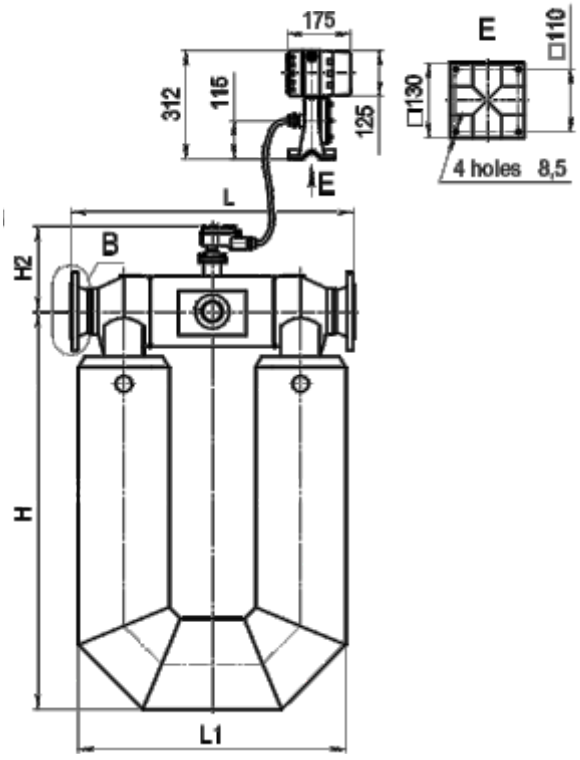
Outline dimensions and weight

U type senor installation dimension



Compact version: Figure A.1.1 (F-1001-U Series)



Remote version: Figure A.1.2 (F-1001-U Series)

Table 1.5 F-1001 U type sensor dimension

Size	L, in mm		L1, in mm	H, in mm	H1, in mm	H2, in mm	Cmax, in mm	Weight, lb kg	
	≤ 300# (4 MPa)	≥ 600# (6.3 MPa)						A.2.1	A.2.2
1½" (DN40mm)	20.47 520	21.54 547	17.72 450	25.98 660	11.02 285	7.56 192	7.87 200	74.96 34	81.57 37
2" (DN50mm)	21.97 558	23.15 588	20.55 522	29.45 748	11.42 288	7.95 202	7.87 200	97 44	103.62 47
3" (DN80mm)	30.71 780	31.81 808	27.76 705	40.55 1030	12.6 326	9.53 242	9.06 230	229.28 104	235.89 107
4" (DN100mm)	36.22 920	37.32 948	33.58 853	44.88 1140	13.78 356	11.02 272	10.71 272	947.99 430	954.6 433
6" (DN150mm)	43.31 1100	44.88 1140	41.34 1050	59.84 1526	60.08 386	11.89 302	11.89 302	1278.68 580	1285.29 583
8" (DN200mm)	53.7 1364	55.51 1410	45.67 1160	65.16 1655	17.09 434	13.78 350	13.78 350	2050.3 930	2056.91 933

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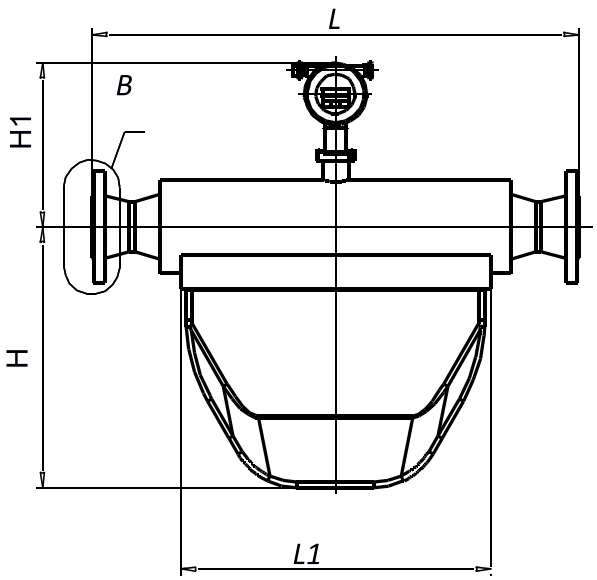
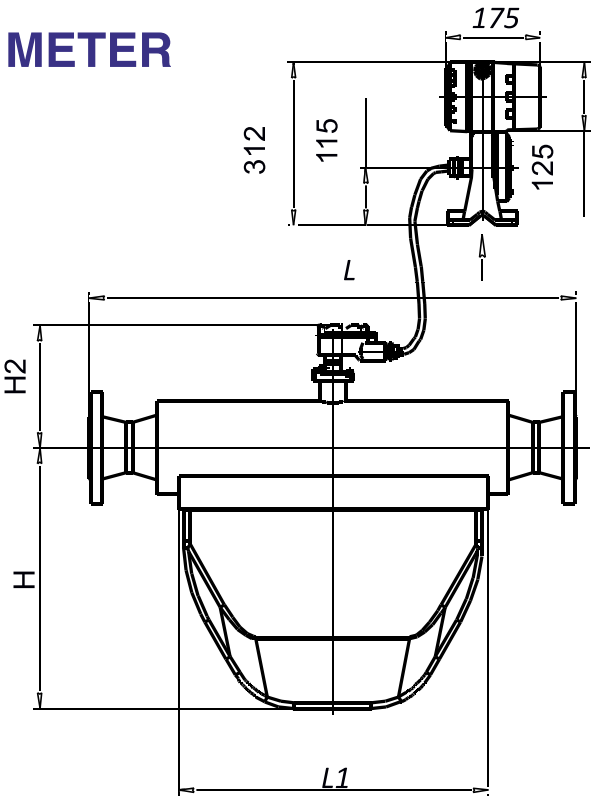
CORIOLIS MASS FLOW METER

M type senor installation dimension





Compact version– Figure A.2.1 (F-1001-M Series) **Remote version Figure A.2.2 (F-1001-M Series)**

Table 1.6 - Outline dimesnions and weight

Process connection size	L, in mm		L1,in mm	H,in mm	H1,in mm	H2,in mm	max,in mm *	Weight,lb kg	
	≤300# (4 MPa)	≥600# (6.3 MPa)						A.2.1	A.2.2
1/8" (DN3mm)	12.64 321	13.58 345	88.98 2260	4.53 115	9.84 250	6.69 170	3.23 82	11.02 5	17.64 8
3/8" (DN10mm)	16.69 424	19.06 484	11.89 302	6.06 154	10.63 270	7.28 185	4.33 110	22.05 10	28.66 13
½" (DN15mm)	15.75 400	16.30 414	11.02 280	7.52 191	11.73 298	8.39 213	4.53 115	24.25 11	30.86 14
1" (DN25mm)	19.69 500	21.1 536	14.17 360	10.16 258	11.89 302	8.58 218	5.91 150	33.07 15	39.68 18
1½" (DN40mm)	23.62 600	24.96 634	18.11 460	12.05 306	12.4 315	9.06 230	6.5 165	61.73 28	68.34 31
2" (DN50mm)	31.5 800	31.6 828	25.2 640	16.14 410	12.8 325	9.45 240	8.07 205	105.82 48	112.44 51
3" (DN80mm)	35.43 900	36.54 928	27.56 700	19.49 495	13.78 350	10.43 265	16.38 416	213.85 97	220.46 100
4" (DN100mm)	44.49 1130	45.51 1156	33.86 860	26.18 665	14.57 370	11.22 285	17.32 440	586.43 266	593.04 269
6" (DN150mm)	57.09 1450	58.66 1490	47.24 1200	35.63 905	15.75 400	12.44 316	21.06 535	1014.13 460	1020.74 463
8" (DN200mm)	70.87 1800	72.64 1845	57.09 1450	46.25 1175	16.77 426	13.46 342	22.83 580	1146.4 520	1153.02 523
10" (DN250mm)	77.4 1966	78.98 2006	60.24 1530	51.18 1300	18.43 468	15.08 383	23.62 600	1278.68 580	1285.29 583

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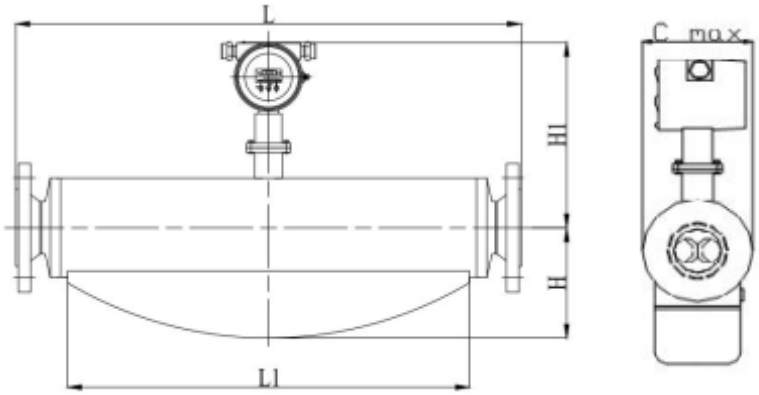
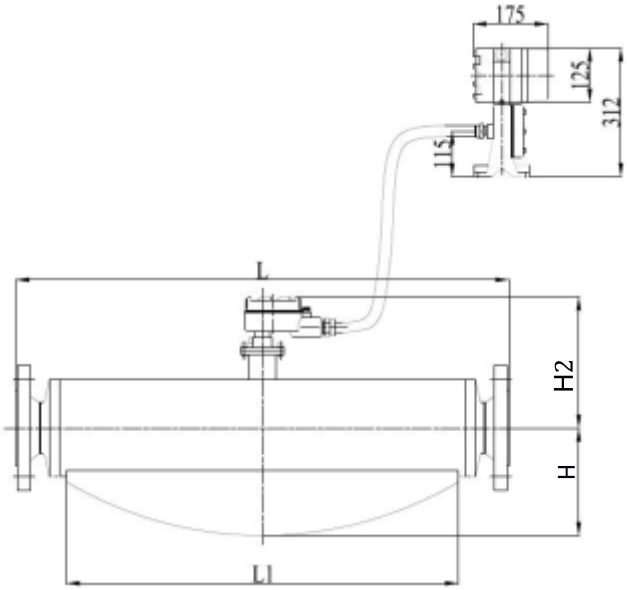


Compact version – Figure A.3.1 (F-1001S series)



Remote version Figure A.3.2 (F-1001S series)

size	L, in mm		L1, in mm	H, in mm	H1, in mm	H2, in mm	max, in mm	Weight, lb kg
	≤ 300# (4 MPa)	≥ 600# (6.3 MPa)						A3.1 A3.2
2" (Dn50mm)	31.5 800	32.83 834	23.15 588	7.87 200	12.99 330	9.84 250	8.07 205	103.62 47
3" (Dn80mm)	36.81 935	38.31 973	28.74 730	7.87 200	13.98 355	10.63 270	16.38 416	176.37 80

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CORIOLIS MASS FLOW METER

Tri-clamp connection

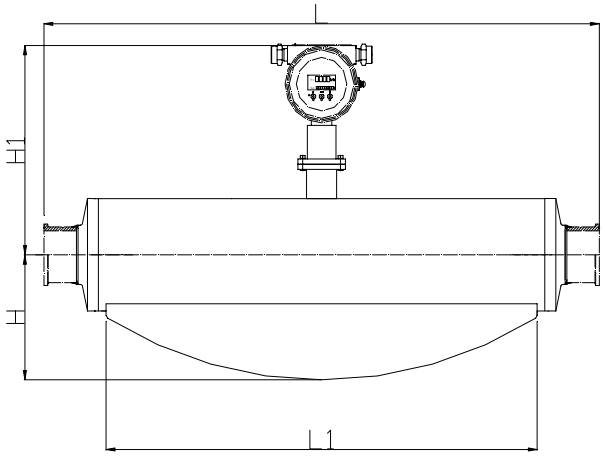
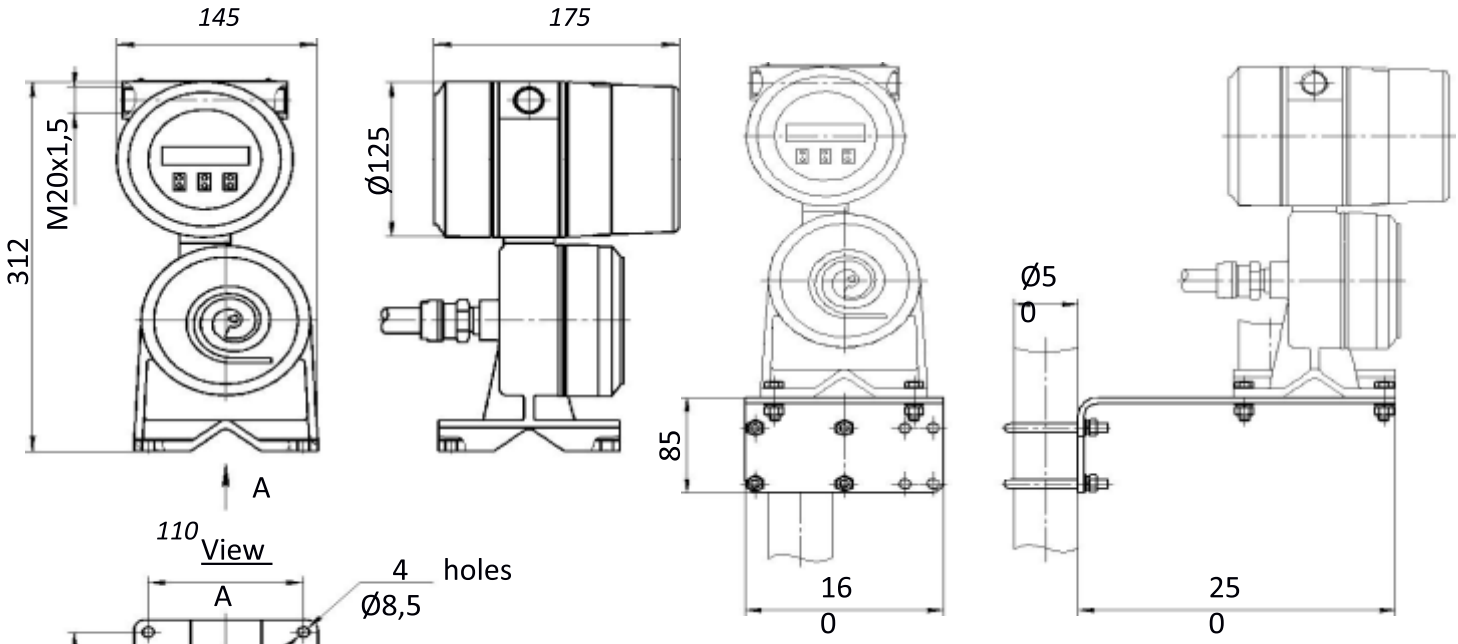


Figure A.3.2 Outline dimensions (F-1001-S series)

Table A.3.2 – Outline dimensions and weight

Process connection size mm,in	Figure	L, mm inch		L_1, mm inch	H, mm inch	H_1, mm inch	C max, mm* inch	Weight, kg lb
		≤ 300# (4 MPa)	≥ 600# (6.3 MPa)					A.3
DN50, 2 inch	A.4	31.5 800	32.83 834	450 17.72	200 7.87	315 12.40	205 8.07	30 66.14
DN80, 3 inch	A.4	36.81 935	38.31 973	645 25.30	200 7.87	335 13.19	416 16.38	60 132.28



A.4 remote type electronic units dimension

A.5 Bracket installation dimension

Figure A.4 Overall dimensions and connection size of electronic unit of remote type

Figure A.5 Bracket for fixing remote type electronic unit on the assembly stand

Model Selection

F-1001 Series Coriolis mass flow meter	Ordering Codes	
F-1001		Description
1/8”	003	Line Size
3/8”	010	
1/2”	015	
1”	025	
1½"	040	
2”	050	
2½"	065	
3”	080	
4”	100	
6”	150	
8”	200	
10”	250	
12”	300	
Liquid	L	Medium
Gas	G	
U-type sensor(from 1 1/2" to 10")	U	Sensor type
M- type sesnor(1/8" to 10")	M	
S type sensor (2" to 3")	S	
DIN PN16 1.6MPa	D16	Process connection
DIN IN25 2.5MPa	D25	
DIN PN40 40.MPa	D40	
DIN PN63 6.3MPa	D63	
DIN PN100 10MPa	D10	
DIN PN160 16MPa	D60	
DIN PN250 25MPa	D50	
ANSI 150# RF	A15	
ANSI 300#RF	A30	
ANSI 600#RF	A60	
ANSI 900#RF	A90	
ANSI 1500#RF	A50	
JIS 10K	10K	
JIS 30K	30K	
Sanitary fitting connection	SFC	
Customized connecton	CSC	
230Psi(16bar)	1	Nominal Pressure (MPa)
360Psi(25bar)	2	
580Psi(40bar)	3	
915Psi(63bar)	4	
1450Psi(100bar)	5	
2320Psi(160bar)	6	
3625Psi(250bar)	7	
Compact version -122°F to +257°F (-50°C to +125°C)	COM	Structures
Remote Version -122°F to +392°F (-50°C to +200°C)	REM	
Remote Version -122°F to +572°F (-50°C to +300°C)	RXM	

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PEREGRINE CORIOLIS MASS FLOW METER

Not for hazardous application	NX					Explosion Proof
UL and CSA approved for Class I, Div.1 Groups B, C and D	CS					
ATEX and IECEX approved for II 2G Exdb ib IIA/IIB/IIC T*Gb	AX					
DC18 to 36V		1				Power
AC85 to 265V		2				
4 to 20mA+ Pulse			P			Output
Modbus RTU(RS485) 4-20mA+Pulse			R			
HART+4-20mA+Pulse			H			
2*4-20mA+Pulse			S			
+/-0.1% of RD				1		Accuracy
+/-0.2% of RD				2		
+/-0.5% of RD				5		

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6318 Union Avenue, Shreveport, LA 71106
318.222.2224 ▪ 318.222.7222 Fax
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