



Advanced mass metering technology

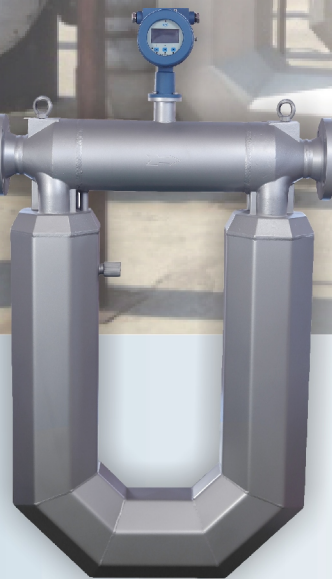
ARTC Coriolis mass flow meter

Typical application

- Custody Transfer
- Reactor Feed Ratio
- Density Measurement
- Batch Control

Industries

- Chemicals
- Food & Beverages
- Machinery
- Minerals & Mining
- Oil & Gas
- Pharmaceuticals
- Power Plant
- Pulp & Paper
- Water
- Waste Water



ARTC

Coriolis Mass Flowmeter



INTRODUCTION

ARTC Coriolis mass flowmeter provides best mass flow, density and temperature measurement performance, and also calculate volume flow, total flow and fluid composition in real-time. Currently it has three styles available which are M type sensor, U type sensor and S type sensor, Meanwhile each series has its own compact and remote meters.

In general, a typical mass flowmeter is made up of a flow sensor and a signal transmitter. The flow sensor is designed to equip two flow tubes for vibration which resulting in signals for pickoff; The signal transmitter is employed with digital signal processor (DSP), and dynamic vibration balance (DVB) circuit to deliver fast response but accurate measurement performance. In addition, in situ node-configuration, diagnostics and data recording are easily handled via HART or Modbus RTU communication.



coriolis mass flow meter families

FEATURES

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

MATERIALS

- Tubes: SS316L (Hastalloy C for options)
- Flow Splitter: SS304 (SS316L and Hastalloy C for options)
- Flanges: SS304 (SS316L and Hastalloy C for options)
- Housing case(NON WETTED PARTS)
SS304(SS316L for options)
- Options: NACE MR 0175/0103 compliant

EX Certificates



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

BENEFITS

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

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ARTC Coriolis Mass Flowmeter



APPLICATION

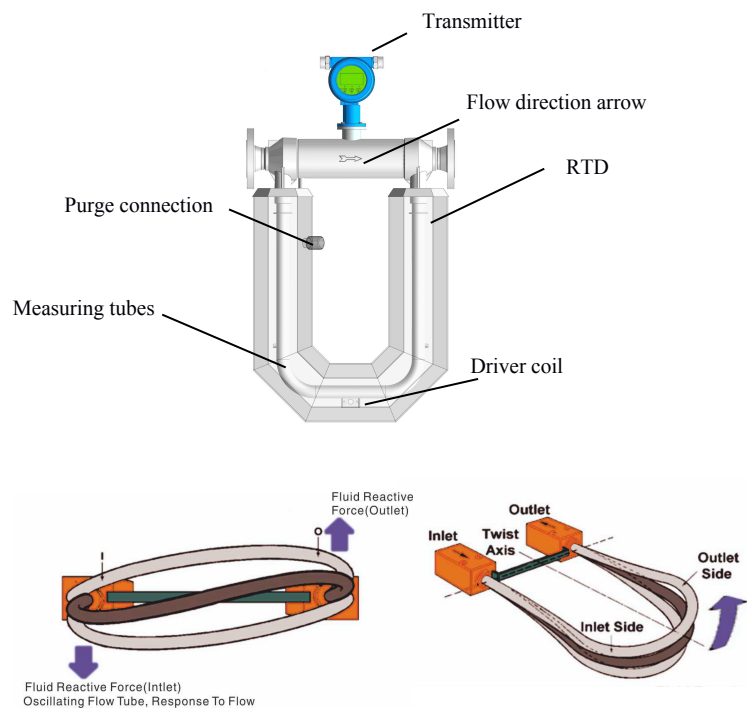
ARTC mass flowmeter is suitable for the most complex and challenging environment for liquid, gas and slurry applications.

Process fluid	Typical application	Industries	
Liquid	Custody Transfer	Chemicals	Pharmaceuticals
	Reactor Feed	Food & Beverages	
Gas	Ratio	Machinery	Power Plant
Slurry	Density Measurement	Minerals & Ming	Pulp & Paper
	Batch Control	Oil & Gas	Water



PRINCIPLE

ARTC 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.



Technical Specification

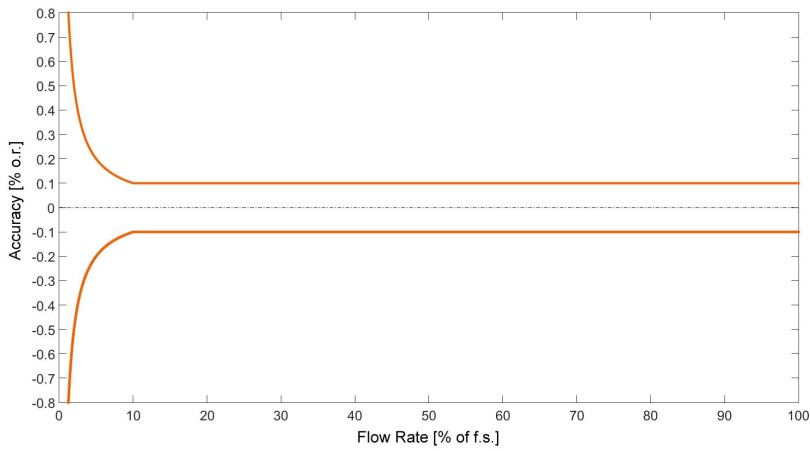
Flow rate	
Mass flow rate(max.):	3,307,000lb/h (1500,000 kg/h)
Volumetric Flow Rate (max.):	6604GPM or 9434BPD or 1500,000liter/h
PRESSURE	3770 PSI (26 MPa), 5800PSIG (40MPa) available (see pressure range table)

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Coriolis Mass Flowmeter

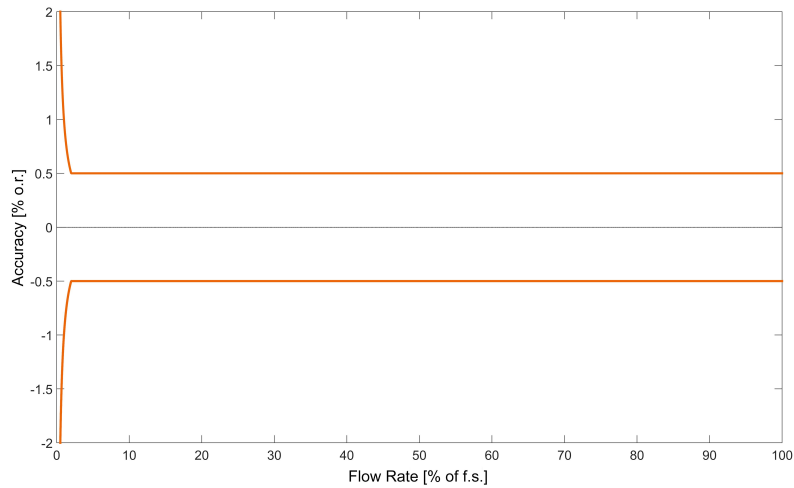
Accuracy For Liquids:

(Five-Point Calibration, Basic Accuracy: $\pm 0.1\%$)



Accuracy For Gases:

(Five-Point Calibration, Basic Accuracy: $\pm 0.5\%$)



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

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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/m ³ , 2.5 g/cm ³
Density Accuracy: ²	±1.0 kg/m ³ , ±0.001 g/cm ³
Density Repeatability:	±0.5 kg/m ³ , ±0.0005 g/cm ³

TEMPERATURE

Process Temperature Range:	-50 °C ... +250 °C (-40 °F ... +212 °F)
Option:	-196 °C ... +55 °C (-320.8...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 to 131 °F (-40 to +55 °C)
Output	4-20 mA and Pulse/Frequency , Optional: HART or Modbus 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

- Stated flow accuracy combines the effects of repeatability, linearity and hysteresis.
- The specifications refer to standard conditions (for further information see GPE -F1001 Series Manual).

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Table 1.2.9 – Measuring mass flow range for liquid(Metric unit)

Model ARTC-S Size 2 to 3 inch available

Size(inch)	Full flow range, kg/h	Accuracy flow range, kg/h		Zero stability, kg/h
		+/-0.1%	+/-0.2% and +/-0.5%	
2"	500 – 40,000	5,000 – 40,000	2,000 – 50,000	2
3"	800 – 120,000	10,000 – 120,000	6,000 – 120,000	3.5

Table 1.2.10 – Measuring mass flow range for liquid(US unit)

Size(inch)	Full flow range, Lb/m	Accuracy flow range, lb/m		Zero stability, Lb/m
		+/-0.1%	+/-0.2% and +/-0.5%	
2"	19 – 1,837	184 – 1837	92 – 1,837	0.13778
3"	30 – 4,409	294 – 4409	294 – 4,409	0.32150

Table 1.2.11 – Measuring volumetric flow range for liquid(Metric unit)

Size(inch)	Full flow range, Liters/h	Accuracy flow range, Liters/h		Zero stability, kg/h
		+/-0.1%	+/-0.2% and +/-0.5%	
2"	500 – 40,000	5,000 – 40,000	2,000 – 50,000	2
3"	800 – 120,000	10,000 – 120,000	6,000 – 120,000	3.5

Table 1.2.12 – Measuring volumetric flow range for liquid(US unit)

Size(inch)	Full flow range, gal/min	Accuracy flow range, gal/min		Zero stability, gal/min
		+/-0.1%	+/-0.2% and +/-0.5%	
2"	2.20 – 220.00	22.01– 220.00	11.01 – 220.00	0.00660
3"	3.52– 528.34	35.22– 528.34	24.22– 528.34	0.01541

Flow range

Flow range for liquid(Metric unit in kg/hr) Table 1.1

Model: ARTC - U type sensor

ARTC - U size 1 1/2" inch to 8 inch

Size(inch)	Full flow range, kg/h r	Accuracy flow range, kg/h r		Zero stability, kg/h
		+/-0.1%	+/-0.2% and +/-0.5%	
1 1/2"	240– 32,000	2,500 – 32,000	1500 – 32,000	0.9
2"	500 – 50,000	3,500 – 50,000	2,000 – 50,000	1.5
3"	800– 140,000	8,000 – 140,000	6,000 – 140,000	3.5
4"	1,500– 200 000	15,000 – 200,000	10,000 – 200,000	7
6"	5,000 – 500,000	50,000 – 500,000	28,000 – 500,000	17
8"	10,000 – 1,200,000	200,000 – 1 200,000	80,000 – 1200,000	45

Flow range for liquid(US unit in lb/hr) Table 1.2

Model: ARTC - U type sensor

ARTC - U: size 1 1/2inch to 8

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

Flow range fo liquid(Metric unit in kg/hr) Table 1.3

Model: ARTC - M series Micro bend sensor Size 1/8 inch to 10 inch

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"	1.2–120	10–120	6–120	0.004
3/8"	10 – 1,000	100– 1,000	50 – 1,000	0.045
1/2"	20 – 3,000	300 – 3,000	150 – 3,000	0.09
1"	80 – 8,000	600– 8,000	300– 8,000	0.25
1 1/2"	240– 32,00	2,400– 3,200	1,000– 3,200	1
2"	500 – 50,000	5,000 – 50,000	2,000– 50,000	2
3"	800– 120,000	10,000– 120,000	6,000– 120,000	3.5
4"	1,500– 200,000	20,000– 200,000	10,000– 200,000	7
6"	5,000 – 500,000	50,000 – 500,000	30,000 – 500,000	23
8"	10,000 – 1,000,000	100,000 – 1,000,000	50,000 – 1,000,000	45
10"	15,000 –1,500,000	150,000–1,500,000	75,000–1,500,000	70

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ARTC

Coriolis Mass Flowmeter



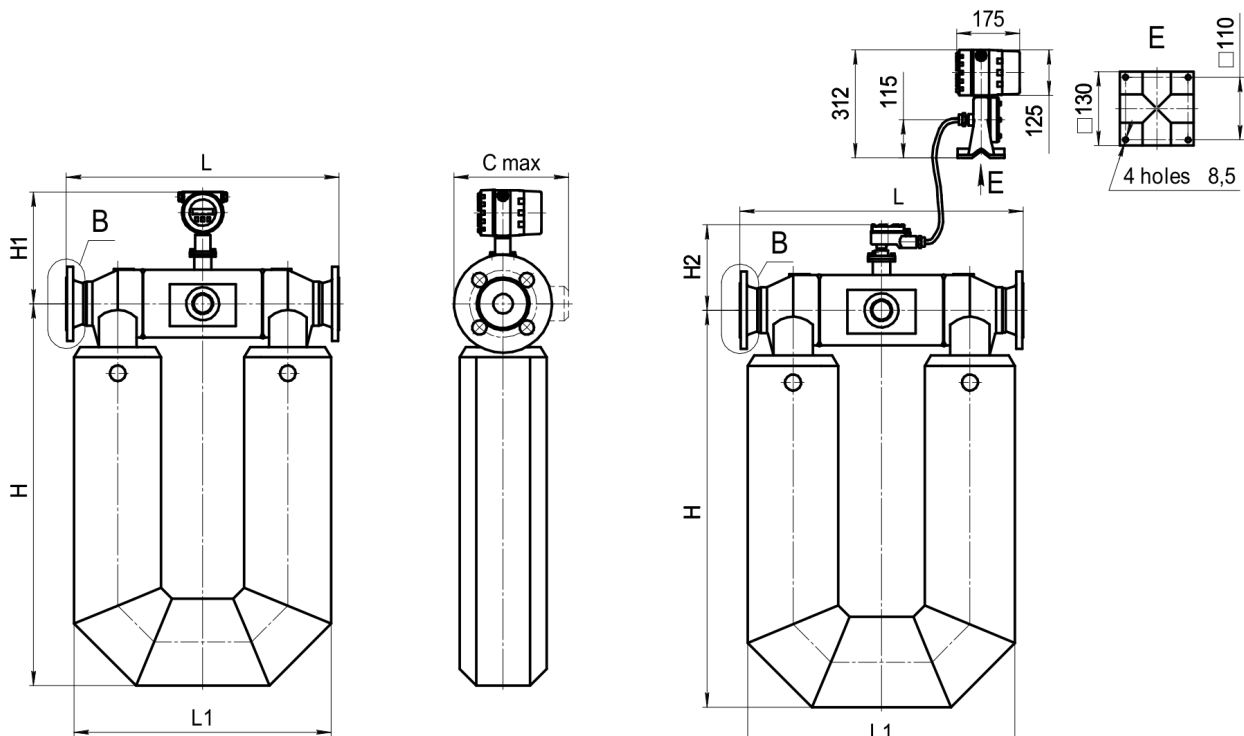
Flow range for liquid(US unit in lb/hr) Table 1.4

Model: ARTC - M series Micro Bend sensor Size 3/8 inch to 10 inch

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"	2–265	22–265	13–265	0.0088
3/8"	22–2,204	220.40–2,204	110–2,204	0.099
1/2"	44–6,613	661.30–6,613	330–6,613	0.2
1"	176–17,636	1322–17,636	661–17,636	0.55
1 1/2"	529–52,910	5,291–52,910	2,204–52,910	2.2
2"	1,102–110,231	11,023–110,231	4,409–110,231	4.41
3"	1,767–264,555	22,046–264,555	13,227–264,555	7.72
4"	3306–440,925	44,092–440,925	22,046–440,925	15.43
6"	11,023– 1,102,311	110,231– 1,102,311	6,6138– 1,102,311	50.71
8"	22,046–2,204,622	220,462–2,204,622	110,231–2,204,622	99.21
10"	33,069–3,307,000	330,693–3,307,000	165,346–3,307,000	154.32

Outline dimensions and weight

U type sensor installation dimension (Fig. A 1.1 and A1.2)



Compact version – Figure A.1.1(F1001-U series)

Remote version – Figure A.1.2(F1001-U series)

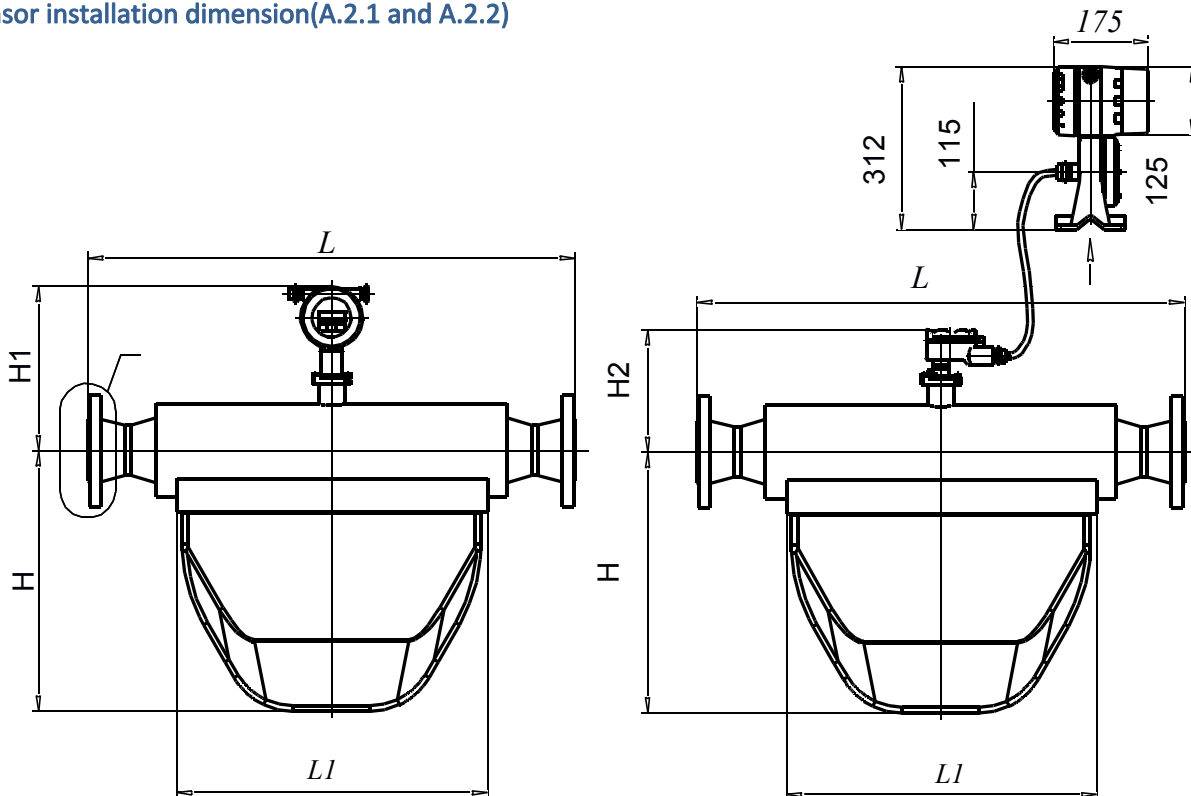
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Coriolis Mass Flowmeter

Table 1.5 ARTC - U type sensor dimension

Size	L, in mm		L ₁ , in mm	H, in mm	H ₁ , in mm	H ₂ , in mm	C _{max} , in MM	Weight,lb kg	
	≤300# (4 MPa)	≥600# (6.3 MPa)						A.2.1	A.2.2
	1 1/2" (Dn40mm)	20.47 520							
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

M type sensor installation dimension(A.2.1 and A.2.2)



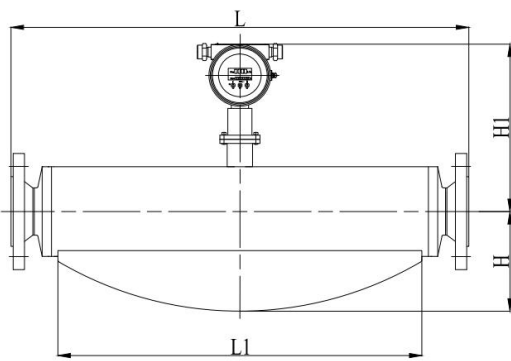
Compact version – Figure A.2.1(F1001-M series)

Remote version Figure A.2.2(F1001-M series)

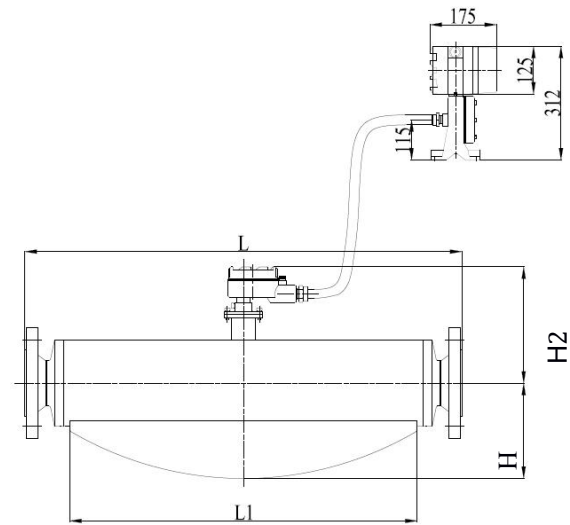
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Table 1.6 – Outline dimensions and weight

Process connection size	L, in mm		L1, in mm	H, in mm	H1, in mm	H2, in mm	C max, in mm *	Weight, lb kg	
	≤300# (4 MPa)	≥600# (6.3 MPa)						A.2.1	A.2.2
1/8”(Dn3mm)	12.64	13.58	88.98	4.53	9.84	6.69	3.23	11.02	17.64
	321	345	2260	115	250	170	82	5	8
3/8”(Dn10mm)	16.69	19.06	11.89	6.06	10.63	7.28	4.33	22.05	28.66
	424	484	302	154	270	185	110	10	13
1/2”(Dn15mm)	15.75	16.30	11.02	7.52	11.73	8.39	4.53	24.25	30.86
	400	414	280	191	298	213	115	11	14
1”(Dn25mm)	19.69	21.1	14.17	10.16	11.89	8.58	5.91	33.07	39.68
	500	536	360	258	302	218	150	15	18
1 1/2”(Dn40mm)	23.62	24.96	18.11	12.05	12.4	9.06	6.5	61.73	68.34
	600	634	460	306	315	230	165	28	31
2”(Dn50mm)	31.5	31.6	25.2	16.14	12.8	9.45	8.07	105.82	112.44
	800	828	640	410	325	240	205	48	51
3”(Dn80mm)	35.43	36.54	27.56	19.49	13.78	10.43	16.38	213.85	220.46
	900	928	700	495	350	265	416	97	100
4”(Dn100mm)	44.49	45.51	33.86	26.18	14.57	11.22	17.32	586.43	593.04
	1130	1156	860	665	370	285	440	266	269
6”(Dn150mm)	57.09	58.66	47.24	35.63	15.75	12.44	21.06	1014.13	1020.74
	1450	1490	1200	905	400	316	535	460	463
8”(Dn200mm)	70.87	72.64	57.09	46.25	16.77	13.46	22.83	1146.4	1153.02
	1800	1845	1450	1175	426	342	580	520	523
10”(Dn250)	77.4	78.98	60.24	51.18	18.43	15.08	23.62	1278.68	1285.29
	1966	2006	1530	1300	468	383	600	580	583



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

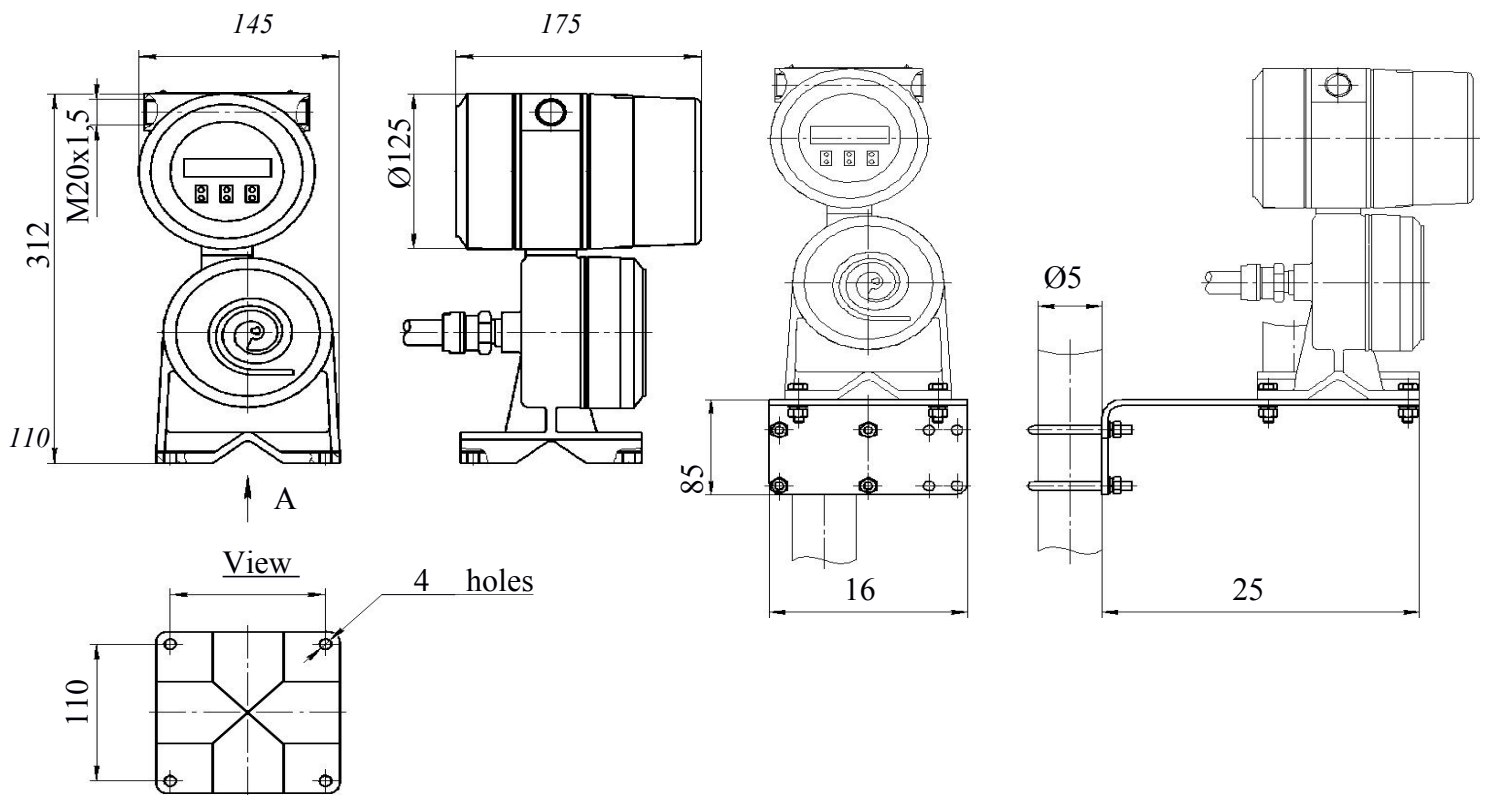


Remote version Figure A.3.2(ARTC-S series)

size	L, in mm		L1, in mm	H, in mm	H1, in mm	H2, in mm	C max, in mm *	Weight, lb kg	
	≤300# (4 MPa)	≥600# (6.3 MPa)						A.3.1	A3.2
2”(Dn50mm)	31.5	32.83	23.15	7.87	12.99	9.84	8.07	103.62	
	800	834	588	200	330	250	205	47	
3”(Dn80mm)	36.81	38.31	28.74	7.87	13.98	10.63	16.38	176.37	
	935	973	730	200	355	270	416	80	

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Remote Transmitter installation dimensions



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

Transmitter and sensor structure



ARTC 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.

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Coriolis Mass Flowmeter



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

Ordering code

**** Please contact your local GPE application engineer when ordering.**

You also need to provide the following information when ordering :

Ordering Model	Fluid Name	Flange type	Temperature	Process pressure.

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Model Selection												Description
ARTC	-050	L	S	A1	-1	CM	U	D	S	2		Suffix Code / Model Number
Caliber / Tube Size												Please Refer to Table 1
Medium		L										Liquid
		G										Gas
Sensor Type			U									U - Type (1-1/2" to 8")
			M									M - Type (1/8" to 10")
			S									S - Type (2" to 3")
				J1								JIS 10K (Flange)
Process Connection				J2								JIS 20K (Flange)
				A1								ANSI 150 (Flange)
				A2								ANSI 300 (Flange)
				P1								PN10 (Flange)
				P2								PN 16 (Flange)
				SF								Sanitary (Tri - clamp)
				OF								Customized (Can Request)
	Working Pressure					1						
					2							360 Psi (25 Bar)
					3							580 Psi (40 Bar)
					4							915 Psi (63 Bar)
					5							1450 Psi (100 Bar)
					6							2320 Psi (160 Bar)
					7							3625 Psi (250 Bar)
					X							Special Pressure (Can Request)
Structure						CM						Compact Version -58°F to +257°F (-50°C to +125°C)
						RE						Remote Version -58°F to +392°F (-50°C to +200°C)
						RX						Remote Version -58°F to +572°F (-50°C to +300°C)
						LO						Low Temp. Version -320°F to +131°F (-196°C to -55°C)
Approval							N				Non for Hazadous Application	
Power									U			UL and CSA Approved for Class I, Div.1 Groups B,C,and D.
									A			ATEX and IECEX Approved for II 2G Exdb ib IIA/IIB/IIC T*Gb
Signal & Communication										D		DC18 to 36V
										A		AC85 to 265V
										P		4 - 20mA + Pulse
										R		4 - 20 mA, Pulse, Modbus RTU (RS485)
Accuracy											H	HART, 4 - 20 mA, Pulse
											S	2 x 4 - 20 mA, Pulse, Modbus RTU (RS485)
										0		± 0.05% of Reading
										1		± 0.1% of Reading
										2		± 0.2% of Reading
										5		± 0.5% of Reading

Caliber Size	Code
1/8"	003
3/8"	010
1/2"	015
1"	025
1.5"	040
2"	050
2.5"	065
3"	080
4"	100
6"	150
8"	200
10"	250
12"	300

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