Datasheet

Coriolis Mass Flow meter

SUP-FCC300

TOTAL PRESSURE SOLUTIONS

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Datasheet

Coriolis Mass Flow Meter
SUP-FCC600

The Coriolis mass flow meter is a new type of flow measurement instrument developed based on the principle of the Coriolis force. It can directly measure the mass flow rate, density, and temperature of the fluid in a closed pipeline. It can be widely applied in industries such as chemical engineering, petroleum, food, pharmaceuticals, and paper making.

Applications

- Chemical engineering
- Petroleum
- Food
- Pharmaceuticals
- Paper making

Coriolis Mass Flow Meter

Features

- directly measures the mass flow of fluids.
- Wide measuring range and high accuracy.
- Low installation requirements, no front and rear straight pipe section requirements.
- Wide range of applications, in addition to normal fluid measurement can also measure the general fluid measurement instrument is more difficult to measure the industrial media, such as high-viscosity fluids, a variety of slurries, suspensions and so on.
- can be online measurement of the measured medium density, temperature and other parameters, and as a result of the derivation of the measurement of the concentration of solutes in solution.
- Reliable operation and low maintenance.

Principle

When a particle in a pipe that rotates around a fixed point P (the center of rotation) moves towards or

away from the center of rotation, an inertial force will be generated. The principle is shown in Figure 1.

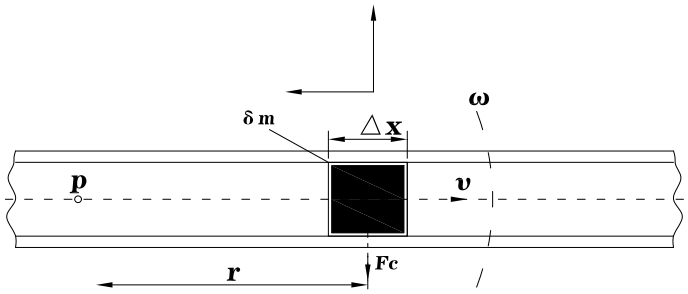


Figure 1 Mass flow measurement principle

In the figure, a particle with a mass of δm moves to the right at a constant velocity υ in the pipeline, while the pipeline rotates around the fixed point P at an angular velocity ω. At this time, the particle will obtain two acceleration components:

(1) The normal acceleration αr (centripetal acceleration), whose magnitude is equal to ω2r and whose direction is towards point P.

(2) The tangential acceleration αt (Coriolis acceleration), whose magnitude is equal to 2ωυ and whose direction is perpendicular to αr.

The force generated by the tangential acceleration is called the Coriolis force, and its magnitude is equal to Fc = 2ωυδm. In Figure 1, the fluid

Δm = ρA×ΔX. Therefore, the Coriolis force can be expressed as:

ΔFc = 2ωυ×δm = 2ω×υ×ρ×A×ΔX = 2ω×δqm×ΔX

where A represents the cross-sectional area inside the pipeline, and

Δqm = δdm/dt = υρA.

For a specific rotating pipeline, its frequency characteristics are fixed, and ΔFc depends only on δqm. Therefore, the mass flow rate can be measured by directly or indirectly measuring the Coriolis force. The Coriolis principle mass flow meter operates according to the above principle.

In actual flow meters, rotational motion is not realized; instead, pipeline vibration is used. The schematic diagrams of its principle are shown in Figures 2, 3, and 4. Both ends of a curved pipeline are fixed, and a vibrating force (at the resonant frequency of the pipeline) is applied to the middle position between the two fixed points, making the pipeline vibrate at its natural frequency ω with the fixed points as the axis. When there is no fluid flowing in the pipeline, the pipeline is only affected by the externally applied vibrating force, and the two halves of the pipeline vibrate in the same direction with no phase difference. When there is fluid flow, affected by the Coriolis force Fc of the medium particles flowing in the pipeline (in the two halves of the pipeline, the Coriolis forces F1 and F2 are equal in magnitude but opposite in direction, as shown in Figure 2), the two halves of the pipeline twist in opposite directions, generating a phase difference (as shown in Figures 3 and 4). This phase difference is proportional to the mass flow rate. The design of the flow meter is to convert the measurement of the Coriolis force into the measurement of the phase time difference on both sides of the vibrating tube. This is the working principle of the Coriolis mass flow meter.

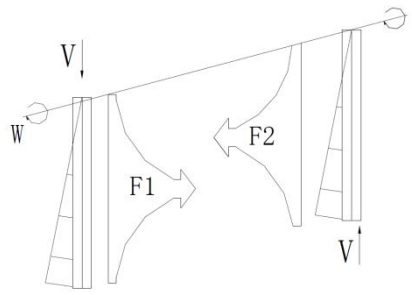


Figure 2

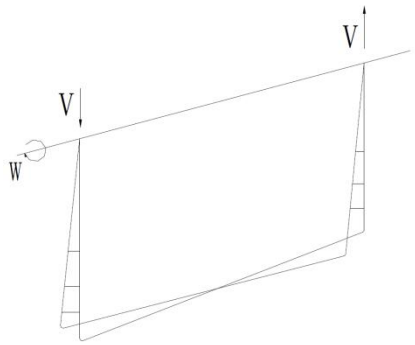


Figure 3

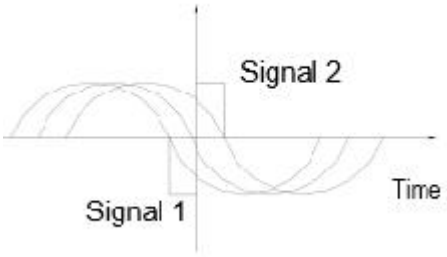
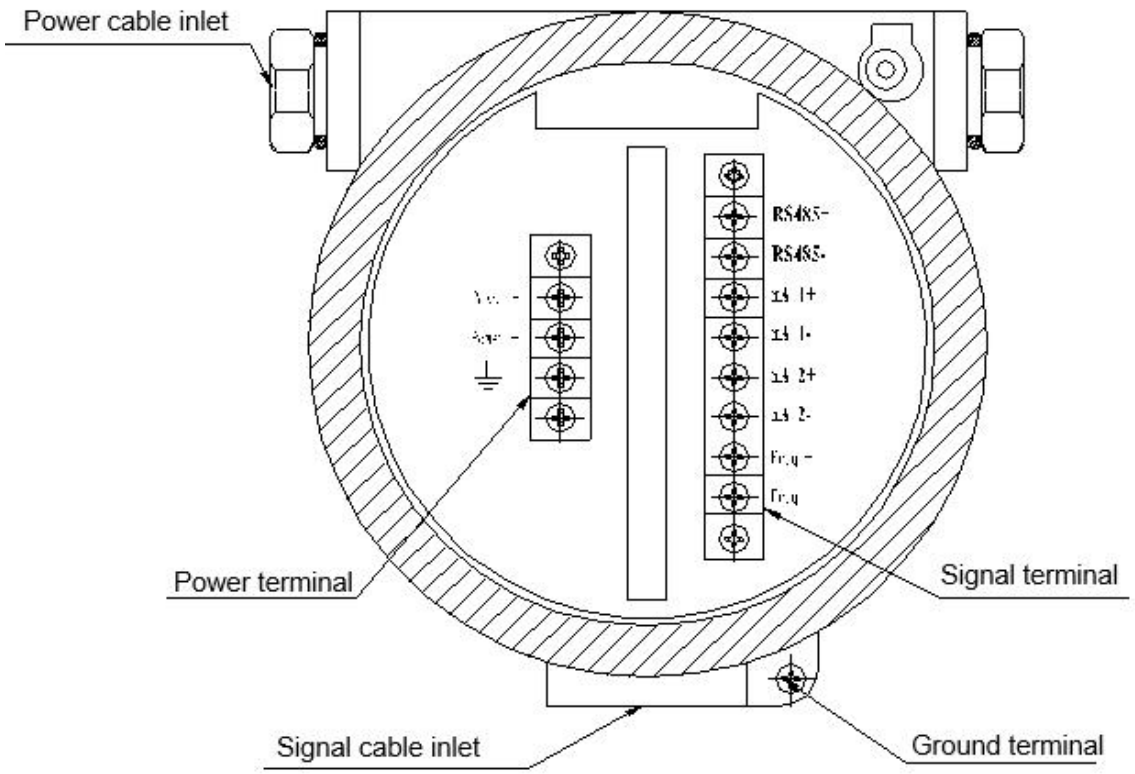


Figure 4

Parameters	
Measured Variables	Mass Flow, Density, Temperature
Nominal Diameter	Straight Pipe Type: DN8 - DN80 U-shaped Type: DN20 - DN150 Triangular Type: DN3 - DN15
Flow Rate Range (L/min)	Refer to Table 2 and Table 3
Density Measurement Range	(0.3 - 3.000) g/cm³
Temperature Measurement Range	(-200 - 300) °C
Transmitter Output	(4 - 20) mA, Output Load (250 - 600) Ω
Communication Output	RS485 Interface, MODBUS-RTU Communication Protocol; Hart
Frequency (Pulse) Output	Pulse Width: 50% Active: Output Current 10 mA, Open-circuit Voltage 24 V
Power Source	24 VDC / 220 VAC
P Power Consumption	≤ 15 W

Power Supply - Electrical Interface	M20×1.5
Accuracy	Flow: Class 0.2, Class 0.5 Density: ± 0.002 g/cm³ Temperature: ± 1 °C
Repeatability	1/2 of the Measurement Error
Medium Temperature	Standard Type: (-50 - 200) °C, (-20 - 200) °C High-temperature Type: (-50 - 350) °C Low-temperature Type: (-200 - 200) °C
Process Pressure	(0 - 4.0) MPa
Pressure Drop	The pressure drop corresponding to the maximum flow rate is 100 kPa (with water as the medium)
Temperature	-40 °C to +60 °C
Humidity	35% - 95%
Protection Grade	IP67

Wiring

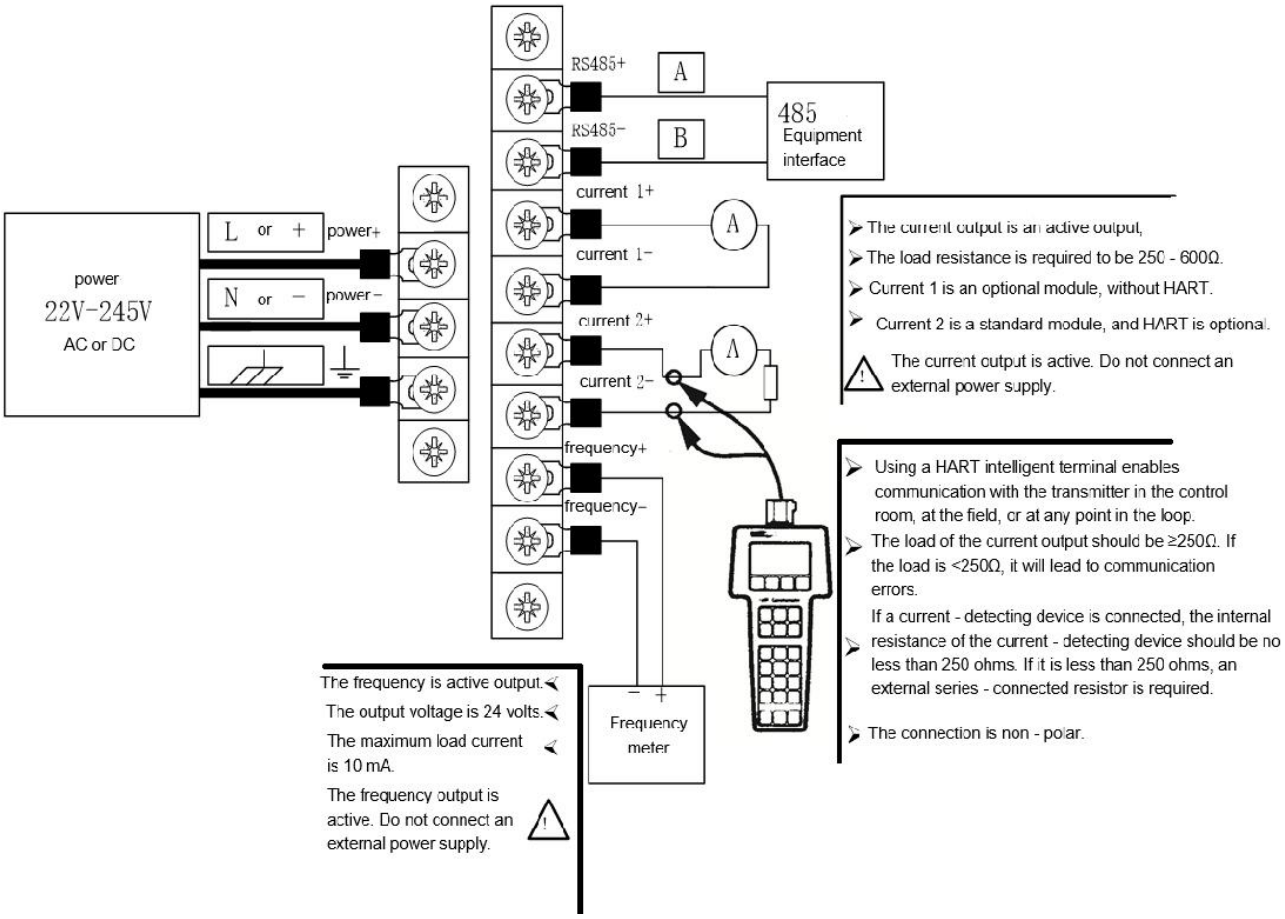


Flow meter terminals

Terminal Definitions

Symbols	Explanation
RS485+, RS485-	RS485 serial communication interface
mA1+, mA1-	The first (4 - 20) mA output interface
mA2+, mA2-	The second (4 - 20) mA output interface Hart output interface (optional)
Freq+, Freq-	Frequency (pulse) output interface
Power+, Power-	Power supply interface
⏚	Protective earth for the converter instrument

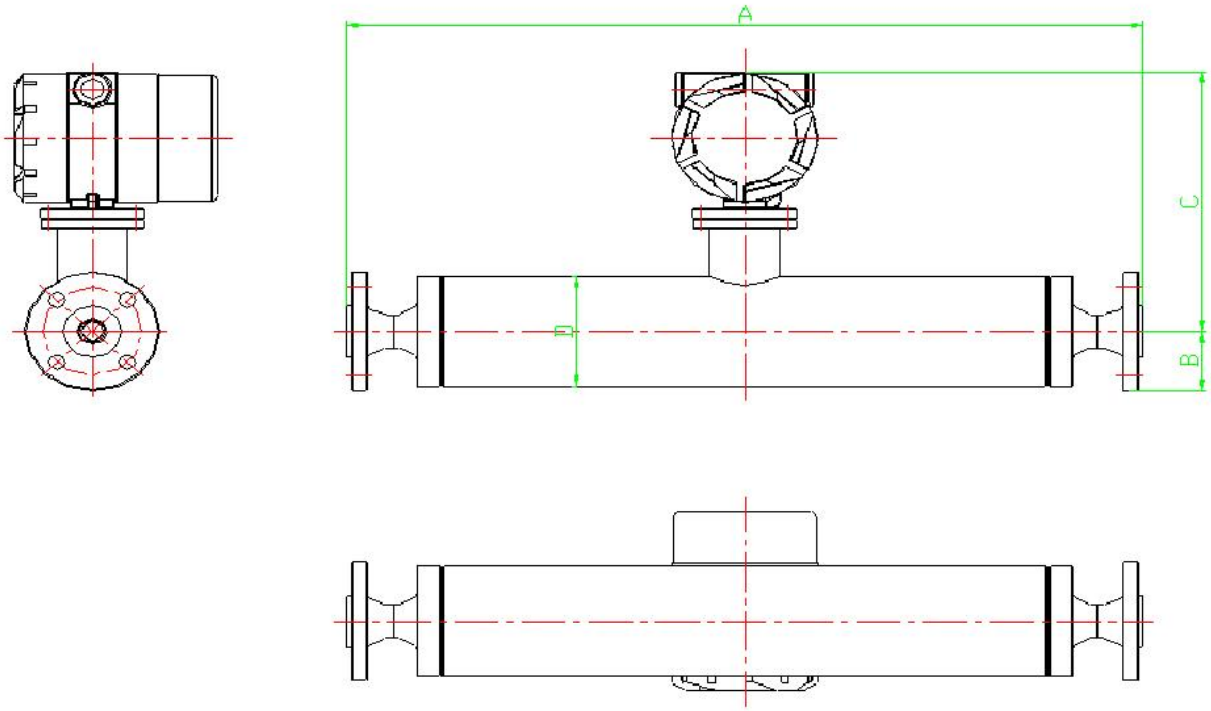
Wiring diagram of the transmitter



Dimension

Straight pipe type Coriolis mass flow meter external dimensions

Ordinary type straight pipe mass flow meter one-piece external dimensions

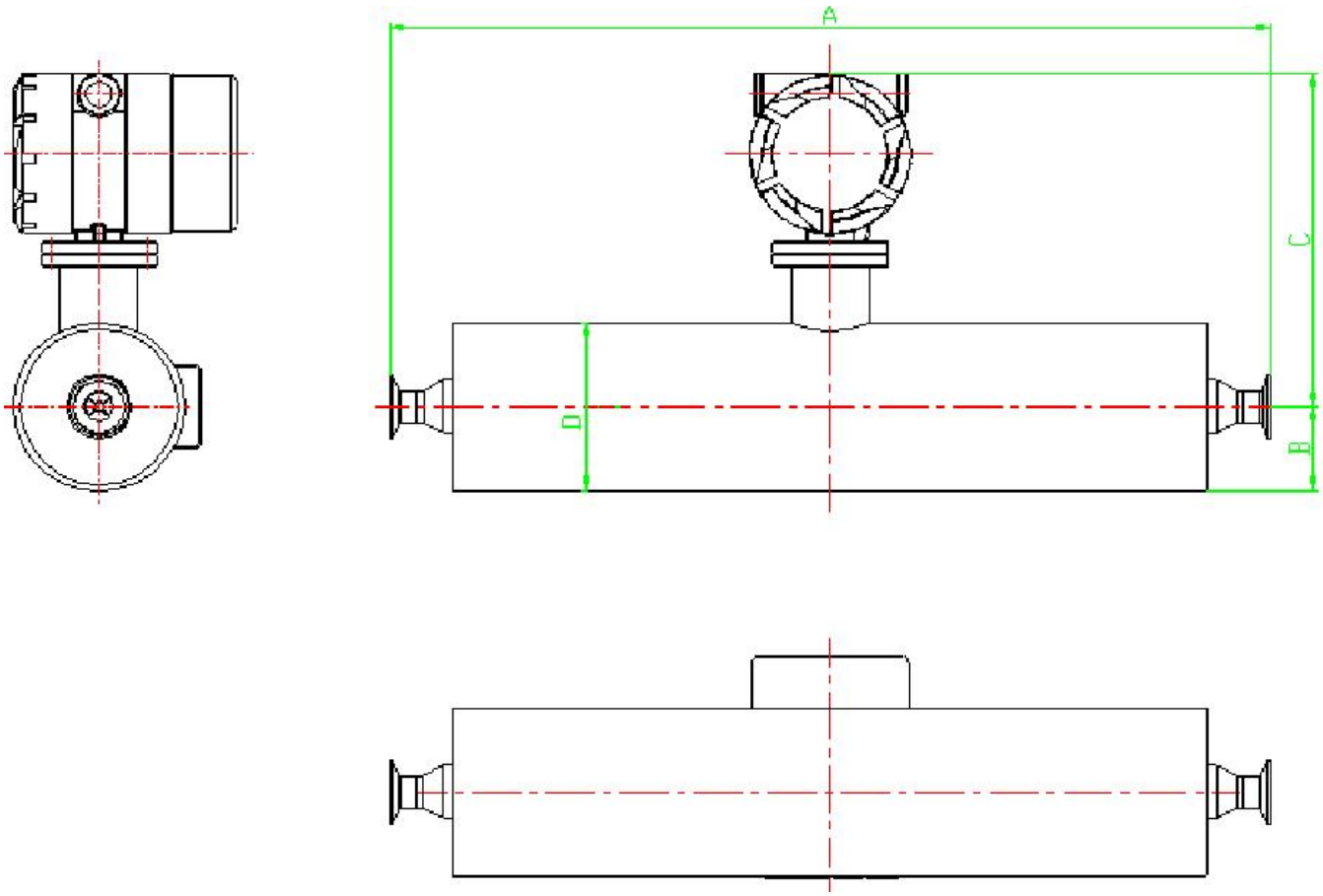


General straight pipe mass flow meter one-piece appearance diagram

Ordinary type ordinary type straight tube mass flow meter one-piece external dimensions

Diameter	A	B	C	D	weight
	mm	mm	mm	mm	kg
DN8	492	45	235	82	10
DN10	542	47.5	238	87	12
DN15	622	52.5	238	87	13
DN20	685	57.5	251	106.5	18
DN25	751	70	257	117	23
DN32	867	70	264	137	31
DN40	963	78.5	279	157	37
DN50	1053	82.5	279	157	42
DN80	1185	115	311.5	219	66

Sanitary Straight Pipe Mass Flow Meter Integral External Dimensions



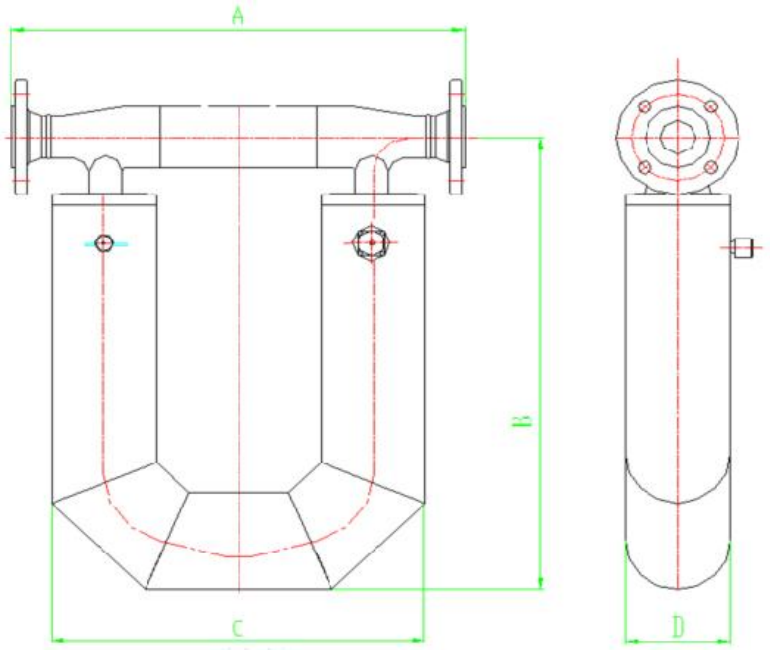
Sanitary straight pipe mass flow meter shape diagram

Sanitary straight pipe mass flow meter external dimensions

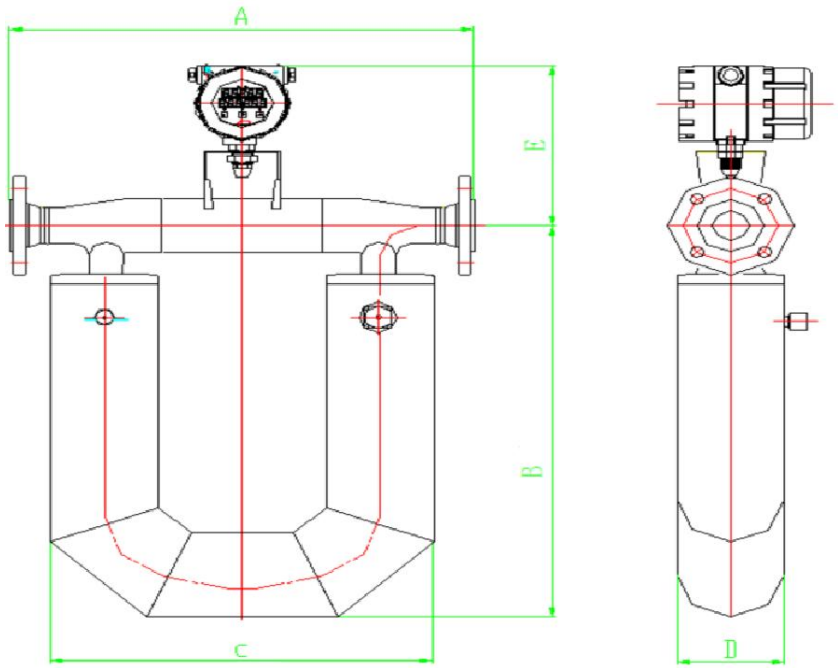
Diameter	A	B	C	D	weight
	mm	mm	mm	mm	kg
DN20	598	54	257	108	17
DN25	680	66.5	261	133	23
DN32	680	66.5	261	133	23
DN40	792	70	273	140	28
DN50	864	79.5	283	159	36
DN65	948	79.5	283	159	42

Non-straight pipe type Coriolis mass flow meter external dimensions

U-type Coriolis mass flow meter external dimensions



Split U-type Coriolis Mass Flow Meter Outline Schematic Diagram

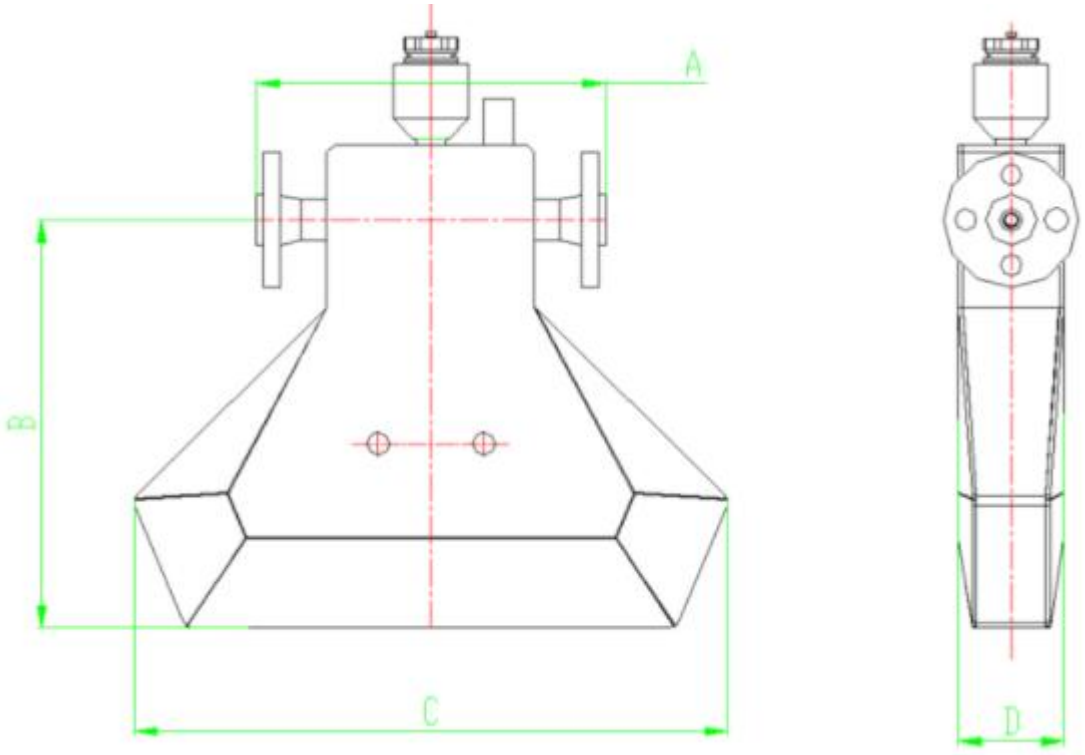


One-piece U-type Coriolis mass flow meter outline schematic diagram

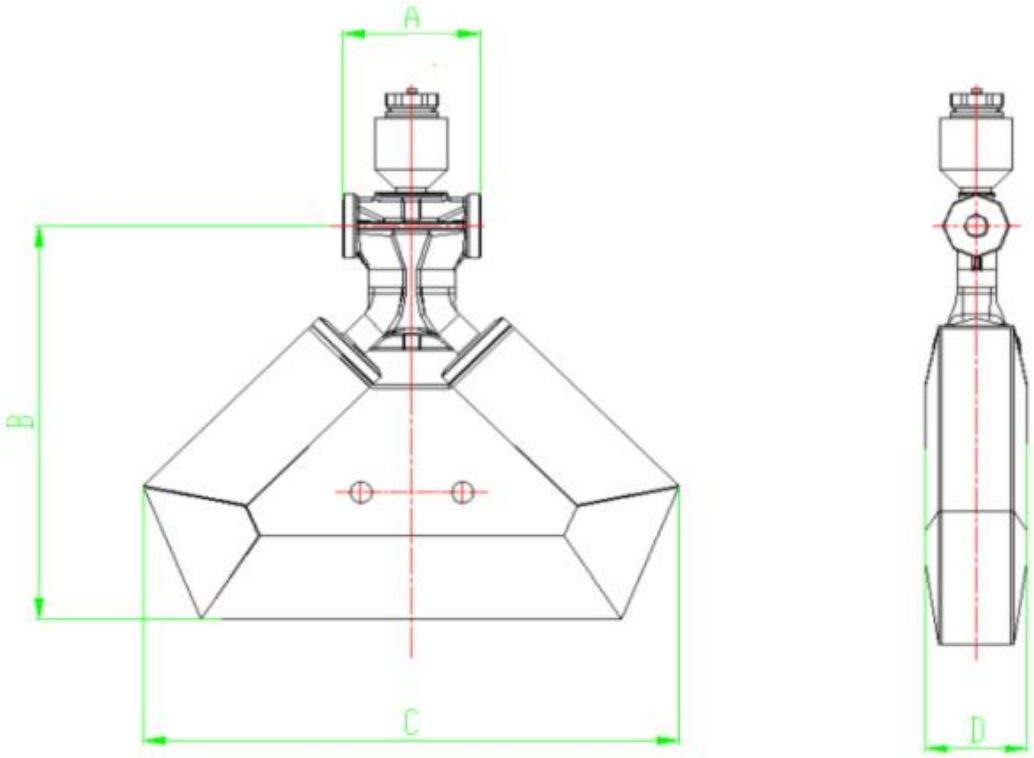
Type Structure Sensor External Dimensions

Diameter	A	B	C	D	E	weight
	mm	mm	mm	mm	mm	kg
DN10	450	324	380	60	236	7.2
DN15	456	324	380	60	236	7.5
DN20	540	478	468	108	245	17
DN25	540	492	468	108	245	17.5
DN32	544	517	468	108	245	24
DN40	600	635	500	140	267	32
DN50	606	653	500	140	267	36
DN80	866	857	779	219	316	87.5
DN100	950	977	833	273	340	165
DN150	1300	1223	1144	324	340	252

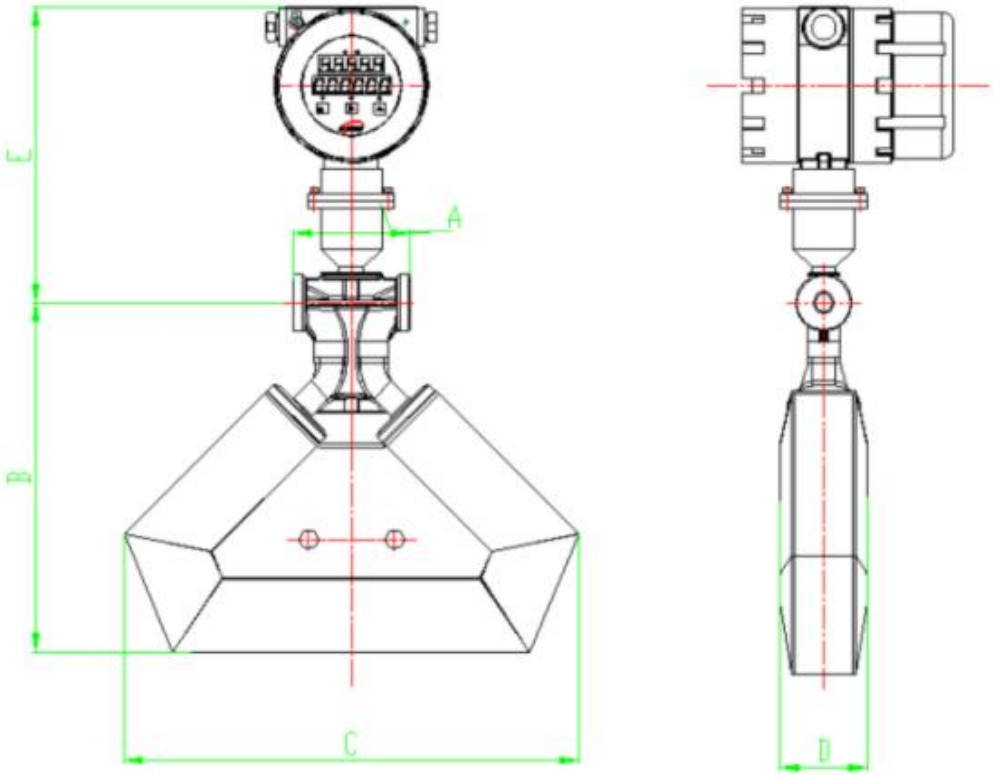
Triangular Coriolis Mass Flow Meter External Dimensions



DN3~DN8 Split Triangular Coriolis Mass Flow Meter Outline Schematic Diagram



DN10~DN15 Split Triangular Coriolis Mass Flow Meter Outline Schematic Diagram



One-piece delta type Coriolis mass flow meter outline schematic diagram

Triangular Coriolis Mass Flow Meter External Dimensions

Diameter	A	B	C	D	E	weight
	mm	mm	mm	mm	mm	kg
DN3	196	176	250	54	270	4.8
DN6	250	263	360	70.5	289	8.1
DN8	250	275	395	70.5	289	8.2
DN10	95	283	370	70.5	264	6.5
DN15	95	302	405	70.5	264	6.5

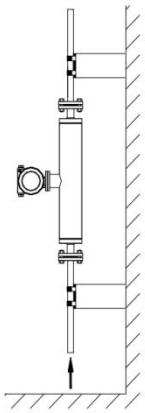
Notes:

(1) A dimensions will be changed according to the connection method, here is only the reference size.For split DN10~DN15 size flowmeter it is the clamping section size, others are the standard configuration flange-to-flange size.

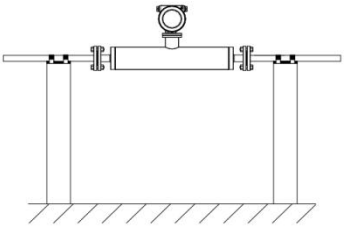
(2) E indicates the size of the part of total height increase after the integrated installation of the converter

Installation

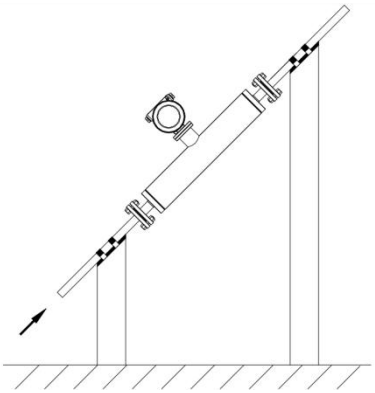
Straight Pipe Mass Flow Installation



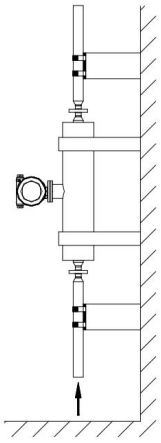
Vertical mounting schematic



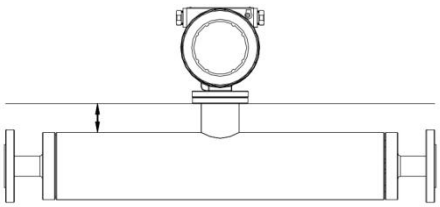
Horizontal mounting schematic



Angle Mounting Schematic

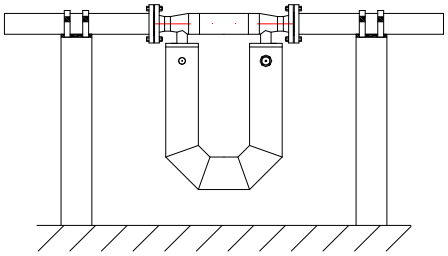


Installation diagram of sanitary straight pipe mass flow meter

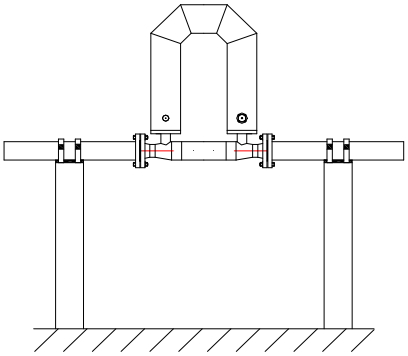


Schematic diagram of insulated and heated straight tube mass flow meters

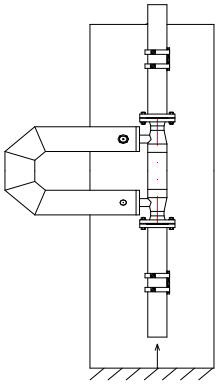
Non-Straight Pipe Mass Flow Installation



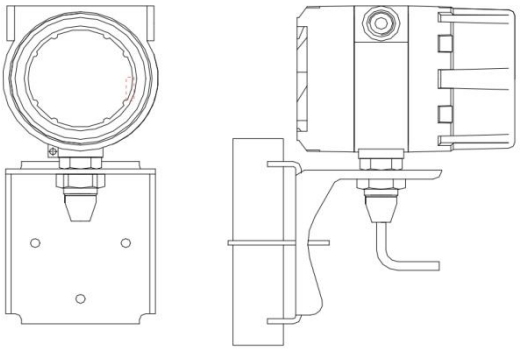
horizontal vertical facing down installation



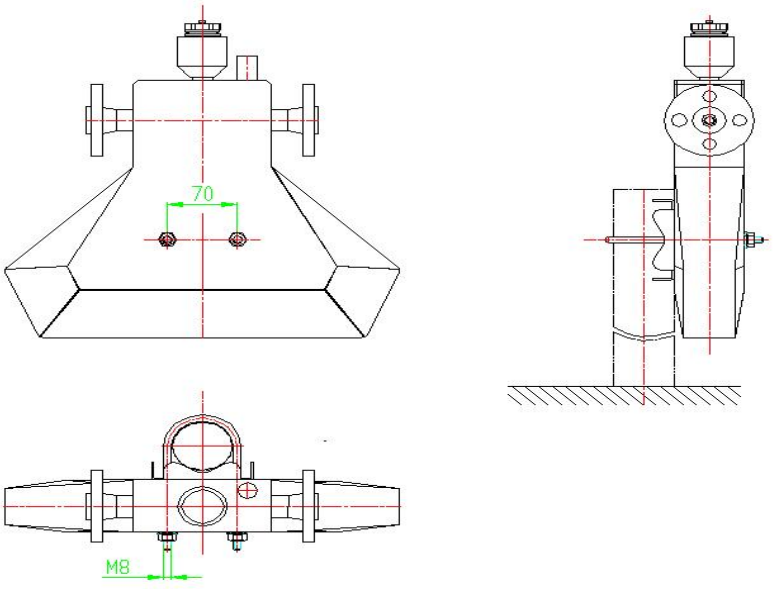
horizontal vertical facing up installation



Vertical (Flag) Installation Schematic



Schematic diagram of fixation of converter with bracket



Schematic diagram of bracket fixation

Ordering code

SUP-FCC300-U-03-H-E-C1-K-AM-TM-WB-00											Description
SUP-FCC300	-	-	-	-	-	-	-	-	-	-	
Sensor type	U										U-type
	S										triangles
	Z										straight pipe
Nominal Diameter		03									DN3
		06									DN6(1/8")
		08									DN8(1/4")
		10									DN10(3/8")
		15									DN15(1/2")
		20									DN20(3/4")
		25									DN25(1")
		32									DN32(1.25")
		40									DN40(1.5")
		50									DN50(2")
		80									DN80(3")
		1C									DN100(4")
		1G									DN150(6")
		XX									other
Thread Type Standard			H								HG/T 20592 flange
			I								ISO2852 clamp
			X								other
Nominal pressure				E							PN40
				D							PN25
				C							PN16
				XX							other
Measuring tube, process connection material and body material					C1						316SS, 304SS, 304SS
					XX						other
Accuracy						K					0.5class
						F					0.2class
						XX					other
Output and Power Supply							AM				4-20mA+Pulse+RS485, 24VDC
							AK				4-20mA+HART+Pulse, 24VDC
							AA				4-20mA + Pulse + RS485, 220VAC
							AB				4-20mA + HART + Pulse, 220VAC
							BK				4-20mA+Pulse+RS485, 24VDC/220VAC dual power supply
							BL				4-20mA+HART+Pulse,

					24VDC/220VAC dual power supply
High Temperature resi		TM			-50-200℃
		TN			-50-300℃
		TP			-200-200℃
		TQ			-20-200℃
		XX			other
Electrical interface, housing material and protection class			WD		One Piece, M20 x 1.5 Cable Plug, Aluminum, IP67
			W8		Split, M20 x 1.5 Cable Plug, Aluminum, IP67
			XX		other
Split cable length				00	0m
				02	2m
				10	10m
				15	15m
				20	20m
				25	25m
				30	30m
				40	40m
				50	50m
				XX	other