

# Coriolis Mass Flowmeter



Coriolis mass flowmeter provides best massflow, densityand temperature measurementperformance, and alsocalculate volume flow, total flowand fluid composition inreal-time. Currently it has threestyles available which areM type sensor, U type sensorand S type sensor ,Meanwhile each series has its owncompact and remotemeters.

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.



## Applications

Coriolis mass flow meter is suitable for the most complex and challenging environment for liquid, gas and slurry applications.

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

**Feature**

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

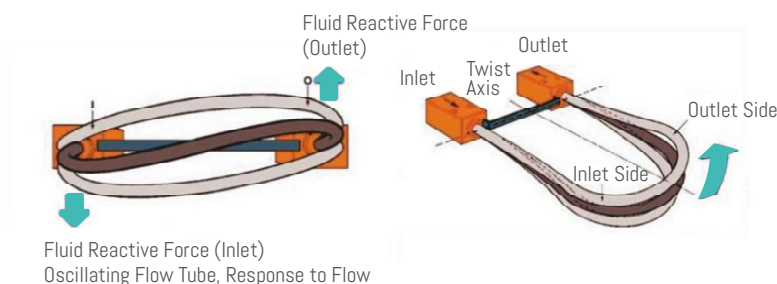
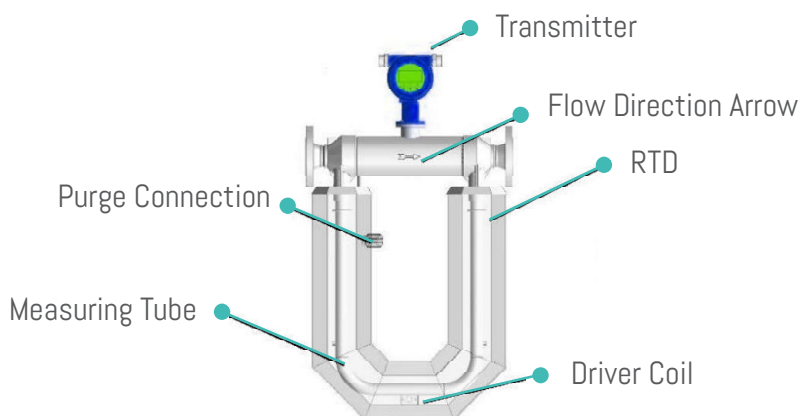
**Material**

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



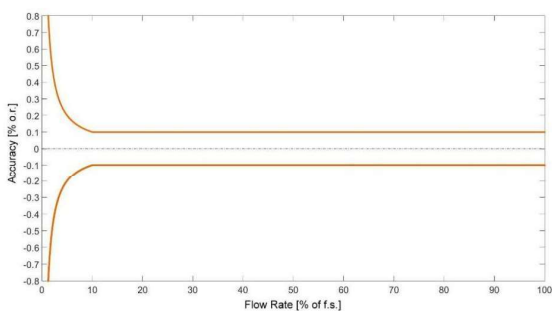
**Structure**

Coriolis Mass Flowmeter 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.

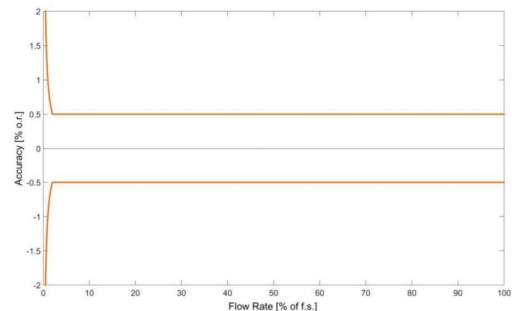


Technical Performance Parameters	
Accuracy (Liquids)	
Basic Accuracy (Mass flow)	$\pm 0.1\%$ , $\pm 0.2\%$ or $\pm 0.5\%$
Mass Flow Repeatability	$\pm 0.05\%$ (for 0.1% accuracy), $\pm 0.1\%$ (for 0.2% accuracy) or $\pm 0.25\%$ (for 0.5% accuracy)
Basic Accuracy (Volume flow)	$\pm 0.4\%$ (option: up to $\pm 0.15\%$ ) of flow rate
Repeatability (Volume Flow)	$\pm 0.05\%$ of flow rate
Zero Stability	$\pm 0.01\%$ of full scale
Accuracy (Gases)	
Basic Accuracy (Mass flow)	$\pm 1\%$ (option: up to $\pm 0.5\%$ ) of flow rate
Mass Flow Repeatability	$\pm 0.25\%$ of flow rate
Density	
Density Range	up to $2500 \text{ kg/m}^3$ , $2.5 \text{ g/cm}^3$
Density Accuracy	$\pm 1.0 \text{ kg/m}^3$ , $\pm 0.001 \text{ g/cm}^3$
Density Repeatability	$\pm 0.5 \text{ kg/m}^3$ , $\pm 0.0005 \text{ g/cm}^3$
Temperature	
Process Temperature Range	$-50 \text{ }^\circ\text{C} \dots +250 \text{ }^\circ\text{C}$ ( $-40 \text{ }^\circ\text{F} \dots +212 \text{ }^\circ\text{F}$ )
Option	$-196 \text{ }^\circ\text{C} \dots +55 \text{ }^\circ\text{C}$ ( $-320.8 \dots 131 \text{ }^\circ\text{F}$ )
Temperature Accuracy	$\pm 1 \text{ }^\circ\text{C} \pm 0.5\%$ of reading ( $\pm 1.8 \text{ }^\circ\text{F} \pm 0.5\%$ of reading)
Temperature Repeatability	$\pm 0.2 \text{ }^\circ\text{C}$ ( $\pm 0.36 \text{ }^\circ\text{F}$ )
Ambient Temperature	$-40$ to $131 \text{ }^\circ\text{F}$ ( $-40$ to $+55 \text{ }^\circ\text{C}$ )
Miscellanies	
Output	4-20 mA and Pulse/Frequency, Optional: HART or Modbus RS485
Option	Pulse Output: 0 to 10 kHz, 0.001%FS; Current Output: 4 to 20mA, 0.005%FS
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

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



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



# U-Type Super Bend Sensor

Size: 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.

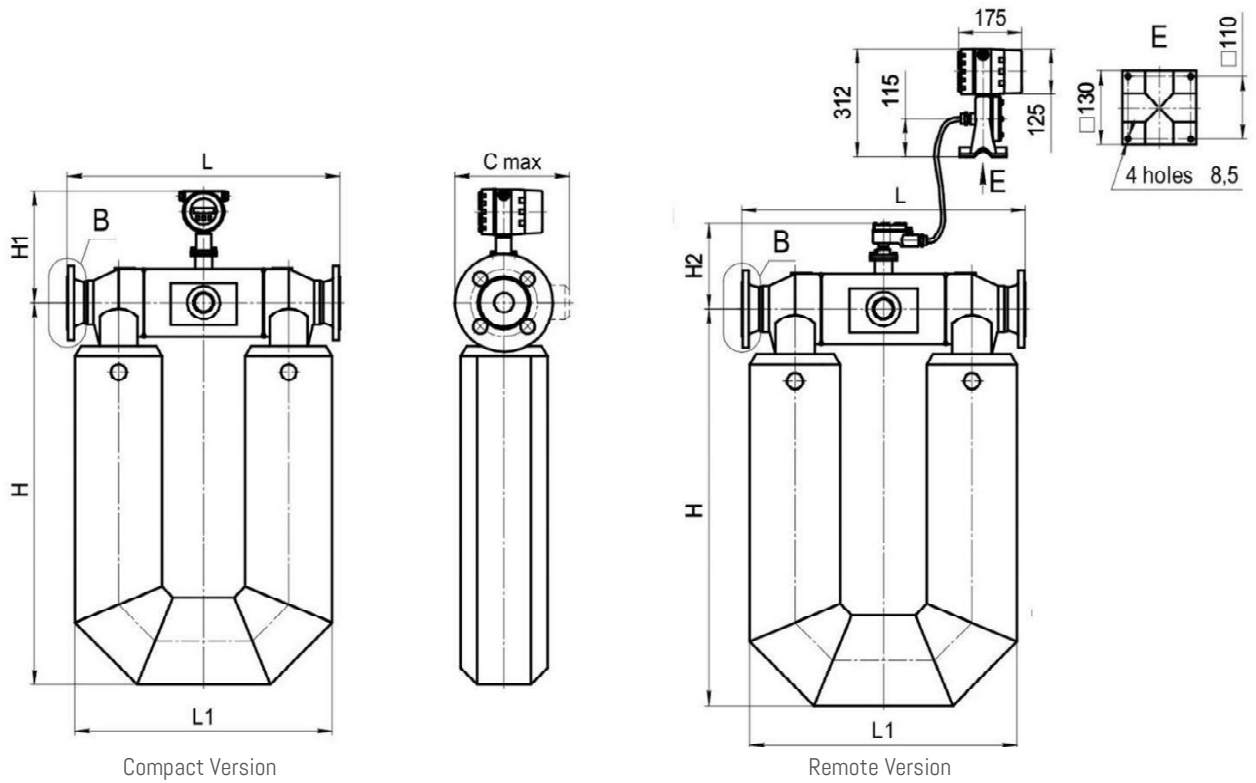


## Flow Range

Size (inch)	Full Flow Range (kg/hr)	Accuracy Flow Range (kg/hr)		Zero stability (kg/hr)
		+/-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

For liquid(Metric unit in kg/hr)

Dimension



Size	L (inch and mm)		L1 in mm	H in mm	H1 in mm	H2 in mm	Cmax in mm	Weight (lb and kg)	
	≤300# (4 MPa)	≥600# (6.3 MPa)						Compact	Remote
1 1/2 DN40	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 DN50	21.91 558	23.15 588	20.55 522	29.45 748	11.42 288	7.95 202	7.87 200	97 44	103.62 47
3 DN80	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 DN100	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 DN150	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 DN200	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 Micro-bend sensor

Size: 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.

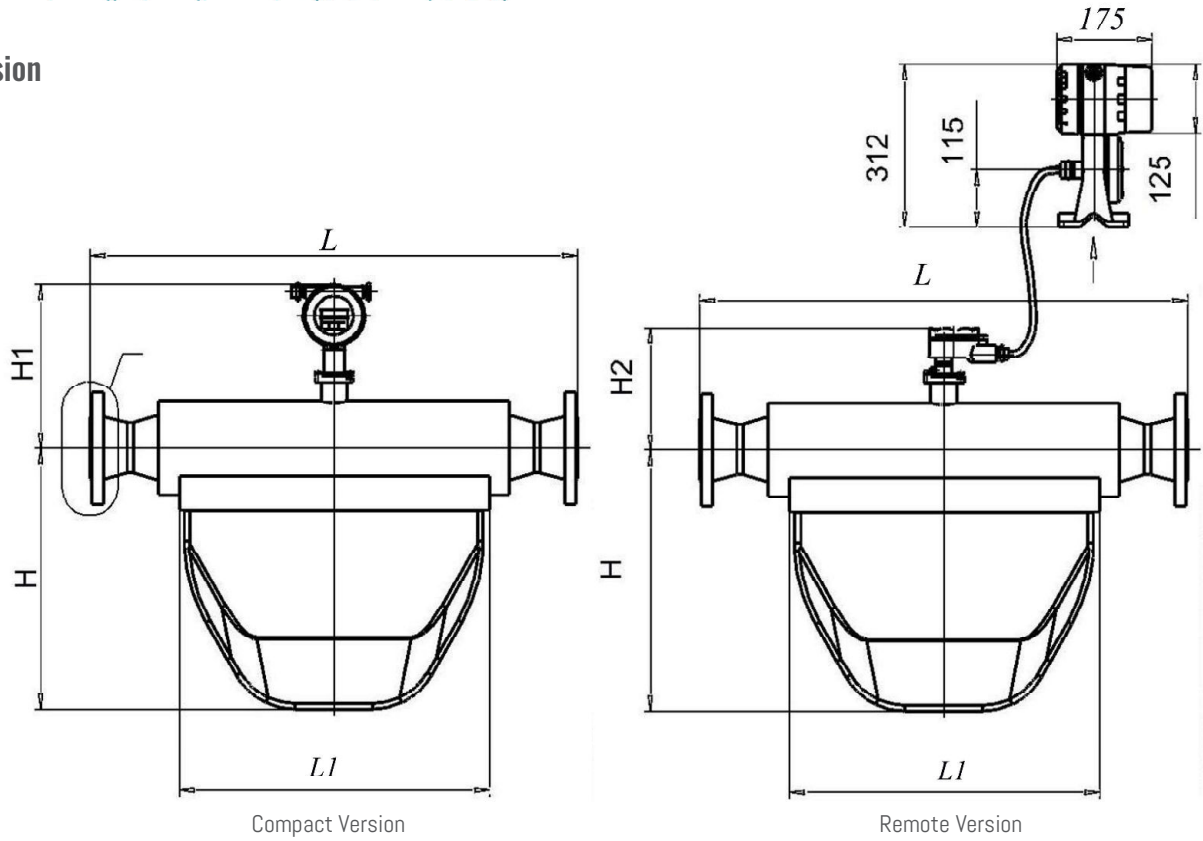


## Flow Range

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 - 32,000	2,400 - 32,000	1,000 - 32,000	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	70,000 - 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

For liquid(Metric unit in kg/hr)

Dimension



Size	L (inch and mm)		L1 in mm	H in mm	H1 in mm	H2 in mm	Cmax in mm	Weight (lb and kg)	
	≤300# (4 MPa)	≥600# (6.3 MPa)						Compact	Remote
1/8 DN3	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 DN10	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
1/2 DN15	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 DN25	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
1 1/2 DN40	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 DN50	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 DN80	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 DN100	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 DN150	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 DN200	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 DN250	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

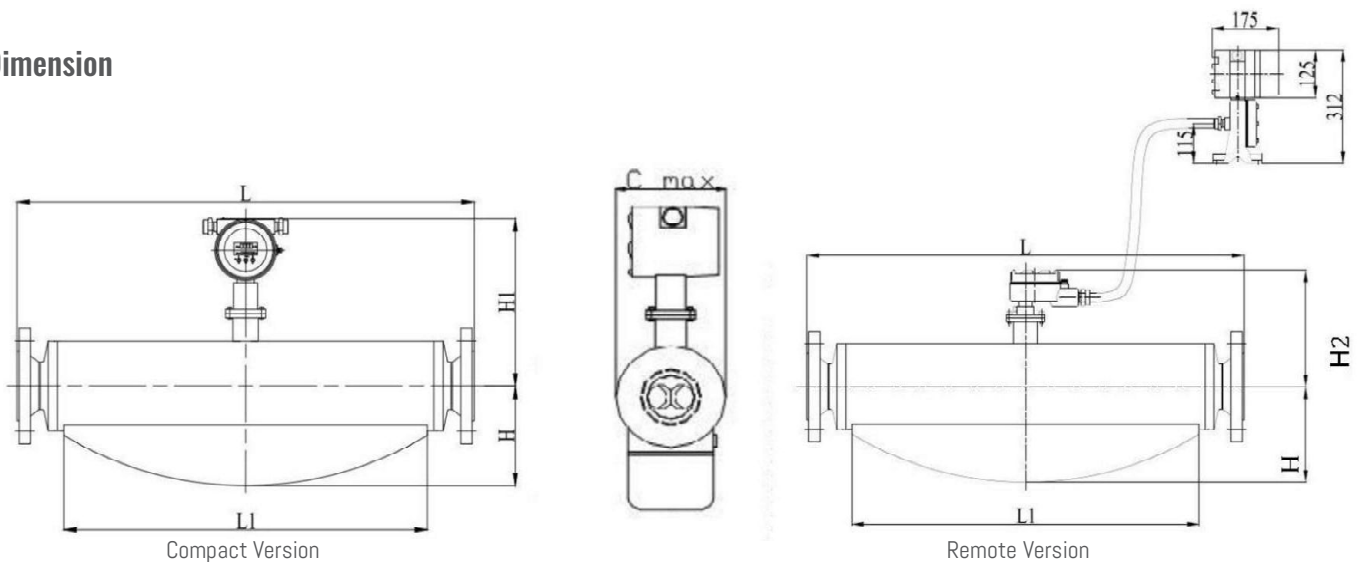
# S-Type Super Bend Sensor

Size: 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.



## Dimension



Size	L (inch and mm)		L1 in mm	H in mm	H1 in mm	H2 in mm	Cmax in mm	Weight (lb and kg)	
	≤300# (4 MPa)	≥600# (6.3 MPa)						Compact	Remote
2 DN50	31.5 800	32.83 834	23.15 588	7.87 200	12.99 330	9.84 250	8.07 205	103.62 47	103.62 47
3 DN80	36.81 935	38.31 973	28.74 730	7.87 200	13.98 355	10.63 270	16.38 416	176.37 80	176.37 80

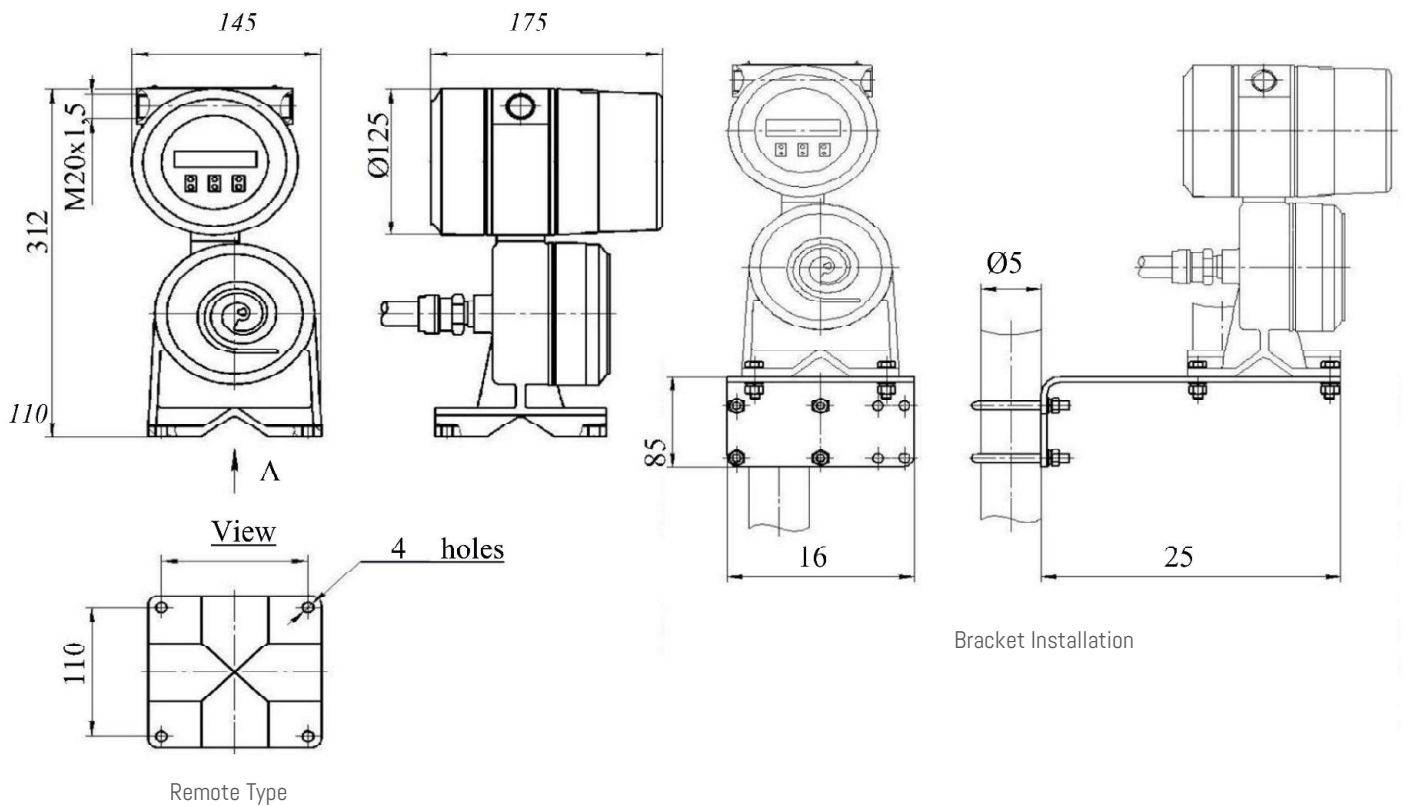


# Transmitter And Sensor Structure



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.

## Dimension



### Model Select

	CLM2	XXX	X	X	X	X	X	X	X	X	X	X	X
Caliber (mm)	1/8" - 12" Reference Code Please check line size code in table 1	Code											
Medium	Liquid	L											
	Gas	G											
Sensor Type	U-Type Sensor(1 1/2" to 8")	U											
	M-Type Sesnor( 1/8" to 10")	M											
	S-Type Sensor (2" to 3")	S											
Conection Standard	ANSI/ASME Standard Flanges	AN											
	DIN Standard Flanges	DI											
	JIS Standard Flanges	JS											
	Sanitary Fitting Connection	SF											
	Customized Connecton	OF											
Maximum Process Pressure	230 psi (16 bar)	1											
	360 psi (25 bar)	2											
	580 psi (40 bar)	3											
	915 psi (63 bar)	4											
	1450 psi (100 bar)	5											
	2320 psi (160 bar)	6											
	3625 psi (250 bar)	7											
	Special Pressure	x											
Structures	Compact Version -58F to +257F(-50C to +125C)	COM											
	Remote Version -58F to +392F (-50C to +200C)	REM											
	Remote Version -58F to +572F (-50C to +300C)	RXM											
	Low Temperature -320Fto +131F (-196C to -55C)	LOW											
Ex-proof	Without Ex-proof	0											
	With Ex-proof	1											
Power	DC18 to 36V	1											
	AC85 to 265V	2											
Output Communication	4 to 20mA	P											
	MODBUS RTU(RS485)	R											
	HART Protocol	H											
	2*4-20mA + Pulse + MODBUS RTU (RS485)	S											
Accuracy	+/-0.05% of RD	0.5											
	+/-0.1% of RD	1											
	+/-0.2% of RD	2											
	+/-0.5% of RD	5											

Table 1 : Caliber Code Table

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