BFC Series Mass Flowmeter

1. General

BFC Series Mass Flowmeter (hereafter we call BFC) is designed according to the Coriolis Principle. It can be widely used for the process detecting and custody transfer/fiscal unit in many industries such as petroleum, petrochemical industry, pharmacy, paper making, food and energy etc.. As a fairly advanced kind of flow measuring instrument, it has been paid attention by the circle of measurement and accepted by many customers home and abroad.

S-Shape BFC(DN50-100)

W-Shape BFC(DN15-200)

U-Shape BFC(DN15-25)

U-Shape BFC(DN40-200)

2. Principle

BFC is designed according to the principle of Coriolis force. Under the alternating current effect, the magnet and coil installed on the measuring tube will make two parallel measuring tubes vibrate according to some fixed frequency. Once there is flow passing through the pipes, Coriolis force will give rise to deflection (phase shift) on the vibration of two pipes and the deflection of vibration is directly proportional to the mass flow of fluid. Pick up them and the mass flowrate could be calculated.

The vibration frequency of measuring tube is determined by the total mass of measuring tube and inner fluid. When the fluid density changes, the vibration frequency of measuring tube will be also changed, as a result, the fluid density can be calculated.

The temperature transducer installed in the pipeline can pick up the fluid temperature on time under the coordination of measuring circuit

3. Feature

3. 1 Digital transmitter Feature

Comparing with traditional analog circuit and analog transmitter, digital circuit and digital transmitter has the following obvious merits:

3.1.1 The DSP chip is the core of digital transmitter for BFC. As we know, the techniques of Digital Signal Processing can greatly increase the accuracy of flowmeter and broaden turndown ratio.

3.1.2 The sampling rate of digital transmitter is much higher than traditional products, so it provides shorter response time for the flow, quicker reaction to the flow change, higher efficiency and better accuracy for small amount tank loading/unloading system.

3.1.3 Digital Signal Processing techniques can filter and shape the flow signal better. Well-designed digital filter can remove industrial frequency electromagnetic fields, spatial electromagnetic fields and noise effect on mass flowmeter, markedly enhance stability and reliability of mass flowmeter.

3.2 Mass Flowmeter Feature

Comparing with the traditional flow measurement method, BFC has following obvious merits:

3.2.1 Enable to directly measure mass flow rate of fluid in the pipeline without changing any parameters, which avoids some measurement error of intermediate links. Its mass flow rate can be high accuracy and good repeatability within bigger range of turndown ratio.

3.2.2 Fluid measured can be more extensive, such as the steady uniform flow of common viscosity fluid, the high viscosity fluid, non-Newtonian fluid, slurry containing some solid components and the liquid containing some trace of gas.

3.2.3 Besides mass flow measurement, the density and temperature and water cut (ratio) can also be picked up and output by RS485-Modbus / HART.

Jacket type BFC

4. Main Technical Specification

4.1. Specification of Sensor and Flow Range for Liquid

Table 1

DN(mm)	15~300
Structure	Integrate Type (50-~+125)°C Separate Type)-50~+200)°C High temp. separated type:-50°C~+300°C Low temp. separted type: -200°C~+125°C
Sensor	U-Series Micro-bend Series
Transmitter	Digital Type Anaglog Type
Explosion-proof	General Type Explosion-proof
Power supply	DC(18~36)V AC(85~265)V
Output Interface	RS485 Hart
Nominl Pressure (MPa)	1.6 2.5 4.0 6.3 (25MPa is available for some sizes)
EMI	Conform to IEC 61362 (Industrial) EMC Directive
Signal output	Pulse output (4-20)mA
Accuracy	0.1% 0.2% 0.5%
Hygienic type	Customized as customers' needs.
Process connection	GB/T 9115-2010, DIN, ANSI, JIS or other customized.

U-Series sensor with digital transmitter

Table 2

DN (mm)	Max.Flow Range (kg/h)	Normal Flow Range for Accuracy 0.1% (kg/h)	Normal Flow Range for Accuracy 0.2% (kg/h)	Normal Flow Range for Accuracy 0.5% (kg/h)	Stability of Zero Point (kg/h)
15	30~3000	150~3000	100~3000	80~3000	0.12
25	80~8000	400~8000	300~8000	280~8000	0.32
40	320~32000	2000~32000	1500~32000	1300~32000	1.2
50	500~50000	3500~50000	2500~50000	2000~50000	2
80	1400~140000	6000~140000	5500~140000	5000~140000	6
100A	2000~200000	15000~200000	12000~200000	10000~200000	8
100B	2000~180000	18000~180000	14000~180000	12000~180000	10
150A	5000~500000	35000~500000	30000~500000	25000~500000	20
150B	5000~480000	42000~480000	32000~480000	28000~480000	24
200	10000~1000000	100000~1000000	70000~1000000	50000~1000000	40
250	15000~1500000	100000~1500000	75000~1500000	70000~1500000	60
300	25000~2500000	170000~2500000	125000~2500000	120000~2500000	100

Microbend Series sensor with digital transmitter

Table 3

DN (mm)	Max.Flow Range (kg/h)	Normal Flow Range for Accuracy 0.1% (kg/h)	Normal Flow Range for Accuracy 0.2% (kg/h)	Normal Flow Range for Accuracy 0.5% (kg/h)	Stability of Zero Point (kg/h)
15	20~3000	200~3000	150~3000	100~3000	0.2
25	80~8000	600~8000	400~8000	300~8000	0.6
40	240~24000	2400~24000	1200~24000	1000~24000	2.4
50	500~50000	5000~40000	2500~40000	2000~50000	5
80	800~120000	8000~120000	5500~120000	5000~120000	8
100A	1500~200000	15000~200000	12000~200000	10000~200000	15
100B	1500~180000	18000~180000	14000~180000	12000~180000	18
150A	5000~500000	50000~500000	30000~500000	25000~500000	50
150B	5000~450000	55000~450000	35000~450000	30000~450000	42
200	10000~1000000	100000~1000000	70000~1000000	50000~1000000	100
250	15000~1500000	150000~1500000	120000~1500000	75000~1500000	150
300	25000~2500000	200000~2500000	150000~2500000	100000~2500000	200

DSP transmitter type coriolis mass flowmeter for gas flow range

Table 4

DN (mm)	Max.Flow Range (kg/h)	Normal Flow Range for Accuracy 0.2% (kg/h)	Normal Flow Range for Accuracy 0.5% (kg/h)	Stability of Zero Point (kg/h)
15	15~3000	150~3000	75~3000	0.38
25	40~8000	400~8000	200~8000	1.00
40	160~32000	1600~32000	800~32000	4.00
50	250~50000	2500~50000	1250~50000	6.25
80	700~140000	7000~140000	3500~140000	17.5
100	1000~200000	10000~200000	5000~200000	25.0
150	2500~500000	25000~500000	12500~500000	62.5
200	5000~1000000	50000~1000000	25000~1000000	125
250	7500~1500000	75000~1500000	37500~1500000	188
300	12500~2500000	125000~2500000	62500~2500000	313

4.2. Accuracy

Table 5

0.1%	0.2%	0.5%
$\pm 0.1\% \pm \left(\frac{\text{Stability of Zero Point}}{\text{Instan taneous Flow}} \times 100\%\right)$	$\pm 0.2\% \pm \left(\frac{\text{Stability of Zero Point}}{\text{Instan taneous Flow}} \times 100\%\right)$	$\pm 0.5\% \pm \left(\frac{\text{Stability of Zero Point}}{\text{Instan taneous Flow}} \times 100\%\right)$
Accuracy is calculated based on the water measurement under the condition of +20~25°C and 0.1~0.2MPa.		

4.3. Repeatability

Table 6

Accuracy	0.1%	0.2%	0.5%
Repeatability	±0.05%	±0.1%	±0.25%
Accuracy is calculated based on the water measurement under the condition of +20~25°C and 0.1~0.2MPa.			

4.4. Measurement of Density

Table 7

Density Range	(0.2~3.0) g/cm^3
Basic Error	±0.002 g/cm^3 (Affected by the sensor)
Repeatability	±0.001g/cm^3

4.5. Measurement of Temperature

Table 8

Temperature Range	Integrated Type	(-50~+125) °C
	Separate Type	(-50~+200) °C
	High Temperature Separated Type	(-50~+300) °C
	Low Temperature Separated Type	(-200~+125) °C
Basic Error	≤ ±1.0 °C	

5. Specification of Function

5.1 Current Output

4-20mA Current Output can be configured to denote the mass flow or volume flow.

Table 9

Output Range	4-20mA
Basic Error	0.1%F.S
Repeatability	±0.01%/ °C
External resistor should be 250~600Ω	

5.2 Frequency Output

Active Frequency Output can be configured to denote the mass flow or volume flow.

Table 10

Output Range	0~10kHz
Basic Error	±0.005%
Temperature Impact	±0.001%/°C
Max.capability of outrange is 12kHz	

5.3 RS485 Output / Hart

RS485 output adopts the RTU communication mode which is compatible with MODBUS protocol.

5.4 Ambient Limitation

5.4.1 Ambient vibration

Table11

Frequency Range	(10~2000) Hz
Acceleration amplitude value	2g
Circulation time	

5.4.2 Ambient temperature

Table12

Working Temperature	(-20~+55) °C
Storage Temperature	(-40~+70) °C

5.4.3 Ambient humidity

Table13

Working Humidity	<90%	+25 °C No condensation
Storage Humidity	<95%	

5.4.4 Enclosure Grade: IP67

5.5 Power consumption

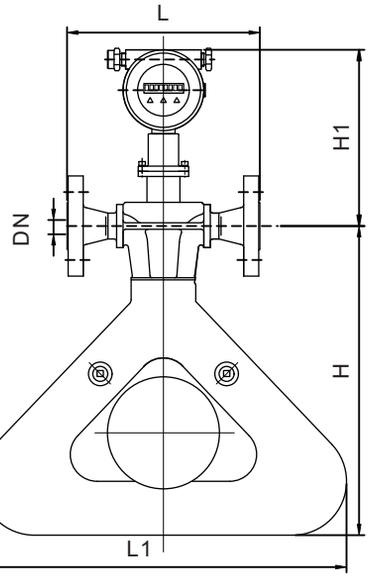
The normal power consumption of the flowmeter is 10W, while the max value is 15W.

5.6 Weight

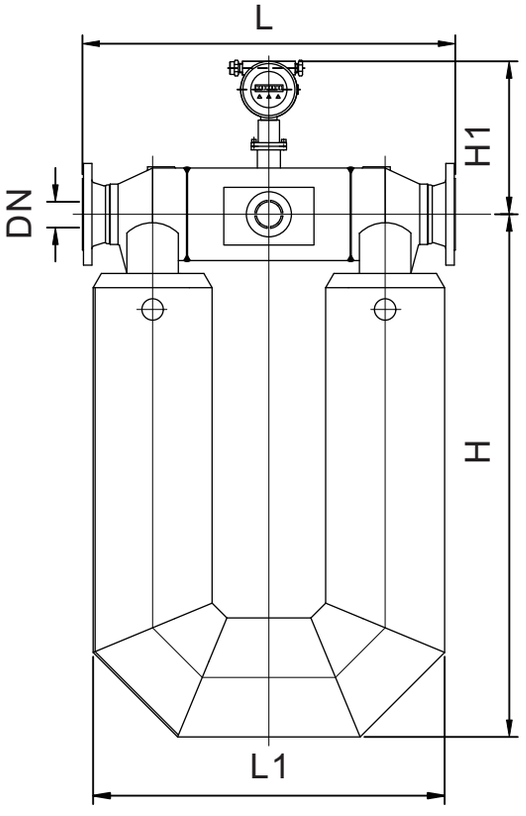
Table14

DN(mm)	15	25	40	50	80	100	150	200	250	300
Triangle / U-type	13	17	30	40	100	190	325	536	960	1523
Micro-bend type	12	15	25	38	78	135	265	430	500	630

6. Outline Dimension (Shown in the following Drawings and Tables)



DN (15~25)

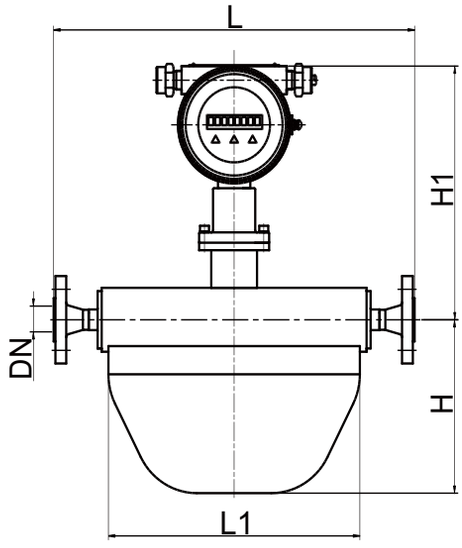


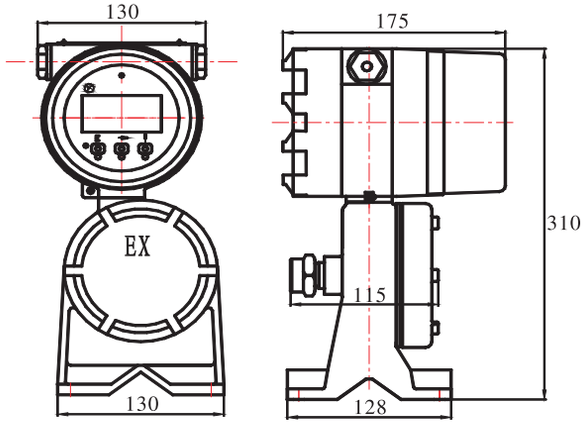
DN (40~300)

Outline dimension for Triangle or Ushape

Table15

BFC	DN	L			L1	H	H1	
		GB/T 9115-2010 (MPa)		ΔL (mm)			Integrated	Separated
		≤ 4.0	≤ 6.3					
015U	15	180	194	±1.5	350	290	260	190
025U	25	200	248		450	400	280	210
040U	40	520	547	±2.5	470	660	280	210
050U	50	558	588		550	750	290	220
080U	80	780	808		710	1040	320	250
100U	100	920	948		860	1290	350	280
150U	150	1100	1140	±3.5	1050	1600	380	310
200U	200	1364	1410		1160	1740	420	350
300U	300	2070	2120		1270	3150	520	450





For Separate Type

Outline dimension for Mirco-bend or Super bend shape

Table16

BFC	DN	L			L1	H	H1	
		GB/T 9115-2010 (MPa)		ΔL (mm)			Integrated	Separated
		¡ 4.0	¡ 6.3					
015W	15	360	374	±1.5	240	180	290	220
025W	25	500	536	±2.5	360	250	300	230
040W	40	600	634		500	340	310	240
050A	50	660	688		500	340	320	250
050B	50	800	828		500	420	320	250
080A	80	900	928		700	405	350	280
080B	80	935	973		730	200	350	280
100A	100	1130	1156	±3.5	860	660	370	290
100B	100	1130	1182		926	255	370	290
150W	150	1450	1450		1200	900	400	330
200W	200	1800	1844		1450	1170	420	350
250W	250	1850	1890		1530	1180	420	350
300W	300	2000	2050		1600	1300	360	390

Model Selection

BFC — □□□ □ □ □ □ □ □ □ □ □ □

Type		1	2	3	4	5	6	7	8	9	10	Instructions
		DN	Medium	Structure	Sensor	Power	Output port	Nominal pressure	Signal output	Accuracy	Customized	
BFC	–											Coriolis Mass Flowmeter
		015										15mm
		025										25mm
		040										40mm
		050										50mm
		080										80mm
		100										100mm
		150										150mm
		200										200mm
		250										250mm
		300										300mm
			Y									To measure liquid
			Q									To measure gas
				1								Integrated -50~125 °C
				2								Separated -50~200 °C
				3								High temp. separated: -50~125 °C
				4								Low temp. separated:-50~200 °C
					U							U-type sensor
					W							Microbend-type sensor
					S							Super bend-type sensor
						1						DC(18~36)V
						2						AC(85~265)V
							S					RS485
							H					Hart
								1.6				1.6 MPa
								2.5				2.5 MPa
								4.0				4.0 MPa
								6.3				6.3 MPa
								10				10 MPa
								16				16 MPa
								26				26 MPa
								150				Class 150
								300				Class 300
								600				Class 600
									F			Pulse output
									I			(4-20mA) current output
										0.1		±0.1%
										0.2		±0.2%
										0.5		±0.5%
											W	Hygienic
											B	Jacket
											D	Customized

Example: BFC-080Y2U1S2.5I0.2
Means: Coriolis Mass Flowmeter, DN80, to measure liquid, separated type, U-type sensor, DC(18~36)V as the power supply, RS485 output port, nominal pressure: 2.5MPa, (4-20)mA current output£accuracy:±0.2%.

Specification		Anti explosion grade
Separated type	LZYN-015~080 sensor	Exib¢CT3~T6
	LZYN-100~200 sensor	Exd ib¢CT3~T6
	LZYN transmitter	Exd[ib]¢CT6
Integrated type	LZYN-015~080 flowmeter	Exdib¢CT3~T6
	LZYN-100~200 flowmeter	Exdib¢CT3~T6