Coriolis Mass Flow Meter GTCMF series

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1. Introduction

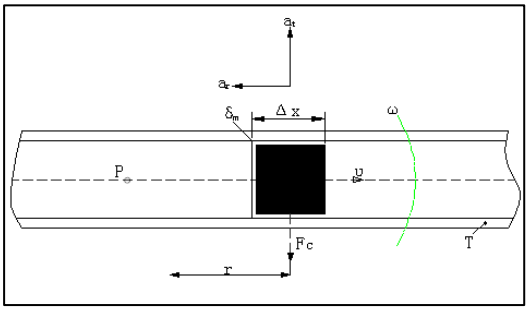
GTCMF-U Series Coriolis Mass Flow Meters' measuring principle is based on the controlled generation of Coriolis forces.

- The measurement would not be affected by the pressure, temperature, viscosity, density, etc.
- And the compensation calculation is not required. The structure contains two parts: Sensor & Transmitter.
- The Coriolis Mass Flow Meters are designed and manufactured based on the national standard of safe explosion proof. The Explosion- proof standard is Exd ib IIC T5 /ATEX.
- The mass flow meter does not measure the volume per unit time (e.g., cubic meters per second) passing through the device; it measures the mass per unit time (e.g., kilograms per second) flowing through the device. The accuracy of the Coriolis Mass Flow Meters is ±0.1%~ ±0.2%.
- The application range is large. (It could be used to measure all sorts of all sorts non-newtonian fluid, slurry, suspensions, high viscosity fluid, etc.)
- The requirements for the installation are low. (The straight pipe requirements in front of and behind the Coriolis Mass Flow Meters are low.)
- They are more reliable, stable, and the maintenance level is low.

GTCMF-V Series Coriolis Mass Flow Meters' have applied the pure digital drive, DSP signal processing, and the high vibration frequency.

- The GTCMF-V Series Coriolis Mass Flow Meters have characteristics of high stability, high shock resistance, fast response, high accuracy, low pressure lose, multi-parameter measurement (including: mass flow, density, temperature, percentage), etc.
- The accuracy of the Coriolis Mass Flow Meters is ±0.1%~ ±0.2%.
- The application range is large. (It could be used to measure all sorts of all sorts' non-newtonian fluid, slurry, suspensions, high viscosity fluid, etc.)
- The requirements for the installation are low. (The straight pipe requirements in front of and behind the Coriolis Mass Flow Meters are low.)
- They are more reliable, stable, and the maintenance level is low.

1-1. Measuring Principle



The measuring principle is based on the controlled generation of Coriolis Forces. Figure in the quality of the δm at a constant speed v of particles revolve around a fixed point P with angular velocity omega ω movement of the pipe, the particle will receive two acceleration components:

1. The normal acceleration αr (centripetal acceleration), its value is equal to the $\frac{2}{\omega r}$, direction toward the point P;
2. The tangential acceleration of αt (Coriolis acceleration), its value is equal to 2ωv, omega direction perpendicular to αr.

According to Newton's second law of motion (force = mass* acceleration).
If it is required to produce Coriolis acceleration αr., there must be in the direction of the αt exert a corresponding force. It is equal to 2ωvδm. And this force comes from in the pipeline.
Reverse the force acting on the pipeline, Fc =2ωvδm (hereinafter referred to as the Coriolis force).

Diagram, fluid delta m = rho A Δ x, so the Coriolis force can be represented as:

$$\Delta Fc=2\omega v\delta m=2\omega v\rho A\Delta x=2\omega\delta qm\Delta x$$

Type: A is cross-sectional area for the pipe: δq

For a specific rotating pipe, its frequency characteristic
directly or indirectly measured flow in the rotating pipe
mass flow rate, this is the basic principle of Coriolis ma

1-2. Density Measurement

The measuring tubes are continuously excited at their r
A change in the mass and thus the density of the oscill
results in a corresponding, automatic adjustment in the
Resonance frequency is thus a function of fluid density
The microprocessor utilizes this relationship to obtain a

Technical Indicators and Performance Parameters

Technical Data	Fa
Liquid Liquid Mass Flow / Volume Flow Accuracy: ±0.1% ±0.15% ±0.20% Repeatability: ≤±0.05%	Per cor me
Gas Accuracy: ±0.2% ±0.5% Repeatability: ≤±0.25%	
Density Performance Indicators Liquid Resolution: ±0.0005 g/cm^3 (0.5 kg/m^3) Repeatability: ±0.0002 g/cm^3 (0.2 kg/m^3) Measurement Accuracy: ±0.002 g/cm^3 (2 kg/m^3)	
Temperature Performance Indicators Error: ±0.5℃ Repeatability: ±0.05℃	

2. Technical Parameters

Applications	Suitable for Liq Liquid- Gas Ma
Meter body	Standard: SS 304, Option: SS 316L Others.
Material of the Pipeline	SS 316L/ HC Hastelloy
Pressure	Please refer to the chart shown above. Special orders would be placed for high pressure.
Medium Temperature	-50°C ~+150°C; (Highest Temperature: +350°C; Lowest Temperature: -300°C could be special ordered.)
Environment Temperature	Sensor: -40°C ~+150°C; Transmitter: -20°C ~+70℃
Flow Rate Accuracy	Gad: ± 0.2%, Liquid: ± 0.1%
Density Measurement Accuracy	±0.002g/cm^3, ±0.001g/cm^3 optional
Repeatability	±0.10% Flow Rate ±[1/2 (Zero Point Stability/ Flow Rate)×100]% Flow Rate
Power	DC24V (More than 0.5A)
Output Signal	4~20mA Load Resistance <500Ω (Instantaneous or Density optional) 0~10kHz Instantaneous Flow Rate Pulse Signal; **Standard RS 485 Communication**. HART protocol.
Explosion- Proof Symbol	On request.
Anti- Explosion Certification No.	On request.

3. Module Selection

3-1. GTCMF-Series Coriolis Mass Flow Meter

- **Micro Flow Meter:**

Model	DN	Measurement scope (kg/h)	Work Pressure (MPa)	Connection type (mm)
GTCMF-U-M-3	3	0~40	0~32	Weld Joints Φ 6×1.5 or Thread M12 *1
GTCMF-U-M-6	6	0~100	0~25	Weld Joints Φ10×2 or Thread M14*1.5
GTCMF-U-M-8	8	0~200	0~20	Weld Joints Φ10×1 or Thread M14*1.5

- **Medium-Small Flow Meter:**

Model	DN	Measurement scope (kg/h)	Work Pressure (MPa)	Connection type (mm)
GTCMF-U-S-10	10	0~500	0~25	Weld Joints Φ 20×4 or Thread M27*1.5
GTCMF-U-S-15	15	0~1500	0~25	Weld Joints Φ 20×3 or Thread
GTCMF-U-S-20	20	0~3000	0~25	Weld Joints Φ20×2 or Thread
GTCMF-U-S-25	25	0~10000	0~25	Weld Joints Φ31×3 or Thread

- **Large-scale Flow Meter:** High pressure could be special ordered. (4~70MPa)

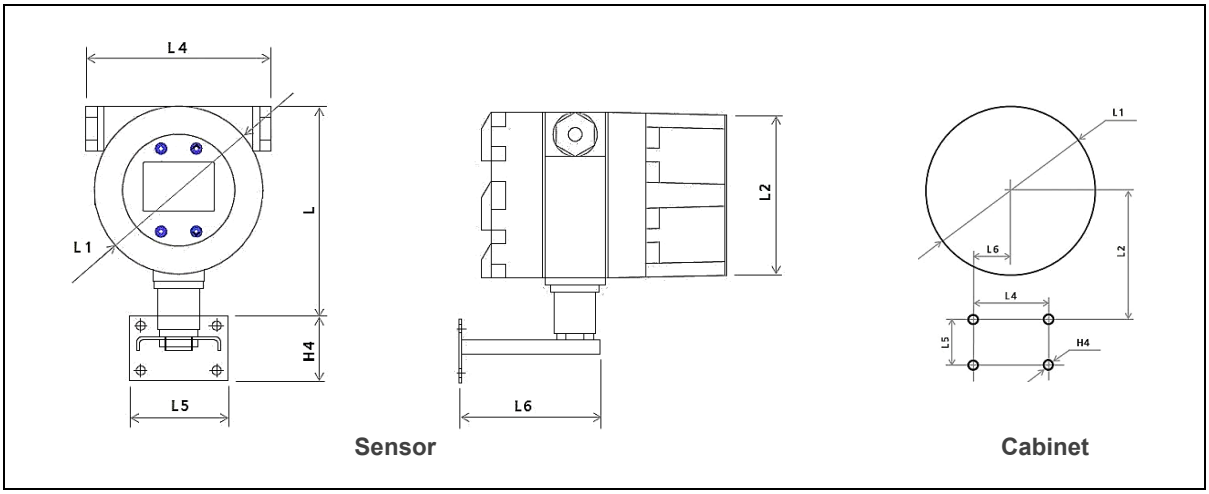
Model	DN	Measurement scope (T/h)	Work Pressure (MPa)	Connection type (mm)
GTCMF-U-G-10	10	0~0.5	0~4	Flange 10
GTCMF-U-G-15	15	0~1.5	0~4	Flange 15
GTCMF-U-G-20	20	0~3.0	0~4	Flange 20
GTCMF-U-G-25	25	0~10	0~1.6	Flange 25
GTCMF-U-G-40	40	0~20	0~1.6	Flange 40
GTCMF-U-G-50	50	0~30	0~1.6	Flange 50
GTCMF-U-G-65	65	0~50	0~1.6	Flange 65
GTCMF-U-G-80	80	0~100	0~1.6	Flange 80
GTCMF-U-G-100	100	0~150	0~1.6	Flange 100
GTCMF-U-G-125	125	0~200	0~1.6	Flange 125
GTCMF-U-G-150	150	0~300	0~1.6	Flange 150
GTCMF-U-G-200	200	0~500	0~1.6	Flange 150

3-2. GTCMF-V-Series Coriolis Mass Flow Meter

Model	DN	Measurement scope (T/h)	Work Pressure (MPa)	Connection type (mm)
GTCMF-V-10	10	0~1.0	0~4	Flange 10
GTCMF-V-15	15	0~3.5	0~4	Flange 15
GTCMF-V-20	20	0~5.5	0~4	Flange 20
GTCMF-V-25	25	0~15	0~4	Flange 25
GTCMF-V-50	50	0~40	0~4	Flange 50
GTCMF-V-80	80	0~100	0~1.6	Flange 80
GTCMF-V-100	100	0~150	0~1.6	Flange 100
GTCMF-V-150	150	0~350	0~1.6	Flange 150
GTCMF-V-250	250	0~500	0~1.6	Flange 250

4. Dimension

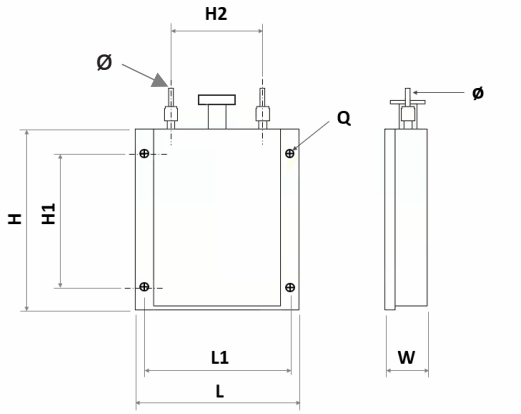
- **Transducer Size**



	L	L1	L2	L4	L5	L6	H4
Sensor	156	125	118	130	70	102	46
Cabinet		120	91	54	32	21	Φ6.5

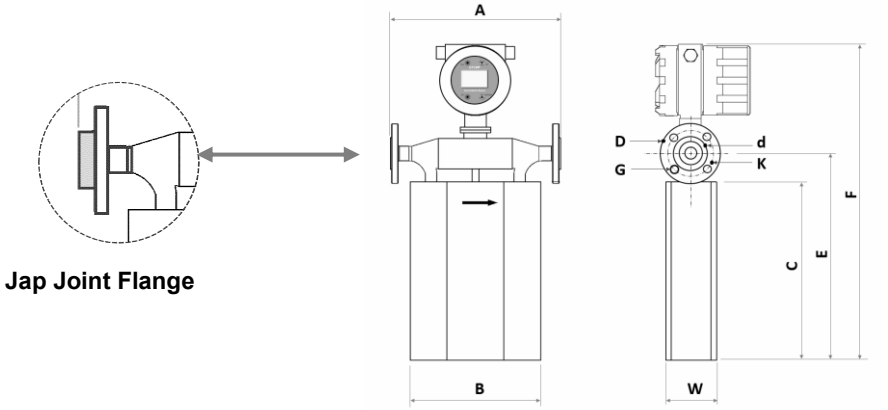
4-1. GTCMF-U-Series Coriolis Mass Flow Meter

- **Coriolis Mass Flow Meters with tiny flow rate**



Model	Connection	L	L1	H	H1	H2	W	Q
GTCMF-U-M-3	Weld Joints Φ 6×1.5 or Thread M12 *1	205	185	220	160	115	52.5	ø7
GTCMF-U-M-6	Weld Joints Φ10×2 or Thread M14*1.5	205	185	220	160	115	52.5	ø7
GTCMF-U-M-8	Weld Joints Φ10×1 or Thread M14*1.5	208	188	245	185	117	58.5	ø7

- **Medium Flow Sensor Outline: Welded Flange, Jap Joint Flange**

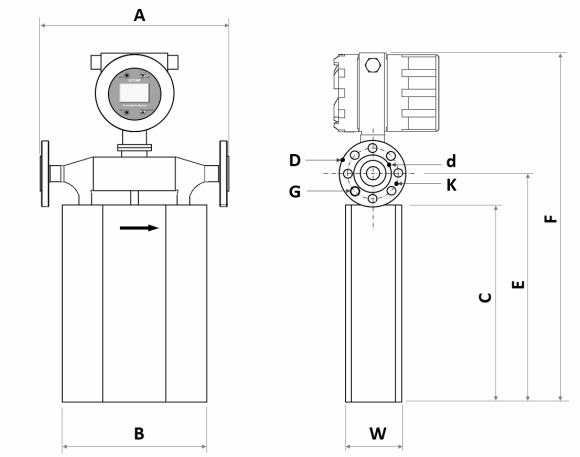


Jap Joint Flange

Welded Flange	DN	MPa	A	B	C	E	F	W	G	K	d	D
GTCMF-U-S-10	10	4.0	280	210	235	285	485	80	14	60	41	90
GTCMF-U-S-15	15	4.0	280	210	275	325	525	80	14	65	46	95
GTCMF-U-S-20	20	4.0	290	230	325	375	575	90	14	75	56	105
GTCMF-U-G-40	40	4.0	520	360	480	585	790	130	18	110	84	150
Jap Joint Flange	DN	MPa	A	B	C	E	F	W	G	K	d	D
GTCMF-U-S-25	25	4.0	410	300	440	500	696	120	14	85	65	115

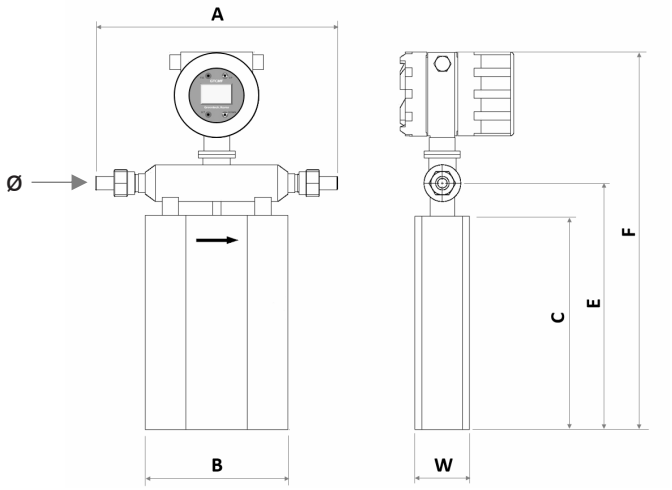
GTCMF-U-G-50	50	4.0	550	370	548	670	875	153	18	125	99	165
GTCMF-U-G-80	80	2.5	660	470	650	767	988	220	18	160	132	200

- **Large Flow Sensor Outline: Welded Flange**



Model	DN	MPa	A	B	C	E	F	W	G	K	d	D
GTCMF-G-65	65	4.0	560	440	600	715	836	200	18	145	118	185
GTCMF-G-100	100	2.5	670	490	720	831	1052	220	22	190	156	235
GTCMF-G-125	125	1.6	700	510	790	908	1142	260	18	210	184	250
GTCMF-G-150	150	1.6	900	700	930	1110	1350	280	22	240	211	285

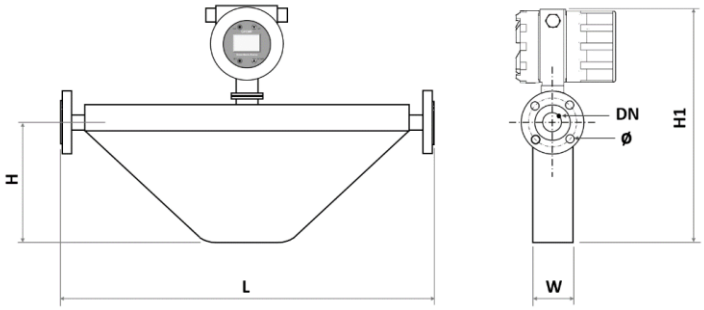
- **High Pressure Flow Sensor Outline:**



Model	DN	MPa	A	B	C	E	F	W	Connection
GTCMF-U-G-10	10	25	346	210	235	282	482	80	ø20x4
GTCMF-U-G-15	15	25	356	210	275	322	522	80	ø20x3
GTCMF-U-G-20	20	25	376	230	325	372	572	90	ø20x2
GTCMF-U-G-25	25	25	460	300	440	500	696	120	ø31x3

Attention: High pressure for more than DN40 model could be special ordered

4-2. GTCMF-V-Series Coriolis Mass Flow Meter



Model	DN	L	H	H1	W	ø
GTCMF-V-10	10	550	160	360	68	ø14
GTCMF-V-15	15	580	170	370	68	ø14
GTCMF-V-20	20	640	200	400	68	ø14
GTCMF-V-25	25	780	320	540	100	ø14
GTCMF-V-50	50	1100	500	730	150	ø18
GTCMF-V-80	80	995	260	515	140	ø18
GTCMF-V-100	100	1300	350	605	150	ø20
GTCMF-V-150	150	1750	490	805	262	ø22
GTCMF-V-250	250	1920	510	825	262	ø24

** Photos of GTCMF-V Series

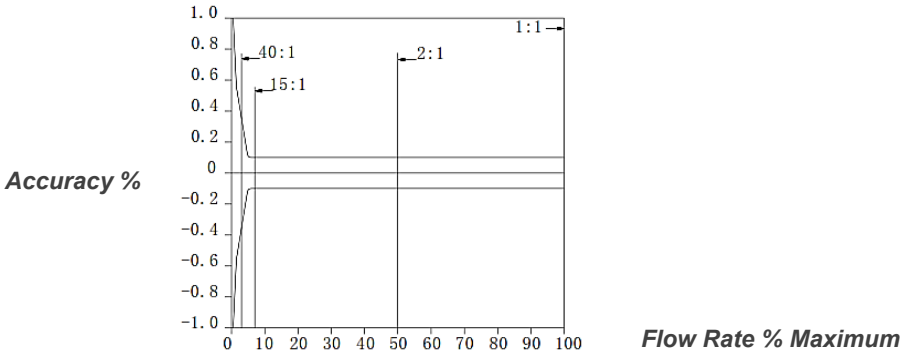
** Photos of DN250 (Core Processor)

- **Technical Indicators:**

Instantaneous Flow Accuracy: ±0.20% Flow Rate ± [(Zero Point Stability/ Flow Rate)* 100] % Flow Rate

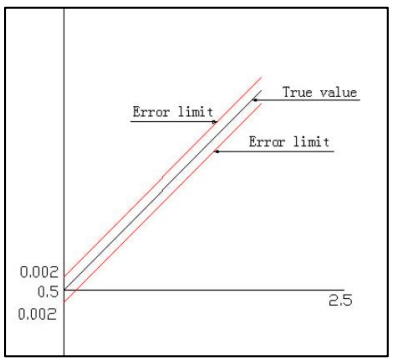
Response Time: Factory set as 1 second. (could be adjusted by the users)

- **Instantaneous Flow Rate Standard Precision Curve:**



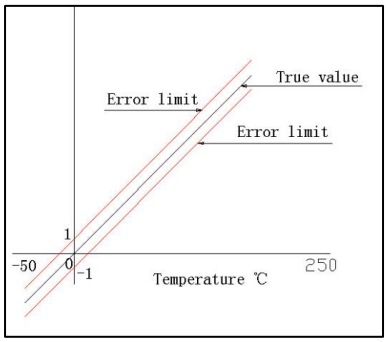
Density Measurement Accuracy: ±0.002g/cm^3 (Only applicable to liquid)
The origin coordinate starts with 0.5 as the graph shown below:

- **Density Accuracy Curve:**



Density Measurement Range: 0.5~2.5g/cm^3

- **Temperature Accuracy Curve:**



Temperature Measurement Accuracy: ±1℃

Attention: Module Selection

1. For the measurement of liquid, the most appropriate module should be selected based on the normal flow rate, maximum & minimum flow rate.
2. For the measurement of gas, the most appropriate module should be selected according to the velocity calculated based on normal flow rate, maximum & minimum flow rate, size of pipeline, pressure.
3. For the measurement of high viscosity liquid, or the double-phase liquid of liquid and solid, it is required.
4. For the measurement of corrosive medium, would you please inform us the detailed name of the measured medium.

And we will select the different materials of measuring pipeline (HC Hastelloy/ PTFE/ Titanium) based on the Corrosion Prevention Manual.

We will select the most appropriate module based on the normal flow rate and the maximum flow rate provided. It is recommended that the normal flow rate would be above 1/3 of the designed flow rate range of different modules.

And at the same time, it advised that the minimum flow rate of the users should be above 1/10 of the calibrated flow rate. Please contact us if there's any special requirement.
We could provide the customer-made modules based on the special technical requirements of the users. We will make sure the Coriolis Mass Flow Meters would meet all the requirements provided.

We will select the material of the sensor, pressure class and the temperature class based on the characteristics of the medium provided.
And for sure, we will guarantee the anti-explosion proof will meet with the actual requirements of the users.