



OPERATION MANUAL

Coriolis mass flow meter



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Installation & Calibration

The proper installation is very important for the performance of the Coriolis Mass Flow Meters. The installation location should be chosen the place that easy for the maintenance. Would you please read the content of the chapter carefully before the installations.

I. The requirements for the installation:

1. The coriolis mass flow meters are working based on the vibration working principle. So it is the best that there will be no vibration on the installation place. And the strong support of the installation pipelines of the coriolis mass flow meters is very import. If the vibration can not be ignored, it is suggested to use the soft tube connection. And the connections pipelines and the mass flow meters should be on the same axis. Please do not add additional force on the mass flow meters, otherwise the accuracy of the mass flow meters might be affected.
2. If the percentage of the gas in the measured liquids is high, then it is a must to install the gas- liquid separation tank on the inlet of the coriolis mass flow meters.
3. The throttle devices, for example the flow control valves should be installed on the outlet of the mass flow meters.
4. The mass flow meters should be installed away from the outlet of the pumps. Especially for the dual pumps, if the installation distance is too close, then the measured flow rate could be affected, which is fluctuated.
5. If measuring high temperature liquids or it is required to keep warm of the measure medium, please keep distance between the inner tubes of the heating jackets or the heating tubes with the housings of the sensor. We factory also provide the heating jackets along with the mass flow meters, for example the heating jackets for steam or transfer oil. (need to special ordered).
6. The measured liquids should be on the suitable flowing status. If under the local environment the flowing status of the liquids is not suitable, then it is suggested to improve with other methods, for example to modify the temperature of the liquids (increasing / decreasing the temperature of the liquids to make sure the measured liquids are in the proper flowing status.
7. Installation direction : please make sure the flowing direction should be the same with the direction marks on the nameplates of the coriolis mass flow meters. Otherwise the accuracy of the mass flow meters could be affected.
8. Please make sure the series numbers of the transmitters and the sensors are one -to-one corresponded to each other. It can not be easily changed. Otherwise the accuracy of the mass flow meters could be affected.

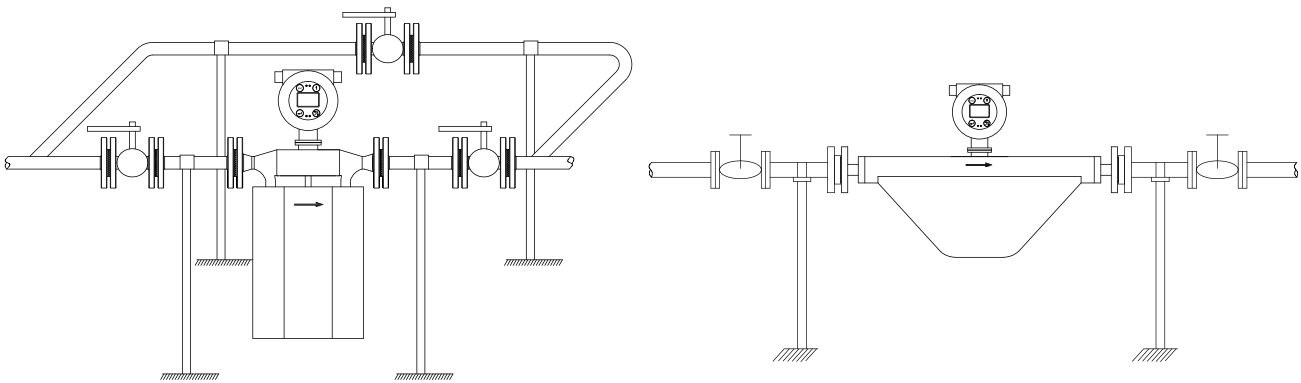
9. If the mass flow meters are installed on the outdoors, then it is the best to install the rain shelters for the mass flow meters. And please make sure to keep both the front and back covers of the mass flow meters tightly closed. And please make sure that the electrical interface is sealed well to prevent the waters flowing inside the transmitters.

10. It is suggested to use the normal working flow rate higher than the 1/3 of the standard flow range of the mass flow meters. And it is suggested that the actual minimum flow rate should be higher than the 1/10 of the standard flow range of the mass flow meters. If it is in special situation, please communicate with the sales of our company. As we have our own R&D team, we can customize the mass flow meters based on your own special requirements, to make sure that we can meet with the requirements of the users of the usage range.

II. Installation method for the coriolis mass flow meters: (pipeline size : 10-300mm)

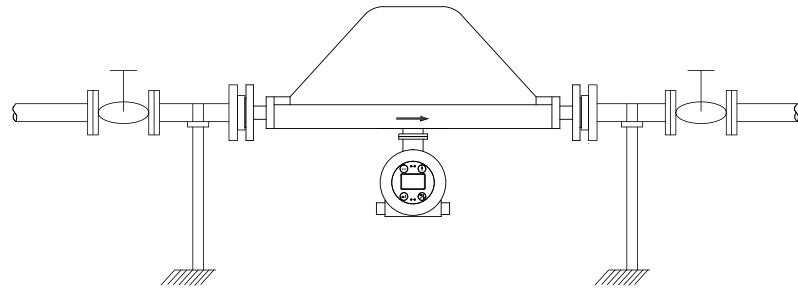
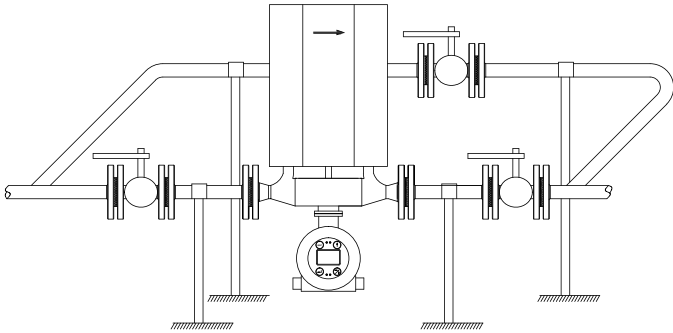
A. Horizontal installation :

- Application : measurement of liquid
- Installation method for the measurement of liquids. The gas that possible stored in the pipelines of the mass flow meters can be easily released and emptied.



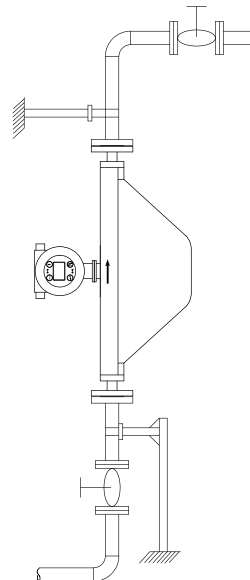
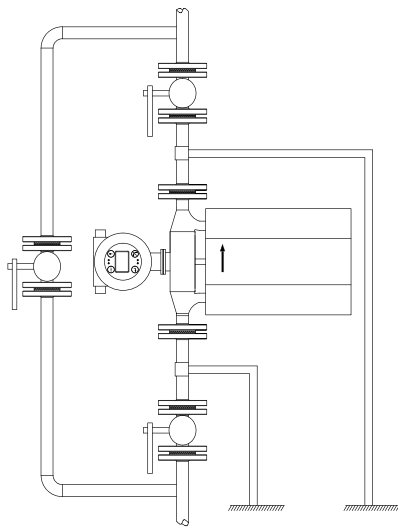
B. Inverted installation :

- Application : measurement of gas, or liquids with high viscosity that can be easily stick on the pipelines.
- The liquids that possible stored in the pipelines of the mass flow meters can be easily released and emptied.



C. Flag type installation :

- Application : measurement of liquid with high viscosity, suspension liquid, double phase liquid of both liquid and solid, or some special working situations.
- The liquids with high temperature that easily solidified that possible stored in the pipelines of the mass flow meters can be easily released and emptied. The flag type installation will not affect the accuracy of measurement in any situation. The direction of the flow must be from bottom to up.

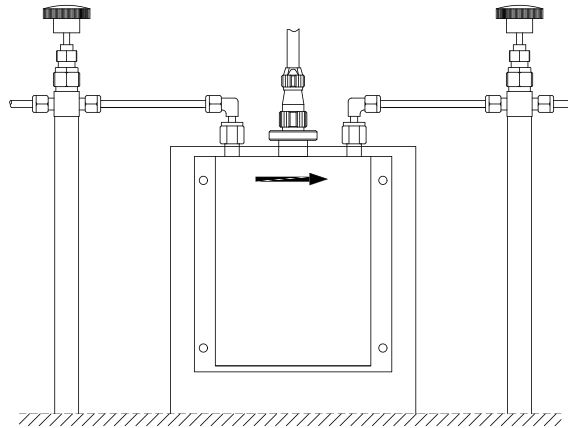


III. Installation method for the coriolis mass flow meters: (tiny pipeline size : 3-8mm)

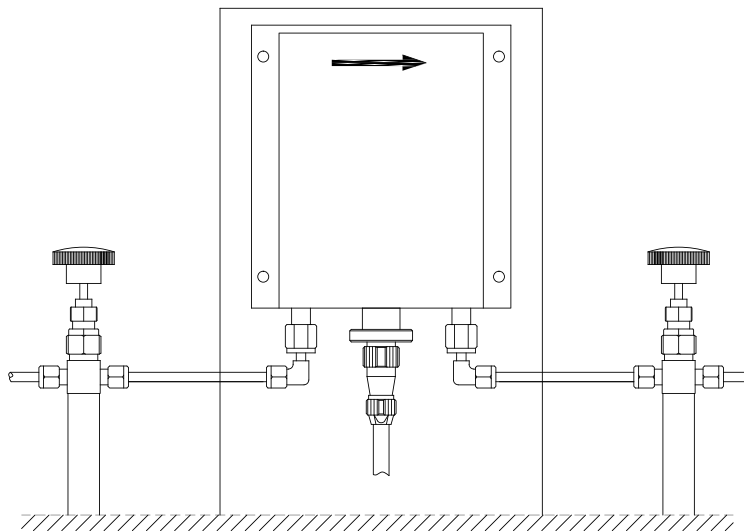
As the flow range of the tiny flow rate mass flow meters is very small, and the requirement of the accuracy is high, the installation is very important. The mounting plate and the strong support of the mass flow meters are the must. The mounting plate must be tightly closed to the mass flow meters. If it is uneven, please use the leveling bolts to adjust the balance.

The installation draft is provided as below:

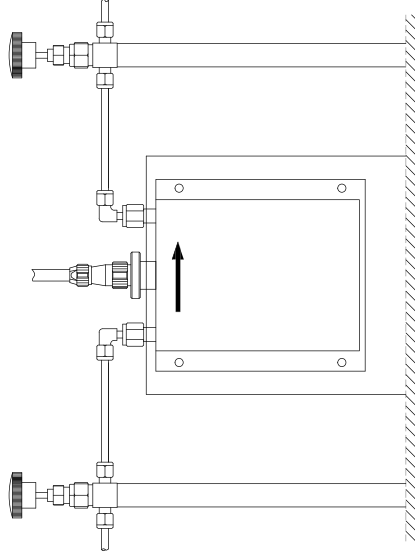
A. Horizontal installation :



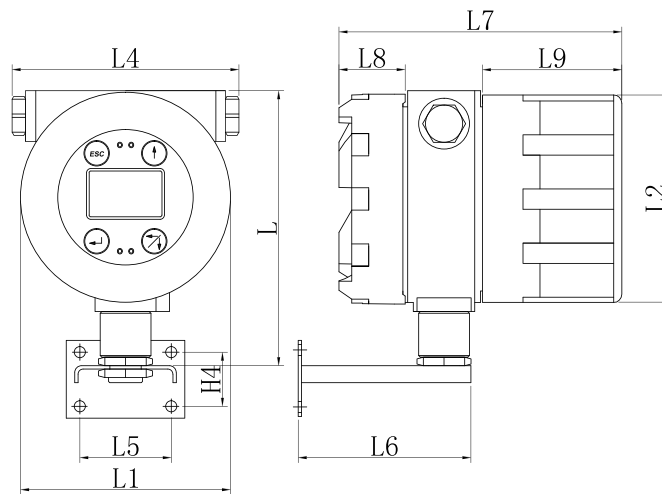
B. Inverted installation :



C. Flag type installation :



IV. Installation for the transmitters for the separated type mass flow meters:



Item	L	L1	L2	L4	L5	L6	L7	L8	L9	H4
Length	156	125	118	130	54	102	180	45.5	85	32

Unit: mm .



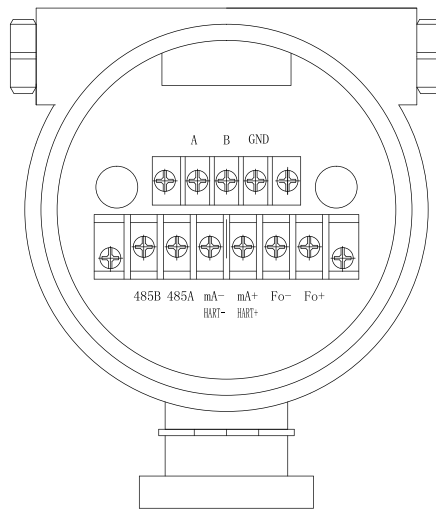
V. Wiring between the transmitters and the sensors of the mass flow meters.

We have already connected and installed the transmitters and the sensors for the integrated type mass flow meters.

For the separated type mass flow meters, the transmitters and the sensors are connected with special cables and connectors. Please communicate with the sales for the communication distance between the transmitters and the sensors. The longest distance should be longer than 300 meters. Please make sure that the series numbers of the sensors and transmitters should be one-by-one corresponded to each other.

ATTENTION
For the power supply of the mass flow meter, please refer to the actual steel seal. Please double check the power supply before the wiring just in case the mass flow meter could be destroyed.
Both the frequency of the transmitters and the current output are the signals with power supply. It is forbidden to connect to the external power resource. The wrong connection to the external power resource could cause damages to the instrument.

VI. Wiring guidance for the transmitters.



A\B	Please refer to the nameplates for the actual power supply. <ul style="list-style-type: none"> ◇ 24VDC (The current should be smaller than 500mA). A(+)/ B(-) ◇ 220VAC A(L)B(N)
Fo+\-	Frequency Output (instantaneous mass flow or volume flow rate). You can change on the 20 password interface.
mA +\-	Current Output (instantaneous flow or density optional)
485A\ 385B	RS-485 protocol (Baud Rate: “9600” , Address: “1”)
GND	Signal Shielding
	Instrument Shell



VII. Energizing & Inspection:

- Please make sure that the wiring connection is correct before energizing the Coriolis Mass Flow Meters. The fault line protection is designed in the transmitters of the mass flow meters. But the wrong wiring connection share still damage of the mass flow meters.
- The screen will display “Initializing, hold on...” after the energizing.

Calibration and operations of the mass flow meters.

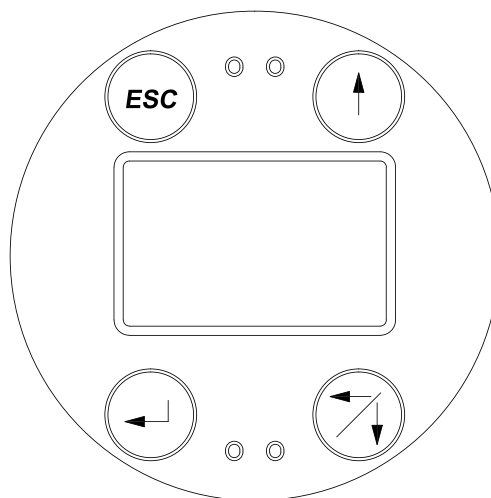
I. Zero point calibration:

The zero point calibration provides the reference point for the flow measurement. Please process the zero point calibration after the installation, completion of the feeding operation, or restart the mass flow meter after long time idle. Please read carefully before the calibration of the mass flow meters.





The steps for the calibration is provided as below:

1. Please let the measured medium flowing through the mass flow meters for about 5-10 minutes. And make sure the inner pipelines are fully filled with the measured medium.
2. Please turn off the stop valve of the exit of the mass flow meters first, and then turn off the stop valve on the entrance.
3. Please wait for one minute, and make sure that the liquid inside the measuring tubes is at the stationary status. (it is the best to process the zero point calibration for twice.)
4. Turn on the stop valve on the entrance first, and then turn on the stop valve on the exit afterwards.

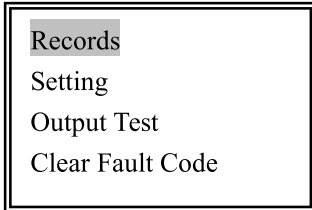
II. Instrument Panel :





The operation guidance is provided as below:

Touch , and the password interface would be shown. Touch , and touch , input 20 (password). Then touch  to enter.


1. Records

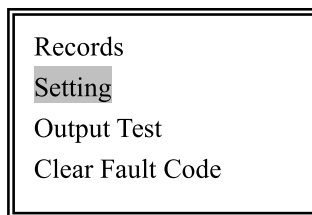


Touch  to enter the inner interface.

Touch  to scroll between several interfaces to check the information of the mass flow meters

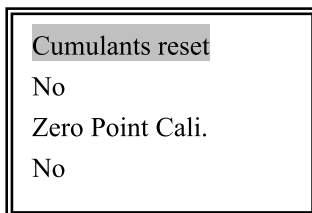
2. Setting

touch  to enter the “Setting” interface.



In the setting interface, total flow clearance, zero point calibration, tiny-signal cut, current output could be processed.

3. Cumulative flow rate reset :



Touch  to enter the cumulants reset, touch  change to “ Yes” , and touch  to confirm. ;



4. Zero point calibration :

Cumulants reset
No
Zero Point Cali.
No

5. Decimal places:

Small signal cut
2 %
Decimal places
3

You can choose the displaying decimal points from 0 to 3.

6. Displaying unit selection :

Unit selection
kg/h ft ³ /d
Cumulative units
kg L

7. Medium 1 density & medium 2 density :

Medium 1 density
1.000 g/cm ³
Medium 2 density
1.000 g/cm ³

Please input the density of the two liquids. Medium 1 and medium 2.
The mass flow meter's displaying percentage is the percentage of the medium 1 in the mixed medium 1 & medium 2. The percentage displaying is from 0 to 100% .



Maintenance:

Symptom	Failure Reason	Solution
No display	Check whether is 24VDC power supply is normal	Make sure 24VDC is working normally
The measured flow rate fluctuated largely.	Please double check whether there's strong vibration of the pipelines connecting to the sensors	Adding support or switching to hose connections
Can not enter the measuring interface after starting	The sensor is not connected	Check the cables, and make sure they are connected to the sensor properly
Zero Point Drift is large	There's stress or additional force on the installation of the mass flow meters.	The connecting line and the sensor interfaces should be at the same axis

Please attention: (0-10)KHz and (4-20)mA output signal is already with the power supply. It is forbidden to connect with other external power sources. Otherwise the damage of the mass flow meter could be caused.



Documentation: RS 485 RTU Communication Protocol

Address:

S/N.	Holding Register	Access Address (Hex/ Decimal)	Definition
1	41001	0x03E8 / 1000	Mass Flow
2	41003	0x03EA / 1002	Volume Flow
3	41005	0x03EC / 1004	Total Mass
4	41007	0x03EE / 1006	Total Volume
5	41009	0x03F0 / 1008	Density
6	41011	0x03F2 / 1010	Temperature
7	41013	0x03F4 / 1012	Pipeline Vibration Frequency
8	41015	0x03F6 / 1014	Module
9	41017	0x03F8 / 1016	S/N
10	41019	0x03FA / 1018	Flow Unit
11	41021	0x03FC / 1020	Density Unit
12	41023	0x03FE / 1022	Range
13	41025	0x0400 / 1024	Decimal Places
14	41027	0x0402 / 1026	Tiny Signal Cut Ratio
15	41029	0x0404 / 1028	Display Refresh Time
16	41031	0x0406 / 1030	Internal Mass Flow Meter Parameters
17	41033	0x0408 / 1032	Internal Mass Flow Meter Parameters
18	41035	0x040A / 1034	Internal Mass Flow Meter Parameters
19	41037	0x040C / 1036	Measured Medium
20	41039	0x040E / 1038	Current Output Selection
21	41041	0x0410 / 1040	Input Password
22	41043	0x0412 / 1042	Internal Mass Flow Meter Parameters
23	41045	0x0414 / 1044	Internal Mass Flow Meter Parameters
24	41047	0x0416 / 1046	Internal Mass Flow Meter Parameters
25	41049	0x0418 / 1048	Total Data Clearance
26	41051	0x041A / 1050	Internal Mass Flow Meter Parameters
27	41053	0x041C / 1052	Internal Mass Flow Meter Parameters
28	41055	0x041E / 1054	Internal Mass Flow Meter Parameters
29	41057	0x0420 / 1056	Internal Mass Flow Meter Parameters
30	41059	0x0422 / 1058	Internal Mass Flow Meter Parameters
31	41061	0x0424 / 1060	Internal Mass Flow Meter Parameters
32	41063	0x0426 / 1062	Internal Mass Flow Meter Parameters
33	41065	0x0428 / 1064	Internal Mass Flow Meter Parameters
34	41067	0x042A / 1066	Internal Mass Flow Meter Parameters
35	41069	0x042C / 1068	Internal Mass Flow Meter Parameters
36	41071	0x042E / 1070	Internal Mass Flow Meter Parameters



Attention:

Each holding register is 4 bytes (2 consecutive maintain registers), and it takes two addresses (low address). The register with a background in the tables is read-only register. The writing operation is invalid.

The address of 0x41049 is total-data clearance register. Write 0 in this address could process the clearance operation. Read the register and it will returns back to 1 (Floating point number).

The flow unit setting is 0-7 (The data will be transferred to 4-byte floating point number to transfer).

0→t/h; 1→kg/h; 2→g/h; 3→kg/min; 4→g/min; 5→m³/h; 6→L/min; 7→ml/min

The density unit setting is 0-2 (The data will be transferred to 4-byte floating point number to transfer). And it respectively stands for: g/cm³、g/L、t/m³

0→g/cm³; 1→g/L; 2→t/m³

The current output selection is 0-1. And it respectively stands for flow and density. The data will be transferred to 4-byte floating point number to transfer.

The measured medium setting is 0-1. And it respectively stands for liquid and gas. The data will be transferred to 4-byte floating point number to transfer.

ModBus Communication (RTU Format)

Check Method: no check

Data Bits: 8

Stop Bits: 1

ModBus Communication Protocol (RTU)

1. Read N variables

The host requested information frame:

Mass Flow Meter Address+0x03+Register's Starting Address (2bytes, High Byte is in the front) + Number of Register's Reading and Writing 2*N (2bytes, High Byte is in the front) + CRC Check Code (2bytes, Low Byte is in the front)

Response Information from the machine frame:

Mass Flow Meter Address +0x03+Bytes of Data 4*N (1 字节) + Register's Data (4*N bytes, High Byte is in the front) + CRC Check Code (2 bytes, Low Byte is in the front)

For Example:

2. Write N variables

The host requested information frame:

Mass Flow Meter Address +Function Code 0x10+ Register's Starting Address (2 bytes, High Byte is in the front)+ Number of Register's Reading and Writing 2*N(2bytes, High Byte is in the front) + Bytes of Data 4*N (1byte) +Data waiting to be written (4*N bytes, High Byte is in the front) + CRC Check Code (2 bytes, Low Byte is in the front)

Response Information from the machine frame:



Mass Flow Meter Address + Function Code 0x10+ Register's Starting Address (2 bytes, High Byte is in the front) Number of Register's Reading and Writing $2*N$ (2bytes, High Byte is in the front)
+
(2 bytes, Low Byte is in the front)