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QINGDAO ADD VALUE

鲁制02000194号

K Series Mass Flow Meter

User's Manual

QINGDAO ADD VALUE FLOW METERING CO., LTD.

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Notice

When an object has both linear motion and rotational motion, it will be subjected to a vector product force proportional to the linear velocity of the linear motion and the angular velocity of the rotational motion. This is the Coriolis force.

K series Coriolis Mass Flow Meter is a high-tech mass flow meter (hereinafter referred to as Flow Meter) that uses Coriolis force principle to measure fluid flow. It consists of K series Mass Flow Meter Sensor (hereinafter referred to as Sensor) and BPM type Mass Flow Meter Transmitter (hereinafter referred to as Transmitter). This manual mainly introduces the principle, features, specifications, installation, maintenance, troubleshooting and other precautions of the Sensors and Transmitters.

This is composite instrument with explosion-proof and intrinsically safe circuits. If it is installed in an explosion-hazardous place such as an oil depot or gas station, the person who installs, operates and maintains it should have basic safety technical knowledge and knowledge of the use of corresponding intrinsically safe equipment and associated equipment. This series of flow meters have been tested by the China National Quality Supervision And Test Center For Explosion Protected Electrical Products (CQST) and meet the relevant requirements for electrical equipment for explosive environments in GB 3836.1-2010, GB 3836.2-2010 and GB 3836.4-2010. The mark and explosion proof certificate number are:

Model	Explosion-proof Mark	Explosion-proof Certificate Number
K1200	Ex ib IIC T1～T6 Gb	CNEx21.2110X
K800	Ex ib IIC T1～T6 Gb	CNEx19.2717X
K600	Ex ib IIC T1～T6 Gb	CNEx19.2717X
K400	Ex ib IIC T1～T6 Gb	CNEx19.2717X
K350	Ex ib IIC T1～T6 Gb	CNEx21.2110X
K300	Ex ib IIC T1～T6 Gb	CNEx21.2110X
K200	Ex ib IIC T1～T6 Gb	CNEx21.2110X
K100	Ex ib IIC T1～T6 Gb	CNEx21.2110X
K050	Ex ib IIC T1～T6 Gb	CNEx19.2717X
K025	Ex ib IIC T1～T6 Gb	CNEx21.2110X
K015	Ex ib IIC T1～T6 Gb	CNEx21.2110X
K010	Ex ib IIC T1～T6 Gb	CNEx20.5532X
BPM-E	Ex d[ib] IIC T6 Gb	CNEx20.5531X

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1.0 Introduction

1.1 Applicable Scope

Mass Flow Meter is a new type of advanced flow measurement instrument and has been rapidly developed in the world. It has been widely used for process detection and custody transfer measurement in many industries such as petroleum, petrochemical, chemical, pharmacy, marine, pharmaceutical, municipal, paper, food and energy and so on. It has been highly valued by the flow research community and welcomed by users at home and abroad.

K series Sensors are used in conjunction with BPM Transmitters to provide accurate instantaneous flow, flow totals, and real-time monitoring of density and temperature.

1.2 Components

K series Mass Flow Meter Sensors are mainly composed of flange, measuring tube, driving system and pickoff system (see Figure 1).

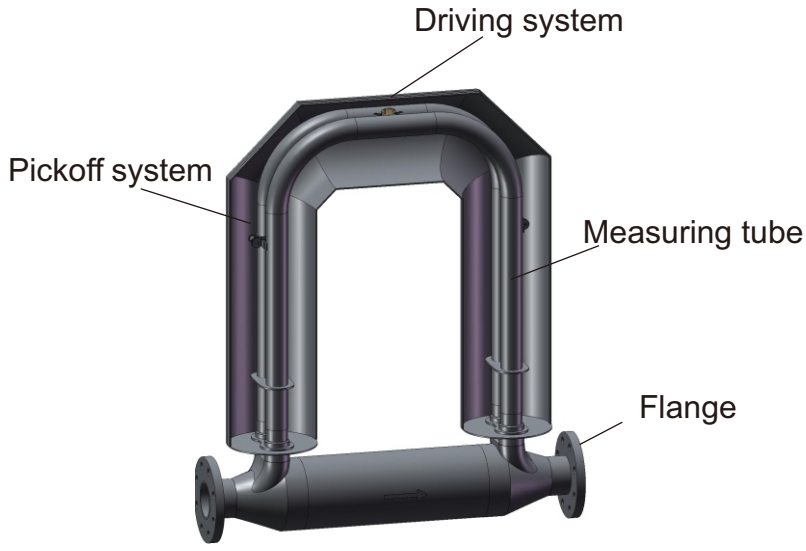


Figure 1

BPM Transmitter is composed of intelligent measurement control systems based on DSP and ARM, to achieve accurate measurement of mass flow, density and temperature.

1.3 Measurement Principles

1) K Series Mass Flow Meters are based on the Coriolis principle, using magnets and coil components installed on the measuring tube, under the action of alternating current, the measuring tube is vibration periodically at a fixed frequency. When the fluid medium of the industrial process flows through the measuring tube, the Coriolis force effect will occur, and torsional vibrations will happen to the two measuring tubes. At this time, the pickoff coils installed at both ends of the measuring tube will generate two signals with different phases, and the phase difference is proportional to the mass of the fluid flowing through the measuring tube of the Sensor. Therefore, the mass value of the fluid can be obtained by measuring the phase difference.

In addition, the vibration frequency of the measuring tube is determined by the total mass of the measuring tube and the fluid in the tube. Therefore, when the density of the fluid changes, the vibration frequency will also change accordingly. According to this, the density value of the fluid in the tube can be obtained.

The temperature Sensor installed on the measuring tube can monitor the fluid temperature in real time.

2) After obtaining the measurement results, the Transmitter will display the measured values of mass total, density, temperature, etc. through the OLED display, on the other hand, the relevant parameters can be passed through the industry standard 4-20mA current or PWM pulse or RS485 interface output outward, easy to read by host computer or other secondary instruments.

3) The Transmitter is equipped with light-sensitive explosion-proof buttons, OLED display screen and LED indicator light, which can realize medium measurement, function operation, query and working status display.

1.4 Features

1) Configurable output: BPM Transmitter can provide 4-20mA current output to the outside through active or passive means, which is used to represent mass flow, volume flow, density and temperature. It can also provide 0-10kHz pulse output to the outside through active or passive means, which is used to represent mass flow and volume flow.

2) Standard RS485 interface mode: BPM Transmitter uses RS485 interface based on MODBUS RTU communication protocol. Through digital communication, all measured values and intermediate values can be output, and the host computer

communication software provided by our company can be used to view, store, and modify data variables.

3) Convenient man-machine interface: the Transmitter is equipped with light-sensitive explosion-proof buttons and OLED display. The query and display of mass flow, volume flow, density, temperature and the calibration of the calibration of zero point can be completed at site through buttons(the above operation does not require to screw the front cover).

4) Temperature and pressure compensation: all internal circuits of the Transmitter adopt industrial-grade low-temperature drift series components, so that the Transmitter is less affected by the ambient temperature, ensuring the measurement accuracy within the normal operating temperature range. In addition, a pressure influence compensation program is added inside the Transmitter, and the user can manually input the pipeline pressure value so that the Transmitter can calculate the pressure compensation value.

5) Compared with traditional flow measurement methods, mass flow meters also have the following advantages:

a. The mass flow meter can directly measure the mass flow of the fluid in the pipeline without the conversion of the intermediate parameter, to avoid the measurement error caused by the intermediate conversion. Therefore, it has high measurement accuracy and good repeatability, and can achieve high-precision direct measurement of instantaneous mass flow in a larger range ratio.

b. The measuring tube of mass flow meter has small amplitude and no moving parts inside, so it has high reliability, long service life and less daily maintenance.

2.0 Specifications

2.1 Accuracy Levels

	Model	Flange	Mass(kg/h)	Volume(l/h)
Maximum flow	K010	DN10，DN15，DN20,DN25	96	110
	K015	DN10，DN15，DN20,DN25	270	310
	K025	DN15，DN20,DN25	1000	1420
	K050	DN15，DN20,DN25	3000	4200
	K100	DN25，DN32	15200	21600
	K200	DN40，DN50，DN65	52500	75000
	K300	DN80，DN100	155000	220000
	K350	DN100，DN125，DN150	290000	403000
	K400	DN150，（DN175），DN200	462000	652000
	K600	DN200，（DN225），DN250	900000	1463000
	K800	DN200，（DN225），DN250	1604000	2350000
	K1200	DN250，DN300，DN350	2380000	3266000

Mass flow error①	Within 30: 1 range ratio②	±0.1%
	Within 40: 1 range ratio②	±0.15%
Mass flow repeatability	Within 30: 1 range ratio	±0.025%
Volume flow error③	Within 30: 1 range ratio	±0.1%

2.2 Zero Stability

	Model	kg/h
Zero Stability④	K010	0.0024
	K015	0.00675
	K025	0.025
	K050	0.075
	K100	0.38
	K200	1.31
	K300	3.88
	K350	7.83
	K400	21.95
	K600	29.25
	K800	64.16
	K1200	99.25

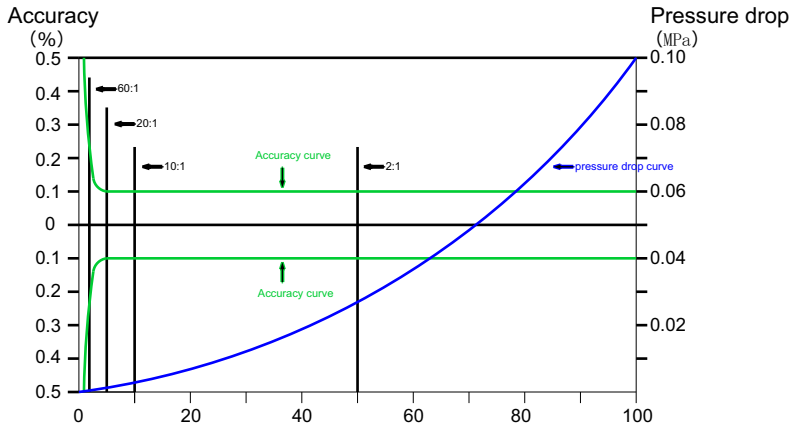
①The stated flow error includes the combined effects of repeatability, linearity and hysteresis. All liquid indicators are based on water at 20 ~ 25℃ and 0.1 ~ 0.2Mpa reference conditions, unless otherwise stated.

②Range ratio is the ratio of maximum flow and minimum flow.

③The volume flow error is based on the process fluid with a density of 1g / cm³. For process fluids with a density other than 1g / cm³, the volume flow is equal to the mass flow divided by the fluid density.

④When the flow value is close to the low end of the flow range, the accuracy of the flow meter begins to deviate from the stated accuracy. At this time, the zero point stability must be considered. The zero point stability is measured under the condition of no installation stress.

2.3 K300 Typical Accuracy, Flow and Pressure Drop Curve



Range ratio	60:1	30:1	10:1	2:1	1:1
Accuracy(±%)①	0.25	0.1	0.1	0.1	0.1
Pressure drop(Mpa)	～0	0.0003	0.001	0.026	0.1

①Accuracy is the actual measurement accuracy. Since the highest accuracy of "JJG 1038-2008 Coriolis Mass Flow Meter" is 0.15, the relevant certificates and qualifications can only be 0.15.

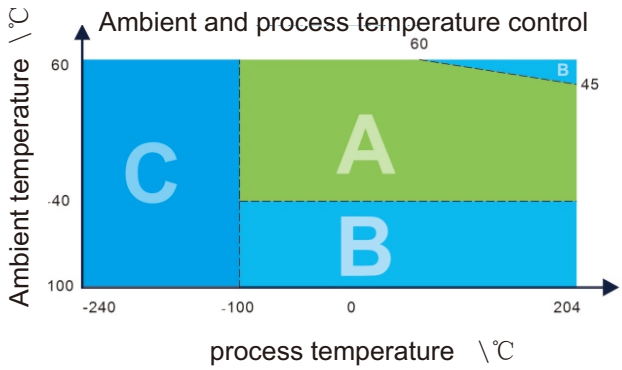
2.4 Density Accuracy (For Liquid)

Density error②	±0.0005g/cm³	±0.5kg/m³
Repeatability	±0.0001g/cm³	±0.1kg/m³
Measuring range	(0.2～2.0)g/cm³	(200～2000)kg/m³

②Density error includes the combined effects of repeatability, linearity and hysteresis. The density error of ± 0.0005g / cm^3 (± kg / m^3) is based on water under the reference conditions of 20℃ and 0.1 ~ 0.2Mpa. Under different operating conditions, accuracy may be reduced.

2.5 Temperature Accuracy

Error	±0.2℃	①If installed in a hazardous location, the explosion-proof certification shall define the applicable temperature range.
Repeatability	±0.1℃	
Temperature limit①	(-240～204)℃	
Temperature display range	(-240～204)℃	
Ambient temperature	Operating temperature	(-40～60)℃
	Storage temperature	(-40～70)℃



Zone A: Integrated installation/split installation

Zone B: Split installation

Zone C: Low-temperature split installation when the operating process temperature is below -100°C
In all cases, electronic components shall not be used at ambient temperatures below -40 ° C or above 60 ° C.

If the sensor is to be used at ambient temperatures beyond the permissible limits of the electronic component.it must be mounted in separate pieces, as shown.

The sensor can be used within the process and ambient temperature range shown in the temperature limit diagram.

2.6 Hazardous Area Classifications

	Explosion-proof mark	
Explosion-proof grade	Sensor	Exib IICT1~T6 Gb
	Transmitter	Ex d [ib] IICT4 Gb
	Explosion-proof performance conforms to GB3836.1-2010, GB3836.2-2010, GB3836.4-2010	
	Application: suitable for Zone 1 and Zone 2 of explosive hazardous locations, equipment category IIC, backward compatible with IIA, IIB, temperature group T1~T6	
Protection level	Sensor	IP67
	Transmitter	IP65

Note: Separate or integrated installation of the Sensor and Transmitter does not affect the explosion-proof performance.

2.7 General Technical Specifications

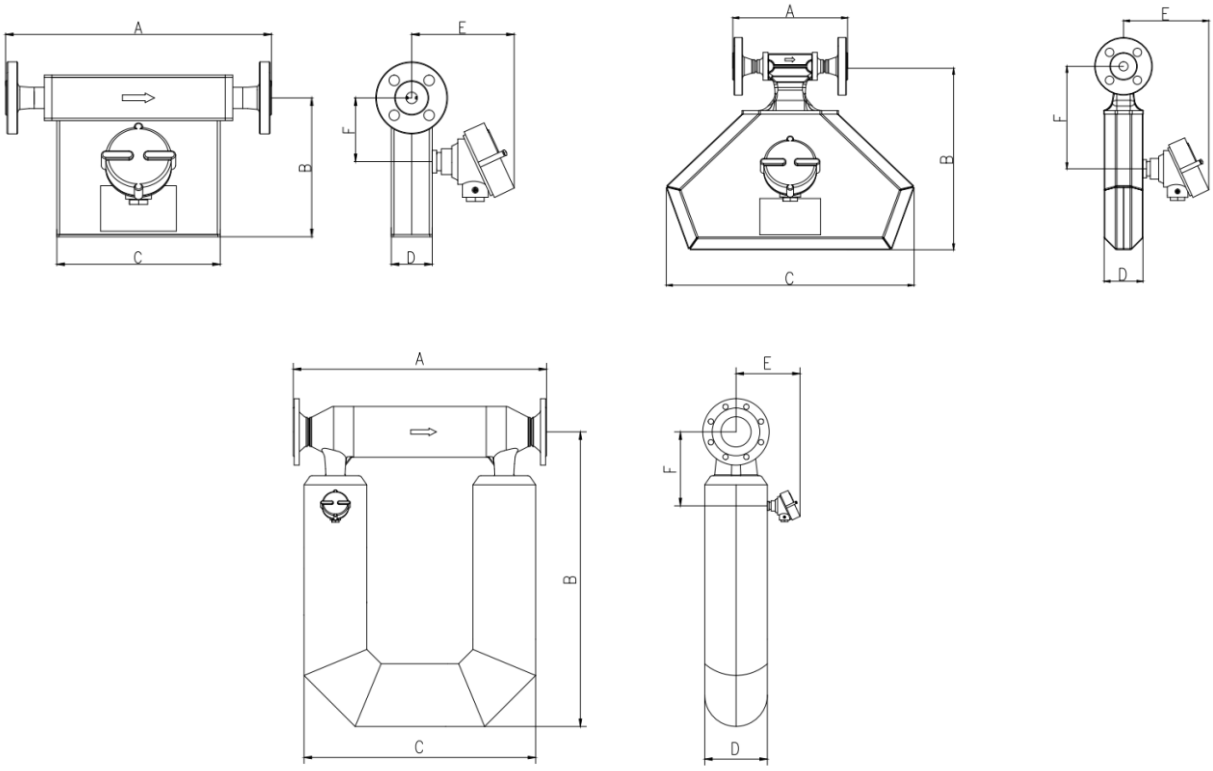
Power supply	AC power supply	(85~265)VAC，50/60Hz
	DC power supply	(18~100)VDC
Pressure resistance and sealing	The compressive strength test was carried out on the pressure part of the flow meter with water, and the test pressure was 1.5 times the nominal pressure, which lasted 5 minutes, and there was no leakage at each connection.	

2.8 Output Signal and Integration

Analog communication (two optional output channels)	It can be set according to site requirements: two channels current communication, two-way pulse communication or one-way current communication and one-way pulse communication.	
Pulse output	Output range	(0~10)kHz
	Basic error	±0.01%
	Temperature influence	±0.001% F.S/℃
Current output	Output range	(4~20)mA
	Basic error	±0.05%
	Temperature influence	±0.005% F.S/℃
Digital communication	RS485 interface, Modbus communication protocol; optional baud rate: 9600, 19200 or 38400, etc .; multi-machine communication and bus connection are available.	
Power consumption	BPM Transmitter maximum power ≤11W	

2.9 Dimensions

K Series Mass Flow Meter Installation Dimensions (Separate Type)

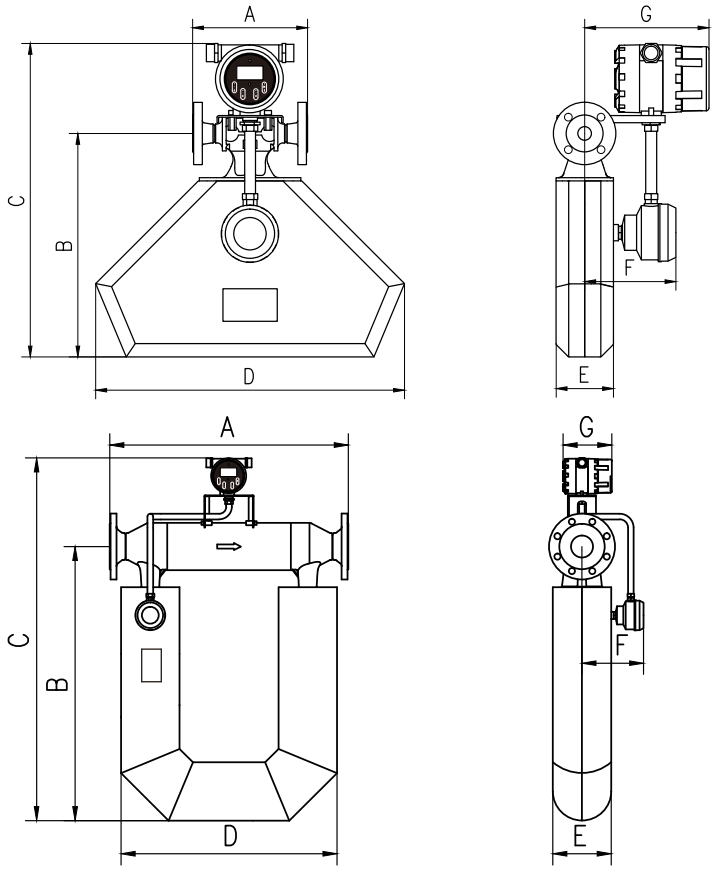


Unit: mm

Types	Model	Specification, pressure level	A(Customizable)	B	C	D	E	F
Δ	K025	DN15/DN20/DN25	161～165	219	279	53	135	107
	K050	DN15/DN20/DN25	189～193	303	408	64	140	169
	K100	DN25/DN32	212～216	412	568	106	167	185
U	K010	DN10/DN15/DN20/DN25	345～355	183	216	54	137	84
	K015	DN10/DN15/DN20/DN25	345～355	183	216	54	137	84
	K200	DN40/DN50/DN65	582～596	727	496	140	186	204
	K300	DN80/DN100	836～866	976	768	208	220	245
	K350	DN100/DN125/DN150	830～876	841	718	212	222	226
	K400	DN150/（DN175）/DN200	990～1056	1095	860	300	260	300
	K600	DN200/（DN225）/DN250	1004～1090	1211	850	379	305	245
	K800	DN200/（DN225）/DN250	1004～1090	1326	850	410	321	245
	K1200	DN250/DN300/DN350	1090～1130	1641	850	506	369	245

The flange standard adopts GB/T 9115-2010, HG/T 20592-2009.

K Series Mass Flow Meter Installation Dimensions (Integral Type)

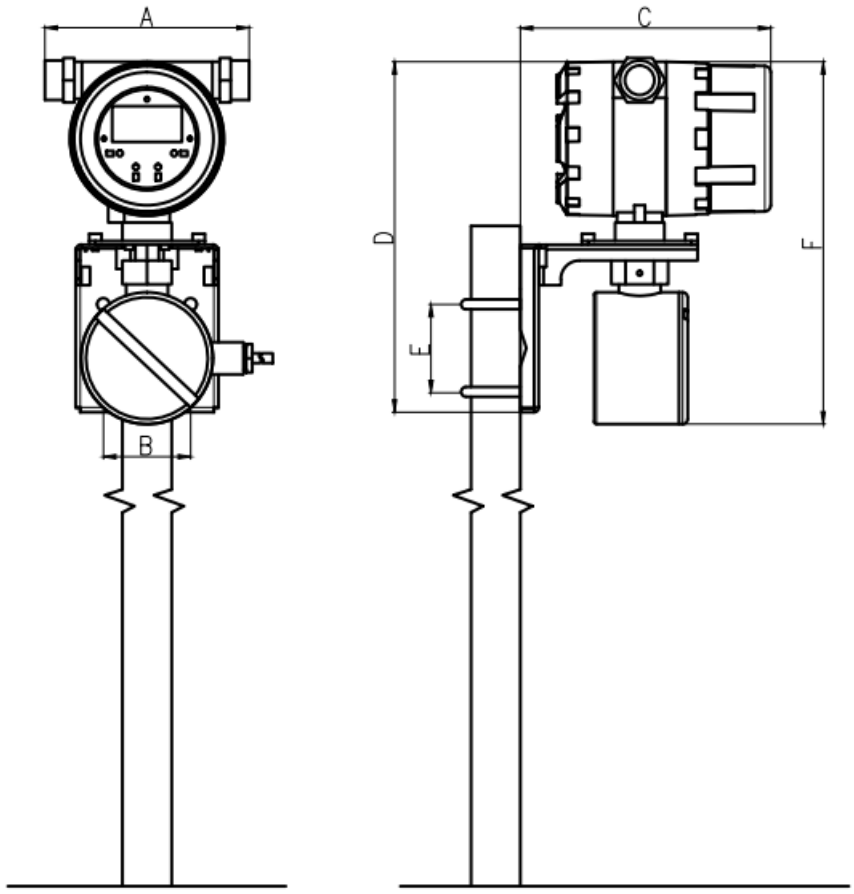


Unit: mm

Types	Model	A(Customizable)	B	C	D	E	F	G
K100	DN25/DN32	212～216	412	578	568	106	167	229
K200	DN40/DN50	582～596	727	1003	496	140	186	174
K300	DN80/DN100	836～866	976	1292	768	208	220	174
K350	DN100	830～876	841	1150	718	212	222	174
K400	DN150/DN200	990～1056	1095	1391	860	300	260	174
K600	DN200/（DN225）/DN250	1004～1090	1211	1578	850	379	305	174
K800	DN200/（DN225）/DN250	1004～1090	1326	1693	850	410	321	174
K1200	DN250/DN300/DN350	1090～1130	1641	2008	850	506	369	174

The flange standard adopts GB/T 9115-2010, HG/T 20592-2009.

Dimensions of BPM-E Transmitter



Unit: mm

Transmitter model	A	B	C	D	E	F
BPM-E	166	71	204	284	71	294

3.0 Installation and Commissioning

3.1 Installation

3.1.1 Check before Installation

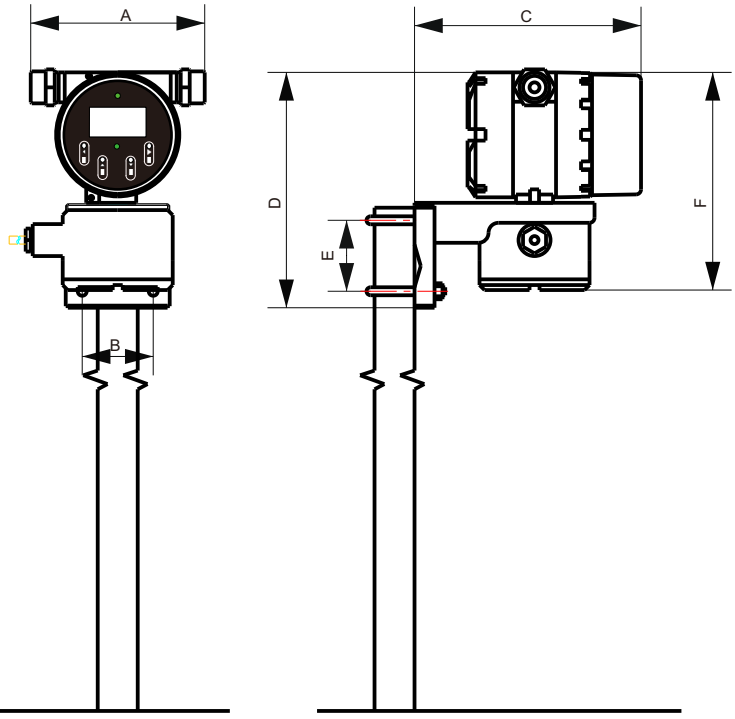
1) Before installing the flow meter in a hazardous area, ensure that the explosion-proof performance indicated on the nameplate is applicable.
2) For newly-built pipelines, install the Sensor after completing the pipeline presetting and pipeline purge to prevent debris from entering the Sensor and prevent accidental damage to the Sensor due to pipeline construction.
3) The instrument should be gently lifted during handling to avoid permanent damage to the Sensor due to falling and knocking.

3.1.2 Installation Note

1) Reduce vibration
a. Ensure that there are special supports on the valves and pumps in the process pipeline near the Sensor, and it is forbidden to use the Sensor to support.
b. The Sensor should be supported by the pipeline system, the pipe support should be as close as possible to the inlet and outlet flanges (about 2-10 times of the pipe diameter), and ensure that the pipe support is attached to the common structure.
c. After the Sensor is installed, its housing should be in free floating state. For installation methods a and b, the support rods should be symmetrically distributed with the Sensor as the center; for installation method c, the choice of the support point of the support depends on the situation. If the lower end of the support rod is fixed to the ground, it must be a cement and reinforced foundation. The purpose is to stabilize the support and to reduce vibration. The more stable the foundation, the better effect of vibration reduction.
d. When the Sensor is installed on the process pipeline, ensure that the piping system is firmly connected to the solid support at the upstream and downstream positions of the Sensor. All threaded connections must be tightened. Clamping the process pipeline helps to reduce potential vibration interference.
2) Installation stress relief
Excessive mechanical stress will affect the zero point of the mass flow meter. If these stresses are constantly changing, the instrument will have an unacceptable zero drift.

a. When installing the Sensor, in order to eliminate the installation stress, the most effective method is to install the pipeline in the very beginning, pre-install the process pipeline, valve and Sensor, then hoist it, and then weld it to the process main line. In order to achieve the best effect of stress relief, the center of the Sensor, shut-off valve and process main line should be in the same vertical plane.
b. The Sensor flange must be coaxially connected to the pipe flange to avoid compression, bending or twisting to reduce installation stress and ensure measurement accuracy.

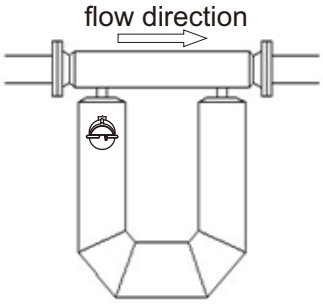
Dimensions of BPM-E Transmitter



3.1.3 Sensor Installation

The flow meter can only work normally when the measuring tube is filled with process fluid. In principle, the flow meter can be installed in any way that will fill the measuring tube with process fluid.

The specific Sensor installation should be determined according to the fluid phase and on-site working conditions. It is mainly divided into the following three types:

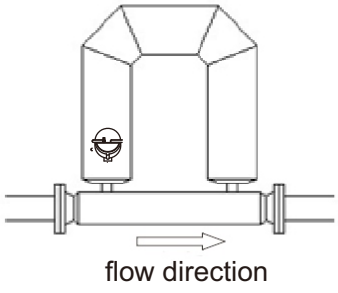


Horizontal installation—bottom mounted

Generally, the Sensor is installed with the shell facing down to prevent air from accumulating in the Sensor measurement tube, thereby achieving the purpose of accurately measuring the mass flow.

Measuring tube under the pipeline

Applicable medium: liquid

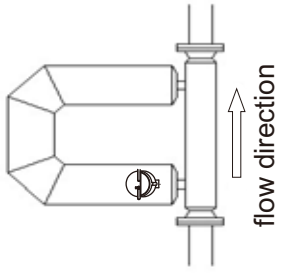


Horizontal installation—top mounted

Generally, the Sensor is installed with the shell facing upward to avoid the accumulation of condensate in the measuring tube of the Sensor.

Measuring tube above the pipeline

Applicable medium: gas



Flag installation—side mounted

Generally, the Sensor is installed on the vertical pipeline to avoid the accumulation of particles in the measuring tube of the Sensor.

Measuring tube on the side of the pipeline

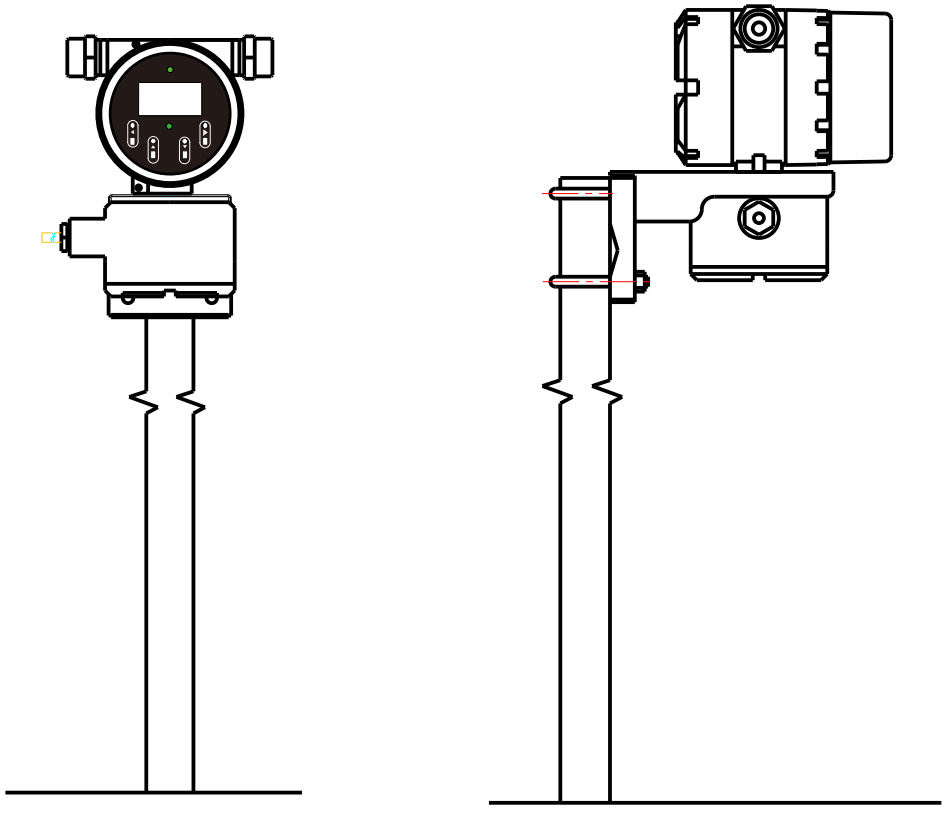
Applicable medium: liquid or solid-liquid mixing

3.1.4 Installation of Mass Flow Meter Transmitter(Separate Type)

Before installing the Transmitter in a hazardous area, ensure that the installation environment is suitable for the explosion-proof performance indicated on theTransmitter nameplate and installed correctly. The Transmitter should be installed in an environment where the temperature is (-40 ~ + 60) ℃ and the humidity is ≤90%.

The Transmitters usually use instrument columns for support and fixation. Please ensure that the instrument column protrudes from the hard base at least 500 mm (usually 1500 mm is appropriate), and its diameter does not exceed 50.8 mm.

The Transmitter should be installed to the end of the instrument column, otherwise it will be inconvenient to unscrew the rear end cover and wiring. For details, see the following figure:



3.2 Wiring

3.2.1 Basic Requirements

Cable type	Cable specification	Maximum length	Remarks
Dedicated nine-wire cable	Dedicated	20 meters	Standard length is 2 meters
Power cable	⩾1.5mm^2 shielded cable	500 meters	Separate power and signal cables
RS485 communication cable	Shielded twisted pair	300 meters	

3.2.2 Transmitter Wiring

1) When the Sensor and Transmitter are installed integrally, only need to connect the power cable and signal cable of the Transmitter, the flow meter can work normally.

2) When the Sensor and Transmitter are installed separately, in addition to connecting the Transmitter power cable and signal cable, a special nine-core cable must be used to connect the junction box on the Sensor and the intrinsically safe cavity on the Transmitter.

3) The K Series Flow Meter Sensor is generally equipped with a 2-meter special 9-wire cable for connecting the Sensor and Transmitter. If you need a longer cable, please contact our company.

4) Wiring

Before installing the special nine-core cable, please cut off the power supply, strip the cable sheath of about 50mm, remove the metal foil around the insulated wire and the filling material between the wires, and retain the metal foil of about 10mm in length, then separate the wires. Combine the shielded woven wire into one strand (see Figure 4).

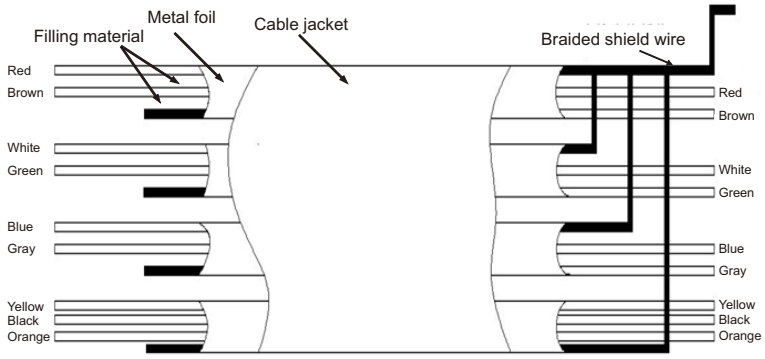


Figure 4

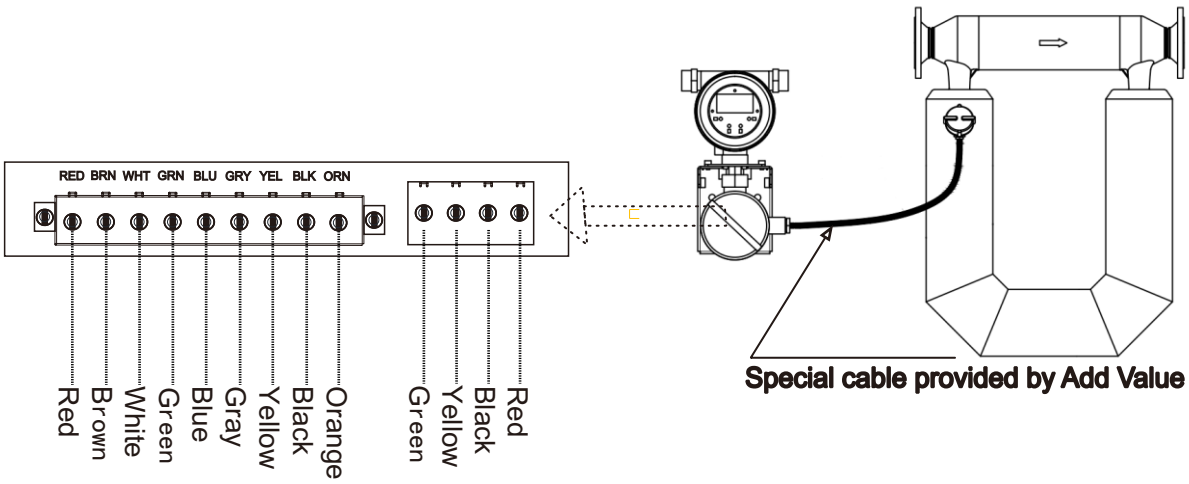
Strip the insulation of the end of each wire, press the wire into the terminal according to the color and port number of the wire, and connect the synthetic shielded woven wire to the grounding screw of the intrinsically safe cavity. Tighten the lock nut.

If the site is an explosion-proof place, it is necessary to protect the nine-core cable with an explosion-proof flexible tube.

3.2.3 Special 9-wire cable wiring

Installation description:

1. Read this manual carefully before installation and connect wires correctly.
2. The Transmitter should be installed in a place that is ventilated, dry, non-corrosive, cool and has a small temperature change. If installed in the open air, a protective cover should be added to avoid direct sunlight and rain to avoid product performance reduction or failure.
3. When the flameproof Transmitter is used in a hazardous location, the cover of the Transmitter must be tightened. In order to ensure the safety of use, the safety regulations should be strictly followed, and it is absolutely not allowed to open the cover of the Transmitter when it is powered on.

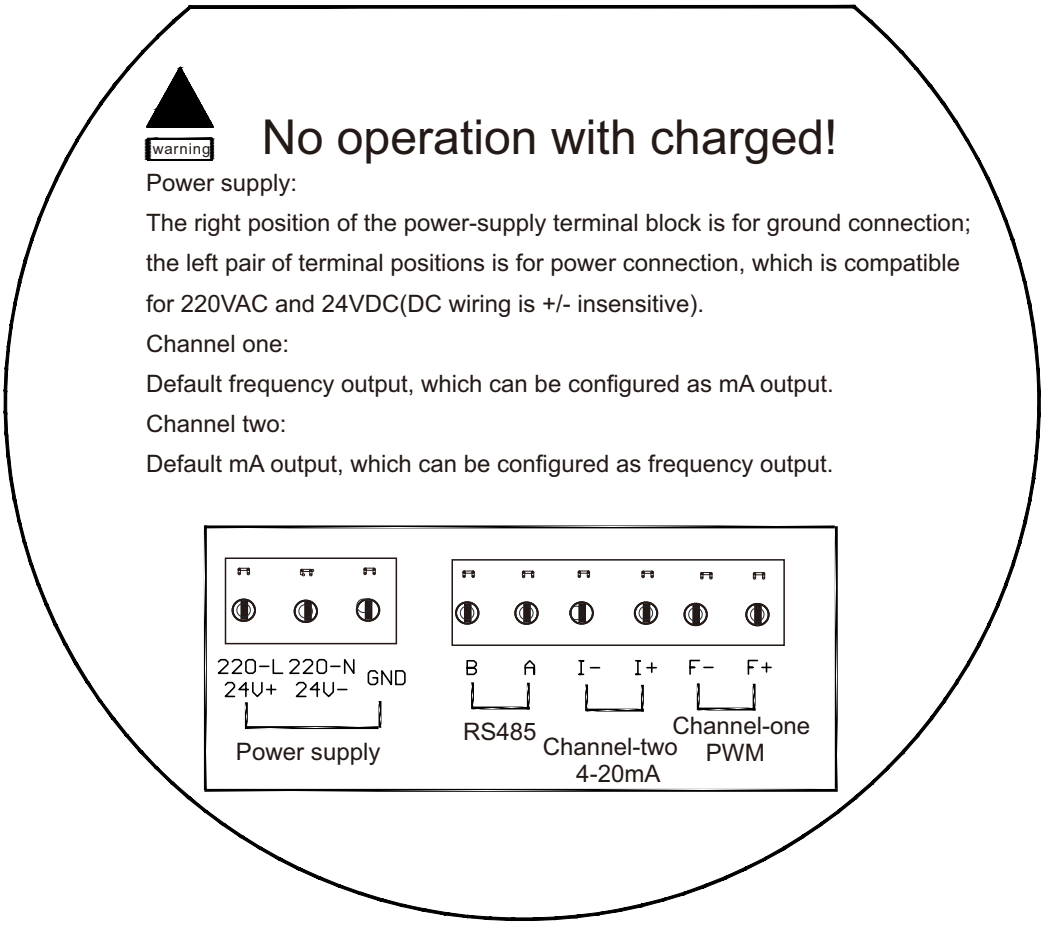


Nine-core Terminal Four-core Terminal

Nine-core Terminal		Four-core Terminal	
Color	Function	Color	Function
Red	drive-	Red	Power +
Brown	drive+	Black	Power -
White	Left pickoff-	Yellow	RS485-A
Green	Left pickoff+	Green	RS485-B
Blue	Right pickoff+		
Gray	Right pickoff-		
Yellow	Temperature+		
Black	Temperature-		
Orange	Temperature+		

3.2.4 Signal connection

See the following figure:



3.2.5 Grounding

Both the Sensor and the Transmitter need to be properly grounded, otherwise it will cause measurement errors, it may even cause the instrument not to work properly. If the process pipeline is not connected to the ground, it is necessary to ground the Sensor separately. Refer to the corresponding national standard or follow the manufacturer's standard for the specific grounding method.

3.3 Commissioning

3.3.1 Zero Calibration

Zero calibration provides a reference point for flow measurement for the flow meter. After the K Series Mass Flow Meter is installed for the first time or the medium is replaced, zero calibration must be performed.

Zero calibration method: Before calibration, close the downstream shut-off valve of the flow meter, and then close the upstream shut-off valve, and let it stand for 30 minutes. At the same time, ensure that the Sensor measurement tube is filled with process fluid during the zero calibration process. Execute the 5.2 "Zero Calibration" command after meeting the above requirements.

3.3.2 Instrument Parameters

Each K Series Mass Flow Sensor has its own unique instrument parameters, which include a flow coefficient and three density coefficients (flow calibration coefficient, density coefficient: K1, K2,TC). The instrument parameters are engraved on the Sensor nameplate, and also available on the Transmitter.

Normally, the Sensor and Transmitter are shipped from the factory in pairs. The instrument parameters have been input into the Transmitter, and the user does not need to make any changes. But if you replace either the Sensor or Transmitter, then you need to re-input the information on the Sensor nameplate.

3.3.3 Flow Correction Coefficient

The mass flow rate measured by the mass flow meter is obtained by multiplying the time difference between the two detection signals and the flow calibration coefficient. The meter will be calibrated before delivery, and usually does not need to be corrected on site, but after long-term use, periodic verification should be performed according to the method described in "JJG1038-2008 Coriolis Mass Flow Meter Verification Regulations".

If it is found that the measurement accuracy cannot meet the technical requirements, the following formula can be used to correct the flow meter coefficient, and the flow correction coefficient is 1.0 when shipped from the factory.

The calculation of flow correction coefficient (MF) is as follows: $MF=M/Mt$

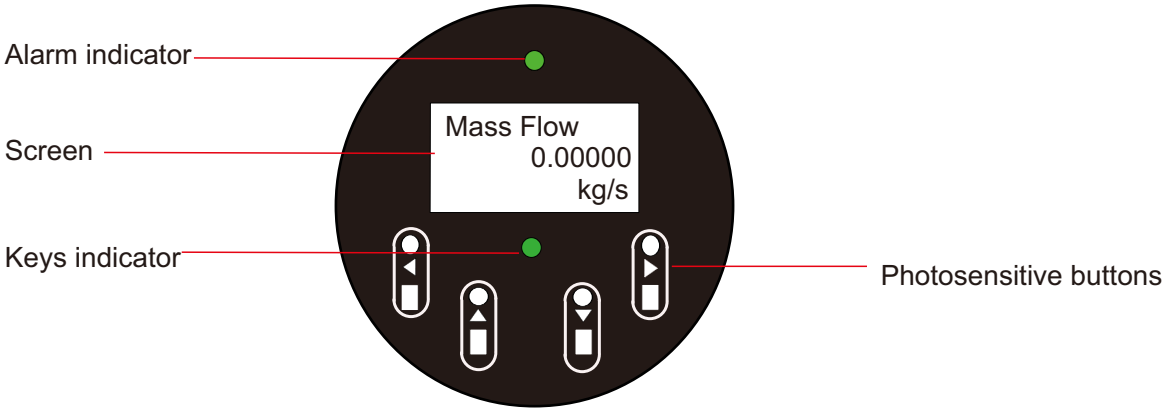
MF--Flow correction coefficient

M--standard total mass (generally weighed mass), in kg

Mt--the total mass displayed by the flow meter, in kg

4.0 Operation

4.1 Display Interface Description



4.2 Keys description

Keys	Menu Switch	Coefficient Input
〉	Short press to enter the lower menu; function switch; long press (representing symbol '》') to enter the lower menu	Input the next digit
〈	Short press to return to the previous menu	Short press to return to the previous numeric input; long press (Representing the symbol '《') to exit the digital input
∧	Short press to page up	Input digit plus 1
∨	Short press to turn page; function switch	Input digit minus 1

Note:

When the button is pressed, the button indicator is green; after pressing and holding the button for 3 seconds, the button indicator turns to red. At this time, the long press works, and you only need to raise your figure to directly trigger the corresponding button.

4.3 Input digits

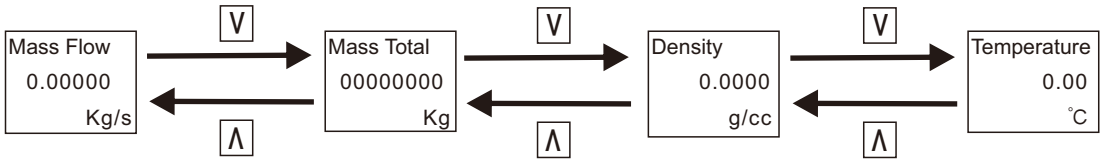
Some coefficient changes and password input require digit input. The coefficient is generally a floating point number (including the decimal point), and the password is a pure digits.

The digital input of the Transmitter starts from the first digit (high digit) on the left, and the digit being input will flash.

1. Press [∨] to change the activated number, the password interface is from 9 to 8, 8 to 7,…, 1 to 0, 0 to 9. The first digit input of the coefficient interface is the same as the password interface, starting from the second digit from the decimal point to 9, 9 to 8, 8 to 7,…, 1 to 0, 0 to the decimal point.
2. Press [∧] to change the activated number, the password interface is from 1 to 2, 2 to 3, ..., 8 to 9, 9 to 0. The first digit input on the coefficient interface is the same as the password interface, from the second digit is from 1 to 2, 2 to 3, 3 to 4,…, 8 to 9, 9 to the decimal point.
3. Press [>] to confirm the input of the current digit and jump to the next digit.
4. Press [<] to cancel the current digit input and return to the last digit.
5. Long press [<] to interrupt the current password or coefficient input and return to the previous interface.

.

4.4 Measured value information

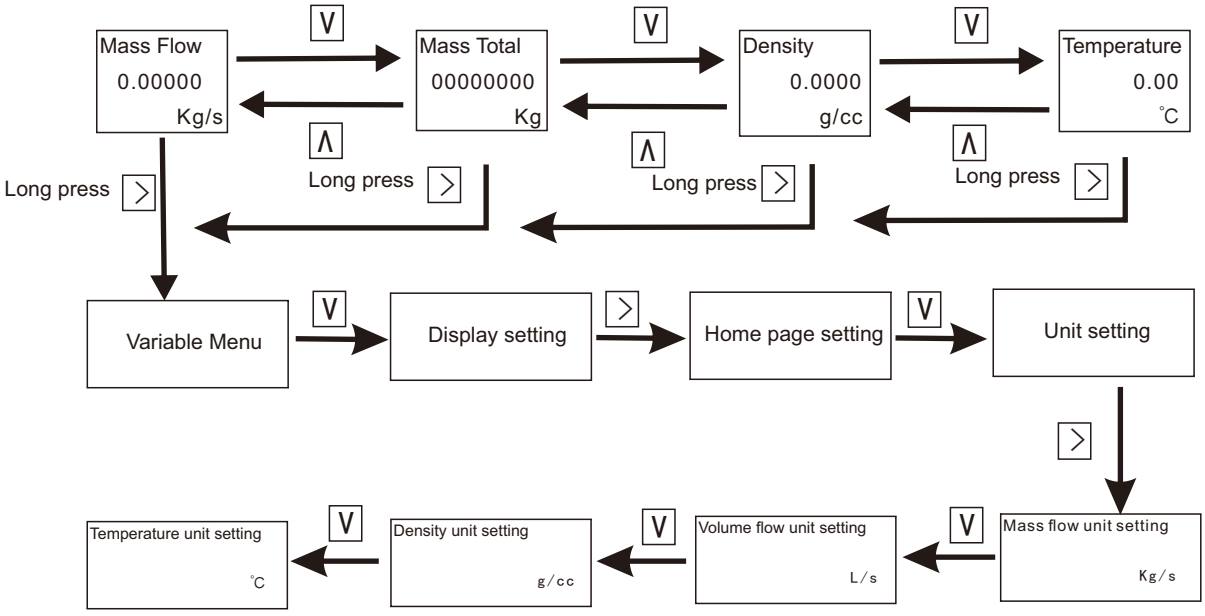


After power-on, the interface displays the mass flow; press [∨] to down to the mass interface; press [∨] to down to the density interface; press [∨] to down to the temperature interface; press [∧] to page up .

4.5 Modification of Instrument Information

4.5.1 Unit of measurement

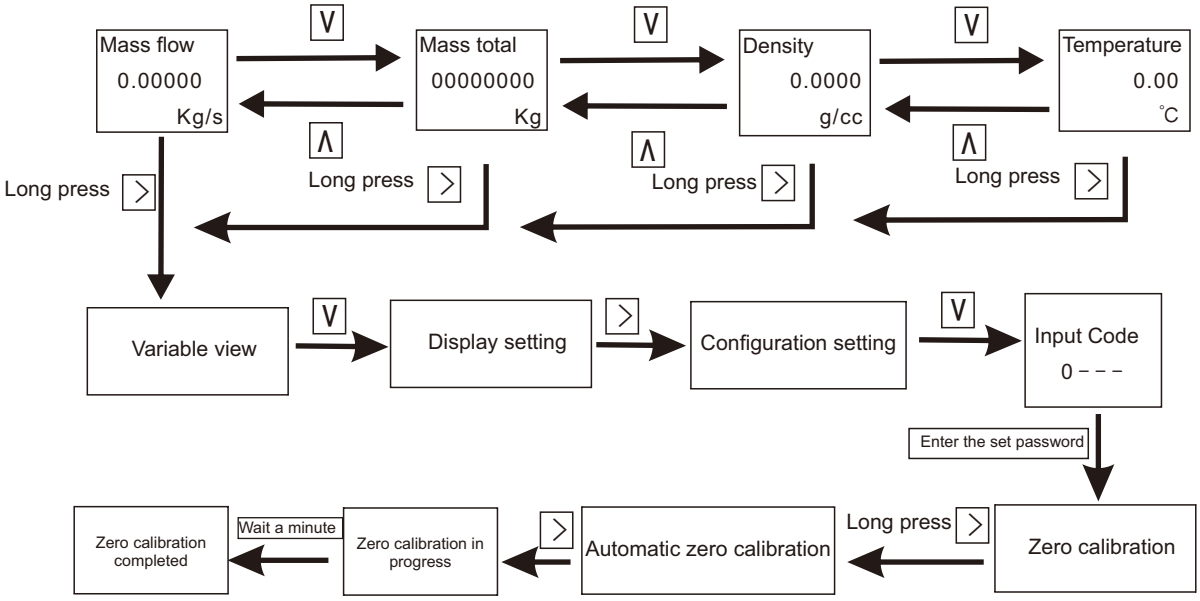
On the measured value interface, long press [>] to enter the secondary menu, short press [V] or [Λ] to jump to the display setting interface, short press [>] to enter the lower menu, short press [V] or [Λ] to jump to the unit setting interface, short press [>] to enter the lower menu, short press the [V] or [Λ] to jump the interface between the mass unit setting interface, volume unit setting interface, density unit setting interface and temperature unit setting interface. Short press [>] the corresponding interface to switch the display unit. Short press [<] multiple times to return to measured value interface.



Mass Flow Unit	Volume Flow Unit	Density Unit	Temperature Unit
Kg/s	L/s	g/cc	℃
Kg/min	L/min	g/mL	F
Kg/h	L/h	g/L	
Kg/day	L/day	Kg/L	
t/min	m^3/s	Kg/m^3	
t/h	m^3/min		
t/day	m^3/h		
	m^3/day		

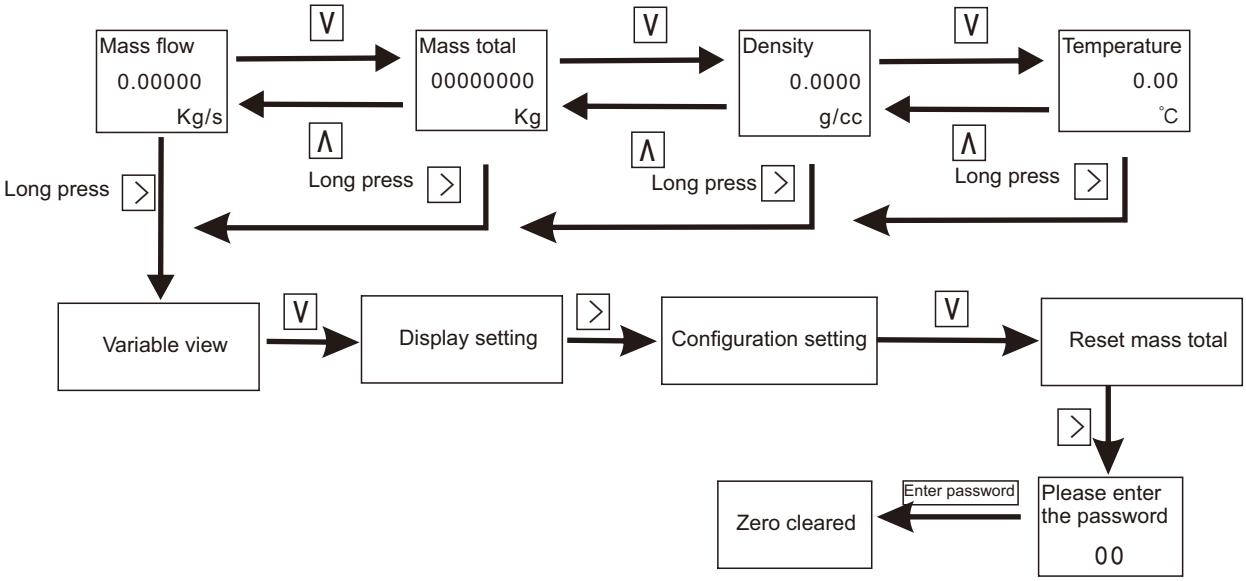
4.5.2 Zero Calibration

Long press [>] key on the measured value interface to enter the secondary menu, short press [V] key or [Λ] key to jump to the configuration setting interface, short press [>] key to enter the password (default password 0000), jump after successful password authentication to the zero calibration interface, long press [>] key to jump to the lower menu, short press [V] key or [Λ] key to jump to automatic zero calibration interface, short press [>] key, the system will perform automatic zero calibration in the next minute, please ensure before this operation, there is no flow rate and the flow meter is guaranteed to be full of media. After calibration is completed, press the [<] key many times to return to the measured value interface.



4.5.3 Reset mass total

On the measured value interface, long press [>] to enter the secondary menu, short press [V] or [Λ] key to jump to ' reset mass total', short press [>] key to enter the password (default password 70) and the reset mass total is finished. After the password authentication is completed, the total reset operation is automatically performed. After the reset operation is completed, short press the [<] key several times to return to the measured value interface.



4.5.4 Signal Setting

On the measured value interface, long press [>] to enter the secondary menu, short press [∧] or [∨] to jump to the configuration setting interface, short press [>] to enter the password (default password default 0000), short press [∧] or [∨] Jump to the communication setting interface, short press [>] key to enter the lower menu, short press [∧] key or [∨] key to switch between the first channel interface, the second channel interface and the 485 setting interface.

The first channel: Short press the right key to enter the lower menu, short press [>] key to switch the output mode (pulse or current), long press [>] key to set the corresponding signal output.

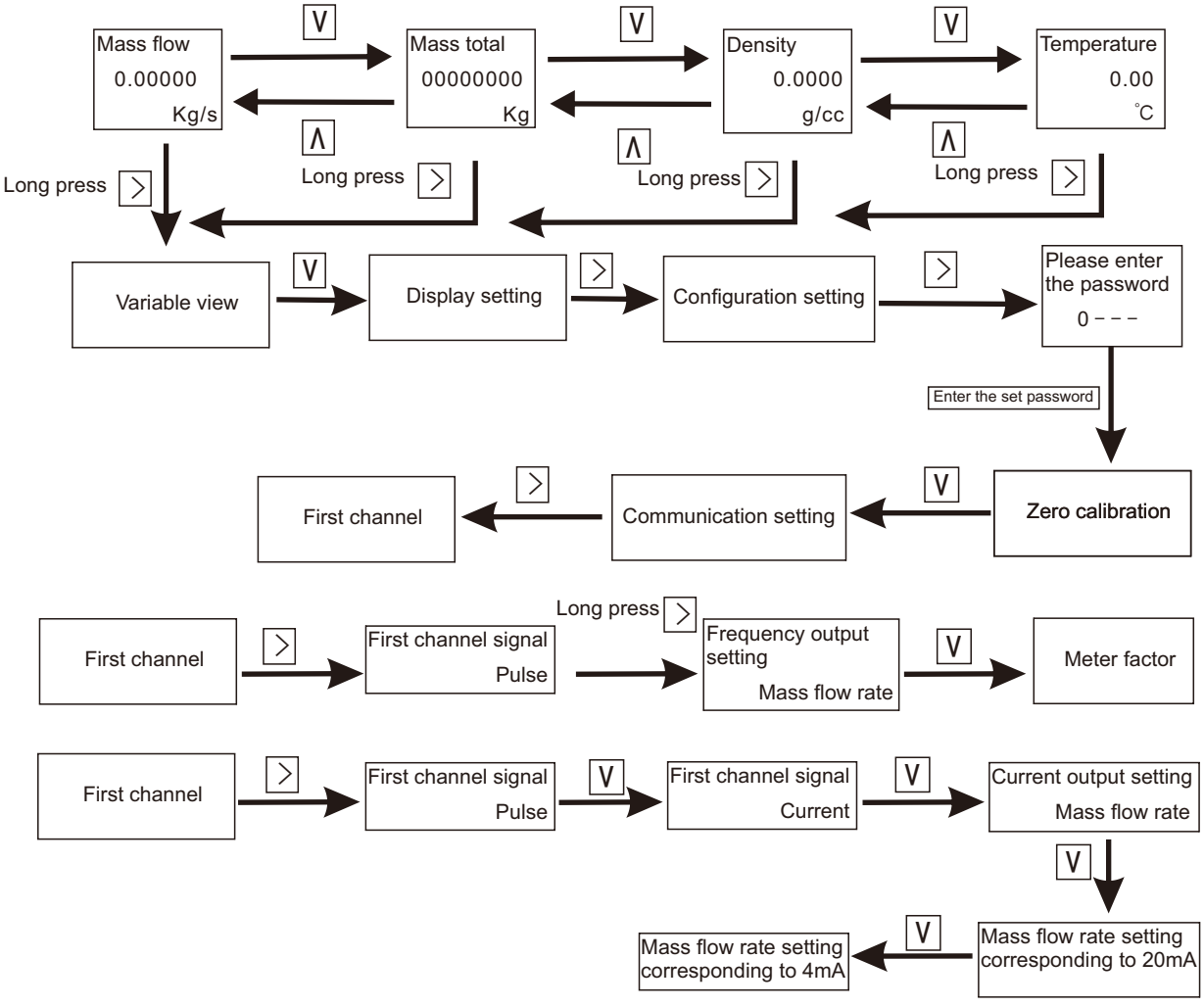
①Pulse mode: short press [∧] key or [∨] key to switch between the frequency output setting interface and the meter factor interface, on the frequency output setting interface, short press [>] key to switch the output mode (mass flow rate or volume flow rate). On the meter factor interface short press [>] key to input new coefficient, the input mode can be operated according to the key function; after completing the target operation, short press [<] key many times to return to the measured value interface.

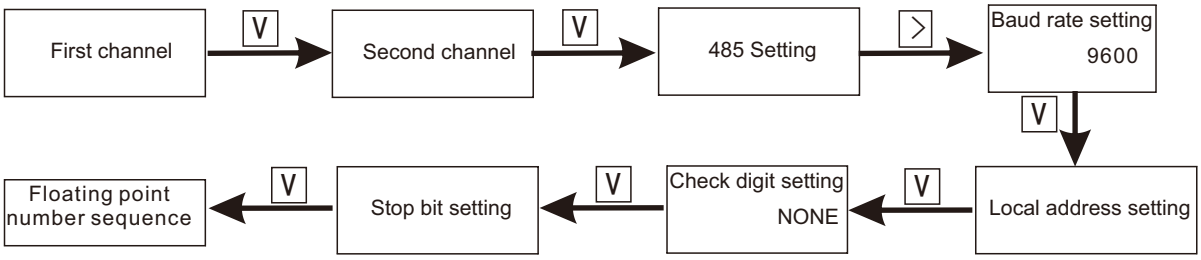
②Current mode: Short press [∧] key or [∨] key on the current output setting interface to switch between ** setting interfaces corresponds to 20mA (** refers to the current output representative value: mass flow rate, volume flow rate, density, temperature) and 4mA. Short press the [>] key on the current output setting interface to switch the output mode (mass flow, volume flow, density, temperature), on the ** setting interface corresponding

to 20mA or 4mA, short press the [>] key to enter the new coefficient. The input method can be operated according to the key function; after completing the target operation, press the [<] key many times to return to the measured value interface.

The second channel: The operation mode is the same as the first channel.

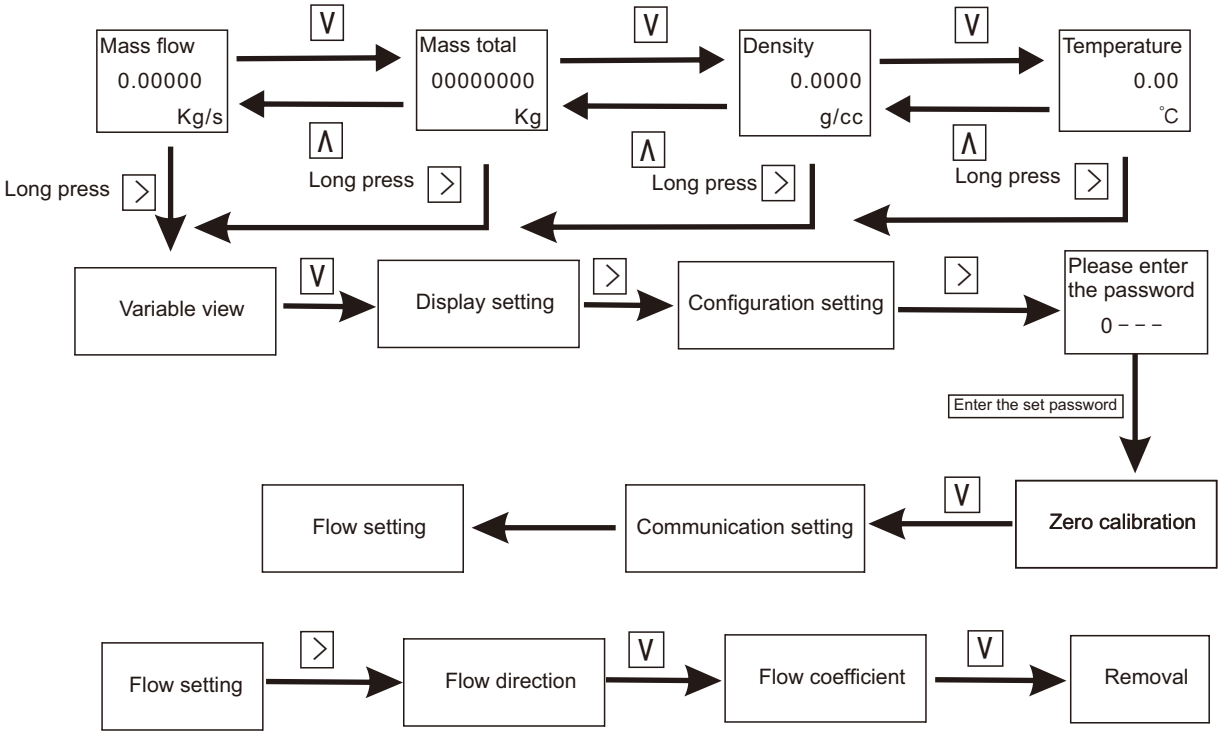
485 setting: Short press [>] key to enter the lower menu, short press [Λ] key or [V] key to switch between menus of baud rate setting, local address setting, check digit setting, stop bit setting and floating point number sequence. Short press [>] on the baud rate setting interface to enter a new address (1-256); short press [>] on the check digit setting interface to switch the verification mode. Short press [>] on the stop setting interface to switch the stop bit. On the floating point number setting interface, short press [>] to enter the floating point sequence (0-3); after setting, press the [<] key many times to return to the measured value interface.

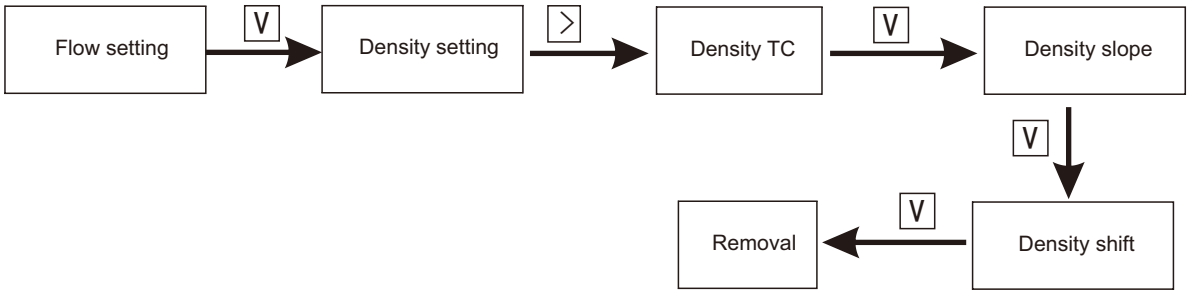




4.5.5 Coefficient Modification

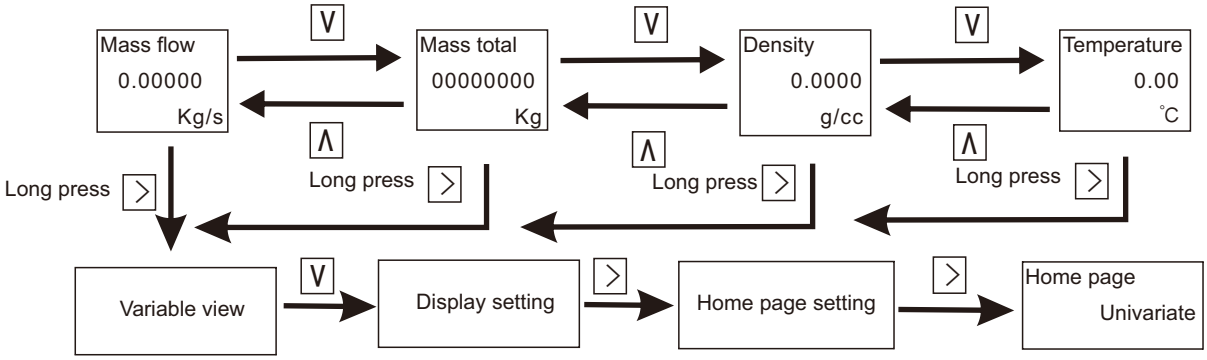
Long press the [>] key on the measured value interface to enter the secondary menu, short press [∧] key or [∨] key to jump to the configuration setting interface, short press key to enter the password (password default 0000), short press [∧] key or [∨] key to jump to the flow setting interface, short press [>] to enter the lower menu, short press [∧] or [∨] to jump to the flow coefficient interface, and short press [>] to enter the new coefficient; after entering the configuration setting interface, short press [∧] or [∨] to jump to the density coefficient interface, short press [>] to enter the lower menu, you can enter coefficients such as density TC, slope, offset, etc., after setting, press [<] several times to return to the measured value interface.





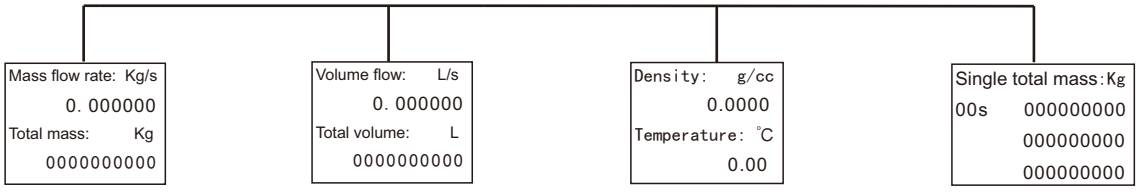
4.5.6 Home Page Setting

In the measured value interface, long press [>] to enter the secondary menu, short press [∧] or [∨] to jump to the display settings interface, short press [>] to enter the lower level menu, short press [∧] or [∨] to jump to the home page setting interface, short press [>] to enter the lower level menu, short press [>] to switch the display variables of the first interface (single variable or double variable or standard).

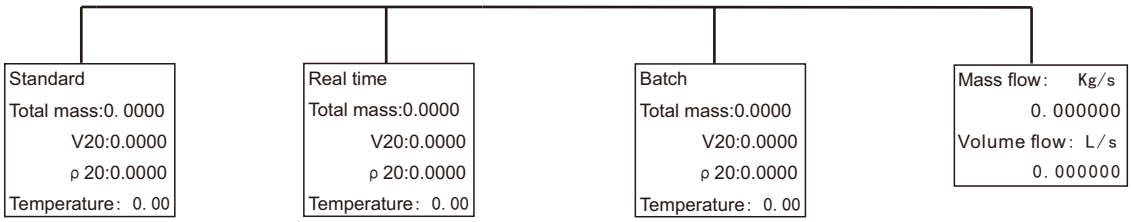


Univariate interface

Bivariate interface

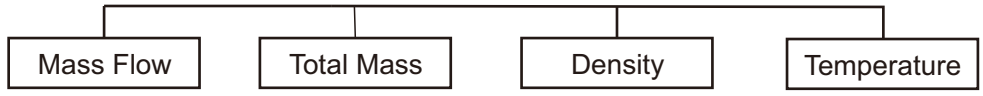


Standard interface

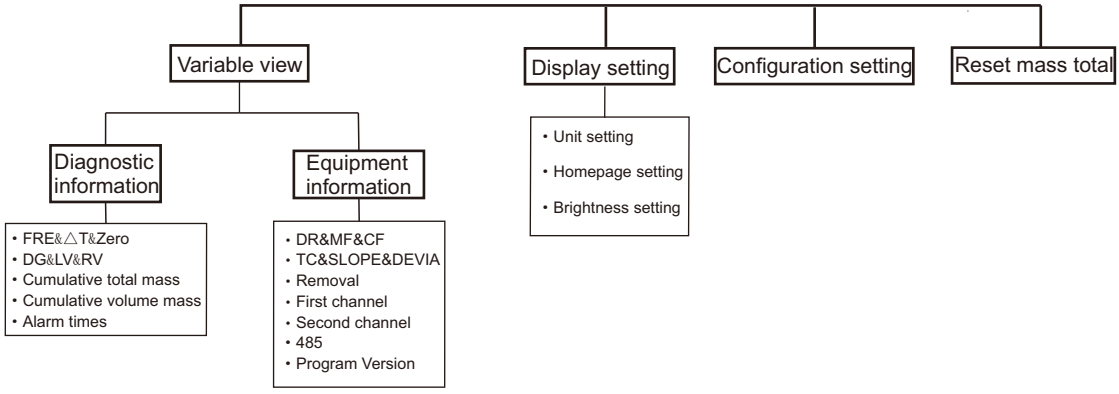


4.6 Menu Structure

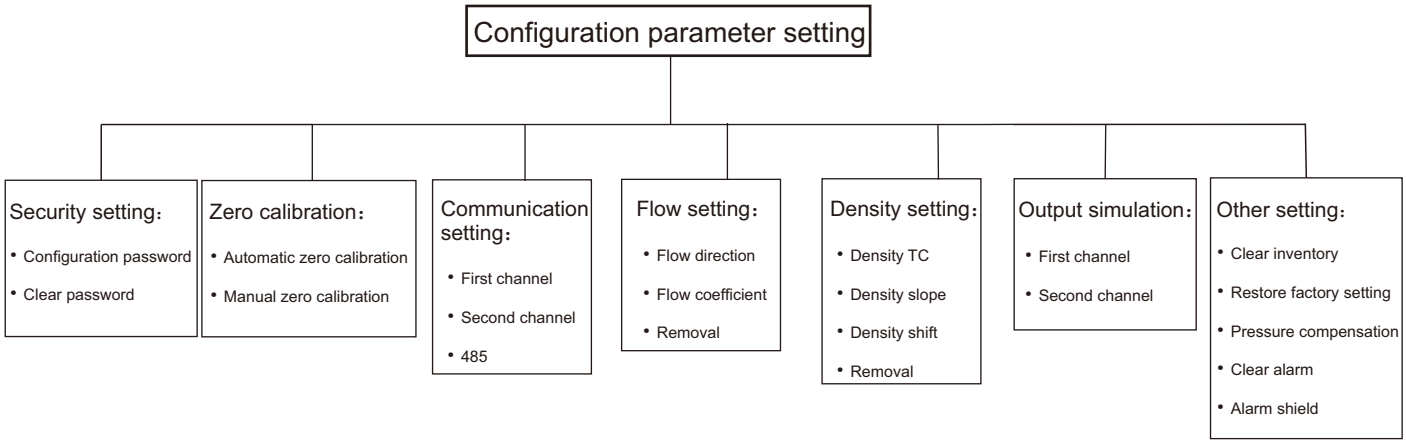
Primary menu: Please adjust the display information in the display setting interface



Secondary menu: Enter from the primary menu by long pressing the right key



Configuration parameter menu: enter 4-digit password to enter



5.0 Troubleshooting

5.1 Overview

During the first installation and use, if the flow meter works abnormally, the cause of the failure should be determined. The causes of failure can be divided into two types: application problems and flow meter system problems. Application problems are more complicated, such as measurement fluctuation errors caused by process, medium state changes, etc., should be analyzed according to the actual situation. This part mainly describes the causes and solutions of flow meter system failures.

5.2 Diagnostic Tools and Methods

For the fault diagnosis of the flow meter, the user can make use of the LED indicators and OLED display on the display panel to judge. Among them, the different colors of the LED indicators represent different working conditions of the flow meter, which is convenient for users to view; the OLED display can display the alarm information of the Transmitter's self-diagnosis, which is helpful for the user to judge and determine the cause of the failure.

Error Codes	Codes Description
C	MVD Communication fault
V	Low left/right voltage
G	Drive gain overrange
D	Density overrange
M	Incompatible Sensor
S	Signal output Saturated
T	Abnormal temperature

5.3 Sensor Failure Detection

When checking the flow meter failure, check whether the resistance value of the Sensor coil is normal according to the following table in the very beginning.

Wire Color	Sensor Model	Normal resistance range
Green, White	K400	（100-120） Ω
	K300/K200/K100	（12-20） Ω
	K025/K050	（15-22） Ω
	K010/K015	(7-18) Ω
Blue, Gray	K400	（100-120） Ω
	K300/K200/K100	（12-20） Ω
	K025/K050	（15-22） Ω
	K010/K015	(7-18) Ω
Red, Brown	K400	（100-120） Ω
	K300/K200	（45-65） Ω
	K100	（12-20） Ω
	K025/K050	（15-22） Ω
	K010/K015	(7-18) Ω
Yellow, Black	K series	（60-175） Ω
Orange, Black	K series	（60-175） Ω
Yellow, Orange	K series	（0-2） Ω

6.0 Cautions for Users

1) Before starting the machine, ensure the nine-core cable connecting the Transmitter and the Sensor is correctly wired, and the power input of the Transmitter is correct, and the Transmitter housing is reliably connected to the ground.
2) K Series Mass Flow Meter Sensor of separate type must be matched with BPM Transmitter(intrinsically safe related equipment), and connected with our company's special nine-core cable (model K. X), special nine-core cable wiring bending radius ≥120mm.
3) The user cannot arbitrarily change the standard mode and electrical structure parameters of the explosion-proof components in the Sensor.
4) Intrinsically safe and non-intrinsically safe wires must be routed separately.
5) The outer diameter range of the cable sheath introduced is φ7-φ13. When used on site, the compression nut should be tightened so that the inner diameter of the sealing rubber column tightly covers the outer diameter of the cable. The sealing rubber column should be replaced in time when it is wearing out.
6) There should be no harmful gases corrosive to the aluminum alloy at the installation site.
7) Maintenance must be carried out in a safe place, and only after confirming that there is no flammable gas on site.
8) When installing and using the product, users must abide by the product instruction manual and GB3836. 13-2013 "Electrical apparatus for explosive gas atmospheres Part 13: Equipment repair, overhaul and reclamation", GB3836. 15-2000 " Electrical apparatus for explosive gas atmospheres Part 15: Electrical installations in hazardous areas (other than mines) ", GB3836. 16-2006 "Electrical apparatus for explosive gas atmospheres Part 16: Inspection and maintenance of electrical installation (other than mines)" and GB50257-1996 Code for construction and acceptance of electric device for explosion atmospheres and fire hazard electrical equipment installation engineering.
9) Products that pass the explosion-proof inspection cannot randomly change the components and structures that affect the explosion-proof performance.

Notice: Explanation under abnormal circumstances

1. For slurry with abrasiveness, the flow rate should be controlled to be less than

3m /s.

2. For concentrated sulfuric acid, the flow rate should be controlled to be less than 3m / s.

3. The mass flow meter can be used in both directions. If the installation direction is opposite to the actual flow direction, just modify the flow direction in the Transmitter.

7.0 Other Information

7.1 Shipping Weight

Model	Installation method	Shipping weight		Note
		Sensor	BPM-E Transmitter	
K400	Integral Type	200±5kg (DN150 PN16 Flange)	3.7±0.5kg	Due to the difference in flange specifications and pressure levels, the weight of the Sensor varies greatly
	Separate Type		5.5±0.5kg	
K300	Integral Type	86±10kg (DN100 PN16 Flange)	3.7±0.5kg	
	Separate Type		5.5±0.5kg	
K200	Integral Type	40±5kg (DN50 PN16 Flange)	3.7±0.5kg	
	Separate Type		5.5±0.5kg	
K100	Integral Type	18.8±3kg (DN25 PN40 Flange)	3.7±0.5kg	
	Separate Type		5.5±0.5kg	
K050	Separate Type	8.4±1kg (DN15 PN16 Flange)	5.5±0.5kg	
K025	Separate Type	5.1±1kg (DN15 PN16 Flange)	5.5±0.5kg	
K015	Separate Type	6.5±1kg (DN15 PN16 Flange)	5.5±0.5kg	
K010	Separate Type	6.5±1kg (DN15 PN16 Flange)	5.5±0.5kg	

7.2 Interface Specifications

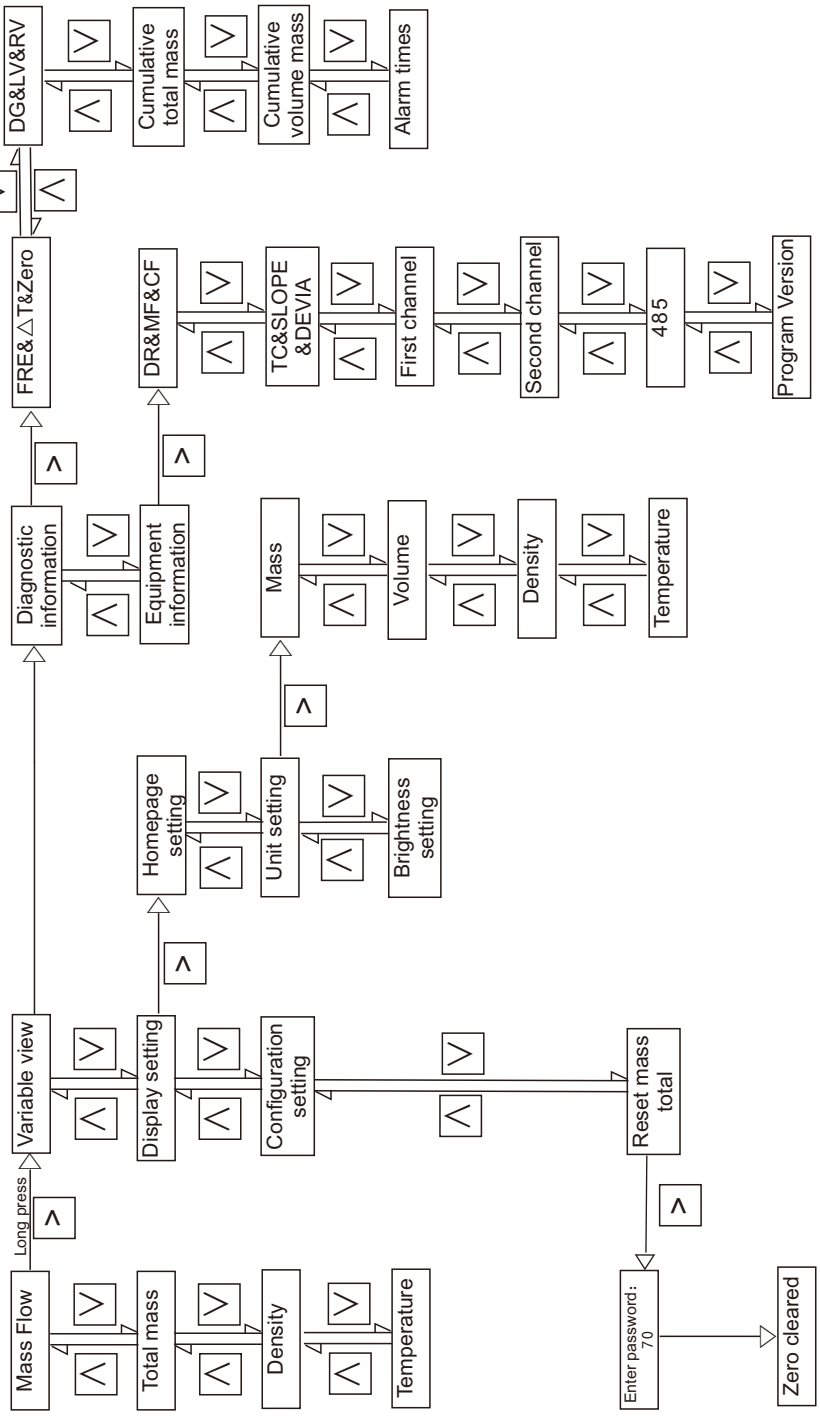
The standard configuration of the interface between the signal cable and the power cable is G3 / 4 (internal threads), and the standard interface of the intrinsically safe cable is G1 / 2 (internal threads).

7.3 Product Materials

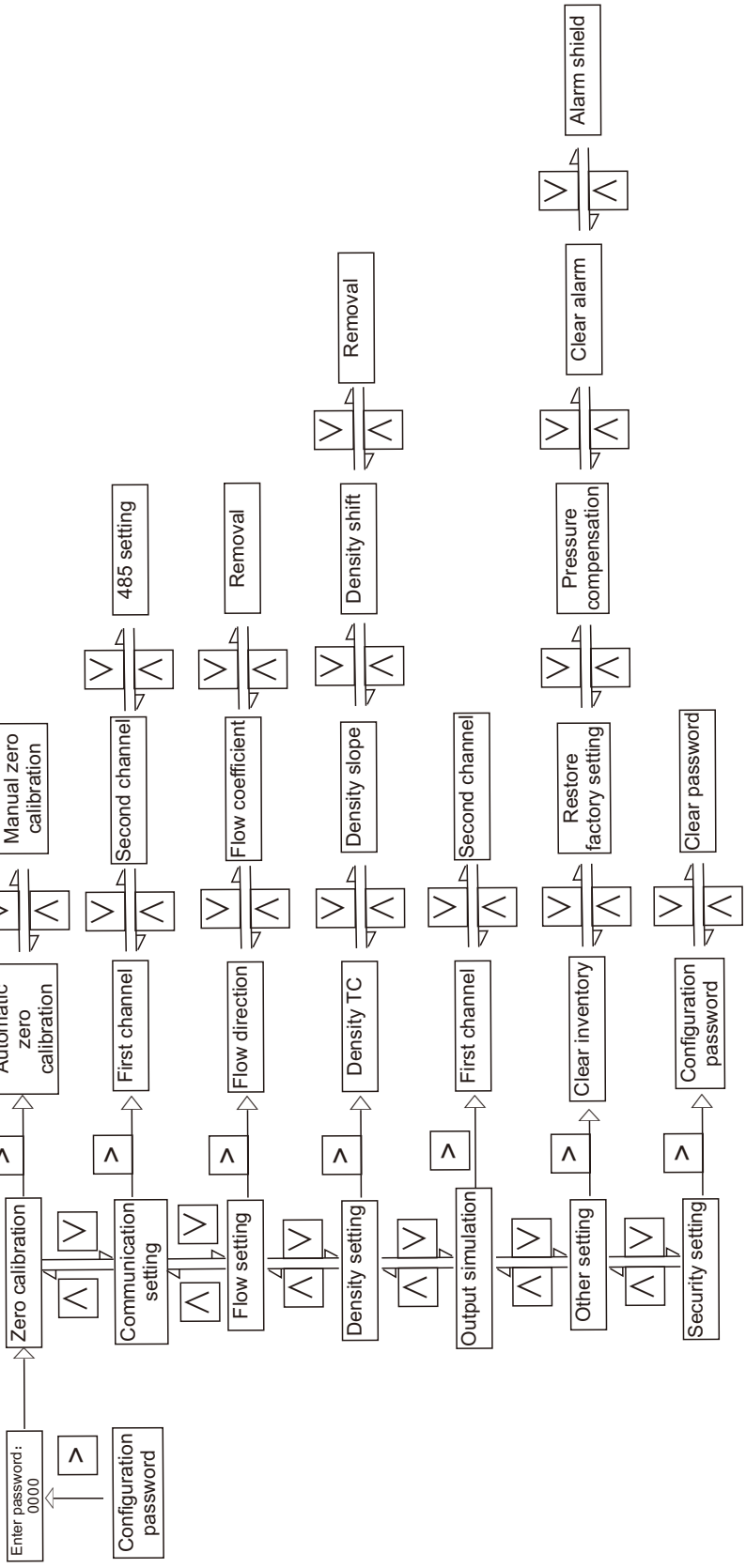
1) Transmitter housing is ADC12 aluminum alloy, tensile strength is not less than 120MPa, can withstand 7J impact energy test, the remaining connecting parts of the Transmitter are 304 stainless steel.

2) The material of the measuring tube of the Sensor is 316L stainless steel, and the remaining connecting parts are 304 stainless steel.

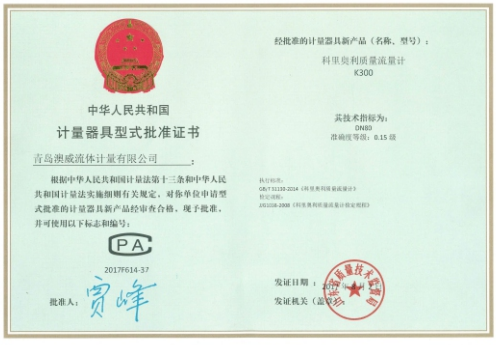
Appendix 1 Menu Structure

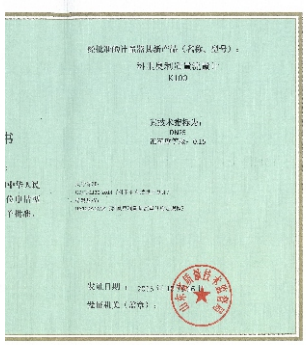


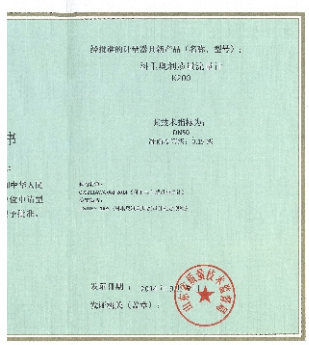
Appendix 2 Configuration Settings Menu



Appendix 3 Certificates and Approvals


中华人民共和国
计量器具型式批准证书





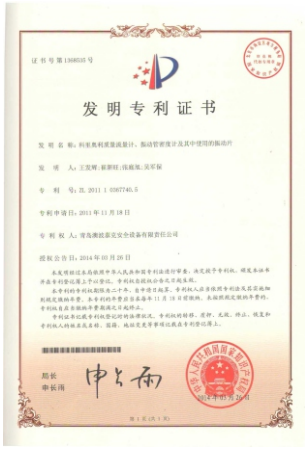

防爆合格证

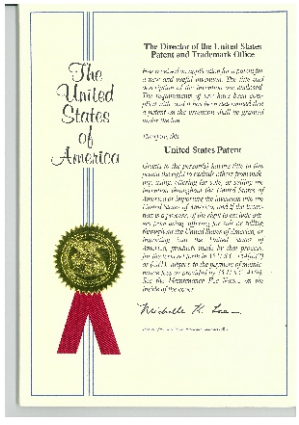

防爆合格证


防爆合格证


防爆合格证


防爆电气设备
防爆合格证


发明专利证书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