

aobo

instrument

**2024
PRODUCT
INTRODUCTION**

Coriolis Mass Flowmeter

CONTENTS

I. General	3
1.1 Introduction	3
1.2 Principle	3
1.3 Feature	3
II. Technical Specifications	4
2.1 Main Technical Specification	4
2.2 Specification of Function	6
2.3 Environment Limitation	7
2.4 Outline Dimension (See the following Drawings and Tables11)	7
2.5 Weights	8
2.6 Model Selection (Coding/Part No.)	8
III. Introduction	9
3.1 About This Manual	9
3.2 Safety	9
3.3 Components	10
3.4 Installation Process	10
IV. Installation	10
4.1 Position selection	10
4.2 Direction	11
4.3 Sensor Installation	12

Company Profile

Weifang AOBO Instrument Technology Development Co., Ltd., founded in 2002, with registration capital of 10 million RMB, is a "High-Tech" and "Double-Software Certification" enterprise specialized in "flow measurement and intelligent measurement & control" industry, integrating R&D, production, sales and service.

The company has a core R&D team for computer software and technology, automatic intelligent control, HVAC engineering design and flow measurement. It has the ability to provide customers with specific solutions and complete sets of products according to their different needs, based on years of practical experience. Especially in the heating industry, by the customer's recognition, has a high reputation in the industry.

The products are mainly used in the measurement and control of "steam, liquid, gas, sewage and tap water"; and especially suitable for energy monitoring and energy-saving control in many industries, such as thermal power plants, thermal companies, residential heating, petroleum, chemical industry, papermaking, food, coating, printing & dyeing and HVAC.

Since its foundation, based on self-developed and leading technology, reliable quality, high-quality service and good reputation, our company has been warmly accepted by customers, and become a designated supplier for many central enterprises and listed companies.

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I. General

1.1 Introduction

K Series mass flowmeter (hereafter we call K) is designed according to the Coriolis the process detecting and custody transfer/fiscal unit in many industries such as petroleum, petroleum and chemical, chemical industry, pharmacy, paper making, food and energy, and so on. As a fairly advanced kind of flow measurement instrument, it has been paid attention by the circle of measurement measurement and accepted by many customers home and abroad.



1.2 Principle

K 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 changing, as a result, the fluid density can be calculated.

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

1.3 Feature

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

1. Enable to measure directly mass flow rate of fluid in the pipeline without changing any parameters, which avoids the some measurement error of intermediate links. Its mass

flow rate can be high accuracy and good repeatability within bigger range of turndown ratio.

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. Due to the small vibration, measuring tube of the K can be regards as non-moving parts, which will reduce the maintenance of flowmeter, enhance the stability and lifetime.

4. Besides the mass flow measurement, the density and temperature and even consistency can also be picked up and output.

II. Technical Specifications

2.1 Main Technical Specification

DN(mm)	25 ~ 100
Medium	Liquid, gas, slurry
Type / Medium temp.	Integrate type: (-40 ~ 125) °C Remote type: (-40 ~ 204) °C
Sensor	Triangle type, U-type
Transmitter	DSP
Certification	Ex-proof
Power supply	DC24V, AC220V
Output port	RS485
Pressure (MPa)	1.6, 2.5, 4.0, 6.3; Customized for high pressure: 10.0, 16.0, 26.0
Output signal	4~20mA, pulse
Accuracy	0.15%, 0.2%
Hygienic type	Customized
Process connection	Customized

2.1.1 Flow Range

Table 1: Flow Range for liquid

DN(mm)	Allowable flow range (kg/h)	Normal flow range for accuracy 0.15% (kg/h)	Normal flow range for accuracy 0.2% (kg/h)	Stability of zero point(kg/h)
25	200 ~ 20000	2000 ~ 20000	1000 ~ 20000	0.68
40	400 ~ 40000	4000 ~ 40000	2000 ~ 40000	2.18
50	600 ~ 60000	6000 ~ 60000	3000 ~ 60000	2.18
80	1200 ~ 120000	20000 ~ 120000	12000 ~ 120000	6.8
100	1800 ~ 180000	20000 ~ 180000	18000 ~ 180000	6.8

2.1.2 Mass Flow Measuring

1.For liquid: Conversion of Maximum Error for Mass flow (Table 2)

0.15%	0.20%
$\pm 0.15\% \pm (1/2 \times \text{Stability of Zero Point} / \text{Instantaneous Flow} \times 100\%)$	$\pm 0.2\% \pm (1/2 \times \text{Stability of Zero Point} / \text{Instantaneous Flow} \times 100\%)$
Accuracy is calculated based on the water measurement under the condition of +10°C~25°C and 0.1MPa~0.3MPa.	

2.Repeatability (Table 3)

Accuracy	0.15%for liquid	0.2% for liquid
Repeatability	$\pm 0.075\%$	$\pm 0.1\%$
Accuracy is calculated based on the water measurement under the condition of +10°C~25°C and 0.1MPa~0.3MPa		

2.1.3 Density Measuring (Table 4)

Density range	(0.2 ~ 2.0)g/cm ³
Basic error	$\pm 0.001\text{g/cm}^3$
Repeatability	$\pm 0.0005\text{g/cm}^3$

2.1.4 Temperature Measuring (Table 5)

Temperature range	(-40 ~ + 80) °C	Integrated type
	(-40 ~ +204) °C	Separate type
Basic error	$\leq \pm 0.1^{\circ}\text{C}$	

2.2 Specification of Function

2.2.1 Current Output (Table 6)

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

Output range	(4 ~ 20)mA
Resolving power	0.000244mA
Basic error	0.1%F.S
Temperature influence	$\pm 0.005\% \text{F.S./ } ^{\circ}\text{C}$
External resistor should be 250 ~ 750 Ω	

2.2.2 Pulse/Frequency Output (Table 7)

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

Output range	(0 ~ 10)kHz
Resolving power	0.152Hz
Basic error	$\pm 0.075\%$
Temperature influence	$\pm 0.001\% \text{F.S./ } ^{\circ}\text{C}$
Capability of outrange is 10kHz	

2.2.3 RS485 Output

RS485-Modbus-RTU is optional for each set K.

2.2.4 Low Flow Cutoff

When the flow value measured is lower than the value of Low Flow Cutoff, the K will output zero flow and the totalizer will stop to accumulate. The value of Low Flow Cutoff is usually set to be 0.3% of the maximum flow rate.

2.3 Environment Limitation

1.Environment vibration (Table 8)

Frequency range	(10 ~ 2000)Hz
Acceleration amplitude value	2g
Circulation time	50 times

2.Environment temperature (Table 9)

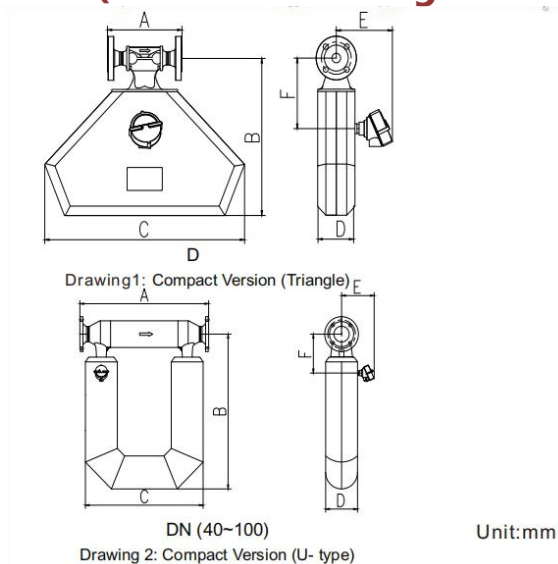
Working temperature	(-40 ~ +55)°C
Storage temperature	(-40 ~ +70)°C

3.Environment humidity (Table 10)

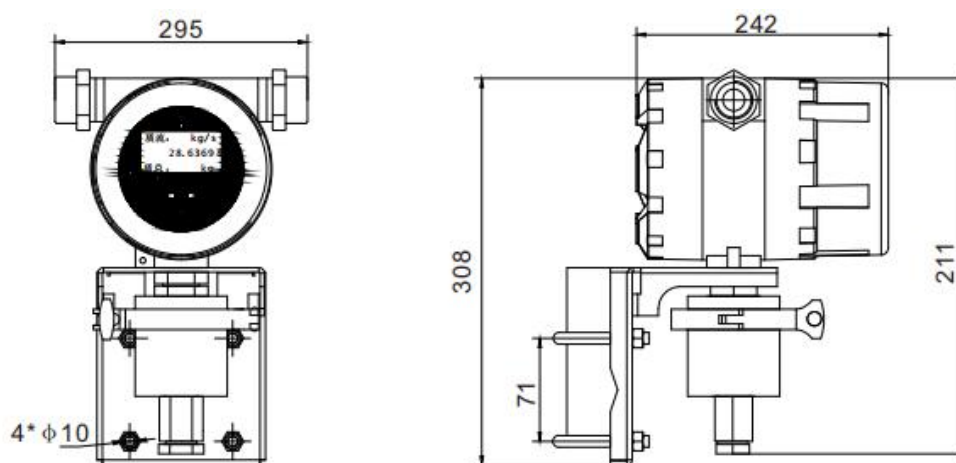
Working humidity	< 90%	25°C No condensation
Storage humidity	< 95%	

4.Enclosure Grade: IP67

2.4 Outline Dimension (See the following Drawings and Tables11)



K-	DN	PN	A	B	C	D	E	F
100	25	40	212	412	568	106	161	185
100	1"Class150		243					
100	1"Class300		256					
200	40	40	588	727	496	140	178	209
200	50	16	582					
200	50	40	588					
300	80	16	836	976	768	208	212	243
300	80	40	852					
300	100	16	840					
300	100	40	866					



Drawing 3: Dimensions for transmitter (unit: mm)

2.5 Weights

Table 11: net weights(table 12)

Unit: kg

K-	100	200	300
Net weights	18.8±3	40±5	86±10

Note: transmitter is 5.6kg.

2.6 Model Selection (Coding/Part No.)

K	□□□	□	□	□	□	□	□
0	1	2	3	4	5	6	7

Note:

0 — K series mass flowmeter

1 — Nominal size(1 inch=25.4mm)

2 — Transmitter type: D -Digital signal processing type

3 — Power supply: 1—24VDC 2—220VAC

4 — Output interface: S—RS485 N—No

5 — Signal output: F—Pulse output I—(4~20)mA

6 — Accuracy: A—± 0.1% B—± 0.2%

7 — W- Hygeian or sanitary; D-Customized

For example: K-100 D 1 S F B D

Meaning: K series mass flowmeter, DN25mm, digital signal processing type,24VDC, RS485 interface, pulse output, ±0.2% accuracy,hygeian.

III. Introduction

3.1 About This Manual

This manual mainly introduces the installation, connection, startup, operation, and trouble-shooting of K. The user must read this manual carefully before use, because improper installation may cause incorrect measurement and even damage the flowmeter.

3.2 Safety

1.When the flowmeter is required to be installed in the dangerous region, please confirm the explosion-proof performance of the flowmeter consistent with the environment in order to avoid the danger.

2.Please ensure that the power goes off to avoid the accident of electric shock when assembling a transmitter.

3.Please defer to the way of installation and usage to ensure the normal operation of the flowmeter.

3.3 Components

K is made up of sensor and transmitter, which can be installed integrally or separately. When K is installed separately, the sensor and transmitter should be connected through special Nine-Core Cable.

3.4 Installation Process

1.Step 1: Location: Determine the installation location of sensor, which should take the installation area, pipeline, transmitter location and valve into account.

2.Step 2: Direction: Determine the installation direction of sensor in the pipeline.

3.Step 3: Installation: Install the sensor and transmitter in the pipeline.

4.Step 4: Connection: When K is installed separately; the sensor and transmitter should be connected through special Nine-Core Cable.

5.Step 5: Start-up.

IV. Installation

4.1 Position selection

1.The sensor should be placed away from interference source which may cause pipe's mechanical vibration such as the pump along the process pipeline. If sensors are used in series along the same line, care must be taken to guard against the mutual influence due to resonance. The distance between sensors should be at least more than three times its width.

2.When installing the sensor, pay attention to the expansion and contraction of the process pipeline due to temperature change. It is strongly recommended that the sensor should not be installed near the expansion joint of the process pipeline. Otherwise, the pipe expansion and contraction of the pipeline will bring about transverse stress which can affect the sensor's zero, as a result of which the measurement accuracy.

3.The sensor should be placed away from industrial electromagnetic interference sources such as large power motors and transformers, otherwise, the measuring tube's auto-oscillation within the sensor will be interfered, and the weak signal detected by the speed sensor may be drowned by the electromagnetic noise. Therefore, the sensor should

be away from such sources as motors and transformers, at least five meters.

4.The sensor should be placed in the position where its measuring tube is always filled with fluids and a certain pressure out is maintained, thus it should be placed in the lower end of the pipeline.

5.Basic requirement: Install the K in the lower position of the pipeline so that the fluid can fill with the sensor during the process of zero point calibration and running. The transmitter should be installed in the environment with temperature from $-40\sim +60^{\circ}\text{C}$ and humidity $<90\%$.

6.Dangerous area: Please confirm the installation environment is suitable to the explosion-proof performance indicated in the nameplate of K for the installation of dangerous area.

7.Straight pipe: K does not require the special straight pipe upstream or downstream. However, if tow or more mass flow sensors are installed serially in the same pipeline, please ensure the length of pipe between any two sets is more than 2 meters.

8.Nine-core cable is two meters long,can be customized

9.Working temperature of sensor: (shown in Table 13)

Integral type	$(-40\sim +80)^{\circ}\text{C}$
Separate type	$(-40\sim +204)^{\circ}\text{C}$

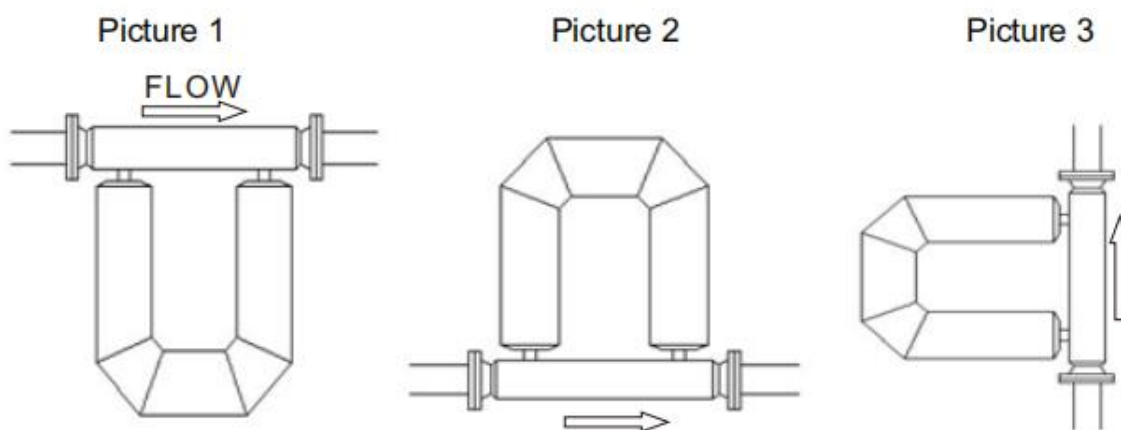
10.Valve: It is necessary to carry through zero point calibration once the installation of K is finished. The downstream stop valve has to be close at first before zero point calibration, and then close the upstream stop valve.

4.2 Direction

1.Basic requirement:

The K works well only when the liquid fills with the measuring tube. In principle, as long as the measuring tube is full of liquid, the K will function in any orientation installation. Generally speaking, the K is installed in the orientation which makes the liquid fill with the measuring tube.

For the horizontal installation, the measuring tube should be installed underside the pipeline when the process medium is liquid or slurry (shown on Picture 1) and topside the pipeline when the process medium is gas (shown on Picture 2). For the vertical installation, the measuring tube should be installed besides the pipeline when the process medium is liquid or slurry or gas (shown on Picture 3).



2.Flow direction:

There is obvious flow arrow which indicates the proper flow direction on the front of the sensor, so please install the K according to it. Otherwise, the transmitter may not display the mass flow normally.

For vertical installation, if the process medium is liquid or slurry, the flow direction is down-to-up; if the process medium is gas, the flow direction can be either down-to-up or up-to-down. The transmitter can be mounted with 90° revolution according to the requirement of installation.

4.3 Sensor Installation

Basic requirements:

The installation of the K should decrease the tortuosity of the process connection. Meanwhile, don't support the pipeline by the sensor of the K.

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