
# Datasheet

# Vortex Flow Meter

# AI-V240

Arka Instruments LLP

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The AI-V240 vortex flow meter is a kind of velocity flow meter, which is designed based on the research and design of the Karman vortex principle. It is mainly used for flow measurement of medium fluid in industrial pipelines, such as gas, steam, or liquid, and other media. Flow control and metering.
The LUGB vortex flow meter can realize the following functions according to different types: measure the temperature, pressure, instantaneous flow, and cumulative flow of the industrial pipeline medium fluid, and has pulse output, (4~20)mA analog signal output, RS485 communication (Modbus RTU protocol), IoT GPRS and other functions.

## Applications

- Energy industry
- Chemical industry
- Environmental Industry
- Metallurgy
- Textile
- Steel
- Pharmaceutical
- Paper-making

Vortex flow meter

## Features

- Ability to measure flow accurately and reliably.
- Low maintenance requirements.
- Easy to install and operate.
- Offer excellent long-term stability.
- Small pressure loss, wide range, high-accuracy.
- It has both analog standard signals and digital pulse signal output to match with computers and other digital systems.

## Principle

The vortex flow meter measures the flow of steam, gas and low-viscosity liquid based on the theory of Kamen and Strohal about the generation of vortex and the relationship between vortex and flow. As shown in Figure 1, a triangular column is vertically inserted into the body, which is the source of the vortex. When the medium flows through the body, Karman vortices with opposite directions and regularity are alternately generated behind the triangular column. The separation frequency of the vortex is F It is proportional to the flow velocity V of the medium. By detecting the number of vortices through the sensor head, the fluid flow rate can be measured, and then the volume flow rate of the measured medium can be calculated according to the diameter of the meter body.

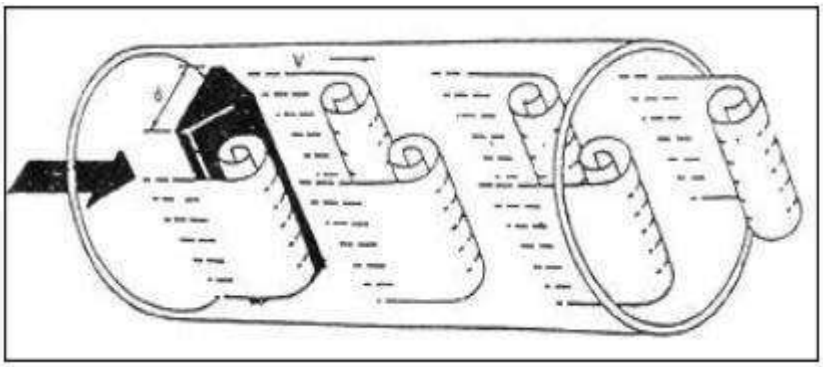


Figure 1

Calculated as follows:

F=St*V/md ..... Formula 1

Q=3600*F/K ..... Formula 2

M=Q*ρ..... Formula 3

In the formula:

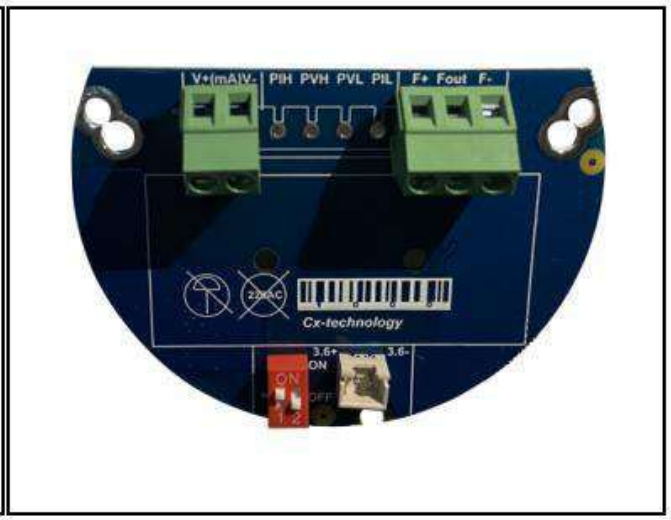
1. F...the vortex frequency generated by the fluid flowing through the triangular column of the vortex flow meter (unit: Hz)
2. St .. Strohal's constant (dimensionless)
3. V ... the average velocity of the fluid in the pipeline (unit: m/s)
4. m... The ratio of the arc flow area on both sides of the triangular column to the cross-sectional area of the measuring pipe (unit: dimensionless)
5. d... Width of the upstream surface of the triangular column in the meter body of the vortex flow meter (unit: m)
6. D ...The inner diameter of the vortex flow meter meter (unit: m)
7. Q... Instantaneous volume flow rate (unit: m3/h)
8. K .. The instrument coefficient of the vortex flow meter (unit: number of pulses/cubic meter)
9. M... Instantaneous mass flow rate (unit: kg/h)
10. ρ….fluid density (unit: kg/m3)

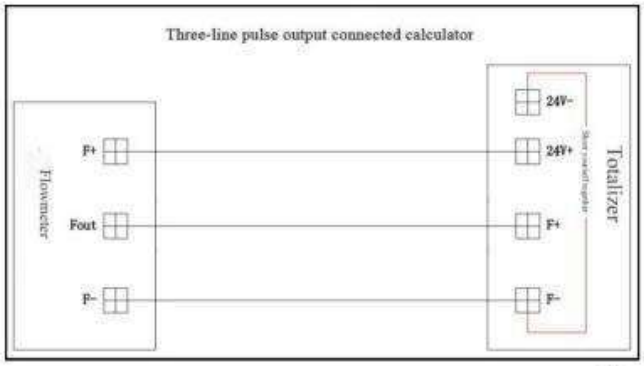
11. Note: The vortex flow meters with different calibers have different instrument coefficient K values, and the specific values are obtained through the actual calibration of the flow calibration device. That is, the number of pulses output by the sensor for one cubic meter of fluid flowing through the working condition.

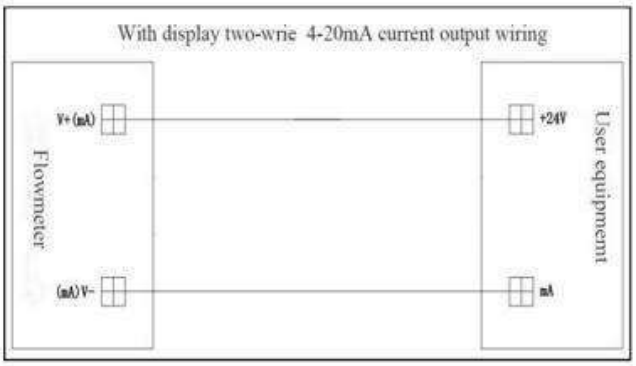
| Parameter | |
|---|---|
| Nominal diameter (mm) | 15, 20, 25, 32, 40, 50, 65, 80, 100, 125, 150, 200, 250, 300, 300-1000 (plug-in) |
| Pressure Resistance | Flange connection:<br>DN15~DN50, pressure 4.0MPa;<br>DN65~DN100, withstand pressure 2.5MPa<br>Above DN125, pressure resistance 1.6MPa<br>Flange connection:<br>DN15~DN50, pressure resistance 2.5MPa;<br>DN65~DN300, withstand pressure 1.6MPa |
| Conditions of Use | Medium temperature:<br>normal temperature type: (-40～100)℃; medium temperature type: (-40～250)℃; high temperature type: (-40～330)℃<br>Ambient temperature: (-20～55)℃<br>Relative humidity: 5% to 90%<br>Atmospheric pressure: (86～106)kPa |
| Material | Body: 304<br>Totalizer housing: Die-cast aluminum |
| Allowable vibration acceleration | Piezoelectric: 0.2g |
| Accuracy | Flow: ±1.5%R; plug-in type: ±2.5%R<br>Temperature: ±0.8℃<br>Pressure: ±0.3%FS |
| Turndown ratio | 1:6～1:25 |
| Supply voltage | Sensor: DC +24V<br>Transmitter: DC +24V<br>Battery powered type: 3.6V battery |
| Output signal | Pulse output, (4～20)mA current, RS485Modbus-RTU protocol) |
| Pressure loss coefficient | Conform to JB/T9249 standard Cd≤2.4 |
| Protection grade | IP65 |
| Electrical Interface | Internal thread M20*1.5 or others |
| Applicable medium | Gas, liquid, steam |
| Transmission distance | Three-wire pulse output type: ≤300m;<br>Two-wire standard current output type (4～20) mA: ≤1500m, load resistance ≤500Ω;<br>RS485: ≤1200m. |

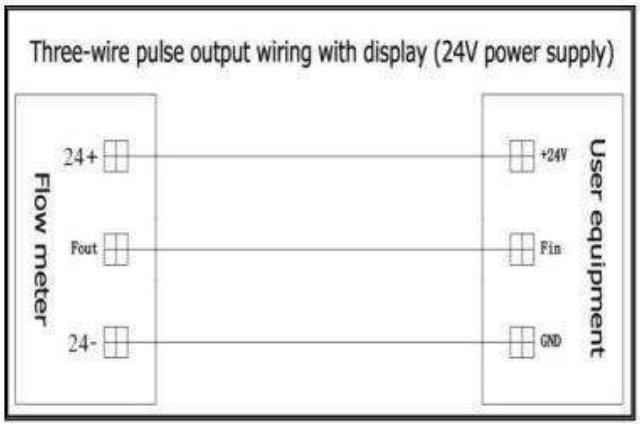
## Wiring

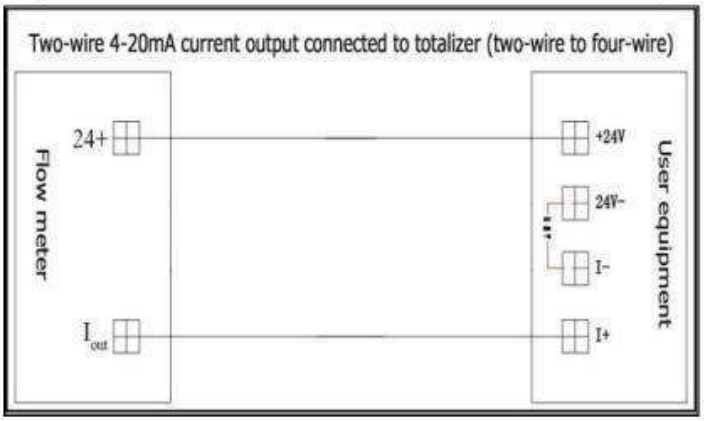

FLOW METER
Instant 0.000kg/m
00000000
T: 0.0℃ P:250.0KPa
ESC
SHIFT
SET

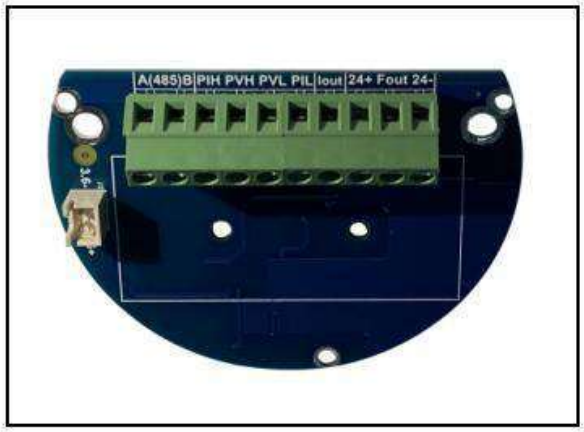

V+(mA)V-
PIH PVH PVL PIL
F+ Fout F-
Cx-technology
3.6+
3.6-
ON
OFF

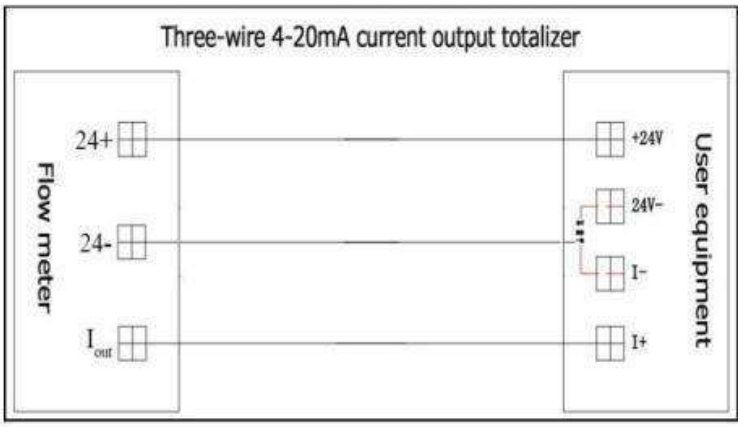

Three-line pulse output connected calculator
Flowmeter
F+
Fout
F-
24V-
24V+
F+
F-
Totalizer

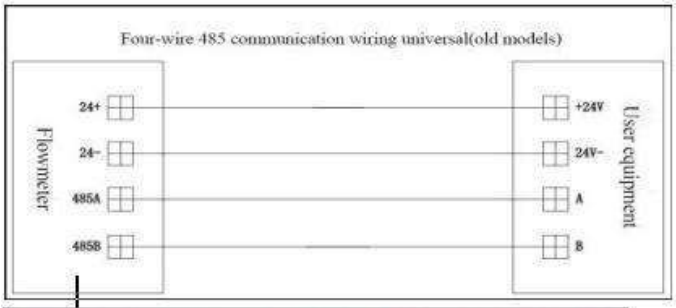

With display two-wrie 4-20mA current output wiring
Flowmeter
V+(mA)
(mA)V-
+24V
mA
User equipment

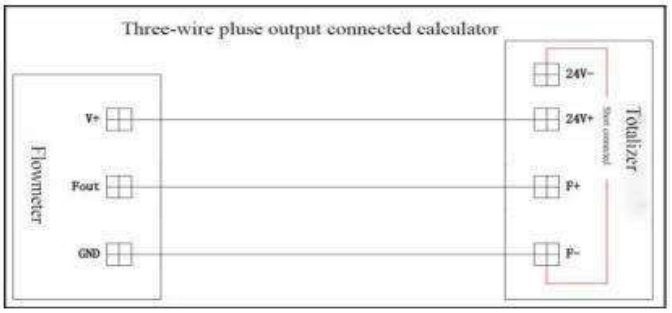

Three-wire pulse output wiring with display (24V power supply)
Flow meter
24+
Fout
24-
+24V
Fin
GND
User equipment

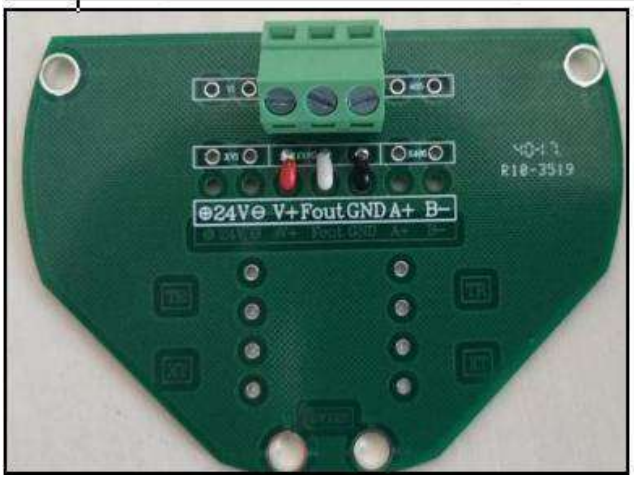

Two-wire 4-20mA current output connected to totalizer (two-wire to four-wire)
Flow meter
24+
Iout
+24V
24V-
I-
I+
User equipment


A(485)B PIH PVH PVL PIL Iout 24+ Fout 24-

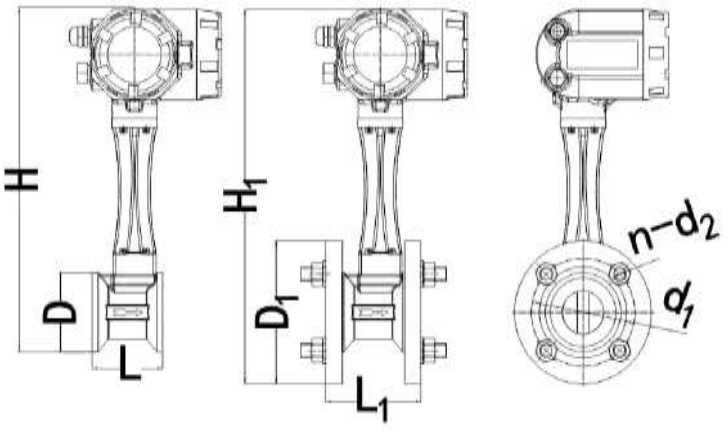

Three-wire 4-20mA current output totalizer
Flow meter
24+
24-
Iout
User equipment
+24V
24V-
I-
I+


Four-wire 485 communication wiring universal(old models)
Flowmeter
24+
24-
485A
485B
User equipment
+24V
24V-
A
B

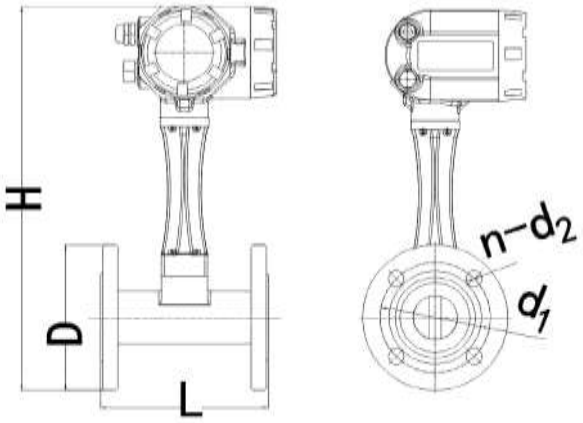

Three-wire pluse output connected calculator
Flowmeter
V+
Fout
GND
Totalizer
24V-
24V+
P+
P-


⊕24V⊖ V+ Fout GND A+ B-

## Dimensions




Flange and clamp connection fig. 1




Flange connection fig. 2

Flange and clamp connection ordinary on-site display dimensions table 1

| Size | Pressure MPa | Common L(mm) | Common $L_1$(mm) | D mm | $D_1$ mm | H mm | $H_1$ mm | $d_1$ mm | $d_2$ mm | n Number of holes |
|---|---|---|---|---|---|---|---|---|---|---|
| DN15 | 0~4.0 | 70 | 95 | 55 | 100 | 366 | 393 | 78 | 14 | 3 |
| DN20 | | 70 | 95 | 55 | 100 | 366 | 393 | 78 | 14 | 3 |
| DN25 | | 70 | 95 | 55 | 100 | 366 | 393 | 78 | 14 | 3 |
| DN32 | | 70 | 95 | 55 | 100 | 366 | 393 | 78 | 14 | 3 |
| DN40 | | 85 | 113 | 80 | 140 | 378 | 405 | 105 | 18 | 4 |
| DN50 | | 85 | 113 | 90 | 145 | 387 | 418 | 115 | 18 | 4 |
| DN65 | 0~1.6 | 85 | 113 | 105 | 165 | 402 | 438 | 130 | 18 | 4 |
| DN80 | | 85 | 113 | 120 | 180 | 417 | 453 | 145 | 18 | 6 |
| DN100 | | 85 | 113 | 140 | 210 | 437 | 478 | 175 | 18 | 6 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| DN125 | | 85 | 119 | 165 | 235 | 462 | 503 | 200 | 18 | 8 |
| DN150 | | 100 | 132 | 194 | 270 | 489 | 533 | 230 | 22 | 8 |
| DN200 | | 100 | 132 | 248 | 325 | 541 | 588 | 285 | 22 | 8 |
| DN250 | | 115 | 151 | 300 | 375 | 592 | 638 | 330 | 24 | 10 |
| DN300 | | 130 | 166 | 350 | 425 | 642 | 688 | 380 | 24 | 10 |

**Note:**

①The above dimensions are clamped without temperature and pressure compensation, the error is ±2mm, and the length L/L1 of the temperature and pressure compensation size DN15-DN32 is increased by 15mm;

② Medium and high temperature (≥100°C), the height is increased by 30mm (one heat sink).

Flange connection ordinary on-site display dimensions table 2

| Size mm | Pressure MPa | L (mm) | D (mm) | H (mm) | d1 (mm) | d2 (mm) | n Number of holes |
|---|---|---|---|---|---|---|---|
| DN10 | 0~4.0 | 170 | 90 | 395 | 60 | 14 | 4 |
| DN15 | | 170 | 95 | 397 | 65 | 14 | 4 |
| DN20 | | 170 | 105 | 402 | 75 | 14 | 4 |
| DN25 | | 170 | 115 | 407 | 85 | 14 | 4 |
| DN32 | | 170 | 140 | 420 | 100 | 18 | 4 |
| DN40 | | 170 | 150 | 425 | 110 | 18 | 4 |
| DN50 | | 170 | 165 | 432 | 125 | 18 | 4 |
| DN65 | 0~1.6 | 190 | 185 | 455 | 145 | 18 | 8 |
| DN80 | | 190 | 200 | 470 | 160 | 18 | 8 |
| DN100 | | 200 | 220 | 490 | 180 | 18 | 8 |
| DN125 | | 200 | 250 | 520 | 210 | 18 | 8 |
| DN150 | | 200 | 285 | 550 | 240 | 22 | 8 |
| DN200 | | 200 | 340 | 605 | 295 | 22 | 12 |
| DN250 | | 240 | 405 | 665 | 355 | 26 | 12 |
| DN300 | | 240 | 460 | 715 | 410 | 26 | 12 |

Note: For medium and high temperature (≥100°C), the height should be increased by 30mm (one heat sink).

## Installation

1. A circular hole slightly smaller than 100mm with gas welding on the pipe,And the round hole around the burr clean, to ensure that the probe rotating smoothly;

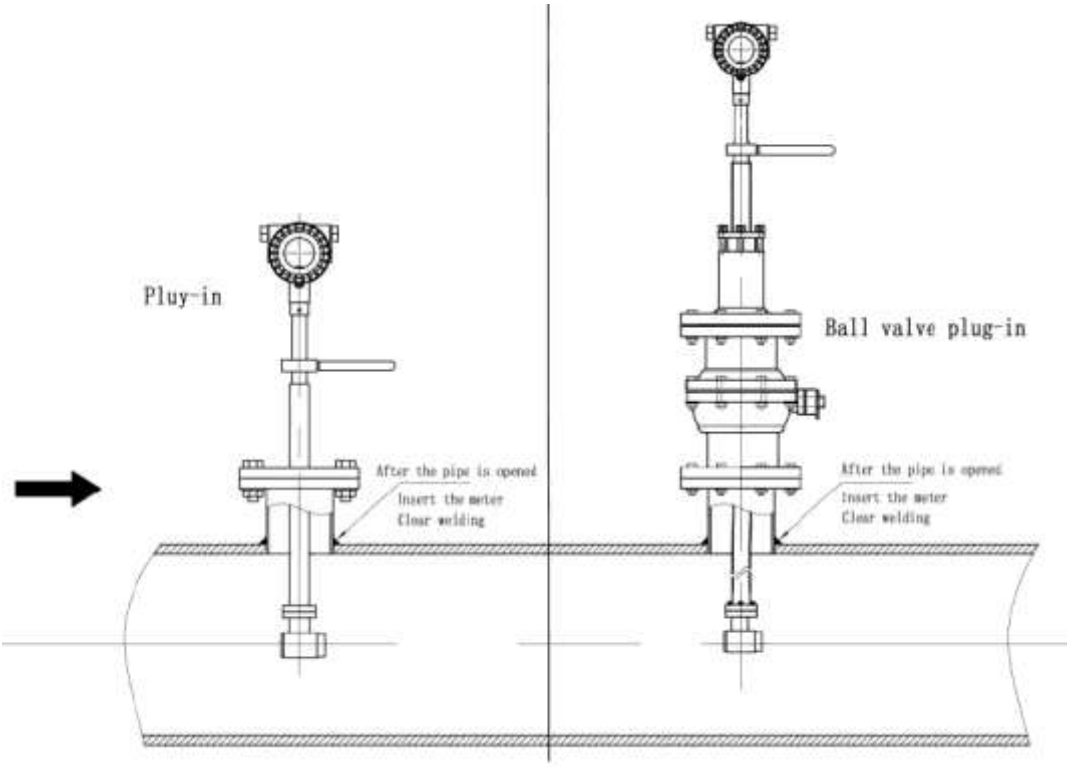
2. Weld the flange provided by the manufacturer at the round hole of the pipe. The flange axis is required to be perpendicular to the pipe axis.

3. Install the ball valve and sensor on the welded flange;

4. Adjust the lead screw to make the insertion depth meet the requirements(ensure that the central axis of the probe and the central axis of the pipeline coincide),the flow direction of the fluid must be consistent with the direction indicated by the arrow;

5 .Tighten the screws on the gland evenly.(note: the tightness of the gland determines the sealing degree of the instrument and whether the lead screw can rotate);

Check whether all links are completed, slowly open the valve to observe whether there is leakage(Special attention should be paid to personal safety)Repeat steps 5 and 6 if there is keakage。



# Ordering Code

| AI-V240-15-U1-M-A-M-0-K0-T1-WG-PC | | Description |
|---|---|---|
| AI-V240 | - - - - - - - - - - | |
| Nominal diameter | 15 | DN15(1/2") |
| | 20 | DN20(3/4") |
| | 25 | DN25(1") |
| | 32 | DN32(1.25") |
| | 40 | DN40(1.5") |
| | 50 | DN50(2") |
| | 65 | DN65(2.5") |
| | 80 | DN80(3") |
| | 1C | DN100(4") |
| | 1E | DN125(5") |
| | 1G | DN150(6") |
| | 2C | DN200(8") |
| | 2G | DN250(10") |
| | 3C | DN300(12") |
| Process connection and body material | U1 | Carbon Steel Clamping Flange，304SS |
| | U2 | 304SSClamping flange，304SS |
| | HA | GB/T9119 flange connection，304SS |
| | XX | other |
| Measuring medium | A | steam |
| | B | gas |
| | C | liquid |
| accuracy | M | 1.5 class |
| Compensation method | 0 | Standard structure without compensation |
| | 1 | Temperature and pressure compensation |
| | 2 | temperature compensation |
| | 3 | pressure compensation |
| Output, display and power supply | K0 | Pulse, No Display, 24VDC |
| | K3 | Pulse + 2-wire 4-20mA, display, 24VDC |
| | K4 | Pulse + 2-wire 4-20mA, display, 24VDC + battery dual power supply |
| | K5 | Pulse + 3-wire 4-20mA + RS485, Display, 24VDC |
| | K6 | Pulse + 2-wire 4-20mA + Hart, Display, 24VDC |
| | R1 | RS485, Display, 24VDC |
| | XX | other |
| heat-resistant temperature | T1 | -40-100℃ |
| | T4 | -40-250℃ |

| | | |
|---|---|---|
| | TR | -40-330℃ |
| | XX | other |
| Electrical interface, housing material and protection class | WG | M20*1.5 cable plug, aluminum alloy, IP65 |
| | WJ | NPT1/2 Cable Plug, Aluminum, IP65 |
| Accessories | PC | Matching Flange 304SS |

**Arka Instruments LLP**

Add: Hyderabad Office: H.no: 08-041/1, Plot no 132, N C L Enclave, Kompally, Hyderabad, Telangana, India - 500067
Land Line: +91 40359 00418
Mobile: +91 81438 12346
Email: admin@arkainstruments.com
Website: www.arkainstruments.com