**CHONGQING CHUANYI AUTOMATION CO.,LTD.**



# METAL TUBE ROTAMETER

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CHONGQING CHUANYI AUTOMATION CO.,LTD. FLOWMETER BRANCH

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# Metal tube rotameter

## I. Product Overview

The metal tube rotameter is a variable area flowmeter commonly used in industrial automation process control. It is characterized by small volume, wide detection range, and convenient use. It can be used to measure the flow of liquid, gas and steam media, especially for media characterized by low flow velocity, small flow, high temperature, high pressure, strong corrosion, conductivity or non-conductivity. It is widely used in flow measurement and process control in petroleum, chemical industry, metallurgy, electric power, papermaking, food, pharmacy and other industries.

This series of metal tube rotameters meet the national standard JB/T 6844-2015, and the factory verification meets the verification regulation of JJG257-2007.

This product has been tested and approved by the explosion-proof quality inspection agency designated by the state, and meets the relevant requirements of GB/T3836.1-2021, GB/T3836.2- 2021, GB/T3836.4-2021 and GB/T3836.31-2021. Its explosion-proof mark is as follows:

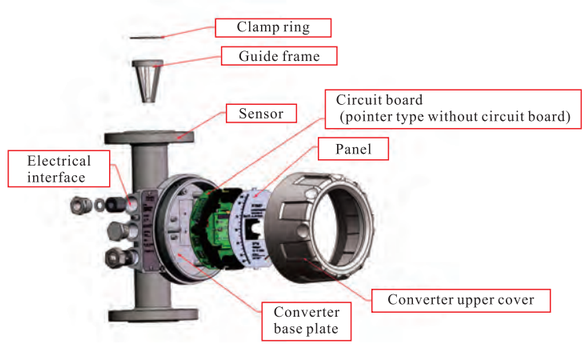
Flameproof Ex db II CT1~T6 Gb; dust flameproof Ex tb III CT85°C~450°C Db;

Intrinsically safe ExianCT1~T5 Gb; Dust intrinsically safe ExiaMCT 100°C~450°C Db.

## II. Product Structure

The metal tube rotameter is mainly composed of two parts: sensor assembly and converter assembly.

The sensor assembly includes the sensor (containing taper tube or orifice plate, float assembly), guide frame, collar and other components. The converter assembly includes the converter base plate, circuit board, panel, converter upper cover, electrical interface and other components.



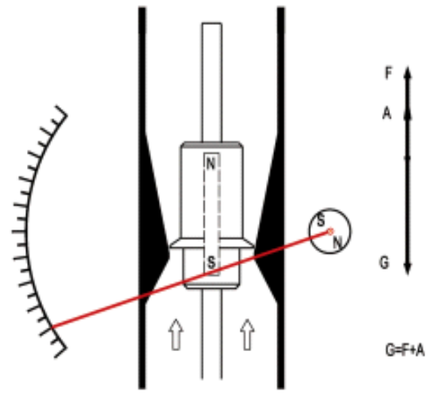





## III. Operating Principle

When flowing through the taper tube from bottom to top, the fluid is throttled by the float, and a differential pressure is generated between the upstream and downstream of the floater. The floater rises under the action of the differential pressure. The float is in equilibrium when the resultant force of differential pressure (A), gravity (G) and buoyancy (F) acting on the float equals zero. Therefore, a certain proportional relationship exists between the fluid flow rate and the rising height of the float, i.e., the flow area of the rotameter.

The height position information of the float rising is transmitted to the pointer component through the coupling between the float magnetic steel and the follow-up magnetic steel. Through the rotation of the pointer component, the pointer rotation angle has a linear displacement with the flow rate. At the same time, the follow-up magnetic steel displaces relative to the Hall element, and the generated differential potential is converted into standard electrical signal output by the converter circuit, which can display instantaneous flow rate and cumulative flow rate in real time.




## IV. Product Features

1. Uniform magnetic field technology makes float measurement more stable

2. Multi-section taper tube technology is adopted to make the dial tend to be linear.

3. Double indication system can meet diverse user needs in different working conditions. The panel is made of aluminum, and the long pointer indicates it mechanically, which makes the panel more beautiful. The low-power full-view double-line backlight LCD can display instantaneous flow, cumulative flow and corresponding units at the same time.

4. The magnetic damping system can effectively reduce the pointer jitter.

5. The geomagnetic interference compensation device is added to effectively overcome the influence of geomagnetic field on the meter.

6. It is suitable for micro-flow measurement of different media.

7. Simple structure and convenient installation.

## V. Main Parameters

| | |
|---|---|
| Measurement range | Water: 20°C (10~200000) L/h Air: 20°C, 0.1013MPa, (0.5~2000)$m^3$/h |
| Turndown ratio | Standard 10:1, Custom 20:1 |
| Accuracy class | Standard type: Class 1.5; Customized type: Class 1.0; |
| Pressure grade | Standard type: DN15~DN50≤4.0MPa; DN65~DN200≤1.6MPa;<br>Special type: DN15~DN50≤32MPa; DN65~DN200≤16MPa;<br>The pressure grade of clamp type and jacket type is 1.6MPa,<br>and the pressure grade of customized type needs to be negotiated during selection. |
| Connection mode | Flange connection, clamp connection, threaded connection and jacketed connection |
| Medium temperature | Standard type: -20°C~100°C; PTFE type: 0°C~80°C; PFA type: 0°C~120°C<br>High temperature type: 100°C~450°C (explosion-proof type 400°C);<br>Low temperature type: -80°C~-20°C |
| Ambient temperature | -40°C~+60°C |
| Power supply | Standard/alarm type: 24VDC two-wire system (4~20) mA (12VDC~32VDC)<br>AC type: (100~240)VAC 50Hz~60Hz<br>Battery type: 3.6V@9AH lithium battery, which can be used continuously for three years |
| Load characteristic | RLmax=600Ω; Intrinsically safe type: 500Ω |
| Alarm selection | Single-point alarm, upper and lower limit alarm, NAMUR switch,<br>NAMUR switch + single-point alarm,<br>NAMUR switch + upper and lower limit alarm, relay alarm |
| Pulse output | Cumulative pulse output is the output of optocoupler signal isolated Darlington tube<br>(internal power supply is 24 VDC, and maximum current is 8 mA) |
| Explosion-proof mark | Flameproof Ex db II CT1~T6 Gb; dust flameproof Ex tb III CT85°C~450°C Db;<br>Intrinsic safety Ex ia II CT1~T5 Gb; dust intrinsically safe Ex ia III CT100°C~450°C Db |
| Output signal | 4-20mA;4-20mA+HART;4-20mA+RS485;PA;FF; 4-20 mA + Pulse |
| Medium viscosity | DN15:n<5mPa.s(S15.0~S15.3),n<30mPa.s(S15.4~S15.10)<br>DN25:n<250mPa.s;DN50~DN200:n<300mPa.s |
| IP rating | IP65；IP66；IP67 |
| Language | Chinese / English / Russian |

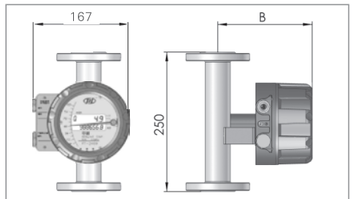




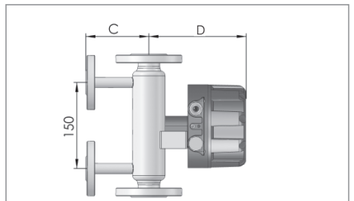
## VI. Overall Dimensions and Weight of Meter

### 1. Overall Dimensions and Weight of Standard/Jacketed Complete Machine Installed Vertically (bottom-in and top-out)

| Specification | B | | C | D | Approx. weight /Kg | |
|---|---|---|---|---|---|---|
| | Standard type | High temperature type | | | Standard type | Jacket type |
| DN15 | 139 | 179 | 100 | 139 | 3.6 | 6.4 |
| DN20 | 139 | 179 | 110 | 139 | 4.1 | 6.9 |
| DN25 | 139 | 179 | 110 | 139 | 5.5 | 10.4 |
| DN32 | 139 | 179 | 120 | 139 | 6.1 | 10.9 |
| DN40 | 139 | 179 | 120 | 158 | 6.6 | 11.1 |
| DN50 | 158 | 179 | 120 | 158 | 9.6 | 12.4 |
| DN65 | 158 | 179 | 140 | 158 | 10.1 | 12.9 |
| DN80 | 158 | 179 | 140 | 158 | 13.4 | 20 |
| DN100 | 179 | 234 | 150 | 179 | 16.9 | 21 |
| DN125 | 179 | 234 | 185 | 234 | 17.9 | 22 |
| DN150 | 234 | 234 | 185 | 234 | 33.6 | 35 |
| DN200 | 234 | 234 | 210 | 234 | 48.6 | 50 |



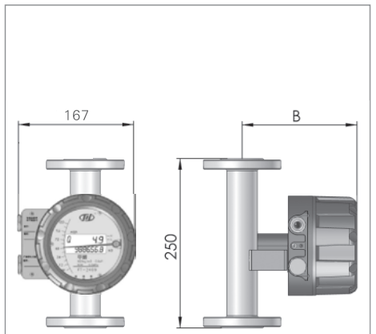
Standard type



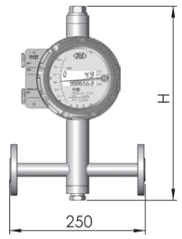
Jacket type

### 2. Overall Dimensions and Weight of Standard Complete Machine Installed Vertically (top-in and bottom-out)

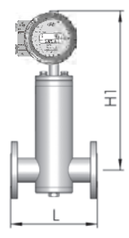
| Specification | B | | Approx. weight /Kg |
|---|---|---|---|
| | Standard type | High temperature type | |
| DN15 | 139 | 179 | 3.9 |
| DN20 | 139 | 179 | 4.2 |
| DN25 | 139 | 179 | 5.4 |
| DN32 | 139 | 179 | 6.5 |
| DN40 | 158 | 179 | 7.5 |
| DN50 | 158 | 179 | 8.3 |
| DN65 | 158 | 179 | 10.5 |
| DN80 | 158 | 179 | 14.4 |
| DN100 | 179 | 234 | 16 |
| DN125 | 234 | 234 | 18 |
| DN150 | 234 | 234 | 33 |
| DN200 | 234 | 234 | 48 |



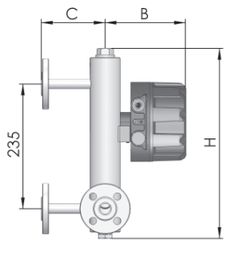
## 3. Overall dimensions and weight of standard/jacketed complete machine installed horizontally (left-in and right-out/right-in and left-out)



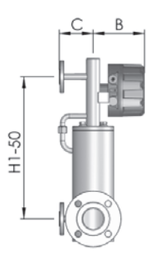

DN15~DN25
(standard type)




DN50~DN200
(standard type)




DN15~DN25
(jacket type)



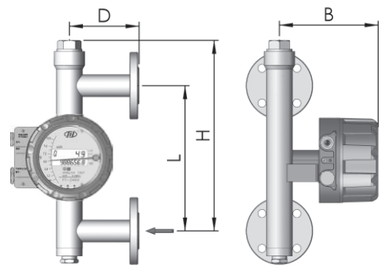

DN25~DN200
(jacket type)

| Specifi cation | B | | C | H | H1 | L | Approx. weight /Kg | |
|---|---|---|---|---|---|---|---|---|
| | Standard type | High tempe rature type | | | | | Standard type | Jacket type |
| DN15 | 139 | 179 | 100 | 355 | / | 250 | 5.3 | 8 |
| DN20 | 139 | 179 | 100 | 370 | / | 250 | 6 | 8.8 |
| DN25 | 139 | 179 | 100 | 370 | / | 250 | 8.7 | 11.5 |
| DN32 | 139 | 179 | 100 | 370 | / | 250 | 10 | 12 |
| DN40 | 139 | 181 | 150 | / | 485 | 250 | 12 | 14 |
| DN50 | 139 | 181 | 150 | / | 485 | 250 | 16.6 | 19 |
| DN65 | 139 | 181 | 190 | / | 520 | 250 | 24 | 27 |
| DN80 | 139 | 181 | 190 | / | 520 | 400 | 28.2 | 32.5 |
| DN100 | 139 | 181 | 210 | / | 540 | 400 | 33.5 | 39.8 |
| DN125 | 139 | 181 | 238 | / | 600 | 500 | 45 | 48 |
| DN150 | 139 | 181 | 238 | / | 600 | 500 | 58 | 63.4 |
| DN200 | 139 | 181 | 290 | / | 800 | 550 | 71 | 81 |

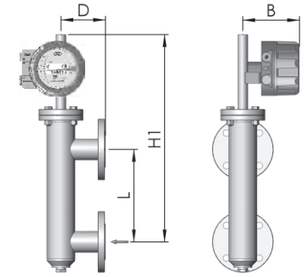




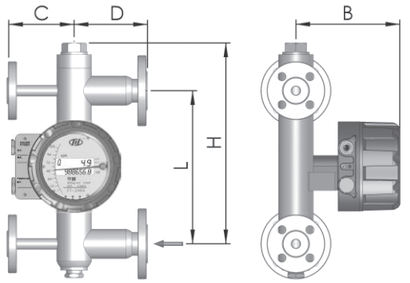
## 4. Overall dimensions and weight of standard/Jacketed complete machine installed on side (side-in and side-out)



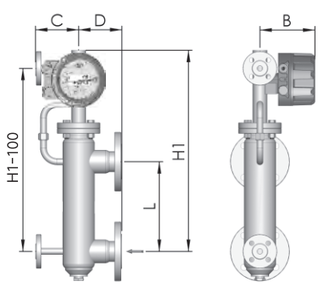

DN15~DN25 (standard type)




DN50~DN200 (standard type)



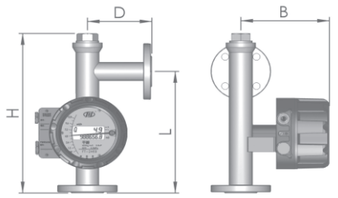

DN15~DN25 (jacket type)



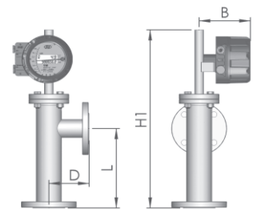

DN50~DN200 (jacket type)

| Specifi cation | B | | C | D | H | H1 | L | Approx. weight /Kg | |
|---|---|---|---|---|---|---|---|---|---|
| | Standard type | High tempe rature type | | | | | | Standard type | Jacket type |
| DN15 | 139 | 179 | 100 | 120 | 330 | / | 250 | 5 | 7.7 |
| DN20 | 139 | 179 | 100 | 120 | 340 | / | 250 | 5.7 | 8.4 |
| DN25 | 139 | 179 | 100 | 120 | 340 | / | 250 | 8.3 | 11.2 |
| DN32 | 139 | 179 | 100 | 120 | 340 | / | 250 | 9.7 | 11.7 |
| DN40 | 139 | 181 | 120 | 120 | / | 560 | 250 | 11.7 | 13.7 |
| DN50 | 139 | 181 | 120 | 120 | / | 560 | 250 | 16.3 | 18.7 |
| DN65 | 139 | 181 | 140 | 150 | / | 575 | 250 | 23.7 | 26.7 |
| DN80 | 139 | 181 | 140 | 150 | / | 575 | 250 | 27.9 | 30 |
| DN100 | 139 | 181 | 150 | 150 | / | 590 | 250 | 33.2 | 39.5 |
| DN125 | 139 | 181 | 185 | 180 | / | 690 | 300 | 40 | 45 |
| DN150 | 139 | 181 | 185 | 180 | / | 690 | 300 | 57.7 | 63 |
| DN200 | 139 | 181 | 210 | 200 | / | 780 | 350 | 68 | 74 |

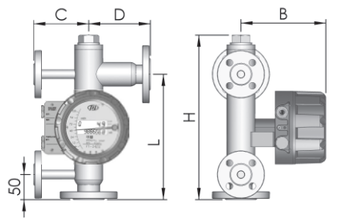
## 5. Bottom-side installation (bottom-in and side-out) Overall dimensions and weight of standard/jacketed complete machine



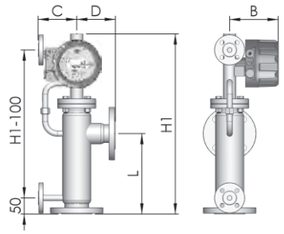

DN15~DN25 (standard type)




DN50~DN200 (standard type)




DN15~DN25 (jacket type)




DN50~DN200 (jacket type)

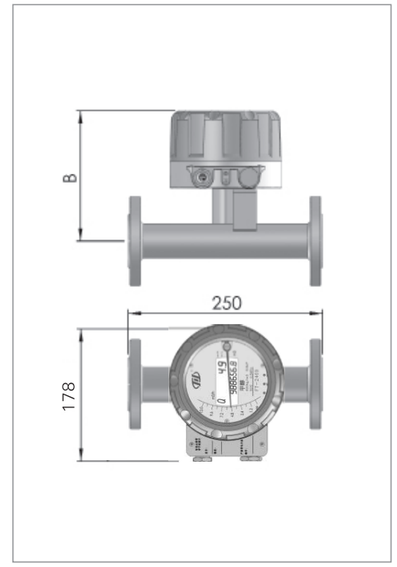
| Specifi cation | B | | C | D | H | H1 | L | Approx. weight /Kg | |
|---|---|---|---|---|---|---|---|---|---|
| | Standard type | High tempe rature type | | | | | | Standard type | Jacket type |
| DN15 | 139 | 179 | 100 | 120 | 330 | / | 250 | 4.7 | 7.4 |
| DN20 | 139 | 179 | 110 | 120 | 340 | / | 250 | 5.3 | 8 |
| DN25 | 139 | 179 | 110 | 120 | 340 | / | 250 | 7.6 | 10.5 |
| DN32 | 139 | 179 | 110 | 120 | 340 | / | 250 | 9 | 11 |
| DN40 | 139 | 181 | 120 | 120 | / | 560 | 250 | 11 | 13 |
| DN50 | 139 | 181 | 120 | 120 | / | 560 | 250 | 15 | 17.5 |
| DN65 | 139 | 181 | 140 | 150 | / | 595 | 250 | 20 | 23 |
| DN80 | 139 | 181 | 140 | 150 | / | 595 | 250 | 25 | 28 |
| DN100 | 139 | 181 | 150 | 150 | / | 600 | 250 | 29 | 32.5 |
| DN125 | 139 | 181 | 185 | 180 | / | 690 | 300 | 35 | 40 |
| DN150 | 139 | 181 | 185 | 180 | / | 690 | 300 | 53 | 57 |
| DN200 | 139 | 181 | 210 | 200 | / | 780 | 350 | 61 | 66 |





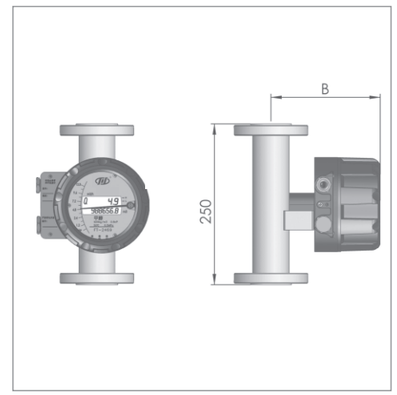
## 6. Overall dimensions and weight of standard complete machine with horizontal spring (left-in and right-out/right-in and left-out)

| Specifi cation | B | | Approx. weight /Kg |
|---|---|---|---|
| | Standard type | High temperature type | |
| DN15 | 139 | 179 | 3.9 |
| DN20 | 139 | 179 | 4.2 |
| DN25 | 139 | 179 | 5.4 |
| DN32 | 139 | 179 | 6.5 |
| DN40 | 158 | 179 | 7.5 |
| DN50 | 158 | 179 | 8.3 |
| DN65 | 158 | 179 | 10.5 |
| DN80 | 158 | 179 | 14.4 |
| DN100 | 179 | 234 | 16 |
| DN125 | 234 | 234 | 18 |
| DN150 | 234 | 234 | 33 |
| DN200 | 234 | 234 | 48 |




## 7. Overall dimensions and weight of standard fluorine-lined complete machine installed vertically (bottom-in and top-out)

| Specif ication | B | Approx. weight /Kg |
|---|---|---|
| DN15 | 139 | 3.9 |
| DN20 | 139 | 4.2 |
| DN25 | 139 | 5.4 |
| DN32 | 139 | 6.5 |
| DN40 | 158 | 7.5 |
| DN50 | 158 | 8.3 |
| DN65 | 158 | 10.5 |
| DN80 | 158 | 14.4 |
| DN100 | 179 | 17 |

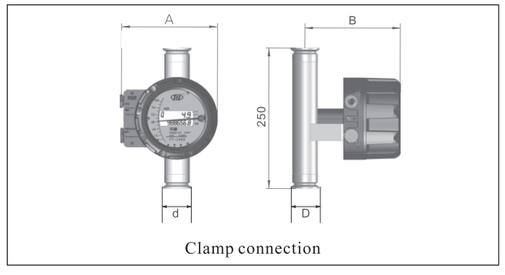


## 8. Overall Dimensions and Weight of Vertically Installed Temperature-pressure Compensation Type Complete Machine

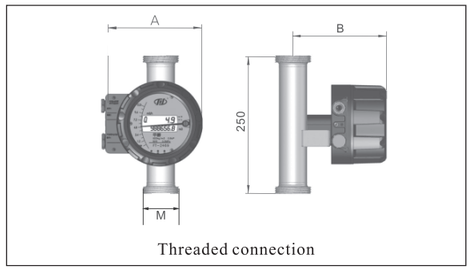
| Specifi cation | A | B | C | Approx. weight /Kg |
|---|---|---|---|---|
| DN15 | 220 | 139 | 150 | 4.1 |
| DN20 | 220 | 139 | 150 | 5 |
| DN25 | 220 | 139 | 150 | 6 |
| DN32 | 220 | 139 | 150 | 7.5 |
| DN40 | 236 | 158 | 166 | 9 |
| DN50 | 236 | 158 | 166 | 10.1 |
| DN65 | 249 | 158 | 179 | 12.5 |
| DN80 | 249 | 158 | 179 | 13.9 |
| DN100 | 259 | 179 | 189 | 17.4 |
| DN125 | 277 | 234 | 207 | 32 |
| DN150 | 277 | 234 | 207 | 34.1 |
| DN200 | 307 | 234 | 237 | 49.1 |




## 9. Overall Dimensions and Weight of Sanitary Clamp Connection/Threaded Connection Type Complete Machine



Clamp connection



Threaded connection

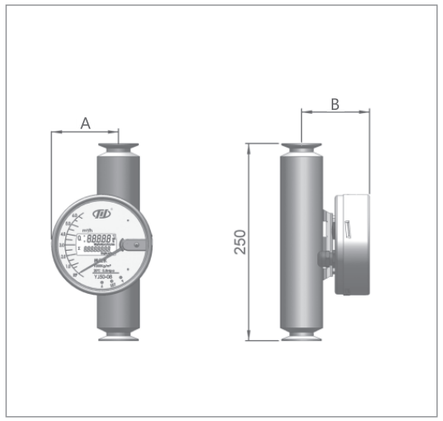
| Specifi cation | A | B | d | D | M | Approx. weight /Kg |
|---|---|---|---|---|---|---|
| DN15 | 133 | 139 | Φ25.4 | 50.5 | RD40X1/6 | 2.4 |
| DN20 | 121 | 139 | Φ32 | 50.5 | RD48X1/6 | 3.5 |
| DN25 | 121 | 139 | Φ42 | 50.5 | RD60X1/6 | 3.5 |
| DN32 | 121 | 139 | Φ42 | 50.5 | RD60X1/6 | 3.5 |
| DN40 | 106 | 158 | Φ50.8 | 50.5 | RD70X1/6 | 3.5 |
| DN50 | 106 | 158 | Φ76 | 64 | RD98X1/6 | 5.3 |
| DN65 | 93 | 158 | Φ76（Φ102） | 77.5 | RD98X1/6（RD125X1/6） | 5.3 |
| DN80 | 93 | 158 | Φ102 | 91/106 | RD125X1/6 | 7.3 |
| DN100 | 83.5 | 179 | Φ122 | 119 | RD125X1/6 | 8.1 |





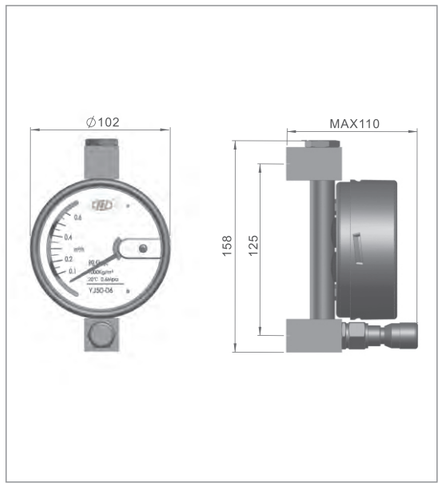
## 10. Overall Dimensions and Weight of Sanitary Polished Pipe Clamp Connection Type Complete Machine

| Specifi cation | A | B | Approx. weight /Kg |
|---|---|---|---|
| DN15 | 97 | 125 | 1.9 |
| DN20 | 92 | 125 | 2.4 |
| DN25 | 87 | 125 | 3 |
| DN32 | 87 | 125 | 3 |
| DN40 | 83 | 147 | 3.5 |
| DN50 | 70 | 147 | 4.8 |
| DN65 | 70 | 147 | 4.8 |
| DN80 | 57 | 147 | 6.8 |
| DN100 | 47 | 168 | 7.6 |



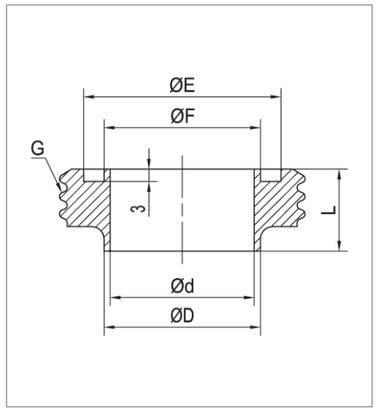

## 11. Overall Dimensions and Weight of Micro-flow Complete Machine

| Measuring taper tube | Needle valve diameter (mm) | Approx. weight /Kg |
|---|---|---|
| K01 | 1 | 0.96 |
| K02 | 1 | 0.96 |
| K03 | 1 | 0.96 |
| K04 | 1 | 0.96 |
| K05 | 1.5 | 0.96 |
| K06 | 1.5 | 0.96 |
| K07 | 2.5 | 0.96 |
| K08 | 2.5 | 0.96 |
| K09 | 2.5 | 0.96 |
| K10 | 4.5 | 0.96 |
| K11 | 4.5 | 0.96 |



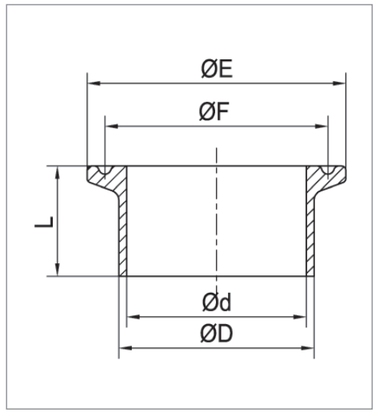
## 12. Overall Dimensions of Sanitary Threaded Connection

| Caliber | | E | F | D | d | L | G |
|---|---|---|---|---|---|---|---|
| 3/4" | ϕ19 | 26.0 | 19.0 | 19.0 | 16.0 | 15.0 | RD34.5x1/6" |
| 1 | ϕ25 | 32.0 | 25.0 | 25.4 | 22.4 | 18.0 | RD40x1/6" |
| 11/4 " | ϕ32 | 40.0 | 32.0 | 32.0 | 29.0 | 20.0 | RD48x1/6 " |
| 11/2 | ϕ38 | 48.0 | 38.0 | 38.0 | 35.0 | 20.0 | RD60x1/6" |
| 2" | ϕ51 | 61.0 | 51.0 | 51.0 | 48.0 | 20.0 | RD70x1/6 |
| 21/2” | ϕ63 | 73.5 | 63.5 | 63.5 | 59.5 | 25.0 | RD85x1/6 " |
| 3" | ϕ76 | 86.0 | 76.0 | 76.2 | 72.2 | 25.0 | RD98x1/6" |
| 31/2" | ϕ89 | 99.0 | 89.0 | 89.0 | 85.0 | 26.0 | RD110x1/6" |
| 4" | ϕ102 | 114.0 | 102.0 | 101.6 | 97.6 | 27.0 | RD125x1/6 " |




## 13. Table of Overall Dimensions for Standard Clamp Connection

| Caliber | | E | F | D | d | L |
|---|---|---|---|---|---|---|
| 3/4” | ϕ19 | 50.5 | 43.5 | 19.0 | 16.0 | 21.5 |
| 1 | ϕ25 | 50.5 | 43.5 | 25.4 | 22.4 | 21.5 |
| 11/4" | ϕ32 | 50.5 | 43.5 | 31.8 | 28.8 | 21.5 |
| 11/2 | ϕ38 | 50.5 | 43.5 | 38.1 | 35.1 | 21.5 |
| 2" | ϕ51 | 64.0 | 56.5 | 50.8 | 47.8 | 21.5 |
| 21/2 | ϕ63 | 77.5 | 69.5 | 63.5 | 59.5 | 21.5 |
| 3" | ϕ76 | 91.0 | 83.5 | 76.2 | 72.5 | 21.5 |
| 31/2 h | ϕ89 | 106.0 | 98.5 | 89.0 | 85.0 | 21.5 |
| 4 | ϕ102 | 119.0 | 111 | 101.6 | 97.6 | 21.5 |

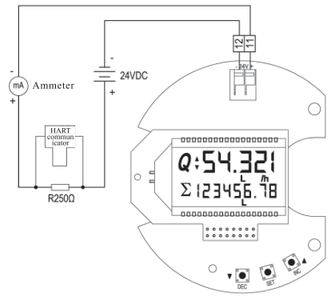







## VII. Schematic Diagram of Product Wiring

1. Wiring diagram of two-wire system (4~20) mA output (including intrinsically safe type and Hart type):

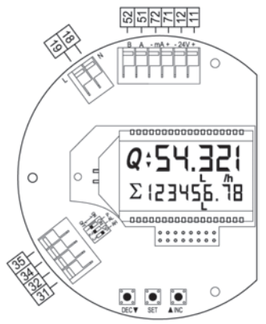



Hart475 and FLUKE744 handsets are supported

The intrinsically safe explosion-proof indicator shall be equipped with corresponding safety barrier. The explosion-proof mark of the safety barrier is Ex ia IIC, and its parameters meet the following requirements:

Ui≤28V
Ii≤100mA
Ci≤0.020F
Li≈mH
Pi≤0.7W

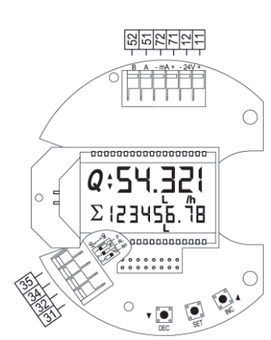
2. Wiring diagram of multi-wire system (24VDC, 220VAC power supply, ModBus, alarm and pulse output, batch processing mode):




M5.M6 wiring terminal diagram

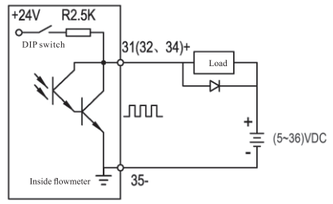
| | | |
|---|---|---|
| 11 | DC power supply | 24VDC+ |
| 12 | | 24VDC– |
| 18 | 220VAC power supply | N |
| 19 | | L |
| 31 | Upper limit alarm/pulse output/batch output | + |
| 32 | Lower limit alarm/ pulse output/batch output | + |
| 34 | Pulse/batch output | + |
| 35 | Alarm/pulse/batch output common GND | – |
| 51 | ModBus protocol output | A |
| 52 | | B |
| 71 | Multi-wire system current output | + |
| 72 | | – |

Description of Wiring Termina

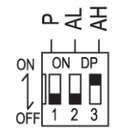



Wiring Terminal Diagram

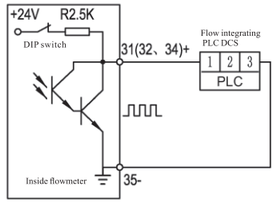
Note: Pulse output, batch output and alarm output terminals are multiplex terminals, and the corresponding output modes need to be set by software. The three outputs are selected as active output or passive output by the corresponding DIP switch, and the DIP switch is ON for the active output, which is internally powered by the flowmeter. The internal power supply is 8mA@24VDC, which can be externally connected with an electronic counter, PLC and DCS. The DIP switch is OFF for the passive output, which requires an external power supply of 5~36VDC, and the maximum power supply is 250mA@36VDC. When the inductive load is used, a freewheeling diode should be added as shown in the figure.




Pulse, batch and alarm active output wiring (DIP switch is ON)

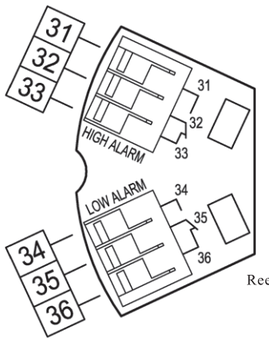



DIP switch
NO: Internal power supply 24VDC
OFF: External power supply of 5-36VDC is required;
No. 1 of the DIP switch corresponds to the pulse output terminal, No. 2 corresponds to the lower limit alarm terminal, and No. 3 corresponds to the upper limit alarm terminal;



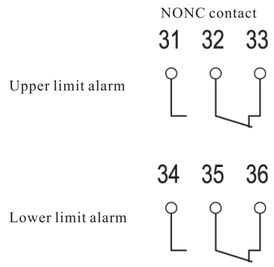

Pulse, batch and alarm active output wiring (DIP switch is ON)

## 3. Wiring Diagram of Reed Switch Switching Value Alarm:



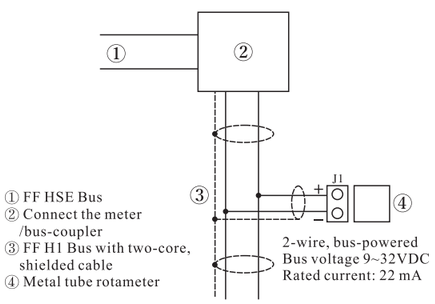

Reed switch has three contact forms:
NO (default), NC and NONC.
When ordering, it is necessary to explain which switch form is needed.

Reed switch contact capacity 1A@30VDC




## 4. Wiring diagram of FF bus:

The FF bus is powered by 9-32 V. It is recommended to use the special field bus cable recommended by IEC61158-2 standard. The bus cable shall not share conduit or open wire trunking with power lines of other equipment, and shall be kept away from high-power equipment. The shielded wires at both ends of FF bus are single-end grounded.

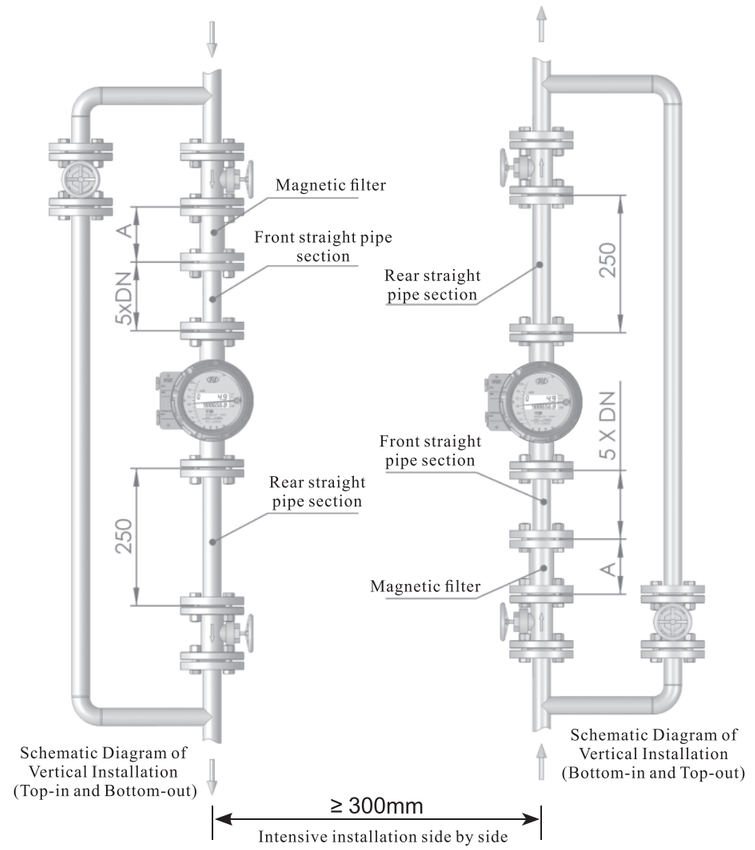



① FF HSE Bus
② Connect the meter /bus-coupler
③ FF H1 Bus with two-core, shielded cable
④ Metal tube rotameter



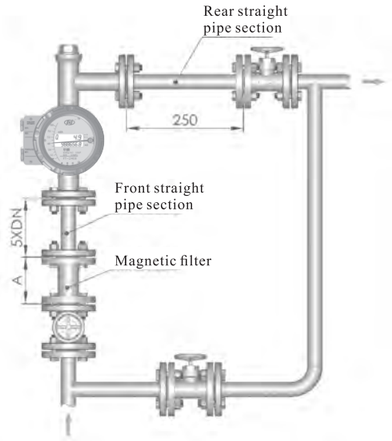


# VIII. Product Installation Diagram

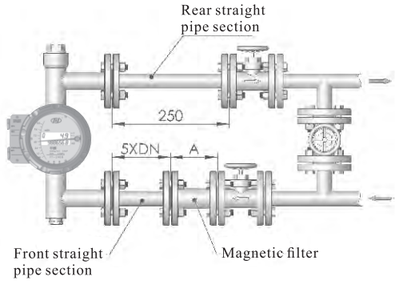



Where:
5×DN is the length of front straight pipe section
250 is the length of the rear straight pipe section
A is the reserved space for magnetic filter installation
Below DN100, A=100mm
Above DN100, A=150mm
Clamping type, A=50mm

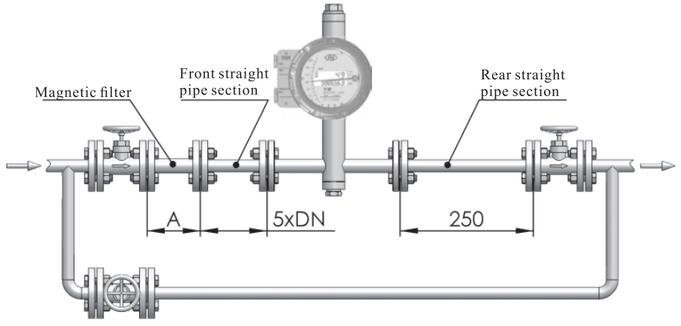
Notes:
1. If the front and rear pipe sections meet the installation requirements, straight pipe sections are not required
2. If there is no ferromagnetic substance in the medium, the magnetic filter is not required



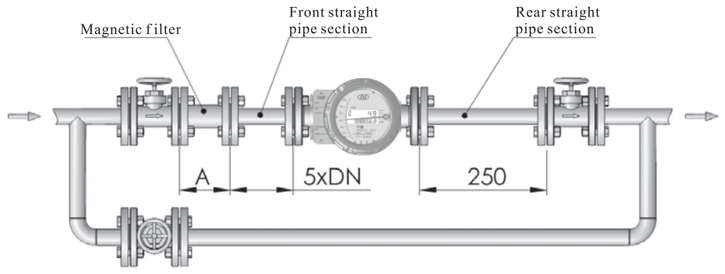

Schematic Diagram of Bottom-in
and Side-out Installation



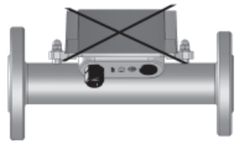

Schematic Diagram of Side-in
and Side-out Installation




Schematic Diagram of Horizontal Installation (Left-in and Right-out/Right-in and Left-out)




Schematic Diagram of Horizontal Snapping
(Left-in and Right-out/Right-in and Left-out) Type Installation



Incorrect installation direction





## IX. Precautions for Product Installation

1. The meter is precision equipment, so in the process of transportation, installation, storage and use, we must handle them with care, and barbaric transportation, overstress installation and misplacing everywhere are prohibited. The relative position of the indicator and the sensor cannot be changed. Once the relative position changes, it will directly affect the measurement accuracy of the meter.

2. Before meter installation, the process pipeline shall be purged to prevent the ferromagnetic substances retained in the pipeline from adhering to the meter, affecting the performance of the meter and even damaging the meter. If ferromagnetic substance is inevitable, a magnetic filter shall be installed at the meter inlet. The meter shall be exempted from air purging before production to avoid damage.

3. Before the meter is installed in the process pipeline, the filler (to prevent the float from moving during transportation) in the measuring tube shall be taken out, and it is required to check whether the meter is damaged during transportation.

4. The installation form of the meter is divided into vertical installation and horizontal installation. In the case of vertical installation, the included angle between the central vertical line of the meter and the plumb line shall be less than 2°; in the case of horizontal installation, the included angle between the horizontal center line of the meter and the horizontal line shall be less than 2°.

5. The upstream and downstream pipelines of the meter shall have the same nominal caliber as the meter, and the connecting flange or thread shall match the flange and thread of the meter. The length of the upstream straight pipe section of the meter shall be 5 times of the nominal caliber of the meter, and the length of the downstream straight pipe section shall be 250mm or more.

6. The meter transmits signals through magnetic coupling, so in order to ensure the accuracy of the meter, ferromagnetic substances are not allowed within a radius of at least 10cm around the installation, and the distance should be ensured to be greater than or equal to 300mm when densely installed side by side.

7. The meter for measuring gas is calibrated with air at 0.1MPa and 20°C. If the gas is directly discharged to the atmosphere at the meter outlet, a pressure drop will be generated at the float, which will make the pointer of the meter jitter. If this is the case, a valve shall be installed at the meter outlet, and the valve opening should be turned down during operation.

8. Meters installed in pipelines shall not be subjected to stress, and the meter inlet and outlet shall be supported by suitable pipelines to keep the meters at the minimum stress.

9. The PTFE-lined meters shall be installed with special care. PTFE will be deformed under pressure, so it is necessary to install another PTFE gasket to avoid flanging and fracturing the lining.

10.In the process of long-term use, ferromagnetic substances are inevitably adsorbed on the float in the pipeline. If there are too many impurities, the float will be stuck or the measurement accuracy will be affected, so the measuring tube of the meter should be cleaned regularly. If a magnetic filter is installed at the meter inlet, the filter should also be cleaned regularly.

11. The indicator of the meter is equipped with electronic devices, so when the meter is disassembled housing or used, the screw or cover should be tightened to keep the shell sealed, and the liquid and ferromagnetic substances must be prevented from entering, and the meter housing should be reliably grounded.

12. When the meter is used for the first time, the following two points shall be paid attention to:

Liquid measurement: In the process of opening the valve, in order to avoid sudden opening of the valve, head impact and damage to the meter, it is necessary to open the valve slowly.

Gas measurement: Do not pressurize the pipeline before opening the valve. Otherwise, if the valve is suddenly opened, the float will rush to the stopper and may damage the meter, so be sure to open the valve slowly. The meter for measuring gas can be equipped with a pneumatic damping device to minimize the oscillation of the float.

13.For the intelligent indicator, it is required to first ensure that the electrical wiring is correct, and then it can be powered on. Otherwise, it is easy to damage the meter. For the key operation, the instructions for use must be observed, and it is prohibited to operate blindly. Otherwise, the data stored in EEPROM in the meter will be lost or damaged.

14.The meter shall be stored at -40°C~55°C, where the relative humidity is not more than 90% and there is no rain, snow, sun exposure and corrosive gas.

15.When cleaning, it is required to avoid washing the meter shell with water to prevent water from entering the meter shell and damaging the meter.

16. Due to the pressure loss of the flowmeter, the medium pressure at the installation position of the meter must be greater than twice the pressure loss of the flowmeter.

17.For meters with LCD screen, try to install the meter in such way that direct sunlight on the screen can be avoided as much as possible; otherwise, the service life of the LCD may be shortened.

18.When measuring low-temperature medium, if thermal insulation jacket or vacuum jacket is not ordered, thermal insulation treatment is needed on site.

19.Before wiring the meter, it is required to determine the power supply and output mode of the meter, and determine the terminal numbers of the power supply and signal on the circuit board to avoid damage to the meter caused by wrong connection.

20.The user must follow the requirements of this manual to ensure the correct and safe use of the meter.

## X. Product Accessories

1. Straight pipe section

The user can select the front 5D (pipe nominal diameter) straight pipe section, and the rear 250mm straight pipe section is installed with the flowmeter to ensure the measurement accuracy of the product.

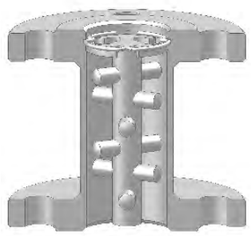
2. Mating flanges, fasteners and gaskets can be provided according to the selected flowmeter flange standards (GB, HG, JB, ANSI, DIN, JIS).

3. Magnetic filter

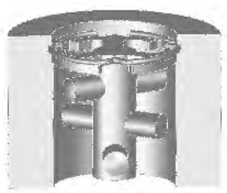
When the medium contains ferromagnetic impurities or the flowmeter is installed and used for the first time, it is recommended to select the magnetic filter. Magnetic filter can be made of stainless steel and lined with PTFE. Flange connection, clamping type and integrated type can be selected according to connection method. Special structure can be customized according to user's requirements.

4. BAT-9AH type batteries may be supplied when battery flowmeters are low on power.

5. ModBus and Hart protocol modem and upper computer software can communicate and be debugged with field meters through computers.



Flange type
Total length 100
>DN100
Total length 150



Clamping type
Total length 50
≤DN100





## XI. Liquid, Gas and Steam Flow Measurement Conversion

**1. Calculation method**

(1) According to the data given by the user, select an appropriate formula to calculate the flow Qs of the corresponding calibration medium:

Qs=K×Q

Where: Qs--flow rate of calibration medium (water or air) in standard state (20°C, 0.1013MPa)

Q--User medium flow K--Correction coefficient

(2) According to the calculated Qs value, check the flow meter to determine the selected float number and the caliber of the measuring tube. The values in the flow meter are all the flow values of water or air in the standard state

(3) The viscosity correction is not considered in the calculation, so it may be different from the results calculated by the factory. Please understand it.

**2. Determination of correction coefficient K**

A. Liquid measurement

a. If Q given by the user is the volume flow of liquid, calculate K with the following formula:

$$K=\sqrt{\frac{(\rho_s-1)\times\rho}{\rho_s-\rho}}$$

b. If Q given by the user is the mass flow of liquid, calculate K with the following formula:

$$K=\sqrt{\frac{\rho_s-1}{(\rho_s-\rho)\times\rho}}$$

Where: ρs: selected float density (g/cm$^3$)

The density of stainless steel float is 7.8

The density of PTFE is 3.4

The density of nickel-based alloy (Hatelloy) is 8.3

ρ: Density of measured medium

B. Gas measurement:

a. If Q given by the user is the volume flow of gas in the standard state (20°C, 0.1013MPa), calculate K with the following formula:

$$K=\sqrt{\frac{\rho\times P_0\times T}{\rho_0\times P\times T_0}}$$

b. If Q given by the user is the volume flow of gas in the operating state, calculate K with the following formula:

$$K=\sqrt{\frac{\rho\times P\times T_0}{\rho_0\times P_0\times T}}$$

c. If Q given by the user is the mass flow of gas, calculate K with the following formula:

$$K=\frac{1}{1.205}\sqrt{\frac{\rho\times P_0\times T}{\rho_0\times P\times T_0}}$$

In the above formulas

ρ: density of the measured gas medium at 20°C and 0.1013MPa (kg/m)

P: Absolute pressure of the gas medium to be measured (MPa)

T: Absolute temperature of the gas medium to be measured (K)

ρo: density of air at 20°C and 0.1013MPa (1.205kg/m)

Po: absolute pressure of calibration medium (0.1013MPa)

To: absolute temperature of calibration medium (293.15K)

d. Auxiliary density conversion formula:

$$\rho=\rho_t\frac{P_0\times T_t}{P_t\times T_0}$$

Where: ρ: density of the measured gas medium in standard state (kg/m)

ρt: Density of measured gas medium in operating state (kg/m)

Tt: absolute temperature of the measured gas medium in operating state (K)

Pt: Absolute pressure of the gas medium to be measured in the operating state (MPa)

Po: Absolute pressure of the gas medium to be measured in the standard state (MPa)

To: absolute temperature of the measured gas medium in standard state (K)

C. Steam measurement

When the flowmeter measures saturated steam, it can be converted and selected according to the following formula:

$$Q_S=29.56\frac{M}{\sqrt{\rho}}$$

Where: Qs: Corresponding water flow

ρ: Density of steam in operating state (kg/m$^3$)

M: Flow rate of steam (kg/h)

According to the steam density and mass flow in the operating state, the user can make conversion according to the above formula, and select the meter according to the specifications of water flow.

This formula is derived from the density of the float material = 7900 kg/m$^3$. If the density of the float changes, the coefficient in the formula will also change.

## XII. Как правильно выбрать тип

Model selection is a very important work for meter application in Central Africa. The right or wrong model selection directly affects the accuracy and use of meters. Special attention must be paid to the following during model selection:

**1. Parameters to be provided for model selection:**

(1) Name of the medium to be measured and its chemical composition

(2) Process parameters: operating pressure, operating temperature, medium density, medium viscosity and medium state; maximum flow, common flow and minimum flow

(3) Process pipeline: pipe material, caliber and direction (horizontal and vertical).

(4) Converter: local, remote transmission, power supply mode, output type, explosion-proof requirements, etc.

(5) Sensor: liquid contacting material, installation mode, connection mode and flange standard (detailed standard number shall be provided).

(6) Accuracy class: 1.5 for standard, 1.0, 2.5 and 4.0 for others.

(7) Tag number (if any).

(8) Ambient temperature

(9) Accessories: including magnetic filter, companion flange, gasket, straight pipe section, isolation barrier, surge protector, etc

**2. Suggestions for meter selection:**

(1) It is mostly used for meters for process control. The best accuracy class is 1.0 and the general class is1.5. The turndown ratio is 10:1.

(2) In hazardous occasions, intrinsically safe explosion-proof or flameproof type can be selected.

(3) The most suitable installation mode is bottom-in and top-out vertical installation.

(4) When measuring low-temperature (below -20°C) medium, it is better to use vacuum jacket type.

(5) It is not suitable for measuring the flow of medium with large density change.

(6) It is not suitable for measuring the flow of pulsating medium (such as metering pump outlet).

(7) Temperature and pressure compensation can be selected for gas measurement. The gas metal tube rotameter is calibrated at a specific pressure and temperature. If the gas is directly discharged to the atmosphere at the outlet of the meter, it will cause air pressure drop at the float and data distortion. If this is the case, a valve shall be installed at the meter outlet.

(8) In order to measure the flow rate of medium containing a large number of ferromagnetic particles, it is necessary to install a magnetic filter in front of the meter.

(9) Select PTFE lined or PFA meter, and only vertically installed bottom-in and top-out type can be selected.

**3. Requirements for use of explosion-proof meters:**

(1) The product housing shall be reliably grounded during installation and use to prevent the ignition hazard caused by impact or friction.

(2) Ambient temperature for explosion-proof products: -40°C~+60°C.

(3) There is no harmful gas corrosive to the cast aluminum shell at the installation site.

(4) Maintenance can only be carried out when it is confirmed that there is no combustible gas at the installation field.

(5) The user shall not replace the parts and components of the product without authorization, but shall solve the faults during operation together with the product manufacturer to prevent damage.

(6) During on-site maintenance, non-explosion-proof inspection meters and lighting fixtures are not allowed to be used. All tools shall be non-sparking and explosion proof. When installing, using and maintaining meters, the relevant provisions of GB3836.13-2013 Explosive Atmospheres - Part 13: Equipment Repair, Overhaul, and Reclamation, GB/T3836.15-2017 Explosive Atmospheres - Part 15: Electrical Installations Design, Selection and Erection, GB/T3836.16-2017 Explosive Atmospheres - Part 16: Electrical Installations Inspection and Maintenance and GB 50257-2014 Code for Construction and Acceptance of Electrical Installations in Explosive and Fire Hazardous Environments must be strictly observed.





## XIII. Common Gas Density Meter

| Gas Name | Element Symbol | Density (20°C, 101.325kPa) kg/m$^3$ |
|---|---|---|
| Hydrogen | $H_2$ | 0.084 |
| Helium | He | 0.166 |
| Methane | $CH_4$ | 0.668 |
| Ammonia | $NH_3$ | 0.719 |
| Carbon monoxide | CO | 1.165 |
| Nitrogen | $N_2$ | 1.165 |
| Ethylene | $C_2H_4$ | 1.174 |
| Air | — | 1.205 |
| Ethane | $C_2H_6$ | 1.263 |
| Oxygen | $O_2$ | 1.331 |
| Hydrogen sulfide | $H_2S$ | 1.434 |
| Hydrogen chloride | HCl | 1.527 |
| Argon | Ar | 1.662 |
| Propane | $C_3H_8$ | 1.867 |
| Carbon dioxide | $CO_2$ | 1.824 |
| Methyl chloride | $CH_3Cl$ | 2.147 |
| Butane | $C_4H_{10}$ | 2.416 |
| Sulfur dioxide | $SO_2$ | 2.726 |
| Chlorine | $CL_2$ | 3 |

## XIV. Range of Flow under Standard Conditions

Comparison Table of Vertical Installation (bottom-in and top-out) Flow Range and Pressure Loss Value

| Caliber (mm) | Flow section | Water flow (L/h) | Airf low ($m^3$/h) | Maximum pressure loss value (kPa) |
|---|---|---|---|---|
| DN15 (DN20) (DN25) | S15.0 | 10 | / | 6.23 |
| | S 15.1 | 16 | 0.5 | 6.15 |
| | S 15.2 | 25 | 0.7 | 6.25 |
| | S 15.3 | 40 | 1.2 | 6.14 |
| | S 15.4 | 63 | 1.8 | 5.97 |
| | S 15.5 | 100 | 3 | 7.32 |
| | S 15.6 | 160 | 4.8 | 6.34 |
| | S 15.7 | 250 | 7 | 9.31 |
| | S 15.8 | 400 | 12 | 7.84 |
| | S 15.9 | 630 | 18 | 11 |
| | S 15.10 | 1000 | 30 | 10.49 |
| DN25 (DN32) (DN40) (DN50) | S 25.0 | 300 | 14 | 4.75 |
| | S 25.1 | 630 | 21 | 4.65 |
| | S 25.2 | 1000 | 30 | 7.12 |
| | S 25.3 | 1600 | 48 | 5.63 |
| | S 25.4 | 2500 | 70 | 3.17 |
| | S 25.5 | 3200 | 100 | 4.1 |
| | S 25.6 | 4000 | 130 | 7.84 |
| | S 25.7 | 5000 | 150 | 4.38 |
| | S 25.8 | 6300 | 180 | 10.04 |
| | S 25.9 | 8000 | / | 11.17 |
| DN50 (DN65) (DN80) | S 50.0 | 4000 | 130 | 2.6 |
| | S 50.1 | 6300 | 180 | 5.5 |
| | S 50.2 | 10000 | 300 | 4.25 |
| | S 50.3 | 16000 | 500 | 7.5 |
| | S 50.4 | 20000 | 600 | 10 |
| | S 50.5 | 25000 | 700 | 13.3 |
| DN80 | S 80.0 | 10000 | 300 | 4.03 |
| | S 80.1 | 16000 | 500 | 4.94 |
| | S 80.2 | 25000 | 700 | 6.87 |
| | S 80.3 | 40000 | 1200 | 8.2 |
| | S 80.4 | 63000 | / | 13.17 |
| DN100 | S 100.0 | 40000 | 1200 | 6.5 |
| | S 100.1 | 63000 | / | 6.5 |
| | S 100.2 | 80000 | / | 20 |
| | S 100.3 | 100000 | 1800 | 22 |
| DN150 | S 150.0 | 80000 | / | 22 |
| | S 150.1 | 100000 | / | 19.5 |
| | S 150.2 | 150000 | / | 60 |
| DN200 | S 200.0 | 150000 | / | 50 |
| | S 200.1 | 200000 | / | 50 |





Comparison Table of Flow Range and Pressure Loss Value for Vertical Installation (top-in and bottom-out)

| Caliber (mm) | Flow section | Water flow (L/h) | Airflow ($m^3$/h) | Maximum pressure loss value (kPa) |
|---|---|---|---|---|
| DN15 | S 15.0 | 63 | 1.8 | 17.8 |
| | S 15.1 | 100 | 3 | 18 |
| | S 15.2 | 160 | 4.8 | 20 |
| | S 15.3 | 250 | 7 | 22 |
| | S 15.4 | 400 | 12 | 25 |
| | S 15.5 | 630 | 18 | 26 |
| | S 15.6 | 1000 | 30 | 28 |
| | S 15.7 | 2500 | 70 | 28 |
| DN25 | S 25.0 | 1000 | 30 | 9.7 |
| | S 25.1 | 1600 | 48 | 9.7 |
| | S 25.2 | 2500 | 70 | 10.5 |
| | S 25.3 | 3200 | 100 | 10.5 |
| | S 25.4 | 4000 | 130 | 11.5 |
| | S 25.5 | 5000 | 150 | 11.5 |
| | S 25.6 | 6300 | 180 | 17.2 |
| | S 25.7 | 10000 | / | 19.5 |
| DN50 | S50.0 | 6300 | 180 | 22.4 |
| | S50.1 | 10000 | 300 | 22.4 |
| | S50.2 | 16000 | 500 | 22.4 |
| | S50.3 | 20000 | 600 | 26 |
| | S50.4 | 25000 | 750 | 40 |
| | S 50.5 | 35000 | / | 40 |
| DN80 | S 80.0 | 16000 | 500 | 14.5 |
| | S 80.1 | 25000 | 750 | 15 |
| | S 80.2 | 40000 | 1200 | 21 |
| | S 80.3 | 63000 | / | 29 |
| DN100 | S 100.0 | 63000 | 1800 | 27 |
| | S 100.1 | 80000 | / | 31.5 |
| | S 100.2 | 100000 | / | 35 |

Comparison Table of Flow Range and Pressure Loss Value for Vertical Installation (bottom-in, top-out Lining PTFE)

| Caliber (mm) | Flow section | Water flow (L/h) | Airflow ($m^3$/h) | Maximum pressure loss value (kPa) |
|---|---|---|---|---|
| DN15 (DN20) (DN25) | S15.0 | 16 | / | 6.8 |
| | S 15.1 | 20 | / | 6.8 |
| | S 15.2 | 25 | / | 6.8 |
| | S 15.3 | 40 | / | 7 |
| | S 15.4 | 60 | 1.4 | 7.2 |
| | S 15.5 | 100 | 2.4 | 7.8 |
| | S 15.6 | 160 | 3.8 | 9 |
| | S 15.7 | 250 | 6 | 12 |
| | S 15.8 | 400 | 9.6 | 13 |
| | S 15.9 | / | / | / |
| | S 15.10 | / | / | / |
| DN25 (DN32) (DN40) (DN50) | S 25.0 | 400 | 9.6 | 3.8 |
| | S 25.1 | 630 | 15 | 4.2 |
| | S 25.2 | 1000 | 24 | 5.7 |
| | S 25.3 | 1600 | 38 | 6 |
| | S 25.4 | 2000 | 47.5 | 7.8 |
| | S 25.5 | 2500 | 60 | 8.8 |
| | S 25.6 | 3600 | 85 | 10.3 |
| | S 25.7 | / | / | / |
| | S 25.8 | / | / | / |
| | S 25.9 | / | / | / |
| DN50 (DN65) (DN80) | S 50.0 | 4000 | 95 | 4.7 |
| | S 50.1 | 6300 | 150 | 6 |
| | S 50.2 | 10000 | 240 | 6 |
| | S 50.3 | 14000 | 330 | 6.5 |
| | S 50.4 | / | / | / |
| | S 50.5 | / | / | / |
| DN80 | S 80.0 | 16000 | / | 7 |
| | S 80.1 | 25000 | 590 | 13 |
| | S 80.2 | / | / | / |
| | S 80.3 | / | / | / |
| | S 80.4 | / | / | / |
| DN100 | S 100.0 | 25000 | 590 | 6.5 |
| | S 100.1 | 40000 | 950 | 13 |
| | S 100.2 | / | / | / |
| | S 100.3 | / | / | / |
| DN150 | S 150.0 | / | / | / |
| | S 150.1 | / | / | / |
| | S 150.2 | / | / | / |
| DN200 | S 200.0 | / | / | / |
| | S 200.1 | / | / | / |





Comparison Table of Flow Range and Pressure Loss Value for Horizontal Installation (Left-in and Right-out/Right-in and Left-out)

| Caliber (mm) | Flow section | Water flow (L/h) | Airflow ($m^3$/h) | Maximum pressure loss value (kPa) |
|---|---|---|---|---|
| DN15 | S 15.0 | 63 | 1.8 | 23 |
| | S 15.1 | 100 | 3 | 23.2 |
| | S 15.2 | 160 | 4.8 | 23.8 |
| | S 15.3 | 250 | 7 | 25 |
| | S 15.4 | 400 | 12 | 28 |
| | S 15.5 | 630 | 18 | 29 |
| | S 15.6 | 1000 | 30 | 32 |
| | S 15.7 | / | / | / |
| | S 15.8 | / | / | / |
| | S 15.9 | / | / | / |
| DN25 | S 25.0 | 630 | 18 | 19.8 |
| | S 25.1 | 1000 | 30 | 20.2 |
| | S 25.2 | 1600 | 48 | 21.7 |
| | S 25.3 | 2500 | 70 | 22 |
| | S 25.4 | 3200 | 100 | 22.6 |
| | S 25.5 | 4000 | 130 | 23.8 |
| | S 25.6 | 5000 | 150 | 24.8 |
| | S 25.7 | 6300 | 180 | 26.3 |
| DN50 | S 50.0 | 4000 | 130 | 20.2 |
| | S 50.1 | 6300 | 180 | 20.7 |
| | S 50.2 | 10000 | 300 | 22 |
| | S 50.3 | 16000 | 500 | 22 |
| DN80 | S 80.0 | 16000 | 500 | 22 |
| | S 80.1 | 25000 | 750 | 22.8 |
| | S 80.2 | 40000 | 1200 | 23 |
| DN100 | S 100.0 | 40000 | 1200 | 22.5 |
| | S 100.1 | 63000 | 1800 | 22.5 |
| | S 100.2 | / | / | / |
| DN150 | S 150.0 | 80000 | / | 50 |
| | S 150.1 | 100000 | / | 50 |
| | S 150.2 | / | / | / |
| DN200 | S200.0 | 140000 | / | 82 |

| Comparison Table of Flow Range and Pressure Loss Value of Horizontal Spring (Left-in and Right-out/Right-in and Left-out) | | | | |
|---|---|---|---|---|
| Caliber (mm) | Flow section | Water flow (L/h) | Airflow ($m^3$/h) | Maximum pressure loss value (kPa) |
| DN15 | S 15.0 | 63 | 1.8 | 19.5 |
| | S 15.1 | 100 | 3 | 20.4 |
| | S 15.2 | 160 | 4.8 | 22.5 |
| | S 15.3 | 250 | 7 | 25 |
| | S 15.4 | 400 | 12 | 25 |
| | S 15.5 | 630 | 18 | 25.5 |
| | S 15.6 | 1000 | 30 | 25.5 |
| | S 15.7 | 2500 | 70 | 25.5 |
| DN25 | S 25.0 | 1000 | 30 | 11 |
| | S 25.1 | 1600 | 48 | 11 |
| | S 25.2 | 2500 | 70 | 12 |
| | S 25.3 | 3200 | 100 | 12 |
| | S 25.4 | 4000 | 130 | 14.5 |
| | S 25.5 | 5000 | 150 | 14.5 |
| | S 25.6 | 6300 | 180 | 21.7 |
| | S 25.7 | 10000 | 300 | 24 |
| DN50 | S50.0 | 6300 | 180 | 24 |
| | S50.1 | 10000 | 300 | 24 |
| | S50.2 | 16000 | 500 | 24 |
| | S50.3 | 20000 | 600 | 30 |
| | S50.4 | 25000 | 750 | 42 |
| | S 50.5 | 35000 | 1000 | 44 |
| DN80 | S 80.0 | 16000 | 500 | 16 |
| | S 80.1 | 25000 | 750 | 18 |
| | S 80.2 | 40000 | 1200 | 23 |
| | S 80.3 | 63000 | 1800 | 32 |
| DN100 | S 100.0 | 63000 | 1800 | 24 |
| | S 100.1 | 80000 | / | 25 |
| | S 100.2 | 100000 | / | 26 |





| Comparison Table of Flow Range and Pressure Loss Value for Horizontal Installation (Side-in and Side-out) | | | | |
|---|---|---|---|---|
| Caliber (mm) | Flow section | Water flow (L/h) | Airflow ($m^3$/h) | Maximum pressure loss value (kPa) |
| DN15 | S 15.0 | / | / | / |
| | S 15.1 | 25 | 0.7 | 16.8 |
| | S 15.2 | 40 | 1.2 | 16.8 |
| | S 15.3 | 63 | 1.8 | 17 |
| | S 15.4 | 100 | 3 | 17.2 |
| | S 15.5 | 160 | 4.8 | 17.8 |
| | S 15.6 | 250 | 7 | 19 |
| | S 15.7 | 400 | 12 | 22 |
| | S 15.8 | 630 | 18 | 23 |
| | S 15.9 | 1000 | 30 | 26 |
| DN25 | S 25.0 | 630 | 18 | 13.8 |
| | S 25.1 | 1000 | 30 | 14.2 |
| | S 25.2 | 1600 | 48 | 15.7 |
| | S 25.3 | 2500 | 70 | 16 |
| | S 25.4 | 3200 | 100 | 16.6 |
| | S 25.5 | 4000 | 130 | 17.8 |
| | S 25.6 | 5000 | 150 | 18.8 |
| | S 25.7 | 6300 | 180 | 20.3 |
| DN50 | S 50.0 | 4000 | 130 | 11.2 |
| | S 50.1 | 6300 | 180 | 11.7 |
| | S 50.2 | 10000 | 300 | 16 |
| | S 50.3 | 16000 | 500 | 16 |
| | S 50.4 | 20000 | 600 | 16.5 |
| DN80 | S 80.0 | 16000 | 500 | 16.8 |
| | S 80.1 | 25000 | 750 | 17 |
| | S 80.2 | 40000 | 1200 | 23 |
| DN100 | S 100.0 | 40000 | 1200 | 16.5 |
| | S 100.1 | 63000 | 1800 | 16.5 |
| | S 100.2 | 80000 | / | 20 |
| DN150 | S 150.0 | 80000 | / | 50 |
| | S 150.1 | 100000 | / | 50 |
| | S 150.2 | / | / | / |
| DN200 | S200.0 | 150000 | / | 80 |

Comparison Table of Flow Range and Pressure Loss Value for Horizontal Installation (Bottom-in and Side-out)

| Caliber (mm) | Flow section | Water flow (L/h) | Airflow ($m^3$/h) | Maximum pressure loss value (kPa) |
|---|---|---|---|---|
| DN15 | S 15.0 | / | / | / |
| | S 15.1 | 25 | 0.7 | 10.8 |
| | S 15.2 | 40 | 1.2 | 10.8 |
| | S 15.3 | 63 | 1.8 | 11 |
| | S 15.4 | 100 | 3 | 11.2 |
| | S 15.5 | 160 | 4.8 | 11.8 |
| | S 15.6 | 250 | 7 | 13 |
| | S 15.7 | 400 | 12 | 16 |
| | S 15.8 | 630 | 18 | 17 |
| | S 15.9 | 1000 | 30 | 20 |
| DN25 | S 25.0 | 630 | 18 | 7.8 |
| | S 25.1 | 1000 | 30 | 8.2 |
| | S 25.2 | 1600 | 48 | 9.7 |
| | S 25.3 | 2500 | 70 | 10 |
| | S 25.4 | 3200 | 100 | 10.6 |
| | S 25.5 | 4000 | 130 | 11.8 |
| | S 25.6 | 5000 | 150 | 12.8 |
| | S 25.7 | 6300 | 180 | 14.3 |
| DN50 | S 50.0 | 4000 | 130 | 8.2 |
| | S 50.1 | 6300 | 180 | 8.4 |
| | S 50.2 | 10000 | 300 | 10 |
| | S 50.3 | 16000 | 500 | 10 |
| | S 50.4 | 20000 | 600 | 10.5 |
| DN80 | S 80.0 | 16000 | 500 | 10.8 |
| | S 80.1 | 25000 | 750 | 11 |
| | S 80.2 | 40000 | 1200 | 17 |
| DN100 | S 100.0 | 40000 | 1200 | 10.5 |
| | S 100.1 | 63000 | 1800 | 10.5 |
| | S 100.2 | 80000 | / | 24 |
| DN150 | S 150.0 | 80000 | / | 50 |
| | S 150.1 | 100000 | / | 52 |
| | S 150.2 | 110000 | / | 55 |
| DN200 | S200.0 | 180000 | / | 80 |





Comparison Table of Flow Range and Pressure Loss Values for Clamp/Threaded Connection

| Caliber (mm) | Flow section | Water flow (L/h) | Airflow ($m^3$/h) | Maximum pressure loss value (kPa) |
|---|---|---|---|---|
| DN15 | S15.0 | 10 | / | 6.23 |
| | S15.1 | 16 | 0.5 | 6.15 |
| | S15.2 | 25 | 0.7 | 6.25 |
| | S15.3 | 40 | 1.2 | 6.14 |
| | S15.4 | 63 | 1.8 | 5.97 |
| | S15.5 | 100 | 3 | 7.32 |
| | S15.6 | 160 | 4.8 | 6.34 |
| | S15.7 | 250 | 7 | 9.31 |
| | S15.8 | 400 | 12 | 7.84 |
| | S15.9 | 630 | 18 | 11 |
| | S15.10 | 1000 | 30 | 10.49 |
| DN20 | S20.0 | 1200 | 36 | 5.7 |
| | S20.1 | 1600 | 48 | 5.63 |
| | S20.2 | 2500 | 75 | 3.17 |
| | S20.3 | 3000 | 90 | 6.5 |
| DN25 | S25.0 | 3200 | 100 | 6.47 |
| | S25.1 | 4000 | 120 | 7.84 |
| | S25.2 | 5000 | 150 | 4.38 |
| | S25.3 | 6300 | 180 | 10.04 |
| | S25.4 | 8000 | / | 11.17 |
| DN32 | S32.0 | 3200 | 100 | 6.47 |
| | S32.1 | 4000 | 120 | 7.84 |
| | S32.2 | 5000 | 150 | 8.8 |
| | S32.3 | 6300 | 180 | 10.04 |
| | S32.4 | 8000 | / | 11.17 |
| DN40 | S40.0 | 8000 | 240 | 11.17 |
| | S40.1 | 10000 | 300 | 4.25 |
| | S40.2 | 13000 | / | 10.5 |
| DN50 | S50.0 | 5000 | 150 | 4.7 |
| | S50.1 | 6300 | 180 | 5.5 |
| | S50.2 | 10000 | 300 | 4.25 |
| | S50.3 | 16000 | 480 | 7.5 |
| | S50.4 | 25000 | / | 13.3 |
| DN65 | S65.0 | 25000 | 450 | 13.3 |
| | S65.1 | 30000 | 900 | 7.2 |
| | S65.2 | 40000 | 1200 | 8.2 |
| | S65.3 | 45000 | / | 9 |
| DN80 | S80.0 | 30000 | 900 | 7.2 |
| | S80.1 | 40000 | 1200 | 8.2 |
| | S80.2 | 50000 | / | 13.7 |
| DN100 | S100.0 | 50000 | 1500 | 6.5 |
| | S100.1 | 80000 | / | 15 |
| | S100.2 | 100000 | / | 20 |

## XV. Main Type Spectrum of RFC Metal Tube Rotameter

Sensor | Converter

RFC XXX X X X X X X X X X X X X X X X X X

Nominal diameter (DN)

Diameter: DN15-DN200
Three digits: The first and second digits of DN and the number of zeros following the first two digits (unit: mm).

**Nominal pressure**
1: 1.6MPa 2:4.0MPa 4:2.5MPa 5:1.0MPa
D:ANSI150 E:ANSI300 F:ANSI600 G:ANSI900
H:ANSI1500 K:6.3MPa L:10.0MPa M:16.0MPa
S: Special

**Flange standard**
1:HG/T20592 2:HG/T20615 3:ASME B16.5
4:GB/T9119 5:EN1092–1 5:DIN
S:Special

**Wetted material (expressed as: measuring tube - float (lining))**
1:304-304 2:316L-316L
3:304-316L 4:304-PTFE(Bottom-in and top-out type only)
5:316L-PTFE(Bottom-in and top-out type only)
7:304-PFA(Bottom-in and top-out type only)
8:316L-PFA(Bottom-in and top-out type only)
S: Special materials

**Measuring medium**
1: Liquid 2: Gas (standard damper) 3: Steam

**Operating environment**
1: Standard type: ambient temperature (-40°C ~ 60°C) medium temperature (-20°C ~ 100°C)
2: High temperature type: ambient temperature (-40°C ~ 60°C) medium temperature (100°C ~ 450°C)
7: Low temperature type: ambient temperature (-40°C ~ 60°C) medium temperature (-80°C ~ -20°C)

**Connection mode**
0: Flange connection 1: Threaded connection 2: Jacket connection
3: Clamp connection S: Special

**Accuracy class**
D: Level 1.5 E: Level 2.5 F: 4.0 class S: Special amendment

**Structural type**
V: Vertical installation (bottom-in and top-out) W: Vertical installation (top-in and bottom-out)
R: Horizontal installation (right-in and left-out) H: Horizontal installation (left-in and right-out)
C: Side-side installation (side-in and side-out) D: Bottom side installation (bottom-in and side-out)
E: Horizontal spring (right-in and left-out) F: Horizontal spring (left-in and right-out)

**Electrical interface**
1:M20×1.5 3:NPT1/2

**Indicator housing**
RH: Aluminum alloy round shell RS: 304 round shell RL: 316 round shell

**Power supply**
0: No power supply 2:24V DC 3:220V AC 4: 3.6 V lithium battery (non-explosion-proof only)

**Display**
1: Local pointer 2: LCD (with power supply only) 3: Local pointer + LCD (with power supply only)

**Output signal**
0: N/A 1:4~20mA 2: 4~20mA+HART (without alarm) 3:4~20mA+RS485 4:Profibus PA 5:FF 6: 4~20mA+pulse

**Explosion-proof mark**
0: N/A 5: Flameproof 6: Dust explosion-proof 7: Intrinsically safe (only flameproof for 220V) 8: Dust intrinsically safe

**Alarm selection**
1. N/A 2: Single-point alarm of reed switch 3: Upper and lower limit alarms of reed switch 4: NAMUR switch (pointer type only)
5: NAMUR switch + single-point alarm 6: NAMUR switch + upper and lower limit alarms 7: Relay warning

**Language**
1: English 2: Chinese 3: Russian

**IP rating**
1：IP65 2:IP66 3:IP67

Additional Options:/XX _____ (See additional options list)
In order to ensure the accuracy class of the meter, users need to provide accurate field operating pressure, operating temperature, medium density, medium viscosity and flow range.





## XVI.Minor Type Spectrum of RFC Metal Tube Rotameter

### Identification Table of Additional Options of Metal Tube Rotameter

| Item | Manifestations | | | | Code | Remarks |
|---|---|---|---|---|---|---|
| Companion flange | Material | Flange type | Sealing face | Series | Example: F0110 | Default setting<br>Material: 304<br>Flange type: PL (Plate-type flat welding flange)<br>Sealing face: RF (Raised face)<br>Series: system II (system II can be changed to system I) |
| | 0: 304 steel | 0: PL (Plate-type flat welding) | 0: RF | 0: Series I | | |
| | 1: 316L steel | 1: SO (Slip-on) | 1: FF (Full face) | 1: U series | | |
| | 2: Carbon steel | 2: WN (Welding neck) | 2: MFM (Male-female face) | | | |
| | S: Special | S: Special | 3: TG (Tongue and groove face) | | | |
| | | | 4: RJ (Ring joint face) | | | |
| Magnetic filter | 0: 304 magnetic filter | | | | M0 | |
| | 1: 316L magnetic filter | | | | M1 | |
| | 2: 304-PTFE magnetic filter | | | | M2 | |
| | 3: 316L-PTFE magnetic filter | | | | M3 | |
| Jacket | 0: vacuum jacket (threaded connection) | | | | J0 | Vacuum jacket (half-clamp) standard for low temperature model |
| | 1: Vacuum jacket (flanged connection) | | | | J1 | |
| | 2: Insulation jacket (threaded connection-half-clamp) | | | | J2 | The high-temperature type must be identified with half clamp or full clamp according to the customer's requirements (full clamp means that a matching flange with an optional caliber is added on the basis of the half clamp, and the matching flange needs to be consistent with the pressure and material corresponding to the selected caliber). The threaded connection structure is equipped with thread type, while the flanged connection structure is equipped with flange type. |
| | 3: Insulation jacket (flanged connection-half-clamp) | | | | J3 | |
| | 4: Insulation jacket (threaded connection-full clamp) | | | | J4 | |
| | 5: Insulation jacket (flanged connection-full clamp) | | | | J5 | |
| Needle valve | DN15 needle valve | | | | N0 | For this configuration, it must be determined whether a needle valve is integral or split. If an integral needle valve is required, it must also be specified whether it is for the outlet or inlet. The threaded connection type is the standard configuration of the needle valve, while the flange connection type needs to be specially customized. The price for the customized will be verified separately based on actual requirements. |
| | DN25 needle valve | | | | N1 | |
| Constant flow valve | DN15 constant flow valve | | | | C0 | |
| | DN25 constant flow valve | | | | C1 | |
| Explosion-proof cable gland | 0: 304 explosion-proof cable gland M20*1.5 | | | | E0 | |
| | 1: 304 explosion-proof cable gland NPT1/2 | | | | E1 | |
| | 2: 316L explosion-proof cable gland M20*1.5 | | | | E2 | |
| | 3: 316L explosion-proof cable gland NPT1/2 | | | | E3 | |
| Compensation mode | 0: Temperature compensation | | | | T0 | |
| | 1: Pressure compensation | | | | T1 | |
| | 2: Temperature and pressure compensation: | | | | T2 | |
| Export packing | 0: Plywood for export packing | | | | B0 | |
| | 1: Fumigated wooden box for export packing | | | | B1 | |
| | 2: Carton for export packing | | | | B2 | |
| | 3: Unmarked export packing | | | | B3 | |

| Item | Manifestations | Code | Remarks |
|---|---|---|---|
| Certification | 0: Verification certificate (in the name of customer) | A0 | |
| | 1: Verification certificate (in the name of Chuanyi) | A1 | |
| | 2: Calibration certificate (in the name of customer) | A2 | |
| | 3: Calibration certificate (in the name of Chuanyi) | A3 | |
| | 4: TS certification | A4 | |
| | 5: PAC certification | A5 | |
| | 6: EAC certification | A6 | CU-TR012 Explosion-proof<br>CU-TR020 Electromagnetic compatibility |
| Surface treatment | 0: Copper-zinc content of wetted materials ≤0.5% | S0 | |
| | 1: Copper-zinc content of wetted materials ≤1% | S1 | |
| | 2: C3 anti-salt spray paint | S2 | |
| | 3: C3 anti-salt spray paint + varnish | S3 | |
| | 4: C5 anti-salt spray paint | S4 | |
| | 5: No oil degreasing | S5 | |
| | 6: EU EN 102043.1 material | S6 | |
| Quality assurance level | 0:QA1 | Q1 | |
| | 1:QA2 | Q2 | |
| | 2:QA3 | Q3 | |
| | 3:QAN/QNC | Q4 | |
| Handover data | 0: Calibration certificates, qualification certificates and nameplates in Chinese and English, with instructions in Chinese as standard configuration | Not selected for standard configuration | The nameplate is in Chinese and English by default, and any Russian nameplate needs to be specially customized |
| | 1: Calibration certificates, qualification certificates and nameplates in Russian, with instructions in Russian as standard configuration | H1 | |
| | 2: Calibration certificates, qualification certificates and nameplates in English, with instructions in English as standard configuration | H2 | |
| | 3. Material report | H3 | ncluding flange, measuring tube, taper tube, float middle section and converter housing |
| | 4: Pressure test report | H4 | Chinese and English by default |
| | 5: Technical passport | H5 | |
| | 6: PVC first inspection certificate | H6 | |
| Accessories | 0: Surge protector | P0 | |
| | 1: Buffer spring | P1 | Buffer spring shall be provided when damper is required for liquid medium |
| | 2: Isolated safety barrier | P2 | |
| | 3: Safety glass | P3 | |
| | 4: Chlorine filter screen | P4 | Standard configuration is a must for chlorine medium |
| | 5: Flange protective cover | P5 | |
| | 6: 316L tag No. plate | P6 | Chinese and English by default |





# Product Qualification




RFC series type rating DN15~DN100




RFC series type rating DN15~DN200




PAC certification




Intrinsically safe explosion -proof requirement:




Flameproof




Dust explosion-proof



Russia explosion-proof CUTR-012



Russia electromagnetic compatibility CUTR-020




FF bus




SIL certification

# Measurement Capability




Liquid Flow Calibration Laboratory




Gas Flow Calibration Laboratory



Micro liquid flow calibration device



Micro gas flow calibration device



Conventional liquid calibration device



Conventional gas calibration device





# Manufacturing Capacity




Civil nuclear welding qualification




Felll/FelV welding qualification




Verification qualification of gauger




Production License
of Special Equipment




ISO International
Welding Qualification




ASME Welding Qualification

# Quality Assurance Capability




Physical and Chemical Inspection Qualification




Environmental Management System Certificate




Quality Management System Certificate of Conformity




Occupational Health and Safety Management System Certification




PTII Grade Inspection Qualification for Special Equipment




UTII Grade Inspection Qualification for Special Equipment




RT Grade II Inspection Qualification for Special Equipment





# Annex Consultation Sheet of Metal Tube Rotameter

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Purchaser | | | | | | Contact | | | | | | |
| Address | | | | | | Tel. | | | | | | |
| Model | | | | | | | | | | | | |
| Tag No. | Medium name | Medium density | Operating pressure | Operating temperature | Operating flow range | | | Caliber | Quantity | Output signal | Flange standard | Material requirement |
| | | | | | Min. | Common | Max. | | | | | |
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| | | | | | | | | | | | | |
| Installation mode | Vertical installation (bottom-in and top-out)　Vertical installation (top-in and bottom-out)<br>Horizontal installation (left-in and right-out)　Horizontal installation (right-in and left-out)<br>Side-side installation (side-in and side-out)　Bottom-side installation (bottom-in and side-out)<br>Horizontal spring (left-in and right-out)　Horizontal spring (right-in and left-out) | | | | | | | | | | | |
| Accessories | Companion flange　Magnetic filter　Surge protector　Buffer spring　Isolated barrier<br>Chlorine filter screen　Safety glass　Flange protective cover　316LTag No. plate | | | | | | | | | | | |
| Remarks | | | | | | | | | | | | |