S-ROTA

ROTAMETRO IN METALLO

Operating manual

Contents

Special Note:

1. When installing the instrument, the pipe welding slag must be blown out!

2. When installing the instrument, the measuring tube must be on the same axis as the pipeline, and the inner hole of the gasket should not be smaller than the measuring tube diameter.

3. When installing the anti-corrosion instrument, the tightening torque of the flange fastening bolts should be moderate, so as not to damage the sealing surface. It is also not allowed to weld the connecting flange after the meter has been installed, which may cause the meter be ruined.

4. For the correct and reliable operation of the meter, the magnetic coupling part of the meter head should not have magnetic particles adsorbed on its surface.

5. In order to achieve the best electromagnetic compatibility for the remote transmission type instrument, the shell need be well grounded.

6. When using the instrument with communication function, please try to consider the influence of the surrounding electromagnetic interference on the instrument. Please better use specific cables.

7. When measuring high temperature medium with liquid crystal display, use cooling fin to ensure transmitter/indicator properly isolated.

8. For electrical wiring, please make sure the wire and the terminal are reliably connected.

9. Please properly handle the waterproof problem of the cable joint to prevent rainwater from entering the case.

10. If the measuring medium contains magnetically conductive particles, a magnetic filter should be installed at the entrance of the meter; When it contains non-magnetic particles, a filter screen should be installed.

1. Overview

S-ROTA series intelligent metal tube flow meter is a variable area flow based on float position measuring. Adopt all-metal structure, it has features of small volume, small pressure loss, large range ratio (10~20:1), HART communication function available, and convenient installation/ maintenance etc; It is widely used for flow measurement and process control for small flow, low flow rate, and various harsh media conditions.

Aiming at different user needs and different occasions, there are a variety of measurement modes for users to choose; According to the output mode, there are local indication type, remote transmission type, and control alarm type; Classified according to explosion-proof requirements, it can be divided into ordinary type, intrinsically safe type and flame-proof type.

S-ROTA series metal tube rotameter adopts advanced Honeywell non-contact and non-hysteresis detection of magnetic field angle changes the magnetic sensor, coupled with high-performance MCU, can realize liquid crystal display: instantaneous flow, accumulative flow, loop current, ambient temperature,damping time, and small signal cut-off. It has optional 4～20mA remote transmission output (with HART communication), pulse output, upper and lower limit alarm output functions. It is reliable and quite cost effective; It also has the function of online parameter calibration, and power failure protection.

The design and manufacturing of the **S-ROTA** series intelligent metal tube flow meter also has considered the user's process flow requirements. There are installation methods such as bottom to top, top to bottom, side to side , bottom to side, and horizontal type.

2. Structure and Principle

S-ROTA series intelligent metal tube flowmeter consists of two parts:

Sensor --- measuring tube and float;

Signal transmitter ---- indicator;

There are four types of wetted materials for the sensor: stainless steel, Hastelloy C, titanium, stainless steel lining FEP; According to different process pressure and corrosive requirements of the medium, user can choose different wetted material to meet the needs of anti-corrosion or high pressure. And based on different measurement requirements, users can choose different indicator combinations.

The flow measurement is performed by the transmitter(of the indicator) by coupling magnet to sense the change of the float position, to complete the flow indication and signal output.

When the measured medium flows through the measuring tube from bottom to top, the float is balanced by gravity, buoyancy, and the vertical upward pushing force of the fluid flow rate. The float is relatively stationary at a certain position; this position changes with the annulus area between the float & the tapered tube, and the fluid flow rate. The position of the float corresponds to the flow of the measured medium.

3. Product Features

■ Robust all-metal structure design.

■ Suitable for gas and liquid measurement in various industries.

■ The new case structure design can be used in high temperature environments without adding parts.

■ The specially designed tapered measuring tube has a wider measuring range and better measuring linearity.

■ A variety of process connection methods such as flanges, clamps, and threads are available, which are suitable for most factory application requirements.

■ Materials for measuring part are optional: stainless steel, titanium, Hastelloy, PTFE, FEP and other materials.

■ The specially designed magnetic coupling system can obviously improve the accuracy and stability of measurement.

■Characteristics of remotely transmitted instrument:

1. Large-screen LCD display, which can display instantaneous flow and accumulative flow at the same time and has an instantaneous flow simulation bar.

The upper row displays the instantaneous flow, the lower row displays the cumulative flow

Instantaneous flow rate display range: 0.000-99999

Accumulated flow display range: 0.00-99999999

Current display range: 3.80-21.00mA

Instantaneous flow percentage display: 0-100%

Pointer angle display range: 0.00-90.00°

Ambient temperature display range: -40-- +150℃

Accumulated small signal removal range: 0-10%

Damping time setting range: 0-10 seconds

A variety of instantaneous and accumulative flow units are optional. After the unit is switched, the range is automatically converted.

2. The upper row can be switched to display: instantaneous flow, loop current, instantaneous flow percentage, cumulative small signal removal, damping time, current loop

Information such as ambient temperature, pointer rotation angle, etc., and can display commonly used symbols and engineering units. At this time, it does not affect the lower discharge cumulative amount and instantaneous flow.

The display of the quantity analog bar.

3. The flow range of the instantaneous flow rate displayed on the LCD can be corrected on-line on-site according to the different measurement media on site.

4. The power consumption of the double-row liquid crystal display is micro-ampere level, which meets the requirements of intrinsically safe explosion-proof.

5. Accuracy: <±0.5%, temperature drift: <±0.1%/10°C.

6. Complete power-down protection function. When power-off, the current cumulative flow can be saved (the cumulative sampling period is 0.3S), and the advanced six

The level of data backup mechanism makes the possibility of data loss minimal.

7. The liquid crystal display can be displayed with backlight, and the three-wire system is used for power supply.

8. The transmitter can output: two-wire system, 4-20mA signal, and has nothing to do with whether it has LCD display function.

9. Support battery power supply function, use different types of rechargeable batteries, according to different applications, one charge can work normally for 3-12 months.

10. No need to open the cover, use a magnetic pen to operate, but also retain the ordinary keys. (Customized according to customer requirements)

11. It can communicate with host computer software or handheld computer through HART protocol. The host computer uses HART modem to connect to the instrument, which can

Dynamic monitoring of flow, accumulation, loop current, instantaneous percentage, etc. (only for two-wire system 4-20mA with HART communication function

Meter).

12. Through the HART protocol, you can use the handheld or host computer software to perform partial or full configuration operations on the flowmeter (only for two Wired 4-20mA instrument with HART communication function).

13. All parameters without HART function and common parameters with HART function can be set through the four buttons on the flow meter.

4. Technical Parameters

Measuring range	water(20℃)	16～150000 l/h
	gas（0.1013MPa 20℃）	0.5～4000 m^3/h
Turn down ration		10:1（Special type 20：1）
Accuracy level		2.5（Special type 1.5% or 1.0%）
Working pressure		DN15～DN50 PN16MPa
		DN80～DN150 PN10MPa （Special type 16MPa）
		Jacket pressure level：1.6MPa
Medium temperature		Standard: -20℃～+200℃
		High temperature type 300℃
		FEP liner type ≤90℃
Ambient temperature		-20℃～+100℃(remote type without LCD display≤85℃)
		(remote type with LCD display≤70℃)
Medium viscosity		DN15： ≤5mPa.s
		≤30mPa.s
		DN25： ≤250mPa.s
		DN50～DN150：≤300mPa.s
LCD display		Instantaneous flow numerical range:0.000～99999
		Total flow numerical range:0.00～99999999
Signal output		Standard signal: Two-wire 4~20mA(HART optional)
		Standard signal :Three-wire 0~10mA

Alarm signal: 1. Two relay outputs(Limits125VAC/0.25A)

2. One or two proximity switches(Switches according to client needs)

Pulse output:0~1KHz Isolated output (Output Level Vpp>4.5V)

Power supply: 1. Standard: 24VDC±20% 2. Customized: 220VAC(85~265VAC)

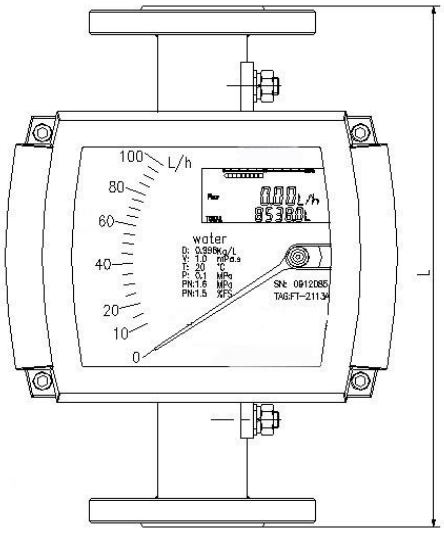
3.Battery powered: 3.7@4.4-5.2AH Lithium Battery ,each group can be used for 3~12 months. Alternate groups.

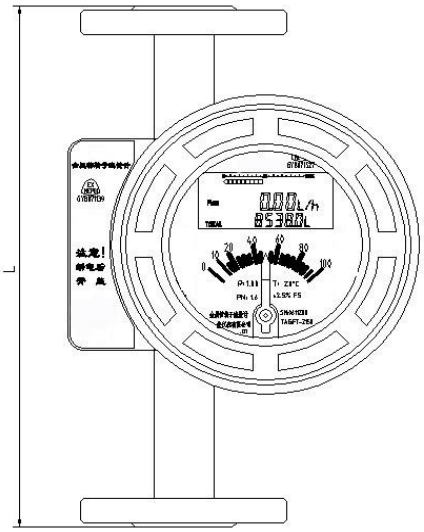
Connection:	Flange: DIN standard, Ansi standard or JIS standard etc
	Sanitary tri-clamp
	Thread; Or others
Electrical Interface	M16×1.5、PG11、1/2”NPT or according to customer’s need
Height	Standard: 250mm (other installation please see related form)
Protection grade	IP65/IP67

Certificazione ATEX in corso di ottenimento

5. Different Type Selection and Dimensions

Standard Dimensions and weight

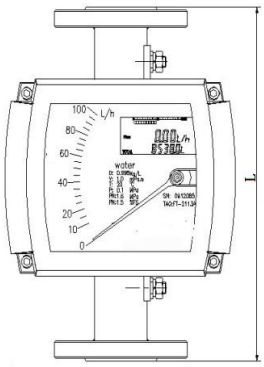


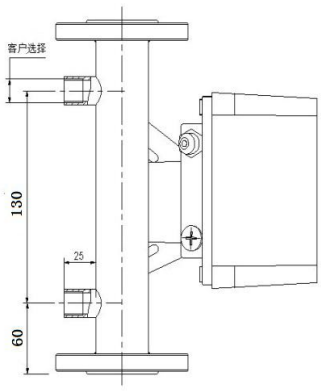


Intrinsically safe type　　Explosion-proof type

Caliber	DN15	DN25	DN50	DN80	DN100	DN150
L (mm)	250	250	250	250	250	250
Weight (kg)	5.0	6.5	10	15.5	17	35

Jacketed Dimensions and weight （Square Intrinsically safe type；Circular：Ex-proof type）





Caliber	L (mm)	Weight (kg)
DN15	250	7.5
DN25	250	10
DN50	250	13
DN80	250	19
DN100	250	21
DN150	250	38

（Insulation Jacket type）

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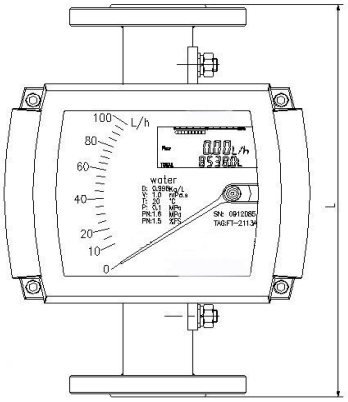
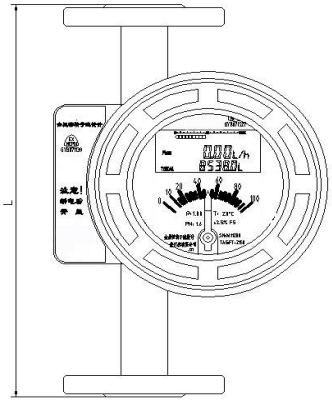
FEP Liner type Dimensions and weight



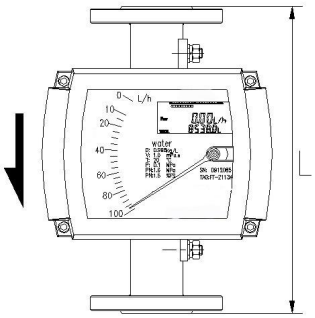
Intrinsically safe type



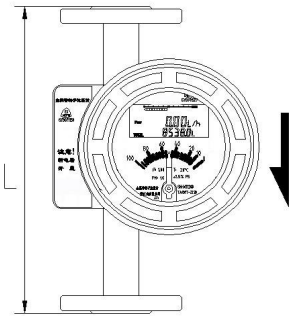
Explosion-proof type

Caliber	L (mm)	weight(kg)
DN15	250	5.0
DN25	250	6.5
DN50	250	10
DN80	250	15.5
DN100	250	16.5
DN150	250	32

Vertical outlet type Dimensions and weight



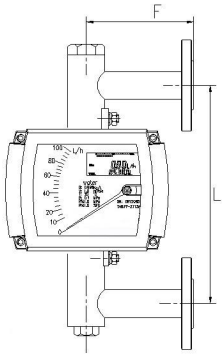
Intrinsically safe type

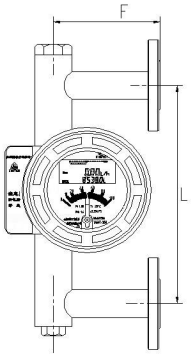


Explosion-proof type

Caliber	L (mm)	Weight (kg)
DN15	250	5
DN25	250	6.5
DN50	250	10
DN80	250	15.5
DN100	250	17
DN150	250	35

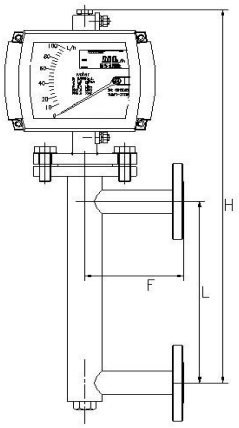
Side aisles outlet type：Dimensions ,weight and pressure loss

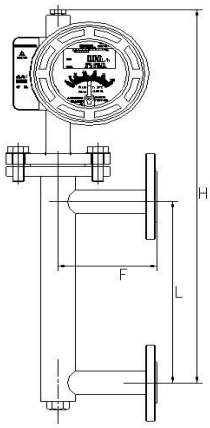




Caliber	DN15	DN25
F（mm）	120	120
L（mm）	250	250
Weight(kg)	6	7.2
Pressure loss（kpa）	21	30

（ DN15～DN25 ）

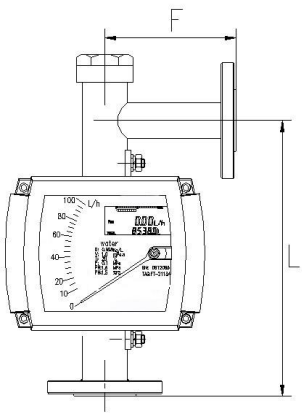


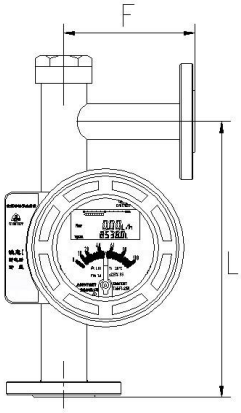


Caliber	F	L	H	W	PressureL
（mm）	（mm）	kg	kpa		
DN50	120	250	650	13	36
DN80	150	300	800	34	45
DN100	150	350	800	49	58
DN150	180	350	850	66	63

（ DN50～DN150 ）

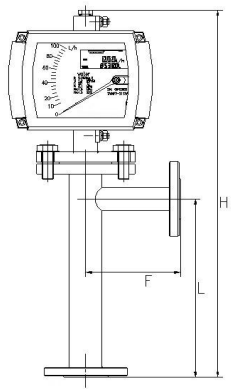
Bottom inlet and side outlet type：Dimensions, weight and pressure loss

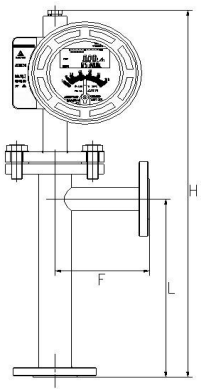




Caliber	DN15	DN25
F（mm）	120	120
L（mm）	250	250
H（mm）	350	350
Weight(kg)	4.5	7
Pressure loss（kpa）	18	22

（ DN15～DN25 ）

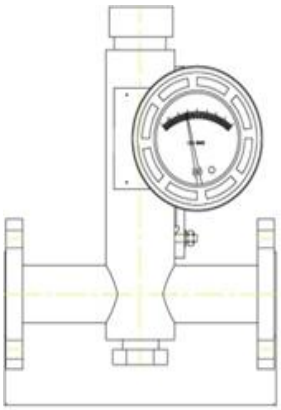


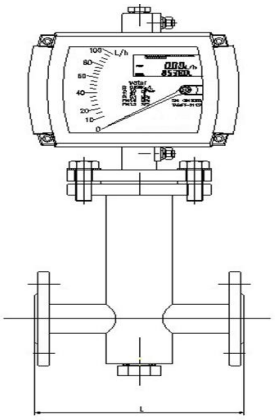


Caliber	F	L	H	Weight	PressureL
	（mm）	（mm）	kg	kpa	
DN50	120	250	600	13	28
DN80	150	350	700	34	35
DN100	150	350	700	49	45
DN150	180	450	760	66	58

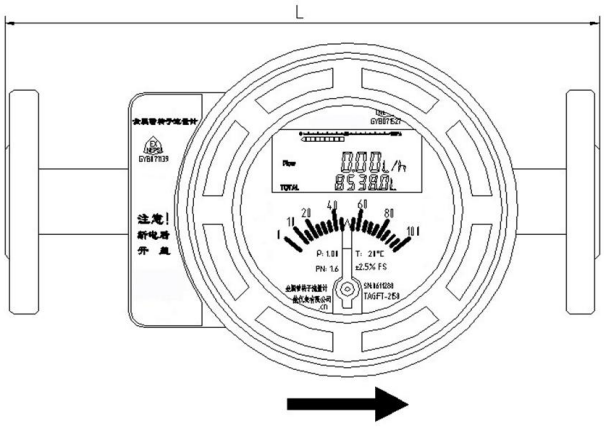
（ DN50～DN150 ）

Horizontal mounting type：Dimensions ,weight and pressure loss





Caliber	L(mm)
15	250
20	250
25	250
40	300
50	300
65	400
80	400
100	400
125	500
150	500



Caliber	L(mm)
15	250
20	250
25	250
40	250
50	250
65	250
80	250
100	250
125	250
150	250

（DN15～DN150 Liquid）

(Can choose M8/M9 meter head)

Additional structure and installation instructions

The correct selection of metal rota meter and additional structure is very important to the stable operation and measurement accuracy of the system. Special attention should be paid to the following points in the selection and installation of the flow meter:

1) For the selection of the remote transmission type metal tube flowmeter, please make sure it is suitable for the explosion-proof requirements; when installing, pay attention to the fastening of the casing and the sealing of the wiring after the meter is powered on. It is also necessary to select a suitable safety barrier and correct wiring to meet the requirements of explosion-proof, protection and anti-corrosion.

2) For some measured media that require heat preservation or cooling, jacket type flow meters (.../T/...) should be selected. The heating or cooling interface of the standard intelligent metal tube float flowmeter adopts G3/8" pipe thread connection, if other flange or thread connection is required, please specify when ordering.

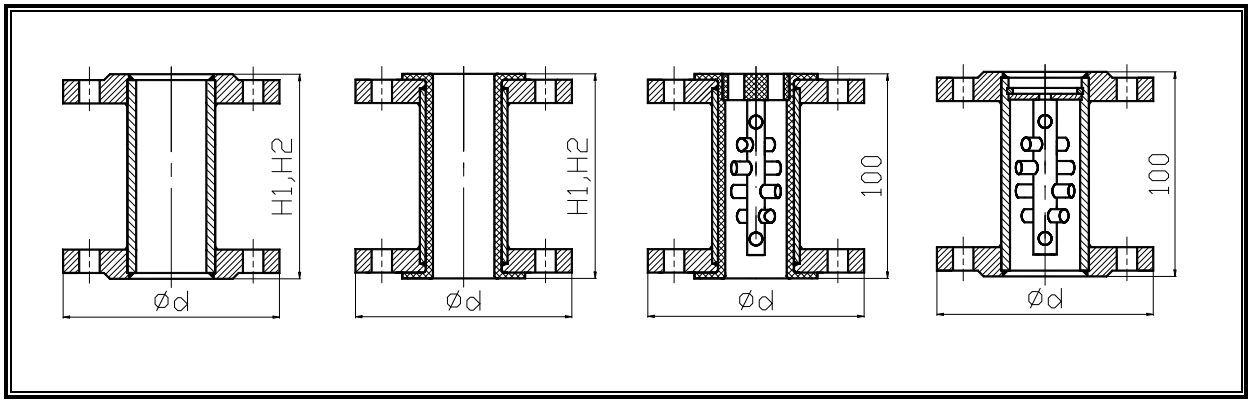
3) For the unstable pressure of the inlet medium of the flowmeter, especially for gas measurement, in order to ensure accuracy and service life, a damping structure (.../Z/...) should be selected.

4) The pressure level required for the medium is relatively high. When the pressure level exceeds the standard pressure level, please select the high-pressure type structure (.../G/...) when selecting the model. The high pressure type adopts HG20595-97 RF butt welded steel pipe flange with neck. If other standards are used, please specify when ordering.

5) When installing the flow meter, ensure that the verticality of the measuring tube is better than 5°, and a bypass should be installed to facilitate maintenance and cleaning without affecting production.

6) The location where the flow meter is installed should ensure that the inlet has a straight pipe section of ≥5DN and the outlet has a straight pipe section of no less than 250mm; if the medium contains

ferromagnetic substances, a magnetic filter should be installed in front of the flow meter. (See the external dimension drawing of magnetic filter and straight pipe section)



Straight pipe type　　Liner FEP straight pipe type　　Liner FEP with Filter　　With Filter

Diameter	DN15	DN25	DN50	DN80	DN100	DN150
Front straight pipe H1≥（mm）	75	125	250	400	500	750
After straight pipe H2≥（mm）	250	250	250	250	250	250
Φd（mm）	95	115	165	200	220	285

Remark： the straight pipe or magnetic filter based on HG20592 PN16 flange standard， other standards also available.

If more than DN100, the magnetic filter height shall be separately determined。

7) The control valve in the measurement and control system should be installed downstream of the flowmeter. When used for gas measurement, ensure that the working pressure is not less than 5 times the pressure loss of the flowmeter to make the flowmeter work stably.

8) Before installing the flowmeter, the welding slag in the pipeline should be purged clean; the stop element in the flowmeter should be removed during installation; when using after installation, the control valve should be opened slowly to avoid impact damage to flow meter.

metal tube rotameter Installation way

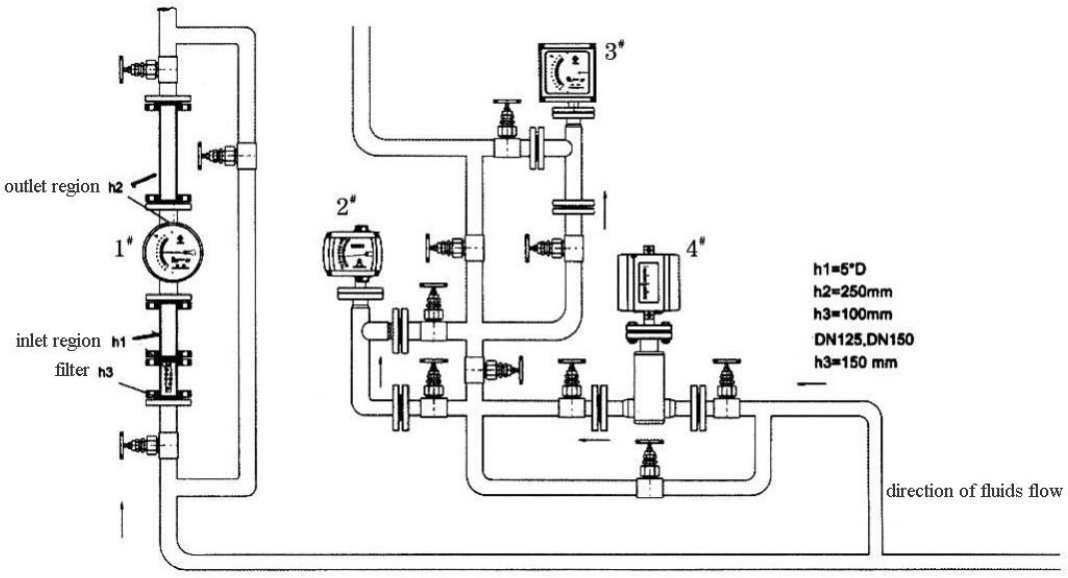


Diagram: 1#. lower-upper path(standard type) 2#. side in side out type 3#. bottom in side out type 4#. right in left out type (horizontal type)

7 Flow Range

Float material： 1□：0Cr18Ni9 00Cr17Ni14Mo2 Hastelloy C 2□： FEP

Diameter		water (20℃)		air 0.1013MPa 20℃	standard type The maximum pressure loss	
DN		L/h		Nm^3/h	KPa	
		1□	2□	1□	water	air
15	*	16	-	0.5	2.0	7.0
	*	25	16	0.7	2.3	7.2
		40	25	1.1	2.5	7.3
		63	40	1.8	2.5	7.5
		100	63	2.8	2.5	7.8
		160	100	4.8	2.6	8.0
		250	160	7.0	2.7	10.0
		400	250	10.0	2.9	10.8
		600	400	16.0	3.4	14
20		600	400	16	4.0	7.0
		1000	600	30	4.1	8.0
		1600	1000	45	4.4	12.0
		2500	1600	70	5.2	19.0
		4000	2500	110	7.0	25.0

	6000	4000	180	12.5	33.0
25	600	400	16	4.0	7.0
	1000	600	30	4.1	8.0
	1600	1000	45	4.4	12.0
	2500	1600	70	5.2	19.0
	4000	2500	110	7.0	25.0
	6000	4000	180	12.5	33.0
32	1000	600	30	4.1	8.0
	1600	1000	45	4.4	12.0
	2500	1600	70	5.2	19.0
	4000	2500	110	7.0	25.0
	6000	4000	180	12.5	33.0
	10000		250	12.5	33.0
40	2500	1600	70	5.2	19.0
	4000	2500	110	7.0	25.0
	6000	4000	180	12.5	33.0
	10000		250	12.5	33.0
50	6000	4000	180	4.7	8.0
	10000	6000	250	5.1	15.0
	16000	10000	400	6.2	22.0
	25000	16000	600	8.0	35.0
65	16000	10000	400	6.2	22.0
	25000	16000	600	8.0	35.0
80	25000	16000	1000	5.3	15.0
	40000	25000	1200	7.8	22.0
	60000	40000	1600	8.3	25.0
100	60000	40000	1800	11.4	35.0
	100000	60000	3000	16.7	45.0
125	100000	40000	3000	11.4	42.0
	125000	50000	3000	11.4	47.0
150	150000	100000	4000	17.0	47.0

Notes：In addition to the above general specifications，* Special specifications can be customized according to customer’s needs.

8 Flow Conversion

The scale of the intelligent metal tube float flowmeter is calibrated with water at a temperature of 20℃ or calibrated with air at a pressure of 101.325KPa and a temperature of 20℃. If the density, working pressure and temperature of the measured medium liquid and gas are different from the calibration parameters, due to the difference in density and viscosity, the reading should be corrected during use. The correction formula:

1. For liquids, the correction formula that does not consider the effect of viscosity：

$$Q_1=Q_0\sqrt{\frac{\rho_0(\rho_f-\rho_1)}{\rho_1(\rho_f-\rho_0)}}$$

In the formula： Q_1 ------the actual flow of the measured medium

Q_0 ------indicating flow of the flow meter

ρ_{0-} ----- water density of the calibrated medium

ρ_f -----density of the float（stainless steel is 7.9g/cm3）

ρ_1 -----density of the measured medium

2. For gas, the correction formula that does not consider the effect of viscosity：

$$Q_1=Q_0\sqrt{\frac{\rho_0}{\rho_1}}\cdot\sqrt{\frac{P_1}{P_0}}\cdot\sqrt{\frac{T_0}{T_1}}$$

In the formula: Q1 -----The measured gas is converted from the volume flow rate in the P1T1 state to the volume flow rate in the P0T0 state.

Q0 -----The volumetric flow when the calibration medium is air in the P0T0 state

P0 ----- standard atmospheric pressure 101.325KPa

T0 ----- thermodynamic temperature 293K

P1 ----- Absolute pressure under working condition

T1 ----- Thermodynamic temperature under working condition K

ρ0 -----The density of calibration medium air in P0T0 state

ρ1 -----The density of the measured gas in the P0T0 state under the working state.

When ordering a flow meter for measuring gas, please calculate the following formula before determining the flow range.

$$Q_0=Q_1\sqrt{\frac{\rho_1}{\rho_0}}\cdot\sqrt{\frac{P_0}{P_1}}\cdot\sqrt{\frac{T_1}{T_0}}$$

9. Electrical Signal Output and Wiring

Electrical wiring diagram ：

41---------- Pulse signal isolation output positive

42---------- Pulse signal isolation output negative

32---------- Common terminal of upper limit alarm output relay

33---------- Upper limit alarm output relay normally closed

31---------- Upper limit alarm output relay normally open

35---------- Common terminal of lower limit alarm output relay

36---------- Lower limit alarm output relay normally closed

34---------- Lower limit alarm output relay normally open

13---------- 24VDC power supply

(-)**12**---------- 4-20mA output

(+)**11**---------- 24V DC supply+

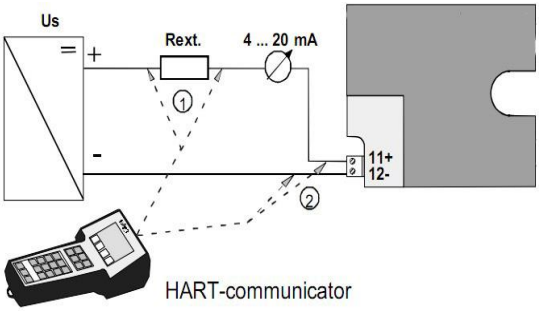
(⊥)10---------- Protective grounding (The brackets are the identification of the two-wire 4-20mA output)

Note 1. When wiring in accordance with intrinsically safe explosion-proof requirements, please combine the wiring method of the relevant safety barrier.

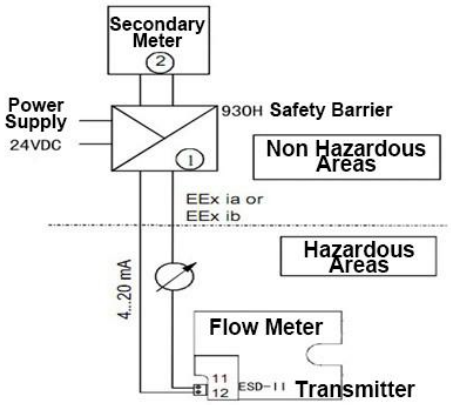
Note 2: 24VDC power supply and pulse output are not in common ground!

Note 3: Battery powered model, use a specific power socket, no output.

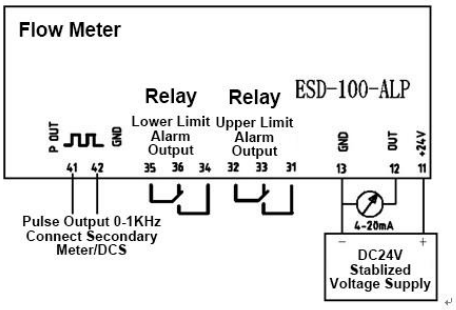
Electrical Interface



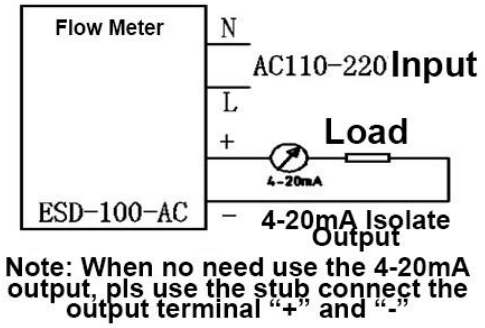
Two-wire system 4-20mA Output(with HART)



Intrinsically Safe System Wire Connection

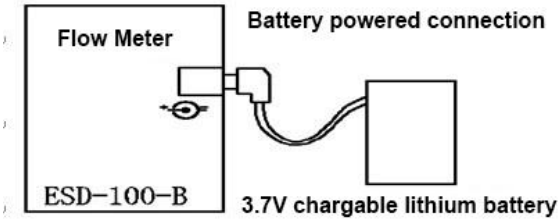


Relay output and pulse output connection

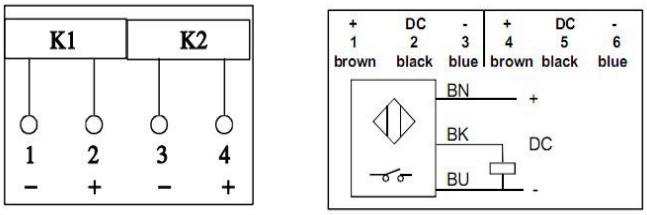


Note: When no need use the 4-20mA output, pls use the stub connect the output terminal "+" and "-"

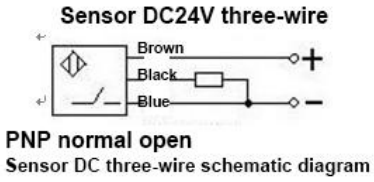
AC power supply connection



Battery powered connection

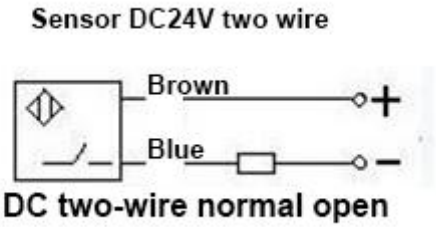


Limit switch



Three wire alarm switch connection

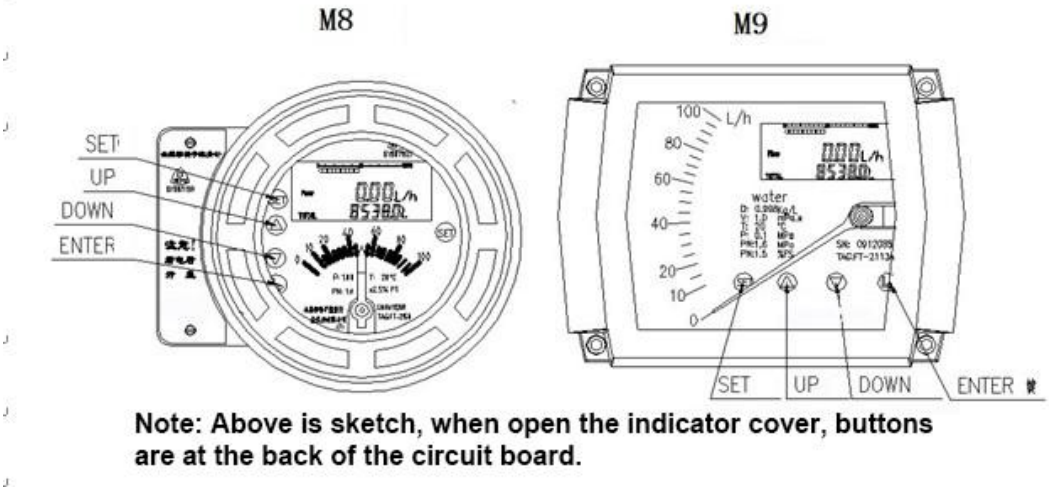
(mechanical type)



Two-wire alarm switch connection

(mechanical type)

10. **Meter Operation Illustration** (Flow range may has slight difference with different model)



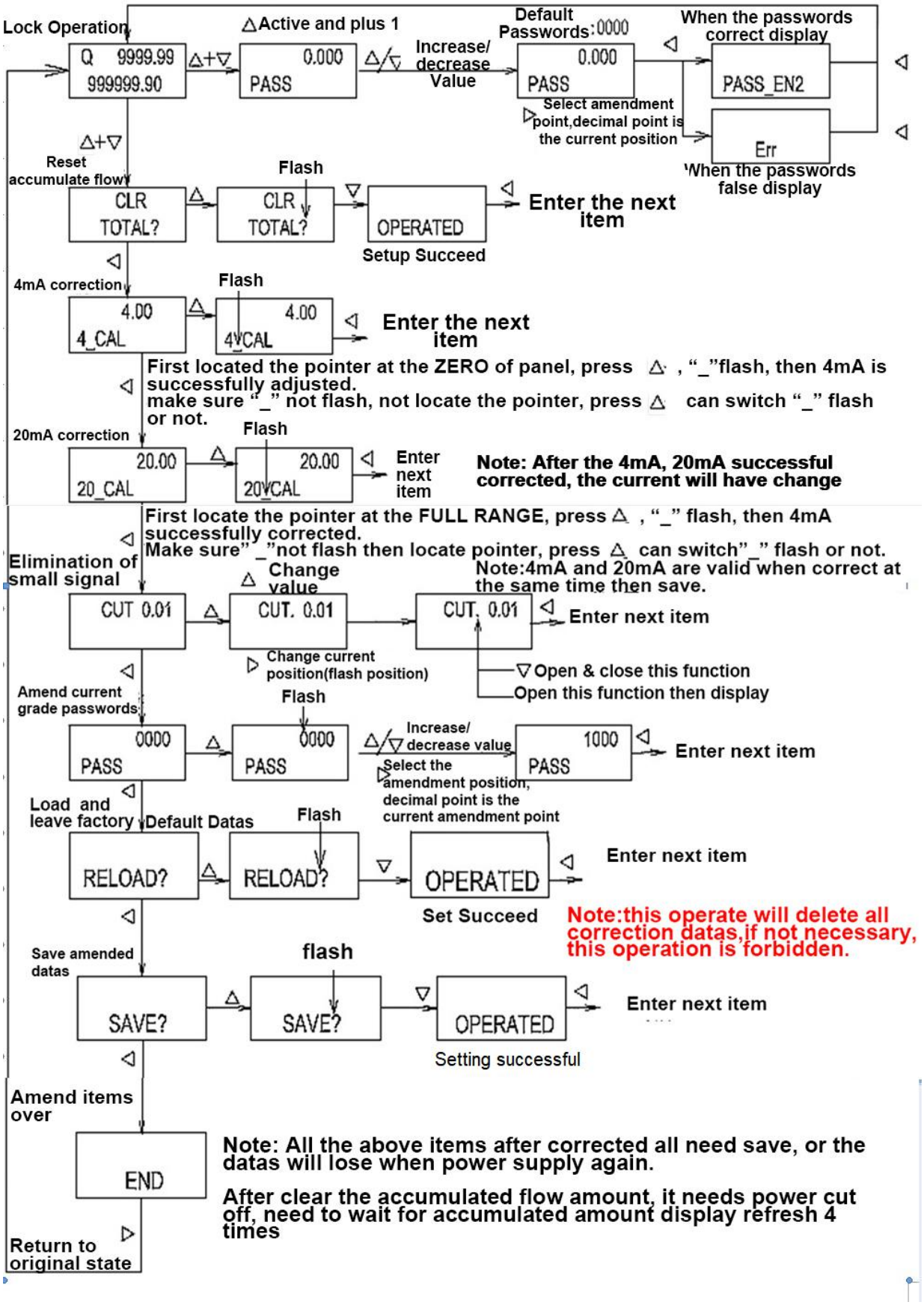
Note: Above is sketch, when open the indicator cover, buttons are at the back of the circuit board.

Note: The intelligent display part has pasted accurate debugging when leaving factory; If not necessary, do not press the button at will. With HART communication, if need amend the date, it needs return to the factory for adjustment.

Accumulative flow reset shortcut: (under secure environment)

Open the indicator cover, press the first and fourth button on the back of the circuit board under power situation(the back terminal has four button).

Basic Parameter Set



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