Metal Tube Rotameter

Supmea

Headquarters

5th floor, Building 4, Singapore Hangzhou Science Technology Park, No. 6 street, Hangzhou Economic Development Area, Hangzhou 310018, China

Singapore

2 Venture Drive #11-30 Vision Exchange Singapore

info@ supmea. com

www.supmea.com

Supmea Automation Co.,Ltd.

Preface

Thank you for purchasing this rotameter. To ensure proper operation and prevent potential losses due to improper use, please read this manual thoroughly before using the device.

Note

- The contents of this manual are subject to change without notice due to updating factors such as function upgrading.
- We strive to ensure the accuracy of the manual. Nevertheless, if you identify any errors or inaccuracies, please contact us.
- Unauthorized reprinting or copying of this manual is strictly prohibited.

Version

U-SUP-LZ-B-EN1

Safety Precautions

For the safe operation of this product, please strictly follow the outlined safety precautions.

About this manual

- Please ensure the instrument operators have a careful reading of this manual.
- Prior to operation, please acquaint yourself with this manual and ensure a thorough understanding of the instrument.
- This manual only describes the product's functions. The operator shall bear responsibility for the suitability of the device for the user's specific purpose.

Precautions for product protection, safety, and modification

- For your safety and the normal operation of the product and its controlling systems, the guidelines and precautions specified in this manual are supposed to be fully observed. Operating the instrument in ways not specified in this manual may compromise its protective features. Our company shall not be liable for any malfunctions or accidents resulting from non-compliance with the precautions described.
- When equipped the product and its controlling systems with lightning protection or separate safety protection circuits, it needs to be implemented by other devices.
- If you need to replace components or fittings of the product, please use the model specified by the company.
- This product is not designed for use in systems directly related to personal safety, such as nuclear power facilities, radioactive equipment, railway systems, aviation equipment, marine equipment, and medical equipment. If applied, it is the user's responsibility to implement additional equipment or systems to ensure personal safety.
- Do not modify this product.
- The following safety symbols are used in this manual:

Hazard: Failure to take appropriate precautions may result in serious personal injury, product damage, or major property loss.

Warning: Pay special attention to critical information related to the product or specific sections of this user manual.

- Confirm whether the supply voltage is consistent with the rated voltage before operation.
- Do not use the instrument in a flammable and combustible or steam area.
- To prevent electric shock and operation errors, ensure proper grounding protection is in place.
- Thunder prevention engineering facilities must be well managed: the shared grounding network shall be grounded at the correct electric level, shielded, with wires properly routed, and an SPD surge protector applied as needed.
- Some internal components may carry high voltage. To avoid the risk of electric shock, do not open the front square panel unless it is being handled by trained personnel or maintenance staff authorized by our company.
- To avoid electric shock, disconnect the power before performing any checks.
- Check the condition of the terminal screws regularly. If loose, please tighten them before use.
- Unauthorized disassembly, modification, or repair of the product is not allowed, as it may lead to malfunctions, electric shock, or fire hazards.
- Wipe the product with a dry cotton cloth. Do not use alcohol, benzine, or other organic solvents, and avoid exposing the product to any liquids. If the product falls into the water, please cut off the power immediately to prevent leakage, electric shock, or fire hazards.

- Please check the grounding protection regularly. Do not operate the product if you think that the protection, such as grounding protection and fuses, is inadequate.
- Ventilation holes on the product housing must be kept clear to avoid malfunctions due to high temperatures, abnormal operation, shortened life, and fire.
- Please strictly follow the instructions in this manual; failure to do so may damage the product's protective devices.

- Do not use the instrument if it is found damaged or deformed upon opening the package.
- Prevent dust, wire end, iron fines, or other objects from entering the instrument during installation, as this may cause abnormal operation or failure.
- During operation, to modify the configuration, signal output, startup, stop, and operation safety shall be fully considered. Operation mistakes may lead to failure and even destruction of the instrument and control equipment.
- Each part of the instrument has a certain service life, which must be maintained and repaired on a regular basis for long-term use.
- If the product comes to the end of its service life, it should be disposed of as industrial waste as a way of environmental protection.
- Disconnect the instrument when it is not in use.
- If you find smoke from the product, smell odor, abnormal noise, etc., please turn off the power switch immediately and contact the company in time.

Disclaimer

- The company does not make any guarantees for the terms beyond the scope of this product warranty.
- This company is not responsible for damage to the instrument or loss of parts or unpredictable damage caused directly or indirectly by improper operation of the user.

No.	Name	Quantity	Note
1	Metal tube rotameter	1	
2	User manual	1	
3	Certificate	1	
4	Test report	1	

Note: Customized products may vary from the standard products; please refer to the purchase order for details.

After opening the box, please confirm the scope of delivery before starting the operation. If you find that the model and quantity are incorrect or there is physical damage to the product's appearance, please contact us.

Contents

1. Introduction

The smart rotameter, also known as a variable area flowmeter (VA flowmeter), is widely used in industrial automation and process control. It offers a compact design, a broad measurement range, and ease of operation. This device is suitable for measuring the flow of liquids, gases, and steam. It excels in applications involving low flow rates, small volumes, high temperatures, high pressures, highly corrosive environments, and both conductive and non-conductive media.

This series of rotameters comply with the national standard JB/T6844-2015, and the factory calibration meets the calibration procedures of JG257-2007.

Additionally, this product has also been inspected and approved by a national quality inspection organization, meeting the requirements of the GB3836. 1-2010, GB3836. 2-2010, and GB3836. 4-2010 standards.

2. Structure and Principle

2.1. Structure

The product primarily consists of two components: the measuring tube and the indicator. The measuring tube includes a tapered tube or orifice plate, director, stopper, float, and other associated parts. The Indicator comprises the magnetic tracking system, pointer, scale, and circuit board (for remote transmission), among others.

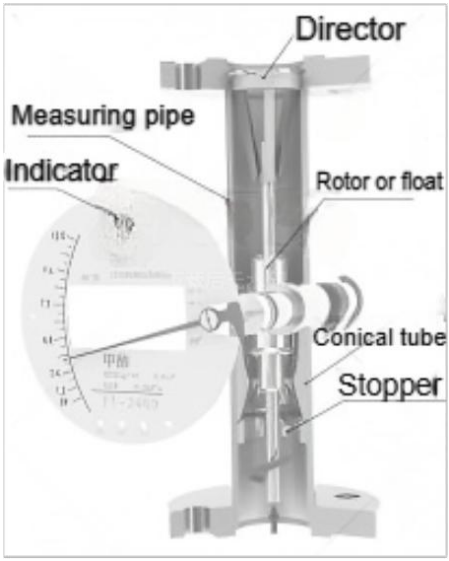


Fig.1

2.2. Working Principle

When the measured medium flows upward through the measuring tube from bottom to top, a differential pressure is generated across the float, creating an upward force. When this lifting force exceeds the effective weight of the float immersed in the fluid, the float rises, When this lifting force exceeds the effective weight of the float immersed in the fluid, the float rises, thereby increasing the flow passage area between the float and the tube wall. As the area increases, the fluid velocity through the passage drops rapidly, leading to a reduced differential pressure. The upward force acting on the float decreases accordingly. Eventually, the float stabilizes at a position where the upward force balances the float's

effective weight. This equilibrium position corresponds to a specific flow rate of the medium—the higher the float, the greater the flow rate.

The float is equipped with a built-in magnetic core. As the flow moves the float up and down, the magnet changes accordingly. The indicator contains a follower magnet mounted on the pointer shaft, which is magnetically coupled with the float's internal magnet. As the float moves, it drives the follower magnet to rotate, driving the pointer and sensing magnet to move in sync. The pointer indicates the instantaneous flow rate on the scale. Meanwhile, the sensing magnet's motion is detected by a magnetic sensor and converted into an electrical signal, which is then processed by the circuit to display both the instantaneous and total flow rates.

①--Measuring tube: 50/51/52/53/54/55

②--Indicator: M30 indicator (full-function indicator), cast aluminum round housing

③--Circuit board: 2-wire system/multi-wire system/ModBus/Hart/FF/battery-powered

④--Scale: remote transmission/local display/alarm

Fig.2 M30 Indicator

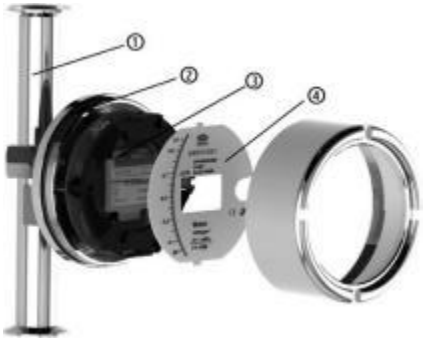
①--Measuring tube: 50/51/52/53/54/55

②--Indicator: M20 indicator, cast aluminum square housing

③--Circuit board: 2-wire/multi-wire/ModBus/Hart/FF/ battery-powered

④--Scale: remote transmission/local display/alarm

Fig.3 M20 Indicator



①--Measuring tube: 55

②--Indicator: M6 indicator, all stainless steel round housing

③--Circuit board: 2-wire/multi-wire /ModBus/Hart/FF

④--Scale: remote transmission/local display/alarm

Fig.4 M6 indicator

3. Technical Parameters

Table 1

Type	Parameter
Measuring range (100% value)	Water (20℃): (1 ~ 200000) L/h Air (20°C. 0.1013 MPa): (0.5-2000) m^3/h
Range ratio	Standard type 10: 1 Special type: 20: 1
Accuracy	➢ Standard type: Liquid: Class 1.5 Gas: Class 2.5; ➢ Customized type: Liquid: Class 1.0 Gas: Class 1.5
Pressure rating	➢ Standard type: DN15 ~ DN50 ≤ 4.0 MPa; DN65 ~ DN200 ≤ 1.6 MPa ➢ High pressure type: temperature range: -80 ℃ ~ 200 ℃, DN15 ~ DN100: ≤ 10MPa Temperature range: 200 ℃ ~ 350 ℃, DN15 ~ DN100: ≤ 6.3MPa The pressure rating for the jacket is 1.6MPa. Special models shall be consulted with the manufacturer prior to selection and ordering.
Connection type	➢ Flange type, tri-clamp connection, thread connection, sanitary threaded type ➢ Special Type: Customizable as per user requirements or user-provided specifications
Jacket connection	➢ Standard type: flange connection HG20592 ➢ Special type: Customizable as per user requirements
Medium temperature	Standard type: -20 ℃ ~ + 120 ℃ High-temperature type: 120 ℃ ~ 450 ℃ Low-temperature type: -80 ℃ ~-20 ℃ PTFE: -40 °C ~ 80 °C
Ambient temperature	Remote transmission type: -40 ℃ ~ + 70 ℃ (the LCD will not be damaged), the LCD works normally at -20 ℃~+70 ℃ Local pointer type, local alarm type: -40 ℃ ~ + 80 ℃
Cable interface	M20 * 1.5 female thread

Type	Parameter
Power supply	➢ Standard type: 24VDC two-wire system (4 ~ 20) mA (12VDC ~ 32VDC) ➢ Alarm type: 24VDC, multi-wire system, (4 ~ 20) mA (12VDC ~ 32VDC) ➢ AC type: (100-240) VAC, 50Hz-60Hz ➢ Battery type: 3.6V @9AH lithium battery, 3 years of continuous operation
Load	Rlmax = 600 Ω
Alarm output	➢ Instantaneous flow alarm for upper and lower limits, optocoupler-isolated Darlington output (internal 24VDC supply, max 8mA, external supply up to 250mA @ 36VDC） ➢ Local alarm type: upper limit, lower limit, or both upper and lower limit instantaneous flow alarms, reed switch contact output (contacting rate1A @ 30VDC) Optional normally open/closed contacts. ➢ Alarm holding range: Max 60% range of the full span, Min. Interval between upper and lower limit alarm: 10% of full scale
Pulse output	Totalizing pulse output via optocoupler-isolated Darlington tube output (internal 24VDC power supply, maximum current 8mA).
Level of protection	IP65
Installation height	➢ For DN10 threaded installation, the center dimension is 125mm. ➢ For DN15 to DN200 standard models, the vertical height is 250mm. For the high-pressure version (pressure＞ 6.3MPa to 10MPa) with diameters greater than or equal to DN80, the installation height is 300mm. ➢ For other specifications, please consult the manufacturer before ordering.
Medium viscosity	DN15: η< 5mPa.s (S15.0 to S15.3) η < 30 mPa.s (S15.4 to S15.10) DN25: n < 250 mPa.s DN50 to DN200; η < 5 mPa · s (S15.0 to S15.3) Viscosity correction is required for special viscosity media measurements. Please consult the manufacturer before ordering.

4. Installation Diagram

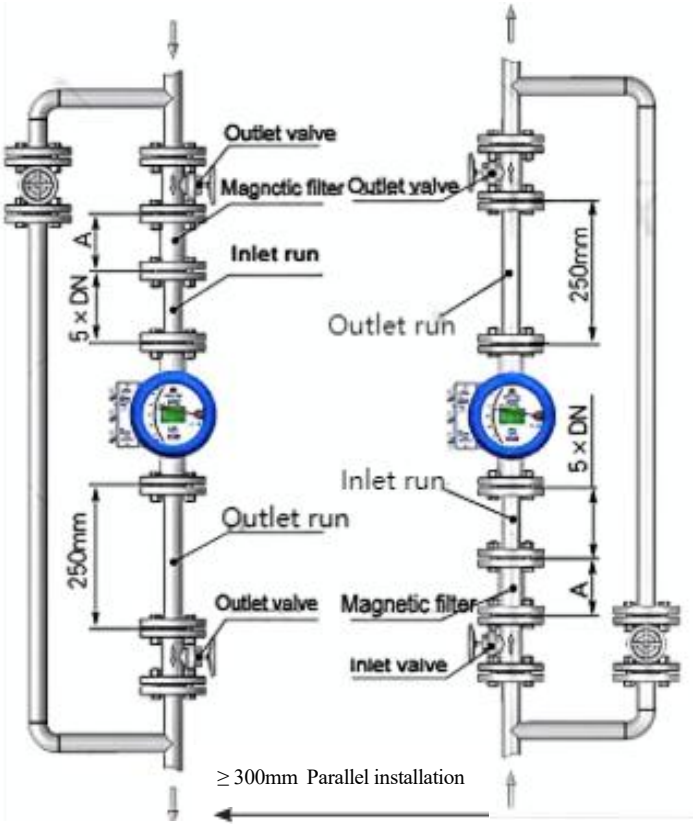


Fig.5 Top-in to bottom-out type installation

Fig.6 Bottom-in to top-out type/hygienic type installation

Note:

- 5 × DN is the length of inlet runs
- 250mm is the length of outlet runs
- A is the reserved position for installing the magnetic filter
- Below DN100 A = 100mm
- Above DN100 A = 150mm

(1) If the inlet and outlet runs meet the installation requirements, no other pipe runs are required.

(2) If there is no ferromagnetic substance in the medium, no magnetic filter is required.

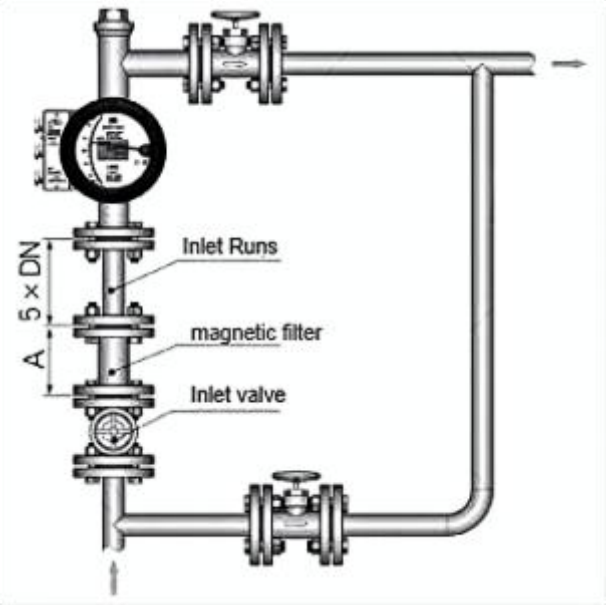


Fig.7 Bottom-in to side-out installation

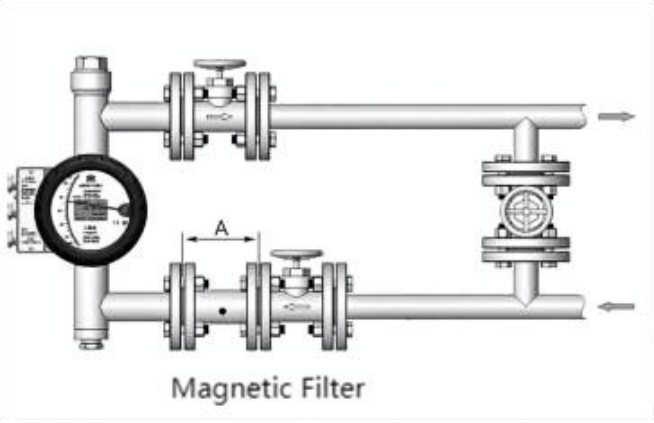


Fig.8 Side-in to side-out installation

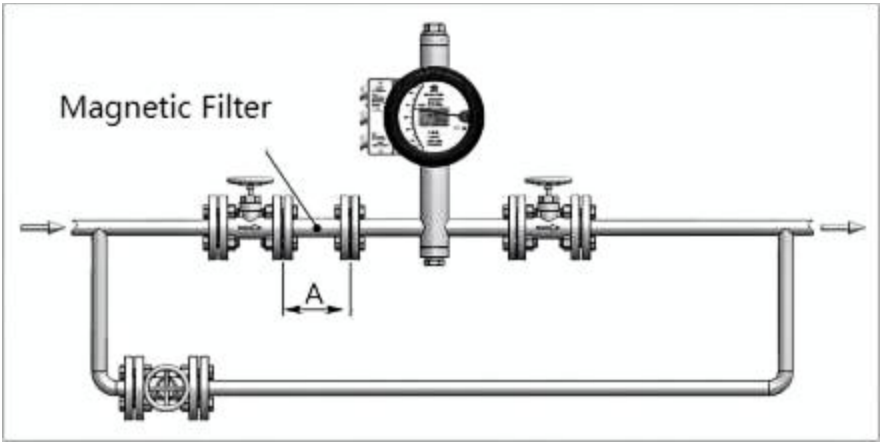


Fig.9 Left-in to right-out installation (When Inlet and outlet runs are reversed, it is right-in to left-out installation)

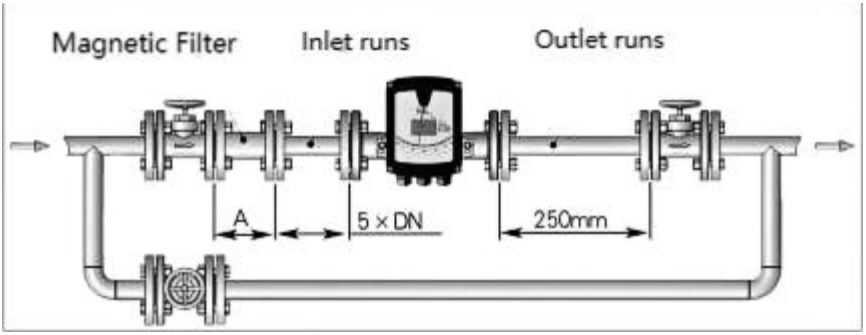


Fig.10 Standard horizontal spring-loaded installation

5. Precautions

(1) As rotameters are precision instruments, they must be handled with care during transportation, installation, storage, and operation. Rough handling, over-tightening during installation, or leaving the instrument lying around must be strictly avoided. It is essential to maintain the correct relative position between the indicator and the sensor, as any shift could directly compromise measurement accuracy.

(2) Before installation, it is necessary to clean the process pipeline to prevent residual ferromagnetic particles from adhering to the instrument. Such particles can impair performance or even cause damage. If it is impossible to avoid this situation, a magnetic filter should be installed at the instrument's inlet. The instrument itself must not be involved in pre-production gas purging to prevent damage.

(3) Before connecting the instrument to the process pipeline, the packing material that secures the float inside the measuring tube (used to prevent float movement during transportation) must be removed. Additionally, the instrument should be carefully inspected for any potential damage sustained during transit.

(4) The rotameter can be installed either vertically or horizontally. For vertical installation, it is crucial to ensure that the angle between the instrument's centerline and the plumb line is less than 2°. In horizontal installations, model 53H requires the angle between the centerline and the horizontal line to be less than 2°, while model 53RL requires the same angle limit for the vertical pipe.

(5) The upstream and downstream pipelines must match the meter's nominal diameter. The connecting flanges or threads must properly fit those on the instrument. The upstream straight pipe section should be five times the instrument's nominal diameter, while the downstream section must be at least 250 mm long.

(6) Since the rotameter transmits signals through magnetic coupling, it is essential to keep the surrounding area within a 10cm radius free of ferromagnetic materials to maintain accuracy. When rotameters are

installed in parallel side by side, the distance between them should be at least 300mm.

(7) For rotameters applied in gas measurement, air is used for calibration under standard conditions of 0.1 MPa and 20°C. When gas is discharged directly into the atmosphere from the instrument's outlet, the resulting pressure drop at the float may cause the pointer to fluctuate. To resolve this issue, a valve should be installed at the outlet and partially closed during operation.

(8) Rotameters installed in pipelines should be protected from mechanical stress. Proper pipe supports at the inlet and outlet help maintain minimal stress on the instrument.

(9) PTFE-lined instruments require careful handling during installation. Since PTFE can deform under pressure, it is advisable to use additional PTFE gaskets to prevent the liner from cracking or flipping.

(10) Over time, ferromagnetic particles may build up the float, potentially causing it to jam or reducing measurement accuracy. Regularly cleaning the measuring tube helps maintain optimal performance. If a magnetic filter is installed at the inlet, it should also be cleaned periodically.

(11) The instrument's indicator contains electronic components, making proper sealing essential. Always tighten screws and covers to prevent liquids or ferromagnetic particles from entering. Reliable grounding is also necessary for safe operation.

Two pieces of important precautions for initial use

- For liquid measurement: Open valves slowly to avoid sudden water hammer that could damage the instrument.
- For gas measurement: Avoid pressurizing the pipeline before opening the valve. A sudden valve opening could cause the float to hit the stopper, potentially damaging the instrument. Installing a pneumatic damping device can reduce float vibration.

(13) Ensure that electrical wiring is correct before powering on smart indicators. Incorrect wiring may damage the instrument. Follow the user manual for button operations to avoid losing or damaging EEPROM data.

(14) The meter should be stored at-40℃ ~ 55℃, and the relative humidity is not more than 90% in a place free of rain, snow, sun, and corrosive gas erosion.

(15) During cleaning, avoid using water to wash the instrument housing. Water ingress can damage internal components.

(16) Since the meter itself has pressure loss, the medium pressure at the installation position must be higher than the meter's pressure loss.

(17) For LCD rotameters, direct sunlight exposure on the display should be avoided.

(18) If thermal or vacuum jackets were not ordered, ensure proper insulation on-site when measuring low-temperature media.

(19) Double-check the meter's power supply and output mode before wiring. Confirm the terminal numbers for power and signals on the circuit board to prevent damage from incorrect wiring.

(20) Users must follow the requirements of this instruction manual to ensure the correct and safe use of the instrument.

6. Dimensions and Weight

6.1. Bottom-in to Top-out Type (standard type)

a. Bottom-in to top-out type and jacketed type with M30 indicator

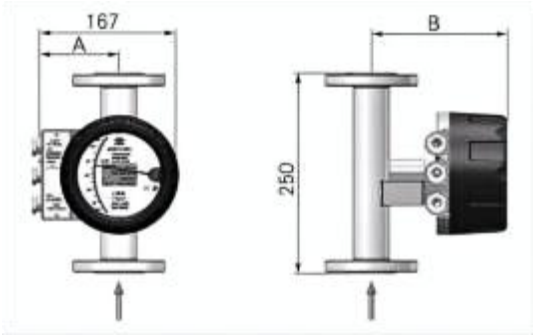


Fig.11 Standard type

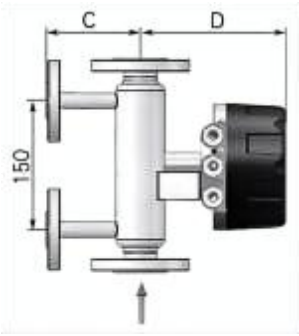


Fig.12 Heat tracing jacket type

Table 2 Standard/ jacketed type with M30 indicator

Dimensions and weight							
Specifications	A	B		C	D	Standard weight	Jacket Type weight
		Standard type	High temperature type			Approximate weight/kg	Approximate weight/kg
DN15	133	139	179	100	139	3.6	6.4
DN20	133	139	179	110	139	4. 1	6.9
DN25	121	139	179	110	139	5.5	10.4
DN32	121	139	179	120	139	6. 1	10.9
DN40	121	139	179	120	158	6.6	11.1
DN50	106	158	179	120	158	9.6	12.4
DN65	106	158	179	140	158	10. 1	12.9
DN80	93	158	179	140	158	13.35	20
DN100	83.5	179	234	150	179	16.9	21
DN125	83.5	179	234	185	234	17.9	22
DN150	64.5	234	234	185	234	33.6	35
DN200	29	234	234	210	234	48.6	50

b. Bottom-in to top-out type with PTFE liner and M30/M20 indicator

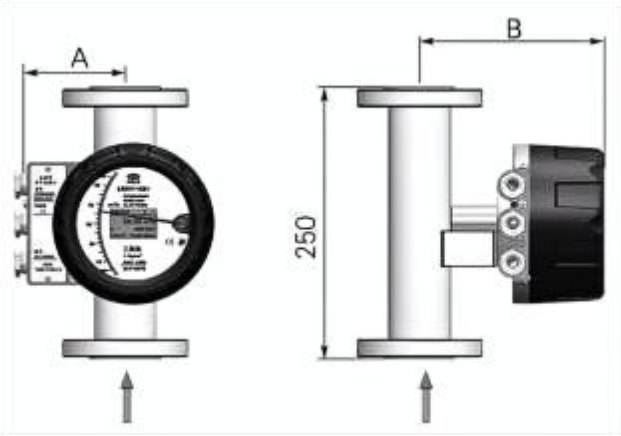


Fig.13

Table 3 Standard type with PTFE Liner and M30/M20 Indicator

Dimensions and weight					
Specifications	M30 Indicator		M20 Indicator		Approximate weight/kg
	A	B	A	B	
DN15	128	139	110	138	3.9
DN20	121	139	103	138	4.2
DN25	115	139	97	138	5.4
DN32	109.5	139	92	138	6.5
DN40	105.5	158	88	157	7.5
DN50	102	158	84	157	8.3
DN65	93	158	75	157	10.5
DN80	90	158	72	157	14.4
DN100	77	179	59	178	17

c. Bottom-in to top-out type and jacket type with M20 indicator

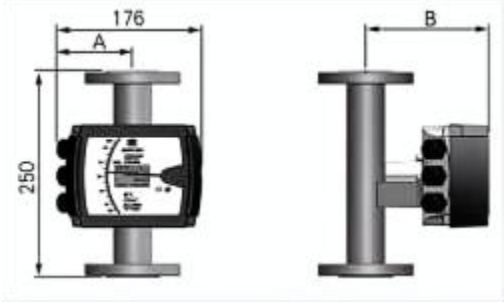


Fig.14 Standard type

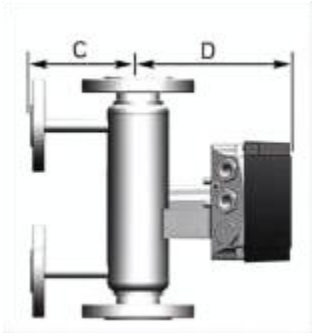


Fig.15 Heat tracing jacket type

Table 4 Standard type and jacketed type with M20 indicator

Dimensions and Weight							
Specifications	A	B		C	D	Standard weight	Jacket Type Weight
		Standard type	High temperature type			Approximate weight/kg	Approximate weight/kg
DN15	115	138	178	100	138	3.6	6.4
DN20	115	138	178	110	138	4. 1	6.9
DN25	103	138	178	110	138	5.5	10.4
DN32	103	138	178	120	138	6. 1	10.9
DN40	103	138	178	120	157	6.6	11.1
DN50	88	157	178	120	157	9.6	12.4
DN65	88	157	178	140	157	10. 1	12.9
DN80	75	157	178	140	157	13.35	20
DN100	65.5	178	233	150	178	16.9	21
DN125	65.5	178	233	185	233	17.9	22
DN150	46.5	233	233	185	233	33.6	35
DN200	11	233	233	210	233	48.6	50

6.2. Bottom-in to Side-out Type

Bottom-in to Side-out (Standard type) and jacket type with M30/M20 indicator

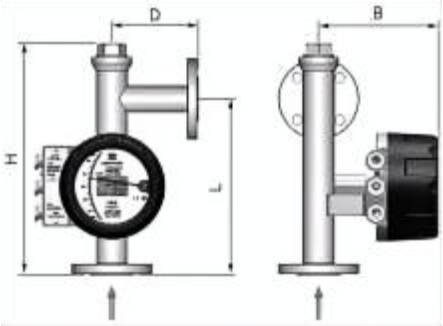


Fig.16 DN15 ~ DN25 (standard type)

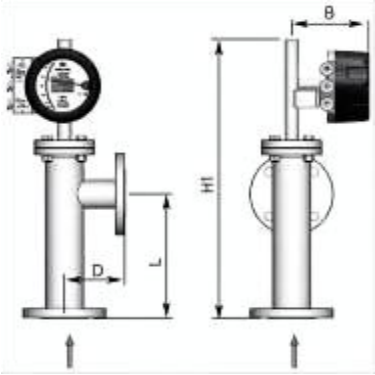


Fig.17 DN50 ~ DN200 (standard type)

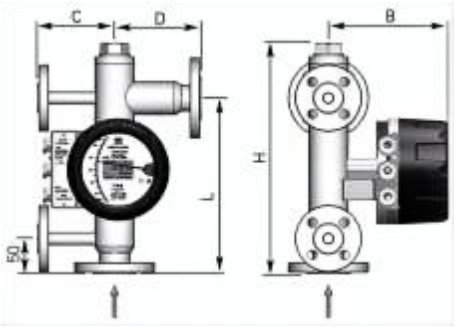


Fig.18 DN15 ~ DN25 (Heat tracing jacket type)

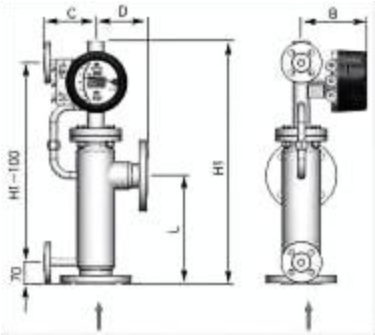


Fig.19 DN50 ~ DN200 (Heat tracing jacket type)

Table 5 Bottom-in to side-out and jacket type with M20/M30 indicator

Dimensions and weight											
Specifications	M30 Indicator B		M20 Indicator B		C	D	H	H1	L	Approximate weight/kg	
	Standard type	High temperature type	Standard type	High temperature type						Standard type	Jacketed type
DN15	139	179	138	178	100	120	330		250	5	7.7
DN20	139	179	138	178	100	120	340		250	5.7	8.4
DN25	139	179	138	178	100	120	340		250	8.3	11.2
DN32	139	179	138	178	100	120	340		250	9.7	11.7
DN40	139	181	138	180	120	120		560	250	11.7	13.7
DN50	139	181	138	180	120	120		560	250	16.3	18.7
DN65	139	181	138	180	140	150		575	250	23.7	26.7
DN80	139	181	138	180	140	150		575	250	27.9	30
DN100	139	181	138	180	150	150		590	250	33.2	39.5
DN125	139	181	138	180	185	180		690	300	40	45
DN150	139	181	138	180	185	180		690	300	57.7	63
DN200	139	181	138	180	210	200		780	350	68	74

6.3. Horizontal Spring-Loaded Type with M30/M20

Horizontal Spring-Loaded Type with M30/M20

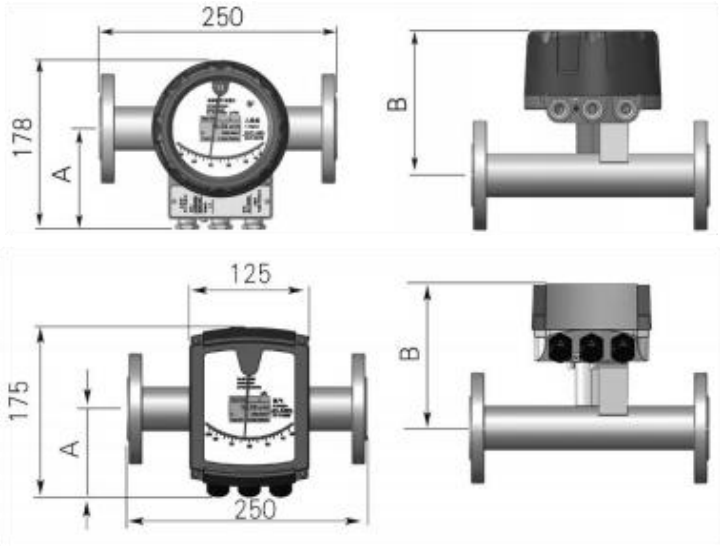


Fig.20

Table 6 Spring type with M30/M20 indicator

Dimensions and Weight							
Specifications	M30 Indicator			M20 Indicator			Approximate weight/kg
	A	B		A	B		
		Criteria	High temperature		Criteria	High temperature	
DN1	133	139	179	115	138	178	3.9
DN2	133	139	179	115	138	178	4.2
DN2	121	139	179	103	138	178	5.4
DN3	121	139	179	103	138	178	6.5
DN4	121	158	179	103	157	178	7.5
DN5	106	158	179	88	157	178	8.3
DN6	106	158	179	88	157	178	10.5
DN8	93	158	179	75	157	178	14.4
DN10	83.5	179	234	65.5	178	233	16
DN12	83.5	234	234	65.5	233	233	18
DN15	64.5	234	234	46	233	233	33
DN20	29	234	234	11	233	233	48

6.4. Left-in to Right-out (Right-in to left-out) Type

Left-in to Right-out (Right-in to left-out) standard type and jacketed type with M30/M20 indicator

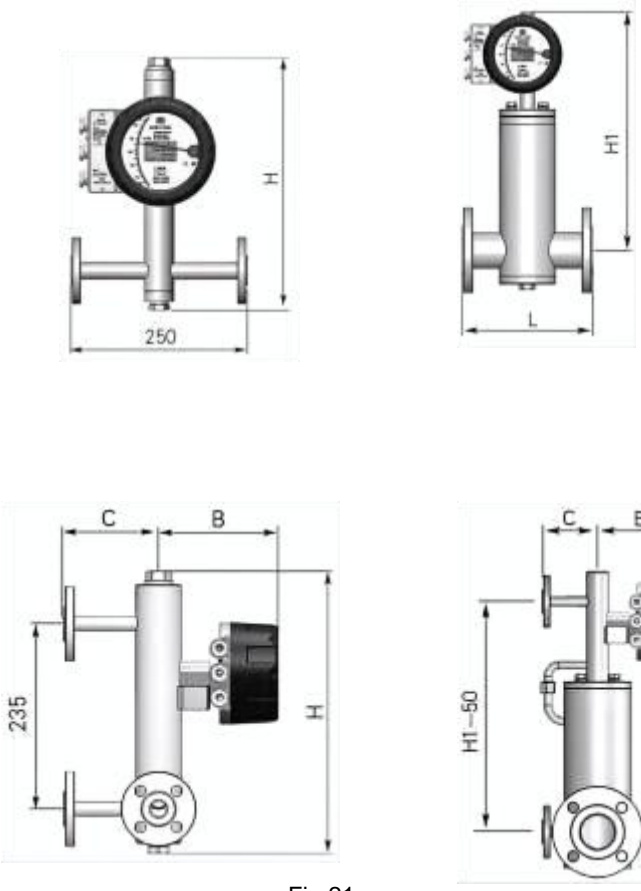


Fig.21

Left-in to Right-out (Right-in to left-out) standard type and jacketed type with M30/M20 indicator

Table 7

Dimensions and Weight										
Gauge	M30 indication		M20 indication		C	H	H	L	Approximate weight/k	
	B		B							
	Criteria	High temperature	Criteria	High temperature					Criteria	Jacket
DN1	139	179	138	178	100	355		250	5.3	8
DN2	139	179	138	178	100	370		250	6	8.8
DN2	139	179	138	178	100	370		250	8.7	11.5
DN3	139	179	138	178	100	370		250	10	12
DN4	139	181	138	180	150		485	250	12	14
DN5	139	181	138	180	150		485	250	16.6	19
DN6	139	181	138	180	190		520	250	24	27
DN8	139	181	138	180	190		520	400	28.2	32.5
DN10	139	181	138	180	210		540	400	33.5	39.8
DN12	139	181	138	180	238		600	500	45	48
DN15	139	181	138	180	238		600	500	58	63.4
DN20	139	181	138	180	290		800	550	71	81

6.5. Top-in to Bottom-out Type

Top-in to bottom-out type with M30/M20 indicator

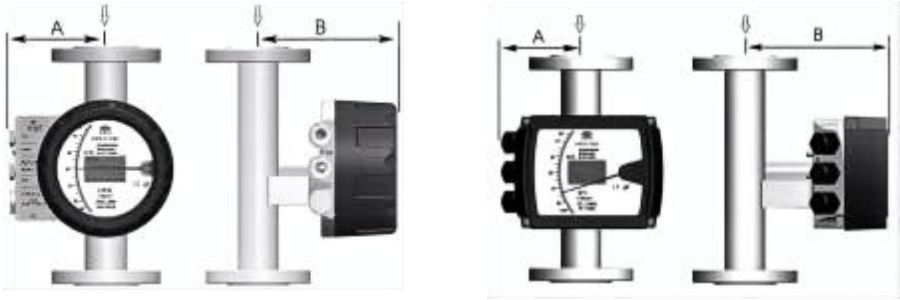


Fig.22

Table 8 Top-in to bottom-out type with M30/M20 indicator

Dimensions and Weight							
Specifications	M30 Indicator			M20 Indicator			Approximate weight/k
	A	B		A	B		
		Standard type	High temperature type		Standard type	High temperature type	
DN15	133	139	179	115	138	178	3.9
DN20	133	139	179	115	138	178	4.2
DN25	121	139	179	103	138	178	5.4
DN32	121	139	179	103	138	178	6.5
DN40	121	158	179	103	157	178	7.5
DN50	106	158	179	88	157	178	8.3
DN65	106	158	179	88	157	178	10.5
DN80	93	158	179	75	157	178	14.4
DN100	83.5	179	234	65.5	178	233	16
DN125	83.5	234	234	65.5	233	233	18
DN15	64.5	234	234	46	233	233	33
DN200	29	234	234	11	233	233	48

6.6. Hygienic Type

a. Hygienic polished pipe with tri-clamp connection and threaded connection, with M30/M20 indicator

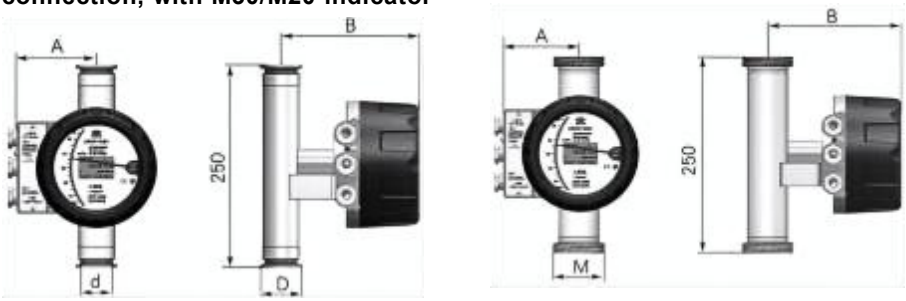


Fig.23

Table 9 Hygienic type with M30/M20 indicator

Dimensions and Weight								
Specifications	M30 Indicator		M20 Indicator		d	D	M	Approximate weight/kg
	A	B	A	B				
DN15	133	139	115	138	Φ 25.4	50.5	RD40X1/6	2.4
DN20	121	139	103	138	Φ32	50.5	RD48X1/6	3.5
DN25/DN32	121	139	103	138	Φ42	50.5	RD60X1/6	3.5
DN40	106	158	88	157	Φ 50.8	50.5	RD70X1/6	3.5
DN50	106	158	88	157	Φ76	64	RD98X1/6	5.3
DN65	93	158	75	157	Φ76/Φ102	77.5	RD98X1/6 RD125X1/6	5.3
DN80	93	158	75	157	Φ 102	91/106	RD125X1/6	7.3
DN100	83.5	179	65.5	178	Φ 122	119	RD125X1/6	8.1

b. Hygienic polished pipe with tri-clamp or threaded connection, with M30/M20 indicator

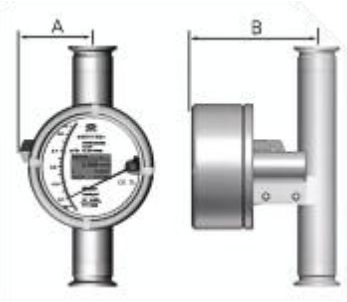


Fig.24

Table 10 Hygienic type with M6 indicator

Dimensions and Weight			
Specifications	A	B	Approximate weight/kg
DN15	97	125	1.9
DN20	92	125	2.4
DN25/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

7. Wiring

7.1. 2-Wire (4 ~ 20) mA Output Wiring Method (Including Hart type, FF fieldbus type)

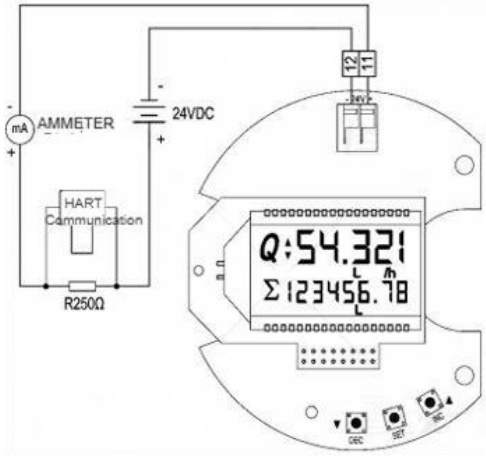


Fig.25

7.2. Multi-wire System (24VDC, 220VAC Power Supply, ModBus, Alarm, Pulse, and Batch) Wiring Method

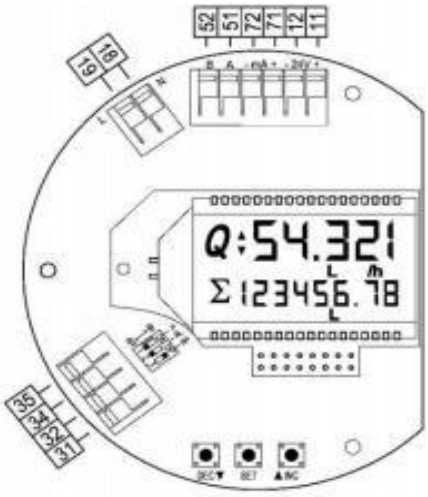


Fig.26

Table 11

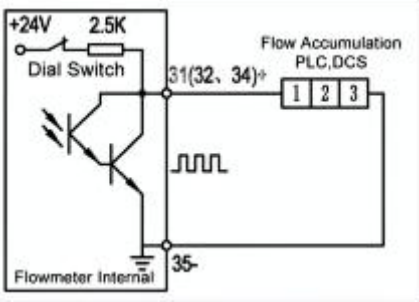
Serial No.	Description	Identification
11	DC power supply	24VDC +
12		24VDC-
18	220VAC power supply	N
19		L
31	Upper limit alarm/pulse output/batch output	+
32	Lower limit alarm/pulse output/batch output	+
34	Pulse/batch output	+
35	Alarm/pulse/batch output common ground	-
51	Modbus protocol output	A
52		B
71	Multi-wire current output	+
72		-

Note: The pulse output, batch output, and alarm output terminals are multiplexed terminals.

The corresponding output mode must be configured via software. The three output channels can be set to active or passive output using the corresponding dial switches.

- When the dial switch is set to the ON position, the output is active, powered internally by the flowmeter (8mA @ 24VDC), and can be connected to an external electronic counter, PLC, or DCS;
- When the dial switch is set to the OFF switch, the output is passive and requires an external 5 ~ 36VDC power supply, with a maximum power supply capacity of 250mA @ 36VDC.

When using inductive loads, a flyback diode should be added as shown in the figure.



Passive output wiring of pulse, batch, and alarm (the dial switch is off)

Fig.27

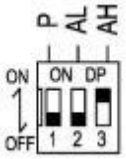
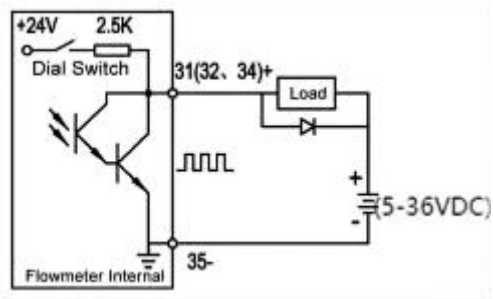


Fig.28

Dial switch setting (no relay output)

ON: internal power supply 24VDC

OFF: external power supply 5~36VDC is required. Dial switch No. 1 corresponds to the pulse output terminal, while No. 2 to the lower limit alarm terminal, and No. 3 to the upper limit alarm terminal.



Positive output wiring of pulse, batch, and alarm (the dial switch is ON)

Fig.29

7.3. Reed Switch Alarm Wiring

Reed switch has three contact forms: normally open (NO by default), normally closed(NC), and normally open and normally closed(NO, NC). When making your order, please specify which switch form is required.

Reed Contact Capacity 1A @ 30VDC

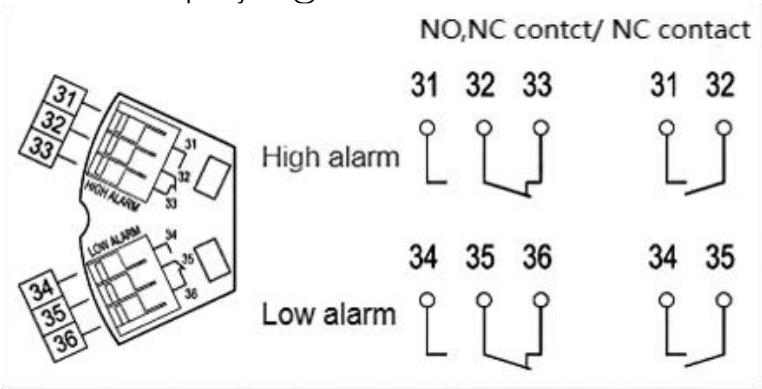


Fig.30

8. Commissioning

(1) Refer to Appendix A: “Operation Instructions of Smart Metal Tube Rotameter Software".

(2) Setting and operation of Hart protocol indicator.

Before communicating with the host system, the meter must be configured with the appropriate parameters. The parameter settings are provided in Table 12.

- For key operation instructions, refer to Appendix A.

(3) Setting and operation of Modbus protocol indicator

Before communicating with the host system, the meter must be configured with the appropriate parameters. The parameter settings are provided in Table 13.

- For key operation instructions, refer to Appendix A.

If the instrument needs to communicate with configuration software such as KingView, refer to Table 14 for variable names and addresses.

Table 12

Baud rate	1200
Data length	8
Stop length	1
Odd/even check	without
Device address range	0 to 15
Communication	Hart

Table 13

Baud rate	1200~38400
Data length	8
Stop length	1
Odd/even check	without
Device address range	1 to 99
Communication	RS485

Table 14

Version number: ModBus-RCP516V-2. 0 ModBus communication command No. 4, read input register, high byte first					
Variables	Decimal address	Hexadecimal address	Data format	Format description	Description
Instantaneous flow rate	31001	0 × 03 E8	Float	4-byte floating point	
Cumulative flow rate	31003	0 × 03 EA	Float	4-byte floating point	
Instantaneous flow unit	31005	0 × 03 EC	Float	2-byte integer	Low byte
Cumulative flow unit	31006	0 × 03 ED	Float	2-byte integer	High byte
Instantaneous current	31007	0 × 03 EE	Float	4-byte floating point	
Instantaneous percentage	31009	0 × 03 F1	Float	4-byte floating point	
Instantaneous flow rate	31011	0 × 03 F3	Float	4-byte floating point	

9. Fault Analysis and Troubleshooting

9.1. Pointer Jittering

(1) Light jittering: typically caused by medium fluctuation. This issue can be mitigated by adding a damping device or extending the length of the straight pipe section.

(2) Moderate jittering: typically caused by the flow features of the medium. For gases, unstable operating pressure is the common cause. This can be resolved by using a pressure stabilizer, a flow-stabilizing rectifier, or by increasing the meter's gas damping.

(3) Violent jittering: primarily caused by medium pulsation, pressure stabilization, or lack of back pressure at the flowmeter outlet. To address this, pressure stabilization, flow stabilization, additional damping devices, or increasing back pressure at the instruments' outlet can be applied.

9.2. The Pointer Stuck at a Fixed Position

The main cause is the float getting stuck.

(1) This usually occurs when the valve is opened quickly, causing the float to shoot upward and strike the guide, which may result in deformation of the guide and jamming of the float. However, another possible cause is misalignment between the float guide and guide itself, which can also lead to jamming. The solution involves disassembling the instrument, removing the deformed director for reshaping, and ensuring it is concentric with the director rod. After reassembly, manually push the float to conform it moves smoothly without obstruction. Additionally, the rotameter must be installed strictly vertically or horizontally; any inclination may cause the float to jam and bring about measurement errors.

If the float stuck because of buildup or foreign objects inside the measuring tube, cleaning them up will be the solution.

9.3. Pointer Reaches Maximum Value When the Valve Is Open

The main reason is that the selected measuring range of the rotameter is too small; the solution is to set a larger range for the rotameter.

9.4. Great Measurement Error

(1) Improper Installation

- **For vertically installed instruments**: Ensure a perfectly vertical position with an inclination angle not exceeding 2°.
- **For horizontally installed instruments**: Ensure a perfectly horizontal position with an inclination angle not exceeding 2°.
- **Avoid magnetic interference:** There should be no ferromagnetic objects within a 100mm radius around the rotameter.
- **Proper installation location**: The installation position should be positioned away from valves, pipe diameter transitions, pump outlets, and pipeline bends. A straight pipe section of at least 5D before and 250mm after the rotameter is required for proper installation.

(2) Significant Variation in Liquid Density:

Before calibration, the medium's flow rate has been converted into the reference flow rate of water on the rotameter based on the density provided by the user. If the actual medium density changes significantly, it can lead to great measurement errors. The solution is to apply the updated density to the correction formula, calculate the correction factor, and multiply the measured flow rate by this factor to obtain the true flow rate.

(3) Temperature and Pressure Effects on Gases:

Gas flow measurements are highly affected by temperature and pressure fluctuations. It is recommended to use temperature and pressure compensation to obtain accurate flow readings.

(4) Components Loosening or Vibration:

- Cause: long-time operation and pipeline vibration may cause the rotameter's sensor magnet, pointer, or rotating magnet to loosen, resulting in great measurement errors.
- Solution: This can be verified by manually pushing the float
  - First, check if the pointer is at the RP position. If it is, confirm whether the output is 4mA and the flow display reads 0.
  - Gradually push the float to verify whether the pointer corresponds correctly to the scale markings.

- If discrepancies are found, adjustments must be made to the components' positions. These adjustments should be carried out by a qualified technician to prevent loss of position accuracy.
- If necessary, the instrument should be sent back to the manufacturer for recalibration.

(5)Viscosity Effects on Liquid Measurement:

If the displayed flow rate is significantly higher than the actual flow rate, the most likely reason is higher-than-expected liquid viscosity. This often happens when the correct viscosity is not provided during ordering. In such cases, the meter needs to be returned to the manufacturer for viscosity correction.

9.5. No Current Output

(1) First, check whether the wiring is correct.

(2) Check if the LCD display is functioning. If the display is working but there is no output, the output transistor may be damaged, requiring a circuit board replacement.

(3) Loss of calibration values: if the EEPROM malfunctions, the rotameter's calibration data may be lost, resulting in no current output, with the output remaining unchanged.

Solution: Attempt data recovery. If this does not work, set the data under password 2000, then set the data under password 2008. The method involves manually pushing the float to calibrate data from RP to 100%.

9.6. No On-Site Display

(1) Check whether the wiring is correct.

(2) Check whether the power supply is functioning correctly.

(3) Check whether the LCD module is damaged or has poor contact.

9.7. On-site LCD Displays 0 or Full Scale

(1) Check the 2008 password setting for the ZERO and SPAN values. The zero point must be smaller than the full-scale value, and the two values cannot be equal.

(2) Check whether the sampled data is being read correctly. Push the pointer manually and observe if the sampled value changes. If there is no change, the issue is likely a sampling circuit failure on the circuit board, requiring replacement.

9.8. Incorrect Alarm

(1) Check whether the deviation setting (d value) is too large.

(2) Check the alarm threshold set in SU.

(3) If the issue persists, the circuit board may be faulty and need replacement.

9.9. Incorrect Cumulative Pulse Output

(1) Check whether the selected cumulative pulse output alarm value is set to zero.

(2) Verify whether the pulse width setting is correct. The maximum pulse output frequency should be lower than the maximum frequency corresponding to the set pulse width (refer to Table 15).

(3) The circuit board is faulty and needs replacement.

Table 15

Pulse width setting	Pulse setting			
	0.001	0.01	0. 1	1
5ms	360/h	3600/h	36000/h	360000/h
10ms	180/h	1800/h	18000/h	18000/h
50ms	36/h	360/h	3600/h	36000/h

Under different pulse widths and pulse equivalents, the maximum range should be less than the corresponding hourly flow rate in the table.

9.10. Discrepancy Between On-Site LCD Display and PLC/DCS Readings

(1) Verify whether the 4-20mA output has been calibrated.

(2) Check whether the range settings in PLC/DCS match the engineering range upper and lower limits configured in SSC.

10. Product Accessories

10.1. Straight Pipe (Runs)

Users may opt for a 5DN (nominal pipe diameter) upstream straight pipe runs. A 250mm downstream straight pipe section is installed together with the flowmeter to ensure measurement accuracy.

10.2. Paired Flanges, Fasteners, and Gaskets

Paired flanges, fasteners, and gaskets are available according to the selected flowmeter flange standard (GB, HG, JB, ANSI, DIN, JIS).

10.3. Magnetic Filter

A magnetic filter is recommended when the medium contains ferromagnetic impurities or when installing the flowmeter for the first time. The magnetic filter is available in stainless steel and PTFE-lined types. Based on connection types, options include flange connection, clamp type, and integrated type. The customized structure may satisfy users' special needs.

Fig.31 Assembly 1

Fig.32 Assembly 2

① C-Type--flange connection, total length 100mm (for>DN100 diameters, total length 1500mm)

② S-type--clamp connection, total length 5mm (≤ DN100)

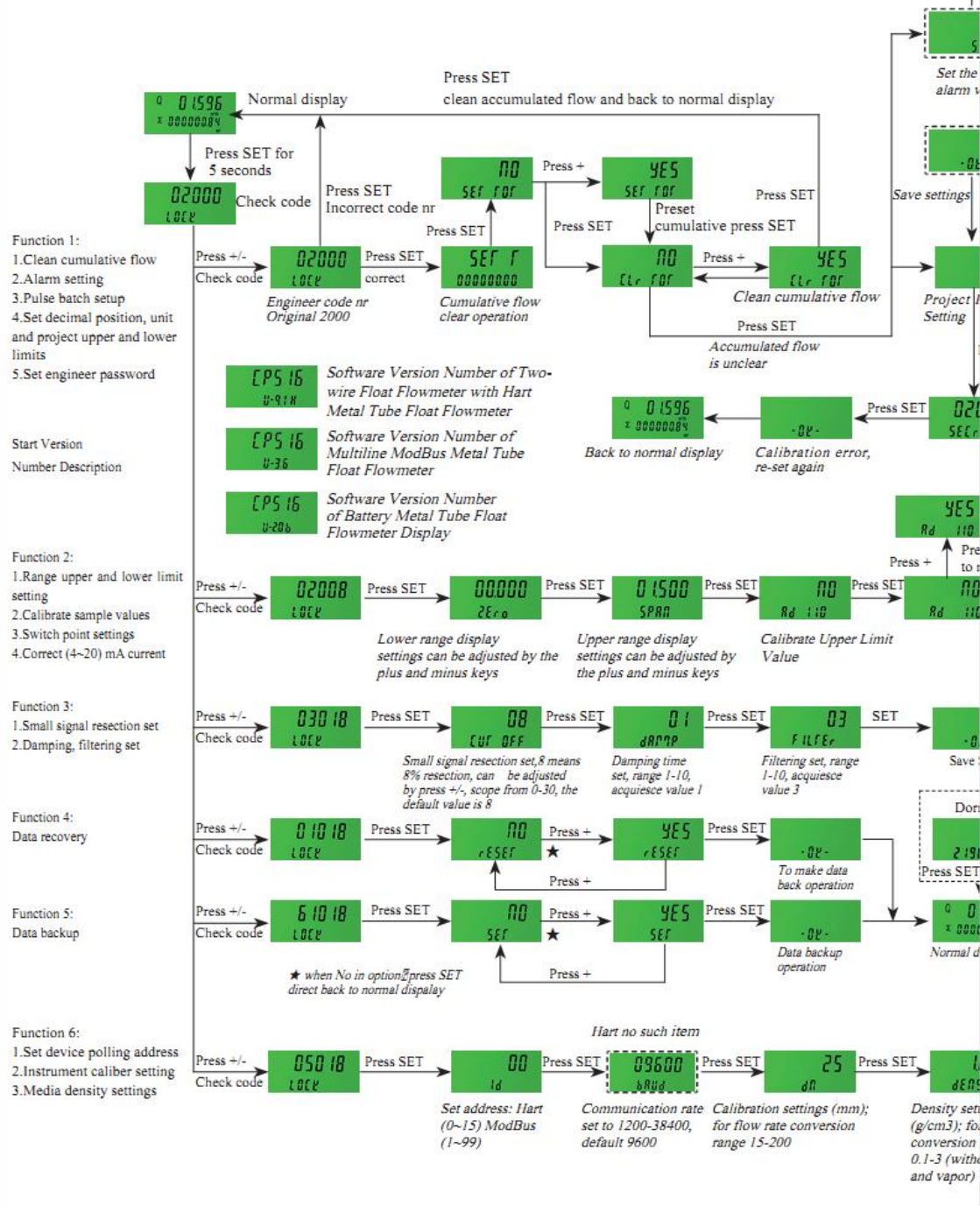
10.4. Batteries

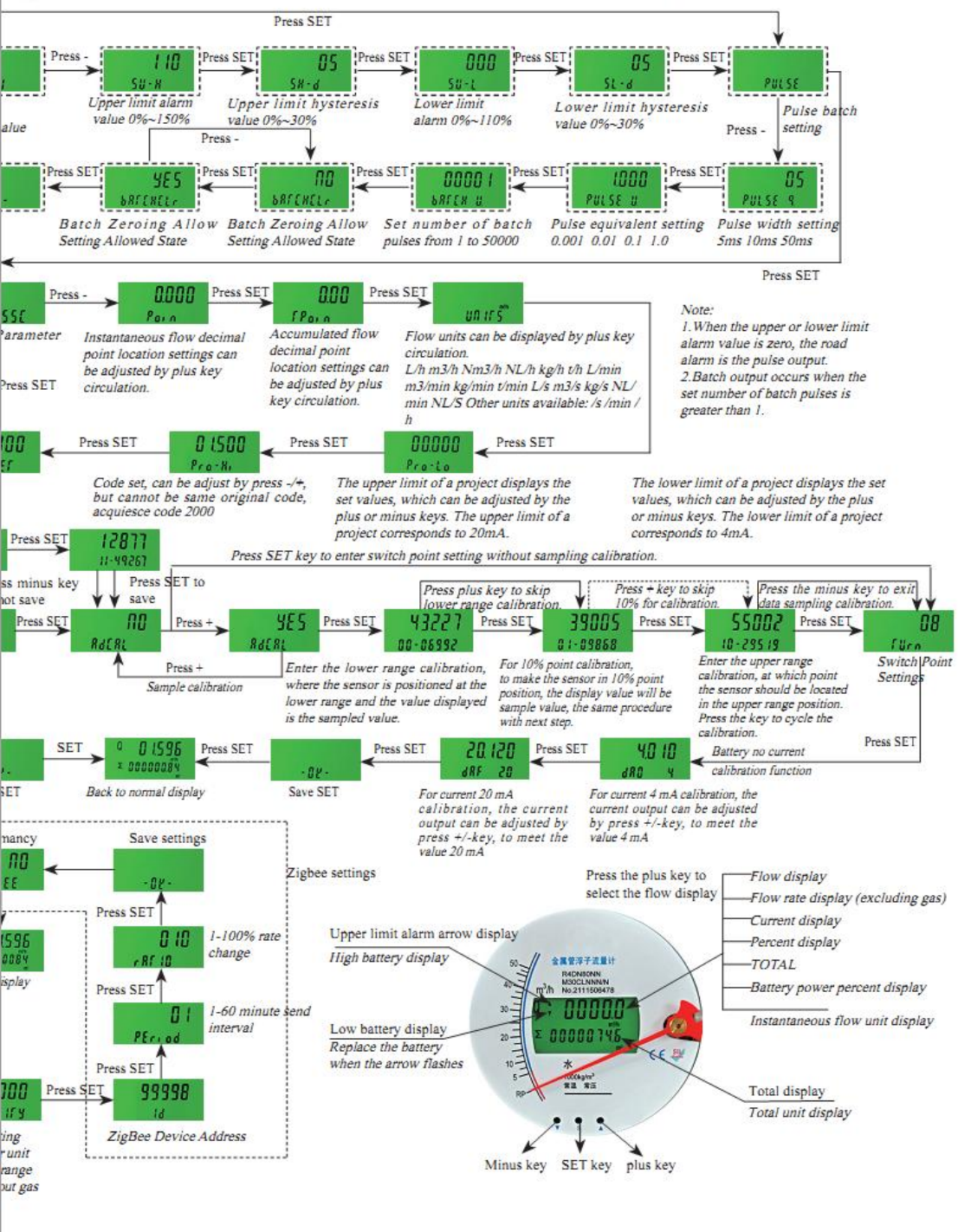
For battery-powered flowmeters, when the power level is low, a BAT-9AH battery can be provided, with the procurement model ATT5-B.

10.5. ModBus, Hart Protocol Modem, and Host Software

The ModBus and HART protocol modem, along with host software, enables communication and debugging of field instruments via a computer.

Appendix A: Operation Instructions of Smart Metal Tube Rotameter Software




Press SET
Press -
110
SH-H
Upper limit alarm value 0%~150%
Press SET
05
SH-d
Upper limit hysteresis value 0%~30%
Press SET
000
SH-L
Lower limit alarm 0%~110%
Press SET
05
SL-d
Lower limit hysteresis value 0%~30%
Press SET
PULSE
Pulse batch setting
Press -
05
PULSE 9
Pulse width setting 5ms 10ms 50ms
Press SET
1000
PULSE U
Pulse equivalent setting 0.001 0.01 0.1 1.0
Press SET
00001
bAtCH U
Set number of batch pulses from 1 to 50000
Press SET
no
bAtCHCLr
Batch Zeroing Allow Setting Allowed State
Press SET
YES
bAtCHCLr
Batch Zeroing Allow Setting Allowed State
Press SET
Press -
0000
Instantaneous flow decimal point location settings can be adjusted by plus key circulation.
Press SET
000
Accumulated flow decimal point location settings can be adjusted by plus key circulation.
Press SET
Flow units can be displayed by plus key circulation.
L/h m3/h Nm3/h NL/h kg/h t/h L/min m3/min kg/min t/min L/s m3/s kg/s NL/min NL/S Other units available: /s /min / h
Note:
1.When the upper or lower limit alarm value is zero, the road alarm is the pulse output.
2.Batch output occurs when the set number of batch pulses is greater than 1.
Press SET
00000
Pro-Lo
The lower limit of a project displays the set values, which can be adjusted by the plus or minus keys. The lower limit of a project corresponds to 4mA.
Press SET
01500
Pro-Hi
The upper limit of a project displays the set values, which can be adjusted by the plus or minus keys. The upper limit of a project corresponds to 20mA.
Press SET
Code set, can be adjust by press -/+, but cannot be same original code, acquiesce code 2000
Press SET
12877
Press SET key to enter switch point setting without sampling calibration.
Press SET to save
Press plus key to skip lower range calibration.
Press + key to skip 10% for calibration.
Press the minus key to exit data sampling calibration.
no
RdCAL
Press +
YES
RdCAL
Press SET
43227
00-06892
Enter the lower range calibration, where the sensor is positioned at the lower range and the value displayed is the sampled value.
Press SET
39005
01-09868
For 10% point calibration, to make the sensor in 10% point position, the display value will be sample value, the same procedure with next step.
Press SET
55002
10-23519
Enter the upper range calibration, at which point the sensor should be located in the upper range position. Press the key to cycle the calibration.
Press SET
08
FUnc
Switch Point Settings
Press +
Sample calibration
SET
01596
00000084
Back to normal display
Press SET
-0Y-
Save SET
Press SET
20.120
dAC 20
For current 20 mA calibration, the current output can be adjusted by press +/-key, to meet the value 20 mA
Press SET
4.010
dAC 4
For current 4 mA calibration, the current output can be adjusted by press +/-key, to meet the value 4 mA
Battery no current calibration function
Save settings
-0Y-
Zigbee settings
Press SET
010
1-100% rate change
Press SET
01
1-60 minute send interval
Press SET
99998
Id
ZigBee Device Address
Press the plus key to select the flow display
Flow display
Flow rate display (excluding gas)
Current display
Percent display
TOTAL
Battery power percent display
Instantaneous flow unit display
Upper limit alarm arrow display
High battery display
Low battery display
Replace the battery when the arrow flashes
Total display
Total unit display
Minus key
SET key
plus key