Metal Tube Variable Area Flowmeter

Model AVF250 Series

Operation Manual

ALIA TECHNOLOGY LLC
633 W. 5th Street, 26th Floor, Los Angeles, CA 90071, USA
TEL : +1 - 213 - 533 - 4139 FAX : +1 - 213 - 223 - 2317
URL : http://www.alia-inc.com
e-mail : alia@alia-inc.com
OP250.1.1.7Z.R8ENG■

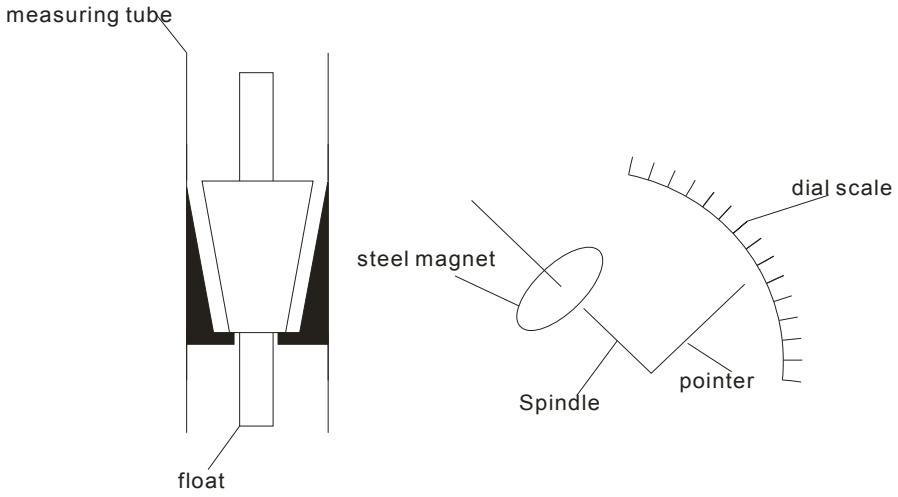
Index

1. Overall Check

A. Check the overwrap first. If any damages occur, please contact ALIA Customer Service Center at once.
B. Confirm whether the instrument has been damaged or its spares are lost.
C. It's recommended that you read the manual thoroughly, once you have any quires, please email or fax to ALIA technical department.
D. Ensure all the specifications of received instrument are in a normal state.
E. Power on to check whether the LCD screen operates normal.
F. Proper installation is required.
G. Move flowmeter and mount it into pipeline under installation instructions.
H. Connect wires and specially attention on whether they have been shielded or grounded.
I. Power on and check whether there is any current leakage (mind your own safety), then observe whether it is displaying any flow rate. If it doesn't, please follow steps above again, particularly on wiring, power supply and grounding. If problem remains, please contact ALIA Technical Support center or local agent.

2. Measuring Principle

The metal tube variable area flowmeter is composed of the following two parts:
Sensor----measuring tube and float
Signal transmitter------indicator



The built-in magnet steel generates magnetic coupling from inside to outside with outside magnet steel of measuring tube's mechanical pole. When flow rate changes, the built-in magnet will move up and down with changes of float, bringing in displacement of outside magnet. Then the inner shaft will be rotated and thus float's straight displacement is changed into shaft's angle displacement.
With capacitor's angle displacement, sensor's angle change is turned into capacitor's change. And then capacitor value's change is turned into voltage signals by signal processing circuit, finally showing medium's flow rate from output signal amplitude.

Volume Flow Rate: $Q = A_0 \nu = \alpha A_0 \sqrt{\frac{2gV_f(\gamma_f - \gamma)}{A_f \gamma}}$

In formula:

A_0 ——Annular flow area between the float and the tube wall; Suppose the cone's radius at float position h is R, float's max. radius is r and cone angle is φ, then:

$A_0 = \pi(R^2 - r^2) = \pi(2hrtg\varphi + h^2 tg^2\varphi)$

ν ——Velocity

α ——Flow rate coefficient $\alpha = \sqrt{\frac{1}{C}}$, C: Drag coefficient, drag from fluid on float $F = CA_f \frac{\gamma V_f^2}{2g}$

g ——Gravity acceleration

V_f ——Float volume

γ_f ——Float weight

A_f ——Float's max. cross-sectional area

γ ——Medium weight

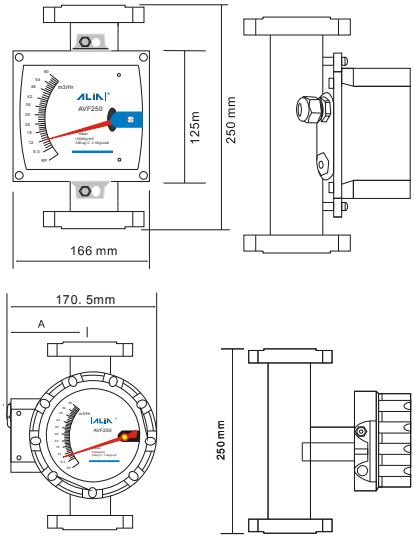
3. Features

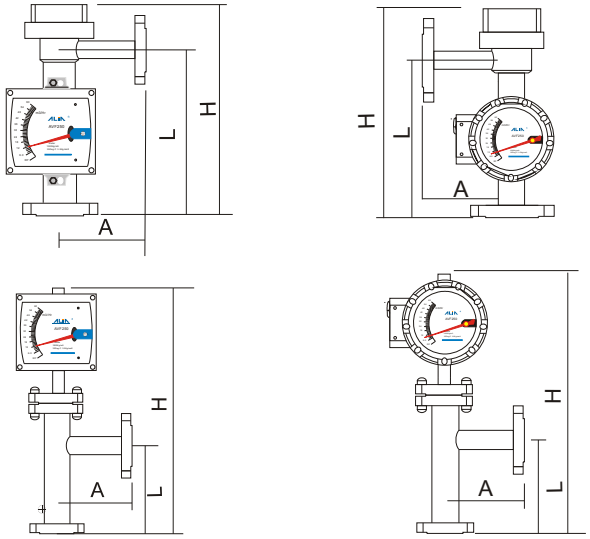
- 5-digit flow rate&8-digit totalizer
- Local indication without auxiliary power
- 4-20 mA and scale pulse output
- Low pressure loss in gas and steam application
- Damper for gas/steam application
- Constant overall length
- Heating jacket design, preventing fluid solidification
- Intrinsically safe&explosion proof for hazardous area

4. Specification

- Size (mm) : 15,20,25,40,50,65,80,100,125,150,200
- Measuring Range : Liquid - 1 to 200000 Liter/Hr
  Gas - 0.03 to 3000 M3/Hr
  Steam - 6.4 to 267,000 Kg/Hr
- Turndown Ratio : 10:1 (20:1 Optional)
- Accuracy : +/-1.6%(Standard)
  +/-1.0%(Optional)
- Repeatability : +/-0.5% of reading
- Material : Stainless Steel 304
  Stainless Steel 316
  Stainless Steel 316L
  Stainless Steel +PTFE Liner
- Standard Pressure : 40 Kg/cm2 (15mm ~ 50mm)
  16 Kg/cm2 (65mm ~ 200mm)
- Temperature : -20 ~ +200 ^{O}C (Standard)
  -25 ~ +100 ^{O}C (LCD Display)
  0 ~ +80 ^{O}C (PTFE Liner)
  -80 ~+400 ^{O}C (Optional)
- Flange Type : JIS 10K / JIS 20K / JIS 40K
  ANSI 150# / ANSI 300# / ANSI 600#
  DIN PN 10 / PN 16 / PN25 / PN 40
- Fluid Viscosity : 15m ~ 20 mm < 30 CP
  25mm ~ 125 mm <250 CP
  150mm ~ 200mm < 300 CP
- Local display : Mechanical Indicator (Standard)
  Digit Display : 5 digit Flowrate
  8 digit Tantalizer
- Current output : 4-20 mA (2 wire)
  Load : 600 Ohm
- Pulse output : General Pulse
  Rating : 3 to 30VDC, Max:100mW
- Data Storage : Operation parameters and totalizer figures are stored by EEPROM for more than 10 years
- Alarm output : 2 point (Open collector)
  Rating : 3 to 30Vdc, 100mA Max.
- Keyboard : 3 keys from internal for programming and display control.
- Ambient temperature : -25 to +60 ^{O}C
- Protection class : IP 65
  Intrinsically Safe, Eex ia IIC T5
  Explosion Proof, Ex d IIB T6
- Housing Material : Aluminum Alloy
- Cable entry : M20 * 1.5 Option: 1/2''NPTF
- Pressure Drop : 0.07 ~ 0.7 Kg/cm2
- Power supply 12 ~ 32VDC (2-wire 4-20 mA)
  Ni-MH Battery(3 years working hours)

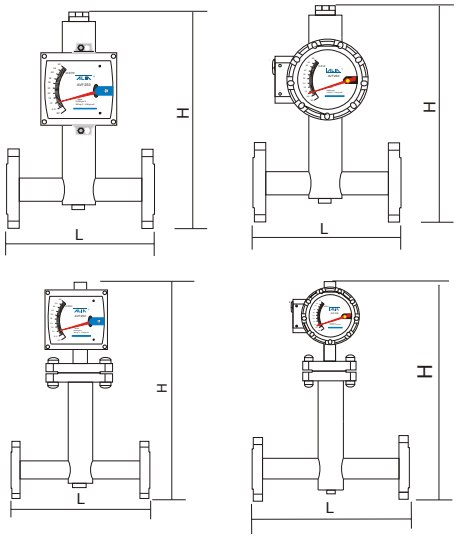
5. Dimensions and Pressure Loss

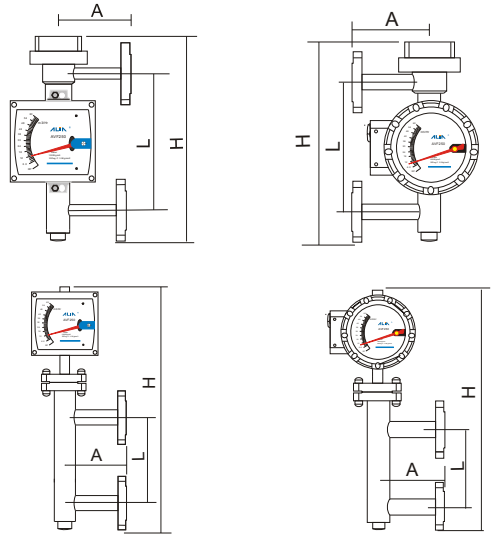




BT (Bottom - Top)			
Size mm	A mm	Weight Kg	∆ P mber
15	108	3.7	140
25	99	5.6	190
50	84	9.7	230
80	71	15	330
100	61	17	420
150	42	34	600
200	12	49	700

BR (Bottom - Top Side)					
Size mm	H mm	L mm	A mm	weight Kg	∆ P mbar
15 mm	330	250	120	7.0	180
25 mm	340	250	120	8.0	220
50 mm	560	250	120	15	280
80 mm	575	250	150	25	350
100 mm	590	250	150	29	450
150 mm	690	300	180	53	580
200 mm	780	350	200	61	700



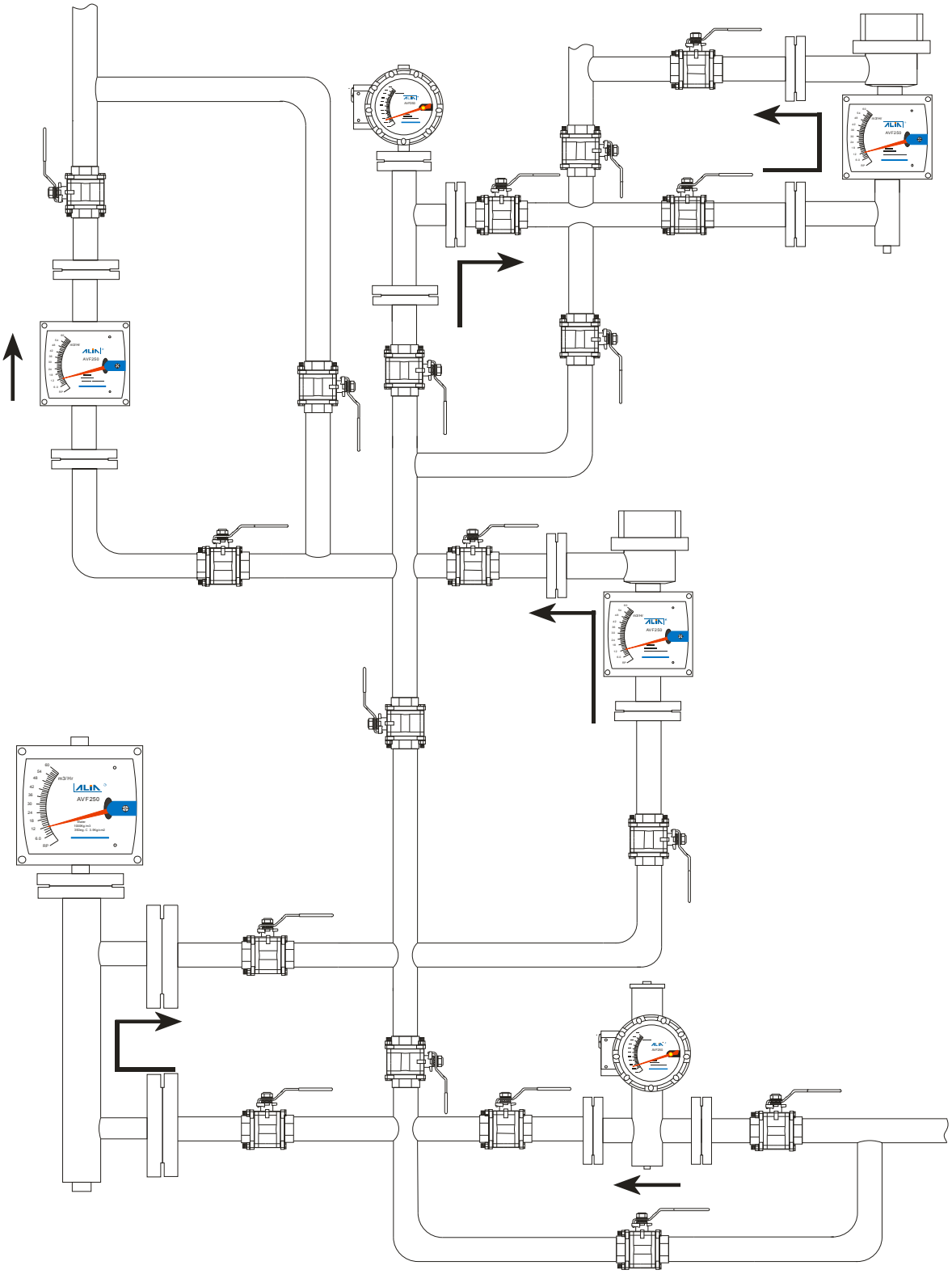


LR / RL (Horizontal)				
Size	H	L	weight	∆ P
mm	mm	mm	Kg	mbar
15	355	250	7.5	300
25	370	250	9	350
50	643	250	18	400
80	690	400	29	450
100	720	400	35	500
150	793	500	60	630
200	970	550	73	850

RR (Bottom Side - Top Side)					
Size mm	H mm	L mm	A mm	weight Kg	∆ P mbar
15	380	250	120	7.2	200
25	400	250	120	8.7	280
50	643	250	120	16.6	360
80	675	250	150	28.2	450
100	700	250	150	33.5	580
150	832	300	180	58	630
200	950	350	200	68	700

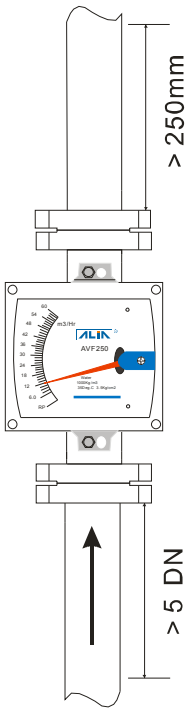
6. Installation

6.1 Scheme

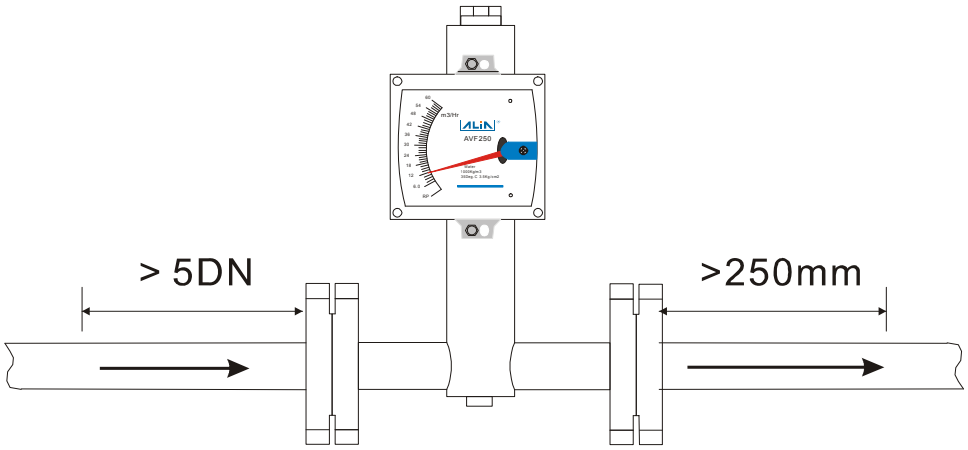


6.2 Straight Pipe Requirement

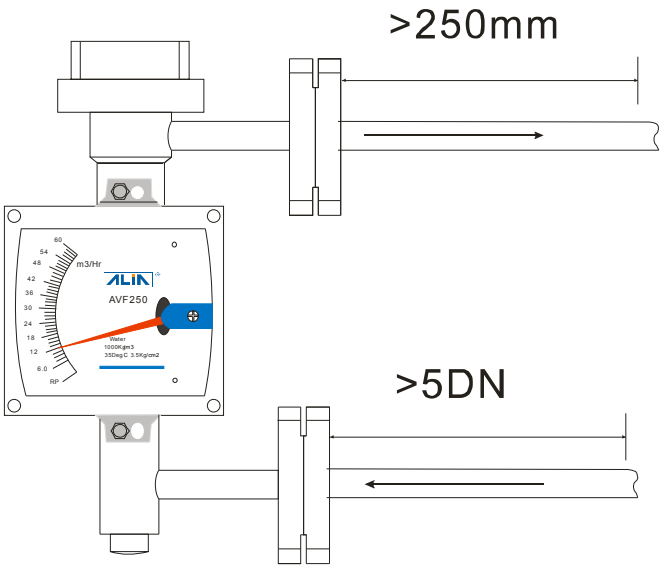
Proper place is vital to flowmeter installation; otherwise flowmeter's accuracy will be influenced or even get damaged.



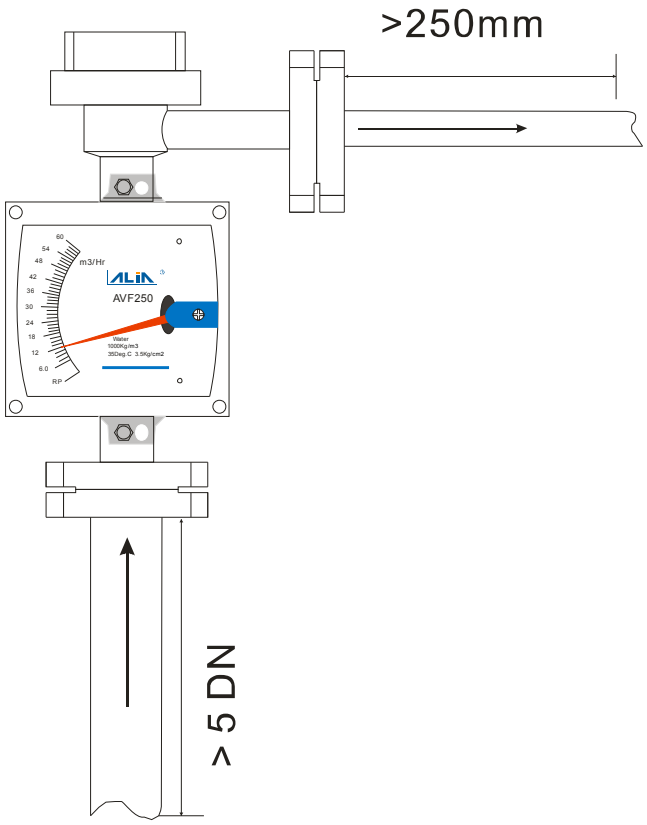
Bottom-Top



Horizontal



Bottom Side – Top Side



Bottom - Top Side

7. Size Calculation

7.1 Method

1) Qs=K×Q

Among:

Qs-flow rate of calibrated medium (water or air) under standard condition (20°C，1atm)

Q-flow rate of user's medium

K-correction factor

2) Based on the Qs, check flow table (page 2 in datasheet) to choose float and measuring tube's size. The flow data in table are both under standard condition of air or water.

7.2 Correction factor K

For liquid medium:

a. If Q is volume flow rate, formula will be as below:

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

b. If Q is mass flow rate, formula will be as below:

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

Among:

ρ_s: density of chosen float (g/cm3)

ρ: density of measured medium

density of stainless steel float is 7.8

density of PTFE float is 3.4

density of Hastelloy is 8.3

For air medium:

a. if Q is volume flow rate under standard condition (20°C，0.1013Mpa), formula will be as below:

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

b. if Q is volume flow rate under operation condition, formula will be as below:

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

c. if Q is mass flow rate of air, formula will be:

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

Among:

ρ: the density of measured gas under condition of 20°C and 0.1013Mpa (kg/m3)

P: the absolute pressure of measured gas (MPa)

T: the absolute temperature of measured medium (K)

ρ_0: the density of air under 20℃ and 0.1013Mpa (1.205kg/m3)

P_0: the absolute pressure of calibrated medium (0.1013Mpa)

T_0: the absolute temperature of calibrated medium (293.15K)

d. Auxiliary formula:

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

Among:

ρ: the density of measured gas under 20°C and 0.1013Mpa (kg/m3)

Pt: the density of measured gas under operation condition (kg/m3)

Tt: the absolute temperature of measured gas under operation condition (K)

Pt: the absolute pressure of measured gas under operation condition (MPa)

P_0: the absolute pressure of measured gas under standard condition (MPa)

T_0: the absolute temperature of measured gas under standard condition (K)

For steam medium:

If AVF250 is to measure saturated steam, formula will be:

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

Among:

Qs: water's flow rate
ρ: steam's density under operation condition (kg/m3)
M: steam's flow rate (kg/h)

Choose flowmeter from Qs (water's flow rate) after calculating as formula above. This formula is derived by taking float's density as 7900kg/m3. If float's density changes, the factor in formula have to change as well.

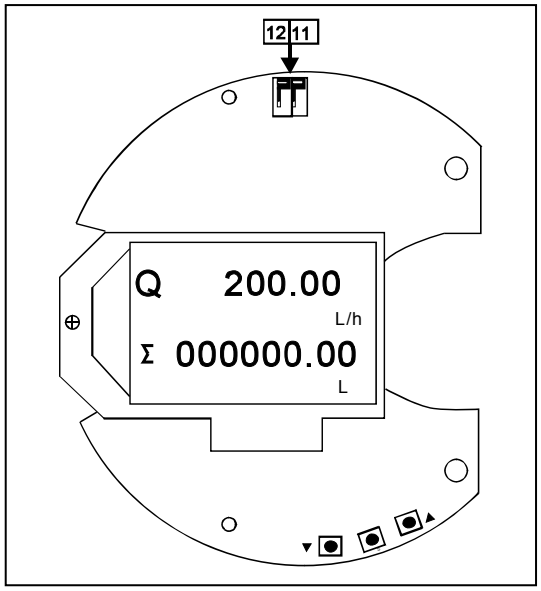
8. Installation Considerations and Maintenance

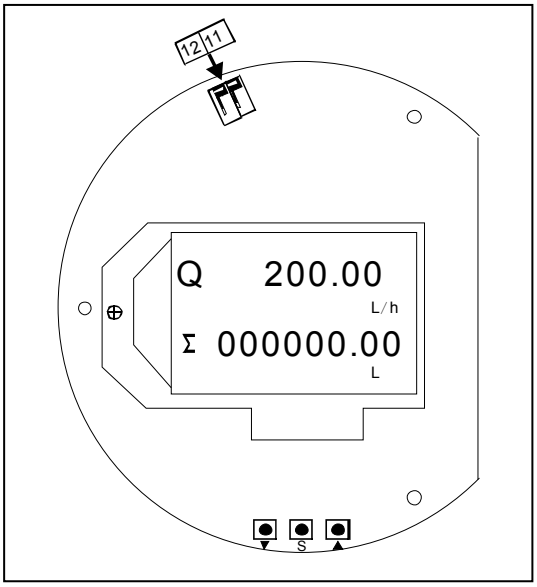
(1) Before installation, please sweep the process pipe first so as to avoid any magnetic particles remained inside pipe as it will influence flowmeter's performance or cause damage to flowmeter due to adhesion onto flowmeter. If it's unavoidable, please install filter before flowmeter's inlet.
(2) The installation can be vertical and horizontal. If vertical, its centerline should not deviate more than 2°. If horizontal, its horizontal centerline should not deviate more than 2°.
(3) The size in upstream pipe and downstream pipe should be the same with that of flowmeter, so does the connecting flange with flowmeter's flange. And straight pipe distance of upstream should be the 5 times of flowmeter's size; straight pipe distance of downstream should be more than or equal to 250mm. Please see page 7 for more details.
(4) As this flowmeter's signal is transmitted by magnetic coupling, to ensure flowmeter's performance, there shouldn't be magnetic objects around, at least 10cm away.
(5) If measuring gas in the pipe, gas should not be drained directly from flowmeter's outlet. Otherwise there will be pressure drop in float which in return will distort data. Thus a valve should be installed around the flowmeter's outlet, turning it down slowly during operation.
(6) Flowmeter that has been installed onto pipe should not be influenced by stress. There should be suitable pipe holding at flowmeter's inlet and outlet, making this flowmeter staying in a min. stress state.
(7) When you are installing flowmeter that has PTFE liner, please install very carefully, because PTFE will be deformed because of pressure influence. So do not tighten the flange screws excessively.
(8) After long time's use, if too many impurities inside pipe, the float will be jammed, or accuracy will not be certain. So it's necessary to clean flowmeter's measuring tube regularly. If magnetic filter has been installed at the inlet of flowmeter, it has to be cleaned regularly too.
(9) For first-time installation, please keep the 2 points in mind below:
Liquid measurement: when you are about to open valve, please slowly open it to avoid sudden shock damage of water column to flowmeter if the valve is opened suddenly.
Gas measurement: do not pressurize pipe before opening the valve. If valve opened suddenly, the float will rocket to stopper and then flowmeter will be damaged probably. So please open valve in a slow way. To measure gas, it's better for you to install an air damper device to minimize the shock from float.
(10) If explosion-proof flowmeter's housing needs to be opened at site for maintenance, please turn off the power first.
(11) For the flowmeter that has liquid crystal screen, please don't let it be exposed to the direct sunlight as it may reduce its life.
(12) When to measure medium of low temperature, heating job should be done if heating jacket is not ordered.
(13) Before connection, please confirm power supply, output and correct terminals of power and signal in circuit board so as to avoid damage due to wrong connection.

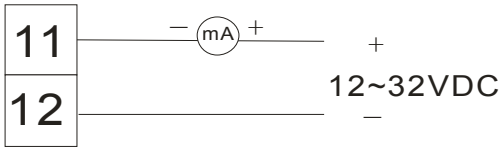
9. Wiring Diagram

This flowmeter adopts 4-20mA output signal of 2-wire to other external equipment of device with power supply 12~36 VDC. The maximum load resistance to output circuit is 600Ω (including resistance of cable).
Generally, it's recommended to use PVC shielded cable that resists 600V. If the environment is easily to be interfered by noises of equipments, please use 2-core shielding cable (RWP2×0.5mm) with one of its terminals connecting to grounding screw of flowmeter's housing and another to the ground. Use special shielding cable that resists high/low temperature if application temperature is too high or too low.

9.1 4-20mA Output (2-wire)

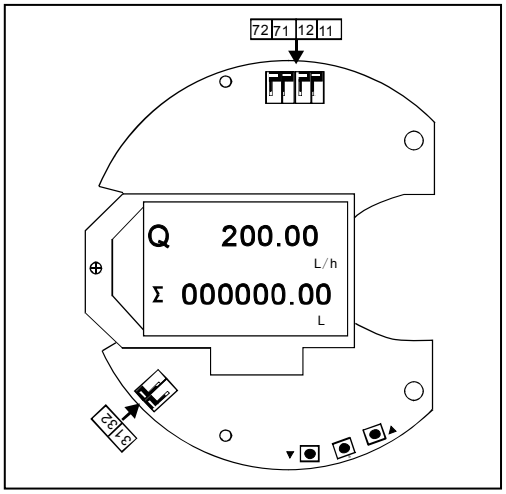


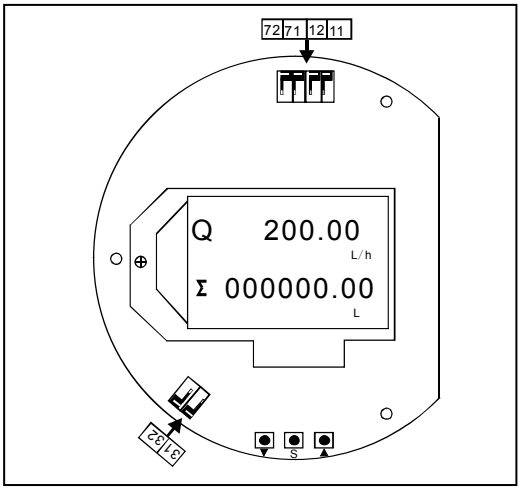


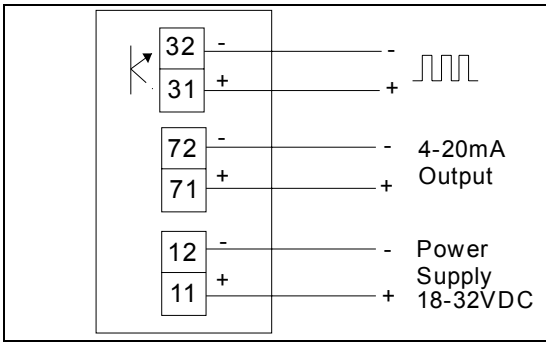


Pin **11**,**12** : 4-20 mA(2 Wire)
12~32VDC Power Supply

9.2 4-20mA + Pulse Output

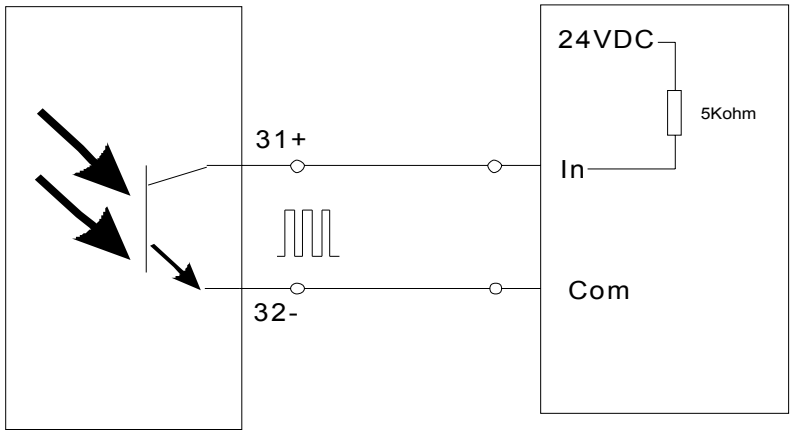






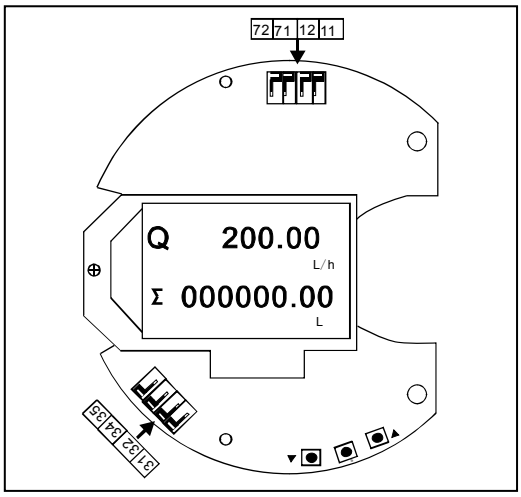
Pin **11,12** : Power Supply:18~32VDC
Pin **71,72** : 4-20mA Output
Pin **31,32** : Pulse Output
Pulse Width : 50 mS
Outer Voltage : 3~30VDC Max.:100mW

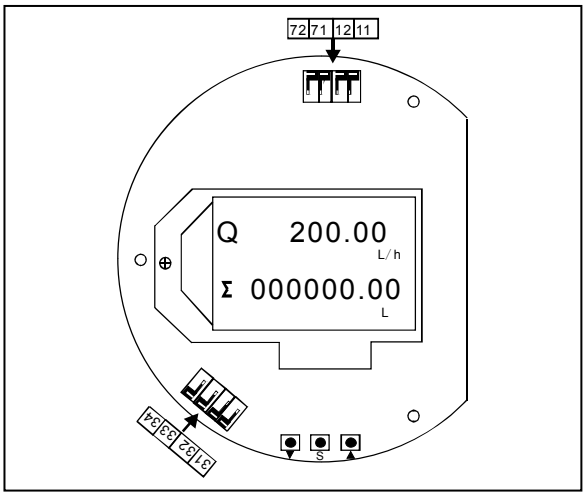
9.3 Pulse Connection

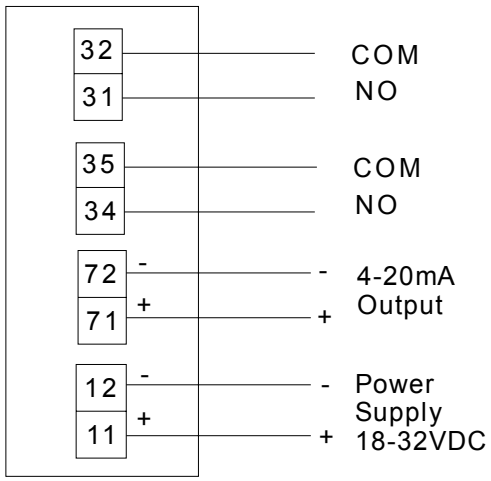


Flow meter terminal

9.4 Alarm

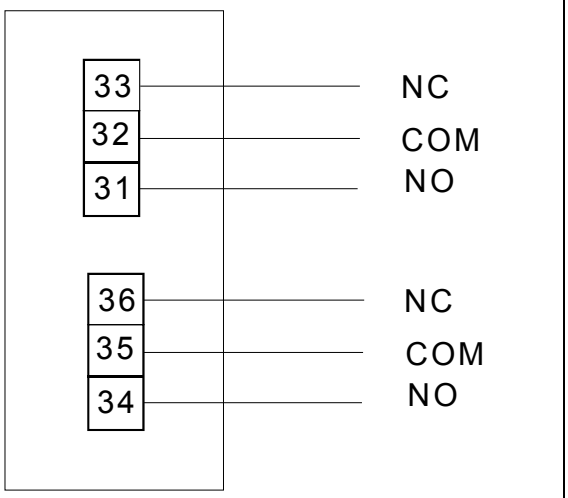






Pin **11,12** : Power Supply:18~32VDC
Pin **31,32,** : H Alarm Output
Pin **34,35,** : L Alarm Output
Pin **71,72** :4-20mA Output

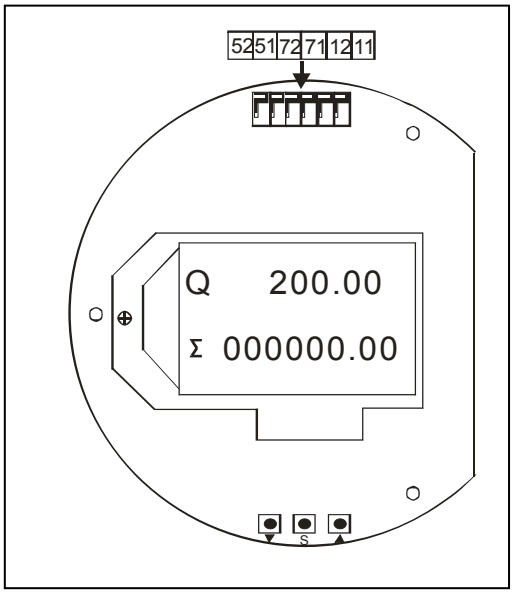
9.5 Local Indicator_ Reed Switch Alarm

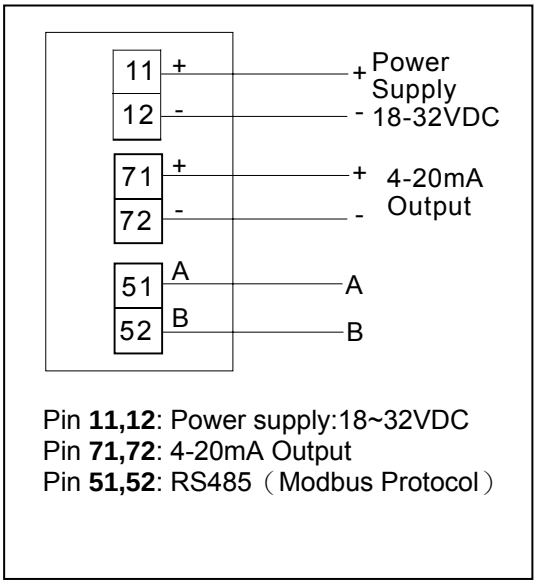


Pin **31,32,33 :**H Alarm
Pin **34,35,36** : L Alarm

Rating:1A@30VDC

9.6 RS485 Modbus Protocol





Pin **11,12**: Power supply:18~32VDC
Pin **71,72**: 4-20mA Output
Pin **51,52**: RS485（Modbus Protocol）

Baud rate, Data length, Stop bit and Parity can not be changed. They are default. User can only change Address, the password is 5018.

Baud rate	9600
Data length	8
Stop bit	1
Parity	None
Address	1~99
Communication	RS485 RTU

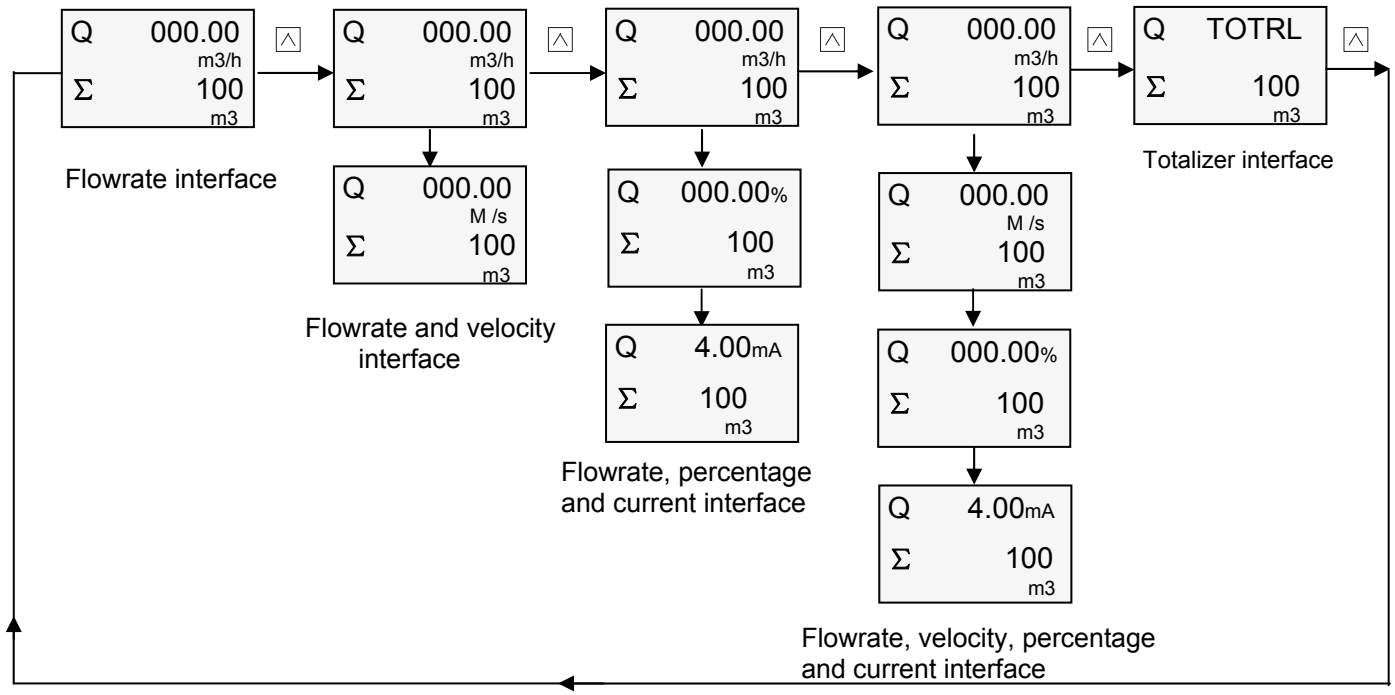
Modbus table

AVF250 Modbus Table						
NO.	Content	Data Type	Address	Length	Read	
1	Flow Rate	float	Ox03E8	Ox0002	04	
2	Totalizer	float	Ox03EA	Ox0002	04	
3	Current	float	Ox03EE	Ox0002	04	
4	Percentage	float	Ox03F1	Ox0002	04	
5	Velocity	float	Ox03F3	Ox0002	04	
6	Unit of flow rate	Short	0x03EC	Ox0002	03	0:L/h 1:m3/h 2:Nm3/h 3:NL/h 4:kg/h 5:t/h 6:L/min 7:m3/min 8:kg/min 9:t/min10:L/s 11:m3/s 12:kg/s 13: /s 14:/min 15:/h
7	Unit of totalizer	Short	0x03ED	Ox0002	03	0: L 1:m3 2: Nm3 3:NL 4:kg 5: t

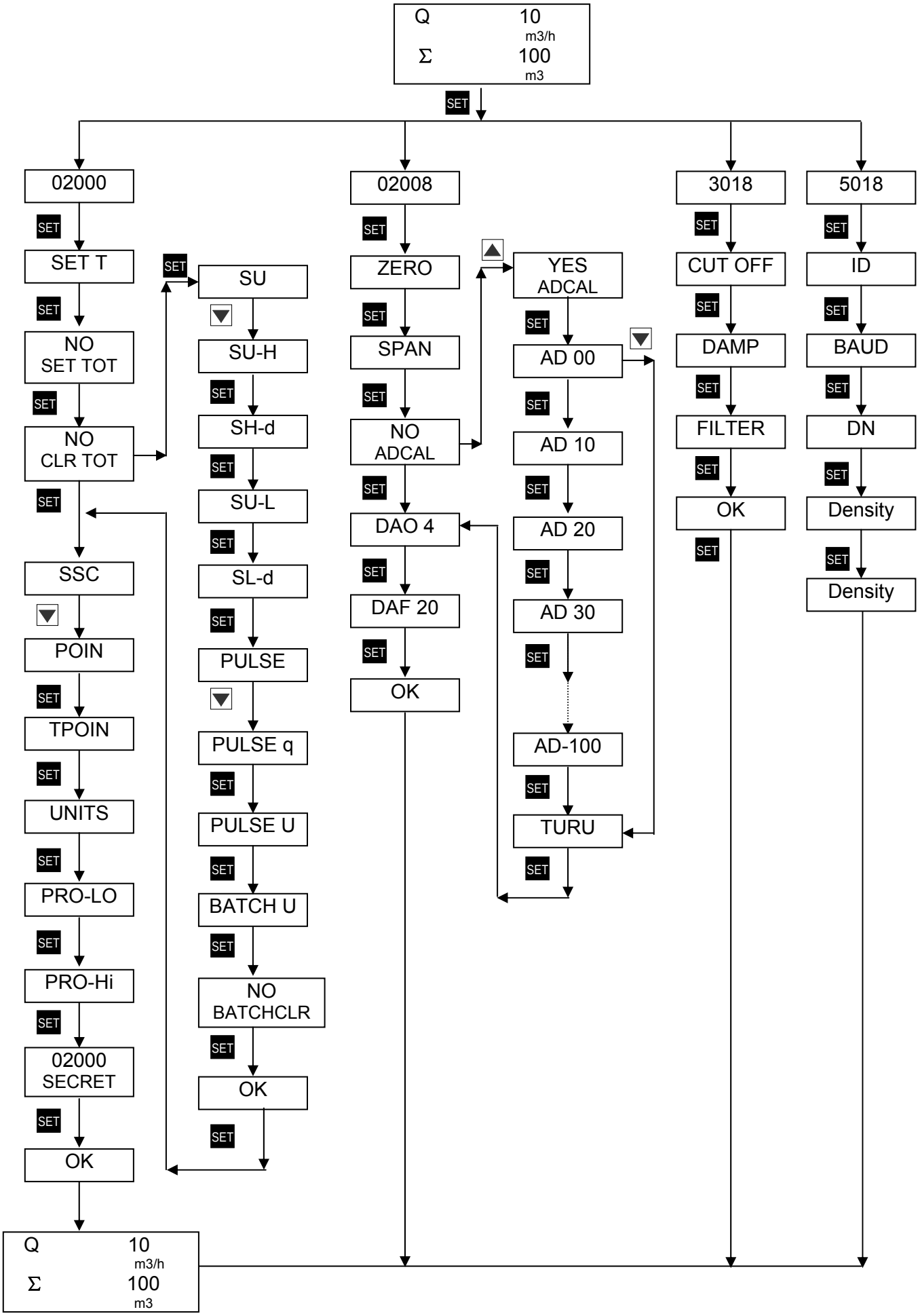
10. Keypad

Key Name	Button	Basic Function	Setting Function
▲	▲	Enter parameter setting	Save data
S	S	Data setting interface	Increase number & Save data
▼	▼	Indicate data setting interface	Digit shift & Decimal point shift

10.1 Display Interface



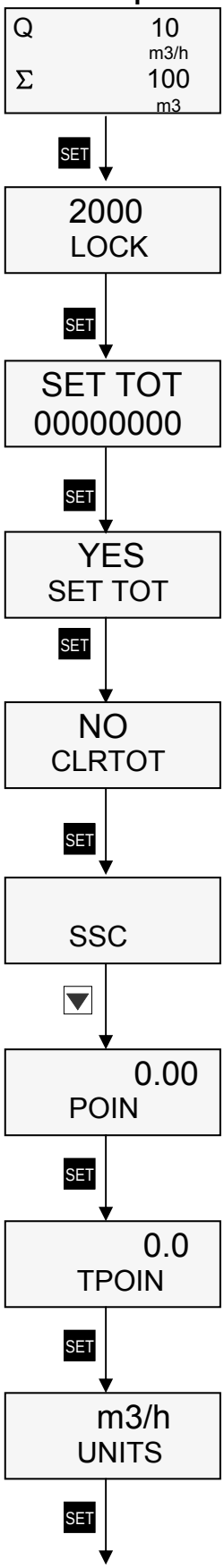
11. Operational Flowchart



12. Operation and Settings

12.1 General Settings

4-20mA output can only be set by keys.



Input Password
Press ▲ ▼ to change value and press SET to next setting.
Password: 2000

Preset Totalizer
Preset totalizer as required.
Press ▲ ▼ to change value and press SET to next setting.

Preset Totalizer
Press ▲ ▼ to choose “YES” to preset totalizer and choose “NO” to deny.
If press SET button directly, it will skip to next setting instead of preset totalizer. .

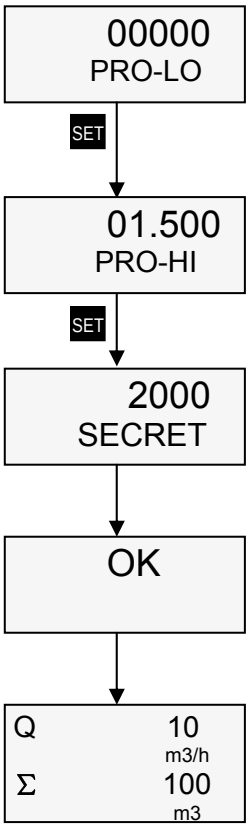
Reset Totalizer
Press ▲ ▼ to choose “YES” to reset totalizer to 0 and return to normal display.
Choose “NO” and press SET to next setting.

Parameter Setting
Press ▼ to enter parameter setting.
Press SET to skip to “SECRET” setting window.

Flow Rate Decimal Point Adjustment
0, 1, 2 and 3 are optional.
Press ▲ to change decimal point position, and press SET to next setting.

Totalizer Decimal Point Adjustment
It is limited by the decimal point of flow rate. For example, if flow rate with two decimal places, totalizer can set up to 2 decimals.
Press ▲ to change decimal point position, and press SET to next setting.

Unit Setting
Press ▲ ▼ to change flow unit. Options: 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. Other options: /s, /min, /h.

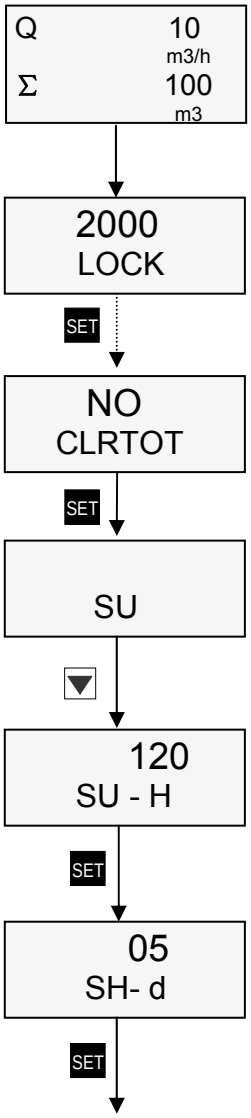


The Corresponding Value of 4mA Output
Press ▲ ▼ to change value. This value corresponds to 4mA output.
Press SET to next setting.

The Corresponding Value of 20mA Output
Press ▲ ▼ to change value. This value corresponds to 20mA output.
Press SET to next setting.

Password Modification
Original Value is 2000. Do not change it unless necessary.
Press ▲ ▼ to change value and press SET to next setting.

Alarm Output and Pulse Output Settings



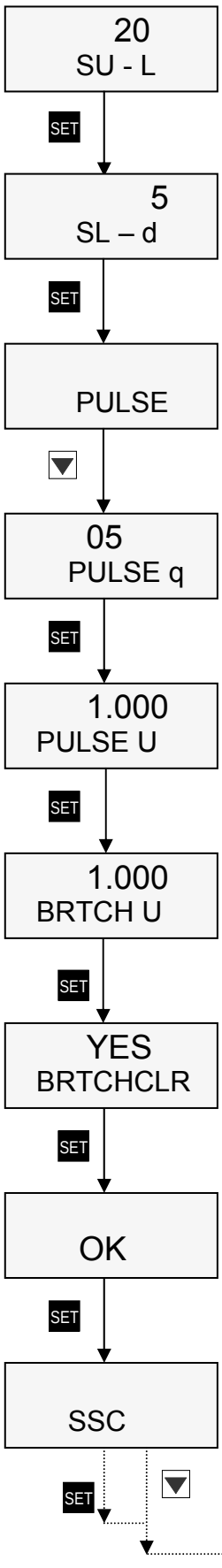
Input Password
Press ▲ ▼ to change value and press SET to next setting.
Password: 2000

Reset Totalizer
Press ▼ ▼ and choose “YES” to reset totalizer to 0 and return to normal display.
Choose “NO” and press SET to next setting.

Alarm Setting
Press ▼ to enter alarm setting.
Press SET to skip to” PULSE” setting window.

Alarm High Limit Setting
Press ▲ ▼ to set the upper limit value (setting range: 0%~150%), and then press SET to next setting.
When setting value is 0, the high limit terminal is the pulse output terminal.

Alarm High Limit Hysteresis Value
Press ▲ ▼ to change hysteresis value of alarm upper limit (setting range: 0%~30%), and then press SET to next setting.
E.g.: Alarm point is 80, above 85 is required. Range is 100, just set 5%.



Alarm Low Limit Setting

Press ▲ ▼ to set lower limit value (range: 0%~110%), and then press SET to next setting.

When setting value is 0, the low limit terminal is the pulse output terminal.

Hysteresis Value of Alarm Low Limit

Press ▲ ▼ to change hysteresis value of alarm low limit (setting range: 0%~30%), and then press SET to next setting.

E.g.: Alarm point is 20, under 15 is required. Range is 100, just set 5%.

Pulse Setting

Press ▼ to pulse setting.

Press SET to skip to “SSC” setting window.

Pulse Width Setting

Modify pulse width by pressing keys. It can be set to 5ms, 10ms or 50ms.

Scale Pulse Setting

Modify scale pulse by pressing keys. It can be set to 0.001, 0.01, 0.1 or 1.0. Totalizer unit corresponds to LCD totalizer unit.

Batch Pulse Setting

It’s used to batch control. Setting range: 1~50000. If choose 1that means pulse output. If it’s not 1 that means batch output. Suppose scale pulse is 1.0L/P. The number of batch pulse is 10 and the value of batch control is 10L.

Batch Clear

Press ▲ to choose “YES”, it can automatically clear batch totalizer. Choose “No” to deny.

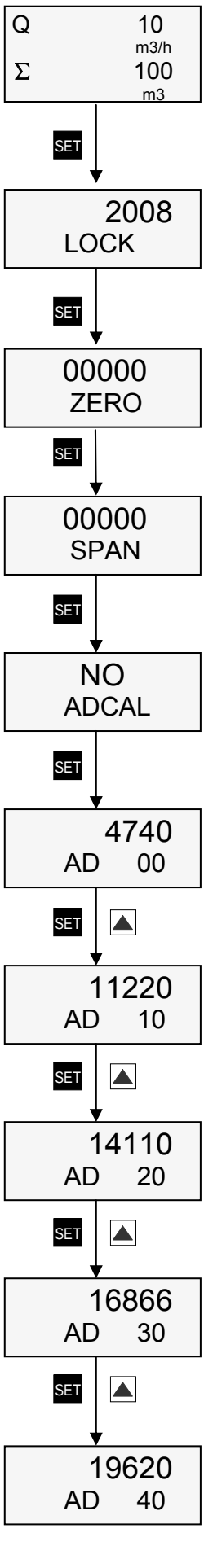
Display and Output Setting

Press ▼ to decimal point setting window.

Press SET to skip to “SECRET” setting window.

Please see page 15 for details.

12.2 Calibration Parameter Setting



Input Password
Press ▲ ▼ to change value and press SET to next setting.
Password: 2008.

Zero Point Adjustment
Default value is 0. It's used to calibrate lower range value. Please do not modify randomly.
Press ▲ ▼ to change value and press SET to next setting.

Full Scale Adjustment
Default value is the max. value pointer stays at. It's used to calibrate upper range value. Please do not modify randomly.
Press ▲ ▼ to change value and press SET to next setting.

Flowmeter Calibration
Press ▲ to choose "Yes" to enter flowmeter calibration, choose "NO" to skip to 4 mA calibration.
Please do not modify randomly, otherwise, instrument's accuracy will be affected.

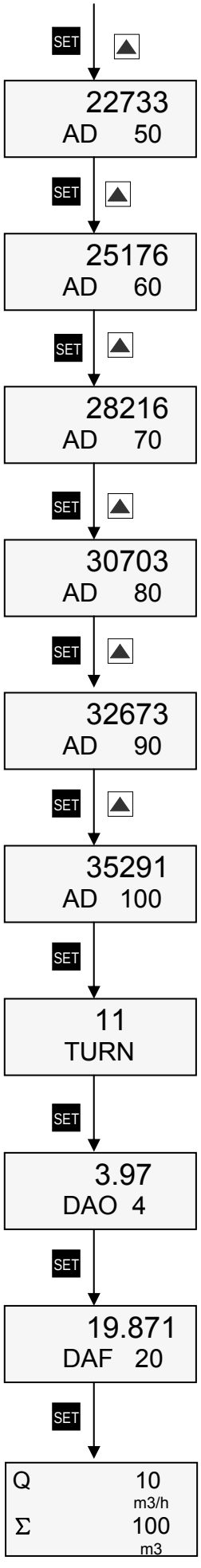
0% Flowrate Calibration (Please do NOT adjust this parameter randomly)
Adjust pointer to the location of RP, wait until value is stable and then press SET to next parameter.
Press ▲ to next parameter directly. Press ▼ to switch point.

10% Flowrate Calibration (Please do NOT adjust this parameter randomly)
Adjust pointer to the location of 10%, wait until value is stable and then press SET to next parameter.
Press ▲ to next parameter directly. Press ▼ to switch point.

20% Flowrate Calibration (Please do NOT adjust this parameter randomly)
Adjust pointer to the location of 20%, wait until value is stable and then press SET to next parameter.
Press ▲ to next parameter directly. Press ▼ to switch point.

30% Flowrate Calibration (Please do NOT adjust this parameter randomly)
Adjust pointer to the location of 30%, wait until value is stable and then press SET to next parameter.
Press ▲ to next parameter directly. Press ▼ to switch point.

40% Flowrate Calibration (Please do NOT adjust this parameter randomly)
Adjust pointer to the location of 40%, wait until value is stable and then press SET to next parameter.
Press ▲ to next parameter directly. Press ▼ to switch point.



50% Flowrate Calibration (Please do NOT adjust this parameter randomly)
Adjust pointer to the location of 50%, wait until value is stable and then press SET to next parameter.
Press ▲ to next parameter directly. Press ▼ to switch point.

60% Flowrate Calibration (Please do NOT adjust this parameter randomly)
Adjust pointer to the location of 60%, wait until value is stable and then press SET to next parameter.
Press ▲ to next parameter directly. Press ▼ to switch point.

70% Flowrate Calibration (Please do NOT adjust this parameter randomly)
Adjust pointer to the location of 70%, wait until value is stable and then press SET to next parameter.
Press ▲ to next parameter directly. Press ▼ to switch point.

80% Flowrate Calibration (Please do NOT adjust this parameter randomly)
Adjust pointer to the location of 80%, wait until value is stable and then press SET to next parameter.
Press ▲ to next parameter directly. Press ▼ to switch point.

90% Flowrate Calibration (Please do NOT adjust this parameter randomly)
Adjust pointer to the location of 90%, wait until value is stable and then press SET to next parameter.
Press ▲ to next parameter directly. Press ▼ to switch point.

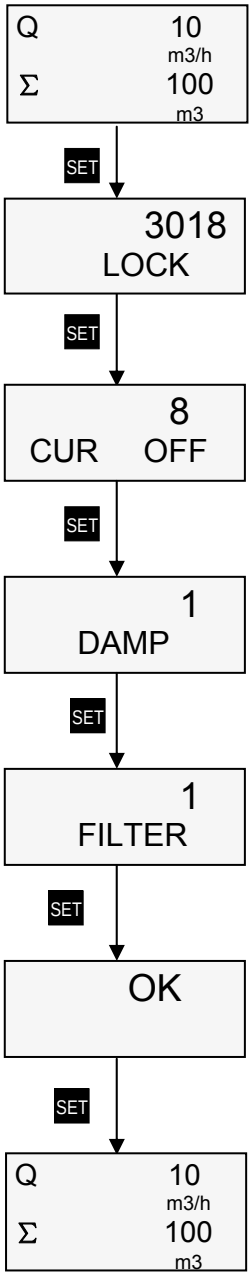
100% Flowrate Calibration (Please do NOT adjust this parameter randomly)
Adjust pointer to the location of 100%, wait until value is stable and then press SET to next parameter.
Press ▲ to next parameter directly. Press ▼ to switch point.

Switch Point Setting
The setting is reserved function. It's invalid for now .Default value is 11.
Press SET to next parameter.

4 mA Calibration
Measure the output with multimeter. If 4 mA value is higher or lower than standard value,
press ▲▼ to adjust it to 4mA and press SET to next parameter.

20mA Calibration
Measure the output with multimeter, If 20 mA value is higher or lower than standard value,
press ▲▼to adjust it to20mA and press SET to skip to normal display.

12.3 Other Parameter Settings



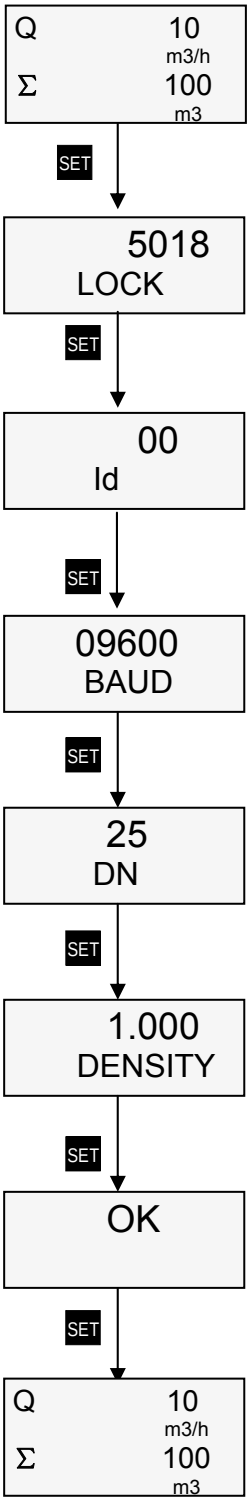
Input Password
Press ▲ ▼ to change value and press SET to next setting.
Password: 3018

Low Flow Cutoff (Setting range:0 –30)
Press ▲▼ to change value and press SET to next setting.
8 mean 8%. If full scale is 80 M3/Hr, when flow rate is less than 6.4 M3/Hr, the display will be 0.

Damping (Setting range:1 – 10)
Default value is 1. It can be modified according to actual display situation.
Press ▲ ▼ to change value and press SET to next setting.

Filter (Setting range:1 – 10)
Default value is 3, press ▲▼ to change value and press SET to next setting.

12.4 Communication Address and Size Setting



Input Password

Press ▲ ▼ to change value and press SET to next setting.

Password: 5018

Device Address

Press ▲ ▼ to change value. HART address(00~15), Modbus address(1~99)

And press SET to next setting.

Baud Rate

Press ▲ ▼ to change baud rate and press SET to next setting. HART communication doesn't have this capability.

Setting range: 1200~38400. Default value is 9600.

Size Setting

Press ▲ ▼ to change size. It's used to calculate velocity. Range: 15~200mm.

Press SET to next setting.

Density Setting

Press ▲ ▼ to change value. Setting range: 0.001~3.999. The unit of density is g/cm3.

Press SET to next setting.

13. Troubleshooting

1. Shake

(1) Slight shake: it's usually caused by medium fluctuation. By adding a buffer device or extending straight pipe will solve this problem.
(2) Medium shake: it's usually caused by medium flowing state. For gas, it's caused by unstable operating pressure. By using a voltage-stabilizing/fluid-stabilizing device or increasing damping will solve this problem.
(3) Heavy shake: it's usually caused by medium pulsing, unstable atmospheric pressure or no back pressure at flowmeter's outlet. To solve this problem, add a voltage-stabilizing/fluid-stabilizing/buffering device or increase back pressure at flowmeter's outlet.

2. Pointer stops at one position

(1) This is generally because valve is opened too fast, making float jump to guide ring, thus the guide ring gets deformed and float gets stuck. There is also another possibility that guide rod and guide ring are not concentric, leading to float jam. To solve this problem, take out the guide ring and shape it to make it concentric with guide rod. After installing float, push float to make sure it goes up and down smoothly. What's more, flowmeter should be vertically or horizontally installed. If it's tilted, float will get jammed as well, resulting in measurement error.
(2) Impurities inside measuring tube. Clean impurities will solve this problem.

3. Open valve, pointer points to max. value

This is mainly caused by parameters such as operating temperature, operating pressure, density and range on site disaccord with ordered information.

4. Big error

(1) Improper installation
  a. For vertically-installed flowmeter, it should be installed vertically and its tilt angle should NOT be over than 2°.
  b. For horizontally-installed flowmeter, it should be installed horizontally and its tilt angle should NOT be over than 2°.
  c. There should be NO iron magnetic objects in flowmeter's radius (100m) area.
  d. Installation position should be far away from valve's reducing port, pump's inlet and pipe's elbow. Straight pipe should be upstream 5D and downstream 250mm.
(2) Huge density change of liquid is also one of the reasons that cause big error. Flowmeter is calibrated as the standard condition according to the flow rate that is calculated from user's given density. So if density changes dramatically, measurement will deviate a lot.
  Solution: calculate the correction factor via formula with the changed density. It's recommended to multiple measured flow rate with factor to get real flow rate.
(3) Gas is easily to be influenced by temperature and pressure. It's recommended to adopt temperature&pressure compensation to get real flow rate.
(4) If flowmeter has been used for a long time or the pipe vibrates a lot, parts like magnetic steel, pointer, balancing spare or rotation rod will get loose, leading to big error.
  Solution: push pointer to RP position to see whether output is 4mA and flow rate 0. Then verify pointer by dial. If value is not correct, adjust related parts (better for professionals to do this); otherwise parts will be lost and flowmeter has to be returned to manufacturer.
(5) For liquid measurement, if displayed flow rate is higher than actual flow rate, mostly it's because liquid's viscosity is high as given viscosity is not correct when user placed his order. In this case, flowmeter has to be returned to manufacturer for viscosity calibration.

5. No current output

(1) Check whether connection is correct or not.
(2) Check whether LCD has display. If it has display but no output, it's highly probably that output tube is broken. Circuit board needs to be replaced.
(3) Calibrated data is lost. If EEPROM is not working, flowmeter's data will be lost, thus there will be no output current, and current will stay unchanged.

6. No local indication

(1) Check whether connection is correct.
(2) Check whether power supply is correct.
(3) Check whether LCD chip is damaged or poorly contacted.

7. LCD always displays 0 or full scale

(1) Input password 2000 to check setting range and zero point. The value of ZERO should be lower than that of SPAN. Two values cannot be equal.
(2) Sample circuit board is malfunctioned. Circuit board needs to be replaced.

8. Wrong alarm

(1) Circuit board is malfunctioned, it needs to be replaced.
(2) Logic function is not correct.
(3) Alarm point setting is not correct.

9. Wrong totalizer pulse output

(1)Check whether the alarm of totalizer pulse output is correct.
(2)Check whether the external power is between 5 and 24VDC and connect 1-5K resistance in series.
(3) Circuit board is malfunctioned. It needs to be replaced.

Appendix Density of Common Gas and Liquid

Density of Common Gas Pressure: 0.1013Mpa Temperature: 20℃ Unit: kg/m3							
Name	Density	Name	Density	Name	Density	Name	Density
Air	1.2041	Propane	1.8332	Benzene	3.2476	Fluorine	1.5798
Nitrogen	1.1646	n-Butane	2.4163	Carbon monoxide	1.1650	Chlorine	2.9476
Oxygen	1.3302	Isobutane	2.4163	Carbon dioxide	1.8290	Methyl Chloride	2.0990
Helium	0.1664	Pentane	2.9994	Nitrogen oxide	1.2474	Ethyl Chloride	2.6821
Hydrogen	0.0838	Ethylene	1.1660	Nitrogen dioxide	1.9121	Ammonia	0.7080
Krypton	3.4835	Propylene	1.7495	Nitrous Oxide	1.8302	Freon-11	5.7110
Xenon	5.4582	1-Butylene	2.3326	Hydrogen Sulfide	1.4169	Freon-12	5.0269
Neon	0.83914	Cis-2-Butene	2.3327	Hydrocyanic acid	1.1235	Freon-13	4.3428
Argon	1.6605	trans-2-Butene	2.3327	Carbonyl sulfide	2.4973	Freon-113	7.7900
Methane	0.6669	Isobutene	2.3327	Ozone	1.9952		
Ethane	1.2500	Acetylene	1.0830	Sulfur dioxide	2.7260		
Density of Common Liquid Temperature: 20℃ Unit: kg/m3							
Name	Density	Name	Density	Name	Density	Name	Density
Water	998.3	Ethanol	789.2	Metacresol	1034.1	Chloroform	1490
Mercury	13545.7	Glycol	111.3	Paracresol	1011(50 °C)	Carbon tetrachloride	1594
Bromine	3120	n-Propanol	804.4	Methyl formate	975	*o*-Xylene	880
Sulfuric acid	1834	Isopropanol	785.1	Methyl acetate	934	*m*-Xylene	864
Nitric acid	1512	n-Butanol	809.6	Methyl propionate	915	*p*-Xylene	861
Hydrochloride acid (30%)	1149.3	Acetonitrile	783	Formic acid	1220	Toluene	866
Octane	702	n-Petanol	813	Acetic acid	1049	o-chlorotoluene	1081
Acetone	791	Ethanal	783	Propanoic acid	993	m-chlorotoluene	1072
MethylEthylKetone	803	Propanal	808	Aniline	1021.7	Cyclohexane	778
Phenol	1050(50°C)	Cyclohexanone	946.6	Propanenitrile	781.8	Hexane	660
Carbon disulfide	1263	Diethyl ether	714	Butyronitrile	790	Heptane	684
Ethanolamine		Glycerine	1261.3	Thiophene	1065		
Methanol	791.3	Orthocresol	1020(50 °C)	Dichloromethane	1325.5		