



# ALIATARGET

## Smart Target Flowmeter

### ATF80 Series

## Operation Manual



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## 1. Overall Check

- A. Check the packaging first, if any damages occur, contact ALIA Customer Service Center at once.
- B. Confirm whether that instrument has been damaged or its spares are lost.
- C. It's recommended that you read the manual thoroughly, once you have any queries, please email or fax to ALIA technical department.
- D. Ensure all the specifications of received instrument are in normal state.
- E. Power on to check whether the LCD screen operates normal.
- F. Proper installation is required.
- G. Move target 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 (pay attention to 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. Brief Introduction

The core component of Smart Target Flowmeter ATF80 is a capacitor which consists of a steady constant-electrode and a moving electrode that swings with elastic tube on the target stem. With digital technique and microelectronic technology, the detected sensor signal is processed into 4-20mA output that is proportional to flow rate and HART communication. And both flow rate and totalizer can be displayed by 2-lines LCD. Apart from measuring common medium, smart target flowmeter plays a very applicable role in actual difficult conditions like intense impurities, high viscosity, easy stuck, high temperature, high pressure, low temperature and heavy corrosion. Smart target flowmeter is already widely applied to industries in steel, petroleum, natural gas, power, papermaking, chemical, energy, food, environment protection and other fields.

## 3. Working Principle

When fluid flows in pipe, differential pressure will be generated because of self kinetic energy by target plate and give some acting force onto target plate, making it proportional to the square of fluid flow velocity. The received acting force  $F$  from target plate is transmitted to capacity sensor via tough transmitting parts (measuring stem) and then the capacity sensor produces power signal output. This signal has been pre-amplified, AD transformed and computer processed, and relevant flow rate and totalizer can be acquired later. The working principle is illustrated by figure below. (Figure 1)

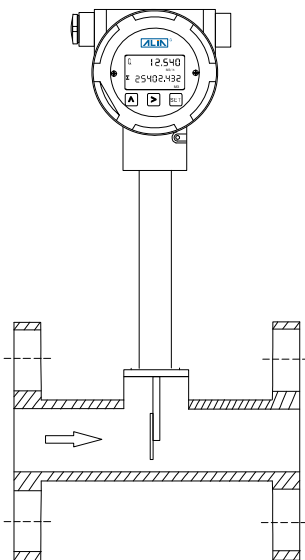


Figure 1

$$Q_n = K \cdot D_i \left( \frac{1}{\beta} - \beta \right) \sqrt{F \cdot \rho / \rho_0}$$

$$Q_m = K \cdot D_i \left( \frac{1}{\beta} - \beta \right) \sqrt{F \cdot \rho}$$

$$Q = K \cdot D_i \left( \frac{1}{\beta} - \beta \right) \sqrt{F / \rho}$$

$$\beta = d / D_i$$

In formula:

$Q_n$  — Normal Flow Rate (Nm<sup>3</sup>/h)

$Q_m$  — Mass Flow Rate (kg/h)

$Q$  — Actual Flow Rate (m<sup>3</sup>/h)

$K$  — Flow Coefficient (Given by Manufacturer)

$D_i$  — Inside Diameter (mm)

$F$  — Acting Force on Target by Medium(kg)

$\rho$  — Operating Density (Kg/m<sup>3</sup>)

$\rho_0$  — Normal Condition Density (Kg/m<sup>3</sup>)

$\beta$  — Target Diameter / Pipe Diameter

$d$  — Target Diameter (mm)

## 4. Installation and Considerations

### 4.1 Installation of Normal Temperature Flowmeter

- Generally, target flowmeter is horizontally installed and will be above pipe.
- To ensure accurate measurement, straight pipe of upstream and downstream of target flowmeter is required. Upstream straight pipe  $\geq 10D$ , downstream straight pipe  $\geq 5D$ , and  $D$  is nominal diameter of pipe.
- To make sure the operating system is not influenced when maintenance and replacement are undertaken, by-pass lines are required.
- To make sure target flowmeter works well, good grounding is required.

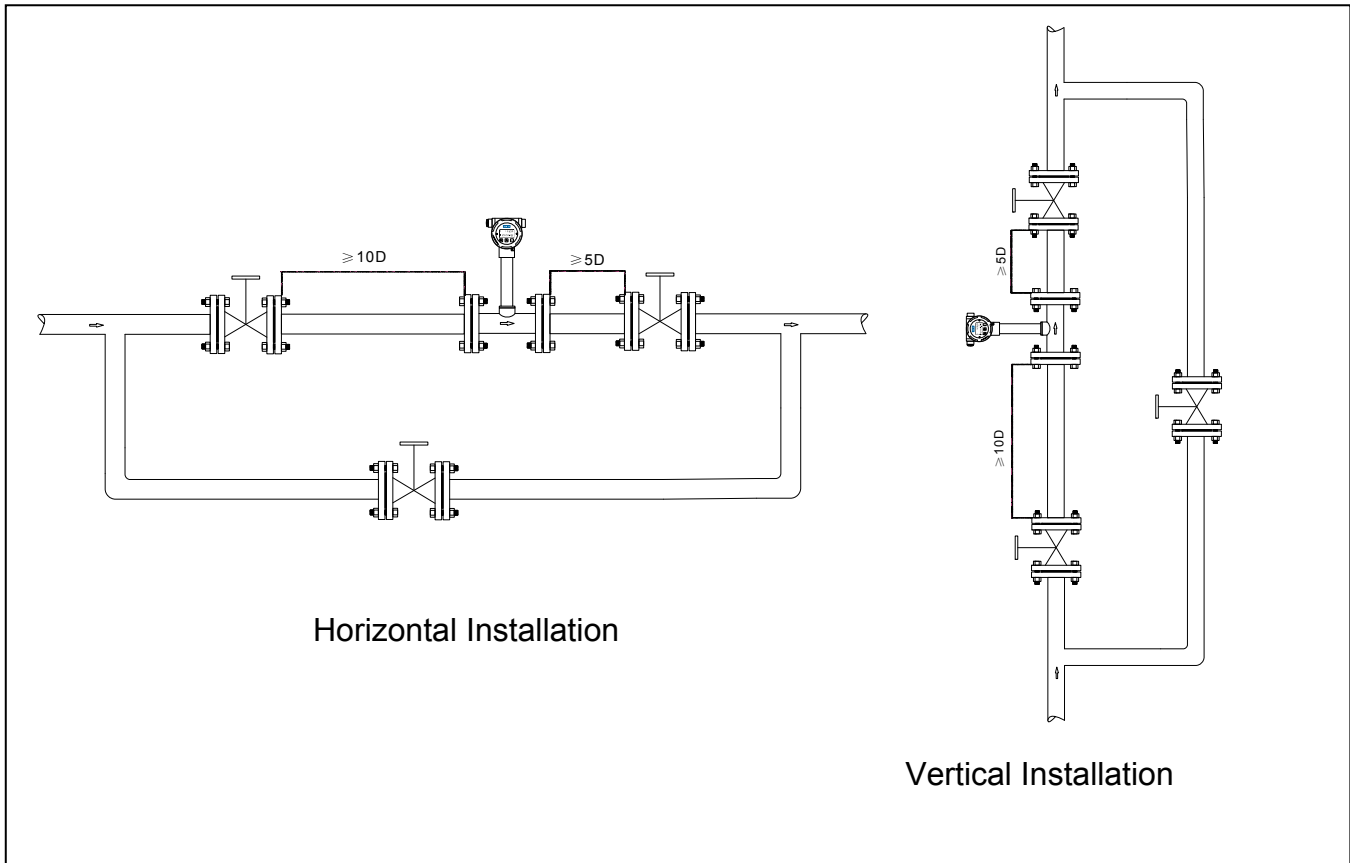
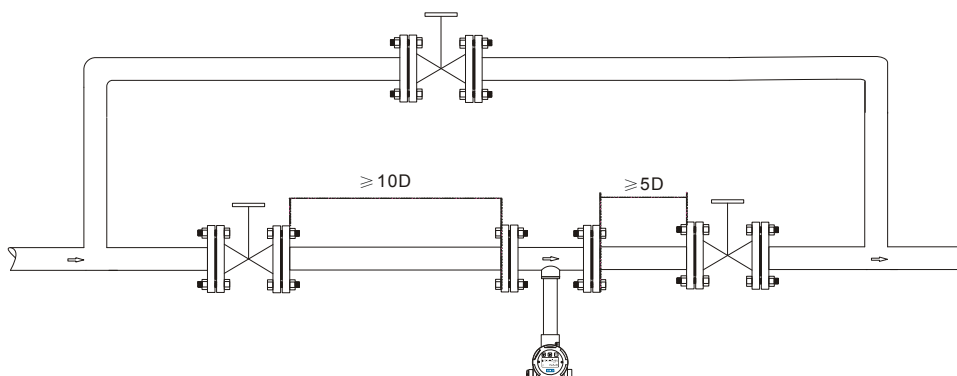


Figure2

### 4.2 The Installation of High Temperature Flowmeter

- Flowmeter housing must be earthed reliably.
- The installation of high temperature (Medium temperature  $\leq 100^{\circ}\text{C}$ ) flowmeter is the same as that of normal temp. flowmeter.
- The high temperature (Medium temperature  $> 100^{\circ}\text{C}$ ) flowmeter should be invertedly installed or side installed. Note: Inverted installation means display of flowmeter is below the pipe. This kind of installation will not affect the flowmeter's performance.



### 4.3 Insertion Probe Mounting

A short flange tube must be welded on the pipeline, connecting with insertion type target flowmeter. Usually a short 2" or 4" pipe is chosen to be short connecting tube. Flange specification is depended on pipeline's pressure and model. Figure 3. Configuration between Short Connecting Tube and Flange Bolt Hole illustrates the size of short connecting tube and installation direction of bolt hole. Size of short connecting tube should be enough to make sure target plate in and out freely and flange bolt holes should straddle the pipe's centerline.

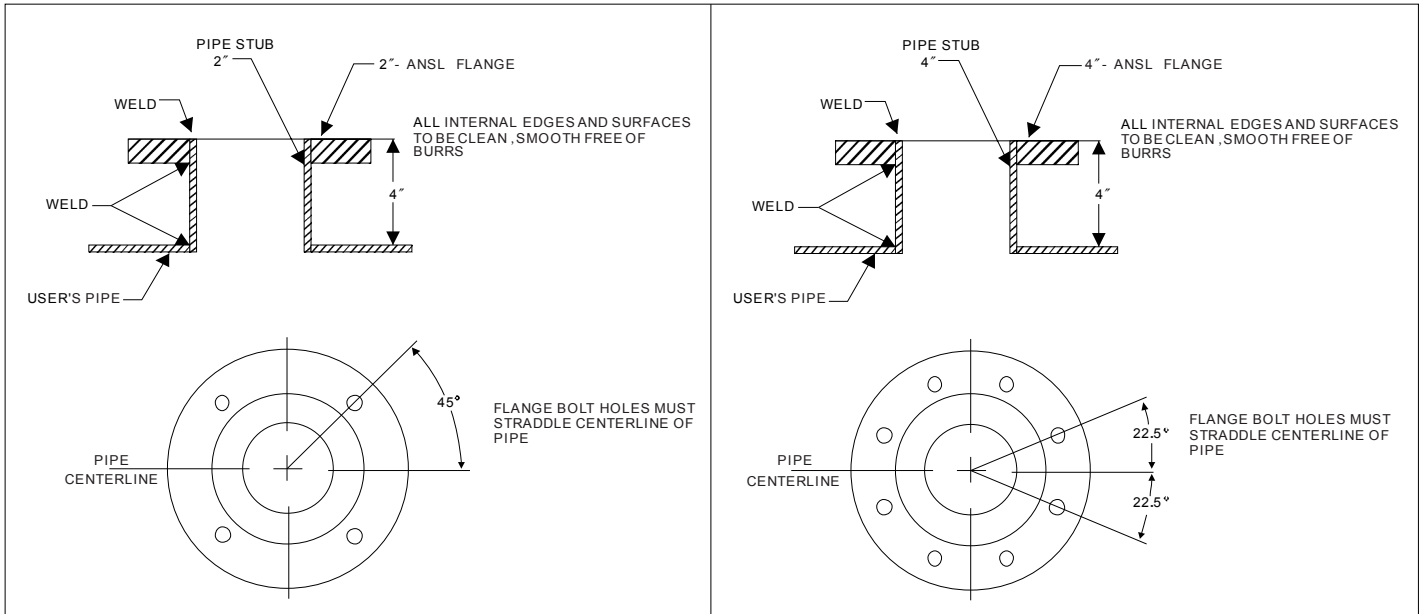


Figure 3. Configuration between Short Connecting Tube and Flange Bolt Hole

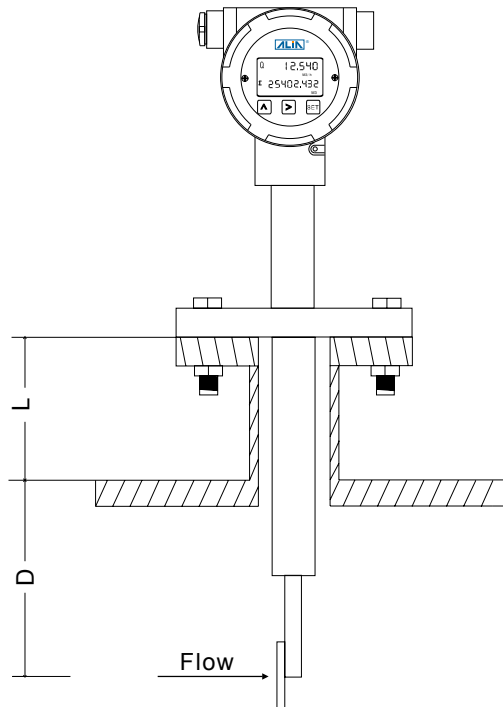


Figure 4. Insertion Type Installation

#### 4.4 Hot Tap (Retractable Probe Mounting)

**Warning:** Please read all tags and instructions carefully. Do not roll handwheel, handle or bolts easily. If necessary, please do as required.

For hot tap (retractable probe mounting), straight pipe of upstream  $\geq 10D$  and downstream  $\geq 5D$  must be ensured. However, full-way valve, pressure gauge or thermocouple is permitted.

For hot tap, a ball valve will be installed on short connecting tube and the target plate will go or outside of pipe through this ball valve. When target plate is moved out of pipe, this ball valve should be closed so that you can dismantle or install flowmeter without stopping the process.

Theoretically hot tap target flowmeter can be installed anywhere on pipe. But the optimum position is horizontally position exactly above the pipe. Please see Figure 5. Retractable Pipe Mounting. Note: For horizontal pipe, if possible try to avoid the 4 to 8 o' clock position to prevent from sediment particles to flowmeter. This arrangement is easier to install. If needed, please give the pipe information to ALIA engineer before placing order so that proper installation can be achieved. If pressure gauge or thermocouple is required on pipe, please make sure that they will not influence measurement.

When install target flowmeter, please install it onto the centerline position of pipe and make sure the target plate is facing front exactly to flow direction.

When install hot tap target flowmeter, firstly, make sure target stem and target plate are both in the chamber and then make sure ball valve is installed properly without leakage problem. At this time, you can install target flowmeter. Before installation, please keep the arrow direction marked in flange same as real pipe flow direction. Later lock the bolt. Secondly, open slowly the ball valve. Once ball valve is fully open, roll the handwheel slowly until it reached the scale marked in guide block and threaded stem. Thirdly, lock fixing bolt of guide block.

Suggestion: After installation of target flowmeter, steady ball valve and handwheel, do not roll them carelessly. What's more, you can mark beside: "Close valve before removing target flowmeter."

**Caution :** After installation, if you are about to remove target flowmeter, you can not close ball valve until the target stem and target plate fully leave ball vale and enter chamber.

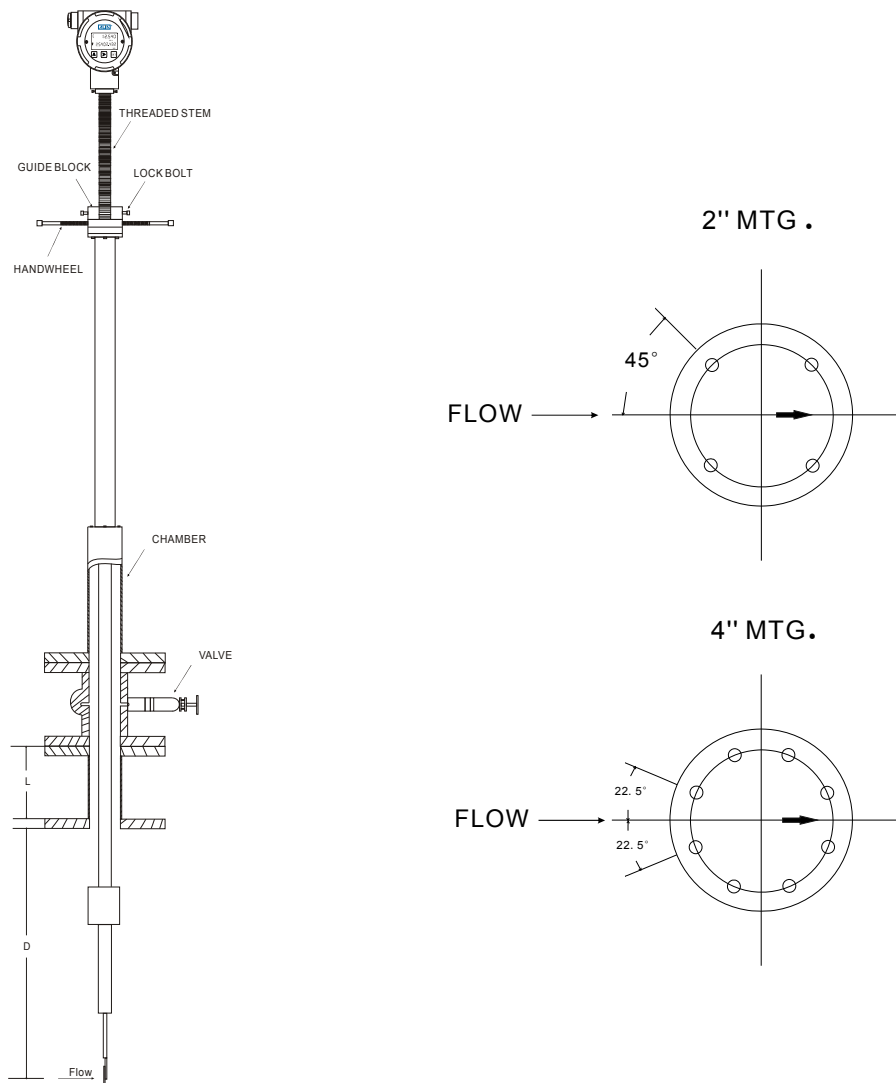


Figure 5. Retractable Pipe Mounting

## 4.5 Zero Setting

1. After installation, zero setting is required.
2. As there is self weight for elastic-tube sensor, target plate and target stem, if original horizontal installation for factory calibration or selection needs to be changed to vertical installation, zero point should be reset. Procedures are as below:

- 1) Close the downstream valve.
- 2) Open the upstream valve slowly to make flowmeter full of medium.
- 3) Open the downstream valve slowly to keep flowmeter working for 10 minutes.
- 4) Close upstream & downstream valve to make sure that there is no medium flowing in pipe.
- 5) Zero point calibration. (See 7.4 Zero calibration)

## 4.6 Others

- If demanded in process, it can be vertically installed. The measured medium can flow bottom to up or to bottom, but this information has to be clarified to supplier.
- Inside diameter of target flowmeter should be the same as that of connecting pipe to avoid flowing disturbance even measurement error.
- During installation of flange type or wafer type, the hole size of gasket seals between flanges should be 6-8 mm bigger than that of flowmeter and process pipe to avoid disturbance, which as a result will influence measuring accuracy.
- For newly finished processing pipe, draining or air blowing are necessary before installing the flowmeter.
- The arrow direction shown on measuring tube of either flange type or wafer type flowmeter is the flow direction of measured fluid.

## 4.7 Special Attention

Parts like valve or elbow that can change flow direction are not allowed to install directly at the front & back position of measuring tube. If you have to, please make sure their upstream & downstream straight pipe is farther than demanded.

## 5. Electrical Connection

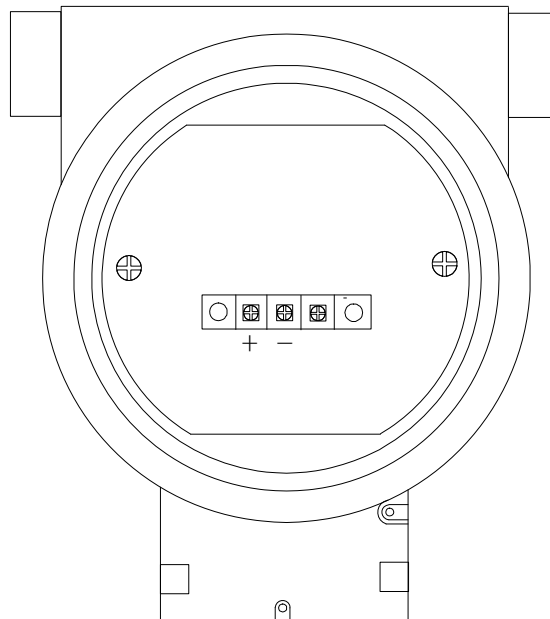
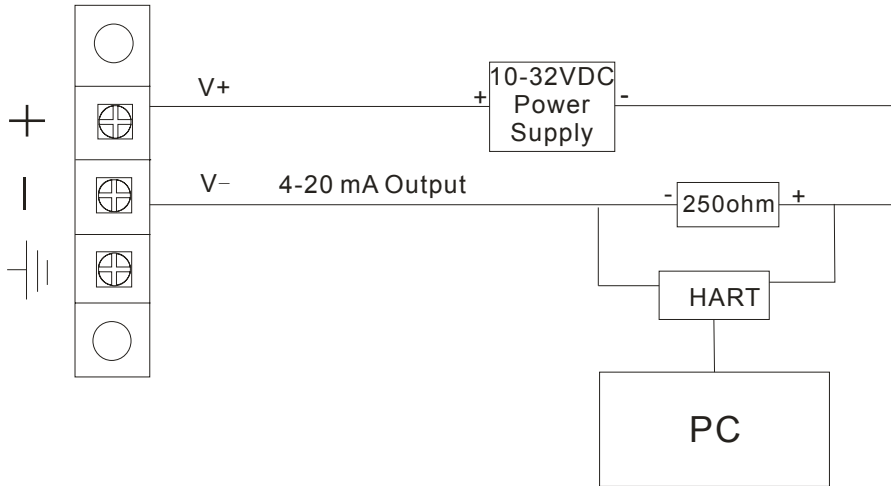


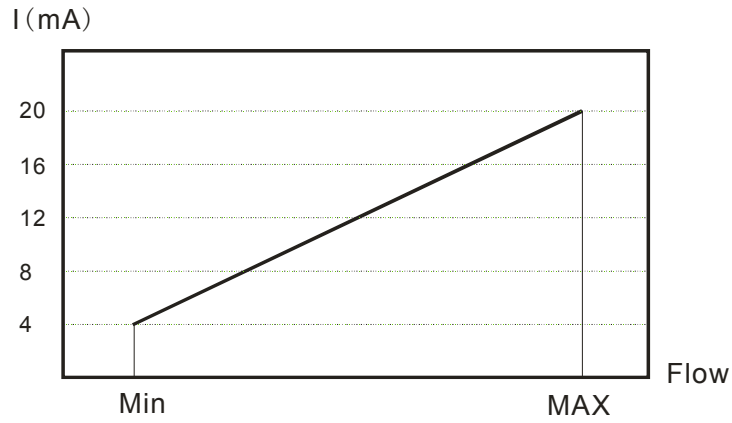
Figure 3

+	24VDC+
-	24VDC -
⏏	GND

1. Two-wire 4-20mA, power supply: 10-32VDC, and superpose HART communication.



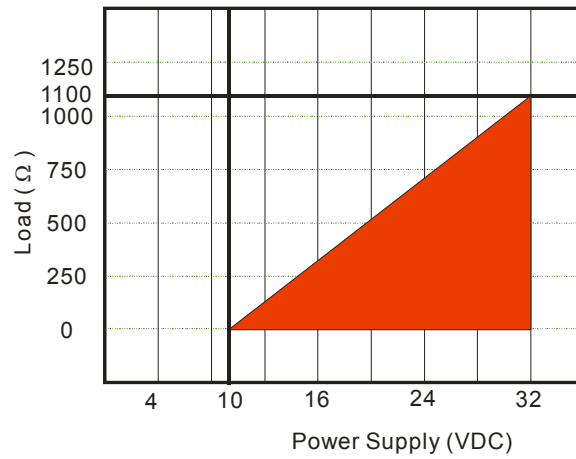
2. The output characteristics of 4-20mA



$$\text{Range} = \text{max} - \text{min}$$

$$I(\text{mA}) = (\text{Flow} / \text{Range}) * 16 + 4$$

3. Power supply & Load requirement



$$\text{Load: } (R_{\text{ohm}} = \text{VDC} - 10) * 50$$



## 6. Function

### 6.1 Display Interface




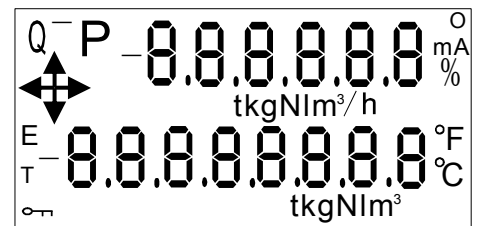
Figure 4

### 6.2 Keypad Function

Name	Keypad	Function in Normal Display	Function in Parameter Settings
Setting	SET	Enter "Parameter Setting" or Exit	Used to exit. Note: The meter can record parameter settings at your last exit. Press "SET" to return to the menu item of last time.
Up	^	Not used	Short press is for "PageUp" & "Value+1". Long press (3s) is for "Enter Settings" & "Confirm".
Right	>	Not used	It is for "PageDown" & "digit position move".

#### Other Display:

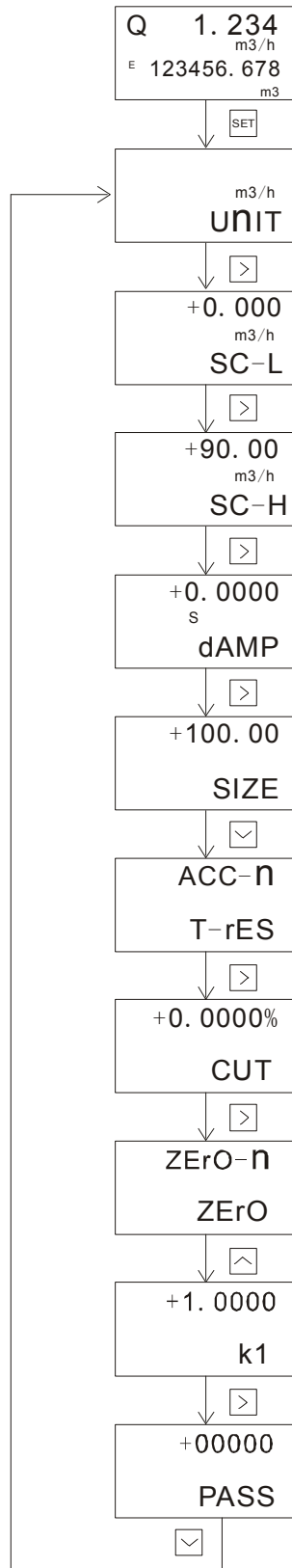
1. When in HART Communication, "o" icon in LCD top right corner will flicker.
2. If Parameter Protection is on,  will be shown in bottom left corner.
3. If measurement value is less than Alarm LRV, "↓" icon will flicker.
4. If measurement value is more than Alarm URV, "↑" icon will flicker.
5. If sensor connection is abnormal, "↕" icon will flicker.
6. If sensor value is beyond measurement range, "→" icon will flicker.
7. If flow rate is more than 0, LCD backlight will be more brighten.

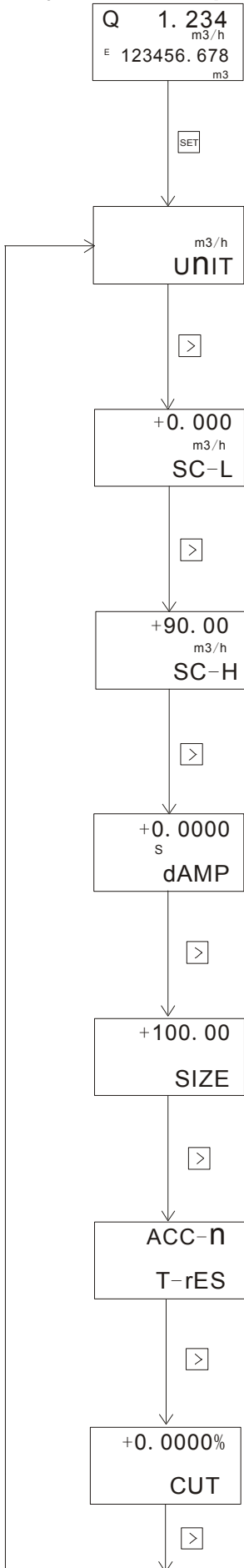


Full Display Interface

# 7. Operating Instructions

## 7.1 Operational Flowchart





**Normal Display Interface**  
 Press  for 1second and release to enter Parameter Setting Menu.

**Unit Setting**  
 Unit display in screen is achieved by  and , these units are: kg/h,t/h, m3/h, l/h, N (N means no unit. In normal display, unit will not be displayed, but the corresponding unit can be pasted on the panel as requested.)  
 Press  to enter next menu.

**Scale Low Value Setting**  
 Scale low value setting is achieved by  and . The corresponding output current of scale low value is 4 mA. Press  to enter next menu.

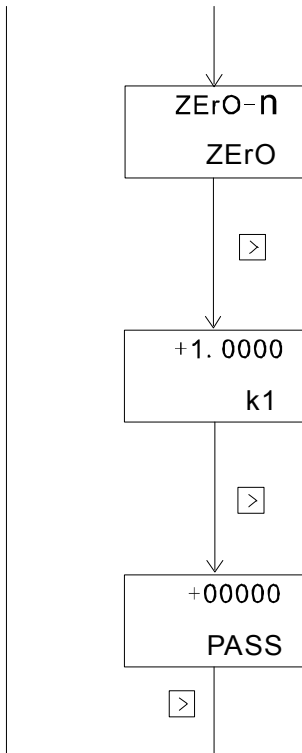
**Scale High Value Setting**  
 Scale high value setting is achieved by  and .The corresponding output current of scale high value is 20mA.  
 Press  to enter next menu.

**Damping Time Setting**  
 Damping time setting is achieved by  and . Setting range: 0-32S.  
 Press  to enter next menu.

**Size Setting**  
 Size setting is achieved by  and . Setting value should be consistent with application. Usually, it' s unnecessary to revise after factory reset.  
 Press  to enter next menu.

**Totalizer Reset Setting**  
 ACC-Y can be selected by  and  to clear totalizer.  
 Press  to enter next menu. (See 7.3 for details.)

**Low Cutoff Setting**  
 LOW CUT setting is achieved by  and  (unit: %, range: 0%-20%).  
 Press  to enter next menu.

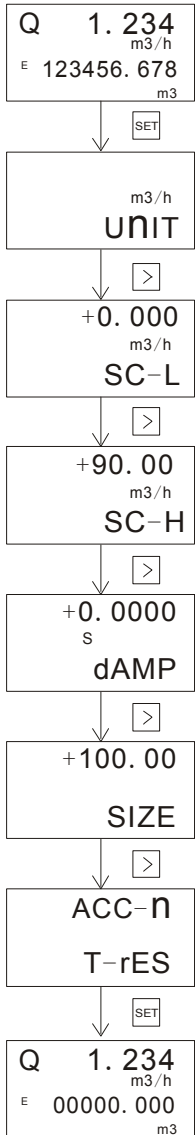


**Zero Calibration Setting**  
 When there is no flow in pipe but the flowmeter displays flow, Zero-Y can be selected by  $\Delta$  and  $\square$  to calibrate zero.  
 Press  $\square$  to enter next menu. (See 7.4 for details.)

**K1 Factor Setting**  
 When displayed value is different with actual value, K1 factor can be applied to change this by  $\Delta$  and  $\square$ .  
 Press  $\square$  to enter next menu. (See 7.5 for details.)

**Factory Parameter Setting**  
 Users are not permitted to modify this menu as it is factory parameter menu. After enter this menu, press  $\square$  to enter unit setting menu or press  $\text{SET}$  to return Normal Display Interface.

**7.3 Totalizer Reset**



**Normal Display Interface**  
Press **SET** for 1 second and release to enter Parameter Setting Menu.

**Unit Setting**  
No need to change and press **>** to enter next menu.

**Scale Low Value Setting**  
No need to change and press **>** to enter next menu.

**Scale High Value Setting**  
No need to change and press **>** to enter next menu.

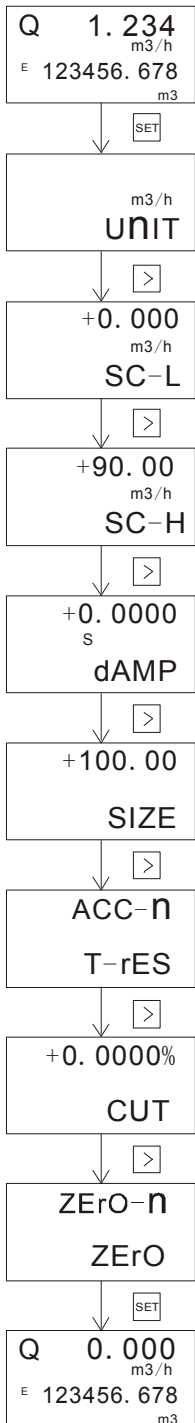
**Damping Time Setting**  
No need to change and press **>** to enter next menu.

**Size Setting**  
No need to change and press **>** to enter next menu.

**Totalizer Reset Setting**  
Press **△** long to start and release **△** until ACC-N flickers. Then press **>** to choose ACC-Y. Press **△** long and release **△** until it displays ACC-N, which means totalizer reset is complete. Press **SET** to enter next menu.

**Normal Display Interface**  
Display interface after totalizer reset.

- A. To prevent from zero shift which is caused by mechanical vibration during transportation, after simulated installation, please leave the target flowmeter alone for 2 days before zero calibration.
- B. After target flowmeter is installed on pipeline, if there is flow rate displaying under full pipe and static flow, zero calibration can be applied after 10-20 minutes.



**Normal Display Interface**  
 Press **SET** for 1 second and release to enter Parameter Setting Menu.

**Unit Setting**  
 No need to change and press **>** to enter next menu.

**Scale Low Value Setting**  
 No need to change and press **>** to enter next menu.

**Scale High Value Setting**  
 No need to change and press **>** to enter next menu.

**Damping Time Setting**  
 No need to change and press **>** to enter next menu.

**Size Setting**  
 No need to change and press **>** to enter next menu.

**Totalizer Reset Setting**  
 No need to change and press **>** to enter next menu.

**Low Cutoff Setting**  
 No need to change and press **>** to enter next menu.

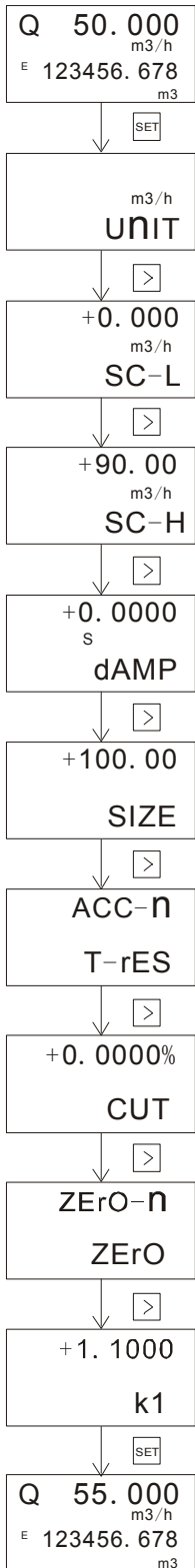
**Zero Calibration Setting**  
 Press **△** long to start and release **△** until ZErO-N flickers. Then press **>** to select ZErO-Y. Press **△** long and release **△** it displays ZErO-N, which means zero calibration is complete. Press **SET** to enter next menu.

**Normal Display Interface**  
 Display interface after zero calibration.

**7.5 K1 Factor**

If displayed flow rate is different from actual flow rate, adjust K1 Factor to make displayed flow rate the same as actual flow rate.

E.g.:The displayed flow rate is 50m<sup>3</sup>/h while the actual flow rate is 55m<sup>3</sup>/h, so K1 value is 55/50=1.1. Input 1.1 in K1 Factor Setting Menu and then both displayed flow rate and actual flow rate are 55m<sup>3</sup>/h.



**Normal Display Interface**  
Press **SET** for 1 second and release to enter Parameter Setting Menu.

**Unit Setting**  
No need to change and press **>** to enter next menu.

**Scale Low Value Setting**  
No need to change and press **>** to enter next menu.

**Scale High Value Setting**  
No need to change and press **>** to enter next menu.

**Damping Time Setting**  
No need to change and press **>** to enter next menu.

**Size Setting**  
No need to change and press **>** to enter next menu.

**Totalizer Reset Setting**  
No need to change and press **>** to enter next menu.

**Low Cutoff Setting**  
No need to change and press **>** to enter next menu.

**Zero Calibration Setting**  
No need to change and press **>** to enter next menu.

**K1 Factor Setting**  
Press **▲** long and release **▲** until displayed icon + flickers. Then press **>** and **▲** to adjust K1 factor as 1.1. Press **▲** long and release **▲** until the value stops flickering to confirm. Press **>** to enter next menu.

**Normal Display Interface**  
Display interface after K1 factor is revised.

