Operation Instructions
Ultrasonic Open Channel Flow Meter

Integrated type PWF-UOC3000

Split type PWF-UOC3003

Pokcenser's ultrasonic open channel flow meter and level meter with LED screen and menu is in English. Very easy for setup. Please follow below instructions for installation and parameters settings, the device can be used normally.

1.Key function: Our products can be debugged through three keys on the panel. Then, the measured value is showed by LED.

SET key

◇ Enter to menu
◇ Confirm menu
◇ Confirm parameter calibration

▲ ▼ key

◇ Move the cursor
◇ Select the menu
◇ parameter calibration

2. After power to the meter and screen is displayed, press the SET key for two seconds and enter the first level menu.

3. Input the height of the probe to the "reference zero". And the location of "reference zero" in the menu is shown in attached appendix table2 menu structure.

(Height of probe is the distance from the launch of probe to the edge of weir and flume).

4 .Setting "4mA Flow value" and "20mA Flow value"

4mA flow value: The device output is 4mA when the instantaneous flow equal to the set value.

20mA flow value: The device output is 20mA when the instantaneous flow equal to the set value.

The location of "4mA flow value" and "20mA flow value" are shown in attached appendix Table2 menu structure files.

5.To select the type of weir and flume, you must consider: the size of flow and dynamics of water in the channel, whether the current is a free flow or not.

- ✧ If the maximum flow is less than 40l/s(144 t/h), we suggest to right-angled triangular Weir.
- ✧ If the max flow is greater than 40l/s, we suggest to use parshall flume.

✧ If the upstream channel is short and the max flow is greater than 40l/s, we suggest to use rectangular Weir.

Before using device for measurement, should firstly calibrate the reference zero point which is the distance from the probe to zero point of weir slot level. (The meter's defaulting choice is parshall flume.)

① Right Triangular Weir

To use the right triangular weir, please follow the following instructions:

"9 weir and flume type"---"1 triangular weir"-----"1 work status" then choose the "start". For "2 triangular weir angle", please choose the actual angle of instrument, then the instrument can be calculated the corresponding flow automatically according to water level.

② Rectangular Weir

To use the rectangular weir, please follow the following instructions:

"9 weir and flume type"---"2 rectangular weir"-----"1 work status" then choose the "start", and choose "0.25m, 0.5m, 0.75m, 1m, Non-standard channels" from menu of "2 standard channel", then the instrument can be calculated the corresponding flow automatically according to water level.

③ Trapezoidal Weir

As trapezoidal weir, please follow the following instructions:

"9 weir and flume type"---"3 trapezoidal weir"-----"1 work status" then choose the "start", and input actual weir cage width in the menu of "2 weir cage width", then the instrument can be calculated the corresponding flow automatically according to water level.

④ Parshall flume

As parshall flume, please follow the following instructions:

"9 weir flume type"---"4 parshall flume"-----"1 work status" then choose the "start". The flow formula of parshall flume:

$Q=Cha^n$, according to the throat width (b), find the mechanic coefficient(c) and index(n) from the table 2 of the parshall flow formula and input to the menu of “9 weir type”---“1 parshall flume”-----“2 mechanic coefficient c”-----“3 index n”. then the instrument can be calculated the corresponding flow automatically according to water level.

Ultrasonic Open Channel Flow Meter Manual

Ⅰ. Application

The ultrasonic open channel flow meter with weir and flume which used together for measured the flow in the open channels. Mainly application is the outfall of sewage plant and the sewage of enterprises, city sewer and irrigation channels.

The instrument produced by our company uses ultrasonic waves through the air, non-contact method to measure. Compare with contact instrument, it has higher reliability and durability in the condition of sticky dirt, corrosive liquid.

Ⅱ. Principle

The direct measurement of this series is liquid height of channel and flume. For flow measurement in open channels, installation of weir and flume on the channel, it makes the flow change into level. After measured the level in the weir and flume, then calculate the flow according to corresponding connection of level-flow.

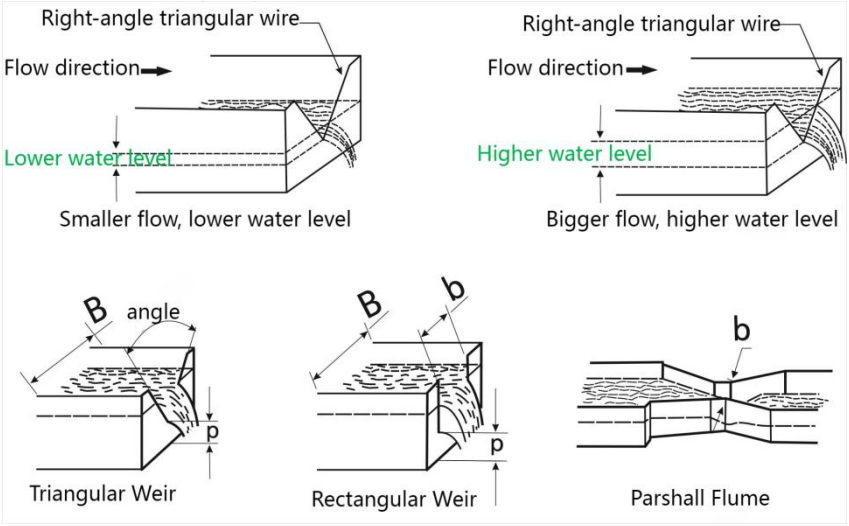
1. The principle of level measurement

The ultrasonic pulses emits by ultrasonic transducer spreads the measured surface through the transmission medium, after reflection, returns to the receiving transducer through the transmission medium, then measured the spreadable time from the emitting to receiving in the transmission medium. According to the sound speed, we can calculate the distance from the transducer to the liquid surface, then we know the level. So we can calculate the distance(D=C*t/2)from probe to reflex surface (the reason of divide by 2 is the sound waves from the transmitter to receiver is actually a back and forth, "D" is distance,"C" is the speed of sound, "t" is time)the liquid level value will be calculate by subtraction.

2. The principle of flow measurement

In the open channel with flow smoothly, bigger flow makes higher level, smaller flow makes lower level.(Figure 2.1). The flow can be calculate by measured the level. In the normal open channel, the connection between the flow and level is effected by the slope ratio and surface roughness of the channel. The throttle caused by the installation of weir slot, produces the stable connection between the flow and level of channel. This connection depends on the structure dimension of weir flume. **Note: Reduce the influence of channel as much as you can.**

The usual wire and flume: Right-angled triangular Weir, rectangular weir and Parshall flume.(figure 2.1)



When the installation of ultrasonic open channel flow meter, you must be aware of the relationship between level and flow.

The relationship of level-flow can be found in the JJG711-90 of <<open channel level meter>> from national metrological verification regulation.

This instruction extracts a portion (VI, Weir slot). As the parshall flume, we know throat width b, you can use the appropriate formulas to figure out level-flow relationship.

Right-angled triangular weir will be calculated corresponding to level-flow relationship by the appropriate formula.

Rectangular weir has a corresponding formula. It has also associated with installation dimensions of channel. When determining the connection of level-flow, rectangular weir relates to the channel width (B), opening width (b), the height of upstream (p).

If you are not familiar with level-flow, please send the parameters to the manufactory to help you to calculate.

Meanwhile let us know these parameters about relation to determine water level-flow connection.

Ⅲ. Technical data

Function	Integrated type	Split type
Range	0.1l/s～99999.99 m3/h	
Cumulative Flow	Max: 4290000000.00 m^3	
Max range for level	3m	
Accuracy for level	0.5%	
Resolution	3mm or 0.1%(which is bigger)	
Display	Chinese and English LED	
Accuracy for Flow	Standard weir: 1～5% (meet the requirements of national standard weir and channels) Non-standard weir: 10～30%	
Analog output	4-wire 4～20mA/750Ω load	
Relay output	(optional)two groups: AC 220V/ 8A or DC 24V/ 5A	
Power supply	Standard: 24VDC 100mA Optional: 220VAC±15% 50Hz	
Optional Power supply	(optional)12VDC, battery, solar	
Environment Temperature	LED: -20～+60℃ Probe: -20～+80℃	
Environmental pressure	Standard atmospheric pressure	
Environment humidity	≤90%RH, non-condensing	
Process temperature	-20～80℃	

Process pressure	Standard atmospheric pressure	
Communication	Optional: RS485, RS232,MODBUS protocol	
Protection Grade	LED: IP67 Probe: IP68	LED: IP65 Probe: IP68
Cable Length	None	Standard: 10m The longest: 100m
Probe installation dimension	M48x2mm thread + matching nuts	
Probe Material	Standard: ABS Teflon material in corrosive environment	
Power Consumption	**Split type:** Power supply: 24V, No relay: 100mA Channel 1 of Relay: 120mA; Channel 2 of Relay: 145mA; Channel 3 of Relay: 170mA; Channel 4 of Relay: 190mA; The specific power is as follows: No relay: 24×100mA=2.4W; Channel 1 of Relay: 24×120mA=2.9W; Channel 2 of Relay: 24×145mA=3.5W; Channel 3 of Relay: 24×170mA=4.1W; Channel 4 of Relay: 24×190mA=4.6W; Channel 3 of Relay: 24×170mA=4.1W; Channel 4 of Relay: 24×190mA=4.6W;	
	Integrated type (4-wire system) Power supply: 24V, No relay: 80mA Channel 1 of Relay: 105mA; Channel 2 of Relay: 130mA; The specific power is as follows: No relay: 24×80mA=1.9W; Channel 1 of Relay: 24×105mA=2.5W; Channel 2 of Relay: 24×130mA=3.1W;	

IV: Installation

1 .Open Channel Flow meter

◆ **Split type**

Figure4.1.1 Outline meter

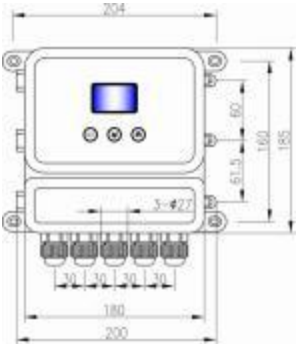


Figure 4.1.2 Structure of flow

The display parts of split type should be installed the indoors with good ventilation and non-corrosive gases. Instrument is wall mounting. If the condition of indoor is bad or it must be hung out the door, installation of instrument must be in the protective box to avoid the sun and rain.

◆ **Integrated type**

Figure 4.1.3 Outline

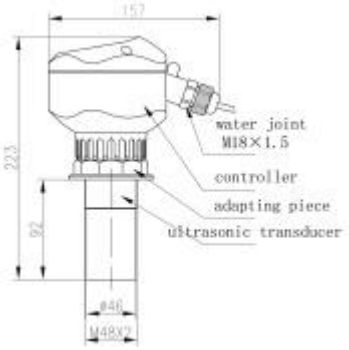


Figure 4.1.4 Structure of flow meter

2.Probe installation

The probe of ultrasonic open channel flow meter can be installed directly above the observation point of weir and flume. Launched surface of probe aims to the water surface by putting the level bar on the probe cover and calibrate the level

and be vertical it. The location of water level observation point in the parshall flume is away from upstream 0.1~0.5m; when triangular weir and rectangle weir are on the upstream side, the distance away from the weir plate is the maximum
weir water depths by 3-4 times

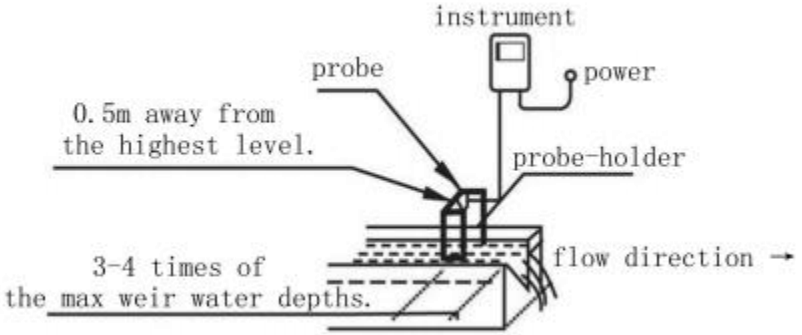


Figure 4.2. 1 Probe installation of Triangular Weir

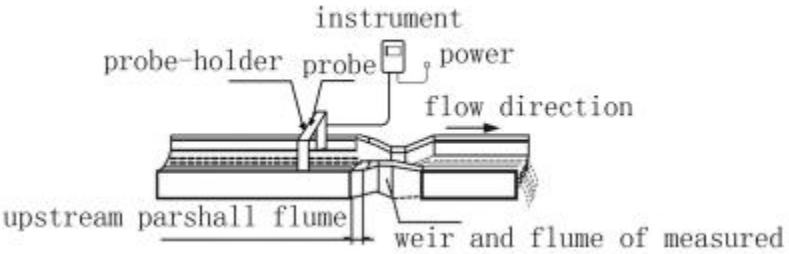


Figure 4.2.2 Probe installation of Parshall flume

◆Bottom thread installation

①Install the flange on the measured object.

②Put the gasket of same inner diameter on the flange.

③Transducer aimed at the hole of flange

④**P**ut it into the hole.

⑤Bottom flange

⑥Put the gasket of same inner diameter under the flange.

⑦Screw the nut and fix the transducer

⑧Finished installation of transducer

◆Top thread installation

①Fix the top thread with the nut

②the connected wire of probe with protection tube

★If installation on the cans, pool, covers and holder, procedures are the same as the above photo.

★After finished the installation of probe, the launch surface of probe must reveal the cover or waveguide.

◆Stilling well Installation

In many scenes, the water surface in the channel has some garbage, foam or other flotsam, which cause measurement errors or no signal. Or the upstream does not have enough length of straight channels and water fluctuations, so we can adopt stilling well installation to resolve it.

Inner Diameter of stilling wall > 50cm, the wall is smooth without bumps and glitches. After probe installation, the distance ≥0.5m from the probe launch to max water level.

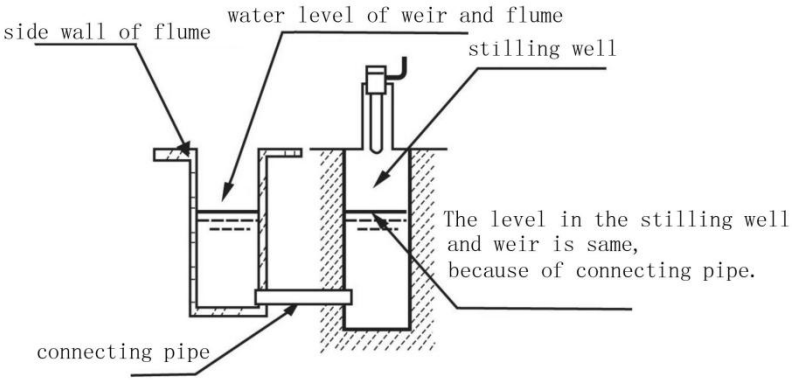


Figure 4.2.3 Stilling well Installation

3.Installation of weir and flume.

◆Installation of Triangular Weir

Figure 4.3.1 Triangular Weir

◆Installation of Rectangular Weir

Figure 4.3.2 Rectangular Weir

◆**Installation of Parshall flume**

Figure 4.3.3 Parshall flume

4.Installation of weir and flume

① The center line of weir and flume coincides with the centerline of the channel, so that water flows into the weir with no bias.

② After weir and flume have water, flow pattern of water is free stream. For triangular weir and rectangular weir, downstream water level must be below the weir edge. (Figure 4.4.1).

For the parshall flume, submergence degree must be less than critical submergence degree of "parshall flume parameter" (Figure 4.4.1).

③ The upstream of the weir and flume has more than the width of straight segments by 5 times, so that water flows can flow into the weir slot smoothly. Standard is "do not spray on the water surface"(neither bias nor momentum caused by channel gradient).

④ Installation of weir and flume on the channel must be firm. It must link closely with the bottom of channel and side walls (no leaking) to make the water flow through the measuring part of weir flume.

The edge of weir is measurement parts of the weir plate, the throat is measurement part of the flume.

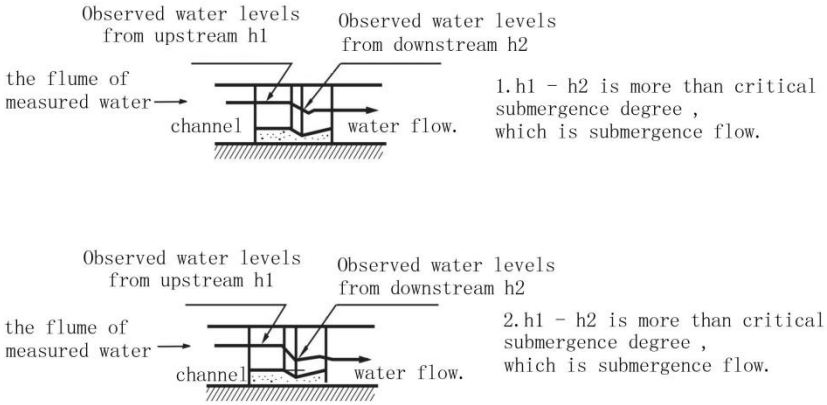


Figure 4.4. 1 Parshall flume Free flow and submerged flow

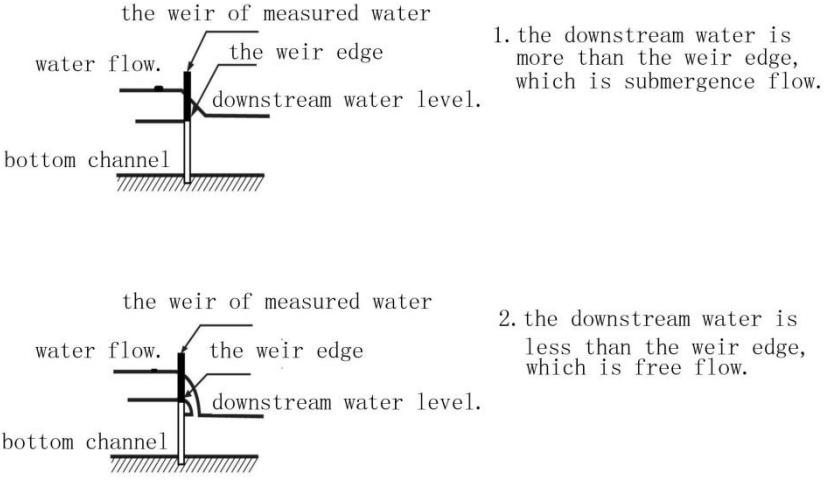


Figure 4.4.2 Triangular Weir and Rectangular Weir

Free flow and submerged flow

5、 Wring

◆Split type

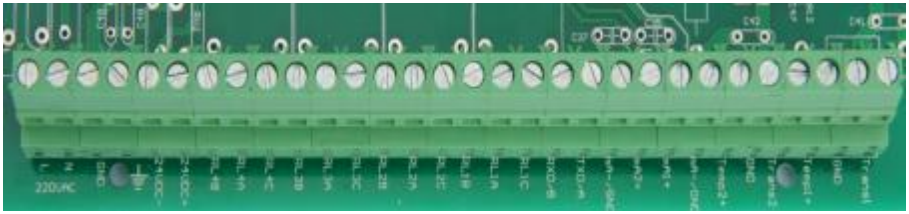


Figure 4.5.1、Split Terminal

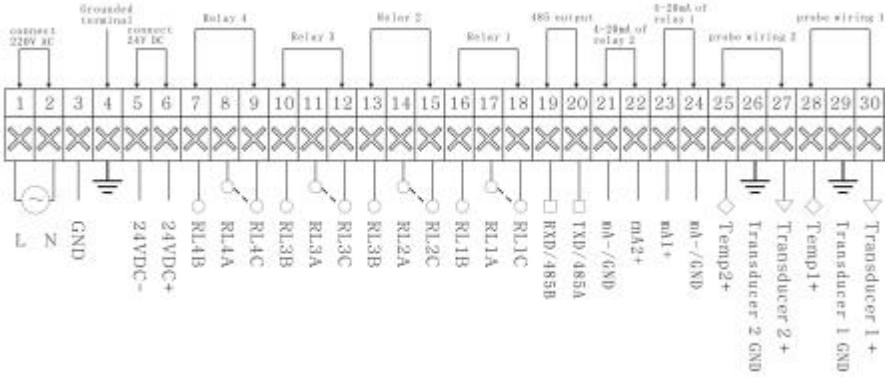


Figure 4.5.2 Split Terminal schematic diagram

Wiring instruction

Transducer： Red: Trans_1 transducer1

Blue: Temp 1 + temperature sensor +

Black： GND

Output：“current＋”connect mA +;

“current －”connect mA-/GND Relay: RLlnA and RLnB show open;

If default state is open , please connect RLlnA and RLnB. RLnA and RLnC show closed.

If default state is closed , please connect RLlnA and RLnC. Power: power supply is AC: L, N

power DC power: 24V+ connect 24VDC+, GND connect 24V DC-

◆ **Integrated type**

Figure 4.5.3 Integrated Terminal schematic diagram

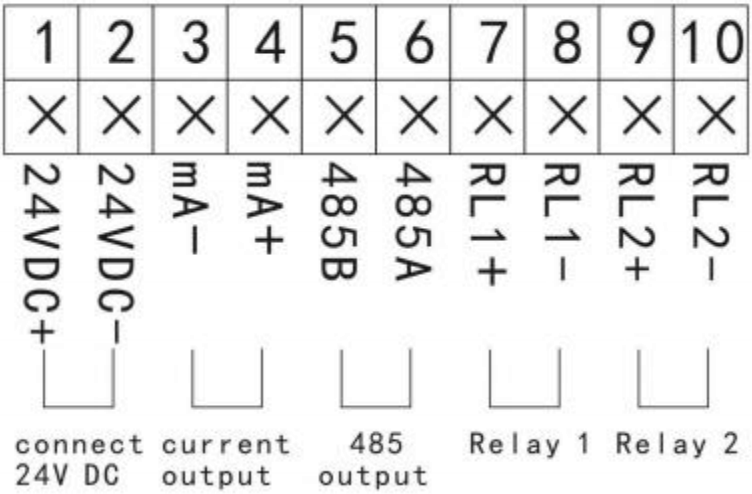


Figure 4.5.4 Integrated 24VDC Terminal schematic diagram

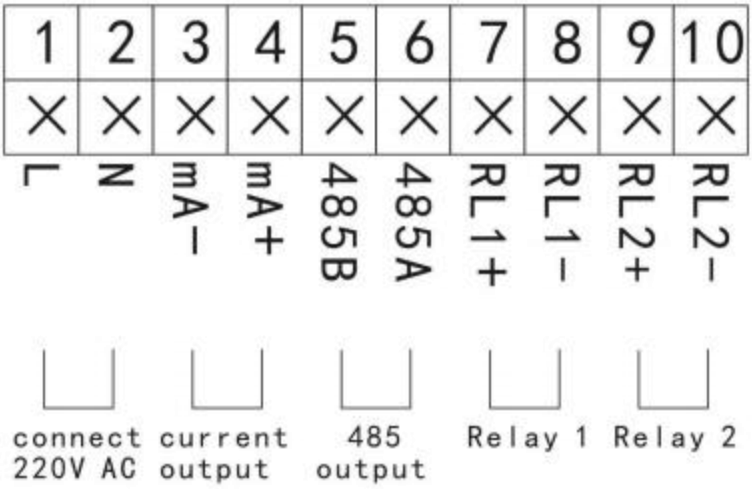


Figure 4.5.5 Integrated 220VAC Terminal schematic diagram

Current: “current ＋ ”connect mA +; “current － ”connect mA-.

Relay: connect the terminal of RLln+ and RLn- , the default is open. n=1 or 2, which means delay1 or delay 2.

Power: For 220VAC, live wire connects terminal L, the null wire connect terminal N.

For DC, 24V+connect 24V+ terminal, 24V- connect 24V- terminal.

V.Setup

1. Introduce of running interface

Ultrasonic open channel flow meter has two work mode: Running mode and Setting mode. After switched on and complete the initialization process, the flow meter will enter automatically running model, then measures and records the data.

2.Menu query tables (check the schedule)

3. Operation Instruction

⑴ Key instruction:

①three keys: Up ,Down, SET

②SET key: enter or quit.

③Up/Down: Move the cursor, choose the item, modify the parameter.

④ Check the echo state diagram: press“▲” all the time, then press “SET” for more than 2 seconds, it will check the echo state diagram.

⑤ Exit the echo state diagram: press“ ▼ ”all the time , then press “SET” for more than 2 seconds, it will exit the echo state diagram.

⑵ Menu interface and instruction：

Enter to the running model, press “SET”key, then come to first lever menu.

please select "1 factory set" and enter to the first level menu.

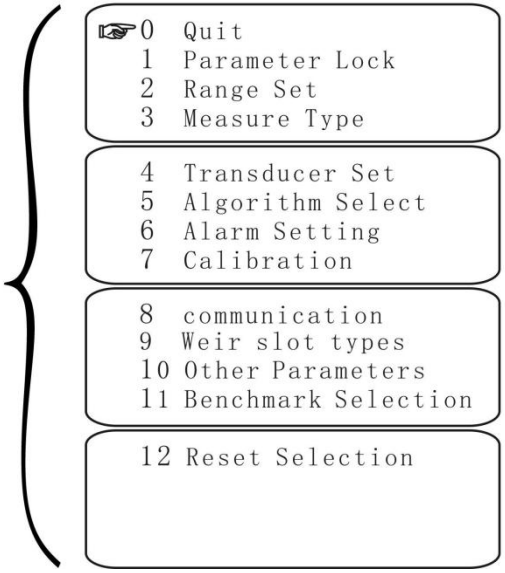
① Enter to the running model, press SET key then come to first lever menu.

② The first level menu instruction:

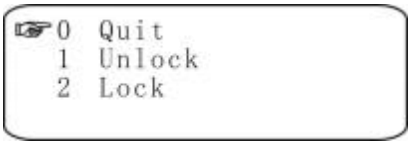
◆the first level menu of unlocked parameters

1. Move″▲″key and″▼″ key, then modify the menu, press″SET″key enter and back this menu.

2. Back to menu press ″SET″ key.



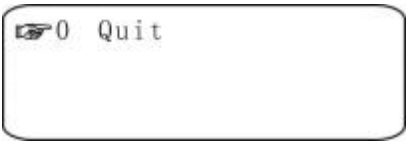
◆the first level menu of locked parameters



②The first level menu

instruction: ◆"0 finish the set"

Select this key, press the SET key and back the running mode.



◆**"1 Unlock"**

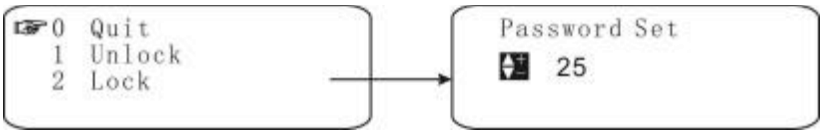
Unlocked menu, it can be allowed to change by others.

◆**"2 Lock"**

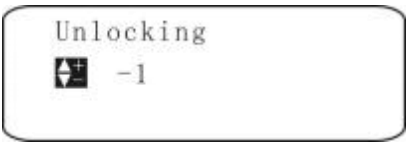
After set all the parameters, you can lock the menu, then it can't be changed by others. You start to operate the menu only input the password. The factory default password is 25, it can be modified by user.(Note: please remember the password by yourself, contact the factory after forgot the password.)

Unlock: All the menus can be allowed to modify.

Lock : After locked, it can modify only input the password.



★The parameters is locked, press SET key and enter the unlock interface.



◆"2 Range Setting"

Reference zero, Low range, High range, Unit

Reference zero: Settings interface reference zero, this is meaningful when material level measurement.

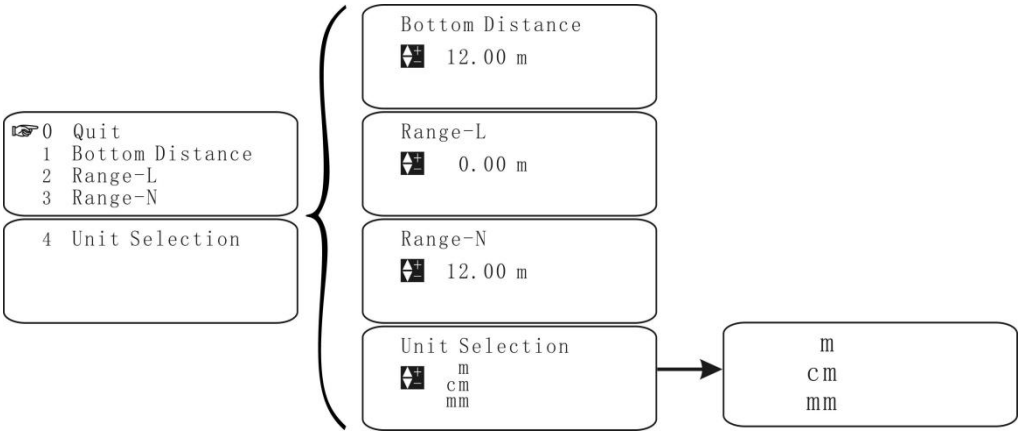
The factory default is the value corresponding to max range.

Low point range: Set the measured value corresponding to output 4mA and as the setting value of flow low restriction. The flow is 0 when the level is less than this set value. The factory default is 0.

High point range: Set the measured value corresponding output 20mA and as the setting value of flow high restriction. The flow keeps the setting value when the level is more than this set value.

For example: the setting value is 0.5m, the level is more than 0.5m, then keep the setting value. The factory default is maximum range.

Unit: m , cm, mm,the factory default is m.



◆ "3 Measurement mode"

Mode : Distance measurement and Material level measurement.

Distance measurement: display value of the distance from probe to measured interface.

Material level measurement: display value of the distance is the height of level from reference zero to level interface.

The factory default is Material level measurement.

Response speed: Slow, Medium, Fast.

Slow: Slow response rate, high measurement precision, No interference

Medium: the middle of slow and fast.

Fast: Fast response rate, high measurement precision, interference.

The factory default is Medium.

Safe Level: Maintain, Minimum, Maximum, Set value.

Maintain: After lost wave, the display value is the final measured values, the current for the corresponding value.

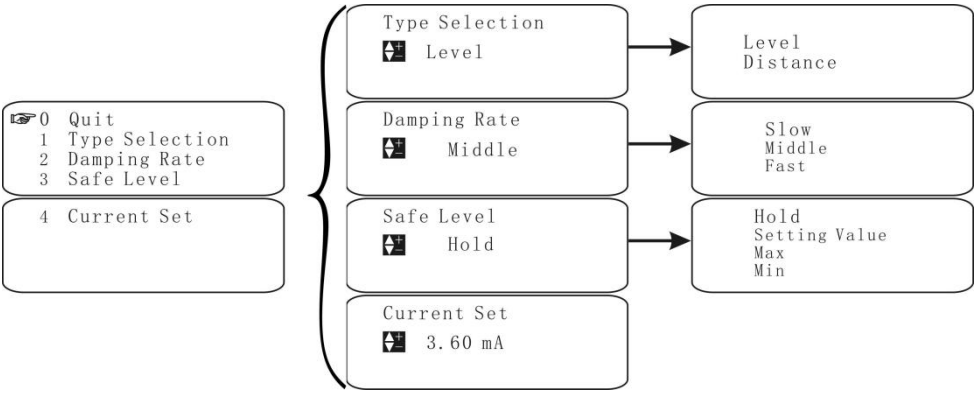
Minimum: After lost wave, the display value is 4mA, current is 4mA Maximum: After lost wave, the display value is 20mA, current is 20mA

Setting: After lost wave, the display value is the final measured value, the output is setting value of current.

The factory default is Maintain.

Current Set: After lost wave, setup the output current, the parameter is more then3.6mA, less than 22mA. Then select one of them: Maintain, Minimum, Maximum and no effect.

The default is 3.6mA



"4 Probe setting"(DO NOT Modify them)

1.Probe selection： Please don't modify by yourself, modify under the guidance of professional and technical person.

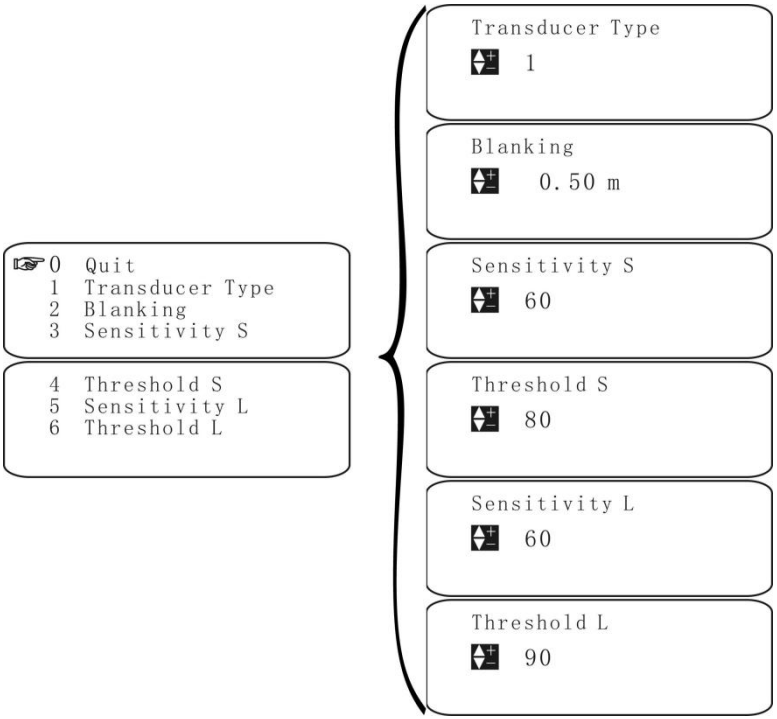
2. Blind setting: Please don't modify by yourself, modify under the guidance of professional and technical person.

3. Short sensitivity: Please don't modify by yourself, modify under the guidance of professional and technical person.

4. Short threshold: Please don't modify by yourself, modify under the guidance of professional and technical person.

5. Long sensitivity: Please don't modify by yourself, modify under the guidance of professional and technical person.

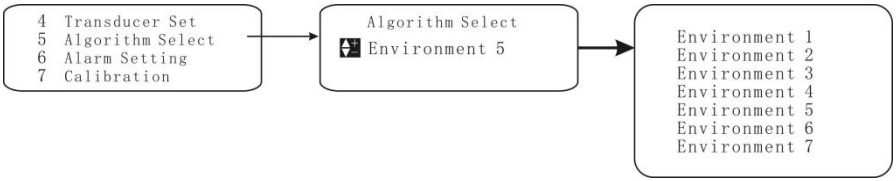
6. Long threshold: Please don't modify by yourself, modify under the guidance of professional and technical person.



" 5 Algorithm selection "(DO NOT Modify them)

Options: special environment 1, special environment 2 special environment 3, special environment 4, special environment 5, special environment 6, special environment 7.

The factory default is special environment 7.



◆ “6 Alarm setting” Setup the alarm of delay.

1.The alarm 1 of water level mode: Closed, Low alarm, High alarm.

Delay 1 is used for the water level alarm.

Closed: No function of relay 1.

Low alarm: Low alarm of relay 1.

High alarm: High alarm of relay 1.

The factory default is Closed.

2.The alarm 1 value: Unit is m, the factory default is 0.00m.

3.The alarm 1 difference: Units as M, when alarm need to be cancel, the measured value (alarm value+/-difference value) is effective. The factory default is 0.

Alarm difference makes relay to control the whole process of the water pump from low level to high level.

1.Eg: used for the water discharge: the water level is less than 1m, the pump stop working; the water level rise to 5m, the pump start to work.

The specific setting is as bellow:

Alarm 1 mode: High Alarm. Value: 5.00m; Difference: 4.00m.

2. Eg: used for the adding water: the water level is less than 1m, the pump start to add the water; the water level rise to 5m, the pump stop working.

The specific setting is as bellow:

Alarm 1 mode: Low Alarm .Value: 1.00m; Difference: 4.00m.

4. The alarm 2 of water level mode: Closed, Low alarm, High alarm.

Delay 2 is used for the water level alarm.

Closed: No function of relay 2.

Low alarm: Low alarm of relay 2.

High alarm: High alarm of relay 2.

The factory default is closed.

5. The alarm 2 value: Unit is m, the factory default is 0.00m.

6.The alarm 2 difference：Units as M， when alarm need to be cancel, the measured value (alarm value+/-difference value) is effective. The factory default is 0.

7. Instantaneous flow alarm mode: Closed, Low alarm, High alarm.

Closed: No function of relay 3.

Low alarm: Low alarm of relay 3.

High alarm: High alarm of relay 3. The factory default is closed.

8. The Instantaneous flow alarm value:

Unit is t/h, the factory default is 0.

9. The Instantaneous flow alarm difference:

Unit is t/h, when the alarm need to be canceled, the measured value (alarm value+/-difference value) is effective. The factory default is 0.

10. Cumulative flow proportional output:

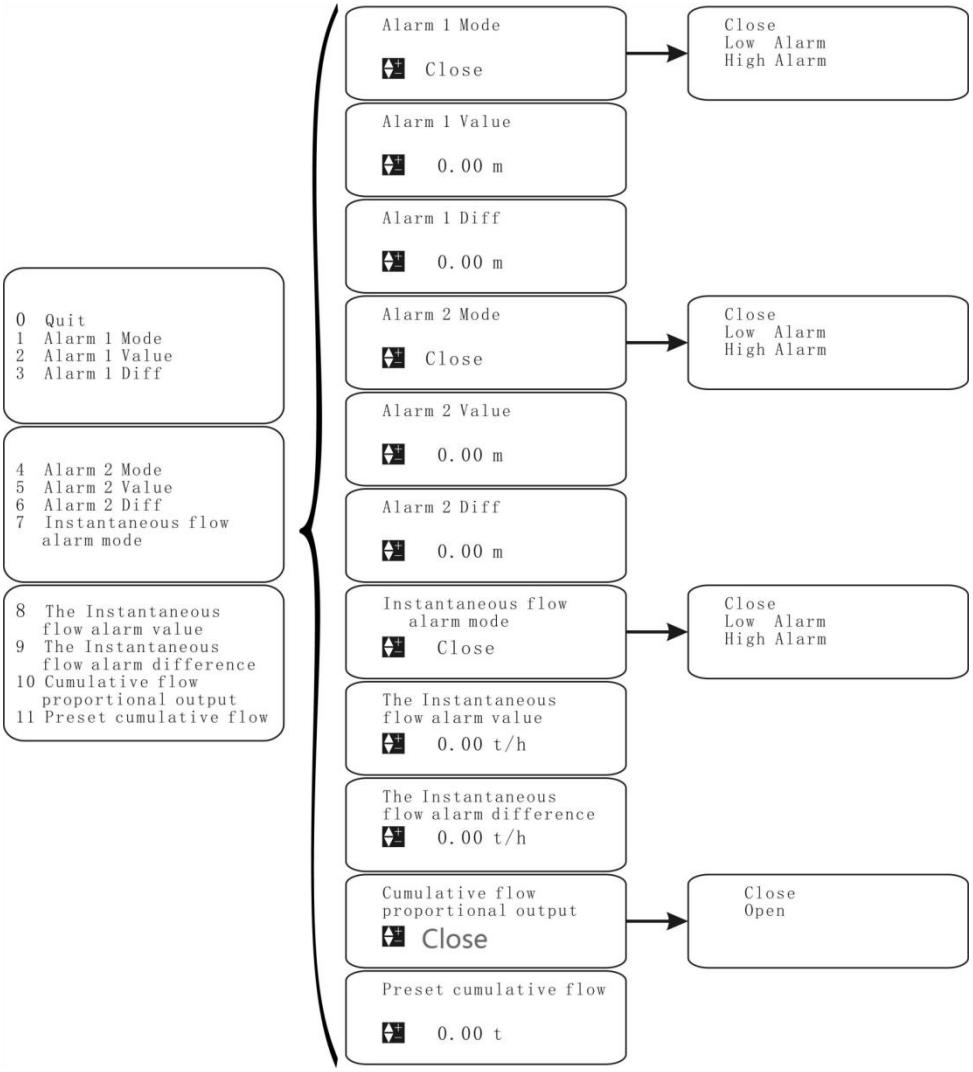
Two options: closed and open.

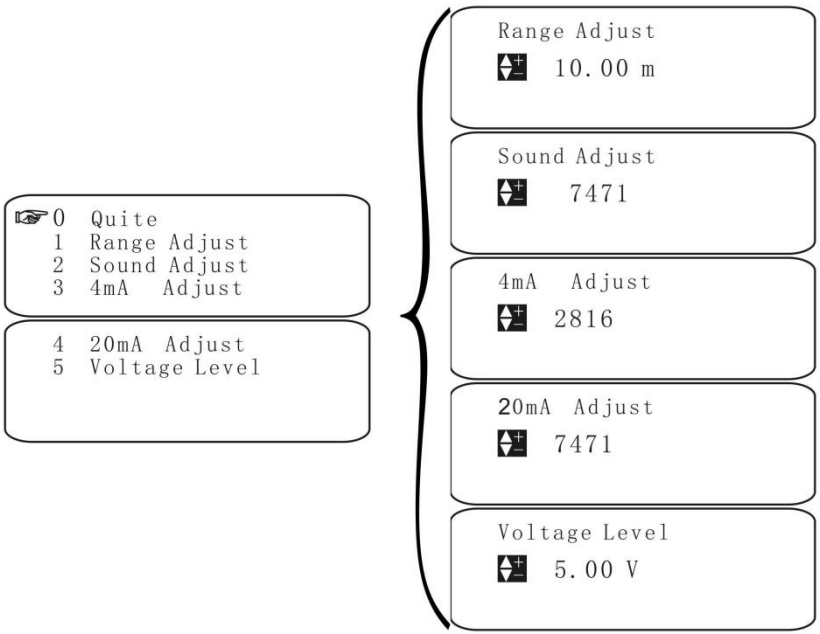
Closed: No function of delay 4.

Open: Delay 4 alarms. The factory default is closed.

11. Preset cumulative flow:

Unit is t, the factory default is 0.


0 Quit
1 Alarm 1 Mode
2 Alarm 1 Value
3 Alarm 1 Diff
4 Alarm 2 Mode
5 Alarm 2 Value
6 Alarm 2 Diff
7 Instantaneous flow alarm mode
8 The Instantaneous flow alarm value
9 The Instantaneous flow alarm difference
10 Cumulative flow proportional output
11 Preset cumulative flow
Alarm 1 Mode
Close
Close
Low Alarm
High Alarm
Alarm 1 Value
0.00 m
Alarm 1 Diff
0.00 m
Alarm 2 Mode
Close
Close
Low Alarm
High Alarm
Alarm 2 Value
0.00 m
Alarm 2 Diff
0.00 m
Instantaneous flow alarm mode
Close
Close
Low Alarm
High Alarm
The Instantaneous flow alarm value
0.00 t/h
The Instantaneous flow alarm difference
0.00 t/h
Cumulative flow proportional output
Close
Close
Open
Preset cumulative flow
0.00 t



◆"7 **Parameters calibration**"(Note: DO NOT Modify these Parameters)

Range calibration: Input the actual value, the system can do the range calibration automatically. The factory default is the measured value.

Sound calibration: Input the actual value, the system can do the sound calibration automatically. The gas doesn't include the air.

4mA calibration : Modify the value until the actual output current for 4mA.The factory default value is 3100. (use it, press ▲ to increase a value, then the output value is 4mA)

20mA calibration : Modify the value until the actual output current for 20mA. The factory default value is 7200.

Voltage : Enter the appropriate voltage values measured at test point. The factory default value is 5.00.

◆**" 8 Communication settings"**

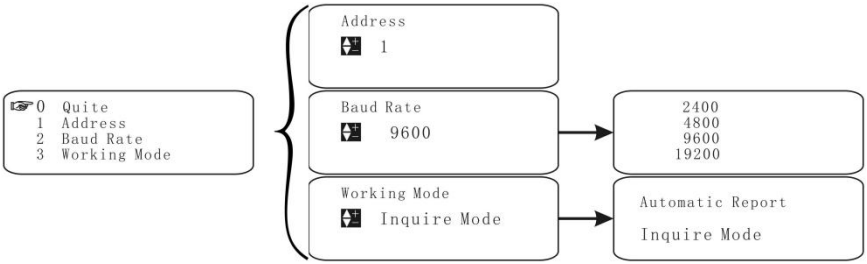
Address : Select the communication address, the factory default is 1.

Baud rate : Four types of baud rate: 2400, 4800, 9600 and 19200. The factory default value is 9600.

Working mode: working mode of communication: “Automatic reporting", "Query", Automatic reporting": Ultrasonic level meter send the data to the host computer automatically, don’t need to send the query instruction.

(Manufacturers protocol has automatic reporting, but MODBUS protocol don’t.)

"Query": when the host computer sends the query order, the level meter can answer.



◆**“9 Weir and flume Type”**

1. Triangle weir

Work state:

closed : not select triangle weir; the default is closed.

Open: select triangle weir.

The angle of triangle weir:

90°（30°/60°/45°)is the angle of triangle wire which can choose different angles by user. Our products can calculate the flow value automatically according to the water level.

2. Rectangle weir

Work state:

closed: not select rectangle weir; the default is closed.

Open: select rectangle weir.

Standard channels:

0.25m(0.50m/0.75m/1.00m and non-standard channels).

These values mean throat width of rectangle weir.

0.25m is the width of throat of rectangle weir.

The user needs to choose the different throat widths, then our products can calculate the flow value automatically according to the water level. If select the non-standard channels, it shows the following hidden menu.

“3 weir width (b) ” “4 upstream channel width(B) ” “5 weir well height P ”

The user inputs the actual size of channel.

3. Trapezoid weir

Work state:

closed : not select trapezoid weir; the default is closed.

Open: select trapezoid weir.

Weir cage width B: The user inputs the actual size of channel. Our products can calculate the flow value automatically according to the water level.

4. Parshall flume

closed : not select Parshall flume;

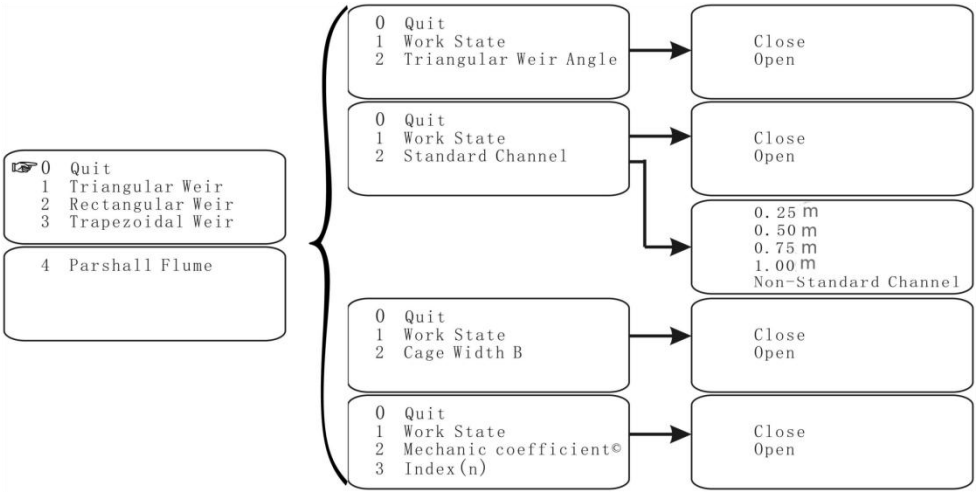
Open: select Parshall flume, the default is open.

Mechanic coefficient(c): Set the c value according to the supporting weir and flume. The factory default is 0.01.

Index(n): Set the n value according to the supporting weir and flume. The factory default is 0.01.

Special Note:

As the Mechanic coefficient (c)and index (n), the user can find the corresponding two parameters according to different size of flume. Please check the attached list No.2.



◆“10 Other parameters”

20mA Flow value: Set the 20mA flow value means 20mA corresponds to the instant flow value. The factory default is max flow.

4mA Flow value : Set the 4mA flow value means 4mA corresponds to the instant flow value. The factory default is 0.

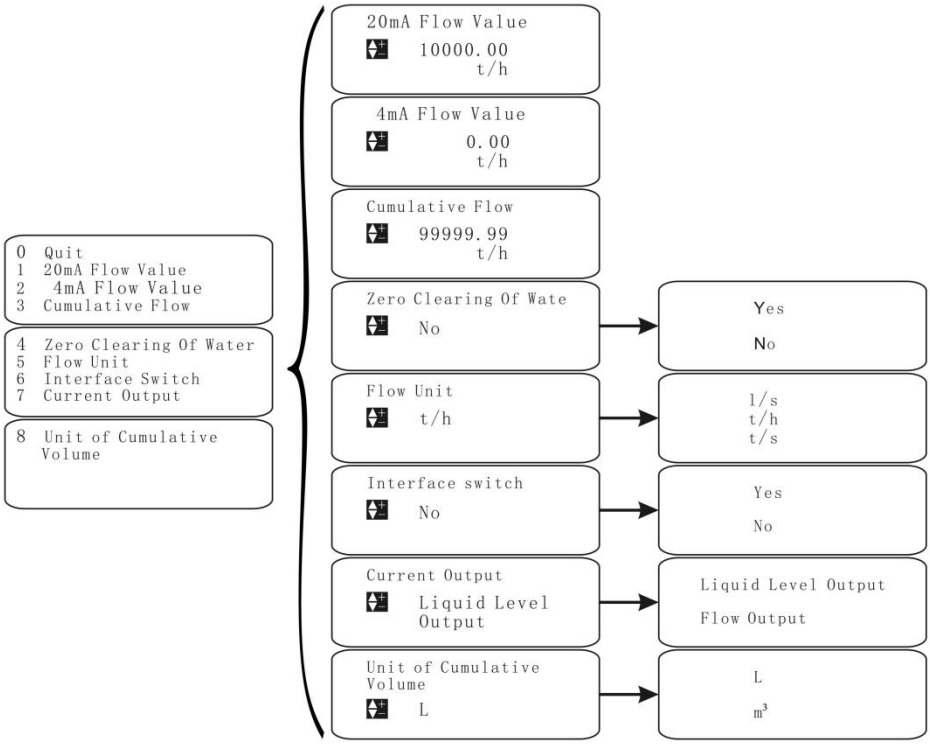
Cumulative flow: For duplicated the cumulative water value when instrument replacement. The factory default is 0.

Zero clearing of water: the cumulative value of water can be cleared.

Flow unit : change into the flow speed unit, “t/h” , “l/s” , “t/s”. The factory default is “t/h ”.

Interface switch : the flow and level interface can be switched each other.

Output: Load capacity of 4～20mA is 750Ω。As the flow, 4～20mA is the instant flow output. As the level, it is the height output of level. The factory default is flow output.

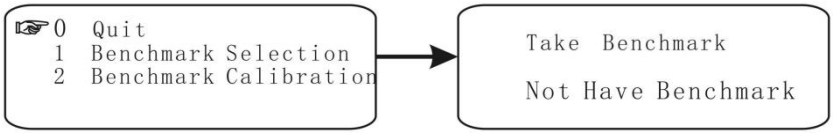


"11 Benchmarks selected" **Benchmark selection**:

Yes: calibrate the measurement accuracy with the benchmarks.

No: calibrate the measurement accuracy without the benchmarks. The factory default is No.

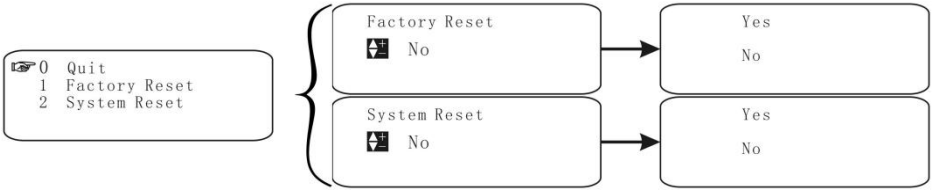
Benchmark calibration: Before the calibration the measurement accuracy with the benchmarks, you should calibrate the benchmarks, just input the measured value into the menu from the bottom probe to interface of benchmarks .



"12 Reset"

Factory Reset: Yes: Restored to the state of factory setting . No: exit. The default setting is No.

System Reset: Yes: Restored to the state of factory setting .No: exit. The default setting is No. (Do not modify it)



VI. Function

1. Level measurement
2. Open channel flow measurement of open channel (**For Triangle weir, Rectangle weir, Trapezoid weir, Parshall flume)**
3. 4~20mA remote current output

Load capacity of 4~20mA resistance is750Ω.For Flow meter, 4~20mA means flow output; For lever meter, it means level output. 4mA corresponds to zero values of level or flow; 20mA corresponds to the value can be set by the following menus. ("set the constant" ------"20mA current values".)

4. SPDT Relay

AC 250V/8A and DC 30V/5A relays are programmable. One of the relays used for limited the size of instantaneous flow, another relay is for cumulative flow proportional output (which means every preset cumulative flow, closed again).

5. Super large storage

Maximum cumulative water of this model is 12 digits (including 2 decimals), when the cumulative value reaches 4290000000.00t, auto zeroing and accumulate again. Maximum instantaneous flow speed be able to reach to 99999.99t/h.

VII. Weir and flume for water measurement

When select the type of weir and flume, please consider the size of channel flow, the water channel flow pattern (the formation of free flow or not). Based on the different of maximum flow, we can choose different weirs and flume.

① Maximum flow is less than 40l/s, suggestion is right-angled triangular weir.

② Maximum flow is more than 40l/s, suggestion is parshall flume.

③ Maximum flow is more than 40l/s and upstream channel is short, suggestion is rectangular weir.

If the condition is good, it is better to select parshall flume. Because the connection between level and flow of parshall flume is determined by calibration laboratories, and it is required that upstream drainage weir environment is not strict. For rectangular and triangular weir, the connection between level and flow is derived from theoretical calculations, which caused the errors caused by ignored some of the conditions of use.

The material weir and flume is RFP.

For triangular and rectangular weir, the notch size must be precise and the surface which is toward the water should be smooth.

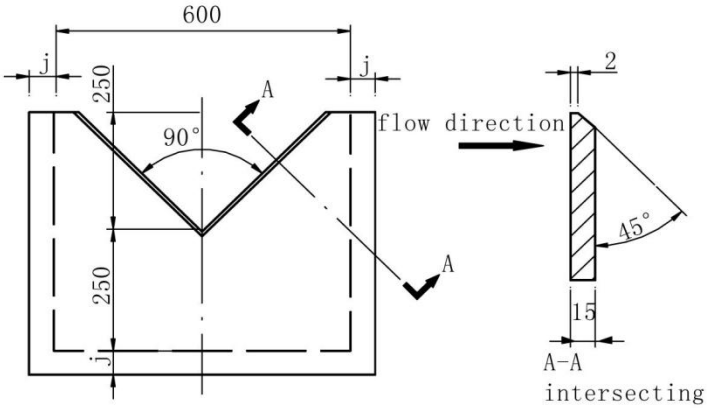
For the parshall flume, the throat portion size must be precise and surface within the flume is smooth.

1、Right-angled triangular weir

The Structure of Right-angled triangular weir was showed by figure 7.1.1.

Select the menu “9 weir and flume type” ------“1 righted-angled triangular weir”----“1 work status” -----“start”, then the

instrument can be calculated the corresponding flow automatically according to water level.



Material: FRP, PVC, Stainless steel.
1. The surface of plate is smooth, flat and have no distortion.
2. The edge of Triangle weir is straight, smooth.
3. J: the embedded part of the side wall and bottom, it's dimension depends on the installation situation of scene.

Figure 7.1.1 Structure of Right-angled triangular weir

2. Triangular weir installed in the channel as shown in Figure 7.1.2.

The weir plate is vertical, which installs in the central axis of the channel. When machining triangular weir, make top angel to change into rounded vertex. Confirmed that the water level is in the zero position, please note that the zero point of level should be on the intersection of extension line at the side of the triangular weir. The probe of instrument should be installed on the position of 0.5-1m between upstream and weir plate.

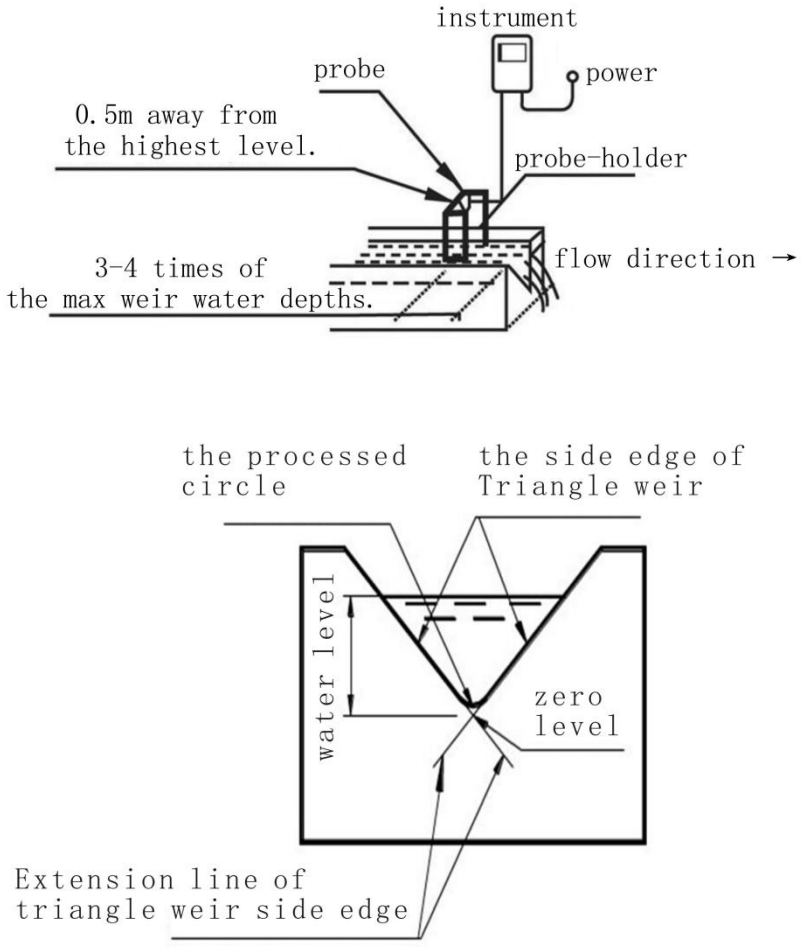


Figure 7.1.2 Installation of Triangular weir in the channel
And Level zero of Triangular weir

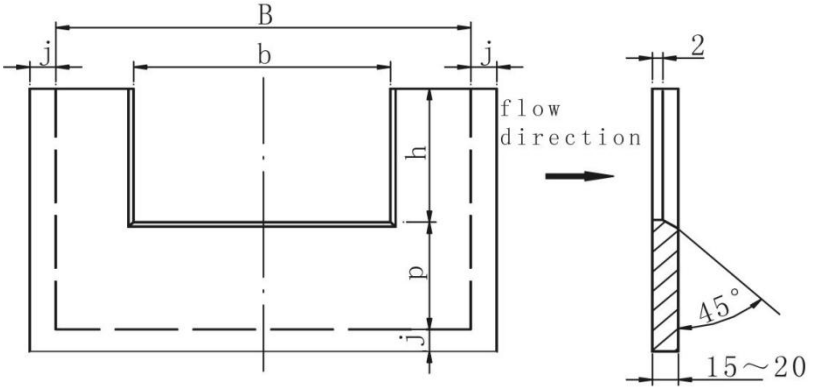
2.Rectangle weir

Figure 7.2.1. is the processing photo of rectangular weir.

For rectangular Weir, the connection between the water level and flow depends on the width “b” of weir notch, width "B" of upstream channel and weir ridge high "p".

As the rectangular weir of Figure 6.2.1, select menu "9 Weir flume type" → "2 rectangular weir " → "1" work status"---“start”, and the menu of "2 standard channel" select "0.25m, 0.50m, 0.75 m, 1.00 m, non-standard channels", then the instrument can be automatically calculated according to water level water level corresponds to the flow.

At the actual site, the notch width of rectangular weir is more than 1m, at this time, then select non-standard rectangular weir to measure. This instrument has this feature. According to the measured value of b, B ,P
from the scene, input them then it can be measured.



Material: FRP, PVC, Stainless steel.

1. The surface of plate is smooth，flat and have no distortion.
2. The edge of rectangular weir is straight, smooth.
3. J: the embedded part of the side wall and bottom, it ’s dimension depends on the installation situation of scene.
4. b= the width of weir edge B= the width of upstream channel
   h= the level height p= the wall height

b (mm)	250	500	750	1000
B (mm)	500	800	1000	1500
h (mm)	250	300	500	500
p (mm)	100	150	200	200

Figure 7.2.1 Structure of Rectangle weir

Triangular weir installed in the channel as shown in Figure 7.2.2.

1. The weir plate is vertical, which installs in the central axis of channel.

2. The probe of instrument should be installed on the position of 0.5 -1m between upstream and weir plate.

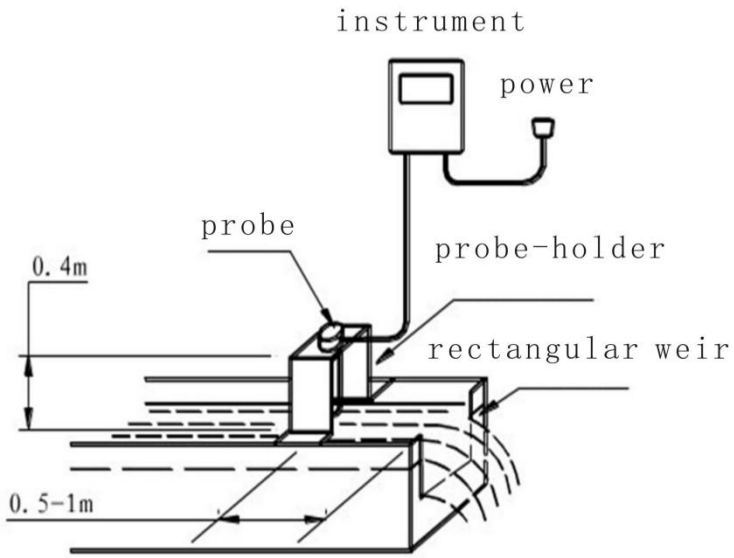
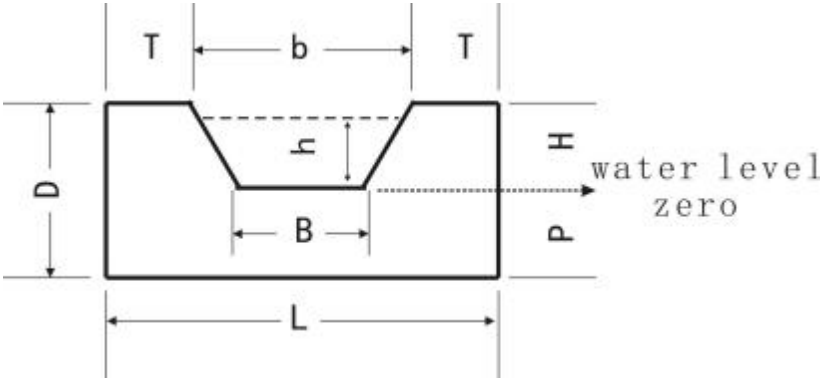


Figure 7.2.2 the installation of Rectangle weir

3. Trapezoidal weir

As the trapezoidal weir, select the menu"9 Weir type" → "3 trapezoidal weir " → "1" work status"---“start”, and the menu of "2 weir width" input the actual value, the instrument can be automatically calculated according to water level water level corresponds to the flow.

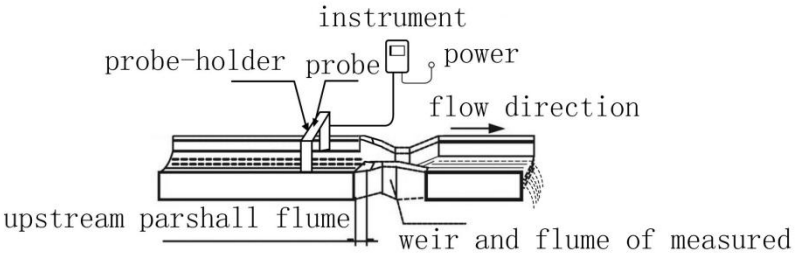
The installation of trapezoidal weir is the same as the rectangular weir.



4 .Parshall flume

The structure photo of parshall flume as in Figure 7.3.1.

For the marked dimension of throat width "b", first find out the max flow by your application needs, second check the appropriate “b” from the "Schedule II parshall flume water-flow formula", third find the other dimensions from "Schedule I parshall flume structure dimension" , such as "L1", "La", "l", "L2" and so on. Finally write these dimensions in the column on the right in Figure 7.3.1. Processing according to Figure 7.3.1, installed on the channel by shown in Figure 7.2.3.



The connection between water level and flow of parshall flume: $Q=Cha^n$ formula. According to throat width "b", check the coefficient c and index n from "Schedule II parshall flume water-flow formula", input the menu "9 Weir type" → "4 parshall flume " → "2 coefficient c" and "3 index n", the instrument can be calculated automatically level corresponds to the flow meter.

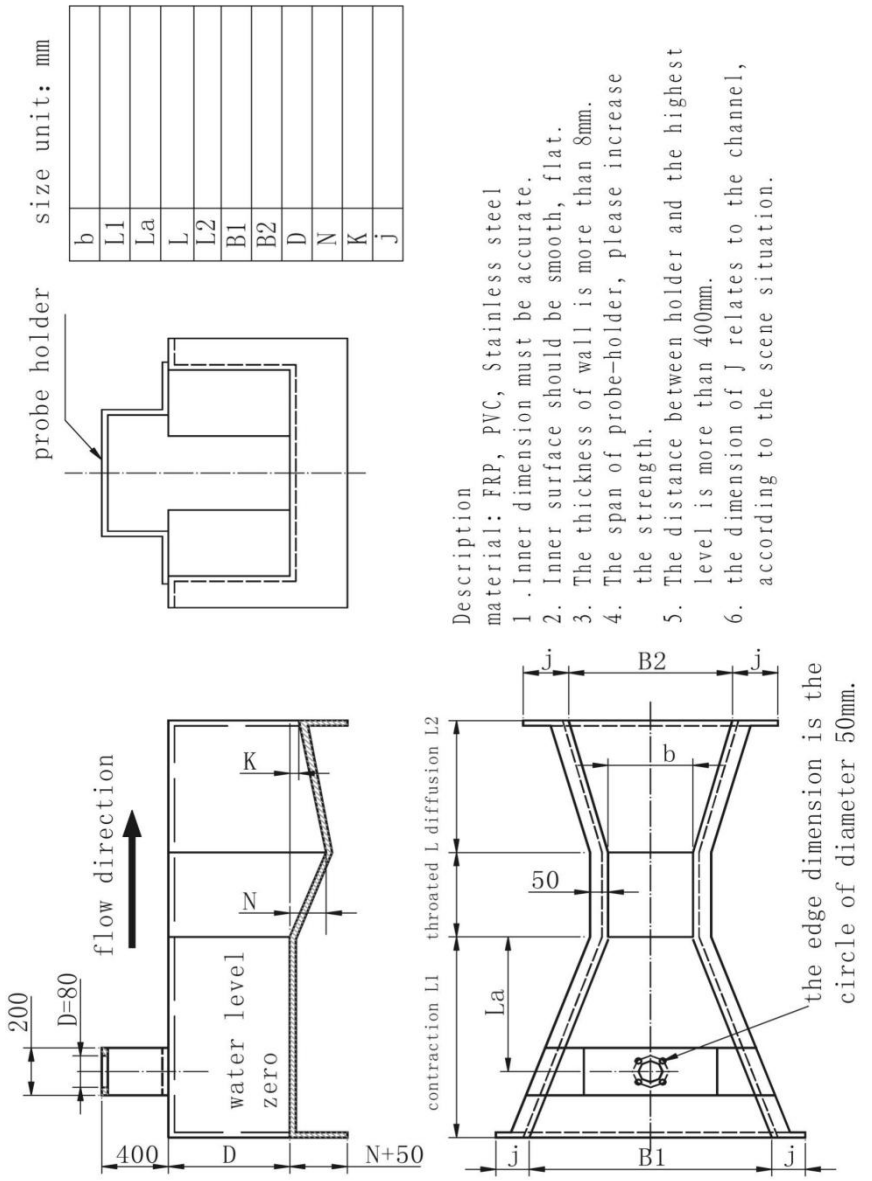


Figure7.3.1 Structure of parshall flume

VIII. Troubleshooting Symptoms and Solutions

Symptom	Reason	Solution
No display	1.not connect power. 2.bad contact of LCD 3.LCD broken	1. check the power line and measure the voltage with multimeter. 2. Reseat the LCD Panel and cable. 3. factory replacement LCD screen
Enter level interface, this mark " ▲ " which showed on the screen doesn't change, it means the system is in the state of lost wave.	1. Measured distance beyond the range of product. 2. Measured medium Have strong interference, waves and stir. 3.There are interference sources such as frequency converter, motor and so on in the environment. 4. The probe doesn't aimed at the measured surface 5.Measured space has unnecessary object, such as support rods, feed opening and so on. 6.Enter the blind area.	1.Consider the longer range 2. Waiting for calm of the material, the device will return to normal measurement or install the flow meter with waveguide (the diameter 150). 3.Grounded the flow meter, isolate the power supply and the output signal line. 4. Reinstall the probe, make sure to perpendicular to the measured surface. 5. Choose new installation position to avoid to appear interference. 6.Raise the probe installation position, the height of probe installation is more than the highest surface +blind area.

Schedule I Parshall flume structure dimension Unit: m

Item	No.	Throated			Contraction			Diffusion			Wall height
		b	L	N	B1	L1	La	B2	L2	K	D
Small type	1	0.025	0.076	0.029	0.167	0.356	0.237	0.093	0.203	0.019	0.23
	2	0.051	0.114	0.043	0.214	0.406	0.271	0.135	0.254	0.022	0.26
	3	0.076	0.152	0.057	0.259	0.457	0.305	0.178	0.305	0.025	0.46
	4	0.152	0.305	0.114	0.400	0.610	0.407	0.394	0.610	0.076	0.61
	5	0.228	0.305	0.114	0.575	0.864	0.576	0.381	0.457	0.076	0.77
Standard type	6	0.25	0.60	0.23	0.78	1.325	0.883	0.55	0.92	0.08	0.80
	7	0.30	0.60	0.23	0.84	1.350	0.902	0.60	0.92	0.08	0.95
	8	0.45	0.60	0.23	1.02	1.425	0.948	0.75	0.92	0.08	0.95
	9	0.60	0.60	0.23	1.20	1.500	1.0	0.90	0.92	0.08	0.95
	10	0.75	0.60	0.23	1.38	1.575	1.053	1.05	0.92	0.08	0.95
	11	0.90	0.60	0.23	1.56	1.650	1.099	1.20	0.92	0.08	0.95
	12	1.00	0.60	0.23	1.68	1.705	1.139	1.30	0.92	0.08	1.0
	13	1.20	0.60	0.23	1.92	1.800	1.203	1.50	0.92	0.08	1.0
	14	1.50	0.60	0.23	2.28	1.95	1.303	1.80	0.92	0.08	1.0
	15	1.80	0.60	0.23	2.64	2.10	1.399	2.10	0.92	0.08	1.0
	16	2.10	0.60	0.23	3.00	2.25	1.504	2.40	0.92	0.08	1.0
	17	2.40	0.60	0.23	3.36	2.40	1.604	2.70	0.92	0.08	1.0
Large type	18	3.05	0.91	0.343	4.76	4.27	1.794	3.68	1.83	0.152	1.22
	19	3.66	0.91	0.343	5.61	4.88	1.991	4.47	2.44	0.152	1.52
	20	4.57	1.22	0.457	7.62	7.62	2.295	5.59	3.05	0.229	1.83
	21	6.10	1.83	0.686	9.14	7.62	2.785	7.32	3.66	0.305	2.13
	22	7.62	1.83	0.686	10.67	7.62	3.383	8.94	3.96	0.305	2.13
	23	9.14	1.83	0.686	12.31	7.93	3.785	10.57	4.27	0.305	2.13
	24	12.19	1.83	0.686	15.48	8.23	4.785	13.82	4.88	0.305	2.13
	25	15.24	1.83	0.686	18.53	8.23	5.776	17.27	6.10	0.305	2.13

Schedule II Parshall flume water-flow formula

Item	No.	Width throat b(m)	Flow Formula $Q=Cha^n$ (L/S)	Water level h(m)		Flow Q(L/s)		Critical flood (%)
				min	max	min	max	
Small type	1	0.025	$60.4ha^{1.55}$	0.015	0.21	0.09	5.4	0.5
	2	0.051	$120.7ha^{1.55}$	0.015	0.24	0.18	13.2	0.5
	3	0.076	$177.1ha^{1.55}$	0.03	0.33	0.77	32.1	0.5
	4	0.152	$381.2ha^{1.54}$	0.03	0.45	1.50	111.0	0.6
	5	0.228	$535.4ha^{1.53}$	0.03	0.60	2.5	251	0.6
Standard type	6	0.25	$561ha^{1.513}$	0.03	0.60	3.0	250	0.6
	7	0.30	$679ha^{1.521}$	0.03	0.75	3.5	400	0.6
	8	0.45	$1038ha^{1.537}$	0.03	0.75	4.5	630	0.6
	9	0.60	$1403ha^{1.548}$	0.05	0.75	12.5	850	0.6
	10	0.75	$1772ha^{1.557}$	0.06	0.75	25.0	1100	0.6
	11	0.90	$2147ha^{1.565}$	0.06	0.75	30.0	1250	0.6
	12	1.00	$2397ha^{1.569}$	0.06	0.80	30.0	1500	0.7
	13	1.20	$2904ha^{1.577}$	0.06	0.80	35.0	2000	0.7
	14	1.50	$3668ha^{1.586}$	0.06	0.80	45.0	2500	0.7
	15	1.80	$4440ha^{1.593}$	0.08	0.80	80.0	3000	0.7
	16	2.10	$5222ha^{1.599}$	0.08	0.80	95.0	3600	0.7
	17	2.40	$6004ha^{1.605}$	0.08	0.80	100.0	4000	0.7
Large type	18	3.05	$7463ha^{1.6}$	0.09	1.07	160.0	8280	0.8
	19	3.66	$8859ha^{1.6}$	0.09	1.37	190.0	14680	0.8
	20	4.57	$10960ha^{1.6}$	0.09	1.67	230.0	25040	0.8
	21	6.10	$14450ha^{1.6}$	0.09	1.83	310.0	37970	0.8
	22	7.62	$17940ha^{1.6}$	0.09	1.83	380.0	47160	0.8
	23	9.14	$21440ha^{1.6}$	0.09	1.83	460.0	56330	0.8
	24	12.19	$28430ha^{1.6}$	0.09	1.83	600.0	74700	0.8
	25	15.24	$35410ha^{1.6}$	0.09	1.83	750.0	93040	0.8

Note: Mechanic coefficient "C" and Index "n". Number 1 of table as an example, the mechanic coefficient c is: 60.4, Index n is: 1.55.