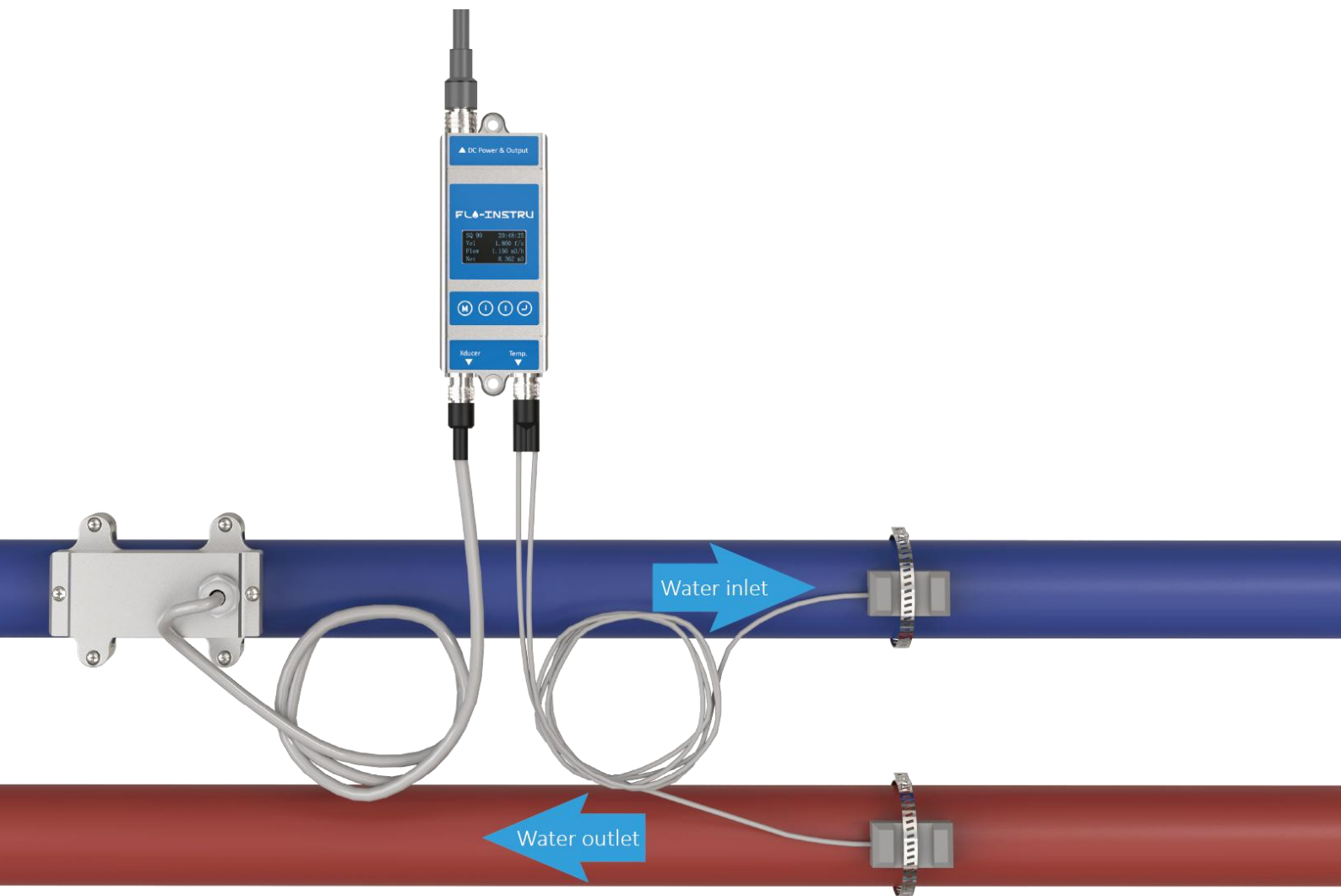




SE603 Ultrasonic Flow Meter

Instruction Manual



Reversion: A
Date: April 2024

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Notice

Thank you for choosing Model SE603 Energy Meter.

This instruction manual contains the important using and operation information of the flow meter. Please read the manual carefully before operation for the expected performance of the flow meter.

Operational mistake would affect the meter's working result, reduce the meter's lifespan or cause some malfunctions.

1.Product component

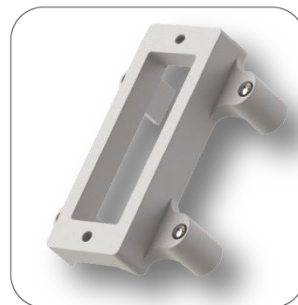
Inspection should be made before installing the flow meter. Check to see if the spare parts are in accordance with the packing list. Make sure that there is no potential damage to the enclosure due to a loose screw or loose wire, which might occur during transportation. Please contact your representative as soon as possible if there is any question.



Transmitter x1



Transducer base x1



Top bracket x1



Bottom bracket x1



Connecting cable x1



Coupling pad x1



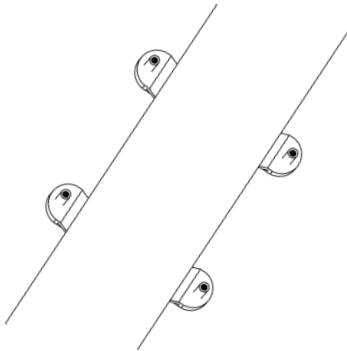
Temp. cable x1



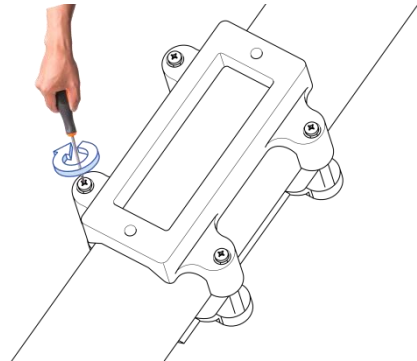
Pipe strap x1

2.Flow meter installation and connect

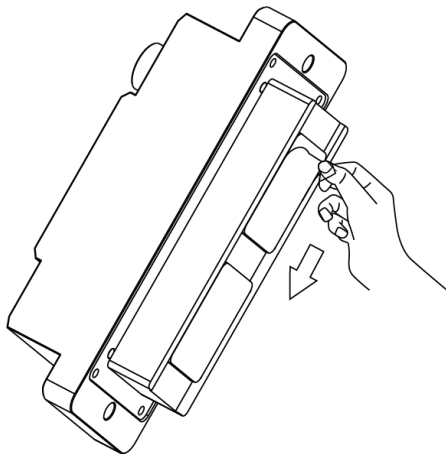
Step1: Make sure no dirt, paint, or other stains on the surface of the tube. If the surface of metal pipes is rough, it needs to be polished with tools. Then put the bottom parts on the side of the pipe.



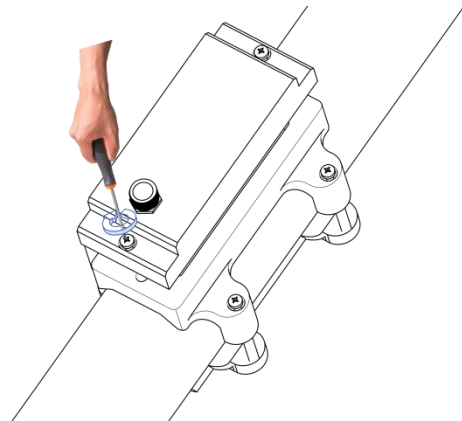
Step2: Align the bracket to the pipe position; Install screw on top part of the bracket, the bottom part of the bracket will automatically connect with the top part. Tighten all four M4 screws.



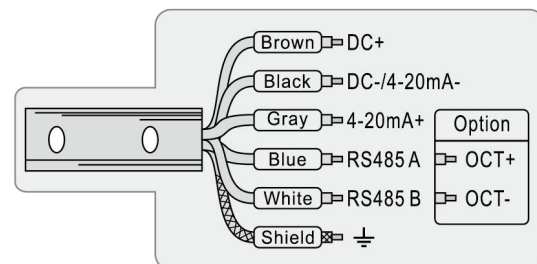
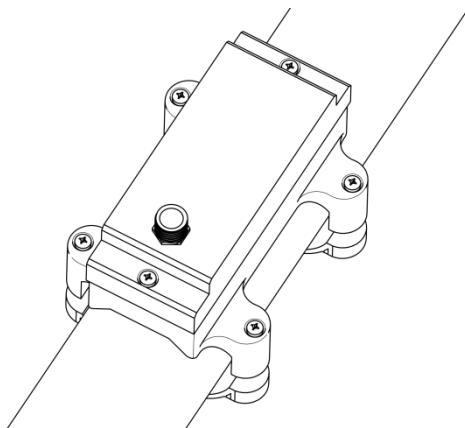
Step3: Take the cover off the sensor.



Step4: Put the flow meter into upper bracket, and tighten two M4 screws

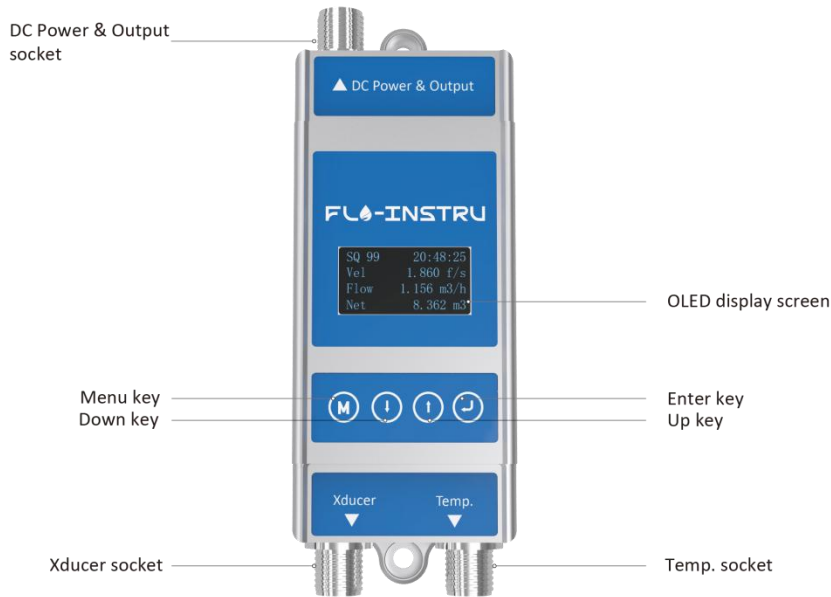


Step5: Installation Finished.



Wiring diagram

3. Panel function



4. Powering on

As soon as the Flow meter is switched on, the self-diagnosis program will start to run.

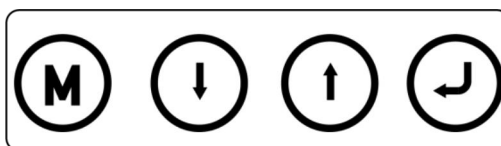
```
SQ 88      12:30:29
Eq 135.28  GJ/H
EH 335.66  GJ
EC 35487.53 GJ
```

4.1 Signal Quality (SQ value)

SQ value is short for Signal Quality. It indicates the level of the signal detected. SQ value is indicated by numbers from 0~99 is the minimum signal could be detected and 99 represents the maximum. Normally, the transducer position should be adjusted repeatedly and coupling compound should be checked frequently until the signal quality detected is as strong as possible.

5. Keypad functions

Follow these guidelines when using the flow meter keypad:



Ⓜ Setting or display mode, when it is on setting mode, it can return to the previous menu, Ⓢ and Ⓡ scroll up and down to select the menu, when press Ⓢ move to next digit, press Ⓡ and the numbers scroll from 0 to 9, you can select the number. Press Ⓣ to confirm.

6.Window descriptions

6.1 Display menu

| | |
|--|--|
| <p>When power is on, The meter will display Velocity/Net Totalize. Display signal quality,time, heat power(Eq),heat totalize(EH),cold totalizer(EC)</p> | <p>SQ 88 12:30:29 Eq 135.28 GJ/H EH 335.66 GJ EC 35487.53 GJ</p> |
| <p>Press ↵ will display T1,T2,delta T, press ↵ will return to previous menu. Display date,time,outlet temp.(T1),inlet temp.(T2),Delta temp.(DT)</p> | <p>19-06-22 12:30:29 T1 11.38 C T2 5.55 C DT 5.832 K</p> |
| <p>Press ↵ will display Eq,EH, press ↵ will return to previous menu. Display signal quality. Time, Heat power(GJ/j),Heat totalizer(EH).</p> | <p>SQ 88 12:30:29 12.933 GJ/H EH 354.53 GJ</p> |
| <p>Press ↵ will display Eq,EC, press ↵ will return to previous menu. Display signal quality. Time, heat power(Eq),cold totalizer(EC).</p> | <p>SQ 88 12:30:29 95.651 GJ/H EC 354.53 GJ</p> |
| <p>Press ↵ will display Flow rate/Net Totalize. Press ↵ will return to previous menu. Display signal quality(SQ),time,flow rate,net totalize.</p> | <p>SQ 88 12:30:29 11.651 m3/h Net 354.53 m3</p> |
| <p>Press ↵ will display the Unit runtime. Press ↵ will return to previous menu. Display Unit runtime,monthly heat totalizer(EHM),monthly energy totalizer(ECM),monthly flow totalizer(ETM)</p> | <p>Runtime 23 h EHM 5.543 Kwh ECM 7.248 Kwh ETM 9.539 m3</p> |

6.2 Setup menu

| | |
|--|---|
| <p>Press M will display setup menu. The following options are available. (by ↑ or ↓ buttons)</p> <ol style="list-style-type: none"> 0. Pipe parameter 1. System setting 2. Calibration 3. Output setting 4. Energy setting 5. History Data | <div style="border: 1px solid black; padding: 5px; background-color: #f0f0f0;"> <p>Setup menu 0. Pipe parameter 1. System setting 2. Calibration</p> </div> |
|--|---|

6.3 Setup menu - Pipe parameter

| | |
|---|--|
| <p>Press ↓, select 0. Pipe parameter, then ↓ display. The following options are available. (by ↑ or ↓ buttons)</p> <ol style="list-style-type: none"> 0. Outer diameter 1. Wall thickness 2. Material: Move ↑ or ↓ can choose PVC, Carbon steel, Steel, Copper, PVDF, PFA, PTFE, PU pipe etc. 3. Fluid type: Move ↑ or ↓ can option Water, Sea Water, Oil etc. | <div style="border: 1px solid black; padding: 5px; background-color: #f0f0f0;"> <p>Pipe Setting 0. Outer diameter 1. Wall thickness 2. Material</p> </div> |
|---|--|

6.4 Setup menu - System setting

| | |
|---|---|
| <p>Press ↓, select 1. System setting, then ↓ display. The following options are available. (by ↑ or ↓ buttons)</p> <ol style="list-style-type: none"> 0. System unit: Move ↑ or ↓ can option Metric, English. 1. Flow rate unit: Move ↑ or ↓ can option m³/h, LPM, GPM. 2. Total unit: Move ↑ or ↓ can m³, L, GAL. 3. Total reset: All parameters are reset, press ↓, move ↑ or ↓ arrow to select "YES" or "NO". After "YES" is selected. | <div style="border: 1px solid black; padding: 5px; background-color: #f0f0f0;"> <p>System setting 0. System unit 1. Flow rate unit 2. Total unit</p> </div> |
| <ol style="list-style-type: none"> 4. Time set: When modifying, the default is 30 seconds. Generally, it is unnecessary to modify date time as the system is equipped with a highly reliable perpetual calendar chip. | <div style="border: 1px solid black; padding: 5px; background-color: #f0f0f0;"> <p>yy-mm-dd hh:mm 20-03-18 12:30</p> </div> |

5. **System lock:** Once the system is locked, any modifications to the system are prohibited, but the parameter is readable. "Unlock" using your designated password. The password is composed of 1 to 4 numbers.

| | | | |
|--------------------------------|------------------------------|----------------------|-----------------------------------|
| System lock System unlocked | System lock ENT to lock | ENT key word 0000 | System lock System locked OK |
| System lock System locked | System lock ENT to unlock | ENT key word 0000 | System lock System unlocked OK |

6. **System info:** Display serial number (SN) of the meter. This SN is the only one assigned to each flow meter ready to leave the factory. The factory uses it for files setup and for management by the user. Press \odot 5 times to enter Manual Totalizer: The manual totalizer is a separate totalizer. Press \odot to start, and press \odot to stop it. It is used for flow measurement and calculation.

| | | | |
|--|----------------------------------|---|--|
| System INFO Flowmeter SN:30001399 V1.00 | Manual Totalizer ENT To Start | Manual Totalizar ENT To Stop 1.239 m3/h SQ 99 1.056L | Manual Totalizer ENT TO Restart 1.239 m3/h SQ 99 1.056L |
|--|----------------------------------|---|--|

7. **Display dir:** Can choose the direction of display, convenient to observe the measurement data.

| |
|--|
| Display dir 0.Normal 1.Inversion |
|--|

6.5 Setup menu - Calibration


Press \odot , Select 2. Calibration, and then \odot display:

| |
|--|
| Calibration 0.Scale factor 1.Set zero 2. Low flow cut |
|--|



0. Scale factor

Refers to the ratio between "actual value" and "reading value". For example, when the measurement is 2.00, and it is indicated at 1.98 on the instrument, the scale factor reading is $2/1.98$. This means that the best scale factor constant is 1.01.

| |
|-----------------------|
| Scale factor 1.000 |
|-----------------------|

| | |
|---|--|
| <p>1. Set zero: Press  reset "Zero Point" which was set by the user. After setting, return to the main interface and the flow is "0". If you return to the main interface, the flow is not "0", the setting is unsuccessful. Check whether the installation is correct or not.</p> | <p>Set zero Ent To set zero Reset zero</p> |
| <p>2. Low flow cut Flow rate falls below the low flow cutoff value. This function can prevent that when the pump stops working and the liquid flows at a low speed in the pipe, data accumulation error caused by continuous reading of flow meter. Input is generally recommended 0.05m/s as the low flow cut-off point.The low flow cut-off value is independent of the measurement results. Generally, pipes made of SS304 or SS316 are with wall thickness of more than 2mm.In practical use, it will receive false signals due to the interference of pipe wall signals, It is recommended that the low flow rate should be cut off at 0.08m/s or above.</p> | <p>Low flow cut 0.0500 m/s</p> |
| <p>3. Manual zero This method is not commonly used and is only suitable for experienced operators. It is not suitable for other parties, Manually input the value and add it to the measured value to obtain the actual value.</p> | <p>Manual zero 0.0000 m³/h</p> |

6.6 Setup menu - Output Setting

| | |
|---|--|
| <p>Press , Select 3, Output setting, and then  display:</p> | <p>Output setting 0.RS485 Setup 1.Alarm value</p> |
| <p>0. RS485 setup The window is used to set serial port. Its connection with the equipment of its serial port set of parameters must match. Firstly to choose baud rate: 2400, 4800, 9600, 19200.Secondly to choose: None. Data digit length is 8, Stop bit for a fixed length; Factory serial port parameters default is "9600, 8, None,1".</p> | <p>RS485 Setup 0.Network addr 1.RS485 Baudrate</p> |
| <p>1. Alarm value (Option) Enter the low alarm value; any measured flow lower than the low value. will activate the alarm in the OCT hardware or relay output signal. Enter the high alarm value; any measured flow higher than the high value, will activate the alarm in the OCT hardware or relay output signal.</p> | <p>Alarm value 0.Low value 1.High value</p> |

6.7 Setup menu - Energy setting

Press **↵**, Select 4, Energy setting, and then **↵** display:

0. Energy unit: Move **↵** or **↵** can option: GJ,MBtu,KWh,MWh.
1. Temp unit: Move **↵** or **↵** can option: C or F
2. Flow position: Move **↵** or **↵** can option: Inlet,Outlet
3. DT sensitivity: Move **↵** or **↵**,You can change the value
4. RTD Calib: Temperature sensor calibration

Energy setting
0.Energy unit
1.Temp. unit
2.Flow position

RTD Caliration
0.T1 K factor
1.T2 K factor

T1 K factor
0.998

T2 K factor
0.998

6.8 Setup menu - History Data

Press **↵**, Select 5, History Data, and then **↵** display:

0. By Day: Display Totalizer flow for days.
1. By Month: Display Totalizer flow for months.
2. By Year: Display Totalizer flow for years.

History data
0.By Day
1.By Month
2.By Year

7. Working Principle

Products developed by adopting the ultrasonic principle of transit-time difference method (also called the speed difference method) send and receive ultrasonic signals through the sensor. The downstream propagation time is fast and the counter-flow propagation time is slow. We can get transit-time difference, thereby converting the flow velocity and multiplying it by the cross-sectional area of the pipe. flow can be calculated.

For first-time using, kindly refer to the following operation:

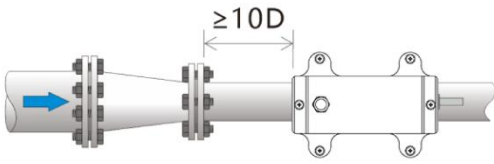
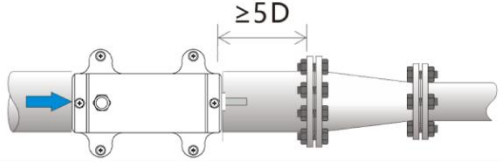
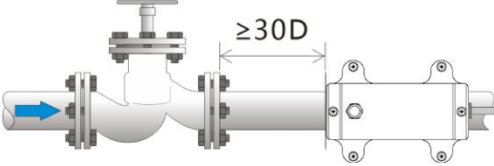
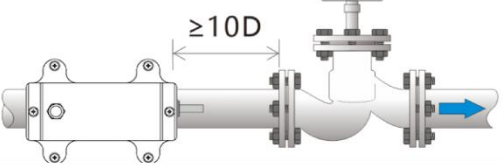
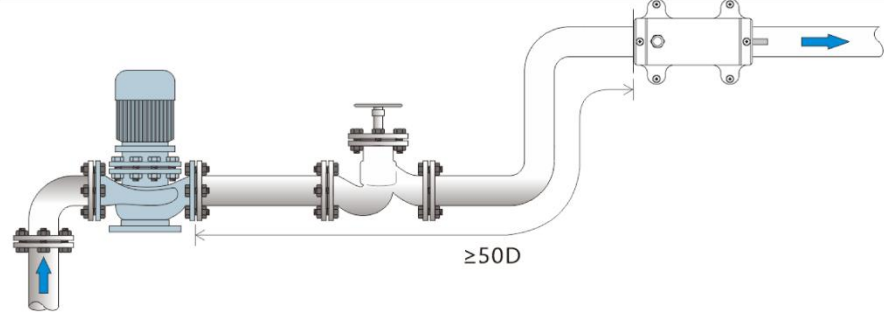
Point selection (Installation Position)

The transit-time difference ultrasonic flowmeter can only be well measured when the flow rate is stable, the medium (liquid) in the pipeline is free of impurities and bubbles, and there is a certain pressure (about 0.4MPa)—— This is a necessary basic condition for flowmeter with velocity difference method.

In order to ensure the above conditions, the flowmeter must be installed on the horizontal pipeline or vertical pipeline (the flow direction is from bottom to top to avoid empty pipes or bubbles)

The pipe is filled with liquid, and the temperature is within the specified range. It should be installed on the side of the pipe (at 3:00 or 9:00), as shown in the following diagram:

| Installation Point | Straight pipe section in the front of installation point | Straight pipe section in the back of installation point |
|--------------------|--|---|
| Elbow | | |
| Three-way Pipe | | |
| Expansion Pipe | | |

| | | |
|-------------|--|--|
| Swaged Pipe |  |  |
| Valve |  |  |
| Bump |  | |

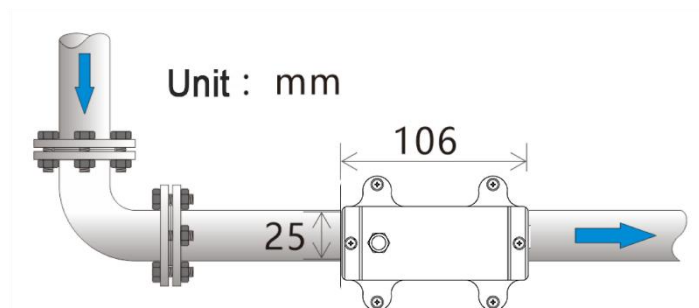
Note: D refers to the diameter of the pipe, such as: the pipe is DN25, 10D is 254mm

Pipeline Treatment

Ultrasonic signals are greatly attenuated in the air, and paint or potholes on the surface of the pipeline will affect the propagation of ultrasonic waves, and surface treatment of the pipeline is required.

The surface of the paint pipe is free from stains, flat and bright. In particular, the surface of the metal pipe should be polished with a grinder, and then scrubbed with clean water.

Refer to the figure below for the grinding area:

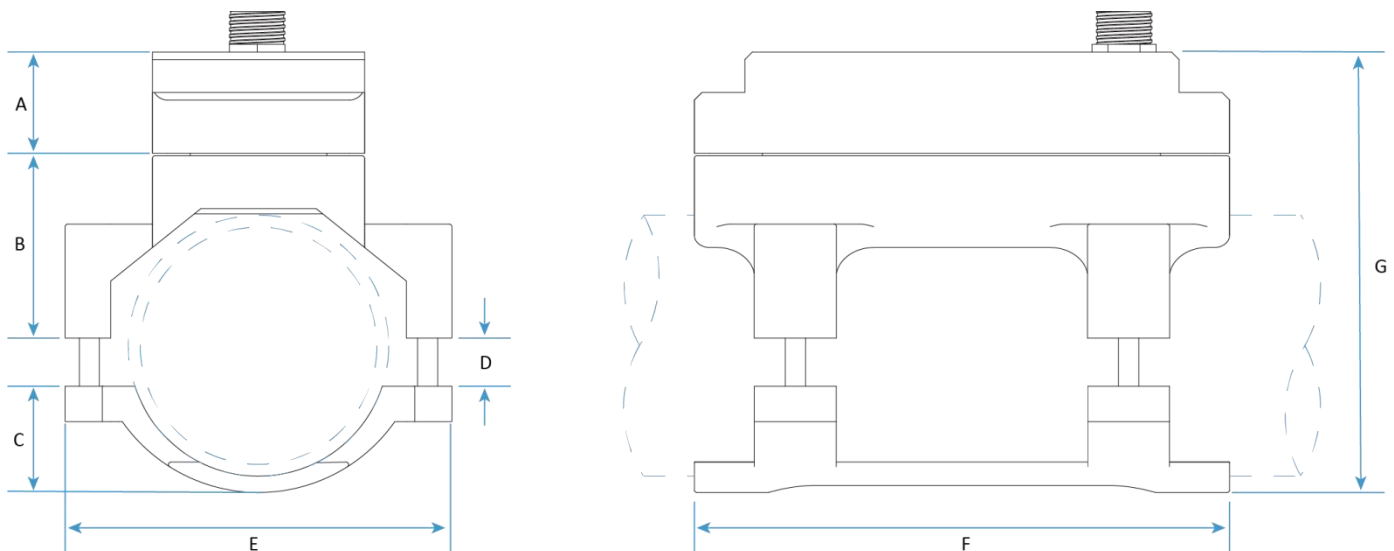


8. Performance index

| Product: Small Pipe Ultrasonic Flowmeter (Model: SE603) | | | | | |
|---|--|-----------|-----------|-----------|-------------|
| Model | Φ 15 | Φ 20 | Φ 25 | Φ 32 | Φ 40 |
| OD | 15 | 20 | 25 | 32 | 40 |
| OD Range(mm) | 14.5-15.4 | 16.5-23.0 | 25.0-30.0 | 32.0-35.0 | 38.0-45.0 |
| DN | 10 | 15 | 20 | 25 | 32 |
| Inch | 3/8" | 1/2" | 3/4" | 1" | 1-1/4" |
| Model | Φ 50 | Φ 63 | Φ 75 | Φ 90 | Φ 110 |
| OD | 50 | 63 | 75 | 90 | 110 |
| OD Range(mm) | 48.0-54.0 | 58.0-64.0 | 72.0-78.0 | 80.0-92.0 | 108.0-116.0 |
| DN | 40 | 50 | 65 | 80 | 100 |
| Inch | 1-1/2" | 2" | 2-1/2" | 3" | 4" |
| Accuracy | ±2.0%(±0.1m/s~±5m/s) | | | | |
| Repeatability | 0.8% | | | | |
| Data Storage | Daily, monthly, and annual flow totalizer | | | | |
| Response Time | 2s | | | | |
| Analog Output | 4-20mA, Maximum load: 750Ω | | | | |
| Alarm Output | OCT upper and lower limit alarm function (optional) | | | | |
| Communication | Support MODBUS protocol, RS485 | | | | |
| Power Supply | 24V DC | | | | |
| Cable Length | 2m | | | | |
| Keypad | Four touch buttons | | | | |
| Screen | OLED 128*64 display screen | | | | |
| Units | Flow Unit: Support Cubic Meters(m ³), Liters(l), USA Gallons(gal). Energy Unit: Giga Joule (GJ), Kilocalorie (Kc), KWh, BTU Time Unit: /hour, /min, The factory default unit is cubic meters per hour. | | | | |
| Totalizer | 6 bit flow rate totalizer | | | | |
| Liquid | Regular water, sea water, cooling/hot water, alcohol... | | | | |
| Piper Material | Carbon Steel, Stainless Steel, Copper, Plastic pipe (PVC, PVDF, PFA, PTFE, PU, PPR, PPH, HDPE, etc.) | | | | |
| Housing Material | Aluminum alloy | | | | |
| Ambient Temperature | 32°F~ +122°F (0°C ~ +50°C) | | | | |
| Fluid Temperature | 32°F~ +176°F (0°C ~ +80°C) | | | | |
| RTD measuring | 35.6°F~ +221°F (2°C ~ +105°C) | | | | |
| Ambient Humidity | RH 0~95%, No condensation | | | | |
| IP Rate | IP54 | | | | |

8.1 Appendix 1—Contrastive table of clamp on specification

| Model | A(mm) | B(mm) | C(mm) | D(mm) Max | E(mm) | F(mm) | G(mm) Max | Min Pipe | Max Pipe |
|-------------|-------|-------|-------|--------------|-------|-------|--------------|-------------|-------------|
| Φ15 | 31 | 25 | 7 | 7.5 | 58 | 106 | 70.5 | Φ14 | Φ16 |
| Φ20 | 31 | 25 | 15.8 | 4 | 58 | 106 | 75.8 | Φ20 | Φ22 |
| Φ25 | 31 | 25 | 14.6 | 4 | 58 | 106 | 74.6 | Φ25 | Φ28 |
| Φ32 | 31 | 28.5 | 18.5 | 4 | 58 | 106 | 82 | Φ32 | Φ35 |
| Φ40 | 31 | 29.5 | 23.5 | 7 | 68 | 106 | 91 | Φ38 | Φ45 |
| Φ50 | 31 | 36 | 27 | 7 | 78 | 106 | 101 | Φ48 | Φ54 |
| Φ63 | 36 | 41 | 32 | 7 | 91 | 130 | 116 | Φ58 | Φ64 |
| Φ75 | 36 | 46.5 | 40 | 7 | 105 | 136 | 129.5 | Φ72 | Φ78 |
| Φ90 | 36 | 53.5 | 47 | 7 | 119 | 150 | 143.5 | Φ88 | Φ96 |
| Φ110 | 36 | 68 | 54.5 | 9 | 143 | 174 | 167.5 | Φ108 | Φ116 |



8.2 Appendix 2—Statistical table of applicable range of pipe clamp for clamp on

| Model | Pipe material | Nominal inner diameter of pipe | Flow Range (0.1~5m/s) (m ³ /h) | Flow Range (0.1~5m/s) (L/min) | Flow Range (0.1~5m/s) (US GPM) |
|-------|---|--------------------------------|---|-------------------------------|--------------------------------|
| SE603 | Carbon Steel, Stainless Steel, Copper, Plastic pipe | DN10 | 0.026 ~ 1.282 | 0.427 ~ 21.366 | 0.113 ~ 5.644 |
| | | DN15 | 0.046 ~ 2.279 | 0.760 ~ 37.984 | 0.201 ~ 10.034 |
| | | DN20 | 0.103 ~ 5.128 | 1.709 ~ 85.464 | 0.452 ~ 22.577 |
| | | DN25 | 0.182 ~ 9.116 | 3.039 ~ 151.935 | 0.803 ~ 40.137 |
| | | DN32 | 0.285 ~ 14.244 | 4.748 ~ 237.399 | 1.254 ~ 62.714 |
| | | DN40 | 0.410 ~ 20.511 | 6.837 ~ 341.854 | 1.806 ~ 90.309 |
| | | DN50 | 0.729 ~ 36.464 | 12.155 ~ 607.741 | 3.211 ~ 160.549 |
| | | DN65 | 1.140 ~ 56.976 | 18.992 ~ 949.595 | 5.017 ~ 250.857 |
| | | DN80 | 1.641 ~ 82.045 | 27.348 ~ 1367.417 | 7.225 ~ 361.234 |
| | | DN100 | 2.917 ~ 145.858 | 48.619 ~ 2430.963 | 12.844 ~ 642.194 |

