



Operation Manual

eyc-tech FUM03

Clamp-on Ultrasonic Flow Meter



eyc-tech FUM03



Contents

I. Before Use	1
II. Installation and Wiring	3
III. Reference for Installation Setup	7

I. Before Use

1. Safety Precautions and Warnings

Safety warnings and precautions are categorized into "Danger," "Warning," and "Caution."

 Danger	Indicates a hazardous situation which, if the operation is carried out, may result in death or serious injury, and where the urgency of the danger is considered high.
 Warning	Indicates a hazardous situation which, if operated incorrectly, could result in death or serious injury.
 Caution	Indicates a hazardous situation which, if operated incorrectly, may result in minor injury or property damage.

Notice

Indicates important instructions that must be followed to prevent product damage or property loss.

Important

Specifies operational precautions, limitations, or restrictions that must be observed during use to ensure proper function and safety.

2. Safety Information

General Precautions

Danger

-  Do not use this product in environments such as nuclear power plants, aviation, railways, ships, vehicles, medical equipment, or amusement facilities where it may directly affect human life or property.
-  Do not use for applications involving direct contact with the human body.
-  This product is not designed or certified for use in explosion - proof areas .

Warning

-  Do not disassemble or modify the product.
- Doing so may result in electric shock, fire, or malfunction.

Operating Precautions

Warning

- Do not install this product on high-temperature piping, as it may cause damage or malfunction.

Notice

- Do not drop, strike, or apply excessive force to the product.

Wiring Precautions

Caution

- Use within the rated range. This product is a sensor that operates on DC power. Do not apply AC voltage or other types of power. Also, do not use loads that exceed the allowable range.

Notice

- Do not immerse the cable ends in water during wiring work.
- Avoid routing together with power or high-voltage lines.
- Keep away from noise sources as much as possible.
- Refer to the specification sheet for wiring methods according to installation environment.
- Use the dedicated power cable provided by our company.
- The total cable length (including M12 connectors) should be within 20 meters.
- The recommended maximum total M12 cable length is 20 meters.
- If lightning risk is present, use insulation switches or surge protectors.
- Cable heat resistance is 80°C. Do not allow cables to contact piping surfaces over 80°C.

Installation Notice

Caution

- Do not install in locations where the device may be submerged in water. Failure to do so may result in electric shock or damage due to poor insulation.

Notice

- Install the product at a location in the measurement pipe where the pipe remains completely filled with liquid.
- If installed on vertical piping, ensure the flow direction is from bottom to top.
- To enhance detection stability, it is recommended to have a straight pipe section upstream of the sensor that is at least five times the pipe diameter. Even if this condition is not met, detection is possible as long as the pipe is full and signal strength is sufficient.
- Do not install in locations exposed to radiant heat sources.
- When installing in locations subject to vibration, secure the piping using support fixtures as close to the main unit as possible. Excessive vibration may lead to unstable operation and place stress on the piping.
- To avoid interference with detection signals, do not install multiple main units in close proximity in series.

Other Precautions

Important

- Upon power-up, the product performs a self-diagnosis for approximately 15 seconds. During this time, the flow detection output will not operate. Configure the program to ignore signals for the first 15 seconds after power is applied.
- Initial offset may occur when power is turned on. To detect small flow variations accurately, allow a warm-up period of 15 to 30 minutes.
- Do not expose the product to strong magnetic fields or magnetic forces.

3. Regulatory Compliance and S standard Notices

Regarding CE and UK CA Markings

eyc-tech confirms that this product meets the essential requirements of EU directives and UK regulations as outlined below. When using this product in EU countries or the UK, please observe the following requirements.

EMC Directive (CE) and Electromagnetic

Compatibility Regulations (UKCA)

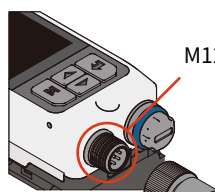
- Applicable Standard: (BS) EN IEC 61326-1:2021

Install this product in an environment without surge interference. (For indoor use: cable length should be within 30 m; for outdoor use: within 10 m)

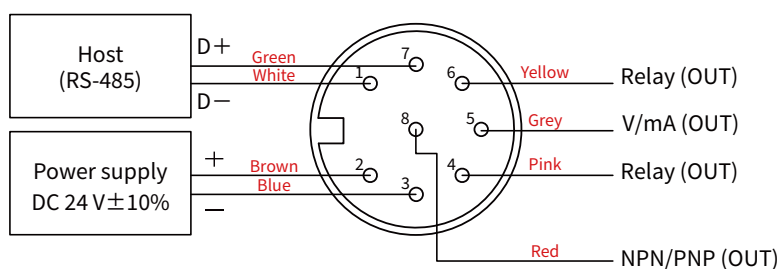
These requirements do not guarantee that the entire system incorporating this product will meet the EMC Directive or Electromagnetic Compatibility Regulations. It is the responsibility of the equipment manufacturer to ensure overall system compliance.

II. Installation and Wiring

1. Cable connection



M12 - 8P Power connector



■ Wiring

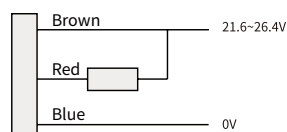
Unused input wires must be individually insulated.

■ Load (Input device)

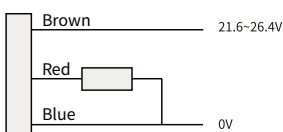
⊗ Analog voltage/current input device

1. Wiring for switch output channel

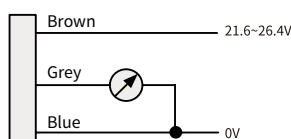
NPN



PNP

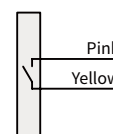


2. Wiring for analog output channel

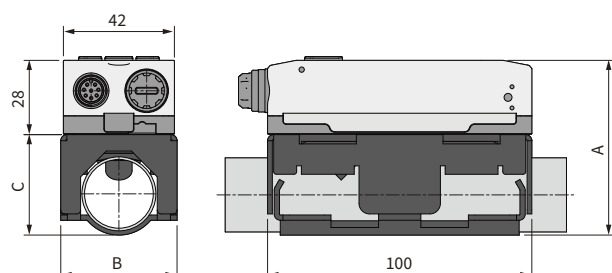


*Selectable output : 0 ... 20 mA / 4 ... 20 mA / 1 ... 5 V / 0 ... 10 V (via configuration)

3. Wiring for relay output channel

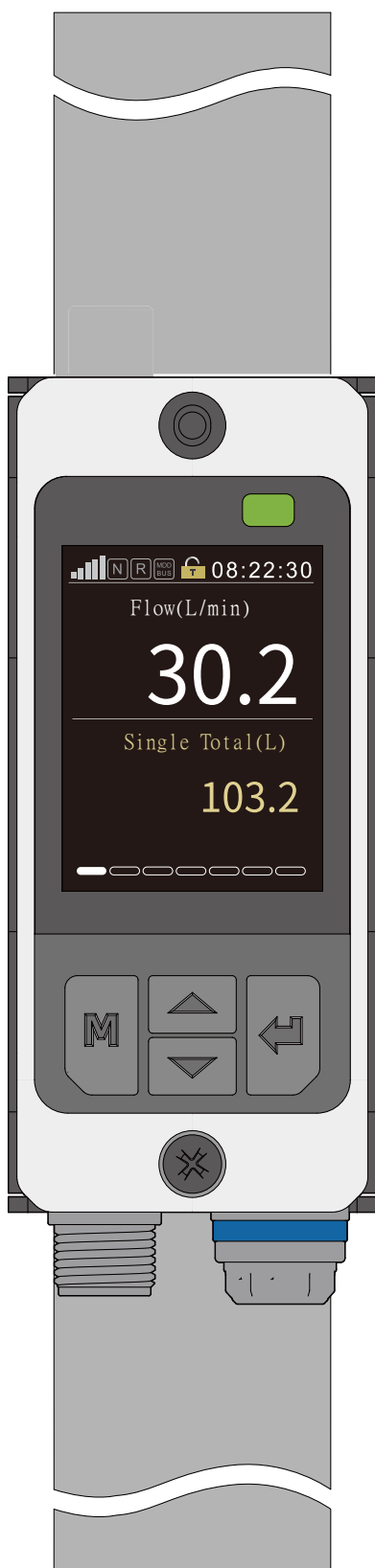


■ Dimension Unit : mm

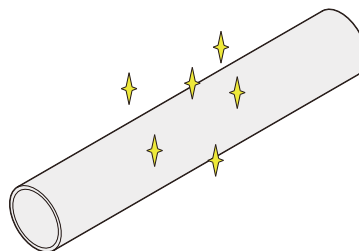


Pipe Diameter	DN08	DN10	DN15	DN20	DN25	DN32	DN40
Pipe Outer Diameter	ø13 ... ø16	ø16 ... ø18	ø18 ... ø23	ø23 ... ø28	ø28 ... ø37	ø37 ... ø44	ø44 ... ø52
A	54.9	56.9	61.9	66.9	75.9	82.9	90.9
B	44	44	44	44	60	60	84
C	26.4	28.9	32.8	39	46.2	54.6	60.9

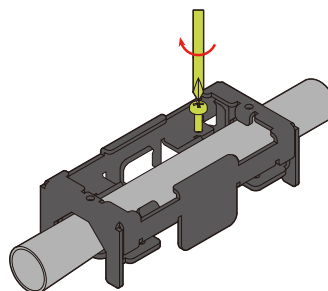
2. Installation Steps



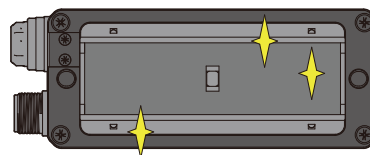
1. Confirm that the pipe is clean; wipe away any oil inside and outside the pipe.



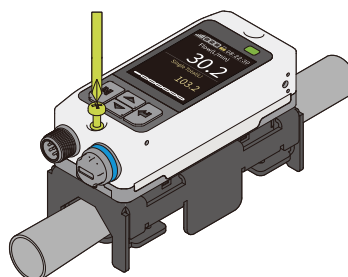
2. Clamp the pipe in place and tighten it.



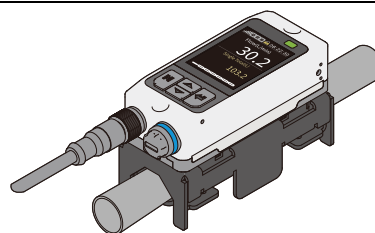
3. Please ensure if silicone base of the main unit is free from dirt or residue.



4. Mount the main unit onto the pipe and secure it with screws.



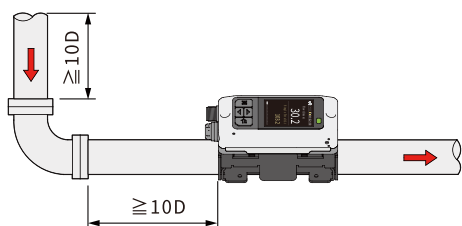
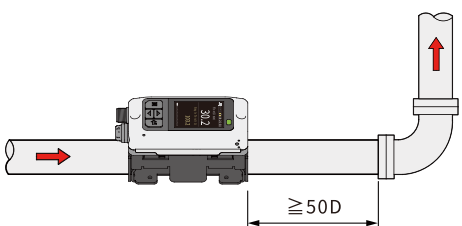
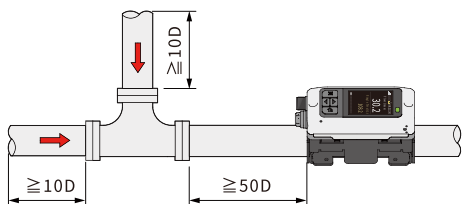
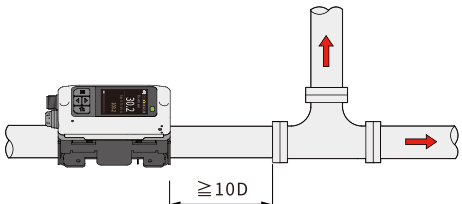
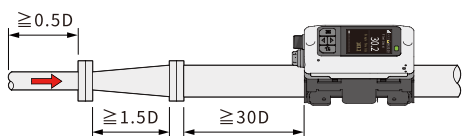
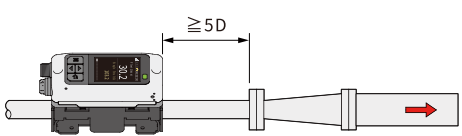
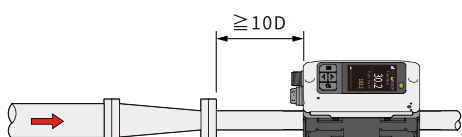
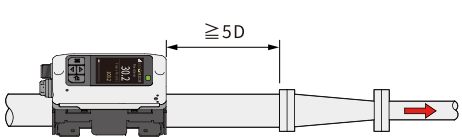
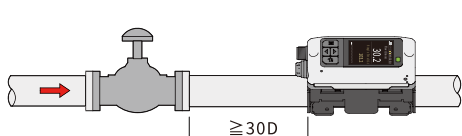
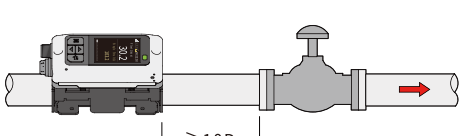
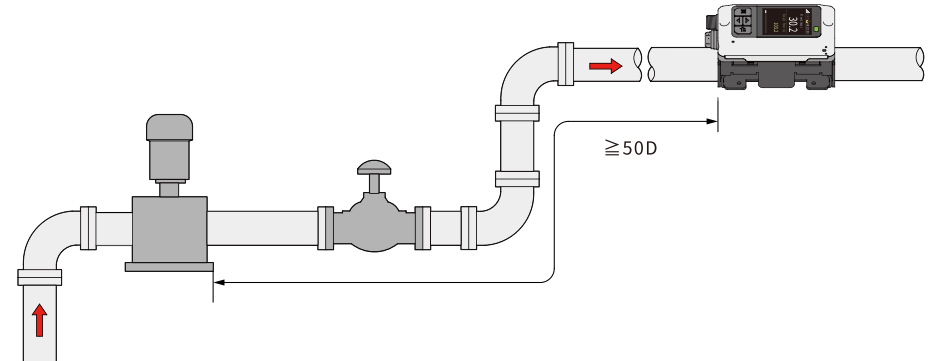
5. Connect the power cable to the main unit to begin flow detection.



Note: After allowing water to drip inside the pipe, conduct a static dripping test and check whether the upper left corner shows a signal. If no signal appears, ensure the pipe is properly secured.

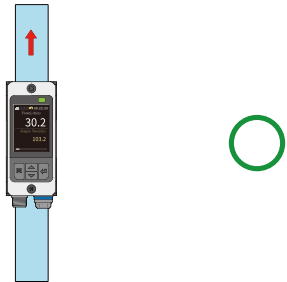
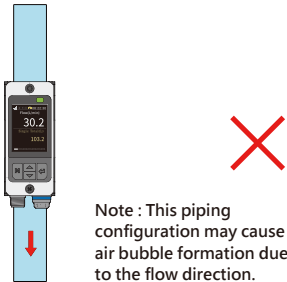
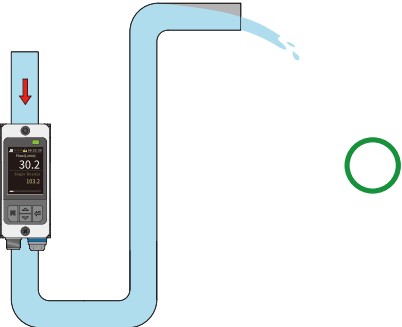
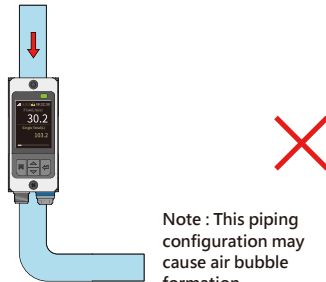
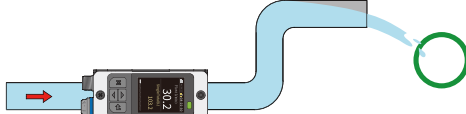
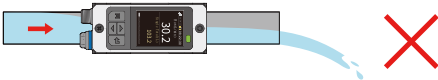
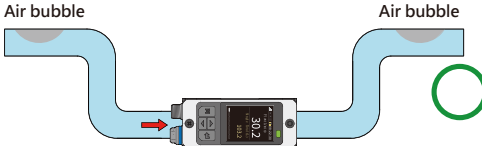
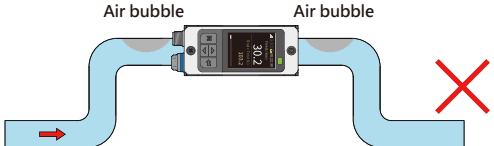
3. Piping Installation Example

□ Straight Pipe Section

Site	Straight Pipe Before Installation Point	Straight Pipe After Installation Point
Elbow		
Tee Pipe		
Enlarging Pipe		
Reducing Pipe		
Valve		
Pump		

Note: D is the Outer Pipe Diameter.

Recommended Piping Method

Recommended Piping Configuration	Not Recommended Piping Configuration
	
	
	
	

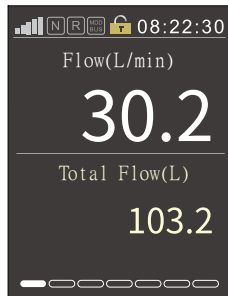
Piping Guidelines

- 1.Ensure the flow path is completely filled with water and that there are no air bubbles in the pipe, as they may affect ultrasonic sensor accuracy.
- 2.Before zero-point calibration, fill the pipe completely and ensure the fluid is stationary.
- 3.Do not allow any g as to mix inside the pipe.
- 4.Confirm the flow direction of the ultrasonic flow meter during installation.

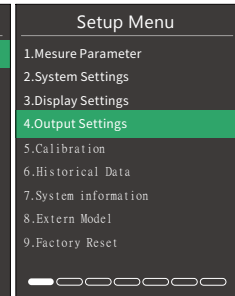
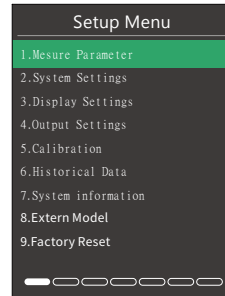
III. Reference for Installation Setup

Setting Operation

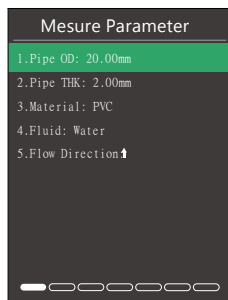
1. Enter Menu Mode



Press **M** on the main screen to enter the menu.

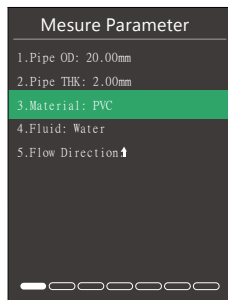


2. Set Pipe Outer Diameter and Wall Thickness

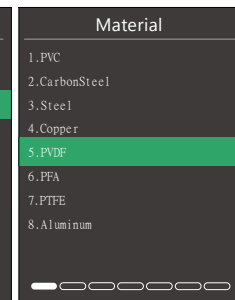
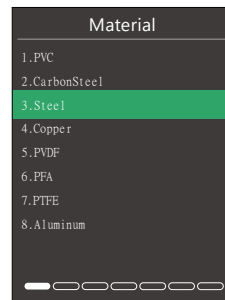


Use set outer diameter and wall thickness, then press to confirm.

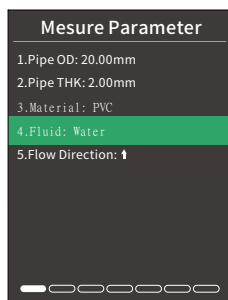
3. Set Pipe Material



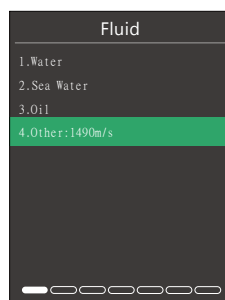
Use to select pipe material, then press to confirm.



4. Set Fluid Type



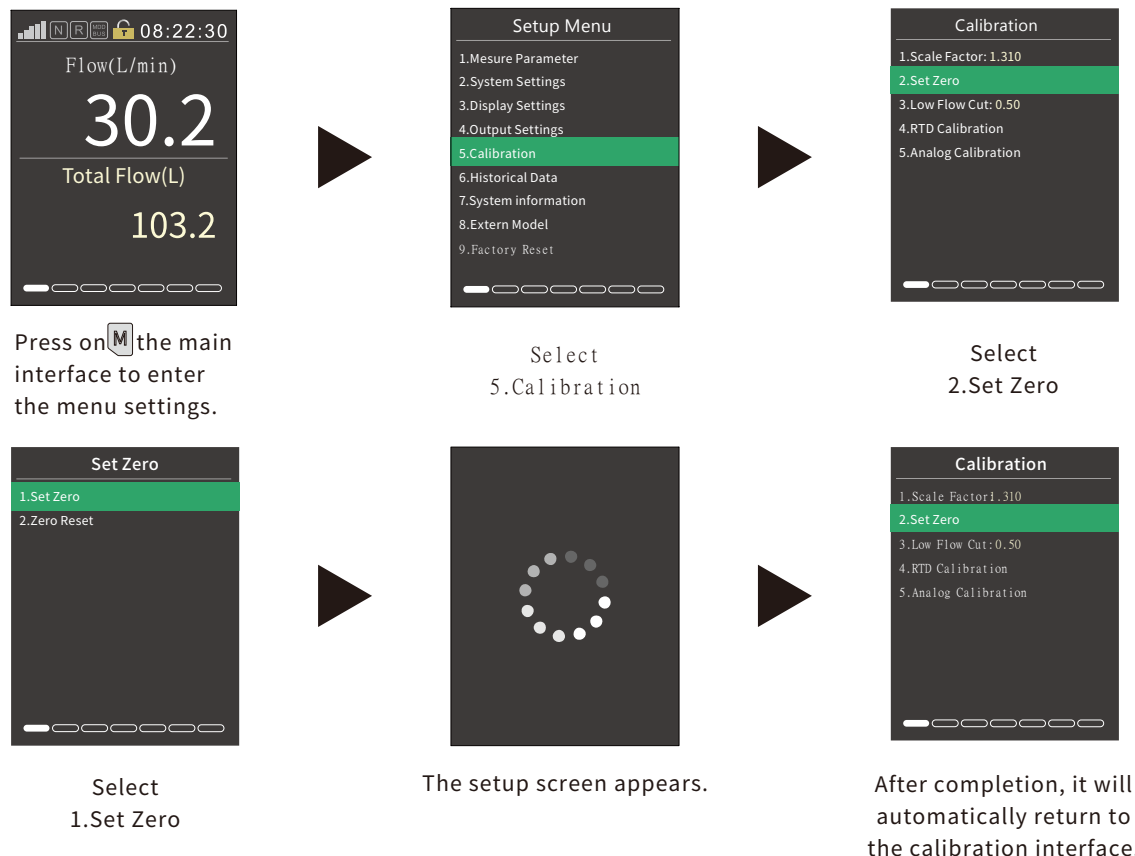
Use to select fluid type, then press to confirm.



Note : If other fluids are used, select "Other" and configure fluid velocity based on the flow parameter

Zero Point Calibration

When using a new product for the first time, perform zero point calibration. During calibration, ensure the pipe is fully filled with fluid (medium) and free of air bubbles. Close the valve to make the fluid stationary, then proceed with zero point calibration.



Open the valve to measure flow normally.

Note: If it is not possible to close the valve on site, this operation can be skipped.

Fluid Property Table

Liquid	Speed of Sound (m/s)	Viscosity
Water 20°C	1482	1.0
Water 50°C	1543	0.55
Water 75°C	1554	0.39
Water 100°C	1543	0.29
Water 125°C	1511	0.25
Water 150°C	1466	0.21
Water 175°C	1401	0.18
Water 200°C	1333	0.15
Water 225°C	1249	0.14
Water 250°C	1156	0.12
Acetone	1190	
Methanol	1121	
Ethanol	1168	
Alcohol	1440	1.5
Ethanone	1310	
Acetaldehyde	1180	
Ethylene Glycol	1620	

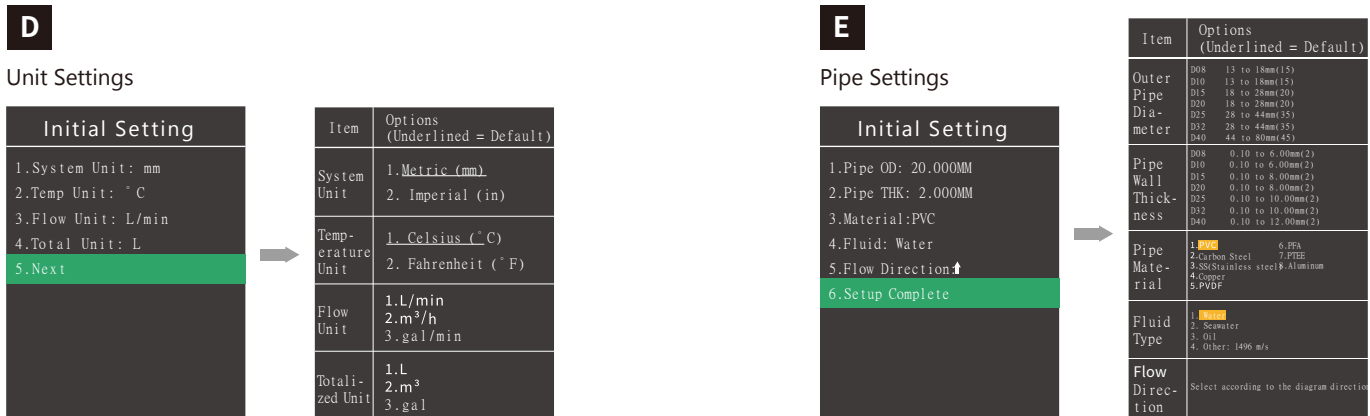
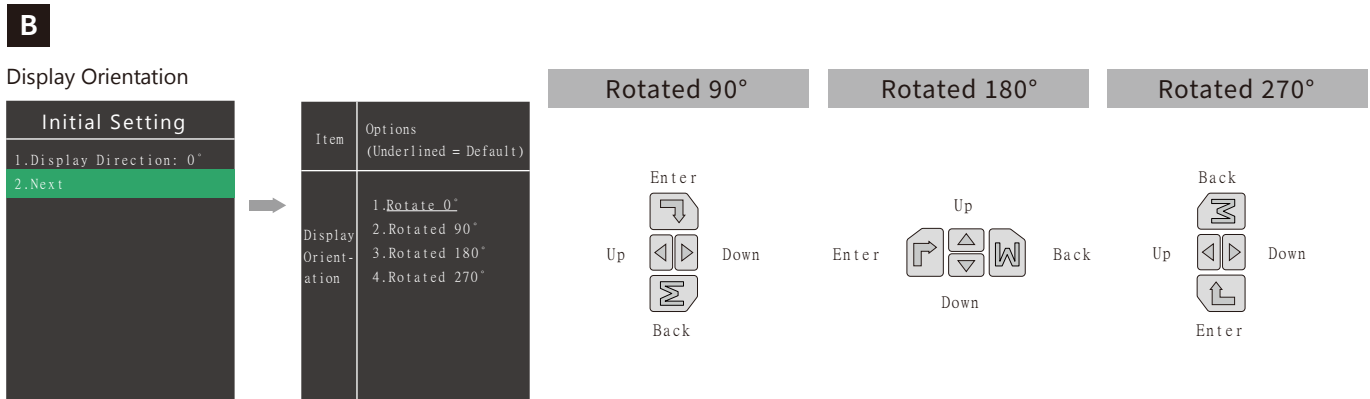
Liquid	Speed of Sound (m/s)	Viscosity
Glycerol	1923	1180
Gasoline	1250	0.8
No.66 Gasoline	1171	
No.80 Gasoline	1139	
No.0 Gasoline	1385	
Benzene	1330	
Ethylbenzene	1340	
Toluene	1170	0.69
Carbon Tetrachloride	938	
Kerosene	1420	2.3
Petroleum	1290	
Turpentine	1280	
Trichloroethylene	1050	0.82
Peanut Oil	1472	
Olive Oil	1502	
Acetic Acid	1159	1.162
Spindle Lubricating Oil	1342	15.7

Display Screen Description—Settings During Initial Power-On (Initialization)

Screen Sequence

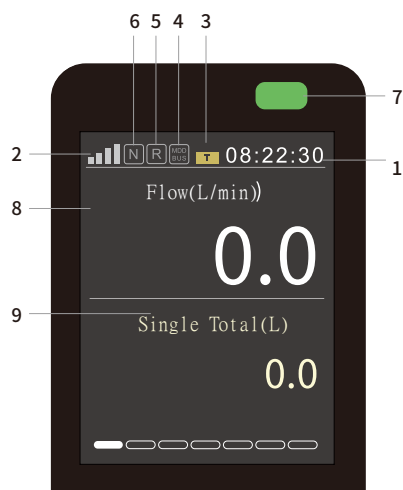


Screen Description



Display Screen Description

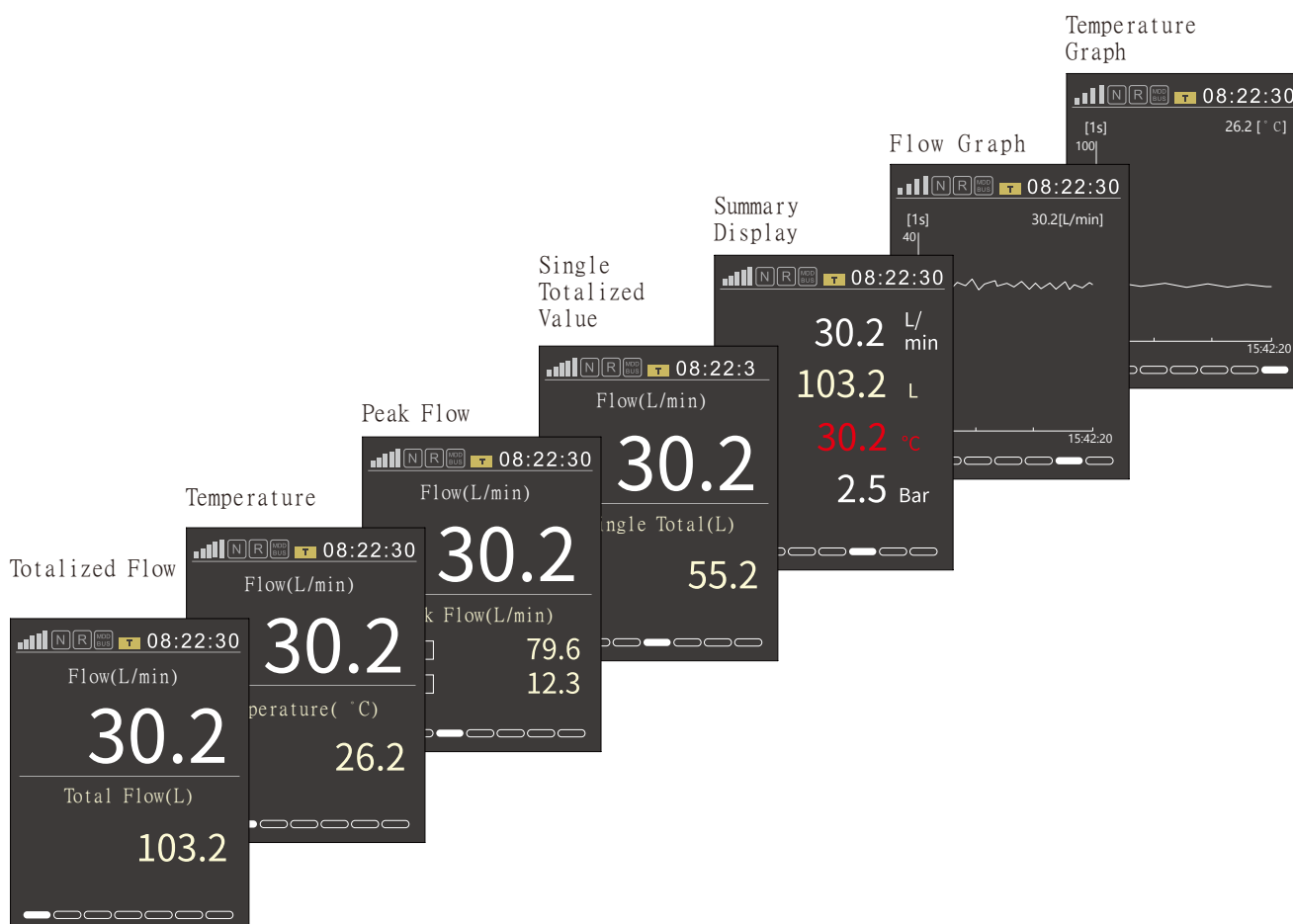
Main Screen Explanation



NO.	Item	Description
1	Current Time	Displays the current time
2	Signal Strength	Displays the current ultrasonic reception strength 5: Strong 2~4: Medium 1: Weak 0: No signal
3	Key Lock Status	Shows whether the keys are locked or unlocked
4	ModBus Communication Status	Indicates active ModBus communication
5	Relay Output Indicator	Green when output is active; gray when inactive
6	Switch Output Indicator	Green when active; gray when inactive (NPN = N, PNP = P)
7	System Status Indicator	Lit according to output state; flashes red in case of error
8	Display Type	Indicates current screen (flow, temperature, peak, total, graph, etc.) Use ↑↓ keys to switch
9	Main Display	Displays the current content

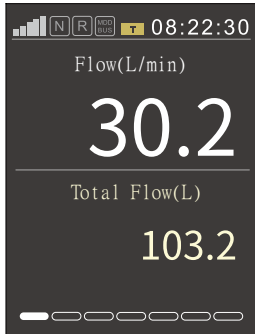
Screen Type Options

Use to switch



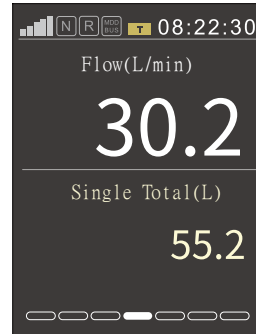
Screen Type Description

1. Totalized Flow



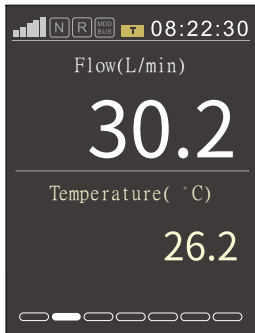
Displays the current totalized value. The value is retained after power-off. (To reset, press and hold  for more than 3 seconds.)

4. Single Totalized Value



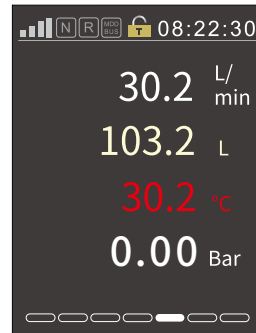
Records the totalized flow starting from a specific point in time. (Press  to reset the value.)

2. Temperature



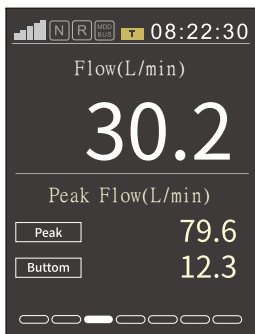
Displays the current temperature value.

5. Summary Display

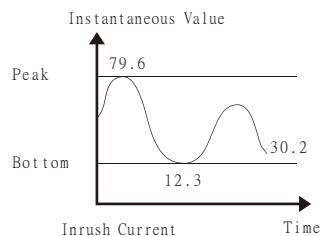


Shows all measurement values.

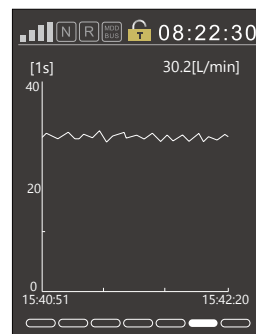
3. Peak Flow



Displays the maximum (Peak) and minimum (Bottom) flow values since power-on. (Press  to refresh the values.)

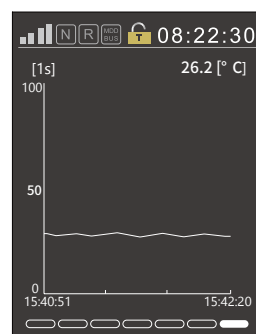


6. Flow Graph



Displays the instantaneous flow curve over a selected time span. (1s, 5s, 30s)

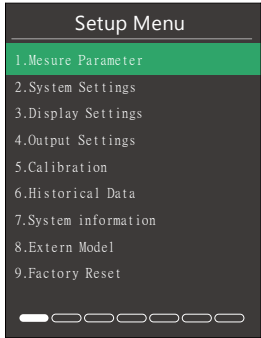
7. Temperature Graph



Displays the temperature variation curve over a selected time span. (1s, 5s, 30s)

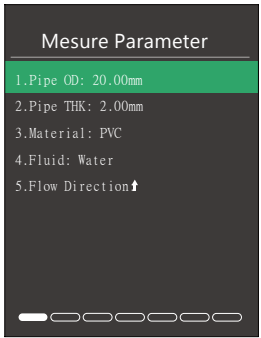
Screen Type Description

Settings Menu



Use   to select an item, then press  to enter the settings menu.

Parameter Settings

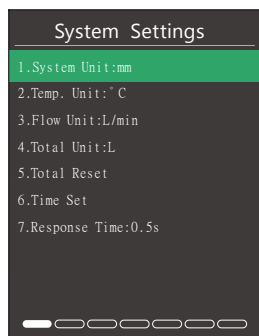


Item	Options (Underlined = Default)
Pipe OD*1	D08 13 to 18 mm (15) D10 13 to 18mm (15) D15 18 to 28mm (20) D20 18 to 28mm(20) D25 28 to 44mm(35) D32 28 to 44mm(35) D40 44 to 80mm(45)
Pipe THK *2	D08 0.10 to 6.00mm(2) D10 0.10 to 6.00mm(2) D15 0.10 to 8.00mm(2) D20 0.10 to 8.00mm(2) D25 0.10 to 10.00mm(2) D32 0.10 to 10.00mm(2) D40 0.10 to 12.00mm(2)
Material	1.PVC 2.Carbon Steel 3.SS(Stainless steel) 4.Copper 5.PVDF 6.PFA 7.PTEE 8.Aluminum
Fluid	1.Water 2.Seawater 3.Oil 4.Others: 1496 m/s
Flow Direction	Select according to the diagram

*1 When changing, press  to move one digit to the right; press  to change the value. When at the last digit, press  again to confirm.

*2. The change method is the same as for outer pipe diameter.

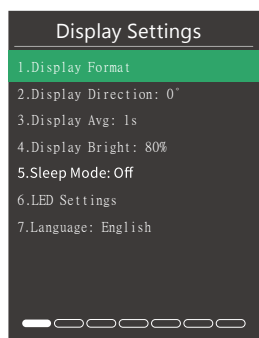
System Settings



Item	Options (Underlined = Default)
System Unit	1. Metric (mm) 2. Imperial (in)
Temp. Unit	1. Celsius (°C) 2. Fahrenheit (°F)
Flow Unit	1. L/min 2. m³/h 3. gal/min
Total Unit *1	1. L 2. m³ 3. gal
Total Reset	Enter to Reset
Time Set	2022/5/20 09:20:00
Response Time	1. 0.5s 2. 1.0s 3. 2.5s 4. 5.0s 5. 10.0s 6. 30.0s

*1. Press   to change the value, press  to move to the next digit, press  to go back to the previous digit. When on seconds, press  to confirm the setting.

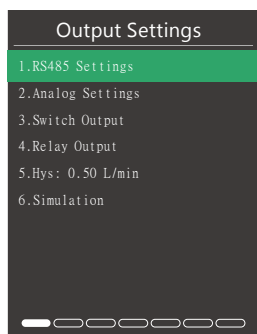
Display Options



Item	Options (Underlined = Default)
Display Format	Flow Format D08 0.01,0.1,1(L/min) D10 0.01,0.1,1(L/min) D15 0.01,0.1,1(L/min) D20 0.01,0.1,1(L/min) D25 0.01,0.1,1(L/min) D32 0.01,0.1,1(L/min) D40 0.01,0.1,1(L/min)
	Total Format D08 0.01,0.1,1(L/min) D10 0.01,0.1,1(L/min) D15 0.01,0.1,1(L/min) D20 0.01,0.1,1(L/min) D25 0.01,0.1,1(L/min) D32 0.01,0.1,1(L/min) D40 0.01,0.1,1(L/min)
Display Direction	1. 0° 2. 90° 3. 180° 4. 270°
Display Avg	0s,1s,2s,3s,4s,5s,6s,7s,8s,9s,10s
Display Bright	10%,20%,30%,40%,50%, 60%,70%,80%,90%,100%
Sleep Mode *1	On / Off
LED Settings	1. Mode 1. SwitchSync 2. RelaySync
	2. Color 1. Off → Green 2. Red → Green 3. Off
Language	1. English 2. Traditional Chinese

*1. Fixed sleep time: 3 minutes

Output Settings



*1. To change the value, press  to enter edit mode, use  to adjust the value, then press  to move to the next digit. When the last digit is reached, press  to confirm.

(Settable range: 1 ~ 247)

*2. Same procedure applies for multi-digit value adjustment  → edit mode  to change,  to advance, confirm on final digit.

*3. This option appears only in Standard, Totalized, and Pulse Output Modes. The value can be set by yourself

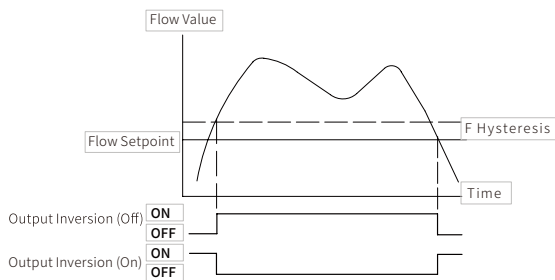
*4. This option appears only under Window Output Mode. The value can be set by yourself.

Item	Options (Underlined = Default)	
RS485 Settings	Communication Format *1	1
	Baudrate	1.9600 2.19200 3.38400 4.115200
	Parity	1.NONE 2.EVEN 3.ODD
Analog Settings	Max *2	10.00L/min
	Min *2	0.00L/min
	Mode	1.Voltage 1-5V 2.Voltage 0-10V 3.Current 4-20mA 4.Current 0-20mA
Switch Output	Out. Mode	1.Not Usign 2.Standard 3.Window 4.Total 5.Pulse 6.Error 7.No Signal
	Output Type	1.NPN 2.PNP
	Output Inversion	On / Off
	Setpoint *3	<u>5.00</u> L/min
	Max *4	<u>50.00</u> L/min
	Min *4	<u>30.00</u> L/min
Relay Output	Out. Mode	1.Not Usign 2.Standard 3.Window 4.Total 5.Error 6.No Signal
	Output Inversion	On / Off
	Setpoint *3	5.00L/min
	Max *4	50.00L/min
	Min *4	30.00L/min
Hys.	D08 0 to 9999.99(L/min) <u>0.3</u> D10 0 to 9999.99(L/min) <u>0.3</u> D15 0 to 9999.99(L/min) <u>1.5</u> D20 0 to 9999.99(L/min) <u>1.5</u> D25 0 to 9999.99(L/min) <u>5.0</u> D32 0 to 9999.99(L/min) <u>5.0</u> D40 0 to 9999.99(L/min) <u>5.0</u>	

Output Settings

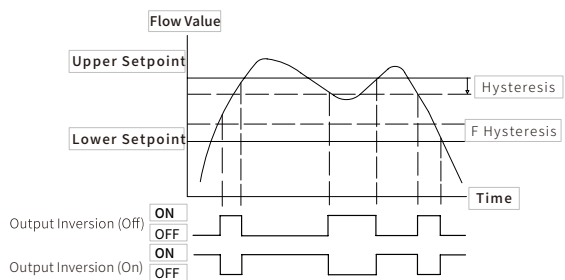
Simulation	Simulation On/Off	On / Off	
	Value *2	D08	D10
		0 to 9999.99 (L/min)(10)	0 to 9999.99 (L/min)(15)
		D15 0 to 9999.99 (L/min)(30)	D20 0 to 9999.99 (L/min)(50)
		D25 0 to 9999.99 (L/min)(100)	D32 0 to 9999.99 (L/min)(150)
		D40 0 to 9999.99 (L/min)(200)	

Standard Output



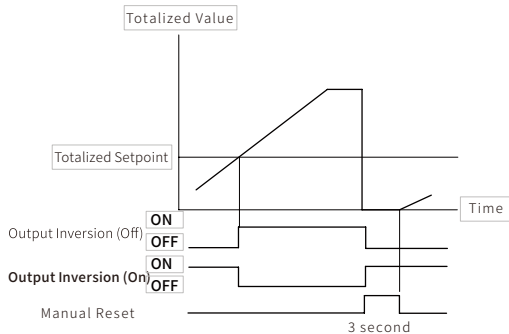
When the instantaneous flow value exceeds the setpoint, the output switches. Additionally, the hysteresis value can be adjusted within the output settings menu.

Window Output



When the instantaneous flow value falls between the upper and lower setpoints, the output switches. Additionally, the hysteresis settings can be adjusted within the output settings menu.

Totalized Output

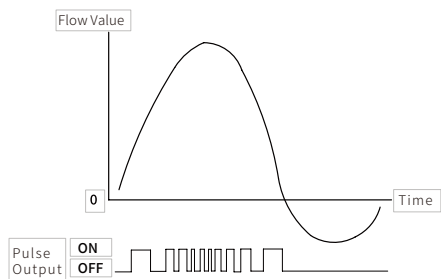


Set a target value for totalized flow. When the instantaneous flow reaches this value, the output switches. One pulse is output each time the accumulated flow reaches one pulse unit.

Example:

1. The displayed totalized value can reach up to 8 digits.
2. During the totalized input reset process, the clear signal is triggered only once.

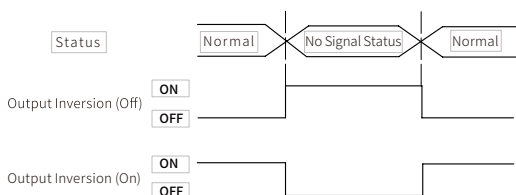
Pulse Output



One pulse is output each time the accumulated flow reaches one pulse unit.

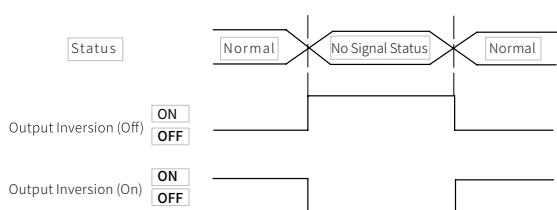
Example: The ON/OFF signal toggles every 1/2 of one pulse unit. (As shown above, when the pulse unit is set to 1 L)

No Signal Output



When there is no liquid in the pipe, the system outputs a no signal status.

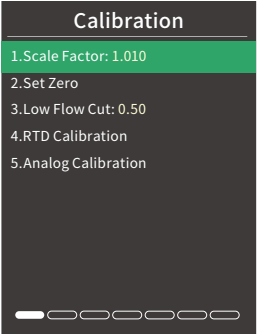
Error Output



Output will be triggered under the following error conditions:

1. Configuration Error
2. Memory Error

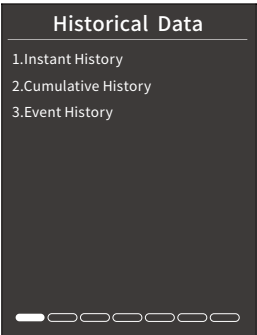
Calibration Settings



- *1. A correction factor can be set from 0.100 to 10.000 times the internal measured value. Useful when a known reference value is available.
- *2. Press  to obtain an average over approximately 10 seconds and use it as a zero reference.
- *3. Press  to clear the average value obtained in step *1.
- *4. To change the value, press  to enter edit mode. Use  to adjust the value, then press  to move to the next digit. When reaching the last digit, press  again to confirm. (The entered value will be directly subtracted.)
- *5. Factory calibration is performed prior to shipment. Over time, slight output drift may occur; this function allows correction. Connect the analog output to a standard device, select the calibration point, press , and use  to fine-tune based on the reference. (The displayed value has no actual meaning; it is used internally for recording.)

Item	Options (Underlined = Default)	
Scale Factor *1	<u>1.000</u>	
Set Zero	1. Set Zero*2 2. Zero Reset*3	
Low Flow Cut	D08 0 to 9999.99 (L/min) <u>0.3</u> D10 0 to 9999.99 (L/min) <u>0.3</u> D15 0 to 9999.99 (L/min) <u>0.5</u> D20 0 to 9999.99 (L/min) <u>0.5</u> D25 0 to 9999.99 (L/min) <u>1.0</u> D32 0 to 9999.99 (L/min) <u>1.0</u> D40 0 to 9999.99 (L/min) <u>1.5</u>	
RTD Calibration	Temp. offset *4	<u>0.0</u> °C
	Temp. coeff. *1	<u>1.000</u>
Analog Calibration *5	Voltage 1V: 2798 Voltage 5V: 14073 Voltage 10V: 28176 Current 4mA: 5852 Current 20mA: 29366	

Historical Data Inquiry

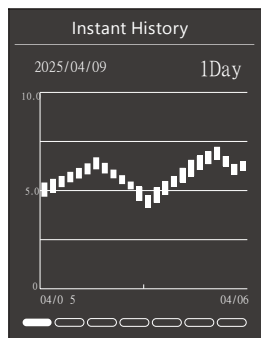


- Reviewing historical records via charts can help identify and resolve issues early, and trace product processing conditions.

■ Historical Data Inquiry

① Instantaneous Data History

Allows tracking of “instantaneous values” such as flow or temperature up to one year in the past.

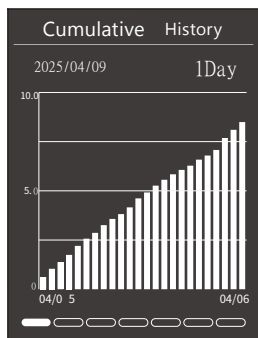


Selectable Display Periods:

- 10 minutes
- 1 hour
- 1 day
- 1 week
- 1 month
- 1 year

② Totalized Data History

Allows tracking up to one year in the past to monitor changes in flow usage (L) per unit time.

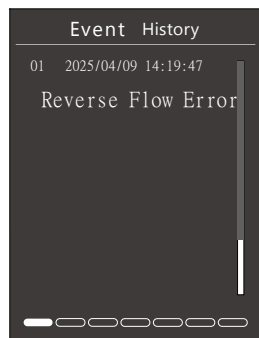


Selectable Display Periods:

- 1 day
- 1 week
- 1 month
- 1 year

③ Event History

Logs past errors and events, up to a maximum of 100 entries.



■ Logged Events Include:

- Error Occurrence
- Flow Adjustment Changes
- Zero Point AdjustmentExecution

Supplementary historical data

The meaning of the display period and data in the ① "Instantaneous Data History"

Display Period	Data Interval	Retention Period	Data Meaning
10 minutes	Every 10 seconds	Last 3 days	Samples, stores, and displays instantaneous data every 10 seconds.
1 hour	Every 1 minute		
1 Day	Every 1 hour		
1 Week	Every 1 day	Last 1 year	Samples, stores, and displays the “peak-to-valley” range of instantaneous data.
1 Month	Every 1 day		
1 Year	Every 1 month		

The meaning of the display time and data in the ② "Cumulative Data History"

Display Period	Data Interval	Retention Period	Data Meaning
1 Day	Every 1 hour	Last 1 year	Records total flow for each "data interval". (e.g., if display period is 1 day, the graph shows hourly totals.)
1 Week	Every 1 day		
1 Month	Every 1 day		
1 Year	Every 1 month		

Regarding Data Recorded in "(3) Event History":

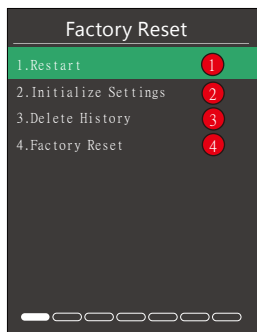
- Events are listed chronologically along with their date and time. Events are retained for 5 seconds.
- If multiple identical events occur within 5 seconds, only one will be recorded.
- If more than 100 events are stored, the oldest data will be overwritten.

System Information



- ① Device Serial Number
- ② Firmware Version
- ③ Number of Power-Ons Since Shipment

Factory Reset



- ① Press to restart the device
- ② Press to return to the initial setup menu (historical data is retained)
- ③ Press to clear historical data
- ④ Press to return to the initial setup menu (historical data is not retained)

Abnormal Descriptions and Solutions

Display	Cause	Solution
EEPROM Error / System Error	Abnormal FLASH memory or EEPROM	1. Perform factory reset. 2. If the issue persists, contact CHELIC.
Time Error	Current time is earlier than factory-set time	Reset the correct system time.
Overcurrent	Output channel current exceeds 80 mA	1. Check if the output wiring is correct and not shorted with other lines. 2. Confirm the load is within rated range.
Pulse Output Error	Pulse output frequency exceeds 500 Hz	Set a larger value for totalized pulse weight.
Reverse Flow Error	Flow direction is opposite to the configured direction	Verify that the configured direction matches the actual flow direction.

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