Operation Manual

eyc-tech FDM06-L

Bi-directional Low Air Flow Thermal Mass Transmitter

Contents

I. Security considerations

Please read this Specification carefully, prior to use of this, and keep the manual properly, for timely reference.

Solemn Statement：

This product can not be used for any explosion-proof area.

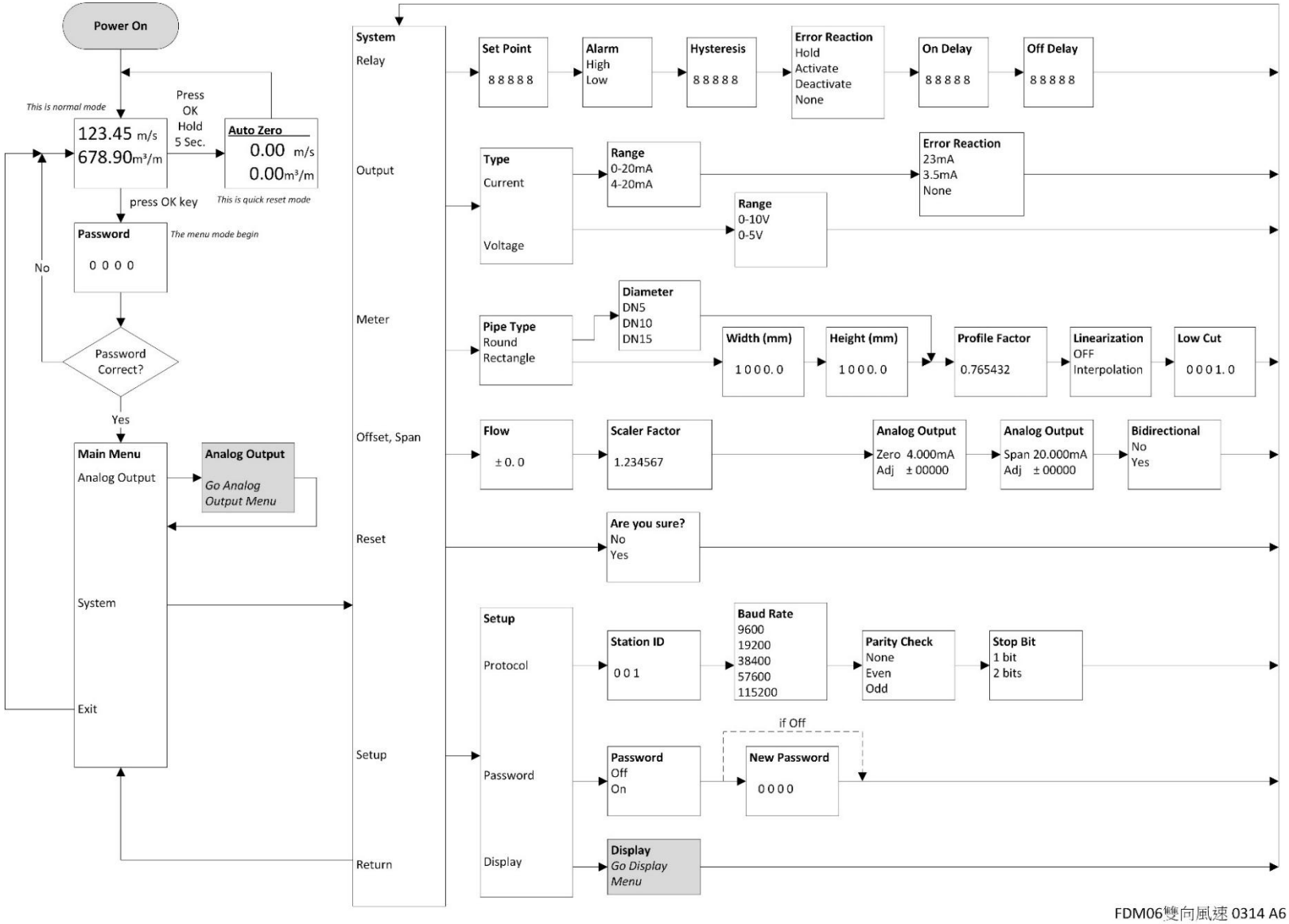
Do not use this product in a situation where human life may be affected.

eyc-tech will not bear any responsibility for the results produced by the operators！

Warning!

- Installation and wiring must be performed by qualified personnel in accordance with all applicable safety standards.
- This product must be operated under the operating conditions specified in manual to prevent equipment damages.
- Please using the product under the ordinary pressure, or it will influence safe problem.
- This product must be operated under the operating condition specified in this manual to prevent equipment damages.
- This product must be operated under the normally atmospheric condition to prevent equipment damages.
- To prevent products damage, always disconnect the power supply from the product before performing any wiring and installation.
- All wiring must comply with local codes of indoor wiring and electrical installation rules.
- Please use crimp type terminal.
- To prevent personal injury, do not touch the moving part of product in operation.
- It may cause high humidity atmosphere during the product was breakdown. Please take safety strategy.

II. Operation Form



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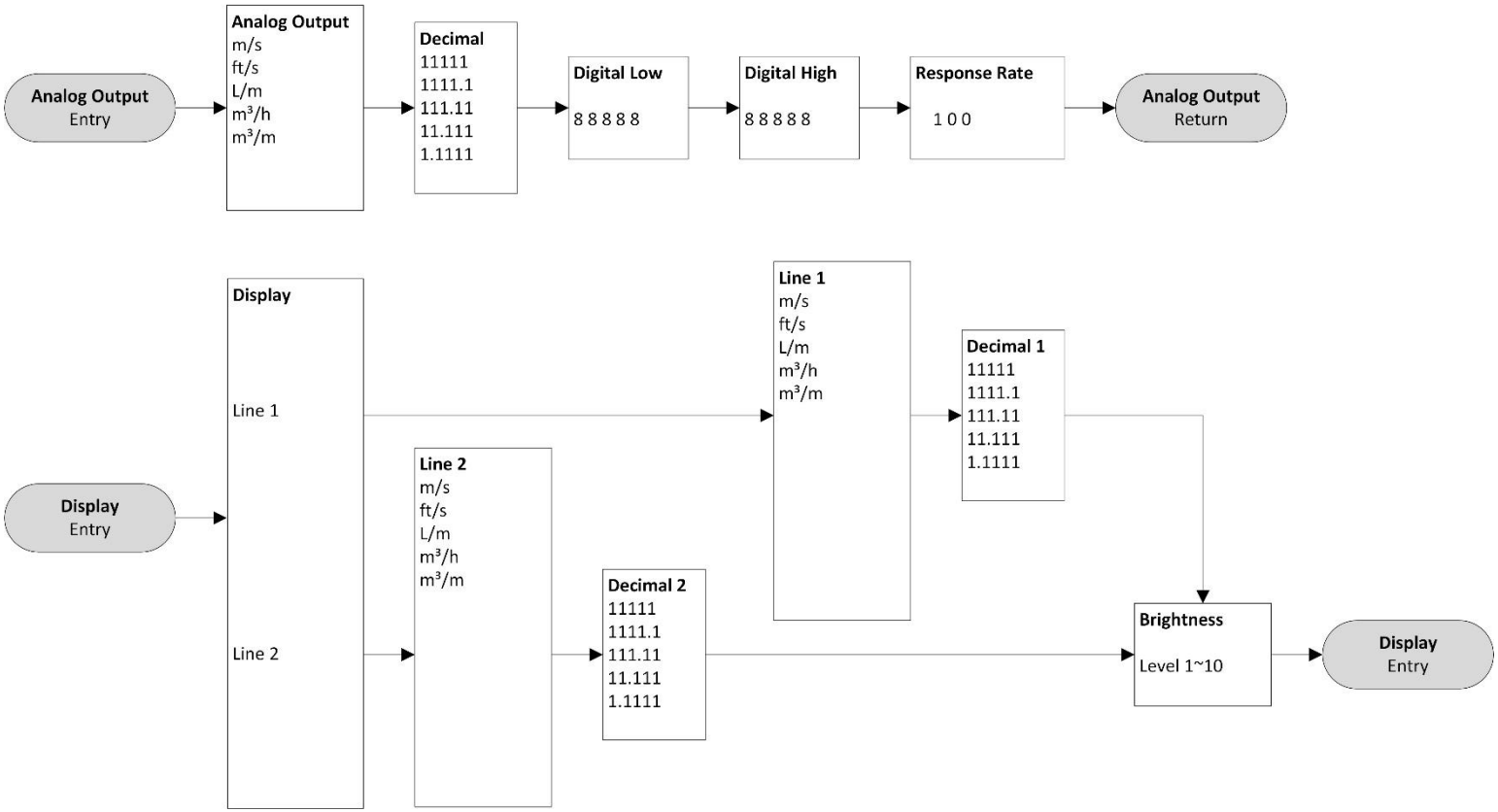
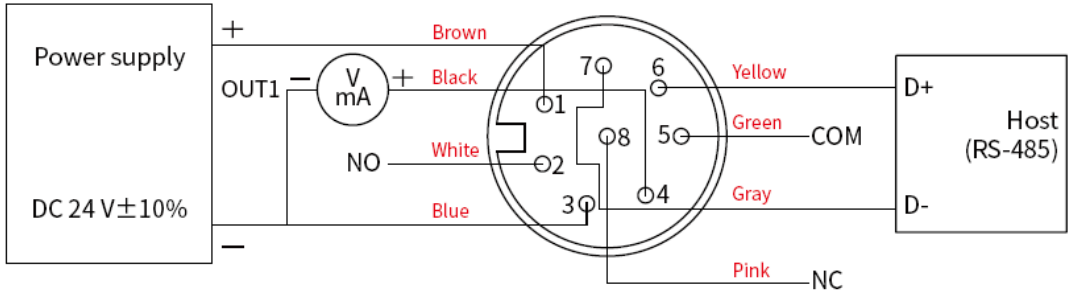

Analog Output
Entry
Analog Output
m/s
ft/s
L/m
m³/h
m³/m
Decimal
11111
1111.1
111.11
11.111
1.1111
Digital Low
88888
Digital High
88888
Response Rate
100
Analog Output
Return
Display
Entry
Display
Line 1
Line 2
Line 1
m/s
ft/s
L/m
m³/h
m³/m
Decimal 1
11111
1111.1
111.11
11.111
1.1111
Line 2
m/s
ft/s
L/m
m³/h
m³/m
Decimal 2
11111
1111.1
111.11
11.111
1.1111
Brightness
Level 1~10
Display
Entry

※Key Pad Operation Mode

Button Instruction	Operation Mode	
	Normal Mode	Menu Mode
Press UP once	Reserved	increase number or option once
Press OK once	Go Menu Mode	Submit the selection, go on next menu or complete the setting and then return to the normal mode
Press DOWN once	Reserved	decrease number or option once, shift cursot if numerical menu
Hold UP	Reserved	increase number or option faster
Hold OK 5 seconds	Set Flow Zero	Return to previous menu, or leave menu mode
Hold DOWN	Reserved	decrease number or option faster
Press UP and DOWN simultaneously	Reserved	Not Available

III. Connection Diagram



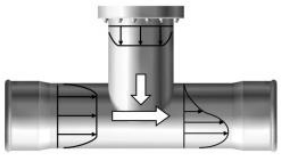
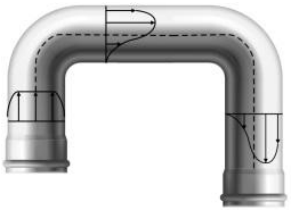
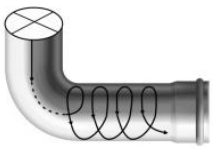
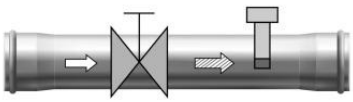
*Please make sure the product and the device which connect with RS-485 are on common ground, avoid damaged product.

IV. Installation

The installation method and conditions of the wind speed sensor will directly affect its measurement accuracy and stability. To ensure optimal performance of both duct type and remote type, be sure to follow these recommendations:

1. Installation location and flow conditions

The measuring probe should be installed in the laminar flow state of the flow field, avoiding the turbulent section. It is recommended to keep a long enough straight pipe section before and after the sensor to ensure the flow field conditions. Because elbows, valves, reducers, filters, etc. can cause airflow turbulence and affect measurement accuracy, please refer to the table below to calculate the recommended straight pipe length based on different pipe diameter styles.

Type	Drawing	Upstream straight pipe	Downstream straight pipe
Light bend (< 90°)		10 x D	10 x D
T-junction		15 x D	10 x D
Two 90° bends in one plane		20 x D	5 x D
Two 90° bends with 3-dimensional Change in direction		35 x D	10 x D
Shut-off valve		45 x D	10 x D

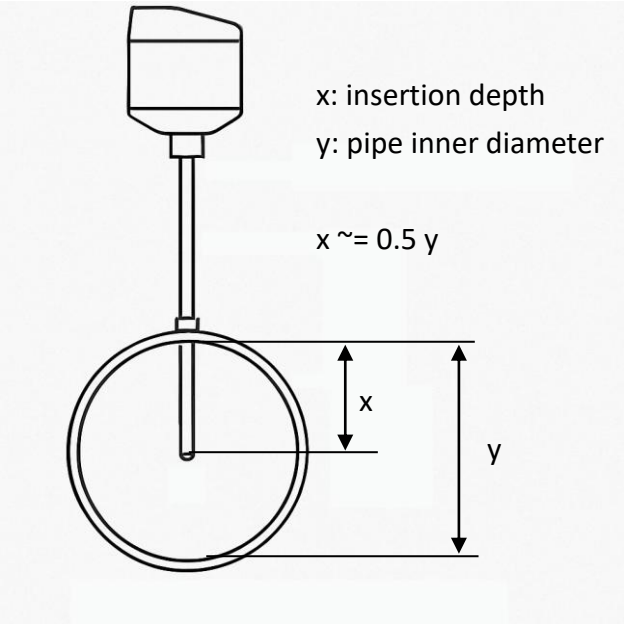
2. **Keep away from heat or cold sources**

Because thermal mass wind speed sensors are extremely sensitive to temperature, they should be installed away from equipment that produces significant thermal effects (such as electric heaters, air conditioning vents, etc.). This especially refers to temperature changes caused by cold and heat sources. Drastic changes in gas temperature will affect measurement stability and may even result in measurement values that exceed accuracy specifications.

3. **Probe insertion depth and alignment requirements**

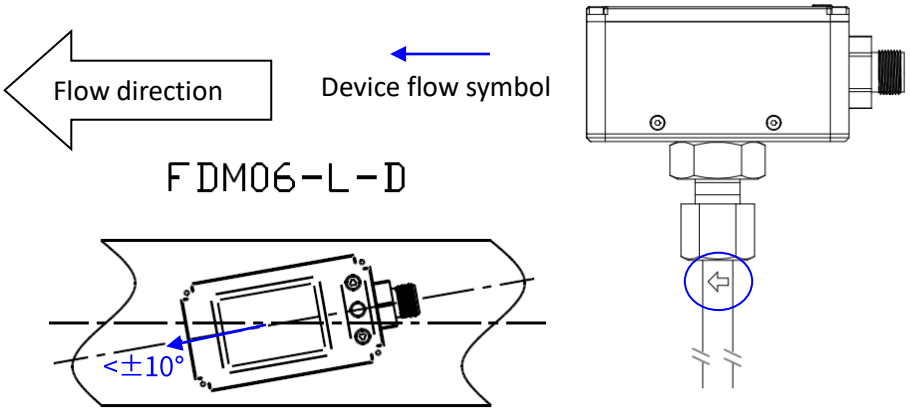
The insertion depth of the sensing element must be far away from the pipe wall. It is recommended that the sensing element of the measuring rod enters the area with uniform flow velocity in the flow field. It is generally recommended to calculate the insertion depth as 1/2 of the pipe diameter. For example: For a pipe with a diameter of 200 mm, the sensor head should be inserted at least 100 mm deep, avoiding close contact with the pipe wall. Inserting the measuring rod too deep will not result in higher accuracy. Instead, it may increase airflow disturbance, pressure loss, noise and energy loss due to the influence of the measuring rod on the pipeline.

On the contrary, when the sensor rod length is shorter than half of the measuring pipe diameter, ensure that the sensing end is inserted into the center of the pipe where the flow velocity is more stable. The insertion depth should be kept at more than 0.3 times the inner diameter of the pipe and should be as close to the center of the pipe as possible. If the insertion depth cannot reach more than 0.3 times the inner diameter of the tube, it is recommended to purchase an extended probe option and contact a sales consultant.



Insufficient insertion depth will cause the sensing element to fail to reach the stable flow.

When installing the thermal mass sensor, the actual airflow should flow in the direction indicated by the airflow direction symbol marked on the sensor. At the same time, in order to achieve the accuracy specification, the alignment deviation between the gas flow direction and the installed indicator symbol should be maintained within <±10°. An insertion type installation example below.



Flow alignment deviation or incorrect flow direction affects measurement accuracy

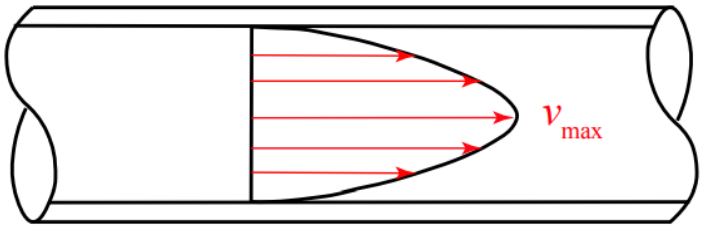
4. Gas Conditions and Scaler Factor

Thermal mass sensors calculate flow rate based on the thermal conductivity and specific heat capacity of the gas. Therefore, when the measured gas is different from the calibration conditions, the thermal mass sensor will calculate a different flow rate. The measuring range of this product is defined under standard conditions of 1013 mbar and 20 °C. The fluid medium is air and it is suitable for measuring applications such as compressed air. When measuring a gas different from the calibration standard, the following table gives correction suggestions based on the thermal properties of the gas such as thermal conductivity, specific heat, density, etc., reflecting the difference in heat transfer caused by the thermal mass sensor. It should be noted that the actual value will also be affected by the gas composition and concentration.

Gas	Reference Scaler	Note
Nitrogen (N_2)	~ 1.00	Very similar to air (about 78% of air is N_2)
Oxygen (O_2)	~ 1.03	Slightly higher thermal conductivity, but also slightly higher density
Carbon dioxide (CO_2)	~ 1.33	High density, low thermal conductivity → poor heat transfer, low readings
Argon (Ar)	~ 1.18	Inert gas, high density, low thermal conductivity

5. Volumetric conversion and Profile Factor

When the gas passes through the duct, the viscosity between the gas and the duct wall causes the wind speed near the wall to be zero (No-slip condition). As the distance from the duct wall increases, the wind speed gradually increases and reaches the maximum value at the center of the cross section. Therefore, the wind speed is non-uniformly distributed in the cross section of the duct. This means that even if the wind speed sensor measurement point is selected at the center of the duct, the wind speed measured is still higher than the average wind speed of the cross section. If it is directly used as the basis for estimating the air volume, it will lead to an overestimation of the total air volume. Single-point wind speed measurement requires a correction factor. Since wind speed distribution is related to wind speed and pipe shape, the following table recommends correction factors based on different pipe diameters. The actual correction factor will change with wind speed. This table provides a setting reference. The correction factor is not a fixed value.



Typical gas velocity distribution in a pipeline. The wind speed reaches the maximum at the center point, and the average wind speed is lower than the wind speed at the center point.

Diameter(mm)	Profile Factor
<50	0.772
~100	0.804
~200	0.829
>500	0.852

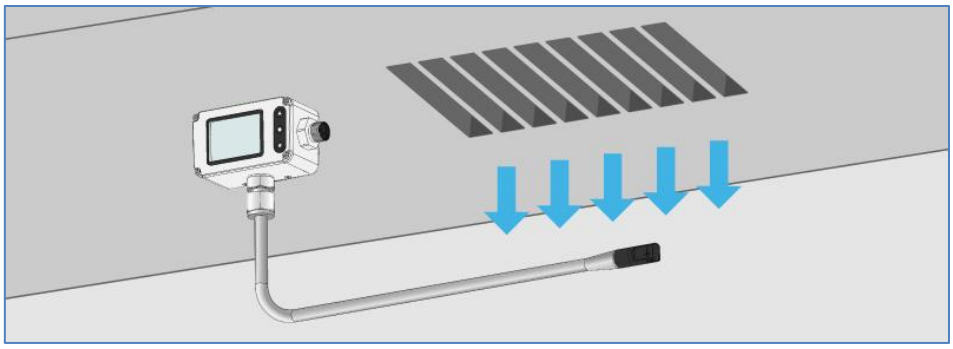
Pipe diameter and correction factor reference value

6. Laminar flow measurement and laminar flow type installation

Laminar flow refers to a controlled air movement in parallel layers, where the airflow remains steady and uniform, effectively minimizing turbulence and instability. This consistency helps reduce contamination risks and is widely used in air and fluid dynamics systems to enhance overall efficiency.

In cleanrooms, laminar flow ensures high air cleanliness by continuously flushing out airborne contaminants, meeting the stringent production standards required in industries like semiconductors, biopharmaceuticals, and precision electronics. In biological safety cabinets, laminar flow maintains a stable airflow over the work area, preventing contamination from escaping. In surgical rooms, it provides a sterile environment, significantly reducing the risk of post-operative infections.

The installation diagram for laminar flow is recommended. The sensor body can be installed on the ceiling or wall to measure the wind speed at the outlet passing through the sensor head.



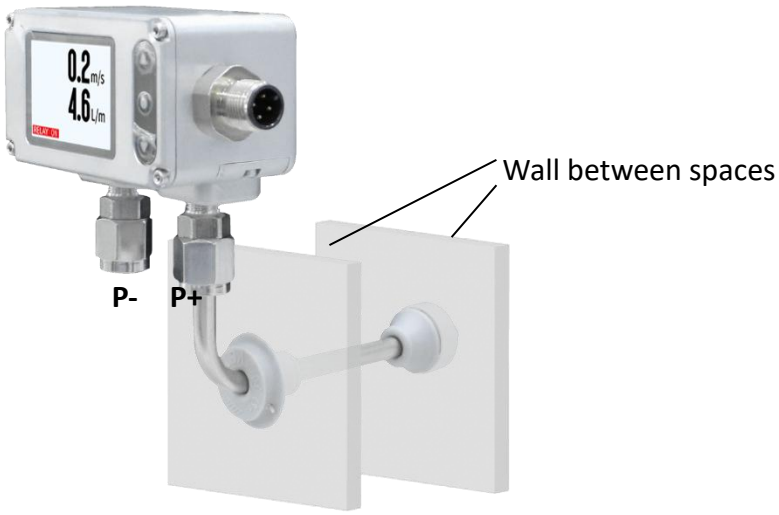
L1 type mounting on a celling

7. Overflow measurement and overflow type installation

Overflow describes the movement of air as it spills or flows outward from one area to another. This mechanism is commonly used to maintain pressure differentials between zones, enabling effective environmental isolation and contamination control.

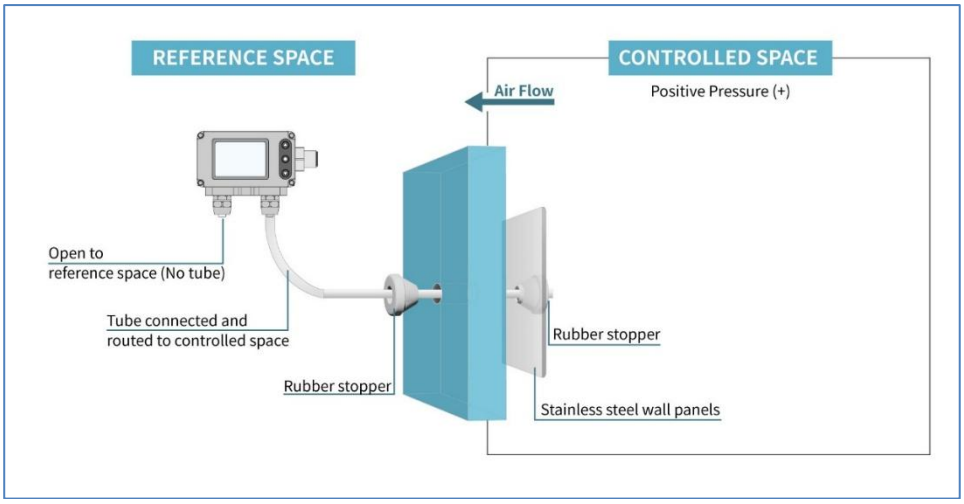
In negative pressure isolation rooms, overflow prevents the spread of pathogens to surrounding areas, protecting medical staff and other patients. In chemical laboratories, low airflow overflow effectively contains hazardous air emissions. In high-temperature processing zones, overflow helps dissipate heat, improving cooling efficiency and ensuring stable equipment operation.

It is recommended that the overflow type be installed through the wall. The device body is fixed by one of the tube passing through the wall, and the other tube remains open to the reference space. The choice of pressure inlet holes during installation varies depending on the negative pressure or positive pressure application. It also varies depending on the location of the device installation site.

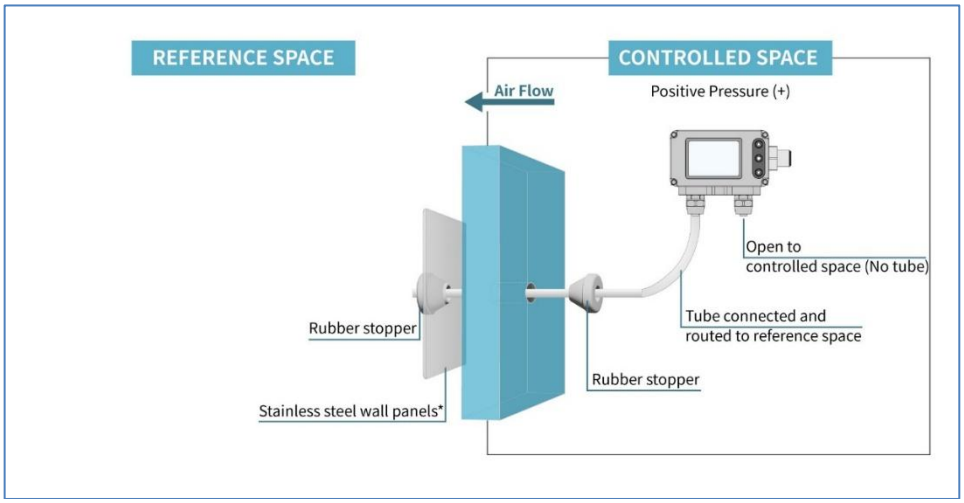


Type L2 application in negative pressure isolation rooms

Type L2 installation has the following four combinations depending on the application and pressure tap point.



Installation diagram using PVC tubing with straight quick connector from accessory pack



Installation diagram using PVC tubing with straight quick connector from accessory pack

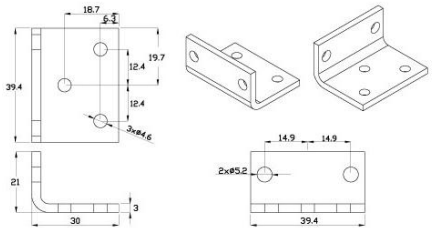
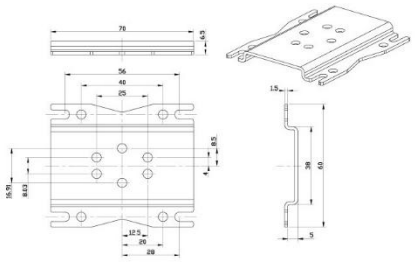
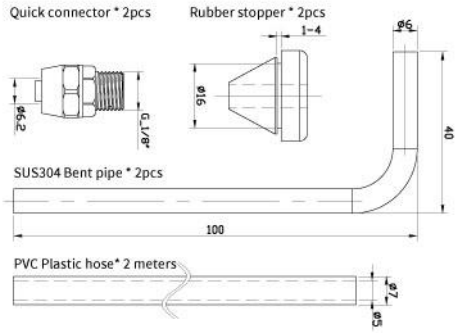
*Stainless steel wall panels is not included in the accessory pack.

Application	Installation Location	P+ Port	P– Port
Positive pressure area overflow monitoring (e.g., cleanroom air flowing outward)	Inside positive pressure area	Open to positive pressure area	Pressure tap fixed on wall
	Outside positive pressure area	Pressure tap fixed on wall	Open to reference area
Negative pressure area overflow monitoring (e.g., isolation room preventing air leakage)	Inside negative pressure area	Pressure tap fixed on wall	Open to negative pressure area
	Outside negative pressure area	Open to reference area	Pressure tap fixed on wall

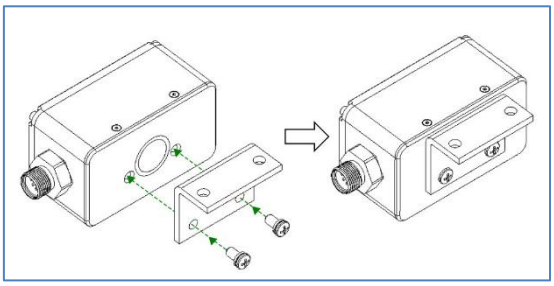
8. Others

The installation location should avoid strong vibration or pipe bending and deformation, which may affect the stability of the sensor or damage the probe, and avoid vibration and mechanical stress. A location that is easily accessible should be chosen to facilitate subsequent inspection, correction or cleaning. If the installation environment is humid or the gas contains a lot of dust, it is recommended to use a filter or clean it regularly. Because the probe of the thermal mass sensor is particularly sensitive to dust and dirt, the readings will be affected over the long term.

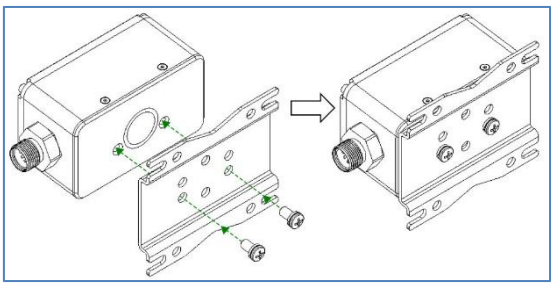
9. Mounting accessories

Name / Order No. / Description	Product	Dimension (mm)
Name：L-bracket Order No.：692.10320 Material：SUS304		
Name：Back plate Order No.：4435000010 Material：SGCC		
Name：Accessory pack Order No.：8203104025 1. ø6 Bent pipe * 2pcs Material : SUS304 2. Plastic hose Material : PVC 3. Rubber stopper Material : Rubber 4. Quick connector Material : Nickel-plated copper		

L-bracket Installation Overview



Back plate Installation Overview



V. RS-485 and Modbus

FDM06-L integrates a RS-485 interface for digital communication as an option feature. Based on Modbus protocol makes the general convenience on PLC, HMI and PC connection. For Modbus protocol information please download the file from website. Besides the PLC, HMI application, the user software provide the device setting and data logging function, it also can free download from website.

Technical Data：

(1) Max. network size：32 transmitters
(2) Communication：with COM-Port (serial interface) of PC
(3) Max. network expansion：1200m (3937ft) total length at 9600 baud
(4) Transmission rate：9600, 19200, 38400, 57600, 115200 Baud
(5) Parity：None, Even, Odd
(6) Data length：8 bit
(7) Stop bit：1 or 2 bit
(8) Factory default Station address = 1, Data format= 9600, N81

VI. Autozero

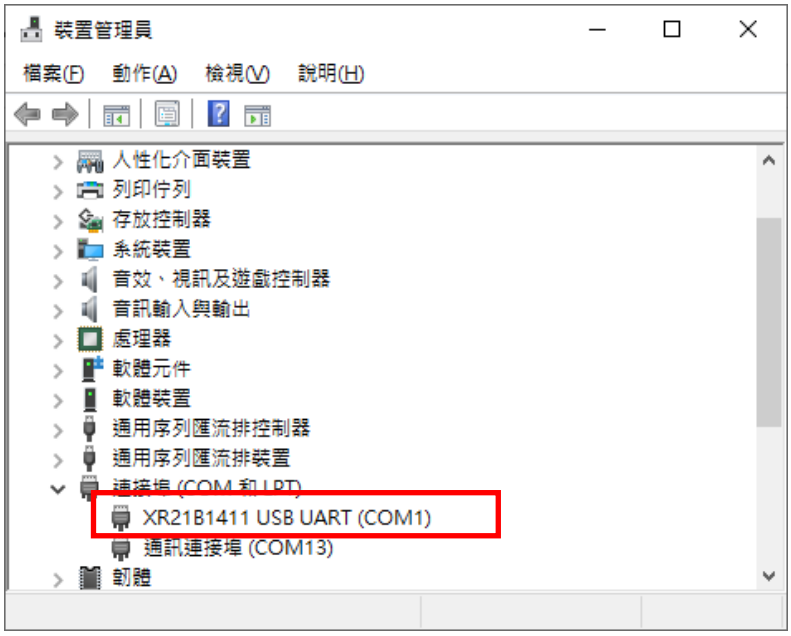
The middle button allows user to set the current flow rate to zero point. It is required to press the button about 5 seconds, and user can see Auto Zero will be display. Then user can release this button and will see the prompt Auto Zero Done, and the new zero point has been set. Please make sure that the gas is completely still prior to execute this function.

This button also allows user to restore factory default setting. It is required to press the button about 10 seconds, user will first see Reset Zero will be display. Then user can release this button and will see the prompt Reset Zero Done, and the new zero point has been set.

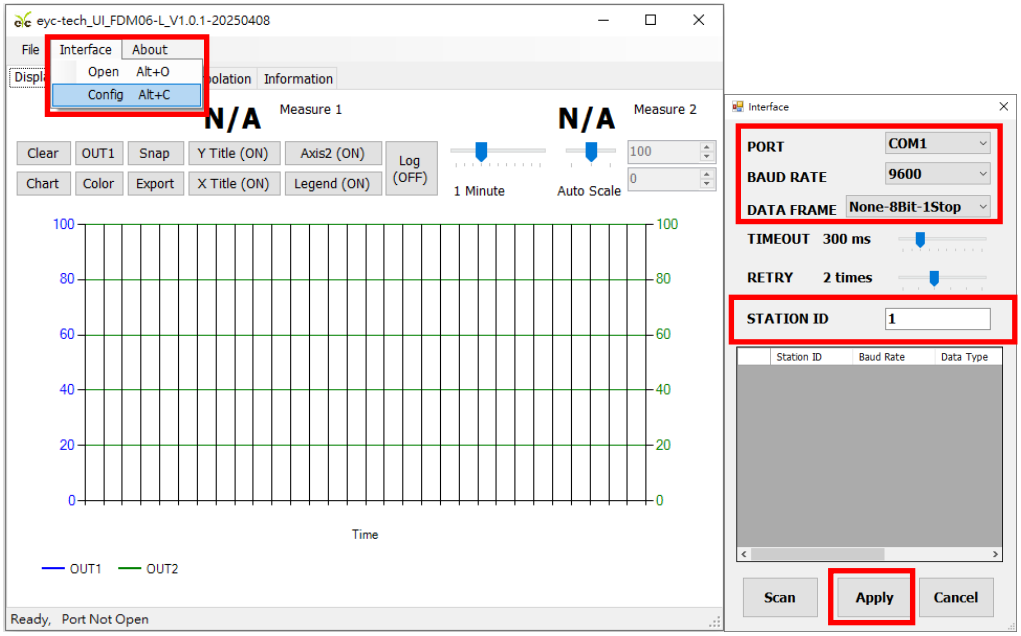
VII. Software and configuration step

User may download the configuration software on eyc-tech web site. Please decompress the application prior to execute it. Operating System requirements：above Windows 10. Hardware connection：Connect the FDM06-L to PC through USB to RS-485 or RS-232 to RS-485 converter

1. Check the COM port number from Device Manager in Computer Management. e.g. COM1 in illustration

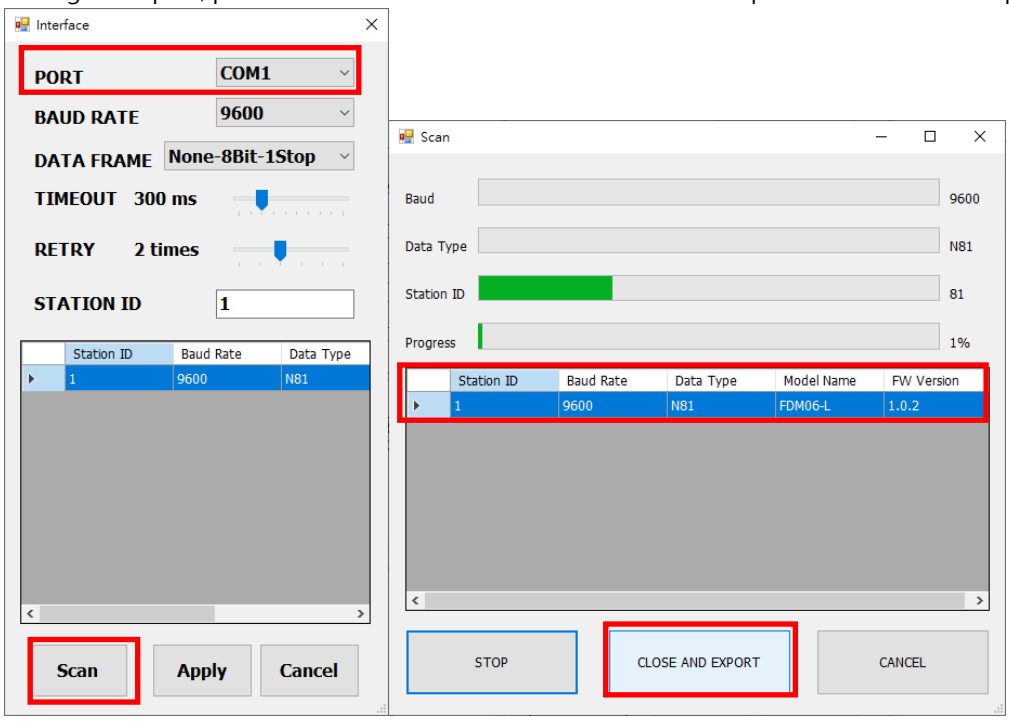


2. Open the FDM06C UI, go to function " Interface " , click item " Config " and then setting COM port, BAUD rate, data format and Station ID, pressed " Apply " for connection



3. Scan RS-485 connection

Open the FDM06-L UI, go to function " Interface " , click item " Config " and then setting COM port, pressed " Scan " bottom for scan devices and pressed " Close and Export "



when the interested devices found.

Pick up the device that you want to connect to and then press "Apply" to go.

4. Setting on Analog Output

In the group of Analog, Output tab. The output1 related setting could be found.

(1) Quantity：Flow Velocity in unit of m/s, Flow Velocity in unit of ft/s, Flow Rate in unit of L/min, Flow Rate in unit of m/h, Flow Rate in unit of m/min

(2) Response rate： 1st order low pass filter inside, set 100 if filter disable and set 0 if the maximum response time. 100~0 possible. Lower value if lower fluctuation but longer response time, higher value if allow higher fluctuation but shorter response time.

(3) Analog Type：Voltage or Current

(4) Bidirectional Measurement：When the flows in the reverse direction, the output velocity or flow rate will be displayed and output as a negative number. Otherwise, the output is cut off and output zero.

(5) Analog Range：0 ... 20 mA / 4 ... 20 mA (if output current) / 0 ... 10 V (if output voltage)

(6) Decimal Places：Up to 4 decimal places. Please note that the number of displayed digits is a fixed maximum of 5 digits, and the decimal digits need to occupy integer digits.

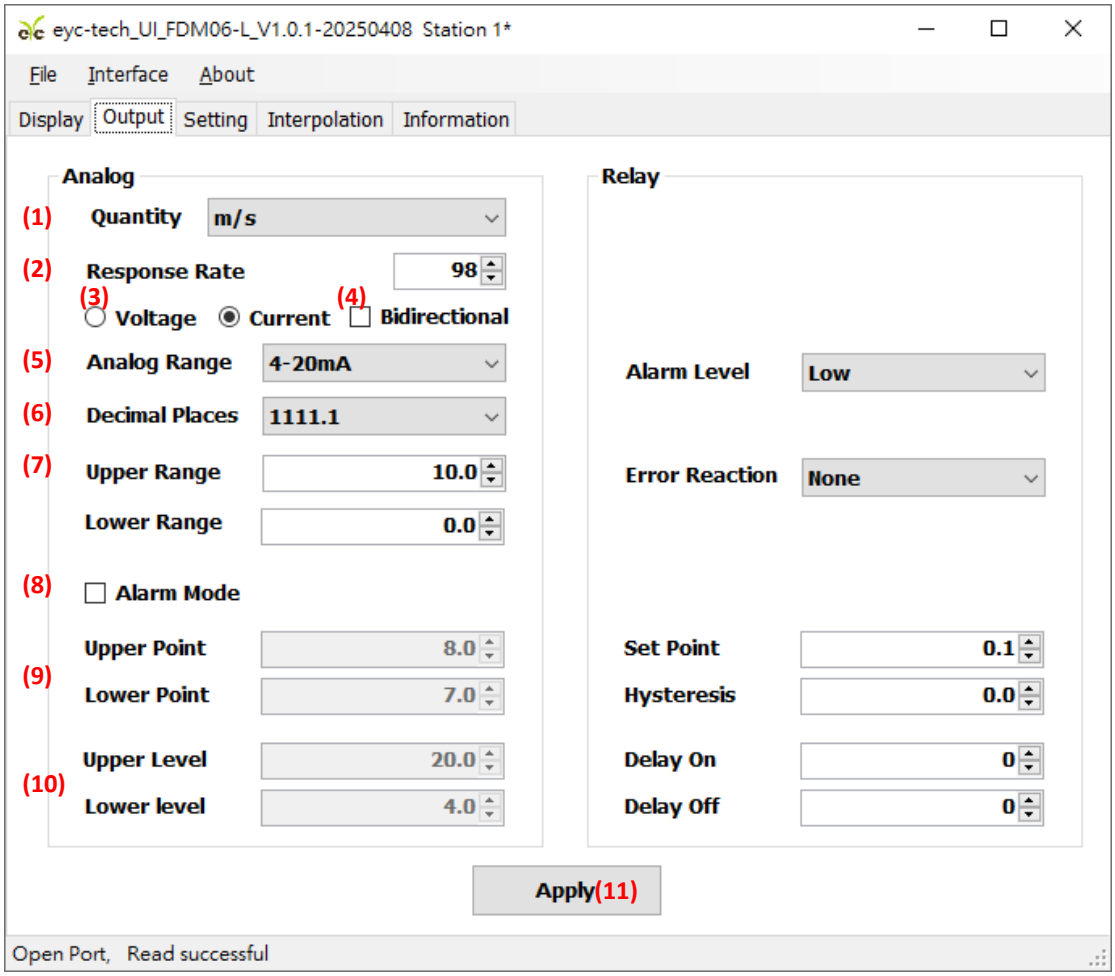
(7) Range for Display Upper and Lower

(8) Alarm Mode: Check the box if analog output pretends an alarm switch output

(9) Alarm Trigger Point: Upper and Lower

(10) Alarm Output Level: Upper and Lower

(11) Apply: Write the setting value to the device. If this button is not clicked, the changes will be discarded.


eyc-tech_UI_FDM06-L_V1.0.1-20250408 Station 1*
File
Interface
About
Display
Output
Setting
Interpolation
Information
Analog
(1)
Quantity
m/s
(2)
Response Rate
98
(3)
Voltage
Current
(4)
Bidirectional
(5)
Analog Range
4-20mA
(6)
Decimal Places
1111.1
(7)
Upper Range
10.0
Lower Range
0.0
(8)
Alarm Mode
(9)
Upper Point
8.0
Lower Point
7.0
(10)
Upper Level
20.0
Lower level
4.0
Relay
Alarm Level
Low
Error Reaction
None
Set Point
0.1
Hysteresis
0.0
Delay On
0
Delay Off
0
Apply(11)
Open Port, Read successful

5. **Setting on Relay Output**

In the group of Relay, Output tab. The relay related setting could be found.

(1) Alarm Level：Relay activate mode, activate at increasing signal (High) or activate at decreasing signal (Low)

(2) Error Reaction Mode：None if disable, Hold if memory and hold the first alarm until reboot, Action if active when alarm assert, Deaction if inactive when alarm assert

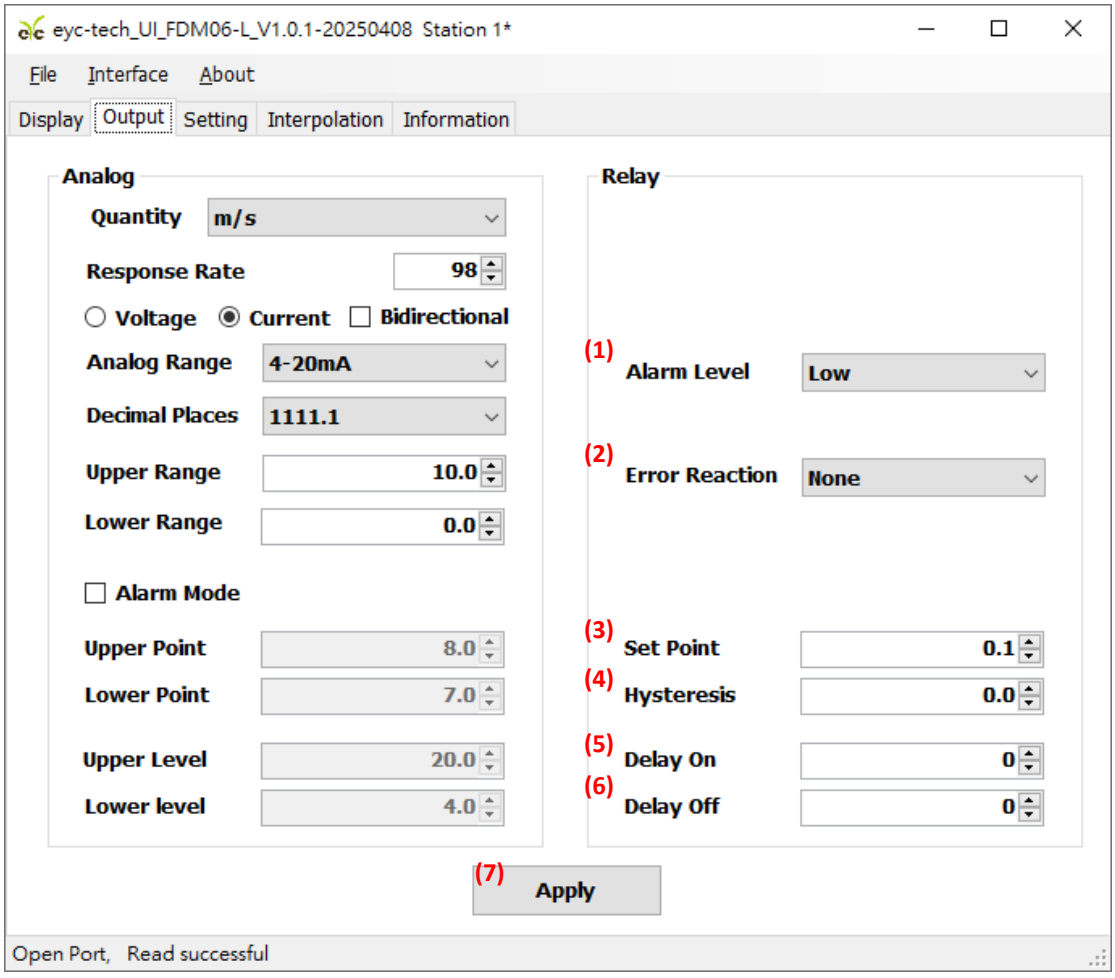
(3) Set Point：Activation Set Point

(4) Hysteresis：Activation Hysteresis Gap

(5) Delay On：Relay Activate Delay Time in second

(6) Delay Off：Relay Deactivate Delay Time in second

(7) Apply: Write the setting value to the device. If this button is not clicked, the changes will be discarded.



6. **Offset adjustment and RS-485 Setup**

There are 3 groups in setting tab. The description of each item as below.

※ Offset adjustment：

(1) Flow Velocity/Rate Offset

(2) Flow Velocity/Rate Low Cut Off Level

(3) Flow Velocity/Rate scaler factor

※ Process Parameter

(4) Pipe Type

(5) Pipe Dimension, specify diameter or width and height

(6) Flow profile factor

※ Display：

(7) LCD display of measurement: Two programmable on-site display columns are provided, namely the first and second lines of the display. The possible measurement including flow velocity unit in m/s, ft/s and flow rate unit in L/min, m^3/h and m^3/min. The position of decimal places can be specified individually.

(8) Device menu access password

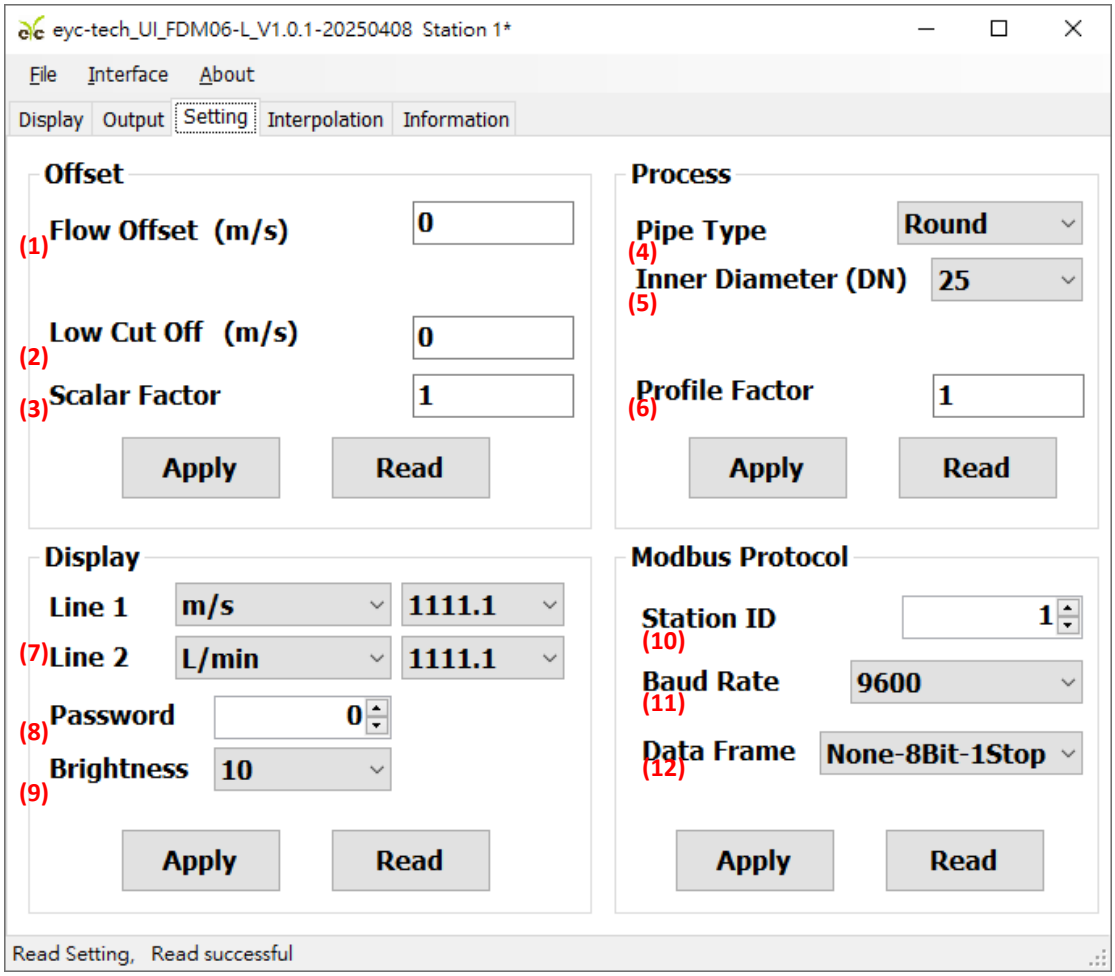
(9) LCD brightness

※ Modbus Protocol：

(10) Station ID

(11) Baud Rate

(12) Data Frame, the combination of parity check and stop bit


eyc-tech_UI_FDM06-L_V1.0.1-20250408 Station 1*
File
Interface
About
Display
Output
Setting
Interpolation
Information
Offset
(1) Flow Offset (m/s)
0
(2) Low Cut Off (m/s)
0
(3) Scalar Factor
1
Apply
Read
Process
(4) Pipe Type
Round
(5) Inner Diameter (DN)
25
(6) Profile Factor
1
Apply
Read
Display
Line 1
m/s
1111.1
(7) Line 2
L/min
1111.1
(8) Password
0
(9) Brightness
10
Apply
Read
Modbus Protocol
(10) Station ID
1
(11) Baud Rate
9600
(12) Data Frame
None-8Bit-1Stop
Apply
Read
Read Setting, Read successful

7. **Linear Interpolation**

Click the Interpolation tab to specify linear interpolation points.

(1) interpolation table

(2) interpolation curve

(3) interpolation input column, device measures value (raw value)

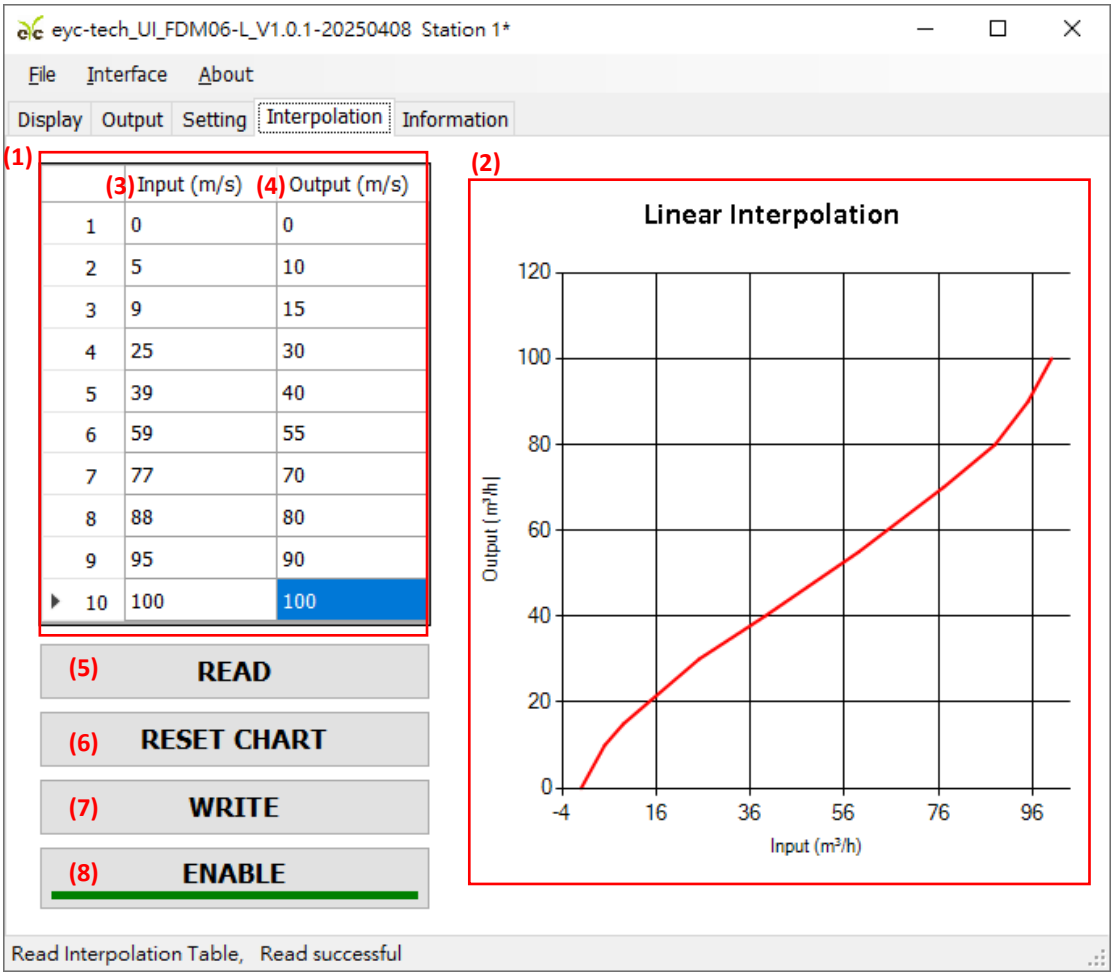
(4) interpolation output column, device output value (standard value or correction value)

(5) read the interpolation table of connected device

(6) Clear the interpolation table on configuration software. Note: this action will not modify the interpolation table of the device

(7) apply, the interpolation would be written in device

(8) enable, activate the interpolation calculation. When a green rectangle as shown below is displayed under the button, it means that interpolation is enabled, otherwise the interpolation function is turned off.



8. **Data display and logging**

On the Display tab, display the measurement data and log the data. The settings are as follows.

※button function description

Clear clear chart

Chart change chart drawing line style

OUT1 select the activate channel to be set color

Color set the activate channel line color

Snap capture drawing chart screen

Export export measurement data since the last "clear chart" or ui start up

Y Title (ON) Y-axis label On/Off

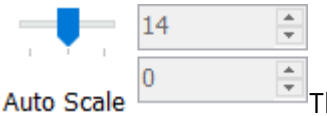
X Title (ON) X-axis label On/Off

Axis2 (ON) secondary Y-axis On/Off

Legend (ON) chart legend On/Off

Log (OFF) data log function On/Off

1 Minute The X-axis scale adjustment

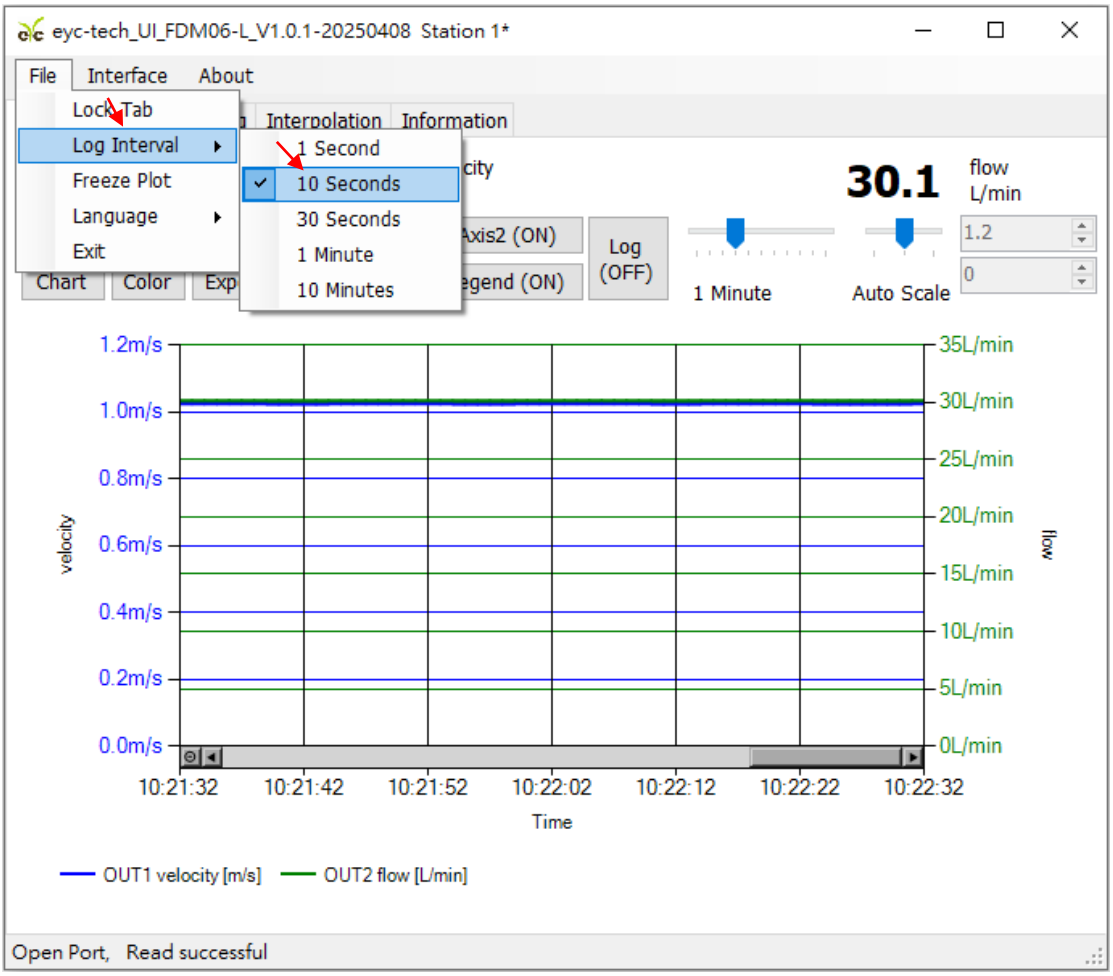


The Y-axis scale mode

※Set recording time interval

a. File > Log Interval

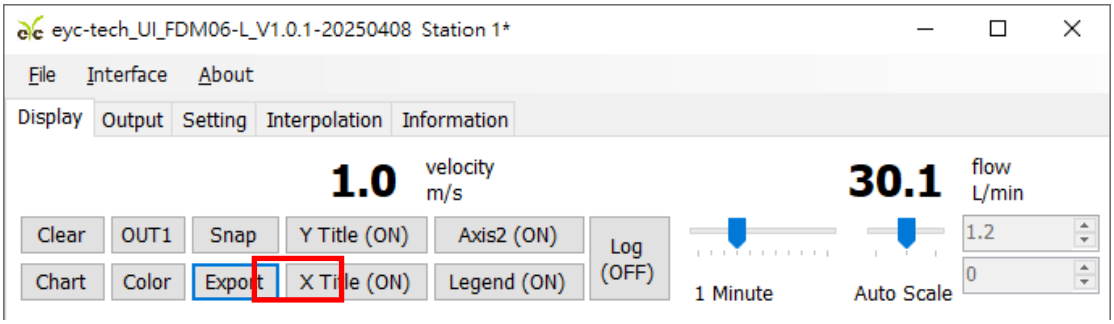
b. Select recording interval



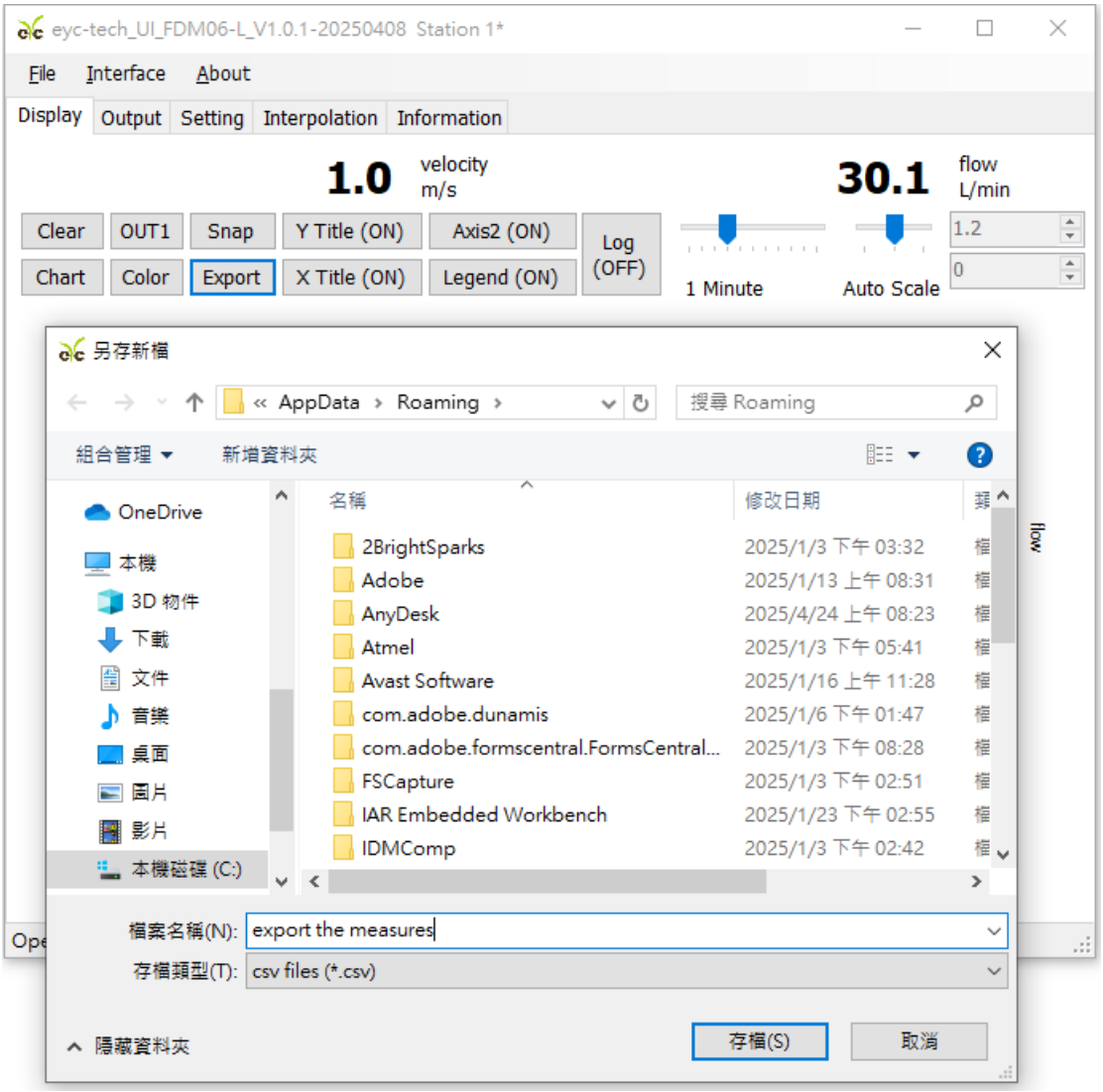
※Export/recording measurement

1. export measurement data since ui start up or the last "clear chart"

1-1. clock Display > Export



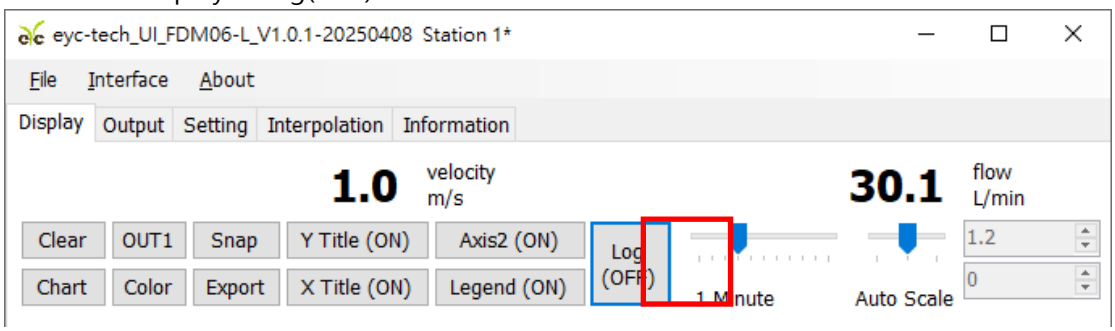
1-2. Specify the file path and file name > Save



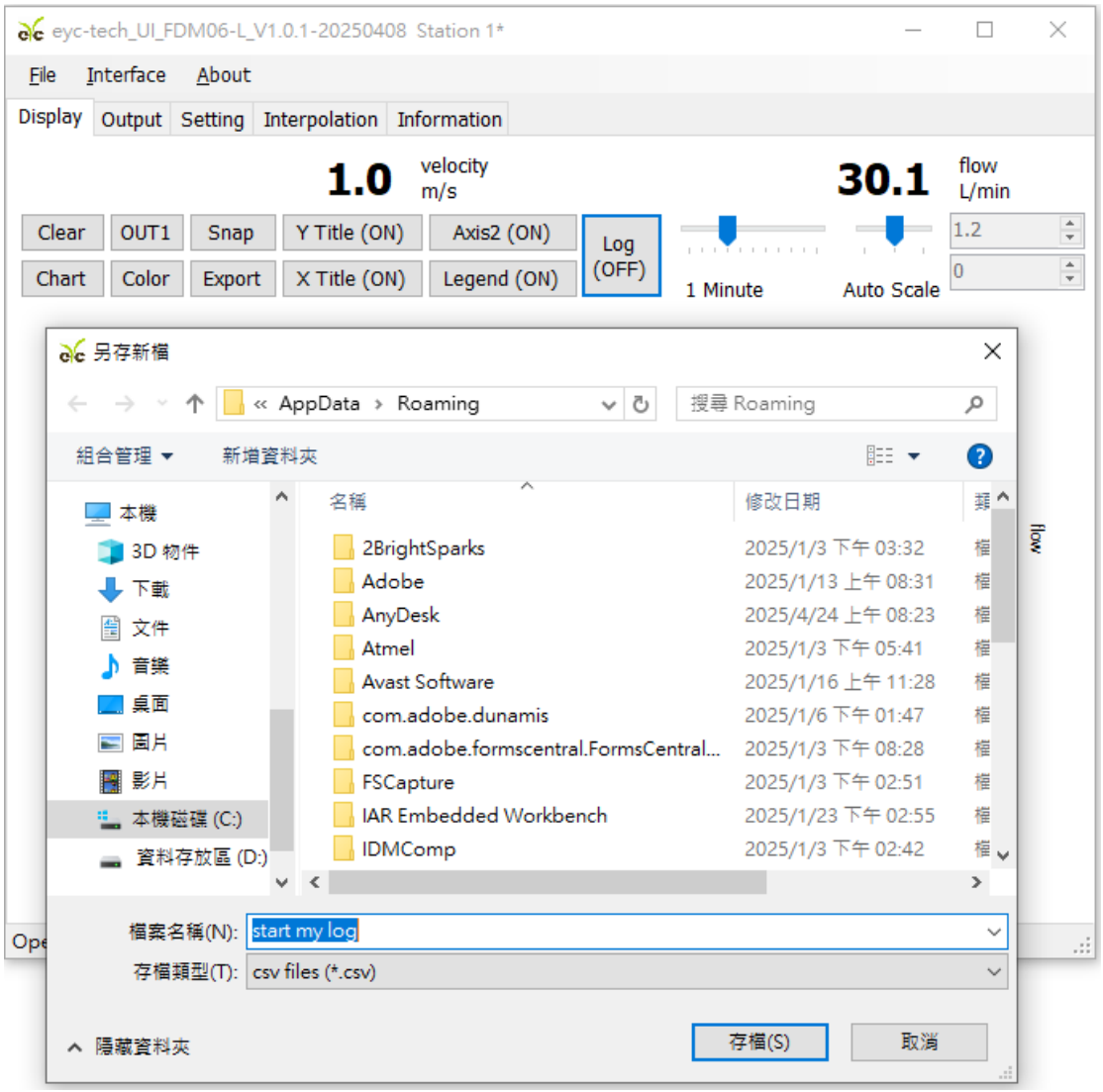
Note: If the specified file already exists, the data will be overwritten.

2. Record measurement data: record data since the Log function is turn on

2-1. Clock Display > Log(OFF)

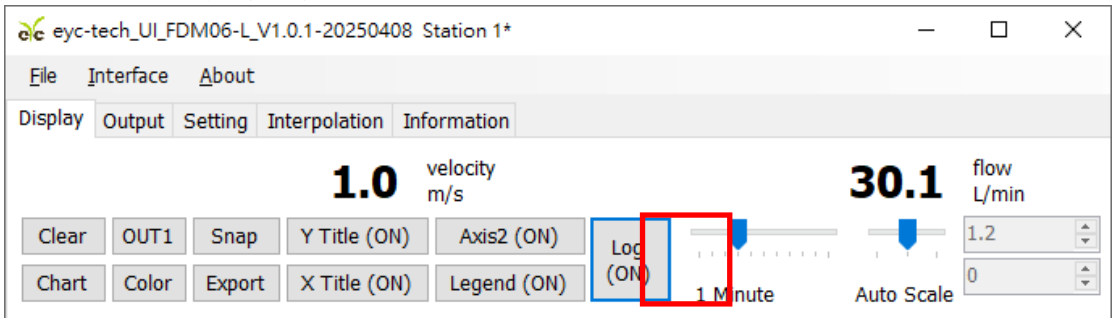


2-2. Specify the file path and file name > Save > Log(ON)



Note: If the specified file already exists, the data will be overwritten.

2-3. Finish recording measurement data: Click Log(ON) again. At this time, the button returns to displaying Log(OFF), and the recorded data file is stored in the specified file.



9. Device Information

(1) Serial Number of Device

(2) Model Name of Device

(3) Firmware Version of Device

(4) Factory Mode Status, default Disable

(5) Firmware Checksum

(6) Output equipment, supports analog output and relay functions

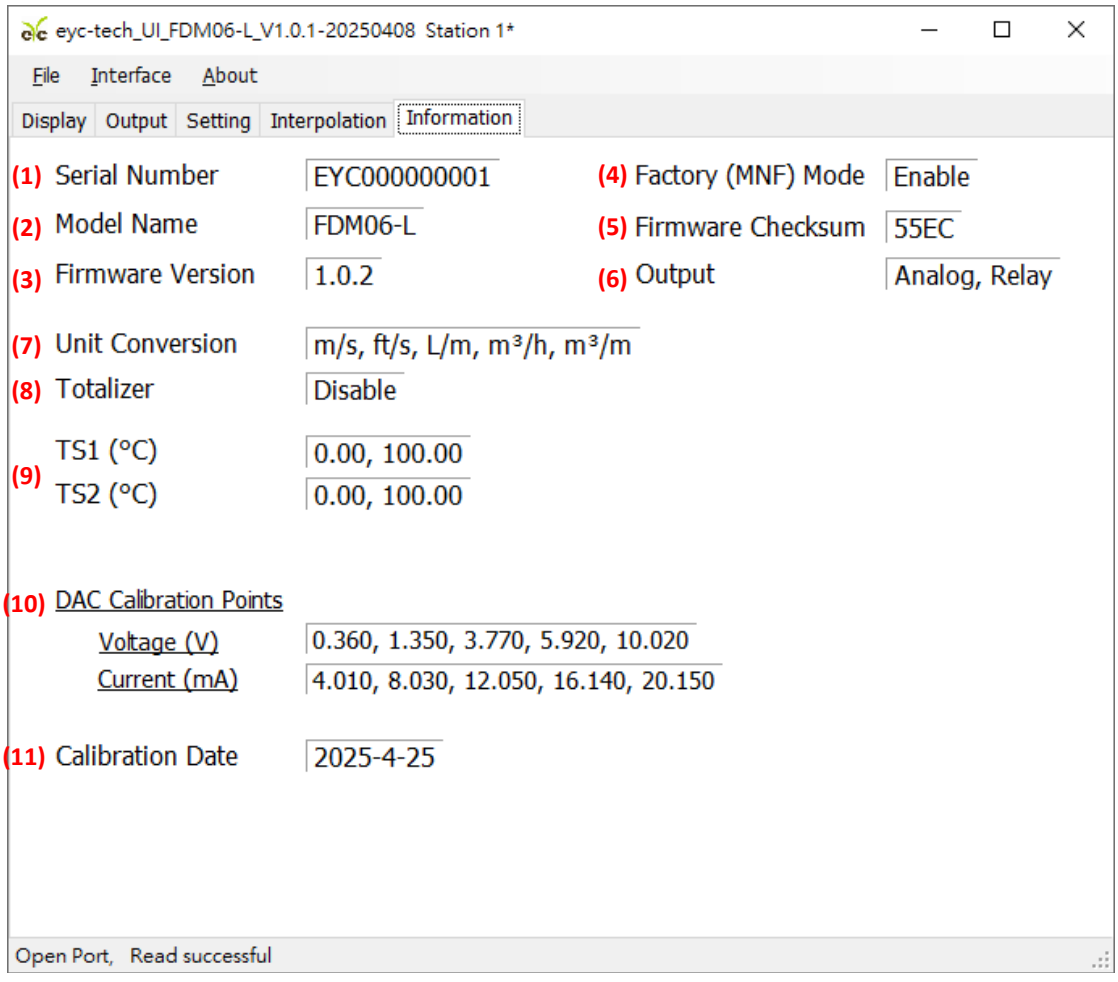
(7) Supported Unit Conversion

(8) Totalizer function, default enable

(9) Temperature Calibration Points

(10) Analog Output Calibration points

(11) Calibration Date



8. Inspection and maintenance

1. Maintenance

Since this product is inspected and calibrated for high accuracy at the factory before shipment, no calibration on the installation site is necessary when this product is installed

For inspection and maintenance follow the instructions below：

(a) Periodic inspection

Periodically inspect this product for its sensing accuracy, clean the sensor element and clean bypass channel (if L2 Overflow type). Set the period between inspections based on atmospheric dust and other contaminants in the installation environment

(b) Sensor maintenance

Do not damage sensor surface during maintenance process

(c) Troubleshooting

If any problem occurs during operation, refer to the table below for appropriate solutions

2. Troubleshooting：

Problem	Cleck items	Soluations
●No output ●Unstable output	●Disconnected wiring ●Loose wiring ●Power supply voltage ●Sensor damages	●Re-perform wiring ●Crew on terminal tightly or replace wires ●Clean up the bypass channel ●Replace the sensor
●Slow response to output ●Error in output	●Moisture / Condensation on the product ●Execute Autozero before measures ●Check installed location ●Check bypass channel ●Check dust and contamination on the sensor	●Remove the sensor cover and filter. Let the sensor unit dry naturally in a clean air environment ●Refer to the section 6. Autozero ●The straight length of pipe did not satisfy design specifications. Refer to the section 4. Installation ●Cleanup the bypass channel if the L2 Overflow type ●Calibrate ●Replace the sensor

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Tel.：886-2-8221-2958
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