FU-ES EchoSense
Instruction Manual

⚠Safety Instructions

⚠ This product uses ultrasonic time-of-flight (ToF) in the forward and reverse directions to measure the flow on the outside of the pipe, so it is necessary to avoid bubbles, solid foreign matter, crystallization and sediments in the fluid. At the same time, try to avoid strong electromagnetic field interference near the device.

The sensing system works on the principle of magnetic sensing, please avoid the interference of strong magnetic fields and ferromagnetic materials.

Please cover the unused wires with insulating materials to avoid leakage, short circuit and damage of the device and be careful of electric shock.

If the device is opened, please make sure that there is no foreign matter above the seal of the lower cover, and then lock all the screws evenly. Uneven force can cause damage to the mechanism. Unlocked or foreign objects on top of the seal will cause the waterproof and dustproof failure.

Before wiring the motor and turning on the device, please confirm that the power is off. To avoid damage to electronic parts and electric shock leakage.

Pressing the button for too long will cause the button to be damaged, please avoid it.

After the warranty period, the electronic components of the product will be aged due to time and operating environment. After long-term use, please replace the new product according to the condition of the product.

Do not operate the product for a long time with the LCD backlight showing orange and red lights to avoid product damage and related losses.

Do not place the screen in direct sunlight or other UV light sources.

This instruction manual version is v1.0

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This document is applicable to the products below.

Hardware version v1.0

Firmware version v1.0

Method for confirming product version

You can find the hardware version on the sticker on the left side of the device.

Firmware version could be found on the bottom right of the boot screen indicated by a red arrow sign like shown below.

Definition of hardware version number

Format of hardware version number vYY.XX.ZZ

Hardware version number starts with a lowercase “V”, followed by 1 to 2 numbers “YY” which represents important modification of electronic parts and mechanisms that affects product’s core function. Following 1 or 2 numbers “XX” represents modification of non-core functions. The last 1 or 2 numbers “ZZ” represents modification which does not affect product function, such as minor mechanism feature modification or substitution of electronic components.

Definition of firmware version number

Format of Firmware version number vYY.XX.ZZ

Firmware version number starts by lowercase “V”, followed by 1 to 2 numbers “YY” which represents important modifications of the firmware. Following 1 or 2 numbers “XX” represents modification of non-core functions. The last 1 or 2 numbers “ZZ” represents modification which does not affect product function.

Definition of manual version

Format of manual version number v.XX.ZZ

Version number starts from lowercase “v”, following 2 numbers “XX” which is the version of manual.The last 1 or 2 numbers “ZZ” represents revised serial number of the version.

Due to modifications in mechanisms, electrical or firmware that could affect usage or installation methods, LORRIC will release new versions of the instruction manual. For example, if the definition of aviation plug changes then we release an updated manual. At the same time, for clients who own older models, the appropriate manual will still be available.

If modifications in the instruction manual don't affect the usage, but are just for improvements in grammar, sentence structure, etc. LORRIC will not release a new version.

We provide multi-language manuals

The manual provides multi-language versions. The same manual version in each language is for the same hardware and firmware version.

Manual Update Log

Update Date: 2024/09/02

Updates:

- **New Additions**:
  - Added a "Manual Update Log" page.
  - Added a "Product Update Record" page.
  - Added pages for category options and descriptions: Z.
  - Added pages for category options and descriptions: A.
  - Added pages for category options and descriptions: B.
  - Added pages for category options and descriptions: K.
  - Added pages for category options and descriptions: C.
  - Added pages for category options and descriptions: D.
  - Added pages for category options and descriptions: E.
  - Added pages for category options and descriptions: H.
  - Added a "Firmware P.1203 Update" page.
- **Improvements**:
  - Corrected links on the product page.
  - Updated the page title and content for the "Manual and Product Update and Version Record" section.
  - Updated parameter table descriptions.
  - Revised product appearance, specifications, and model information.
- **Fixes**:
  - Updated the default password setting for H08.

Measurement principle and usage scenario

Measurement Principle

A number of global invention patent applications are pending.

The LORRIC clamp-on ultrasonic flowmeter uses the ultrasonic time difference to measure the flow, and uses the linear relationship between the ultrasonic transmission time difference between the upstream and downstream of the pipe and the flow rate to measure the flow. Due to the one-piece clamp-on structure, it can be installed without interventions in the pipe, compared with the in-line flowmeter, it can also provide the highest chemical resistance and leak-proof performance. Compared with the traditional ultrasonic flowmeter, since there is no need to adjust the position of the upstream and downstream probes, it can be installed quickly, and also greatly reduces the training required for installers.

> **Due to the inevitable dimensional tolerances of all mass-manufactured pipes, there may still be tiny flow data when the fluid does not flow, or the device displays a data of 0 but there is still a small amount of fluid passing through.**

This product uses ultrasonic measurement, so it is necessary to avoid the interference of ultrasonic transmission caused by a large number of solid foreign objects, a large number of air bubbles, and crystals in the fluid. At the same time, try to avoid strong magnetic field interference near the device.

> **The ultrasonic flowmeter measures the flow correctly only when the fluid shows stable flow. Please choose the installation location according to the guidelines.**

Usage Scenario

This product provides flow measurement of liquids that do not contain a large amount of impurities in full pipe in industrial environments. The installation location should allow the fluid in the pipe to be as stable and fully developed as possible. The temperature of the pipe can be up to 100 degrees Celsius, but the ambient temperature should allow the device to work between -10 and 60 degrees Celsius. The device also provides IP66 water repellent design and cannot be used under water. The product material is PC, PMMA, PPS, PA66, stainless steel 304 and PEEK, which can resist light chemicals, but should not be exposed to chemicals for a long time or in large quantities.

In order to reduce the difficulty of installation, each model corresponds to a range of pipe outer diameters. Please select the model according to the pipe specifications to be installed. Some combinations of pipe materials and wall thicknesses that are unfavorable for ultrasonic transmission may make it difficult to measure the flow rate (for example, too thick PVDF pipes or some metal pipes). Please consult the sales staff before purchasing.

Firmware Update Date and Version Feature Description

Firmware Version: P1203
Release Date: August 2024

Improvements:

- **Improvement I**:
  - Added the Hybrid1 main screen.
  - Enhanced Modbus RTU functionality for large numbers (dosing/totalizer) and support for int64 data format:
    - **Command 04**: Enables reading of int64 large numbers.
    - **Command 03**: Enables reading of int64-related configuration parameters.
    - **Command 31**: Introduced a new 64-bit parameter write command. Modbus RTU now supports data reading for dosing.
- **Improvement II**:
  - Corrected default pipeline size string and improved cumulative precision when cumulative values are extremely large.
  - Fixed an issue where an incorrect password entry displayed abnormally on the main screen when the password feature was enabled.
  - Resolved a data error when the time unit for instantaneous flow rate was set to "day."

Firmware Version: 1.202

Improvement:

- Added Modbus RTU commands 03, 06, and 30 to enable remote parameter configuration.

Warranty

⚠ This product uses ultrasonic time-of-flight (ToF) in the forward and reverse directions to measure the flow on the outside of the pipe, so it is necessary to avoid bubbles, solid foreign matter, crystallization and sediments in the fluid. At the same time, try to avoid strong electromagnetic field interference near the device.

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Before wiring the motor and turning on the device, please confirm that the power is off. To avoid damage to electronic parts and electric shock leakage.

Pressing the button for too long will cause the button to be damaged, please avoid it.

After the warranty period, the electronic components of the product will be aged due to time and operating environment. After long-term use, please replace the new product according to the condition of the product.

Do not operate the product for a long time with the LCD backlight showing orange and red lights to avoid product damage and related losses.

Do not place the screen in direct sunlight or other UV light sources.

ⓘ **Measuring range and accuracy:**

Low flow rate (<1m/s) will have a large measurement error, please select the appropriate pipe diameter for installation.

If not otherwise agreed, the warranty program of this product is as follows.

Please confirm the condition of the product within 14 days after receiving it. If there are any defects caused during shipment, please contact the sales personnel for a product replacement.

The product warranty is for 12 months from the delivery date. The warranty covers functional failures due to the non-human error and the non-specified environmental factors. During the warranty period, there will be no charge for product inspection, replacement of parts, or maintenance, etc.

When the product needs to be shipped back for maintenance, the packaging must be in perfect condition to avoid any additional damage during shipping.

This product warranty only covers normal use. Any special applications, abnormal and excessive use are not covered by this warranty.

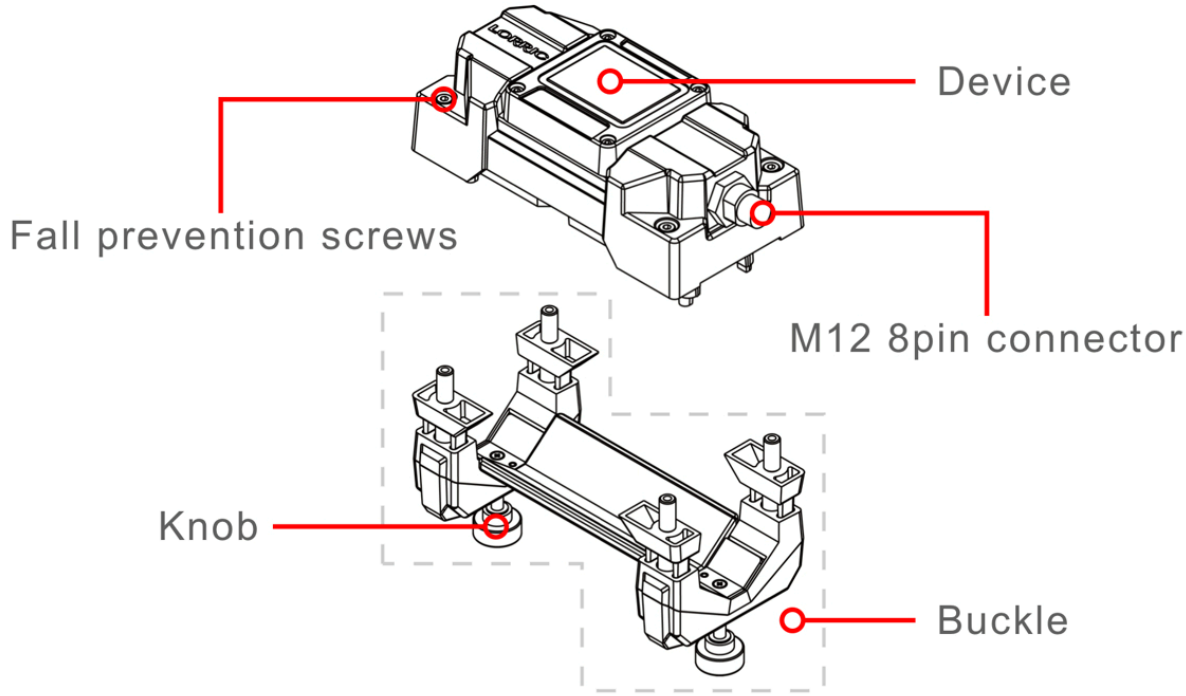
The failures under the following conditions shall not be covered by this warranty, and the expenses for inspection, parts, maintenance, etc. shall be charged accordingly:

- Natural disasters: flood, fire, earthquake, lighting strike, typhoon, etc.
- Human caused damages: scratch, falling, tenon fracture, beating, breaking and heavy hitting.
- Human errors: use of inappropriate voltage, high humidity, water, stain, corrosion, loss, improper storage, etc.
- Caused by other abnormal factors. The failure was caused by the unprecedented force of natural disasters.
- Other abnormal factors: The damage caused by the installation, appending, expanding, modifying and repair of the product or using an unauthorized third party for parts.
- Product aging under long-term UV exposure.

Exterior, Specs, Model

Exterior

Exploded views



Product Specs

Mechanism Specs

Installation method	Clamp-On
Maximum working temperature of pipe wall	100°C
Device working environment temperature	-10~60°C (14~140°F) (The higher the temperature of the fluid in the pipe, the lower the upper limit of the ambient temperature.)
Applicable pipe size	DN15-50 (1/2" to 2")
Power supply	DC 12V to 36V 200mA
Response time	< 0.5 or 1 sec
Waterproof level	IP66 **

Size and Model

Model	Applicable pipeline	Axial length mm	Width mm	Full height including pipe fasteners mm
FU-ES-015	DN15	155	79	120.53
FU-ES-020	DN20	155	79	124.02
FU-ES-025	DN25	155	79	133.52
FU-ES-032	DN32	155	79	143.2
FU-ES-040	DN40	155	100	null
FU-ES-050	DN50	155	100	null

Measurement Specs

Applicable fluid	Clear, oil or chemicals with less impurities (<1%)
Linearity	± 0.5 % FS (>0.3m/s)
Reproducibility	± 0.4 %
OR tolerance	± 2.5 % OR (Zero Offset)
Measuring principle	Ultrasonic method
Transient data	Instantaneous flow volume and flow velocity
Transient data	Cumulative flow (optional positive, negative or net flow)

User Interface

Language	English, Traditional Chinese, Simplified Chinese (Others customizable)

Unit	Metric: Liter, cubic meters, meters Imperial: foot, Cubic foot, Uk gallon, US gallon Time: second, minute, hour, day
Display	Double screen display : Large 5-Digit LED, 16x3 3-Color Backlight LCD display
Display digits	LED 5 Digits (4 digits when negative value) LCD 10 Digits (Not including sign and decimal point)
Operation buttons	**4 Key touch buttons**

** IP66： The IP Code, International Protection Marking, IEC standard 60529, sometimes interpreted as Ingress Protection Marking, classifies and rates the degree of protection provided by mechanical casings and electrical enclosures against intrusion, dust, accidental contact, and water. The first digit indicates the level of protection that the enclosure provides against access to hazardous parts (e.g., electrical conductors, moving parts) and the ingress of solid foreign objects. The second digit indicates the level of protection that the enclosure provides against harmful ingress of water. First 6 stands for dust tight: No ingress of dust; complete protection against contact (dust tight). A vacuum must be applied. Test duration of up to 8 hours based on air flow.

***** This machine is calibrated with normal temperature water and CNS UPVC pipe before delivery. Different environments and different fluids will result in different performance.**

Device Functionalities

LED screen mainly provides high contrast numbers display for high visibility even in a dark environment.

LED screen also provides 5 displayed digits within a decimal point which mainly displays real-time and accumulated flow volume data. For more digits of data, such as historical data and long-term cumulative data, please look at the LCD screen.

LCD screen allows display for 16 English characters in 3 rows . The first row is current content with units. The second row is data. The third row is a definition of each button.

The LCD screen has a 3-color backlit display. Definition of each color light as below:

- Green: Real-time data, device is working normally.
- Blinking red light: Alarm A- Major error. Please see the "Alarm and Description of System Conditions" page for more details.
- Steady red: Alarm B host meets the conditions specified by the user, or for Alarm C maintenance matters, please see the warning page.
- Orange: The device is normal, and the display screen is on the setting page.

There are 4 buttons on the device, the definition of each button will be displayed at the upper row on the LCD screen. Generally, the leftmost button stands for "Exit" or "Back to last page". The middle 2 buttons are for users to review page by page, modify data, or switch options. The rightmost button stands for "Set" or "Confirm". Previously mentioned definitions are only for general use. For some other usage scenarios, button definitions are modifiable for usability or error proof.

Package contains

Besides other agreed contents, our standard package contains:

- **FU-ES Device * 1**
- **2m 8 pin cable * 1**
- **Quick starting manual * 1**
- **A buckles for the corresponding pipe diameter**

Size, material, model

Parts	**Material**
Screws for top side housing	**Stainless steel 304**

Screen cover	PMMA
Whole housing without screen cover	PC+GF
Buttons	PET
2 meters long 8 pin cable with insulation cover	Nylon
Middle lid	PPS+GF
Lower lid	PPS+GF, Silicon
Buckle	**PPS+GF, PA66+GF, Silicon, Stainless steel 304**

Mechanical and electrical spec of device

Power supply

Working specification	
Working specification	12V ~ 36V 90mA (4-20mA and RS485 current are not included.)
Reverse voltage protection	**Yes**

OCT output

OCT output	
Power supply spec	5V~30V 200mA
Reverse voltage protection	Yes
NPN connection	Yes
PNP connection	Yes
Maximum output frequency	700Hz
Overcurrent protection	200mA

Analog output (4-20mA, 0-20mA)

Analog output (4-20mA, 0-20mA)	
Wiring	3 wiring
Power supply	Device is self-powered, no external power supply required.
Maximum output range	0~21.6mA
Response time	<1s, the same as screen data.
Loop Resistance	1100 ohm @ 36V 600 ohm @ 24V 250 ohm @ 12V

Digital communication Modbus RTU RS485

Digital communication Modbus RTU RS485	
Baud	9600, 19200, 38400, 57600
Wiring	2 wiring
Nodes on the bus	32 or 256 (256 is customized)

Installation and Setup

Important notice before installing

- Check if the version of your hardware and firmware device is consistent with the version of the instruction manual you will follow. To check the version of the manual, please go to the version page.
- Make sure that your installation environment meets the standard requirements for flow volume monitoring. There should be a certain distance in front and after the location of the installed flowmeter. The correct location for the flowmeter should be facing up horizontally or vertically depending on the flow direction.
- Confirm the pipe material and size before installation.

Mechanism Installation

Extremely important precautions to take note before installing!!

If any of the scenarios below occur and cause damage to the flowmeter, the warranty is void.

- If the device material is PC then it is not highly resistant to PVC glue which is a strong gas and lubricant for PVC pipe. Therefore, before installing the flowmeter you must ensure that the glue is dry between the connecting pipe and adapter.
- Please pay special attention to the vertical flow of solvents and chemicals outside the pipeline since it may potentially cause damage to the flowmeter
- Do not use this device as a support point for pipelines or other objects, which will cause the flowmeter to withstand external forces which it is not designed for, thus , shortening the usage life of the product or damaging it.
- During the installation process, it's crucial to tighten the union nuts only by hand until the flowmeter does not move and rotate. Do not use iron pliers or other tools to avoid damage to the flowmeter.
- The flowmeter is not permanently fixed to the outside of the pipeline, and can still move and rotate under excessive external force. Please do not use the flowmeter as a structure for personnel fixing, moving and safety protection.
- The electronic device of the flowmeter is not UV resistant. Therefore, we suggest covering it with a protector if installed outdoors.
- The seller will not be responsible for free maintenance for any defect or malfunction incurred by improper use and human errors.
- If the flowmeter is transported with its piping system to another site without protection then it could be damaged.

⚠ **The torque value of the knob should be between 0.20 N-m (2kgf-cm) and 0.35 N-m (3.5kgf-cm), and should not exceed 0.4 N-m (4.0kgf-cm), which will damage the flowmeter or shorten the life of the flowmeter.**

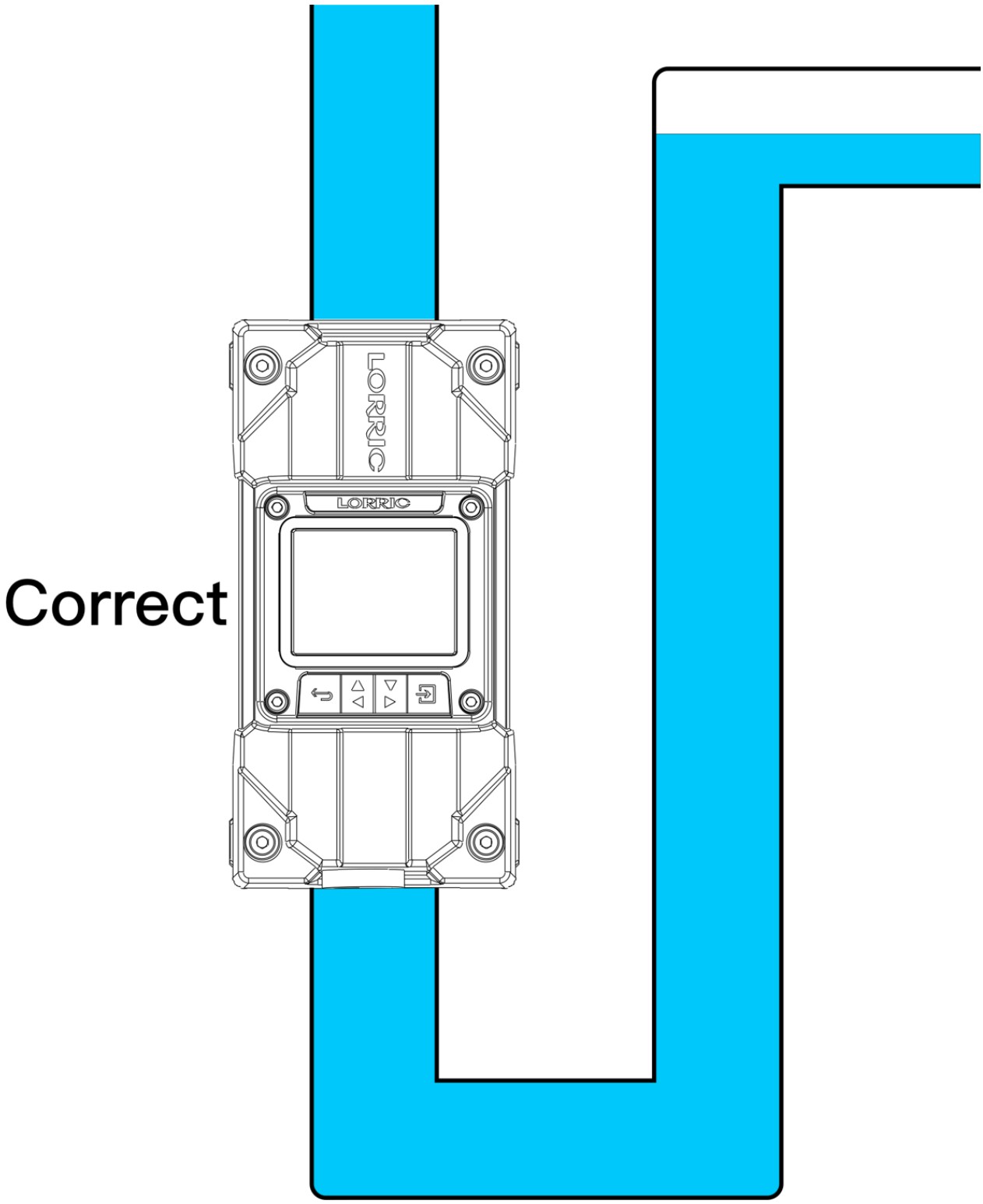
How to Choose an Installation Location

The 1st principle for choosing an installation location is wherein the pipe is filled completely with liquid to avoid issues caused by air bubbles or precipitation in the pipe. The 2nd principle is allowing the flow in the pipe to be fully developed by having enough length on both sides of the straight pipe. This means no equipment should be left on either side like adaptors, elbow pipe, valves or pumps.

The LCD display screen should not be exposed to direct sunlight that could cause visibility issues and a shorter life usage. Therefore, installing the flowmeter under direct sunlight should be avoided or with a sunlight protector is recommended.

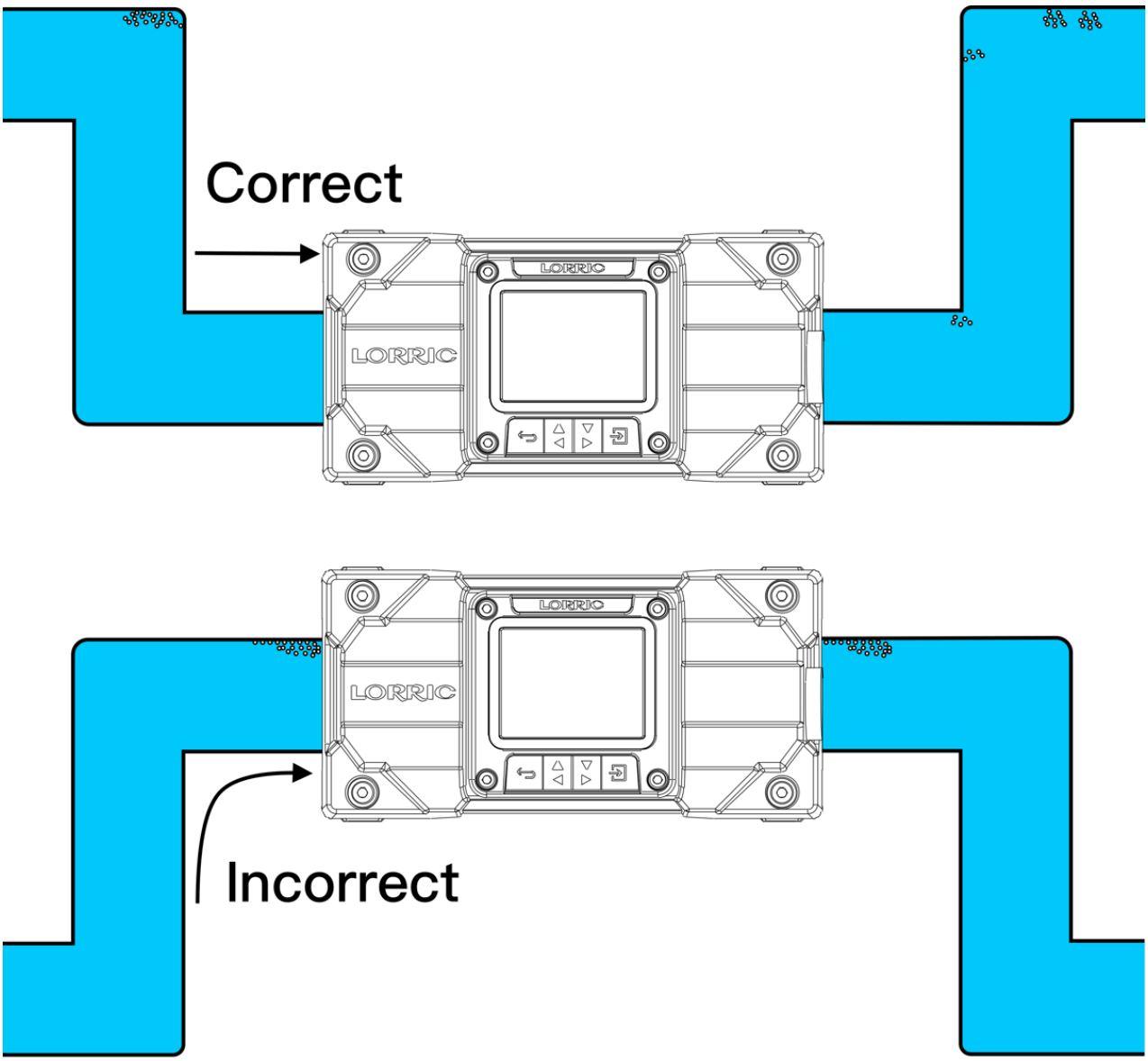
Vertical pipe

Please choose the vertical pipe with a bottom-up flow direction.



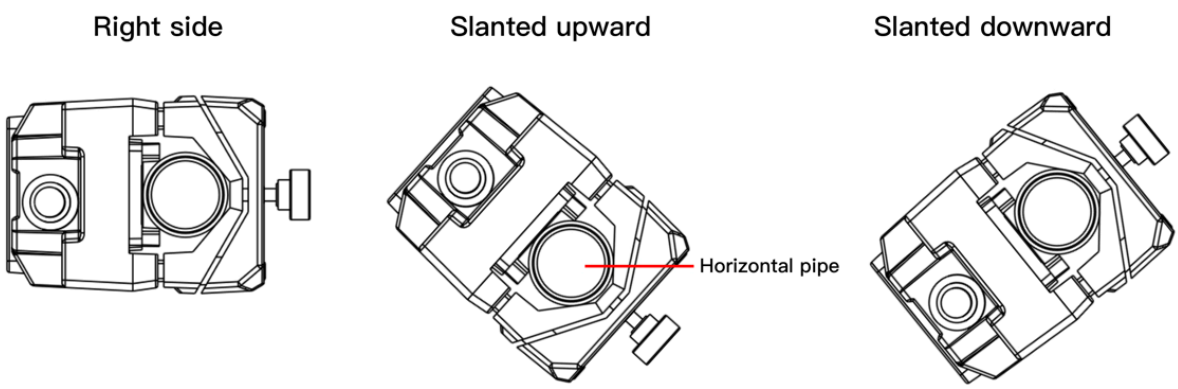
Horizontal pipe

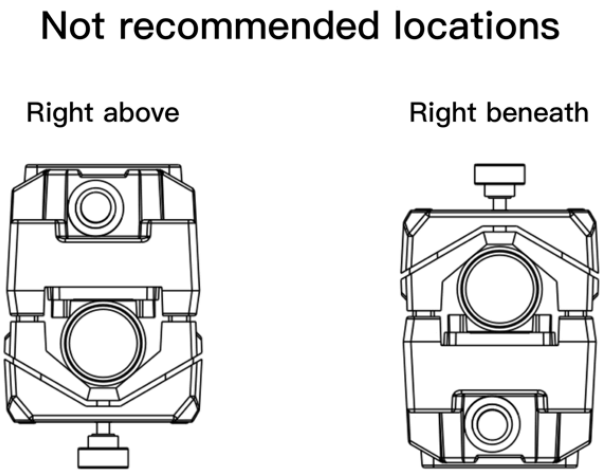
- Please choose the location with full liquid, like the lower part of the inclined pipe.



- LORRIC's EchoSense flow meter should not be installed at the top right or bottom side of the pipe in order to avoid the interruption of air bubbles or precipitation.

Recommended locations



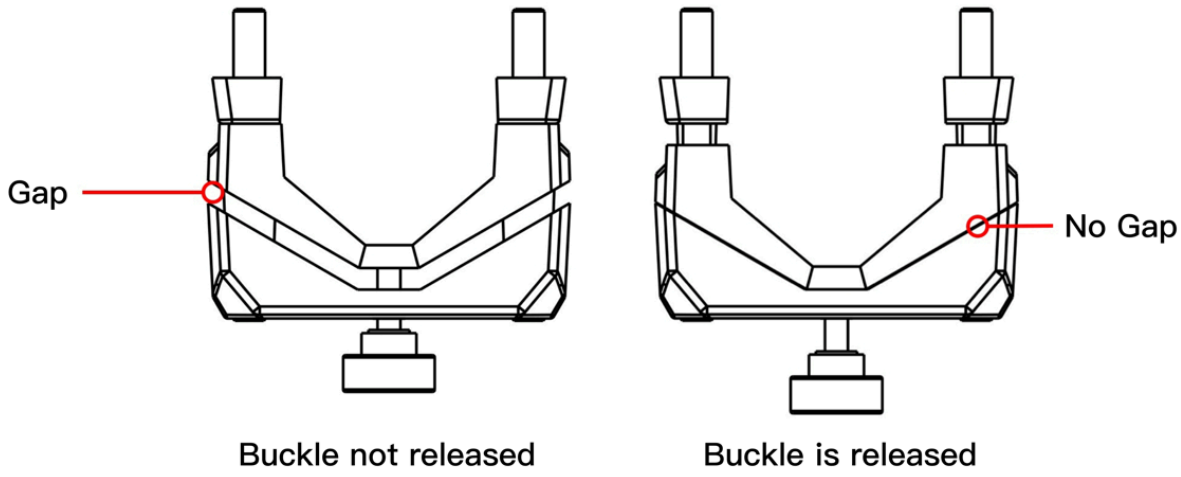


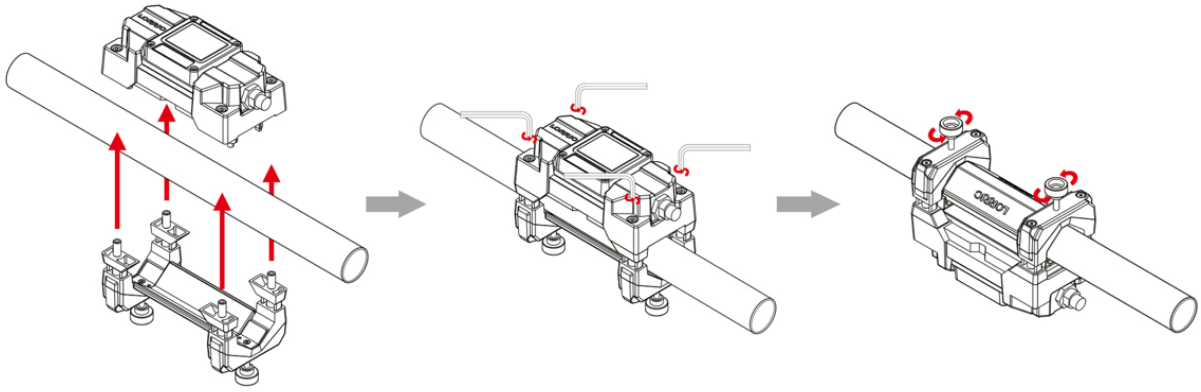
Please be cautious of the air bubble in the pipe to avoid measurement error.

If the installation location for the flowmeter is close to a tank where pressure is low. We recommend installing a valve at the pipe exit to avoid generating any air bubbles.

> **If air bubbles are frequently generated in the pipe, it may lead to a large non-reproducible measurement error which should be avoided.**

New Product Installation Process





1. Make sure that the buckle is in the released position.
2. After the device faces the intended operation direction, pre-lock the device and the buckle on both sides of the pipeline with screws. At this time, if it is a large pipe in the applicable pipeline, the device may not move. If it is a small pipe in the applicable pipeline and the device is still in a movable state, please lock the flowmeter.
3. Tighten the two knobs on the fastener by hand, as long as the device does not rotate and move.
4. Finished

⚠ **The torque value of the knob should be between 0.20 N-m (2kgf-cm) and 0.35 N-m (3.5kgf-cm), and should not exceed 0.4 N-m (4.0kgf-cm), which will damage or shorten the life of the flowmeter.**

How to rotate the display screen direction

Hex socket head cap screws on the top housing

1. Please turn off the device and unplug it before disassembling.
2. Take off the four hex socket head cap screws on the top housing according to the above image.
3. Separate the top and bottom housing.
    a. Be aware when separating the top and bottom housing because there are many wires connecting both.
4. Rotate top housing to a desired viewing orientation.
    a. Do not rotate the top housing too many times to prevent the cables from being damaged from unnecessary pulls.
5. On the bottom housing there is an O-ring with an inner groove for a thread hole . For it to work properly, please confirm there is no particle, fiber or any object that may break the sealing function before attaching the top and bottom housing.
6. Combine top with bottom housing.
7. Tighten four screws on top housing.
    a. Too much torque may damage the device.
8. Finish.

Mechanical and Electrical iInstallation

Definition of M12 8-Pin connector

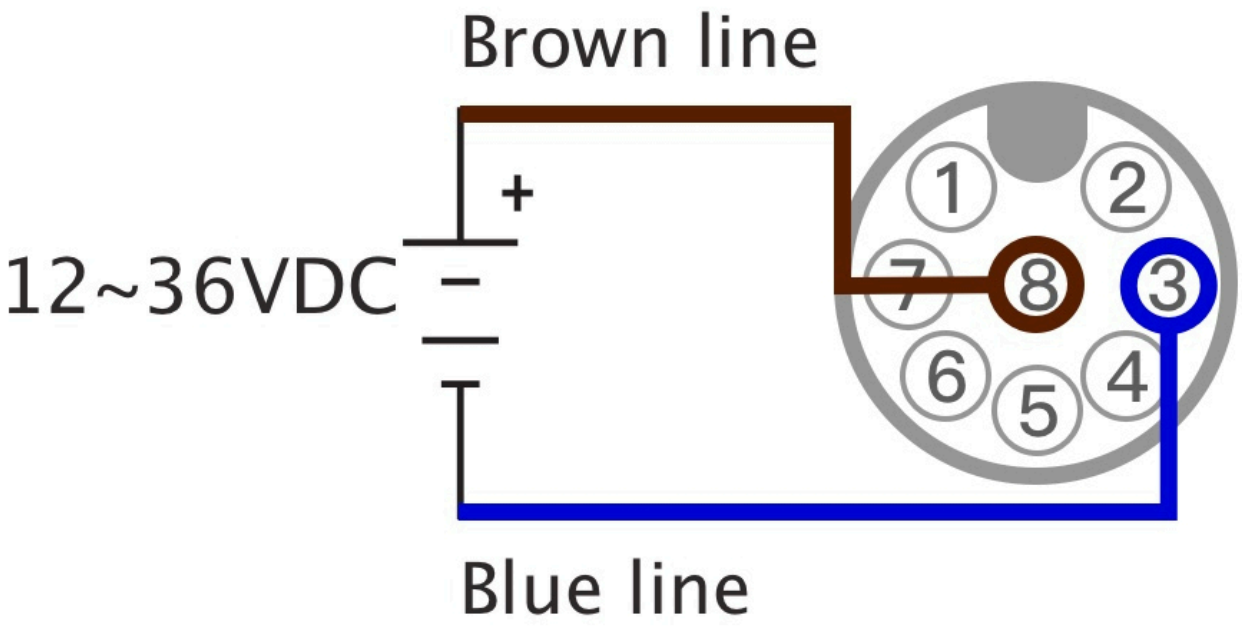
1. Connect the cable inside the box to the power supply and communication system. The unused color cables should be covered or protected to avoid electric leakage or short circuit.
2. Before removing the top housing of the device and wiring, the device should be powered off and the M12 8-pin cable should be removed.
3. Due to space constraints, the sticker on the side of the device and subsequent illustrations only use cable contact definitions.
4. Please see below images to know where each cable is connected.

Cable Pin Map

Number	Color	Function
1	Black	RS485 (B-)
2	Yellow	OCT output (-)
3	Blue	VDC (-)

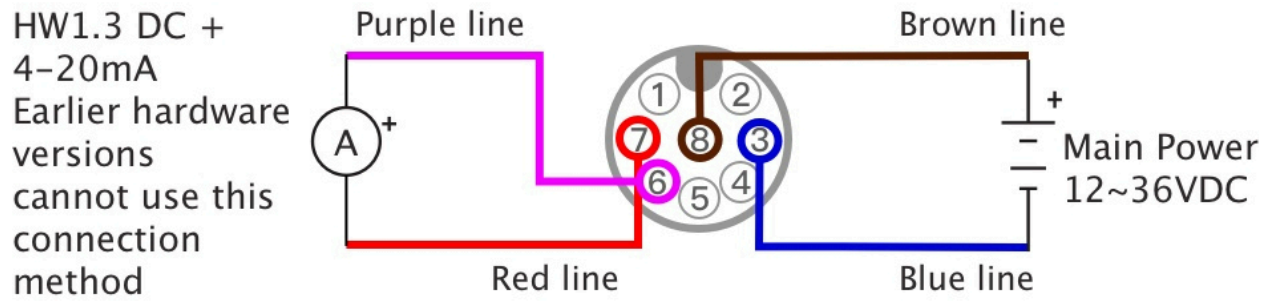
4	Orange	OCT output (+)
5	Green	RS485 (A+)
6	Purple	4~20mA (+)
7	Red	4~20mA (-)
8	Brown	12-36 VDC (+)
Shielding net	White heat-shrinkable sleeve	(optional) Shielding net, please connect to ground

Wiring diagram of DC power supply



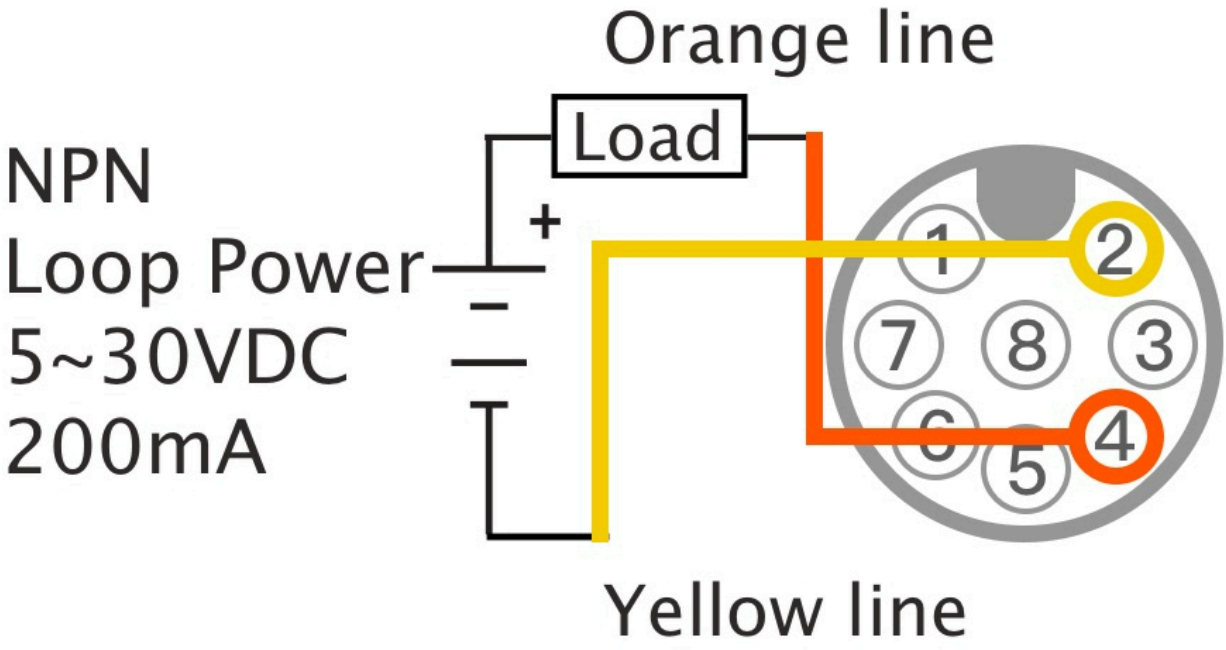
Wiring diagram of 4-20mA analog output

This function will only work with power supplies through the brown and blue lines. The following diagram is not showing power supply wiring for readability.



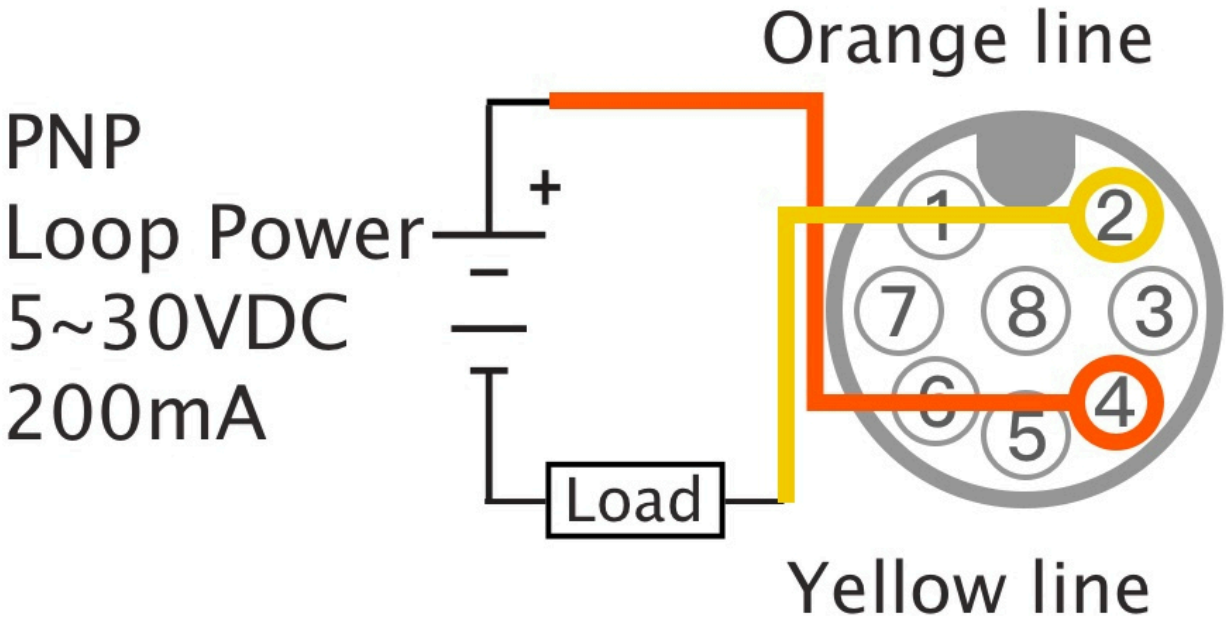
OCT NPN Output Wiring Diagram

This function can only work when the brown and blue lines of the DC power supply are powered. Please note that the DC power supply diagram is omitted in this figure. For more details, see the DC power supply wiring diagram.



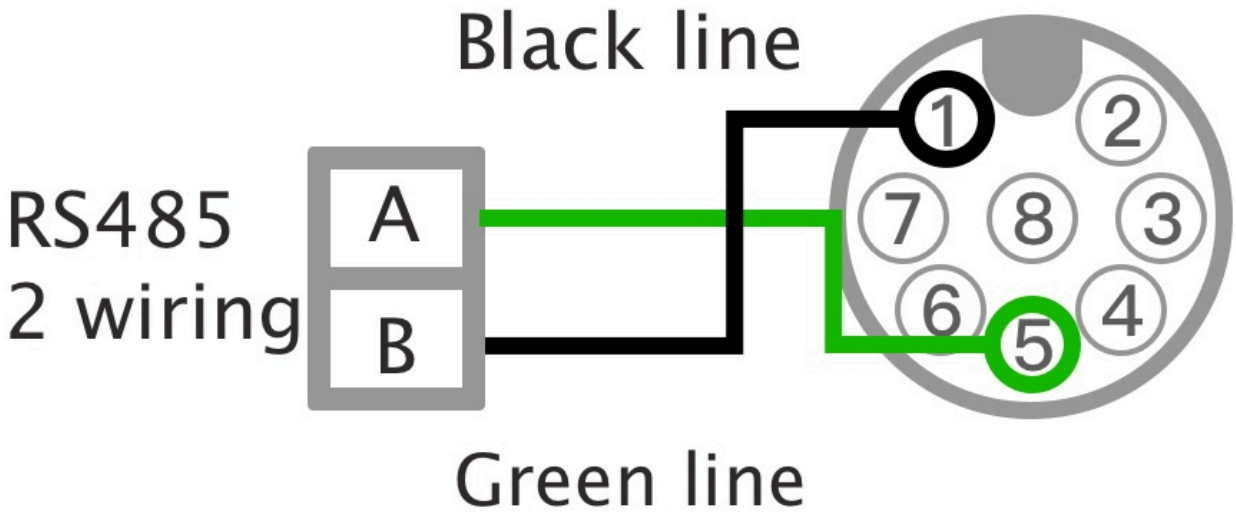
OCT PNP Output Wiring Diagram

This function can only work when the brown and blue lines of the DC power supply are powered. Please note that the DC power supply diagram is omitted in this figure. For more details, see the DC power supply wiring diagram.



RS485 Two-Wire Wiring Diagram

This function can only work when the brown and blue lines of the DC power supply are powered. Please note that the DC power supply diagram is omitted in this figure. For more details, see the DC power supply wiring diagram



Wiring Suggestions

1. It is generally recommended to use a 24awg twisted pair cable with grounded shielding. The RS485 network must be designed as one line with multiple drops, not as a star or ring topology.
2. When the connection is long, please use the terminal resistance on the master and the farthest end of the line. It is generally recommended to use a 120Ω terminating resistor. For the actual value, please refer to the wire specifications.
3. If the signal is unstable, please choose a point on the line to use a bias resistor.
4. The 8-core cable is shipped with the device, if used in RS485 communication, please trim the length, try to use a short wire to reduce noise interference. Connect the shielding net to the main communication wire shielding and then ground it.
5. When there is a lot of signal interference, the software may need to do multiple inquiries to get a valid response.

Device Contact Definitions

1. Due to space constraints, the sticker on the side of the device only uses cable contact definitions.
2. The number of the device contact and the cable contact is mirrored and symmetrical.
3. Please see below device contact number:

Device pin map

Parameter setup

Recommended flow of parameter setup

1. After the mechanism is installed, execute Z03 to automatically initialize the flowmeter parameters, and the machine can work normally.

Basic tuning

1. If there is still large flow data with the fluid stationary, execute a Z04 Zero Offset correction with water in the pipe and the fluid stationary.
2. If there is a reference value for the flow rate, you can use the Z05 Scale Factor to multiply the flow rate data by a certain ratio to correct it to the correct value.

> **For advanced tuning settings, please refer to the complete parameter description page**

Z02 Automatic Pipe Size Detection Guide

The Z02 automatic pipe size detection feature is designed to enhance user efficiency and accuracy. This section introduces its main functions and usage steps:

Main Functions and Steps

1. **System Startup**: On the main screen, open the system menu and navigate to the "(Z Quick Menu)" interface.

1. Activate the System: Open the system menu on the main screen and enter the (Z Quick Menu) interface.

2. **Settings Page**: In the "(Z Quick Menu)" options interface, locate and select the "(Z02 Automatic Pipe Size Detection)" menu, then press enter.

2. Access the Settings Page: In the [Z Quick Menu] options interface, find the [Z02 Auto Pipe Specification Detection] menu and press Enter.

3. **Initiate Detection**: Click the “Start Detection” button. The system will automatically begin the pipe size detection process.
4. **Viewing Results**: Once detection is complete, the screen will display detailed results. You can then return to the main screen.

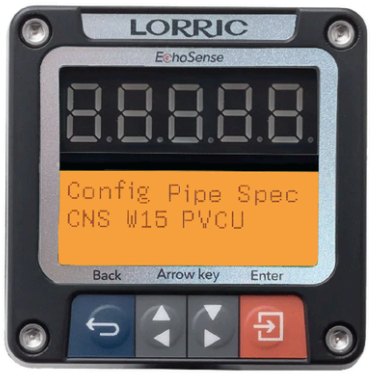
3. Start Detection: Click the "Start Detection" button. The system will automatically detect the pipe specifications.

Example Explanation

- **Example Installation**: For a pipe size CNS W15 PVCU, the system will display normal detection results if installed correctly.
  - **(Left Image)**: If a matching pipe size is found, the screen will display the pipe size name.
  - **(Right Image)**: If no matching pipe size is found, the system will default to a CNS W size specification.

4. View Results: Once detection is complete, the detailed results will be displayed on the screen. (After reviewing, you can return to the main screen.)

Correct Installation Detection Results



Matching Pipe Specification Found:
Displays the pipe specification name.

No Matching Pipe Specification:
Displays a notification and sets to CNSW standard.

Common Reasons for Unsuccessful Z02 Detection

- The pipe size is not in the built-in options. Refer to the A02 list for different model pipe sizes. See the pipe size guide for further details.
- Improper installation: Excessive or insufficient torque can cause inaccurate detection results.
- Pipe deformation due to material, pressure, wall thickness, or temperature may lead to inconsistent detection results.

Important Notes

- Ensure the pipe is properly installed to prevent detection errors.
- Regularly calibrate the system to maintain detection accuracy.

Human Machine Interface

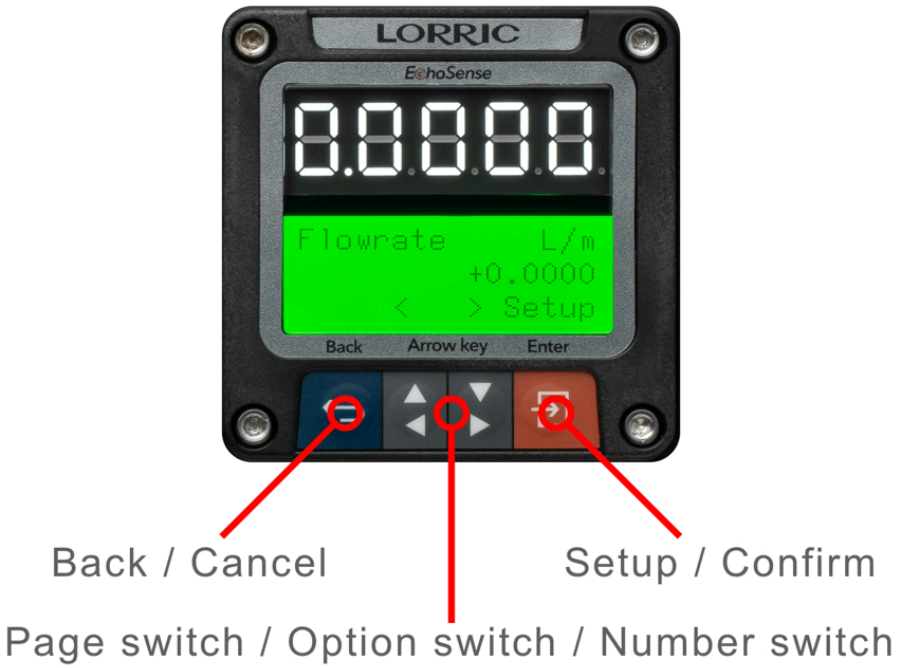
Introduction of human machine interface

LCD screen displays 3 rows of information.

Functions of each button

There are 4 buttons on the device, the definition of each button will be displayed at the upper row on the LCD screen. Generally, the leftmost button stands for “Exit” or “Back to last page”. The middle 2 buttons are for users to review page by page, modify data, or switch options. The rightmost button stands for “Set” or “Confirm”. Previously mentioned definitions are only for general use. For some other usage scenarios, button definitions are modifiable for usability or error proof.

⚠ **Pressing the button for an extended period will cause damage to the button. Please avoid excessive pressing.**



Three-color large indicator lights

LCD green backlight
Real-time data monitoring screen
Normal operation

LCD red backlight
Real-time data monitoring screen
Alarm A

LCD red backlight
Real-time data monitoring screen
Alarm B or Alarm C

LCD orange backlight
"Set-up" Alarm D

Definition of each LCD backlight color:

- Green: Real-time data, device is working normally.
- Red: **Blinking red light**: Alarm A- Major error. Please see the "Alarm and Description of System Conditions" page for more details. **Continuous red light**: Alarm B- Current status of the device meets the parameters set-up by the user so must pay attention to it. Alarm C- Maintenance Required.
- Orange: Non real-time data display. Set-up page display.

Frequency of data update

Due to frequent data updates for real time flow volume, data on the LED screen will update first, then data on the LCD screen. Therefore, they may have about 0.1 seconds updated time difference. between both data sets.If there are not many digits in the data, please use the LED screen for the main data.

Displayed digits on LED screen

Maximum 5 displayed digits are provided on the LED screen. If data digits exceed more than 5 digits, “FFFFF” will be displayed on the LED screen (please refer to the image below). At this time, for reading complete data, you can try to modify the units or see the 2nd row data on the LCD screen to confirm exact flow volume.

If data digits exceed more than 5 digits,
“FFFFF” will be displayed on the LED screen.

When the flow direction is reversed and the data is a negative number, the 1st digit will be a minus sign with four remaining digits.

Hybrid Page Setup and Usage Interface Guide

Hybrid Page Application Monitoring

Application Scenario the Hybrid Page provides real-time monitoring of two key metrics—instantaneous flow rate and cumulative flow rate—allowing users to make prompt adjustments based on current conditions. This dual-data display is designed to optimize operational decision-making and efficiency.

Hybrid Page Setup Guide

Follow these steps to configure the Hybrid Page:

Boot Information Screen

1. **Open the Settings Menu**:
    - Navigate to the **Settings** screen and select **Option H**.
    - Press the button to enter the settings submenu **H09: Boot Screen Settings**.

2. **Select the Hybrid Page Option**:
    - In the settings menu, locate and select the "Hybrid Page" option.

Enter H Options

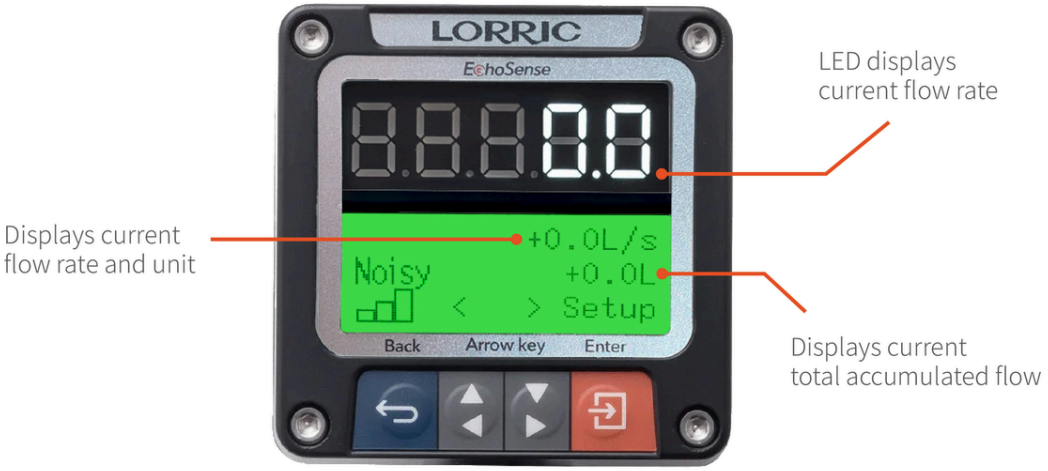
Navigate to H09 selection

3. **Set Parameters**:
    - Adjust display parameters based on operational needs, such as the flow rate display format or alarm threshold indicators.
4. **Save Settings and return**:
    - Once adjustments are complete, click the **"Save"** button to apply and retain the settings.

Select the [Hybrid] screen option
and save before exiting.

HybHybrid Page Function Page Display

Hybrid Main Screen Information



Monitoring Screen

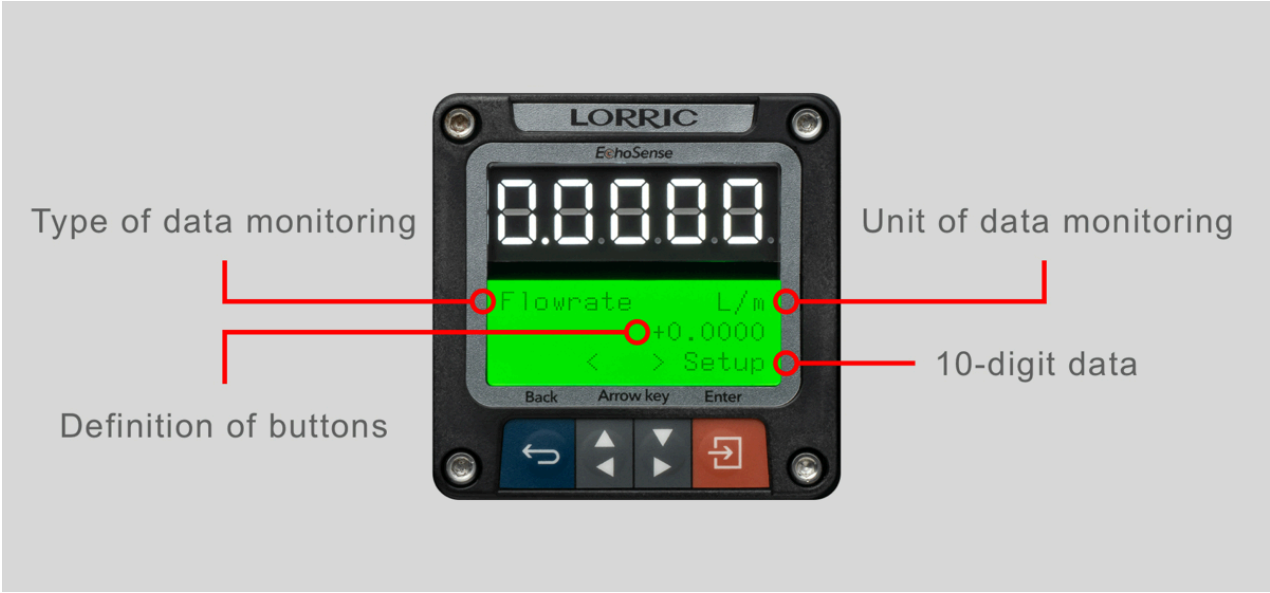
The monitoring screen is composed of 2 sections. The first 7 pages are real-time data monitoring. The last 15 pages are the current date, time and historical cumulative volume for the past 14 days. All the pages can be viewed cyclically by pressing the middle 2 direction buttons. Each definition on these 22 pages could be found below.

Monitoring screen detail

Page number	Page English Name	LED	LCD backlight	Content of first row	Content of second row	Cor thir
Monitoring Page No.1	FLOWRATE	Data (Up to five digits)	Green means normal condition. Red means abnormal.	Page name and unit	**10-digit flow volume data**	Fur eac but sim mo pro
Monitoring Page No.2	FLOW SPEED	Data (Up to five digits)	Green means normal condition. Red means abnormal.	Page name and unit	10-digit flow speed data	Fur eac but sim mo pro
Monitoring Page No.3	TOTAL	Data (Up to five digits)	Green means normal condition. Red means abnormal.	Page name and unit	Cumulative method+ 10-digit cumulative data	Fur eac but sim mo pro
Monitoring Page No.4	FLOWRATE	Data (Up to five digits)	Green means normal condition. Red means abnormal.	7-digit large font data		Pag and

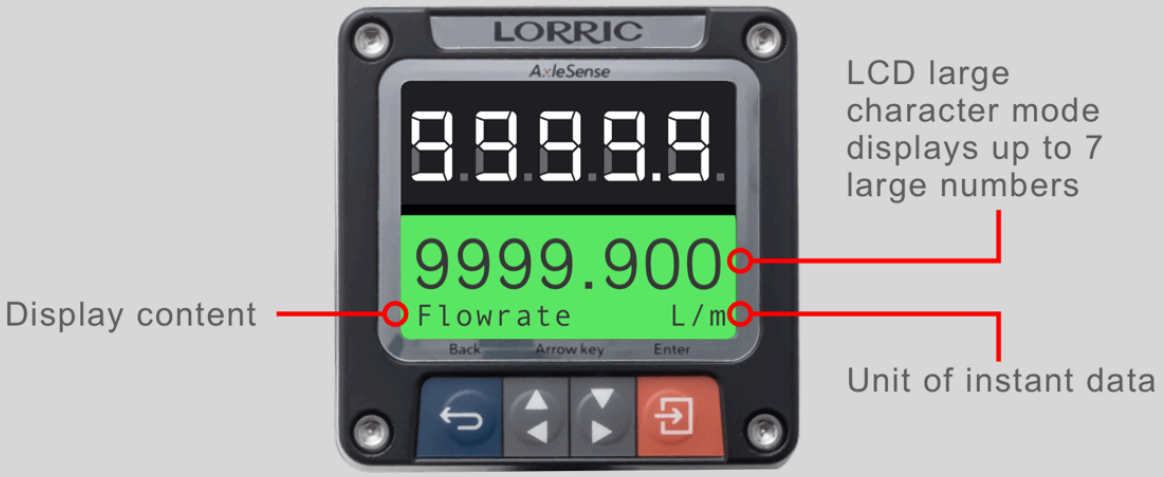
Monitoring Page No.5	FLOW SPEED	Data (Up to five digits)	Green means normal condition. Red means abnormal.	7-digit large font flow speed data		Pag and
Monitoring Page No.6	TOTAL	Data (Up to five digits)	Green means normal condition. Red means abnormal.	7-digit large font cumulative data		Pag cur me uni
State 1	Alarm Status	Instantaneous flow data	Green means normal condition. Red means abnormal.	Alarm A	Alarm B + Alarm C	Sys Sta
State 2	Debug Page	Instantaneous flow data	Green means normal condition. Red means			

Monitoring Page No.1~No.3



Monitoring Page No.4~No.6

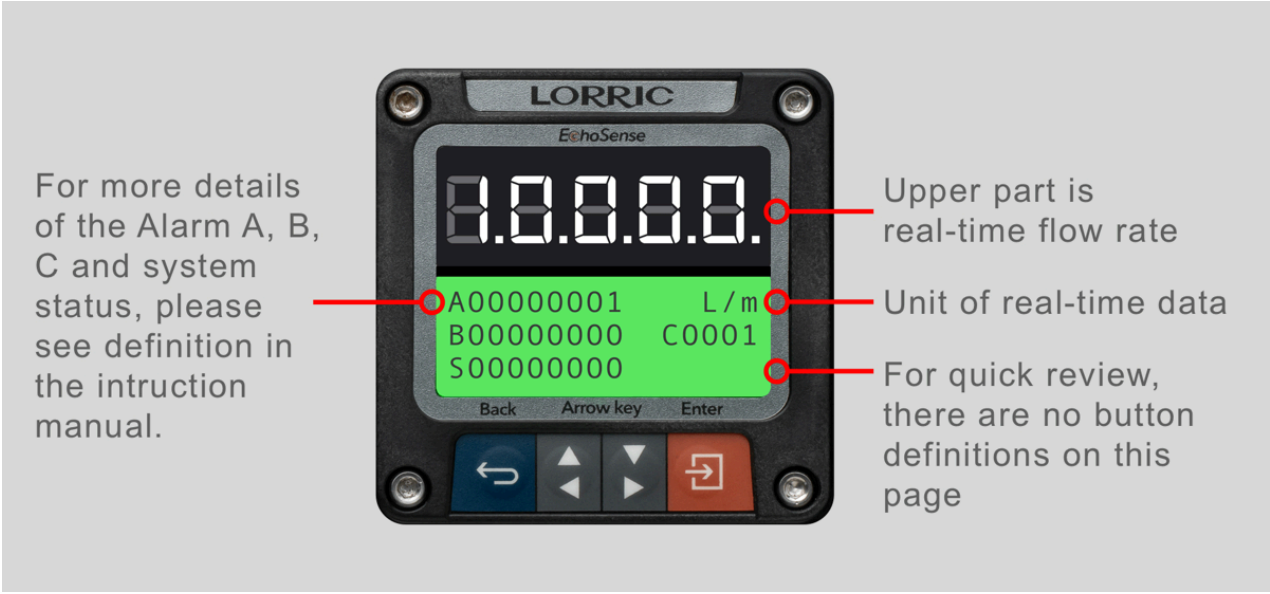
In order to enlarge the font this page shows the key definitions and sim.



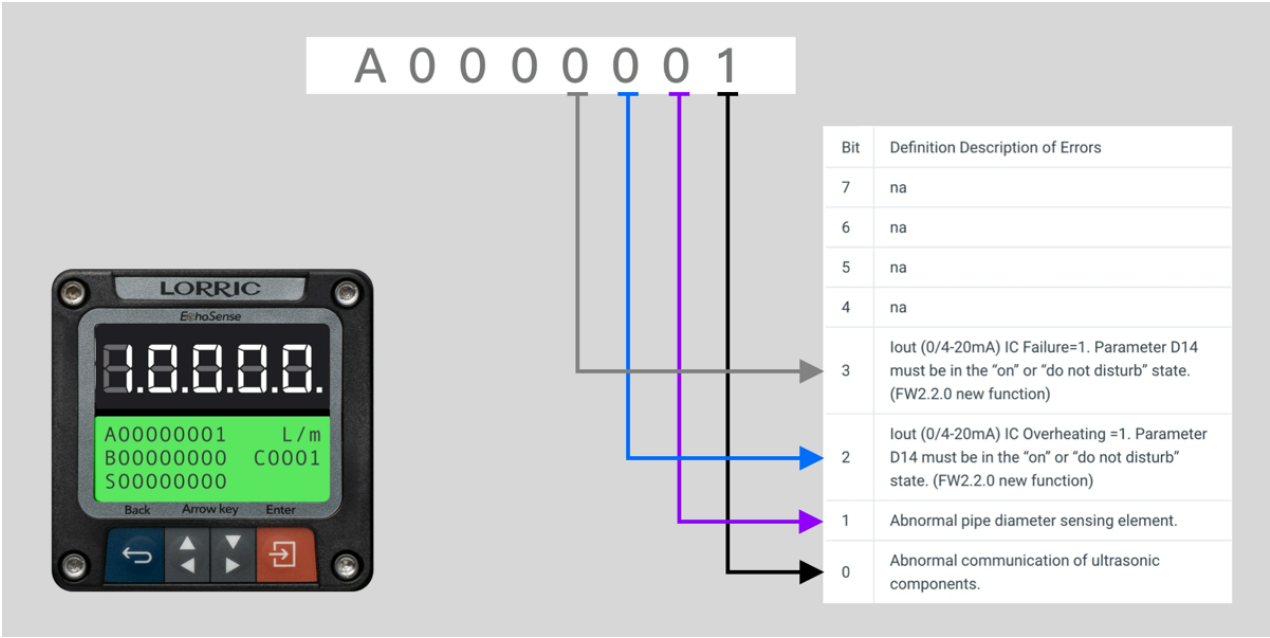
State 1 screen description

If there is a problem, please make a video or take a photo of this page for the company's factory to confirm.

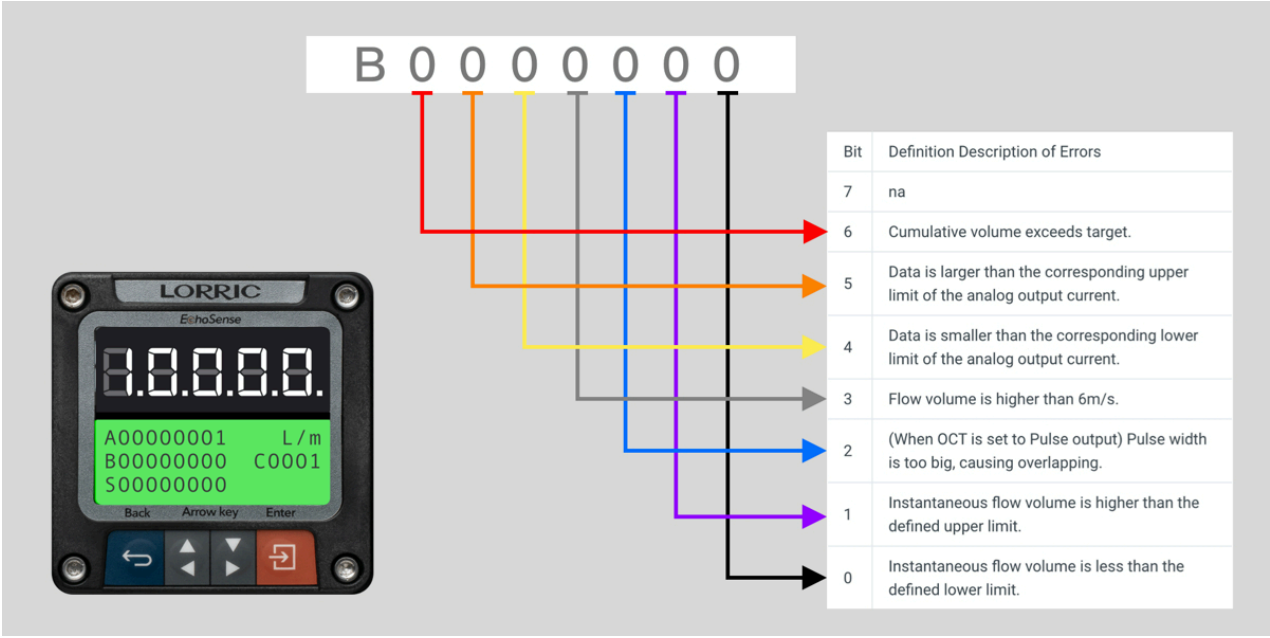
Monitoring screen No. 4 is mainly for checking the status of the device, if upper and lower limit alarm functions work as expected, or for troubleshooting there will be a red light. Please see “Description of status and Alarm” for a detailed definition.



Description of Alarm A

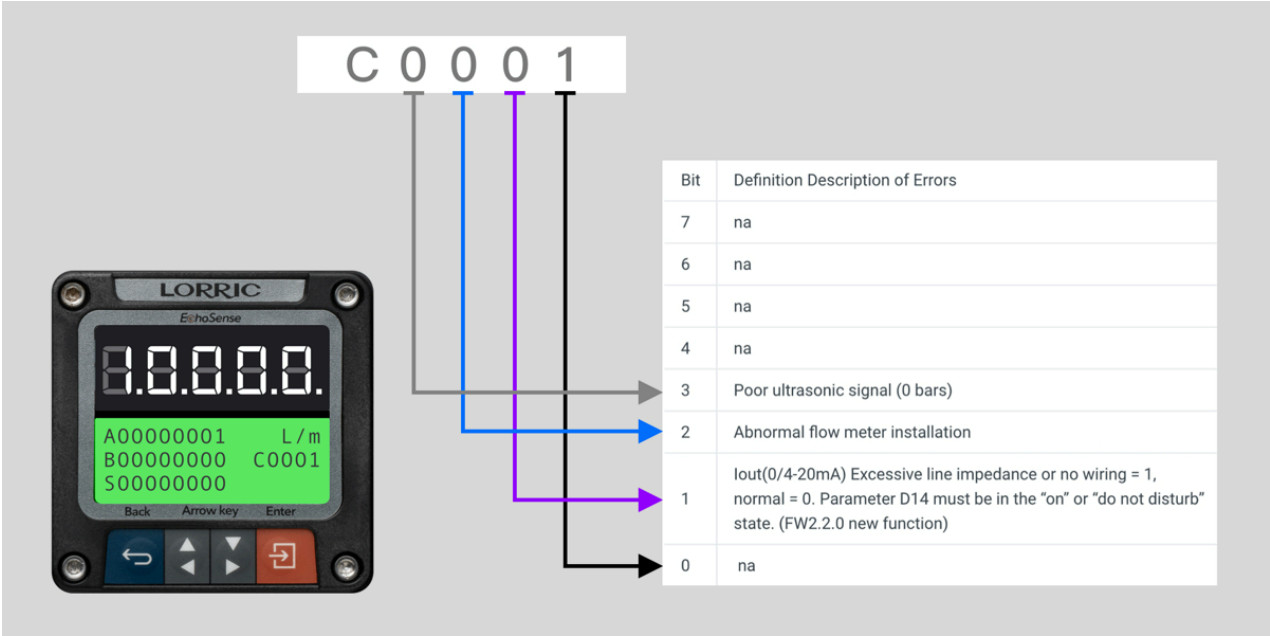


Description of Alarm B



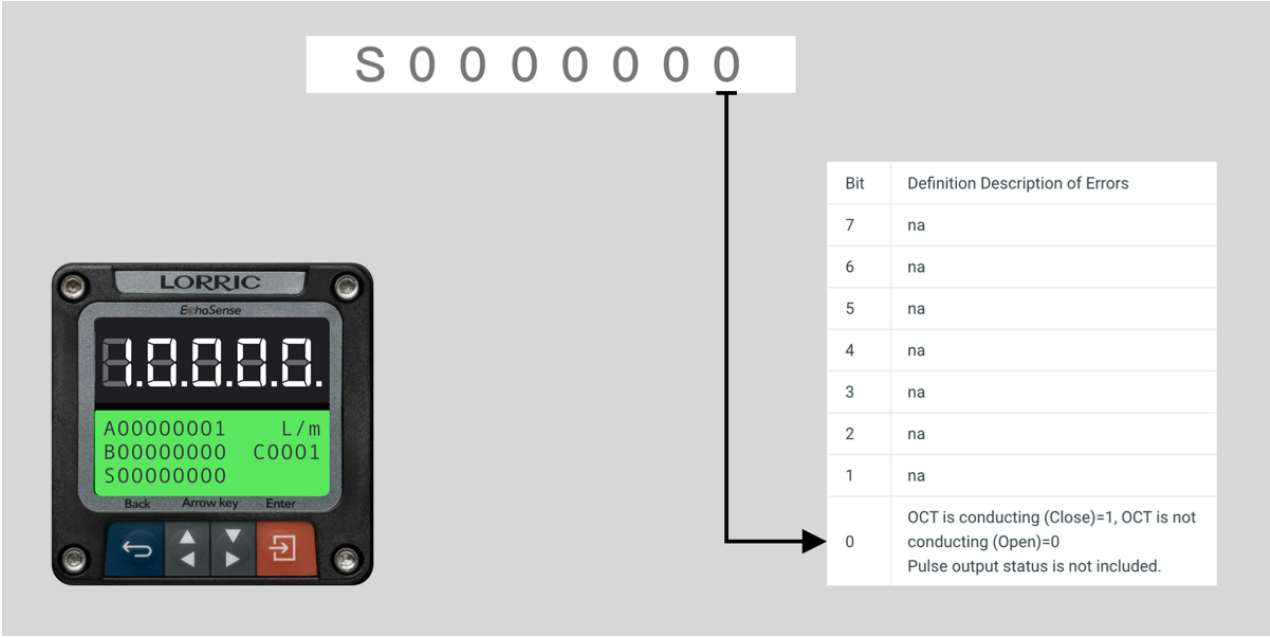
Bit	Definition Description of Errors
7	na
6	Cumulative volume exceeds target.
5	Data is larger than the corresponding upper limit of the analog output current.
4	Data is smaller than the corresponding lower limit of the analog output current.
3	Flow volume is higher than 6m/s.
2	(When OCT is set to Pulse output) Pulse width is too big, causing overlapping.
1	Instantaneous flow volume is higher than the defined upper limit.
0	Instantaneous flow volume is less than the defined lower limit.

Description of Alarm C



Bit	Definition Description of Errors
7	na
6	na
5	na
4	na
3	Poor ultrasonic signal (0 bars)
2	Abnormal flow meter installation
1	Iout(0/4-20mA) Excessive line impedance or no wiring = 1, normal = 0. Parameter D14 must be in the “on” or “do not disturb” state. (FW2.2.0 new function)
0	na

Description of system status



Bit	Definition Description of Errors
7	na
6	na
5	na
4	na
3	na
2	na
1	na
0	OCT is conducting (Close)=1, OCT is not conducting (Open)=0 Pulse output status is not included.

Description of State 2

If there is a problem, please make a video or take a photo of this page for the company's factory to confirm.

Simulation Mode

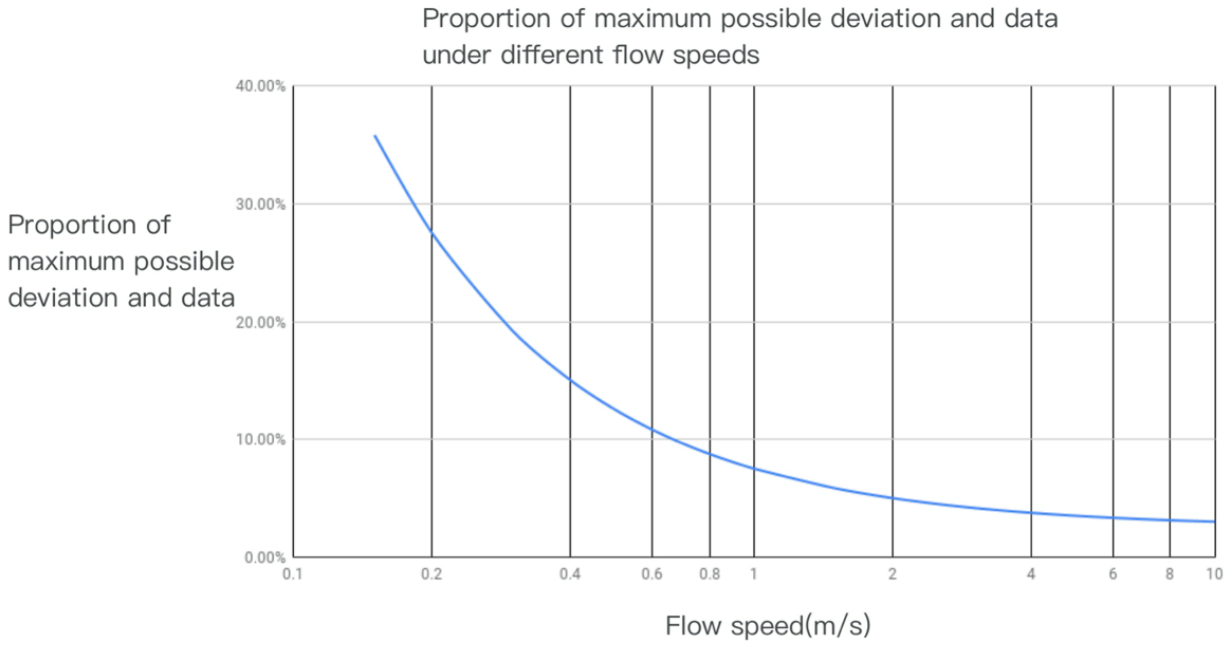
When F02 simulation mode is turned on, all monitoring screens only show desired simulation values.The monitoring screen will display orange backlight.

Under simulation mode, there is a word “Sim.” on the lower left corner, and the backlight will be orange

Data interpretation on monitoring screens

Instantaneous flow volume and deviation

The maximum possible deviation for LORRIC's flow meter is 0.5 % F.S. + 2.5 % O.R. which could be converted to the relation of maximum possible deviation and displayed data under different flow speed as seen below.



Flow speed

The data displayed on the screen is the flow speed in the T-connector. In most cases it will be a bit faster than the flow speed of the same ordinary pipe at the same flow volume.

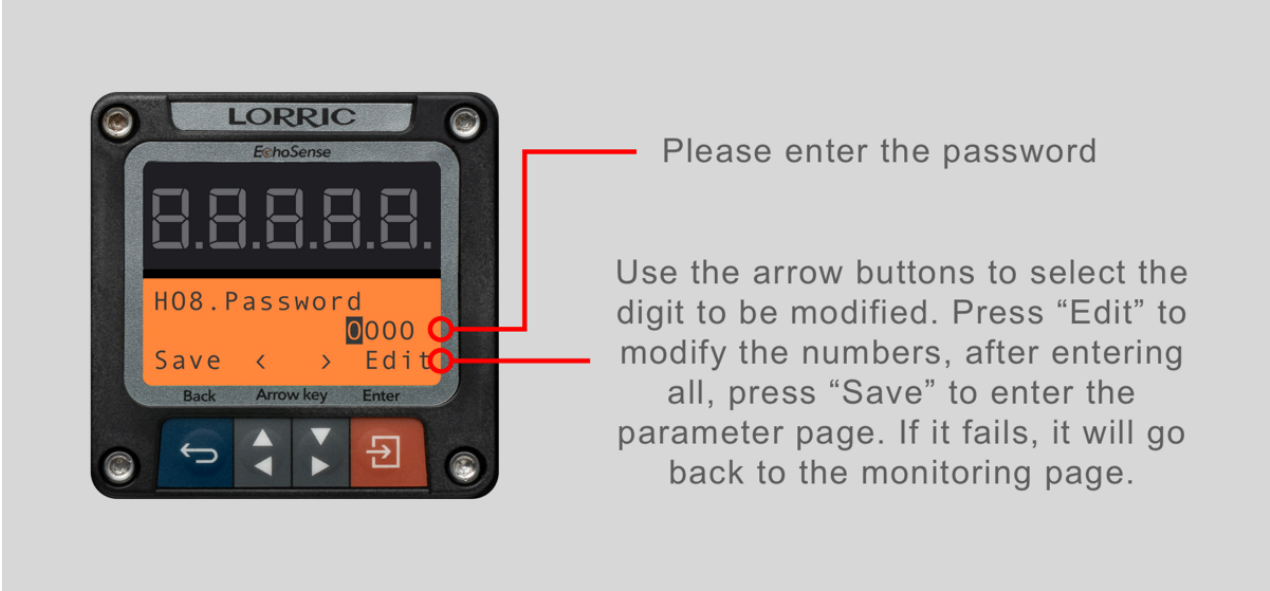
Cumulative flow speed

The accumulated flow rate continuously counts until manually reset.

The maximum limit for the accumulated flow rate is 999,999,999 Liters, and it will reset to zero once exceeded.

Password input page

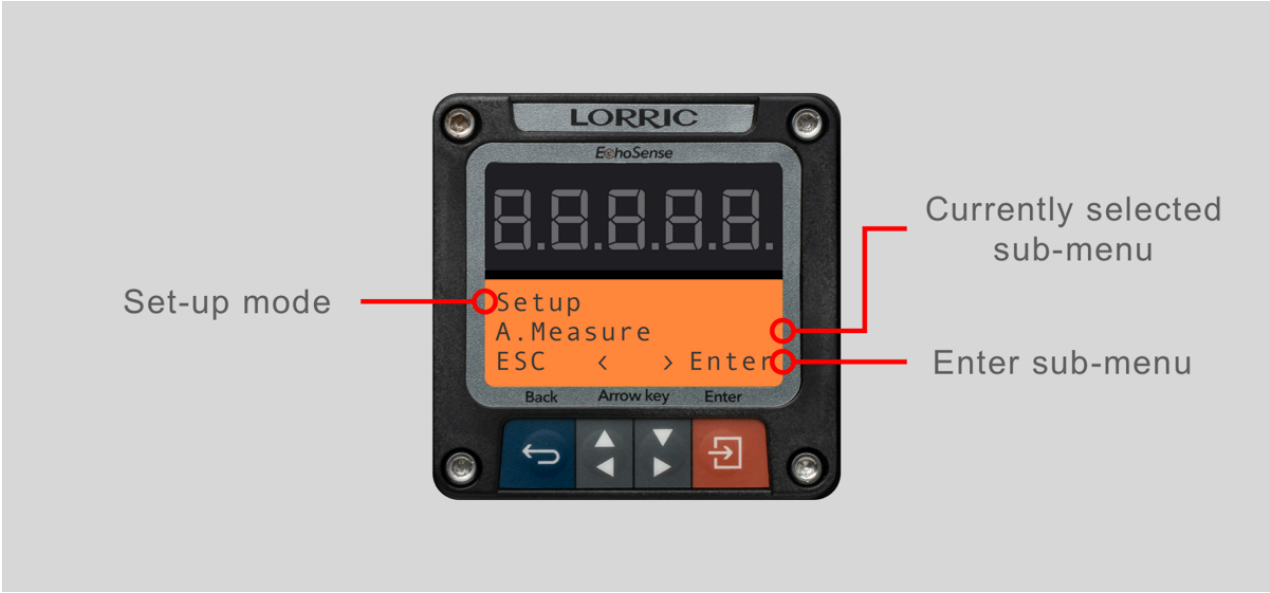
If the password function is turned on, press Setup from the monitoring screen to modify the parameters, the following screen will appear first:



Setup screen

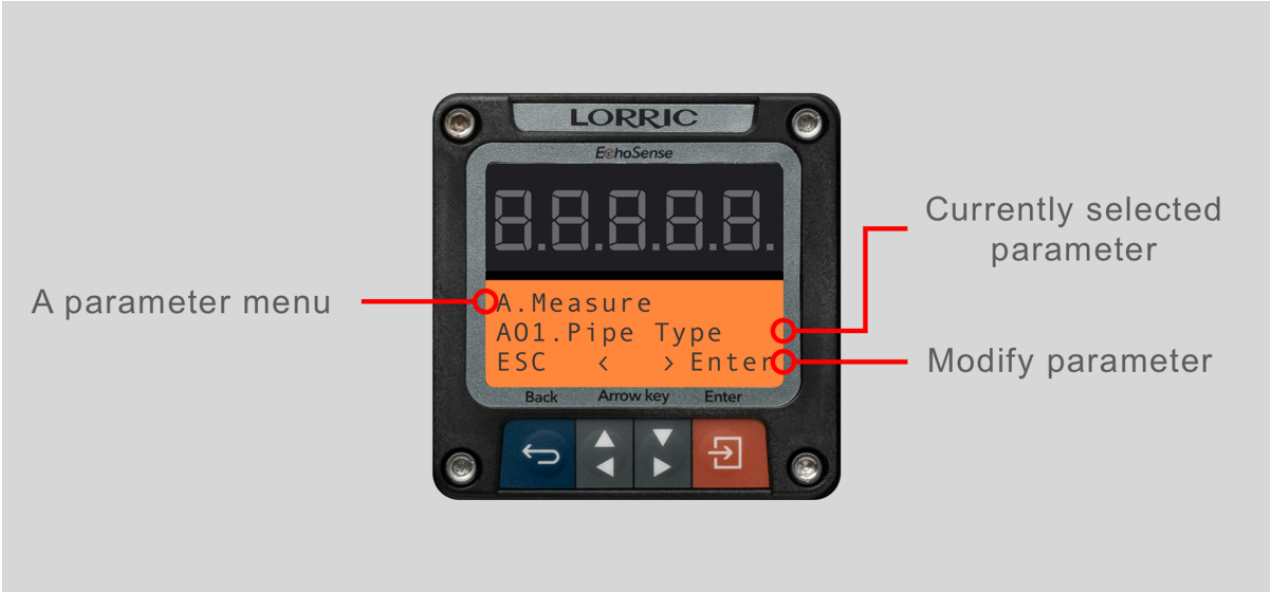
Under the set-up page, flow volume calculating, accumulating, and communication functions will be stopped.

Press the bottom-right button for entering the set-up page as below.

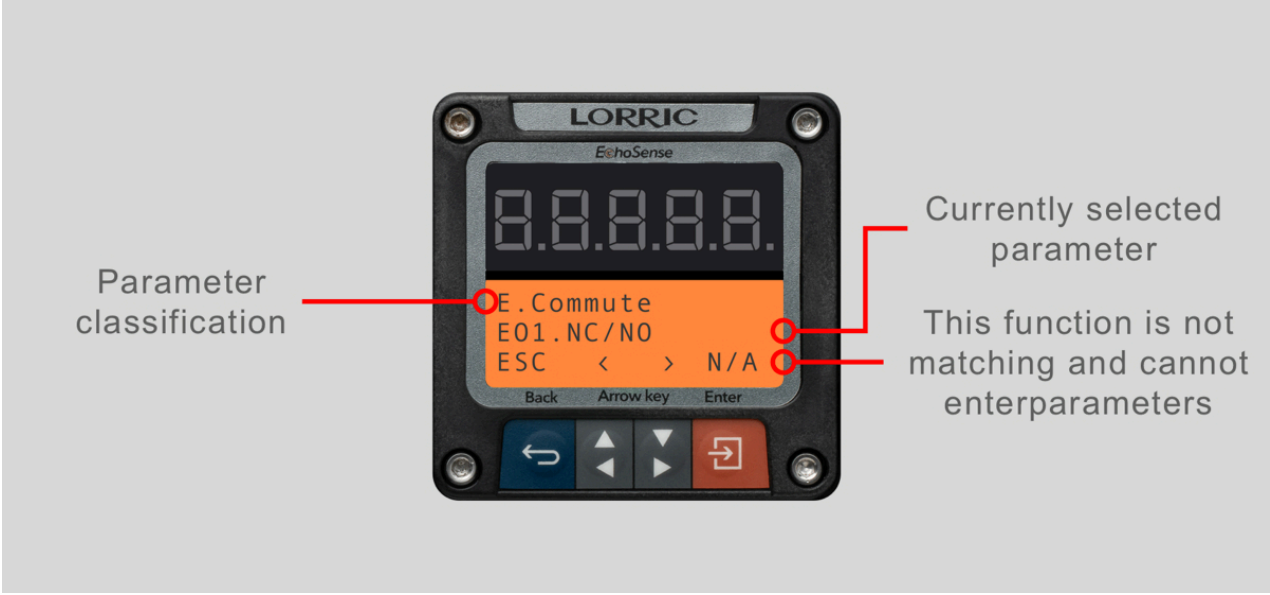


You can switch parameter classification by the middle 2 buttons. For more details of parameter classification and definitions, please see the parameter set-up page.

Enter the sub menu, then select the expected parameter. Accordingly, find below image for display reference.



If there is a N/A on the lower right corner of an option, it means that this version of the hardware does not have this function, and you cannot enter the option.



Communication

OCT output

Specs

Please see the page of the monitoring screen.

Cable wiring

Please see the page of mechanical and electrical installation.

Parameter setup

Please refer to the parameter set-up page.

Set-up steps as below:

1. Please set up the basic parameters first.
2. Connect cable first according to the cable wiring instructions on this page.
3. Set up parameter E01 for selecting NC(Normal Close) or NO(Normal Open) when there is no signal.
4. Set up parameter E02 for specifying output signal content.
    a. For selecting “pulse output”
        i. Use E03 to confirm each pulse width.
        ii. Use F03 to simulate specific pulse output frequency at OCT for testing with external devices.
    b. For selecting “pulse v2”
        i. Use E03 to confirm each pulse width.
        ii. Use E14 to determine each pulse capacity.
        iii. F03 to simulate specific pulse output frequency at OCT for testing with external devices.

c. For selecting “out of range flow volume notice”.
    i. Use D05 to turn on the alarm.
    ii. Use D06 D07 for specifying normal flow range.
    iii. Use D08 for specifying hysteresis range percentage. D07 is a positive value, it means the single range must exceed in order to disable the alarm.
    iv. Set up F01 and F02 to simulate flow volume and go back to the monitoring screen to confirm if the alarm works.
    v. Turn off the simulation mode.
d. For selecting “Total Alarm.” (“Inform of over total target”)
    i. Use D09 to turn off alarm.
    ii. Use D10 for specifying notification conditions. "Larger Than" is for positive flow direction, "Less Than" is for negative flow direction.
    iii. Use D11 for specifying total target, positive number is for positive flow, negative number is for negative flow.
    iv. Set up F01 and F02 to simulate flow volume and go back to the monitoring screen to confirm the alarm works.
    v. Turn off the simulation mode.

5. Go back to the monitoring screen, finish.

Pulse output

The user uses parameter E13 to select a volume first, and the device outputs a digital square wave every time it accumulates through a specified volume.

Analog current output (0-20mA, 4-20mA)

Specs

Please see the page of the monitoring screen.

Cable wiring

Please see the page of mechanical and electrical installation.

Parameter setup

Please refer to the parameter set-up page.

Set-up steps as below:

1. Please set up the basic parameters first.
2. Connect cable first according to the cable wiring instructions on this page.
3. Set up parameter E06 for opening Analog current output function, and select the data content to be output.
4. The current range to be set up by using parameter E13 is 0-20mA or 4-20mA.
5. Parameter E07 and E08 are for specifying maximum and minimum value to output. These 2 values can be either positive or negative, however, E07 has to be smaller than E08.
6. Use E09 to set output current milliamps when output data is out of the E07 and E08 range.
7. Please enter the E11 parameter page to test and adjust 0mA/ 4mA output current. Adjustment unit is uA.

8. Please enter the E12 parameter page to test and adjust 20mA output current. Adjustment unit is uA.
9. If the output current is too low and can not reach 20mA after modifying parameter E12, please check the 4-20mA specification on the monitoring screen page for line impedance and supply voltage requirement.
10. Use parameter F01 for setting up the flow volume value to be simulated. Turn on F02 and go back to the monitoring screen.
11. Confirm that the external device receives the signal correctly.
12. Turn off F02 and go back to the monitoring screen.
13. Finish.

RS485 and Modbus RTU Setting

RS485 will not respond in the setup screen.

Specs

Please see the page of the monitoring screen.

Cable wiring

Please see the page of mechanical and electrical installation.

Parameter setup

Please refer to the parameter set-up page.

Set-up steps as below:

1. Please set up the basic parameters first.
2. Connect cable according to the cable wiring instructions on this page.
3. This machine uses Modbus RTU protocol, communication parameter set-up as below:
    a. Set E04 for Modbus ID , and please make sure there is no other device using the same address.
    b. Set E05 for specifying communication Baud, this machine supports 9600, 19200, 38400 and 57600.
4. Please go back to the monitoring screen. RS485 only responses on monitoring screens.
5. If needed, please use F01 and F02 to set up the machine to do a communication test under simulation mode.

6. Please refer to the Modbus RTU protocol page for testing the memory with read and write instruction.
7. Turn off F02 simulation mode.
8. Finish.

Advanced parameter setting (available since FW 2.3.0)

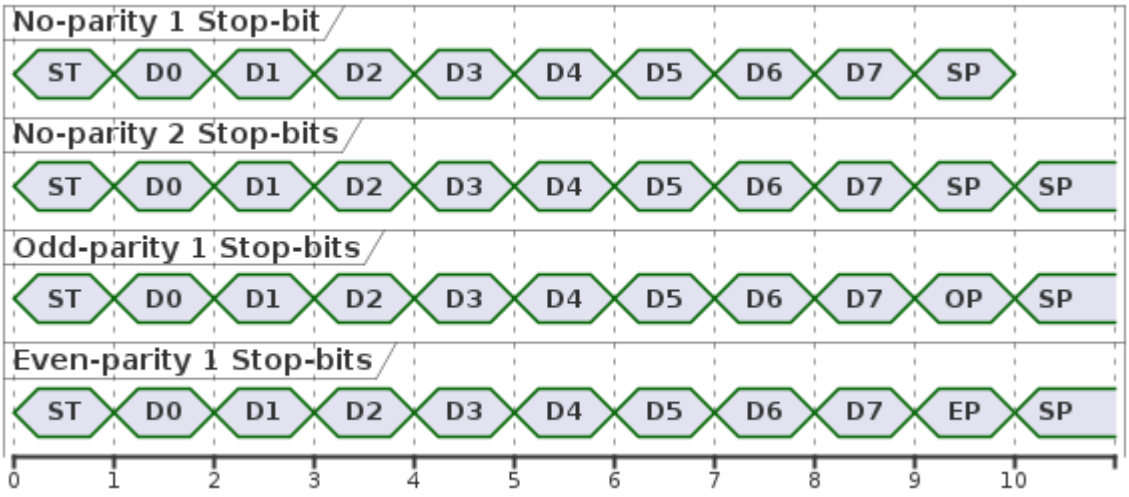
E15 Byte format

This setting provides 4 options.

Option name	Full name
N.8.1	No parity bit with 1 stop bit
N.8.2	No parity bit with 2 stop bits
O.8.1	Odd parity bit with 1 stop bit.
E.8.1	Even parity bit with 1 stop bit

ST stands for start bit, D0 ~ D7 are data bits, SP stands for stop bit.

OP and EP stands for Odd-parity and Even-parity respectively

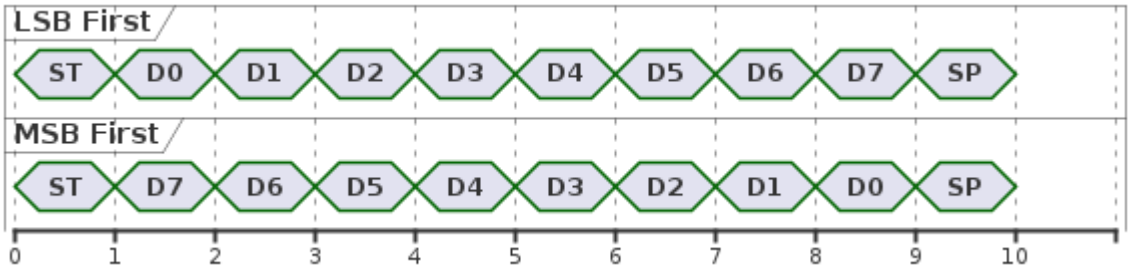


E16 Bit order

This option controls the direction of the transfer and selects LSB or MSB first.

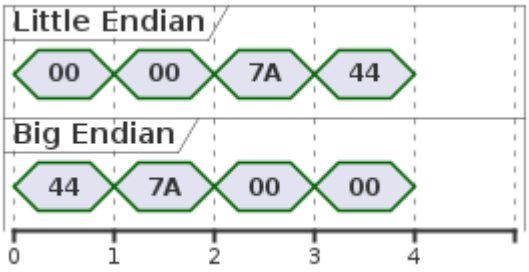
LSB first is typically used for Modbus RTU.

The figure below presents the difference with N-8-1 mode.



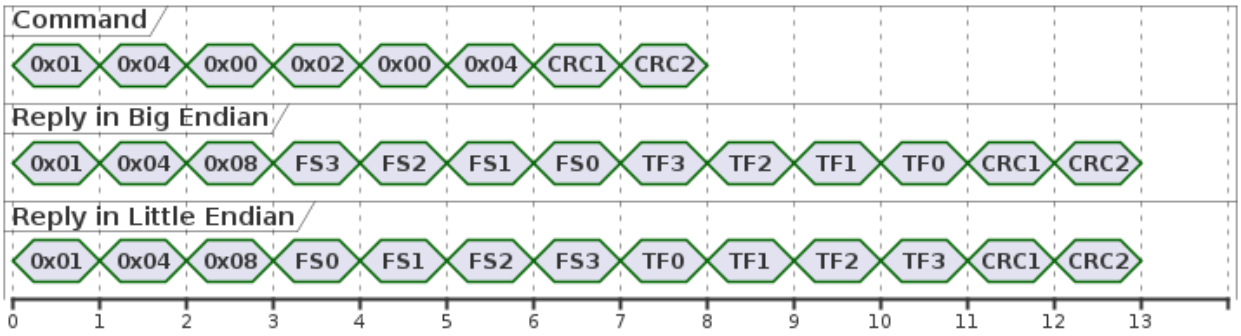
E17 Endianness

This setting controls the byte order of multi-byte data. This setting solely interacts with the byte order of replied data. The byte format of register address and length in the commands still conform to the examples provided by manual. The figure below presents the byte order for when converting number 1000 in IEEE-754 format.



Example

The command below requests instantaneous flow speed (abbreviated to FS) and totalized flow rate (abbreviated to TF) from the device.



The first line is the command sent by the master device. It is not affected by the current settings. Please refer to Modbus 04 command for details.

The second line is the response from the flow meter in Big Endian format. From left to right, 0x01 to 0x08 and CRC1 to CRC2 are not affected by the current settings. The order of the instantaneous flow rate (indicated as FS+number) and the accumulated flow rate (indicated as TF+number) in the response is also unaffected. Because it is set as Big Endian, the four bytes of the instantaneous flow rate (represented by FS3 to FS0) will be returned starting from FS3. The four bytes of the cumulative flow (represented by TF3 to TF0) will be returned starting from TF3.

The third line is the response from the flow meter in Little Endian format. From left to right, 0x01 to 0x08 and CRC1 to CRC2 are not affected by the current settings. The order of the instantaneous flow rate (indicated as FS+number) and the accumulated flow rate (indicated as TF+number) in the response is also unaffected. Because it is set as Little Endian, the four bytes of the instantaneous flow rate (represented by FS0 to FS3) will be

returned starting from FS0. The four bytes of the cumulative flow (represented by TF0 to TF3) will be returned starting from TF0.

Modbus RTU Protocol

Communications format

bit order: lsb first

byte order: big endian

Data bits:8

Parity: None

Stop bits: 1

Floating point number follows IEEE754-1985. The float32 below stands for 32bits Single precision floating point number.

Terminology

Register: Length of 2 Byte or 16bit which is unit length of memory in Modbus RTU.

Byte: 8 bit length

Definition and function of memory

Modbus memory is divided into two categories, read-only and read-write.

Read-only type is mainly for flow meter status related memory, such as instantaneous flow rate. This is also the most commonly used memory. Detail information in following page:

Read-only memory read instruction(04) and memory lists.

Read-write memory is mainly to set-up parameters such as pipe diameter, and to reset variables, such as set zero on the cumulative flow. Read-write memory is only readable by using instruction 03. You can only change one parameter at a time with the write operation. If the length of the target register is 1, please use instruction 06. If the length is 2 registers, please use instruction 30. Please see read-write memory detail page below:

Read-write memory list

Read-write memory instruction detail information as below:

Read-write memory read instruction(03)

Read-write memory single Register write instruction(06)

Read-write memory double Register write instruction(30)

Read-only memory read instruction(04) and memory lists

The length of total register requested by a single reading command must be less than or equal to 20 registers. Instructions longer than this will be ignored.

Instruction example

Format of command (04) from master

Byte#	1	2	3	4	5	6
Node ID	Slave Address	Function Code	Address of first reading register	Address of first reading register	Quantity of registers to be read	Qua reg be
Example 01~FF	01	04	00	00	00	02

Description of master command

The example will read instantaneous flow volume.

slave address: 01(address of this flowmeter)

function code: 04(read instruction)

Address of first reading register: 0000(Address of first register to read)

Quantity of registers to be read: 0002 (need to read 2 registers from 0000)

CRC: 71 CB(Calculating error correcting code according to CRC algorithm)

Format of flowmeter response(04)

Byte#	1	2	3	4	5	6
Node ID	Slave Address	Function Code	Amount of response Byte	Data Byte #1	Data Byte #2	Dat #3
Example 01~FF	01	04	04	00	00	00

Description of flowmeter response example

slave address: 01(address of this flowmeter)

function code: 04(read instruction)

Amount of response Byte: 04 (2 register=4 byte)

Data Byte: 00 00 00 00(Assume the instantaneous flow volume is 0)

CRC: FB 84(Calculating error correcting code according to CRC algorithm)

Definition and address of memory

How to use these charts

Function	Function
Register location	Read-write memory address is not shared with read-only memory.
Register length	The length of variable memory. The unit is Register(2Byte).

Memory definition	For memory data description.

Read-only memory list

Register location	Register length	Memory definition	Data type	Remarks
0000	2	instantaneous flow rate	float32	
0002	2	instantaneous flow velocity	float32	
0004	2	totalized flow volume	float32	
0006	2	instantaneous flow rate	int32	The value is the cumulative flow X100 integer
0008	2	instantaneous flow velocity	int32	The value is the cumulative flow X100 integer
000A	2	totalized flow volume	int32	The value is the cumulative flow X100 integer
000C	2	Iout current value uA	unsigned int32	
000E	1	error code a	unsigned int16	First byte is 0, due to no definition.
000F	1	error code b	unsigned int16	First byte is 0, due to no definition.
0010	1	error code c	unsigned int16	First byte is 0, due to no definition.
0011	1	error code d	unsigned int16	First byte is 0, due to no definition.

0012	1	System Status	unsigned int16	First byte is 0, due to no definition.
0013	4	totalized flow volume	int64	The value represents **cumulative flow multiplied by 100,000**, rounded to the nearest integer (introduced in **P1203**).
0017	2	Dosing	loat32	(introduced in **P1203**).
0019	2	Dosing	int32	The value represents **cumulative flow multiplied by 100** rounded to the nearest integer (introduced in **P1203**).
001B	4	Dosing	int64	The value represents **cumulative flow multiplied by 100,000**, rounded to the nearest

Read-Write Memory List

Large numerical values read or written in different formats (float32/int64) may exhibit a variance below 1/10,000. In read commands, the register length must not exceed 20 registers. Commands exceeding this length will be disregarded. More refer to the list for details.

Usage Instructions for the Read-Write Memory List

Field Name	Function
Reg Location	Specifies the location of the read-write memory, distinct from the read-only memory space.
Reg Length	Defines the data length of the register variable.
Memory Content Name	Provides a description of the memory content.
Data Format	Specifies the format used for data transmission and reception.
Read Command	Indicates availability for read commands.
Write Command	Indicates availability for write commands. Certain register positions marked with "X" do not support remote writing.
Classification Option List Link	Links to detailed items under each category menu.

Read-Write Memory List

Reg Location	Reg Lengt	Memory Content Name	Data Format	R C d

A parameter Category				
00 00	1	A02 Preset Pipe Spec	int16	0
00 01	1	A03 Pipe Geo Unit	int16	0
00 02	2	A04 Pipe Outer Diameter	float32	0
00 04	2	A05 Pipe Perimeter	float32	0
00 06	2	A06 Pipe Thickness	float32	0
00 08	2	A07 Pipe Inner Diameter	float32	0
00 0A	1	A08 Pipe Material	int16	0
00 0B	2	A09 Pipe Soundspeed	float32	0
00 0D	1	A10 Liquid Type	int16	0
00 0E	2	A12 Liquid Soundspeed	float32	0
00 10	2	A13 K Viscosity cst	float32	0
00 12	1	A15 Damping	int16	0
00 13	1	A16 Direction	int16	0
00 14	1	A17 Neg Flow	int16	0
00 15	2	A18 Low Flow Cutoff	float32	0

00 17	1	A19 Fast Update	int16	0
00 18	1	A20 Anti Noise	int16	0
00 19	2	A23 Zero Offset	float32	0
00 1B	1	A24 Start up check	int16	0
00 1C	1	A25 Off-pipe zero	int16	0
00 1D	1	A26 Beta Mode	int16	0
B parameter Category				
01 00	1	B01 Vol Unit	int16	0
01 01	1	B02 Time Unit	int16	0
01 02	1	B03 Total Unit	int16	0
01 03	1	B04 VelocityUnit	int16	0
01 04	1	B05 Dec Place	int16	0
01 05	1	B06 Pipe Geo Unit	int16	0
K parameter Category				
0A 00	1	K02 Calibra Mode	int16	0
0A 01	2	K03 Scale Factor	float32	0

0A 03	2	K04 Manual Offset	float32	0
0A 05	2	K05 Totalizer Scale	float32	0
C parameter Category				
02 00	1	C01 Total Method	int16	0
02 01	1	C02 Del Total	int16	0
02 02	1	C03 Dosing Mode	int16	0
02 03	2	C04 Dosing Target	float32	0
02 05	1	C05 Dosing Reset Time	int16	0
02 83	4	C04 Dosing Target(64)	int64	0
D parameter Category				
03 00	1	D01 BoardComm Ala	int16	0
03 01	1	D02 Pipe Sensor Alarm	int16	0
03 02	1	D03 Bad UltraS Signal	int16	0
03 03	1	D04 Off Pipe Alarm	int16	0
03 04	1	D05 FlowLIM Ala	int16	0
03 05	2	D06 Up LIM	float32	0

03 07	2	D07 Low LIM	float32	0
03 09	1	D08 Hysteresis%	int16	0
03 0A	1	D09 Total Ala	int16	0
03 0B	1	D10 Total Trig	int16	0
03 0C	2	D11 Total Target	float32	0
03 0E	1	D12 Iout Alarm	int16	0
03 0F	1	D13 Speed Alarm	int16	0
03 10	1	D14 PulseOverlap	int16	0
03 11	1	D15 IoutStatAla	int16	0
03 12	1	D16 Dosing Alarm	int16	0
03 8C	4	D11 Total Target(64)	int64	0
E parameter Category				
04 00	1	E01 NC/NO	int16	0
04 01	1	E02 OCT Info	int16	0
04 02	1	E03 Pulse Width	int16	0
04 03	1	E06 Iout Def	int16	0

04 04	2	E07 4mA Value	float32	0
04 06	2	E08 20mA Value	float32	0
04 08	1	E09 Iout Error	int16	0
04 09	2	E11 4mA Adj uA	float32	0
04 0B	2	E12 20mA Adj uA	float32	0
04 0D	1	E13 Iout Range	int16	0
04 0E	1	E14 PulseV2 Unit	int16	0
04 0F	1	E17 Endianness	int16	0
F parameter Category				
05 00	2	F01 Sim Volume	float32	0
05 02	1	F02 Sim Mode	int16	0
H parameter Category				
07 00	1	H01 LED Bri	int16	0
07 01	1	H02 LCD Bri	int16	0
07 02	1	H03 Green Light	int16	0
07 03	1	H04 Language	int16	0

07 04	1	H06 Reset	int16	0
07 05	1	H07 Lock Device	int16	0

Read/Write Memory Read Command (03)

`For large numbers, reading and writing in different formats (float32/int64) may result in a discrepancy of less than 1/10,000.`

Example Command:

Format for issuing the read command (03) from the control terminal.

Byte#	1	2	3	4	5	6
Node ID	Slave Address	Function Code	Starting Address of Data to Read	Starting Address of Data to Read	Number of Registers to Read	Nu Reg Rea
Example 01~FF	01	03	00	00	00	03

This example reads the pipe diameter data of **A02 Preset Pipe Spec**.

- **Slave Address:** `01` (Address of the flow meter)
- **Function Code:** `03` (Read command)
- **Starting Address of Data to Read:** `00 00` (Starting address of the A02 Preset Pipe Spec data)
- **Number of Registers to Read:** `00 03` (Read three registers starting from address `00 00`)
- **CRC:** `05 CB` (Error-checking code calculated using the CRC algorithm)

Flow Meter Response Format (03)

Byte#	1	2	3	4	5	6
Node ID	Slave Address	Function Code	Number of Bytes Returned	Data Byte #1	Data Byte #2	Dat #3

Example 01~FF	01	03	06	00	06	00

Example Explanation of Flow Meter Response

- **Slave Address:** `01` (Address of the flow meter)
- **Function Code:** `03` (Read command)
- **Number of Bytes Returned:** `06` (3 registers = 6 bytes)

Data Bytes:

- `00 06` (Current type option: ASTM SCH 80 PVC)
- `00 00` (Reading A02 RS485 init)
- `42 41` (Reading A02 RS485 init)

CRC: `59 E5` (Error-checking code calculated using the CRC algorithm)

Read-write memory single Register write instruction(06)

This instruction if for memory with 1 register length only, please refer to the list.

Instruction example

Format of command (06) from master

Byte#	1	2	3	4	5	6
Node ID	Slave Address	Function Code	Memory address to write	Memory address to write	Write data	Wri
Example 01~FF	01	06	00	00	00	01

Description of master command

This example will change A01 pipe diameter option

slave address: 01(address of this flowmeter)

function code: 06(Single Register write instruction)

Address of first reading register: 0000(memory address to write)

Write data: 0000 (1" PVC pipe)

CRC: C40B (Calculating error correcting code according to CRC algorithm)

Format of flowmeter response(06)

Byte#	1	2	3	4	5	6
Node ID	Slave Address	Function Code	Memory address to write	Memory address to write	Write data	Wri
Example 01~FF	01	06	00	00	00	01

Description of flowmeter response example

Valid command received. It will output the same command back to master.

slave address: 01(address of this flowmeter)

function code: 06(Single Register write instruction)

Address of first reading register: 0000(memory address to write)

Write data: 0000 (1" PVC pipe)

CRC: C40B (Calculating error correcting code according to CRC algorithm)

Read-write memory list

Register location	Register length	Memory definition	Data type

Read/Write Memory Dual-Register Write Command (30)

`For large numbers, writing and reading in different formats (float32/int64) may result in a discrepancy of less than 1/10,000. This command is limited to memory with a register length of 4. Please refer to the provided list.`

Example Command:

Format for Issuing the Write Command (30) from the Control Terminal

Byte#	1	2	3	4	5	6
Node ID	Slave Address	Function Code	Starting Address of Data to Write	Starting Address of Data to Write	Data to Write	Dat Wri
Example Content 01~FF	01	30	00	15	00	00

Example Explanation of Control Terminal Command

This example modifies the **A18 Low Flow Cutoff** value to `0` (default).

- **Slave Address:** `01` (Address of the flow meter)
- **Function Code:** `30` (Dual-register write command)
- **Starting Address of Data to Write:** `00 15` (Memory address for A18 Low Flow Cutoff)
- **Data to Write:** `00 00 00 00` (Set A18 Low Flow Cutoff value to `0`)
- **CRC:** `BC 07` (Error-checking code calculated using the CRC algorithm)

Flow Meter Response Format (30)

Byte#	1	2	3	4	5	6
Node ID	Slave Address	Function Code	Starting Address of Data to Write	Starting Address of Data to Write址	Data to Write	Dat Wri
範例內容 01~FF	01	30	00	15	00	00

Example Explanation of Flow Meter Response

If the write command format is correct, the received control command will be echoed back to the master device.

- **Slave Address:** `01` (Address of the flow meter)
- **Function Code:** `30` (Dual-register write command)
- **Starting Address of Data to Write:** `00 15` (Memory address for A18 Low Flow Cutoff)
- **Data to Write:** `00 00 00 00` (Set A18 Low Flow Cutoff value to `0`)
- **CRC:** `BC 07` (Error-checking code calculated using the CRC algorithm)

Read/Write Memory Four-Register Write Command (31)

For large numbers, reading and writing in different formats (float32/int64) may result in a discrepancy of less than 1/10,000. This command is limited to memory with a register length of 4. Please refer to the provided list. More refer to the list for details.

Instruction example

Format for Issuing the Write Command (31) from the Control Terminal

Byte#	1	2	3	4	5	6
Node ID	Slave Address	Function Code	Starting Address of Data to Write	Starting Address of Data to Write	Data to Write	Dat Wri
Example 01~FF	01	31	02	83	00	00

Example Explanation of Control Terminal Command

This example reads and writes data for **C04 Dosing Target (64)**.

- **Slave Address:** 01 (Address of the flow meter)
- **Function Code:** 31 (Write command)
- **Starting Address of Data to Write:** 02 83 (Memory address for C04 Dosing Target (64))
- **Data to Write:** 00 00 00 00 00 BC 61 FF (Data for C04 Dosing Target (64))
- **CRC:** 1E F5 (Error-checking code calculated using the CRC algorithm)

Flow Meter Response Format (31)

Byte#	1	2	3	4	5	6
Node ID	Slave Address	Function Code	Starting Address of Data to Write	Starting Address of Data to Write	Data to Write	Dat Wri
Example 01~FF	01	31	02	83	00	00

Example Explanation of Flow Meter Response

If the write command format is correct, the flow meter will echo the received command back to the master.

- **Slave Address:** 01 (Address of the flow meter)
- **Function Code:** 31 (Write command)
- **Starting Address of Data to Write:** 02 83 (Memory address for C04 Dosing Target (64))
- **Data to Write:** 00 00 00 00 00 BC 61 FF (Data for C04 Dosing Target (64))
- **CRC:** 1E F5 (Error-checking code calculated using the CRC algorithm)

Single Bit Data Read/Write Commands (01/05) (Commonly Used in HMIs)

Purpose and Use Cases: Certain Human-Machine Interfaces (HMIs) only support the **05 Write Command** to send a signal to reset the accumulated total. Additionally, some HMIs require support for the **01 Read Command** to verify that the sensor is functioning correctly.

01 Command Example

This command does **not reset** the **C02.Del.Total** (Clear Accumulated Total) option. It only provides the HMI with the ability to read Single Bit data using the 01/05 commands. If the command format is correct, the flow meter will respond to the master device with a Bit read acknowledgment.

Control Terminal TX (Transmit) Command Example for 01

Byte#	1	2	3	4	5	6
Node ID	Slave Address	Function Code	Starting Address of Data to Read	Starting Address of Data to Read	Data to Read (Bits)	Dat Rea
Example 01~FF	01	01	02	01	00	01

Control Terminal TX (Transmit) Command Example for 01

- **Slave Address:** `01` (Address of the flow meter)
- **Function Code:** `01` (1-bit Read Command)
- **Starting Address of Data to Read:** `02 01` (Start address for C02.Del.Total Clear Accumulated Total)
- **Data to Read (Bits):** `00 01` (Read C02.Del.Total data)
- **CRC:** `AD B2` (Error-checking code calculated using the CRC algorithm)

Flow Meter RX (Receive) Response Example for 01

Byte#	1	2	3	4	5	6
Node ID	Slave Address	Function Code	Response Bit	Response Bit	CRC	CR(
Example 01~FF	01	01	01	00	51	88

- **Slave Address:** `01` (Address of the flow meter)
- **Function Code:** `01` (Read Command)
- **Response Bit:** `01 00` (The flow meter is still online and operational, responding to the control terminal)
- **CRC:** `51 88` (Error-checking code calculated using the CRC algorithm)

05 Command Example

`This example activates the` **`C02.Del.Total`** `option to clear accumulated data, resetting the total to zero.`

Control Terminal TX (Transmit) Command Example for 05

Byte#	1	2	3	4	5	6
Node ID	Slave Address	Function Code	Starting Address of Data to Write	Starting Address of Data to Write	Data to Write	Dat Wri
Example 01~FF	01	05	02	01	FF	00

- **Slave Address:** `01` (Address of the flow meter)
- **Function Code:** `05` (Register Write Command)

- **Starting Address of Data to Write:** `02 01` (Start address for C02.Del.Total Clear Accumulated Total)
- **Data to Write:** `FF 00` (Reset C02.Del.Total data)
- **CRC:** `DC 42` (Error-checking code calculated using the CRC algorithm)

Flow Meter RX (Receive) Response Example for 05

Byte#	1	2	3	4	5	6
Node ID	Slave Address	Function Code	Starting Address of Data to Write	Starting Address of Data to Write	Data to Write	Dat Wri
Example 01~FF	01	05	02	01	FF	00

- **Slave Address:** `01` (Address of the flow meter)
- **Function Code:** `05` (Register Write Command)
- **Starting Address of Data to Write:** `02 01` (Memory address for C02.Del.Total Clear Accumulated Total)
- **Data Written:** `FF 00` (Acknowledgment of reset action sent back to the control terminal)
- **CRC:** `DC 42` (Error-checking code calculated using the CRC algorithm)

Parameters Table

Parameter Categorizing Table

Serial number	Name	Function
Z	Easy Setup	Z group has the most commonly used functions in other categories arranged in order to facilitate users to adjust the machine.
A	Measure	A group is about flow volume measurement
B	Unit	B group is about unit
K	Calibration	K group is related to Field Calibration
C	Total	C group is about accumulated
D	Alarm & Info (Alarm & Information)	D group is about alarm and notification.
E	Commute	E group adjust OCT 4-20mA and RS485
F	Simulate	F group is about simulation mode for communication and alarm testing.
H	System	H group is for other host settings

Parameter Description

Z Quick Setup Parameter List

Serial number	Name	Function
Z01	Fully Auto Setup	Automatically execute Z02+Z03+Z04.
Z02	Auto Pipe Spec	Automatically detect pipeline specifications, and automatically jump to A02 to display the results after completion. This function is the same as A01.

		For more details on pipe specifications, refer to ->
Z03	Auto Initialization	Enabling this function will allow the flowmeter to adjust the signal state based on the environmental conditions. Please execute this function once every time you reinstall. This function is the same as A21. For more details on pipe specifications, refer to ->*(After installation is complete or if the pipeline size or material is changed, please perform Auto Initialize (Z03) and Auto Zero Offset (Z04) again to improve the accuracy of the flow meter readings and ensure product stability.*)
Z04	Auto Zero Offset	Please install the pipeline on a pipeline that is still and full inside, and activate this function to correct the zero flow error. This function is the same as A22. *(After installation is complete or if the pipeline size or material is changed, please perform Auto Initialize (Z03) and Auto Zero Offset (Z04) again to improve the accuracy of the flow meter readings and ensure product stability.*)
Z05	Scale Factor	Multiply the measured flow data by a fixed ratio, ranging from 0.001 to 1000. For negative flow, please go to A17 to set. This setting is synchronized with K03.

A Measure Parameter List

Serial number	Name	Function
A01	Auto Pipe Spec	Automatically detect pipeline specifications, and automatically jump to A02 to display the results after completion. This function is the same as Z02. For more details on pipe specifications, refer to ->
		Select the line model to correct the data. Or select "Custom" to customize the pipe size and material. For more details on pipe specifications, refer to ->

A02	Pipe Type	*(After installation is complete or if the pipeline size or material is changed, please perform Auto Initialize (Z03) and Auto Zero Offset (Z04) again to improve the accuracy of the flow meter readings and ensure product stability.*)
A03	Pipe Geo. Unit	Pipe gauge unit, synchronized with B06. For more details on pipe specifications, refer to -> *(After installation is complete or if the pipeline size or material is changed, please perform Auto Initialize (Z03) and Auto Zero Offset (Z04) again to improve the accuracy of the flow meter readings and ensure product stability.*)
A04	Pipe OD	Can be set when A01 is "custom". Dimensions are in accordance with B06. After adjustment, A04 and A06 will be automatically recalculated. For more details on pipe specifications, refer to -> *(After installation is complete or if the pipeline size or material is changed, please perform Auto Initialize (Z03) and Auto Zero Offset (Z04) again to improve the accuracy of the flow meter readings and ensure product stability.*)
A05	Pipe Perimeter	Can be set when A01 is "custom". Dimensions are in accordance with B06. After adjustment, A03 and A06 will be automatically recalculated. For more details on pipe specifications, refer to -> *(After installation is complete or if the pipeline size or material is changed, please perform Auto Initialize (Z03) and Auto Zero Offset (Z04) again to improve the accuracy of the flow meter readings and ensure product stability.*)

A06	Pipe thickness	Can be set when A01 is "custom". Dimensions are in accordance with B06. A06 will automatically recalculate after adjustment. For more details on pipe specifications, refer to ->*(After installation is complete or if the pipeline size or material is changed, please perform Auto Initialize (Z03) and Auto Zero Offset (Z04) again to improve the accuracy of the flow meter readings and ensure product stability.*)
A07	Pipe ID	Can be set when A01 is "custom". Dimensions are in accordance with A02. For more details on pipe specifications, refer to ->*(After installation is complete or if the pipeline size or material is changed, please perform Auto Initialize (Z03) and Auto Zero Offset (Z04) again to improve the accuracy of the flow meter readings and ensure product stability.*)
A08	Pipe Material	Set the pipe material, modify the flow data or select "Custom" to customize the sound velocity of the pipe. For more details on pipe specifications, refer to ->*(After installation is complete or if the pipeline size or material is changed, please perform Auto Initialize (Z03) and Auto Zero Offset (Z04) again to improve the accuracy of the flow meter readings and ensure product stability.*)
A09	Pipe Soundspeed	When A08 is customized, you can manually set the sound velocity of the pipe, and the unit is set in B04. For more details on pipe specifications, refer to ->
A10	Liq. Type	Select the fluid type to correct the data. Or select "Custom" to customize fluid parameters. For more details on pipe specifications, refer to ->

A11	Auto Liq. Sound Speed	After enabling this function, the flowmeter will automatically detect the sound velocity of the fluid into the calculation. The default is off. (FW 2.0.0 released.) For more details on pipe specifications, refer to ->
A12	Liq. Sound Speed	When A10 is customized, the fluid sound velocity can be manually set, and the unit is set in B04. For more details on pipe specifications, refer to ->
A13	Liq. Dyna. Viscosity	When A10 is customized, the fluid dynamic viscosity can be manually set, and the unit is g/cm3. For more details on pipe specifications, refer to ->
A15	Damping	Reduce data fluctuations, the lowest is 0, which is off, the default value is 10. For more details on pipe specifications, refer to ->
A16	Direction	The direction of the fluid can be reversed, and the normal flow direction can be preset. For more details on pipe specifications, refer to ->
A17	Neg Flow (Negative Flow)	Whether to display negative flow, the default is on. For more details on pipe specifications, refer to ->
A18	Zero Cutoff	How much flow rate (absolute value) below is displayed as zero, set to 0 means off, default off. For more details on pipe specifications, refer to ->
A19	Fast Update	Increased screen update rate to every 0.5 seconds. The default is off. For more details on pipe specifications, refer to ->
A20	Anti-Noise	Eliminates unstable noise in measurement, can be turned off, and is turned on by default. For more details on pipe specifications, refer to ->
A21	Auto Initialization	Enabling this function will allow the flowmeter to adjust the signal state based on the environmental conditions. Please execute this function once every time you reinstall. This

B Unit Parameter List

Serial number	Name	Function
B01	Vol. Unit (Volume Unit)	Unit of instantaneous flow speed, default liter. Metric: L, m3 Imperial: U.gal (US Gallon)、I.gal (Imperial Gallon), ft3 For more details on pipe specifications, refer to ->
B02	Time Unit	Unit of flow time seconds, minutes, hours, days. Default minutes. For more details on pipe specifications, refer to ->
B03	Total Unit (Total Volume Unit)	Unit of cumulative and history flow volume, default litre. Metric: L, m3 Imperial: U.gal (US Gallon)、I.gal (Imperial Gallon), ft3 For more details on pipe specifications, refer to ->
B04	VelocityUnit	Unit of flow speed, default m/s. Metric: m/s Imperial: ft/s For more details on pipe specifications, refer to ->
B05	Dec. Place (Decimal Place)	For setting digits displayed after the decimal point on LCD and LE by using the round down method. The maximum number of digit 4 digits. The default display shows 4 digits after the decimal. Cumulative flow volume is still calculated by using the original value. For mo details on pipe specifications, refer to ->
B06	Pipe Geo. Unit	Pipe gauge unit, synchronized with A03 For more details on pipe specifications, refer to ->

K On site Calibration Parameter List

Serial number	Name	Function
K02	Calibra. Mode	Select the correction scheme, currently only the simple mode. For more details on pipe specifications, refer to ->
K03	Scale Factor	Fine-tune flow proportionally, default 1.0. This parameter is synchronized with Z05.For more

		details on pipe specifications, refer to ->
K04	Manual Offset	Subtract the fixed instantaneous flow rate from the input value, and the unit is the same as the system setting value. For example, inputting 1.0 means that when the original instantaneous flow is 3.0, the instantaneous flow will be output at 2.0. The default value is 0.0. This parameter works independently of Zero Offset. For more details on pipe specifications, refer to ->

C Total Parameter List

Serial number	Name	Function
C01	Total Method	Set cumulative calculation direction. There are 3 options available: forward flow, reverse flow, and net flow volume. Switching method will set the cumulative volume to zero. Default method is forward flow. FoFor more details on pipe specifications, refer to ->
C02	Del. Total(Delete Total)	Set cumulative flow volume to 0. First select "Yes" then save. For more details on pipe specifications, refer to ->

D Alarm & Information Parameter List

Serial number	Name	Function
D01	Sensor Error Alarm.	Alarm-A0 Alarm when the ultrasonic module is abnormal. Do not disturb mode is preset. For more details on pipe specifications, refer to ->
D02	Pipe Sensor Alarm	Alarm-A1 Alarm when the module detecting pipe diameter is abnormal. Do not disturb mode is preset. For

		more details on pipe specifications, refer to ->
D03	Bad UltraS. Signal	Alarm-C3 Alarm when the ultrasonic signal is poor. Do not disturb mode is preset. For more details on pipe specifications, refer to ->
D04	Off Pipe Alarm.	Alarm-A4 Alarm when the flowmeter is not installed correctly on the pipeline. Preset Do Not Disturb Mode: The red light will not flash, but the flow will return to zero when the alarm occurs, and the alarm a04 will become 1. on - When the alarm occurs, the red light will flash, the flow will return to zero, and the alarm a04 will become 1. For more details on pipe specifications, refer to ->
D05	FlowLIM Ala (Flow Volume Limit Alarm)	Alarm-B Set the alarm when the instantaneous flow rate exceeds the range, which can be turned off. The default is off. For more details on pipe specifications, refer to ->
D06	Up LIM (Upper Limit)	Defines the upper normal range of flow for D04. For more details on pipe specifications, refer to ->
D07	Low LIM (Lower Limit)	Defines the flow normal range lower limit for D04. For more details on pipe specifications, refer to ->
D08	Hysteresis% (Hysteresis Percentage)	Set the hysteresis percentage for the release of the flow upper and lower limit alarms Percentages are defined as percentages of the upper and lower bounds. The range is 0-33%, and the default value is 3%. This parameter must be a positive value. For more details on pipe specifications, refer to ->
D09	Total Ala. (Total Alarm)	Alarm-B The alarm can be set to be turned off when the accumulated flow range is exceeded. The default is off. For more details on pipe specifications, refer to ->

D10	Total Trig. (Total Alarm Trigger Condition)	Set the notification condition of the cumulative target value (D08), greater than the target or less than the target. The preset is larger than the target. For more details on pipe specifications, refer to ->
D11	Total Target	Set the cumulative target value. For more details on pipe specifications, refer to ->
D12	Iout Alarm	Alarm B Set whether to alarm when it exceeds the range of 4-20mA, and it can be closed. The default is off. For more details on pipe specifications, refer to ->
D13	Speed Alarm	Alarm B Set whether to alarm when the absolute value of the flow velocity exceeds the range of 6m/s, which can be turned off. On by default. For more details on pipe specifications, refer to ->
D14	PulseOverlap	Alarm B Pulse output (Pulse output) signal overlap alarm. The setting of parameter E03 is too large, resulting in overlapping of Pulse Output output signals. Can be turned off, default is on. For more details on pipe specifications, refer to ->
D15	IoutStatAla (Iout Status Alarm)	Set the Iout state warning mode, selectable on, off and do not disturb mode (Do not disturb), default do not disturb mode. The Do Not Disturb mode means that when an abnormality occurs, the color and LED displayed on the screen will not change, but it can still display numbers in the communication part and display abnormalities on the status page. For more details on pipe specifications, refer to ->
D16	Install Issue	Alarm - C2 The signal quality is not ideal due to poor installation of the flowmeter. It is recommended to lock the flowmeter evenly to achieve the best signal quality. Default non-disturbance mode: no light, Alarm C2 displays 1.

E Commute Parameter List

Serial number	Name	Function
E01	NC/NO	Under normal conditions(when the oct condition does not meet). OCT should be closed(connected) or open (disconnected). The default is open. For more details on pipe specifications, refer to ->
E02	OCT Info	There are options below are options to define OCT output, default OFF: OFF, Alarm A, Alarm A+B, Alarm A+B+C, flow volume alarm(adjusted by D04 D05 D06), cumulation alarm(adjusted by D08 D09 D10), PulseV2(adjusted by E03 and E14, please refer to the OCT output for instructions). For more details on pipe specifications, refer to ->
E03	Pulse Width	If E02 selects pulse v2, set the pulse time width in this item, optional 0.5ms (millisecond), 1ms, 10ms, default 0.5 ms. For more details on pipe specifications, refer to ->
E04	Modbus ID	Set up Modbus ID location, default 1.
E05	Baud	You can set-up Modbus communication baud rate at turning off, 9600, 19200, 38400, or 57600. Default off. For more details on pipe specifications, refer to ->
E06	Iout Def. (Iout Definition)	For setting output data of Analog signal, 4 options are available, off, flow rate, velocity, total. The unit is according to parameter group B. Default off. For more details on pipe specifications, refer to ->
	4mA Value	Set up the corresponding value to 0 or 4mA, default 0. Both positive and negative values work.

E07	/0mA Value	The value should be smaller than 20mA. For more details on pipe specifications, refer to ->
E08	20mA Value	Set up the corresponding value to 20mA, default 100. Both positive and negative values work. The value should be larger than 4mA. For more details on pipe specifications, refer to ->
E09	Iout Error	Set up the outputted value when the flow volume is not between E07 and E08. 4 Options modes: 1. 2.4 and 21.6 mA (When less than E07, it outputts 2.4mA. When greater than E08, it outputs 21.6mA) 2. 2.4 mA 3. 21.6 mA 4. 0 or 4 & 20mA (When less than or equal to E07, it outputts 4mA or 0mA (According to E13). When greater than or equal to E08, it outputs 20mA) Default 0 or 4 & 20mA. For more details on pipe specifications, refer to ->
E11	4mA Adj. uA (4mA Output Adjustment in microAmp)/ 0mA Adj. uA (0mA Output Adjustment in microAmp)	Fine tune 0 or 4mA output value, the unit is uA. After fine tuning and saving the setting, output current will be varied for immediate check. Positive value increases output current, negative value decreases output current. For more details on pipe specifications, refer to ->
E12	20mA Adj. uA (20mA Output Adjustment in microAmp)	Fine tune 20mA output value, the unit is uA. After fine tuning and saving the setting, output current will be varied for immediate check. Positive value increases output current, negative value decreases output current. For more details on pipe specifications, refer to ->
		To define the output range of Analog signals, there are 2 options: 1. 4-20mA

E13	Iout Range	2. 0-20mA Default is 4-20mA. Modifying this item will affect the options of E09. After modifying this item, please confirm E09 meets the requirements. For more details on pipe specifications, refer to ->
E14	PulseV2 Unit	Define how much flow volume to output a pulse, the unit is determined by B01 as follows: 1. The unit of L and m3 is Litre. 2. The unit of U.gal(US Gallon) and ft3 is U.gal. 3. The unit of I.gal(Imperial Gallon) is I.gal. For more details on pipe specifications, refer to ->
E15	Byte Format	Please refer to RS485 and Modbus RTU Setting for more information. (available since FW 2.3.0) For more details on pipe specifications, refer to ->
E16	Bit Order	Please refer to RS485 and Modbus RTU Setting for more information. For more details on pipe specifications, refer to ->
E17	Endianness	Please refer to RS485 and Modbus RTU Setting for more information. For more details on pipe specifications, refer to ->

F Simulate Parameter List

Serial number	Name	Function
F01	Sim. Volume (Simulation Volume)	Set up a simulate value of instantaneous flow speed, the unit will be the one set in parameter group B. For more details on pipe specifications, refer to ->
F02	Sim. Mode (Simulation Mode)	Simulation function will be activated after selecting “ on ”, default off. OCT (besides pulse), RS485 and Analog current output will be operated according to the changes of simulated data and cumulative flow. Please be noted that cumulative flow and history data will be affected.

		Simulate mode will be reminded on the screen. **The corresponding communication function will work normally only after being turned on.** For more details on pipe specifications, refer to ->

H System Parameter List

Serial number	Name	Function
H01	LED Bri. (LED Brightness)	Set up brightness of LED with 3 levels, default middle level. For more details on pipe specifications, refer to ->
H02	LCD Bri. (LCD Brightness)	Set up brightness of LCD with 3 levels, default middle level. For more details on pipe specifications, refer to ->
H03	Green Light	Set up time of LCD green lighting with 3 durations, 10s, 60s, and always on. For more details on pipe specifications, refer to ->
H04	Language	Set up language. There are 3 languages: English, Traditional Chinese, Simplified Chinese, default off. For more details on pipe specifications, refer to ->
H06	Reset	Clear all the data, reset all parameters to default values. For more details on pipe specifications, refer to ->
H07	Lock Device	Turn on the password function to prevent unauthorized access to the setting screen. The password can be changed in parameter H08, default off. For more details on pipe specifications, refer to ->
H08	Password	Modify the 4 digits password to prevent unauthorized access to the setting screen. The password function is enabled at parameter H07. The preset password is 0000. For more details on pipe specifications, refer to ->

H09	Home Page	Set the start-up screen, the default is instantaneous flow. For more details on pipe specifications, refer to ->
H10	Debug Page	Display the debugging screen, please return to the main screen after enabling it, and take a picture of the debugging screen information to the original factory to assist in debugging. For more details on pipe specifications, refer to ->
H11	Engineering Mode	Original factory use, please do not modify it. For more details on pipe specifications, refer to ->
		Display system information. For more details on

Z Category Options and Descriptions

The Z category lists the most frequently used functions from other categories in sequence, allowing users to adjust the device more conveniently.

Z02 Auto Pipe Spec – Automatic Pipe Specification Detection

This function automatically detects the pipeline specifications and, upon completion, switches to A02 to display the results. It is identical to A01. Utilising patented technology, the system senses the pipe dimensions and selects the closest matching specification. If the pipeline size has deformed or is not found in the database, a default pipeline specification will be used. Refer to A02 for further details.

Z03 Auto Initialization – Automatic System Initialization

Activating this function allows the flow meter to adjust its signal state according to environmental conditions. This function should be executed after every reinstallation. It is identical to A21.

Ensure the pipe is completely filled with liquid before executing this function. Pay attention to the installation position—refer to the mechanical installation section for details.

Z04 Auto Zero Offset – Automatic Zero-Flow Calibration

Ensure the pipeline is stationary and fully filled with liquid before executing this function to correct zero-flow errors. This function is identical to A22.

Z05 Scale Factor – Flow Scaling Factor Setting

Multiplies the measured flow data by a fixed ratio, adjustable from 0.001 to 1000. To configure negative flow measurement, refer to A17. This setting is synchronised with

K03.

A Category Options and Descriptions

A01 Auto Pipe Spec: Automatic Pipe Specification Detection

Automatically detects pipe specifications and, upon completion, automatically switches to A02 to display the results. This function is identical to Z02.

A02 Preset Pipe Spec: Pipe Specification

Select a pipe model to adjust the data, or choose "Custom" to define pipe dimensions and material. Supported pipe specifications are listed below:
A02 Different Model Preset Pipe Specification Table. For more details on pipe specifications, refer to ->

Pipe Material Options	RS-485 對應數字	Remarks
Custom	0	Default
cns w	1	
cns e	2	
jisk	3	
astm sch 40 pvc	4	
astm sch 40 sus	5	
astm sch 80 pvc	6	
jisg	7	
iso pp	8	
iso pvdf	9	

After selecting the command, please confirm whether to **Save** or **Not**.

A03 Pipe Geo. Unit: Pipe Dimension Unit

Specifies the unit for pipe dimensions, synchronized with B06.
A03 to A07 follow the model data range. For more details on pipe specifications, refer to ->

選項	RS-485 Numbers	Remarks
mm	0	Default
inch	1	

After selecting the command, please confirm whether to **Save** or **Not**.

A04 Pipe OD (Outer Diameter): Pipe Outer Diameter

When A01 is set to "Custom," the pipe outer diameter can be manually configured. The unit is determined by B06. Adjustments will automatically recalculate A04 and A06.
A03 to A07 follow the model data range. For more details on pipe specifications, refer to ->

Parameter Input Range	Values
Data Type	float32
Default	32
Minimum	1 mm
Maximum	200

After selecting the command, please confirm whether to **Save** or **Not**.

A05 Pipe Perimeter: Pipe Circumference

When A01 is set to "Custom," the pipe circumference can be manually configured. The unit is determined by B06. Adjustments will automatically recalculate A03 and A06.
A03 to A07 follow the model data range. For more details on pipe specifications, refer to ->

Parameter Input Range	Values
Data Type	float32
Default	
Minimum	3.15 mm
Maximum	800

After selecting the command, please confirm whether to **Save** or **Not**.

A06 Pipe Thickness: Pipe Wall Thickness

When A01 is set to "Custom," the pipe thickness can be manually configured. The unit is determined by B06. Adjustments will automatically recalculate A06.
A03 to A07 follow the model data range. For more details on pipe specifications, refer to ->

Parameter Input Range	Values
Data Type	float32
Default	2.5
Minimum	0.1 mm
Maximum	50

After selecting the command, please confirm whether to **Save** or **Not**.

A07 Pipe ID (Inner Diameter): Pipe Inner Diameter

When A01 is set to "Custom," the pipe inner diameter can be manually configured. The unit is determined by A02.
A03 to A07 follow the model data range. For more details on pipe specifications, refer to ->

Parameter Input Range	Values
Data Type	float32
Default	
Minimum	1 mm
Maximum	199

After selecting the command, please confirm whether to **Save** or **Not**.

A08 Pipe Material: Pipe Material

Specifies the pipe material to adjust flow data, or choose "Custom" to define the pipe's sound velocity.

Options	RS-485 Numbers	Remarks
Custom	0	Default
UPVC	1	
PVC	2	
PP	3	
PVDF	4	
ABS	5	
Steel	6	
SUS 304	7	
SUS 316	8	

After selecting the command, please confirm whether to **Save** or **Not**.

A09 Pipe Sound Speed: Pipe Sound Velocity

When A08 is set to "Custom," manually configure the pipe's sound velocity. The unit is determined by B04.

Parameter Input Range	Values
Data Type	float32
Default	2300
Minimum	500
Maximum	10000

After selecting the command, please confirm whether to **Save** or **Not**.

A10 Liquid Type: Fluid Type

Select the type of fluid to adjust the data, or choose "Custom" to define fluid parameters.

Options	RS-485 Numbers	Remarks
Custom	0	Default
Water 20℃	1	
Water 50℃	2	
Water 75℃	3	
Water 100℃	4	
Water 125℃	5	
Water 150℃	6	
Water 175℃	7	

Water 200℃	8	
Water 225℃	9	
Acetone	10	
Carbinol	11	
Ethanol	12	
Alcohol	13	
Acetaldehyde	14	
Arachis Oil	15	
Glycerin	16	
Gasoline	17	
Benzene	18	
Ethyl Benzene	19	
Toluene	20	
Chloromethane	21	
Petroleum	22	
Pine Oil	23	
Cloroethylene	24	
Ketone	25	
Glycol	26	

After selecting the command, please confirm whether to **Save** or **Not**.

A12 Liquid SS (Sound Speed): Fluid Sound Velocity

When A10 is set to "Custom," the fluid sound speed can be manually configured. The unit is determined by B04.

Parameter Input Range	Values
Data Type	float32
Default	1482
Minimum	100
Maximum	3000

After selecting the command, please confirm whether to **Save** or **Not**.

A13 K. Viscosity cST: Kinematic Viscosity in cST

When A10 is set to "Custom," the kinematic viscosity of the fluid can be manually configured. The unit is in centistokes (cST).

Parameter Input Range	Values
Data Type	float32
Default	1
Minimum	0.05
Maximum	20000

After selecting the command, please confirm whether to **Save** or **Not**.

A15 Damping: Damping Coefficient

Reduces data fluctuation. The minimum value is 0 (off), and the default is set to 3.

Parameter Input Range	Values
Data Type	int
Default	3
Minimum	0

Maximum	600

After selecting the command, please confirm whether to **Save** or **Not**.

A16 Direction: Flow Direction

Allows for reversing the direction of fluid flow. The default setting is normal flow.

Options	RS-485 Numbers	Remarks
Normal	0	Default
Inverse	1	

After selecting the command, please confirm whether to **Save** or **Not**.

A17 Neg Flow (Negative Flow): Negative Flow Display

Indicates whether negative flow is displayed. The default setting is enabled.

Options	RS-485 Numbers	Remarks
OFF	0	
ON	1	Default

After selecting the command, please confirm whether to **Save** or **Not**.

A18 Low Flow Cutoff: Force Zero

Displays a value of zero for flow rates below a specified absolute threshold. The default is set to 0 (disabled), with a maximum threshold of 150,000,000.

Parameter Input Range	Values

Data Type	float32
Default	0
Minimum	0

After selecting the command, please confirm whether to **Save** or **Not**.

A19 Fast Update: High-Speed Update

Increases the display update rate to within 0.5 seconds. The default setting is disabled.

Options	RS-485 Numbers	Remarks
OFF	0	Default
ON	1	

After selecting the command, please confirm whether to **Save** or **Not**.

A20 Anti-Noise: Noise Reduction

Eliminates unstable measurement noise. The default setting is enabled, but it can be disabled if required.

Options	RS-485 Numbers	Remarks
Off	0	
Low	1	Default
High	2	

After selecting the command, please confirm whether to **Save** or **Not**.

A21 Auto Initialization: Automatic Initialisation

Activating this function adjusts the signal state based on the environmental conditions. It is recommended to run this function after each reinstallation. This function is identical to Z03.

A22 Auto Zero Offset: Automatic Zero Flow Adjustment

Ensure the pipe is fully installed and filled. Activating this function corrects zero-flow errors. This function is synchronised with Z04.

A23 Zero Offset Setting

Manually adjust or reset the zero offset data to zero.

Parameter Input Range	Values
Data Type	float32
Default	0
Minimum	-100
Maximum	100

After selecting the command, please confirm whether to **Save** or **Not**.

A24 Startup Pipe Check: Initial Pipe Check at Startup

After activation, there is a 5-second window to confirm whether to use the A01 Auto Pipe Specification function. The default setting is enabled.

Options	RS-485 Numbers	Remarks
OFF	0	
ON	1	Default

After selecting the command, please confirm whether to **Save** or **Not**.

A25 Off-Pipe Zero: Off-Pipe Zero Function

Enables or disables the off-pipe state. The default setting is disabled.

Options	RS-485 Numbers	Remarks
OFF	0	Default
ON	1	

After selecting the command, please confirm whether to **Save** or **Not**.

A26 Beta Mode

Enables or disables Beta mode. The default setting is disabled.

Options	RS-485 Numbers	Remarks
Off	0	Default
Low	1	
High	2	

After selecting the command, please confirm whether to **Save** or **Not**.

A02 Preset Pipe Specification Table for Different Models

The RS-485 integer correspondence table is explained as follows.

RS-485 int	015	020	025	032	040	050
0(Default)	custom	custom	custom	custom	custom	cus
1	CNS W15 PVCU	CNS W20 PVCU	CNS W25 PVCU	CNS W32 PVCU	CNS W40 PVCU	CN PV
2	CNS E15 PVCU	CNS E20 PVCU	CNS E25 PVCU	CNS E32 PVCU	CNS E40 PVCU	CN PV
3	JIS K6742NO.15	JIS K6742NO.20	JIS K6742NO.25	JIS K6742NO.32	JIS K6742NO.40	JIS K67 0
4	ASTM¾"Sch40PVCU	ASTM1"Sch40PVCU	ASTMSch40PVCU	ASTMSch40PVCU	ASTMSch40PVCU	AS 0P
5	ASTM½"Sch40SS304	ASTM¾"Sch40SS304	ASTM1"Sch40SS304	ASTMSch40SS304	ASTMSch40SS304	AS 0S
6	ASTM½"Sch80PVCU	ASTM¾"Sch80PVCU	ASTM1"Sch80PVCU	ASTMSch80PVCU	ASTMSch80PVCU	AS 0P
7	JIS G3459NO.15	JIS G3459NO.20	JIS G3459NO.25	JIS G3459NO.32	JIS G3459NO.40	JIS G3 0
8	ISO 15 PP	ISO 20 PP	ISO 25 PP	ISO 32 PP	ISO 40 PP	ISO
9	ISO 15 PVDF	ISO 20 PVDF	ISO 25 PVDF	ISO 32 PVDF	ISO 40 PVDF	ISO PV

A03 ~ A07 Data Range Explanation Based on Model Specifications

A03 Options

A03 offers two different units for inputting pipe dimension data:

Options	RS-485 Numbers	Remarks
mm	0	Default
inch	1	

- Depending on the selection of A03 and the machine model, the input ranges for A04 ~ A07 will vary.
- If A04 ~ A07 values are entered first and A03's unit is subsequently changed, the machine will automatically perform unit conversion.
    - Example: If A04 (Outer Diameter) is entered as 1.0 in inch mode, and A03 is later switched to mm, the A04 value will automatically convert to 25.4 mm.
    -

Input Range for A04 ~ A07 When A03 is in mm Mode

Since the relationship is **OD - 2 × thickness = ID**, if any of the entered parameters cause one of these four parameters (OD, thickness, ID) to exceed the minimum or maximum limits, the data cannot be saved.

FU-ES015 (mm)

Parameter	Default	Minimum	Maximum
A04 Pipe OD(Outer Diameter)	22	15	30
A05 Pipe Perimeter	69.08	47.1	94.2
A06 Pipe thickness	2.7	0.5	5

A07 Pipe ID(Inner		5	20

FU-ES020 (mm)

Parameter	Default	Minimum	Maximum
A04 Pipe OD(Outer Diameter)	26	18	35
A05 Pipe Perimeter	81.64	56.52	109.9
A06 Pipe thickness	2.7	0.8	5.5
A07 Pipe ID(Inner Diameter)	20.6	7	33.4

FU-ES025 (mm)

Parameter	Default	Minimum	Maximum
A04 Pipe OD(Outer Diameter)	32	24	43
A05 Pipe Perimeter	100.48	75.36	135.02
A06 Pipe thickness	3.2	1	6
A07 Pipe ID(Inner Diameter)	25.6	12	41

FU-ES032 (mm)

Parameter	Default	Minimum	Maximum
A04 Pipe OD(Outer Diameter)	38	30	53
A05 Pipe Perimeter	119.32	94.2	166.42

A06 Pipe thickness	3.2	1	6
A07 Pipe ID(Inner	31.6	18	51

FU-ES040 (mm)

Parameter	Default	Minimum	Maximum
A04 Pipe OD(Outer Diameter) 管路外徑	48	36	65
A05 Pipe Perimeter 管路圓周	150.72	113.04	204.1
A06 Pipe thickness 管路厚度	3.7	1	6.5
A07 Pipe ID(Inner Diameter)	40.6	23	63

FU-ES050 (mm)

Parameter	Default	Minimum	Maximum
A04 Pipe OD(Outer Diameter)	60	46	78
A05 Pipe Perimeter	188.4	144.44	244.92
A06 Pipe thickness	4.1	1	8
A07 Pipe ID(Inner Diameter)	51.8	30	76

FU-ES065 (mm)

Parameter	Default	Minimum	Maximum

A04 Pipe OD(Outer Diameter)	76	58	92
A05 Pipe Perimeter	238.64	182.12	288.88
A06 Pipe thickness	4.1	1.4	10
A07 Pipe ID(Inner	[illegible]	38	89.2

FU-ES075 (mm)

Parameter	Default	Minimum	Maximum
A04 Pipe OD(Outer Diameter)	89	70	120
A05 Pipe Perimeter	279.46	219.8	376.8
A06 Pipe thickness	5.4	1.5	12
A07 Pipe ID(Inner Diameter)	78.2	46	117

Input Range for A04 ~ A07 When A03 is in Inch Mode

The same rule applies: **OD - 2 × thickness = ID**. If any entered parameter causes one of these four parameters to exceed the permissible range, saving will be restricted.

FU-ES015 (inch)

Parameter	Default	Minimum	Maximum
A04 Pipe OD(Outer Diameter) 管路外徑	0.866	0.591	1.181
A05 Pipe Perimeter 管路圓周	2.720	1.854	3.709
A06 Pipe thickness 管路厚度	0.106	0.02	0.197

A07 Pipe ID(Inner		0.197	1.142

FU-ES020 (inch)

Parameter	Default	Minimum	Maximum
A04 Pipe OD(Outer Diameter) 管路外徑	1.024	0.709	1.378
A05 Pipe Perimeter 管路圓周	3.214	2.225	4.327
A06 Pipe thickness 管路厚度	0.106	0.031	0.217
A07 Pipe ID(Inner Diameter)	0.811	0.276	1.315

FU-ES025 (inch)

Parameter	Default	Minimum	Maximum
A04 Pipe OD(Outer Diameter) 管路外徑	1.260	0.945	1.693
A05 Pipe Perimeter 管路圓周	3.956	2.967	5.316
A06 Pipe thickness 管路厚度	0.126	0.039	0.236
A07 Pipe ID(Inner Diameter)	1.008	0.472	1.614

FU-ES032 (inch)

Parameter	Default	Minimum	Maximum

A04 Pipe OD(Outer Diameter)	1.496	1.181	2.087
A05 Pipe Perimeter	4.698	3.709	6.552
A06 Pipe thickness	0.126	0.039	0.236

FU-ES040 (inch)

Parameter	Default	Minimum	Maximum
A04 Pipe OD(Outer Diameter)	1.890	1.417	2.559
A05 Pipe Perimeter	5.934	4.45	8.035
A06 Pipe thickness	0.146	0.039	0.256
A07 Pipe ID(Inner Diameter)	1.598	0.906	2.48

FU-ES050 (inch)

Parameter	Default	Minimum	Maximum
A04 Pipe OD(Outer Diameter)	2.362	1.811	3.071
A05 Pipe Perimeter	7.417	5.687	9.643
A06 Pipe thickness	0.161	0.039	0.315
A07 Pipe ID(Inner Diameter)	2.039	1.181	2.992

FU-ES065 (inch)

Parameter	Default	Minimum	Maximum
A04 Pipe OD(Outer Diameter)	2.992	2.283	3.622
A05 Pipe Perimeter	9.395	7.17	11.373
A06 Pipe thickness	0.161	0.055	0.394
A07 Pipe ID(Inner	2.660	1.496	3.512

FU-ES075 (inch)

Parameter	Default	Minimum	Maximum
A04 Pipe OD(Outer Diameter)	3.504	2.756	4.724
A05 Pipe Perimeter	11.002	8.654	14.835
A06 Pipe thickness	0.213	0.059	0.472
A07 Pipe ID(Inner Diameter)	3.079	1.811	4.606

B Category Options and Descriptions

B01 Vol. Unit (Volume Unit)

The unit for instantaneous flow volume, default is **L**.

- **Metric units**: L (litres), m³ (cubic metres)
- **Imperial units**: U.gal (US Gallon), I.gal (Imperial Gallon), ft³ (cubic feet)

Options	RS-485 Numbers	Remarks
L (Liter)	0	Default
m³	1	
US Gallon	2	
UK Gallon	3	
*ft*³	4	

After selecting the command, please confirm whether to **Save** or **Not Save**.

B02 Time Unit

The time unit for flow rate, available options: seconds, minutes, hours, days.

- Default: **minutes**

Options	RS-485 Numbers	Remarks
Second	0	
Minute	1	Default
Hour	2	
Day	3	

After selecting the command, please confirm whether to **Save** or **Not Save**.

B03 Total Unit (Total Volume Unit)

The unit for cumulative and historical volume measurements, default is **L**.

- **Metric units**: L (litres), m³ (cubic metres)
- **Imperial units**: U.gal (US Gallon), I.gal (Imperial Gallon), ft³ (cubic feet)

Options	RS-485 Numbers	Remarks
L (Liter)	0	Default
m³	1	
US Gallon	2	
UK Gallon	3	
*ft*³	4	

After selecting the command, please confirm whether to **Save** or **Not Save**.

B04 Velocity Unit

The unit for flow velocity and sound velocity, default is **m/s**.

- **Metric unit**: m/s (metres per second)
- **Imperial unit**: ft/s (feet per second)

Options	RS-485 Numbers	Remarks
m/s	0	Default
f/s	1	

After selecting the command, please confirm whether to **Save** or **Not Save**.

B05 Dec. Place (Decimal Place)

Specifies the number of decimal places displayed on the LCD/LED screen. Data is truncated without rounding.

- Maximum of 4 decimal places, default is **4**.
- This parameter affects display only, not calculations; cumulative flow uses original data.

Parameter Input	Values
Data Type	int
Default	1
Minimum	0
Maximum	4

After selecting the command, please confirm whether to **Save** or **Not Save**.

B06 Pipe Geo. Unit (Pipe Geometry Unit)

The unit for pipe dimensions, synchronised with **A03**.

Options	RS-485 Numbers	Remarks
mm	0	Default
inch	1	

After selecting the command, please confirm whether to **Save** or **Not Save**.

K Category Options and Descriptions

K02 Calibration Mode

Options	RS-485 Numbers	Remarks
Simple mode	0	Default

The simple calibration mode applies a formula to adjust the instantaneous flow rate:

Calibrated instantaneous flow = (K03 × uncalibrated instantaneous flow) − K04

Example 1
If the desired calibrated flow rate is half of the current displayed value, set **K03** to **0.5**, and leave **K04** at the default value **0**.

- Example:
  - Uncalibrated instantaneous flow: 5.0 L/min
  - Calibrated instantaneous flow: 2.5 L/min = 0.5 × 5.0 L/min

Example 2
For multi-point calibration requiring the addition or subtraction of a constant to maintain linearity:

Uncalibrated Flow Rate	Target Calibrated Flow Rate
10	4
20	9

Set **K03** to **0.5** and **K04** to **1.0**.

- 4 L/min = 0.5 × 10 L/min − 1.0
- 9 L/min = 0.5 × 20 L/min − 1.0

K03 Scale Factor

A proportional adjustment to the flow rate, default is **1.0**.
This parameter is synchronised with **Z05**.

Parameter Input	Values
Data Type	float32
Default	1.0
Minimum	0.001
Maximum	1000.

K04 Manual Offset

A fixed value is subtracted from the instantaneous flow rate according to the input. The unit matches the system setting.

- Example: Entering **1.0** subtracts 1.0 from the current flow. If the original flow is 3.0, the output becomes **2.0**.
  Default value: **0.0**.
  This parameter functions similarly to **Zero Offset** but operates independently.

Parameter Input	Values
Data Type	float32
Default	0
Minimum	-100000
Maximum	100000

K05 Totalizer Scale (Cumulative Total Ratio)

Adjusts the ratio of the amount added to the **Totalizer** from the calibrated instantaneous flow. It does not affect previously accumulated data. Adjustments amplify both positive and negative values.

- Use case: Maintain the same instantaneous flow data while accounting for differences in cumulative values (e.g., using density to reflect weight).

Default value: **1.0**.

Parameter Input	Values
Data Type	float32
Default	1
Minimum	0.001
Maximum	1000

Formula:

New cumulative value = Previous cumulative value + (K05 × newly added calibrated flow)

Example:
If the Totalizer currently increases by **1 L/min**, and the cumulative value is **100 L**, to double the accumulation rate without altering the flow rate, set **K05** to **2.0**:

- New cumulative value = 100 + 2 × 1 = **102 L**

C Category Options and Descriptions

C01 Total Method

Defines the method for calculating the cumulative flow. Options include:

- Positive Flow
- Negative Flow
- Net Flow

Changing this method will reset the cumulative flow data. Default setting: Positive Flow.

Option	RS-485 Numbers	Remarks
POS	0	Default
NET	1	
NEG	2	

After selecting a command, confirm whether to **Save** or **Not Save**.

C02 Del. Total (Delete Total)

Clears the cumulative flow data.
Selecting this option will reset all cumulative flow values to zero.

Option	RS-485 Numbers	Remarks
No	0	
Yes	1	

After selecting a command, confirm whether to **Save** or **Not Save**.

C03 Dosing Mode

Manually adjusts the dosing mode to either **Count Up** (incremental) or **Count Down** (decremental). Default setting: Off.

Option	RS-485 Numbers	Remarks
OFF	0	
Count Up	1	Default
Count Down	2	

After selecting a command, confirm whether to **Save** or **Not Save**.

C04 Dosing Target

Sets the target value for dosing operations. Default value: 1000.

Parameter Input Range	Values
Data Type	float32
Default	1000
Minimum	0.1
Maximum	999,999,999

After selecting a command, confirm whether to **Save** or **Not Save**.

C05 Dosing Timer

Resets the dosing timer. Minimum value: 1 second. Default value: 300 seconds.

Parameter Input Range	Values

Data Type	int
Default	300
Minimum	1

After selecting a command, confirm whether to **Save** or **Not Save**.

D Category Options and Descriptions

D01 Board Communication Alarm

An alarm is triggered when a carrier communication module malfunction is detected. Default setting: Do Not Disturb Mode.

Options	RS-485 Numbers	備註
On	1	
Do Not Disturb	2	Default

After selecting a command, confirm whether to **Save** or **Not Save**.

D02 Pipe Sensor Alarm

Alarm - A1: Triggers an alarm when the pipe diameter sensing module malfunctions. Default setting: Do Not Disturb Mode.

Options	RS-485 Numbers	Remarks
On	1	
Do Not Disturb	2	Default

After selecting a command, confirm whether to **Save** or **Not Save**.

D03 Bad Signal Alarm

Alarm - C3: Triggers an alarm when the ultrasonic signal is poor. Default setting: Do Not Disturb Mode.

Options	RS-485 Numbers	Remarks

On	1	
[illegible]	[illegible]	[illegible]

After selecting a command, confirm whether to **Save** or **Not Save**.

D04 Off-Pipe Alarm

Alarm - A4: Triggers an alarm when the flow meter is not correctly installed on the pipe.

- Default Do Not Disturb Mode: Red light will not flash, but when the alarm is triggered, flow is reset to zero, and alarm A04 is set to 1.
- **On:** Red light flashes, flow is reset to zero, and alarm A04 is set to 1 when triggered.

Options	RS-485 Numbers	Remarks
On	1	
Do Not Disturb	2	Default

After selecting a command, confirm whether to **Save** or **Not Save**.

D05 FlowLIM Ala. (Flow Volume Limit Alarm)

Alarm - B: Triggers an alarm when instantaneous flow exceeds the defined range. Can be turned off. Default: Off.

Options	RS-485 Numbers	Remarks
Off	0	Default
On	1	
Do Not Disturb	2	

After selecting a command, confirm whether to **Save** or **Not Save**.

D06 Up LIM (Upper Limit)

Defines the upper limit of the normal flow range for **D04**.

Parameter Input Range	Values
Data Type	float32
Default	100
Minimum	-99999
Maximum	100000

After selecting a command, confirm whether to **Save** or **Not Save**.

D07 Low LIM (Lower Limit)

Defines the lower limit of the normal flow range for **D04**.

Parameter Input Range	Values
Data Type	float32
Default	0
Minimum	-100000
Maximum	99999

After selecting a command, confirm whether to **Save** or **Not Save**.

D08 Hysteresis% (Hysteresis Percentage)

Sets the percentage of hysteresis for clearing flow upper/lower limit alarms. The percentage is defined as a portion of the range between the upper and lower limits.

- Range: 0–33%.

- Default: 3%.
- Must be a positive value.

Parameter Input Range	Values
Data Type	int
Default	3
Minimum	0
Maximum	10

After selecting a command, confirm whether to **Save** or **Not Save**.

D09 Total Ala. (Total Alarm)

Alarm - B: Triggers an alarm when the cumulative flow exceeds the defined range. Can be turned off. Default: Off.

Options	RS-485 Numbers	Remarks
Off	0	Default
On	1	
Do Not Disturb	2	

After selecting a command, confirm whether to **Save** or **Not Save**.

D10 Total Trig. (Total Alarm Trigger Condition)

Defines the trigger condition for the cumulative target value (**D11**), such as whether the value exceeds or falls below the target. Default: Greater Than Target.

Options	RS-485 Numbers	Remarks
Higher than target	0	Default

Lower than target	1	

After selecting a command, confirm whether to **Save** or **Not Save**.

D11 Total Target

Defines the cumulative target value.

Parameter Input Range	相應數值
Data Type	float32
Default	100
Minimum	-999,999,999
Maximum	999,999,999

After selecting a command, confirm whether to **Save** or **Not Save**.

D12 Iout Alarm

Alarm - B: Triggers an alarm when the output current exceeds the 4–20 mA range. Can be turned off. Default: Off.

Options	RS-485 Numbers	Remarks
Off	0	Default
On	1	
Do Not Disturb	2	

After selecting a command, confirm whether to **Save** or **Not Save**.

D13 Speed Alarm

Alarm - B: Triggers an alarm when the absolute value of flow velocity exceeds 6 m/s. Default: On.

Options	RS-485 Numbers	Remarks
Off	0	
On	1	Default
Do Not Disturb	2	

After selecting a command, confirm whether to **Save** or **Not Save**.

D14 PulseOverlap Alarm

Alarm - B: Indicates pulse output signal overlap due to an excessively large parameter setting in **E03**. Can be turned off. Default: On.

Options	RS-485 Numbers	Remarks
On	1	Default
Do Not Disturb	2	

After selecting a command, confirm whether to **Save** or **Not Save**.

D15 IoutStatAla (Iout Status Alarm)

Defines the alarm mode for Iout status. Options: **On**, **Off**, and **Do Not Disturb**.

- Default: Do Not Disturb Mode, where screen colour and LED indicators remain unchanged during an abnormality, but the status is displayed in the communication section and status page.

Options	RS-485 Numbers	Remarks
On	1	

Do Not Disturb	2	Default

After selecting a command, confirm whether to **Save** or **Not Save**.

D16 Dosing Alarm

Manually adjusts the dosing alarm mode. Options: **Off**, **On**, and **Do Not Disturb**. Default: Off.

Options	RS-485 Numbers	Remarks
Off	0	Default
On	1	
Do Not Disturb	2	

After selecting a command, confirm whether to **Save** or **Not Save**.

E Category Options and Descriptions

E01 NC/NO (Normally Closed or Normally Open)

Defines whether the circuit is in a conductive (open) or non-conductive (closed) state. Default: Non-conductive.

Options	RS-485 Numbers	Remarks
Normal Close	0	Default
Normal Open	1	

After selecting a command, confirm whether to **Save** or **Not Save**.

E02 OCT Info. (Output Control Terminal Definition)

Configures the operating mode of the OCT. Available options:

- **OFF**、**Alarm A**、**Alarm A + B**、**Alarm A + B + C Flow Alarm** (adjustable via **D05**, **D06**, **D07**)
- **Total Alarm** (adjustable via **D08**, **D09**, **D10**)
- **Pulse V2** (adjustable via **E03**, **E14**; see OCT Output page for usage details).

Default: OFF.

Options	RS-485 Numbers	Remarks
Alarm a	0	
Alarm a b	1	
Alarm a b c	2	
Over Flowrate	3	
Over Total	4	

Pulse 2.0	5	
Off	6	Default
Dosing	7	

After selecting a command, confirm whether to **Save** or **Not Save**.

E03 Pulse Width

Defines the pulse width when **E02** is set to Pulse V2.
Selectable values: **0.5 ms**, **1 ms**, **10 ms**, **50 ms**, **100 ms**. Default: 0.5 ms.

Options	RS-485 Numbers	Remarks
0.5 ms	0	Default
1 ms	1	
10 ms	2	
50 ms	3	
100 ms	4	

After selecting a command, confirm whether to **Save** or **Not Save**.

E04 Modbus ID

Configures the transmission protocol for Modbus ID. Default: 1.

Parameter Input Range	Values
Data Type	Int
Default	1
Minimum	1
Maximum	255

E05 Baud (Baud Rate)

Defines the Modbus communication baud rate. Options: **9600**, **19200**, **38400**, **57600**. Default: Disabled.

Options	RS-485 Numbers	Remarks
9600		
19200		
38400		
57600		
OFF		Default

The baud rate cannot be modified via RS485.

After selecting a command, confirm whether to **Save** or **Not Save**.

E06 Iout Def. (Analogue Output Definition)

Defines the data output via analogue signal. Options: **Off**, **Flow**, **Velocity**, or **Cumulative Flow**. The unit corresponds to settings in the B category. Default: Off.

Options	RS-485 Numbers	Remarks
Flowrate	0	
Velocity	1	
Total	2	
OFF	3	Default

After selecting a command, confirm whether to **Save** or **Not Save**.

E07 4mA Value / 0mA Value

Sets the value corresponding to 0 mA or 4 mA. Default: 0. Positive and negative values are accepted, but this value must be less than the **20mA Value**.

Parameter Input Range	Values
Data Type	float32
Default	0
Minimum	-100000
Maximum	100000

E08 20mA Value

Sets the value corresponding to 20 mA. Default: 100. Positive and negative values are accepted, but this value must be greater than the **4mA Value**.

Parameter Input Range	Values
Data Type	float32
Default	100
Minimum	-100000
Maximum	100000

E09 Iout Error (Analogue Output Error Value)

Configures the output value when the flow value is outside the range defined by **E07** and **E08**. Options:

1. **2.4 & 21.6** (Outputs 2.4 mA for values below **E07**, and 21.6 mA for values above **E08**).
2. **2.4 mA**.

3. **21.6 mA**.
4. **0 or 4 & 20 mA** (Outputs 4 mA or 0 mA—depending on **E13**—for values ≤ **E07** and 20 mA for values ≥ **E08**).

Default: **0 or 4 & 20 mA**.

Options	RS-485 Numbers	Remarks
2.4 mA & 21.6 mA	0	
2.4 mA	1	
21.6 mA	2	
4mA & 20mA	3	Default

After selecting a command, confirm whether to **Save** or **Not Save**.

E11 4mA Adj. uA / 0mA Adj. uA

Allows fine-tuning of the 0 mA or 4 mA output value, in units of microamps (uA). Adjustments immediately affect output current for real-time verification.

- Positive values increase the output. Negative values decrease the output.

Parameter Input Range	Values
Data Type	float32
Default	0
Minimum	-2000
Maximum	2000

E12 20mA Adj. uA

Allows fine-tuning of the 20 mA output value, in units of microamps (uA). Adjustments immediately affect output current for real-time verification.

- Positive values increase the output. Negative values decrease the output.

Parameter Input Range	Values
Data Type	float32
Default	0
Minimum	-2000
Maximum	2000

E13 Analogue Output Range

Defines the analogue signal output range. Options:

- **4–20 mA**
- **0–20 mA**

Default: 4–20 mA.
Modifying this parameter affects the options in **E09**. After changes, confirm that **E09** settings meet requirements.

Options	RS-485 Numbers	Remarks
4 - 20 mA	0	Default
0 - 20 mA	1	

After selecting a command, confirm whether to **Save** or **Not Save**.

E14 Pulse V2 Unit

Specifies the flow volume per pulse. The unit is determined by **B01** settings:

- **L** or **m³**: **Litres** (L)
- **U.gal** (US Gallon) or **ft³**: **US Gallons**
- **I.gal** (Imperial Gallon): **Imperial Gallons**

Options	RS-485 Numbers	Remarks
0.001 unit	0	Default
0.002 unit	1	
0.003 unit	2	
0.005 unit	3	
0.007 unit	4	
0.01 unit	5	
0.02 unit	6	
0.03 unit	7	
0.05 unit	8	
0.07 unit	9	
0.1 unit	10	
0.2 unit	11	
0.3 unit	12	
0.5 unit	13	
0.7 unit	14	
1 unit	15	
5 unit	16	
10 unit	17	
50 unit	18	
100 unit	19	

After selecting a command, confirm whether to **Save** or **Not Save**.

E15 Byte Format

Refer to RS485 and Modbus RTU settings for details.
This parameter cannot be modified via RS485.

Options	Remarks
N81	Default
N81	
O81	
E81	

After selecting a command, confirm whether to **Save** or **Not Save**.

E16 Bit Order

Refer to RS485 and Modbus RTU settings for details.
This parameter cannot be modified via RS485

Options	Remarks
LSB first	Default
MSB first	

After selecting a command, confirm whether to **Save** or **Not Save**.

E17 Endianness

Refer to RS485 and Modbus RTU settings for details.

Options	RS-485 Numbers	Remarks

Big Endian	0	Default
Little Endian	1	
Mid Big Endian	2	

After selecting a command, confirm whether to **Save** or **Not Save**.

F Category Options and Descriptions

F01 Sim. Rate (Simulation Rate) - Simulated Flow

Defines the instantaneous flow rate to simulate. The unit applied will follow the settings defined in the B classification parameters.

Parameter Input Range	Value
Data Type	float32
Default	60
Minimum	-100000
Maximum	100000

F02 Sim. Mode (Simulation Mode)

Activating this option enables the simulation function, which is disabled by default. When enabled, the OCT outputs (excluding pulse), RS485 communication, and analogue current output will operate based on the simulated data and changes in the totalised flow.

- Please note that the totalised flow and historical data will be affected.
- The main screen will display an indication that the system is in simulation mode. Ensure the relevant communication functions are enabled for proper operation.

Options	RS-485 Numbers	Remarks
OFF	0	Default
ON	1	

After selecting a command, confirm whether to **Save** or **Not Save**.

H Category Options and Descriptions

H01 LED Bri. (LED Brightness)

Adjusts the brightness of the LED indicator. Three levels are available: High, Medium, and Low. The default setting is **Medium**.

Options	RS-485 Numbers	Remarks
Low	0	
Mid	1	Default
High	2	

After selecting a command, confirm whether to **Save** or **Not Save**.

H02 LCD Bri. (LCD Brightness)

Adjusts the brightness of the LCD display. Three levels are available: High, Medium, and Low. The default setting is **Medium**.

Options	RS-485 Numbers	Remarks
Low	0	
Mid	1	Default
High	2	

After selecting a command, confirm whether to **Save** or **Not Save**.

H03 Green Light (Power Saving Mode for Green Backlight)

Defines the duration for which the green LCD backlight remains active. Options: 10 seconds, 60 seconds, or Always On. The default setting is **Always On**.

Options	RS-485 Numbers	Remarks
60 seconds	0	
Always On	1	Default
10 seconds	2	

After selecting a command, confirm whether to **Save** or **Not Save**.

H04 Language (Language Settings)

Selects the display language. Currently available options: **English**, **Traditional Chinese**, and **Simplified Chinese**. The default language is **English**.

Options	RS-485 Numbers	Remarks
Traditional Chinese	0	
English	1	Default
Simplified Chinese	2	

After selecting a command, confirm whether to **Save** or **Not Save**.

H06 Reset (Restore Factory Defaults)

Clears all custom settings and restores factory default values.

Options	RS-485 Numbers	Remarks
No	0	
Yes	1	

After selecting a command, confirm whether to **Save** or **Not Save**.

H07 Lock Device (Password Protection)

Enables the password protection feature to restrict unauthorised access to the settings page. The password can be configured via **H08**. The default setting is **Disabled**.

Options	RS-485 Numbers	Remarks
OFF	0	Default
ON	1	

After selecting a command, confirm whether to **Save** or **Not Save**.

H08 Password (Password Configuration)

Allows modification of the four-digit password to prevent unauthorised access to the settings page. Password protection must be activated in **H07**. The default password is **4321** (for older firmware, the default password is **0000**).

Parameter Input Range	Value
Data Type	int
Default Password	4321
Minimum	0000
Maximum	9999

After selecting a command, confirm whether to **Save** or **Not Save**.

H09 Home Page (Startup Display)

Defines the default display shown on the startup screen. The default setting is **Instantaneous Flow Rate**.

Options	RS-485 Numbers	Remarks
Flowrate	0	Default
Status Page	1	
Dosing	2	
Total (L)	3	
Velocity (L)	4	
Flowrate (L)	5	
Total	6	

After selecting a command, confirm whether to **Save** or **Not Save**.

H10 Debug Page (Diagnostics Display)

Activates the diagnostics display. After enabling, return to the main screen and capture the displayed debug information to share with the manufacturer for troubleshooting assistance.

Options	RS-485 Numbers	Remarks
OFF	0	
ON	1	Default

After selecting a command, confirm whether to **Save** or **Not Save**.

H11 Engineering Mode

This mode is intended **for manufacturer use only**. Do not modify any settings.
The item cannot be modified via RS485.

H12 System Info. Pass (System Information)

Displays essential system information, including firmware version and hardware details.
The item cannot be modified via RS485.

H13 Pipe Sensor System (Pipe Diameter Sensor System)

Configures or displays data related to the pipe diameter sensing system.
The item cannot be modified via RS485.

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Alarm and description of system conditions

Alarm - A Major Abnormality

Suggestions of system abnormality are the same with Failed message level mentioned in NAMUR NE107 standard.

The Output Display when the flow sensing function is abnormal or the host is abnormal.

“Error” is displayed on the LED screen, and the LCD backlight blinking red light.

Alarm - A Following explains error message bits from higher bit (7th digit) to lower bit (0th digit):

Bit	Definition Description of Errors
7	na
6	na
5	na
4	The flowmeter is not on the pipeline (off pipe)
3	Iout (0/4-20mA) IC Failure=1. Parameter D14 must be in the “on” or “do not disturb” state. (FW2.2.0 new function)
2	Iout (0/4-20mA) IC Overheating =1. Parameter D14 must be in the “on” or “do not disturb” state. (FW2.2.0 new function)
1	Abnormal pipe diameter sensing element.
0	Abnormal communication of ultrasonic components.

Alarm - B Out of Specification

Indicates out-of-range usage of flowmeter. Suggestions of system abnormality are the same with Out of Specification message level mentioned in NAMUR NE107 standard.

Indicates out of designed range flow volume and other matters needing attention. Could be set up in the main class of parameter D.

Display on the LED screen remains the same, and the LCD backlight will have a continuous red light.

Alarm - B Following explains error message bits from higher bit (7th digit) to lower bit (0th digit):

Bit	Definition Description of Errors
7	na
6	Cumulative volume exceeds target.
5	Data is larger than the corresponding upper limit of the analog output current.
4	Data is smaller than the corresponding lower limit of the analog output current.
3	Flow volume is higher than 6m/s.
2	(When OCT is set to Pulse output) Pulse width is too big, causing overlapping.
1	Instantaneous flow volume is higher than the defined upper limit.
0	Instantaneous flow volume is less than the defined lower limit.

Alarm - C Maintenance Required

Indicates maintenance requirement of flowmeter. Suggestions of system abnormality are the same with Maintenance Required message level mentioned in NAMUR NE107 standard.

Display on the LED screen remains the same, and the LCD backlight will have a continuous red light.

Alarm - C Following explains error message bits from higher bit (7th digit) to lower bit (0th digit):

Bit	Definition Description of Errors
7	na
6	na
5	na
4	na
3	Poor ultrasonic signal (0 bars)
2	The flowmeter installation problem leads to poor signal, it is recommended to lock the flowmeter evenly to achieve the best signal quality.
1	Iout(0/4-20mA) Excessive line impedance or no wiring = 1, normal = 0. Parameter D14 must be in the “on” or “do not disturb” state.
0	na

Alarm - D Function Check

Suggestions of system abnormality are the same with the Function Check message level mentioned in NAMUR NE107 standard.

The bit will be 1 when the device LCD screen is not one of the monitoring screens.

When the LED screen displays the set-up menu, the LCD backlight will have orange lighting.

Alarm - D Following explains error message bits from higher bit (7th digit) to lower bit (0th digit):

Bit	Definition Description of Errors
7	na

6	na
5	na
4	na
3	na
2	na
1	na
0	The device is not in the monitoring screen.

System Status

Following explains status bits from higher bit (7th digit) to lower bit (0th digit):

Bit	Definition Description of Errors
7	na
6	na
5	na
4	na
3	na
2	na
1	na
0	OCT is conducting (Close)=1, OCT is not conducting (Open)=0 Pulse output status is not included.

Troubleshootings and Abnormalities

Troubleshooting

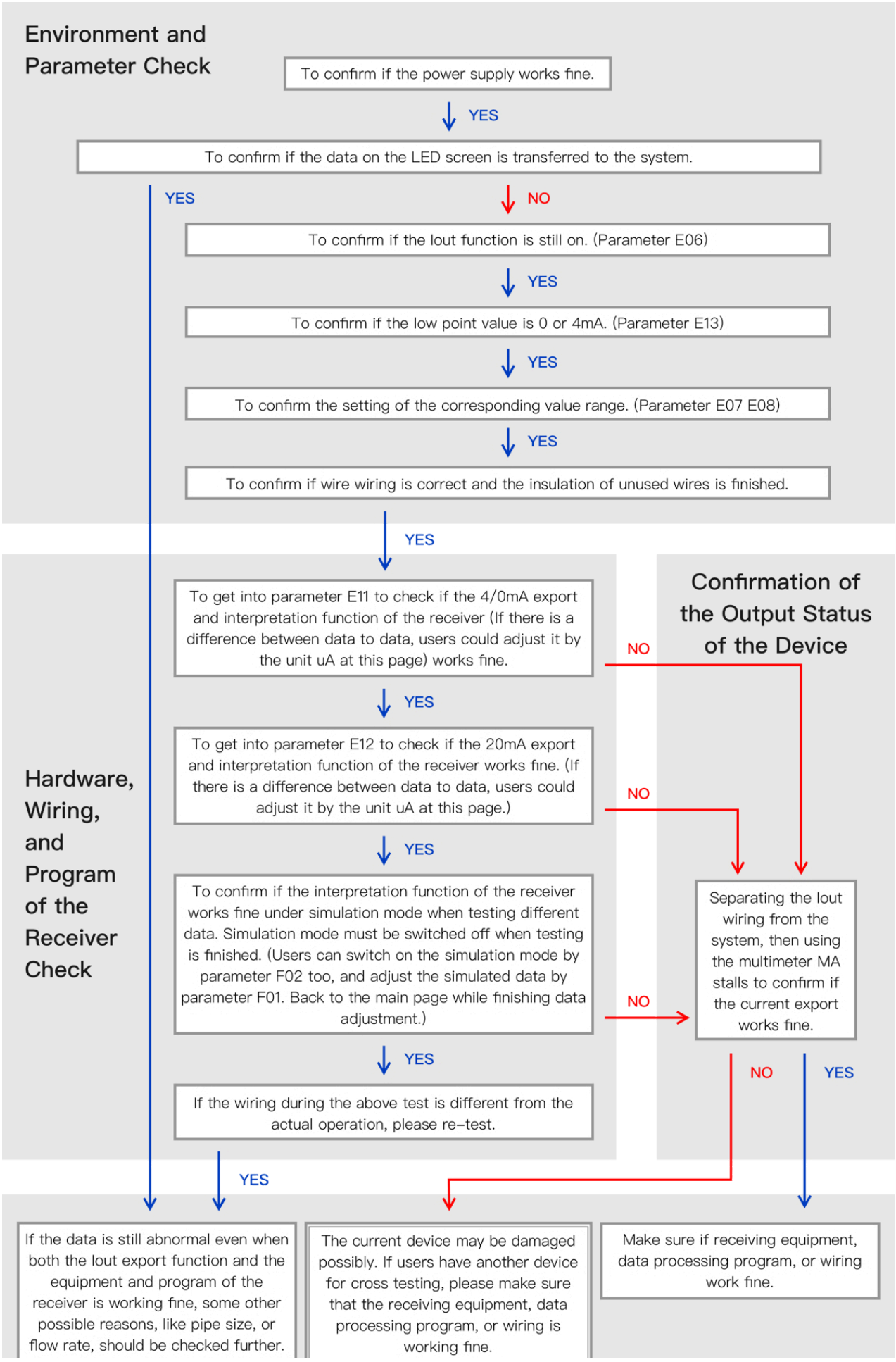
Messages Information	Possible Causes	Solution
Abnormal communication of ultrasonic components	Too much noise in the power system causes component abnormalities	1. Replace the power supply. 2. Verify that the power cord is not overwound. 3. Are the wires too close to high-noise electromechanical equipment such as motors and power lines?
	Device exception	Contact the original factory or agent.
Analog current signal unable to output	Abnormal wiring	Please make sure if the cable connection is correct or not.
	The function is not turned on	Please go to parameter E06 to turn on the function.
Abnormal output value of analog current signa	Output value needs to be fine tuned	Please adjust output current value by set-up parameters E11 and E12.
	Excessive Line and measuring resistance	1. Please confirm if total loop resistance exceeds usage limit, and if it is replaceable. 2. Please increase external supply voltage, proper external supply voltage will increase usage limit of total loop resistance.
	Wrong output parameter set-up	Please confirm the correction of set-up parameter E06 E07 E08 E09 E11 E12 E13.
RS485 Unable to receive response	Communication parameter set-up mismatch	Please confirm the correction of set-up parameter E04 E05.
	Address conflict	Please confirm that there is only one piece of equipment at a specified address.

RS485 signal is unstable	Poor wiring	Please refer to the wiring instructions to confirm if the wiring is correct.
Other abnormalities		Please use parameter H06 to return to the factory parameters

Abnormality

Issues	Possible Causes	Solutions
Persistent shut-down problems	Unstable power supply	Please confirm if supply voltage and current is within the range.
	Device exception	Contact the original factory or agent.

Iout 4-20/0-20mA debug process


Environment and Parameter Check
To confirm if the power supply works fine.
YES
To confirm if the data on the LED screen is transferred to the system.
YES
NO
To confirm if the Iout function is still on. (Parameter E06)
YES
To confirm if the low point value is 0 or 4mA. (Parameter E13)
YES
To confirm the setting of the corresponding value range. (Parameter E07 E08)
YES
To confirm if wire wiring is correct and the insulation of unused wires is finished.
YES
Hardware, Wiring, and Program of the Receiver Check
To get into parameter E11 to check if the 4/0mA export and interpretation function of the receiver (If there is a difference between data to data, users could adjust it by the unit uA at this page) works fine.
NO
YES
To get into parameter E12 to check if the 20mA export and interpretation function of the receiver works fine. (If there is a difference between data to data, users could adjust it by the unit uA at this page.)
NO
YES
To confirm if the interpretation function of the receiver works fine under simulation mode when testing different data. Simulation mode must be switched off when testing is finished. (Users can switch on the simulation mode by parameter F02 too, and adjust the simulated data by parameter F01. Back to the main page while finishing data adjustment.)
NO
YES
If the wiring during the above test is different from the actual operation, please re-test.
Confirmation of the Output Status of the Device
Separating the Iout wiring from the system, then using the multimeter MA stalls to confirm if the current export works fine.
NO
YES
YES
If the data is still abnormal even when both the Iout export function and the equipment and program of the receiver is working fine, some other possible reasons, like pipe size, or flow rate, should be checked further.
The current device may be damaged possibly. If users have another device for cross testing, please make sure that the receiving equipment, data processing program, or wiring is working fine.
Make sure if receiving equipment, data processing program, or wiring work fine.

Results and Actions	Contact the original manufacturer with the serial number, wiring diagram (all related wiring of the flowmeter), and the model and brand of receiver.

Environment and Parameter Check

1. To confirm if the power supply works fine.
2. To confirm if the data on the LED screen is transferred to the system.
3. To confirm if the Iout function is still on. (Parameter E06)
4. To confirm if the low point value is 0 or 4mA. (Parameter E13)
5. To confirm the setting of the corresponding value range. (Parameter E07 E08)
6. To confirm if wire wiring is correct and the insulation of unused wires is finished.

Hardware, Wiring, and Program of the Receiver Check

1. To get into parameter E11 to check if the 4/0mA export and interpretation function of the receiver (If there is a difference between data to data, users could adjust it by the unit uA at this page) works fine.
2. To get into parameter E12 to check if the 20mA export and interpretation function of the receiver works fine. (If there is a difference between data to data, users could adjust it by the unit uA at this page.)
3. To confirm if the interpretation function of the receiver works fine under simulation mode when testing different data. Simulation mode must be switched off when testing is finished. (Users can switch on the simulation mode by parameter F02 too, and adjust the simulated data by parameter F01. Back to the main page while finishing data adjustment.)
4. If the wiring during the above test is different from the actual operation, please re-test.

Confirmation of the Output Status of the Device

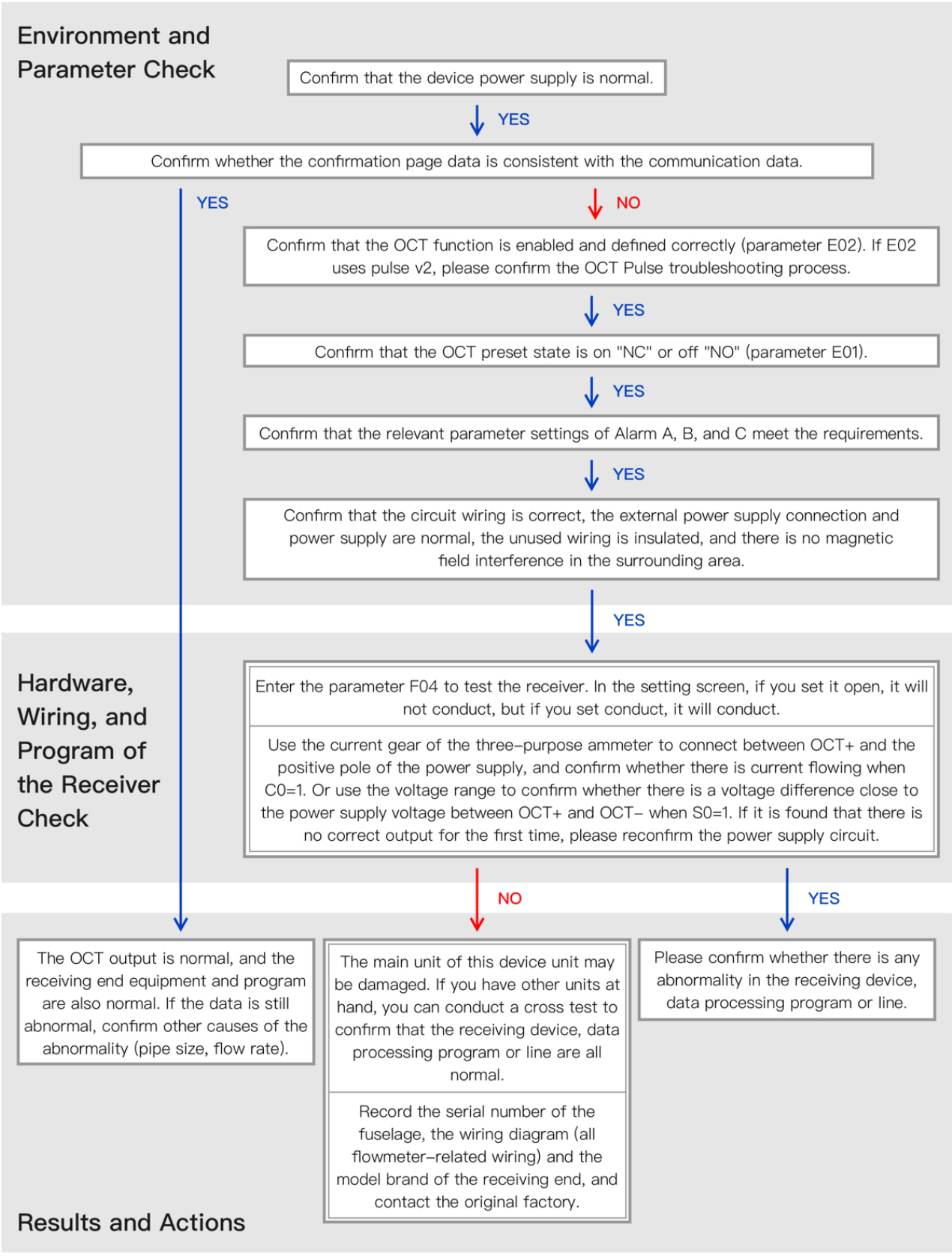
1. Separating the Iout wiring from the system, then using the multimeter MA stalls to confirm if the current export works fine.

Results and Actions

1. If the data is still abnormal even when both the Iout export function and the equipment and program of the receiver is working fine, some other possible reasons, like pipe size, or flow rate, should be checked further.
2. The current device may be damaged possibly. If users have another device for cross testing, please make sure that the receiving equipment, data processing program, or wiring is working fine.
3. Contact the original manufacturer with the serial number, wiring diagram (all related wiring of the flowmeter), and the model and brand of receiver.
4. Contact the original manufacturer with the serial number, wiring diagram (all related wiring of the flowmeter), and the model and brand of receiver.

Users need to refer to the actual situation, detailed troubleshooting, please contact LORRIC.

OCT Alarm Debug Process



Environment and Parameter Check

1. Confirm that the device power supply is normal.
2. Confirm whether the confirmation page data is consistent with the communication data.
3. Confirm that the OCT function is enabled and defined correctly (parameter E02). If E02 uses pulse v2, please confirm the OCT Pulse troubleshooting process.
4. Confirm that the OCT preset state is on "NC" or off "NO" (parameter E01).
5. Confirm that the relevant parameter settings of Alarm A, B, and C meet the requirements.
6. Confirm that the circuit wiring is correct, the external power supply connection and power supply are normal, the unused wiring is insulated, and there is no magnetic field interference in the surrounding area.

Hardware, Wiring, and Program of the Receiver Check

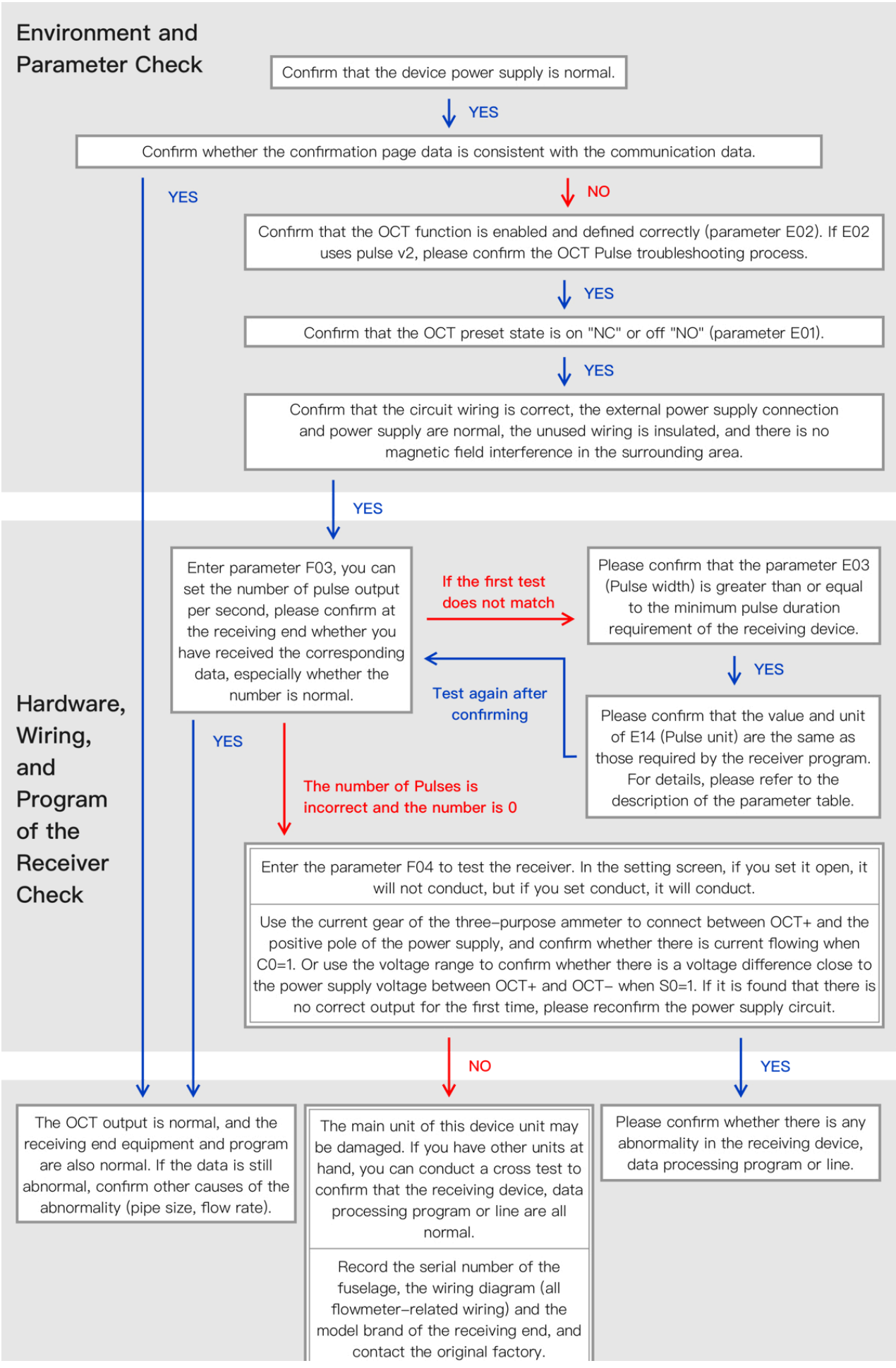
1. Enter the parameter F04 to test the receiver. In the setting screen, if you set it open, it will not conduct, but if you set conduct, it will conduct.
2. Use the current gear of the three-purpose ammeter to connect between OCT+ and the positive pole of the power supply, and confirm whether there is current flowing when C0=1. Or use the voltage range to confirm whether there is a voltage difference close to the power supply voltage between OCT+ and OCT- when S0=1. If it is found that there is no correct output for the first time, please reconfirm the power supply circuit.

Results and Actions

1. The OCT output is normal, and the receiving end equipment and program are also normal. If the data is still abnormal, confirm other causes of the abnormality (pipe size, flow rate).
2. The main unit of this device unit may be damaged. If you have other units at hand, you can conduct a cross test to confirm that the receiving device, data processing program or line are all normal.
3. Record the serial number of the fuselage, the wiring diagram (all flowmeter-related wiring) and the model brand of the receiving end, and contact the original factory.
4. Please confirm whether there is any abnormality in the receiving device, data processing program or line.

Users need to refer to the actual situation, detailed troubleshooting, please contact LORRIC.

OCT Pulse Debug Process


Environment and Parameter Check
Confirm that the device power supply is normal.
YES
Confirm whether the confirmation page data is consistent with the communication data.
YES
NO
Confirm that the OCT function is enabled and defined correctly (parameter E02). If E02 uses pulse v2, please confirm the OCT Pulse troubleshooting process.
YES
Confirm that the OCT preset state is on "NC" or off "NO" (parameter E01).
YES
Confirm that the circuit wiring is correct, the external power supply connection and power supply are normal, the unused wiring is insulated, and there is no magnetic field interference in the surrounding area.
YES
Hardware, Wiring, and Program of the Receiver Check
Enter parameter F03, you can set the number of pulse output per second, please confirm at the receiving end whether you have received the corresponding data, especially whether the number is normal.
If the first test does not match
Please confirm that the parameter E03 (Pulse width) is greater than or equal to the minimum pulse duration requirement of the receiving device.
YES
Test again after confirming
Please confirm that the value and unit of E14 (Pulse unit) are the same as those required by the receiver program. For details, please refer to the description of the parameter table.
YES
The number of Pulses is incorrect and the number is 0
Enter the parameter F04 to test the receiver. In the setting screen, if you set it open, it will not conduct, but if you set conduct, it will conduct.
Use the current gear of the three-purpose ammeter to connect between OCT+ and the positive pole of the power supply, and confirm whether there is current flowing when C0=1. Or use the voltage range to confirm whether there is a voltage difference close to the power supply voltage between OCT+ and OCT- when S0=1. If it is found that there is no correct output for the first time, please reconfirm the power supply circuit.
NO
YES
The OCT output is normal, and the receiving end equipment and program are also normal. If the data is still abnormal, confirm other causes of the abnormality (pipe size, flow rate).
The main unit of this device unit may be damaged. If you have other units at hand, you can conduct a cross test to confirm that the receiving device, data processing program or line are all normal.
Record the serial number of the fuselage, the wiring diagram (all flowmeter-related wiring) and the model brand of the receiving end, and contact the original factory.
Please confirm whether there is any abnormality in the receiving device, data processing program or line.

Results and Actions

Environment and Parameter Check

1. Confirm if the power supply works fine.
2. Confirm whether the confirmation page data is consistent with the communication data.
3. Confirm that the OCT function is enabled and defined correctly (parameter E02), if E02 uses pulse v2.
4. Confirm that the OCT preset state is on "NC" or off "NO" (parameter E01).
5. Confirm that the circuit wiring is correct, the external power supply connection and power supply work fine, the unused wiring is insulated, and there is no magnetic field interference in the surrounding area.

Hardware, Wiring, and Program of the Receiver Check

1. Enter parameter F03, you can set the number of pulse output per second, please confirm at the receiving end whether you have received the corresponding data, especially whether the number is normal.
2. Please confirm that the parameter E03 (Pulse width) is greater than or equal to the minimum pulse duration requirement of the receiving device.
3. Please confirm that the value and unit of E14 (Pulse unit) are the same as those required by the receiver program. For details, please refer to the description of the parameter table.
4. Enter the parameter F04 to test the receiving end. In the setting screen, if you set open, it will not conduct, and if you set conduct, it will conduct.
5. Use the current gear of the three-purpose ammeter to connect between OCT+ and the positive pole of the power supply, and confirm whether there is current flowing when C0=1. Or use the voltage range to confirm whether there is a voltage difference close to the power supply voltage between OCT+ and OCT- when S0=1. If it is found that there is no correct output for the first time, please reconfirm the power supply circuit.

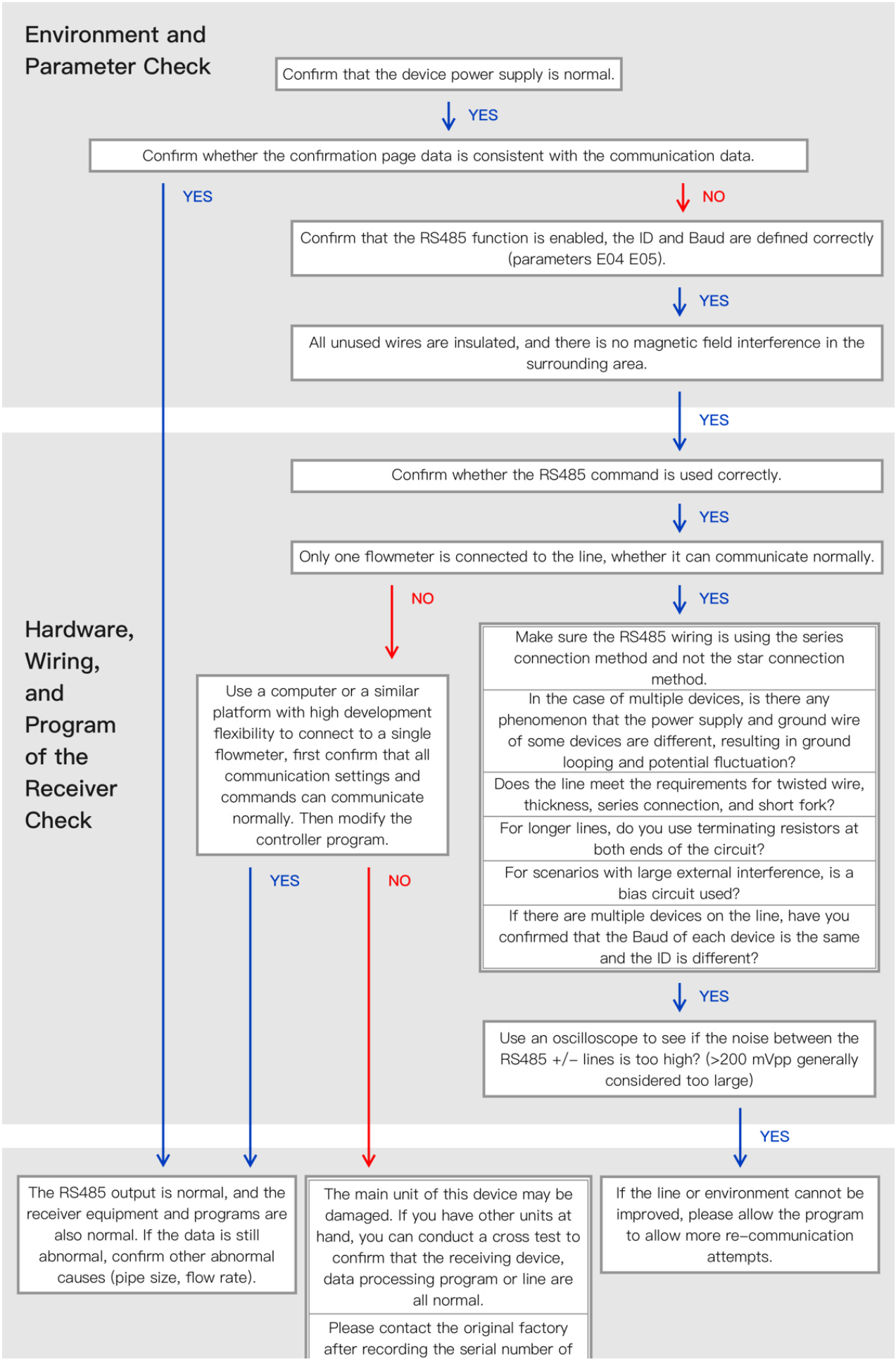
Results and Actions

1. The OCT output is normal, and the receiving end equipment and program are also normal. If the data is still abnormal, confirm other causes of the abnormality (pipe size, flow rate).

2. The main unit of this device may be damaged. If you have other units at hand, you can conduct a cross test to confirm that the receiving device, data processing program or line are all normal.
3. Record the serial number of the fuselage, the wiring diagram (all flowmeter-related wiring) and the model brand of the receiving end, and contact the original factory.
4. Please confirm whether there is any abnormality in the receiving device, data processing program or line.

Users need to refer to the actual situation, detailed troubleshooting, please contact LORRIC.

RS485 Debug Process


Environment and Parameter Check
Confirm that the device power supply is normal.
YES
Confirm whether the confirmation page data is consistent with the communication data.
YES
NO
Confirm that the RS485 function is enabled, the ID and Baud are defined correctly (parameters E04 E05).
YES
All unused wires are insulated, and there is no magnetic field interference in the surrounding area.
YES
Hardware, Wiring, and Program of the Receiver Check
Confirm whether the RS485 command is used correctly.
YES
Only one flowmeter is connected to the line, whether it can communicate normally.
NO
YES
Use a computer or a similar platform with high development flexibility to connect to a single flowmeter, first confirm that all communication settings and commands can communicate normally. Then modify the controller program.
YES
NO
Make sure the RS485 wiring is using the series connection method and not the star connection method.
In the case of multiple devices, is there any phenomenon that the power supply and ground wire of some devices are different, resulting in ground looping and potential fluctuation?
Does the line meet the requirements for twisted wire, thickness, series connection, and short fork?
For longer lines, do you use terminating resistors at both ends of the circuit?
For scenarios with large external interference, is a bias circuit used?
If there are multiple devices on the line, have you confirmed that the Baud of each device is the same and the ID is different?
YES
Use an oscilloscope to see if the noise between the RS485 +/− lines is too high? (>200 mVpp generally considered too large)
YES
The RS485 output is normal, and the receiver equipment and programs are also normal. If the data is still abnormal, confirm other abnormal causes (pipe size, flow rate).
The main unit of this device may be damaged. If you have other units at hand, you can conduct a cross test to confirm that the receiving device, data processing program or line are all normal.
Please contact the original factory after recording the serial number of
If the line or environment cannot be improved, please allow the program to allow more re-communication attempts.

Results and Actions	the fuselage, the wiring diagram (all flowmeter–related wiring) and the model brand of the receiving end.

Environment and Parameter Check

1. Confirm that the device power supply is normal.
2. Confirm whether the confirmation page data is consistent with the communication data.
3. Confirm that the RS485 function is enabled, the ID and Baud are defined correctly (parameters E04 E05).
4. Confirm that the advanced parameters are set correctly (parameters E15 E16 E17).
5. All unused wires are insulated, and there is no magnetic field interference in the surrounding area.

Hardware, Wiring, and Program of the Receiver Check

1. Confirm whether the RS485 command is used correctly.
2. Only one flowmeter is connected to the line, whether it can communicate normally.
3. Make sure the RS485 wiring is using the series connection method and not the star connection method.
4. In the case of multiple devices, is there any phenomenon that the power supply and ground wire of some devices are different, resulting in ground looping and potential fluctuation?
5. Does the line meet the requirements for twisted wire, thickness, series connection, and short fork?
6. For longer lines, do you use terminating resistors at both ends of the circuit?
7. For scenarios with large external interference, is a bias circuit used?
8. If there are multiple devices on the line, have you confirmed that the Baud of each device is the same and the ID is different?
9. Use an oscilloscope to see if the noise between the RS485 +/- lines is too high? (>200 mVpp generally considered too large)
10. Use a computer or a similar platform with high development flexibility to connect to a single flowmeter, first confirm that all communication settings and commands can communicate normally. Then modify the controller program.

Results and Actions

1. The RS485 output is normal, and the receiver equipment and programs are also normal. If the data is still abnormal, confirm other abnormal causes (pipe size, flow rate).
2. The main unit of this device may be damaged. If you have other units at hand, you can conduct a cross test to confirm that the receiving device, data processing program or line are all normal.
3. Please contact the original factory after recording the serial number of the fuselage, the wiring diagram (all flowmeter-related wiring) and the model brand of the receiving end.
4. If the line or environment cannot be improved, please allow the program to allow more re-communication attempts.

Users need to refer to the actual situation, detailed troubleshooting, please contact LORRIC.

Certification

This product has passed the third-party IP66(Not UL certificated) test and obtained CE, FCC test.

Rohs application pending.