DL501 Intelligent Quantitative Control System

(Single channel quantitative control)

Operating Instruction

preface

- Thank you very much for using our intelligent quantitative control system!
- This manual provides the performance indicators, installation wiring, operation, parameter setting, fault diagnosis and other aspects of the use of this quantitative control system. Before operation, please read this manual carefully, correctly master the use method before specific operation, to avoid unnecessary losses caused by wrong operation.
- After you have read it, please keep it in a place where you can easily read it at any time for reference.

statement

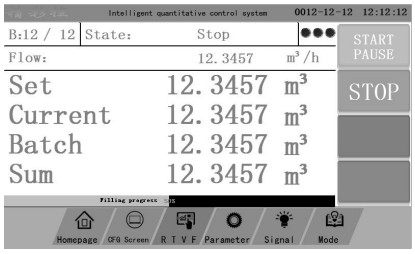
- This manual may be modified due to functional and performance upgrades without prior notice.
- The contents of this manual are strictly prohibited from being reproduced in whole or in part.
- We make every effort to ensure that the contents of this manual are correct and error-free. If you find any inappropriate or incorrect information, please contact us.

edition

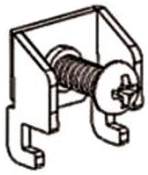
DL501-V1.0.0

Pack the items

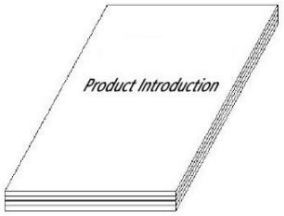
Please confirm the following items before you use the package box. If there is any error in the product or quantity received or physical damage to the appearance, please contact our company or sales outlets.



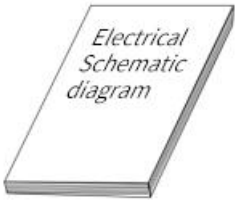
Liquid quantitative control system



Install the LCD screen clip



operating instruction



Electrical schematic

certificate

order number	name	quantity	remarks
1	Liquid quantitative control box	1	
2	Install clips (including screws)	4	Used for disc installation and fixation
3	instructions	1	
4	Electrical schematic	1	
5	certificate	1	

matters need attention

- If the instrument is found to be damaged due to transportation, please contact the manufacturer.
- This series of instruments is suitable for general industrial occasions, if there are special requirements for use please set up a separate protection device.
- For the safety of you and the instrument, please do not install it with power on. Please use the rated voltage power supply, correct wiring, proper grounding, after connecting the power supply, please do not touch the terminal at the back of the instrument to prevent electric shock.
- The instrument should be installed indoors, and the installation position should ensure smooth ventilation (to prevent the internal temperature of the instrument from being too high), avoid wind and rain and direct sunlight, and do not install in the following situations:
  - Where temperature and humidity exceed the operating conditions
  - Where corrosive, combustible or explosive gases are present
  - Where there is a lot of dust, salt and metal powder
  - Where water, oil and chemical liquids are easily splashed
  - Where there is direct vibration or impact
  - Where electromagnetic sources are used
- The instrument should take corresponding shielding measures in the case of interference such as power supply line, strong electric field, strong magnetic field, static electricity, noise or AC contactor.
- In order to extend the service life of the instrument, please carry out regular maintenance and maintenance. Do not repair or disassemble the instrument by yourself. When wiping the instrument, please use a clean soft cloth, do not dip in alcohol, gasoline and other organic solvents to clean, which may cause discoloration or deformation.
- If the instrument has water in, smoke, odor, abnormal sound and other conditions, please immediately cut off the power supply, stop using and contact the supplier or our company in time.

CATALOGUE

CHAPTER 1. OVERVIEW ····· 1

1.1 Product Introduction ····· 1
1.2 Product features ····· 1

CHAPTER 2 TECHNICAL SPECIFICATIONS ····· 3

2.1 Product appearance ····· 3
2.2 Technical parameters ····· 3

CHAPTER 3 INSTALLATION AND WIRING ····· 5

3.1 Installation tips ····· 5
3.2 Installation method ····· 5
3.3 Opening size ····· 6
3.4 LCD screen installation diagram ····· 6
3.5 Distribution wiring ····· 8

CHAPTER 4 INSTRUMENT DISPLAY AND OPERATION ····· 10

4.1 Operation of the operation interface ····· 10

CHARPTER 5 PARAMETER SETTING AND AUXILIARY SCREEN ····· 11

5.1 Flow configuration ····· 11
5.1.1 Input signal Settings ····· *11*
5.1.2 Compensation Settings ····· *11*
5.1.3 Output signal Settings ····· *12*
5.1.4 Pulse input type parameter setting ····· *12*
5.1.5 4-20mA input type parameter setting ····· *12*
5.2 Modify configuration ····· 13
5.2.1 Interference signal correction ····· *13*
5.2.2 Flow accumulation Settings ····· *13*
5.2.3 Pulse coefficient correction (effective when the signal type is pulse signal input) ····· *13*
5.3 Formula configuration ····· 14
5.4 System configuration ····· 15
5.4.1 Time Settings ····· *15*
5.4.2 Change the password ····· *15*
5.4.3 Restore factory ····· *15*
5.5 Signal debugging ····· 16
5.6 Record query ····· 16

CHAPTER 6 COMMUNICATIONS ····· 17

6.1 Printer connection (optional) ····· 17
6.2 RS485 communication ····· 17
6.3 RS485 communication parameters ····· 18
6.4 Register address list ····· 19

CHAPTER 7 FAULT ANALYSIS AND USAGE EXAMPLES ····· 21

7.1 Fault analysis ····· 21
7.2 Usage Examples ····· 21

CHAPTER 8 SERVICE GUIDE ····· 23

Chapter 1. Overview

1.1 Product Introduction

The intelligent liquid flow quantitative control system is a specialized intelligent quantitative control product developed by our company, drawing on extensive experience in quantitative control of petrochemicals, liquid materials, and material level. This system, centered around an industrial-grade ARM core CPU, features high precision, fast response, ease of operation, and a wide range of functions.

It can measure and control flow meters, thermometers, scales (optional), and level meters (optional). It forms a complete intelligent quantitative control system with electromagnetic valves and pump bodies. This system is suitable for automated control systems in industries such as petroleum, chemical, agriculture, medicine, and food, including quantitative filling, metering, loading, batching, discharging, material distribution, and gas addition.

DL501 intelligent LCD quantitative control system can be connected to the pulse signal of electromagnetic and turbine flowmeter, analog signal of thermometer, serial communication signal of weighing meter and flowmeter.

The DL501 intelligent LCD quantitative control system features a flexible configuration interface and a 7-inch full LCD display. It allows for easy and convenient adjustments to set values. The system includes a large-capacity contact relay and is equipped with an unloaded operation protection alarm, which prevents pump wear caused by abnormal flow or dry pumping. It is designed for high reliability and a long operational life, and supports secondary development. It is an ideal choice for quantitative filling and dispensing applications.

1.2 Product features

- High-performance industrial-grade ARM CPU embedded processor is adopted to realize automatic intelligent quantitative control.
- 7-inch LCD screen, real-time display of instantaneous flow, quantity, quantity, batch, total.
- The all-liquid crystal touch design makes it easier to set technical parameters such as working mode, batch and quantity.

- It has the intelligent cyclic filling function according to the quantitative interval time of each batch automatically.
- Working mode setting, can preset any filling mode, automatic circulation to improve work efficiency.
- It can realize pulse frequency input and serial port communication input to calculate the amount of use.
- It can control 2 sets of valves and 1 set of pump control, and can be expanded.
- Optional bill printing function.
- Industrial grade quality assurance, stable and reliable performance, high cost performance.

Chapter 2 Technical Specifications

2.1 Product appearance

2.2 Technical parameters

name	configure
Power supply for distribution box	AC220v or AC380V (three-phase four-wire) 8W
screen	7-inch LCD display
incoming signal	Flow pulse: 0 ~ 5KHZ, low level less than or equal to 1V, high level greater than or equal to 10V Flow serial port signal: 9600bits/s Temperature analog signal: 4-20mA (optional)
output signal	Relay output of 3 circuits Contact capacity 220VAC 5A 30VDC 5A Support three relay contact outputs for large valve, small valve and pump.
interactive mode	Four switch signals: start/pause, stop, reset, print

External power supply	DC24V 1A all the way
display mode	7-inch industrial display (configurable)
Measure the medium	Liquid/gas is determined by the flowmeter
Set the quantity	Multiple working modes, batch, quantitative value, lead time working mode can be quickly switched
Set the unit	m3/h、L/h、T/h、K/h、g/h、L/m
communication	Print ticket interface on the way (optional) The whole RS485 communication supports modbus RTU protocol
service condition	Environmental temperature: --20℃~70℃ Air relative humidity <95% (no condensation)
size	Size: 400*300*150mm (high * width * thickness)

pay attention to

- The technical parameters are the general indicators of this series of instruments, and the function configuration is subject to the actual goods.
- If the technical parameters are not consistent with the physical instrument, please take the physical instrument as the standard.

Chapter 3 Installation and wiring

3.1 Installation tips

This section describes the installation site and method of this LCD screen. Please read this section when installing.

Installation precautions:

- This LCD screen is disk-mounted. Please install indoors, away from wind and rain and direct sunlight.
- To prevent the internal temperature of this instrument from rising, please install in a well-ventilated place.
- When installing this instrument, please do not tilt left and right, try to install horizontally.

Avoid the following places during installation:

- Where the sun shines directly and near hot appliances.
- Workplace where the ambient temperature exceeds 50℃.
- Workplaces with humidity exceeding 85%.
- Near the source of electromagnetic induction.
- A place with strong mechanical vibration.
- A place where large temperature changes are prone to condensation.
- Where there is a lot of smoke, steam, moisture, dust and corrosive gases.

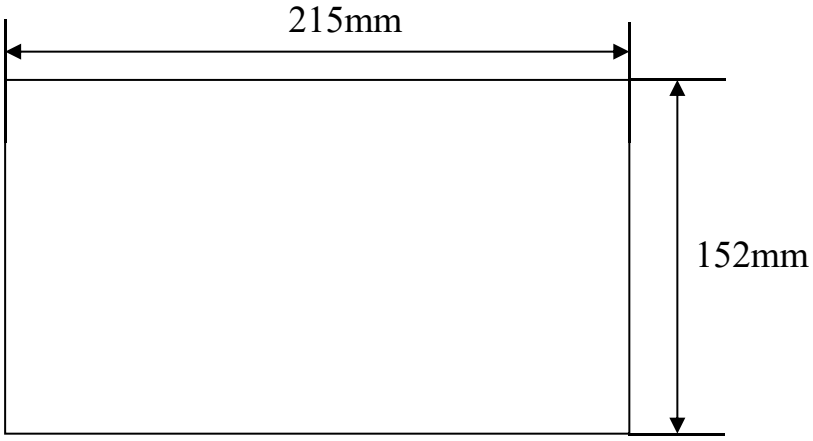
3.2 Installation method

Use 1.5~6.5mm steel plate for the instrument panel.

1. Place the instrument in front of the dashboard.
2. Install the installation bracket with the LCD screen as shown in the figure below.

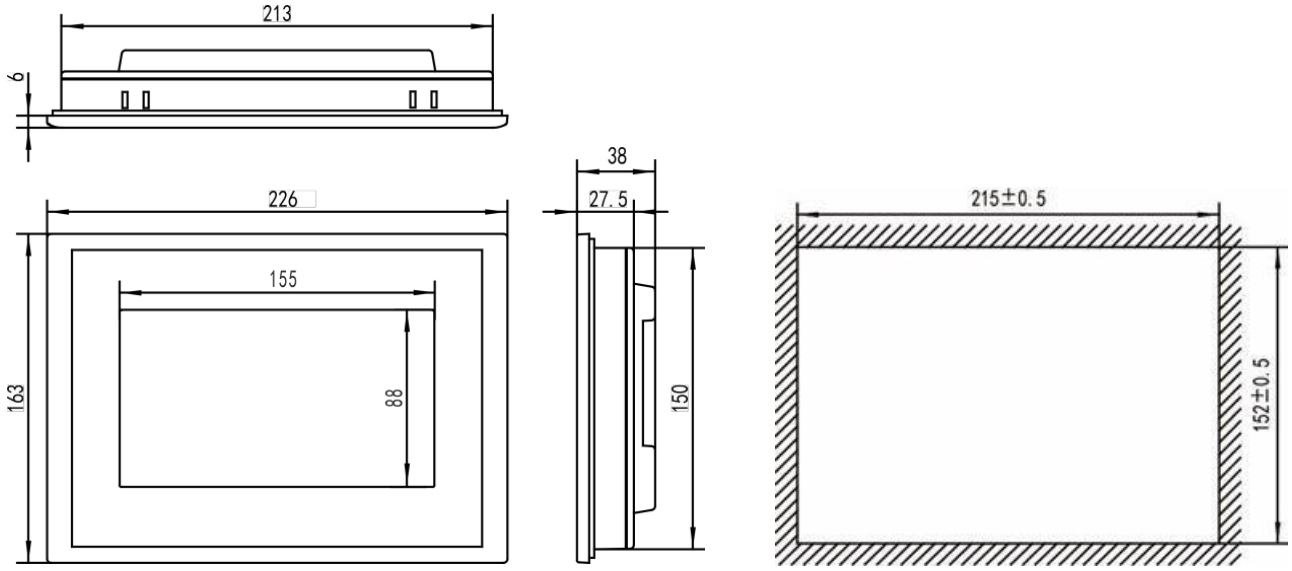
- Install the bracket on both sides of the LCD screen.
- The screws used for the dashboard mounting bracket are M4 standard screws.

3.3 Opening size

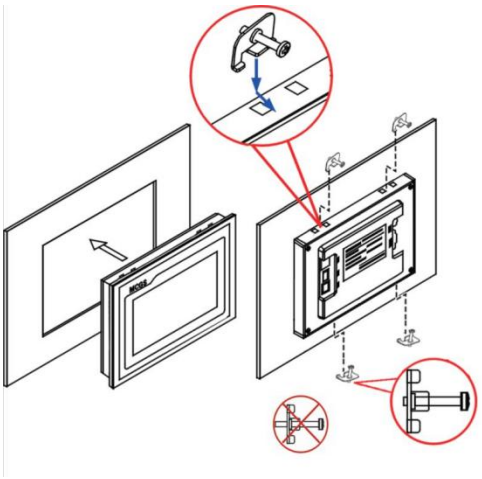


When installed centrally, the minimum spacing between instrument rooms is 20mm to ensure necessary heat dissipation and loading space. The above figure is in mm.

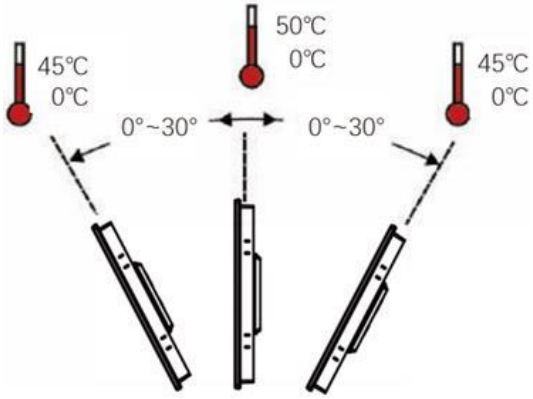
3.4 LCD screen installation diagram



method of erection ：



Hook installation



Installation Angle

3.5 Distribution wiring

To improve the safety of the distribution box, please follow the following warnings when wiring:

pay attention to

- To prevent electric shock, confirm that the supply power is cut off before wiring.
- Use double insulation to prevent fire.
- There is a circuit breaker switch in the distribution box. Please disconnect the circuit breaker when wiring.
- Tighten the terminal screw firmly. Torque: 0.5N.m(5kgf.cm).
- After connecting the power cable, connect the power supply and check whether the LCD screen of the distribution box is normal. Do not connect the signal line before this. After confirming that it can work normally, disconnect the power supply and then connect the signal line.
- The measurement circuit and the power supply circuit should be laid separately. The measurement object should not be a source of interference. If it cannot be avoided, please insulate the measurement object from the measurement circuit and ground the measurement object.
- For the interference generated by static electricity, it is better to use shielding wire.
- For the interference caused by electromagnetic induction, it is better to connect the measuring circuit with dense twisting at equal distance.

Distribution box terminal definition:

Terminal name	L1	L2	L3	N	T11	T21	T31	L12	N2	1F24	1F+	1F-
explain	AC380V source			null line	380v pump			220v electromagnetic valve		pulsing signal flowmeter		

Definition of the upper terminal on the quantitative controller host:

Terminal name	description
RB	LCD hold
RA	
RB	Collect meter reading interface
RA	
RB	Modbus RTU communication interface
RA	
F1+	1# Flowmeter pulse signal input
NC	
F0V	DC power output Maximum load current 0.2A
F24V	
Kcom	Button inputs public points

Definition of the lower row terminals of the quantitative controller host:

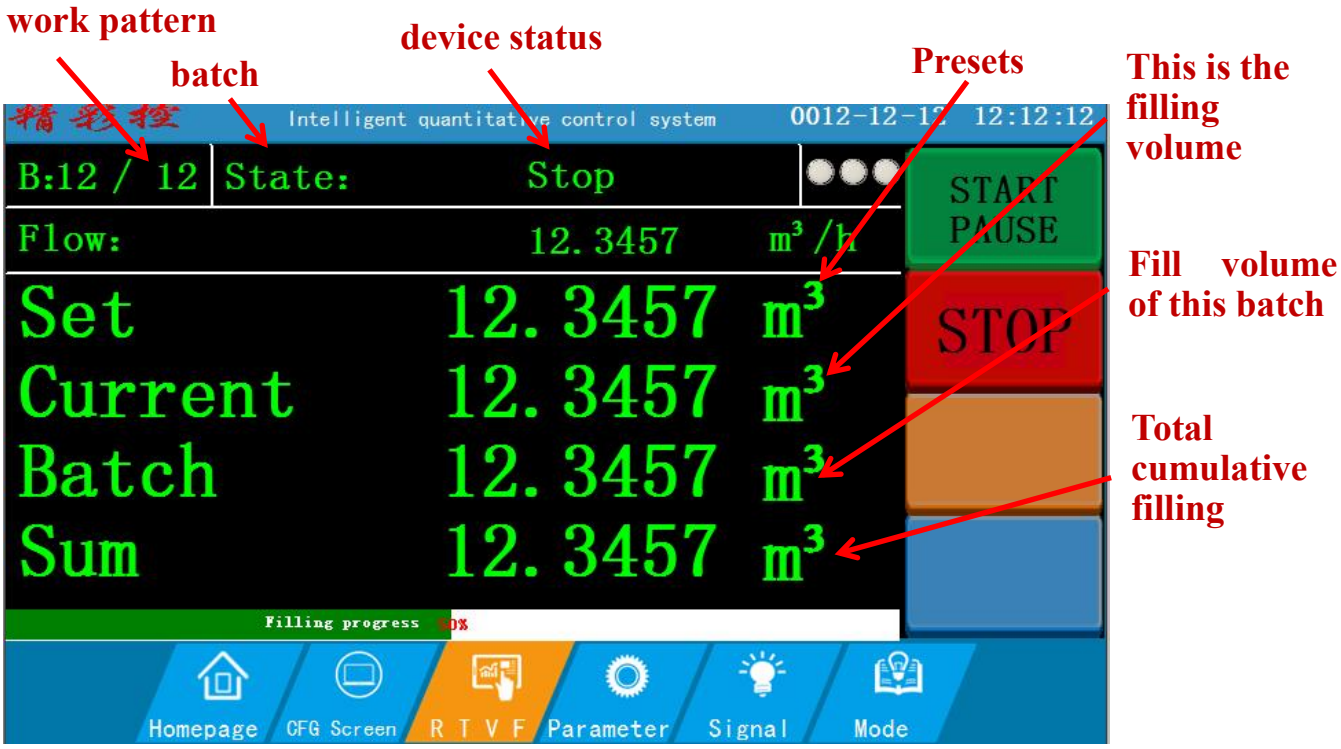
Terminal name	description
V+	Power supply 24V DC
V-	
K1	1# Start/pause button
K2	1# Stop button
K3	
K4	
DO1	1# solenoid valve relay
DO2	1# Electric pump relay
RA	printer interface
RB	
COM	Relay with load current of 3A

pay attention to

- The power supply voltage at the project site must be limited to the voltage range that the instrument can withstand.
- Do not plug or unplug communication cables with power on.
- This specification gives the basic wiring diagram. When the instrument function conflicts with the basic wiring diagram, please take the actual object as the standard.

Chapter 4 Instrument display and operation

4.1 Operation of the operation interface



The operation interface is the main interface for users to operate. It displays the current device's operation data and status in real time.

The status of the device includes:

Waiting to start: The device waits for a start command.

Being filled: The equipment is in operation.

Pause: the device is in the pause stage. Press the pause button again to continue running.

Stop: The device becomes the stop state after running.

Abnormal flow: the instantaneous flow within the set time is less than the predetermined value (refer to 5.1.3 for details).

Control operation area:

[Start/Pause]: The control system starts to perform quantitative filling. During the filling, you can pause the filling by pressing the pause button, and press the pause button again to continue filling until the quantitative value is reached and stop automatically.

[Stop]: Stop filling forcibly and end the quantitative filling of this batch.

[Clear]: Batch value is cleared.

[Print]: Print the receipt.

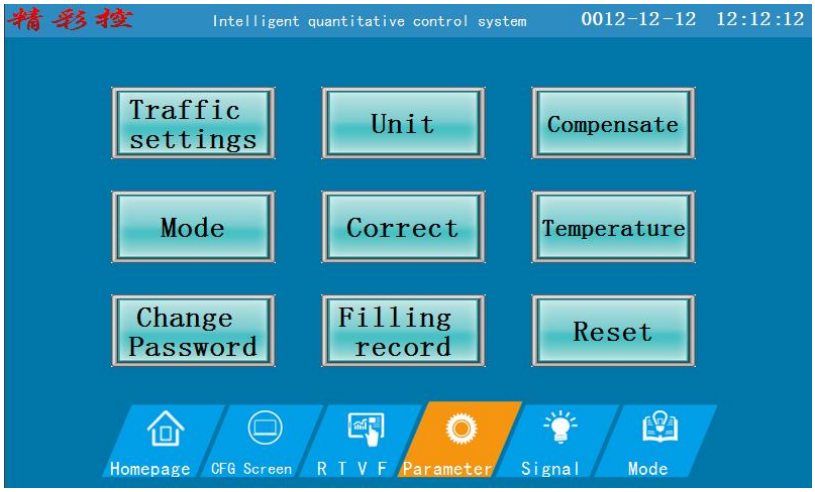
[Mode]: Short press to switch work mode.

Charpter 5 Parameter setting and auxiliary screen

Press the parameter setting key, enter the password (default 000000) and enter the setting screen.

5.1 Flow configuration

Configuration position: parameter setting → flow



5.1.1 Input signal Settings

Signal input type: 4-20mA \ pulse \ RS485.

Unit of flow selection: m3/h L/h T/h Kg/h g/h L/m.

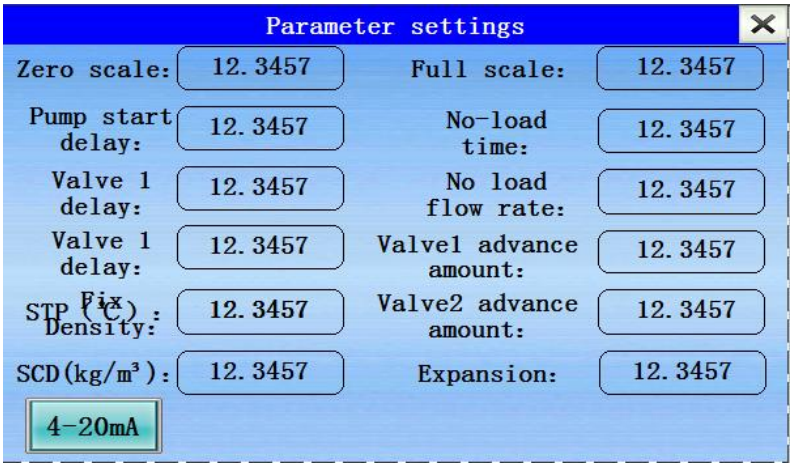
Compensation method: fixed density, other liquids (input medium density varies with temperature).

5.1.2 Compensation Settings

The compensation method is fixed density: fixed density (Kg/m3).

The compensation method is other liquids: standard temperature (℃), standard density (kg/m ^{3}), expansion coefficient, upper limit of temperature range, lower limit of temperature range.

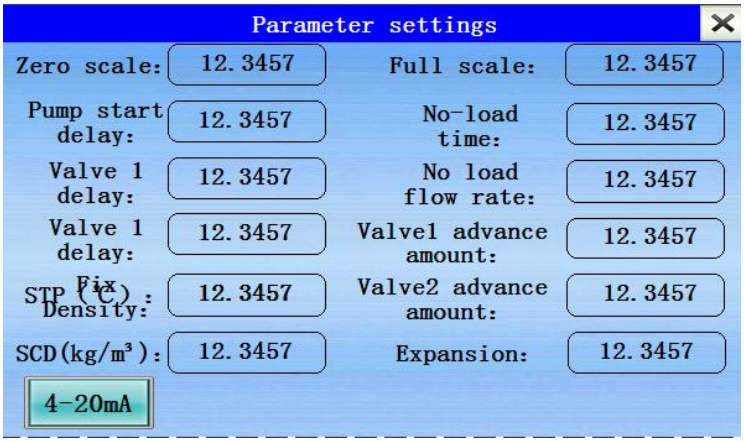
The configuration interface is as follows:



5.1.3 Output signal Settings

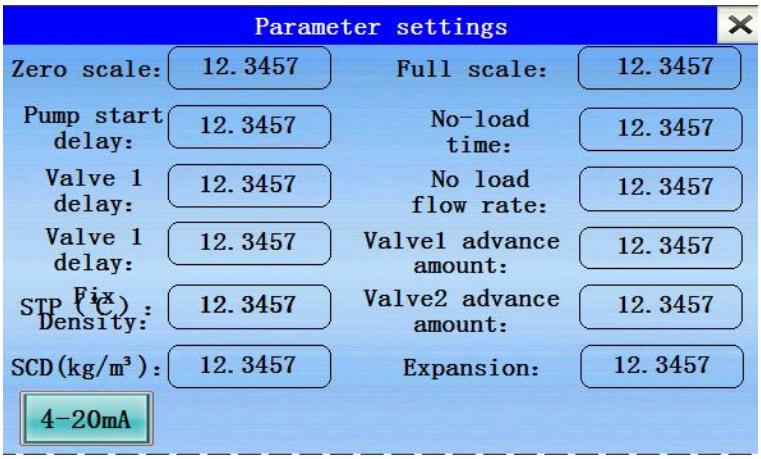
No-load protection: After the equipment starts and runs, when the instantaneous flow is lower than the no-load flow and exceeds the no-load time, the equipment will stop immediately to prevent the equipment from idling and burning out the electric pump (no-load time "0" means that this function is disabled).

The configuration interface is as follows:



Pump valve setting: the starting order of pump and valve and the advance amount of valve closing can be set.

The configuration interface is as follows:



5.1.4 Pulse input type parameter setting

Pulse coefficient setting: 00000.000 times /m3.

Small signal removal: 00.00HZ Remove pulse interference signals. (Refer to 5.2.1 for details)

Pulse coefficient correction: Correct the error of pulse flow signal. (Refer to 5.2.3 for details)

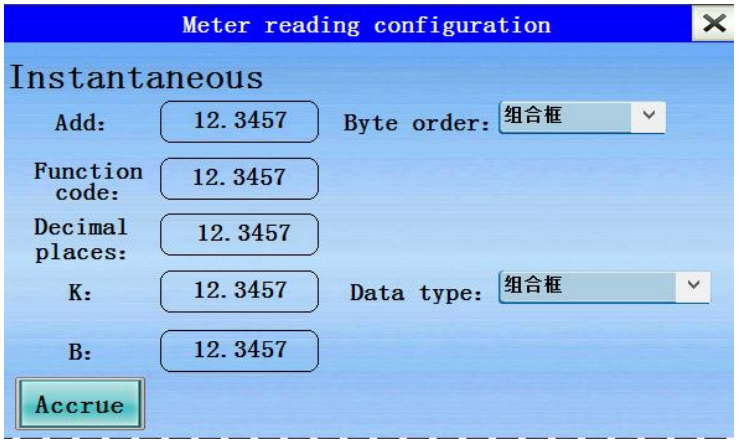
5.1.5 4-20mA input type parameter setting

Range setting: set the upper and lower limits of the flow range.

Small signal removal: 00.00mA Remove milliampere interference signals (refer to 5.2.1 for details)

5.2 Modify configuration

Configuration position: Settings → Corrections



5.2.1 Interference signal correction

Small signal cut-off: 1, 00.00mA 2, 00.00HZ.

For example, if 0.3 is removed, it means that the milliampere signal is greater than 4.3mA to be effective.

5.2.2 Flow accumulation Settings

Total initial value: Enter the total cumulative flow value to be set.

Batch automatic zeroing: 1. Open 2. Close.

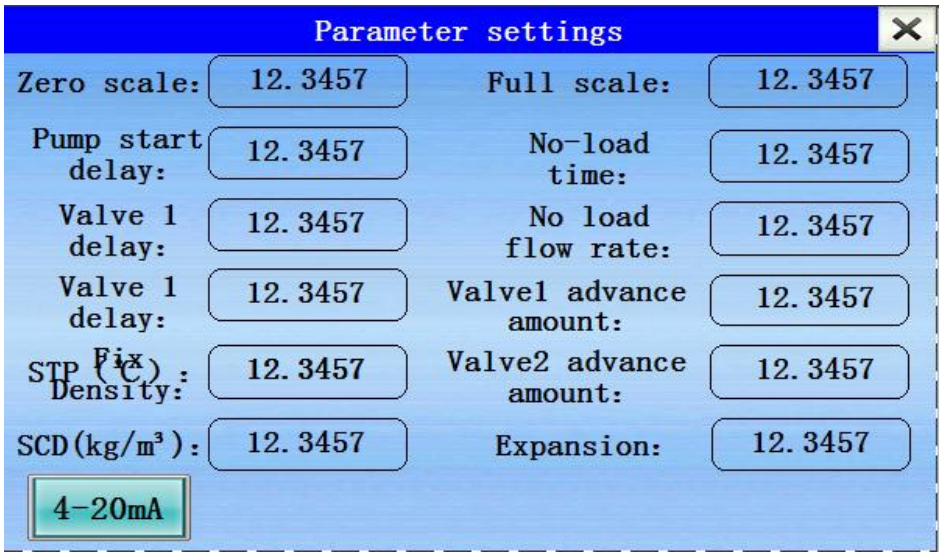
After this function is enabled, the batch will be automatically cleared after all the cycles are completed and stopped.

5.2.3 Pulse coefficient correction (effective when the signal type is pulse signal input)

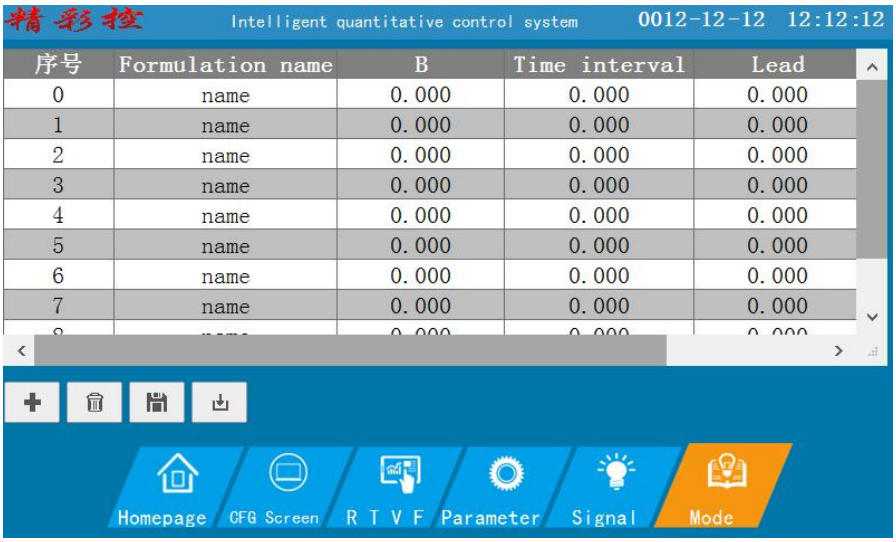
When the pulse signal is wrong, fill in the quantitative set value at the quantitative value of this interface and fill in the actual filling value at the actual value to achieve the correction of the pulse coefficient.

Quantitative value: the set quantitative value. Actual value: the actual filling value. Quantitative value: the set quantitative value. Actual value: the actual filling value.

The configuration interface is as follows:



5.3 Formula configuration



Customize the recipe

1. : Add a recipe

2. : Delete a recipe

3. : Insert a recipe

4. : Copy a recipe

5. : Save the newly added formula

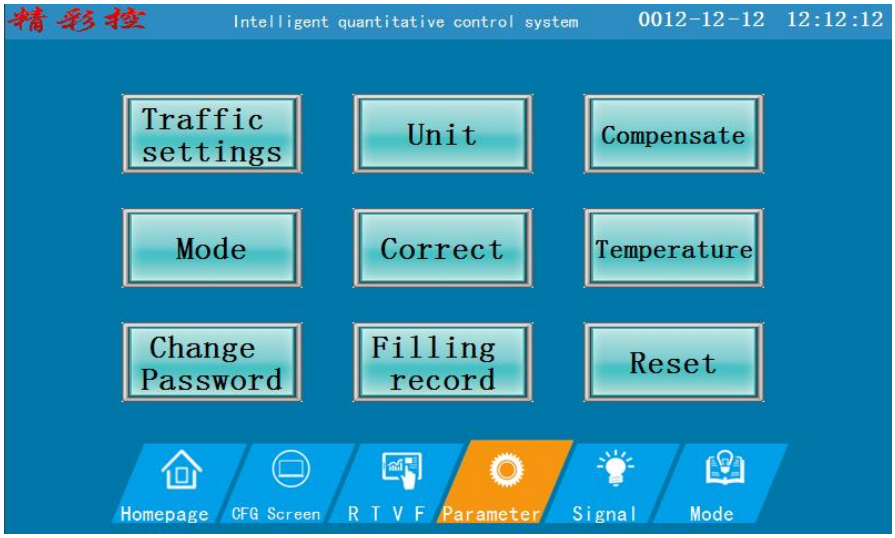
6. : Turn the page up

7. : Scroll down

8. : Use this formula

5.4 System configuration

Configuration location: Settings → System



5.4.1 Time Settings

Enter the number and click OK

5.4.2 Change the password

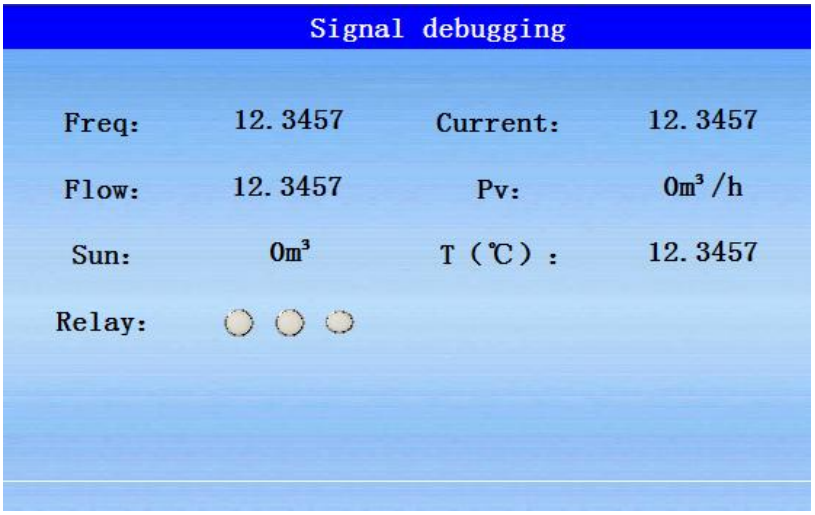
5.4.3 Restore factory

The reset device is the initial value.

5.5 Signal debugging

Configuration location: Main page → Signal debugging

The configuration interface is as follows:

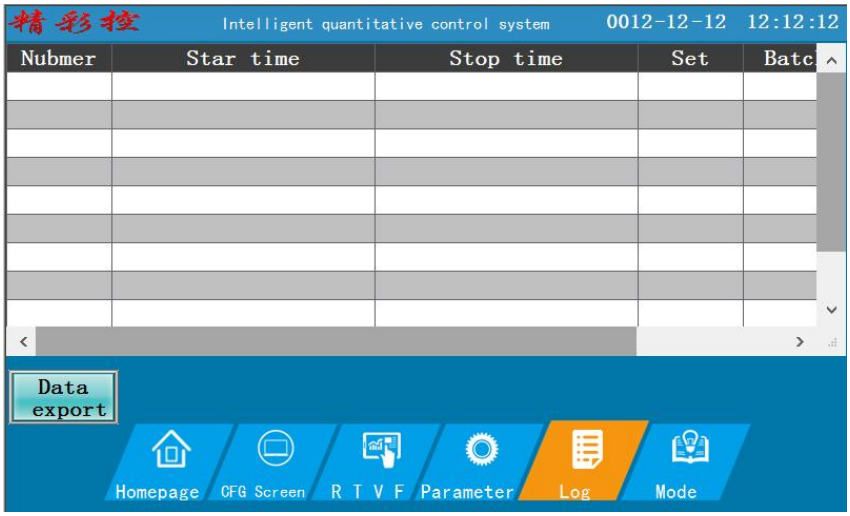


Monitoring function: The signal debugging interface can clearly view the input signal value, so as to judge whether the acquired signal is accurate.

5.6 Record query

Configuration position: Filling record

The configuration interface is as follows:



You can find the corresponding records according to the time period

Chapter 6 Communications

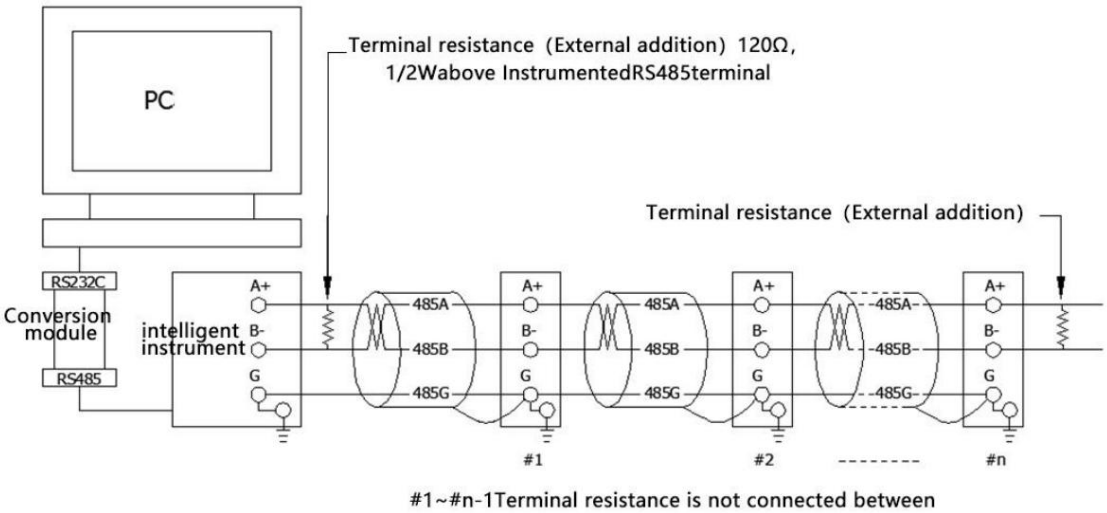
This instrument can provide RS485 communication and ticket printer interface, and support standard Modbus RTU protocol.

6.1 Printer connection (optional)

This device is primarily used for communication with ticket printers. If the printer is not powered on, disconnected, or offline, the instrument will not respond to print commands. In such cases, users should check the printer's power supply and status indicator lights to ensure all settings are correct and that the paper is properly installed. If the printer still fails to print normally, check the printer settings, including baud rate, data format, and serial/parallel port settings.

6.2 RS485 communication

The communication line should be a shielded twisted pair (the communication length should not exceed 100 meters). One end of the communication line is connected to the serial communication port of the computer through the RS485 conversion module, and the other end is connected to the 485 communication terminal of the instrument. The connection mode is shown in the figure below.



6.3 RS485 communication parameters

project	Set content
Operating mode	ModbusSlave
address	1~247Optional
Baud rate	1200/2400/4800/9600/19200/38400/57600Optional
data format	8 data bits, 1 stop bit
Validation	No validation

6.4 Register address list

Function code 03:01030000001EC5C2

address	content	form	mode of operation
0x0000	Current model	Uint16	RO
0x0001	Current batch	Uint16	RO
0x0002	current state 0x0000: Stop 0x0001: Waiting to start 0x0002: Waiting interval 0x0003: Filling is in progress 0x0004: Pause 0x0005: Abnormal traffic	Uint16	RO
0x0003	unit 0x0000：m^3/h 0x0001：L/h 0x0002：T/h 0x0003：Kg/h 0x0004：g/h	Uint16	RO
0x0004 0x0005	Quantitative value (three decimal places) For example, 07 5B CD 15 = 123456789 = 123456.789	Uint32	RW
0x0006 0x0007	Instantaneous (three decimal places)	Uint32	RO
0x0008 0x0009	Quantity (three decimal places)	Uint32	RO
0x000A 0x000B	Batch (three decimal places)	Uint32	RO
0x000C 0x000D	The total is an integer	Uint32	RO
0x000E 0x000F	Total quantity (three decimal places) Example 00 00 00 7B = 123 = 0.123	Uint32	RO
0x0010 0x0011	Batch number 0-65535	Uint32	RW
0x0012	Interval time 0-65,535 seconds	Uint32	RW

0x0013			
0x0014	lead	Float	RW
0x0015			
0x0016	temperature	Float	RO
0x0017			
0x0018	Year (HEX) Example: 07 E2 = 2018	Uint16	RW
0x0019	moon	Uint16	RW
0x001A	sun	Uint16	RW
0x001B	time	Uint16	RW
0x001C	component	Uint16	RW
0x001D	second	Uint16	RW
0x001E	electric relay Bit0~bit4--→1~5:1 is closed and 0 is open	Uint16	RO

Chapter 7 Fault analysis and usage examples

7.1 Fault analysis

This quantitative control instrument adopts advanced production technology and has been tested strictly before leaving the factory, which greatly improves the reliability of the instrument. Common faults are generally caused by improper operation or parameter setting. If you find any unmanageable faults, please record the fault phenomenon and contact the local agent or us in time.

The following table shows several common faults of quantitative control instrument in daily application:

order number	fault phenomenon	Cause analysis and treatment
1	**Press the start button After 5 seconds, the traffic is abnormal!!!**	1、Check whether the flow input signal cable is correctly connected or loose. 2、Check whether the valve and pump body start normally. 3、Enter the device detection menu interface to check whether the signal input and relay action are normal.
2	**The actual flow does not match the quantitative value (First, eliminate the sensor problem)**	1、Please reset the lead time parameter. 2、Check that the flow input signal is normal. 3、The meter coefficient is set incorrectly. 4、The range decimal point is set incorrectly. 5、Unit setup error.
3	**It doesn't work when it's powered on**	1、The power cord is not properly connected. 2、The power supply voltage does not meet the technical requirements.

7.2 Usage Examples

Flow is divided into mass flow (T/h Kg/h g/h) and volume flow (m3/h L/h L/m).

in compliance with ：

Measurement of methanol medium: input signal selection (4-20mA), range setting, compensation selection (fixed density), compensation setting (fixed density 786.4674 kg/m3).

Water medium with temperature compensation: input signal selection (pulse), pulse coefficient setting, access to the temperature sensor, compensation selection (water temperature).

Expansion coefficient compensation is required in the measurement: input signal selection

(pulse), pulse coefficient setting, access to temperature sensor, compensation selection (other liquids), compensation setting (standard density, expansion coefficient).

General liquid flow measurement does not require compensation such as water medium: input signal selection (pulse), pulse coefficient setting.

Chapter 8 Service Guide

Dear user, hello! Thank you for choosing our department's instrument. We are committed to providing high-quality service to thank you for your trust in our company. When using this instrument for the first time, please verify that the actual product configuration matches the instrument configuration sheet and that all necessary accessories and documents are included in the box. If you have any questions or concerns, please contact us immediately.

■ **matters need attention**

- Read the random data: Please read the random data and warranty principles carefully, and keep them intact.
- After the purchase of the machine, keep the purchase invoice properly.

Warranty principle:

■ **maintenance cycle**

Within five working days from the date of receipt of the product.

■ **maintenance and repair cost**

- The free warranty period of this series quantitative controller is 12 months (product quality problems).
- The warranty period is calculated from the date of purchase by the user, and the purchase invoice (indicating the product model and serial number) or a copy of the invoice shall be used as proof. If the invoice cannot be provided, the warranty period shall be calculated from the date of production by our company.
- During the warranty period, if the product is damaged due to improper use by the customer or if the product has been opened with a qualified seal, a certain fee will be charged. After the product is repaired, the replaced components will be free of charge for another three months.

■ **Customer information**

- Please send the product back with a description of the fault to help the engineer fix it as soon as possible.
- Please fill in the telephone/fax number, mailing address and contact person accurately for the return of the repair item.

- If you wish the engineer to go to the site for repairs, you will be responsible for the costs incurred.

The company will return the goods by express (without insurance). If you need to transport them by other parties, please indicate in the form and pay the relevant fees.