LONGER

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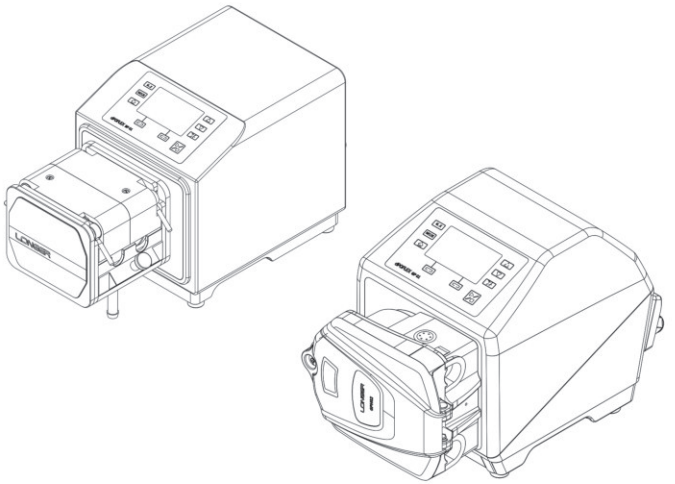
dPOFLEX Industrial Peristaltic Pumps

LONGER

dPOFLEX

Industrial Peristaltic Pumps

Installation and Operation Guide



Baoding Longer Precision Pump Co.,Ltd.

Contents

1 General Notes ····· 1
1.1 Statement ····· 1
1.2 Use and Safety ····· 1
1.3 Running warnings ····· 1
1.4 Commitments for warranty and after-sales service ····· 2
1.4.1 Warranty commitment ····· 2
1.4.2 Commitment for repair ····· 3
1.4.3 Dispute settlement ····· 3
1.4.4 Notes for product repair ····· 3
1.5 Contact information ····· 3
2 Product Description ····· 4
2.1 Main features of the product ····· 4
2.2 Unpacking inspection ····· 4
2.3 Product system structure ····· 4
2.3.1 Operation panel ····· 4
2.3.2 Matching pump heads and hoses ····· 5
2.4 Notes for driver cable ····· 5
2.5 Technical specifications ····· 5
3 System Installation ····· 8
3.1 Outline dimensions ····· 8
3.2 Installation of pump head ····· 8
3.2.1 GPH01/GPH02/ GPH03 pump head ····· 9
3.2.2 LPH01 pump head ····· 10
3.3 Disassembly and assembly of back shroud ····· 12
3.4 Installation of hose ····· 14
3.4.1 GPH01/GPH02/ GPH03 pump head ····· 14
3.4.2 LPH01 pump head ····· 15
3.5 Connection of connector and power cord ····· 15

LONGER Instructions for use of peristaltic pump

4 Use and Operation ····· 16
4.1 Booting ····· 16
4.2 Main page ····· 18
4.2.1 Flow mode ····· 18
4.2.2 Quantitative mode ····· 20
4.2.3 Calibration mode ····· 23
4.2.4 Instructions for the use of the MAX button ····· 25
4.3 Parameter settings ····· 26
4.3.1 Selection of pump head model ····· 26
4.3.2 Selection of hose specification ····· 27
4.3.3 Enabling of liquid leakage detection ····· 28
4.4 External control setting ····· 28
4.4.1 Input control source ····· 29
4.4.2 Internal control configuration ····· 30
4.4.3 External control configuration ····· 30
4.4.3.1 Analog input selection ····· 31
4.4.3.2 Calibration method ····· 31
4.4.3.3 Analog Input signal configuration ····· 31
4.4.3.4 Speed range ····· 33
4.4.3.5 Flow sensor configuration ····· 33
4.4.4 Communication parameter configuration ····· 34
4.4.4.1 RS485 Configuration ····· 35
4.4.4.2 RS232 configuration ····· 37
4.4.4.3 Ethernet TCP/IP configuration ····· 37
4.4.5 Running state control ····· 38
4.4.5.1 Start/stop control state ····· 39
4.4.5.2 Direction control state ····· 39
4.4.5.3 Liquid leakage detection input ····· 40
4.4.5.4 Abnormal signal state ····· 40

4.4.6 Status output configuration ····· 41
4.4.6.1 #1 Relay status ····· 42
4.4.6.2 #2 Relay status ····· 43
4.4.6.3 #3 Relay status ····· 43
4.5 System settings ····· 44
4.5.1 Language selection ····· 45
4.5.2 Date/Time ····· 45
4.5.3 Log ····· 46
4.5.4 Key tone ····· 47
4.5.5 Calibration time setting ····· 47
4.5.6 Firmware upgrade ····· 48
4.5.7 Factory reset ····· 48
4.5.8 About ····· 49
4.6 Authority management ····· 49
4.6.1 Security lock setting ····· 50
4.6.2 PIN password protection setting ····· 51
4.6.3 Password login ····· 52
5 Terminal board interface description ····· 52
5.1 Digital signal wiring diagram ····· 54
5.1.1 Start/stop control ····· 54
5.1.2 Direction control ····· 54
5.1.3 Liquid leakage detection ····· 55
5.1.4 Frequency output ····· 55
5.1.5 Relay output ····· 56
5.1.6 Digital input ····· 56
5.2 Analog wiring diagram ····· 57
5.2.1 4-20mA input ····· 57
5.2.2 4-20mA output ····· 57
5.2.3 0-10V input ····· 58

LONGER Instructions for use of peristaltic pump

5.2.4 0-10V output ····· 58
5.3 Wiring diagrams of communication interfaces ····· 59
5.3.1 RS485 wiring diagram ····· 59
5.3.2 RS232 wiring diagram ····· 59
5.3.3 Ethernet wiring diagram ····· 60
6 Appendixes ····· 60
6.1 Default parameters ····· 60
6.2 Definition of three-level authority scope ····· 61
6.3 Error code comparison table ····· 62
6.4 Modbus register definition ····· 63

1 General Notes

1.1 Statement

- The contents of this manual and the specifications of this equipment are subject to change without notice.
- Longer Company reserves the right to change the specifications and materials contained therein without further notice.
- The equipment model and software version may be different, so the pictures in this manual may be different..
- The equipment shown in the manual may be different from the real object, so the real object shall prevail.

1.2 Use and Safety

Please read over the operating manual prior to use of the system; When using this system, please strictly follow the safety precautions in this manual.

1.3 Running warnings

	**WARNING** Do not operate this system without following the safety precautions in this manual and system documentationt.
	**WARNING** Please pay attention to hand safety. When the system is running, keep your hands off the rollers of the pump head. Please read over the safety precautions and the operating manual before operation.

- Hot-swap is not supported in all interfaces. The interface shall be plugged in or unplugged when power off.
- The various interfaces at the end of the driver should be protected from moisture and water.
- Rupture of hoses may cause fluid to spray out, so please replace ruptured hoses in time or use appropriate protective measures to ensure the safety of operators.
- When removing and installing a hose, please turn off the power of the equipment, and drain the medium from the hose to make sure there is no pressure in the piping system.
- When connecting the control wires, please disconnect the power.
- When the pump is running, operators are prohibited to touch the rollers.
- When the pump is not running for a long time, please loosen the pressing block that holds the hose to avoid squeezing the hose for a long time to deform it.

- The roller of the pump head should be kept clean and dry; otherwise, it will accelerate the wear of the hose and shorten the service life of the pump head and driver.
- Do not lubricate the roller of the pump head by yourself, because improper operation may cause displacement of the hose or corrosion of the pump head casing.
- Please properly connect the driver's power cable, external control communication cable, etc., and do not damage the plug.
- Pump head is not resistant to organic solvents and highly corrosive liquids, and if any liquid remains on the surface of the pump head, please remove it in time.
- Appearance or software is subject to upgrading, change, or suspended production without notice.

1.4 Commitments for warranty and after-sales service

1.4.1 Warranty commitment

1)The warranty period of the overall product is 1 year, and if the product fails during the warranty period, free repairs and replacement of parts will be provided. Consumables are not covered by the warranty.

2)The failure or damage of the product under the following conditions, regardless of whether it is covered by free warranty, is not covered by the free warranty.

- The warranty period of the overall product has expired.
- Failure or damage caused by improper installation, improper storage, improper maintenance, or improper use by product users failing to follow the instructions.
- The product is used beyond the service conditions agreed in the contract or technical agreement.
- Failure or damage caused by installation, repair, change or disassembly not performed by Longer service agencies or personnel.
- Failure or damage caused by the use of non-original parts or the replacement of spare parts by the user, in which the spare parts are not purchased from Longer or a designated dealer.
- Failure or damage due to unexpected factors or human reasons (including improper input voltage, corrosion, falling-off, etc.).
- Failure or damage caused by force majeure such as natural disasters (e.g., earthquakes, fires, etc.);
- Failure or damage not caused by other problems in the design, manufacturing or quality of the product.

1.4.2 Commitment for repair

- In case of failure out of the warranty period, repairs and replacement of parts will be charged at cost;
- Replacement of parts can be completed within 3 working days, but if it cannot be completed within the time limit for maintenance, the estimated completion date will be given in advance.

1.4.3 Dispute settlement

In case of dispute arising from product quality, service, etc., it shall be settled in accordance with the contract or agreement. If there is no contract or agreement, the two parties shall settle it by negotiation; otherwise, it shall be settled in accordance with relevant national laws and regulations.

1.4.4 Notes for product repair

If it is needed to return the product for repair, please contact the Company or an authorized distributor in advance, provide the product serial number, and indicate the customer′ s contact information and product failure symptoms. If the product has been exposed to toxic chemicals or other substances harmful to human health, please clean the product before returning it. The product should be properly packed in the original packaging or not lower than the original packaging standard to prevent damage to the pump during transportation.

1.5 Contact information

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2 Product Description

2.1 Main features of the product

BP01/GP01 is the latest industrial peristaltic pump launched by Longer Company.

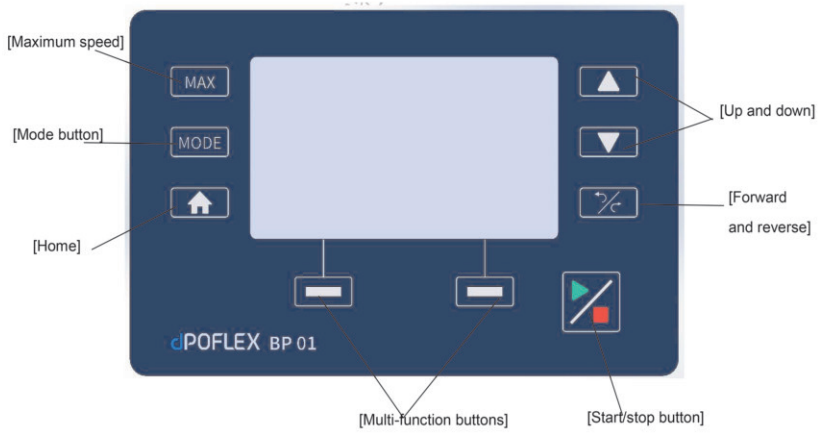
- Available in stainless steel and die-cast aluminum to meet different application needs.
- Adapt to complex and harsh environments with IP66 high-level protection.
  Support a variety of field bus communication, digital and analog input and output control.
- Three-level user authority management, with electronic signature and audit trail functions, which meets the requirements of 21CFR Part 11 and the GMP laboratory requirements.
- Support multiple sensing techniques: liquid leak detection, open-cover stop, and flow sensor for predictive maintenance.

2.2 Unpacking inspection

1)Take out the equipment and accessories from the packing box.
2)Check the packing list and make sure the accessories are complete.
3)In case of any problem, please contact us or the local distributor.

2.3 Product system structure

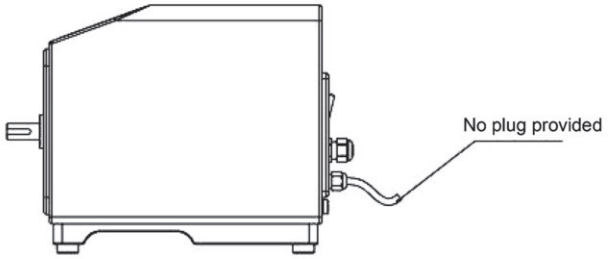
2.3.1 Operation panel



2.3.2 Matching pump heads and hoses

Applicable pump heads	Applicable hoses/silicone hoses	Maximum reference discharge (0 suction head, no pressure, clean water)
GPH01	26#, 73#, 82#, 184#	0-15.0L/min
GPH02	186#, 188#	0-17.0L/min
GPH03	186#, 188#	0-14.0L/min
LPH01	185#, 186#, 187#	0-13.5L/min

2.4 Notes for driver cable



1)The driver is not supplied with a household plug. To use, it can be connected to the plug or directly connected to the power supply cable as required, and the corresponding wire colors are as follows: L-brown, N-blue, GND-yellow green.

2)If it is needed to ensure IP66 protection, the back cover should be installed correctly. In case of a cable adaptor used, the cable and the adaptor module should be provided with additional protection.

3)The fuse used is a quick-recovery fuse, with the specification and model of F5A 250V. For replacement, the power supply must be turned off.

2.5 Technical specifications

Product model		GP01	BP01
Main functions	Casing material	Die-cast aluminum	304 stainless steel
	Range of speed	0.1rpm-265rpm, reversible	
	Speed adjustment resolution	0.1rpm	
	Display language	Chinese or English	

	Control mode	Button control, external signal control, communication control
	Real time clock function	Available
	Operating mode	Flow mode, quantitative mode, calibration mode
	Flow mode	The pump runs continuously according to the flowrate setting, and the flow and speed are displayed during operation.
	Flow setting range	1.1mL/min-17.0L/min (depending on pump head and hose)
	Quantitative mode	The pump performs continuous automatic quantitative distribution according to the set distribution volume, distribution times, interval time, and the volume dispensed in one cycle, cumulative/accumulated volume, the completed times/ total times are displayed during operation.
	Quantitative dispersion range in one cycle	1.0mL-274.9L (depending on pump head and hose)
	Times of quantitative dispersion	1-9999 times, infinite loop
	Interval of quantitative dispersion	5-9999s
Manual control	Display mode	4.3 inch industrial grade LCD screen
	Input	Waterproof membrane keyboard
	Flow calibration	By inputting the actual flow value, the pump automatically performs flow calibration, and the calibration time can be set
Communication control	Communication interface	RS485, TCP/IP
	Communication protocol	Support Modbus RTU, Industrial Ethernet , Profibus DP (optional)*
	Printer interface	External thermal printer RS232 interface (optional)*
Analog control	Analog input	1 line of 0~10V analog input, 1 line of 4~20mA analog input
	Analog output	1 line of 0~10V analog output, 1 line of 4~20mA analog output*
Remote control	Digital input	Direction switching trigger, start/stop control trigger
	Digital output	Frequency output, 3 configurable relay outputs
Safety control	Open-cover stop	Available
	Power-down	In case of accidental power failure, the equipment should be stopped immediately;

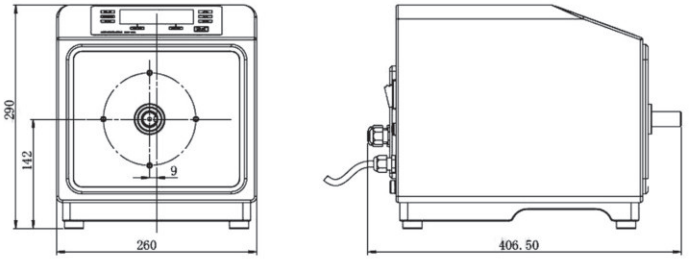
	memory	after power restoration and restarting, manual operation is required, and the product will not be automatically turned on.			
	Lock screen to prevent misuse	Available			
Sensor detection	Liquid leakage detection	Available (optional)			
	Flow detection	Flowmeter* (optional)			
Compliance	Three-level authority management	Available			
	Electronic signature	Meet the audit trail requirements of FDA 21CFR Part 11			
	Logging	Available			
	3Q verification system	IQ/OQ			
	Certification	CE, UKCA (authoritative certification by TUV SUD) Safety regulations: EN 61010-1:2010, EN IEC 61010-2-201; EMC: EN IEC61000-6-2, EN IEC 61000-6-4			
Physical parameters	Overall dimensions (L*W*H), excluding pump head	260*407*298mm	260*407*290 mm		
	Applicable power supply	AC100-240V 50/60Hz			
	Temperature of operating environment	5-40℃			
	Relative humidity of operating environment	100% RH max.			
	Protection class	IP66			
	Weight (excluding pump head)	≤17.6kg	≤16.6 kg		
Pump head and tube	Driver model (Product number)	Applicable pump head model	Quantity of pump head rollers	Applicable hose specifications	Max. reference flow rate (L/min)-silicone hose
	GP01 BP01	GPH01	2	26#, 73#, 82#, 184#	15
		GPH02	2	186#, 188#	17
		GPH03	4	186#, 188#	14
		LPH01	6	185#, 186#, 187#	13.5
Notes: In this manual, unspecified length units are in mm.					

3 System Installation

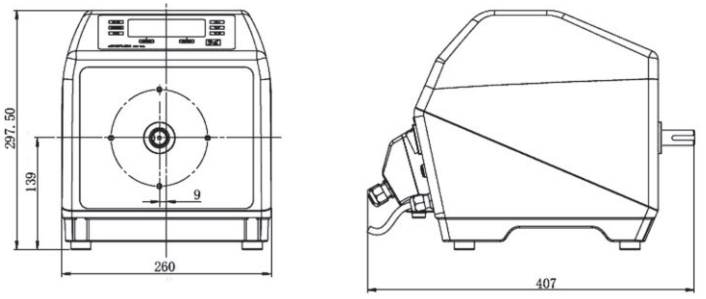
Please assemble the product correctly before use.

3.1 Outline dimensions

BP01:



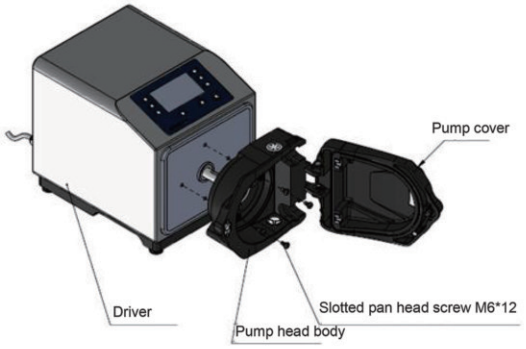
GP01:



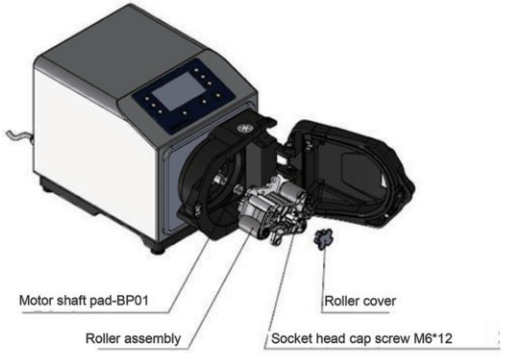
3.2 Installation of pump head

The installation instructions of GP01 and BP01 are given by taking BP01 as example, and the installation steps of GP01 are the same as those of BP01.

3.2.1 GPH01/GPH02/ GPH03 pump head



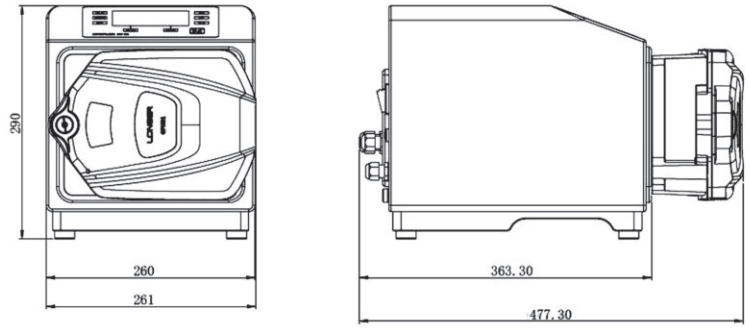
1)Open the pump cover, align the large hole at the bottom of the pump head body with the driver positioning boss, fit the pxxump head body to the front end of the driver, and fix the pump head body to the driver with 4 M6x12 slotted pan head screws.



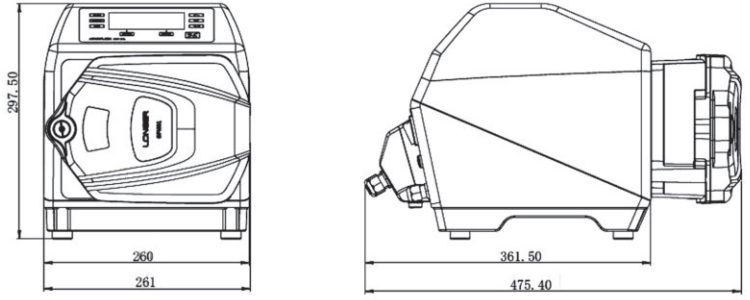
2)Put the motor shaft washer-BP01 (corresponding to the driver) into the shaft hole of the roller assembly, insert the roller assembly into the driver's output shaft, align the keyway with the flat button, and fix the roller assembly to the driver's output shaft with M6x20 socket head cap screws, and cover the end cover of the roller assembly.

For the installation of the pump head body and the roller assembly, it should be ensured that the screws are tightened and the roller cover is pressed in place.

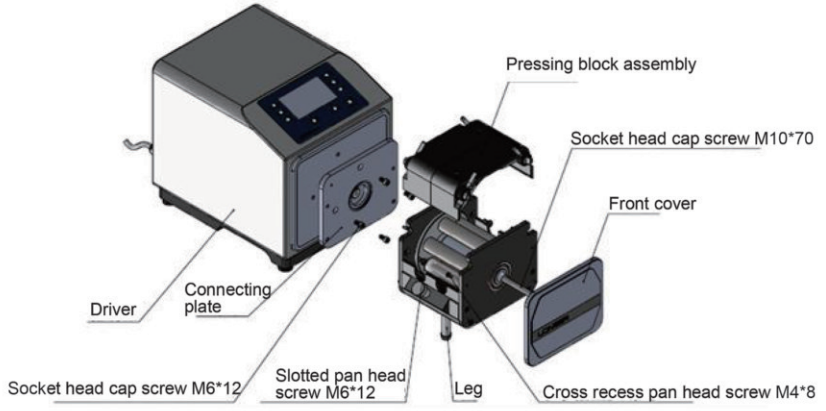
BP01:



GP01:



3.2.2 LPH01 pump head



1)First remove the connecting plate and front cover of LPH01.

2)Attach the connecting plate to the driver with 4 M6x12 socket head cap screws.

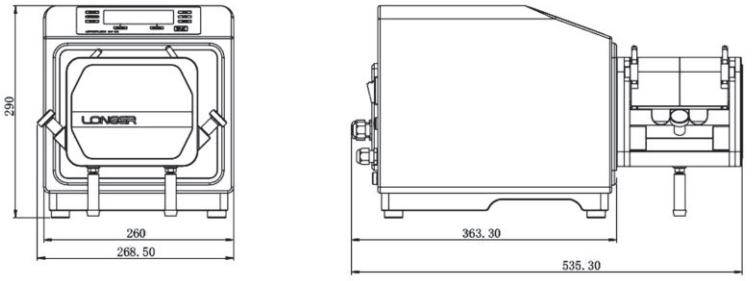
3)Align the keyway of the roller assembly with the flat button of the driver, install the LPH pump head, and fix it to the connecting plate with 2 M6x12 slotted pan head screws.

4)Tighten the M10x70 socket head cap screws at the front end of the roller assembly so that the coupling and the output shaft of the driver are tightly held.

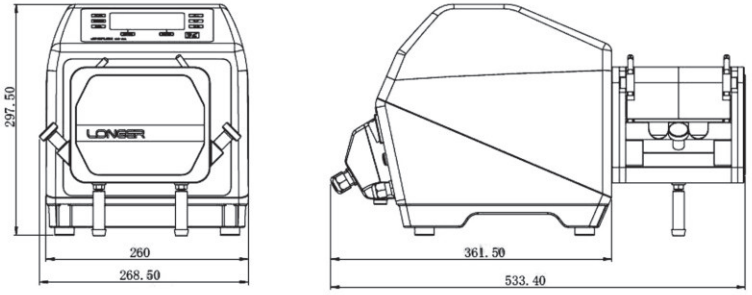
5)Install the front panel to the pump head with 2 M4x8 cross recessed pan head screws, fasten the pressing block assembly, and adjust the height of the support feet to make it as high as the driver.

In the installation of the connecting plate and the pump head, it should be ensured that the screws are tightened and they are installed in place.

BP01:

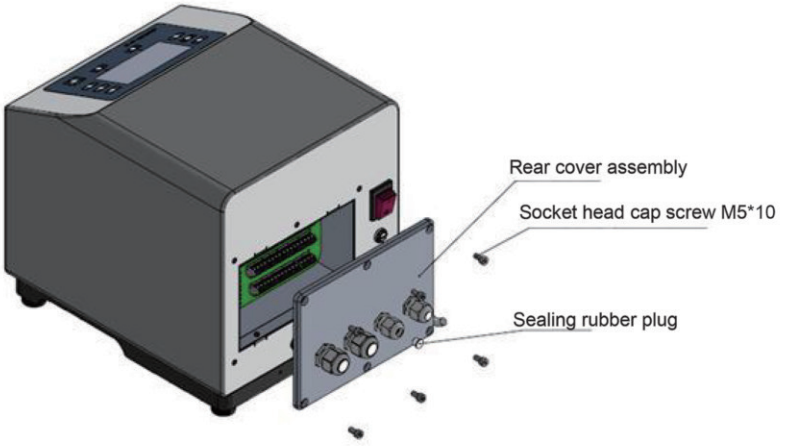


GP01:



3.3 Disassembly and assembly of back shroud

BP01:

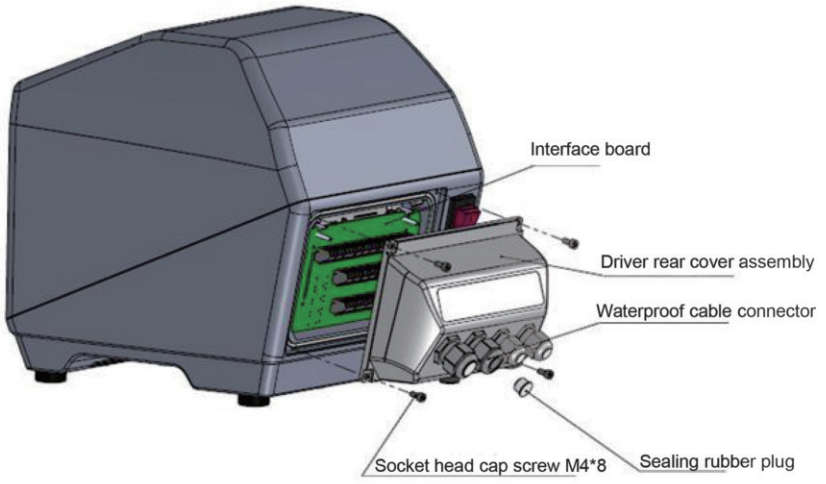


1)Use an Allen wrench to remove the 6 socket head cap screws securing the back shroud assembly, and then remove the back shroud assembly.

2)According to the outer diameter of the wire to be connected, loosen the corresponding waterproof cable connector cap (M16 is suitable for wire diameter 5-8, M20 is suitable for wire diameter 8-12), take out the sealing rubber plug, pass the cable through the waterproof cable connector, and connect it to the required function interface.

3)During the disassembly and assembly of the back shroud, it should be ensured that the sealing strip is kept in the sealing groove and must not come out. Use 6 M5x10 socket head cap screws to install the driver′ s back shroud assembly on the casing, and tighten the screws to make the back shroud assembly fit with the casing. After arranging the wires, tighten the waterproof cable connector caps to hold the cables tightly.

GP01:



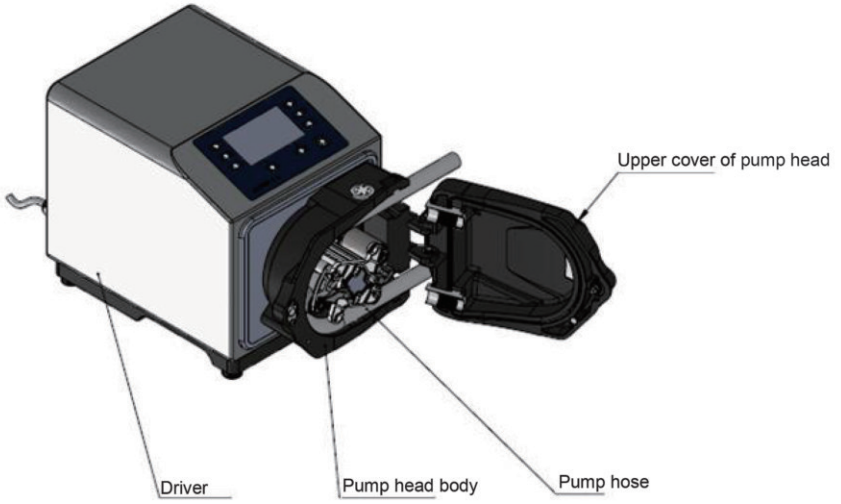
1)Use an Allen wrench to remove the 4 socket head cap screws securing the back shroud assembly, and then remove the back shroud assembly.

2)According to the outer diameter of the wire to be connected, loosen the corresponding waterproof cable connector cap (M16 is suitable for wire diameter 5-8, M20 is suitable for wire diameter 8-12), take out the sealing rubber plug, pass the cable through the waterproof cable connector, and connect it to the required function interface.

3)Make sure that the sealing strip is kept in the sealing groove of the lower casing and does not come out, use 4 M4x8 socket head cap screws to install the drive back shroud assembly on the casing, and tighten the screws. After arranging the wires, tighten the waterproof cable connector caps to hold the cables tightly.

3.4 Installation of hose

3.4.1 GPH01/GPH02/ GPH03 pump head



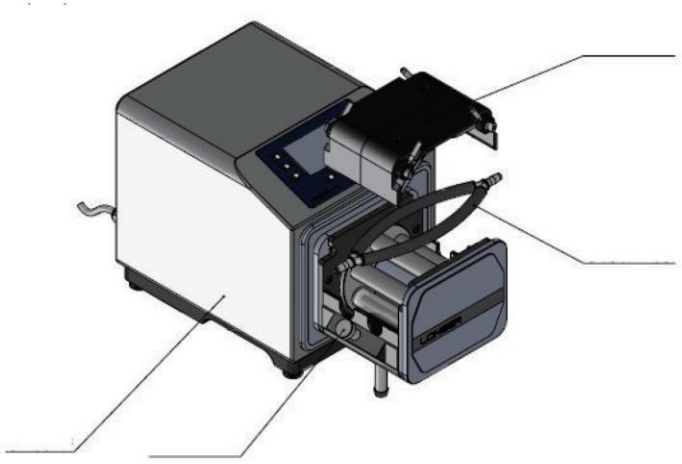
1)Insert an Allen wrench into the knob hole of the pump cover, turn it rightward to open the pump head locking screw, open the pump head cover, turn the handle of the roller assembly, and fold the roller for easy installation of the hose.

2)Hose clamp method: Put the hose into the pump head along the bending direction of the hose, as shown in the figure, tighten the hose so that the length of the hose inside the pump head is 420mm (dimension to the outermost of the hose clamp); be careful not to twist the hose during installation to prevent life reduction during operation.

3)Hose assembly method: Snap the two pipe joints of the hose assembly into the groove of the pump head body, and be careful not to twist the hose.

4)Turn the handle of the roller assembly to open the roller to complete the hose installation. Press the pump head cover directly to the end, and the locking pin will automatically lock.

3.4.2 LPH01 pump head



1)First lift the plate rods of the pressing block assembly as shown above, and open and remove the pressing block assembly of LPH01.

2)Snap the hose assembly to the tube clamp handles on both sides of the pump head, and adjust the hose assembly so that the hose assembly is not twisted.

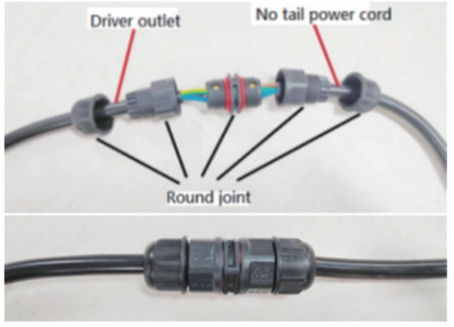
3)Put down the pressing block assembly, press the plate rods in the opposite direction, install the pressure block assembly of the pump head on the pump head, and the installation is completed.

3.5 Connection of connector and power cord

1) Disassemble the round connector, pass the locking cap and sealing body through the driver power cord and tailless power cord connector in the direction shown in the figure, and connect the driver outlet and tailless power cord outlet according to the same definition. The color polarity of different power cord is defined as follows:

The line color standard for different countries and regions when connecting different power lines to "L", "N" and "⏚"								
Symbol	Driver outlet	China	EU	USA	UK	Israel	Indian	Australian
L	Brown	Brown	Brown	Black	Brown	Brown	Red	Brown
N	Blue	Blue	Blue	White	Blue	Blue	Black	Blue
⏚	Yellow/Green	Yellow/Green	Yellow/Green	Green	Yellow/Green	Yellow/Green	Green	Yellow/Green

2) After the connection is completed, tighten the circular joint parts together, and the installation is as shown in the figure.



4 Use and Operation

4.1 Booting up

1)After booting up, the following Logo screen will be displayed for 3 seconds.



2)When the system is booted up for the first time, it will show the following page for language selection. If the system is not booted up for the first time, it will skip this page and directly display the main page in step 4.



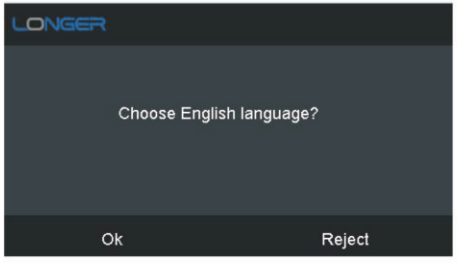
Click the up or down button to switch between language options (Chinese, English).

The selected language is highlighted in blue..

Click the [Select] button to confirm the selected language.

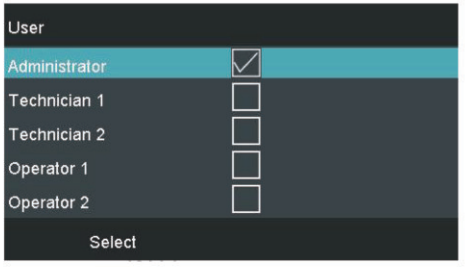
In this page, except the [▲][▼]]buttons and the multi-function buttons, all other buttons are in an invalid state.

3)Click [Select] to confirm the selected language.



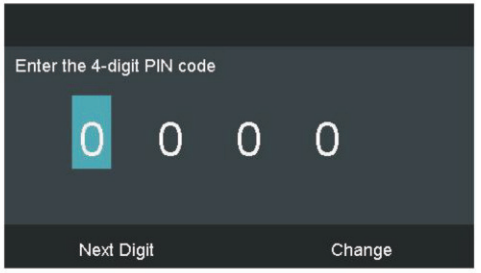
Click the [Yes] button to enter the login page, or the [No] button to return to the second step to re-select the language.

4) After the language is selected, the user selection page is shown.



The title of this page is “User”, 5 options are shown. The checkbox on the right show if the option is selected. The tick mark means the option is selected; when selecting, only the enabled user can be selected to enter the system.

5)Password input page



-The title is the user selected in the previous page.

-Click the [Up] or [Down] button to adjust the number of the current digit. Click the [Next Digit] button to move to the next digit. When moving to the last digit, [Yes] will be displayed in the lower left corner. After you click [Yes], if it is the password of the current user name, the page will show the operation main page.

-Click the [Change] button, and the four-digit PIN will be cleared.

-The factory default of the user name is [Administrator] and the password is 1234.

-If the password entered is incorrect, a message will be displayed below the password, "The password is incorrect, please re-enter your password”. Click [Change] to re-enter the password.

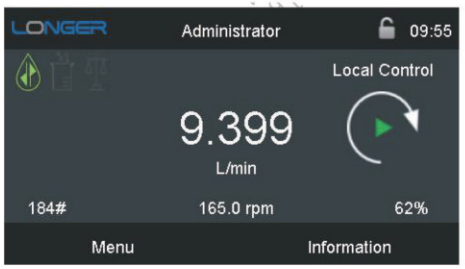
4.2 Main page

The functions and logic described in this chapter are as follows:

- The logic of switching between modes through the MODE button.
- The main page layout and corresponding display logic in three modes (flow mode, quantitative mode, calibration mode).
- The function description of the MAX button.

4.2.1 Flow mode

The figure below is the factory default screen after booting up (the default mode is the flow mode).



The content displayed on the default screen:

1)The factory default user is the administrator, and only the administrator account is allowed to log in at the first bootup.

2)The default mode is the flow mode. The flow mode icon is highlighted in green ,and the other two icons are white.

3)When the screen lock function is in the unlocked state, the unlock icon is displayed on the right side of the status bar.

4)The parameter display line at the bottom of the display area and the flowrate and unit settings in the middle of the screen show the factory default values. See [6.1 Default parameters] for the specific default flowrate, unit, hose specification, pump head speed, full speed ratio, and other default values.

5)On the left side of the title bar of the main page, Longer's LOGO is displayed, the user name currently logged in is displayed in the center, and the security lock status and the current hour and minute of time are displayed on the right side from left to right.

-See [6.3 Alarm code comparison table] for the category of abnormal states and the corresponding prompt content, and the abnormality icon will not be displayed in case of no abnormality.

-Default state: The security lock is in the unlocked state.

-When the security lock function in the authority management menu is turned on, the security lock will be enabled. Except for the calibration mode, the security lock function is activated 20 seconds after the click to start, and only the stop button is activated.

6)The flow setting value in large font size is displayed in the center of the display area of the main page, and the flow unit in small font size is displayed below the flow setting value. See [4.3 Parameter settings] for the display range of flowrate and the number of decimal places.

7)In the standby or stop state, the rotating circle on the right side of the screen is still, and the inside of the rotating circle is a green triangle start icon.

8)In the running state, the rotating circle has the effect of dynamic rotation in clockwise or counterclockwise direction (clockwise in the dispensing state, counterclockwise in the suction state), and there is a red square stop icon inside the rotating circle.

9)The default speed value displayed at the first bootup is 165RPM.

10)The operation mode, control mode, flow value, calibration coefficient, and flow unit after each bootup are the same as the last selected flow value and unit.

11)The main parameters are displayed at the bottom of the display area on the main page, from left to right are hose specification, corresponding RPM speed value, and full speed ratio value.

12)On the upper left side of the middle display area, corresponding icons of the three modes are displayed, from left to right are flow mode, quantitative mode and calibration mode icons. Only the icon of the current mode is highlighted in the page, and the icons of the other two modes are gray.

13)[Menu] is displayed on the left side of the status bar at the bottom of the main page, and [Information] is displayed on the right.

-When the pump is in flow mode, click the button below [Menu] to show the main menu page.

-Click [Information] to show the information display page.

14)During the operation in flow mode, the enabling conditions of all the buttons on the panel are described as follows:

-The HOME button is disabled.

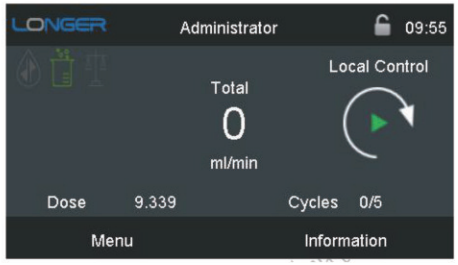
-Click the up and down buttons to increase or decrease the flowrate in real time, and the RPM speed below will be adjusted accordingly.

-Click the direction button to switch the rotation direction in real time.

-During the operation, only the stop button and the multi-function buttons under the [Menu] and [Information] are enabled. If the screen lock function is enabled, it can only be unlocked when the two multi-function buttons are pressed at the same time.

4.2.2 Quantitative mode

When the pump is in flow mode, clicking [MODE] button can change the pump to quantitative mode. The main page of the quantitative mode is shown in the figure below.



The items shown in quantitative mode is listed below.

1)On the left side of the title bar of the main page, Longer's LOGO is displayed, the user name currently logged in is displayed in the center, and the security lock status and the current hour and minute of time are displayed on the right side from left to right.

-See [6.3 Alarm code comparison table] for the category of abnormal states and the corresponding prompt content, and the abnormality icon will not be displayed in case of no abnormality.

-Default state: The abnormality icon is not displayed, and the security lock is in the unlocked state.

-When the screen lock function in the authority management menu is turned on, the security lock will be enabled. Except for the calibration mode, the security lock function is activated 20 seconds after the click to start, and only the stop button is activated.

2)The cumulative filling volume in large font size is displayed in the center of the display area of the main page, and the volume unit in small font size is displayed below the filling volume. (The unit is automatically selected according to the current speed)

3)In the standby or stop state, the rotating circle on the right side of the screen is still, and the inside of the rotating circle is a green triangle start icon.

4)In the running state, the rotating circle has the effect of dynamic rotation in clockwise or counterclockwise direction (clockwise in the dispensing state, counterclockwise in the suction state), and there is a red square stop icon inside the rotating circle.

5)The default cumulative filling volume value is displayed as 0.0 in L.

6)The flow value, the setting value of the filling amount, cycle index, and the interval time after each bootup are the same as the values set the last time.

7)The main parameters are displayed at the bottom of the display area on the main page, from left to right are dispersion amount in one cycle and dispersion times.

8)On the upper left side of the middle display area, corresponding icons of the three modes are displayed, from left to right are flow mode, quantitative mode and calibration mode icons. Only the icon of the current mode is highlighted in the page, and the icons of the other two modes are white.

9)[Menu] is displayed on the left side of the status bar at the bottom of the main page, and [Information] is displayed on the right.

-When the pump is in quantitative mode, click [Menu] to show the parameter settings page of the quantitative mode.

-Click [Information] to show the information display page (The content displayed is consistent with that in flow mode).

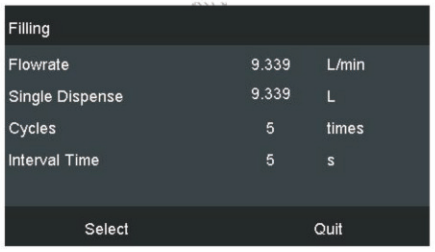
10)During the operation in quantitative mode, the enabling conditions of all the buttons on the panel are described as follows:

-The HOME button, MAX button, up and down buttons, direction button, MODE button are disabled.

-The Stop button is enabled.

-During the operation, only the stop button and the [Information] button are enabled. If the screen lock function is enabled, it can only be unlocked when the two multi-function buttons are pressed at the same time.

11)When the pump is in quantitative mode, click [Menu] to show the setting page of the quantitative mode as shown below:



-Click the [Select] button to switch among the corresponding setting items. Click the up and down buttons to set the corresponding value.

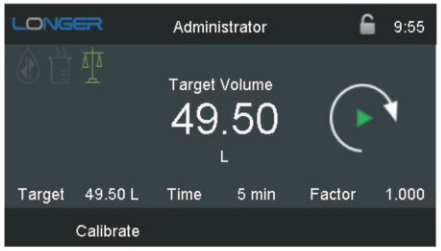
-The range of filling volume in one cycle: The lower limit is 0, and the upper limit is 274.9L.

-Range of cycle index: 0-9999, where 0 indicates infinite loop

-Interval time range: 5-9999.

4.2.3 Calibration mode

When the pump is in quantitative mode, click the [MODE] button on the panel to switch to the calibration mode, and the main page of the calibration mode is shown in the figure below.



The items shown in calibration mode is listed below.

1)On the left side of the title bar of the main page, Longer's LOGO is displayed, the user name currently logged in is displayed in the center, and the security lock status and the current hour and minute of time are displayed on the right side from left to right.

-See [6.3 Alarm code comparison table] for the category of abnormal states and the corresponding prompt content.

-Default state: The security lock is in the unlocked state.

-When the screen lock function in the authority management menu is turned on, the security lock will be enabled. Except for the calibration mode, the security lock function is activated 20 seconds after the click to start, and only the stop button is activated.

2)On the upper left side of the middle display area, corresponding icons of the three modes are displayed, from left to right are flow mode, quantitative mode and calibration mode icons. Only the icon of the current mode is highlighted in the page, and the icons of the other two modes are white.

3)The value of the theoretical liquid volume is displayed in the center of the display area on this page. After the end of the calibration run, you can use the up and down buttons to set the actual volume value on the calibration parameter page.

4)The main parameters are displayed at the bottom of the display area on the main page, from left to right are theoretical liquid volume, calibration time, and calibration

coefficient.

5)Only the calibration button is displayed on the status bar at the bottom of the main page, and the multi-function button on the right is disabled.

6)Test time, theoretical liquid volume, and calibration coefficient cannot be modified. The test time can be modified in the system settings. The theoretical liquid volume is automatically calculated by the system according to the set rotating speed, software specifications, and start-stop time. The calibration coefficient is calculated by the system based on the actual volume and theoretical liquid volume.

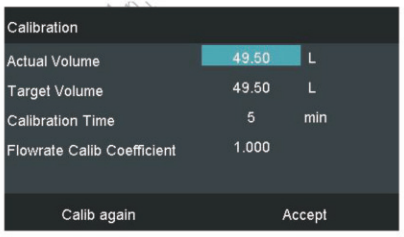
After the user clicks the [Start] button to conduct calibration, if the user does not click the [Stop] button when reaching the calibration time set by the system,

the system will automatically stop, and the theoretical liquid volume will be calculated and displayed on the screen. The user only needs to input the actual volume using the up and down buttons to obtain the calibration coefficient.

-After the user clicks the [Start] button to conduct calibration, if the user clicks the [Stop] button before the calibration time set by the system is reached, the system will stop, and calculate the theoretical liquid volume according to the actual start and stop time, and the user can input the actual volume to obtain the calibration coefficient.

-When the user clicks the [Accept] button on the calibration parameter settings page, the system will save this calibration coefficient.

-When the user clicks the [Recalibration] function button, the actual volume will be reset to zero, and the calibration coefficient will be restored to the latest calibration coefficient value saved by the system. (The effective coefficient range is 0.5-1.5, and if the range is exceeded, it will prompt that the calibration coefficient exceeds the limit.)

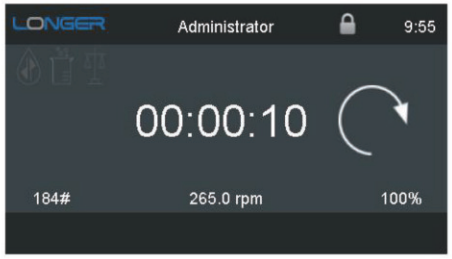


-After inputting the value of the measured volume in the setting page, the system will calculate the calibration coefficient according to the input value of the actual volume and the theoretical liquid volume, and the measurement time will be updated according to the actual running time of this calibration.

-Click the function button under the [Accept] button to save and exit. When clicking the [Recalibration] function button, the system will abandon the current calibration coefficient and return to the main page of the calibration mode for recalibration.

-When you need to reset the calibration coefficient to 1, you can first select any other pump head or hose model, and then re-select the desired pump head or hose model.

4.2.4 Instructions for the use of the MAX button



1)When the device is idle, long press the [MAX] button in any mode, and the main page will switch to the page above.

2)When the device is running, the MAX button can only be enabled in flow mode, and the MAX function cannot be enabled during the operation in the other two modes.

3)When long pressing the MAX button for operation, the stopwatch will start in the middle display area. The rotating direction of the right rotating circle depends on the current direction setting.

4)The parameter display area below shows the current hose specification, the maximum speed 265RPM, and the full speed ratio 100% from left to right. (The maximum value may be different under the configuration of different hoses and pump heads, please refer to [6.1 Default parameters] for details).

5)When the MAX button is long-pressed, all buttons on the panel except the MAX button are disabled.

6)When releasing the MAX button, the pump will stop (if it is released during opera-

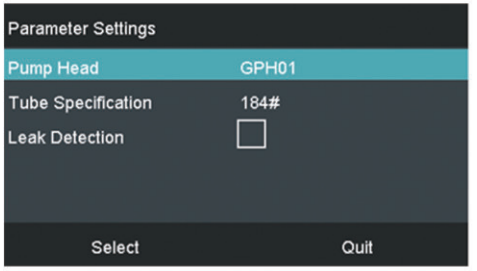
4.3 Parameter settings

The functions and logic described in this chapter are as follows:

- The setting item categories in parameter settings.
- Methods for setting of each setting item.
- Setting range of each setting item.

1)In the main menu page, click the [[▲][▼] buttons to select the parameter settings, and click [Select] to show the main page of parameter settings.

2)The main page of parameter settings is as follows:



-Enter the main page of parameter settings, from top to bottom are [Pump head model], [Hose specification], [Pump head identification], and [Liquid leakage detection].

-Press [▲][▼] buttons to move the dark blue background bar up and down, select the corresponding setting object and press [Select] to set the corresponding parameters.

3)In the related operations on the parameter settings page, the [MAX], [MODE], [Direction], [Start/Stop] buttons are disabled.

4)In the related operations on the parameter settings page, click the [Home] button to return to the operation main page.

4.3.1 Selection of pump head model



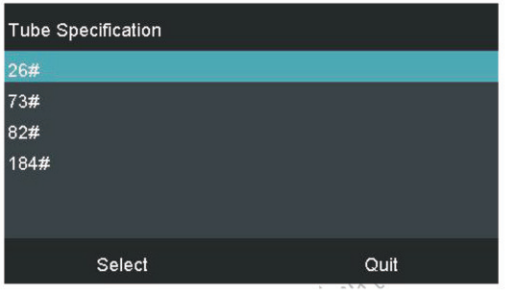
-After entering the pump head model setting page, the options available from top to bottom are: GPH01, GPH02, GPH03, LPH01.

-Use the up and down buttons to select; after moving to the corresponding pump head, click [Select], then the page returns to the main page of parameter settings, and the corresponding selection is saved in the system.

If you click the [Quit] button, the system will abandon this selection and return to main page of parameter settings.

-Because the list of hoses supported by each pump head is different, after selecting the pump head, the hose list in the hose specification setting should be adjusted accordingly. See [2.3.2 Matching pump heads and hoses] for the corresponding table of pump heads and hoses. After changing the pump head, if the currently selected hose specification does not support the selected pump head, the hose specification will automatically switch to the default hose specification that supports the pump head of this model; for specific specifications, see [6.1 Default parameters].

4.3.2 Selection of hose specification



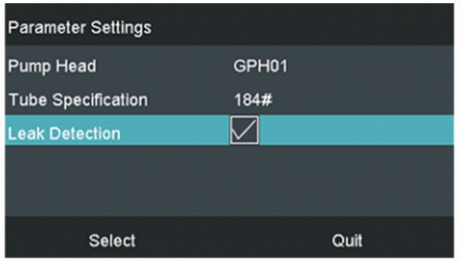
-After entering the hose specification setting page, the options available from top to bottom are: 26#, 73#, 184#, 185#, 186#, 188#.

-The hose list in this page will be adjusted automatically according to the selected pump head model. See [2.3.2 Matching pump heads and hoses] for the specific hose list.

-Use the up and down buttons to move to the corresponding hose specification, click [Select], then the page returns to the main page of parameter settings, and the corresponding selection is saved in the system.

-If you click the [Quit] button, the system will abandon this selection and return to the main page of parameter settings.

4.3.3 Enabling of liquid leakage detection



- After pressing [▲][▼] buttons to move to liquid leakage detection, press [Select] to enable or disable it.
- Tick means enabled, and no icon means disabled. After changing the enabling setting, the corresponding selection is saved in the system.
- When liquid leakage is detected, a "liquid leakage" error message will be displayed.

4.4 External control setting

The functions and logic described in this chapter are as follows:

●Layout and function description of the internal trigger control page

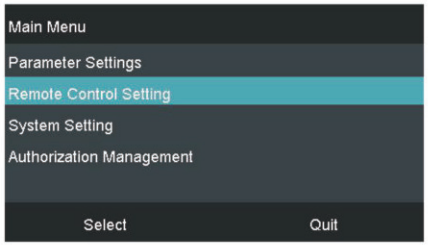
●Layout and function description of the external trigger control page

●Layout and function description of the running state control page

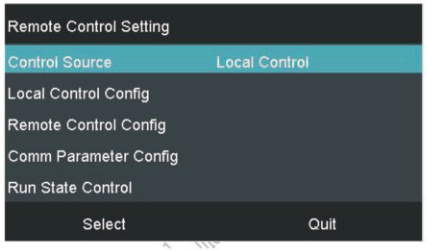
●Layout and function description of the communication parameter configuration page

●Layout and function description of the status output configuration page

1)In the main menu page, click the [▲][▼] buttons to select the external control setting, and click [Select] to show the main page of external control setting.



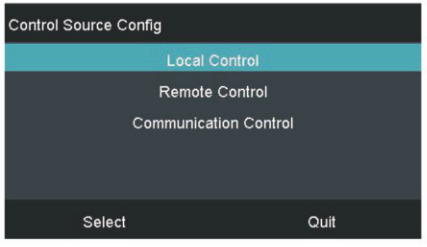
2)The main page of external control setting is as follows:



-After entering the main page of external control setting, from top to bottom are [Input control source], [Internal control configuration], [External control configuration], [Communication parameter configuration], [Motion state control], and [State output configuration], the default selection is [Input control source], and the default control source is internal trigger.

-After pressing [▲][▼] buttons to select the corresponding setting object, press [Select] to set the corresponding parameters.

4.4.1 Input control source

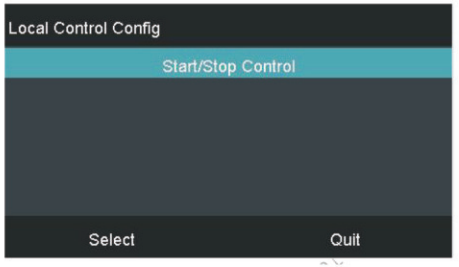


-In the main page of external control setting, select the [Input control source] setting item, and then click [Select] to show the main page of the control source configuration, and the page is as shown above.

-There are three options for the control source, namely: internal control, external control, and communication control.

-The default option is internal control.

4.4.2 Internal control configuration

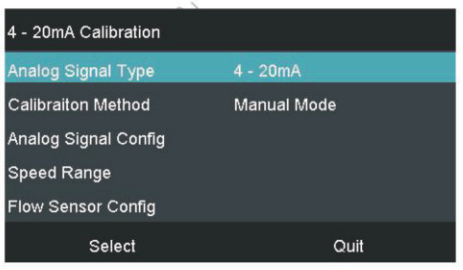


-In the main page of external control setting, select the [Internal control configuration] setting item, and then click [Select] to show the main page of the control source configuration, and the page is as shown above.

-There is one option for the control source, namely: start/stop control state.

-This is the reserved function for the configuration of the foot switch corresponding to the input of the digital IN1, and because the foot switch start/stop triggering function is fixed, the state configuration is not supported. Please refer to "4.4.5.4 Digital signal input" for the foot switch function.

4.4.3 External control configuration

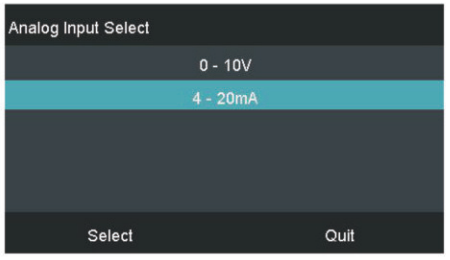


-In the main page of external control setting, select the [External control configuration] setting item, and then click [Select] to show the main page of the control source configuration, and the page is as shown above.

-There are five options for the control source, namely: input type, calibration method, analog input signal configuration, speed range, and flow sensor configuration.

4.4.3.1 Analog input selection

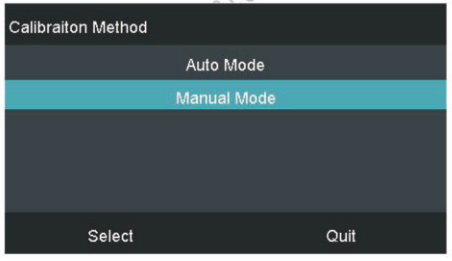
-Select the analog input type, click the function button under [Select] to show the type selection, and the specific page is as follows:



Please refer to "5.2.1 4-20mA input" and "5.2.3 0-10V input" for the wiring of analog input.

4.4.3.2 Calibration method

-Select the calibration method, and click [Select] to show the selection of the calibration method, and the specific page is as follows:



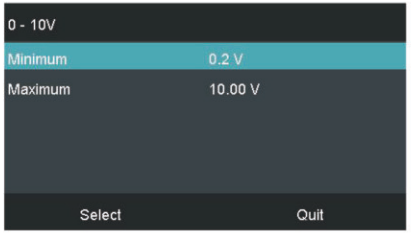
4.4.3.3 Analog Input signal configuration

0-10V calibration:

- The 0-10v analog input signal configuration page is as follows.

-When the calibration method is manual, select the maximum or minimum value first and then adjust it by the up and down buttons.

-When the calibration mode is automatic, the upper and lower limits are obtained by reading the external analog input voltage signal in real time; when the minimum value is selected, set the minimum analog voltage at the analog voltage input port, click [Select] to switch to the maximum value, and set the maximum analog voltage at the analog voltage input port; the voltage setting range is 0-10V.

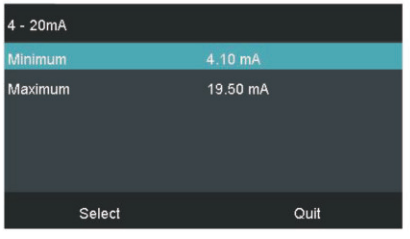


4-20mA calibration:

- The 4-20mA analog input signal configuration page is as follows.

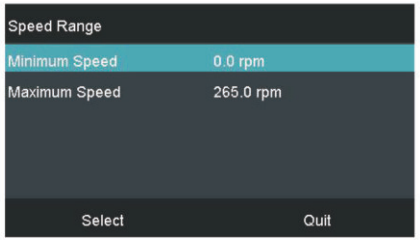
-When the calibration method is manual, select the maximum or minimum value first and then adjust it by the up and down buttons.

-When the calibration mode is automatic, the upper and lower limits are obtained by reading the external analog input current signal in real time; when the minimum value is selected, set the minimum analog current at the analog current input port, click [Select] to switch to the maximum value, and set the maximum analog current at the analog current input port; the current setting range is 4-20mA.



4.4.3.4 Speed range

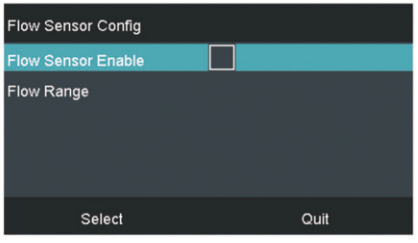
The setting page of the corresponding relationship between the speed and the maximum and minimum values of the analog input signal is as follows:



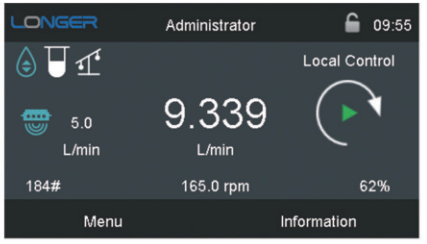
-The maximum and minimum values can be adjusted by the up and down buttons. When you click [Quit] in the above page, the system will save the parameters and return to the previous page.

4.4.3.5 Flow sensor configuration

When the device is equipped with a flow sensor (optional), this item is configured when it is needed to display the real flow rate of the flow sensor in the interface.



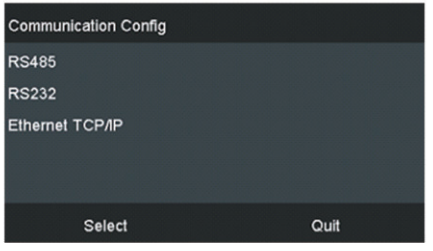
Flow sensor enabling: After it is checked, the real time flow rate of the flow sensor can be displayed on the main page of the flow mode.



Flow range: The set maximum and minimum flow rate values shall be consistent with the actually configured maximum and minimum values of the sensor, or else there will be a large display error. The input terminal of the flow sensor is the analog current input interface, which is also the interface for analog current control in the external control mode, and the function of flow sensor cannot be used in the external control mode of analog current control.

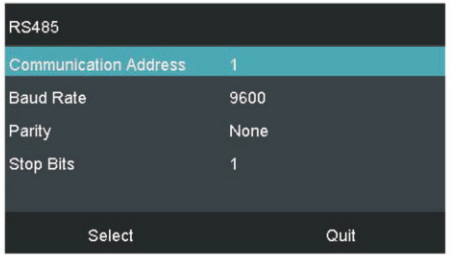
4.4.4 Communication parameter configuration

The main page of communication parameter configuration is as shown above. RS485, RS232 and Ethernet TCP/IP can be configured for communication. RS485 and Ethernet TCP/IP are used for MODBUS protocol to control the device. RS232 is a reserved function for thermal printer, and device control operation is not allowed.

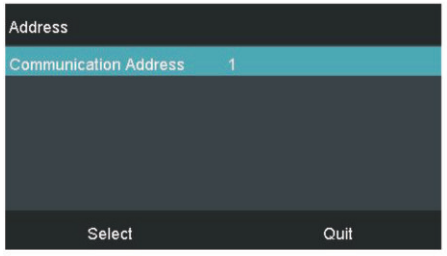


4.4.4.1 RS485 configuration

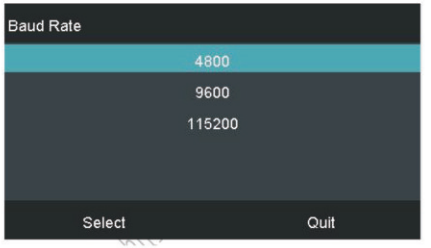
Refer to 5.3.1 RS485 Wiring Diagram for RS485 functions and wiring.



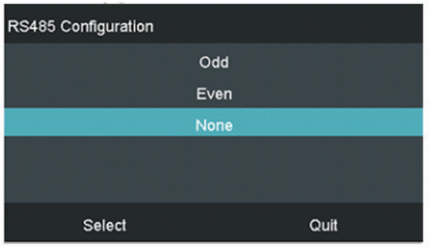
- The setting objects of RS485 are: communication address, baud rate, parity bit, stop bit.
- Communication address range: 1-32.
- Baud rate options: 4800, 9600, 115200.
- Parity bit: Odd parity, even parity, no parity.
- Stop bit: 1, 2.
- The corresponding setting interfaces are as follows:



- Click the up and down buttons to set the communication address, and the range is 1-32.



- Click the up and down buttons to select the Baud rate.



- Click the up and down buttons to select the parity bit.



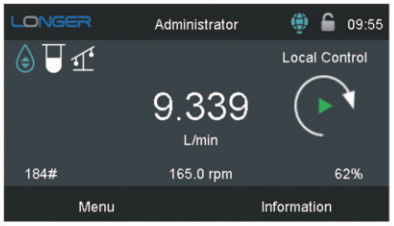
- When you click [Quit] in the above interface, the system will return to the previous interface without saving the set parameters.
- When you click [Select] in the above interface, the system will save the parameters and return to the previous page.

4.4.4.2 RS232 configuration

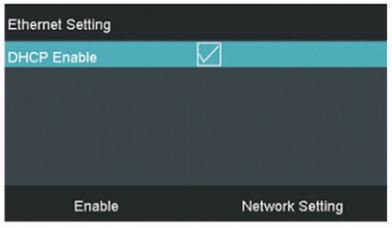
It is consistent with the RS485 configuration page, and the corresponding wiring mode is shown in 5.3.2 RS232 wiring diagram.

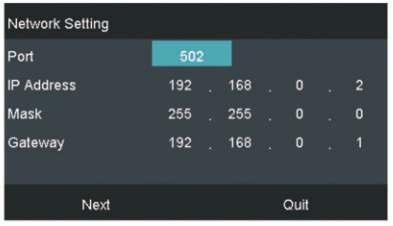
4.4.4.3 Ethernet TCP/IP configuration

When the device is equipped with TCP/IP module, this function can be used for remote control of Modbus protocol. See 5.3.3 Ethernet Wiring Diagram for wiring mode. When the device is equipped with an Ethernet module, there will be a networking icon on the upper right corner of the main interface of traffic and quantitative internal mode, as shown in the following figure:



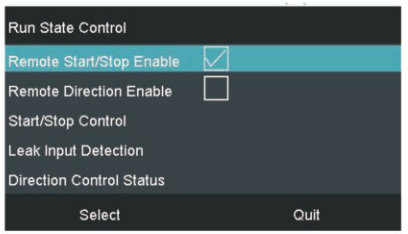
When DHCP is enabled, the device automatically generates an IP. After enabling DHCP function, you can view the specific assigned IP when you can select [Network Setting] after 30 seconds. At this time, all parameters on the page cannot be modified.

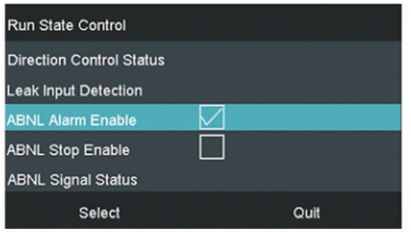




When DHCP function is not enabled, you can manually set network parameters, switch parameters through the next bit, and adjust parameters by pressing up and down.

4.4.5 Running state control





- Settings from top to bottom include: [External control start/stop enable], [External control direction enable], [Start/stop control status], [Direction control status], leakage detection input], [Abnormal alarm enable], [Abnormal shutdown enable], and [Abnormal signal status]. Press up and down to select the setting item with the enable flag, and click [Select] to switch between enable (√) and unable (incon).

- In the external control mode, after the start stop and direction enable, the corresponding control state is configured for high and low level configuration. The start stop and direction signal can be controlled externally through the state of the external control terminal control part and the automatic wiring.

- Abnormal alarm enable: after the corresponding control state is configured, the required abnormal signal can be input through the input terminal IN3+/IN3 - of digital signal input.

- After enabling the abnormal shutdown, the equipment will shut down in case of abnormal alarm; When it is not enabled, the equipment will only alarm and not stop.

- See "5. Description of terminal board interface" for specific hardware interface.

- In the external control/communication mode, the pump can be stopped and switched to the internal control mode by long pressing the start/stop button.

4.4.5.1 Start/stop control state

-After pressing the up and down buttons to select the start/stop state control setting item, click [Select] to show the start/stop state control page, and the page is as follows:

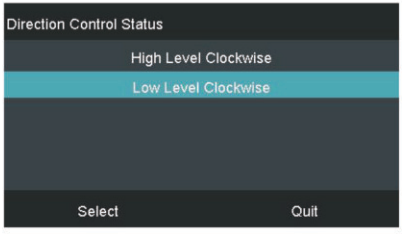


-Click the up and down buttons to switch between high-level startup or low-level startup, click the [Select] function button to save the currently selected settings, and exit to the main page of running state control, or click the [Quit] function button to abandon this operation and exit to the main page of running state control.

- The corresponding external wiring is described in the chapter "5.1.1 Start stop control".

4.4.5.2 Direction control state

-On the main page of running state control, use the up and down buttons to select the direction control state item, and click [Select] to show the direction control state page, and the page is as follows:

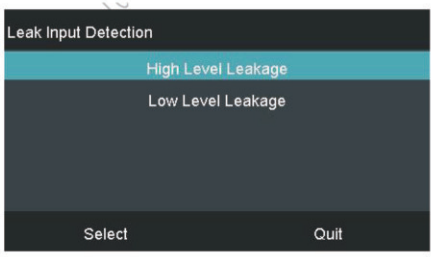


-Click the up and down buttons to select the low-level clockwise or high-level clockwise. Click [Select] to save the currently selected settings, and exit to the main page of running state control. Click [Quit] to abandon this operation and exit to the main page of running state control.

- The corresponding external wiring is described in "5.1.2 Direction Control".

4.4.5.3 Direction control state

- On the main page of running state control, use the up and down buttons to select the direction control state item, and click [Select] to enter the direction control state page, and the page is as follows:

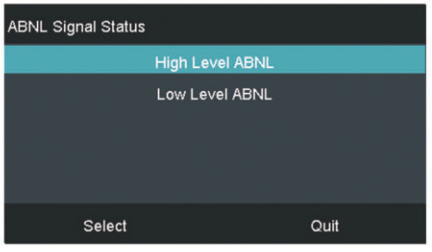


- Click the up and down buttons to select the low-level clockwise or high-level clockwise. Click [Select] to save the currently selected settings, and exit to the main page of running state control. Click [Quit] to abandon this operation and exit to the main page of running state control.

- The corresponding external wiring is described in the chapter "5.1.3 Liquid leakage detection".

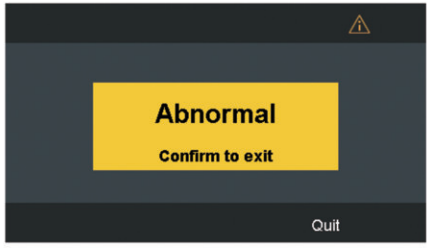
4.4.5.4 Abnormal signal status

On the main page of operation status control, select the setting item of abnormal signal status with up and down keys, click the [Select] function key to enter into the leakage detection input page, as shown below.



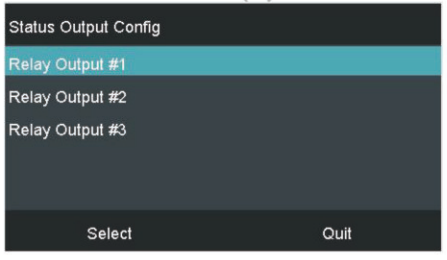
-The external wiring of the corresponding digital IN3+ is described in the chapter "5.1.6 Digital input".

When enabling abnormal signal alarm, when the corresponding IN3+input is the selected level signal, an abnormal alarm signal will appear; when enabling abnormal shutdown, the equipment will shut down when the alarm signal appears. See the figure below for abnormal alarm signal.



4.4.6 Status output configuration

When selecting the external control mode, the output of 3 relays can be configured. Please refer to "5.1.5 Relay output" for the specific wiring method of relay output.



-The status output configuration page is shown in the figure above, and [1# relay output] is selected by default.

-Click the up and down buttons to switch among the four different setting items, and click [Select] to show the corresponding setting page.

-Click the [Quit] function key to return to the main page of external control configuration.

4.4.6.1 #1 Relay status



- Click the up and down buttons to switch between no-trigger and start/stop trigger settings (high level for start, low level for stop).

- When there is no trigger, the relay maintains the initial power off state, the normally open contact is open, and the normally closed contact is closed

- When the start stop trigger is selected, when the equipment is started by external control, the relay coil is powered on, the corresponding normally open contact is closed, and the normally closed contact is disconnected. When the equipment stops, the relay coil is powered off, the normally open contact is disconnected, and the normally closed contact is closed.

- When you click [Quit] in the above interface, the system will return to the main page of status output configuration without saving the set parameters. Click [Select] to save the current settings and return to the main page of status output configuration.

4.4.6.2 #2 Relay status



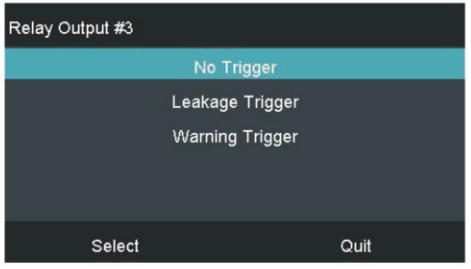
- Click the up and down buttons to switch between no-trigger and direction trigger settings (high level for clockwise, low level for counterclockwise).

- When there is no trigger, the relay maintains the initial power off state, the normally open contact is open, and the normally closed contact is closed

- When the direction trigger is selected, when the equipment conducts direction control through external control, the relay coil is energized when it operates clockwise, the corresponding normally open contact is closed, and the normally closed contact is open. When operating in the counterclockwise direction, the relay coil is powered off, the normally open contact is disconnected, and the normally closed contact is closed.

- When you click [Quit] in the above interface, the system will return to the main page of status output configuration without saving the set parameters. Click [Select] to save the current settings and return to the main page of status output configuration.

4.4.6.3 #3 Relay status



- Click the up and down buttons to switch among no-trigger, leakage trigger, and alarm trigger settings.

- When there is no trigger, the relay maintains the initial power off state, the normally open contact is open, and the normally closed contact is closed

- When liquid leakage trigger is selected, when the equipment conducts direction control through external control, the relay coil is powered on when liquid leakage alarm occurs, the corresponding normally open contact is closed, and the normally closed contact is disconnected. When there is no leakage alarm, the relay coil is powered off, the normally open contact is disconnected, and the normally closed contact is closed.

- When the alarm trigger is selected, when the equipment conducts direction control through external control, the relay coil is energized when an abnormal alarm occurs (see 6.3 for specific alarm information), the corresponding normally open contact is closed, and the normally closed contact is open. When there is no alarm, the relay coil is powered off, the normally open contact is disconnected, and the normally closed contact is closed.

- When you click [Quit] in the above interface, the system will return to the main page of status output configuration without saving the set parameters. Click [Select] to save the current settings and return to the main page of status output configuration.

4.5 System settings

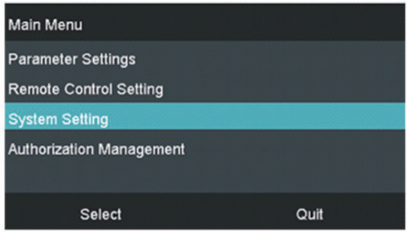
The functions and logic described in this chapter are as follows:

●Category of system setting items.

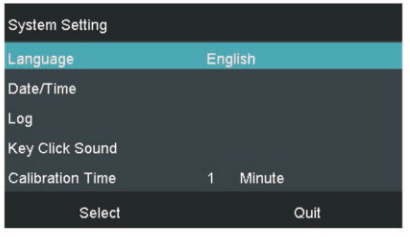
●Methods for setting of each setting item.

●Setting range of each setting item.

1)In the main menu page, click the [▲][▼] buttons to select the system settings, and click [Select] to show the main page of system settings.



2)The main page of system settings is as follows:



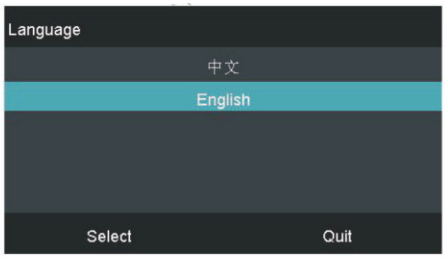
- Enter the main page of system settings, from top to bottom are [Language], [Date/Time], [Log], [Key tone], [Calibration time], [Firmware upgrade], [Factory Reset], and [About]. After entering this menu, the default selected item is [Language].

3) Press [▲][▼] buttons to select the corresponding setting object and press [Select] to set the corresponding parameters.

4) In the related operations on the system settings page, the [MAX], [MODE], [Direction], [▲][▼] buttons are disabled.

5) In the related operations on the system settings page, click the [Home] button to return to the operation main page.

4.5.1 Language selection

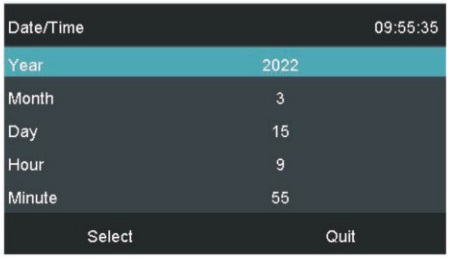


-After entering the language selection page, the options available from top to bottom are: Chinese, English.

-Use the up and down buttons to move to the corresponding language option, click [Select] to select it, then the page returns to the main page of system settings, and the corresponding selection is saved in the system.

-If you click the [Quit] button, the system will abandon this selection and return to the main page of system settings.

4.5.2 Date/Time



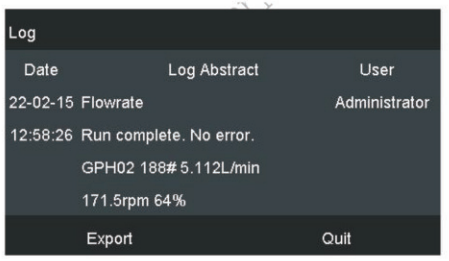
-After entering the date/time setting item, the page is as shown above.

-Click [Select] to select year, month, day, hour and minute. Click the up and down buttons to set the corresponding value.

-After setting, click [Quit] to exit to the main page of system settings and save the settings at the same time.

4.5.3 Log

-Click the up and down buttons on the panel to select the log, and then click [Select] to show the main page of the log:



-The main page of the log is shown in the figure above, with three columns in total, in which the date, parameter, and user are displayed from left to right.

-The left side of the key information is Export, and the right side is Exit.

-Use the up and down buttons to select different logs, and then click [Export] to export the logs. If a U-disk is inserted into the device, the logs will be stored in the U-disk in CVS format; if the device is connected to a thermal printer through the 232 interface, the logs will be exported through the printer.

-If you click the [Quit] button, the page will return to the main page of system settings.

-For the display of parameter information, due to the limitation of screen size, only such information as mode, pump head and hose is displayed on the screen, but the saved and exported log information covers the following information:

- Report
- 1. Model: current equipment model
- 2. Serial number: current equipment serial number
- 3. User: current operation user

- 4. Control mode: current operation mode, internal control, external control and communication mode

- 5. Category: flow, quantitative, calibration, password, factory reset, calibration coefficient

- 6. Pump head: current pump head parameters

- 7. Hose: current hose parameters

- 8. Flow: current flow parameters

- 9. Calibration coefficient: display the calibration coefficient of the current mode

- 10. Speed: current speed parameter

- 11. Full speed ratio: current full speed ratio parameter

- 12. Error message: see 6.3 Error code comparison table for specific information of current error message code (if any)

- 13. Generation time: device time for log generation

- 14. Print time: the device time when the log is printed

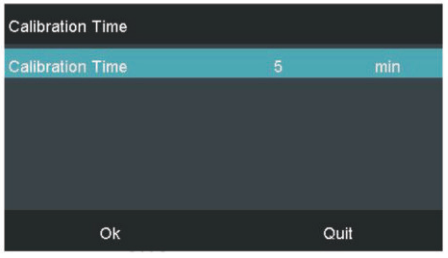
- 15. Printer: the operation account when printing the log

4.5.4 Key tone

-Use the up and down buttons to select the key tone, and click [Select] to switch between enabled and disabled.

-Tick means enabled, and no icon means disabled.

4.5.5 Calibration time setting



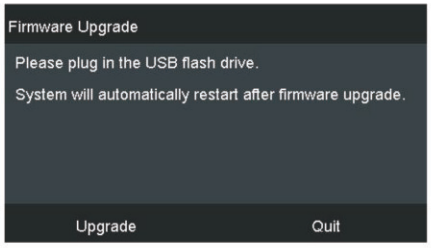
-After entering the calibration time setting page, the displayed content includes: calibration time, time value of calibration operation, and unit of operation time, as shown in the figure above.

-The unit is fixed to minutes. The user can click the up and down buttons to increase and decrease the time value, and the time setting range is 1-5, totaling five levels.

-Click [OK] to return to the main page of system settings, and the corresponding selection will be saved in the system. If you click [Quit], the system will abandon this selection and return to the main page of system settings.

4.5.6 Firmware upgrade

When the firmware needs to be upgraded, save the firmware upgrade file .bin to the root directory of a U-disk, insert the U-disk into the USB interface on the backboard of the device (the rear cover needs to be opened), and perform upgrading on the firmware upgrade page in the system settings.

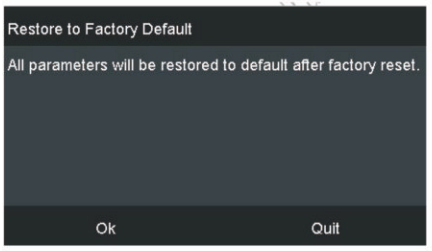


-After entering the Firmware Upgrade page, it prompts "Please insert the U disk, the machine will restart automatically after the firmware upgrade."

-Click [Upgrade] to upgrade the firmware and restart the machine.

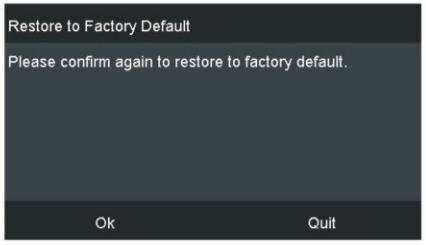
-If you click [Quit], the system will abandon this upgrade and return to the main page of system settings.

4.5.7 Factory reset



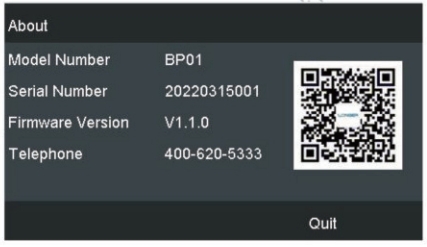
-After entering the Factory Reset page, it will display "After restoring factory settings, all setting parameters will be restored to the factory default values."

-After you click [Select], the page will show the reconfirmation prompt page (see the figure below). If you click [Quit], the system will abandon this selection and return to the main page of system settings.



-On the factory reset reconfirmation page as shown in the figure above, click the [Reconfirm] button, the system will restore the parameters to the factory settings, and the system will restart at the same time. See [6.1 Default parameters] for the factory default values; click [Quit] to return to the main page of system settings.

4.5.8 About



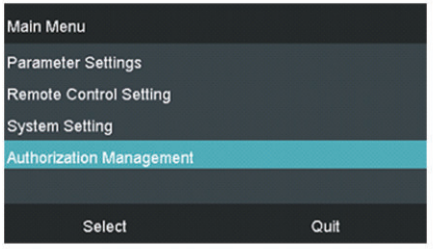
-After entering the About page, the display area displays from top to bottom: product model, serial number, firmware version, service hotline, QR code of Longer′ s public account (through which you can view all product information and download product manuals).

-The function button below is only [Quit]; click [Quit] to return to the main page of system settings.

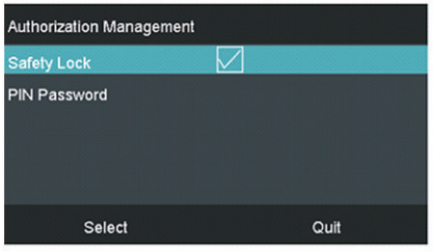
4.6 Authority management

Please refer to "6.2 Definition of three-level authority scope" for definitions of different user authorities.

1)On the main page, click [Menu] to show the main menu page, then select Authority Management and click [Select] to show the main page of authority management.



2)After entering authority management, the main page of authority management is shown in the figure below. From top to bottom are security lock, PIN password protection, and password login.



3)In the related operations on the authority management page, the [MAX], [MODE], [Direction], [Start/Stop] buttons are disabled.

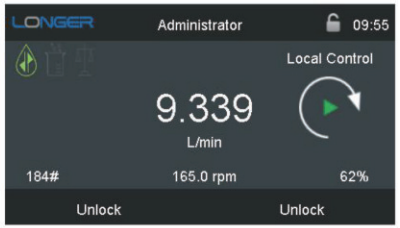
4)In the related operations on the authority management page, click the [Home] button to return to the operation main page.

4.6.1 Security lock setting

-Click the up and down buttons on the panel to select the security lock for setting.

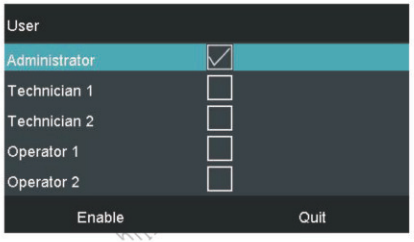
-If the current item is enabled (the corresponding line is followed by √), the prompt message on the bottom left of the screen is Disable. If the current item is disabled (no icon), the prompt message on the bottom left of the screen is Enable.

-When the security lock function is enabled (the corresponding line is followed by √), once the instrument is running (the function starts 20 seconds after the device is started), the security lock icon in the upper right corner of the main page becomes the locked state, and the device can only be unlocked by clicking the two unlock buttons on the left and right at the same time. As shown below:



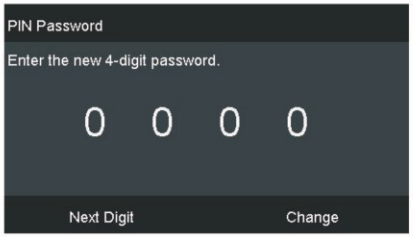
4.6.2 PIN password protection setting

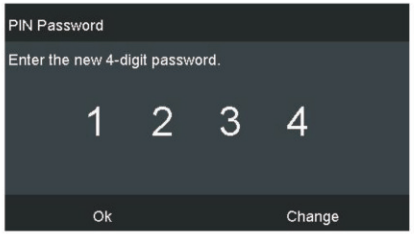
-Press the up and down buttons to select PIN password protection, and click [Select] to show the main page of PIN password protection, as follows:



-Click the up and down buttons to select the user authority to be set, and then click [Select] to show the password setting step. If the current user is in the enabled state (✓), the lower left function button will display [Disable].

-The specific steps for password setting are as follows:





-Click the up and down buttons to scroll the current digit (from 0-9), and after it is selected, click [Next digit] to select the next digit; after all the four digits are input, the buttons below will change to Confirm and Change. If you click Confirm, the page returns to the main page of PIN password protection. If you click Change, the four numbers will be cleared for resetting.

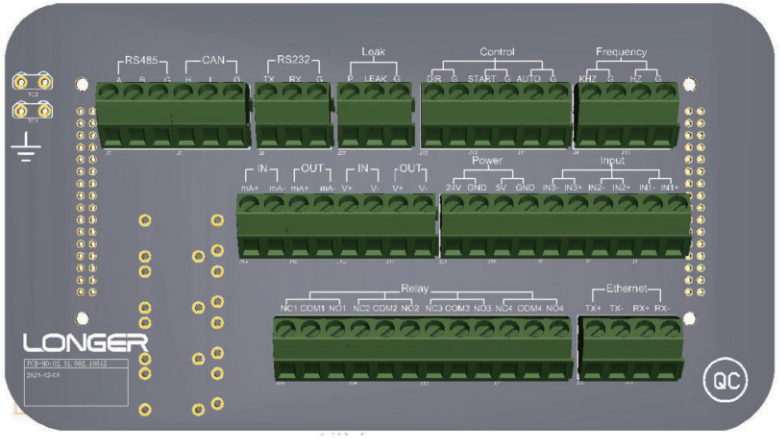
-When switching between technician, operator, and administrator, it is necessary to restart the device and enter the user selection page, click [Yes] to show the login page, and enter the corresponding password to show the main page.

4.6.3 Password Login

After the password login is enabled, you need to select the account and enter the password to enter the main page of the traffic mode each time you start up; If it is not enabled, you can directly enter the main page of traffic mode after starting.

5 Terminal board interface description

The top row of terminals on the terminal board (viewed from top to bottom) are RS485, CAN, RS232, liquid leakage detection, direction control, start/stop control, manual/automatic switching, frequency output 1, and frequency output 2 from left to right. The middle row of terminals on the terminal board are 4-20mA input, 4-20mA output, 0-10V input, 0-10V output, 24V output, 5V output, signal input 3, signal input 2, and signal input 1 from left to right.



The details are as follows:

Terminal number	Terminal definition	Terminal description	Remarks
J7	RS485	3 terminals: A (RS485 bus A), B (RS485 bus B), G (digital signal earthing), respectively	
J9	CAN	3 terminals: (CAN bus H), L (CAN bus L), G (digital signal earthing), respectively	Reserved
J8	RS232	3 terminals: TX (RS232 sending), RX (RS232 receiving), G (digital signal earthing), respectively	

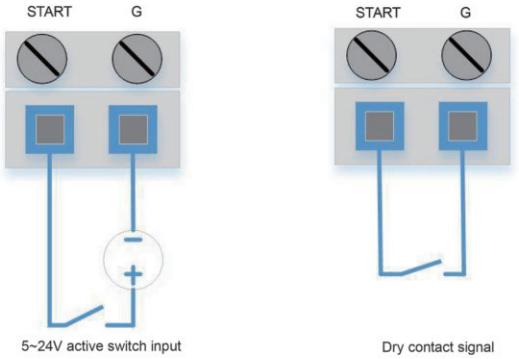
Terminal number	Terminal definition	Terminal description	Remarks
J22	24V output	2 terminals: 24V (positive terminal of 24V power), G (power earthing)	The power output is 24V/50mA
J18	5V output	2 terminals: 5 V (positive terminal of 5 V power), G (power earthing)	The power output is 5V/50mA
J3	Signal input 3	2 terminals: IN3- (negative terminal of signal), IN3+ (positive terminal of signal)	Reserved, input allowed 1、 TTL level signal 2、 Frequency signal, frequency amplitude≤5V, frequency≤10Khz
J2	Signal input 2	2 terminals: IN2-(negative terminal of signal), IN2+ (positive terminal of signal)	Reserved, dry contact
J1	Signal input 1	2 terminals: IN1-(negative terminal of signal), IN1+ (positive terminal of signal)	External trigger signal such as foot switch can be used

The last row of terminals on the interface terminal board (viewed from top to bottom) are relay 1, relay 2, relay 3, relay 4, Ethernet signal sending terminal, and Ethernet signal receiving terminal from left to right. The details are as follows:

Terminal number	Terminal definition	Terminal description	Remarks
J26	Ethernet signal sending terminal	2 terminals: TX+ (positive terminal of sending signal), TX- (negative terminal of sending signal)	
J27	Ethernet signal receiving terminal	2 terminals: RX+ (positive terminal of receiving signal), RX- (negative terminal of receiving signal)	

5.1 Digital signal wiring diagram

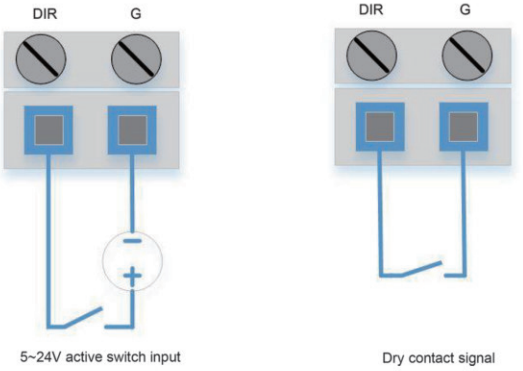
5.1.1 Start/stop control



J12	Direction control	2 terminals: START (Signal input), G (digital signal earthing), respectively	Start stop control wiring for external control mode;5~24V active switch input or dry contact signal

The signal source input uses 5-24V safe voltage.

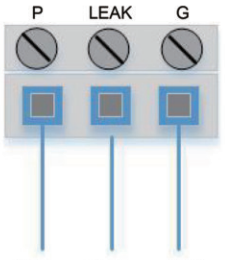
5.1.2 Direction control



J13	Start/stop control	2 terminals: DIR (Signal input), G (digital signal earthing), respectively	Direction control wiring for external control mode;5~24V active switch input or dry contact signal

The signal source input uses 5-24V safety voltage.

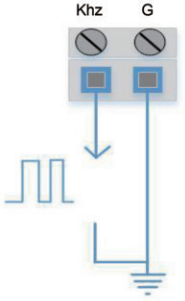
5.1.3 Liquid leakage detection



Liquid leakage sensor wiring

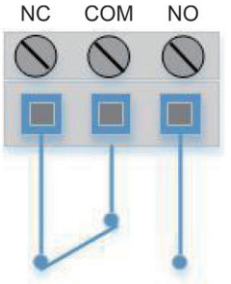
J25	Liquid leakage detection	3 terminals: P (Output + 5V, providing power for the sensor), LEAK (detection output), G (digital signal earthing), respectively	For external leakage sensor wiring, J25 terminals P, LEAK and G are respectively connected with VCC (red) OUT (yellow) GND (blue) of the leakage sensor (optional),The high level output of the leakage sensor represents leakage.

5.1.4 Frequency output



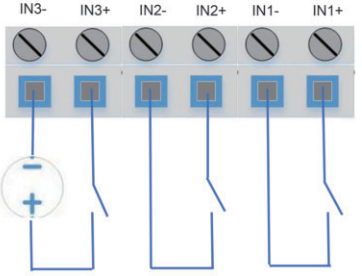
J4	Frequency output 1	2 terminals: KHZ, G (digital signal earthing), respectively	The output function used for the frequency corresponding to the speed,1rpm corresponds to 12hz Frequency⩽10Khz,amplitude⩽5V
J10	Frequency output 2	2 terminals: HZ, G (digital signal earthing), respectively	Reserved

5.1.5 Relay output



J20	Relay 1	3 terminals: NC1 (normally closed contact), COM1 (common terminal), NO1 (normally open contact), respectively	Wiring for status output of external control mode; The maximum switching voltage of relay contact is 250VAC 30DC; Maximum switching power 1 250VA/150W.
J24	Relay 2	3 terminals: NC2 (normally closed contact), COM2 (common terminal), NO2 (normally open contact), respectively	
J19	Relay 3	3 terminals: NC3 (normally closed contact), COM3 (common terminal), NO3 (normally open contact), respectively	

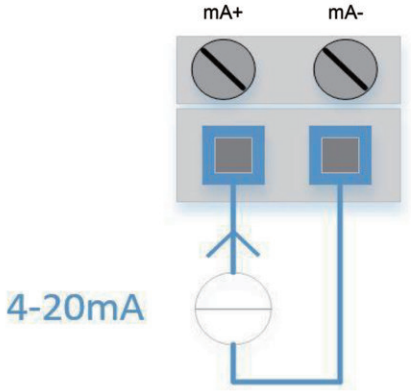
5.1.6 Digital input



J3	Digital input	terminals: IN3- IN3+	terminals: IN3- IN3+	5V/20mA (MAX) active switch input, For abnormal signal input, the external signal and equipment shall be grounded together.
J2	Digital input	terminals: IN2- IN2+	terminals: IN2- IN2+	Dry contact signal, Reserved signal.
J1	Digital input	terminals: IN1- IN1+	terminals: IN1- IN1+	Dry contact signal, which can be connected to foot switch for start stop control, and pulse trigger start stop state.

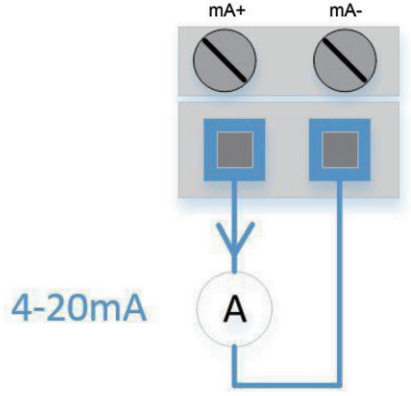
5.2 Analog wiring diagram

5.2.1 4-20mA input



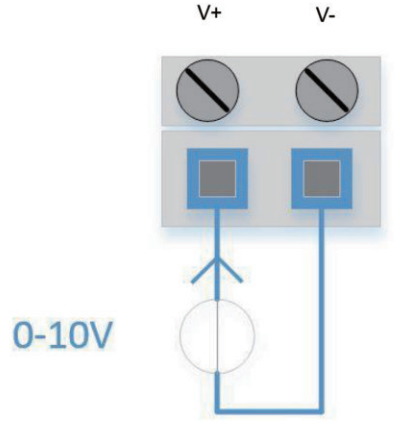
J14	4-20mA input	2 terminals: mA+ (4-20mA positive input), mA- (4-20mA negative input), respectively	Input terminal of analog current input or flow sensor for external control.

5.2.2 4-20mA output



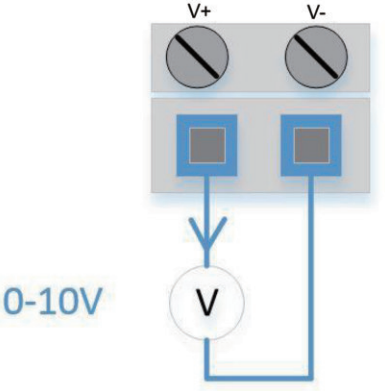
J16	4-20mA output	2 terminals: mA+ (4-20mA positive output), mA- (4-20mA negative output), respectively	Applied to the output function of analog current corresponding to speed;Output load ⩽1KΩ

5.2.3 0-10V input



J15	0-10V input	2 terminals: V+ (0-10V positive input), V- (0-10V negative input), respectively	Analog voltage input for external control

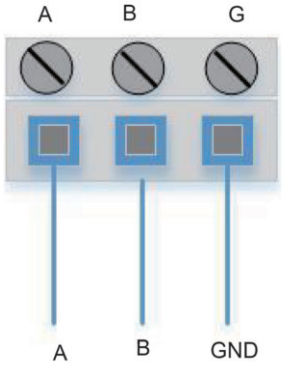
5.2.4 0-10V output



J17	0-10V output	2 terminals: V+ (0-10V positive output), V- (0-10V negative output), respectively	Used for speed corresponding analog voltage output function

5.3 Wiring diagram of communication interface

5.3.1 RS485 wiring diagram



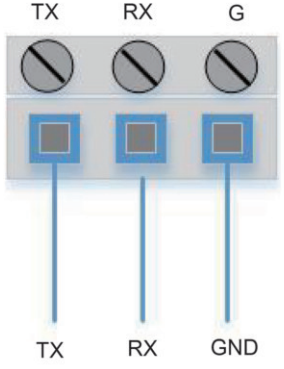
RS485 wiring

RS485 communication mode supports Modbus protocol. For details, refer to "6.4 Modbus Register Definition for Device Control".

It can also be externally connected with 485 to profibus module (optional) to support profibus communication.

5.3.2 RS232 wiring diagram

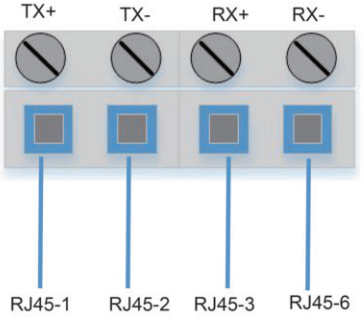
The RS232 function can be used to connect the log printing function of the thermal printer. For specific wiring, see the printer interface description



RS232 wiring

5.3.3 Ethernet Wiring Diagram

The Ethernet communication function supports the Modbus protocol. For details, refer to "6.4 Modbus Register Definition for Device Control". The corresponding relationship with RJ45 pin wiring is shown in the



Ethernet Wiring Diagram

6 Appendixes

6.1 Default parameters

Parameters	Default value	Parameters	Default value
Language	Not set	Key tone	Disabled
Default mode	Flow mode	Baud rate	9600
Default speed	165rpm	Parity bit	None
Running state	Stop	Stop bit	1
Maximum speed	265rpm	DHCP	Prohibit
Direction	Clockwise	Port	502
Pump head	GPH01	IP address	192.168.0.2
Hose specification	#184	Subnet mask	255.255.0.0
Hose material	Silicone hose	Gateway	192.168.0.1
Calibration coefficient	1	Remote start/stop input	High=Stop
Flow unit	L/min	Leakage detector input	High=Leakage
Filling amount	9.339L	Output 1 status	No trigger
Cycle index	5 cycles	Output 2 status	No trigger
Interval time	5s	Output 3 status	No trigger
Calibration time	5min	Liquid leakage detection	Disabled
Keyboard lock	Disabled	User	Administrator
Analog signal type	mA	Password	1234

Analog scaling type	mA
Analog minimum current	4mA
Analog maximum current	20mA
Analog minimum current speed/rpm	0rpm
Analog maximum current speed/rpm	265rpm

Password input	Enable
Abnormal alarm	Unable
Abnormal shutdown	Unable
Abnormal signal state	High level

6.2 Definition of three-level authority scope

Function	Administrator	Technician	Operator	Remarks
Start/stop operation	•	•	•	In the case of function operation with no authority assigned, the relevant page will be displayed, but it will prompt "No authority assigned" when performing the operation.
Mode selection	•	•		
MAX button operation	•	•	•	
Calibration function	•	•		
Log export	•			
Communication setting	•			
External control configuration	•			
Authority switching	•			
Firmware upgrade	•			
Language switching	•			
Security lock	•	•		
Key tone	•	•		
Parameter setting	•	•		
Password modification	•	•	•	The administrator can modify all user passwords, other roles can only modify their own passwords

6.3 Error code comparison table

Error code	Alarm name	Possible causes	Clear condition
E01	Overcurrent	Overcurrent occurs to the motor winding	Cleared after power off
E02	EEPROM failure	The driver memory chip is abnormal	Cleared after power off
E03	Undervoltage	The power supply of main circuit is undervoltage	Cleared by instructions
E04	Overvoltage	The power supply of main circuit is overvoltage	Cleared by instructions
E05	Encoder failure	The encoder signal is abnormal	Cleared after power off
E08	The disabling of the driver is abnormal	This signal is used for the limit switch, which is to prevent the accident from occurring due to the action of the mechanism exceeding the design range. After the switch is actuated, a signal alarm is given to protect the mechanism from damage due to excessive action.	Cleared by instructions
E09	Location out of tolerance	The error of the actual position of the motor from the position of the following instruction exceeds the set value (Pb32)	Cleared by instructions
E10	Speed PID saturation	When the deviation exists for a long time, the integral control action in the controller will cause the problem of excessive integral	Cleared by instructions
E11	Overspeed	The motor speed exceeds the normal speed	Cleared by instructions
E14	The motor current is too high	1. Check whether the motor wiring is in good condition, whether there is damage, and whether the motor wire and encoder wire are connected correctly 2. Whether the motor is damaged; replace the motor or driver	Cleared after power off

		3. Whether the load is too heavy; disconnect the load for comparison test 4. Whether the instruction acceleration is too large; reduce the acceleration for comparison test	
E15	Motor overload	It is usually caused by excessive motor load; please check the load	Cleared after power off
E16	Thermal overload of motor	Cumulative output power of motor	Cleared by instructions
E18	Brake failure	Temporarily invalid	
E19	Encoder count error	Temporarily invalid	
E21	Z-phase pulse missing	Temporarily invalid	
E31	Liquid leakage	Liquid leakage, level sensor error	
E32	Open cover	The cover is open; sensor error	
E33	Calibration value out of limit	The input value exceeds the limit; the device is abnormal	
E34	Abnormal signal shutdown	When enabling abnormal signal shutdown function, IN3 abnormal signal is detected	

6.4 Modbus register definition

Address	Read and write	Variable	Description	Remarks
0x0001	R/W	Dispersion and transfer control characters	Start/stop: 0 - stop, 1 - start	
0x0008	R/W	Running at maximum speed	Start/stop: 0 - stop, 1 - full speed clockwise, 2 - full speed counterclockwise	Corresponding to the MAX button function
0x0060	R	Dispersion and transfer direction	Running direction.	
0x0062	R/W	Dispersion and transfer parameter type	0 - Liquid volume (weight)/time, 1 - Liquid volume (weight)/Flow, 2 - Flow/time, 3 - Liquid volume (weight)/speed, 4 - Speed/time, 5 - Flow mode, 6 - Liquid volume mode	Types 5-6. Flow/liquid volume mode

0x0063	R/W	Dispersion and transfer volume	0 - 9999	
0x0064	R/W	Dispersion and transfer volume	Unit index value, volume: 1nL, 10nL, 100nL, 1uL, 10uL, 100uL, 1mL, 10mL, 100mL, 1L; weight: 1ug, 10ug, 100ug, 1mg, 10mg, 100mg, 1g, 10g, 100g, 1kg	
0x0067	R/W	Dispersion and transfer volume value	0 - 9999	
0x0068	R/W	Dispersion and transfer volume unit	100 - uL/min, min nL/min, max L/min; 200 - uL/s, min nL/s, max L/s; 300 - uL/hour, min nL/hour, max L/hour	
0x006E	R/W	Dispersion and transfer times	1 - 65535, 0 - infinite	
0x006F	R/W	Dispersion and transfer delay value	1 – 9999, setting range: 0.1s-999.9s	
0x0070	R/W	Dispersion and transfer delay unit	Unit index value, 1ms, 10ms, 0.1s, 1s, 0.1min, 1min, 0.1h, 1h,	
0x0200	R/W	Ethernet enabling	Start/stop: 0 - stop, 1 - start	
0x0201	R/W	DHCP enabling	Start/stop: 0 - stop, 1 - start	
0x0202	R/W	IP address 1	High-order	
0x0203	R/W	IP address 2	Low-order	
0x0204	R/W	Subnet mask 1	High-order	
0x0205	R/W	Subnet mask 2	Low-order	
0x0206	R/W	Gateway address 1	High-order	
0x0207	R/W	Gateway address 2	Low-order	
0x0220	R/W	Date-time - Year	2000 - 2099	
0x0221	R/W	Date-time - Month	1 - 12	
0x0222	R/W	Date-time - Day	1 - 31	
0x0223	R/W	Date-time - Hour	0 - 23	
0x0224	R/W	Date-time - Minute	0 - 59	
0x0225	R/W	Date-time - Second	0 - 59	
0x0226	R/W	Date-time - Day of week	1 - 7	